SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

NOTE: *All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.*
Application
Engine Coolant Air Bleed Pipe Seal
Engine Coolant Manifold Gasket
Engine Coolant Thermostat
Engine Coolant Thermostat Housing Gasket
Engine Coolant Thermostat Housing Seal
Engine Oil Cooler Seal
Exhaust Gas Recirculation Manifold Cooling Feed Pipe Gasket
Exhaust Gas Recirculation Manifold Cooling Feed Pipe Seal
Exhaust Gas Recirculation Manifold Cooling Return Pipe Gasket
Thermostat Bypass Pipe Gasket
Thermostat Bypass Pipe Seal
Turbocharger Coolant Feed Pipe Gasket
Turbocharger Coolant Return Pipe Gasket
Water Pump Gasket
Water Pump Outlet Pipe Gasket

Reusable Threaded Fastener Tightening Specifications

Note: All fasteners listed in this table can be reused after removal.	
Application	**Specification Metric (English)**
Air Conditioning Evaporator Hose Bracket Bolt	10 N.m (89 lb in)
Coolant Air Bleed Pipe Bolt (LC8, L96)	12 N.m (106 lb in)
Coolant Heater (LV3, L83)	50 N.m (37 lb ft)
Coolant Heater (L5P)	60 N.m (44 lb ft)
Engine Coolant Fan Bolt (L8B)	6.5 N.m (58 lb in)
Engine Coolant Fan Bracket Bolt (L8B)	25 N.m (18 lb ft)
Engine Coolant Fan Rear Fan Shroud Bolt (L83, L86, LV3)	7 N.m (62 lb in)

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Note: All fasteners listed in this table can be reused after removal.	
Application	**Specification Metric (English)**
Engine Coolant Fan Shroud Bolt (L5P)	8 N.m (71 lb in)
Engine Coolant Heater Pump Bracket Bolt (L8B)	9 N.m (80 lb in)
Engine Coolant Manifold Bolt (LV3, L83, L8B)	25 N.m (18 lb ft)
Engine Coolant Thermostat Housing Bolt (LV3, L8B, L83)	10 N.m (89 lb in)
Engine Coolant Thermostat Housing Bolt (LC8, L96)	15 N.m (11 lb ft)
Engine Coolant Thermostat Housing Bolt (L5P)	25 N.m (18 lb ft)
Engine Coolant Thermostat Housing Nut (L5P)	25 N.m (18 lb ft)
Engine Oil Cooler Bolt (L5P)	25 N.m (18 lb ft)
Engine Oil Cooler Nut (L5P)	25 N.m (18 lb ft)
Engine Wiring Harness Bracket Bolt (L5P)	9 N.m (80 lb in)
Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt (L5P)	10 N.m (89 lb in)
Exhaust Gas Recirculation Manifold Cooling Return Pipe Bolt (L5P)	10 N.m (89 lb in)
Fan Blade Clutch Nut (L5P)	100 N.m (74 lb ft)
Fan Blade Nut (L5P)	9 N.m (80 lb in)
Fan Clutch (LC8, L96)	100 N.m (74 lb ft)
Fan Clutch Bolt (LC8, L96)	23 N.m (17 lb ft)
Fan Pulley Bolt	41 N.m (30 lb ft)
Fan Pulley Nut	41 N.m (30 lb ft)
Radiator Bolt @ Charge Air Cooler (L5P)	20 N.m (15 lb ft)
Radiator Outlet Hose Clamp (L5P)	5.5 N.m (49 lb in)
Radiator Surge Tank Bolt (L8B)	9 N.m (80 lb in)
Radiator Surge Tank Inlet Hose Bracket Bolt (Large, L5P)	22 N.m (16 lb ft)
Radiator Surge Tank Inlet Hose Bracket Bolt (Small, L5P)	9 N.m (80 lb in)
Radiator Upper Mount Bracket Bolt (LC8, L5P, L96)	25 N.m (18 lb ft)
Surge Tank Bolt (LC8, L5P, L96)	9 N.m (80 lb in)
Surge Tank Bolt (L83, L86, LV3)	10 N.m (89 lb in)
Surge Tank Nut (LC8, L96)	9 N.m (80 lb in)
Surge Tank Nut (L83, L86, LV3)	10 N.m (89 lb in)
Thermostat Bypass Pipe Bolt (L5P)	25 N.m (18 lb ft)
Turbocharger Coolant Feed Pipe Bolt (Large, L5P)	25 N.m (18 lb ft)
Turbocharger Coolant Feed Pipe Bolt (Small, L5P)	10 N.m (89 lb in)
Turbocharger Coolant Return Pipe Bolt (L5P)	10 N.m (89 lb in)
Water Outlet Bolt (L5P)	25 N.m (18 lb ft)
Water Pump Bolt (LV3, L8B, L83)	10 N.m (89 lb in)
Water Pump Bolt (L96, LC8)	

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Note: All fasteners listed in this table can be reused after removal.	
Application	**Specification Metric (English)**
First Pass:	15 N.m (11 lb ft)
Final Pass:	30 N.m (22 lb ft)
Water Pump Bolt (L5P)	25 N.m (18 lb ft)
Water Pump Nut (L5P)	25 N.m (18 lb ft)
Water Pump Outlet Pipe Nut (L5P)	25 N.m (18 lb ft)
Water Pump Outlet Pipe Stud (L5P)	9 N.m (80 lb in)

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	**US English**
Cooling System		
• 4.3L (LV3)	15.1 L	16.0 qt
• 5.3L (L8B)	16.4 L	17.3 qt
• 5.3L (L83)	16.0 L	16.9 qt
• 6.0L (LC8 L96 with MYD)	15.4 L	16.3 qt
• 6.0L (L96 with MQ7)	16.3 L	17.1 qt
• 6.2L (L86)	16.0 L	16.9 qt
• 6.6L (L5P)	29.8 L	31.5 qt

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	**Canada**
Extended Life Coolant Leak Detection Dye	Dye	89022219	89022220
DEX-COOLÂ®	Coolant	12346290	10953464

SCHEMATIC WIRING DIAGRAMS

ENGINE HEATING/COOLING WIRING SCHEMATICS

Dual Fan (1500)

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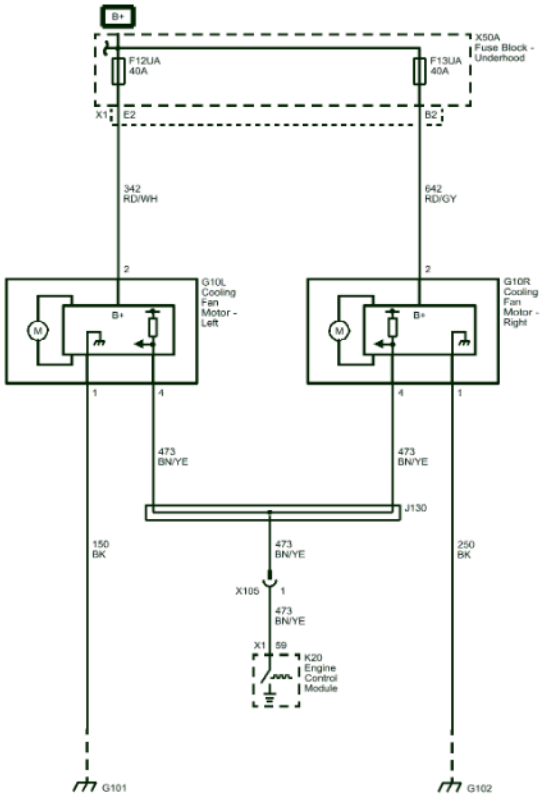

Fig. 1: Dual Fan (1500)
Courtesy of GENERAL MOTORS COMPANY

Single Clutch (L5P)

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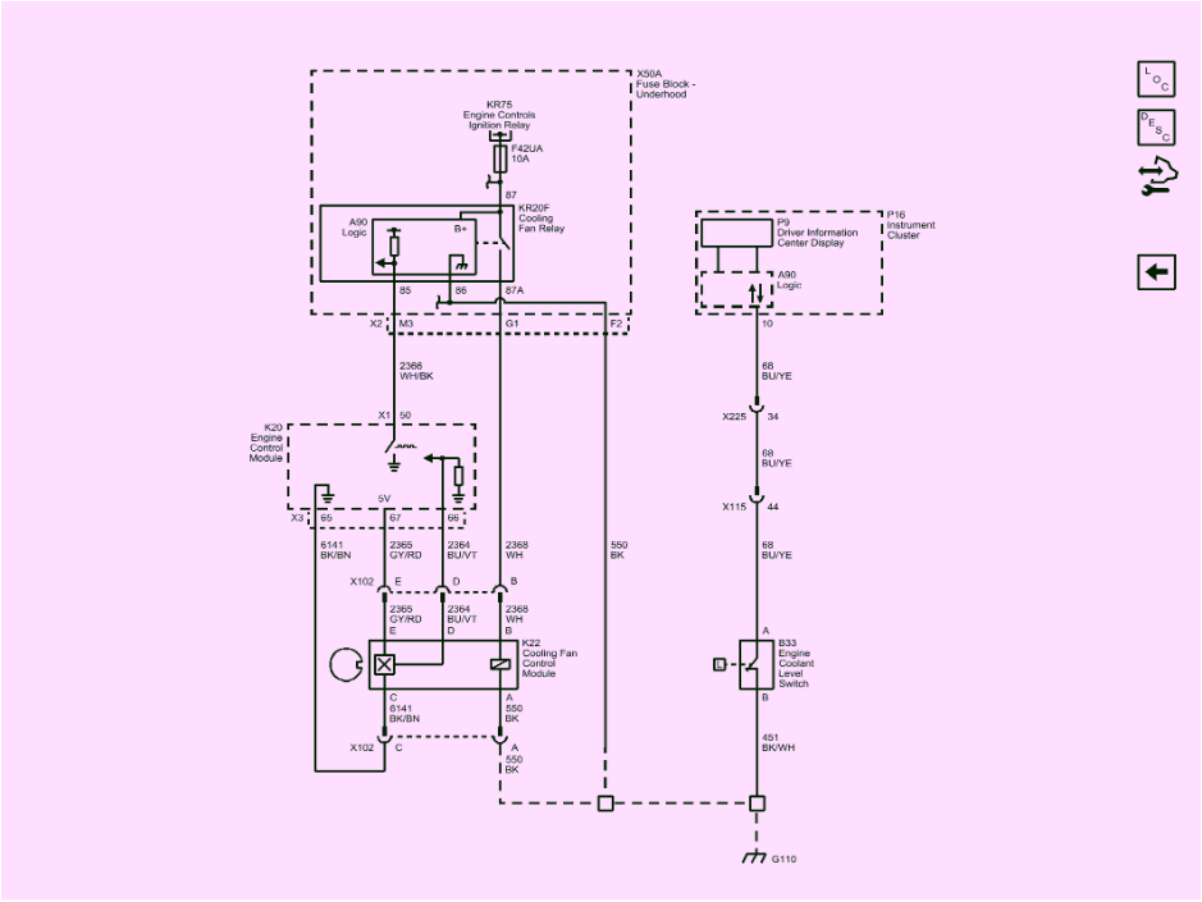

Fig. 2: Single Clutch (L5P)
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0480, P0691, OR P0692: COOLING FAN SPEED OUTPUT (L83, L86, L8B, LV3)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0480

Cooling Fan Speed Output Circuit

DTC P0691

Cooling Fan Speed Output Circuit Low Voltage

DTC P0692

Cooling Fan Speed Output Circuit High Voltage

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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
G10L Cooling Fan Motor - Left Ignition Voltage	1	2	-	-
G10L Cooling Fan Motor - Left Ground	-	-	-	-
G10L Cooling Fan Motor - Left Control	P0691 or 2	P0480 or 2	P0692 or 2	-
G10R Cooling Fan Motor - Right Ignition Voltage	3	4	-	-
G10R Cooling Fan Motor - Right Ground	-	-	-	-
G10R Cooling Fan Motor - Right Control	P0691 or 4	P0480 or 4	P0692 or 4	Â

1. Opens left cooling fan fuse without a DTC.
2. Left fan inoperative without a DTC.
3. Opens right cooling fan fuse without a DTC.
4. Right cooling fan inoperative without a DTC.

Circuit/System Description

The engine control module (ECM) commands the speed of the cooling fans based on cooling requirements. The ECM controls the cooling fan speed by commanding the cooling fan control modules. Each cooling fan control module is supplied power through its own fused power circuit. Each cooling fan control module is supplied ground though its own ground circuit. The ECM sends a pulse width modulated (PWM) signal to the cooling fan control module. The cooling fan control module interprets the signal and operates the cooling fans at the commanded speeds.

Conditions for Running the DTC

- The ignition voltage is 11 volts or greater.
- The engine speed is 400 RPM or greater.
- The ECM driver transitions from ON to OFF or from OFF to ON.
- DTCs P0480, P0691, and P0692 run continuously once the above conditions are met.

Conditions for Setting the DTC

The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match for greater than 5 seconds.

Action Taken When the DTC Sets

- DTCs P0480, P0691, and P0692 are Type B DTCs.

Conditions for Clearing the MIL/DTC

- DTCs P0480, P0691, and P0692 are Type B DTCs.

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Diagnostic Aids

- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation (L83, L86, LV1, LV3, or L8B)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

K20 Engine Control Module: Scan Tool Information (L5P) **K20 Engine Control Module: Scan Tool Information (Except Diesel)** for scan tool information

Circuit/System Verification

NOTE: **There is a slight delay before the cooling fans activate.**

1. Engine operating, command the Cooling Fans from 0 % to 90 % with a scan tool.
2. Verify the G10 Cooling Fan Motors activates in each available speed.
   - **The cooling fan does not activate or increase in speed as commanded**

     Refer to Circuit/System Testing

   - **The cooling fan activates and increases in speed as commanded**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
   - **If the DTC sets**

     Refer to Circuit/System Testing

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- **If the DTC does not set**

5. All OK.

Circuit/System Testing

NOTE: **Both cooling fan motors must be disconnected or incorrect diagnosis may result.**

1. Ignition OFF, disconnect the following G10 Cooling Fan Motors.
   - G10L Cooling Fan Motor Left.
   - G10R Cooling Fan Motor Right.
2. Ignition ON, verify that a test lamp illuminates between the following terminals and ground.
   - G10L Cooling Fan Motor Left - terminal 2
   - G10R Cooling Fan Motor Right - terminal 2
   - **If the test lamp does not illuminate and the circuit fuse is good**
   1. Ignition OFF, remove the test lamp and turn all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
   2. Test for less than 2 Ω in the appropriate B+ circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.
   - **If the test lamp does not illuminate and the circuit fuse is open**
   1. Ignition OFF, remove the test lamp and turn all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
   2. Test for infinite resistance between the terminals listed below and ground.
      - G10L Cooling Fan Motor Left - terminal 2.
      - G10R Cooling Fan Motor Right - terminal 2
      - If less than infinite resistance, repair the short to ground in the circuit.
      - If infinite resistance, replace the appropriate G10 Cooling Fan Motor.
   - **If the test lamp illuminates**

NOTE: **The cooling fan speed output circuit is pulled-up to a voltage within the ECM, 3-4 volts on the output circuit is normal.**

3. Ignition OFF, disconnect the following G10 Cooling Fan Motors.
   - G10L Cooling Fan Motor Left
   - G10R Cooling Fan Motor Right
4. Connect a DMM, set on the diode setting, between the following terminals and ground.
   - G10L Cooling Fan Motor Left - terminal 4
   - G10R Cooling Fan Motor Right - terminal 4
5. Ignition ON, verify the DMM reading is greater than 2.5 V or displays O.L. with the cooling fan commanded OFF.
   - **If 2.5 V or less**
   1. Ignition OFF, all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.

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2. Disconnect the K20 Engine Control Module harness connector X1.
3. Test for infinite resistance between the appropriate G10 Cooling Fan Motor control circuit terminal 4 and ground.
    - If less than infinite resistance, repair the short to ground in the circuit.
    - If infinite resistance, replace the K20 Engine Control Module.

- **If greater than 2.5 V or displays O.L.**

6. Command the Cooling Fan ON to 90 % with a scan tool.
7. Verify the DMM reading is less than 1 V.

- **If 1 V or greater**

1. Ignition OFF, disconnect harness connector X1 at the K20 Engine Control Module, ignition ON.
2. Test for less than 1 V between the appropriate G10 Cooling Fan Motor control circuit terminal 4 and ground.
    - If 1 V or greater, repair the short to voltage on the circuit.
    - If less than 1 V.
3. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
4. Test for less than 2 Ω in the G10 Cooling Fan Motor control circuit terminal 4, end to end.
    - If 2 Ω or greater, repair the open/high resistance in the control circuit.
    - If less than 2 Ω, replace the K20 Engine Control Module.

- **If less than 1 V**

8. Test or replace the appropriate G10 Cooling Fan Motor.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Engine Coolant Fan Replacement (L83, L86,LV3)Engine Coolant Fan Replacement (L8B)** for G10 Cooling Fan Motor Replacement.
- **Control Module References** for ECM replacement, setup, and programming

DTC P0483 OR P0493: COOLING FAN SYSTEM (L5P)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0483

Cooling Fan System Performance

Diagnostic Fault Information

Circuit	Short to	Open/High	Short to	Signal

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	Ground	Resistance	Voltage	Performance
Fan Clutch Relay Ground	-	P0483	-	-
Fan Clutch Relay Voltage Supply	P0480, P0483	P0480, P0483	-	-
Fan Clutch Relay Control	P0480	P0480	P0480	-
Fan Speed Sensor Low Reference	-	P0483, P0526	-	-
Fan Speed Sensor 5-Volt Reference	P0526, P06D2	P0526	P0526, P06D2	-
Fan Speed Sensor Signal	P0526	P0526	P0526	-
Fan Clutch Solenoid Valve Ground	-	P0483	-	-
Fan Clutch Solenoid Valve Control	P0480	P0483	P0483, P0495	-

Circuit/System Description

The cooling fan relay sends a pulse width modulated (PWM) signal of 12-14 volts to the cooling fan clutch through the cooling fan clutch solenoid voltage control circuit. The cooling fan relay varies the voltage drop across the cooling fan clutch solenoid in relation to a pulse width modulated signal from the ECM in order to control the speed of the cooling fan. The signal controls the position of the oil control valve inside the cooling fan clutch housing.

Conditions for Running the DTC

- DTC P0016, P007C, P007D, P0112, P0113, P0117, P0118, P0335, P0336, P0340, P0341, P0480, P0495, or P0526 is not set.
- The engine is operating for greater than 10 seconds.
- The engine speed is between 200-5,320 RPM.
- The BARO is greater than 75 kPa.
- The engine coolant temperature is warmer than 70Â°C (158Â°F).
- The intake air temperature is warmer than -7Â°C (19Â°F).
    - The ambient air temperature is warmer than -7Â°C (19Â°F)
- The ECM commanded fan duty cycle is greater than 15 percent.
- The cooling fan input shaft speed is steady.
- DTC P0483 runs continuously every 100 mS when the conditions above exist.

Conditions for Setting the DTC

- The difference between the desired and the actual cooling fan speeds is 2000 RPM or greater.
- The condition exists for 1 minute.

Action Taken When the DTC Sets

DTC P0483 is a Type B DTC.

Conditions for Clearing the DTC

DTC P0483 is a Type B DTC.

Reference Information

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Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

Description and Operation

Cooling Fan Description and Operation (L5P)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition OFF, inspect the cooling fan and the drive belt for the following conditions:
   - A loose, worn, or mis-routed drive belt
   - Oil leaks at the cooling fan clutch
   - A free-spinning cooling fan
   - A seized cooling fan clutch
   - A broken cooling fan
   - **If a condition is found**

     Repair as necessary.

   - **If a condition is not found**
2. Ignition ON.
3. Verify DTC P0480 or P0526 is not set.
   - **If a DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **If no DTC is set**
4. Operate the engine at 1,500 RPM while slowly commanding the Cooling Fan from 10 % to 80 %, then return to 10 % with a scan tool. Observe the difference between the scan tool Fan Speed and Desired Fan Speed parameters throughout the test.
5. Verify the difference between the parameters is less than 500 RPM throughout the speed transition.

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- **If not within 500 RPM**

  Refer to Circuit/System Testing.

- **If within 500 RPM**

6. Verify DTC P0483 is not set.
   - **If the DTC sets**

     Refer to Circuit/System Testing

   - **If no DTC is set**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
8. Verify that P0483 does not set.
   - **If the DTC sets**

     Refer to Circuit/System Testing

   - **If no DTC is set**
9. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the KR20F Cooling Fan Relay.
2. Test for less than 5 Ω between the fan relay ground circuit terminal 6 and ground.
   - **If 5 Ω or greater**
   1. Test for less than 2 Ω in the ground circuit end to end
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If less than 5 Ω**
3. Disconnect the harness connector at the cooling fan clutch solenoid valve.
4. Test for less than 5 Ω between the fan clutch solenoid valve ground circuit terminal A and ground.
   - **If 5 Ω or greater**
   1. Test for less than 2 Ω in the ground circuit end to end
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If less than 5 Ω**
5. Install the KR20F Cooling Fan Relay.
6. Connect a test lamp between the cooling fan clutch solenoid valve control circuit terminal B and ground, engine running.
7. Verify a test lamp illuminates and flashes ON and OFF while commanding the Cooling Fan Solenoid Valve to 50 % with a scan tool.
   - **If the test lamp does not illuminate**
   1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.

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2. Test for infinite resistance between the control circuit terminal B and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance.
3. Test for less than 2 Ω between the solenoid valve control circuit terminal B and the cooling fan relay terminal 4.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the KR20F Cooling Fan Relay.

- **If the test lamp illuminates without flashing**

1. Ignition OFF, disconnect the KR20F Cooling Fan Relay, ignition ON.
2. Test for less than 1 V between the solenoid valve control circuit terminal B and ground.
    - If greater than 1 V, repair the short to voltage on the circuit.
    - If less than 1 V, replace the KR20F Cooling Fan Relay.

- **If the test lamp flashes**

8. Test or replace the cooling fan clutch assembly.

Component Testing

EV Fan Clutch Solenoid Valve Test-Static

1. Disconnect the harness connector at the cooling fan clutch.
2. Test for 7-17 Ω between terminal B and terminal A of the jumper harness connector.
    - **If not within specified range**
    1. Replace the Fan Clutch Assembly
    - **If within specified range**
3. Test for infinite resistance between the jumper harness terminals listed below.
    - B and C
    - B and D
    - B and E
    - B and the fan clutch housing/ground
    - **If less than infinite**
    1. Repair or replace the jumper harness.
    - **If infinite**
    1. Replace the Fan Clutch Assembly

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fan Blade Clutch Replacement (LC8, L96)Fan Blade Clutch Replacement (L5P)**
- **Control Module References** for replacement, setup, and programming

DTC P0495: COOLING FAN SPEED TOO HIGH (L5P)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

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- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0495

Cooling Fan Speed Too High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fan Clutch Relay Ground	-	P0483	-	-
Fan Clutch Relay Voltage Supply	P0480, P0483	P0480, P0483	-	-
Fan Clutch Relay Control	P0480	P0480	P0480	-
Fan Speed Sensor Low Reference	-	P0483, P0526	-	-
Fan Speed Sensor 5-Volt Reference	P0526, P06D2	P0526	P0526, P06D2	-
Fan Speed Sensor Signal	P0526	P0526	P0526	-
Fan Clutch Solenoid Valve Ground	-	P0483	-	-
Fan Clutch Solenoid Valve Control	P0480	P0483	P0483, P0495	-

Circuit/System Description

The cooling fan relay sends a pulse width modulated (PWM) signal of 12-14 volts to the cooling fan clutch through the cooling fan clutch solenoid voltage control circuit. The cooling fan relay varies the voltage drop across the cooling fan clutch solenoid in relation to a pulse width modulated signal from the ECM in order to control the speed of the cooling fan. The signal controls the position of the oil control valve inside the cooling fan clutch housing.

Conditions for Running the DTC

- DTC P0016, P0112, P0113, P0117, P0118, P0335, P0336, P0340, P0341, P0480, P0483, P0526, P2228, or P2229 is not set.
- The engine is operating for greater than 10 seconds.
- The engine speed is greater than 1,181 RPM.
- The engine OFF time after the previous ignition cycle was greater than 0 seconds.
- The ambient air temperature (AAT) is warmer than -40Â°C (-40Â°F).
- The BARO is greater than 55 kPa.
- The ECM commanded fan duty cycle is less than 45 percent.
- DTC P0495 runs continuously when the conditions above exist.

Conditions for Setting the DTC

- The cooling fan speed is greater than 1,500 RPM for 80 seconds.

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- The clutch fluid pump-out, which is the time it takes for the fan clutch to disengage completely, is greater than a range of 10 minutes at sea level to 52 minutes at elevations of 6,500 ft.

Action Taken When the DTC Sets

DTC P0495 is a Type B DTC.

Conditions for Clearing the DTC

DTC P0495 is a Type B DTC.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation (L5P)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition OFF, verify the fan clutch is not seized or binding.
2. Ignition ON, Verify DTC P0480, P0483, or P0526 is not set.
   - **If a DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **If no DTC is set**
3. Engine idling at operating temperature with all accessories turned OFF, for greater than 10 minutes.

NOTE: **Depending on elevation above sea level it may take up to 52 minutes for the fan clutch to completely disengage.**

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4. Verify DTC P0495 is not set.
    - **If the DTC is set**

      Refer to Circuit/System Testing.

    - **If no DTC is set**
5. Operate the engine at 1,500 RPM for 2 minutes.
6. Verify DTC P0495 is not set.
    - **If the DTC is set**

      Refer to Circuit/System Testing.

    - **If no DTC is set**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
8. Verify DTC P0495 is not set.
    - **If the DTC is set**

      Refer to Circuit/System Testing.

    - **If no DTC is set**
9. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the cooling fan clutch assembly.
2. Connect a test lamp between the cooling fan clutch solenoid voltage control circuit terminal B and ground, ignition ON.

NOTE: **Engine may have to be running to control the Cooling Fan Solenoid Valve.**

3. Command the Cooling Fan Solenoid Valve to 50 % with a scan tool.
4. Verify the test lamp illuminates and flashes ON and OFF
    - **If the test lamp illuminates without flashing**
    1. Ignition OFF, disconnect the KR20F Cooling Fan Relay, ignition ON.
    2. Test for less than 1 V between the Cooling Fan Clutch Solenoid voltage control circuit terminal B and ground.
        - If greater than 1 V, repair the short to voltage on the circuit.
        - If less than 1 V, replace the KR20F Cooling Fan Relay.
    - **If the test lamp flashes**
5. Replace the cooling fan clutch assembly.

Component Testing

Relay Test

1. Remove the cooling fan clutch relay.
2. Connect a 10 A fused jumper wire between relay terminal 2 and B+. Connect a jumper wire between

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relay terminal 6 and ground.

3. Test for less than 1 V between terminal 4 and ground.
    - **If greater than 1 V**
    1. Replace the KR20F Cooling Fan Relay.
    - **If less than 1 V**
4. Connect a jumper wire between terminal 5 and ground.
5. Test for B+ between terminal 4 and ground.
    - **If not B+**
    1. Replace the KR20F Cooling Fan Relay
    - **If B+**
    1. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fan Blade Clutch Replacement (LC8, L96)Fan Blade Clutch Replacement (L5P)**
- **Control Module References** for ECM replacement, setup, and programming

DTC P0526: COOLING FAN SPEED SENSOR

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0526

Cooling Fan Speed Sensor Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fan Clutch Relay Ground	-	P0483	-	-
Fan Clutch Relay Voltage Supply	P0480, P0483	P0480, P0483	-	-
Fan Clutch Relay Control	P0480	P0480	P0480	-
Fan Speed Sensor Low Reference	-	P0483, P0526	-	-
Fan Speed Sensor 5-Volt Reference	P0526, P0651	P0526	P0526, P0651	-
Fan Speed Sensor Signal	P0526	P0526	P0526	-
Fan Clutch Solenoid Valve Ground	-	P0483	-	-
Fan Clutch Solenoid Valve Control	P0480	P0483	P0483, P0495	-

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Circuit/System Description

The engine control module (ECM) uses the cooling fan speed signal in order to determine the actual fan speed in relation to the desired fan speed. The ECM uses the cooling fan speed signal in order to reduce the cooling fan noise and maintain the powertrain cooling requirements. The ECM supplies a 5-volt reference and low reference circuit to clutch hall effect sensor in the cooling fan clutch. The hall effect sensor returns a signal pulse through the signal circuit in response to the reluctor track, which is located inside the fan clutch.

Conditions for Running the DTC

- The engine is operating for greater than 10 S.
- The engine speed is grater than 550 RPM.
- The ECM commanded fan duty cycle is greater than 45 percent.
- DTC P0526 runs continuously when the conditions above exist for greater than 30 S.

Conditions for Setting the DTC

- The ECM detects a loss of cooling fan speed signal for greater than 300 mS.
- The ECM detects that the cooling fan speed signal is greater or less than a predetermined threshold.
- DTC P0526 sets if either condition above exists for greater than 3 S.

Action Taken When the DTC Sets

DTC P0526 is a Type B DTC.

Conditions for Clearing the DTC

DTC P0526 is a Type B DTC.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation (L5P)Cooling Fan Description and Operation (L83, L86, LV1, LV3, or L8B)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

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Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Observe the DTC information with a scan tool. Verify DTC P0651 is not set.
   - **If a DTC is set**

     Refer to **DTC P0641, P0651, P0697, or P06A3**

   - **If no DTC is set**
2. Observe the DTC information with a scan tool. Verify DTC P0526 is not set.
   - **If a DTC is set**

     Refer to **DTC P0526**

   - **If no DTC is set**
3. Engine operating, observe the scan tool Fan Speed parameter. The parameter should display a fan speed greater than 0 RPM.
   - **If 0 RPM**

     Refer to Circuit/System Testing.

   - **If greater than 0 RPM**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
   - **If DTC sets**

     Refer to Circuit/System Testing

   - **If no DTC is set**
5. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the cooling fan clutch.
2. Ignition OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Test for less than 5 Ω between low reference circuit terminal C and ground.
   - **If 5 Ω or greater**
   1. Test for less than 2 Ω in the ground circuit end to end
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, replace the K20 Engine Control Module.
   - **If less than 5 Ω**
3. Ignition ON, test for 4.8-5.2 V between the 5 V reference circuit terminal E and ground.
   - **If less than 4.8 V**
   1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to

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power down. Disconnect the X1 harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the 5 V reference circuit terminal and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance.
3. Test for less than 2 Ω in the 5 V reference circuit terminal end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the K20 Engine Control Module.

- **If greater than 5.2**

1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down. Disconnect the X1 harness connector at the K20 Engine Control Module.
2. Test for less than 1 V between the 5 V reference circuit terminal and ground.
    - If greater than 1 V, repair the short to voltage on the circuit.
    - If less than 1 V, replace the K20 Engine Control Module.

- **If between 4.8- 5.2 V**

4. Test for 4.8-5.2 V between the signal circuit terminal D and ground.
    - **If less than 4.8 V**

    1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down. Disconnect the X1 harness connector at the K20 Engine Control Module.
    2. Test for infinite resistance between the signal circuit terminal and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - If infinite resistance.
    3. Test for less than 2 Ω in the signal circuit terminal end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K20 Engine Control Module.

    - **If greater than 5.2**

    1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down. Disconnect the X1 harness connector at the K20 Engine Control Module.
    2. Test for less than 1 V between the signal circuit terminal and ground.
        - If greater than 1 V, repair the short to voltage on the circuit.
        - If less than 1 V, replace the K20 Engine Control Module.

    - **If between 4.8- 5.2 V**

5. If all the circuit/connections test normal, test or replace the cooling fan clutch assembly.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fan Blade Clutch Replacement (LC8, L96)Fan Blade Clutch Replacement (L5P)**
- **Control Module References** for ECM replacement, setup, and programming

DTC P1258: ENGINE COOLANT OVER TEMPERATURE

Diagnostic Instructions

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- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P1258

Engine Coolant Over temperature - Protection Mode Active

Circuit/System Description

The engine control module (ECM) uses the engine coolant temperature (ECT) sensor to monitor the engine for an over-temperature condition. This condition occurs when the coolant temperature is above a calibrated value for a calibrated length of time. The ECM will disable half of the cylinders by turning OFF the fuel injectors. By disabling half of cylinders, the ECM is able to reduce the temperature of the coolant.

Conditions for Running the DTC

The engine is operating.

Conditions for Setting the DTC

All V8

The coolant temperature is warmer than 129Â°C (264Â°F) for greater than 10 seconds.

Action Taken When the DTC Sets

- DTC P1258 is a Type A DTC.
- The engine will operate in the Overheated Engine Protection Operating Mode.
- The engine coolant temperature indicator lamp, if equipped, will illuminate.
- The driver information center (DIC), if equipped, may display a message.
- If the protection mode is active and an ECT sensor DTC sets, the protection mode will activate during the next drive cycle until the ECT sensor DTC runs and passes.

Conditions for Clearing the DTC

DTC P1258 is a Type A DTC.

Reference Information

Description and Operation

- **Cooling System Description and Operation**
- **Instrument Cluster Description and Operation**
- **Indicator/Warning Message Description and Operation**
- **Audible Warnings Description and Operation**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC P0480, P0691 or P0692 is not set.
   - **If a DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

   - **If no DTCs is set**

   NOTE: A short delay occurs before the ECM changes the cooling fan speed.

3. Verify the cooling fan operates at each available speed as commanded with a scan tool.
   - **Cooling fan does not operate**

     Refer to **Cooling Fan Inoperative (L83, L86, L8B, LV3, or LV1)**.

   - **Cooling fan operates**
4. Verify that the engine does not overheat.
   - **Engine overheats**

     Refer to **Engine Overheating**.

   - **Engine does not overheat**
5. Operate the vehicle within the Conditions for Running the DTC.
   - **If the DTC sets**

     Refer to **Symptoms - Engine Cooling**.

   - **If the DTC does not set**
6. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

DTC P2600-P2603: AUXILIARY COOLANT PUMP RELAY

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2600

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Auxiliary Coolant Pump Relay Control Circuit

DTC P2601

Auxiliary Coolant Pump Performance

DTC P2602

Auxiliary Coolant Pump Relay Control Circuit Low Voltage

DTC P2603

Auxiliary Coolant Pump Relay Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Auxiliary Coolant Pump Relay Coil Ignition Voltage	-	P2600	1	P2601
Auxiliary Coolant Pump Relay Control	P2600, P2602, 2	P2600, P2602, 1	P2600, P2603	P2601

1. Auxiliary coolant pump inoperative.
2. Auxiliary coolant pump always ON

Typical Scan Tool Data

Auxiliary Coolant Pump Relay Control Circuit Open, Low, or High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Component Commanded OFF **Parameter Normal Range:** The following illustrates the normal parameter state with no circuit conditions: • Component OFF - OK for Open/Low Voltage test and Not Run for High Voltage test • Component ON - Not Run for Open/Low Voltage test and OK for High Voltage test			
Ignition Voltage	Malfunction	Malfunction	-
Auxiliary Coolant Pump Relay Control	Malfunction	Malfunction	Not Run

Circuit/System Description

The auxiliary heater coolant pump relay provides power to the heater coolant pump. The engine control module (ECM) commands the ON when the engine is not running. The ECM applies ground to the coil side of the auxiliary pump relay. This energizes the coil and applies voltage directly to the pump motor through the switch side of the relay. The heater coolant pump is used for powertrain cooling and HVAC.

Conditions for Running the DTC

- Ignition is ON.

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- Engine is not running.
- The ECM driver transitions from ON to OFF or from OFF to ON.
- DTCs P2600-P2603 run continuously once the above conditions are met.

Conditions for Setting the DTC

The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match for greater than 5 seconds.

Action Taken When the DTC Sets

The DTCs are Type B DTCs.

Conditions for Clearing the DTC

The DTCs are Type BDTCs.

Reference Information

Schematic Reference

- **Engine Heating/Cooling Schematics**
- **HVAC Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **Electrical Center Identification Views** **Electrical Center Identification Views**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, verify that DTC P0480, P0691, or P0692, is not set.
   - If a DTC is set, refer to **DTC P0480, P0691, or P0692 (L83, L86, L8B, LV3 or LV1)** for further diagnosis.

NOTE: **There is a slight delay before the cooling fan activates and reaches full speed.**

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2. Command the cooling fan ON from 0-90 % with a scan tool. Verify that the cooling fan turns ON and operates as commanded.
    - If the cooling fan does not respond to the commanded states, refer to **Cooling Fan Inoperative (L83, L86, L8B, LV3, or LV1)** for further diagnosis.
3. Ignition ON.
4. Verify the KR33 Auxiliary Heater Coolant Pump Relay turns on and off/clicks when commanding the KR33 Auxiliary Heater Coolant Pump Relay On and Off with a scan tool
5. Verify the parameters listed below do not display Malfunction when commanding the KR33 Auxiliary Heater Coolant Pump Relay ON and OFF On and Off with a scan tool
    - Auxiliary Coolant Pump Relay Control Circuit Open Test Status
    - Auxiliary Coolant Pump Relay Control Circuit Low Voltage Test Status
    - Auxiliary Coolant Pump Relay Control Circuit High Voltage Test Status
    - **If Malfunction is displayed**

      Refer to Circuit/System Testing

    - **If Malfunction is not displayed**
6. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect KR33 Auxiliary Heater Coolant Pump Relay, Ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 85 and ground
    - **If the test lamp does not Illuminate and the circuit fuse is good**
    1. Ignition OFF, remove the test lamp
    2. Test for less than 2 Ω in the B+ circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.
    - **If the test lamp does not illuminate and the circuit fuse is open**
    1. Ignition OFF, remove the test lamp
    2. Test for infinite between the B+ circuit and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - if infinite resistance, test or replace the KR33 Auxiliary Heater Coolant Pump Relay.
    - **If the test lamp illuminates**
3. Connect a test lamp between the ignition circuit terminal 86 and the control circuit terminal 85.
4. Verify the test lamp turns ON and OFF when commanding the KR33 Auxiliary Heater Coolant Pump Relay On and Off with a scan tool.
    - **If the test lamp is always off.**
    1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
    2. Test for less than 1 V between the control circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF.

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4. Test for less than 2 Ω in the control circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the K20 Engine Control Module.
- **If the test lamp illuminates**

5. Test or Replace the KR33 Auxiliary Heater Coolant Pump Relay.

Component Testing

1. Ignition OFF, disconnect and remove the KR33 Auxiliary Heater Coolant Pump Relay.
2. Test for 70-110 Ω between terminals 85 and 86.
    - **If less than 70 Ω or greater than 110 Ω**

      Replace the KR33 Auxiliary Heater Coolant Pump Relay

    - **If between 70-110 Ω**
3. Test for infinite resistance between the terminals listed below:
    - 30 and 86
    - 30 and 87
    - 30 and 85
    - 85 and 87
    - **If less than infinite resistance**

      Replace the KR33 Auxiliary Heater Coolant Pump Relay

    - **If infinite resistance**
4. Install a 3 A fused jumper wire between relay terminal 85 and 12 volts. Install a jumper wire between relay terminal 86 and ground.
5. Test for less than 2 Ω between terminals 30 and 87
    - **If 2 Ω or greater**

      Replace the KR33 Auxiliary Heater Coolant Pump Relay

    - **If less than 2 Ω**
6. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Relay Replacement (Attached to Wire Harness)** **Relay Replacement (Within an Electrical Center)**
- **Control Module References** for ECM replacement, setup, and programming

SYMPTOMS - ENGINE COOLING

Important Preliminary Inspections Before Starting

Before using the Symptom diagnosis, perform the following:

- Perform **Diagnostic System Check - Vehicle** and verify all of the following items:

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- Ensure that the engine control module (ECM) and indicator lamp are operating correctly.
- Ensure that there are no diagnostic trouble codes (DTCs) that are stored.
- Scan tool data is within a normal operating range. Refer to **Control Module References** for scan tool information.

- Verify the customer concern.
- Perform the Visual/Physical Inspection in this section. The visual/physical inspection is extremely important, and can lead to correcting a condition without additional testing. It may also help reveal the cause of an intermittent condition.
- Locate the correct symptom. Perform the tests and inspections associated with the symptom.

Review the cooling fan and cooling system operation in order to familiarize yourself with the system functions.

- **Cooling Fan Description and Operation (L5P)Cooling Fan Description and Operation (L83, L86, LV1, LV3, or L8B)**
- **Cooling System Description and Operation**

Visual/Physical Inspection

CAUTION: Use the connector test adapter kit EL-35616-F for any test that requires probing the following items:

- **The control module harness connectors**
- **The electrical center fuse/relay cavities**
- **The component terminals**
- **The component harness connector**

Using this kit will prevent damage caused by the improper probing of connector terminals.

Several of the symptom procedures call for a careful visual and physical inspection. This can lead to correcting a condition without further tests and can save time. This inspection should include the following areas:

- Ensure that the control module grounds are clean, tight, and correctly located.
- Inspect cooling system hoses and pipes for splits, kinks, and proper connections. Inspect thoroughly for any type of a leak or a restriction.
- Inspect for a dirty or restricted radiator and HVAC condenser.
- Inspect for aftermarket devices which could affect the operation of the Cooling System.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the surge tank reservoir for the proper coolant level.

Identifying Intermittent Conditions

Many intermittent conditions occur with harness or connector movement due to engine torque, rough pavement, vibration or physical movement of a component. Refer to the following for a list to help determine an intermittent condition:

- Moisture and water intrusion in connectors, terminals, and components

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- Connector mating
- Terminal contact
- High circuit or component resistance-High resistance can include any resistance, regardless of the amount, which can interrupt the operation of the component.
- Harness that is located too tight, or chaffed circuits
- High or low ambient temperature
- High or low engine coolant temperatures
- High underhood temperatures
- Heat build up in component or circuit due to circuit resistance, poor terminal contact, or high electrical load
- High or low system voltage
- High vehicle load conditions
- Rough road surface
- Electro-magnetic interference (EMI)/circuit interference from relays, solenoids or other electrical surge
- Incorrect installation of non-factory, aftermarket, and after factory add on accessories

If an intermittent is determined, refer to **Testing for Intermittent Conditions and Poor Connections** for specific strategies in diagnosing intermittent conditions.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Engine Overheating**
- **Loss of Coolant (L8B, L83, L86)Loss of Coolant (LV3)Loss of Coolant (LC8, L96)Loss of Coolant (L5P)**
- **Thermostat Diagnosis**
- **Coolant Heater Inoperative**
- **Engine Fails To Reach Normal Operating Temperature**
- **Fan Clutch Diagnosis (Diesel)** , except diesel

COOLING FAN ALWAYS ON (L83, L86, L8B, LV3)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The engine cooling fan system is composed of two electric cooling fans. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control modules. The cooling fan control module varies the voltage drop across the cooling fan motor in relation to the pulse width modulated signal, which enables cooling fan operation at variable speeds. The cooling fan control module is thermally protected to prevent module damage in the case of a short circuit condition in the cooling fan motor.

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Diagnostic Aids

- Certain resistance conditions with IAT or ECT sensors may cause unwarranted cooling fan activation. If the ECM is commanding the cooling fan ON for no apparent reason and without any component or system DTCs set, the IAT or ECT sensor may be skewed. If this condition is suspected, refer to the temperature versus resistance tables in the appropriate engine controls subsection.
- The cooling fans will not operate when the scan tool Cooling Fan Motor Command parameter displays 0 %. This is a normal condition.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation (L83, L86, LV3, or L8B)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC P0480, P0691, or P0692, is not set.
   - **If a DTC is set**

     Refer to **DTC P0480, P0691, or P0692 (L83, L86, L8B, LV3 or LV1)**.

   - **If no DTC is set.**
3. Verify the scan tool Cooling Fan Motor Command parameter is 0 %.
   - **If greater than 0 %**

     Refer to Diagnostic Aids and **Symptoms - Engine Cooling** for further diagnosis.

   - **If 0 %**
4. Verify that the G10 Cooling Fan Motors are not operating.
   - **If a G10 Cooling Fan Motor is operating**

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Test or replace the appropriate G10 Cooling Fan Motor.

- **If the G10 Cooling Fan Motor is not operating**

5. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Engine Coolant Fan Replacement (L83, L86,LV3)Engine Coolant Fan Replacement (L8B)** for G10 Cooling Fan Motor Replacement.
- **Control Module References**

COOLING FAN INOPERATIVE (L83, L86, L8B, LV3)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The engine cooling fan system is composed of two electric cooling fans. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control modules. The cooling fan control module varies the voltage drop across the cooling fan motor in relation to the pulse width modulated signal, which enables cooling fan operation at variable speeds. The cooling fan control module is thermally protected to prevent module damage in the case of a short circuit condition in the cooling fan motor.

Diagnostic Aids

A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation (L83, L86, LV3, or L8B)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**

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- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC P0480, P0691, or P0692, is not set.
   - **If a DTC is set**

     Refer to **DTC P0480, P0691, or P0692 (L83, L86, L8B, LV3)**.

   - **If no DTC is set.**

   NOTE: A slight delay may occur before the cooling fan activates.

3. Verify the G10 Cooling Fan Motor activates and increases in speed with each command using a scan tool.
   - **The cooling fan does not activate or increase in speed**

     Refer to Circuit/System Testing

   - **The cooling fan activates and increases in speed**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the appropriate G10 Cooling Fan Motor harness connector.
2. Ignition ON, verify that a test lamp illuminates between ground circuit terminal 1 and B+.
   - **If the test lamp does not illuminate**
   1. Ignition OFF, test for less than 2 Ω in the ground circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If the test lamp illuminates**
3. Verify that a test lamp illuminates between B+ circuit terminal 2 and ground.
   - **If the test lamp does not illuminate and the circuit fuse is good**
   1. Ignition OFF, test for less than 2 Ω in the appropriate B+ circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.
   - **If the test lamp does not illuminate and the circuit fuse is open**
   1. Ignition OFF, test for infinite resistance between the appropriate B+ circuit terminal and ground.
      - If less than infinite resistance, repair the short to ground in the circuit.
      - If infinite resistance, replace the appropriate G10 Cooling Fan Motor.
   - **If the test lamp illuminates**

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NOTE: **Both G 10 Cooling Fan Motors must be disconnected or incorrect diagnosis may result.**

4. Ignition OFF, disconnect the other G 10 Cooling Fan Motor harness connector.
5. Ignition ON, test appropriate G 10 Cooling Fan Motor for 3-4 volts on the control circuit terminal 4.
   - **If 3 V or less**
   1. Ignition OFF, all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
   2. Test for less than 2 Ω between the terminals listed below:
      - G10L Cooling Fan Motor Left - terminal 4
      - G10R Cooling Fan Motor Right - terminal 4
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
   - **If 3-4 V**
6. Test or replace the appropriate G 10 Cooling Fan Motor.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Engine Coolant Fan Replacement (L83, L86,LV3)Engine Coolant Fan Replacement (L8B)** for G10 Cooling Fan Motor replacement.
- **Control Module References**

ENGINE OVERHEATING

Step	Action	Yes	No
1	Inspect for a missing or damaged radiator side or upper baffle and/or radiator air deflector. Is the baffle and/or deflector missing or damaged?	Go to **Step 8**	Go to **Step 2**
2	Inspect for a loss of coolant. Is there a loss of coolant?	Go to **Step 3**	Go to **Step 4**
3	Fill the system to the specified level. Does the engine overheat?	Go to **Step 4**	System OK
4	Inspect for low temperature protection. Is the coolant to the correct concentration?	Go to **Step 5**	Go to **Step 8**
5	Inspect for a loss of cooling system pressure. Is there a loss of system pressure?	Go to **Step 8**	Go to **Step 6**
6	Inspect for a faulty engine coolant temperature (ECT) sensor. Refer to **Engine Coolant Temperature Sensor Replacement** . Is the sensor operating properly?	Go to **Step 7**	Go to **Step 8**
7	Inspect for the following: • Damaged coolant surge tank • Leaking hose • Bad/incorrect surge tank or radiator cap	Go to **Step 8**	Go to **Step 3**

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Step	Action	Yes	No
	Were any of the above found?		
8	Repair or install new parts as necessary, then retest. Does the engine overheat?	Go to **Step 9**	System OK
9	Inspect for incorrect drive belt tension. Is the belt tension correct?	Go to **Step 10**	Go to **Step 8**
10	1. Remove the water pump. Refer to **Water Pump Replacement (L96, LC8)Water Pump Replacement (L5P)Water Pump Replacement (LV3)Water Pump Replacement (L83, L86, L8B)**. 2. Inspect for a damaged water pump shaft/hub. Is the water pump driveshaft damaged or is the seal leaking?	Go to **Step 8**	Go to **Step 11**
11	Inspect for obstructed radiator air flow or bent radiator fins. Is the radiator air flow obstructed?	Go to **Step 8**	Go to **Step 12**
12	Inspect for blocked cooling system passages. Are the cooling system passages blocked?	Go to **Step 8**	Go to **Step 13**
13	Inspect the thermostat. Refer to **Thermostat Diagnosis**. Is the thermostat stuck in the closed position?	Go to **Step 15**	Go to **Step 16**
14	Replace the thermostat. Refer to **Engine Coolant Thermostat Replacement (L96, LC8)Engine Coolant Thermostat Replacement (L5P)**. Does the engine overheat?	Go to **Step 16**	System OK
15	Inspect the radiator cooling capacity. Is the proper sized radiator being used on the vehicle?	Go to **Step 3**	Go to **Step 16**
16	Consult the current parts catalog and replace the radiator. Refer to **Radiator Replacement (LV3)Radiator Replacement (L83, L86)Radiator Replacement (LC8, L96)Radiator Replacement (L8B)Radiator Replacement (L5P)**. Is the repair complete?	System OK	-

LOSS OF COOLANT (L8B, L83, L86)

Step	Action	Yes	No
DEFINITION: The cooling system is loosing coolant either internally or externally.			
1	Were you sent here from Symptoms, or another diagnostic table?	Go to **Step 2**	Go to **Symptoms - Engine Cooling**
2	Repair any present DTCs. Refer to **Diagnostic System Check - Vehicle** . Is the action complete?	Go to **Step 3**	-
3	Inspect the coolant level. Is the coolant at the proper level?	Go to **Step 5**	Go to **Step 4**

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Step	Action	Yes	No
4	Fill the cooling system to the proper level. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Vac N Fill L8B)**. Is the action complete?	Go to **Step 5**	-
5	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to **Step 19**	Go to **Step 6**
6	1. Idle the engine at normal operating temperature. 2. Inspect for heavy white smoke coming out of the exhaust pipe. Is a heavy white smoke present from the exhaust pipe?	Go to **Step 7**	Go to **Step 8**
7	1. Coolant in the exhaust system creates a distinctive, burning coolant odor in the exhaust. 2. Condensation in the exhaust system can cause an odorless white smoke during engine warm up. Does the white smoke have a burning coolant type odor?	Go to **Step 20**	Go to **Step 8**
8	Visually inspect the hoses, pipes and hose clamps. Are any of the hoses, clamps or pipes leaking?	Go to **Step 21**	Go to **Step 9**
9	Visually inspect the following components: • Block heater • Coolant pressure cap • Core plugs • Throttle body • Engine block • Intake manifold • Radiator • Thermostat housing • Water pump Are any of the listed components leaking?	Go to **Step 21**	Go to **Step 10**
10	1. Pressure test the cooling system. Refer to **Cooling System Leak Testing (L8B, L83, L86, LV3)Cooling System Leak Testing (LC8, L96)**. 2. With the cooling system pressurized, visually inspect the components listed in steps 7 and 8. Are any leaks present?	Go to **Step 21**	Go to **Step 11**

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Step	Action	Yes	No
11	Pressure test the coolant pressure cap. Refer to **Pressure Cap Testing**. Does the coolant pressure cap hold pressure?	Go to **Step 12**	Go to **Step 16**
12	Inspect for the following conditions: • A coolant smell inside of the vehicle • Coolant in the HVAC module drain tube • Coolant on the vehicle floor covering near the HVAC module Is coolant present?	Go to **Step 21**	Go to **Step 13**
13	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is there a milky substance under the oil fill cap?	Go to **Step 14**	Go to **Step 15**
14	Inspect the engine oil fluid level indicator for a gray/white milky substance. Is there a milky substance on the engine oil fluid level indicator?	Go to **Step 17**	Go to **Step 15**
15	Inspect the automatic transmission oil fluid level indicator, if equipped, for a gray/white milky substance. Is there a milky substance on the automatic transmission fluid level indicator?	Go to **Step 18**	Go to **Step 22**
16	Replace the coolant pressure cap. Is the repair complete?	Go to **Step 22**	-
17	1. Replace the radiator. Refer to **Radiator Replacement (L83, L86)Radiator Replacement (L8B)**. 2. Replace the oil and filter. Refer to **Engine Oil and Oil Filter Replacement** . Is the repair complete?	Go to **Step 22**	-
18	1. Replace the radiator. Refer to **Radiator Replacement (L83, L86)Radiator Replacement (L8B)**. 2. Service the automatic transmission. Refer to the following: **Engine Coolant/Water in Transmission** . Is the repair complete?	Go to **Step 22**	-
19	Repair the engine overheating condition. Refer to **Engine Overheating**. Is the repair complete?	Go to **Step 22**	-
20	Repair the engine internal coolant leak. Refer to **Coolant in Combustion Chamber** , or, **Coolant in Engine Oil** .	Go to **Step 22**	-

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Step	Action	Yes	No
	Is the repair complete?		
21	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to **Step 22**	-
22	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to **Step 2**

LOSS OF COOLANT (LV3)

Step	Action	Yes	No
DEFINITION: The cooling system is loosing coolant either internally or externally.			
1	Were you sent here from Symptoms, or another diagnostic table?	Go to **Step 2**	Go to **Symptoms - Engine Cooling**
2	Repair any present DTCs. Refer to **Diagnostic System Check - Vehicle** . Is the action complete?	Go to **Step 3**	-
3	Inspect the coolant level. Is the coolant at the proper level?	Go to **Step 5**	Go to **Step 4**
4	Fill the cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**. Is the action complete?	Go to **Step 5**	-
5	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to **Step 19**	Go to **Step 6**
6	1. Idle the engine at normal operating temperature. 2. Inspect for heavy white smoke coming out of the exhaust pipe. Is a heavy white smoke present from the exhaust pipe?	Go to **Step 7**	Go to **Step 8**
7	1. Coolant in the exhaust system creates a distinctive, burning coolant odor in the exhaust. 2. Condensation in the exhaust system can cause an odorless white smoke during engine warm up. Does the white smoke have a burning coolant type odor?	Go to **Step 20**	Go to **Step 8**
8	Visually inspect the hoses, pipes and hose clamps. Are any of the hoses, clamps or pipes leaking?	Go to **Step 21**	Go to **Step 9**
9	Visually inspect the following components: • Block heater • Coolant pressure cap • Core plugs • Throttle body	Go to **Step 21**	Go to **Step 10**

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Step	Action	Yes	No
	• Engine block • Intake manifold • Radiator • Thermostat housing • Water pump Are any of the listed components leaking?		
10	1. Pressure test the cooling system. Refer to **Cooling System Leak Testing (L8B, L83, L86, LV3)**. 2. With the cooling system pressurized, visually inspect the components listed in steps 7 and 8. Are any leaks present?	Go to **Step 21**	Go to **Step 11**
11	Pressure test the coolant pressure cap. Refer to **Pressure Cap Testing**. Does the coolant pressure cap hold pressure?	Go to **Step 12**	Go to **Step 16**
12	Inspect for the following conditions: • A coolant smell inside of the vehicle • Coolant in the HVAC module drain tube • Coolant on the vehicle floor covering near the HVAC module Is coolant present?	Go to **Step 21**	Go to **Step 13**
13	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is there a milky substance under the oil fill cap?	Go to **Step 14**	Go to **Step 15**
14	Inspect the engine oil fluid level indicator for a gray/white milky substance. Is there a milky substance on the engine oil fluid level indicator?	Go to **Step 17**	Go to **Step 15**
15	Inspect the automatic transmission oil fluid level indicator, if equipped, for a gray/white milky substance. Is there a milky substance on the automatic transmission fluid level indicator?	Go to **Step 18**	Go to **Step 22**
16	Replace the coolant pressure cap. Is the repair complete?	Go to **Step 22**	-
17	1. Replace the radiator. Refer to **Radiator Replacement (LV3)**. 2. Replace the oil and filter. Refer to **Engine Oil and Oil Filter Replacement** .	Go to **Step 22**	-

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Step	Action	Yes	No
	Is the repair complete?		
18	1. Replace the radiator. Refer to **Radiator Replacement (LV3)**. 2. Service the automatic transmission. Refer to the following: **Engine Coolant/Water in Transmission** . Is the repair complete?	Go to **Step 22**	-
19	Repair the engine overheating condition. Refer to **Engine Overheating**. Is the repair complete?	Go to **Step 22**	-
20	Repair the engine internal coolant leak. Refer to **Coolant in Combustion Chamber** , or, **Coolant in Engine Oil** . Is the repair complete?	Go to **Step 22**	-
21	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to **Step 22**	-
22	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to **Step 2**

LOSS OF COOLANT (LC8, L96)

Step	Action	Yes	No
DEFINITION: The cooling system is loosing coolant either internally or externally.			
1	Were you sent here from Symptoms, or another diagnostic table?	Go to **Step 2**	Go to **Symptoms - Engine Cooling**
2	Repair any present DTCs. Refer to **Diagnostic System Check - Vehicle** . Is the action complete?	Go to **Step 3**	-
3	Inspect the coolant level. Is the coolant at the proper level?	Go to **Step 5**	Go to **Step 4**
4	Fill the cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. Is the action complete?	Go to **Step 5**	-
5	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to **Step 19**	Go to **Step 6**
6	1. Idle the engine at normal operating temperature. 2. Inspect for heavy white smoke coming out of the exhaust pipe. Is a heavy white smoke present from the exhaust pipe?	Go to **Step 7**	Go to **Step 8**
7	1. Coolant in the exhaust system creates a distinctive, burning coolant odor in the exhaust.	Go to **Step 20**	Go to **Step 8**

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Step	Action	Yes	No
	2. Condensation in the exhaust system can cause an odorless white smoke during engine warm up. Does the white smoke have a burning coolant type odor?		
8	Visually inspect the hoses, pipes and hose clamps. Are any of the hoses, clamps or pipes leaking?	Go to **Step 21**	Go to **Step 9**
9	Visually inspect the following components: • Block heater • Coolant pressure cap • Core plugs • Throttle body • Engine block • Intake manifold • Radiator • Thermostat housing • Water pump Are any of the listed components leaking?	Go to **Step 21**	Go to **Step 10**
10	1. Pressure test the cooling system. Refer to **Cooling System Leak Testing (LC8, L96)**. 2. With the cooling system pressurized, visually inspect the components listed in steps 7 and 8. Are any leaks present?	Go to **Step 21**	Go to **Step 11**
11	Pressure test the coolant pressure cap. Refer to **Pressure Cap Testing**. Does the coolant pressure cap hold pressure?	Go to **Step 12**	Go to **Step 16**
12	Inspect for the following conditions: • A coolant smell inside of the vehicle • Coolant in the HVAC module drain tube • Coolant on the vehicle floor covering near the HVAC module Is coolant present?	Go to **Step 21**	Go to **Step 13**
13	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is there a milky substance under the oil fill cap?	Go to **Step 14**	Go to **Step 15**
14	Inspect the engine oil fluid level indicator for a gray/white milky substance. Is there a milky substance on the engine oil fluid level	Go to **Step 17**	Go to **Step 15**

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Step	Action	Yes	No
	indicator?		
15	Inspect the automatic transmission oil fluid level indicator, if equipped, for a gray/white milky substance. Is there a milky substance on the automatic transmission fluid level indicator?	Go to **Step 18**	Go to **Step 22**
16	Replace the coolant pressure cap. Is the repair complete?	Go to **Step 22**	-
17	1. Replace the radiator. Refer to **Radiator Replacement (LC8, L96)**. 2. Replace the oil and filter. Refer to **Engine Oil and Oil Filter Replacement** . Is the repair complete?	Go to **Step 22**	-
18	1. Replace the radiator. Refer to **Radiator Replacement (LC8, L96)**. 2. Service the automatic transmission. Refer to the following: **Engine Coolant/Water in Transmission** . Is the repair complete?	Go to **Step 22**	-
19	Repair the engine overheating condition. Refer to **Engine Overheating**. Is the repair complete?	Go to **Step 22**	-
20	Repair the engine internal coolant leak. Refer to **Coolant in Combustion Chamber** , or, **Coolant in Engine Oil** . Is the repair complete?	Go to **Step 22**	-
21	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to **Step 22**	-
22	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to **Step 2**

LOSS OF COOLANT (L5P)

Step	Action	Yes	No
DEFINITION: The cooling system is loosing coolant either internally or externally.			
1	Were you sent here from Symptoms, or another diagnostic table?	Go to **Step 2**	Go to **Symptoms - Engine Cooling**
2	Repair any present DTCs. Refer to **Diagnostic System Check - Vehicle** . Is the action complete?	Go to **Step 3**	-
3	Inspect the coolant level. Is the coolant at the proper level?	Go to **Step 5**	Go to **Step 4**

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Step	Action	Yes	No
4	Fill the cooling system to the proper level. Refer to **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**. Is the action complete?	Go to **Step 5**	-
5	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to **Step 19**	Go to **Step 6**
6	1. Idle the engine at normal operating temperature. 2. Inspect for heavy white smoke coming out of the exhaust pipe. Is a heavy white smoke present from the exhaust pipe?	Go to **Step 7**	Go to **Step 8**
7	1. Coolant in the exhaust system creates a distinctive, burning coolant odor in the exhaust. 2. Condensation in the exhaust system can cause an odorless white smoke during engine warm up. Does the white smoke have a burning coolant type odor?	Go to **Step 20**	Go to **Step 8**
8	Visually inspect the hoses, pipes and hose clamps. Are any of the hoses, clamps or pipes leaking?	Go to **Step 21**	Go to **Step 9**
9	Visually inspect the following components: • Block heater • Coolant pressure cap • Core plugs • Throttle body • Engine block • Intake manifold • Radiator • Thermostat housing • Water pump Are any of the listed components leaking?	Go to **Step 21**	Go to **Step 10**
10	1. Pressure test the cooling system. Refer to **Cooling System Leak Testing (L5P)**. 2. With the cooling system pressurized, visually inspect the components listed in steps 7 and 8. Are any leaks present?	Go to **Step 21**	Go to **Step 11**
11	Pressure test the coolant pressure cap. Refer to **Pressure Cap Testing**. Does the coolant pressure cap hold pressure?	Go to **Step 12**	Go to **Step 16**

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Step	Action	Yes	No
12	Inspect for the following conditions: • A coolant smell inside of the vehicle • Coolant in the HVAC module drain tube • Coolant on the vehicle floor covering near the HVAC module Is coolant present?	Go to **Step 21**	Go to **Step 13**
13	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is there a milky substance under the oil fill cap?	Go to **Step 14**	Go to **Step 15**
14	Inspect the engine oil fluid level indicator for a gray/white milky substance. Is there a milky substance on the engine oil fluid level indicator?	Go to **Step 17**	Go to **Step 15**
15	Inspect the automatic transmission oil fluid level indicator, if equipped, for a gray/white milky substance. Is there a milky substance on the automatic transmission fluid level indicator?	Go to **Step 18**	Go to **Step 22**
16	Replace the coolant pressure cap. Is the repair complete?	Go to **Step 22**	-
17	1. Replace the radiator. Refer to **Radiator Replacement (L5P)**. 2. Replace the oil and filter. Refer to **Engine Oil and Oil Filter Replacement** . Is the repair complete?	Go to **Step 22**	-
18	1. Replace the radiator. Refer to **Radiator Replacement (L5P)**. 2. Service the automatic transmission. Refer to the following: **Engine Coolant/Water in Transmission** . Is the repair complete?	Go to **Step 22**	-
19	Repair the engine overheating condition. Refer to **Engine Overheating**. Is the repair complete?	Go to **Step 22**	-
20	Repair the engine internal coolant leak. Refer to **Coolant in Combustion Chamber** , or, **Coolant in Engine Oil** . Is the repair complete?	Go to **Step 22**	-
21	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to **Step 22**	-

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Step	Action	Yes	No
22	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to **Step 2**

THERMOSTAT DIAGNOSIS

Special Tools

J 24731 Tempil Stick

For equivalent regional tools, refer to **Special Tools**.

Use one of the following procedures in testing for a malfunctioning thermostat.

Thermostat Test Procedure Using Tempil Sticks

The coolant thermostat can be tested using a temperature (tempil) stick. The temperature stick is a pencil like device. It has a wax material containing certain chemicals which melt at a given temperature. Temperature sticks can be used to determine a thermostat's operating range, by rubbing 87Â°C (188Â°F) and 97Â°C (206Â°F) sticks on the thermostat housing.

1. Use a tempil stick in order to find the opening and the closing temperatures of the coolant thermostat.
   - **J 24731** stick -188 tempil stick melts at 87Â°C (188Â°F). The thermostat should begin to open.
   - **J 24731** stick -206 tempil stick melts at 97Â°C (206Â°F). The thermostat should be fully open.
2. Replace the coolant thermostat if it does not operate properly between this temperature range.

Thermostat Test Procedure Using Glycol

Inspect the operation of the thermostat by hanging the thermostat on a hook in a 50/50 percent solution of DEX-COOLÂ® and clean drinkable water.

In order to inspect if the thermostat valve is opening properly, perform the following test:

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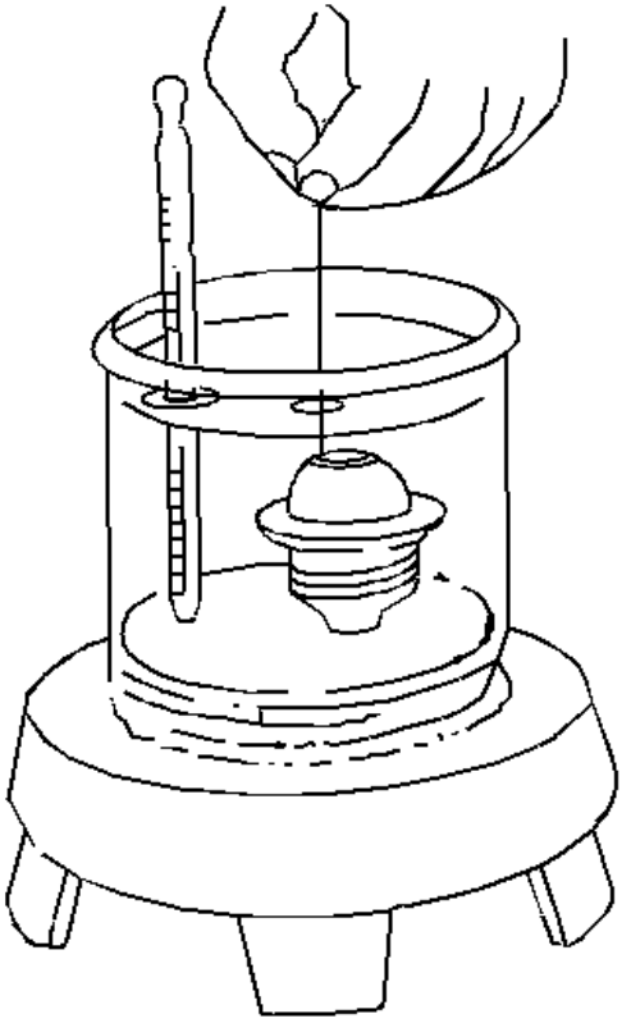

Fig. 3: View Of Thermostat Test Procedure Using Glycol
Courtesy of GENERAL MOTORS COMPANY

1. Completely submerge the thermostat in the glycol solution. The solution should be 11Â°C (22Â°F) above the temperature indicated on the thermostat valve.
2. Thoroughly agitate the solution. Under these conditions, the thermostat valve should open.

In order to inspect if the thermostat valve is closing properly, perform the following test:

1. Completely submerge the thermostat in a glycol solution. The solution should be 6Â°C (10Â°F) below the temperature indicated on the thermostat valve.
2. Thoroughly agitate the solution. Under these conditions, the thermostat valve should close completely.

COOLANT HEATER INOPERATIVE (WITHOUT DIESEL)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

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- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The coolant heater operates using 110 V AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather. The coolant heater also helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. There is an internal thermal switch in the coolant heater cord that prevents operation above -18Â°C (0Â°F). A weather shield on the cord is provided to protect the plug when not in use.

Reference Information

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Circuit/System Testing

NOTE: **The coolant heater cord will read Open due to an internal thermal switch if the ambient temperature is above -18Â°C (0Â°F).**

1. Ignition OFF, disconnect the coolant heater cord from the E19 Coolant Heater.
2. Test for 30-40 Ω between the terminals of the E19 Coolant Heater.
   - **If not within 30-40 Ω**

     Replace the E19 Coolant Heater.

   - **If within 30-40 Ω**
3. Test for infinite resistance between each terminal of the E19 Coolant Heater and ground.
   - **If less than infinite resistance**

     Replace the E19 Coolant Heater.

   - **If infinite resistance**
4. Test for less than 2 ohms between the engine coolant heater cord plug and the engine coolant heater cord connector for each circuit.

   If greater than 2ohms

   Replace the engine coolant heater cord.

   If less than 2 ohms

   All OK

Repair Instructions

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Perform the **Diagnostic Repair Verification** after completing the diagnostic repair.

- **Engine Coolant Heater Replacement**
- **Engine Coolant Heater Cord Replacement**

COOLANT HEATER INOPERATIVE (WITH DIESEL)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The coolant heater operates using 110 V AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather. The coolant heater also helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. There is an internal thermal switch in the coolant heater cord that prevents operation above -18Â°C (0Â°F). A weather shield on the cord is provided to protect the plug when not in use.

Reference Information

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Circuit/System Testing

1. Ignition OFF, disconnect the coolant heater cord from the E19 Coolant Heater.
2. Test for 10-20 Ω between the terminals of the E19 Coolant Heater.
    - **If not within 10-20 Ω**

      Replace the E19 Coolant Heater.

    - **If within 10-20 Ω**
3. Test for infinite resistance between the outside terminals of the E19 Coolant Heater and the center ground terminal.
    - **If less than infinite resistance**

      Replace the E19 Coolant Heater.

    - **If infinite resistance**
4. Test for less than 2 ohms between the engine coolant heater cord plug and the engine coolant heater cord connector for each circuit.

    If greater than 2ohms

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Replace the engine coolant heater cord.

If less than 2 ohms

All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic repair.

- **Engine Coolant Heater Replacement**
- **Engine Coolant Heater Cord Replacement**

ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE

Step	Action	Yes	No
1	Did you review the Symptoms - Engine Cooling diagnostic information and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Engine Cooling**
2	Verify that the engine does not reach normal operating temperature. Does the engine reach normal operating temperature?	System OK	Go to **Step 3**
3	Inspect the coolant level. Is the coolant level below the add mark?	Go to **Step 4**	Go to **Step 5**
4	1. Add coolant as necessary. 2. Perform a cooling system pressure test. Does the cooling system hold pressure?	System OK	Go to **Step 5**
5	Inspect for a stuck open, missing, or incorrect thermostat. Refer to **Thermostat Diagnosis**. Is the thermostat operating properly?	System OK	Go to **Step 6**
6	Install the correct replacement thermostat. Refer to **Engine Coolant Thermostat Housing Replacement (LV3, L8B & L83 with Thermostat)Engine Coolant Thermostat Housing Replacement (L96, LC8)Engine Coolant Thermostat Housing Replacement (L5P)**. Is the repair complete?	Go to **Step 7**	-
7	Run the engine in order to verify the repair. Does the engine fail to reach normal operating temperature?	-	System OK

PRESSURE CAP TESTING

Special Tools

- **EN-24460-A** Cooling System Pressure Tester
- **GE-42401-A** Radiator Cap / Surge Tank Test Adapter

For equivalent regional tools, Refer to **Special Tools**

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Pressure Cap Testing

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

1. Remove the pressure cap.
2. Wash the pressure cap sealing surface with water.

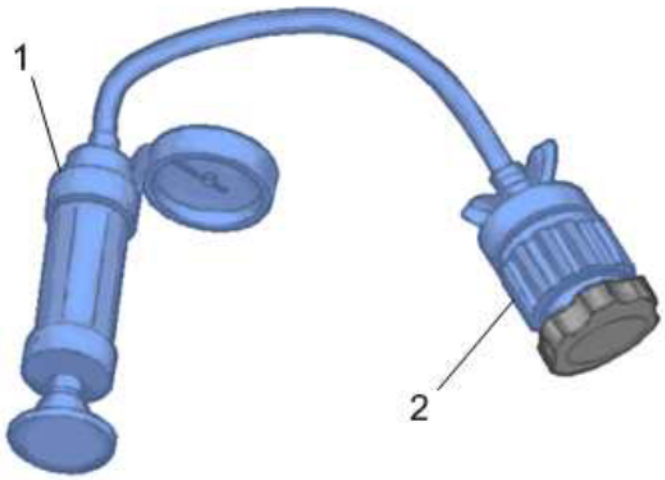

Fig. 4: Identifying Pressure Cap Tester
Courtesy of GENERAL MOTORS COMPANY

NOTE: Lubricate J-42401-1 and pressure cap o-rings with coolant and press cap to seat o-ring on J-42401-1 before turning to engage threads.

3. Use the **EN-24460-A** Cooling System Pressure Tester (1) with **GE-42401-A** Radiator Cap / Surge Tank Test Adapter (2) in order to test the pressure cap.
4. Test the pressure cap for the following conditions:
   - Pressure release when the **EN-24460-A** Cooling System Pressure Tester exceeds the pressure rating of the pressure cap.
   - Maintain the rated pressure for at least 10 seconds.

     Note the rate of pressure loss.
5. Replace the pressure cap under the following conditions:
   - The pressure cap does not release pressure which exceeds the rated pressure of the cap.
   - The pressure cap does not hold the rated pressure.

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COOLING SYSTEM LEAK TESTING (L8B, L83, L86, LV3)

Special Tools

- **J-24460-01** Cooling System Pressure Tester
- **J-42401** Radiator Cap/Surge Tank Test Adapter

For equivalent regional tools, refer to **Special Tools**.

WARNING: Under pressure, the temperature of the solution in the radiator can be considerably higher, without boiling. Removing the radiator cap while the engine is hot (pressure is high), will cause the solution to boil instantaneously, with explosive force. The solution will spew out over the engine, fenders, and the person removing the cap. Serious bodily injury may result. Flammable antifreeze, such as alcohol, is not recommended for use at any time. Flammable antifreeze could cause a serious fire.

WARNING: In order to help avoid being burned, do not remove the radiator cap while the engine and the radiator are hot. Scalding fluid and steam can be blown out under pressure if the cap is removed too soon.

1. Remove the pressure cap.
2. Test the operation of the pressure cap. Refer to **Pressure Cap Testing**.
3. Wash the pressure cap mating surface with water.

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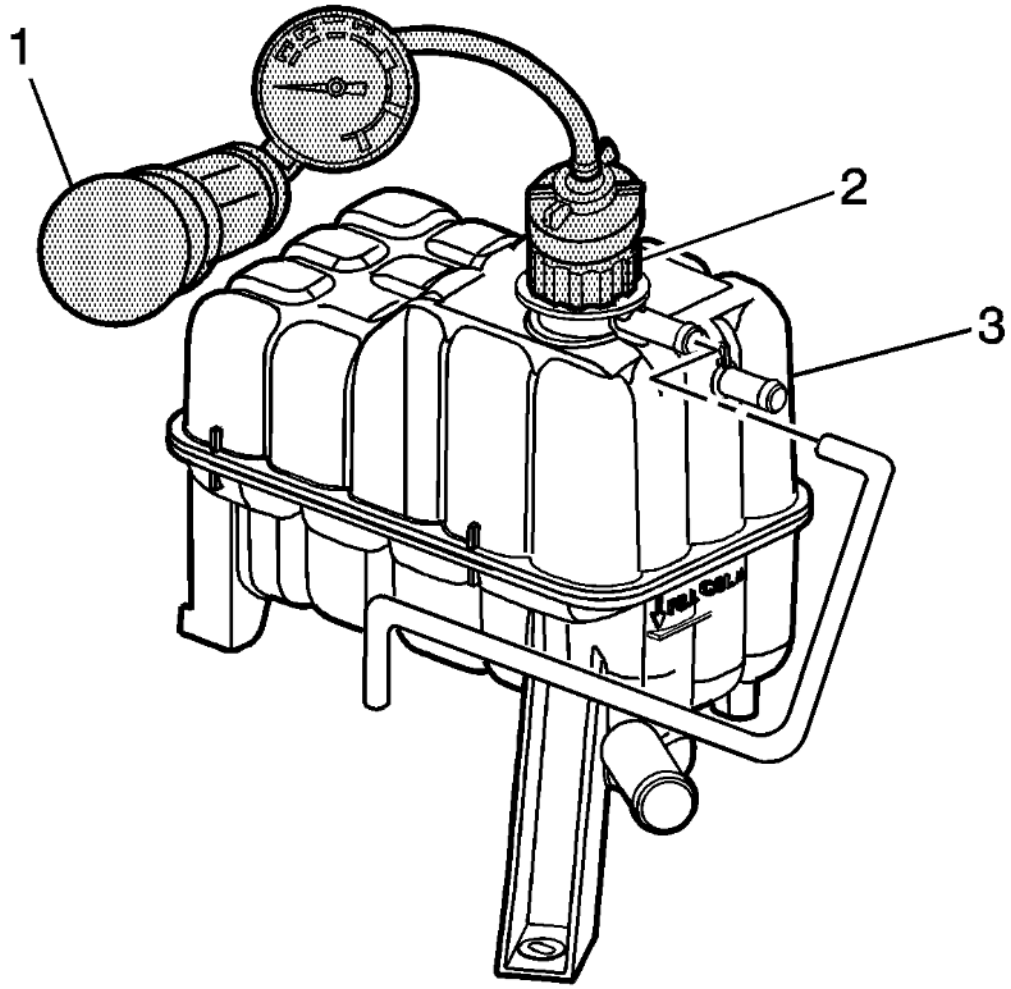

Fig. 5: Applying Pressure To Cooling System
Courtesy of GENERAL MOTORS COMPANY

4. Use the **J-24460-01** cooling system pressure tester with the **J-42401** radiator cap/surge tank test adapter in order to apply pressure to the cooling system.

   Do not exceed the pressure cap rating.

5. The cooling system should hold the rated pressure for at least 2 minutes.

   Observe the gauge for any pressure loss.

6. Repair any leaks as required.

COOLING SYSTEM LEAK TESTING (LC8, L96)

Special Tools

- **J-24460-01** Cooling System Pressure Tester
- **J-42401** Radiator Cap/Surge Tank Test Adapter

For equivalent regional tools, refer to **Special Tools**.

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WARNING: **Under pressure, the temperature of the solution in the radiator can be considerably higher, without boiling. Removing the radiator cap while the engine is hot (pressure is high), will cause the solution to boil instantaneously, with explosive force. The solution will spew out over the engine, fenders, and the person removing the cap. Serious bodily injury may result. Flammable antifreeze, such as alcohol, is not recommended for use at any time. Flammable antifreeze could cause a serious fire.**

WARNING: **In order to help avoid being burned, do not remove the radiator cap while the engine and the radiator are hot. Scalding fluid and steam can be blown out under pressure if the cap is removed too soon.**

1. Remove the pressure cap.
2. Test the operation of the pressure cap. Refer to **Pressure Cap Testing**.
3. Wash the pressure cap mating surface with water.

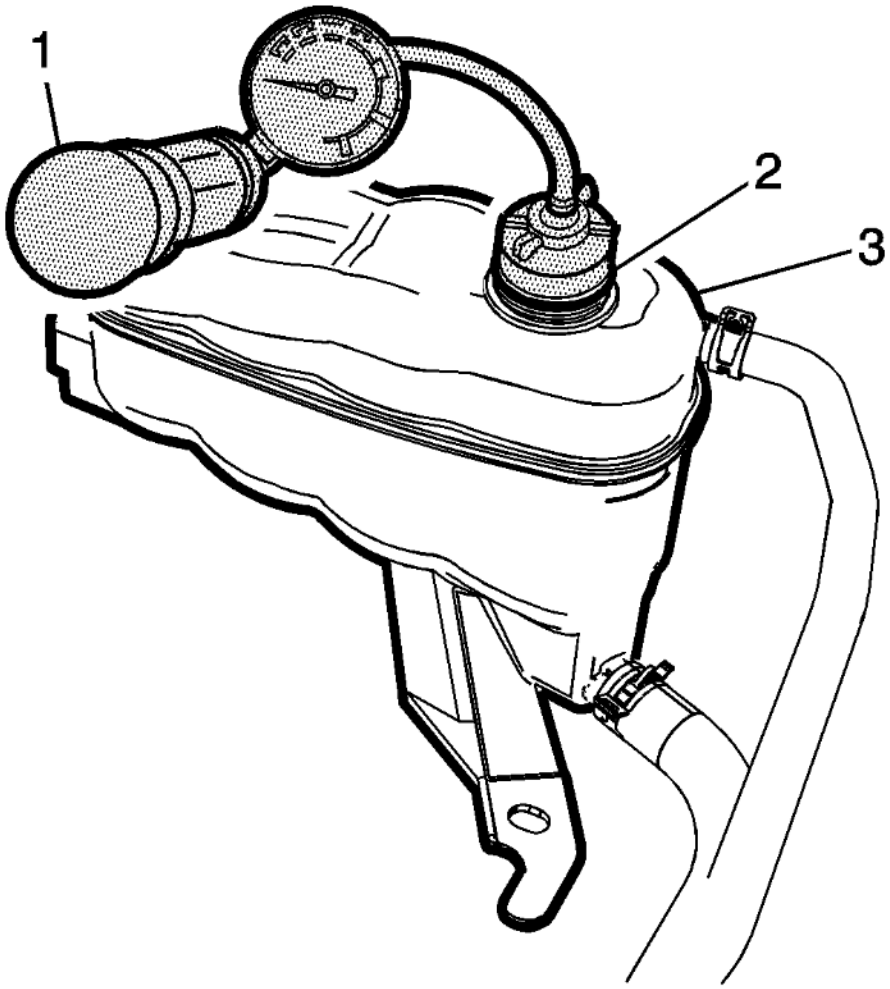

Fig. 6: Radiator Cap/Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

4. Use the **J-24460-01** cooling system pressure tester (1) with the **J-42401** radiator cap/surge tank test adapter (2) in order to apply pressure to the cooling system.

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Do not exceed the pressure cap rating.

5. The cooling system should hold the rated pressure for at least 2 minutes.

   Observe the gauge for any pressure loss.

6. Repair any leaks as required.

COOLING SYSTEM LEAK TESTING (L5P)

Special Tools

- **J-24460-01** Cooling System Pressure Tester
- **GE-52098** Cooling System Pressure Test Adapter

Equivalent regional tools:**Special Tools**.

WARNING: Under pressure, the temperature of the solution in the radiator can be considerably higher, without boiling. Removing the radiator cap while the engine is hot (pressure is high), will cause the solution to boil instantaneously, with explosive force. The solution will spew out over the engine, fenders, and the person removing the cap. Serious bodily injury may result. Flammable antifreeze, such as alcohol, is not recommended for use at any time. Flammable antifreeze could cause a serious fire.

WARNING: In order to help avoid being burned, do not remove the radiator cap while the engine and the radiator are hot. Scalding fluid and steam can be blown out under pressure if the cap is removed too soon.

Fig. 7: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

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NOTE: **The radiator surge tank uses two different radiator surge tank caps. The radiator surge tank cap that vents pressure in the event of excessive cooling system pressure is located on the lower outboard side of the radiator surge tank (2). The radiator surge tank cap that is located on top of the radiator surge tank (1) is where the cooling system is filled and where pressure testing equipment is to be mounted.**

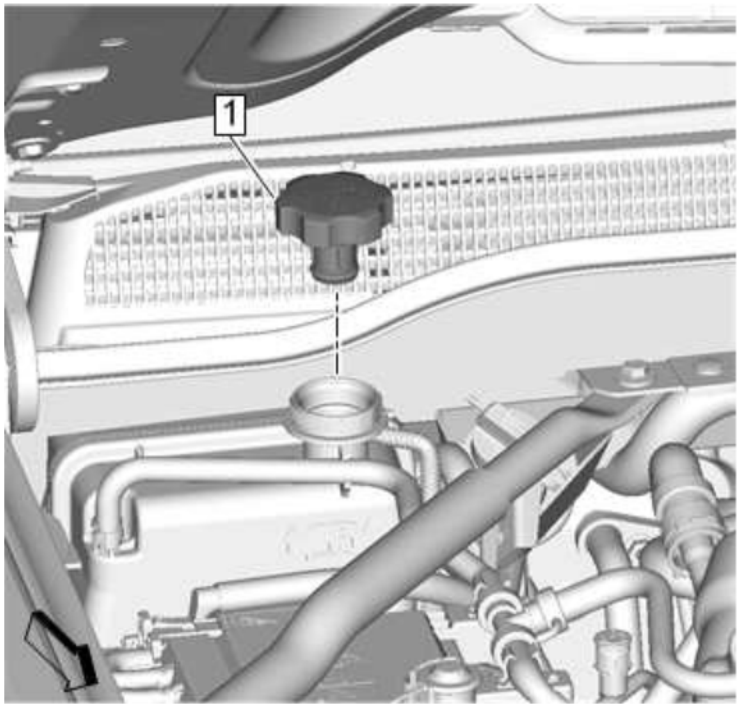

Fig. 8: Radiator Surge Tank Cap
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **The cap mounted to the top of the surge tank uses LEFT HAND threads. Turn the cap clockwise to remove the cap or counter clockwise to install the cap. Failure to turn the cap in the proper direction when installing or removing it may cause damage to the cap and/or the surge tank.**

1. Remove the radiator surge tank cap (1) that is on top of the radiator surge tank by turning it clockwise.
2. Test the operation of the radiator surge tank cap (1). **Pressure Cap Testing**
3. Wash the radiator surge tank cap mating surface with water.

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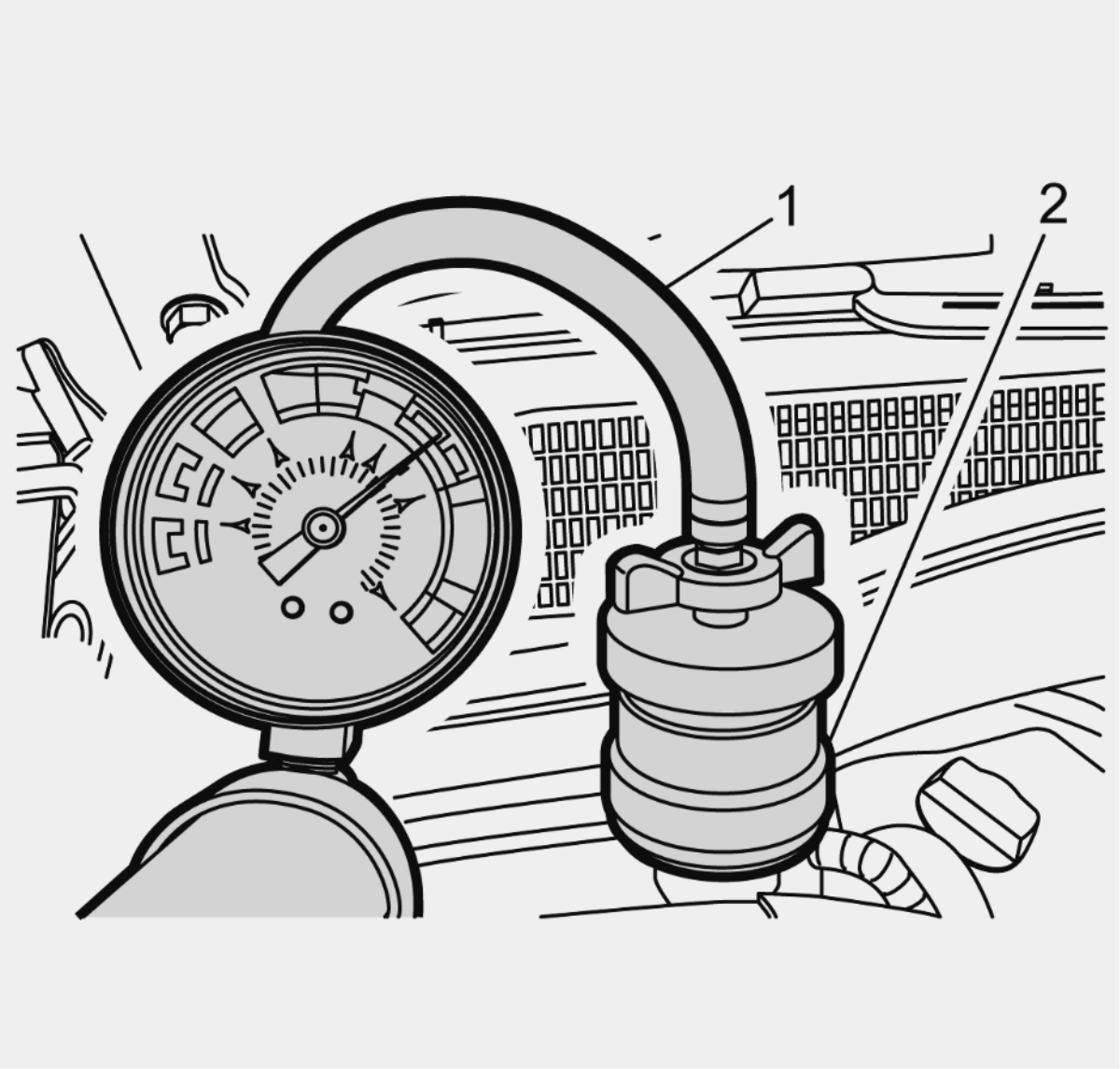

Fig. 9: Cooling System Pressure Tester
Courtesy of GENERAL MOTORS COMPANY

4. Install **GE-52098** Cooling System Pressure Test Adapter (2) to the radiator surge tank by turning it counter-clockwise until the adapter is fully seated.
5. Install **J-24460-01** Cooling System Pressure Tester (1) to **GE-52098** Cooling System Adapter (2)

   Do not exceed the pressure rating that is printed on the radiator surge tank cap that is located on the lower outboard side of the surge tank.

6. The cooling system should hold the rated pressure for at least 2 minutes.

   Observe the gauge for any pressure loss.

7. Inspect the cooling system for any system leaks.
8. Repair any leaks as required.
9. After diagnosis is complete, slowly vent cooling system pressure from the cooling system until there is no remaining cooling system pressure.
10. Remove **J-24460-01** Cooling System Pressure Tester (1) from **GE-52098** Cooling System Pressure Test

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Adapter (2)

11. Remove **GE-52098** Cooling System Pressure Adapter (2) from the radiator surge tank by turning it clockwise.
12. Clean any residual coolant from the radiator surge tank and pressure testing tools.
13. If diagnosis is complete and no other repairs are necessary, verify cooling coolant level and adjust as necessary. Then reinstall the top cap and tighten the cap counter clockwise until the cap is fully seated.

FAN CLUTCH DIAGNOSIS (DIESEL)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The ECM controls the electro-viscous (EV) fan clutch operation. The ECM regulates a 12-volt pulse width modulated signal (PWM) to the cooling fan relay. The PWM signal determines the ON time of the relay. As the ECM command increases, so does the ON time of the relay. The relay ON time directly controls the amount of time the solenoid, which is internal to the fan clutch, is energized. When the solenoid in the fan clutch is energized, it opens the spring loaded valve and allows fluid to flow from the storage chamber to the fluid coupling of the cooling fan clutch, which increases the fan speed. When the solenoid is de-energized, the spring loaded valve closes, and allows the fluid in the coupling of the fan clutch to drain back to the storage chamber, which reduces fan speed. The rapid modulation of the fan clutch solenoid valve gives the ECM the ability to precisely control the amount of fluid that remains in the fluid coupler, allowing more effective regulation of the fan speed and powertrain cooling requirements.

Reference Information

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **Electrical Center Identification Views** **Electrical Center Identification Views**

Description and Operation

Cooling Fan Description and Operation (L5P)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

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Control Module References for scan tool information

Circuit/System Verification

1. Ignition OFF.
2. Verify the conditions listed below do not exist with the cooling fan system:
   - A loose, worn, or mis-routed drive belt
   - Oil leaks at the cooling fan clutch
   - A free-spinning cooling fan
   - A seized cooling fan clutch
   - A broken cooling fan
   - Inspect the cooling fan clutch harness connector and the fan clutch jumper harness for the conditions listed below:
     - Poorly mated connectors
     - Backed/pushed out connector terminals
     - Poor terminal tension
     - Cut, chaffed, or nicked harness wiring at the fan clutch
   - **If a condition is found**

     Repair as necessary

   - **If a condition is not found**
3. Ignition ON.
4. Verify DTC P0480, P0483, P0495, or P0526 is not set.
   - **If a DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **If a DTC is not set**
5. Engine at operating temperature.
6. Verify the scan tool Fan Speed and Desired Fan Speed parameters are within 500 RPM while performing the test listed below:
   1. Increase engine speed to 1,500 RPM

      NOTE: **In each of the commanded states, it may take up to 2 minutes for the Fan Speed to achieve the Desired Fan Speed.**

   2. Command the Cooling Fan slowly from 10 % to 80 % with a scan tool.
   3. Command the Cooling Fan to 10 % with a scan tool.
   - **The Fan Speed is not within 500 RPM of the Desired Fan Speed**

     Refer to Circuit/System Testing

   - **The Fan Speed is within 500 RPM of the Desired Fan Speed**
7. All OK

Circuit/System Testing

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1. Ignition OFF, and all vehicle systems OFF, disconnect the cooling fan relay. It may take up to 2 minutes for all vehicle systems to power down.
2. Ignition ON.
3. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.
    - **If the test lamp does not illuminate**
    1. Remove the Fan Fuse.
    2. Test for less than 2 Ω in the B+ circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.
    - **If the test lamp illuminates**
4. Test for less than 5 Ω between the fan relay ground circuit terminal 86 and ground.
    - **If 5 Ω or greater**
    1. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 5 Ω**
5. Test for 7-17 Ω between fan relay terminal 87A and terminal 86.
    - **If less than 7 Ω**
    1. Disconnect the engine cooling fan harness connector.
    2. Verify a test lamp does not illuminate between the fan relay terminal 87A and B+.
        - If the test lamp illuminates, repair the short to ground in the solenoid valve control circuit terminal 87A.
        - If the test lamp does not illuminate, test the circuits of the jumper harness for a shorted condition. If the jumper harness tests normal, replace the cooling fan clutch assembly.
    - **If greater than 17 Ω**
    1. Disconnect the engine cooling fan harness connector.
    2. Test for less than 2 Ω between relay terminal 87A and fan harness connector terminal B.
        - If 2 Ω or greater, repair the open/high resistance in the fan clutch solenoid valve control circuit.
        - If less than 2 Ω.
    3. Test for less than 2 Ω between the fan harness connector terminal A and ground.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, test the circuits of the jumper harness for an open/high resistance condition. If the jumper harness tests normal, replace the cooling fan clutch assembly.
    - **If within 7-17 Ω**
6. Engine operating, connect a 10 A fused jumper wire between fan relay terminal 87A and B+.

NOTE: **It may take several minutes for the fan clutch to fully engage with the engine at idle.**

7. Verify the fan gets much louder to indicate the fan clutch is engaged.

NOTE: **It may take anywhere from 10-52 minutes for the fan clutch to disengage**

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depending on the factors below:

- **Engine speed**
- **Coupler fluid temperature**
- **Elevation above sea level**

8. Disconnect the 10 A fused jumper wire from B+. The fan should become quiet to indicate the clutch is disengaged.
    - **If the fan clutch doesn't engage or disengage according to the test**

      Replace the cooling fan clutch assembly.

    - **If the fan clutch engages and disengages according to the test**
9. Test or replace the fan relay.

Component Testing

Relay Test

1. Remove the cooling fan clutch relay.
2. Connect a 10 A fused jumper wire between relay terminal 87 and B+. Connect a jumper wire between relay terminal 6 and ground.
3. Test for less than 1 V between terminal 87Aand ground.
    - If greater than the specified value, replace the fan relay.
4. Connect a jumper wire between terminal 85 and ground.
5. Test for B+ between terminal 87A and ground.
    - If less than the specified value, replace the fan relay.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Fan Blade Clutch Replacement (LC8, L96)Fan Blade Clutch Replacement (L5P)

REPAIR INSTRUCTIONS

HOSE CLAMP REPLACEMENT GUIDELINES - SPRING TYPE

Special Tools

- **BO-38185** Hose Clamp Pliers
- **GE-47622** Hose Clamp Pliers.

Equivalent regional tools:**Special Tools**

Spring Type Hose Clamp Replacement Guidelines

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Fig. 10: Spring Type Hose Clamps
Courtesy of GENERAL MOTORS COMPANY

Vehicles utilize spring type hose clamps (1) to secure joints in which fluids, gases, or engine vacuum can travel to various vehicle systems. Spring type hose clamps are engineered to provide the proper amount of tension to maintain a leak & maintenance free joint for the life of the vehicle.

Spring type hose clamps have a special coating applied to the exterior of the clamp that is engineered to resist rust/corrosion, improve durability and increase the life of the hose clamp. If the coating is damaged, rust/corrosion could form resulting in the need to replace the hose clamp.

Many spring type hose clamps within GM utilize a small amount of adhesive placed directly on the hose clamp to secure the clamp to the mating hose for manufacturing purposes. Over time the strength of the adhesive will deteriorate. It is extremely important when a technician is attempting to service a joint or remove the hose clamp, that the clamp is not rotated or repositioned so that is tears and/or damages the hose. In this case, the hose and clamp must both be replaced.

When repairing a vehicle it is very important to observe the condition of both the hose and the spring type hose clamp as well as the orientation of the clamp to the hose.

If the spring type hose clamp(s) have any of the following conditions on any area of the clamp, replace the clamp(s) immediately.

- Rust/Corrosion
- Cracks
- Physical damage
- Leakage attributed to the retention of the clamp

Removing The Spring Type Hose Clamp

While keeping the hose stationary, use BO-38185 Hose Clamp Pliers or GE-47622 Hose Clamp Pliers and

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release the spring type hose clamp tension while attempting to separate the hose clamp from the hose.

- If the spring type hose clamp will not easily separate from the hose and/or the clamp tears or damages the hose, both the hose and hose clamp must be replaced
- If the spring type hose clamp is easily removed from the hose, the clamp can be reused provided that the clamp does not have any of the conditions as noted above.

If The Spring Type Hose Clamp Is Being Reused

It is extremely important that the spring type hose clamp is orientated to the hose in the exact same position as it was installed during vehicle assembly so that the hose clamp is not damaged or the hose clamp does not contact or damage any adjacent components. Do not use any type of adhesive on the hose clamp prior to installation.

When Reusing The Spring Type Hose Clamp and Replacing The Hose

- The inside and outside hose diameter must be identical between the new hose and the existing hose to guarantee proper hose clamp tension and joint integrity.
- Always place the existing spring type hose clamp in the same orientation as it was positioned prior to separating the joint. The new hose might have a marking on the hose indicating the correct position of a hose clamp, which should re-confirm the correct hose clamp position. The hose clamp should not contact any adjacent components after installation.

When Reusing The Spring Type Hose Clamp with an Existing Hose

Always place the existing spring type hose clamp in the same orientation as it was positioned prior to separating the joint. The existing hose might have an indentation or compression mark on the hose from where the hose clamp was installed previously. The hose clamp should identically overlay this position. The existing hose might also have a marking on the hose indicating the correct position of the hose clamp, which should re-confirm the correct hose clamp position. The hose clamp should not contact any adjacent components after installation.

If The Spring Type Hose Clamp Is Being Replaced

If the hose clamp needs to be replaced, always replace the hose as part of the service repair. It is extremely important that a new spring type hose clamp is orientated to the hose in the exact same position as it was installed during vehicle assembly so that the hose clamp is not damaged or the hose clamp does not contact or damage any adjacent components. Do not use any type of adhesive on the hose clamp prior to installation.

When Replacing The Spring Type Hose Clamp and Replacing The Hose

- The inside and outside hose diameter must be identical between the new hose and the existing hose to guarantee proper hose clamp tension and joint integrity.
- Always place the new spring type hose clamp in the same orientation as it was positioned prior to separating the joint. The new hose might have a marking on the hose indicating the correct position of a hose clamp, which should re-confirm the correct hose clamp position. The hose clamp should not contact any adjacent components after installation.

When Replacing The Spring Type Hose Clamp with an Existing Hose

Always place the new spring type hose clamp in the same orientation as it was positioned prior to separating the joint. The existing hose might have an indentation or compression mark on the hose from where a hose clamp was installed previously. The hose clamp should identically overlay this position. The existing hose might also

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have a marking on the hose indicating the correct position of the hose clamp, which should re-confirm the correct hose clamp position. The hose clamp should not contact any adjacent components after installation.

COOLING SYSTEM DRAINING AND FILLING (STATIC FILL LC8 L96)

Special Tools

- **J-26568** Coolant and Battery Tester
- **J-38185** Hose Clamp Pliers

Draining Procedure

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

1. Follow the steps below in order to remove the surge tank fill cap:
    1. Slowly rotate the cap counterclockwise.
    2. Stop rotating and allow the hissing to stop.
    3. After all the hissing stops, continue turning counterclockwise in order to remove the cap.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Place a drain pan under the lower radiator hose and/or drain cock.
4. Reposition the lower radiator hose and/or drain cock from the radiator.
5. Drain the cooling system.

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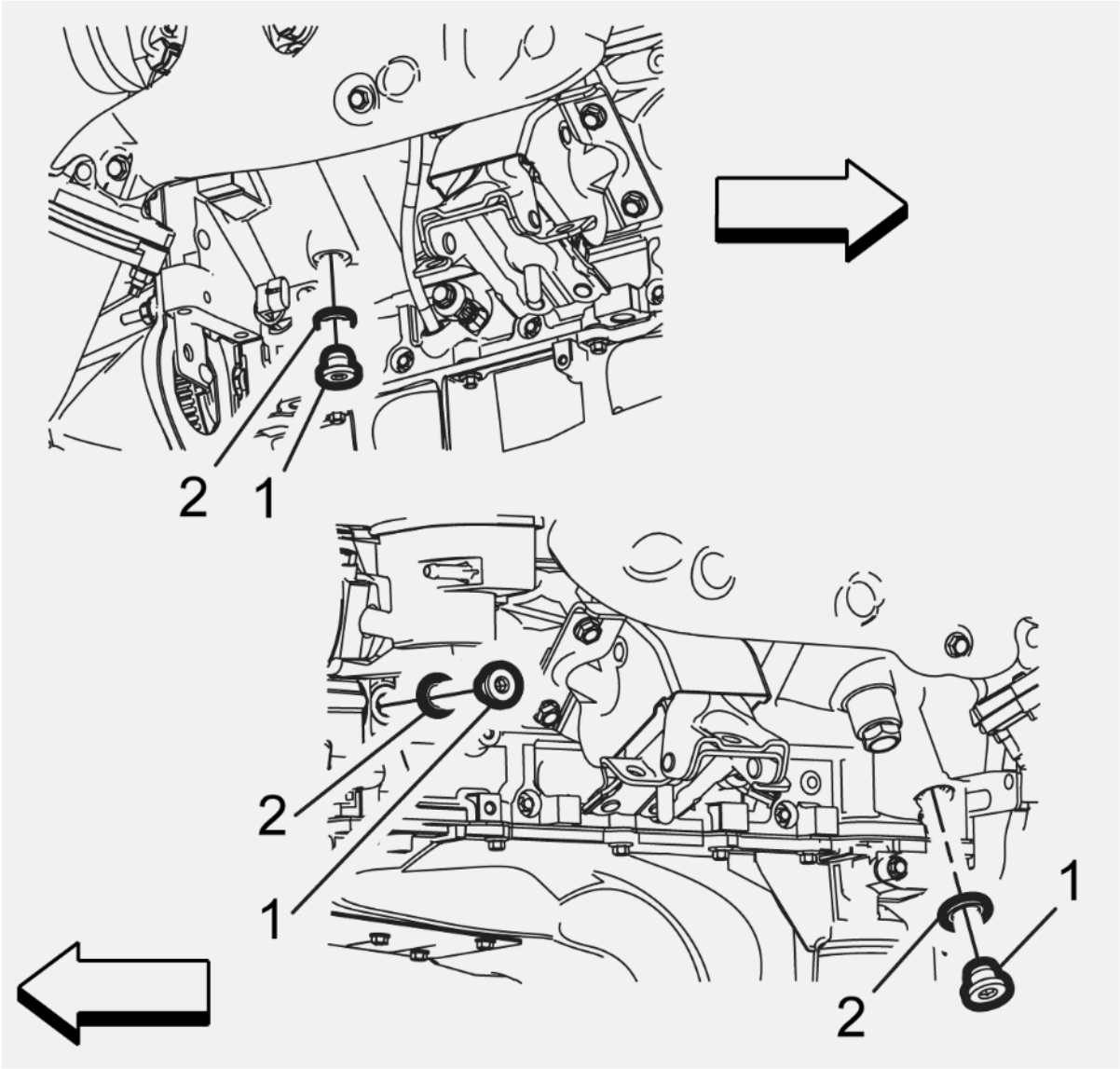

Fig. 11: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

6. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2).
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant:
   - Normal in appearance-Follow the filling procedure.
   - Discolored-Follow the flush procedure. Refer to **Flushing**.

Filling Procedure

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

1. Install the lower radiator hose and/or drain cock to the radiator.

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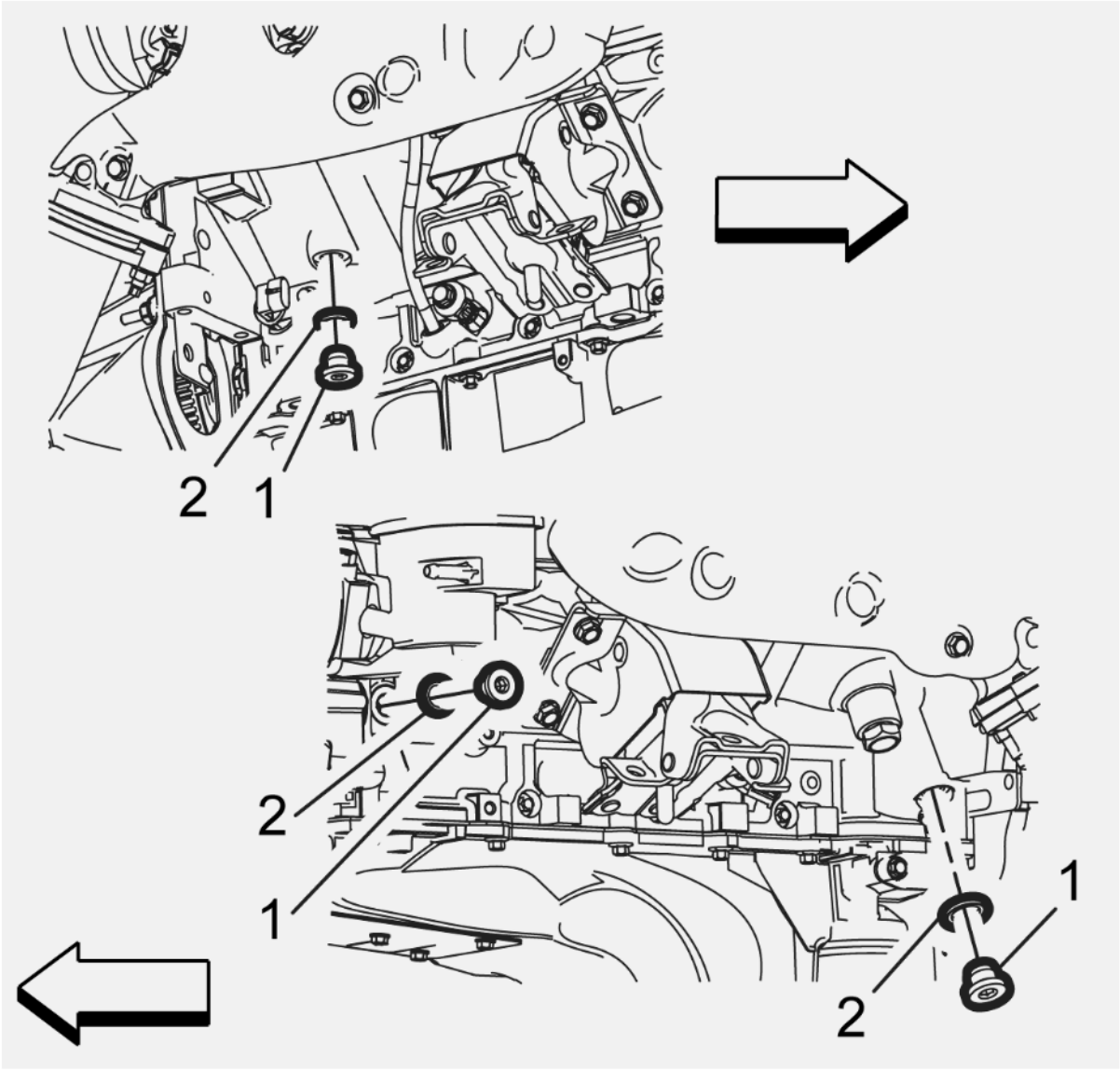

Fig. 12: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

2. If the left and right engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2) were removed, install the engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2). Refer to **Engine Block Plug Installation** .
3. Lower the vehicle.

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

4. Slowly fill the cooling system with a 50/50 coolant mixture. Refer to **Approximate Fluid Capacities**.
5. Install the coolant pressure cap.
6. Start the engine.
7. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.

Engine should reach an operating temperature of 90Â°C (194Â°F) and the upper radiator hose should be

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HOT.

8. Allow the engine to idle for 3 minutes.
9. Shut the engine OFF.
10. Allow the engine to cool.
11. Top off the coolant as necessary.
12. Inspect the concentration of the engine coolant using the **J-26568** coolant and battery tester.
13. Rinse away any excess coolant from the engine and the engine compartment.

COOLING SYSTEM DRAINING AND FILLING (VAC N FILL LC8 L96)

Special Tools

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

Draining Procedure

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

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Place a drain pan under the drain cock and/or lower radiator hose.
5. Reposition the radiator drain cock and/or lower radiator hose.
6. Drain the cooling system.

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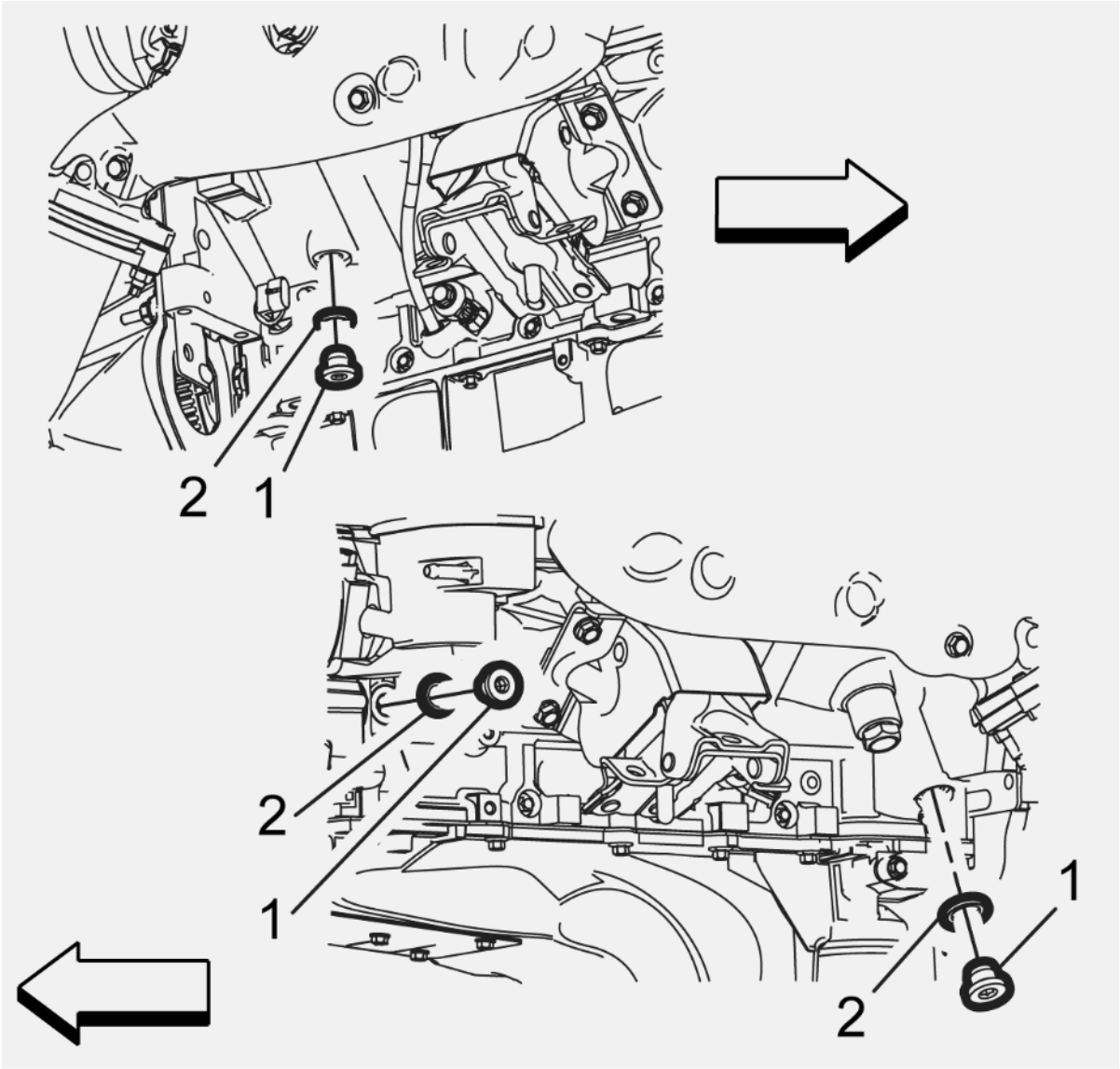

Fig. 13: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

7. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2).
8. Inspect the coolant.
9. Follow the appropriate procedure based on the condition of the coolant.
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. Refer to **Flushing**.

Vac-N-Fill Procedure

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

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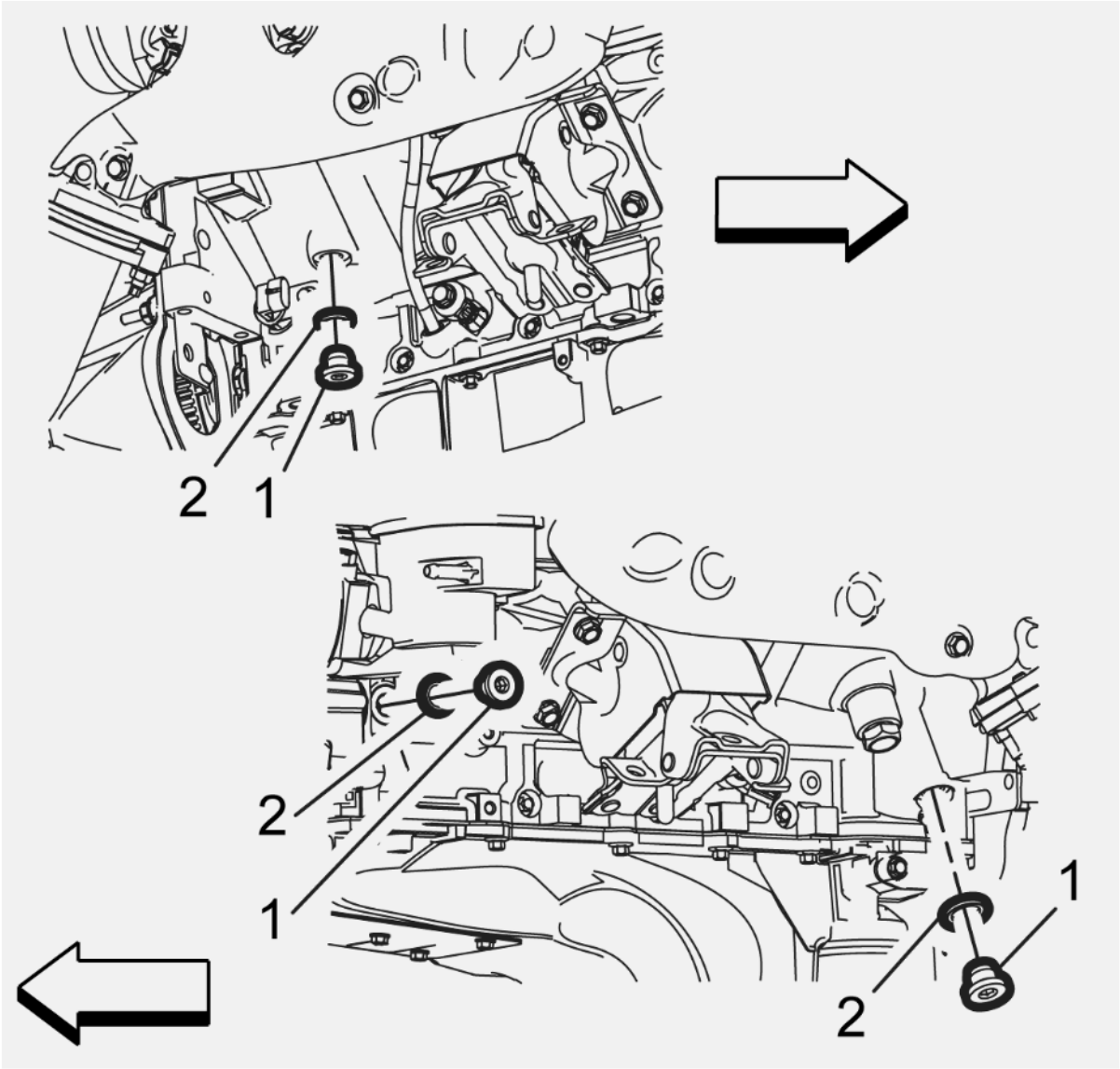

Fig. 14: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

1. If the left and right engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2) were removed, install the engine block coolant drain hole plugs (1) and engine block coolant drain hole plug gaskets (2). Refer to **Engine Block Plug Installation** .
2. Install the **J-42401** radiator cap and surge tank test adapter.

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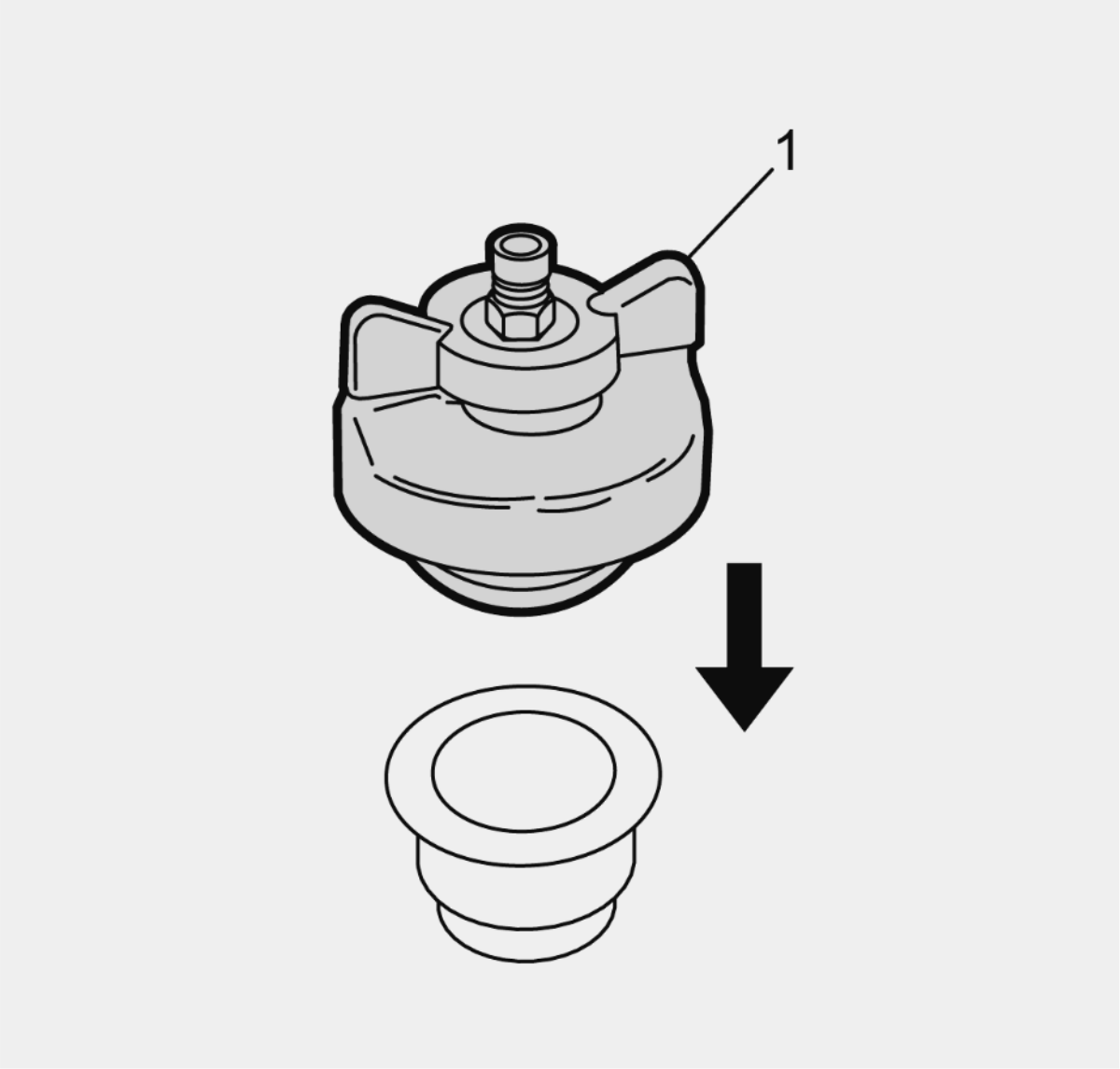

Fig. 15: Radiator Cap & Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

3. Attach the Vac-N-Fill cap (1) to the vehicles coolant fill port.

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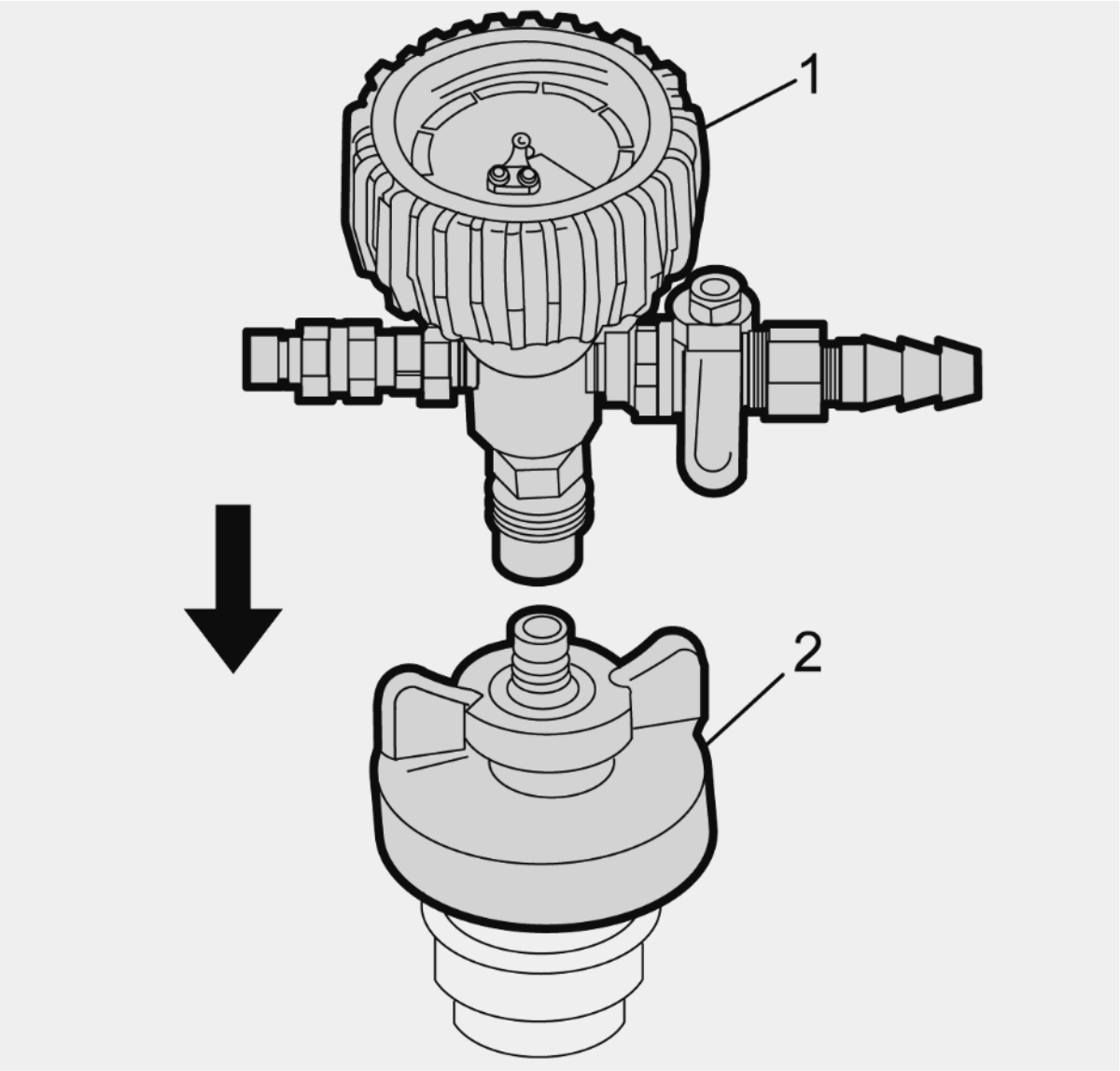

Fig. 16: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

4. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

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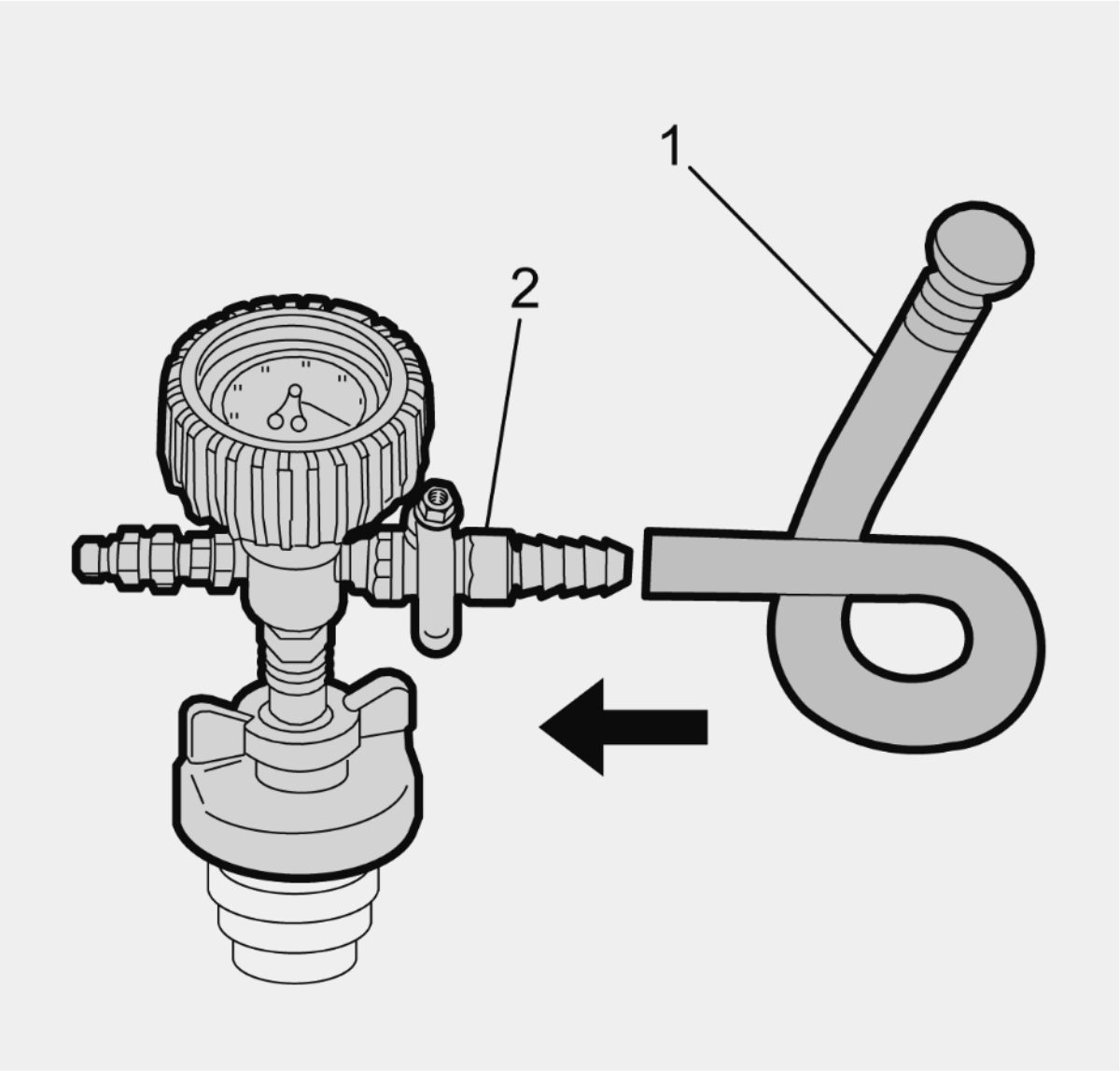

Fig. 17: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

5. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

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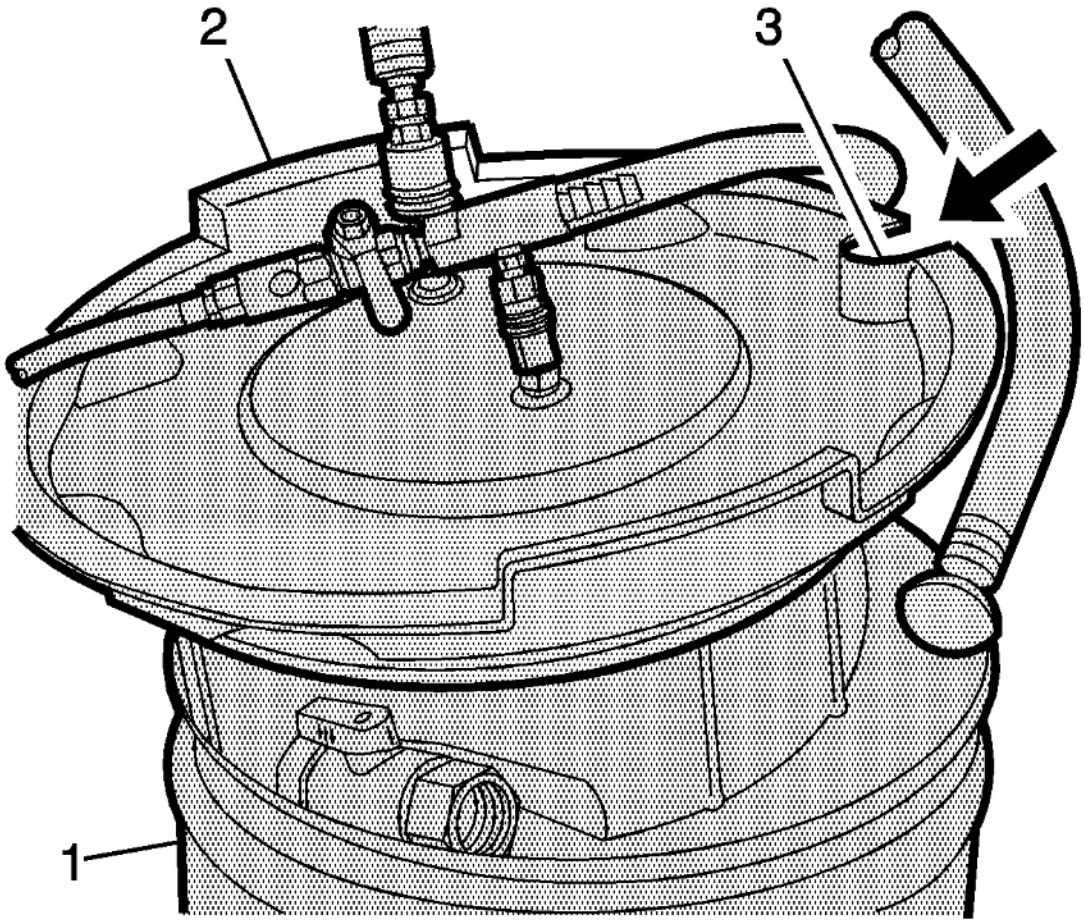

Fig. 18: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

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.

6. Pour the coolant mixture into the graduated reservoir (1).
7. Place the fill hose in the graduated reservoir (1).

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.**

8. Install the vacuum tank (2) on the graduated reservoir with the fill hose routed through the cut-out area (3) in the vacuum tank.

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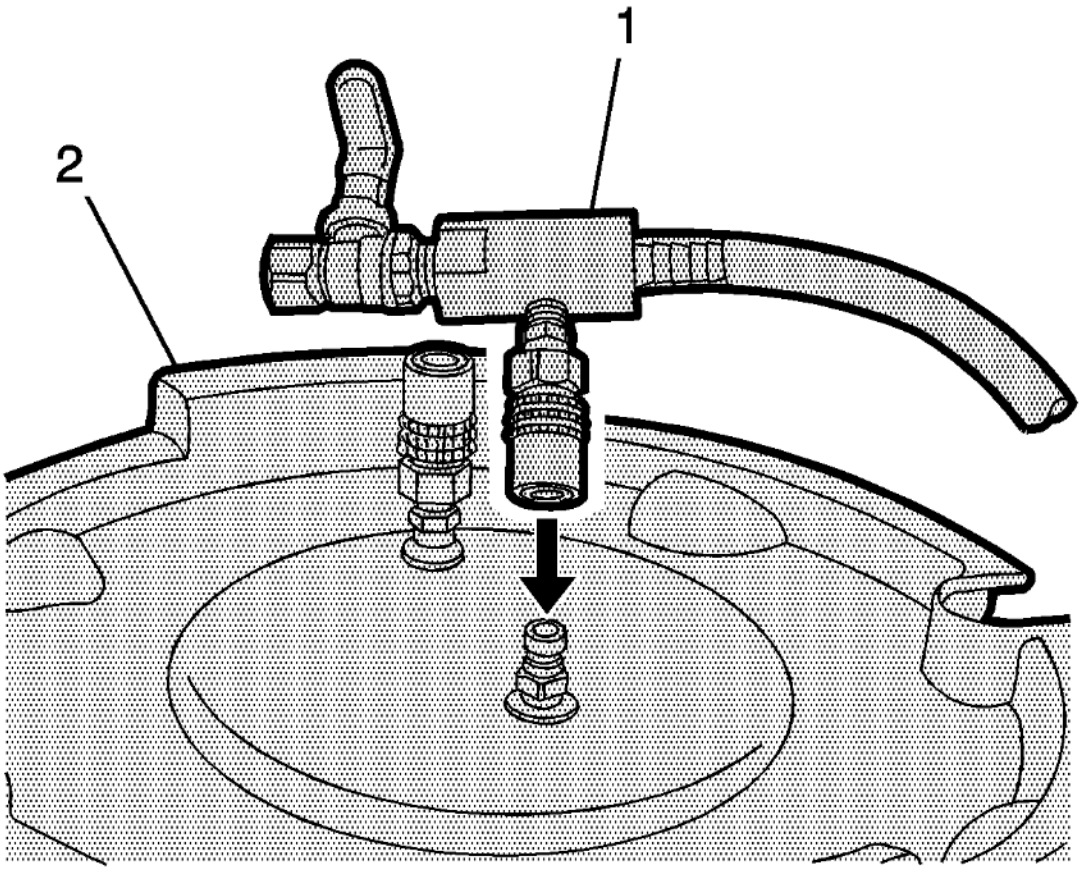

Fig. 19: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

9. Attach the venturi assembly (1) to the vacuum tank (2).

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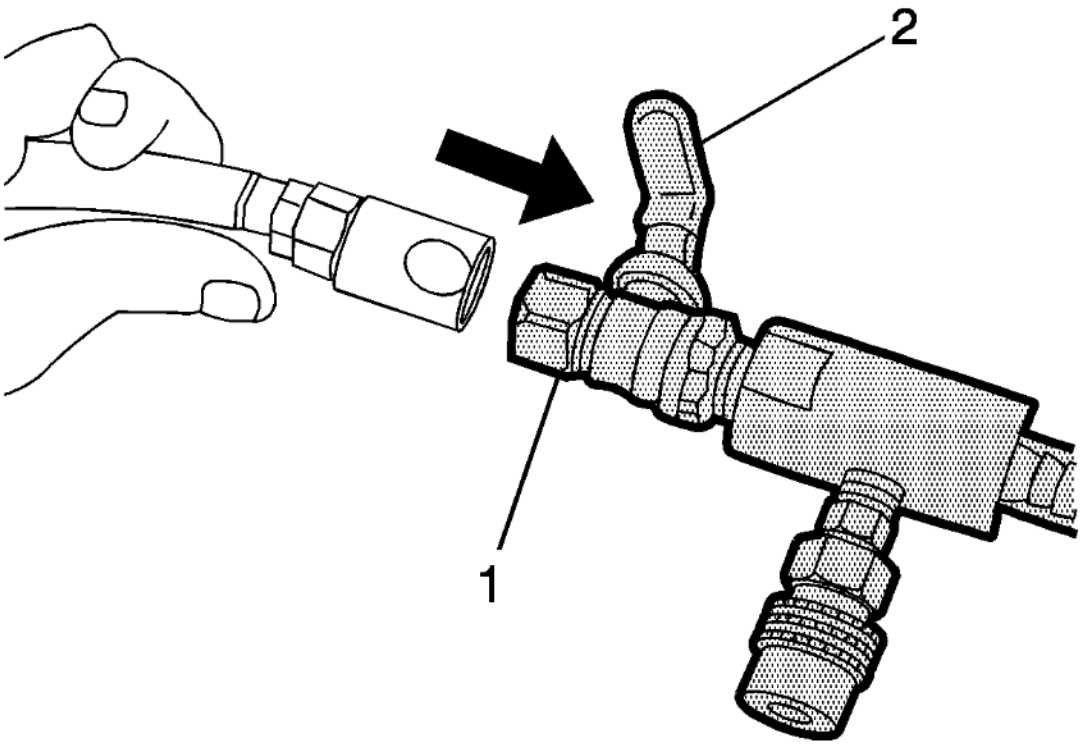

Fig. 20: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

10. Attach a shop air hose to the venturi assembly (1).

    Ensure the valve (2) on the venturi assembly is closed.

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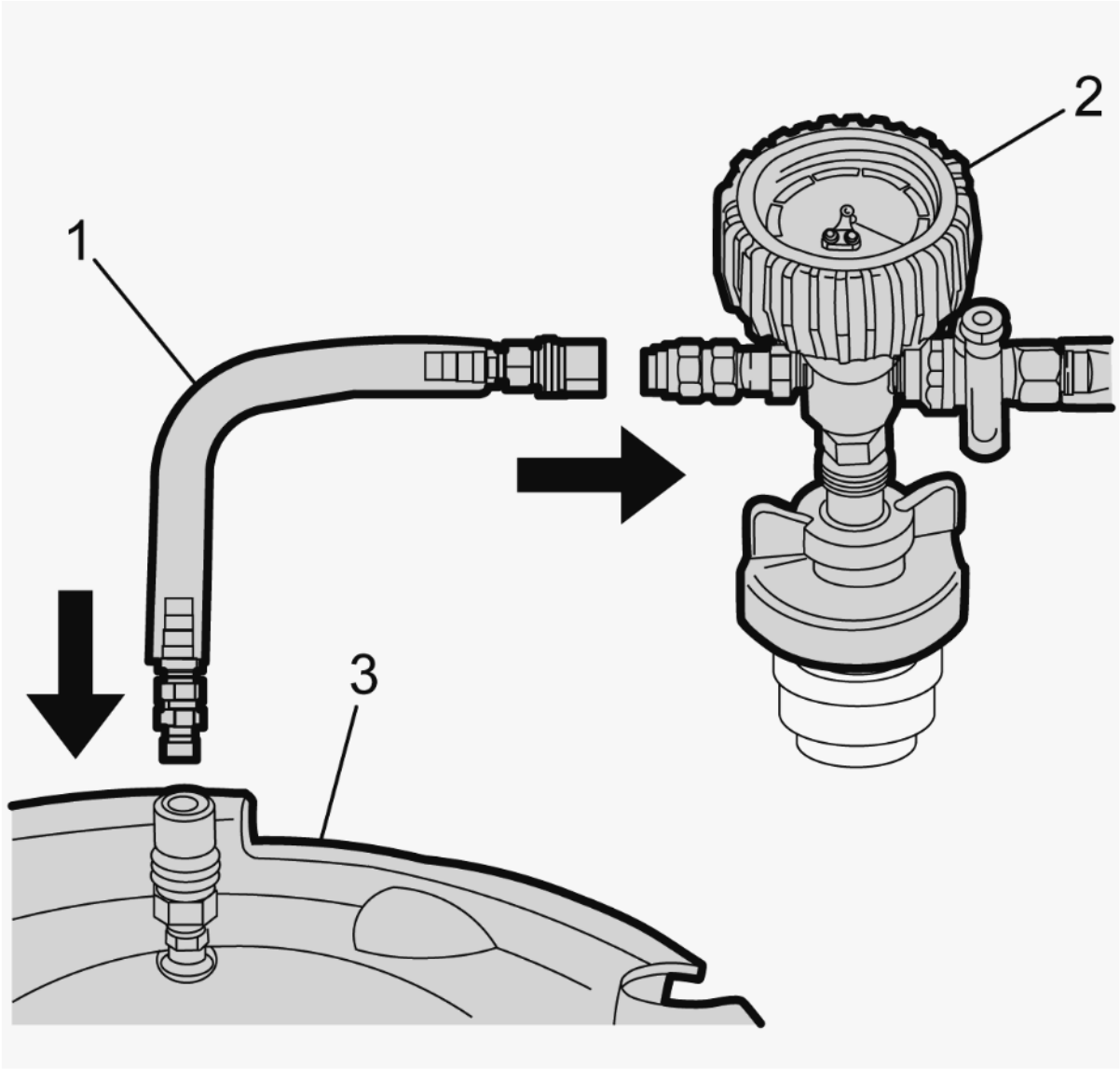

Fig. 21: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

11. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).
12. Clamp off the overflow hose.

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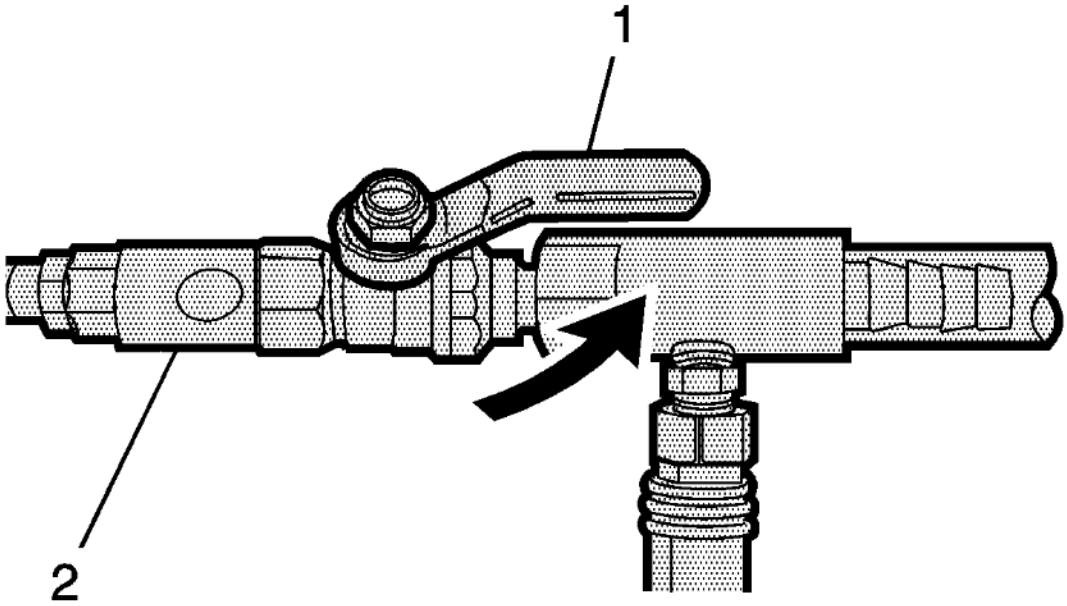

Fig. 22: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

13. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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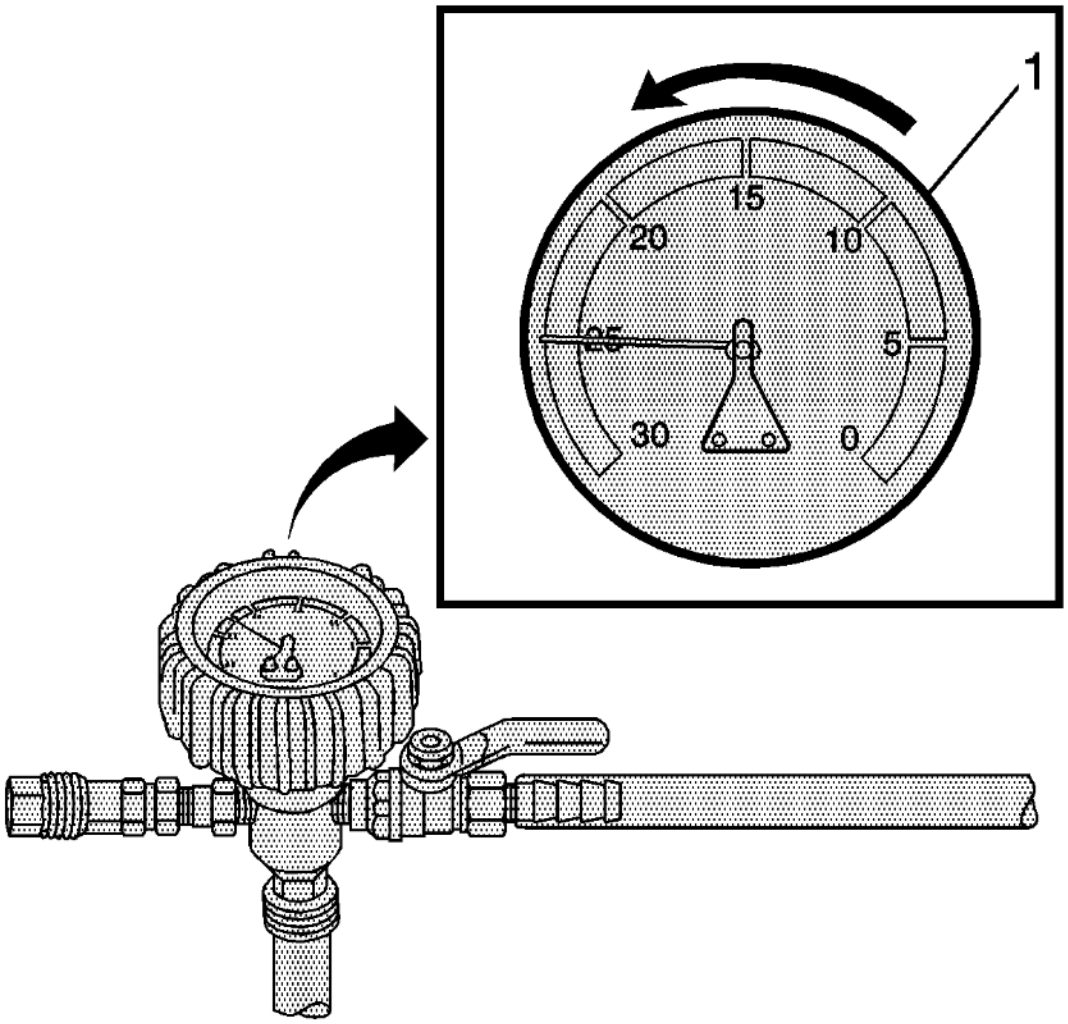

Fig. 23: Vacuum Gauge Needle
Courtesy of GENERAL MOTORS COMPANY

14. Continue to draw vacuum until the needle stops rising (1). This should be 610-660 mm Hg (24-26 in Hg).

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

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

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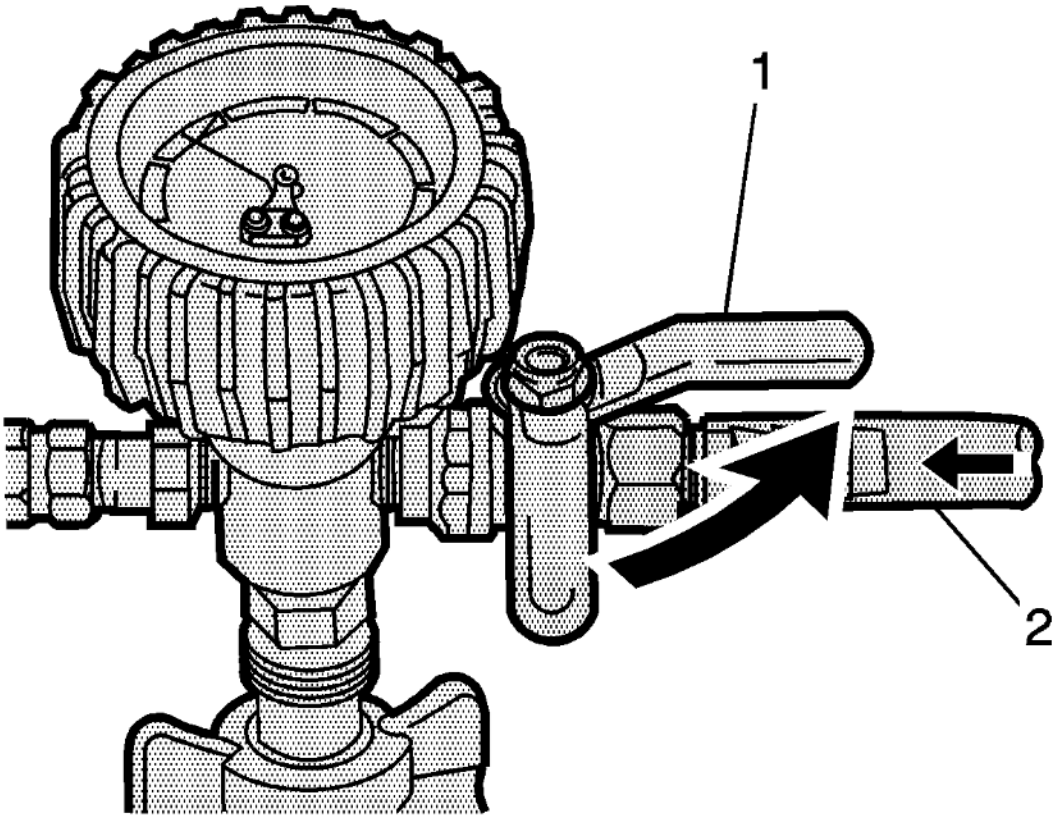

Fig. 24: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

16. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
17. Close the valve on the venture assembly.
18. 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 (LC8, L96)**.

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

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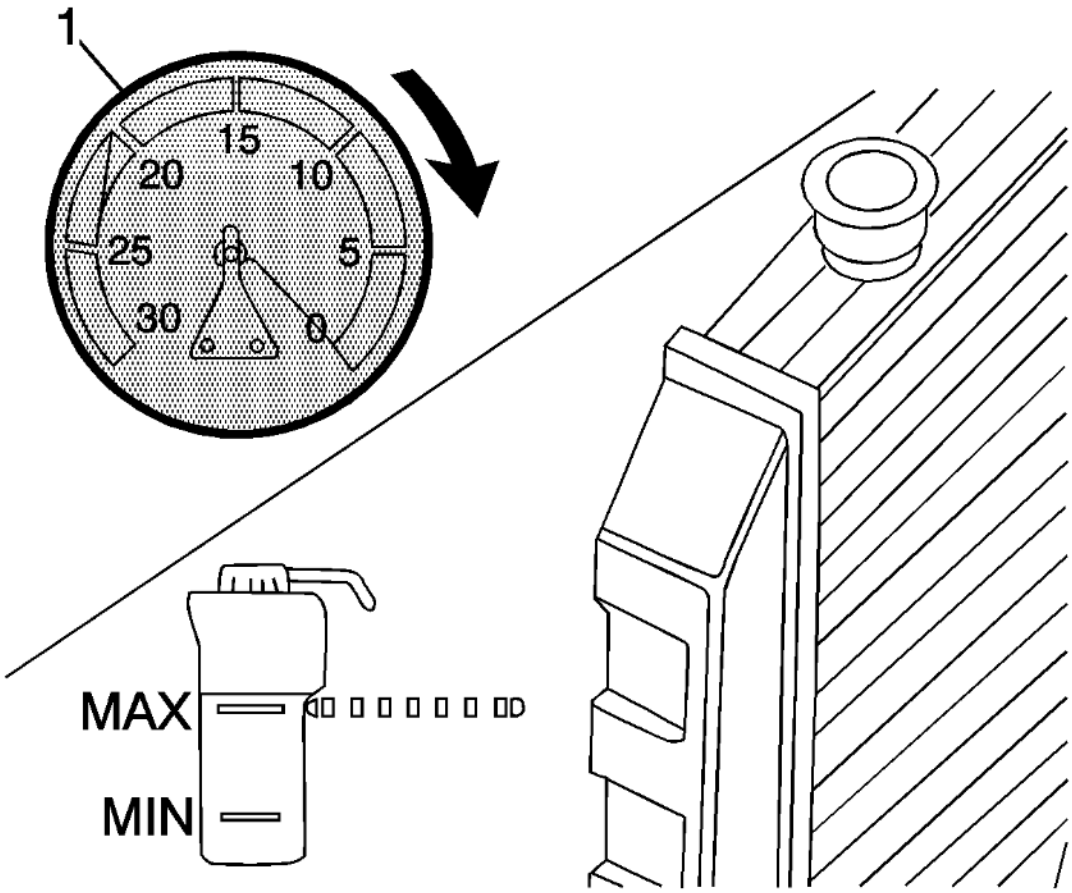

Fig. 25: Vacuum Gauge At Zero
Courtesy of GENERAL MOTORS COMPANY

20. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11-17.
21. Remove the **J-42401** radiator cap and surge tank test adapter.
22. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
23. Add coolant to the system as necessary.
24. Inspect the concentration of the coolant mixture using **J-26568** coolant and battery tester.

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

25. Detach the vacuum hose form the vacuum gauge assembly.

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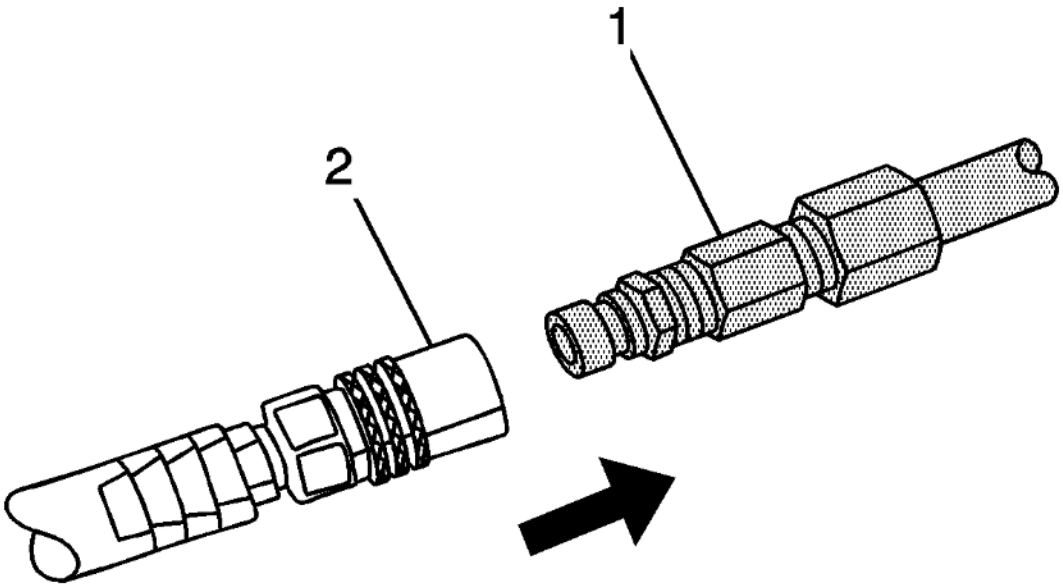

Fig. 26: Vacuum Hose & Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

26. Attach the extraction hose (1) to the vacuum hose (2).

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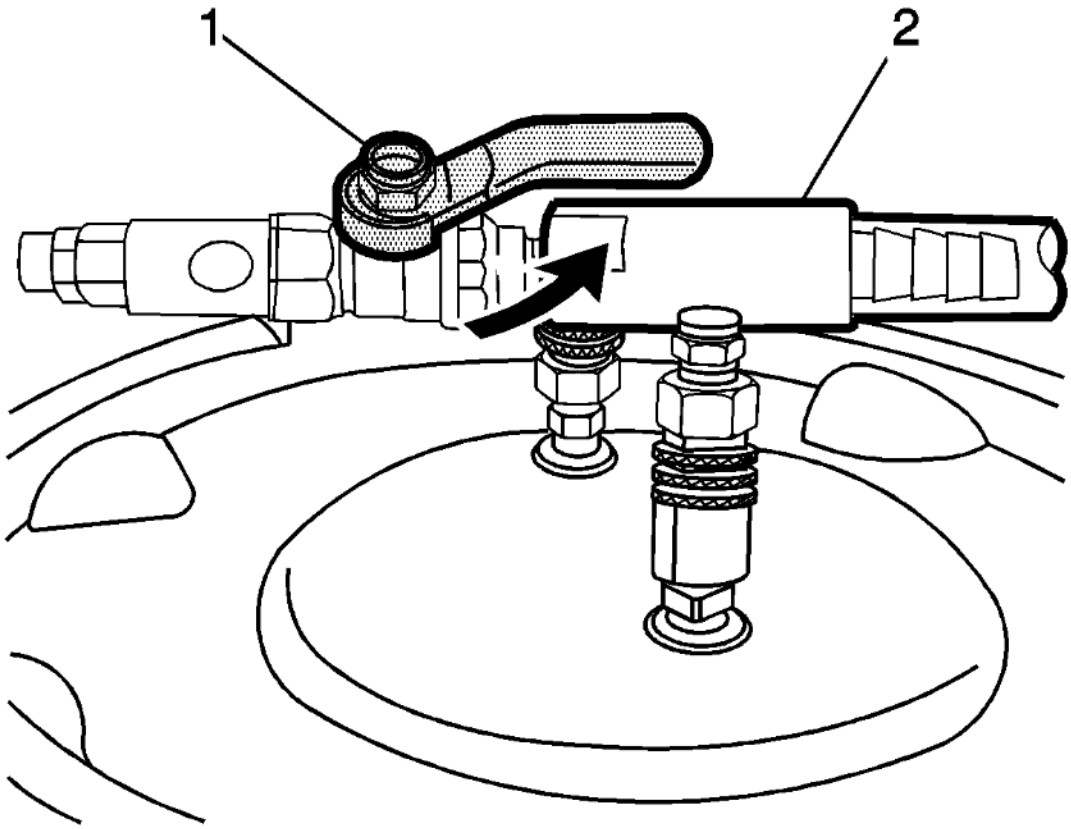

Fig. 27: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

27. Open the valve (1) on the venturi assembly (2) to start a vacuum draw.

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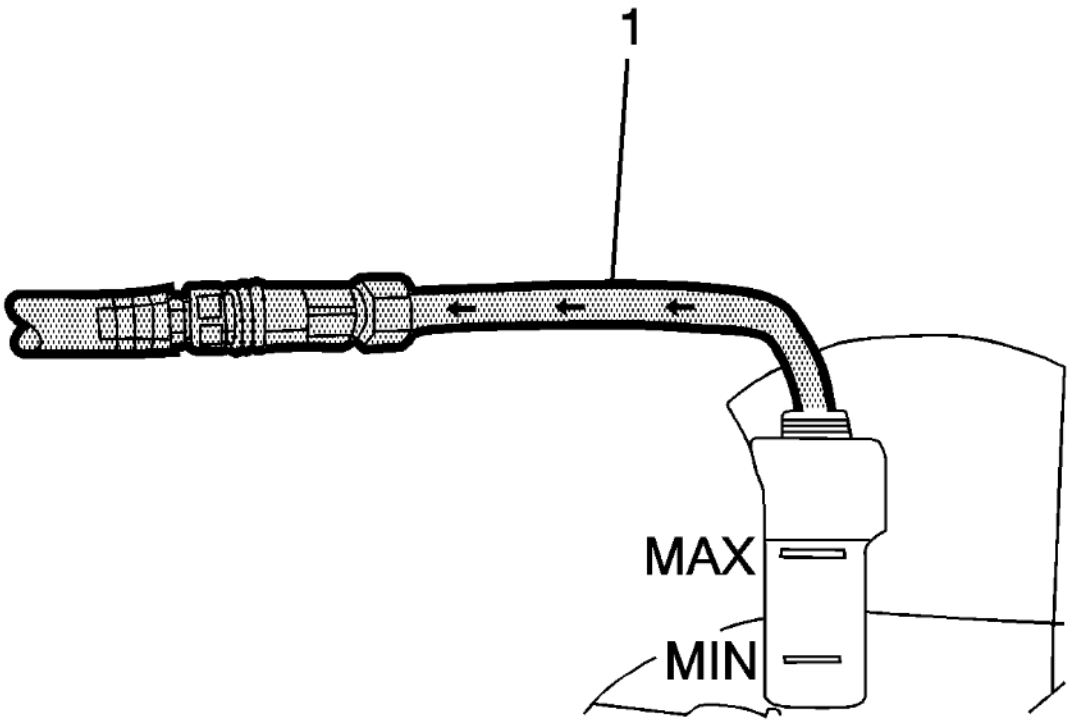

Fig. 28: Coolant Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

28. Use the extraction hose (1) to draw out coolant to the proper level.
29. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

COOLING SYSTEM DRAINING AND FILLING (VAC N FILL L83 L86)

Special Tools

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

Draining Procedure

WARNING: With a pressurized cooling system, the coolant temperature in the radiator can be considerably higher than the boiling point of the solution at atmospheric pressure. Removal of the surge tank cap, while the cooling system is hot and under high pressure, causes the solution to boil instantaneously with explosive

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force. This will cause the solution to spew out over the engine, the fenders, and the person removing the cap. Serious bodily injury may result.

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. **Lifting and Jacking the Vehicle** .
4. Place a drain pan under the radiator drain cock.
5. Install a suitable length of hose to the radiator drain cock nipple and route the hose to allow free drain of coolant.
6. Open the radiator drain cock.
7. Drain the cooling system.

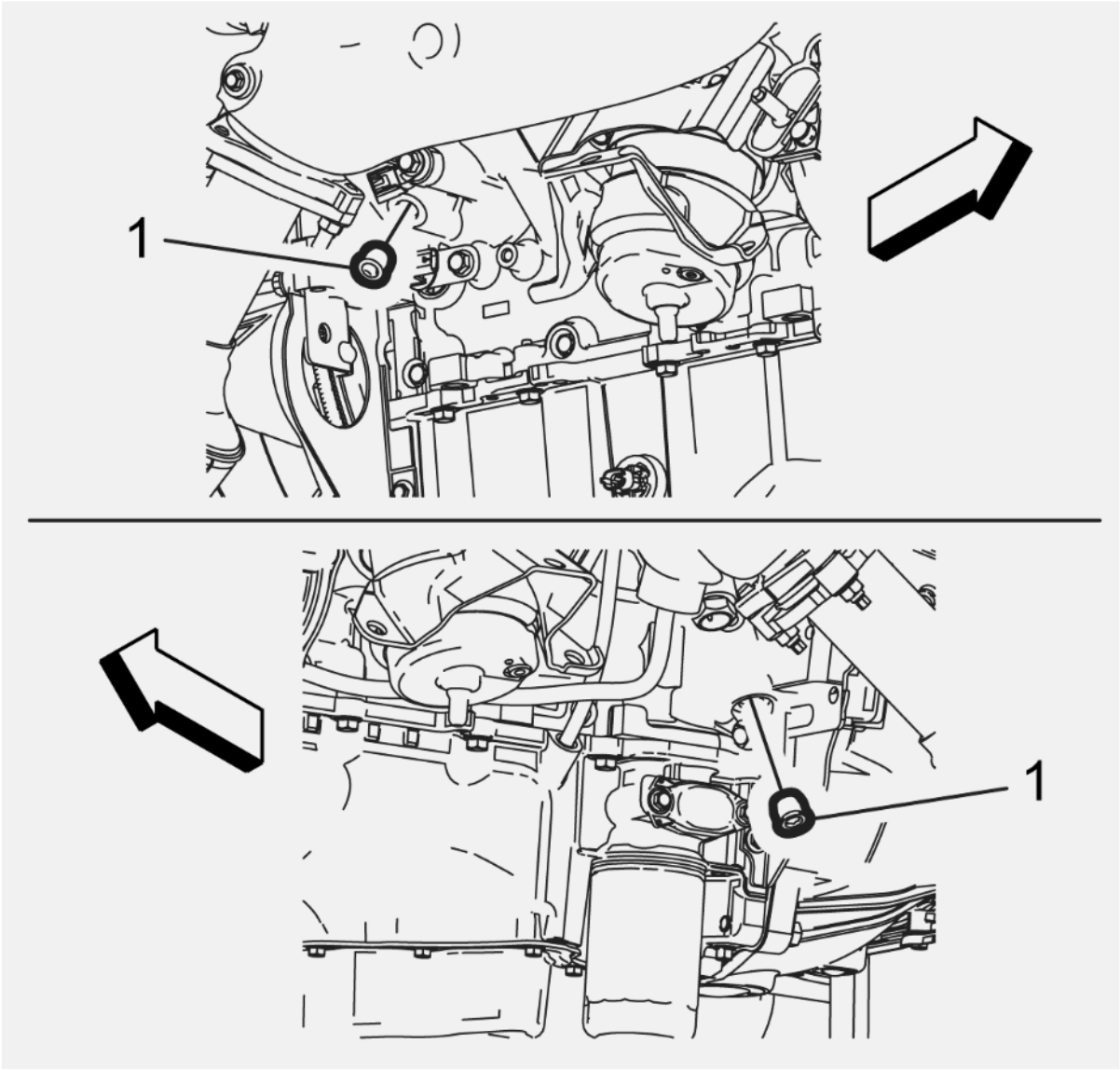

Fig. 29: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

8. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1).
9. Inspect the coolant.

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10. Follow the appropriate procedure based on the condition of the coolant.
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**.

Vac-N-Fill Procedure

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

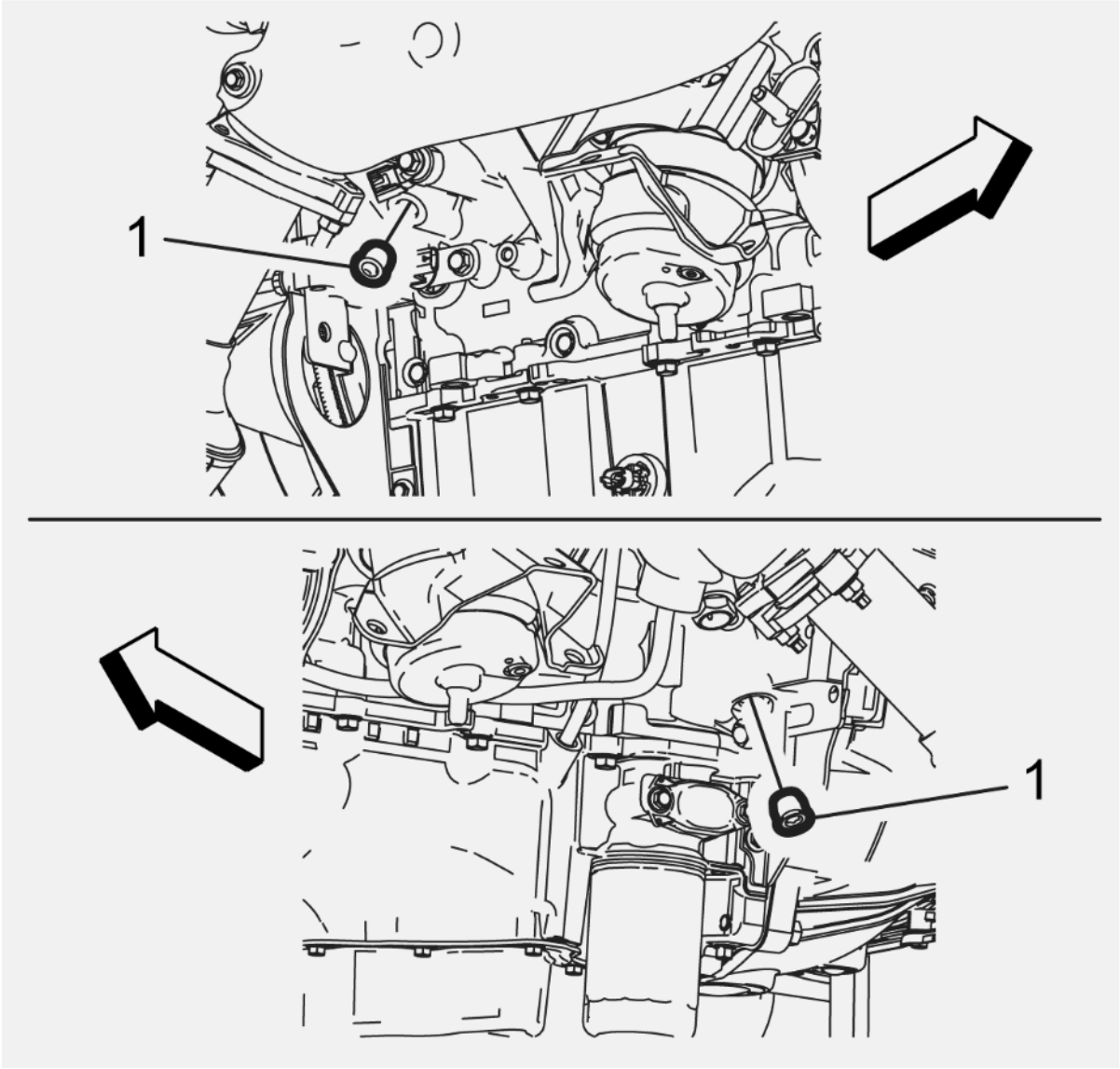

Fig. 30: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

1. If the left and right engine block coolant drain hole plugs (1) were removed, install the engine block coolant drain hole plugs (1). **Engine Block Plug Installation** .
2. Install the **J-42401** radiator cap and surge tank test adapter.

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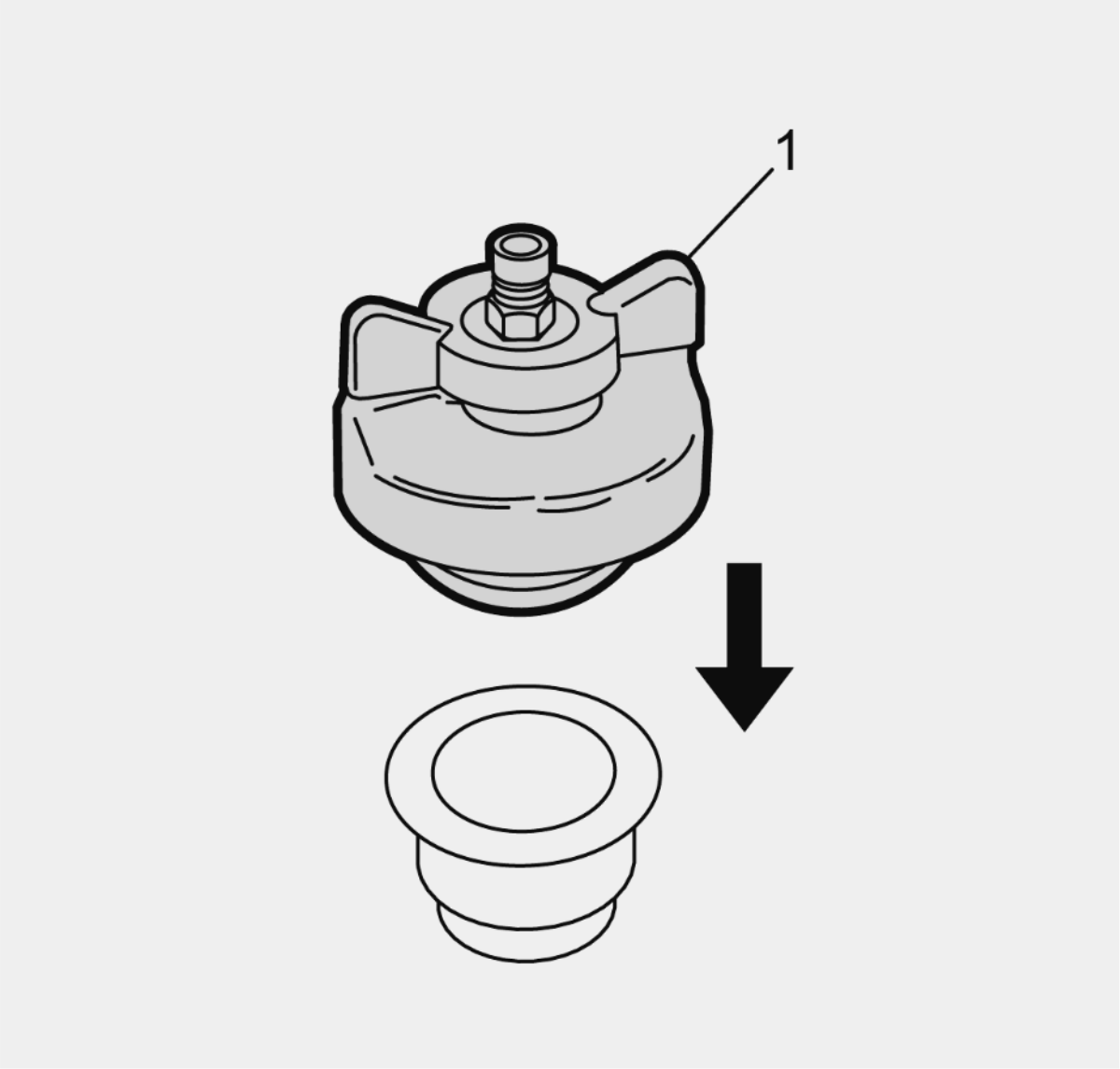

Fig. 31: Radiator Cap & Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

3. Attach the Vac-N-Fill cap (1) to the vehicles coolant fill port.

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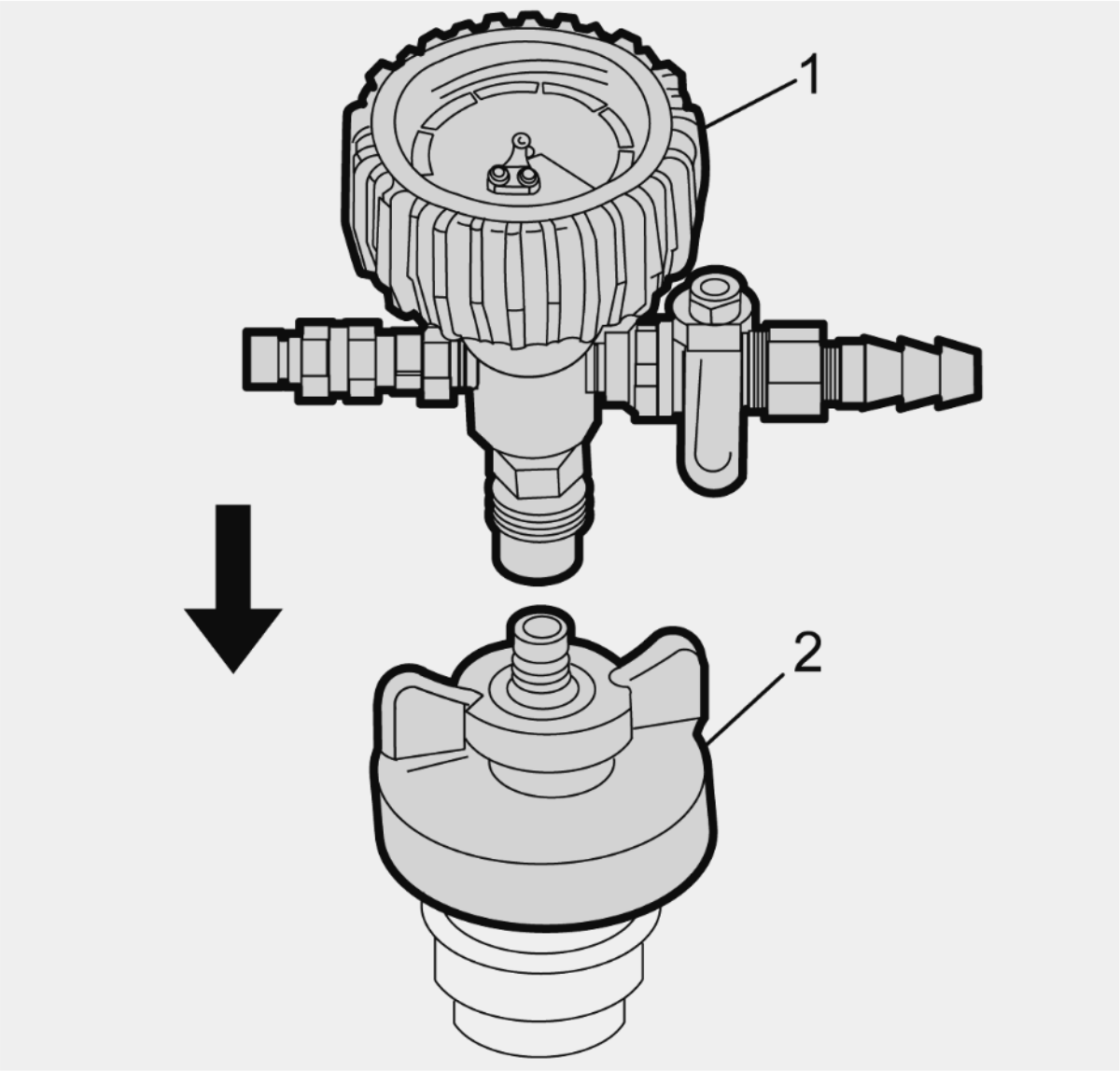

Fig. 32: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

4. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

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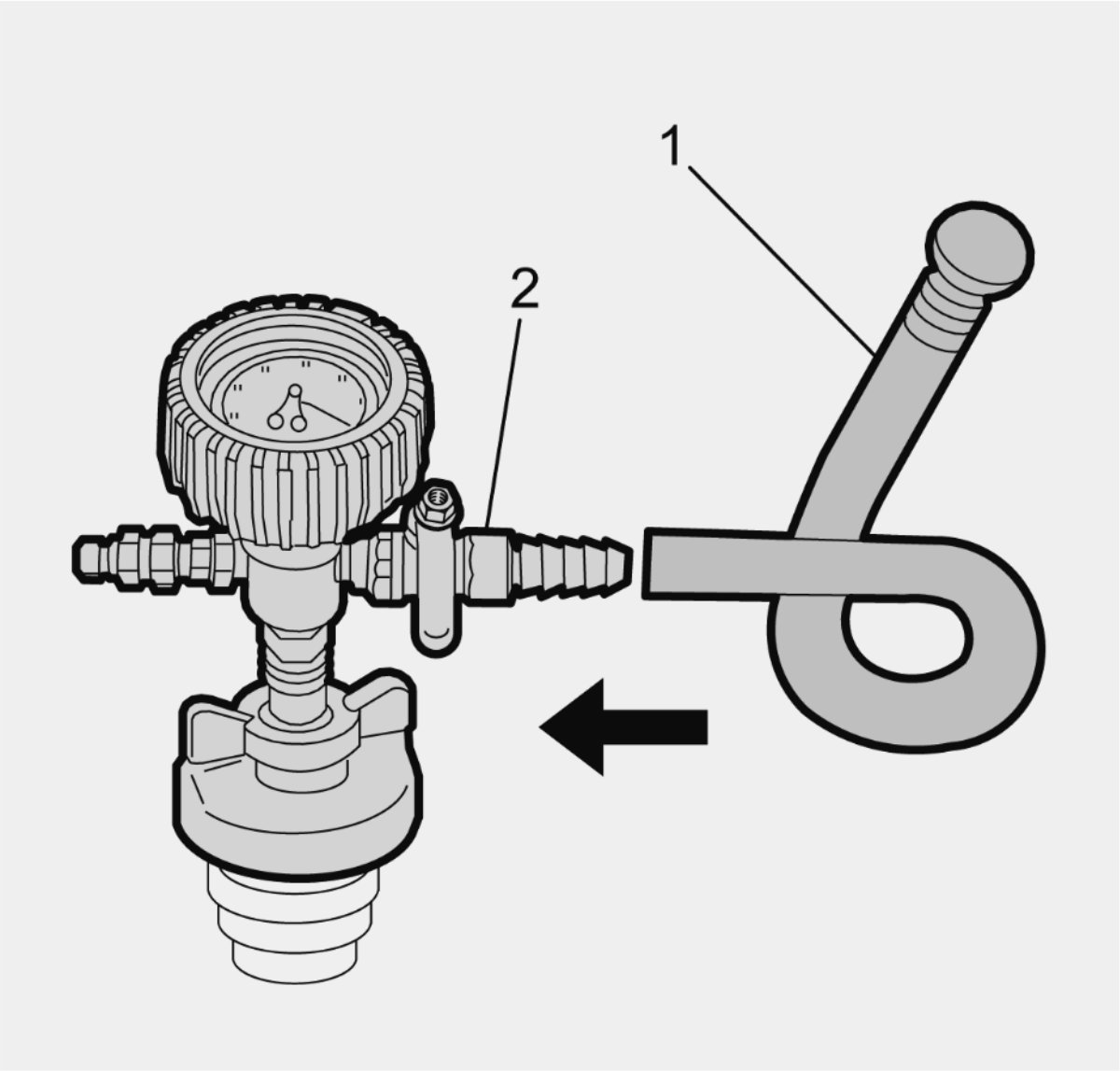

Fig. 33: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

5. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

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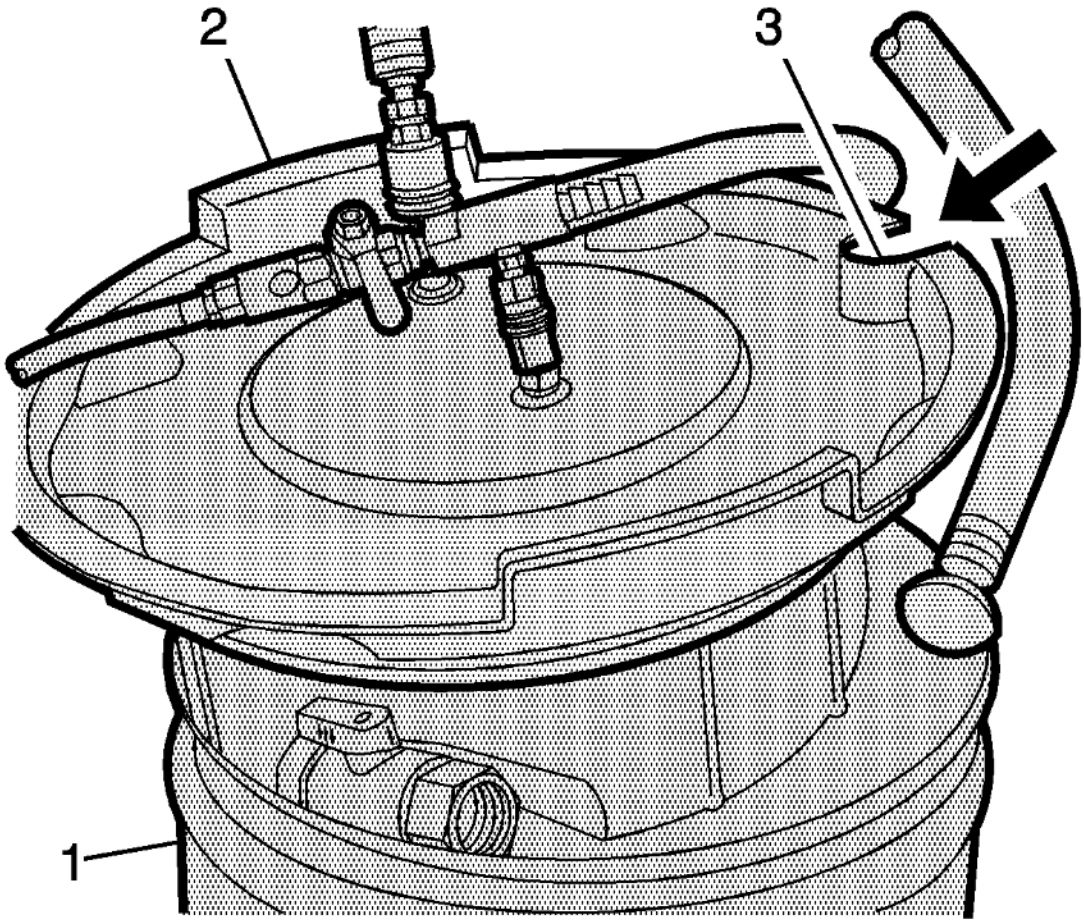

Fig. 34: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

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.

6. Pour the coolant mixture into the graduated reservoir (1).
7. Place the fill hose in the graduated reservoir (1).

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.**

8. Install the vacuum tank (2) on the graduated reservoir with the fill hose routed through the cut-out area (3) in the vacuum tank.

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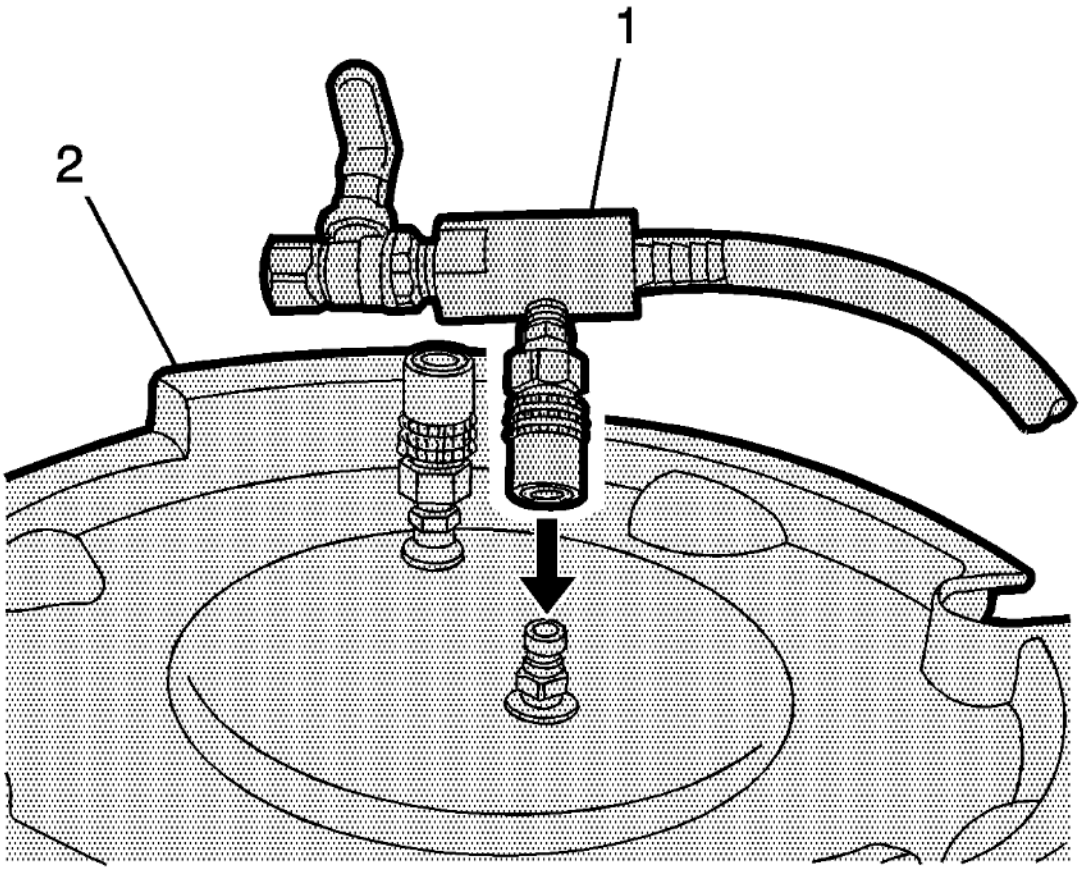

Fig. 35: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

9. Attach the venturi assembly (1) to the vacuum tank (2).

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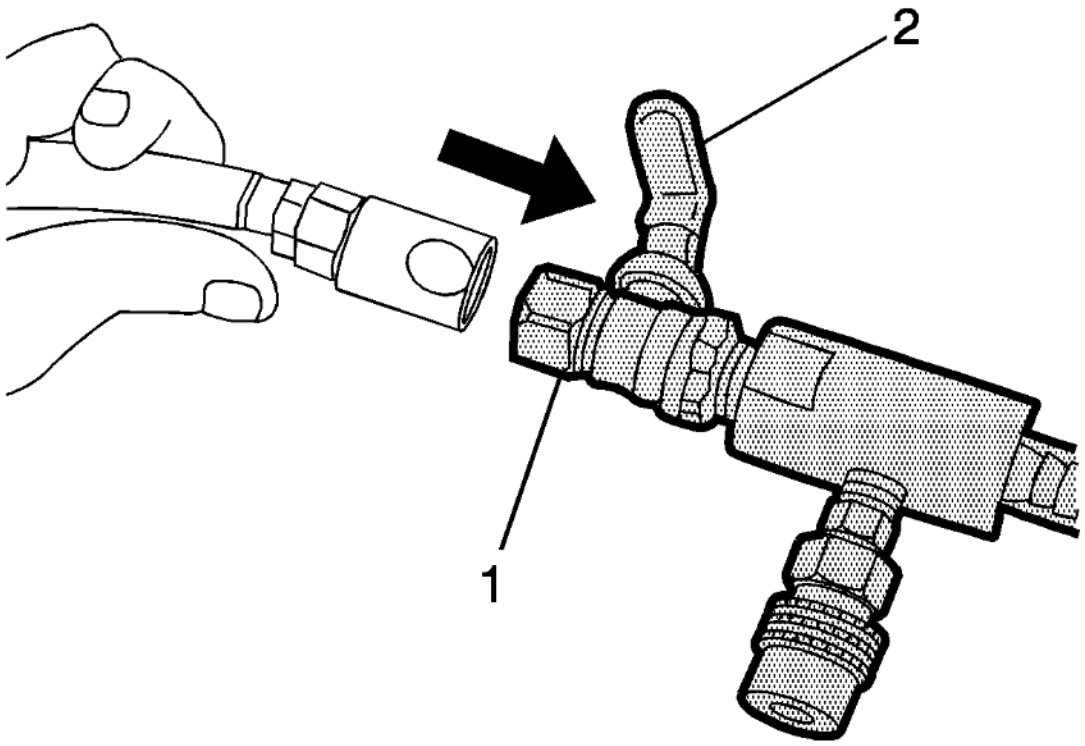

Fig. 36: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

10. Attach a shop air hose to the venturi assembly (1).

    Ensure the valve (2) on the venturi assembly is closed.

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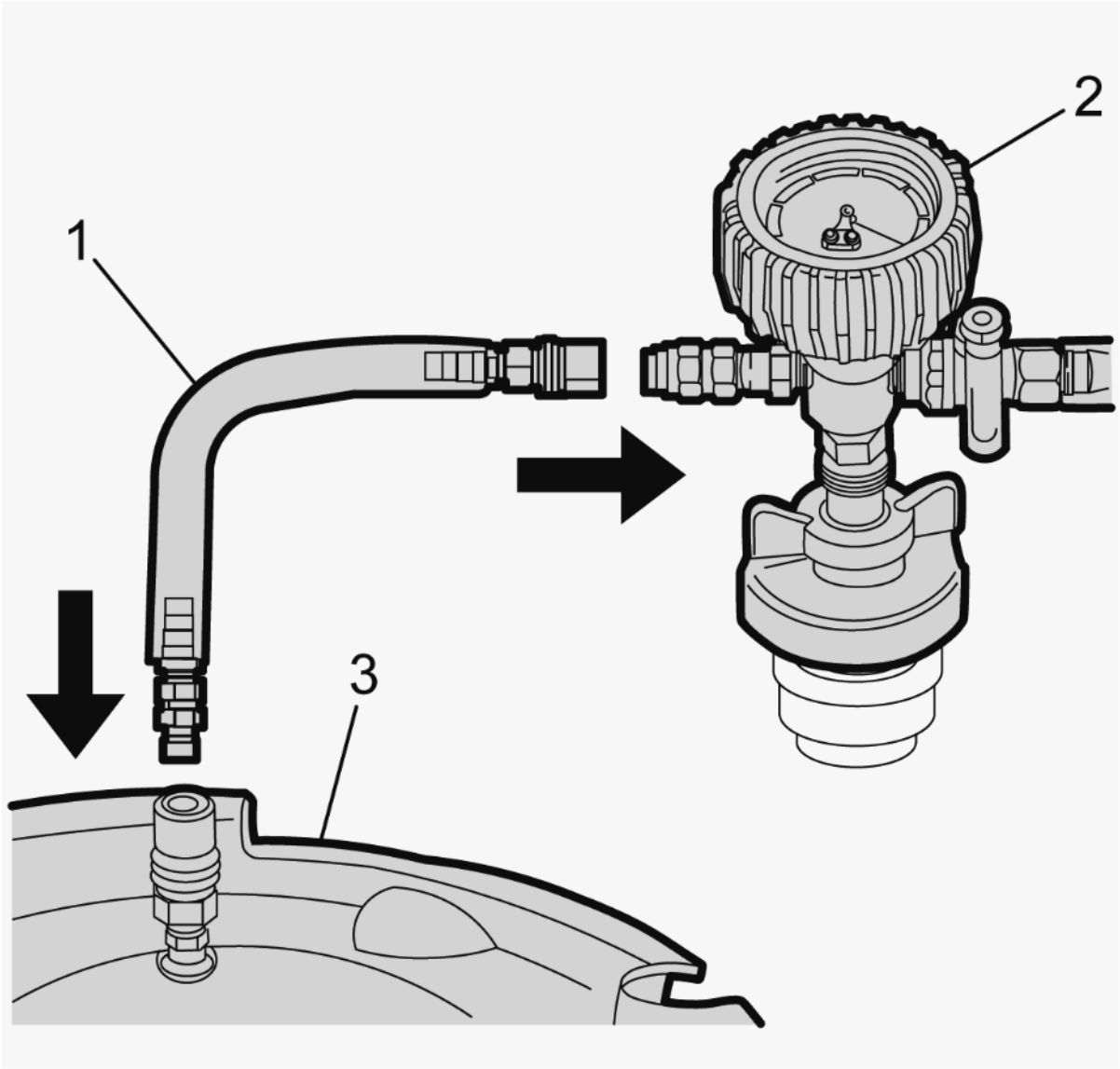

Fig. 37: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

11. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).
12. Clamp off the overflow hose.

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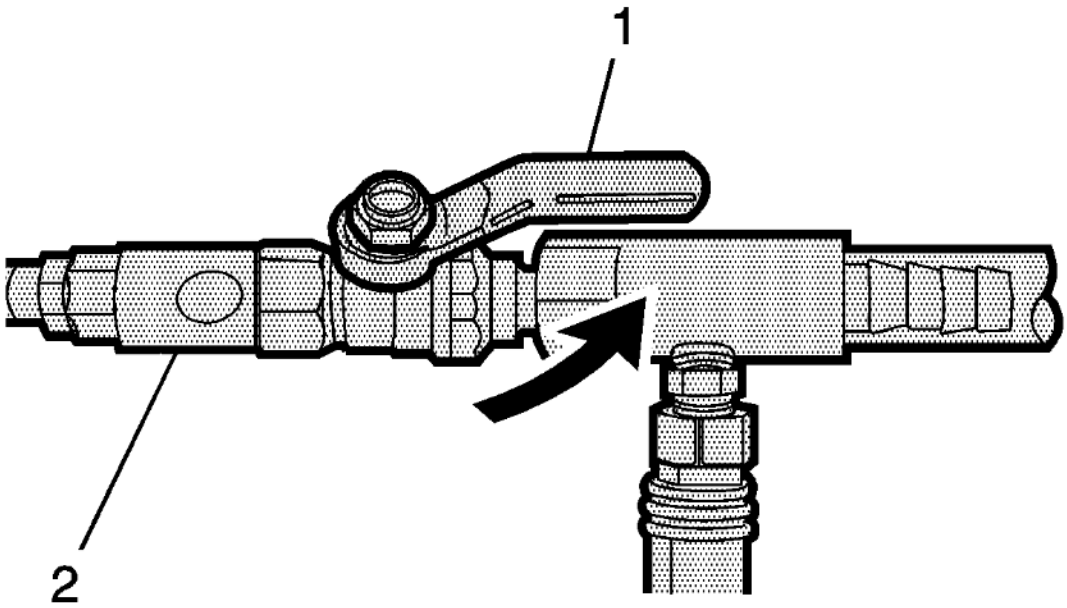

Fig. 38: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

13. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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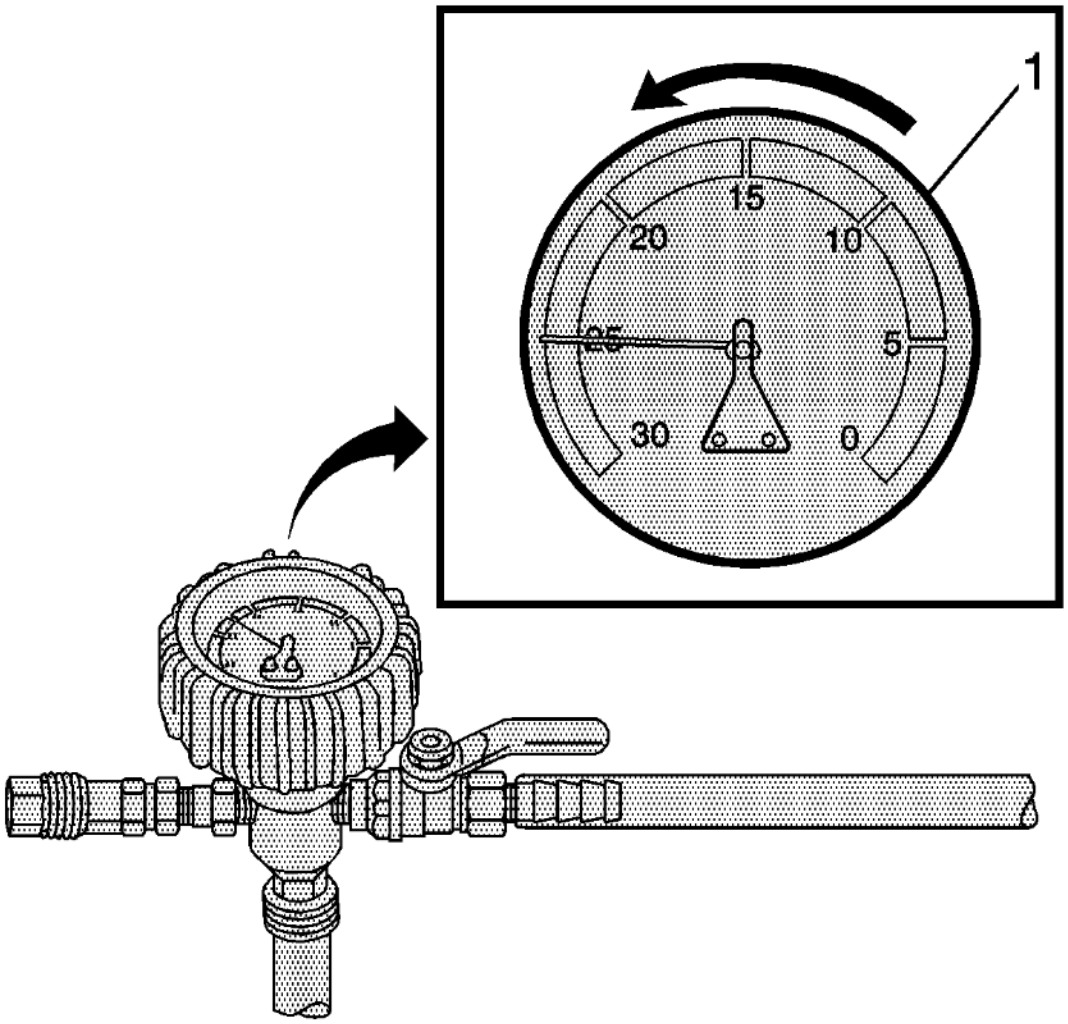

Fig. 39: Vacuum Gauge Needle
Courtesy of GENERAL MOTORS COMPANY

14. Continue to draw vacuum until the needle stops rising (1). This should be 610-660 mm Hg (24-26 in Hg).

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

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

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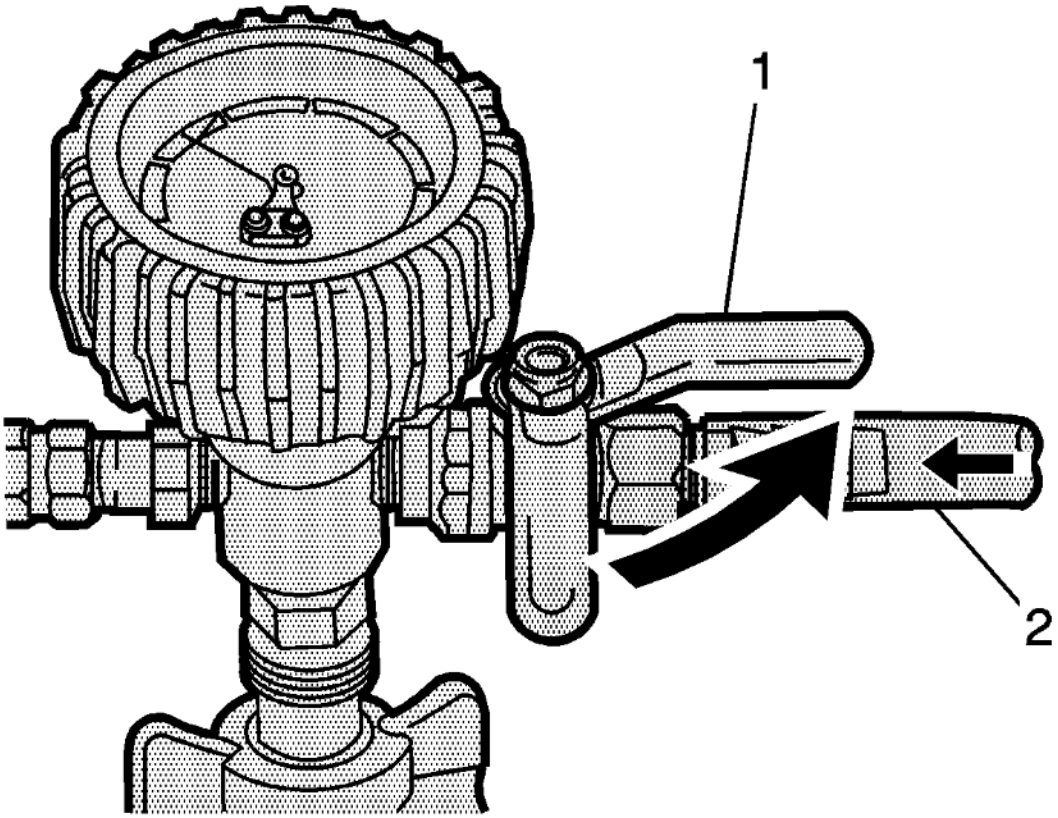

Fig. 40: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

16. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
17. Close the valve on the venture assembly.
18. 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 (L8B, L83, L86)**.

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

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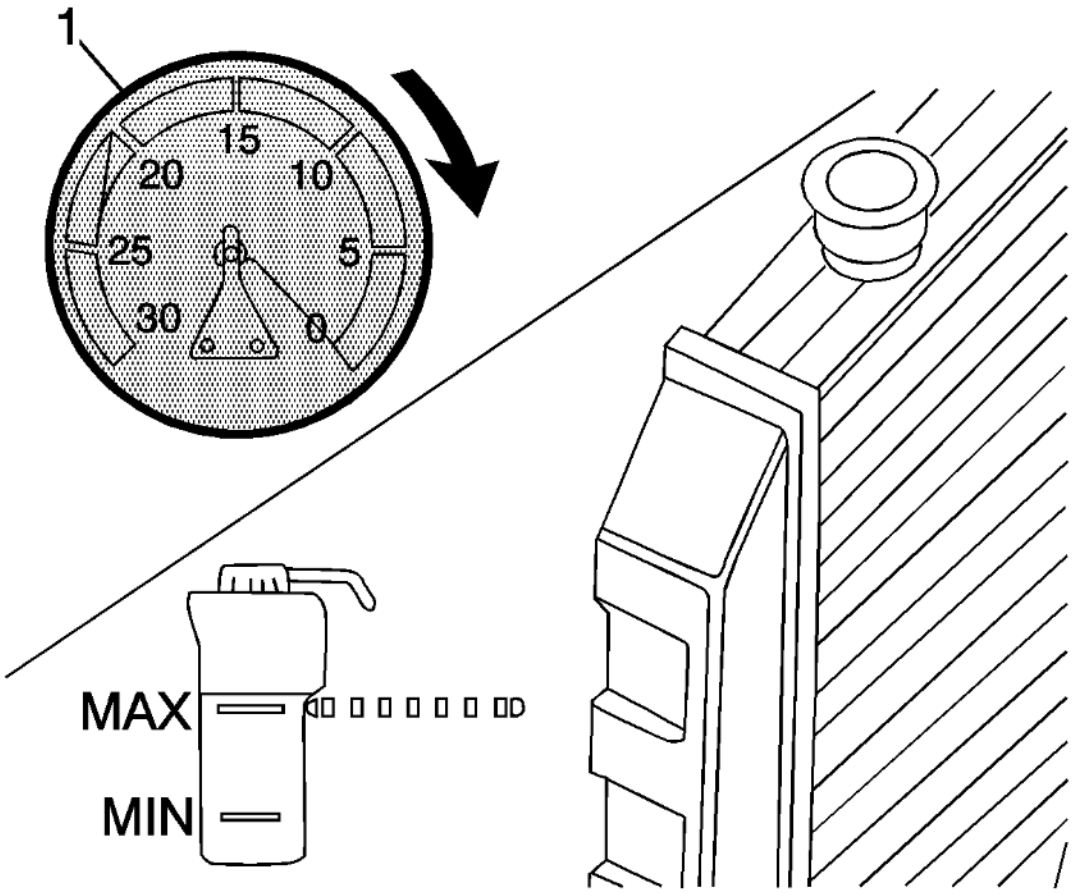

Fig. 41: Vacuum Gauge At Zero
Courtesy of GENERAL MOTORS COMPANY

20. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11-17.
21. Remove the **J-42401** radiator cap and surge tank test adapter.
22. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
23. Add coolant to the system as necessary.
24. Inspect the concentration of the coolant mixture using **J-26568** coolant and battery tester.

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

25. Detach the vacuum hose form the vacuum gauge assembly.

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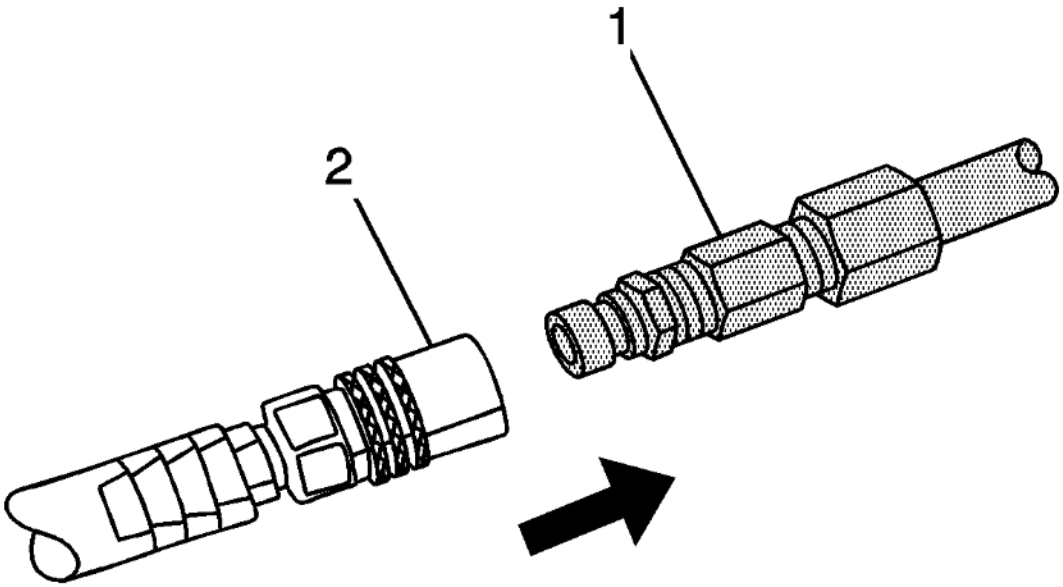

Fig. 42: Vacuum Hose & Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

26. Attach the extraction hose (1) to the vacuum hose (2).

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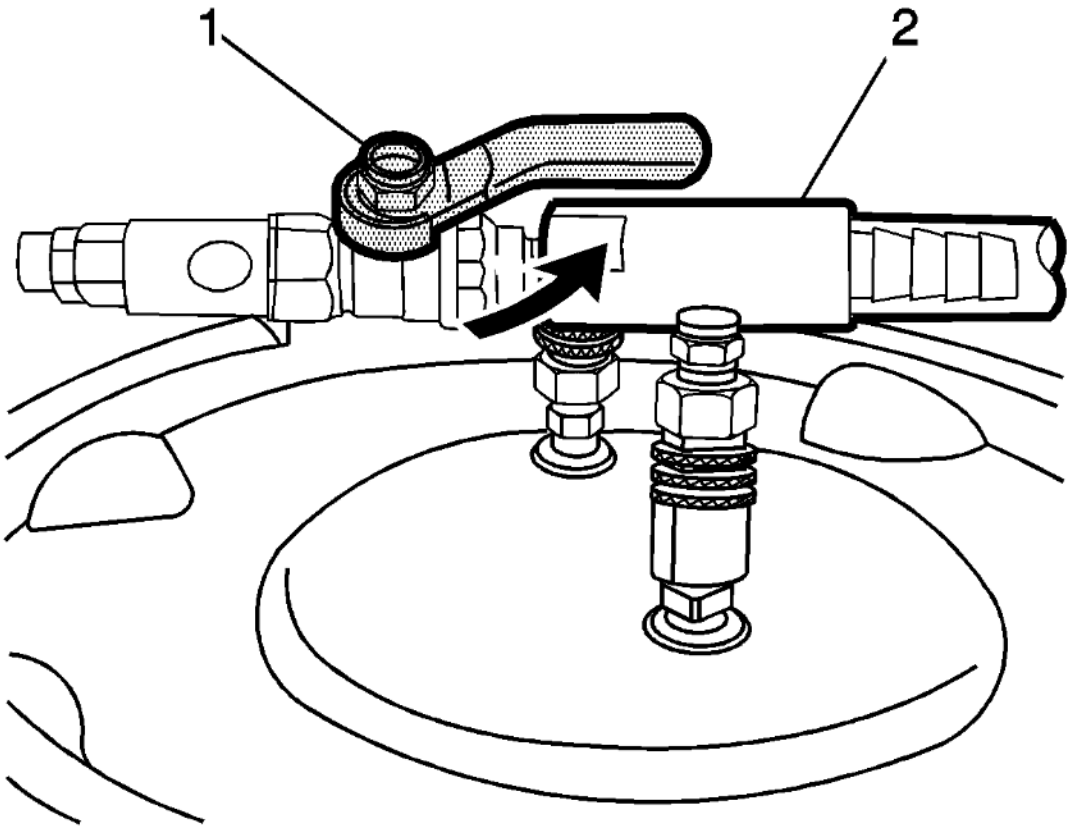

Fig. 43: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

27. Open the valve (1) on the venturi assembly (2) to start a vacuum draw.

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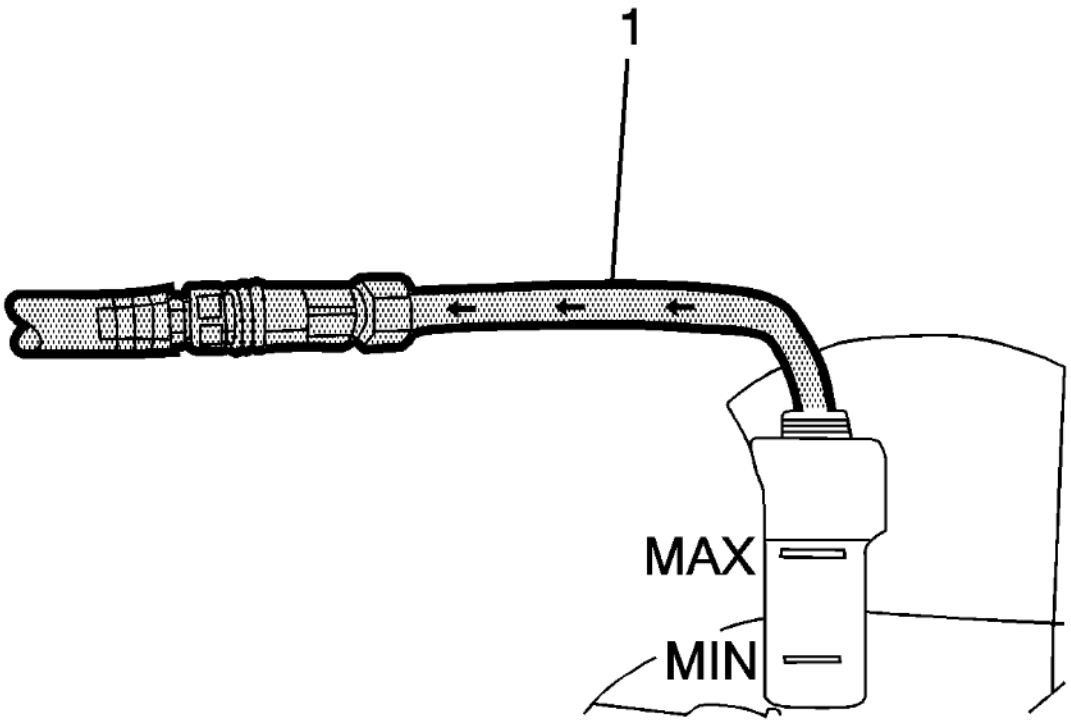

Fig. 44: Coolant Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

28. Use the extraction hose (1) to draw out coolant to the proper level.
29. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

COOLING SYSTEM DRAINING AND FILLING (STATIC FILL L83 L86)

Special Tool

J-26568 Coolant and Battery Tester

Draining Procedure

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

1. Follow the steps below in order to remove the surge tank fill cap:

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1. Slowly rotate the cap counterclockwise.
2. Stop rotating and allow the hissing to stop.
3. After all the hissing stops, continue turning counterclockwise in order to remove the cap.

2. Raise and support the vehicle. **Lifting and Jacking the Vehicle** .
3. Place a drain pan under the radiator drain cock.
4. Install a suitable length of hose to the radiator drain cock nipple and route the hose to allow free drain of coolant.
5. Open the radiator drain cock.
6. Drain the cooling system.

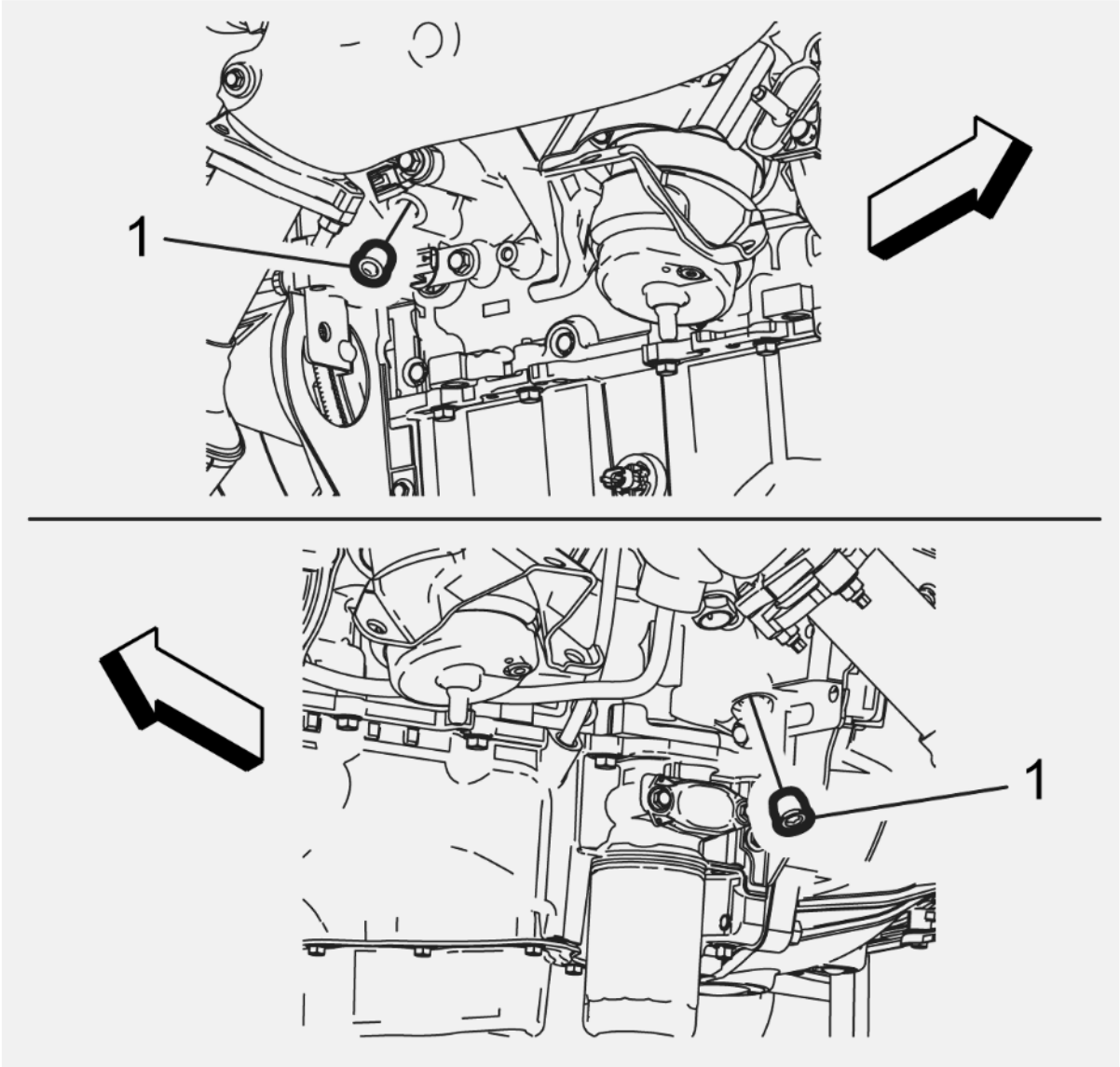

Fig. 45: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

7. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1).
8. Remove the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**.
9. Inspect the coolant.

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10. Follow the appropriate procedure based on the condition of the coolant:
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**.

Filling Procedure

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

1. Close the radiator drain cock.
2. Remove the drain hose.

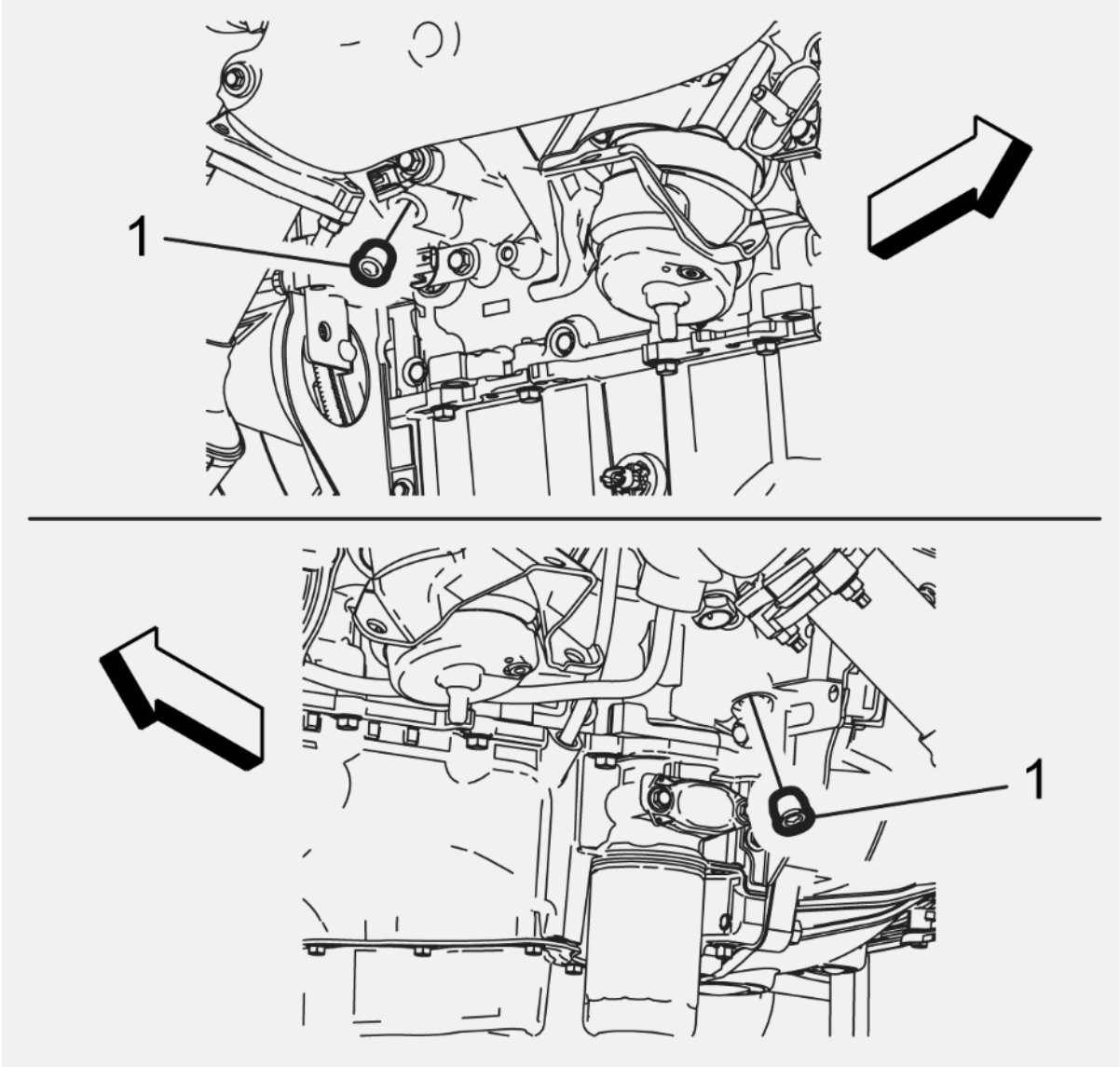

Fig. 46: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. If the left and right engine block coolant drain hole plugs (1) were removed, install the engine block coolant drain hole plugs (1). **Engine Block Plug Installation** .

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4. Install the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**.
5. Lower the vehicle.

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

6. Slowly fill the cooling system with a 50/50 coolant mixture. **Approximate Fluid Capacities**.
7. Install the coolant pressure cap.
8. Start the engine.
9. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.

   Engine should reach an operating temperature of 90Â°C (194Â°F) and the upper radiator hose should be HOT.

10. Allow the engine to idle for 3 minutes.
11. Shut the engine OFF.
12. Allow the engine to cool.
13. Top off the coolant as necessary.
14. Inspect the concentration of the engine coolant using the **J-26568** coolant and battery tester.
15. Rinse away any excess coolant from the engine and the engine compartment.

COOLING SYSTEM DRAINING AND FILLING (STATIC FILL LV3)

Special Tools

- **J-26568** Coolant and Battery Tester
- **J-38185** Hose Clamp Pliers

Draining Procedure

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

1. Follow the steps below in order to remove the surge tank fill cap:
   1. Slowly rotate the cap counterclockwise.
   2. Stop rotating and allow the hissing to stop.
   3. After all the hissing stops, continue turning counterclockwise in order to remove the cap.
2. Raise and support the vehicle. **Lifting and Jacking the Vehicle** .
3. Place a drain pan under the radiator drain cock.
4. Install a suitable length of hose to the radiator drain cock nipple and route the hose to allow free drain of coolant.
5. Open the radiator drain cock.
6. Drain the cooling system.

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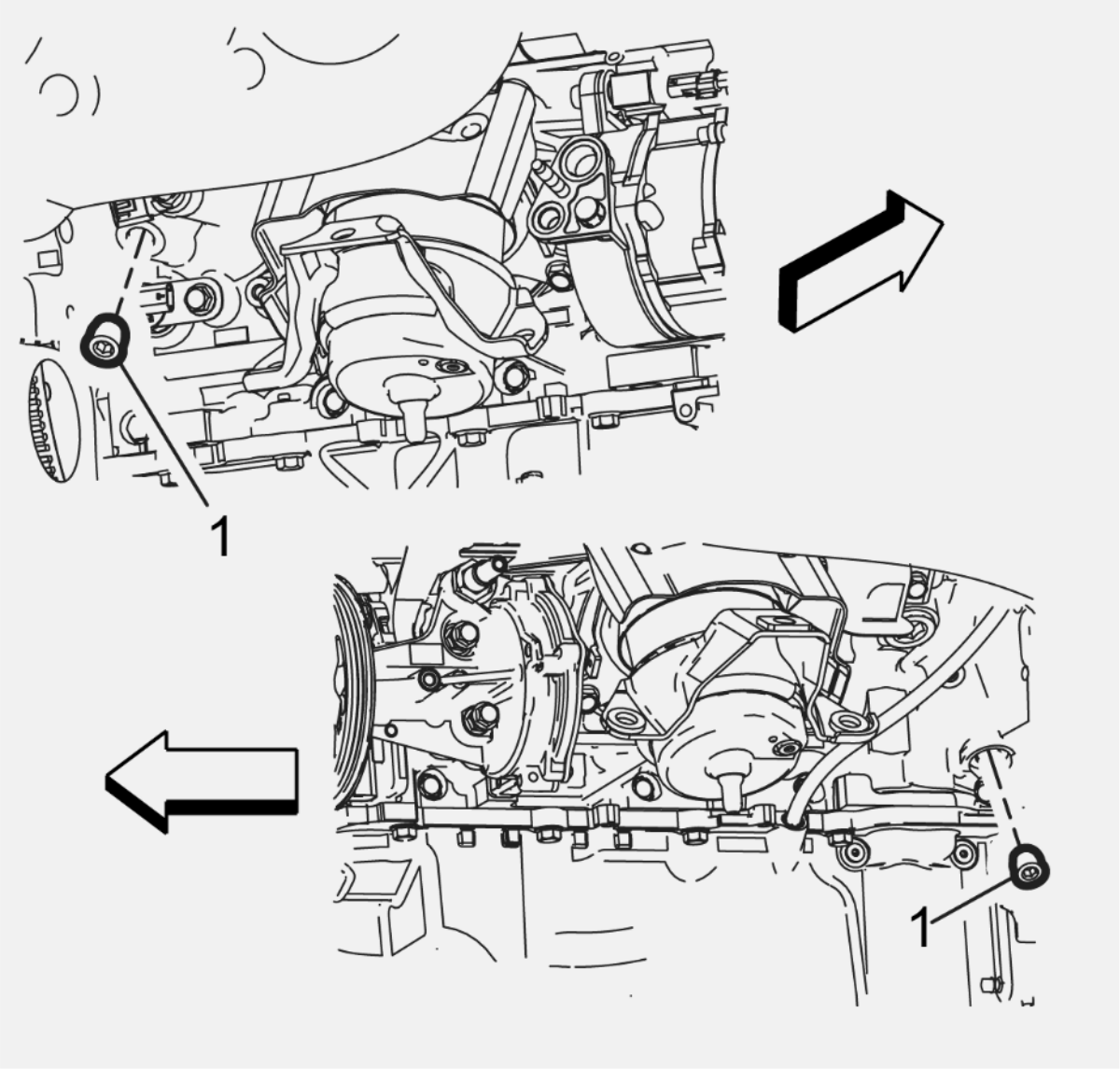

Fig. 47: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

7. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1).
8. Remove the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**.
9. Inspect the coolant.
10. Follow the appropriate procedure based on the condition of the coolant:
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**.

Filling Procedure

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

1. Close the radiator drain cock.
2. Remove the drain hose.

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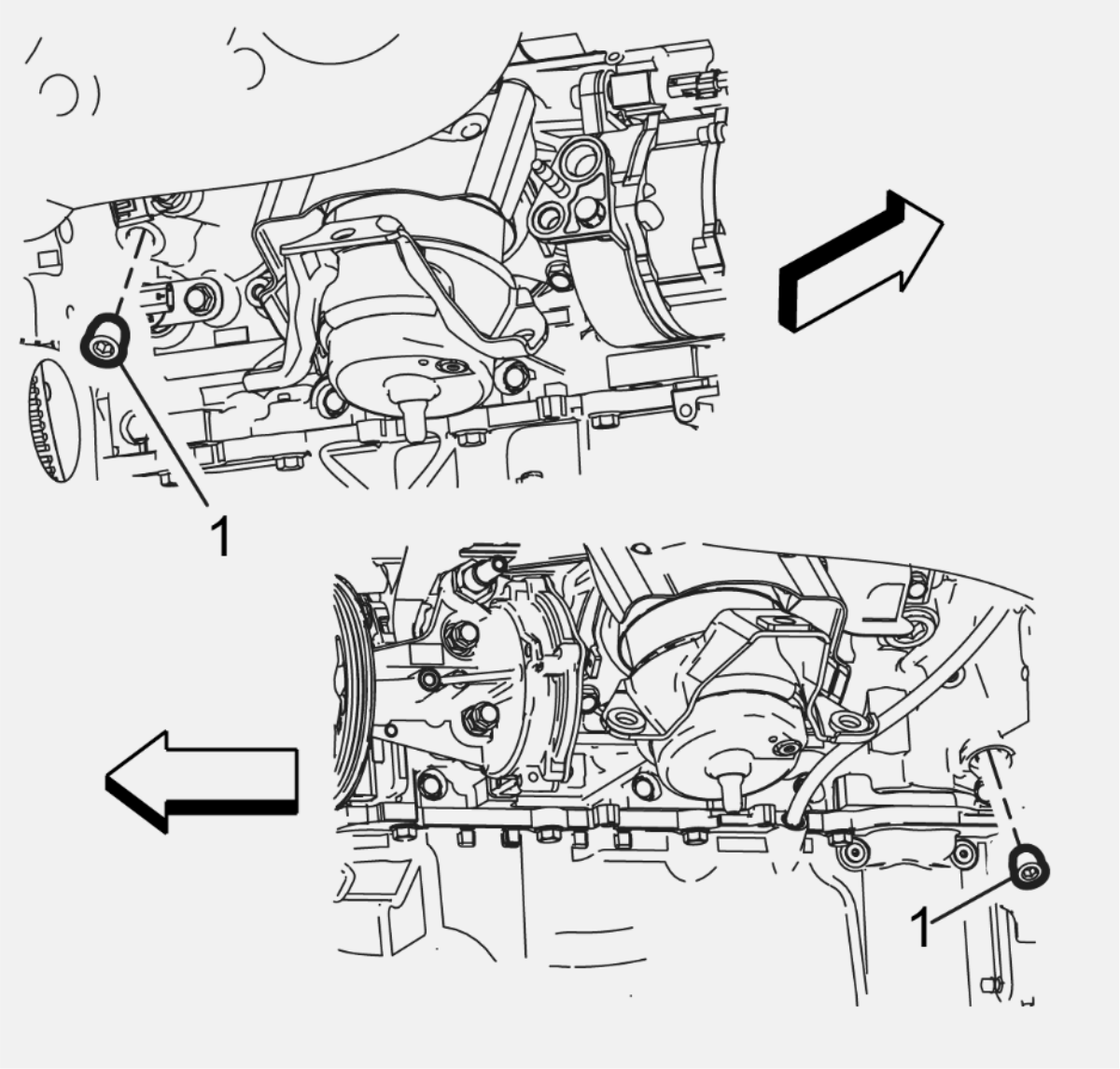

Fig. 48: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. If the left and right engine block coolant drain hole plugs (1) were removed, install the engine block coolant drain hole plugs (1). **Engine Block Plug Installation** .
4. Install the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**.
5. Lower the vehicle.

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

6. Slowly fill the cooling system with a 50/50 coolant mixture. **Approximate Fluid Capacities**.
7. Install the coolant pressure cap.
8. Start the engine.
9. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.

Engine should reach an operating temperature of 90Â°C (194Â°F) and the upper radiator hose should be

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HOT.

10. Allow the engine to idle for 3 minutes.
11. Shut the engine OFF.
12. Allow the engine to cool.
13. Top off the coolant as necessary.
14. Inspect the concentration of the engine coolant using the **J-26568** coolant and battery tester.
15. Rinse away any excess coolant from the engine and the engine compartment.

COOLING SYSTEM DRAINING AND FILLING (VAC N FILL LV3)

Special Tools

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

Draining Procedure

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

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. **Lifting and Jacking the Vehicle** .
4. Place a drain pan under the radiator drain cock.
5. Install a suitable length of hose to the radiator drain cock nipple and route the hose to allow free drain of coolant.
6. Open the radiator drain cock.
7. Drain the cooling system.

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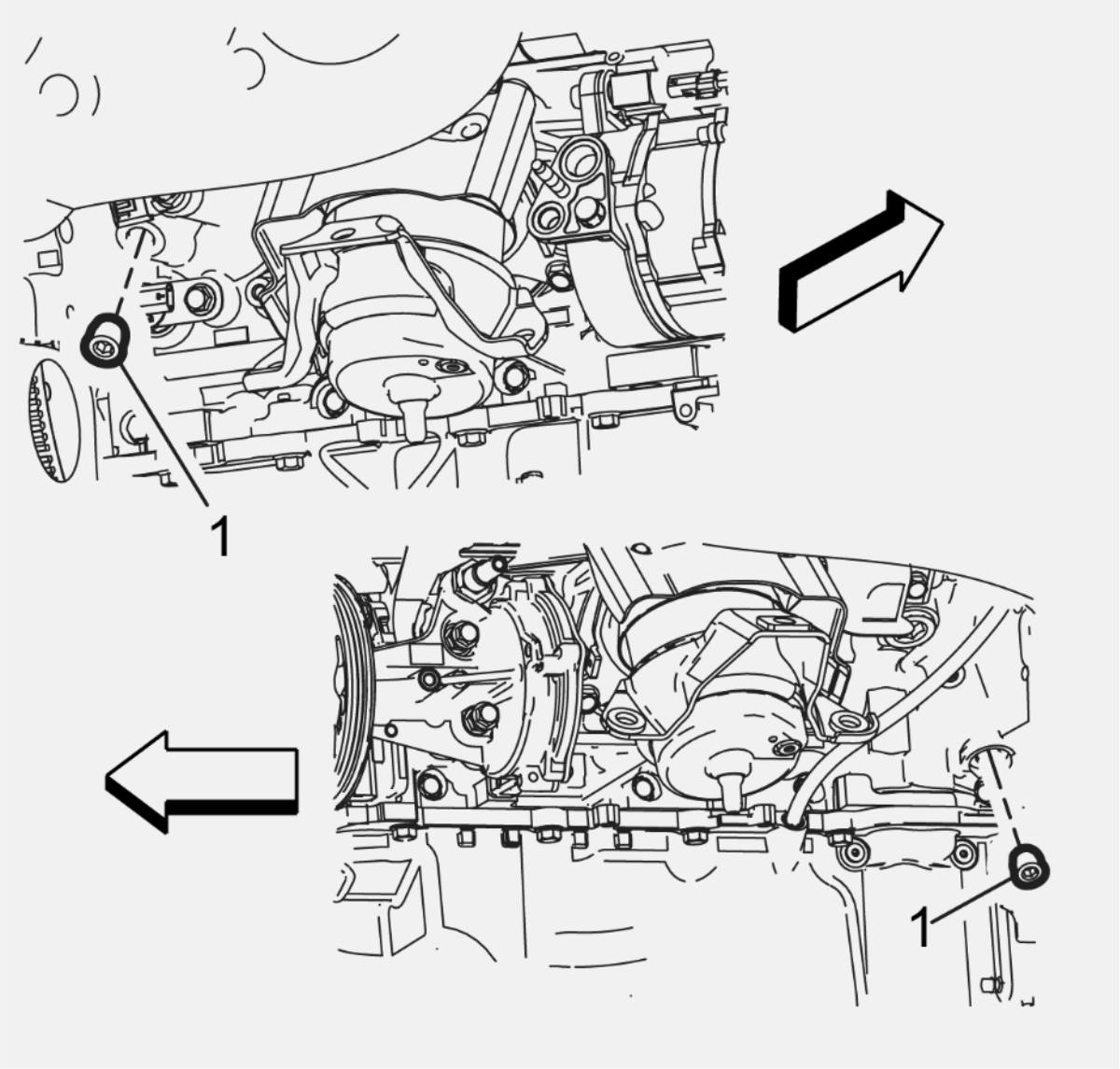

Fig. 49: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

8. If a complete engine block drain is required, remove the left and right engine block coolant drain hole plugs (1).
9. Inspect the coolant.
10. Follow the appropriate procedure based on the condition of the coolant.
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**.

Vac-N-Fill Procedure

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

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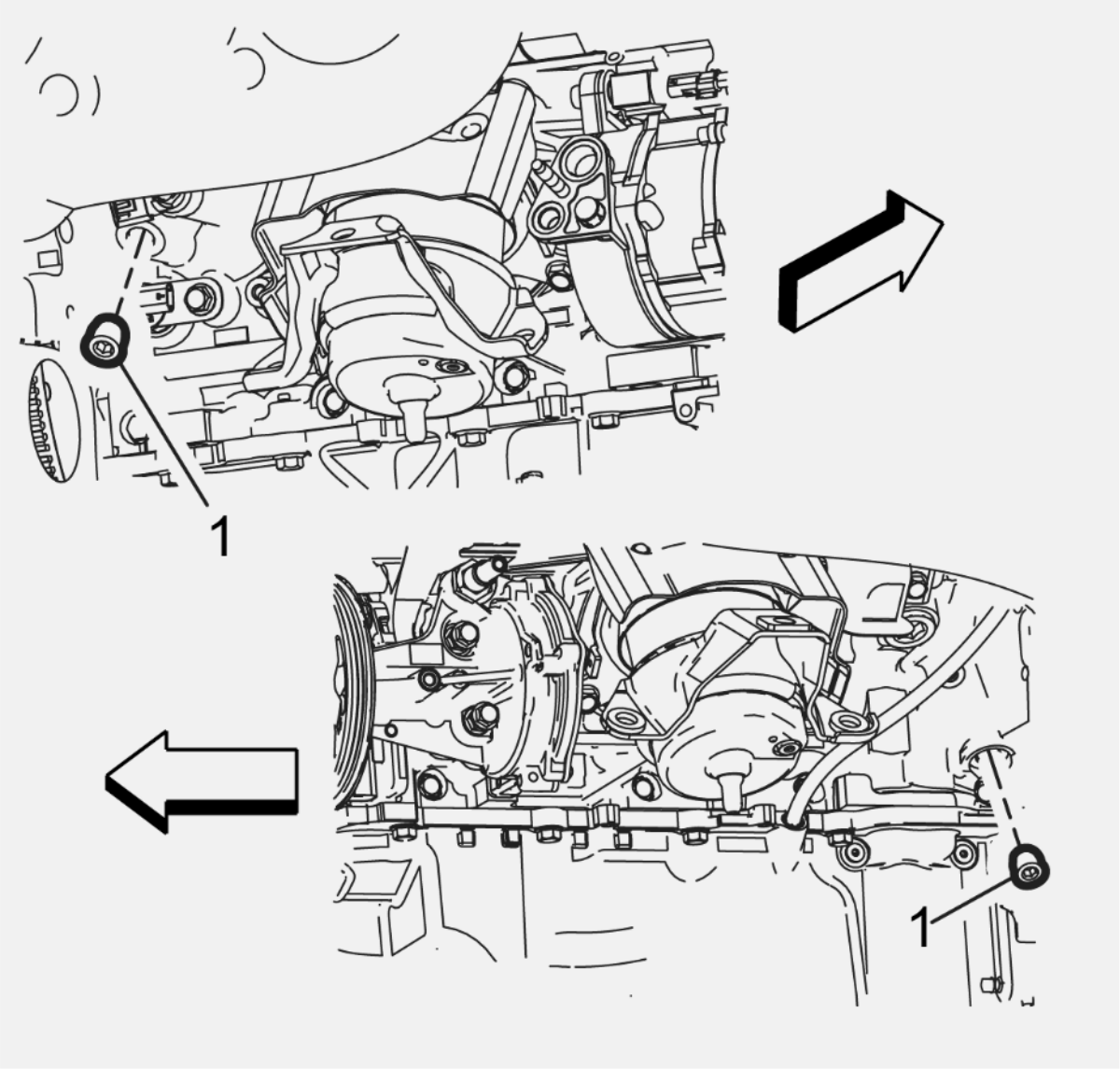

Fig. 50: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

1. If the left and right engine block coolant drain hole plugs (1) were removed, install the engine block coolant drain hole plugs (1). **Engine Block Plug Installation** .
2. Install the **J-42401** radiator cap and surge tank test adapter.

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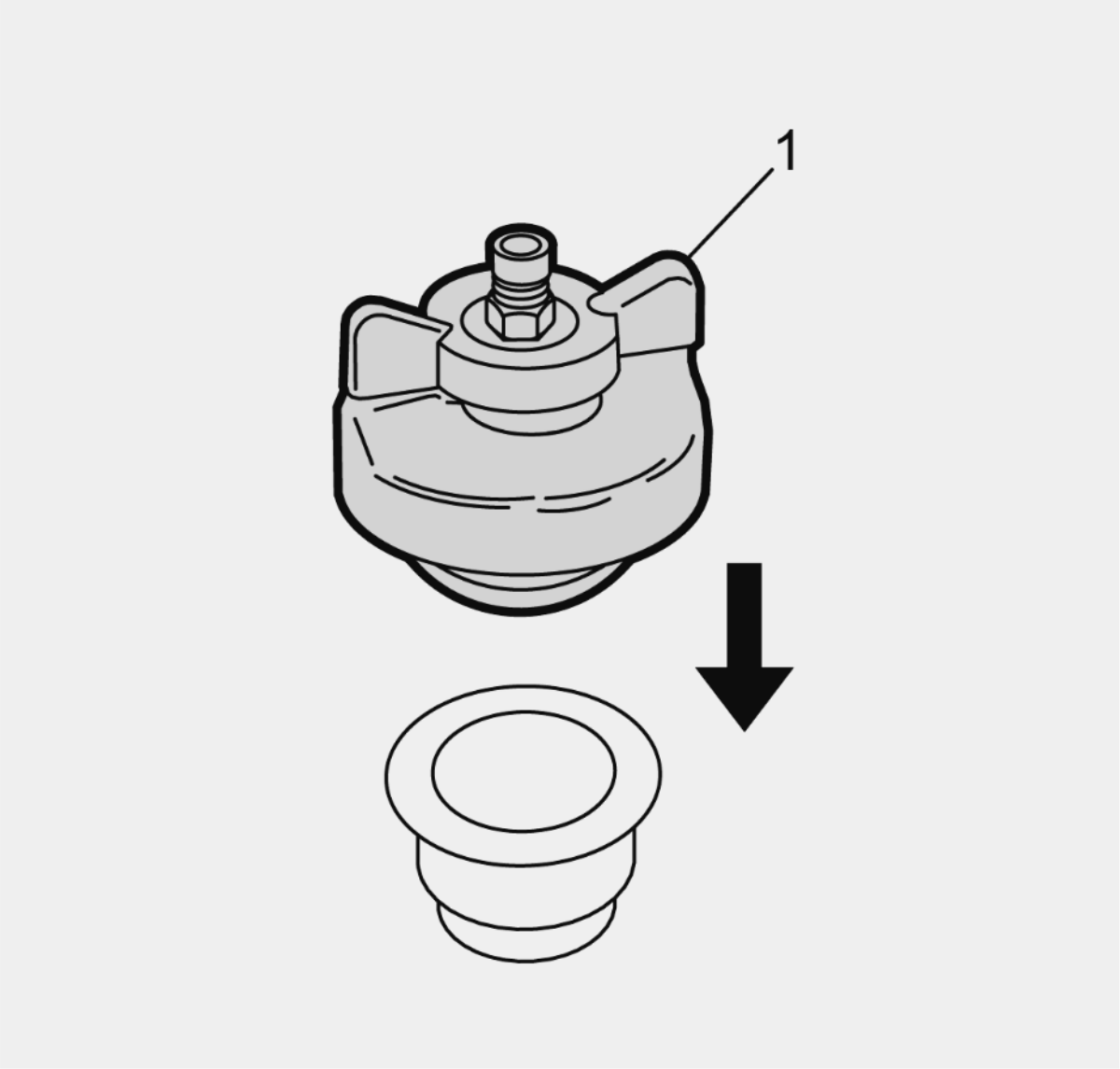

Fig. 51: Radiator Cap & Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

3. Attach the Vac-N-Fill cap (1) to the vehicles coolant fill port.

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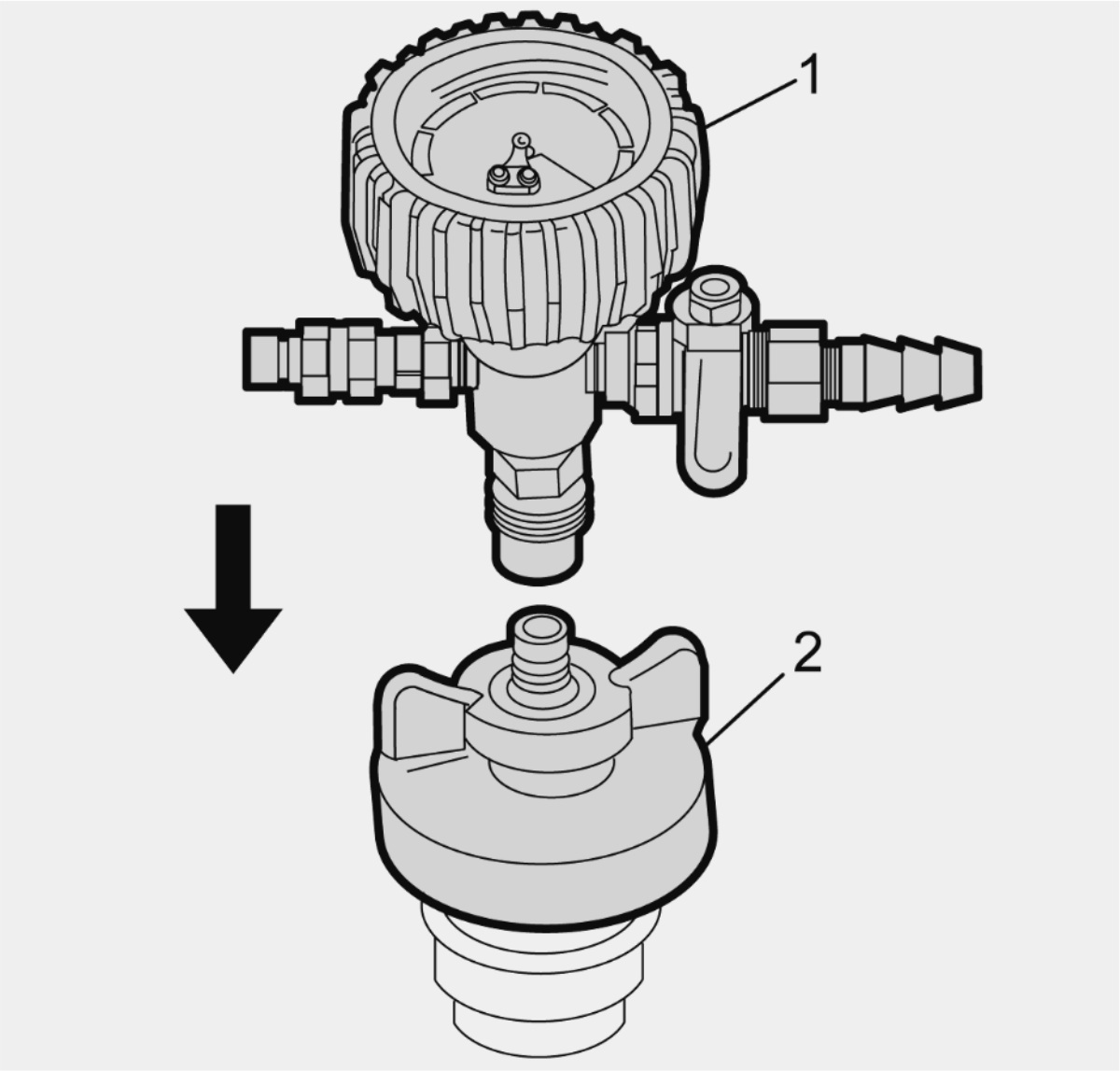

Fig. 52: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

4. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

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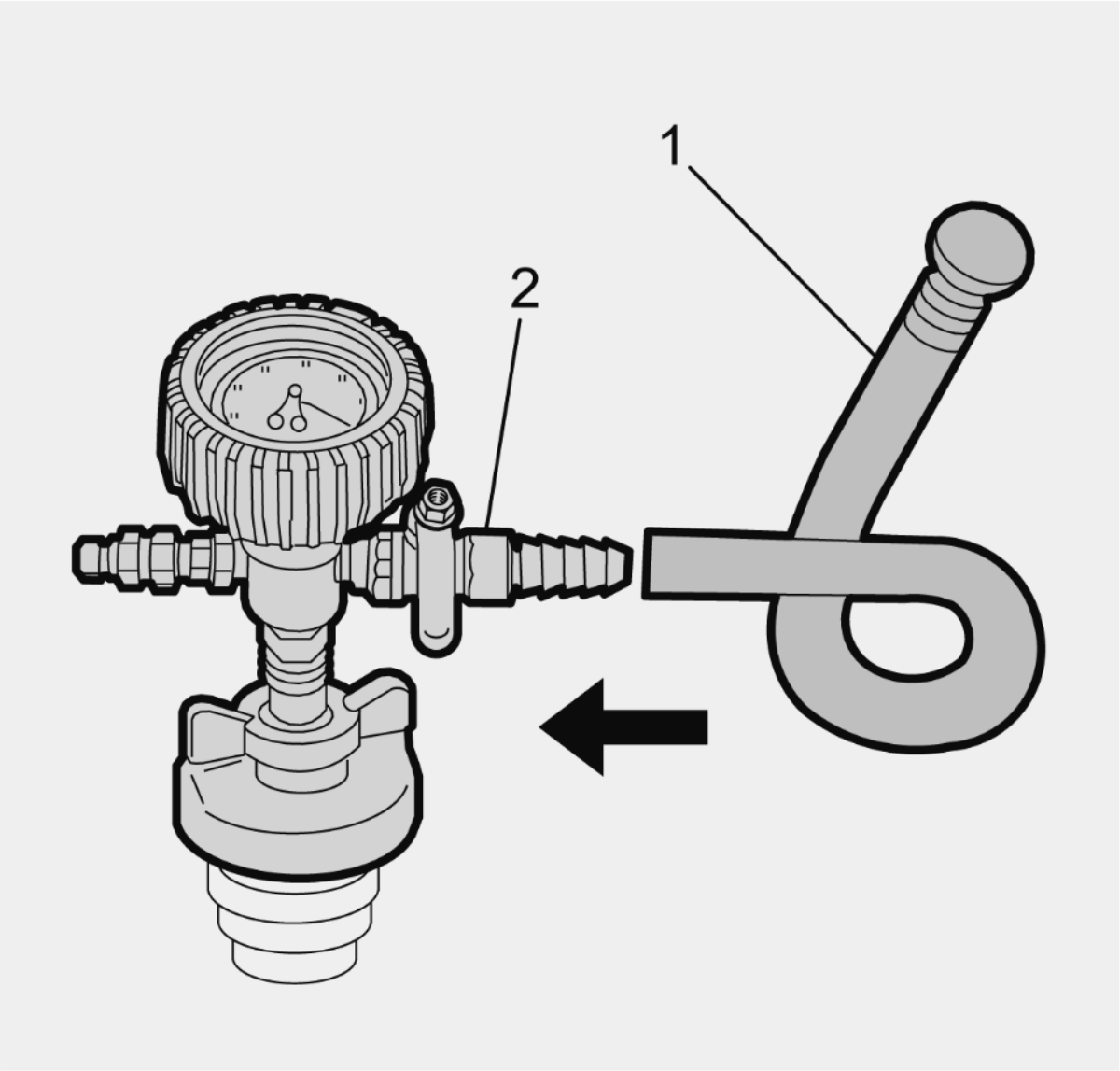

Fig. 53: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

5. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

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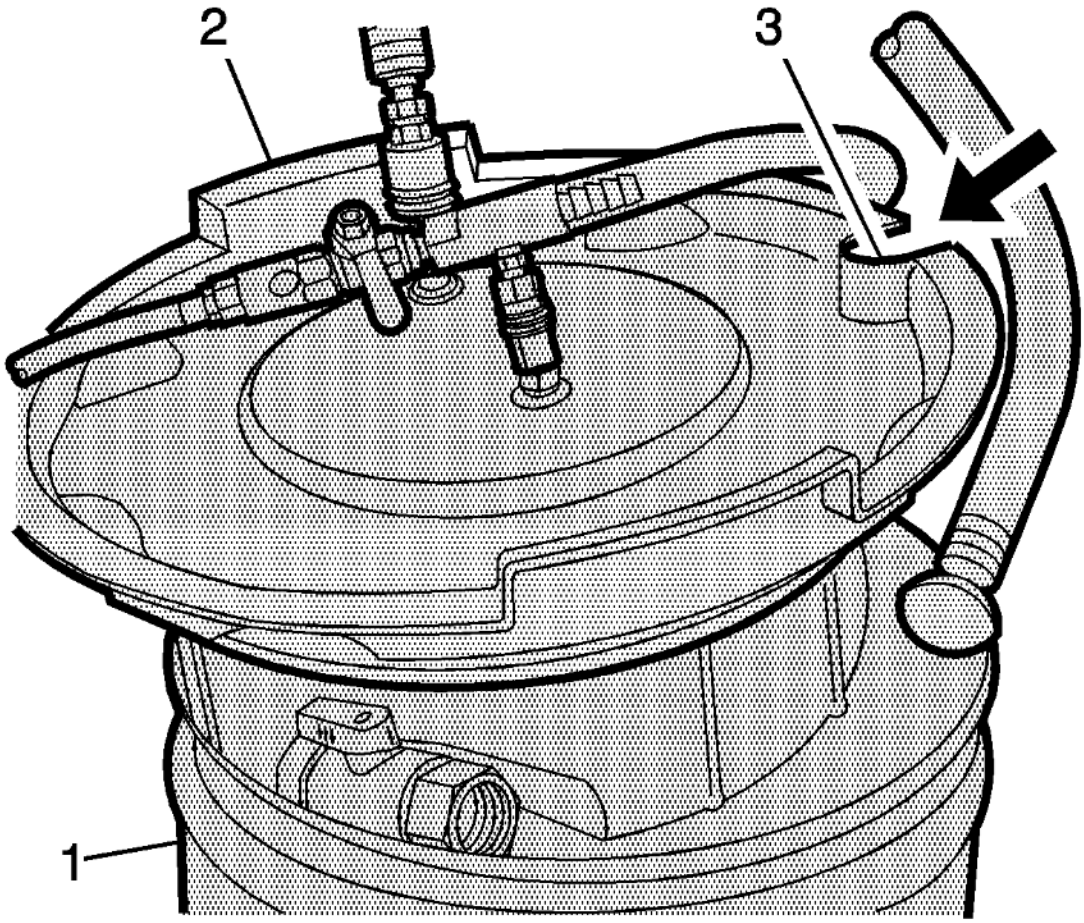

Fig. 54: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

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.

6. Pour the coolant mixture into the graduated reservoir (1).
7. Place the fill hose in the graduated reservoir (1).

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.**

8. Install the vacuum tank (2) on the graduated reservoir with the fill hose routed through the cut-out area (3) in the vacuum tank.

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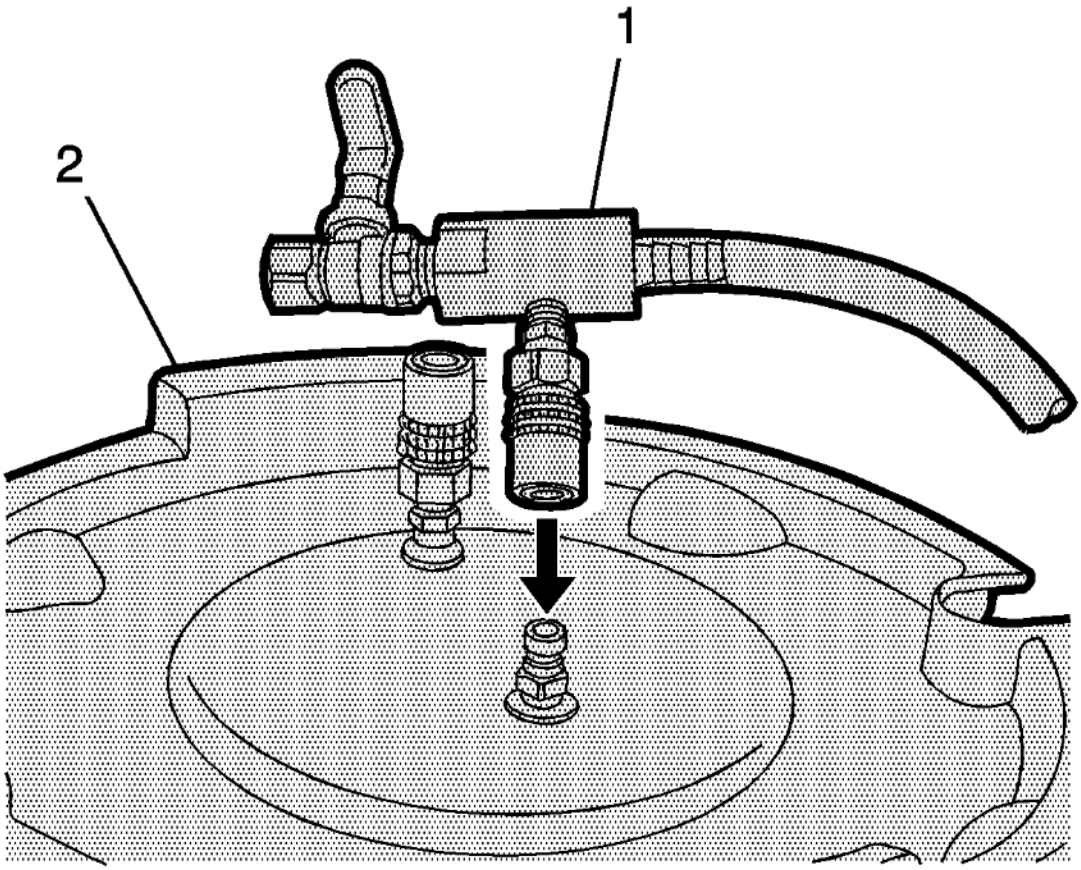

Fig. 55: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

9. Attach the venturi assembly (1) to the vacuum tank (2).

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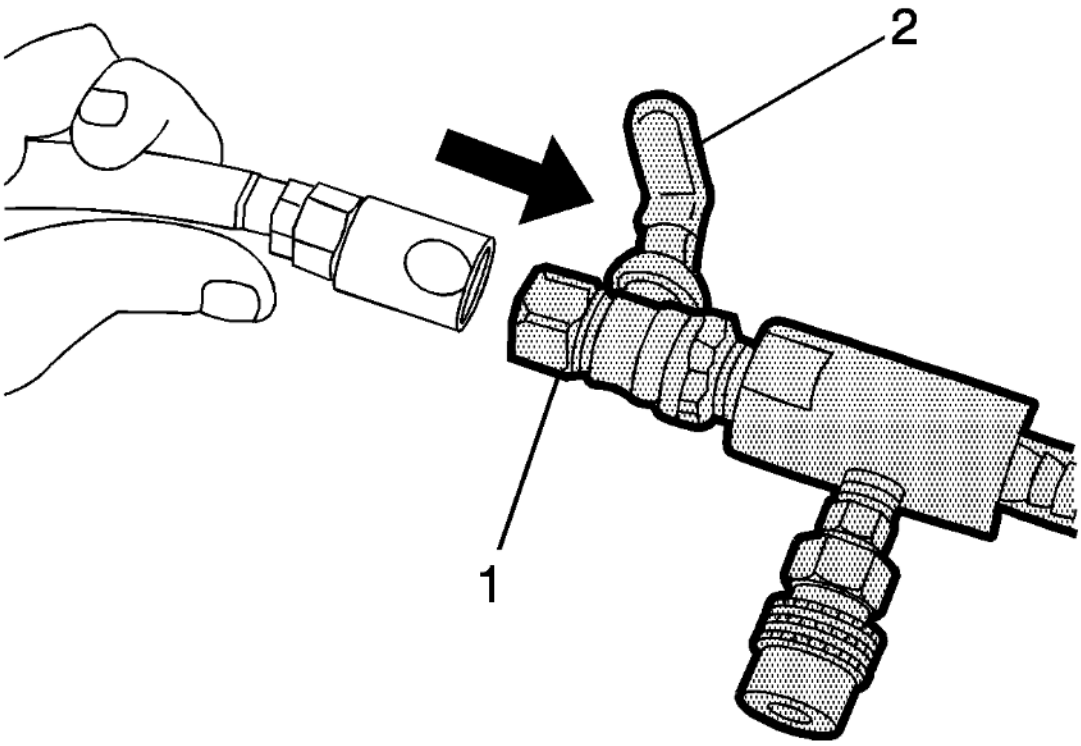

Fig. 56: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

10. Attach a shop air hose to the venturi assembly (1).

    Ensure the valve (2) on the venturi assembly is closed.

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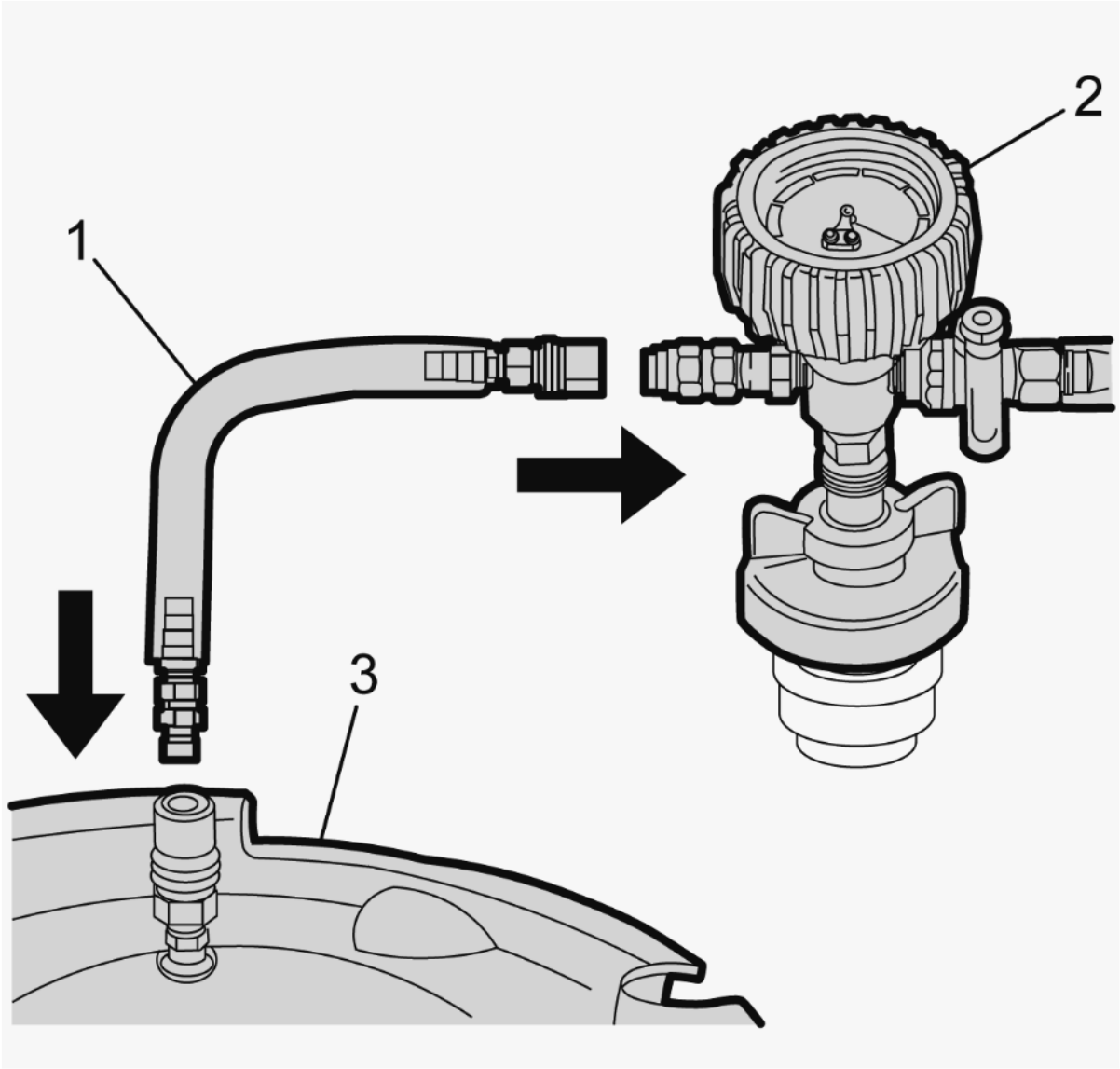

Fig. 57: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

11. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).
12. Clamp off the overflow hose.

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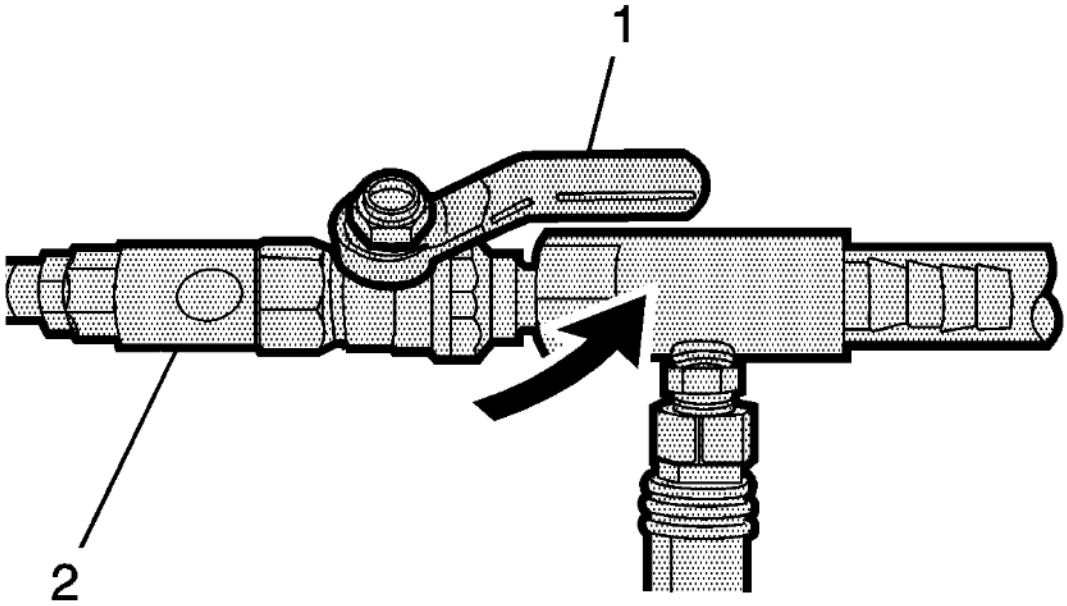

Fig. 58: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

13. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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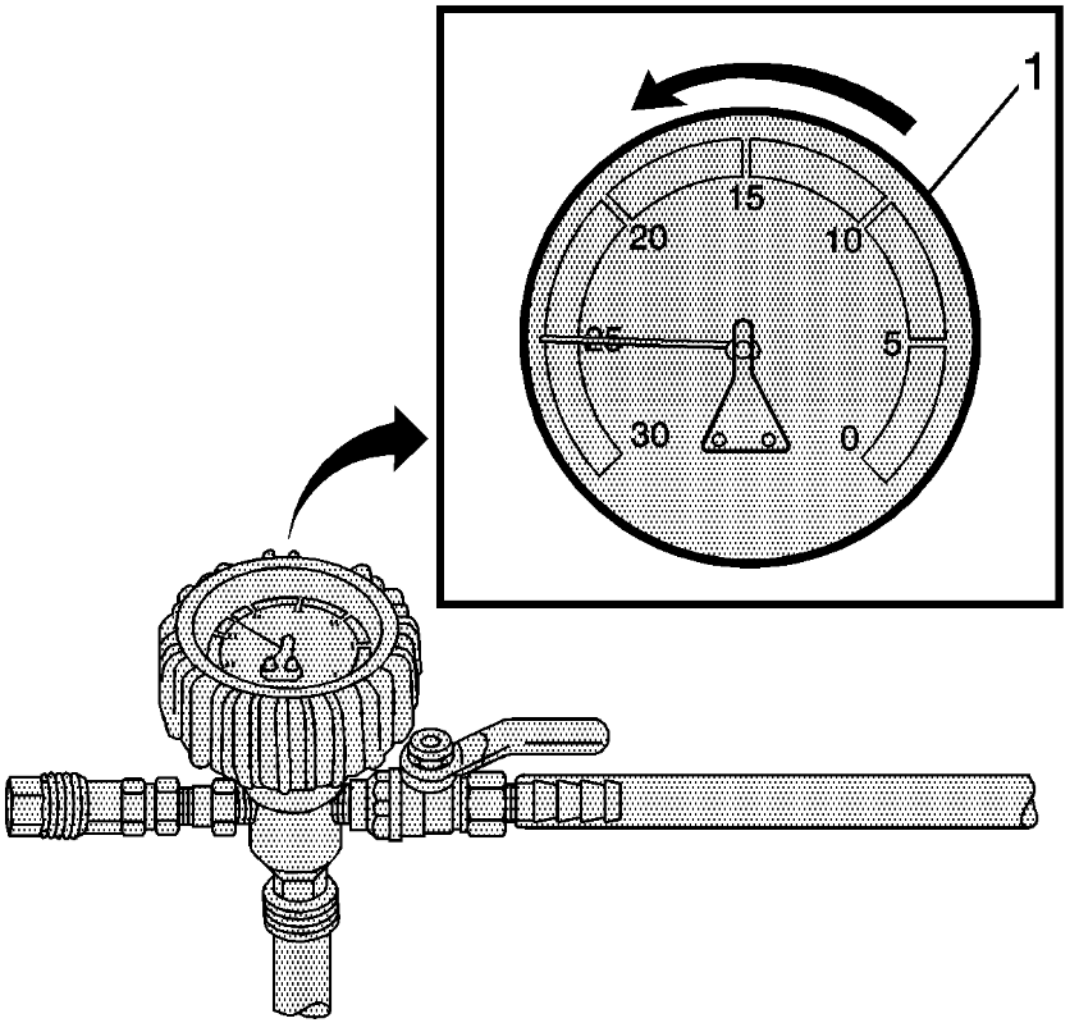

Fig. 59: Vacuum Gauge Needle
Courtesy of GENERAL MOTORS COMPANY

14. Continue to draw vacuum until the needle stops rising (1). This should be 610-660 mm Hg (24-26 in Hg).

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

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

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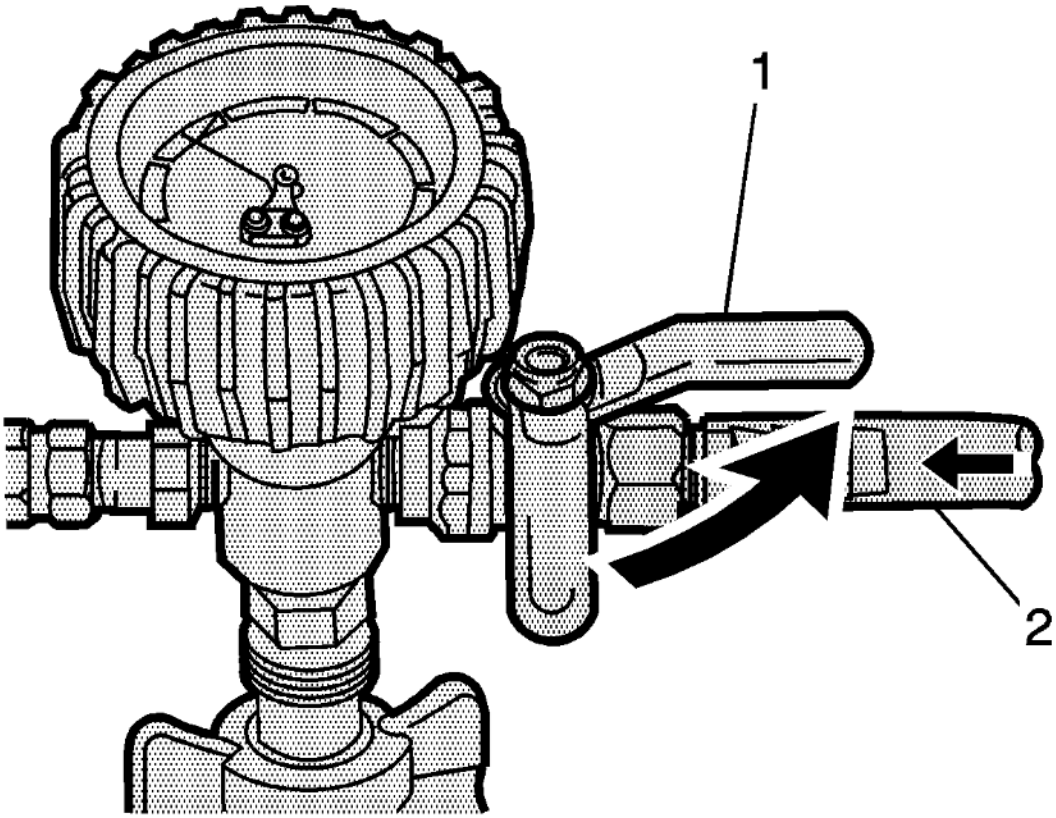

Fig. 60: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

16. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
17. Close the valve on the venture assembly.
18. 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 (LV3)**.

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

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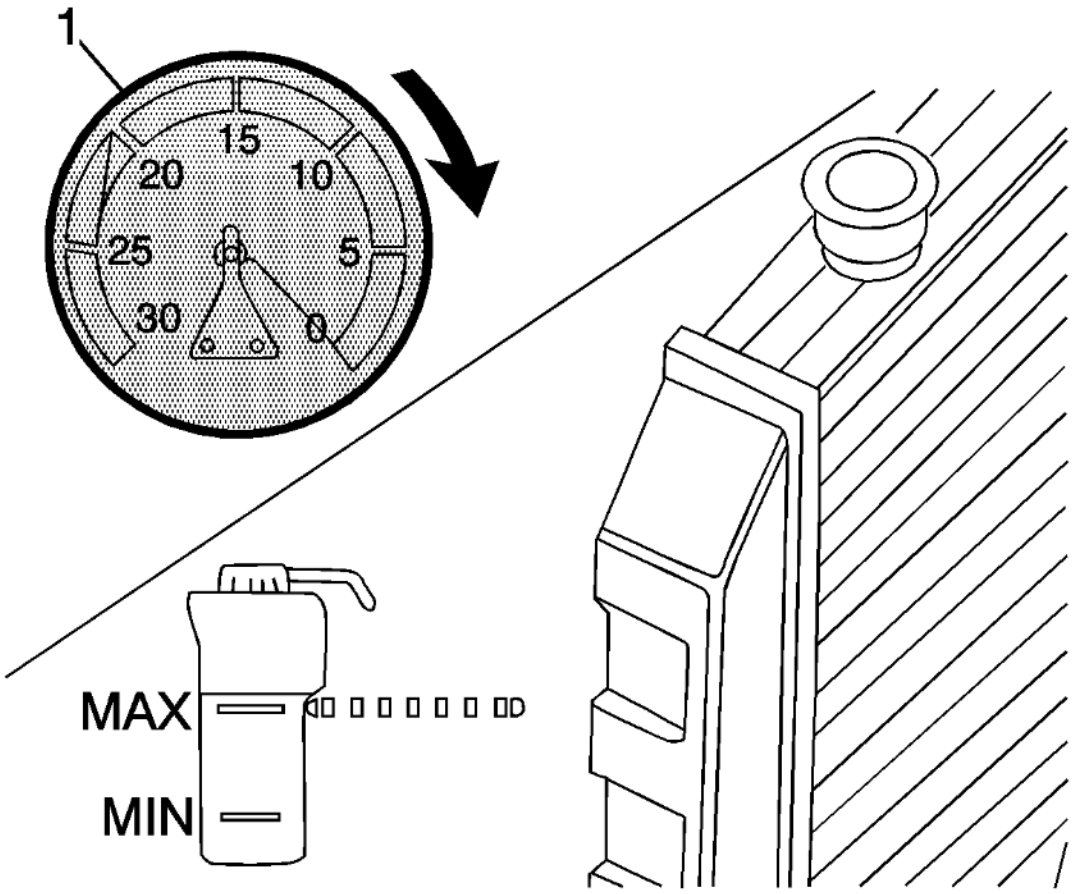

Fig. 61: Vacuum Gauge At Zero
Courtesy of GENERAL MOTORS COMPANY

20. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11-17.
21. Remove the **J-42401** radiator cap and surge tank test adapter.
22. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
23. Add coolant to the system as necessary.
24. Inspect the concentration of the coolant mixture using **J-26568** coolant and battery tester.

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

25. Detach the vacuum hose form the vacuum gauge assembly.

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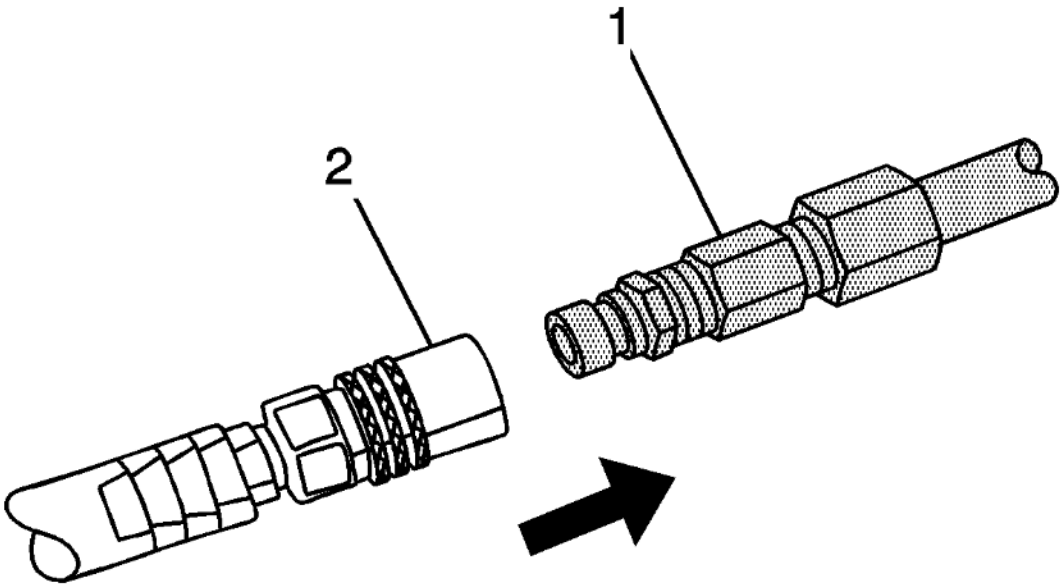

Fig. 62: Vacuum Hose & Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

26. Attach the extraction hose (1) to the vacuum hose (2).

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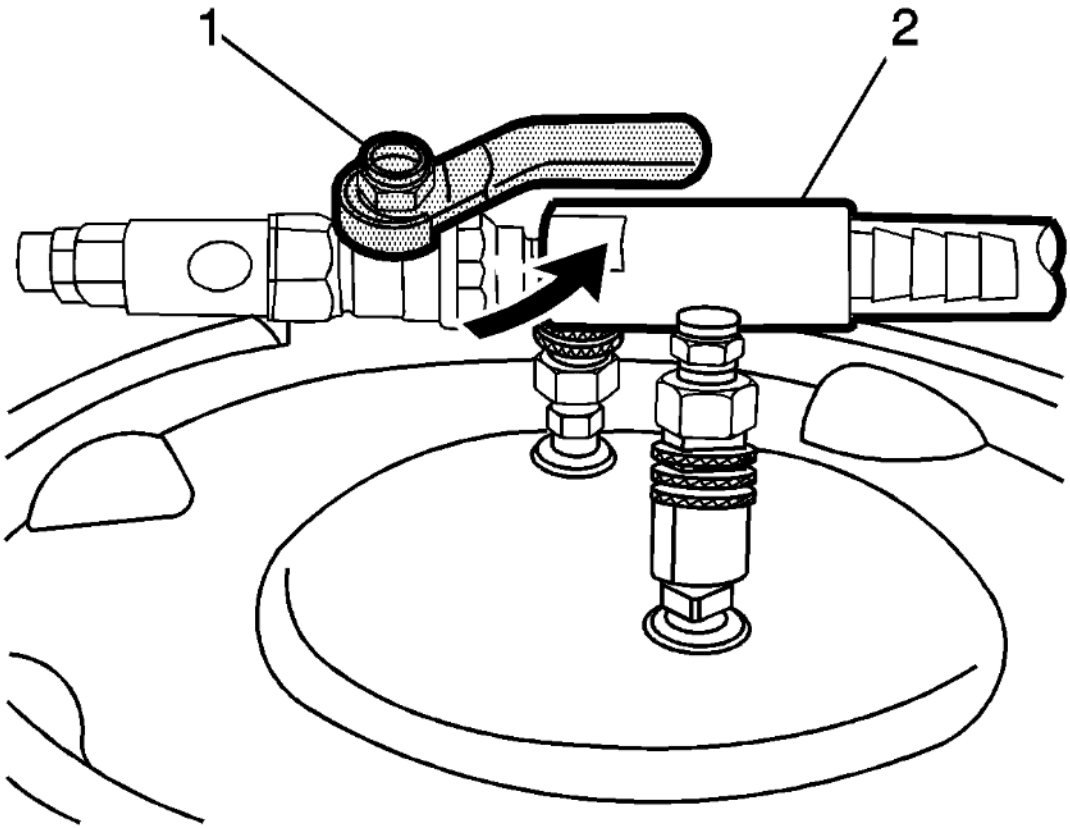

Fig. 63: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

27. Open the valve (1) on the venturi assembly (2) to start a vacuum draw.

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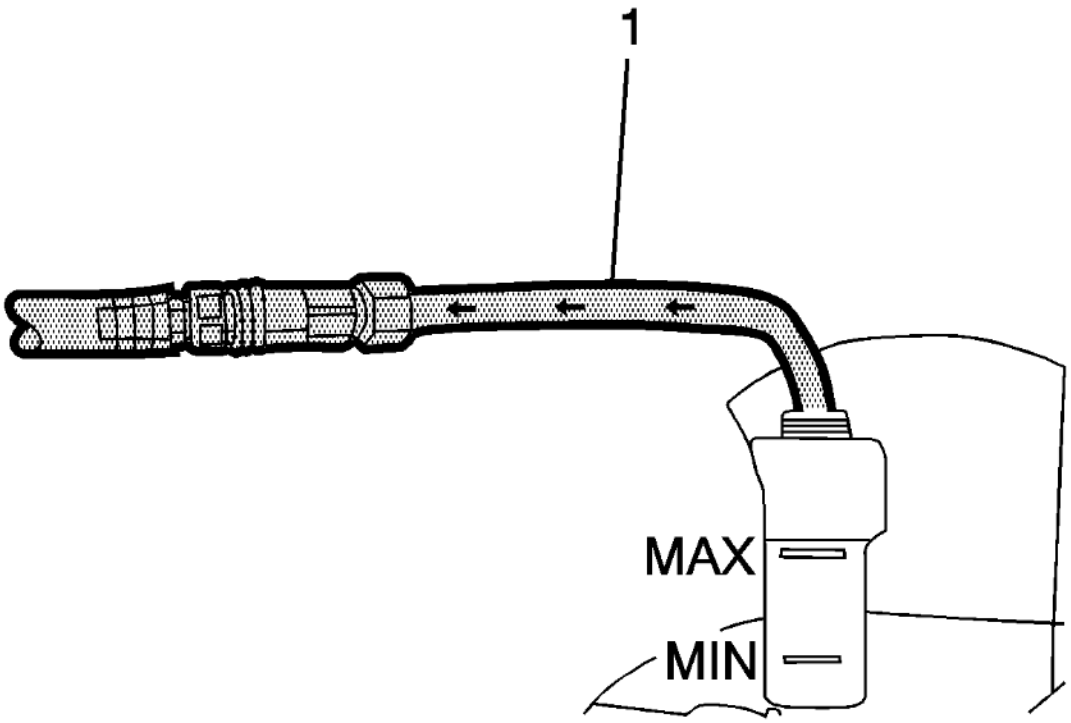

Fig. 64: Coolant Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

28. Use the extraction hose (1) to draw out coolant to the proper level.
29. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

COOLING SYSTEM DRAINING AND FILLING (VAC N FILL L8B)

Special Tools

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

Draining Procedure

WARNING: With a pressurized cooling system, the coolant temperature in the radiator can be considerably higher than the boiling point of the solution at atmospheric pressure. Removal of the surge tank cap, while the cooling system is hot and under high pressure, causes the solution to boil instantaneously with explosive

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force. This will cause the solution to spew out over the engine, the fenders, and the person removing the cap. Serious bodily injury may result.

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. **Lifting and Jacking the Vehicle**
4. Place a drain pan under the radiator drain cock.
5. Install a suitable length of hose to the radiator drain cock nipple and route the hose to allow free drain of coolant.
6. Open the radiator drain cock.
7. Drain the cooling system.
8. Place a drain pan under the generator control module coolant pump hose at the radiator.
9. Remove the generator control module coolant pump hose from the radiator. **Generator Control Module Coolant Pump Hose Replacement (Left Side L8B)**
10. Drain the cooling system.
11. Inspect the coolant.
12. Follow the appropriate procedure based on the condition of the coolant.
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**

Vac-N-Fill Procedure

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

1. Close the radiator drain cock.
2. Remove the hose from the radiator drain cock nipple.
3. Install the generator control module coolant pump hose to the radiator. **Generator Control Module Coolant Pump Hose Replacement (Left Side L8B)**

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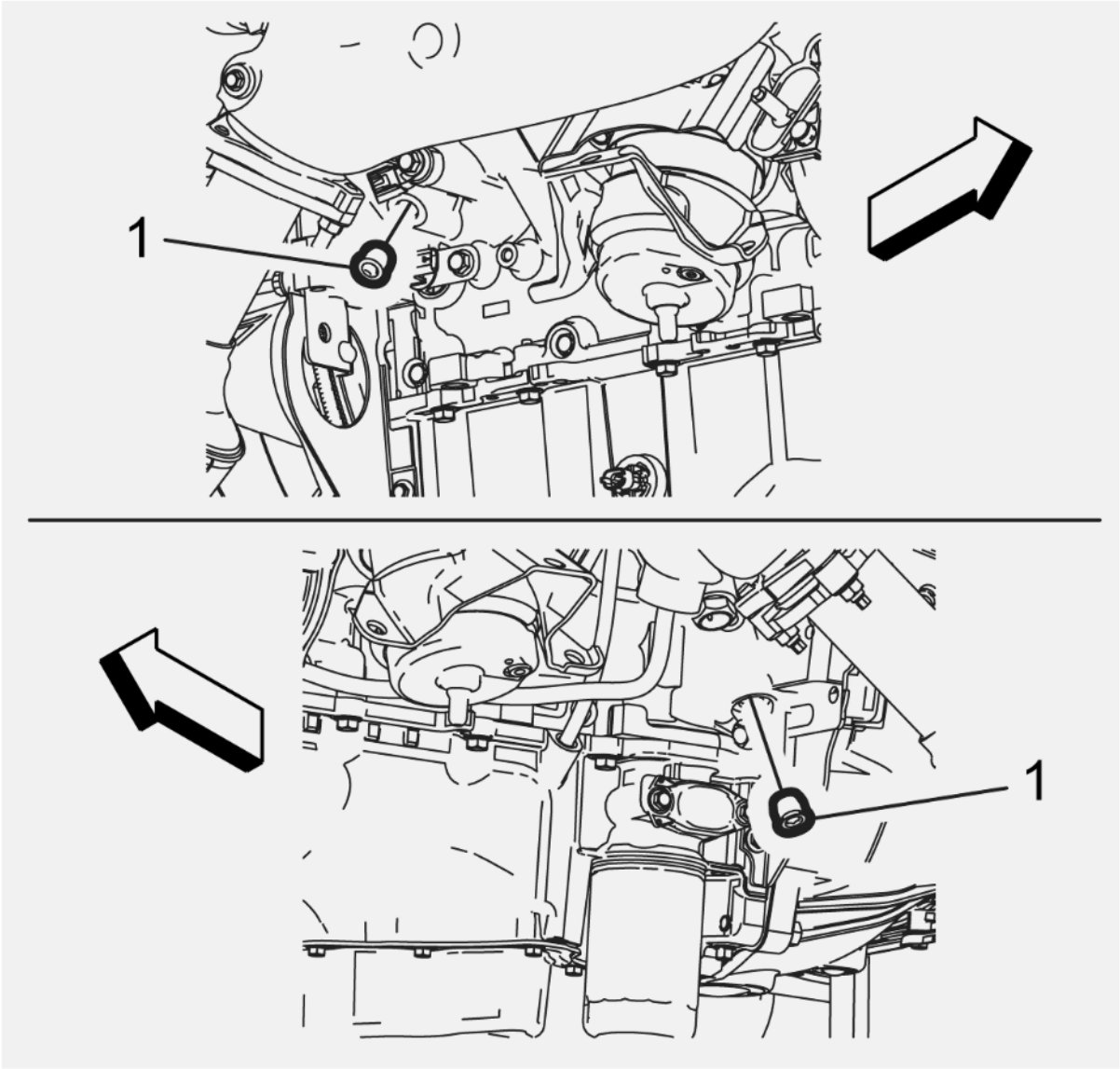

Fig. 65: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

4. If the left and right engine block coolant drain hole plugs (1) were removed, install the engine block coolant drain hole plugs (1). **Engine Block Plug Installation**
5. Install the **J-42401** radiator cap and surge tank test adapter.

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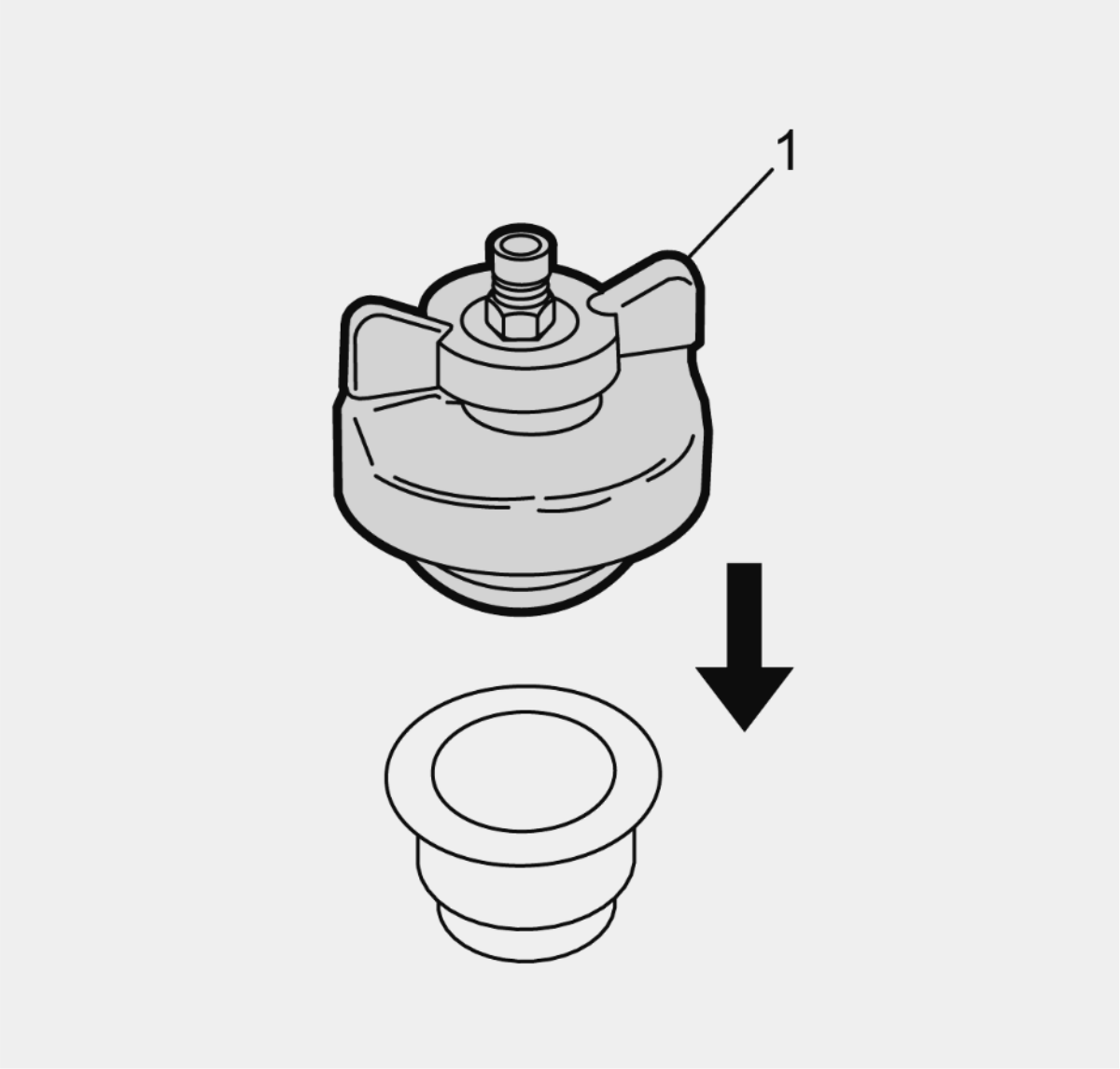

Fig. 66: Radiator Cap & Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

6. Attach the Vac-N-Fill cap (1) to the vehicles coolant fill port.

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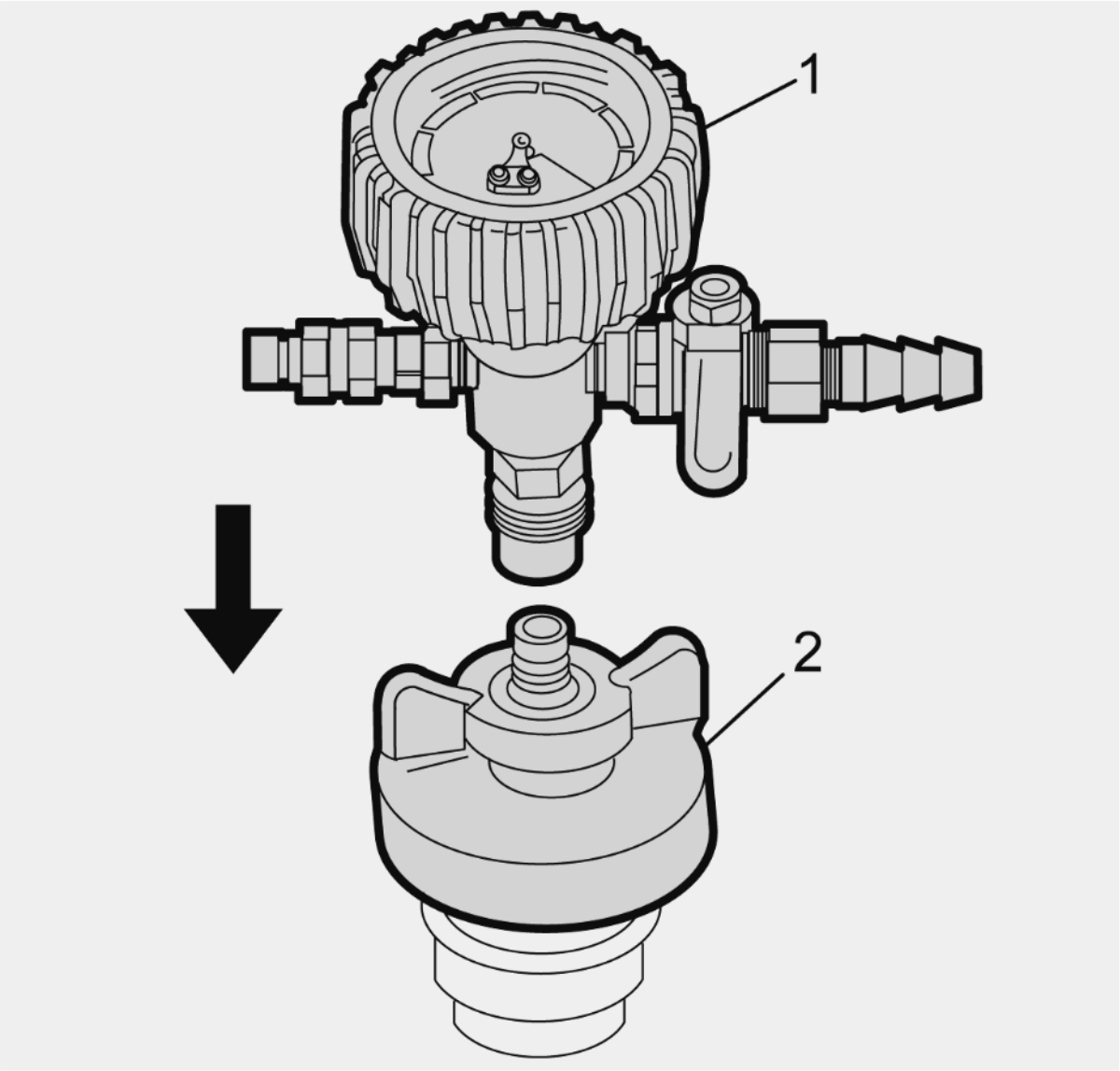

Fig. 67: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

7. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

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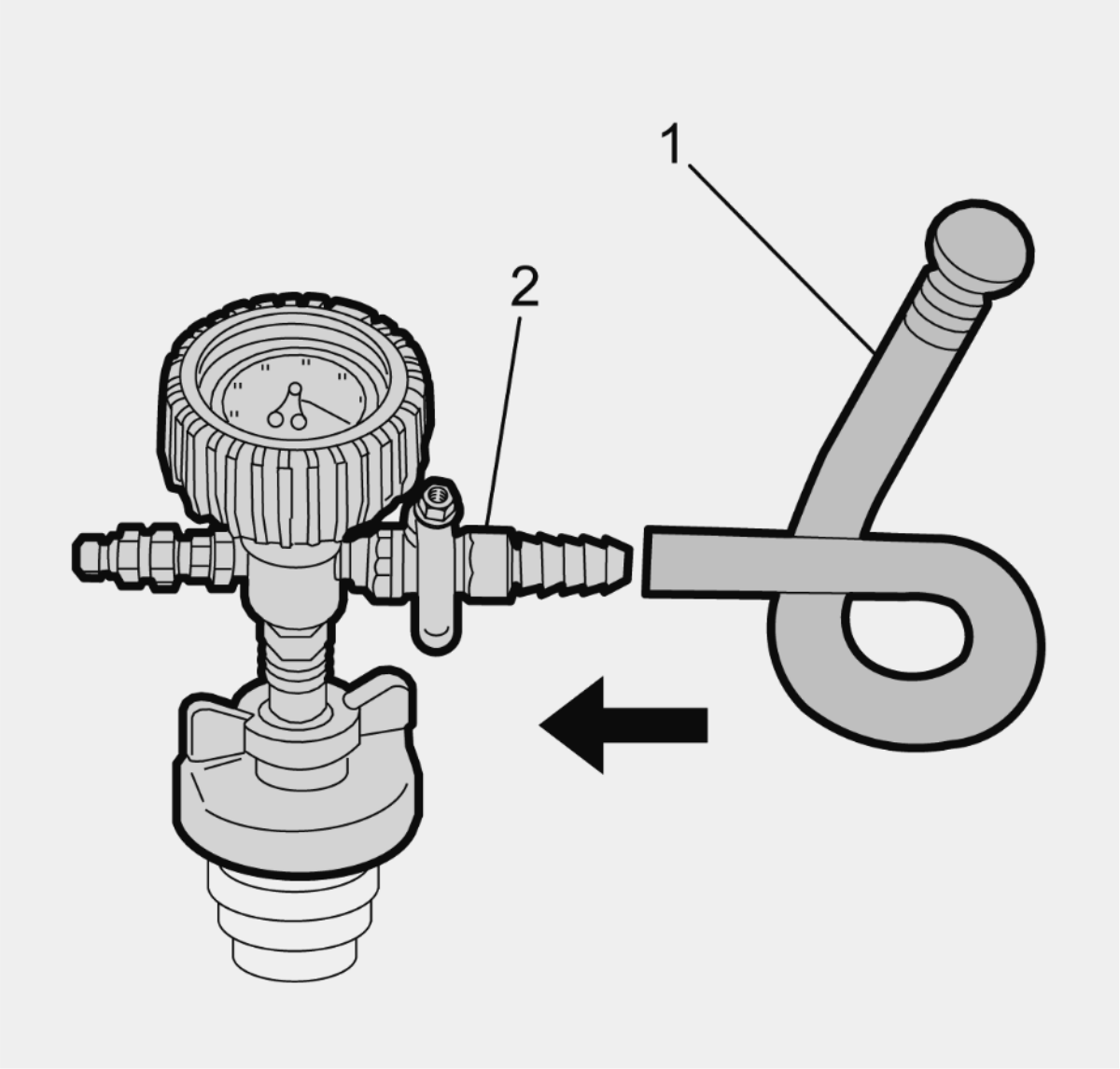

Fig. 68: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

8. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

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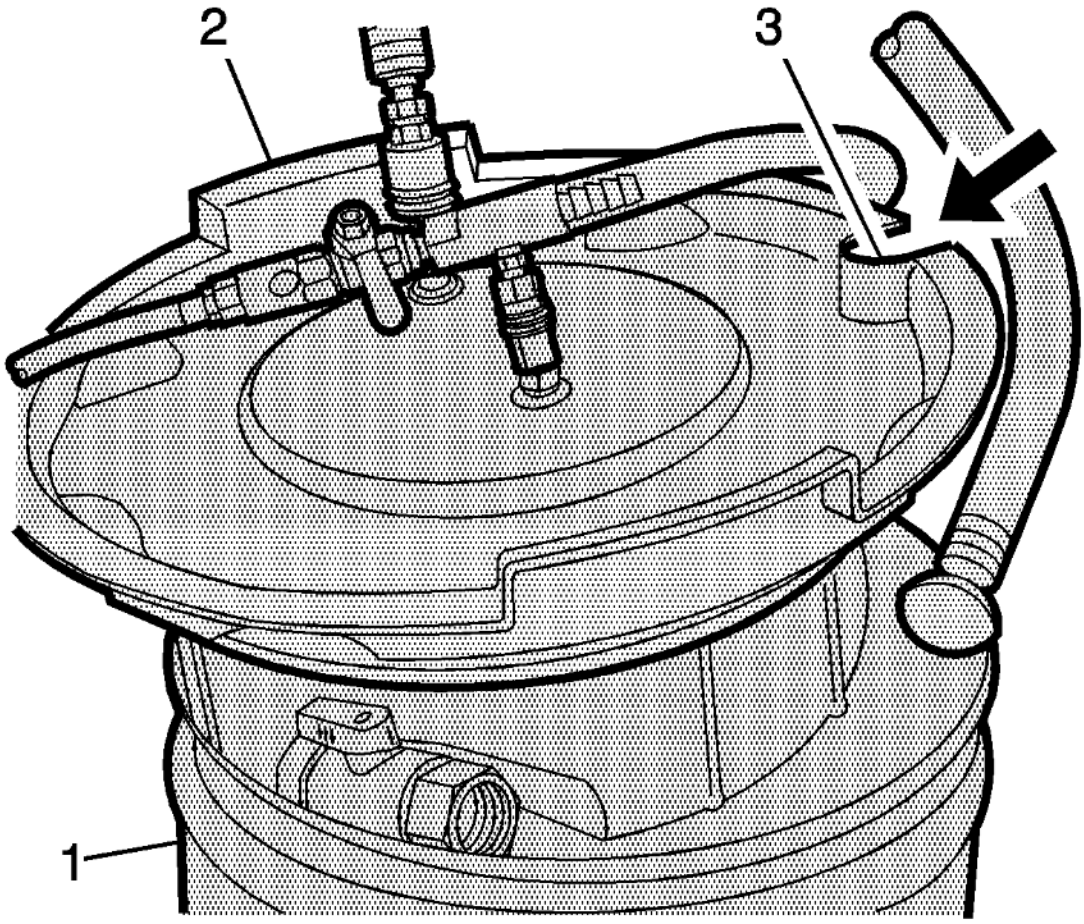

Fig. 69: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

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.

9. Pour the coolant mixture into the graduated reservoir (1).
10. Place the fill hose in the graduated reservoir (1).

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.**

11. Install the vacuum tank (2) on the graduated reservoir with the fill hose routed through the cut-out area (3) in the vacuum tank.

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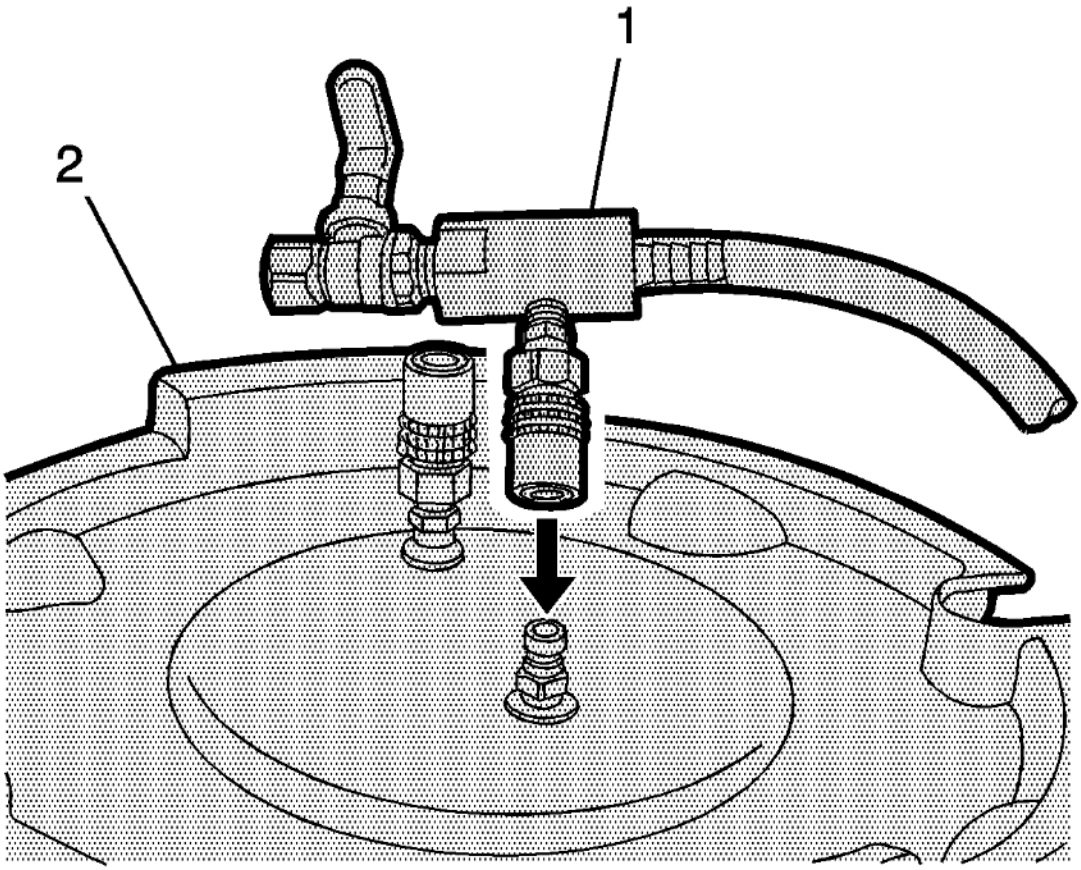

Fig. 70: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

12. Attach the venturi assembly (1) to the vacuum tank (2).

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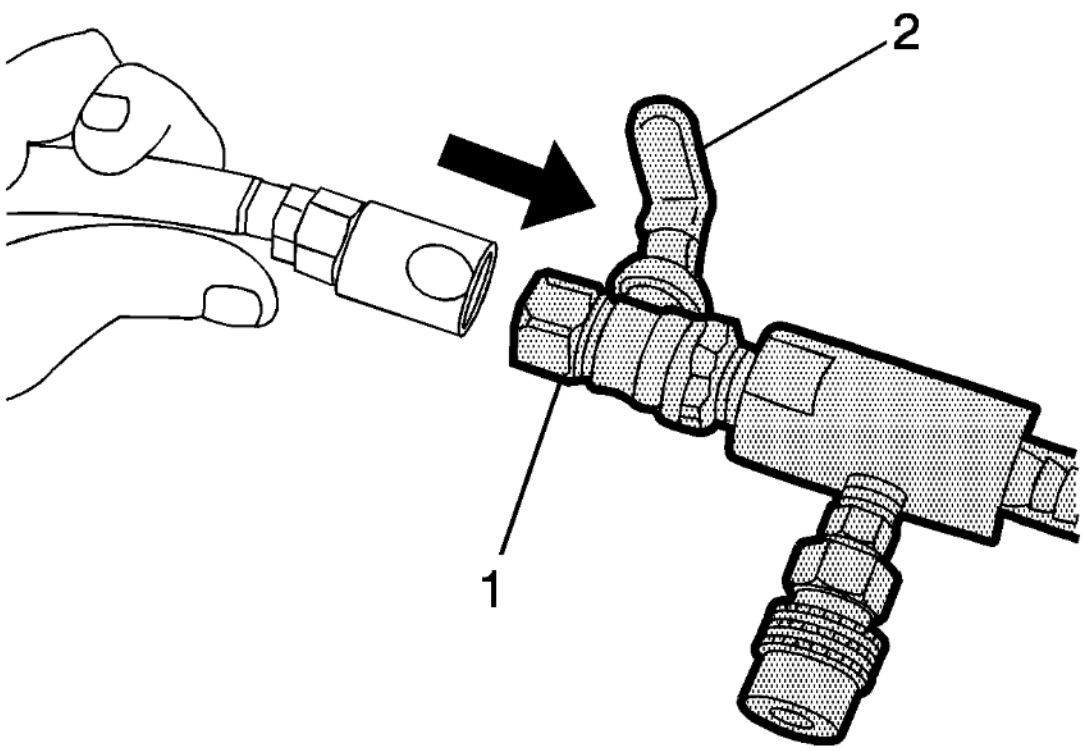

Fig. 71: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

13. Attach a shop air hose to the venturi assembly (1).

    Ensure the valve (2) on the venturi assembly is closed.

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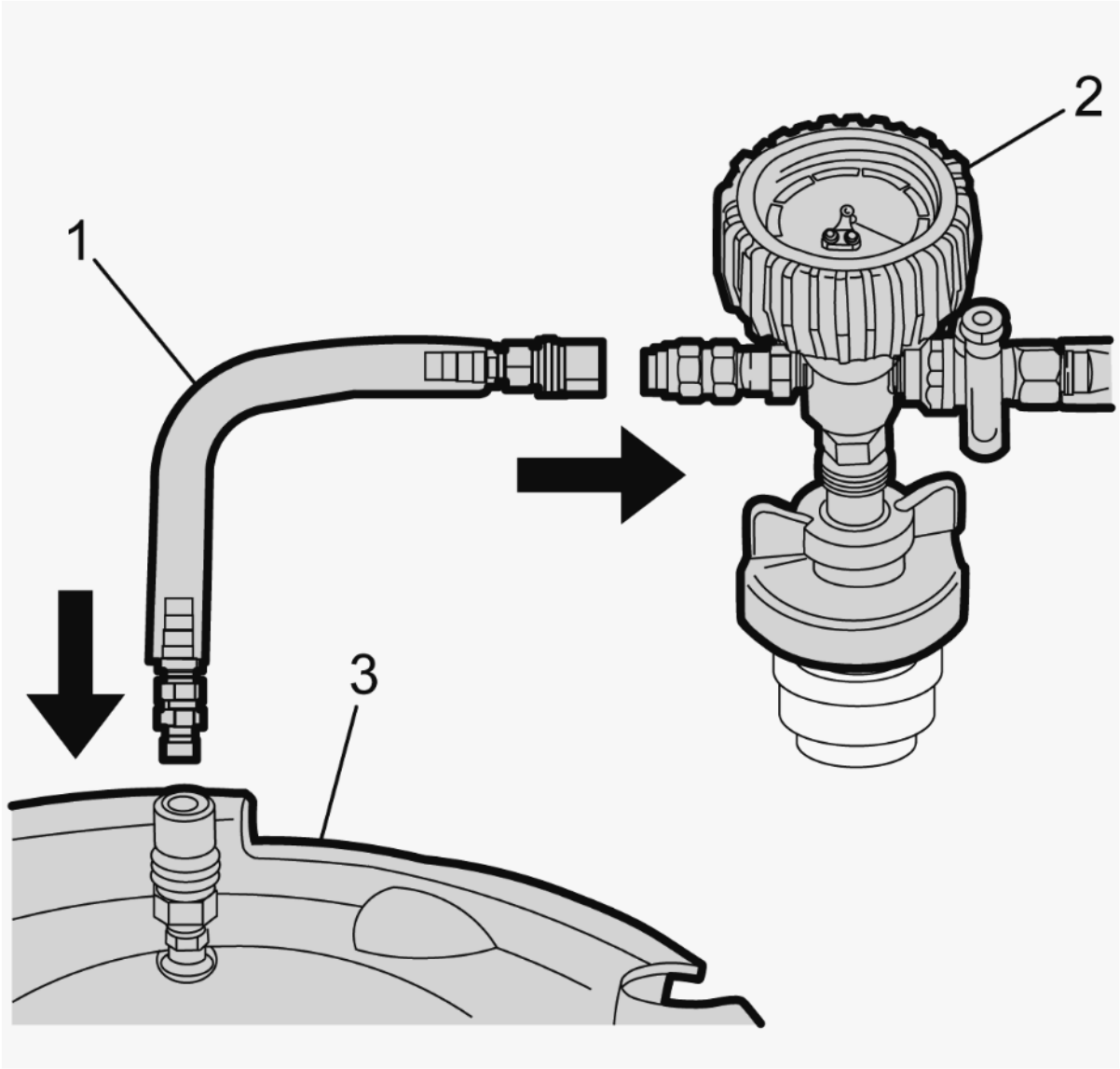

Fig. 72: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

14. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).
15. Clamp off the overflow hose.

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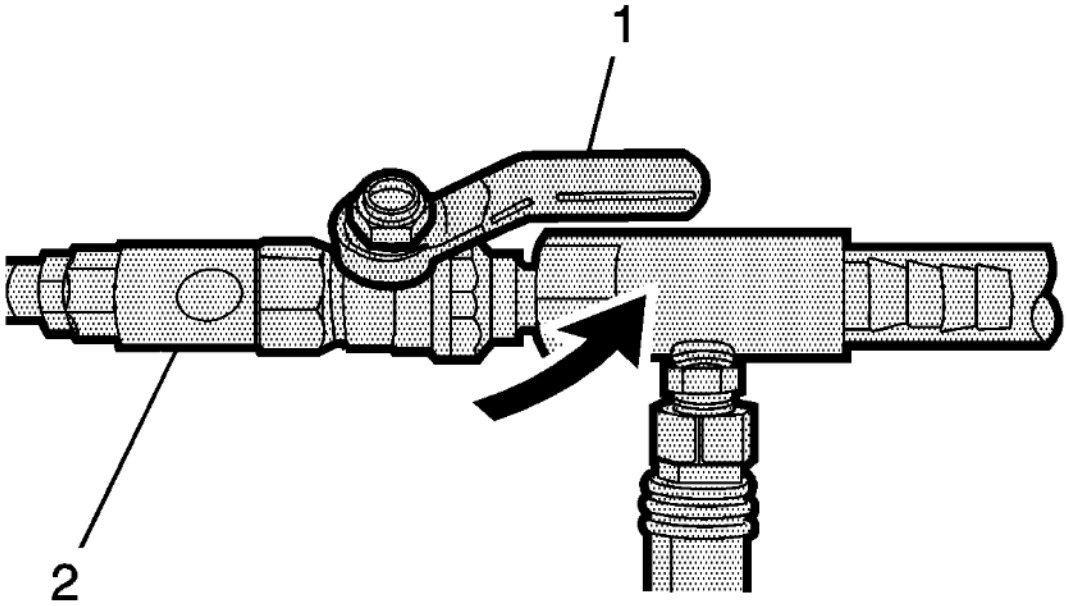

Fig. 73: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

16. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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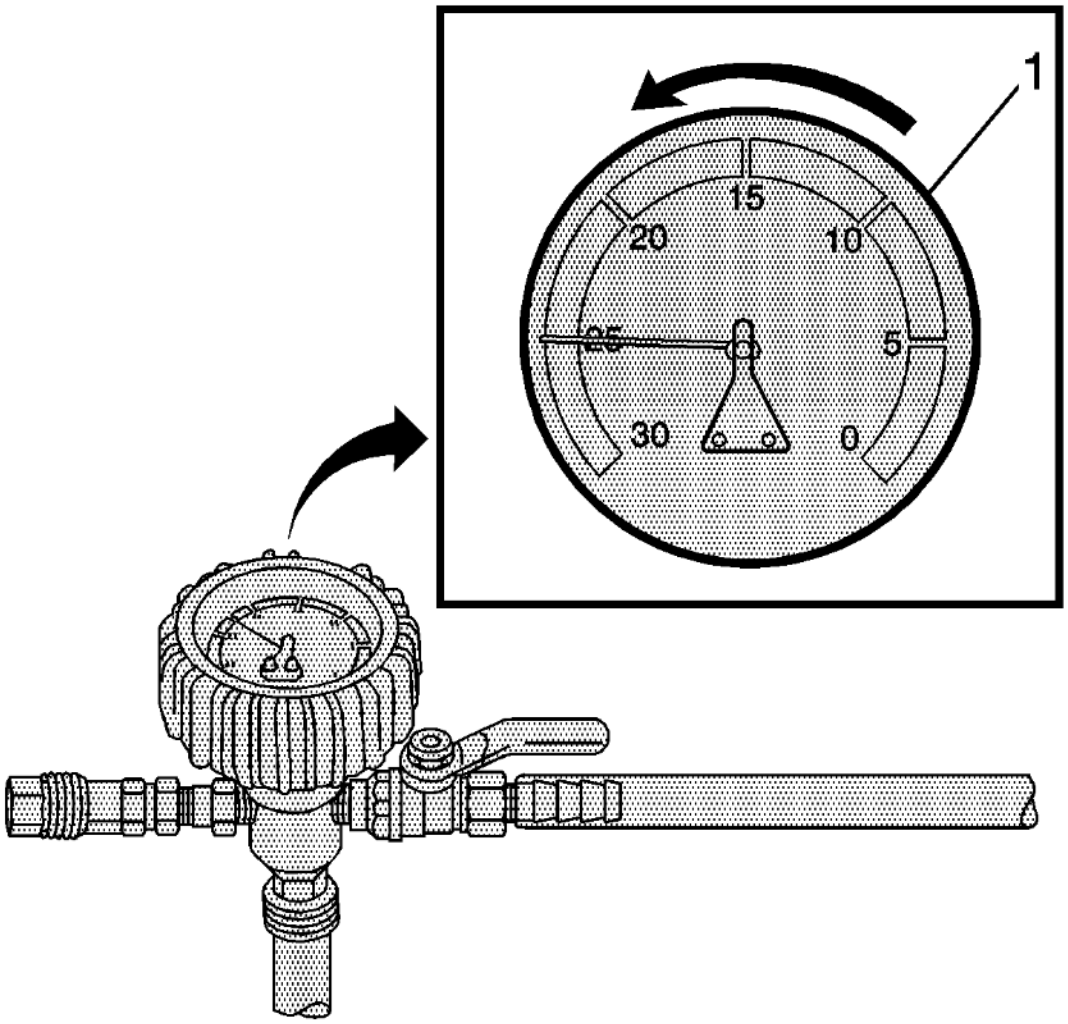

Fig. 74: Vacuum Gauge Needle
Courtesy of GENERAL MOTORS COMPANY

17. Continue to draw vacuum until the needle stops rising (1). This should be 610-660 mm Hg (24-26 in Hg).

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

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

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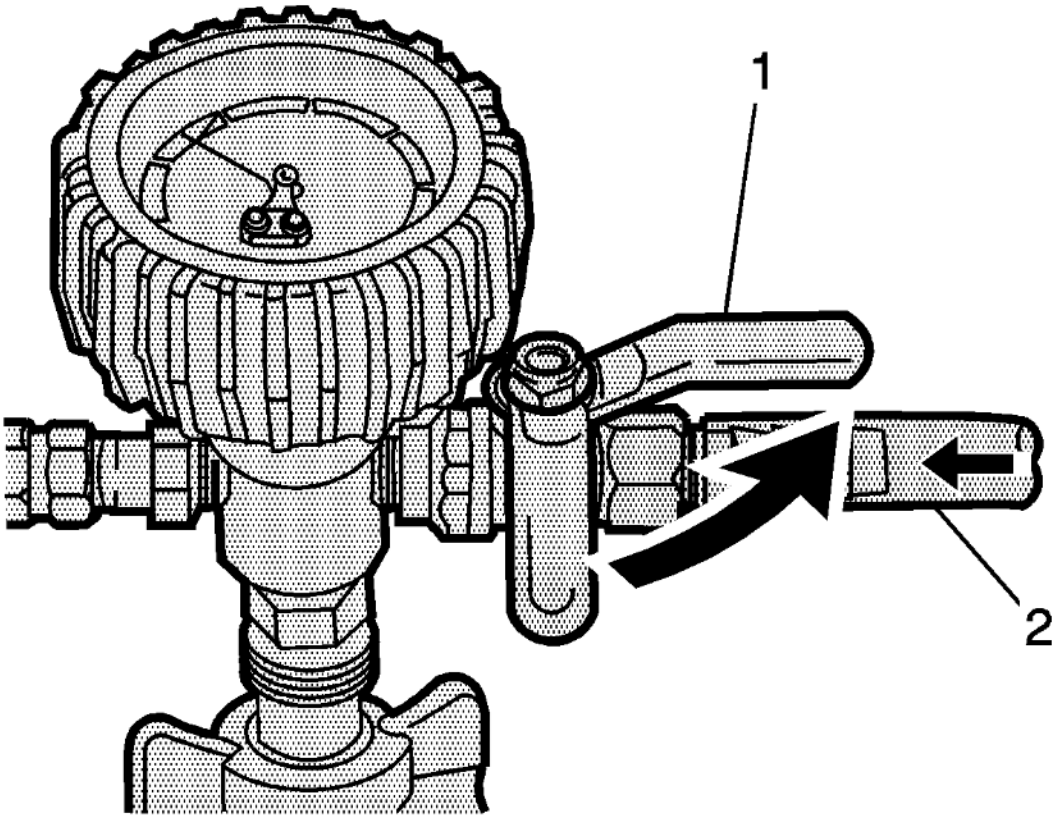

Fig. 75: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

19. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
20. Close the valve on the venture assembly.
21. 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, **Loss of Coolant (L8B, L83, L86)**.

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

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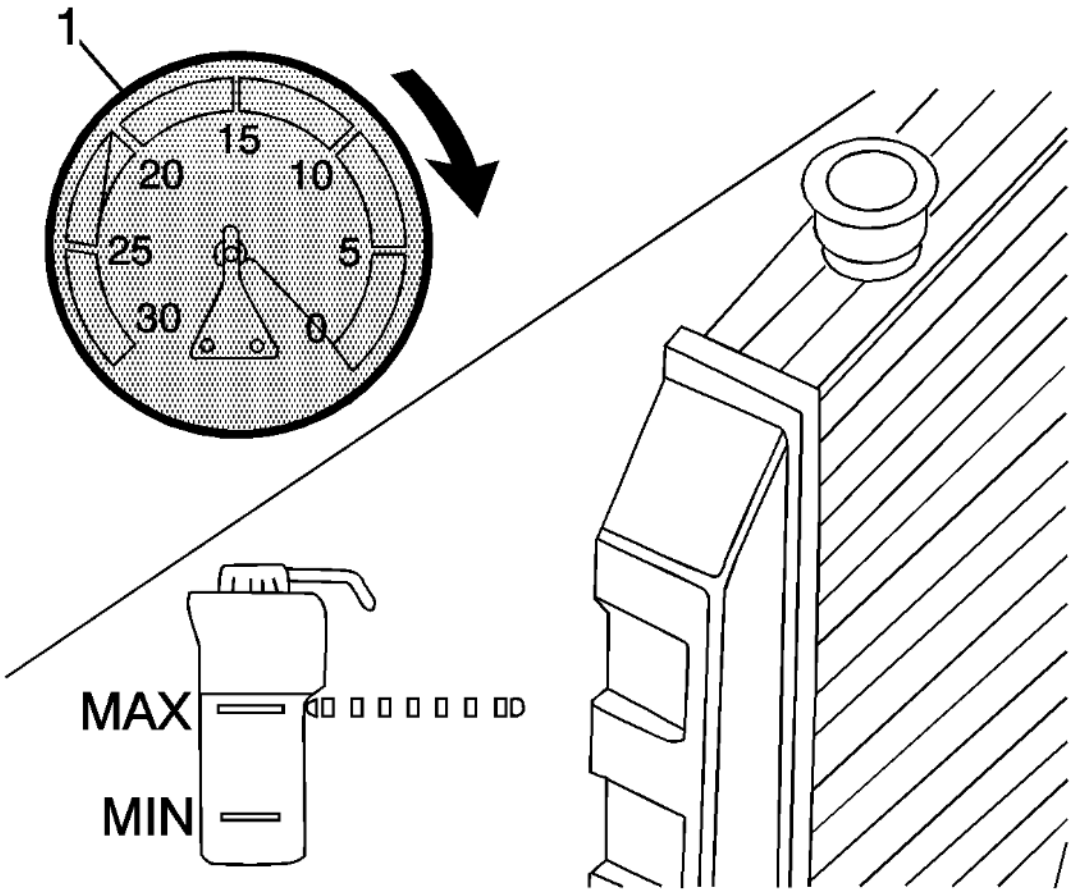

Fig. 76: Vacuum Gauge At Zero
Courtesy of GENERAL MOTORS COMPANY

23. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11-17.
24. Remove the **J-42401** radiator cap and surge tank test adapter.
25. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
26. Add coolant to the system as necessary.
27. Inspect the concentration of the coolant mixture using **J-26568** coolant and battery tester.

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

28. Detach the vacuum hose form the vacuum gauge assembly.

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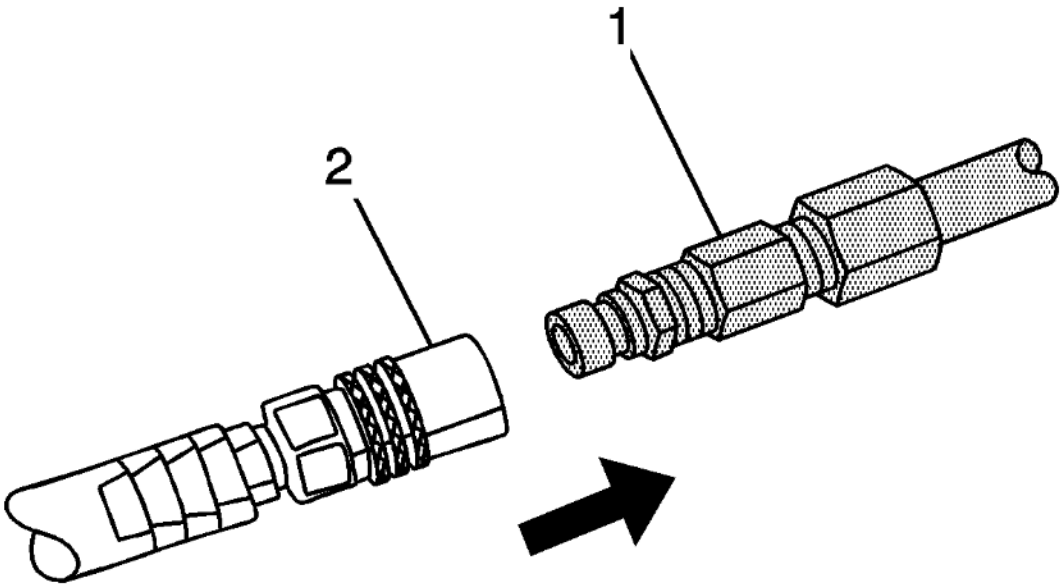

Fig. 77: Vacuum Hose & Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

29. Attach the extraction hose (1) to the vacuum hose (2).

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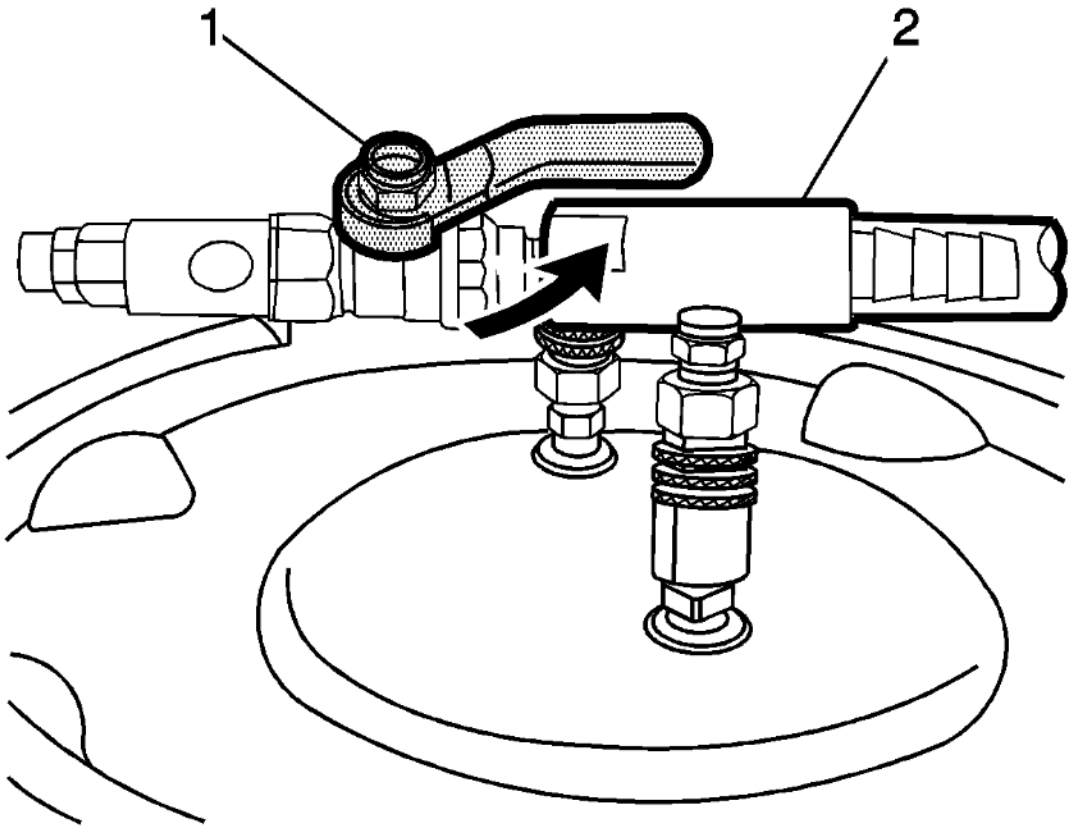

Fig. 78: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

30. Open the valve (1) on the venturi assembly (2) to start a vacuum draw.

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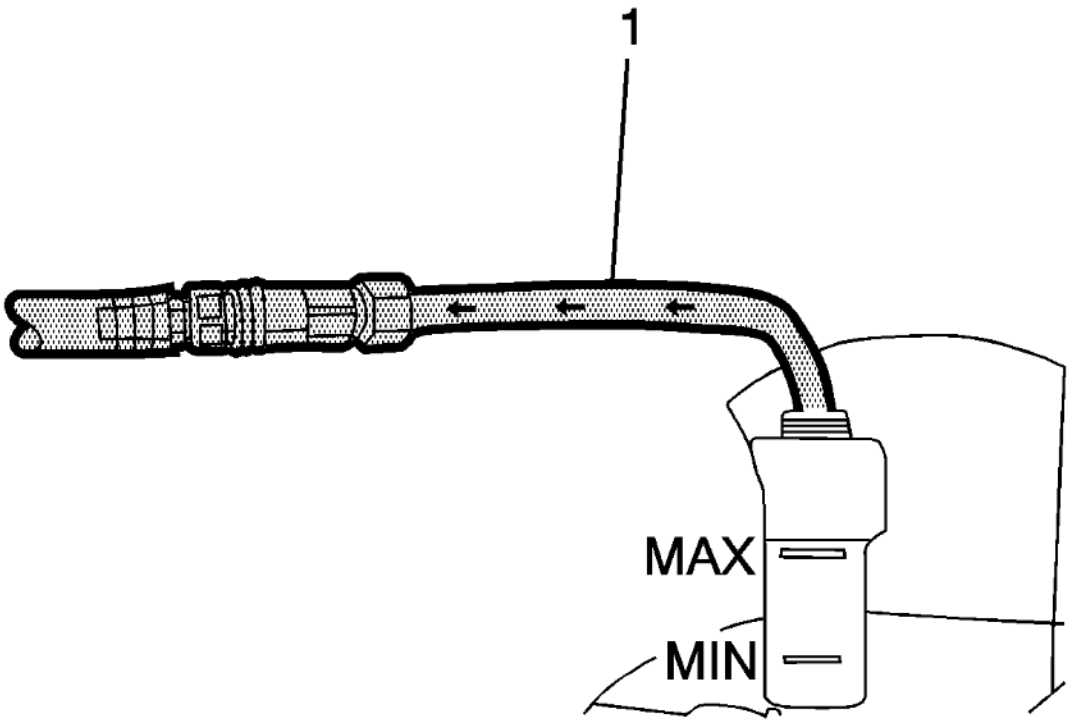

Fig. 79: Coolant Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

31. Use the extraction hose (1) to draw out coolant to the proper level.
32. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

COOLING SYSTEM DRAINING AND FILLING (GE 47716 L5P)

Special Tools

- **GE-47716** Vac-N-Fill Coolant Refill Tool
- **J-26568** Coolant and Battery Tester
- **GE-52098** Cooling System Pressure Test Adapter

Equivalent regional tools:**Special Tools**

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

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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.

CAUTION: The cap mounted to the top of the surge tank uses LEFT HAND threads. Turn the cap clockwise to remove the cap or counter clockwise to install the cap. Failure to turn the cap in the proper direction when installing or removing it may cause damage to the cap and/or the surge tank.

1. Follow the steps below in order to remove the radiator surge tank fill cap:
    1. Slowly rotate the cap clockwise.
    2. Stop rotating and allow the hissing to stop.
    3. After all the hissing stops, continue turning clockwise in order to remove the cap.
2. Raise and support the vehicle. **Lifting and Jacking the Vehicle**
3. Place a drain pan under the drain cock.
4. Remove the radiator drain cock. **Radiator Drain Cock Replacement (L5P)**
5. Drain the cooling system.
6. If a complete engine block drain is required, remove the engine block coolant drain hole plugs and engine block coolant drain hole plug gaskets.
7. Remove the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**
8. Inspect the coolant.
9. Follow the appropriate procedure based on the condition of the coolant:
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**

Vac-N-Fill Procedure

CAUTION: Refer to Fastener Caution .

1. If the engine block coolant drain hole plugs and engine block coolant drain hole plug gaskets were removed, install the engine block coolant drain hole plugs and engine block coolant drain hole plug gaskets. **Engine Block Cleaning and Inspection**

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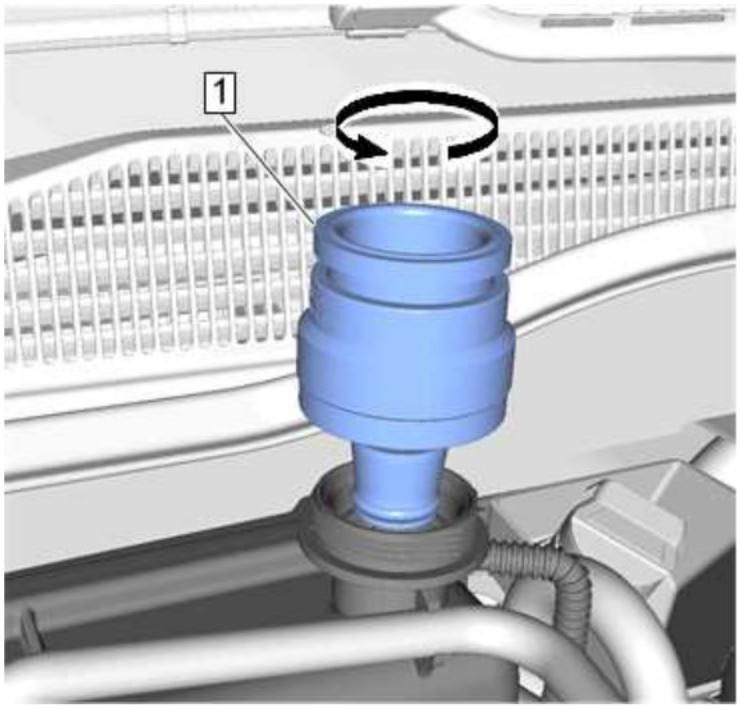

Fig. 80: Cooling System Pressure Test Adapter
Courtesy of GENERAL MOTORS COMPANY

2. Install the **GE-52098** Cooling System Pressure Test Adapter (1) onto the radiator surge tank.

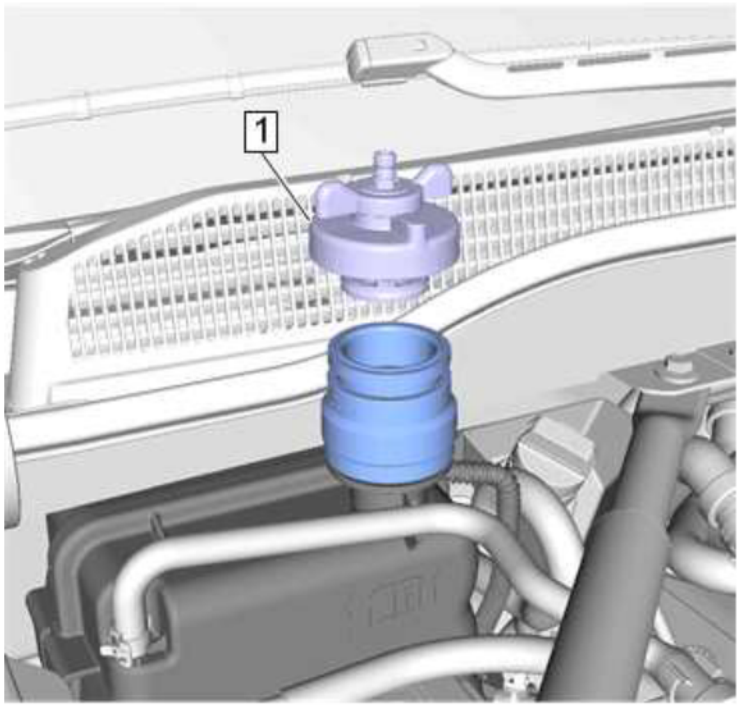

Fig. 81: Cooling System Pressure Test Adapter
Courtesy of GENERAL MOTORS COMPANY

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.

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3. Attach the Vac-N-Fill cap to **GE-52098** Cooling System Pressure Test Adapter (1).

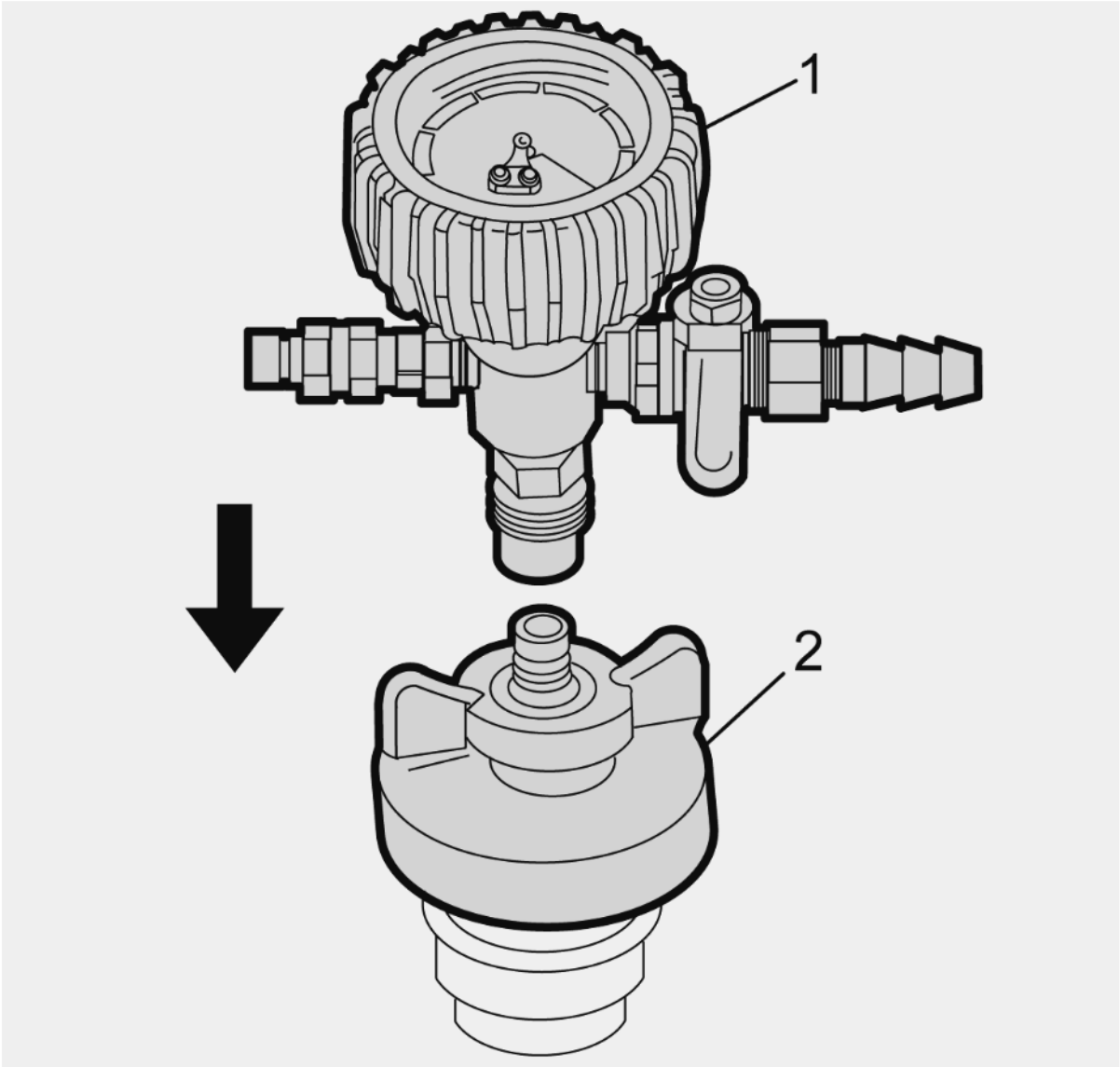

Fig. 82: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

4. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

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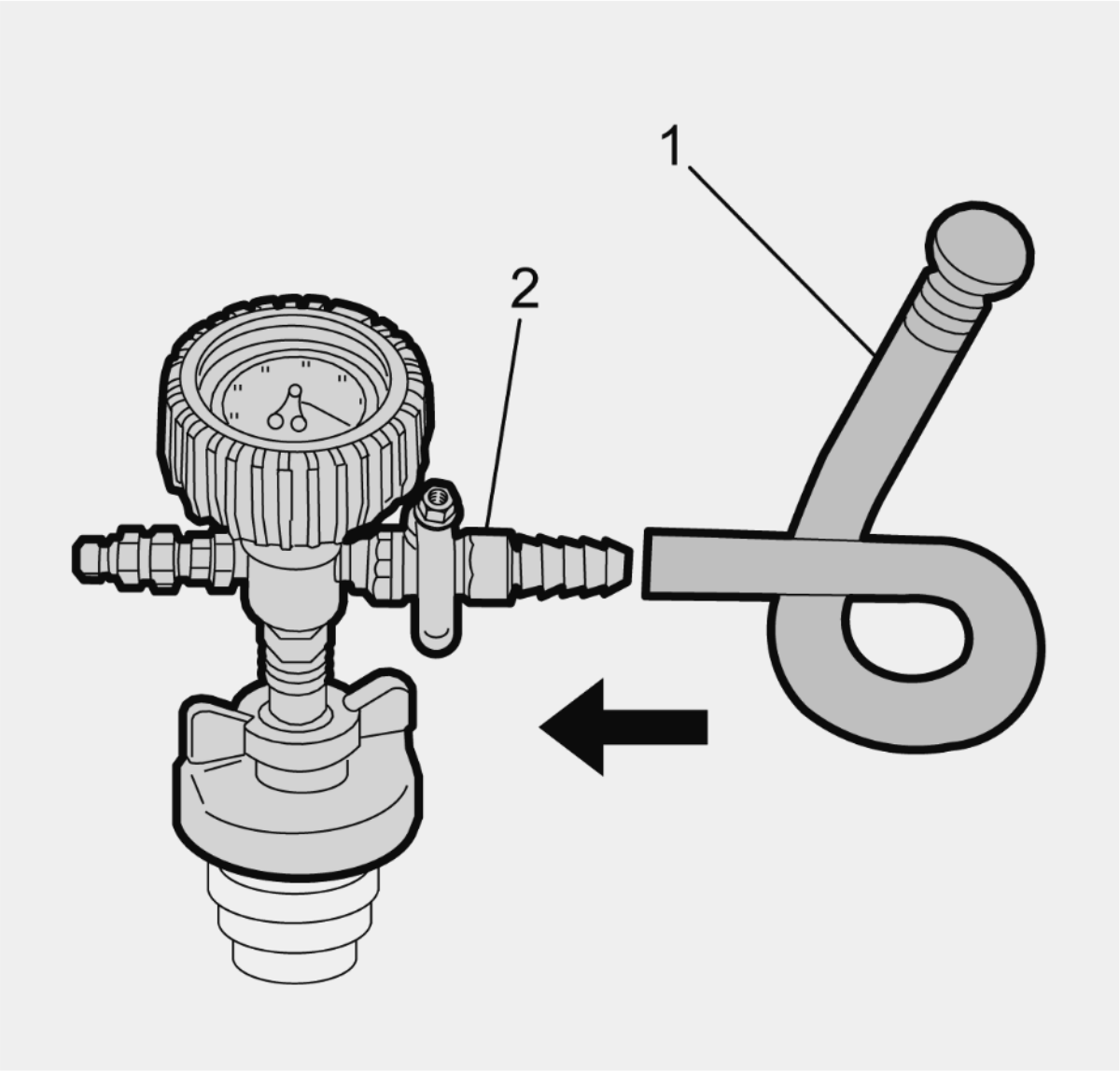

Fig. 83: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

5. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

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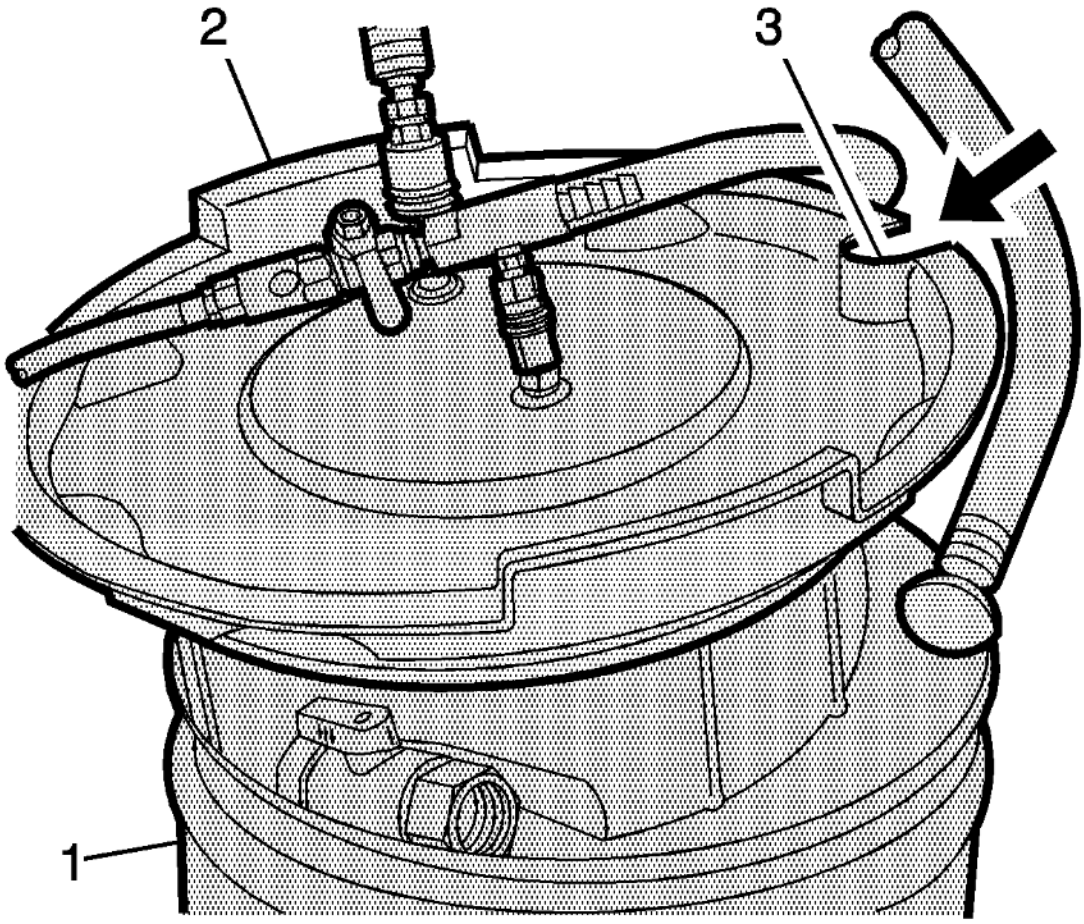

Fig. 84: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

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.

6. Pour the coolant mixture into the graduated reservoir (1).
7. Place the fill hose in the graduated reservoir (1).

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.**

8. Install the vacuum tank (2) on the graduated reservoir with the fill hose routed through the cut-out area (3) in the vacuum tank.

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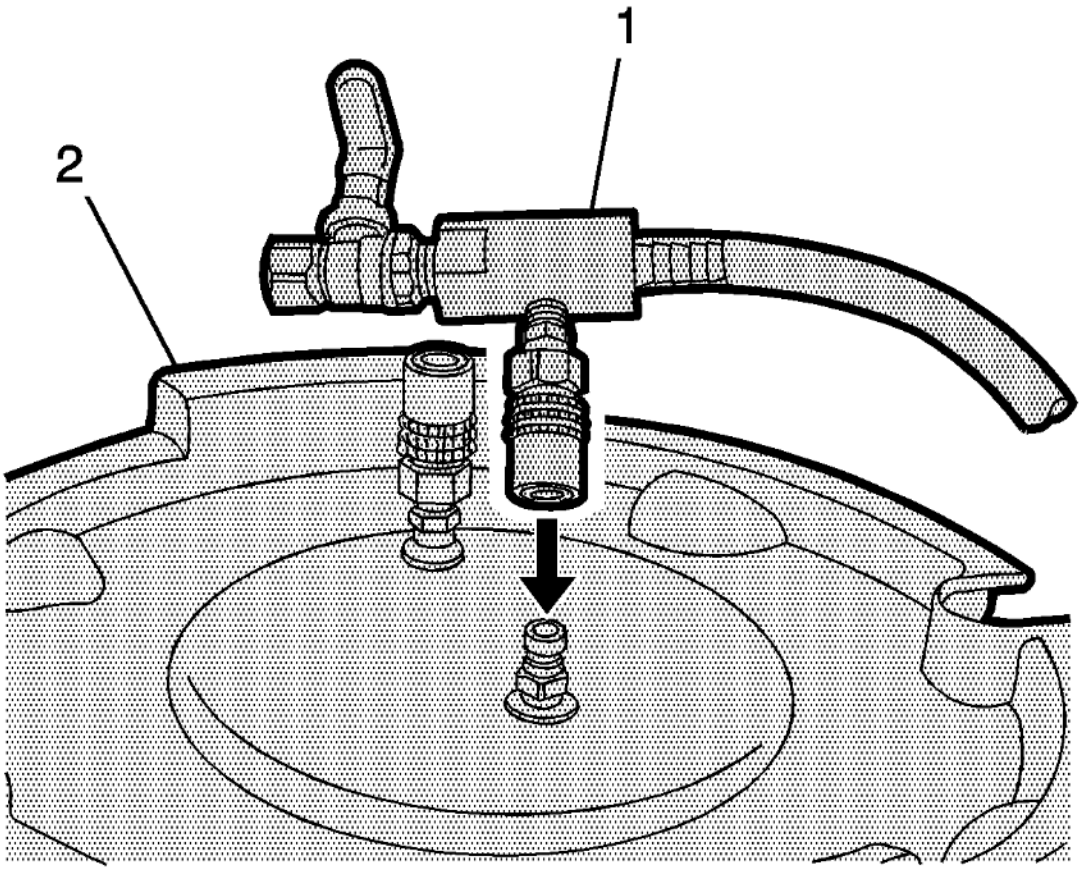

Fig. 85: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

9. Attach the venturi assembly (1) to the vacuum tank (2).

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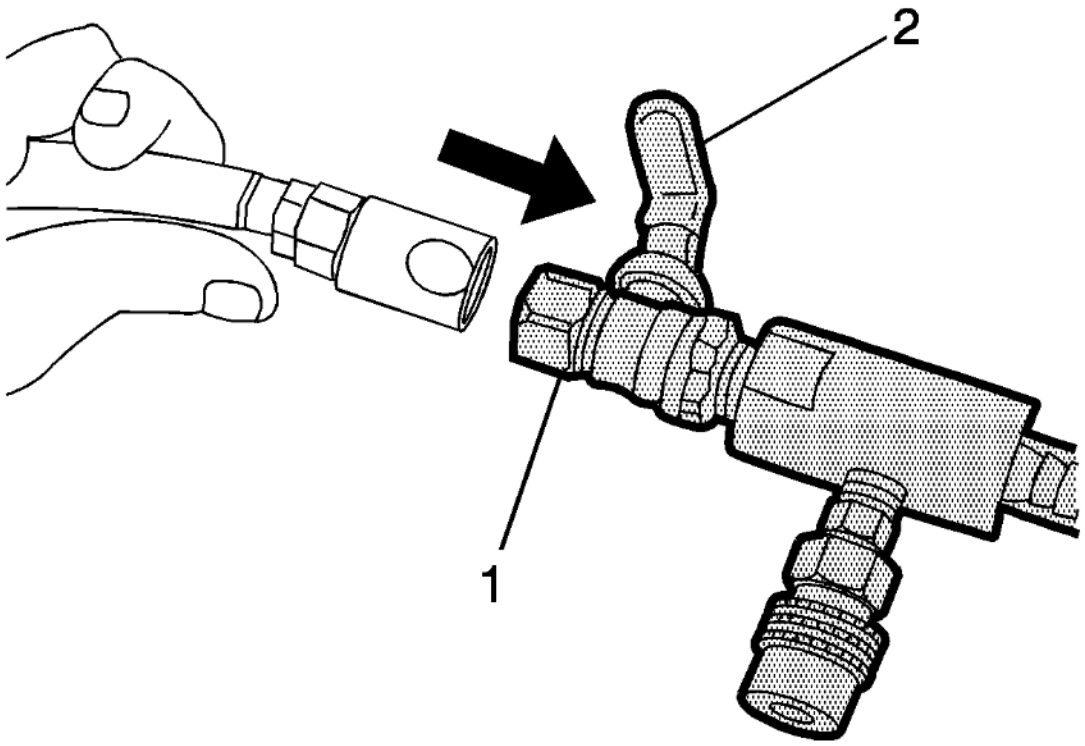

Fig. 86: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

10. Attach a shop air hose to the venturi assembly (1).

    Ensure the valve (2) on the venturi assembly is closed.

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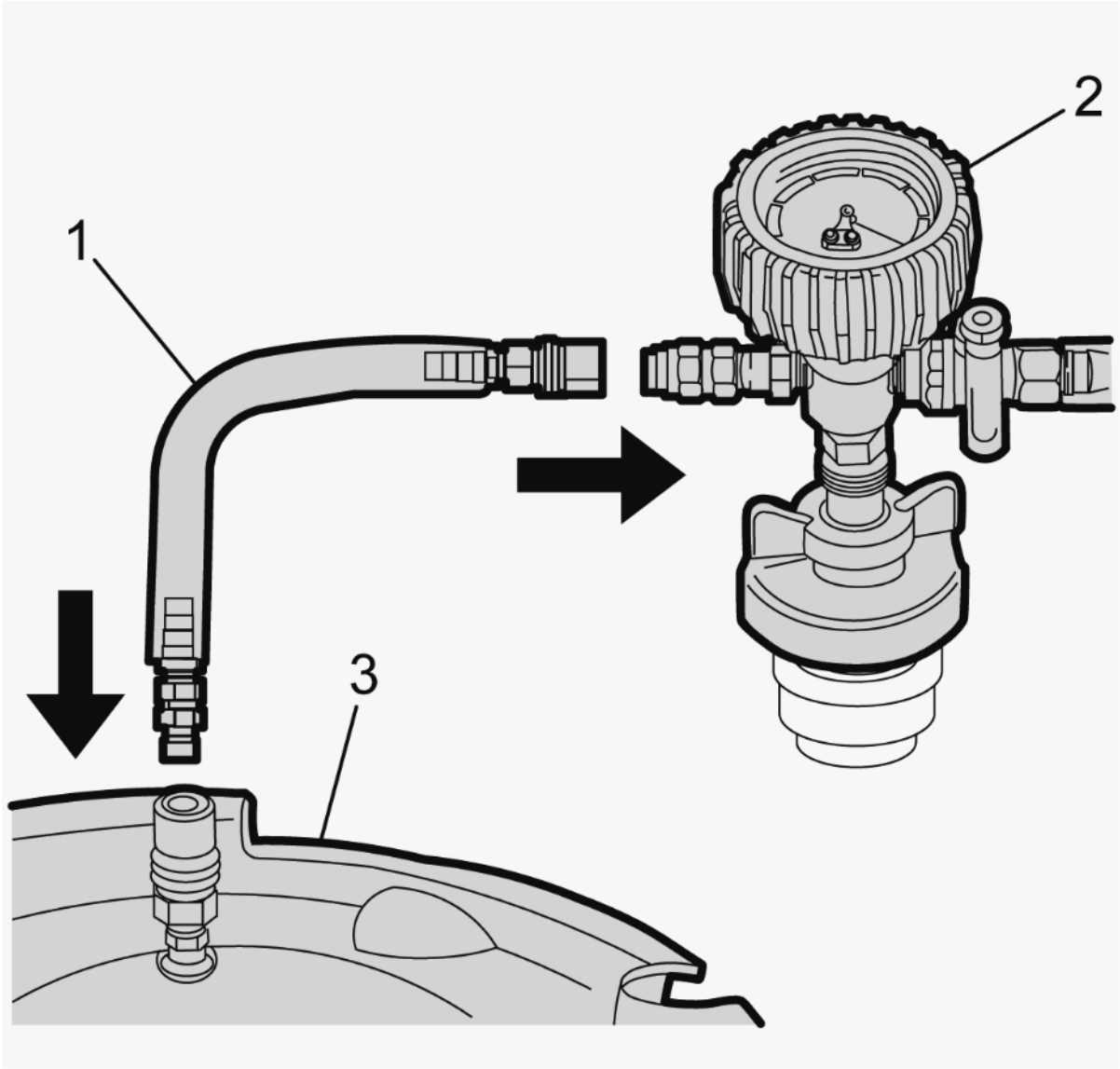

Fig. 87: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

11. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).
12. Clamp off the overflow hose.

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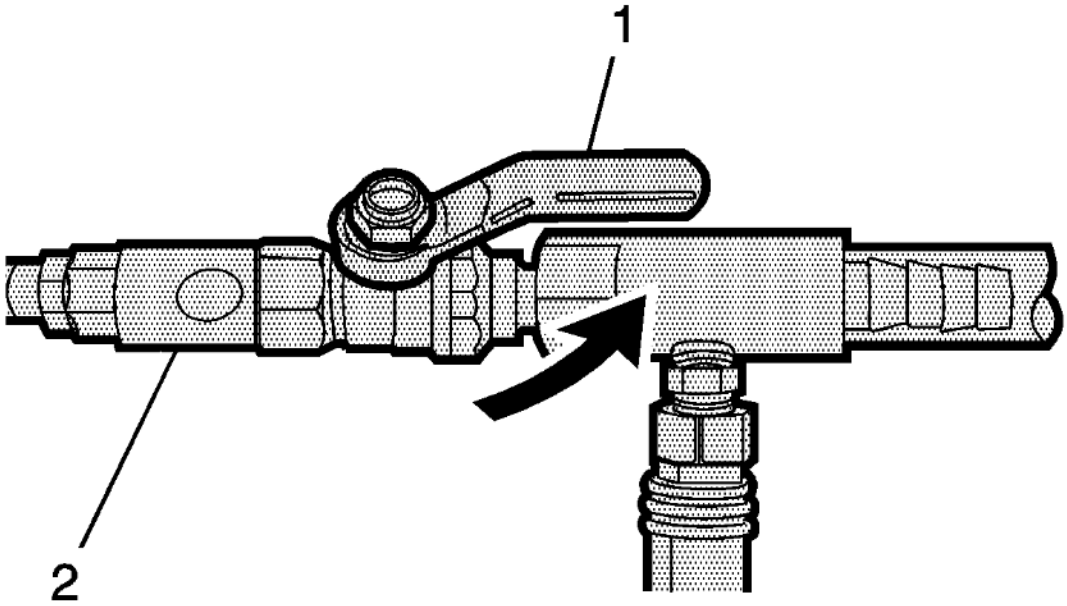

Fig. 88: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

13. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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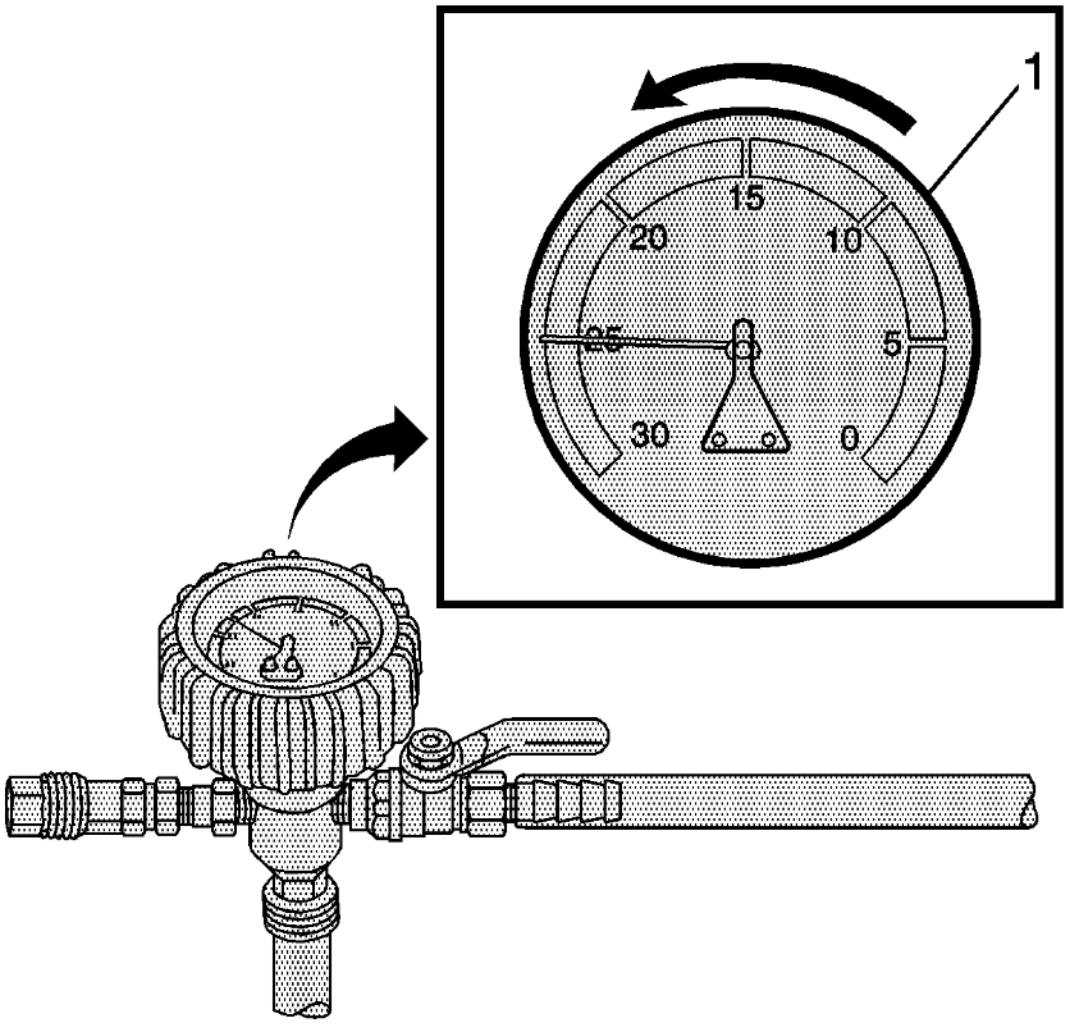

Fig. 89: Vacuum Gauge Needle
Courtesy of GENERAL MOTORS COMPANY

14. Continue to draw vacuum until the needle stops rising (1). This should be 610-660 mm Hg (24-26 in Hg).

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

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

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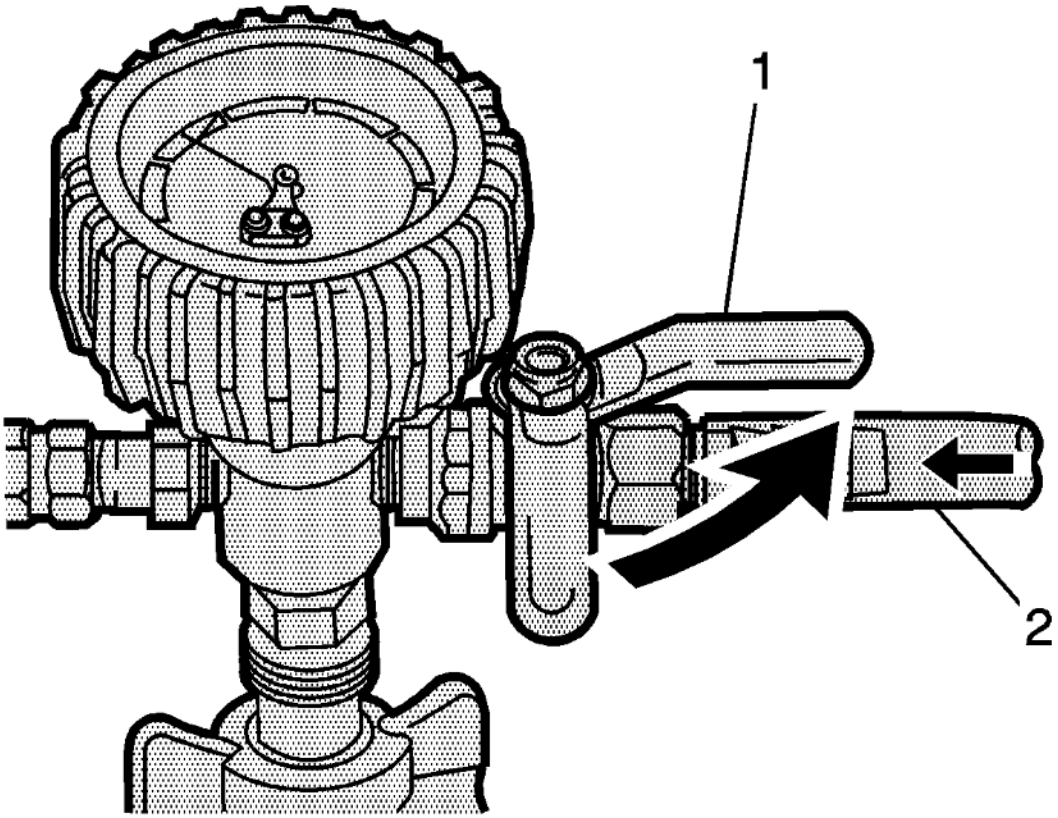

Fig. 90: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

16. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
17. Close the valve on the venture assembly.
18. 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 (L8B, L83, L86)**.

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

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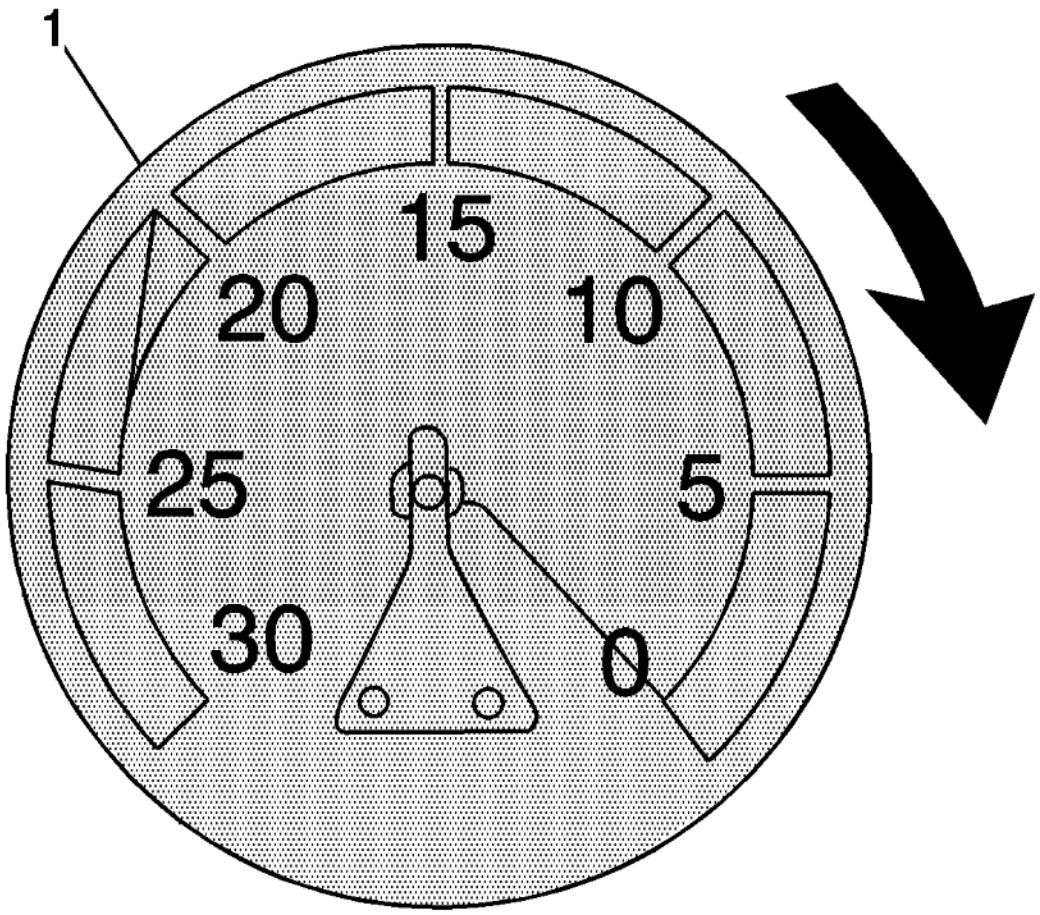

Fig. 91: Vacuum Gauge
Courtesy of GENERAL MOTORS COMPANY

20. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11-17.

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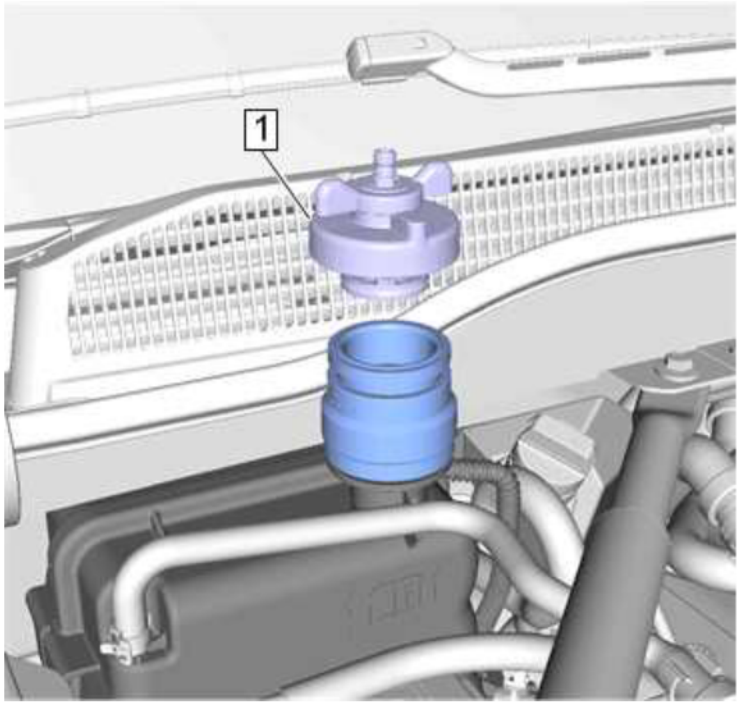

Fig. 92: Vac-N-Fill Cap
Courtesy of GENERAL MOTORS COMPANY

21. Detach the Vac-N-Fill cap (1) from **GE-52098** Cooling System Pressure Test Adapter.

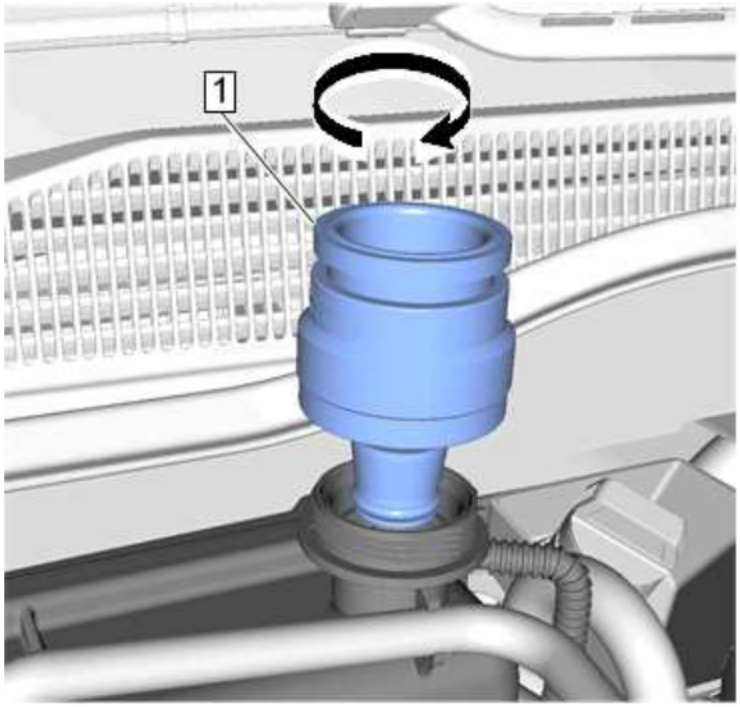

Fig. 93: Cooling System Pressure Test Adapter
Courtesy of GENERAL MOTORS COMPANY

22. Remove the **GE-52098** Cooling System Pressure Test Adapter (1) radiator surge tank.

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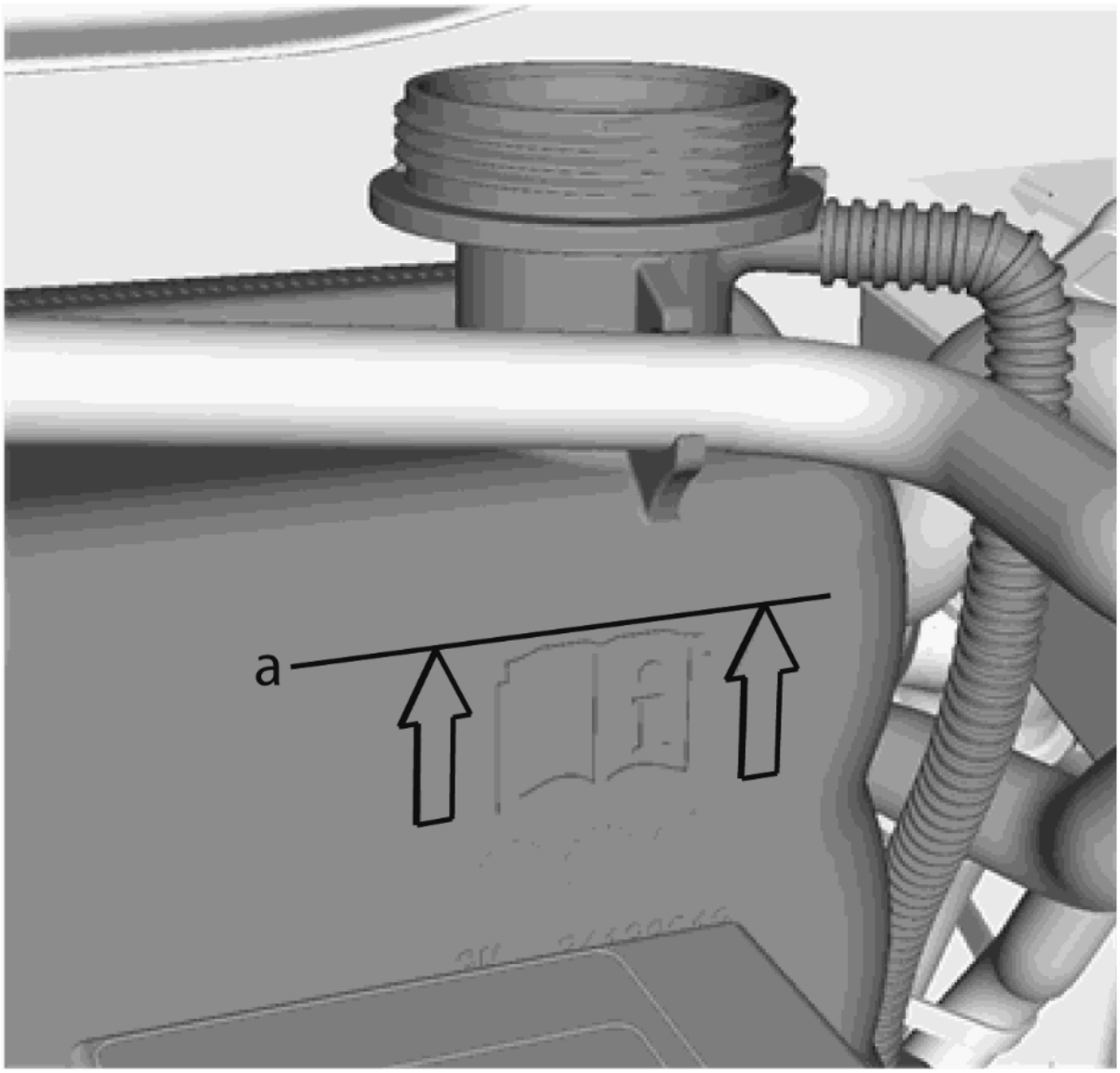

Fig. 94: Coolant Level
Courtesy of GENERAL MOTORS COMPANY

23. If the coolant level is above the arrows on the radiator surge tank, use the extraction hose if needed, to adjust the coolant level to the top of the arrows on the radiator surge tank (a).
24. If the coolant level is below the top of the arrows on the radiator surge tank, add coolant to the top of the arrows on the radiator surge tank (a).
25. Inspect the concentration of the engine coolant using the **J-26568** tester.
26. Install radiator surge tank cap by turning counterclockwise.
27. Rinse away any excess coolant from the engine and the engine compartment.
28. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

COOLING SYSTEM DRAINING AND FILLING (STATIC L5P)

Special Tools

J-26568 Coolant and Battery Tester

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For equivalent regional tools, refer to **Special Tools**.

Draining Procedure

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

CAUTION: The cap mounted to the top of the surge tank uses LEFT HAND threads. Turn the cap clockwise to remove the cap or counter clockwise to install the cap. Failure to turn the cap in the proper direction when installing or removing it may cause damage to the cap and/or the surge tank.

1. Follow the steps below in order to remove the radiator surge tank fill cap:
    1. Slowly rotate the cap clockwise.
    2. Stop rotating and allow the hissing to stop.
    3. After all the hissing stops, continue turning clockwise in order to remove the cap.
2. Raise and support the vehicle. **Lifting and Jacking the Vehicle**
3. Place a drain pan under the drain cock.
4. Remove the radiator drain cock. **Radiator Drain Cock Replacement (L5P)**
5. Drain the cooling system.
6. If a complete engine block drain is required, remove the engine block coolant drain hole plugs and engine block coolant drain hole plug gaskets.
7. Remove the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**
8. Inspect the coolant.
9. Follow the appropriate procedure based on the condition of the coolant:
    - Normal in appearance-Follow the filling procedure.
    - Discolored-Follow the flush procedure. **Flushing**

Filling Procedure

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

NOTE: If a complete engine block was drained, the recommended fill is by (Vac-N-Fill).

1. Install the radiator drain cock. **Radiator Drain Cock Replacement (L5P)**
2. Remove the drain pan.

CAUTION: Refer to Fastener Caution .

3. If the coolant was drained from the engine block, install the engine block coolant drain hole plugs and engine block coolant drain hole plug gaskets. **Engine Block Cleaning and Inspection**
4. Install the engine block coolant heater, if equipped. **Engine Coolant Heater Replacement**
5. Lower the vehicle.

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

6. Slowly fill the cooling system with a 50/50 coolant. **Approximate Fluid Capacities**

NOTE: **Only fill the coolant level to the bottom of the arrows on the radiator surge tank.**

7. Slowly continue filling as the level drops.

NOTE: **The cap remains off until step 20.**

8. With radiator cap off, start the engine.
9. Run the engine at 2,000 RPM until the engine reaches normal operating temperature.

   The engine should reach an operating temperature of 91Â°C (195Â°F) and the upper radiator hose should be HOT.

10. Slowly reduce the RPM to idle.

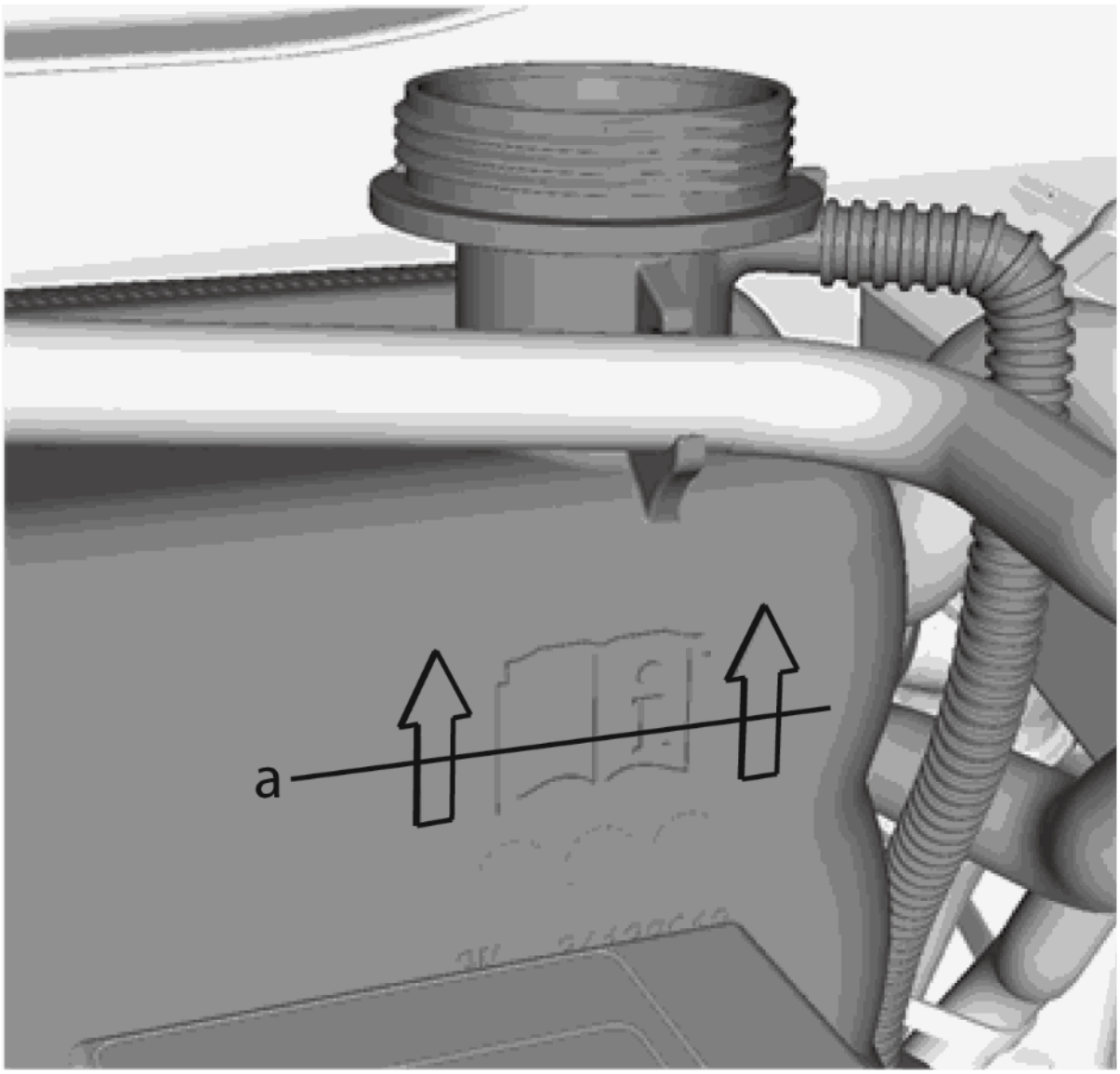

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Fig. 95: Arrows (a)
Courtesy of GENERAL MOTORS COMPANY

11. Allow the engine to idle for 10 minutes, then slowly add coolant until the coolant level reaches the middle of the arrows (a) on the radiator surge tank.
12. Run the engine at 2,000 RPM for 5 minutes.
13. Slowly reduce the RPM to idle.
14. With the engine at idle, add coolant until the coolant level reaches the middle of the arrows (a) on the radiator surge tank.
15. Repeat step 13.
16. Engine off and key in the OFF position, let the vehicle sit for 10 minutes for the coolant level to stabilize.

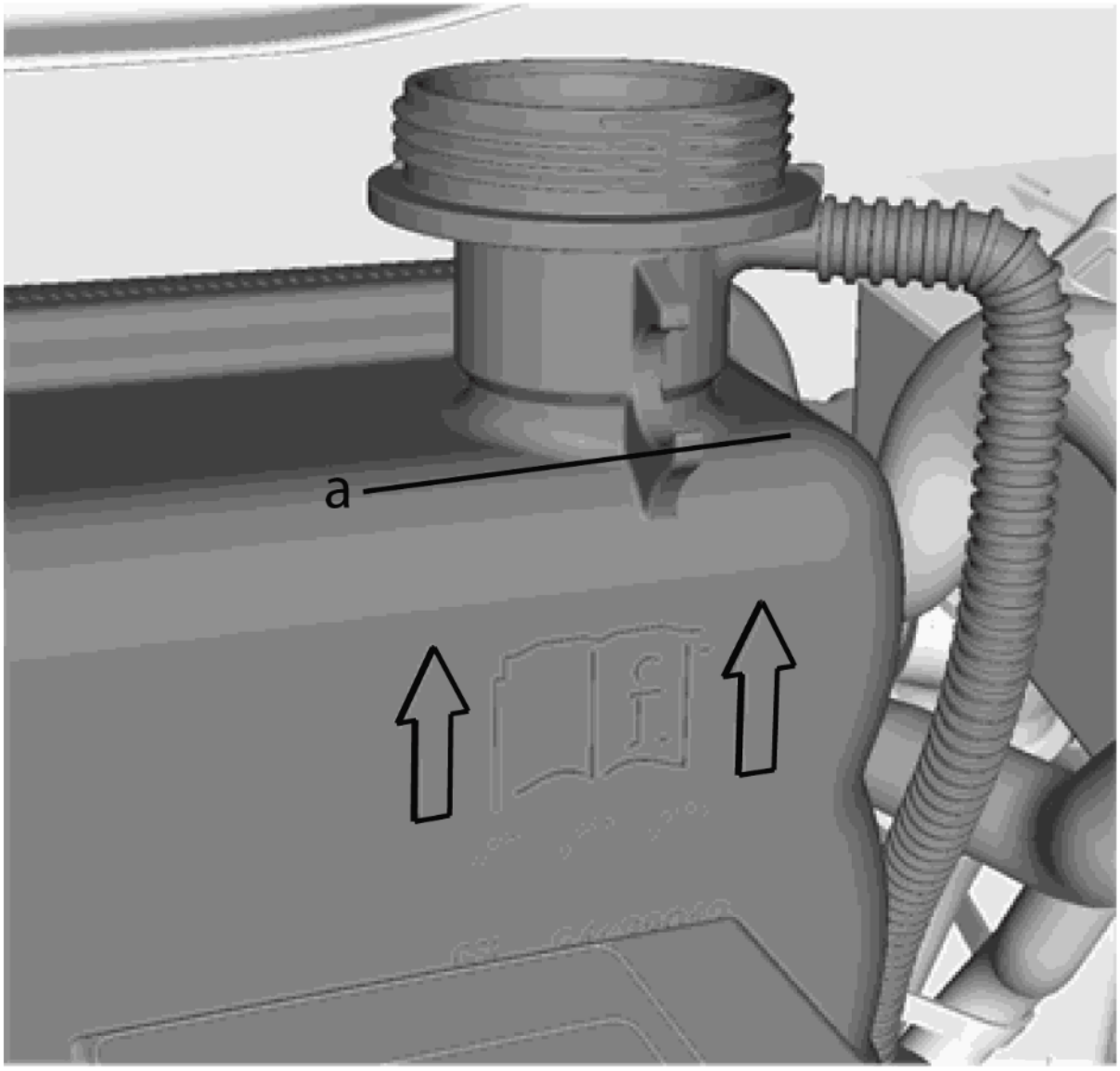

Fig. 96: Radiator Surge Tank Fill Neck
Courtesy of GENERAL MOTORS COMPANY

17. Fill the coolant level to the bottom of the radiator surge tank fill neck (a).
18. Inspect the concentration of the engine coolant using the **J-26568** coolant and battery tester.
19. Install radiator surge tank cap by turning counterclockwise.

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20. Rinse away any excess coolant from the engine and the engine compartment.

FLUSHING

NOTE:

- **When the cooling system becomes contaminated, the cooling system should be flushed thoroughly to remove the contaminants before the engine is seriously damaged.**
- **This procedure is effective in removing contaminants caused by the use of improper coolants, coolant at the end of its life, or some liquid chemical flushing agents. This procedure is NOT effective for removing debris contamination caused by component failure, or the use of 'stop leak' additives. When the system is contaminated by this type of debris, use the system flow diagrams to identify components that may need replacement to restore proper system flow.**
- **Do not use chemical flush agents.**
- **Store used coolant in the proper manner, such as in a used engine coolant holding tank. Do not pour used coolant down a drain. Ethylene glycol antifreeze is a very toxic chemical. Do not dispose of coolant into the sewer system or ground water. This is illegal and ecologically unsound.**
- **Various methods and equipment can be used to flush the cooling system. If special equipment is used, such as a back flusher, follow the manufacturer's instruction. Always remove the thermostat before flushing the cooling system.**

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. **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)Cooling System Draining and Filling (Vac N Fill L8B)Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**.
7. Fill the coolant reservoir to the FULL HOT mark.
8. Fill the cooling system. **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)Cooling System Draining and Filling (Vac N Fill L8B)Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**.

RADIATOR CLEANING

WARNING: NEVER spray water on a hot heat exchanger. The resulting steam could cause

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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.

Keep compressed air stream perpendicular to the core face and allow adequate distance of the air nozzle to the core face so not to cause fin damage.

- Some conditions may require the use of warm water and a mild (non caustic) detergent.
- Clean the A/C condenser fins.
- Clean between the A/C condenser and radiator.
- Clean the charge air cooler fins, if equipped.
- Clean between the air cooler fins and radiator, if equipped.
- Clean the radiator cooling fins.
- Straighten any damaged cooling fins.

RADIATOR SURGE TANK CAP REPLACEMENT (L5P)

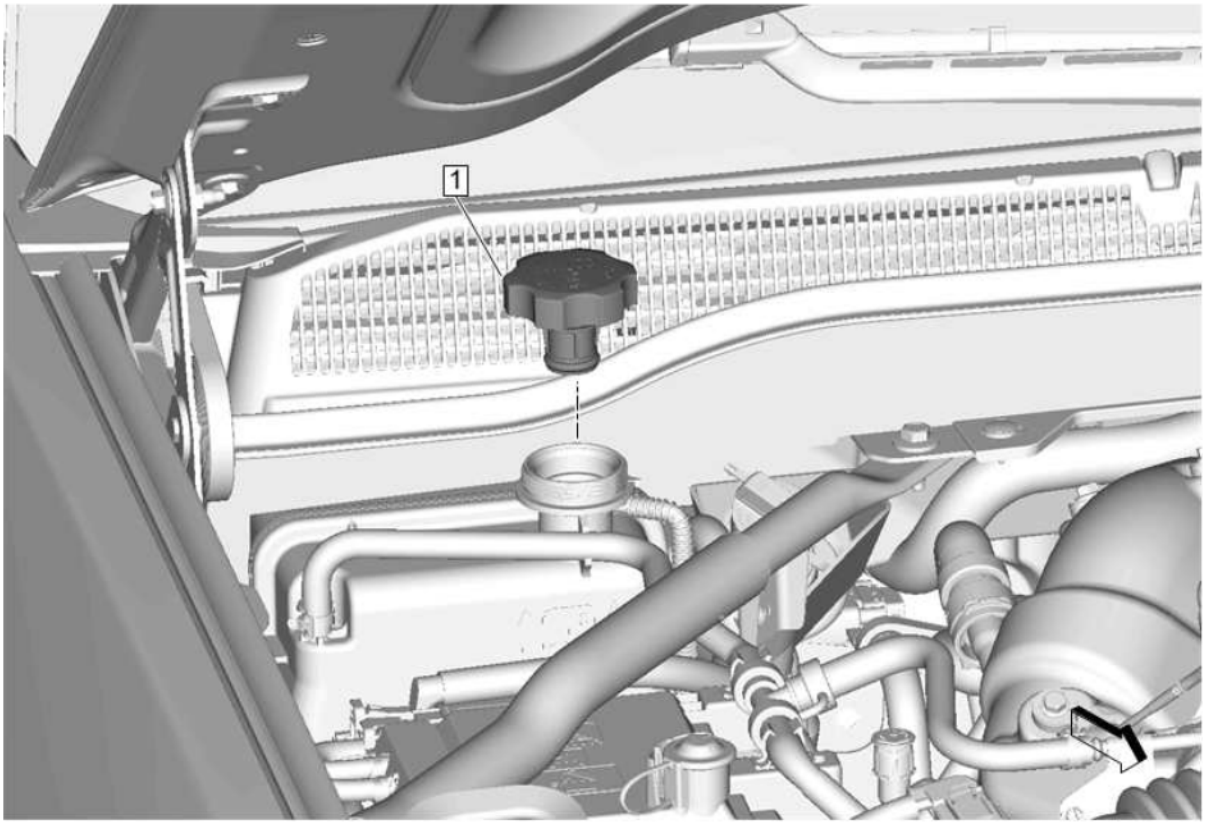

Fig. 97: Radiator Surge Tank Cap (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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Callout	Component Name
1	Radiator Surge Tank Cap **CAUTION:** **The cap mounted to the top of the surge tank uses LEFT HAND threads. Turn the cap clockwise to remove the cap or counter clockwise to install the cap. Failure to turn the cap in the proper direction when installing or removing it may cause damage to the cap and/or the surge tank.**

RADIATOR SURGE TANK REPLACEMENT (L83, L86)

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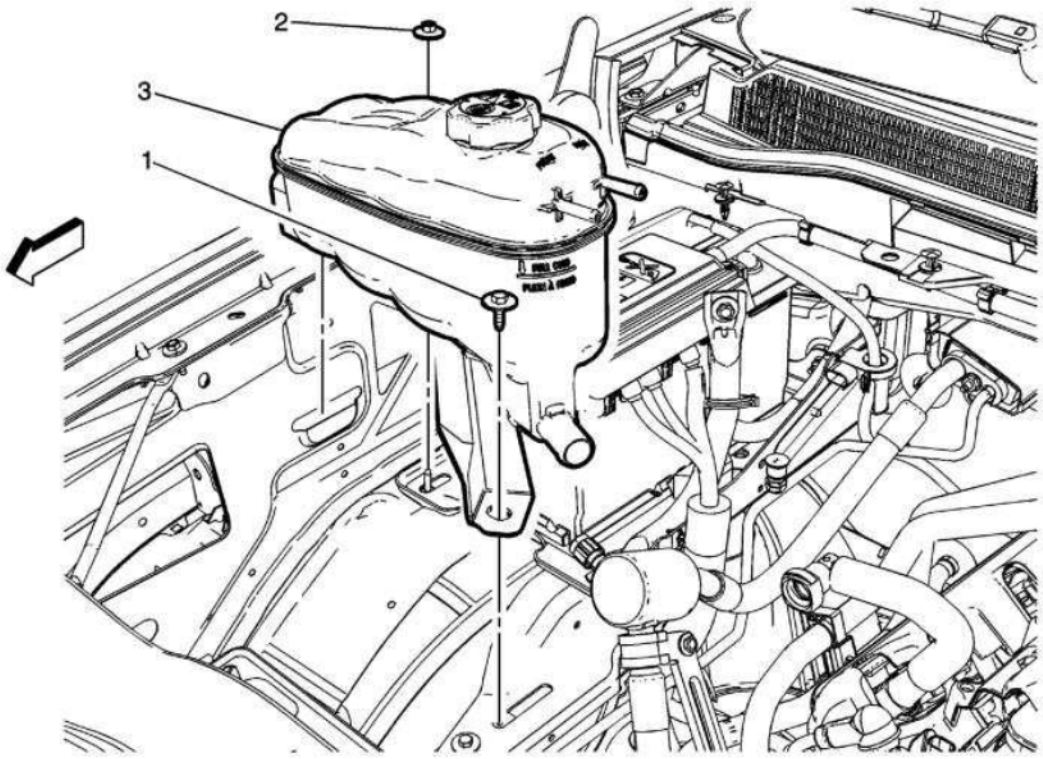

Fig. 98: Radiator Surge Tank (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**. 2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 3. Remove the radiator surge tank inlet hoses from the radiator surge tank. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet L83, L86)**. 4. Remove the radiator outlet hose from the radiator surge tank. Refer to **Radiator Outlet Hose Replacement (L83, L86)**.	
1	Surge Tank Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)

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Callout	Component Name
2	Surge Tank Nut **Tighten** 10 N.m (89 lb in)
3	Surge Tank **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR SURGE TANK REPLACEMENT (LV3)

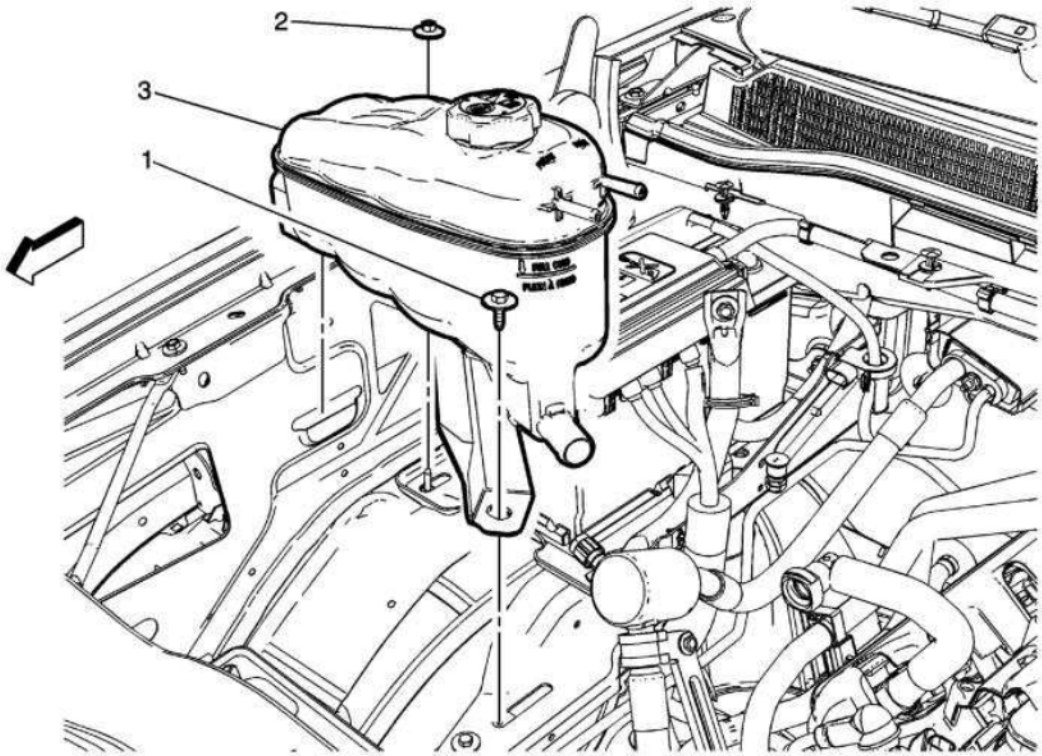

Fig. 99: Radiator Surge Tank (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**. 2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 3. Remove the radiator surge tank inlet hoses from the radiator surge tank. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**. 4. Remove the radiator outlet hose from the radiator surge tank. Refer to **Radiator Outlet Hose**	

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Callout	Component Name
	Replacement (LV3).
1	Surge Tank Bolt **CAUTION:** **Refer to** **Fastener** **Caution .** **Tighten** 10 N.m (89 lb in)
2	Surge Tank Nut **Tighten** 10 N.m (89 lb in)
3	Surge Tank **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR SURGE TANK REPLACEMENT (LC8, L96)

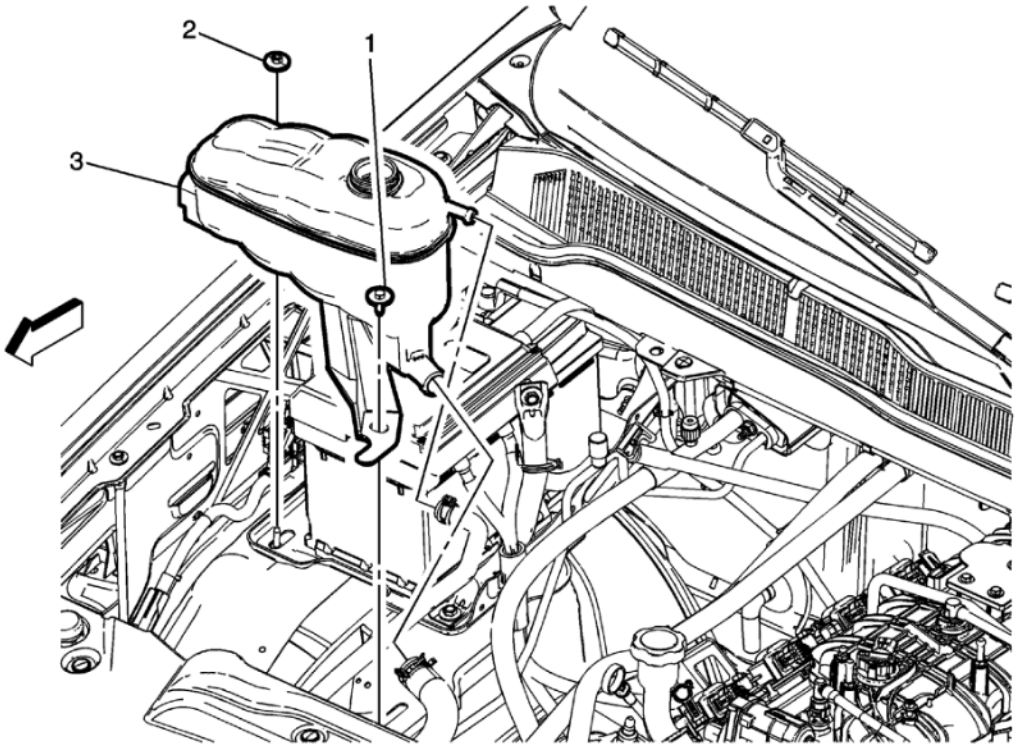

Fig. 100: Radiator Surge Tank (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 3. Remove the front fender rear upper brace. Refer to **Front Fender Rear Upper Brace Replacement (LV3, L96, LC8, lL83, L8B, L86)** . 4. Remove the radiator surge tank inlet hose from the radiator surge tank. Refer to **Radiator Surge Tank Inlet Hose Replacement (LC8, L96)**. 5. Remove the radiator surge tank outlet hose from the radiator surge tank. Refer to **Radiator Surge Tank Outlet Hose Replacement (LC8, L96)**.	
1	Surge Tank Bolt **CAUTION:** **Refer to** **Fastener Caution** . **Tighten** 9 N.m (80 lb in)
2	Surge Tank Nut **Tighten** 9 N.m (80 lb in)
3	Surge Tank **Procedures** 1. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (LC8, L96)**.

RADIATOR SURGE TANK REPLACEMENT (L8B)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
2. Air Cleaner Outlet Duct - Remove - **Air Cleaner Outlet Duct Replacement**

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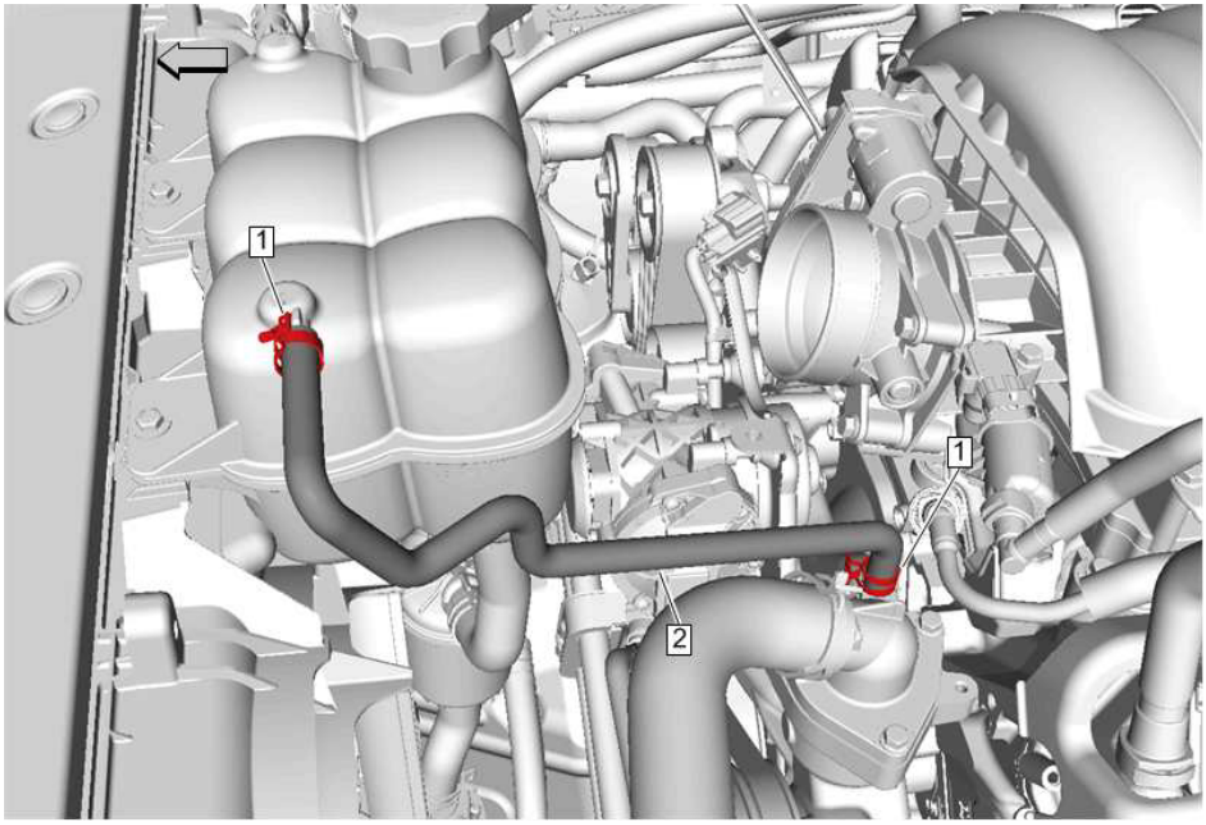

Fig. 101: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

3. Engine Coolant Air Bleed Hose 2 @Radiator Surge Tank - Remove - **Engine Coolant Air Bleed Hose Replacement (L8B)**

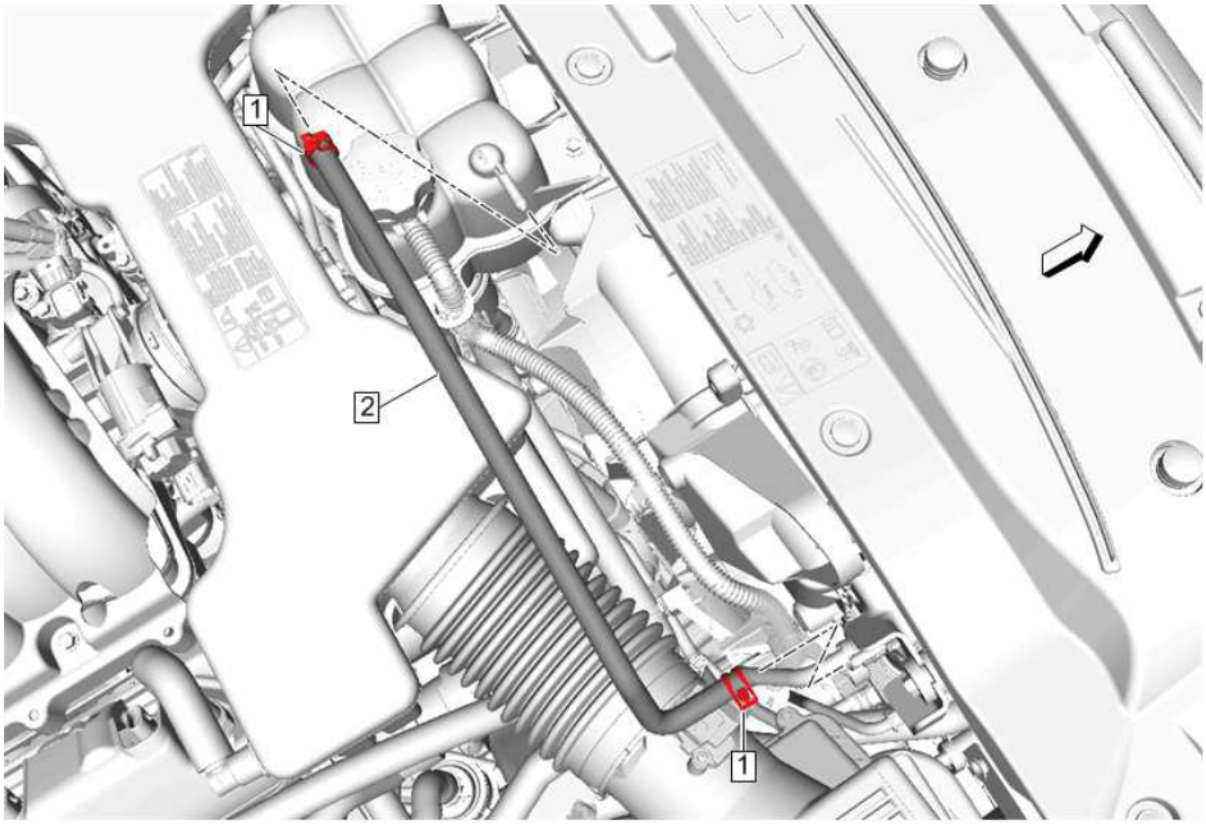

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Fig. 102: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Remove - **Radiator Surge Tank Inlet Hose Replacement (L8B)**

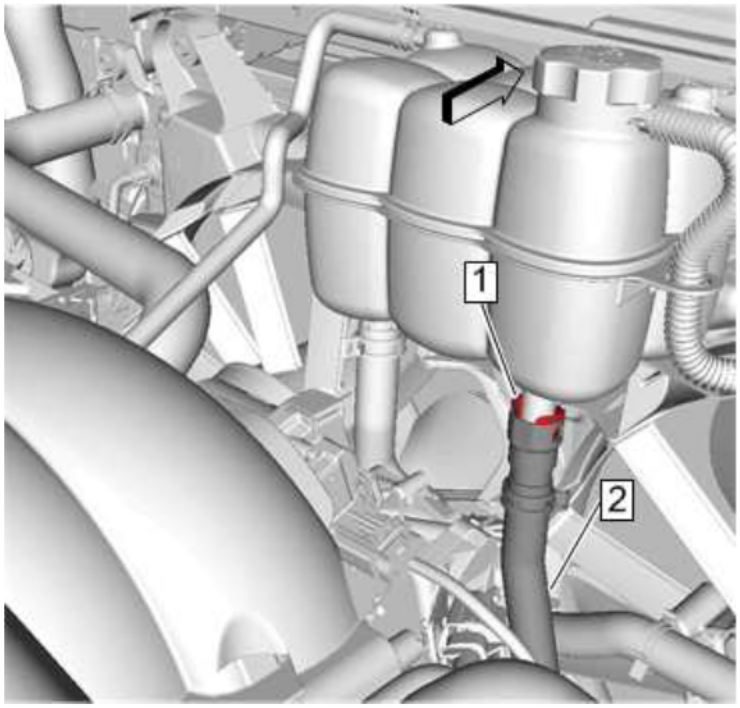

Fig. 103: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Outlet Hose 2 @Radiator Surge Tank

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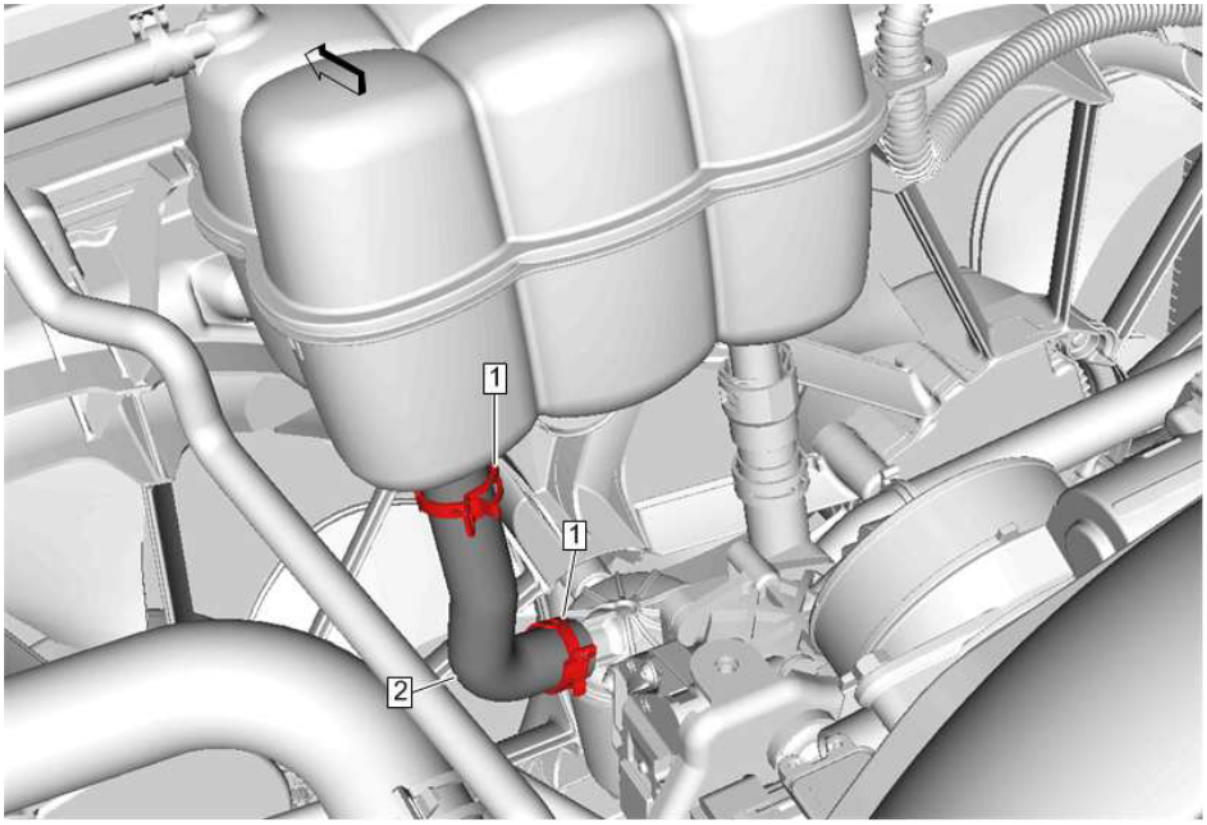

Fig. 104: Generator Control Module Coolant Pump Hose
Courtesy of GENERAL MOTORS COMPANY

6. Generator Control Module Coolant Pump Hose 2 @Radiator Surge Tank - Remove **Drive Motor Battery Surge Tank Inlet Hose Replacement (L8B)**

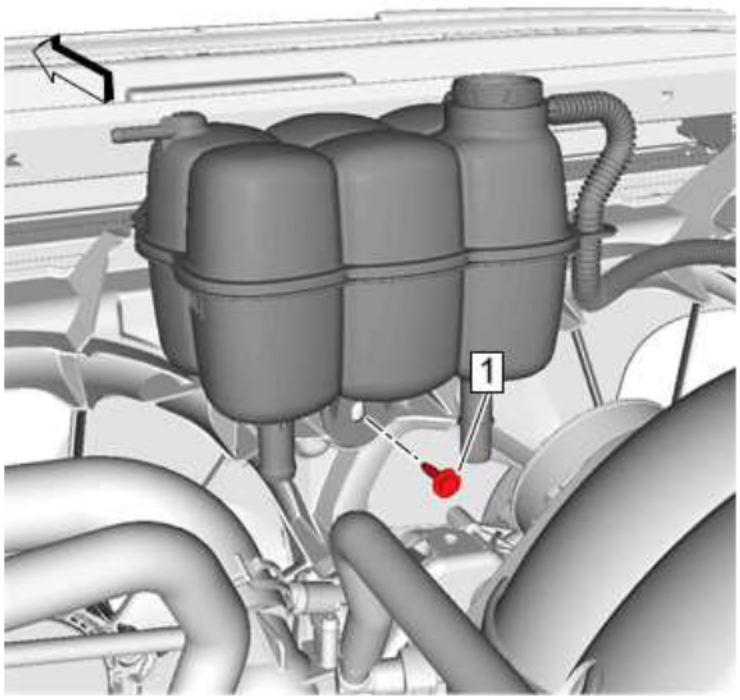

Fig. 105: Radiator Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

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7. Radiator Surge Tank Bolt 1 - Remove

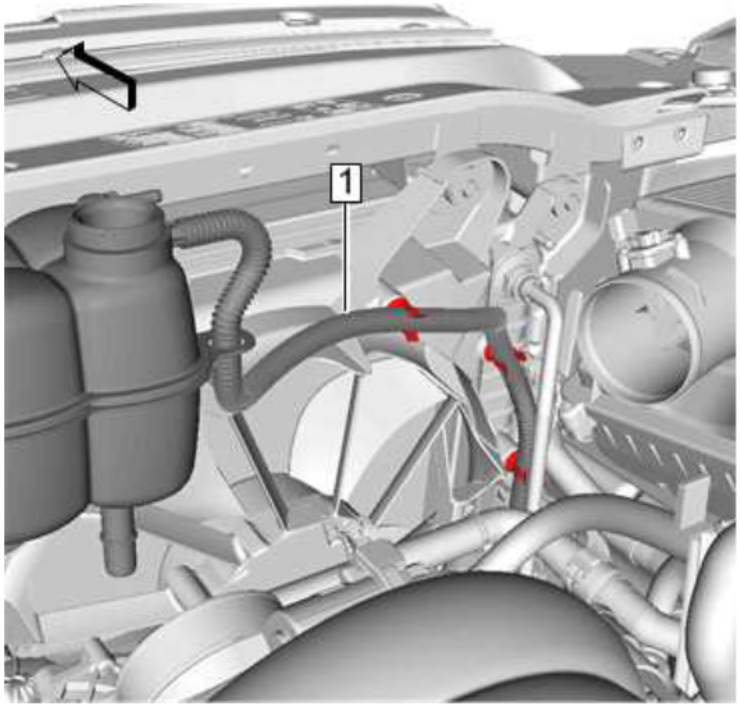

Fig. 106: Radiator Surge Tank Overflow Hose
Courtesy of GENERAL MOTORS COMPANY

8. Radiator Surge Tank Overflow Hose 1 @Engine Coolant Fan Shroud - Remove

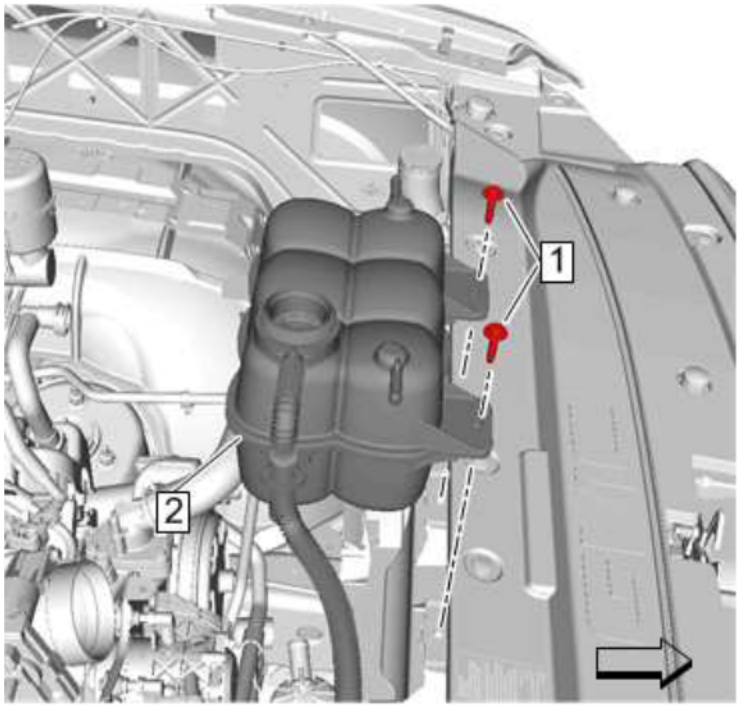

Fig. 107: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

9. Radiator Surge Tank Bolt 1 - Remove
10. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Remove

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11. Radiator Surge Tank 2 - Remove

Installation Procedure

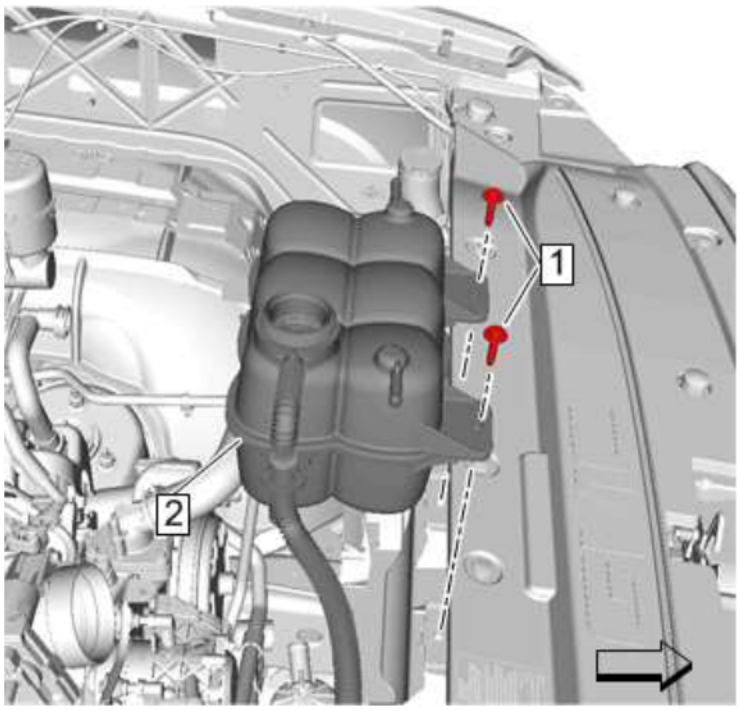

Fig. 108: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Remove

CAUTION: **Refer to Fastener Caution .**

2. Radiator Surge Tank Bolt 1 - Install and tighten 9 N.m (80 lb in)

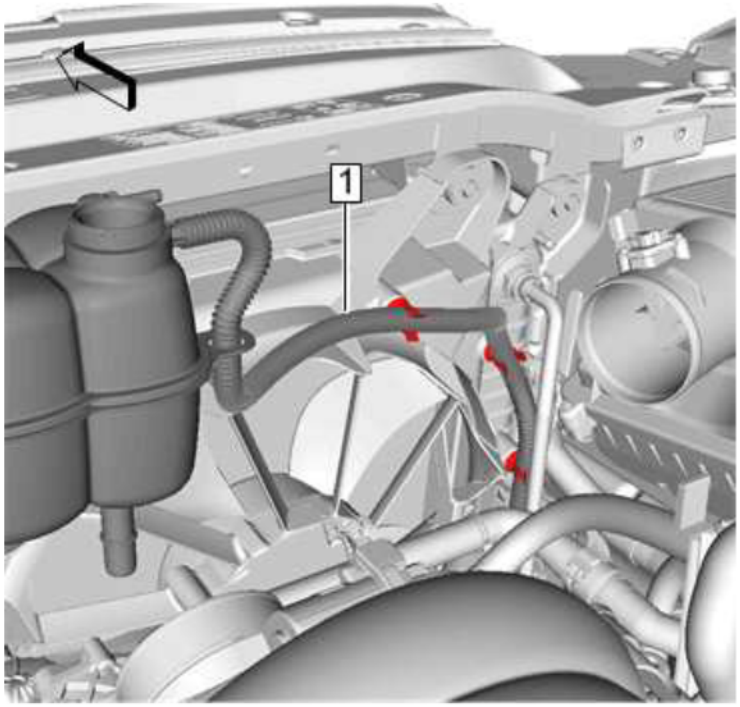

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Fig. 109: Radiator Surge Tank Overflow Hose
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Surge Tank Overflow Hose 1 @Engine Coolant Fan Shroud - Install

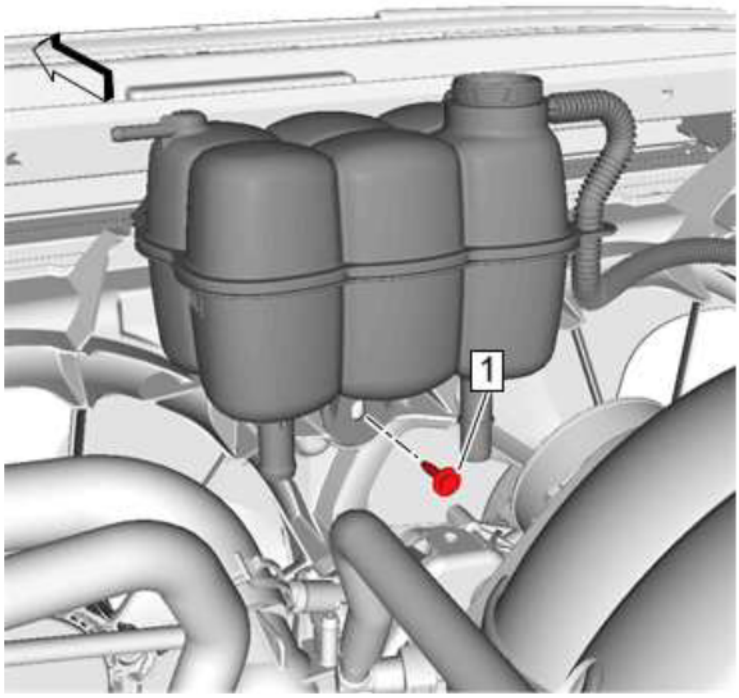

Fig. 110: Radiator Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Surge Tank Bolt 1 - Install and tighten 9 N.m (80 lb in)

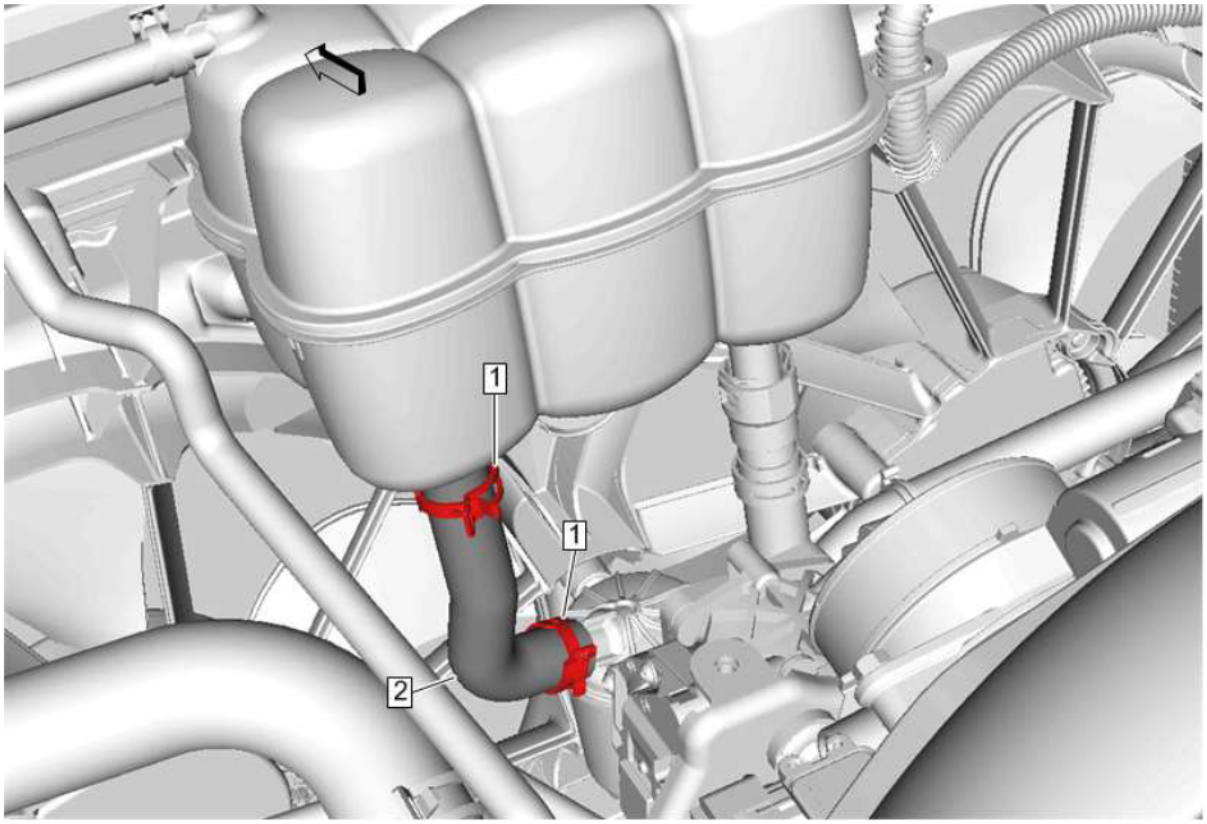

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Fig. 111: Generator Control Module Coolant Pump Hose
Courtesy of GENERAL MOTORS COMPANY

5. Generator Control Module Coolant Pump Hose 2 @Radiator Surge Tank - Install - **Drive Motor Battery Surge Tank Inlet Hose Replacement (L8B)**

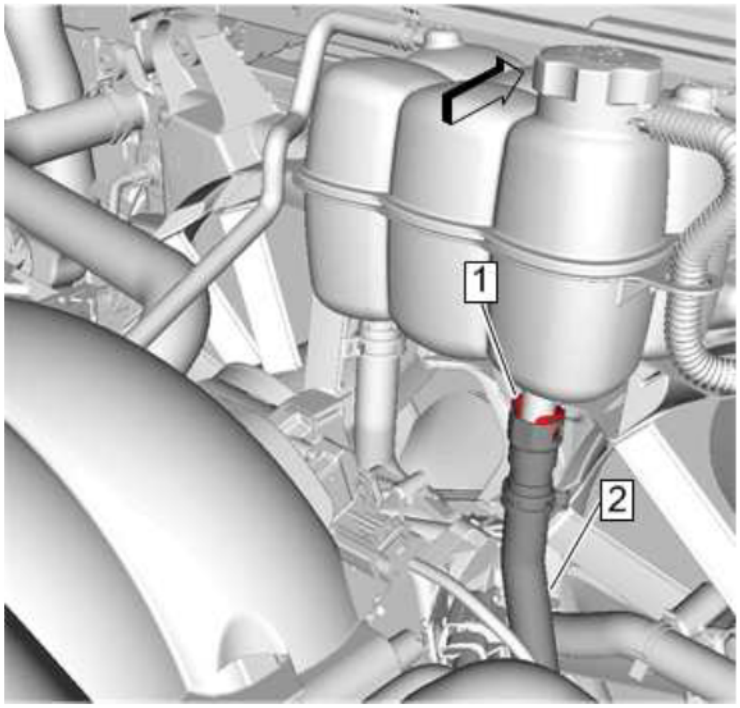

Fig. 112: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Outlet Hose 2 @Radiator Surge Tank - Install

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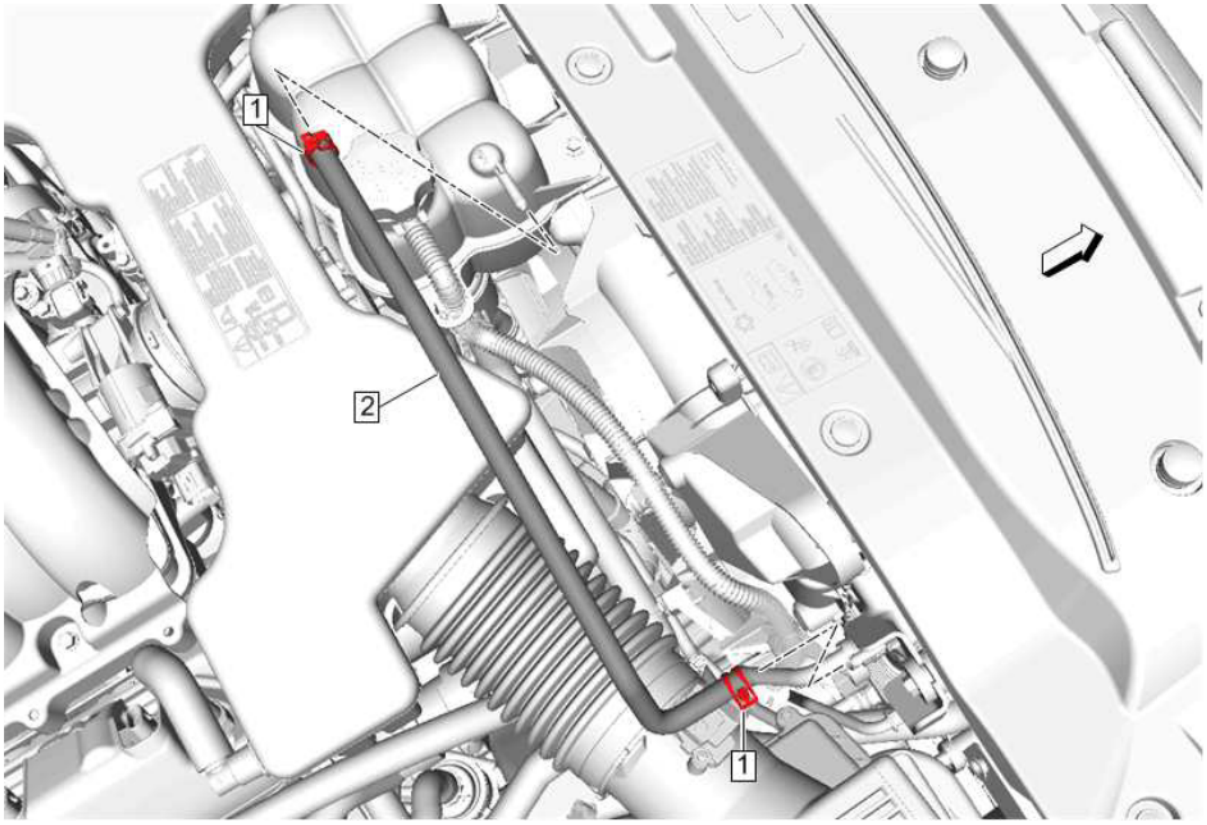

Fig. 113: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Install - **Radiator Surge Tank Inlet Hose Replacement (L8B)**

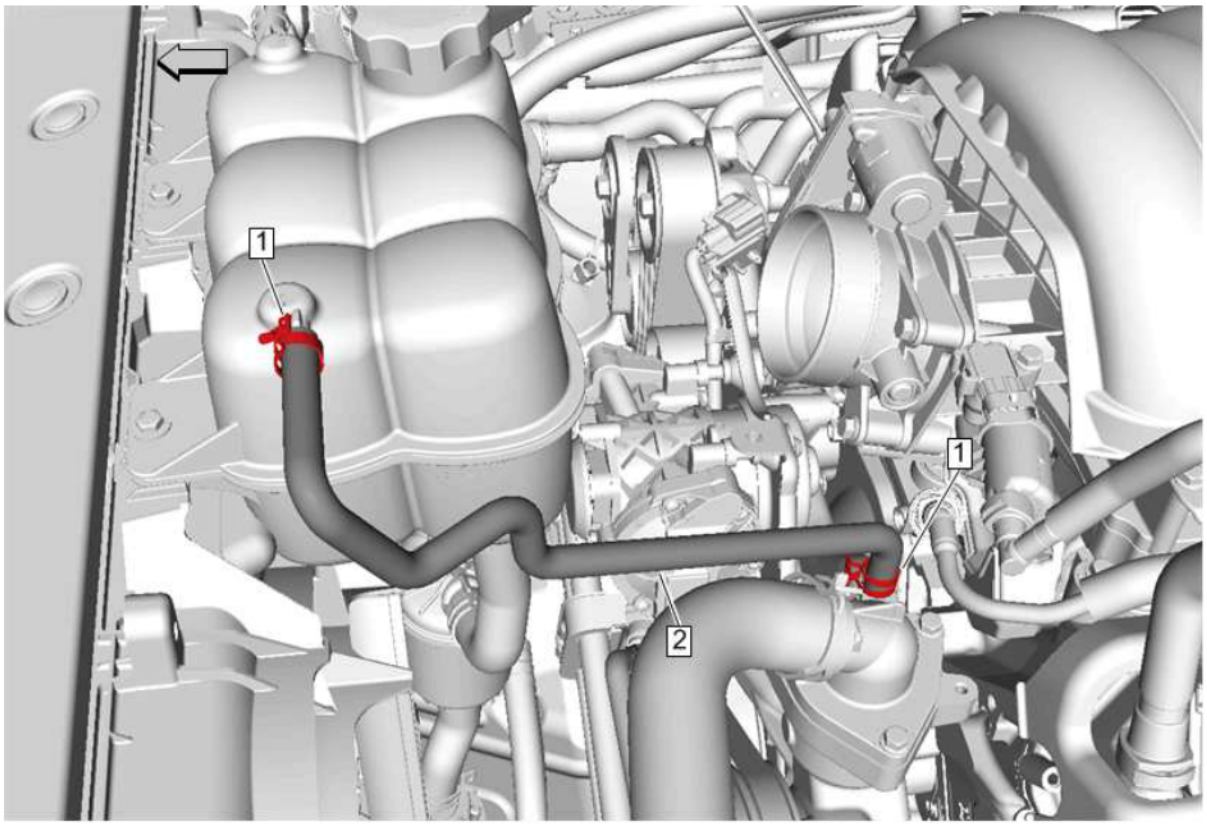

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Fig. 114: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

8. Engine Coolant Air Bleed Hose 2 @Radiator Surge Tank - Install - **Engine Coolant Air Bleed Hose Replacement (L8B)**
9. Air Cleaner Outlet Duct - Install - **Air Cleaner Outlet Duct Replacement**
10. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
11. Start the engine and check for coolant leaks.

RADIATOR SURGE TANK REPLACEMENT (L5P)

Removal Procedure

CAUTION: The cap mounted to the top of the surge tank uses LEFT HAND threads. Turn the cap clockwise to remove the cap or counter clockwise to install the cap. Failure to turn the cap in the proper direction when installing or removing it may cause damage to the cap and/or the surge tank.

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

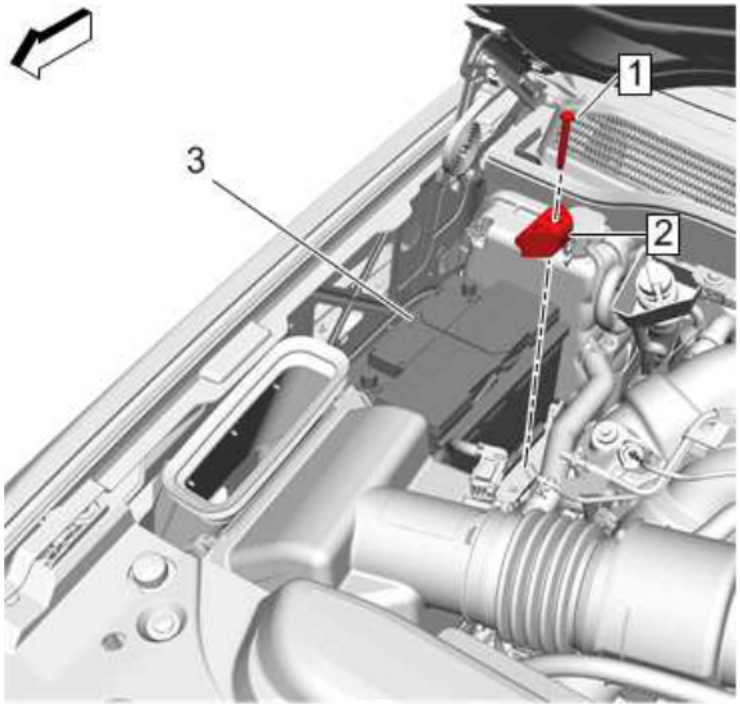

Fig. 115: Battery Hold Down Retainer
Courtesy of GENERAL MOTORS COMPANY

2. Battery 3 - Remove - **Battery Replacement (Diesel)**

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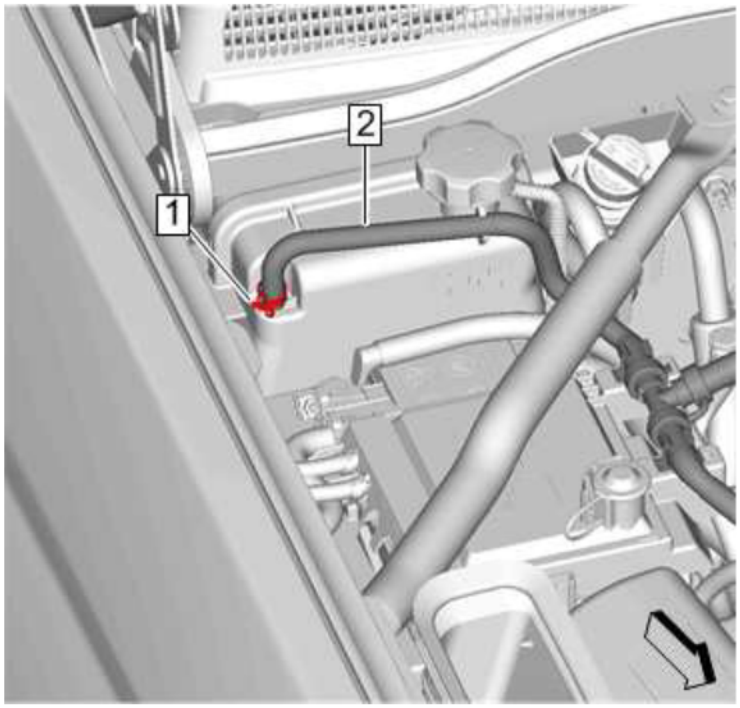

Fig. 116: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Remove - **Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Radiator to Radiator Surge Tank Inlet Hose L5P)Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Engine L5P)**

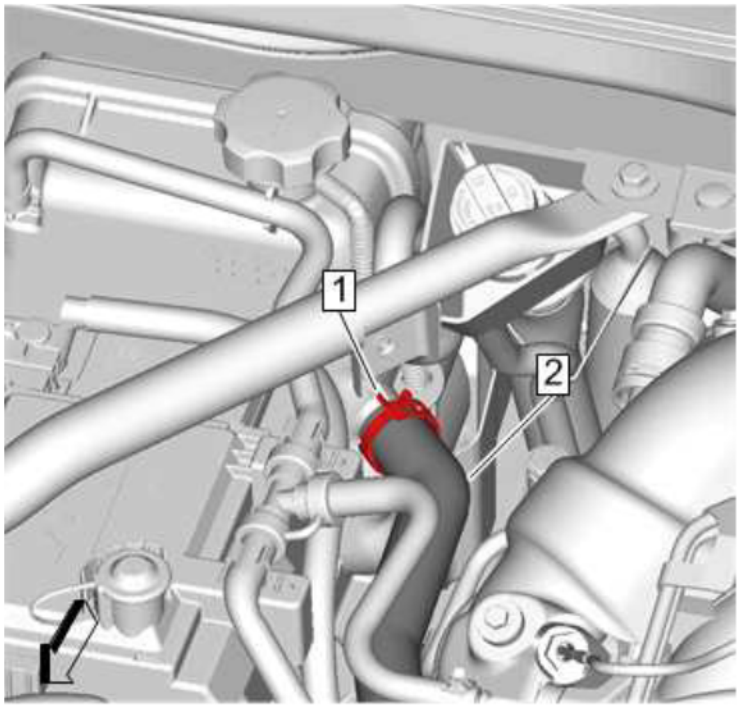

Fig. 117: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Outlet Hose 2 @Radiator Surge Tank - Remove - **Radiator Outlet Hose Replacement (L5P)**

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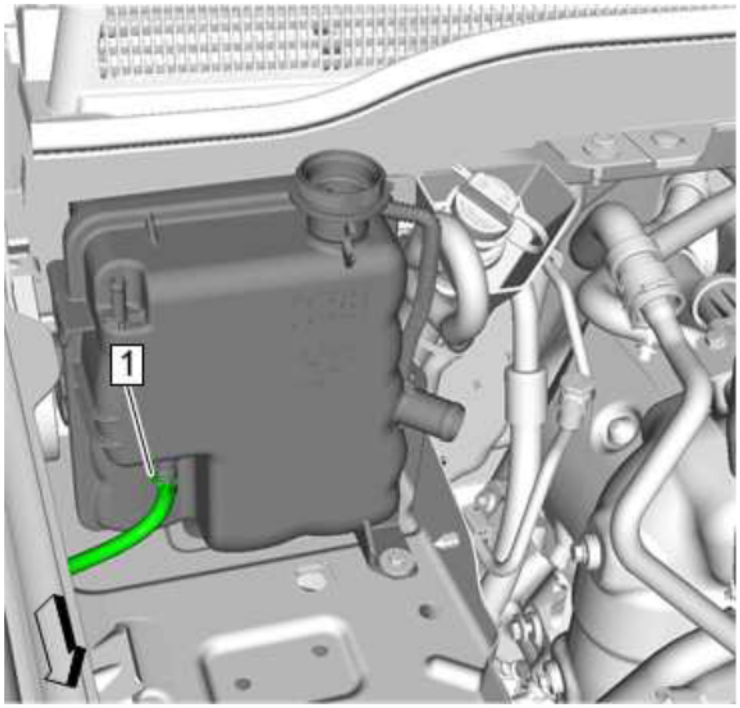

Fig. 118: Electrical Connector And Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

5. Electrical Connector 1 @Radiator Surge Tank - Disconnect

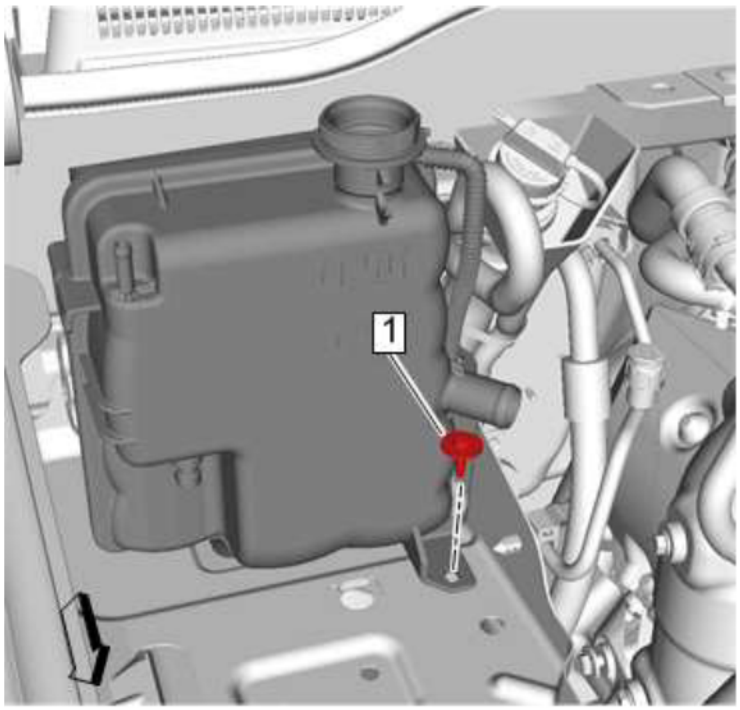

Fig. 119: Radiator Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Surge Tank Bolt 1 - Remove

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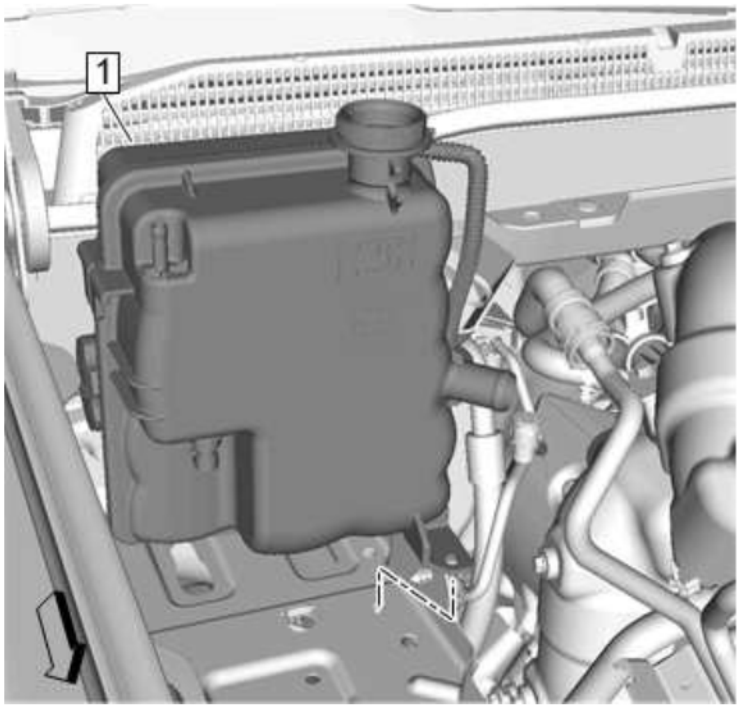

Fig. 120: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Surge Tank 1 - Remove

Installation Procedure

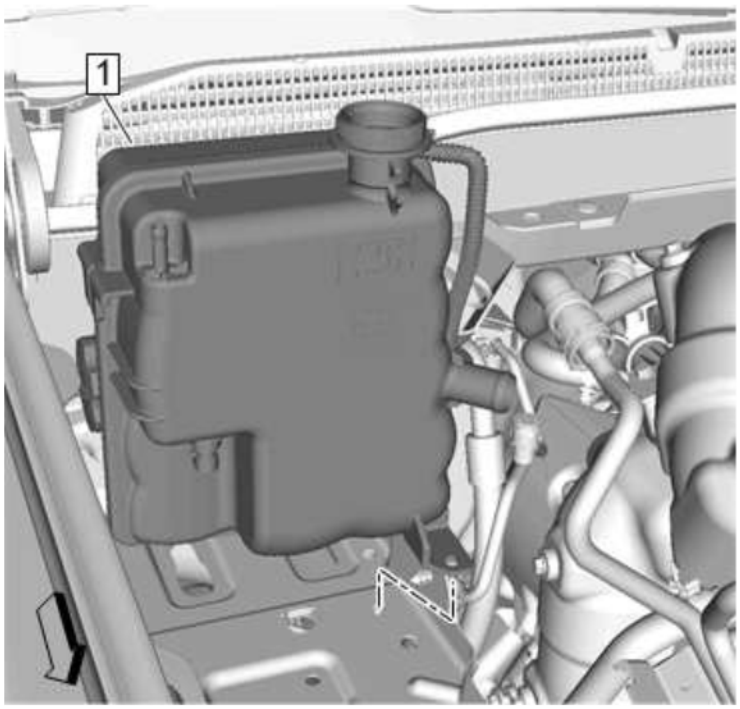

Fig. 121: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Surge Tank 1 - Install

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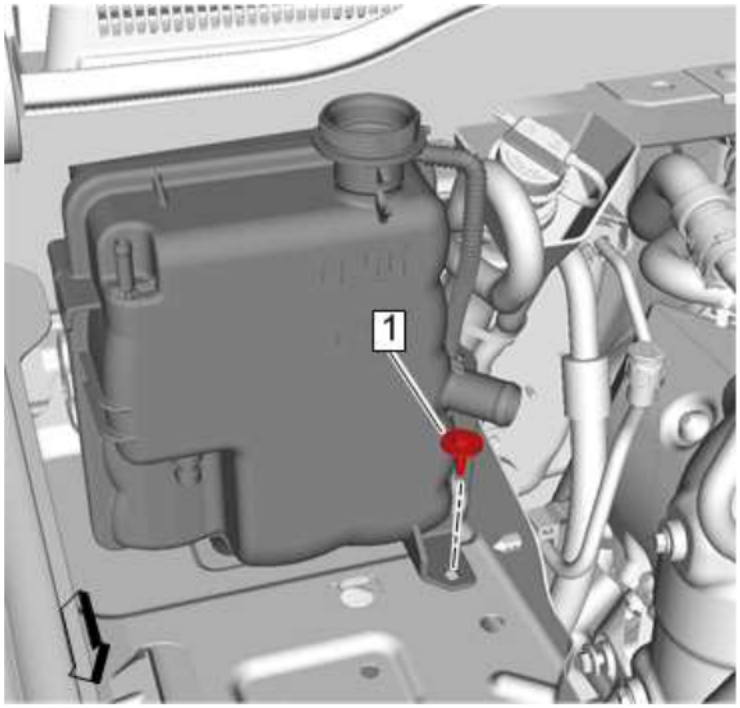

Fig. 122: Radiator Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

2. Radiator Surge Tank Bolt 1 - Install and tighten 9 N.m (80 lb in)

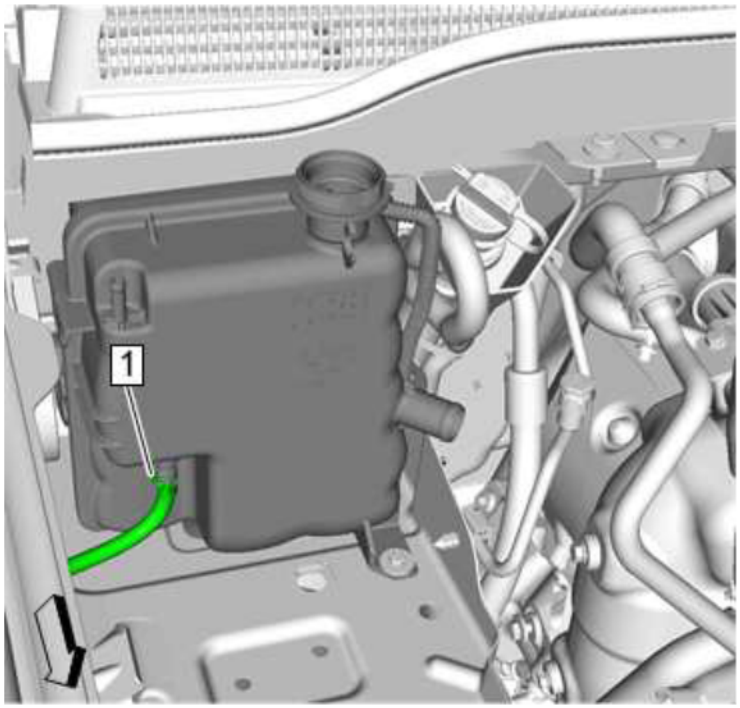

Fig. 123: Electrical Connector And Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

3. Electrical Connector 1 @Radiator Surge Tank - Connect

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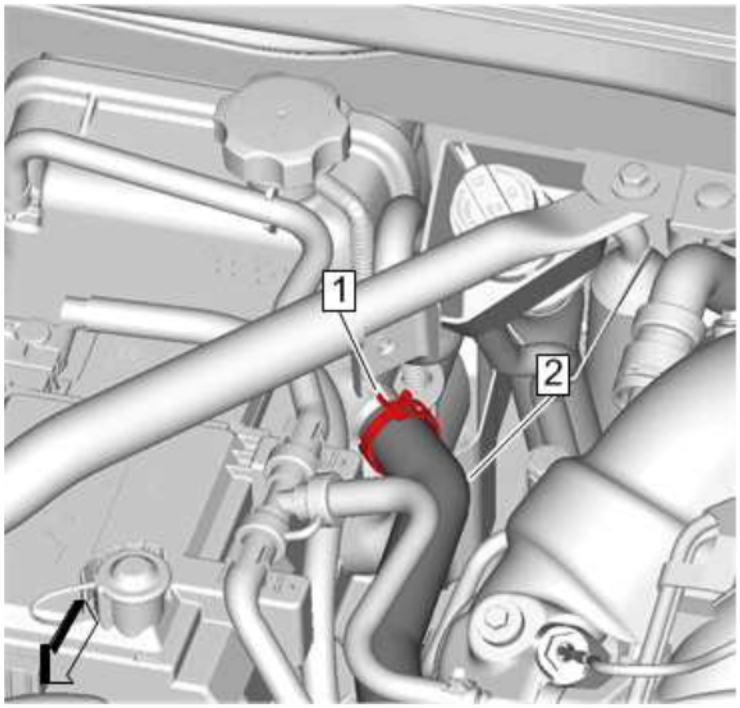

Fig. 124: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Outlet Hose 1 @Radiator Surge Tank - Install - **Radiator Outlet Hose Replacement (L5P)**

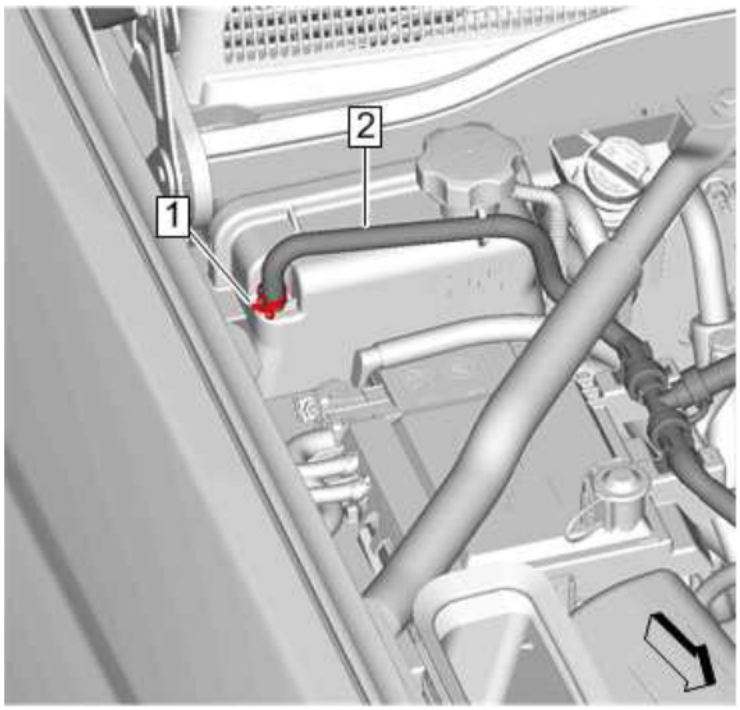

Fig. 125: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Install - **Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Radiator to Radiator Surge Tank Inlet Hose L5P)Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Engine L5P)**

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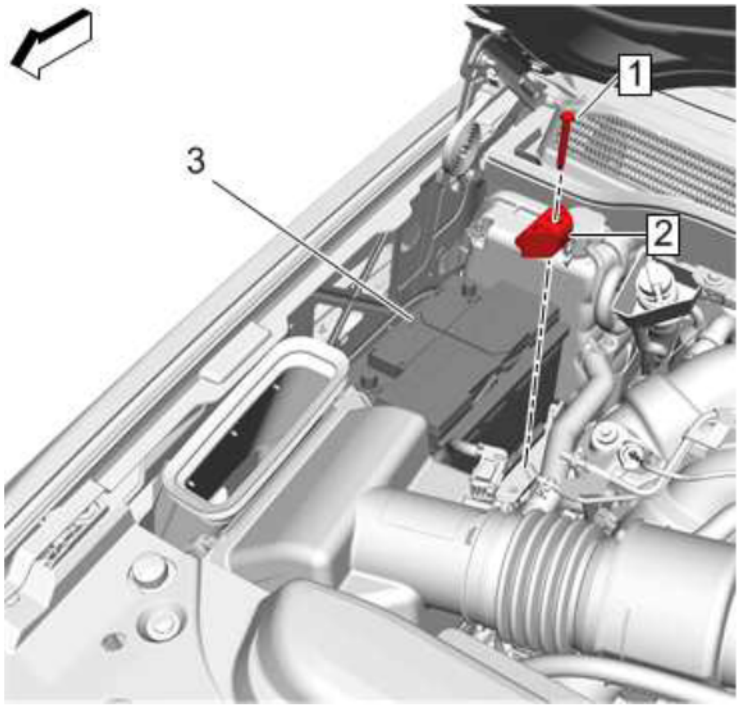

Fig. 126: Battery Hold Down Retainer
Courtesy of GENERAL MOTORS COMPANY

6. Battery 3 - Install - **Battery Replacement (Diesel)**
7. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
8. Start the engine and check for coolant leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (SURGE TANK TO RADIATOR L83, L86, LV3)

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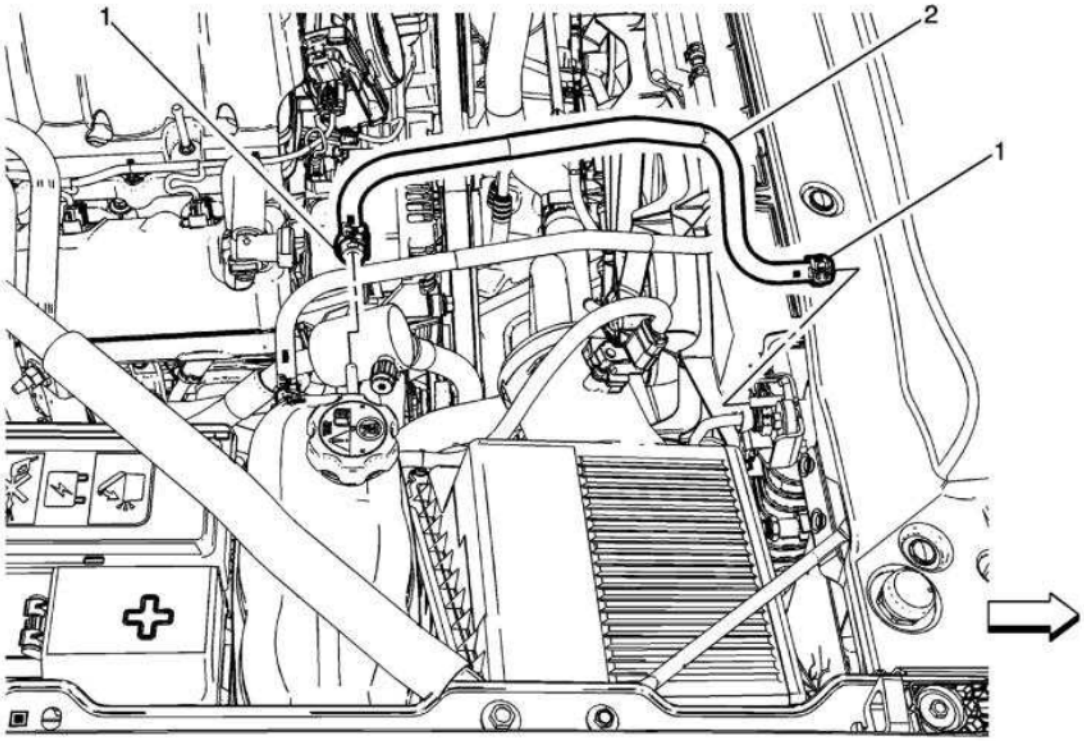

Fig. 127: Radiator Surge Tank Inlet Hose (Surge Tank To Radiator L83, L86. LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. Refer to Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86).	
1	Radiator Surge Tank Inlet Hose Clamps (Qty: 2) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator surge tank inlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to Special Tools.
2	Radiator Surge Tank Inlet Hose **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (SURGE TANK TO WATER OUTLET L83, L86)

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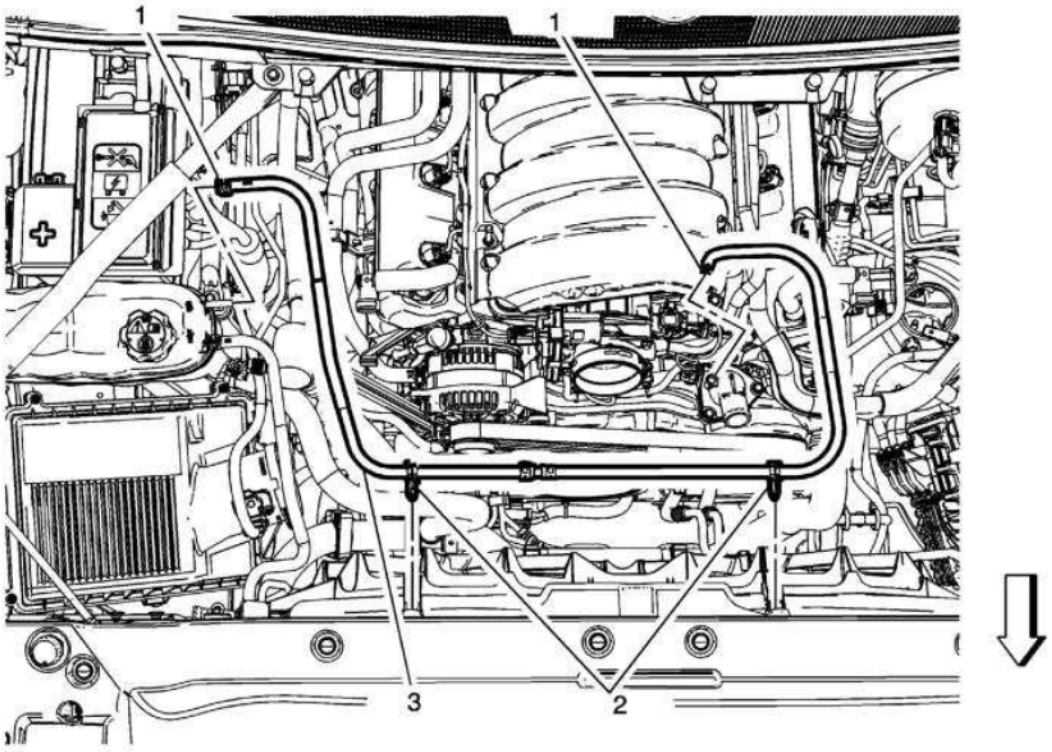

Fig. 128: Radiator Surge Tank Inlet Hose (Surge Tank To Water Outlet L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: **Use caution when removing the hose from the thermostat housing. The plastic thermostat housing may break if excessive force is used.**	

Preliminary Procedure

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**.
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

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Callout	Component Name
1	Radiator Surge Tank Inlet Hose Clamps (Qty: 2) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator surge tank inlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Surge Tank Inlet Hose Retainers (Qty: 2) **Procedure** Remove radiator surge tank inlet hose from retainers.
3	Radiator Surge Tank Inlet Hose **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (SURGE TANK TO WATER OUTLET LV3)

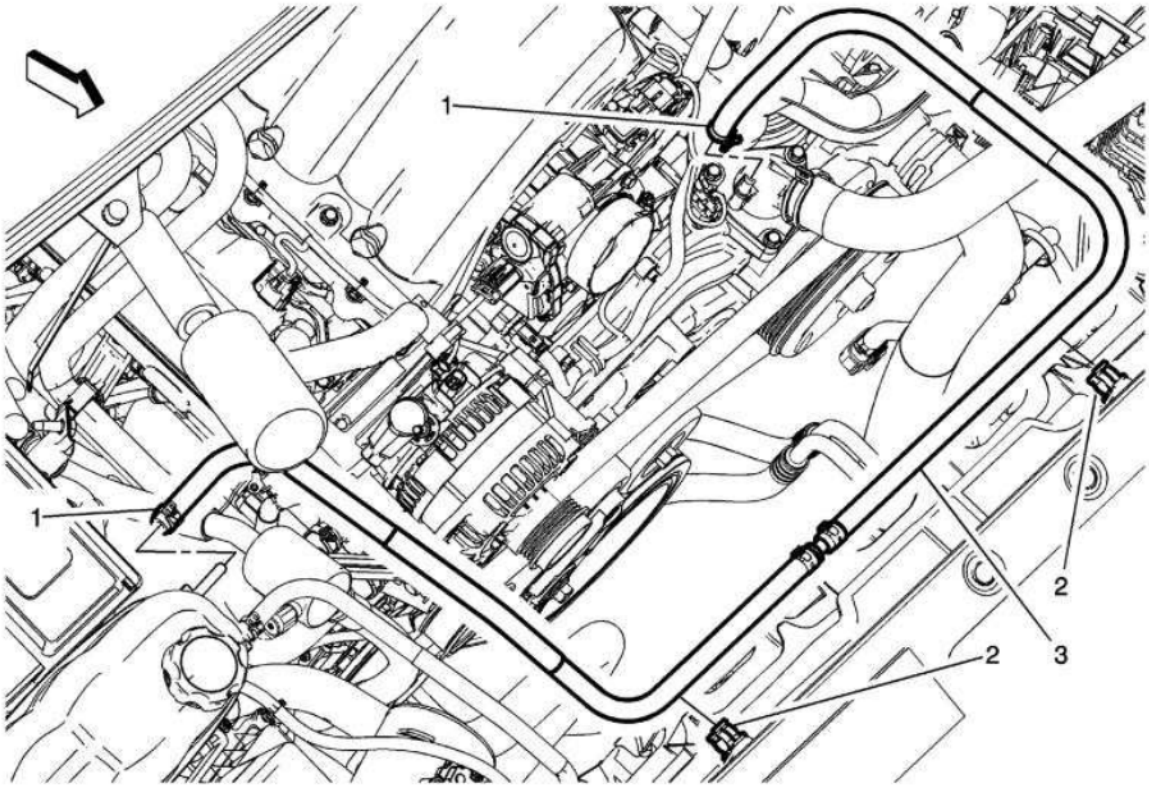

Fig. 129: Radiator Surge Tank Inlet Hose (Surge Tank To Water Outlet LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION:	

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Callout	Component Name
Use caution when removing the hose from the thermostat housing. The plastic thermostat housing may break if excessive force is used. **Preliminary Procedure** 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Surge Tank Inlet Hose Clamps (Qty: 2) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator surge tank inlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Surge Tank Inlet Hose Retainers (Qty: 2) **Procedure** Remove radiator surge tank inlet hose from retainers.
3	Radiator Surge Tank Inlet Hose **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (LC8, L96)

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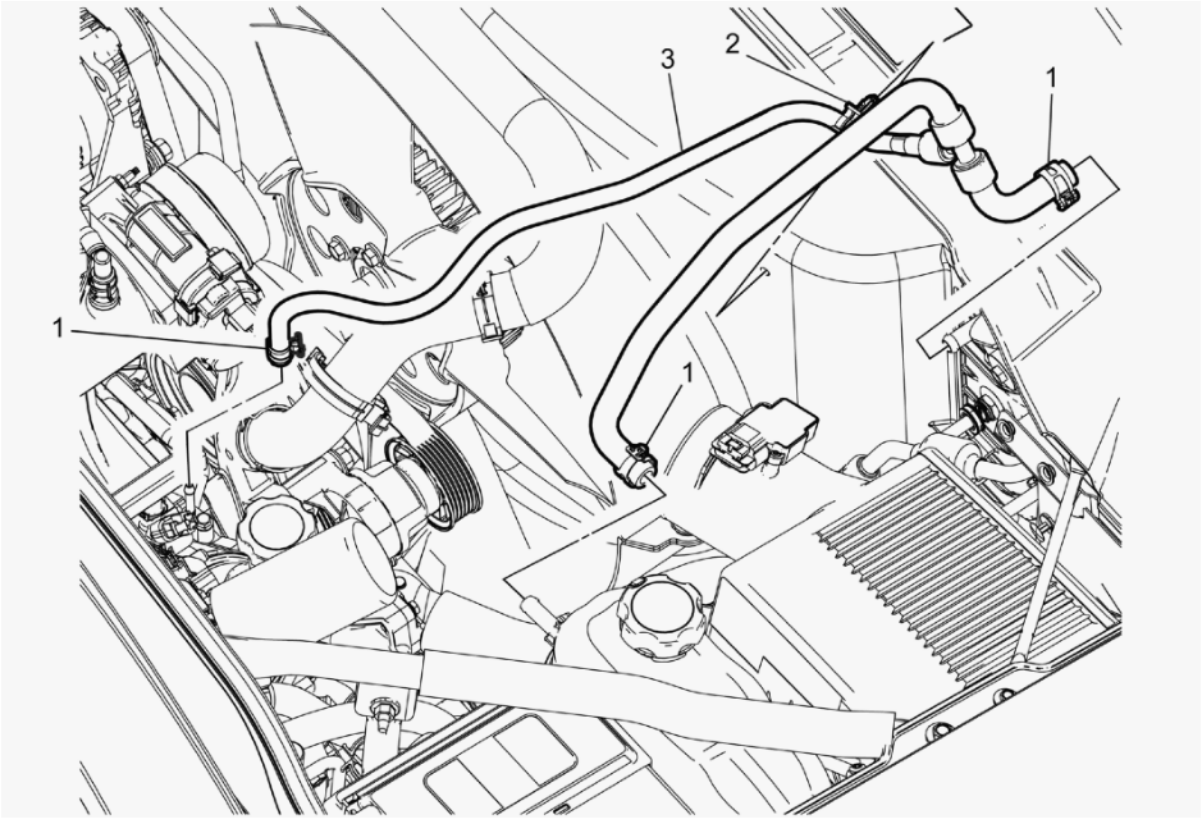

Fig. 130: Radiator Surge Tank Inlet Hose (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Surge Tank Inlet Hose Clamp (Qty: 3) **Procedure** Disengage tension on the radiator surge tank inlet hose clamps using **BO-38185** hose clamp pliers and remove the radiator surge tank inlet hose and clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Surge Tank Inlet Hose Retainer **Procedure** Remove radiator surge tank inlet hose retainer from the engine coolant fan upper shroud.
3	Radiator Surge Tank Inlet Hose **Procedures** 1. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (LC8,**

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Callout	Component Name
	L96).

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (L8B)

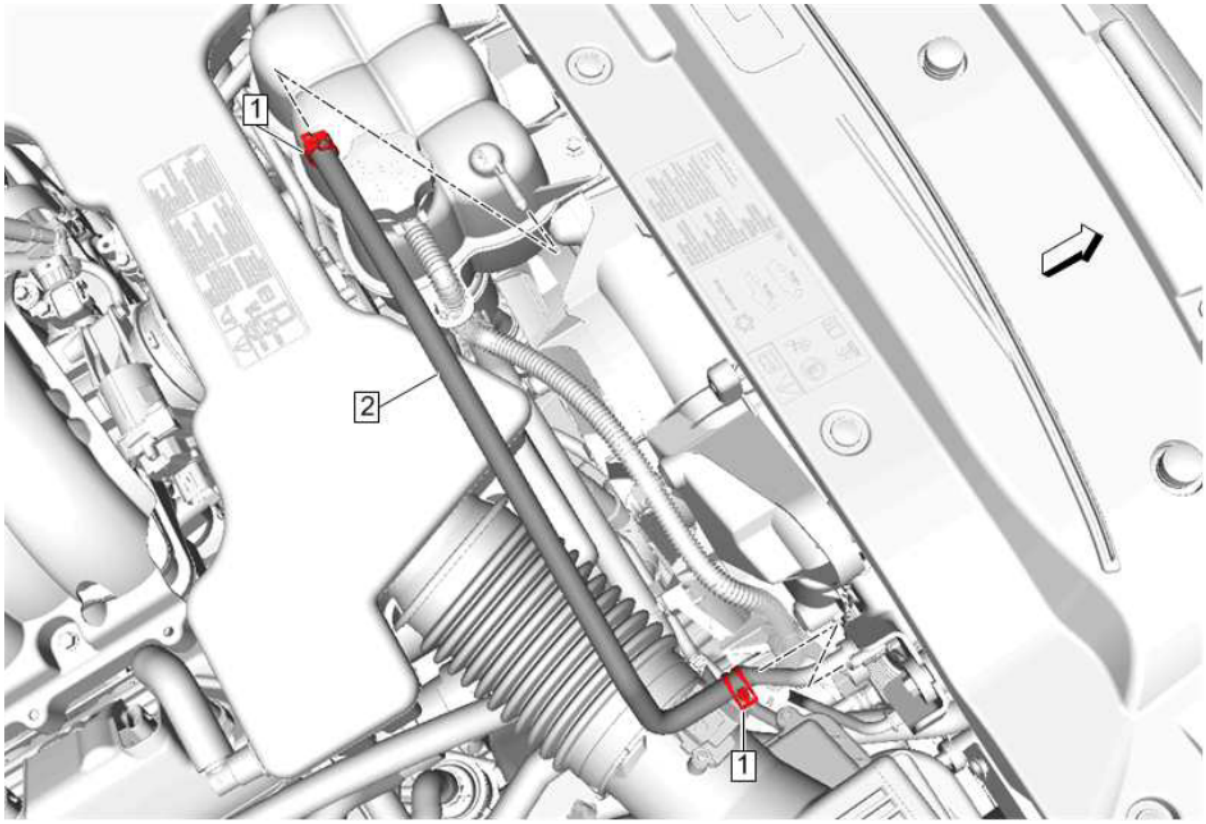

Fig. 131: Radiator Surge Tank Inlet Hose (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Surge Tank Inlet Hose Clamp **Procedure** Hose Clamp Replacement Guidelines - Spring Type
2	Radiator Surge Tank Inlet Hose **Procedure** 1. Fill the cooling system to the proper level. Cooling System Draining and Filling (Vac N Fill L8B) 2. Start the engine and check for coolant leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (SURGE TANK TO RADIATOR TO RADIATOR SURGE TANK INLET HOSE L5P)

Removal Procedure

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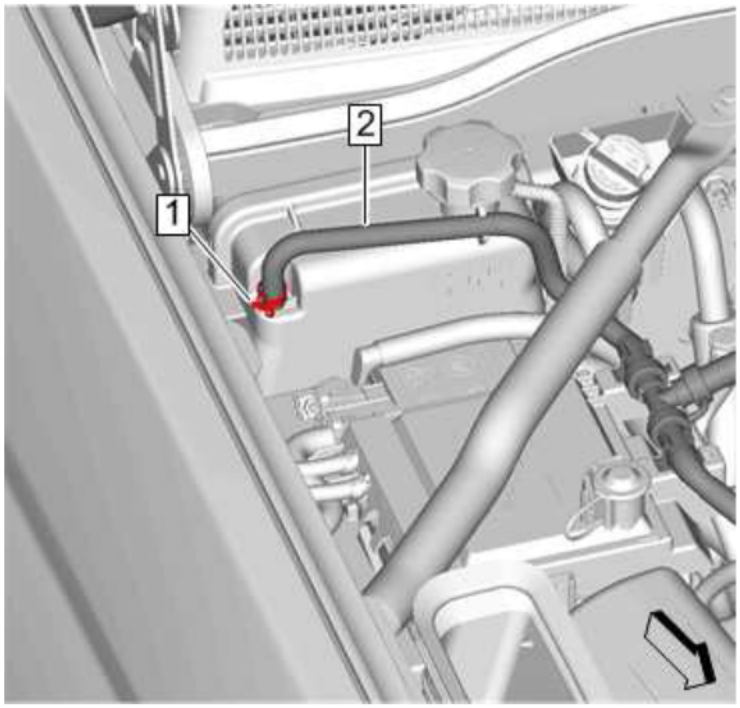

Fig. 132: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Surge Tank Inlet Hose Clamp 1 - Disengage - **Hose Clamp Replacement Guidelines - Spring Type**
2. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Remove

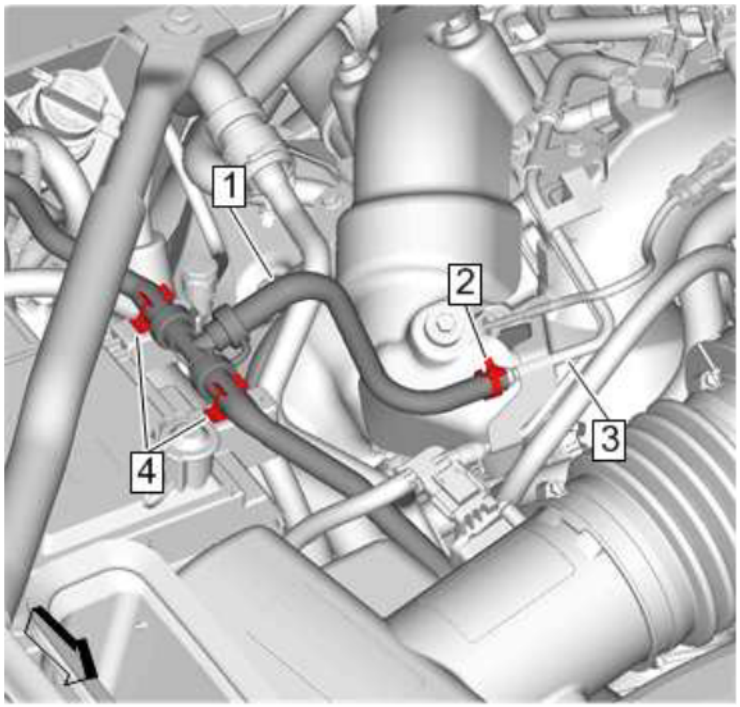

Fig. 133: Radiator Surge Tank Inlet Hose And Retainers
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Surge Tank Inlet Hose 1 @Radiator Surge Tank Inlet Hose Clip 4 - Remove
4. Radiator Surge Tank Inlet Hose Clamp 2 - Disengage - **Hose Clamp Replacement Guidelines - Spring**

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Type

5. Radiator Surge Tank Inlet Hose 1 @Radiator Surge Tank Inlet Hose 3 - Remove

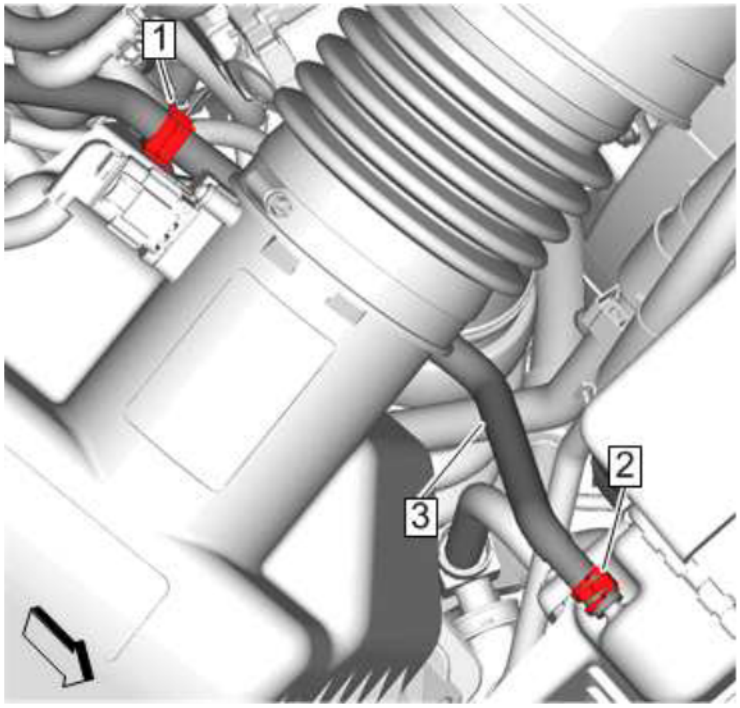

Fig. 134: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Surge Tank Inlet Hose 3 @Radiator Surge Tank Inlet Hose Clip 1 - Remove
7. Radiator Surge Tank Inlet Hose Clamp 2 - Disengage - **Hose Clamp Replacement Guidelines - Spring Type**
8. Radiator Surge Tank Inlet Hose 3 @Radiator - Remove
9. Radiator Surge Tank Inlet Hose 3 - Remove

Installation Procedure

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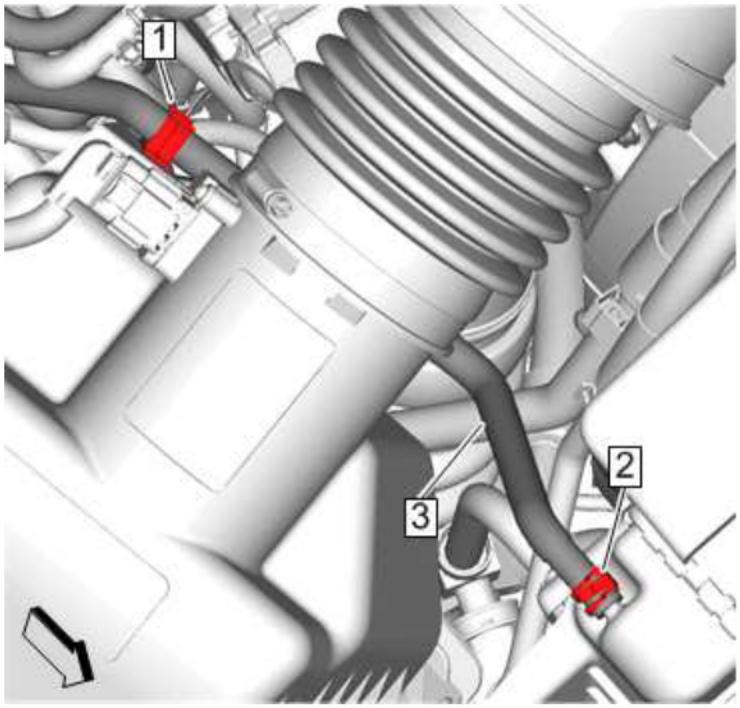

Fig. 135: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Surge Tank Inlet Hose 3 @Radiator - Install
2. Radiator Surge Tank Inlet Hose Clamp 2 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
3. Radiator Surge Tank Inlet Hose 3 @Radiator Surge Tank Inlet Hose Clip 1 - Install

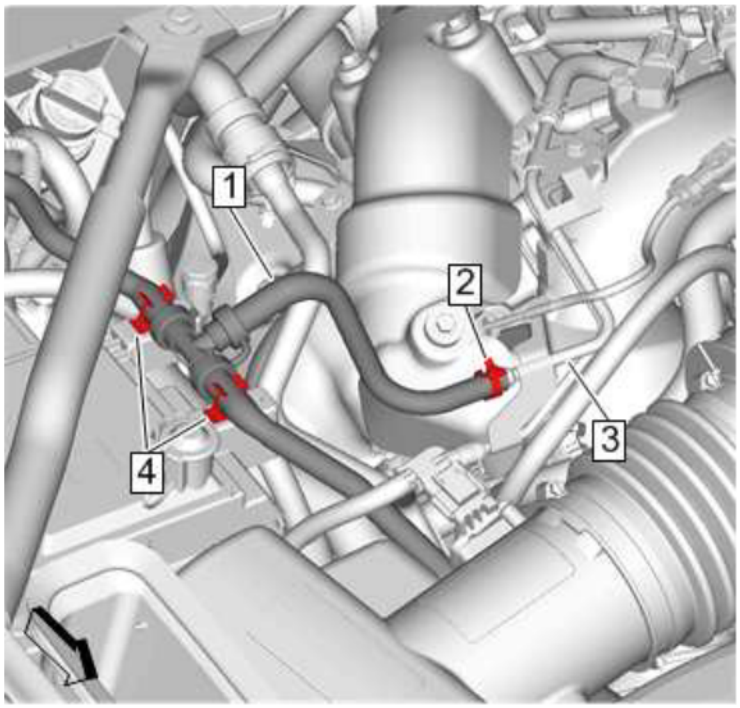

Fig. 136: Radiator Surge Tank Inlet Hose And Retainers
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Surge Tank Inlet Hose 1 @Radiator Surge Tank Inlet Hose 3 - Install

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5. Radiator Surge Tank Inlet Hose Clamp 2 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
6. Radiator Surge Tank Inlet Hose 1 @Radiator Surge Tank Inlet Hose Clip 4 - Install

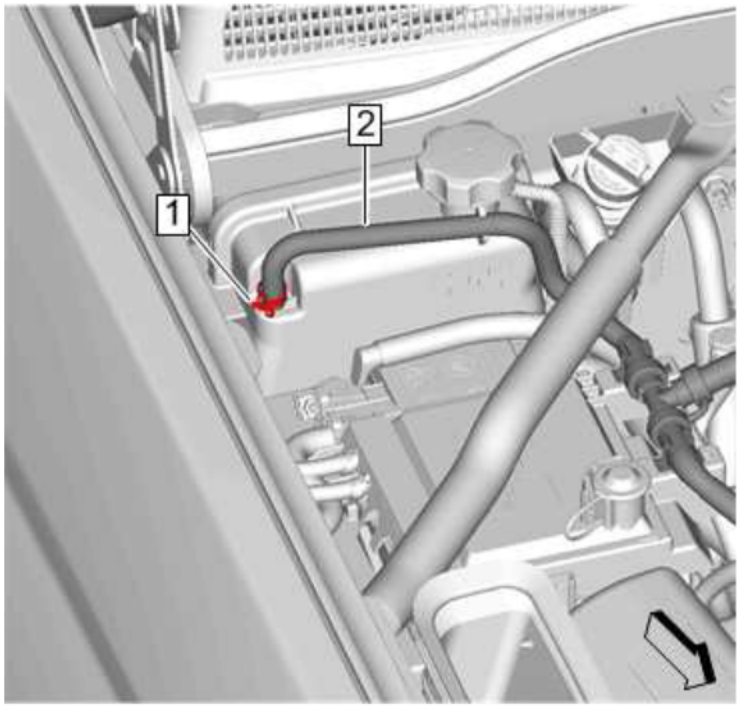

Fig. 137: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Surge Tank Inlet Hose 2 @Radiator Surge Tank - Install
8. Radiator Surge Tank Inlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
9. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
10. Start the engine and check for coolant leaks.

RADIATOR SURGE TANK INLET HOSE REPLACEMENT (SURGE TANK TO ENGINE L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

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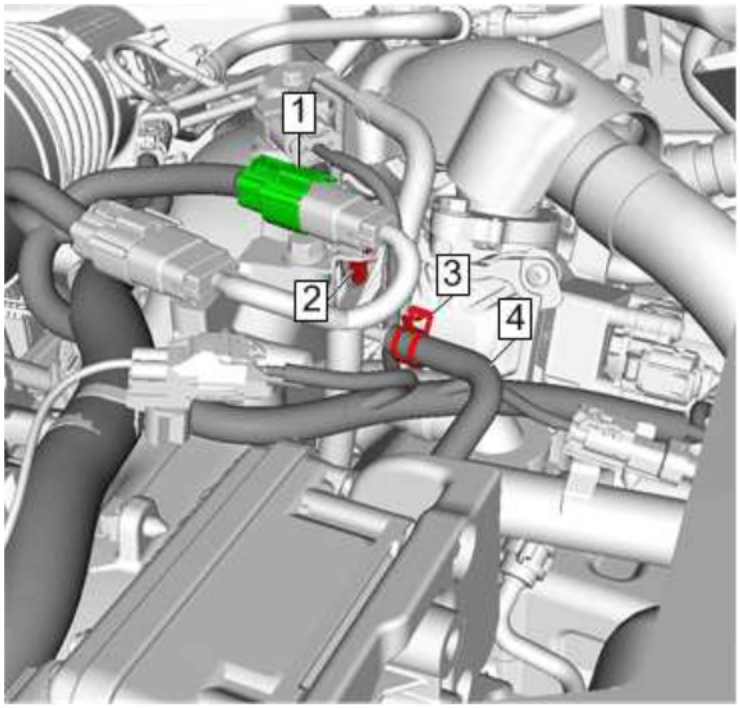

Fig. 138: Radiator Surge Tank Inlet Hose, Clamps And Retainers
Courtesy of GENERAL MOTORS COMPANY

2. Engine Wiring Harness Retainer 2 - Disengage
3. Radiator Surge Tank Inlet Hose Clamp 3 - Disengage - **Hose Clamp Replacement Guidelines - Spring Type**
4. Radiator Surge Tank Inlet Hose 4 - Disconnect

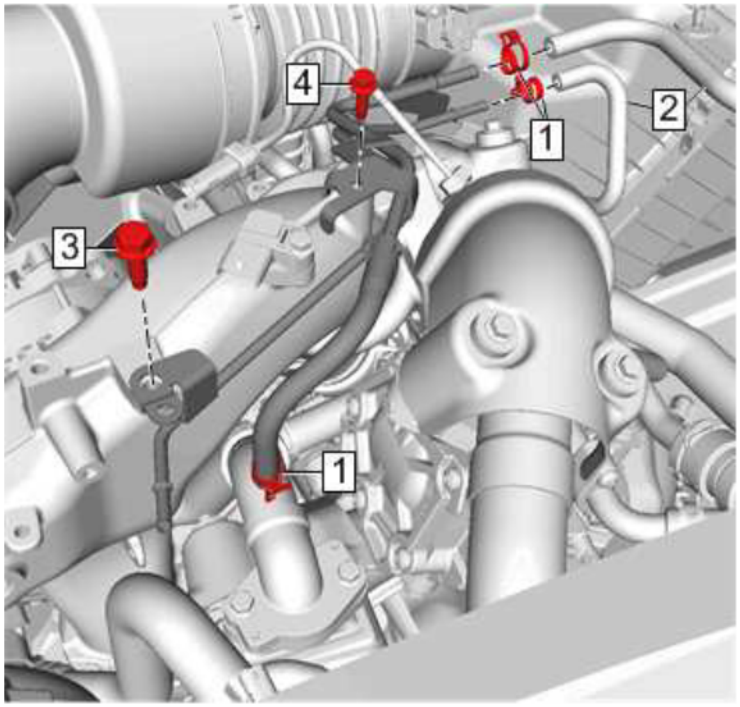

Fig. 139: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Surge Tank Inlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring**

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Type

6. Radiator Surge Tank Inlet Hose 2 - Disconnect
7. Radiator Surge Tank Inlet Hose Bracket Bolt 3 - Remove
8. Radiator Surge Tank Inlet Hose Bracket Bolt 4 - Remove

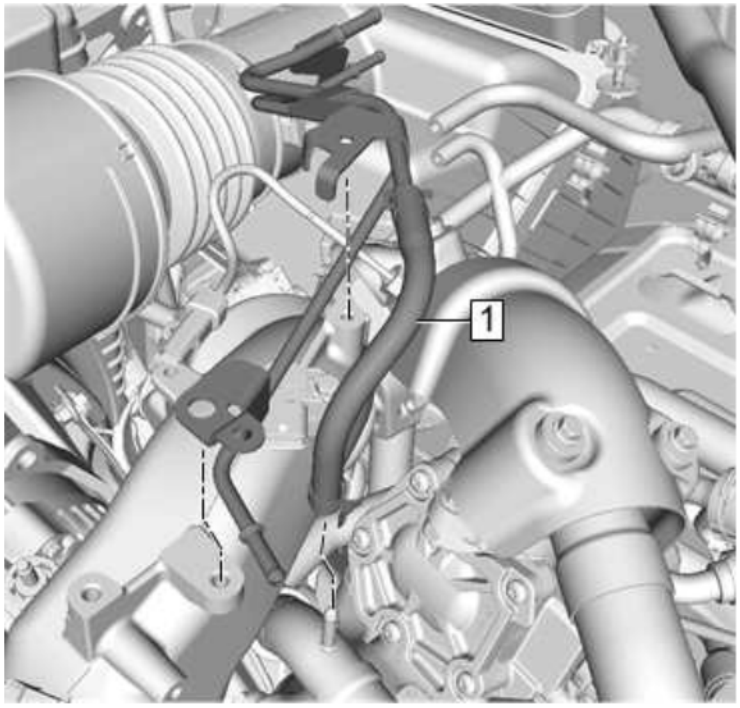

Fig. 140: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

9. Radiator Surge Tank Inlet Hose (1) - Remove

Installation Procedure

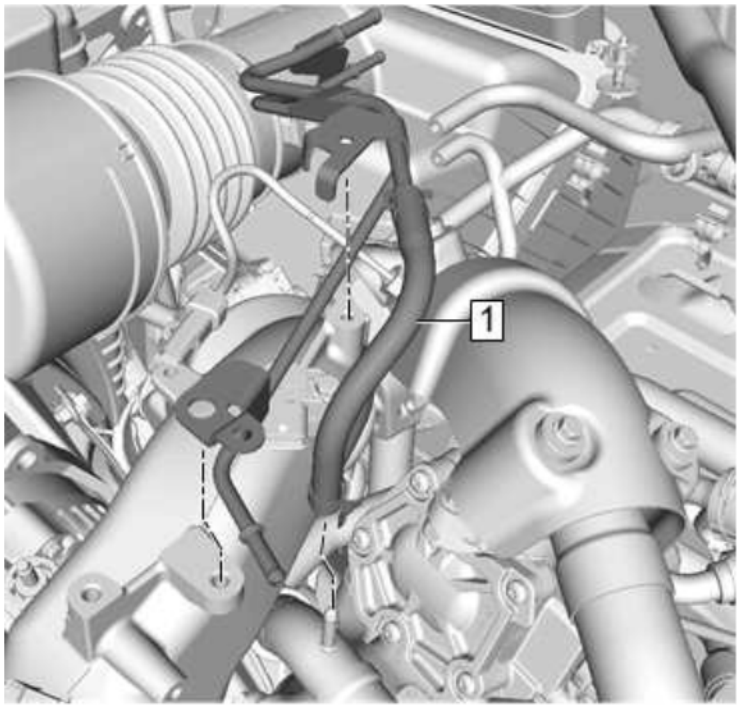

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Fig. 141: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Surge Tank Inlet Hose 1 - Install

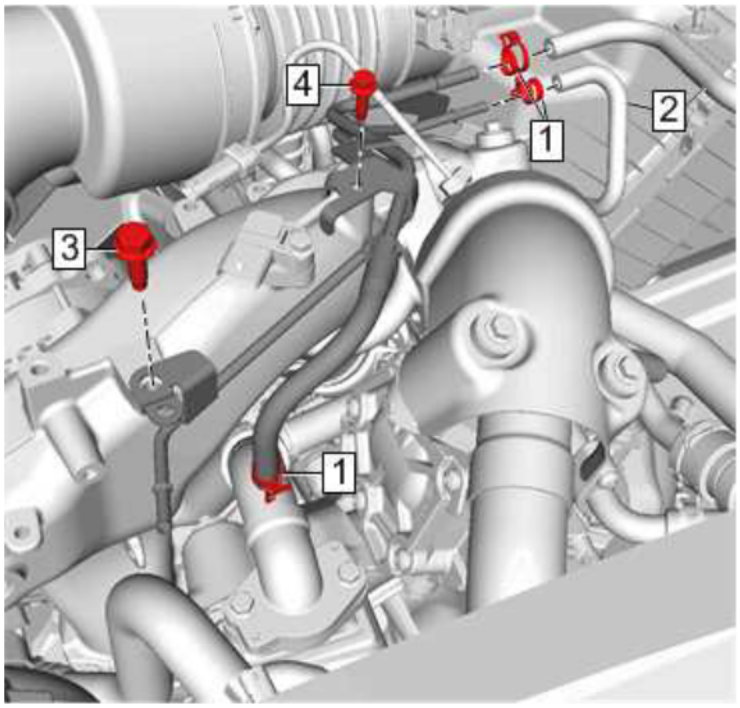

Fig. 142: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

2. Radiator Surge Tank Inlet Hose Bracket Bolt 4 - Install and tighten 9 N.m (80 lb in)
3. Radiator Surge Tank Inlet Hose Bracket Bolt 3 - Install and tighten 22 N.m (16 lb ft)
4. Radiator Surge Tank Inlet Hose 2 - Connect
5. Radiator Surge Tank Inlet Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**

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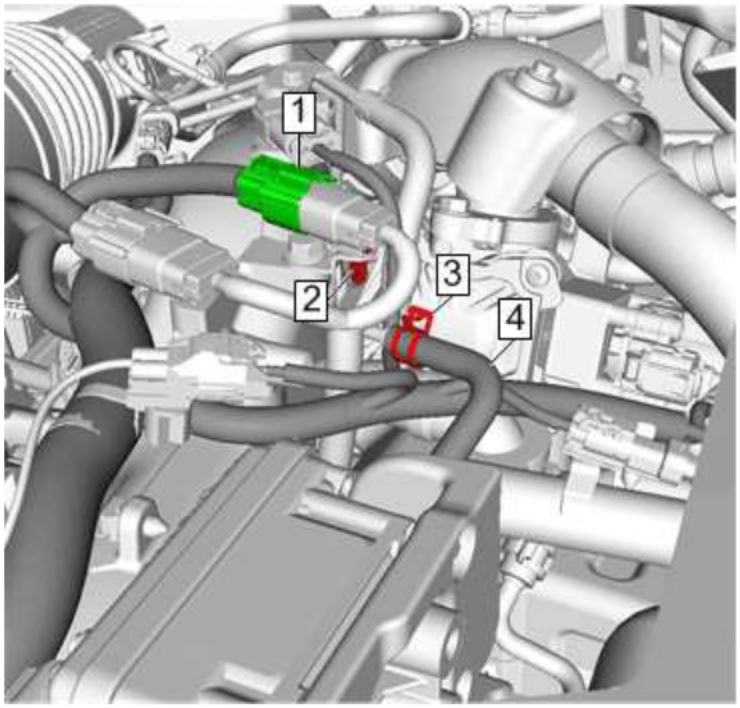

Fig. 143: Radiator Surge Tank Inlet Hose, Clamps And Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Surge Tank Inlet Hose 4 - Connect
7. Radiator Surge Tank Inlet Hose Clamp 3 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
8. Engine Wiring Harness Retainer 2 - Engage
9. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
10. Start the engine and check for leaks.

RADIATOR SURGE TANK OUTLET HOSE REPLACEMENT (LC8, L96)

Special Tools

- **BO-38185** Hose Clamp Pliers
- **J-43181** Heater Line Q.C. Release Tool

For equivalent regional tools, refer to **Special Tools** .

Removal Procedure

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**.
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

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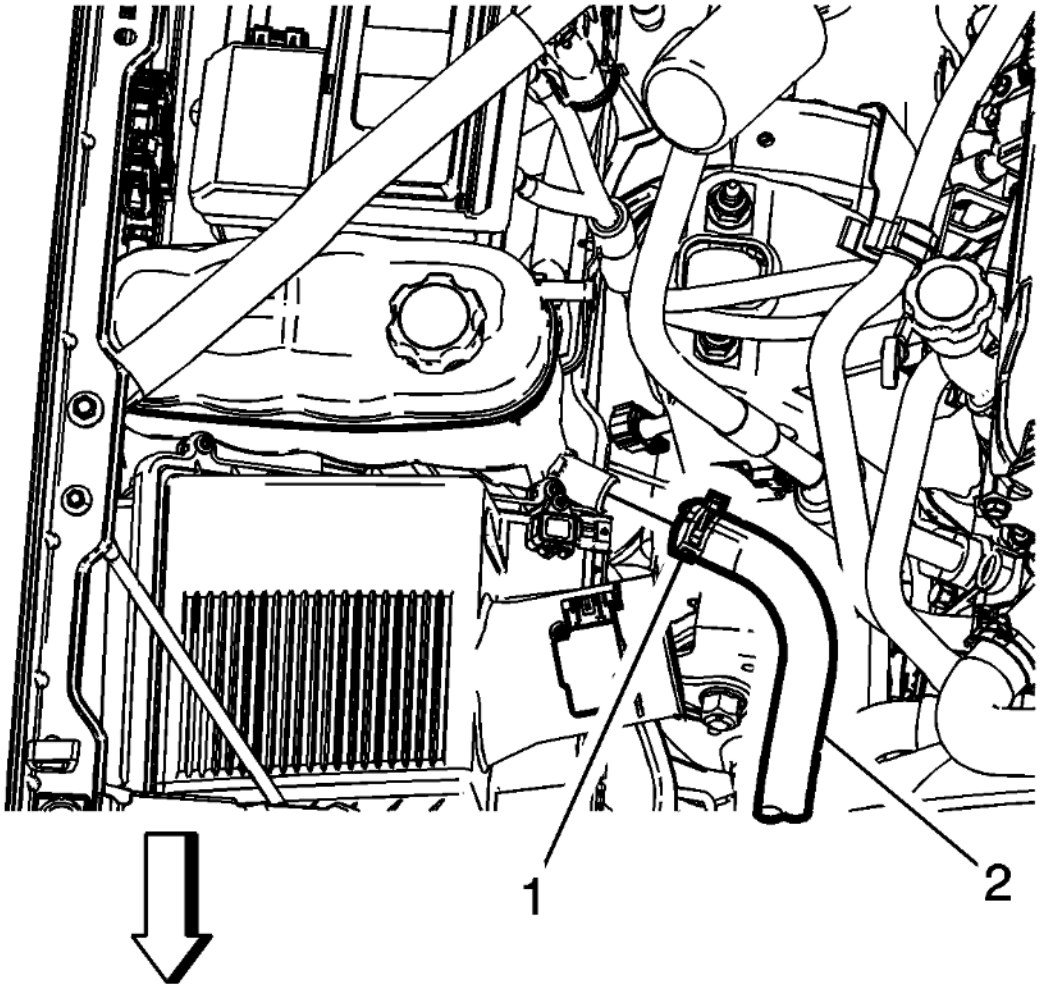

Fig. 144: Radiator Surge Tank Outlet Hose Clamp At Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

3. Disengage tension on the radiator surge tank outlet hose clamp (1) at the radiator surge tank using **BO-38185** hose clamp pliers.
4. Remove the radiator surge tank outlet hose (2) and clamp (1) from the radiator surge tank.

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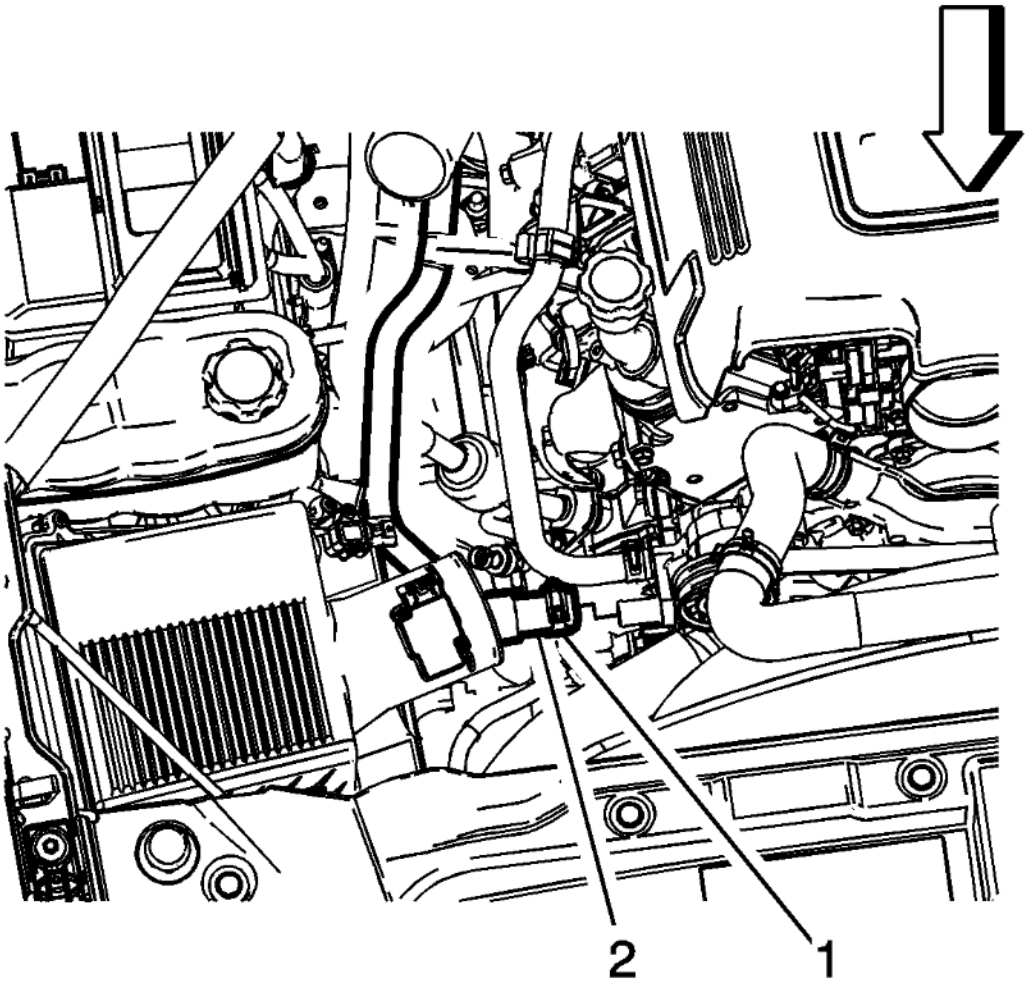

Fig. 145: Radiator Surge Tank Outlet Hose Clamp At Water Pump
Courtesy of GENERAL MOTORS COMPANY

5. Disengage tension on the radiator surge tank outlet hose clamp (1) at the water pump using **BO-38185** hose clamp pliers.
6. Remove the radiator surge tank outlet hose (2) and clamp (1) from the water pump.

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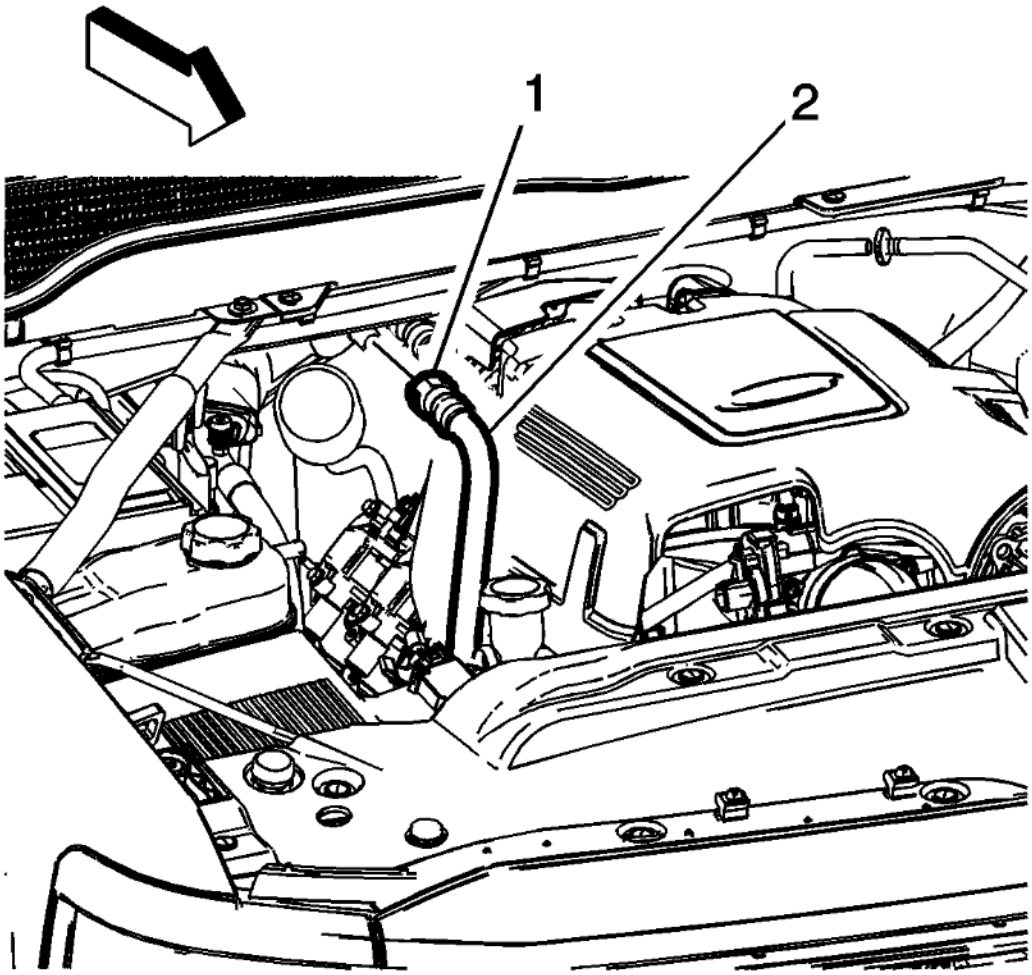

Fig. 146: Radiator Surge Tank Outlet Hose Clamp At Heater Core Outlet Tube
Courtesy of GENERAL MOTORS COMPANY

7. Disengage tension on the radiator surge tank outlet hose clamp (1) at the heater core outlet tube using **J-43181** heater line Q.C. release tool.
8. Remove the radiator surge tank outlet hose (2) and clamp (1) from the heater core outlet tube.
9. Remove the radiator surge tank outlet hose (2) from the vehicle.

Installation Procedure

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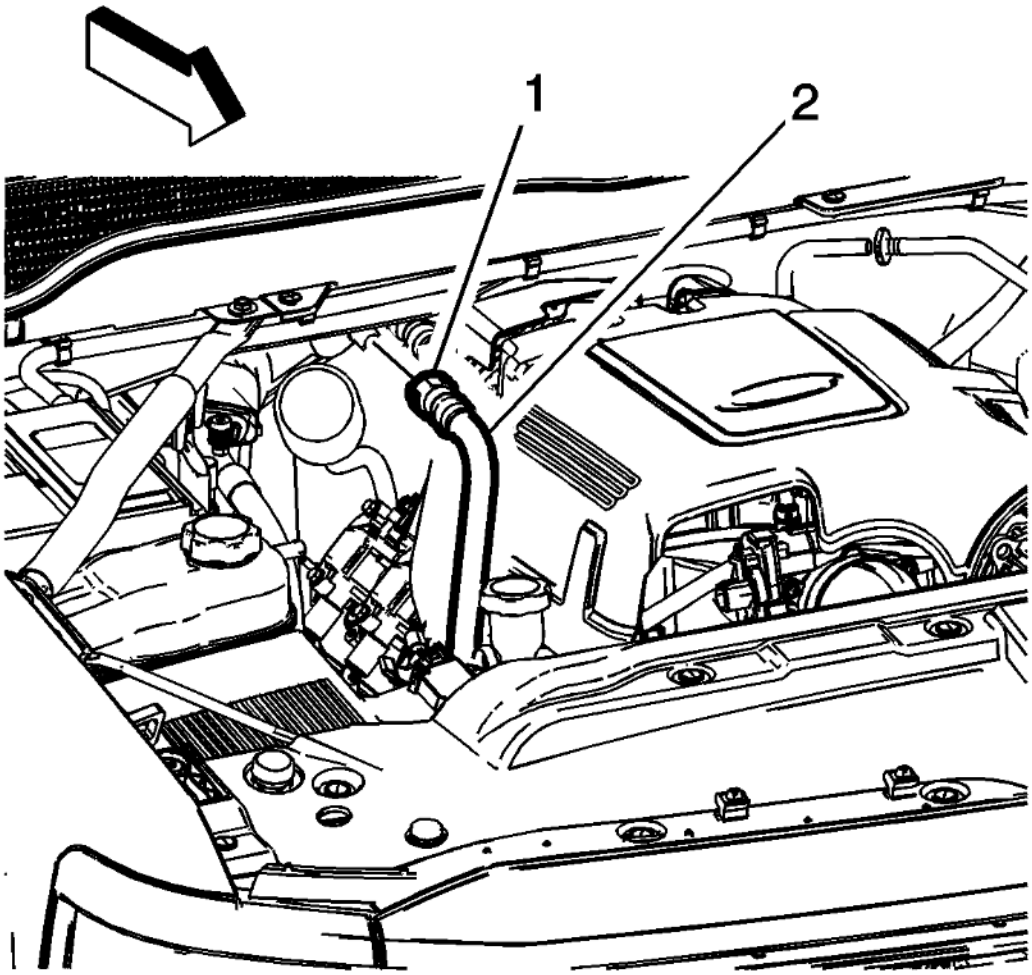

Fig. 147: Radiator Surge Tank Outlet Hose Clamp At Heater Core Outlet Tube
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Lubricate the inside diameters of the radiator surge tank outlet hose with clean coolant prior to installation.**

1. Install the radiator surge tank outlet hose (2) and clamp (1) to the heater core outlet tube.
2. Engage tension on the radiator surge tank outlet hose clamp (1) at the heater core outlet tube using **J-43181** heater line Q.C. release tool.

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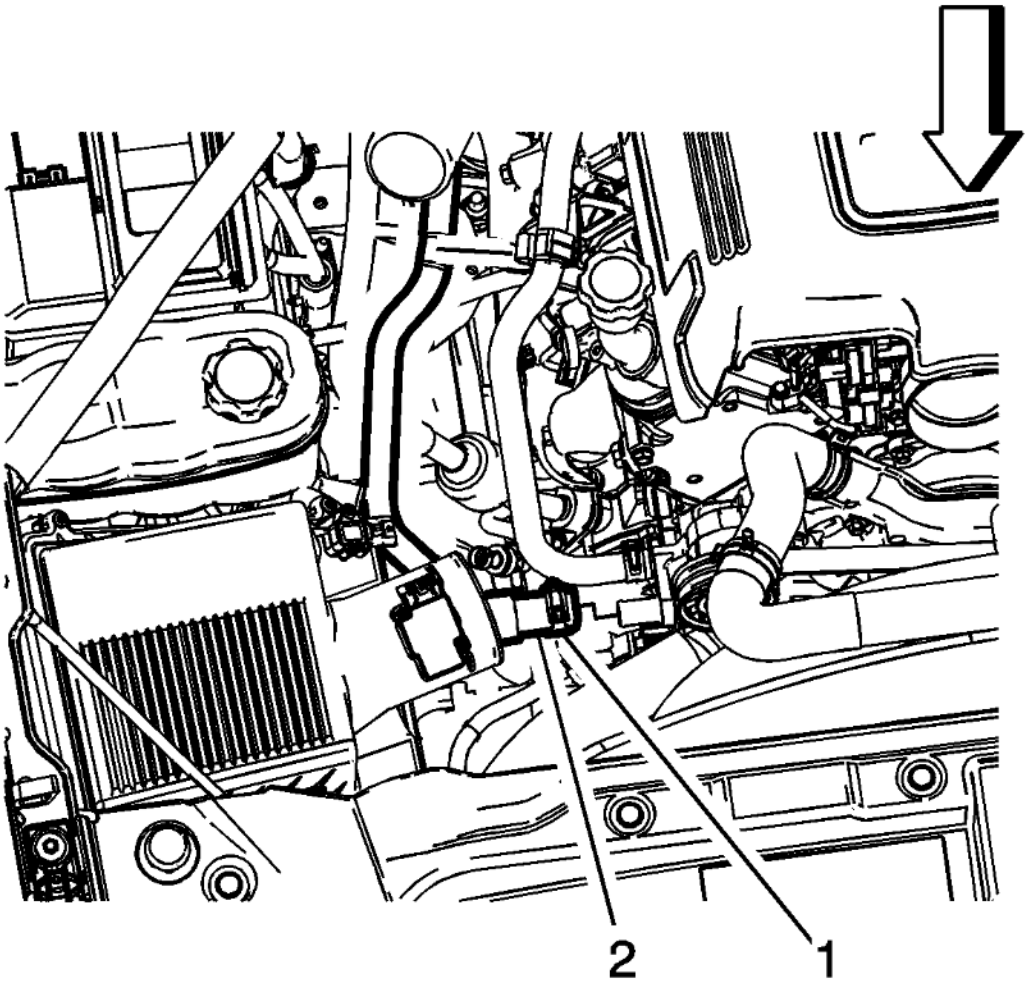

Fig. 148: Radiator Surge Tank Outlet Hose Clamp At Water Pump
Courtesy of GENERAL MOTORS COMPANY

3. Install the radiator surge tank outlet hose (2) and clamp (1) to the water pump.
4. Engage tension on the radiator surge tank outlet hose clamp (1) at the water pump using **BO-38185** hose clamp pliers.

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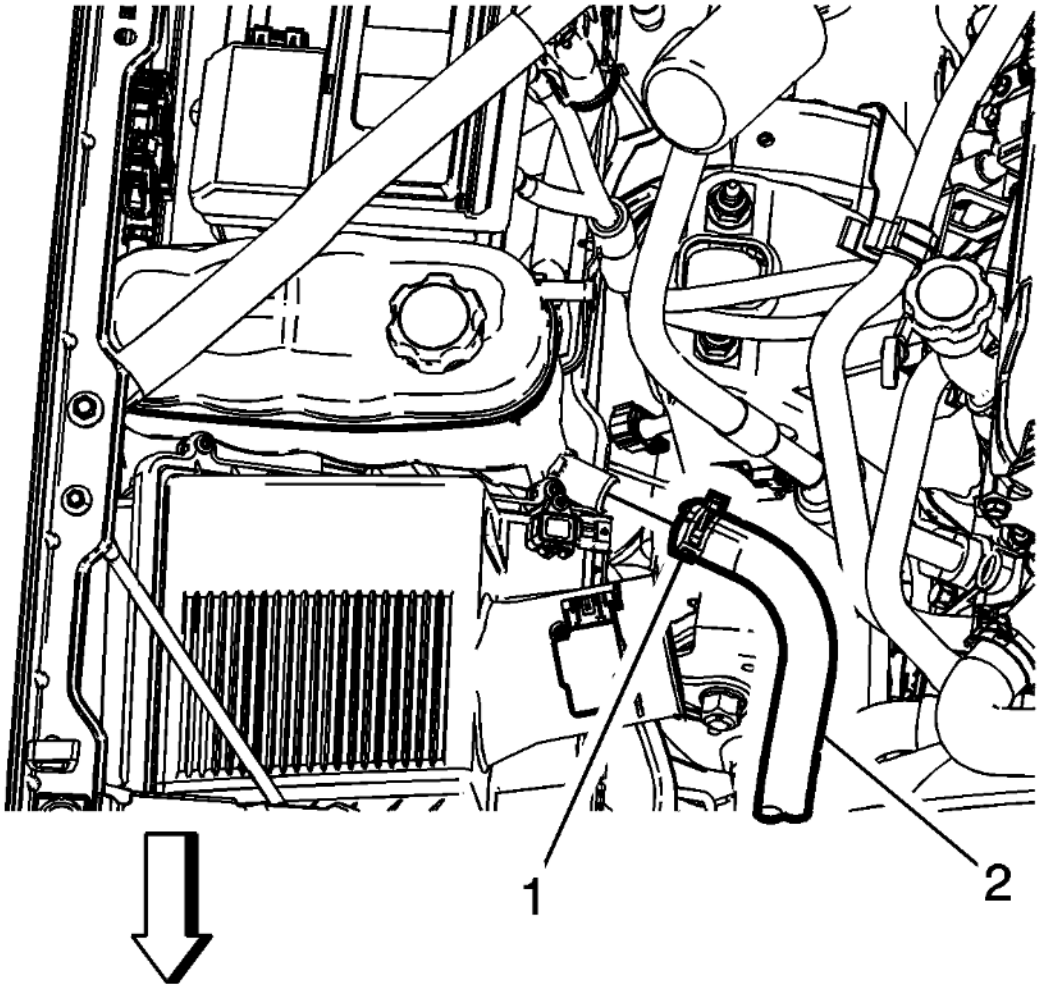

Fig. 149: Radiator Surge Tank Outlet Hose Clamp At Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

5. Install the radiator surge tank outlet hose (2) and clamp (1) to the radiator surge tank.
6. Engage tension on the radiator surge tank outlet hose clamp (1) at the radiator surge tank using **BO-38185** hose clamp pliers.
7. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
8. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**.
9. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (LC8, L96)**.

RADIATOR SURGE TANK OUTLET HOSE REPLACEMENT (CNG)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools** .

Removal Procedure

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1. Drain the coolant. **Cooling System Draining and Filling (Vac N Fill L8B)**
2. **Air Cleaner Outlet Duct Replacement** - Remove

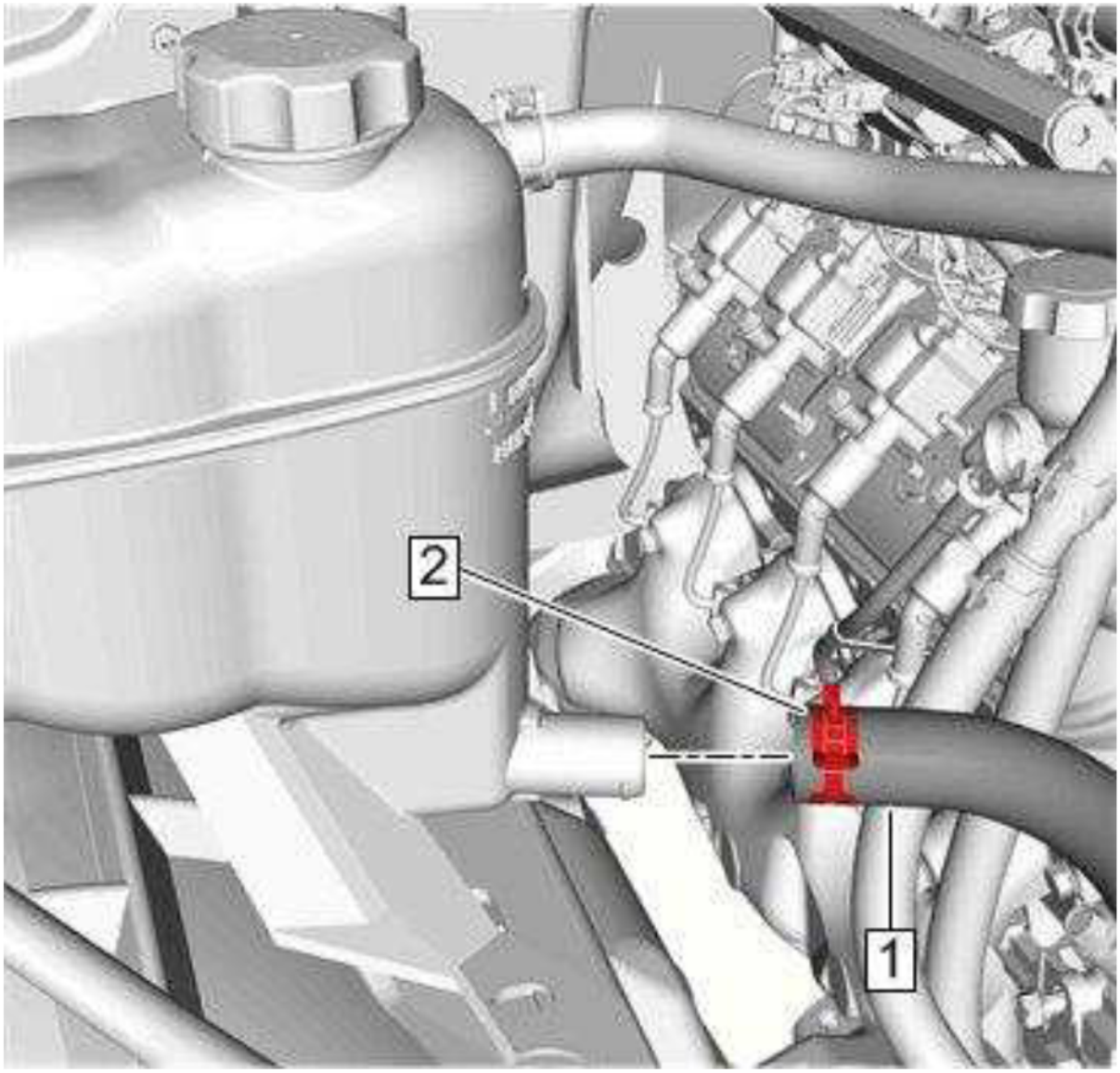

Fig. 150: Radiator Surge Tank Outlet Hose Clamp at Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Surge Tank Outlet Hose Clamp 1 @Radiator Surge Tank - Disengage - Using **BO-38185** Hose Clamp Pliers
4. Radiator Surge Tank Outlet Hose 2 @Radiator Surge Tank - Remove

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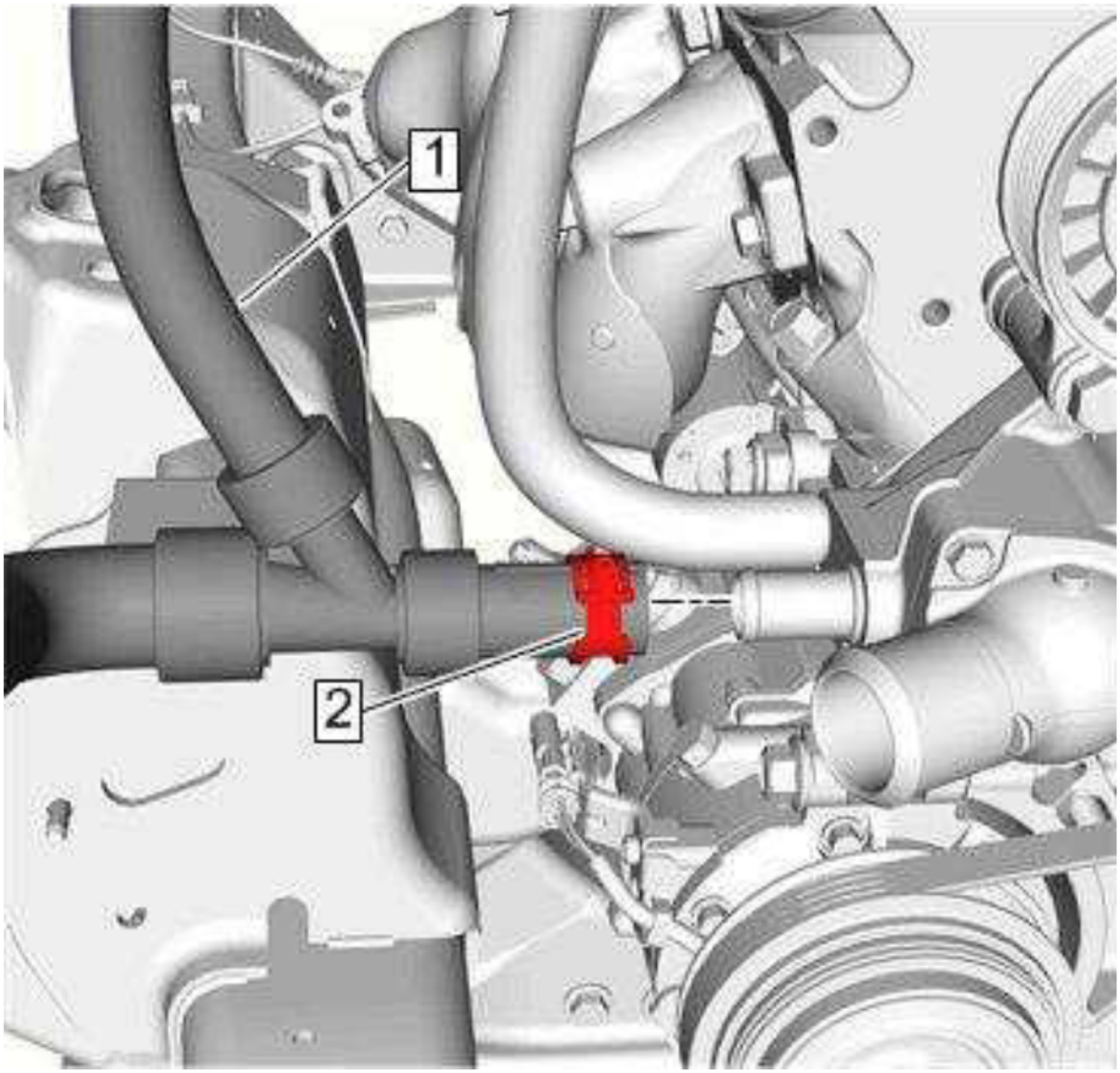

Fig. 151: Radiator Surge Tank Outlet Hose Clamp at the Water Pump
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Surge Tank Outlet Hose Clamp 1 @Water Pump - Disengage - Using **BO-38185** Hose Clamp Pliers
6. Radiator Surge Tank Outlet Hose 2 @Water Pump - Remove

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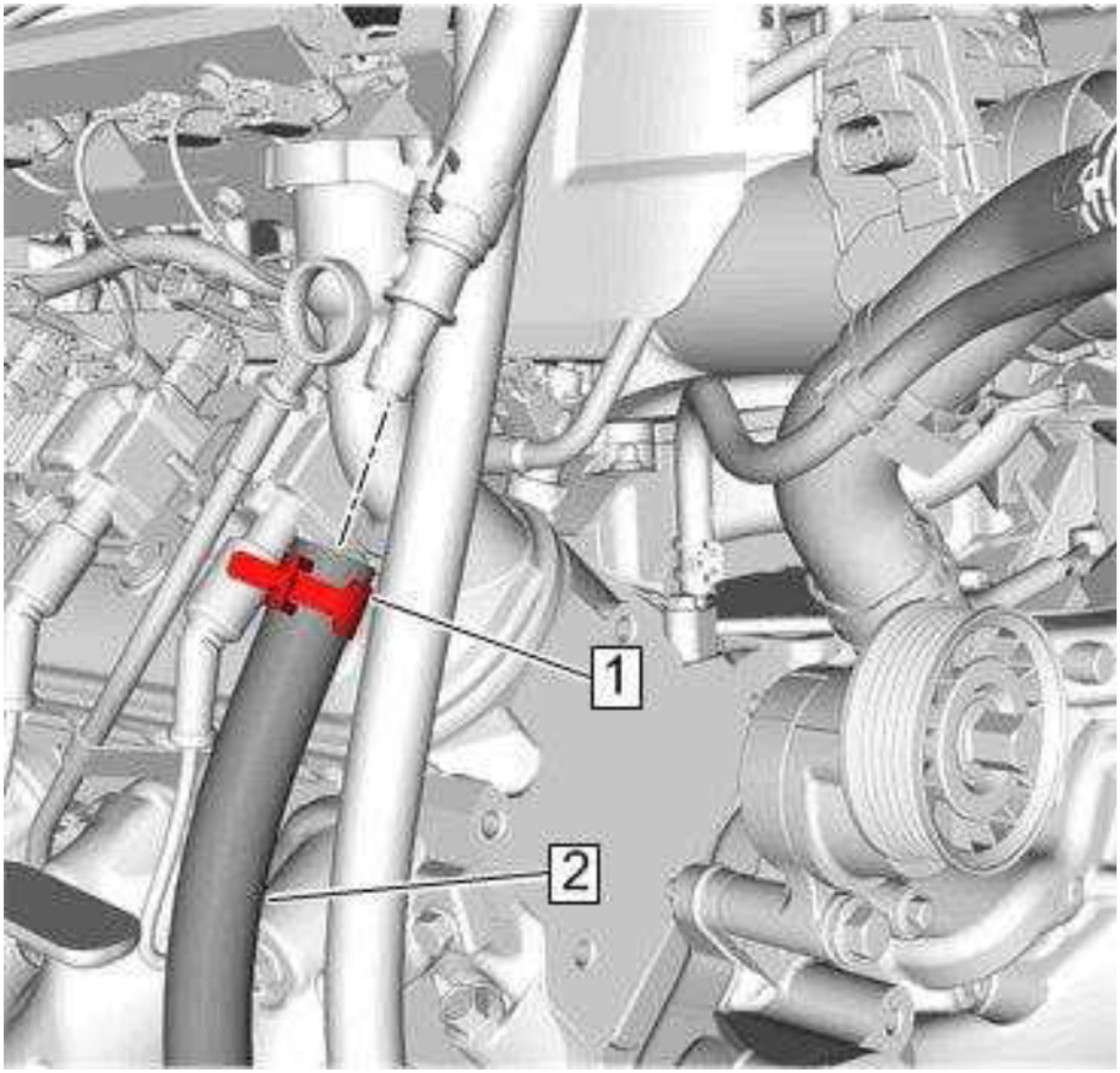

Fig. 152: Radiator Surge Tank Outlet Hose Clamp at the Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Surge Tank Outlet Hose Clamp 1 @Heater Inlet Hose - Disengage - Using **BO-38185** Hose Clamp Pliers
8. Radiator Surge Tank Outlet Hose 2 @Heater Inlet Hose - Remove
9. Radiator Surge Tank Outlet Hose - Remove

Installation Procedure

1. Radiator Surge Tank Outlet Hose - Position in vehicle.

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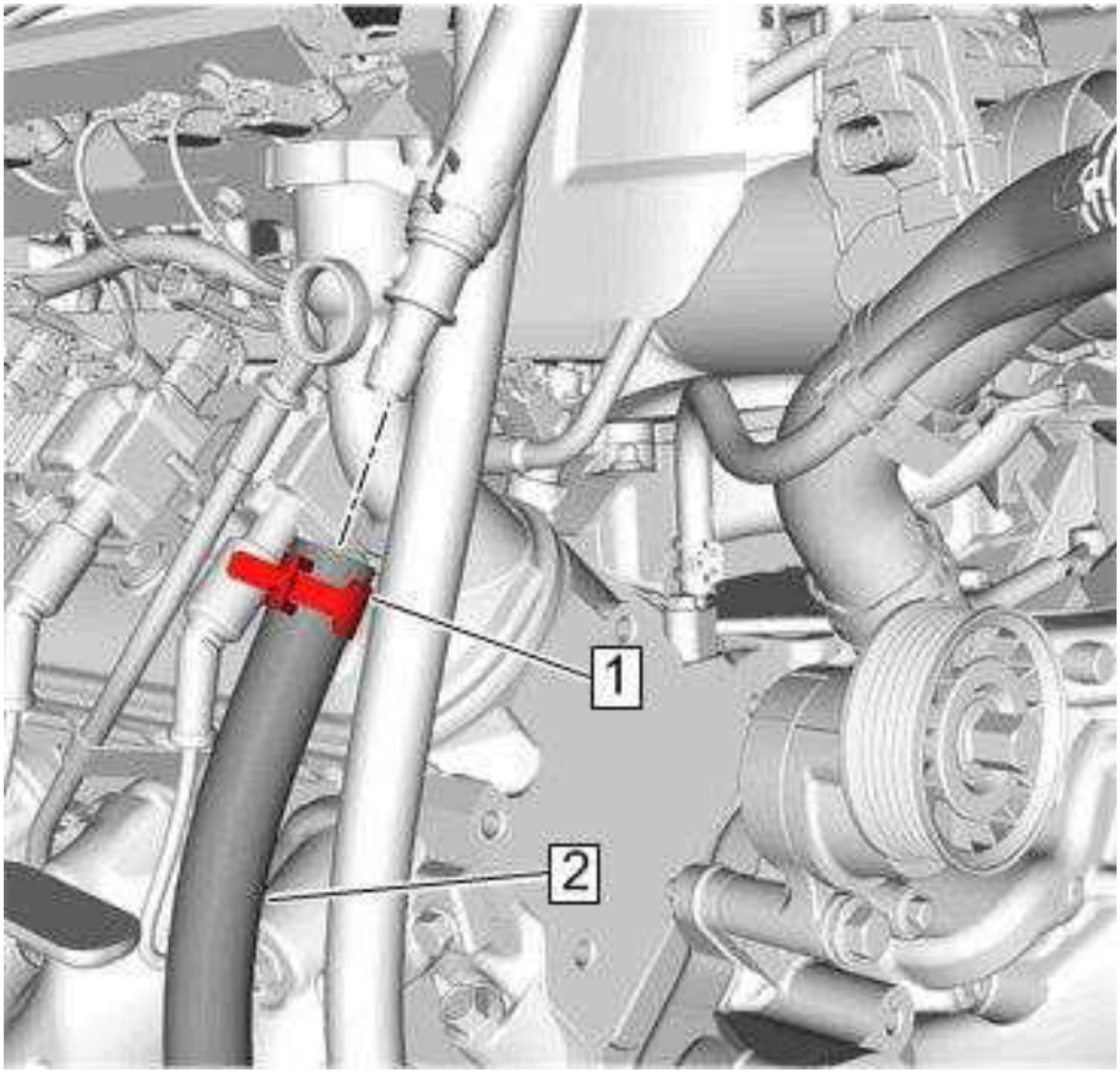

Fig. 153: Radiator Surge Tank Outlet Hose Clamp at the Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

2. Radiator Surge Tank Outlet Hose 2 @Heater Inlet Hose - Install
3. Radiator Surge Tank Outlet Hose Clamp 1 @Heater Inlet Hose - Engage - Using **BO-38185** Hose Clamp Pliers

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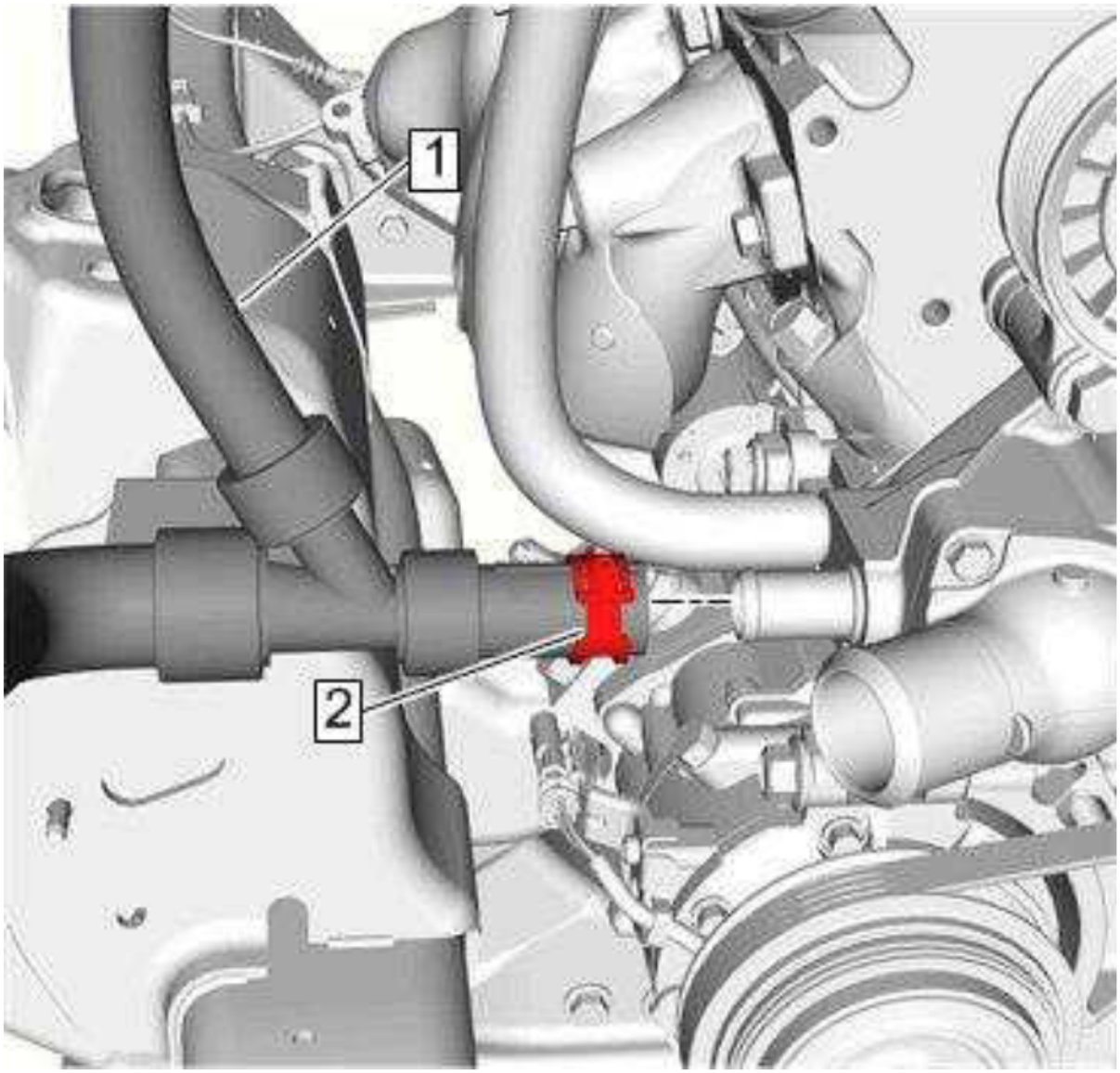

Fig. 154: Radiator Surge Tank Outlet Hose Clamp at the Water Pump
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Surge Tank Outlet Hose 2 @Water Pump - Install
5. Radiator Surge Tank Outlet Hose Clamp 1 @Water Pump - Engage - Using **BO-38185** Hose Clamp Pliers

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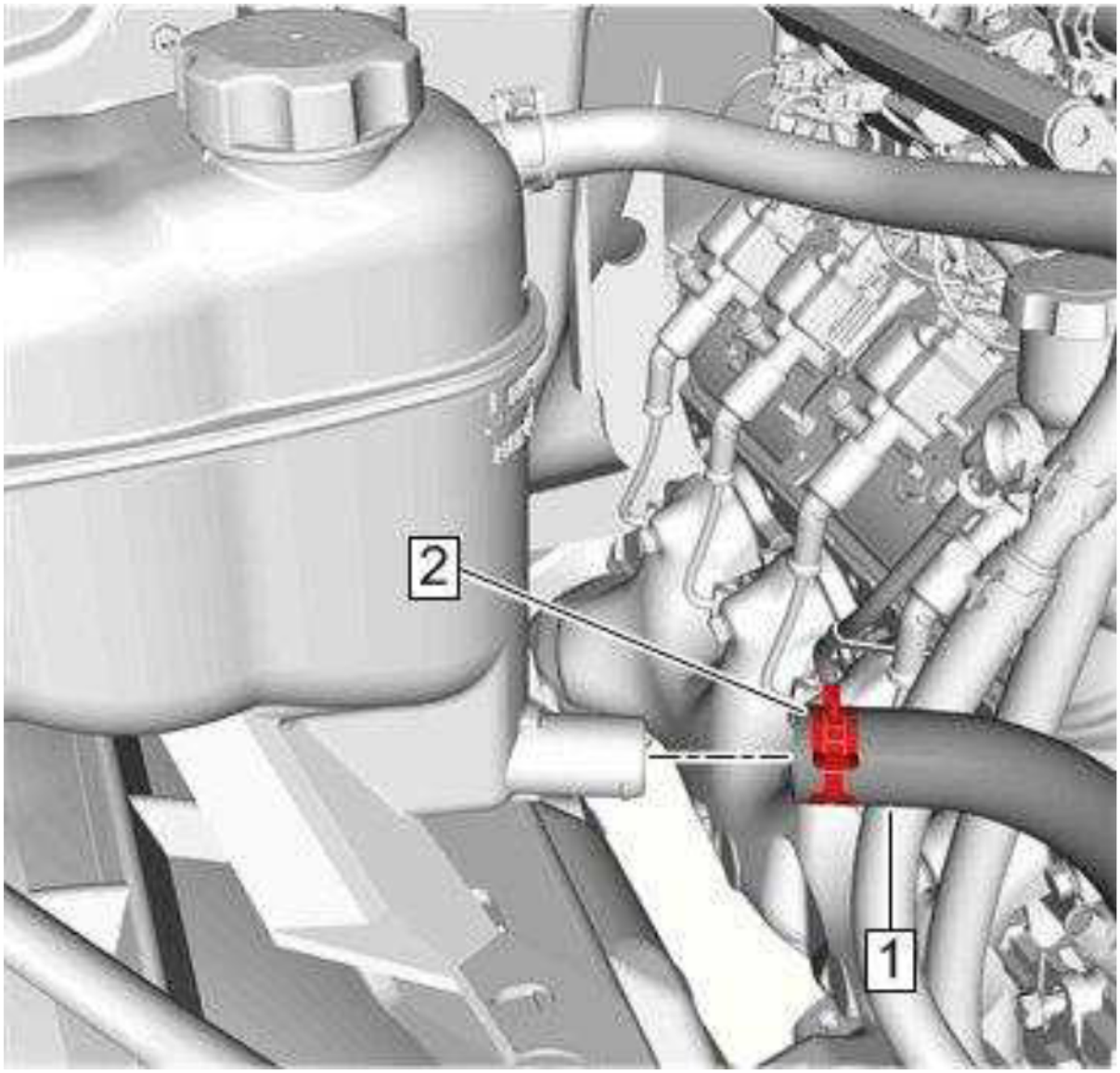

Fig. 155: Radiator Surge Tank Outlet Hose Clamp at Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Surge Tank Outlet Hose 2 @Radiator Surge Tank - Install
7. Radiator Surge Tank Outlet Hose Clamp 1 @Radiator Surge Tank - Engage - Using **BO-38185** Hose Clamp Pliers
8. **Air Cleaner Outlet Duct Replacement** - Install
9. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
10. Start the engine and inspect for leaks.

RADIATOR INLET HOSE REPLACEMENT (L83, L86)

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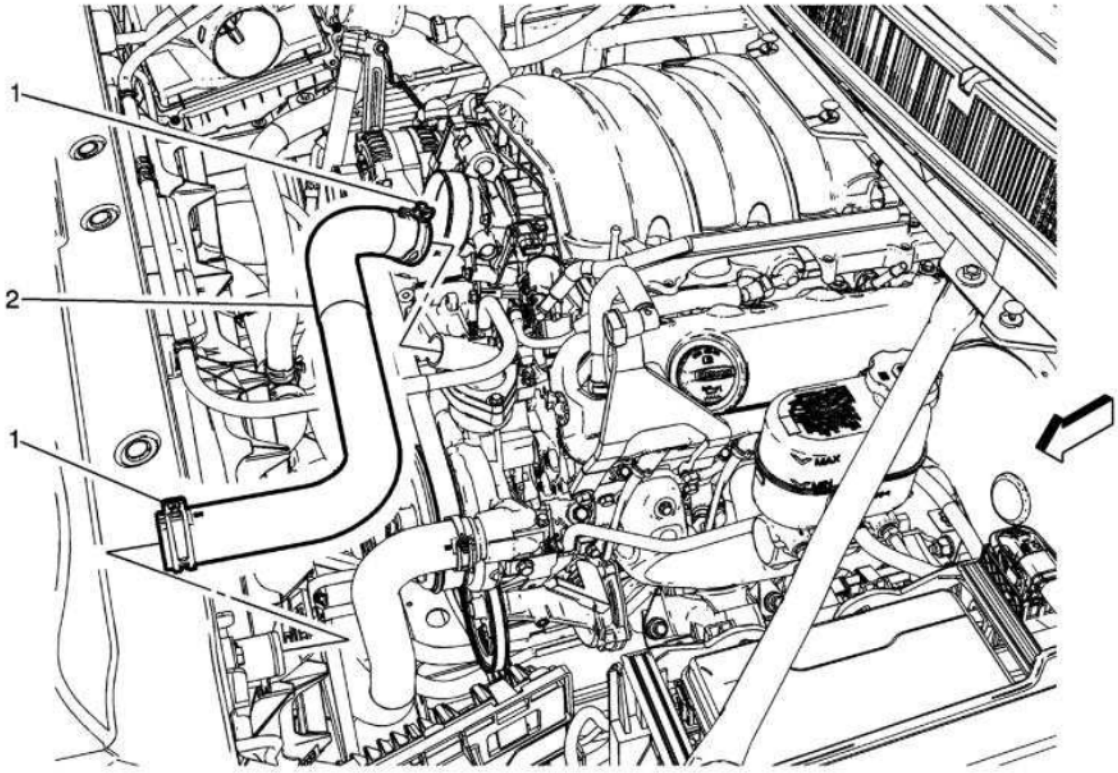

Fig. 156: Radiator Inlet Hose (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Inlet Hose Clamps (Qty: 2) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator inlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Inlet Hose **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR INLET HOSE REPLACEMENT (LV3)

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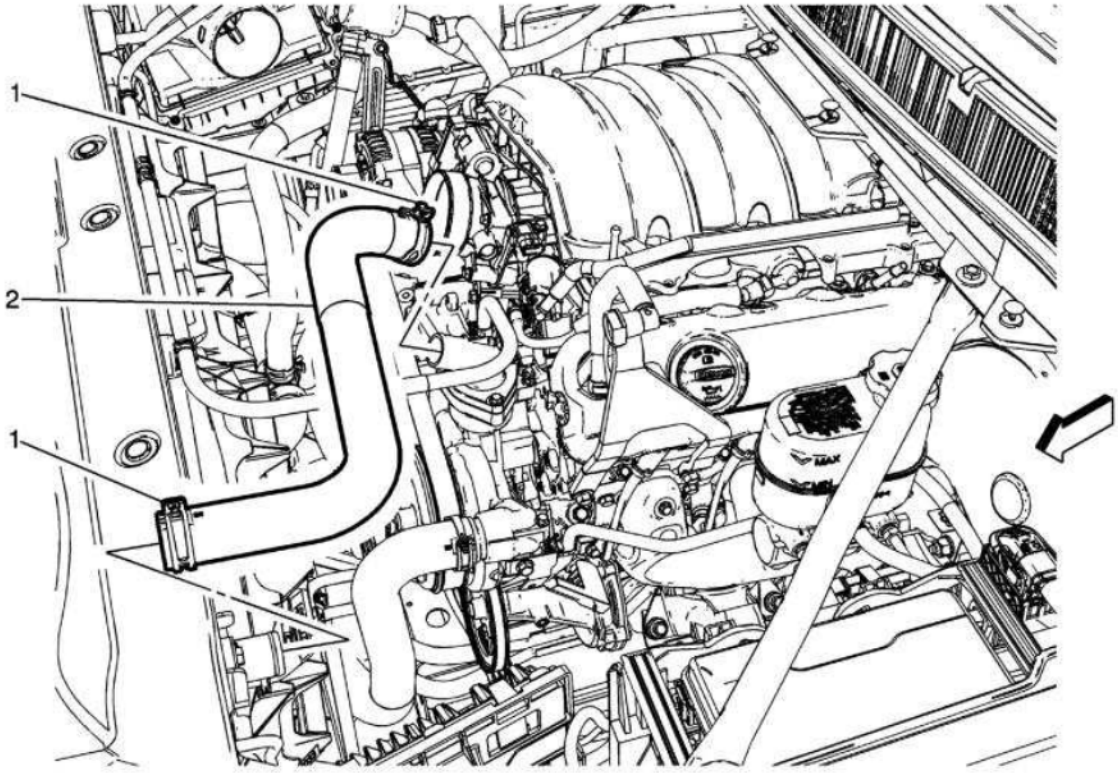

Fig. 157: Radiator Inlet Hose (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Inlet Hose Clamps (Qty: 2) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator inlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Inlet Hose **Procedures** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR INLET HOSE REPLACEMENT (LC8, L96)

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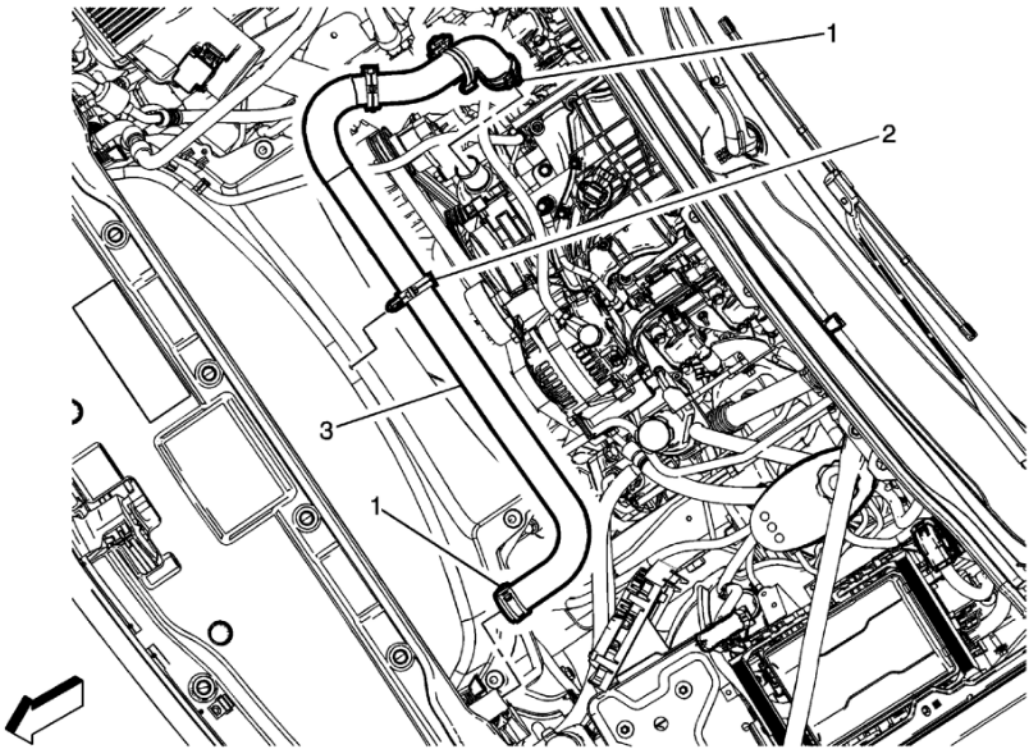

Fig. 158: Radiator Inlet Hose And Retainer (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Inlet Hose Clamp (Qty: 2) **Procedure** Disengage tension on the radiator inlet hose clamps using **BO-38185** hose clamp pliers and remove the radiator inlet hose and clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Inlet Hose Retainer
3	Radiator Inlet Hose **Procedures** 1. Unclip the radiator surge tank inlet hose from the radiator inlet hose retainers. 2. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 3. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (LC8,**

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Callout	Component Name
	L96).

RADIATOR INLET HOSE REPLACEMENT (L8B)

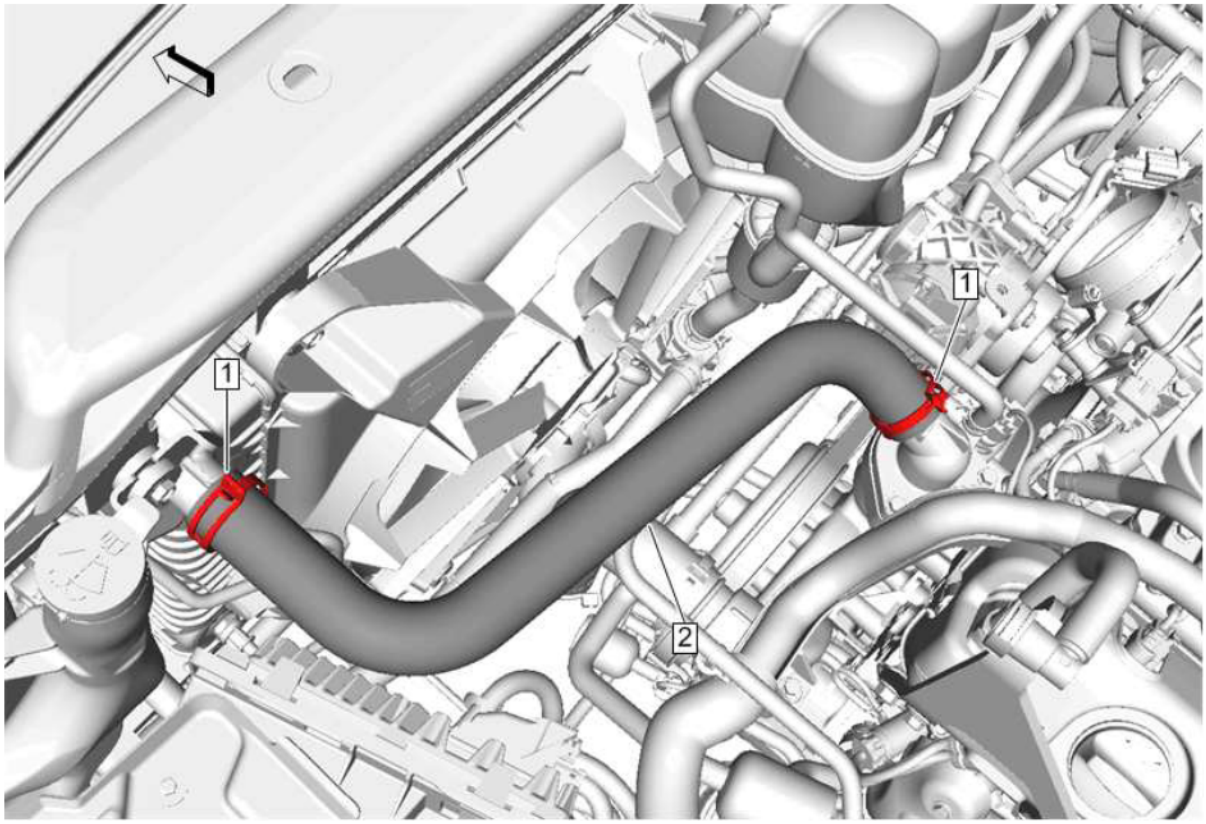

Fig. 159: Radiator Inlet Hose (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)** 2. Air Cleaner Outlet Duct - Remove - **Air Cleaner Outlet Duct Replacement**	
1	Radiator Inlet Hose Clamp **Procedure** **Hose Clamp Replacement Guidelines - Spring Type**
2	Radiator Inlet Hose **Procedure** 1. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)** 2. Start the engine and check for coolant leaks.

RADIATOR INLET HOSE REPLACEMENT (L5P)

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Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

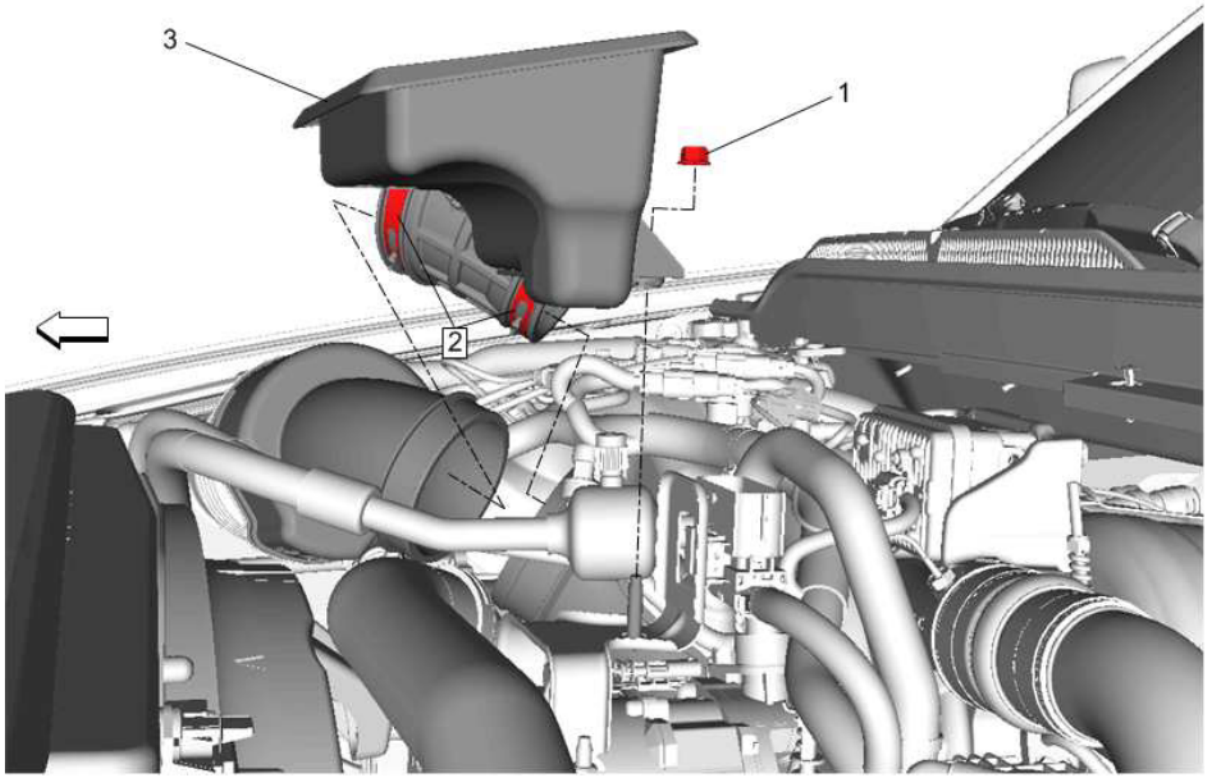

Fig. 160: Air Cleaner Outlet Resonator
Courtesy of GENERAL MOTORS COMPANY

2. Air Cleaner Outlet Resonator 3 - Remove **Air Cleaner Outlet Resonator Replacement**

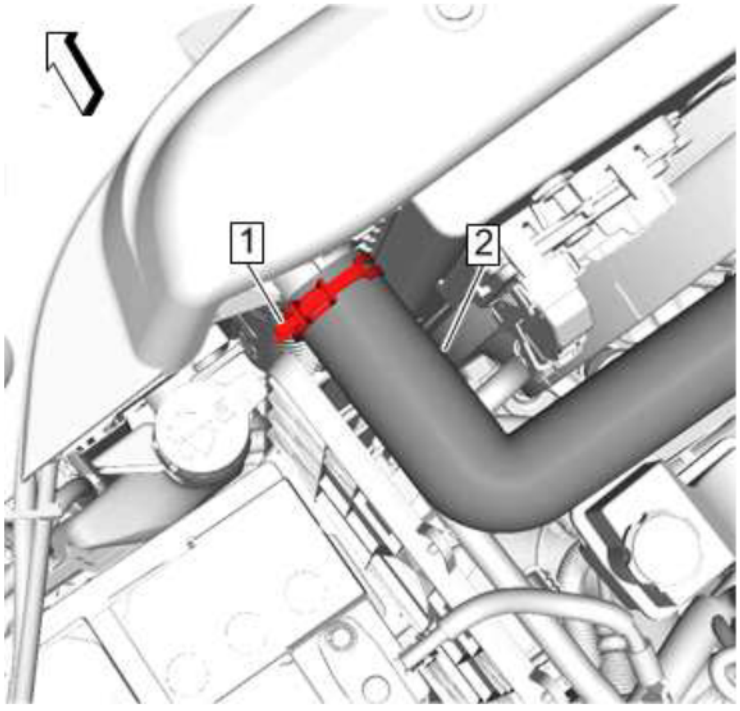

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Fig. 161: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Inlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
4. Radiator Inlet Hose 2 @Radiator - Remove

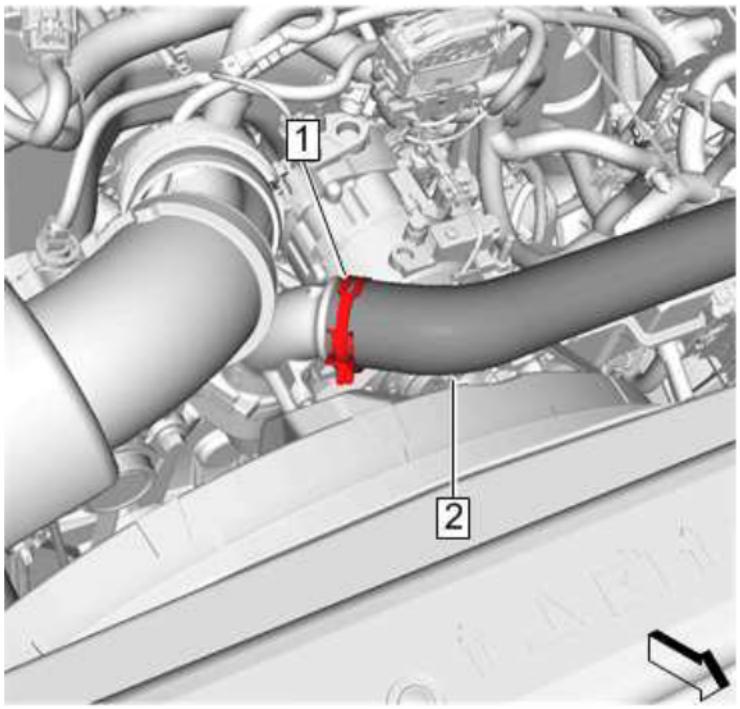

Fig. 162: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Inlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
6. Radiator Inlet Hose 2 @Water Outlet - Remove
7. Radiator Inlet Hose 2 - Remove

Installation Procedure

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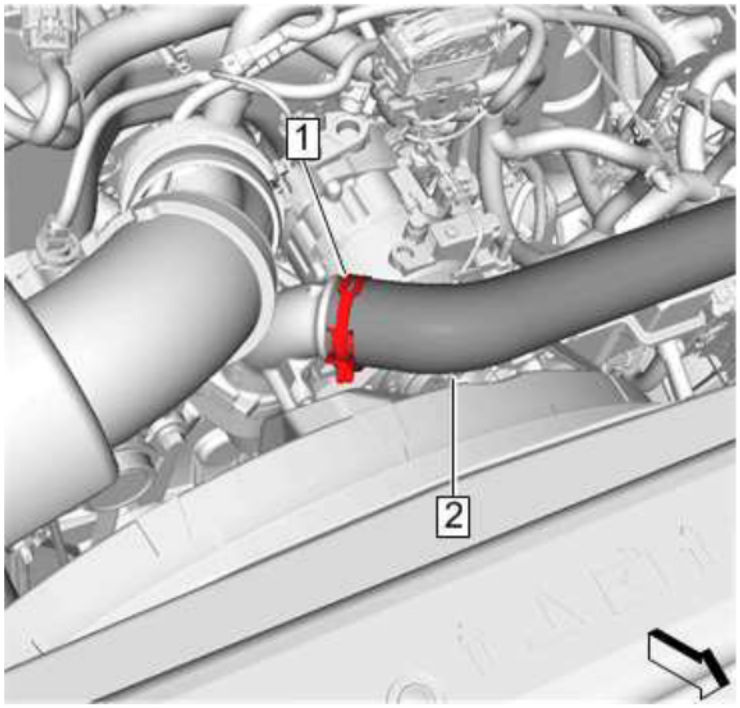

Fig. 163: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Inlet Hose 2 @Water Outlet - Install
2. Radiator Inlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**

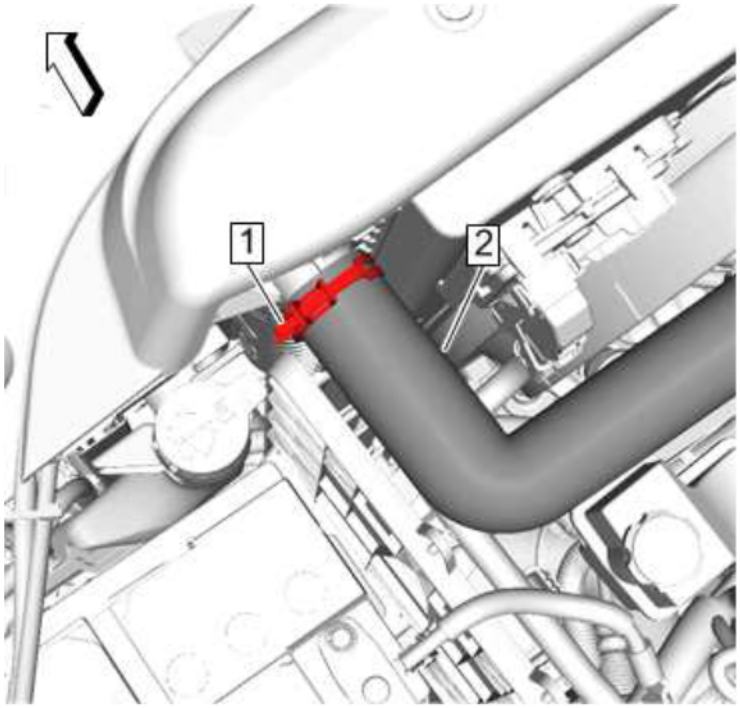

Fig. 164: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Inlet Hose 2 @Radiator - Install
4. Radiator Inlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**

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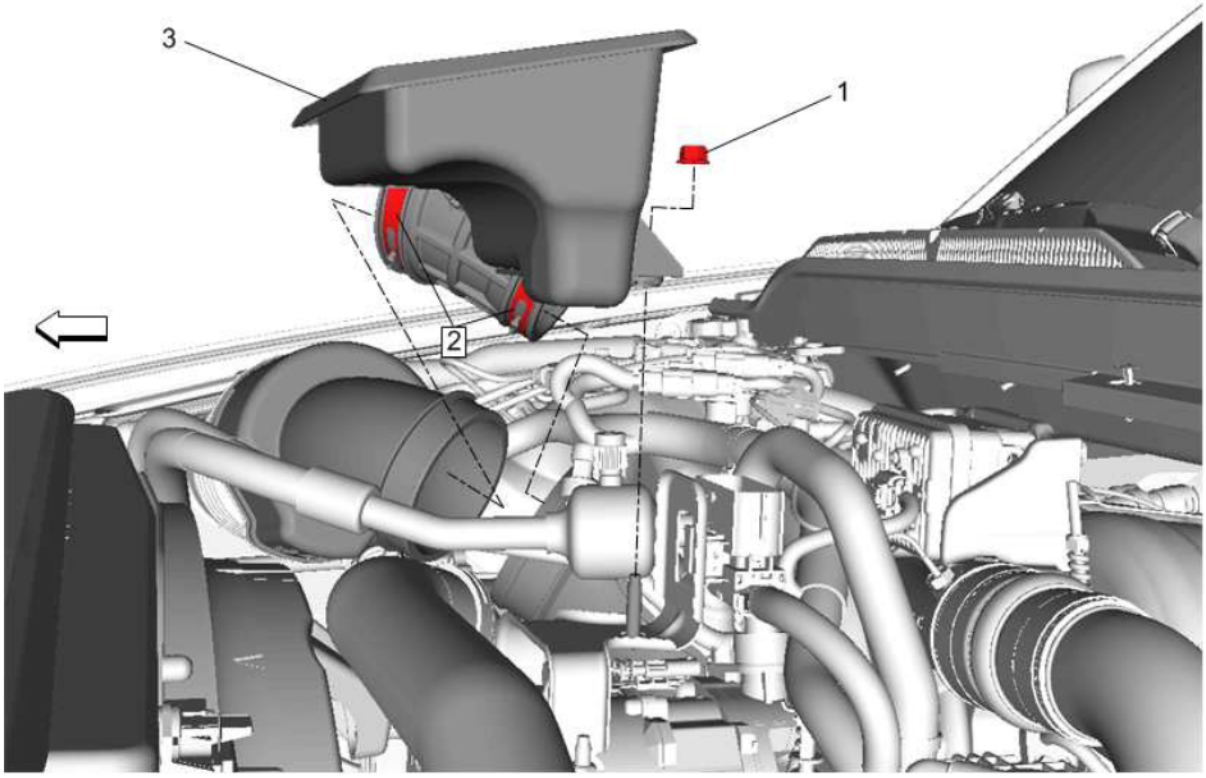

Fig. 165: Air Cleaner Outlet Resonator
Courtesy of GENERAL MOTORS COMPANY

5. Air Cleaner Outlet Resonator 3 - Install - **Air Cleaner Outlet Resonator Replacement**
6. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
7. Start the engine and check for coolant leaks.

RADIATOR OUTLET HOSE REPLACEMENT (L83, L86)

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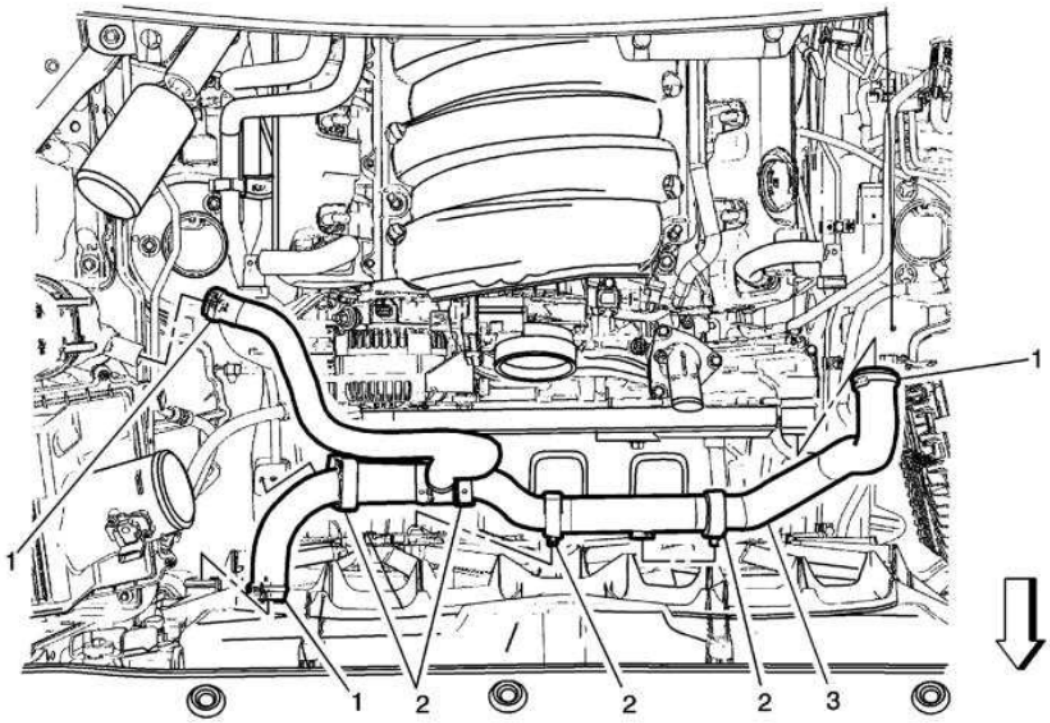

Fig. 166: Radiator Outlet Hose (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Outlet Hose Clamp (Qty: 3) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator outlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Outlet Hose Retainer (Qty: 3) **Procedure** Remove the radiator outlet hose retainers from the engine coolant fan rear shroud and the radiator outlet pipe bracket.
3	Radiator Outlet Hose **Procedure** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

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RADIATOR OUTLET HOSE REPLACEMENT (LV3)

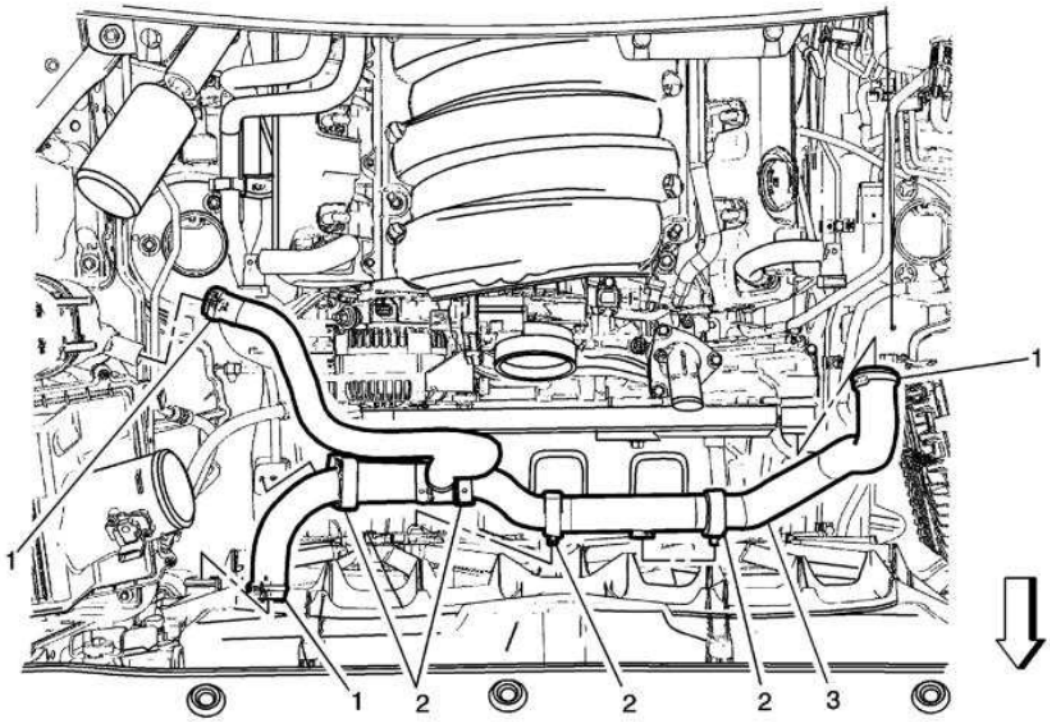

Fig. 167: Radiator Outlet Hose (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Outlet Hose Clamp (Qty: 3) **Procedure** Using **BO-38185** hose clamp pliers , reposition the radiator outlet hose clamps. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Outlet Hose Retainer (Qty: 3) **Procedure** Remove the radiator outlet hose retainers from the engine coolant fan rear shroud and drivetrain and front suspension frame.
3	Radiator Outlet Hose **Procedure** 1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

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RADIATOR OUTLET HOSE REPLACEMENT (LC8, L96)

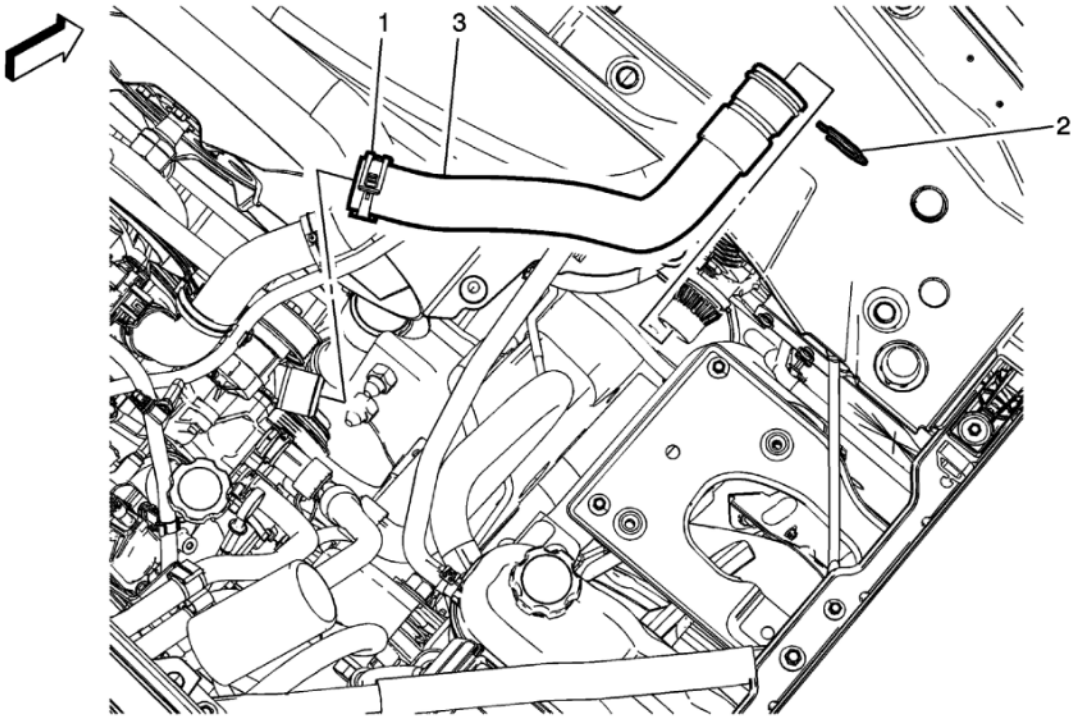

Fig. 168: Radiator Outlet Hose (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .	
1	Radiator Outlet Hose Clamp **Procedure** Disengage tension on the radiator outlet hose clamp using **BO-38185** hose clamp pliers and remove the radiator outlet hose and clamp from the water pump. **Special Tools** **BO-38185** Hose Clamp Pliers For equivalent regional tools, refer to **Special Tools**.
2	Radiator Outlet Hose Retaining Clip **Procedure** Remove the retaining clip from the radiator outlet hose connector.
3	Radiator Outlet Hose **Procedure** 1. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling**

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Callout	Component Name
	(Vac N Fill LC8 L96). 2. Inspect the cooling system for leaks. Refer to Cooling System Leak Testing (LC8, L96).

RADIATOR OUTLET HOSE REPLACEMENT (L8B)

Removal Procedure

1. Drain the cooling system. Cooling System Draining and Filling (Vac N Fill L8B)

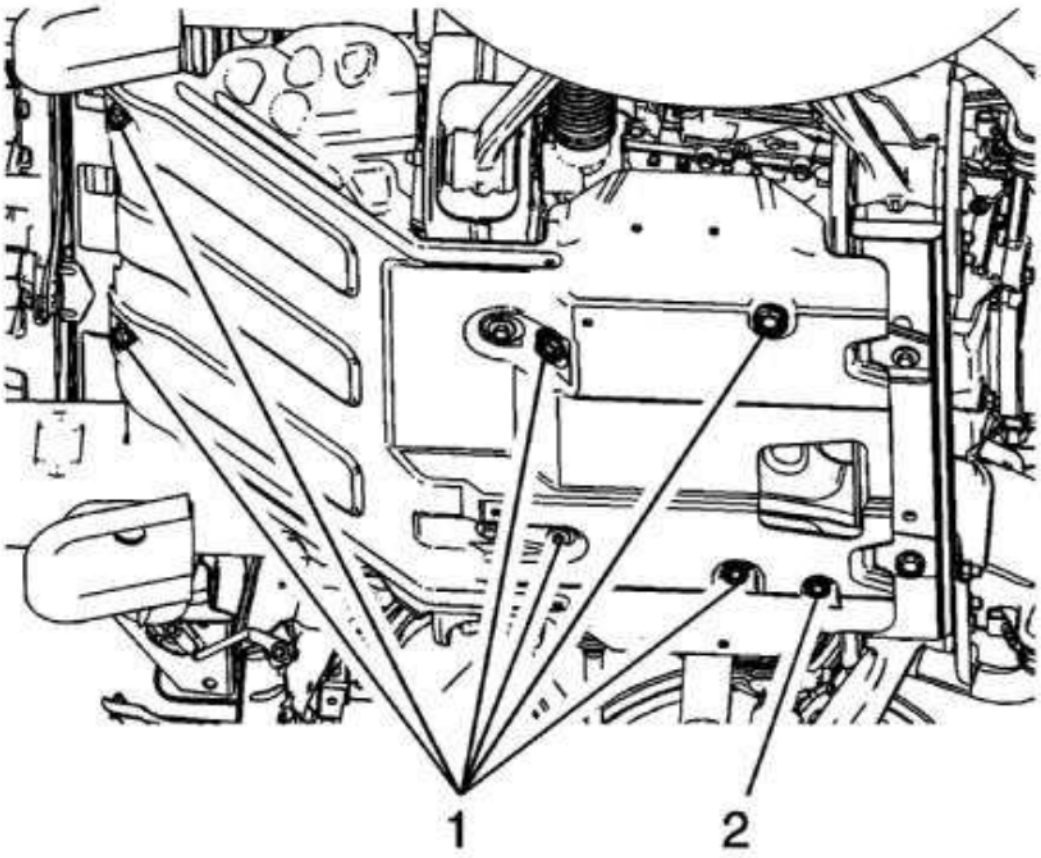

Fig. 169: Steering Gear Skid Shield Mounting Fasteners
Courtesy of GENERAL MOTORS COMPANY

2. Steering Gear Skid Shield 2 - Remove - Steering Gear Skid Shield Replacement

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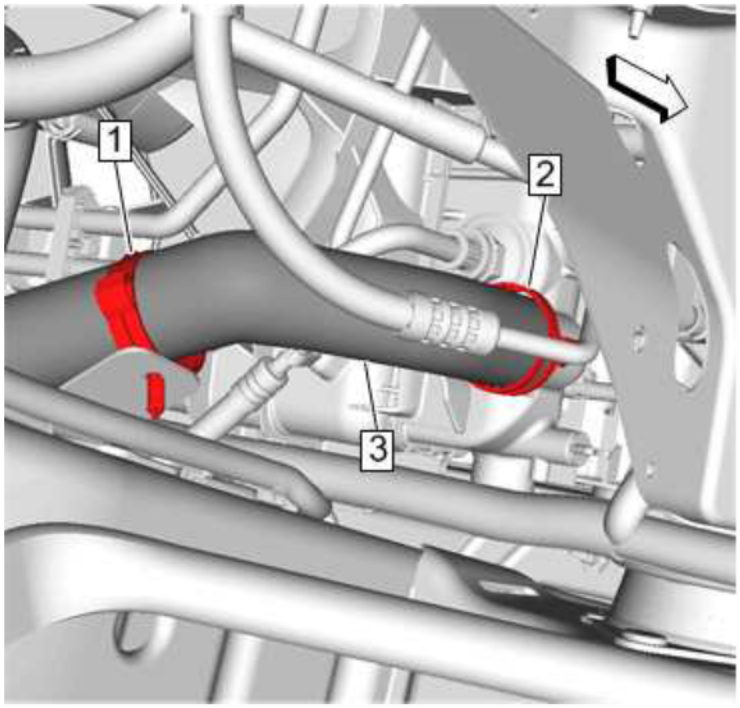

Fig. 170: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Outlet Hose Clip 1 @Radiator Outlet Pipe Bracket - Remove
4. Radiator Outlet Hose Clamp 2 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
5. Radiator Outlet Hose 3 @Radiator - Remove

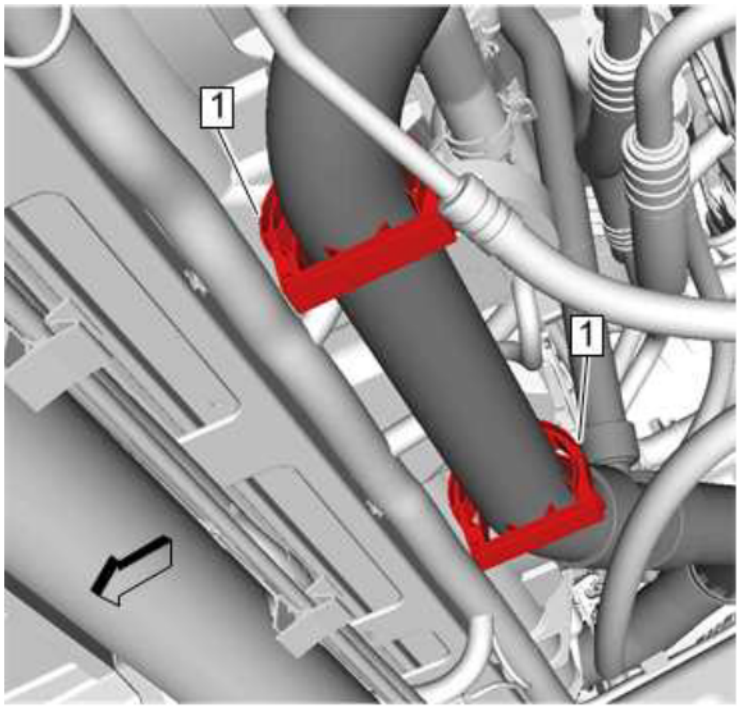

Fig. 171: Radiator Outlet Hose Clips
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Outlet Hose Clip 1 @Engine Coolant Fan Shroud - Remove

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7. Lower the vehicle. **Lifting and Jacking the Vehicle**
8. Air Cleaner Outlet Duct - Remove **Air Cleaner Outlet Duct Replacement**

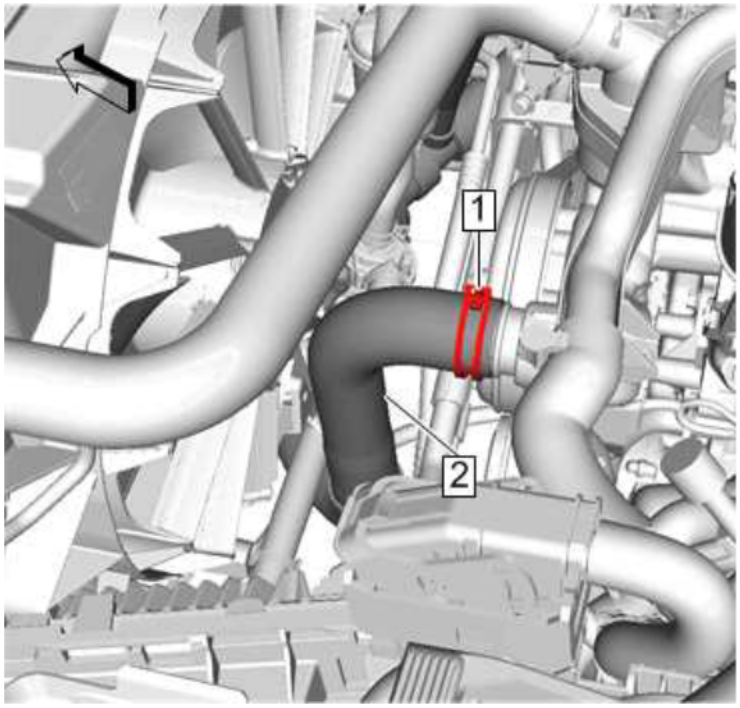

Fig. 172: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

9. Radiator Outlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
10. Radiator Outlet Hose 2 @Engine Coolant Manifold - Remove

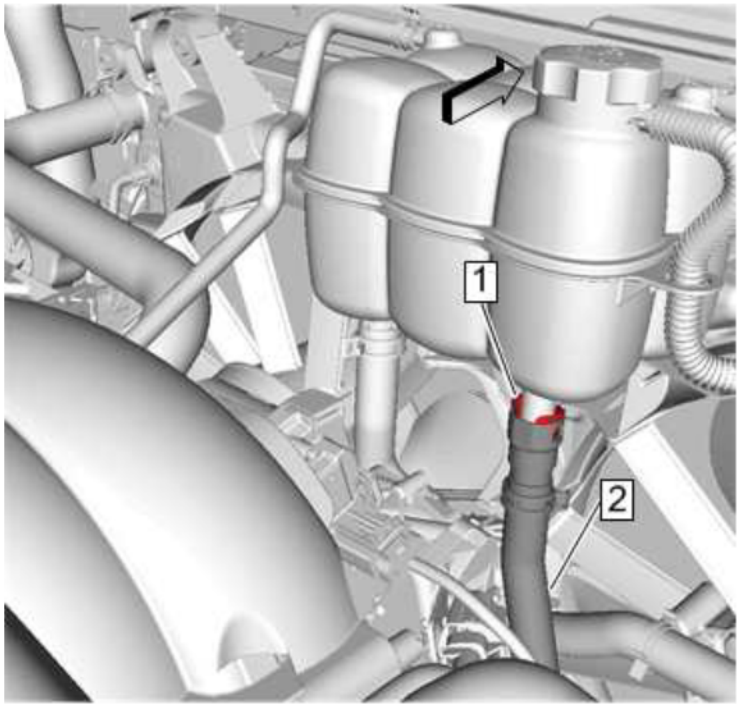

Fig. 173: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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11. Radiator Outlet Hose Retainer 1 - Disengage
12. Radiator Outlet Hose 2 @Radiator Surge Tank - Remove
13. Radiator Outlet Hose 2 - Remove

Installation Procedure

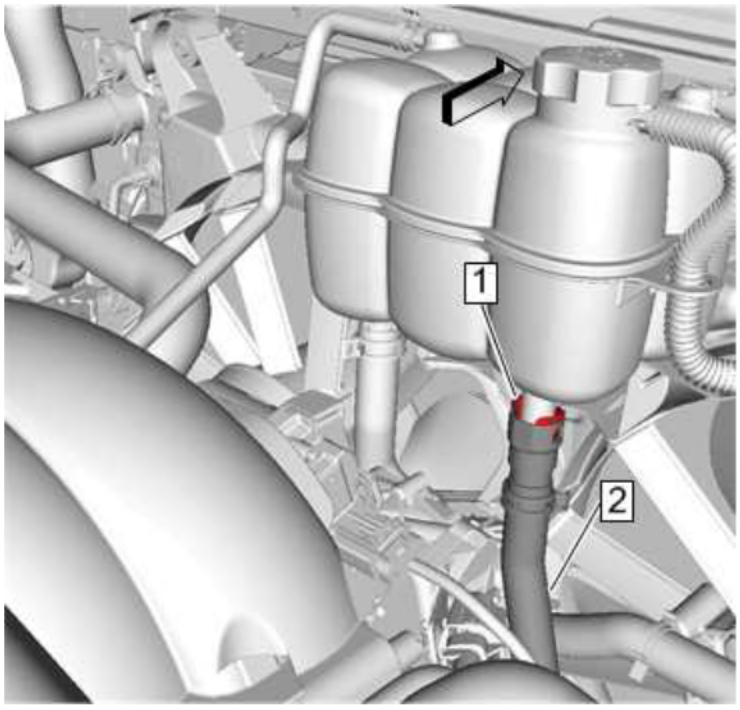

Fig. 174: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Radiator Outlet Hose 2 @Radiator Surge Tank - Install

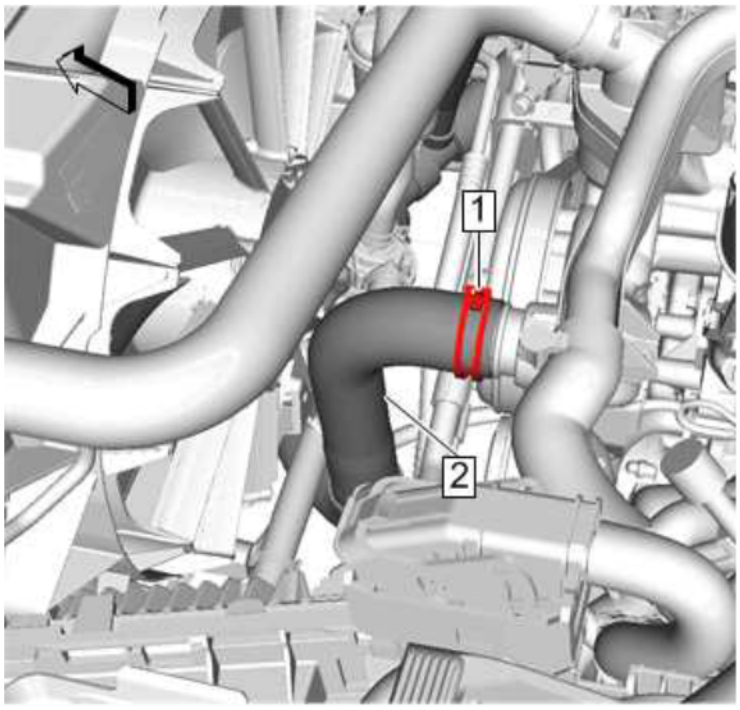

Fig. 175: Radiator Outlet Hose

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Courtesy of GENERAL MOTORS COMPANY

2. Radiator Outlet Hose 2 @Engine Coolant Manifold - Install
3. Radiator Outlet Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
4. Air Cleaner Outlet Duct - Install **Air Cleaner Outlet Duct Replacement**
5. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

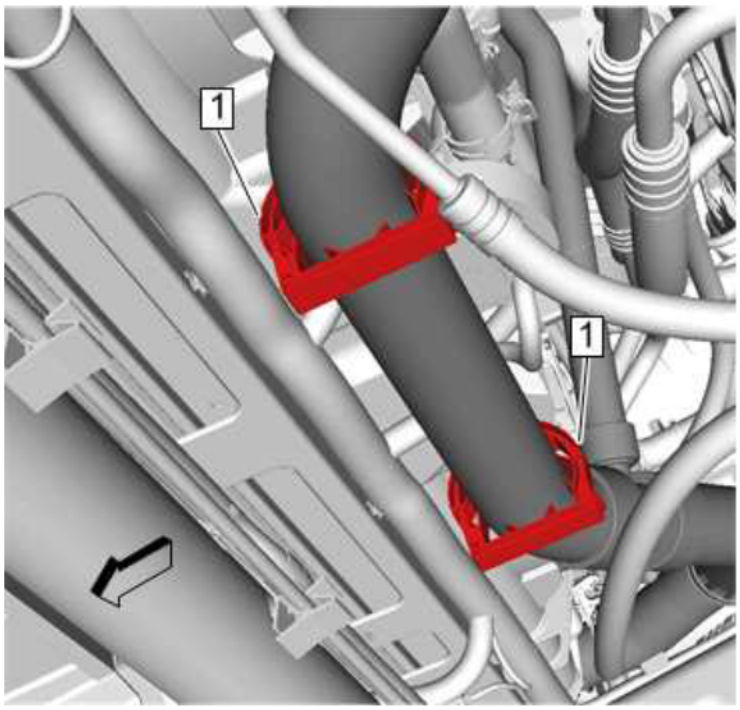

Fig. 176: Radiator Outlet Hose Clips
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Outlet Hose Clip 1 @Engine Coolant Fan Shroud - Install

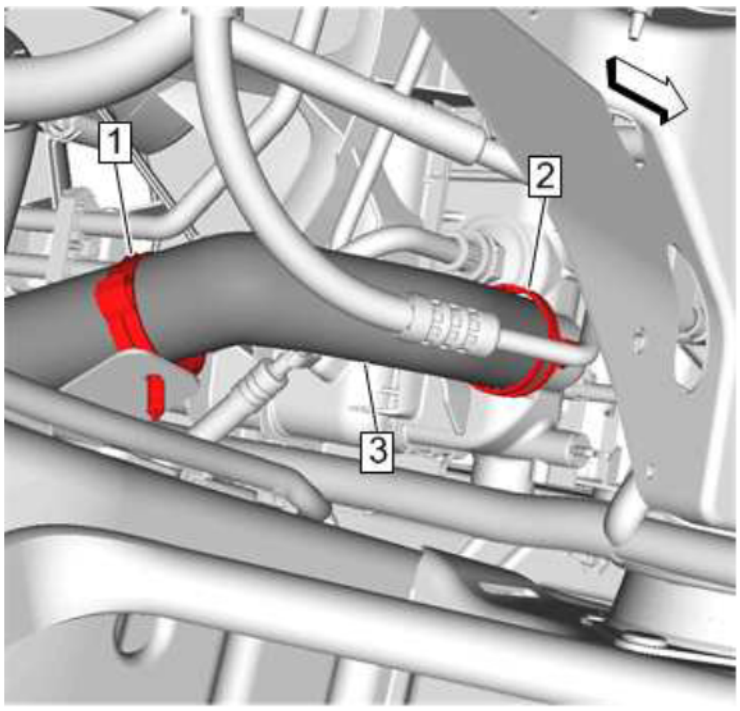

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Fig. 177: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Outlet Hose 3 @Radiator - Install
8. Radiator Outlet Hose Clamp 2 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
9. Radiator Outlet Hose Clip 1 @Radiator Outlet Pipe Bracket - Install

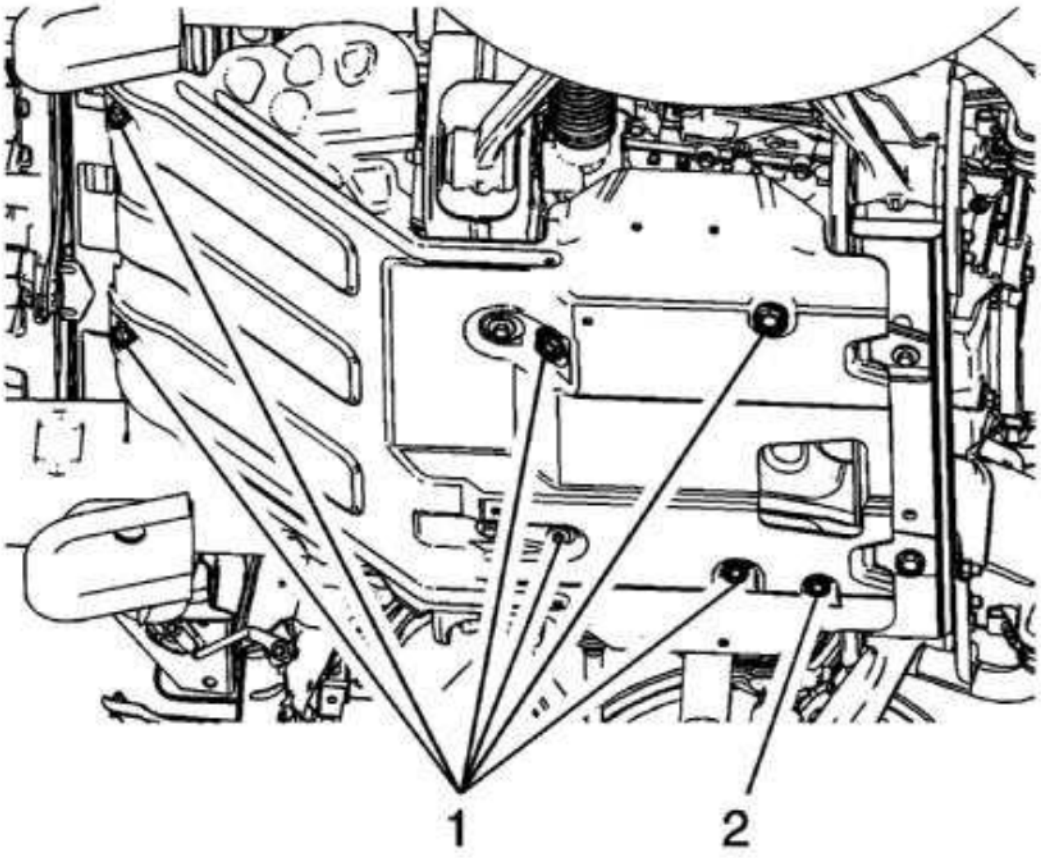

Fig. 178: Steering Gear Skid Shield Mounting Fasteners
Courtesy of GENERAL MOTORS COMPANY

10. Steering Gear Skid Shield 2 - Install **Steering Gear Skid Shield Replacement**
11. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
12. Start the engine and check for coolant leaks.

RADIATOR OUTLET HOSE REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

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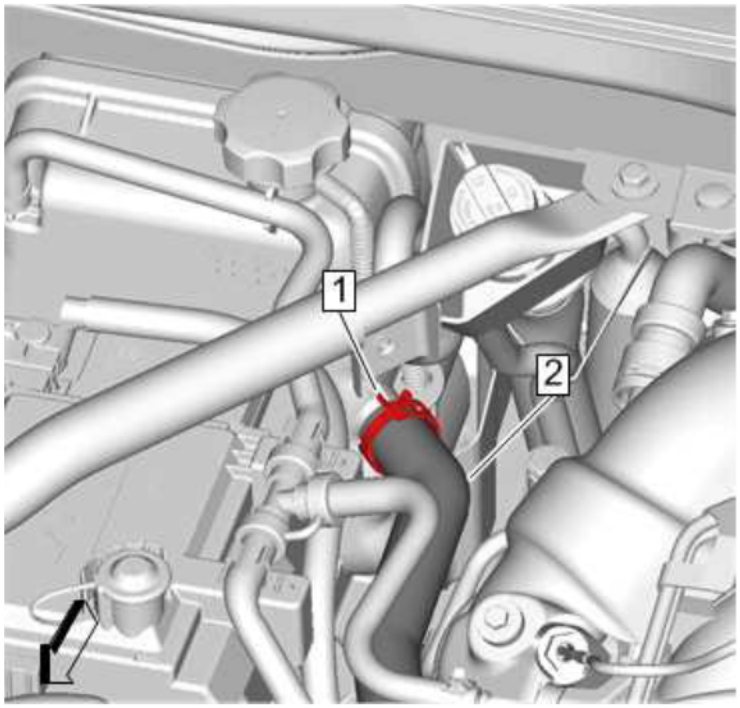

Fig. 179: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

2. Radiator Outlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
3. Radiator Outlet Hose 2 @Radiator Surge Tank - Remove

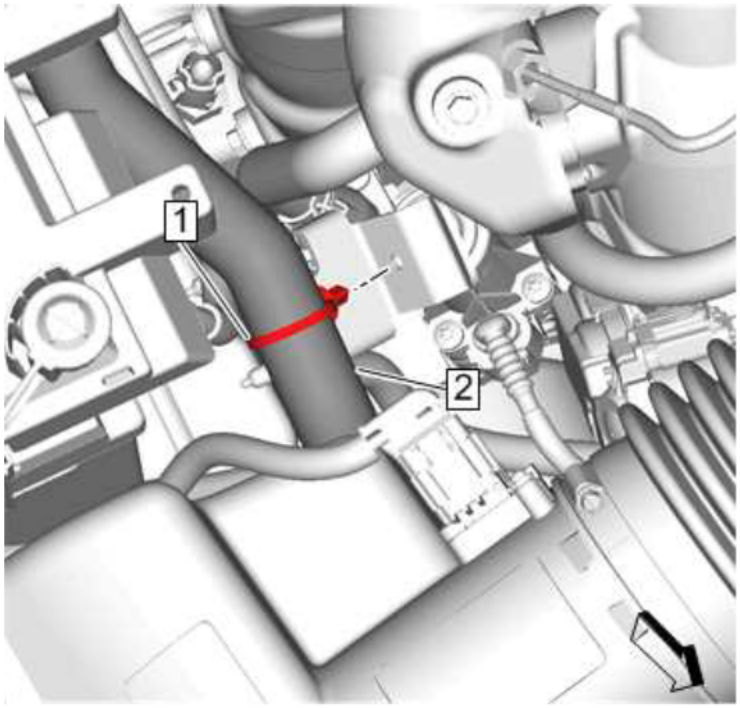

Fig. 180: Radiator Outlet Hose Clip And Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Outlet Hose Clip 1 @Heater Outlet Pipe - Remove

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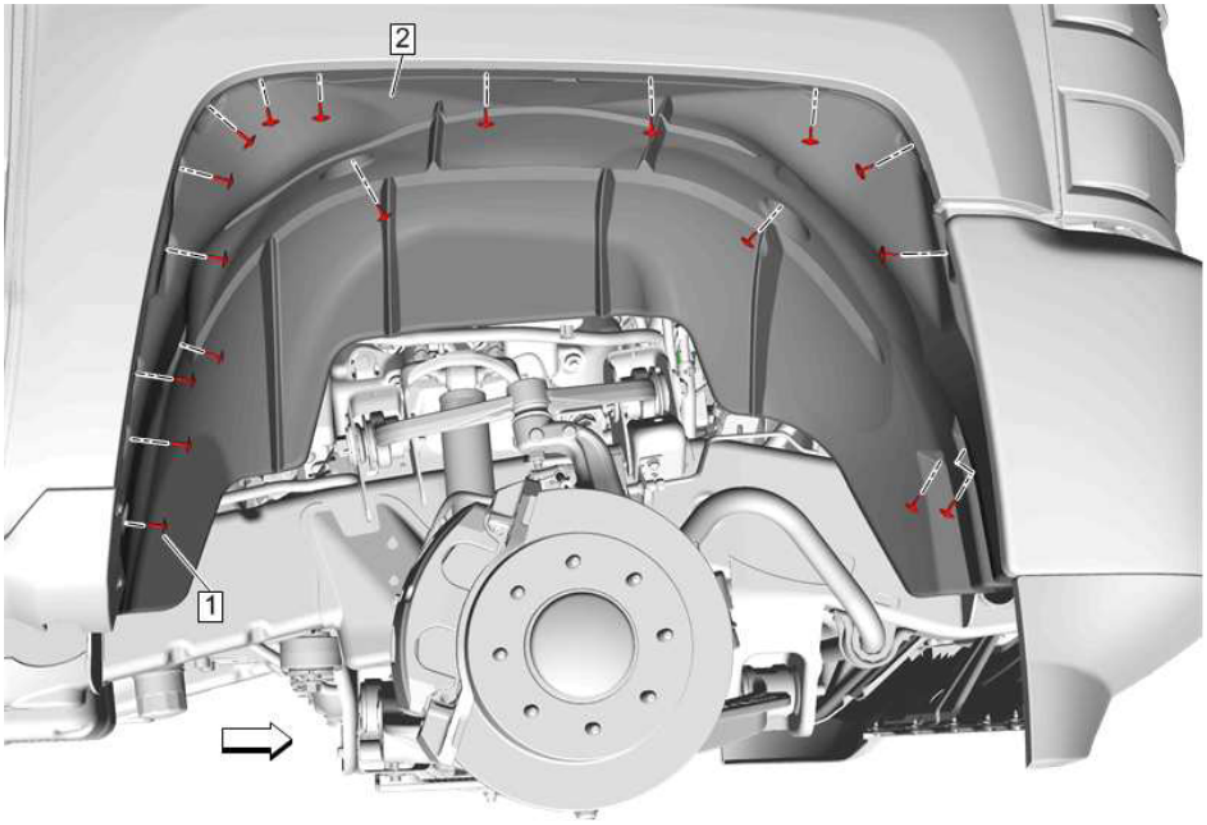

Fig. 181: Front Wheelhouse Liner
Courtesy of GENERAL MOTORS COMPANY

5. Front Wheelhouse Liner-Right Side 2 - Remove **Front Wheelhouse Liner Replacement - Right Side**

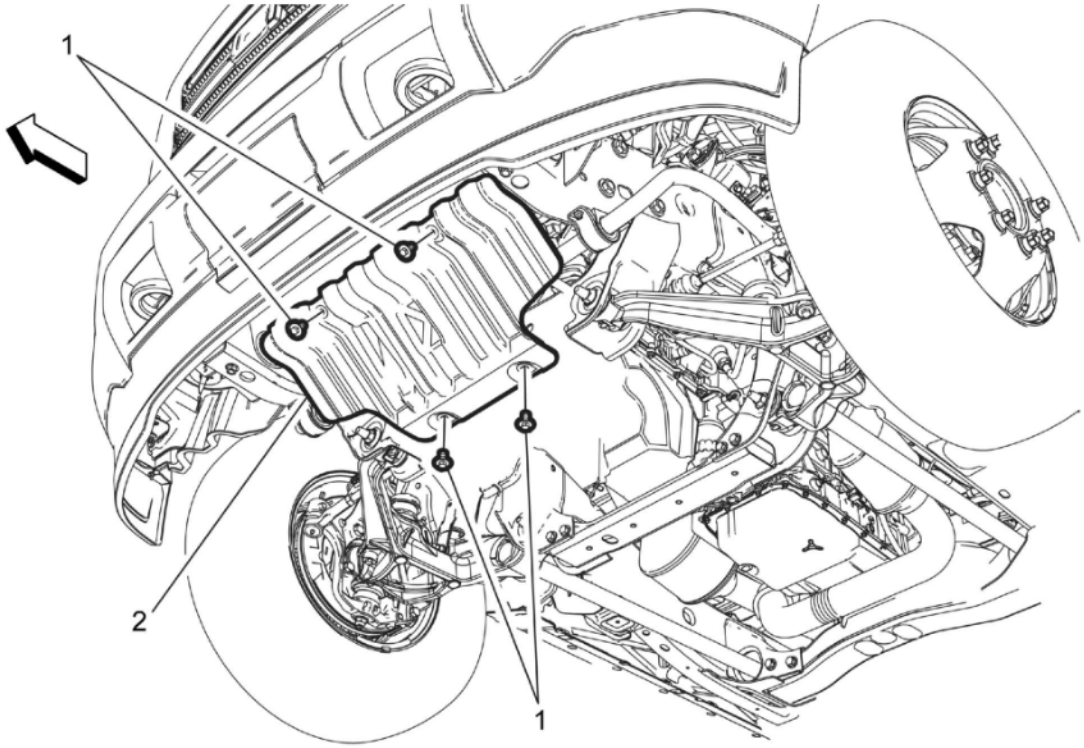

Fig. 182: Underbody Splash Shield

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Courtesy of GENERAL MOTORS COMPANY

6. Underbody Splash Shield 2 - Remove **Underbody Splash Shield Replacement**

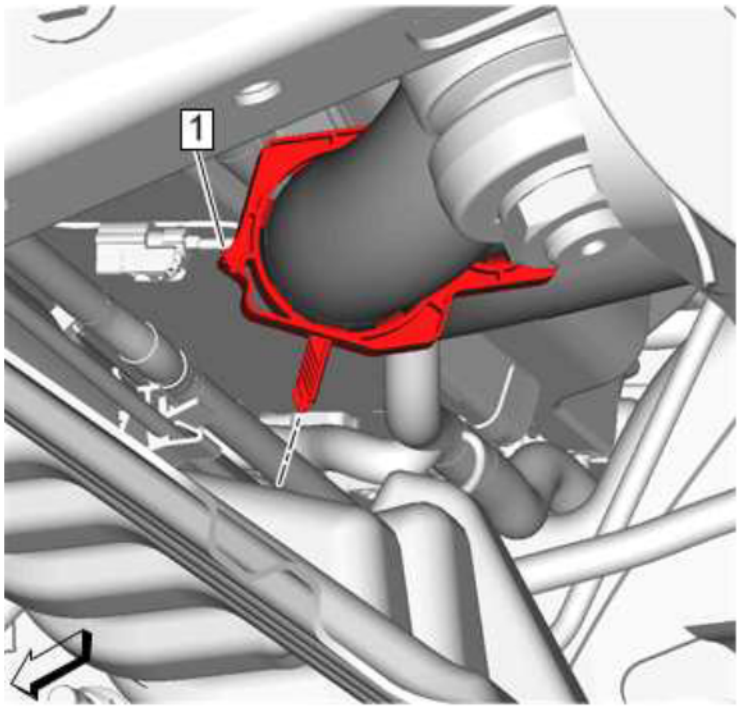

Fig. 183: Radiator Outlet Hose Clip And Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Outlet Hose Clip 1 @Underbody Splash Shield - Remove

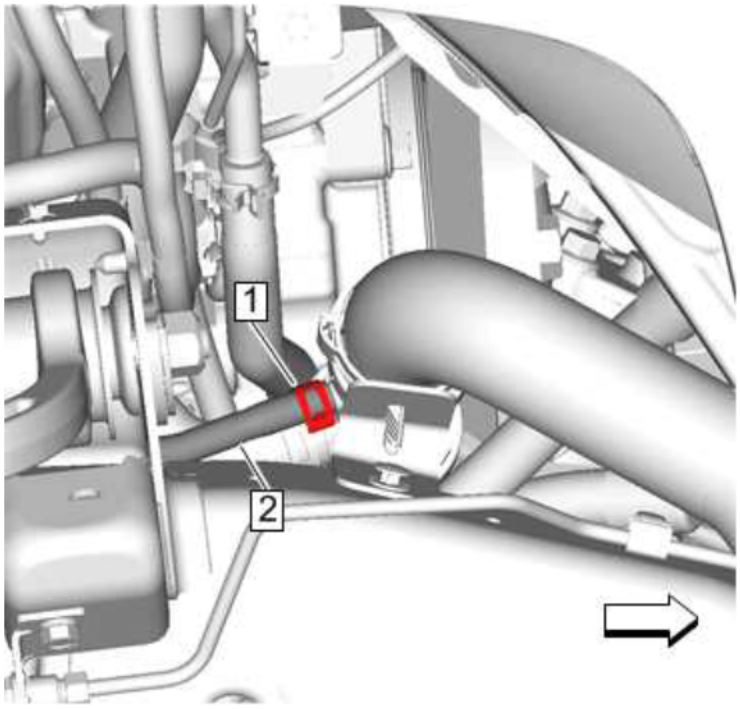

Fig. 184: Emission Reduction Fluid Injector Outlet Hose And Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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8. Emission Reduction Fluid Injector Outlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
9. Emission Reduction Fluid Injector Outlet Hose 2 @Radiator Outlet Hose - Remove

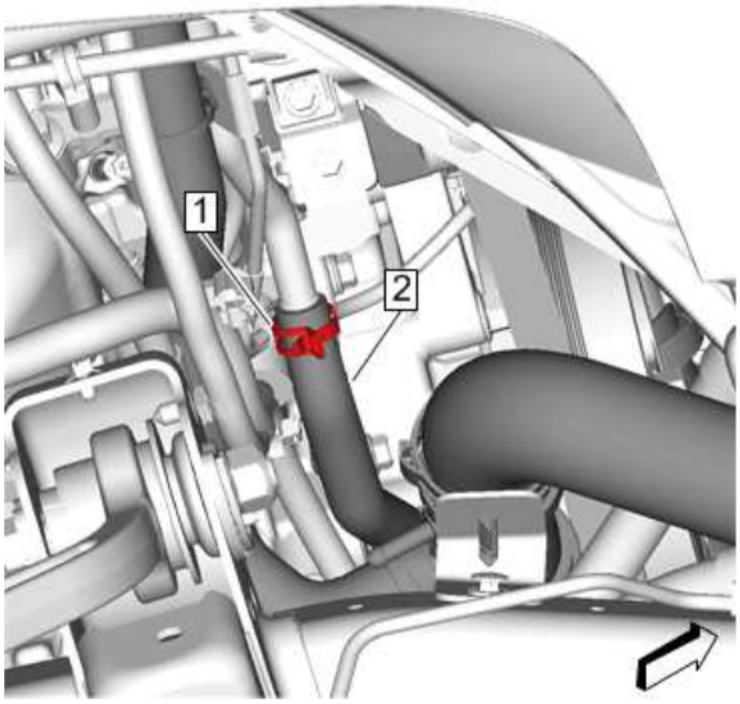

Fig. 185: Radiator Outlet Hose And Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

10. Radiator Outlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
11. Radiator Outlet Hose 2 @Heater Outlet Pipe - Remove

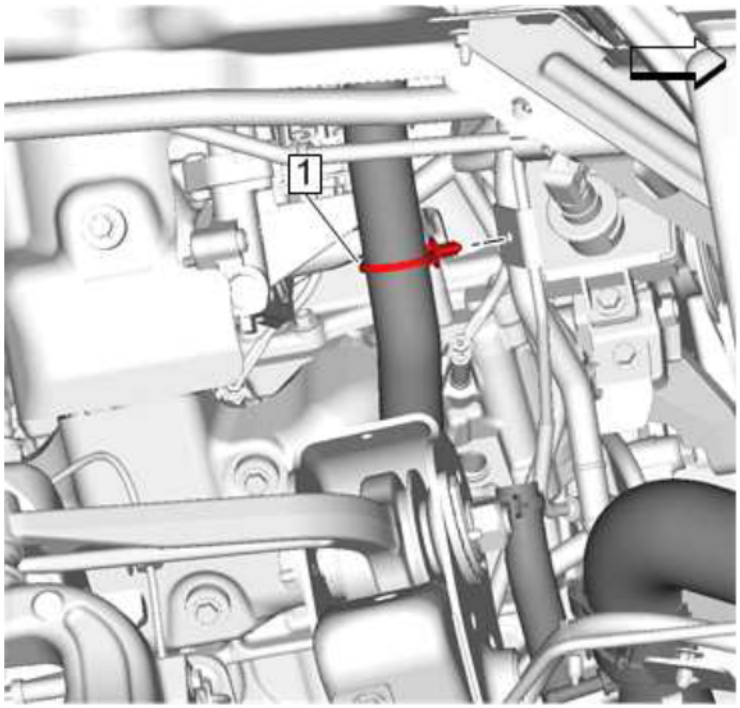

Fig. 186: Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

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12. Radiator Outlet Hose Clip 1 @Heater Outlet Pipe - Remove

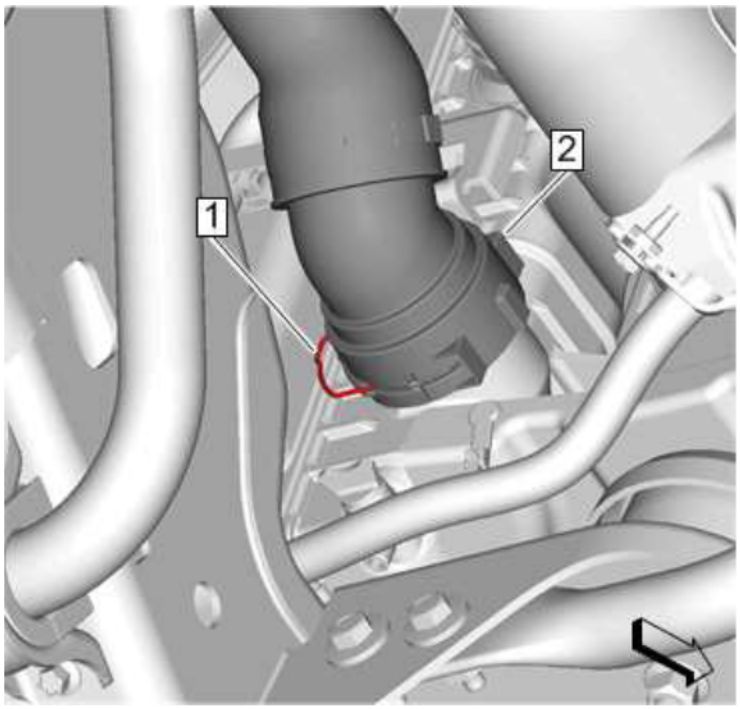

Fig. 187: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

13. Radiator Outlet Hose Retainer 1 - Disengage
14. Radiator Outlet Hose 2 @Radiator - Remove

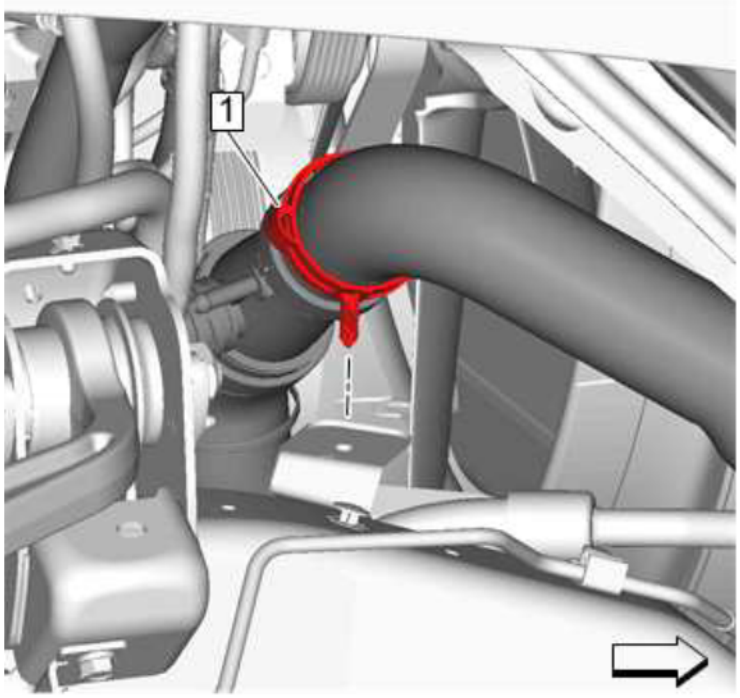

Fig. 188: Radiator Outlet Hose Clip And Radiator Outlet Pipe Bracket
Courtesy of GENERAL MOTORS COMPANY

15. Radiator Outlet Hose Clip 2 @Radiator Outlet Pipe Bracket - Remove

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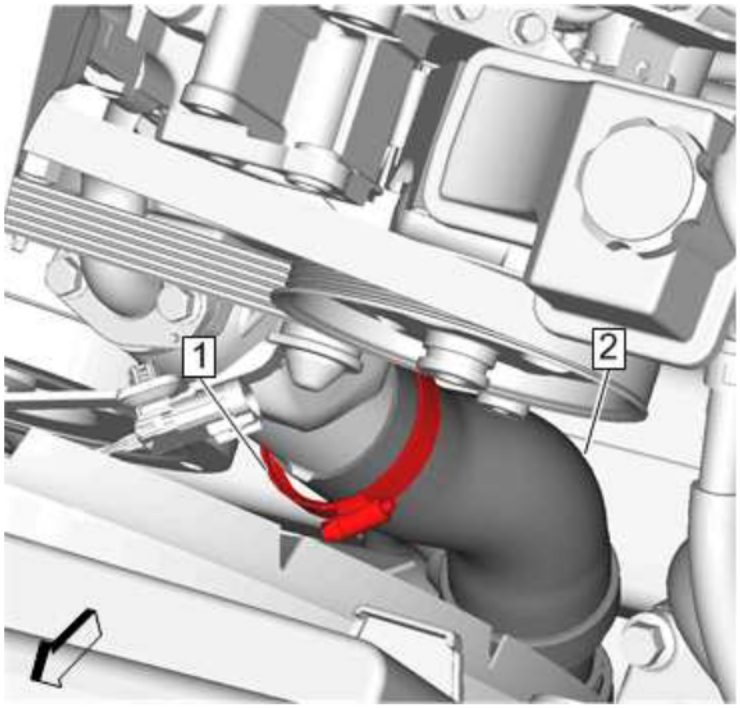

Fig. 189: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

16. Radiator Outlet Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
17. Radiator Outlet Hose 2 @Water Pump - Remove
18. Radiator Outlet Hose 2 - Remove

Installation Procedure

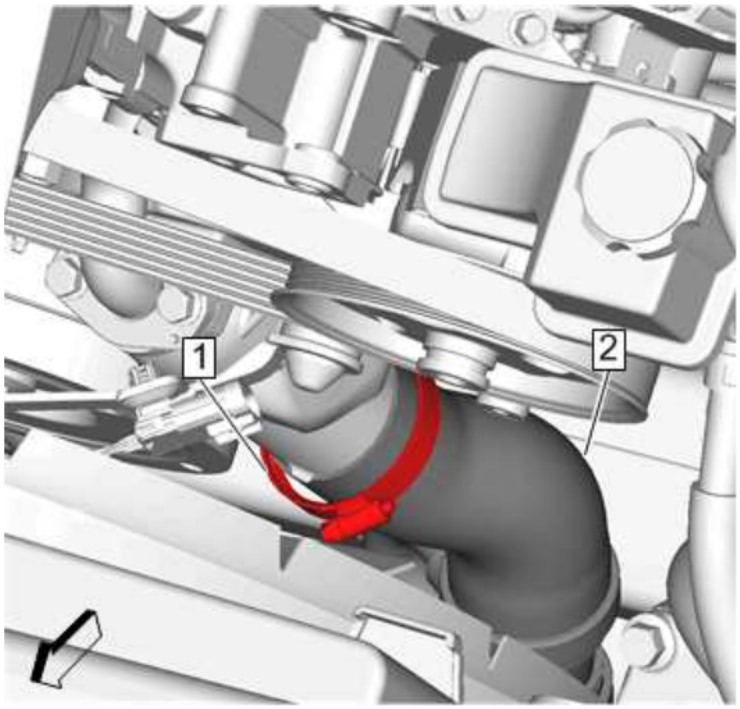

Fig. 190: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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1. Radiator Outlet Hose 2 @Water Pump - Install
2. Radiator Outlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**

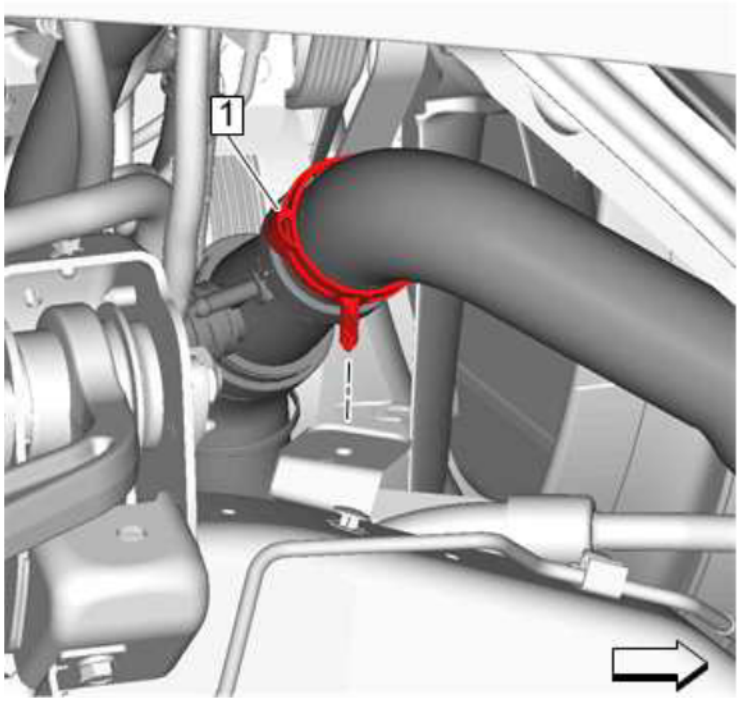

Fig. 191: Radiator Outlet Hose Clip And Radiator Outlet Pipe Bracket
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Outlet Hose Clip 1 @Radiator Outlet Pipe Bracket - Install

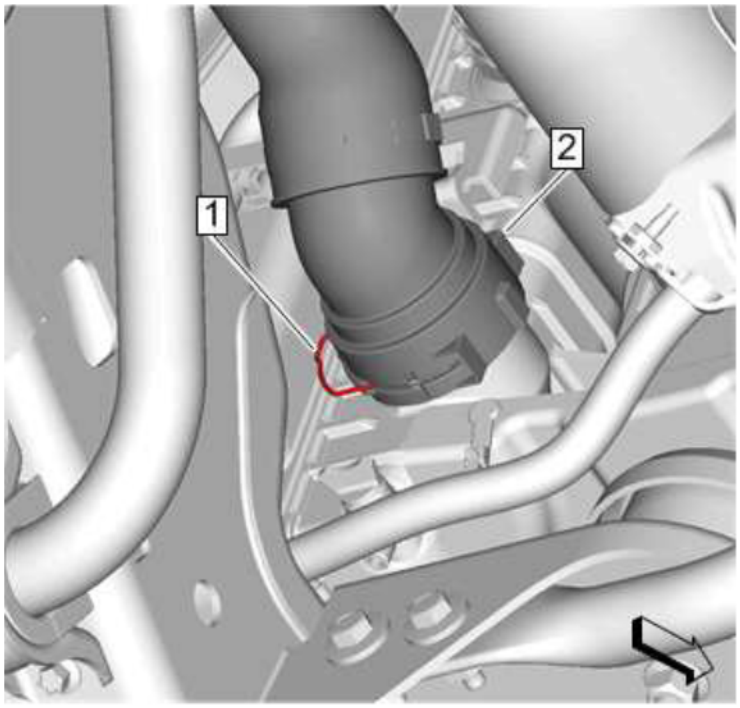

Fig. 192: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Outlet Hose 2 @Radiator - Install

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5. Radiator Outlet Hose Retainer 1 - Engage

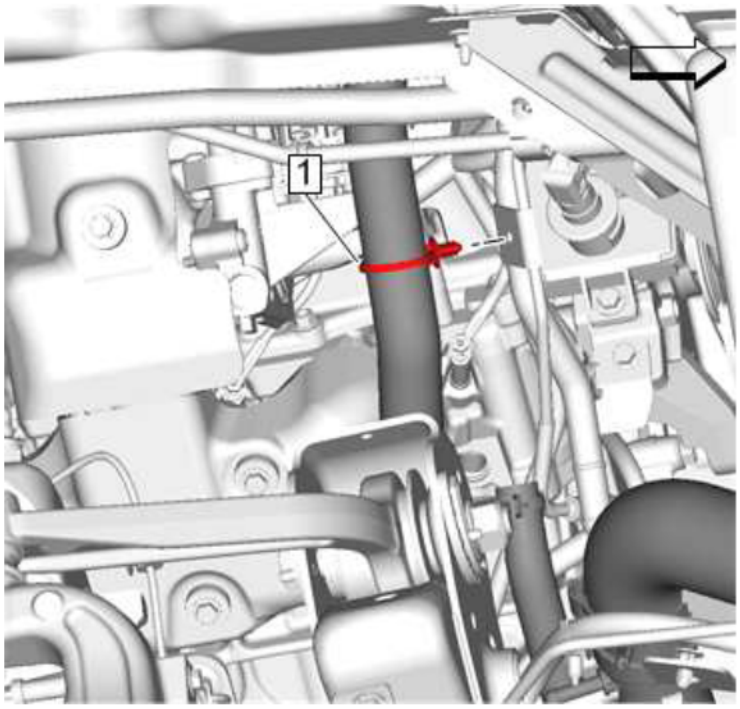

Fig. 193: Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

6. Radiator Outlet Hose Clip 1 @Heater Outlet Pipe - Install

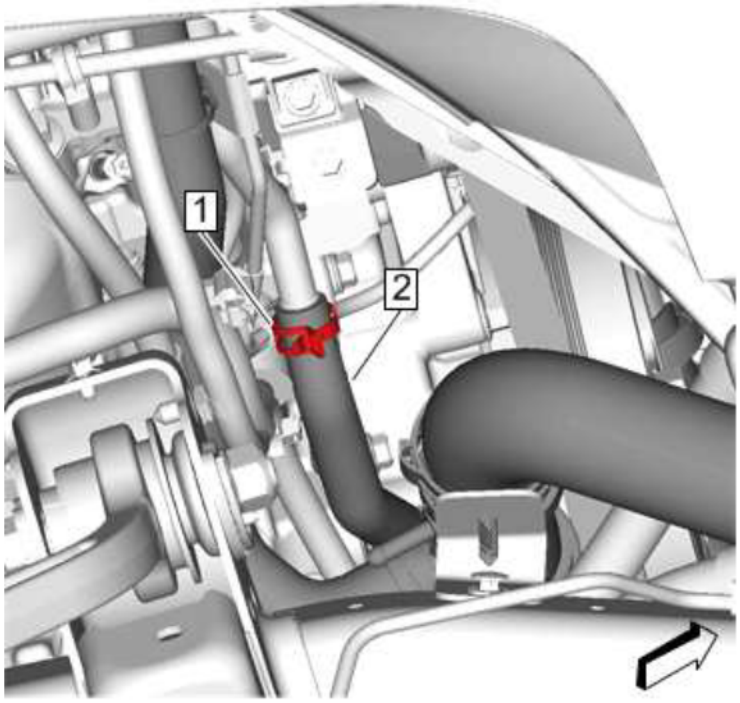

Fig. 194: Radiator Outlet Hose And Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Outlet Hose 2 @Heater Outlet Pipe - Install
8. Radiator Outlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**

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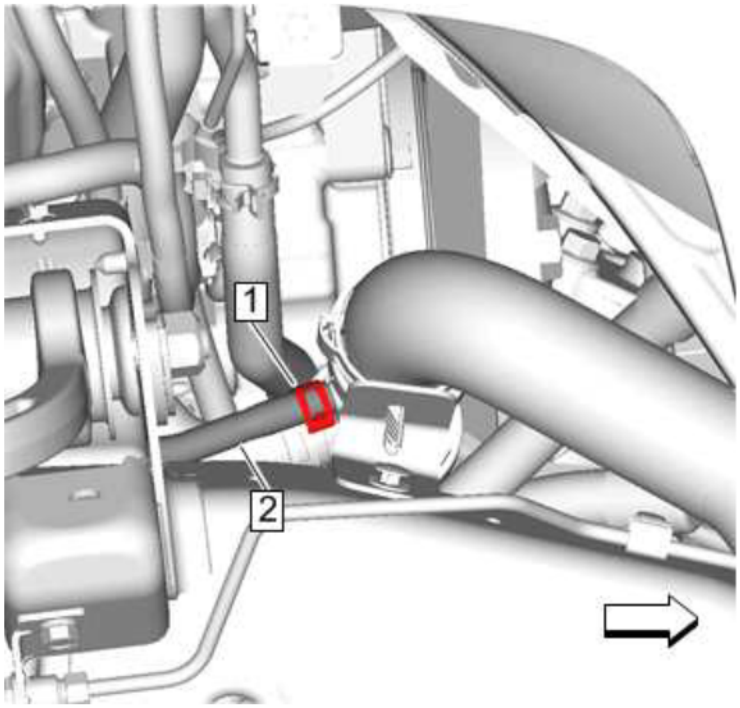

Fig. 195: Emission Reduction Fluid Injector Outlet Hose And Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

9. Emission Reduction Fluid Injector Outlet Hose 2 @Radiator Outlet Hose - Install
10. Emission Reduction Fluid Injector Outlet Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**

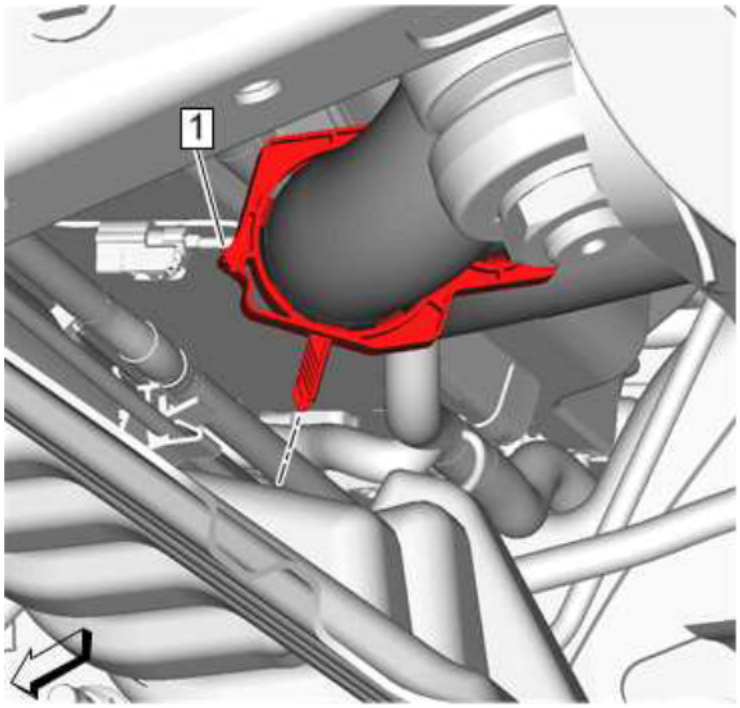

Fig. 196: Radiator Outlet Hose Clip And Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

11. Radiator Outlet Hose Clip 1 @Underbody Splash Shield - Install

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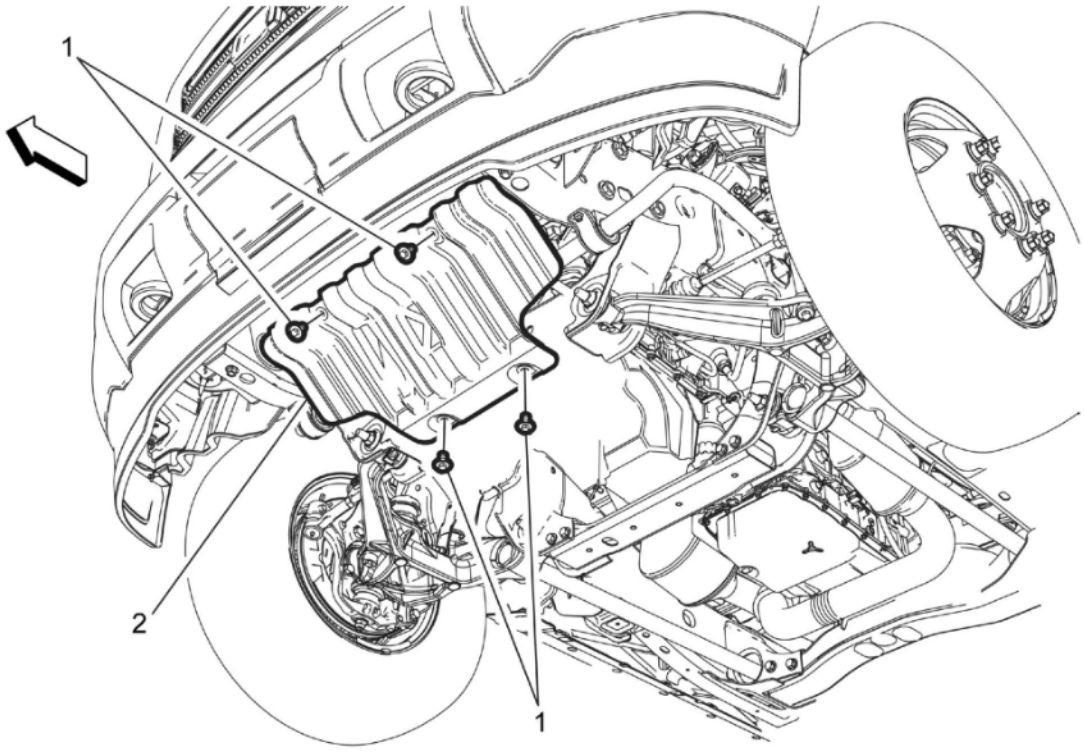

Fig. 197: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

12. Underbody Splash Shield 2 - Install **Underbody Splash Shield Replacement**

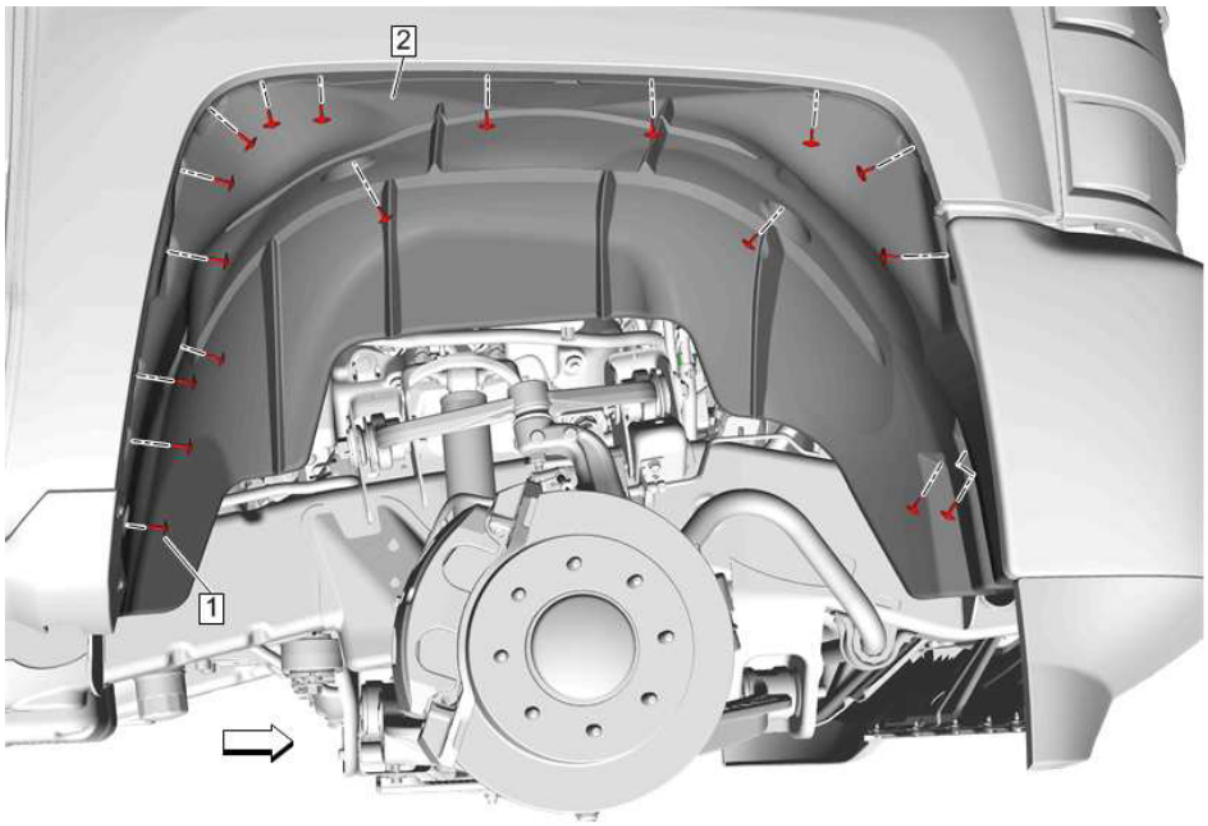

Fig. 198: Front Wheelhouse Liner

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Courtesy of GENERAL MOTORS COMPANY

13. Front Wheelhouse Liner-Right Side 2 - Install **Front Wheelhouse Liner Replacement - Right Side**

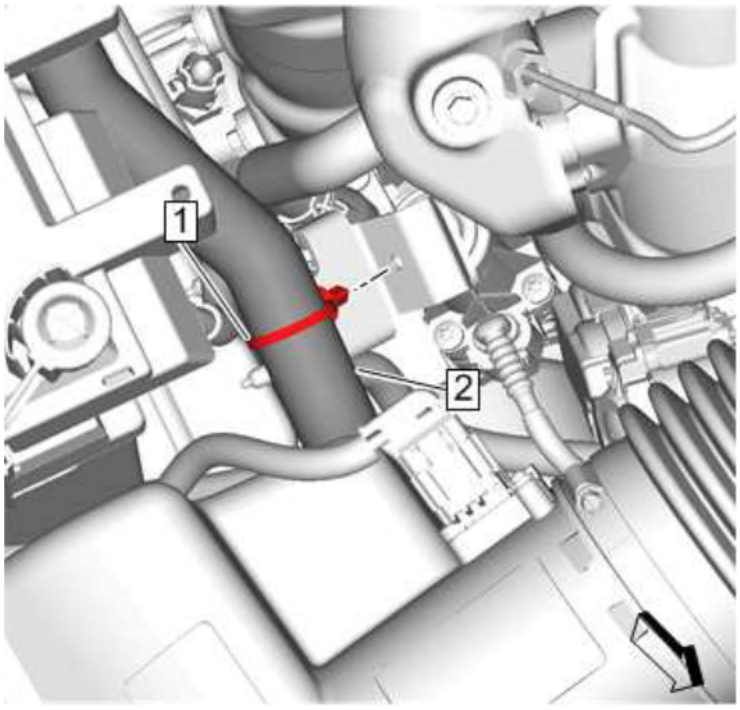

Fig. 199: Radiator Outlet Hose Clip And Heater Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

14. Radiator Outlet Hose Clip 1 @Heater Outlet Pipe - Install

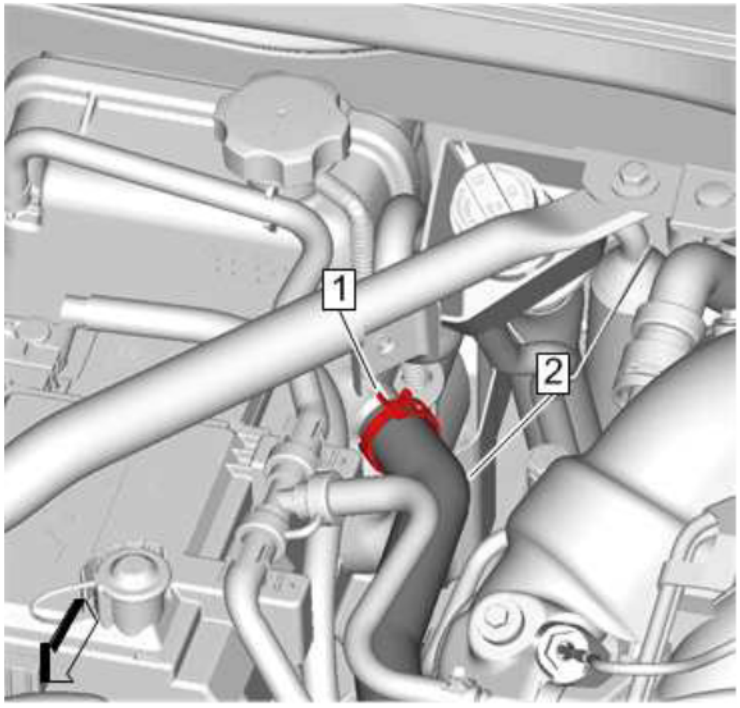

Fig. 200: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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15. Radiator Outlet Hose 2 @Radiator Surge Tank - Install
16. Radiator Outlet Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
17. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
18. Start the engine and check for coolant leaks.

RADIATOR LOWER MOUNT REPLACEMENT (L8B)

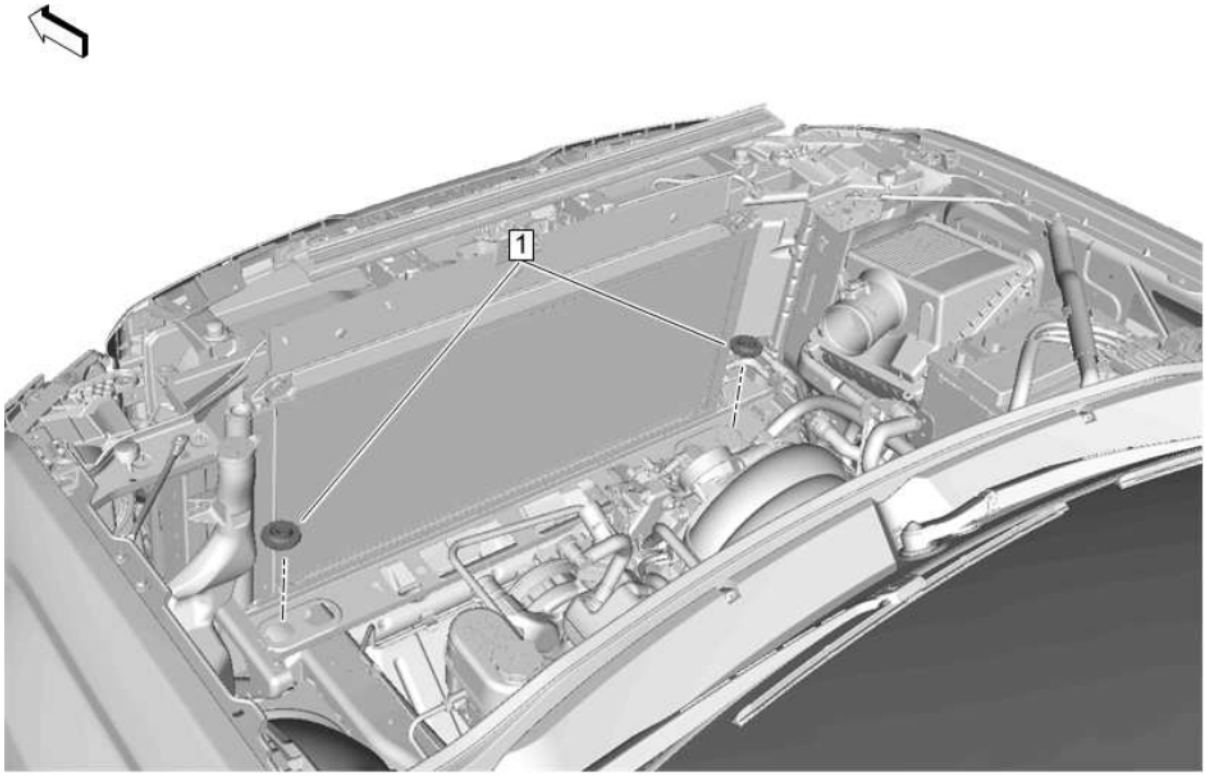

Fig. 201: Radiator Lower Mount (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the radiator. **Radiator Replacement (L8B)**.	
1	Radiator Lower Mount

ENGINE OIL COOLER REPLACEMENT (2WD, L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Remove and DISCARD the oil filter. **Engine Oil and Oil Filter Replacement**

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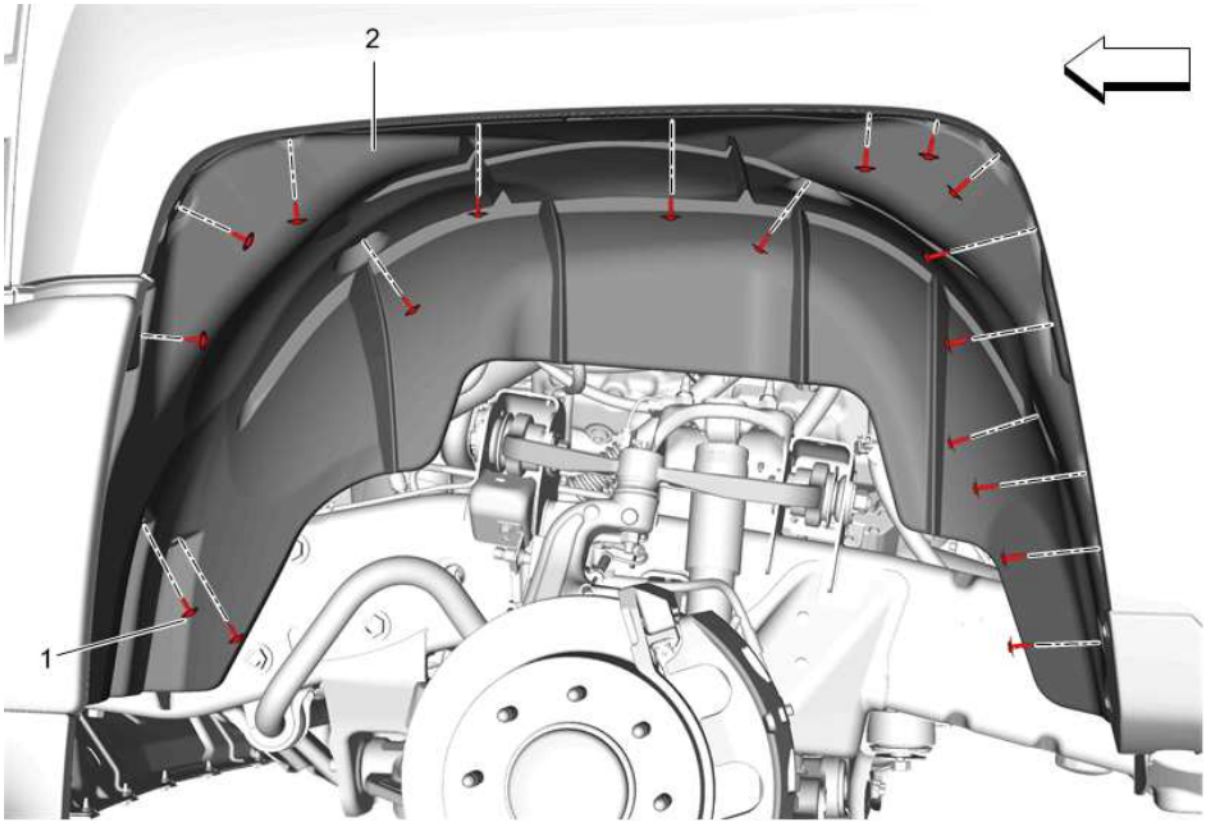

Fig. 202: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

3. Front Wheelhouse Liner-Left Side 2 - Remove - **Front Wheelhouse Liner Replacement - Left Side**

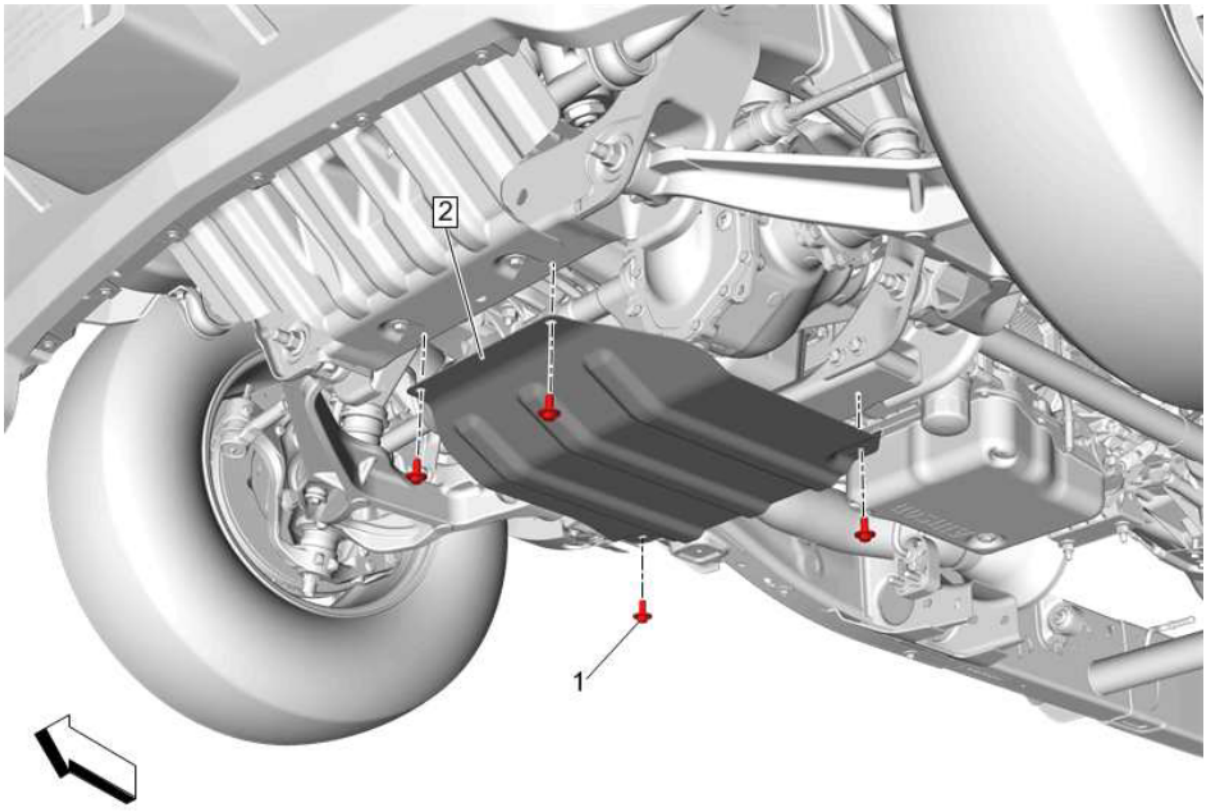

Fig. 203: Underbody Skid Shield

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Courtesy of GENERAL MOTORS COMPANY

4. Underbody Skid Shield 2 - Remove **Underbody Skid Shield Replacement**

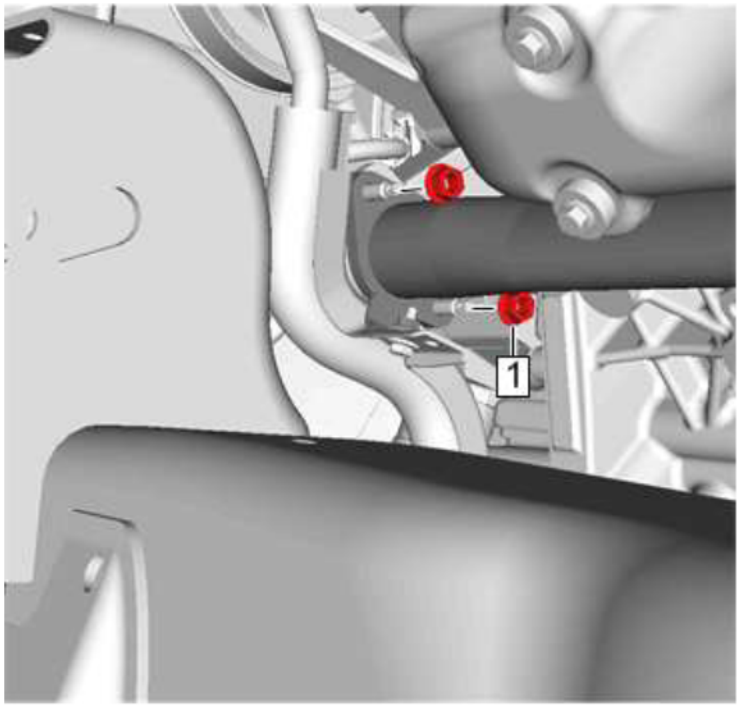

Fig. 204: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

5. Engine Wiring Harness Bracket Bolt 1 - Remove
6. Water Pump Outlet Pipe Nut 2 - Remove

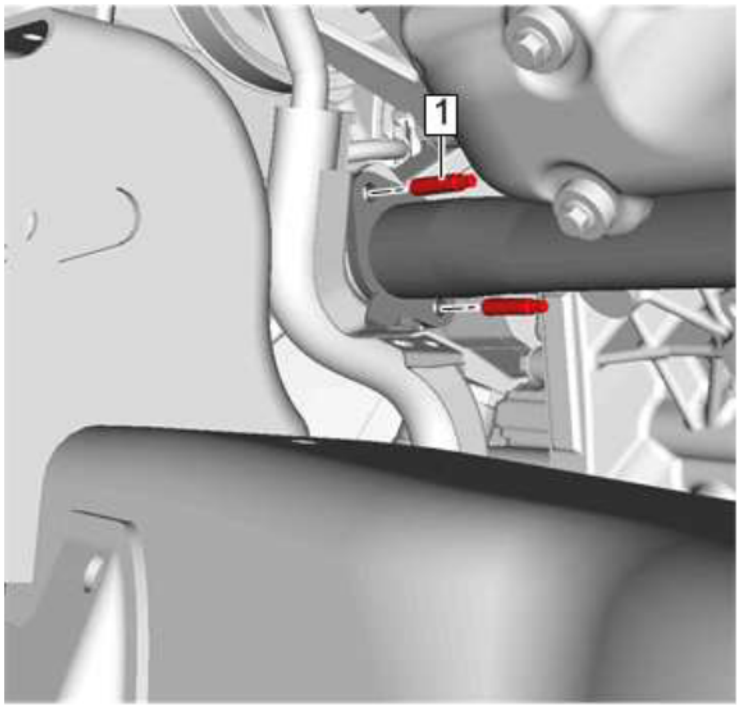

Fig. 205: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

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7. Water Pump Outlet Pipe Stud 1 - Remove

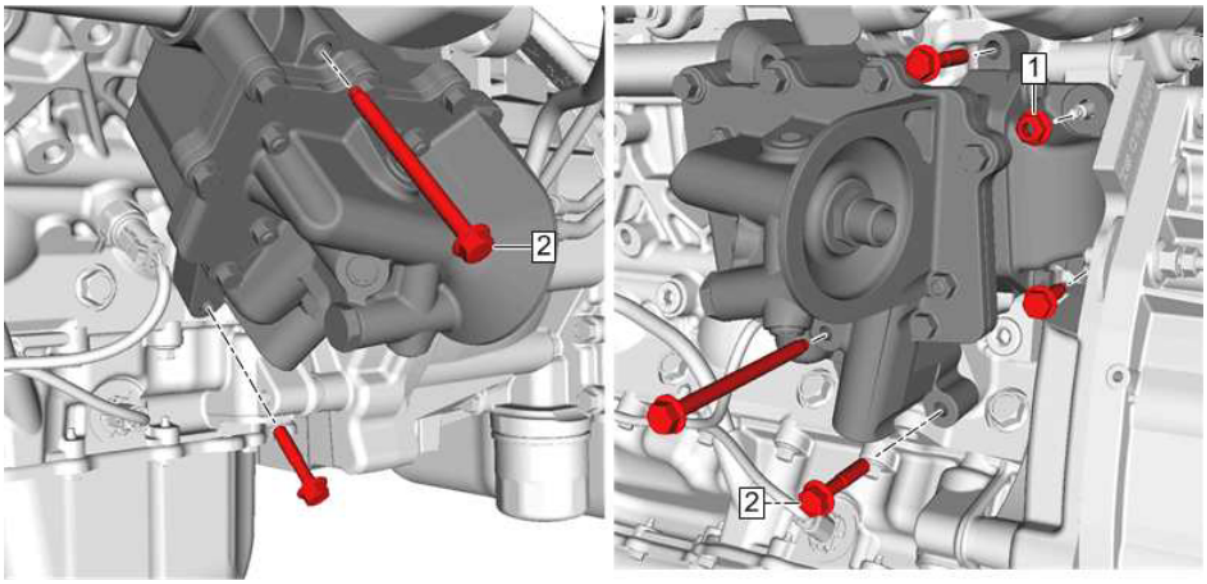

Fig. 206: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Engine Oil Cooler Nut 1 - Remove
9. Engine Oil Cooler Bolt 2 - Remove

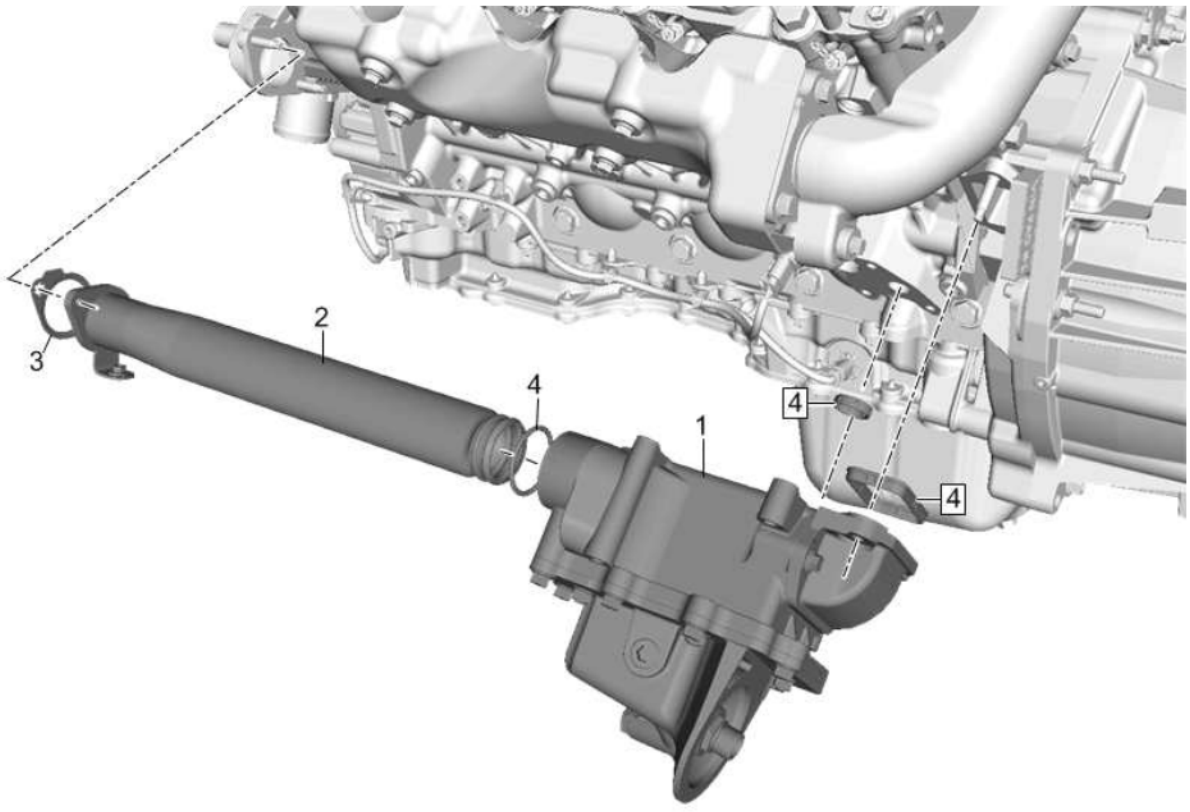

Fig. 207: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

10. Engine Oil Cooler 1 - Remove

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11. Water Pump Outlet Pipe 2 - Remove
12. Water Pump Outlet Pipe Gasket 3 - Remove and DISCARD
13. Engine Oil Cooler Seal 4 - Remove and DISCARD

Installation Procedure

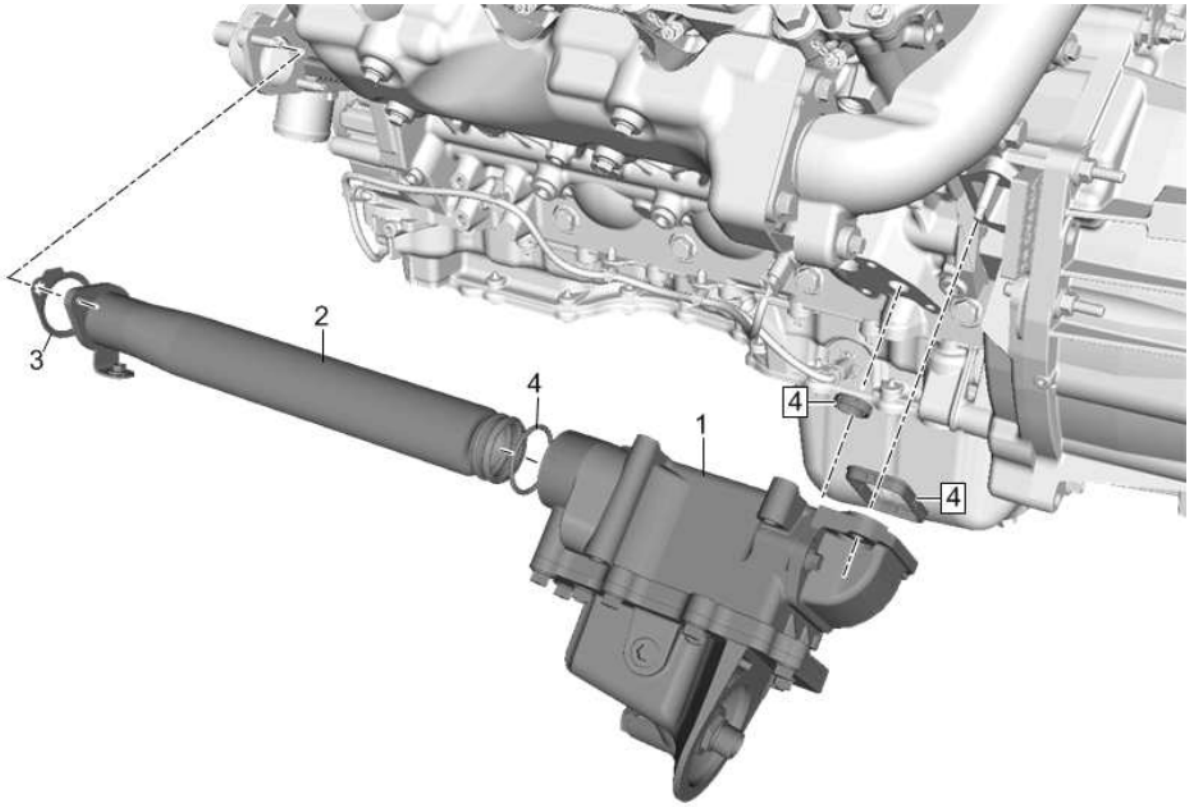

Fig. 208: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install NEW seals.

1. Engine Oil Cooler Seal 4 - Install

NOTE: Install a NEW gasket.

2. Water Pump Outlet Pipe Gasket 3 - Install
3. Water Pump Outlet Pipe 2 - Install
4. Engine Oil Cooler 1 - Install

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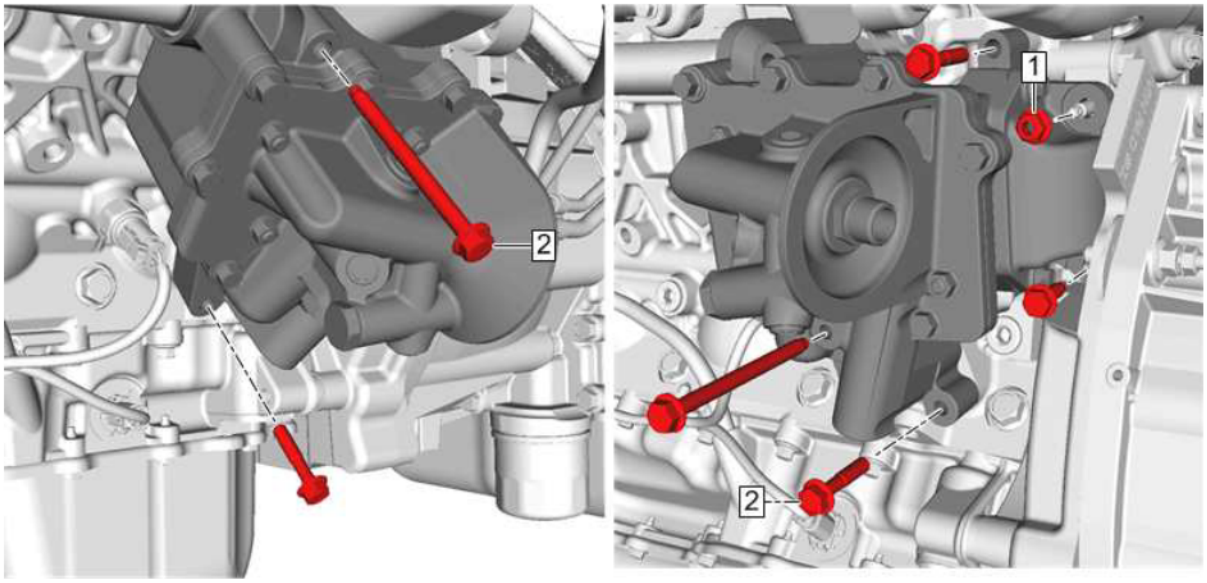

Fig. 209: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Engine Oil Cooler Bolt 2 - Install and tighten 25 N.m (18 lb ft)
6. Engine Oil Cooler Nut 1 - Install and tighten 25 N.m (18 lb ft)

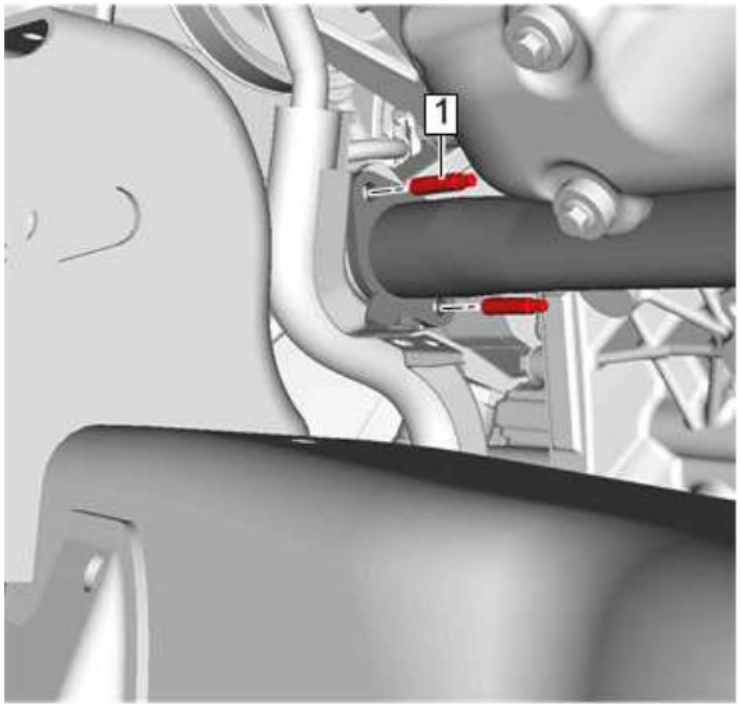

Fig. 210: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Install and tighten 9 N.m (80 lb in)

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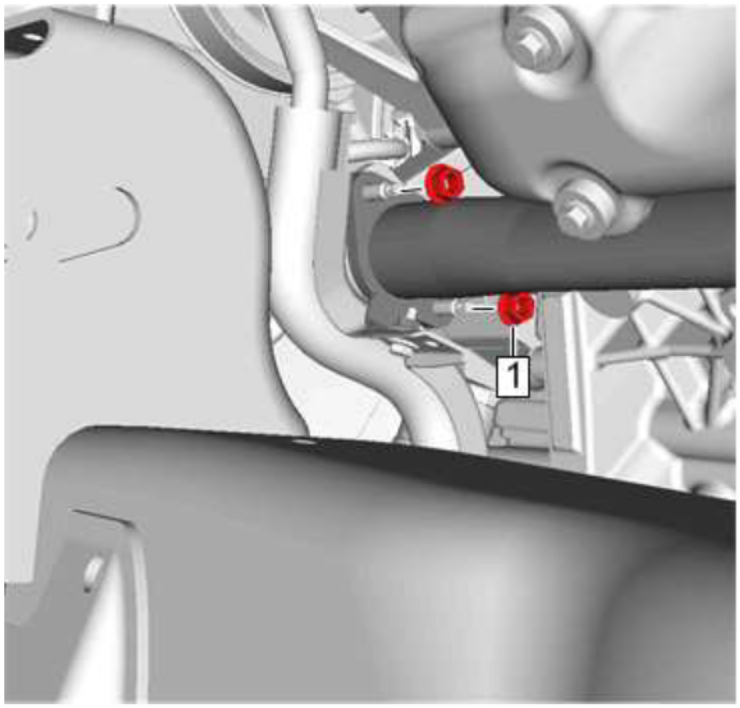

Fig. 211: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

8. Water Pump Outlet Pipe Nut 2 - Install and tighten 25 N.m (18 lb ft)
9. Engine Wiring Harness Bracket Bolt 1 - Install and tighten 9 N.m (80 lb in)

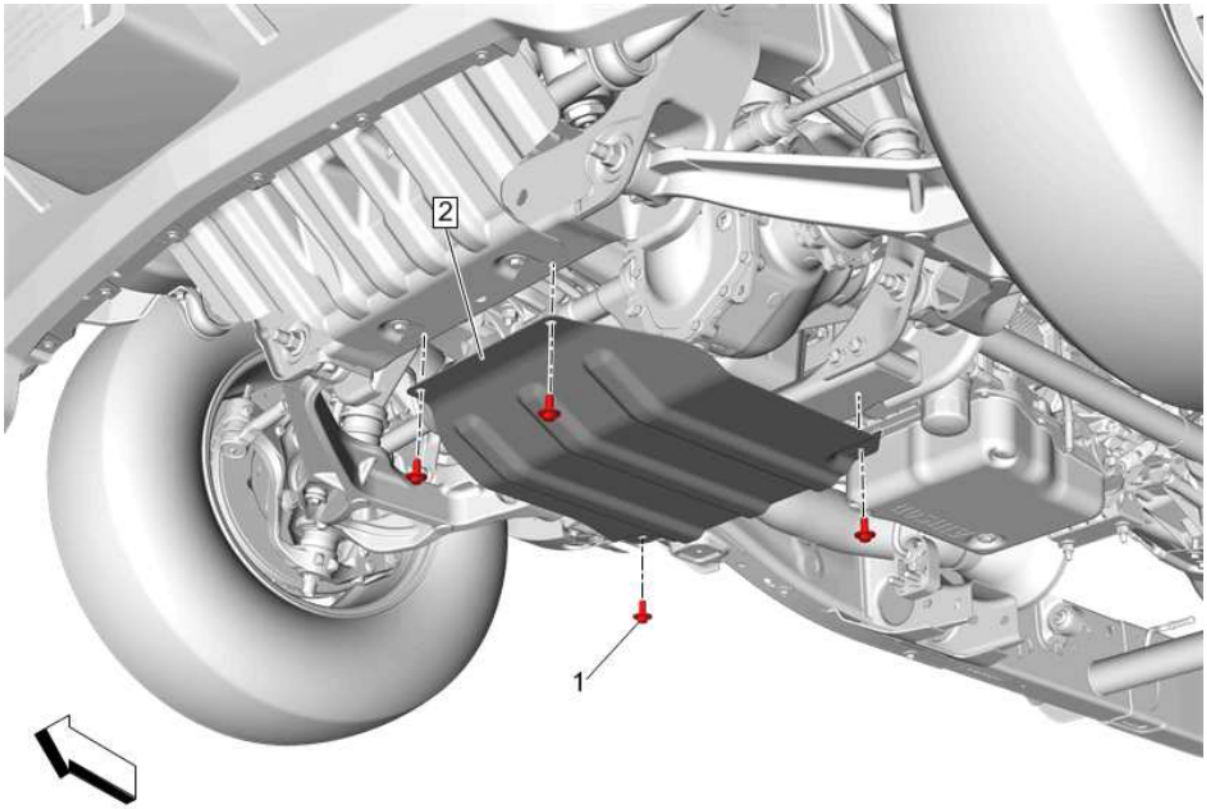

Fig. 212: Underbody Skid Shield
Courtesy of GENERAL MOTORS COMPANY

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10. Underbody Skid Shield 2 - Install - **Underbody Skid Shield Replacement**

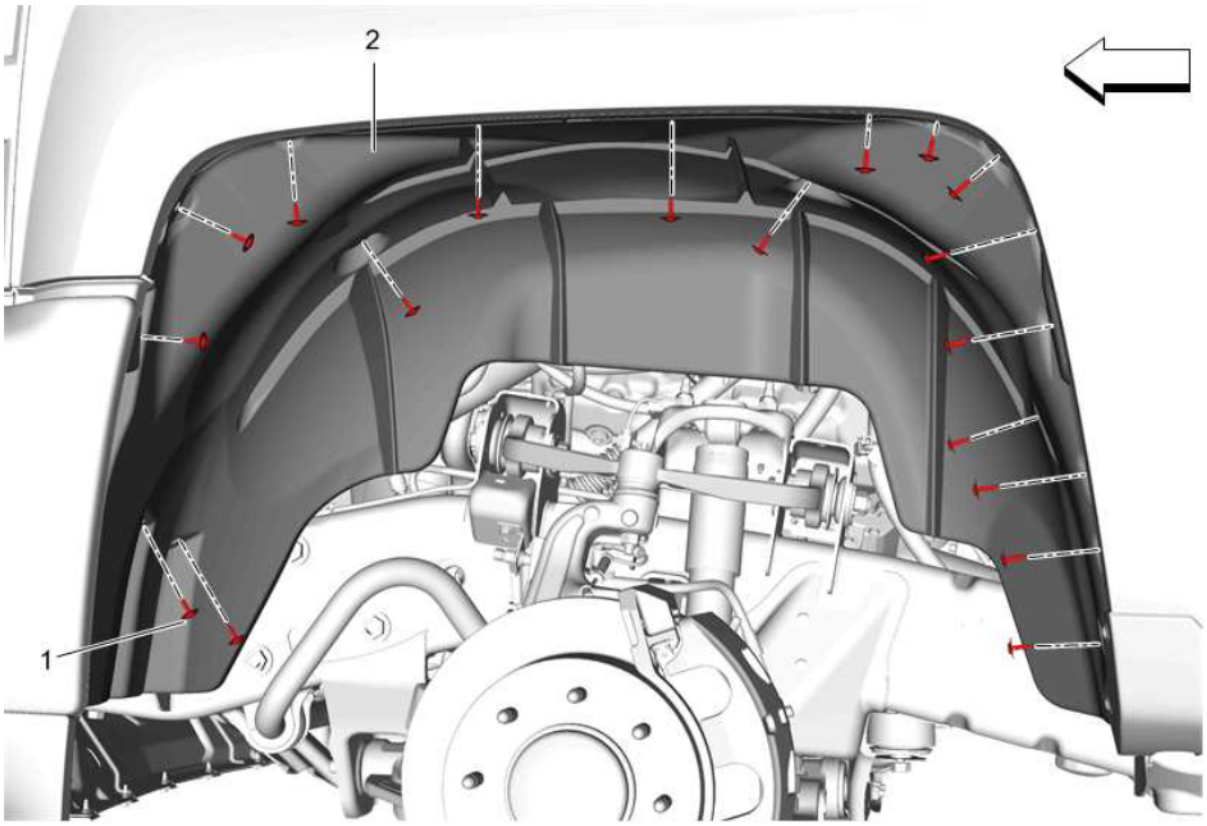

Fig. 213: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

11. Front Wheelhouse Liner-Left Side 2 - Install - **Front Wheelhouse Liner Replacement - Left Side**
12. Install a NEW oil filter. **Engine Oil and Oil Filter Replacement**
13. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

ENGINE OIL COOLER REPLACEMENT (4WD, L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Remove and DISCARD the oil filter. **Engine Oil and Oil Filter Replacement**

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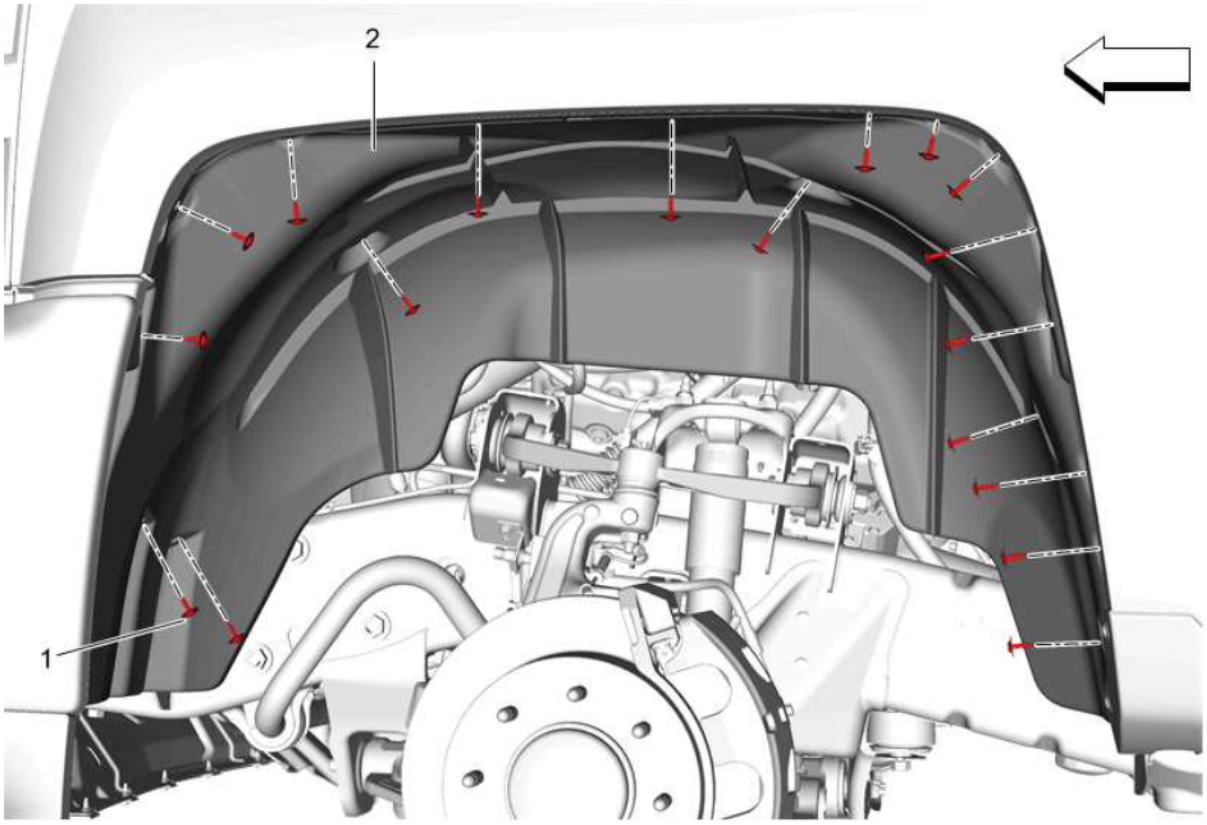

Fig. 214: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

3. Front Wheelhouse Liner-Left Side 2 - Remove **Front Wheelhouse Liner Replacement - Left Side**
4. Front Axle Propeller Shaft - Remove **FRONT AXLE PROPELLER SHAFT REPLACEMENT**

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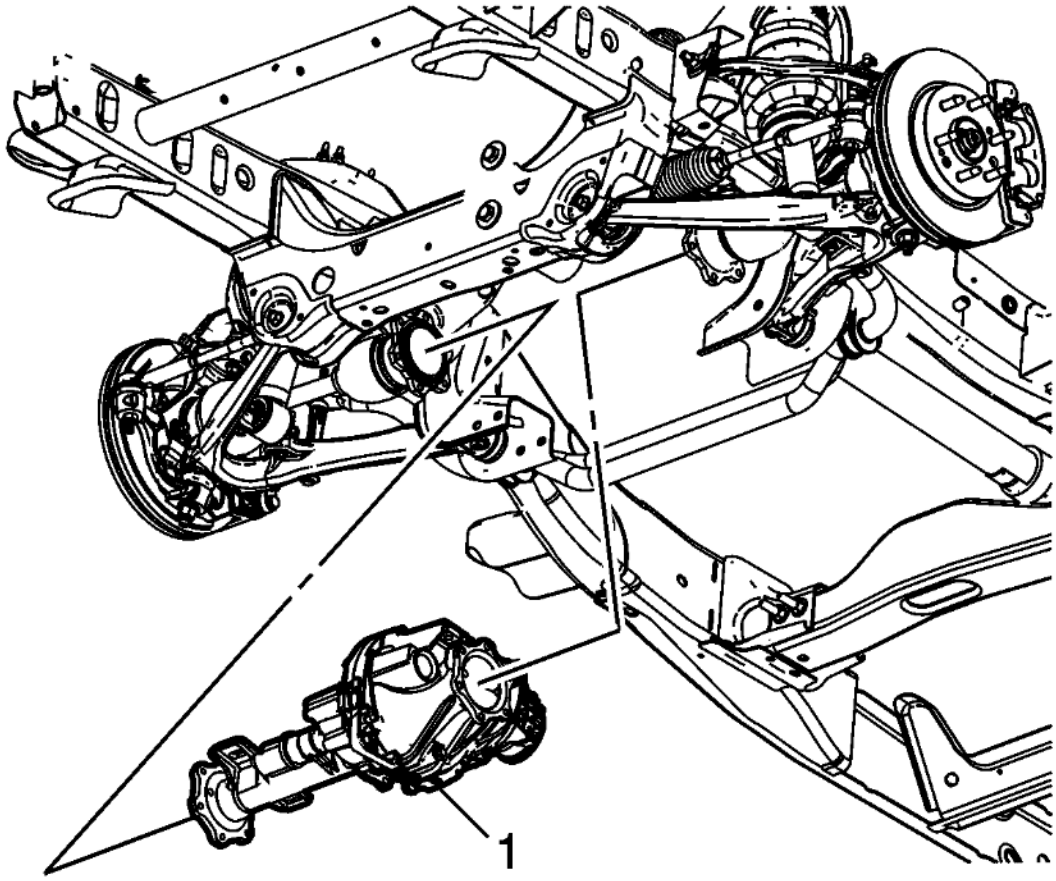

Fig. 215: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

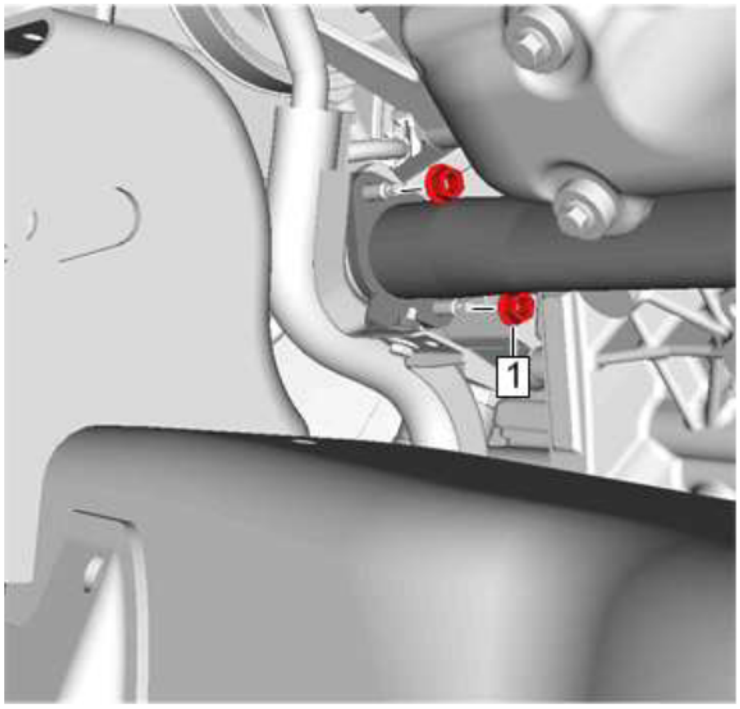

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Fig. 216: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

5. Engine Wiring Harness Bracket Bolt Remove
6. Water Pump Outlet Pipe Nut 2 - Remove

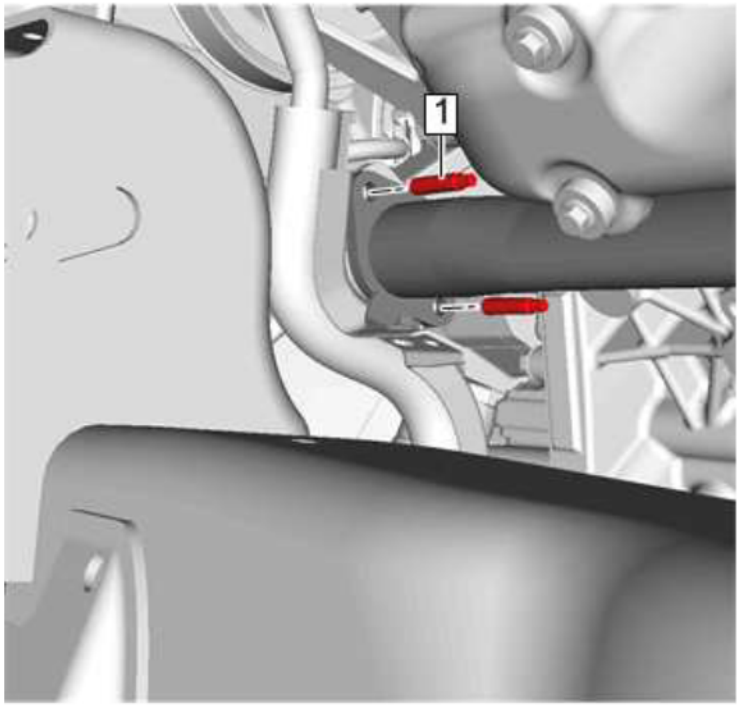

Fig. 217: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Remove

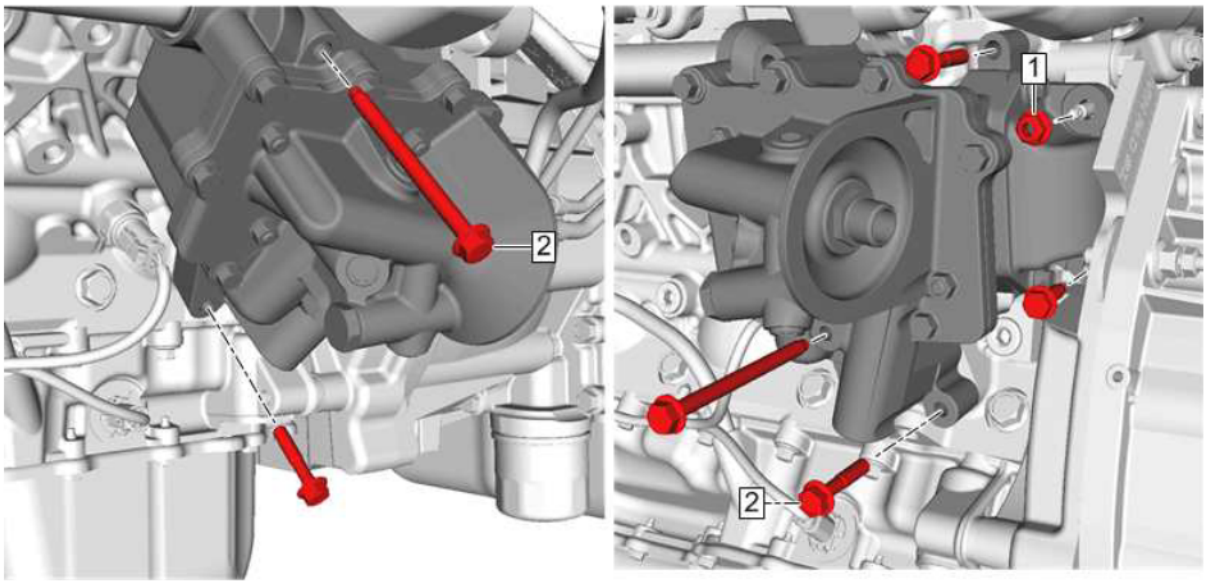

Fig. 218: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Engine Oil Cooler Nut 1 - Remove

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9. Engine Oil Cooler Bolt 2 - Remove

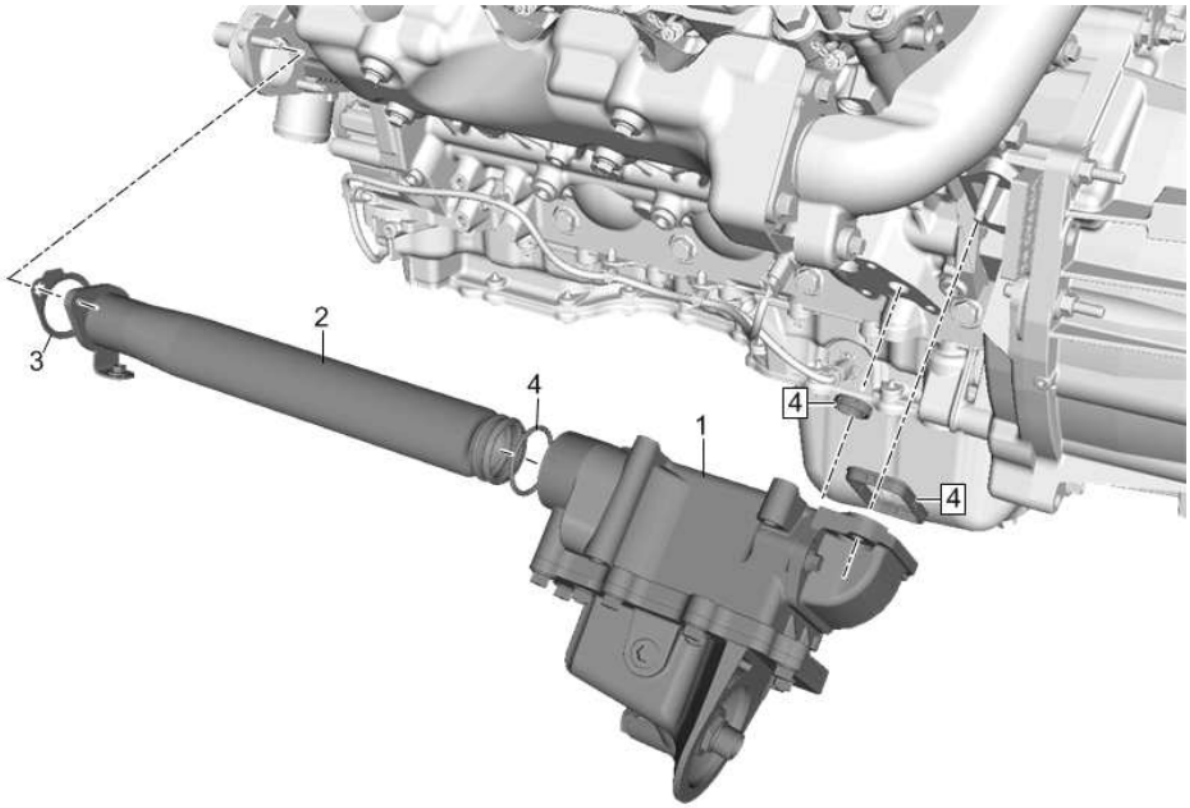

Fig. 219: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

10. Engine Oil Cooler 1 - Remove
11. Water Pump Outlet Pipe 2 - Remove
12. Water Pump Outlet Pipe Gasket 3 - Remove and DISCARD
13. Engine Oil Cooler Seal 4 - Remove and DISCARD

Installation Procedure

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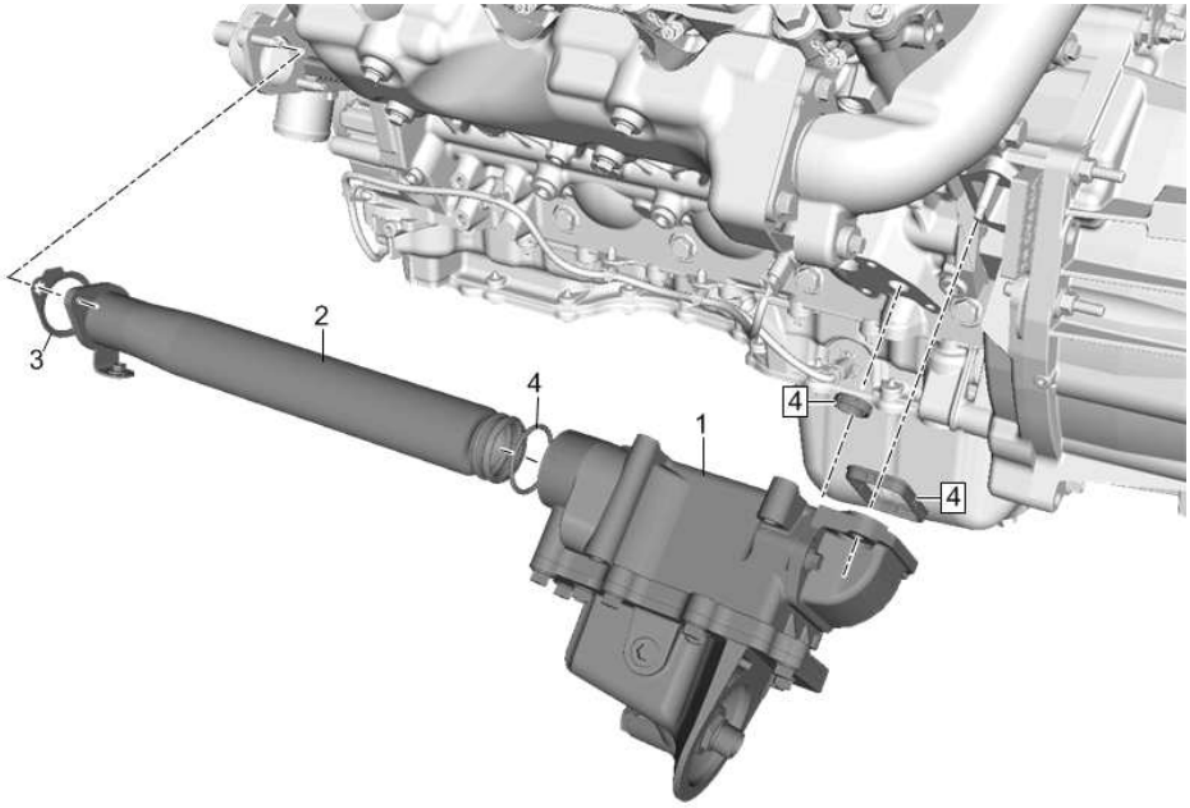

Fig. 220: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install NEW seals.**

1. Engine Oil Cooler Seal 4 - Install

NOTE: **Install a NEW gasket.**

2. Water Pump Outlet Pipe Gasket 3 - Install
3. Water Pump Outlet Pipe 2 - Install
4. Engine Oil Cooler 1 - Install

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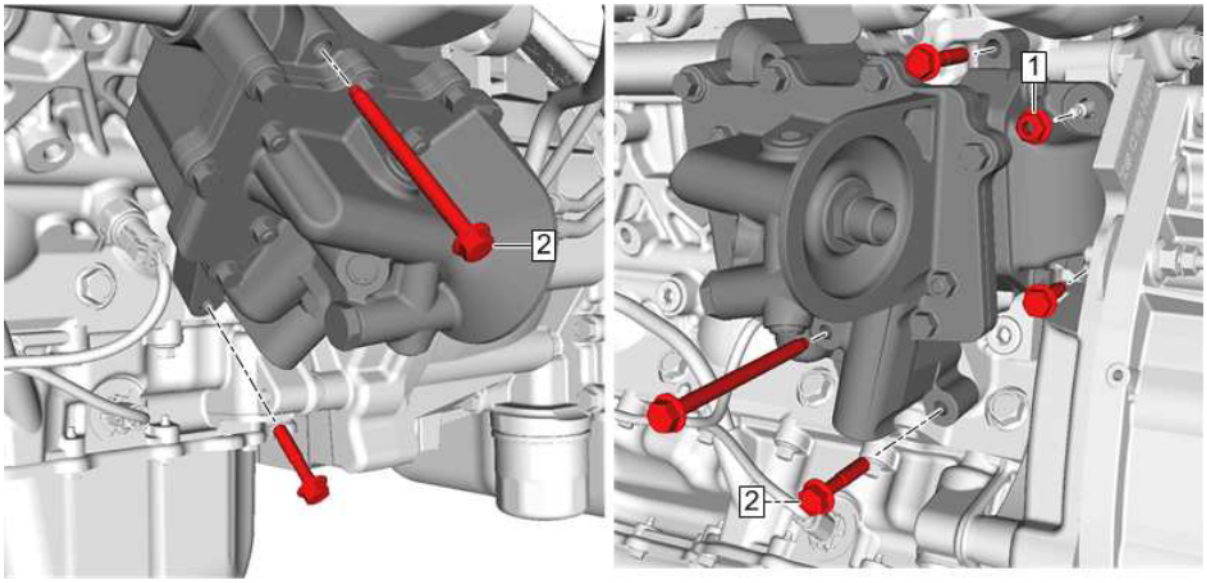

Fig. 221: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Engine Oil Cooler Bolt 2 - Install and tighten 25 N.m (18 lb ft)
6. Engine Oil Cooler Nut 1 - Install and tighten 25 N.m (18 lb ft)

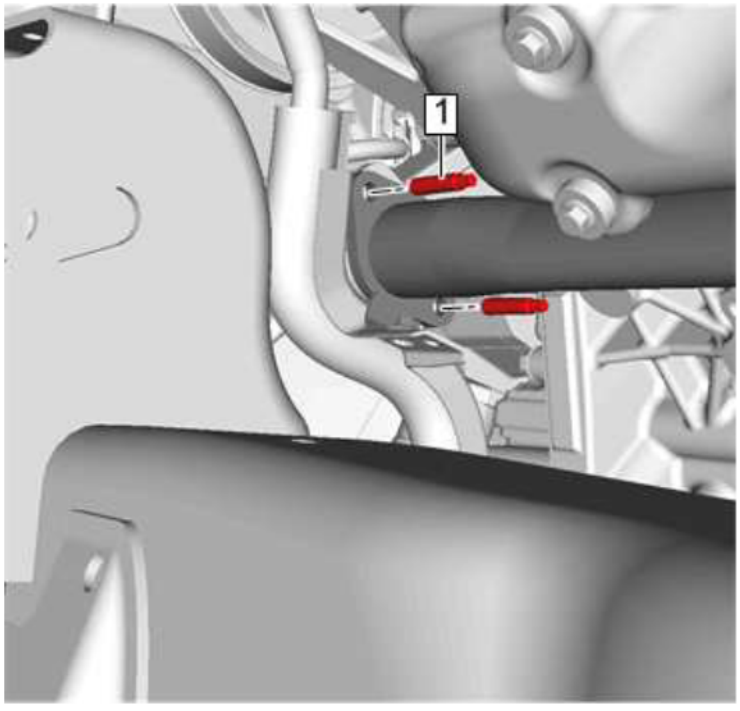

Fig. 222: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Install and tighten 9 N.m (80 lb in)

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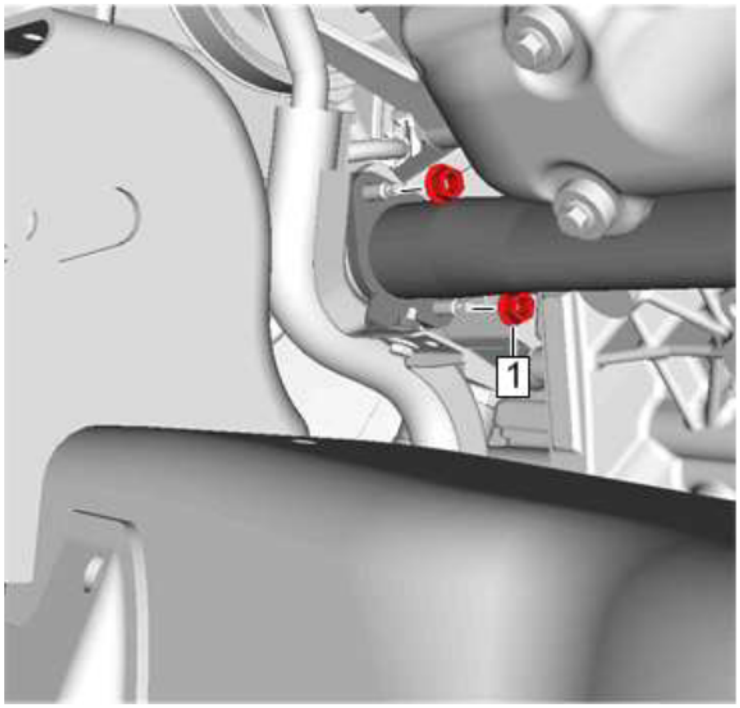

Fig. 223: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

8. Water Pump Outlet Pipe Nut 2 - Install and tighten 25 N.m (18 lb ft)
9. Engine Wiring Harness Bracket Bolt 1 - Install and tighten 9 N.m (80 lb in)

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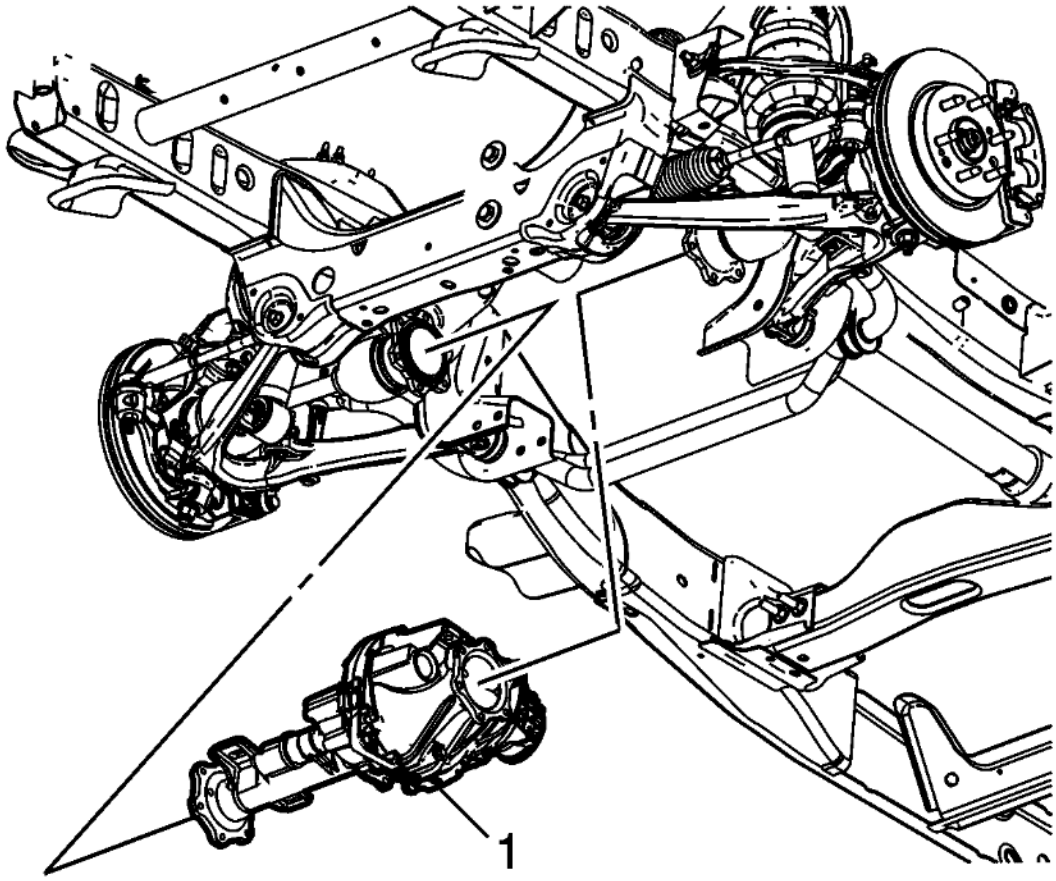

Fig. 224: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

10. Front Axle Propeller Shaft - Install **FRONT AXLE PROPELLER SHAFT REPLACEMENT**

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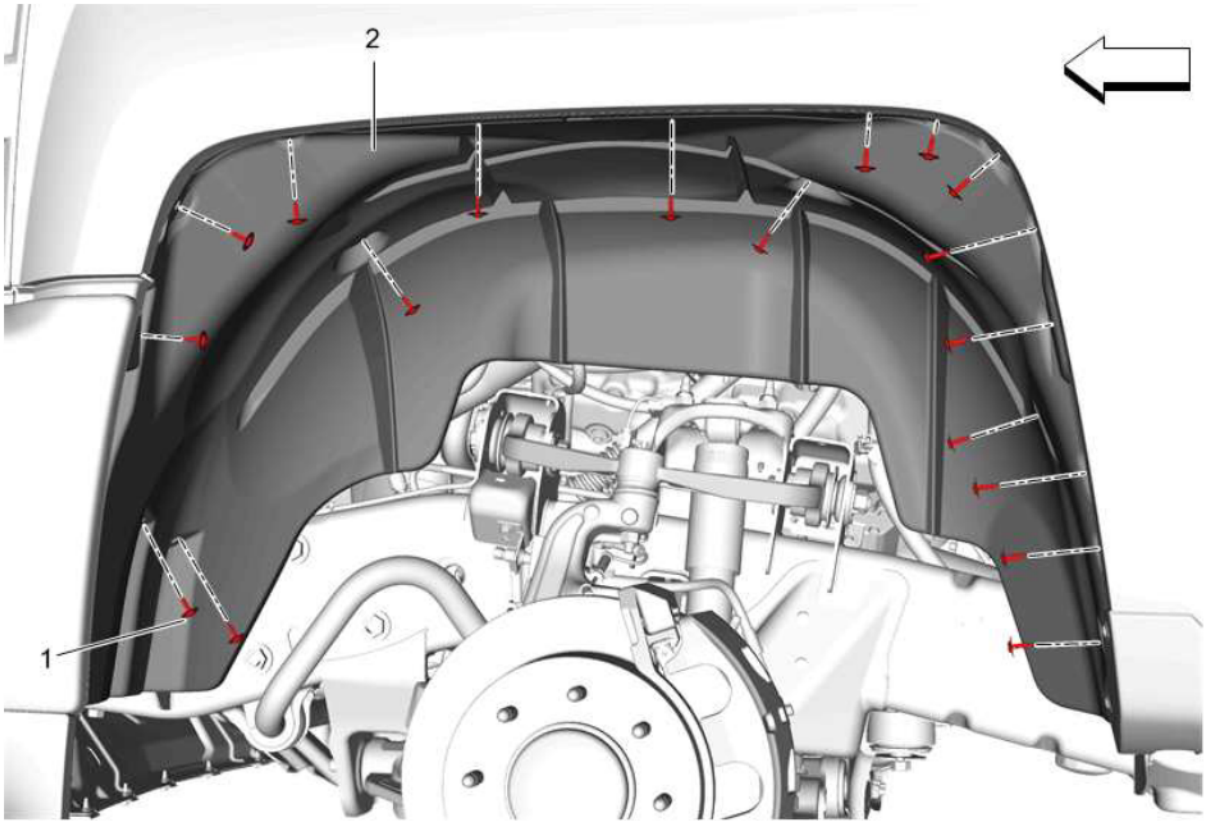

Fig. 225: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

11. Front Wheelhouse Liner-Left Side 2 - Install - **Front Wheelhouse Liner Replacement - Left Side**
12. Install a NEW oil filter. **Engine Oil and Oil Filter Replacement**
13. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

FAN BLADE REPLACEMENT (LC8, L96)

Special Tools

- **J-41240-2** Fan Clutch Wrench
- **J-46406-A** Fan Clutch Remover and Installer

For equivalent regional tools **Special Tools**.

Removal Procedure

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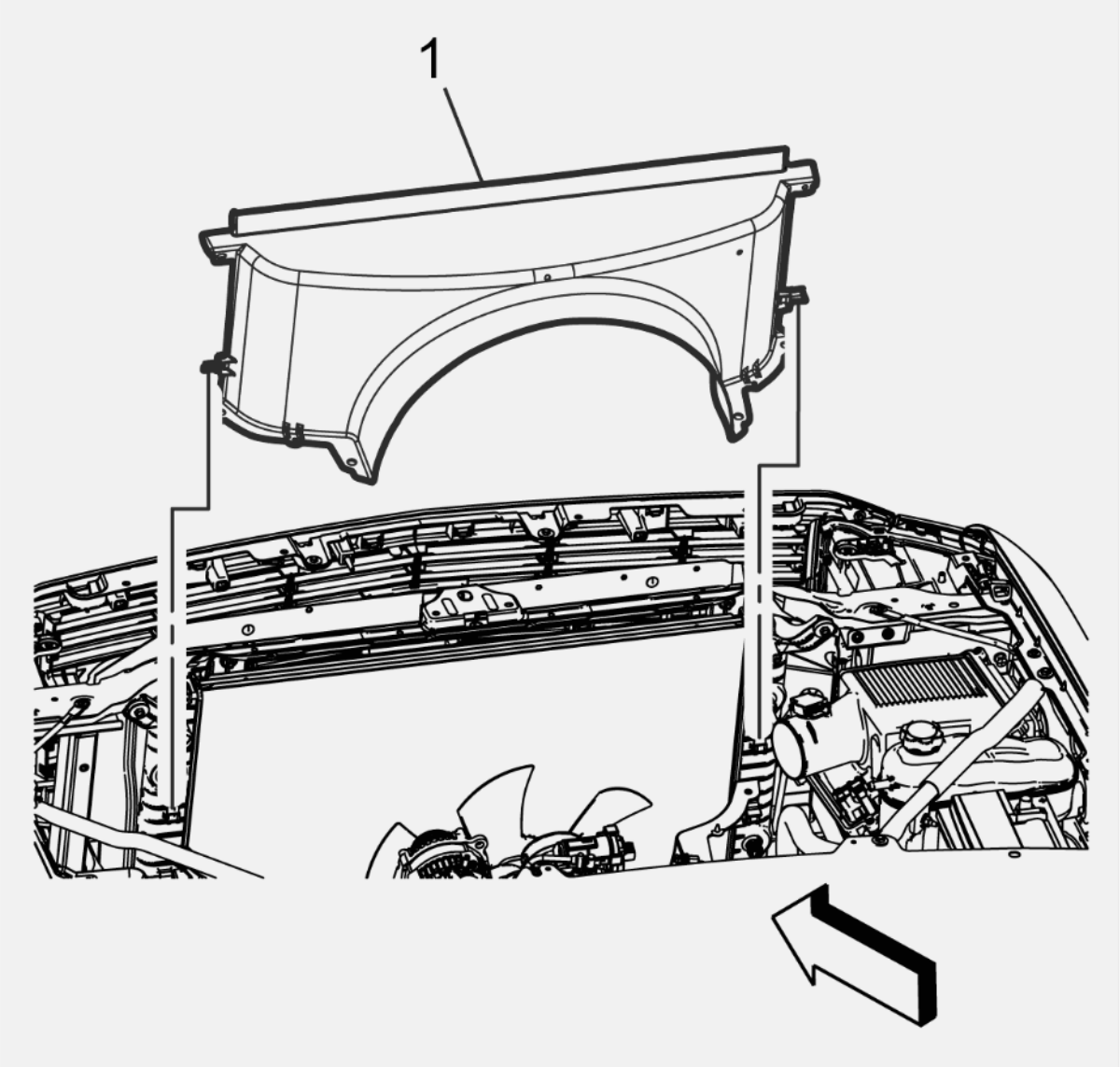

Fig. 226: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Remove the engine coolant fan upper shroud. **Engine Coolant Fan Upper Shroud Replacement (LC8, L96)**.

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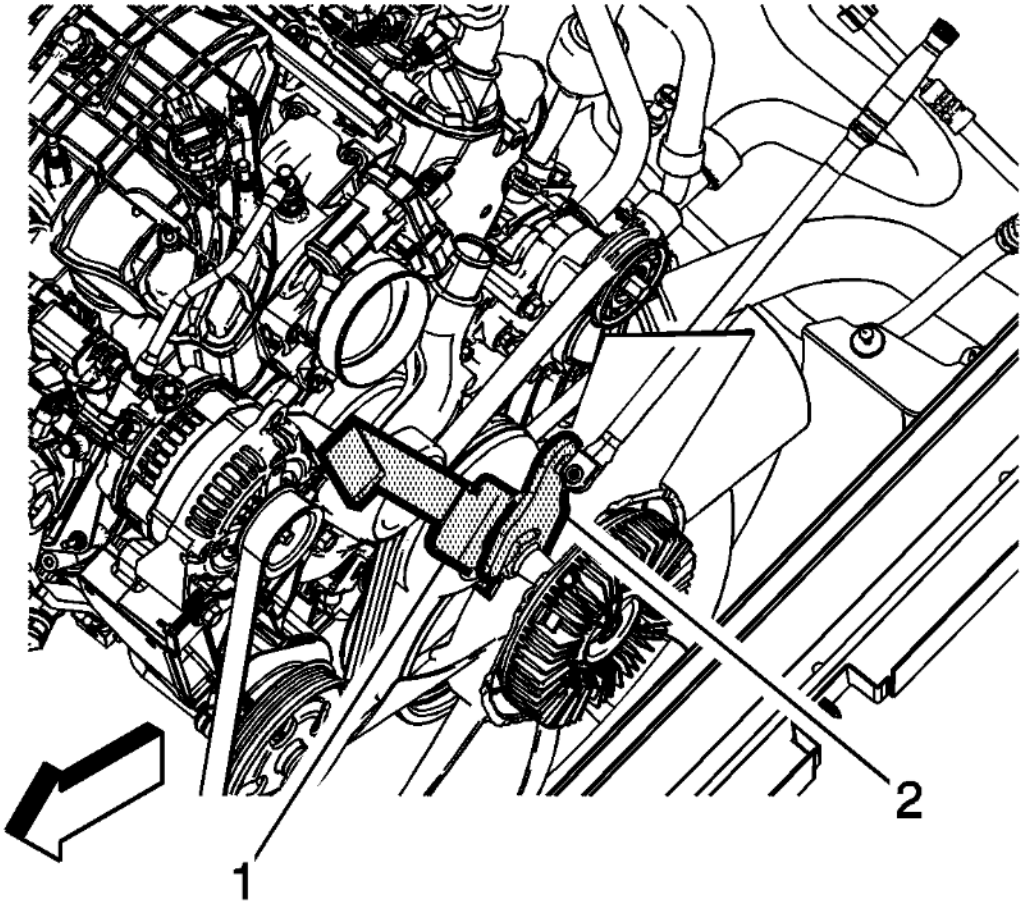

Fig. 227: Fan Clutch Remover and Installer
Courtesy of GENERAL MOTORS COMPANY

2. Install the **J-46406-A** Fan Clutch Remover and Installer (1).
3. Install the **J-41240-2** Fan Clutch Wrench (2).

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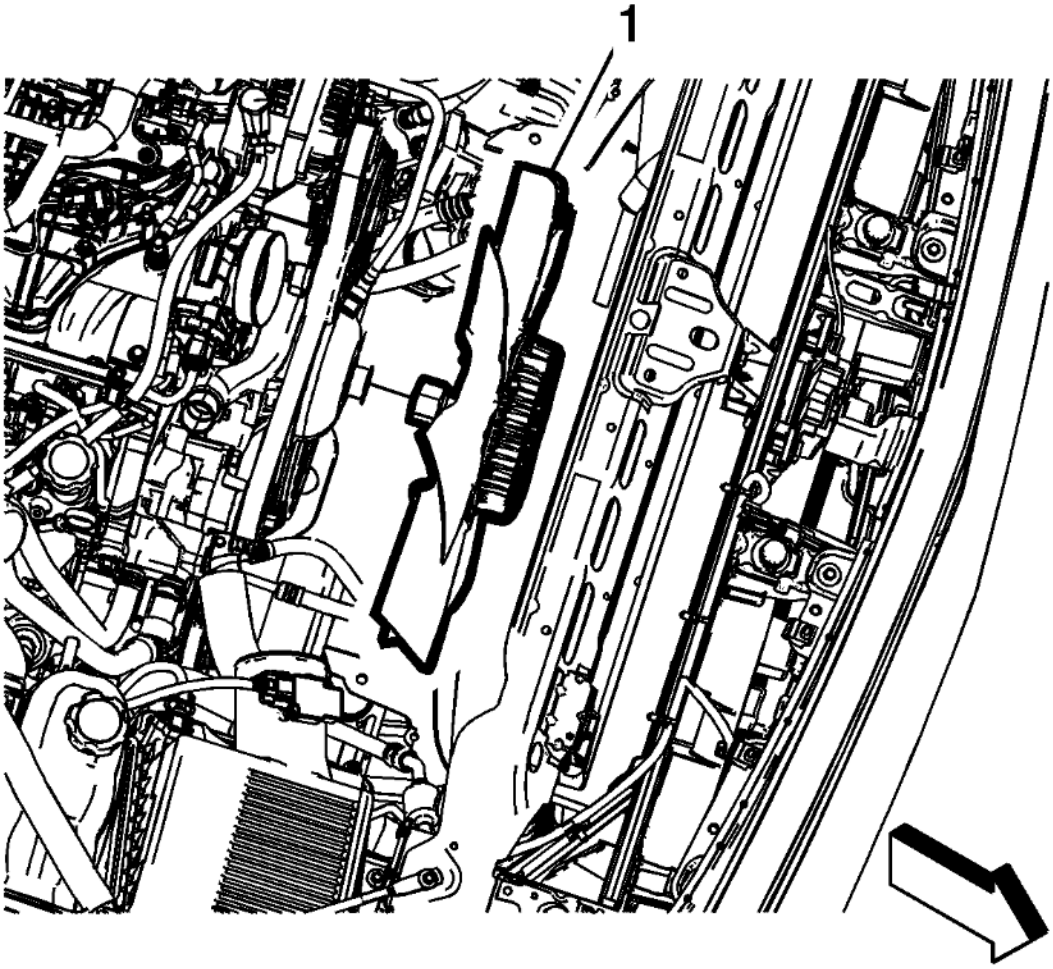

Fig. 228: Fan And Fan Clutch
Courtesy of GENERAL MOTORS COMPANY

4. Remove the fan and fan clutch (1) as an assembly from the water pump in a counterclockwise rotation.

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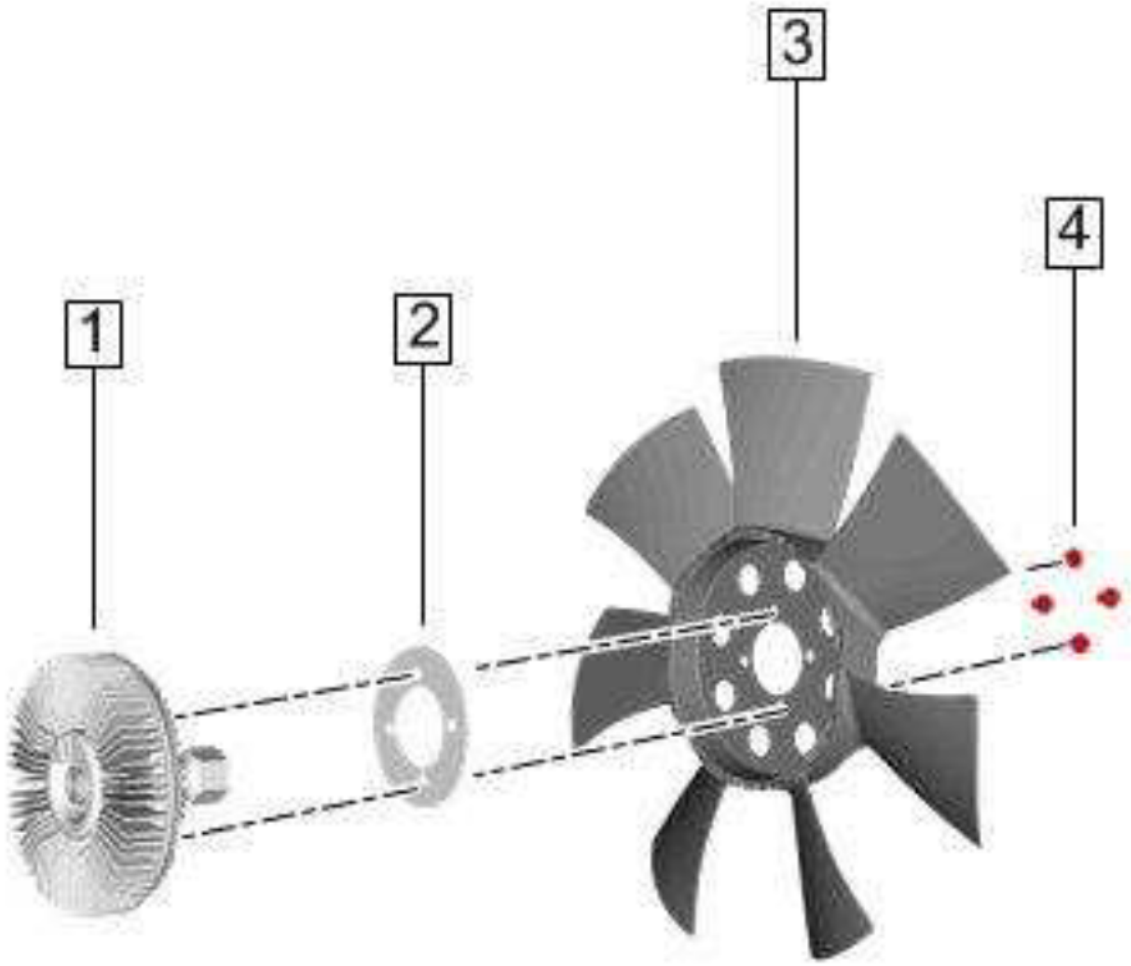

Fig. 229: Fan Clutch Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the fan clutch bolts (4) from the fan clutch.
6. Separate the fan blade (3) and fan blade clutch adapter (2) from the fan clutch (1).

Installation Procedure

WARNING: Do not use or attempt to repair a damaged cooling fan assembly. Replace damaged fans with new assemblies. An unbalanced cooling fan could fly apart causing personal injury and property damage.

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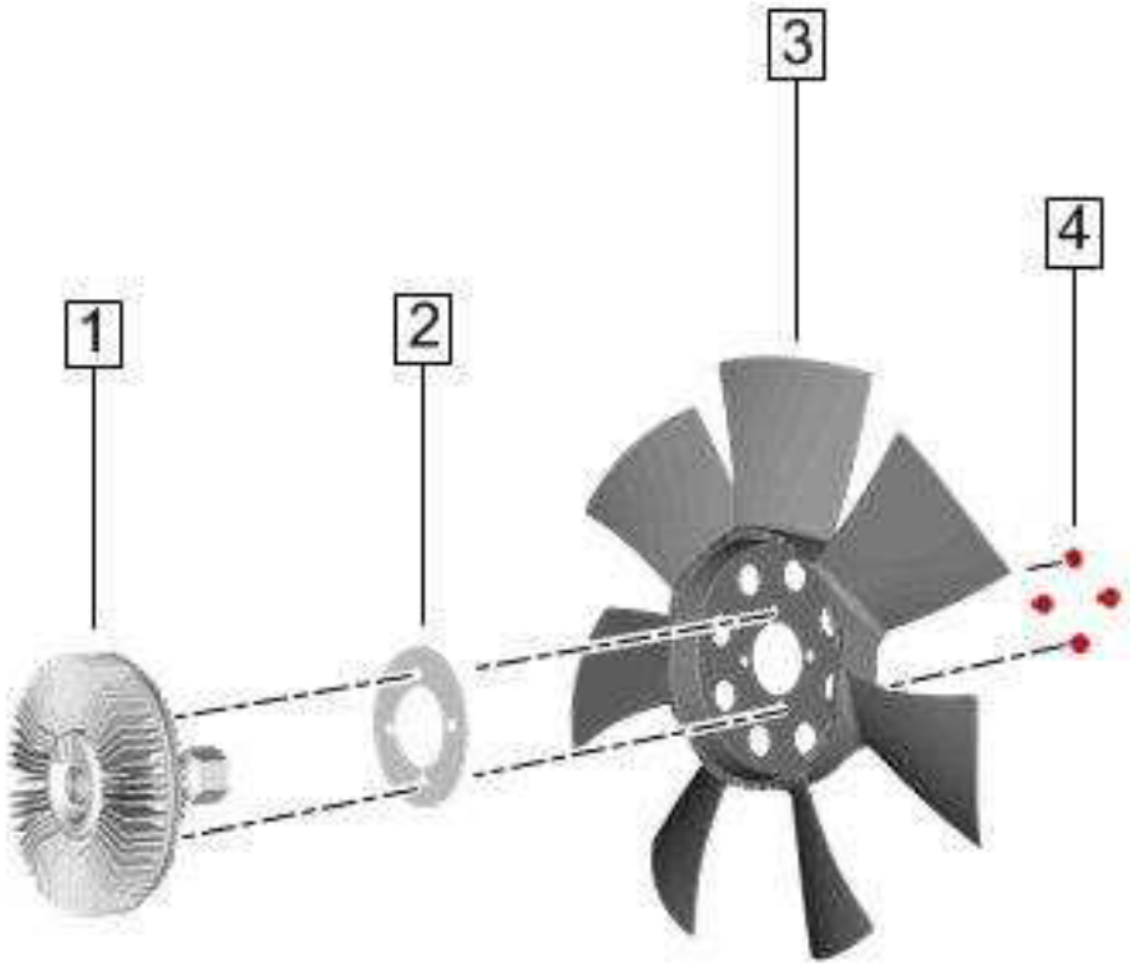

Fig. 230: Fan Clutch Bolts
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Pulley and clutch threads must be wiped with a clean cloth before reassembly.**

1. Install the fan blade (3) and the fan blade clutch adapter (2) onto the fan clutch (1).

CAUTION: **Refer to Fastener Caution .**

2. Install the fan clutch bolts (4) and tighten to 23 N.m (17 lb ft).

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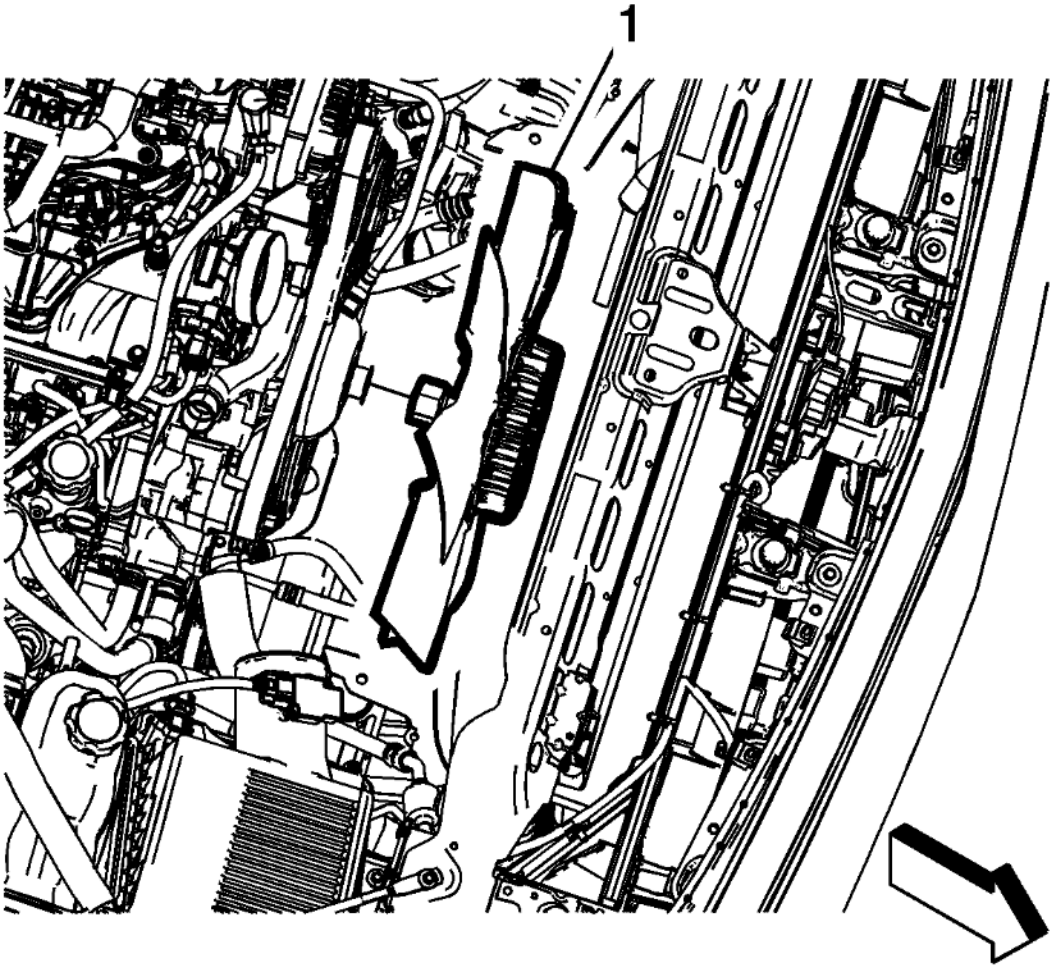

Fig. 231: Fan And Fan Clutch
Courtesy of GENERAL MOTORS COMPANY

3. Install the fan and fan clutch (1) as an assembly.

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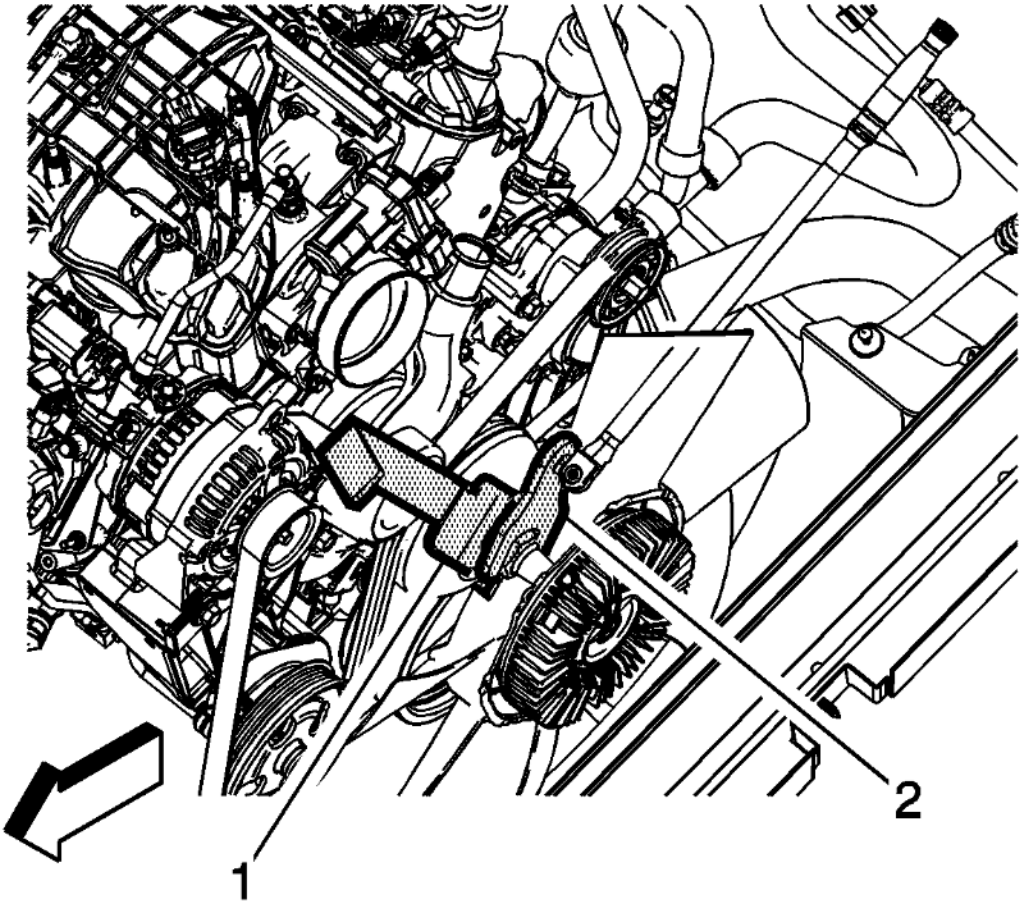

Fig. 232: Fan Clutch Remover and Installer
Courtesy of GENERAL MOTORS COMPANY

4. Install the **J-46406-A** Fan Clutch Remover and Installer (1) and **J-41240-2** Fan Clutch Wrench (2) and tighten to 100 N.m (74 lb ft).

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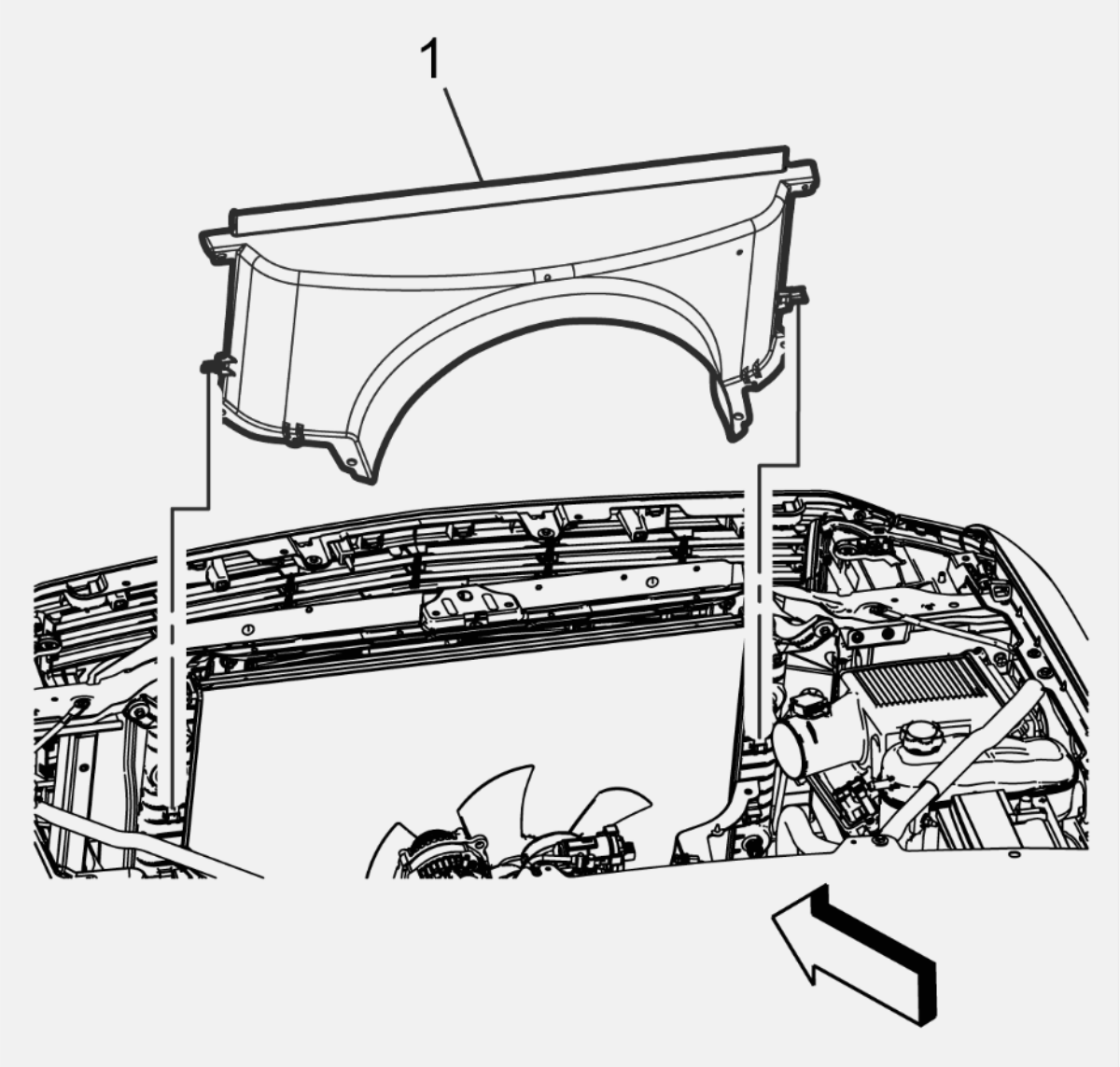

Fig. 233: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

5. Install the upper fan shroud (1). **Engine Coolant Fan Upper Shroud Replacement (LC8, L96)**.

FAN BLADE REPLACEMENT (L5P)

Special Tools

J-41240-5A Fan Clutch Wrench

Equivalent regional tools:**Special Tools**

Removal Procedure

1. Drain the coolant. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

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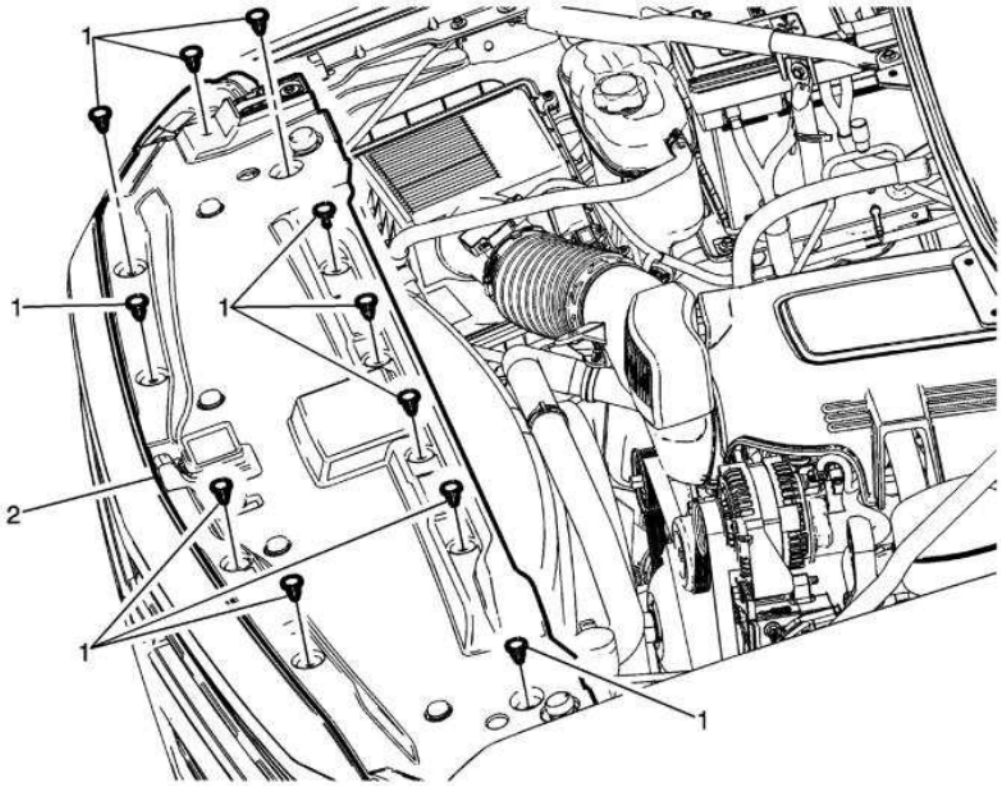

Fig. 234: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

2. Front Compartment Front Sight Shield 2 - Remove - **Front Compartment Front Sight Shield Replacement**
3. Air Cleaner Outlet Front Duct - Remove - **Air Cleaner Outlet Front Duct Replacement**
4. Air Conditioning Compressor Hose - Remove - **Air Conditioning Compressor Hose Replacement (L5P)**

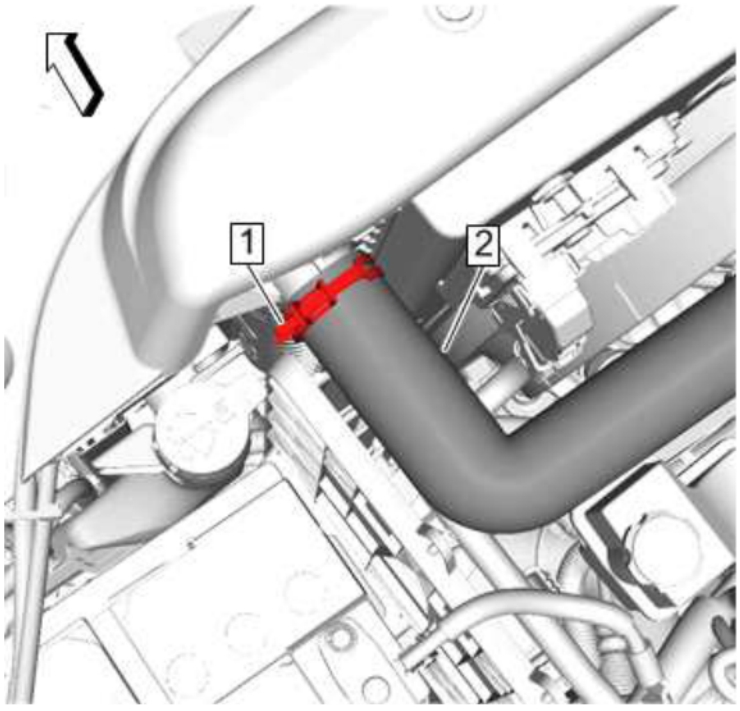

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Fig. 235: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Inlet Hose 2 Remove - **Radiator Inlet Hose Replacement (L5P)**

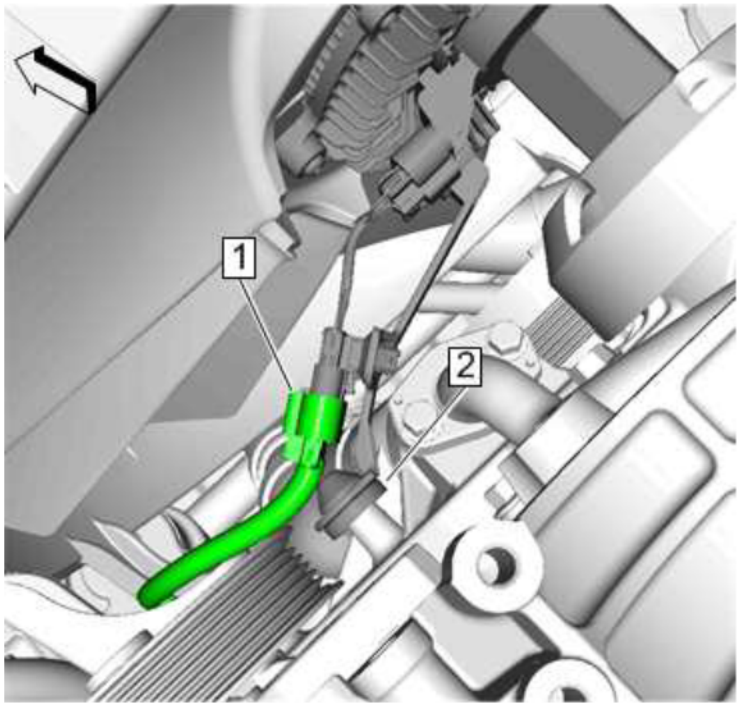

Fig. 236: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

6. Engine Wiring Harness 1 @Fan Blade Clutch - Disconnect
7. Fan Blade Clutch 2 @Engine - Remove

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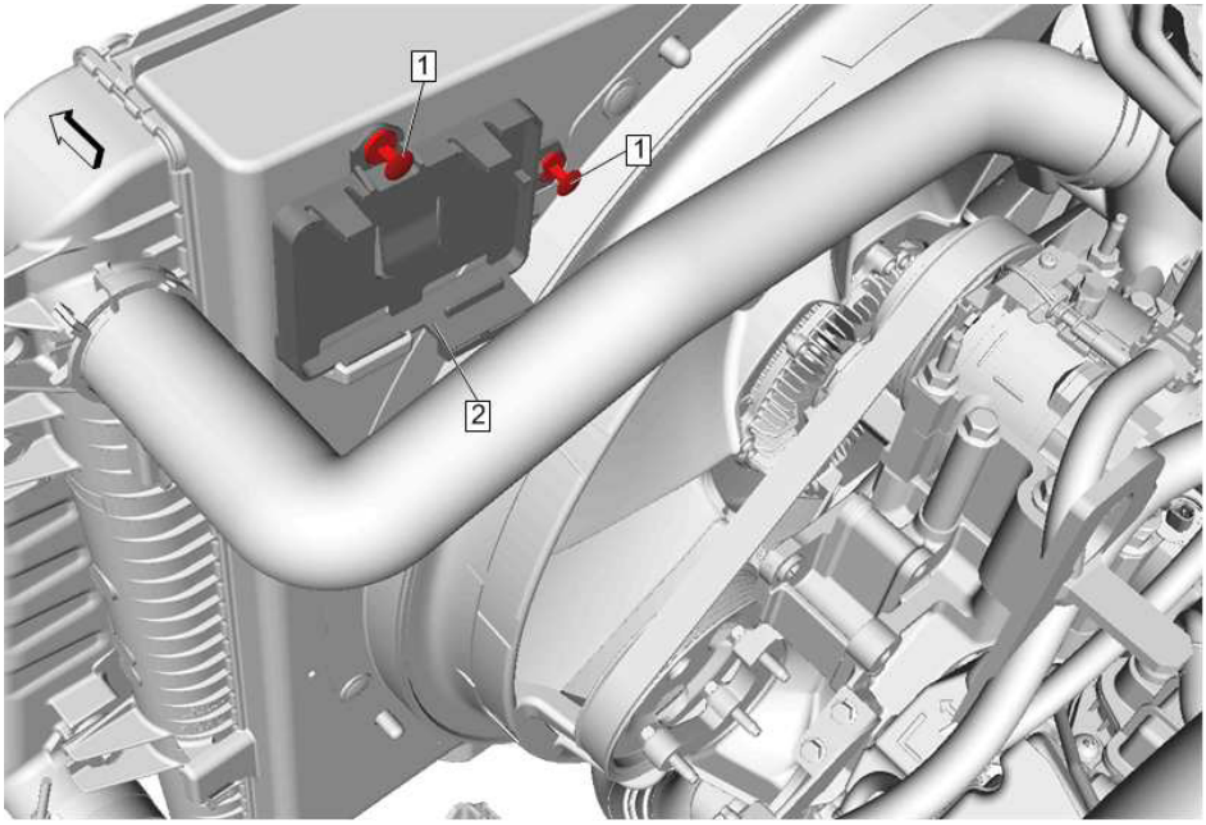

Fig. 237: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

8. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Remove - **Transmission Control Module Bracket Replacement**

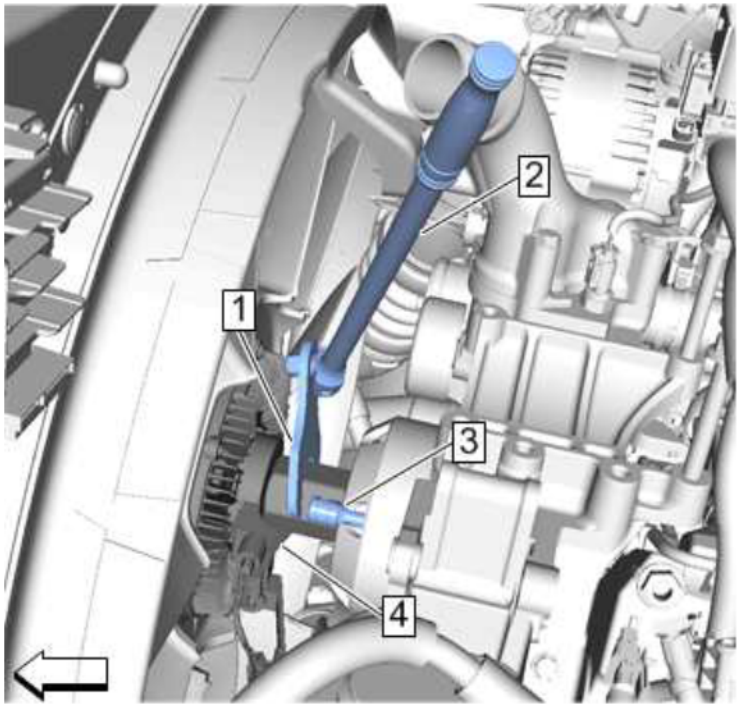

Fig. 238: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

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9. Install a suitable blunt end tool (3) into one of the holes in the fan pulley preventing the pulley from turning allowing the fan clutch to be removed.
10. Install **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) onto the fan blade clutch nut.
11. Turn the fan blade clutch nut counterclockwise to remove the fan blade and fan blade clutch (4) as an assembly from the fan pulley.
12. Remove **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) from the fan blade clutch nut.
13. Remove the suitable blunt end tool (3) from the fan pulley.

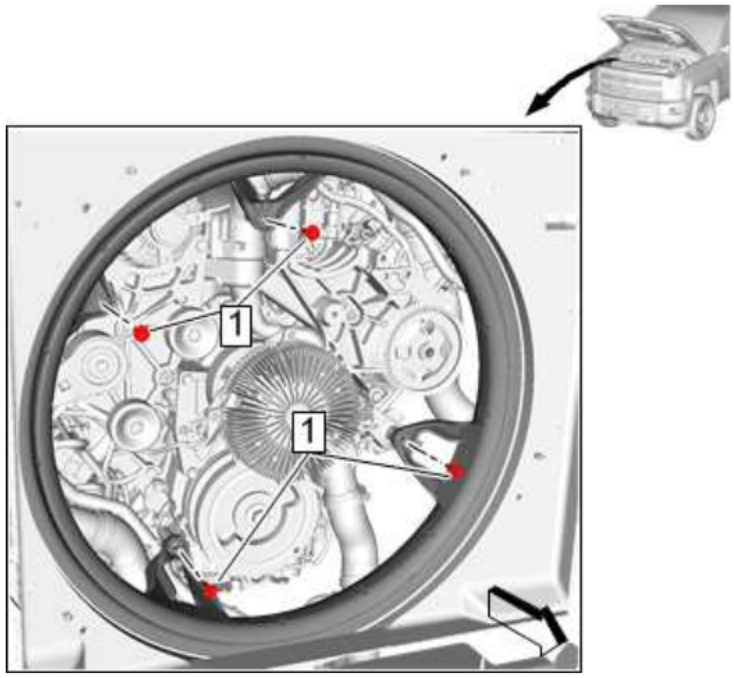

Fig. 239: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Fan Shroud Bolt- Upper 1 - Remove

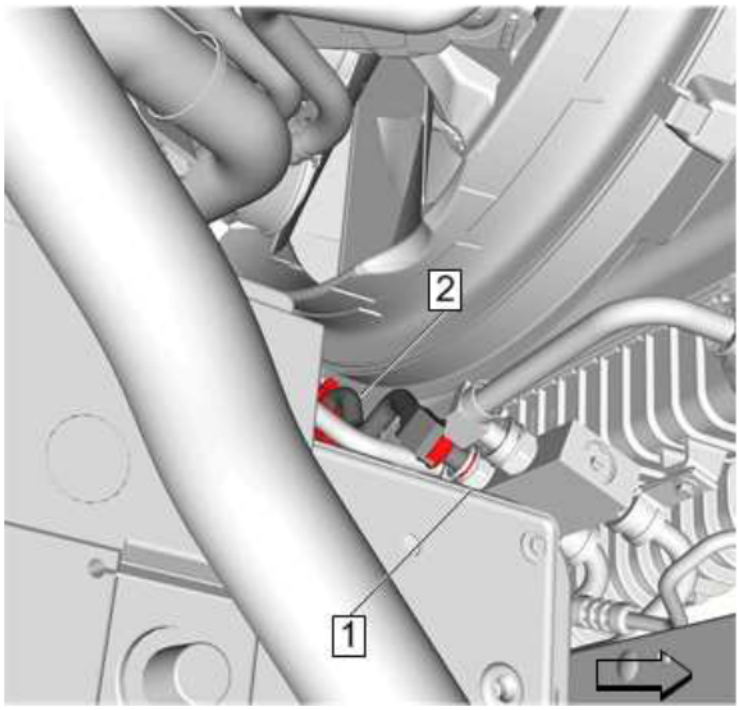

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Fig. 240: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

15. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

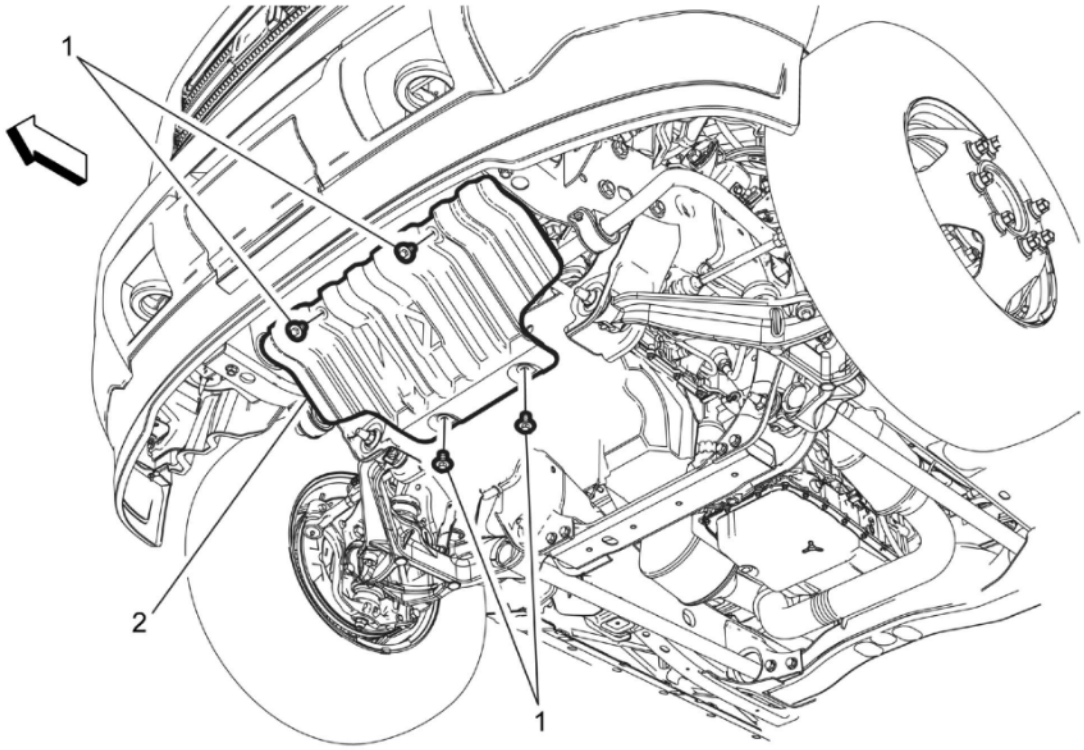

Fig. 241: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

16. Underbody Splash Shield 2 - Remove **Underbody Splash Shield Replacement**

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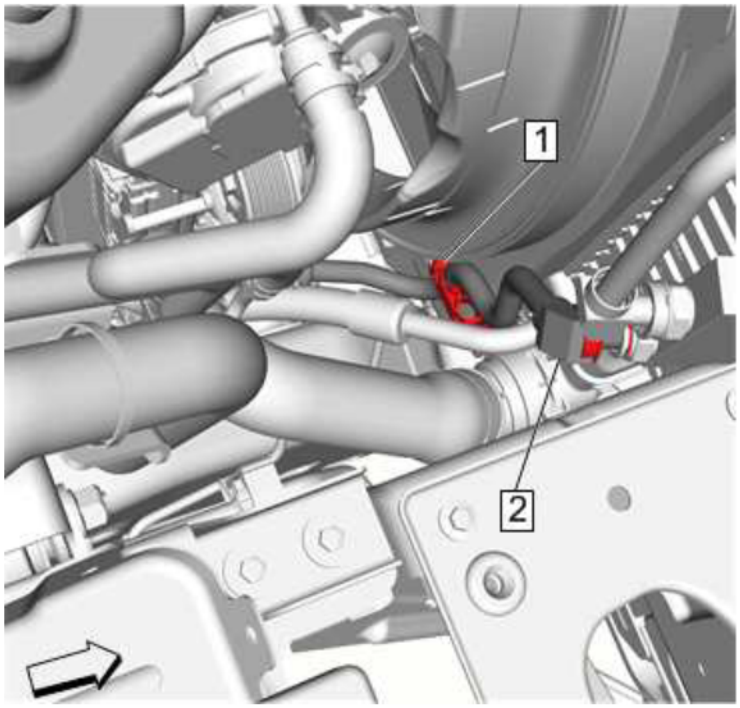

Fig. 242: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

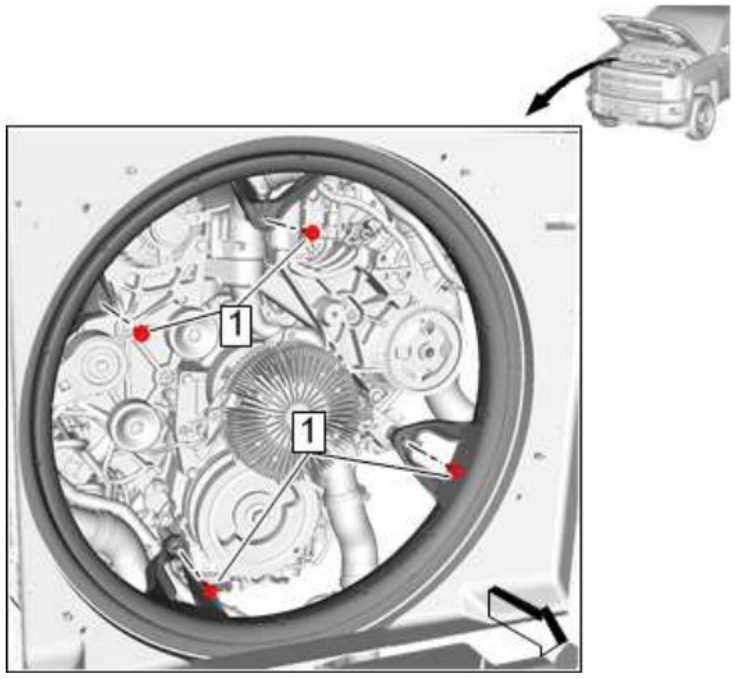

Fig. 243: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

18. Engine Coolant Fan Shroud Bolt- Lower 1 - Remove
19. Lower the vehicle.

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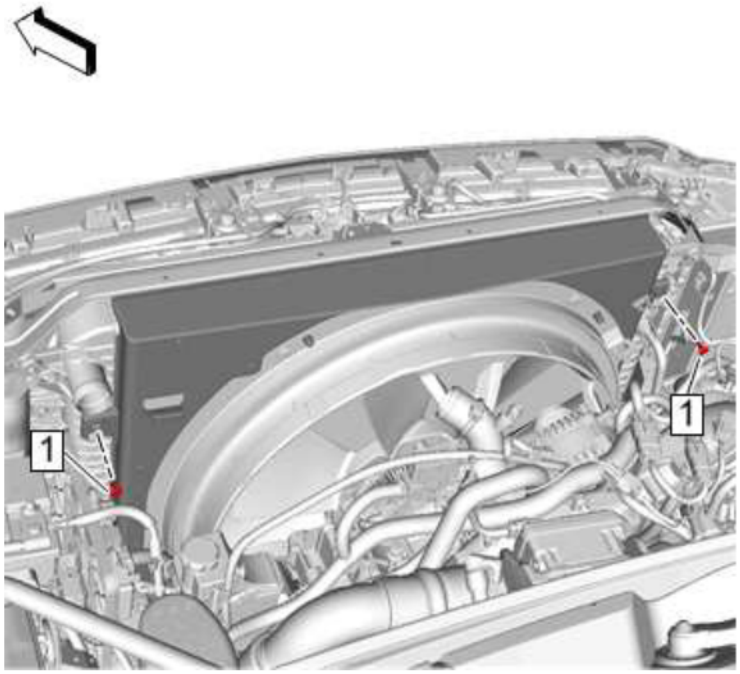

Fig. 244: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

20. Engine Coolant Fan Shroud Retainer 1 @Radiator - Remove

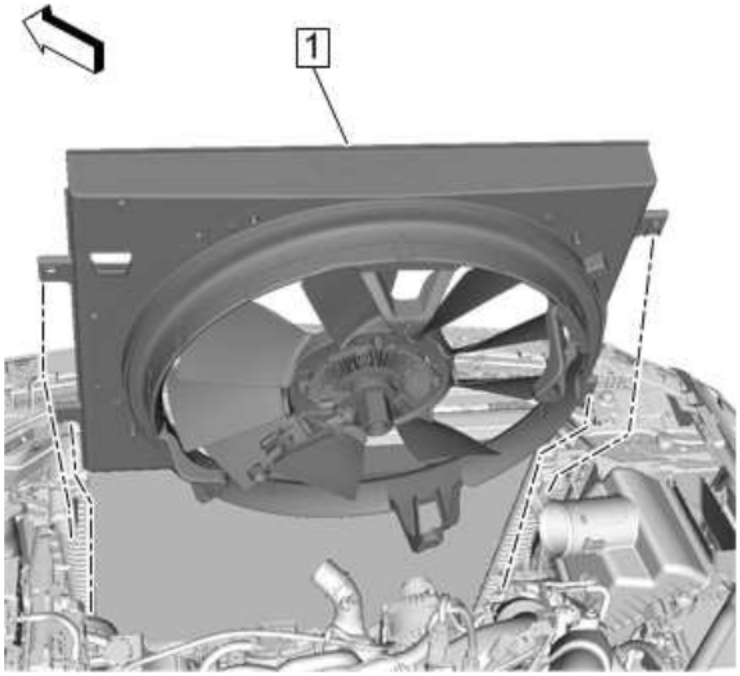

Fig. 245: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

21. Remove the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) from the vehicle.

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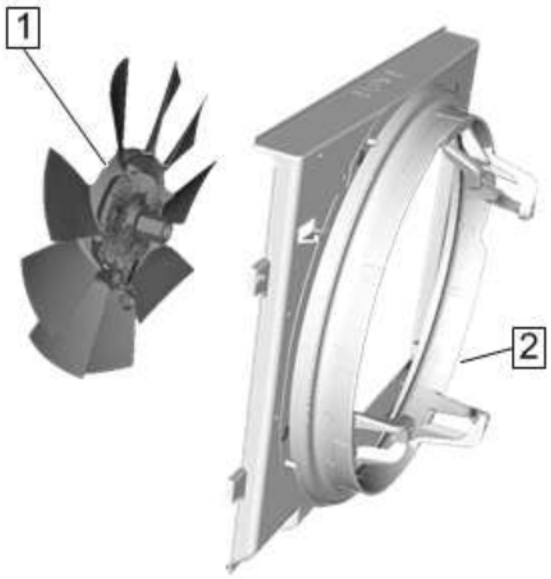

Fig. 246: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

22. Remove the fan blade and fan blade clutch as an assembly (1) from the engine coolant fan shroud (2).

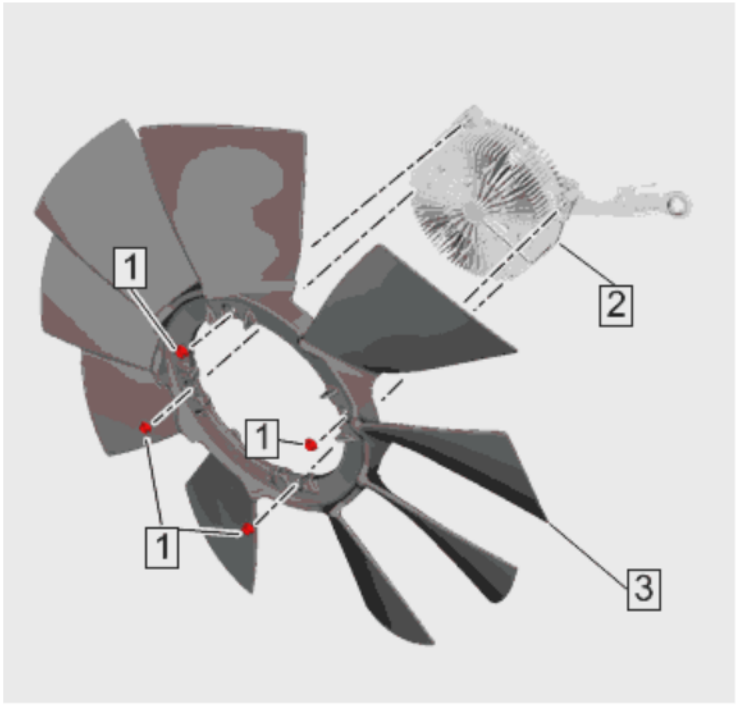

Fig. 247: Fan Blade Nut And Clutch
Courtesy of GENERAL MOTORS COMPANY

23. Fan Blade Nut 1 @Fan Blade Clutch 2 - Remove

NOTE: **Do not place clutch on a dirty surface.**

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24. Fan Blade 3 @Fan Blade Clutch 2 - Remove

Installation Procedure

WARNING: Do not use or attempt to repair a damaged cooling fan assembly. Replace damaged fans with new assemblies. An unbalanced cooling fan could fly apart causing personal injury and property damage.

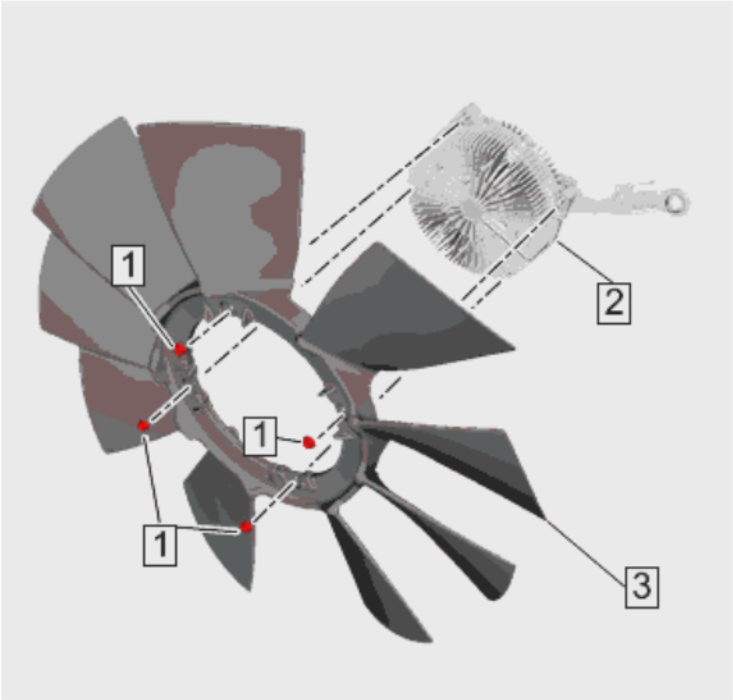

Fig. 248: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

NOTE: Pulley and clutch threads must be wiped with a clean cloth before reassembly.

1. Fan Blade 3 @Fan Blade Clutch 2 - Install

CAUTION: Refer to Fastener Caution .

2. Fan Blade Nut 1 @Fan Blade Clutch 2 - Install and tighten 9 N.m (80 lb in)

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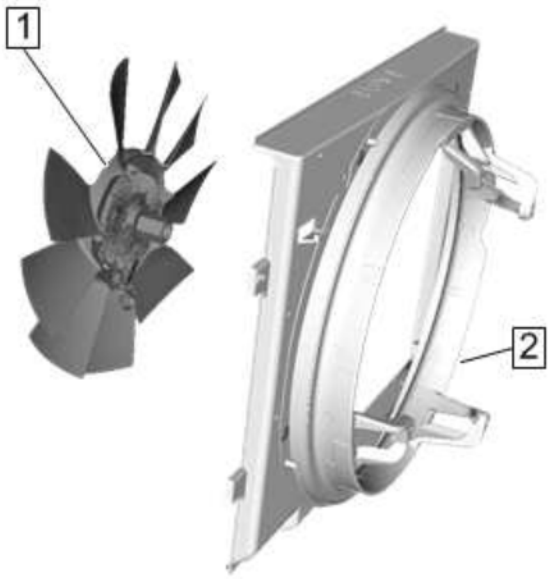

Fig. 249: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Install the fan blade and fan blade clutch as an assembly (1) into the engine coolant fan shroud (2).

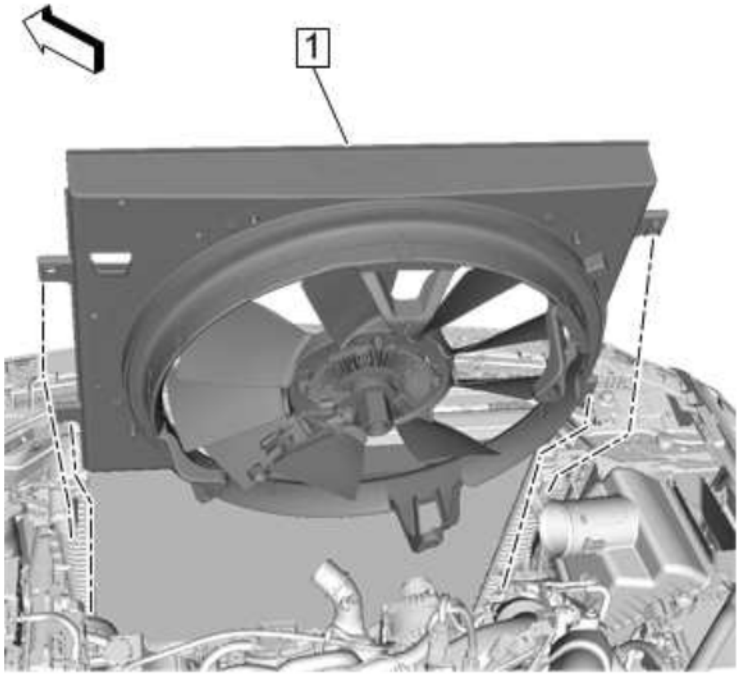

Fig. 250: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

4. Install the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) to the vehicle.

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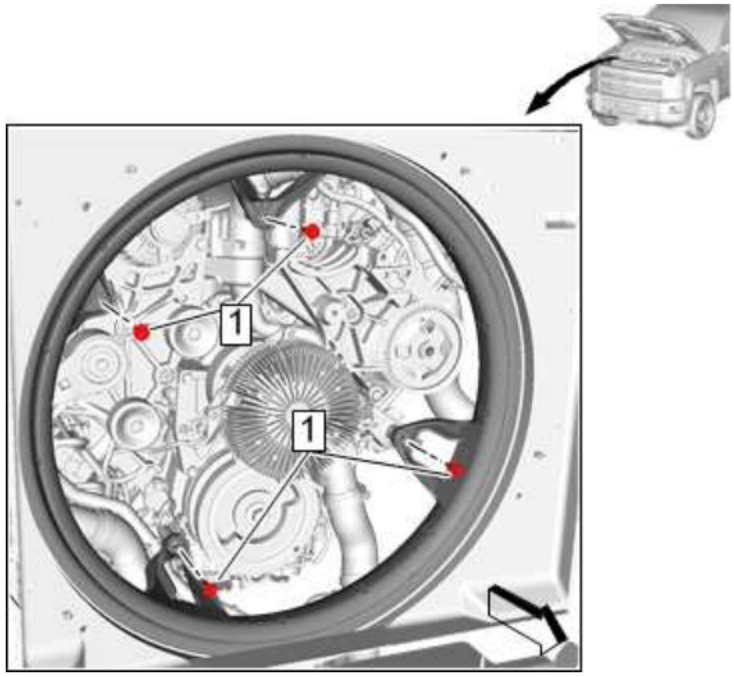

Fig. 251: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Engine Coolant Fan Shroud Bolt- Upper 1 - Install and hand tighten

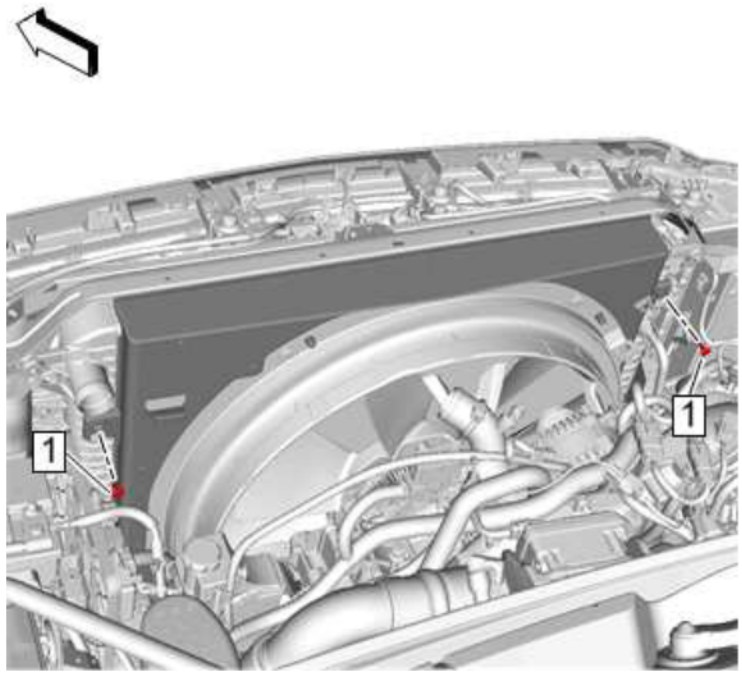

Fig. 252: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

6. Engine Coolant Fan Shroud Retainer 1 @Radiator - Install

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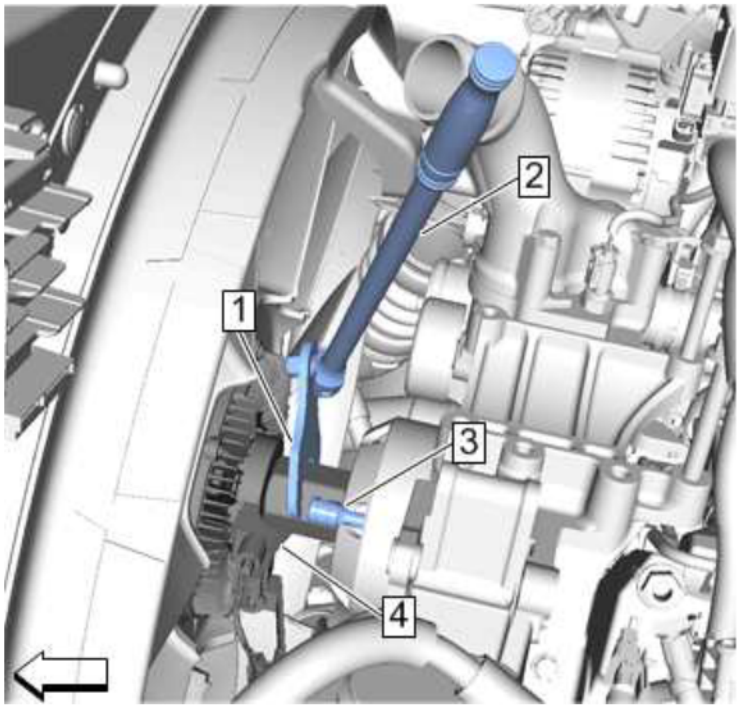

Fig. 253: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

7. Install the fan blade, fan blade clutch to the fan pulley (4).
8. Install a suitable blunt end tool (3) into one of the holes in the fan pulley preventing the pulley from turning allowing the fan clutch to be removed.
9. Install **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) onto the fan blade clutch nut.
10. Turn the fan blade clutch nut clockwise to install the fan blade and fan blade clutch as an assembly to the fan pulley and tighten to 100 N.m (74 lb ft).
11. Remove **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) from the fan hub nut.
12. Remove the suitable blunt end tool (3) from the fan pulley.
13. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

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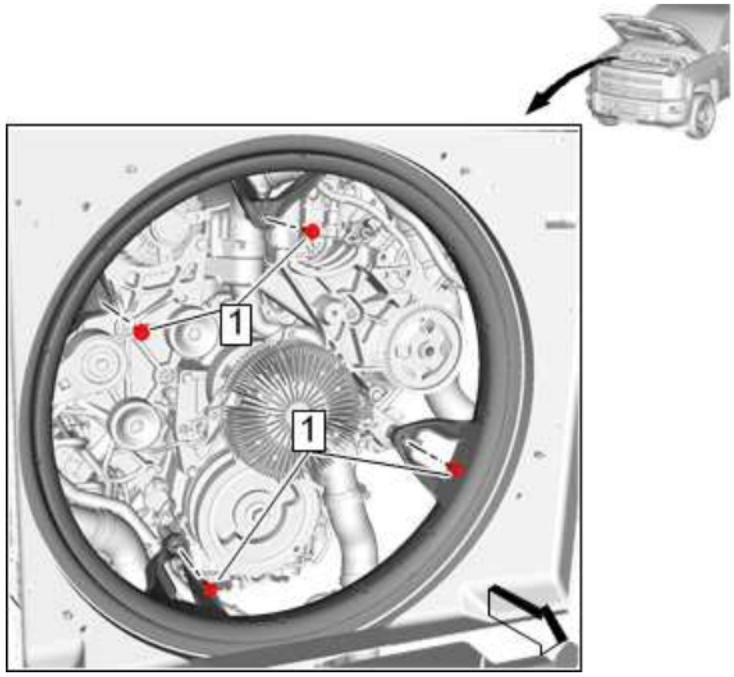

Fig. 254: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Fan Shroud Bolt- Lower 1 - Install and tighten 8 N.m (71 lb in)
15. Lower the vehicle.

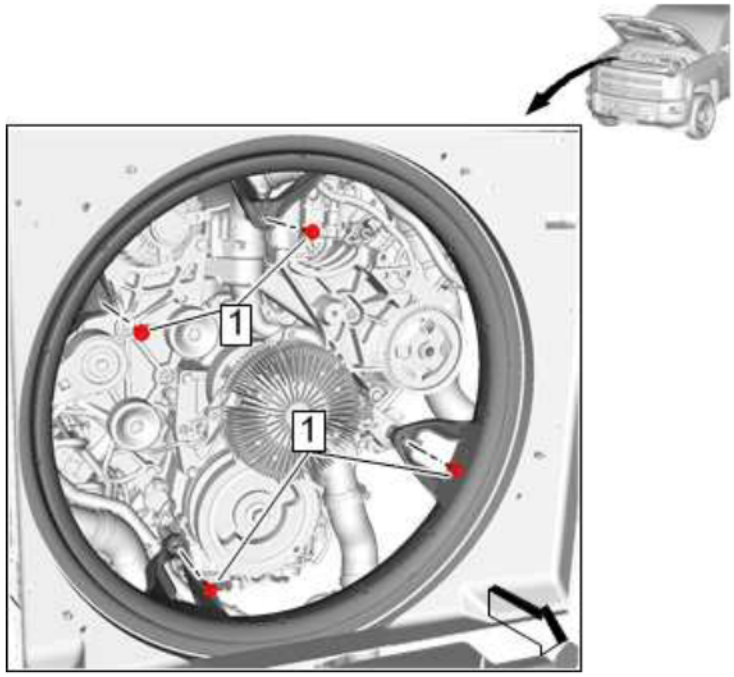

Fig. 255: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

16. Engine Coolant Fan Shroud Bolt- Upper 1 - Tighten 8 N.m (71 lb in)

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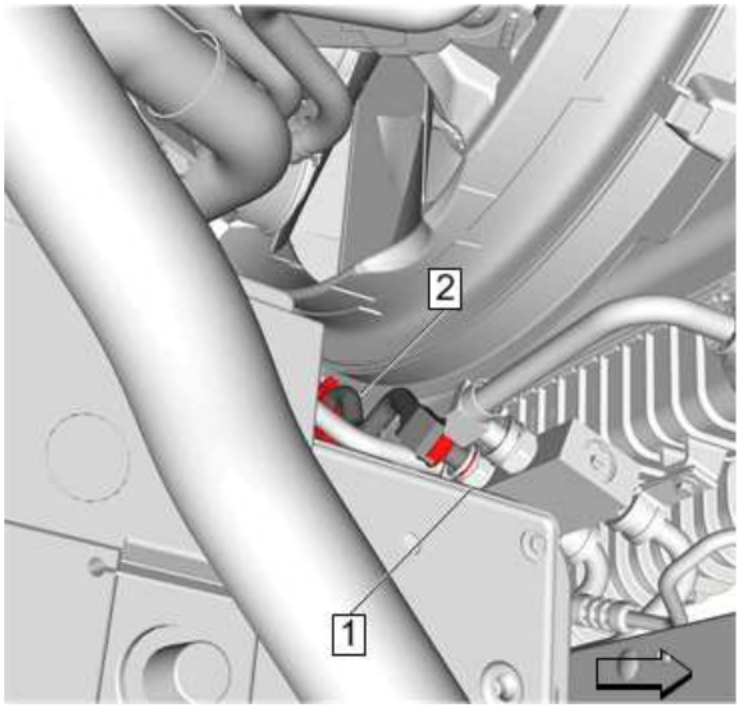

Fig. 256: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**
18. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

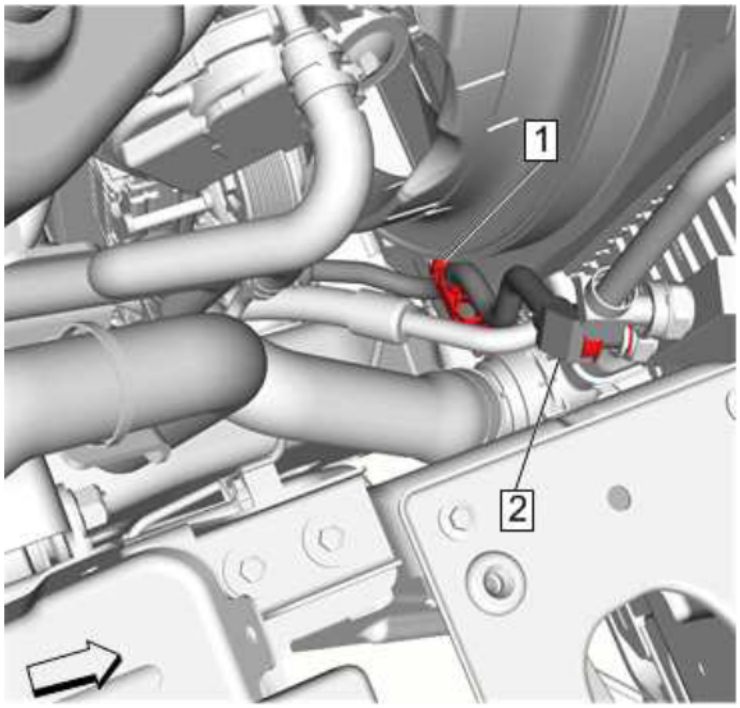

Fig. 257: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

19. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

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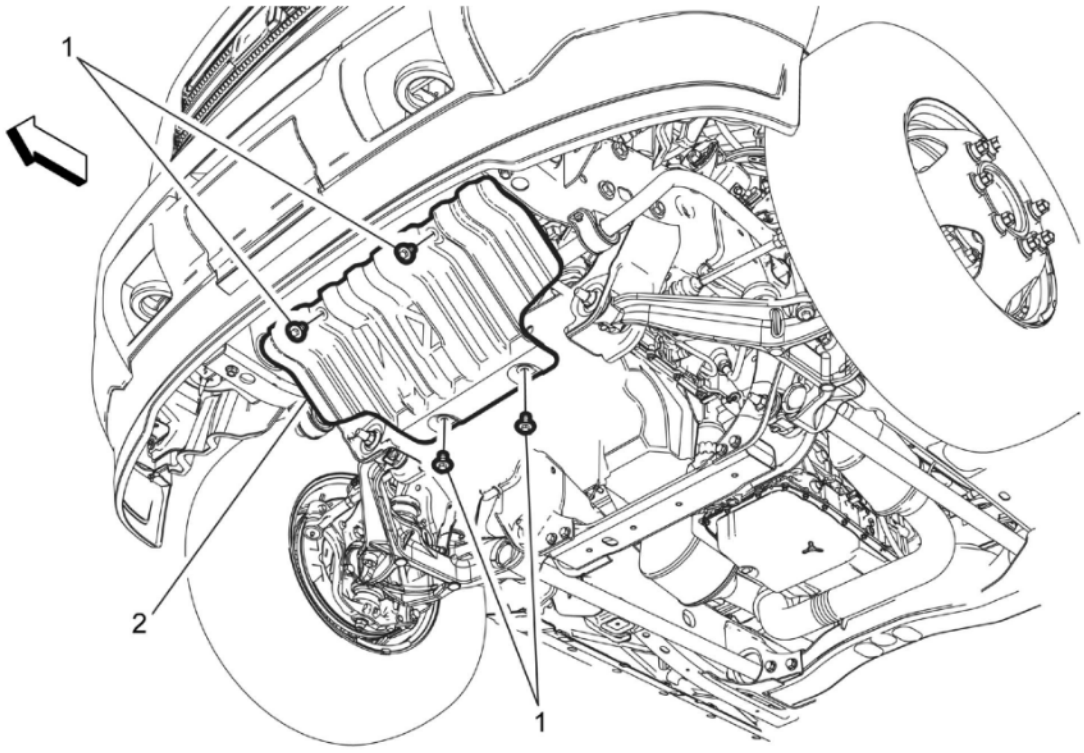

Fig. 258: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

20. Underbody Splash Shield 2 - Install **Underbody Splash Shield Replacement**
21. Lower the vehicle.

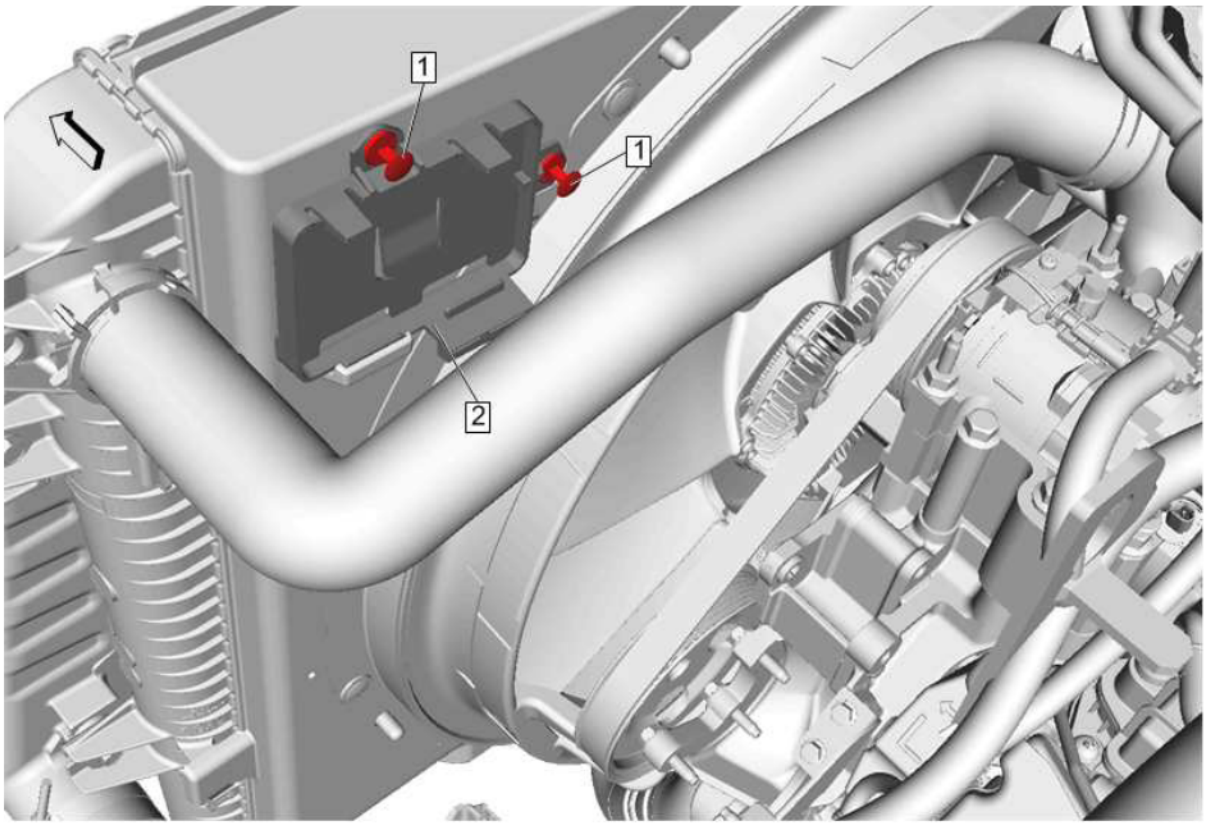

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Fig. 259: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

22. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Install **Transmission Control Module Bracket Replacement**

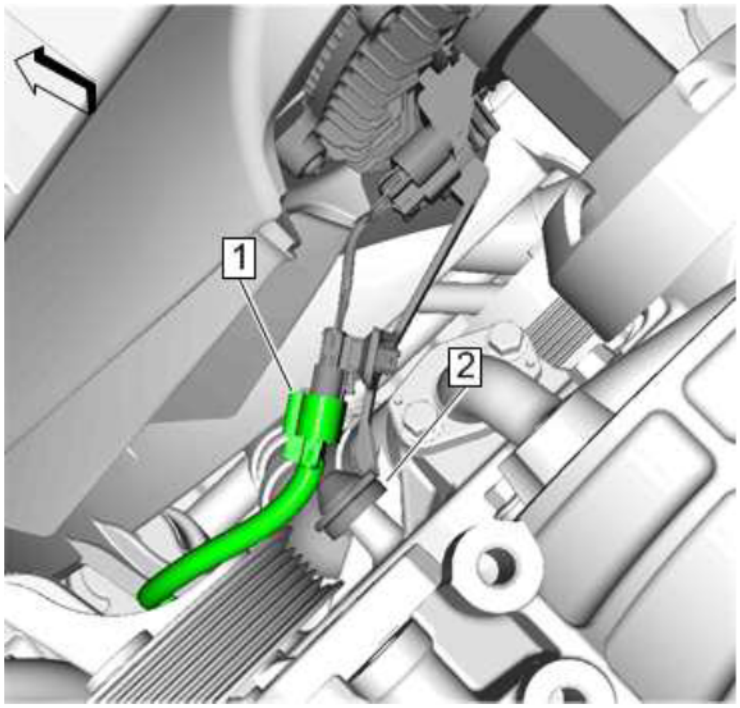

Fig. 260: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

23. Fan Blade Clutch 2 @Engine - Install
24. Engine Wiring Harness 1 @Fan Blade Clutch - Connect

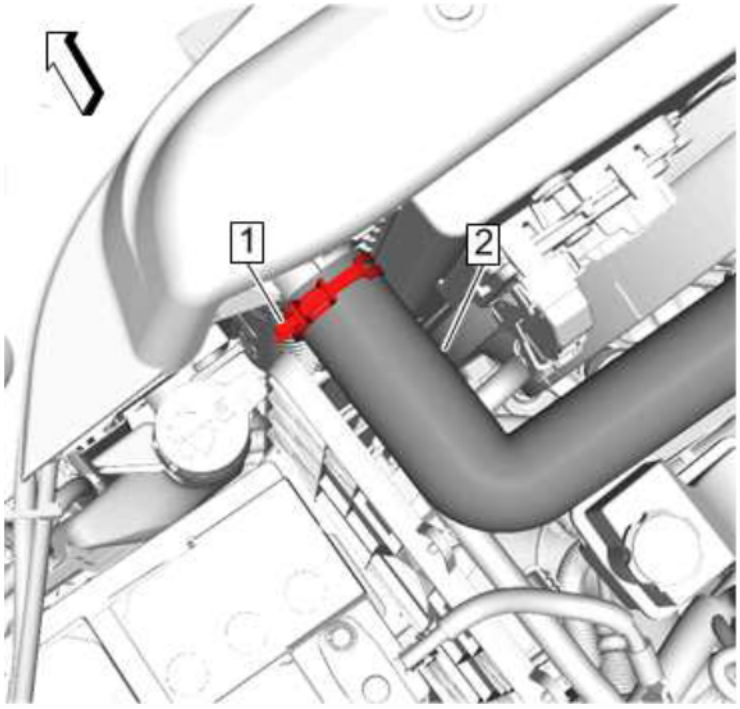

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Fig. 261: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

25. Radiator Inlet Hose 2 Install **Radiator Inlet Hose Replacement (L5P)**
26. Air Conditioning Compressor Hose - Install **Air Conditioning Compressor Hose Replacement (L5P)**
27. Air Cleaner Outlet Front Duct - Install **Air Cleaner Outlet Front Duct Replacement**

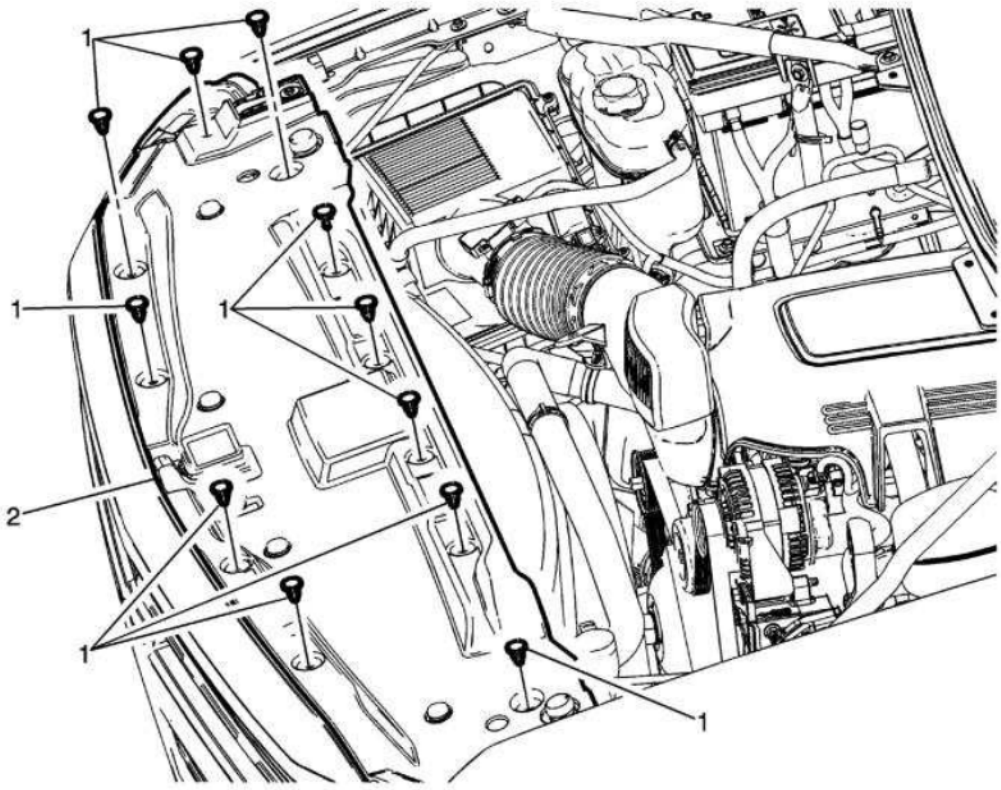

Fig. 262: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

28. Front Compartment Front Sight Shield 2 - Install - **Front Compartment Front Sight Shield Replacement**
29. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
30. Start the engine and inspect for leaks.

FAN BLADE CLUTCH REPLACEMENT (LC8, L96)

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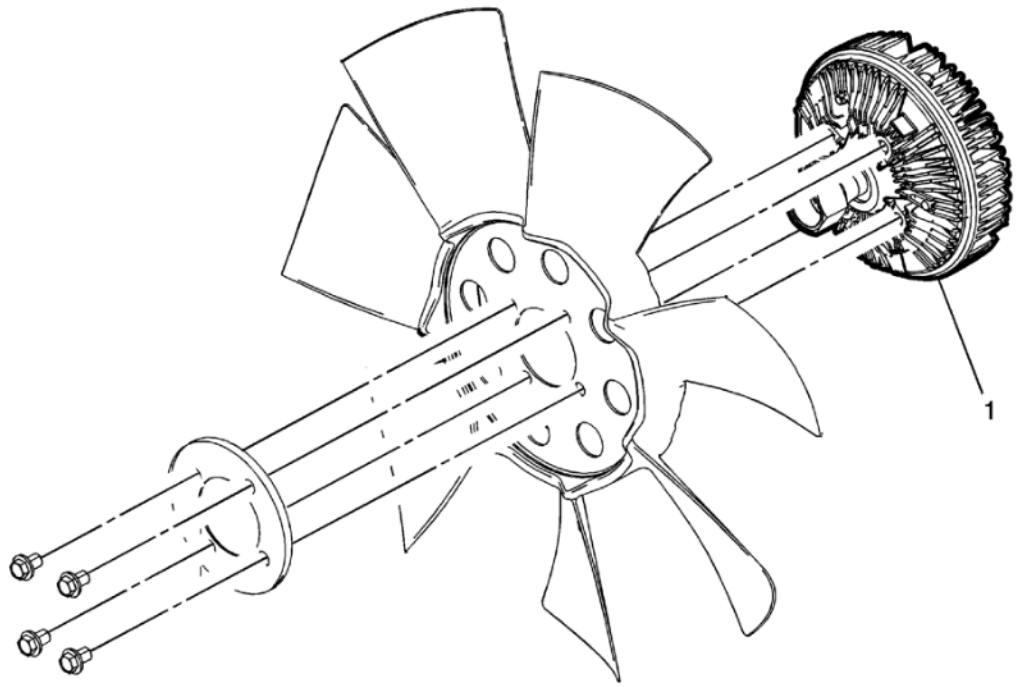

Fig. 263: Fan Blade Clutch (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the fan blade. Refer to **Fan Blade Replacement (LC8, L96)**.	
1	Fan Blade Clutch **NOTE:** **Pulley threads must be wiped with a clean cloth before assembling the new clutch.**

FAN BLADE CLUTCH REPLACEMENT (L5P)

Special Tools

J-41240-5A Fan Clutch Wrench

Equivalent regional tools:**Special Tools**

Removal Procedure

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1. Drain the coolant. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

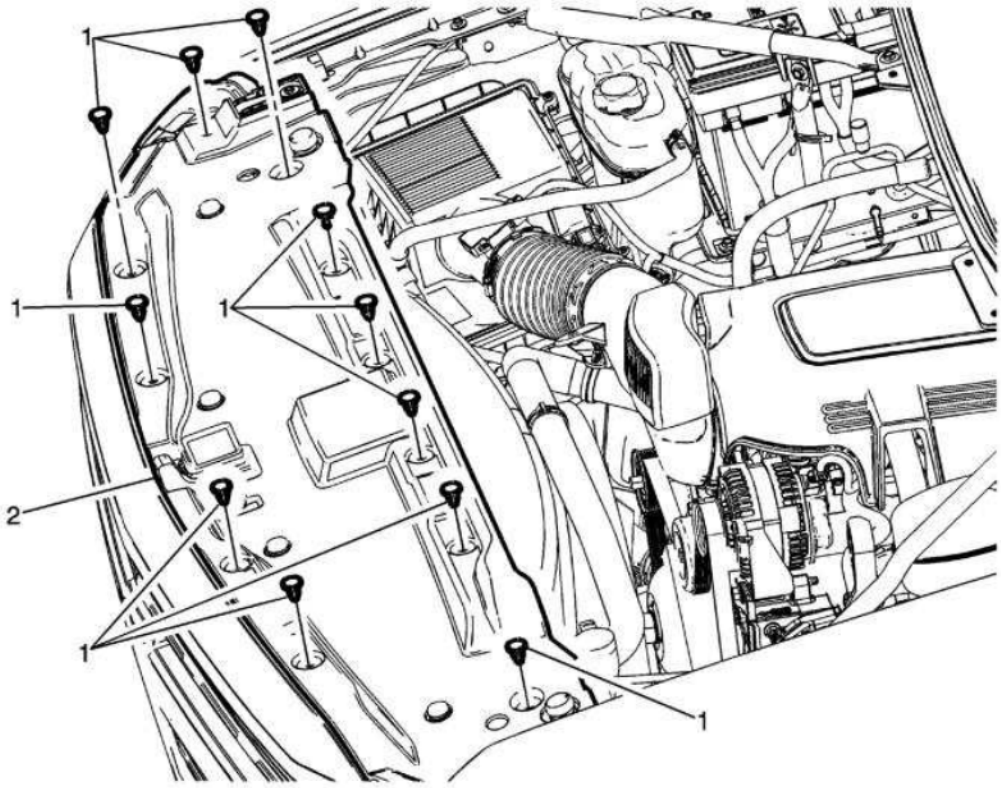

Fig. 264: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

2. Front Compartment Front Sight Shield 2 - Remove **Front Compartment Front Sight Shield Replacement**
3. Air Cleaner Outlet Front Duct - Remove **Air Cleaner Outlet Front Duct Replacement**
4. Air Conditioning Compressor Hose - Remove **Air Conditioning Compressor Hose Replacement (L5P)**

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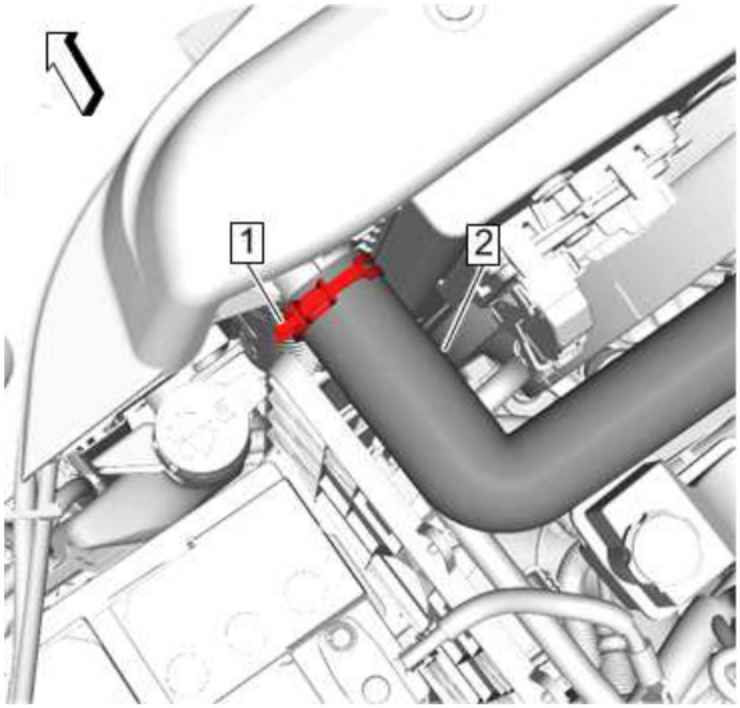

Fig. 265: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Inlet Hose 2 Remove - **Radiator Inlet Hose Replacement (L5P)**

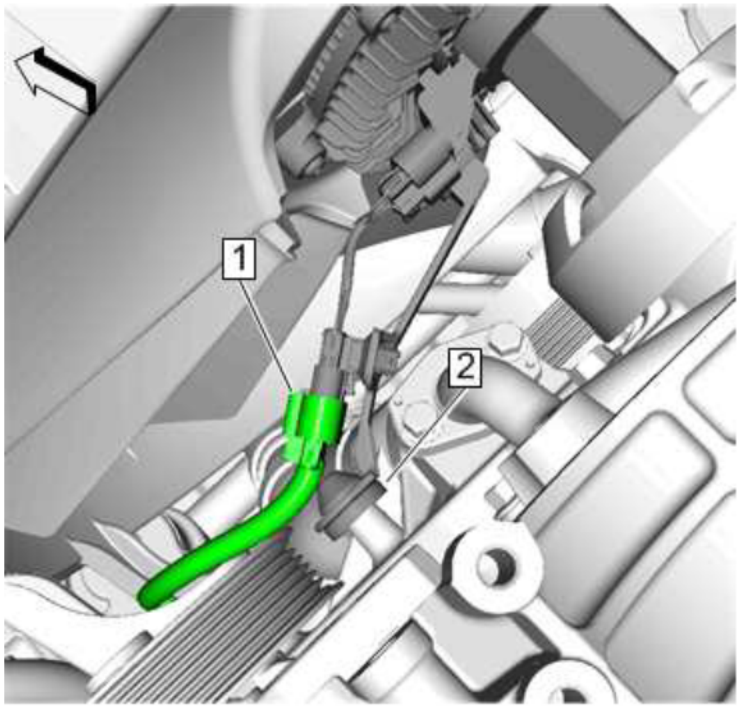

Fig. 266: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

6. Engine Wiring Harness 1 @Fan Blade Clutch - Disconnect
7. Fan Blade Clutch 2 @Engine - Remove

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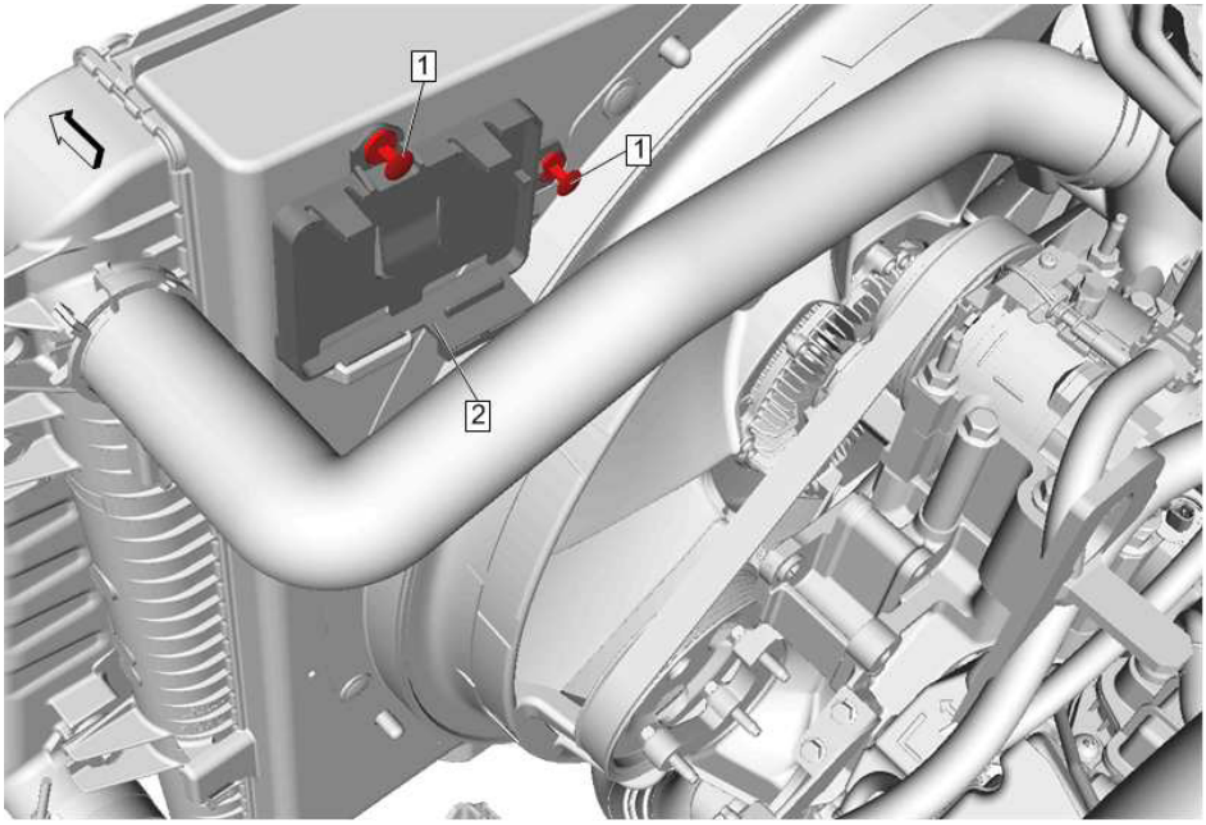

Fig. 267: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

8. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Remove **Transmission Control Module Bracket Replacement**

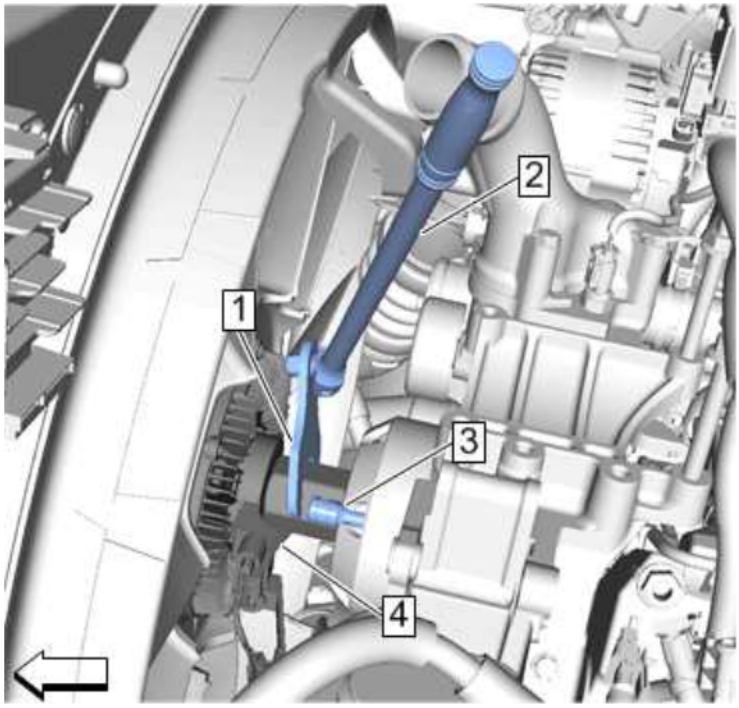

Fig. 268: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

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9. Install a suitable blunt end tool (3) into one of the holes in the fan pulley preventing the pulley from turning allowing the fan clutch to be removed.
10. Install **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) onto the fan blade clutch nut.
11. Turn the fan blade clutch nut counterclockwise to remove the fan blade and fan blade clutch (4) as an assembly from the fan pulley.
12. Remove **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) from the fan blade clutch nut.
13. Remove the suitable blunt end tool (3) from the fan pulley.

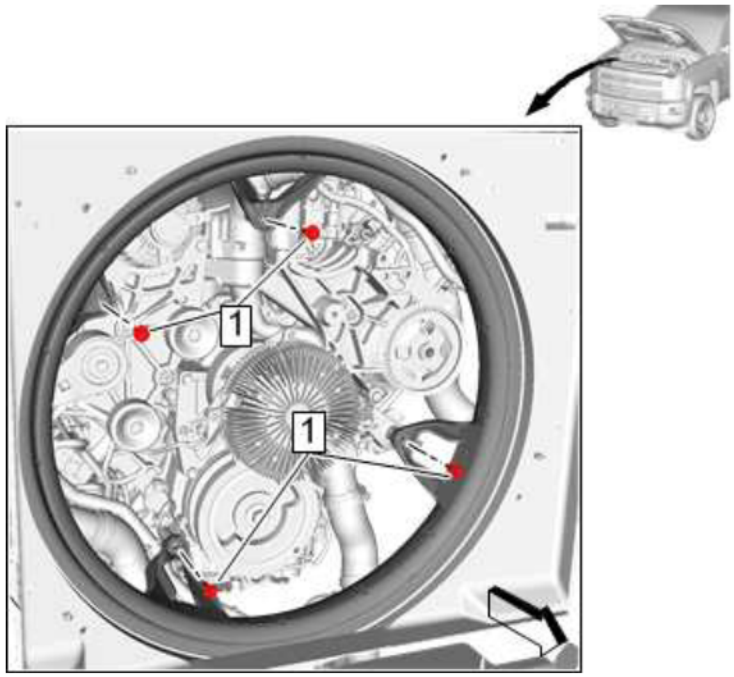

Fig. 269: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Fan Shroud Bolt- Upper 1 - Remove

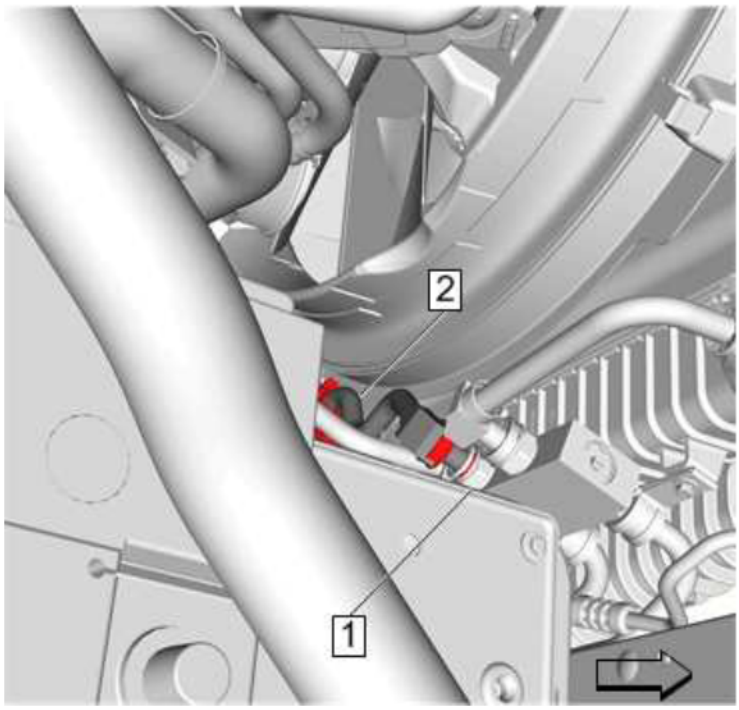

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Fig. 270: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

15. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

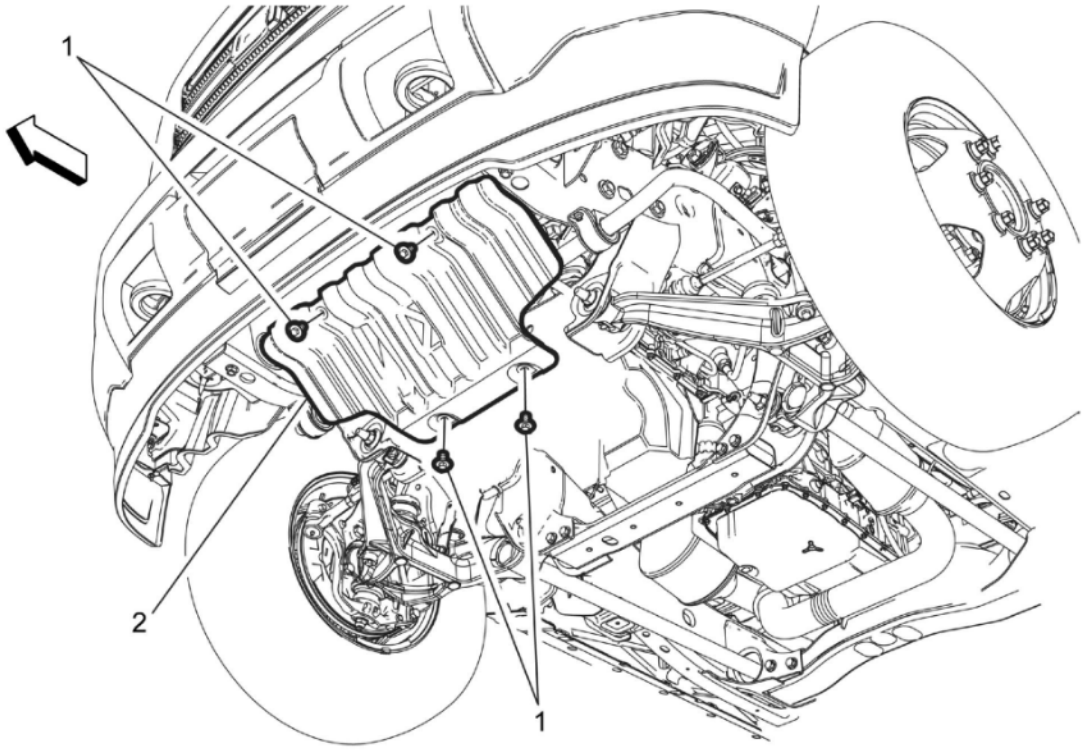

Fig. 271: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

16. Underbody Splash Shield 2 - Remove **Underbody Splash Shield Replacement**

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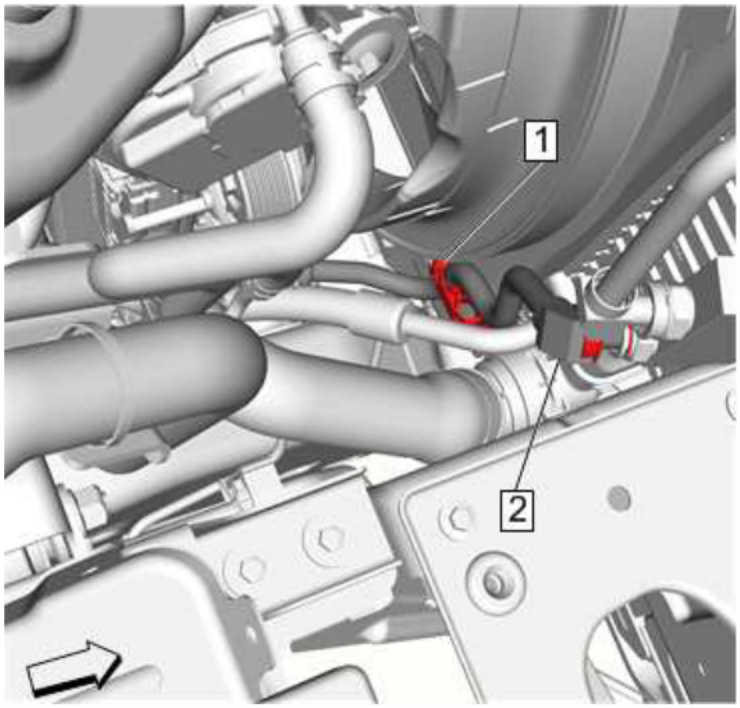

Fig. 272: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

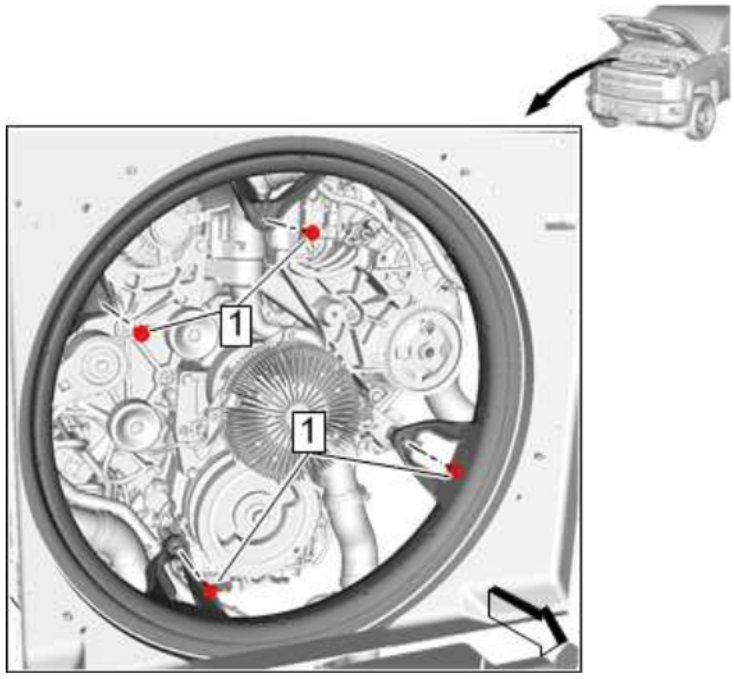

Fig. 273: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

18. Engine Coolant Fan Shroud Bolt- Lower 1 - Remove
19. Lower the vehicle.

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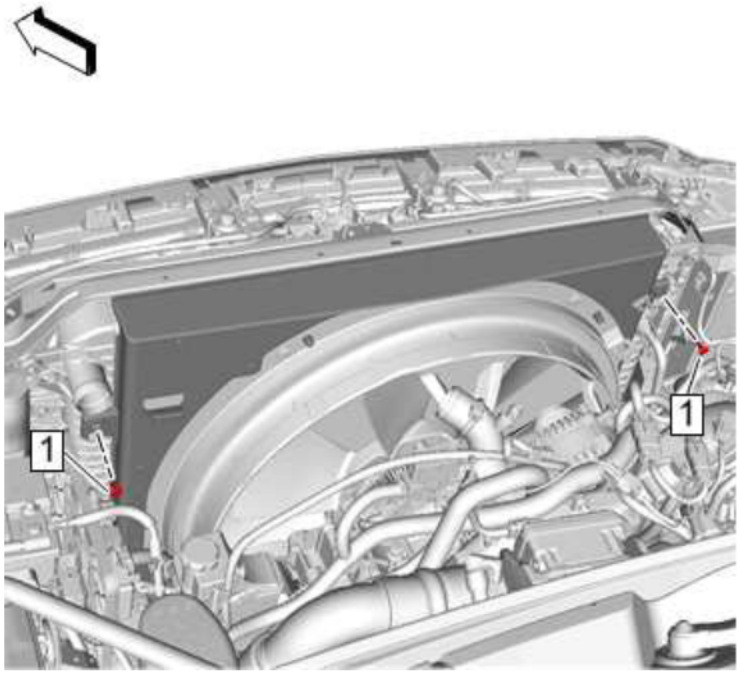

Fig. 274: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

20. Engine Coolant Fan Shroud Retainer 1 @Radiator - Remove

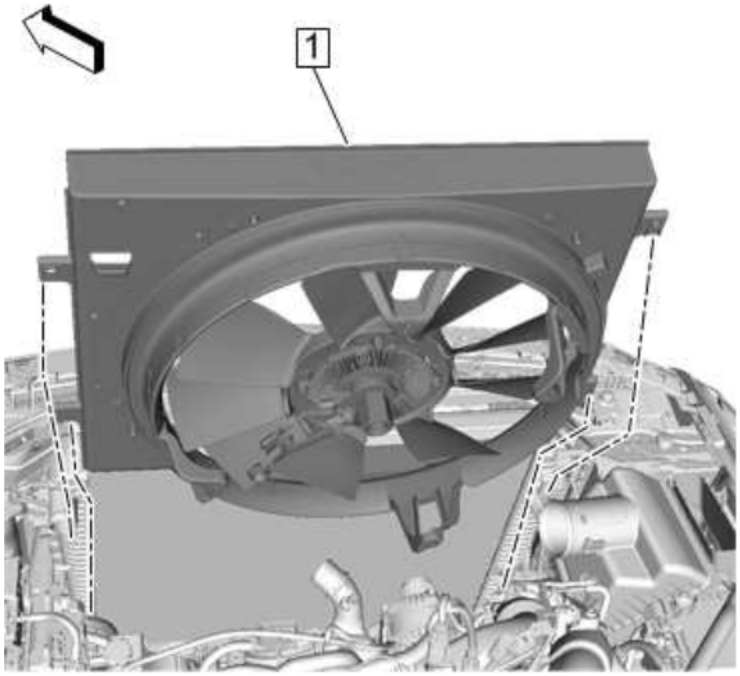

Fig. 275: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

21. Remove the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) from the vehicle.

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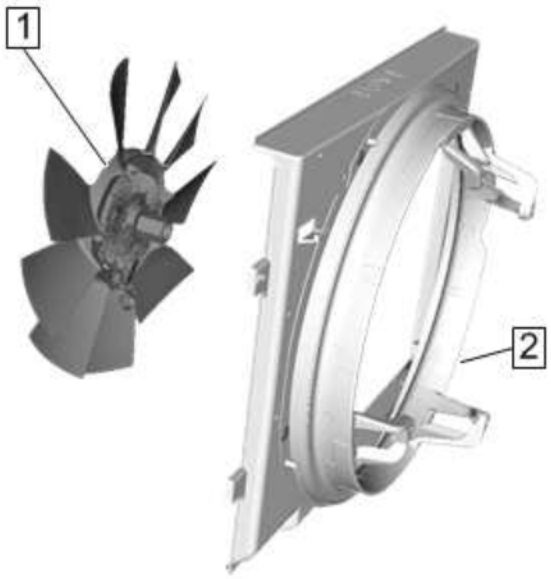

Fig. 276: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

22. Remove the fan blade and fan blade clutch as an assembly (1) from the engine coolant fan shroud (2).

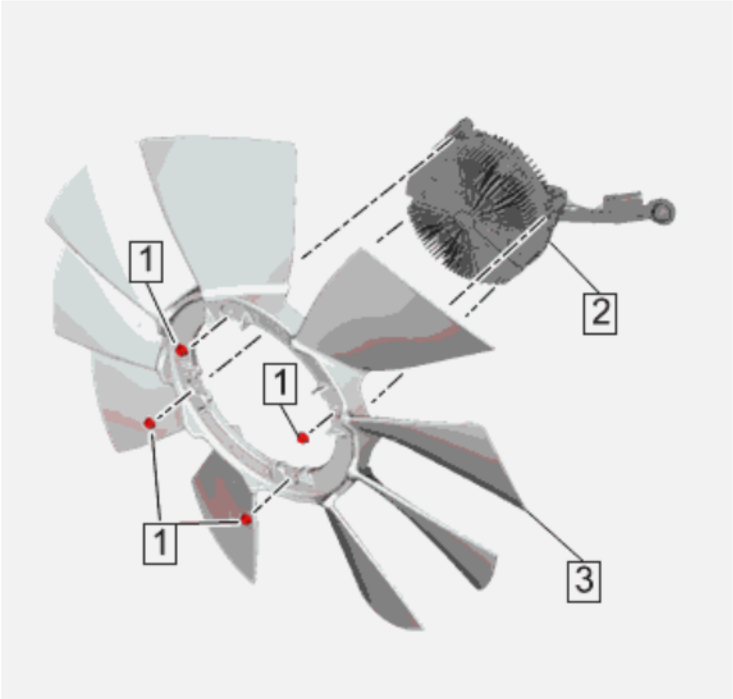

Fig. 277: Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

23. Fan Blade Nut 1 @Fan Blade Clutch 2 - Remove

NOTE: **Do not place clutch on a dirty surface.**

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24. Fan Blade 3 @Fan Blade Clutch 2 - Remove

Installation Procedure

WARNING: Do not use or attempt to repair a damaged cooling fan assembly. Replace damaged fans with new assemblies. An unbalanced cooling fan could fly apart causing personal injury and property damage.

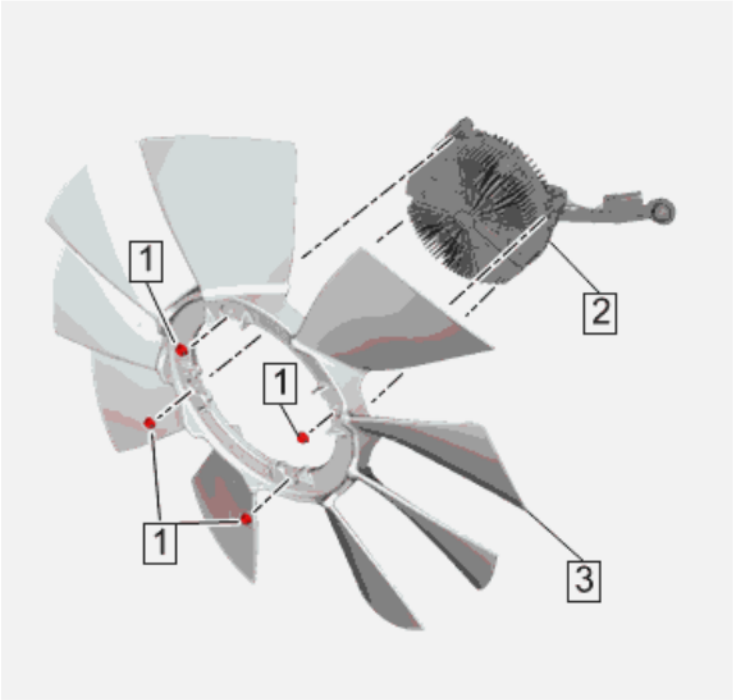

Fig. 278: Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

NOTE: Pulley and clutch threads must be wiped with a clean cloth before reassembly.

1. Fan Blade 3 @Fan Blade Clutch 2 - Install

CAUTION: Refer to Fastener Caution .

2. Fan Blade Nut 1 @Fan Blade Clutch 2 - Install and tighten 9 N.m (80 lb in)

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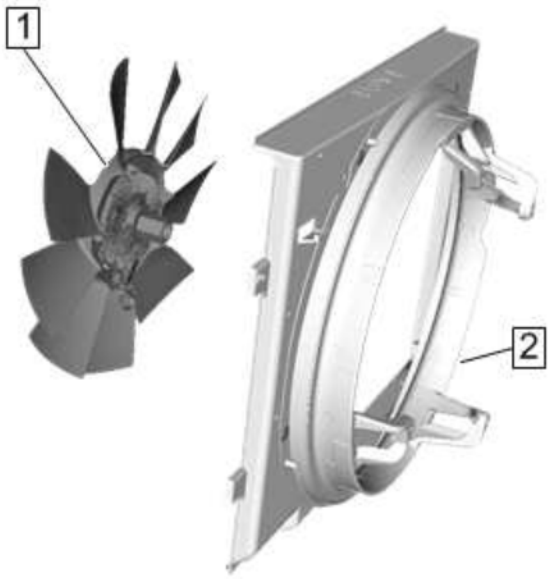

Fig. 279: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Install the fan blade and fan blade clutch as an assembly (1) into the engine coolant fan shroud (2).

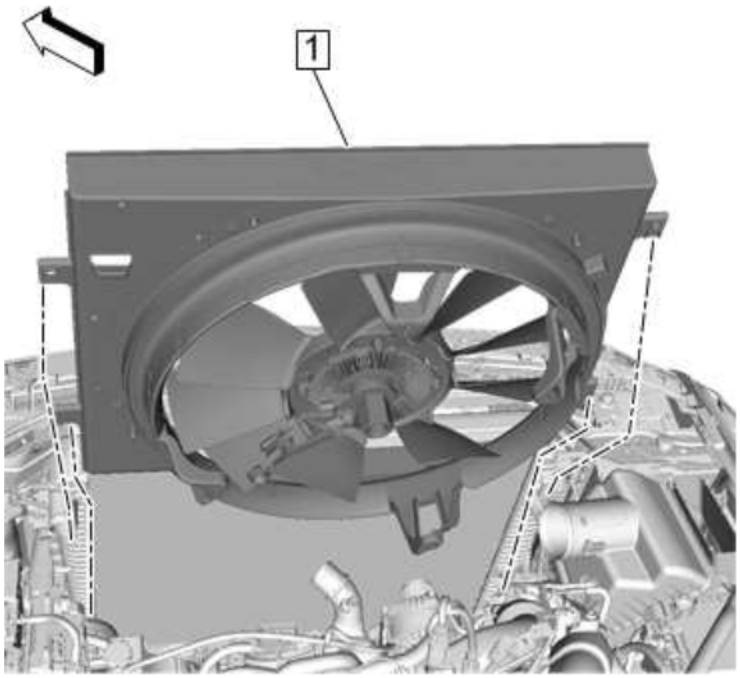

Fig. 280: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

4. Install the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) to the vehicle.

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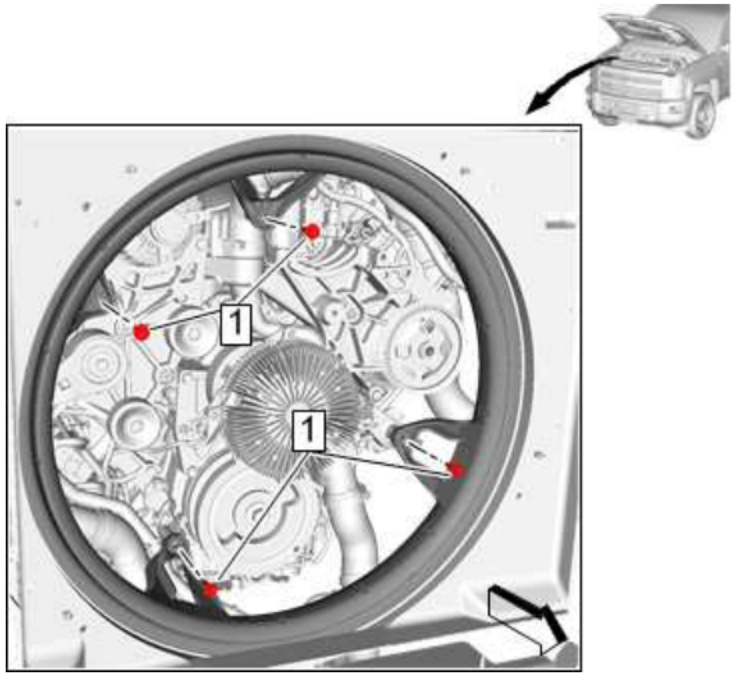

Fig. 281: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Engine Coolant Fan Shroud Bolt- Upper 1 - Install and hand tighten

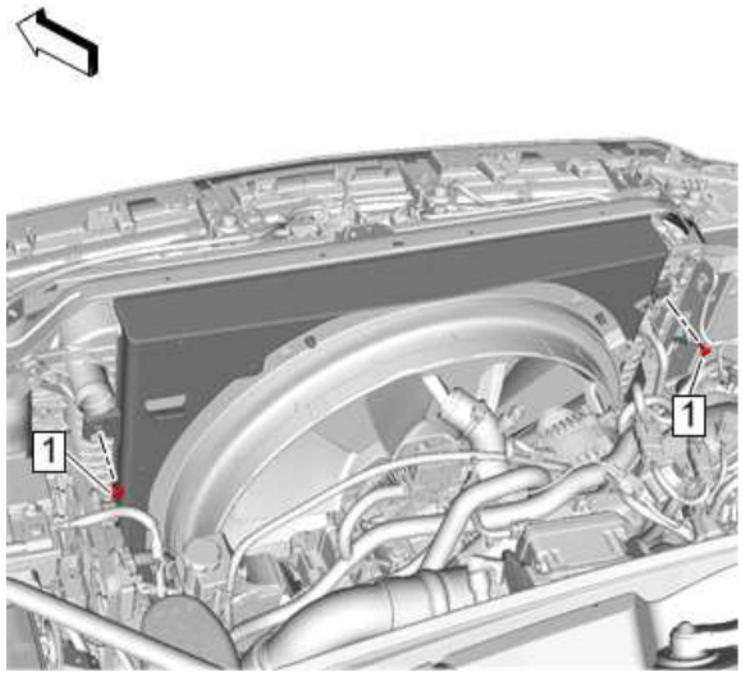

Fig. 282: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

6. Engine Coolant Fan Shroud Retainer 1 @Radiator - Install

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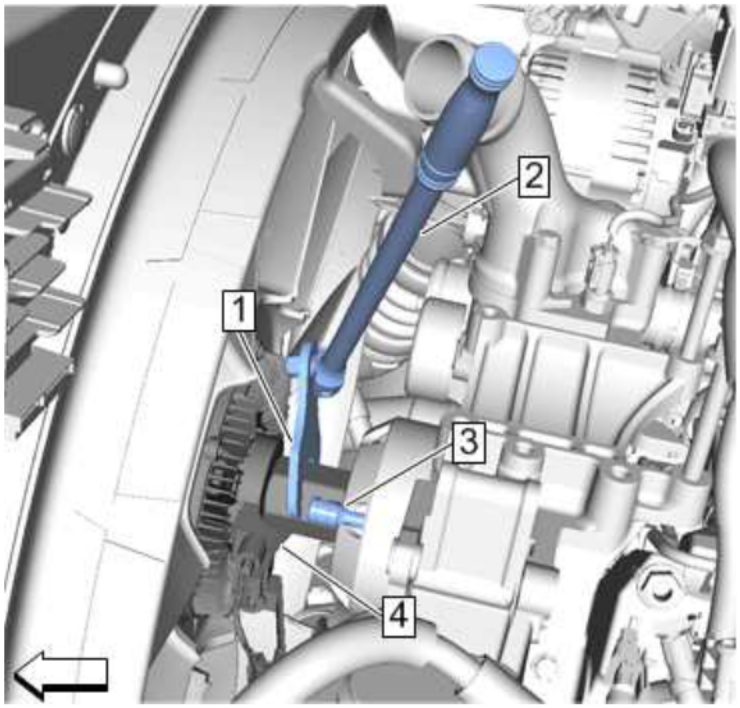

Fig. 283: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

7. Install the fan blade, fan blade clutch (4) to the fan pulley.
8. Install a suitable blunt end tool (3) into one of the holes in the fan pulley preventing the pulley from turning allowing the fan clutch to be removed.
9. Install **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) onto the fan blade clutch nut.
10. Turn the fan blade clutch nut clockwise to install the fan blade and fan blade clutch as an assembly to the fan pulley and tighten to 100 N.m (74 lb ft).
11. Remove **J-41240-5A** fan clutch wrench (1) with a long breaker bar (2) from the fan hub nut.
12. Remove the suitable blunt end tool (3) from the fan pulley.
13. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

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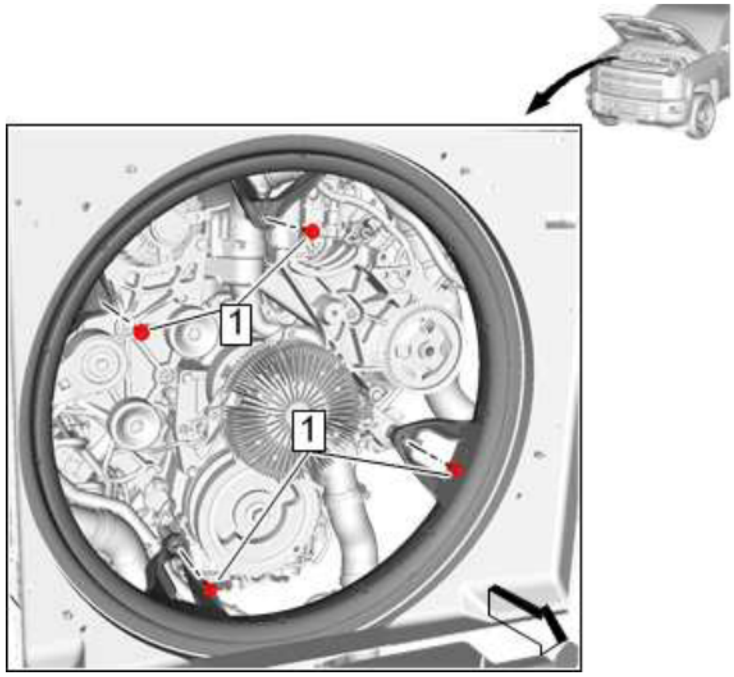

Fig. 284: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Fan Shroud Bolt- Lower 1 - Install and tighten 8 N.m (71 lb in)
15. Lower the vehicle.

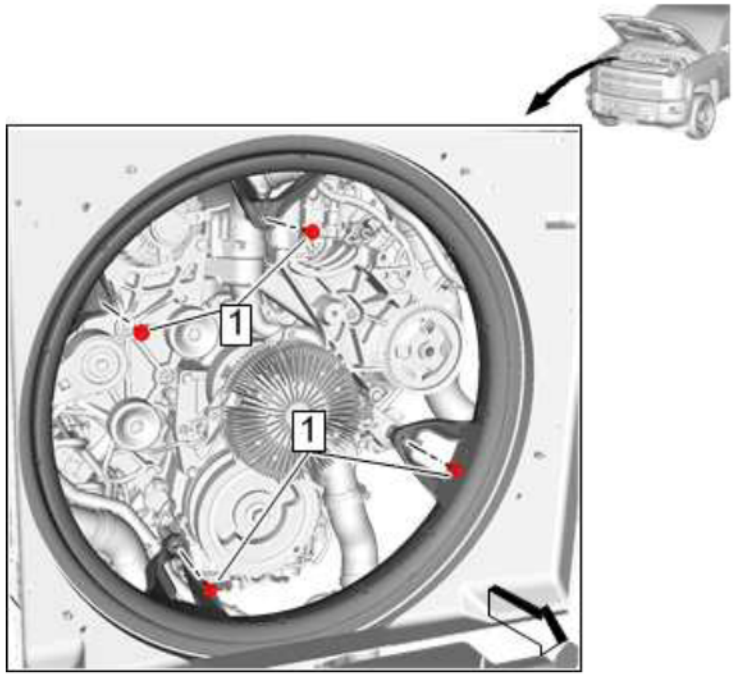

Fig. 285: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

16. Engine Coolant Fan Shroud Bolt- Upper 1 - Tighten 8 N.m (71 lb in)

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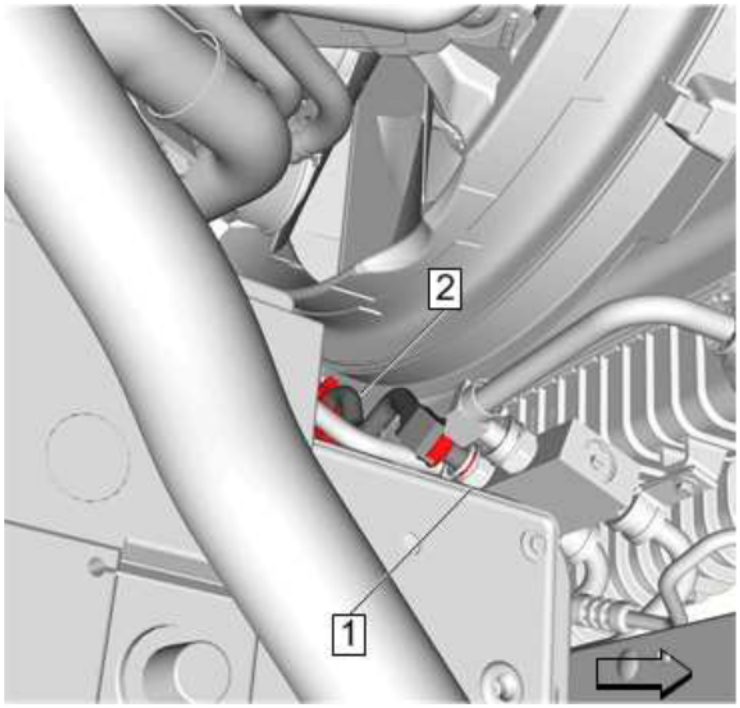

Fig. 286: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**
18. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

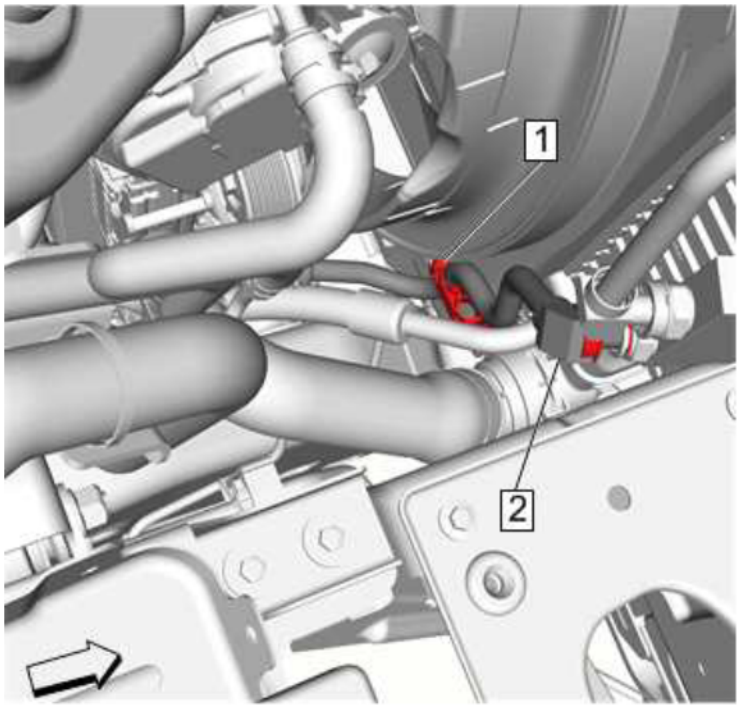

Fig. 287: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

19. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

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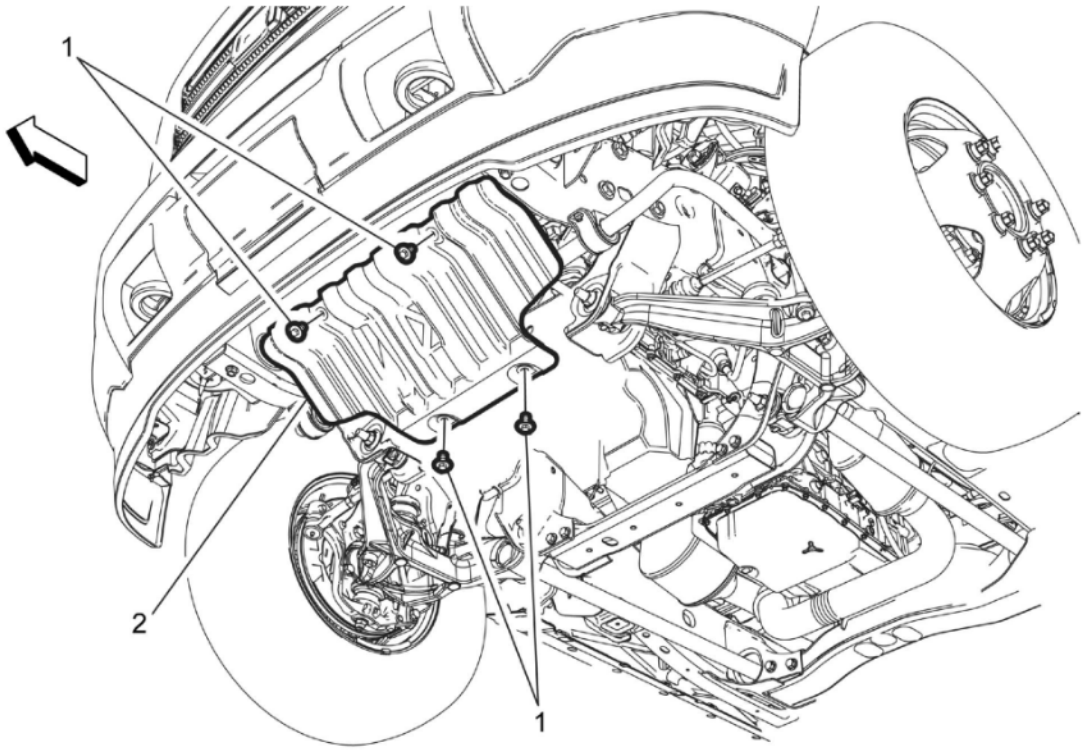

Fig. 288: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

20. Underbody Splash Shield 2 - Install **Underbody Splash Shield Replacement**
21. Lower the vehicle.

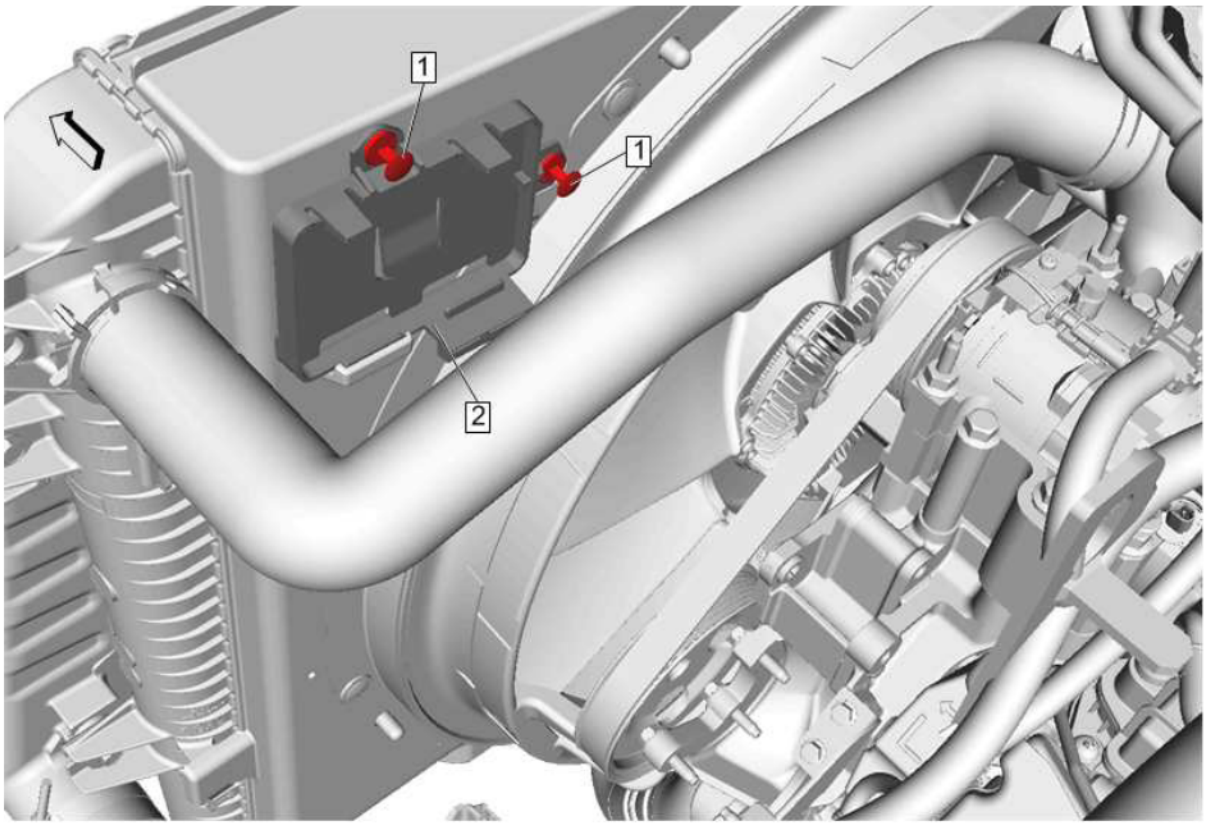

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Fig. 289: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

22. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Install **Transmission Control Module Bracket Replacement**

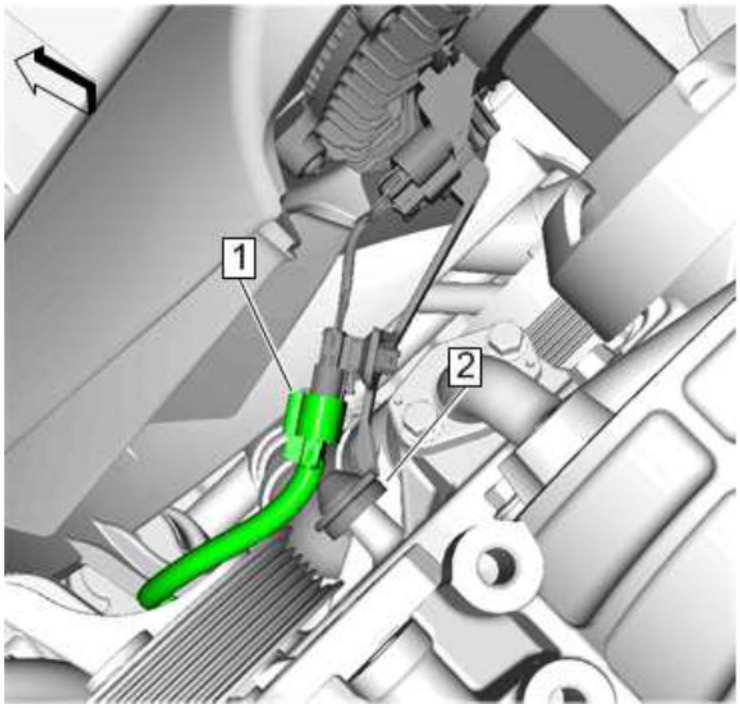

Fig. 290: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

23. Fan Blade Clutch 2 @Engine - Install
24. Engine Wiring Harness 1 @Fan Blade Clutch - Connect

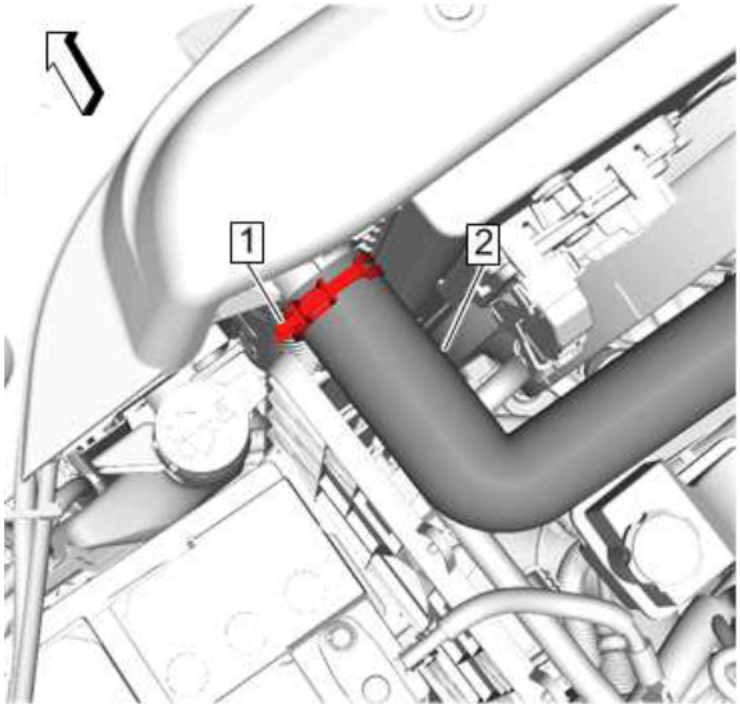

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Fig. 291: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

25. Radiator Inlet Hose 2 Install **Radiator Inlet Hose Replacement (L5P)**
26. Air Conditioning Compressor Hose - Install **Air Conditioning Compressor Hose Replacement (L5P)**
27. Air Cleaner Outlet Front Duct - Install **Air Cleaner Outlet Front Duct Replacement**

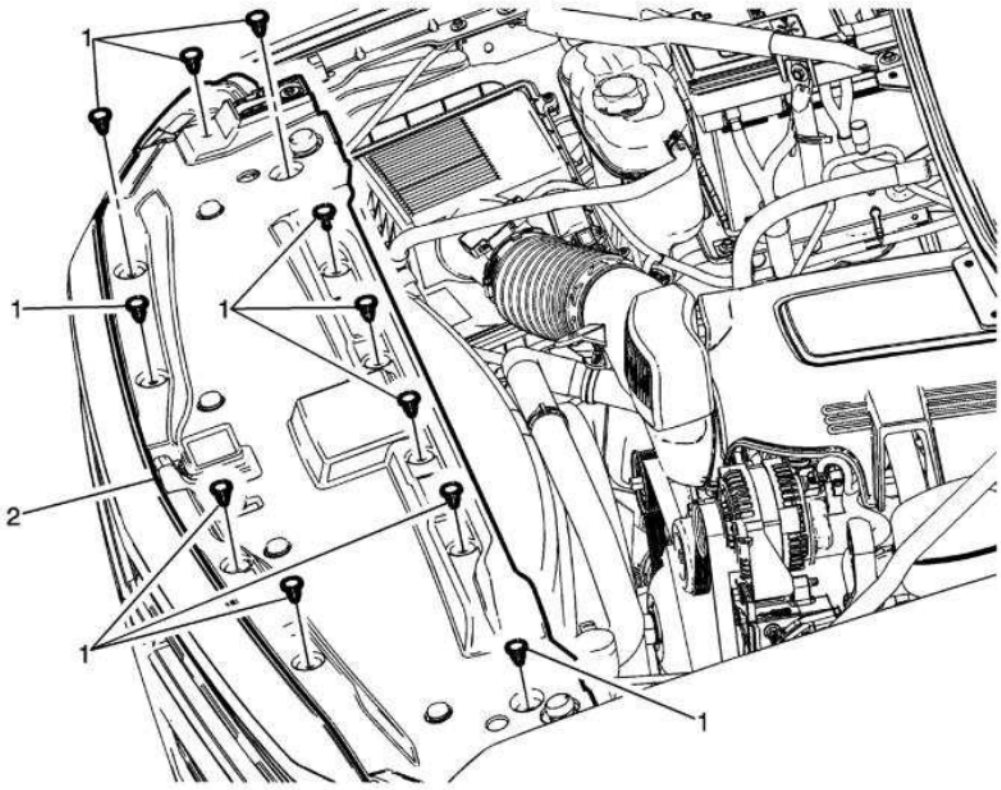

Fig. 292: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

28. Front Compartment Front Sight Shield 2 - Install **Front Compartment Front Sight Shield Replacement**
29. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
30. Start the engine and inspect for leaks.

FAN PULLEY REPLACEMENT

Removal Procedure

1. Drive Belt - Remove **Drive Belt Replacement (Dual Generators) Drive Belt Replacement (Single Generator)** .

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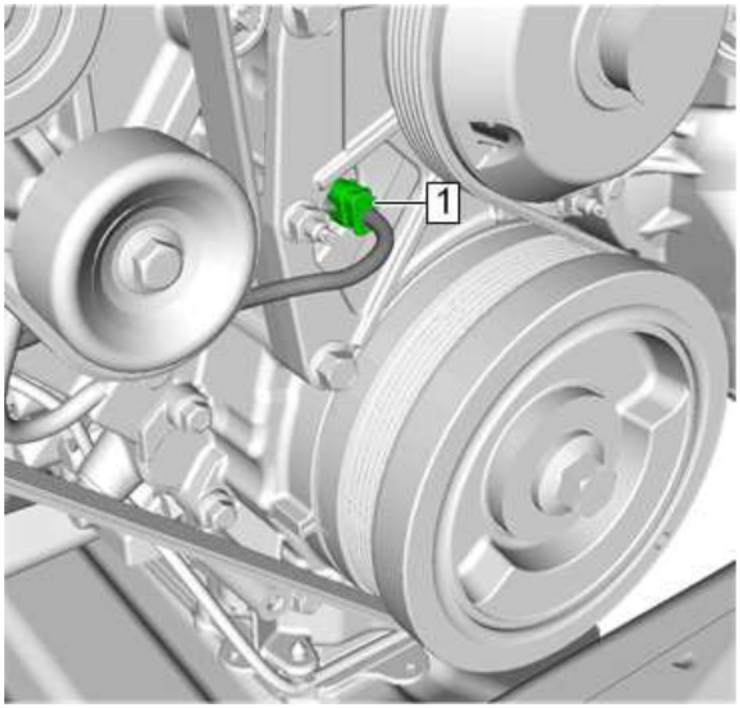

Fig. 293: Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the camshaft position (CMP) sensor electrical connector (1).

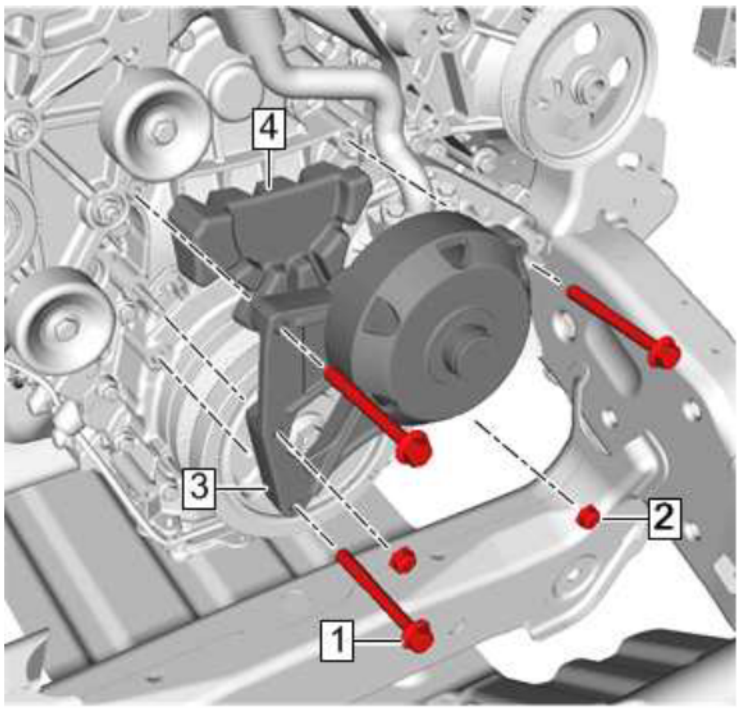

Fig. 294: Fan Pulley
Courtesy of GENERAL MOTORS COMPANY

3. Fan Pulley Bolt 1 - Remove
4. Fan Pulley Nut 2 - Remove
5. Fan Pulley 3 - Remove

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6. Engine Cooling Fan Bracket Insulator 4 - Remove

Installation Procedure

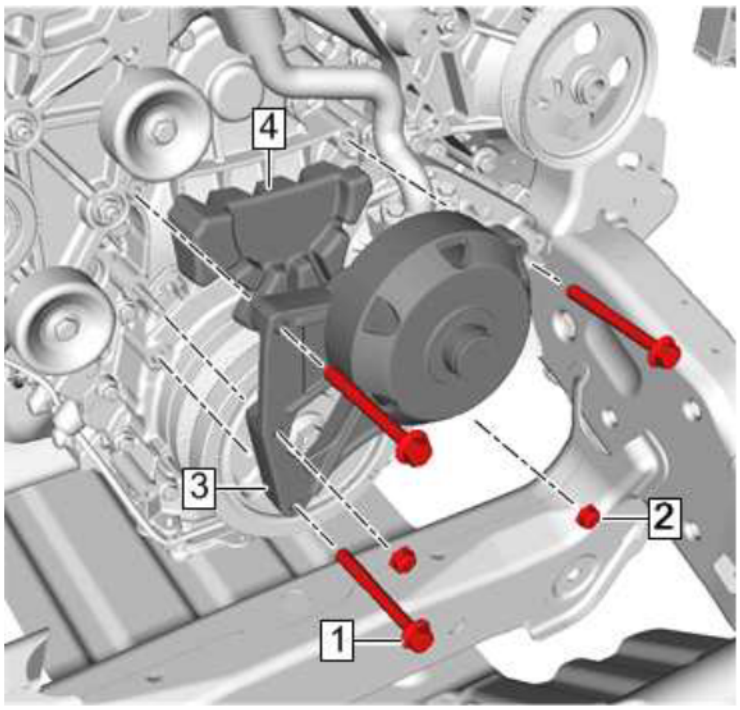

Fig. 295: Fan Pulley
Courtesy of GENERAL MOTORS COMPANY

1. Engine Cooling Fan Bracket Insulator 4 - Install
2. Fan Pulley 3 - Install

CAUTION: Refer to Fastener Caution .

3. Fan Pulley Nut 2 - Install and tighten 41 N.m (30 lb ft)
4. Fan Pulley Bolt 1 - Install and tighten 41 N.m (30 lb ft)

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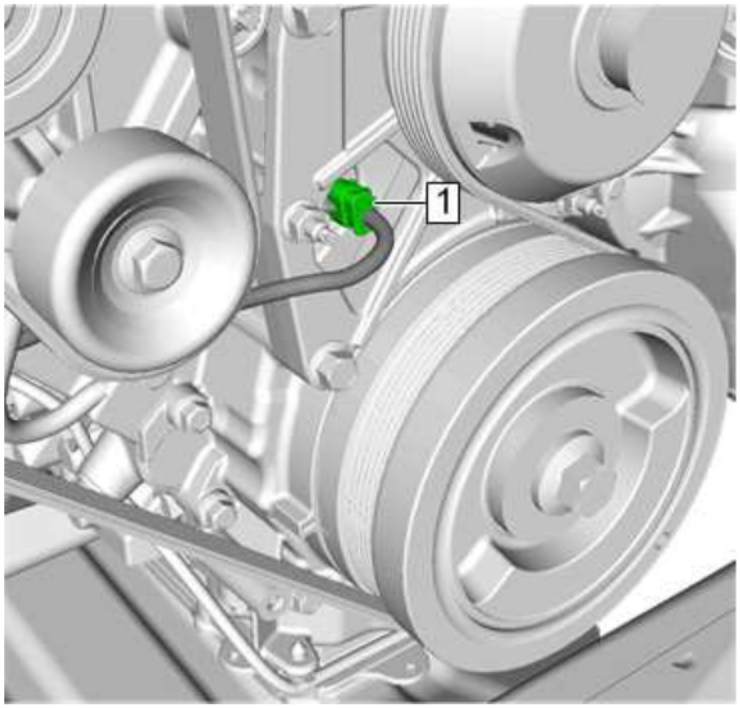

Fig. 296: Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Connect the camshaft position (CMP) sensor electrical connector (1).
6. Drive Belt - Install **Drive Belt Replacement (Dual Generators)** **Drive Belt Replacement (Single Generator)** .

ENGINE COOLANT FAN REPLACEMENT (L83, L86, LV3)

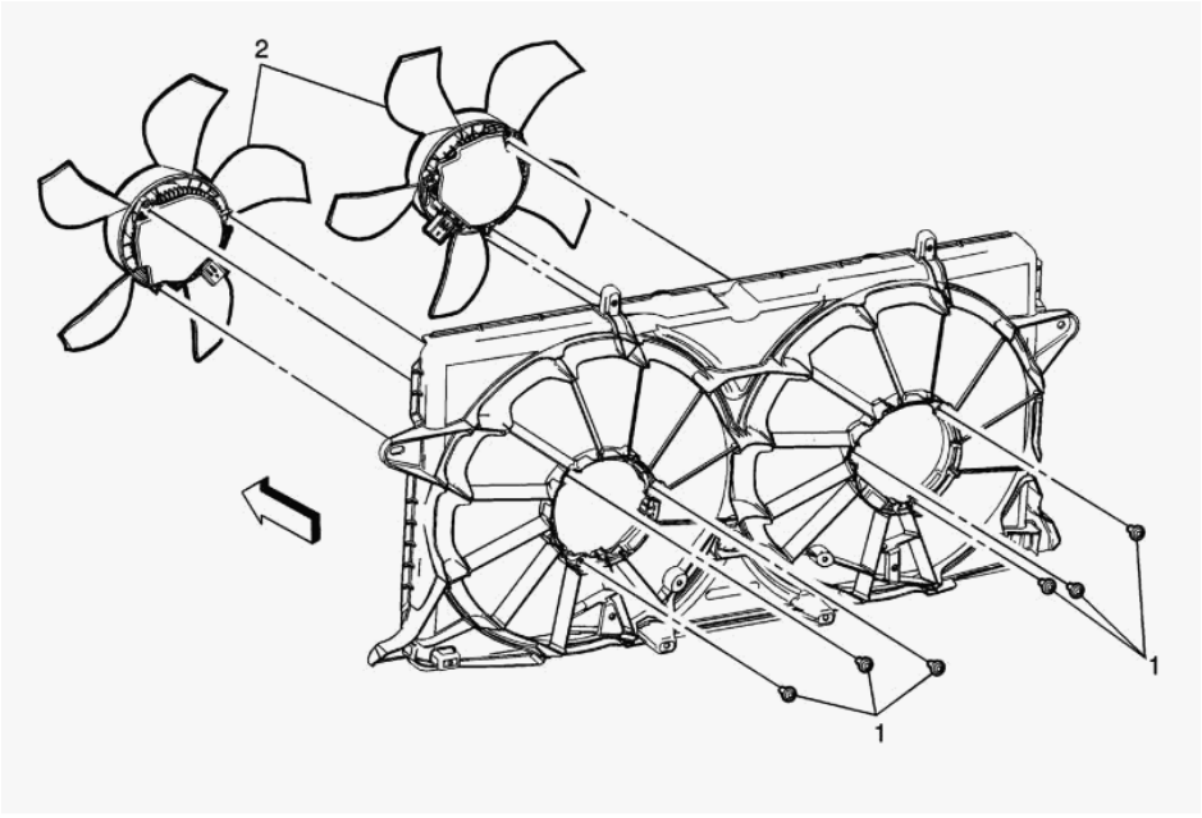

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Fig. 297: Engine Coolant Fan (L83, L86, LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove engine coolant fan rear shroud. Refer to **Engine Coolant Fan Rear Shroud Replacement (LV3)Engine Coolant Fan Rear Shroud Replacement (L83, L86)**. **NOTE:** **The left and right side engine coolant fans are different. Ensure you install the left or right side engine coolant fans on the proper side.**	
1	Engine Coolant Fan Fastener (Qty: 6) Three Per Motor **CAUTION:** **Refer to Fastener Caution .**
2	Engine Coolant Fan (Qty: 2)

ENGINE COOLANT FAN REPLACEMENT (L8B)

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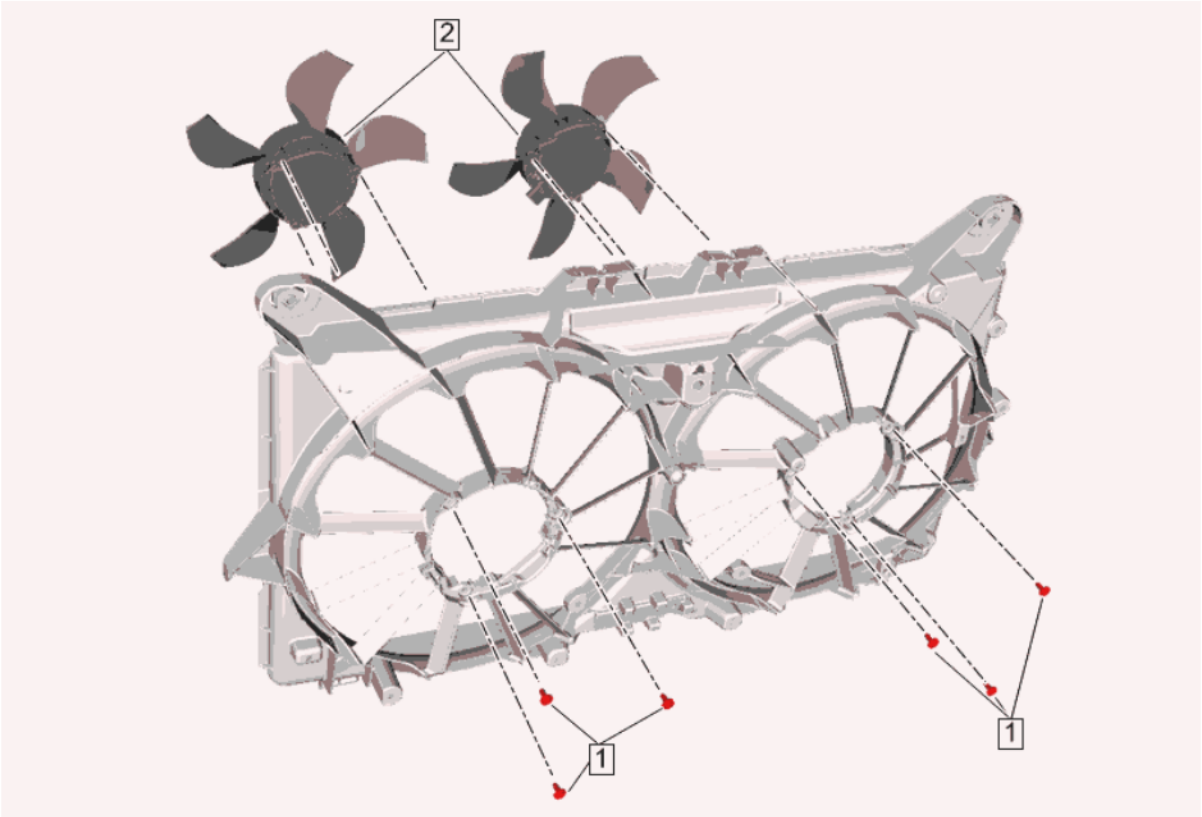

Fig. 298: Engine Coolant Fan (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Engine Coolant Fan Shroud - **Engine Coolant Fan Shroud Replacement (L8B)** **NOTE:** **The left and right side engine coolant fans are different. Ensure you install the left or right side engine coolant fans on the proper side.**	
1	Engine Coolant Fan Bolt **CAUTION:** **Refer to Fastener Caution .**

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Callout	Component Name
	Tighten 6.5 N.m (58 lb in)
2	Engine Coolant Fan

TURBOCHARGER COOLANT FEED PIPE REPLACEMENT (L5P)

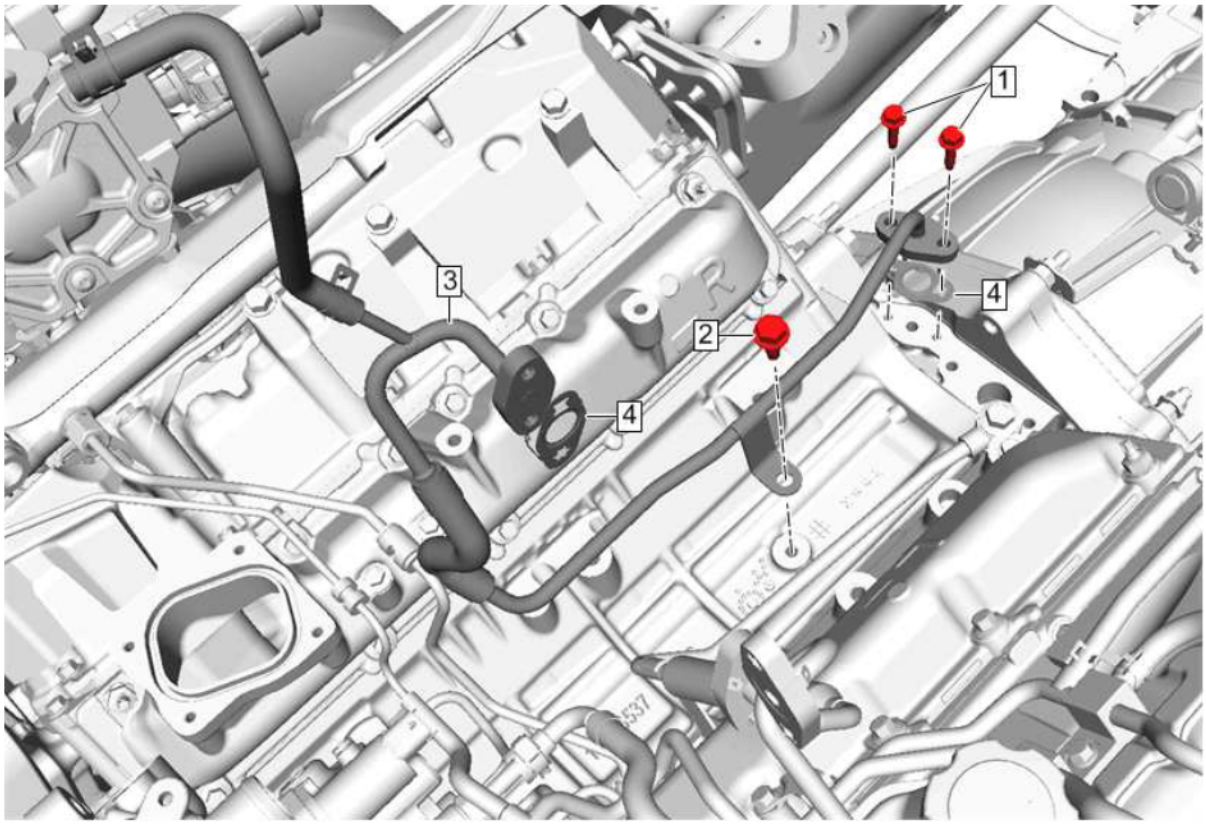

Fig. 299: Turbocharger Coolant Feed Pipe (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. **Turbocharger Heat Shield Replacement (L5P)** 2. **Turbocharger Oil Return Pipe Replacement**	
1	Turbocharger Coolant Feed Pipe Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)

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Callout	Component Name
2	Turbocharger Coolant Feed Pipe Bolt **Tighten** 25 N.m (18 lb ft)
3	Turbocharger Coolant Feed Pipe
4	Turbocharger Coolant Feed Pipe Gasket

TURBOCHARGER COOLANT RETURN PIPE REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

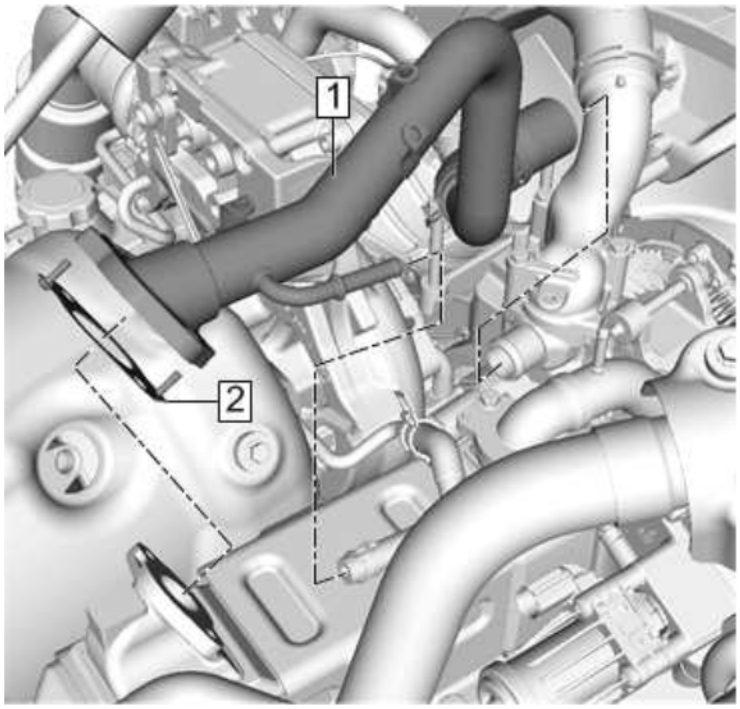

Fig. 300: Exhaust Gas Recirculation Manifold Cooling Return Pipe
Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Gas Recirculation Manifold Cooling Return Pipe 1 - Remove **Exhaust Gas Recirculation Manifold Cooling Return Pipe Replacement (L5P)**

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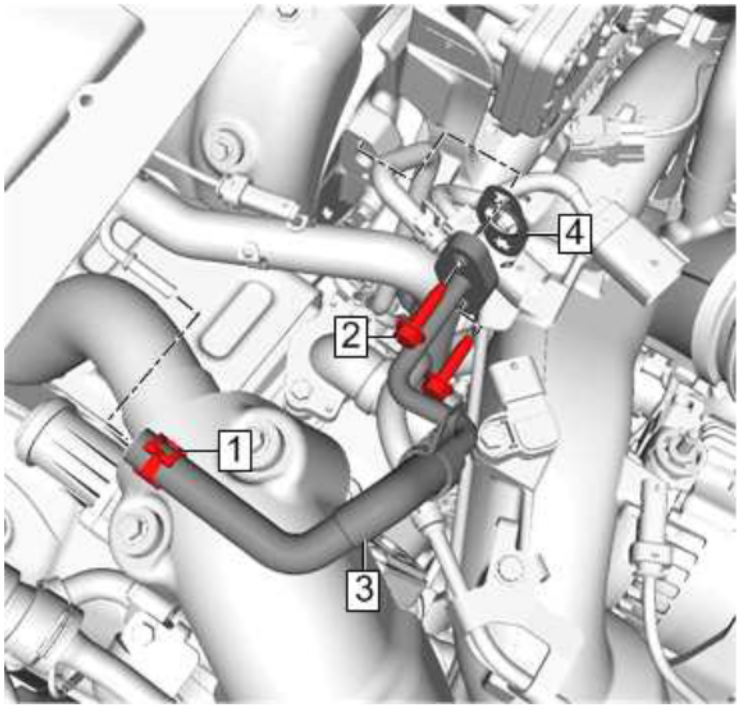

Fig. 301: Turbocharger Coolant Return Pipe
Courtesy of GENERAL MOTORS COMPANY

3. Turbocharger Coolant Return Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
4. Turbocharger Coolant Return Pipe Bolt 2 - Remove
5. Turbocharger Coolant Return Pipe 3 - Remove
6. Turbocharger Coolant Return Pipe Gasket 4 - Remove and DISCARD

Installation Procedure

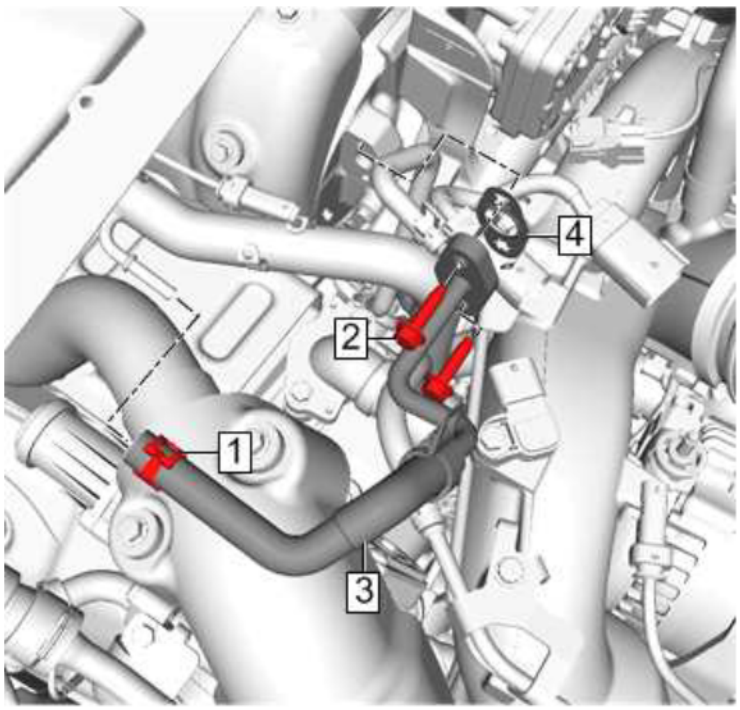

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Fig. 302: Turbocharger Coolant Return Pipe
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Insert a NEW gasket.**

1. Turbocharger Coolant Return Pipe Gasket 4 - Install
2. Turbocharger Coolant Return Pipe 3 - Install

CAUTION: **Refer to Fastener Caution .**

3. Turbocharger Coolant Return Pipe Bolt 2 Install and tighten 10 N.m (89 lb in)
4. Turbocharger Coolant Return Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**

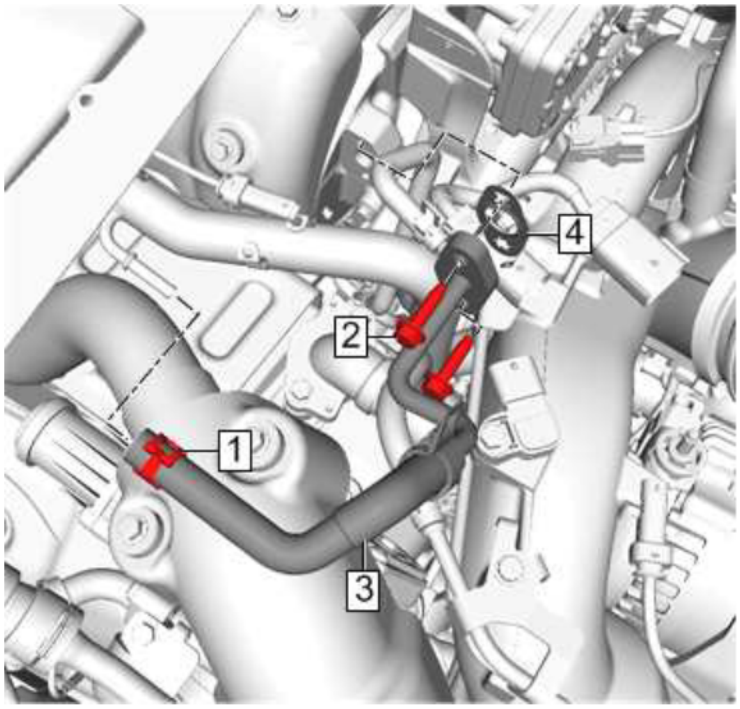

Fig. 303: Turbocharger Coolant Return Pipe
Courtesy of GENERAL MOTORS COMPANY

5. Exhaust Gas Recirculation Manifold Cooling Return Pipe - Install **Exhaust Gas Recirculation Manifold Cooling Return Pipe Replacement (L5P)**
6. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

TURBOCHARGER COOLANT RETURN HOSE REPLACEMENT (L5P)

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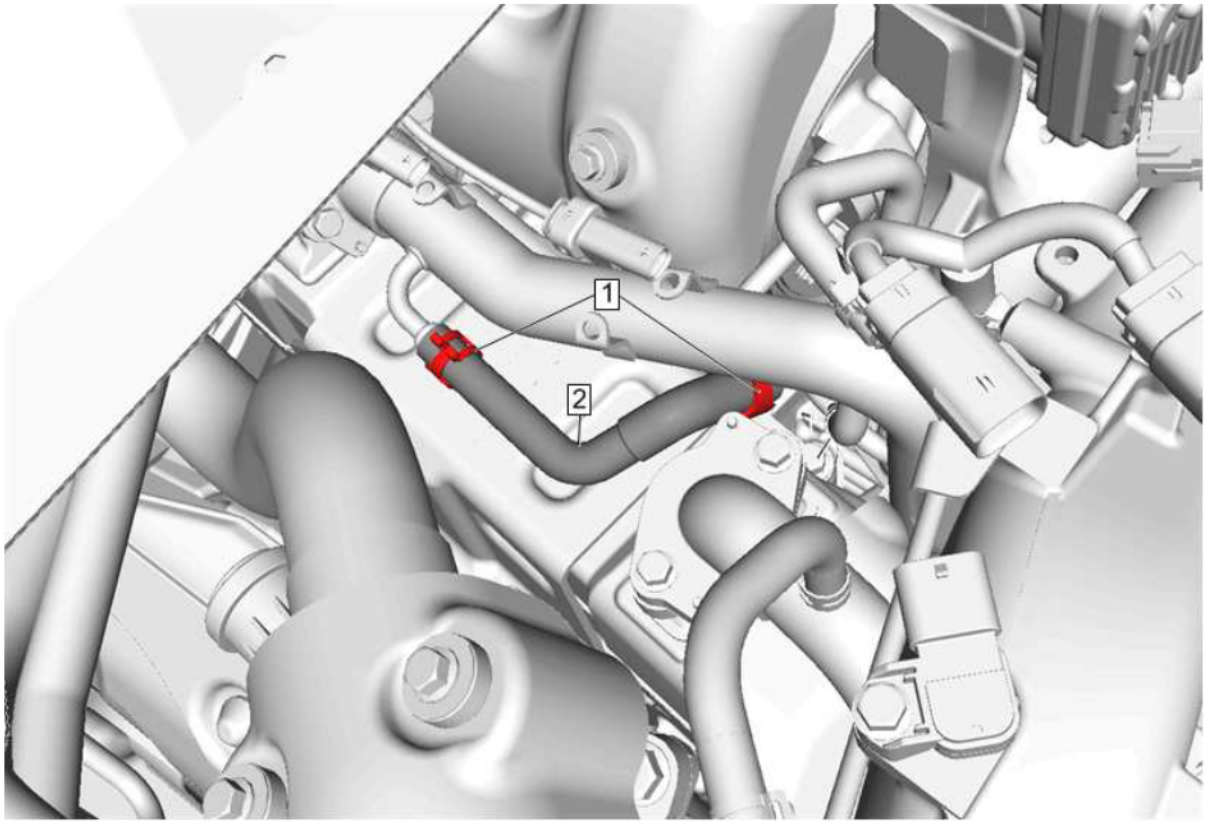

Fig. 304: Turbocharger Coolant Return Hose (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**	
1	Turbocharger Coolant Return Hose Clamp **Hose Clamp Replacement Guidelines - Spring Type**
2	Turbocharger Coolant Return Hose

EXHAUST GAS RECIRCULATION COOLER WATER BYPASS INLET HOSE REPLACEMENT (L5P)

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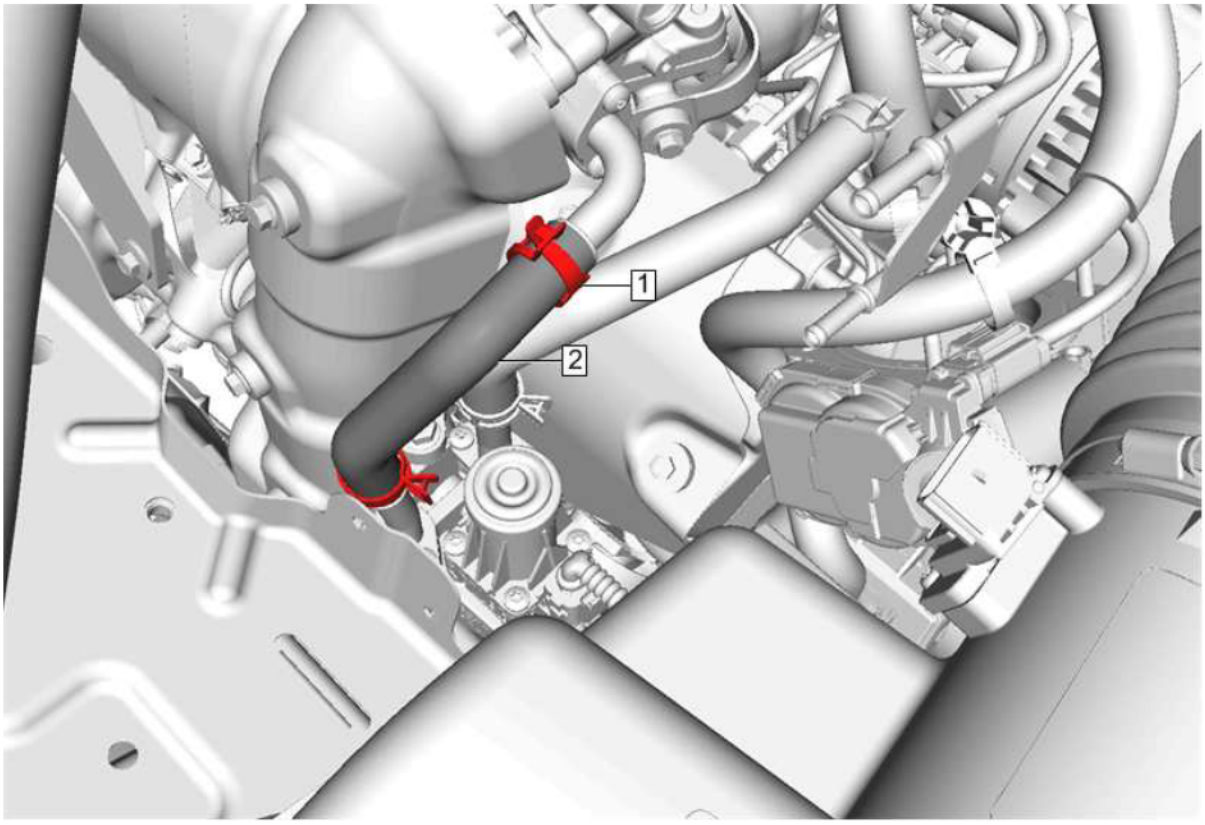

Fig. 305: Exhaust Gas Recirculation Cooler Water Bypass Inlet Hose (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**	
1	Exhaust Gas Recirculation Cooler Water Bypass Inlet Hose Clamp **Hose Clamp Replacement Guidelines - Spring Type**
2	Exhaust Gas Recirculation Cooler Water Bypass Inlet Hose

EXHAUST GAS RECIRCULATION VALVE COOLING FEED HOSE REPLACEMENT (L5P)

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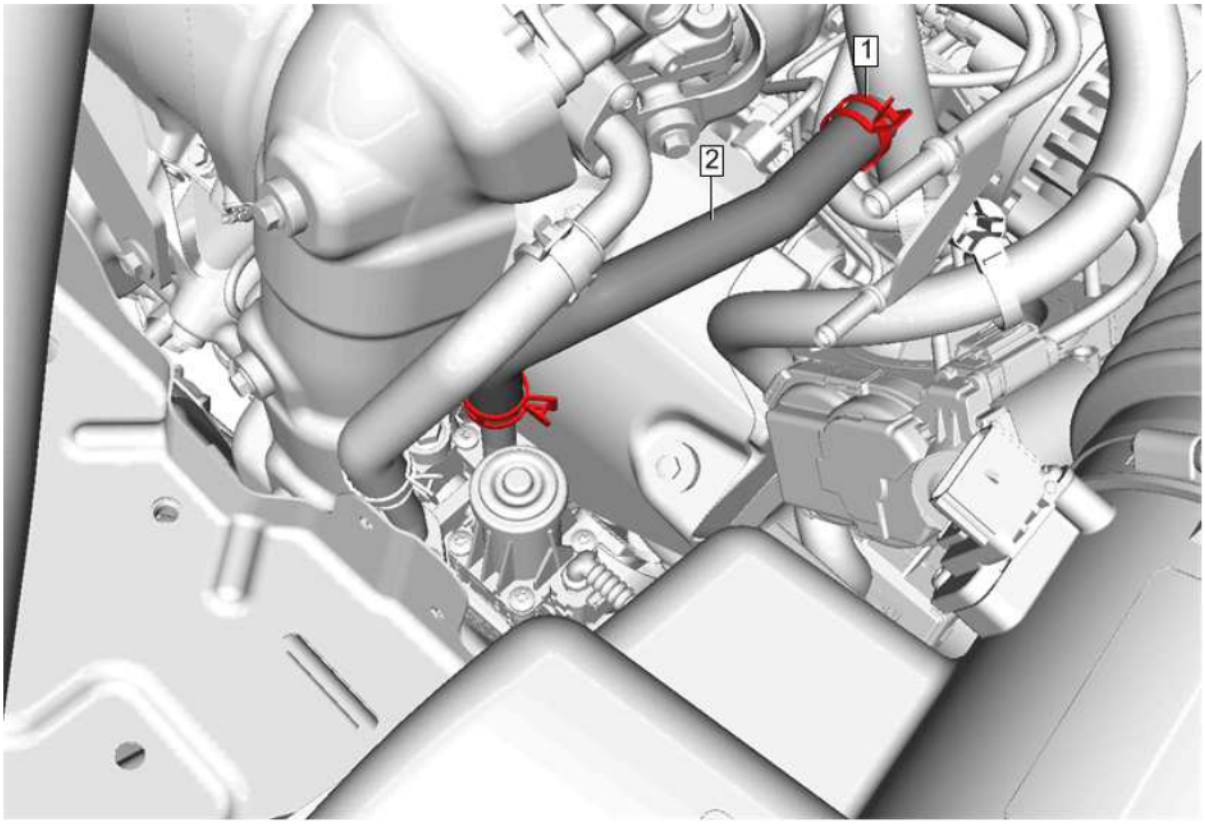

Fig. 306: Exhaust Gas Recirculation Valve Cooling Feed Hose (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**	
1	Exhaust Gas Recirculation Valve Cooling Feed Hose Clamp **Hose Clamp Replacement Guidelines - Spring Type**
2	Exhaust Gas Recirculation Valve Cooling Feed Hose

EXHAUST GAS RECIRCULATION MANIFOLD COOLING RETURN PIPE REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Air Conditioning Compressor - Remove **Air Conditioning Compressor Replacement (L5P)**

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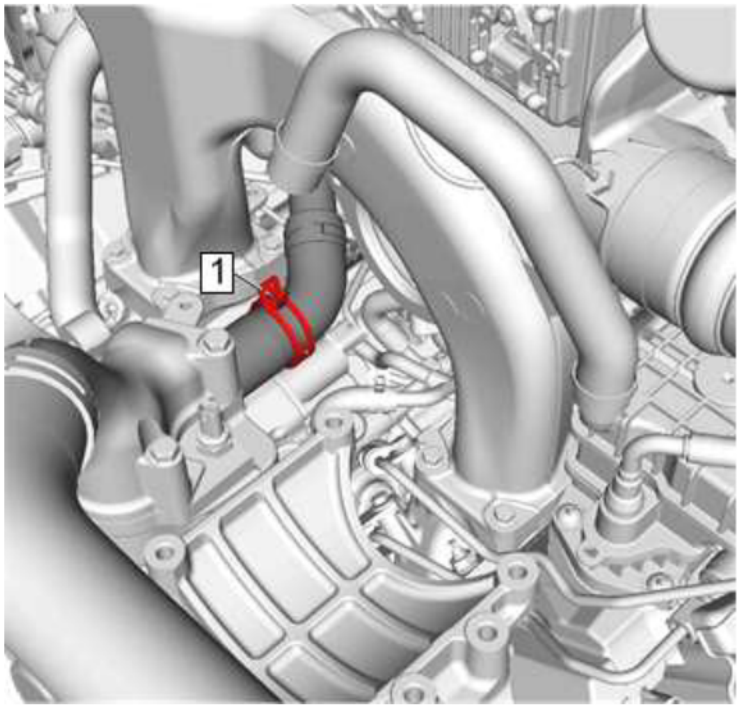

Fig. 307: Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**

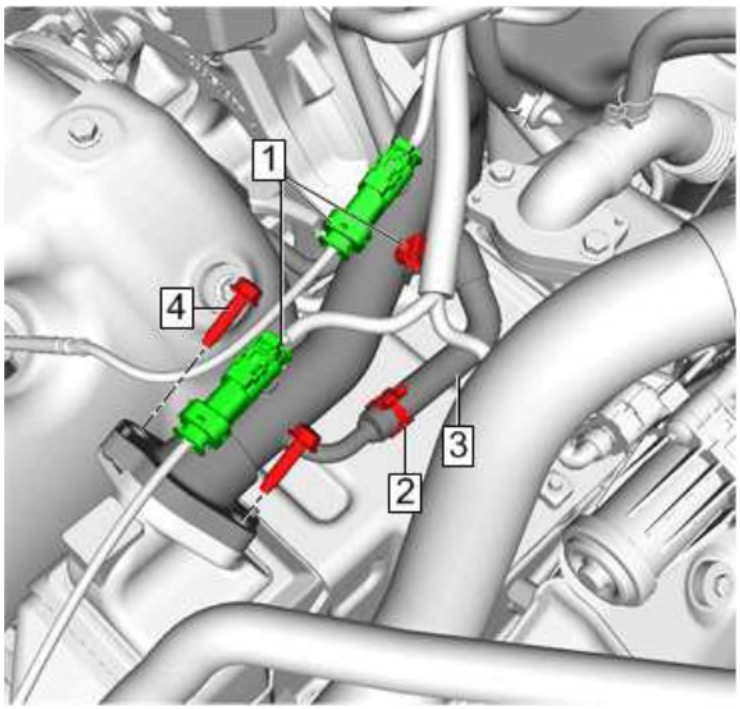

Fig. 308: Turbocharger Coolant Return Hose
Courtesy of GENERAL MOTORS COMPANY

4. Disengage the electrical wiring harness retaining clips (1) from the exhaust gas recirculation manifold cooling return pipe.
5. Turbocharger Coolant Return Hose Clamp 2 - Disengage **Hose Clamp Replacement Guidelines -**

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Spring Type

6. Turbocharger Coolant Return Hose 3 - Disconnect
7. Exhaust Gas Recirculation Manifold Cooling Return Pipe Bolt 4 - Remove

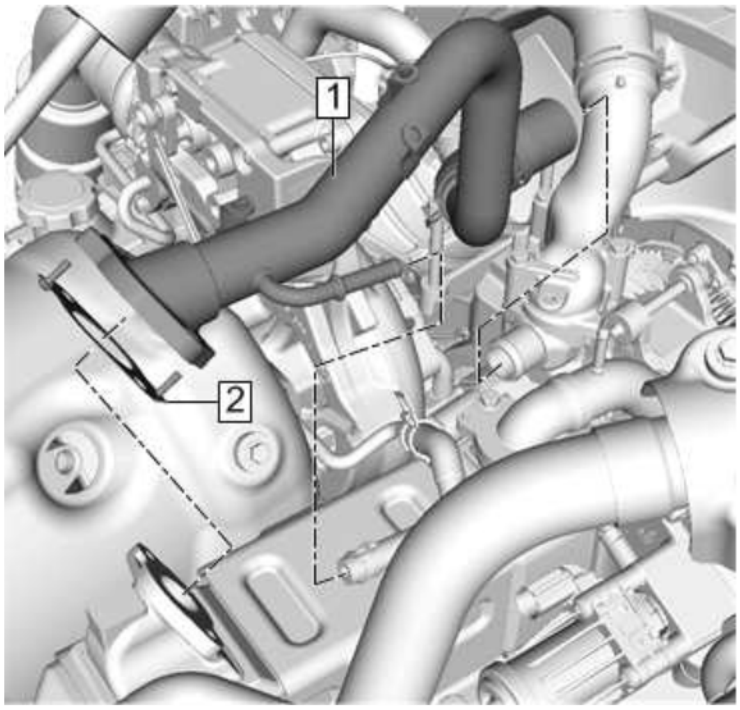

Fig. 309: Exhaust Gas Recirculation Manifold Cooling Return Pipe
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Gas Recirculation Manifold Cooling Return Pipe 1 - Remove
9. Exhaust Gas Recirculation Manifold Cooling Return Pipe Gasket 2 - Remove and DISCARD

Installation Procedure

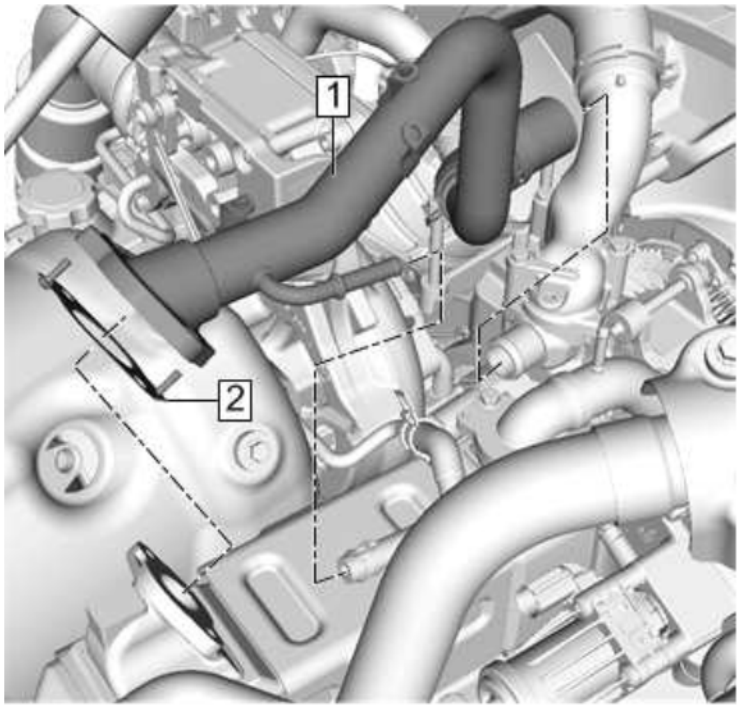

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Fig. 310: Exhaust Gas Recirculation Manifold Cooling Return Pipe
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Insert a NEW gasket.**

1. Exhaust Gas Recirculation Manifold Cooling Return Pipe Gasket 2 - Install
2. Exhaust Gas Recirculation Manifold Cooling Return Pipe 1 - Install

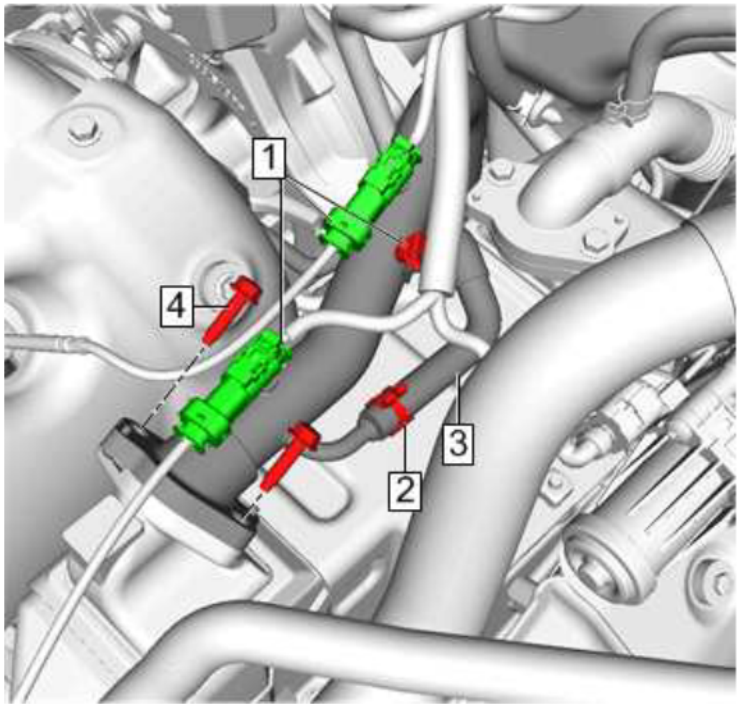

Fig. 311: Turbocharger Coolant Return Hose
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

3. Exhaust Gas Recirculation Manifold Cooling Return Pipe Bolt 4 - Install and tighten 10 N.m (89 lb in)
4. Turbocharger Coolant Return Hose 3 - Connect
5. Turbocharger Coolant Return Hose Clamp 2 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
6. Engage the electrical wiring harness retaining clips (1) to the exhaust gas recirculation manifold cooling return pipe.

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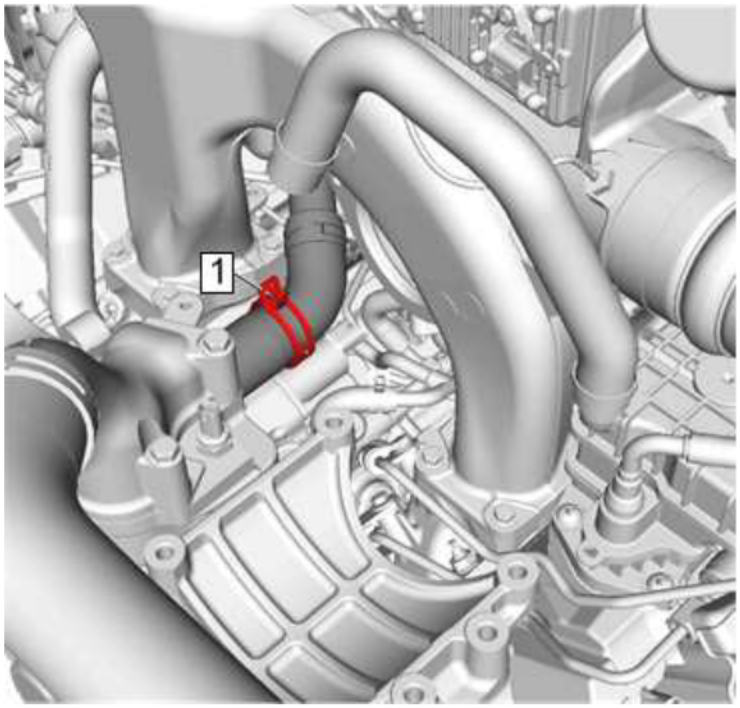

Fig. 312: Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
8. Air Conditioning Compressor - Install - **Air Conditioning Compressor Replacement (L5P)**
9. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

EXHAUST GAS RECIRCULATION MANIFOLD COOLING FEED PIPE REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Generator - Remove - **Generator Replacement (L5P)**

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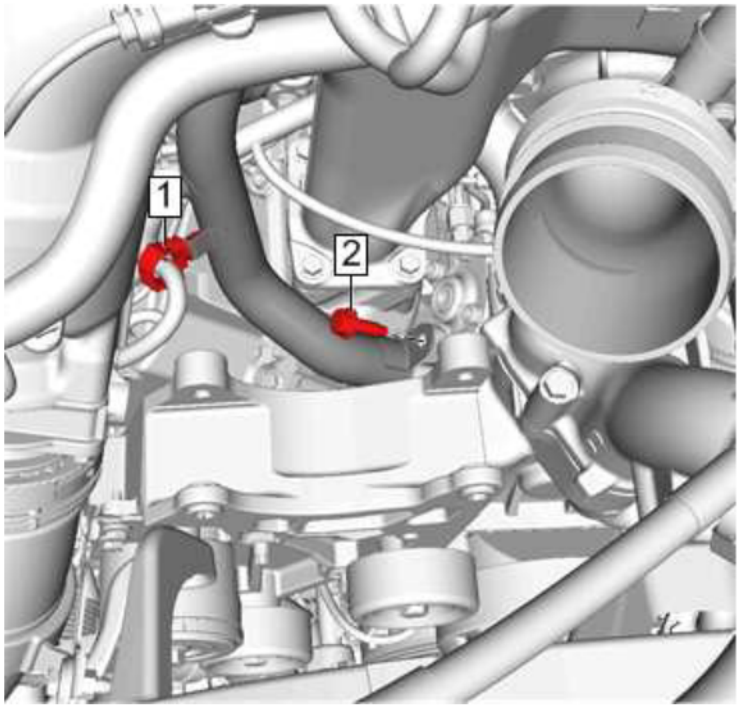

Fig. 313: Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Disengage the electrical wiring harness retaining clip (1).
4. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt 2 - Remove

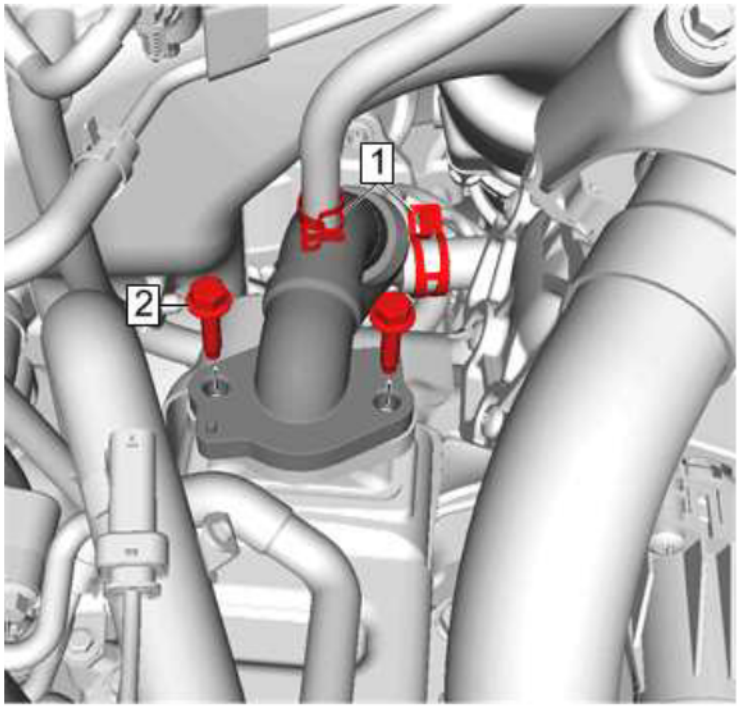

Fig. 314: Engine Coolant Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Engine Coolant Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
6. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt 2 - Remove

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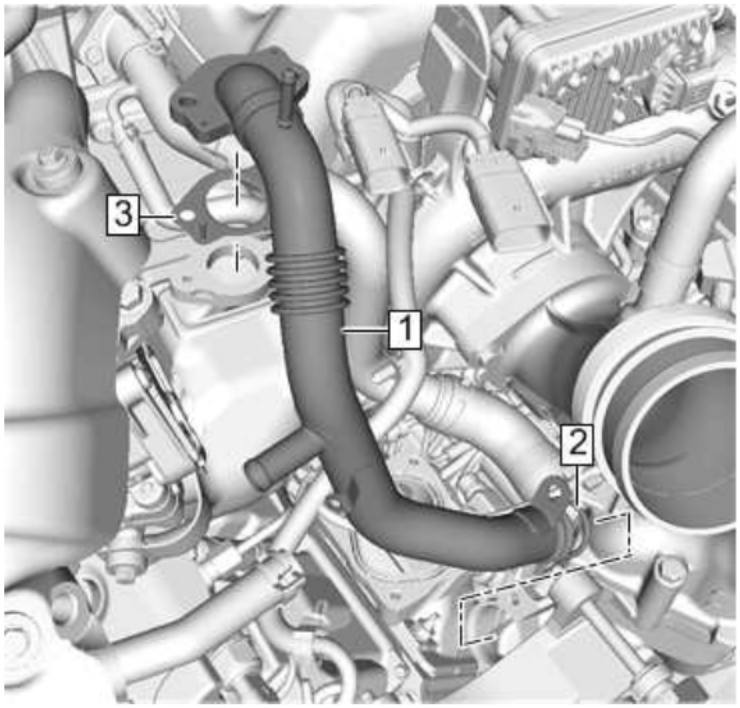

Fig. 315: Exhaust Gas Recirculation Manifold Cooling Feed Pipe
Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Gas Recirculation Manifold Cooling Feed Pipe 1 - Remove
8. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Seal 2 - Remove and DISCARD
9. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Gasket 3 - Remove and DISCARD

Installation Procedure

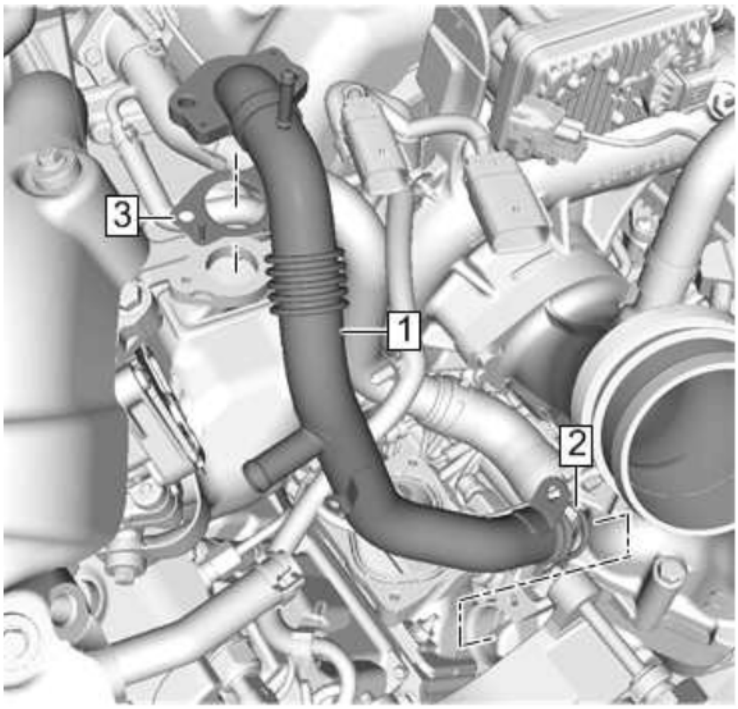

Fig. 316: Exhaust Gas Recirculation Manifold Cooling Feed Pipe
Courtesy of GENERAL MOTORS COMPANY

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NOTE: **The exhaust gas recirculation manifold cooling feed pipe gasket (3) is attached to exhaust turbocharger inlet pipe (1) with pins to aid in factory installation. The gasket IS serviceable and IS a one time use ONLY. When servicing the feed pipe, remove the pins and replace the gasket with NEW. Re-install the pins with a soft-blow hammer. The pins will help ensure proper gasket alignment and prevent leaks.**

1. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Gasket 3 - Install NEW
2. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Seal 2 - Install NEW
3. Exhaust Gas Recirculation Manifold Cooling Feed Pipe 1 - Install

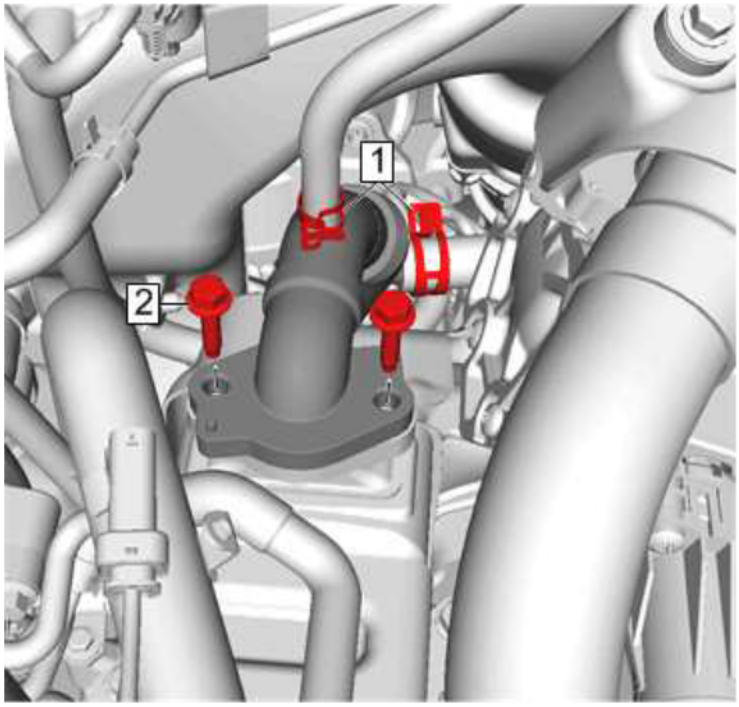

Fig. 317: Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

4. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt 2 - Install and tighten 10 N.m (89 lb in)
5. Engine Coolant Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**

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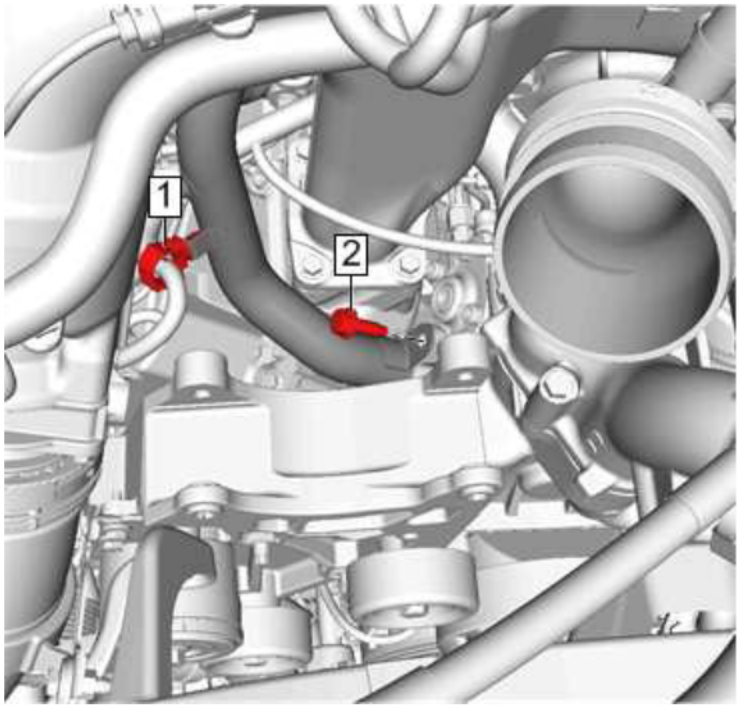

Fig. 318: Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Gas Recirculation Manifold Cooling Feed Pipe Bolt 2 - Install and tighten 10 N.m (89 lb in)
7. Engage the electrical wiring harness retaining clip (1).
8. Generator - Install **Generator Replacement (L5P)**
9. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (LV3, L8B & L83 WITH THERMOSTAT)

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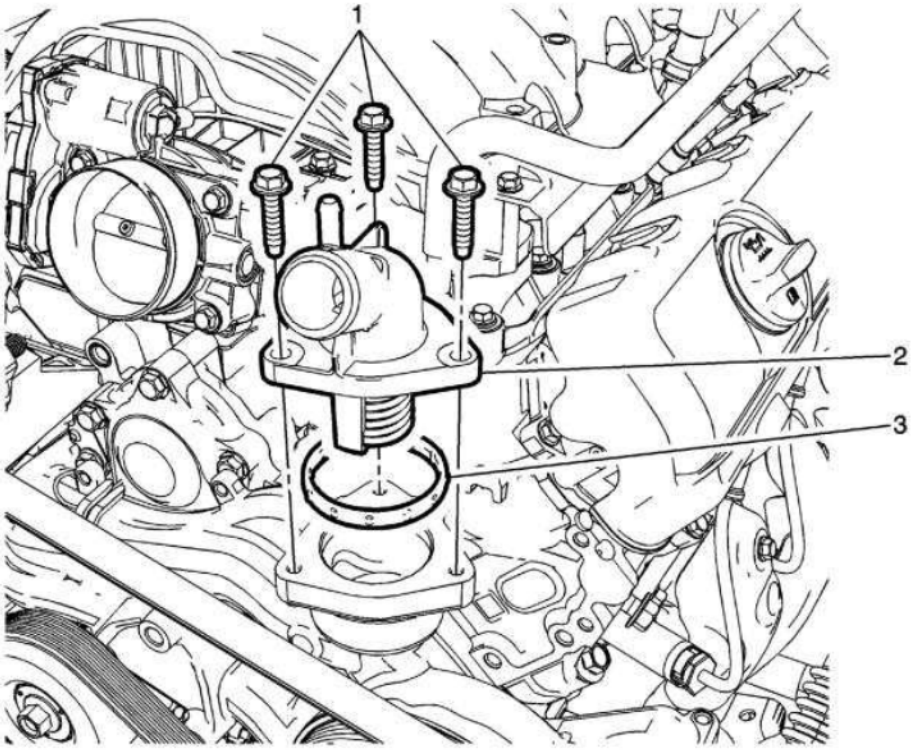

Fig. 319: Engine Coolant Thermostat Housing (LV3, L8B & L83 With Thermostat)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: **Use caution when removing the hose from the thermostat housing. The plastic thermostat housing may break if excessive force is used.**	

Preliminary Procedures

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)Cooling System Draining and Filling (Vac N Fill L8B)**.
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

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Callout	Component Name
3. Disconnect the radiator inlet hose from the thermostat housing. Refer to **Radiator Inlet Hose Replacement (L83, L86)Radiator Inlet Hose Replacement (LV3)Radiator Inlet Hose Replacement (L8B)**. 4. Disconnect the radiator surge tank inlet hose from the thermostat housing. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet L83, L86)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)Radiator Surge Tank Inlet Hose Replacement (L8B)**.	
1	Thermostat Housing Bolt (Qty: 3) **CAUTION:** **Refer to Fastener Caution .** **Procedure** Remove the thermostat housing bolts. **Tighten** 10 N.m (89 lb in)
2	Thermostat Housing
3	Thermostat housing gasket **Procedure** Install a NEW thermostat gasket.

ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (L96, LC8)

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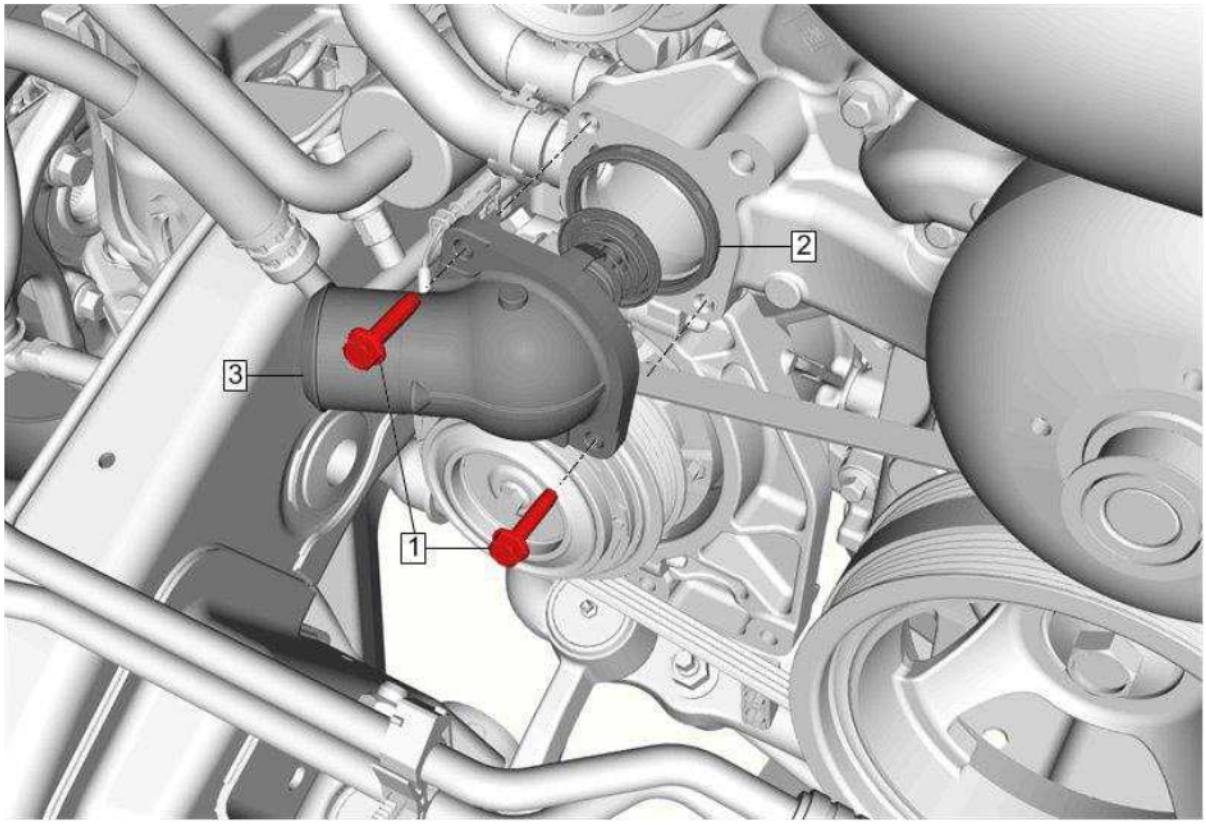

Fig. 320: Engine Coolant Thermostat Housing (L96, LC8)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96) 2. Air Cleaner Outlet Duct Replacement 3. Radiator Outlet Hose@Engine Coolant Thermostat Housing - Disconnect - Radiator Outlet Hose Replacement (LC8, L96)	
1	Engine Coolant Thermostat Housing Bolt **CAUTION:** **Refer to** Fastener Caution . **Tighten** 15 N.m (11 lb ft)
2	Engine Coolant Thermostat Housing Seal
3	Engine Coolant Thermostat Housing

ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (L5P)

Removal Procedure

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1. Air Cleaner Outlet Resonator - Remove **Air Cleaner Outlet Resonator Replacement**
2. Radiator Outlet Hose - Remove **Radiator Outlet Hose Replacement (L5P)**
3. Drive Belt Tensioner - Remove **Drive Belt Tensioner Replacement**
4. Generator Bracket - Remove **Generator Bracket Replacement (L5P)**
5. Air Conditioning Compressor Bracket - Remove **Air Conditioning Compressor Bracket Replacement (L5P)**
6. Turbocharger Air Inlet Adapter - Remove **Turbocharger Air Inlet Adapter Replacement**
7. Exhaust Gas Recirculation Manifold Cooling Feed Pipe - Remove **Exhaust Gas Recirculation Manifold Cooling Feed Pipe Replacement (L5P)**

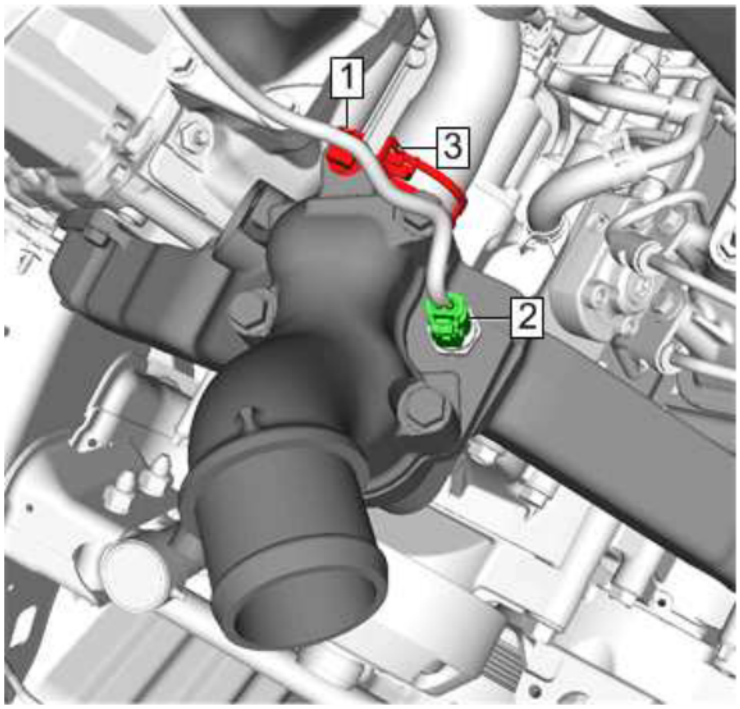

Fig. 321: Engine Coolant Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disengage the engine coolant temperature sensor wiring harness retainer (1) from the water outlet.
9. Disconnect the engine coolant temperature sensor electrical connector (2).
10. Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp 3 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**

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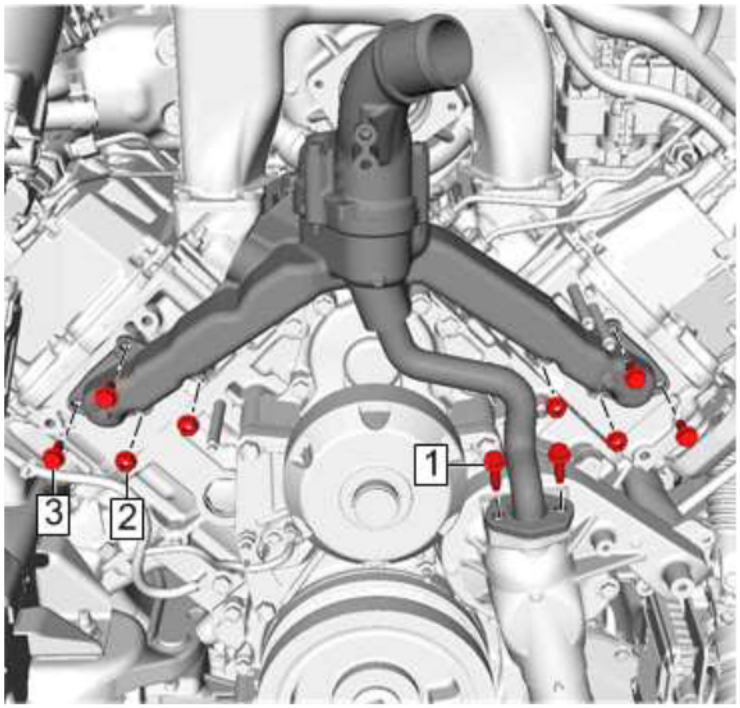

Fig. 322: Engine Coolant Thermostat Housing Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Thermostat Bypass Pipe Bolt 1 - Remove
12. Engine Coolant Thermostat Housing Nut 2 - Remove
13. Engine Coolant Thermostat Housing Bolt 3 - Remove

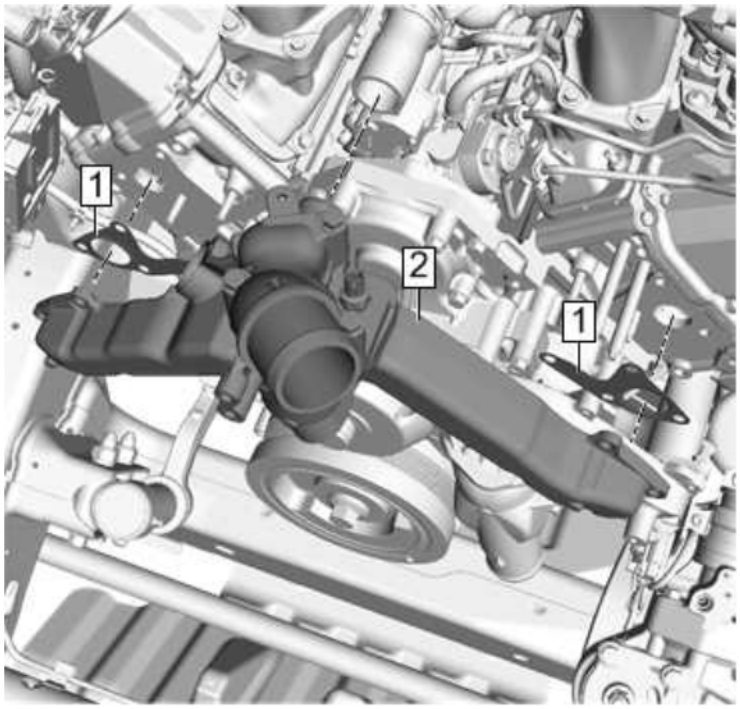

Fig. 323: Engine Coolant Thermostat Housing
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Thermostat Housing 2 - Remove

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15. Engine Coolant Thermostat Housing Gasket 1 - Remove and DISCARD
16. Transfer components as necessary.

Inspection Procedure

1. Clean all sealing surfaces.

NOTE: **The thermostat bypass pipe gasket is part of the pipe.**

2. Inspect the thermostat bypass pipe seal ring and gasket. Replace as necessary. **Thermostat Bypass Pipe Replacement (L5P)**

Installation Procedure

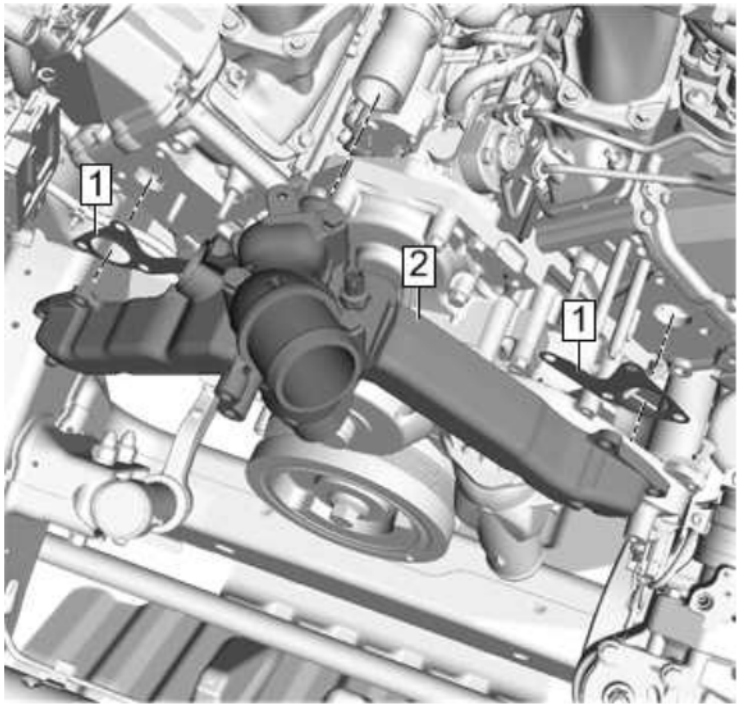

Fig. 324: Engine Coolant Thermostat Housing
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW gasket.**

1. Engine Coolant Thermostat Housing Gasket 1 - Install
2. Engine Coolant Thermostat Housing 2 - Install

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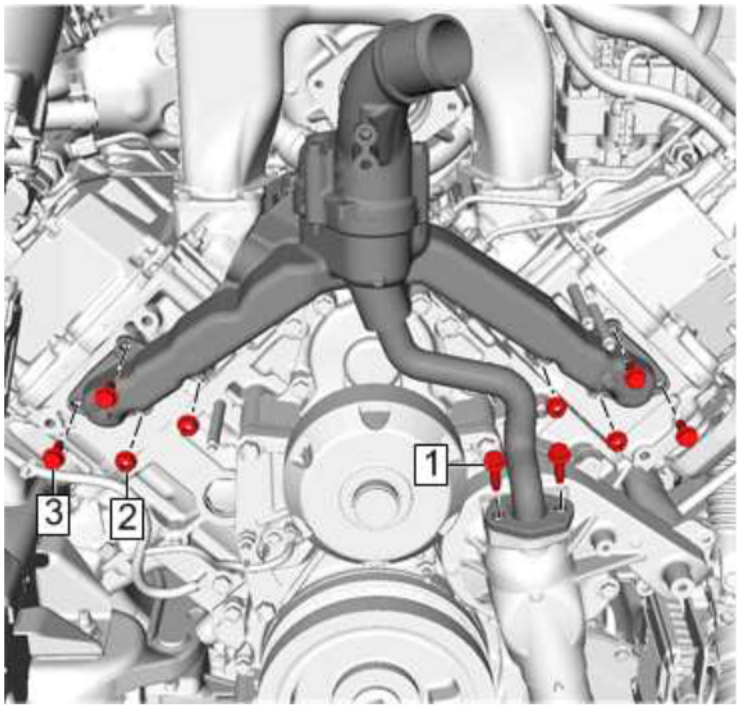

Fig. 325: Engine Coolant Thermostat Housing Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Engine Coolant Thermostat Housing Bolt 3 - Install and hand tighten
4. Engine Coolant Thermostat Housing Nut 2 - Install and hand tighten
5. Thermostat Bypass Pipe Bolt 1 - Install and hand tighten

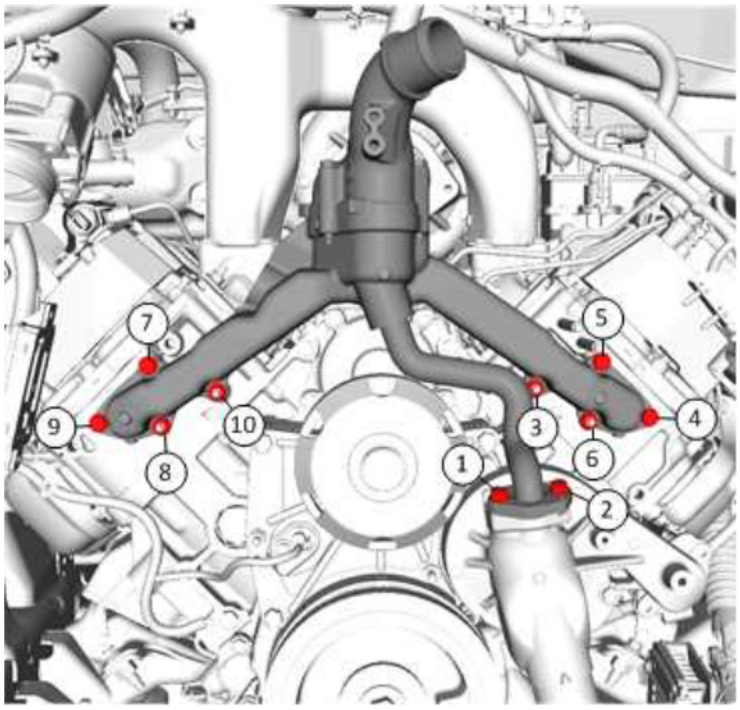

Fig. 326: Engine Coolant Thermostat Housing Bolt Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

6. Tighten all fasteners in sequence shown to 25 N.m (18 lb ft).

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7. Repeat the torque sequence one time.

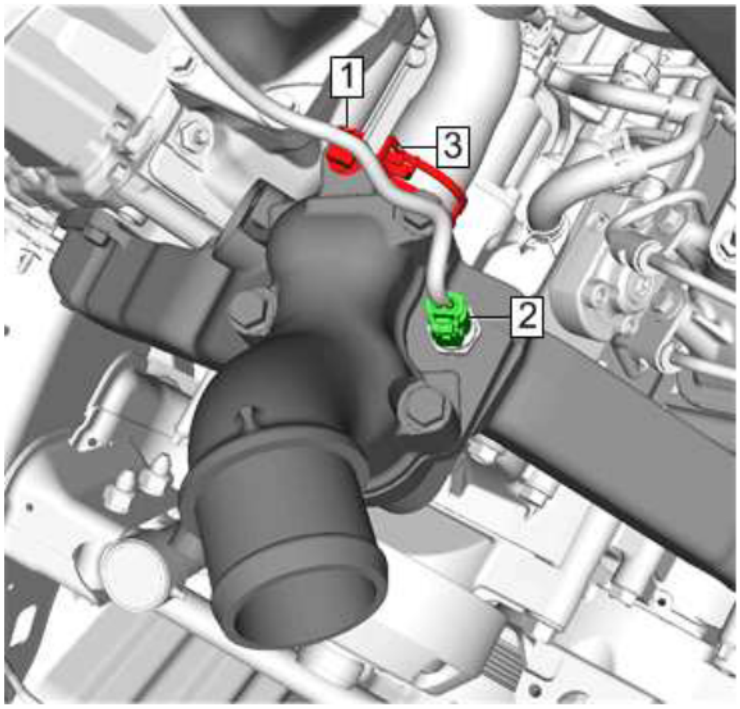

Fig. 327: Engine Coolant Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Gas Recirculation Manifold Cooling Return Hose Clamp 3 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
9. Connect the engine coolant temperature sensor electrical connector (2).
10. Engage the engine coolant temperature sensor wiring harness retainer (1) to the water outlet.
11. Exhaust Gas Recirculation Manifold Cooling Feed Pipe - Install **Exhaust Gas Recirculation Manifold Cooling Feed Pipe Replacement (L5P)**
12. Turbocharger Air Inlet Adapter - Install **Turbocharger Air Inlet Adapter Replacement**
13. Air Conditioning Compressor Bracket - Install **Air Conditioning Compressor Bracket Replacement (L5P)**
14. Generator Bracket - Install **Generator Bracket Replacement (L5P)**
15. Drive Belt Tensioner - Install **Drive Belt Tensioner Replacement**
16. Radiator Outlet Hose - Install **Radiator Outlet Hose Replacement (L5P)**
17. Air Cleaner Outlet Resonator - Install **Air Cleaner Outlet Resonator Replacement**

ENGINE COOLANT THERMOSTAT REPLACEMENT (L96, LC8)

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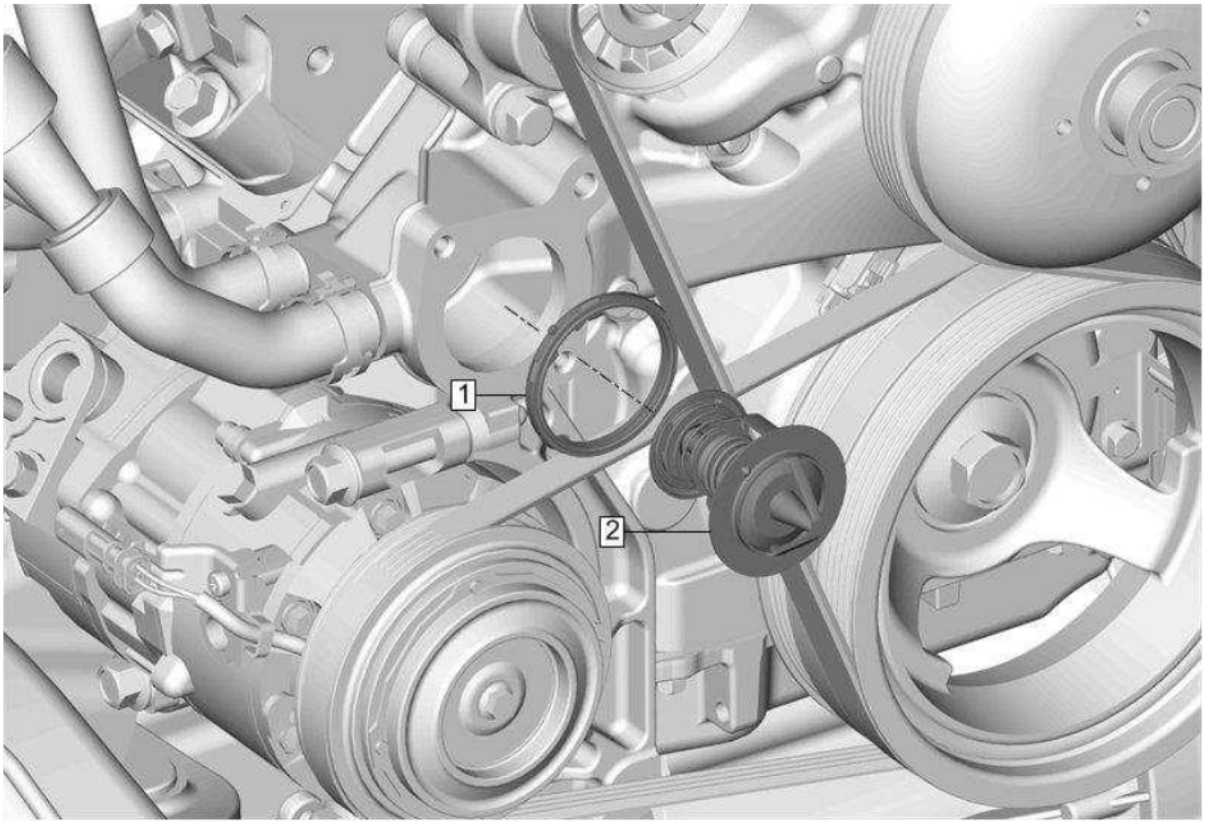

Fig. 328: Engine Coolant Thermostat (L96, LC8)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure **Engine Coolant Thermostat Housing Replacement (L96, LC8)**	
1	Engine Coolant Thermostat Housing Seal **NOTE:** **Install a NEW engine coolant thermostat housing seal.**
2	Engine Coolant Thermostat

ENGINE COOLANT THERMOSTAT REPLACEMENT (L5P)

Removal Procedure

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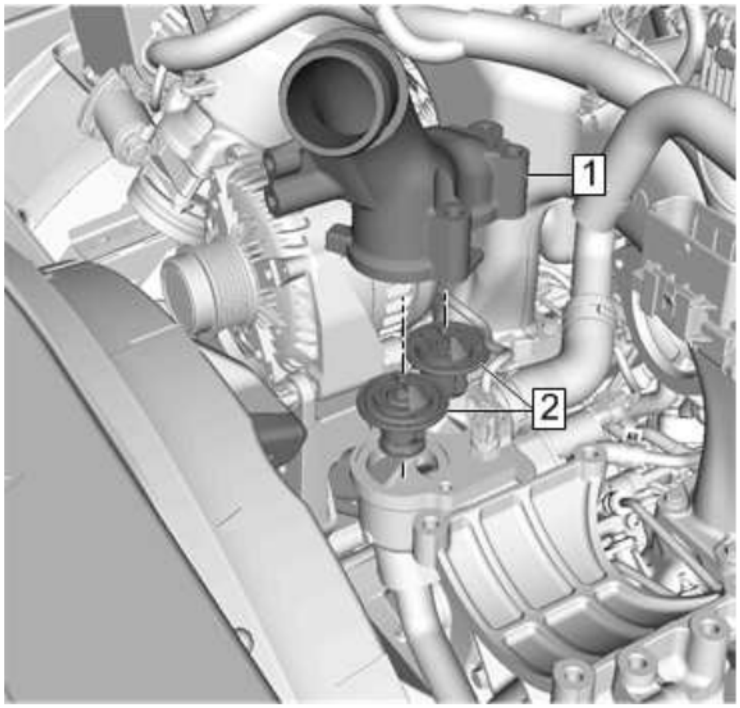

Fig. 329: Water Outlet
Courtesy of GENERAL MOTORS COMPANY

1. Water Outlet 1 - Remove **Water Outlet Replacement (L5P)**
2. Engine Coolant Thermostat 2 - Remove and DISCARD

Installation Procedure

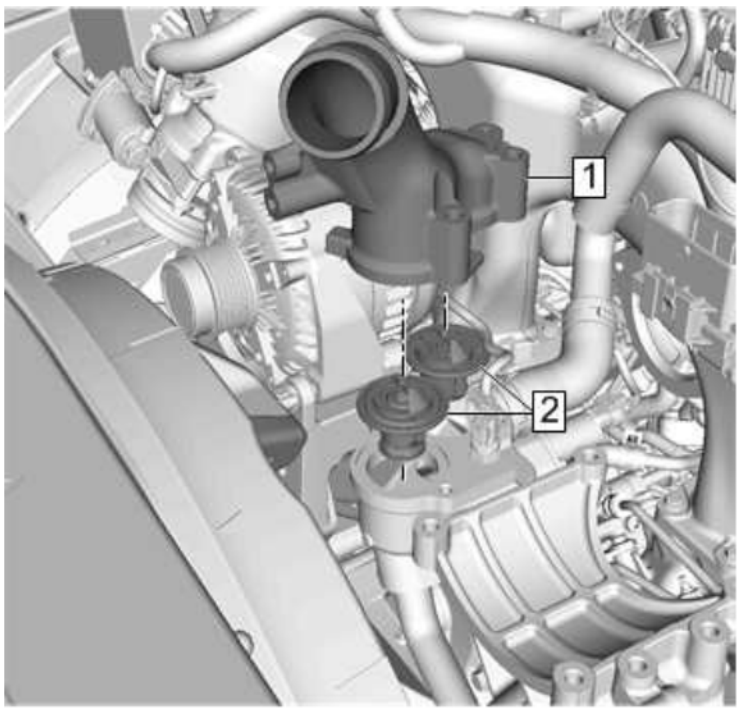

Fig. 330: Water Outlet
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install NEW engine coolant thermostats.**

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1. Engine Coolant Thermostat 2 - Install

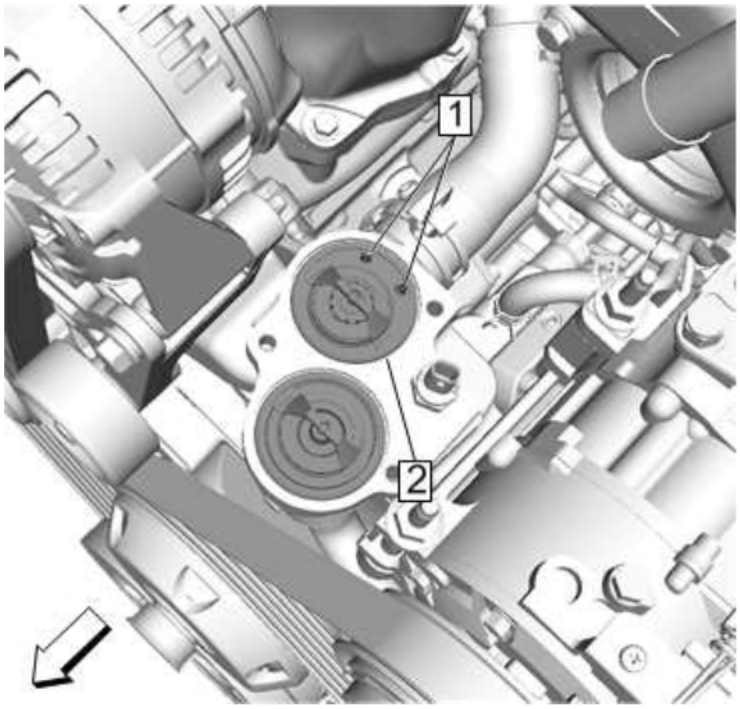

Fig. 331: Thermostat Bleed Holes
Courtesy of GENERAL MOTORS COMPANY

2. Ensure that the bleed holes (1) in the thermostat (2) are orientated as shown.

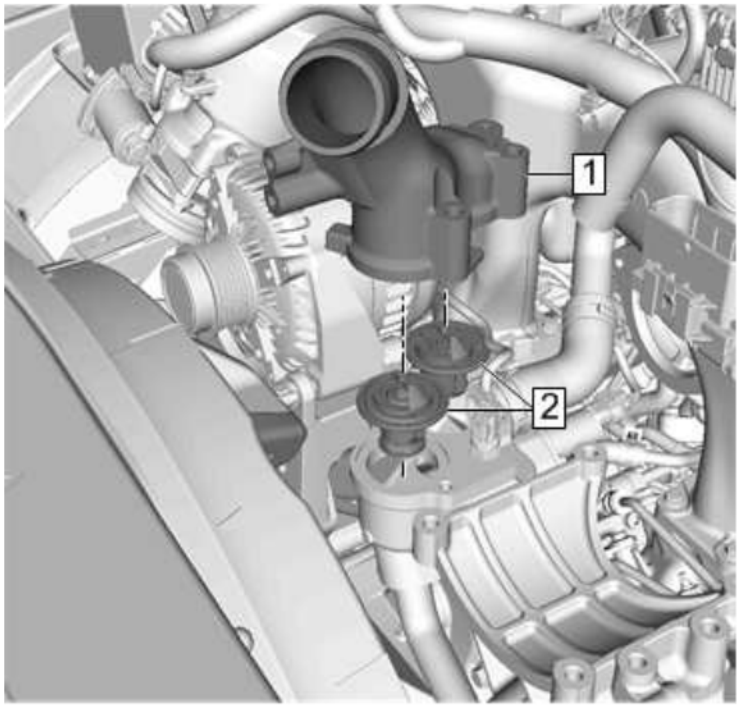

Fig. 332: Water Outlet
Courtesy of GENERAL MOTORS COMPANY

3. Water Outlet 1 - Install - **Water Outlet Replacement (L5P)**

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ENGINE COOLANT MANIFOLD REPLACEMENT (LV3, L83)

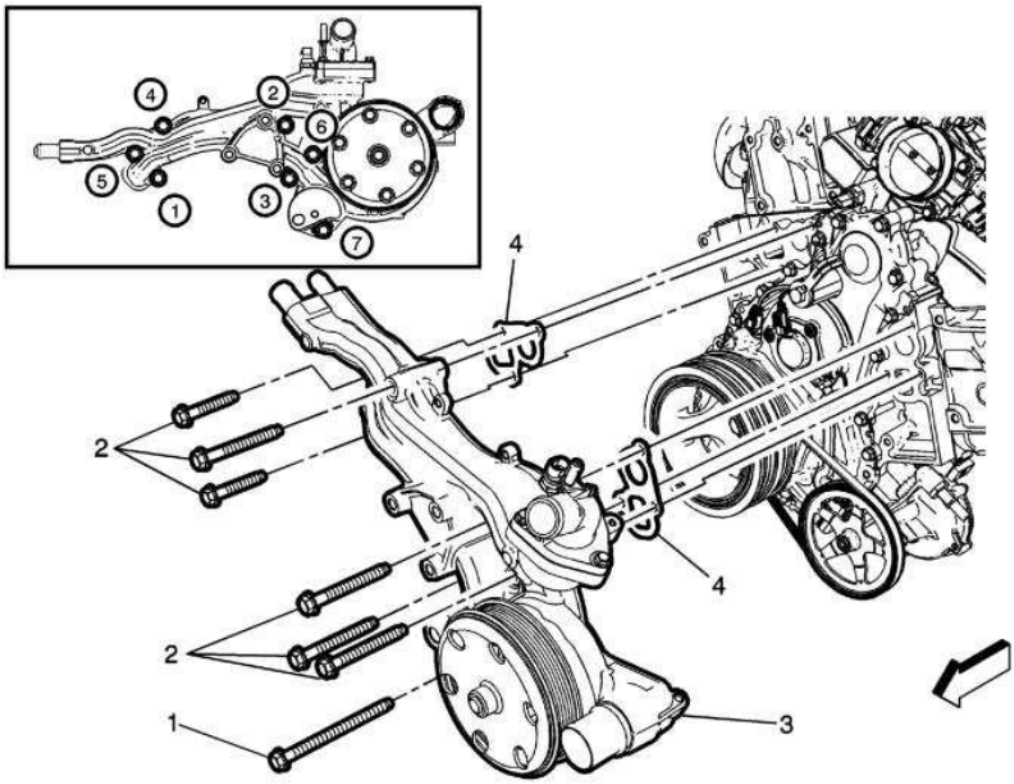

Fig. 333: Engine Coolant Manifold (LV3, L83)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Preliminary Procedures

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**.
2. Disconnect the engine coolant temperature sensor. Refer to **Engine Coolant Temperature Sensor Replacement** .
3. Remove the generator and drive belt tensioner bracket. Refer to **Generator Bracket Replacement (L83,L8B)** **Generator Bracket Replacement (LV3)** .
4. Disconnect the radiator surge tank inlet hose from the engine coolant manifold. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet L83, L86)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**.
5. Disconnect the radiator inlet and outlet hoses from the engine coolant manifold. Refer to **Radiator Inlet Hose Replacement (L83, L86)Radiator Inlet Hose Replacement (LV3)**, and **Radiator Outlet Hose Replacement (L83, L86)Radiator Outlet Hose Replacement (LV3)**.
6. Disconnect the heater inlet and outlet hoses from the engine coolant manifold. Refer to **Heater Inlet Hose Replacement (L83, L86)** **Heater Inlet Hose Replacement (LV3)** , and **Heater Outlet Hose Replacement (L83, L86)** **Heater Outlet Hose Replacement (LV3)** .
7. Separate the engine electrical wiring harness from the engine coolant manifold and reposition the harness.

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ENGINE COOLANT MANIFOLD REPLACEMENT (L8B)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
2. Generator and Drive Belt Tensioner Bracket - Remove - **Generator and Drive Belt Tensioner Bracket Replacement**
3. Radiator Surge Tank - Remove - **Radiator Surge Tank Replacement (L8B)**

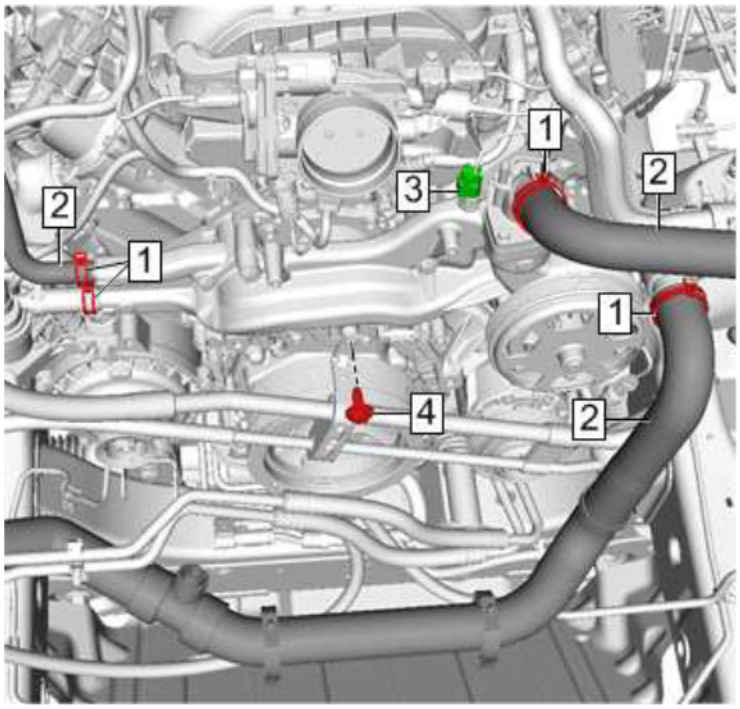

Fig. 334: Engine Coolant Temperature Sensor, Hoses And Clamps
Courtesy of GENERAL MOTORS COMPANY

4. Engine Coolant Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**

NOTE: **Only remove the upper engine coolant hose at this time. The lower hose can be disconnected from the engine coolant manifold when the manifold is removed from the engine.**

5. Engine Coolant Hose 2 - Disconnect
6. Engine Coolant Temperature Sensor 3 - Disconnect
7. Air Conditioning Evaporator Hose Bracket Bolt 4 - Remove

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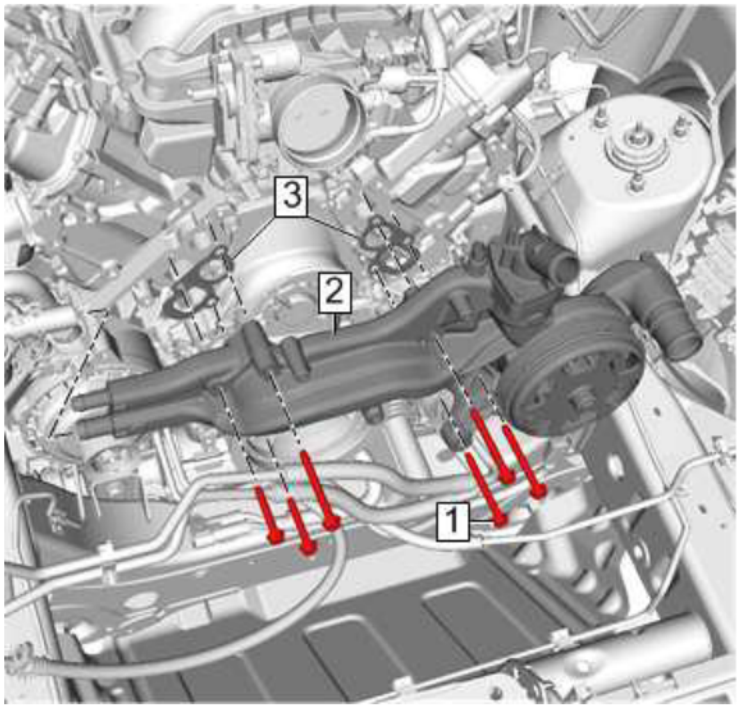

Fig. 335: Engine Coolant Manifold
Courtesy of GENERAL MOTORS COMPANY

8. Engine Coolant Manifold Bolt 1 - Remove
9. Engine Coolant Manifold 2 - Remove
10. Engine Coolant Manifold Gasket 3 - Remove and DISCARD
11. Refer to **Engine Coolant Manifold Cleaning and Inspection (L8B)** .

Installation Procedure

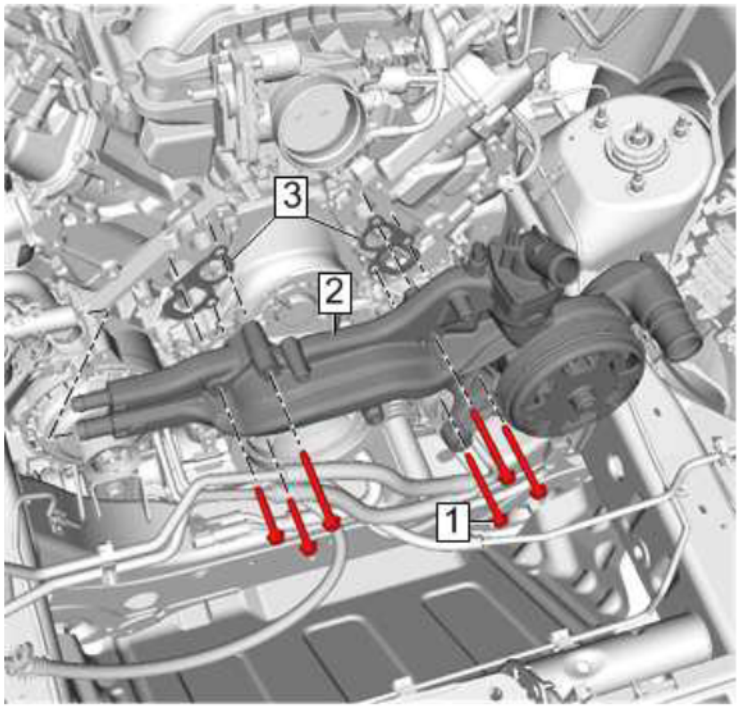

Fig. 336: Engine Coolant Manifold

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Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install NEW gaskets.**

1. Engine Coolant Manifold Gasket 3 - Install
2. Engine Coolant Manifold 2 - Install

NOTE: **Clean the threads and apply a threadlocker. Refer to Adhesives, Fluids, Lubricants, and Sealers .**

3. Engine Coolant Manifold Bolt 1 - Install and hand tighten

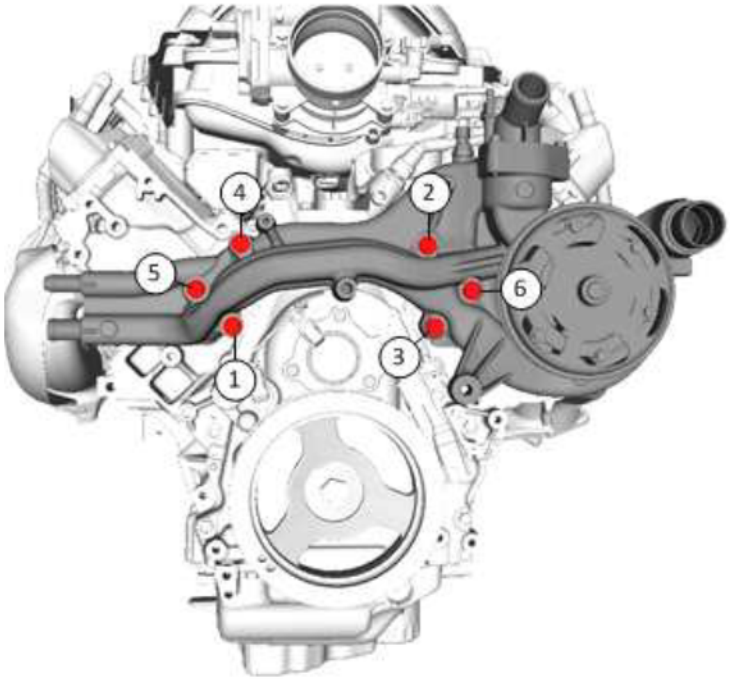

Fig. 337: Engine Coolant Manifold Bolt Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

4. Engine Coolant Manifold Bolt - Tighten in sequence 25 N.m (18 lb ft)

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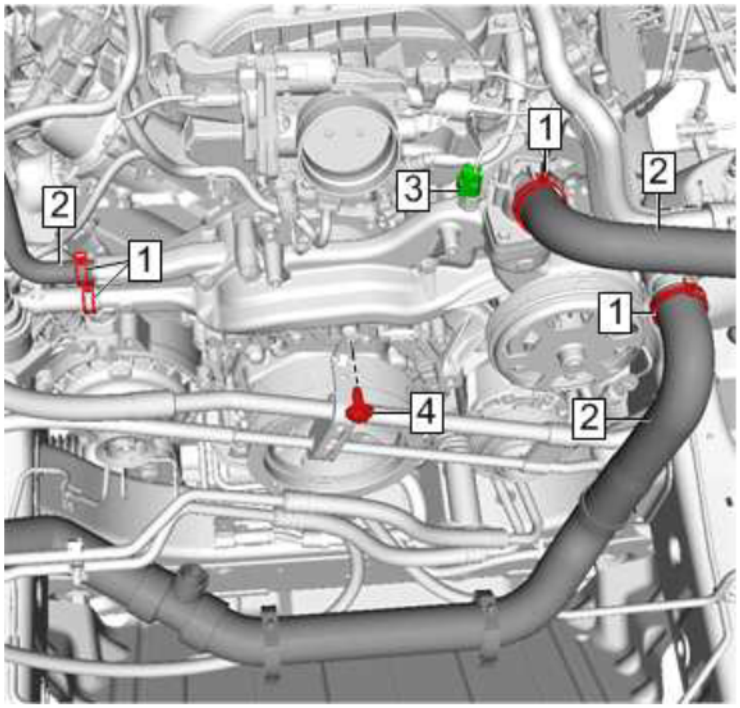

Fig. 338: Engine Coolant Temperature Sensor, Hoses And Clamps
Courtesy of GENERAL MOTORS COMPANY

5. Air Conditioning Evaporator Hose Bracket Bolt 4 - Install and tighten 10 N.m (89 lb in)
6. Engine Coolant Temperature Sensor 3 - Connect
7. Engine Coolant Hose 2 - Connect
8. Engine Coolant Hose Clamp 1 - Engage **Hose Clamp Replacement Guidelines - Spring Type**
9. Radiator Surge Tank - Install **Radiator Surge Tank Replacement (L8B)**
10. Generator and Drive Belt Tensioner Bracket - Install **Generator and Drive Belt Tensioner Bracket Replacement**
11. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
12. Start the engine and check for leaks.

ENGINE COOLANT AIR BLEED PIPE REPLACEMENT (L96, LC8)

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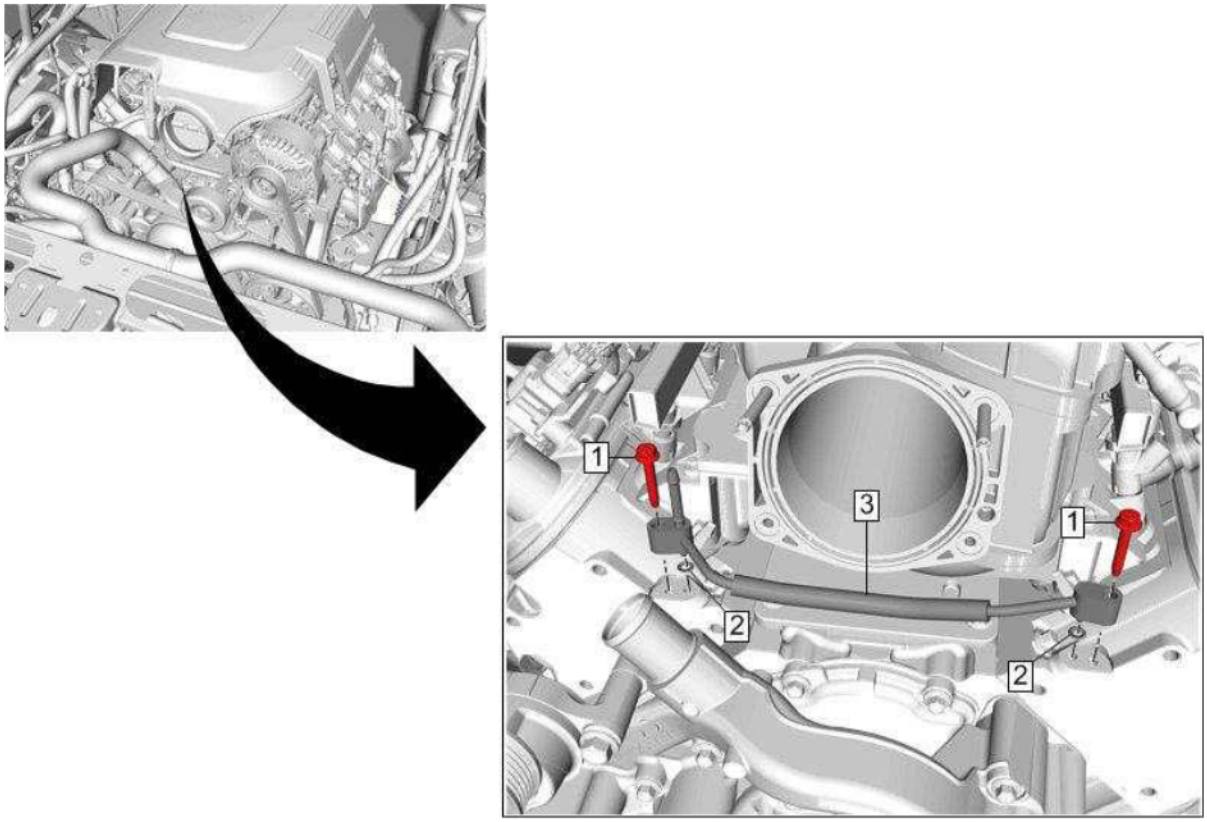

Fig. 339: Engine Coolant Air Bleed Pipe (L96, LC8)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Surge Tank Inlet Hose@Engine Coolant Air Bleed Pipe - Disconnect - **Radiator Surge Tank Inlet Hose Replacement (LC8, L96)**	
1	Engine Coolant Air Bleed Pipe Bolt **CAUTION:** **Refer to** **Fastener Caution** . **Tighten** 12 N.m (106 lb in)
2	Engine Coolant Air Bleed Pipe O-Ring **Procedure** Install a NEW O-ring seal.
3	Engine Coolant Air Bleed Pipe

ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (L8B)

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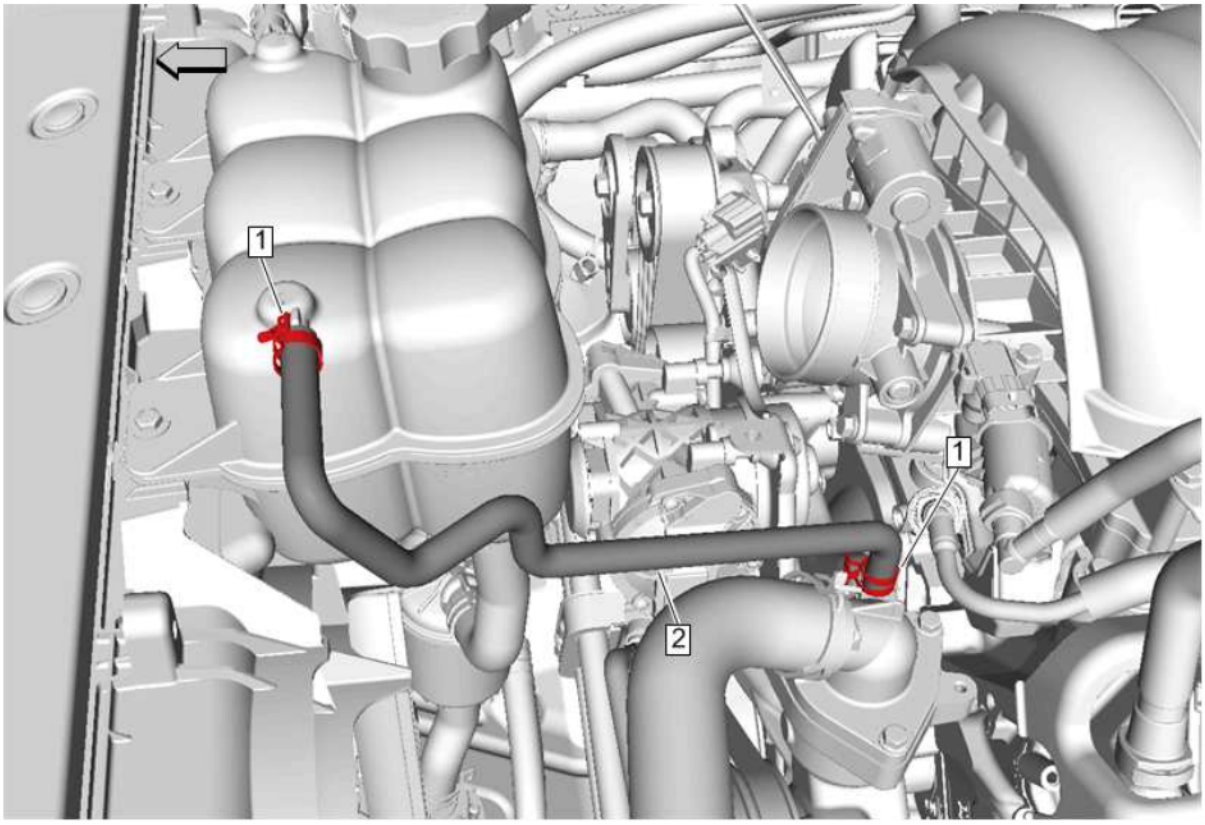

Fig. 340: Engine Coolant Air Bleed Hose (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)** 2. Air Cleaner Outlet Duct - Remove **Air Cleaner Outlet Duct Replacement**	
1	Engine Coolant Air Bleed Hose Clamp **Procedure** **Hose Clamp Replacement Guidelines - Spring Type**
2	Engine Coolant Air Bleed Hose **Procedure** 1. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)** 2. Start the engine and check for coolant leaks.

WATER OUTLET REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Radiator Inlet Hose - Remove **Radiator Inlet Hose Replacement (L5P)**

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3. Turbocharger Air Inlet Adapter - Remove **Turbocharger Air Inlet Adapter Replacement**

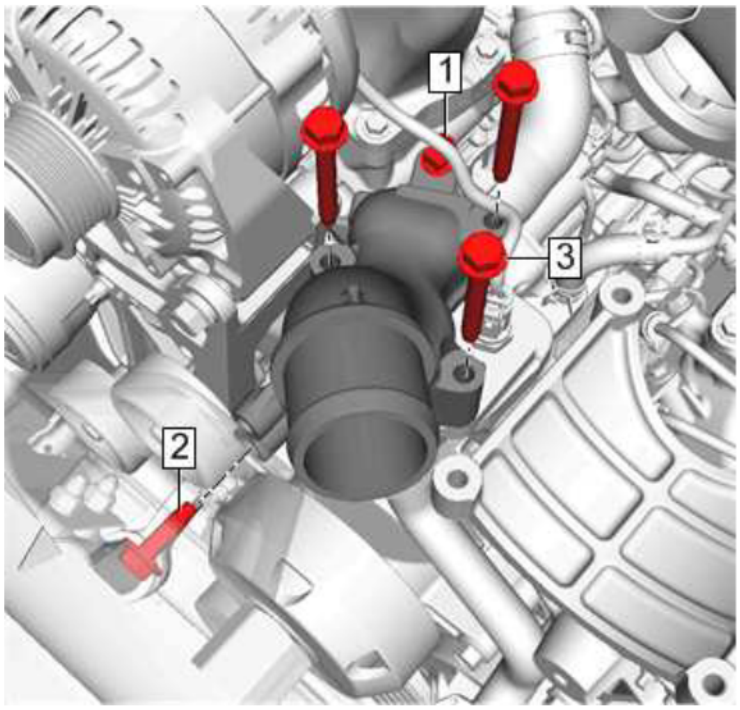

Fig. 341: Water Outlet Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Disengage the engine coolant temperature sensor wiring harness retainer (1) from the water outlet.
5. Engine Coolant Fan Shroud Bolt 2 - Remove - **Engine Coolant Fan Shroud Replacement (L5P)**
6. Water Outlet Bolt 3 - Remove

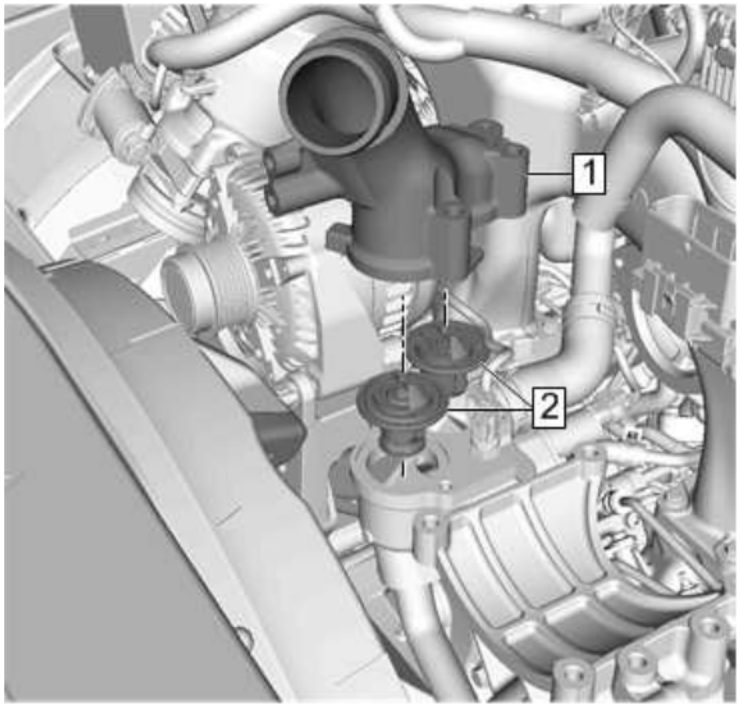

Fig. 342: Water Outlet
Courtesy of GENERAL MOTORS COMPANY

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7. Water Outlet 1 - Remove
8. Engine Coolant Thermostat 2 - Remove and DISCARD **Engine Coolant Thermostat Replacement (L5P)**

Installation Procedure

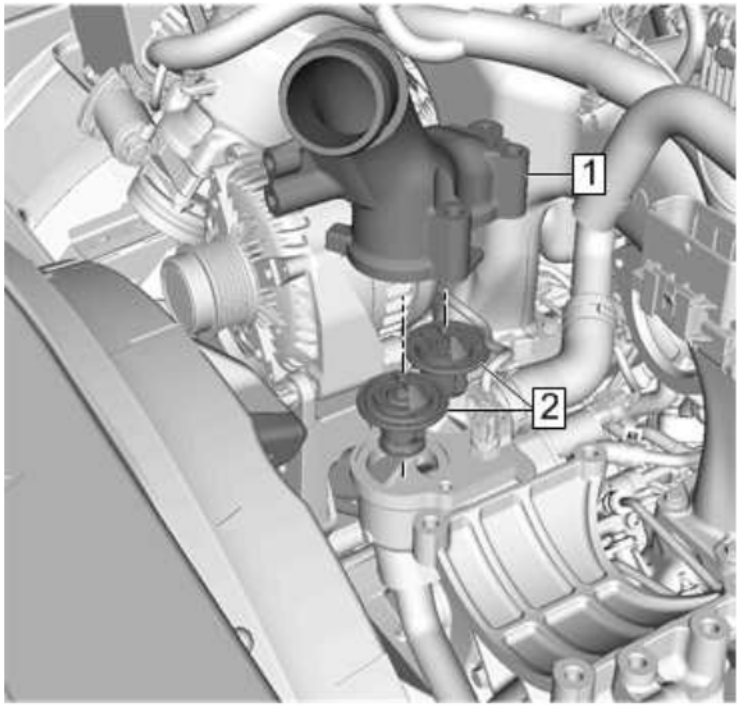

Fig. 343: Water Outlet
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install NEW engine coolant thermostats.**

1. Engine Coolant Thermostat 2 - Install **Engine Coolant Thermostat Replacement (L5P)**
2. Water Outlet 1 - Install

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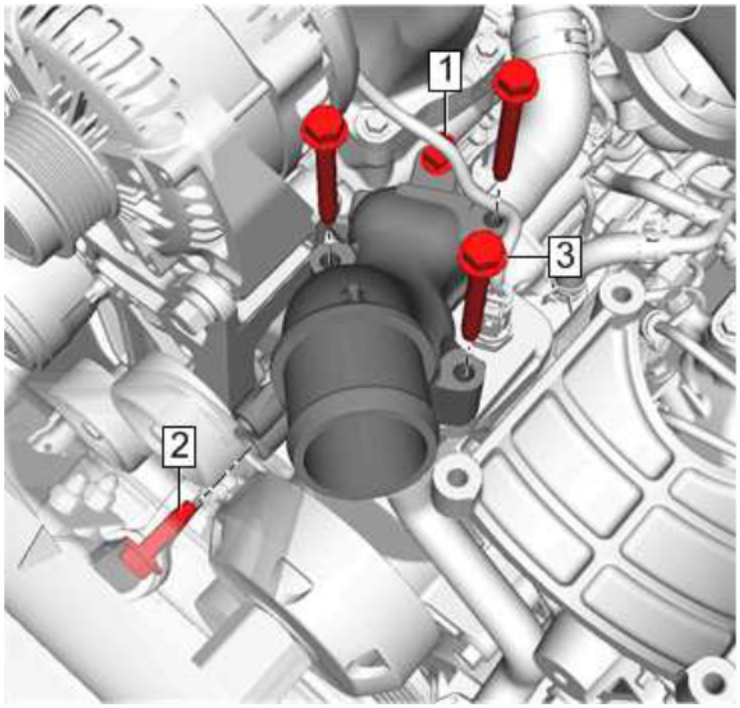

Fig. 344: Water Outlet Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

3. Water Outlet Bolt 3 - Install and tighten 25 N.m (18 lb ft)
4. Engine Coolant Fan Shroud Bolt 2 - Install and tighten - **Engine Coolant Fan Shroud Replacement (L5P)**
5. Engage the engine coolant temperature sensor wiring harness retainer (1) to the water outlet.
6. Turbocharger Air Inlet Adapter - Install - **Turbocharger Air Inlet Adapter Replacement**
7. Radiator Inlet Hose - Install - **Radiator Inlet Hose Replacement (L5P)**
8. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

THERMOSTAT BYPASS PIPE REPLACEMENT (L5P)

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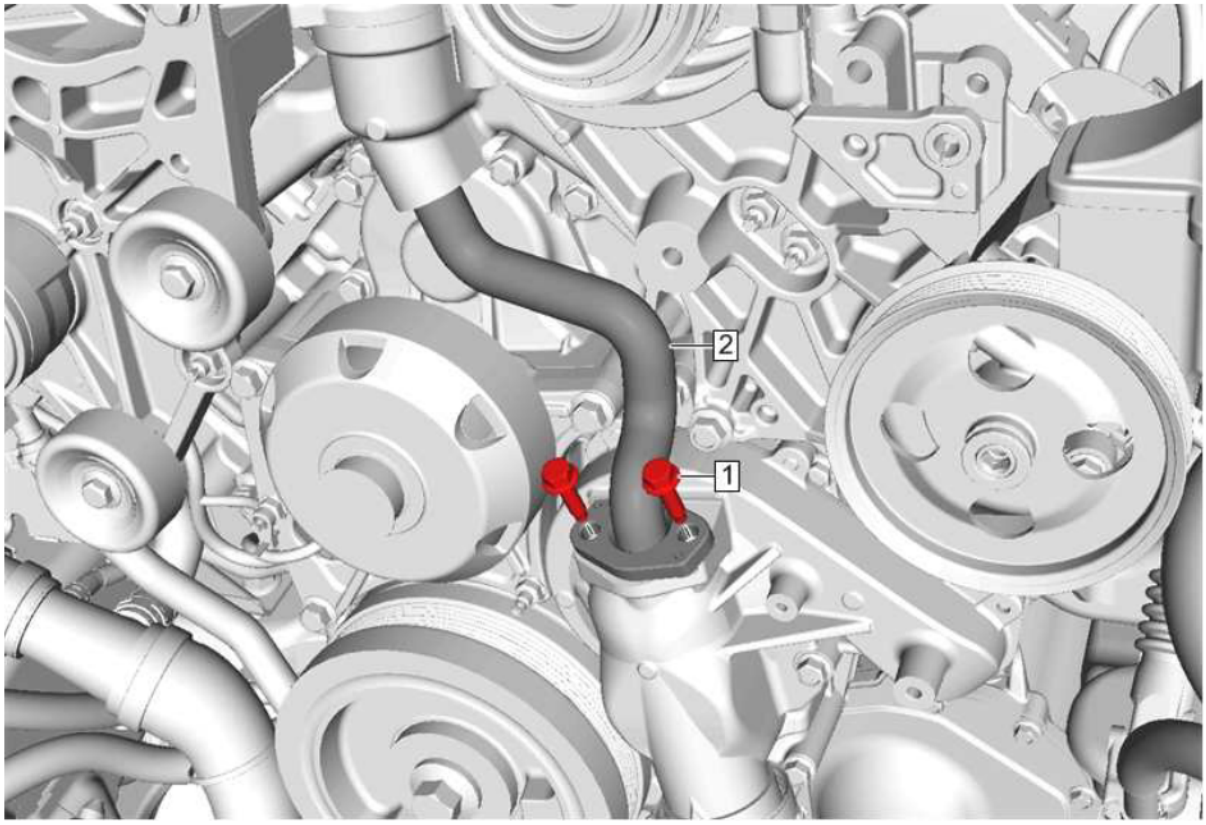

Fig. 345: Thermostat Bypass Pipe (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**. 2. **Fan Pulley Replacement**.	
1	Thermostat Bypass Pipe Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 25 N.m (18 lb ft)
2	Thermostat Bypass Pipe **Procedure** 1. Clean all sealing surfaces. 2. Install a NEW O-ring seal. 3. Install a NEW gasket.

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WATER PUMP REPLACEMENT (L96, LC8)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**
2. **Air Cleaner Outlet Duct Replacement** - Remove
3. **Fan Blade Replacement (LC8, L96)** - Remove
4. **Drive Belt Replacement - Accessory** - Remove

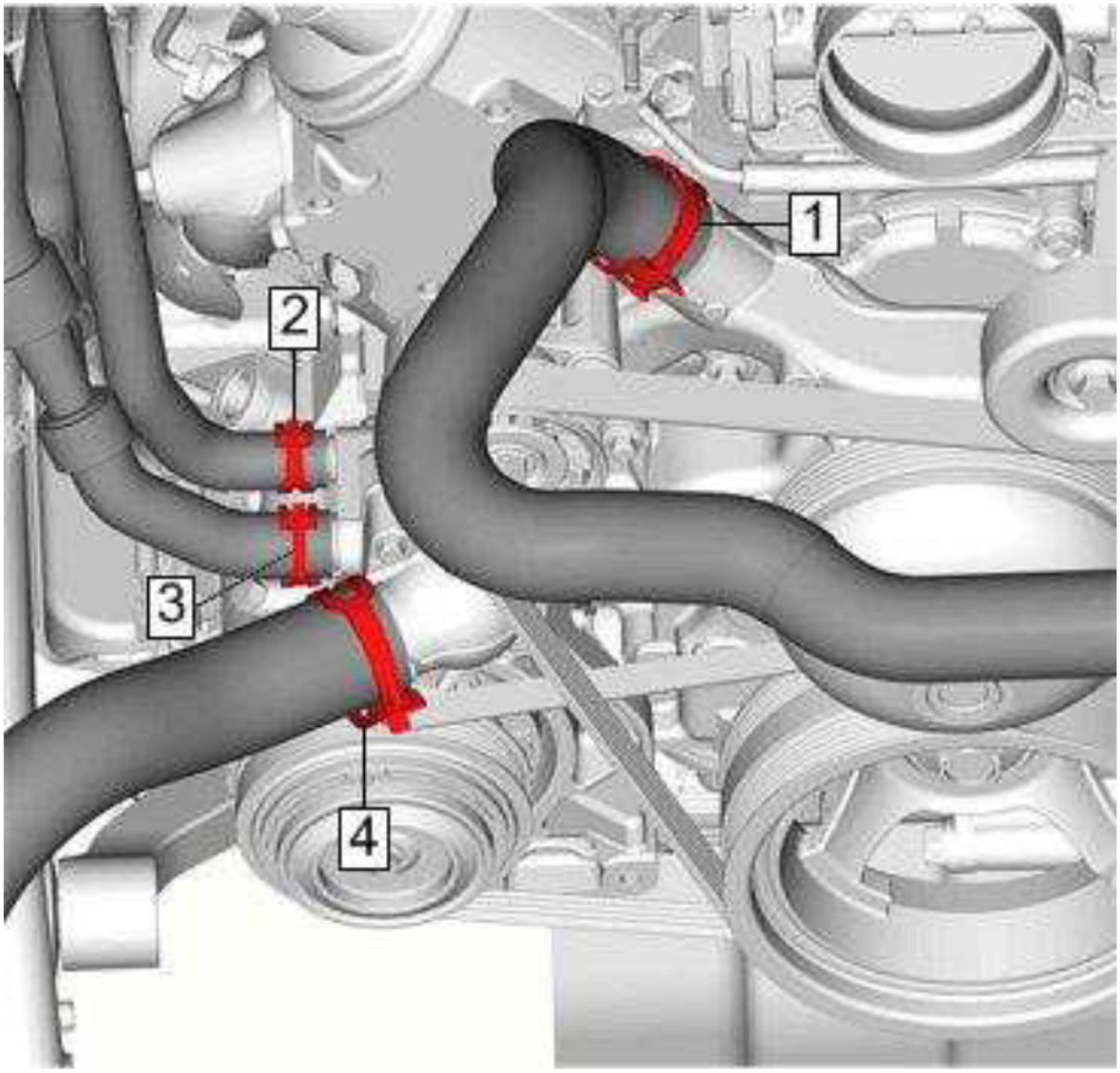

Fig. 346: Hoses
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Inlet Hose 1 - Disconnect
6. Heater Inlet Hose 2 - Disconnect
7. Heater Outlet Hose 3 - Disconnect
8. Radiator Outlet Hose 4 - Disconnect

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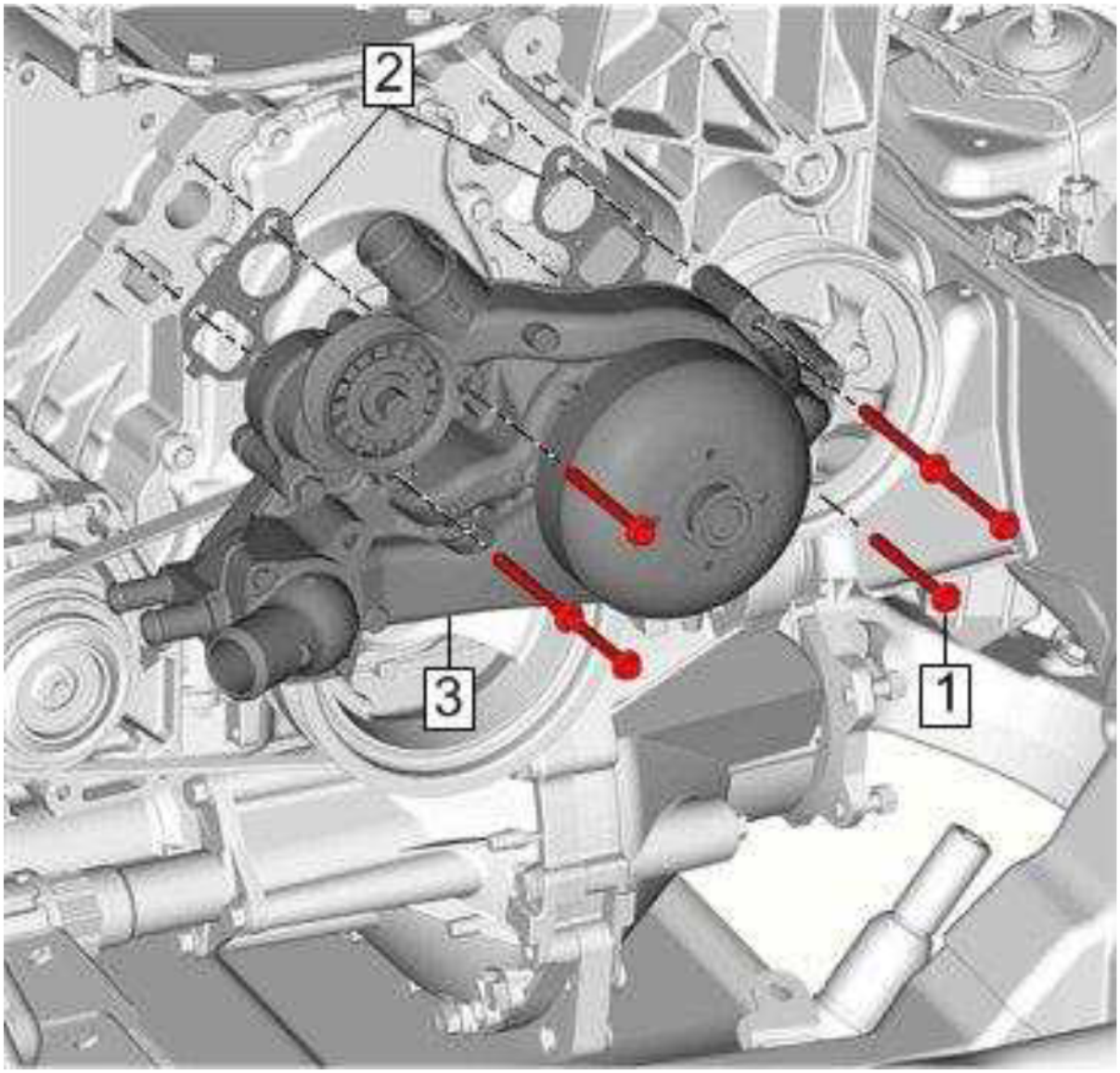

Fig. 347: Water Pump Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Water Pump Bolt 1 - Remove
10. Water Pump 3 - Remove
11. Water Pump Gasket 2 - Remove and DISCARD
12. Transfer components as necessary.

Installation Procedure

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

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

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1. Carefully clean the water pump sealing surfaces.

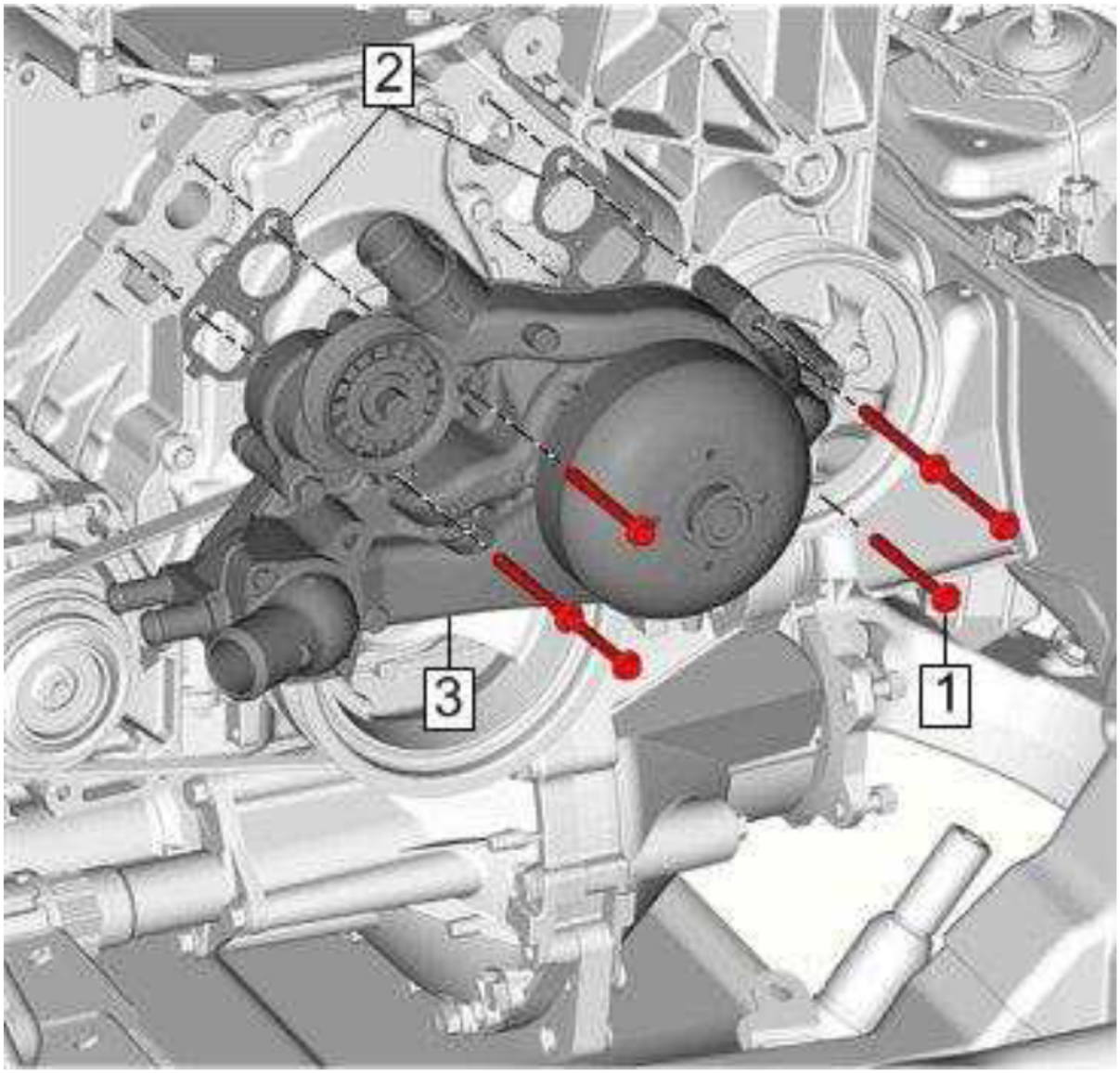

Fig. 348: Water Pump Bolt
Courtesy of GENERAL MOTORS COMPANY

2. Install a NEW water pump gasket. 2
3. Water Pump 3 - Install

CAUTION: Refer to Fastener Caution .

4. Water Pump Bolt 1 - Install and tighten
   - First Pass 15 N.m (11 lb ft)
   - Second Pass 30 N.m (22 lb ft)

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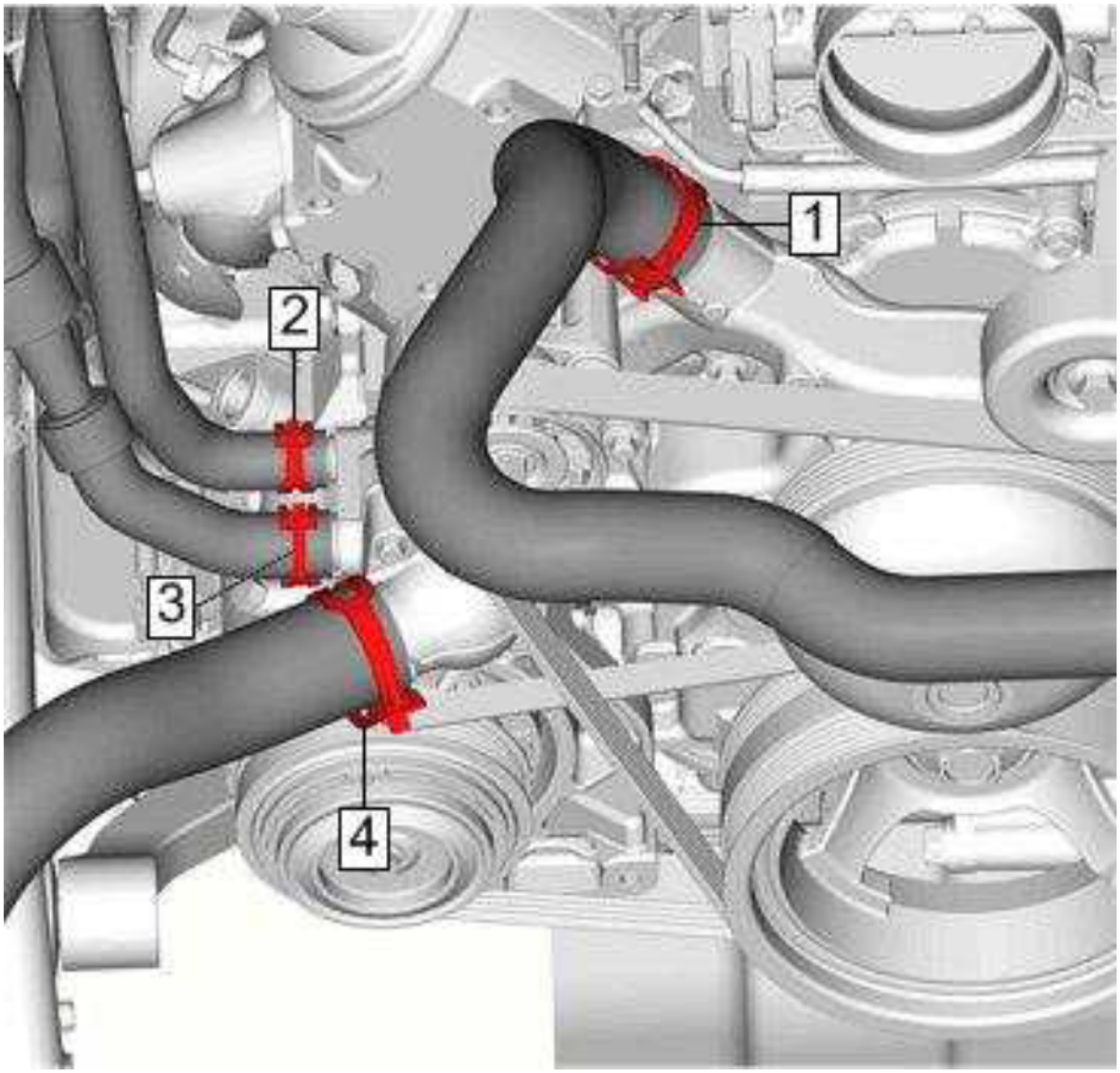

Fig. 349: Hoses
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Outlet Hose 4 - Connect
6. Heater Outlet Hose 3 - Connect
7. Heater Inlet Hose 2 - Connect
8. Radiator Inlet Hose 1 - Connect
9. **Drive Belt Replacement - Accessory** - Install
10. **Fan Blade Replacement (LC8, L96)Fan Blade Replacement (L5P)** - Install
11. **Air Cleaner Outlet Duct Replacement** - Install
12. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**

WATER PUMP REPLACEMENT (L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System**

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Draining and Filling (Static L5P)

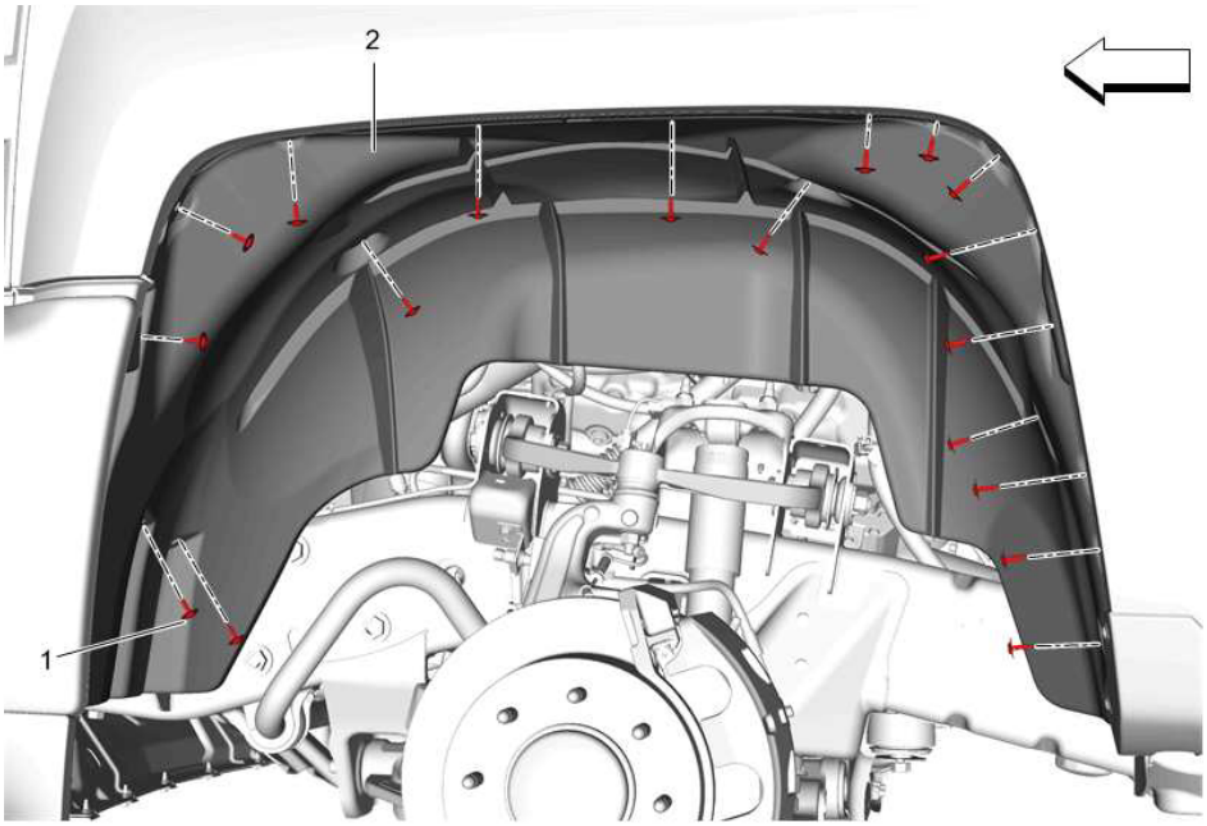

Fig. 350: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

2. Front Wheelhouse Liner-Left Side 2 - Remove **Front Wheelhouse Liner Replacement - Left Side**

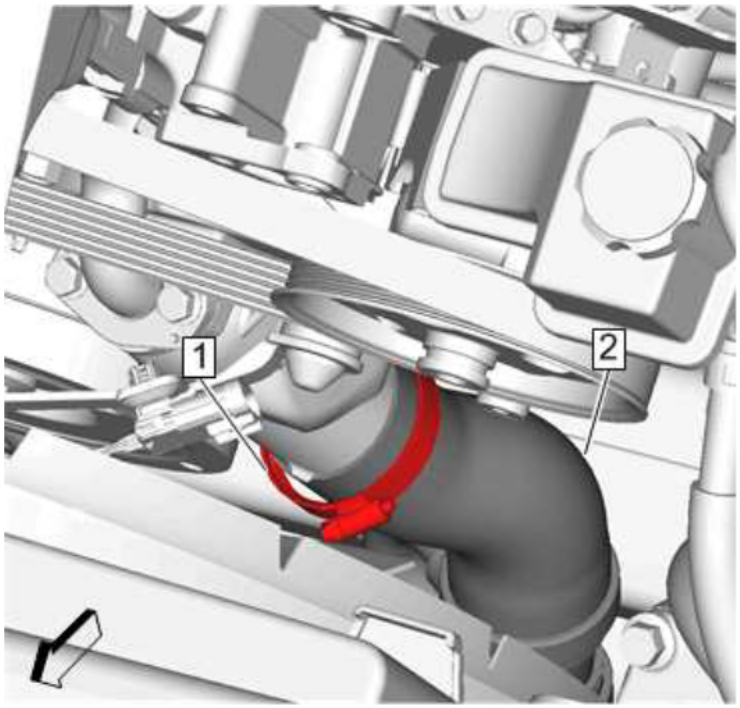

Fig. 351: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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3. Radiator Outlet Hose 2 @Water Pump - Disconnect **Radiator Outlet Hose Replacement (L5P)**

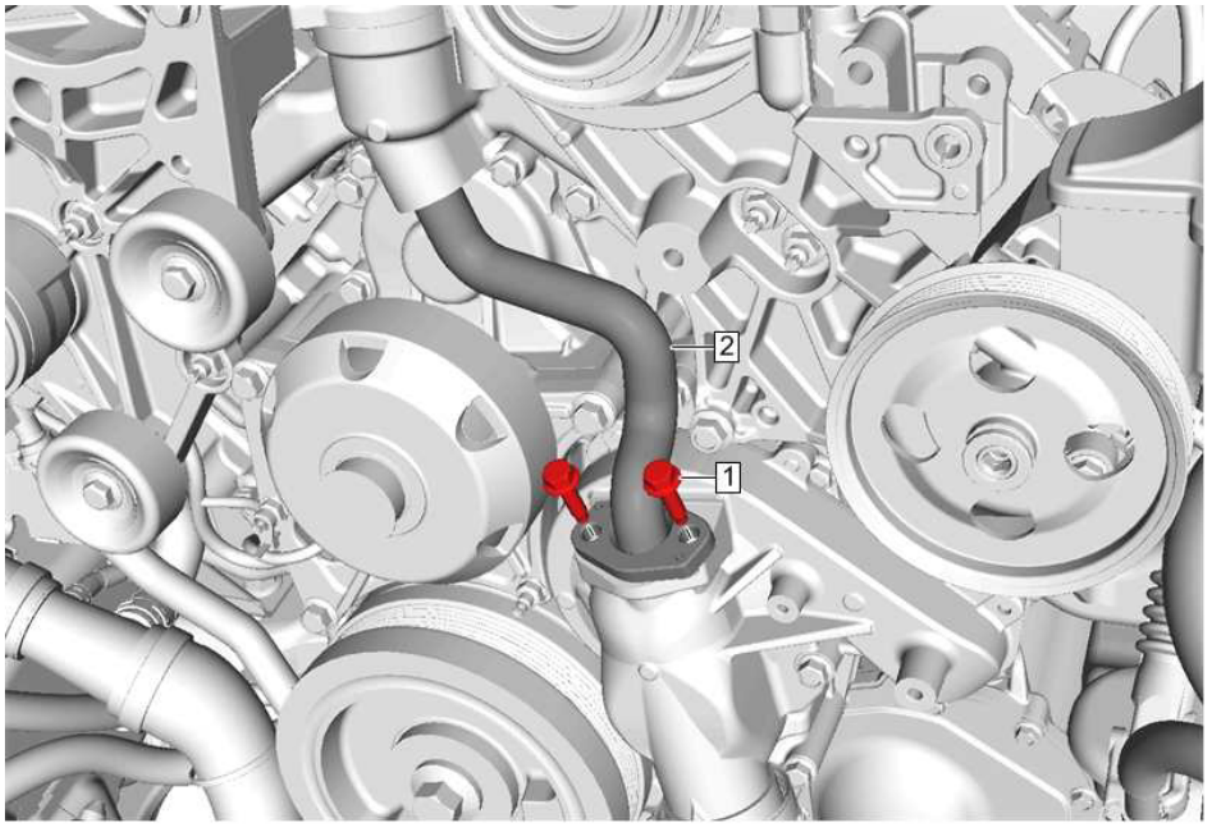

Fig. 352: Thermostat Bypass Pipe (L5P)
Courtesy of GENERAL MOTORS COMPANY

4. Thermostat Bypass Pipe 2 - Remove **Thermostat Bypass Pipe Replacement (L5P)**

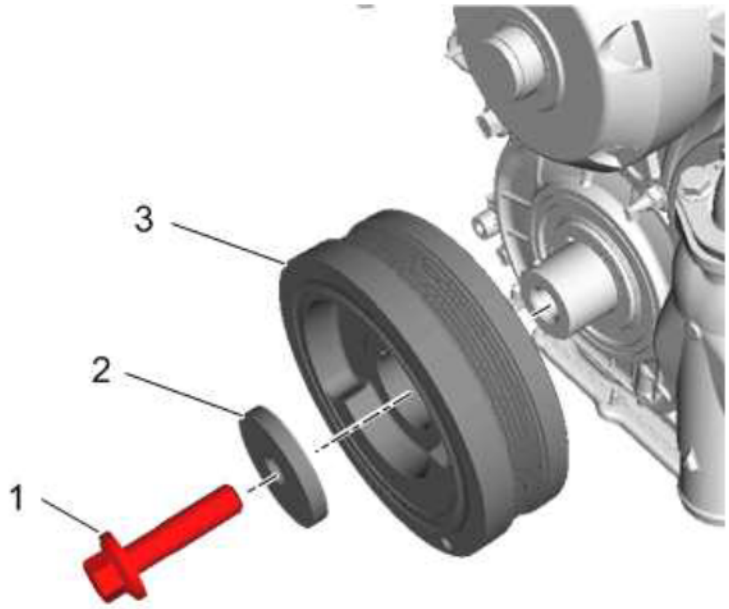

Fig. 353: Crankshaft Balancer
Courtesy of GENERAL MOTORS COMPANY

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5. Crankshaft Balancer 3 - Remove **Crankshaft Balancer Replacement**

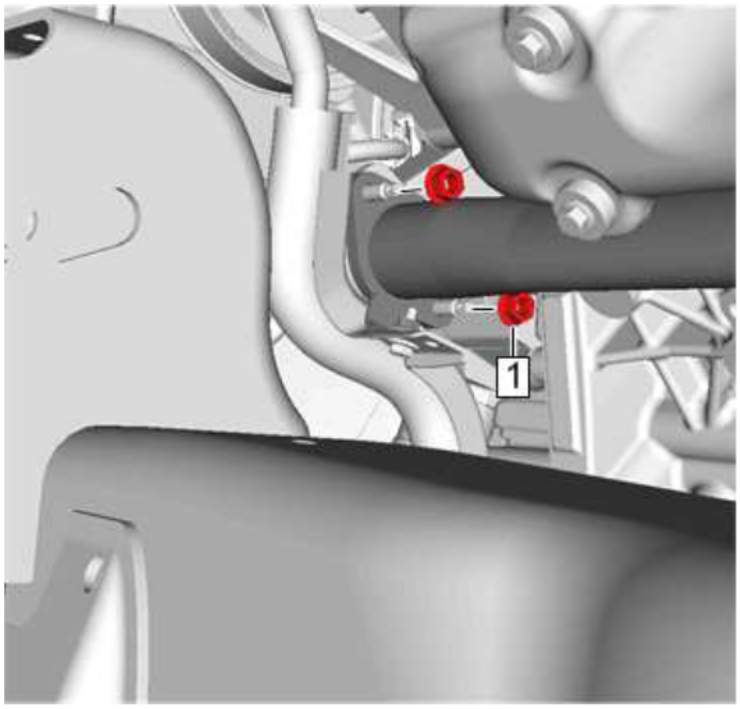

Fig. 354: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

6. Water Pump Outlet Pipe Nut 1 - Remove

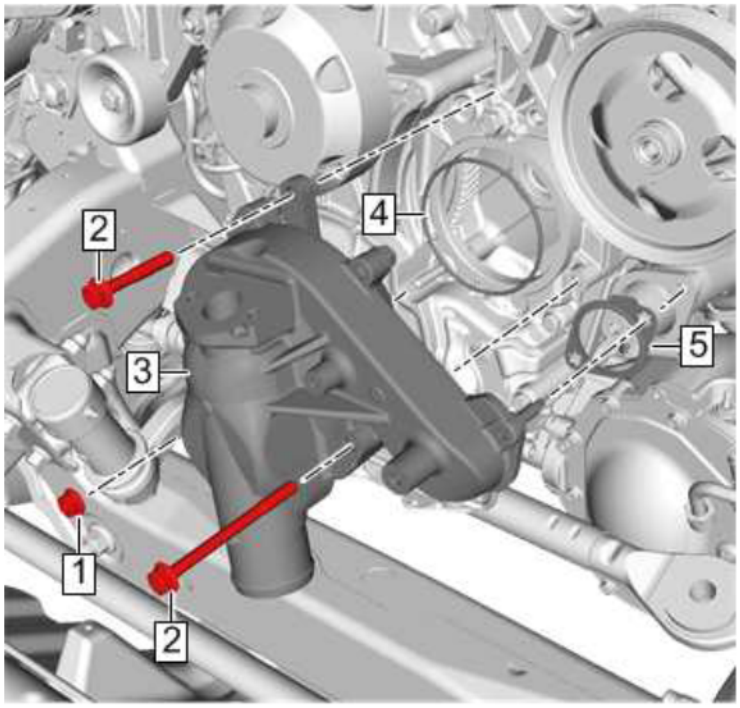

Fig. 355: Water Pump
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Nut 1 - Remove
8. Water Pump Bolt 2 - Remove

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9. Water Pump 3 - Remove
10. Water Pump Seal 4 - Remove and DISCARD
11. Water Pump Gasket 5 - Remove and DISCARD

Installation Procedure

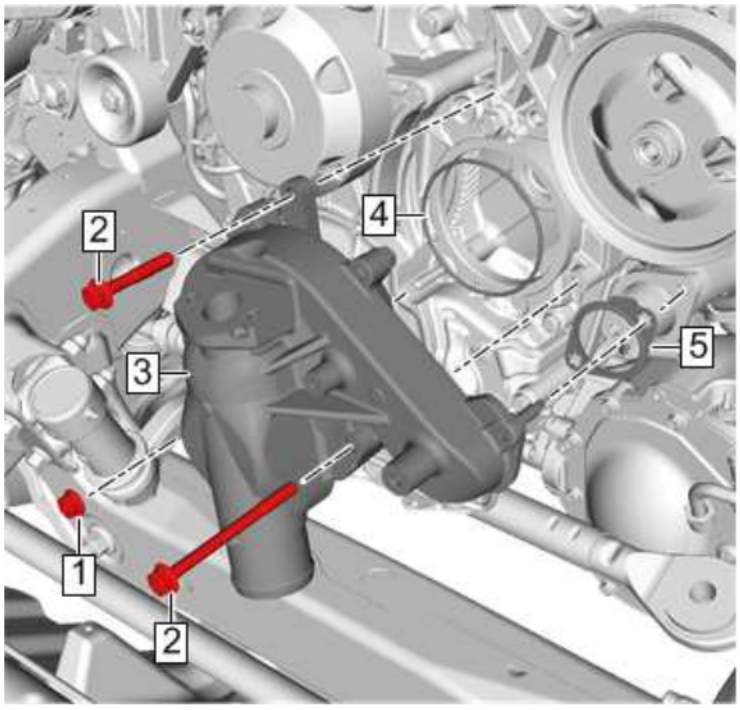

Fig. 356: Water Pump
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW water pump gasket.**

1. Water Pump Gasket 5 - Install

NOTE: **Install a NEW water pump seal.**

2. Water Pump Seal 4 - Install
3. Water Pump 3 - Install

CAUTION: **Refer to Fastener Caution .**

4. Water Pump Bolt 2 - Install and tighten 25 N.m (18 lb ft)
5. Water Pump Nut 1 - Install and tighten 25 N.m (18 lb ft)

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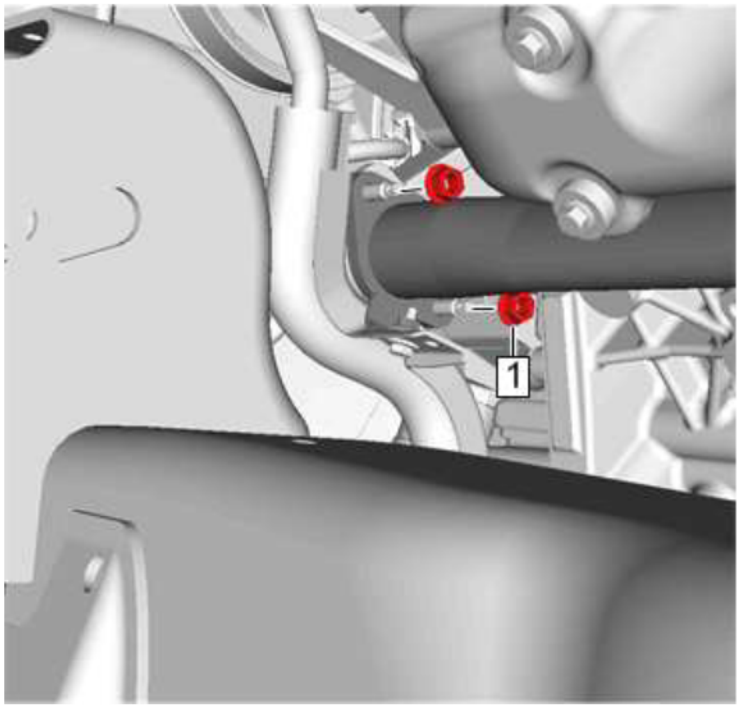

Fig. 357: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

6. Water Pump Outlet Pipe Nut 1 - Install and tighten 25 N.m (18 lb ft)

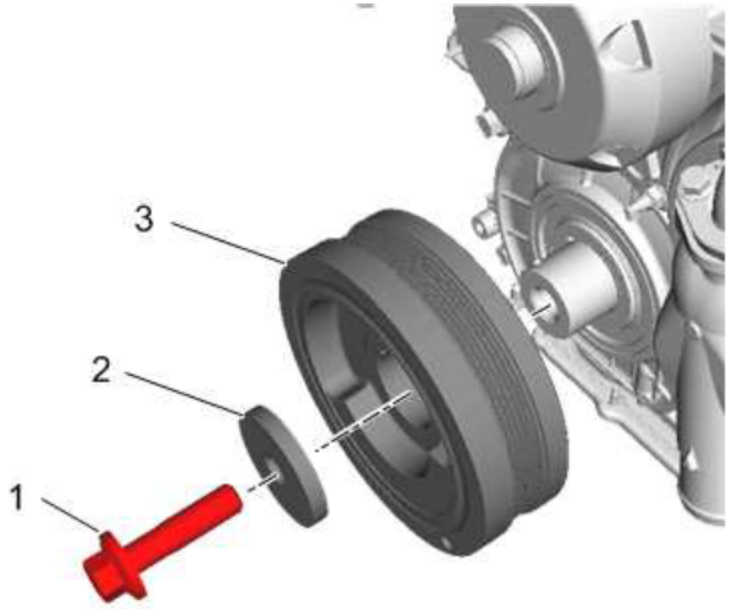

Fig. 358: Crankshaft Balancer
Courtesy of GENERAL MOTORS COMPANY

7. Crankshaft Balancer 3 - Install **Crankshaft Balancer Replacement**

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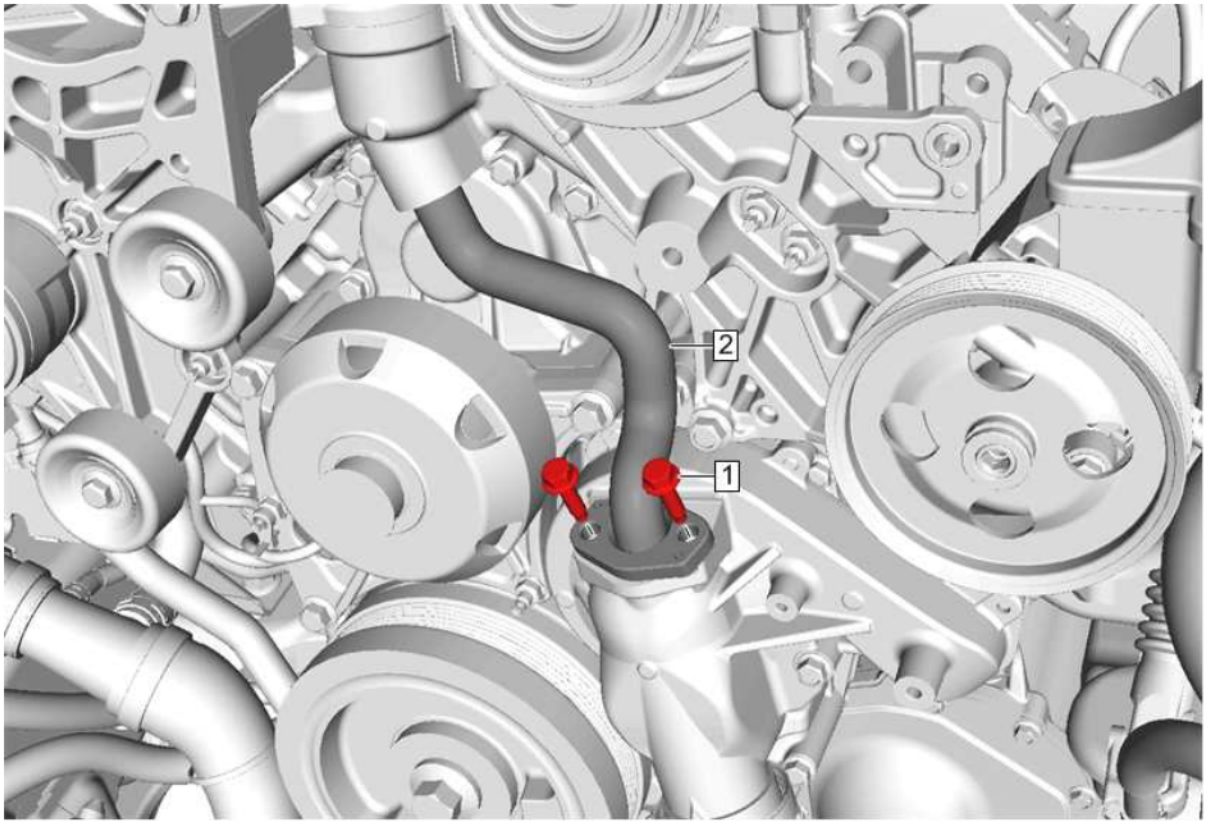

Fig. 359: Thermostat Bypass Pipe (L5P)
Courtesy of GENERAL MOTORS COMPANY

8. Thermostat Bypass Pipe 2 - Install **Thermostat Bypass Pipe Replacement (L5P)**

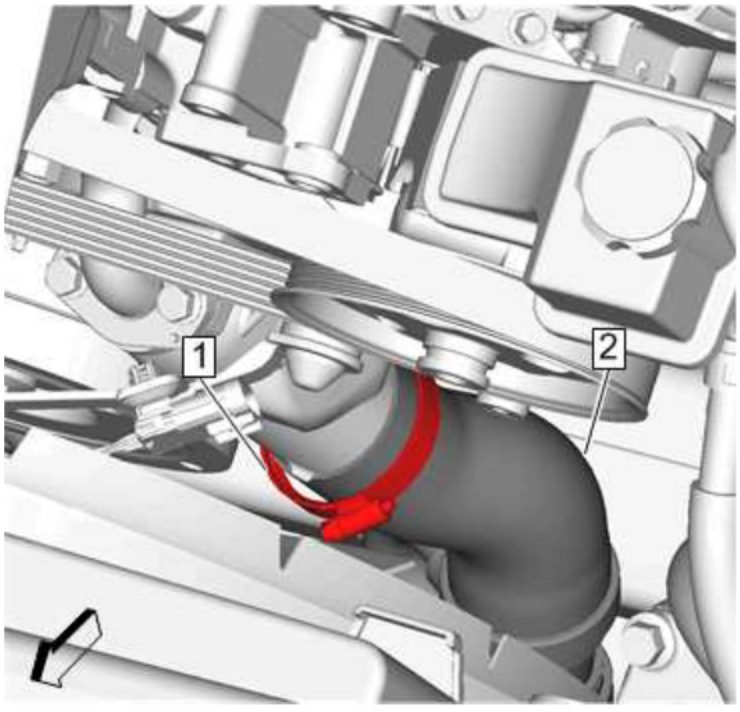

Fig. 360: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

9. Radiator Outlet Hose 2 @Water Pump - Connect **Radiator Outlet Hose Replacement (L5P)**

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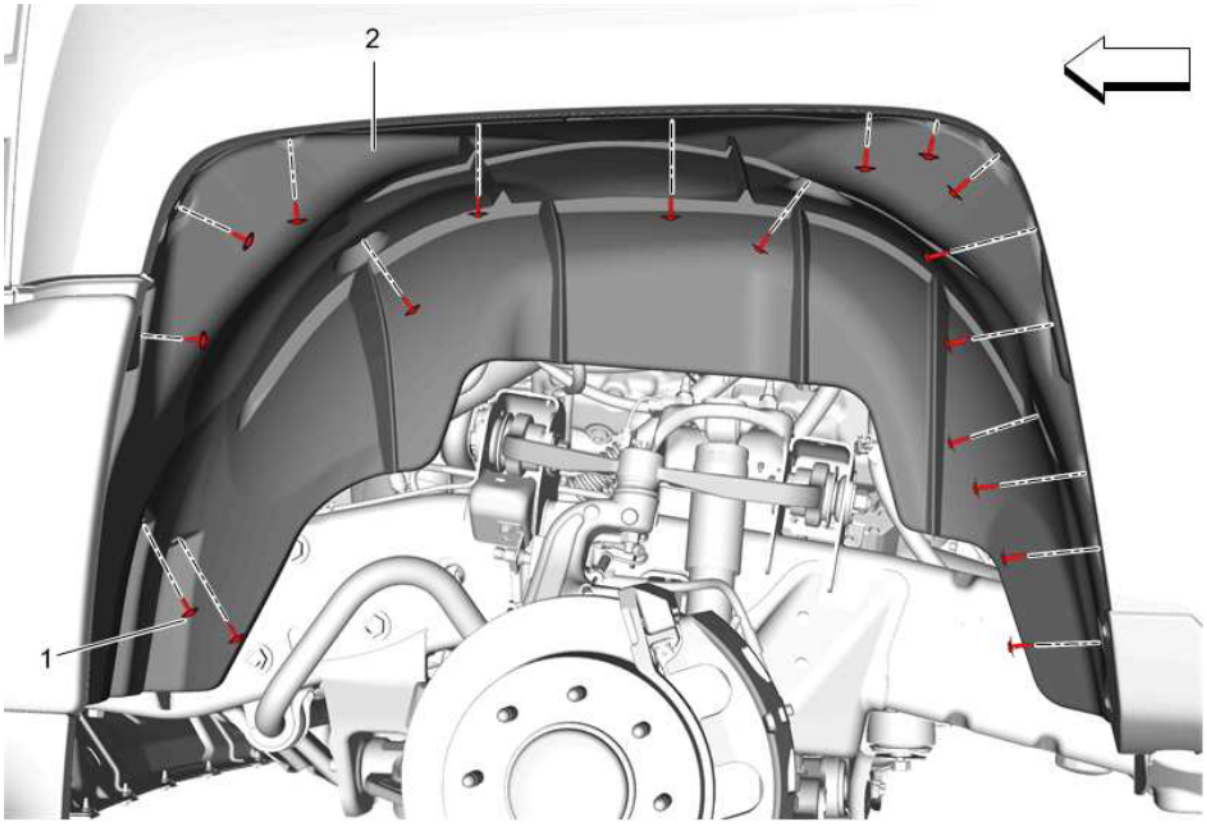

Fig. 361: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

10. Front Wheelhouse Liner-Left Side 2 - Install **Front Wheelhouse Liner Replacement - Left Side**
11. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
12. Start the engine and check for leaks.

WATER PUMP REPLACEMENT (LV3)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**

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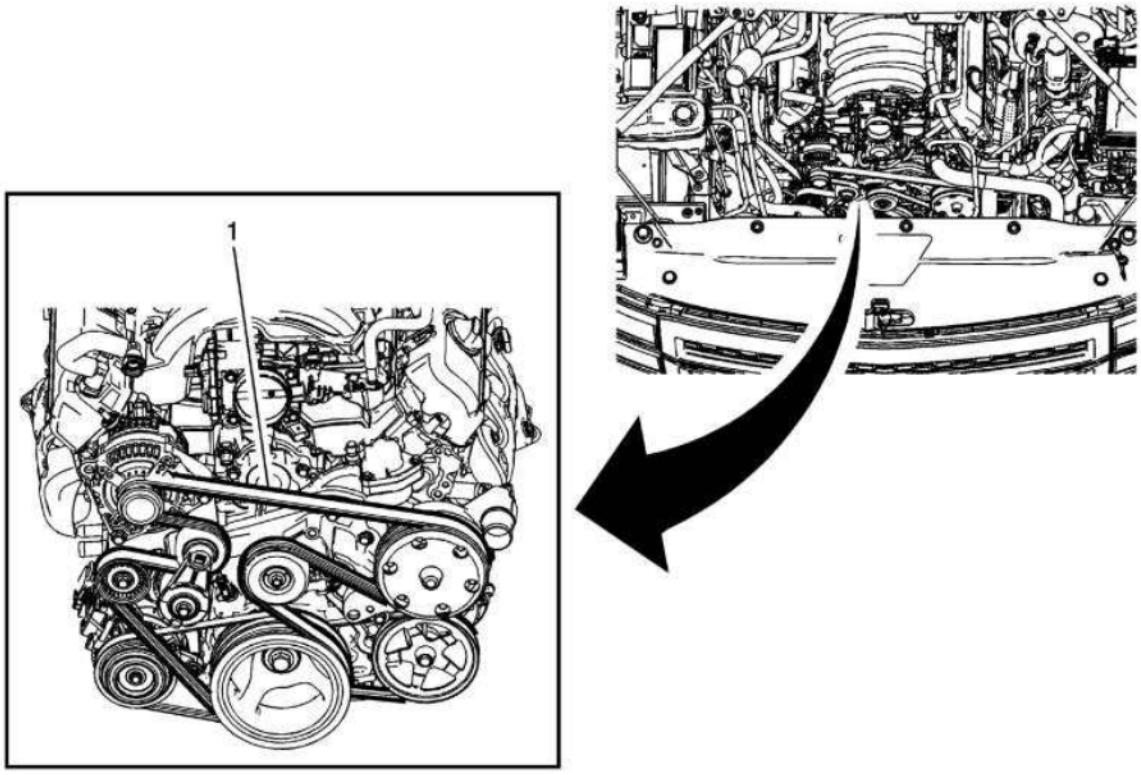

Fig. 362: Accessory Drive Belt Routing
Courtesy of GENERAL MOTORS COMPANY

2. Drive Belt - Accessory 1 - Remove - **Drive Belt Replacement - Accessory**

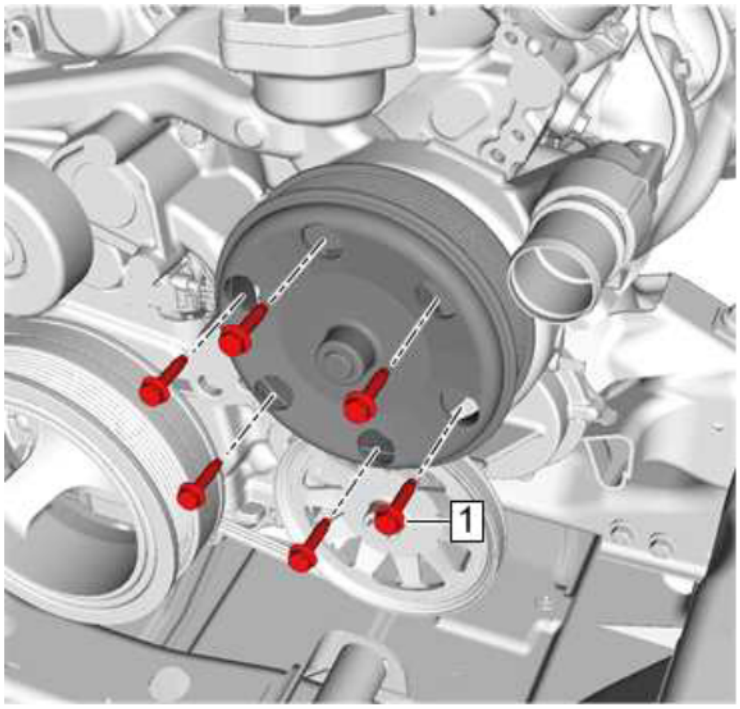

Fig. 363: Water Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Water Pump Bolt 1 - Remove

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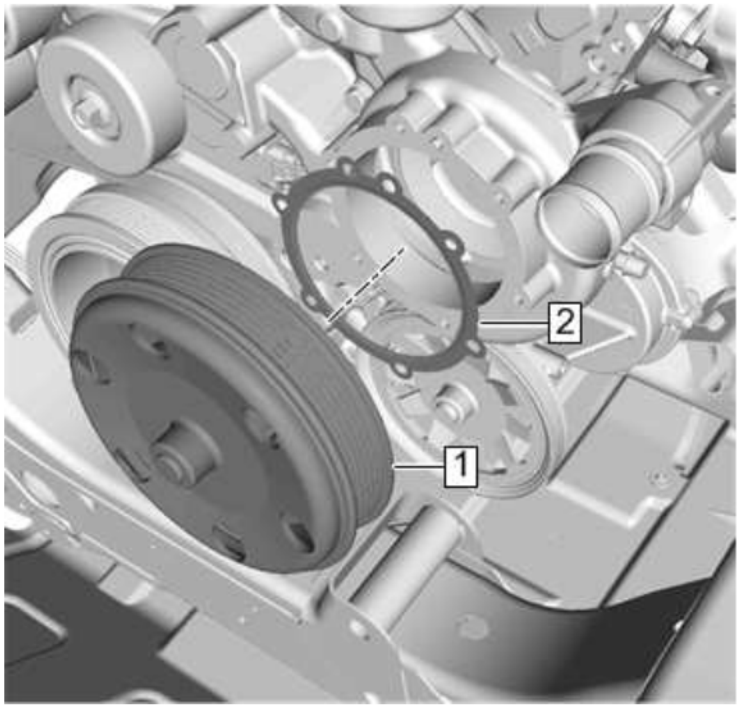

Fig. 364: Water Pump
Courtesy of GENERAL MOTORS COMPANY

4. Water Pump 1 - Remove
5. Water Pump Gasket 2 - Remove and DISCARD

Installation Procedure

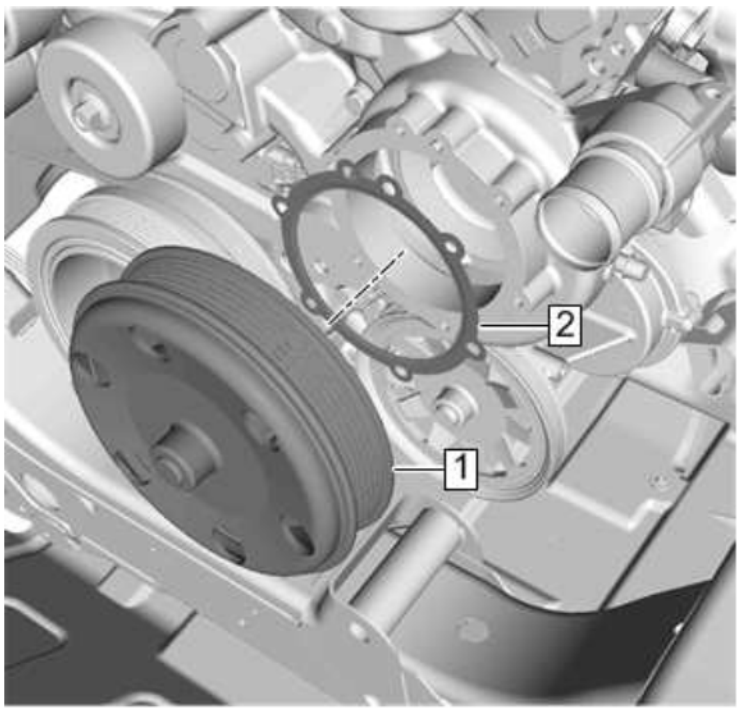

Fig. 365: Water Pump
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW water pump gasket.**

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1. Water Pump Gasket 2 - Install
2. Water Pump 1 - Install

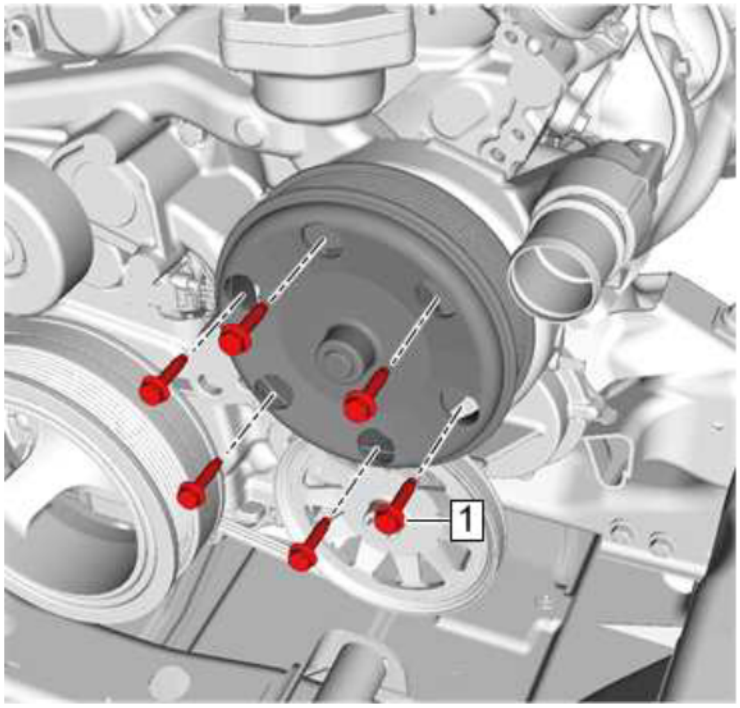

Fig. 366: Water Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Water Pump Bolt 1 - Install and tighten 10 N.m (89 lb in)

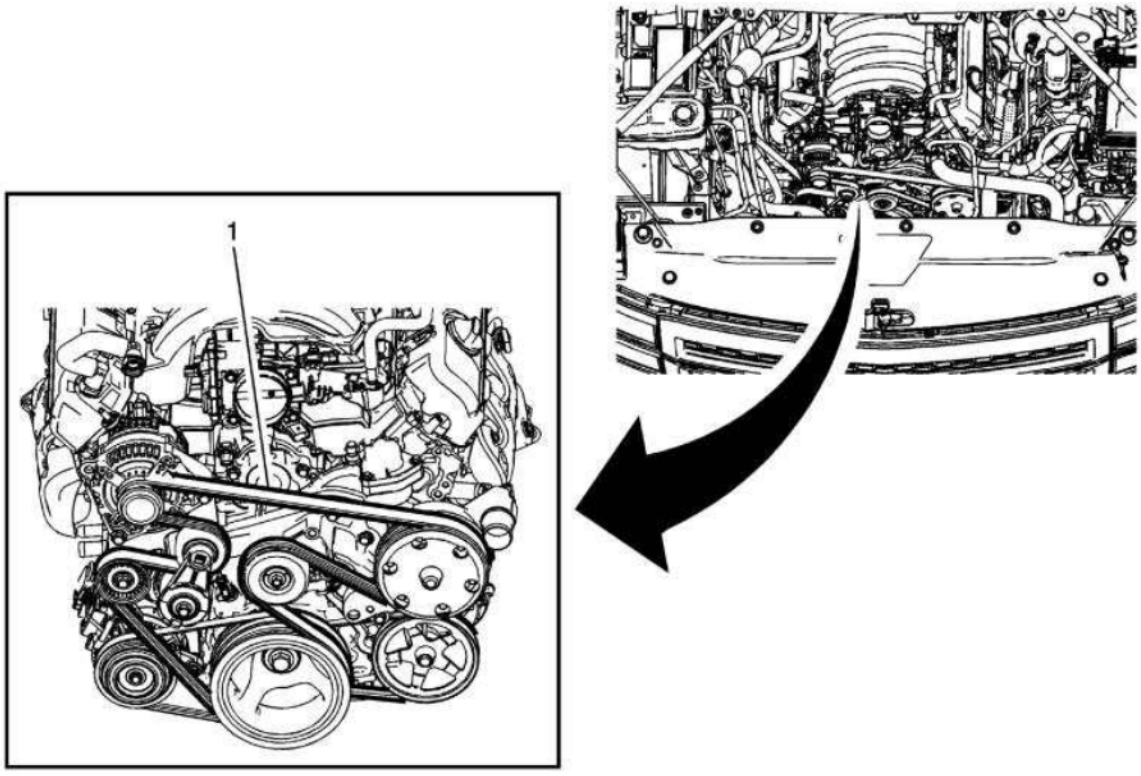

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Fig. 367: Accessory Drive Belt Routing
Courtesy of GENERAL MOTORS COMPANY

4. Drive Belt - Accessory 1 - Install - **Drive Belt Replacement - Accessory**
5. Fill the cooling system. **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**

WATER PUMP REPLACEMENT (L83, L86, L8B)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Vac N Fill L8B)**

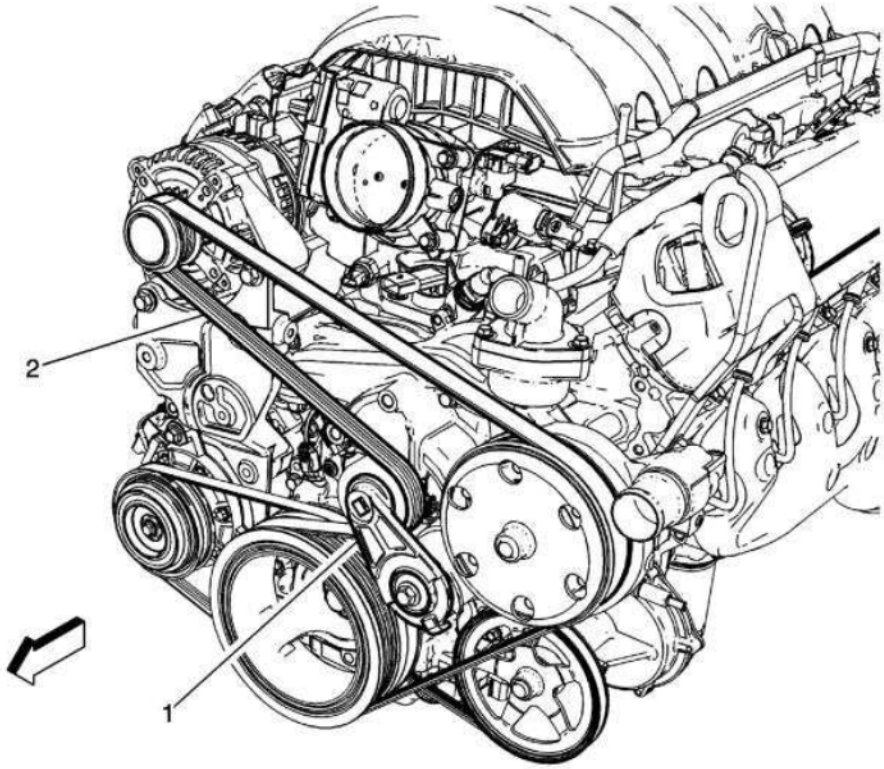

Fig. 368: Accessory Drive Belt Routing
Courtesy of GENERAL MOTORS COMPANY

2. Drive Belt - Accessory 2 - Remove **Drive Belt Replacement - Accessory**

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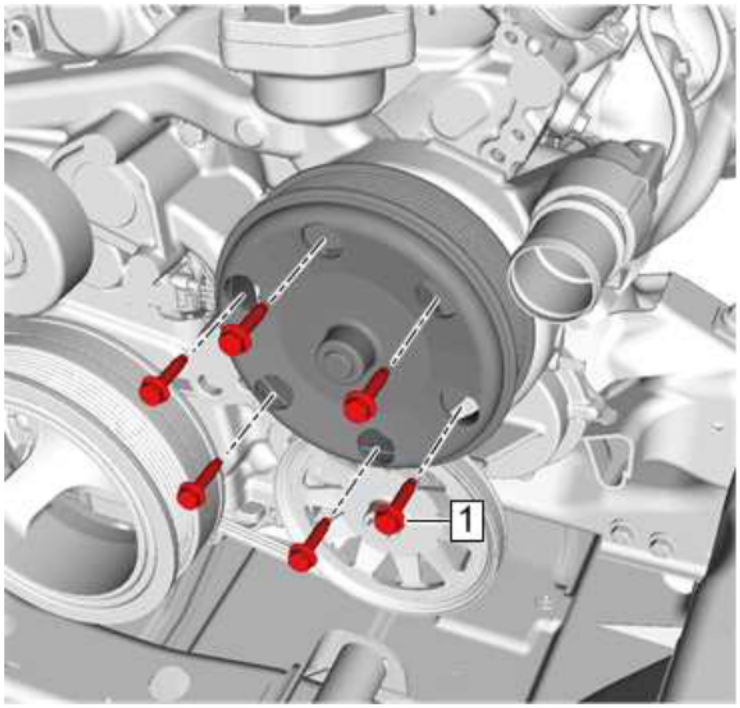

Fig. 369: Water Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Water Pump Bolt 1 - Remove

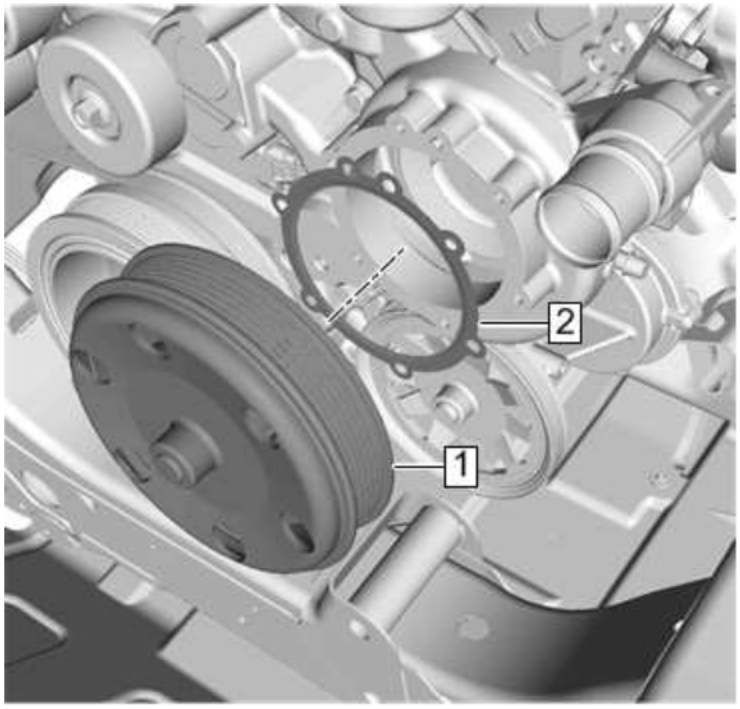

Fig. 370: Water Pump
Courtesy of GENERAL MOTORS COMPANY

4. Water Pump 1 - Remove
5. Water Pump Gasket 2 - Remove and DISCARD

Installation Procedure

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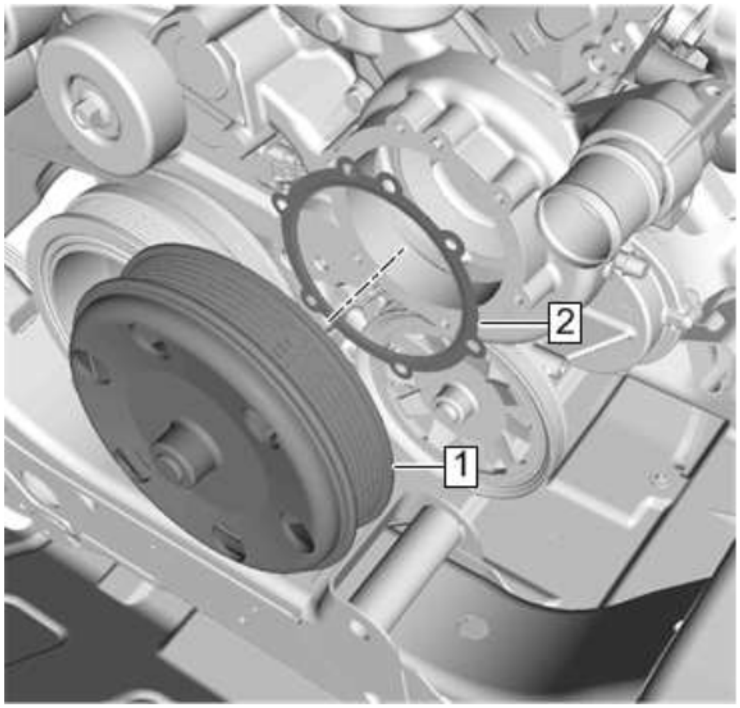

Fig. 371: Water Pump
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW water pump gasket.**

1. Water Pump Gasket 2 - Install
2. Water Pump 1 - Install

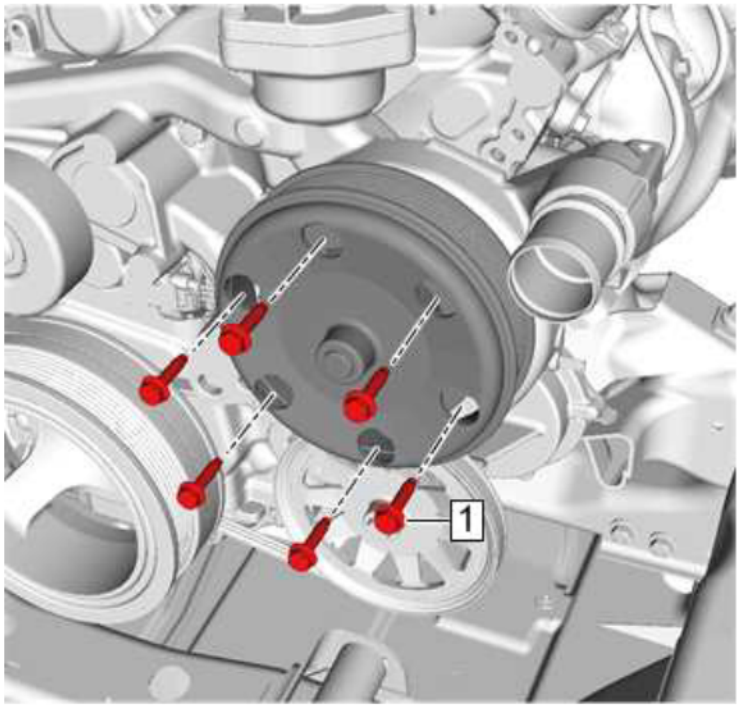

Fig. 372: Water Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

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CAUTION: **Refer to Fastener Caution .**

3. Water Pump Bolt 1 - Install and tighten 10 N.m (89 lb in)

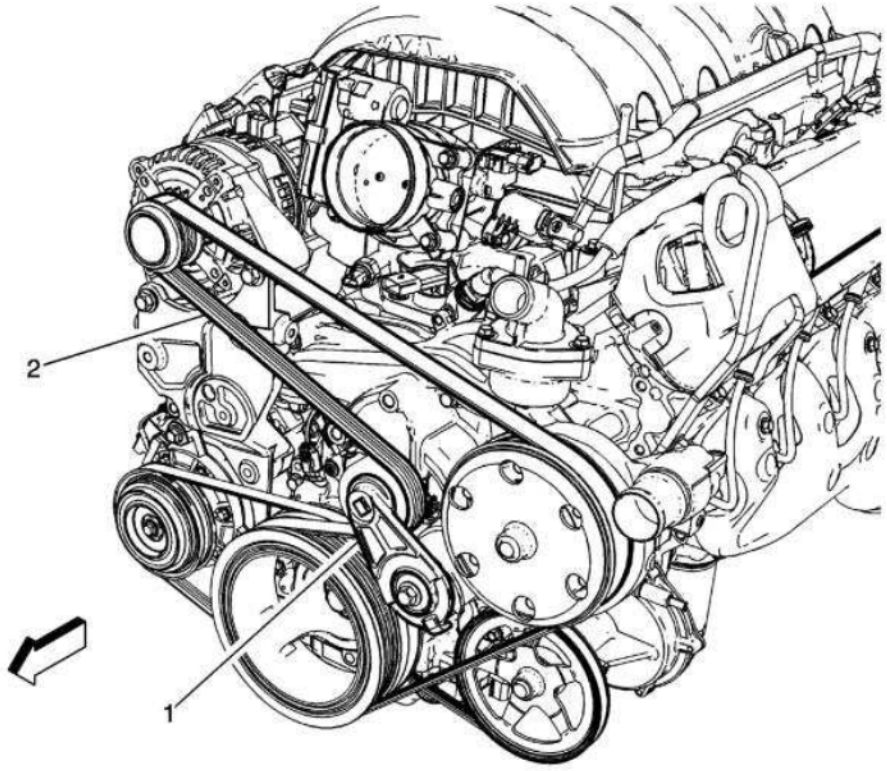

Fig. 373: Accessory Drive Belt Routing
Courtesy of GENERAL MOTORS COMPANY

4. Drive Belt - Accessory 2 - Install - **Drive Belt Replacement - Accessory**
5. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)Cooling System Draining and Filling (Vac N Fill L8B)**

WATER PUMP OUTLET PIPE REPLACEMENT (2WD, L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Remove and DISCARD the oil filter. **Engine Oil and Oil Filter Replacement**

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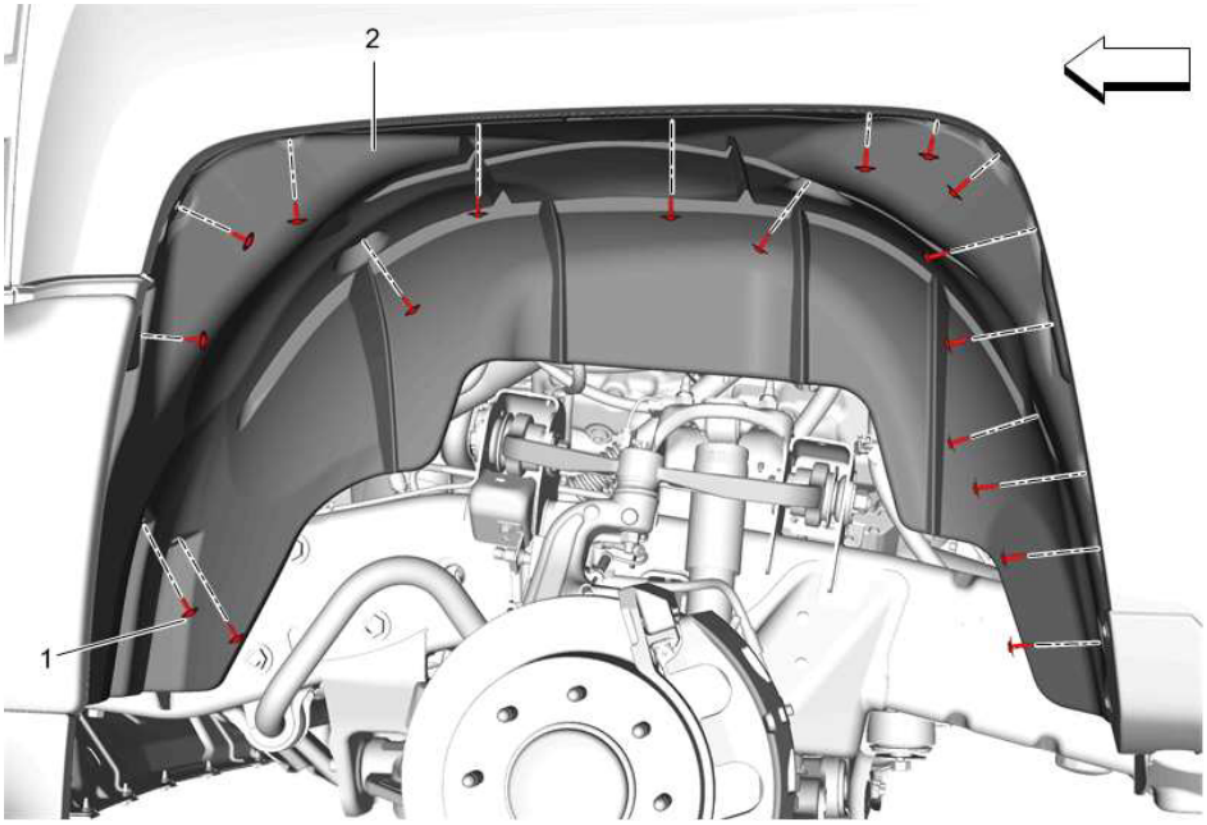

Fig. 374: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

3. Front Wheelhouse Liner-Left Side2 - Remove - **Front Wheelhouse Liner Replacement - Left Side**

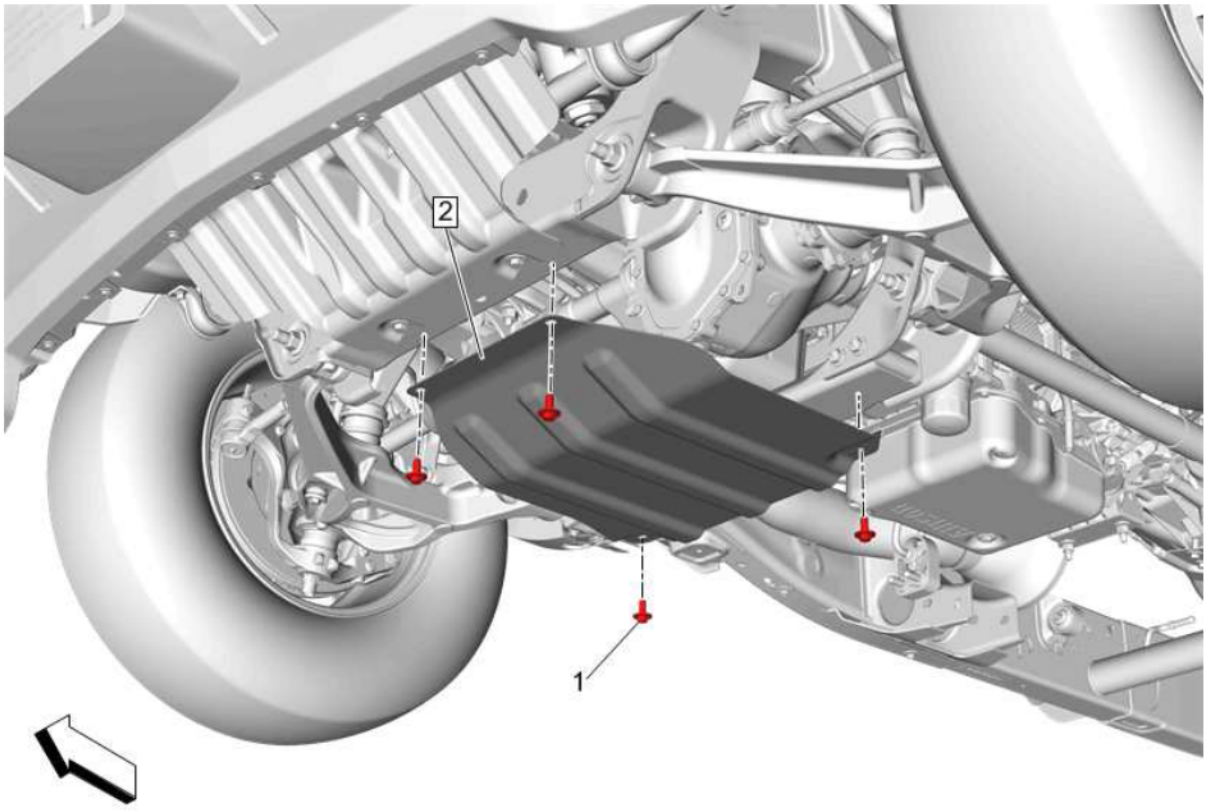

Fig. 375: Underbody Skid Shield

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Courtesy of GENERAL MOTORS COMPANY

4. Underbody Skid Shield 2 - Remove - **Underbody Skid Shield Replacement**

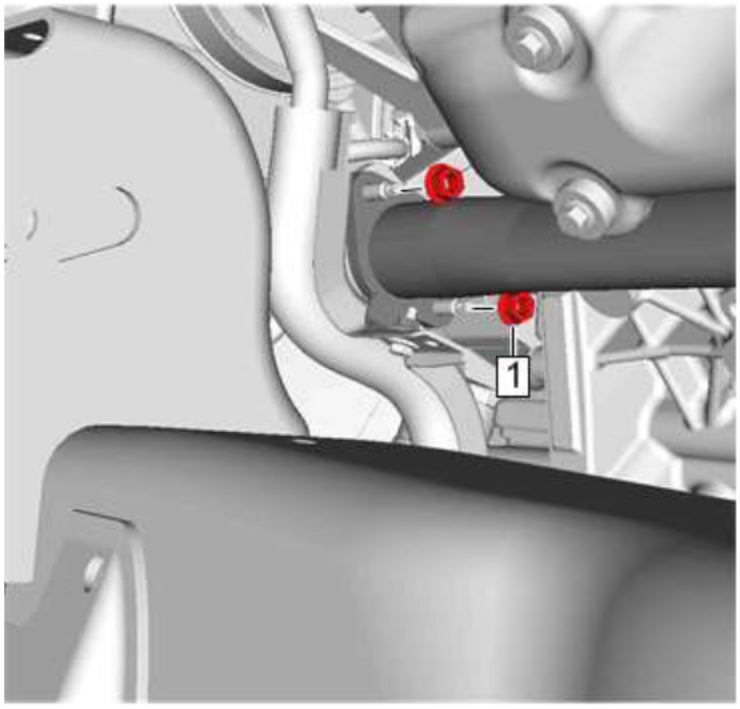

Fig. 376: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

5. Engine Wiring Harness Bracket Bolt 1 - Remove
6. Water Pump Outlet Pipe Nut 2 - Remove

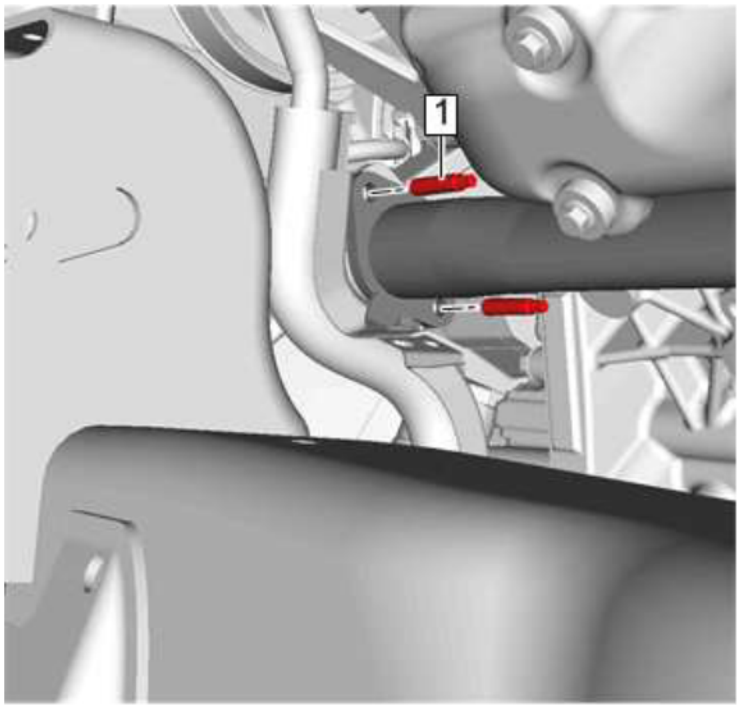

Fig. 377: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

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7. Water Pump Outlet Pipe Stud 1 - Remove

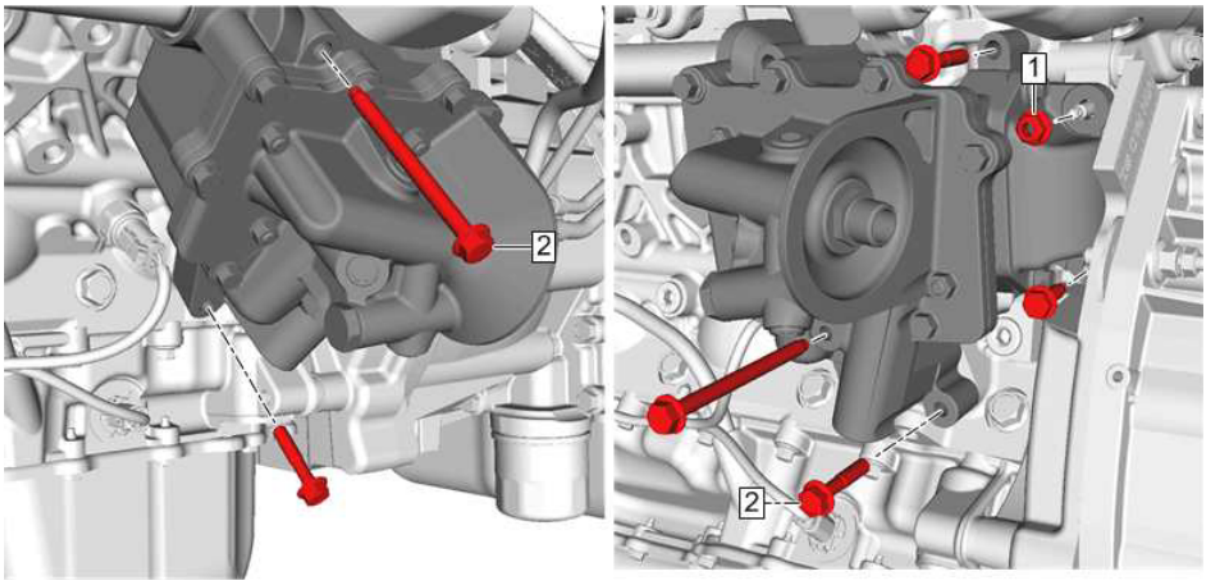

Fig. 378: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Engine Oil Cooler Nut 1 - Remove
9. Engine Oil Cooler Bolt 2 - Remove

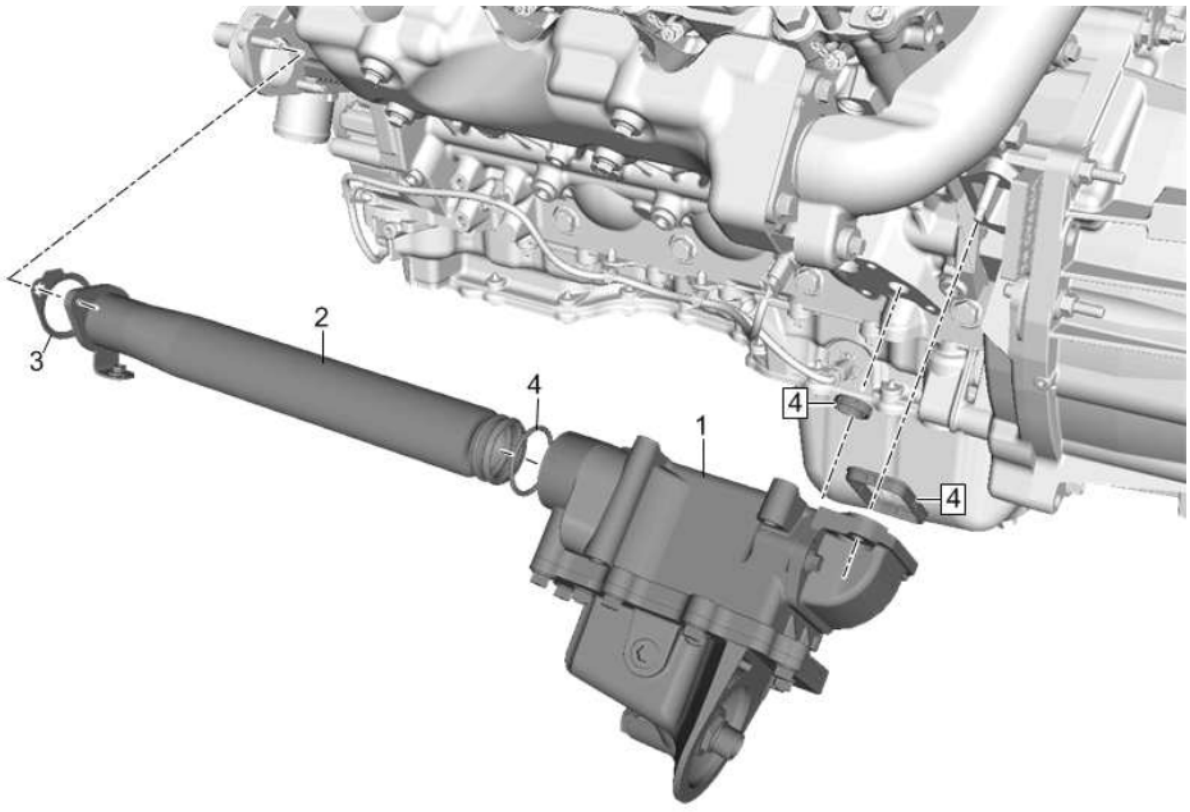

Fig. 379: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

10. Engine Oil Cooler 1 - Remove

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11. Water Pump Outlet Pipe 2 - Remove
12. Water Pump Outlet Pipe Gasket 3 - Remove and DISCARD
13. Engine Oil Cooler Seal 4 - Remove and DISCARD

Installation Procedure

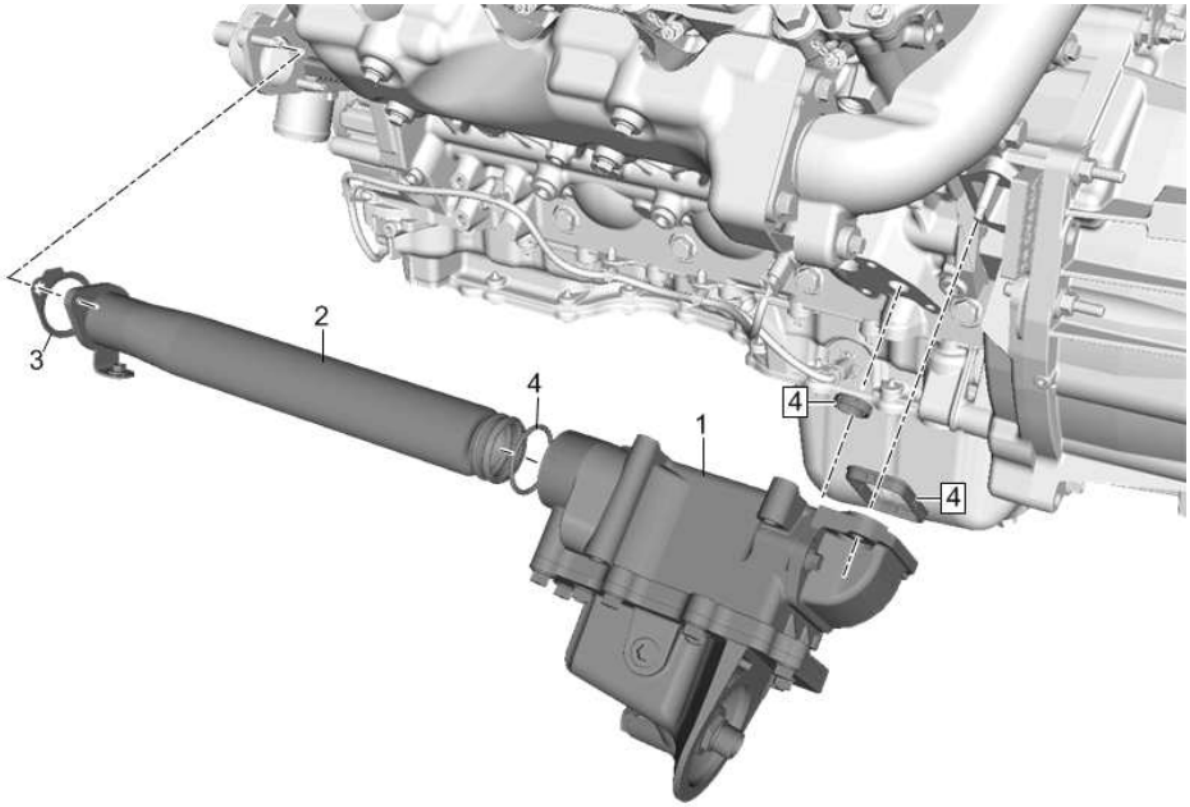

Fig. 380: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install NEW seals.

1. Engine Oil Cooler Seal 4 - Install

NOTE: Install a NEW gasket.

2. Water Pump Outlet Pipe Gasket 3 - Install
3. Water Pump Outlet Pipe 2 - Install
4. Engine Oil Cooler 1 - Install

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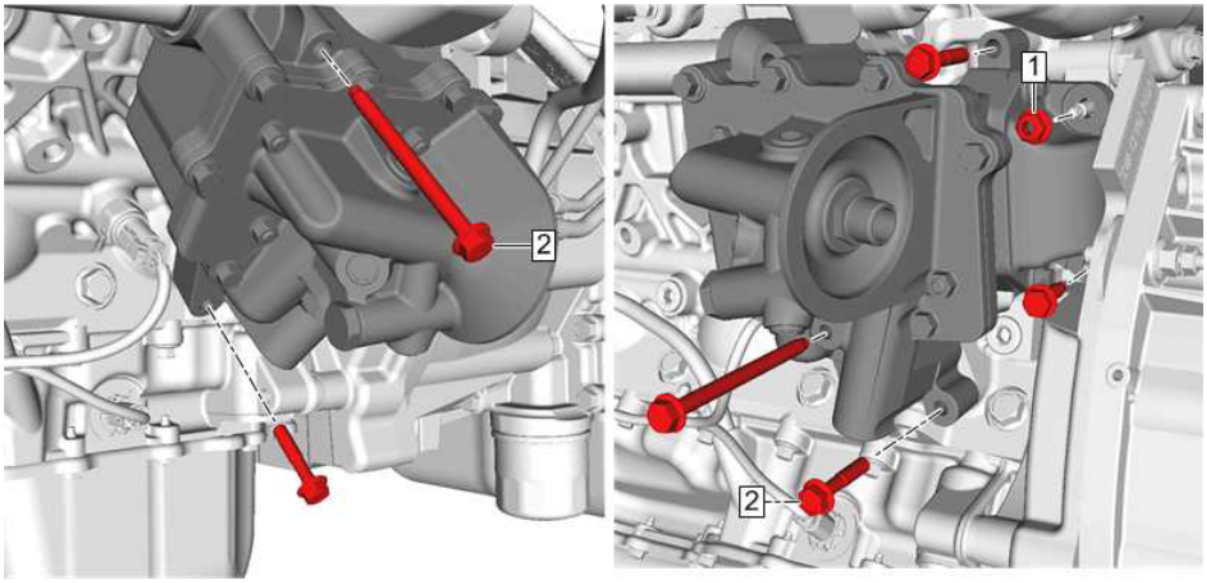

Fig. 381: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Engine Oil Cooler Bolt 2 - Install and tighten 25 N.m (18 lb ft)
6. Engine Oil Cooler Nut 1 - Install and tighten 25 N.m (18 lb ft)

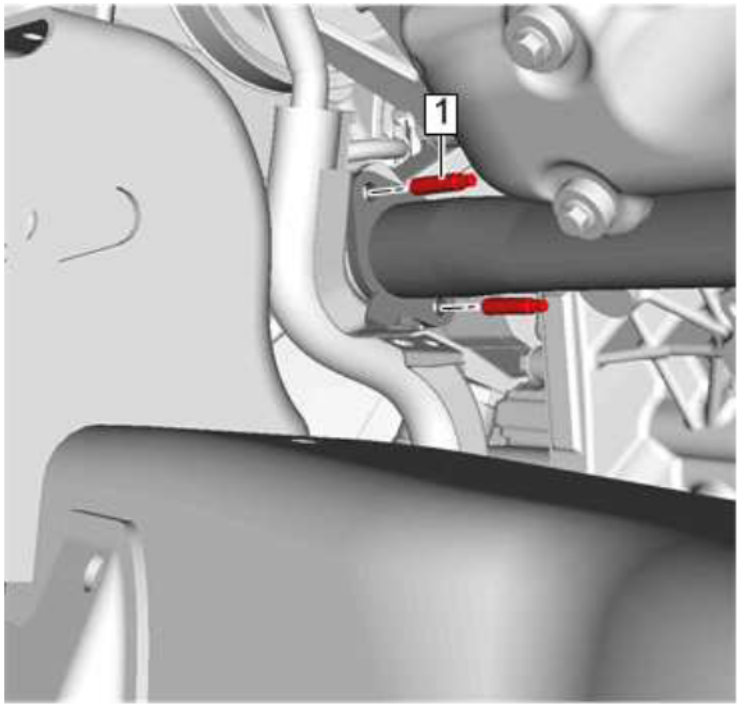

Fig. 382: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Install and tighten 9 N.m (80 lb in)

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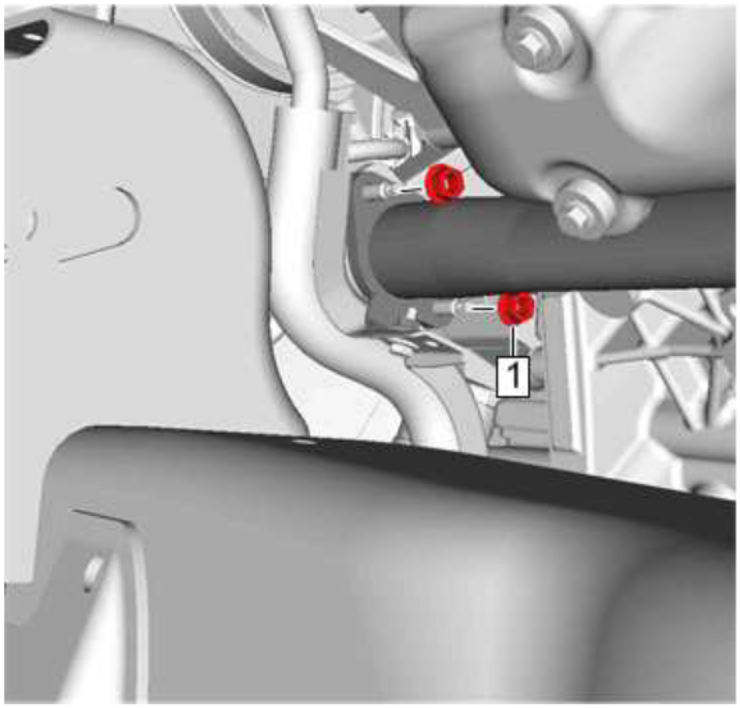

Fig. 383: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

8. Water Pump Outlet Pipe Nut 2 - Install and tighten 25 N.m (18 lb ft)
9. Engine Wiring Harness Bracket Bolt 1 - Install and tighten 9 N.m (80 lb in)

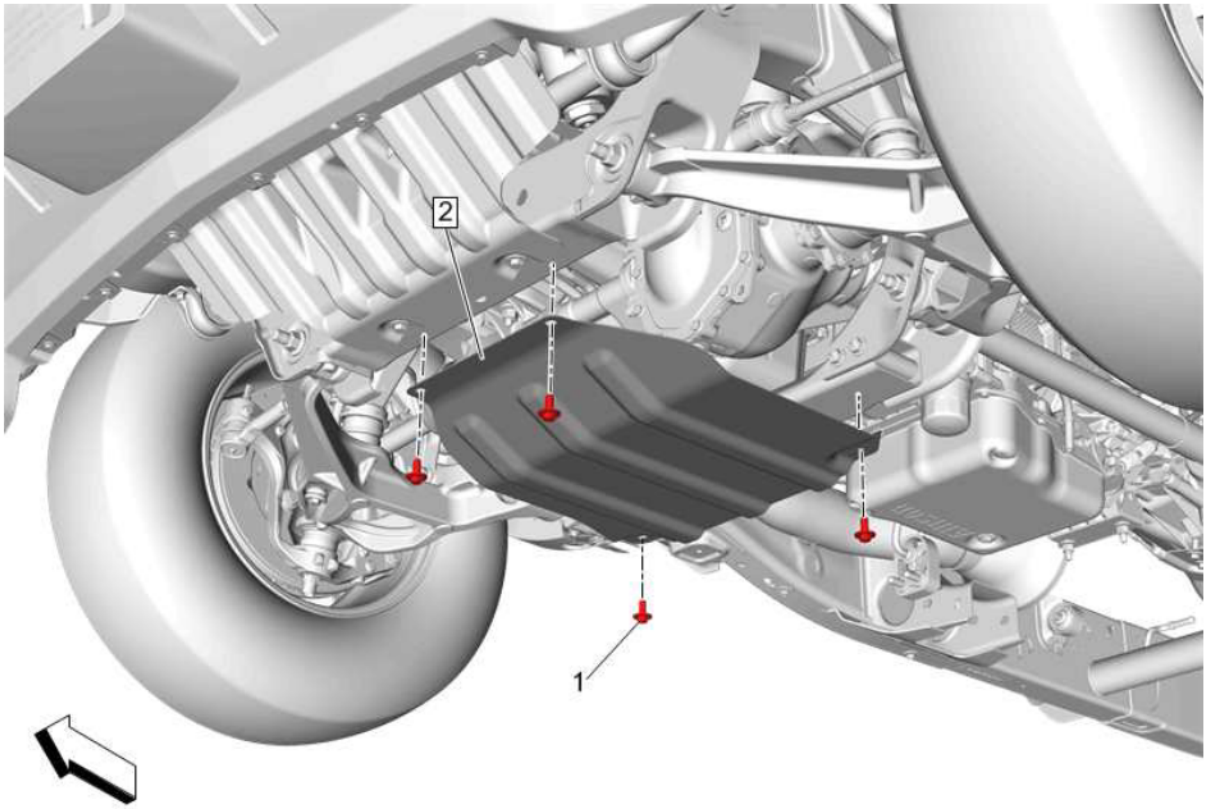

Fig. 384: Underbody Skid Shield
Courtesy of GENERAL MOTORS COMPANY

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10. Underbody Skid Shield 2 - Install - **Underbody Skid Shield Replacement**

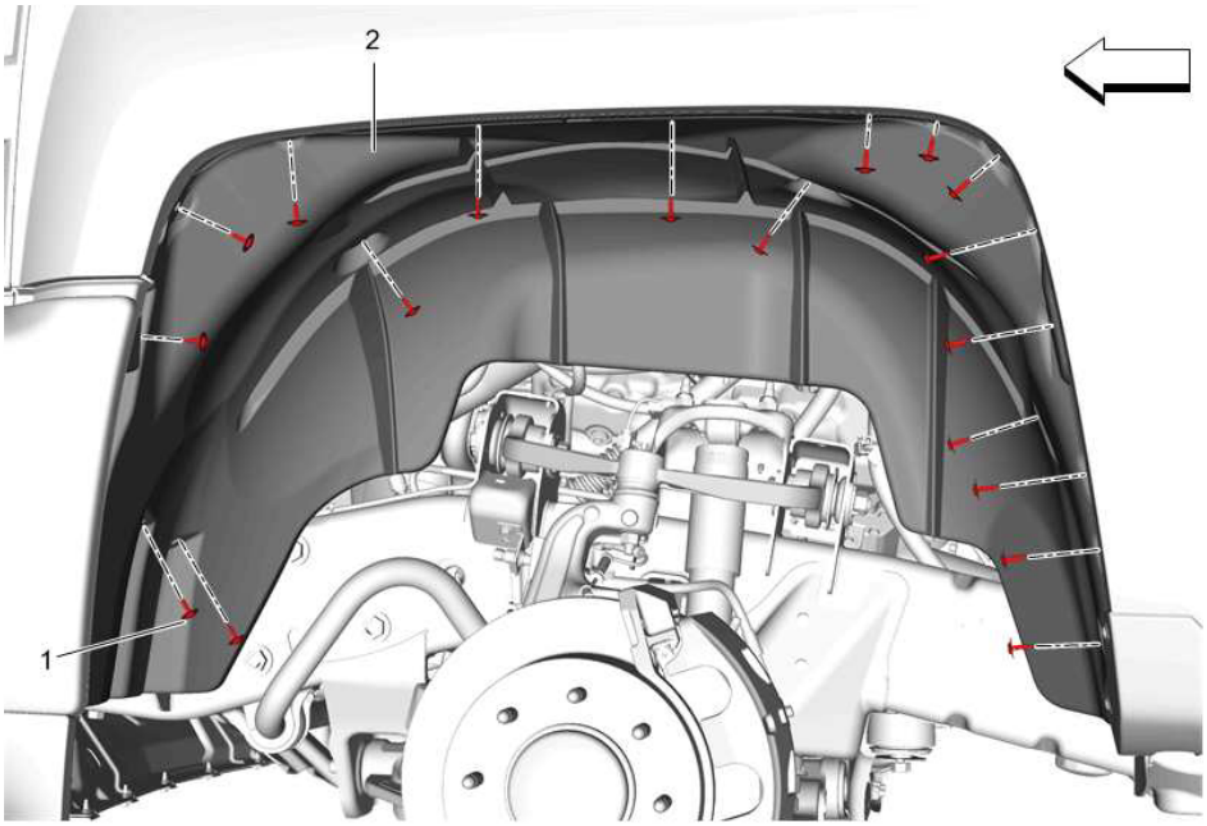

Fig. 385: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

11. Front Wheelhouse Liner-Left Side 2 - Install - **Front Wheelhouse Liner Replacement - Left Side**
12. Install a NEW oil filter. **Engine Oil and Oil Filter Replacement**
13. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

WATER PUMP OUTLET PIPE REPLACEMENT (4WD, L5P)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
2. Remove and DISCARD the oil filter. **Engine Oil and Oil Filter Replacement**

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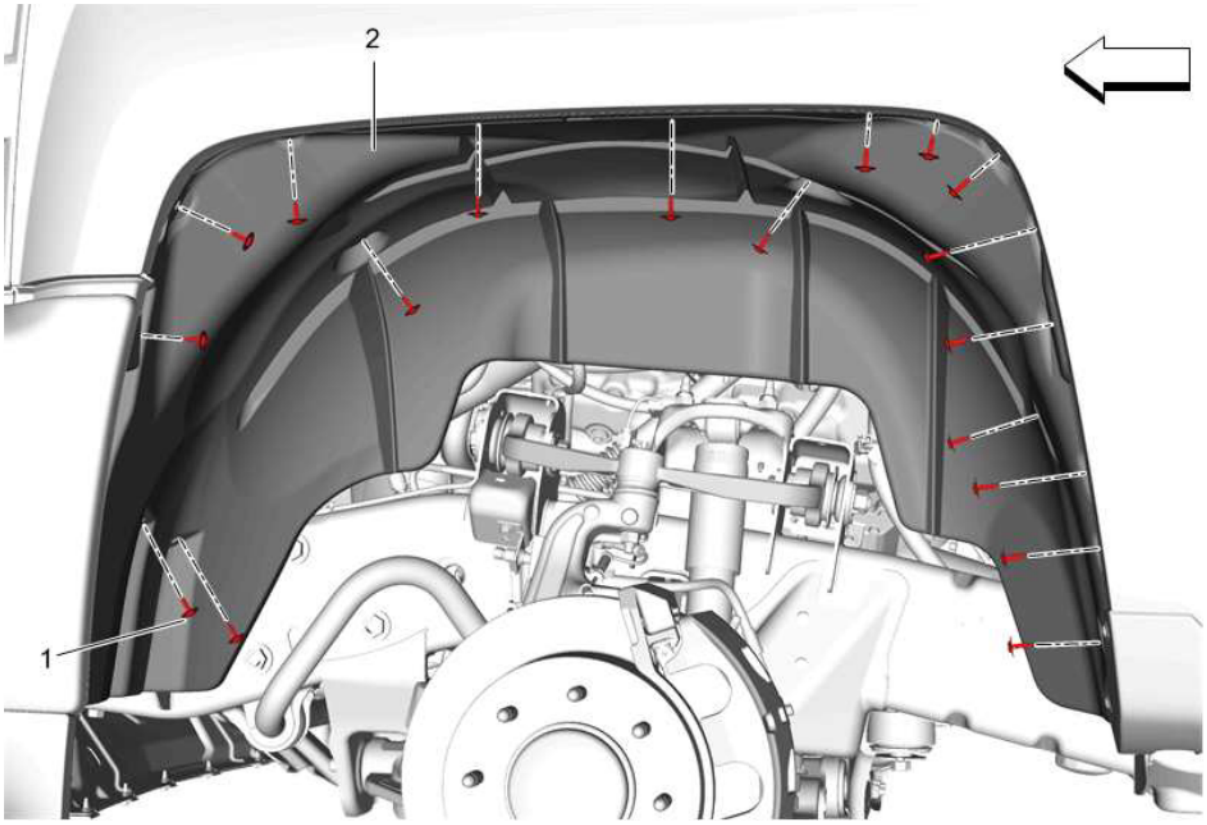

Fig. 386: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

3. Front Wheelhouse Liner-Left Side 2 - Remove **Front Wheelhouse Liner Replacement - Left Side**

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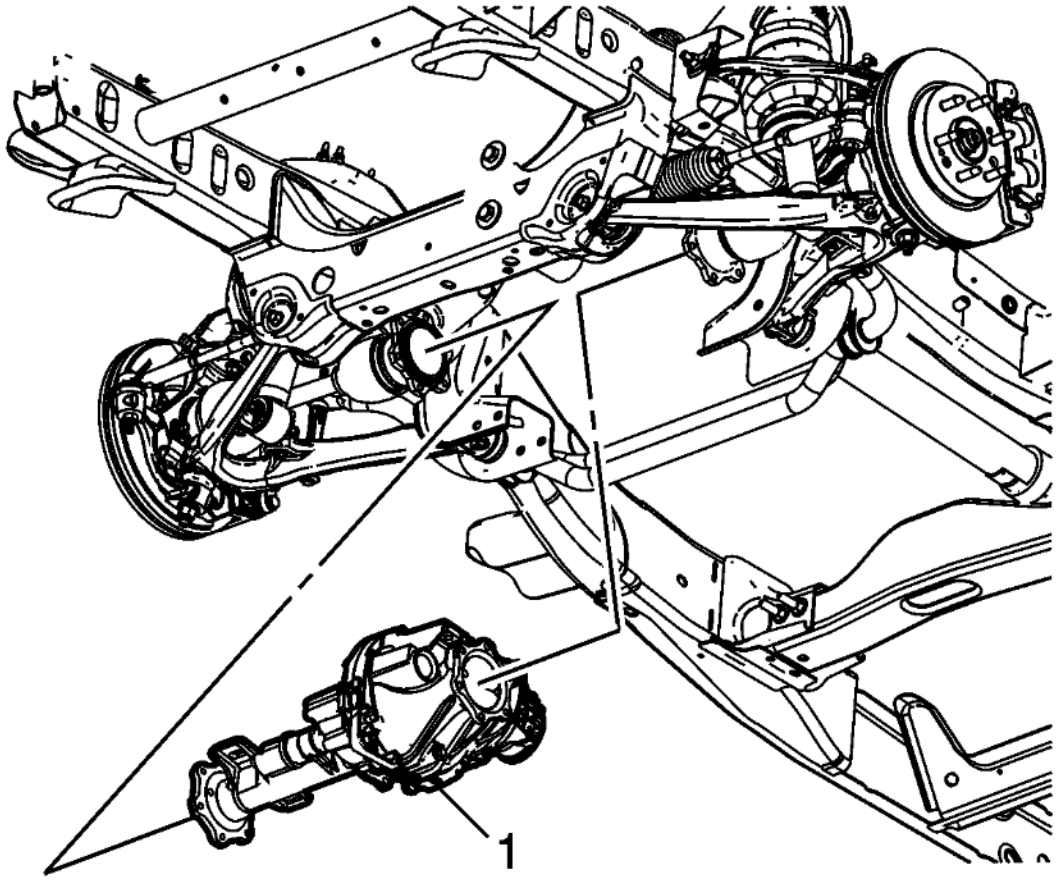

Fig. 387: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

4. Front Axle Propeller Shaft - Remove **FRONT AXLE PROPELLER SHAFT REPLACEMENT**

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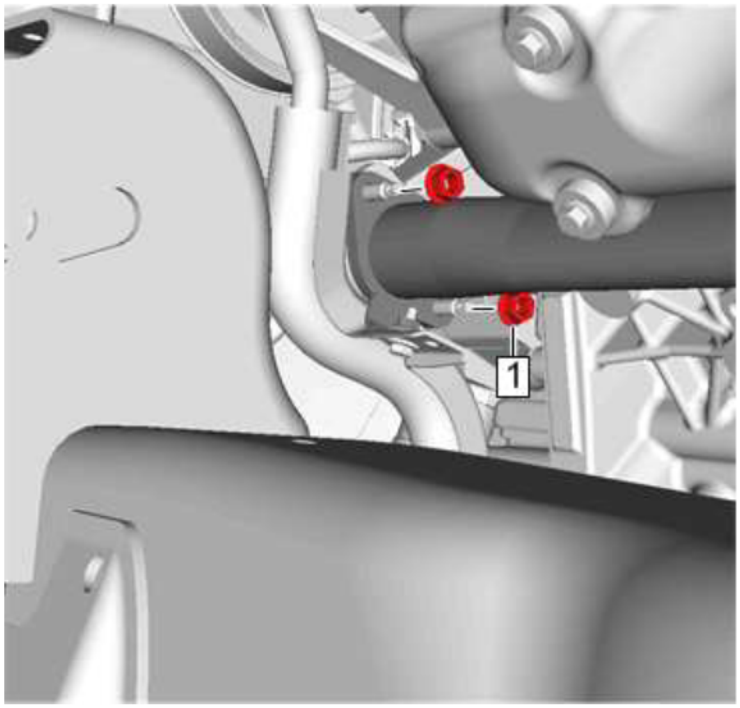

Fig. 388: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

5. Engine Wiring Harness Bracket Bolt 1 - Remove
6. Water Pump Outlet Pipe Nut 2 - Remove

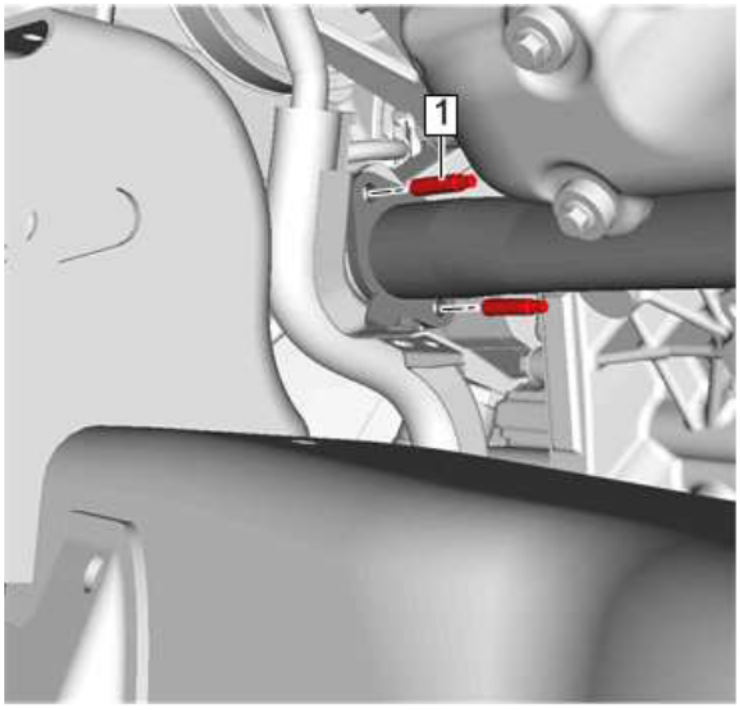

Fig. 389: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Remove

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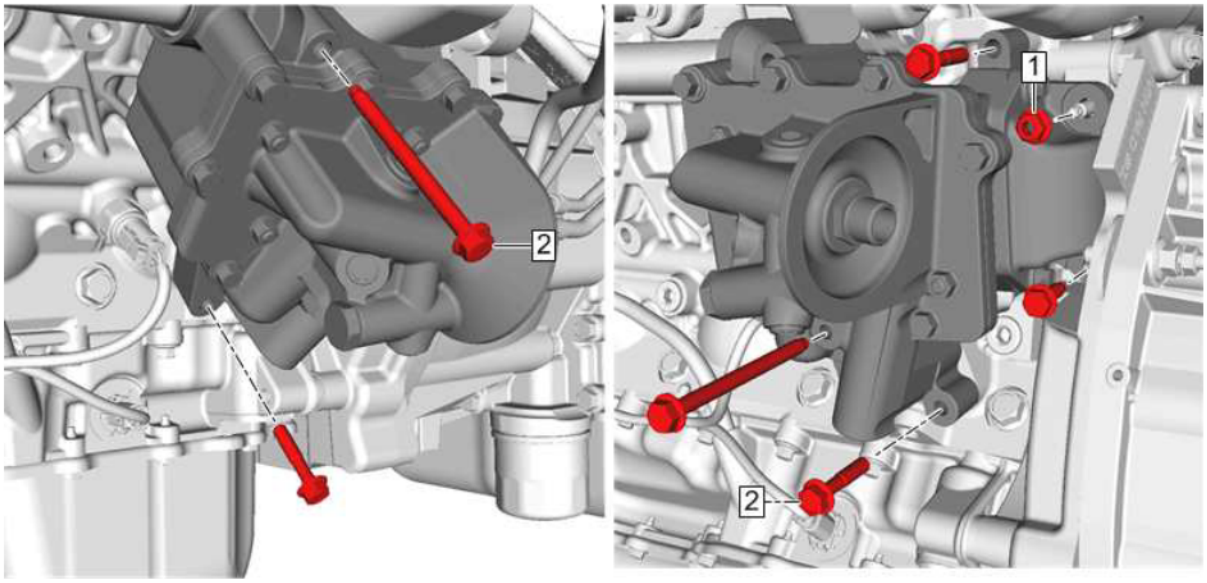

Fig. 390: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Engine Oil Cooler Nut 1 - Remove
9. Engine Oil Cooler Bolt 2 - Remove

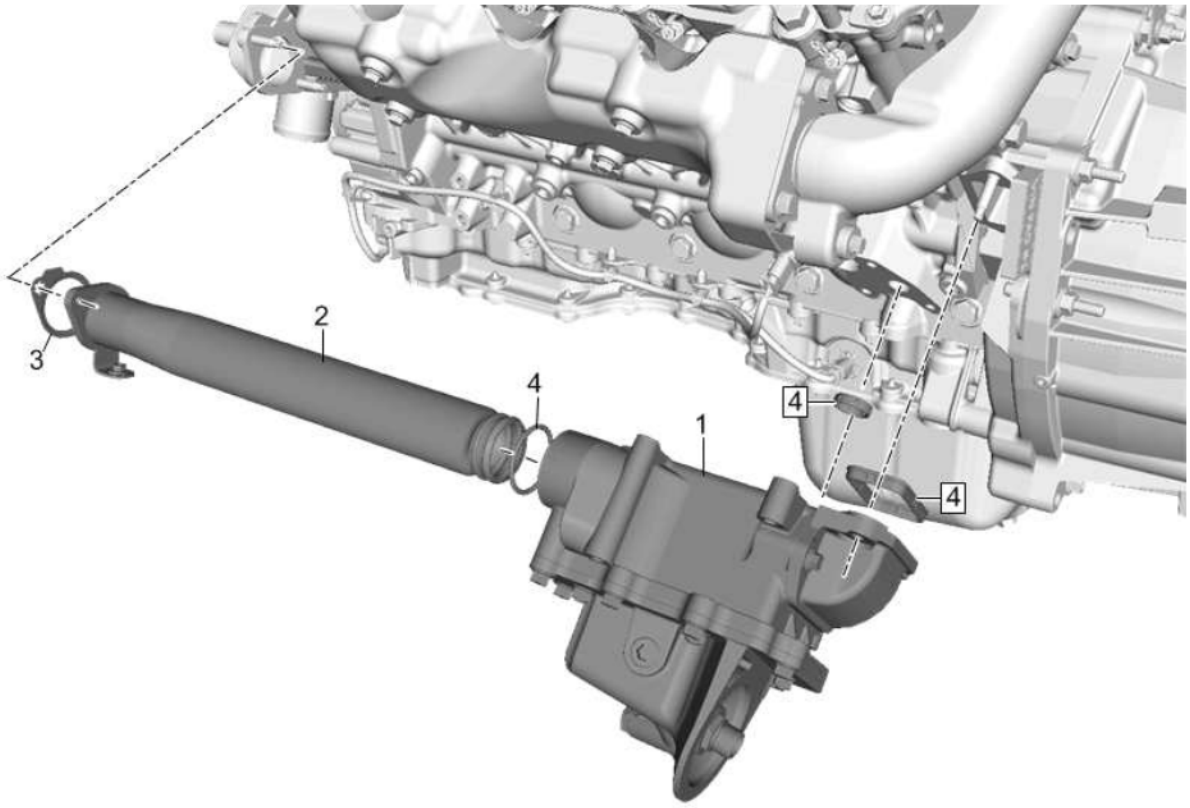

Fig. 391: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

10. Engine Oil Cooler 1 - Remove
11. Water Pump Outlet Pipe 2 - Remove
12. Water Pump Outlet Pipe Gasket 3 - Remove and DISCARD

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13. Engine Oil Cooler Seal 4 - Remove and DISCARD

Installation Procedure

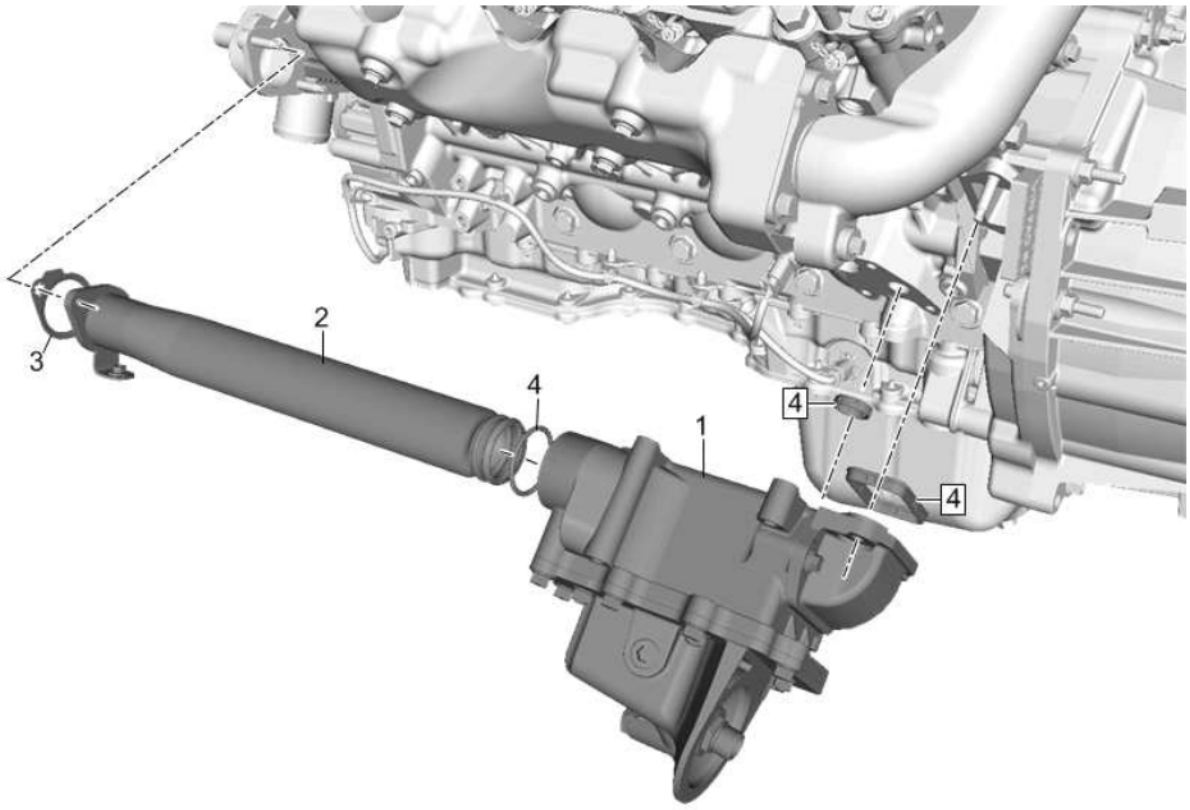

Fig. 392: Engine Oil Cooler
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install NEW seals.

1. Engine Oil Cooler Seal 4 - Install

NOTE: Install a NEW gasket.

2. Water Pump Outlet Pipe Gasket 3 - Install
3. Water Pump Outlet Pipe 2 - Install
4. Engine Oil Cooler 1 - Install

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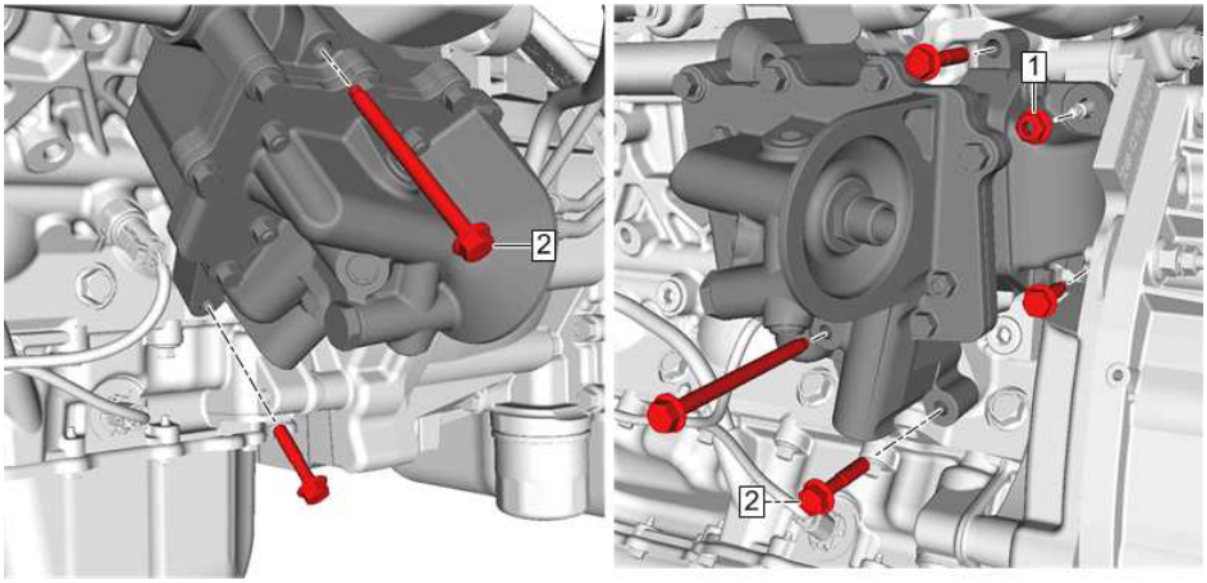

Fig. 393: Engine Oil Cooler Nuts And Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Engine Oil Cooler Bolt 2 - Install and tighten 25 N.m (18 lb ft)
6. Engine Oil Cooler Nut 1 - Install and tighten 25 N.m (18 lb ft)

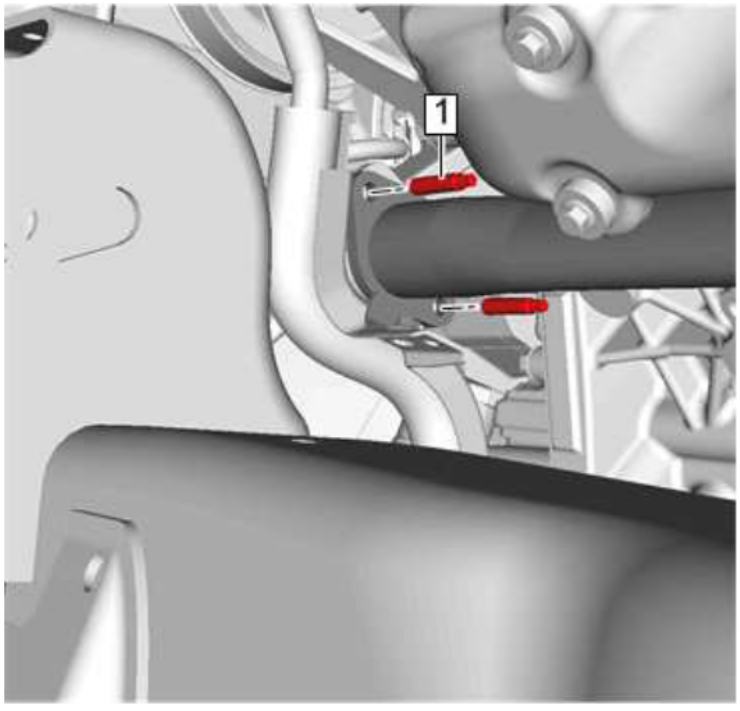

Fig. 394: Water Pump Outlet Pipe Stud
Courtesy of GENERAL MOTORS COMPANY

7. Water Pump Outlet Pipe Stud 1 - Install and tighten 9 N.m (80 lb in)

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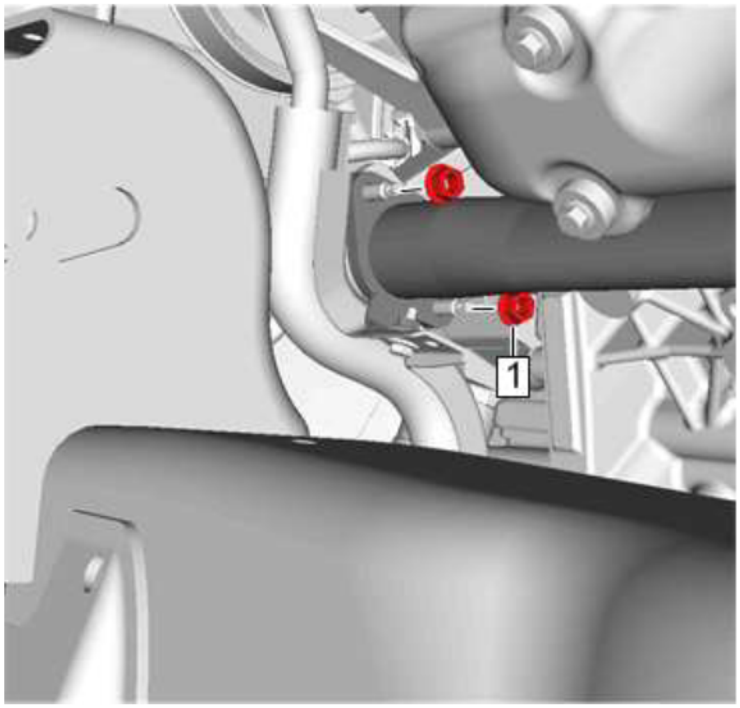

Fig. 395: Engine Wiring Harness Bracket Bolt And Water Pump Outlet Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

8. Water Pump Outlet Pipe Nut 2 - Install and tighten 25 N.m (18 lb ft)
9. Engine Wiring Harness Bracket Bolt 1 - Install and tighten 9 N.m (80 lb in)

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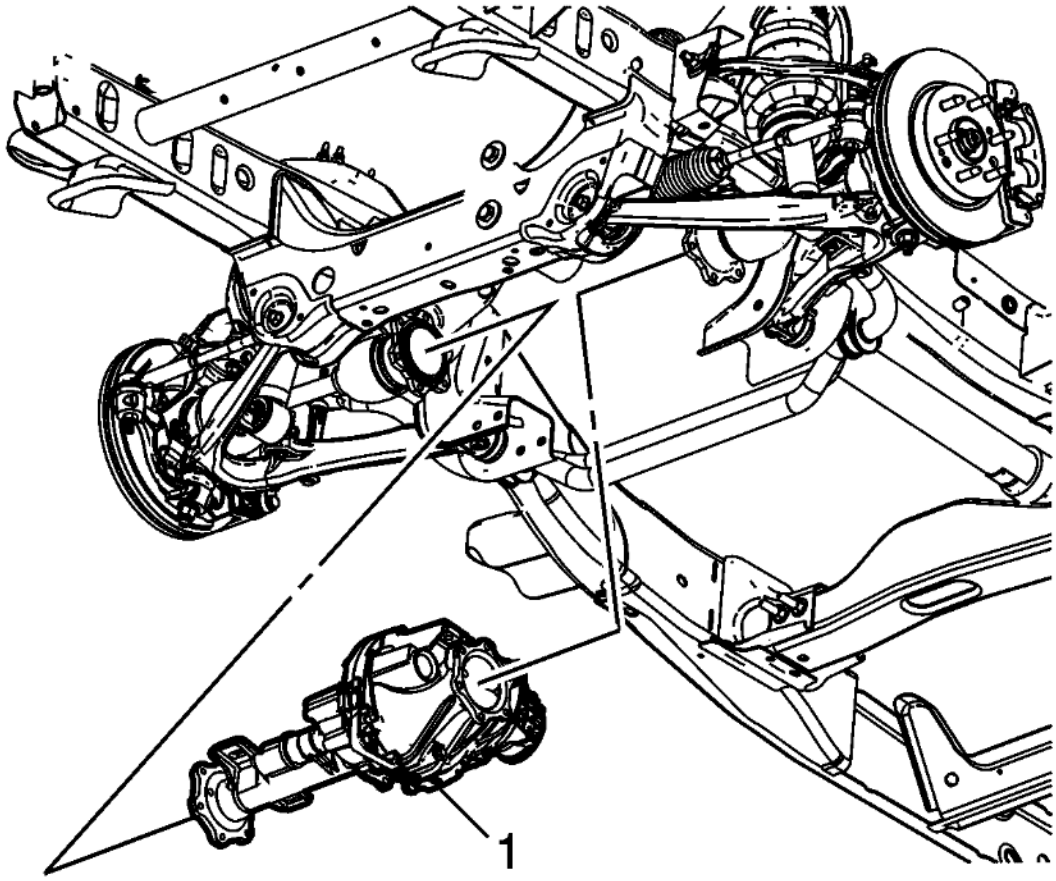

Fig. 396: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

10. Front Axle Propeller Shaft - Install **FRONT AXLE PROPELLER SHAFT REPLACEMENT**

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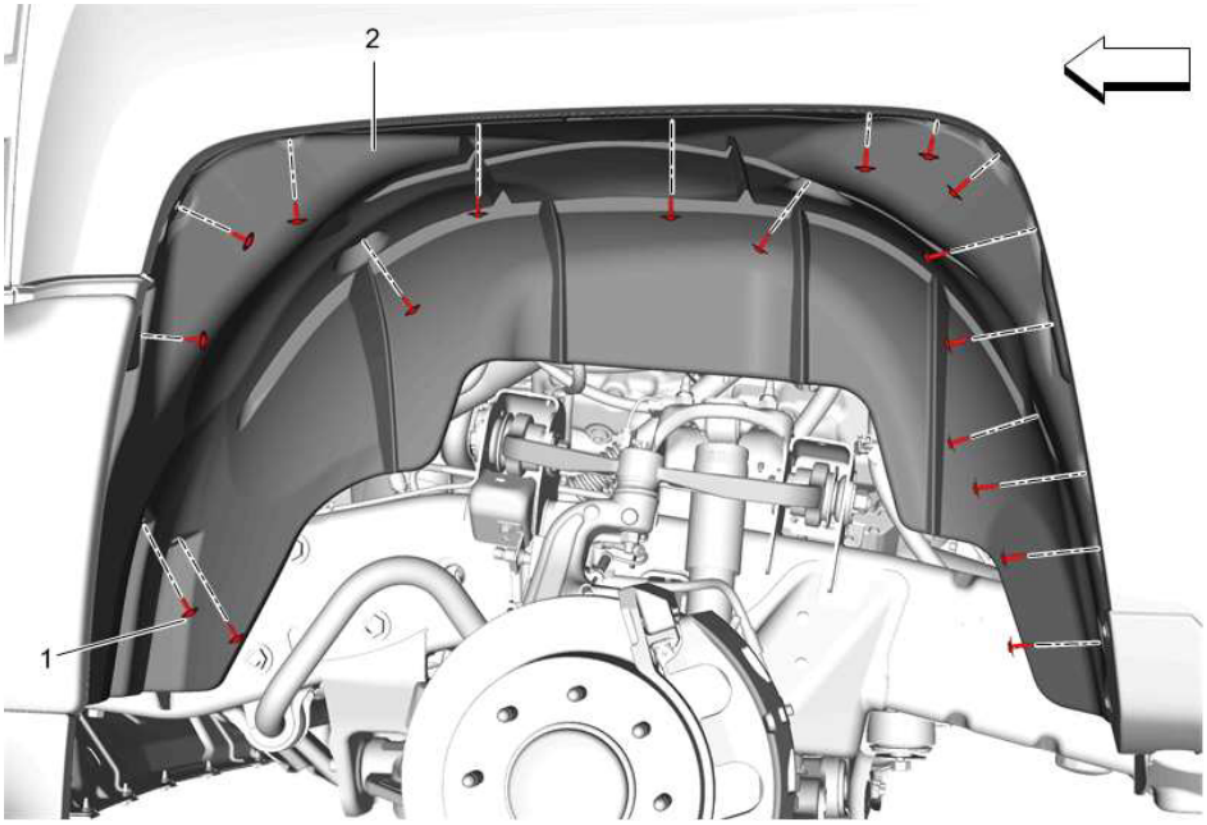

Fig. 397: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

11. Front Wheelhouse Liner-Left Side 2 - Install - **Front Wheelhouse Liner Replacement - Left Side**
12. Install a NEW oil filter. **Engine Oil and Oil Filter Replacement**
13. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

AUXILIARY WATER PUMP REPLACEMENT (L8B)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**

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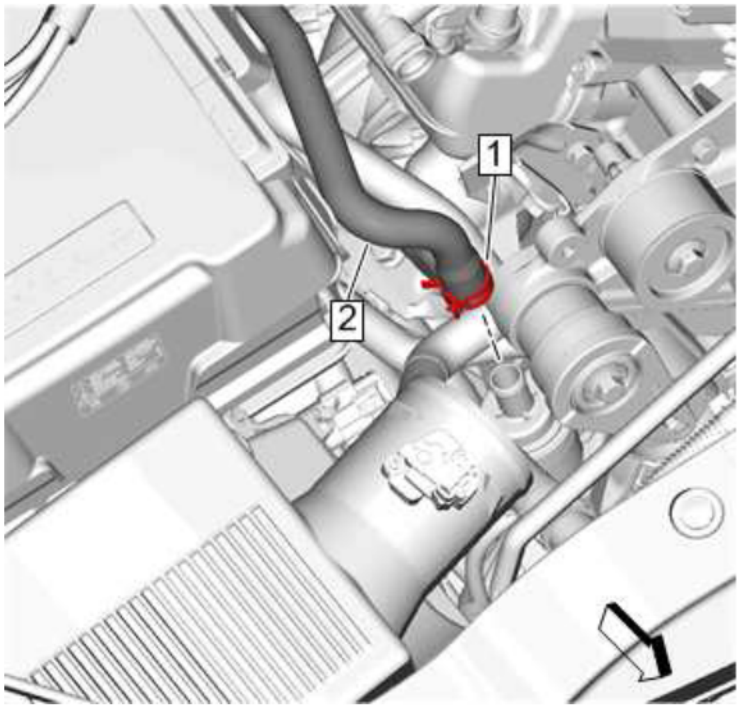

Fig. 398: Heater Outlet Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

2. Heater Outlet Hose Clamp 1 - Disengage - **Hose Clamp Replacement Guidelines - Spring Type**
3. Heater Outlet Hose 2 @Auxiliary Water Pump - Remove
4. Electrical Connector @Heater Coolant Pump - Disconnect

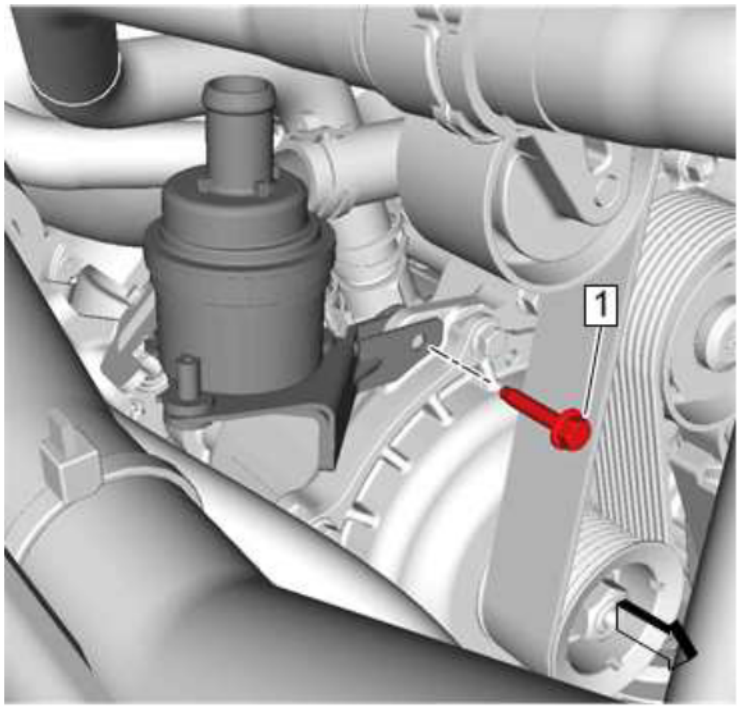

Fig. 399: Engine Coolant Heater Pump Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Engine Coolant Heater Pump Bracket Bolt 1 - Remove

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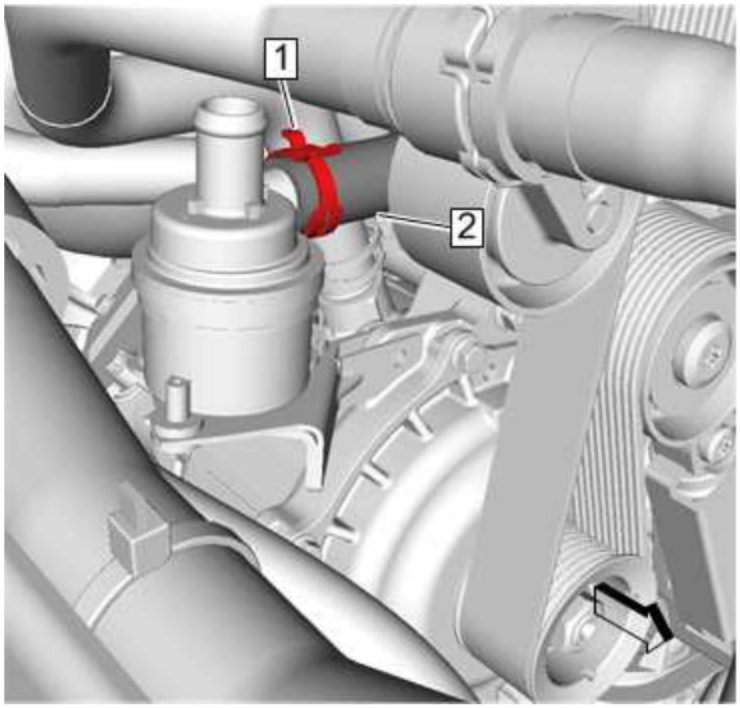

Fig. 400: Auxiliary Heater Outlet Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Auxiliary Heater Outlet Hose Clamp 1 @Auxiliary Heater Outlet Hose 2 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**

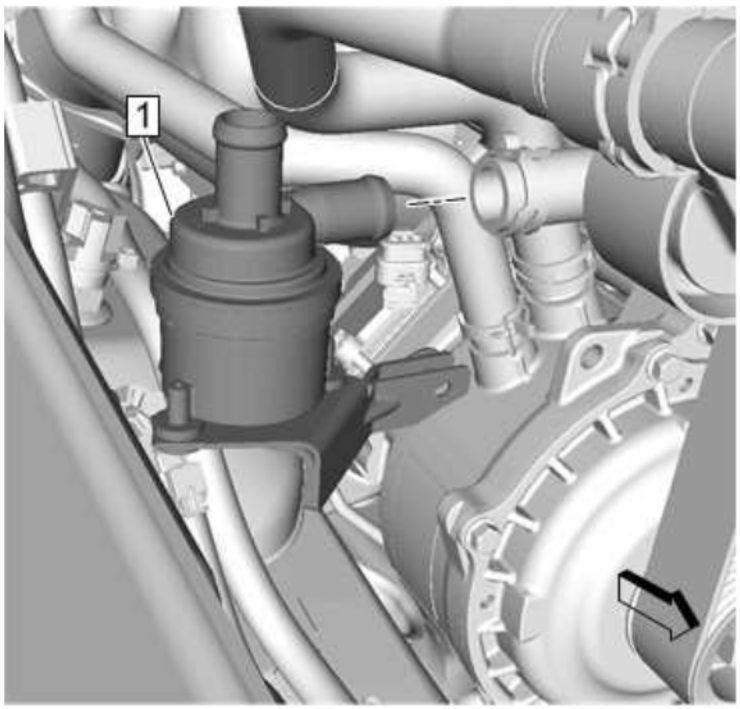

Fig. 401: Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

7. Auxiliary Water Pump 1 @Auxiliary Heater Outlet Hose - Remove
8. Auxiliary Water Pump 1 - Remove

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Installation Procedure

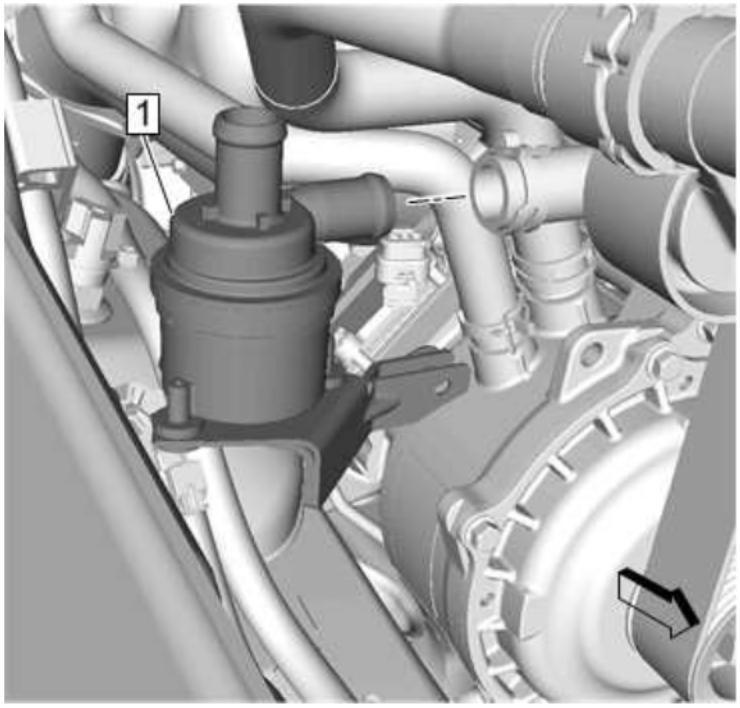

Fig. 402: Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

1. Auxiliary Water Pump 1 @Auxiliary Heater Outlet Hose - Install

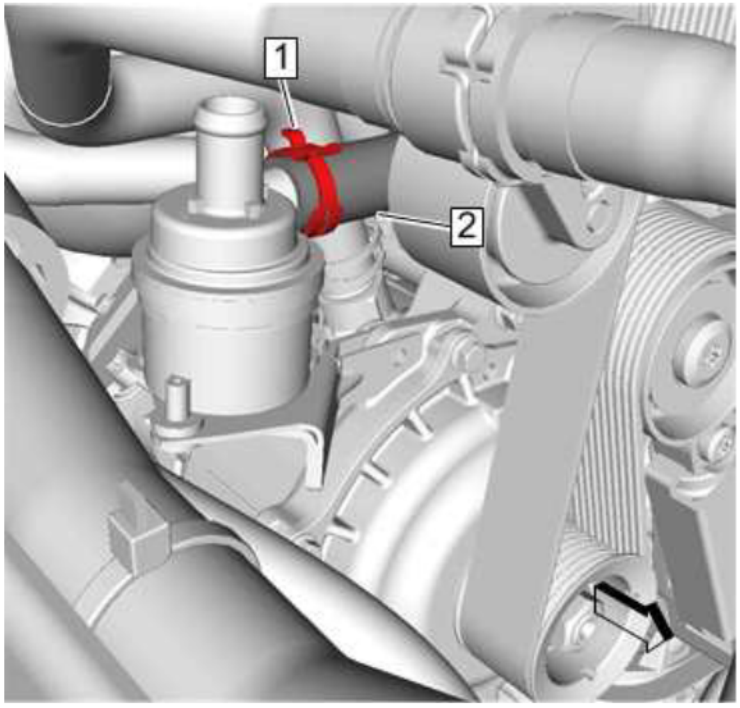

Fig. 403: Auxiliary Heater Outlet Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

2. Auxiliary Heater Outlet Hose Clamp 1 @Auxiliary Heater Outlet Hose 2 - Engage **Hose Clamp Replacement Guidelines - Spring Type**

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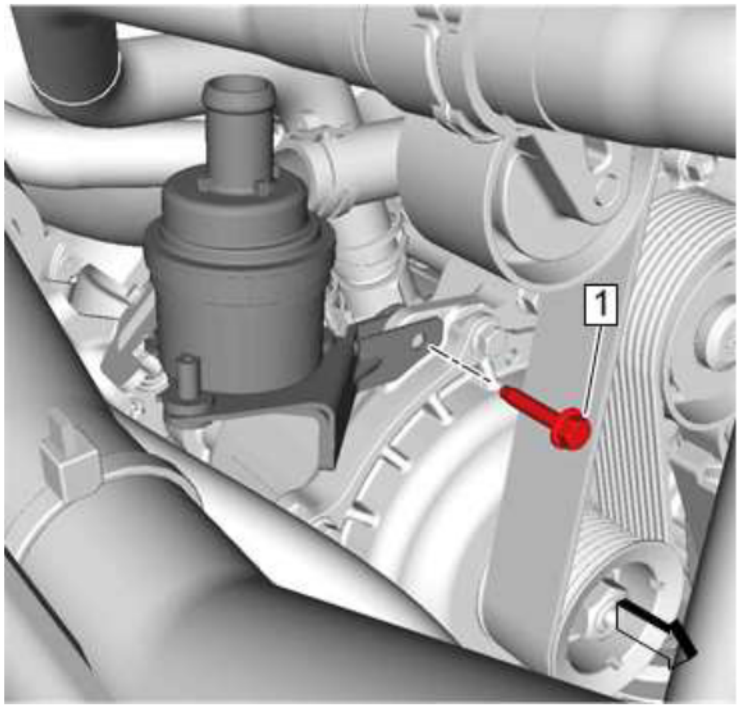

Fig. 404: Engine Coolant Heater Pump Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Engine Coolant Heater Pump Bracket Bolt 1 - Install and tighten 9 N.m (80 lb in)
4. Electrical Connector@Heater Coolant Pump - Connect

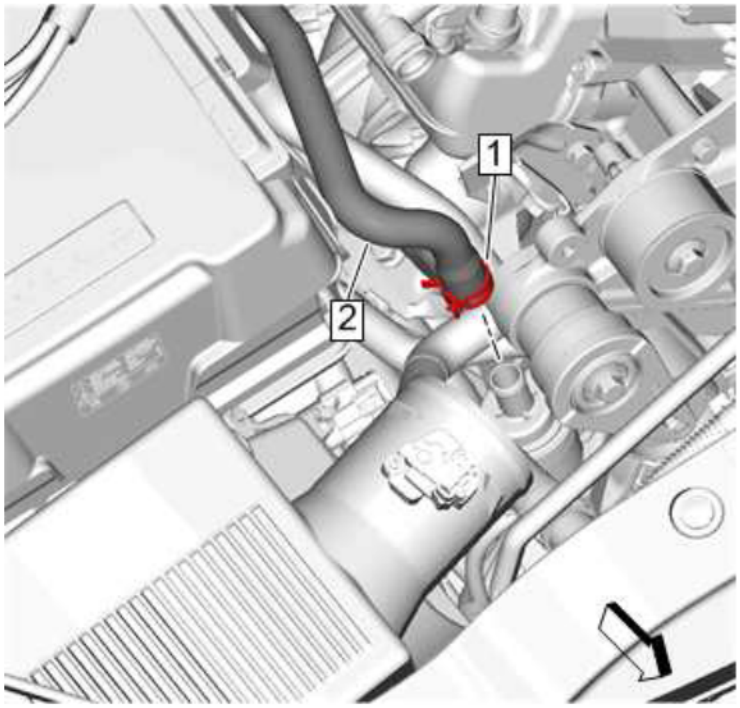

Fig. 405: Heater Outlet Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Heater Outlet Hose 2 @Auxiliary Water Pump - Install

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6. Heater Outlet Hose Clamp 1 - Engage - **Hose Clamp Replacement Guidelines - Spring Type**
7. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
8. Start the engine and check for coolant leaks.

RADIATOR DRAIN COCK REPLACEMENT (L83, L86, LV3)

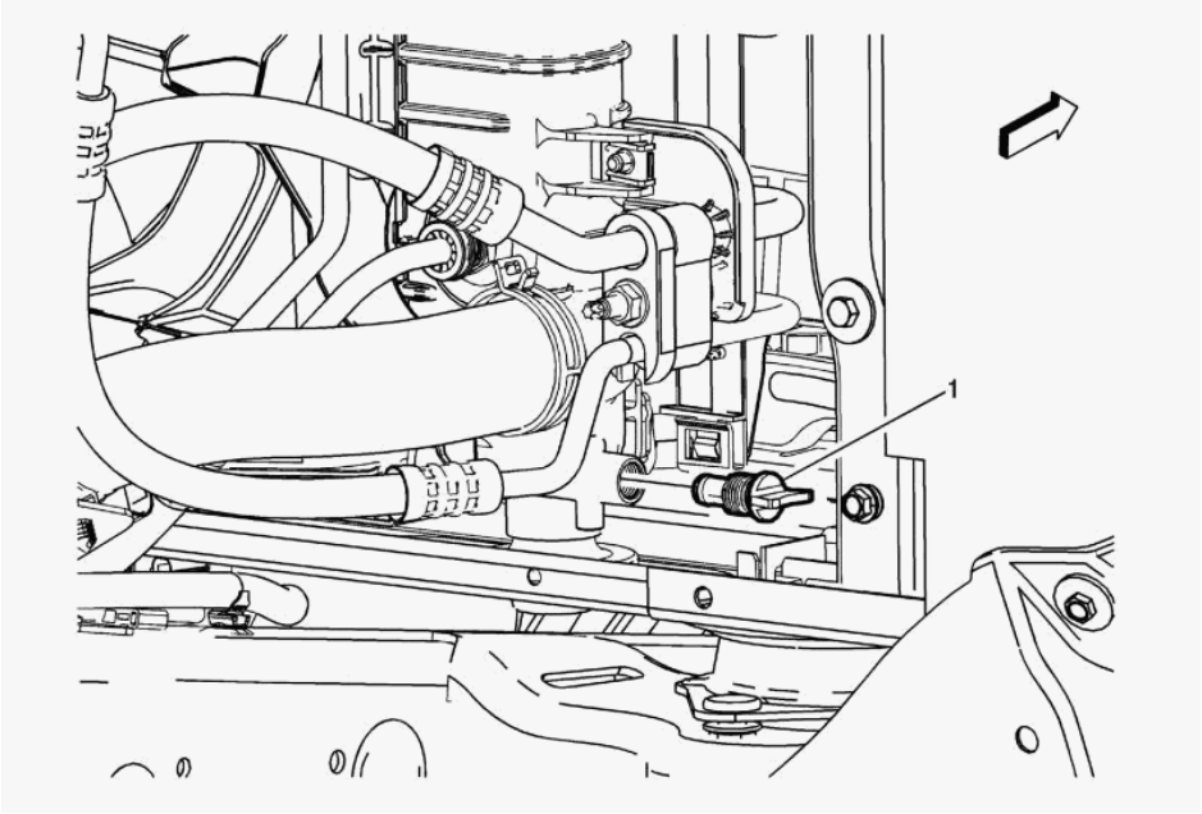

Fig. 406: Radiator Drain Cock (L83, L86, LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Place a drain pan under the radiator drain cock. 3. Attach a rubber hose to the radiator drain port to guide the coolant into the drain pan 4. Drain the engine coolant. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)** **Cooling System Draining and Filling (Static Fill L83 L86)**.	
1	Radiator Drain Cock **CAUTION:** **Refer to** **Fastener Caution** . **Procedures**

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Callout	Component Name
	1. Fill the cooling system to the proper level. 2. Inspect the cooing system for leaks.

RADIATOR DRAIN COCK REPLACEMENT (L8B)

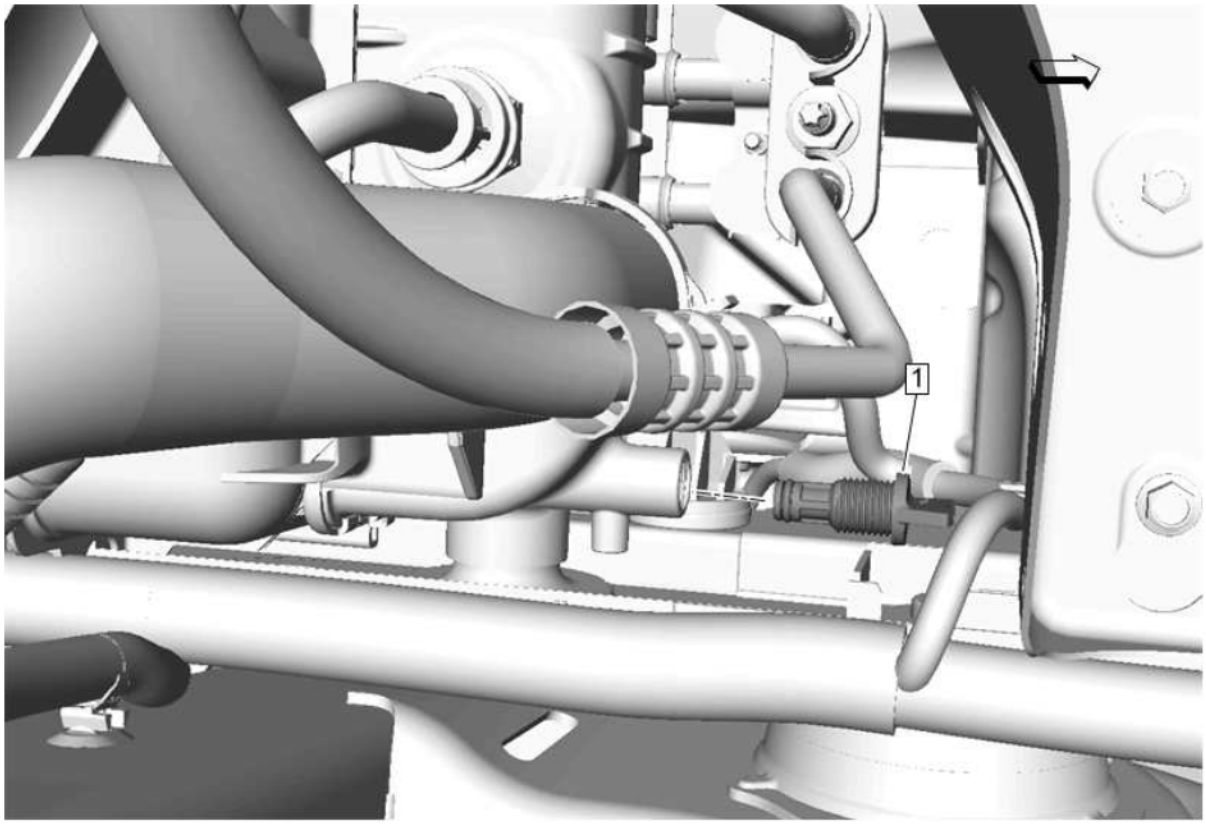

Fig. 407: Radiator Drain Cock (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Front Wheelhouse Liner-Right Side - Remove - **Front Wheelhouse Liner Replacement - Right Side** 2. **Cooling System Draining and Filling (Vac N Fill L8B)**	
1	Radiator Drain Cock **Procedure** 1. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)** 2. Check the cooling system for leaks.

RADIATOR DRAIN COCK REPLACEMENT (L5P)

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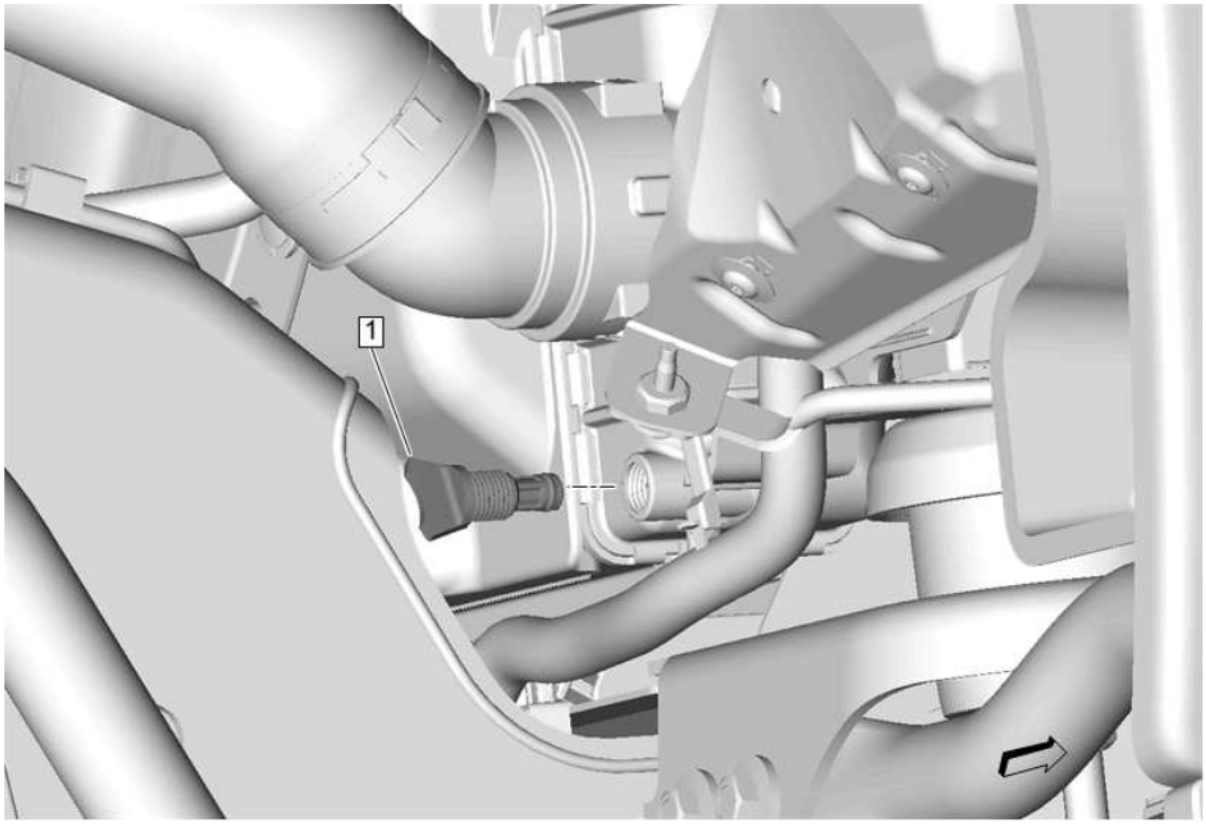

Fig. 408: Radiator Drain Cock (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Place a drain pan under the vehicle. 2. Attach a rubber hose to the radiator drain port to guide the coolant into the drain pan.	
1	Radiator Drain Cock **CAUTION:** **Refer to Fastener Caution .** **Procedures** 1. Remove the drain pan. 2. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)** 3. Start the engine and check for coolant leaks.

ENGINE COOLANT FAN SHROUD REPLACEMENT (L8B)

Removal Procedure

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1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**

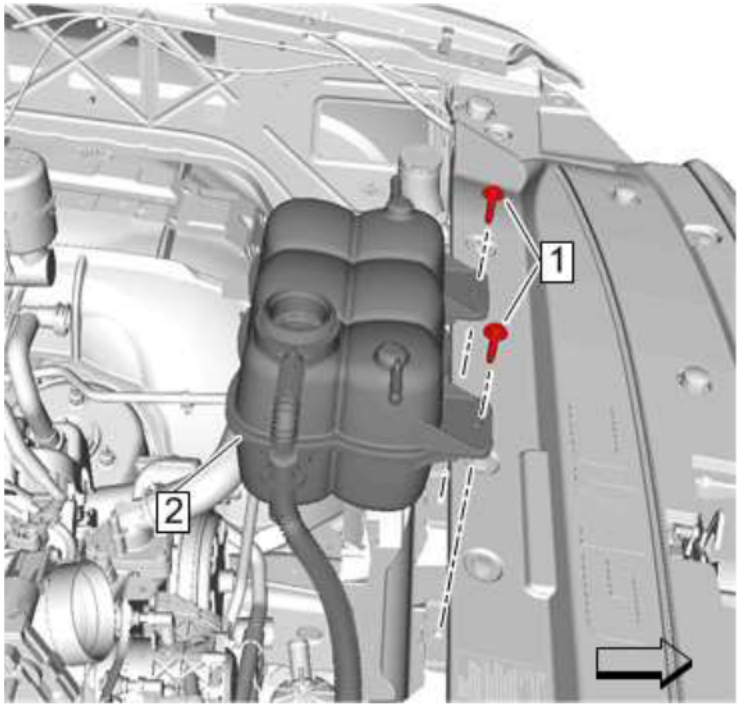

Fig. 409: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

2. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Remove **Radiator Surge Tank Replacement (L8B)**

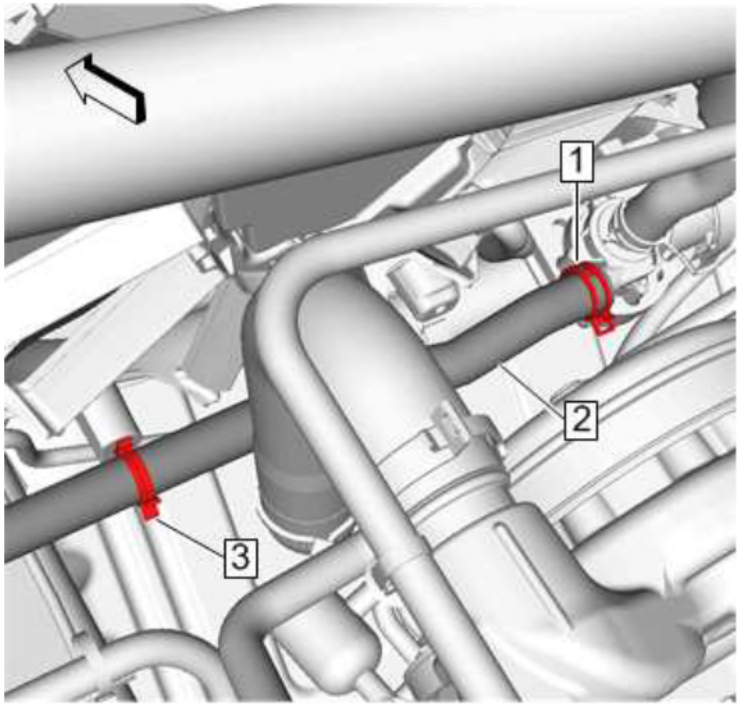

Fig. 410: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

3. Hose Clip 3 @Engine Coolant Fan Shroud - Remove

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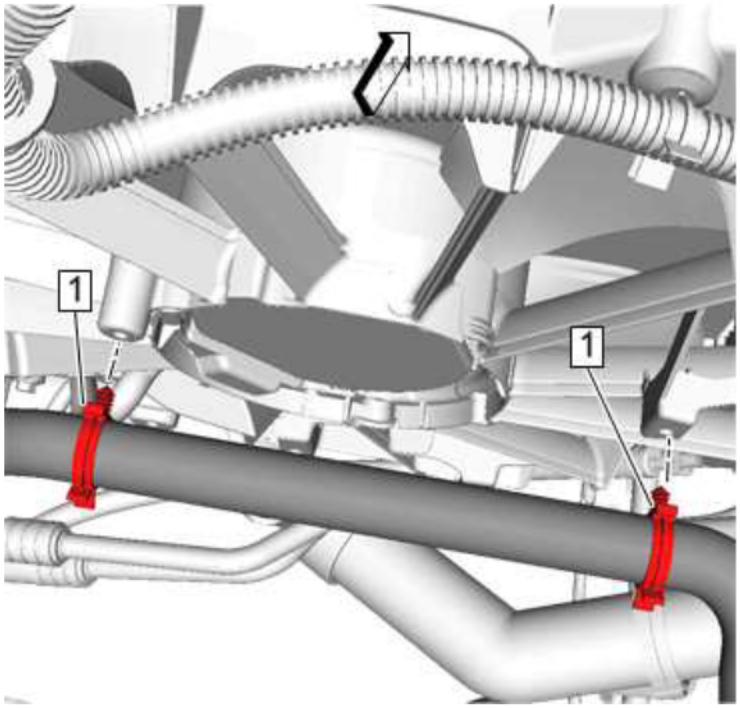

Fig. 411: Engine Coolant Fan Shroud Clip
Courtesy of GENERAL MOTORS COMPANY

4. Hose Clip 1 @Engine Coolant Fan Shroud - Remove
5. Transmission Fluid Cooler Inlet and Outlet Pipe@Engine Coolant Fan Shroud - Unclip
6. Engine Oil Cooler Hose@Engine Coolant Fan Shroud - Unclip

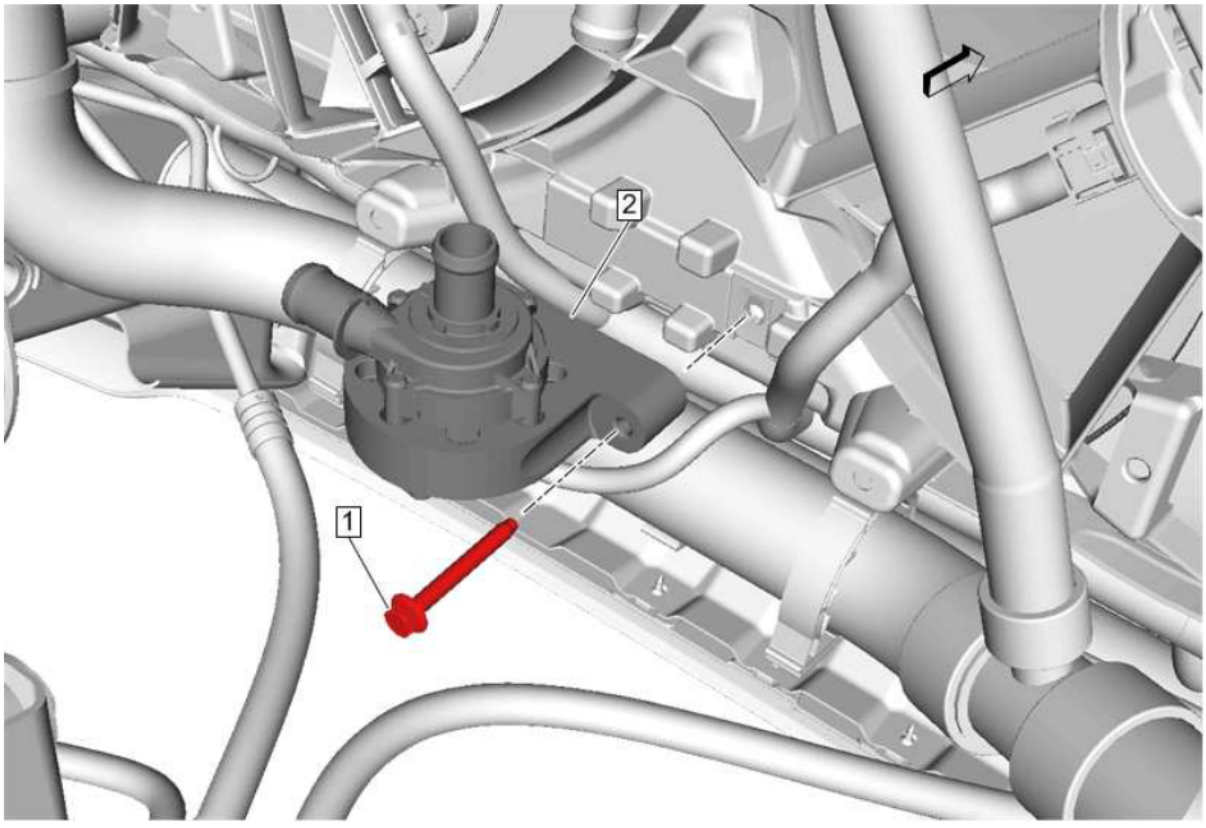

Fig. 412: Generator Coolant Pump

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Courtesy of GENERAL MOTORS COMPANY

7. Generator Coolant Pump 2 @Engine Coolant Fan Shroud - Remove **Generator Coolant Pump Replacement (L8B)**

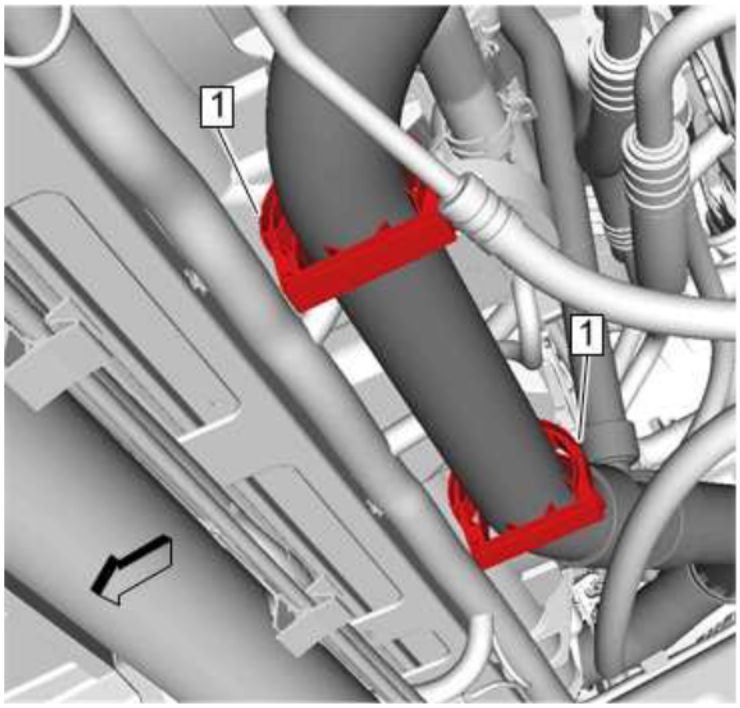

Fig. 413: Radiator Outlet Hose Clips
Courtesy of GENERAL MOTORS COMPANY

8. Radiator Outlet Hose Clip 1 @Engine Coolant Fan Shroud - Remove
9. Electrical Connector@Engine Coolant Fan Motor - Disconnect

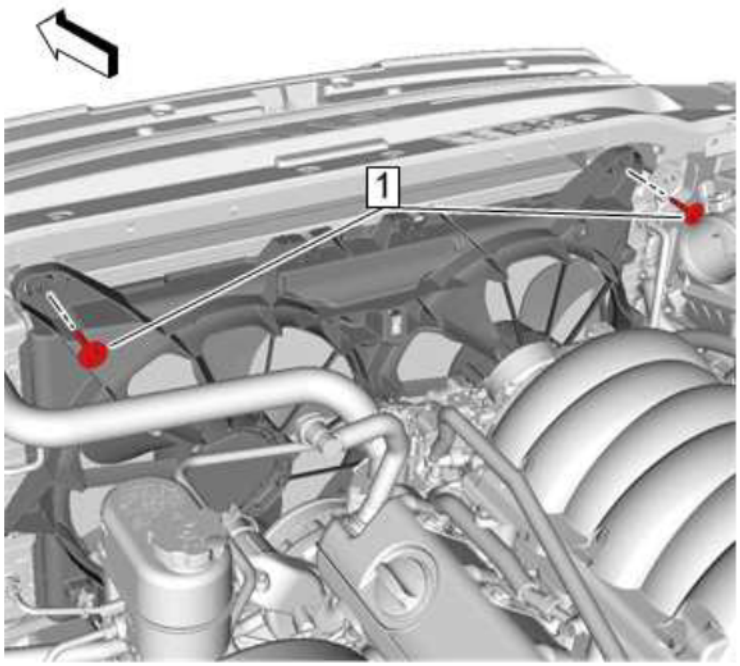

Fig. 414: Engine Coolant Fan Bracket Bolts

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Courtesy of GENERAL MOTORS COMPANY

10. Engine Coolant Fan Bracket Bolt 1 - Remove

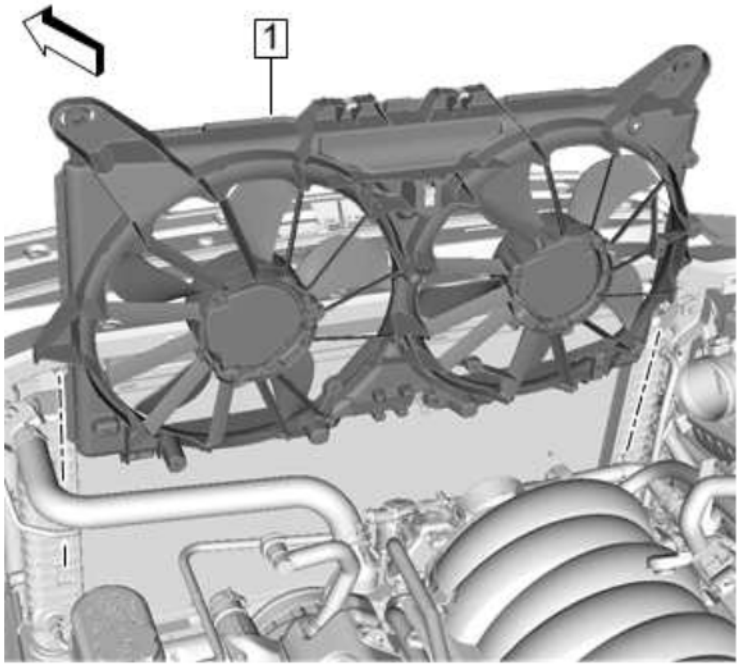

Fig. 415: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

11. Engine Coolant Fan Shroud 1 @Radiator - Remove
12. Engine Coolant Fan Shroud 1 - Remove

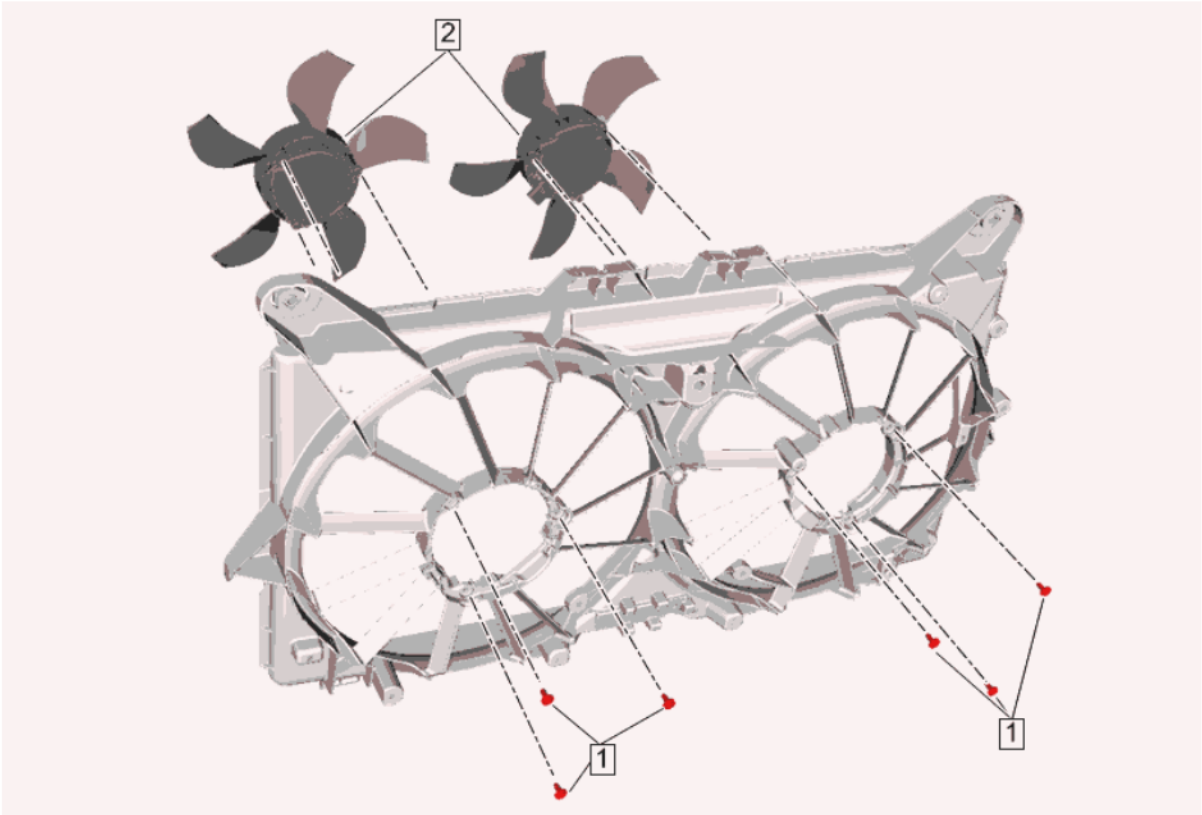

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Fig. 416: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

13. Engine Coolant Fan Motor 2 @Engine Coolant Fan Shroud - Remove - **Engine Coolant Fan Replacement (L8B)**
14. Transfer components as necessary.

Installation Procedure

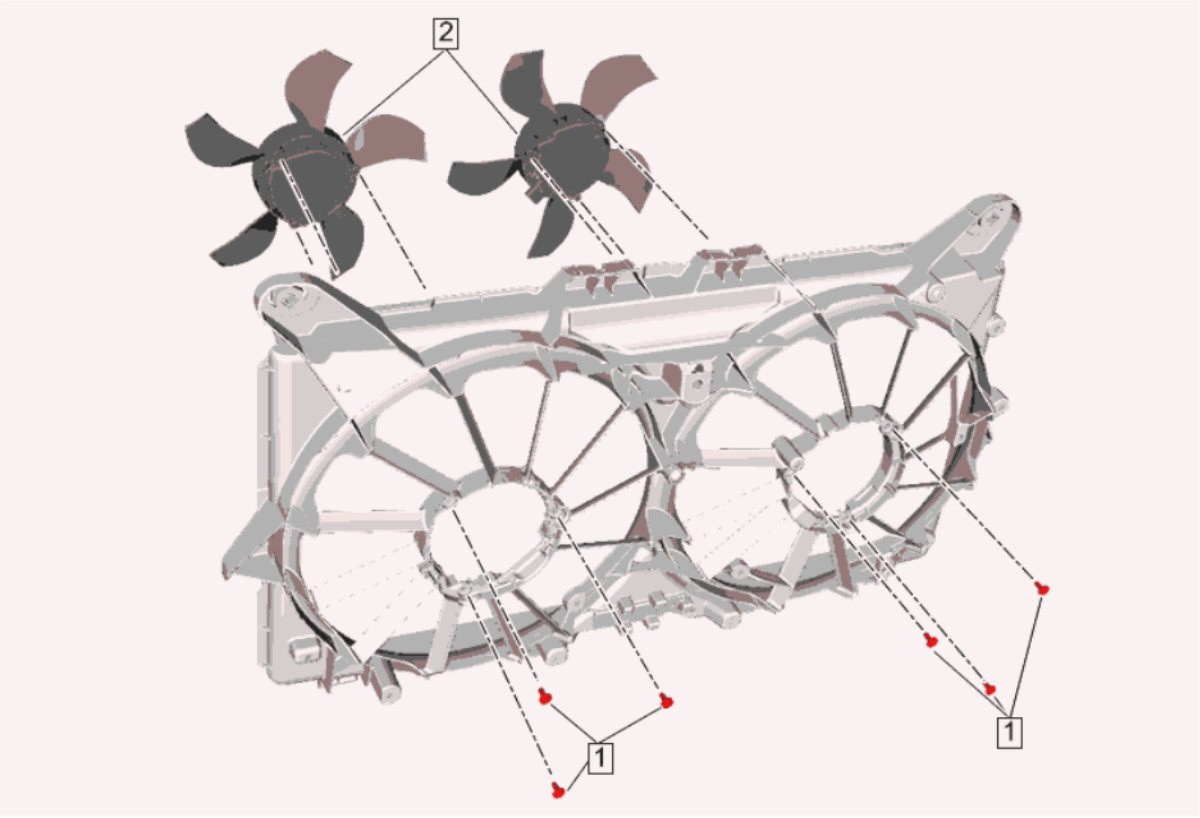

Fig. 417: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Engine Coolant Fan Motor 2 @Engine Coolant Fan Shroud - Install - **Engine Coolant Fan Replacement (L8B)**

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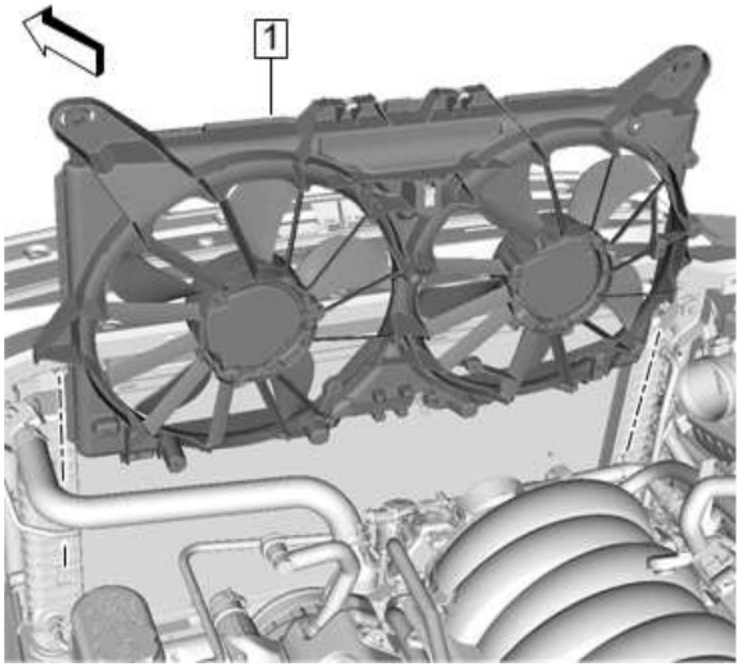

Fig. 418: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

2. Engine Coolant Fan Shroud 1 @Radiator - Install

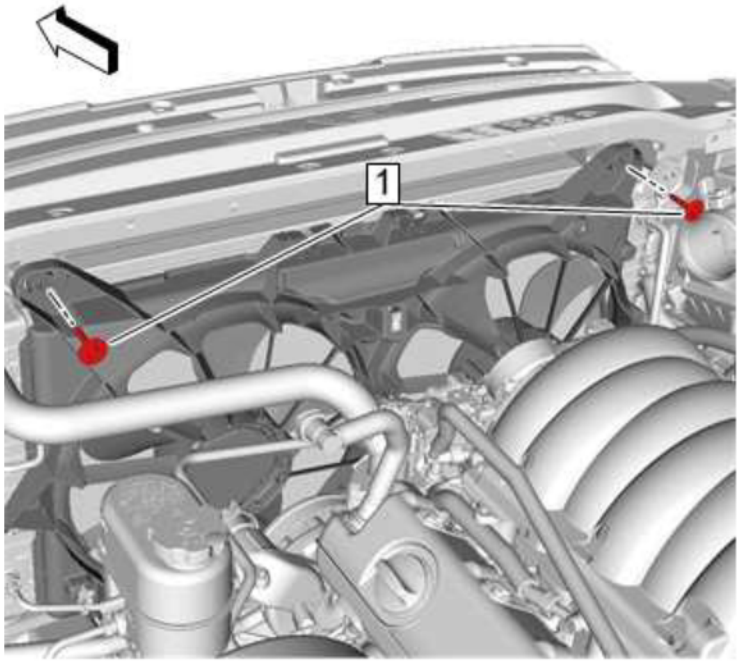

Fig. 419: Engine Coolant Fan Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Engine Coolant Fan Bracket Bolt 1 - Install and tighten 25 N.m (18 lb ft)
4. Electrical Connector@Engine Coolant Fan Motor - Connect

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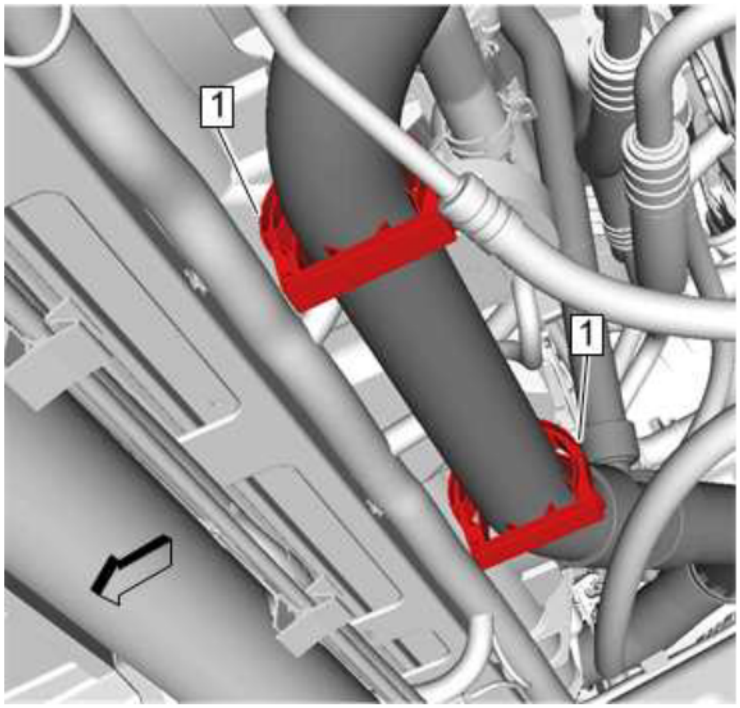

Fig. 420: Radiator Outlet Hose Clips
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Outlet Hose Clip 1 @Engine Coolant Fan Shroud - Install

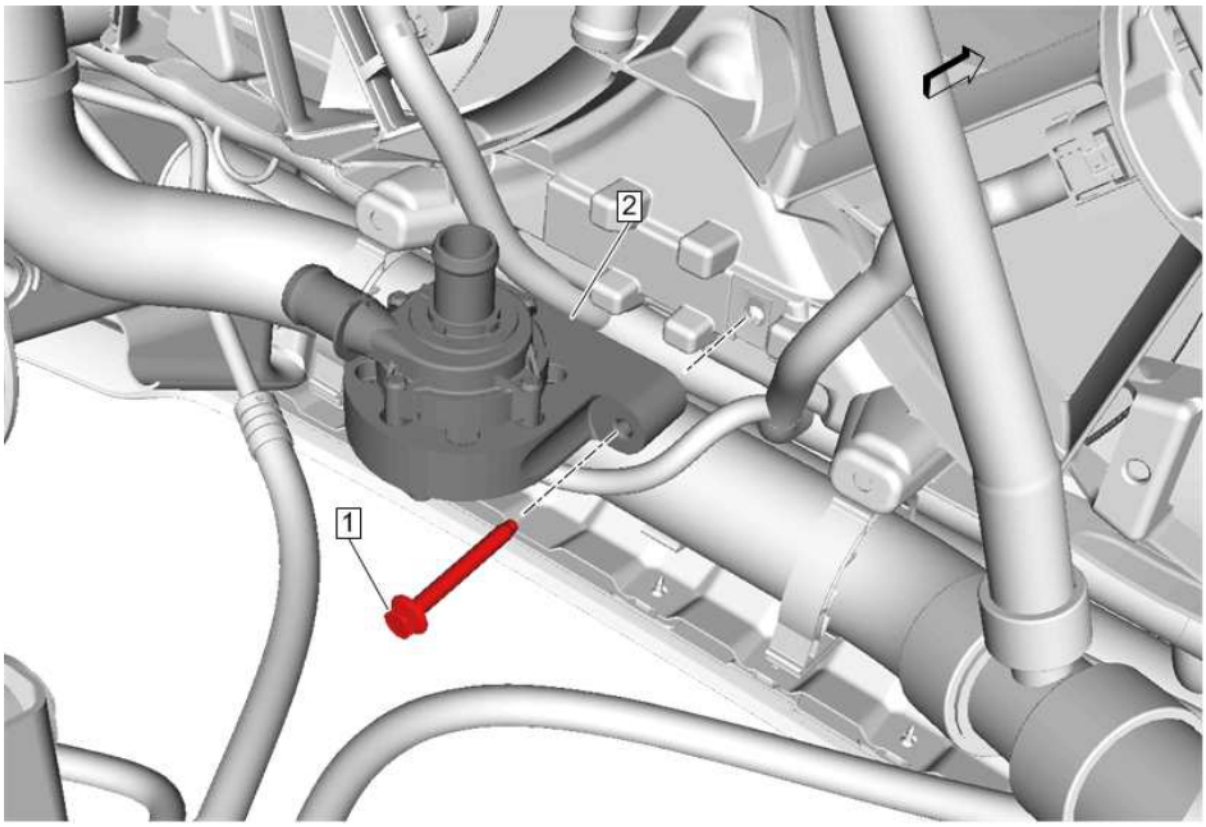

Fig. 421: Generator Coolant Pump
Courtesy of GENERAL MOTORS COMPANY

6. Generator Coolant Pump 2 @Engine Coolant Fan Shroud - Install - **Generator Coolant Pump**

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Replacement (L8B)

7. Engine Oil Cooler Hose@Engine Coolant Fan Shroud - Clip
8. Transmission Fluid Cooler Inlet and Outlet Pipe@Engine Coolant Fan Shroud - Clip

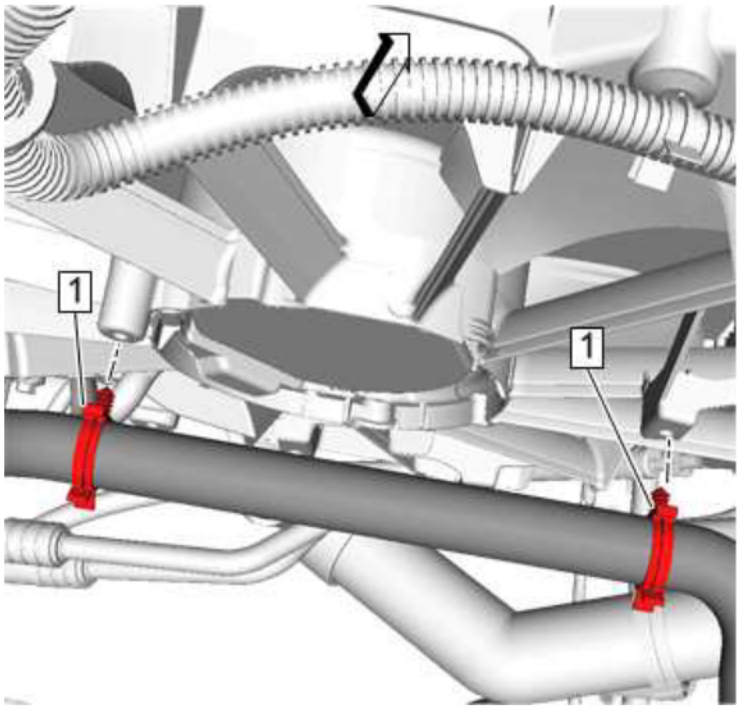

Fig. 422: Engine Coolant Fan Shroud Clip
Courtesy of GENERAL MOTORS COMPANY

9. Hose Clip 1 @Engine Coolant Fan Shroud - Install

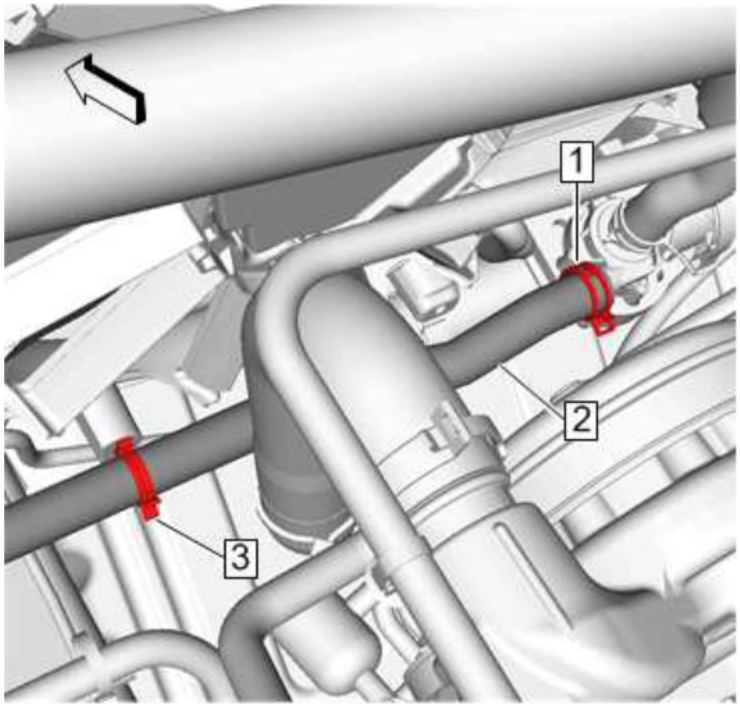

Fig. 423: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

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10. Hose Clip 3 @Engine Coolant Fan Shroud - Install

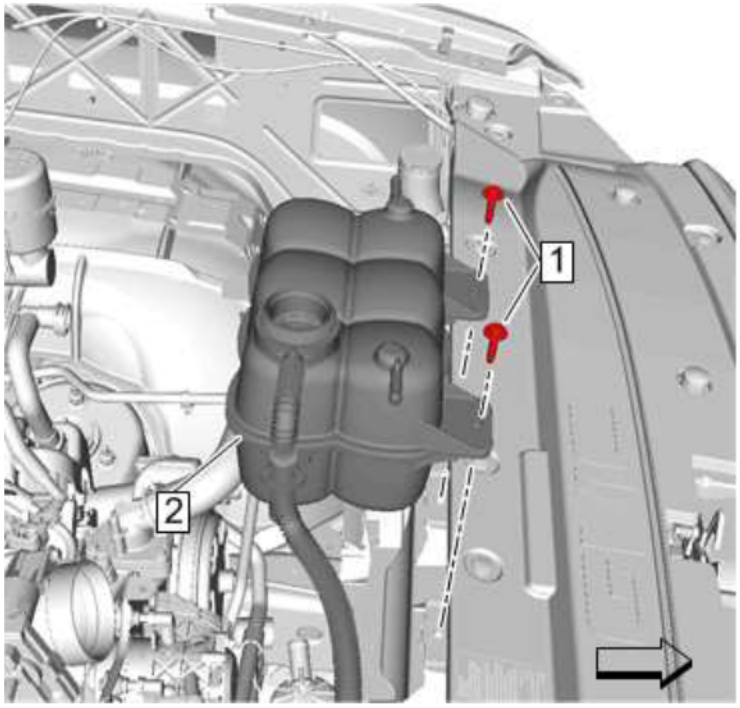

Fig. 424: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

11. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Install - **Radiator Surge Tank Replacement (L8B)**
12. Air Cleaner Outlet Duct - Install - **Air Cleaner Outlet Duct Replacement**
13. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
14. Start the engine and check for coolant leaks.

ENGINE COOLANT FAN SHROUD REPLACEMENT (L5P)

Removal Procedure

1. Drain the coolant. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

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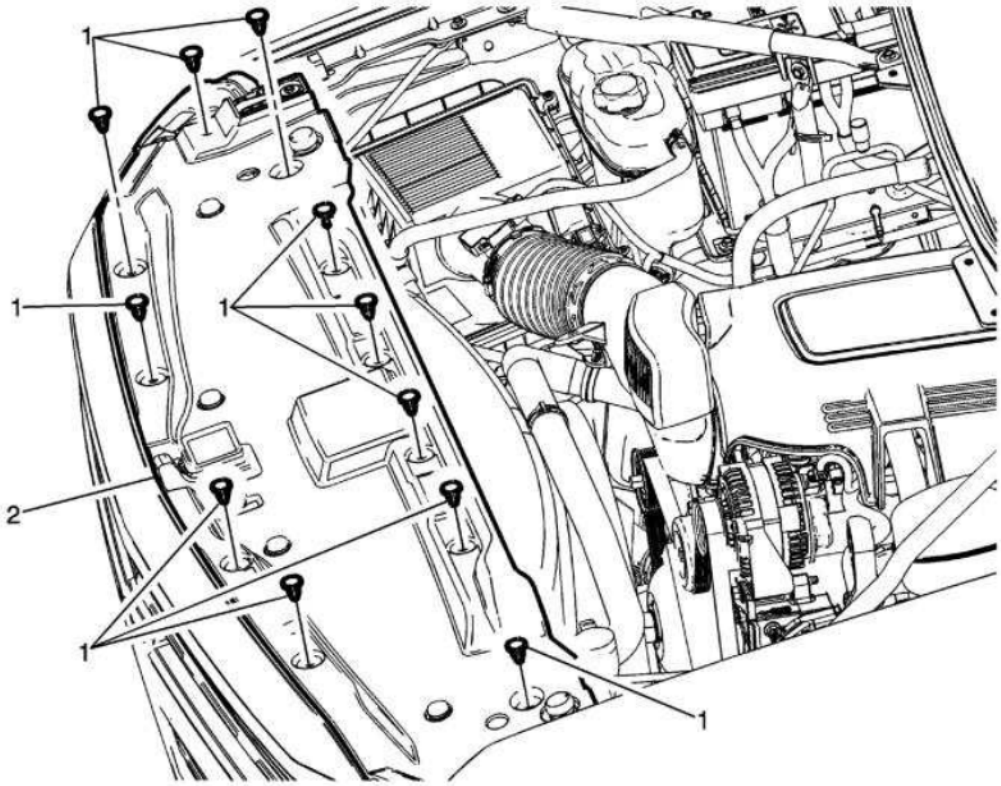

Fig. 425: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

2. Front Compartment Front Sight Shield 2 - Remove **Front Compartment Front Sight Shield Replacement**
3. Air Cleaner Outlet Front Duct - Remove **Air Cleaner Outlet Front Duct Replacement**
4. Air Conditioning Compressor Hose - Remove **Air Conditioning Compressor Hose Replacement (L5P)**

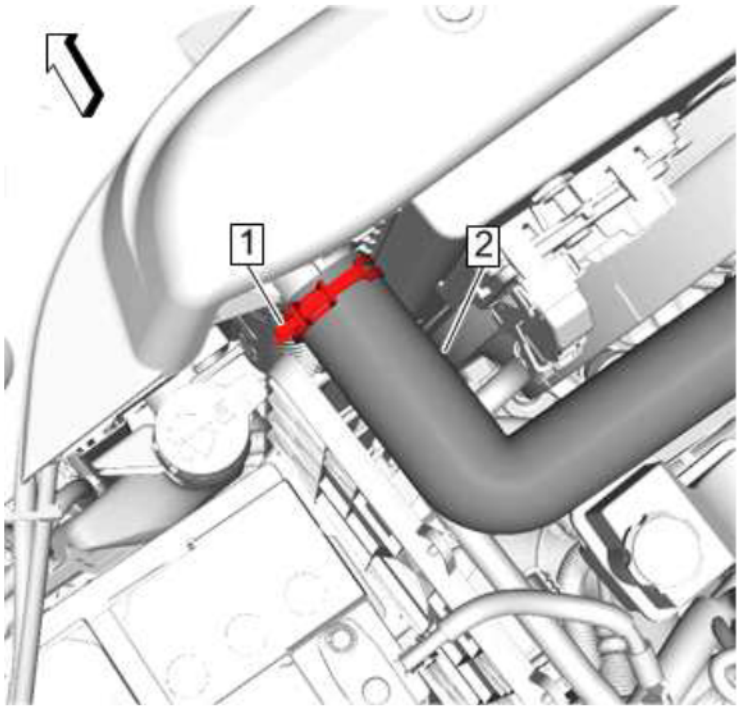

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Fig. 426: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Radiator Inlet Hose 2 Remove - **Radiator Inlet Hose Replacement (L5P)**

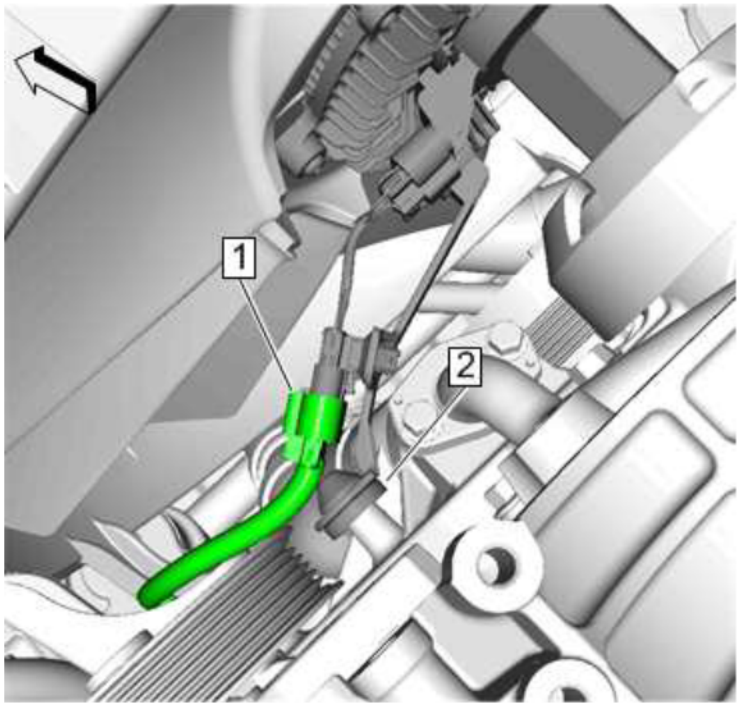

Fig. 427: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

6. Engine Wiring Harness 1 @Fan Blade Clutch - Disconnect
7. Fan Blade Clutch 2 @Engine - Remove

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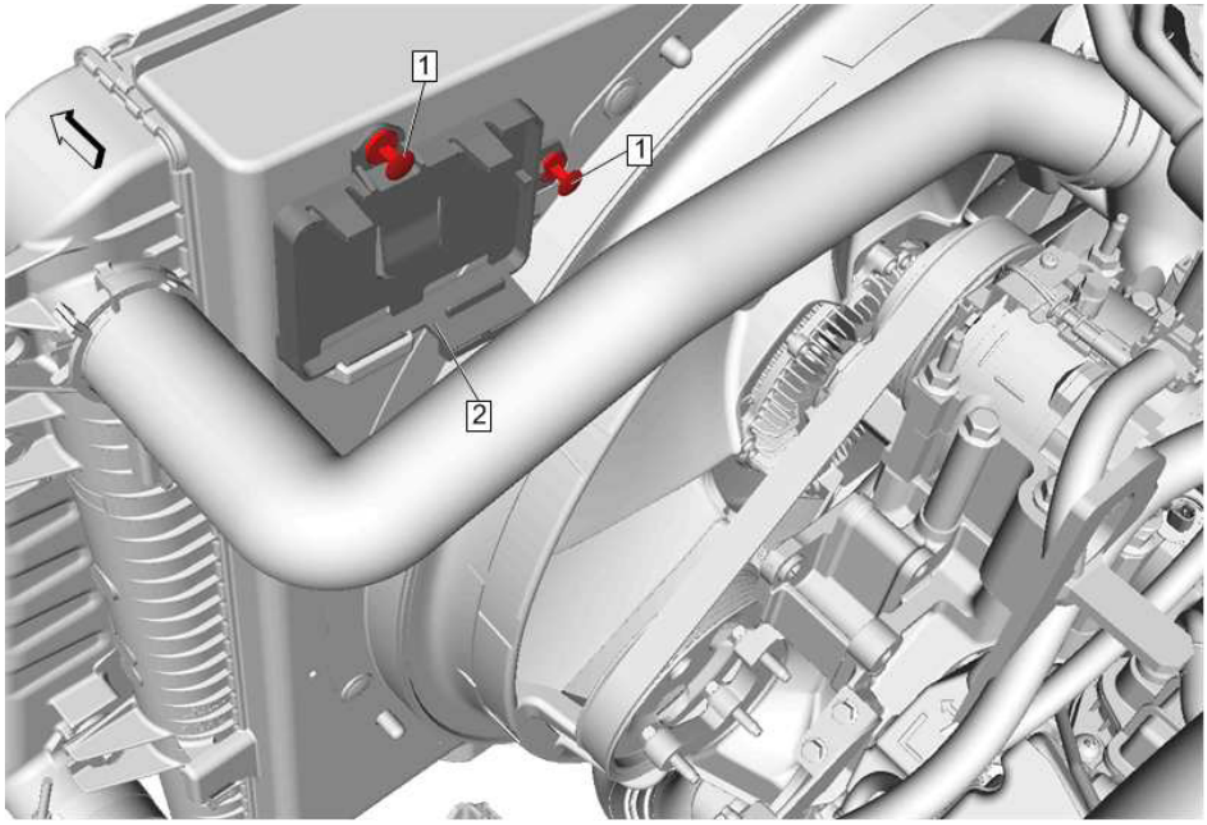

Fig. 428: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

8. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Remove - **Transmission Control Module Bracket Replacement**

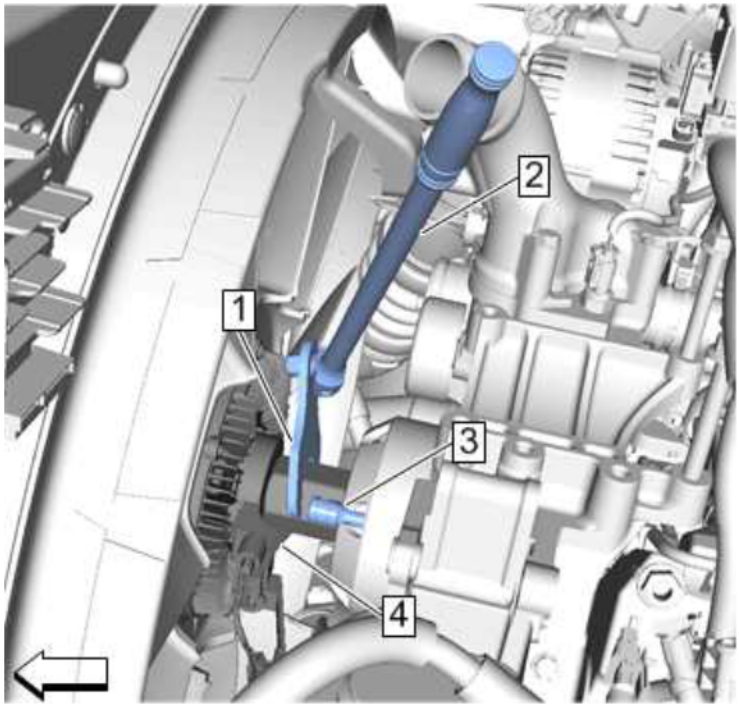

Fig. 429: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

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9. Fan Blade Clutch 4 - Remove **Fan Blade Clutch Replacement (L5P)**

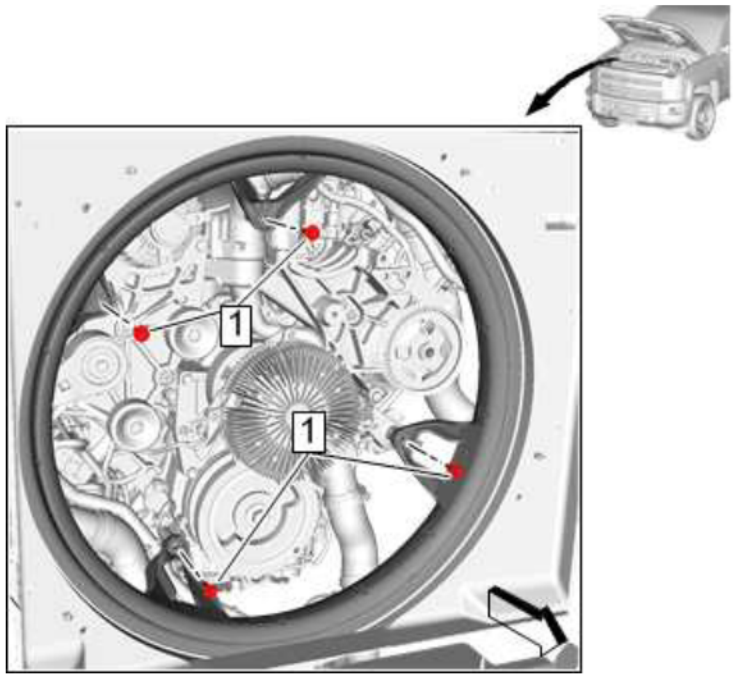

Fig. 430: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Engine Coolant Fan Shroud Bolt- Upper 1 - Remove

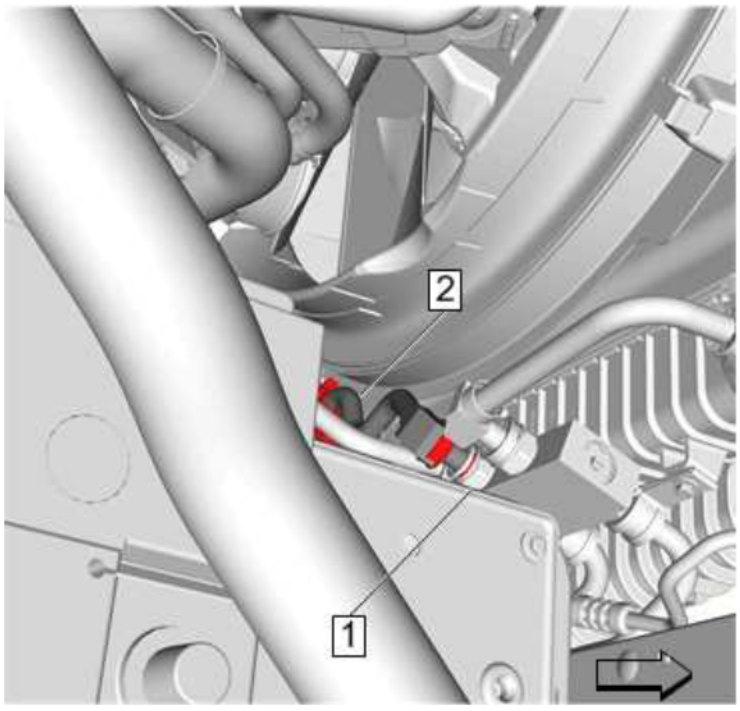

Fig. 431: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

11. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

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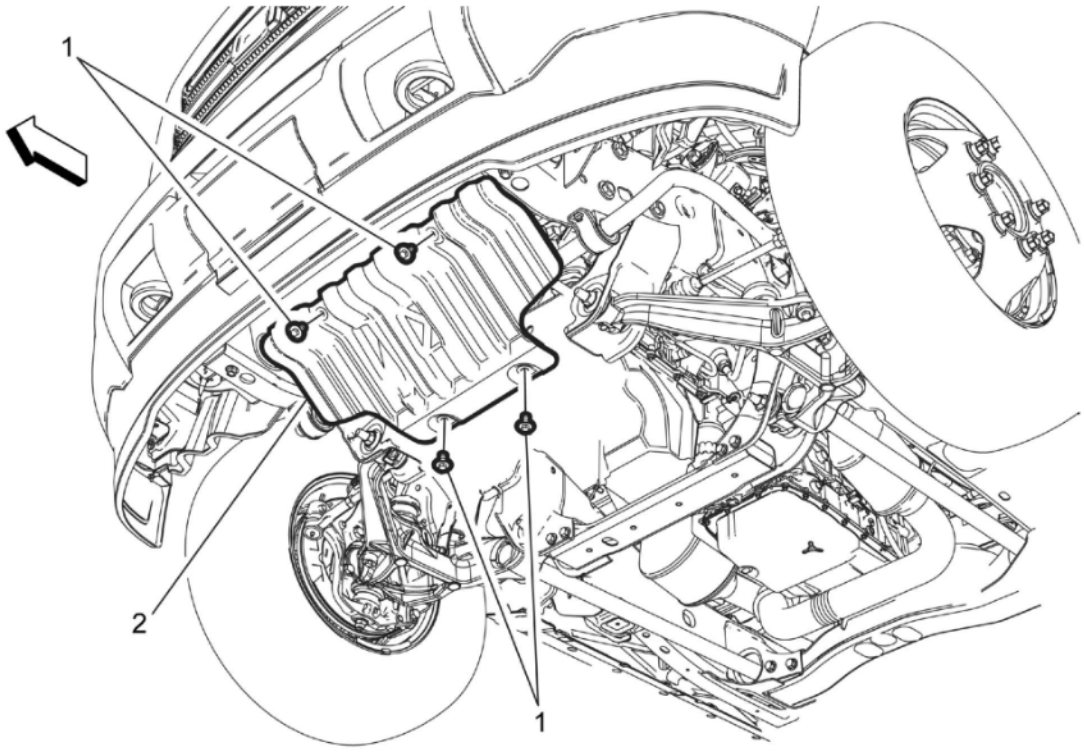

Fig. 432: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

12. Underbody Splash Shield 2 - Remove **Underbody Splash Shield Replacement**

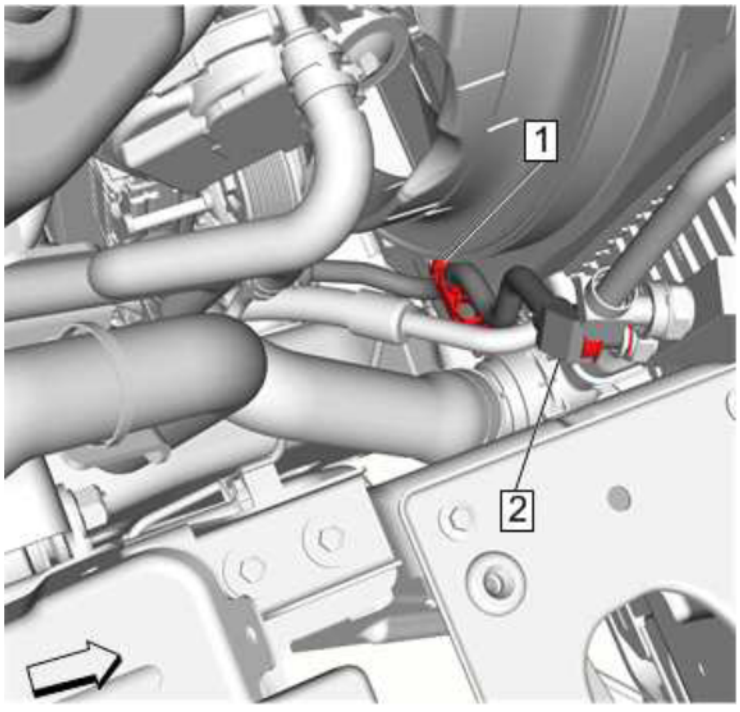

Fig. 433: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

13. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Remove **Transmission**

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Fluid Cooler Outlet Pipe Replacement (L5P with MW7)

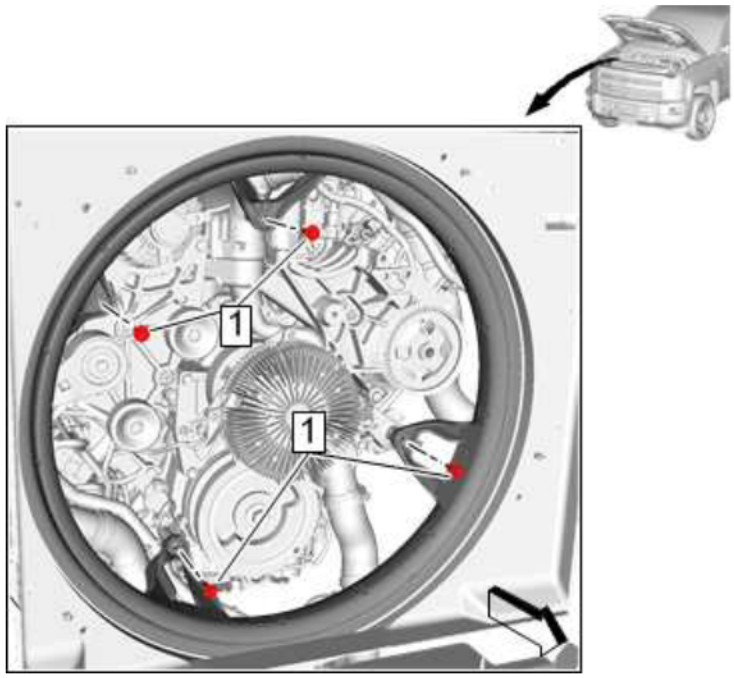

Fig. 434: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

14. Engine Coolant Fan Shroud Bolt- Lower 1 - Remove
15. Lower the vehicle.

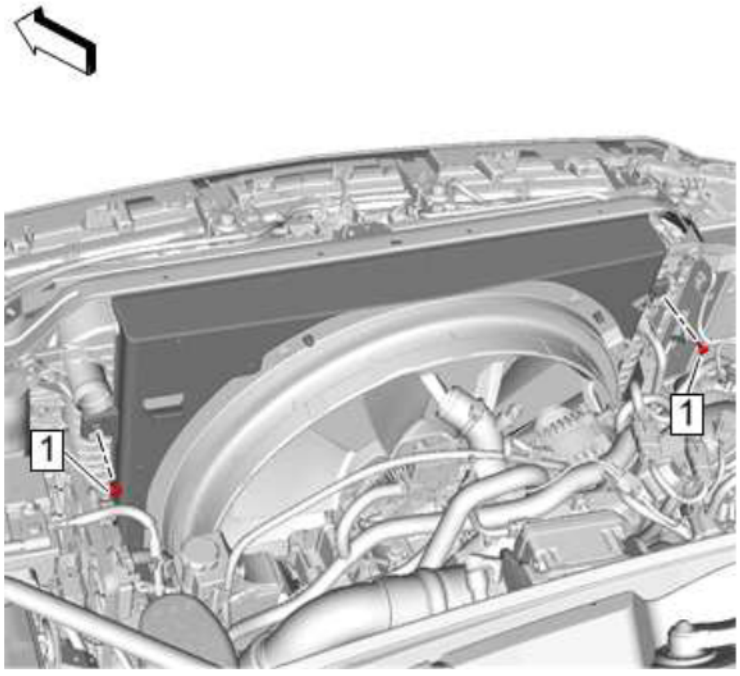

Fig. 435: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

16. Engine Coolant Fan Shroud Retainer 1 @Radiator - Remove

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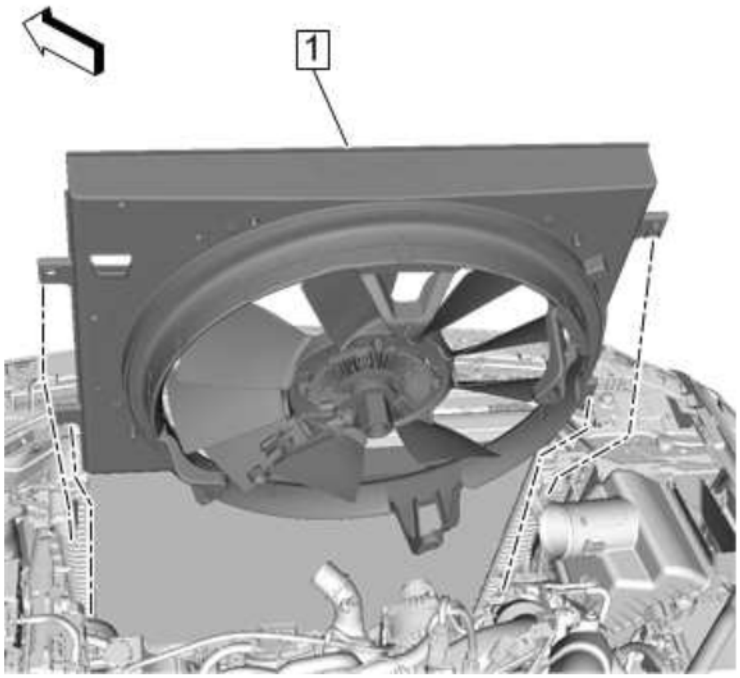

Fig. 436: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

17. Remove the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) from the vehicle.

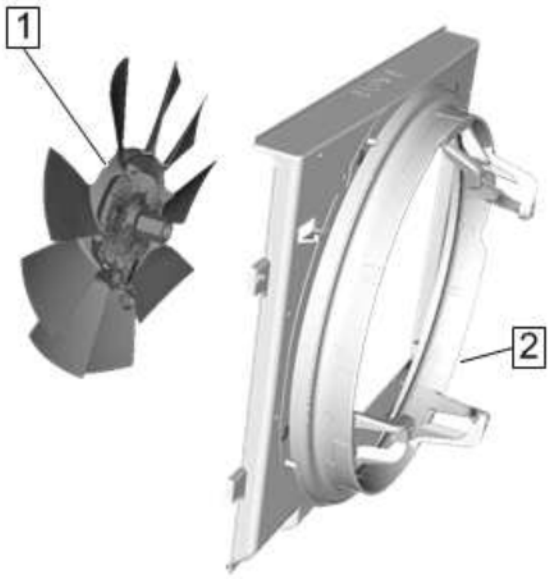

Fig. 437: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

18. Remove the fan blade and fan blade clutch as an assembly (1) from the engine coolant fan shroud (2).

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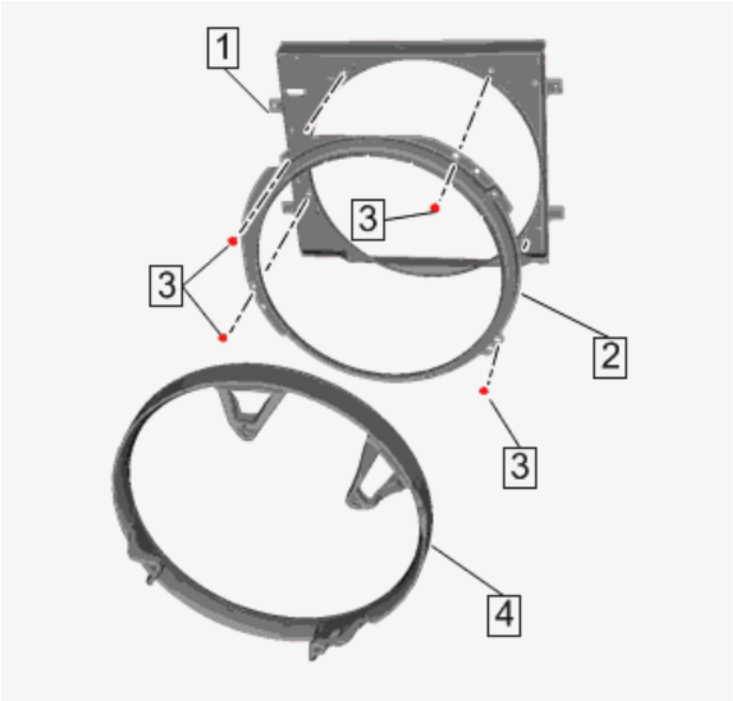

Fig. 438: Engine Coolant Fan Shrouds
Courtesy of GENERAL MOTORS COMPANY

19. Engine Coolant Fan Shroud Retainer 3 @Engine Coolant Fan Shroud- Front 1 - Remove
20. Engine Coolant Fan Shroud- Front 1 @Engine Coolant Fan Shroud- Middle 2 - Remove
21. Engine Coolant Fan Shroud- Rear 4 @Engine Coolant Fan Shroud- Middle 2 - Remove

Installation Procedure

WARNING: Do not use or attempt to repair a damaged cooling fan assembly. Replace damaged fans with new assemblies. An unbalanced cooling fan could fly apart causing personal injury and property damage.

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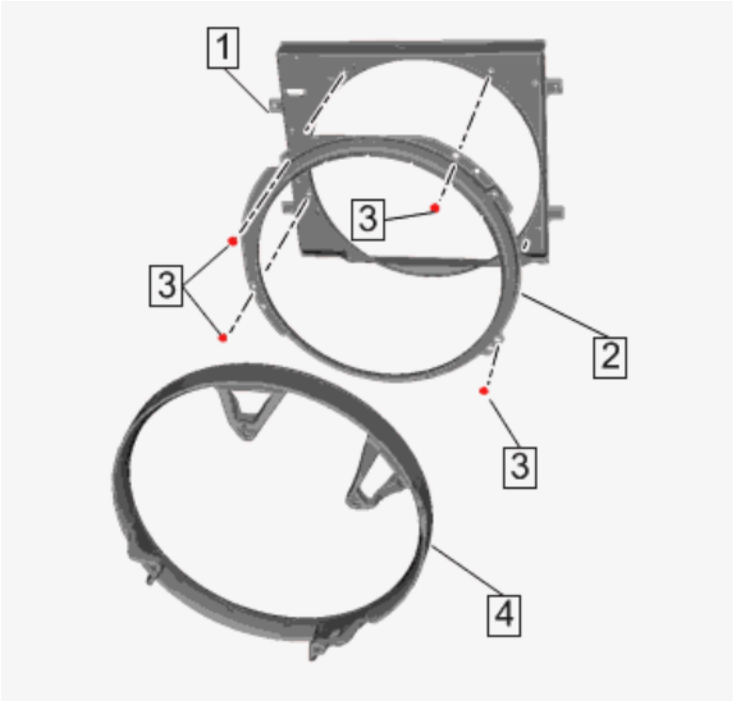

Fig. 439: Engine Coolant Fan Shrouds
Courtesy of GENERAL MOTORS COMPANY

1. Engine Coolant Fan Shroud- Rear 4 @Engine Coolant Fan Shroud- Middle 2 - Install
2. Engine Coolant Fan Shroud- Front 1 @Engine Coolant Fan Shroud- Middle 2 - Install
3. Engine Coolant Fan Shroud Retainer 3 @Engine Coolant Fan Shroud- Front 1 - Install

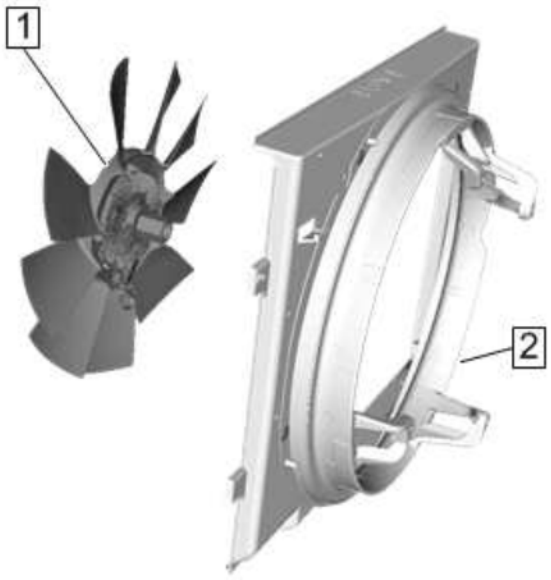

Fig. 440: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

4. Install the fan blade and fan blade clutch as an assembly (1) into the engine coolant fan shroud (2).

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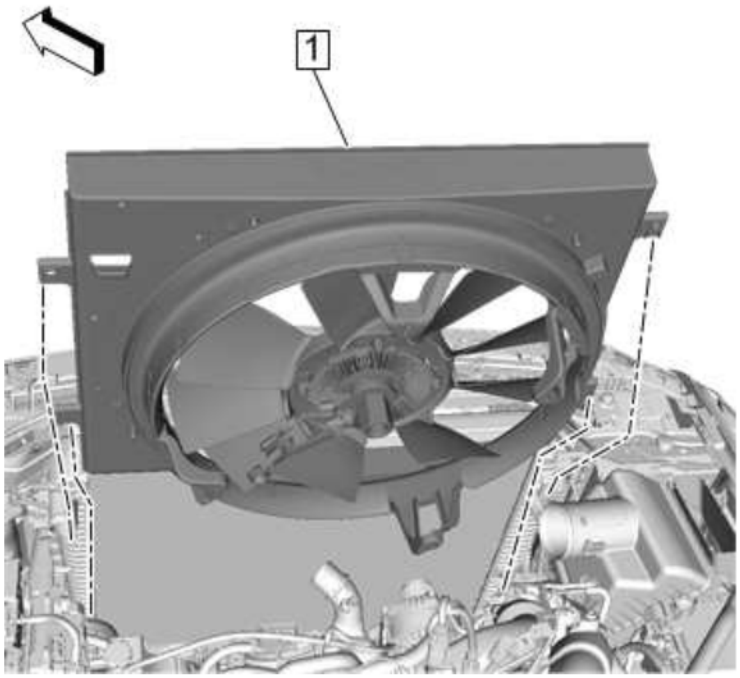

Fig. 441: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

5. Install the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) to the vehicle.

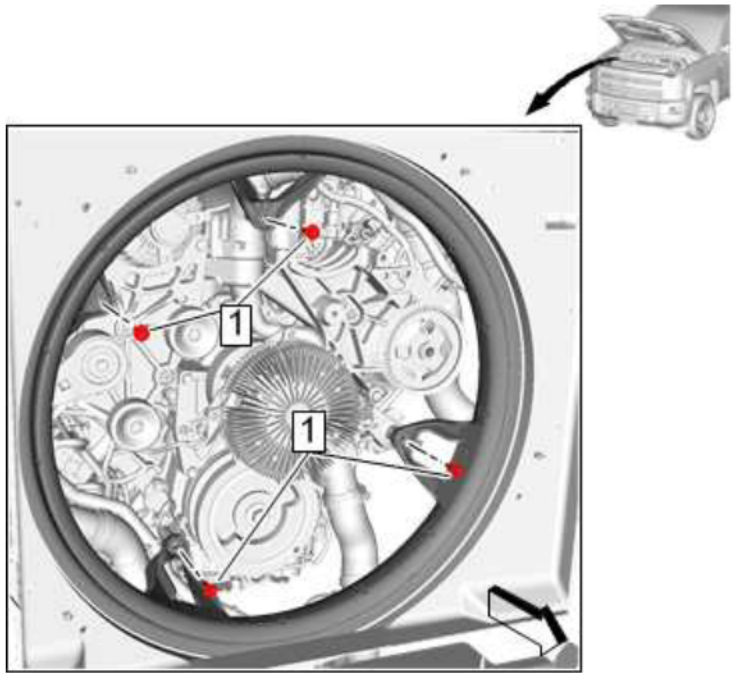

Fig. 442: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Engine Coolant Fan Shroud Bolt- Upper 1 - Install and hand tighten

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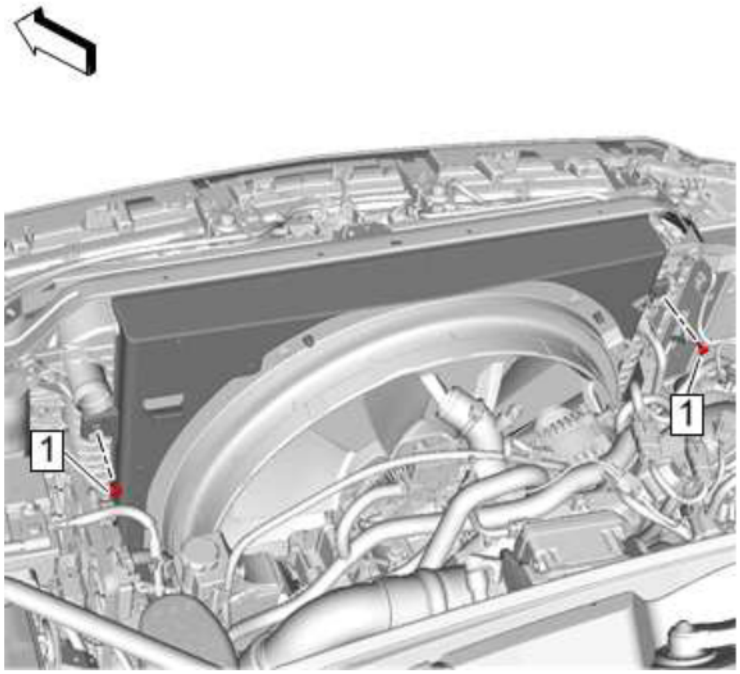

Fig. 443: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Engine Coolant Fan Shroud Retainer 1 @Radiator - Install
8. Install the fan blade, fan blade clutch to the fan pulley.

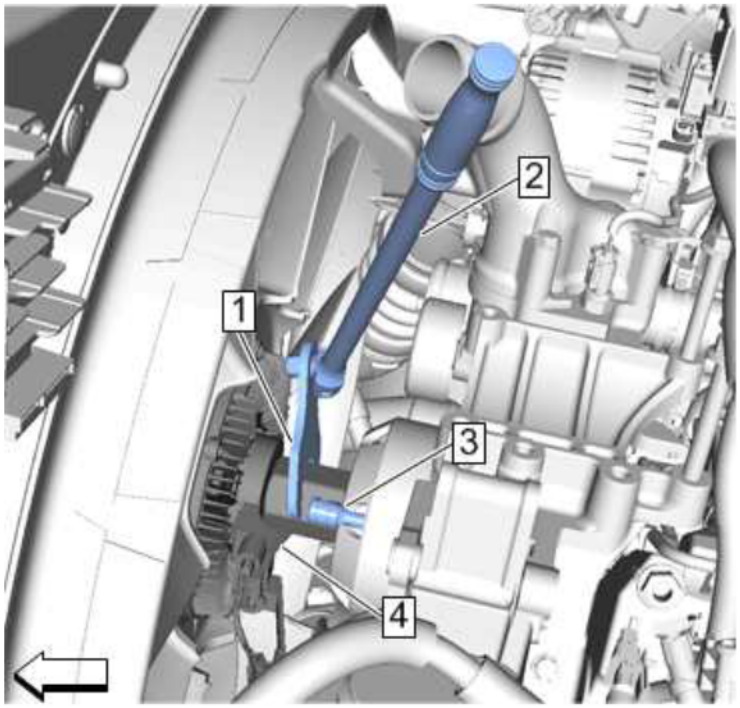

Fig. 444: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

9. Fan Blade Clutch 4 - Install - **Fan Blade Clutch Replacement (L5P)**
10. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

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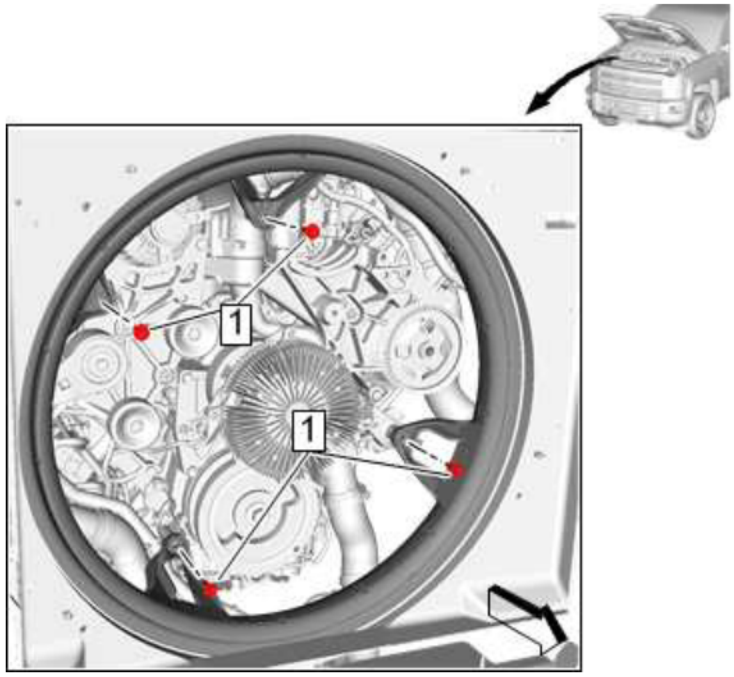

Fig. 445: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

11. Engine Coolant Fan Shroud Bolt- Lower 1 - Install and tighten 8 N.m (71 lb in)
12. Lower the vehicle.

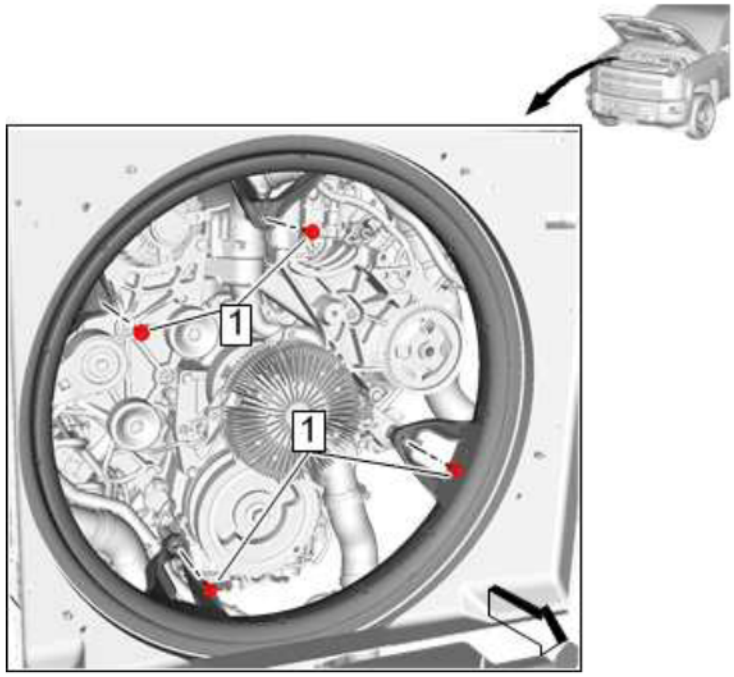

Fig. 446: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

13. Engine Coolant Fan Shroud Bolt- Upper 1 - Tighten 8 N.m (71 lb in)

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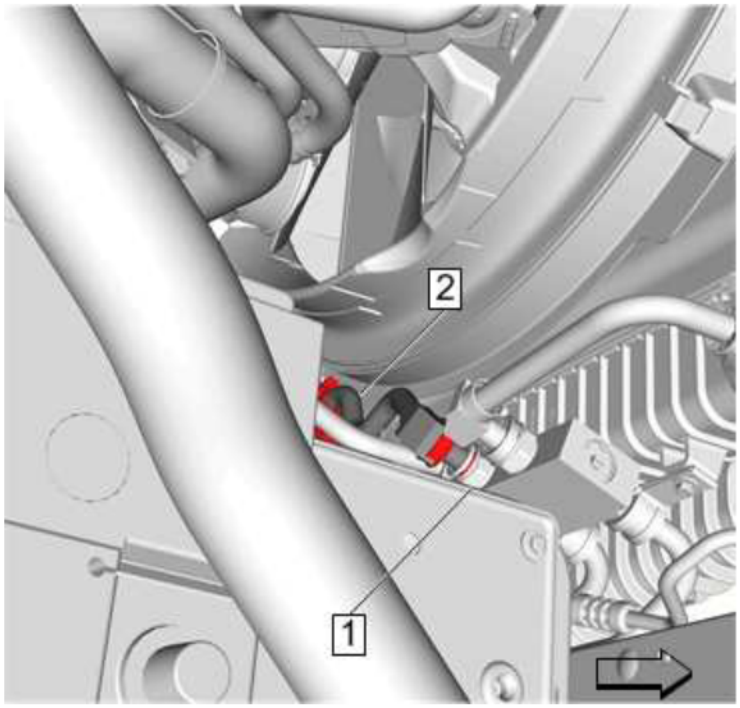

Fig. 447: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

14. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**
15. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

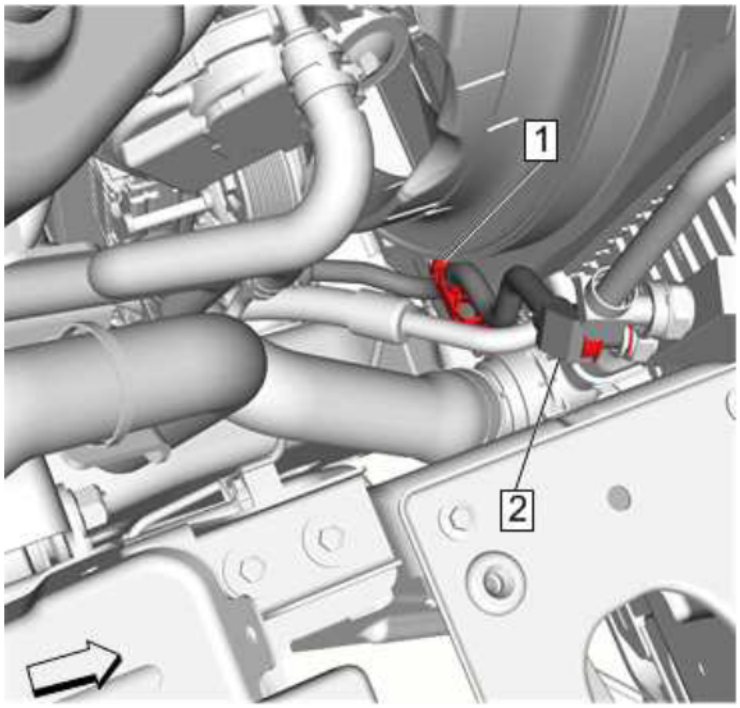

Fig. 448: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

16. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

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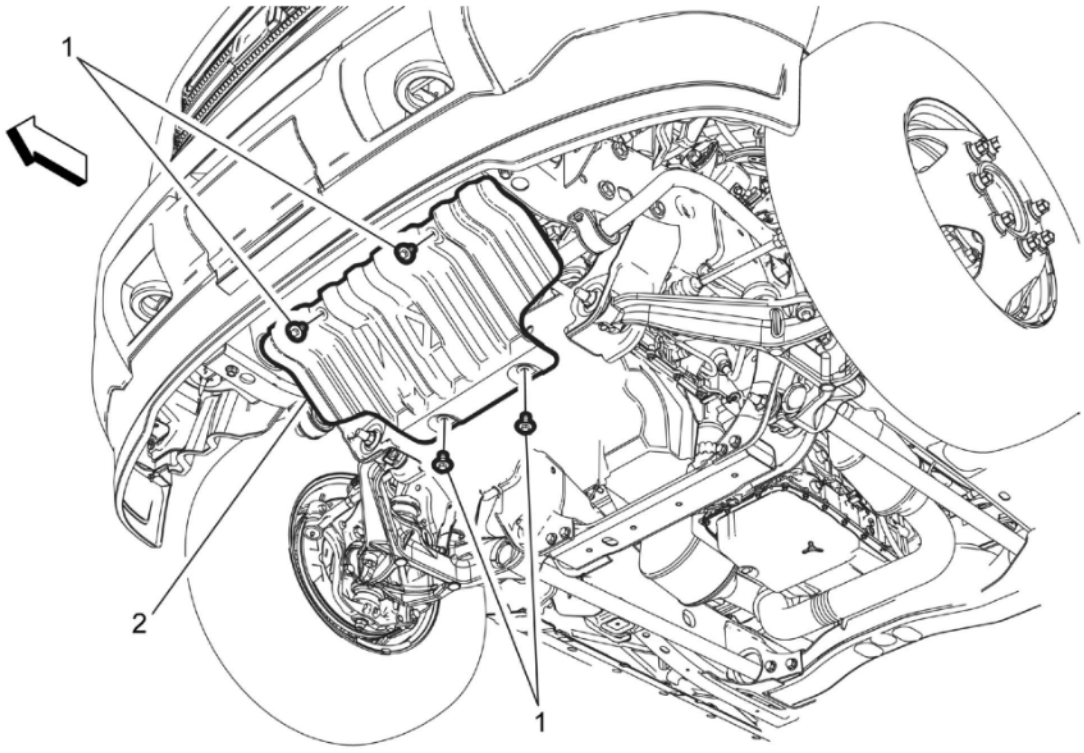

Fig. 449: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

17. Underbody Splash Shield 2 - Install **Underbody Splash Shield Replacement**
18. Lower the vehicle.

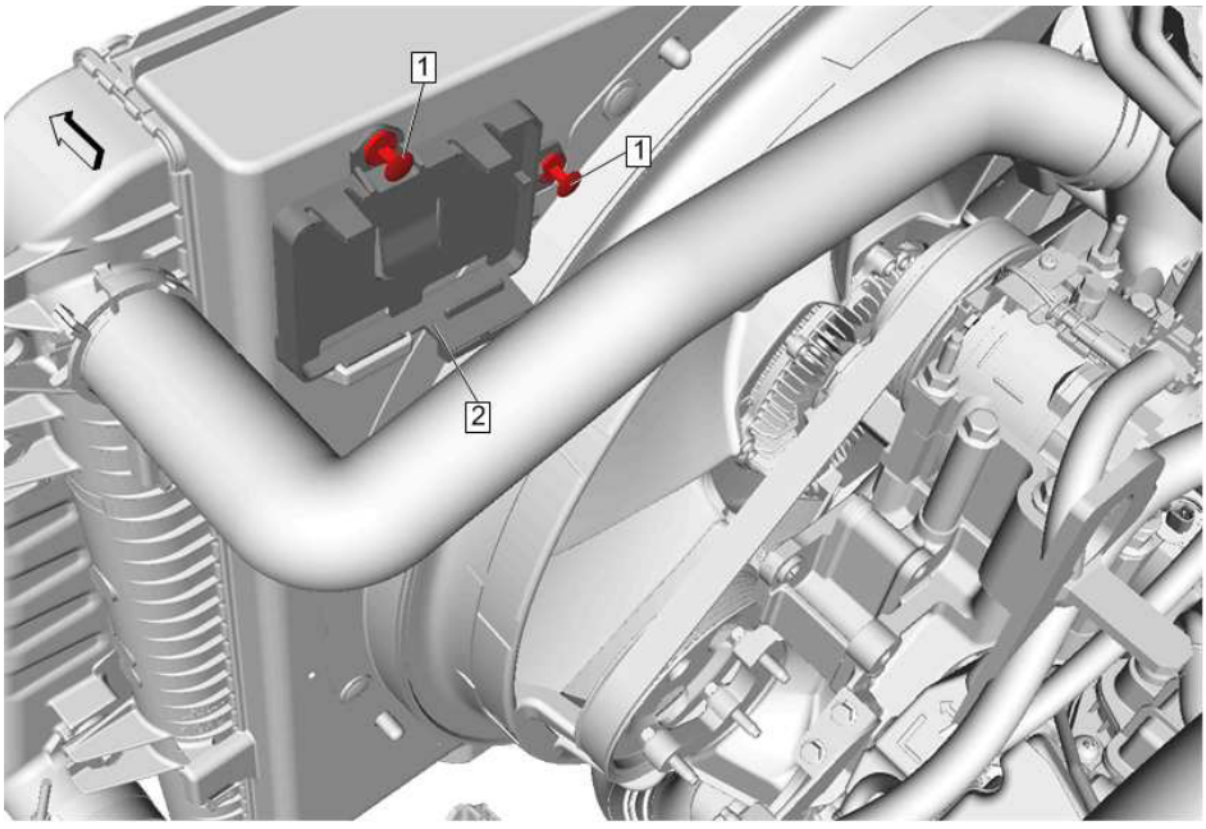

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Fig. 450: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

19. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Install **Transmission Control Module Bracket Replacement**

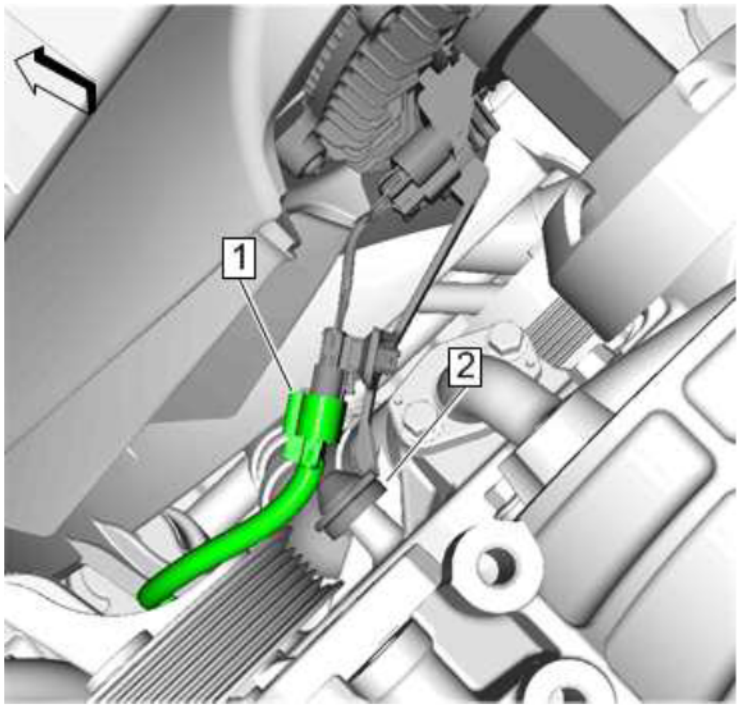

Fig. 451: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

20. Fan Blade Clutch 2 @Engine - Install
21. Engine Wiring Harness 1 @Fan Blade Clutch - Connect

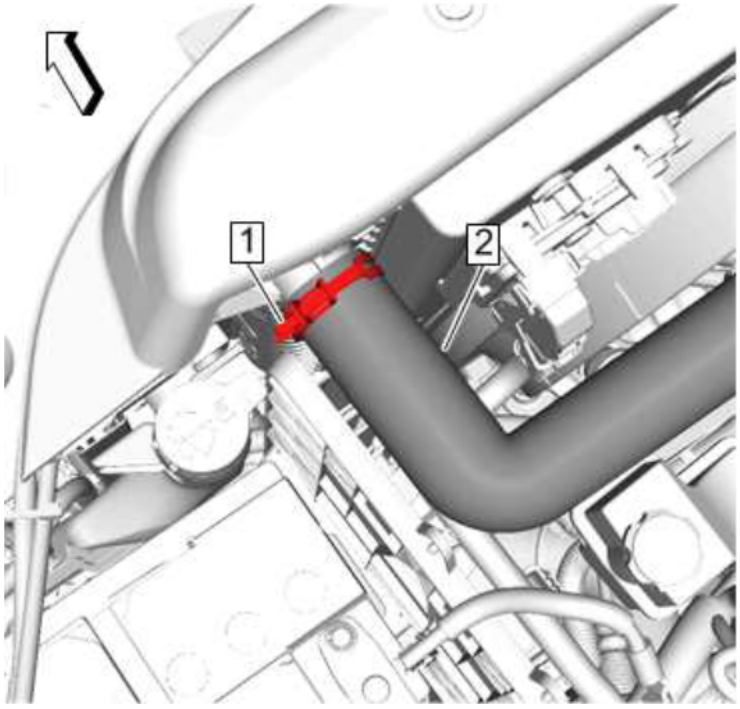

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Fig. 452: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

22. Radiator Inlet Hose 2 Install - **Radiator Inlet Hose Replacement (L5P)**
23. Air Conditioning Compressor Hose - Install - **Air Conditioning Compressor Hose Replacement (L5P)**
24. Air Cleaner Outlet Front Duct - Install - **Air Cleaner Outlet Front Duct Replacement**

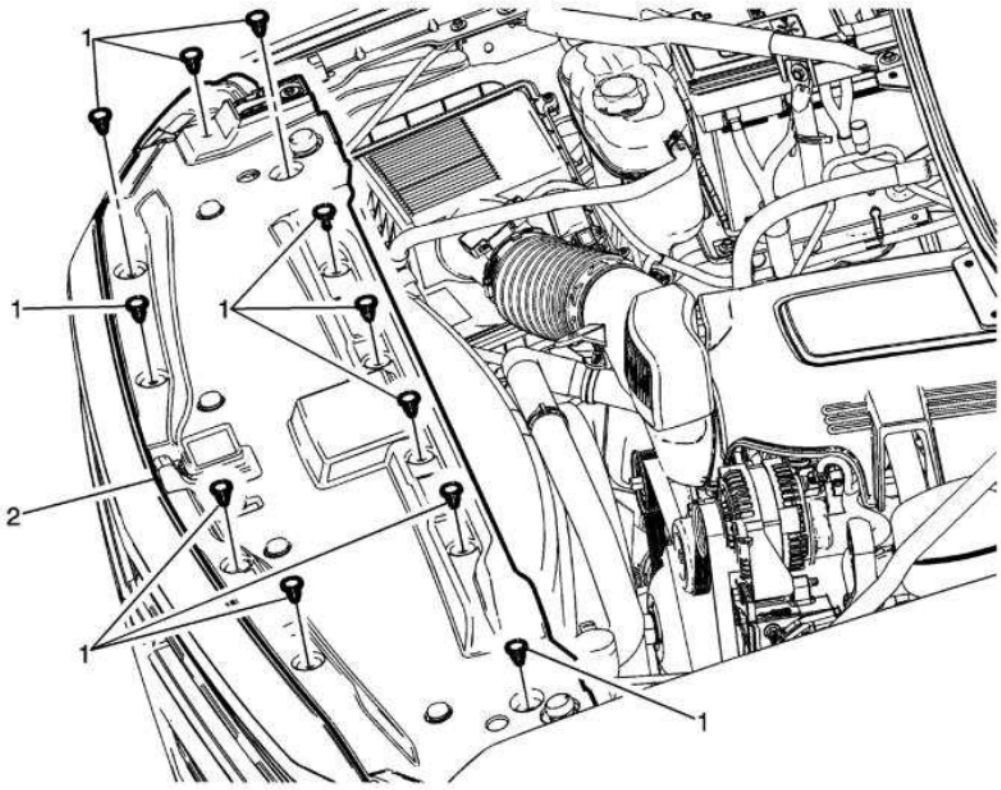

Fig. 453: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

25. Front Compartment Front Sight Shield 2 - Install - **Front Compartment Front Sight Shield Replacement**
26. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
27. Start the engine and inspect for leaks.

ENGINE COOLANT FAN UPPER SHROUD REPLACEMENT (LC8, L96)

Removal Procedure

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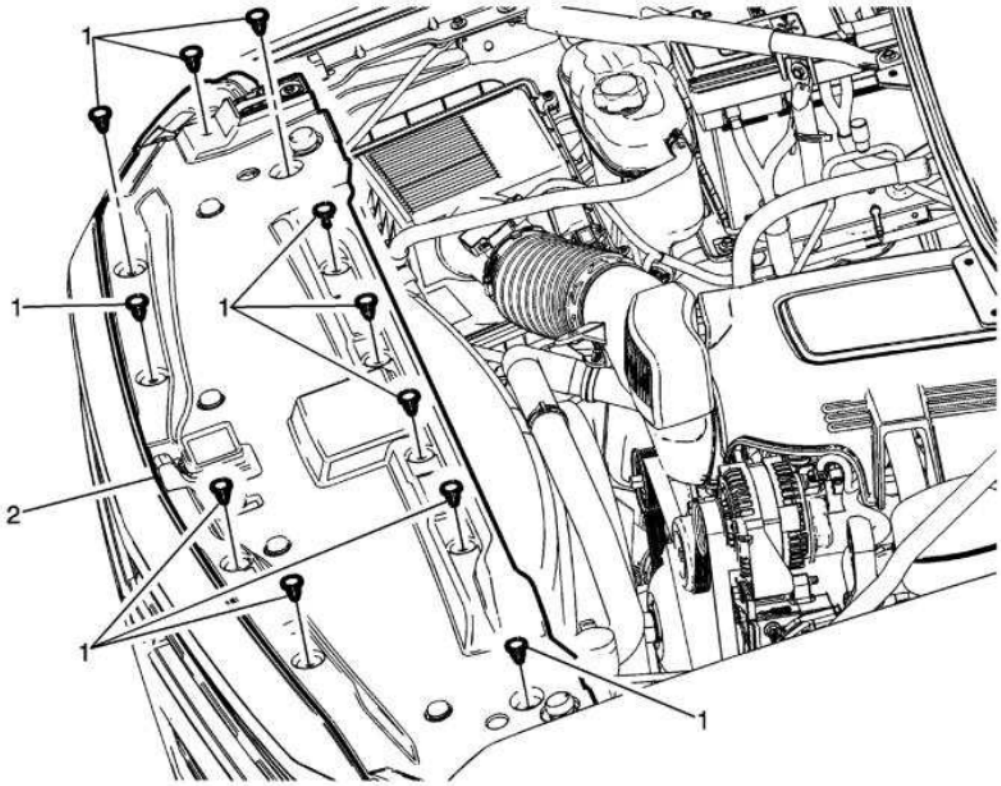

Fig. 454: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

1. Remove the Front Compartment Front Sight Shield (2). Refer to **Front Compartment Front Sight Shield Replacement** .
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

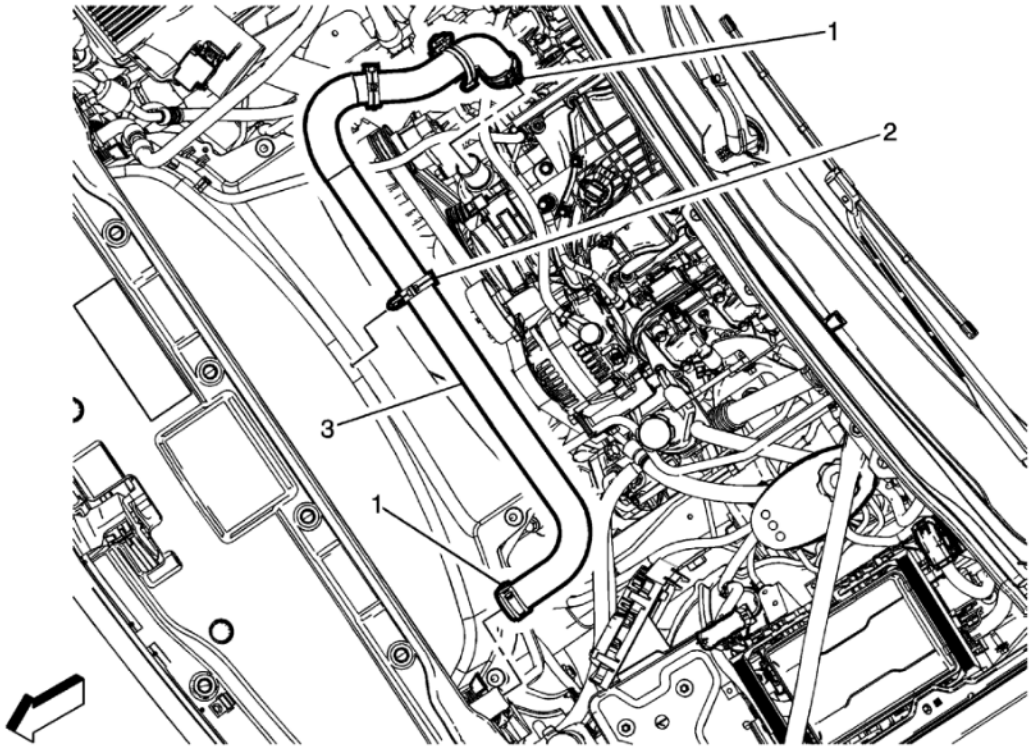

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Fig. 455: Radiator Inlet Hose And Retainer (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

3. Remove the radiator inlet hose (3) from the radiator and remove the radiator inlet hose retainer (2) from the engine coolant fan upper shroud. Refer to **Radiator Inlet Hose Replacement (LC8, L96)**.

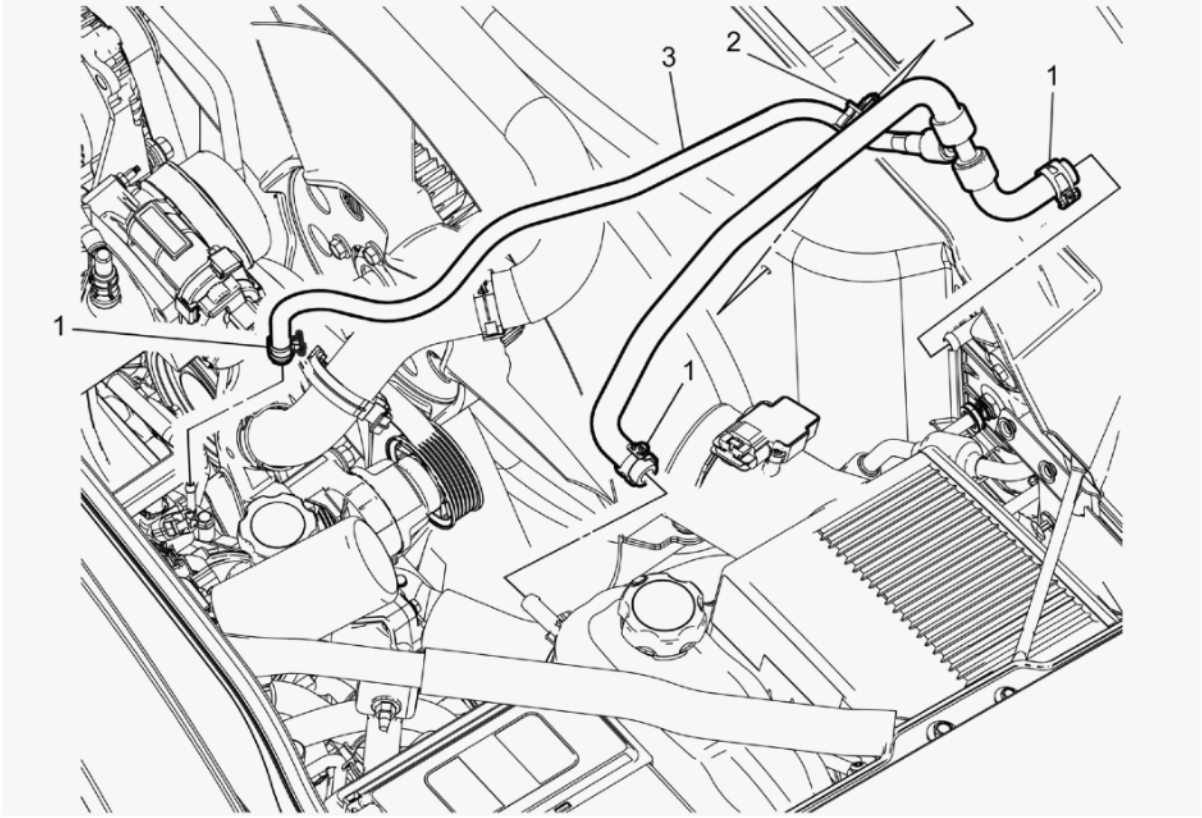

Fig. 456: Radiator Surge Tank Inlet Hose And Retainer
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator surge tank inlet hose (3) from the radiator and remove the radiator surge tank inlet hose retainer (2) from the engine coolant fan upper shroud. Refer to **Radiator Surge Tank Inlet Hose Replacement (LC8, L96)**.

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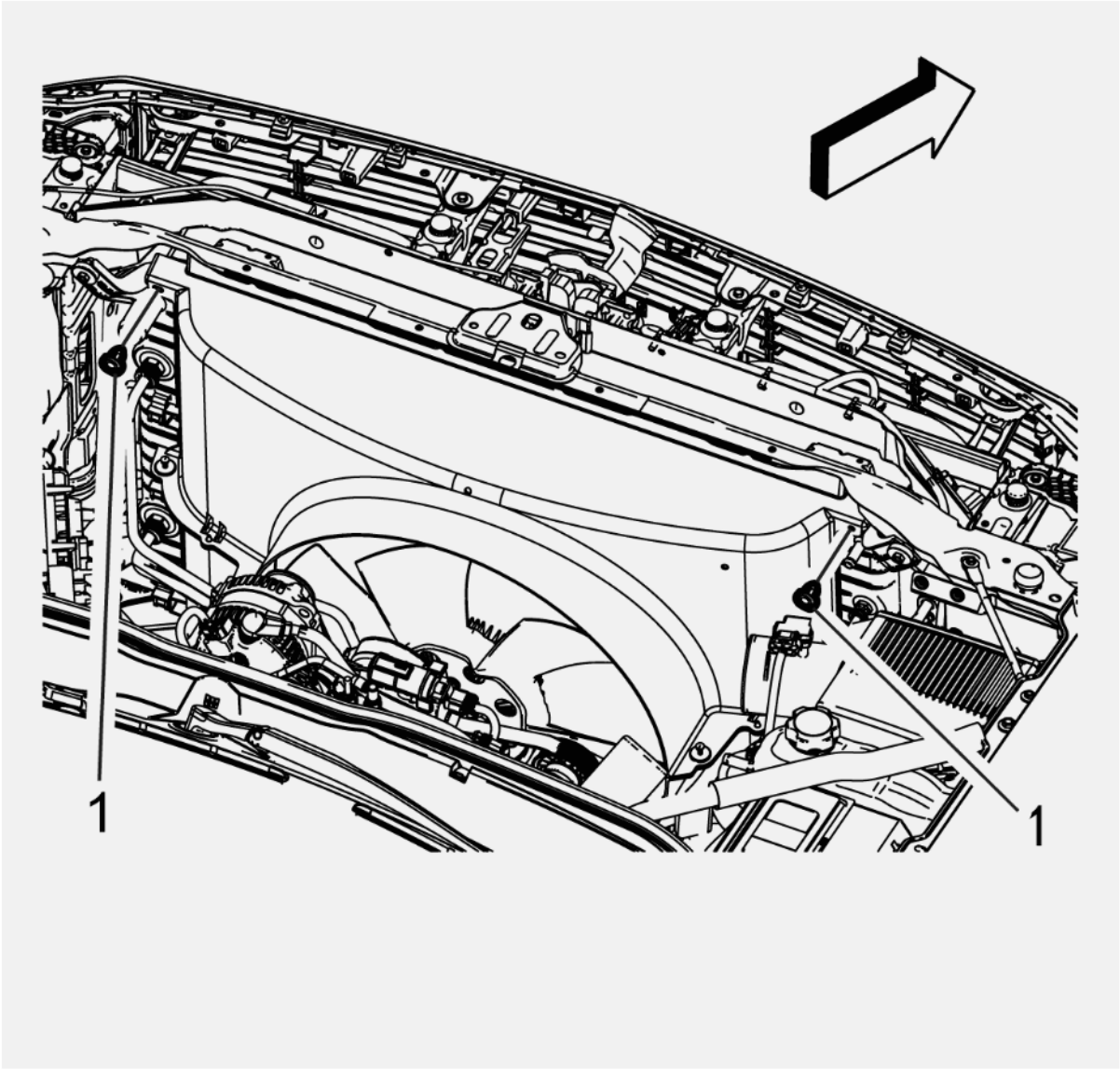

Fig. 457: Engine Coolant Fan Upper Shroud Retainers
Courtesy of GENERAL MOTORS COMPANY

5. Remove the engine coolant fan upper shroud retainers (1).

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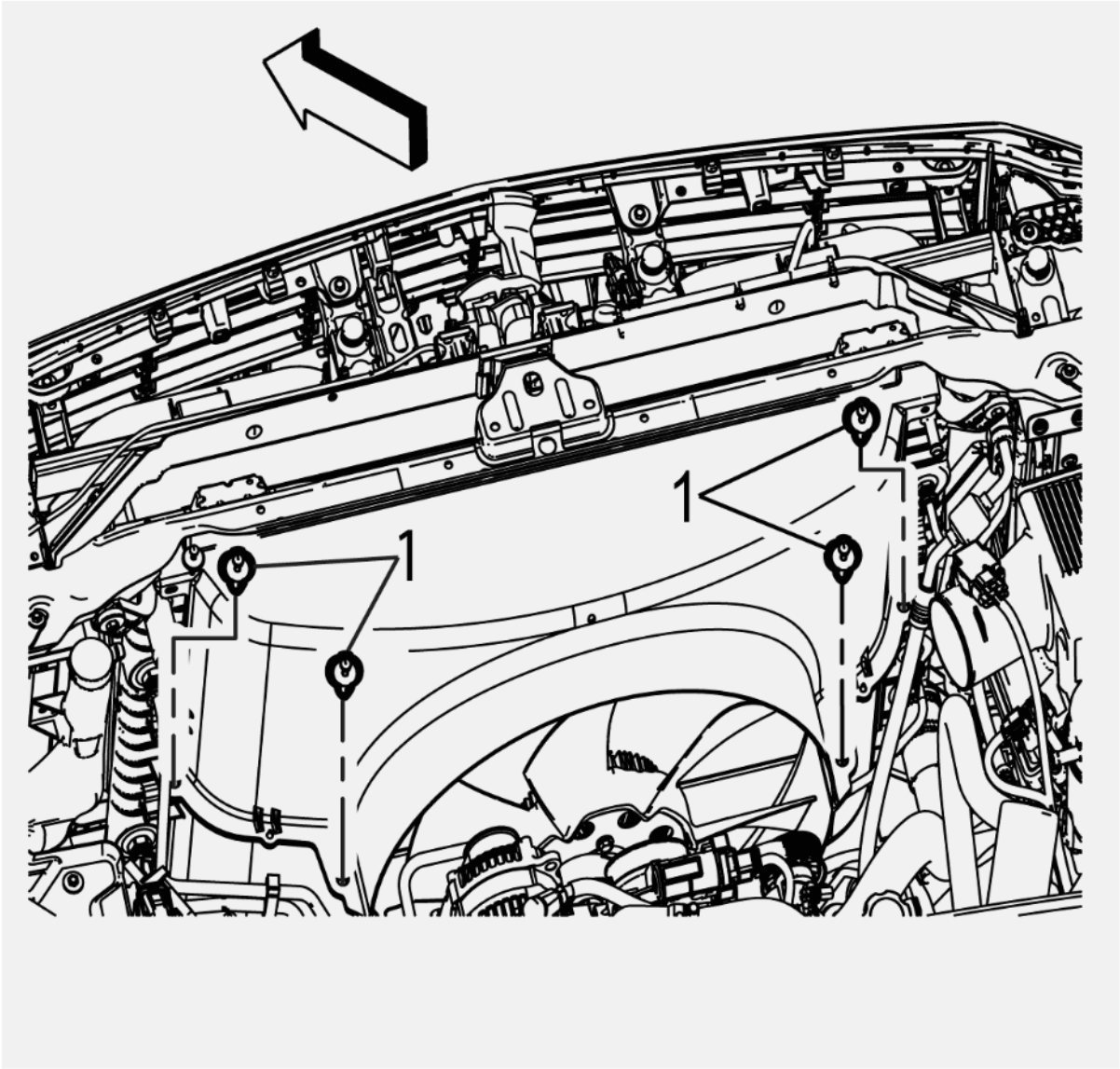

Fig. 458: Engine Coolant Fan Upper Shroud Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Remove the engine coolant fan upper shroud retainers (1).

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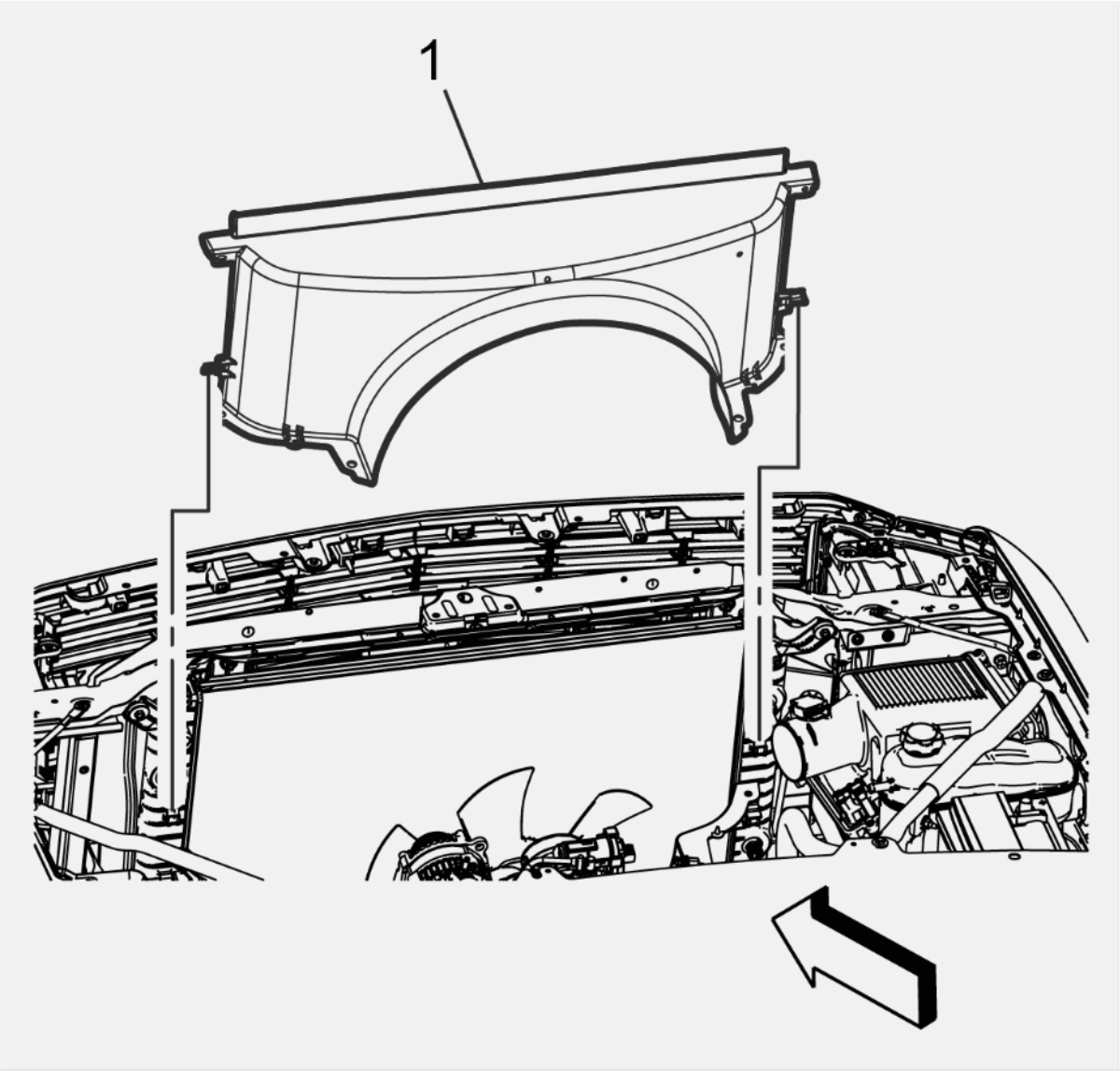

Fig. 459: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

7. Lift the engine coolant fan upper shroud (1) off the radiator and remove from the vehicle.

Installation Procedure

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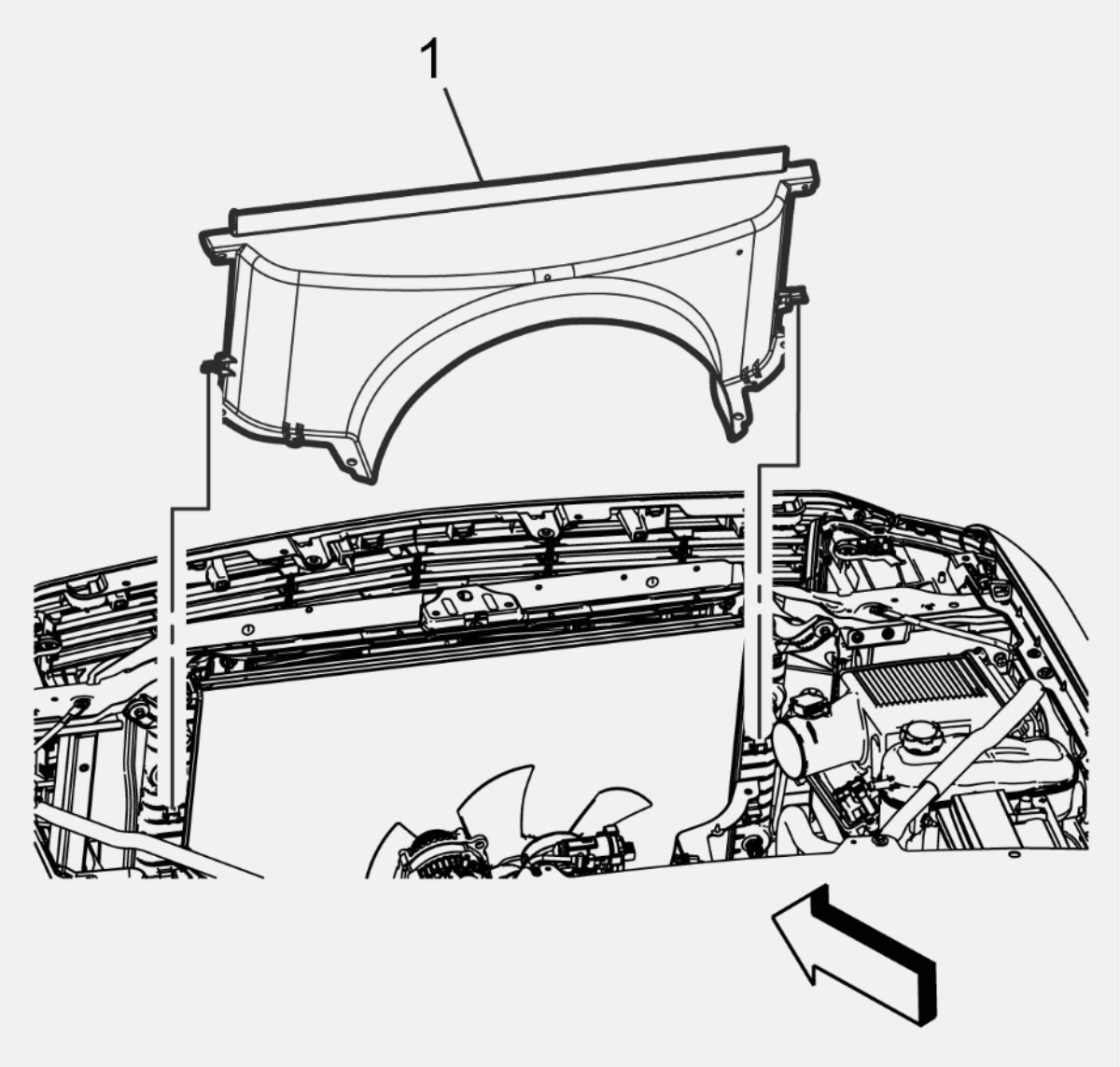

Fig. 460: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Install the engine coolant fan upper shroud (1) to the radiator.

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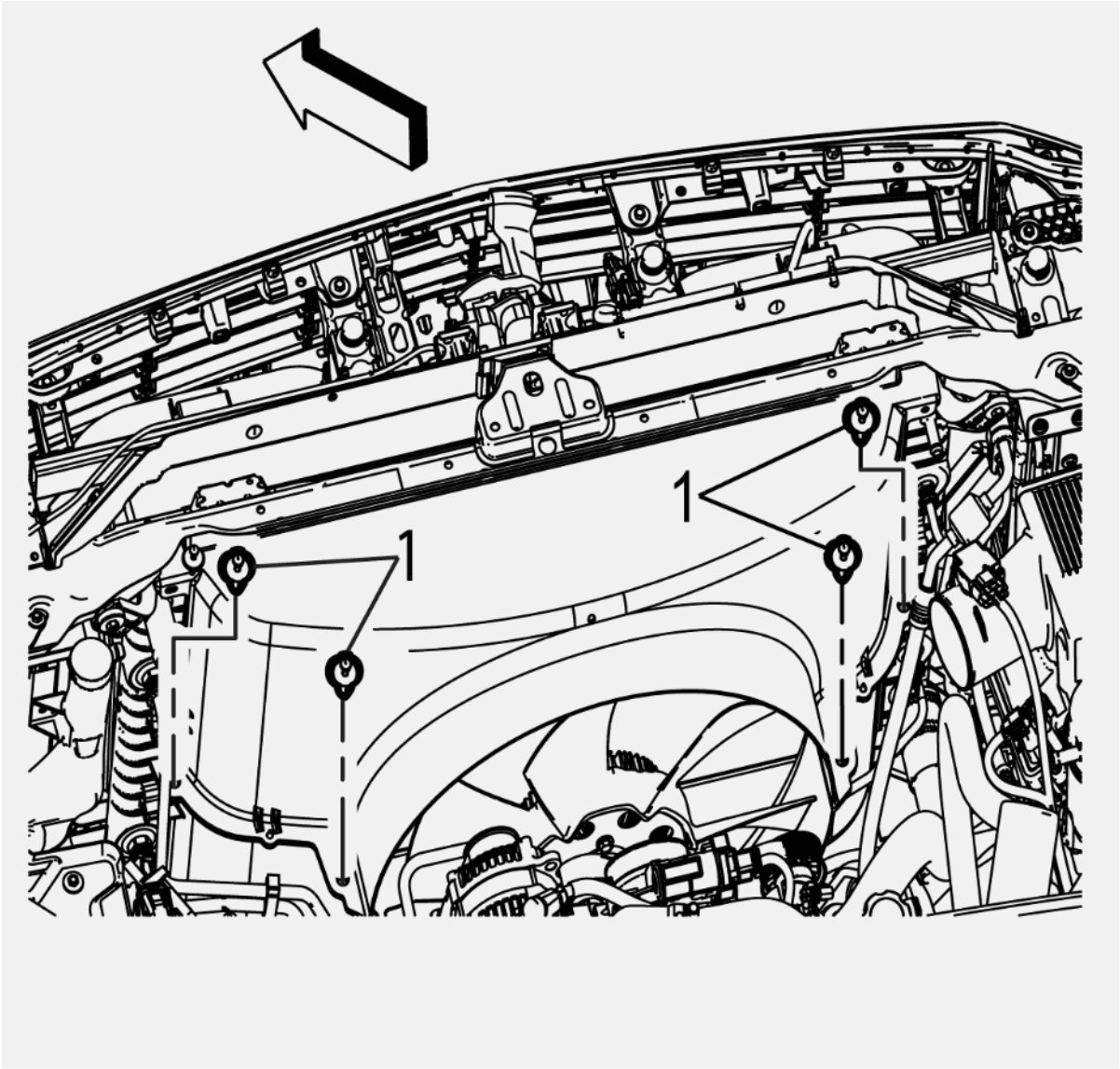

Fig. 461: Engine Coolant Fan Upper Shroud Retainers
Courtesy of GENERAL MOTORS COMPANY

2. Install the engine coolant fan upper shroud retainers (1).

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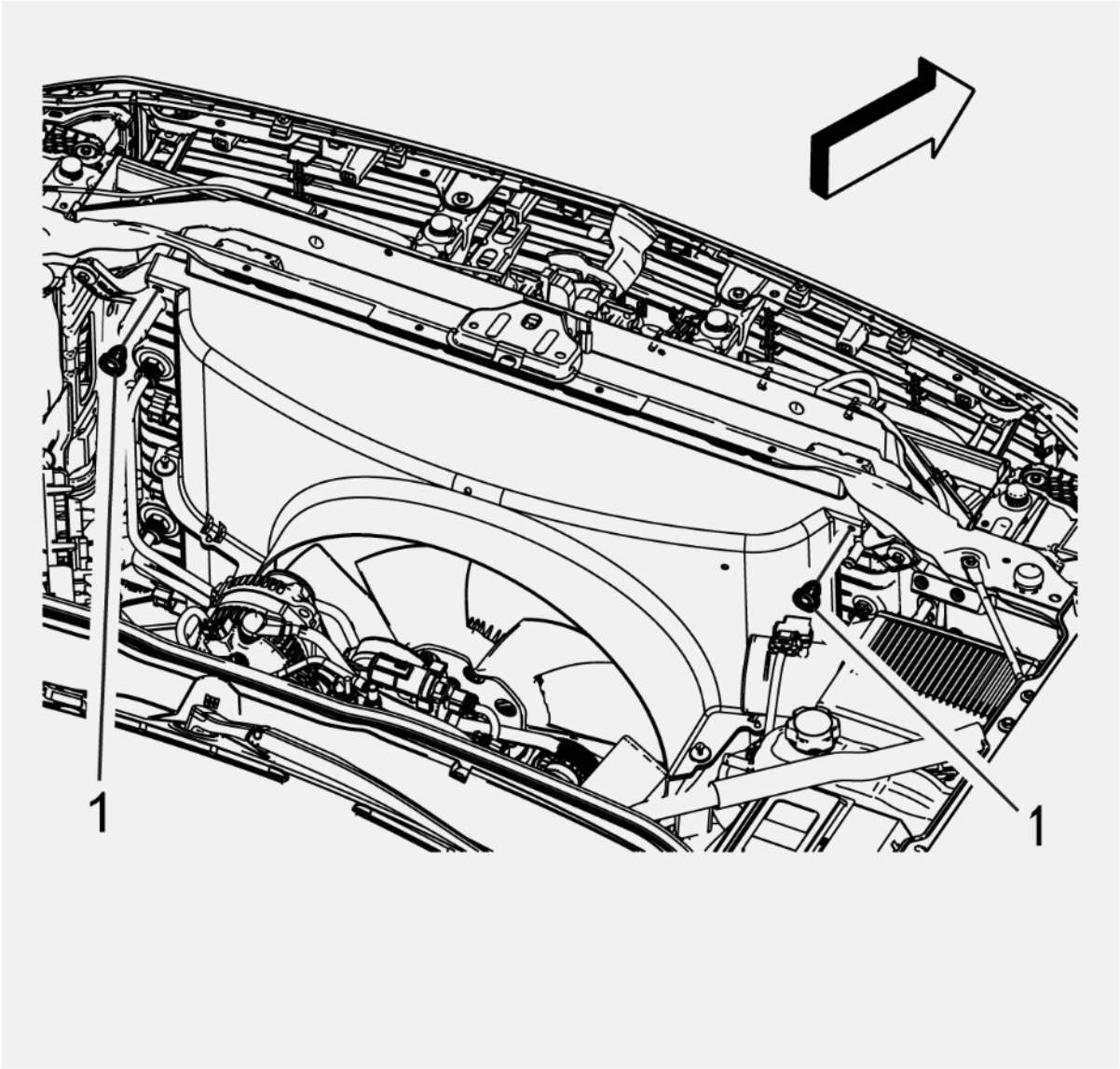

Fig. 462: Engine Coolant Fan Upper Shroud Retainers
Courtesy of GENERAL MOTORS COMPANY

3. Install the engine coolant fan upper shroud retainers (1).

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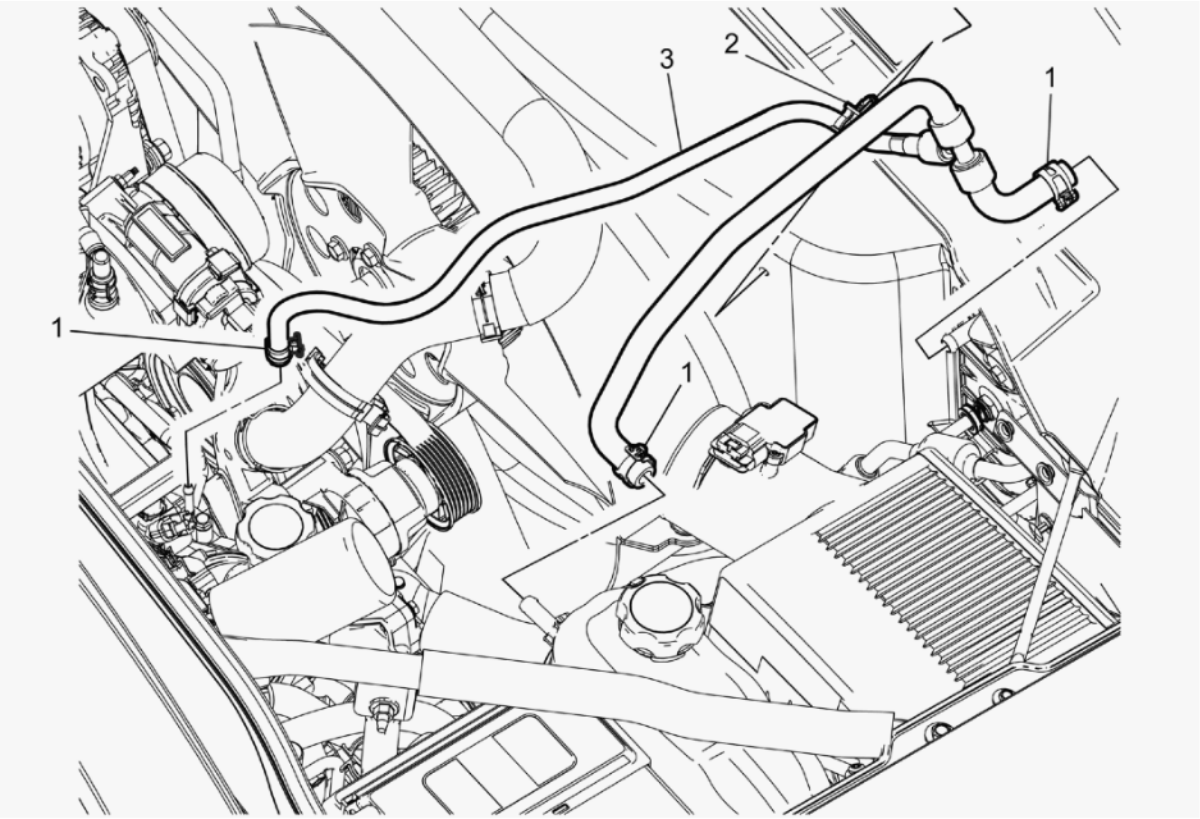

Fig. 463: Radiator Surge Tank Inlet Hose And Retainer
Courtesy of GENERAL MOTORS COMPANY

4. Install the radiator surge tank inlet hose (3) to the radiator and the radiator surge tank inlet hose retainer (2) to the engine coolant fan upper shroud. Refer to **Radiator Surge Tank Inlet Hose Replacement (LC8, L96)**.

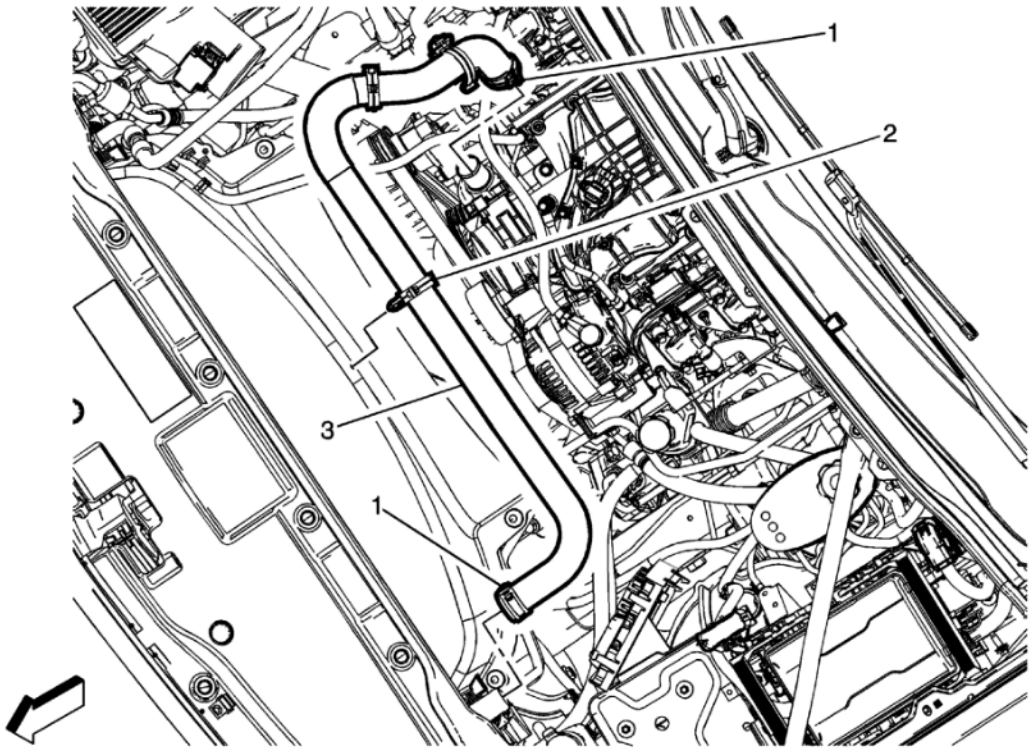

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Fig. 464: Radiator Inlet Hose And Retainer (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

5. Install the radiator inlet hose (3) to the radiator and the radiator inlet hose retainer (2) to the engine coolant fan upper shroud. Refer to **Radiator Inlet Hose Replacement (LC8, L96)**.
6. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

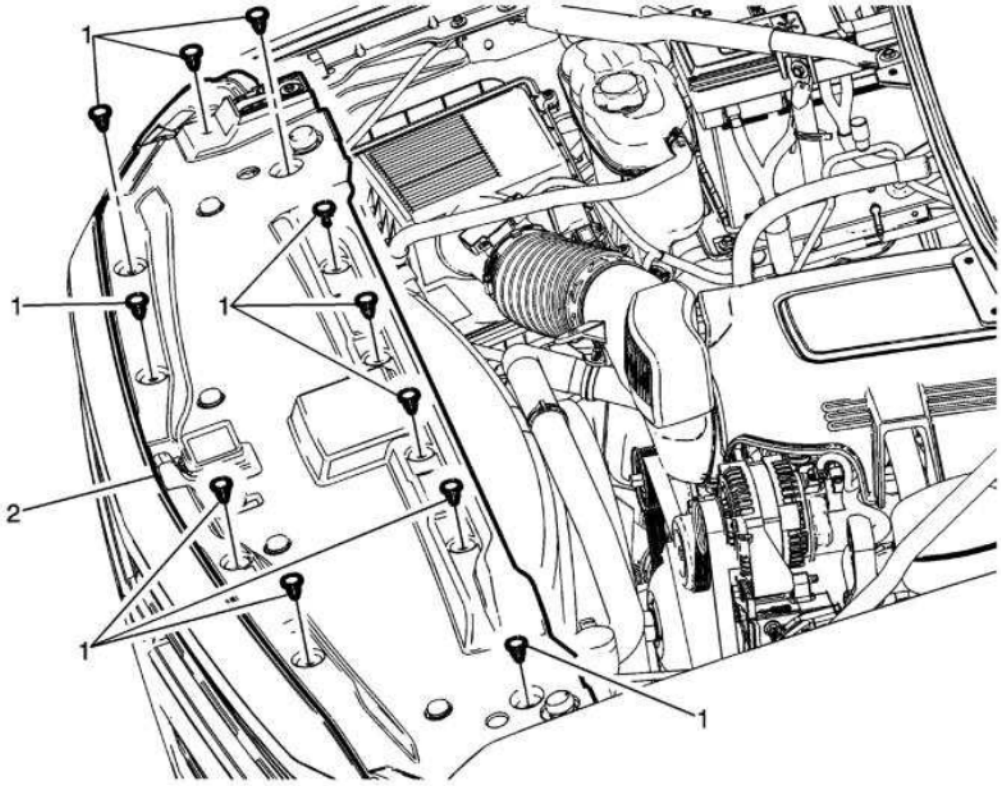

Fig. 465: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

7. Install the Front Compartment Front Sight Shield (2). Refer to **Front Compartment Front Sight Shield Replacement** .

ENGINE COOLANT FAN LOWER SHROUD REPLACEMENT (LC8, L96)

Removal Procedure

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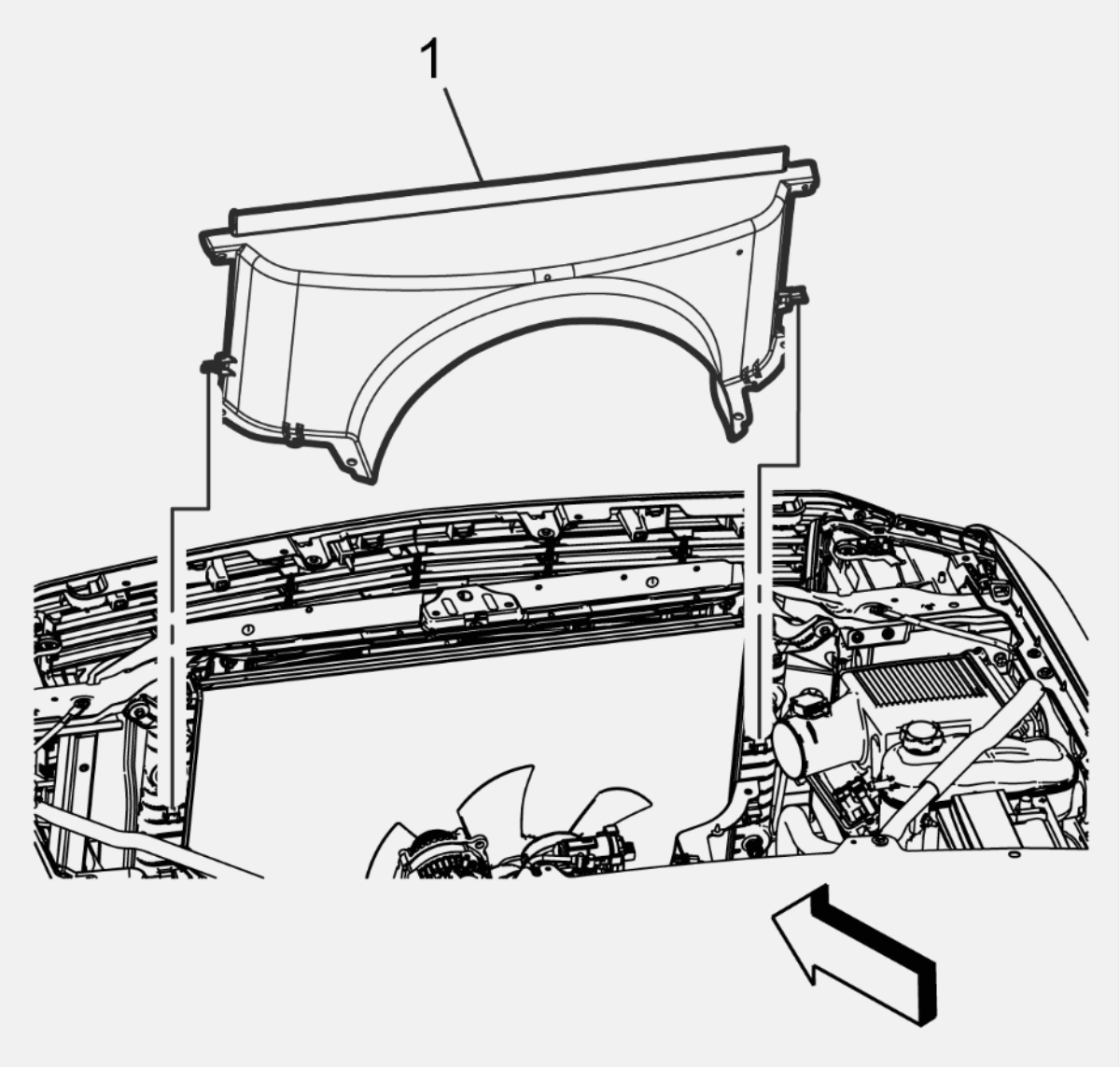

Fig. 466: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Remove the engine coolant fan upper shroud (1). Refer to **Engine Coolant Fan Upper Shroud Replacement (LC8, L96)**.

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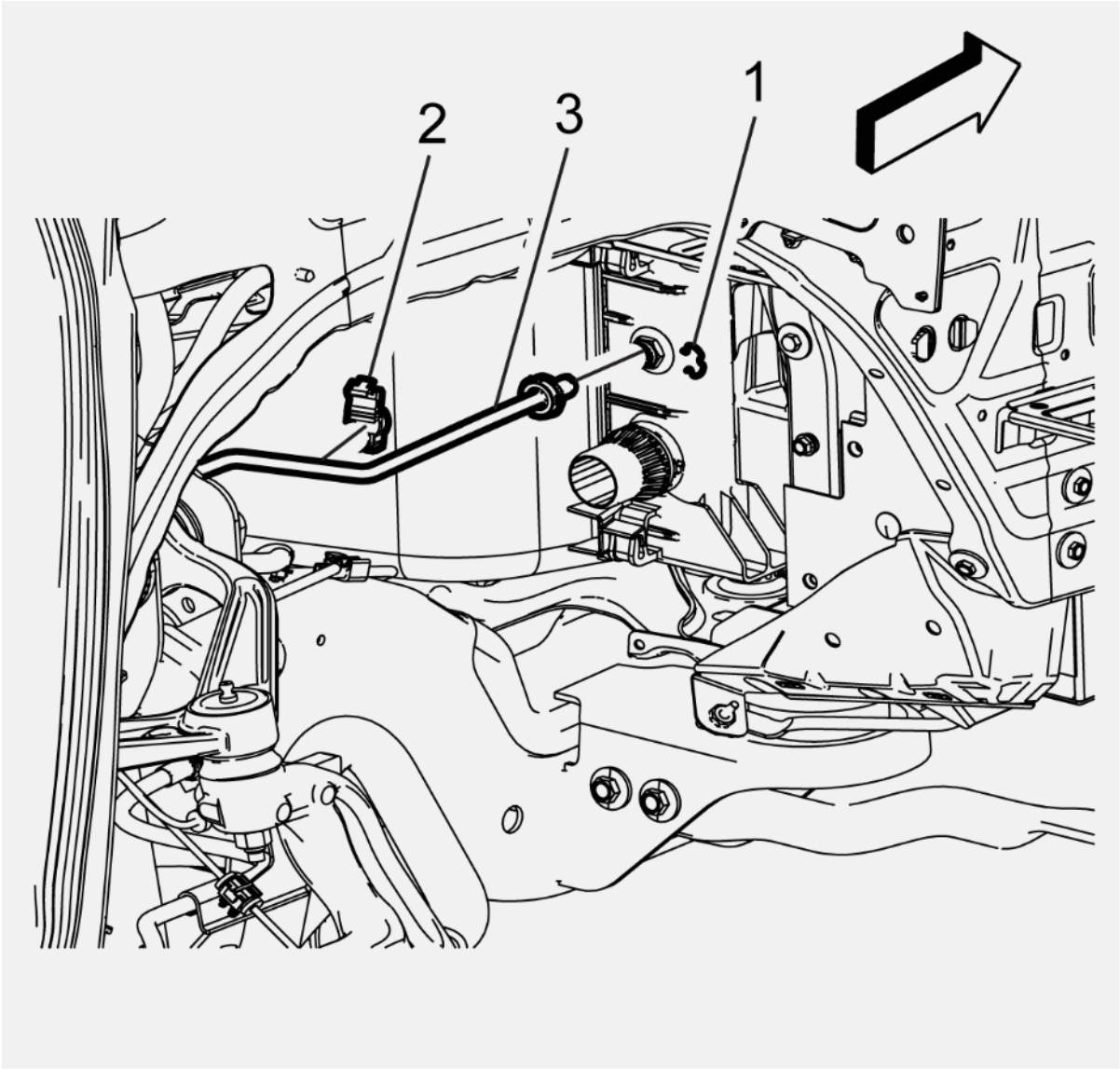

Fig. 467: Transmission Fluid Cooler Inlet And Outlet Pipe Retainer
Courtesy of GENERAL MOTORS COMPANY

2. Remove the transmission fluid cooler inlet and outlet pipe retainer (2) from the engine coolant fan lower shroud if equipped. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LC8, L96 with MYD)** .
3. If equipped with engine oil cooler, remove the engine oil cooler hose retainer from the coolant fan lower shroud. Refer to **Engine Oil Cooler Hose Replacement** .
4. Remove the fan blade and clutch. Refer to **Fan Blade Clutch Replacement (LC8, L96)**.

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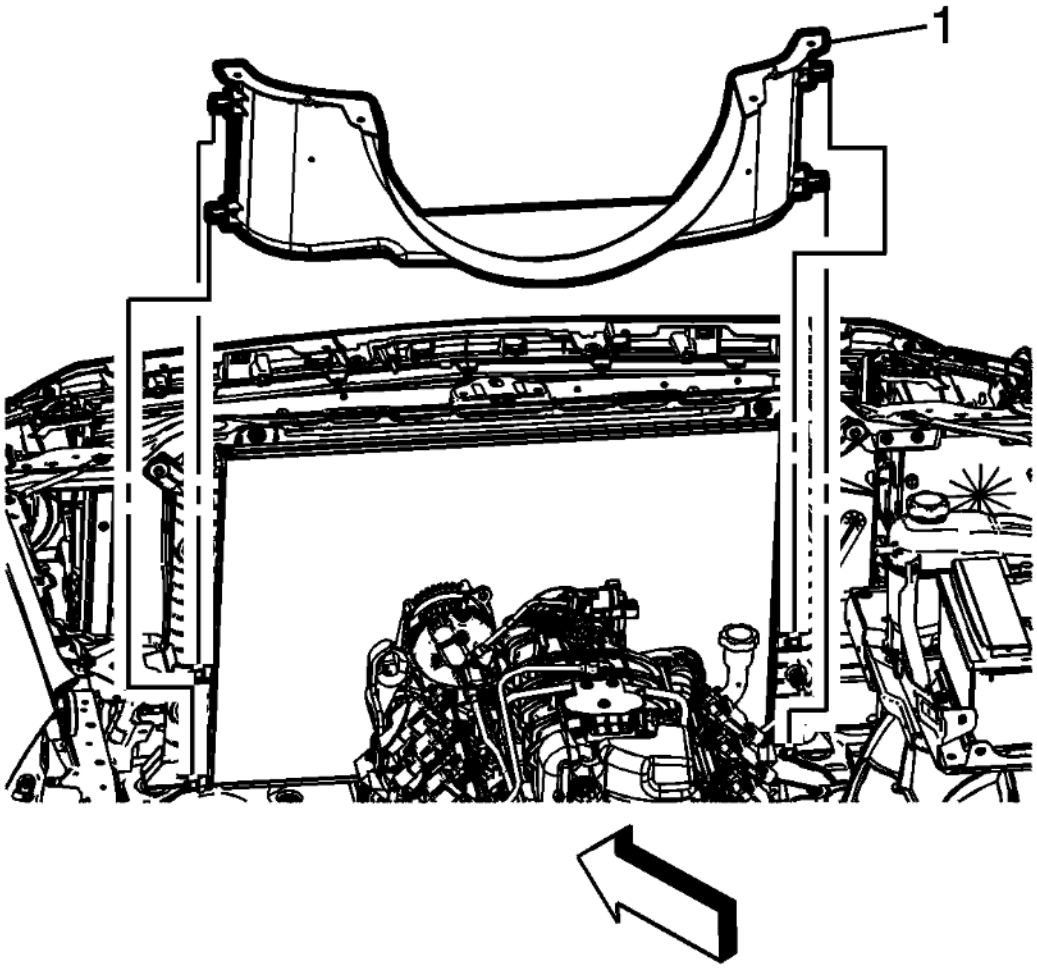

Fig. 468: Coolant Fan Lower Shroud
Courtesy of GENERAL MOTORS COMPANY

5. Lift the coolant fan lower shroud off the radiator and remove the coolant fan lower shroud from the vehicle.

Installation Procedure

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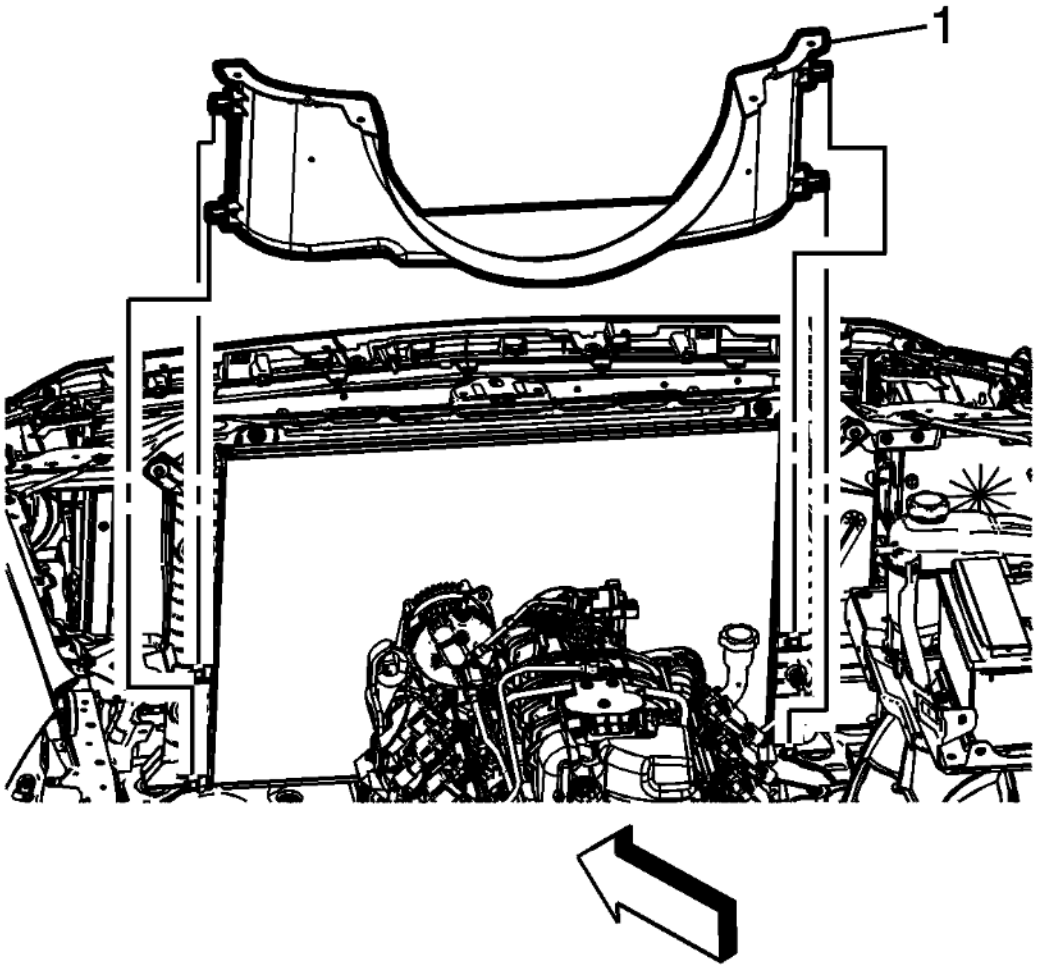

Fig. 469: Coolant Fan Lower Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Install the coolant fan lower shroud to the radiator.
2. Install the fan blade and clutch. Refer to **Fan Blade Clutch Replacement (LC8, L96)**.
3. If equipped with engine oil cooler, remove the engine oil cooler hose retainer from the coolant fan lower shroud. Refer to **Engine Oil Cooler Hose Replacement** .

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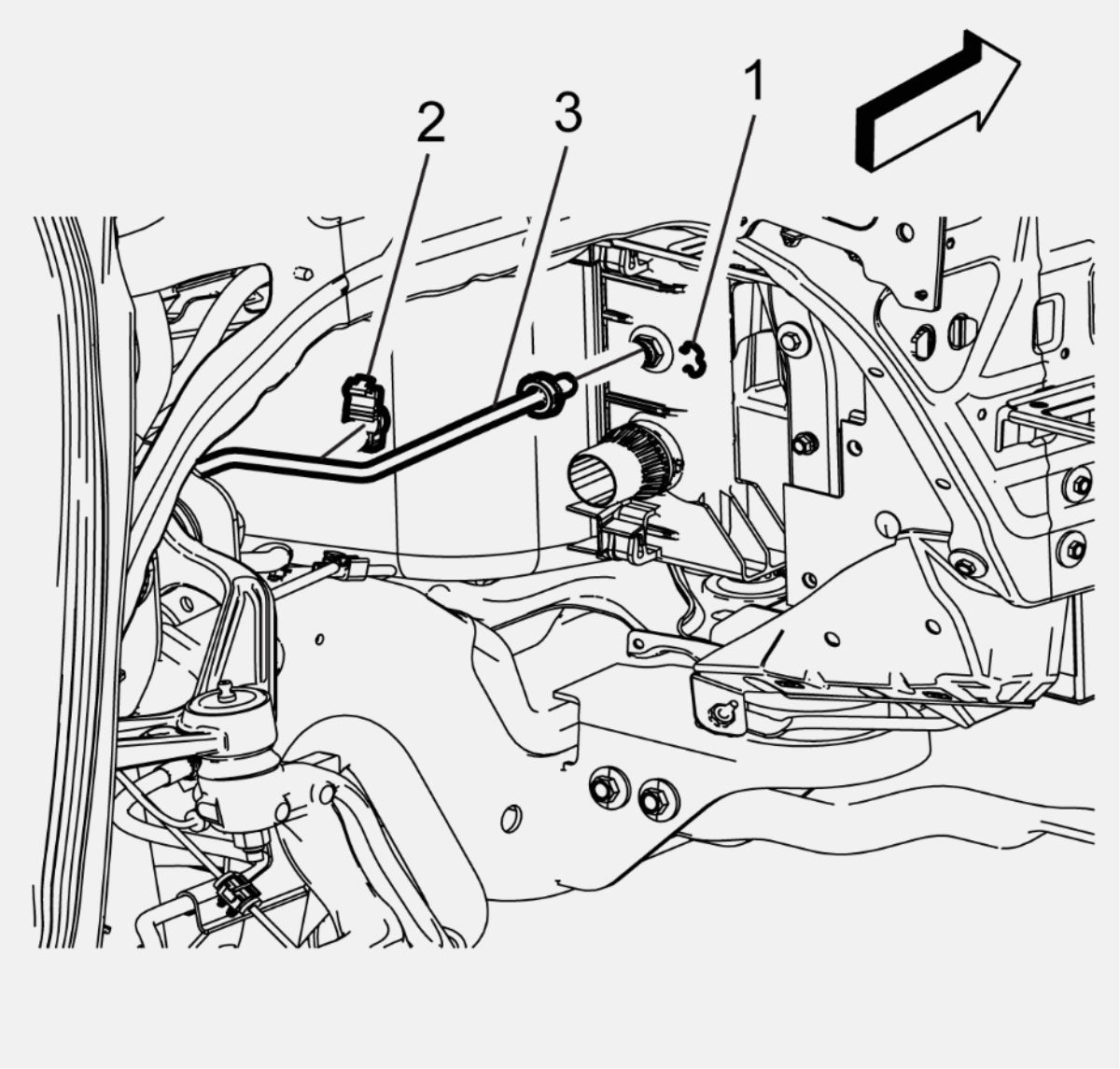

Fig. 470: Transmission Fluid Cooler Inlet And Outlet Pipe Retainer
Courtesy of GENERAL MOTORS COMPANY

4. Install the transmission fluid cooler inlet and outlet pipe retainer (2) to the engine coolant fan lower shroud if equipped. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LC8, L96 with MYD)** .

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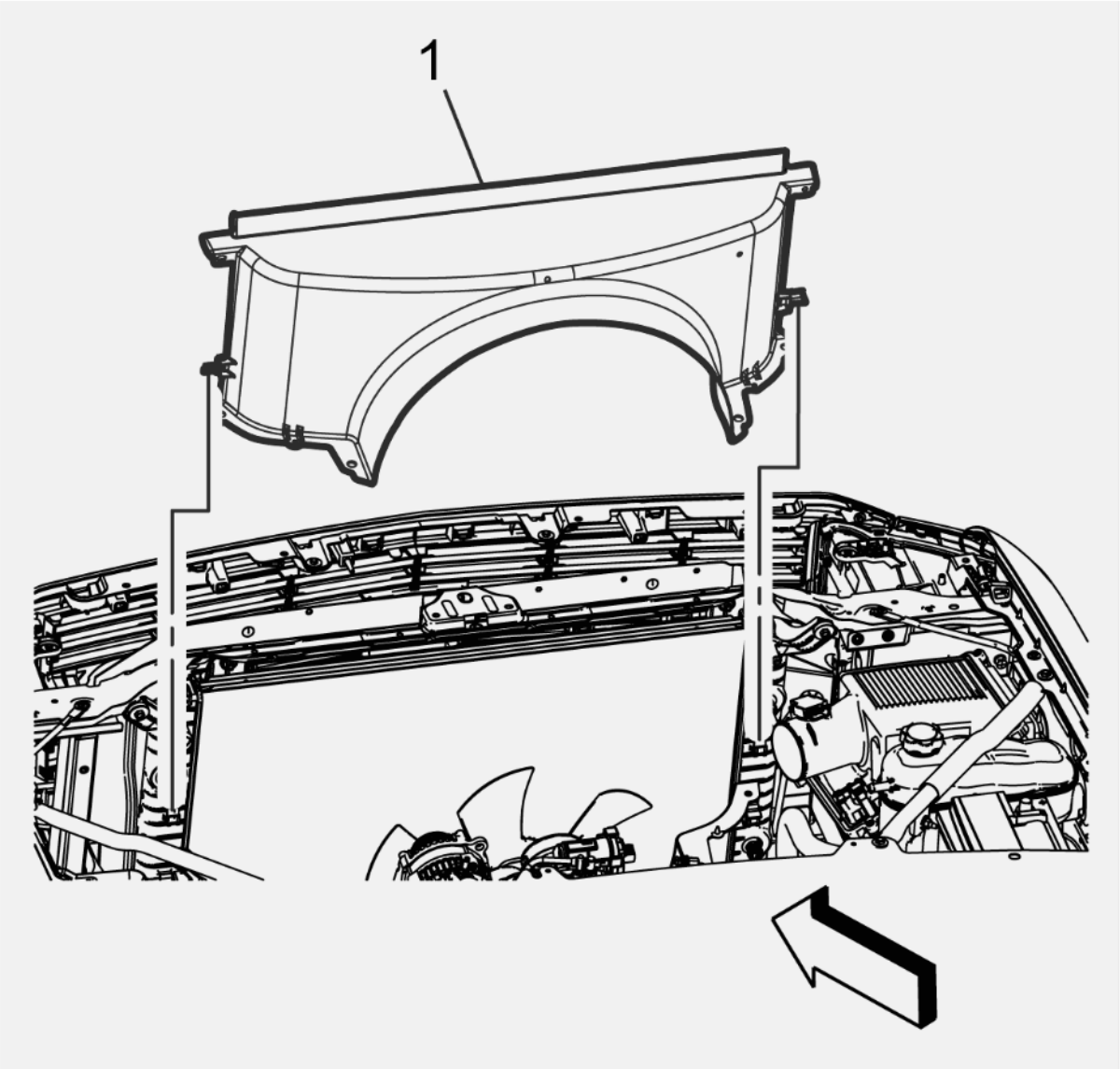

Fig. 471: Engine Coolant Fan Upper Shroud
Courtesy of GENERAL MOTORS COMPANY

5. Install the engine coolant fan upper shroud (1). Refer to **Engine Coolant Fan Upper Shroud Replacement (LC8, L96)**.

ENGINE COOLANT FAN REAR SHROUD REPLACEMENT (LV3)

Removal Procedure

1. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
2. Remove the front compartment side sight shield. Refer to **Front Compartment Front Sight Shield Replacement** .

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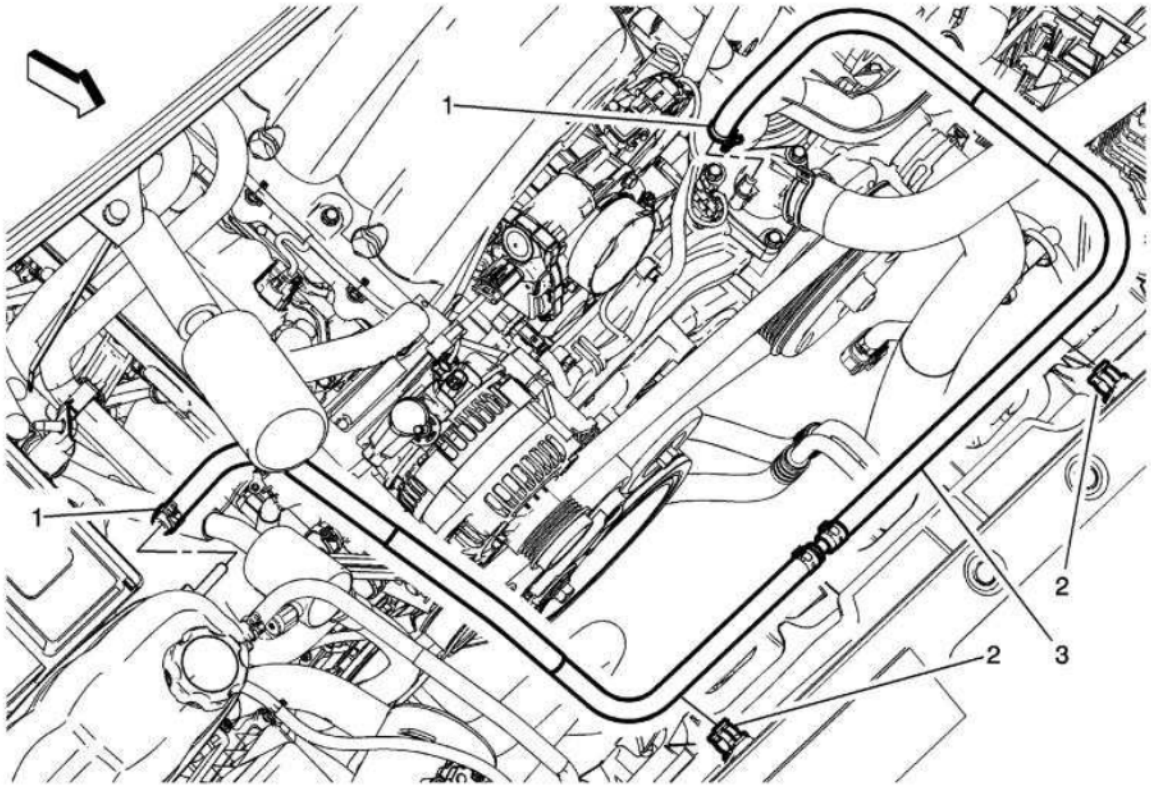

Fig. 472: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Unclip the radiator surge tank inlet hose (3) from the engine coolant fan rear shroud and reposition out of the way. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**.
4. Disconnect the electrical connectors from the engine coolant fans and reposition out of the way.
5. Unclip the electrical harness from the engine coolant fan rear shroud.

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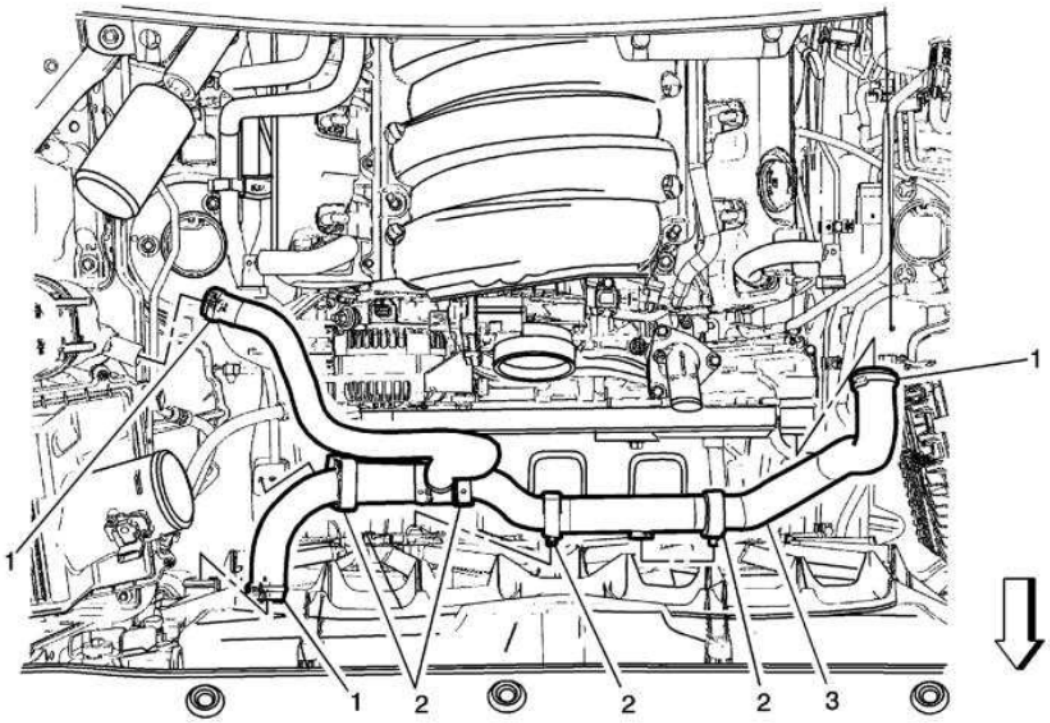

Fig. 473: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Unclip the radiator outlet hose retainers (2) from the engine coolant fan rear shroud. Refer to **Radiator Outlet Hose Replacement (LV3)**.
7. Remove the transmission fluid cooler inlet and outlet pipe from the radiator. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LV3)** .
8. Unclip the transmission fluid cooler inlet and outlet pipe from the engine coolant fan rear shroud.
9. Remove the engine oil cooler hose from the radiator. Refer to **Engine Oil Cooler Hose Replacement** .
10. Unclip the engine oil cooler hose from the engine coolant fan rear shroud.

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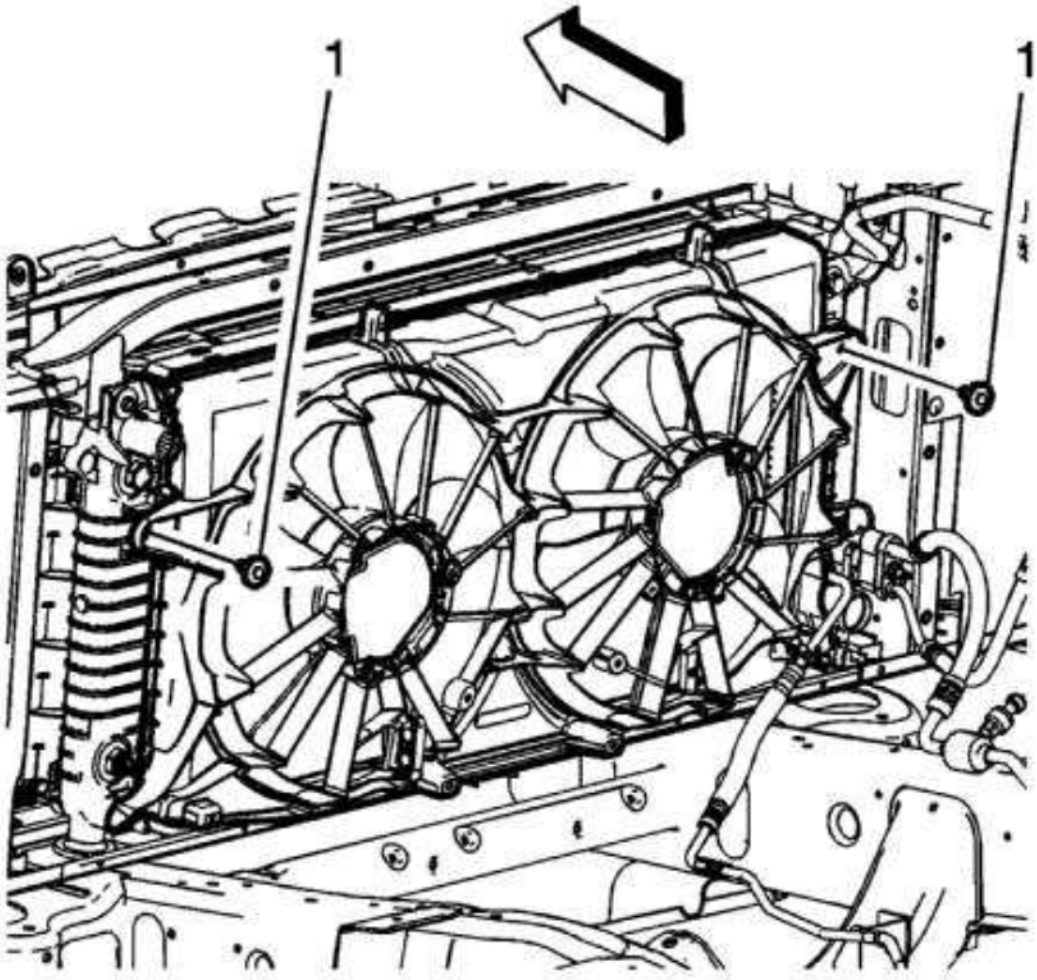

Fig. 474: Engine Coolant Fan Rear Shroud Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Remove the engine coolant fan rear shroud bolts (1).

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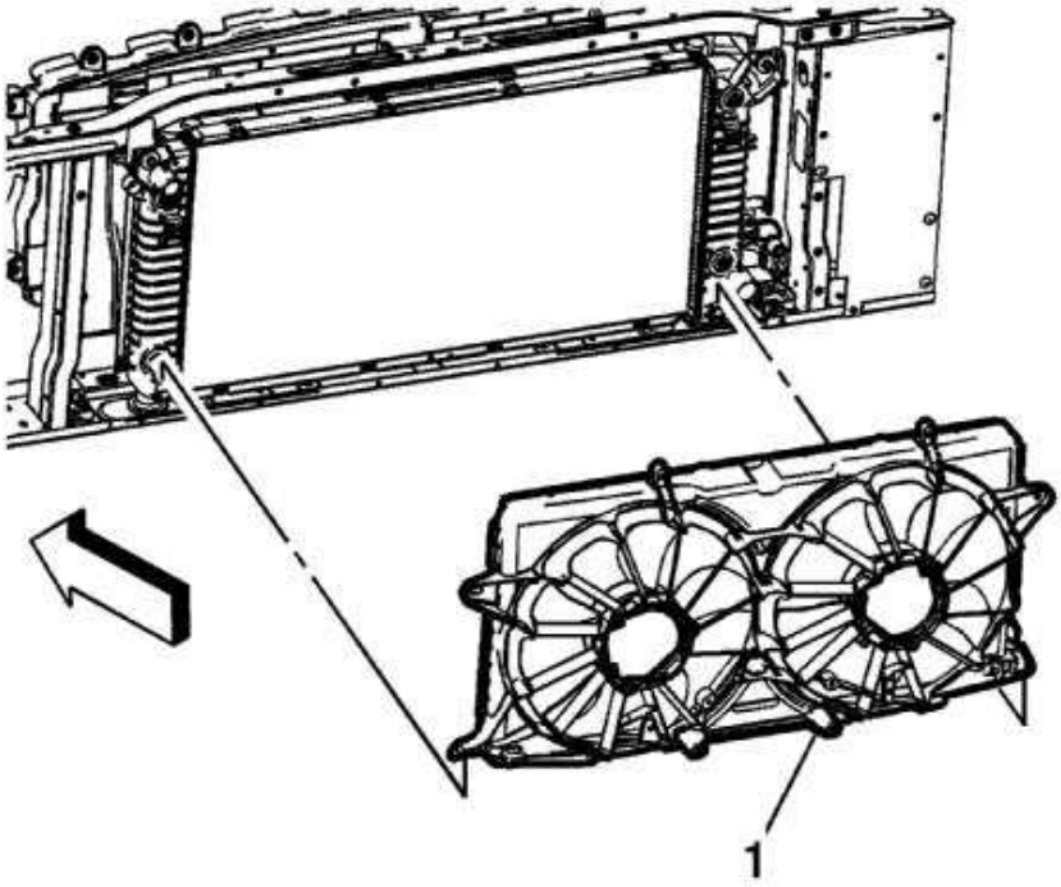

Fig. 475: Engine Coolant Fan Rear Shroud
Courtesy of GENERAL MOTORS COMPANY

12. Remove the engine coolant fan rear shroud (1) from the vehicle.

Installation Procedure

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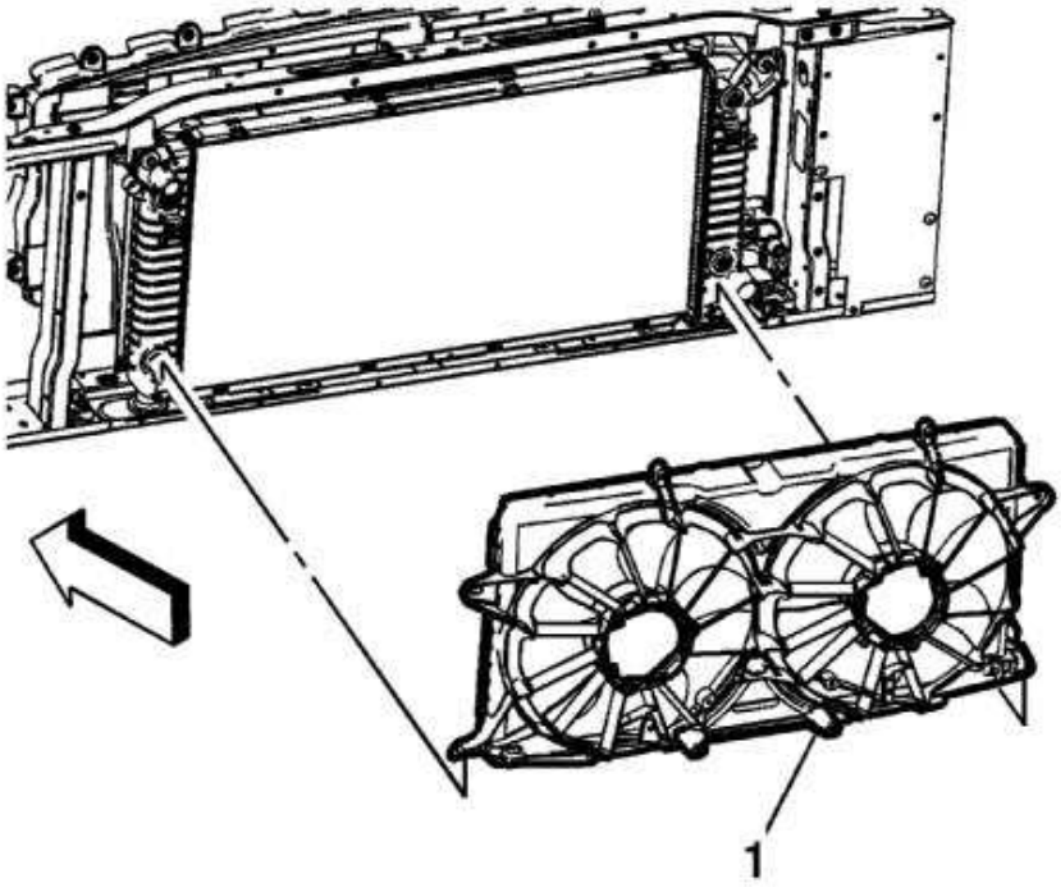

Fig. 476: Engine Coolant Fan Rear Shroud
Courtesy of GENERAL MOTORS COMPANY

1. Install the engine coolant fan rear shroud (1) to the vehicle.

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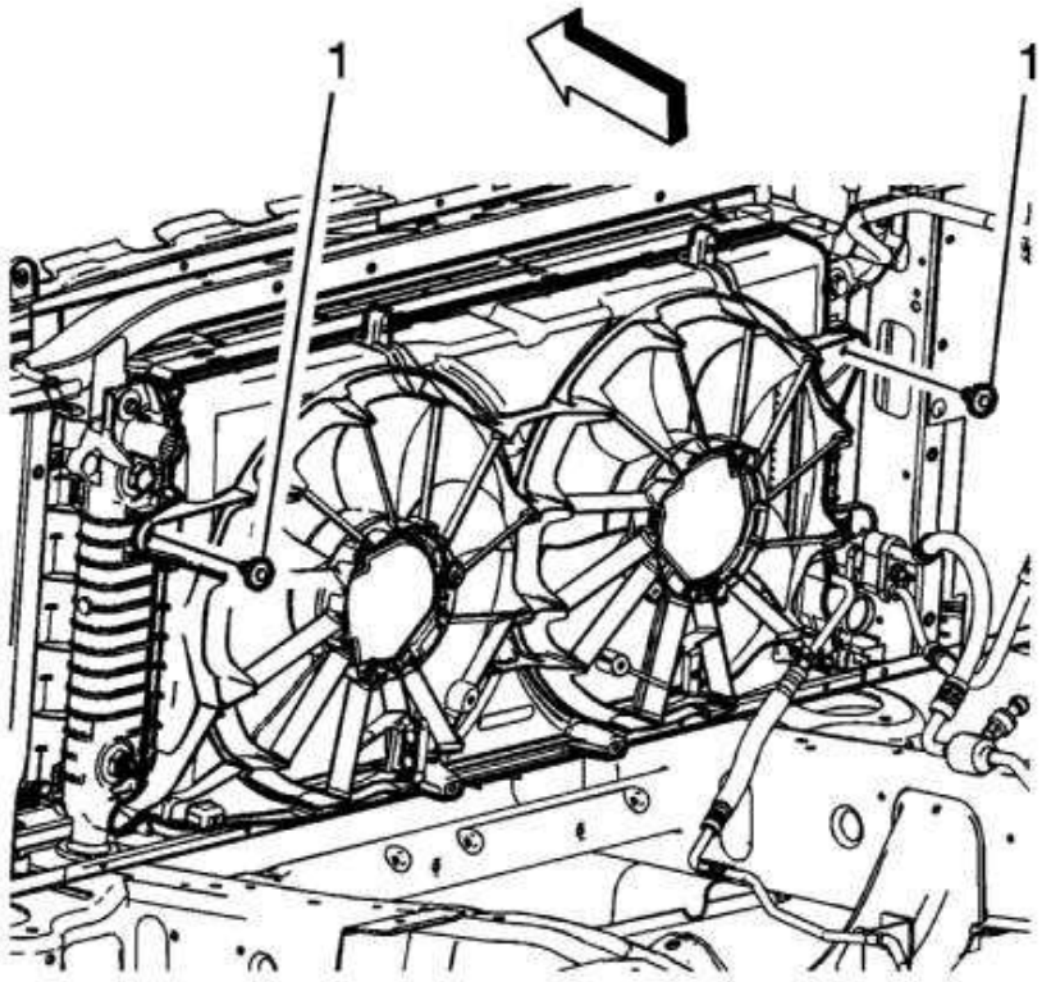

Fig. 477: Engine Coolant Fan Rear Shroud Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

2. Install the engine coolant fan rear fan shroud bolts (1) and tighten to 7 N.m (62 lb in).
3. Install the engine oil cooler hose to the radiator. Refer to **Engine Oil Cooler Hose Replacement** .
4. Install the engine oil cooler hose to the engine coolant fan rear shroud.
5. Install the transmission fluid cooler inlet and outlet pipe to the radiator. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LV3)** .
6. Install the transmission fluid cooler inlet and outlet pipe to the engine coolant fan rear shroud.

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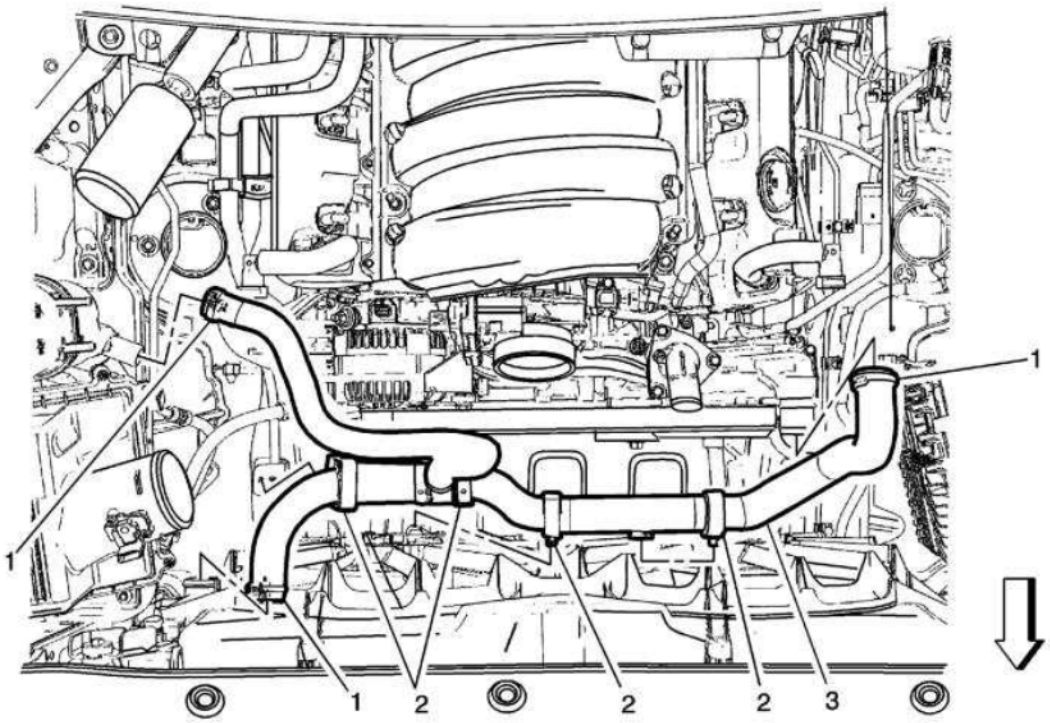

Fig. 478: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

7. Install the radiator outlet hose retainers (2) to the engine coolant fan rear shroud. Refer to **Radiator Outlet Hose Replacement (LV3)**.
8. Install the electrical harness to the engine coolant fan rear shroud.
9. Connect the electrical connectors to the engine coolant fans.

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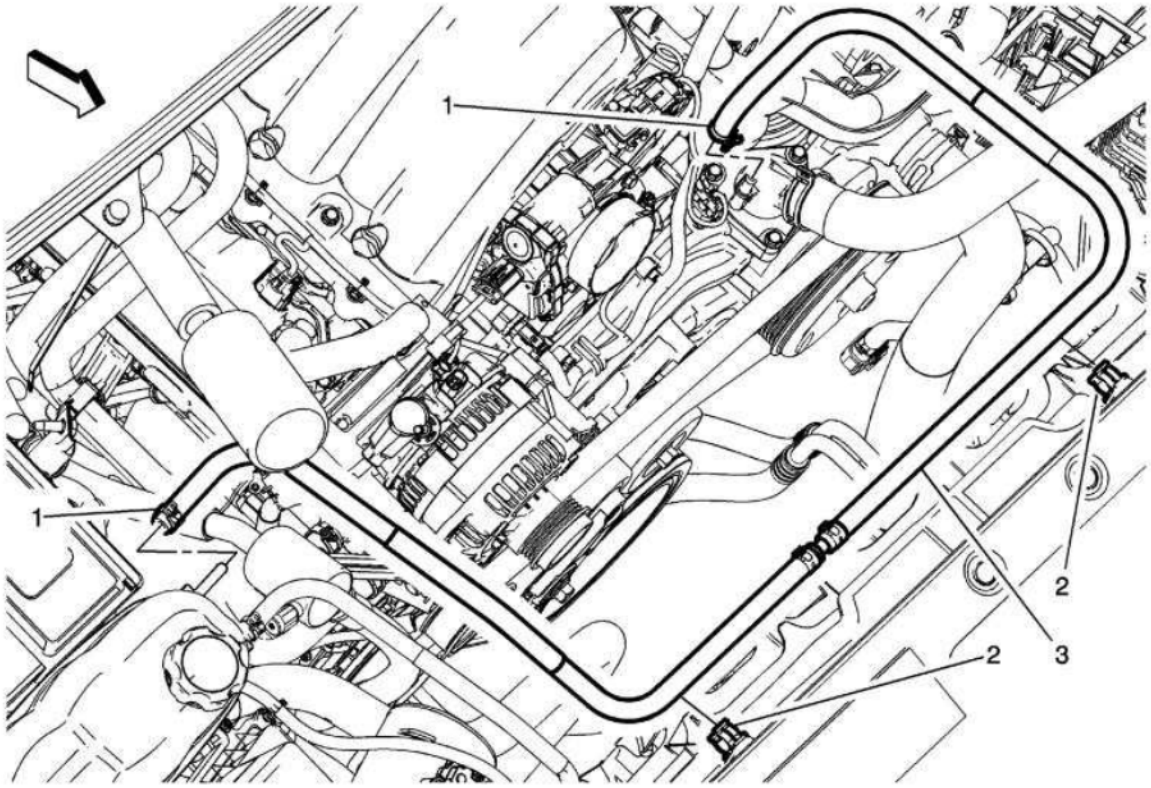

Fig. 479: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

10. Install the radiator surge tank inlet hose (3) to the engine coolant fan rear shroud. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**.
11. Install the front compartment side sight shield. Refer to **Front Compartment Front Sight Shield Replacement** .
12. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

ENGINE COOLANT FAN REAR SHROUD REPLACEMENT (L83, L86)

Removal Procedure

1. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
2. Remove the front compartment front sight shield. Refer to **Front Compartment Front Sight Shield Replacement** .

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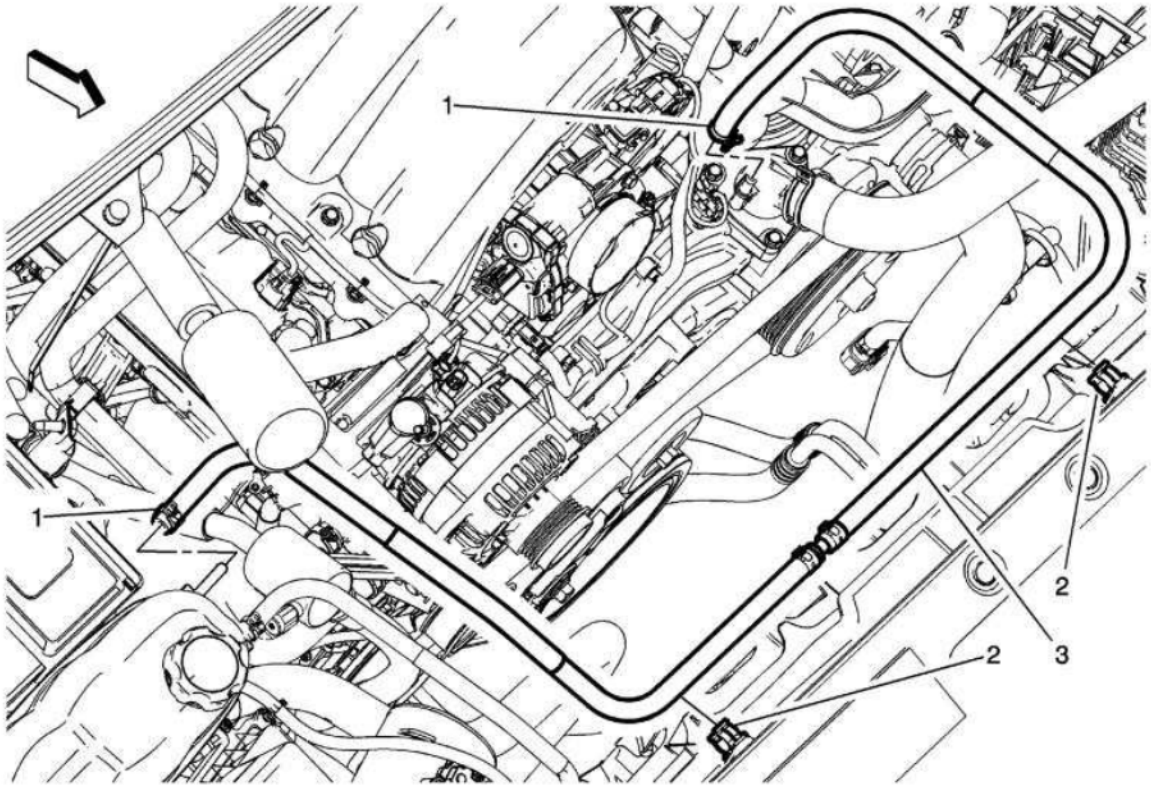

Fig. 480: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Unclip the radiator surge tank inlet hose (3) from the engine coolant fan rear shroud and reposition out of the way. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)**.
4. Disconnect the electrical connectors from the engine coolant fans and reposition out of the way.
5. Unclip the electrical harness from the engine coolant fan rear shroud.

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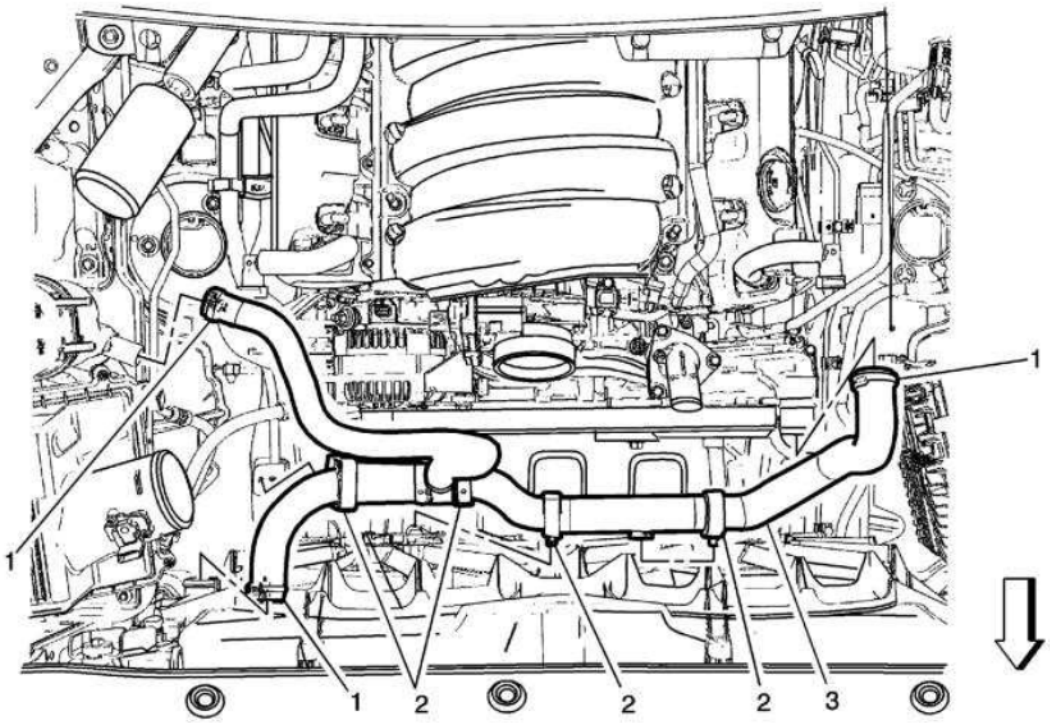

Fig. 481: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Unclip the radiator outlet hose retainers (2) from the engine coolant fan rear shroud.
7. Remove the transmission fluid cooler inlet and outlet pipe from the radiator.
8. Unclip the transmission fluid cooler inlet and outlet pipe from the engine coolant fan rear shroud.
9. Remove the engine oil cooler hose from the radiator. Refer to **Engine Oil Cooler Hose Replacement** .
10. Unclip the engine oil cooler hose from the engine coolant fan rear shroud.

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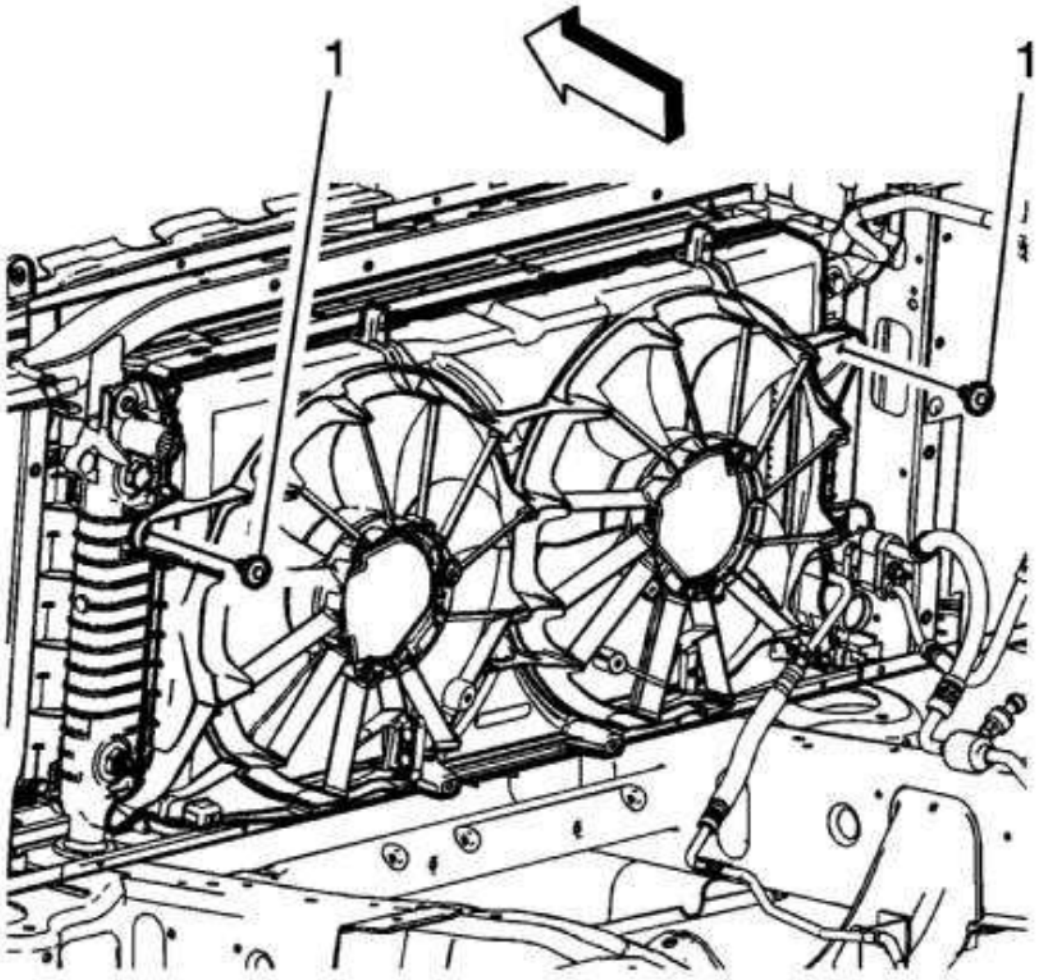

Fig. 482: Engine Coolant Fan Rear Shroud Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Remove the engine coolant fan rear shroud bolts (1).

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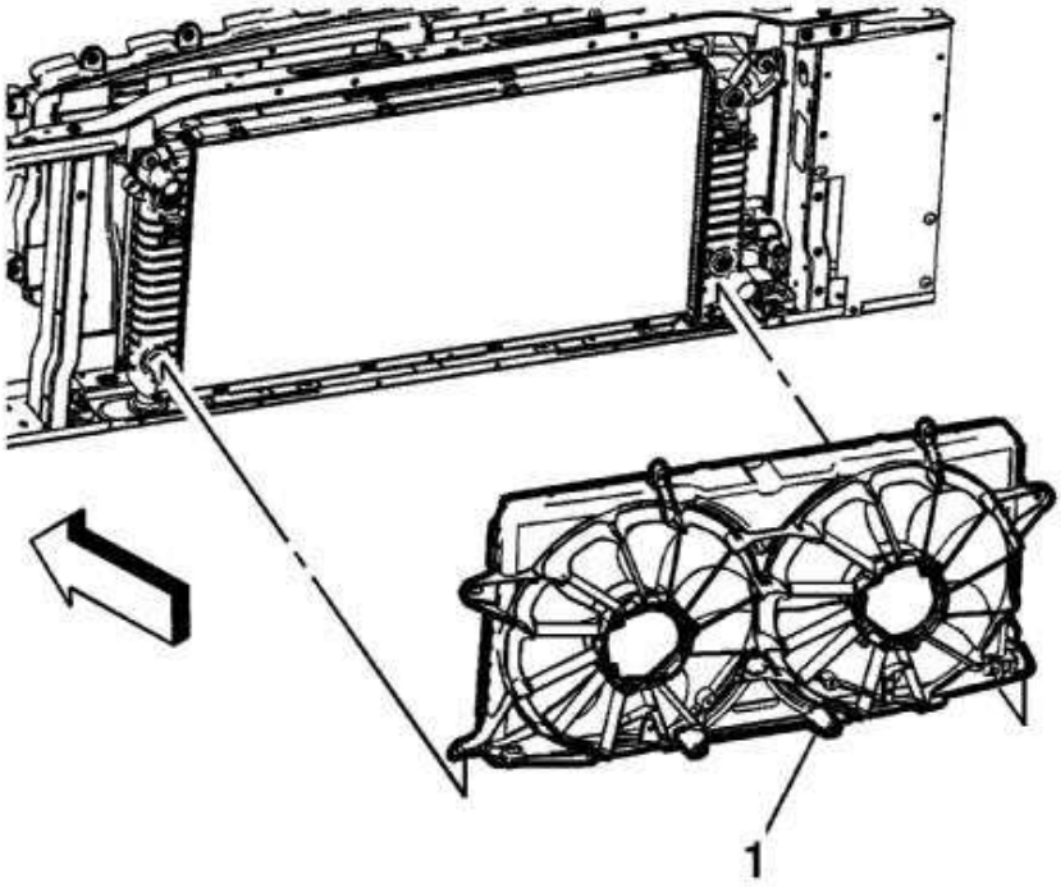

Fig. 483: Engine Coolant Fan Rear Shroud
Courtesy of GENERAL MOTORS COMPANY

12. Remove the engine coolant fan rear shroud (1) from the vehicle.

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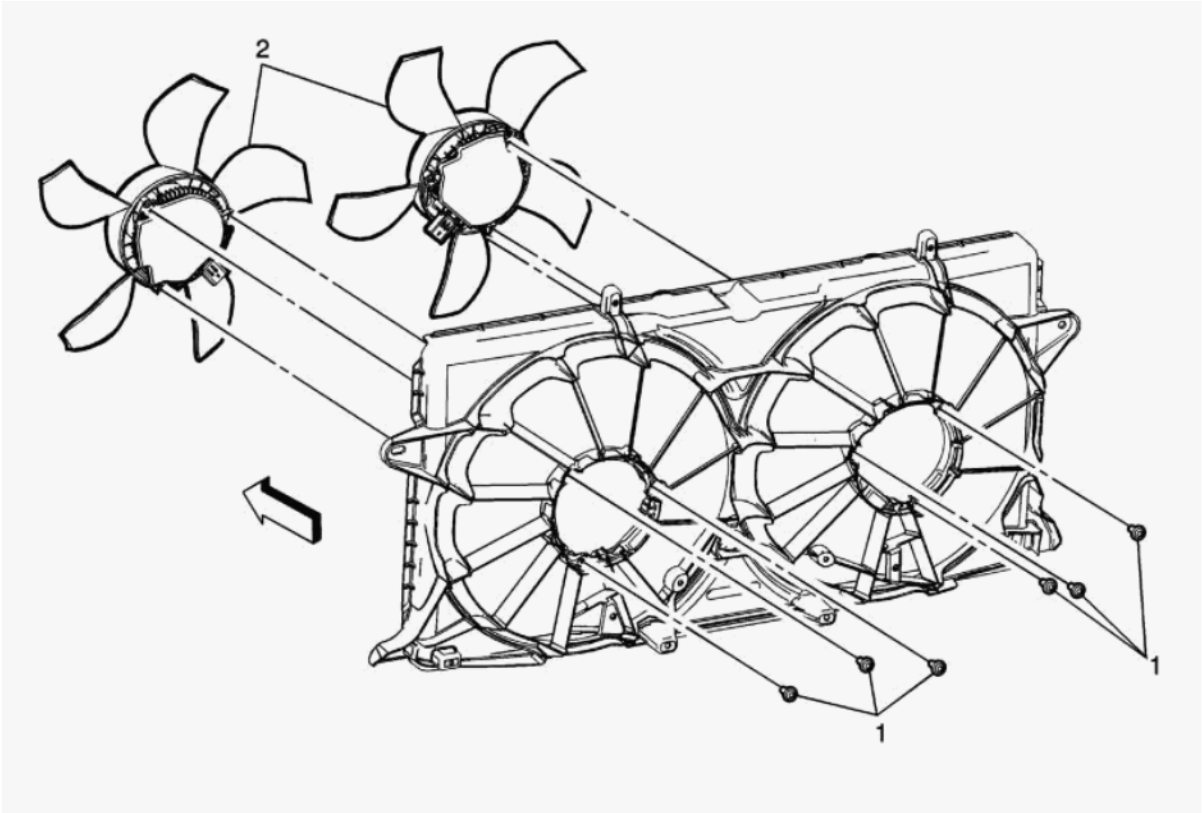

Fig. 484: Fan Blade (L83 L86)
Courtesy of GENERAL MOTORS COMPANY

13. Remove the engine coolant fan (2) from the engine coolant fan rear shroud. Refer to **Engine Coolant Fan Replacement (L83, L86,LV3)**.

Installation Procedure

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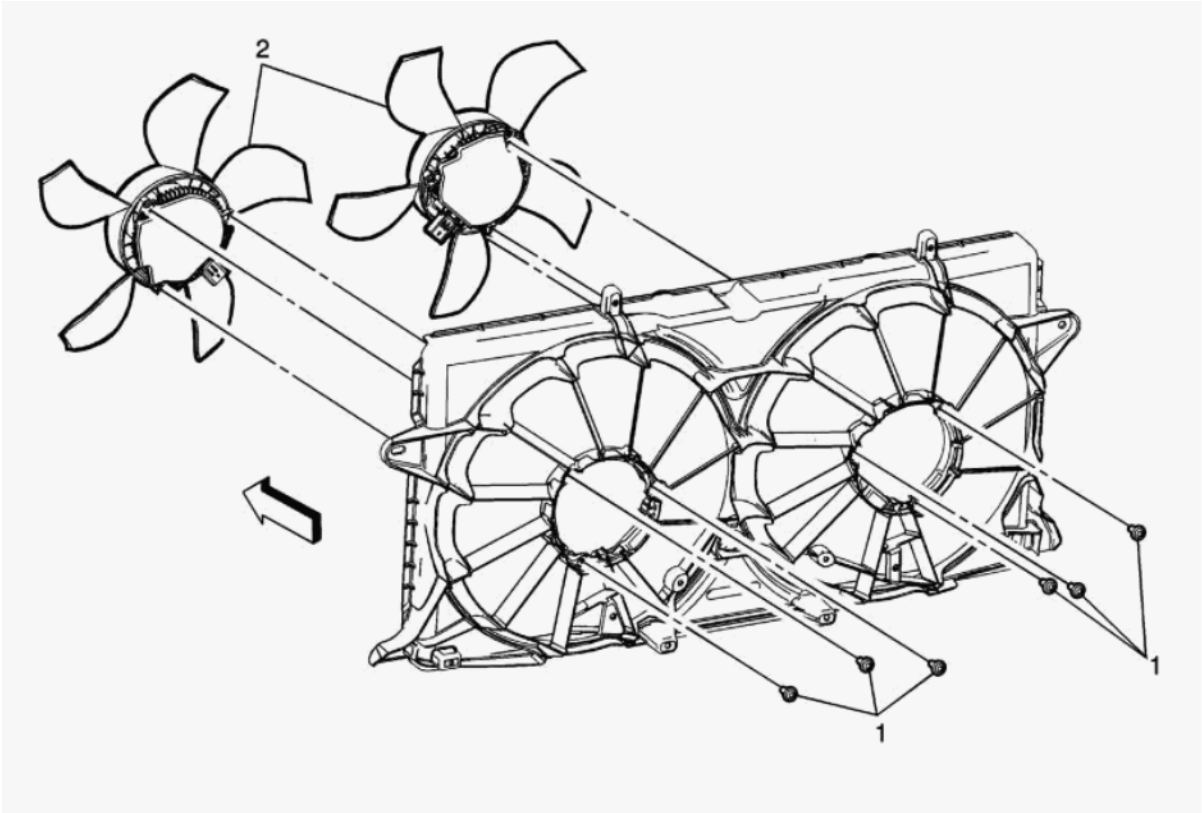

Fig. 485: Fan Blade (L83 L86)
Courtesy of GENERAL MOTORS COMPANY

1. Install the engine coolant fan (2) to the engine coolant fan rear shroud. Refer to **Engine Coolant Fan Replacement (L83, L86,LV3)**.

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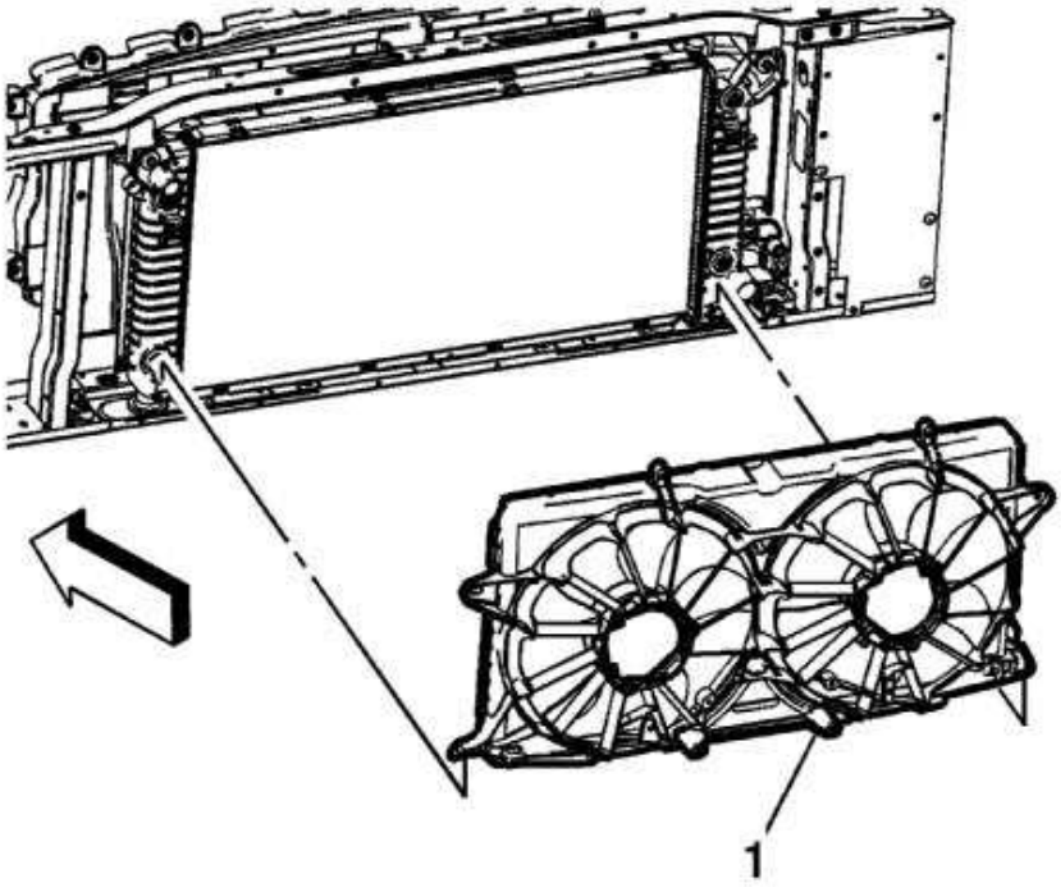

Fig. 486: Engine Coolant Fan Rear Shroud
Courtesy of GENERAL MOTORS COMPANY

2. Install the engine coolant fan rear shroud (1) to the radiator.

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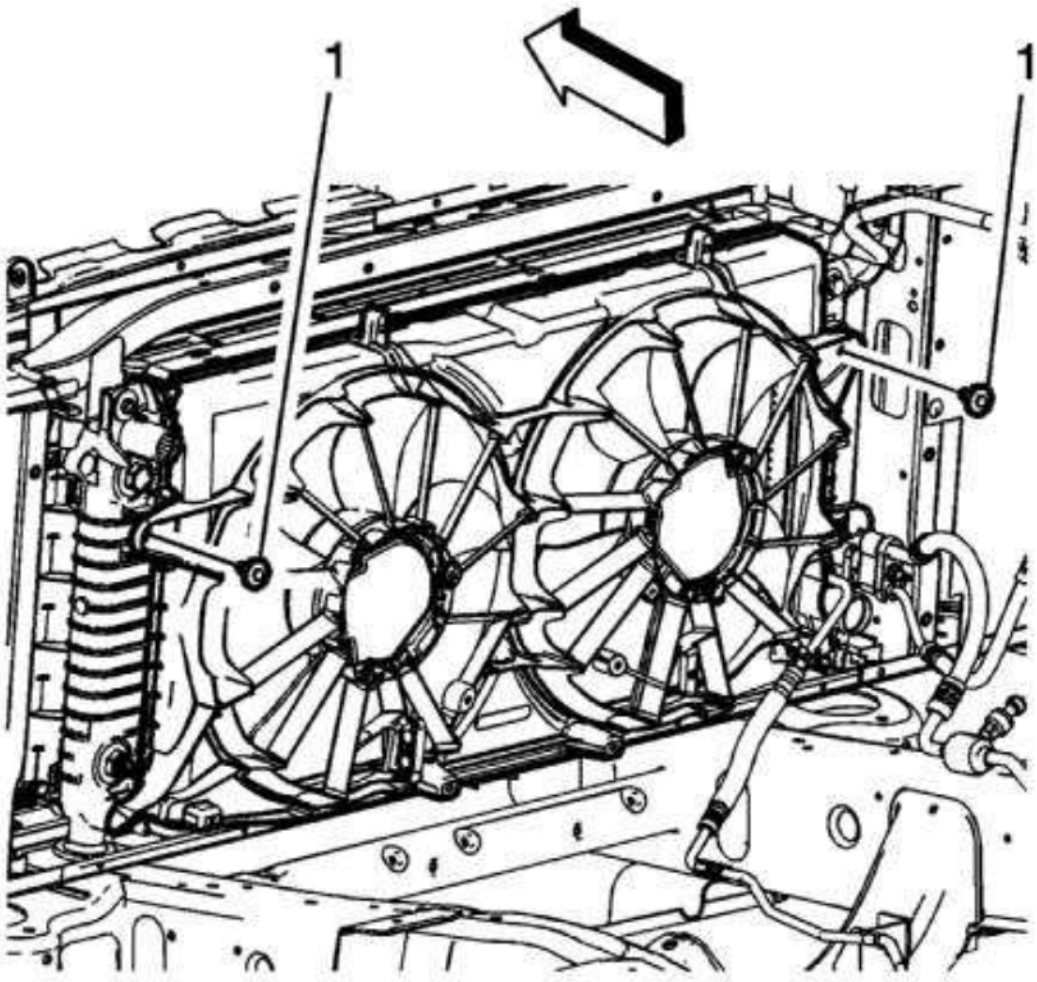

Fig. 487: Engine Coolant Fan Rear Shroud Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the engine coolant fan rear fan shroud bolts (1) and tighten to 7 N.m (62 lb in).
4. Install the engine oil cooler hose to the radiator. Refer to **Engine Oil Cooler Hose Replacement** .
5. Install the engine oil cooler hose to the engine coolant fan rear shroud.
6. Install the transmission fluid cooler inlet and outlet pipe to the radiator.
7. Install the transmission fluid cooler inlet and outlet pipe to the engine coolant fan rear shroud.

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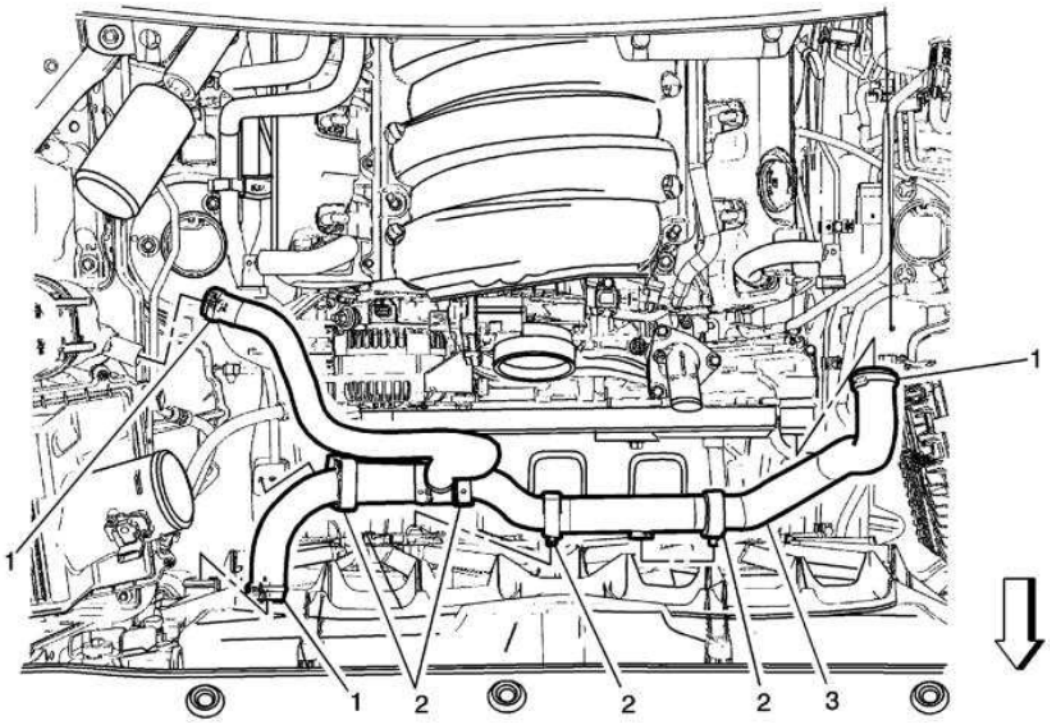

Fig. 488: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

8. Install the radiator outlet hose retainers (2) to the engine coolant fan rear shroud.
9. Connect the electrical connectors to the engine coolant fans.
10. Install the electrical harness to the engine coolant fan rear shroud.

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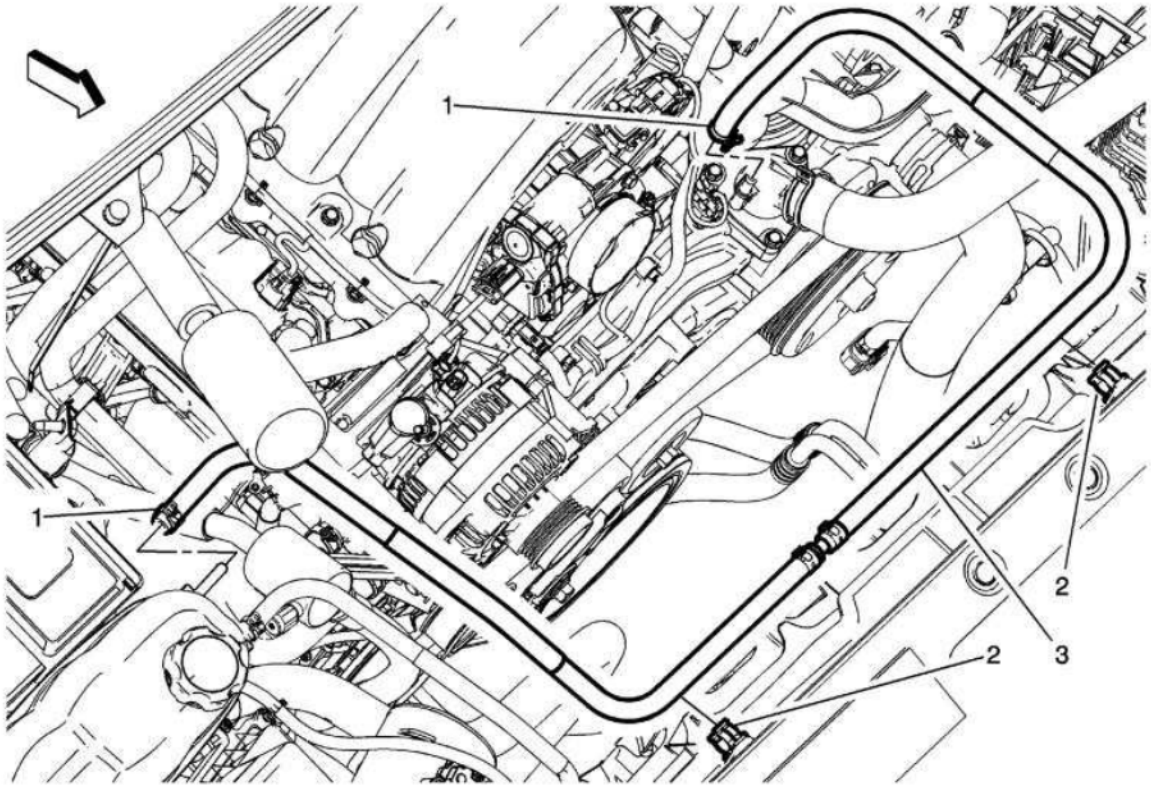

Fig. 489: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

11. Install the radiator surge tank inlet hose (3) to the engine coolant fan rear shroud. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)**.
12. Install the front compartment front sight shield. Refer to **Front Compartment Front Sight Shield Replacement** .
13. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

RADIATOR REPLACEMENT (LV3)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**.
2. Remove the engine coolant fan rear shroud. **Engine Coolant Fan Rear Shroud Replacement (LV3)**.

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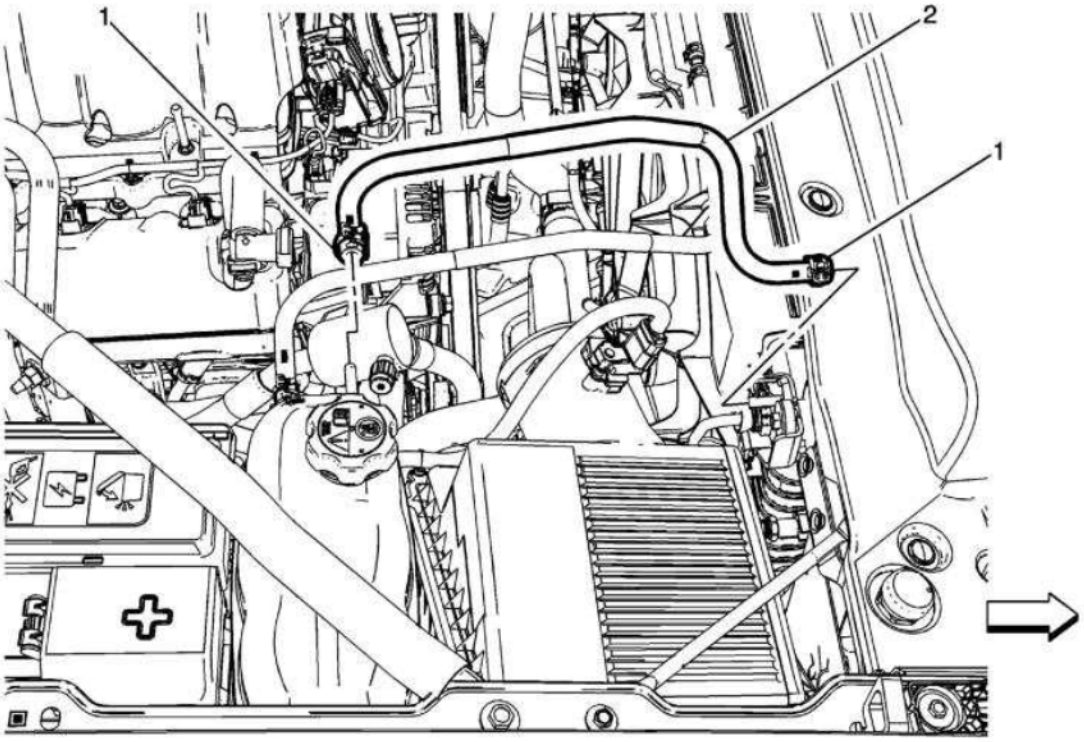

Fig. 490: Radiator Surge Tank Inlet Hose (Surge Tank To Radiator)
Courtesy of GENERAL MOTORS COMPANY

3. Remove the radiator surge tank inlet hose (2) from the radiator. **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**.

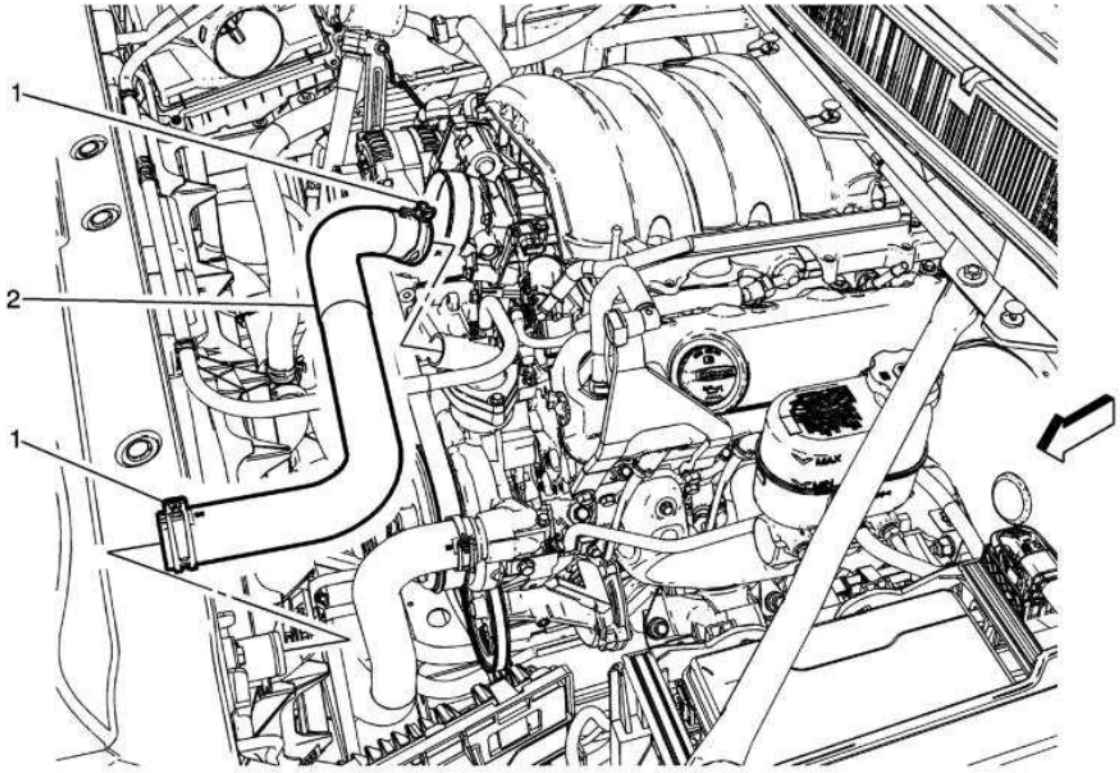

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Fig. 491: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator inlet hose (2) from the radiator. **Radiator Inlet Hose Replacement (LV3)**.

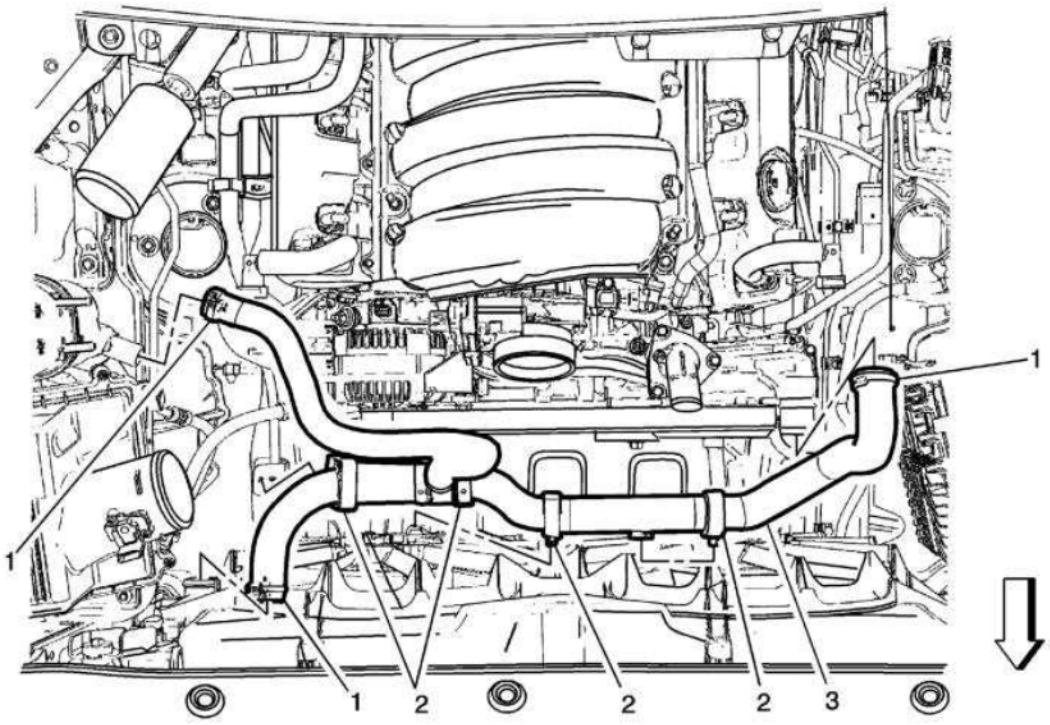

Fig. 492: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

5. Remove the radiator outlet hose (3) from the radiator. **Radiator Outlet Hose Replacement (LV3)**.

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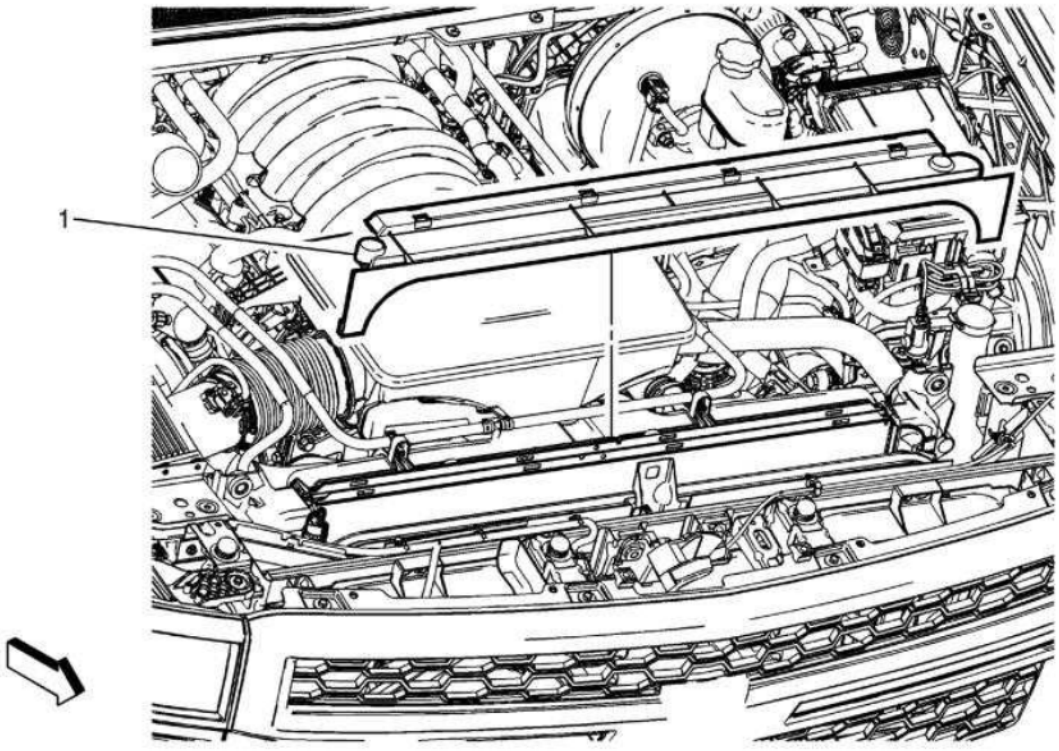

Fig. 493: Radiator Air Upper Baffle And Deflector (L83, L86, LV1, LV3)
Courtesy of GENERAL MOTORS COMPANY

6. Remove the radiator air upper baffle and deflector (1). **Radiator Air Upper Baffle and Deflector Replacement (L83, L86, LV3)**.

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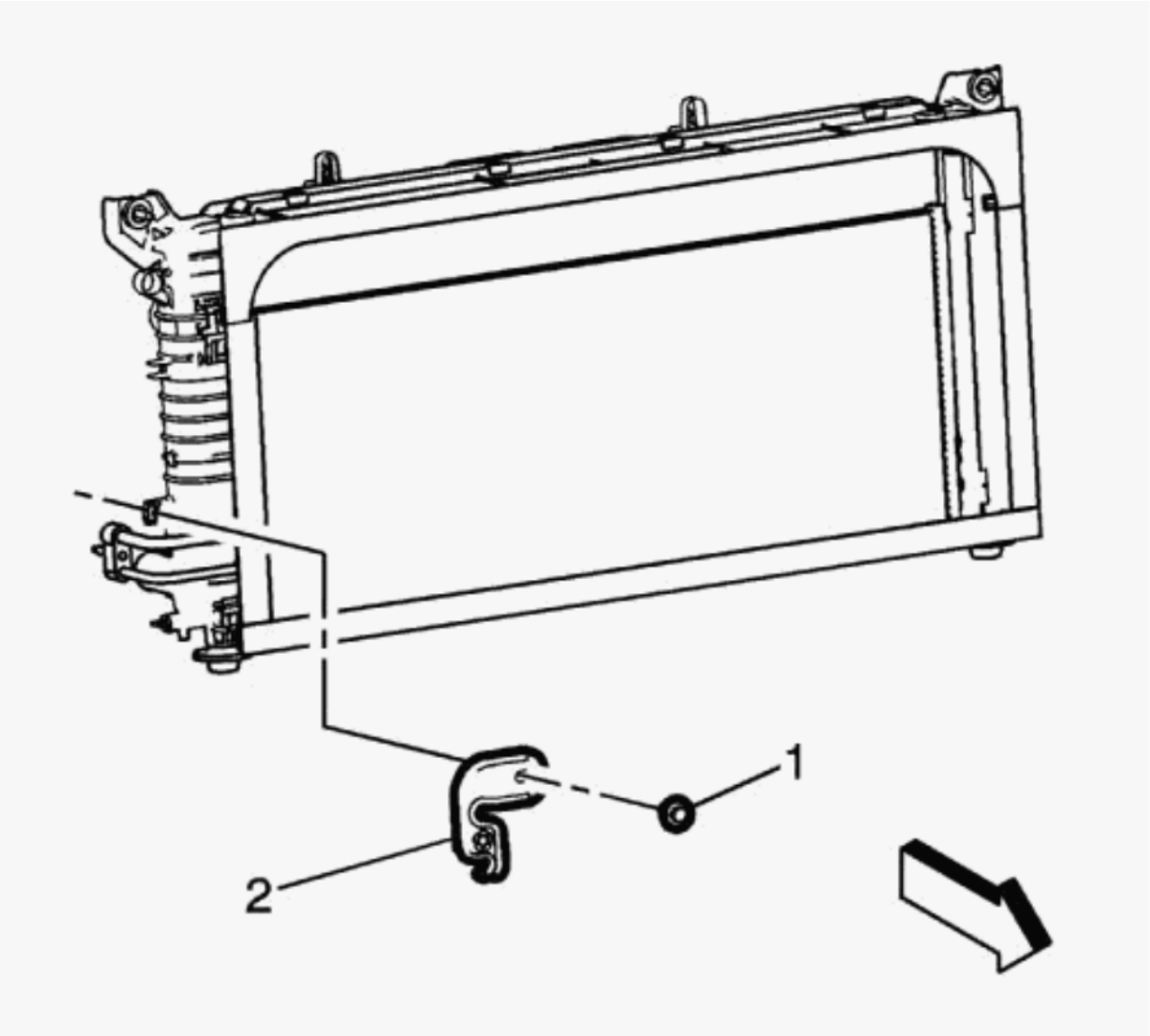

Fig. 494: Air Conditioning Condenser Bracket
Courtesy of GENERAL MOTORS COMPANY

7. Remove the air conditioning condenser bracket (2) from the radiator. **Air Conditioning Condenser Bracket Replacement (L83, L86, LV3)** .
8. Without disconnecting the air conditioning compressor and condenser hoses, depress the tabs and carefully lift the air conditioning condenser assembly off the radiator and position out of the way.

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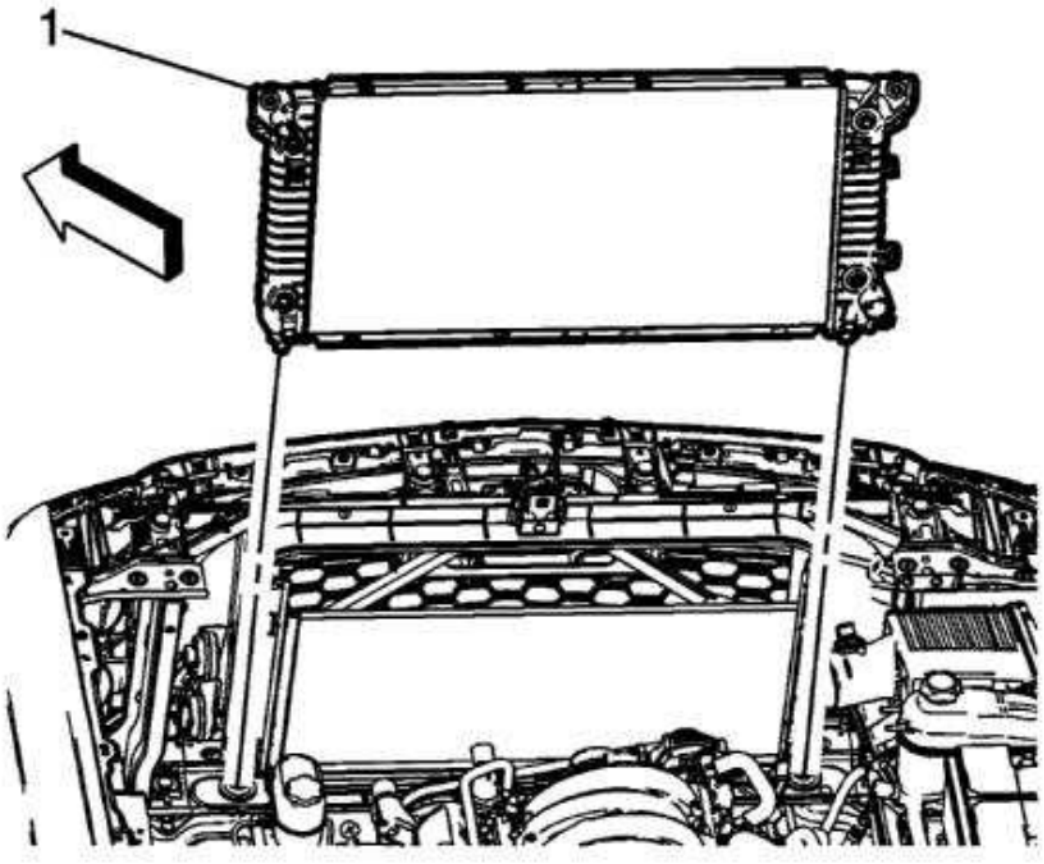

Fig. 495: Radiator
Courtesy of GENERAL MOTORS COMPANY

9. Tilt the radiator rearward and release the radiator air lower baffle retaining tabs from the radiator. **Radiator Air Lower Baffle Replacement (L83, L86, LV3)**.
10. Remove the radiator (1) from the vehicle.
11. If replacing the radiator transfer the components as necessary.

Installation Procedure

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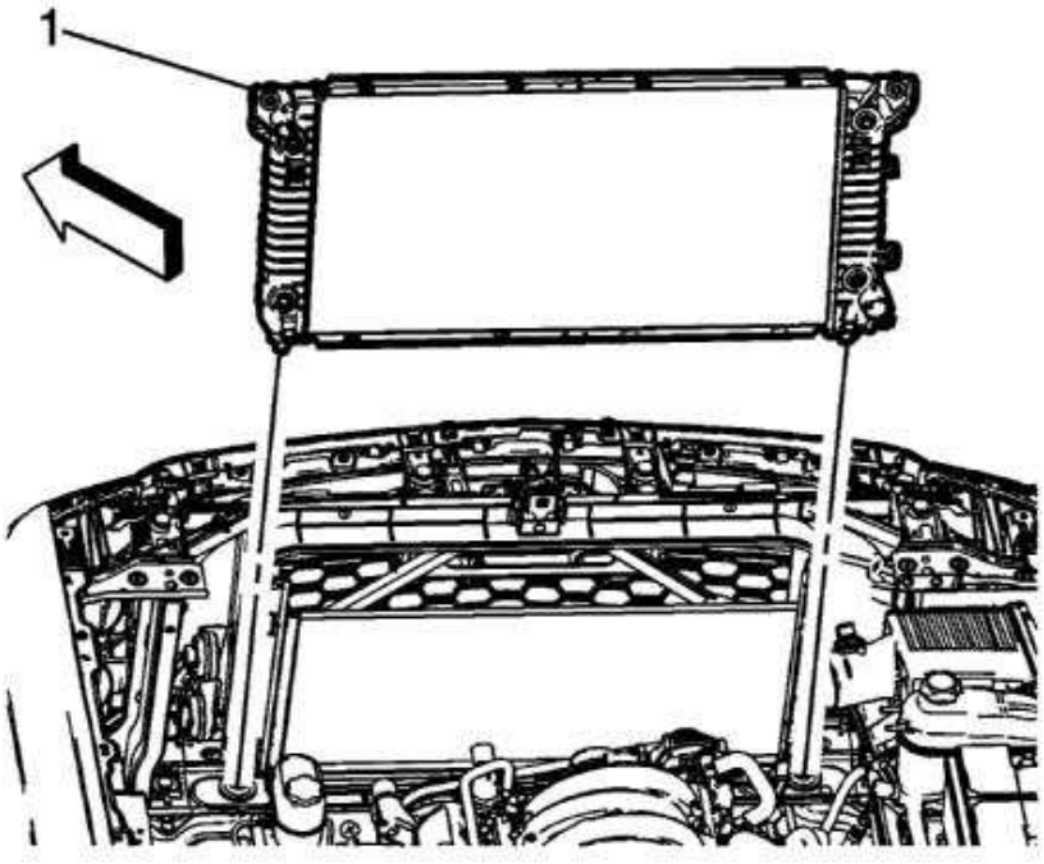

Fig. 496: Radiator
Courtesy of GENERAL MOTORS COMPANY

1. Install the radiator (1) to the vehicle.
2. Ensure the radiator air lower baffle retaining tabs are engaged to the radiator. **Radiator Air Lower Baffle Replacement (L83, L86, LV3)**.
3. Carefully install the air conditioning condenser assembly to the radiator.

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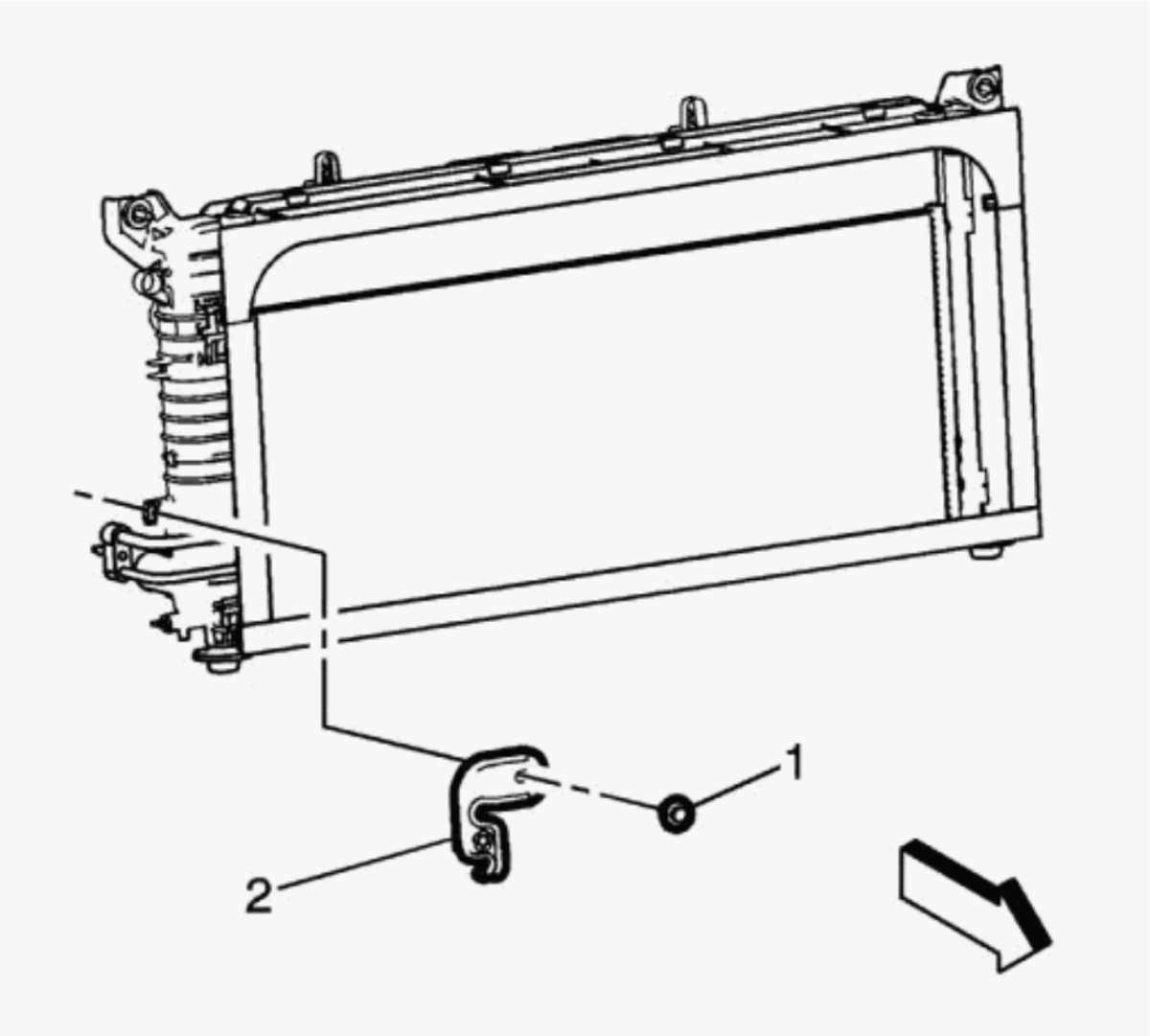

Fig. 497: Air Conditioning Condenser Bracket
Courtesy of GENERAL MOTORS COMPANY

4. Install the air conditioning condenser bracket (2) to the radiator. **Air Conditioning Condenser Bracket Replacement (L83, L86, LV3)** .

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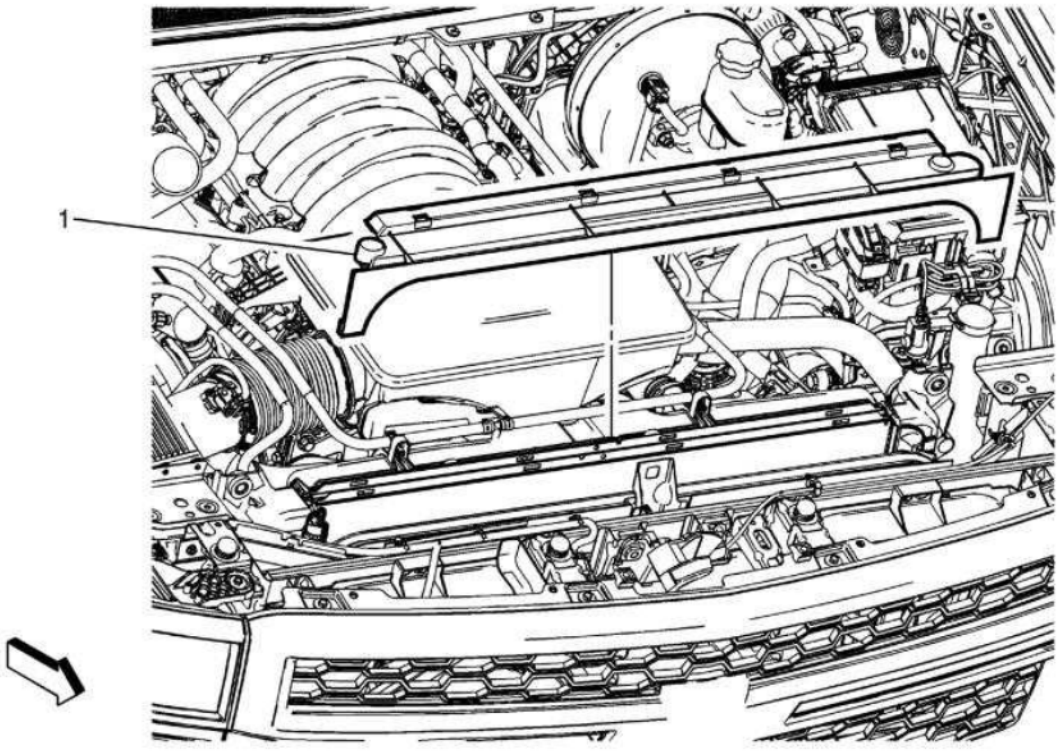

Fig. 498: Radiator Air Upper Baffle And Deflector
Courtesy of GENERAL MOTORS COMPANY

5. Install the radiator air upper baffle and deflector (1). **Radiator Air Upper Baffle and Deflector Replacement (L83, L86, LV3)**.

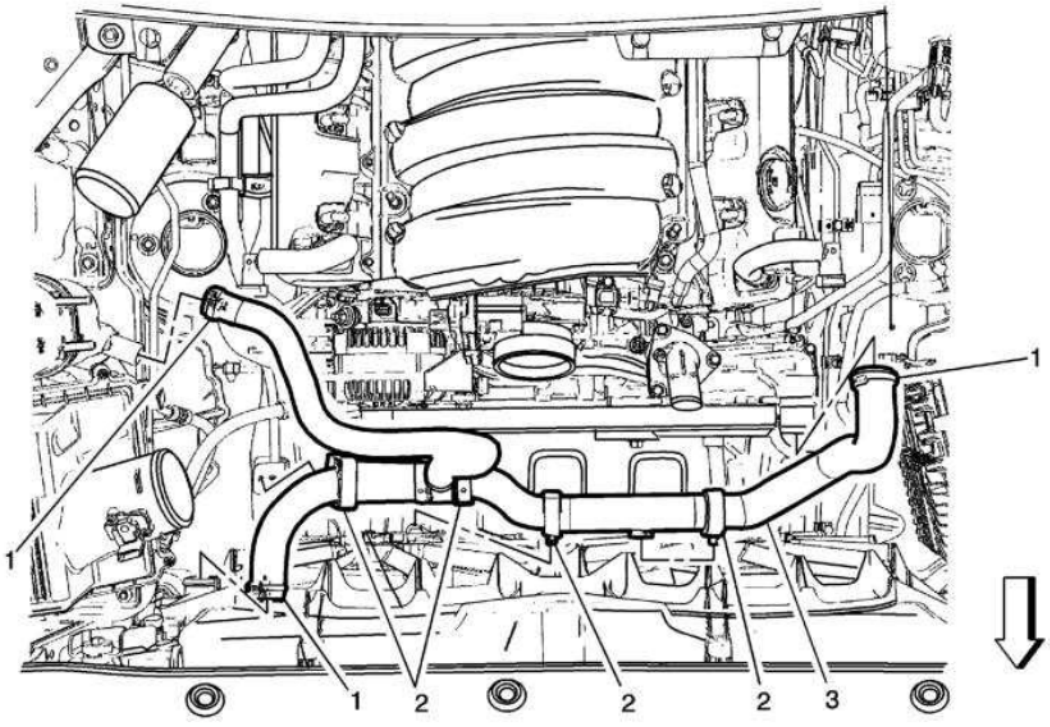

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Fig. 499: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Install the radiator outlet hose (3) to the radiator. **Radiator Outlet Hose Replacement (LV3)**.

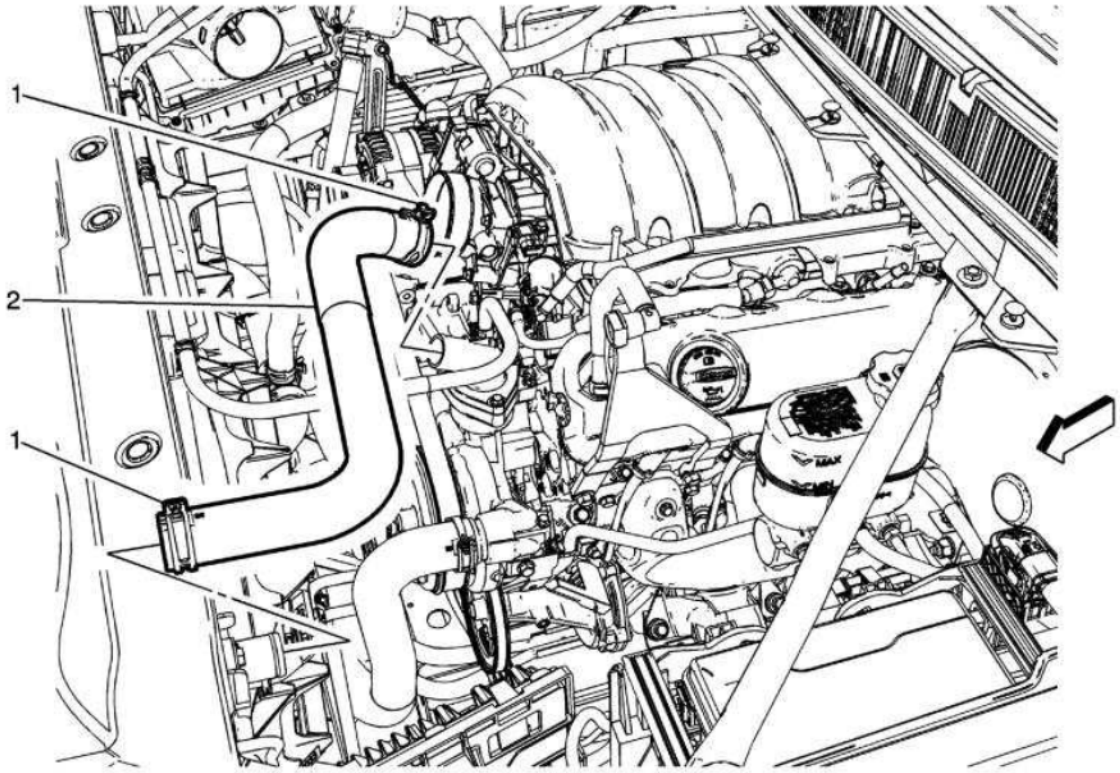

Fig. 500: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Install the radiator inlet hose (2) to the radiator. **Radiator Inlet Hose Replacement (LV3)**.

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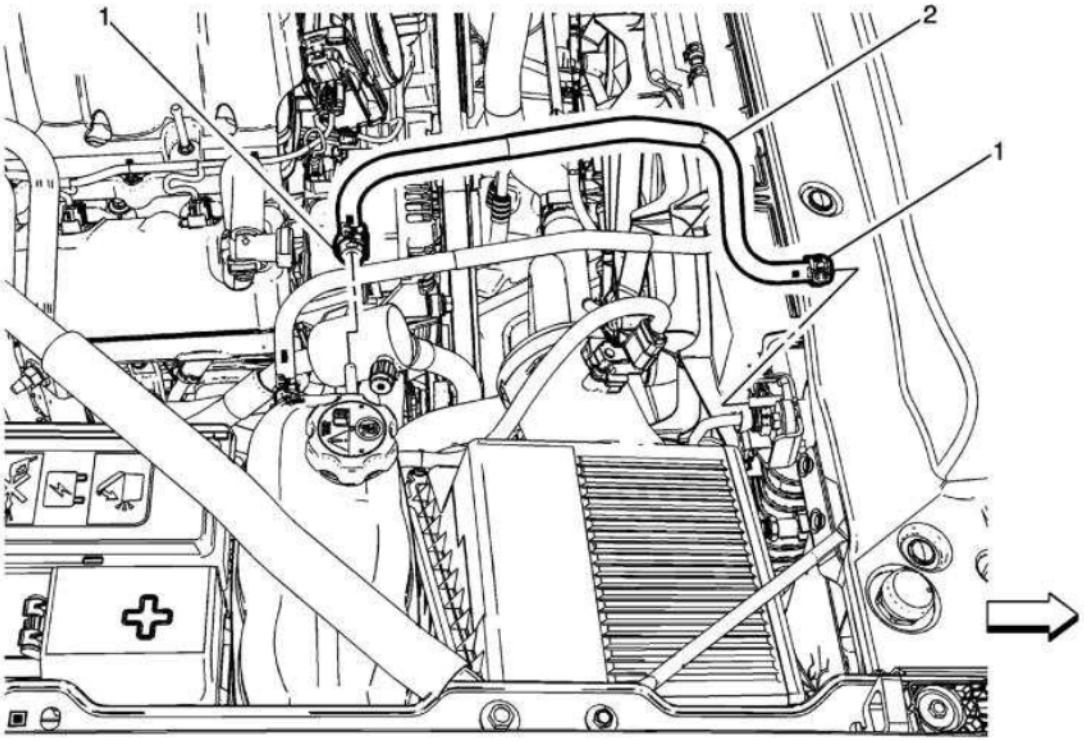

Fig. 501: Radiator Surge Tank Inlet Hose (Surge Tank To Radiator)
Courtesy of GENERAL MOTORS COMPANY

8. Install the radiator surge tank inlet hose (2) to the radiator. **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet LV3)**.
9. Install the engine coolant fan rear shroud. **Engine Coolant Fan Rear Shroud Replacement (LV3)**.
10. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)**.
11. Inspect the cooling system for leaks. **Cooling System Leak Testing (L8B, L83, L86, LV3)**.

RADIATOR REPLACEMENT (L83, L86)

Removal Procedure

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**.
2. Remove the engine coolant fan rear shroud. Refer to **Engine Coolant Fan Rear Shroud Replacement (L83, L86)**.

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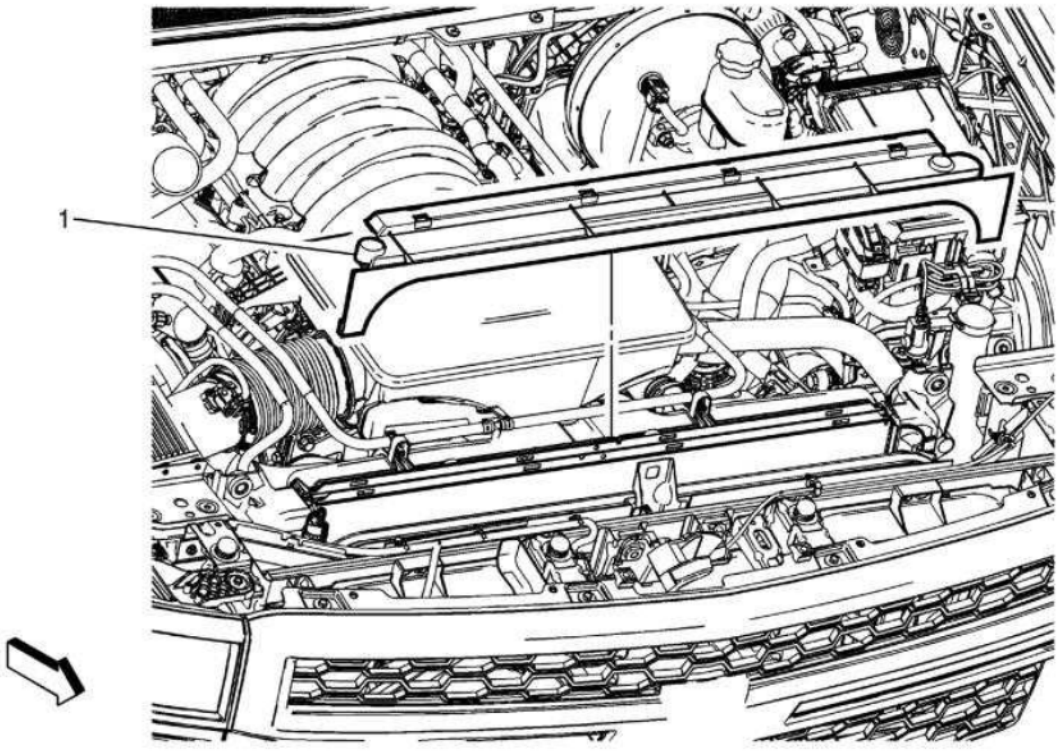

Fig. 502: Radiator Air Upper Baffle And Deflector
Courtesy of GENERAL MOTORS COMPANY

3. Remove the radiator air upper baffle and deflector (1). Refer to **Radiator Air Upper Baffle and Deflector Replacement (L83, L86, LV3)**.

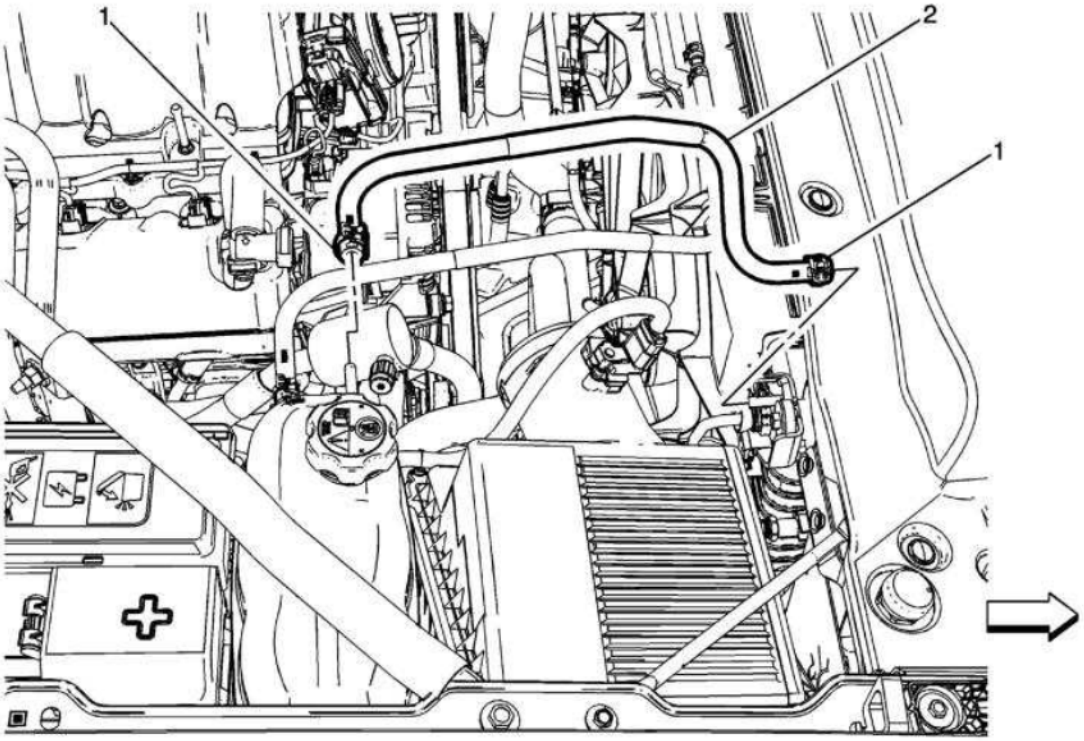

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Fig. 503: Radiator Surge Tank Inlet Hose (Surge Tank To Radiator)
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator surge tank inlet hose (2) from the radiator. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet L83, L86)**.

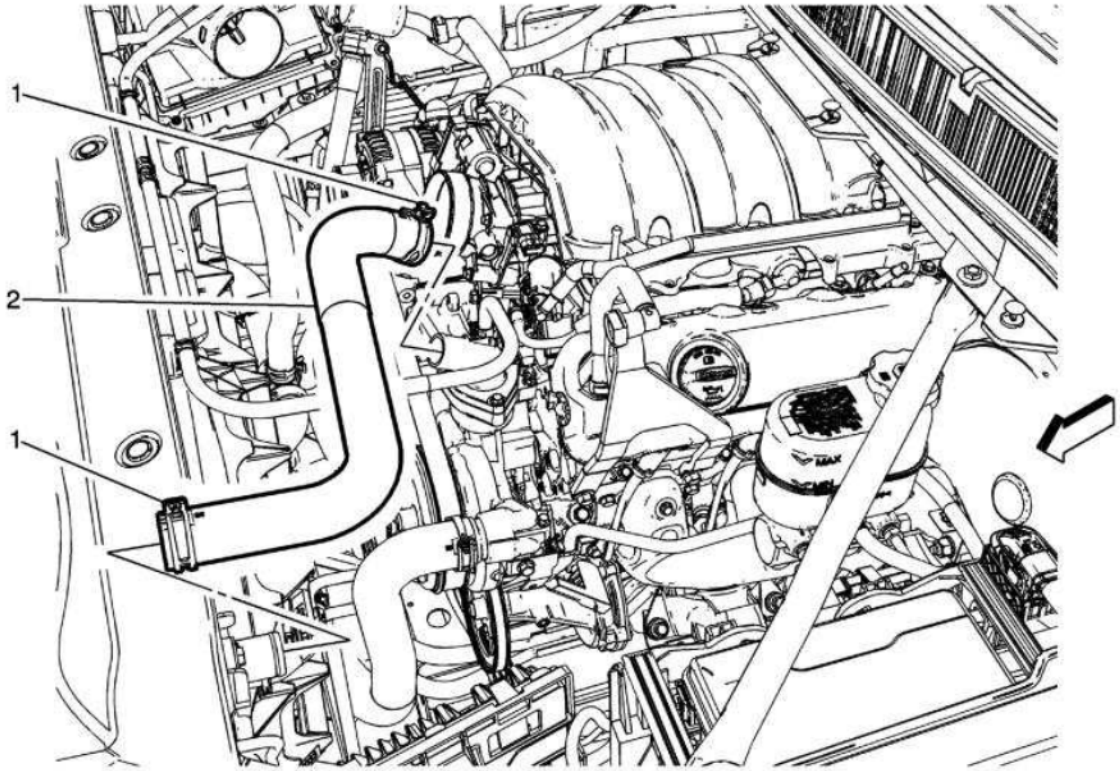

Fig. 504: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Remove the radiator inlet hose (2) from the radiator. Refer to **Radiator Inlet Hose Replacement (L83, L86)**.

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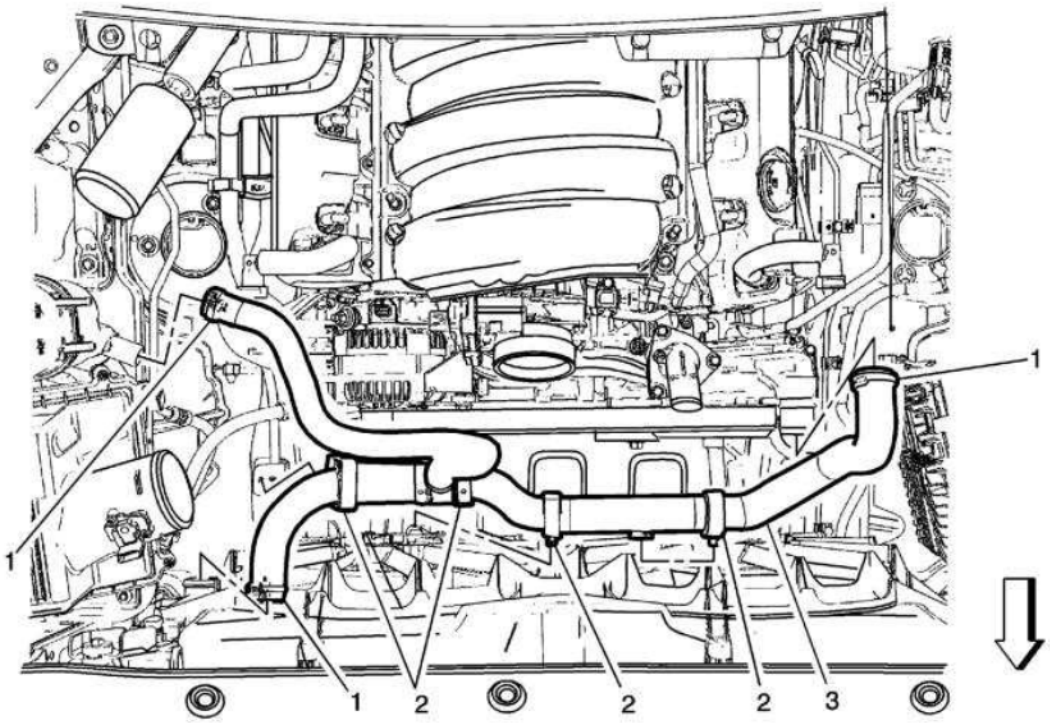

Fig. 505: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

6. Remove the radiator outlet hose (3) from the radiator. Refer to **Radiator Outlet Hose Replacement (L83, L86)**.
7. Remove the transmission fluid auxiliary cooler inlet pipe. Refer to **Transmission Fluid Auxiliary Cooler Inlet Pipe Replacement (L83, L86)** .
8. Remove the transmission fluid auxiliary cooler outlet pipe. Refer to **Transmission Fluid Auxiliary Cooler Outlet Pipe Replacement (L83, L86)** .

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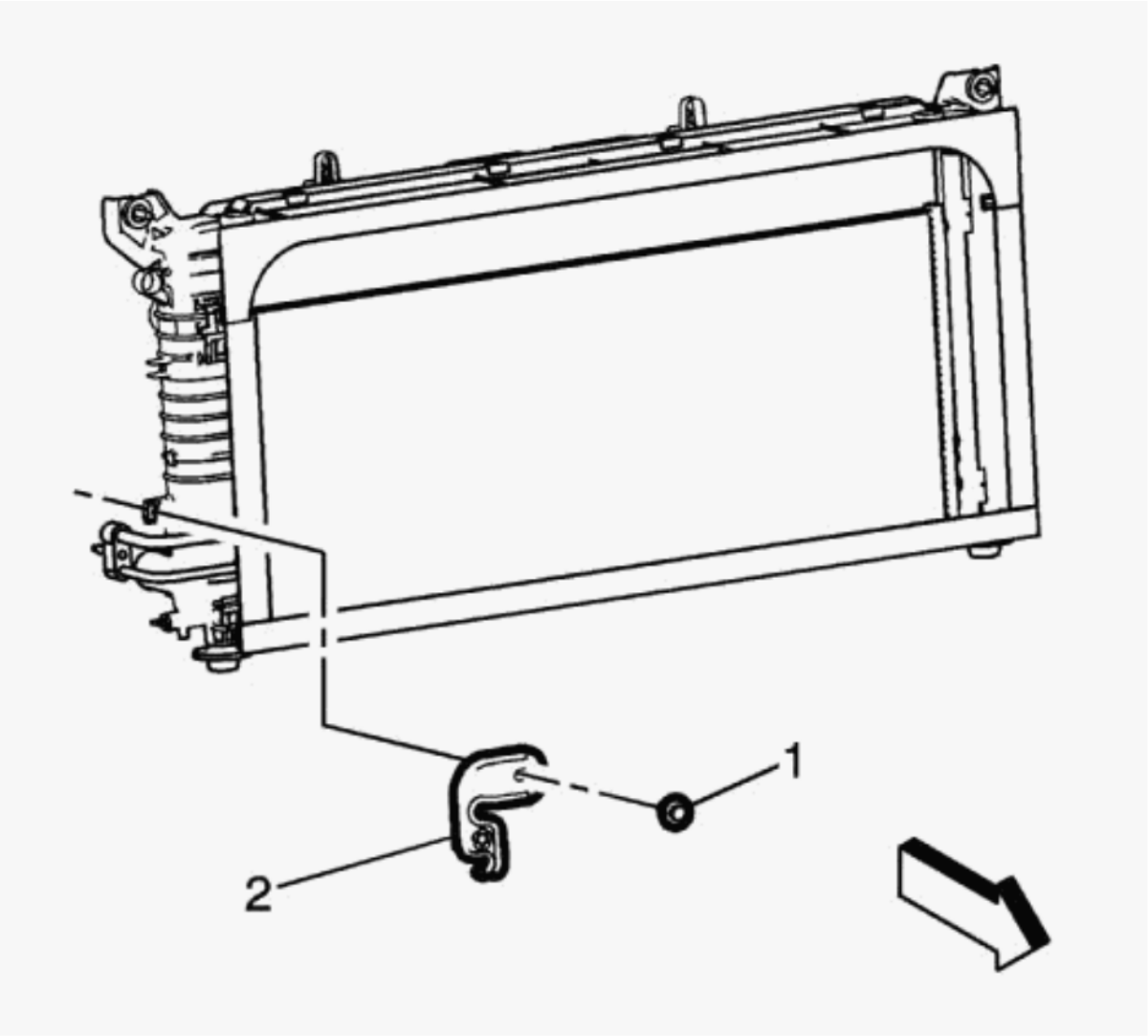

Fig. 506: Air Conditioning Condenser Bracket
Courtesy of GENERAL MOTORS COMPANY

9. Remove the air conditioning condenser bracket (2) from the radiator. Refer to **Air Conditioning Condenser Bracket Replacement (L83, L86, LV3)** .
10. Without disconnecting the air conditioning compressor and condenser hoses, carefully lift the air conditioning condenser assembly off the radiator and position out of the way.

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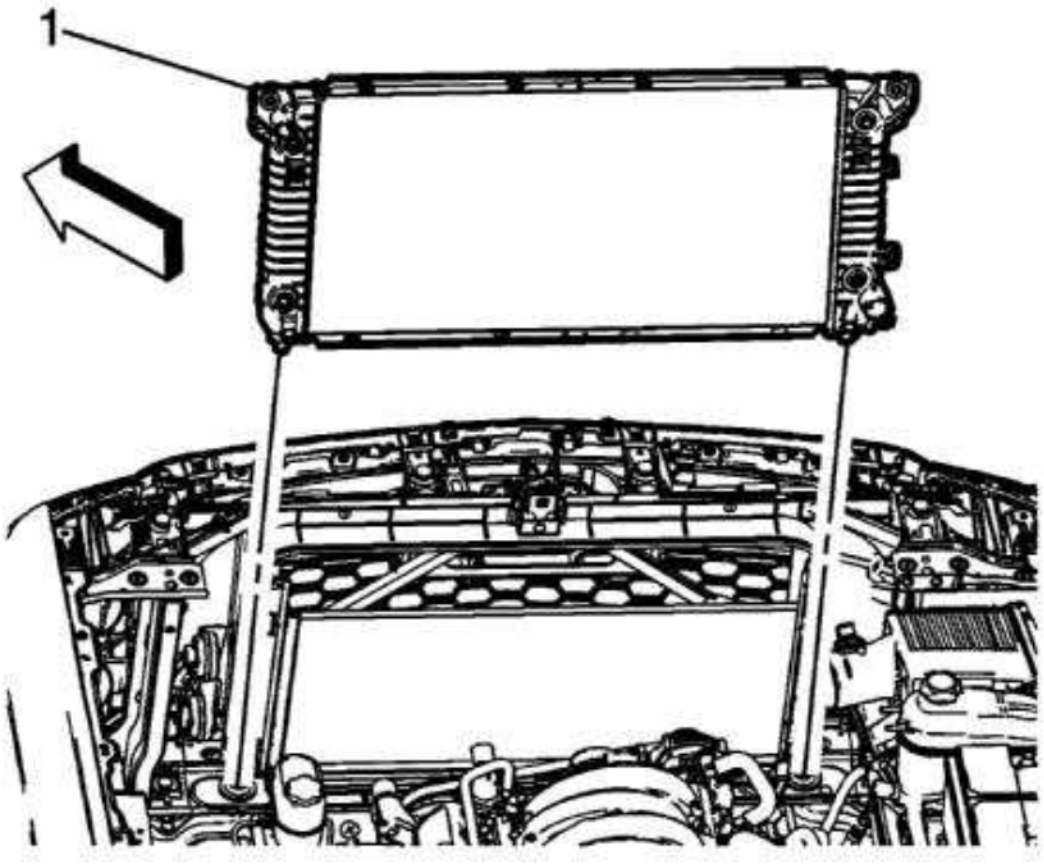

Fig. 507: Radiator
Courtesy of GENERAL MOTORS COMPANY

11. Tilt the radiator rearward and release the radiator air lower baffle retaining tabs from the radiator. Refer to **Radiator Air Lower Baffle Replacement (L83, L86, LV3)**.
12. Remove the radiator (1) from the vehicle.
13. If replacing the radiator transfer the components as necessary.

Installation Procedure

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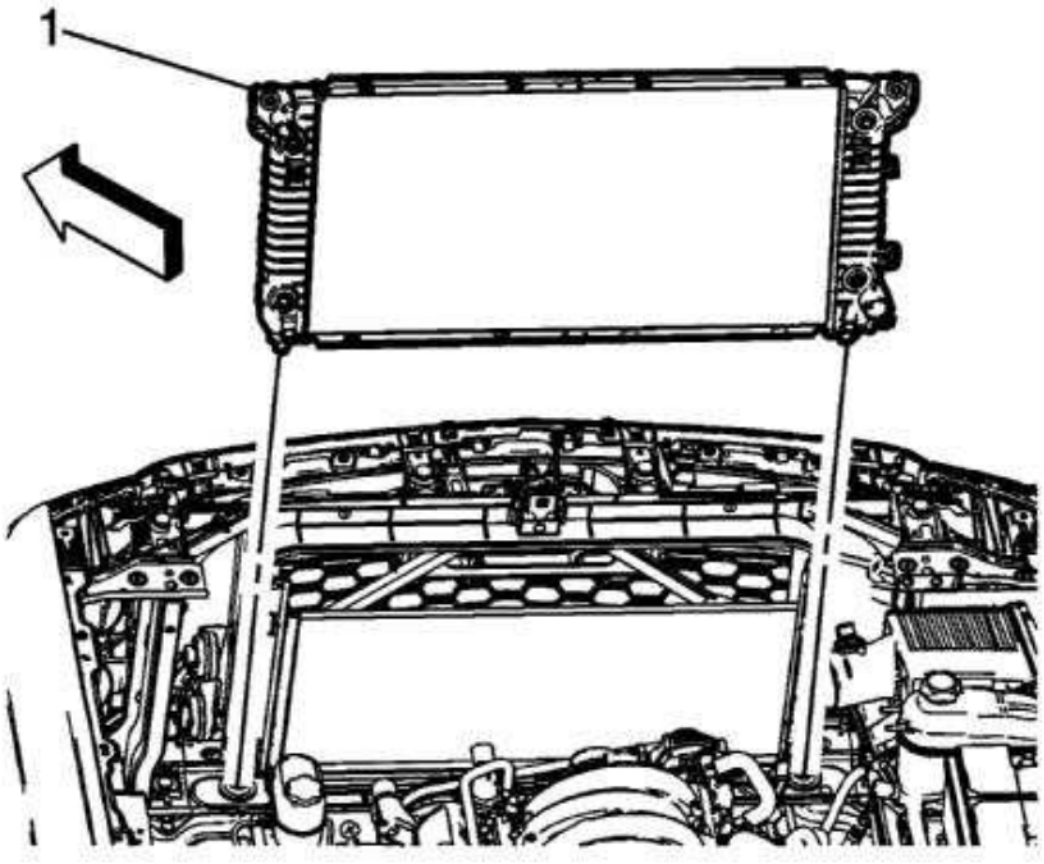

Fig. 508: Radiator
Courtesy of GENERAL MOTORS COMPANY

1. Install the radiator (1) to the vehicle.
2. Ensure the radiator air lower baffle retaining tabs are engaged to the radiator. Refer to **Radiator Air Lower Baffle Replacement (L83, L86, LV3)**.
3. Carefully install the air conditioning condenser assembly to the radiator.

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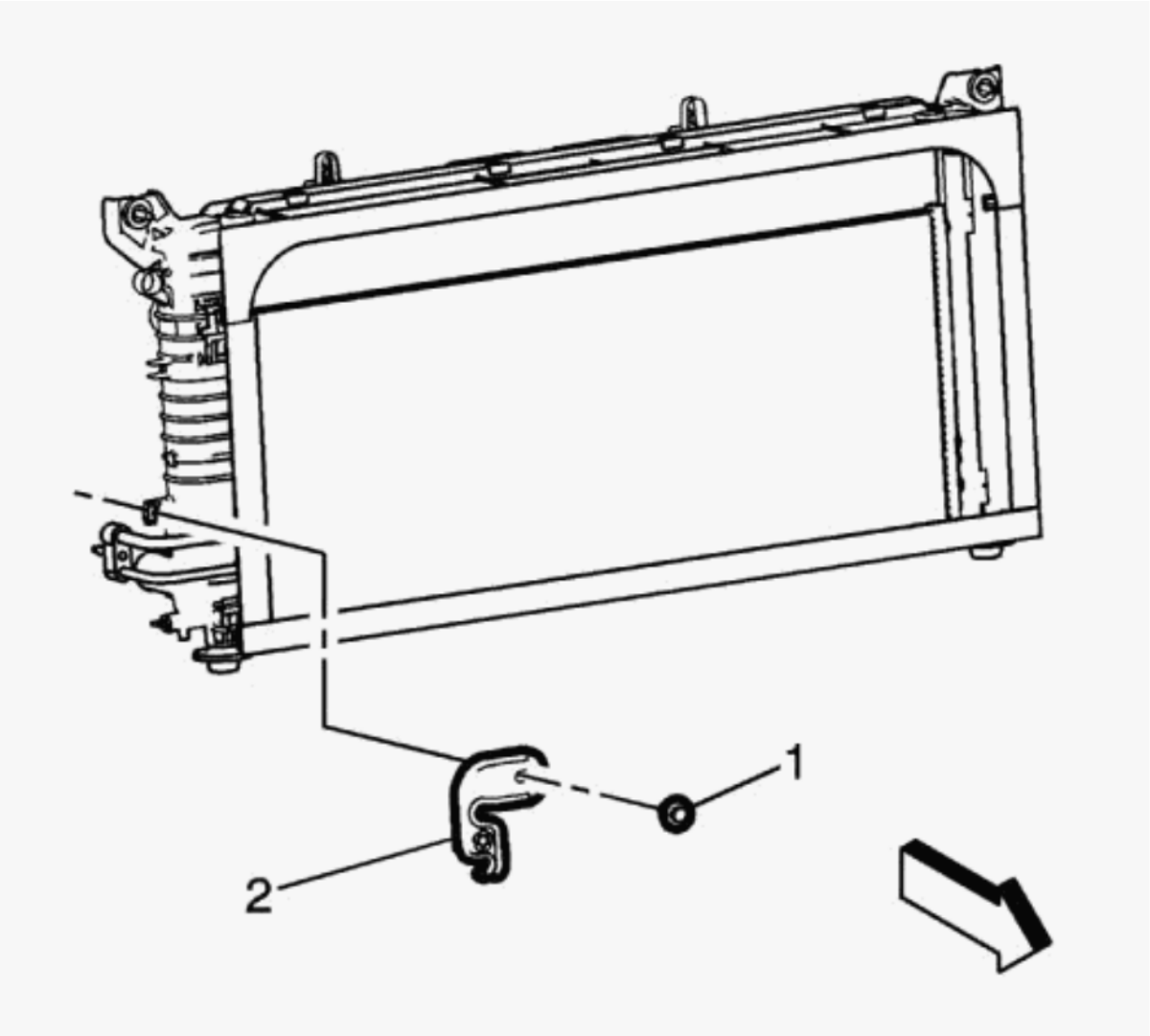

Fig. 509: Air Conditioning Condenser Bracket
Courtesy of GENERAL MOTORS COMPANY

4. Install the air conditioning condenser bracket (2) to the radiator. Refer to **Air Conditioning Condenser Bracket Replacement (L83, L86, LV3)** .
5. Install the transmission fluid auxiliary cooler outlet pipe. Refer to **Transmission Fluid Auxiliary Cooler Outlet Pipe Replacement (L83, L86)** .
6. Install the transmission fluid auxiliary cooler inlet pipe. Refer to **Transmission Fluid Auxiliary Cooler Inlet Pipe Replacement (L83, L86)** .

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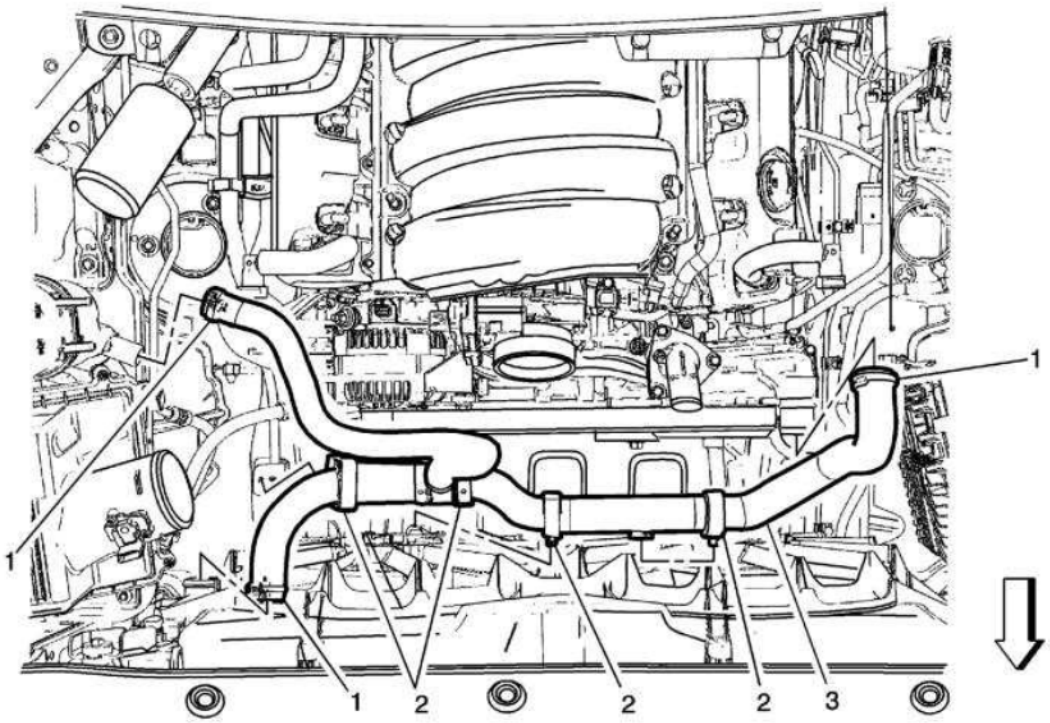

Fig. 510: Radiator Outlet Hose Retainers
Courtesy of GENERAL MOTORS COMPANY

7. Install the radiator outlet hose (3) to the radiator. Refer to **Radiator Outlet Hose Replacement (L83, L86)**.

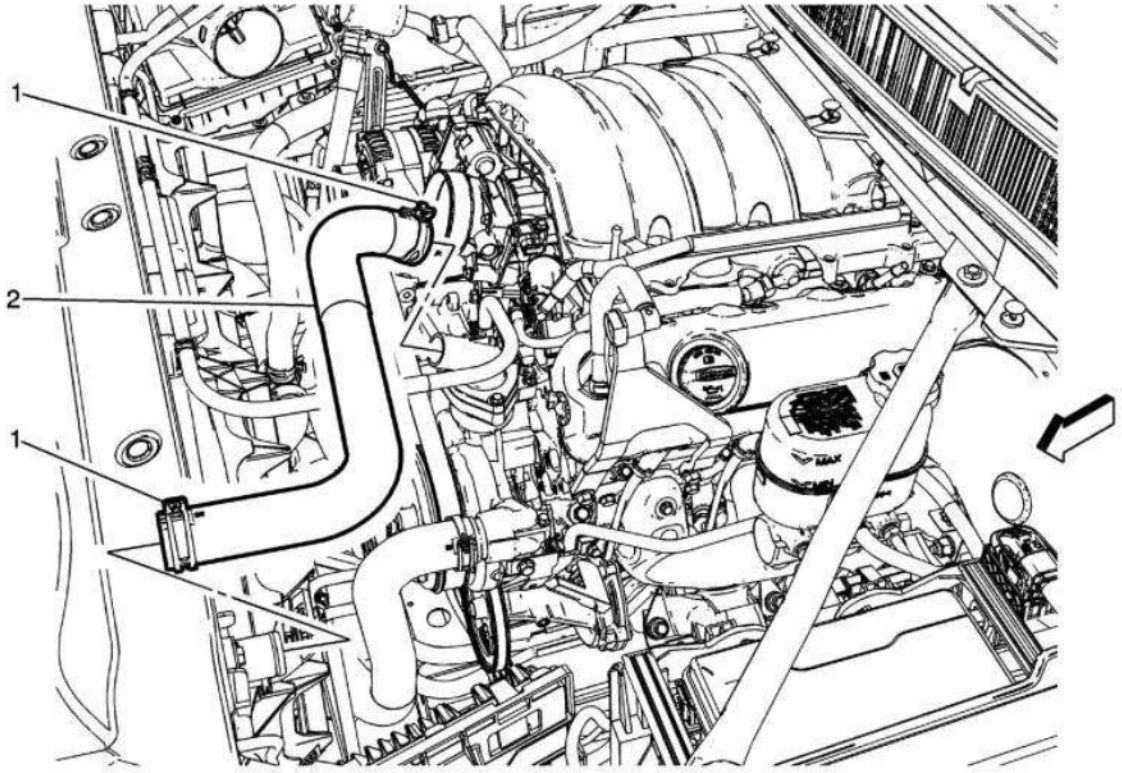

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Fig. 511: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

8. Install the radiator inlet hose (2) to the radiator. Refer to **Radiator Inlet Hose Replacement (L83, L86)**.

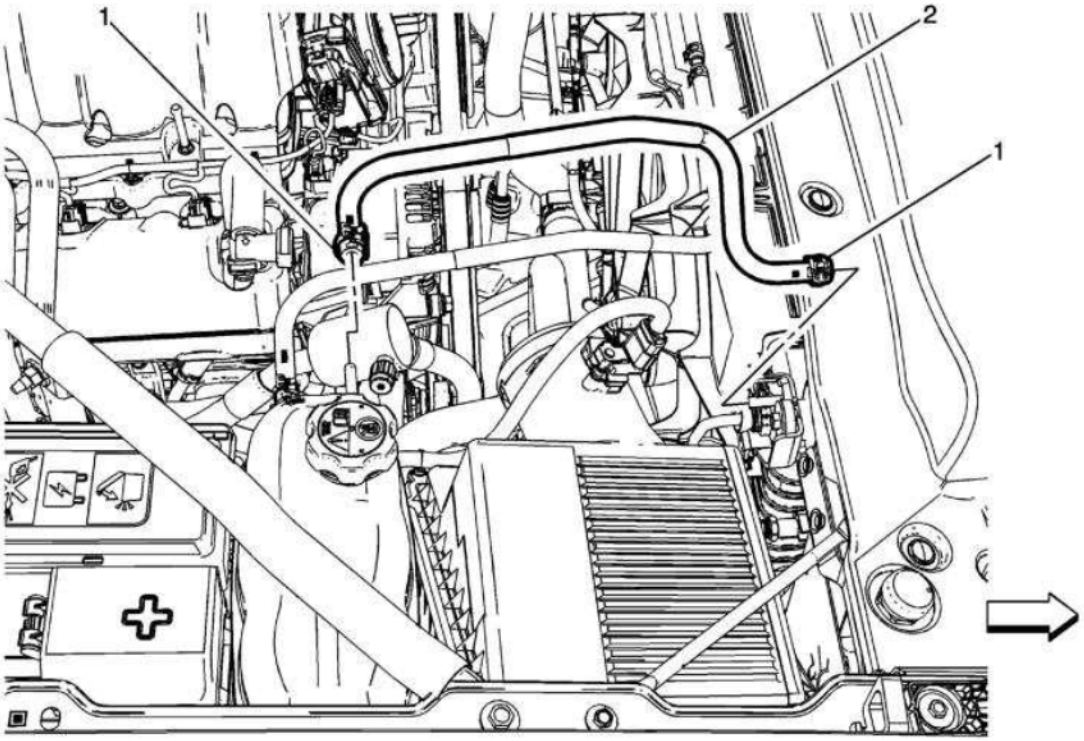

Fig. 512: Radiator Surge Tank Inlet Hose (Surge Tank To Radiator)
Courtesy of GENERAL MOTORS COMPANY

9. Install the radiator surge tank inlet hose (2) to the radiator. Refer to **Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Radiator L83, L86, LV3)Radiator Surge Tank Inlet Hose Replacement (Surge Tank To Water Outlet L83, L86)**.

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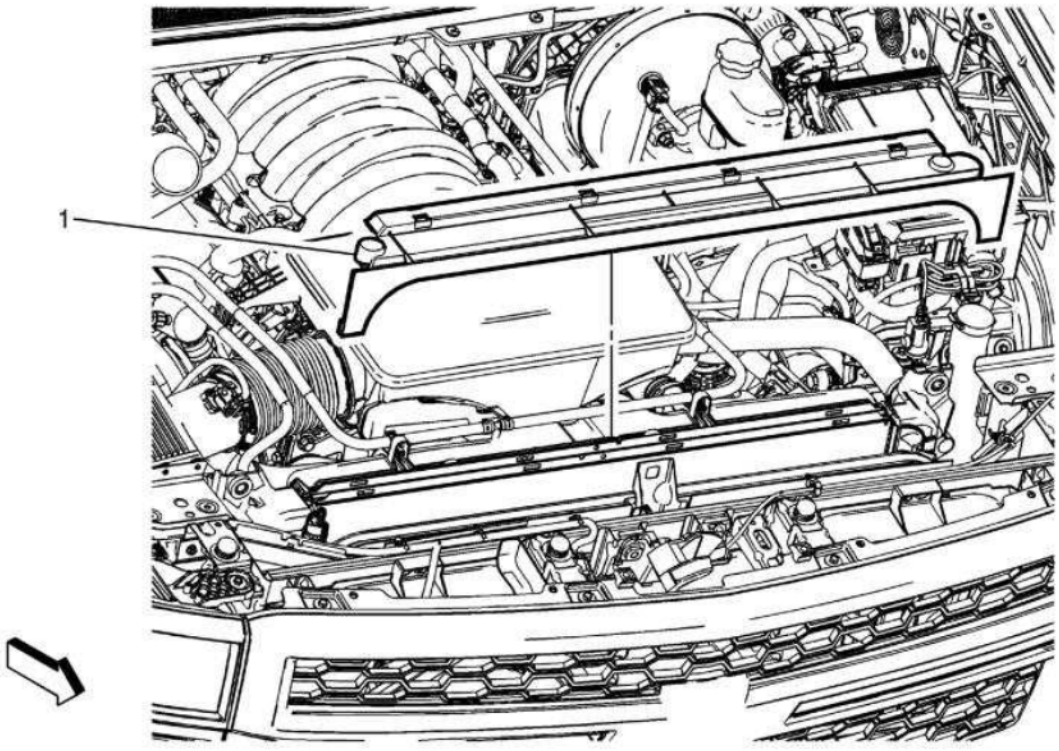

Fig. 513: Radiator Air Upper Baffle And Deflector (L83, L86, LV1, LV3)
Courtesy of GENERAL MOTORS COMPANY

10. Install the radiator air upper baffle and deflector (1). Refer to **Radiator Air Upper Baffle and Deflector Replacement (L83, L86, LV3)**.
11. Install the engine coolant fan rear shroud. Refer to **Engine Coolant Fan Rear Shroud Replacement (L83, L86)**.
12. Fill the cooling system to the proper level. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**.
13. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (L8B, L83, L86, LV3)**.

RADIATOR REPLACEMENT (LC8, L96)

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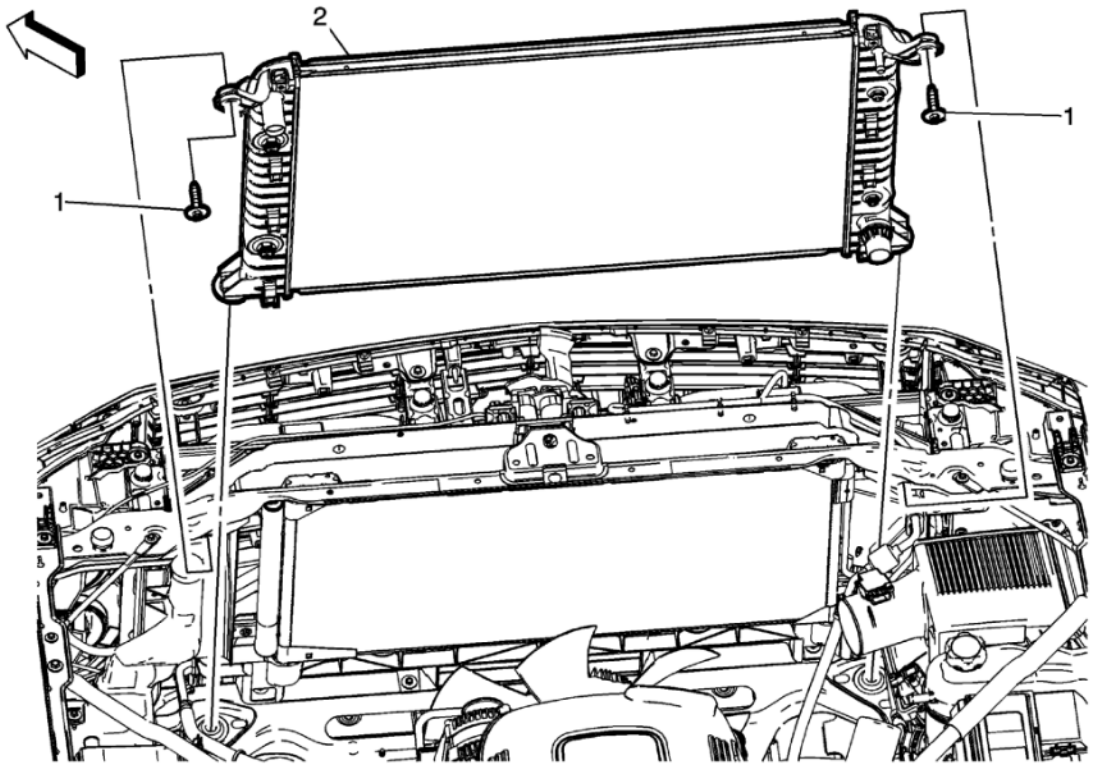

Fig. 514: Radiator (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the engine coolant fan lower shroud. Refer to **Engine Coolant Fan Lower Shroud Replacement (LC8, L96)**. 2. Remove the radiator outlet hose from the radiator. Refer to **Radiator Outlet Hose Replacement (LC8, L96)**. 3. Remove the transmission fluid auxiliary cooler inlet pipe from the radiator if equipped. Refer to **Transmission Fluid Auxiliary Cooler Inlet Pipe Replacement - Radiator Transmission Cooler Pipe to Auxiliary Cooler (LC8, L96 with MYD)** . 4. Remove the transmission fluid cooler inlet and outlet pipe from the radiator if equipped. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LC8, L96 with MYD)** . 5. Remove the engine oil cooler hoses from the radiator if equipped. Refer to **Engine Oil Cooler Hose Replacement** .	
1	Radiator Upper Mount Bracket Bolt (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tighten**

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Callout	Component Name
	25 N.m (18 lb ft)
2	Radiator 1. Tilt the radiator rearward and remove the radiator from the vehicle. 2. Fill the engine cooling system to the proper level. Refer to **Cooling System Draining and Filling (Static Fill LC8 L96)Cooling System Draining and Filling (Vac N Fill LC8 L96)**. 3. Inspect the cooling system for leaks. Refer to **Cooling System Leak Testing (LC8, L96)**.

RADIATOR REPLACEMENT (L8B)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**

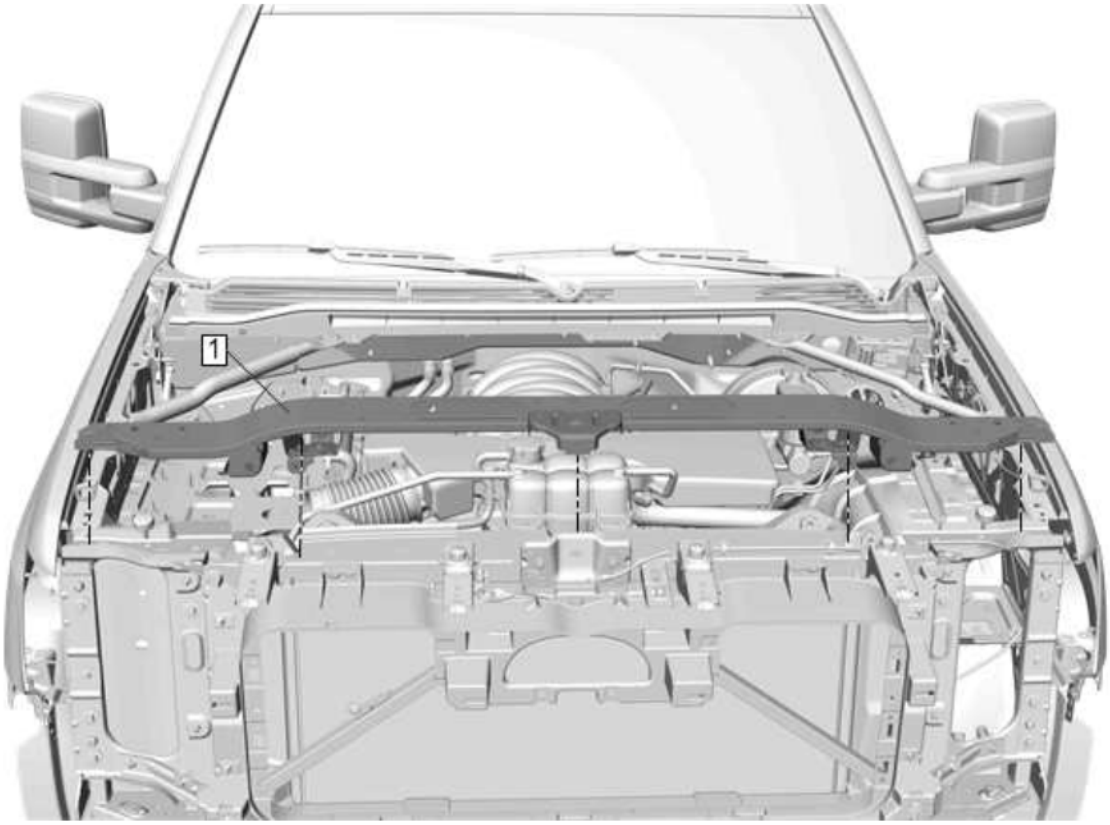

Fig. 515: Front End Upper Tie Bar
Courtesy of GENERAL MOTORS COMPANY

2. Front End Upper Tie Bar 1 - Remove **Front End Upper Tie Bar Support Replacement**

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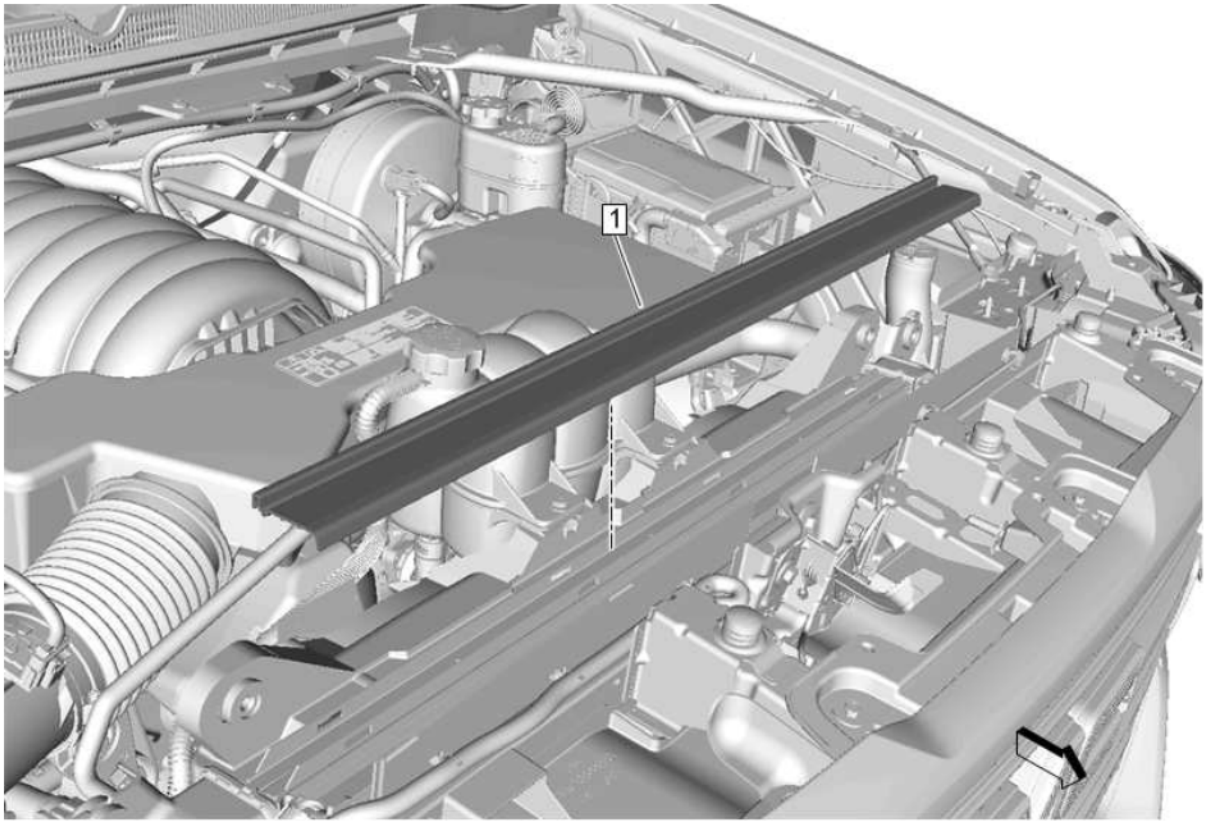

Fig. 516: Radiator Air Upper Baffle and Deflector (L8B)
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Air Upper Baffle 1 - Remove **Radiator Air Upper Baffle and Deflector Replacement (L8B)**

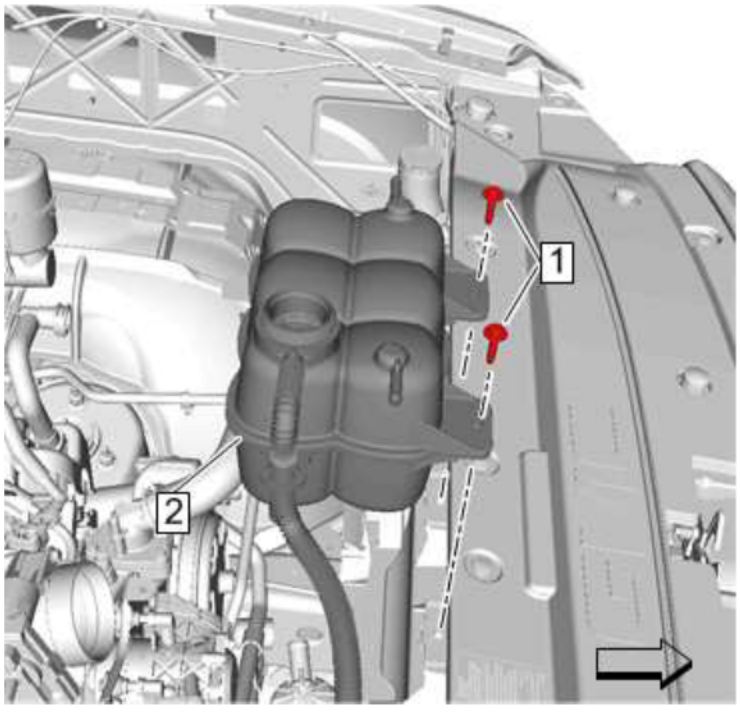

Fig. 517: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

4. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Remove **Radiator Surge Tank Replacement**

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(L8B)

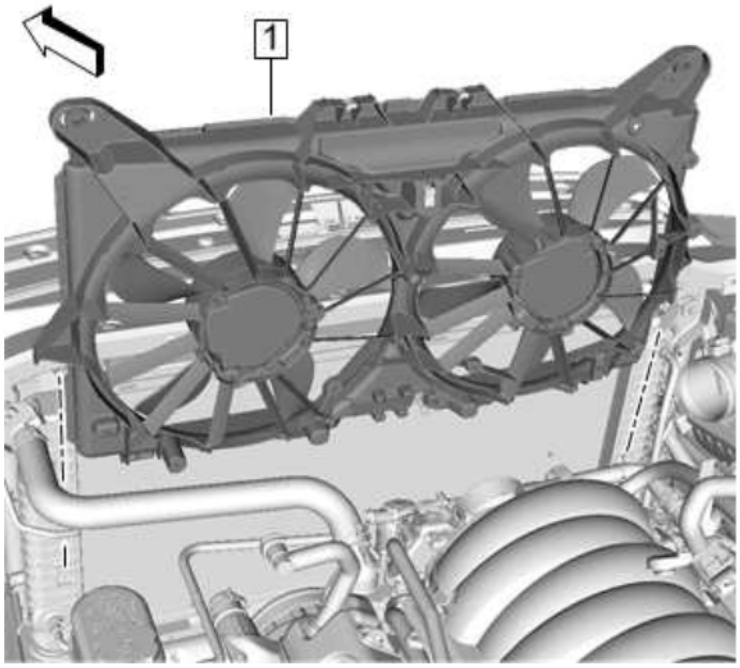

Fig. 518: Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

5. Engine Coolant Fan Shroud 1 - Remove - **Engine Coolant Fan Shroud Replacement (L8B)**

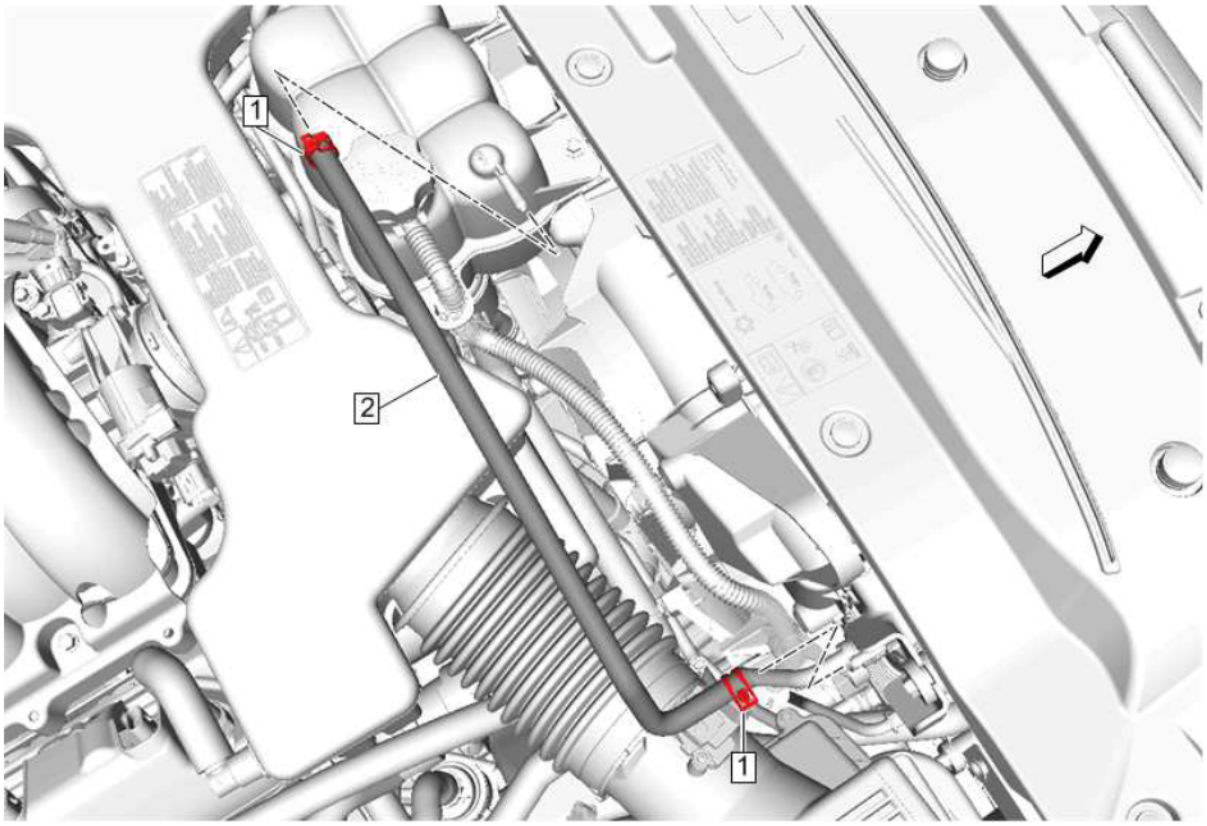

Fig. 519: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

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6. Radiator Surge Tank Inlet Hose 2 @Radiator - Remove - **Radiator Surge Tank Inlet Hose Replacement (L8B)**

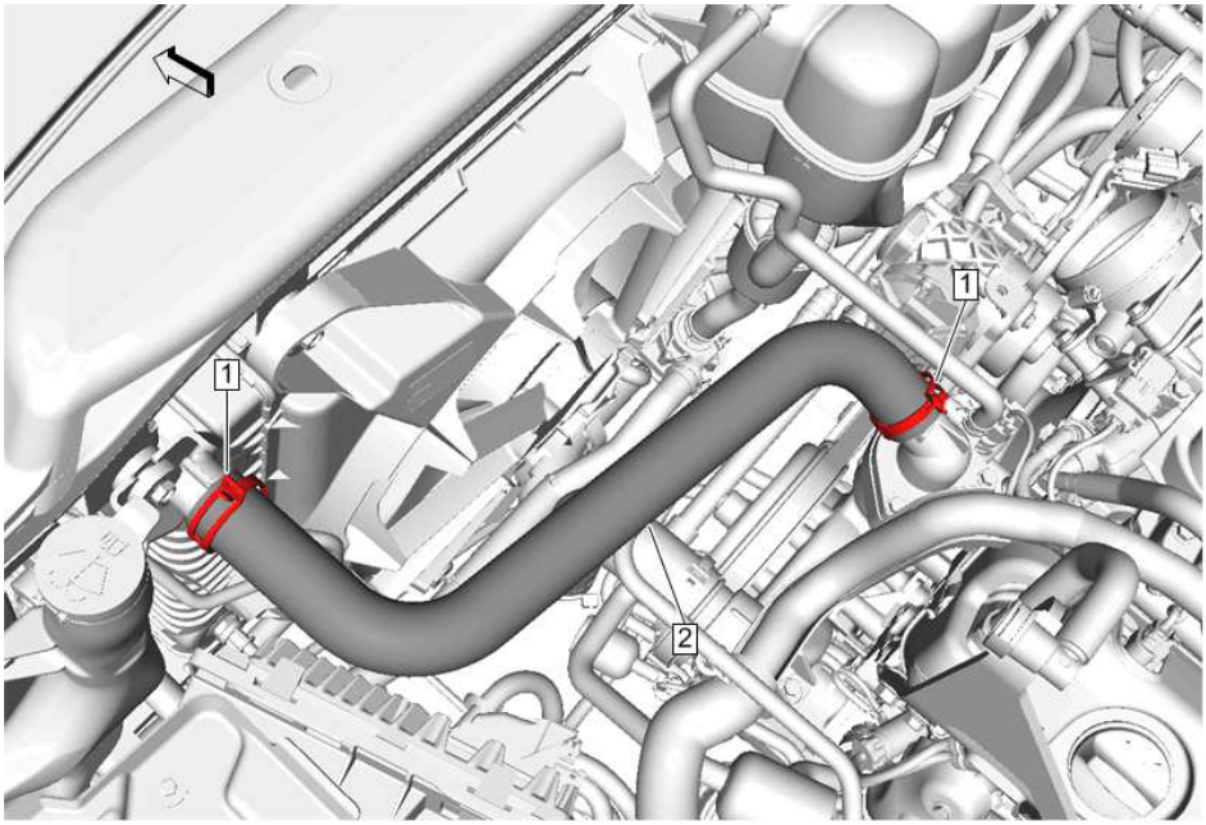

Fig. 520: Radiator Inlet Hose (L8B)
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Inlet Hose 2 @Radiator - Remove - **Radiator Inlet Hose Replacement (L8B)**

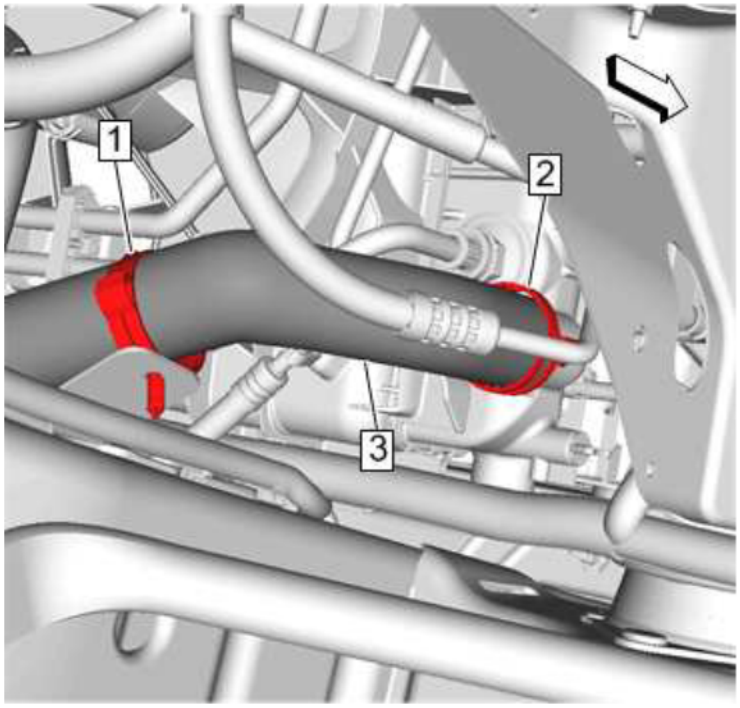

Fig. 521: Radiator Outlet Hose

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Courtesy of GENERAL MOTORS COMPANY

8. Radiator Outlet Hose 3 @Radiator - Remove - **Radiator Outlet Hose Replacement (L8B)**

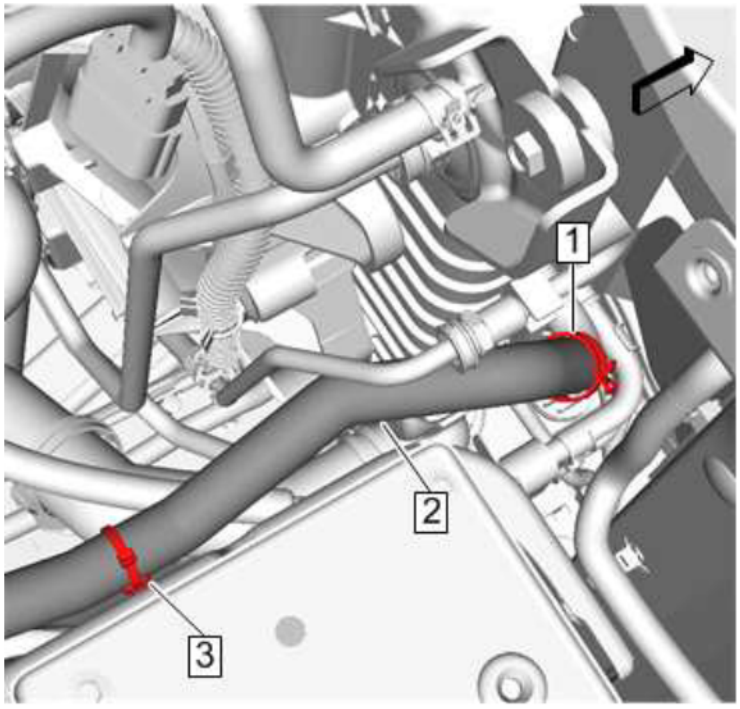

Fig. 522: Generator Control Module Coolant Tank Hose
Courtesy of GENERAL MOTORS COMPANY

9. Generator Control Module Coolant Tank Hose 2 @Radiator - Remove - **Generator Control Module Coolant Tank Hose Replacement (Bottom L8B)**

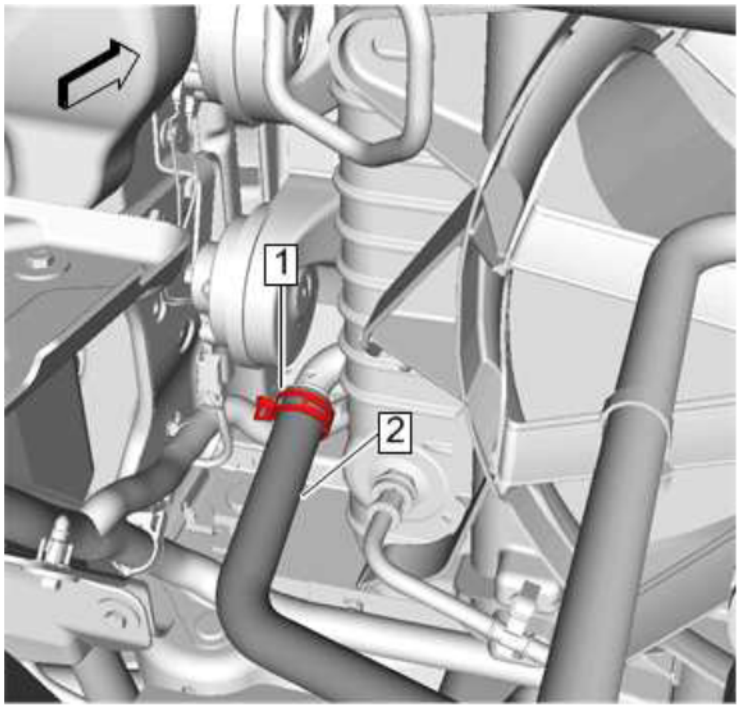

Fig. 523: Generator Control Module Coolant Pump Hose
Courtesy of GENERAL MOTORS COMPANY

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10. Generator Control Module Coolant Pump Hose 2 @Radiator - Remove - **Generator Control Module Coolant Pump Hose Replacement (Left Side L8B)**

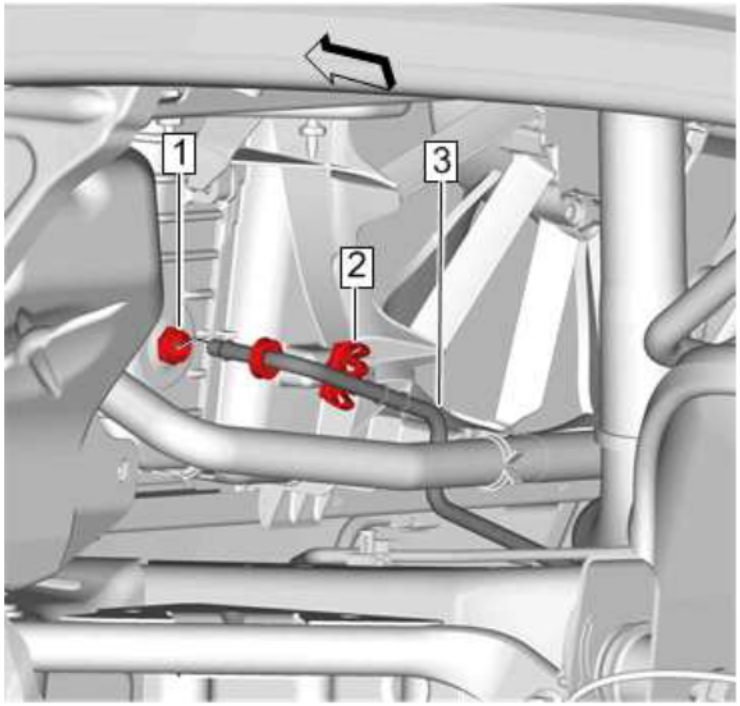

Fig. 524: Transmission Fluid Cooler Inlet and Outlet Pipe @ Radiator
Courtesy of GENERAL MOTORS COMPANY

11. Transmission Fluid Cooler Inlet and Outlet Pipe 3 @Radiator - Remove - **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (L8B)**

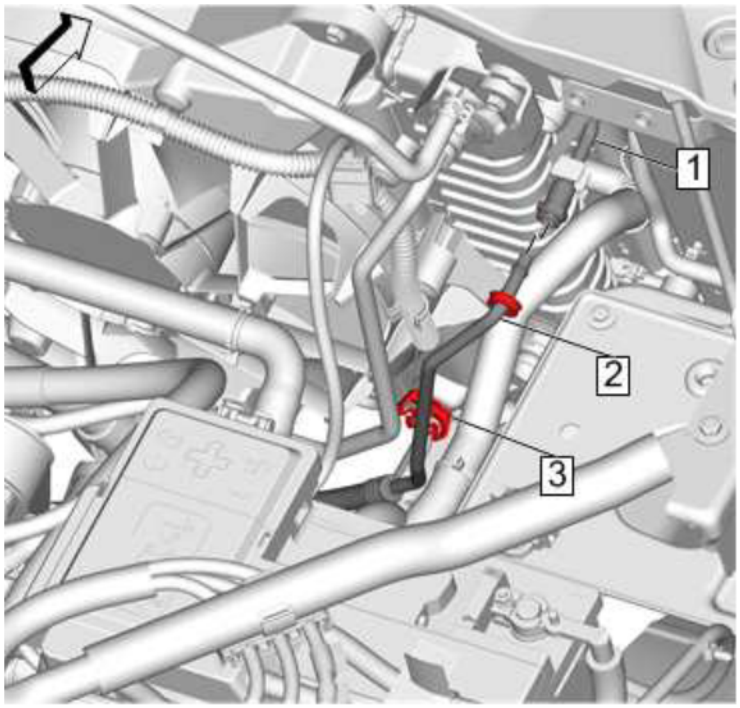

Fig. 525: Transmission Fluid Cooler Inlet and Outlet Pipe @ Transmission
Courtesy of GENERAL MOTORS COMPANY

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12. Transmission Fluid Cooler Inlet and Outlet Pipe 3 @Transmission Fluid Auxiliary Cooler Outlet Pipe - Remove - **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (L8B)**

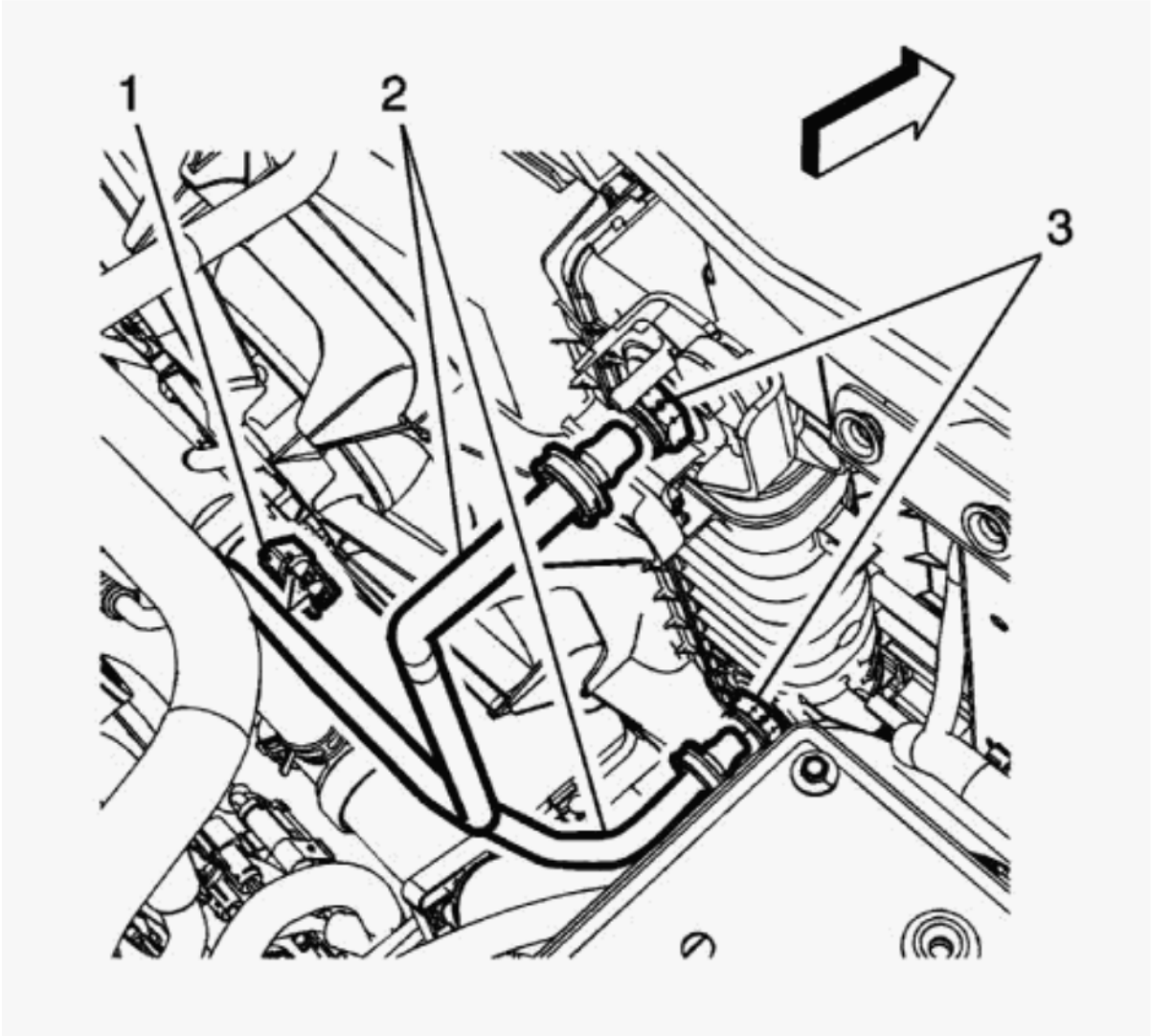

Fig. 526: Engine Oil Cooler Hoses And Retainer
Courtesy of GENERAL MOTORS COMPANY

13. Engine Oil Cooler Hose 2 @Radiator - Remove - **Engine Oil Cooler Hose Replacement**

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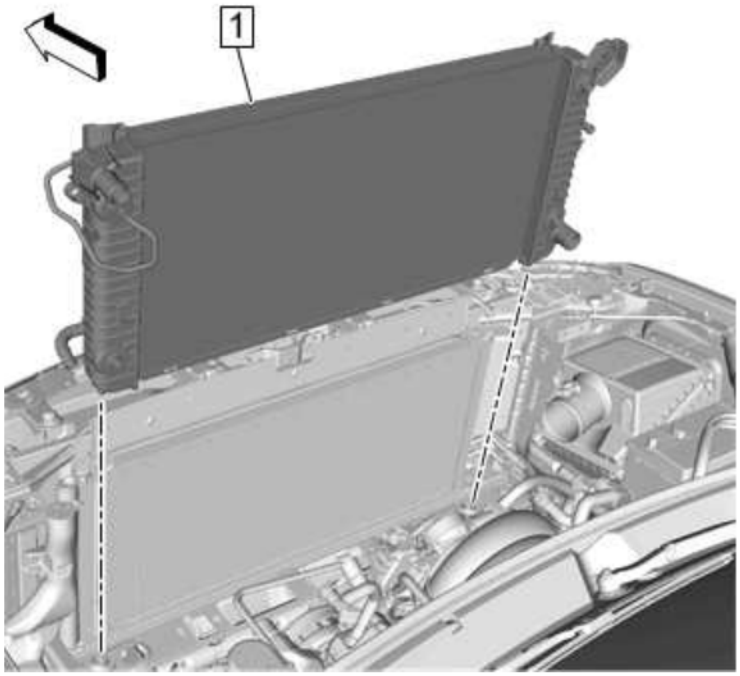

Fig. 527: Radiator
Courtesy of GENERAL MOTORS COMPANY

14. Without disconnecting the transmission fluid auxiliary cooler inlet pipe and transmission fluid auxiliary cooler outlet pipe, carefully lift the radiator and low temperature radiator (1) out of the vehicle.

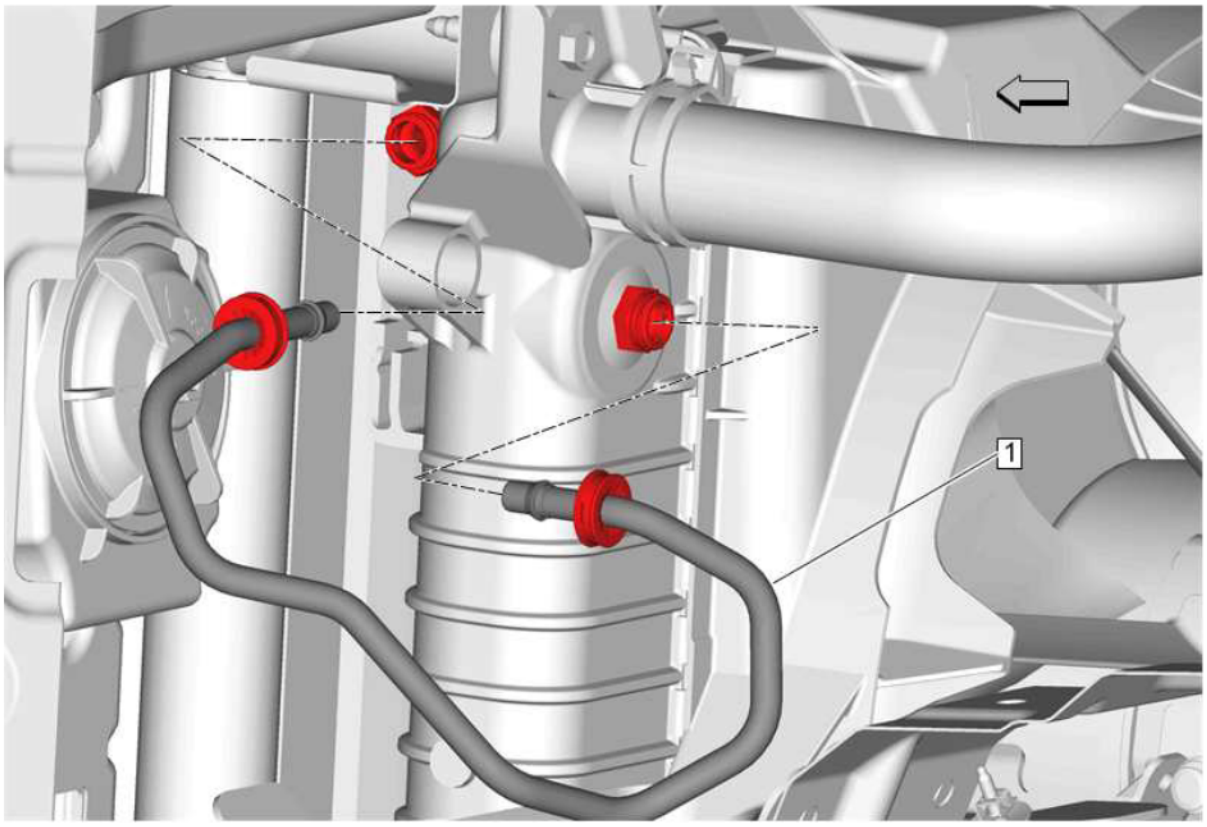

Fig. 528: Transmission Fluid Auxiliary Cooler Inlet Pipe (L8B)
Courtesy of GENERAL MOTORS COMPANY

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15. Transmission Fluid Auxiliary Cooler Inlet Pipe 1 - Remove - **Transmission Fluid Auxiliary Cooler Inlet Pipe Replacement (L8B)**

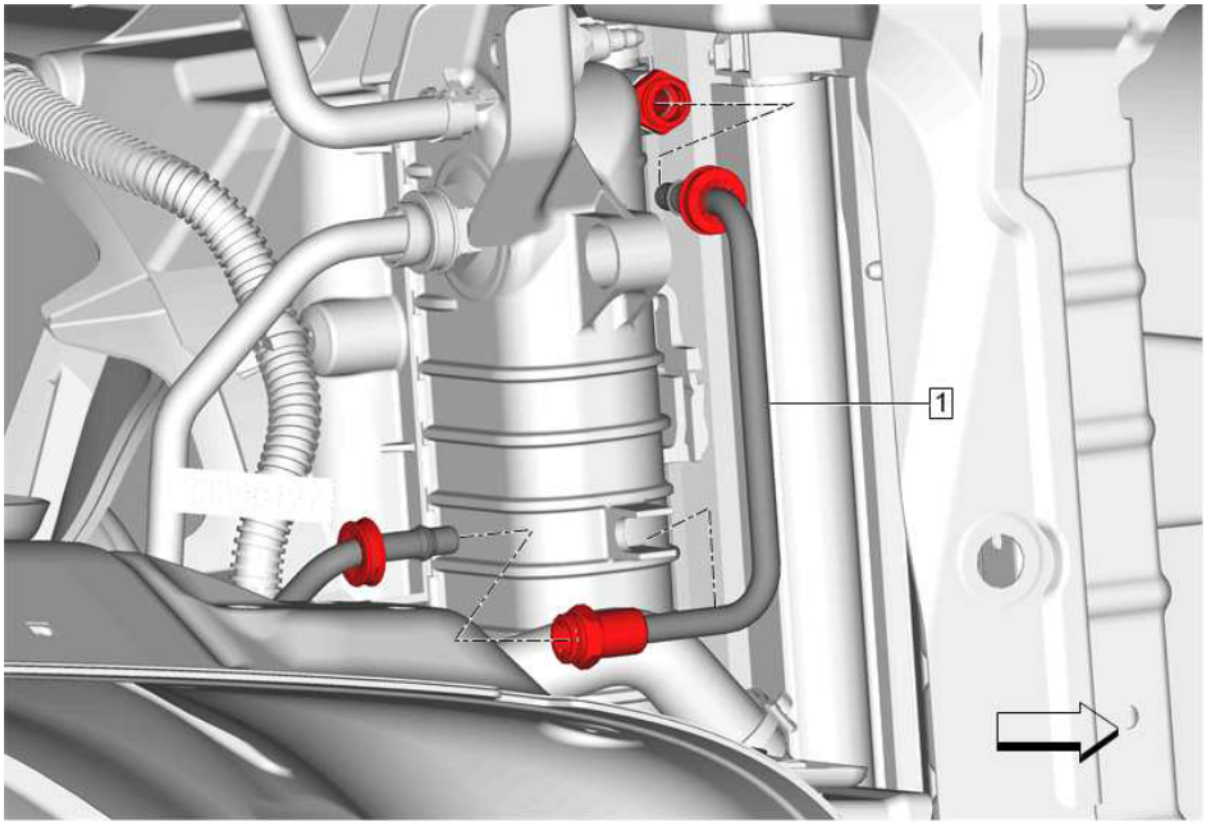

Fig. 529: Transmission Fluid Auxiliary Cooler Outlet Pipe (L8B)
Courtesy of GENERAL MOTORS COMPANY

16. Transmission Fluid Auxiliary Cooler Outlet Pipe 1 - Remove - **Transmission Fluid Auxiliary Cooler Outlet Pipe Replacement (L8B)**

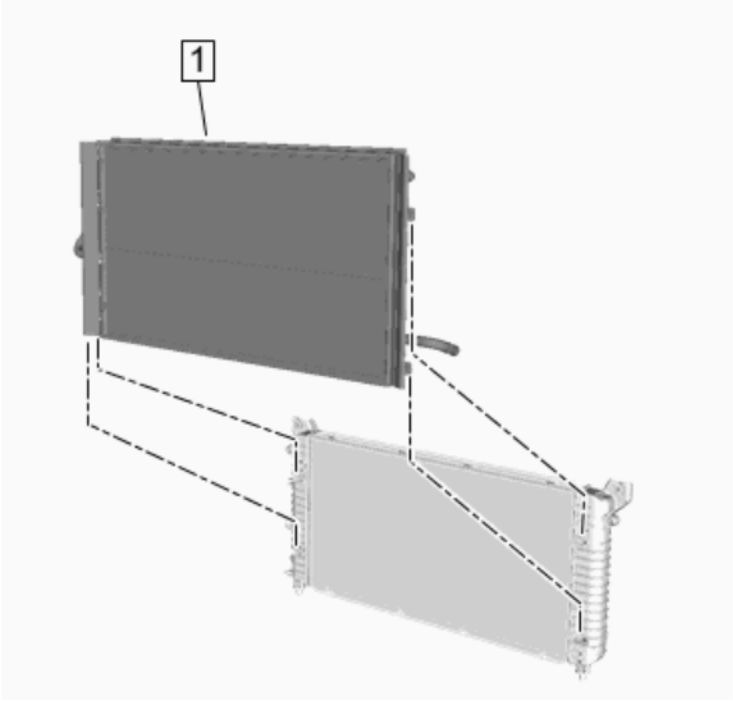

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Fig. 530: Low Temperature Radiator
Courtesy of GENERAL MOTORS COMPANY

17. Remove the low temperature radiator (1) from the radiator.
18. Transfer components as necessary.

Installation Procedure

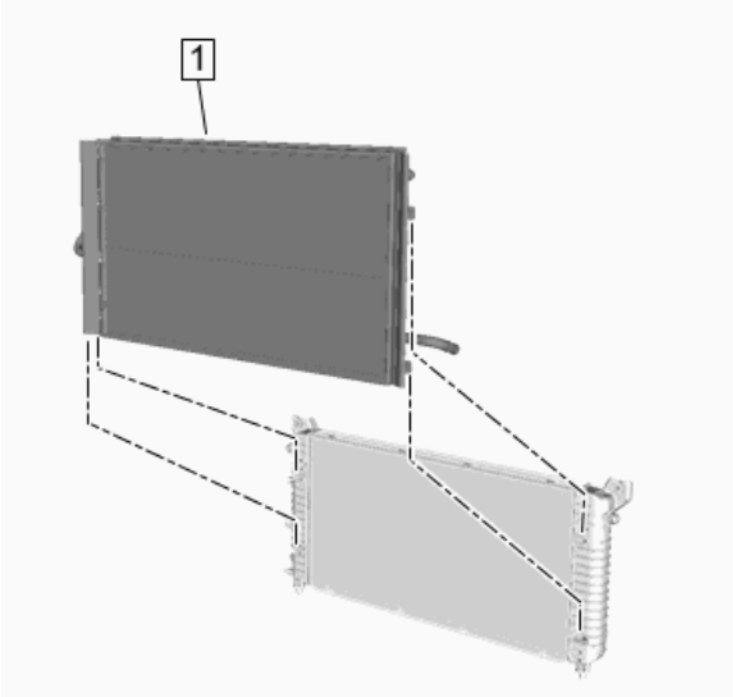

Fig. 531: Low Temperature Radiator
Courtesy of GENERAL MOTORS COMPANY

1. Install the low temperature radiator (1) to the radiator.

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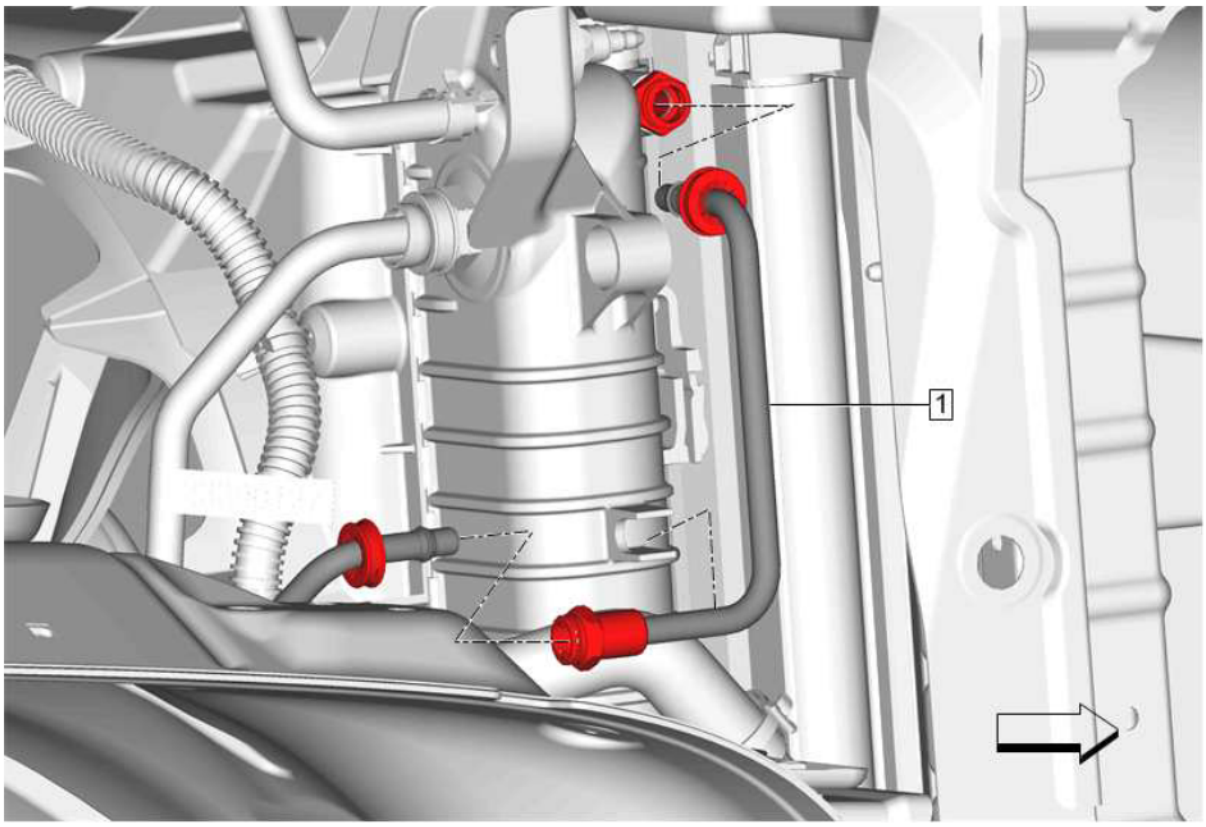

Fig. 532: Transmission Fluid Auxiliary Cooler Outlet Pipe (L8B)
Courtesy of GENERAL MOTORS COMPANY

2. Transmission Fluid Auxiliary Cooler Outlet Pipe 1 - Install - **Transmission Fluid Auxiliary Cooler Outlet Pipe Replacement (L8B)**

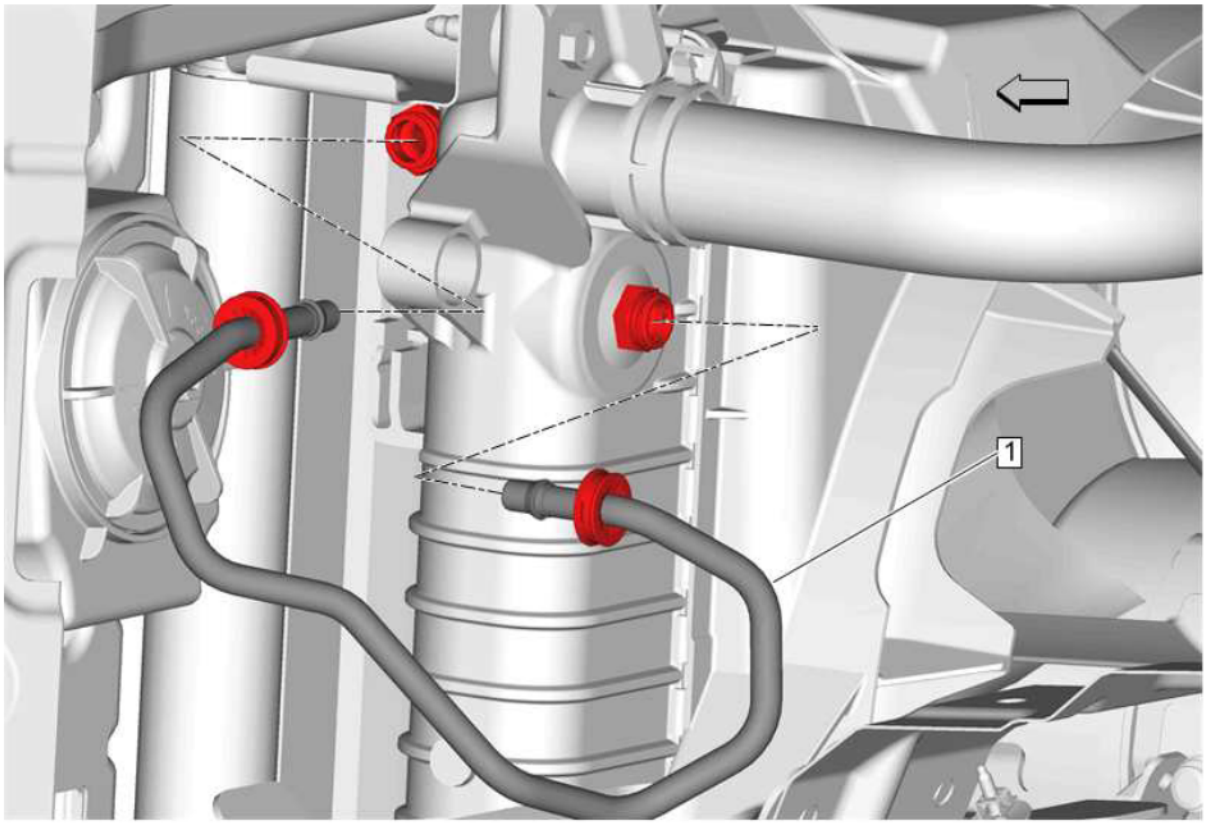

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Fig. 533: Transmission Fluid Auxiliary Cooler Inlet Pipe (L8B)
Courtesy of GENERAL MOTORS COMPANY

3. Transmission Fluid Auxiliary Cooler Inlet Pipe 1 - Install - **Transmission Fluid Auxiliary Cooler Inlet Pipe Replacement (L8B)**

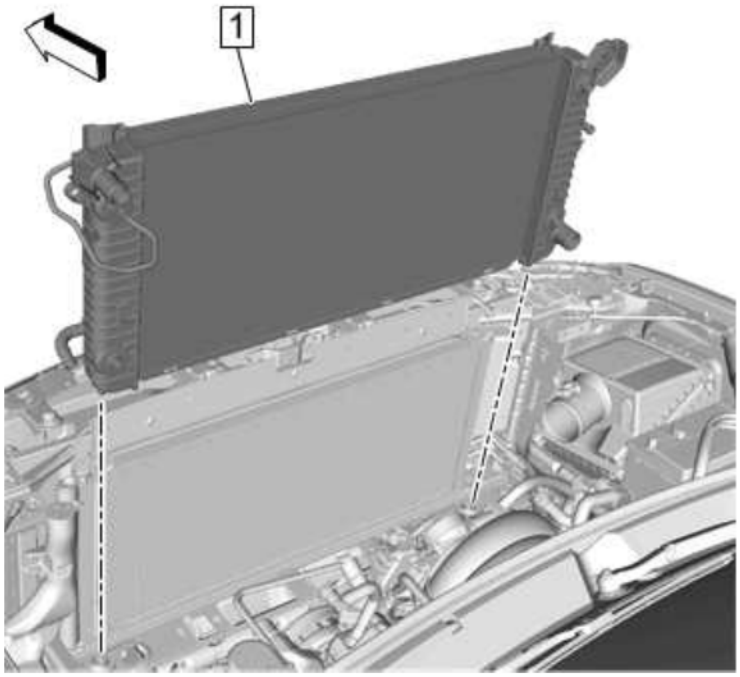

Fig. 534: Radiator
Courtesy of GENERAL MOTORS COMPANY

4. Install the radiator and low temperature radiator (1) as an assembly to the vehicle.

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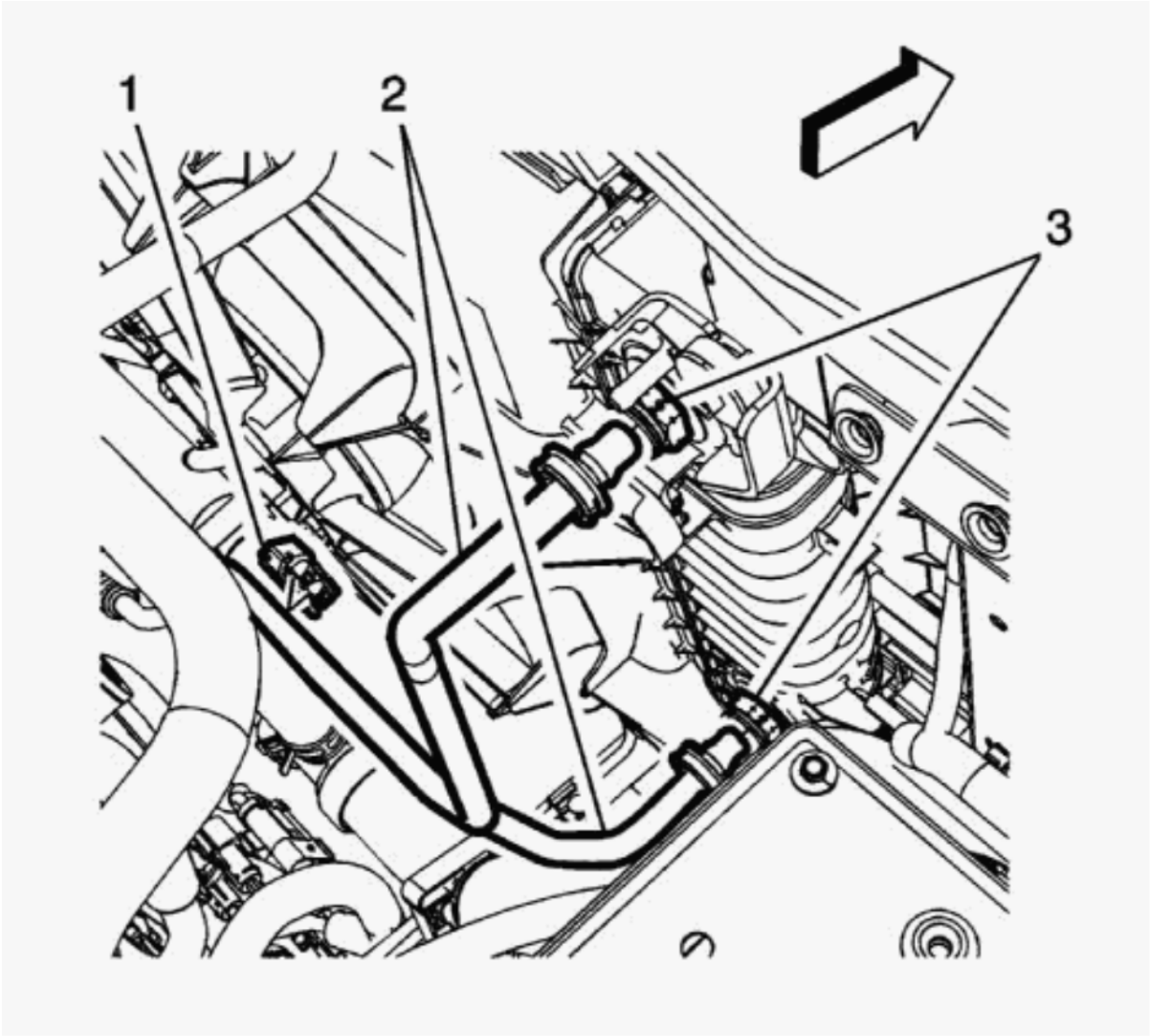

Fig. 535: Engine Oil Cooler Hoses And Retainer
Courtesy of GENERAL MOTORS COMPANY

5. Engine Oil Cooler Hose 2 @Radiator - Install **Engine Oil Cooler Hose Replacement**

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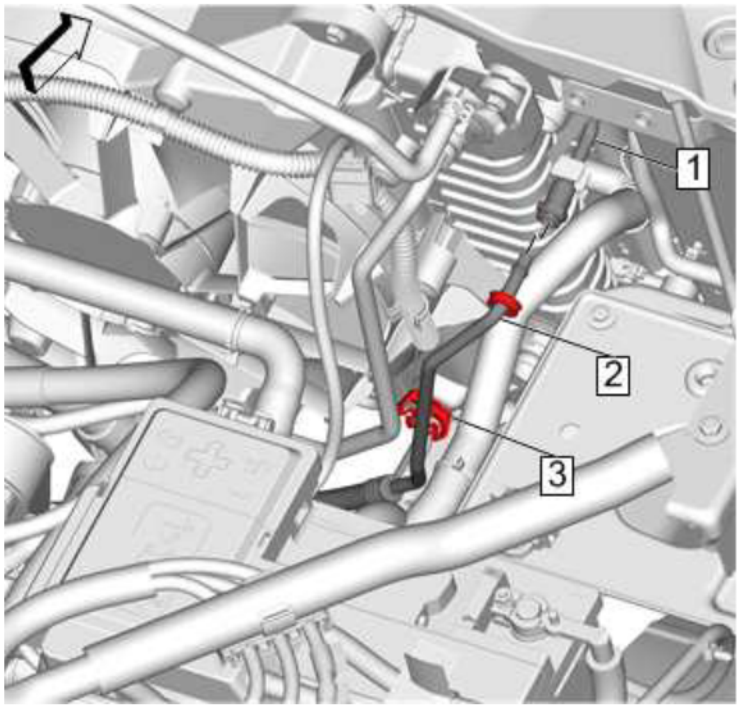

Fig. 536: Transmission Fluid Cooler Inlet and Outlet Pipe @ Transmission
Courtesy of GENERAL MOTORS COMPANY

6. Transmission Fluid Cooler Inlet and Outlet Pipe 3 @Transmission Fluid Auxiliary Cooler Outlet Pipe - Install **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (L8B)**

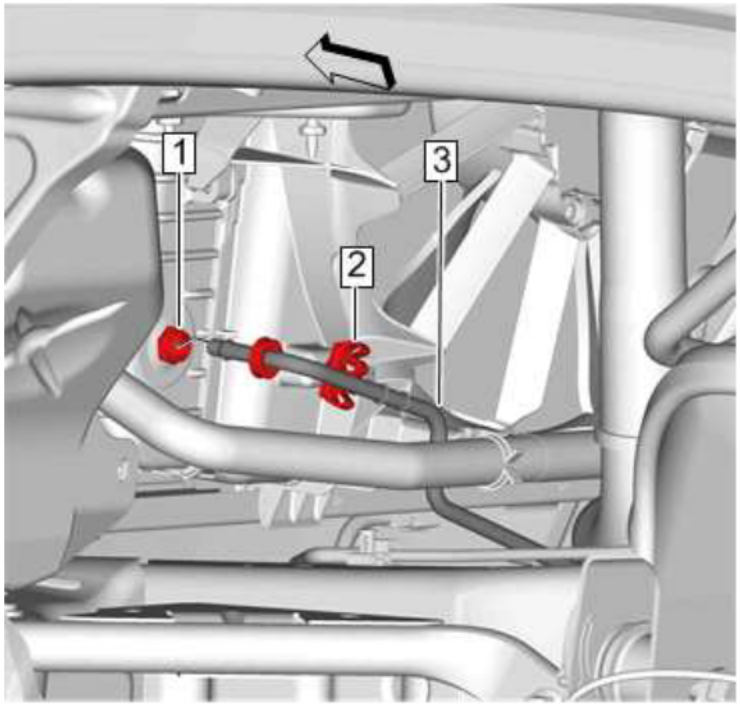

Fig. 537: Transmission Fluid Cooler Inlet and Outlet Pipe @ Radiator
Courtesy of GENERAL MOTORS COMPANY

7. Transmission Fluid Cooler Inlet and Outlet Pipe 3 @Radiator - Install **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (L8B)**

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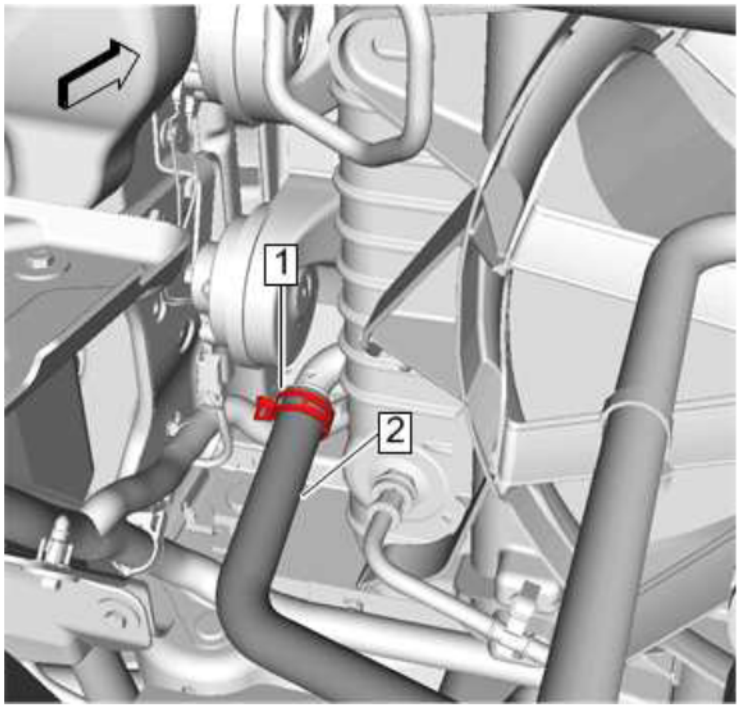

Fig. 538: Generator Control Module Coolant Pump Hose
Courtesy of GENERAL MOTORS COMPANY

8. Generator Control Module Coolant Pump Hose 2 @Radiator - Install **Generator Control Module Coolant Pump Hose Replacement (Left Side L8B)**

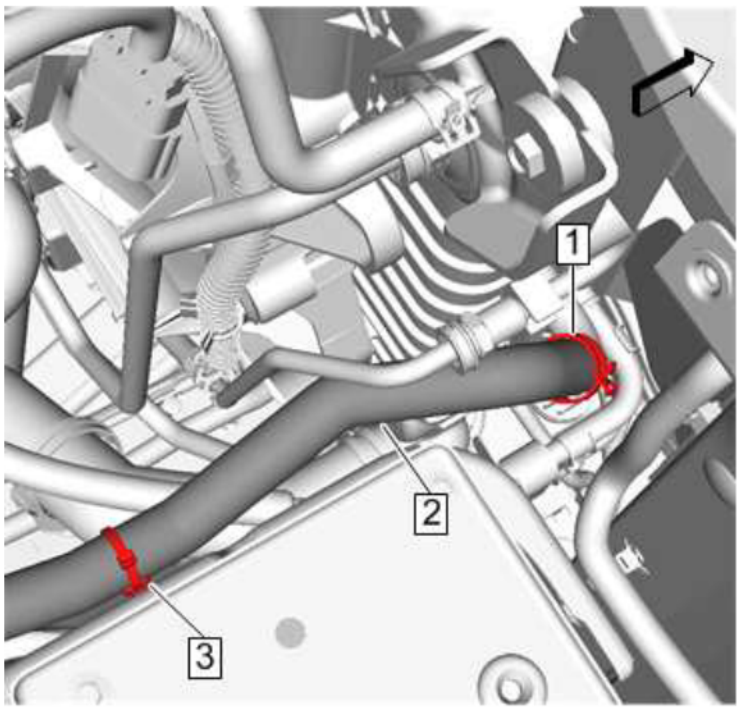

Fig. 539: Generator Control Module Coolant Tank Hose
Courtesy of GENERAL MOTORS COMPANY

9. Generator Control Module Coolant Tank Hose 2 @Radiator - Install **Generator Control Module Coolant Tank Hose Replacement (Bottom L8B)** **Generator Control Module Coolant Tank Hose Replacement (Low Temp Radiator to Generator Control Module L8B)**

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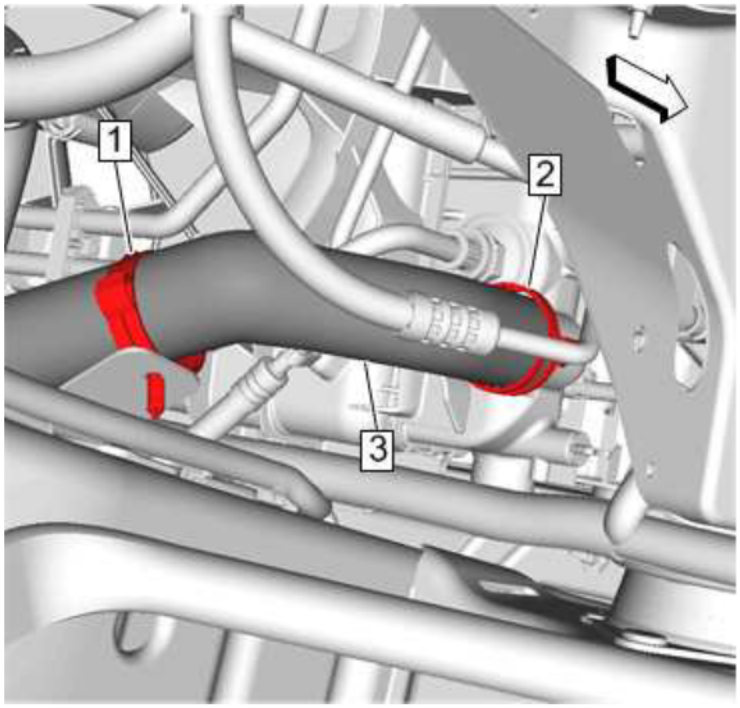

Fig. 540: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

10. Radiator Outlet Hose 3 @Radiator - Install **Radiator Outlet Hose Replacement (L8B)Radiator Outlet Hose Replacement (L5P)**

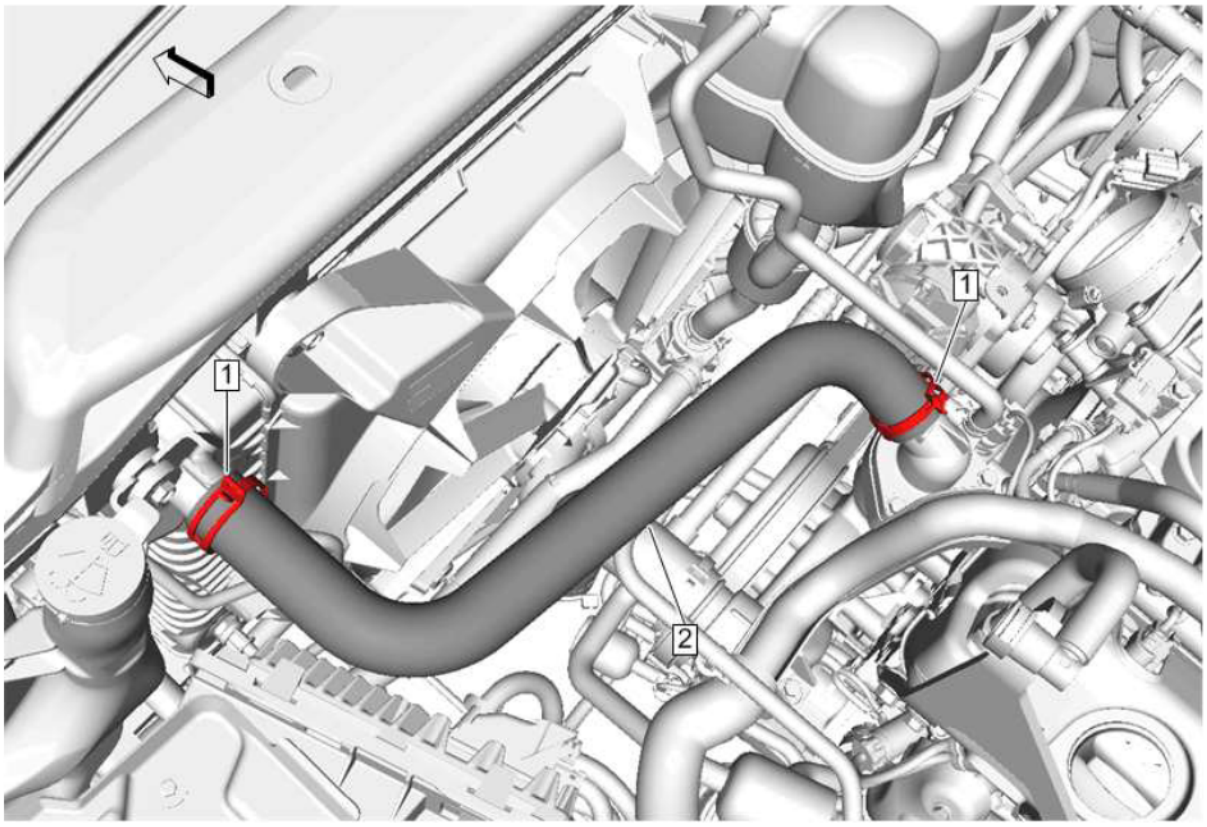

Fig. 541: Radiator Inlet Hose (L8B)
Courtesy of GENERAL MOTORS COMPANY

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11. Radiator Inlet Hose 2 @Radiator - Install **Radiator Inlet Hose Replacement (L8B)**

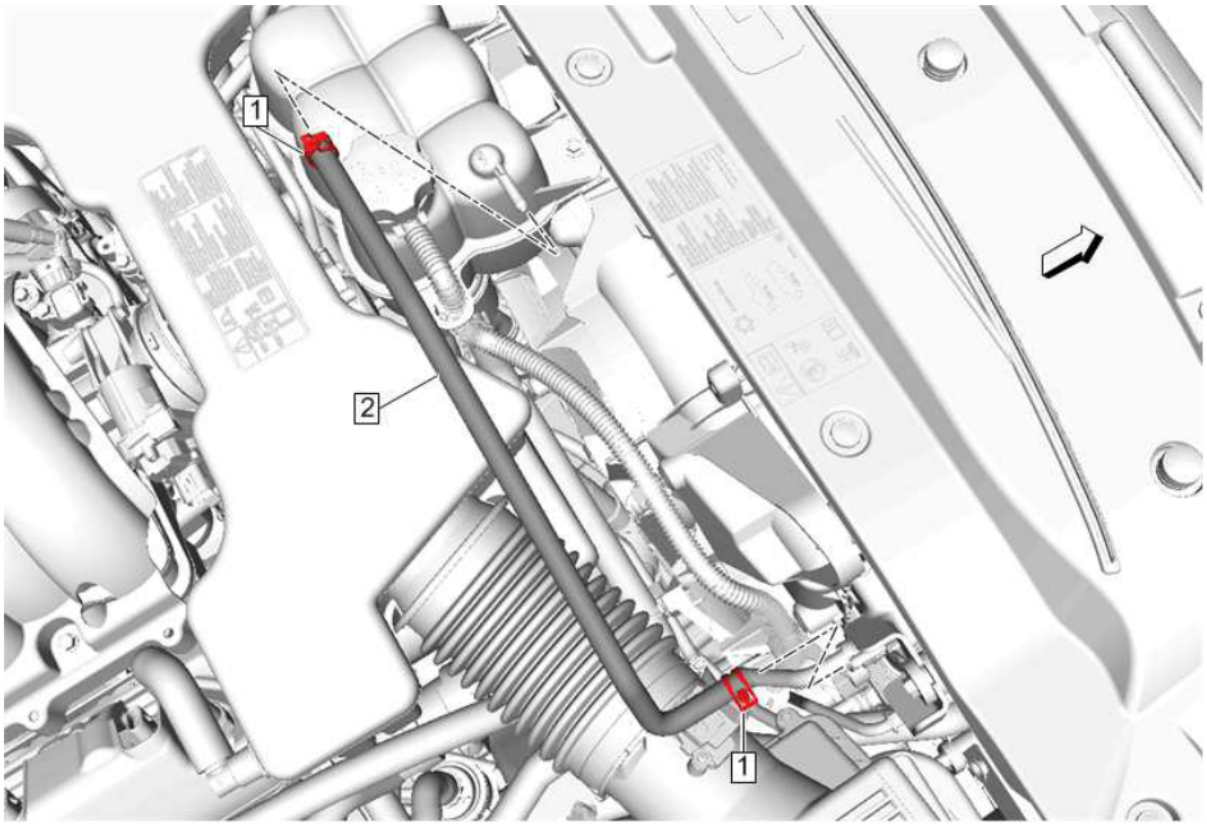

Fig. 542: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

12. Radiator Surge Tank Inlet Hose 2 @Radiator - Install **Radiator Surge Tank Inlet Hose Replacement (L8B)**

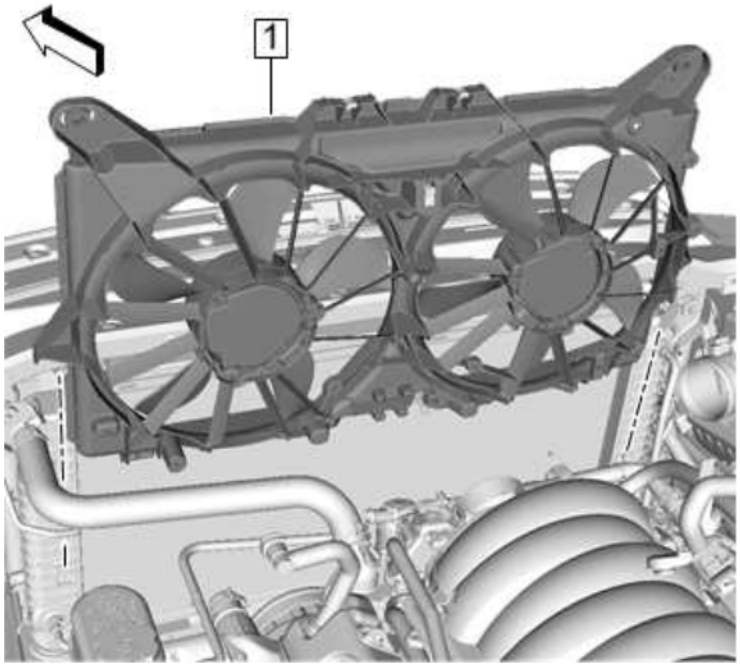

Fig. 543: Engine Coolant Fan Shroud

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Courtesy of GENERAL MOTORS COMPANY

13. Engine Coolant Fan Shroud 1 - Install **Engine Coolant Fan Shroud Replacement (L8B)**

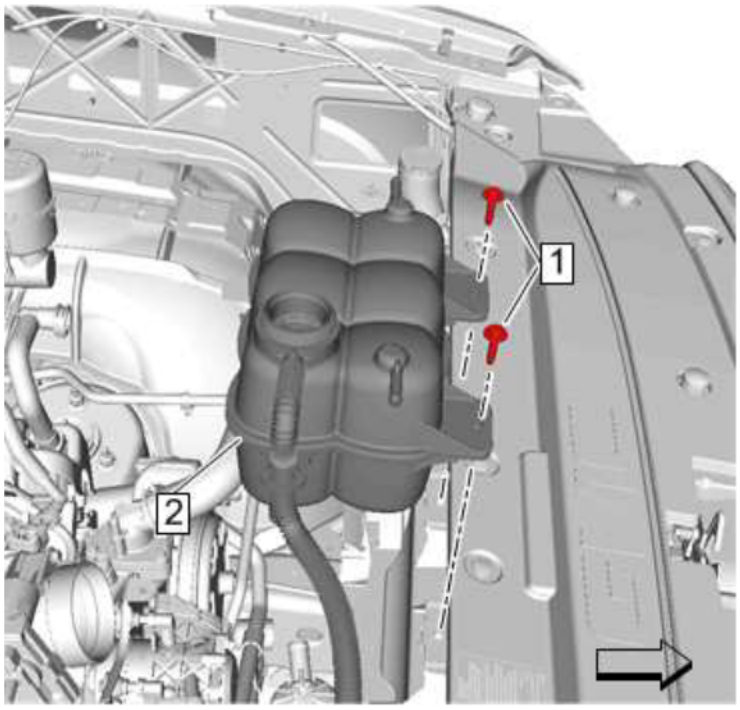

Fig. 544: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

14. Radiator Surge Tank 2 @Engine Coolant Fan Shroud - Install **Radiator Surge Tank Replacement (L8B)**

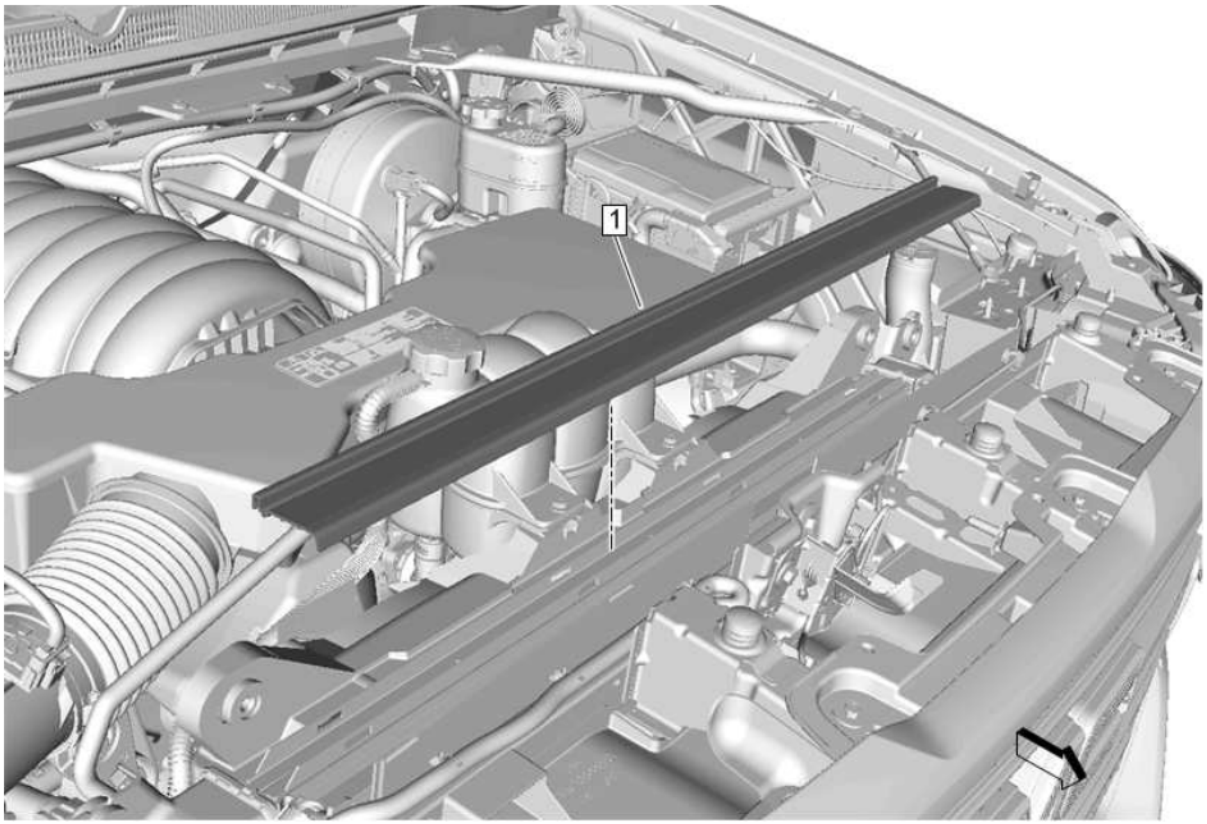

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Fig. 545: Radiator Air Upper Baffle and Deflector (L8B)
Courtesy of GENERAL MOTORS COMPANY

15. Radiator Air Upper Baffle 1 - Install **Radiator Air Upper Baffle and Deflector Replacement (L8B)**

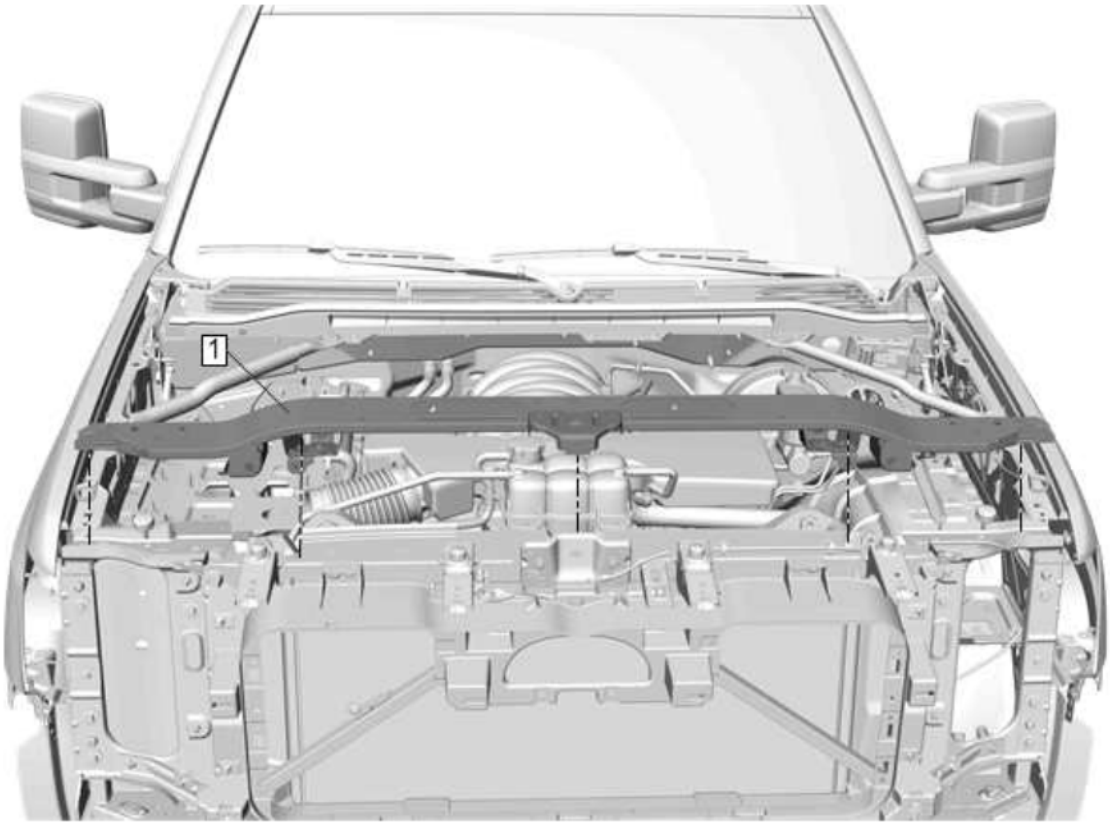

Fig. 546: Front End Upper Tie Bar
Courtesy of GENERAL MOTORS COMPANY

16. Front End Upper Tie Bar 1 - Install **Front End Upper Tie Bar Support Replacement**
17. Fill the cooling system. **Cooling System Draining and Filling (Vac N Fill L8B)**
18. Start the engine and check for coolant leaks.

RADIATOR REPLACEMENT (L5P)

Removal Procedure

1. Drain the coolant. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**

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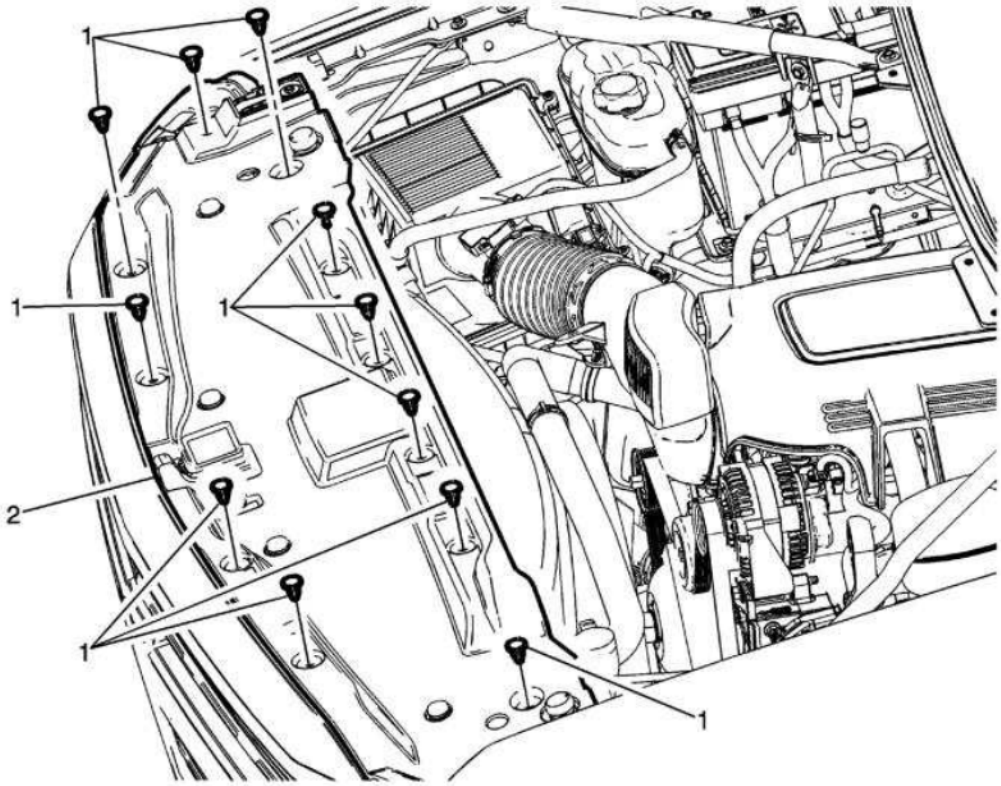

Fig. 547: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

2. Front Compartment Front Sight Shield 2 - Remove - **Front Compartment Front Sight Shield Replacement**

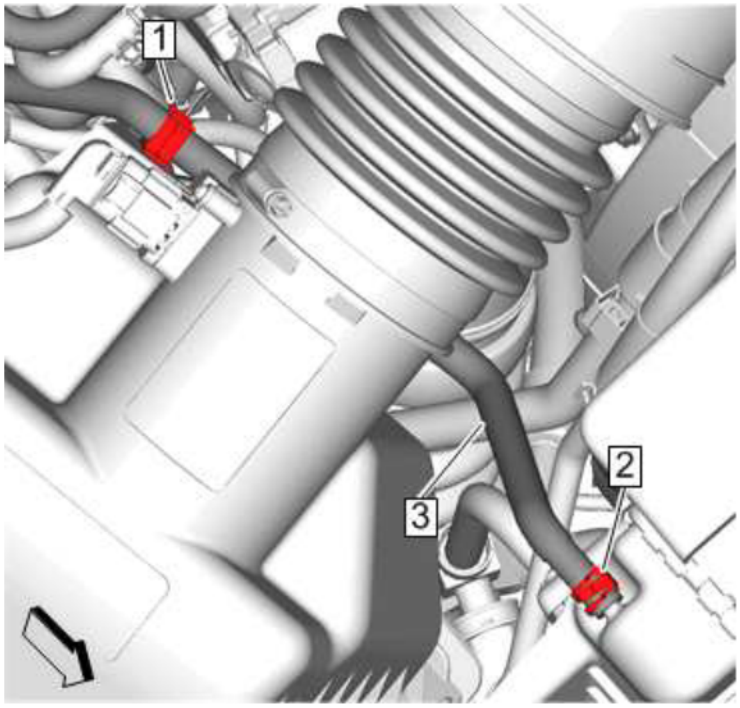

Fig. 548: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

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3. Radiator Surge Tank Inlet Hose 3 @Radiator - Remove - **Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Radiator to Radiator Surge Tank Inlet Hose L5P)Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Engine L5P)**
4. Air Cleaner Outlet Front Duct - Remove - **Air Cleaner Outlet Front Duct Replacement**
5. Air Conditioning Compressor Hose - Remove - **Air Conditioning Compressor Hose Replacement (L5P)**

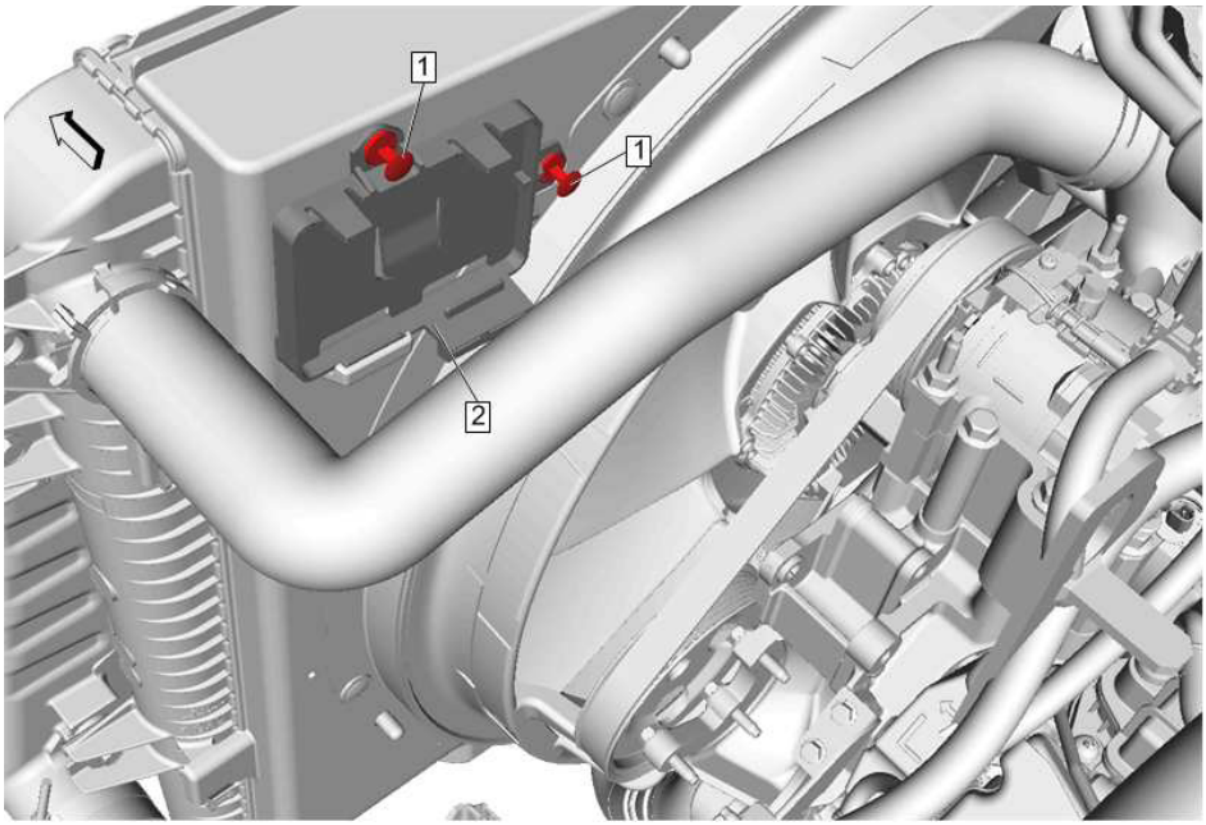

Fig. 549: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

6. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Remove **Transmission Control Module Bracket Replacement**

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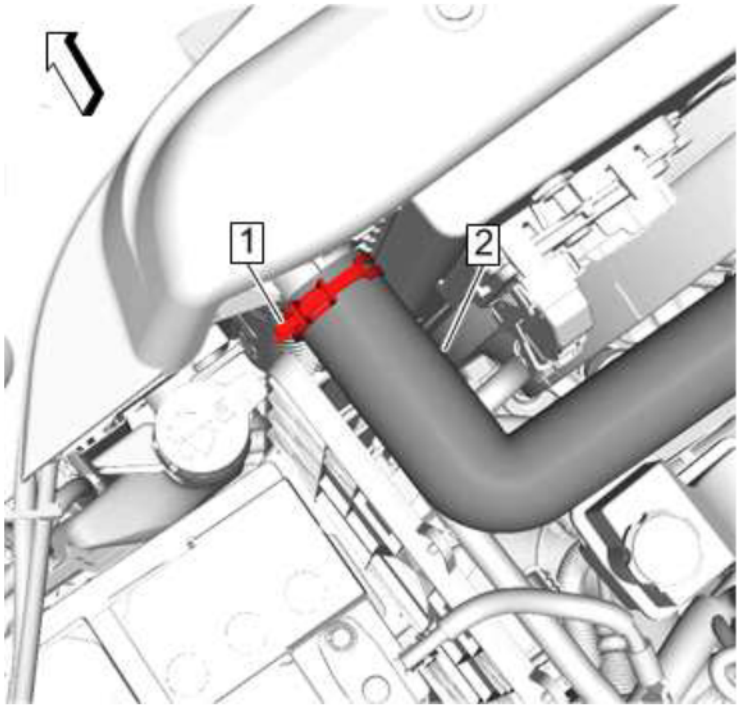

Fig. 550: Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Radiator Inlet Hose 2 Remove **Radiator Inlet Hose Replacement (L5P)**

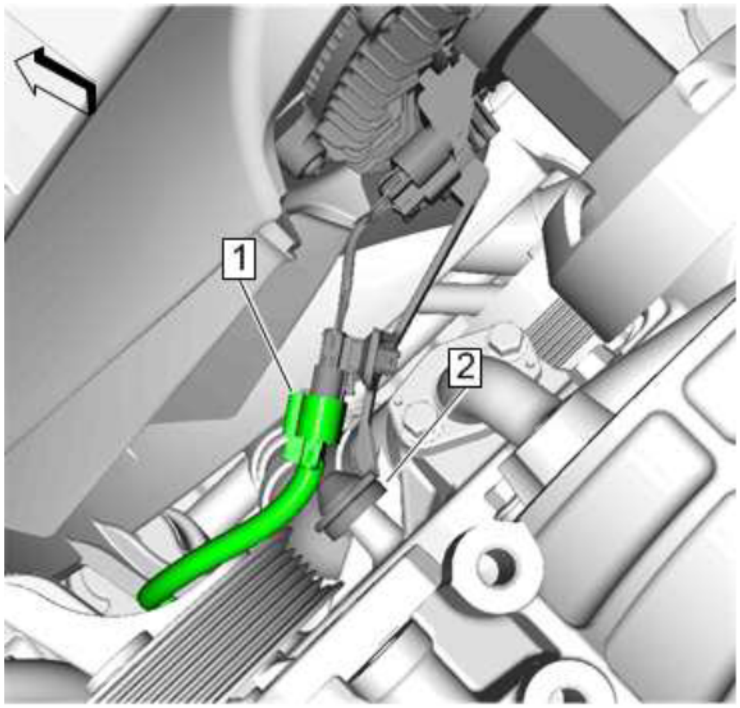

Fig. 551: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

8. Engine Wiring Harness 1 @Fan Blade Clutch - Disconnect
9. Fan Blade Clutch 2 @Engine - Remove

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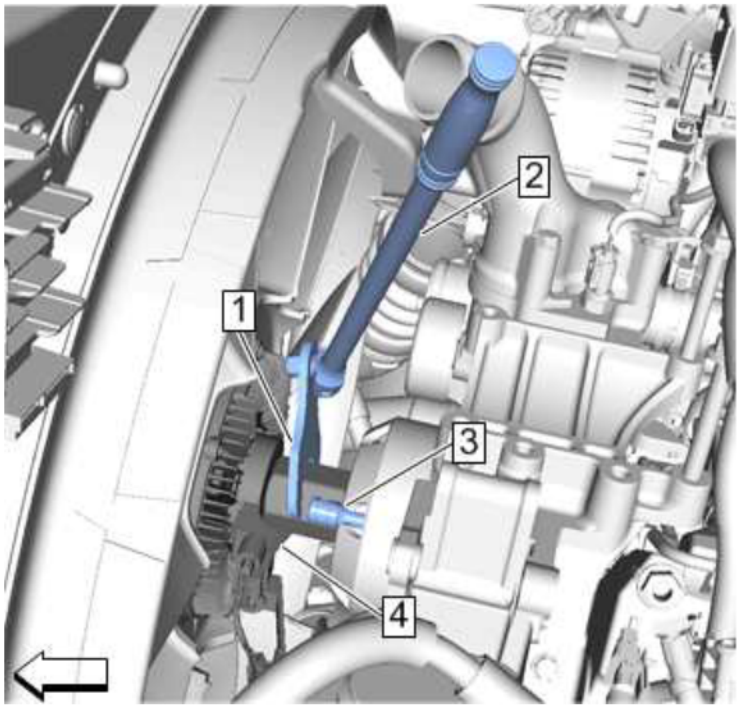

Fig. 552: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

10. Fan Blade Clutch 4 - Remove **Fan Blade Clutch Replacement (L5P)**

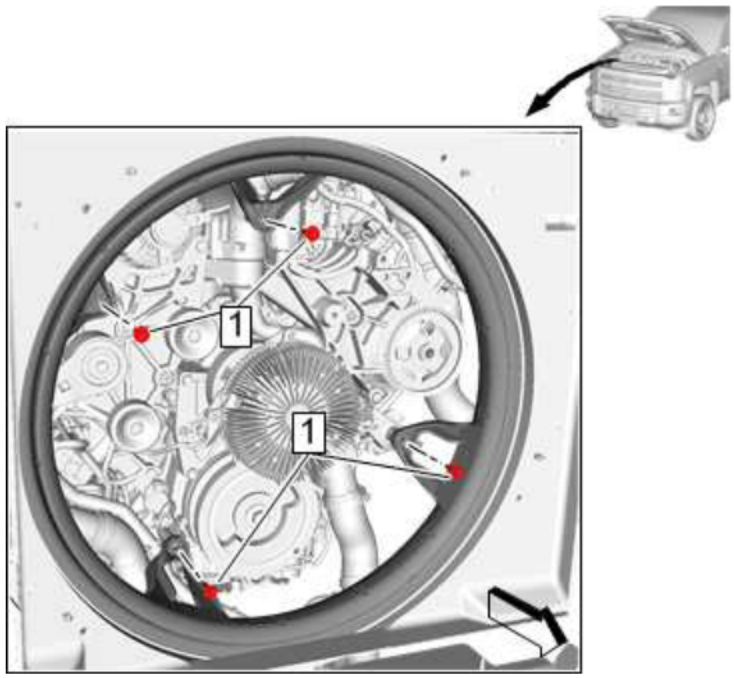

Fig. 553: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

11. Engine Coolant Fan Shroud Bolt- Upper 1 - Remove

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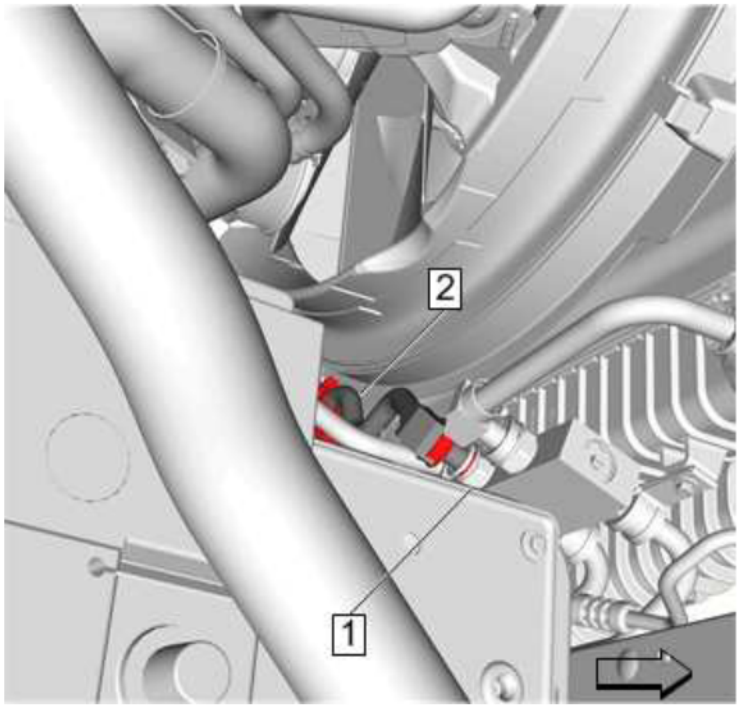

Fig. 554: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

12. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Remove **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

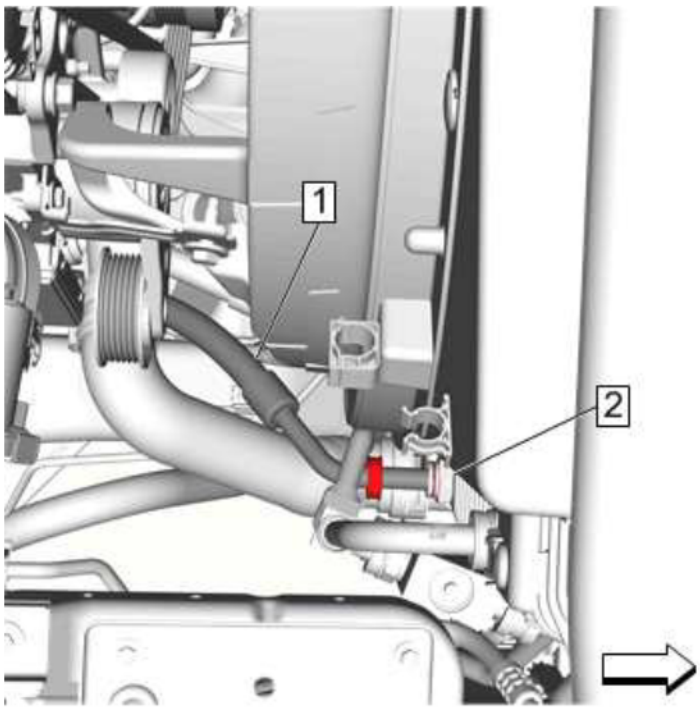

Fig. 555: Transmission Fluid Cooler Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

13. Transmission Fluid Cooler Inlet Pipe 1 @Radiator - Remove - **Transmission Fluid Cooler Inlet Pipe Replacement (L5P with MW7)**

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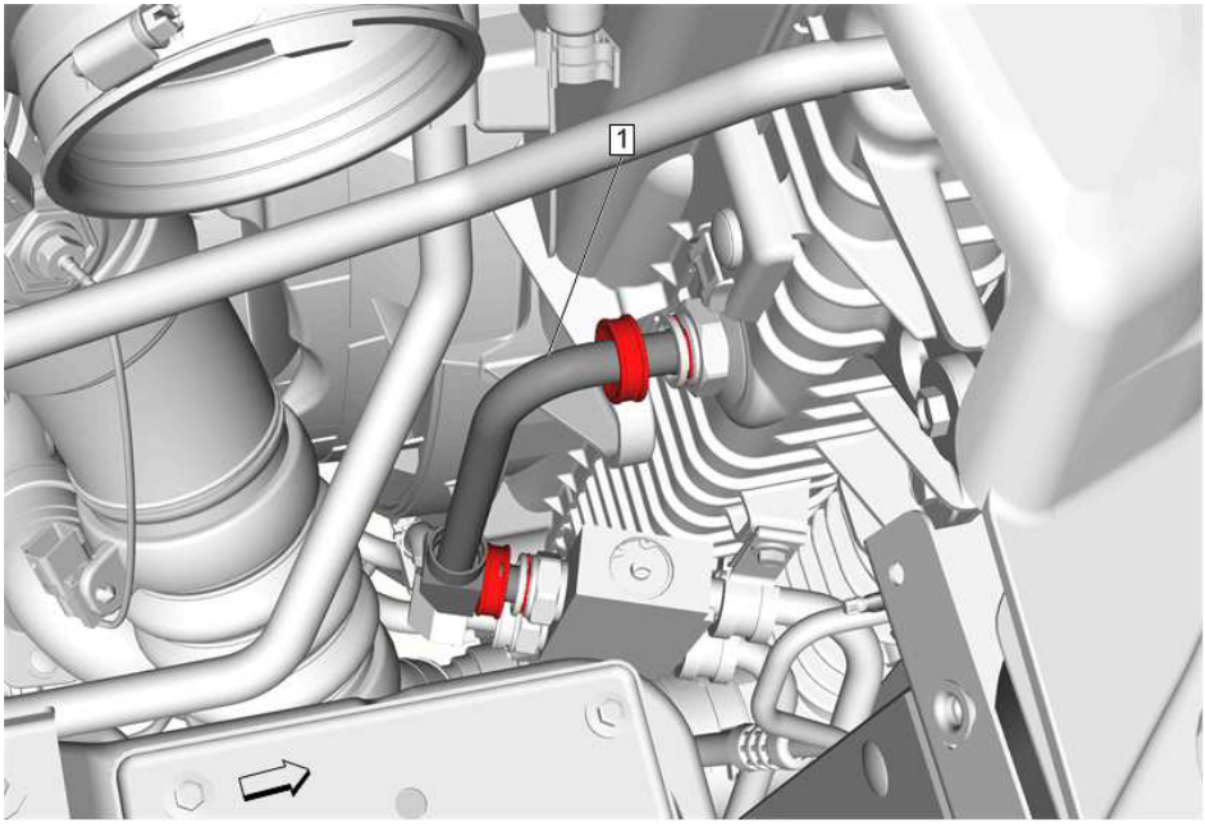

Fig. 556: Transmission Fluid Auxiliary Cooler Inlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

14. Transmission Fluid Auxiliary Cooler Inlet Pipe 1 - Remove - **Transmission Fluid Cooler Inlet Pipe Replacement (L5P with MW7)**

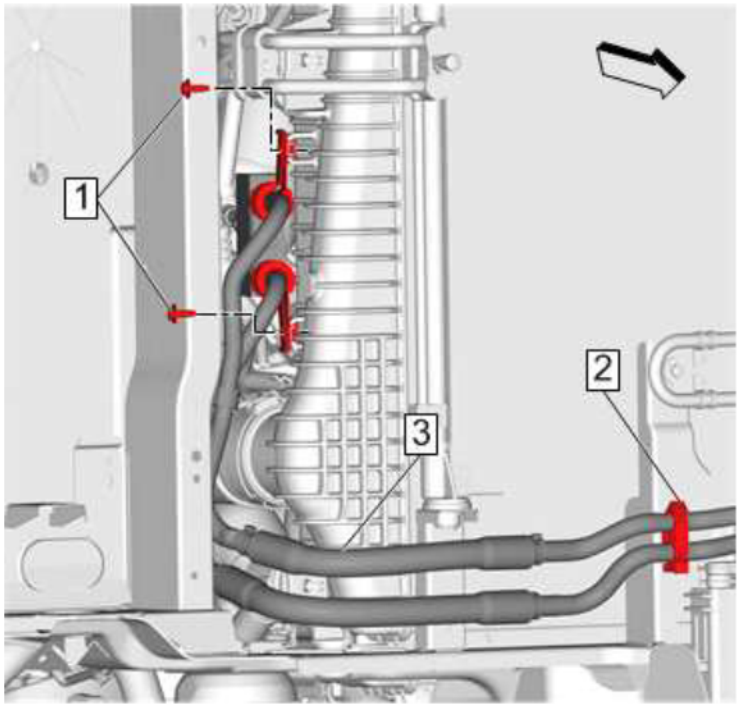

Fig. 557: Transmission Fluid Cooler Pipe Clip And Support Bracket
Courtesy of GENERAL MOTORS COMPANY

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15. Transmission Cooler Bypass Valve Bracket Bolt 3 @Radiator - Remove **Transmission Fluid Cooler Thermal Bypass Valve Replacement (L5P With MW7)**

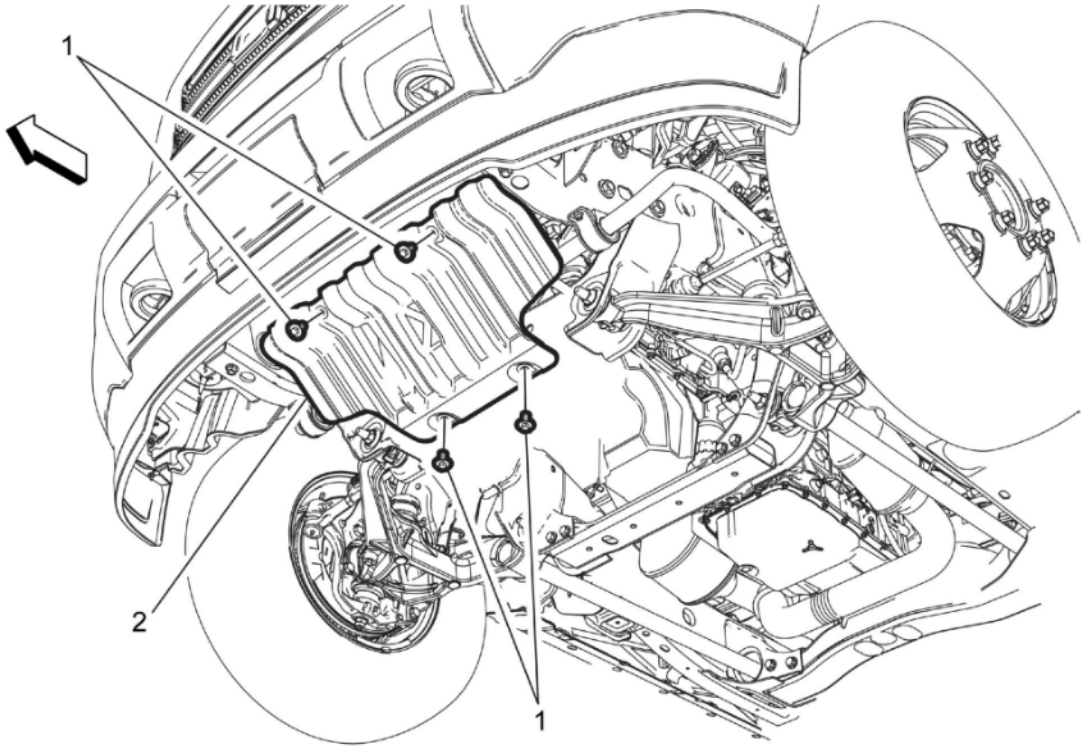

Fig. 558: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

16. Underbody Splash Shield 2 - Remove - **Underbody Splash Shield Replacement**

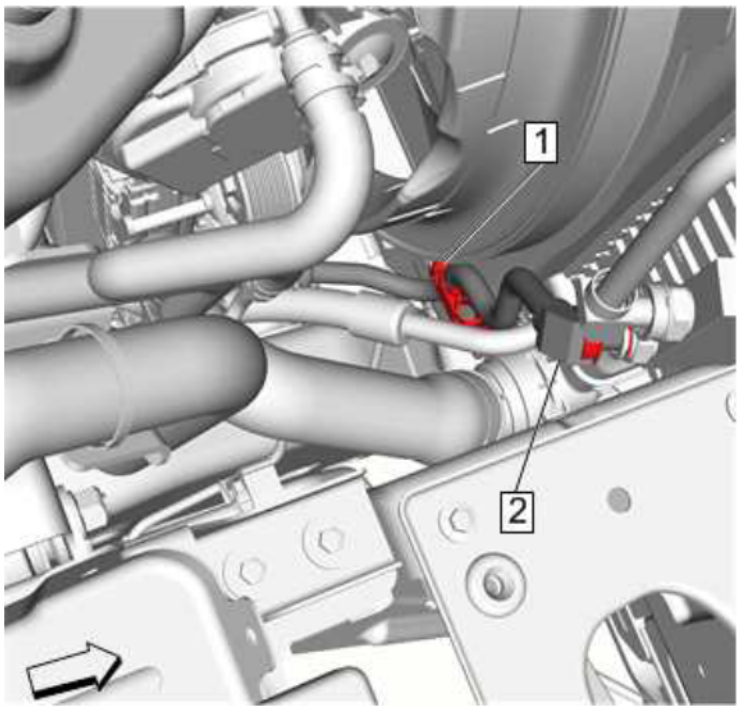

Fig. 559: Transmission Fluid Cooler Outlet Pipe

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Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Remove - **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

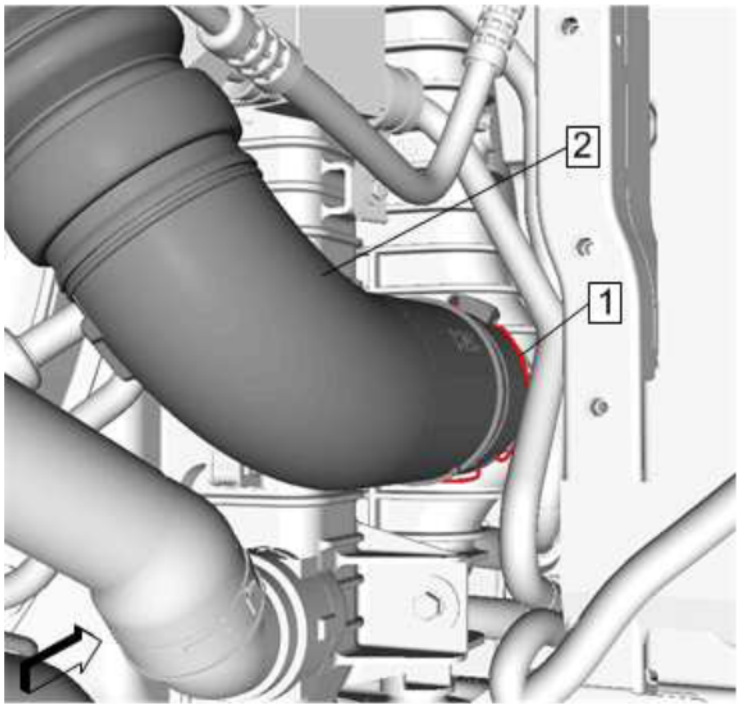

Fig. 560: Charge Air Cooler Outlet Air Hose
Courtesy of GENERAL MOTORS COMPANY

18. Charge Air Cooler Outlet Air Hose@Radiator - Remove - **Charge Air Cooler Outlet Air Hose Replacement**

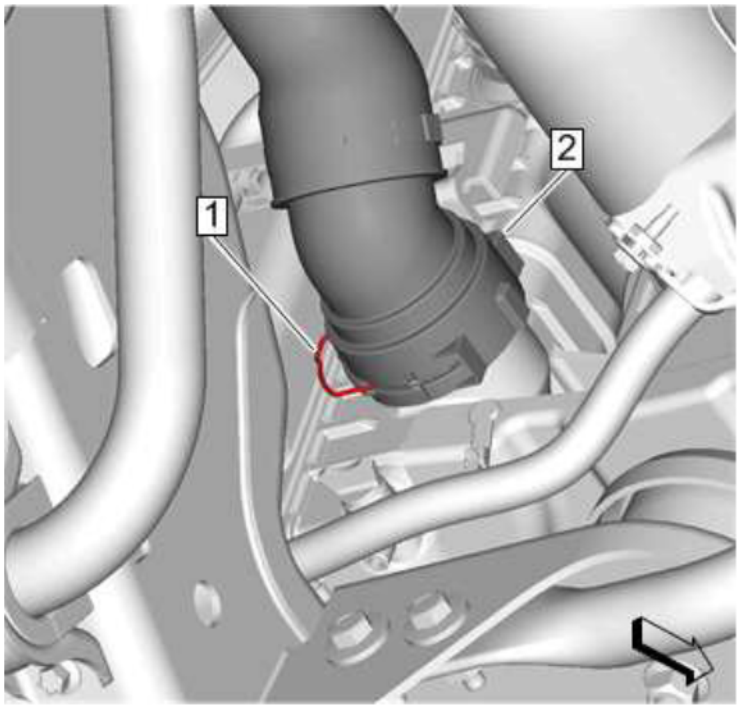

Fig. 561: Radiator Outlet Hose

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Courtesy of GENERAL MOTORS COMPANY

19. Radiator Outlet Hose 2 @Radiator - Remove - **Radiator Outlet Hose Replacement (L5P)**

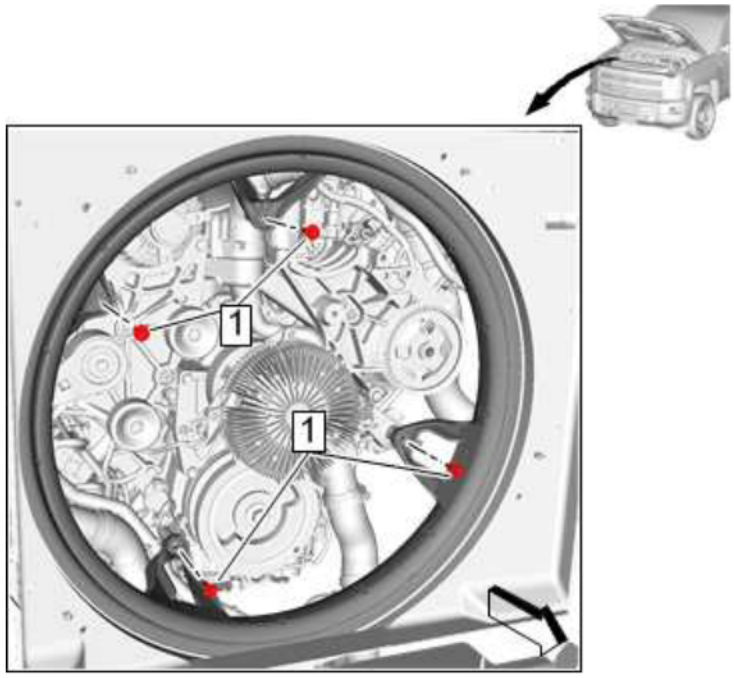

Fig. 562: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

20. Engine Coolant Fan Shroud Bolt- Lower 1 - Remove
21. Lower the vehicle.

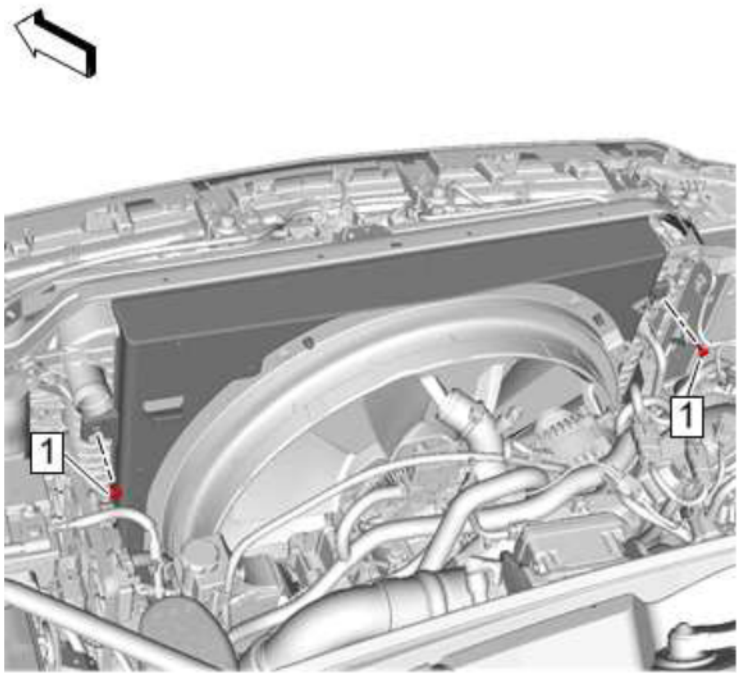

Fig. 563: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

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22. Engine Coolant Fan Shroud Retainer 1 @Radiator - Remove

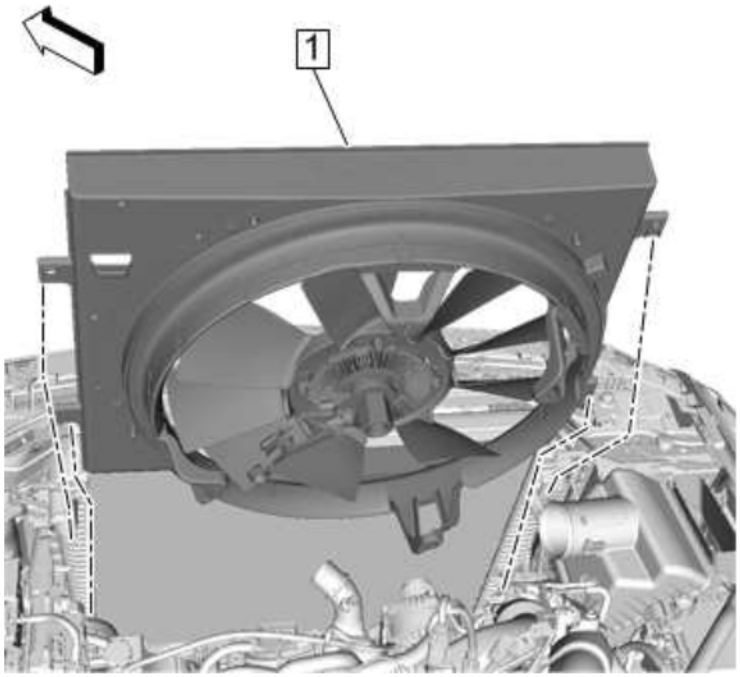

Fig. 564: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

23. Remove the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) from the vehicle.

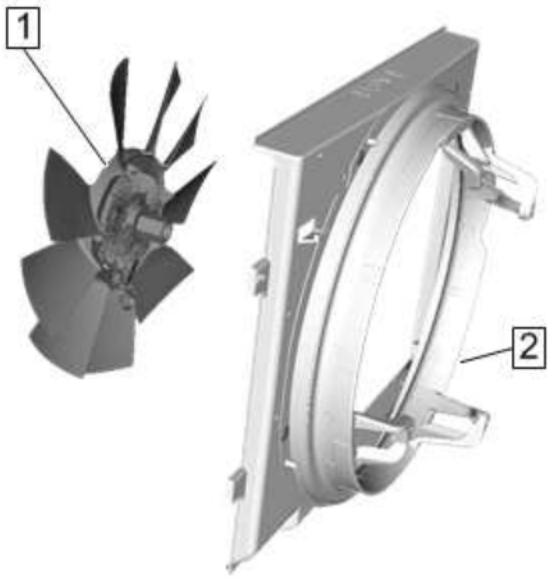

Fig. 565: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

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24. Remove the fan blade and fan blade clutch as an assembly (1) from the engine coolant fan shroud (2).

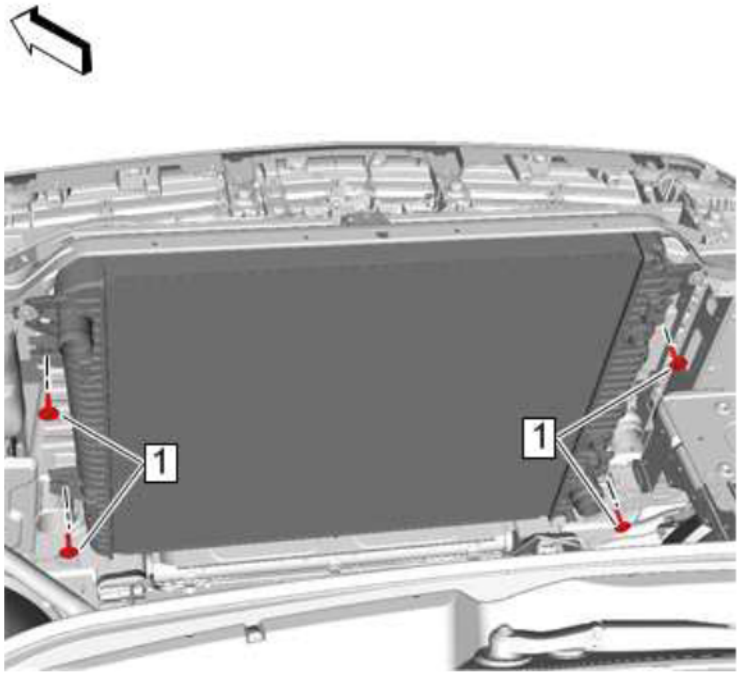

Fig. 566: Charge Air Cooler
Courtesy of GENERAL MOTORS COMPANY

25. Radiator Bolt 1 @Charge Air Cooler - Remove

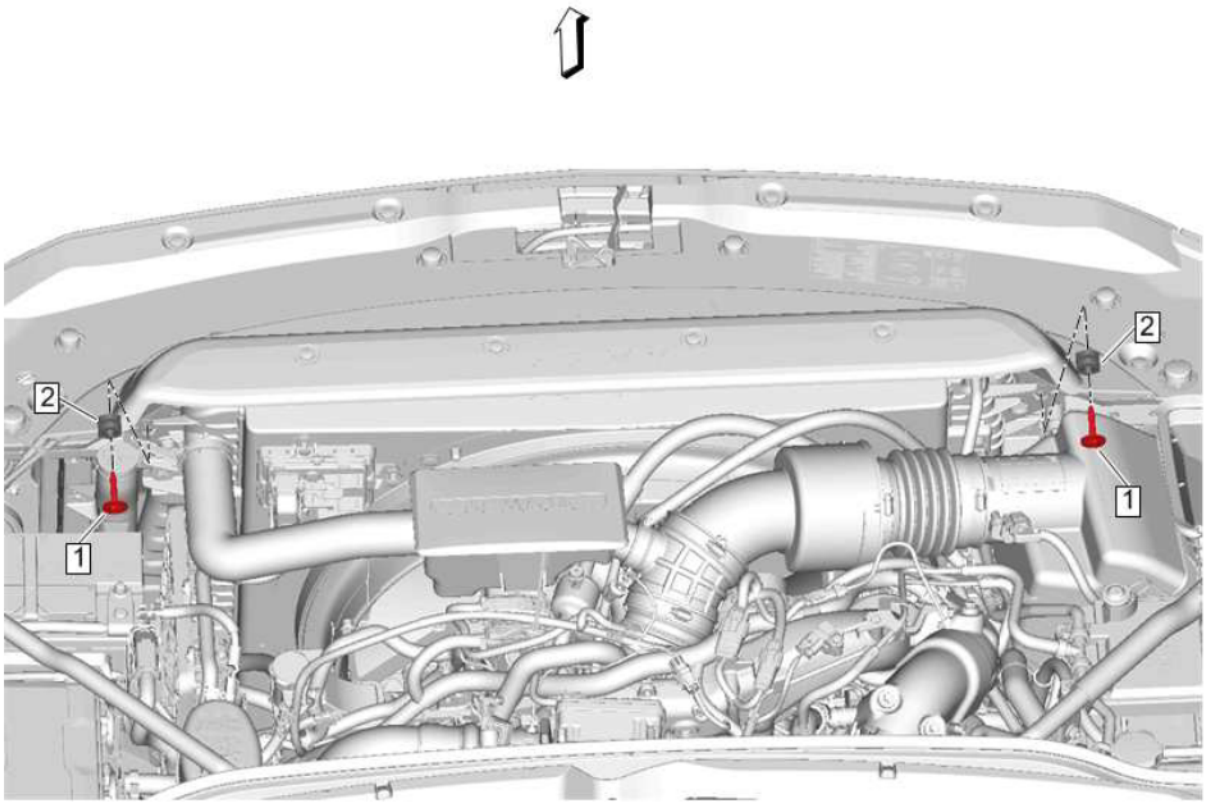

Fig. 567: Radiator Upper Insulator (L5P)
Courtesy of GENERAL MOTORS COMPANY

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26. Radiator Upper Insulator Bolt 1 - Remove **Radiator Upper Insulator Replacement (L5P)**

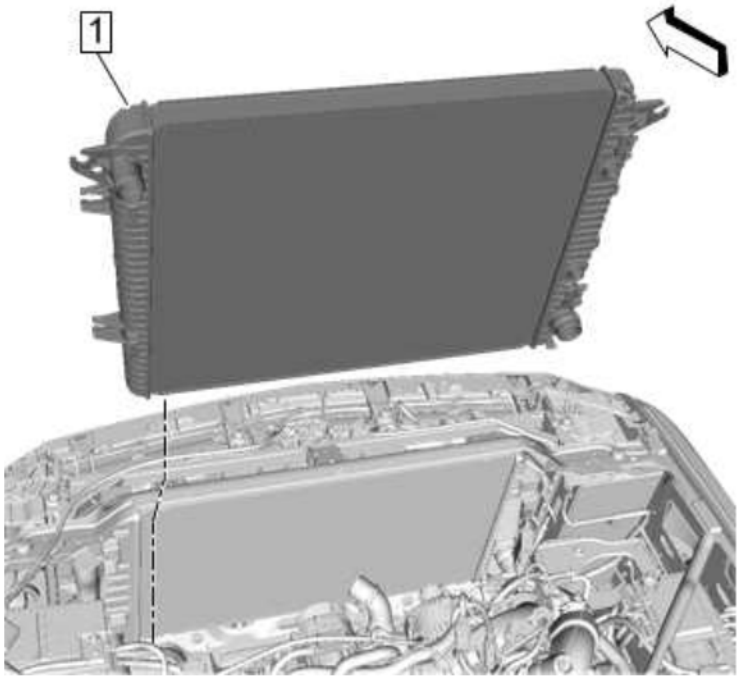

Fig. 568: Radiator
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

27. Radiator 1 - Remove

Installation Procedure

WARNING: **Do not use or attempt to repair a damaged cooling fan assembly. Replace damaged fans with new assemblies. An unbalanced cooling fan could fly apart causing personal injury and property damage.**

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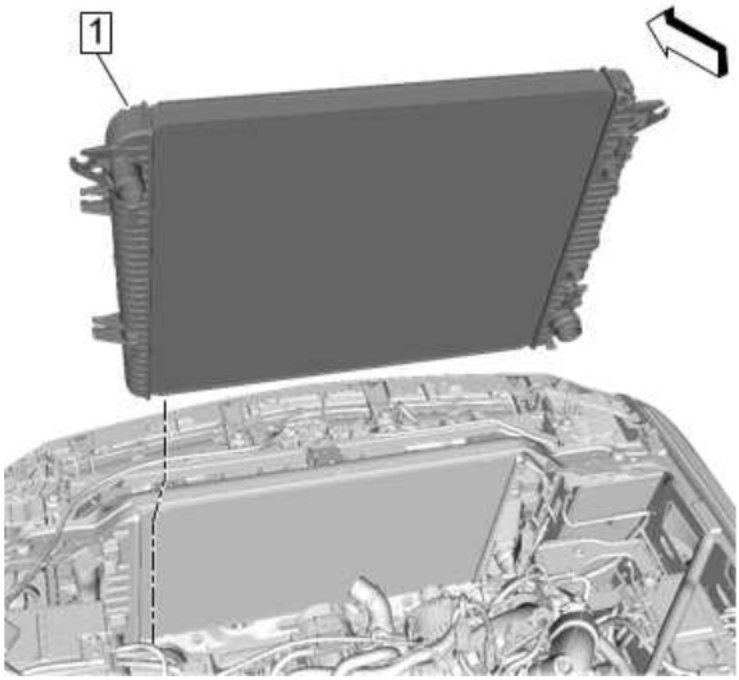

Fig. 569: Radiator
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

1. Radiator 1 - Install

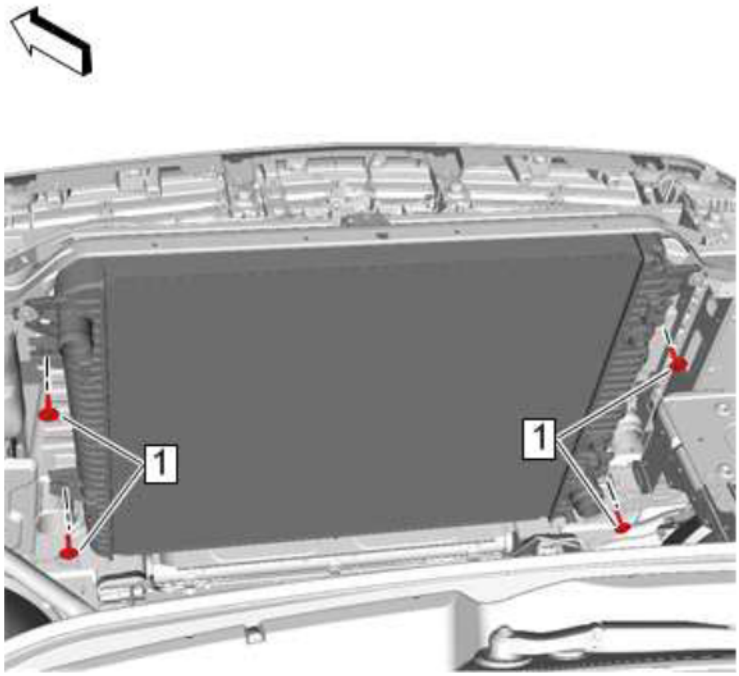

Fig. 570: Charge Air Cooler
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

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2. Radiator Bolt 1 @Charge Air Cooler - Install and tighten 20 N.m (15 lb ft)

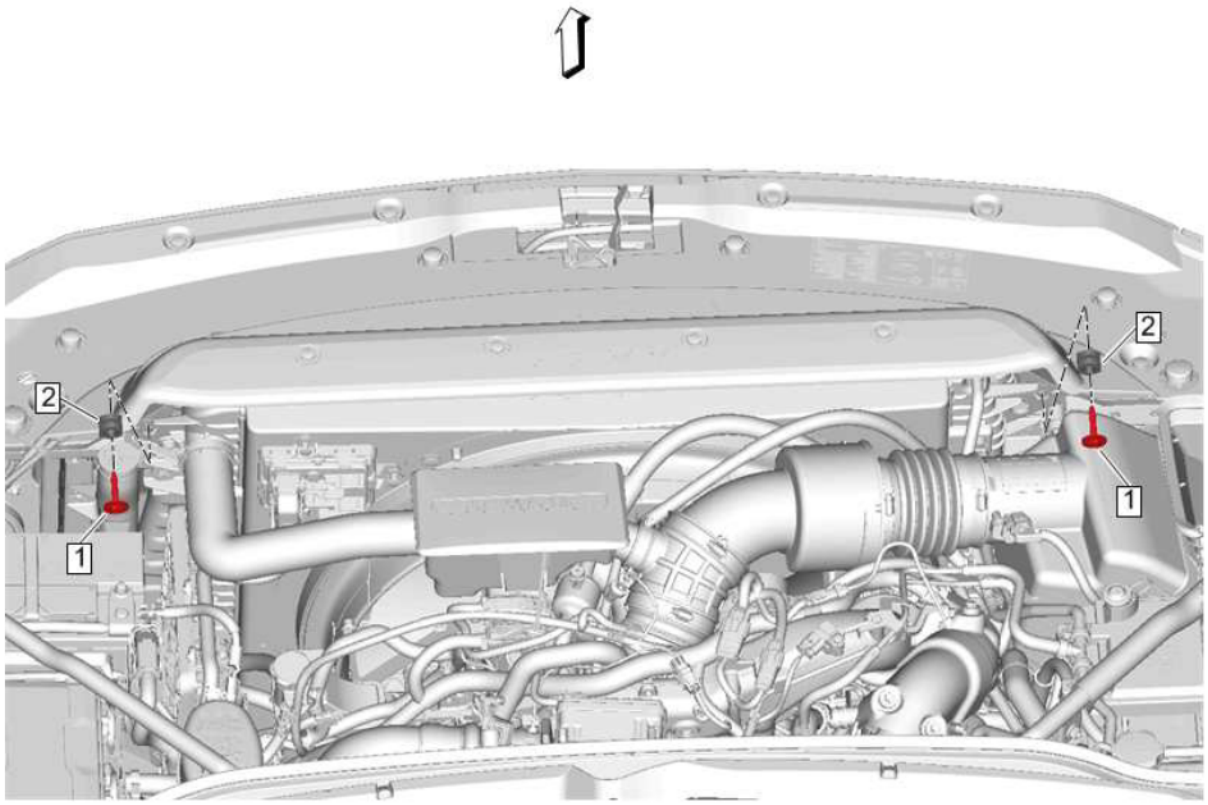

Fig. 571: Radiator Upper Insulator (L5P)
Courtesy of GENERAL MOTORS COMPANY

3. Radiator Upper Insulator Bolt 2 - Install **Radiator Upper Insulator Replacement (L5P)**

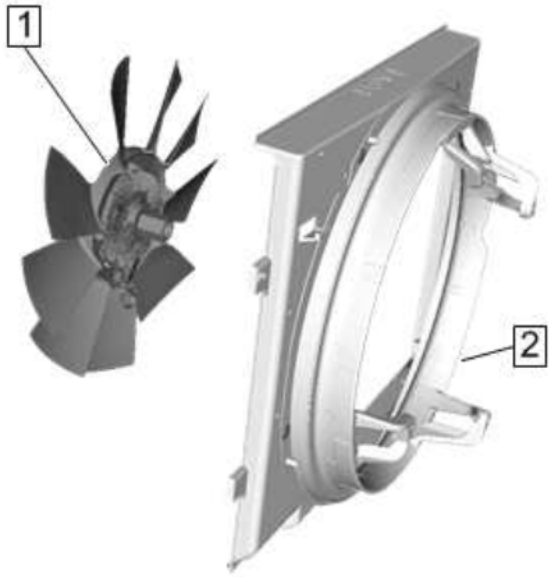

Fig. 572: Fan Blade And Fan Blade Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

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4. Install the fan blade and fan blade clutch as an assembly (1) into the engine coolant fan shroud (2).

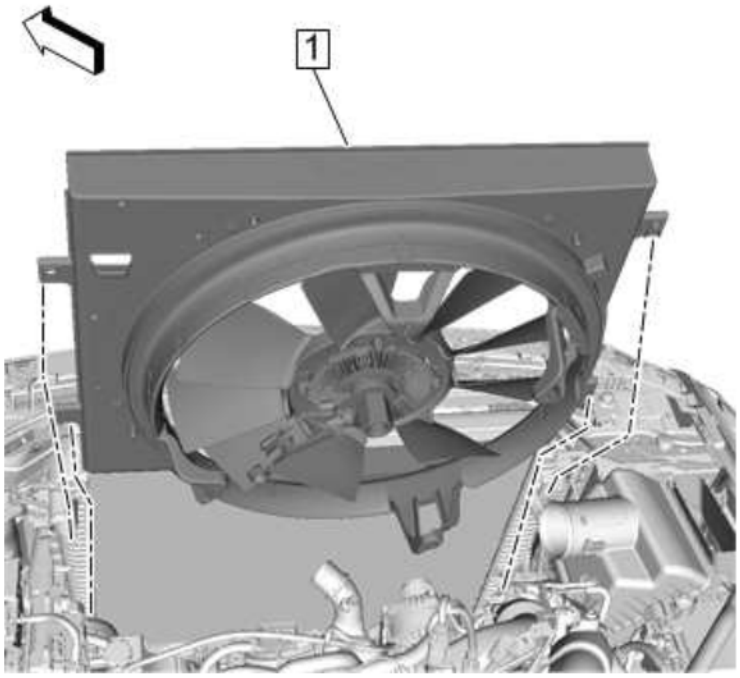

Fig. 573: Fan Blade, Fan Blade Clutch And Engine Coolant Fan Shrouds Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **A second technician is required.**

5. Install the fan blade, fan blade clutch and the engine coolant fan shrouds as an assembly (1) to the vehicle.

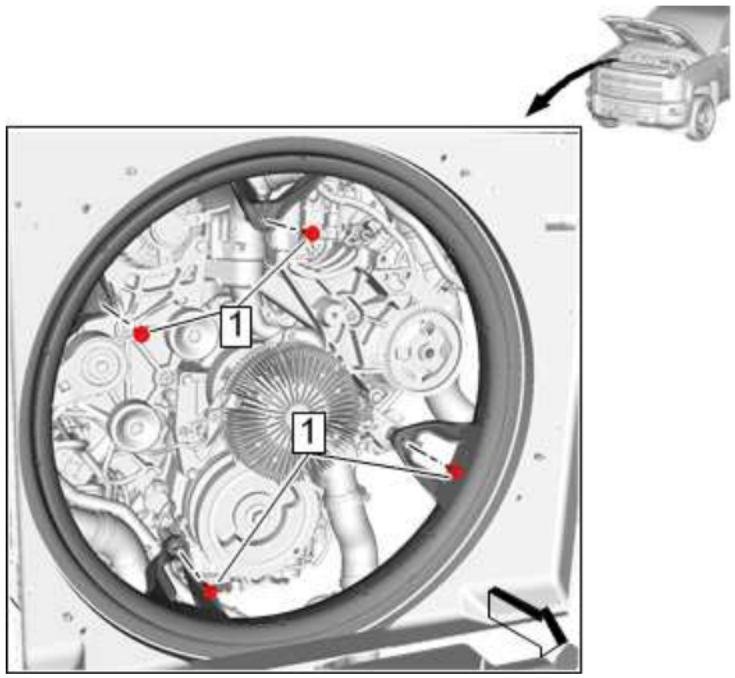

Fig. 574: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

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6. Engine Coolant Fan Shroud Bolt- Upper 1 - Install and hand tighten

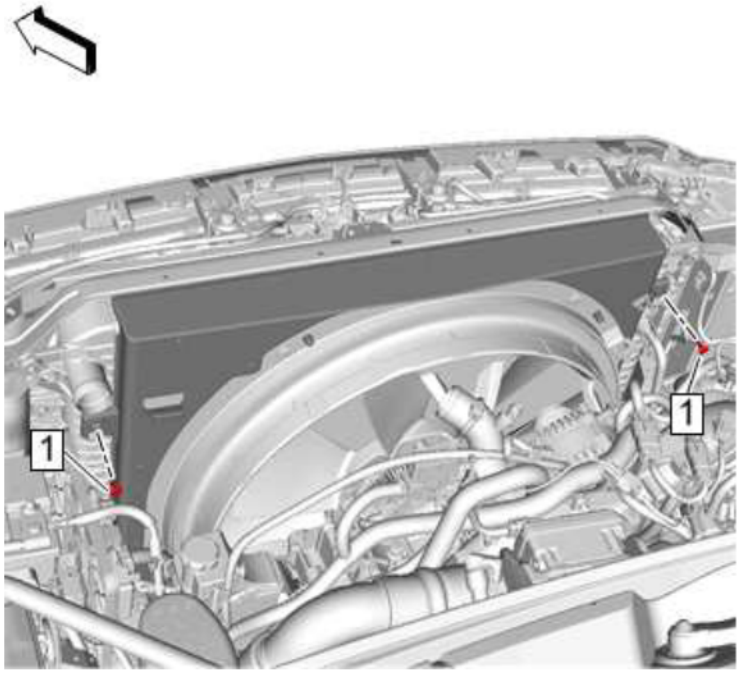

Fig. 575: Engine Coolant Fan Shroud Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Engine Coolant Fan Shroud Retainer 1 @Radiator - Install
8. Install the fan blade, fan blade clutch to the fan pulley.

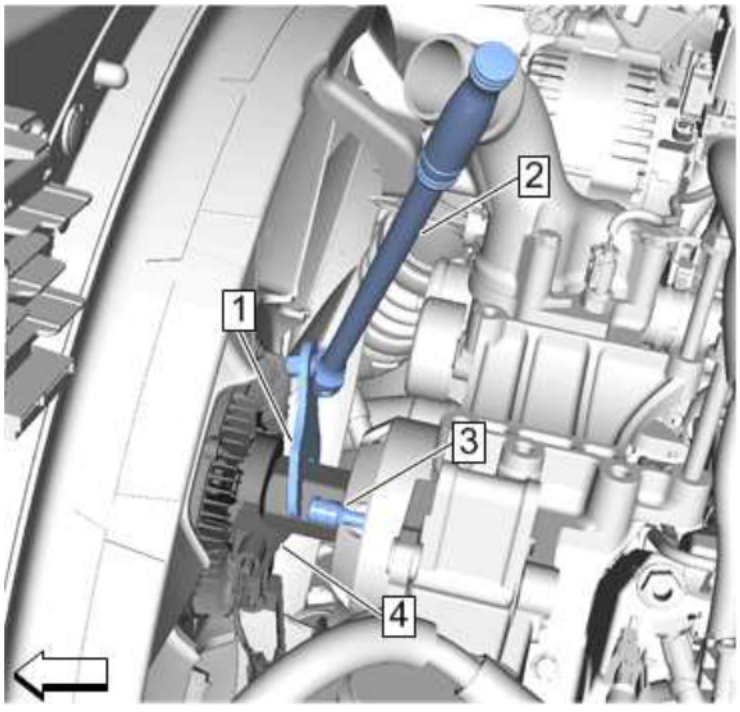

Fig. 576: Fan Blade And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

9. Fan Blade Clutch 4 - Install - **Fan Blade Clutch Replacement (L5P)**

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10. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

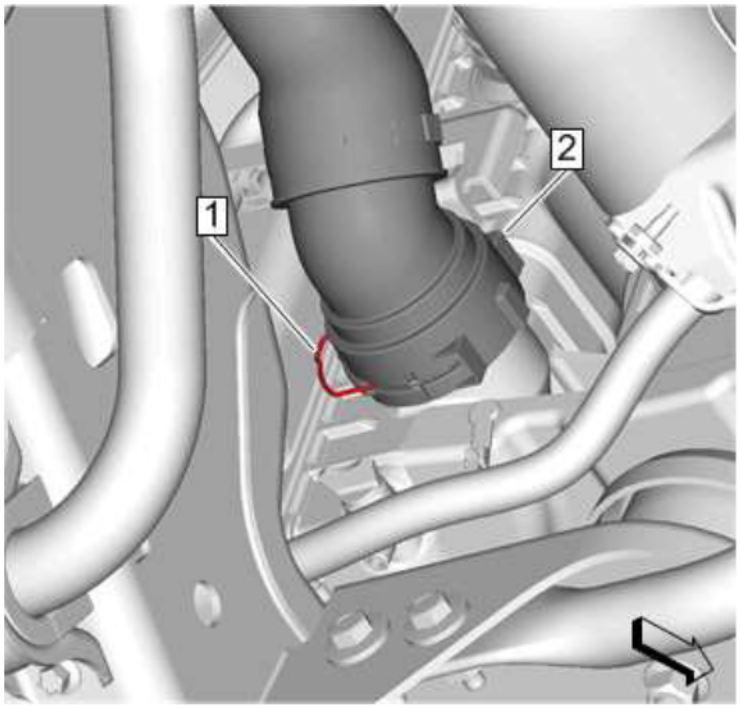

Fig. 577: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

11. Radiator Outlet Hose 2 @Radiator - Install **Radiator Outlet Hose Replacement (L5P)**

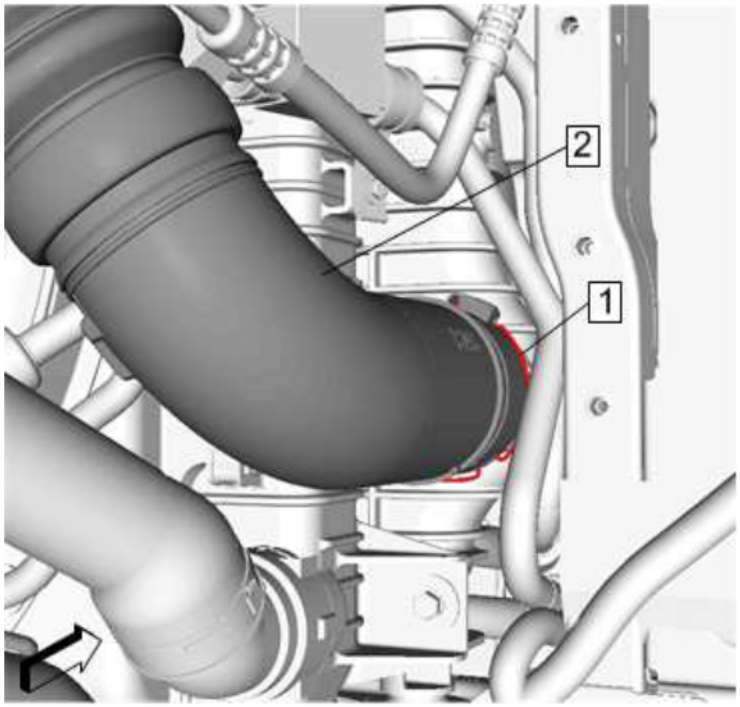

Fig. 578: Charge Air Cooler Outlet Air Hose
Courtesy of GENERAL MOTORS COMPANY

12. Charge Air Cooler Outlet Air Hose@Radiator - Install **Charge Air Cooler Outlet Air Hose Replacement**

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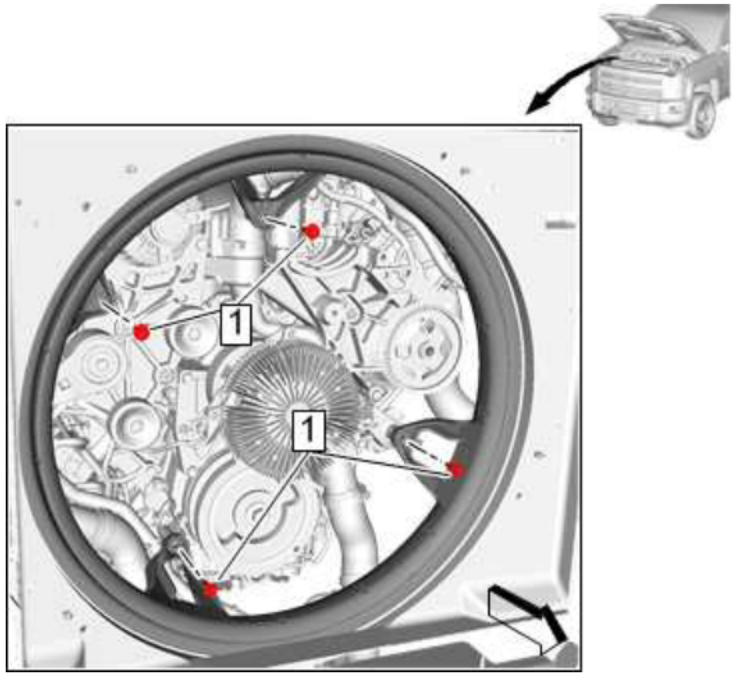

Fig. 579: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

13. Engine Coolant Fan Shroud Bolt- Lower 1 - Install and tighten 8 N.m (71 lb in)
14. Lower the vehicle.

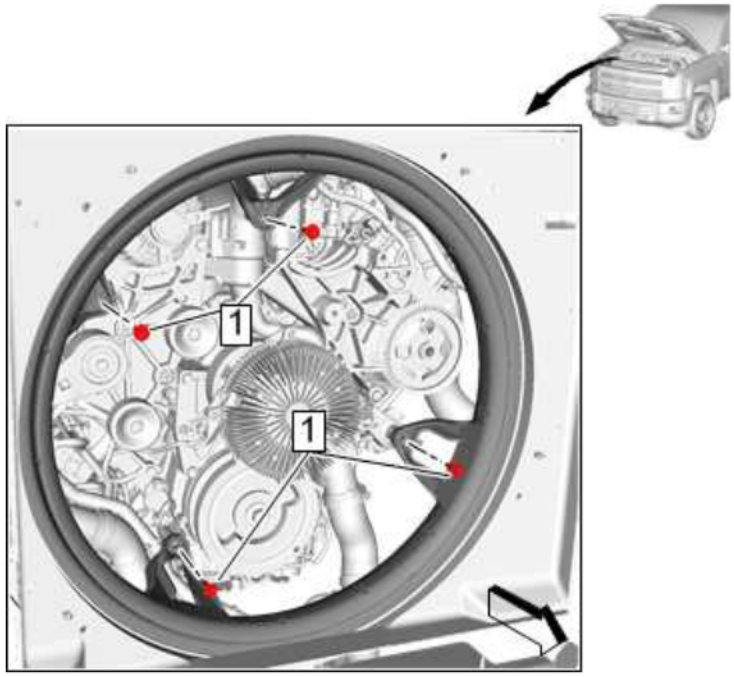

Fig. 580: Engine Coolant Fan Shroud Bolt
Courtesy of GENERAL MOTORS COMPANY

15. Engine Coolant Fan Shroud Bolt- Upper 1 - Tighten 8 N.m (71 lb in)

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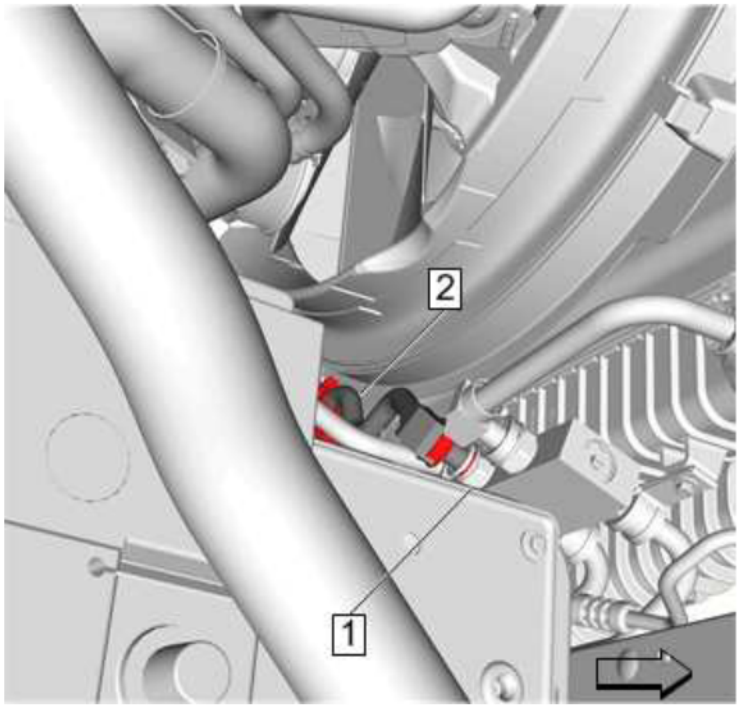

Fig. 581: Transmission Fluid Cooler Outlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

16. Transmission Fluid Cooler Outlet Pipe 2 @Transmission Fluid Cooler Thermal Bypass Valve - Install **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

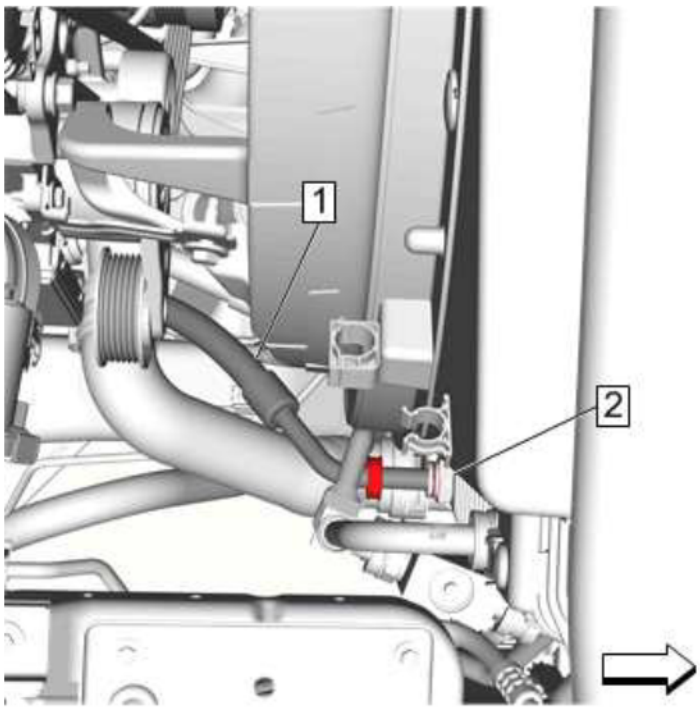

Fig. 582: Transmission Fluid Cooler Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

17. Transmission Fluid Cooler Inlet Pipe 1 @Radiator - Install - **Transmission Fluid Cooler Inlet Pipe Replacement (L5P with MW7)**

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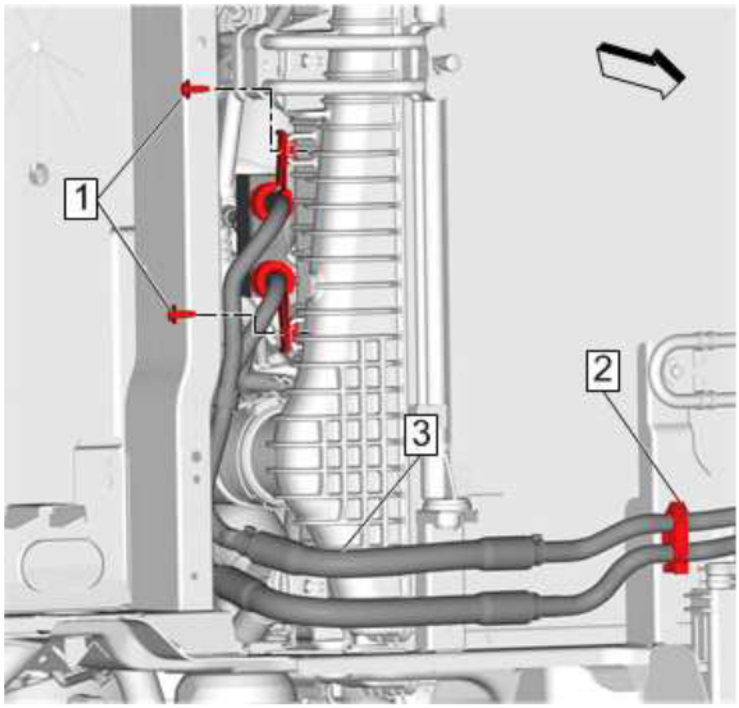

Fig. 583: Transmission Fluid Cooler Pipe Clip And Support Bracket
Courtesy of GENERAL MOTORS COMPANY

18. Transmission Cooler Bypass Valve Bracket Bolt 3 @Radiator - Install **Transmission Fluid Cooler Thermal Bypass Valve Replacement (L5P With MW7)**

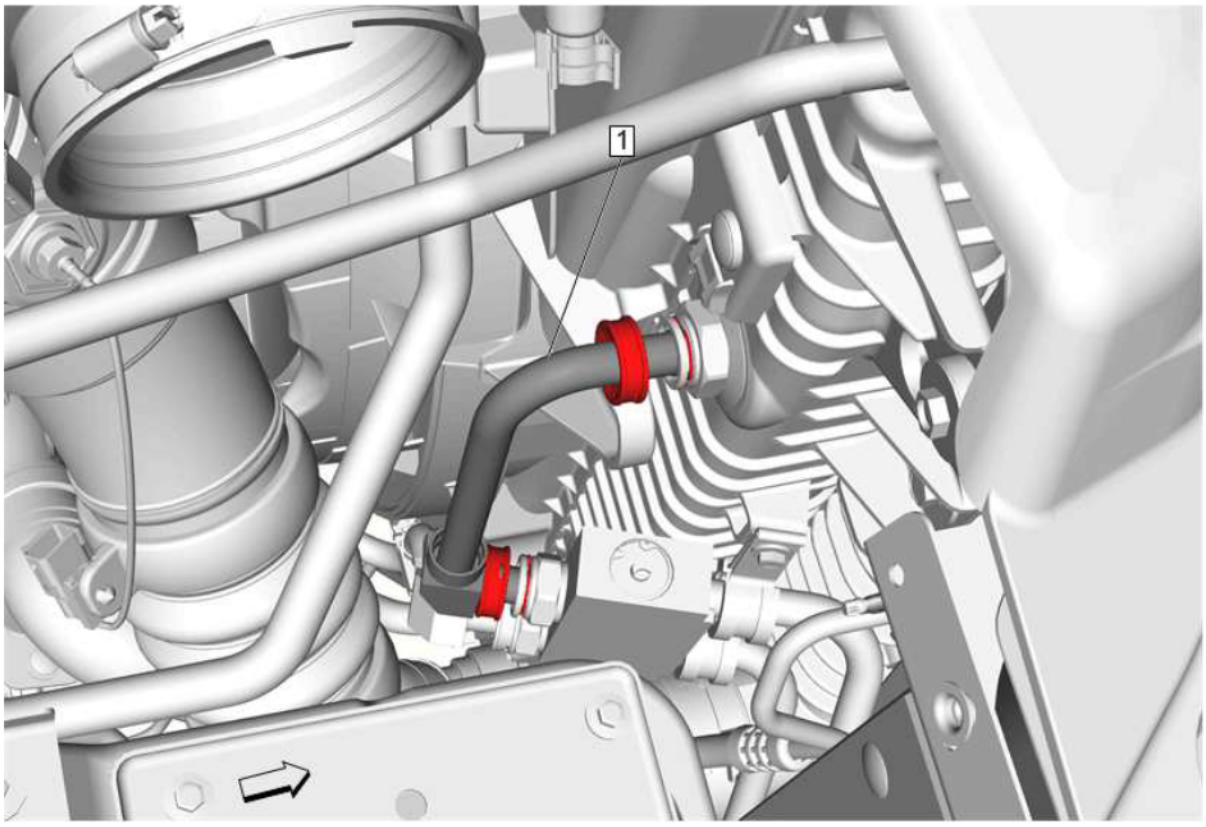

Fig. 584: Transmission Fluid Auxiliary Cooler Inlet Pipe And Transmission Cooler Bypass Valve
Courtesy of GENERAL MOTORS COMPANY

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19. Transmission Fluid Auxiliary Cooler Inlet Pipe 1 - Install - **Transmission Fluid Cooler Inlet Pipe Replacement (L5P with MW7)**
20. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

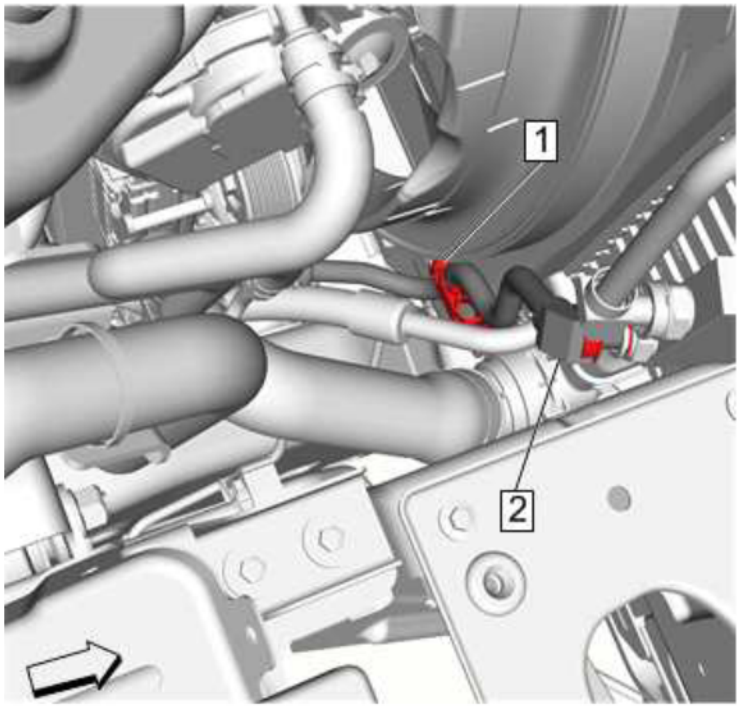

Fig. 585: Transmission Fluid Cooler Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

21. Transmission Fluid Cooler Outlet Pipe Clip 1 @Engine Coolant Fan Shroud - Install - **Transmission Fluid Cooler Outlet Pipe Replacement (L5P with MW7)**

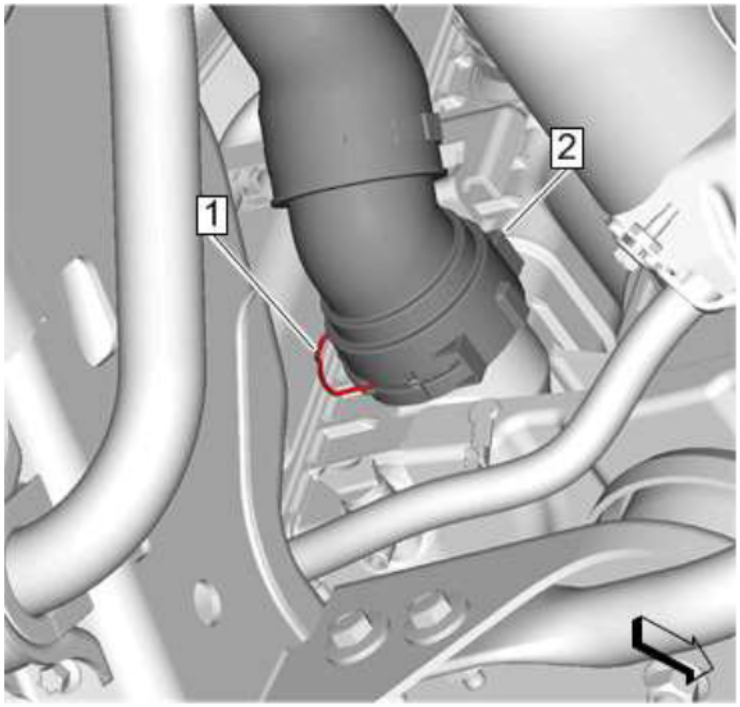

Fig. 586: Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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22. Radiator Outlet Hose 2 @Radiator - Install - **Radiator Outlet Hose Replacement (L5P)**

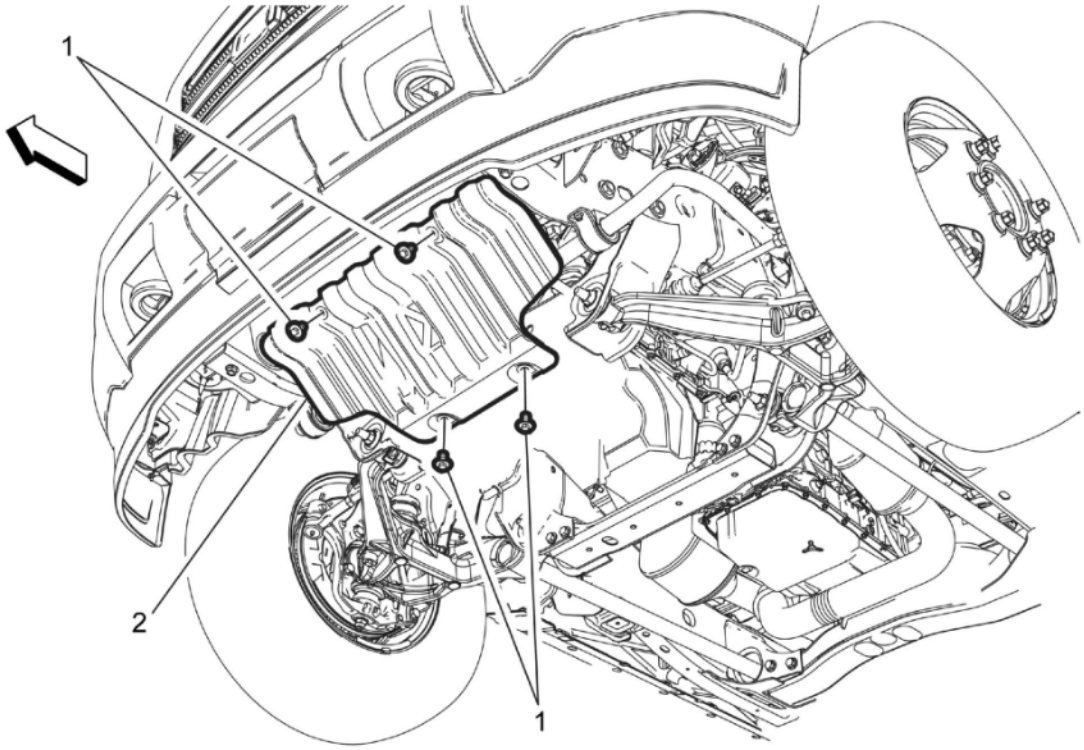

Fig. 587: Underbody Splash Shield
Courtesy of GENERAL MOTORS COMPANY

23. Underbody Splash Shield 2 - Install - **Underbody Splash Shield Replacement**
24. Lower the vehicle.

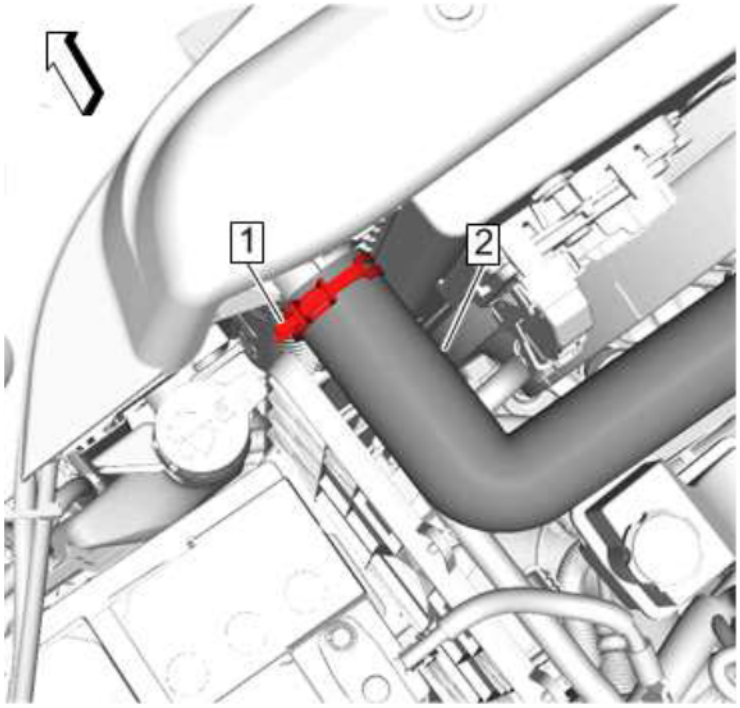

Fig. 588: Radiator Inlet Hose

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Courtesy of GENERAL MOTORS COMPANY

25. Radiator Inlet Hose 2 Install - **Radiator Inlet Hose Replacement (L5P)**

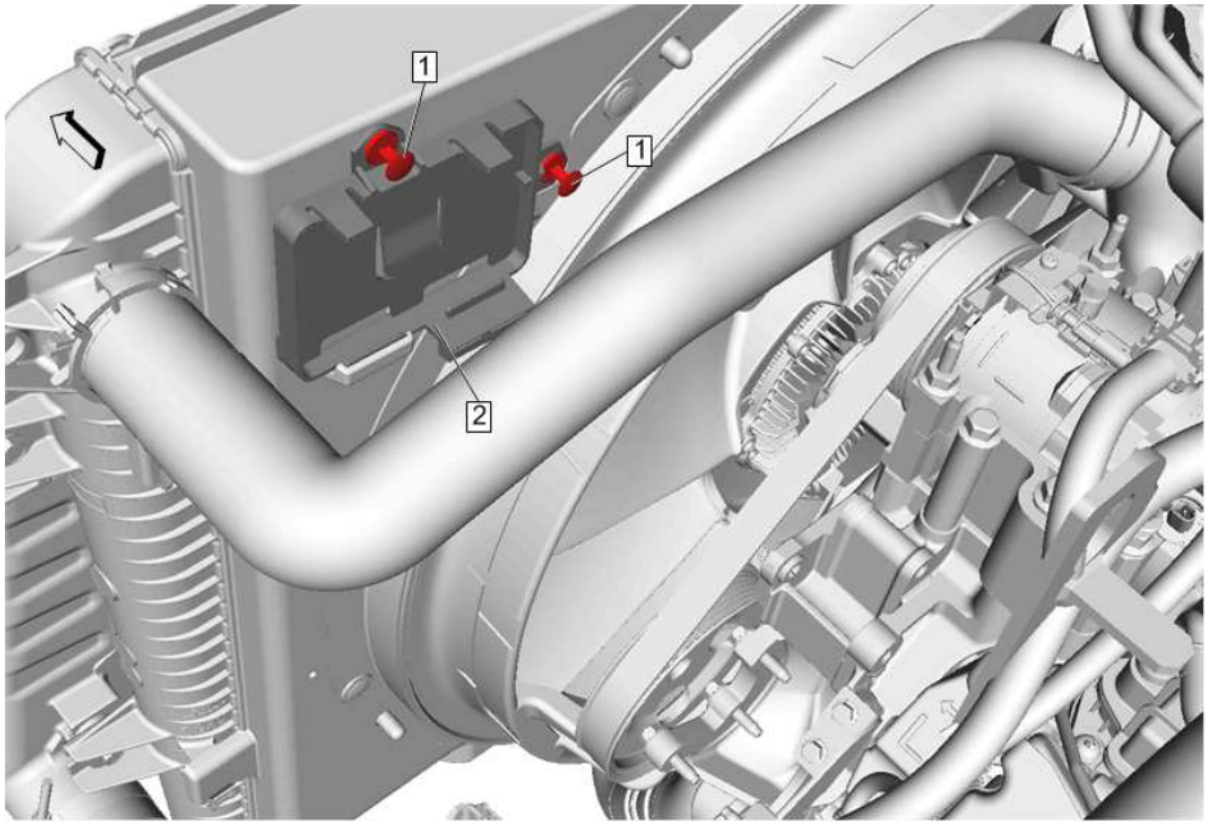

Fig. 589: Transmission Control Module Bracket And Engine Coolant Fan Shroud
Courtesy of GENERAL MOTORS COMPANY

26. Transmission Control Module Bracket 2 @Engine Coolant Fan Shroud - Install - **Transmission Control Module Bracket Replacement**

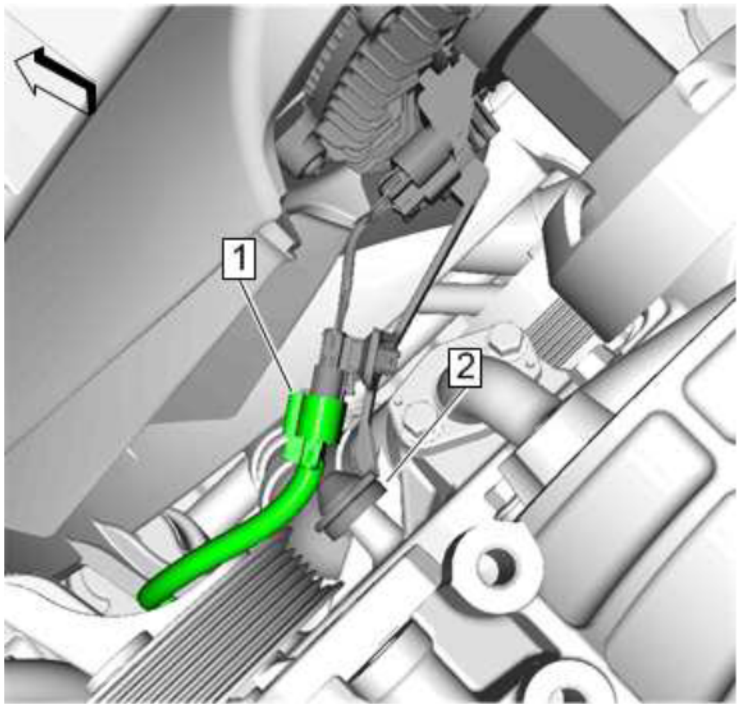

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Fig. 590: Engine Wiring Harness And Fan Blade Clutch
Courtesy of GENERAL MOTORS COMPANY

27. Fan Blade Clutch 2 @Engine - Install
28. Engine Wiring Harness 1 @Fan Blade Clutch - Connect
29. Air Conditioning Compressor Hose - Install - **Air Conditioning Compressor Hose Replacement (L5P)**
30. Air Cleaner Outlet Front Duct - Install - **Air Cleaner Outlet Front Duct Replacement**

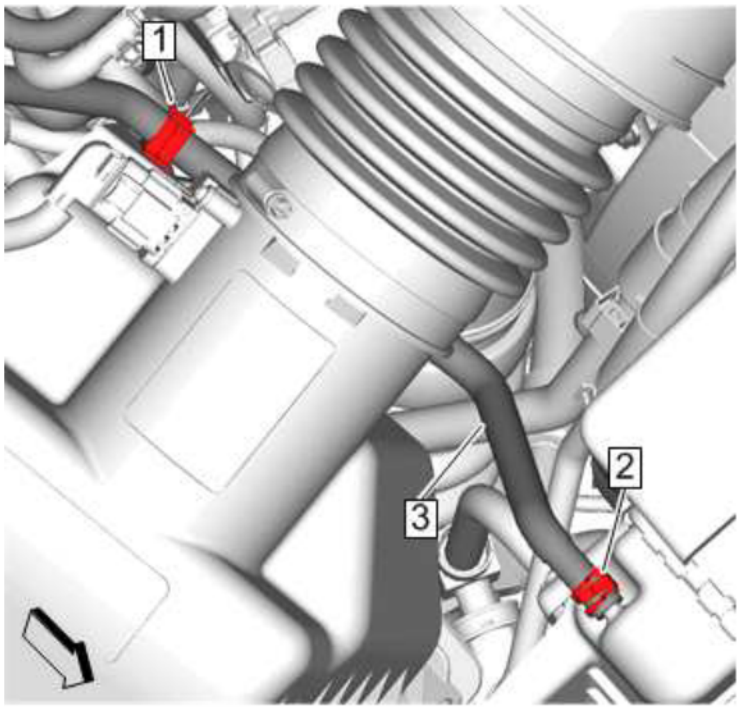

Fig. 591: Radiator Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

31. Radiator Surge Tank Inlet Hose 3 @Radiator - Install - **Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Radiator to Radiator Surge Tank Inlet Hose L5P)Radiator Surge Tank Inlet Hose Replacement (Surge Tank to Engine L5P)**

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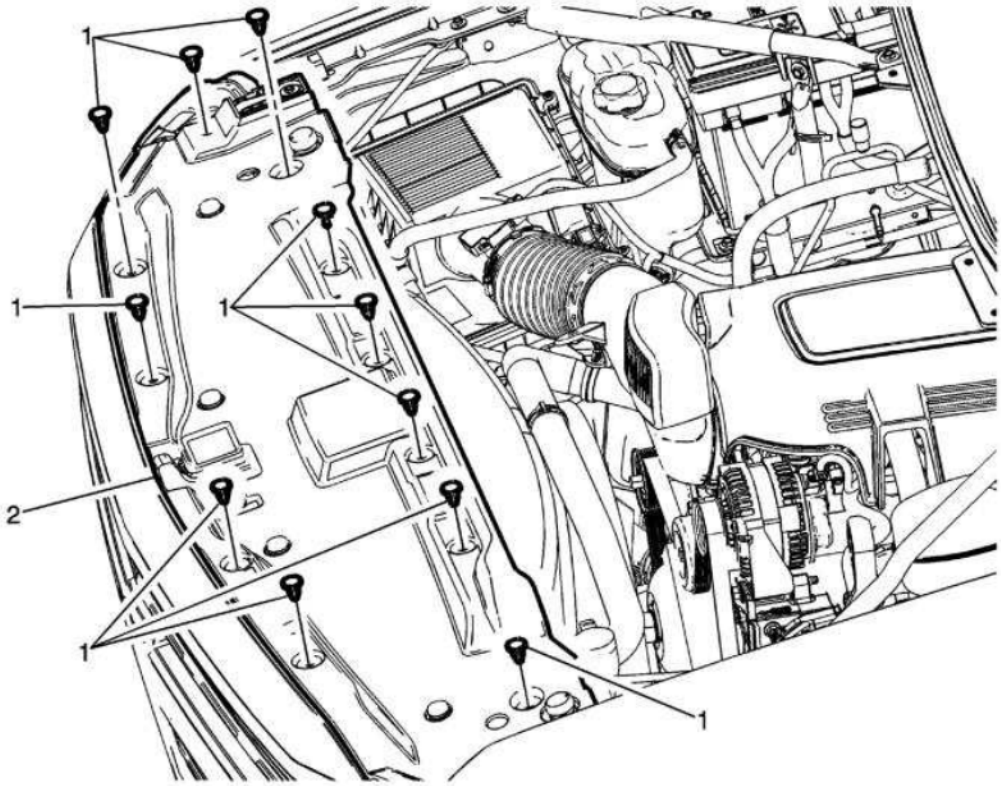

Fig. 592: Front Compartment Front Sight Shield
Courtesy of GENERAL MOTORS COMPANY

32. Front Compartment Front Sight Shield 2 - Install - **Front Compartment Front Sight Shield Replacement**
33. Fill the cooling system. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)**
34. Start the engine and inspect for leaks.

RADIATOR UPPER INSULATOR REPLACEMENT (LC8, L96)

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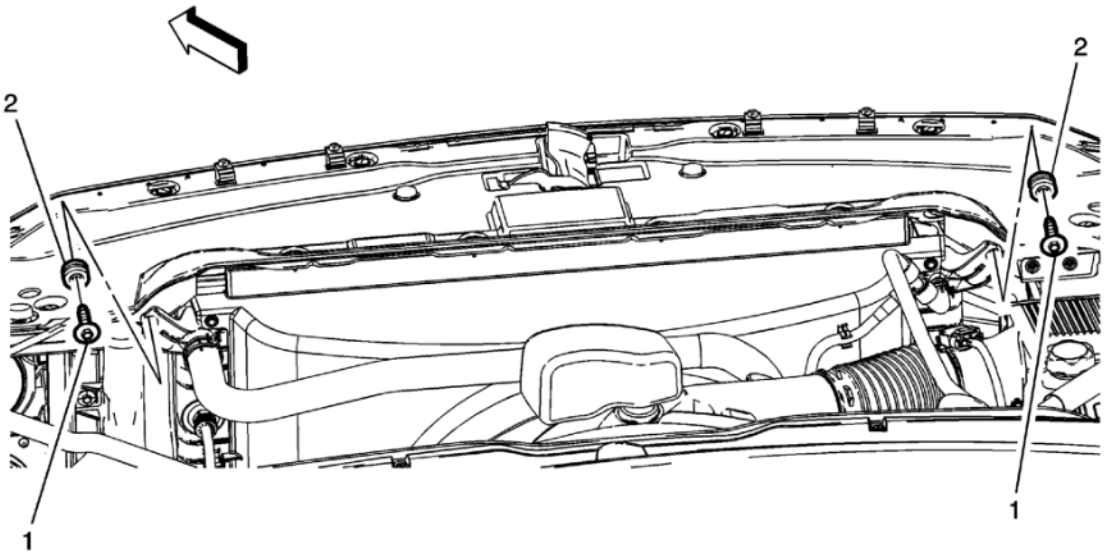

Fig. 593: Radiator Upper Insulator (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front end upper tie bar support. Refer to **Front End Upper Tie Bar Support Replacement** .	
1	Radiator Upper Mount Bracket Bolt (Qty: 2) **CAUTION:** **Refer to** **Fastener** **Caution** . **Tighten** 25 N.m (18 lb ft)
2	Radiator Upper Insulator (Qty: 2) **Procedure** Carefully move the top of the radiator rearward to remove the radiator upper insulators.

RADIATOR UPPER INSULATOR REPLACEMENT (L5P)

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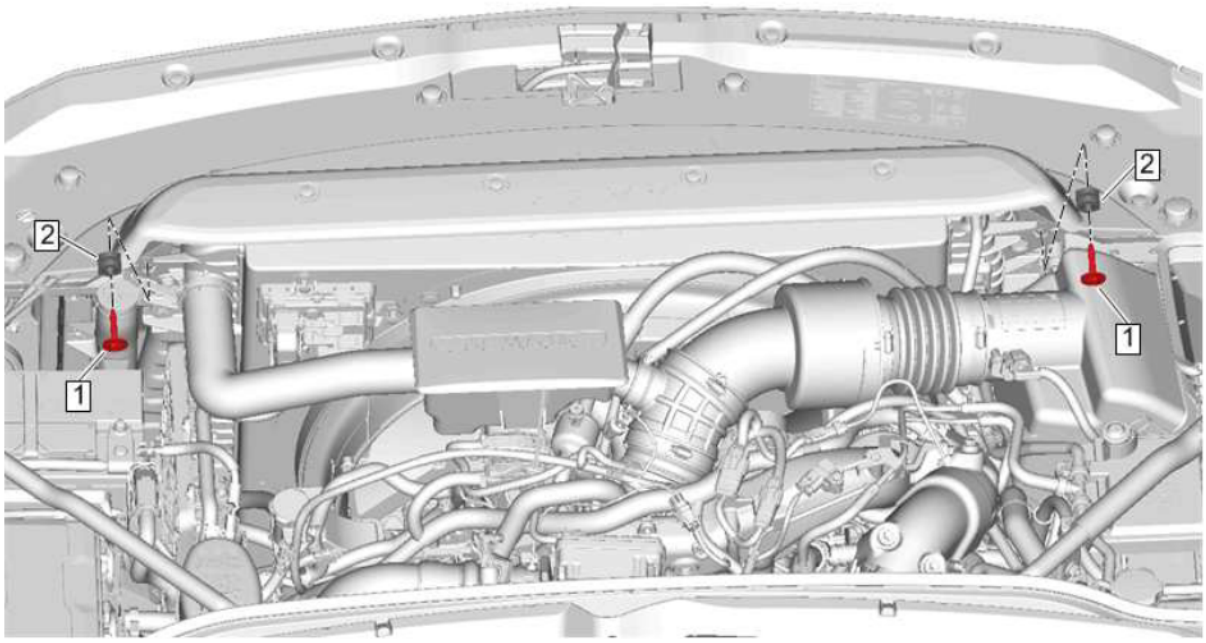

Fig. 594: Radiator Upper Insulator (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Upper Mount Bracket Bolt **CAUTION:** **Refer to** **Fastener Caution** . **Tighten** 25 N.m (18 lb ft)
2	Radiator Upper Insulator **Procedure** Carefully move the top of the radiator rearward to remove the radiator upper insulators.

RADIATOR LOWER INSULATOR REPLACEMENT (LC8, L96)

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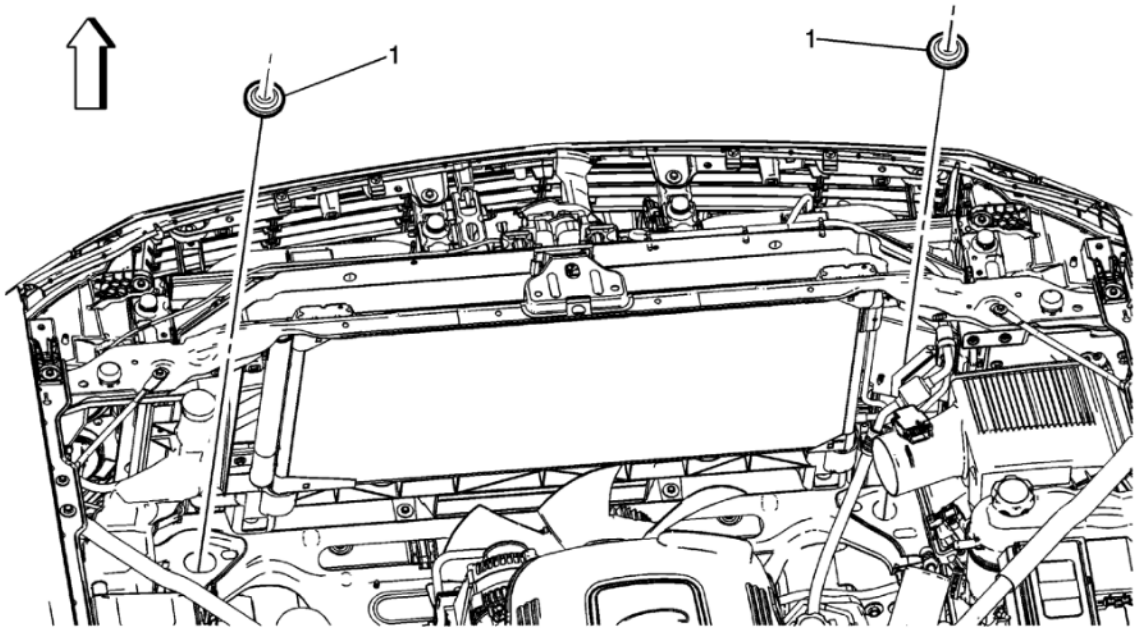

Fig. 595: Radiator Lower Insulator (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the radiator. Refer to **Radiator Replacement (LC8, L96)**.	
1	Radiator Lower Insulator (Qty: 2)

RADIATOR INNER GRILLE REPLACEMENT (CHEVROLET)

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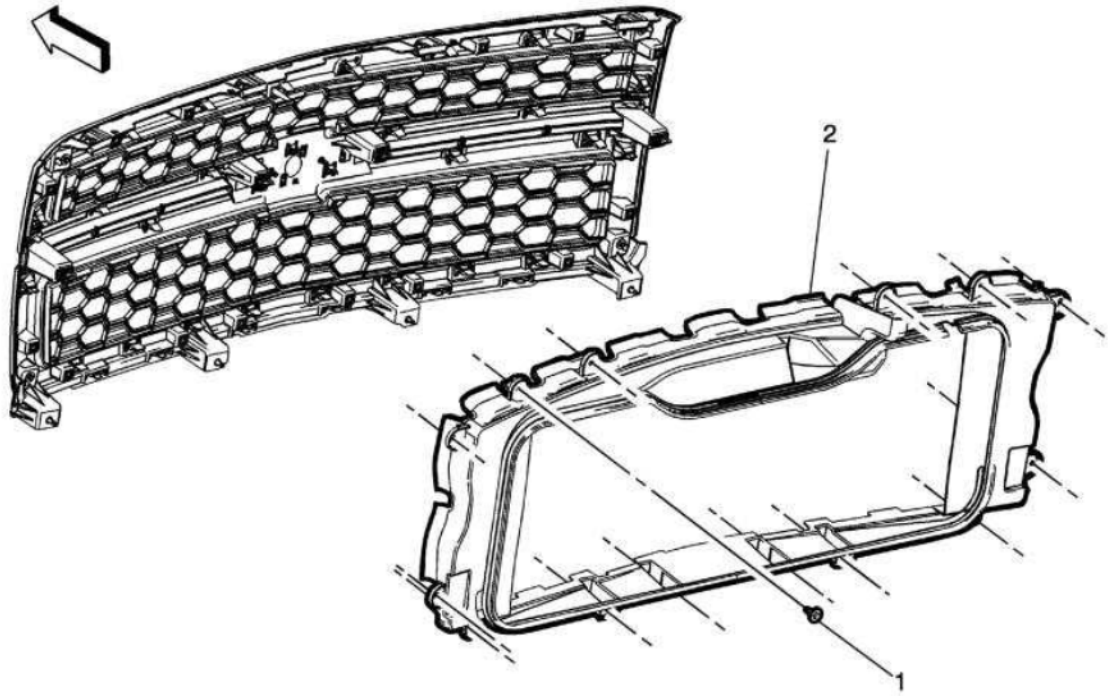

Fig. 596: Radiator Inner Grille (Chevrolet)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front grille from the vehicle. Refer to **Front Grille Replacement (Chevrolet 2500 3500)** **Front Grille Replacement (Chevrolet 1500)** .	
1	Radiator Inner Grille Screw (Qty: 14) **CAUTION:** **Refer to** **Fastener** **Caution** .
2	Radiator Inner Grille

RADIATOR INNER GRILLE REPLACEMENT (GMC)

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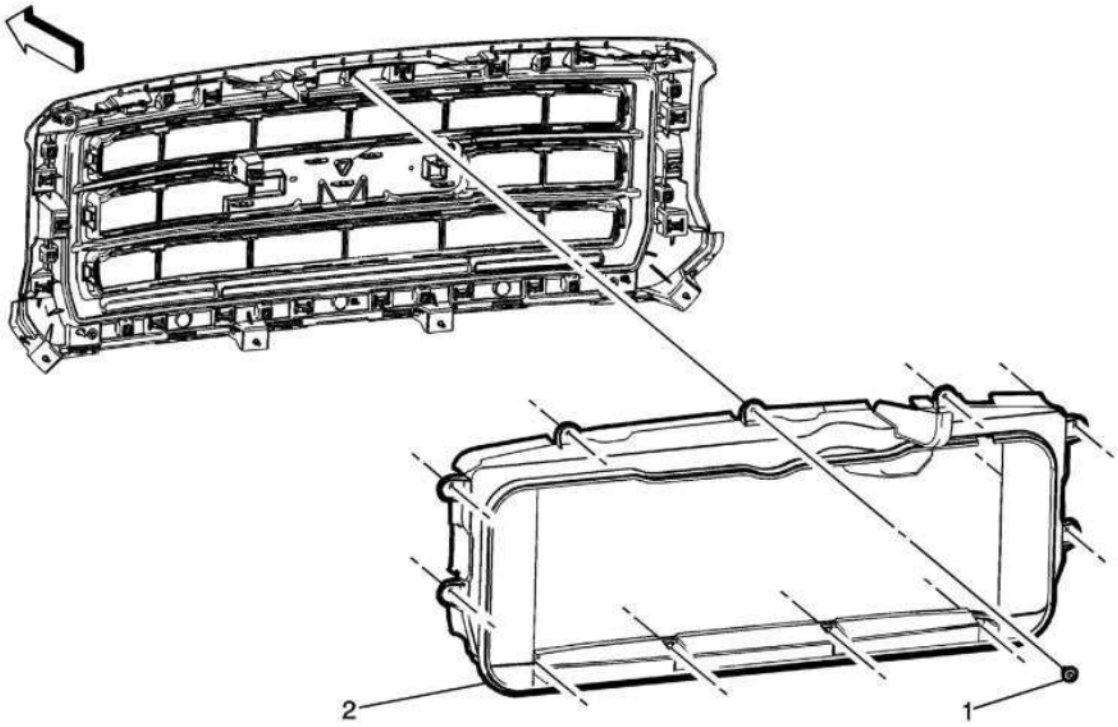

Fig. 597: Radiator Inner Grille (GMC)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front grille from the vehicle. Refer to Front Grille Replacement (GMC 1500) Front Grille Replacement (GMC 2500 3500) .	
1	Radiator Inner Grille Screw (Qty: 11) **CAUTION:** **Refer to** **Fastener** **Caution** .
2	Radiator Inner Grille

FRONT GRILLE BAFFLE REPLACEMENT (GMC L8B)

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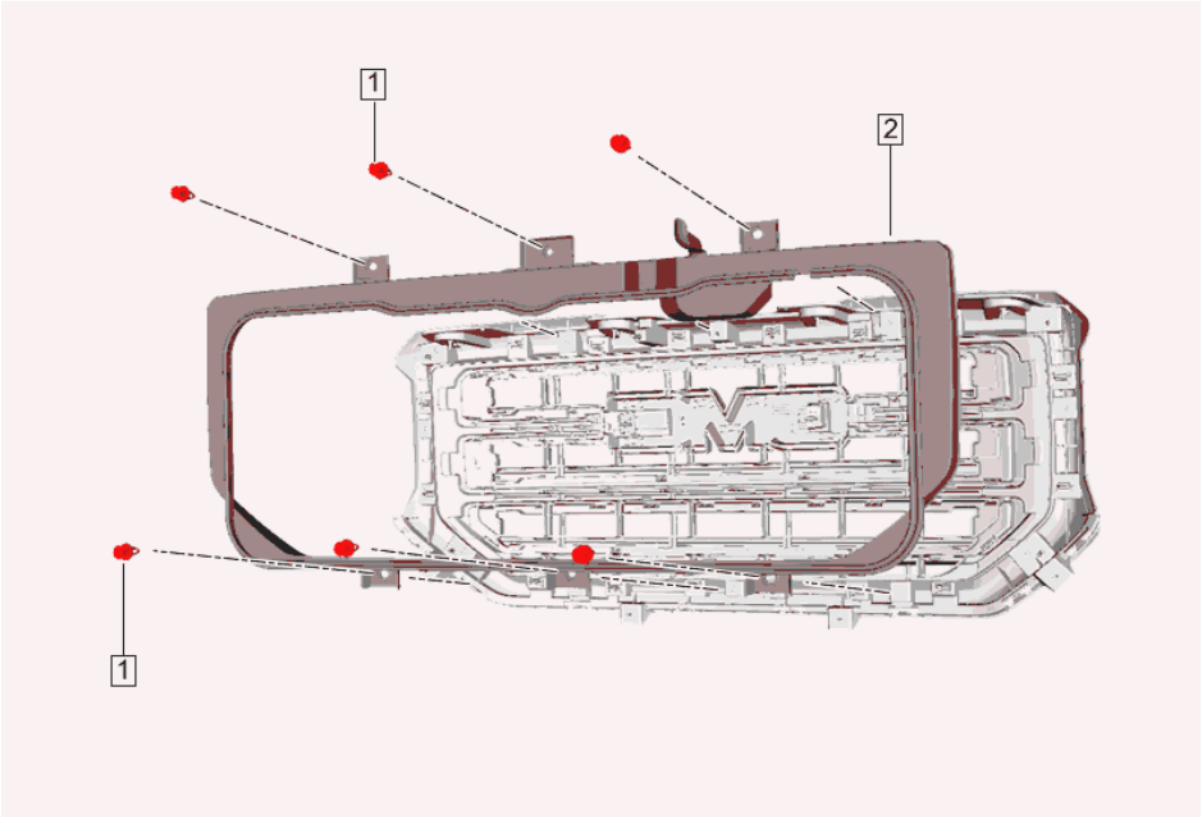

Fig. 598: Front Grille Baffle (GMC L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Grille - Remove - **Front Grille Replacement (GMC)**	
1	Baffle Retainer
2	Front Grille Baffle

FRONT GRILLE BAFFLE REPLACEMENT (CHEVROLET L8B)

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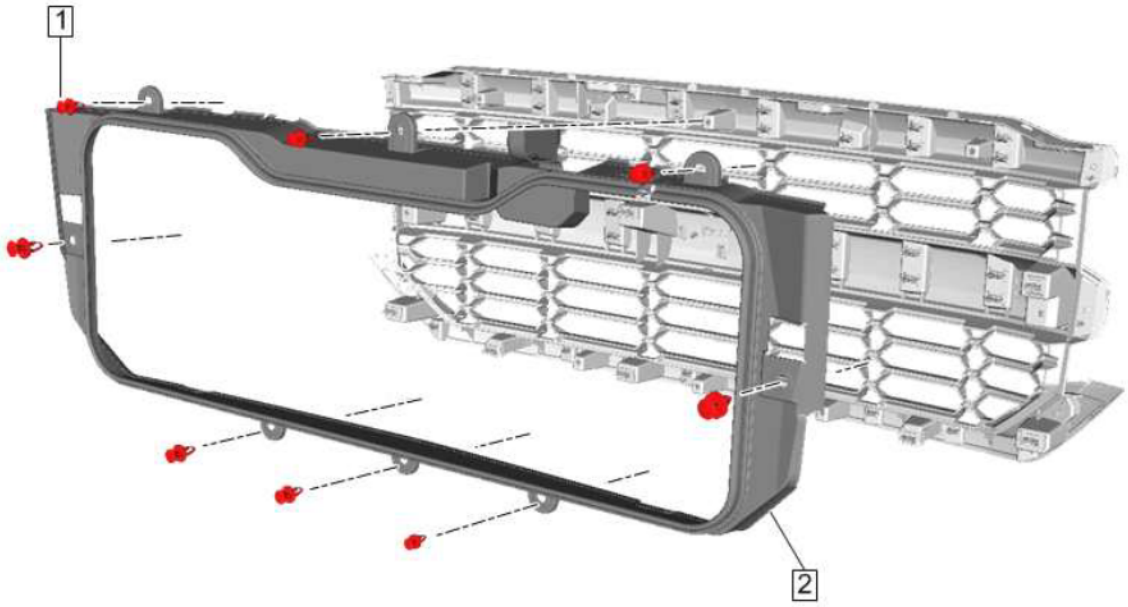

Fig. 599: Front Grille Baffle (Chevrolet L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Grille - Remove - **Front Grille Replacement (Chevrolet)**	
1	Baffle Retainer
2	Front Grille Baffle

RADIATOR SUPPORT BAFFLE REPLACEMENT (LV3)

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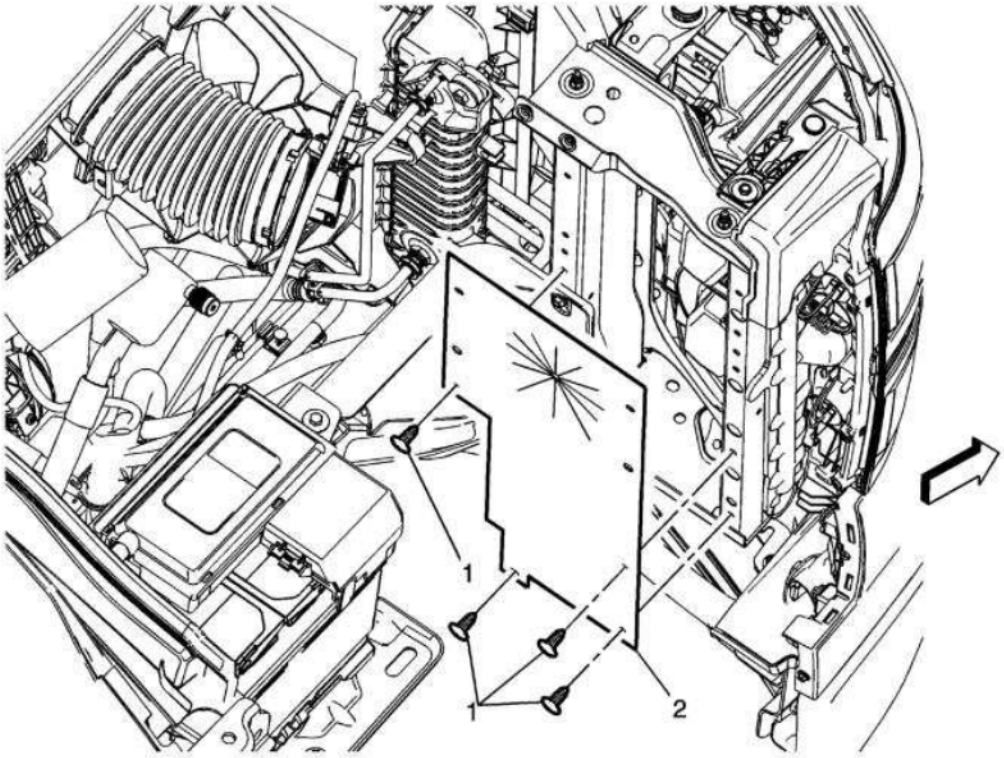

Fig. 600: Radiator Support Baffle (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 2. Remove the electrical harness from the radiator support baffle and reposition out of the way.	
1	Radiator Support Baffle Retainer (Qty: 4)
2	Radiator Support Baffle

RADIATOR SUPPORT BAFFLE REPLACEMENT (L83, L86)

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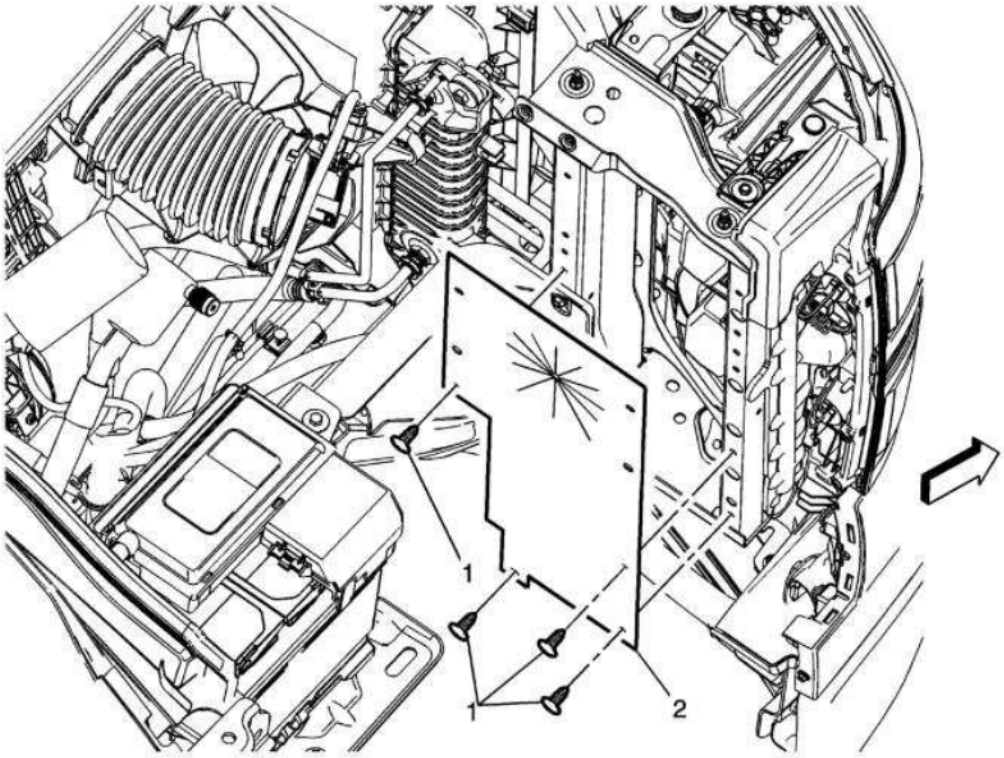

Fig. 601: Radiator Support Baffle (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 2. Remove the electrical harness from the radiator support baffle and reposition out of the way.	
1	Radiator Support Baffle Retainer (Qty: 4)
2	Radiator Support Baffle

RADIATOR SUPPORT BAFFLE REPLACEMENT (LC8, L96)

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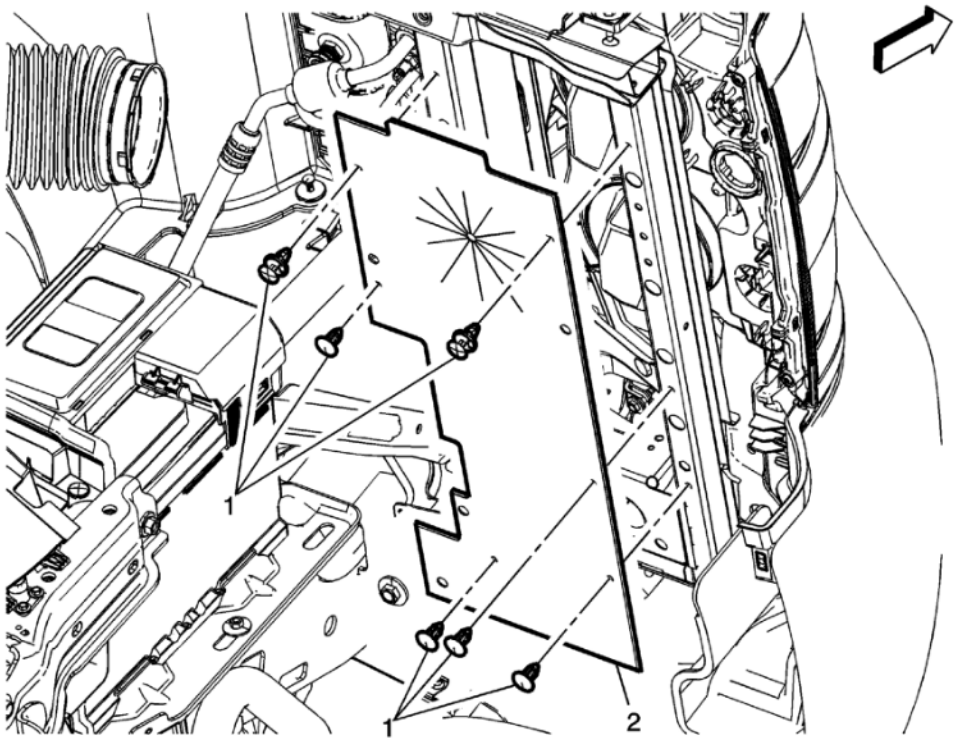

Fig. 602: Radiator Support Baffle (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** . 2. Unclip the electrical harness retainer from the radiator support baffle and reposition out of the way.	
1	Radiator Support Baffle Retainer (Qty: 6)
2	Radiator Support Baffle

RADIATOR SUPPORT BAFFLE REPLACEMENT (L8B)

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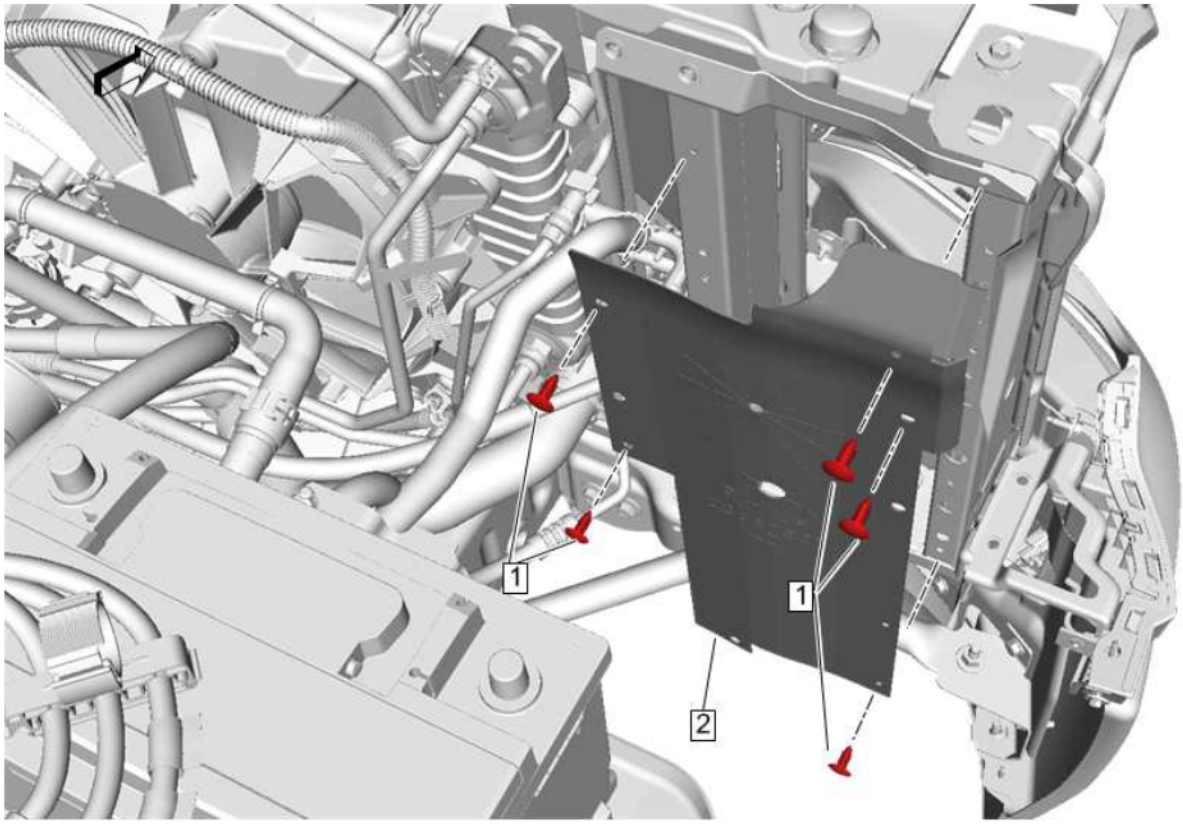

Fig. 603: Radiator Support Baffle (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Air Cleaner Assembly - Remove Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** 2. Reposition the wiring harness.@Radiator Support Baffle	
1	Radiator Support Baffle Retainer
2	Radiator Support Baffle

RADIATOR SUPPORT BAFFLE REPLACEMENT (L5P)

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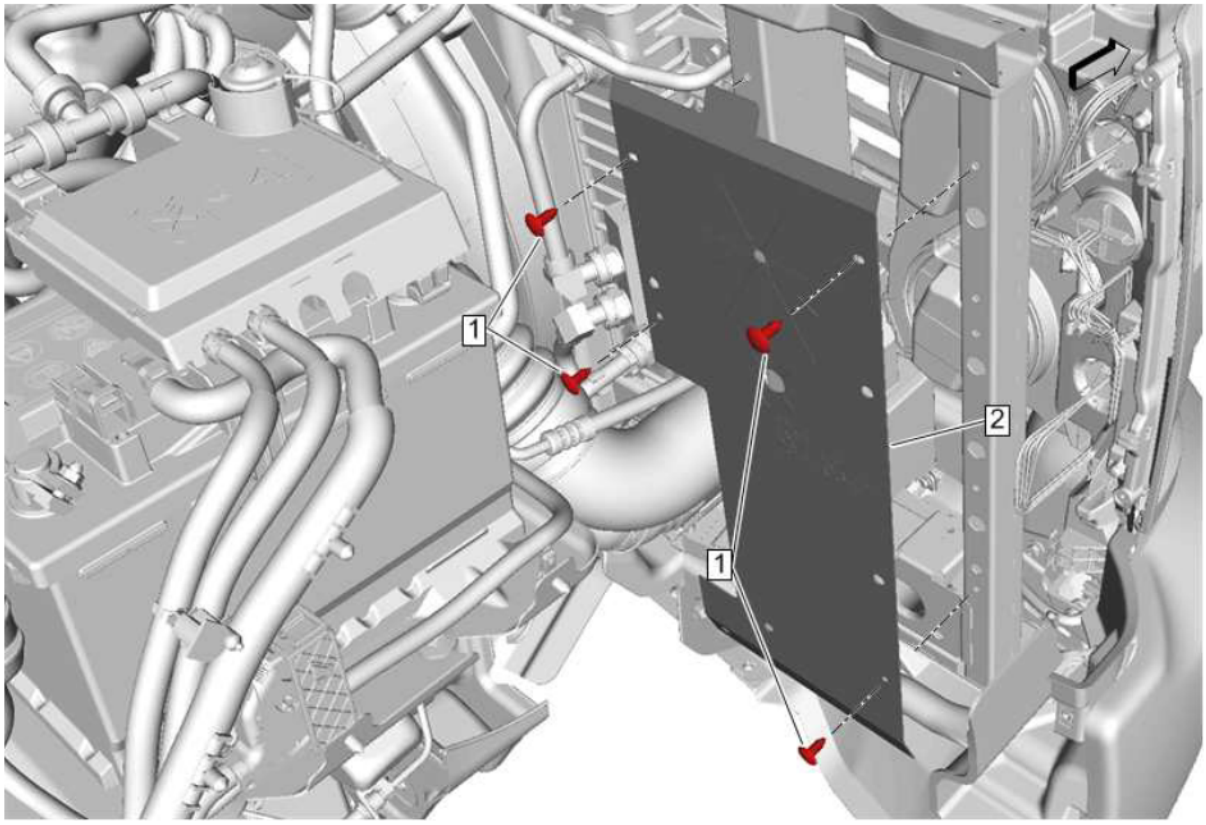

Fig. 604: Radiator Support Baffle (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. **Air Cleaner Assembly Replacement** 2. Reposition the wiring harness.@Radiator Support Baffle	
1	Radiator Support Baffle Retainer
2	Radiator Support Baffle

RADIATOR AIR BAFFLE REPLACEMENT - LEFT (LV3)

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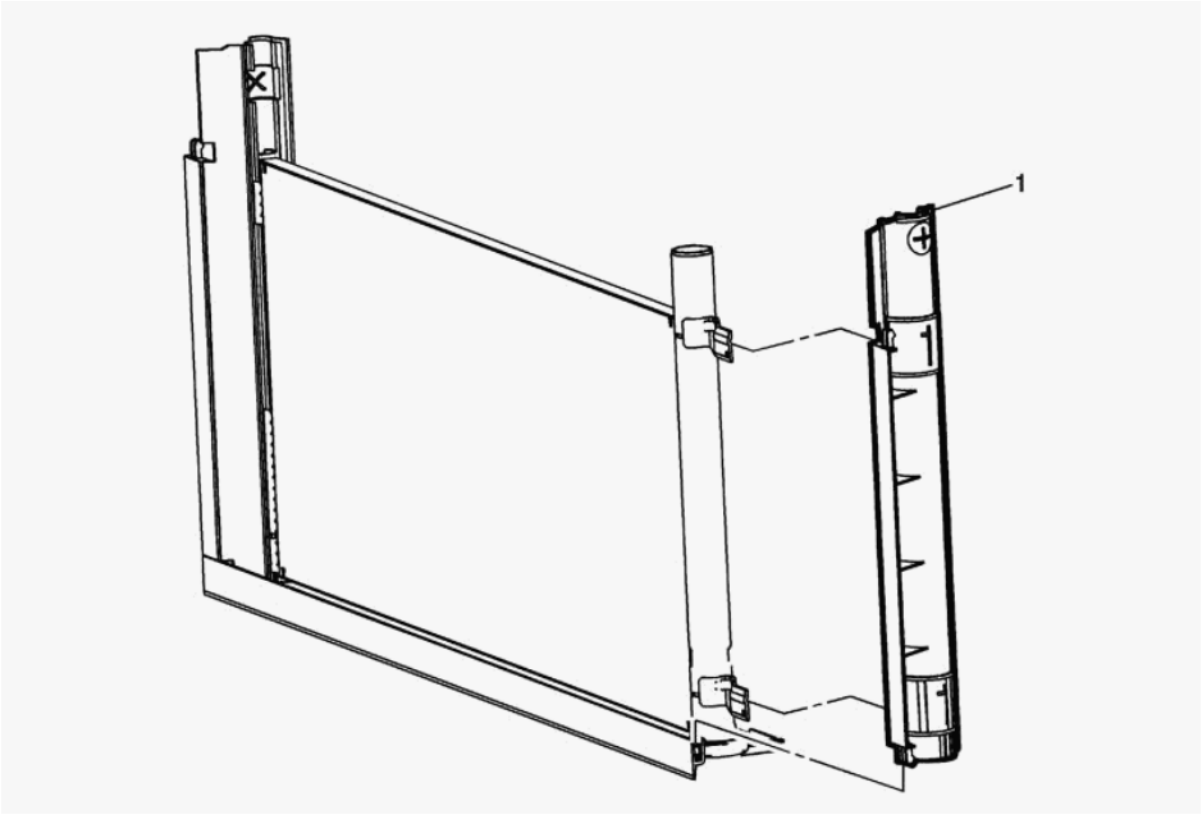

Fig. 605: Radiator Air Baffle - Left (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the air conditioning condenser from the vehicle. Refer to **Air Conditioning Condenser Replacement (LV3)** .	
1	Radiator Air Baffle Left **Procedure** Remove the radiator air baffle left from the radiator air lower baffle and remove from the condenser.

RADIATOR AIR BAFFLE REPLACEMENT - LEFT (L83, L86)

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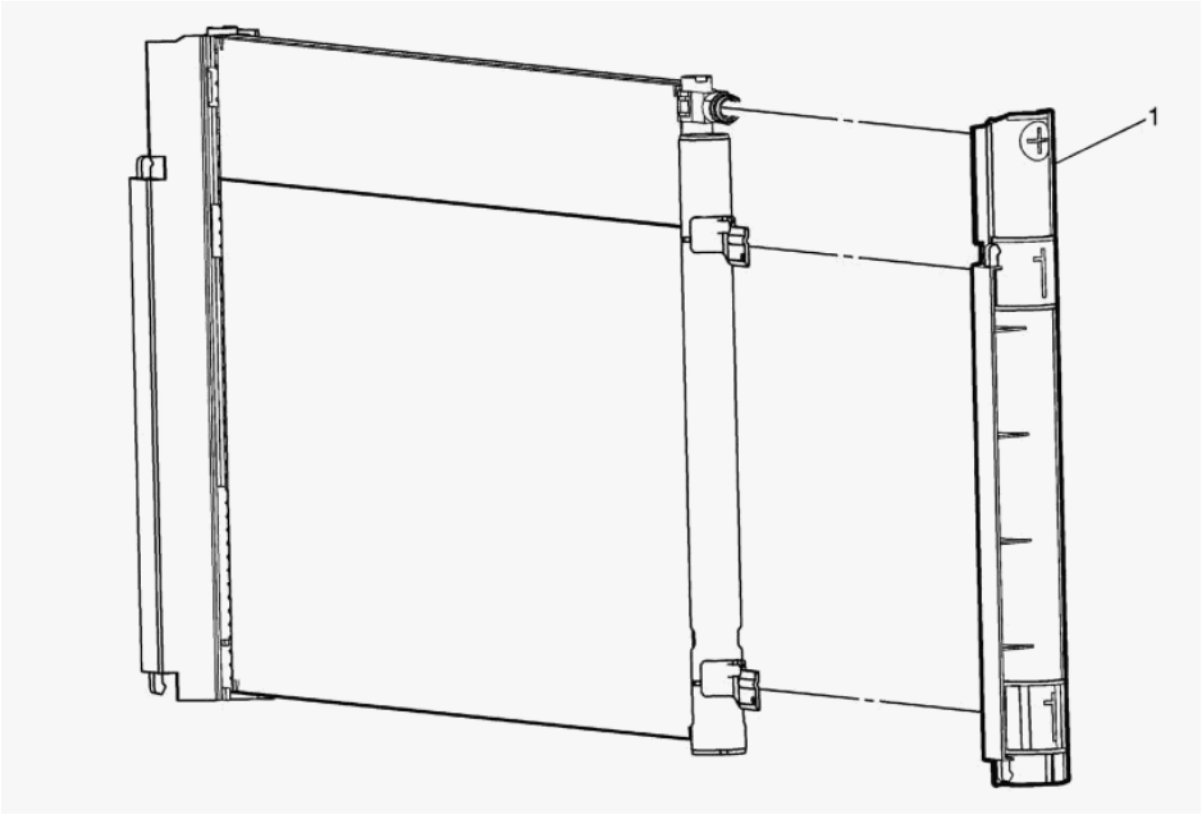

Fig. 606: Radiator Air Baffle - Left (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the air conditioning condenser from the vehicle. Refer to **Air Conditioning Condenser Replacement (L83, L86)** .	
1	Radiator Air Baffle Left **Procedure** Remove the radiator air baffle left from the radiator air lower baffle and remove from the condenser.

RADIATOR AIR BAFFLE REPLACEMENT - RIGHT (LV3)

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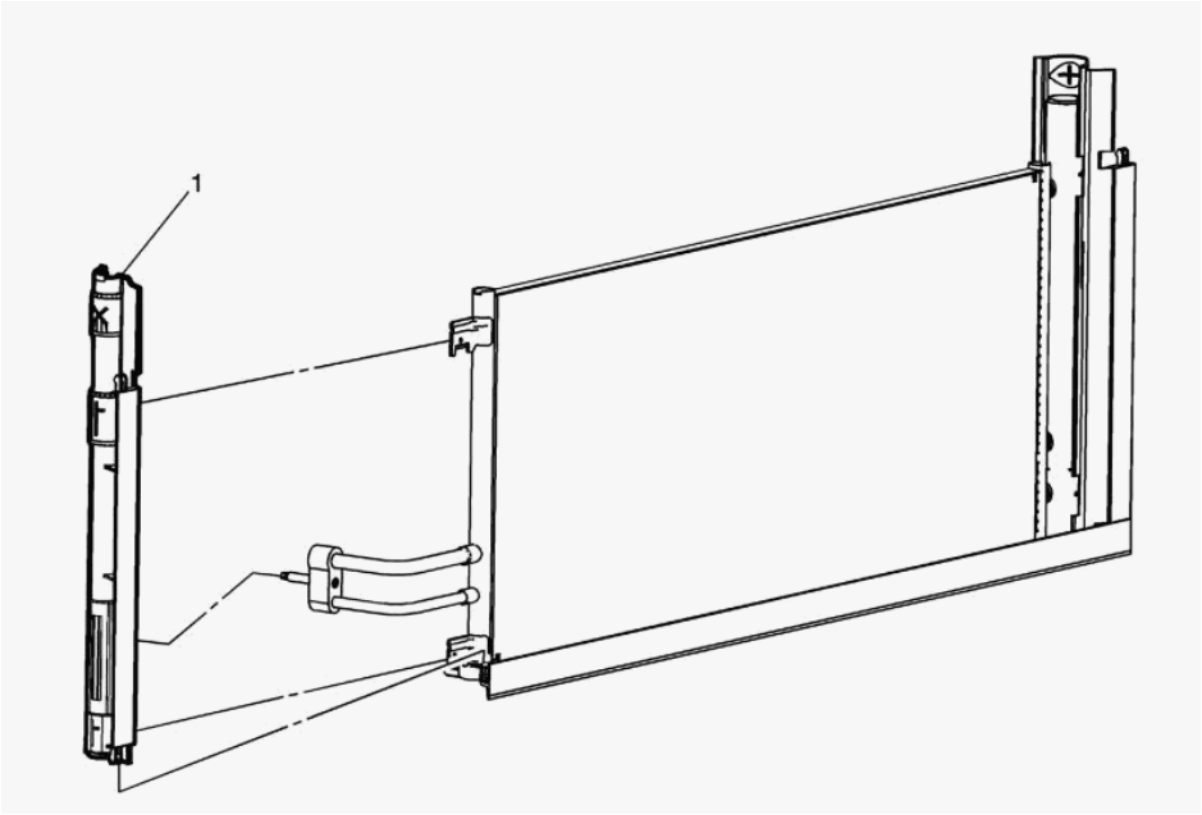

Fig. 607: Radiator Air Baffle - Right (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the air conditioning condenser from the vehicle. Refer to **Air Conditioning Condenser Replacement (LV3)** .	
1	Radiator Air Baffle Right **Procedure** Remove the radiator air baffle right from the radiator air lower baffle and remove from the condenser.

RADIATOR AIR BAFFLE REPLACEMENT - RIGHT (L83, L86)

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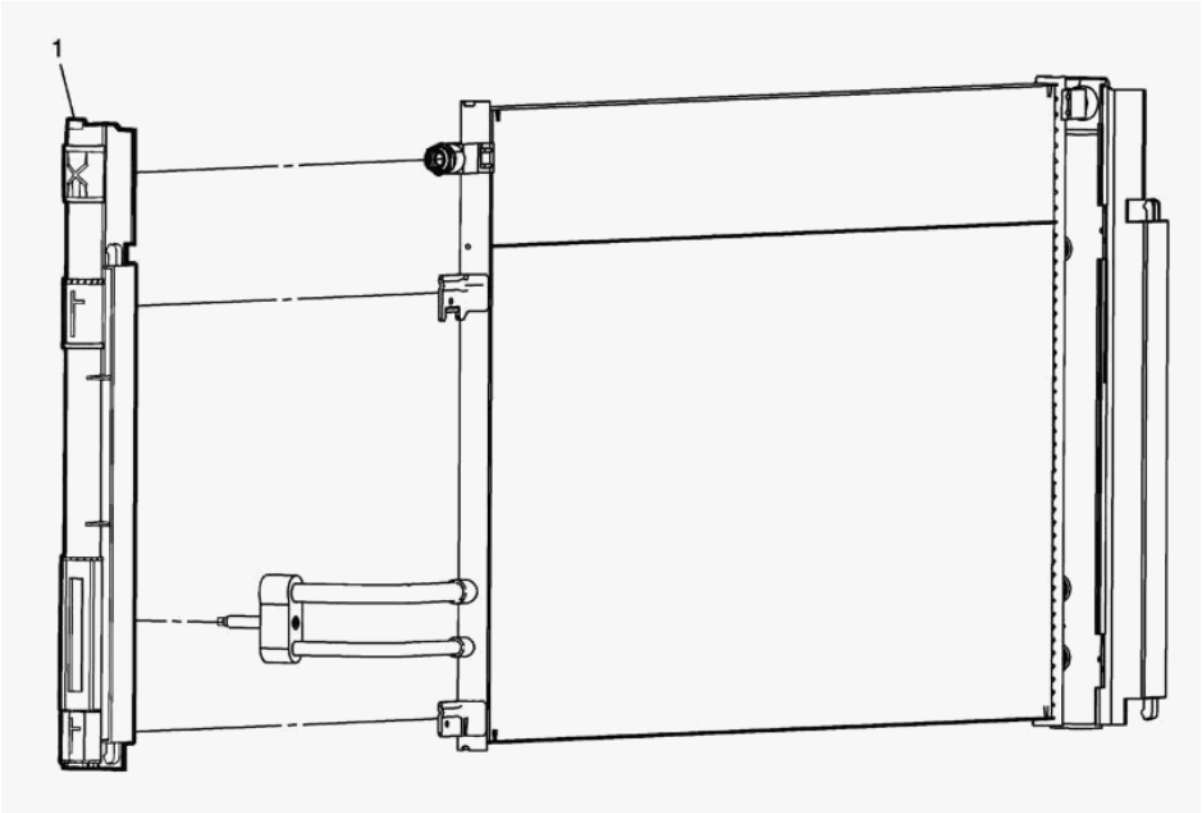

Fig. 608: Radiator Air Baffle - Right (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the air conditioning condenser from the vehicle. Refer to **Air Conditioning Condenser Replacement (L83, L86)** .	
1	Radiator Air Baffle Right **Procedure** Remove the radiator air baffle right from the radiator air lower baffle and remove from the condenser.

RADIATOR AIR LOWER BAFFLE REPLACEMENT (L83, L86, LV3)

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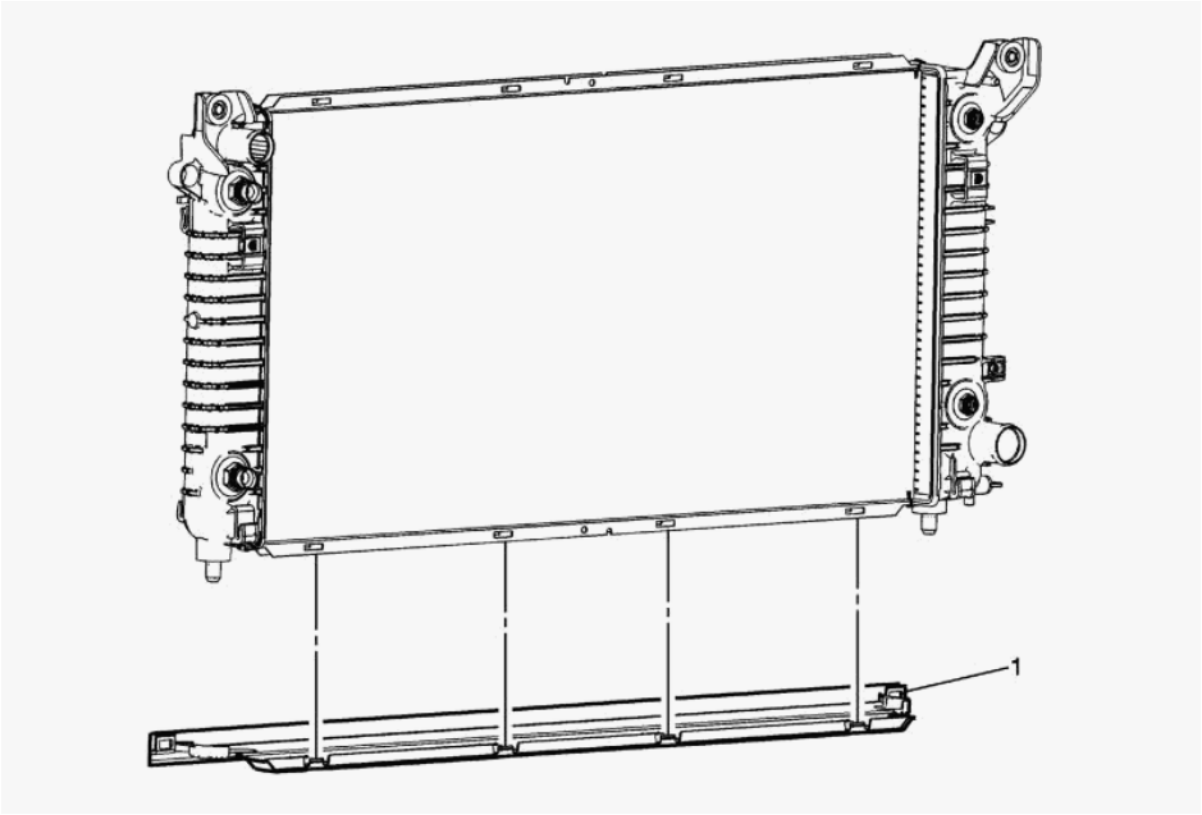

Fig. 609: Radiator Air Lower Baffle (L83, L86, LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the engine coolant fan rear shroud from the vehicle. Refer to **Engine Coolant Fan Rear Shroud Replacement (L83, L86)**. 2. Remove the front end upper tie bar support. Refer to **Front End Upper Tie Bar Support Replacement** . 3. Raise the condenser and radiator as and assembly (CRA) upward and support CRA above lower tie-bar. 4. Push downward on radiator air lower baffle to remove the left and right radiator air baffle retaining tabs from the radiator air lower baffle. Refer to **Radiator Air Baffle Replacement - Left (L83, L86)**, and **Radiator Air Baffle Replacement - Right (L83, L86)**. **NOTE:** **Some early builds have 1 or 2 tie straps holding the baffle to the radiator at the inner tabs. Cut tie strap before**	

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Callout	Component Name
removing baffle.	
1	Radiator Air Lower Baffle **Procedure** Push each of the four radiator air lower baffle retaining tabs inward to disengage the radiator air lower baffle from the radiator.

RADIATOR AIR LOWER BAFFLE REPLACEMENT (LC8, L96)

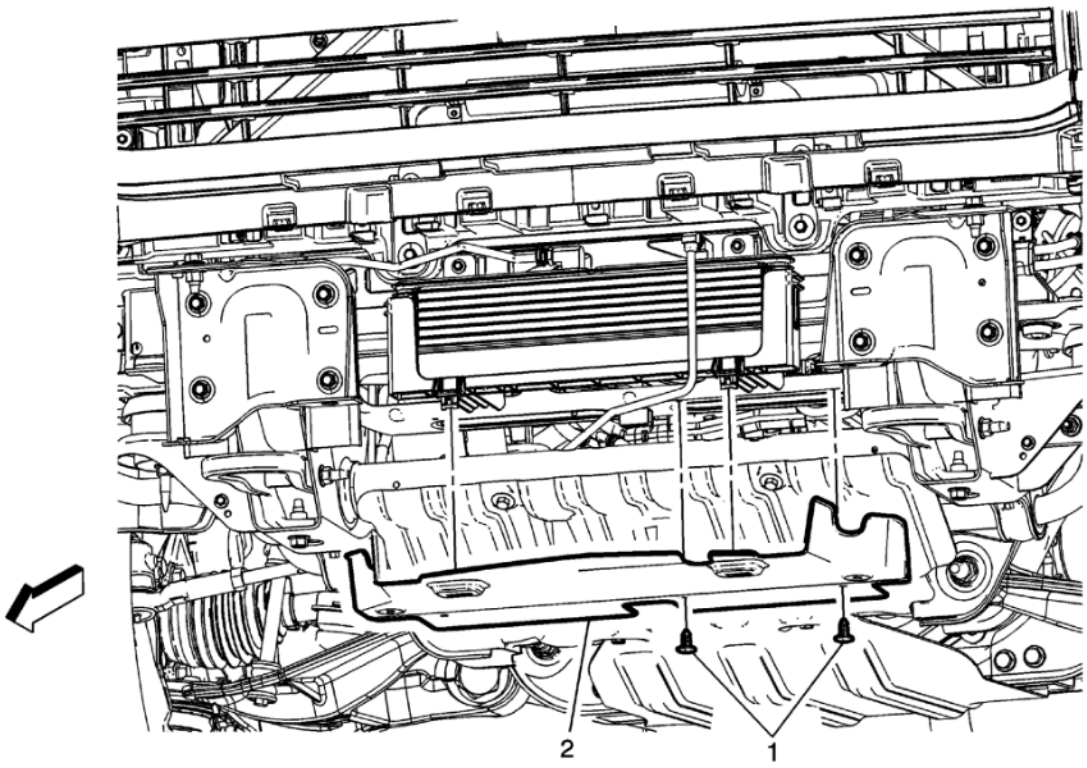

Fig. 610: Radiator Air Lower Baffle (LC8, L96)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove the Front Bumper Impact Bar. Refer to **Front Bumper Impact Bar Replacement (2500, 3500)** .	
1	Radiator Air Lower Baffle Retainer (Qty: 2)
2	Radiator Air Lower Baffle **Procedure** 1. Remove the electrical wiring harness retainer from the radiator air lower baffle and reposition out of the way. 2. Unclip the transmission fluid auxiliary cooler from the radiator air lower baffle.

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RADIATOR AIR LOWER BAFFLE REPLACEMENT (L8B)

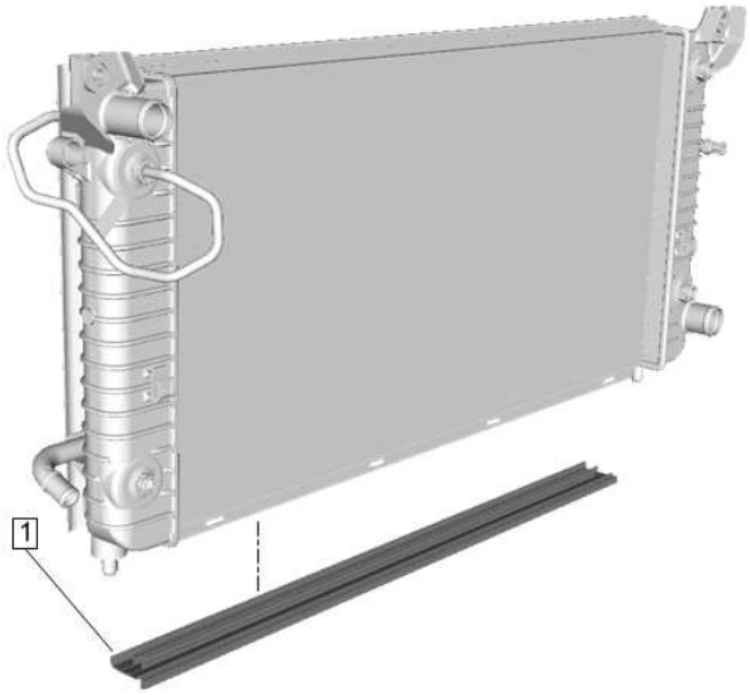

Fig. 611: Radiator Air Lower Baffle (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Engine Coolant Fan Shroud - Remove - **Engine Coolant Fan Shroud Replacement (L8B)** 2. Front End Upper Tie Bar - Remove - **Front End Upper Tie Bar Support Replacement** 3. Without disconnecting the transmission fluid auxiliary cooler inlet pipe and transmission fluid auxiliary cooler outlet pipe, carefully lift the radiator and low temperature radiator above the lower tie bar center support and support the radiator.	
1	Radiator Air Lower Baffle

RADIATOR AIR LOWER BAFFLE REPLACEMENT (L5P)

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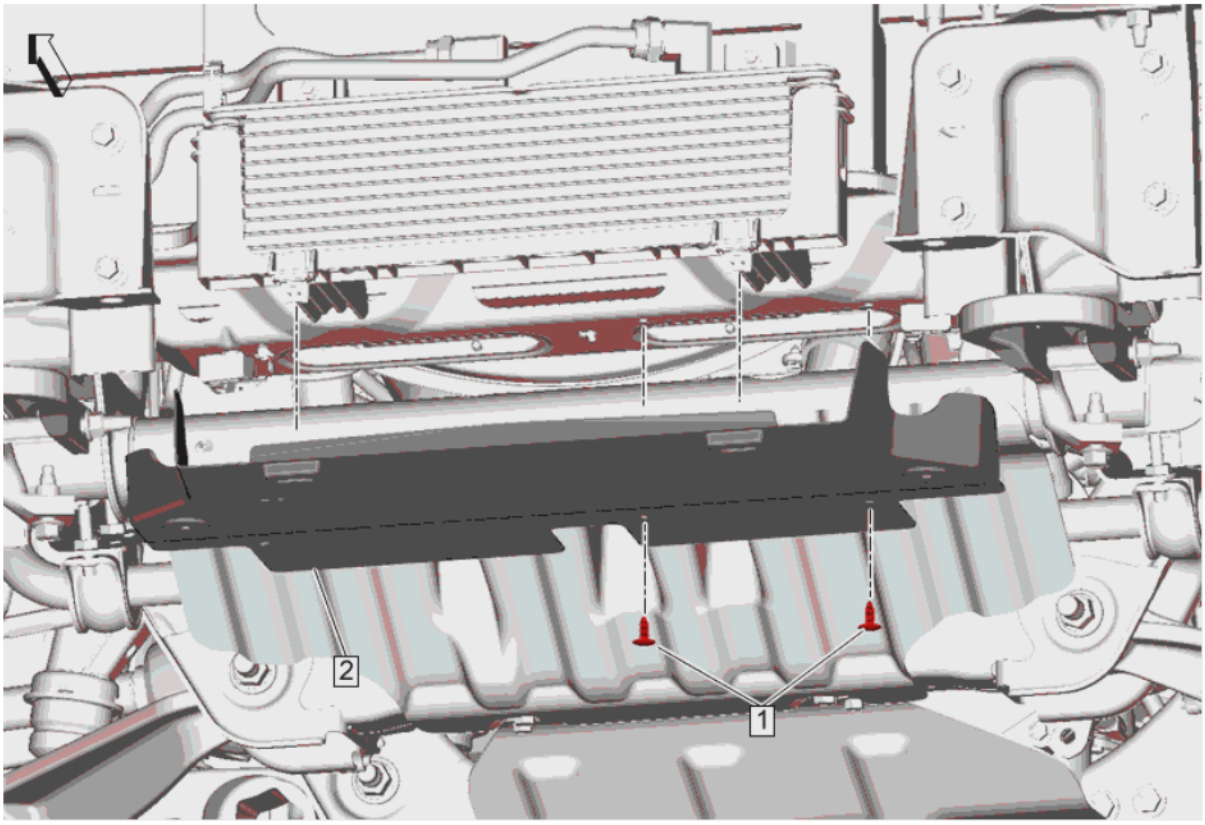

Fig. 612: Radiator Air Lower Baffle (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure **Front Bumper Impact Bar Replacement (2500, 3500)**	
1	Radiator Air Lower Baffle Retainer
2	Radiator Air Lower Baffle **Procedure** 1. Remove the electrical wiring harness retainer from the radiator air lower baffle and reposition out of the way. 2. Unclip the transmission fluid auxiliary cooler from the radiator air lower baffle.

RADIATOR AIR UPPER BAFFLE AND DEFLECTOR REPLACEMENT (L83, L86, LV3)

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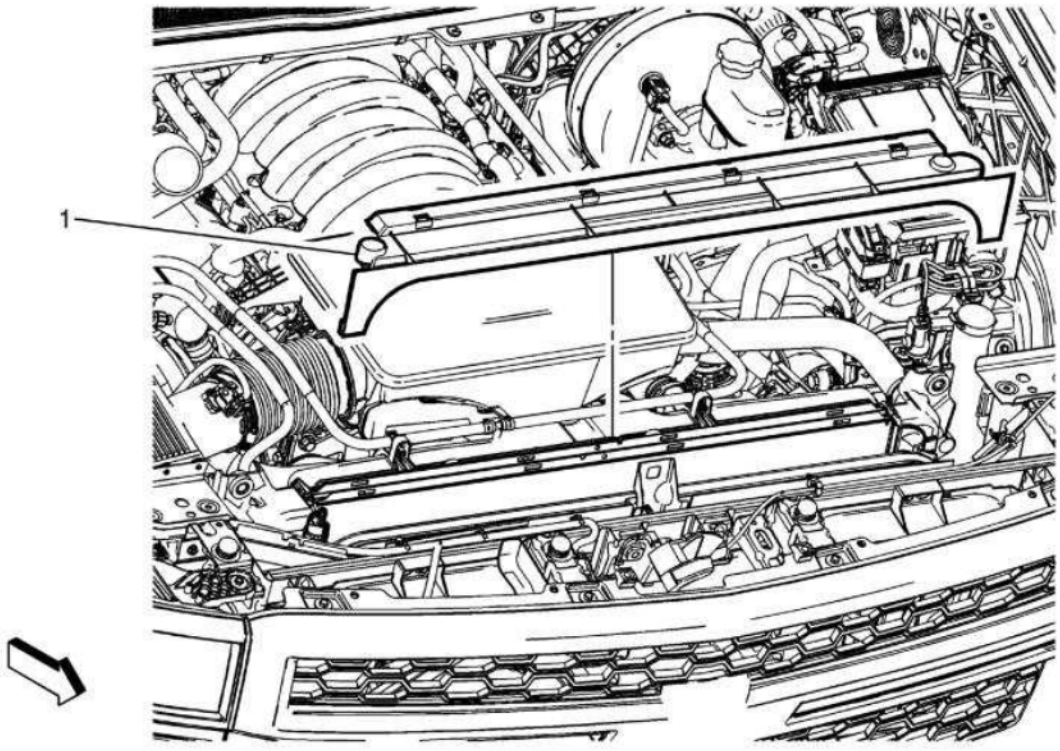

Fig. 613: Radiator Air Upper Baffle And Deflector (L83, L86, LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the front compartment front sight shield. Refer to **Front Compartment Front Sight Shield Replacement** . 2. Remove the front end upper tie bar support. Refer to **Front End Upper Tie Bar Support Replacement** .	
1	Radiator Air Upper Baffle and Deflector **Procedure** Unclip the radiator air upper baffle and deflector from the radiator and lift up to remove.

RADIATOR AIR UPPER BAFFLE AND DEFLECTOR REPLACEMENT (L8B)

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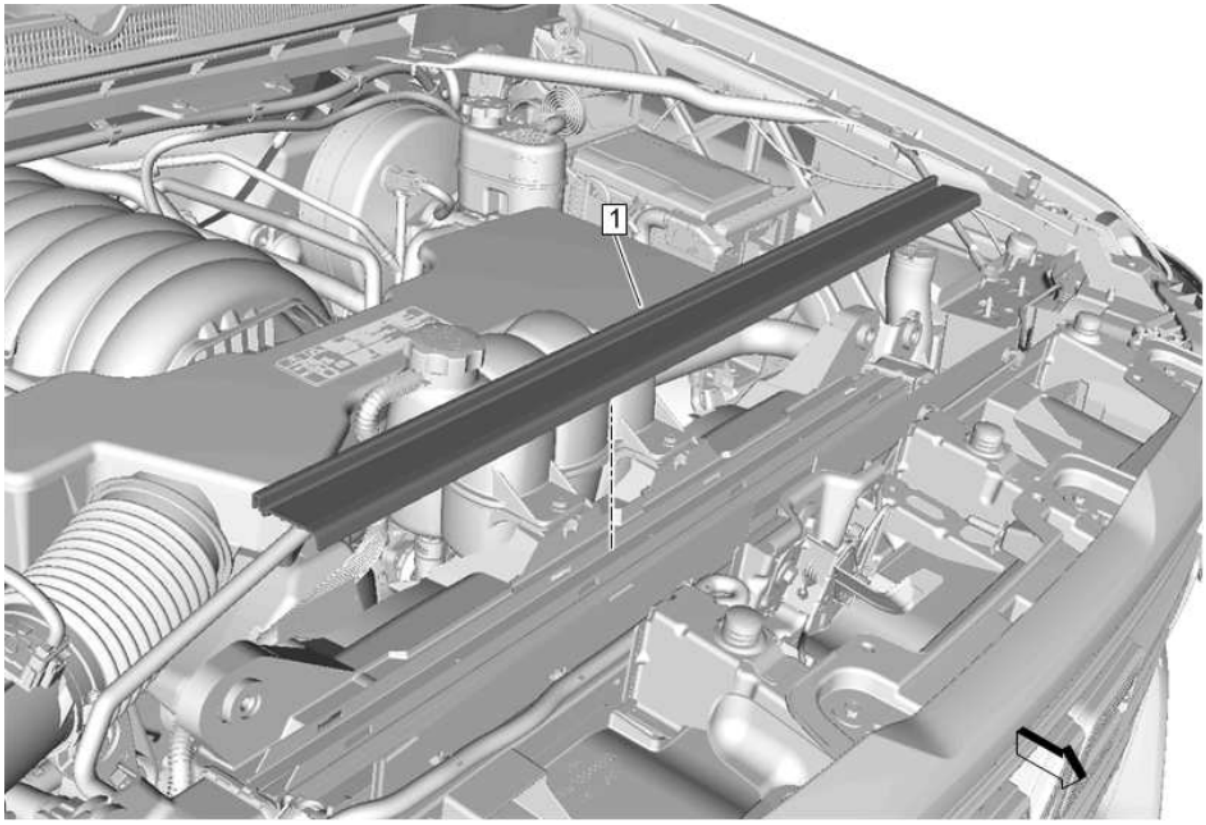

Fig. 614: Radiator Air Upper Baffle and Deflector (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the front end upper tie bar support. **Front End Upper Tie Bar Support Replacement**	
1	Radiator Air Upper Baffle **Procedure** Radiator Air Upper Baffle@Radiator - Unclip

RADIATOR AIR SEAL REPLACEMENT (L83, L86, LV3)

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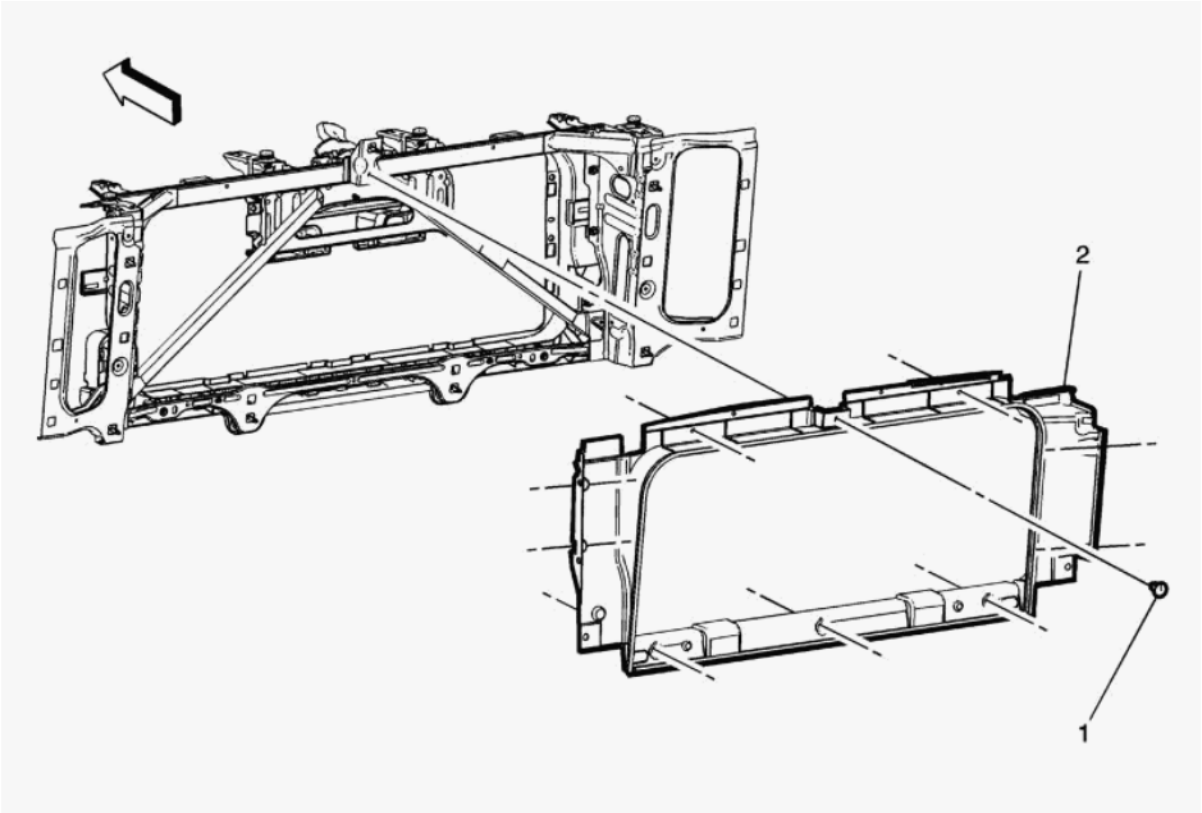

Fig. 615: Radiator Air Seal (L83, L86, LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the headlamp radiator grille mount panel from the vehicle. Refer to **Headlamp and Radiator Grille Mount Panel Replacement (Without LP)** .	
1	Radiator Air Seal Retainer (Qty: 10)
2	Radiator Air Seal

RADIATOR AIR SEAL REPLACEMENT (LC8, L96 - CHEVROLET)

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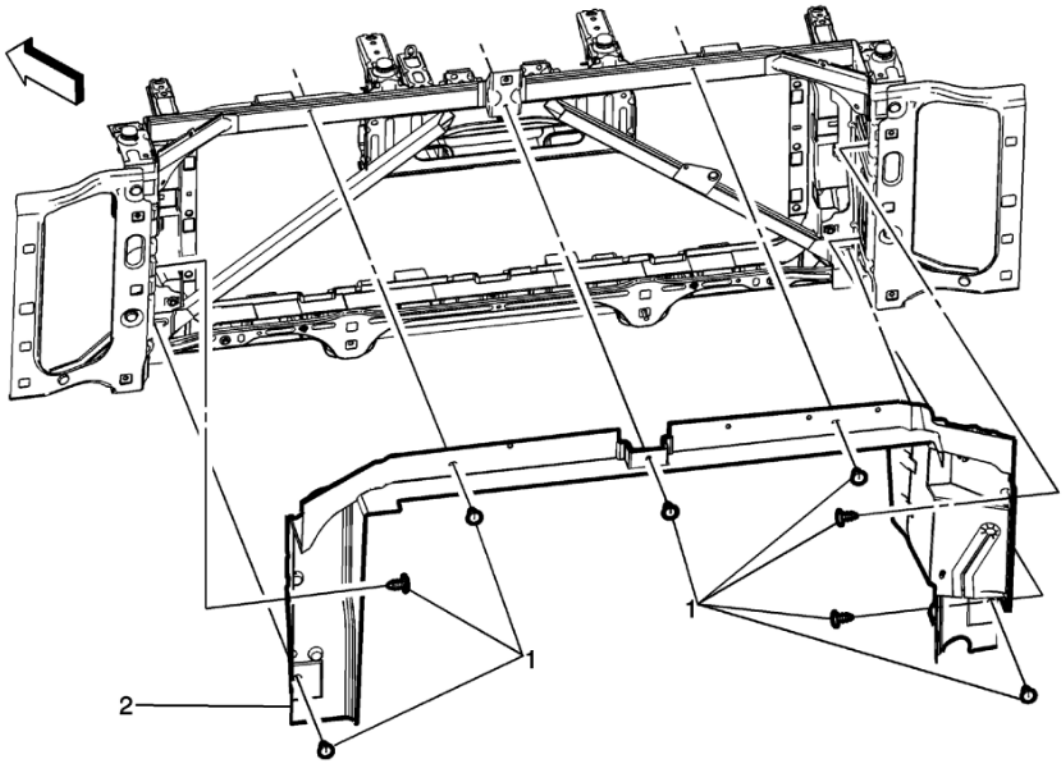

Fig. 616: Radiator Air Seal (LC8, L96 - Chevrolet)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the headlamp and radiator grille mount panel. Refer to **Headlamp and Radiator Grille Mount Panel Replacement (Without LP)** .	
1	Radiator Air Seal Retainer (Qty: 8)
2	Radiator Air Seal **Procedure** Remove the intake air baffle from the radiator air seal. Refer to **Intake Air Baffle Replacement** .

RADIATOR AIR SEAL REPLACEMENT (LC8, L96 - GMC)

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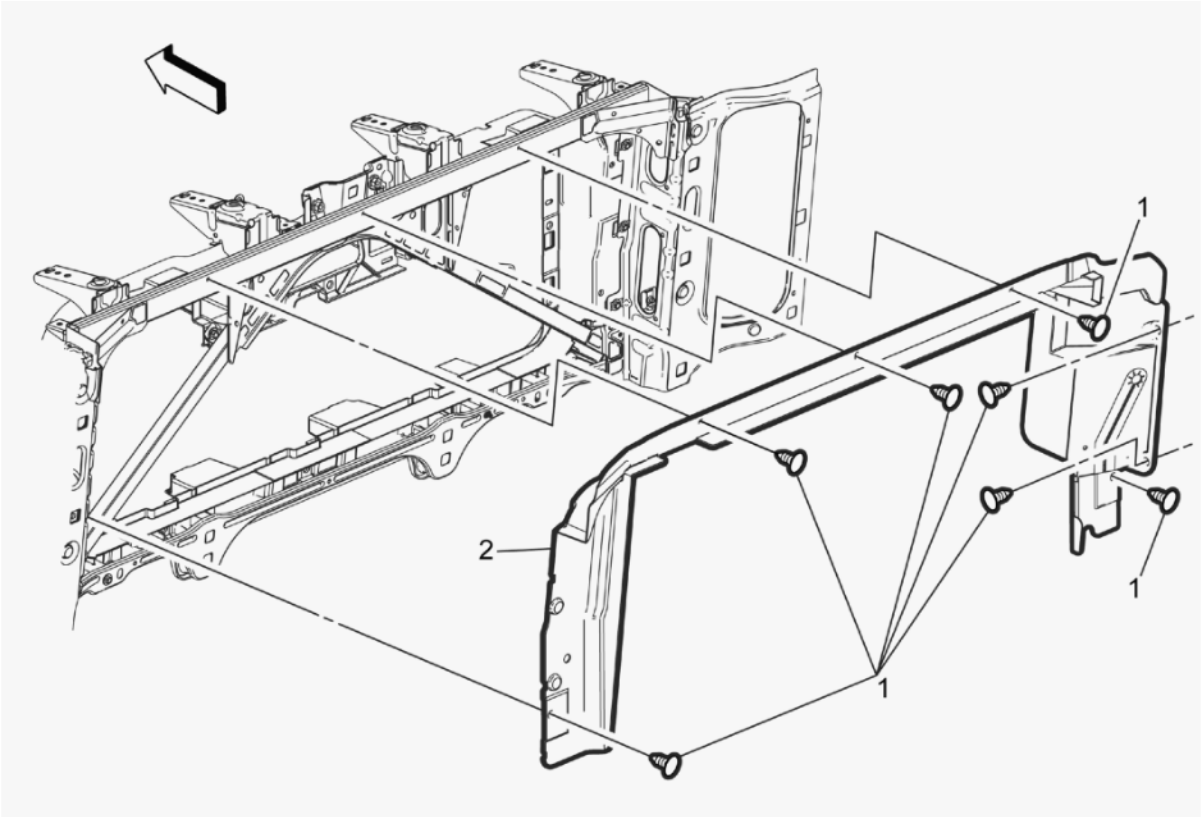

Fig. 617: Radiator Air Seal (LC8, L96 - GMC)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the headlamp and radiator grille mount panel. Refer to **Headlamp and Radiator Grille Mount Panel Replacement (Without LP)** .	
1	Radiator Air Seal Retainer (Qty: 7)
2	Radiator Air Seal **Procedure** Remove the intake air baffle from the radiator air seal, if equipped. Refer to **Intake Air Baffle Replacement** .

RADIATOR AIR SEAL REPLACEMENT (L8B)

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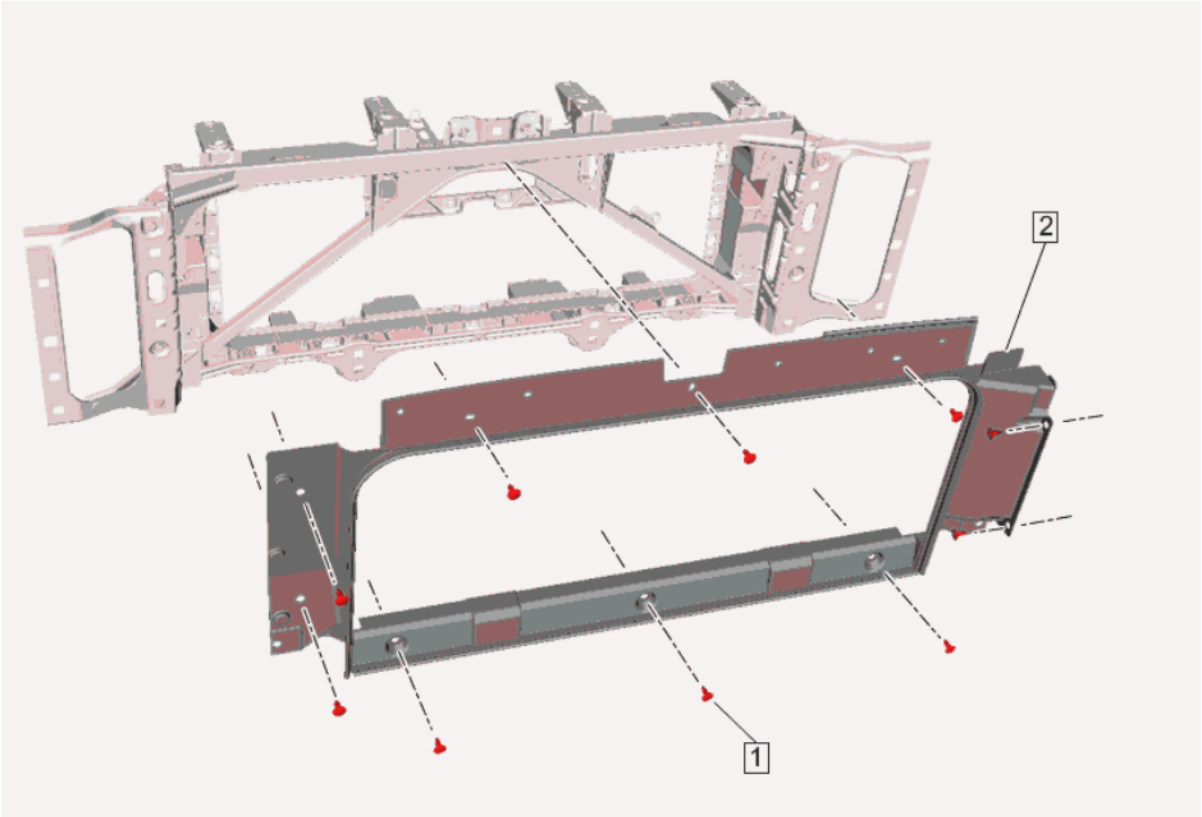

Fig. 618: Radiator Air Seal (L8B)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Headlamp and Radiator Grille Mount Panel - Remove **Headlamp and Radiator Grille Mount Panel Replacement (Without LP)**	
1	Radiator Air Seal Retainer
2	Radiator Air Seal

RADIATOR AIR SEAL REPLACEMENT (L5P)

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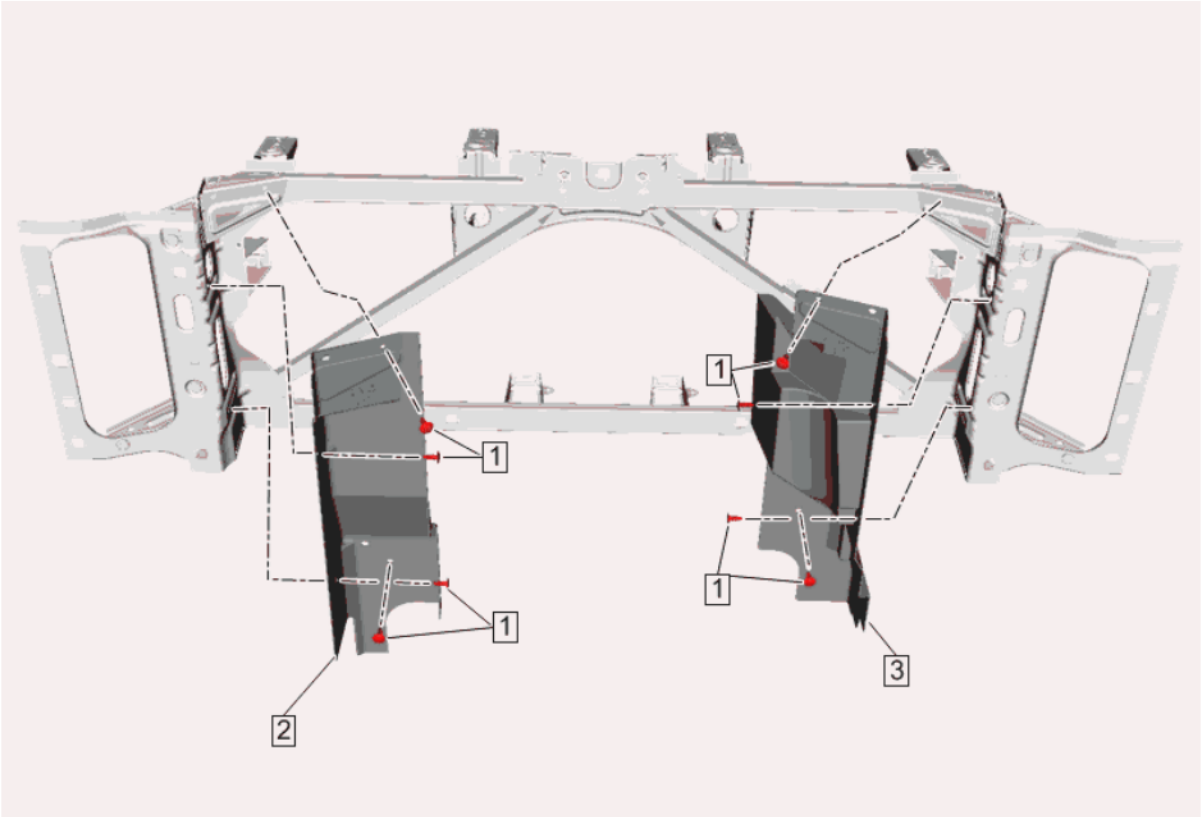

Fig. 619: Radiator Air Seal (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure **Headlamp and Radiator Grille Mount Panel Replacement (With LP5)**	
1	Radiator Air Seal Retainer
2	Radiator Air SealLeft Side
3	Radiator Air SealRight Side

ENGINE COOLANT HEATER REPLACEMENT

Engine Coolant Heater Replacement (LV3)

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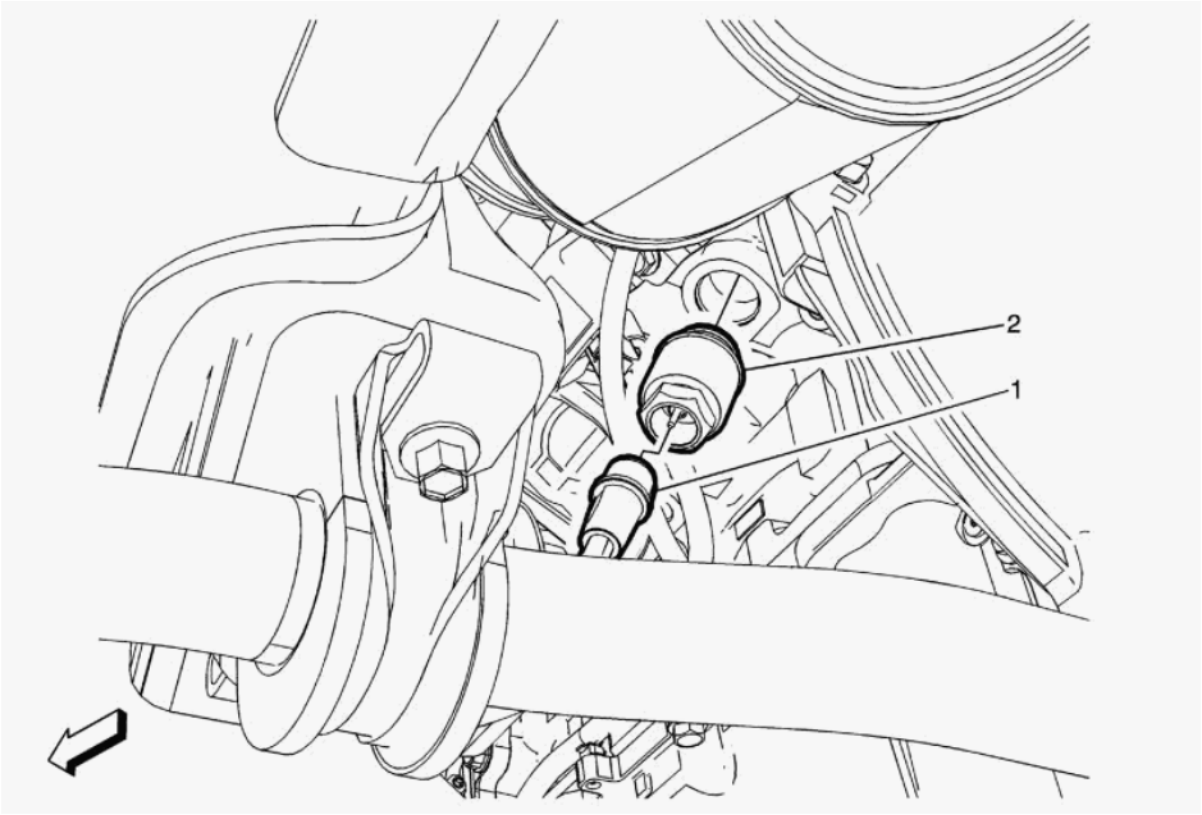

Fig. 620: Coolant Heater (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)** . 2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Coolant Heater Connector
2	Coolant Heater **CAUTION:** **Refer to Component Fastener Tightening Caution .** **Procedure** Remove the engine coolant heater. **Tighten** 50 N.m (37 lb ft)

Engine Coolant Heater Replacement (L83)

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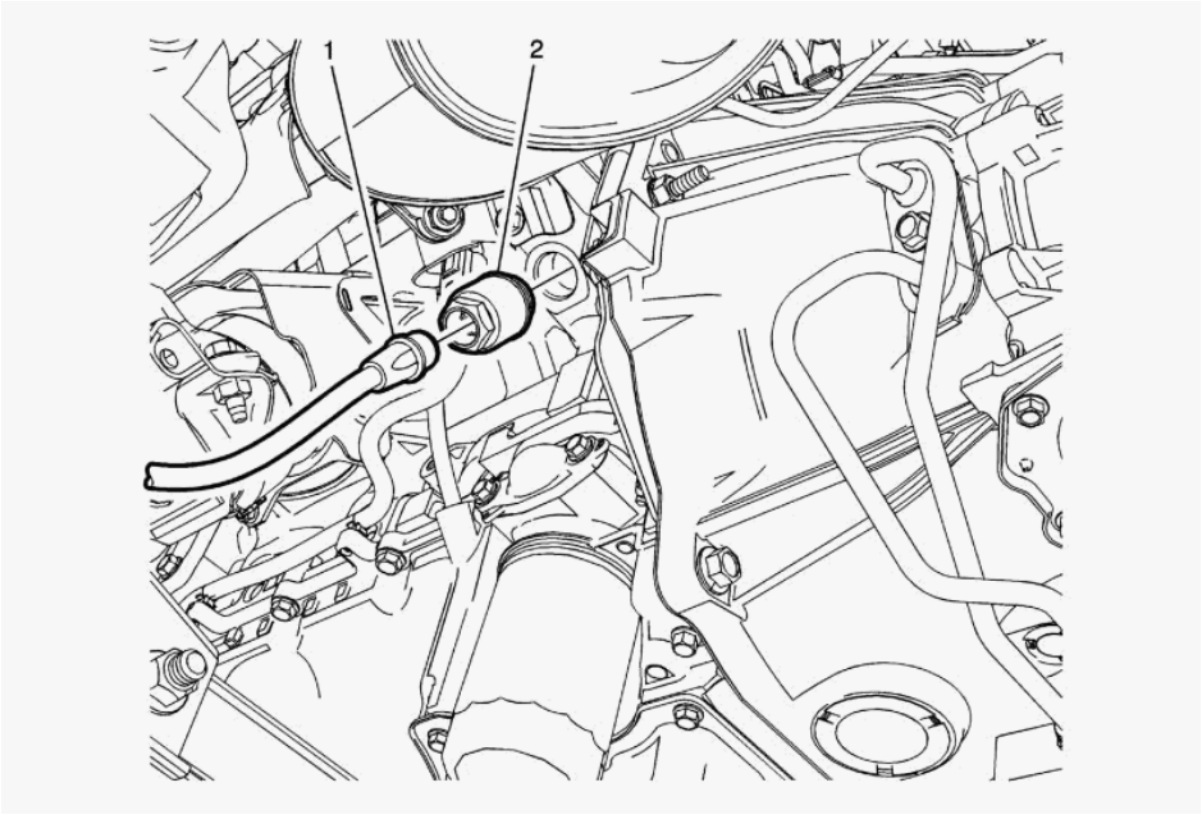

Fig. 621: Coolant Heater (L83)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. Refer to **Cooling System Draining and Filling (Vac N Fill L83 L86)Cooling System Draining and Filling (Static Fill L83 L86)**.	
1	Coolant Heater Connector
2	Coolant Heater **CAUTION:** **Refer to** **Component Fastener Tightening Caution** . **Procedure** Remove the engine coolant heater. **Tighten** 50 N.m (37 lb ft)

Engine Coolant Heater Replacement (L5P)

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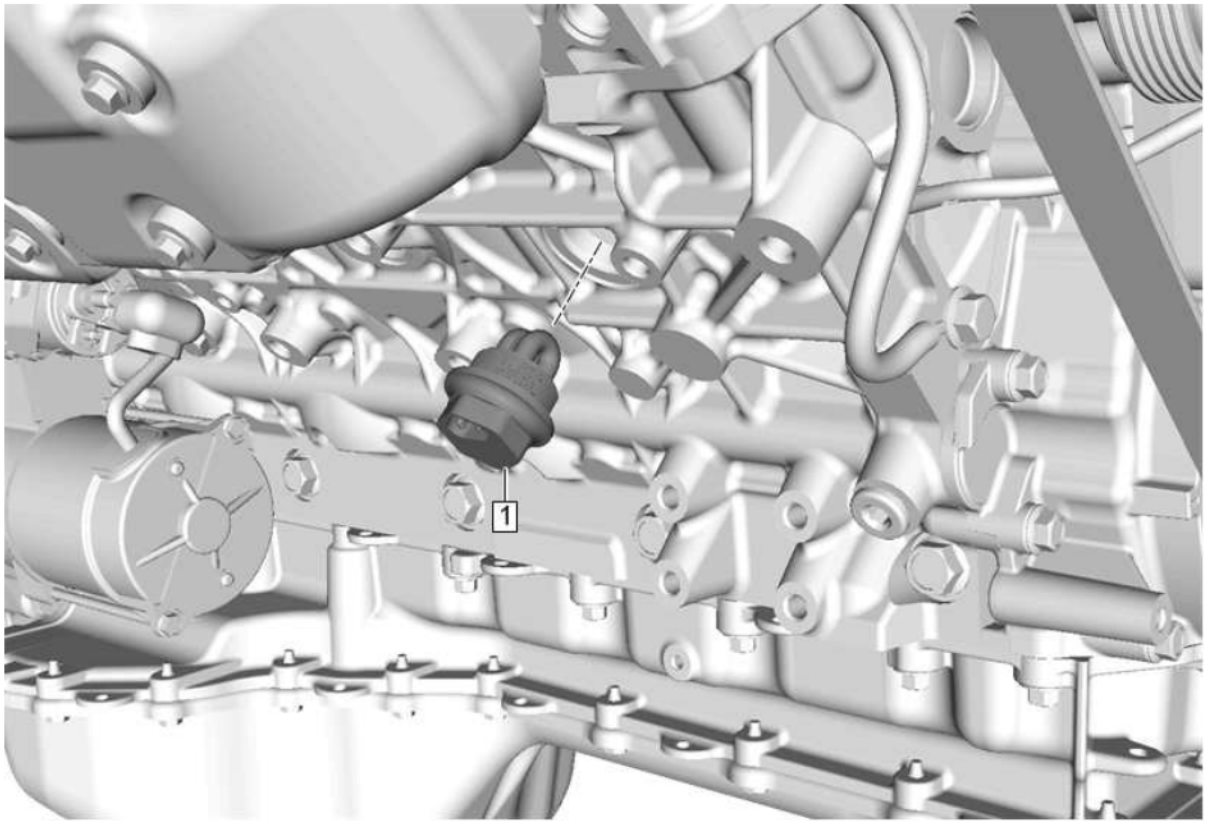

Fig. 622: Engine Coolant Heater (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the coolant. **Cooling System Draining and Filling (GE 47716 L5P)Cooling System Draining and Filling (Static L5P)** 2. Disconnect the electrical connector.	
1	Coolant Heater **CAUTION:** **Refer to** **Component Fastener Tightening Caution** . **Procedure** Apply sealant to the threads. **Adhesives, Fluids, Lubricants, and Sealers** **Tighten** 65 N.m (48 lb ft)

Engine Coolant Heater Replacement (LV3 with 4WD)

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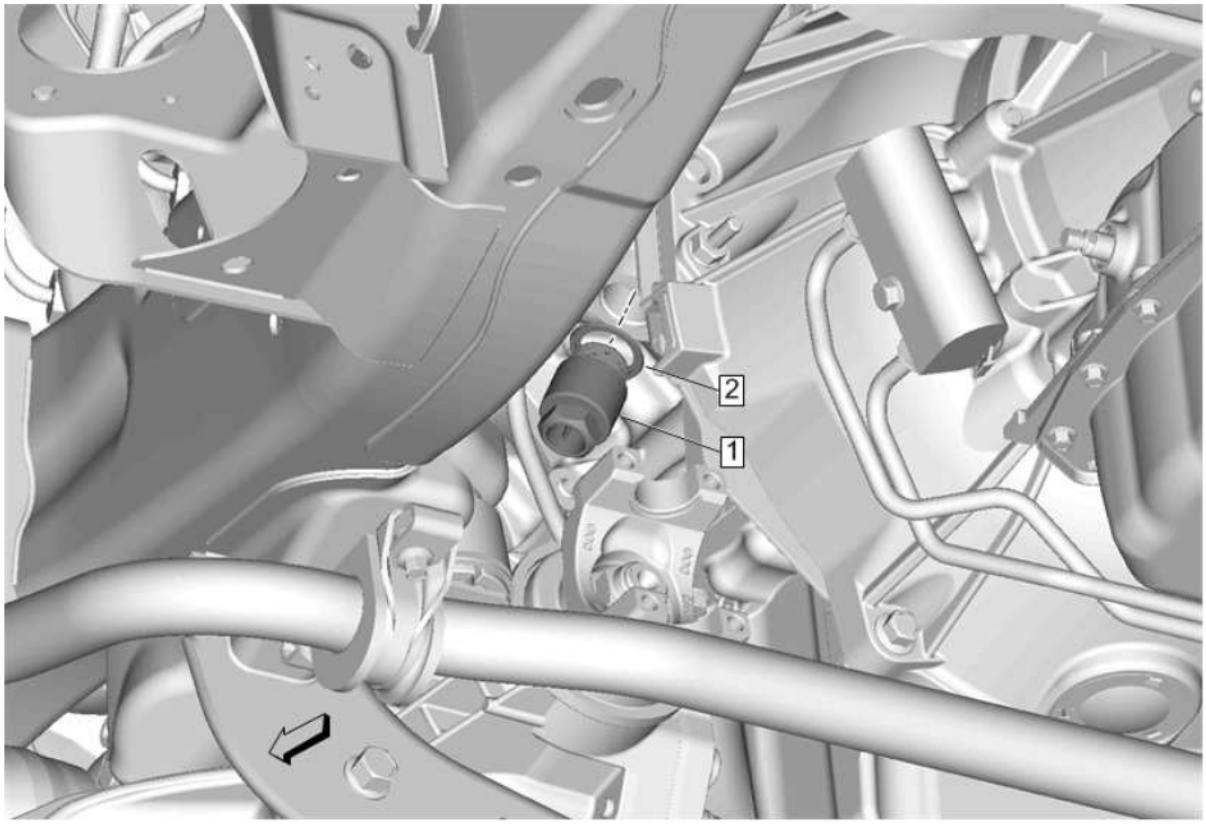

Fig. 623: Engine Coolant Heater (LV3 with 4WD)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. **Cooling System Draining and Filling (Static Fill LV3)Cooling System Draining and Filling (Vac N Fill LV3)** 2. **Front Axle Propeller Shaft Replacement** 3. Disconnect the engine coolant heater electrical connector from the engine cooling heater.	
2	Coolant Heater **CAUTION:** **Refer to** **Component Fastener Tightening Caution** . **Procedure** Remove the engine coolant heater. **Tighten** 50 N.m (37 lb ft)

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Callout	Component Name
2	Engine Coolant Heater Gasket **Procedure** Install a NEW gasket.

ENGINE COOLANT HEATER CORD REPLACEMENT

Engine Coolant Heater Cord Replacement (LV3, L83, L86)

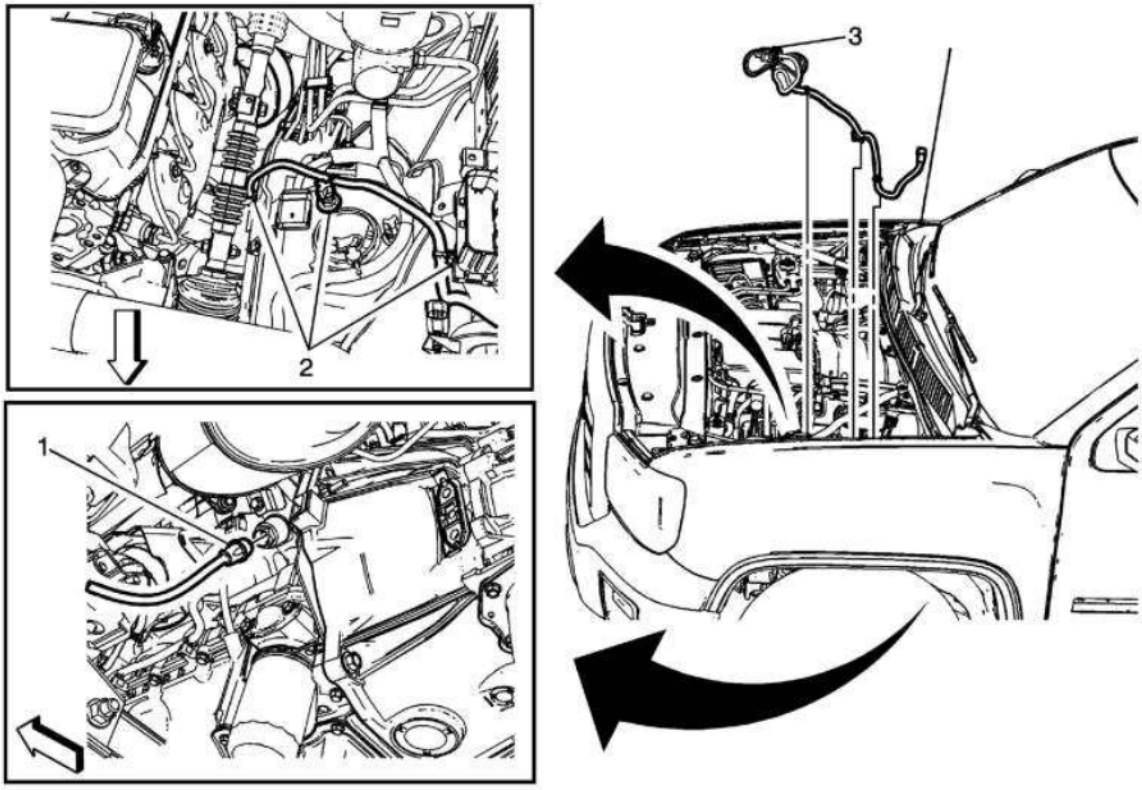

Fig. 624: Coolant Heater Cord (LV3, L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Coolant Heater Cord Connector
2	Coolant Heater Cord Retainers
3	Coolant Heater Cord **Procedure** Note the location and routing of the coolant heater cord prior to removal in order to ensure proper installation.

Engine Coolant Heater Cord Replacement (L5P)

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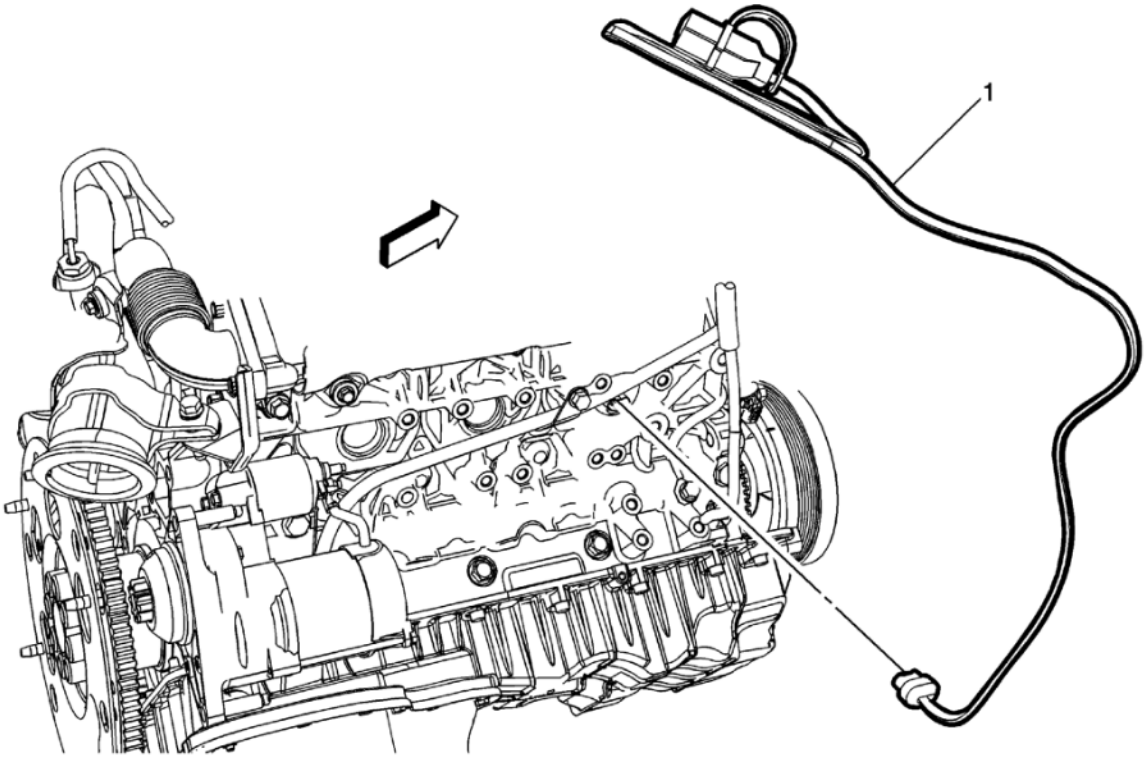

Fig. 625: Identifying Coolant Heater Cord (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the right front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement - Right Side** .	
1	Coolant Heater Cord **Procedure** Route coolant heater cord properly and clip into place.

CNG HIGH PRESSURE REGULATOR HEATER INLET HOSE REPLACEMENT (HEATER HOSE TO PIPE)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools** .

Removal Procedure

1. Drain the coolant. **Cooling System Draining and Filling (Vac N Fill L8B)**

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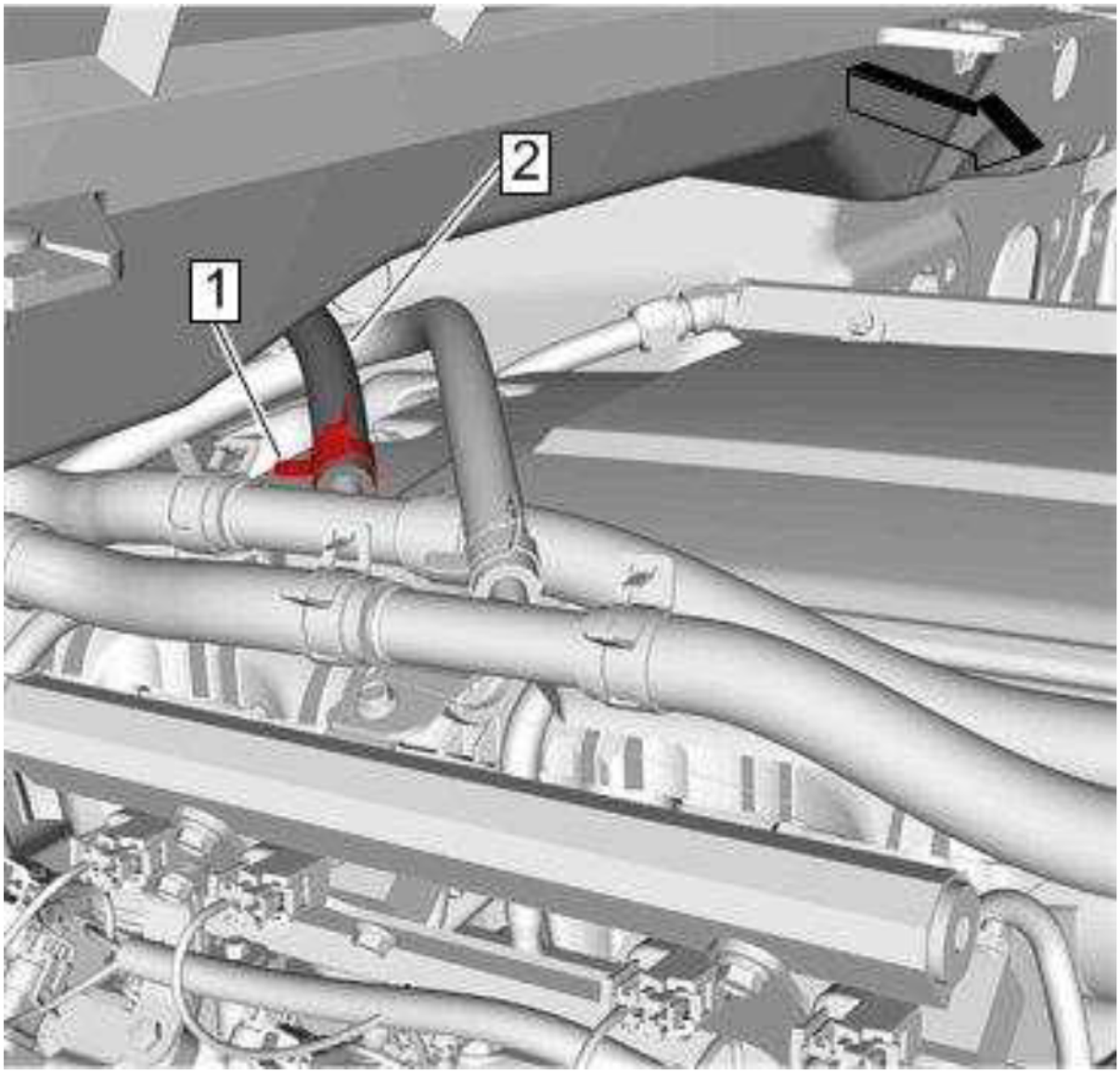

Fig. 626: Compressed Natural Gas (CNG) High Pressure Regulator Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

2. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (2) using **BO-38185** Hose Clamp Pliers.
3. (CNG) High Pressure Regulator Heater Inlet Hose 2 @Heater Inlet Hose Assembly - Remove
4. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

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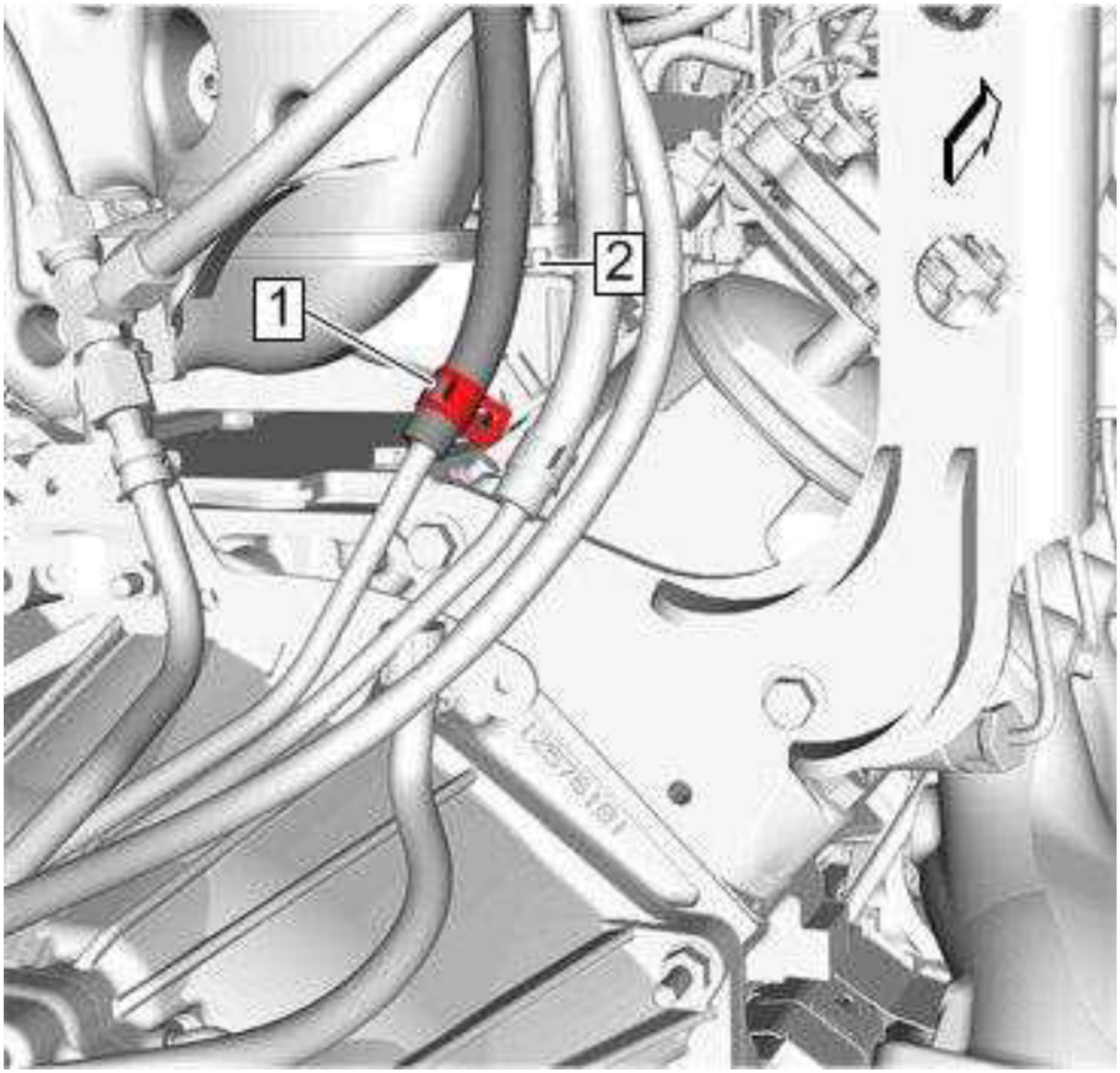

Fig. 627: Compressed Natural Gas (CNG) High Pressure Regulator Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (2) using **BO-38185** Hose Clamp Pliers.
6. Remove the CNG high pressure regulator heater inlet hose (2) from the CNG high pressure regulator heater inlet pipe.
7. Remove the CNG high pressure regulator heater inlet hose from the vehicle.

Installation Procedure

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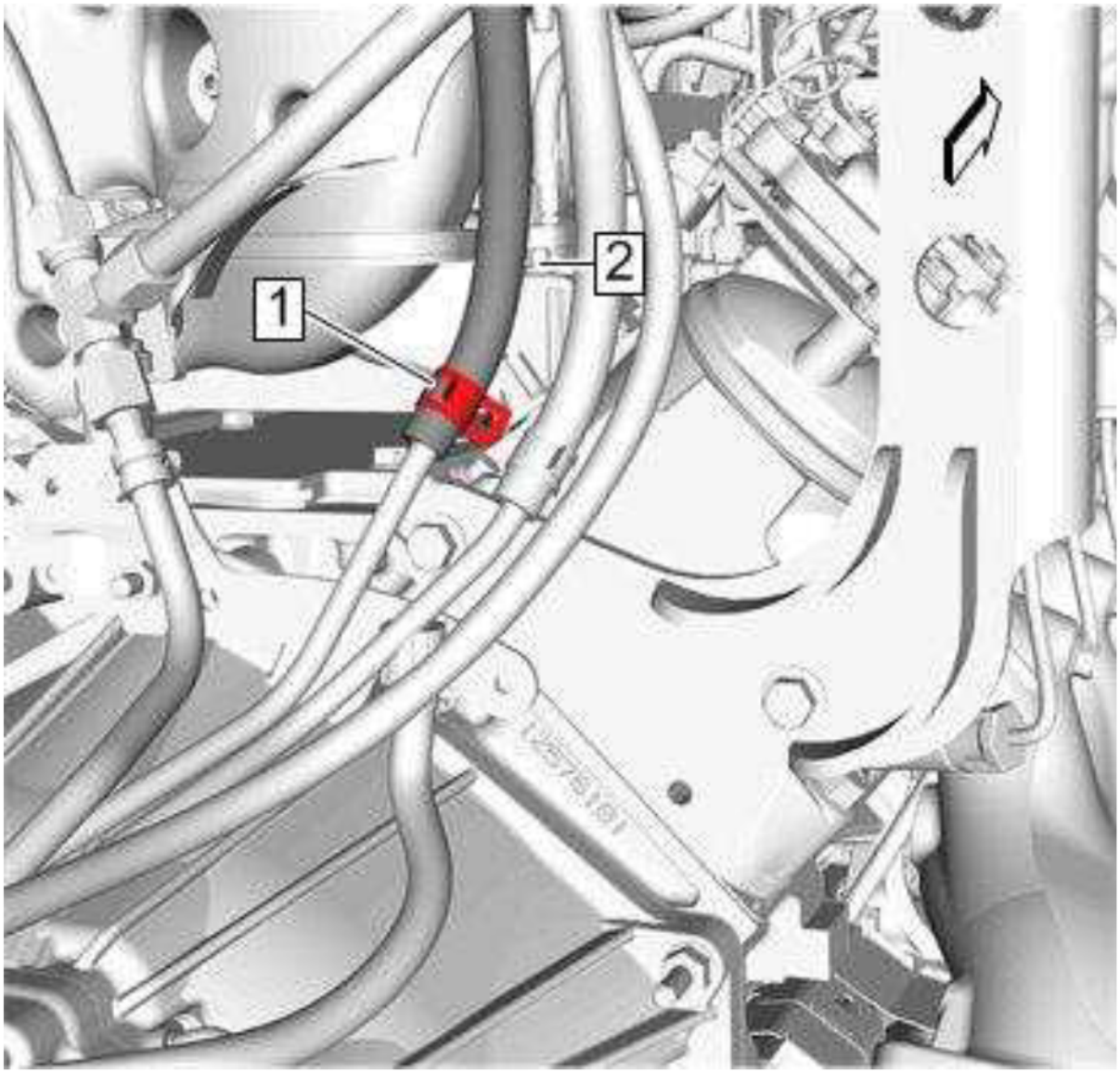

Fig. 628: Compressed Natural Gas (CNG) High Pressure Regulator Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Position the CNG high pressure regulator heater inlet hose (2) in the vehicle.
2. Install the CNG high pressure regulator heater inlet hose (2) to the CNG high pressure regulator heater inlet pipe.
3. Engage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (1) using **BO-38185** Hose Clamp Pliers.
4. Remove the supports and lower the vehicle.

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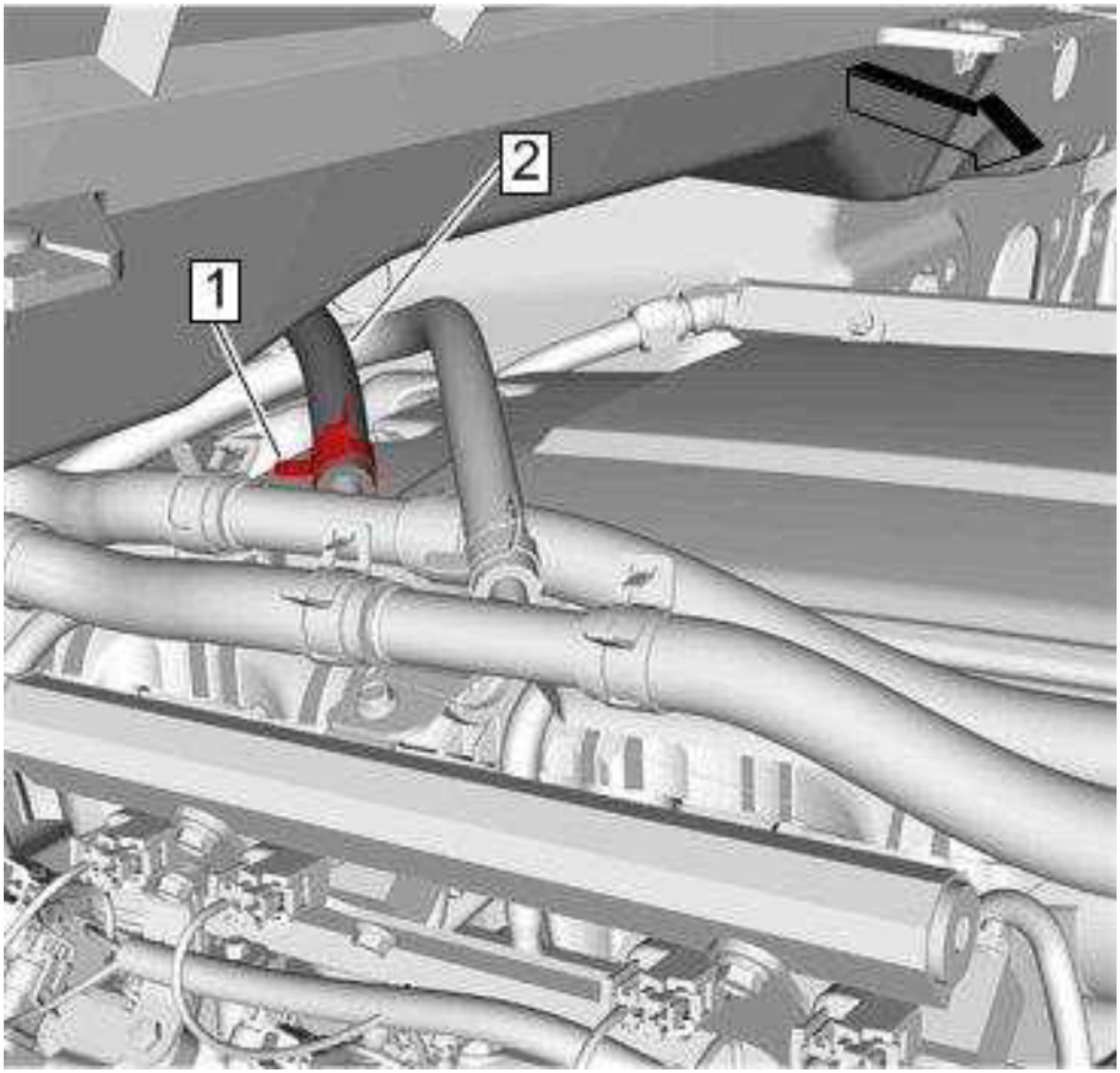

Fig. 629: Compressed Natural Gas (CNG) High Pressure Regulator Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. (CNG) High Pressure Regulator Heater Inlet Hose 2 @Heater Inlet Hose Assembly - Install
6. Engage the clamp (2) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (1) using **BO-38185** Hose Clamp Pliers.
7. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
8. Start the engine and inspect for leaks.

CNG HIGH PRESSURE REGULATOR HEATER INLET HOSE REPLACEMENT (PIPE TO REGULATOR)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools** .

Removal Procedure

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1. Drain the coolant. **Cooling System Draining and Filling (Vac N Fill L8B)**
2. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

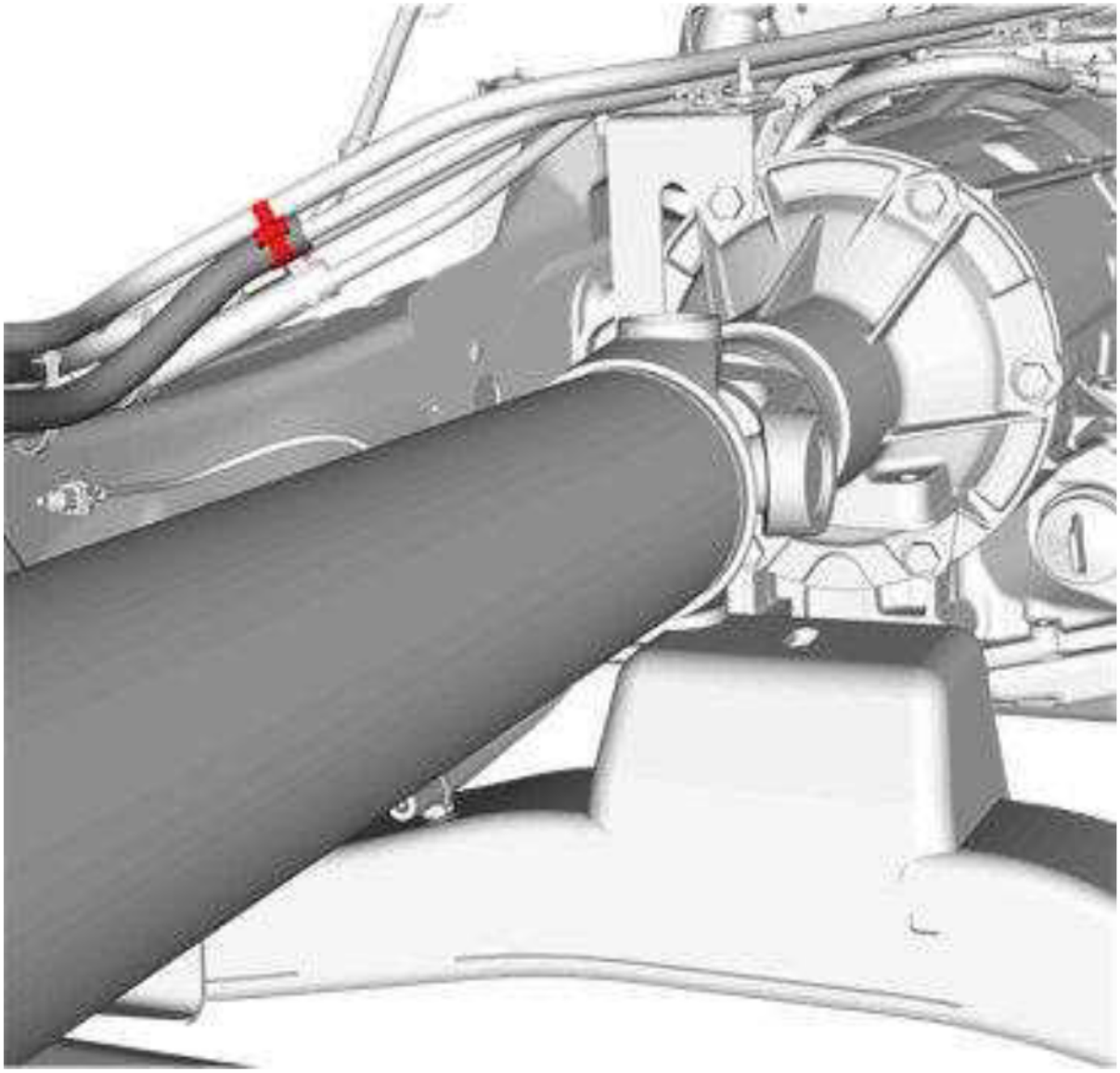

Fig. 630: Compressed Natural Gas High Pressure Regulator Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (2) using **BO-38185** Hose Clamp Pliers.
4. Remove the CNG high pressure regulator heater inlet hose (2) from the CNG high pressure regulator heater inlet pipe.

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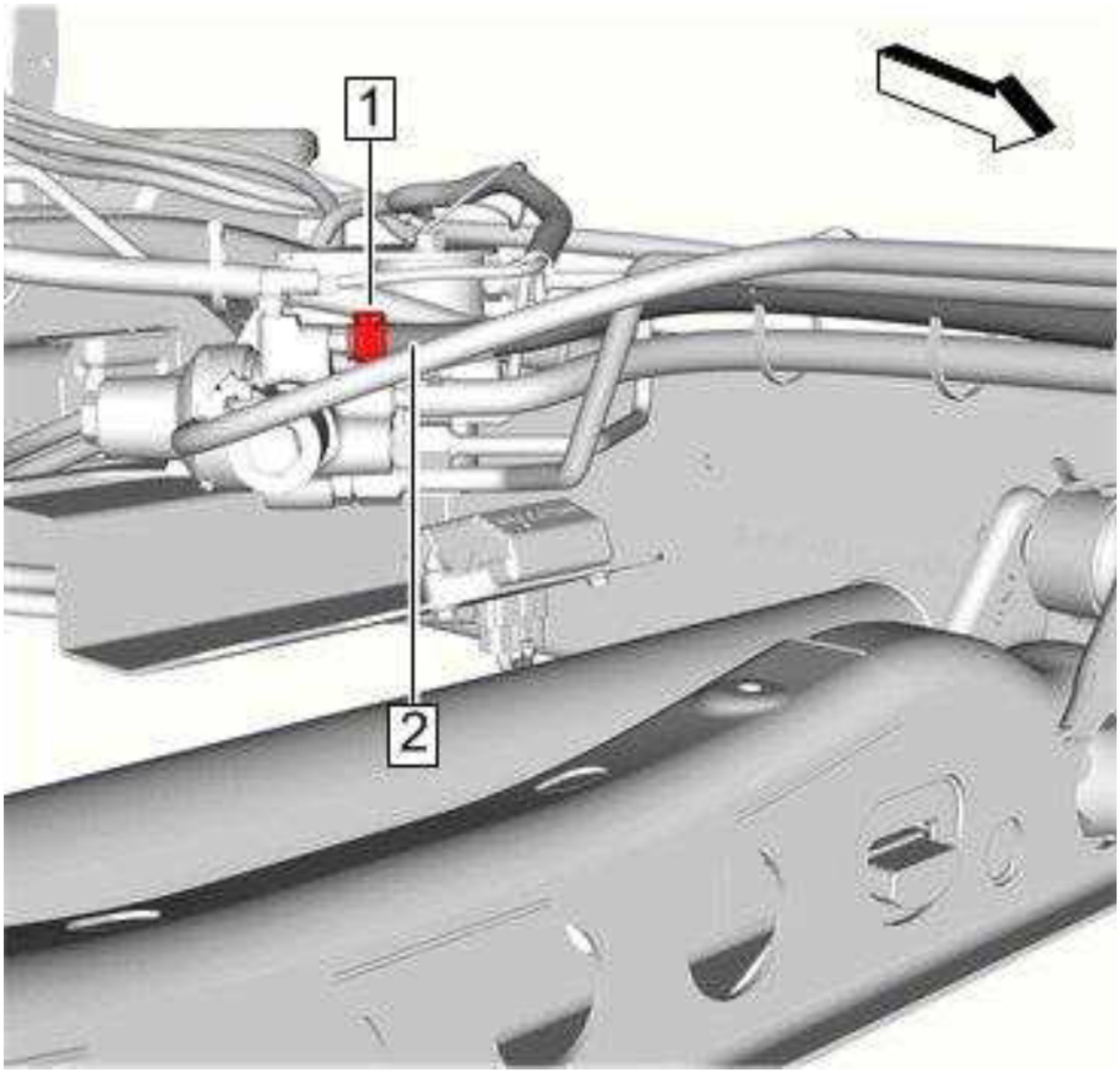

Fig. 631: Compressed Natural Gas High Pressure Regulator Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater inlet hose (2) using **BO-38185** Hose Clamp Pliers.
6. Remove the CNG high pressure regulator heater inlet hose (2) from the CNG high pressure regulator.
7. Remove the CNG high pressure regulator heater inlet hose from the vehicle.

Installation Procedure

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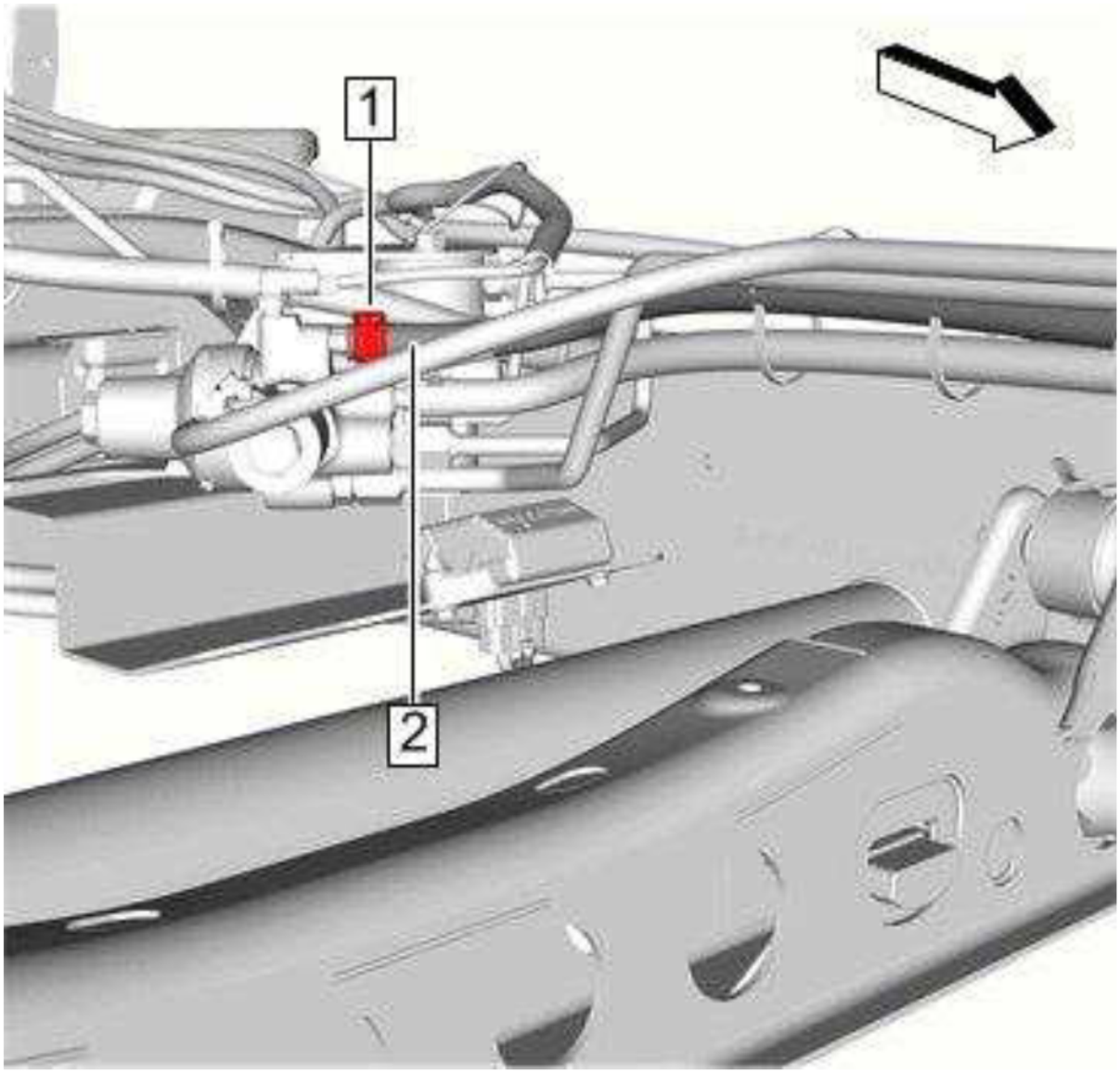

Fig. 632: Compressed Natural Gas High Pressure Regulator Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

1. Position the CNG high pressure regulator heater inlet hose (2) in the vehicle.
2. Install the CNG high pressure regulator heater inlet hose (2) to the CNG high pressure regulator.
3. Engage the clamp (1) securing the compressed natural gas CNG high pressure regulator heater inlet hose (1) using **BO-38185** Hose Clamp Pliers.

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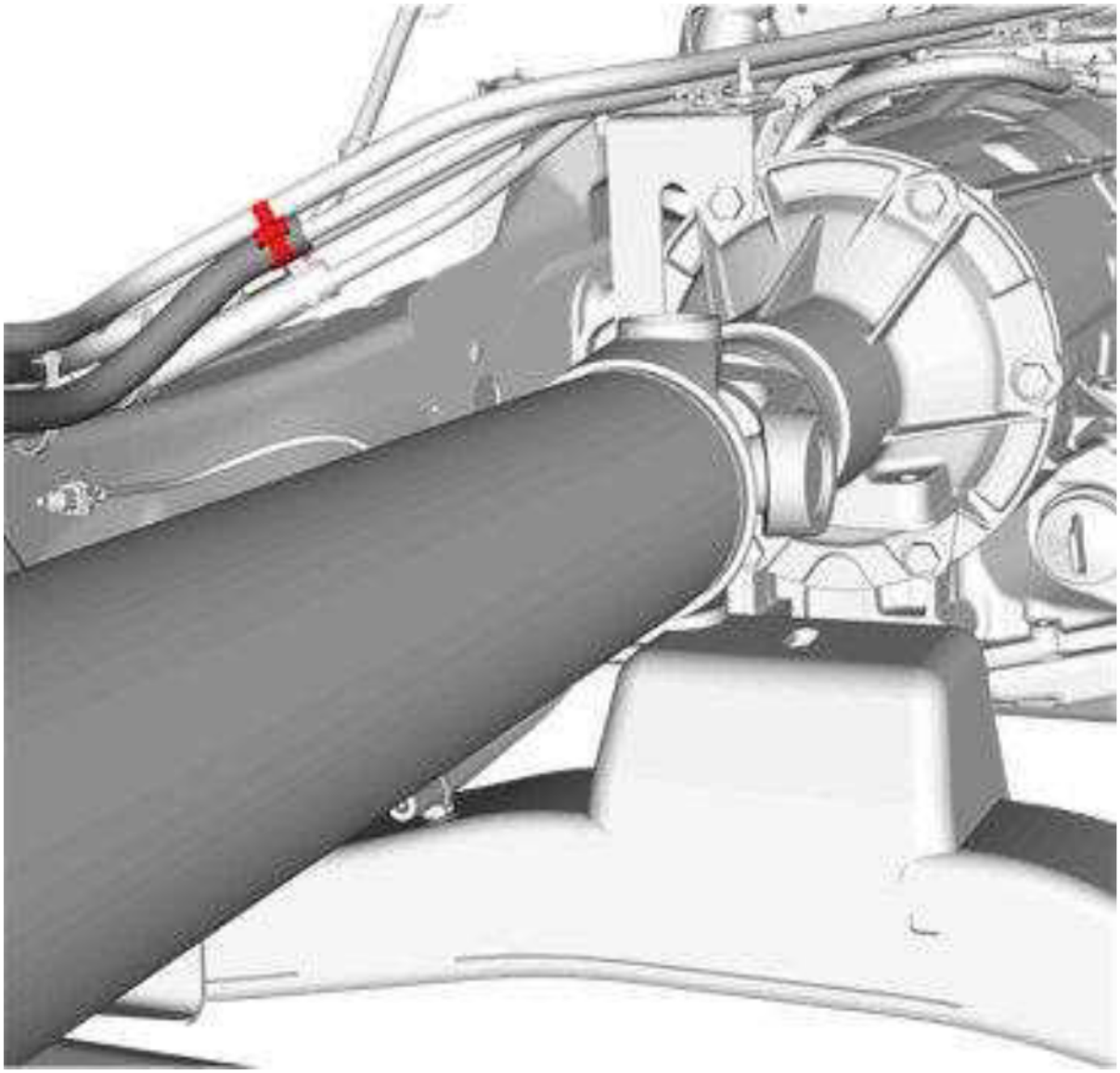

Fig. 633: Compressed Natural Gas High Pressure Regulator Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Install the CNG high pressure regulator heater inlet hose (2) to the CNG high pressure regulator heater inlet pipe.
5. Engage the clamp (2) securing the compressed natural gas CNG high pressure regulator heater inlet hose (1) using **BO-38185** Hose Clamp Pliers.
6. Remove the supports and lower the vehicle.
7. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
8. Start the engine and inspect for leaks.

CNG HIGH PRESSURE REGULATOR HEATER OUTLET HOSE REPLACEMENT (HEATER HOSE TO PIPE)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools** .

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Removal Procedure

1. Drain the coolant. **Cooling System Draining and Filling (Vac N Fill L8B)**

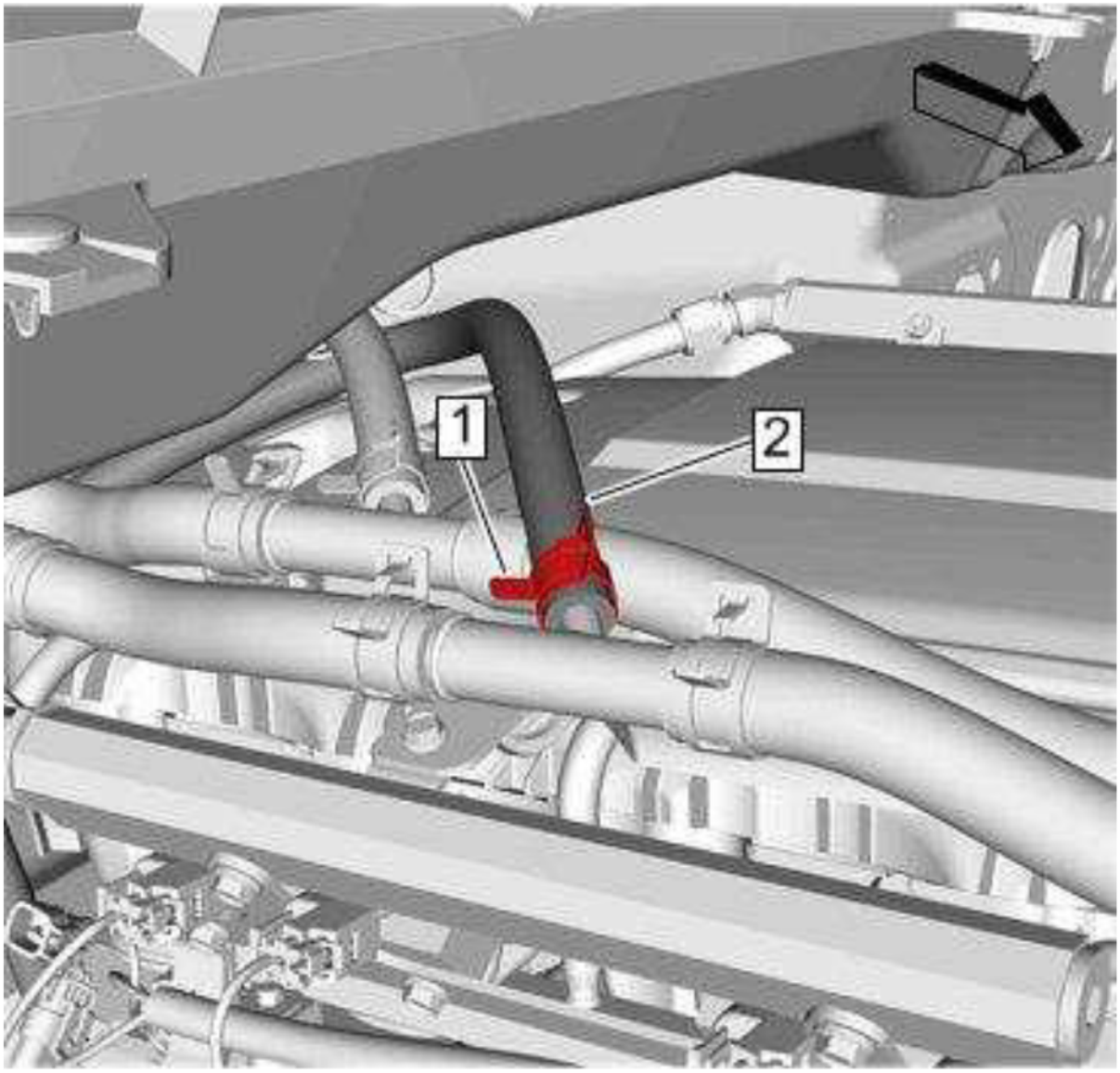

Fig. 634: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

2. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater Outlet hose (2) using **BO-38185** Hose Clamp Pliers.
3. (CNG) High Pressure Regulator Heater Outlet Hose 2 @Heater Outlet Hose - Remove
4. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

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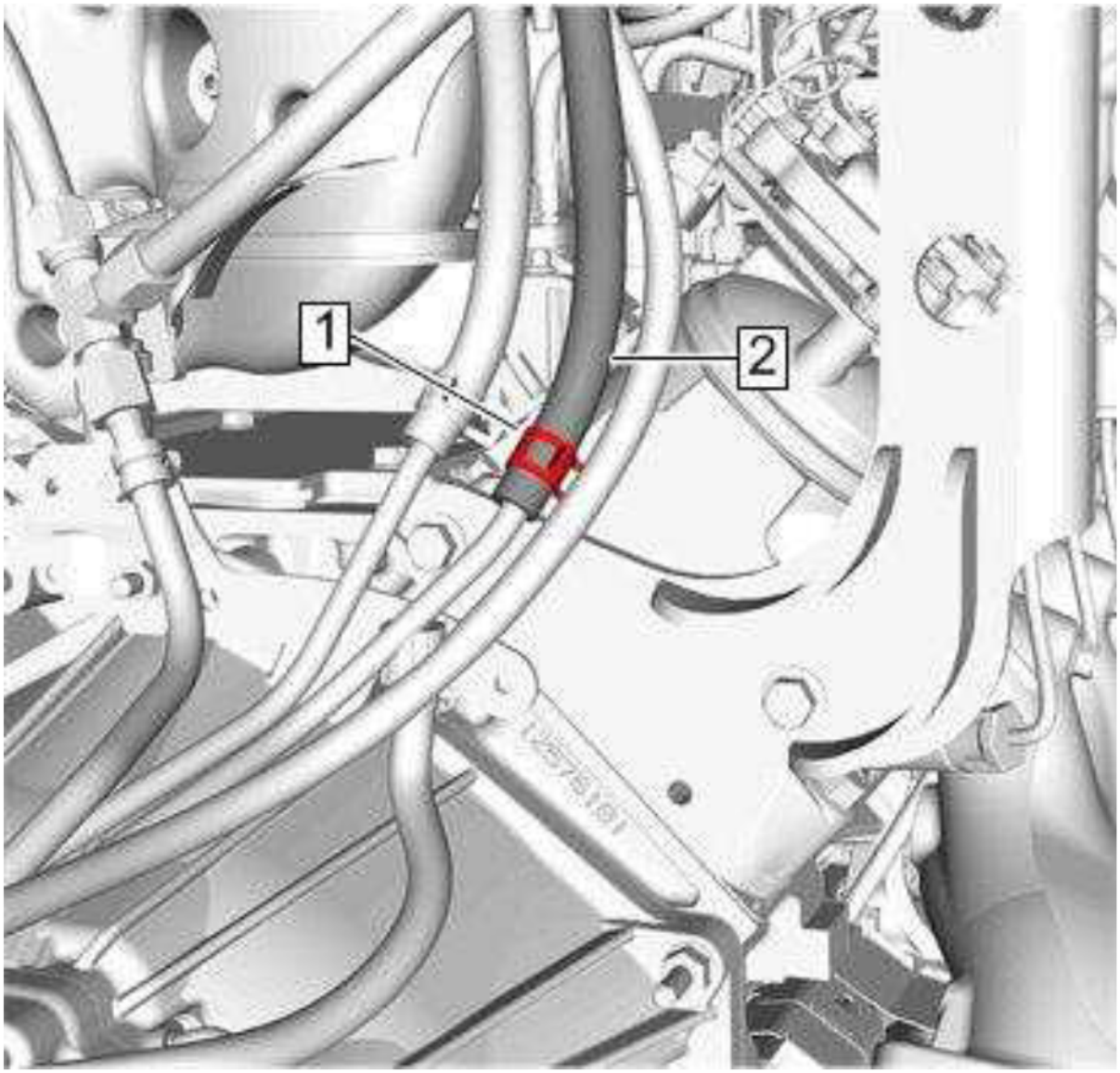

Fig. 635: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater outlet hose (2) using **BO-38185** Hose Clamp Pliers.
6. Remove the CNG high pressure regulator heater outlet hose (2) from the CNG high pressure regulator heater outlet pipe.
7. Remove the CNG high pressure regulator heater outlet hose from the vehicle.

Installation Procedure

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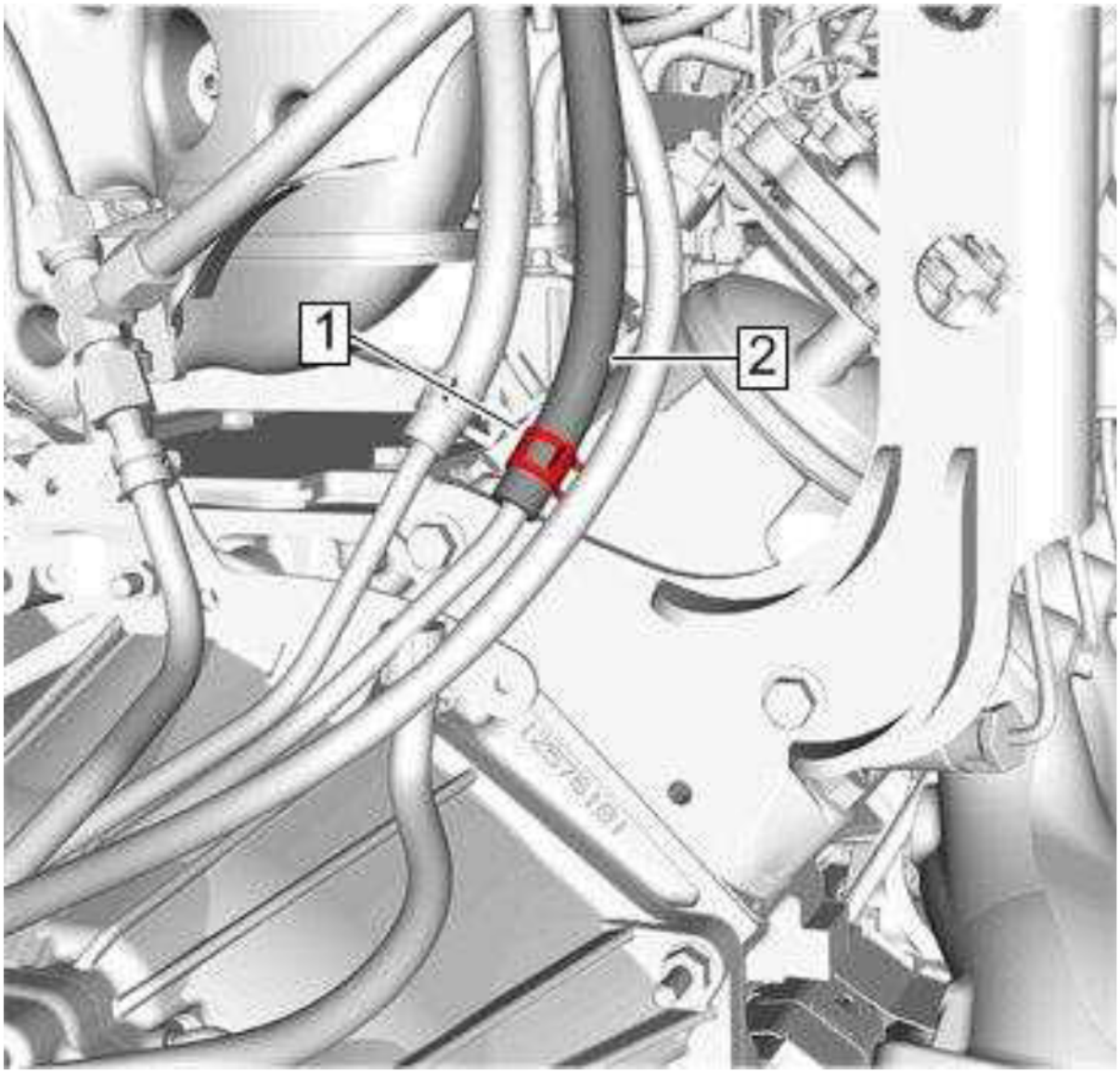

Fig. 636: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

1. Position the CNG high pressure regulator heater outlet hose (2) in the vehicle.
2. Install the CNG high pressure regulator heater outlet hose (2) to the CNG high pressure regulator heater outlet pipe.
3. Engage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater outlet hose (1) using **BO-38185** Hose Clamp Pliers.
4. Remove the supports and lower the vehicle.

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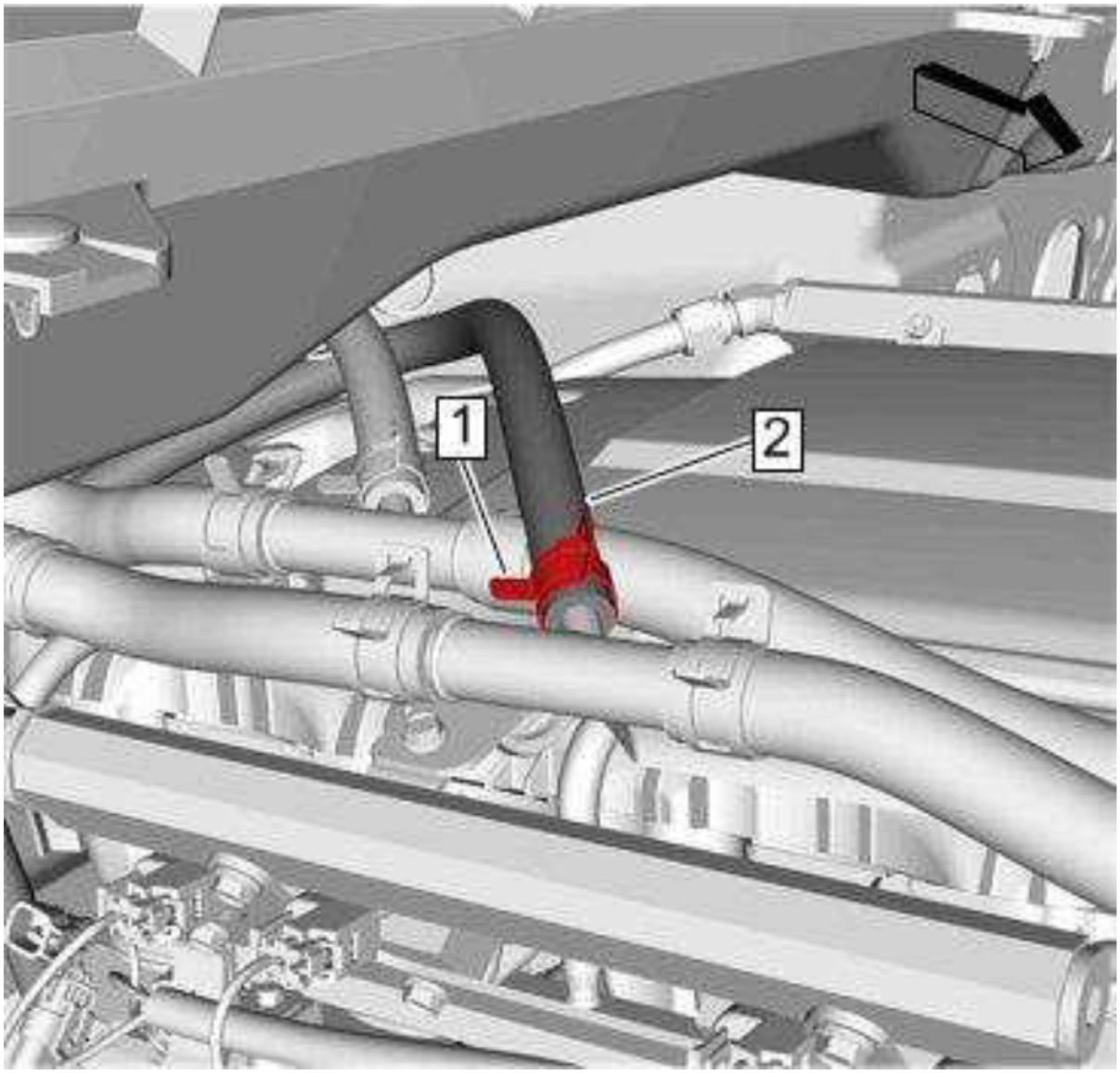

Fig. 637: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. (CNG) High Pressure Regulator Heater outlet Hose 2 @Heater Outlet Hose - Install
6. Engage the clamp (2) securing the compressed natural gas (CNG) high pressure regulator heater outlet hose (1) using **BO-38185** Hose Clamp Pliers.
7. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
8. Start the engine and inspect for leaks.

CNG HIGH PRESSURE REGULATOR HEATER OUTLET HOSE REPLACEMENT (PIPE TO REGULATOR)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools** .

Removal Procedure

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1. Drain the coolant. **Cooling System Draining and Filling (Vac N Fill L8B)**
2. Raise and support the vehicle. **Lifting and Jacking the Vehicle**

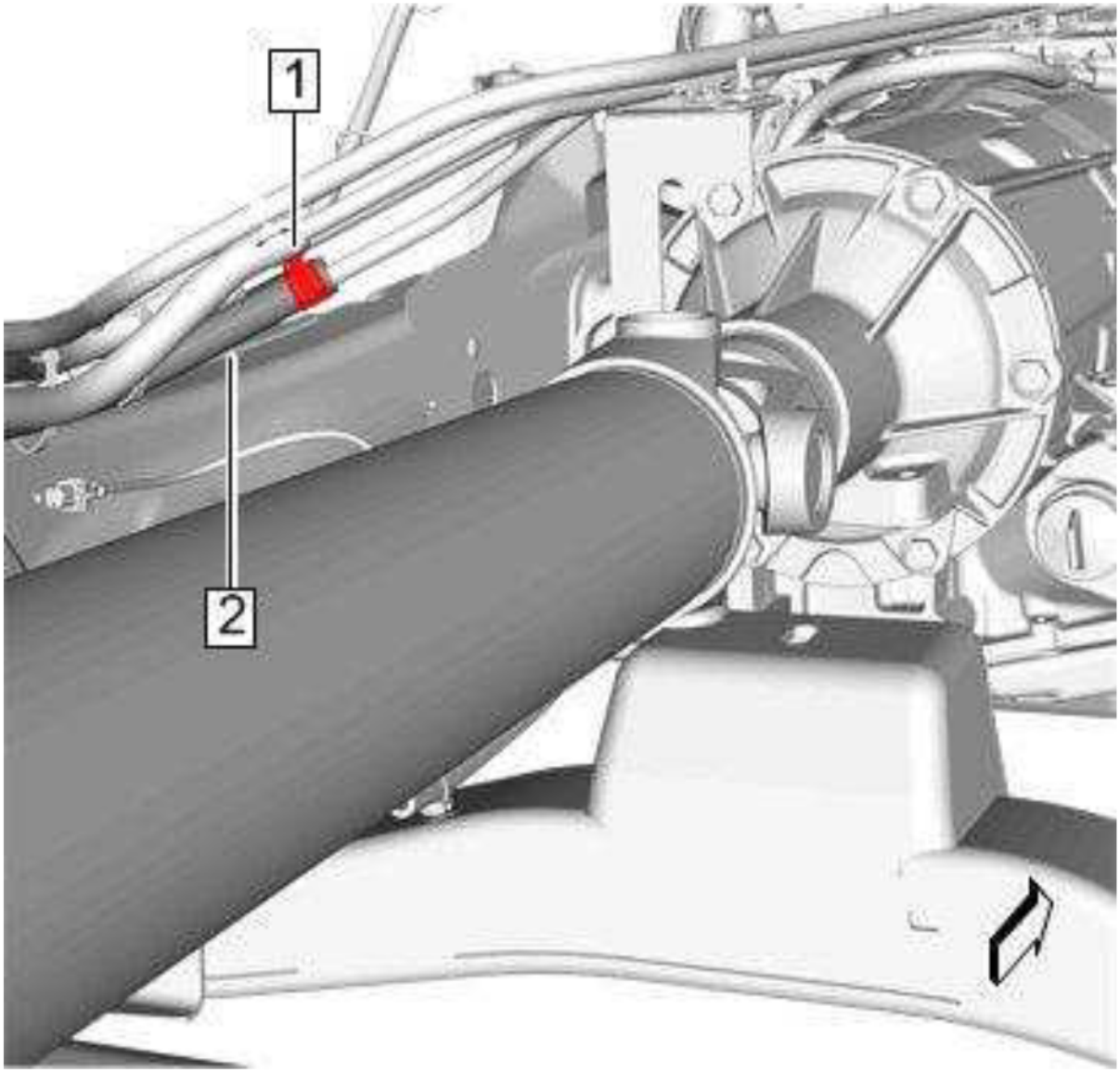

Fig. 638: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater outlet hose (2) using **BO-38185** Hose Clamp Pliers.
4. Remove the CNG high pressure regulator heater outlet hose (2) from the CNG high pressure regulator heater outlet pipe.

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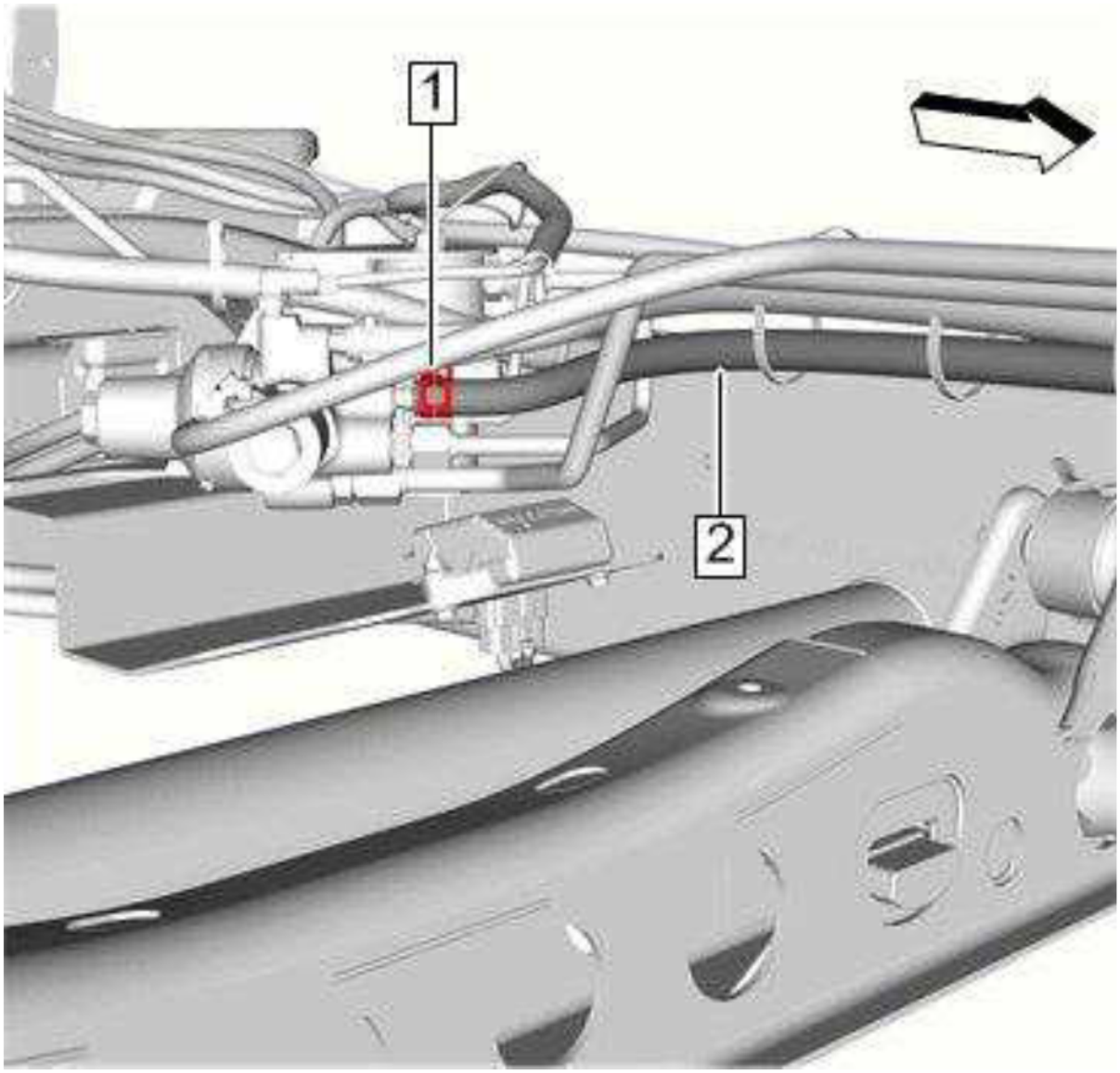

Fig. 639: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage the clamp (1) securing the compressed natural gas (CNG) high pressure regulator heater outlet hose (2) using **BO-38185** Hose Clamp Pliers.
6. Remove the CNG high pressure regulator heater outlet hose (2) from the CNG high pressure regulator.
7. Remove the CNG high pressure regulator heater outlet hose from the vehicle.

Installation Procedure

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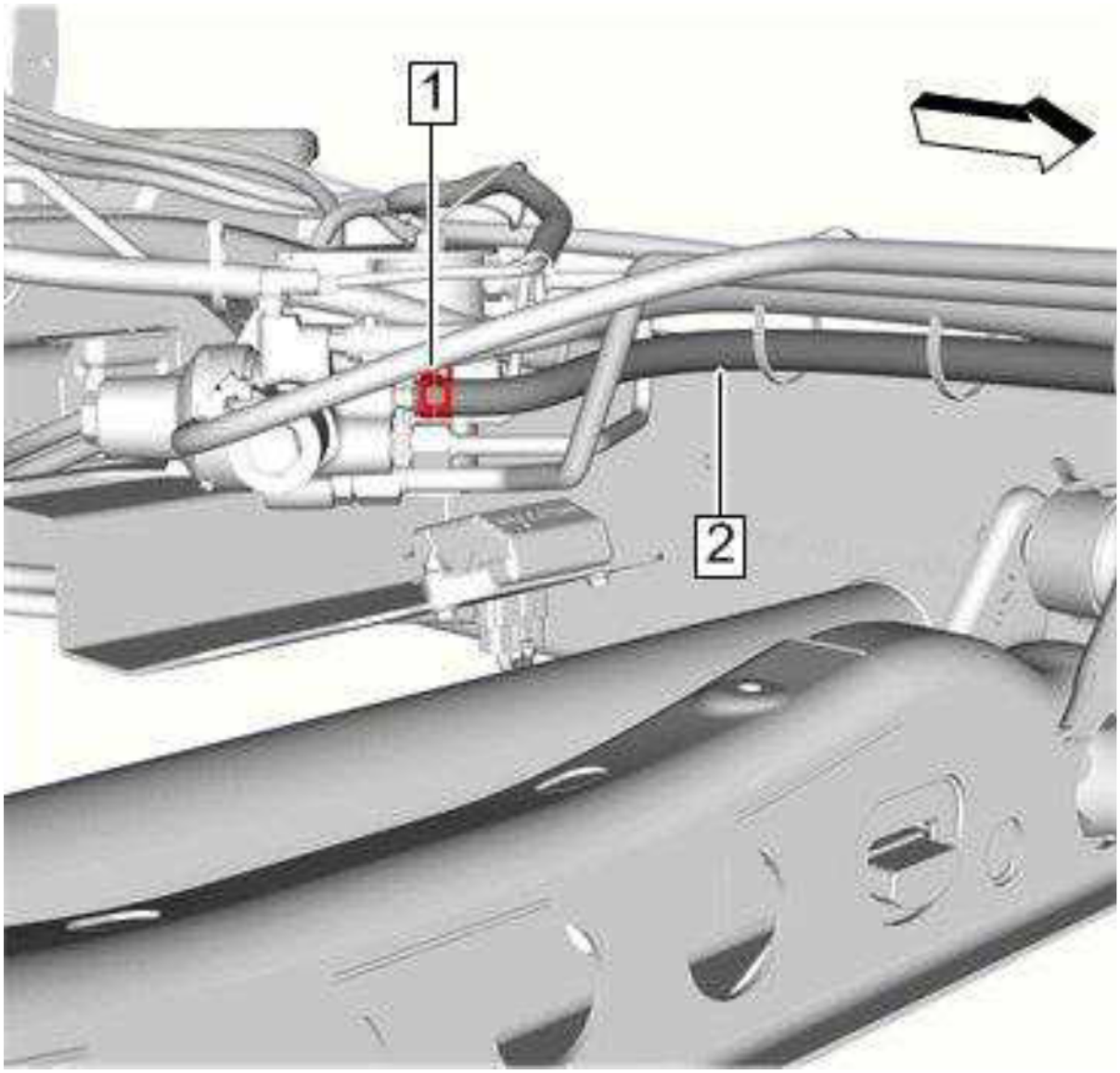

Fig. 640: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

1. Position the CNG high pressure regulator heater outlet hose (2) in the vehicle.
2. Install the CNG high pressure regulator heater outlet hose (2) to the CNG high pressure regulator.
3. Engage the clamp (1) securing the compressed natural gas CNG high pressure regulator heater outlet hose (1) using **BO-38185** Hose Clamp Pliers.

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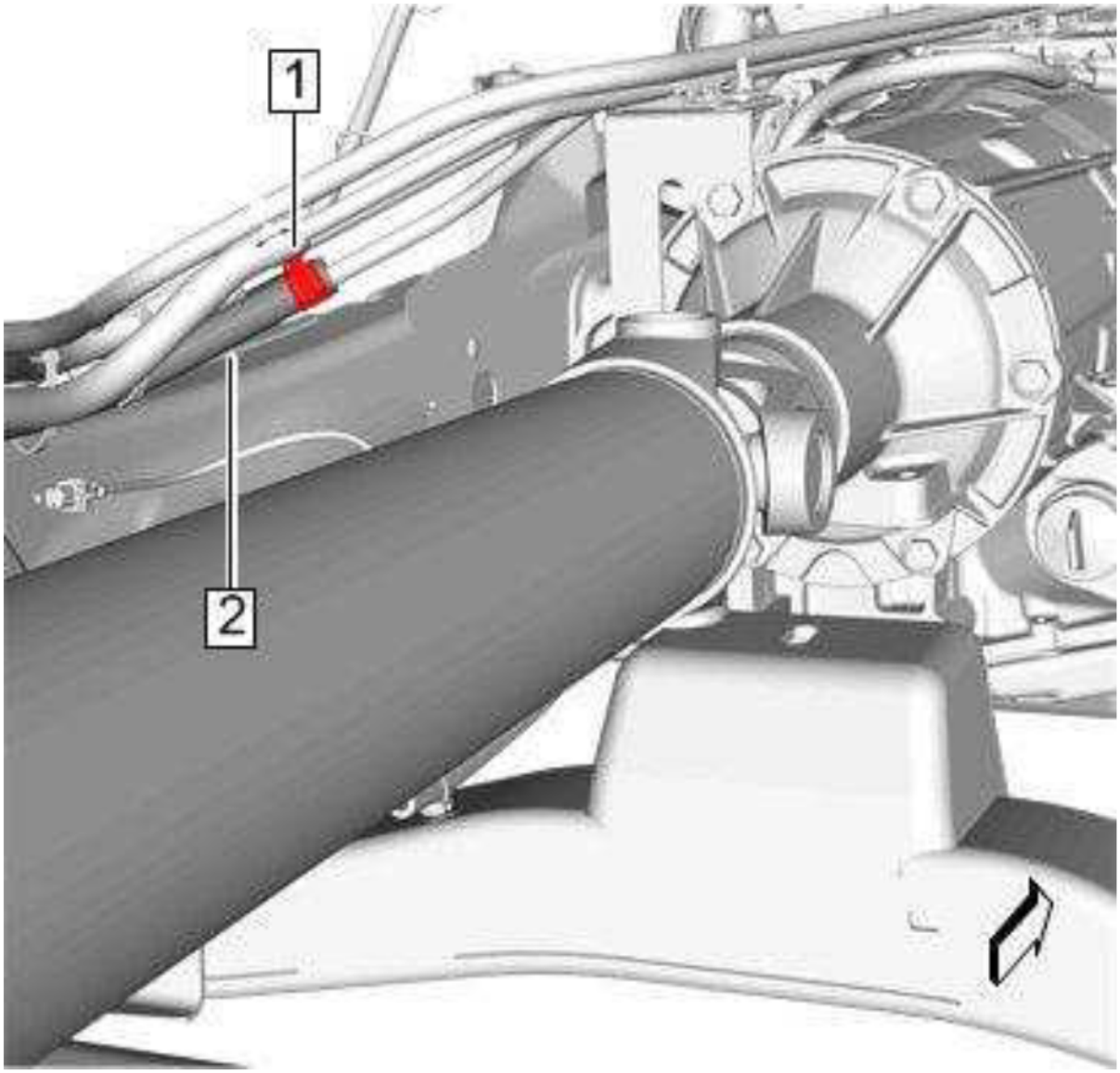

Fig. 641: Compressed Natural Gas High Pressure Regulator Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Install the CNG high pressure regulator heater outlet hose (2) to the CNG high pressure regulator heater outlet pipe.
5. Engage the clamp (2) securing the compressed natural gas CNG high pressure regulator heater outlet hose (1) using **BO-38185** Hose Clamp Pliers.
6. Remove the supports and lower the vehicle.
7. Fill the cooling system to the proper level. **Cooling System Draining and Filling (Vac N Fill L8B)**
8. Start the engine and inspect for leaks.

DESCRIPTION AND OPERATION

COOLING FAN DESCRIPTION AND OPERATION (L5P)

Cooling Fan Control

The purpose of the electro-viscous (EV) fan clutch is to maintain powertrain cooling requirements. The engine control module (ECM) monitors the following sensors to regulate the fan speed:

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- Engine coolant temperature sensor
- A/C refrigerant pressure sensor
- Vehicle speed sensor
- Intake air temperature sensor
- Transmission fluid temperature sensor
- Ambient air temperature sensor
- Cooling fan speed sensor

The ECM controls the EV fan clutch operation. The ECM regulates a 12-volt pulse width modulated signal (PWM) to the cooling fan relay. The PWM signal determines the ON time of the relay. As the ECM command increases, so does the ON time of the relay. The relay ON time directly controls the amount of time the solenoid, which is internal to the fan clutch, is energized. When the solenoid in the fan clutch is energized, it opens the spring loaded valve and allows fluid to flow from the storage chamber to the fluid coupling of the cooling fan clutch, which increases the fan speed. When the solenoid is de-energized, the spring loaded valve closes, and allows the fluid in the coupling of the fan clutch to drain back to the storage chamber, which reduces fan speed. The rapid modulation of the fan clutch solenoid valve gives the ECM the ability to precisely control the amount of fluid that remains in the fluid coupler, allowing more effective regulation of the fan speed and powertrain cooling requirements.

The fan clutch supplies a feedback signal to the ECM, as an actual fan speed input. The fan speed sensor is a hall effect sensor which is internal to the fan clutch. The ECM supplies a 5-volt reference and a low reference to the hall effect sensor. The hall effect sensor returns a signal pulse through the cooling fan speed signal circuit in response to the reluctor track passing by the magnetic field of the hall effect sensor.

The scan tool can operate the cooling fan clutch. This is done through the controls function menu screen. Cooling fan clutch engagement can take up to 2 minutes with a 100 percent command and the engine speed at 2,000 RPM. The lower the engine speed, the longer it will take for the fan to engage. Cooling fan disengagement can take up to 2 minutes with the engine speed at 2,000 RPM. The lower the engine speed, the longer it will take to disengage. In lower ambient air temperatures the cooling fan will engage in less time, however, it will take longer to disengage due to the properties of the fluid vs. temperature.

Under certain conditions the cooling fan may be engaged at engine start. The cooling may have been engaged at the time the engine was turned off. Or, fluid may bleed from the storage chamber into the fluid coupling of the cooling fan clutch while the engine is off. Although the fan clutch is commanded off during a cold start, this is the most likely time a vehicle driver will notice that the fan noise is excessive in comparison to engine starts when the fan clutch is disengaged.

COOLING FAN DESCRIPTION AND OPERATION (L83, L86, LV1, LV3, OR L8B)

Cooling Fan Control

The engine cooling fan system is composed of 2 electric cooling fans, fan motors, and 2 control modules. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control modules. The cooling fan control module varies the voltage drop across the cooling fan motors in relation to the pulse width modulated signal, which allows the cooling fans to operate at variable speeds.

The cooling fan speed is effected by many different conditions and the ECM will adjust the duty cycle from 0-100 percent based on cooling system requirements. The scan tool output control is only capable of operating the cooling fan increments, between 10-90 percent. 90 percent is considered high speed fan. When multiple cooling fan speed requests are received, the ECM operates the fan at the highest of speed requests. The ECM

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commands the fans ON under the following conditions:

- The engine coolant temperature is warmer than a predetermined temperature.
- The engine oil temperature is warmer than a predetermined temperature.
- The A/C pressure reaches a predetermined pressure.
- If the engine coolant temperature at key-off is warmer than a predetermined value, or the A/C pressure is greater than a predetermined value, the cooling fan will operate at a low speed. The fan will shut OFF if the temperature or pressure drops below the predetermined value, but will only operate for 2 minutes, regardless of the coolant temperature or A/C pressure.

COOLING SYSTEM DESCRIPTION AND OPERATION

Engine Coolant Indicators

ENGINE COOLANT HOT

The instrument panel cluster (IPC) displays ENGINE COOLANT HOT message when the IPC receives a message from the powertrain control module (PCM) requesting illumination of this driver warning.

ENGINE OVERHEATED

The IPC displays ENGINE OVERHEATED message when the IPC receives a message from the PCM requesting illumination of this driver warning.

REDUCED ENGINE POWER

The IPC displays REDUCED ENGINE POWER message when the IPC detects a reduced engine power condition from the PCM. The IPC receives a message from the PCM requesting illumination when the engine temperature exceeds a calibrated value.

Coolant Heater (If Equipped)

The optional engine coolant heater (RPO K05) operates using 110-volt AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather -18Â°C (0Â°F). The coolant heater helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. A weather shield on the cord is provided to protect the plug when not in use.

Cooling System

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the coolant does not flow to the radiator until the thermostat opens. This allows the engine to warm quickly.

Cooling Cycle

Coolant is drawn from the radiator outlet and into the water pump inlet by the water pump. Coolant will then be pumped through the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders, where it absorbs heat.

Some coolant is also pumped from the water pump to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost.

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The coolant is then forced through the cylinder head gasket openings and into the cylinder heads. In the cylinder heads, the coolant flows through the water jackets surrounding the combustion chambers and valve seats, where it absorbs additional heat.

Coolant

The engine coolant is a solution made up of a 50-50 mixture of DEX-COOL and suitable drinking water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

Radiator

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a tube and fin crossflow design that extends from the inlet tank to the outlet tank. Fins are placed around the outside of the tubes to improve heat transfer to the atmosphere.

The inlet and outlet tanks are a molded, high temperature, nylon reinforced plastic material. A high temperature rubber gasket seals the tank flange edge to the aluminum core. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core.

The radiator also has a drain cock (except HD), located in the bottom of the right hand tank. The drain cock unit includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core transfer heat from the coolant passing through the tubes. As air passes between the fins, it absorbs heat and cools the coolant.

Surge Tank

The surge tank is a plastic tank with a threaded pressure cap. The tank is mounted at a point higher than all other coolant passages. The surge tank provides an air space in the cooling system that allows the coolant to expand and contract. The surge tank provides a coolant fill point and a central air bleed location.

During vehicle use, the coolant heats and expands. Increased coolant volume flows into the surge tank. The increased coolant volume can in some conditions push past the pressure cap and through a channel into the overflow bottle. As the coolant circulates, the air is allowed to bubble out. This air is then transferred to the overflow bottle, through the surge tank cap, where it returns to the atmosphere. Coolant without air bubbles absorbs heat much better than coolant with bubbles. When the engine cools, the coolant, without air bubbles, contracts back into the surge tank from the bottom of the overflow bottle.

Radiator Surge Tank (L5P)

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Fig. 642: Top Radiator Surge Tank Cap
Courtesy of GENERAL MOTORS COMPANY

The L5P radiator surge tank comes with 2 different radiator surge tank caps. The top radiator surge tank cap (1) used to fill the system, is a non-pressurized radiator surge tank cap with left hand threads. The side radiator surge tank cap (2), is a pressurized radiator surge tank cap.

This radiator surge tank has the liquid volume at the top and the air portion at the bottom of the tank. The purpose of this design is to ensure that the liquid volume will be at the highest level in the cooling system. When thermal expansion occurs (due increase in the system temperature and pressure), the liquid raises to the top of the radiator surge tank and then goes to the air portion through the left side channel. When the liquid reaches the bottom and starts to fill the lower portion, the intention is that all liquid will be contained in the lower portion.

NOTE: **The assumption is that there will be approximately 6% expansion, but the system can contain 8% to 9%.**

When the system starts to cool (lose heat), the coolant contracts, and this causes a vacuum effect resulting in the upper portion exerting a suction on the liquid that is in the lower portion. This suction continues until the system cools completely.

The air contained in the lower portion exerts a pressure on the bottle walls, and when this pressure reaches the value of 20 PSI (140 KPa) the check valve in the pressurized radiator surge tank cap opens and allows excess pressure to escape, flowing through the lower overflow port.

The top radiator surge tank cap has 3 seals (instead of the 2 seals used in the side radiator surge tank cap) to protect the customer and/or service personnel from hot fluid exiting through the top portion of the neck itself, during hot engine conditions, and redirects the fluid to the lower part of the radiator surge tank.

The channel at the left of the radiator surge tank has the function of protecting the customer and/or service personnel if the fill radiator surge tank cap is accidentally opened during a hot condition. If the radiator surge tank cap is opened when the fluid is hot, the hot fluid will flow through the fill neck using an internal channel.

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This channel will not allow fluid passage, under pressure and/or hot conditions, and hence, there is no requirement for a pressurized radiator surge tank cap.

Radiator Surge Tank Cap

The pressure radiator surge tank cap seals the cooling system. It contains a blow off or pressure relief valve and a vacuum or atmospheric valve. The pressure valve is held against its seat by a spring, which protects the radiator from excessive cooling system pressure. The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, might cause the radiator and/or coolant hoses to collapse.

The pressure radiator surge tank cap allows cooling system pressure to build up as the temperature increases. As the pressure builds, the boiling point of the coolant increases. Engine coolant can be safely run at a temperature much higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat transfers from the radiator to the cooler, passing air.

The pressure in the cooling system can get too high. When the cooling system pressure exceeds the rating of the pressure radiator surge tank cap, it raises the pressure valve, venting the excess pressure.

As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the radiator surge tank. This equalizes the pressure in the cooling system with atmospheric pressure, preventing the radiator and coolant hoses from collapsing.

Air Baffles and Seals

The cooling system uses deflectors, air baffles and air seals to increase cooling system capability. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle and through the radiator to increase engine cooling. Air baffles are also used to direct airflow through the radiator and increase cooling capability. Air seals prevent air from bypassing the radiator and A/C condenser, and prevent recirculation of hot air for better hot weather cooling and A/C condenser performance.

Transmission Oil Cooler

The transmission oil cooler is a heat exchanger. It is located inside the right side (V6) or left side (V8), end tank of the radiator. The transmission fluid temperature is regulated by the temperature of the engine coolant that surrounds the oil cooler as the transmission fluid passes through the cooler.

The transmission oil pump, pumps the fluid through the transmission oil cooler feed line to the oil cooler. The fluid then flows through the cooler while the engine coolant absorbs heat from the fluid. The fluid is then pumped through the transmission oil cooler return line, to the transmission.

Engine Oil Cooler (If Equipped)

The engine oil cooler is a heat exchanger located inside the left side end tank of the radiator. The engine oil temperature is controlled by the temperature of the engine coolant that surrounds the oil cooler in the radiator.

The engine oil pump, pumps the oil through the engine oil cooler line to the oil cooler. The oil then flows through the cooler where the engine coolant absorbs heat from the oil. The oil is then pumped through the oil cooler return line, to the engine block system.

SPECIAL TOOLS AND EQUIPMENT

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SPECIAL TOOLS

Illustration	Tool Number/ Description
	BO 38185 J 38185 Hose Clamp Pliers

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Illustration	Tool Number/ Description
	EL 35616-F J 35616-F Connector Test Adapter Kit

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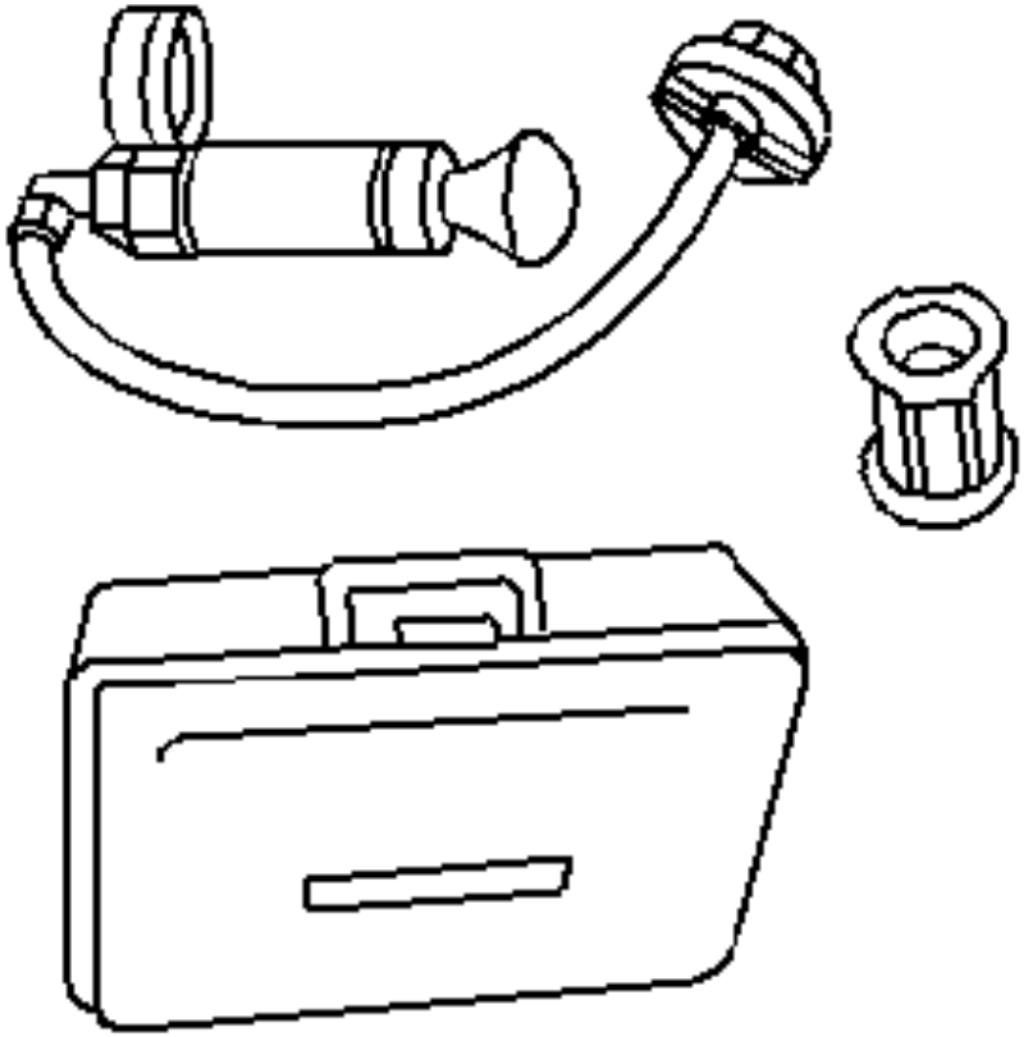
Illustration	Tool Number/ Description
	EN 24460-A J 24460-01 Cooling System Pressure Tester

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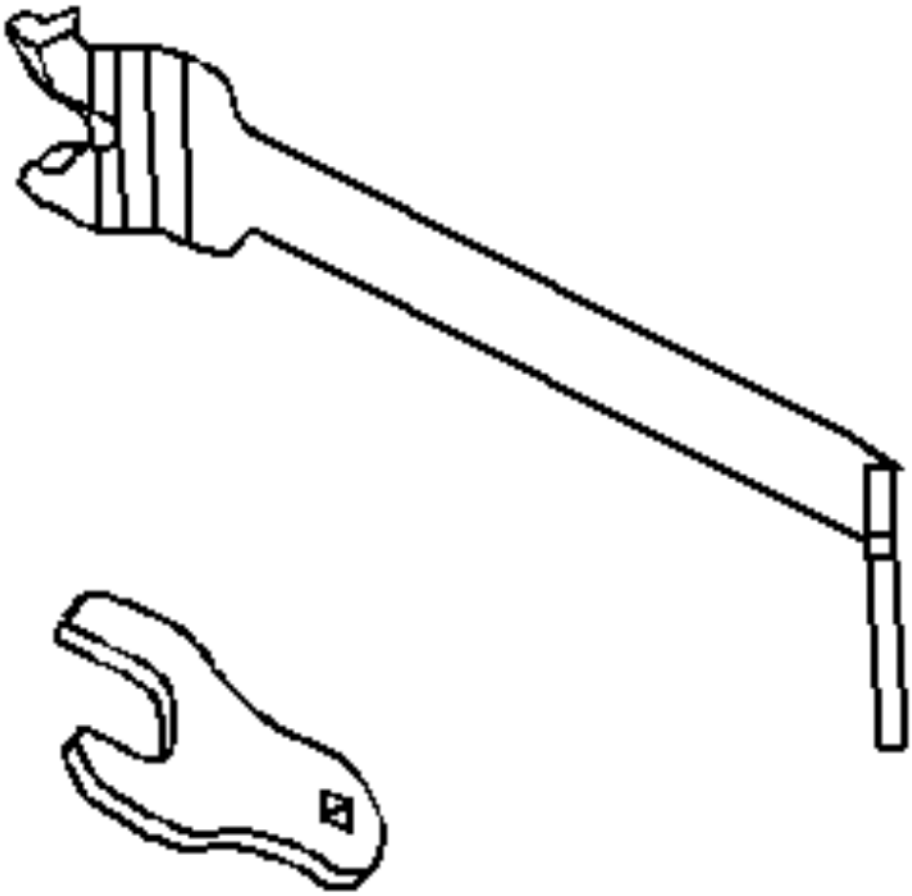
Illustration	Tool Number/ Description
	EN 41240 J 41240 Fan Clutch Wrench

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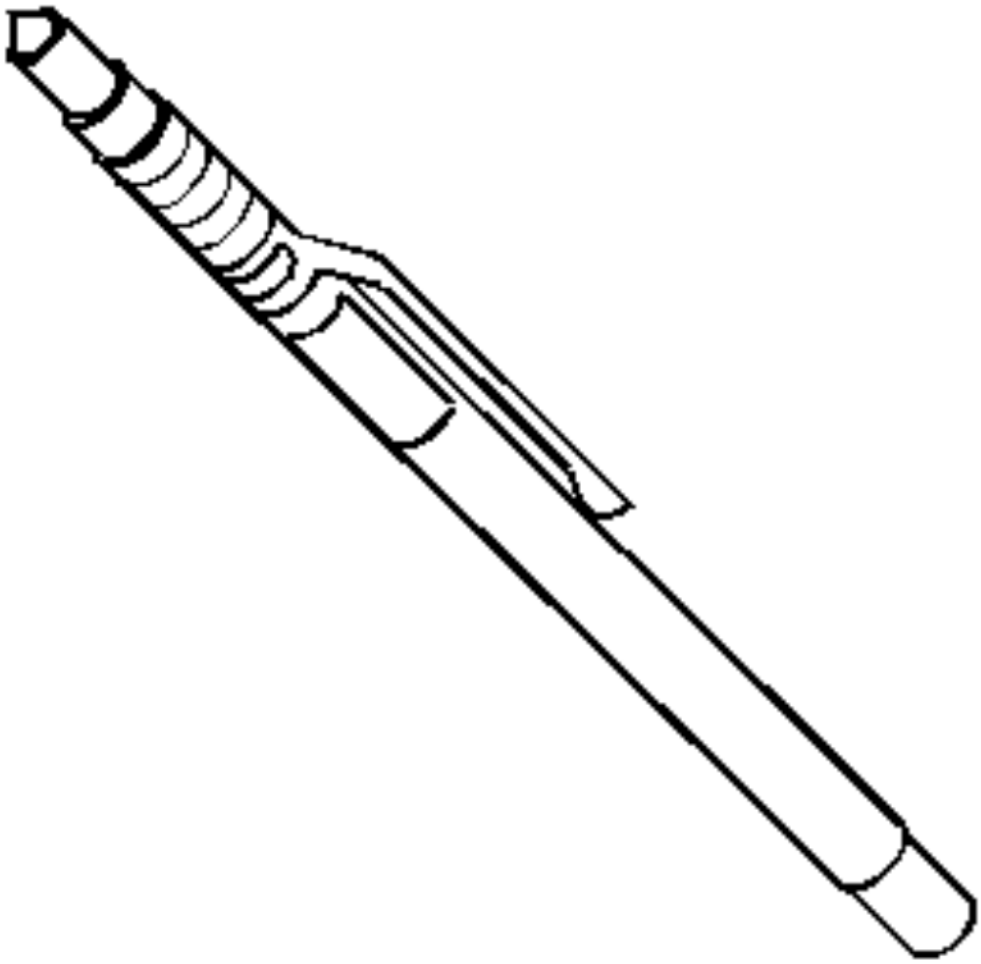
Illustration	Tool Number/ Description
	GE 24731 J 24731 Tempil Stick

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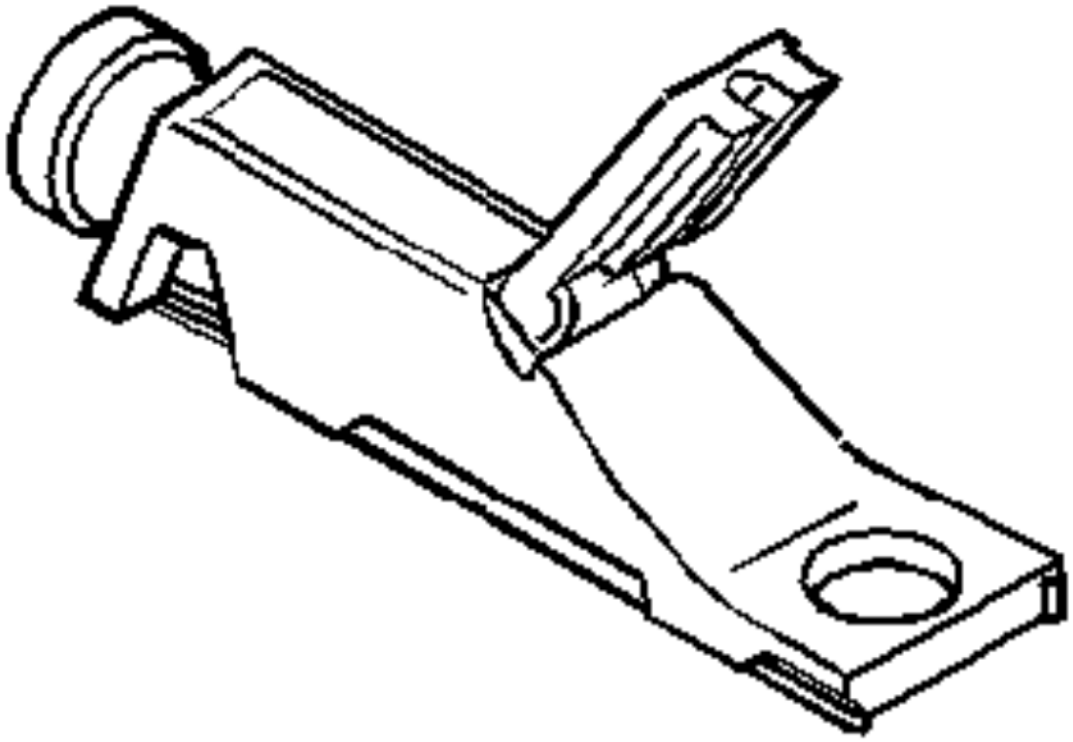
Illustration	Tool Number/ Description
	GE 26568 J 26568 Coolant and Battery Fluid Tester

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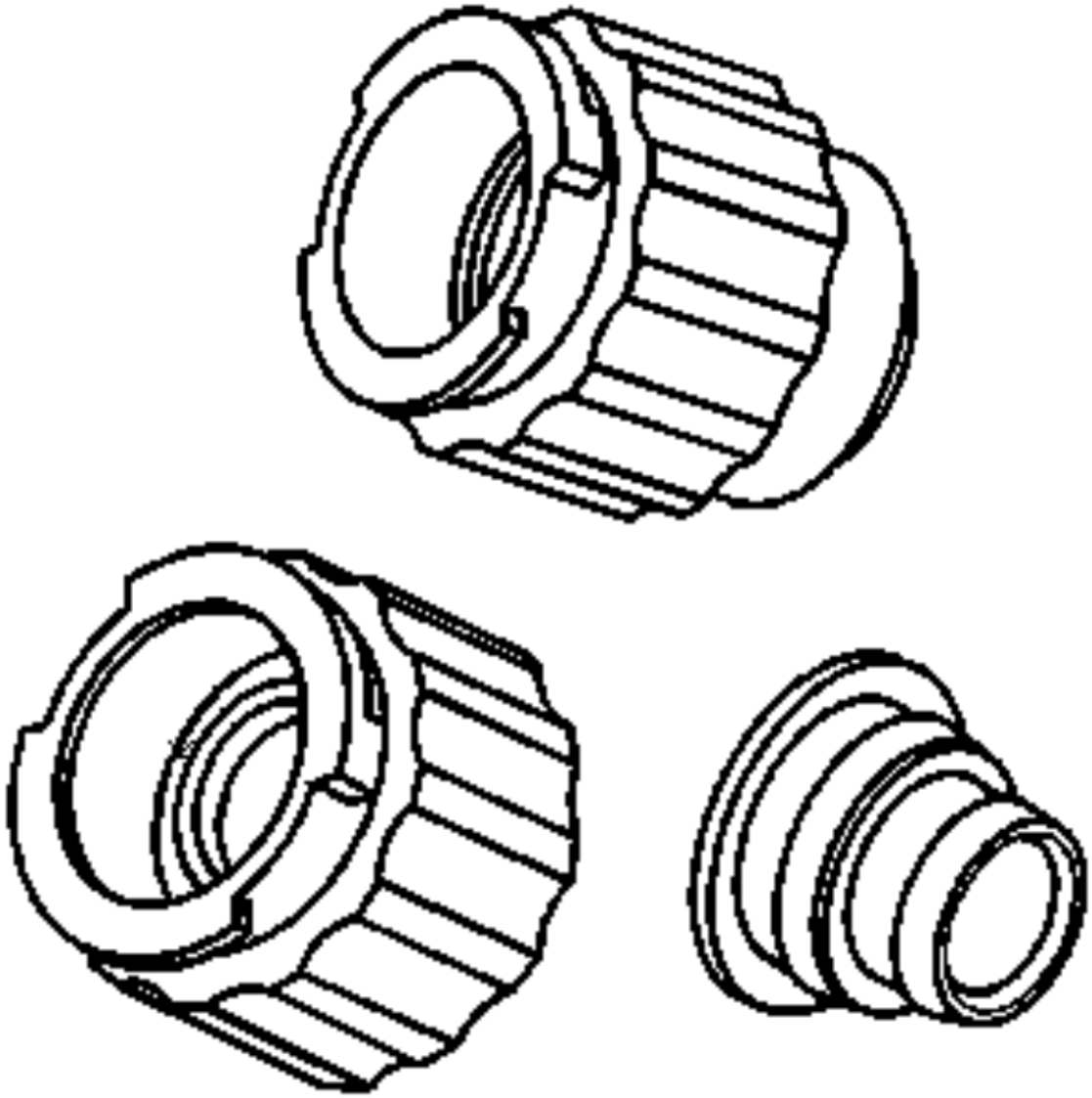
Illustration	Tool Number/ Description
	GE 42401-A J 42401 Radiator Cap and Surge Tank Test Adapter

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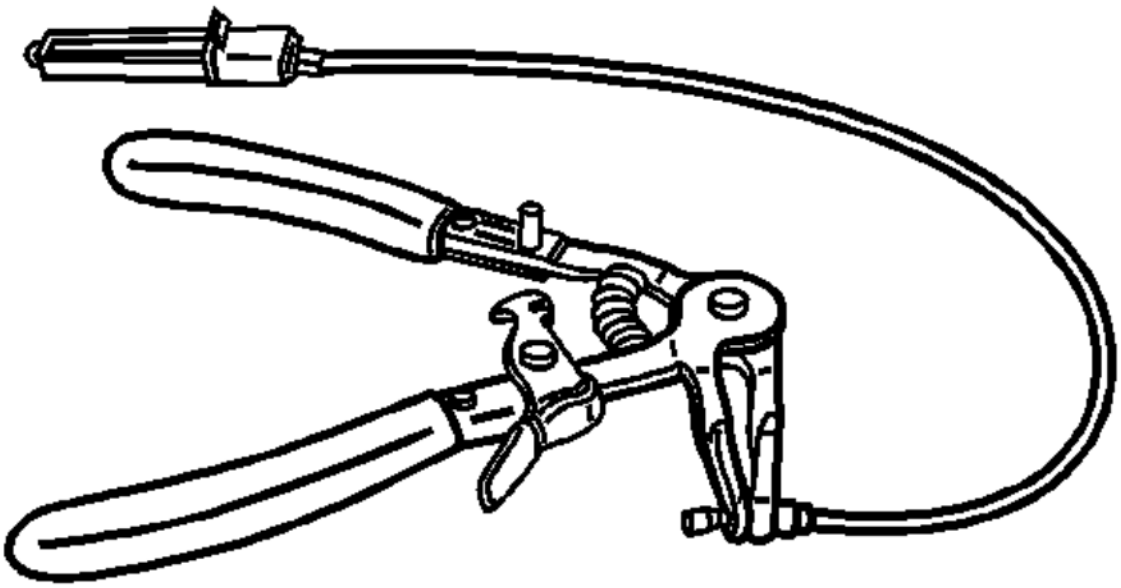
Illustration	Tool Number/ Description
	GE 47622 Hose Clamp Pliers

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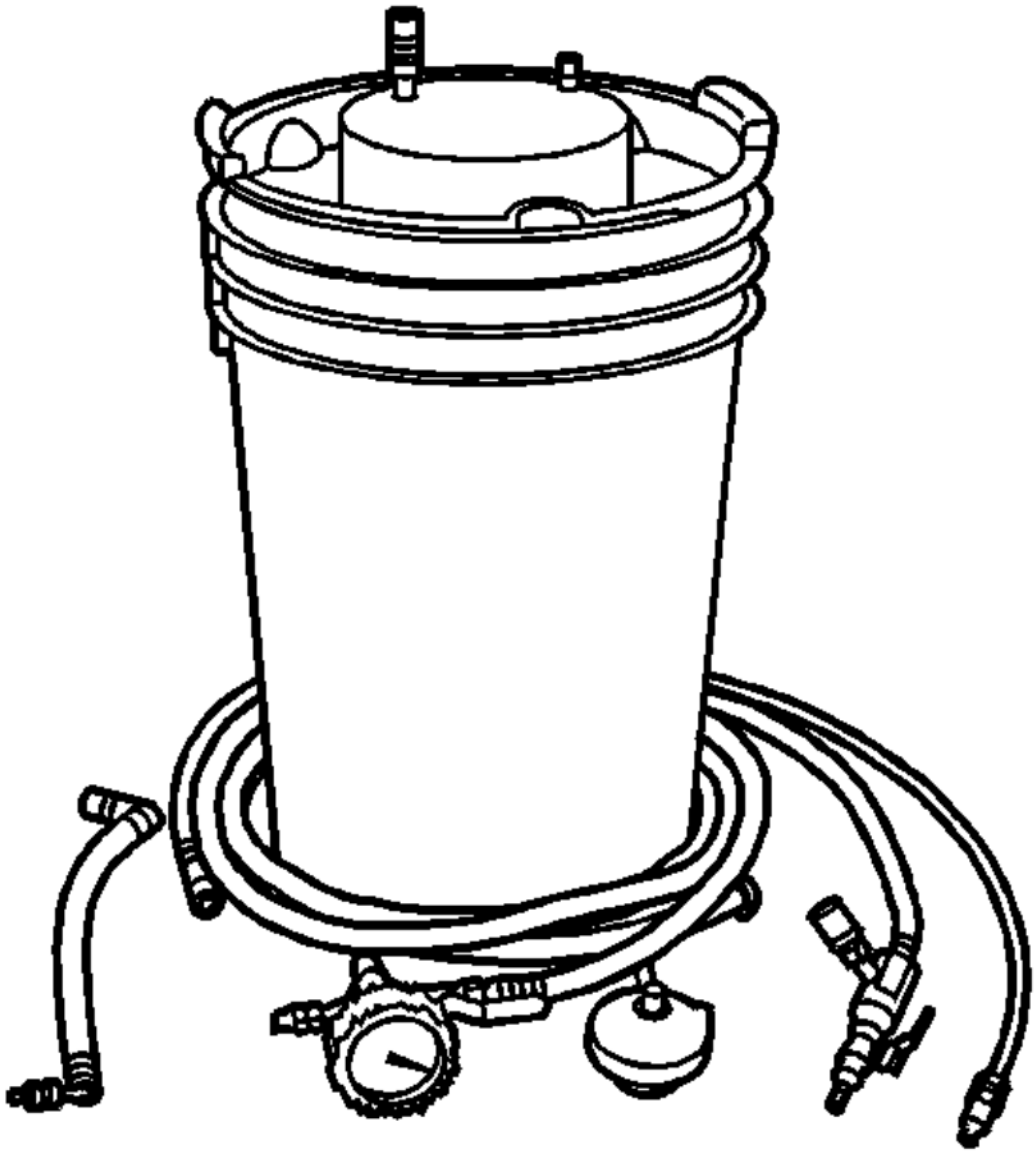
Illustration	Tool Number/ Description
	GE 47716 Vac N Fill Coolant Refill Tool

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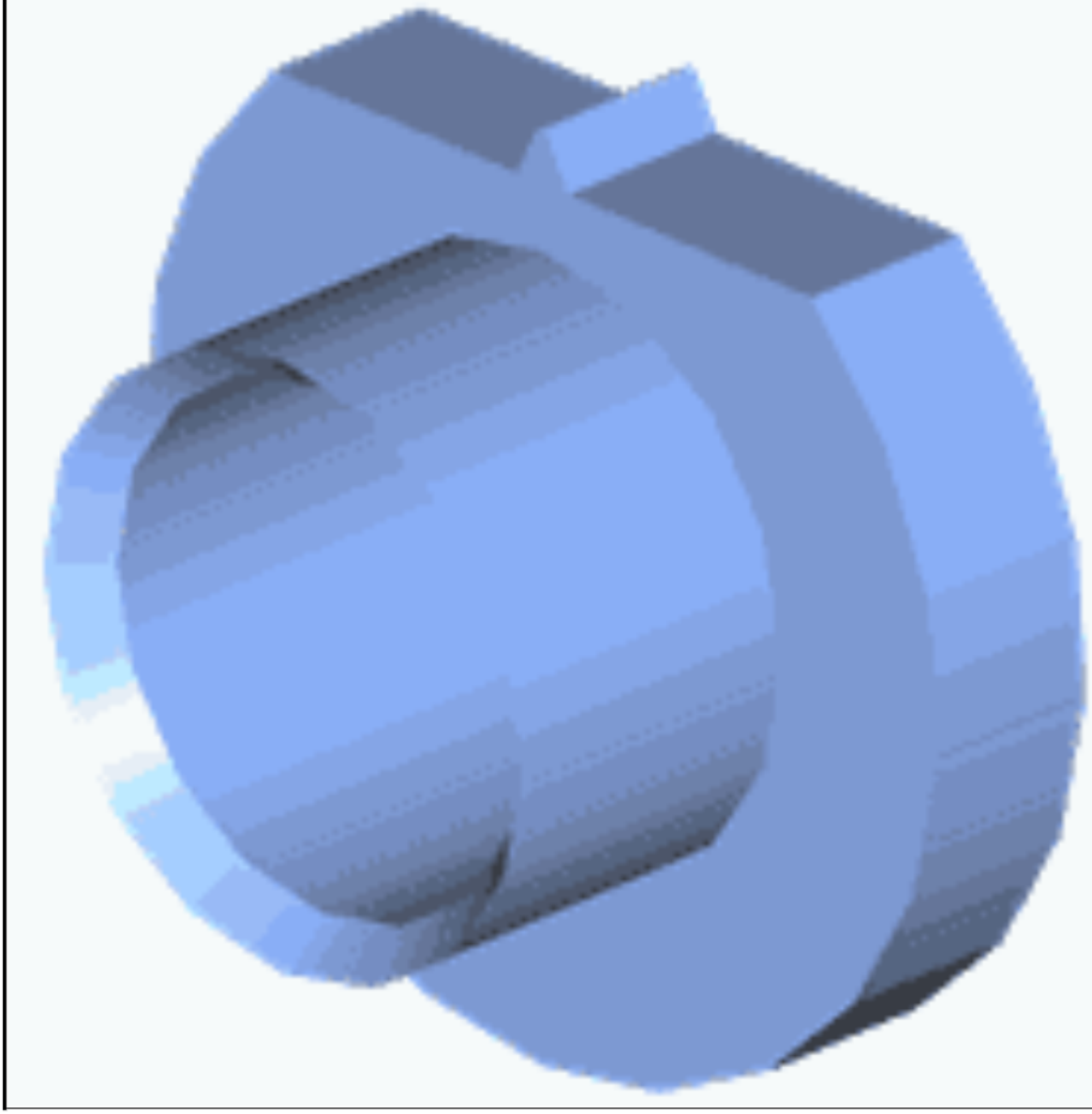
Illustration	Tool Number/ Description
	J 43181 Heater Line Q.C. Release Tool

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Illustration	Tool Number/ Description
	GE 52098 Cooling System Pressure Test Adapter

Article GUID: A00854498

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