

2018 ENGINE**Engine Heating And Cooling - Equinox, Terrain****SPECIFICATIONS****TEMPERATURE VERSUS RESISTANCE**

Temperature	Resistance
150Â°C (302Â°F)	42 to 44 Ω
140Â°C (284Â°F)	53 to 57 Ω
130Â°C (266Â°F)	68 to 72 Ω
120Â°C (248Â°F)	88 to 92 Ω
110Â°C (230Â°F)	114 to 120 Ω
100Â°C (212Â°F)	151 to 159 Ω
90Â°C (194Â°F)	203 to 215 Ω
80Â°C (176Â°F)	275 to 293 Ω
70Â°C (158Â°F)	379 to 405 Ω
60Â°C (140Â°F)	532 to 572 Ω
50Â°C (122Â°F)	762 to 824 Ω
45Â°C (113Â°F)	921 to 997 Ω
40Â°C (104Â°F)	1118 to 1212 Ω
35Â°C (95Â°F)	1366 to 1484 Ω
30Â°C (86Â°F)	1683 to 1829 Ω
25Â°C (77Â°F)	2088 to 2266 Ω
20Â°C (68Â°F)	2608 to 2828 Ω
15Â°C (59Â°F)	3289 to 3567 Ω
10Â°C (50Â°F)	4182 to 4532 Ω
5Â°C (41Â°F)	5356 to 5800 Ω
0Â°C (32Â°F)	6914 to 7484 Ω
-5Â°C (23Â°F)	8994 to 9732 Ω
-10Â°C (14Â°F)	11796 to 12762 Ω
-15Â°C (5Â°F)	15589 to 16871 Ω
-20Â°C (-4Â°F)	20791 to 22517 Ω
-30Â°C (-22Â°F)	37991 to 41273 Ω
-40Â°C (-40Â°F)	72230 to 78834 Ω

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 Heater Seal
Engine Coolant Thermostat Housing Gasket
Engine Oil Cooler Gasket
Thermostat Bypass Pipe Gasket
Turbocharger Coolant Feed Pipe Retainer
Turbocharger Coolant Return Pipe Hose Clamp
Water Outlet Seal

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
Water Pump Gasket

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Auxiliary Water Pump Bracket Bolt (LTG)	22 N.m (16 lb ft)
Auxiliary Water Pump Bracket Bolt (LYX)	9 N.m (80 lb in)
Auxiliary Water Pump Bracket Nut (LH7)	22 N.m (16 lb ft)
Engine Block Drain Plug	22 N.m (16 lb ft)
Engine Coolant Fan Bolt (LH7, LTG, LYX)	5 N.m (44 lb in)
Engine Coolant Heater (LYX)	50 N.m (37 lb ft)
Engine Coolant Thermostat Housing Bolt (LYX)	10 N.m (89 lb in)
Engine Oil Cooler Large Bolt (LYX)	25 N.m (18 lb ft)
Engine Oil Cooler Small Bolt (LYX)	10 N.m (89 lb in)
Ground Nut	9 N.m (80 lb in)
Radiator Surge Tank Bolt	9 N.m (80 lb in)
Radiator Upper Bracket Bolt	14 N.m (10 lb ft)
Thermostat Bypass Pipe Bolt (LYX)	10 N.m (89 lb in)
Turbocharger Coolant Feed Pipe Hollow Screw (LYX)	35 N.m (26 lb ft)
Turbocharger Coolant Return Pipe Fastener (LYX)	10 N.m (89 lb in)
Turbocharger Coolant Return Pipe Hollow Screw (LYX)	35 N.m (26 lb ft)
Water Outlet Bolt (LYX)	10 N.m (89 lb in)
Water Pump Bolt (LYX)	25 N.m (18 lb ft)

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	US English
Cooling Systems		
1.4 L (LH7) Engine	7.5 L	7.9 qt
2.0 L (LTG) Engine	7.8 L	8.2 qt
1.5 L (LYX) Engine	6.6 L	7.0 qt

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

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

SCHEMATIC WIRING DIAGRAMS

ENGINE HEATING/COOLING WIRING SCHEMATICS

Cooling Fan

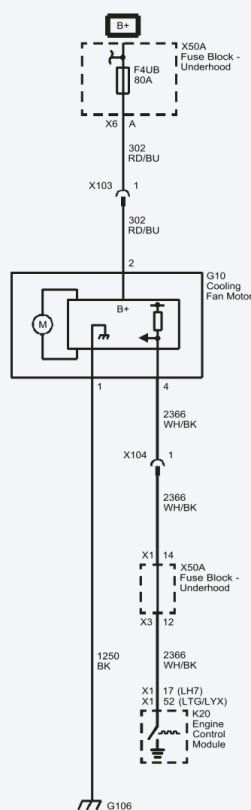


Fig. 1: Cooling Fan

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0480, P0691 OR P0692: COOLING FAN RELAY 1 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC P0480

Cooling Fan Relay 1 Control Circuit

DTC P0691

Cooling Fan Relay 1 Control Circuit Low Voltage

DTC P0692

Cooling Fan Relay 1 Control Circuit High Voltage

Circuit/System Description

For an overview of the component/system, refer to [Cooling Fan Description and Operation](#)

Circuit	Description
Ground	Chassis Ground
B+	Supplied from a relay.
Control	The output is PWM controlled.

Component	Description
G10 Cooling Fan Motor	The control module receives a PWM signal from the control module K20 and converts it into another PWM signal which directly supplies the fan motor.
K20 Engine Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module controls a series of actuators to ensure optimal engine performance. The control module does this by reading values from a variety of sensors, interprets the data and adjusts the engine actuators accordingly.

Conditions for Running the DTC

- Ignition - On / Vehicle - In Service Mode
- Battery Voltage=Greater than 11 V

Conditions for Setting the DTC

The commanded state of the driver and the actual state of the control circuit do not match for greater than 5 s.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category=Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category=Type B DTC

Reference Information

Schematic Reference

Engine Heating/Cooling Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Perform the scan tool control function:Cooling Fan - 0 to 90%

Verify the component activates:Cooling Fan Motor

- **If the component does not activate**

Refer to Circuit/System Testing below

- **Go to next step: If the component activates**

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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

4. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector:@G10 Cooling Fan Motor
3. Connect a test lamp between the test points:Control circuit terminal 4 & B+

Verify the test lamp does not turn On.

- **If the test lamp turns On**

1. Disconnect the electrical connector: X1 @ K20 Engine Control Module
2. Test for infinite resistance between the test points:Control circuit terminal 52 @ Control module harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component:K20 Engine Control Module

- **Go to next step: If the test lamp does not turn On**

4. Ignition - On / Vehicle - In Service Mode
5. Perform the scan tool control function:Cooling Fan - 0 to 90%

Verify the test lamp turns On.

- **If the test lamp does not turn On**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X1 @ K20 Engine Control Module
3. Test for less than 2 Ω between the test points:Control circuit terminal 52 @ Control module harness & Terminal 4 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω
4. Connect the electrical connector: X1 @ K20 Engine Control Module
5. Ignition - On / Vehicle - In Service Mode
6. Test for less than 1 V between the test points:Terminal 4 @ Control module harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component:K20 Engine Control Module

- **Go to next step: If the test lamp turns On**

Replace the component:G10 Cooling Fan Motor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- [Engine Coolant Fan Replacement \(LYX\)](#)[Engine Coolant Fan Replacement \(LTG\)](#)[Engine Coolant Fan Replacement \(LH7\)](#) - G10 Cooling Fan Motor
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2600, P2601, P2602, P2603: AUXILIARY COOLANT PUMP

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

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	-	-
Auxiliary Coolant Pump Relay Switched B+	1	1	-	-
Auxiliary Coolant Pump Relay Control	P2602	P2600	P2603	-
Auxiliary Coolant Pump Relay Controlled Output	1	1	2	-
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 - Component Commanded OFF

Circuit	Short to Ground	Open	Short to Voltage

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

Auxiliary Coolant Pump Relay Control Circuit Open, Low or High Voltage Test Status - Component Commanded ON

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Component Commanded ON 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	Not Run	Not Run	-
Auxiliary Coolant Pump Relay Control	Not Run	Not Run	Malfunction

Circuit/System Description

The auxiliary coolant pump and cooling fan system provides a measure of prevention against fuel vaporization due to excessive engine temperatures. The engine control module (ECM) commands the auxiliary or after boil coolant pump ON when the engine coolant temperature exceeds a calibrated value after engine shut down. The ECM applies ground to the coil side of the auxiliary pump printed circuit board (PCB) relay. This energizes the coil and applies voltage directly to the pump motor through the switch side of the relay. When the auxiliary coolant pump is activated, coolant is drawn from radiator and pumped into the engine through a tee in the engine coolant inlet pipe. As the colder temperature coolant is drawn into the engine warmer coolant is expelled from the engine and back to the radiator. Removing high temperature coolant from the engine after shut down helps prevent vaporization of the fuel that remains in the fuel injectors and fuel rail during a hot soak.

Conditions for Running the DTC

P2600, P2602 or P2603

- The engine speed is greater than 80 RPM.
- The ignition voltage is between 10 - 18 V.
- The ECM has commanded the pump ON and OFF at least once during the ignition cycle.
- The DTCs run continuously once the above conditions are met.

P2601

- DTC P0111, P0112, P0113, P0116, P0117, P0118, P0119, P2600, P2602 or P2603 is not set.
- The ignition is OFF.
- The engine coolant temperature (ECT) at engine shut down is warmer than 110Â°C (230Â°F).
- The auxiliary coolant pump is enabled.
- The DTC runs continuously once the conditions above are met for greater than 30 S.

Conditions for Setting the DTC

P2600

The ECM detects the pump control circuit is open. The condition exists for 4 S or a cumulative of 30 S.

P2601

The ECM detects that the ECT decreases less than 2Â°C (4Â°F) within 60 S. The condition exists for 4 S or a cumulative of 30 S.

P2602

The ECM detects the pump control circuit is shorted to ground. The condition exists for 4 S or a cumulative of 30 S.

P2603

The ECM detects the pump control circuit is shorted to voltage. The condition exists for 4 S or a cumulative of 30 S.

Action Taken When the DTC Sets

The DTCs are Type C DTCs.

Conditions for Clearing the DTC

The DTCs are Type C DTCs.

Diagnostic Aids

- This diagnostic uses a comprehensive approach to the diagnosis of the KR31 auxiliary coolant pump relay and its related circuits. The auxiliary coolant pump relay is a printed circuit board (PCB) relay. The relay is an integral component to the underhood bussed electrical center (UBEC). It cannot be removed and it is not visible.
- Much of the diagnosis is performed at the ECM connectors. Great care should be taken to ensure that the correct terminals are tested and the proper test probes are utilized when performing this diagnostic.
- The test lamp is used to provide a visual aid to observe the integrity of the KR31 relay, the UBEC and the relay control circuit.
- Grounding terminal X2-58 activates the powertrain relay, which will supply power through KR31 relay coil and the relay control circuit. Under normal circumstances the test lamp will illuminate with dim intensity due to the load created by the KR31 relay coil. If the test lamp does not illuminate, or illuminates brightly a condition exists in the KR31 relay control circuit or the UBEC.

Reference Information

Schematic Reference

- [Engine Heating/Cooling Wiring Schematics](#)
- [Engine Controls Wiring Schematics \(1.5L \(LYX\)\)](#)

Connector End View Reference

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [Electrical Center Identification Views](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

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** for further diagnosis.

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

2. Command the cooling fan ON from 20 - 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** for further diagnosis.
3. Ignition ON, command the KR31 auxiliary coolant pump relay ON and OFF with the scan tool. An audible click should be heard when changing between the commanded states.
4. Command the KR31 auxiliary coolant pump relay ON and OFF while observing the scan tool parameters listed below:
 - 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

Each of the parameters should display OK or Not Run when changing between the commanded states.

5. Start the engine, observe the DTC information with a scan tool. DTCs P2600, P2602, or P2603 should not set.
 - If a DTC is set, refer to Circuit/System Testing for further diagnosis.
6. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

Circuit/System Testing

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.

NOTE: **Refer to Diagnostic Aids before performing the Circuit/System Testing.**

1. Ignition OFF, disconnect harness connector X2 at the K20 engine control module.
2. Connect a test lamp between terminal X2-45 and ground.

NOTE: **• A DMM connected between the test lamp probe and ground will measure 5 - 6 V if the test lamp illuminates with low intensity. The voltage will measure near B+ if the test lamp illuminates with bright intensity.**

- The values listed above are based on the use of the J-35616-210 test lamp, or a comparable test lamp that has approximately 30 Ω of internal resistance.
3. Ignition ON, connect a fused jumper wire between the powertrain relay control circuit terminal X2-58 and ground. The test lamp should illuminate with low intensity.
 - If the test lamp does not illuminate, test the auxiliary coolant pump relay control circuit for a short to ground or an open/high resistance. If the circuit tests normal, test or replace the X50A fuse block.
 - If the test lamp illuminates with bright intensity, test the auxiliary coolant pump relay control circuit for a short to voltage. If the circuit tests normal, test or replace the X50A fuse block.
 4. If all circuits/connections test normal, replace the K20 engine control module.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- [Battery Distribution Engine Compartment Fuse Block Replacement](#)
- [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:
 - Engine control module (ECM) and malfunction indicator lamp (MIL) are operating correctly.
 - There are no diagnostic trouble codes (DTCs) stored.
 - Scan tool data is within a normal operating range.
- 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 entire cooling system operation in order to familiarize yourself with the system functions. Refer to [Cooling Fan Description and Operation](#) and [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:

- Ensure that the control module grounds are clean, tight, and correctly located.
- Inspect cooling system hoses and pipes for splits, kinks, and improper connections. Inspect thoroughly for any type of leak or restriction.

- Inspect for a dirty or restricted radiator or 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 coolant recovery reservoir for 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 isolate an intermittent condition:

- Water intrusion in connectors, terminals, or components
- Poor 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 are routed too tight, or chaffed circuits
- High or low ambient temperatures
- High or low engine coolant temperatures
- High underhood temperatures
- Heat build up in components or circuits 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, or after factory add on accessories

If an intermittent fault is detected, 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:

- [Cooling Fan Always On](#)
- [Cooling Fan Inoperative](#)
- [Engine Overheating](#)
- [Loss of Coolant](#)
- [Thermostat Diagnosis](#)
- [Engine Fails To Reach Normal Operating Temperature](#)

COOLING FAN ALWAYS ON

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 one electric cooling fan and a cooling fan control module. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control module. 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 ECM will only operate the cooling fan at certain percentages to prevent undesirable noise and vibration. 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

- 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 fan will not operate when the scan tool Cooling Fan Motor Command parameter displays less than 4 %. This is a normal condition.

Reference Information

Schematic Reference

Engine Heating/Cooling Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation

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**.
 - **Go to next step: If no DTC is set.**
3. Verify the scan tool Cooling Fan Motor Command parameter is less than 4 %.
 - **If 4% or greater**

Refer to **Diagnostic Aids** and **Symptoms - Engine Cooling** for further diagnosis.
 - **Go to next step: If less than 4 %**
4. Verify that the G10 Cooling Fan Motor is not operating.
 - **If the G10 Cooling Fan Motor is operating**

Test or replace the G10 Cooling Fan Motor.
 - **Go to next step: 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 \(LYX\)](#)[Engine Coolant Fan Replacement \(LTG\)](#)[Engine Coolant Fan Replacement \(LH7\)](#) for G10 Cooling Fan Motor Replacement.
- [Control Module References](#)

COOLING FAN INOPERATIVE

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 one electric cooling fan and a cooling fan control module. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control module. 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 ECM will only operate the cooling fan at certain percentages to prevent undesirable noise and vibration. 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

- During normal operating conditions the ECM may initially activate the cooling fan at 4 or 5 % and then increase, as needed, to satisfy powertrain cooling requirements.

Reference Information

Schematic Reference

[Engine Heating/Cooling Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Cooling Fan Description and Operation](#)

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

Special Tools

EL 36169 - HD Heavy Duty Fused Jumper

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](#).

- **Go to next step: If no DTC is set.**

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

3. Verify the G10 Cooling Fan Motor activates when A/C is On.

- **The cooling fan does not activate**

Refer to Circuit/System Testing

- **Go to next step: The cooling fan activates**

4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the 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.
3. Verify that a test lamp illuminates between the B+ circuit terminal 2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, and 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 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, and 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 B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance, replace the G10 Cooling Fan Motor.
 - **Go to next step: If the test lamp illuminates**

NOTE: The cooling fan speed output circuit is pulled-up to a voltage within the ECM, 2-3 volts on the output circuit is normal.

4. Connect a DMM, set on the diode setting, between the control circuit terminal 4 and ground.
5. 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, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
 2. Disconnect the harness connector X1 at the K20 Engine Control Module.
 3. Test for infinite resistance between the 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.

- **Go to next step: If greater than 2.5 V or displays O.L.**
6. Activate the cooling fan ON by turning on the A/C.
 7. Verify the DMM reading is less than 1 V.
 - **If 1 V or greater**
 1. Ignition OFF.
 2. Disconnect the harness connector X1 at the K20 Engine Control Module, ignition ON.
 3. Test for less than 1 V between the 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.
 4. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
 5. Test for less than 2 Ω in the G10 Cooling Fan Motor control circuit end to end.
 - If 2 Ω or greater, repair the open in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **Go to next step: If less than 1 V**
 8. Replace the G10 Cooling Fan Motor.

Component Testing

1. Ignition OFF.
2. Disconnect the G10 Cooling Fan Motor harness connector from the G10 Cooling Fan Motor.
3. Connect the **EL 36169 - HD** between the G10 Cooling Fan Motor terminal 1 and B+. Connect a jumper wire between the G10 Cooling Fan Motor terminal 2 and ground.
4. Verify the G10 Cooling Fan Motor operates.
 - **The cooling fan does not operate**

Replace the G10 Cooling Fan Motor.
 - **Go to next step: The cooling fan operates**
5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- [Engine Coolant Fan Replacement \(LYX\)](#)[Engine Coolant Fan Replacement \(LTG\)](#)[Engine Coolant Fan Replacement \(LH7\)](#)
- [Control Module References](#)

ENGINE OVERHEATING

Step	Action	Yes	No
DEFINITION: The engine temperature lamp comes on and stays on, or temperature gauge shows hot, or coolant overflows from the surge tank onto the ground while the engine is running.			
1	Check for a loss of coolant. <u>Loss of Coolant</u> Is there a loss of coolant?	Go to Step 2	Go to Step 3
2	Fill the system to the specified level. Does the engine still overheat?	Go to Step 3	System OK
3	Check for kinked or pinched surge tank hoses, especially at the radiator. Are any surge tank hoses kinked or pinched?	Go to Step 4	Go to Step 5

Step	Action	Yes	No
4	1. Relieve any kinks by rerouting the hoses. 2. Replace the hoses, if necessary. Does the engine still overheat?	Go to Step 5	System OK
5	Check for loose, missing, or damaged radiator air seals or deflectors. Are there any loose, missing, or damaged radiator air seals or deflectors?	Go to Step 6	Go to Step 7
6	Repair or replace any loose, missing, or damaged radiator air seals or deflectors. Does the engine still overheat?	Go to Step 7	System OK
7	Check the coolant concentration. Does the coolant concentration test correctly?	Go to Step 9	Go to Step 8
8	Replace the coolant, if necessary. Does the engine still overheat?	Go to Step 9	System OK
9	NOTE: Use the correct pressure cap. Check the system for loss of pressure. Pressure Cap Testing Is there a loss of pressure?	Go to Step 10	Go to Step 11
10	Repair any leaks, as necessary. Does the engine still overheat?	Go to Step 11	System OK
11	Check for a faulty engine coolant temperature sensor. Is the engine coolant temperature sensor faulty?	Go to Step 12	Go to Step 13
12	Replace the engine coolant temperature sensor. Engine Coolant Temperature Sensor Replacement Does the engine still overheat?	Go to Step 13	System OK
13	Check the radiator for any air flow obstructions or bent fins. Is there any airflow obstruction or bent fins?	Go to Step 14	Go to Step 15
14	1. Remove or relocate add-on parts that block air flow to the radiator. 2. Clean any debris from the radiator core. Does the engine still overheat?	Go to Step 15	System OK
15	Check for any blocked cooling system passages including inoperative or obstructed in-line auxiliary electric pumps. Are there any blocked cooling system passages?	Go to Step 16	Go to Step 17
16	1. Remove any obstruction. 2. Flush the cooling system, as required. 3. Refill the coolant. Does the engine still overheat?	Go to Step 17	System OK
17	Check for an inoperative cooling fan. Is the cooling fan inoperative?	Go to Step 18	Go to Step 19
18	Replace the cooling fan. Engine Coolant Fan Replacement (LYX) Engine Coolant Fan Replacement (LTG) Engine Coolant Fan Replacement (LH7). Does the engine still overheat?	Go to Step 19	System OK

Step	Action	Yes	No
19	Check for a thermostat that is stuck closed. Thermostat Diagnosis Is the thermostat stuck closed?	Go to Step 20	Go to Step 21
20	Replace the thermostat housing. Engine Coolant Thermostat Housing Replacement (LYX)Engine Coolant Thermostat Housing Replacement (LTG) Does the engine still overheat?	Go to Step 21	System OK
21	Check for a faulty water pump. The impeller blades may be eroded or broken. Is the water pump faulty?	Go to Step 22	-
22	Replace the water pump. Water Pump Replacement (LTG)Water Pump Replacement (LYX)Water Pump Replacement (LH7) Does the engine still overheat?	-	System OK

LOSS OF COOLANT

Step	Action	Yes	No
DEFINITION: The cooling system is losing 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. 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. Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static) Is the action complete?	Go to Step 5	-
5	If the engine is suspected to have a coolant leak into a cylinder, the coolant can hydraulically lock the engine. Does the engine crankshaft rotate?	Go to Step 6	Go to Step 23
6	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to Step 24	Go to Step 7
7	Extended operation with a low coolant level can cause engine internal component failure. Is the engine knocking?	Go to Step 26	Go to Step 8
8	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 9	Go to Step 10
9	- Coolant in the exhaust system creates a distinctive, burning coolant odor in the exhaust. - 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 25	Go to Step 10

Step	Action	Yes	No
10	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . With the engine idling, inspect the surge tank. Does the surge tank discharge coolant while the engine is idling?	Go to Step 14	Go to Step 11
11	Visually inspect the hoses, pipes and hose clamps at the following locations: • Coolant surge tank • Heater core • Radiator Are any of the hoses, clamps or pipes leaking?	Go to Step 20	Go to Step 12
12	Visually inspect the following components: • The coolant pressure cap • The core plugs • The cylinder head gaskets • The engine block • The intake manifold • The radiator • The thermostat housing • The water pump Are any of the listed components leaking?	Go to Step 20	Go to Step 13
13	1. Pressure test the cooling system. <u>Cooling System Leak Testing</u> 2. With the cooling system pressurized, visually inspect the components listed in steps 11 and 12. Are any leaks present?	Go to Step 20	Go to Step 14
14	Pressure test the coolant pressure cap. <u>Pressure Cap Testing</u> Does the coolant pressure cap hold pressure?	Go to Step 15	Go to Step 21
15	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 22	Go to Step 16

Step	Action	Yes	No
16	1. Add 30 ml (1 oz) of Extended Life Coolant Leak Detection Dye to the cooling system for each 15 liters (4 gallons) of coolant. <u>Adhesives, Fluids, Lubricants, and Sealers</u>, and <u>Approximate Fluid Capacities</u> 2. Start the vehicle and allow the engine to reach normal operating temperature. 3. Shut the engine off. 4. Use J 42220 Universal 12V Leak Detection Lamp to visually inspect the components listed in steps 11 and 12. Are any leaks present?	Go to Step 20	Go to Step 17
17	Use J 42220 Universal 12V Leak Detection Lamp to inspect for the following conditions: • Coolant dye in the HVAC module drain tube • Coolant dye on the vehicle floor covering near the HVAC module Is coolant dye present?	Go to Step 22	Go to Step 18
18	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is there a milky substance on under the oil fill cap?	Go to Step 19	Go to Step 20
19	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 25	System OK
20	Repair or replace the leaking component. Is the repair complete?	Go to Step 28	-
21	Replace the coolant pressure cap. Is the repair complete?	Go to Step 28	-
22	Replace the heater core. <u>Heater Core Replacement</u> Is the repair complete?	Go to Step 28	-
23	Repair the engine no crank condition. <u>Engine Will Not Crank - Crankshaft Will Not Rotate</u> Is the repair complete?	Go to Step 28	-
24	Repair the engine overheating condition. <u>Engine Overheating</u> Is the repair complete?	Go to Step 28	-
25	Repair the engine internal coolant leak. <u>Coolant in Combustion Chamber</u> , or <u>Coolant in Engine Oil</u> Is the repair complete?	Go to Step 28	-
26	Repair the engine knock. <u>Lower Engine Noise, Regardless of Engine Speed</u> Is the repair complete?	Go to Step 28	-
27	Repair the combustion pressure in the cooling system problem. <u>Coolant in Combustion Chamber</u> Is the repair complete?	Go to Step 28	-
28	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

GE 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. Take a 87°C (188°F) tempil stick or a 97°C (206°F) tempil stick and rub it on the thermostat housing. Temperature sticks can be used to determine a thermostat's operating range.

1. Use a **GE 24731** Tempil Stick in order to find the opening and the closing temperatures of the coolant thermostat.
 - The 188 tempil stick melts at 87°C (188°F). The thermostat should begin to open.
 - The 206 tempil stick melts at 97°C (206°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-COOL® and clean drinkable water.

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

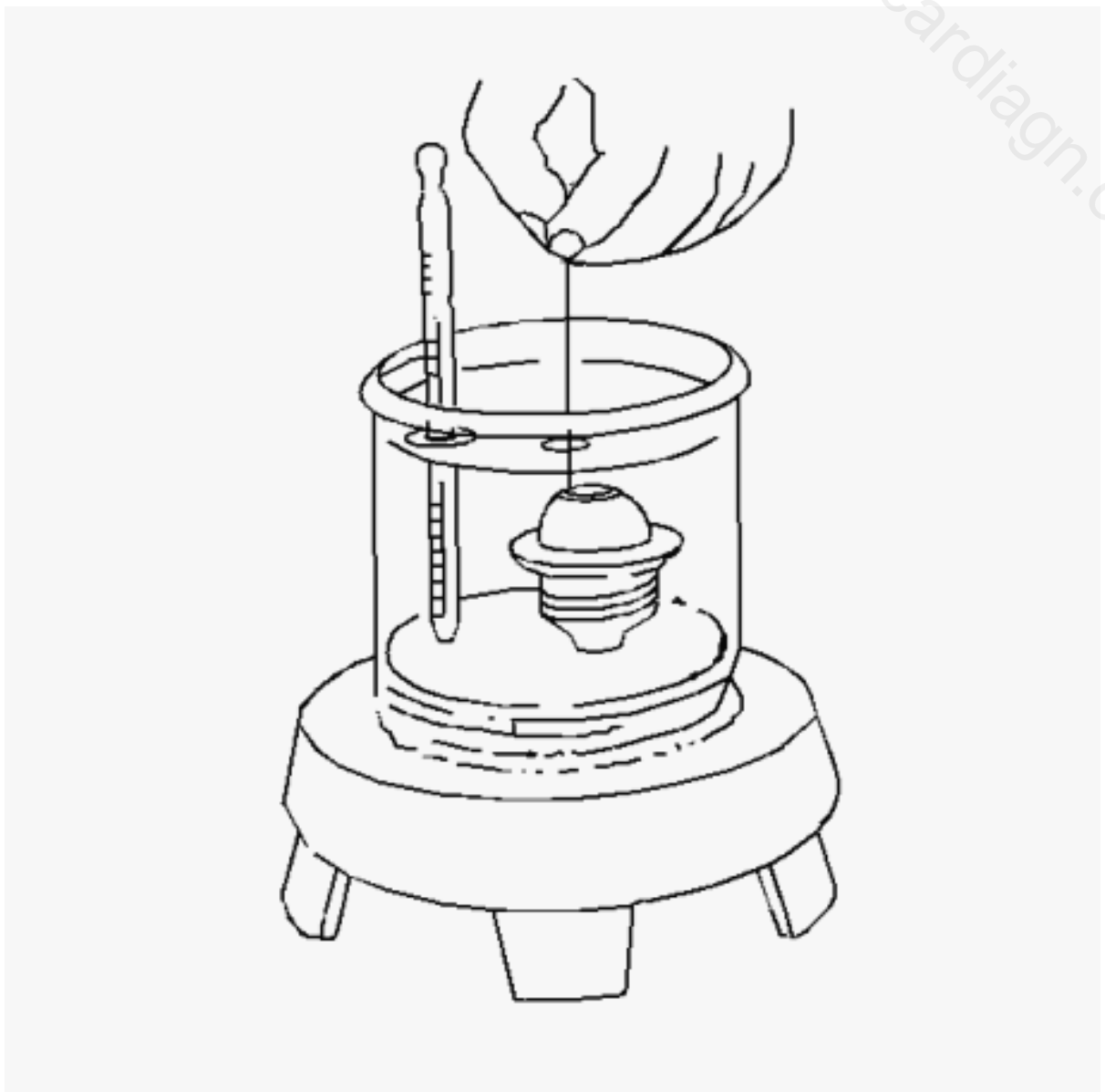


Fig. 2: View Of Thermostat Test Procedure Using Glycol
Courtesy of GENERAL MOTORS COMPANY

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

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

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.
 - **Go to next step: 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.
 - **Go to next step: If infinite resistance**
4. Test for less than 2 Ω between the engine coolant heater cord plug and the engine coolant heater cord connector for each circuit.
 - **If greater than 2 Ω**

Replace the engine coolant heater cord.

- **Go to next step: If less than 2 Ω**

All OK.

Repair Instructions

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

- **Coolant Heater Replacement (LTG)****Coolant Heater Replacement (LYX)**
- **Coolant Heater Cord Replacement (LYX)****Coolant Heater Cord Replacement (LTG)**

ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE

Step	Action	Yes	No
1	1. Ensure that the cooling system is full. 2. Allow the engine to cool. 3. Start the engine. 4. Turn the air conditioning system off. 5. Inspect the engine cooling fan(s). Is the electric cooling fan on?	Go to Step 2	Go to Step 3
2	1. Diagnose and repair the cooling fan system. Refer to <u>Cooling Fan Inoperative</u> . 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to Step 3	System OK
3	Install the Scan Tool to the DLC. Compare the Scan Tool coolant temperature reading to the I/P cluster coolant temperature. Is the I/P cluster coolant temperature close to the reading on the Scan Tool?	Go to Step 5	Go to Step 4
4	1. Diagnose and repair the coolant temperature gauge system. 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to Step 5	System OK
5	Inspect the thermostat for correct operation. Refer to <u>Thermostat Diagnosis</u> . Is the thermostat operating correctly?	System OK	Go to Step 6
6	1. Replace the thermostat housing. Refer to <u>Engine Coolant Thermostat Housing Replacement (LYX)</u> <u>Engine Coolant Thermostat Housing Replacement (LTG)</u> . 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to Step 1	System OK

PRESSURE CAP TESTING

Special Tools

- **J 24460-01** Cooling System Pressure Tester

- **J 42401-1** Radiator Cap / Surge Tank Test Adapter

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. 3: 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 **J 24460-01** Cooling System Pressure Tester (1) with **J 42401-1** 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 **J 24460-01** 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.

COOLING SYSTEM LEAK TESTING

Special Tools

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

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.

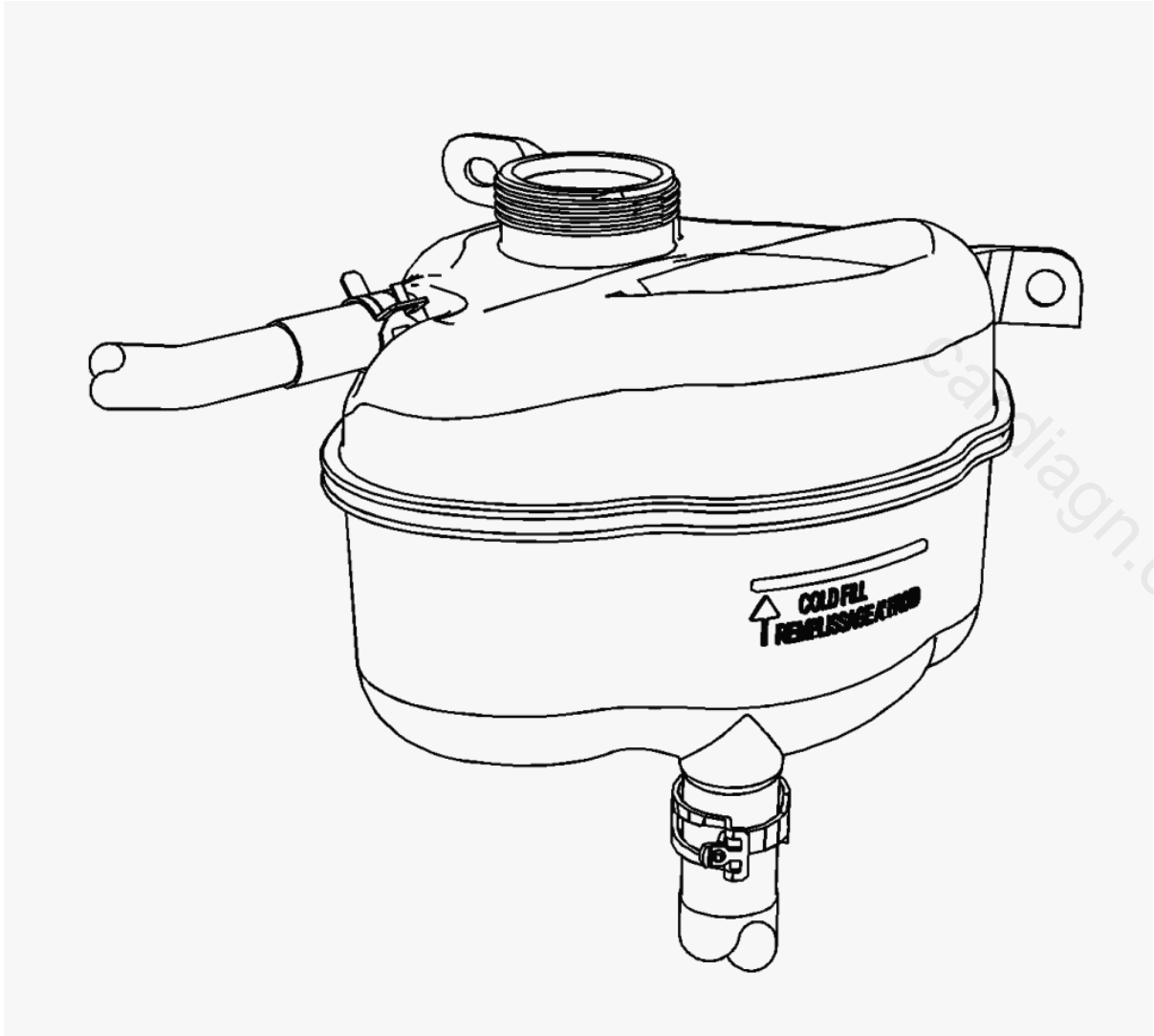


Fig. 4: Applying Pressure To Cooling System
Courtesy of GENERAL MOTORS COMPANY

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.

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



Fig. 5: 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 it 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 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 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 (GE 47716)

Special Tools

- **J 26568** Coolant and Battery Fluid Tester

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

Draining Procedure

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

1. Remove the radiator surge tank cap.
2. Raise and support the vehicle.



Fig. 6: Lower Deflector Panel Insert

Courtesy of GENERAL MOTORS COMPANY

3. Remove the lower deflector panel insert (1) on the passenger side to gain access to drain cock.
4. Install suitable length of hose to radiator drain nipple, and route hose through opening to allow free drain of coolant.
5. Place a drain pan under the drain cock.
6. Loosen, but do not remove, drain cock until coolant begins to drain from the hose.
7. When cooling system is completely drained, tighten the drain cock by hand.
8. Remove hose segment.



Fig. 7: Lower Deflector Panel Insert
Courtesy of GENERAL MOTORS COMPANY

9. Install lower deflector panel insert (1).
10. Lower the vehicle.
11. Inspect the coolant.
12. Follow the appropriate procedure based on the condition of the coolant.
 - Normal in appearance - Follow the filling procedure.
 - Discolored - Follow the flush procedure. Refer to [Flushing](#).

Vac-N-Fill Procedure

1. Install the **J 42401** Radiator Cap and Surge Tank Test Adapter onto the coolant surge tank.

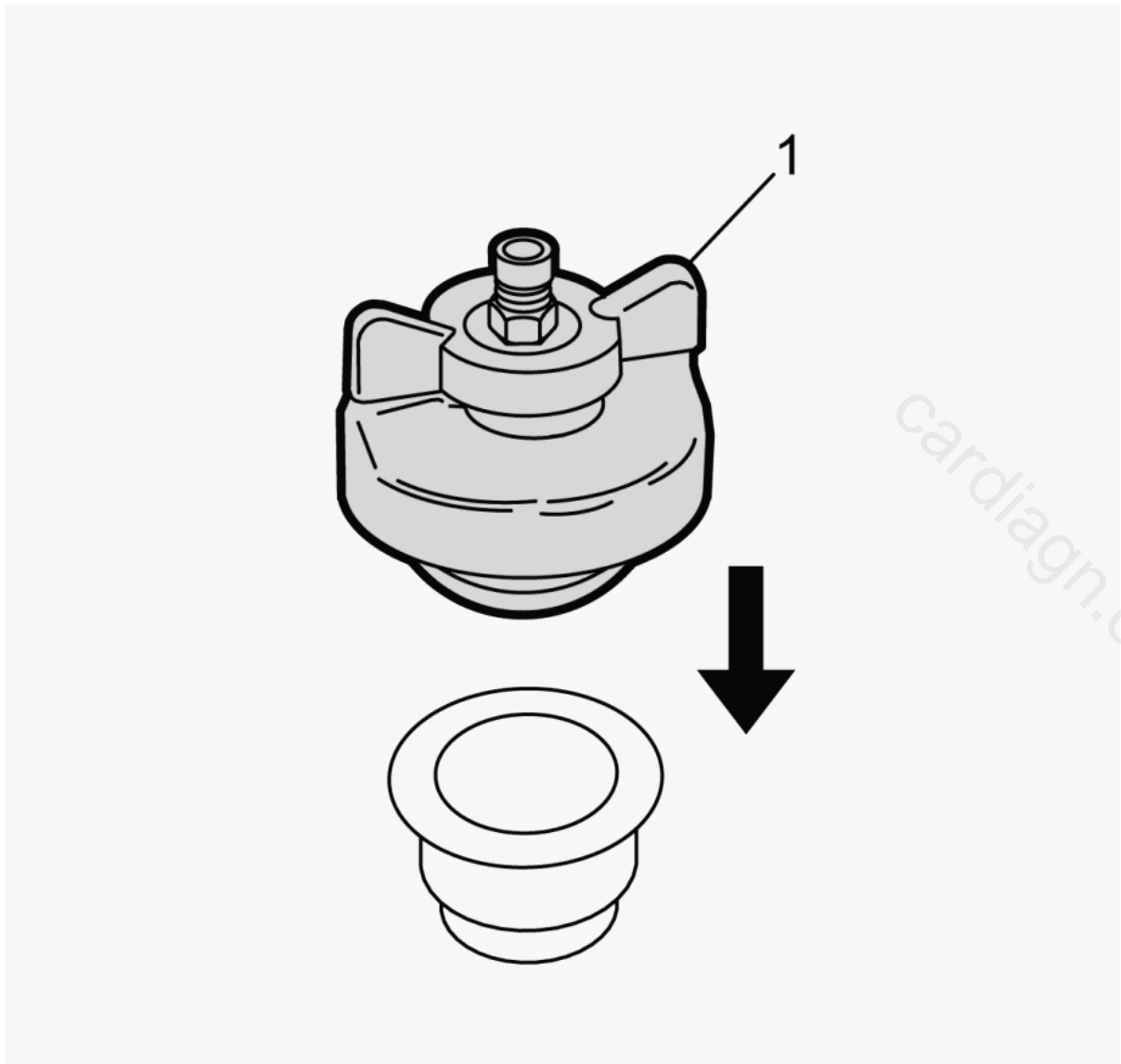


Fig. 8: Radiator Cap & Surge Tank Test Adapter
Courtesy of GENERAL MOTORS COMPANY

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.

2. Attach the Vac N Fill cap to the **J 42401** Radiator Cap and Surge Tank Test Adapter (1).

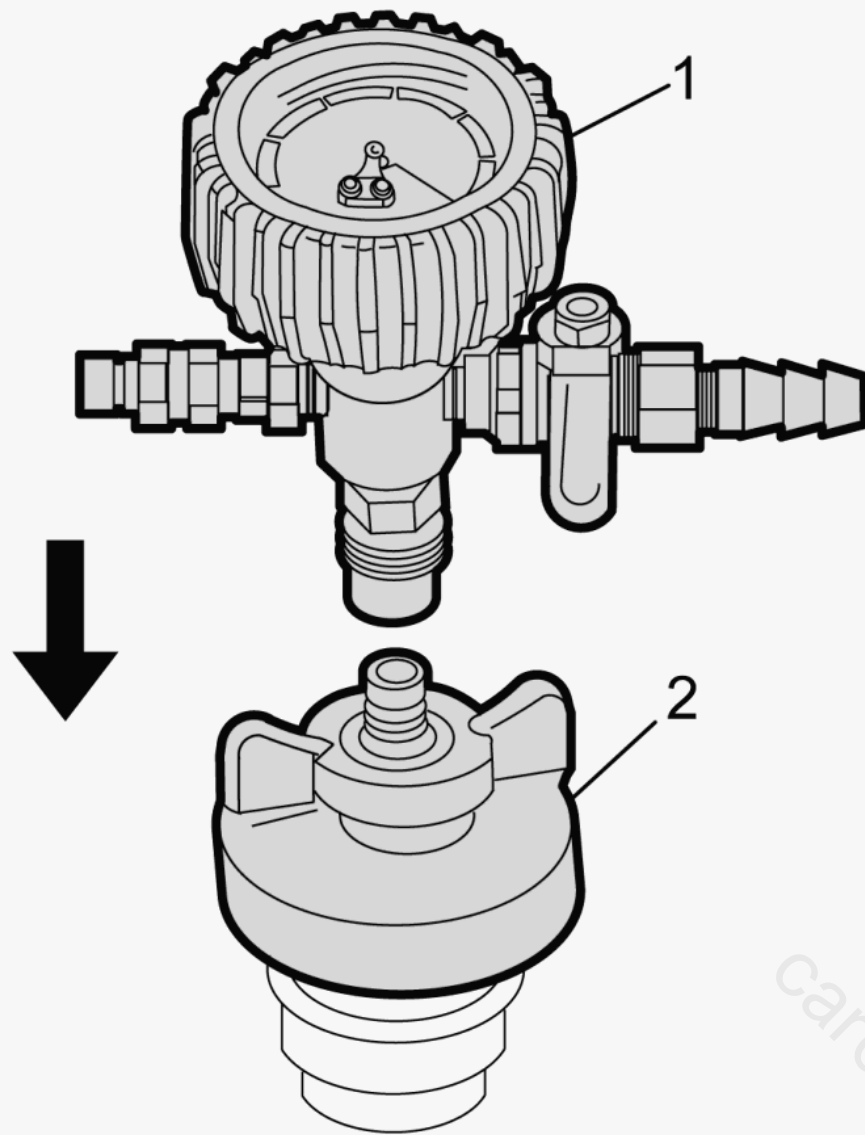


Fig. 9: Vacuum Gauge Assembly & Vac N Fill Cap
Courtesy of GENERAL MOTORS COMPANY

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

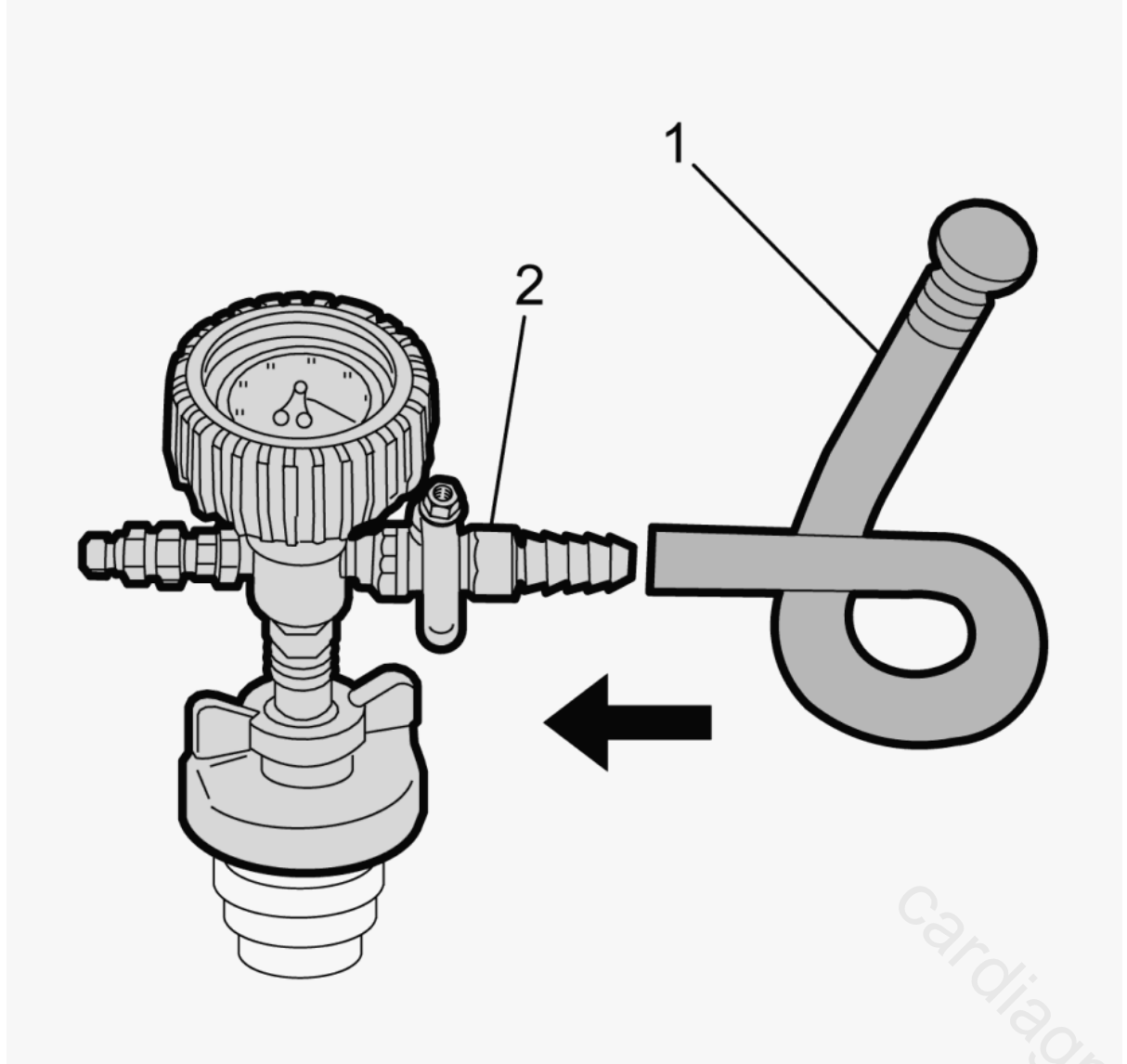


Fig. 10: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

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

Ensure that the valve is closed.

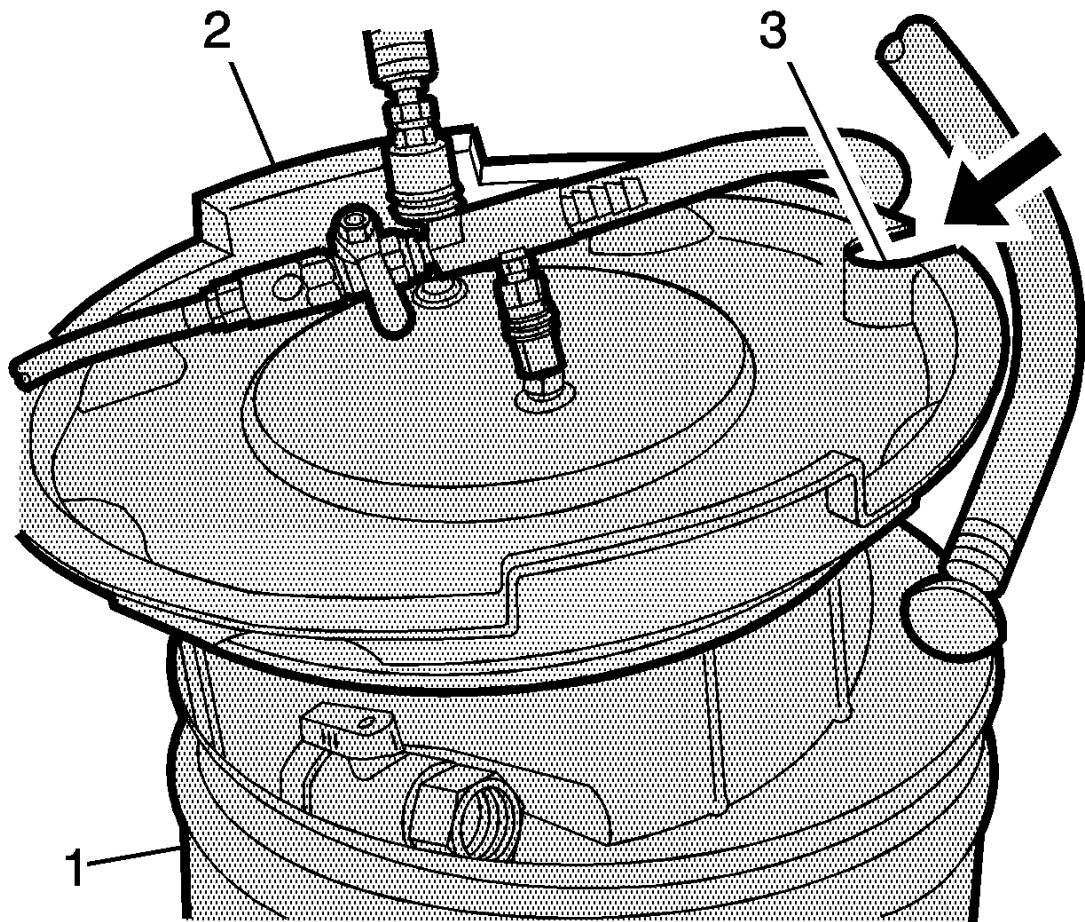


Fig. 11: Graduated Reservoir, Vacuum Tank & Cut-Out Area

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.

5. Pour the coolant mixture into the graduated reservoir (1).
6. 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.

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

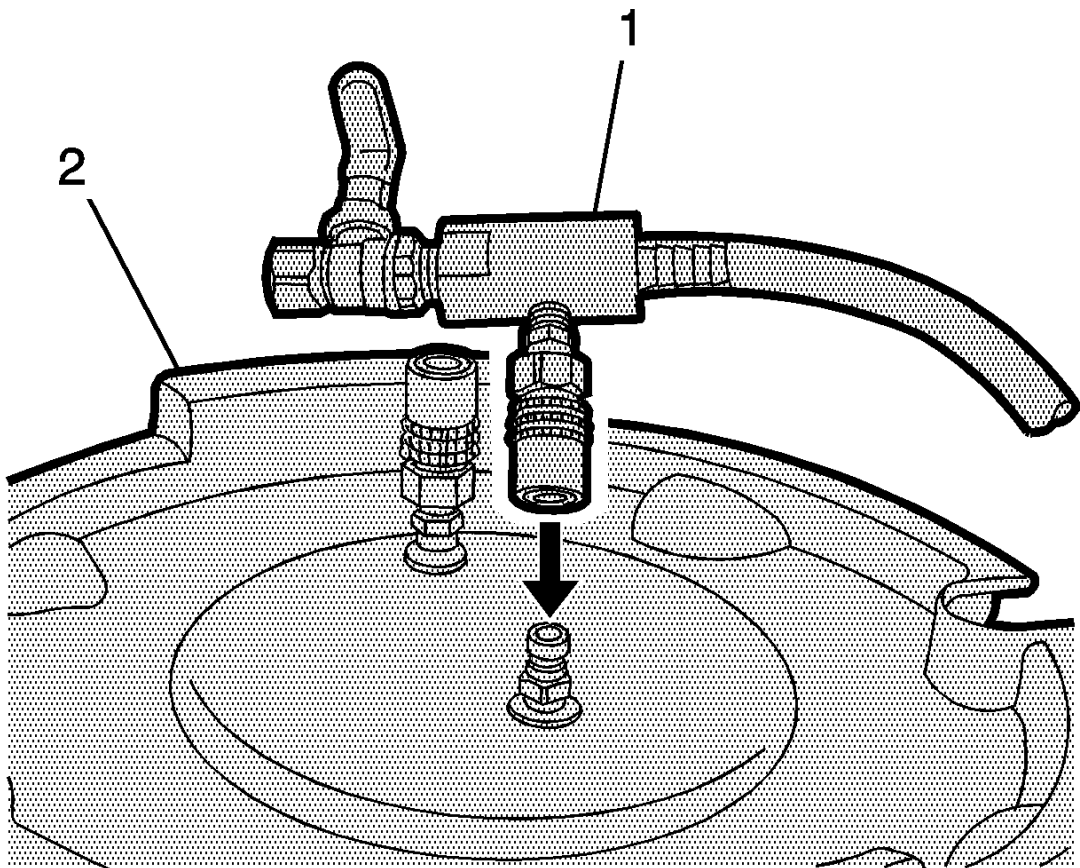


Fig. 12: Vacuum Tank & Venturi Assembly

Courtesy of GENERAL MOTORS COMPANY

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

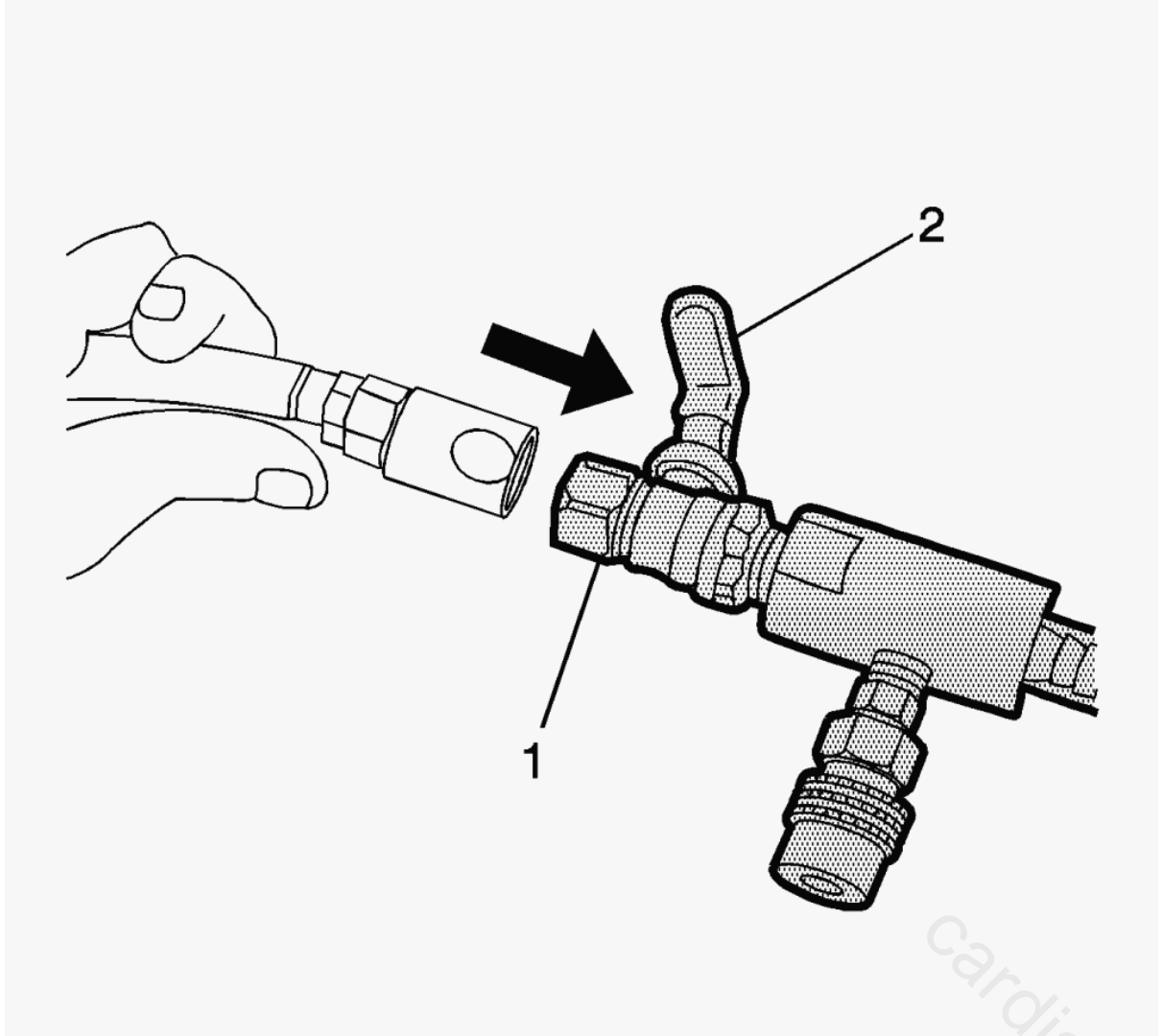


Fig. 13: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

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

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

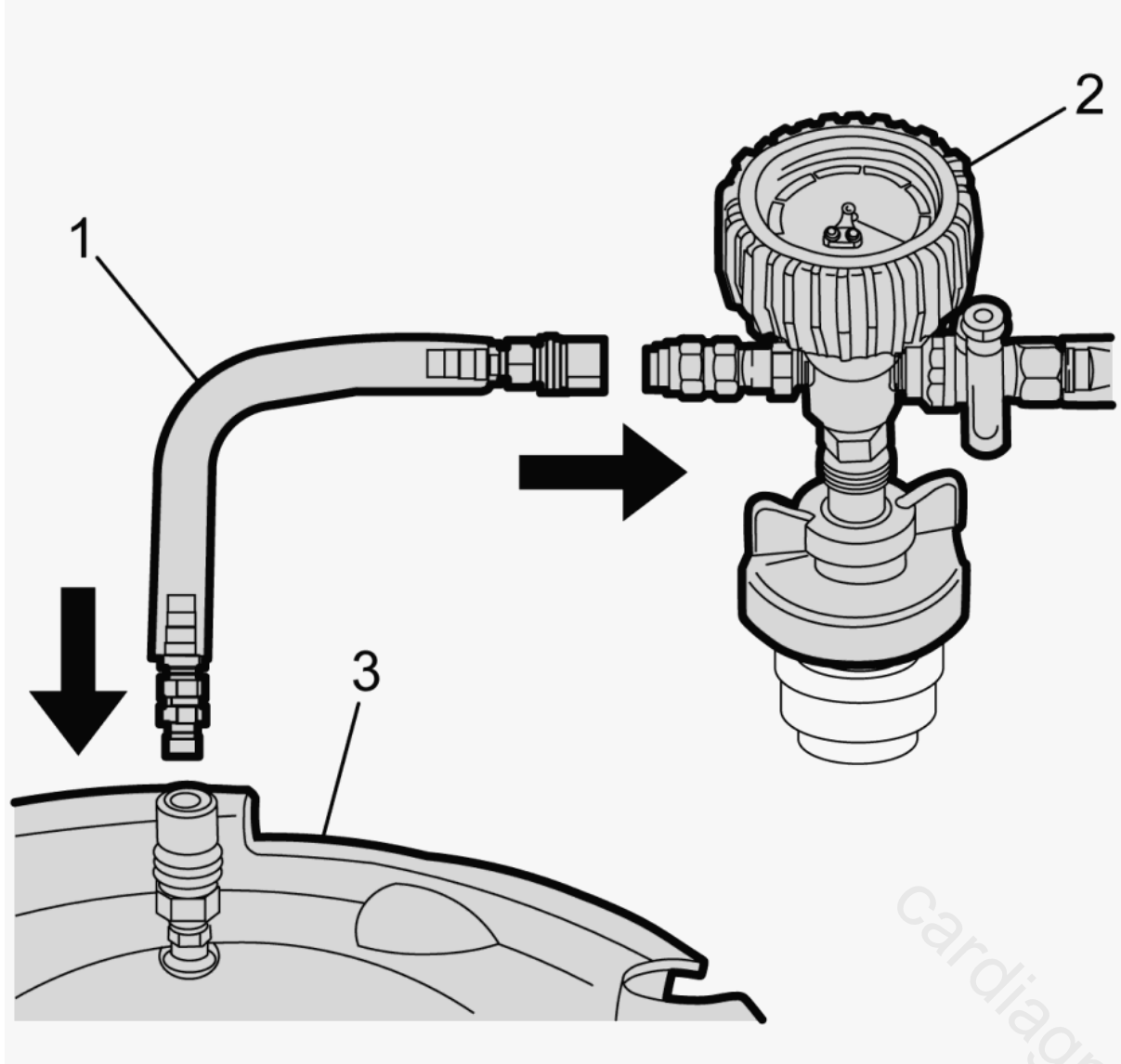


Fig. 14: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

10. Attach the vacuum hose (1) to the vacuum gauge assembly (2) and the vacuum tank (3).

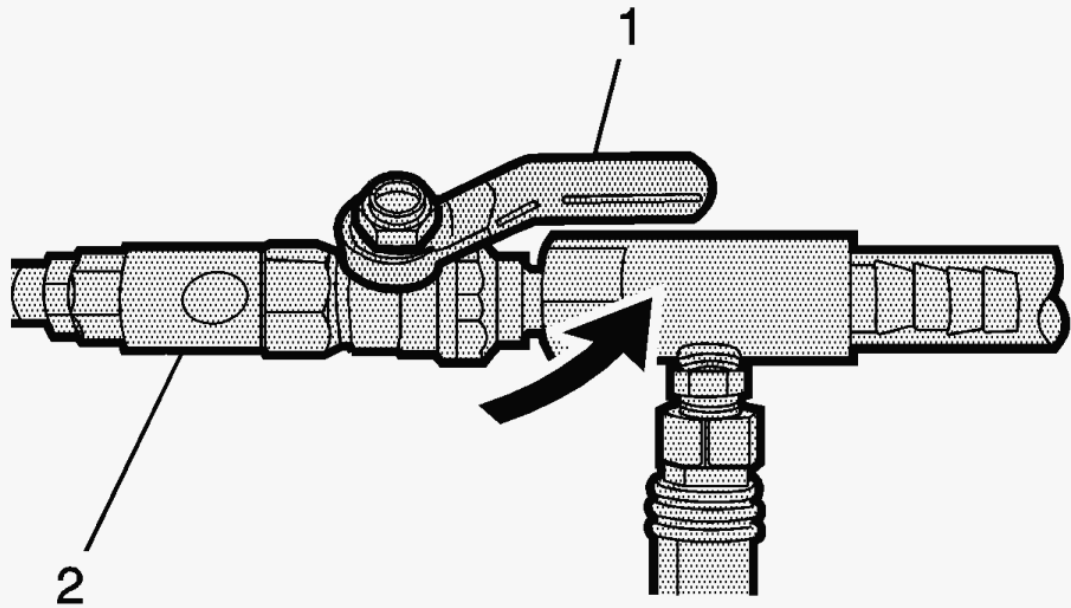


Fig. 15: Valve & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

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

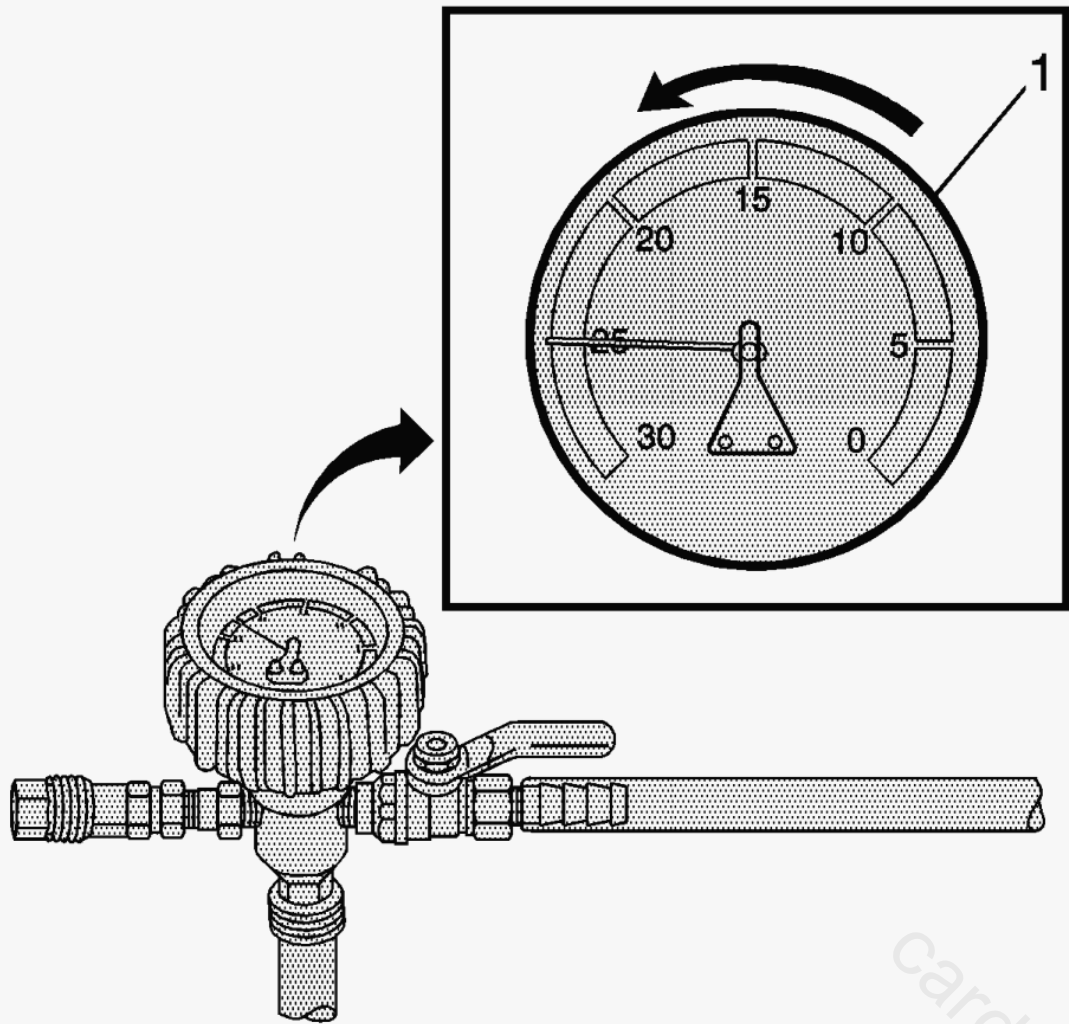


Fig. 16: Vacuum Gauge Needle

Courtesy of GENERAL MOTORS COMPANY

12. 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.

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

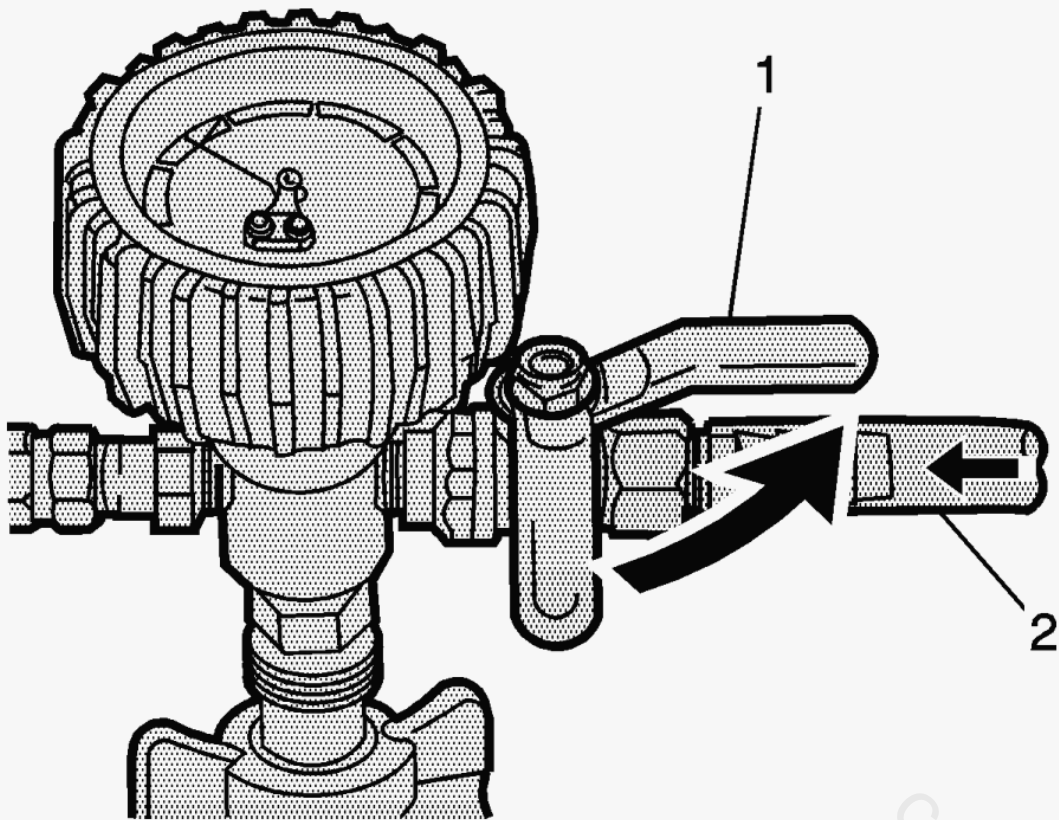


Fig. 17: Vacuum Gauge Assembly & Needle

Courtesy of GENERAL MOTORS COMPANY

14. 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.
15. Close the valve on the venturi assembly.
16. If there is a suspected leak in the cooling system, allow the system to stabilize under vacuum and monitor for vacuum loss.

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

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

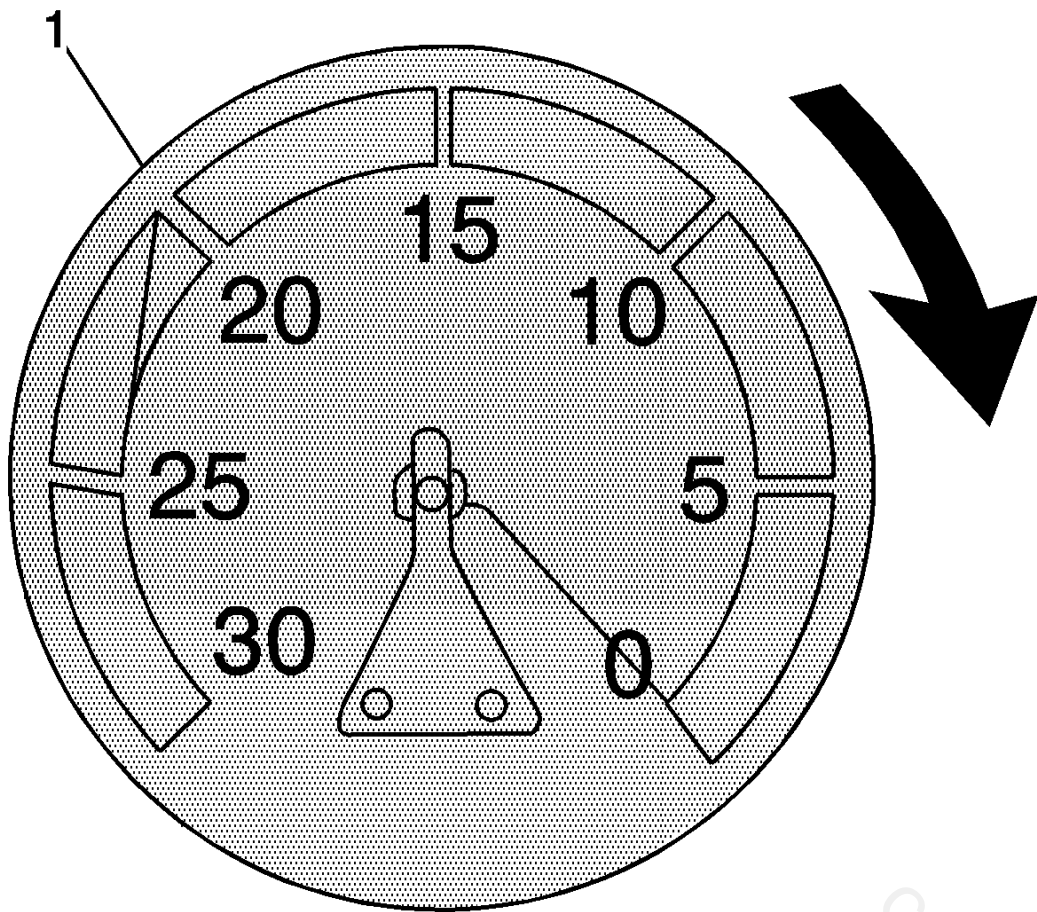


Fig. 18: Vacuum Gauge

Courtesy of GENERAL MOTORS COMPANY

18. Once the vacuum gauge reaches zero (1), close the valve on the vacuum gauge assembly and repeat steps 11 - 17.
19. Detach the Vac N Fill cap from the **J 42401** Radiator Cap and Surge Tank Test Adapter.
20. Remove the **J 42401** Radiator Cap and Surge Tank Test Adapter from the coolant surge tank.
21. Add coolant to the system as necessary.
22. Inspect the concentration of the coolant mixture using **J 26568** Coolant and Battery Fluid Tester.

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

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

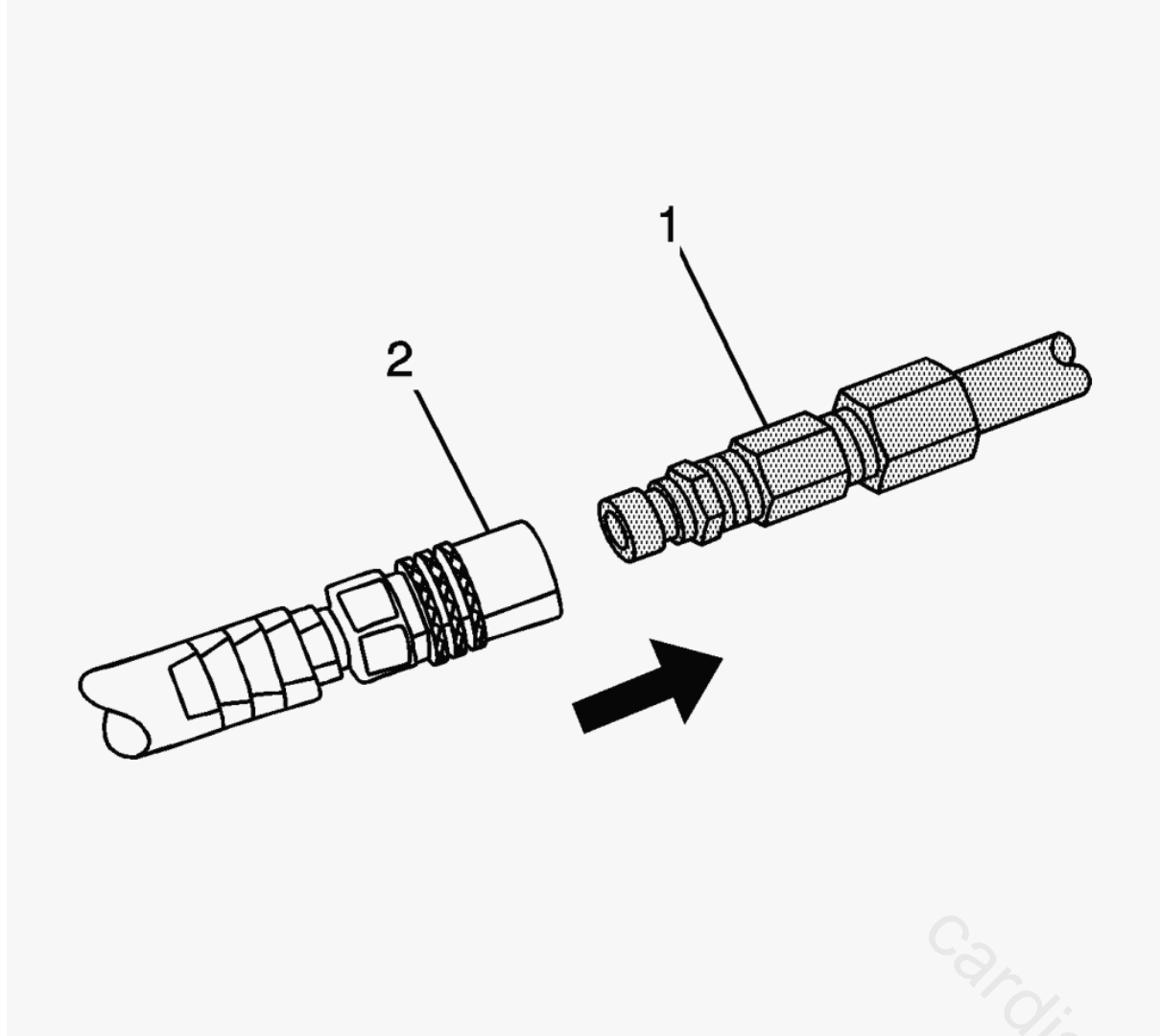


Fig. 19: Vacuum Hose & Extraction Hose
Courtesy of GENERAL MOTORS COMPANY

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

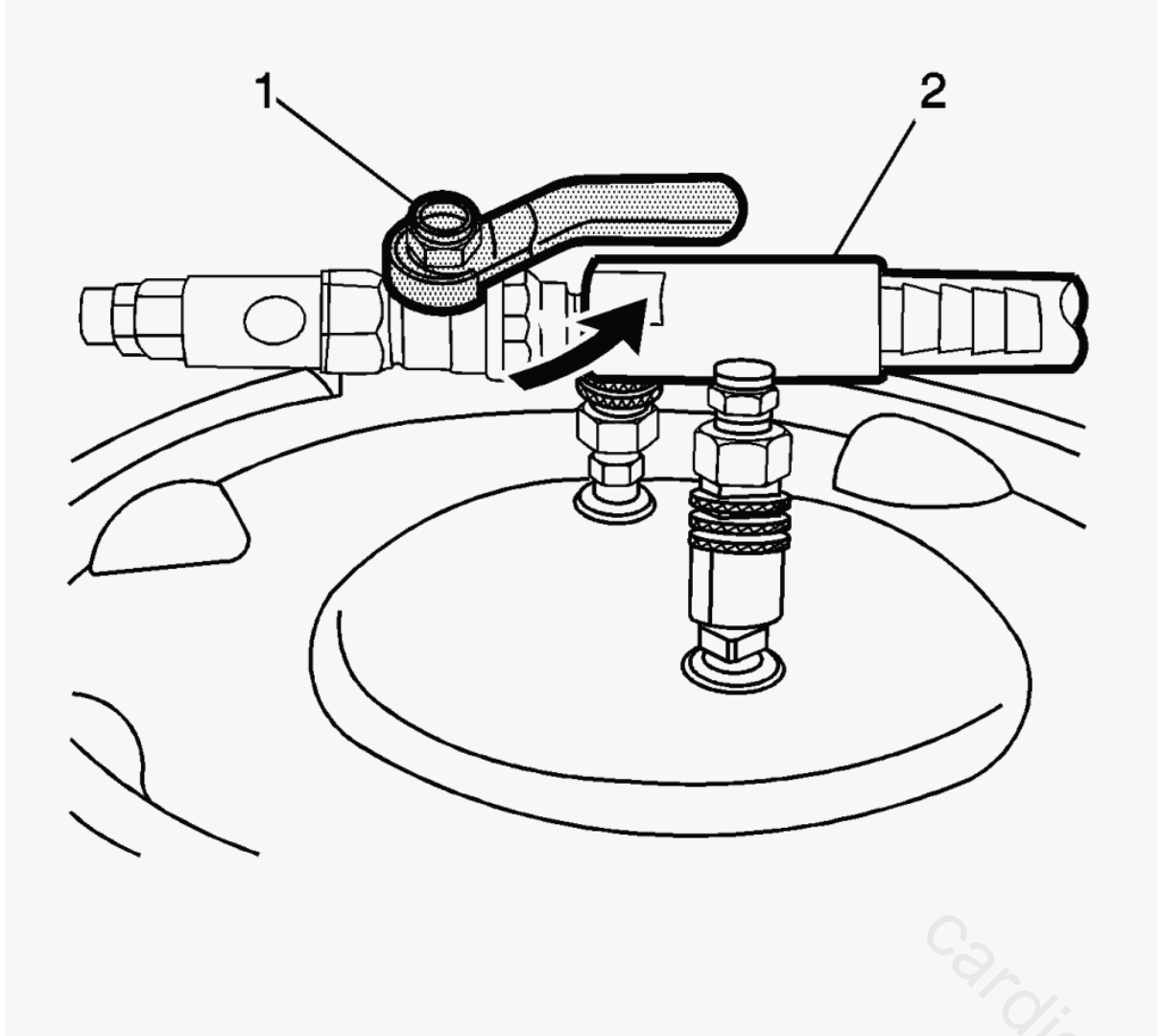


Fig. 20: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

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

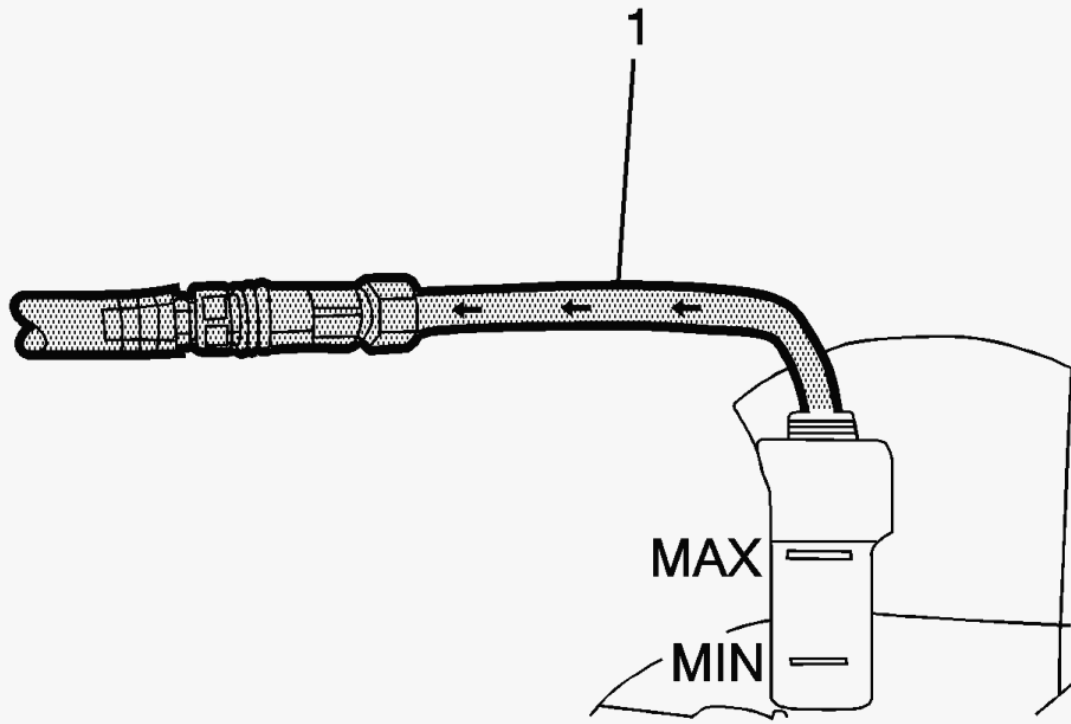


Fig. 21: Coolant Extraction Hose

Courtesy of GENERAL MOTORS COMPANY

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

COOLING SYSTEM DRAINING AND FILLING (STATIC)

Draining Procedure

Special Tools

J 26568 Coolant and Battery Tester

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

NOTE: Draining the cooling system with the radiator surge tank cap installed will syphon the coolant from the overflow tank.

1. Remove the radiator surge tank cap.
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)



Fig. 22: Lower Deflector Panel Insert

Courtesy of GENERAL MOTORS COMPANY

3. Remove the lower deflector panel insert (1) on the passenger side to gain access to drain cock.
4. Install suitable length of hose to radiator drain nipple, and route hose through opening to allow free drain of coolant.
5. Place a drain pan under the drain cock.
6. Loosen, but do not remove, drain cock until coolant begins to drain from the hose.
7. When cooling system is completely drained, tighten the drain cock by hand.
8. Remove hose segment.



Fig. 23: Lower Deflector Panel Insert

Courtesy of GENERAL MOTORS COMPANY

9. Install lower deflector panel insert (1).
10. Lower the vehicle.
11. Inspect the coolant.
12. Follow the appropriate procedure based on the condition of the coolant.
 - Normal in appearance - Follow the filling procedure.
 - Discolored - Follow the flush procedure. Refer to **Flushing**.

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. Lower the vehicle.

NOTE:

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

2. Slowly fill the cooling system with a 50/50 coolant mixture. [Approximate Fluid Capacities](#)
3. Install Radiator Surge Tank Cap
4. Start the engine.
5. Run the engine at 2, 000 - 2, 500 RPM until the engine reaches normal operating temperature.
6. Allow the engine to idle for 3 minutes.
7. Shut the engine OFF.
8. Allow the engine to cool.
9. Top off the coolant as necessary.
10. Inspect the concentration of the engine coolant, using the **J 26568** coolant and battery tester.
11. 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. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
2. Remove [Radiator Surge Tank Replacement \(LYX without KL9\)Radiator Surge Tank Replacement \(LTG LYX with KL9\)Radiator Surge Tank Replacement \(LH7 FWD\)Radiator Surge Tank Replacement \(LH7 AWD\)](#).
3. Clean and flush the radiator surge tank with clean, drinkable water.
4. Install [Radiator Surge Tank Replacement \(LYX without KL9\)Radiator Surge Tank Replacement \(LTG LYX with KL9\)Radiator Surge Tank Replacement \(LH7 FWD\)Radiator Surge Tank Replacement \(LH7 AWD\)](#).
5. Follow the drain and fill procedure using only clean, drinkable water. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
6. Run the engine for 20 minutes.
7. Stop the engine.
8. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
9. Repeat the procedure if necessary, until the fluid is nearly colorless.

10. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).

RADIATOR CLEANING

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

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

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

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

RADIATOR SURGE TANK REPLACEMENT (LYX WITHOUT KL9)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

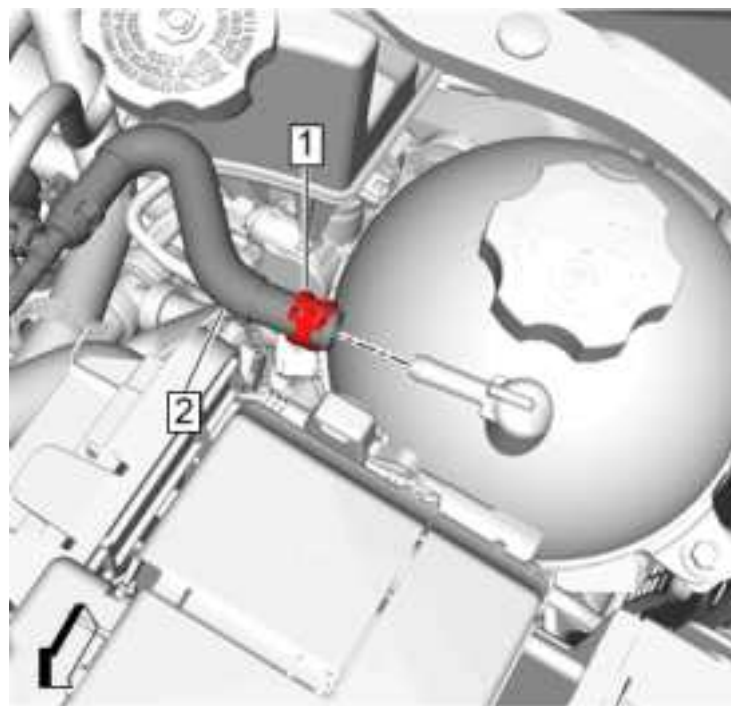


Fig. 24: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - [Engine Coolant Air Bleed Hose Replacement \(Turbocharger Coolant Return pipe to Water Outlet, LYX\)Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX\)](#)

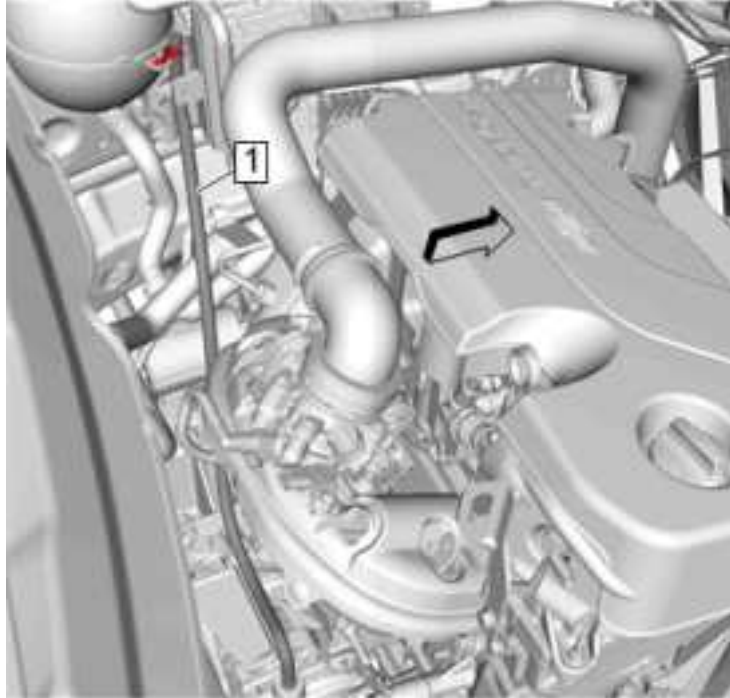


Fig. 25: Power Transfer Unit Vent Hose

Courtesy of GENERAL MOTORS COMPANY

3. Remove {If equipped} Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

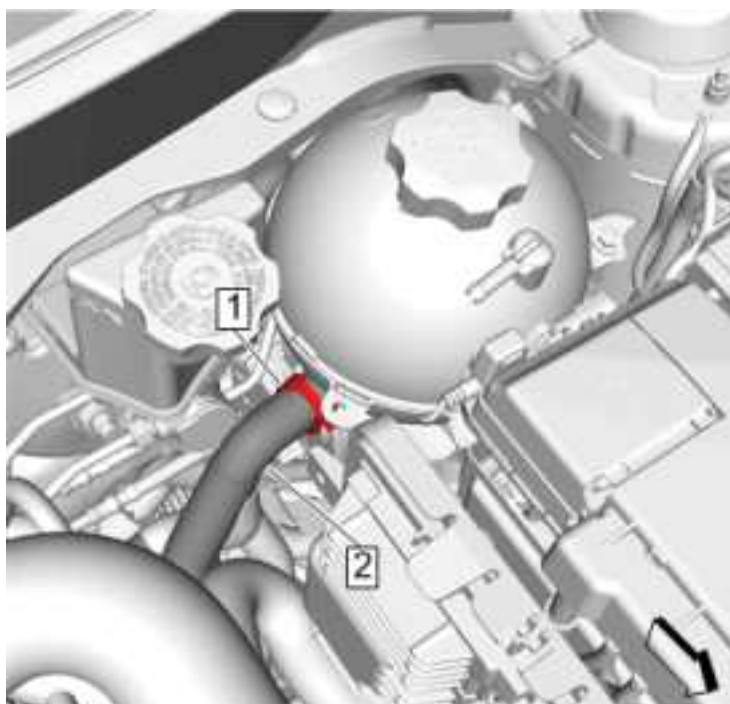


Fig. 26: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Remove Heater Outlet Hose (2) @ Radiator Surge Tank - **Heater Outlet Hose Replacement (LYX without KL9)**

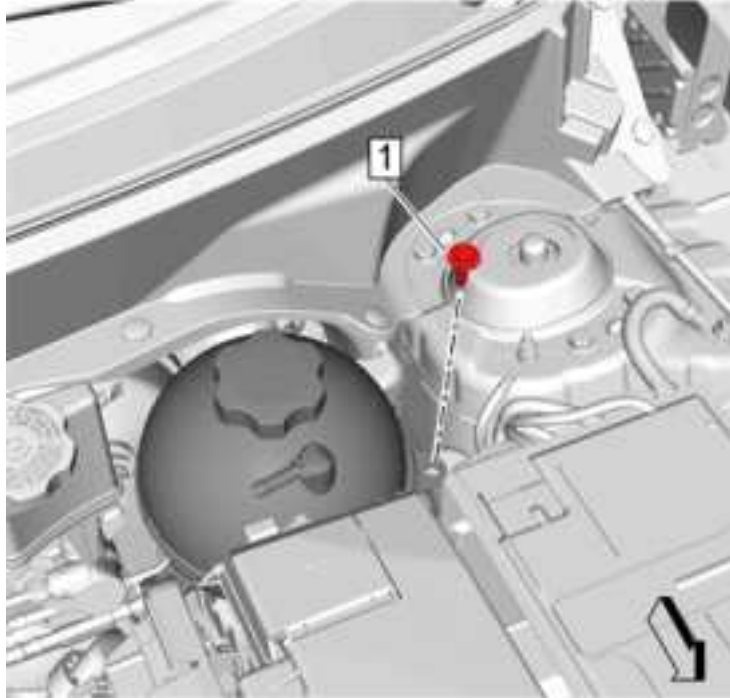


Fig. 27: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Surge Tank Bolt (1) @ Radiator Surge Tank.
6. Reposition the wiring harness.

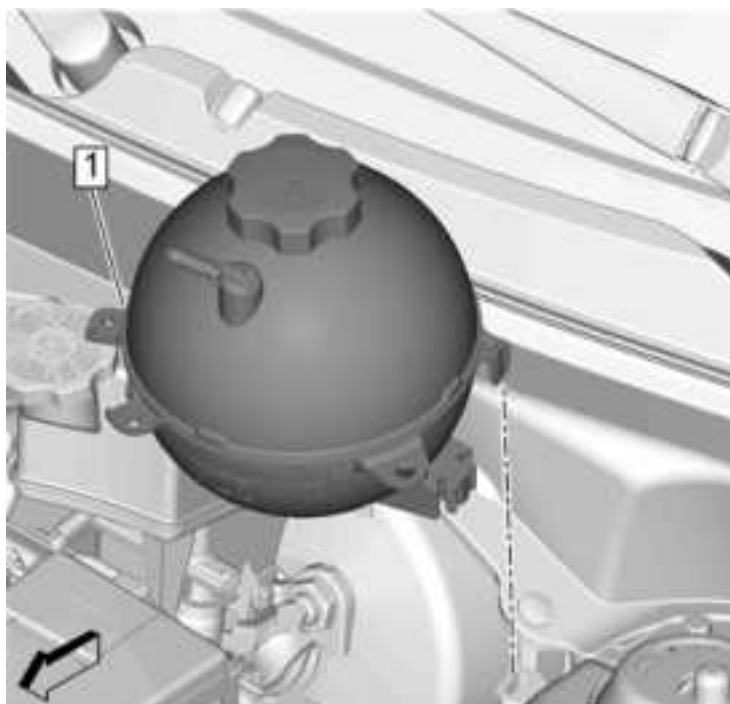


Fig. 28: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank (1).

Installation Procedure

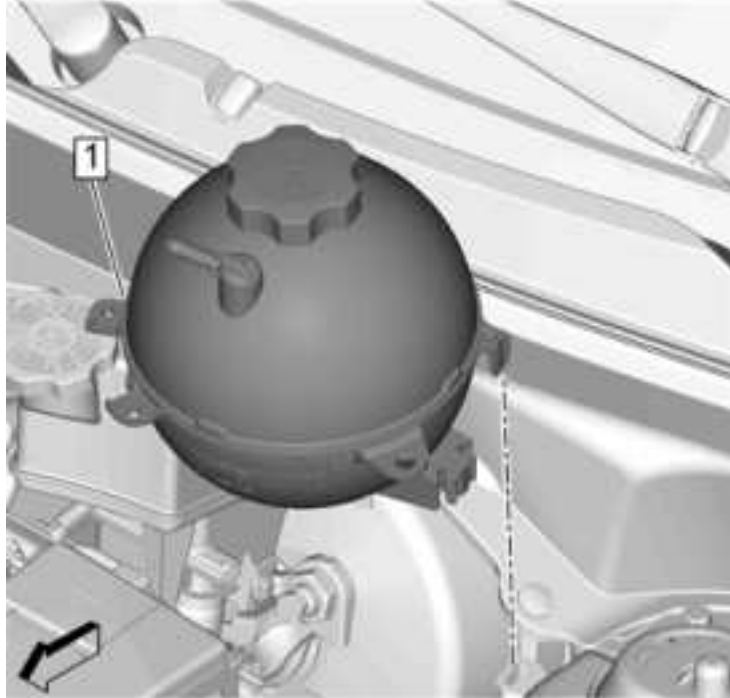


Fig. 29: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank (1).

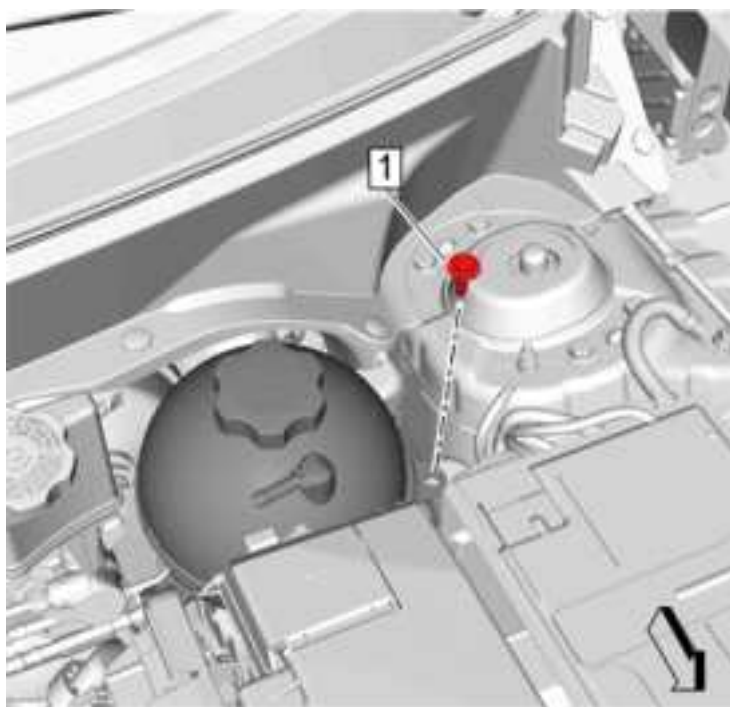


Fig. 30: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install Radiator Surge Tank Bolt (1) and tighten 9 N.m (80 lb in)
3. Reposition the wiring harness.

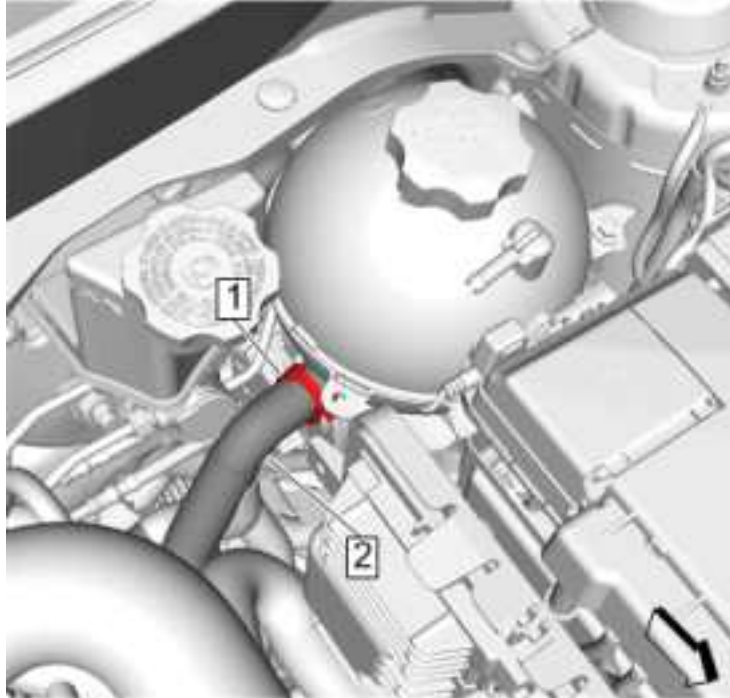


Fig. 31: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Install Heater Outlet Hose (2) @ Radiator Surge Tank - [Heater Outlet Hose Replacement \(LYX without KL9\)](#)

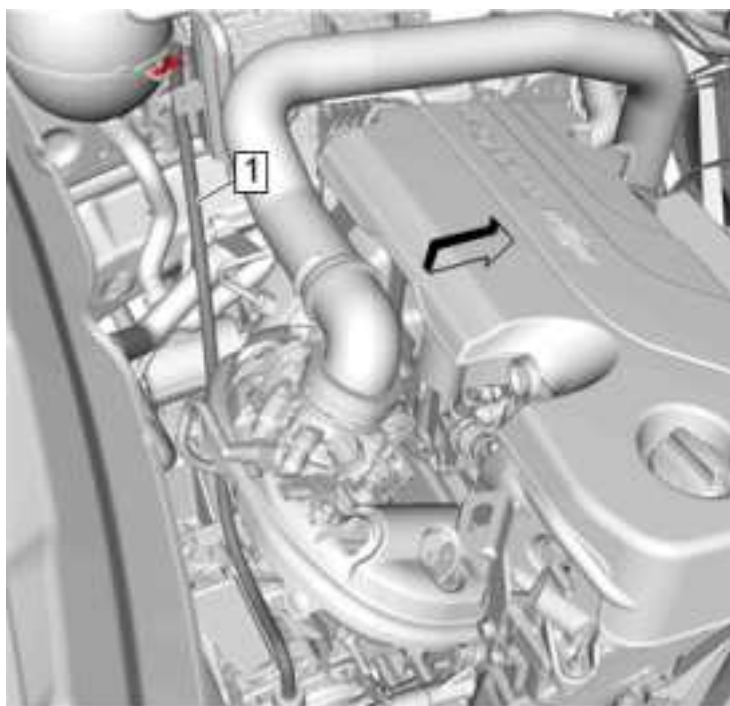


Fig. 32: Power Transfer Unit Vent Hose

Courtesy of GENERAL MOTORS COMPANY

5. Install {If equipped} Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - [Power Transfer Unit Vent Hose Replacement](#)

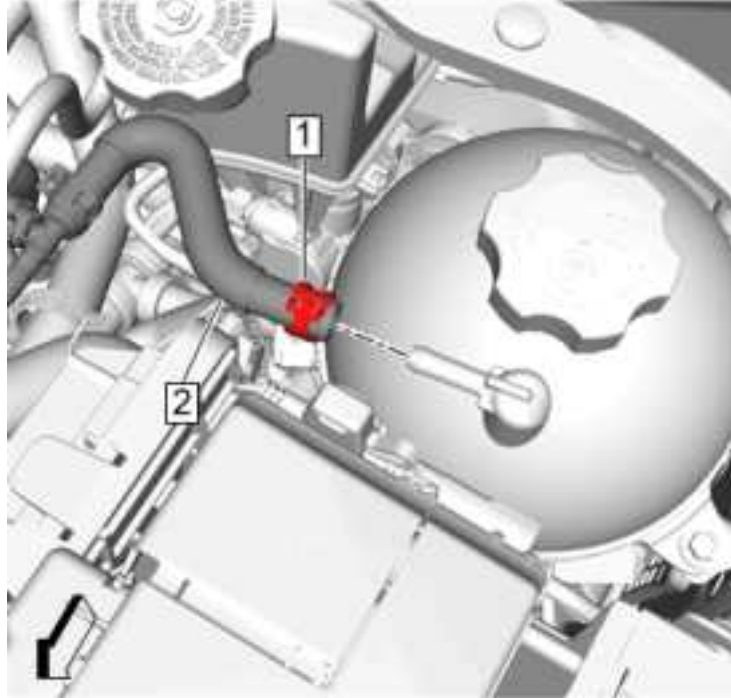


Fig. 33: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX)Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)**
7. Fill the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**
8. Check the cooling system for leaks.

RADIATOR SURGE TANK REPLACEMENT (LTG LYX WITH KL9)

Removal Procedure

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

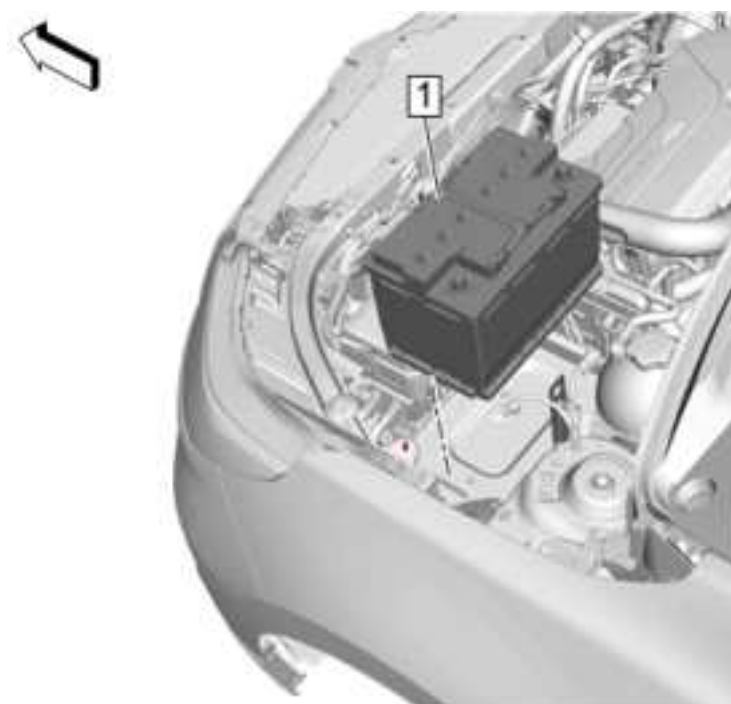


Fig. 34: Battery

Courtesy of GENERAL MOTORS COMPANY

2. Remove Battery (1) - **Battery Replacement**

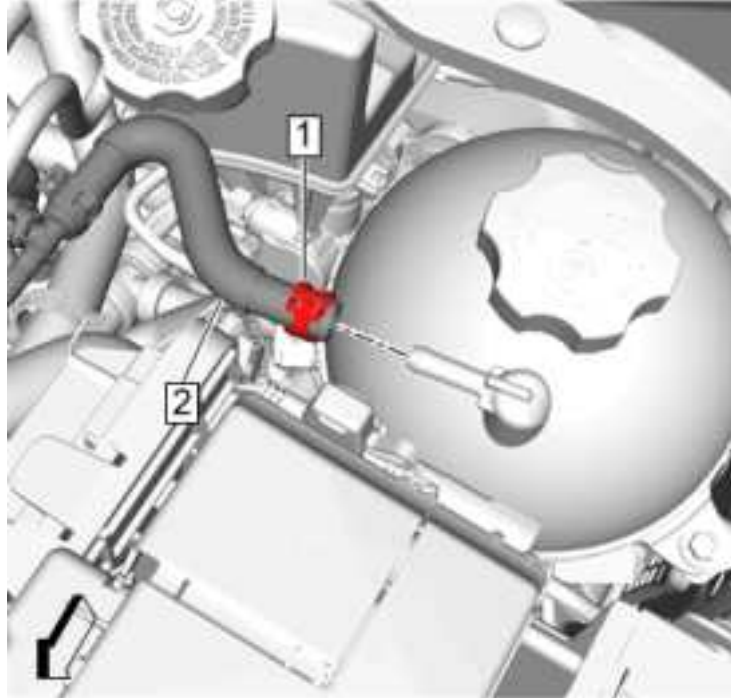


Fig. 35: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX)****Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)****Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG)**
4. Remove If equipped Power Transfer Unit Vent Hose @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

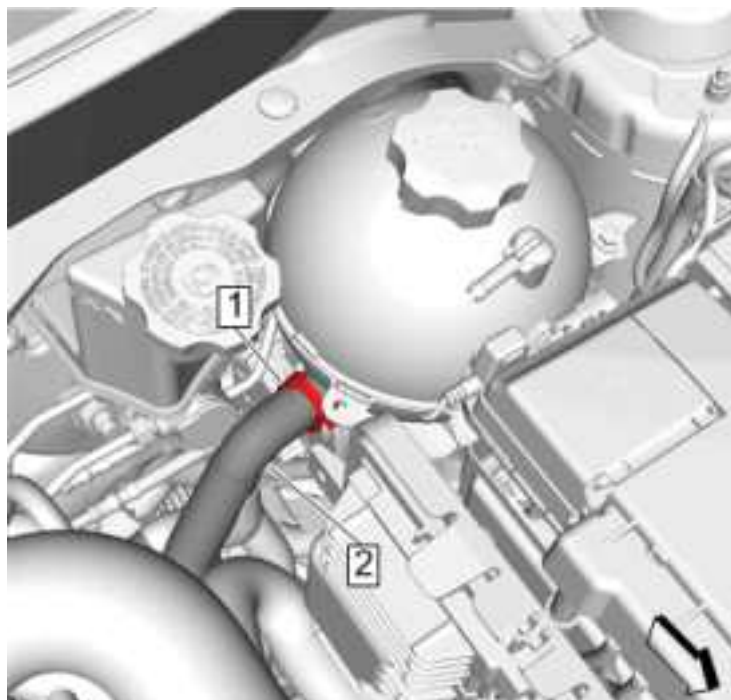


Fig. 36: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

5. Remove Heater Water Auxiliary Pump Inlet Hose (2) @ Radiator Surge Tank - **Heater Water Auxiliary Pump Inlet Hose Replacement (LYX with KL9)****Heater Water Auxiliary Pump Inlet Hose Replacement (LTG with KL9)**

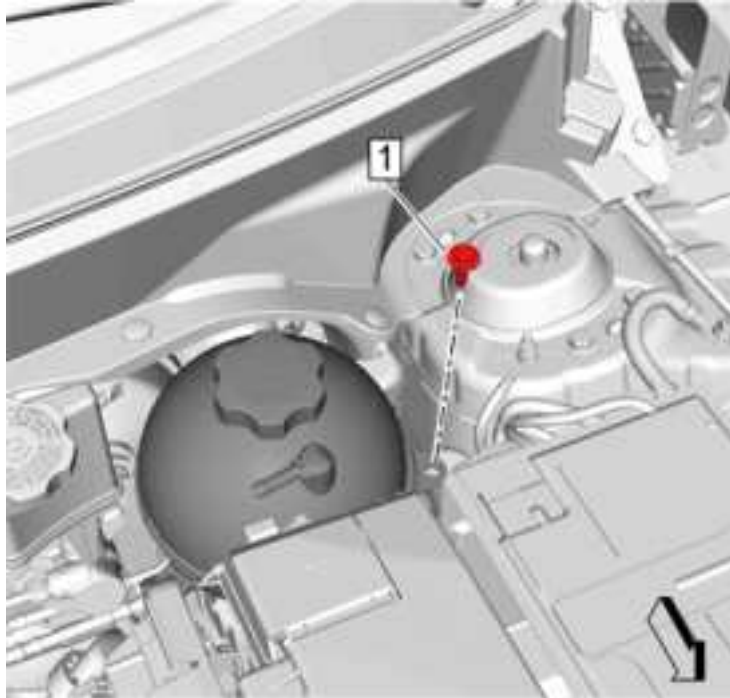


Fig. 37: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

6. Remove Radiator Surge Tank Bolt (1) @ Radiator Surge Tank.
7. Reposition the wiring harness.

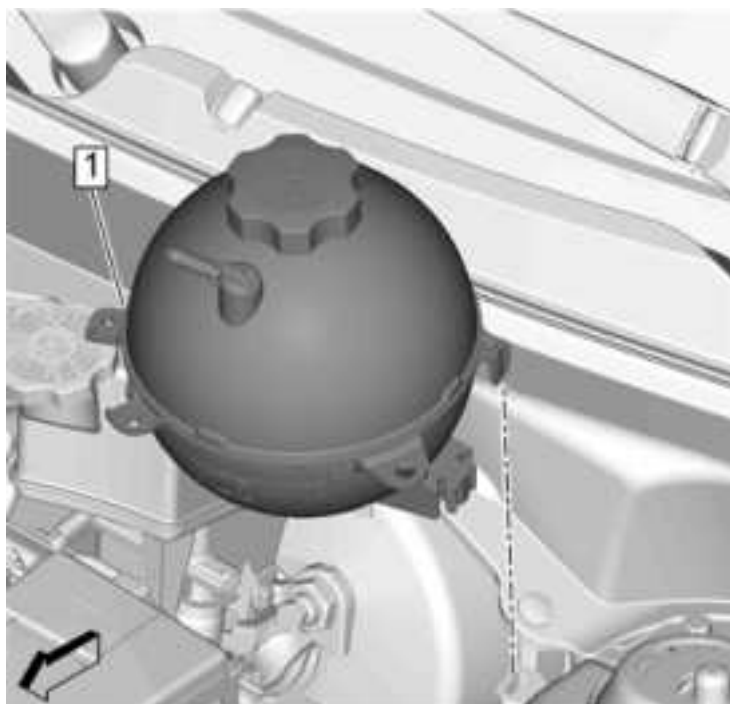


Fig. 38: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Surge Tank (1).

Installation Procedure

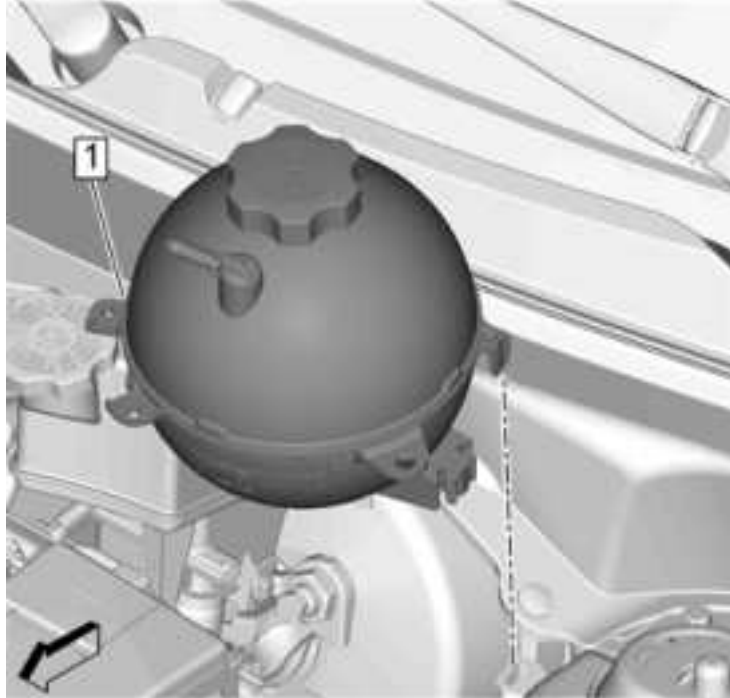


Fig. 39: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank (1).

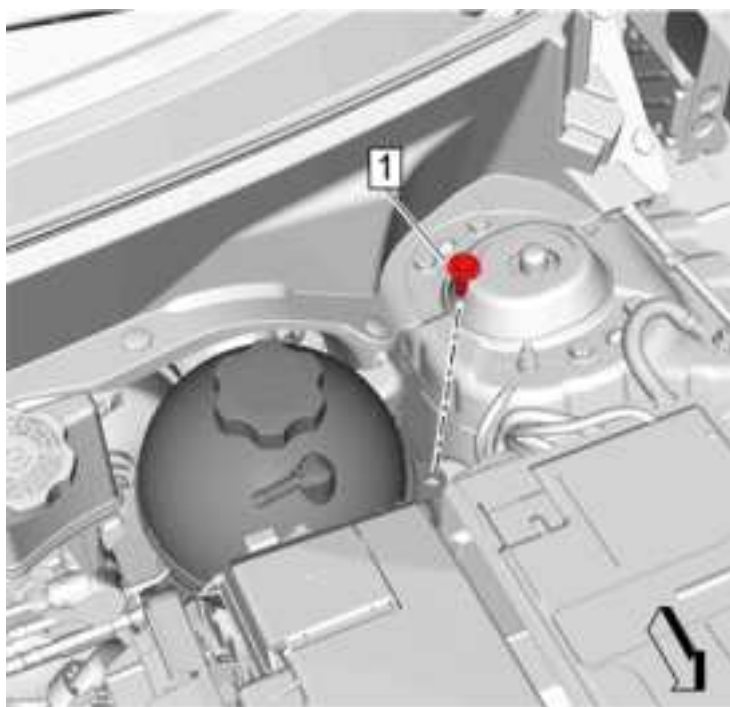


Fig. 40: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install Radiator Surge Tank Bolt (1) and tighten 9 N.m (80 lb in)
3. Reposition the wiring harness.

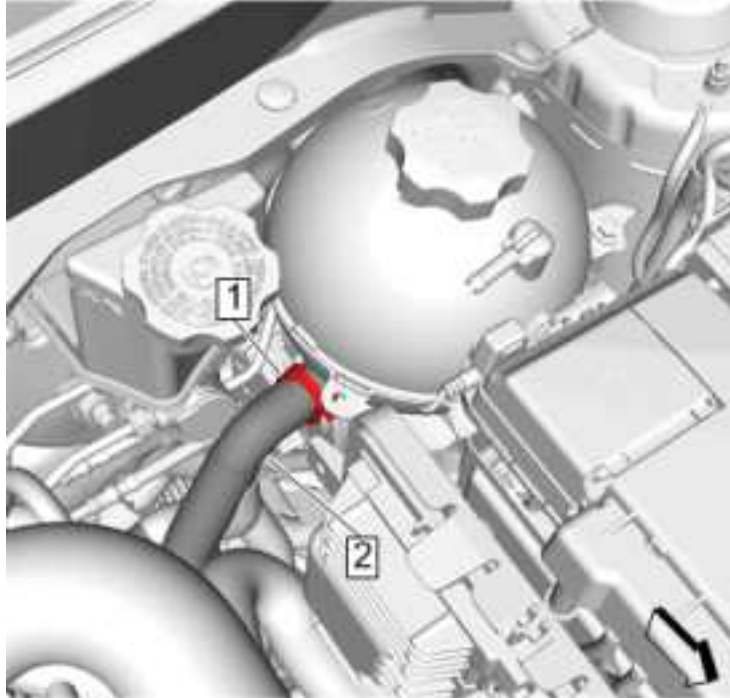


Fig. 41: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Install Heater Water Auxiliary Pump Inlet Hose (2) @ Radiator Surge Tank - **Heater Water Auxiliary Pump Inlet Hose Replacement (LYX with KL9) Heater Water Auxiliary Pump Inlet Hose Replacement (LTG with KL9)**
5. Install If equipped Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

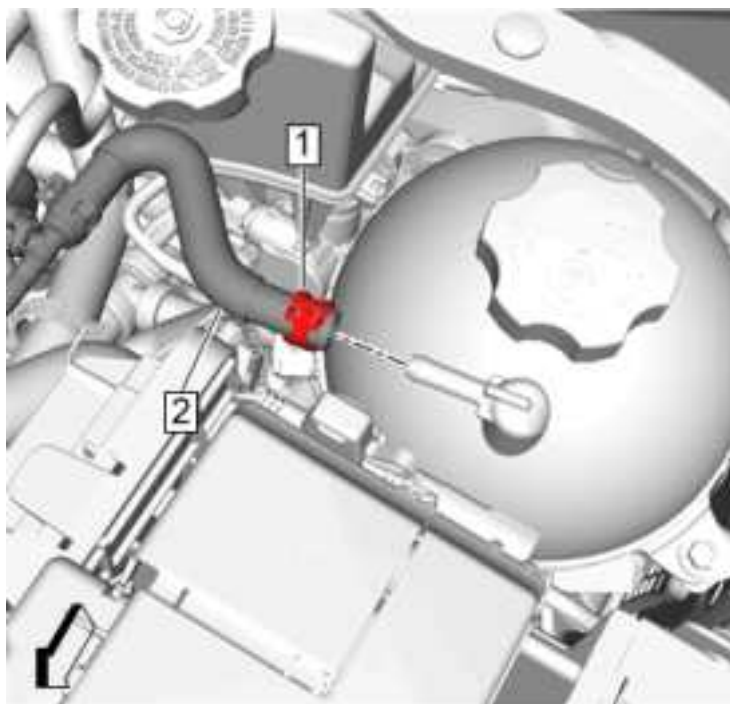


Fig. 42: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX) Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX) Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG)**

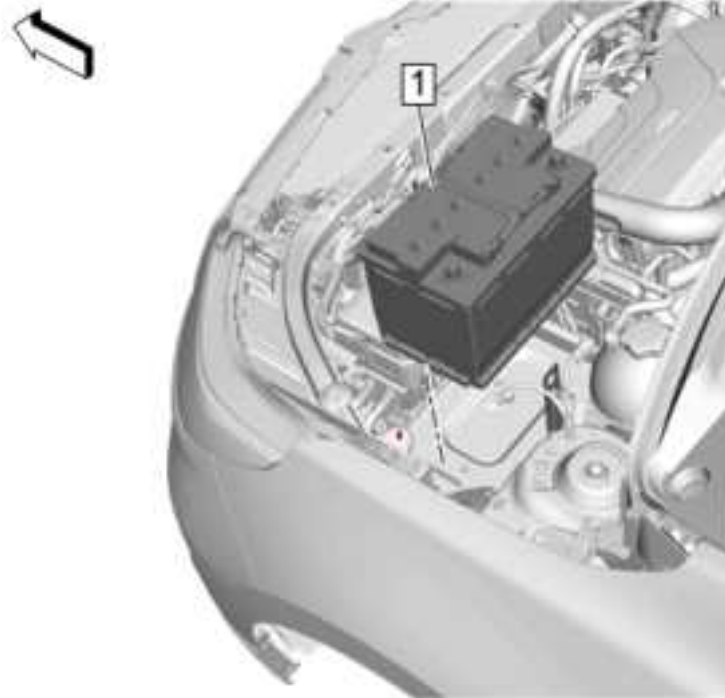


Fig. 43: Battery

Courtesy of GENERAL MOTORS COMPANY

7. Install Battery (1) - **Battery Replacement**
8. Fill the cooling system. **Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static)**
9. Check the cooling system for leaks.

RADIATOR SURGE TANK REPLACEMENT (LH7 FWD)

Removal Procedure

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

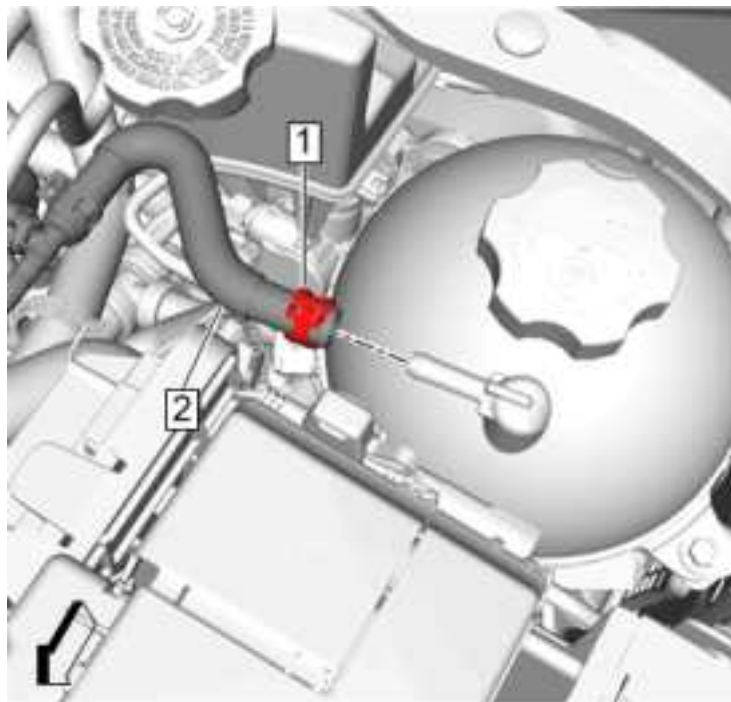


Fig. 44: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**

3. Remove {If equipped} Power Transfer Unit Vent Hose@Radiator Surge Tank - [Power Transfer Unit Vent Hose Replacement](#)

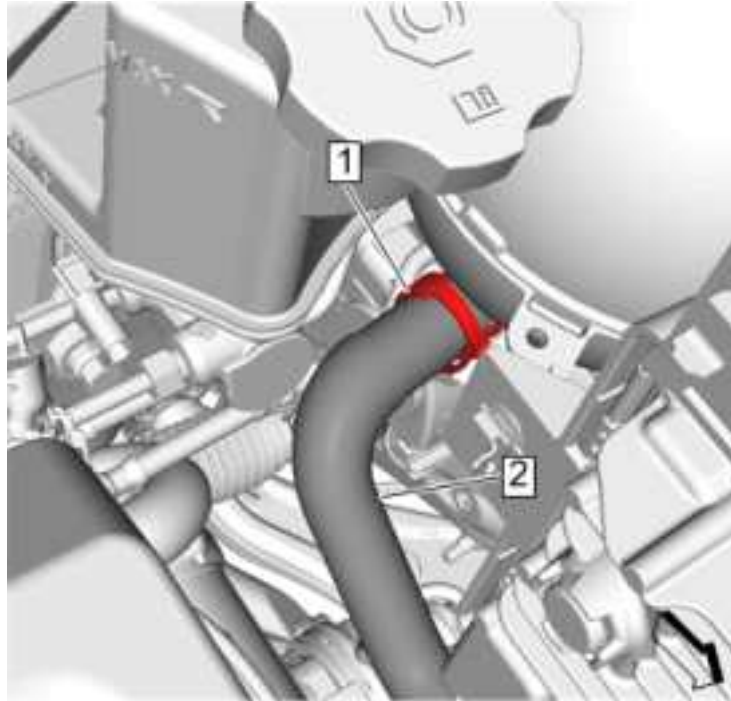


Fig. 45: Radiator Surge Tank Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank - [Radiator Surge Tank Outlet Hose Replacement \(LH7\)](#)

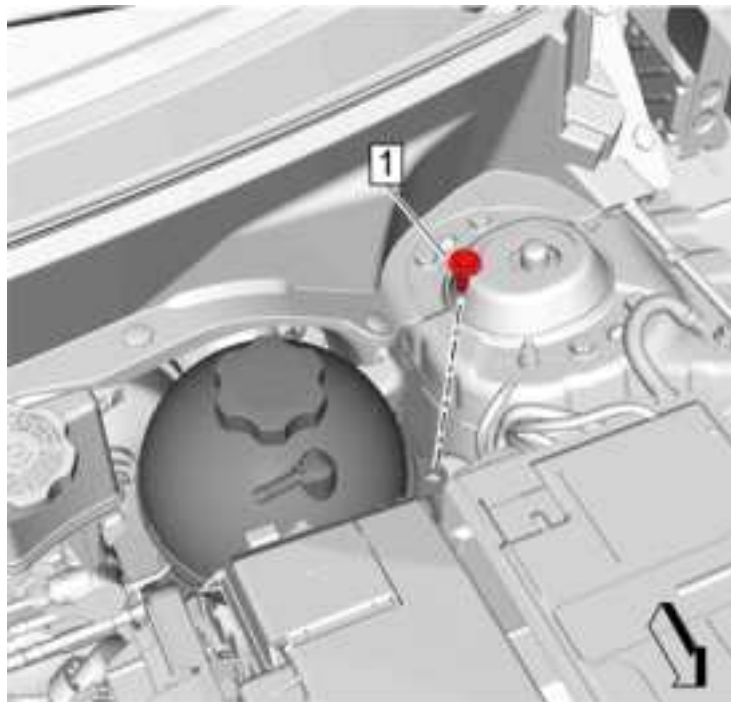


Fig. 46: Radiator Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Surge Tank Bolt (1) @ Radiator Surge Tank.
6. Reposition the wiring harness.

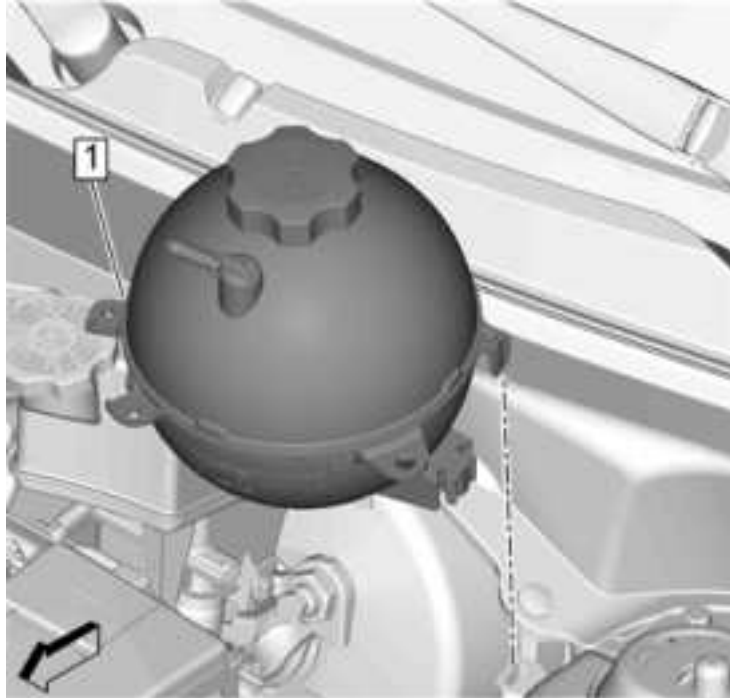


Fig. 47: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank (1).

Installation Procedure

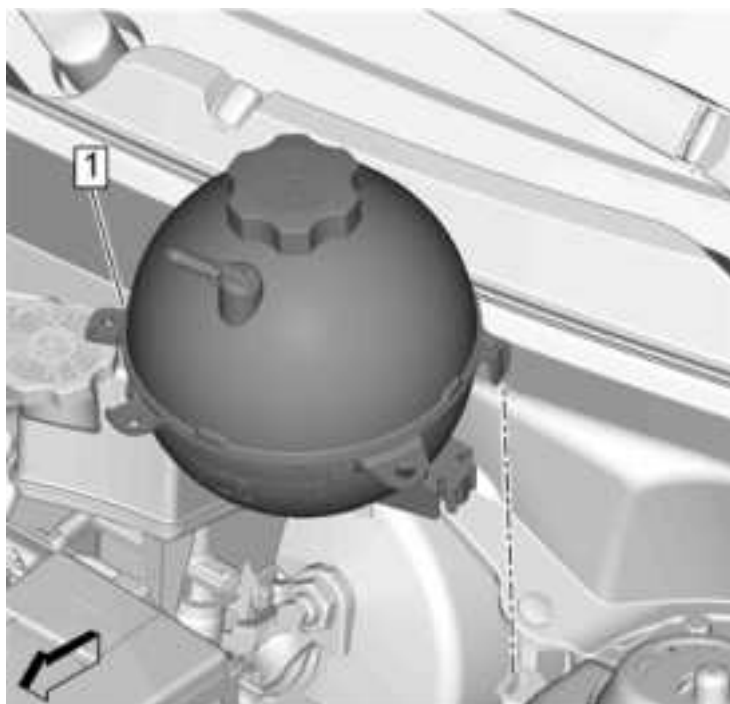


Fig. 48: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank (1).

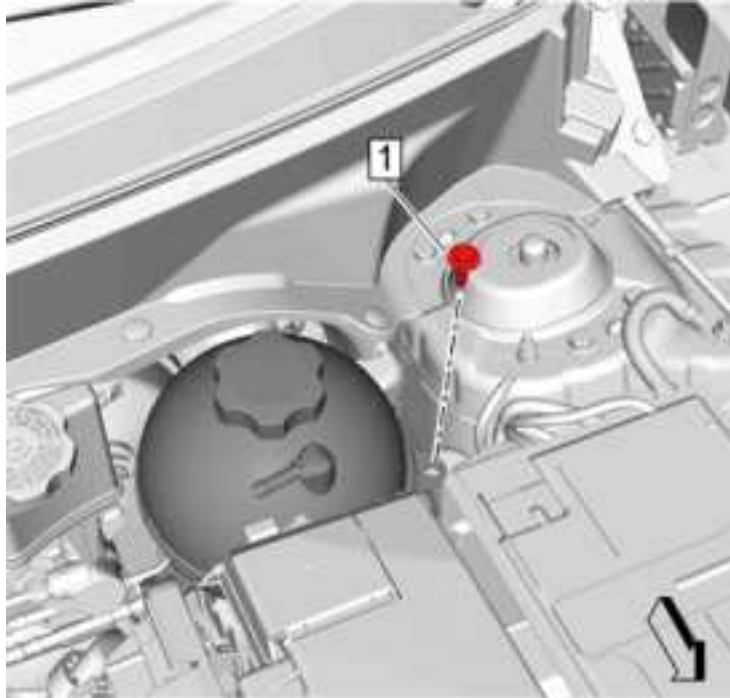


Fig. 49: Radiator Surge Tank Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install Radiator Surge Tank Bolt (1) and tighten 9 N.m (80 lb in)
3. Reposition the wiring harness.

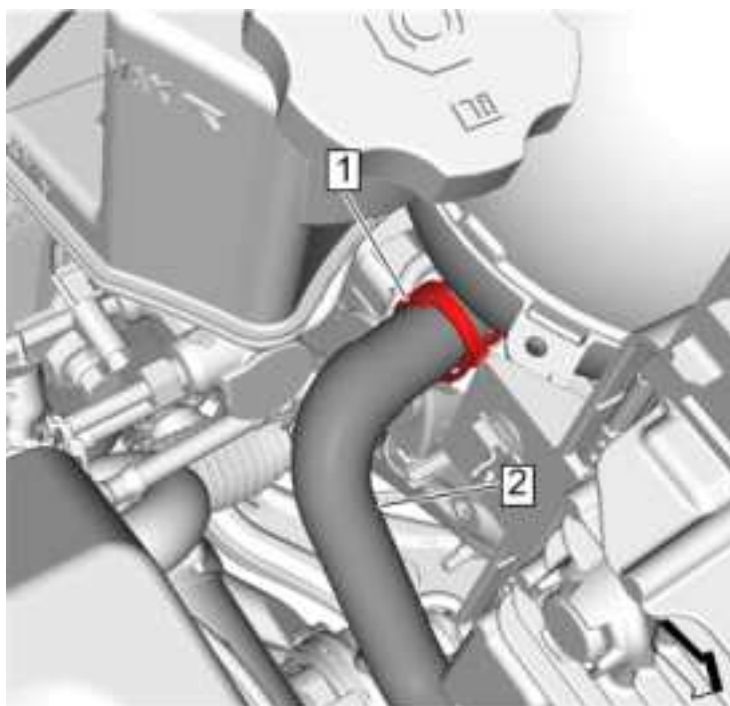


Fig. 50: Radiator Surge Tank Outlet Hose
 Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank - [Radiator Surge Tank Outlet Hose Replacement \(LH7\)](#).
5. Install {If equipped} Power Transfer Unit Vent Hose @ Radiator Surge Tank - [Power Transfer Unit Vent Hose Replacement](#)

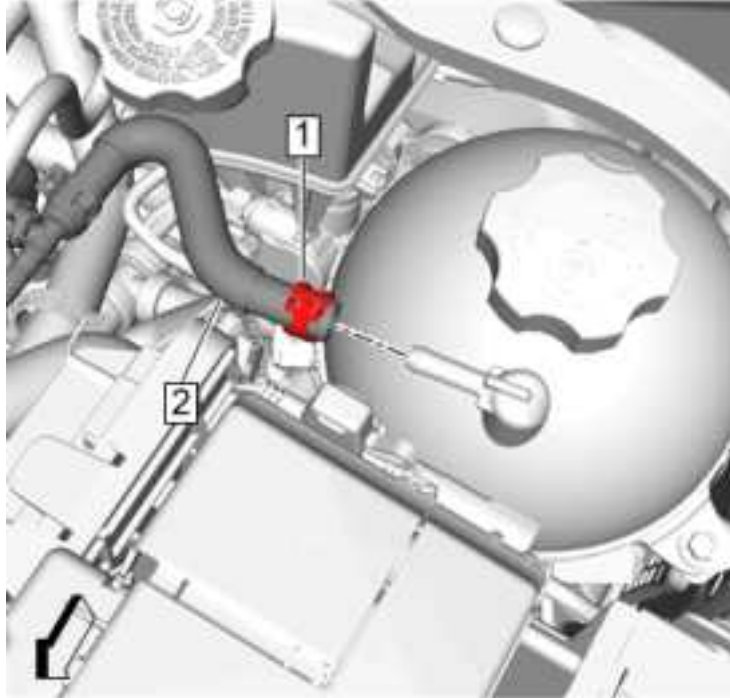


Fig. 51: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**
7. Fill the cooling system. Refer to **Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static)**
8. Check the cooling system for leaks.

RADIATOR SURGE TANK REPLACEMENT (LH7 AWD)

Removal Procedure

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

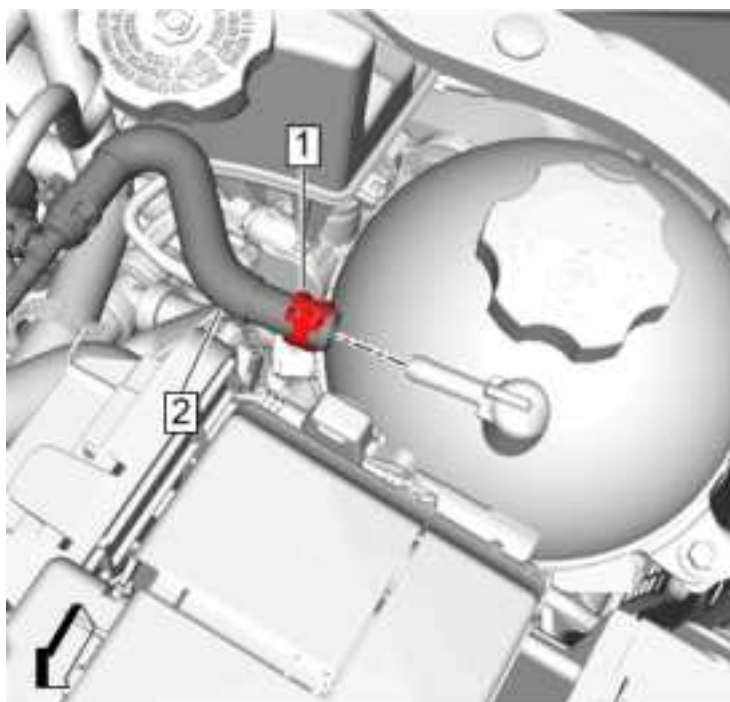


Fig. 52: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and**

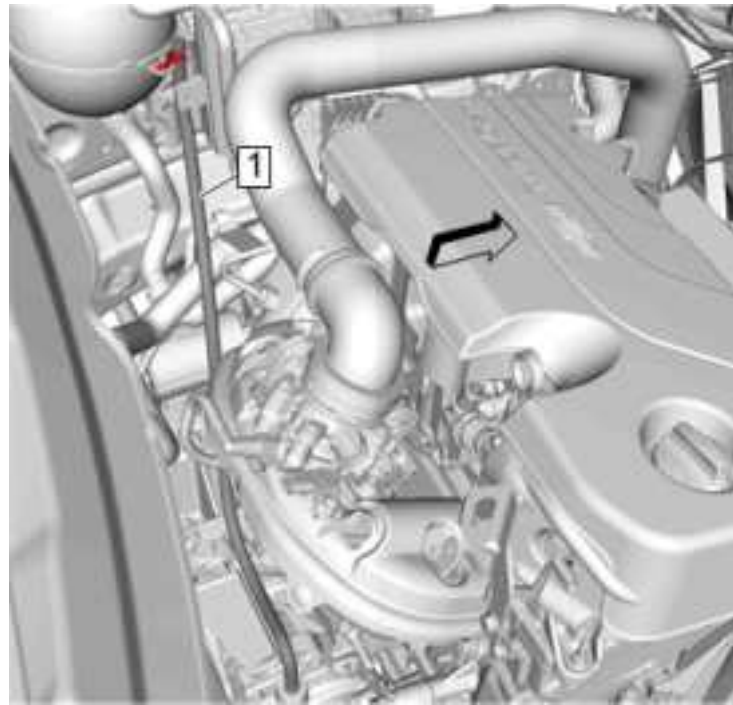


Fig. 53: Power Transfer Unit Vent Hose

Courtesy of GENERAL MOTORS COMPANY

3. Remove Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

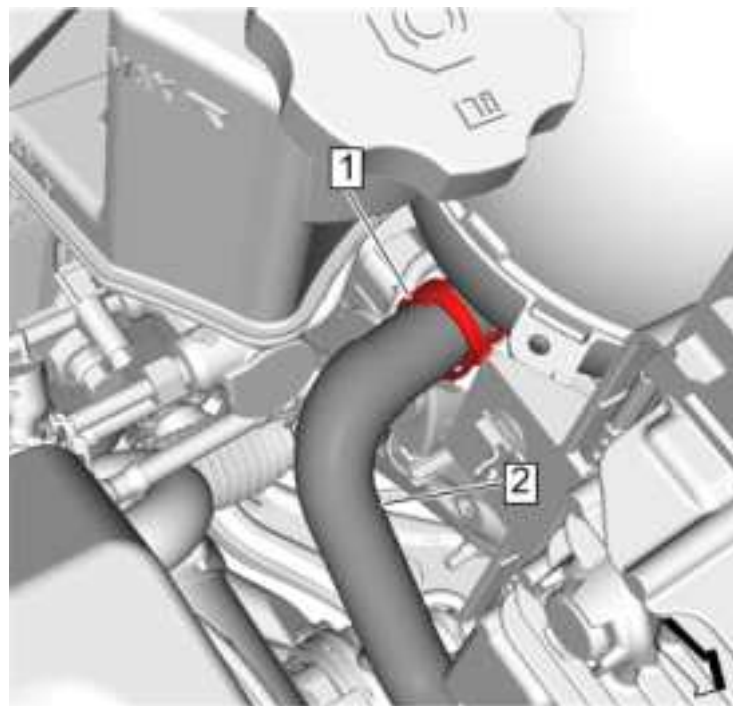


Fig. 54: Radiator Surge Tank Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank - **Radiator Surge Tank Outlet Hose Replacement (LH7).**

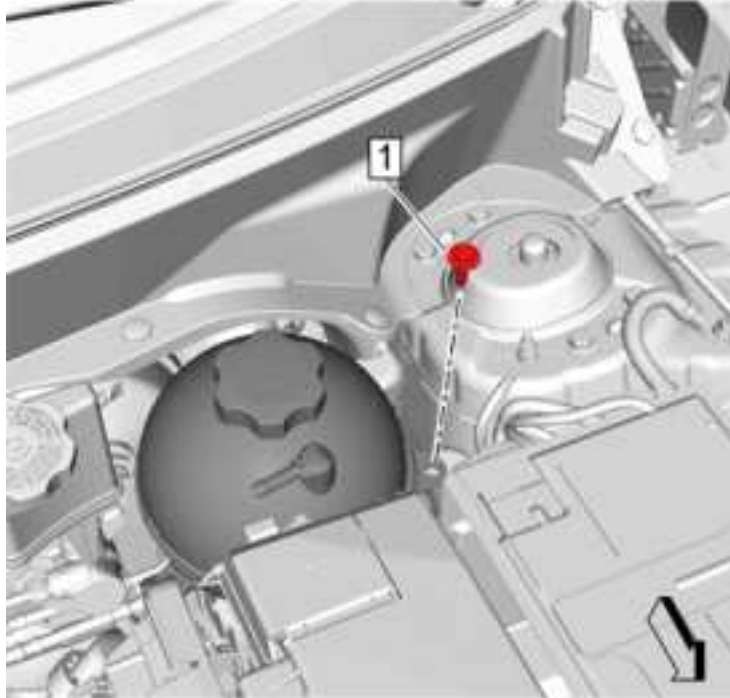


Fig. 55: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Surge Tank Bolt (1) @ Radiator Surge Tank.
6. Reposition the wiring harness.

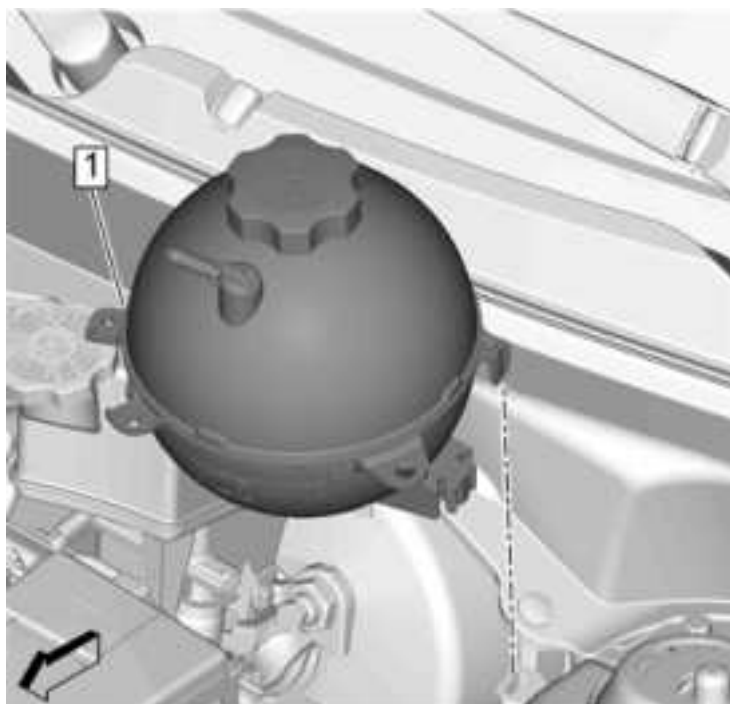


Fig. 56: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank (1).

Installation Procedure

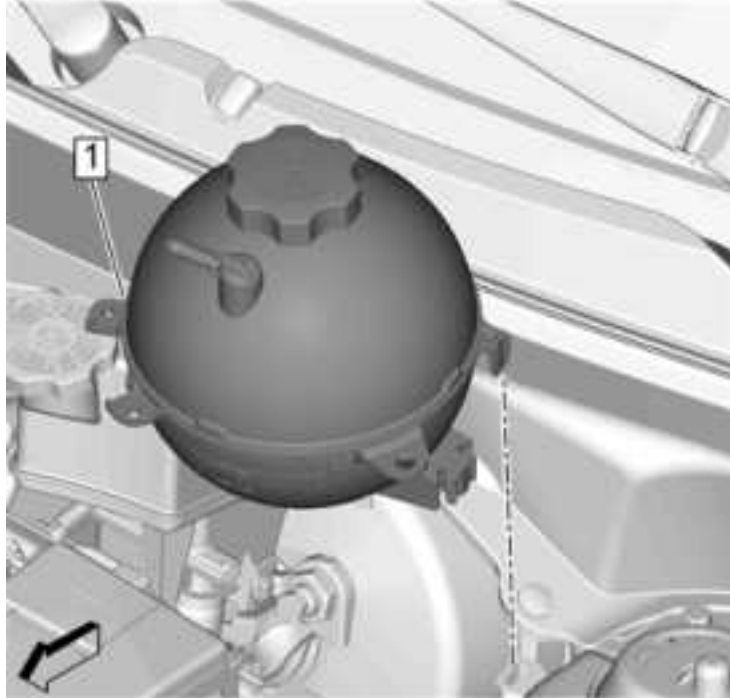


Fig. 57: Radiator Surge Tank

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank (1).

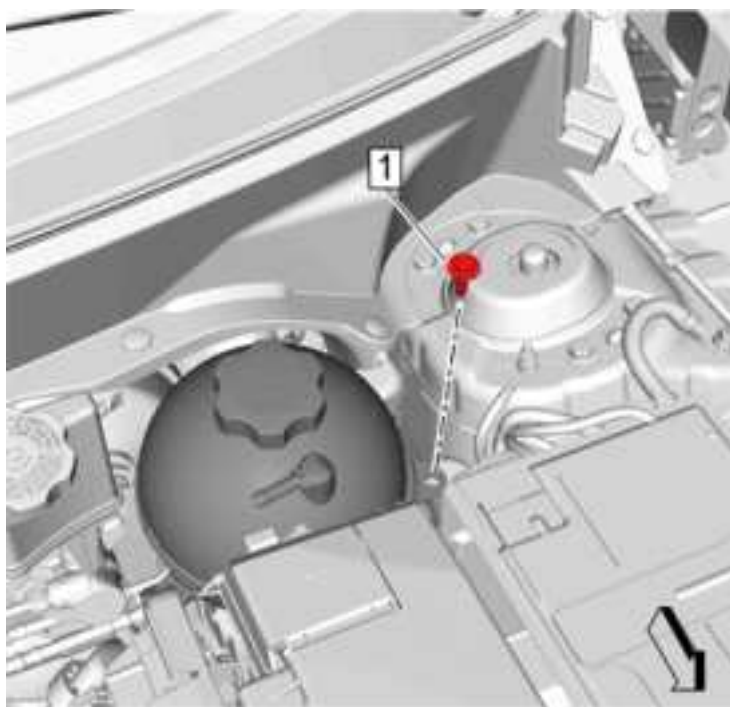


Fig. 58: Radiator Surge Tank Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install Radiator Surge Tank Bolt (1) and tighten 9 N.m (80 lb in)
3. Reposition the wiring harness.

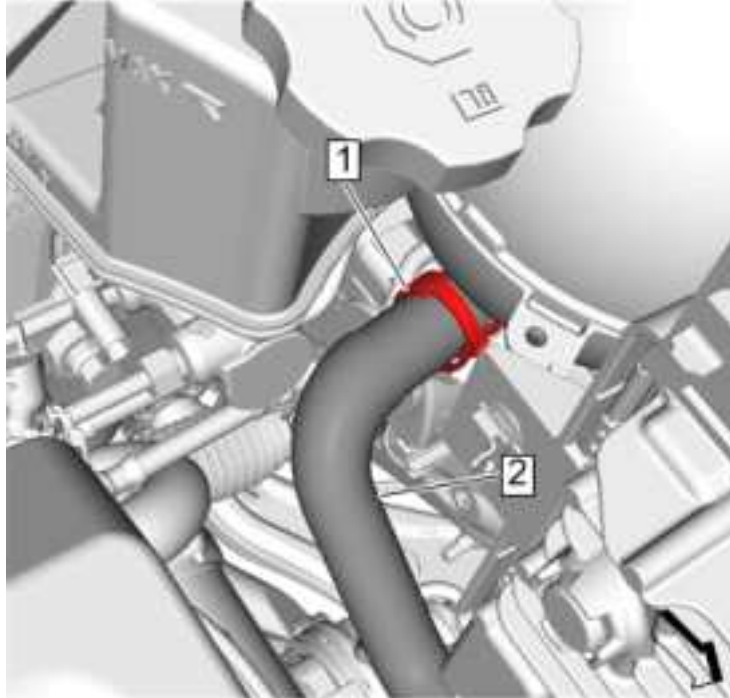


Fig. 59: Radiator Surge Tank Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank - **Radiator Surge Tank Outlet Hose Replacement (LH7)**

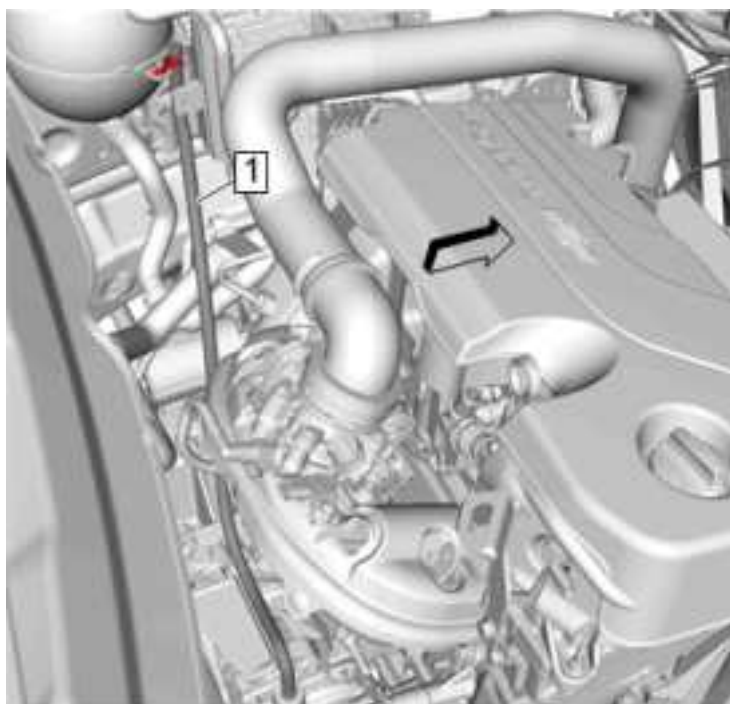


Fig. 60: Power Transfer Unit Vent Hose

Courtesy of GENERAL MOTORS COMPANY

5. Install Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

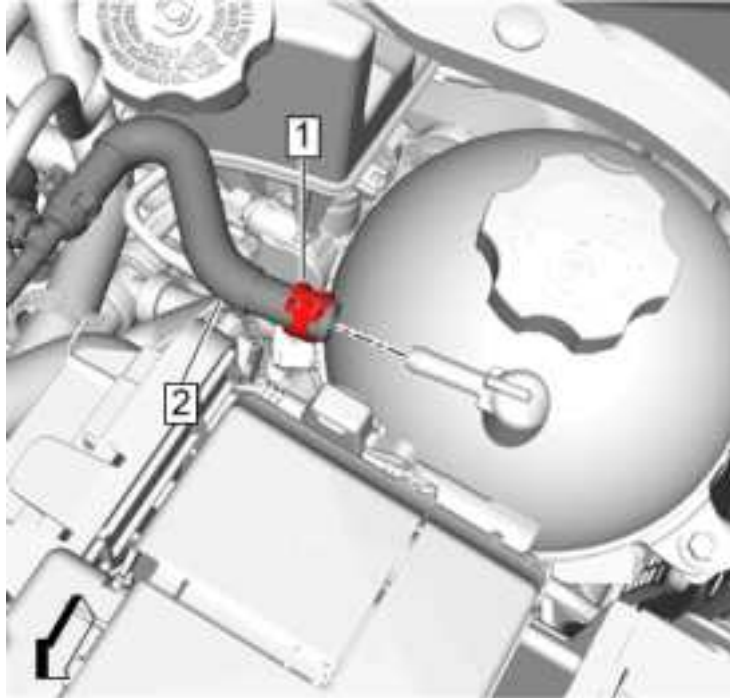


Fig. 61: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**
7. Fill the cooling system. Refer to **Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static)**
8. Check the cooling system for leaks.

RADIATOR SURGE TANK OUTLET HOSE REPLACEMENT (LH7)

Removal Procedure

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

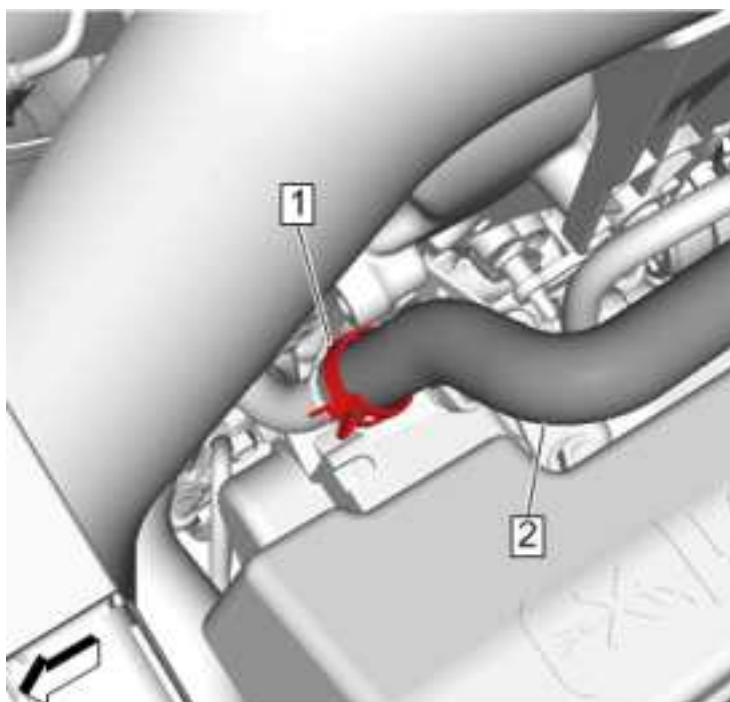


Fig. 62: Radiator Surge Tank Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

2. Disengage Radiator Surge Tank Outlet Hose Clamp (1) - **Hose Clamp Replacement Guidelines - Spring Type**

3. Remove Radiator Surge Tank Outlet Hose (2) @ Thermostat Bypass Pipe.
4. Reposition the wiring harness.
5. Reposition Engine Coolant Air Bleed Hose - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7\)](#)

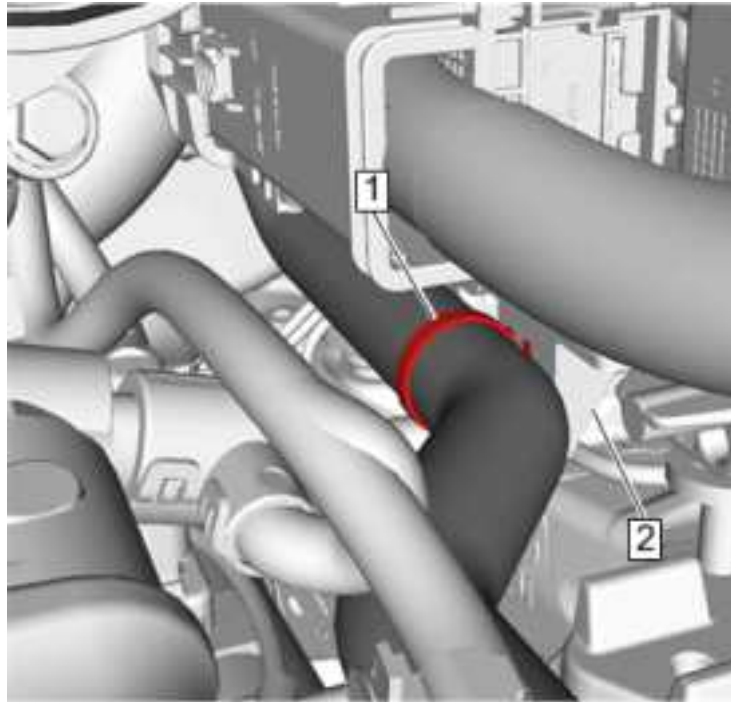


Fig. 63: Radiator Surge Tank Outlet Hose Strap
Courtesy of GENERAL MOTORS COMPANY

6. Remove Radiator Surge Tank Outlet Hose Strap (1) @ Engine Control Module Bracket (2).

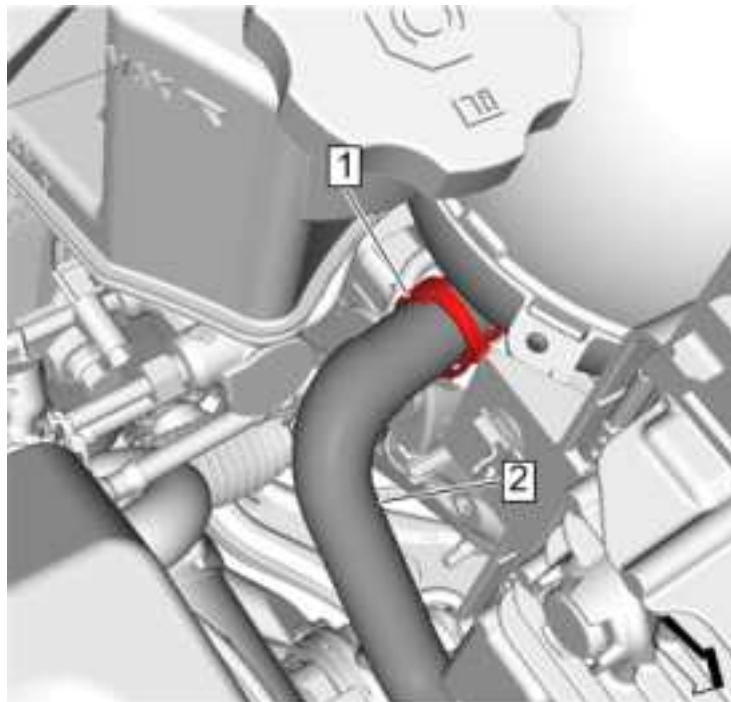


Fig. 64: Radiator Surge Tank Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Disengage Radiator Surge Tank Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
8. Remove Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank.
9. Remove Radiator Surge Tank Outlet Hose (2).

Installation Procedure

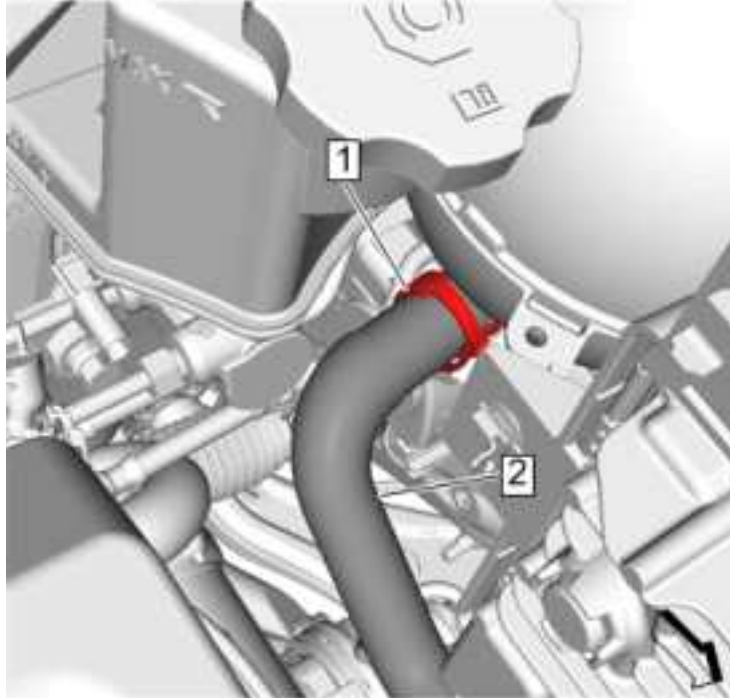


Fig. 65: Radiator Surge Tank Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank Outlet Hose (2) @ Radiator Surge Tank.
2. Engage Radiator Surge Tank Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

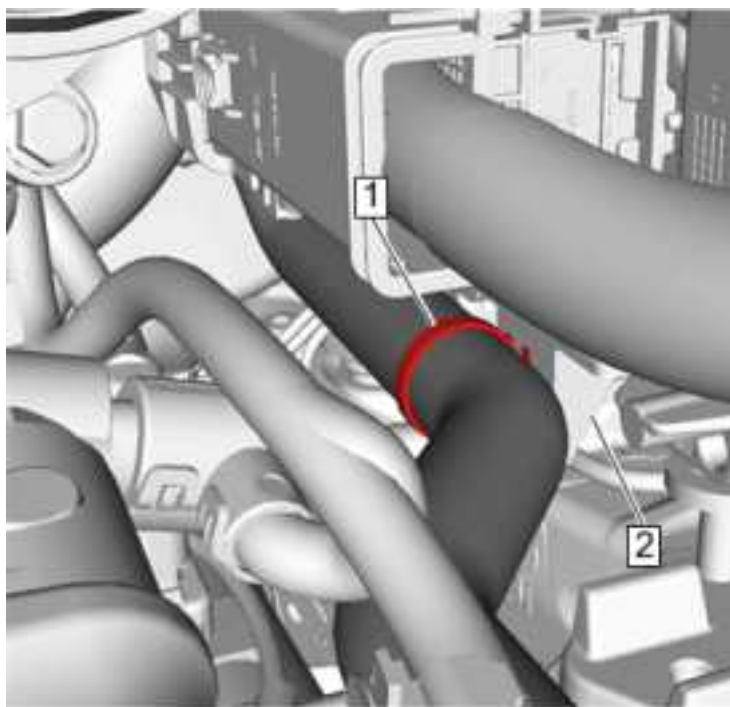


Fig. 66: Radiator Surge Tank Outlet Hose Strap
Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Surge Tank Outlet Hose Strap (1) @ Engine Control Module Bracket (2).
4. Reposition Engine Coolant Air Bleed Hose - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7\)](#)
5. Reposition the wiring harness.

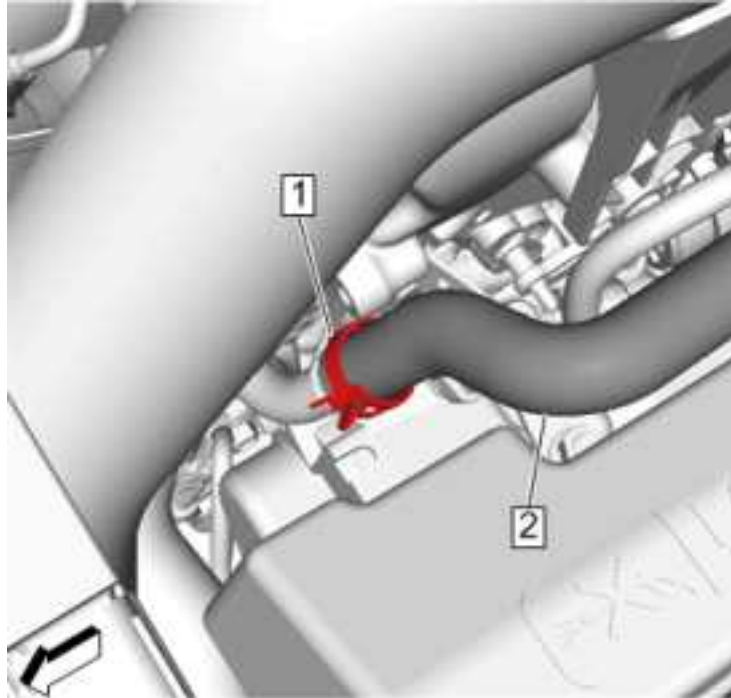


Fig. 67: Radiator Surge Tank Outlet Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

6. Install Radiator Surge Tank Outlet Hose (2) @ Thermostat Bypass Pipe.
7. Engage Radiator Surge Tank Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
8. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
9. Check the cooling system for leaks.

RADIATOR INLET HOSE REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)

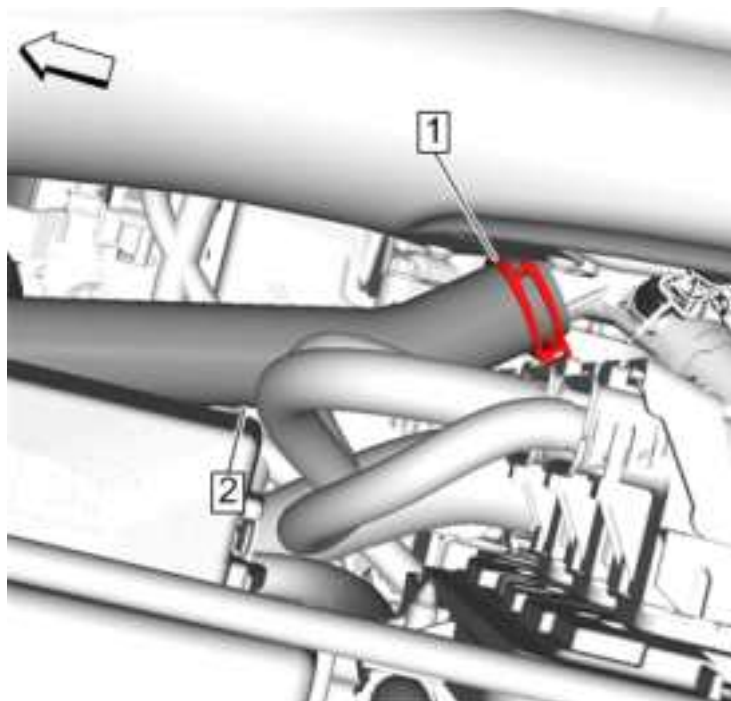


Fig. 68: Radiator Inlet Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

2. Disengage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

3. Remove Radiator Inlet Hose (2) @ Water Outlet.

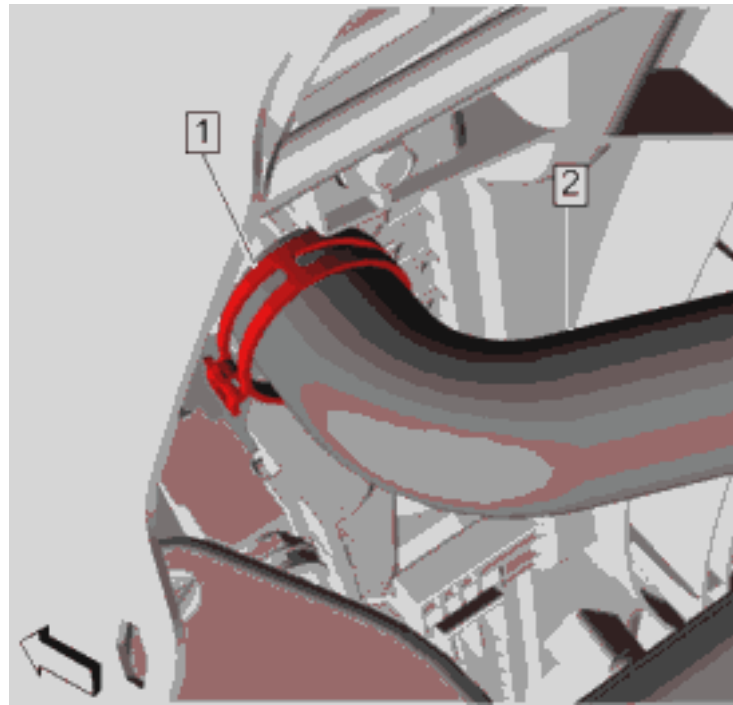


Fig. 69: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

4. Disengage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Remove Radiator Inlet Hose (2) @ - Radiator
6. Remove Radiator Inlet Hose (2).

Installation Procedure

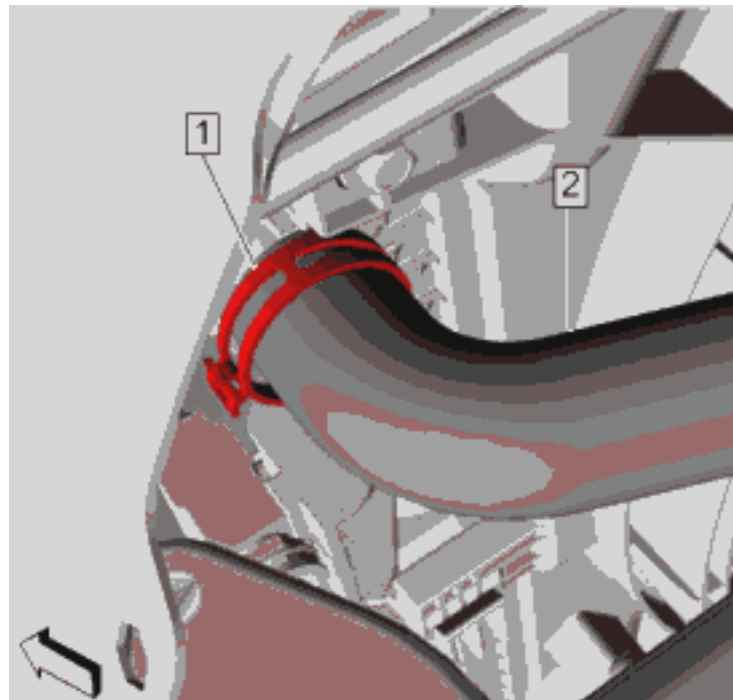


Fig. 70: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Hose (2) @ - Radiator.
2. Engage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

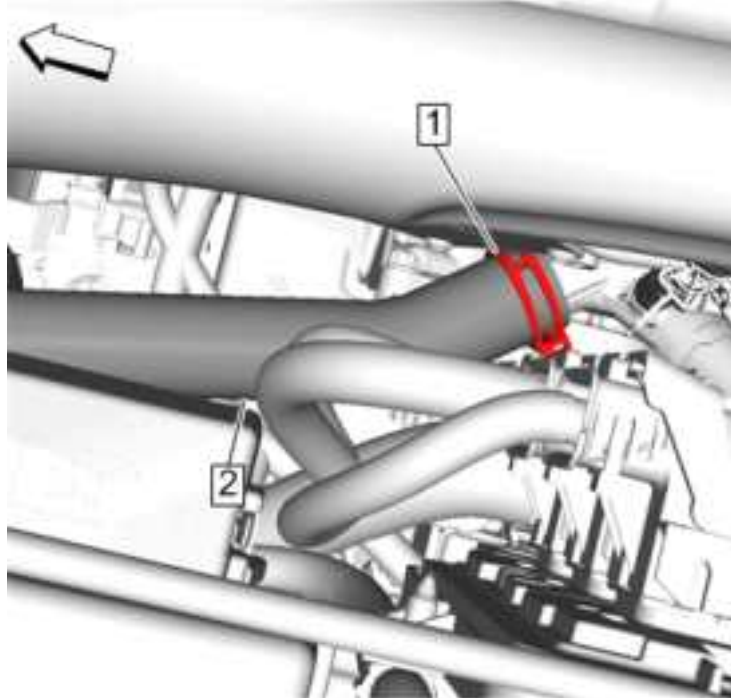


Fig. 71: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Inlet Hose (2) @Water Outlet.
4. Engage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
6. Start the engine and inspect for leaks.

RADIATOR INLET HOSE REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

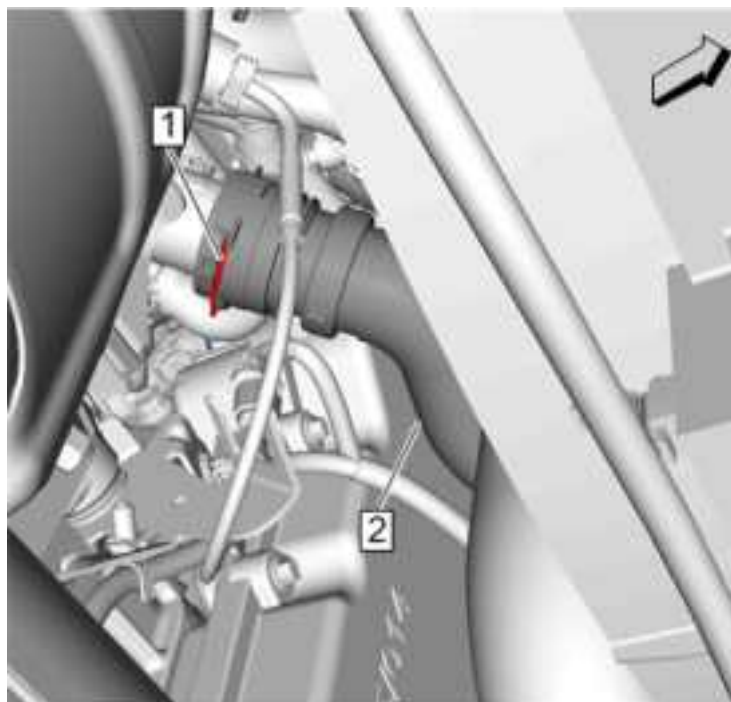


Fig. 72: Radiator Inlet Hose Retainer

Courtesy of GENERAL MOTORS COMPANY

2. Disengage Radiator Inlet Hose Retainer (1).
3. Remove Radiator Inlet Hose (2) @ Water Outlet.

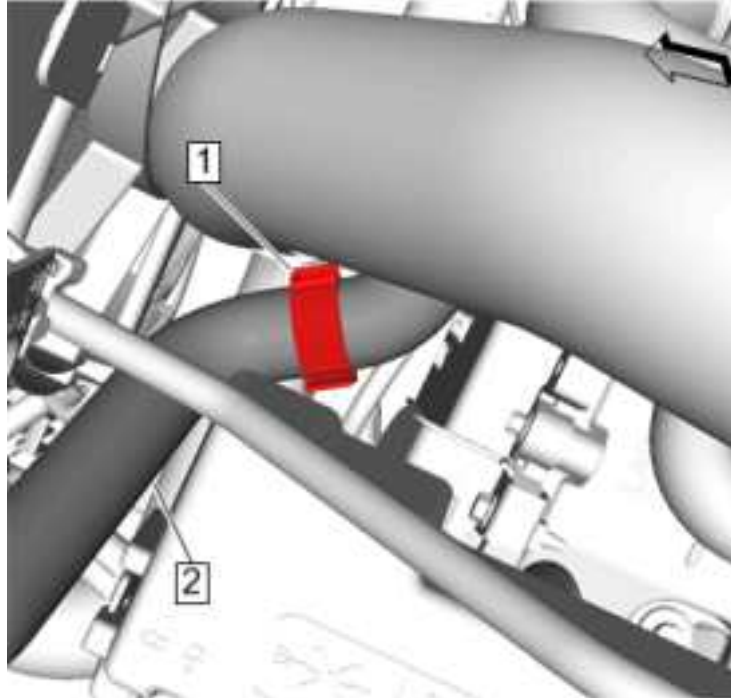


Fig. 73: Radiator Outlet Hose Clip And Radiator Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Outlet Hose Clip (1) @ Radiator Inlet Hose (2).

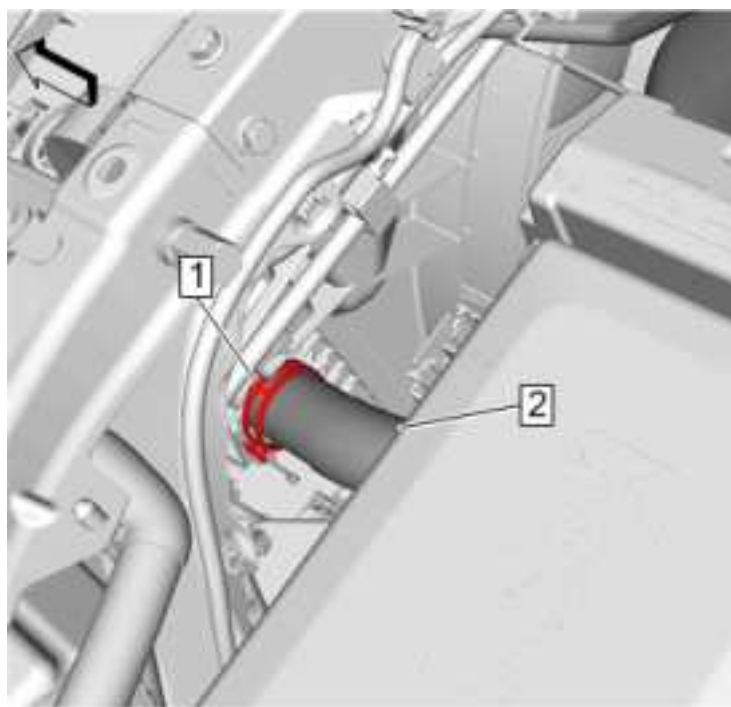


Fig. 74: Radiator Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
6. Remove Radiator Inlet Hose (2) @ - Radiator.
7. Remove Radiator Inlet Hose (2).

Installation Procedure

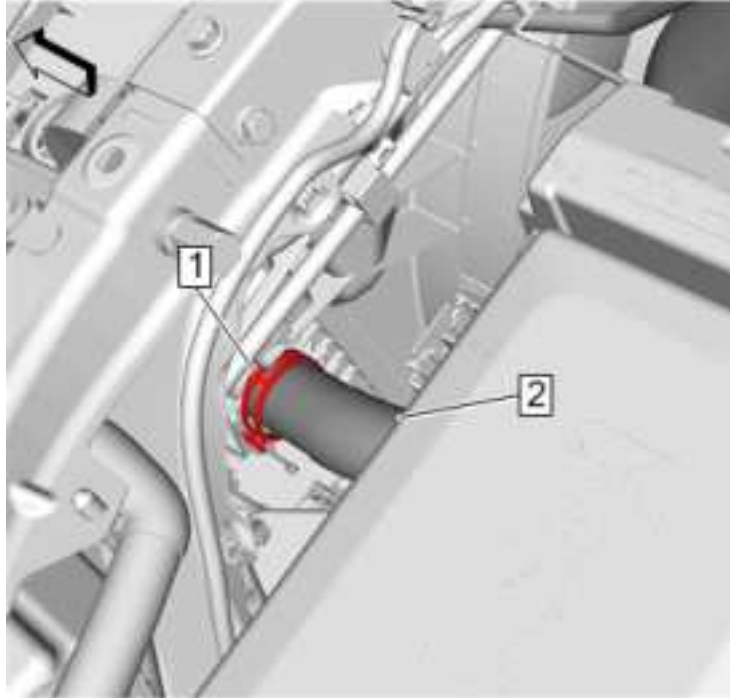


Fig. 75: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Hose (2) @ - Radiator.
2. Engage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

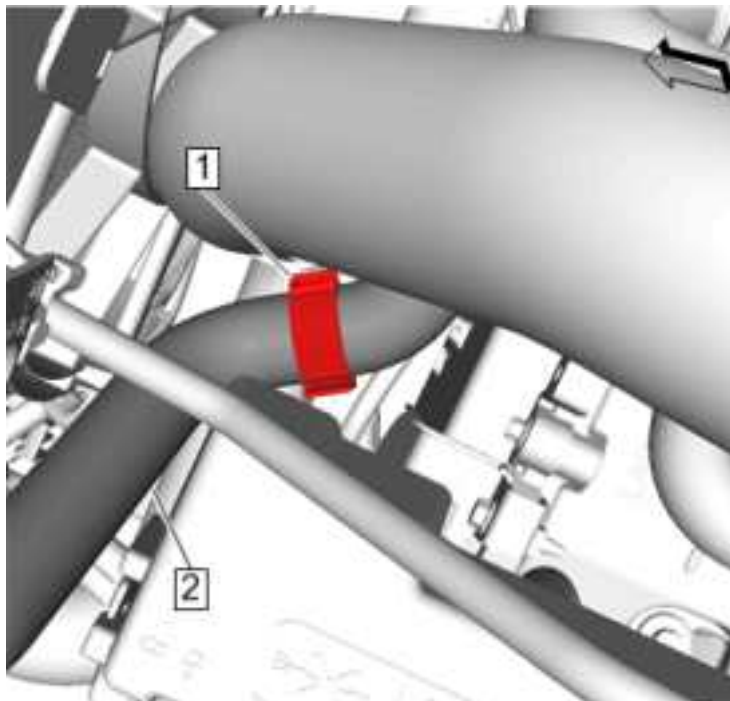


Fig. 76: Radiator Outlet Hose Clip And Radiator Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Outlet Hose Clip (1) @ Radiator Inlet Hose (2).

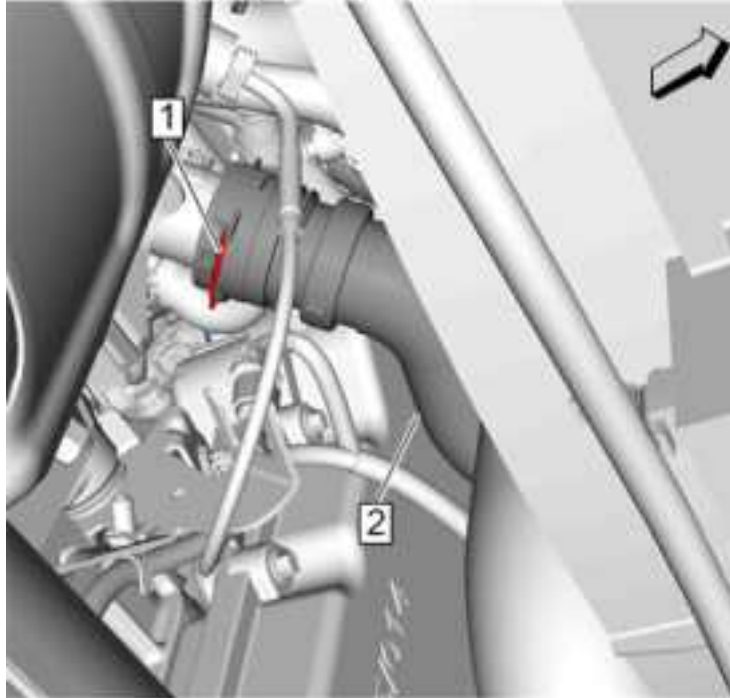


Fig. 77: Radiator Inlet Hose Retainer

Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Inlet Hose (2) @ Water Outlet.
5. Engage Radiator Inlet Hose Retainer (1).
6. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
7. Start the engine and inspect for leaks.

RADIATOR INLET HOSE REPLACEMENT (LTG WITH KL9)

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#).
2. Reposition Wiring Harnesses.

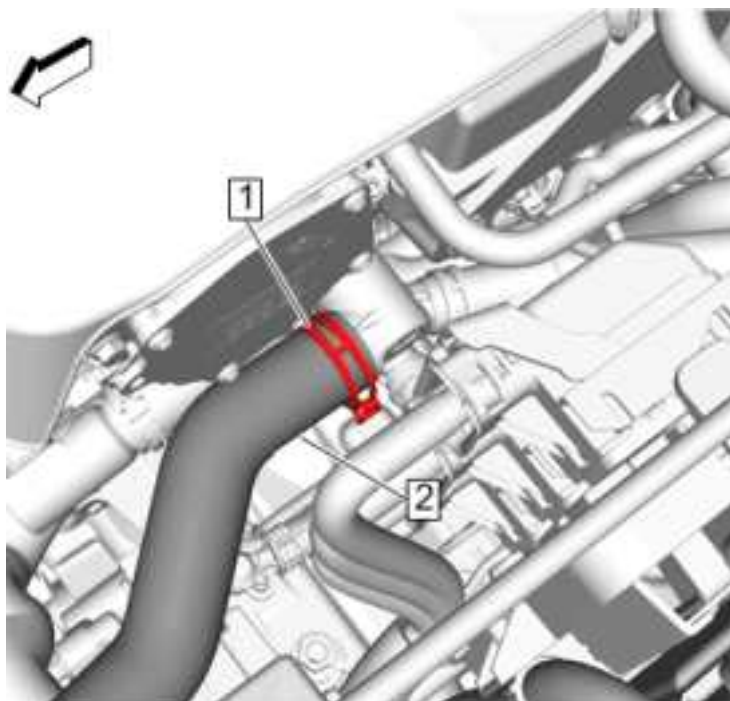


Fig. 78: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Disengage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

4. Remove Radiator Inlet Hose (2) @ Water Outlet.

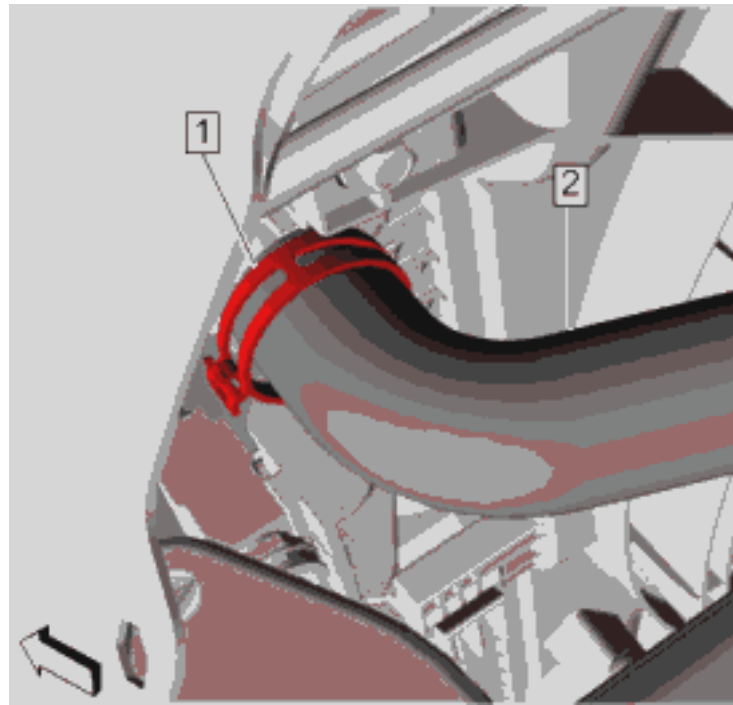


Fig. 79: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Disengage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
6. Remove Radiator Inlet Hose (2) @ - Radiator.
7. Remove Radiator Inlet Hose (2).

Installation Procedure

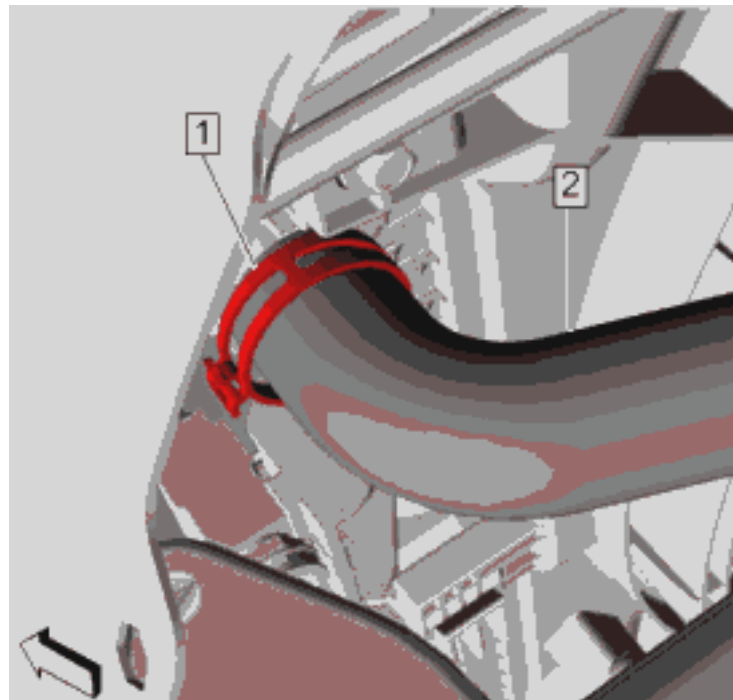


Fig. 80: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Hose (2) @ - Radiator.
2. Engage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

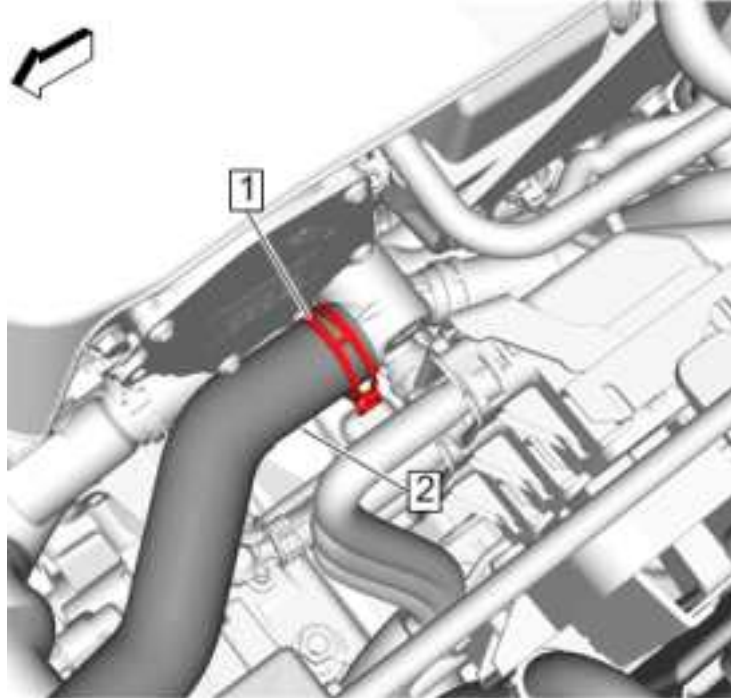


Fig. 81: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Inlet Hose (2) @ Water Outlet.
4. Engage Radiator Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Reposition Wiring Harnesses.
6. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
7. Start the engine and inspect for leaks.

RADIATOR OUTLET HOSE REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
2. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#), [Front Bumper Fascia Replacement \(Terrain\)](#)

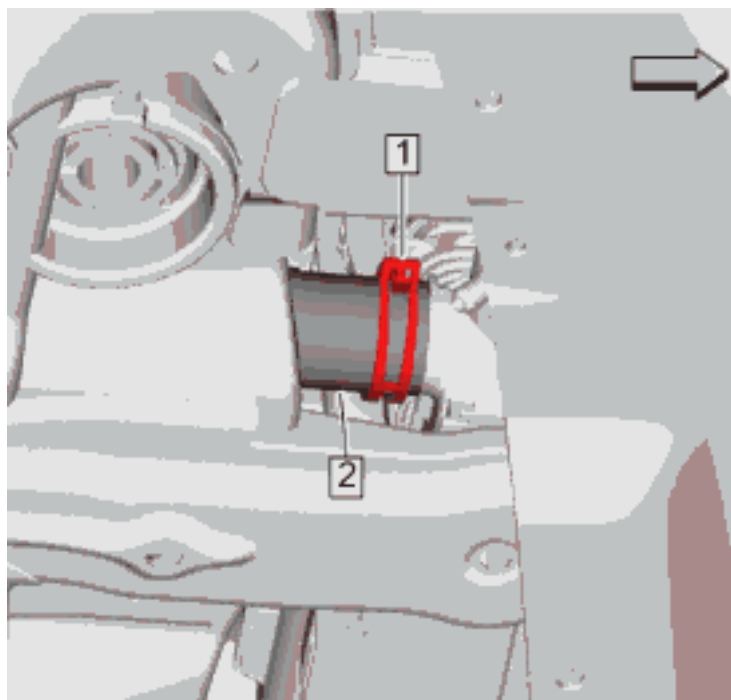


Fig. 82: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Disengage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
4. Remove Radiator Outlet Hose (2) @ Radiator.

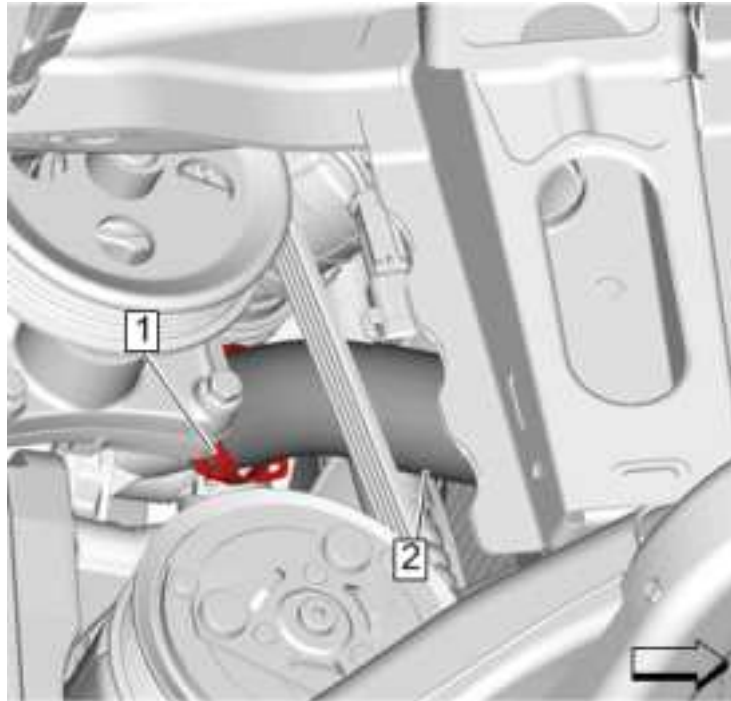


Fig. 83: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Disengage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
6. Remove Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
7. Remove Radiator Outlet Hose (2).

Installation Procedure

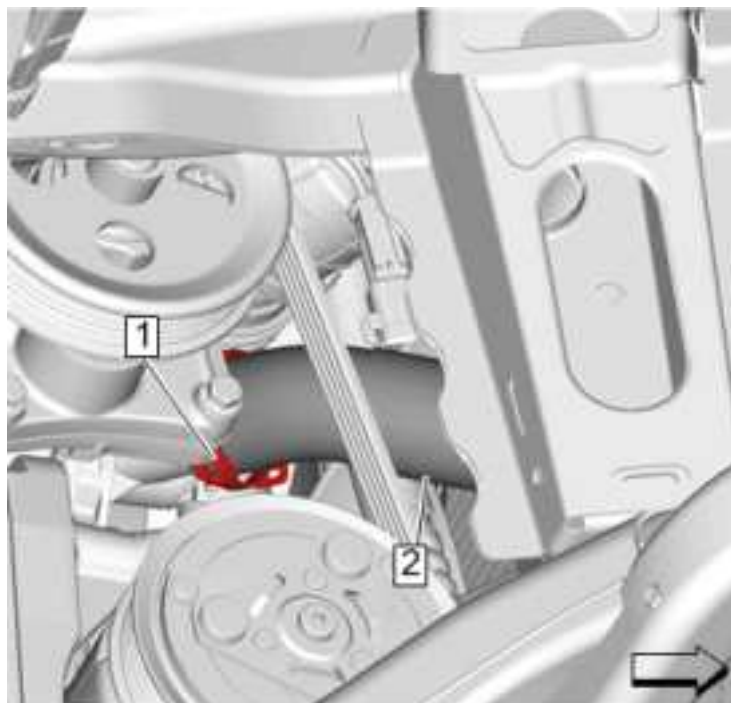


Fig. 84: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
2. Engage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

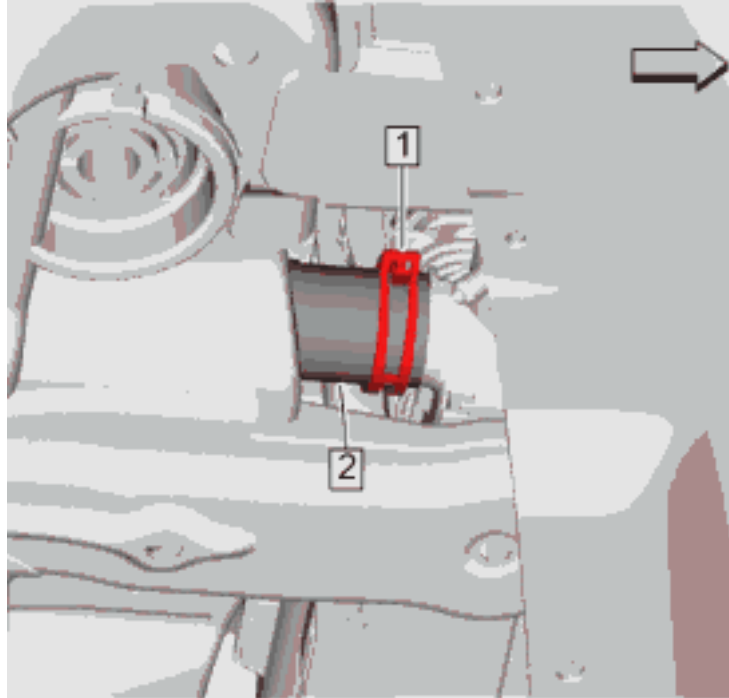


Fig. 85: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Outlet Hose (2) @ Radiator.
4. Engage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Install Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)
6. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)](#) [Cooling System Draining and Filling \(Static\)](#)
7. Start the engine and check for coolant leaks.

RADIATOR OUTLET HOSE REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)](#) [Cooling System Draining and Filling \(Static\)](#)
2. Remove Underbody Front Air Deflector - [Underbody Front Air Deflector Replacement \(Equinox\)](#) [Underbody Front Air Deflector Replacement \(Terrain\)](#)

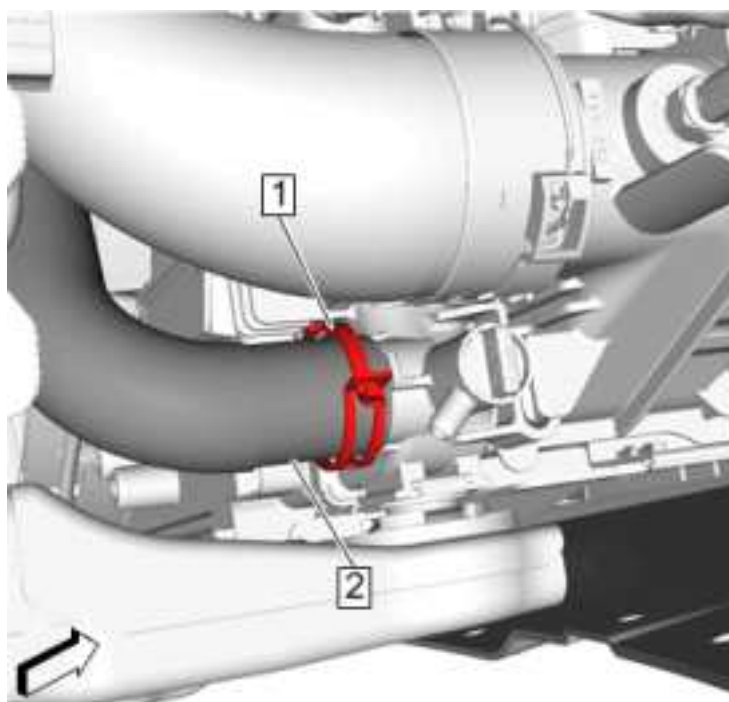


Fig. 86: Radiator Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Disengage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
4. Remove Radiator Outlet Hose (2) @ Radiator.

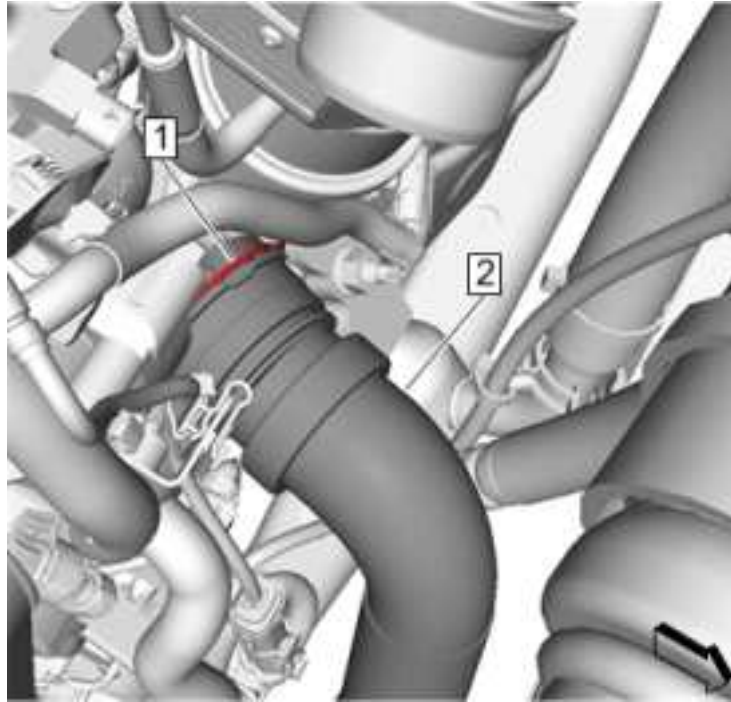


Fig. 87: Radiator Outlet Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

5. Disengage Radiator Outlet Hose Retainer (1).
6. Remove Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
7. Remove Radiator Outlet Hose (2).

Installation Procedure

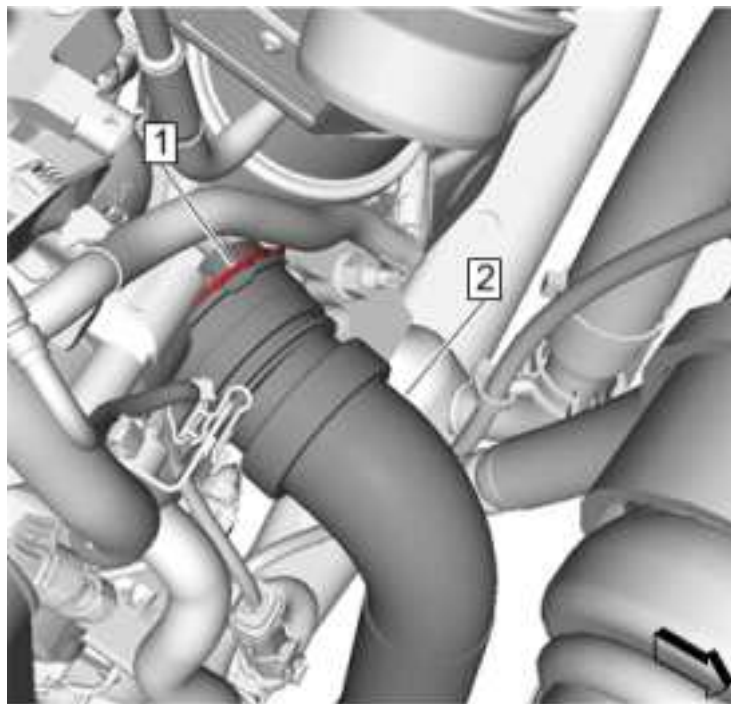


Fig. 88: Radiator Outlet Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
2. Engage Radiator Outlet Hose Retainer (1).

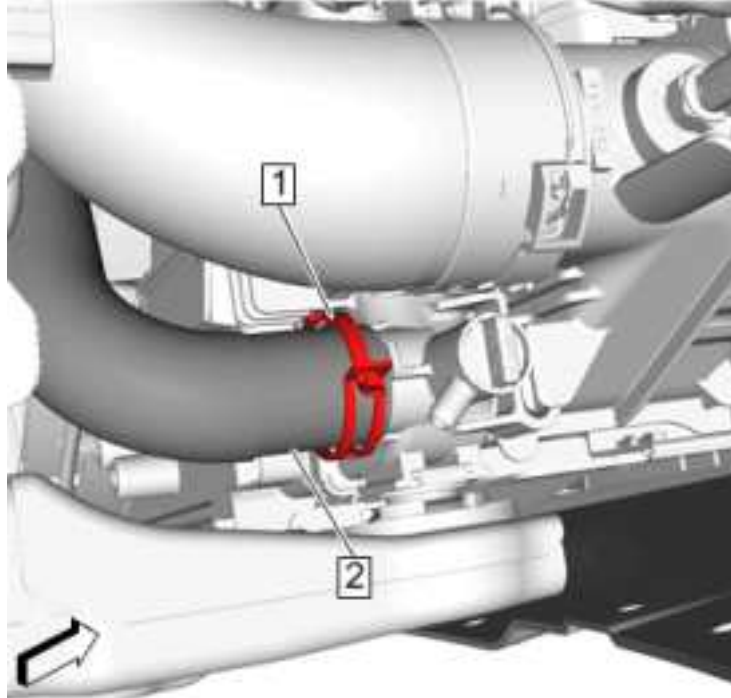


Fig. 89: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Outlet Hose (2) @ Radiator.
4. Engage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Install Underbody Front Air Deflector - [Underbody Front Air Deflector Replacement \(Equinox\)](#)
[Underbody Front Air Deflector Replacement \(Terrain\)](#)
6. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
7. Start the engine and check for coolant leaks.

RADIATOR OUTLET HOSE REPLACEMENT (LTG WITH KL9)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

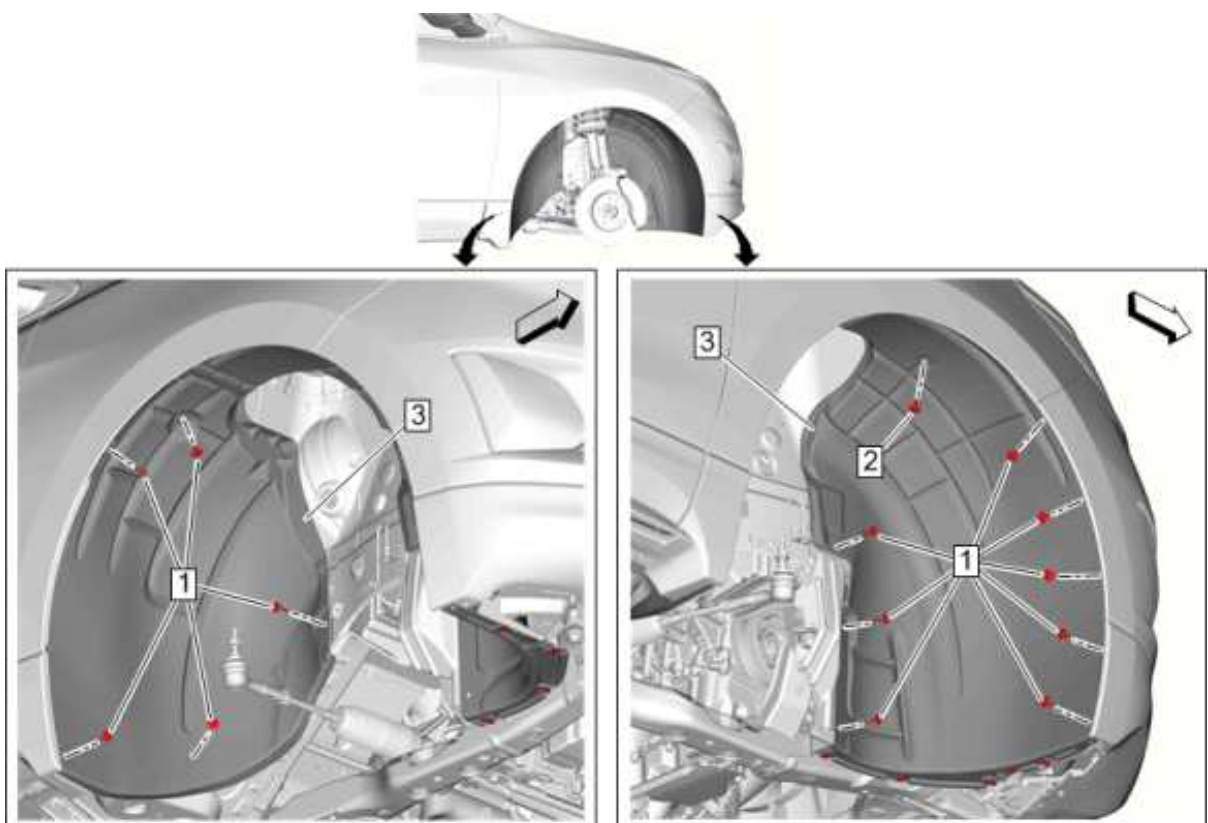


Fig. 90: Front Wheelhouse Liner - Right Side
Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Wheelhouse Liner-Right Side (3) - [Front Wheelhouse Liner Replacement - Right Side \(Equinox\)](#) [Front Wheelhouse Liner Replacement - Right Side \(Terrain\)](#).

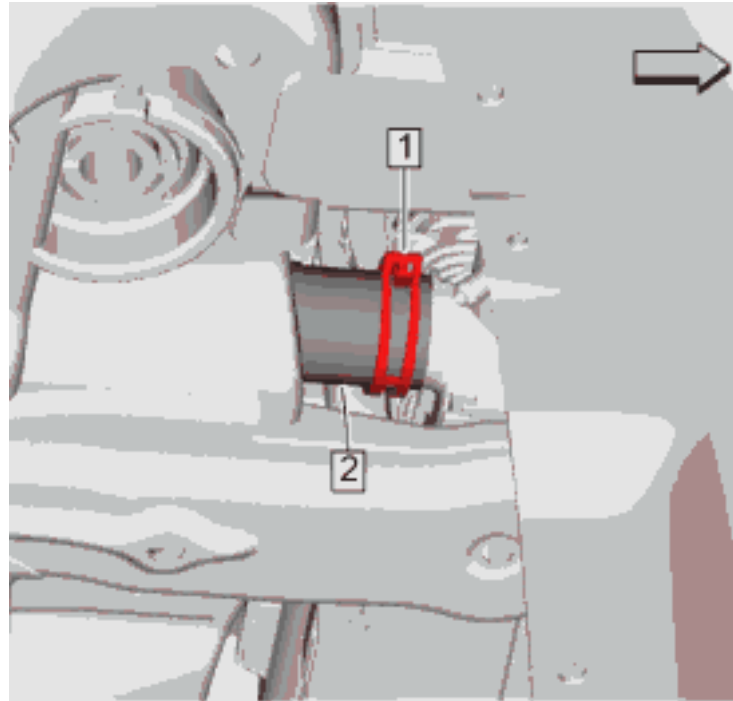


Fig. 91: Radiator Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Disengage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
4. Remove Radiator Outlet Hose (2) @Radiator.
5. Lower the vehicle.

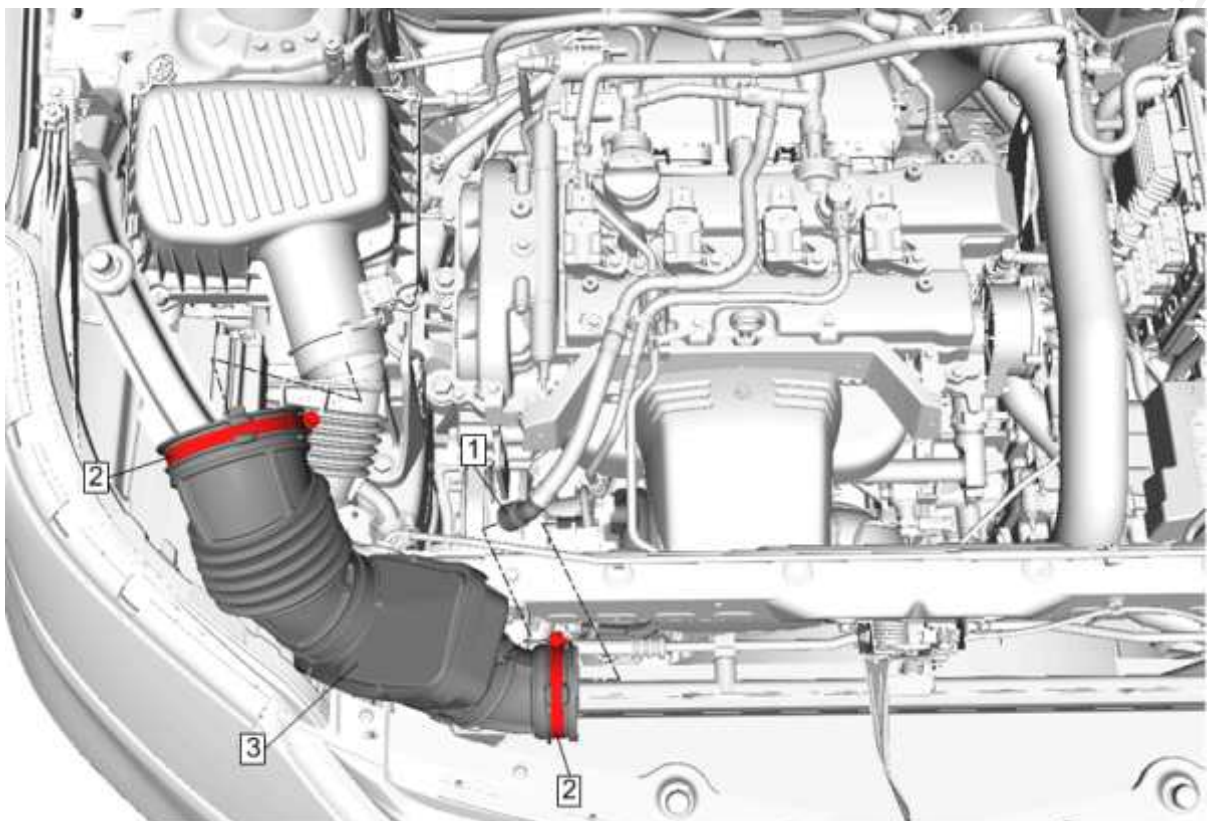


Fig. 92: Air Cleaner Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

6. Remove Air Cleaner Outlet Duct (3) - [Air Cleaner Outlet Duct Replacement \(Non-Tamperproof\)](#) [Air Cleaner Outlet Duct Replacement \(Tamperproof\)](#).

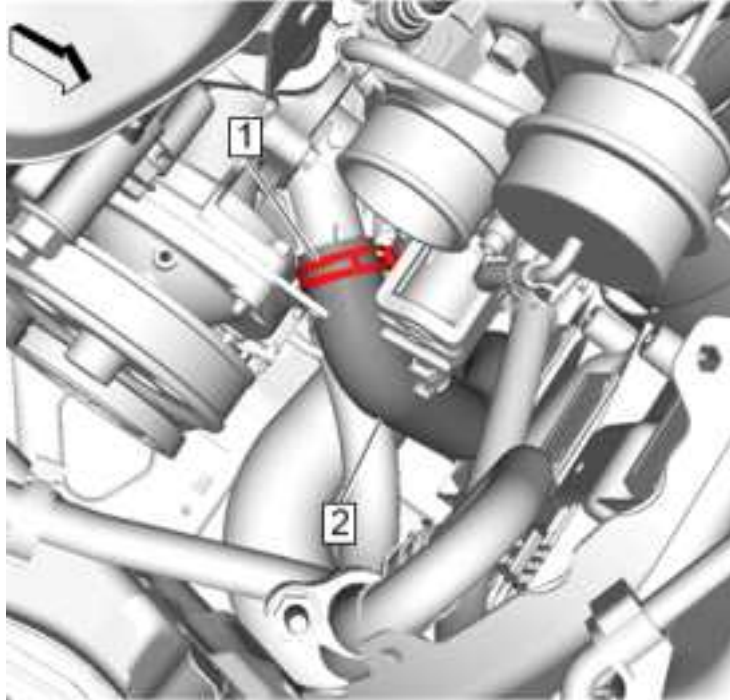


Fig. 93: Radiator Outlet Hose Clamp And Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Disengage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
8. Remove Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
9. Remove Radiator Outlet Hose (2).

Installation Procedure

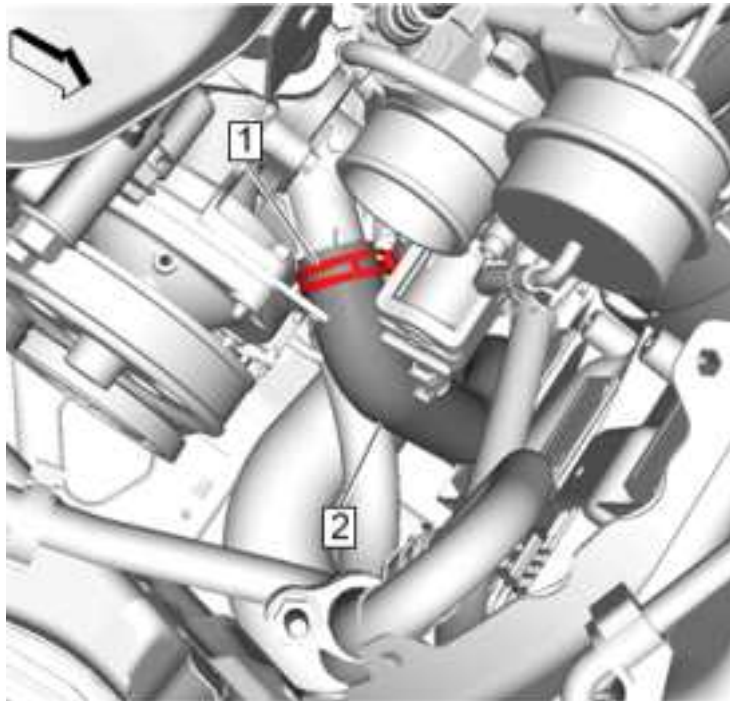


Fig. 94: Radiator Outlet Hose Clamp And Radiator Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (2) @ Engine Coolant Thermostat Housing.
2. Engage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

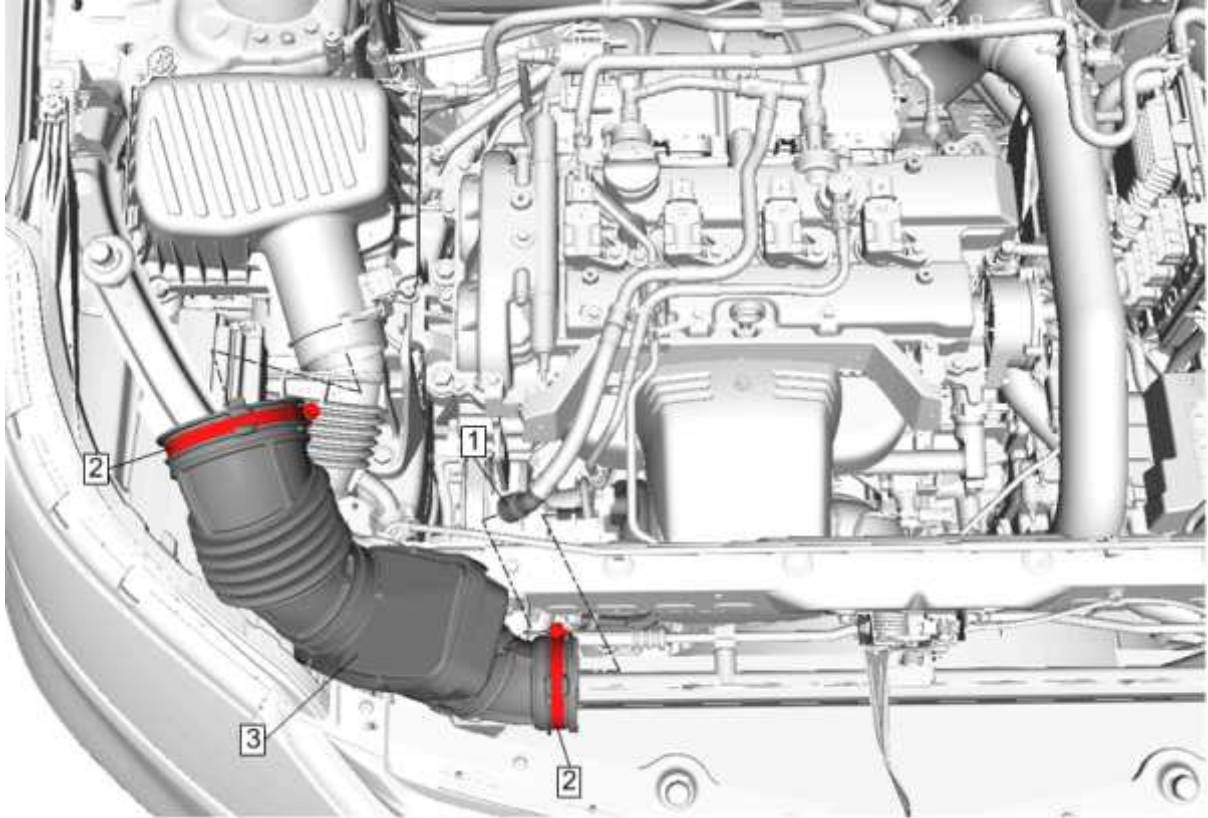


Fig. 95: Air Cleaner Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

3. Install Air Cleaner Outlet Duct (3). [Air Cleaner Outlet Duct Replacement \(Non-Tamperproof\)](#)
[Air Cleaner Outlet Duct Replacement \(Tamperproof\)](#)
4. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)

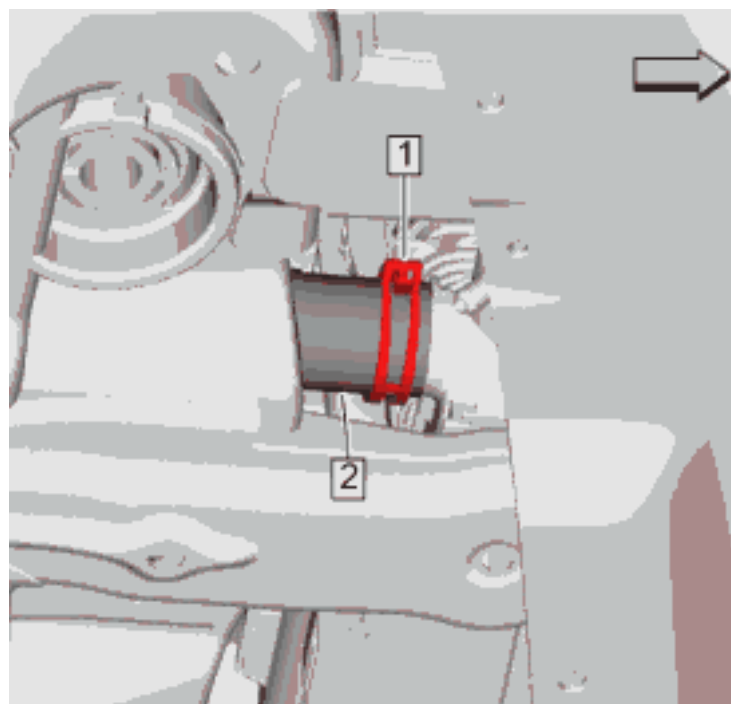


Fig. 96: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Outlet Hose (2) @Radiator.
6. Engage Radiator Outlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

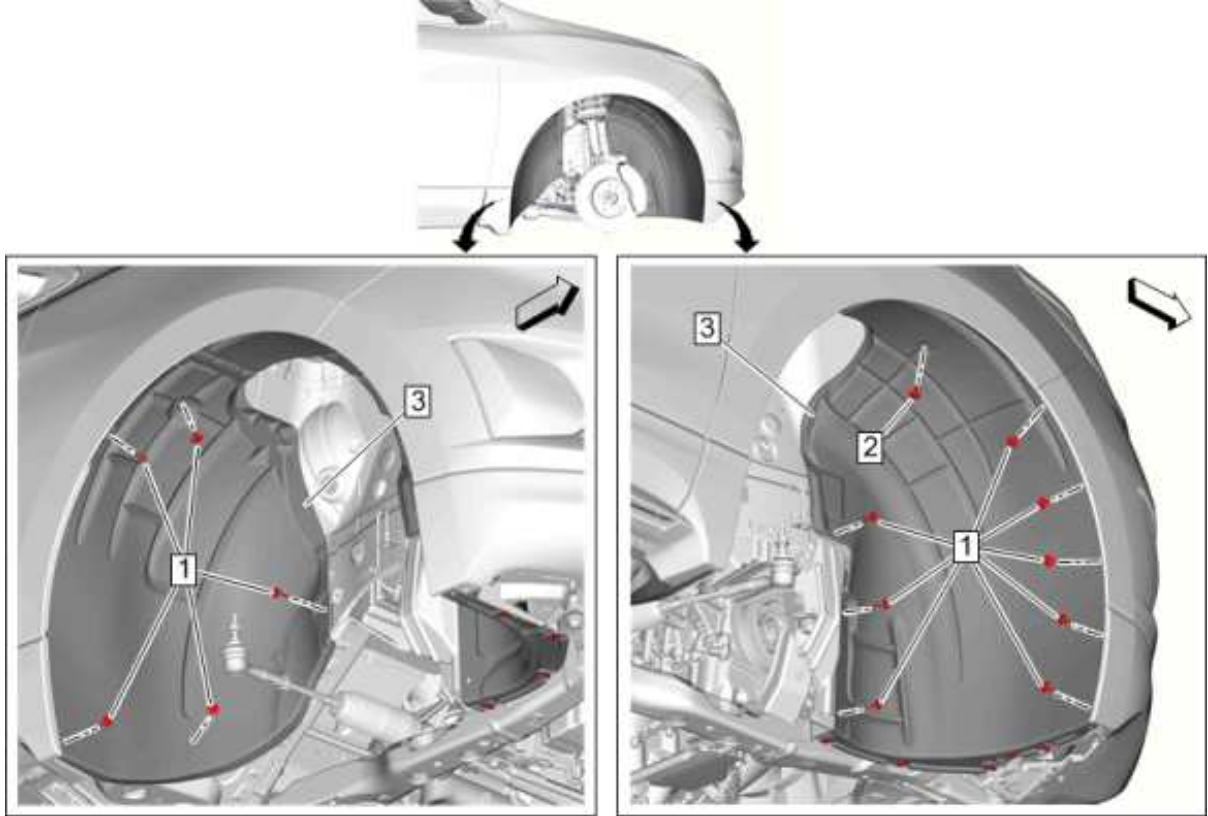


Fig. 97: Front Wheelhouse Liner - Right Side
 Courtesy of GENERAL MOTORS COMPANY

7. Install Front Wheelhouse Liner-Right Side (3) - **Front Wheelhouse Liner Replacement - Right Side (Equinox)** **Front Wheelhouse Liner Replacement - Right Side (Terrain)**
8. Fill the cooling system. **Cooling System Draining and Filling (GE 47716)****Cooling System Draining and Filling (Static)**
9. Start the engine and check for coolant leaks.

RADIATOR SLEEVE REPLACEMENT - UPPER (LEFT)

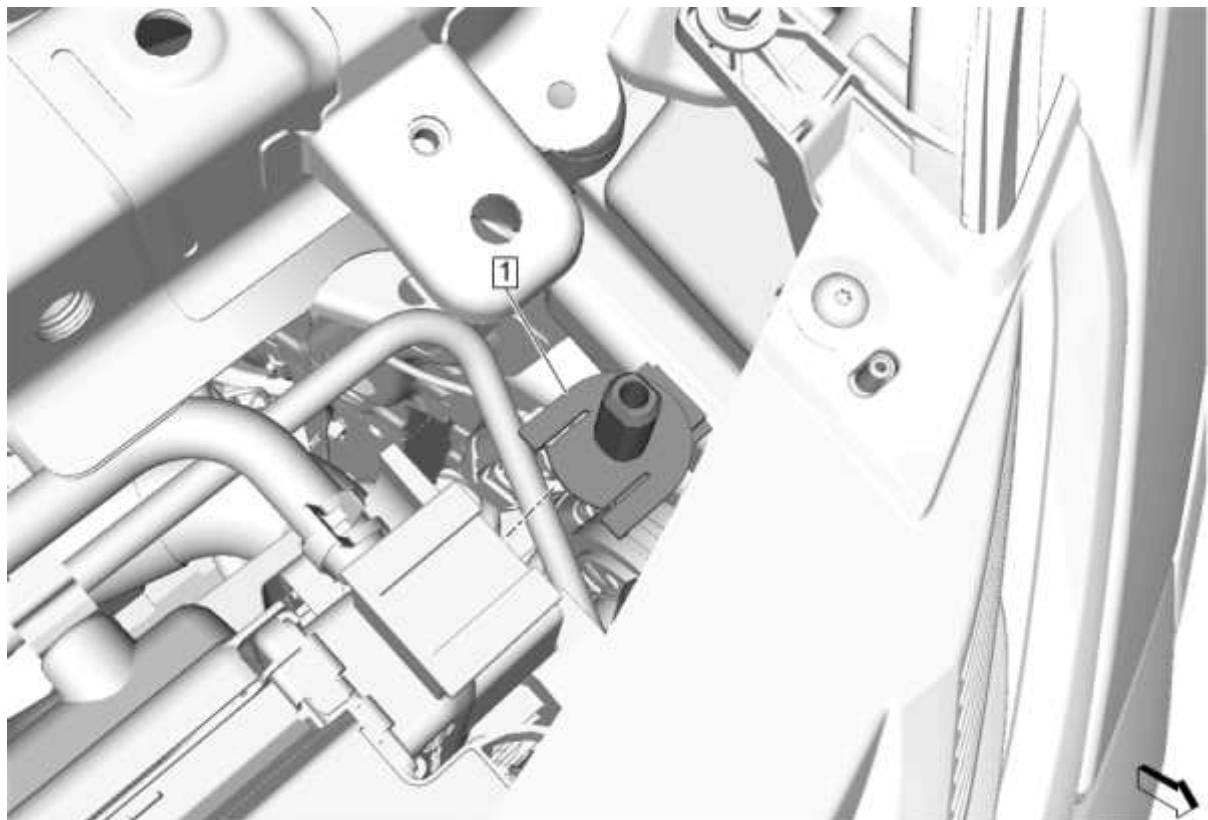


Fig. 98: Radiator Sleeve - Upper (Left)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Radiator Upper Bracket Replacement - Left Side</u>	
1	Radiator Sleeve Procedure Lift the retaining tabs on the radiator sleeve to remove.

RADIATOR SLEEVE REPLACEMENT - UPPER (RIGHT)

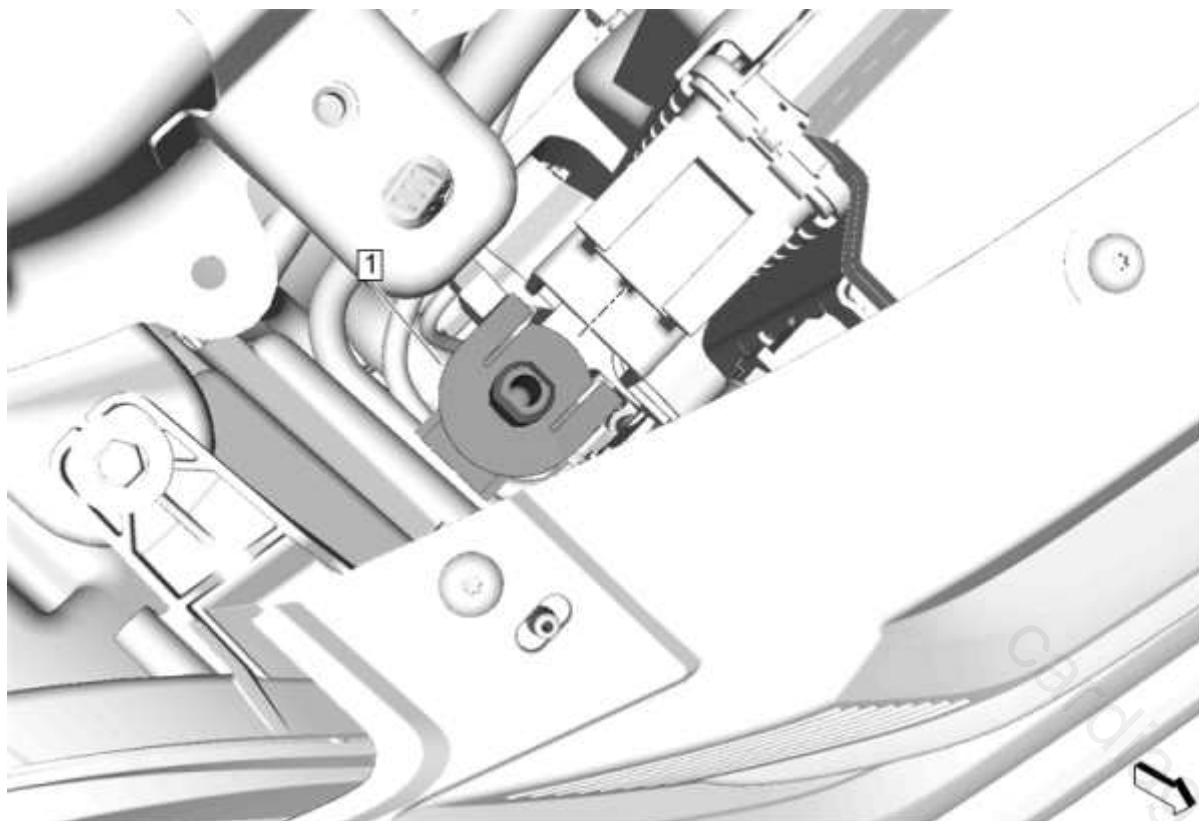


Fig. 99: Radiator Sleeve - Upper (Right)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Radiator Upper Bracket Replacement - Right Side</u>	
1	Radiator Sleeve Procedure Lift the retaining tabs on the radiator sleeve to remove.

RADIATOR SLEEVE REPLACEMENT - LOWER (LEFT)

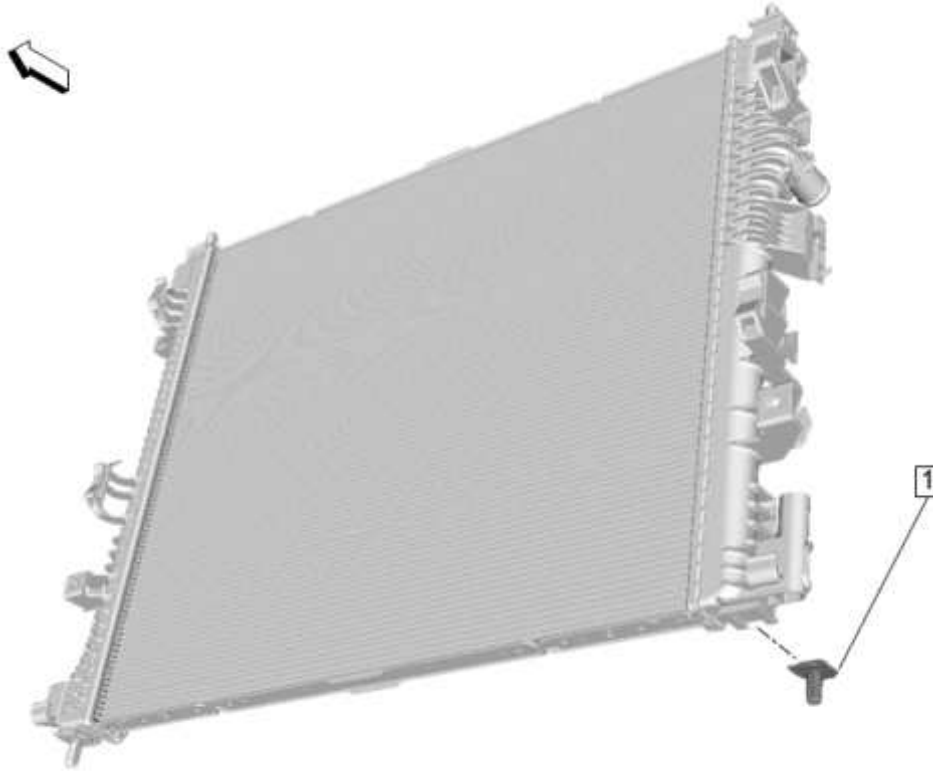


Fig. 100: Radiator Sleeve - Lower (Left)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Front Bumper Fascia - Front Bumper Fascia Replacement (Equinox) Front Bumper Fascia Replacement (Terrain). 2. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static). 3. Remove Radiator - Radiator Replacement (LYX) Radiator Replacement (LTG) Radiator Replacement (LH7).	
1	Radiator Sleeve Procedure Lift the retaining tabs on the radiator sleeve to remove.

RADIATOR SLEEVE REPLACEMENT - LOWER (RIGHT)

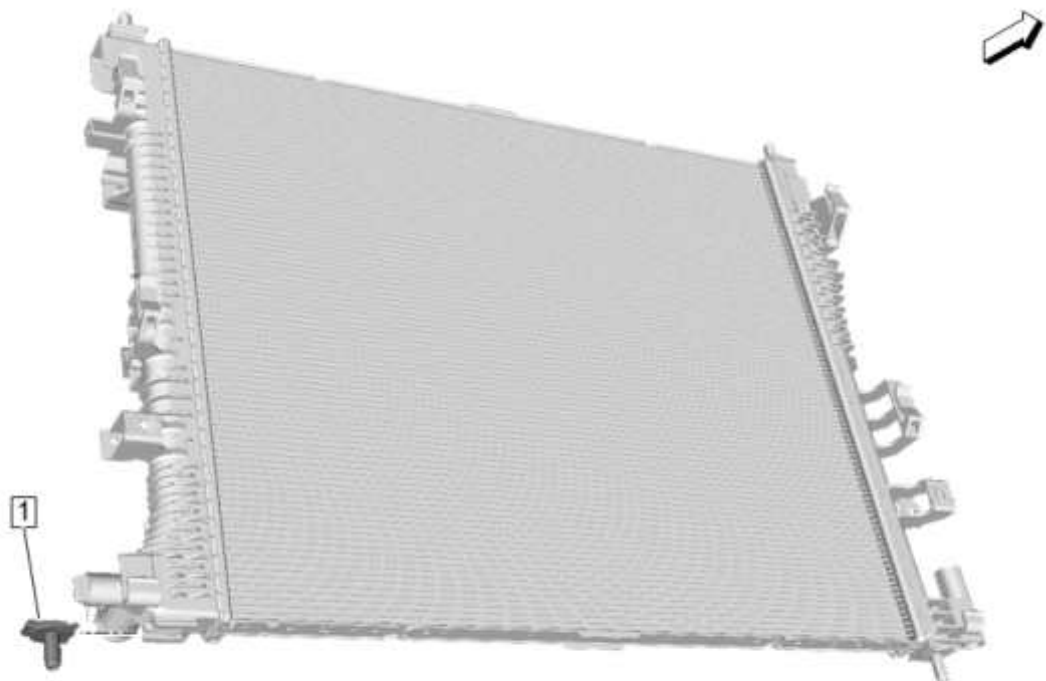


Fig. 101: Radiator Sleeve - Lower (Right)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Front Bumper Fascia - Front Bumper Fascia Replacement (Equinox) Front Bumper Fascia Replacement (Terrain). 2. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static). 3. Remove Radiator - Radiator Replacement (LYX) Radiator Replacement (LTG) Radiator Replacement (LH7).	
1	Radiator Sleeve Procedure Lift the retaining tabs on the radiator sleeve to remove.

ENGINE COOLANT FAN WIRING HARNESS REPLACEMENT (LTG LYX)

Removal Procedure

NOTE: Typical wiring harness shown, individual harness may be different due to option content. Various components may need to be removed to access the harness depending on content options.

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#).

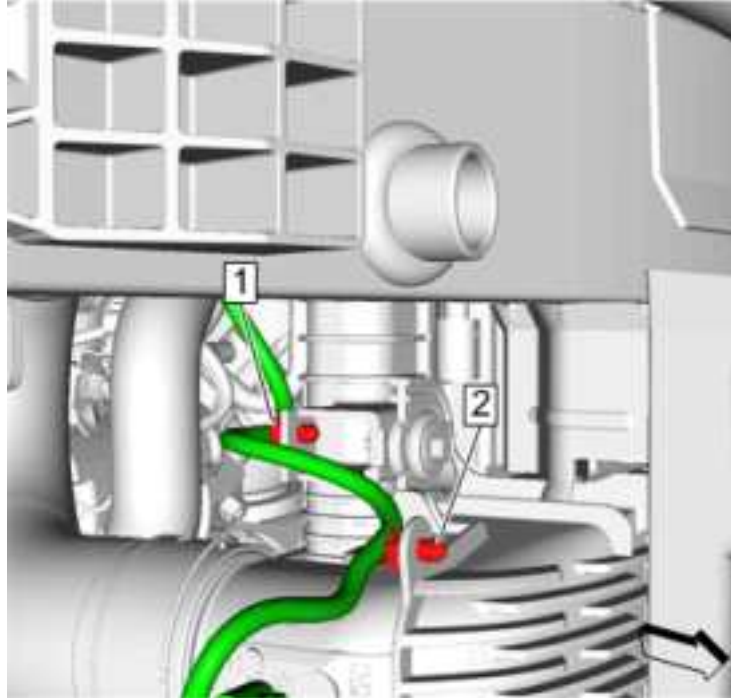


Fig. 102: Wiring Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

2. Remove Wiring Harness Retainer (1) @ Radiator.
3. Remove Wiring Harness Retainer (2) @ Charge Air Cooler.

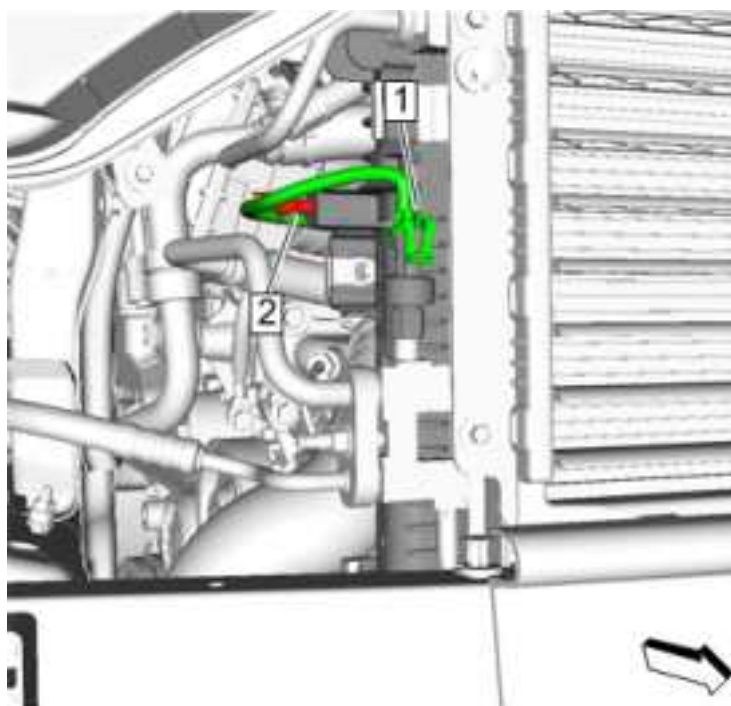


Fig. 103: Wiring Harness Retainer And Connector

Courtesy of GENERAL MOTORS COMPANY

4. Remove Wiring Harness Retainer (2) @ Radiator.
5. Remove Wiring Harness Connector (1) @ Air Conditioning Cycling and Fan Control Refrigerant Pressure Sensor.

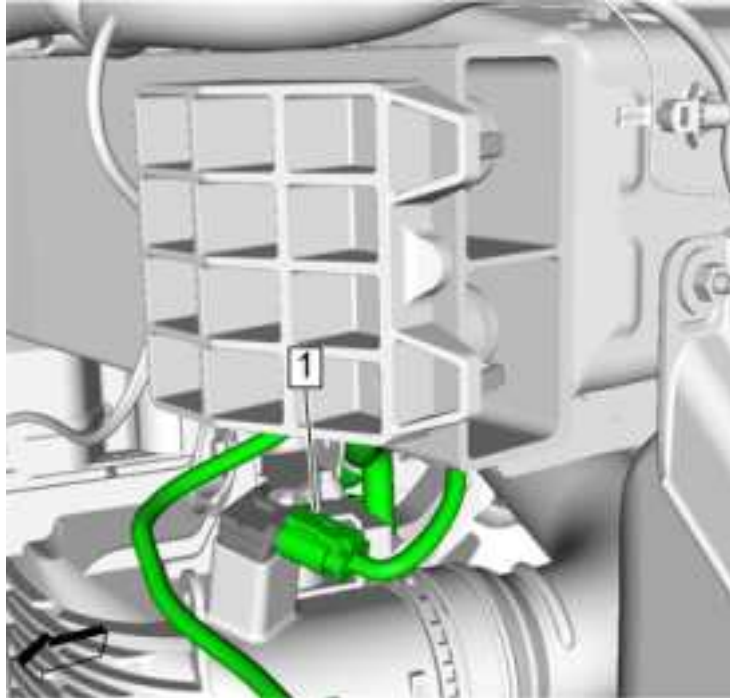


Fig. 104: Wiring Harness Connector

Courtesy of GENERAL MOTORS COMPANY

6. Disconnect Wiring Harness Connector (1) @ Turbocharger Air Pressure Sensor.

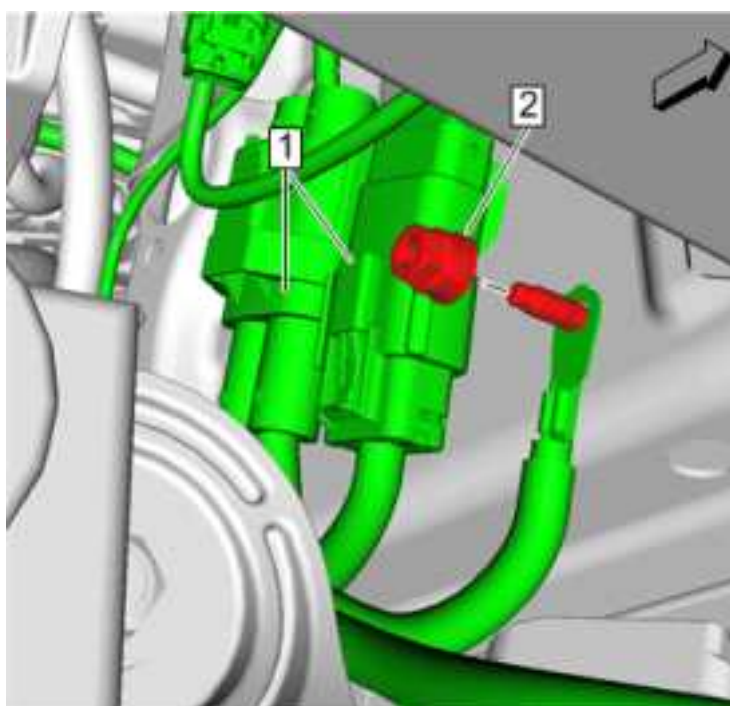


Fig. 105: Electrical Connector And Ground Nut

Courtesy of GENERAL MOTORS COMPANY

7. Disconnect Electrical Connector (1) @ Engine Wiring Harness - [2x]
8. Remove Ground Nut (2) - @ Stud.

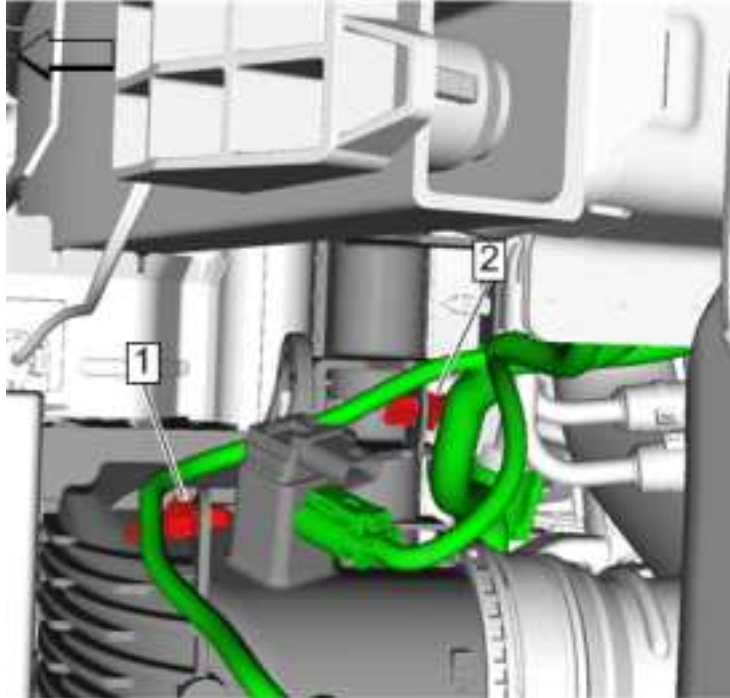


Fig. 106: Wiring Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

9. Remove Wiring Harness Retainer (1) @ Charge Air Cooler.
10. Remove Wiring Harness Retainer (2) @ Radiator.

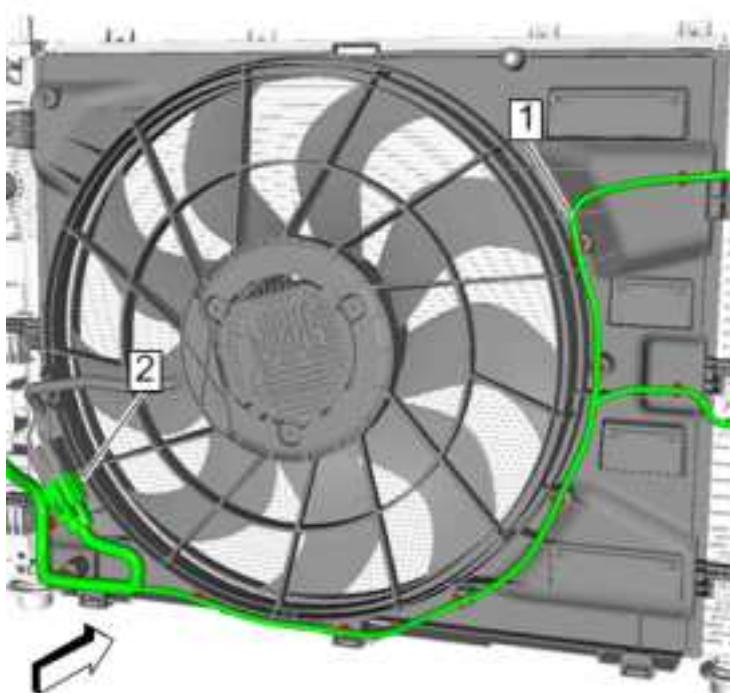


Fig. 107: Engine Coolant Fan Wiring Harness And Retainer

Courtesy of GENERAL MOTORS COMPANY

11. Disconnect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
12. Remove Wiring Harness Retainer (1) @ Engine Coolant Fan - [10x]
13. Remove Engine Coolant Fan Wiring Harness (1).
14. Transfer components as necessary.

Installation Procedure

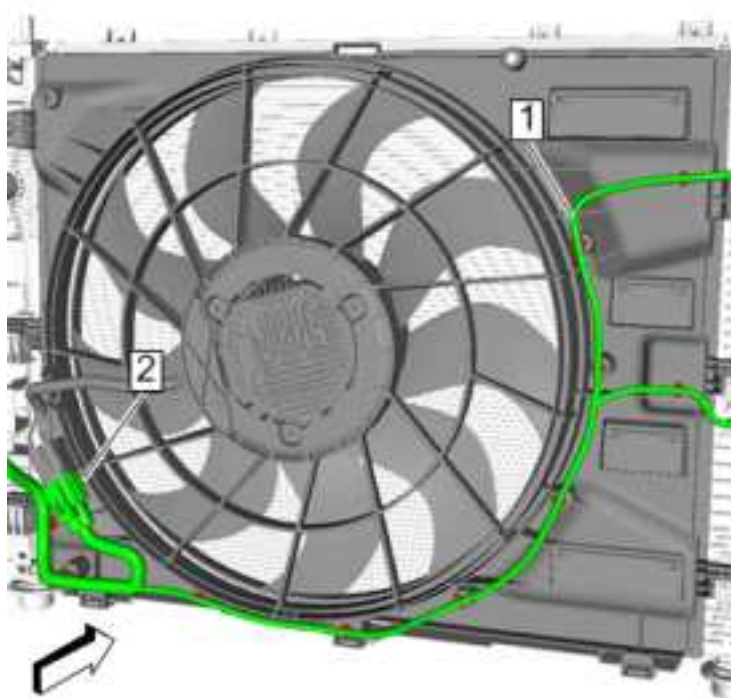


Fig. 108: Engine Coolant Fan Wiring Harness And Retainer
 Courtesy of GENERAL MOTORS COMPANY

1. Install Wiring Harness Retainer (1) @ Engine Coolant Fan - [10x]
2. Connect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.

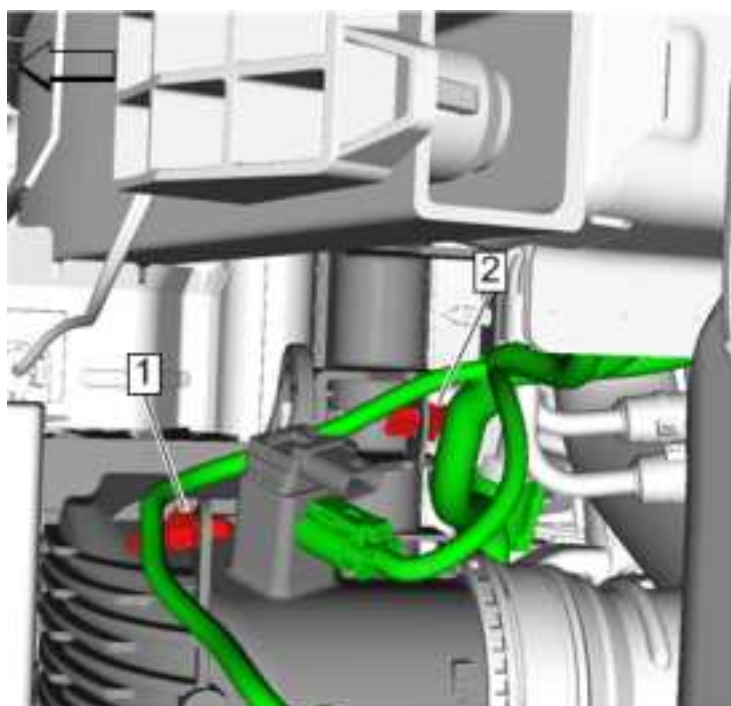


Fig. 109: Wiring Harness Retainer
 Courtesy of GENERAL MOTORS COMPANY

3. Install Wiring Harness Retainer (2) @ Radiator.
4. Install Wiring Harness Retainer (1) @ Charge Air Cooler.

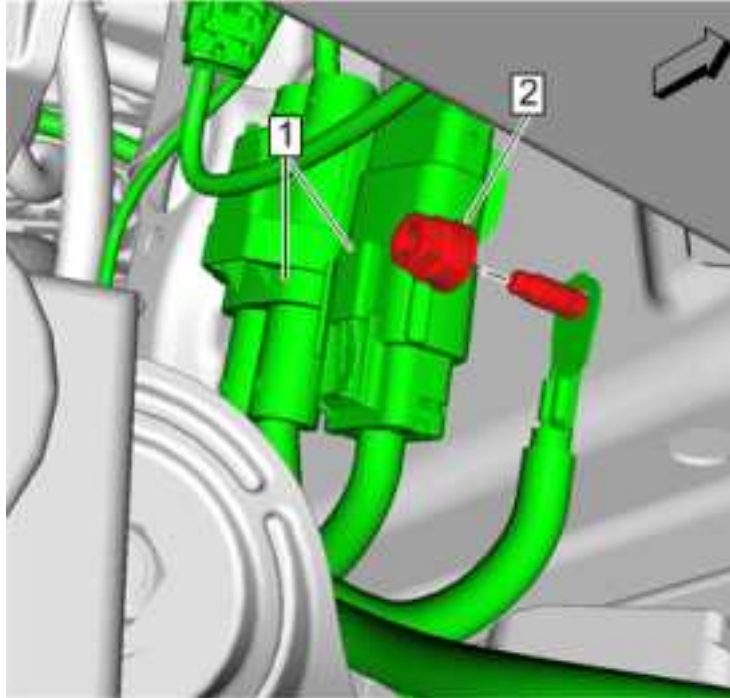


Fig. 110: Electrical Connector And Ground Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

5. Install Ground Nut (2) - @ Stud and tighten 9 N.m (80 lb in)
6. Connect Electrical Connector (1) @ Engine Wiring Harness [2x]

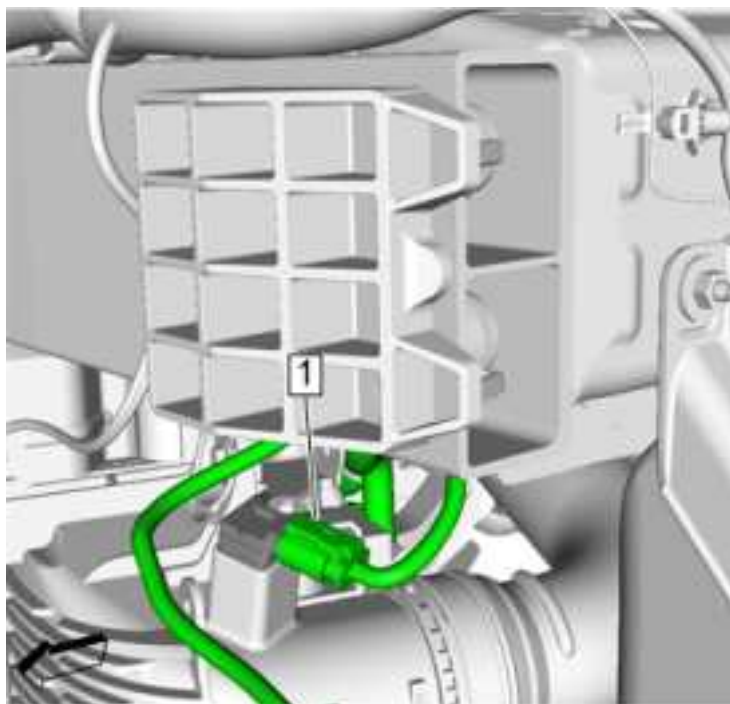


Fig. 111: Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

7. Connect Wiring Harness Connector (1) @ Turbocharger Air Pressure Sensor.

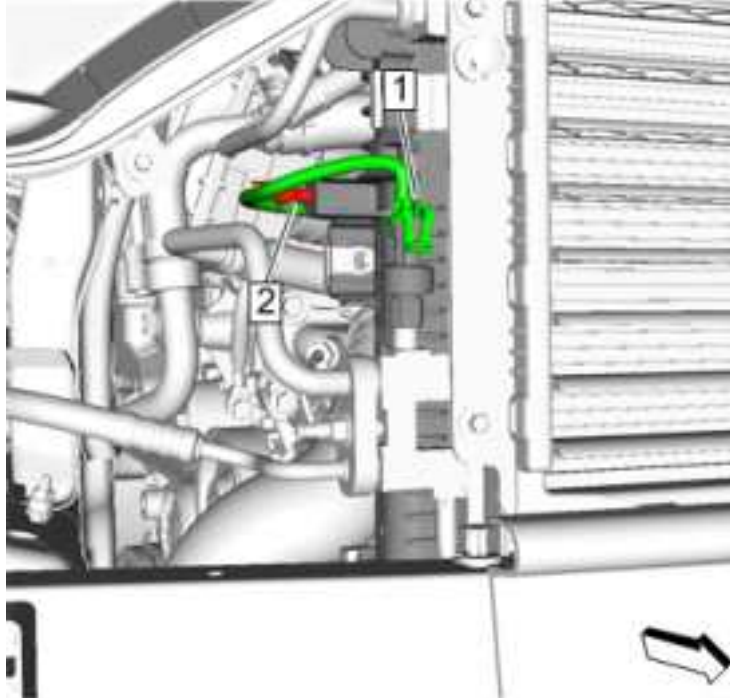


Fig. 112: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

8. Install Wiring Harness Retainer (2) @ Radiator.
9. Install Wiring Harness Connector (1) @ Air Conditioning Cycling and Fan Control Refrigerant Pressure Sensor.

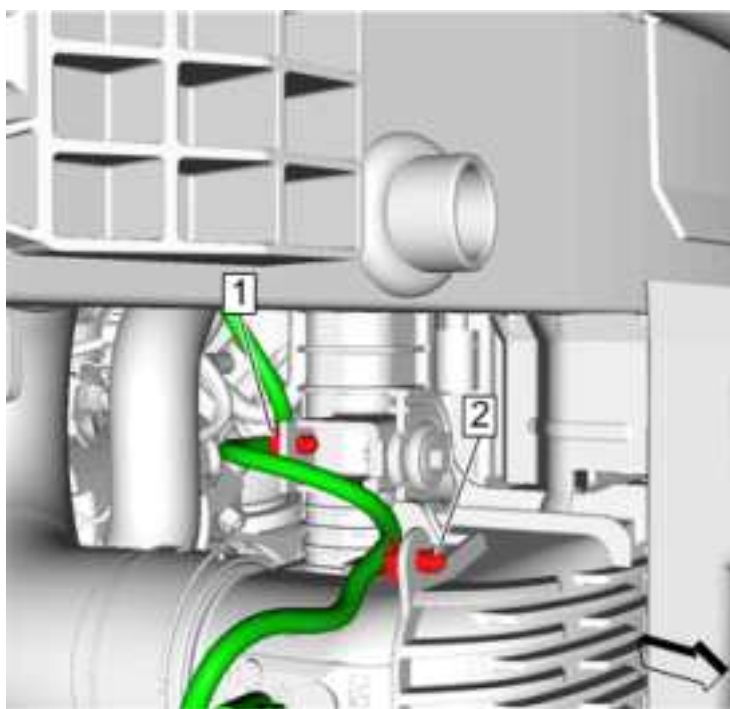


Fig. 113: Wiring Harness Retainer
Courtesy of GENERAL MOTORS COMPANY

10. Install Wiring Harness Retainer (2) @ Charge Air Cooler.
11. Install Wiring Harness Retainer (1) @ Radiator.
12. Install Front Bumper Fascia - **Front Bumper Fascia Replacement (Equinox)** **Front Bumper Fascia Replacement (Terrain)**.

ENGINE COOLANT FAN WIRING HARNESS REPLACEMENT (LH7)

Removal Procedure

NOTE: Typical wiring harness shown, individual harness may be different due to option content. Various components may need to be removed to

access the harness depending on content options.

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#), [Front Bumper Fascia Replacement \(Terrain\)](#).

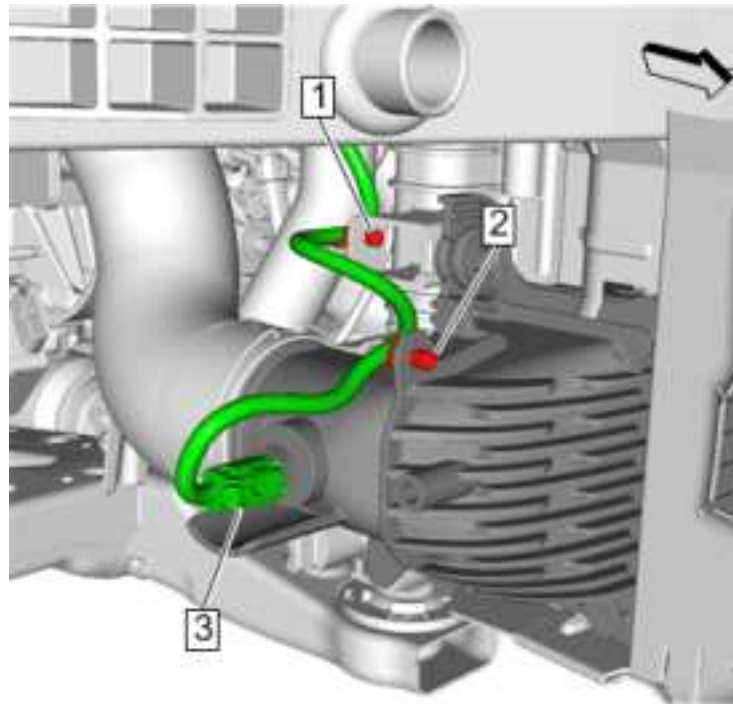


Fig. 114: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

2. Remove Wiring Harness Retainer (1) @ Radiator.
3. Remove Wiring Harness Retainer (2) @ Charge Air Cooler.
4. Disconnect Wiring Harness Connector (3) @ Charge Air Temperature Sensor.

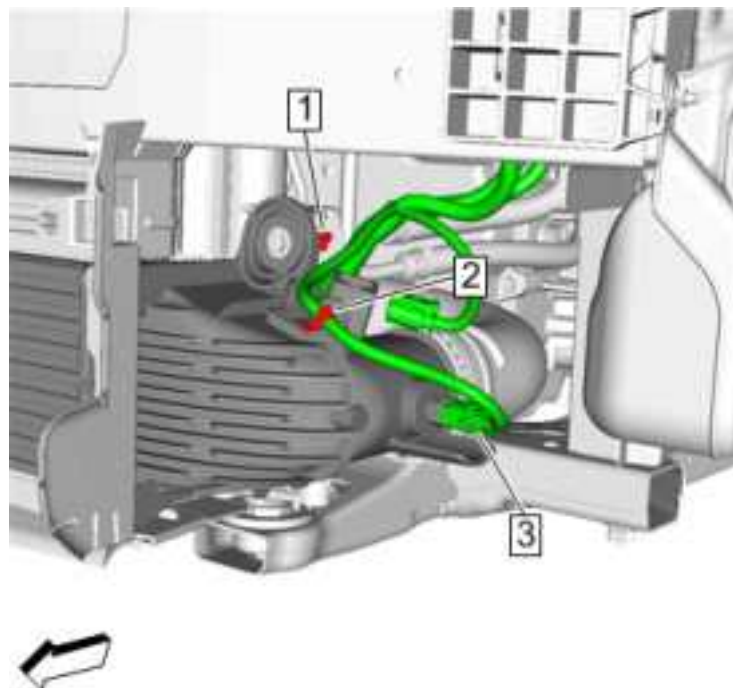


Fig. 115: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

5. Remove Wiring Harness Retainer (1) @ Radiator.
6. Remove Wiring Harness Retainer (2) @ Charge Air Cooler.
7. Disconnect Wiring Harness Connector (3) @ Charge Air Temperature Sensor.

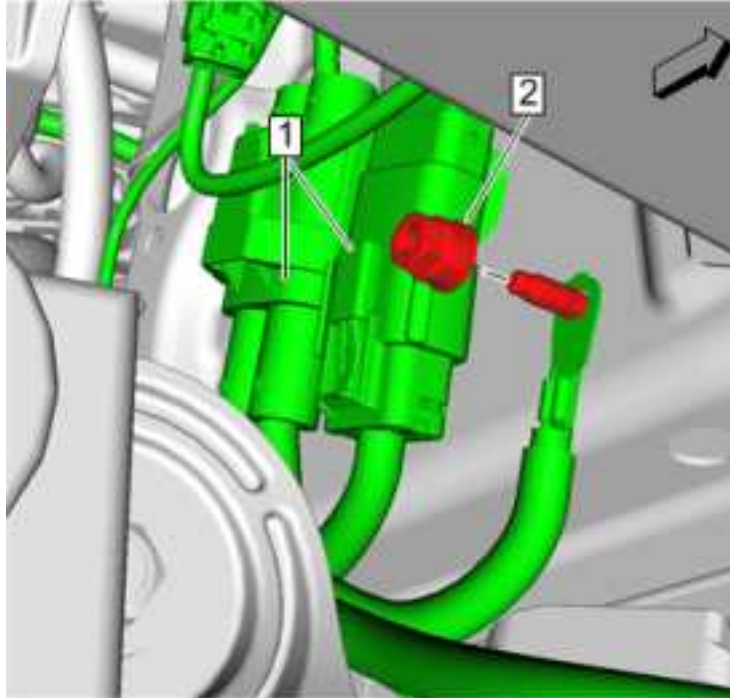


Fig. 116: Electrical Connector And Ground Nut
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect Electrical Connector (1) @ Engine Wiring Harness - [2x]
9. Remove Ground Nut (2) @ Stud.

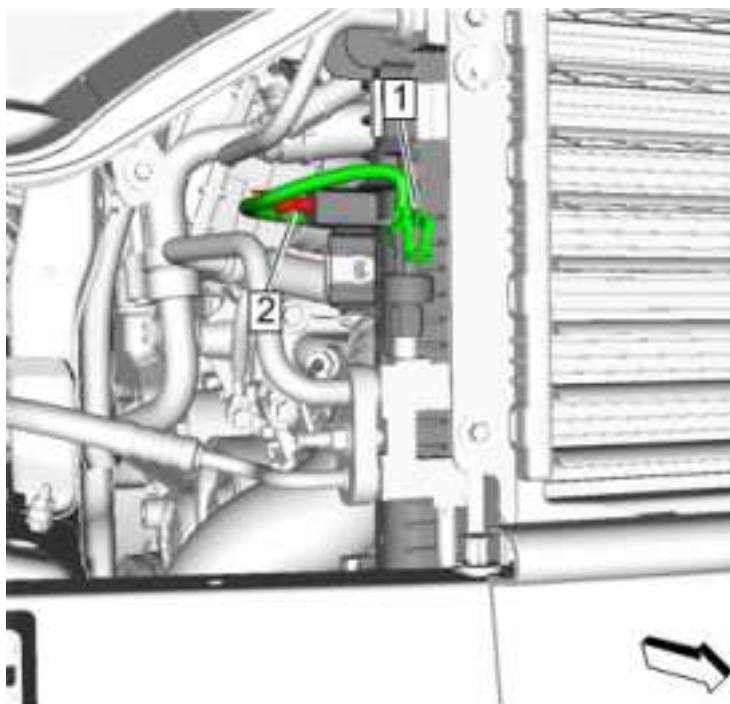


Fig. 117: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

10. Remove Wiring Harness Retainer (1) @ Radiator.
11. Disconnect Wiring Harness Connector (2) @ Air Conditioning Cycling and Fan Control Refrigerant Pressure Sensor.

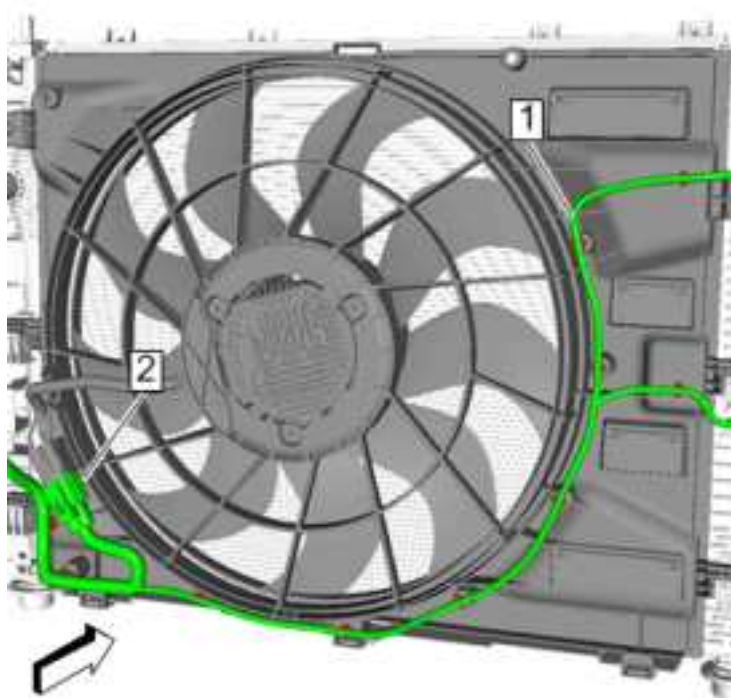


Fig. 118: Engine Coolant Fan Wiring Harness And Retainer
Courtesy of GENERAL MOTORS COMPANY

12. Disconnect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
13. Remove Wiring Harness Retainer (1) @ Engine Coolant Fan - [10x]
14. Remove Engine Coolant Fan Wiring Harness (1).
15. Transfer components as necessary.

Installation Procedure

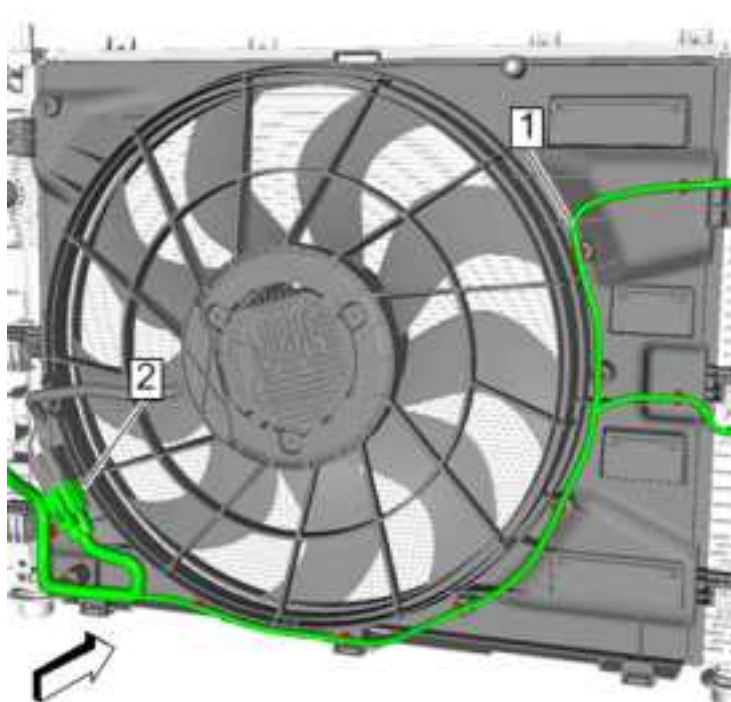


Fig. 119: Engine Coolant Fan Wiring Harness And Retainer
Courtesy of GENERAL MOTORS COMPANY

1. Install Wiring Harness Retainer (1) @ Engine Coolant Fan - [10x]
2. Connect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.

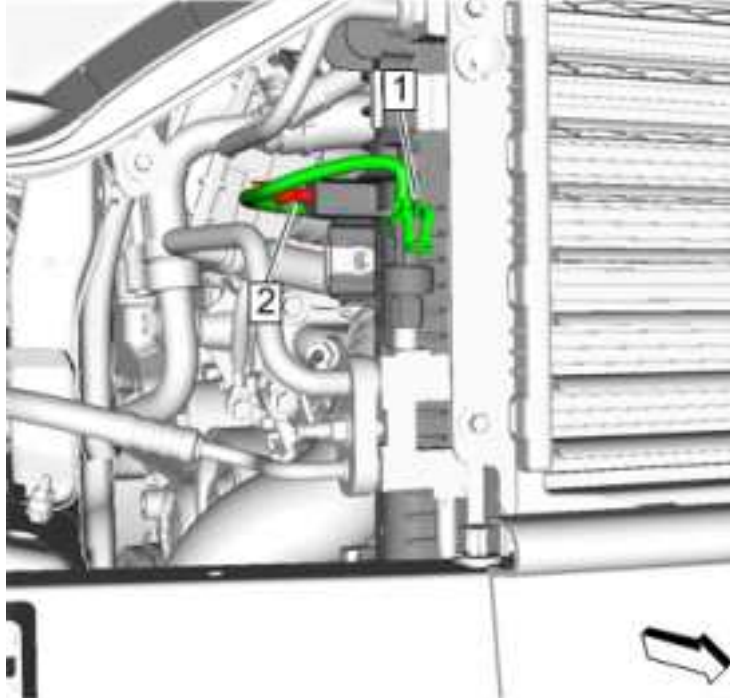


Fig. 120: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

3. Connect Wiring Harness Connector (2) @ Air Conditioning Cycling and Fan Control Refrigerant Pressure Sensor.
4. Install Wiring Harness Retainer (1) @ Radiator.

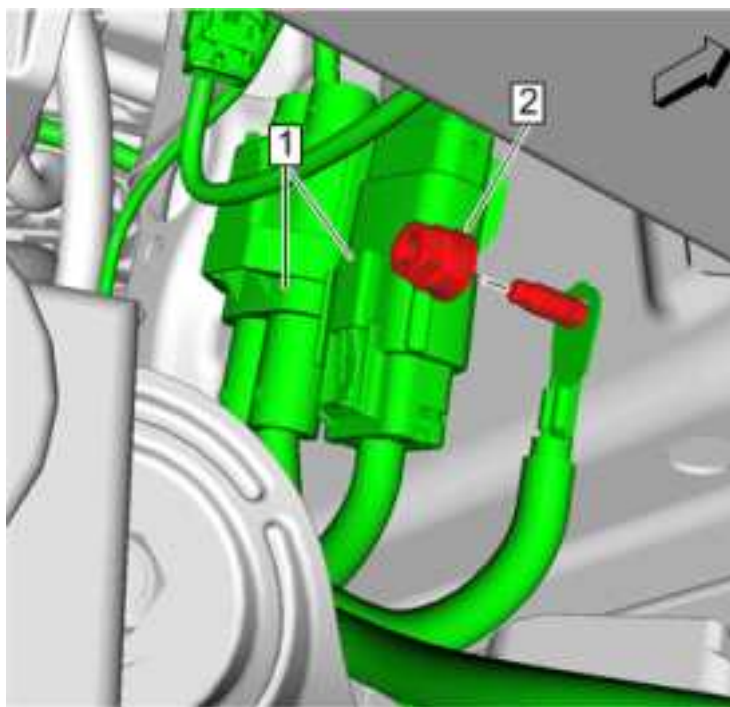


Fig. 121: Electrical Connector And Ground Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

5. Install Ground Nut (2) @ Stud and tighten 9 N.m (80 lb in)
6. Connect Electrical Connector (1) @ Engine Wiring Harness - [2x]

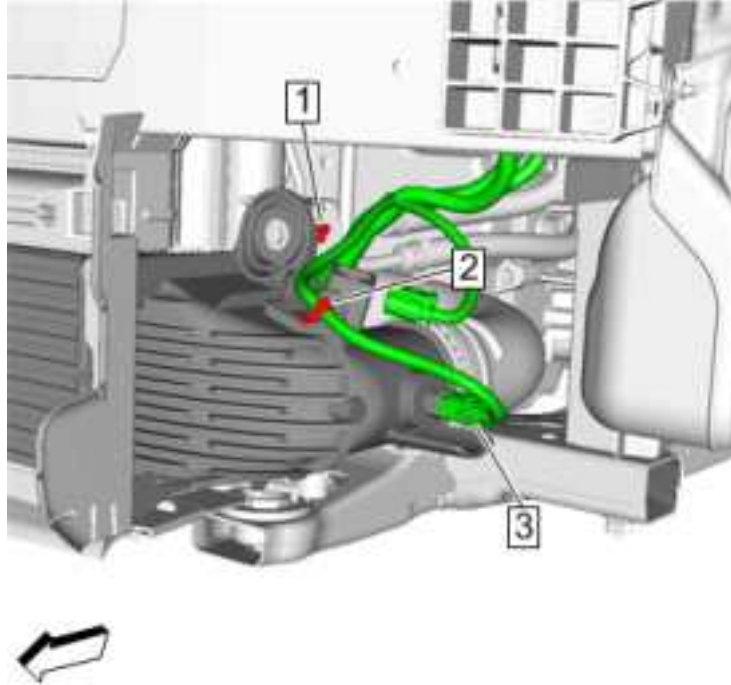


Fig. 122: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

7. Connect Wiring Harness Connector (3) @ Charge Air Temperature Sensor.
8. Install Wiring Harness Retainer (2) @ Charge Air Cooler and tighten
9. Install Wiring Harness Retainer (1) @ Radiator and tighten

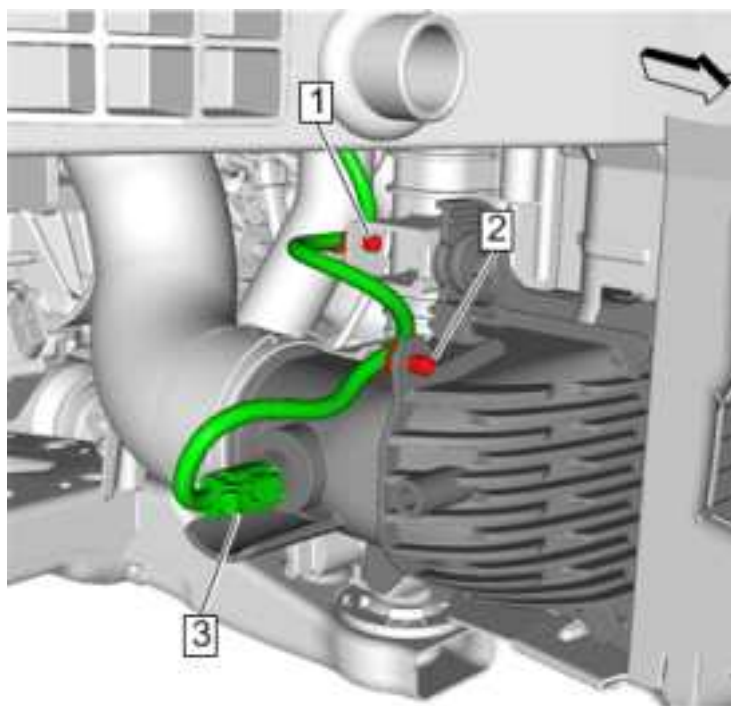


Fig. 123: Wiring Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

10. Connect Wiring Harness Connector (3) @ Charge Air Temperature Sensor.
11. Install Wiring Harness Retainer (2) @ Charge Air Cooler.
12. Install Wiring Harness Retainer (1) @ Radiator.
13. Install Front Bumper Fascia - **Front Bumper Fascia Replacement (Equinox)**, **Front Bumper Fascia Replacement (Terrain)**.

RADIATOR UPPER BRACKET REPLACEMENT - LEFT SIDE

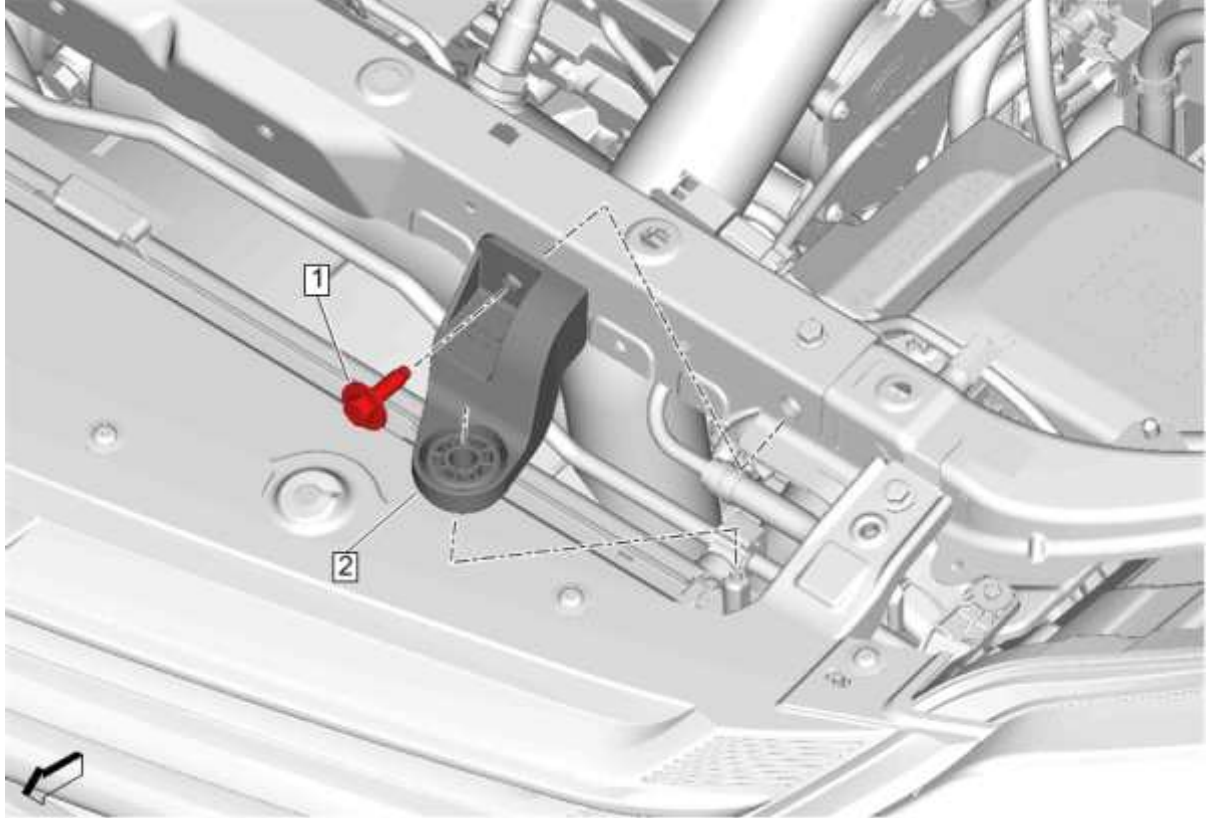


Fig. 124: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Upper Bracket Bolt CAUTION: Refer to Fastener Caution . Tighten: 14 N.m (10 lb ft)
2	Radiator Upper Bracket

RADIATOR UPPER BRACKET REPLACEMENT - RIGHT SIDE

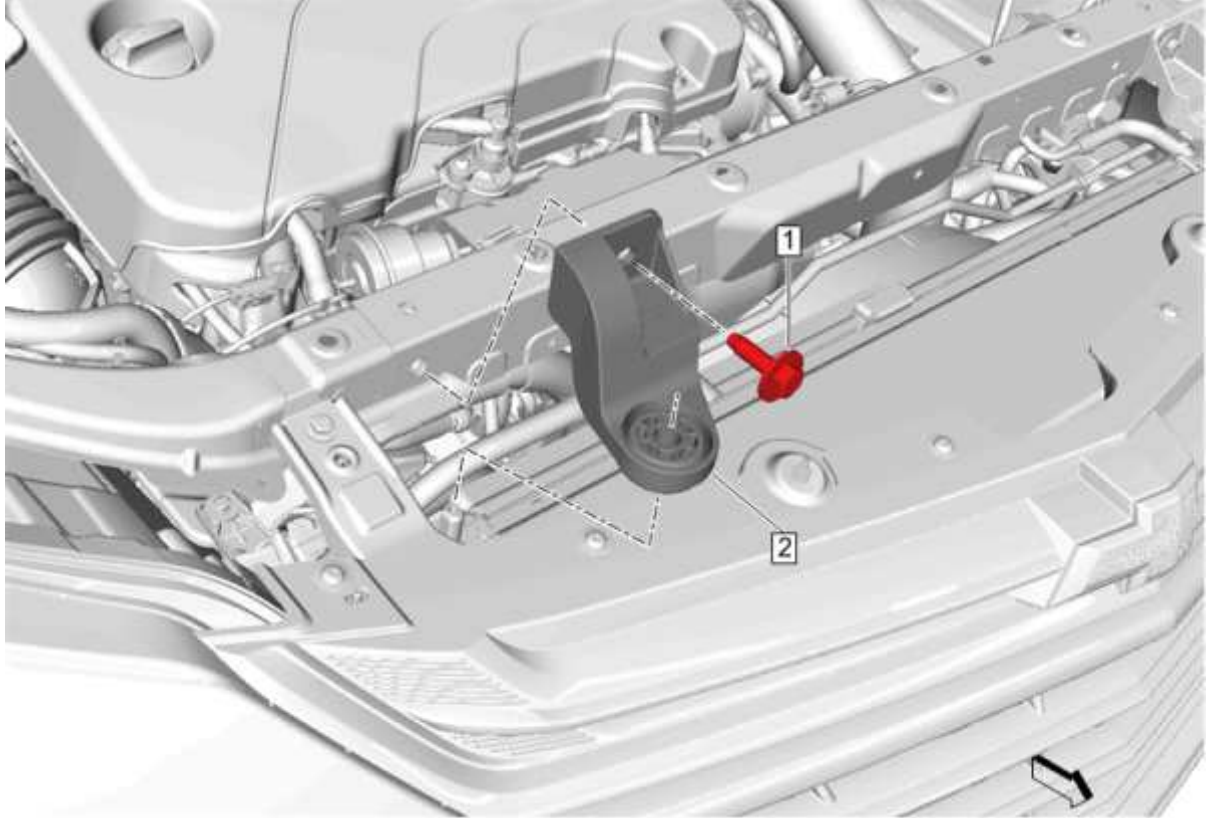


Fig. 125: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Upper Bracket Bolt CAUTION: Refer to Fastener Caution . Tighten: 14 N.m (10 lb ft)
2	Radiator Upper Bracket

ENGINE OIL COOLER REPLACEMENT (LYX)

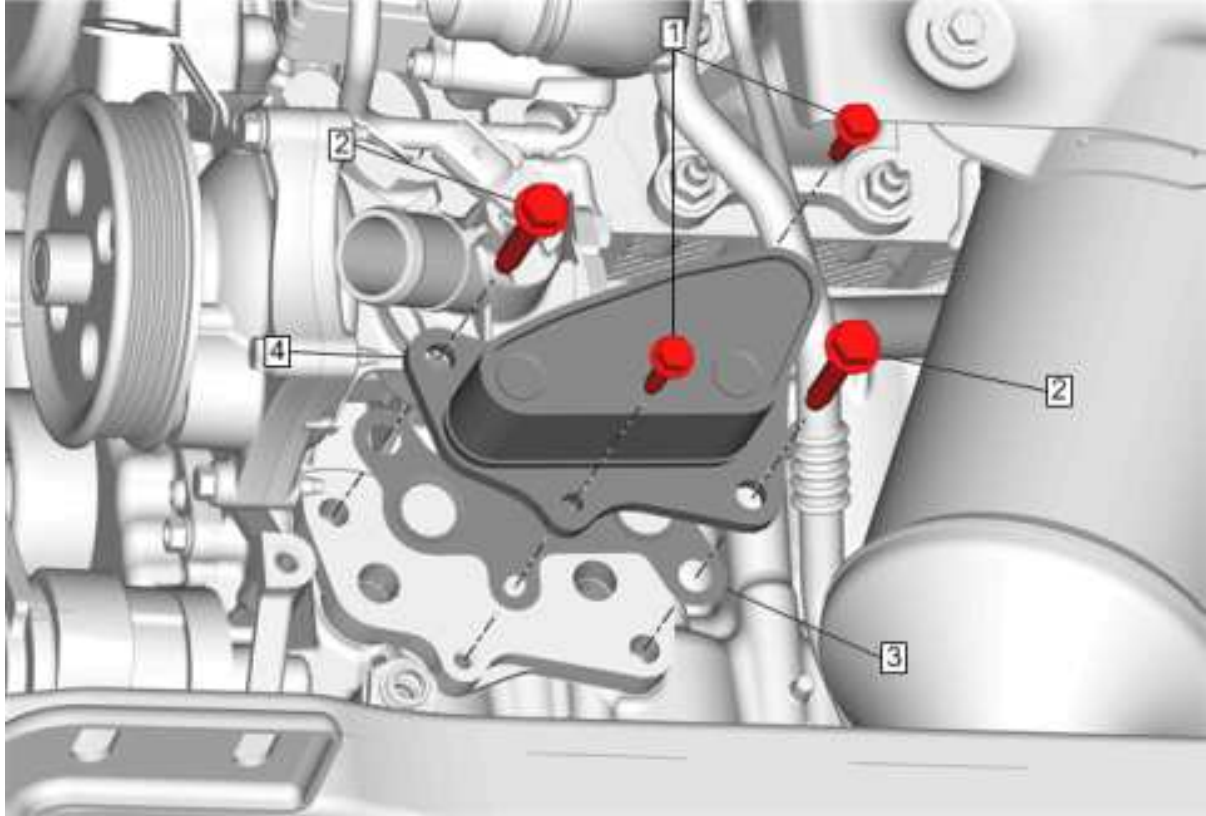


Fig. 126: Engine Oil Cooler

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static). 2. Drain the engine oil. Engine Oil and Oil Filter Replacement 3. Air Conditioning Compressor Bracket Replacement (LYX)	
1	Engine Oil Cooler Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Engine Oil Cooler Bolt [2x] Tighten 25 N.m (18 lb ft)
3	Gasket Procedure Install a NEW engine oil cooler gasket.
4	Engine Oil Cooler

ENGINE OIL COOLER REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
2. Remove [Exhaust Front Pipe Replacement \(LH7\)](#).

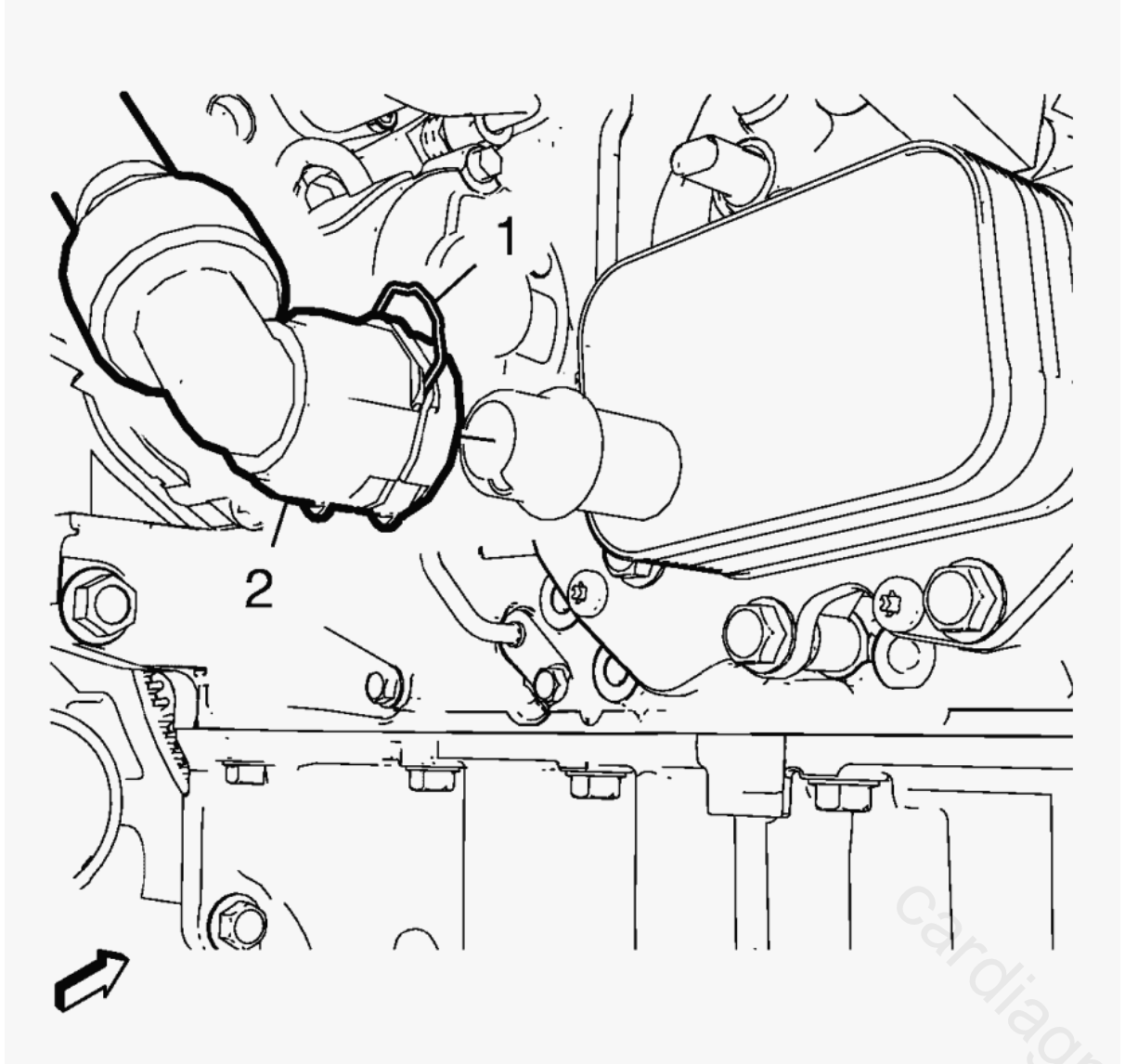


Fig. 127: Quick Connector Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Unlock the quick connector clamp (1) and disconnect the heater inlet hose (2) from the oil cooler.
4. Place a drain pan below the vehicle.

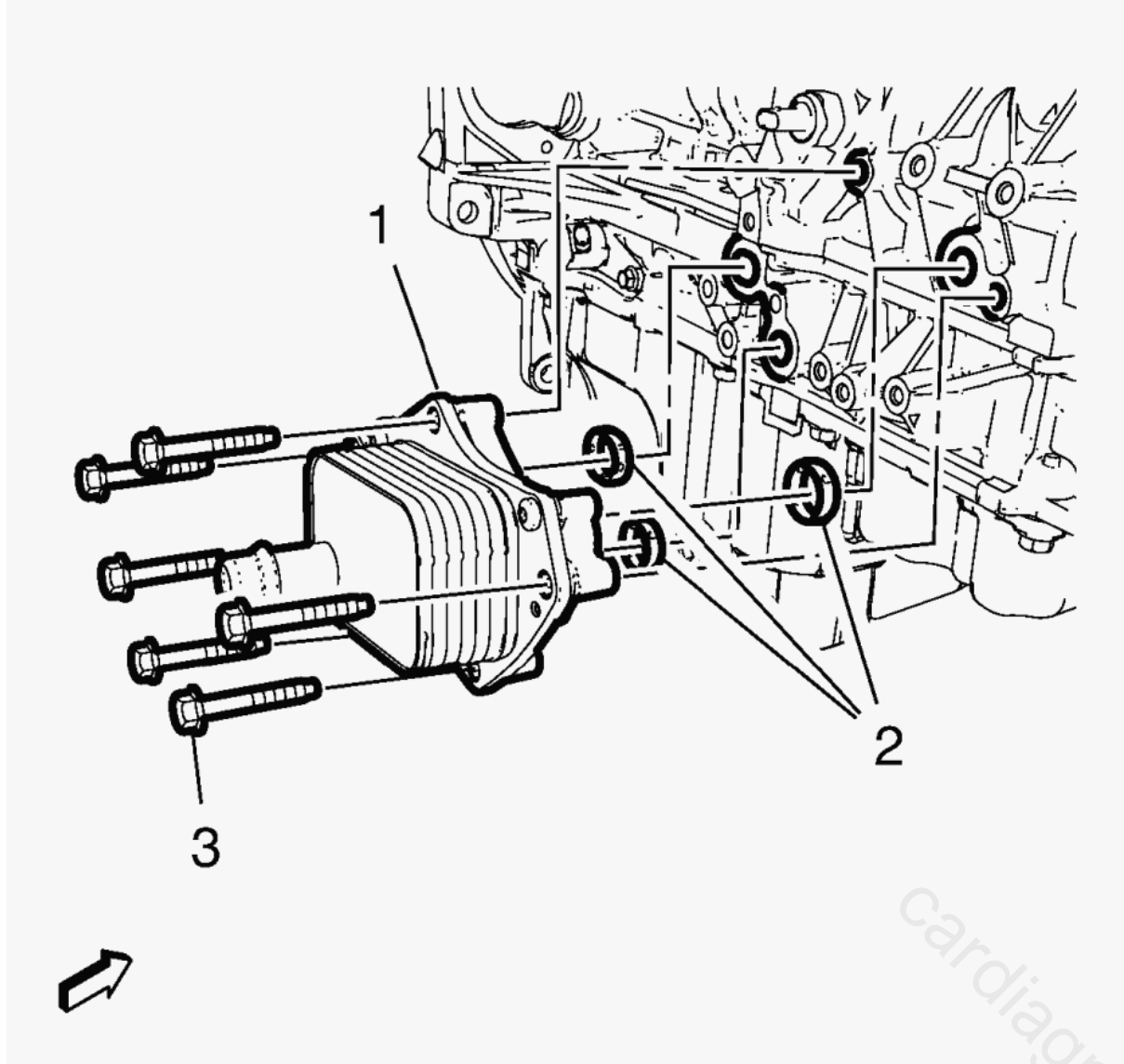


Fig. 128: Engine Oil Cooler, Bolts And Gaskets
Courtesy of GENERAL MOTORS COMPANY

5. Remove Engine Oil Cooler Bolt (3) [6x]

NOTE: A small quantity of oil will drop off the cooler interface.

6. Remove the oil cooler with oil cooler adapter (1).
7. Remove and DISCARD the 3 oil cooler adapter gaskets (2).

Installation Procedure

1. Clean the engine block and sealant surfaces, if some oil drained on the cooler mating surfaces.

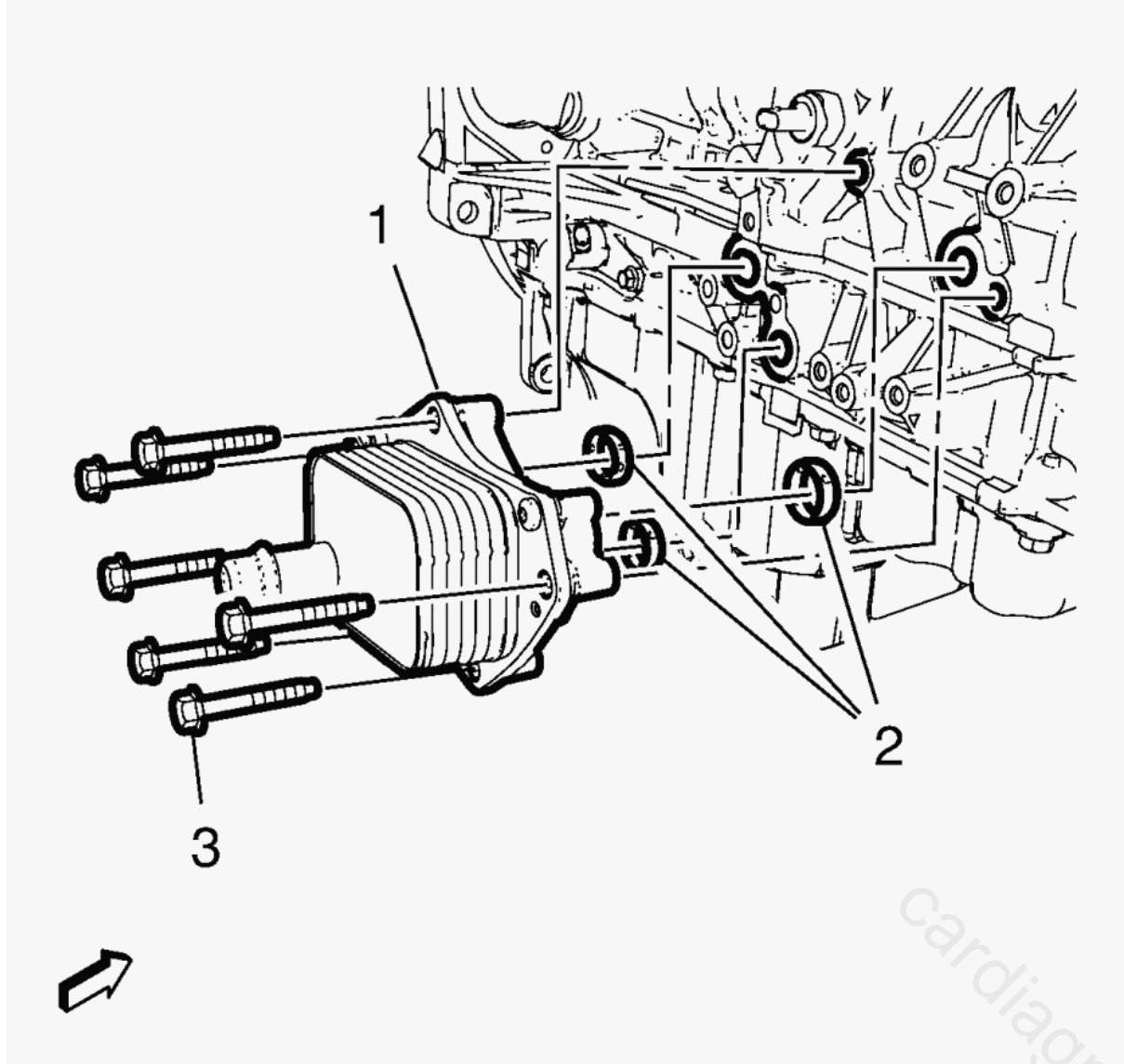


Fig. 129: Engine Oil Cooler, Bolts And Gaskets
Courtesy of GENERAL MOTORS COMPANY

2. Install 3 New oil cooler adapter gaskets (2).
3. Install the oil cooler with oil cooler adapter (1).

CAUTION: Refer to **Fastener Caution** .

4. Install Engine Oil Cooler Bolt (3) and tighten 25 N.m (18 lb ft) [6x]

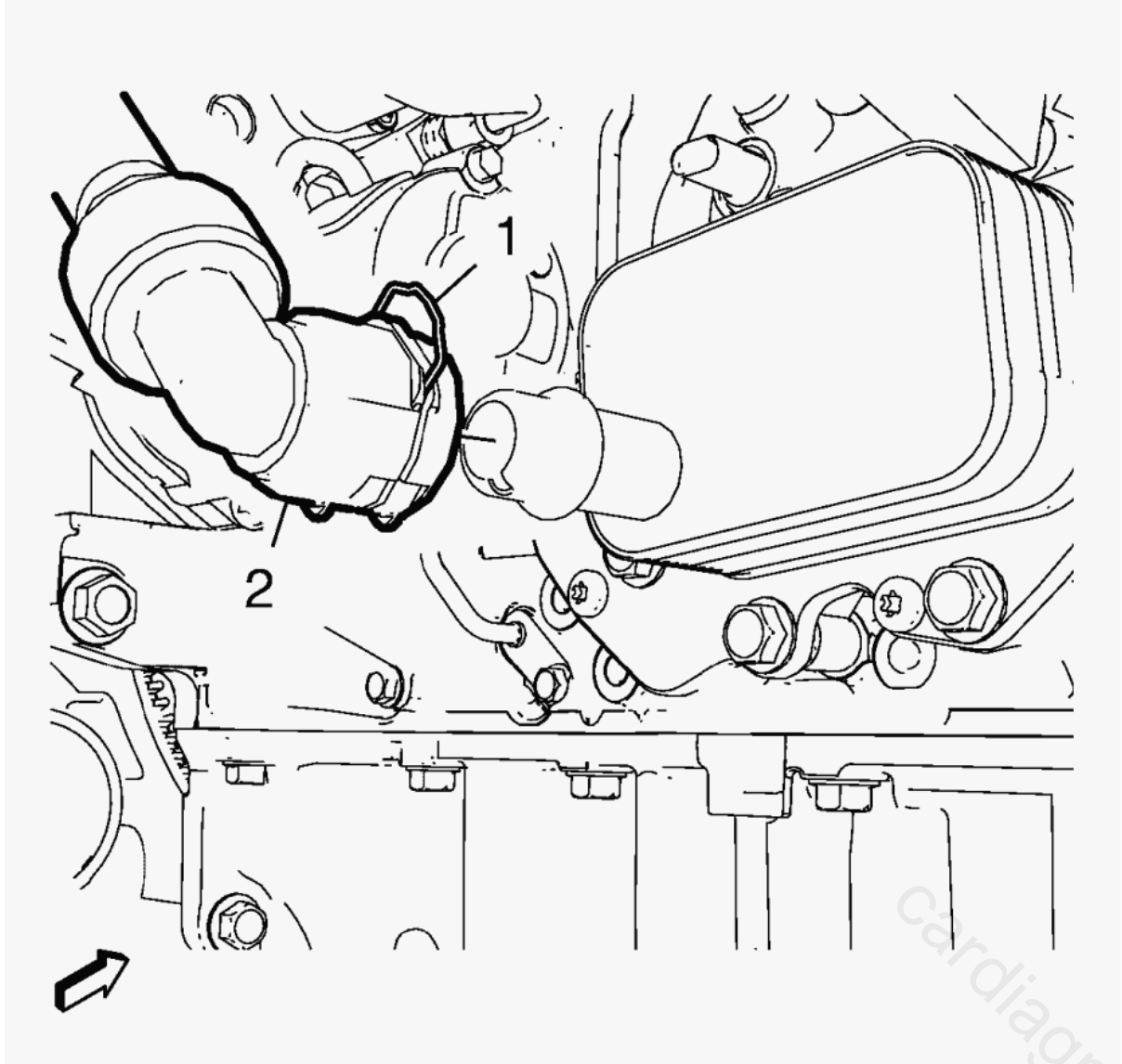


Fig. 130: Quick Connector Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Connect the heater inlet hose (2) to the oil cooler. Ensure the quick connector clamp (1) engages audible.
6. Install [Exhaust Front Pipe Replacement \(LH7\)](#)
7. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)
8. Check and correct the engine oil level.

ENGINE OIL COOLER REPLACEMENT (LTG)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)
2. Remove the engine oil filter. [Engine Oil and Oil Filter Replacement](#)
3. Remove Oil Pump Flow Control Valve Heat Shield - [Oil Pump Flow Control Valve Heat Shield Replacement](#)

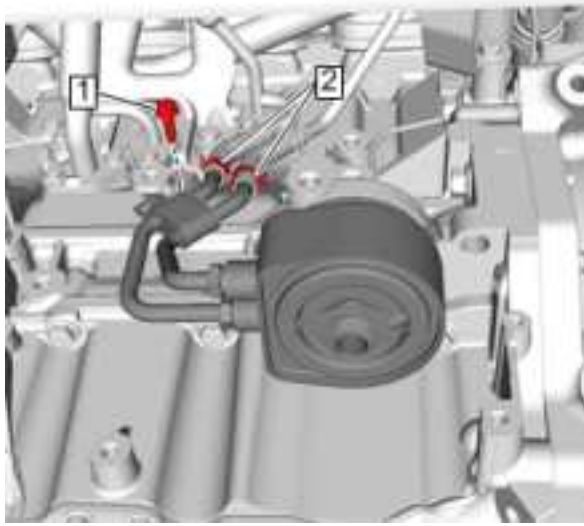


Fig. 131: Engine Oil Cooler Pipe Fastener
Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Oil Cooler Pipe Fastener (1).
5. Disengage Engine Oil Cooler Hose Clamp (2) - [2x][Hose Clamp Replacement Guidelines - Spring Type](#)

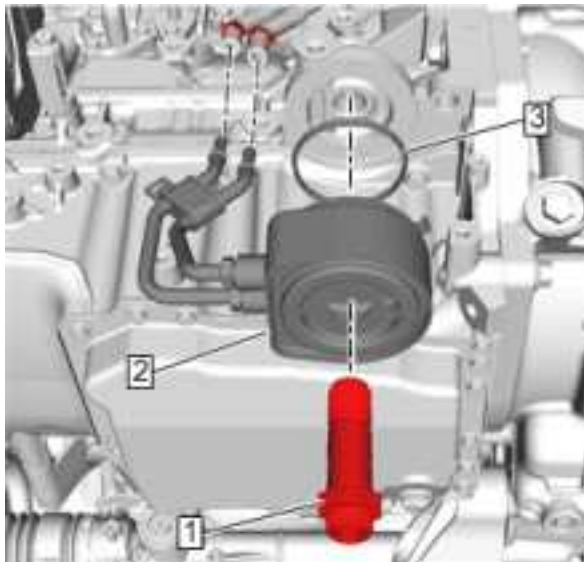


Fig. 132: Engine Oil Cooler Connector
Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Oil Cooler Core Bolt (1).
7. Remove Engine Oil Cooler (2).
8. Remove Engine Oil Cooler Seal (3) and DISCARD

Installation Procedure

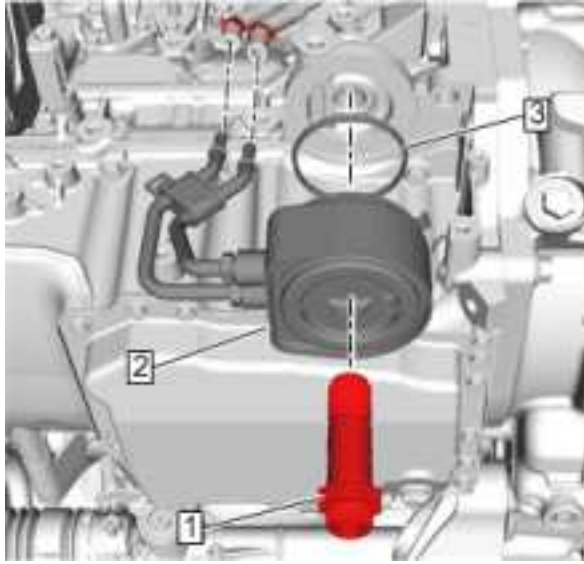


Fig. 133: Engine Oil Cooler Connector
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** seal.

1. Install Engine Oil Cooler Seal (3).
2. Install Engine Oil Cooler (2).
3. Engine Oil Cooler Core Bolt (1) - Hand tighten

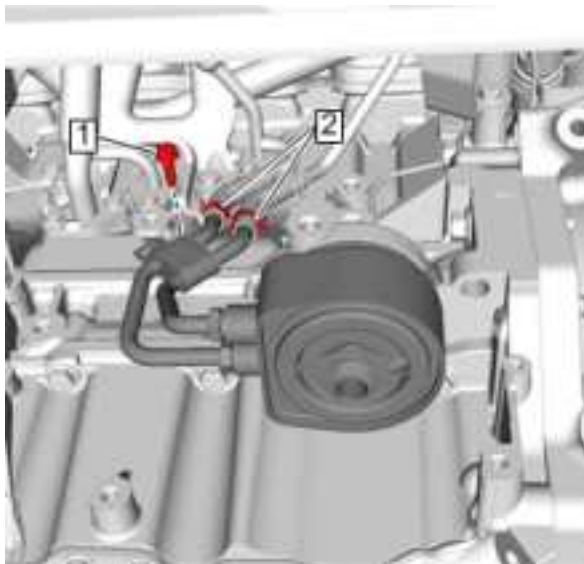


Fig. 134: Engine Oil Cooler Pipe Fastener
Courtesy of GENERAL MOTORS COMPANY

4. Engage Engine Oil Cooler Hose Clamp (2) - [2x][Hose Clamp Replacement Guidelines - Spring Type](#)

CAUTION: Refer to [Fastener Caution](#) .

5. Install Engine Oil Cooler Pipe Fastener (1) and tighten 10 N.m (89 lb in)

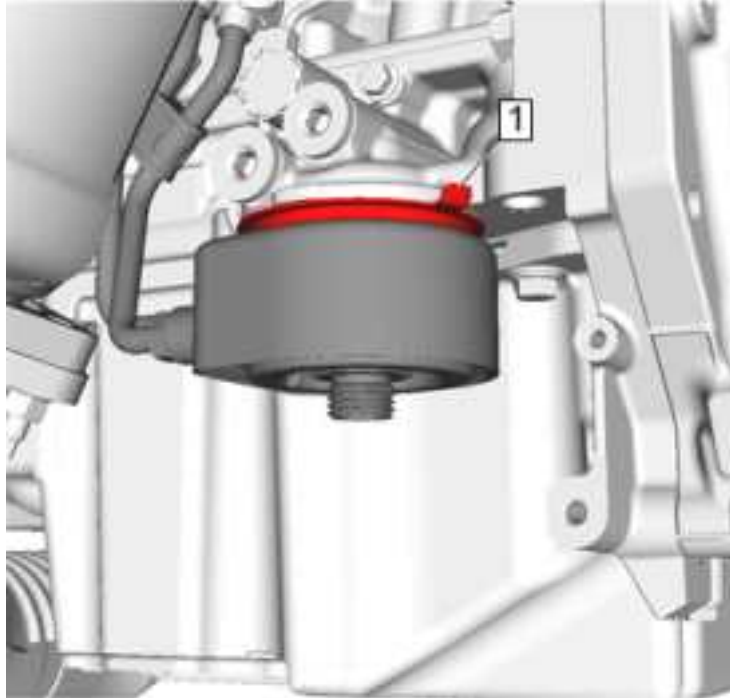


Fig. 135: Engine Oil Cooler Locating Tab
Courtesy of GENERAL MOTORS COMPANY

6. Ensure that the engine oil cooler locating tab (1) is positioned against the engine block.

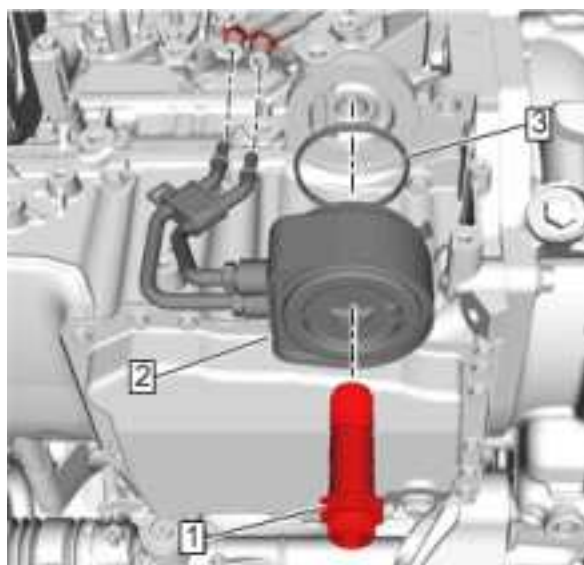


Fig. 136: Engine Oil Cooler Connector
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Component Fastener Tightening Caution](#) .

7. Engine Oil Cooler Core Bolt (1) - Tighten 50 N.m (37 lb ft)
8. Install Oil Pump Flow Control Valve Heat Shield - [Oil Pump Flow Control Valve Heat Shield Replacement](#)
9. Change the engine oil and filter. [Engine Oil and Oil Filter Replacement](#)
10. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

ENGINE COOLANT FAN REPLACEMENT (LYX)

Removal Procedure

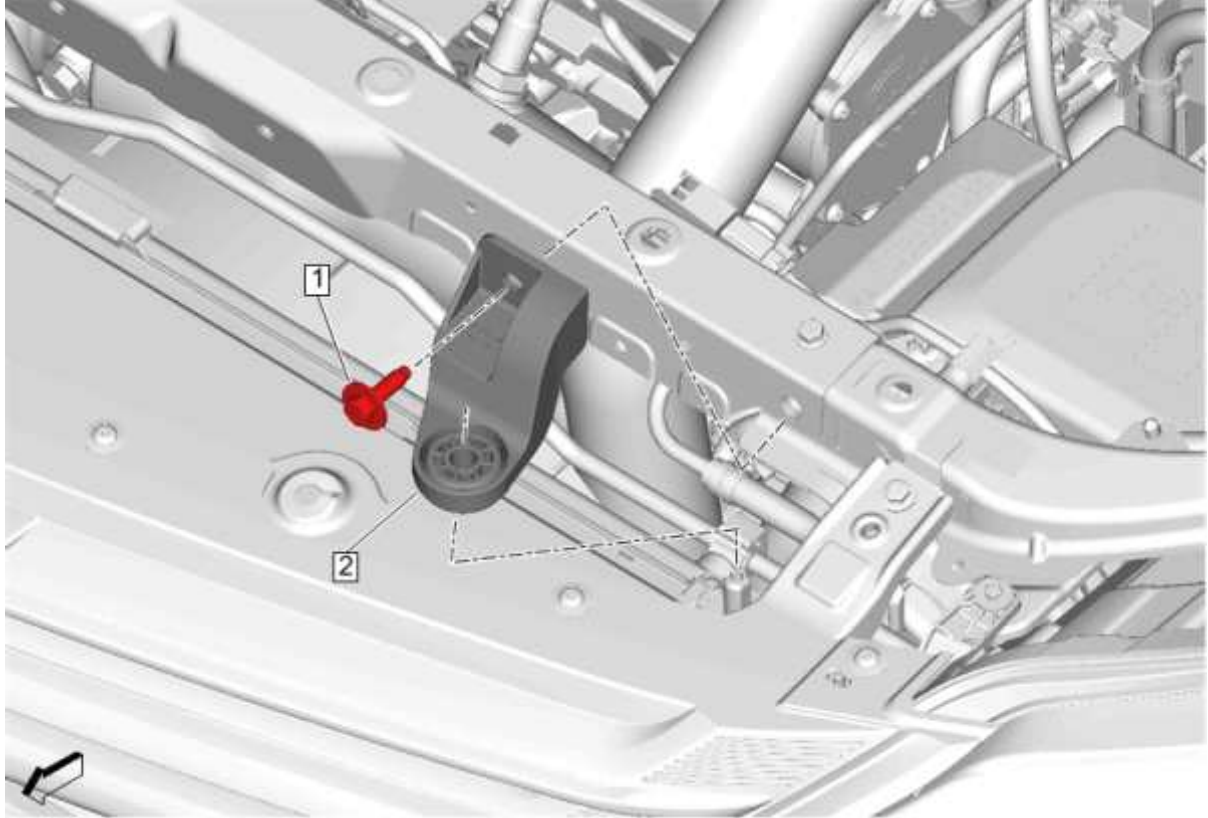


Fig. 137: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Radiator Upper Bracket-Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

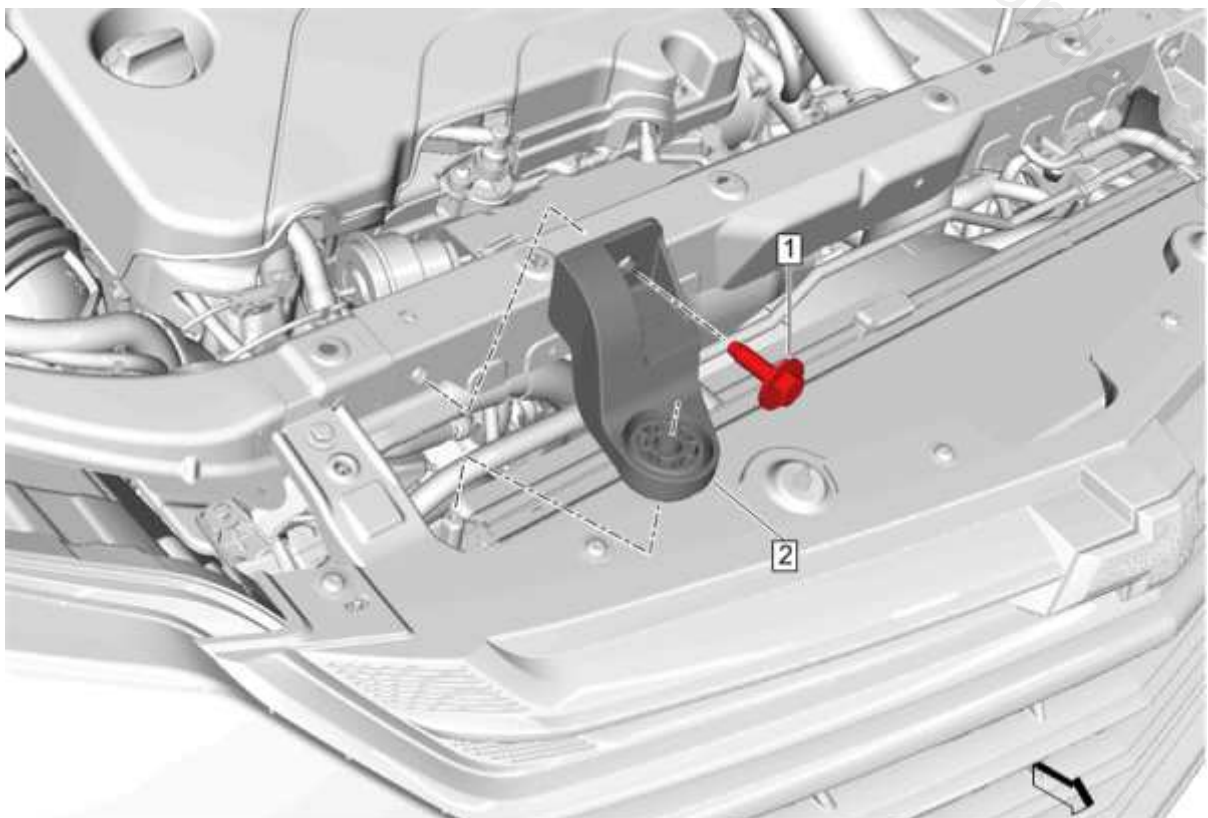


Fig. 138: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Radiator Upper Bracket-Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)
3. Remove Front End Upper Tie Bar - [Front End Upper Tie Bar Replacement \(Equinox\)](#) [Front End Upper Tie Bar Replacement \(Terrain\)](#)
4. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

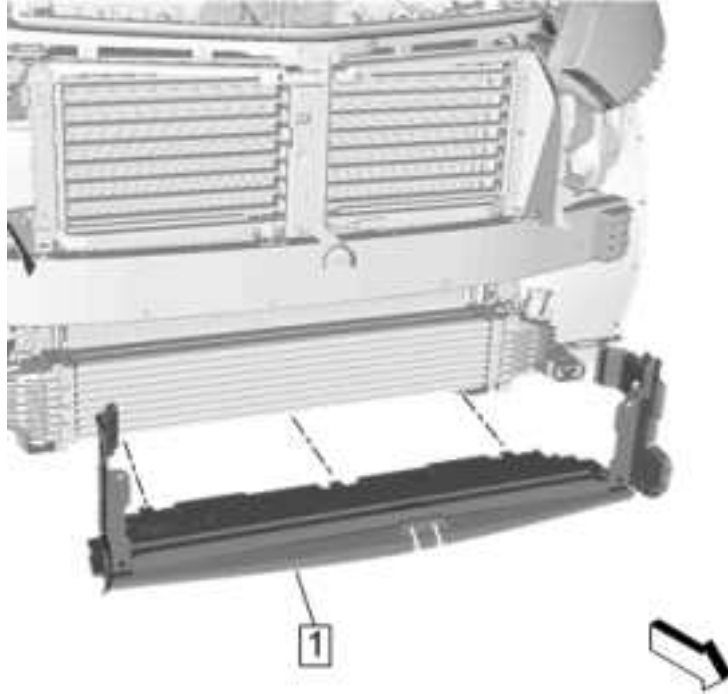


Fig. 139: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

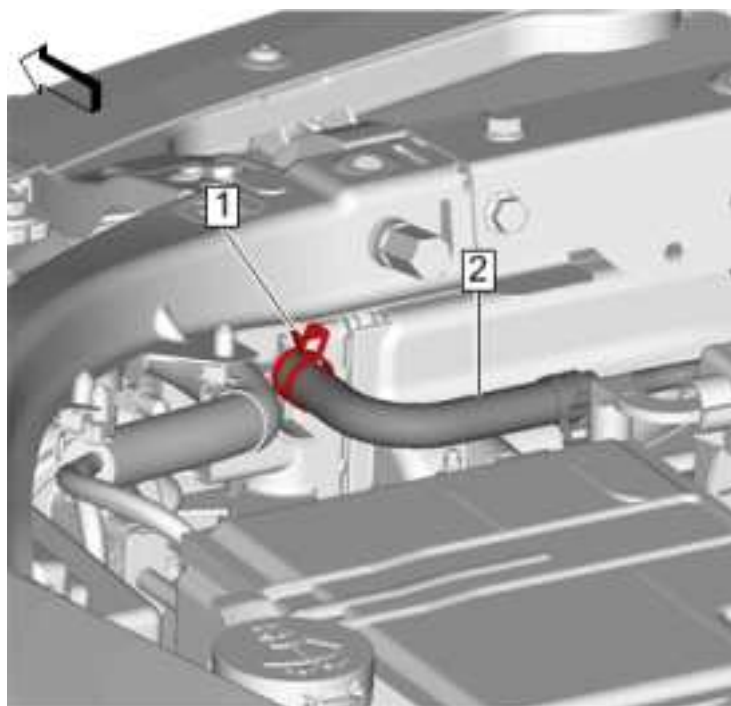


Fig. 140: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - [Engine Coolant Air Bleed Hose Replacement \(Turbocharger Coolant Return pipe to Water Outlet, LYX\)](#)[Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX\)](#)

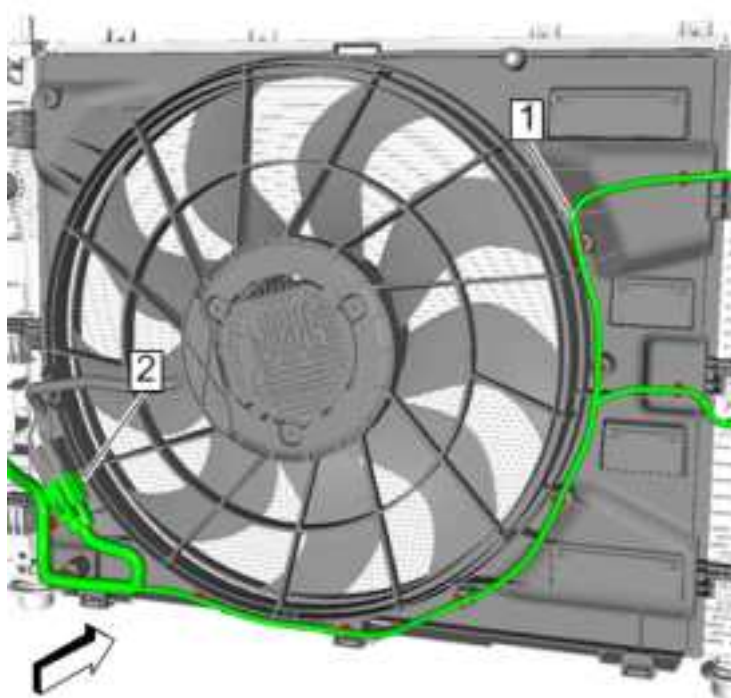


Fig. 141: Engine Coolant Fan Wiring Harness And Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.
8. Disconnect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
9. Remove Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

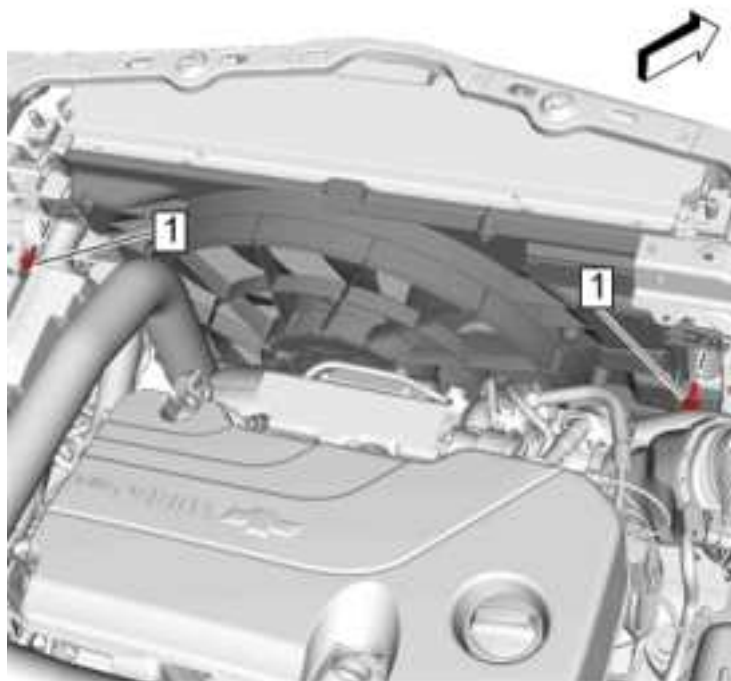


Fig. 142: Engine Coolant Fan Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Remove Engine Coolant Fan Bolt (1) - [2x]

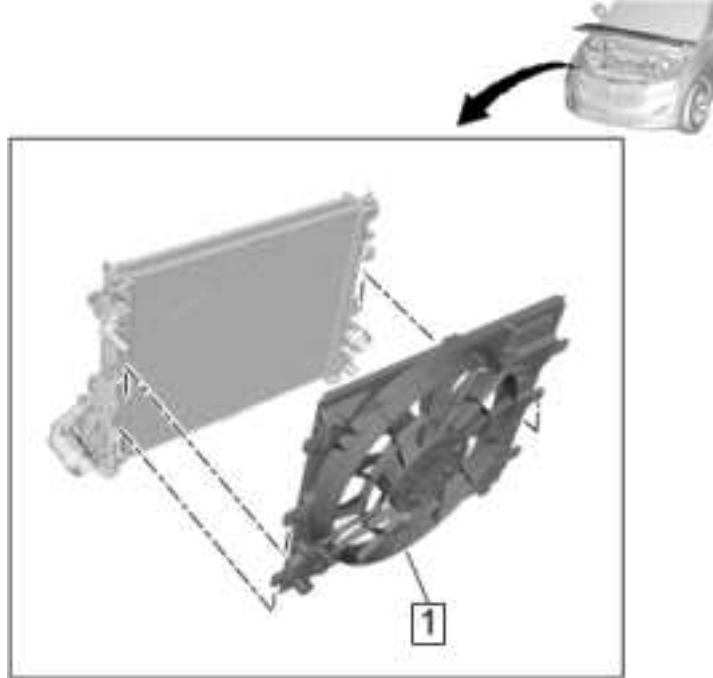


Fig. 143: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

11. Remove Engine Coolant Fan (1).
12. Transfer components as necessary.

Installation Procedure

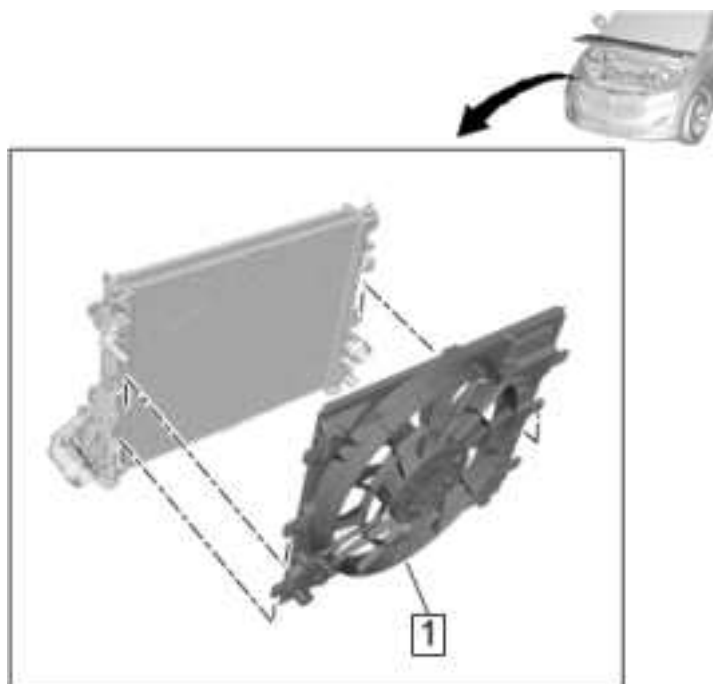


Fig. 144: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Fan (1).

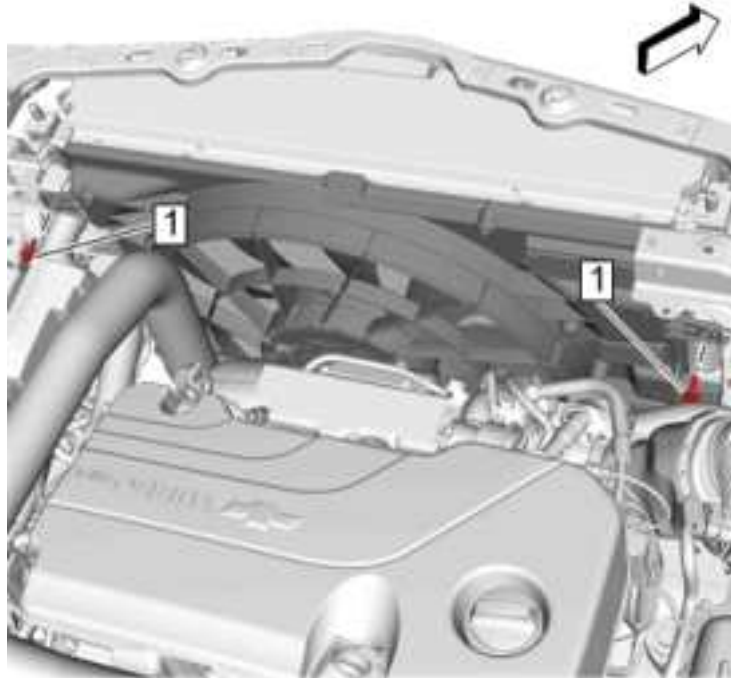


Fig. 145: Engine Coolant Fan Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install Engine Coolant Fan Bolt (1) and tighten [2x] 5 N.m (44 lb in)
3. Install Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

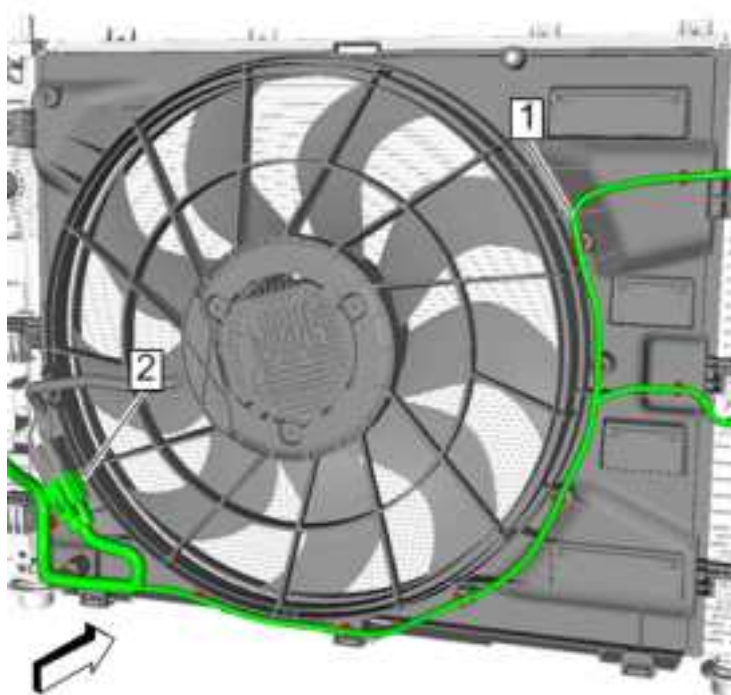


Fig. 146: Engine Coolant Fan Wiring Harness And Retainer
 Courtesy of GENERAL MOTORS COMPANY

4. Connect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan
5. Install Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.

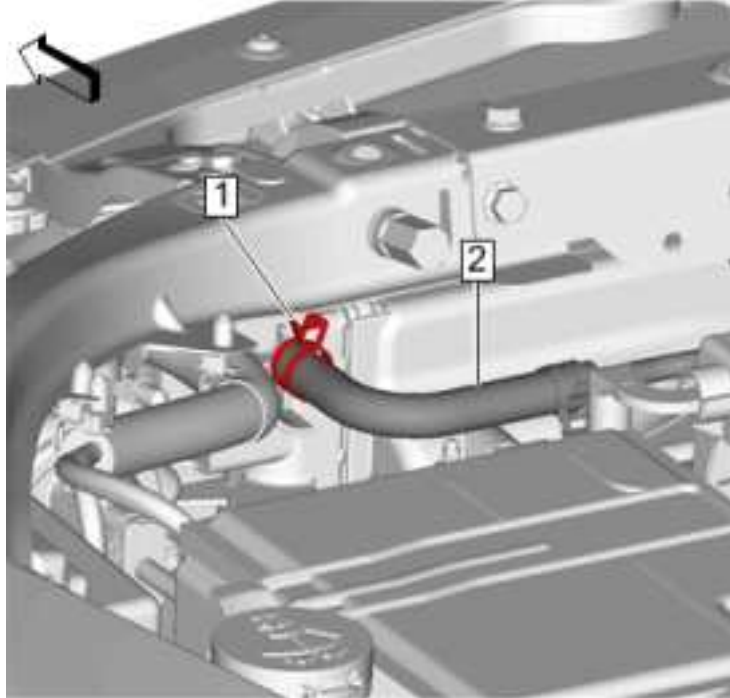


Fig. 147: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX)****Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)**

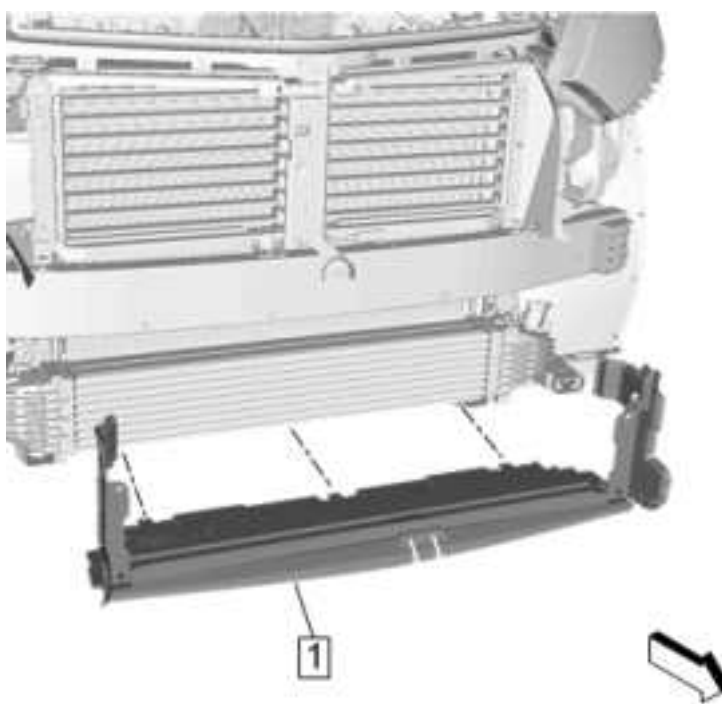


Fig. 148: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Air Lower Baffle (1) - **Radiator Air Lower Baffle Replacement (LH7 LTG LYX)**
8. Install Front Bumper Fascia -**Front Bumper Fascia Replacement (Equinox)** **Front Bumper Fascia Replacement (Terrain)**
9. Install Front End Upper Tie Bar -**Front End Upper Tie Bar Replacement (Equinox)** **Front End Upper Tie Bar Replacement (Terrain)**

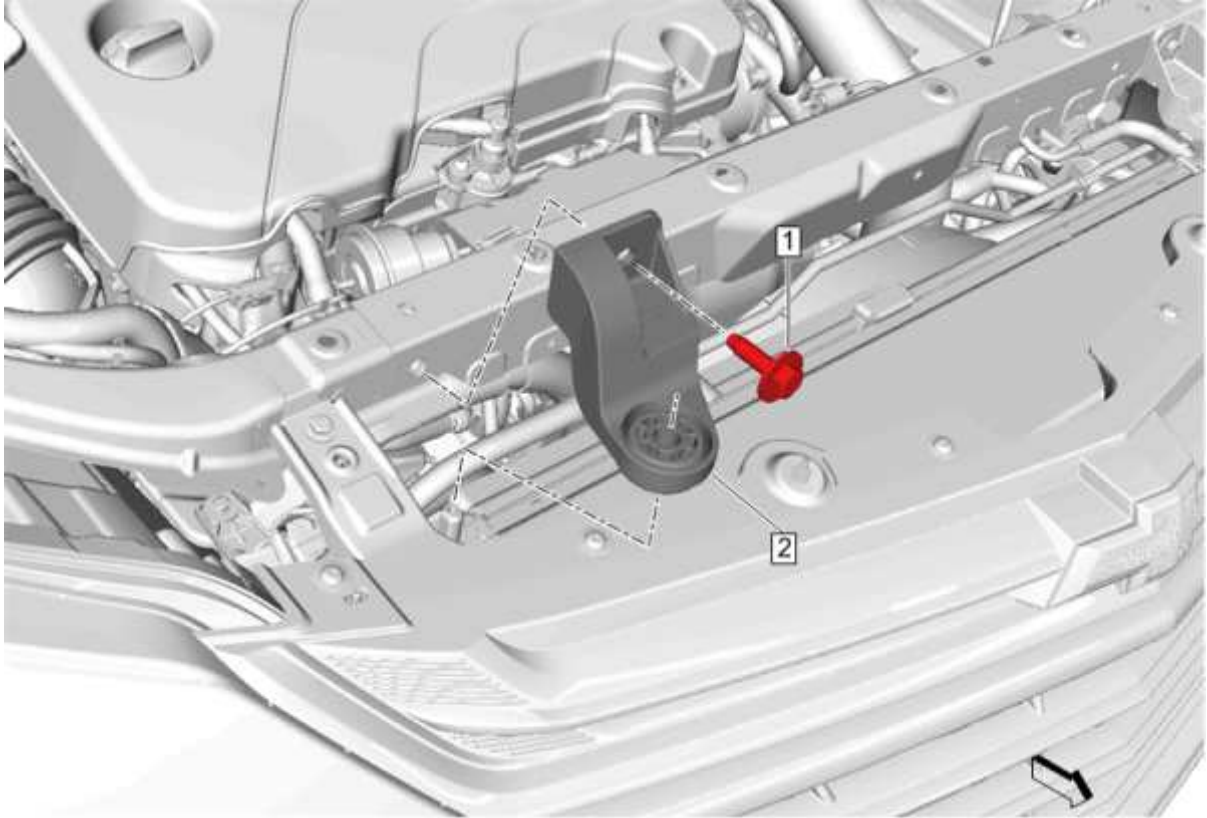


Fig. 149: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Upper Bracket-Right Side (2) - **Radiator Upper Bracket Replacement - Right Side**

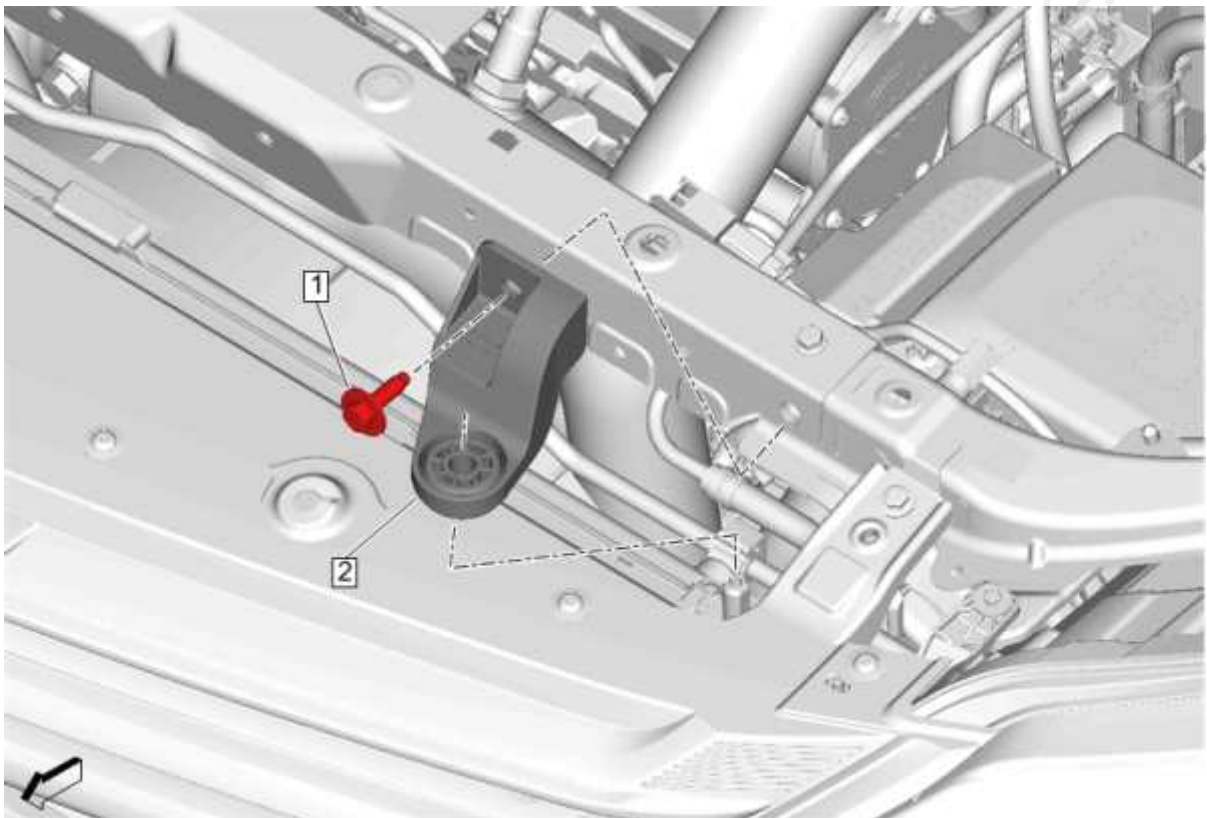


Fig. 150: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Upper Bracket-Left Side (2) - **Radiator Upper Bracket Replacement - Left Side**

ENGINE COOLANT FAN REPLACEMENT (LTG)

Removal Procedure

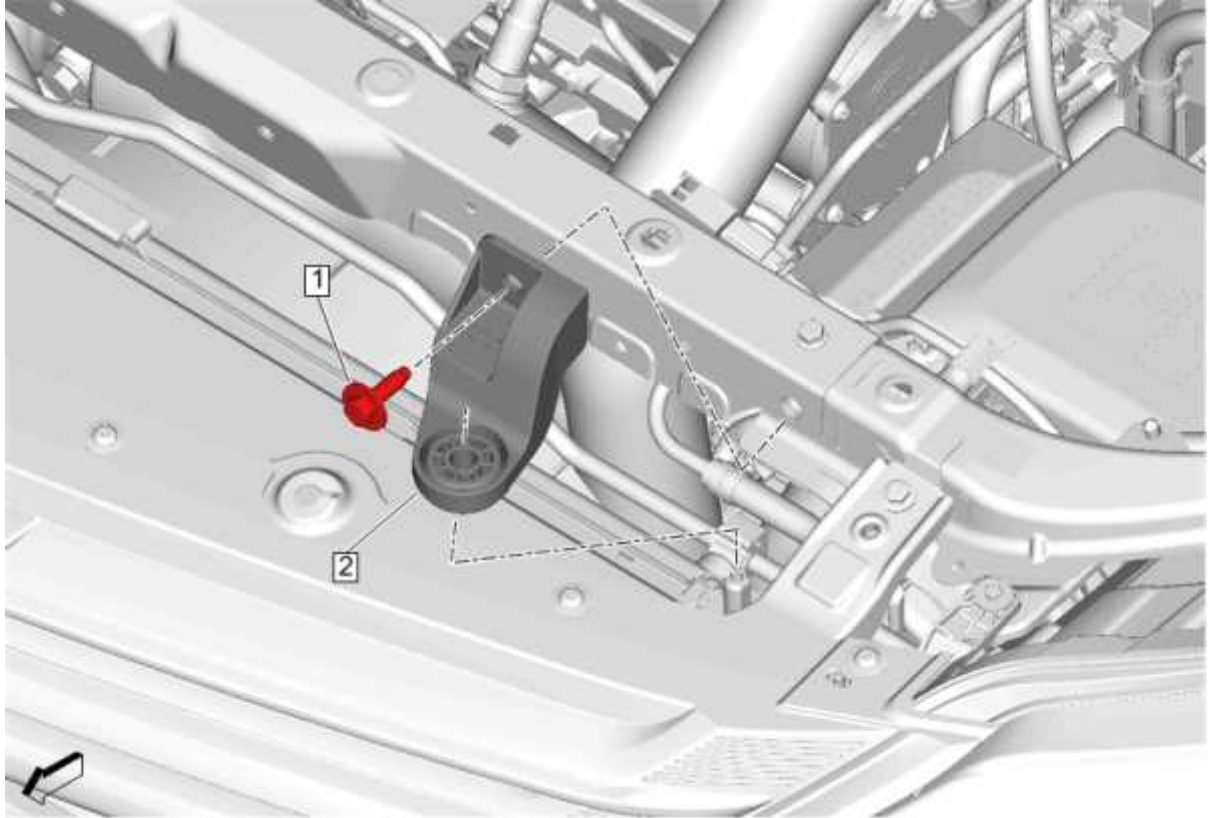


Fig. 151: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Radiator Upper Bracket-Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

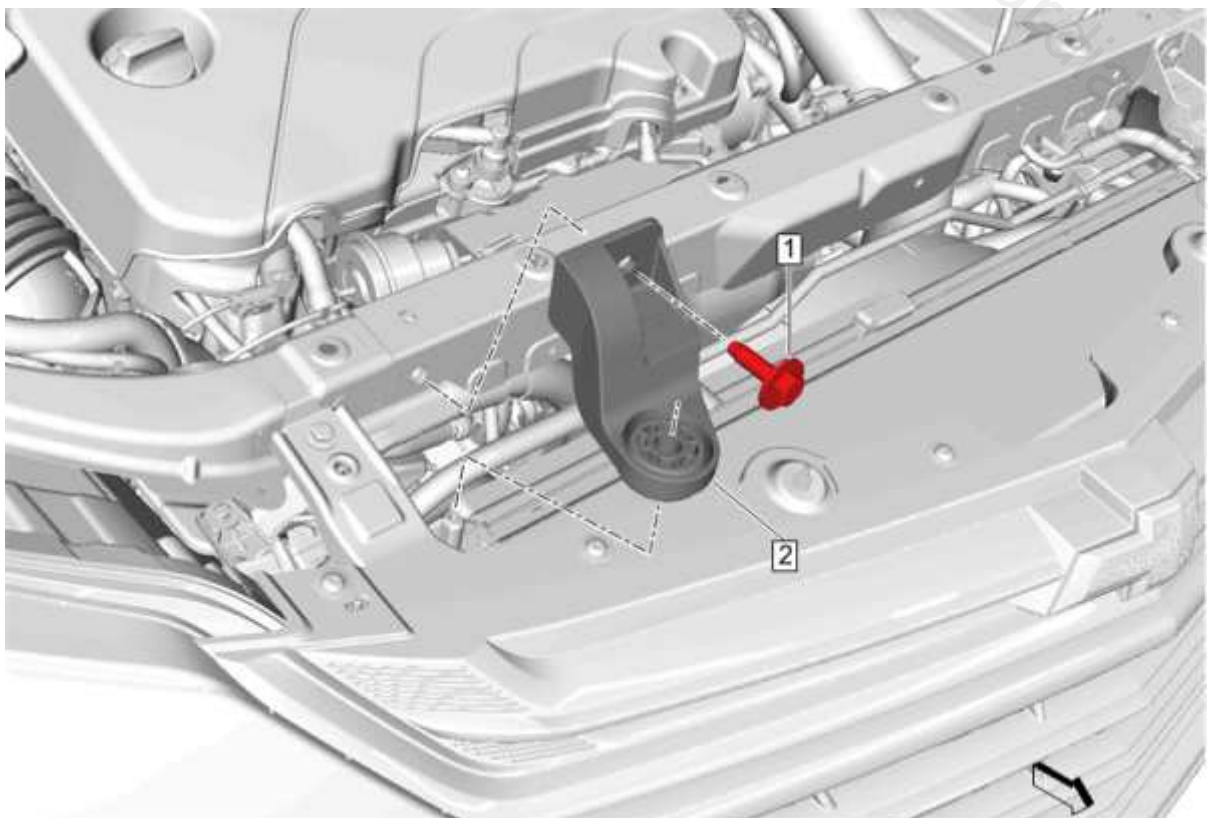


Fig. 152: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Radiator Upper Bracket-Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)
3. Remove Front End Upper Tie Bar - [Front End Upper Tie Bar Replacement \(Equinox\)](#) [Front End Upper Tie Bar Replacement \(Terrain\)](#)
4. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

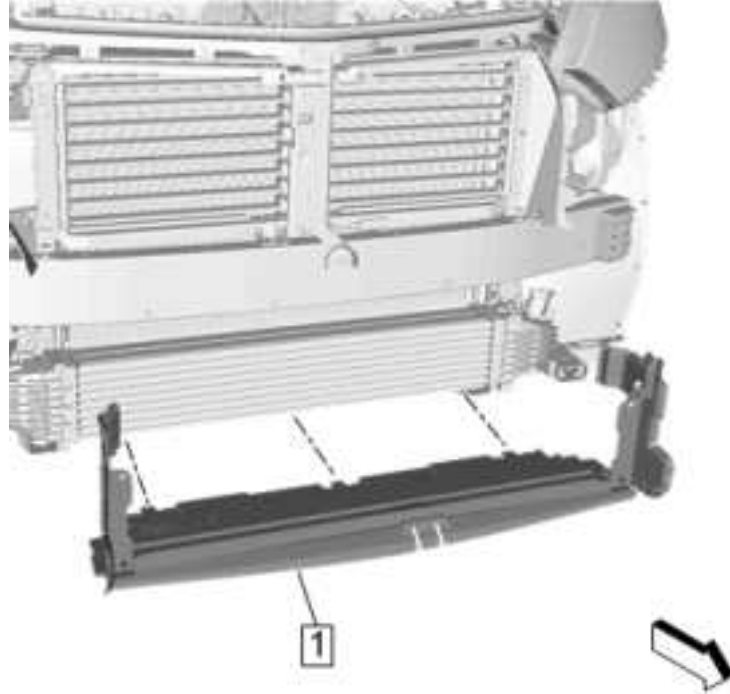


Fig. 153: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

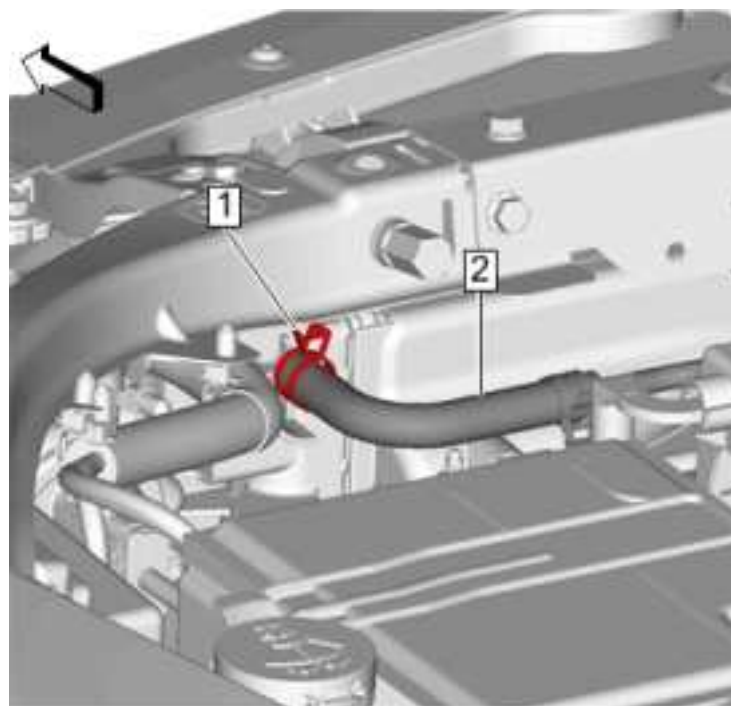


Fig. 154: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG\)](#)

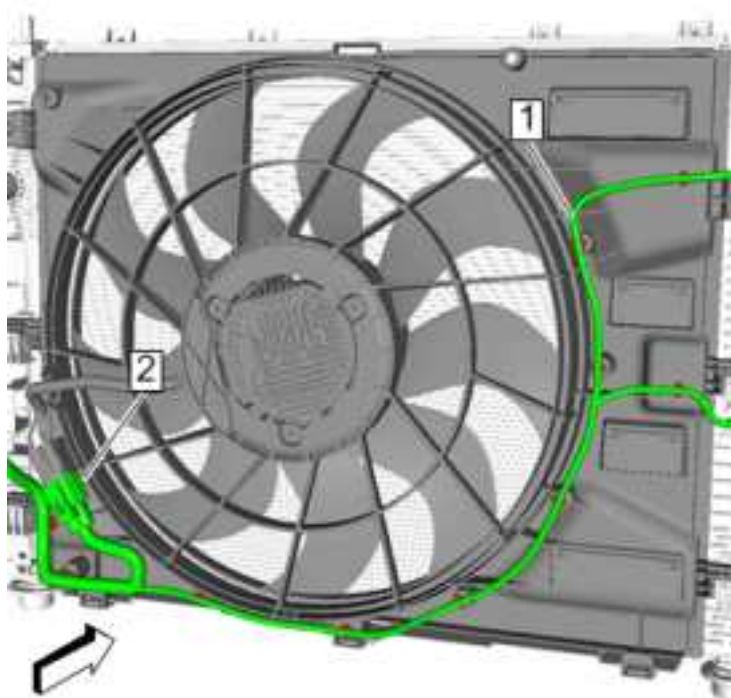


Fig. 155: Engine Coolant Fan Wiring Harness And Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.
8. Disconnect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
9. Remove Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

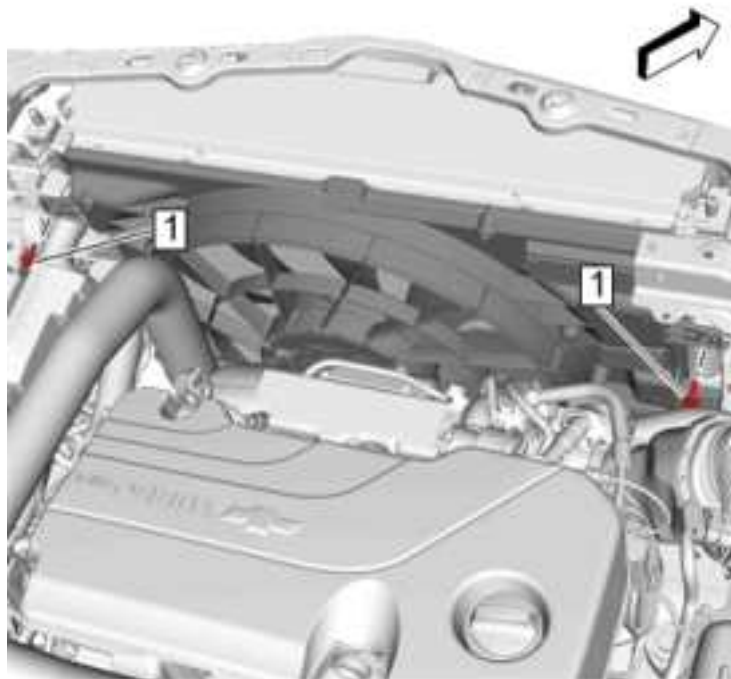


Fig. 156: Engine Coolant Fan Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Remove Engine Coolant Fan Bolt (1) - [2x]

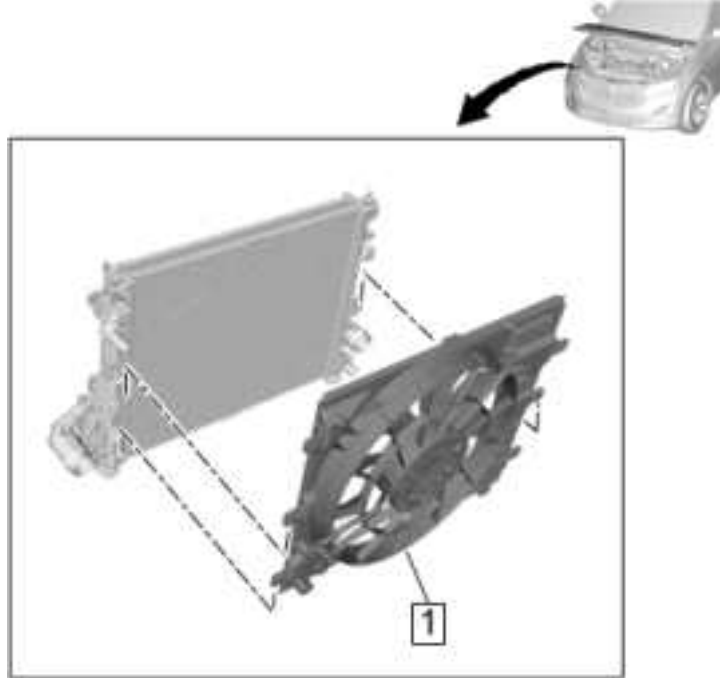


Fig. 157: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

11. Remove Engine Coolant Fan (1).
12. Transfer components as necessary.

Installation Procedure

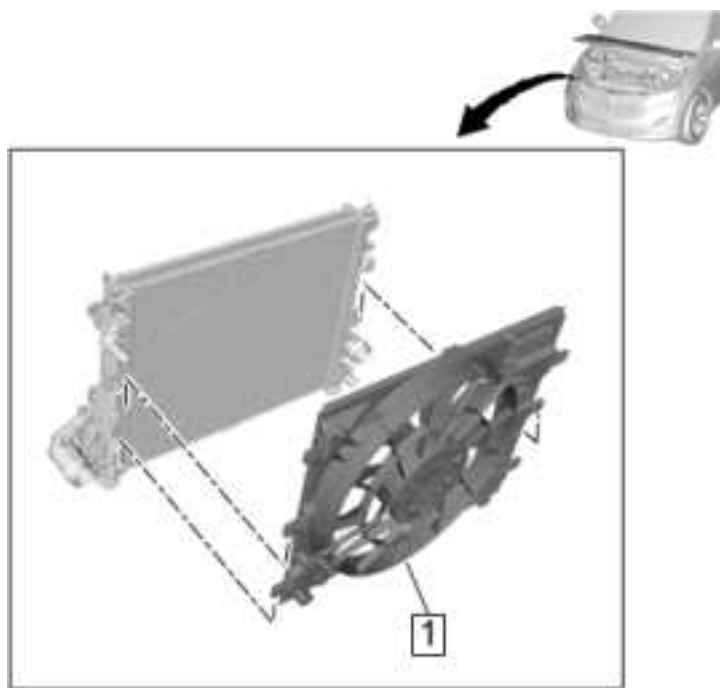


Fig. 158: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Fan (1).

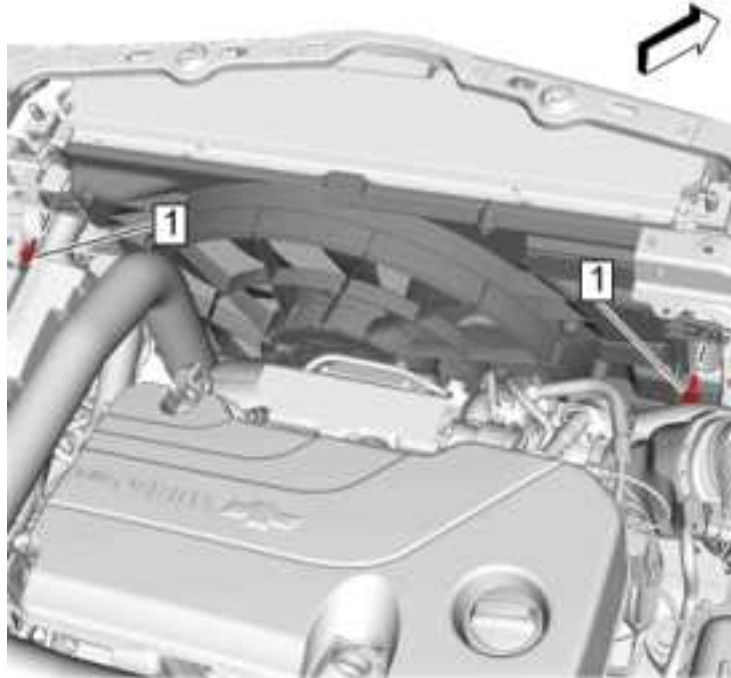


Fig. 159: Engine Coolant Fan Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install Engine Coolant Fan Bolt (1) and tighten [2x] 5 N.m (44 lb in)
3. Install Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

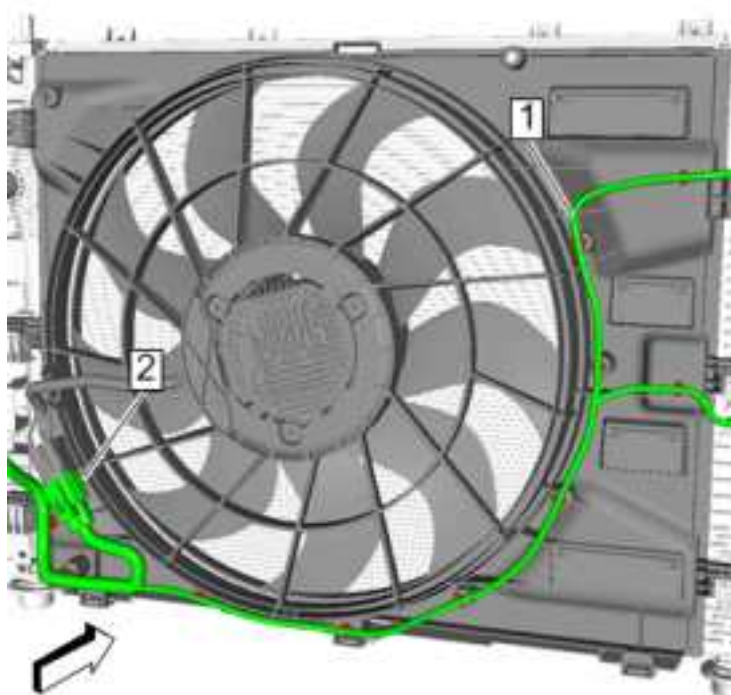


Fig. 160: Engine Coolant Fan Wiring Harness And Retainer
 Courtesy of GENERAL MOTORS COMPANY

4. Connect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
5. Install Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.

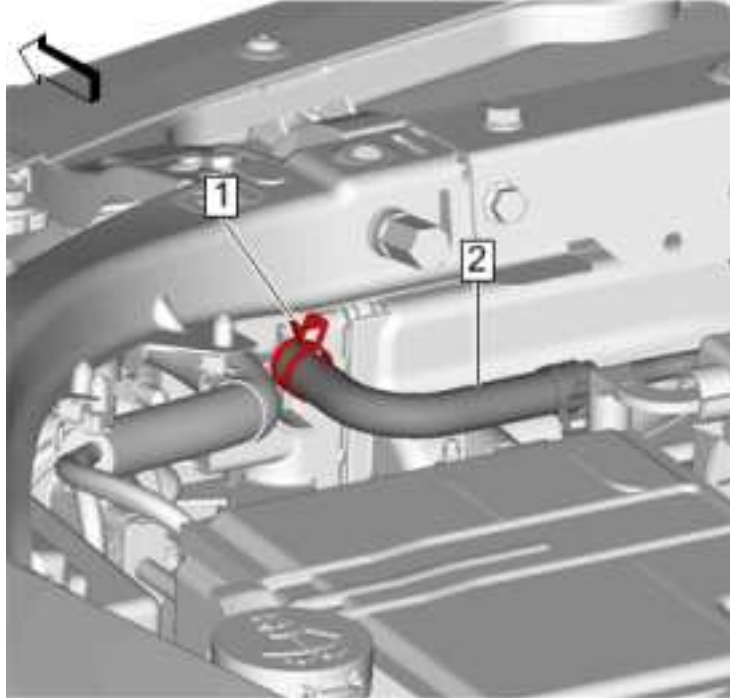


Fig. 161: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG)**

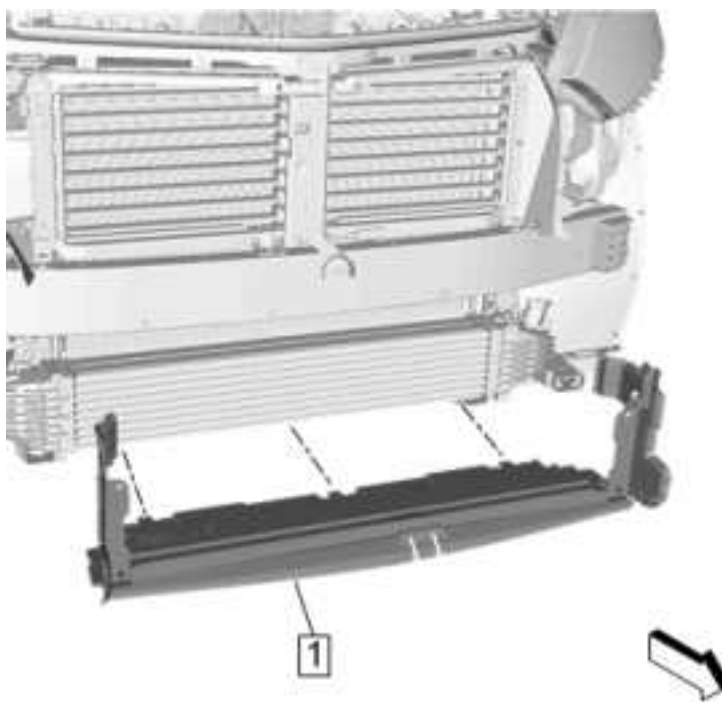


Fig. 162: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Air Lower Baffle (1) - **Radiator Air Lower Baffle Replacement (LH7 LTG LYX)**
8. Install Front Bumper Fascia - **Front Bumper Fascia Replacement (Equinox) Front Bumper Fascia Replacement (Terrain)**
9. Install Front End Upper Tie Bar - **Front End Upper Tie Bar Replacement (Equinox) Front End Upper Tie Bar Replacement (Terrain)**

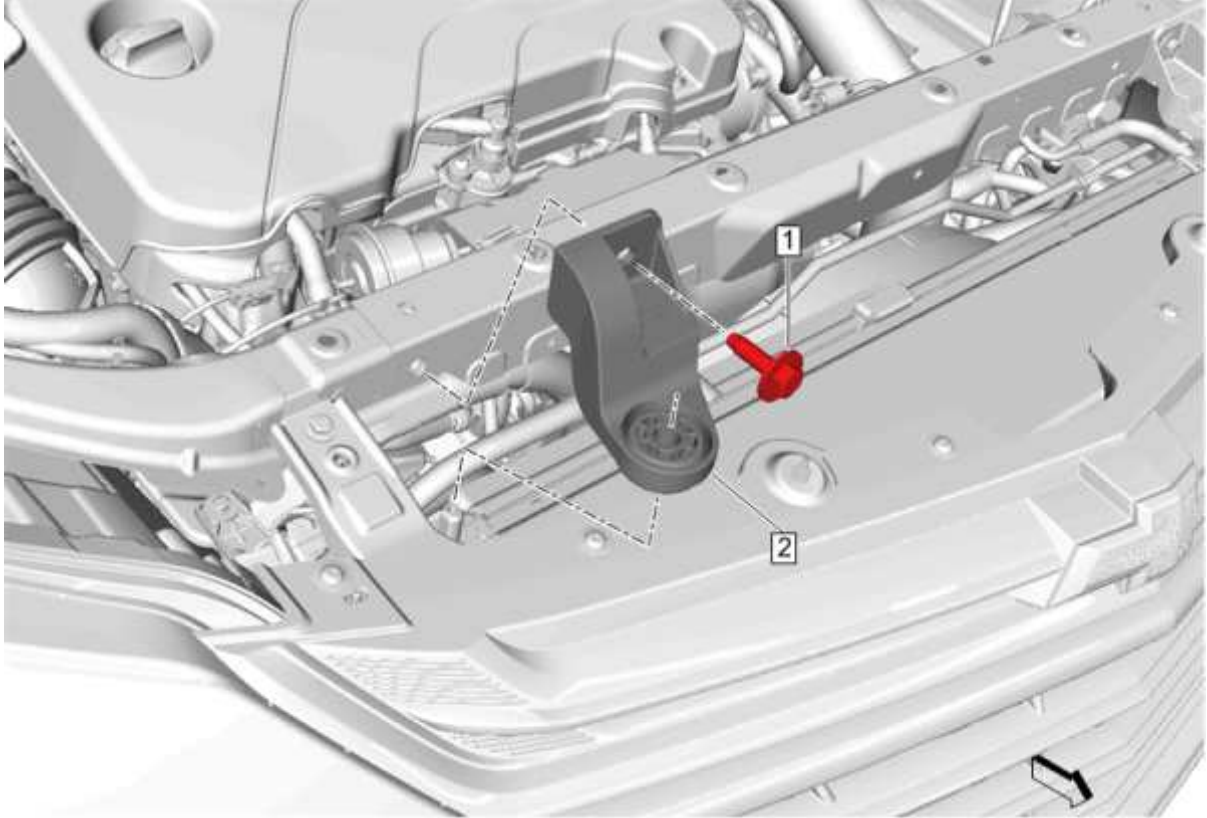


Fig. 163: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Upper Bracket-Right Side (2) - **Radiator Upper Bracket Replacement - Right Side**

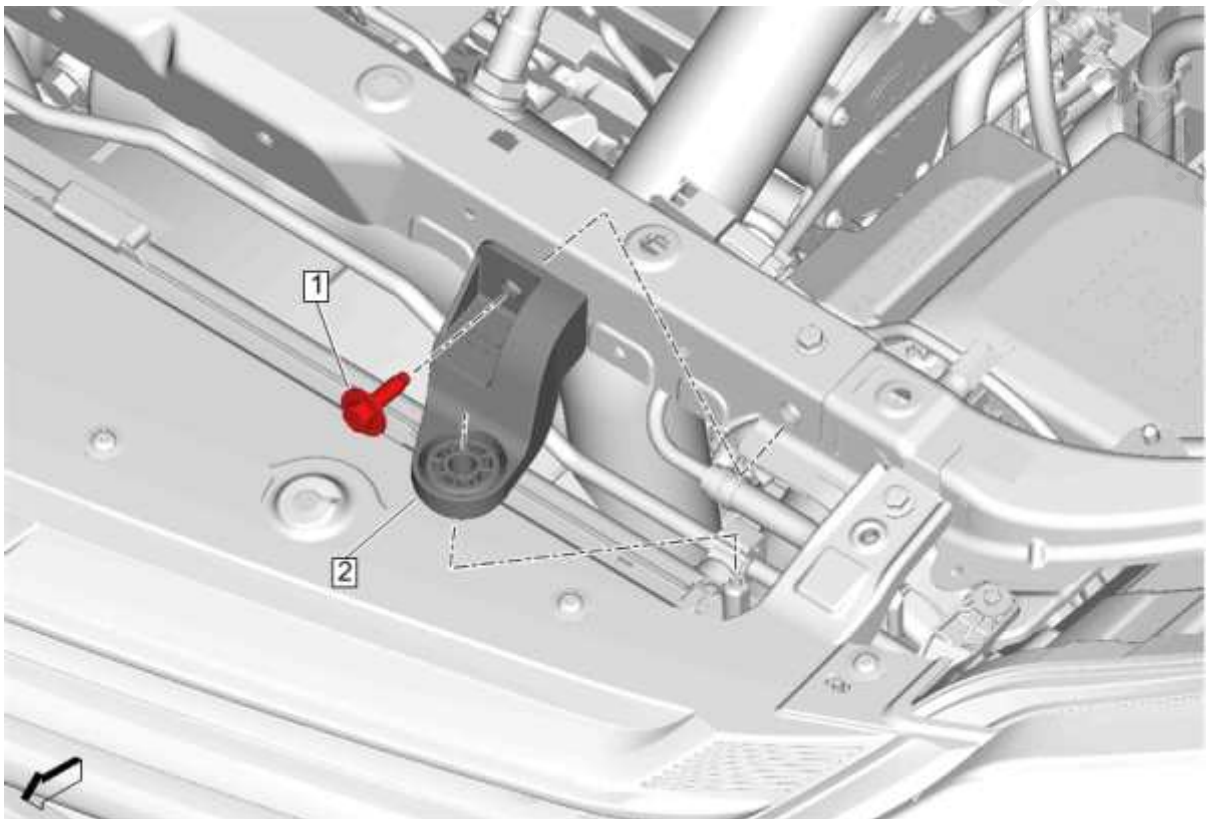


Fig. 164: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Upper Bracket-Left Side (2) - **Radiator Upper Bracket Replacement - Left Side**

ENGINE COOLANT FAN REPLACEMENT (LH7)

Removal Procedure

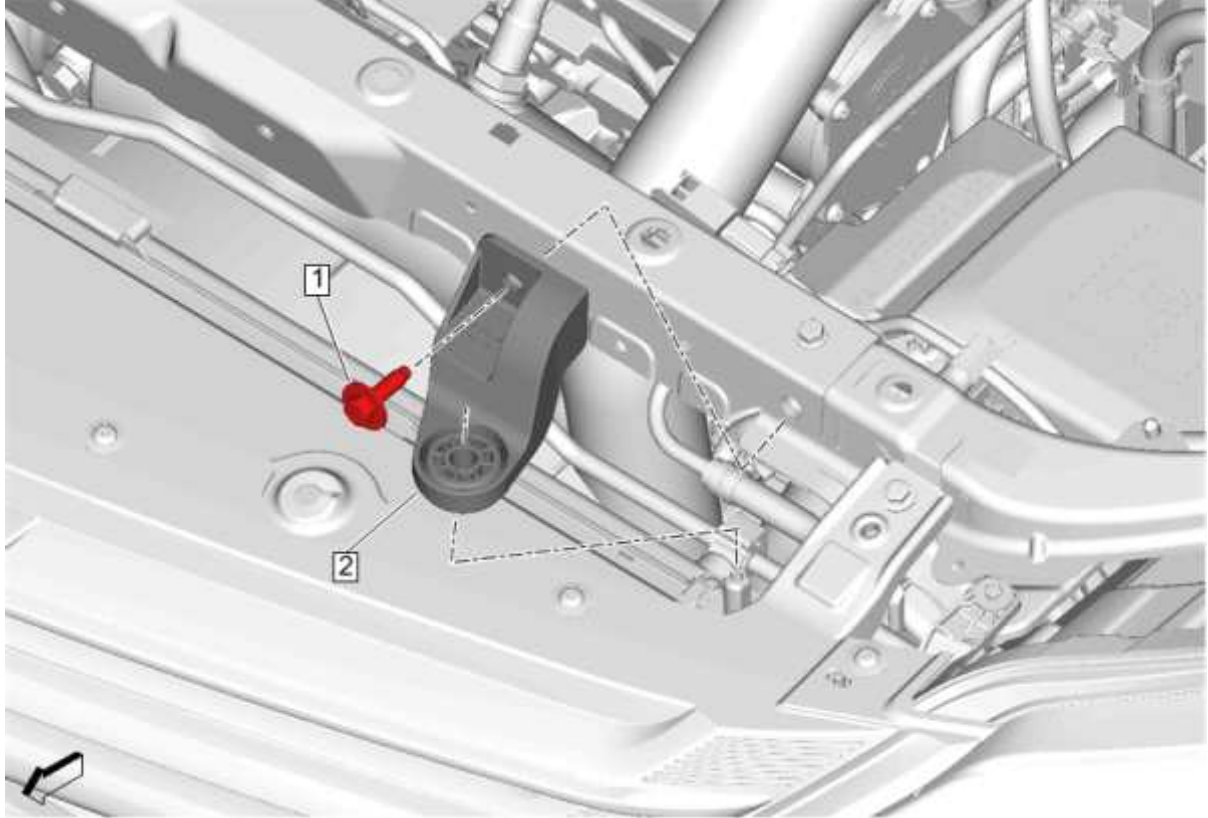


Fig. 165: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Radiator Upper Bracket-Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

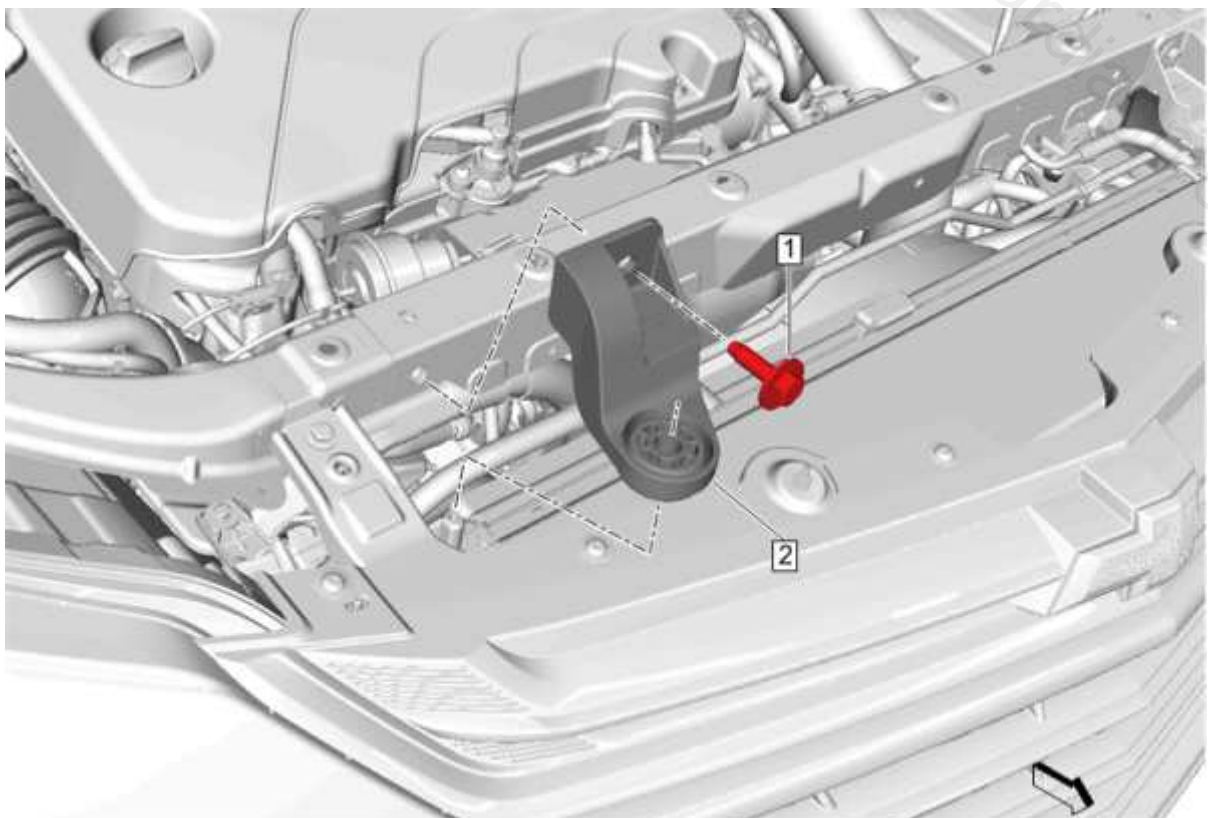


Fig. 166: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Radiator Upper Bracket-Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)
3. Remove Front End Upper Tie Bar - [Front End Upper Tie Bar Replacement \(Equinox\)](#) [Front End Upper Tie Bar Replacement \(Terrain\)](#)
4. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

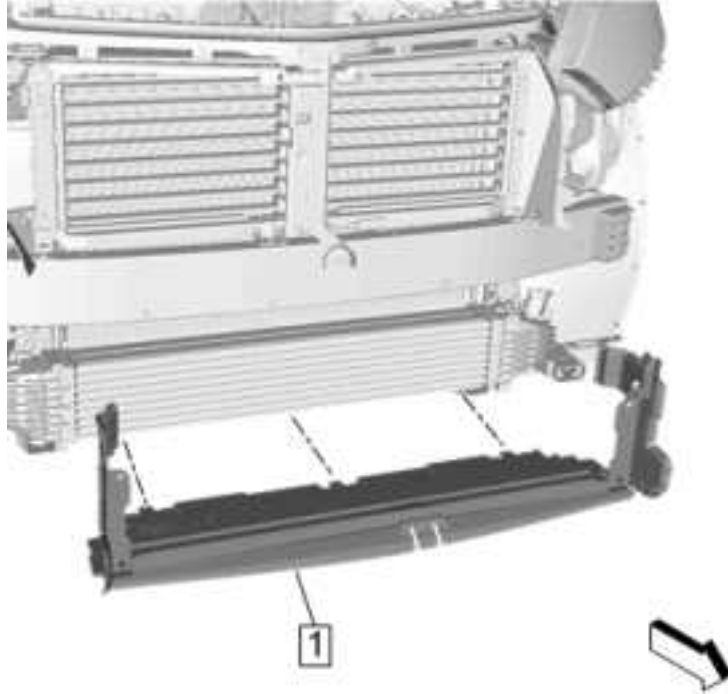


Fig. 167: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

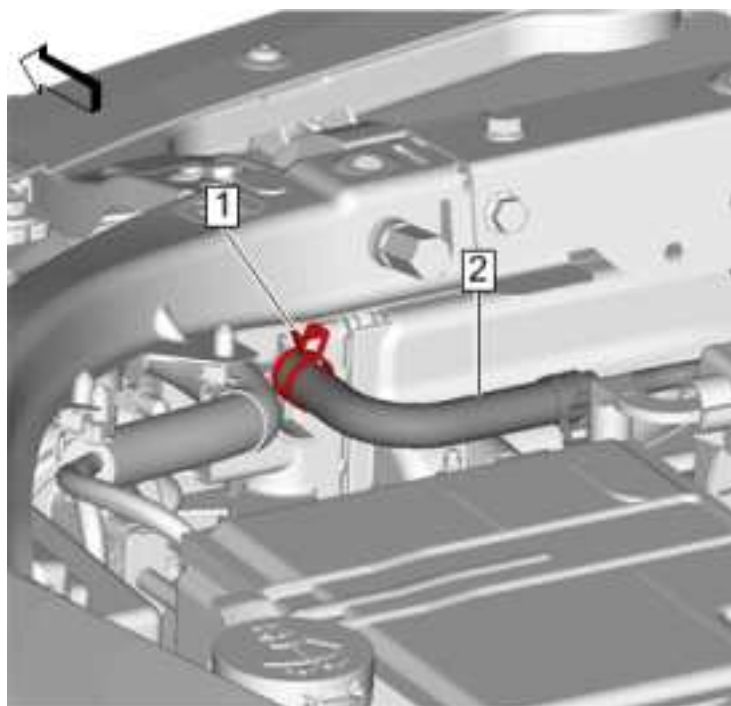


Fig. 168: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7\)](#)

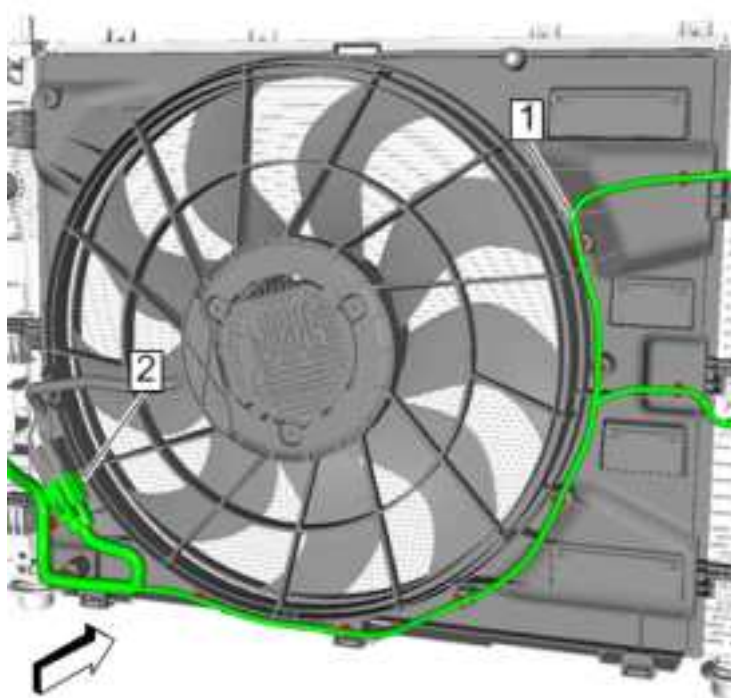


Fig. 169: Engine Coolant Fan Wiring Harness And Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.
8. Disconnect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
9. Remove Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

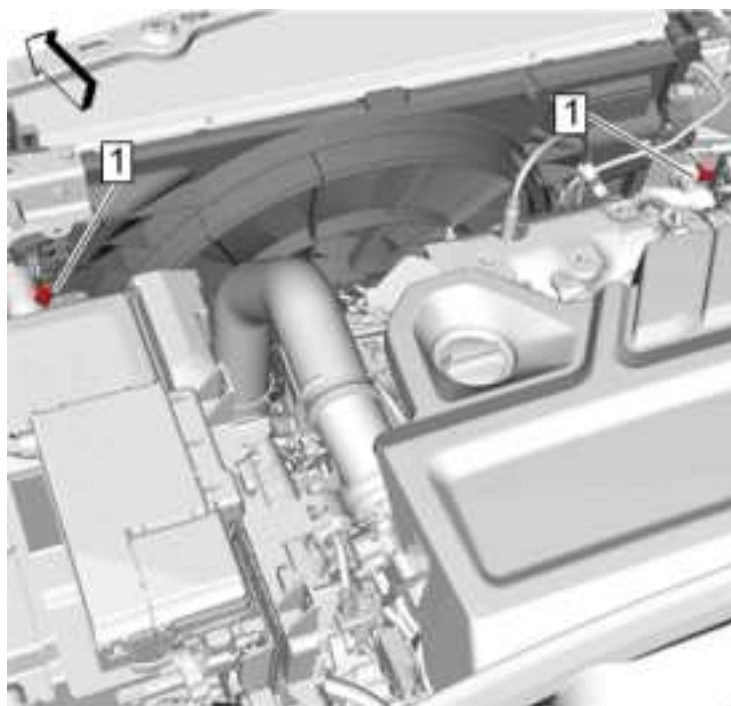


Fig. 170: Engine Coolant Fan And Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Remove Engine Coolant Fan Bolt (1) - [2x]

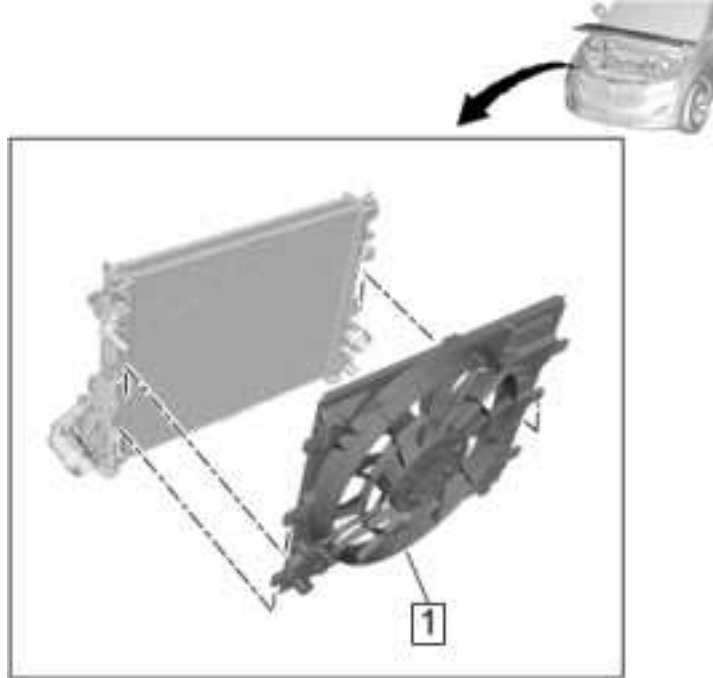


Fig. 171: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

11. Remove Engine Coolant Fan (1).
12. Transfer components as necessary.

Installation Procedure

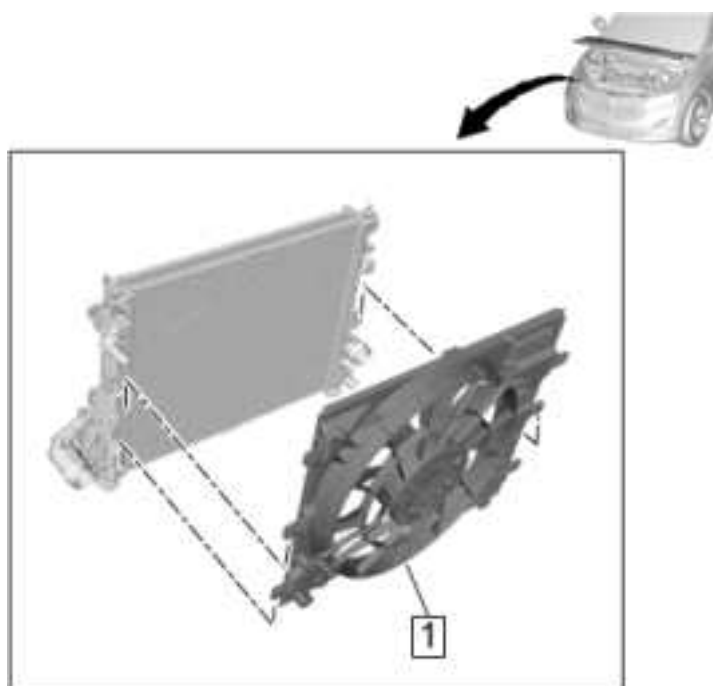


Fig. 172: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Fan (1).

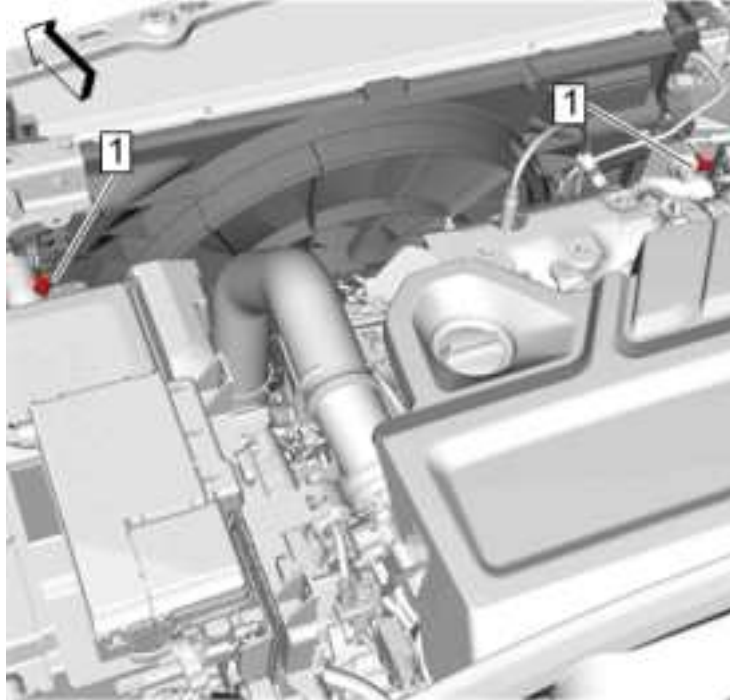


Fig. 173: Engine Coolant Fan And Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install Engine Coolant Fan Bolt (1) and tighten [2x] 5 N.m (44 lb in)
3. Install Transmission Fluid Cooler Pipe - [Transmission Fluid Cooler Pipe Replacement](#)

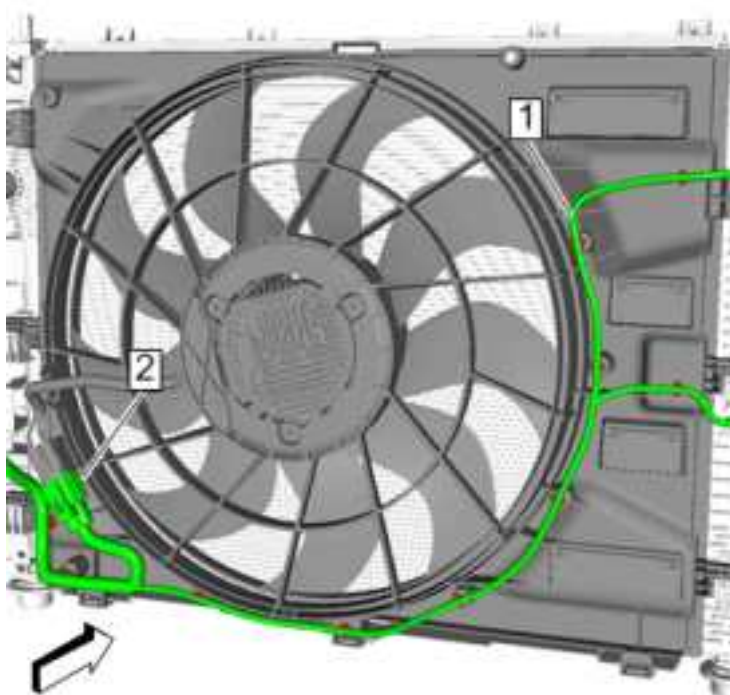


Fig. 174: Engine Coolant Fan Wiring Harness And Retainer
 Courtesy of GENERAL MOTORS COMPANY

4. Connect Engine Coolant Fan Wiring Harness (2) @ Engine Coolant Fan.
5. Install Engine Coolant Fan Wiring Harness (1) @ Engine Coolant Fan.

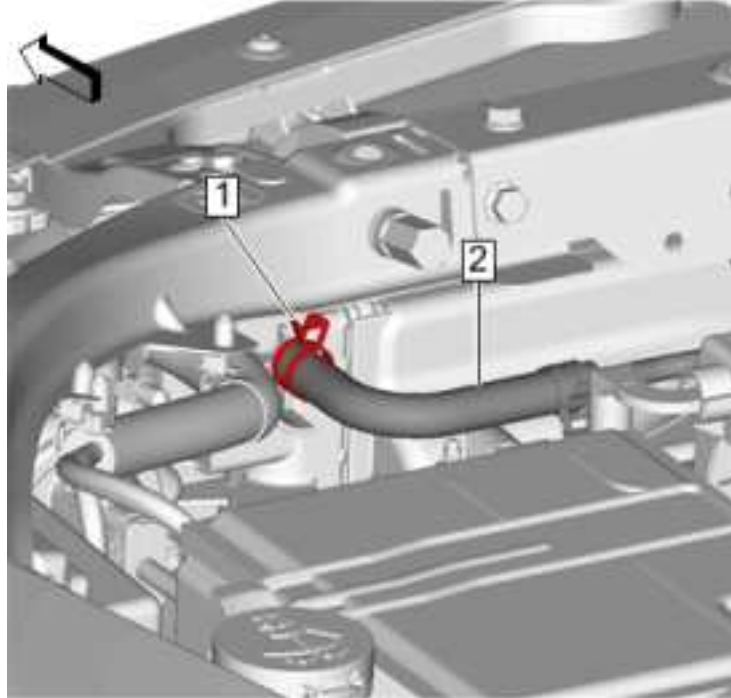


Fig. 175: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**

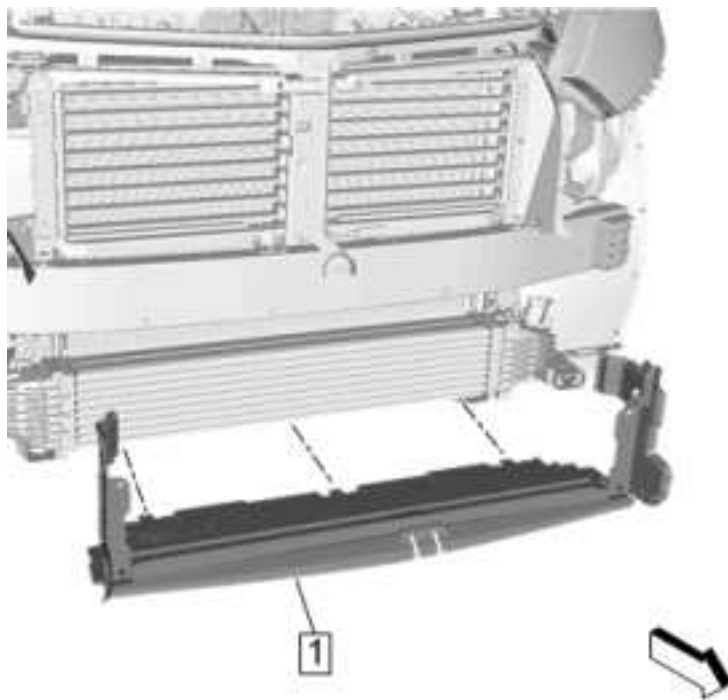


Fig. 176: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Air Lower Baffle (1) - **Radiator Air Lower Baffle Replacement (LH7 LTG LYX)**
8. Install Front Bumper Fascia - **Front Bumper Fascia Replacement (Equinox) Front Bumper Fascia Replacement (Terrain)**
9. Install Front End Upper Tie Bar - **Front End Upper Tie Bar Replacement (Equinox) Front End Upper Tie Bar Replacement (Terrain)**

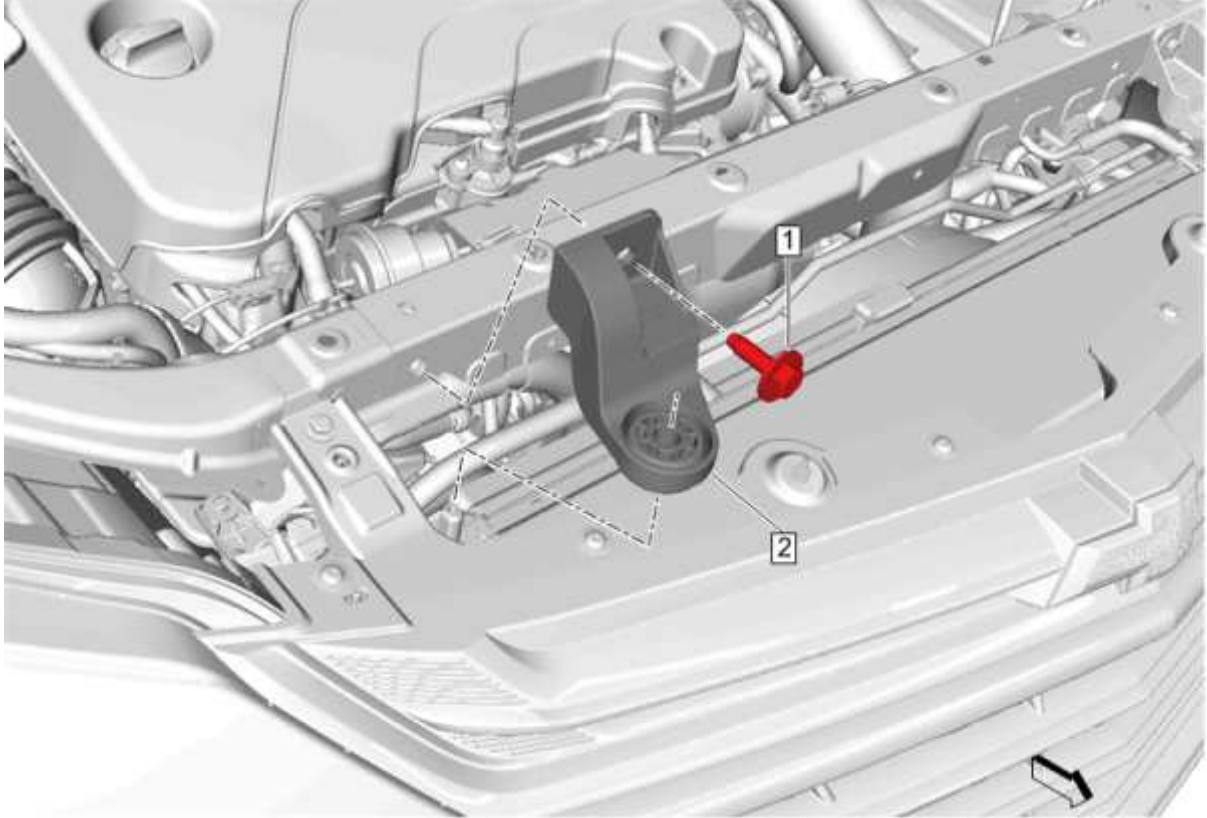


Fig. 177: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Upper Bracket-Right Side (2) - **Radiator Upper Bracket Replacement - Right Side**

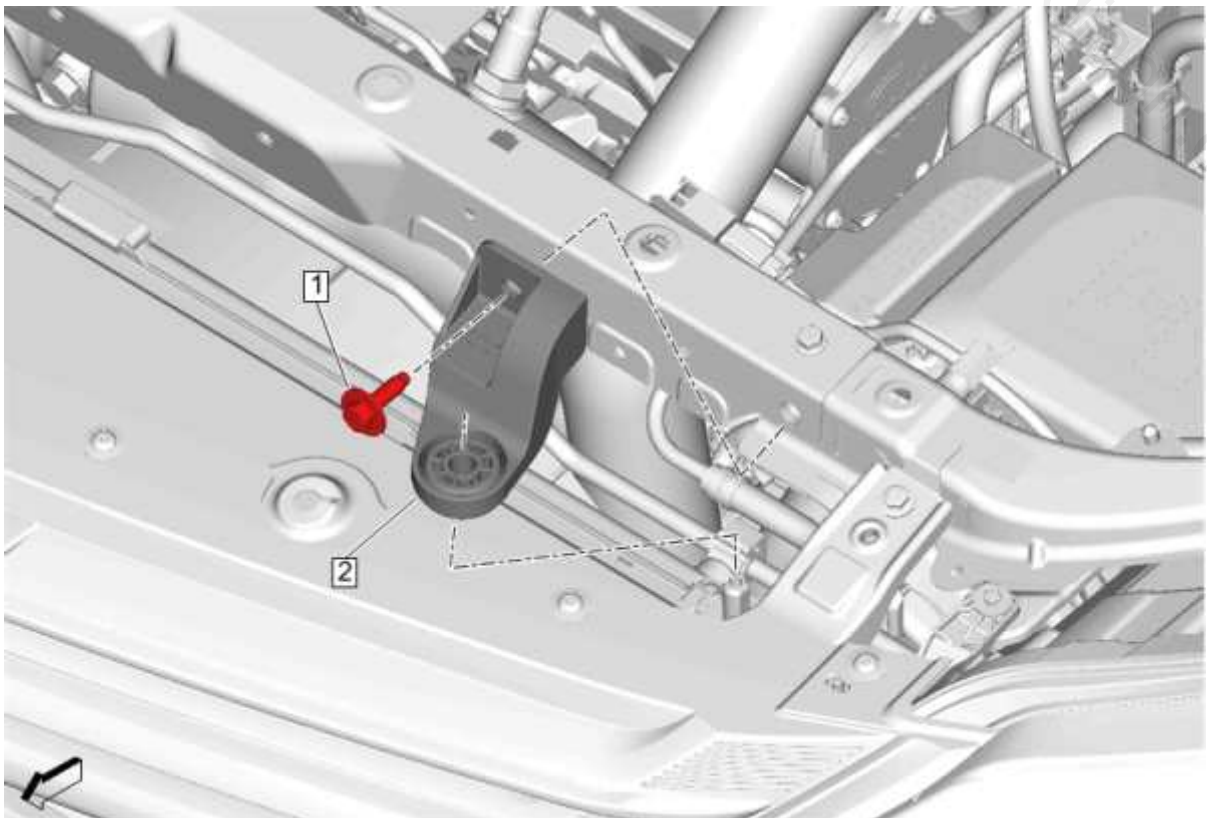


Fig. 178: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Upper Bracket-Left Side (2) **Radiator Upper Bracket Replacement - Left Side**

TURBOCHARGER COOLANT FEED PIPE REPLACEMENT (LH7)

Removal Procedure

1. Remove the turbocharger. Refer to **Turbocharger Replacement** .

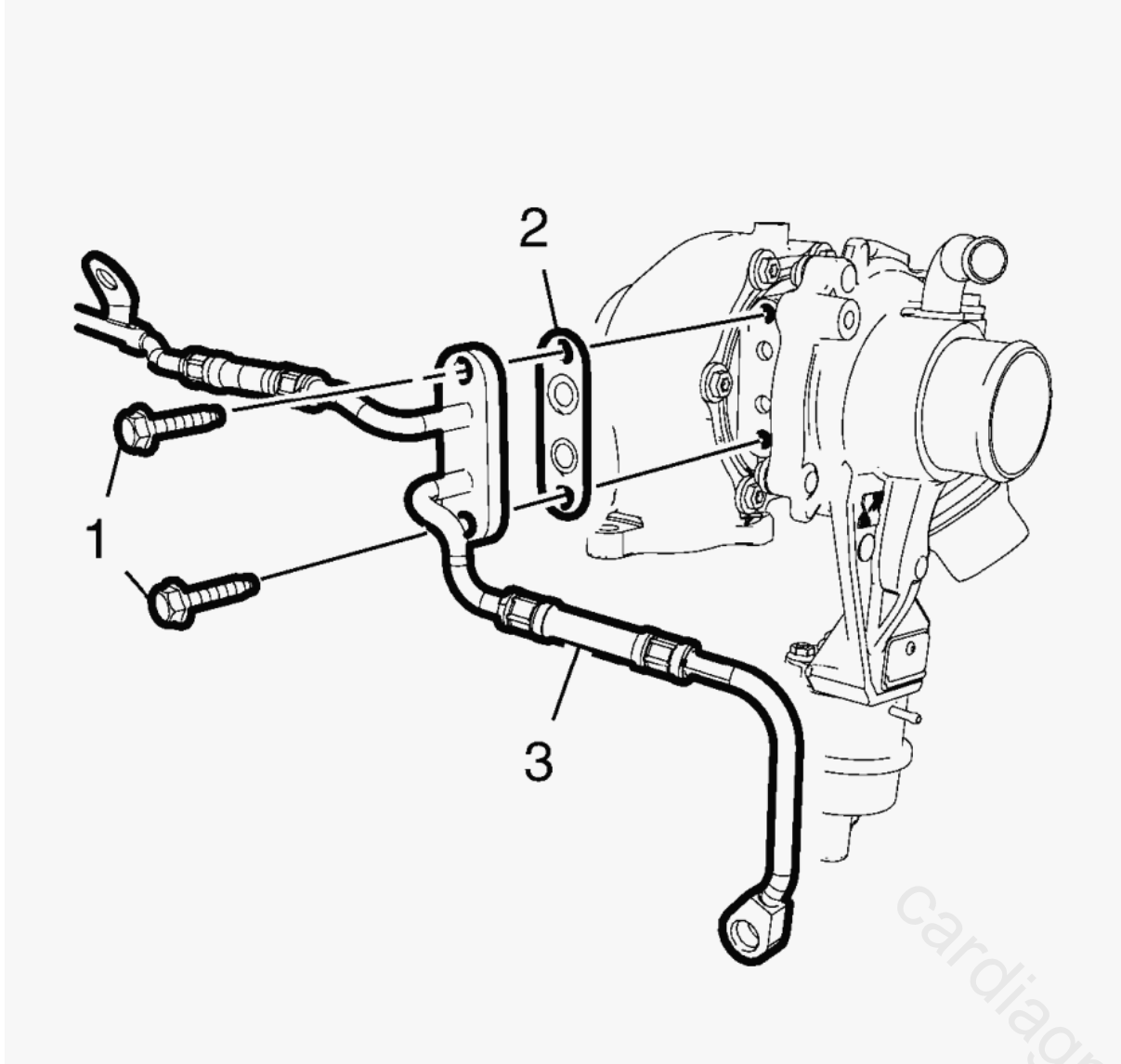


Fig. 179: 2 Turbocharger Coolant Feed And Return Pipe Assembly Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Remove the 2 turbocharger coolant feed and return pipe assembly bolts (1).
3. Remove the turbocharger coolant feed and return pipe assembly (3) and the gasket (2).

Installation Procedure

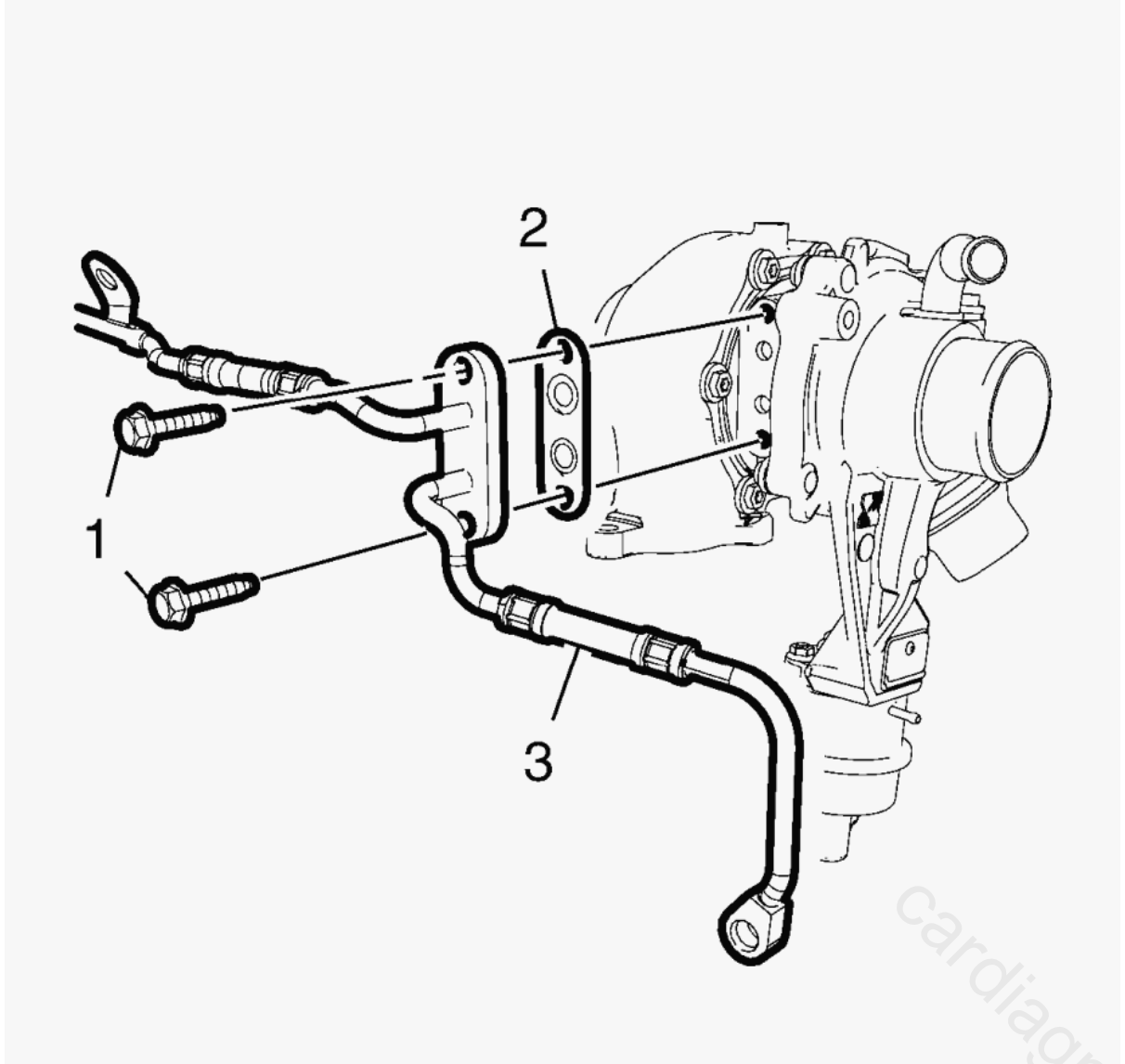


Fig. 180: 2 Turbocharger Coolant Feed And Return Pipe Assembly Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the turbocharger coolant feed and return pipe assembly (3) and a NEW gasket (2).

CAUTION: Refer to [Fastener Caution](#) .

2. Install the 2 turbocharger coolant feed and return pipe assembly bolts (1) and tighten to 10 N.m (89 lb in).
3. Install the turbocharger. Refer to [Turbocharger Replacement](#) .

TURBOCHARGER COOLANT FEED PIPE REPLACEMENT (LYX)

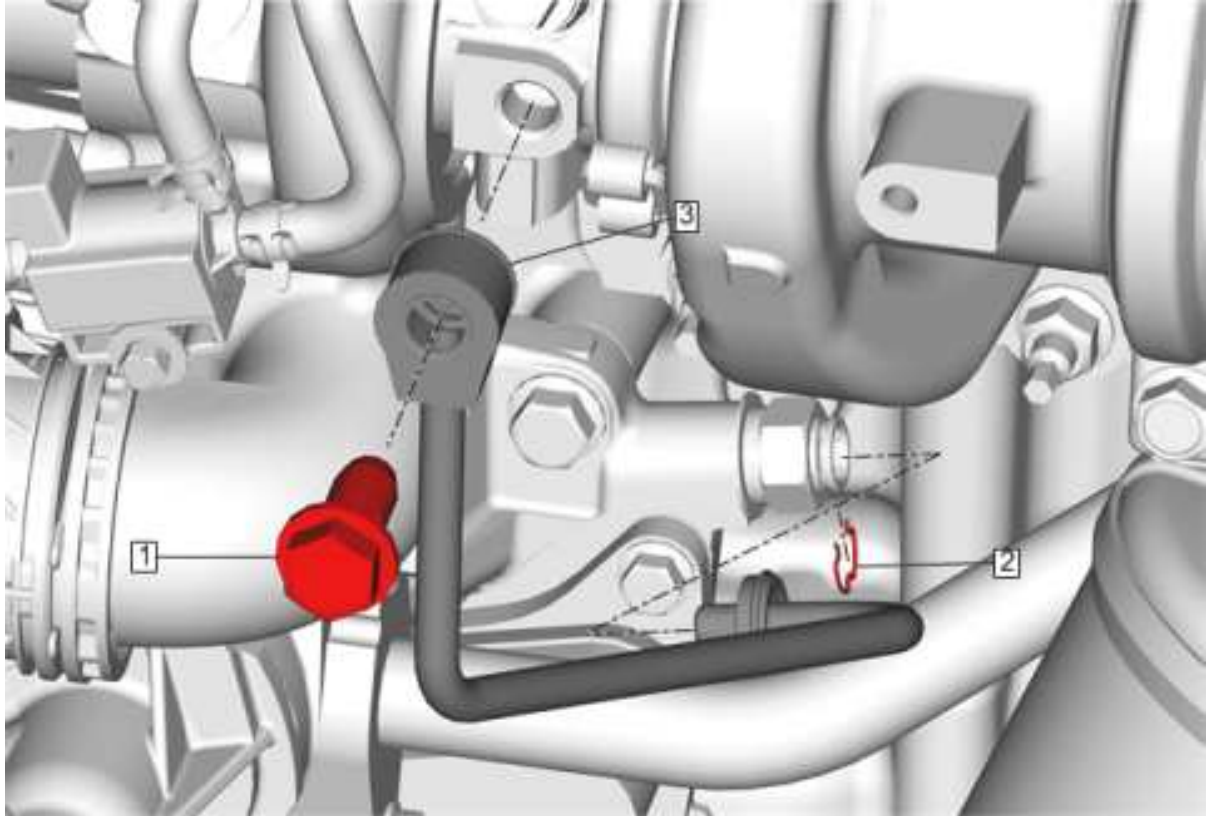


Fig. 181: Turbocharger Coolant Feed Pipe
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)</u> <u>Turbocharger Heat Shield Replacement</u> <u>Warm Up Three-Way Catalytic Converter Replacement (LYX)</u>	
1	Turbocharger Coolant Feed Pipe Hollow Screw CAUTION: Refer to <u>Fastener Caution</u> . Tighten 35 N.m (26 lb ft)
2	Retainer Procedure Install a NEW retainer.
3	Turbocharger Coolant Feed Pipe

TURBOCHARGER COOLANT FEED PIPE REPLACEMENT (LTG)

Removal Procedure

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)
2. Remove Warm Up Three-Way Catalytic Converter - Warm Up Three-Way Catalytic Converter Replacement (LTG)

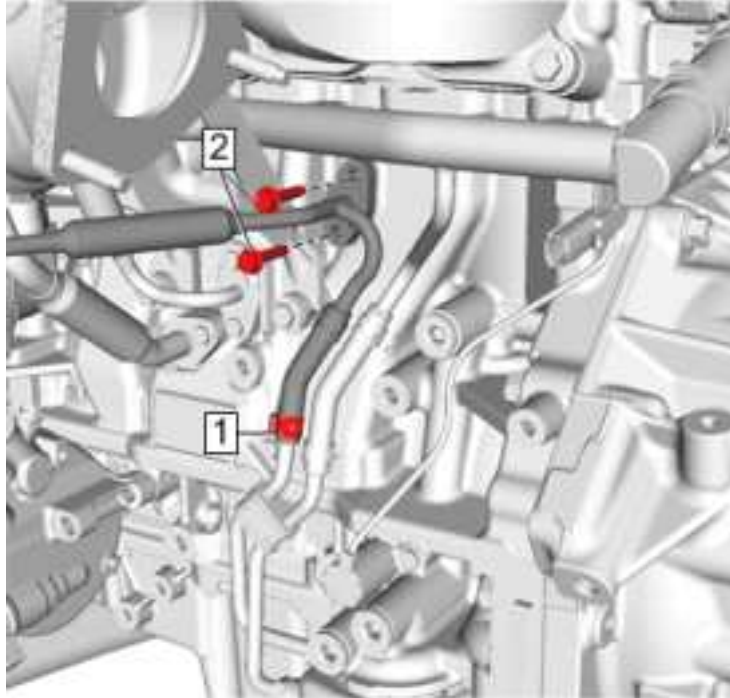


Fig. 182: Turbocharger Coolant Feed Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

3. Disengage Turbocharger Coolant Feed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
4. Turbocharger Coolant Feed Pipe Bolt (2) - [2x]

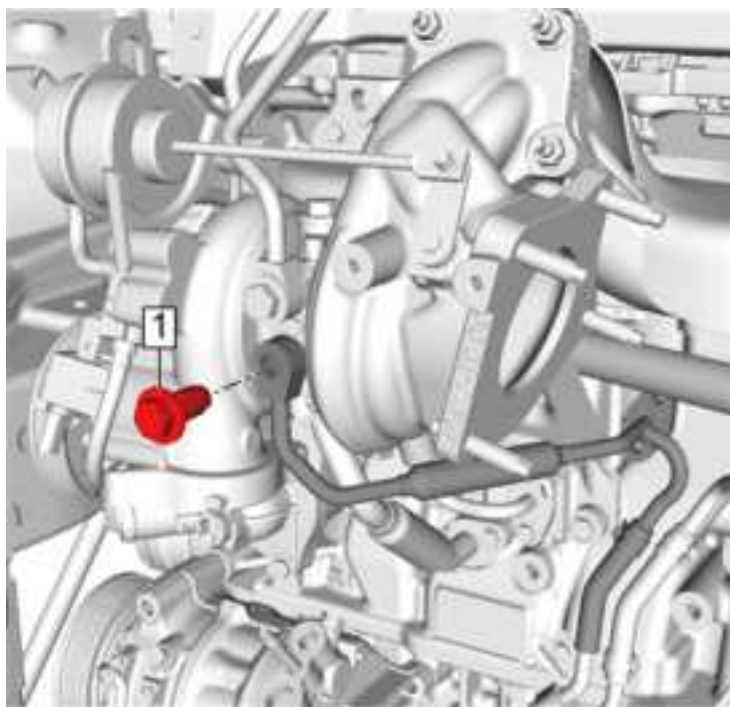


Fig. 183: Turbocharger Coolant Feed Pipe Hollow Screw
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Turbocharger Coolant Feed Pipe Hollow Screw (1).

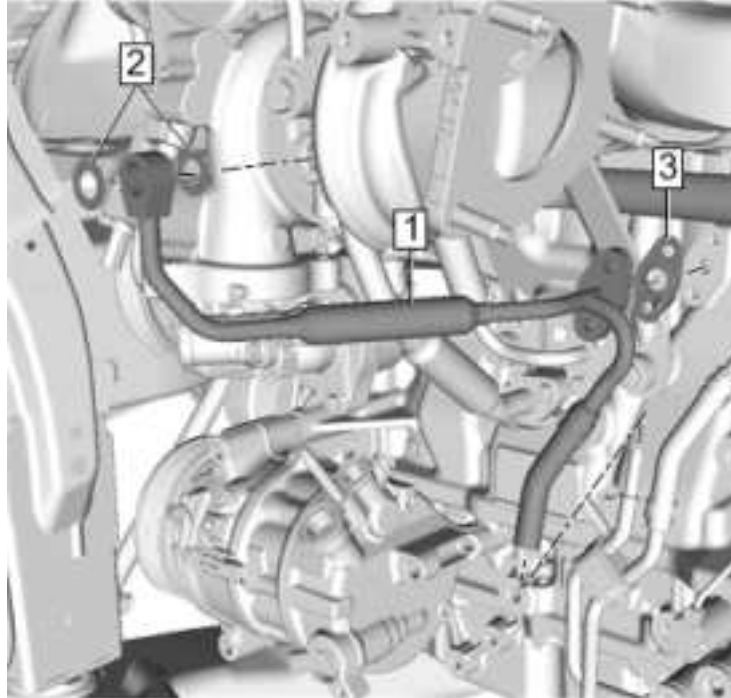


Fig. 184: Turbocharger Coolant Feed Pipe
Courtesy of GENERAL MOTORS COMPANY

6. Remove Turbocharger Coolant Feed Pipe (1).
7. Remove Turbocharger Coolant Feed Pipe Washer (2) and DISCARD [2x]
8. Remove Turbocharger Coolant Feed Pipe Gasket (3) and DISCARD

Installation Procedure

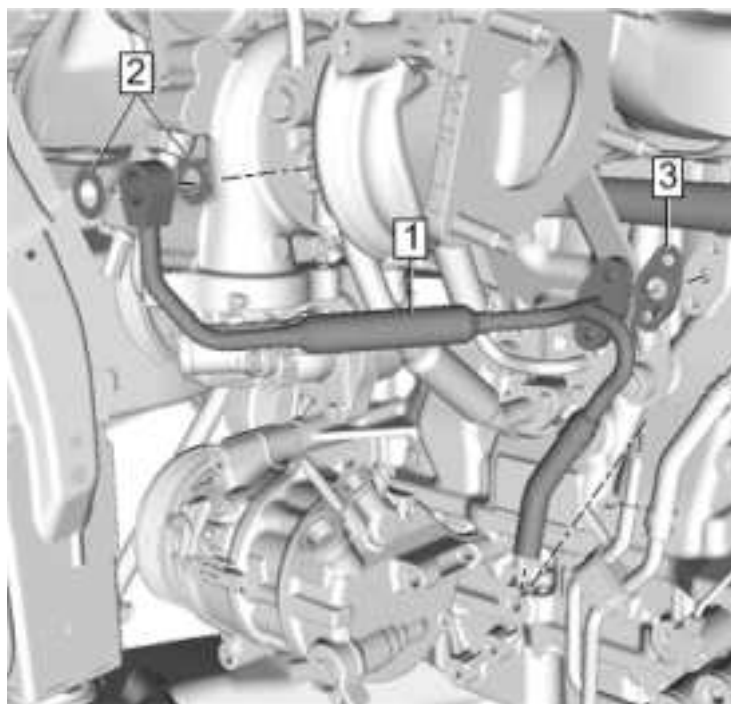


Fig. 185: Turbocharger Coolant Feed Pipe
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** gasket.

1. Install Turbocharger Coolant Feed Pipe Gasket (3).

NOTE: Install a **NEW** washer.

2. Install Turbocharger Coolant Feed Pipe Washer (2) - [2x]
3. Install Turbocharger Coolant Feed Pipe (1).

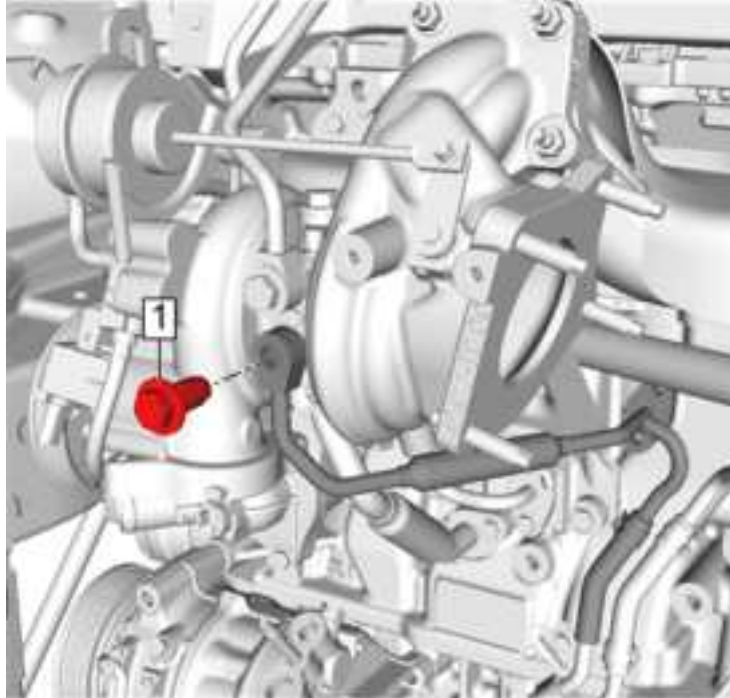


Fig. 186: Turbocharger Coolant Feed Pipe Hollow Screw
 Courtesy of GENERAL MOTORS COMPANY

4. Turbocharger Coolant Feed Pipe Hollow Screw (1) - Hand tighten

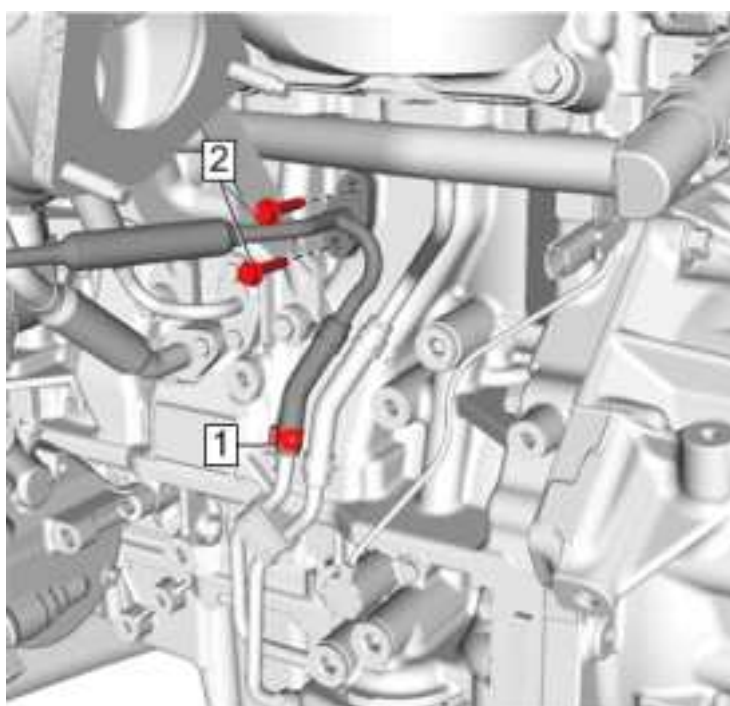


Fig. 187: Turbocharger Coolant Feed Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

5. Install Turbocharger Coolant Feed Pipe Bolt (2) and tighten [2x] 10 N.m (89 lb in)
6. Engage Turbocharger Coolant Feed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

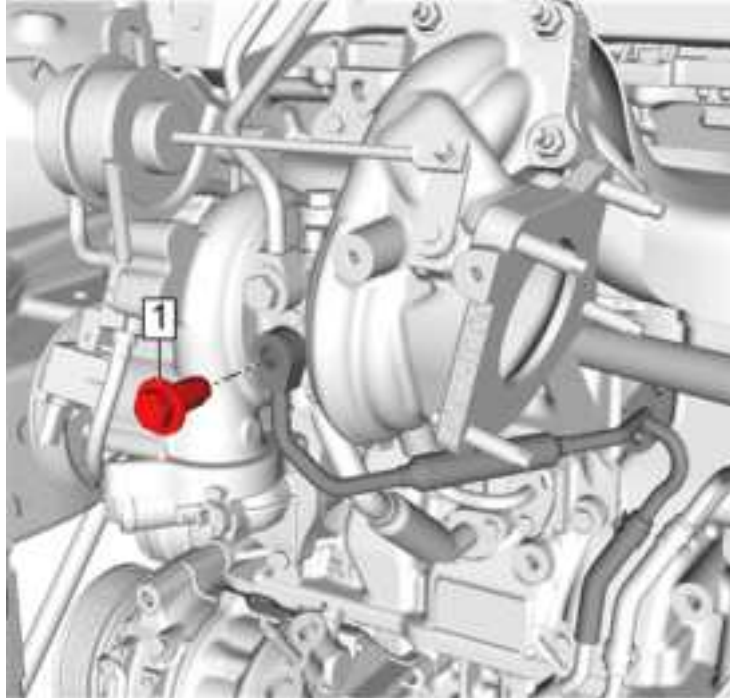


Fig. 188: Turbocharger Coolant Feed Pipe Hollow Screw
 Courtesy of GENERAL MOTORS COMPANY

7. Turbocharger Coolant Feed Pipe Hollow Screw (1) - Tighten 35 N.m (26 lb ft)
8. Install Warm Up Three-Way Catalytic Converter - [Warm Up Three-Way Catalytic Converter Replacement \(LTG\)](#)
9. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
10. Start the engine and check for leaks.

TURBOCHARGER COOLANT RETURN PIPE REPLACEMENT (LYX)

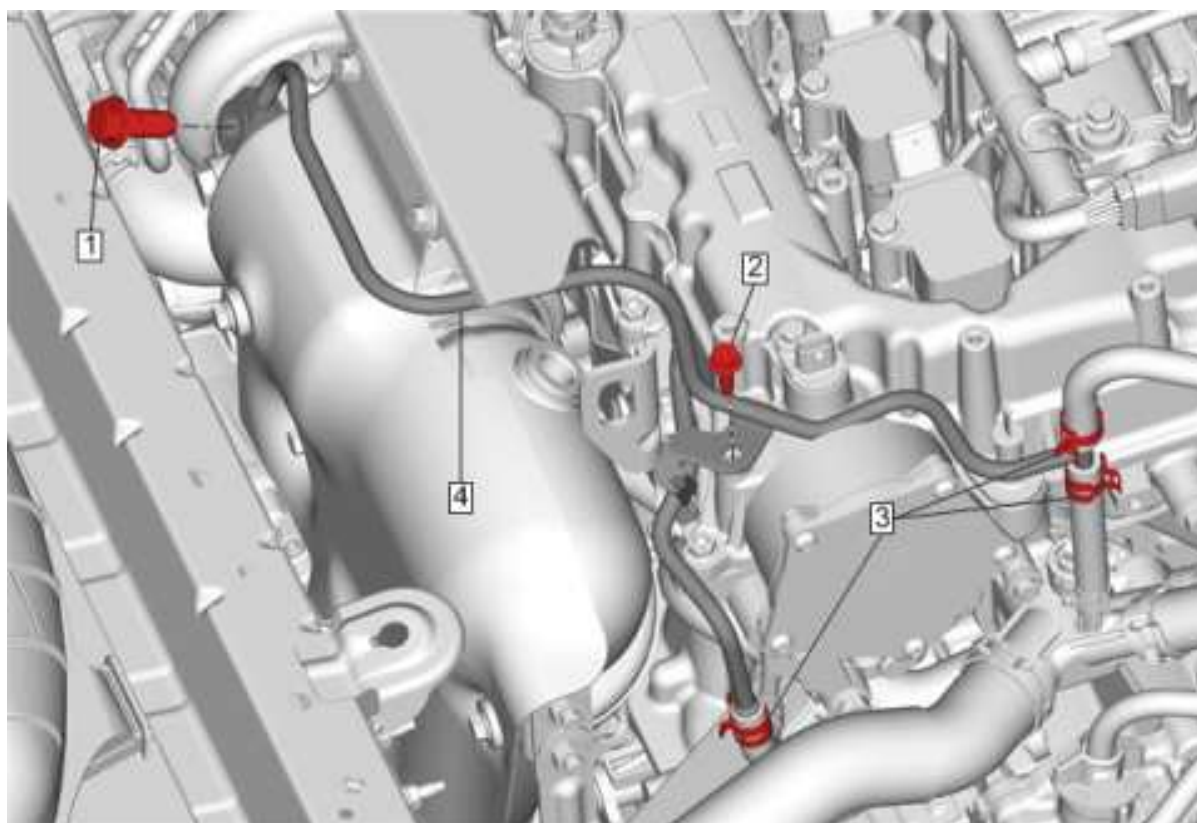


Fig. 189: Turbocharger Coolant Return Pipe
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static). 2. Intake Manifold Cover Replacement 3. Disconnect the heated oxygen sensor electrical connector. 4. Reposition Charge Air Cooler Outlet Air Tube Replacement	
1	Turbocharger Coolant Return Pipe Hollow Screw CAUTION: Refer to Fastener Caution . Tighten 35 N.m (26 lb ft)
2	Turbocharger Coolant Return Pipe Fastener Tighten 10 N.m (89 lb in)
3	Clamp [3x] Procedure Install a NEW clamp. Hose Clamp Replacement Guidelines - Spring Type
4	Turbocharger Coolant Return Pipe

TURBOCHARGER COOLANT RETURN PIPE REPLACEMENT (LTG)

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
2. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)
3. Remove Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement](#)

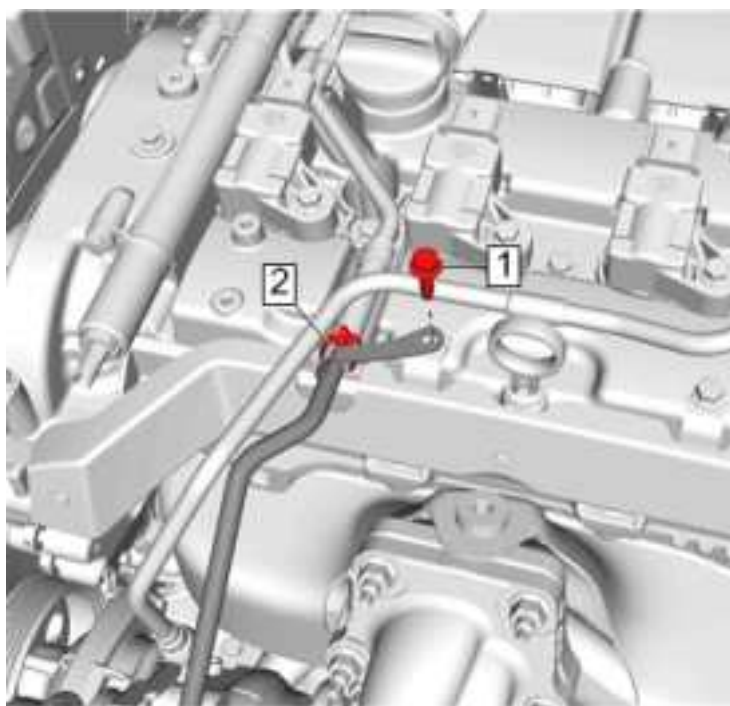


Fig. 190: Turbocharger Coolant Return Pipe Clamp
 Courtesy of GENERAL MOTORS COMPANY

4. Disengage Turbocharger Coolant Return Pipe Clamp (2) - [Hose Clamp Replacement Guidelines - Spring Type](#)

5. Remove Turbocharger Coolant Return Pipe Bolt (1).

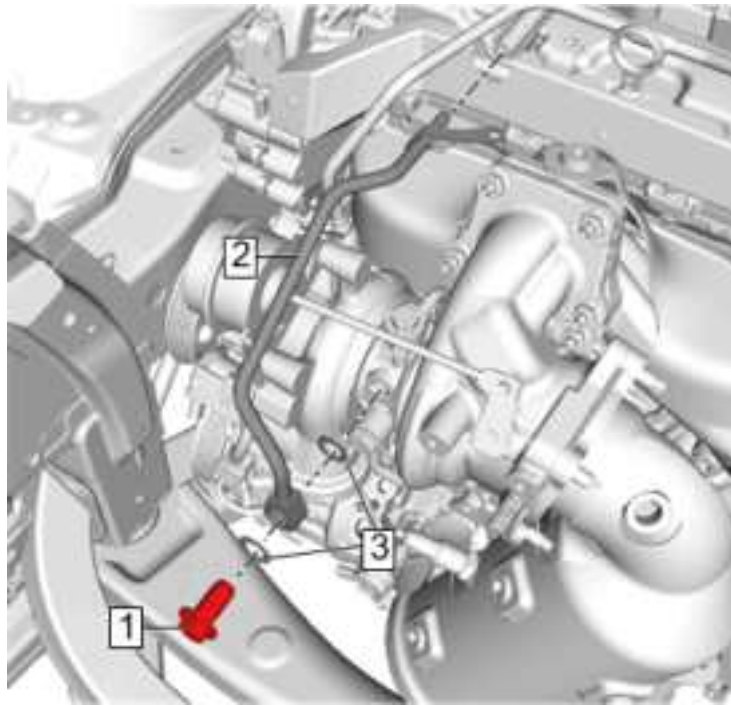


Fig. 191: Turbocharger Coolant Return Pipe Hollow Screw
Courtesy of GENERAL MOTORS COMPANY

6. Remove Turbocharger Coolant Return Pipe Hollow Screw (1).
7. Remove Turbocharger Coolant Return Pipe (2).
8. Remove Turbocharger Coolant Return Pipe Washer (3) and DISCARD [2x]

Installation Procedure

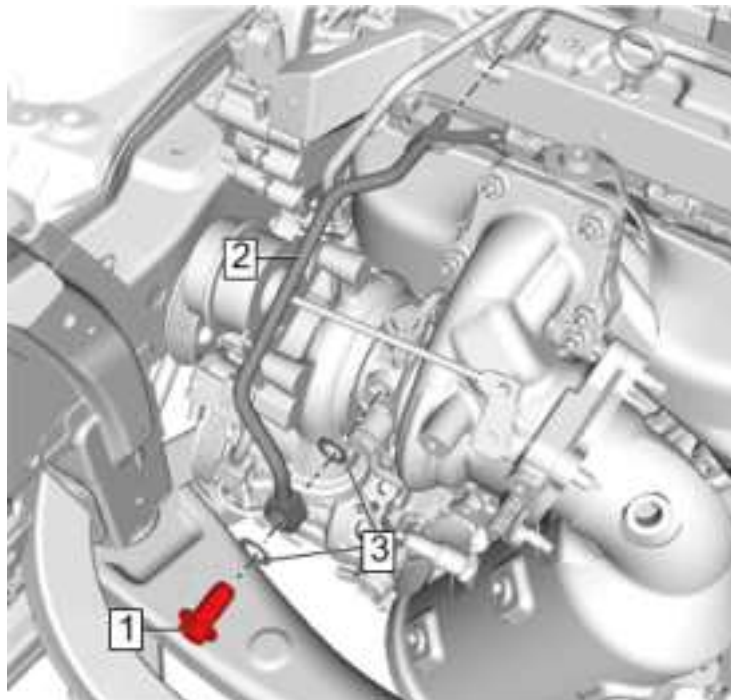


Fig. 192: Turbocharger Coolant Return Pipe Hollow Screw
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW washer.

1. Install Turbocharger Coolant Return Pipe Washer (3) - [2x]
2. Install Turbocharger Coolant Return Pipe (2).
3. Turbocharger Coolant Return Pipe Hollow Screw (1) - Hand tighten

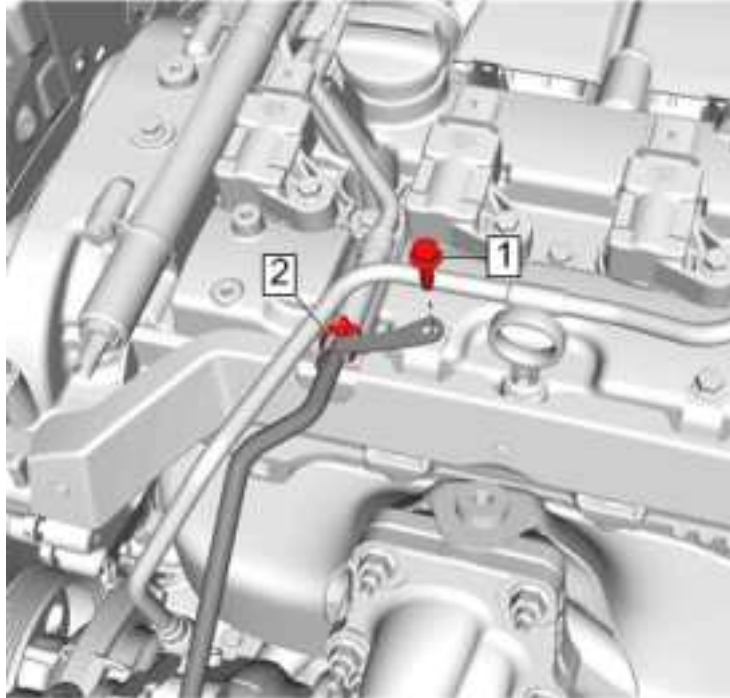


Fig. 193: Turbocharger Coolant Return Pipe Clamp
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

4. Install Turbocharger Coolant Return Pipe Bolt (1) and tighten 10 N.m (89 lb in)
5. Engage Turbocharger Coolant Return Pipe Clamp (2) - [Hose Clamp Replacement Guidelines - Spring Type](#)

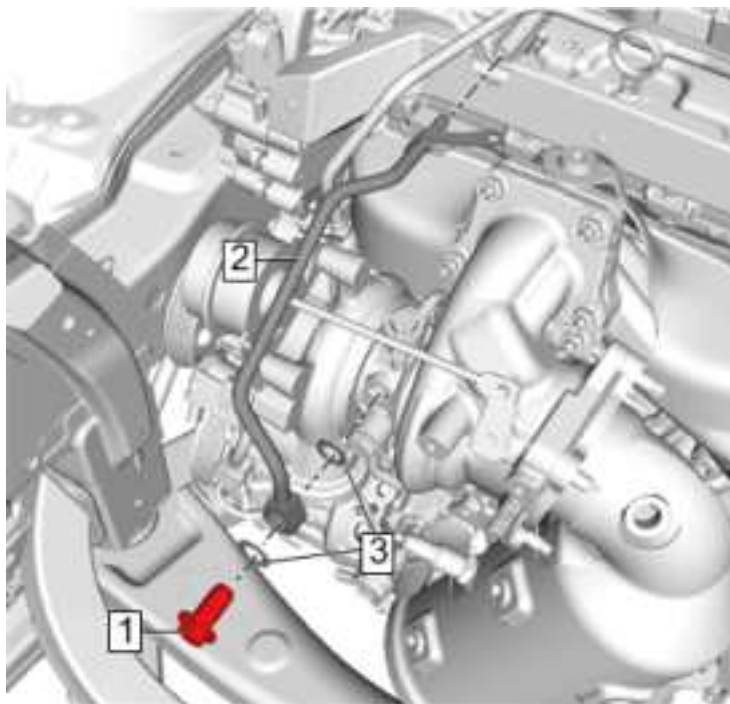


Fig. 194: Turbocharger Coolant Return Pipe Hollow Screw
Courtesy of GENERAL MOTORS COMPANY

6. Turbocharger Coolant Return Pipe Hollow Screw (1) - Tighten 35 N.m (26 lb ft)
7. Remove Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement](#)
8. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)
9. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
10. Start the engine and check for leaks.

THERMOSTAT BYPASS HOSE REPLACEMENT (LYX)

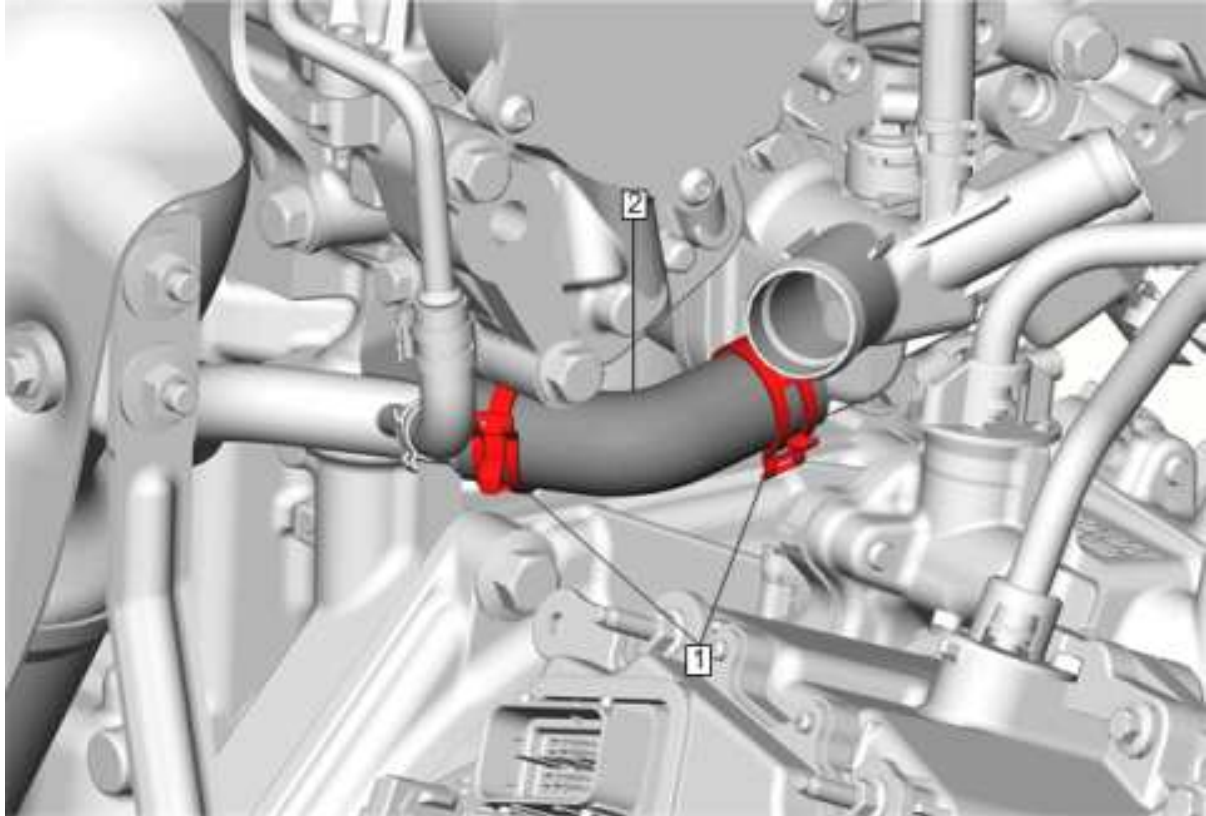


Fig. 195: Thermostat Bypass Hose

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Radiator Inlet Hose Replacement (LYX)</u>	
1	Clamp [2x]
2	Thermostat Bypass Hose

ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (LYX)

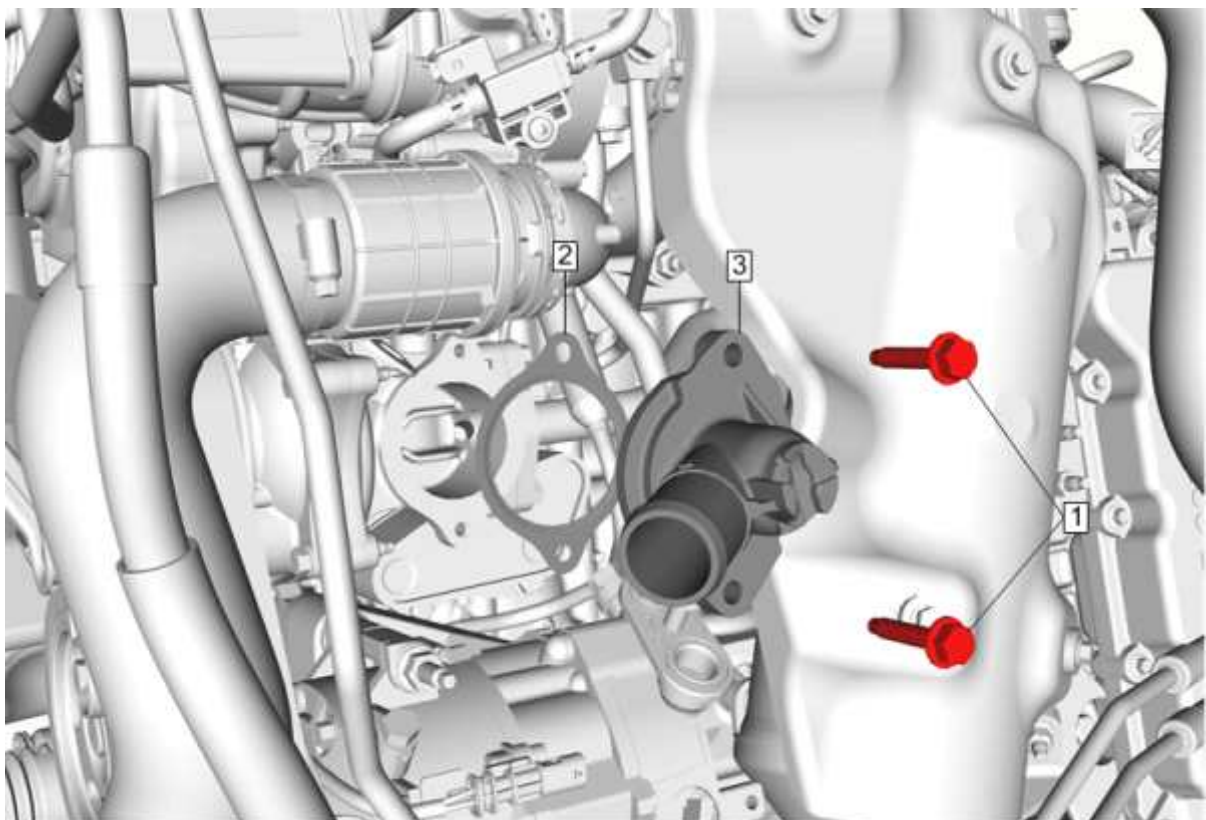


Fig. 196: Engine Coolant Thermostat Housing

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Radiator Outlet Hose Replacement (LYX) @Engine Coolant Thermostat Housing - Disconnect	
1	Engine Coolant Thermostat Housing Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 N.m (89 lb in)
2	Gasket Procedure Install a NEW gasket.
3	Engine Coolant Thermostat Housing

ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (LTG)

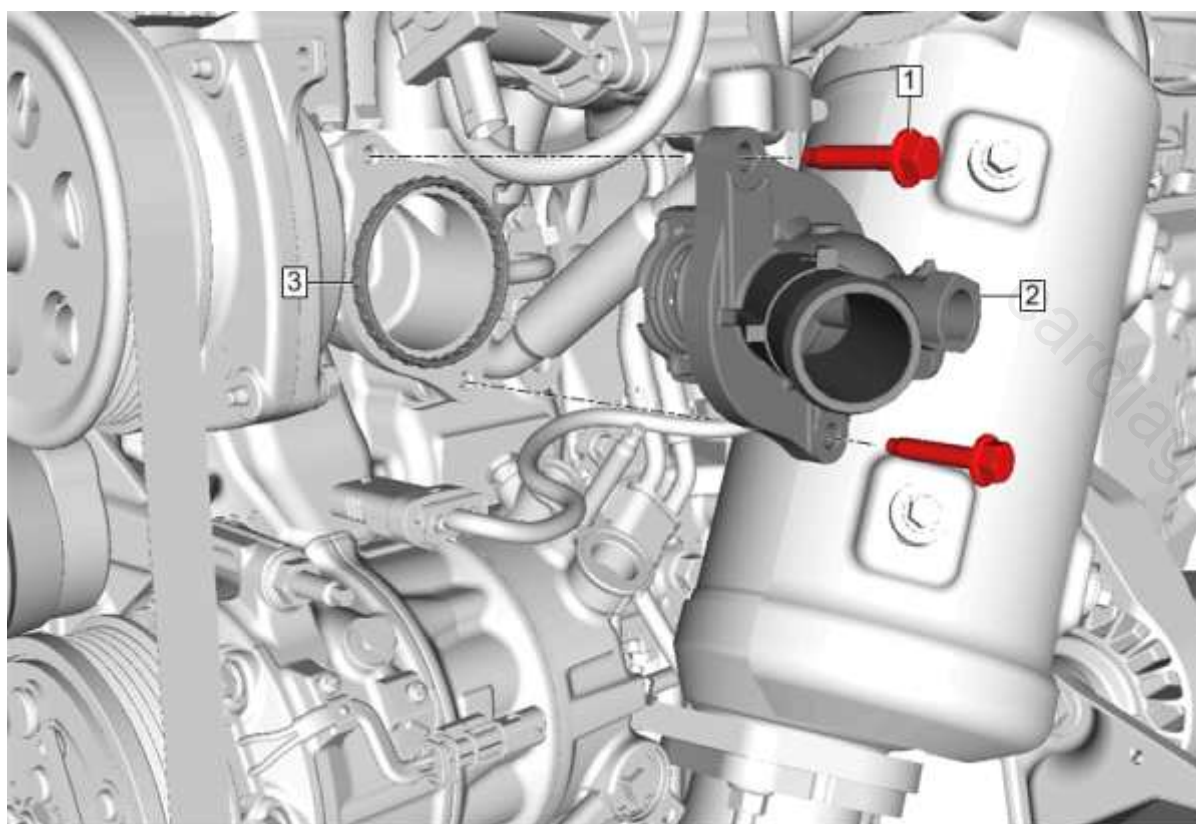


Fig. 197: Engine Coolant Thermostat Housing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. <u>Air Cleaner Outlet Duct Replacement (Non-Tamperproof)</u> <u>Air Cleaner Outlet Duct Replacement (Tamperproof)</u> 2. <u>Radiator Outlet Hose Replacement (LYX)</u>	
1	Engine Coolant Thermostat Housing Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 N.m (89 lb in)

Callout	Component Name
2	Engine Coolant Thermostat Housing
3	Engine Coolant Thermostat Housing Seal Procedure Install a NEW engine coolant thermostat housing seal.

ENGINE COOLANT THERMOSTAT REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
2. Remove [Water Pump Replacement \(LYX\)](#)

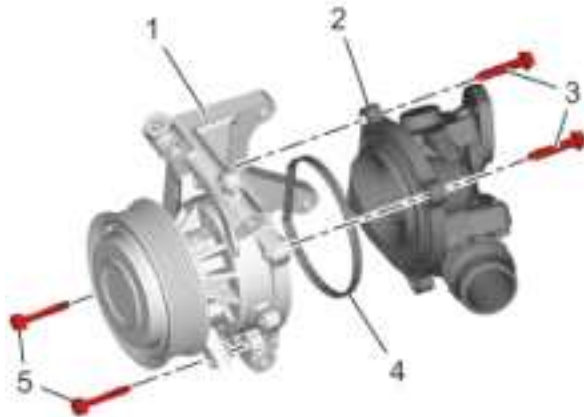


Fig. 198: Engine Coolant Thermostat Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Coolant Thermostat Bolt (3, 5) - [4x]
4. Remove Engine Coolant Thermostat (2) @ Water Pump (1).
5. Remove Engine Coolant Thermostat Gasket (4) and DISCARD

Installation Procedure

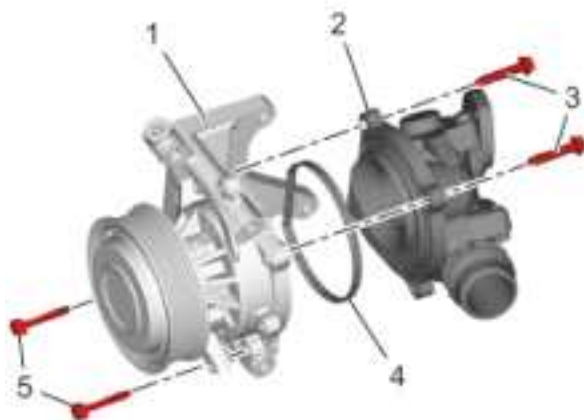


Fig. 199: Engine Coolant Thermostat Bolt
Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW gasket. (4)
2. Install Engine Coolant Thermostat (2) @ Water Pump (1).

CAUTION: Refer to [Fastener Caution](#) .

3. Install Engine Coolant Thermostat Bolt (3, 5) and tighten [4x] 10 N.m (89 lb in)
4. Install -[Water Pump Replacement \(LH7\)](#).
5. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

ENGINE COOLANT AIR BLEED PIPE REPLACEMENT (LTG)

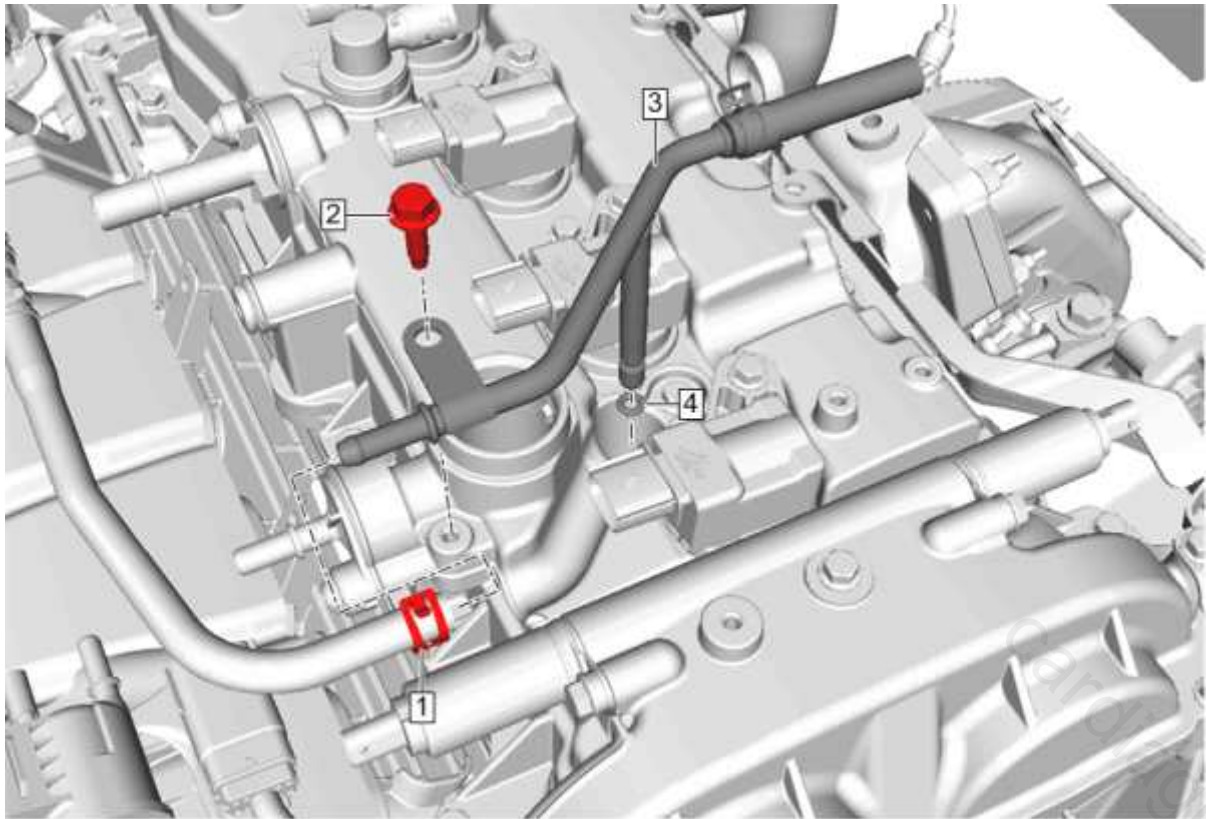


Fig. 200: Engine Coolant Air Bleed Pipe (LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Turbocharger Coolant Return Pipe Replacement (LTG) 2. Positive Crankcase Ventilation Hose/Pipe/Tube Replacement (Camshaft Cover to Air Inlet) 3. Disconnect the electrical wiring harness connector from the ignition coil.	
1	Radiator Surge Tank Inlet Hose Clamp Hose Clamp Replacement Guidelines - Spring Type
2	Engine Coolant Air Bleed Pipe Bolt CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
3	Engine Coolant Air Bleed Pipe
4	Engine Coolant Air Bleed Pipe O-Ring Procedure Install a NEW O-ring seal.

ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (TURBOCHARGER COOLANT RETURN PIPE TO WATER OUTLET, LYX)

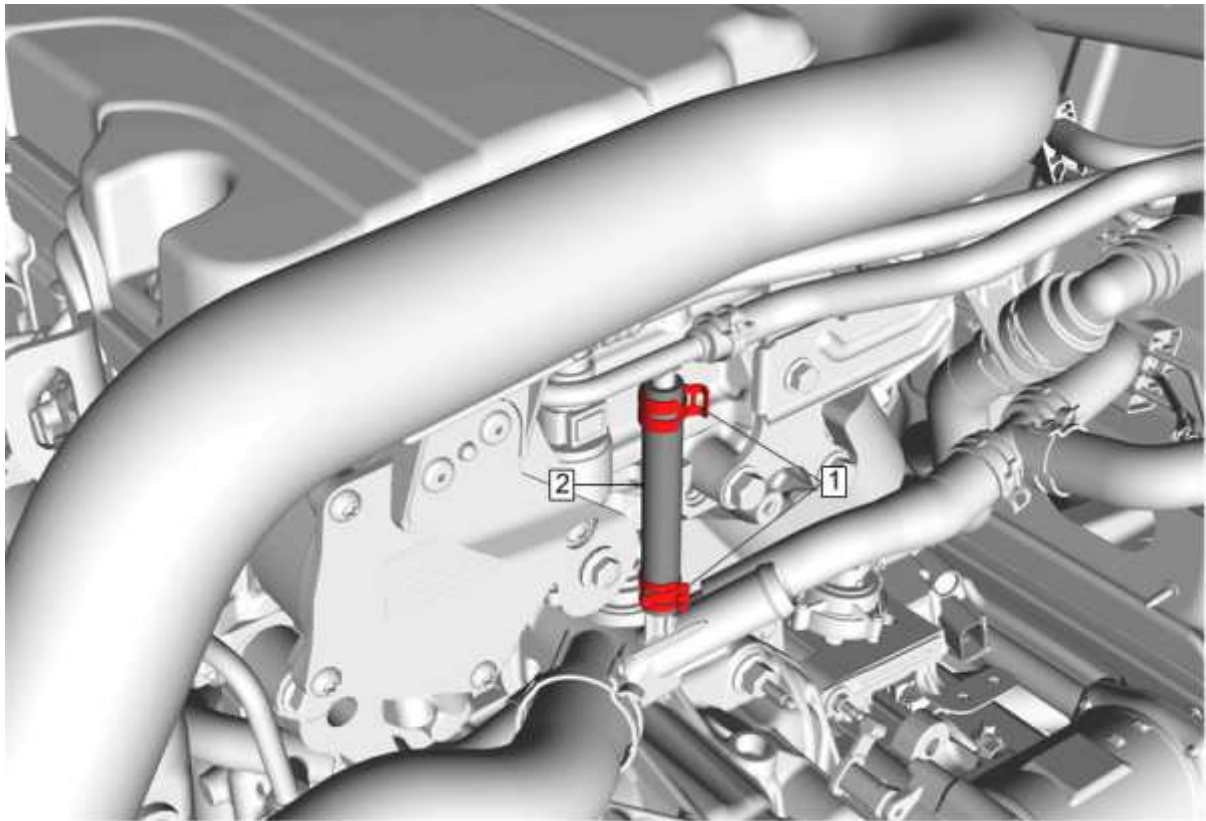


Fig. 201: Engine Coolant Air Bleed Hose (Turbocharger Coolant Return Pipe to Water Outlet
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)	
1	Clamp [2x]
2	Engine Coolant Air Bleed Hose

ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (RADIATOR SURGE TANK TO TURBOCHARGER COOLANT RETURN PIPE TO RADIATOR, LYX)

Removal Procedure

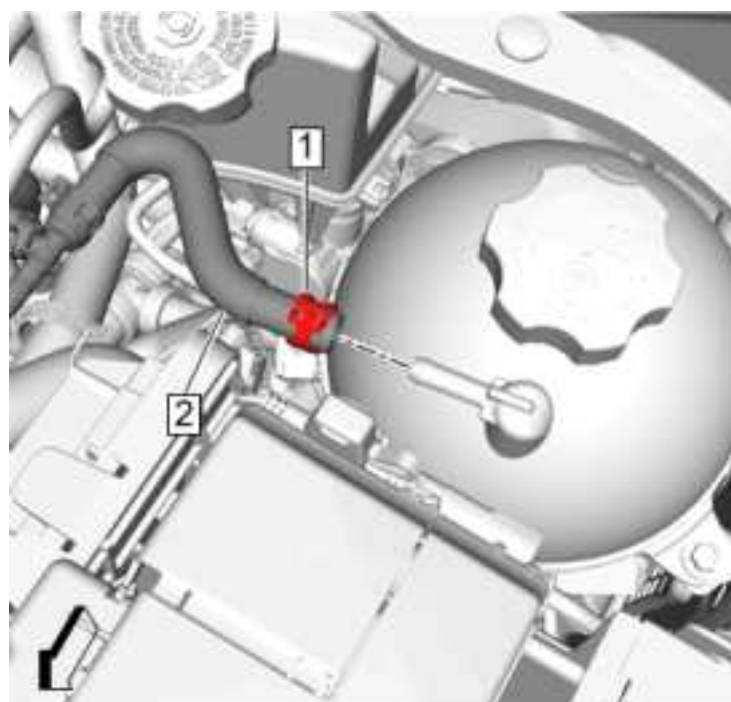


Fig. 202: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

1. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.

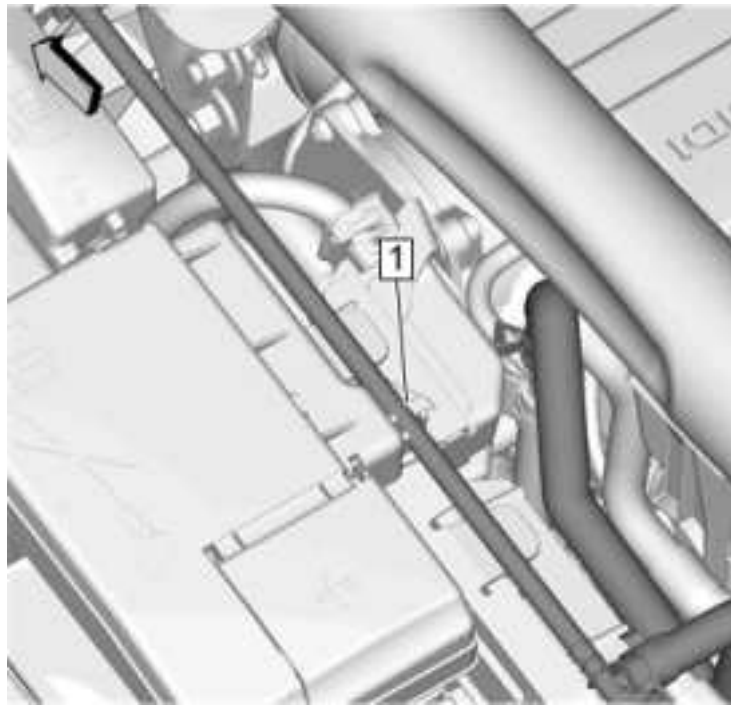


Fig. 203: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Coolant Air Bleed Hose (1) @ Engine Control Module Bracket.

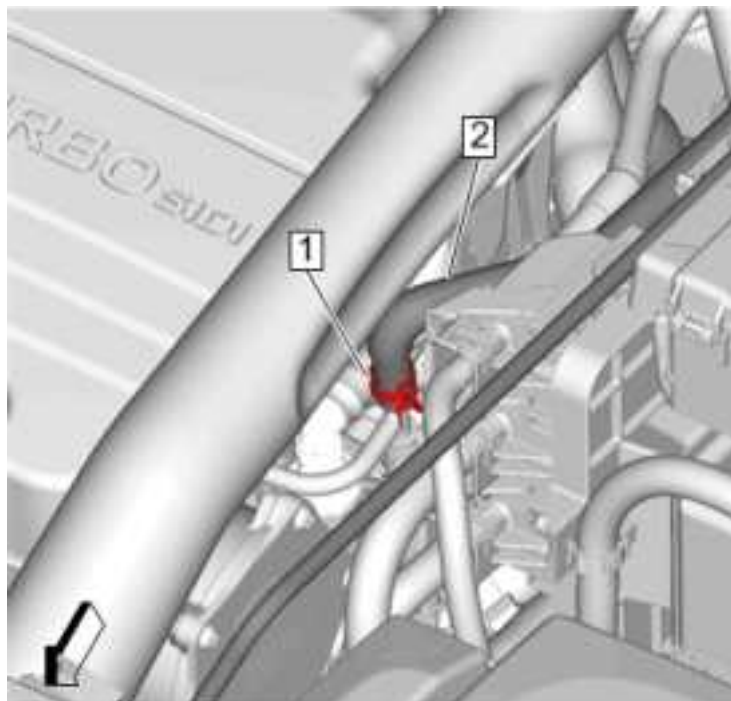


Fig. 204: Engine Coolant Air Bleed Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Remove Engine Coolant Air Bleed Hose (2) @ Turbocharger Coolant Return Pipe.

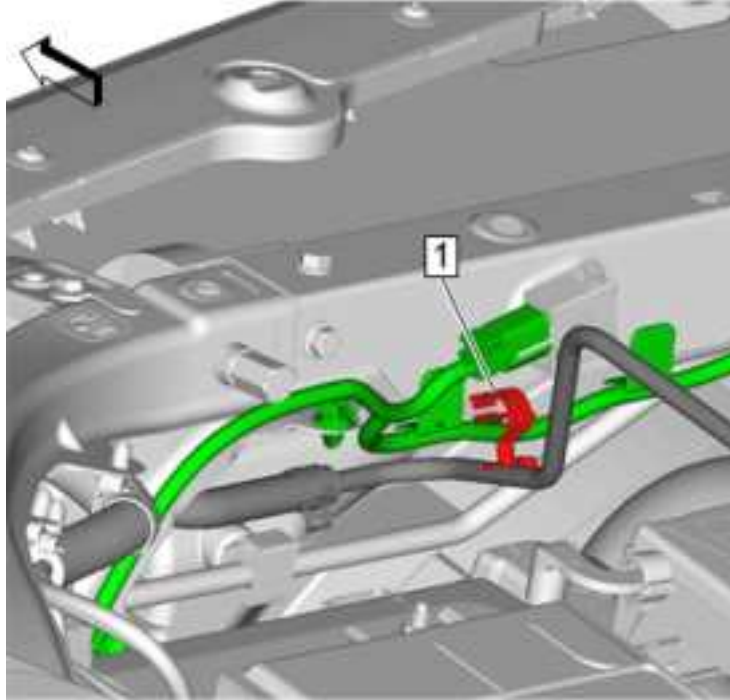


Fig. 205: Engine Coolant Air Bleed Pipe Clip
 Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.

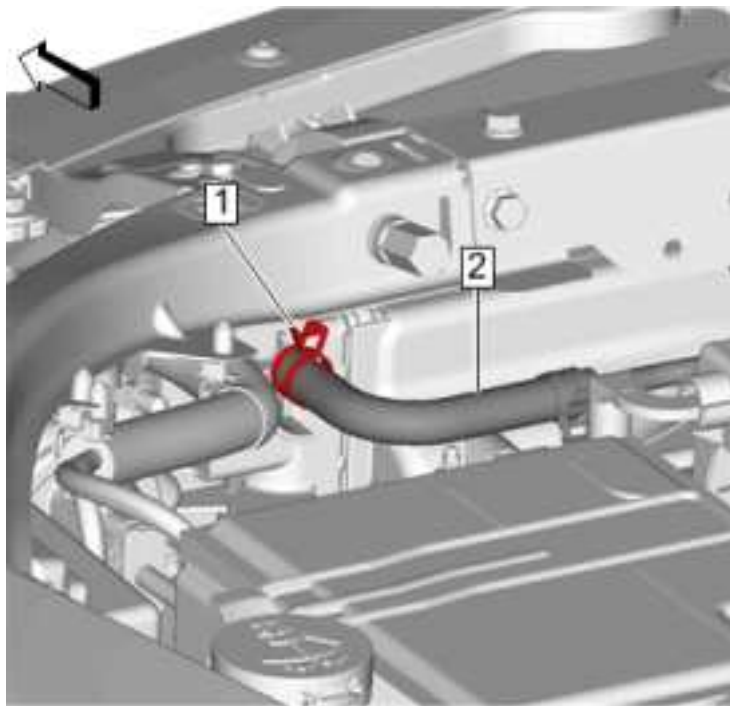


Fig. 206: Engine Coolant Air Bleed Hose
 Courtesy of GENERAL MOTORS COMPANY

7. Disengage Engine Coolant Air Bleed Hose Clamp (1) - **Hose Clamp Replacement Guidelines - Spring Type**
8. Remove Engine Coolant Air Bleed Hose (2) @ Radiator.
9. Remove Engine Coolant Air Bleed Hose (2).

Installation Procedure

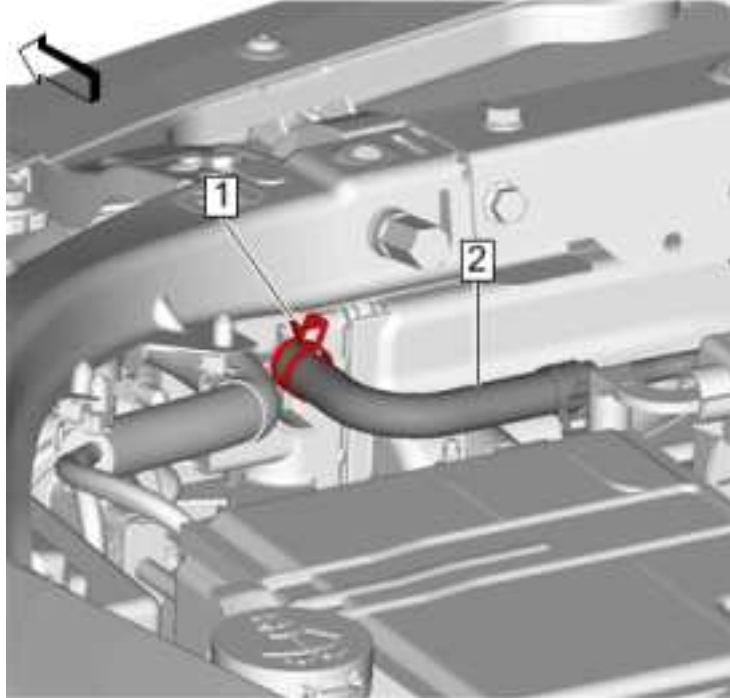


Fig. 207: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Air Bleed Hose (2) @ Radiator.
2. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

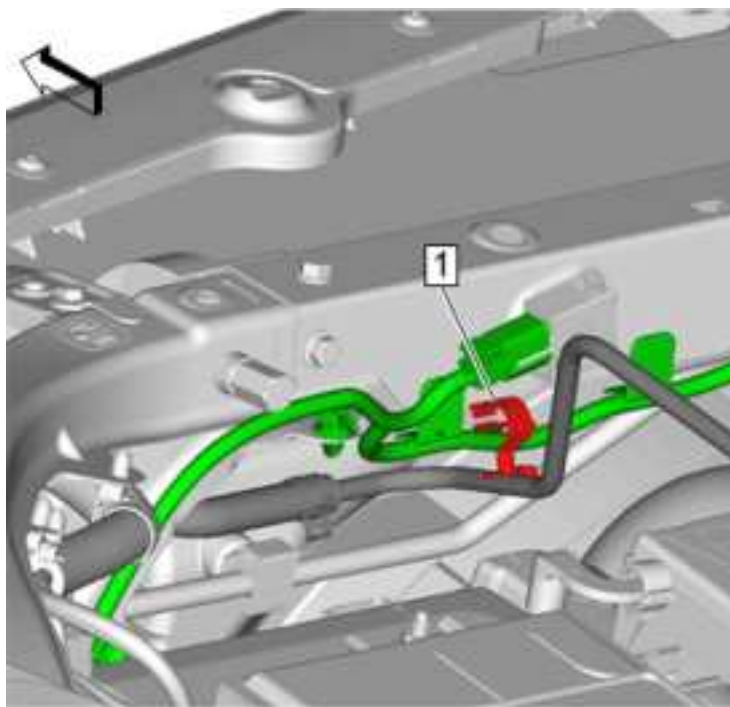


Fig. 208: Engine Coolant Air Bleed Pipe Clip
Courtesy of GENERAL MOTORS COMPANY

3. Install Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.

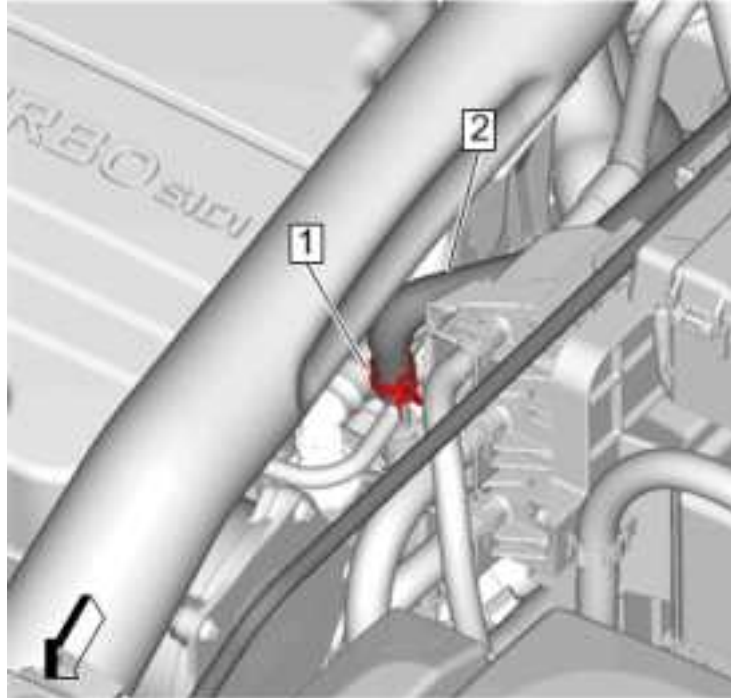


Fig. 209: Engine Coolant Air Bleed Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

4. Install Engine Coolant Air Bleed Hose (2) @ Turbocharger Coolant Return Pipe.
5. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

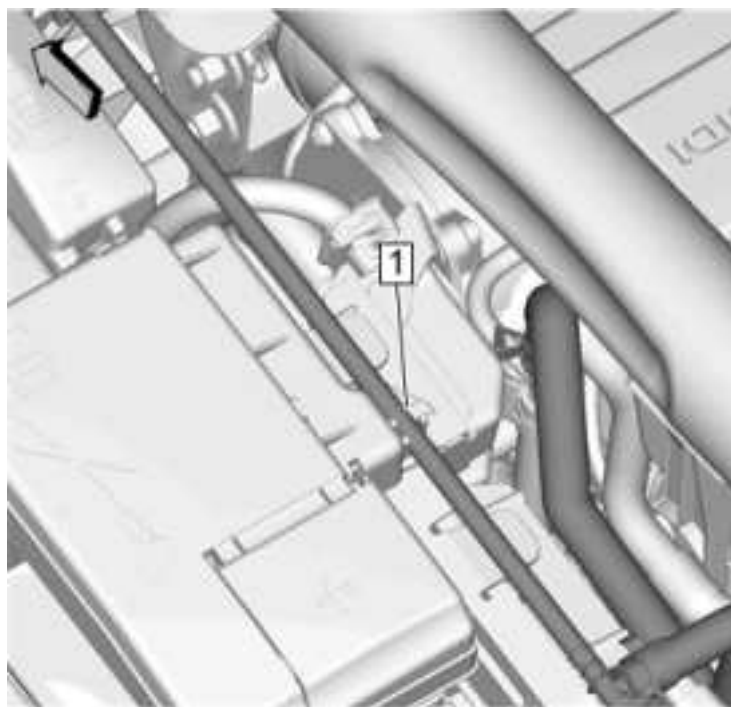


Fig. 210: Engine Coolant Air Bleed Hose
 Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (1) @ Engine Control Module Bracket.

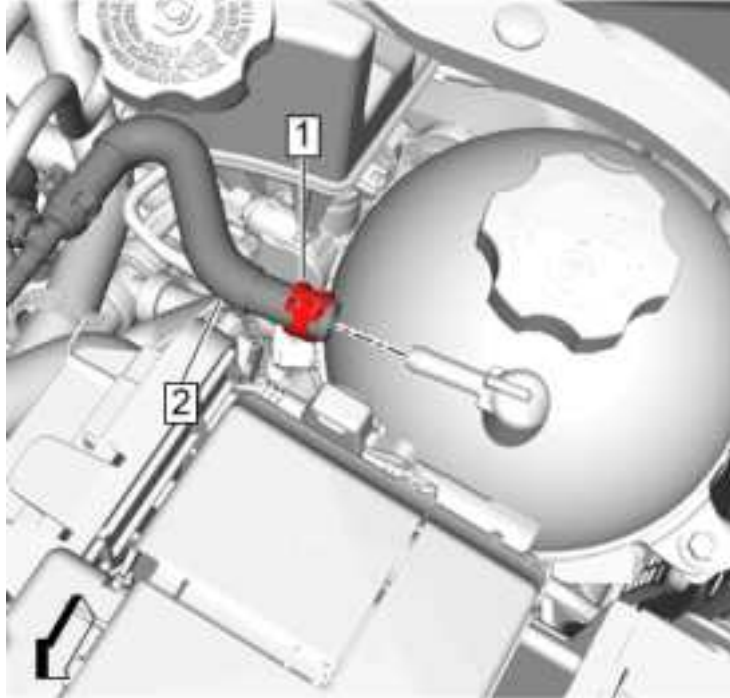


Fig. 211: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

7. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.
8. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
9. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
10. Check the cooling system for leaks.

ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (RADIATOR SURGE TANK TO RADIATOR TO ENGINE COOLANT AIR BLEED PIPE LTG)

Removal Procedure

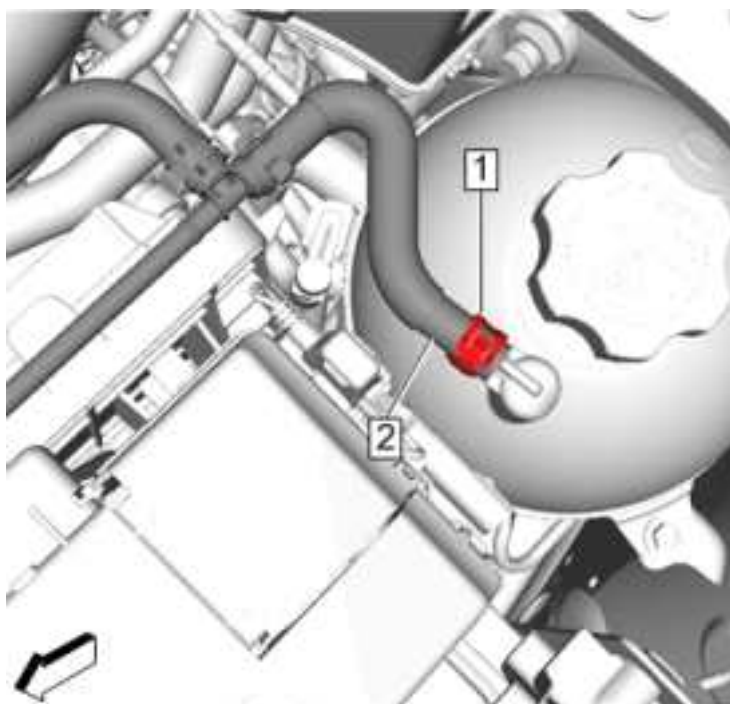


Fig. 212: Engine Coolant Air Bleed Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.

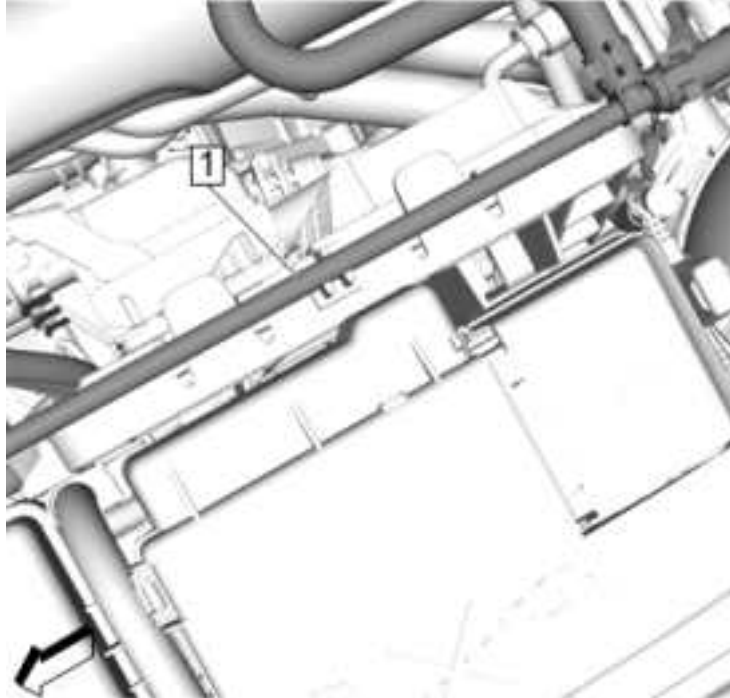


Fig. 213: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Coolant Air Bleed Hose (1) @ Engine Control Module Bracket.

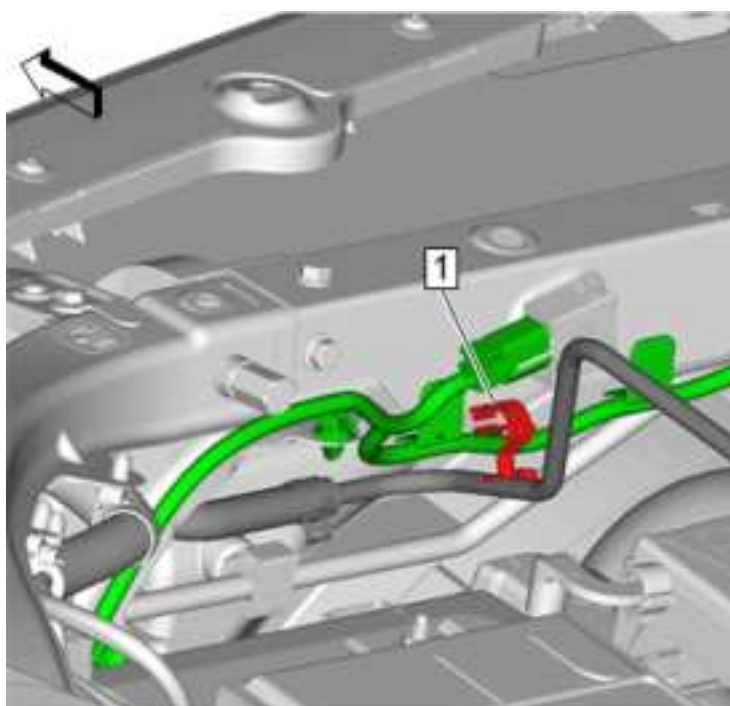


Fig. 214: Engine Coolant Air Bleed Pipe Clip
Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.

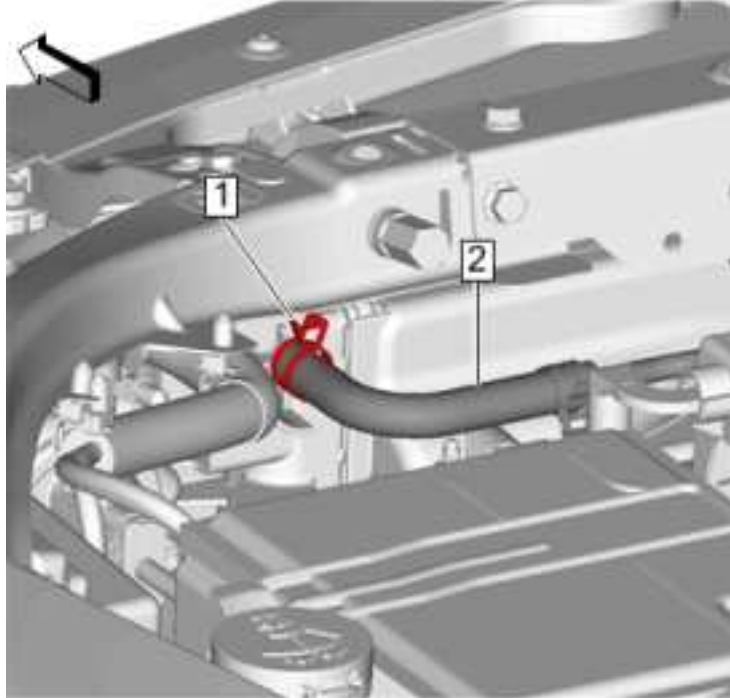


Fig. 215: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

5. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
6. Remove Engine Coolant Air Bleed Hose (2) @ Radiator.
7. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)

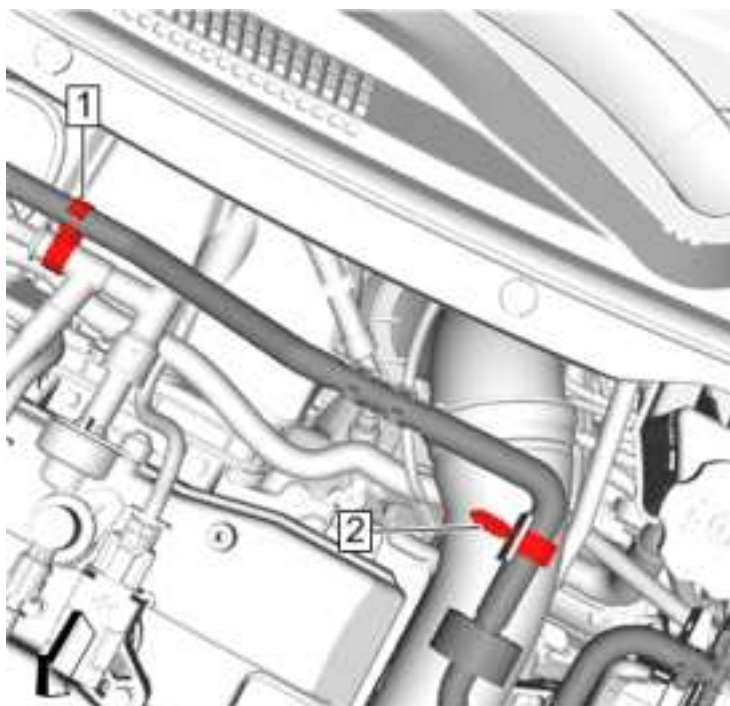


Fig. 216: Engine Coolant Air Bleed Pipe Clip

Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Coolant Air Bleed Pipe Clip (2) @ Charge Air Cooler Outlet Air Tube.
9. Remove Engine Coolant Air Bleed Pipe Clip (1) @ Positive Crankcase Ventilation Tube.

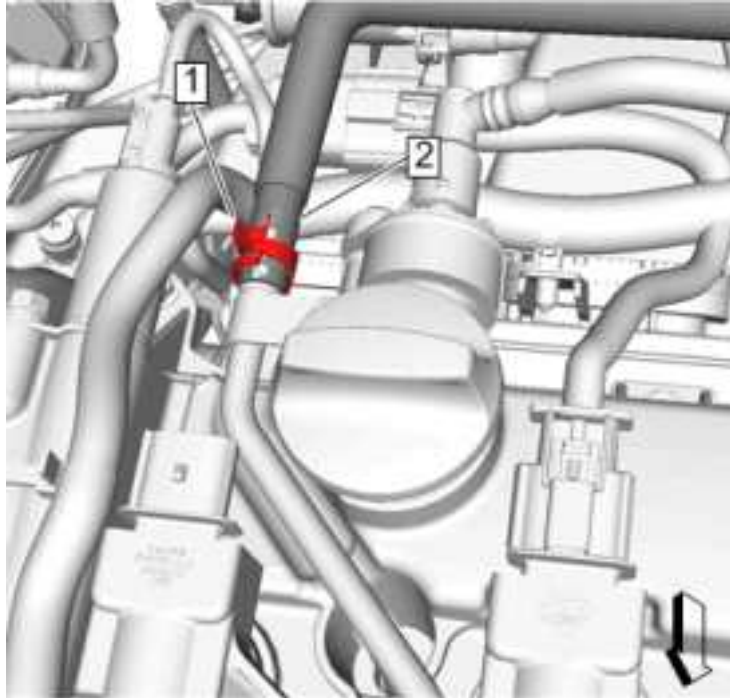


Fig. 217: Engine Coolant Air Bleed Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

10. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
11. Remove Engine Coolant Air Bleed Hose@Engine Coolant Air Bleed Pipe.
12. Remove Engine Coolant Air Bleed Hose (2).

Installation Procedure

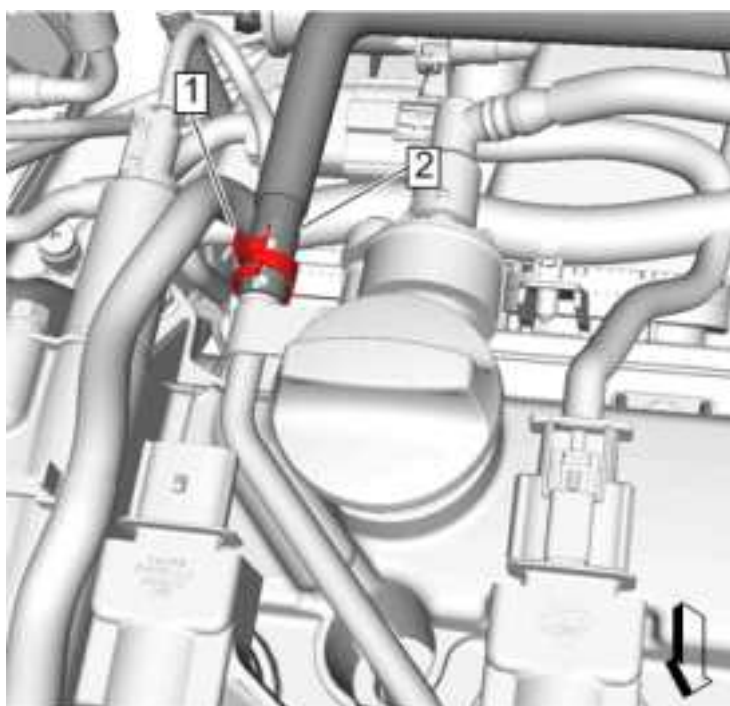


Fig. 218: Engine Coolant Air Bleed Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Air Bleed Hose@Engine Coolant Air Bleed Pipe.
2. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

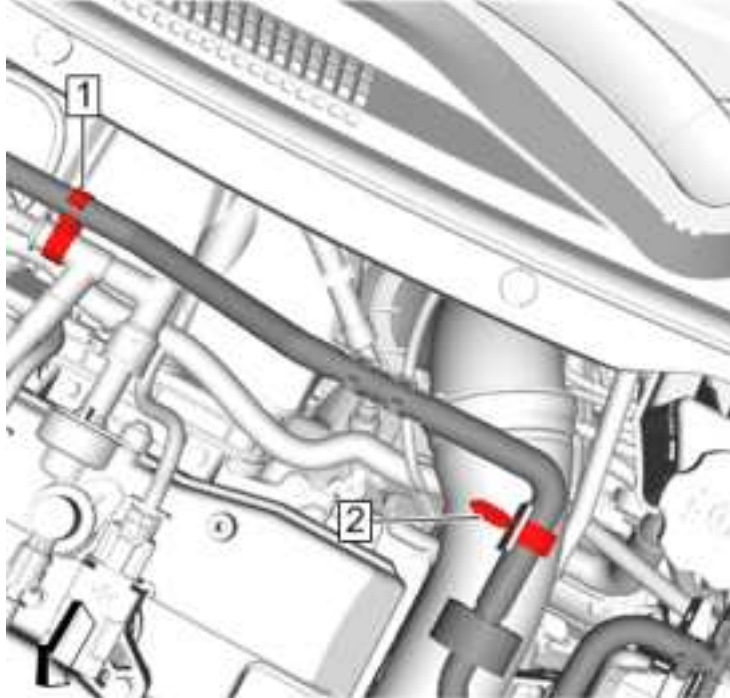


Fig. 219: Engine Coolant Air Bleed Pipe Clip

Courtesy of GENERAL MOTORS COMPANY

3. Install Engine Coolant Air Bleed Pipe Clip (1) @ Positive Crankcase Ventilation Tube.
4. Install Engine Coolant Air Bleed Pipe Clip (2) @ Charge Air Cooler Outlet Air Tube.
5. Install Intake Manifold Cover - [Intake Manifold Cover Replacement](#)

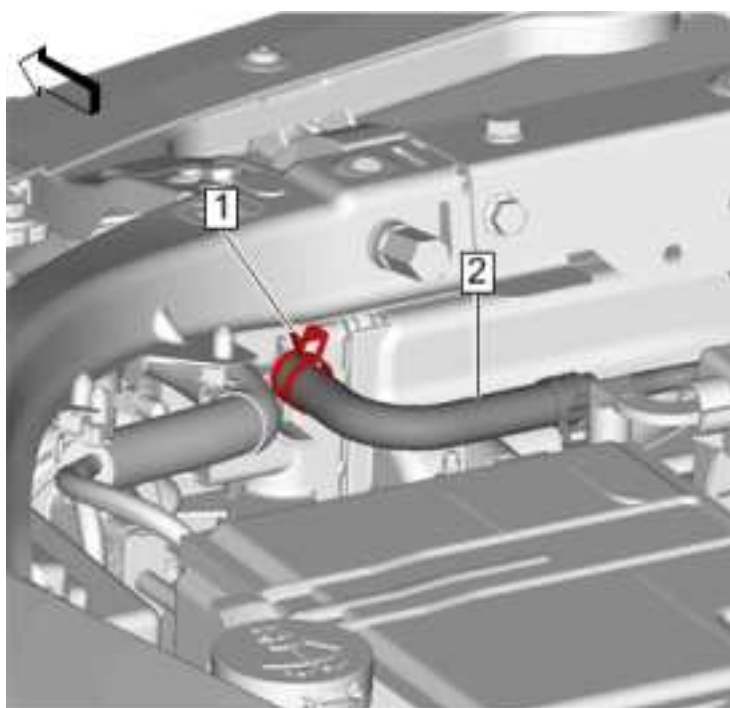


Fig. 220: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator.
7. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

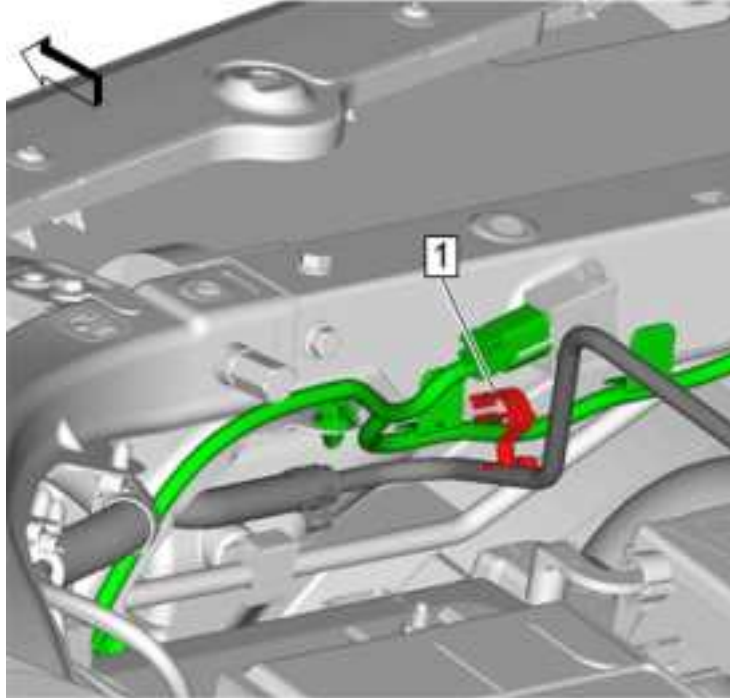


Fig. 221: Engine Coolant Air Bleed Pipe Clip
Courtesy of GENERAL MOTORS COMPANY

8. Install Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.



Fig. 222: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

9. Install Engine Coolant Air Bleed Hose (1) @ Engine Control Module Bracket.

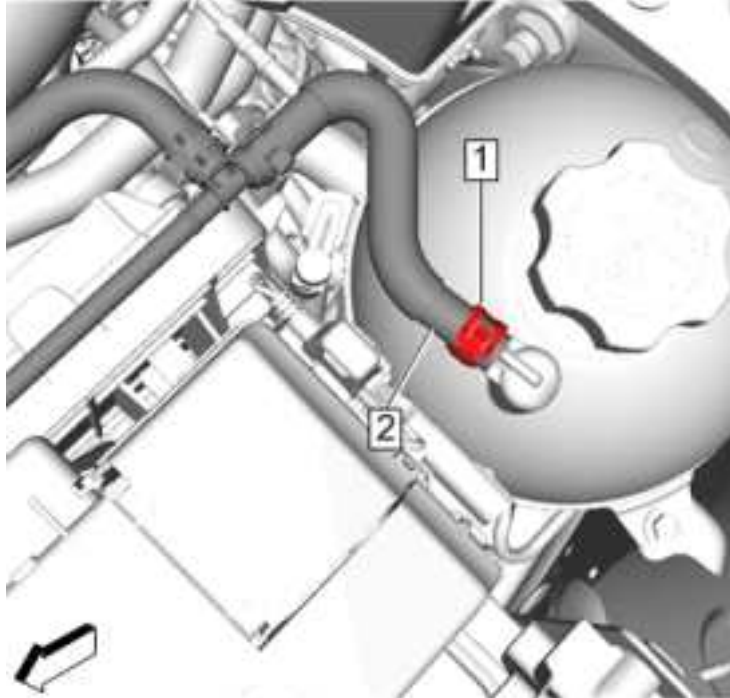


Fig. 223: Engine Coolant Air Bleed Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

10. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.
11. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
12. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
13. Check the cooling system for leaks.

ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (RADIATOR SURGE TANK TO EXHAUST GAS RECIRCULATION COOLER HOUSING AND RADIATOR LH7)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
2. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)

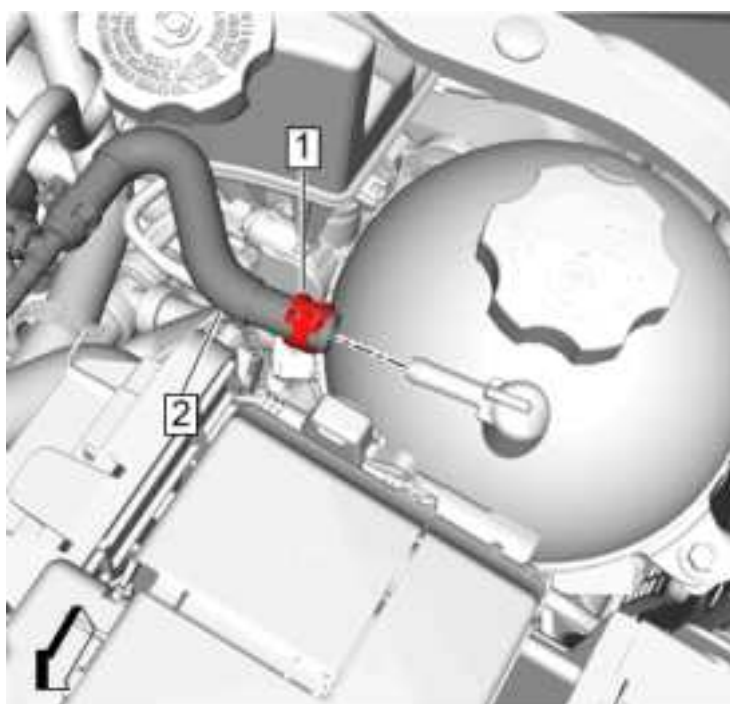


Fig. 224: Engine Coolant Air Bleed Hose
Courtesy of GENERAL MOTORS COMPANY

3. Disengage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

4. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.

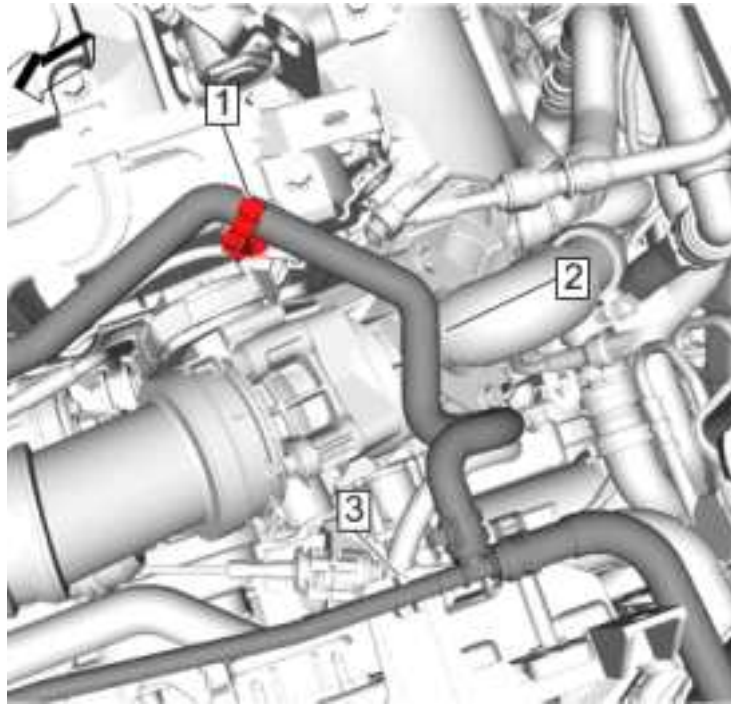


Fig. 225: Engine Coolant Air Bleed Hose, Clip And Bracket
Courtesy of GENERAL MOTORS COMPANY

5. Remove Engine Coolant Air Bleed Hose (2) @Engine Coolant Air Bleed Hose Clip (1).

6. Remove Engine Coolant Air Bleed Hose (2) @Engine Control Module Bracket (3).

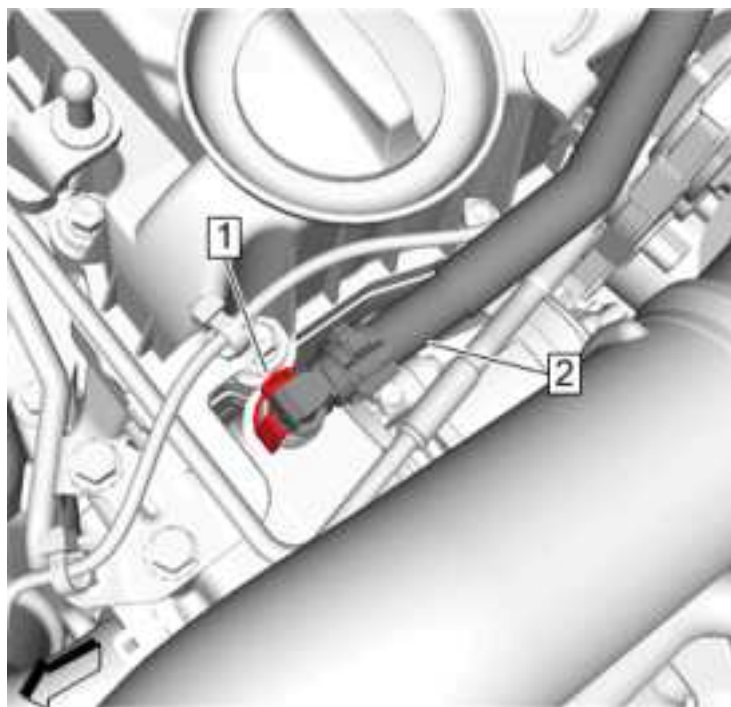


Fig. 226: Engine Coolant Air Bleed Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Disengage Engine Coolant Air Bleed Hose Retainer (1).

8. Remove Engine Coolant Air Bleed Hose (2) @ Exhaust Gas Recirculation Cooler Housing.

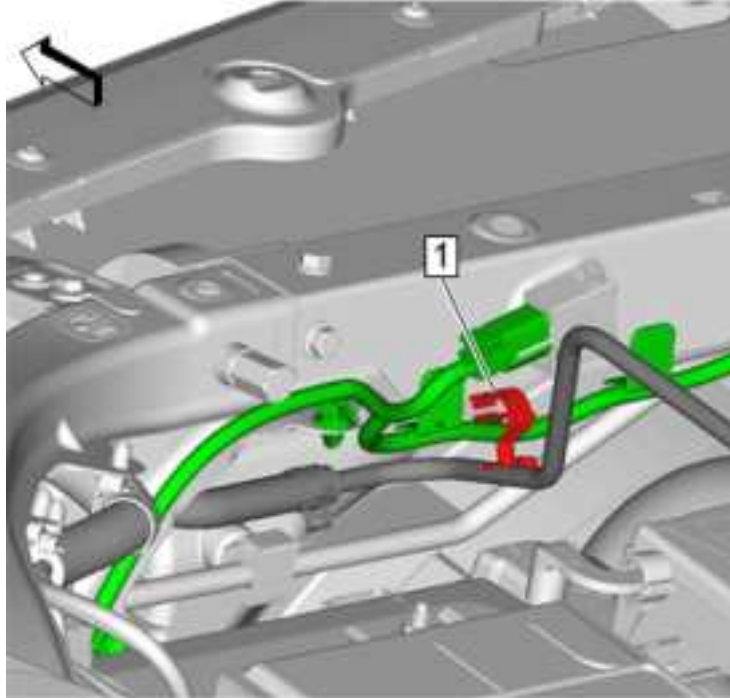


Fig. 227: Engine Coolant Air Bleed Pipe Clip
 Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.

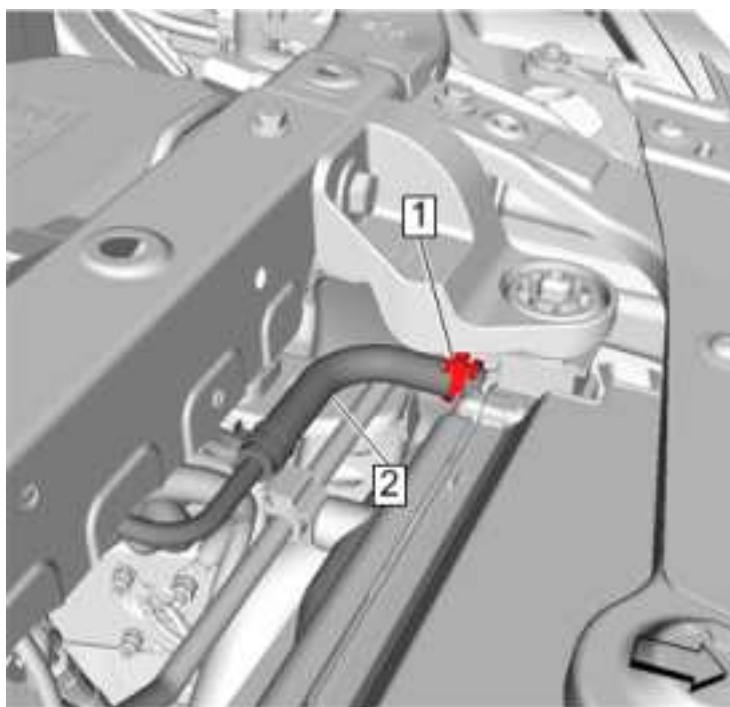


Fig. 228: Engine Coolant Air Bleed Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

10. Disengage Engine Coolant Air Bleed Hose Clamp (1) - **Hose Clamp Replacement Guidelines - Spring Type**
11. Remove Engine Coolant Air Bleed Hose (2) @ Radiator.
12. Remove Engine Coolant Air Bleed Hose (2).

Installation Procedure

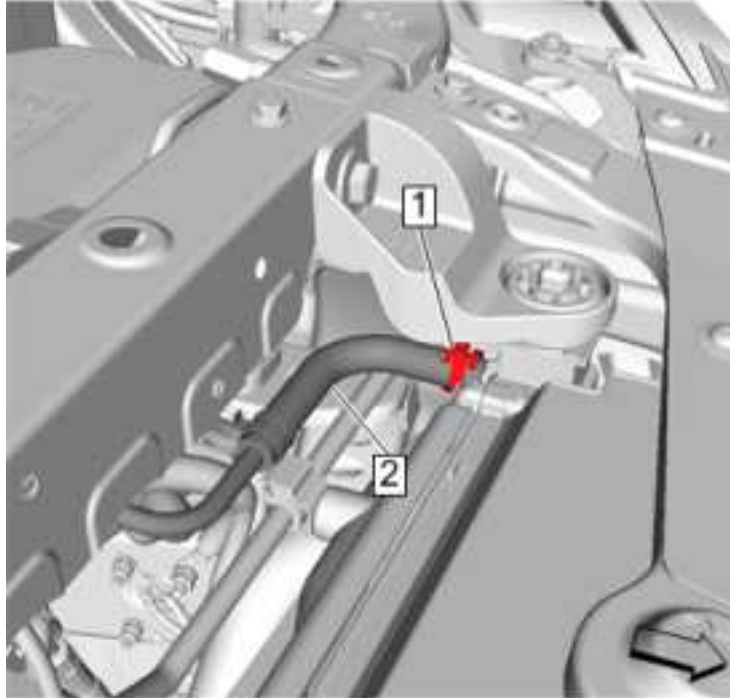


Fig. 229: Engine Coolant Air Bleed Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Air Bleed Hose (2) @ Radiator.
2. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

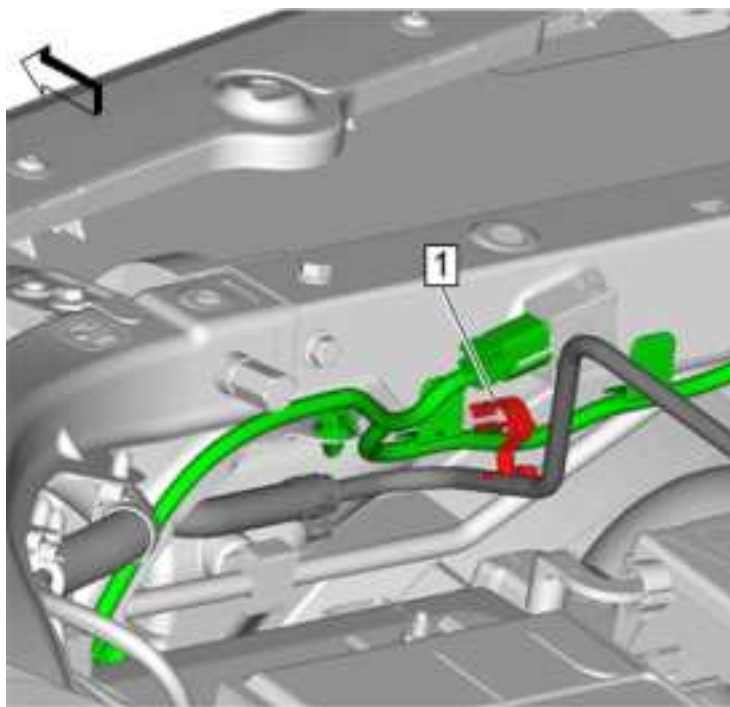


Fig. 230: Engine Coolant Air Bleed Pipe Clip
Courtesy of GENERAL MOTORS COMPANY

3. Install Engine Coolant Air Bleed Pipe Clip (1) @ Wiring Harness Wire.

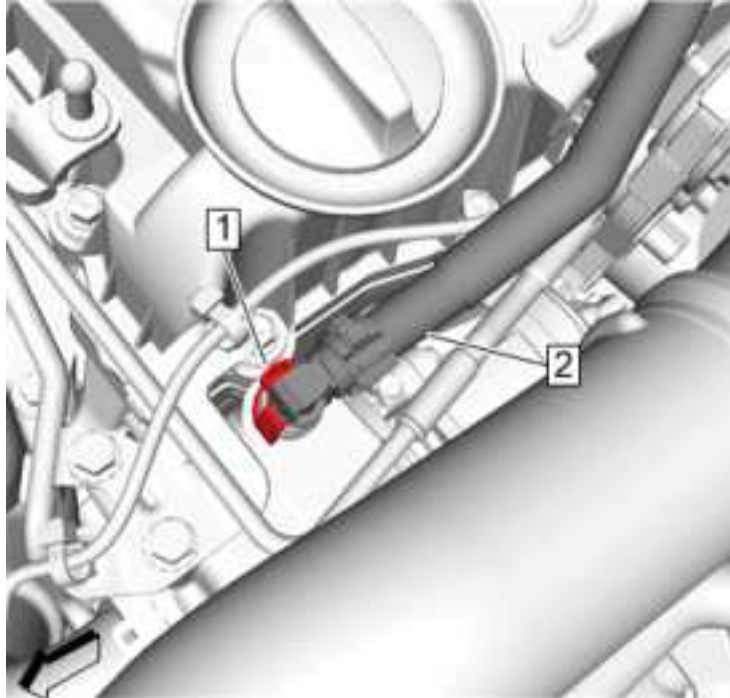


Fig. 231: Engine Coolant Air Bleed Hose Retainer
 Courtesy of GENERAL MOTORS COMPANY

4. Install Engine Coolant Air Bleed Hose (2) @ Exhaust Gas Recirculation Cooler Housing.
5. Engage Engine Coolant Air Bleed Hose Retainer (1).

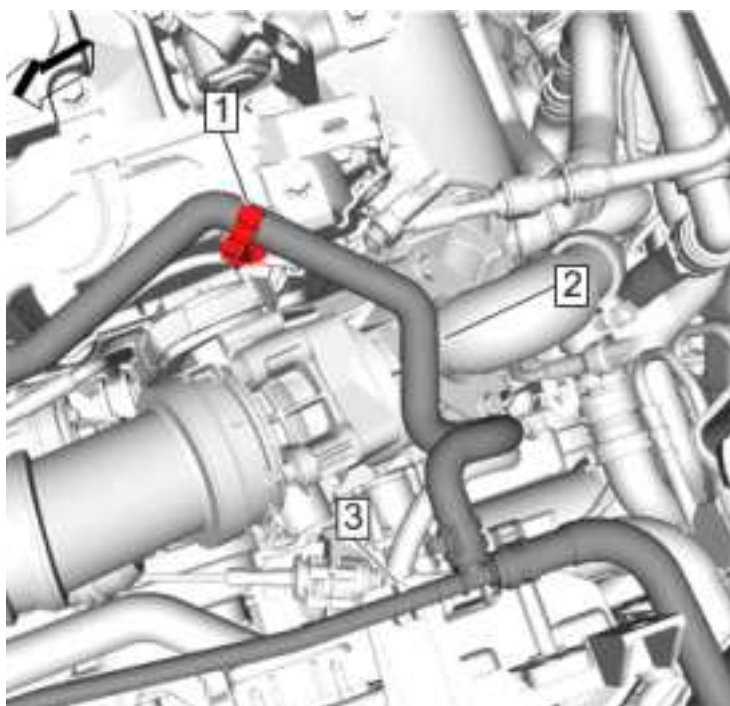


Fig. 232: Engine Coolant Air Bleed Hose, Clip And Bracket
 Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Engine Control Module Bracket (3).
7. Install Engine Coolant Air Bleed Hose (2) @ Engine Coolant Air Bleed Hose Clip (1).

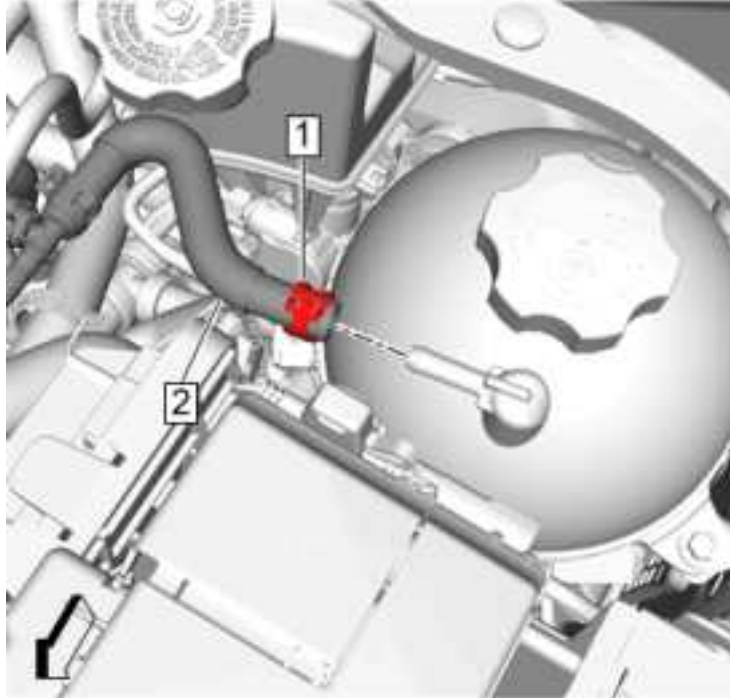


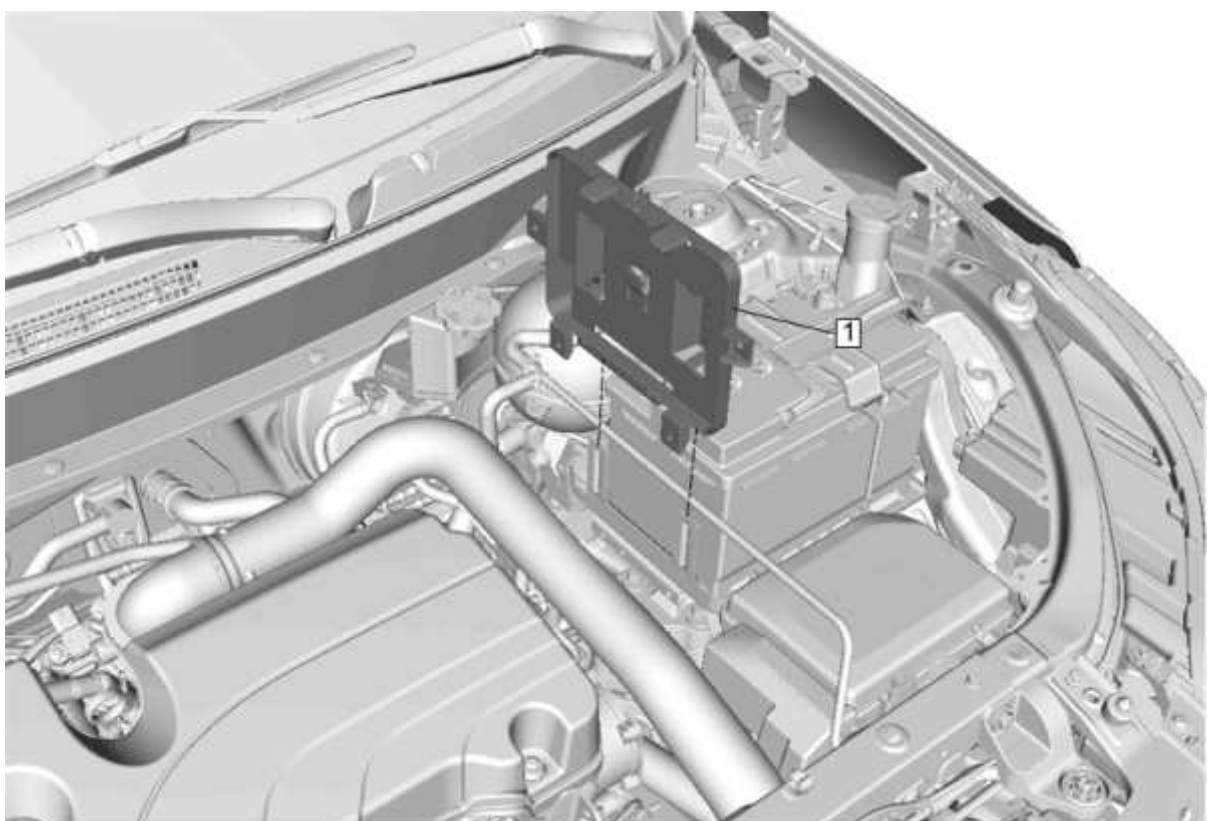
Fig. 233: Engine Coolant Air Bleed Hose
 Courtesy of GENERAL MOTORS COMPANY

8. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank.
9. Engage Engine Coolant Air Bleed Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
10. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
11. Check the cooling system for leaks.

WATER OUTLET REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
2. Remove [Charge Air Cooler Outlet Air Tube Replacement](#) .



3. Remove Engine Control Module Bracket (1) - **Engine Control Module Bracket Replacement**

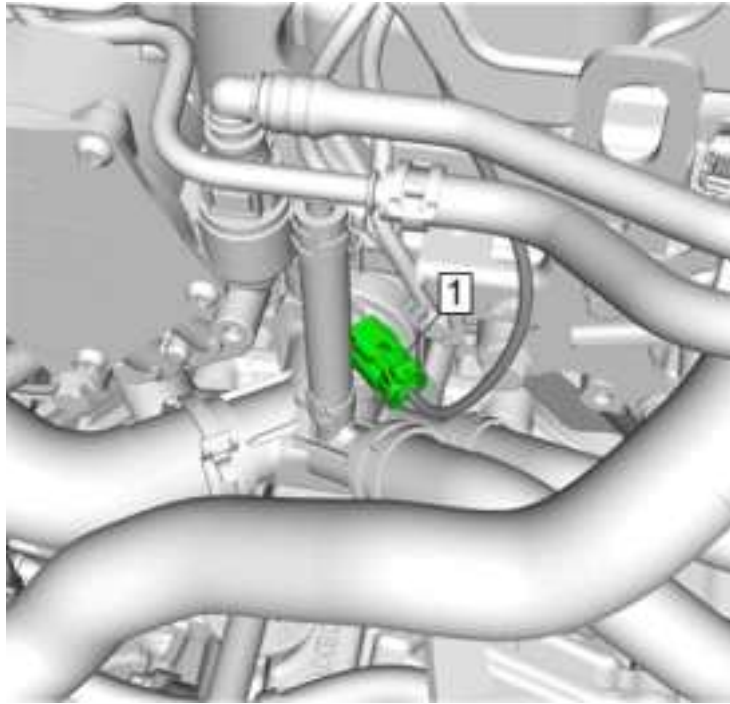


Fig. 235: Engine Coolant Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Engine Coolant Temperature Sensor Electrical Connector (1).

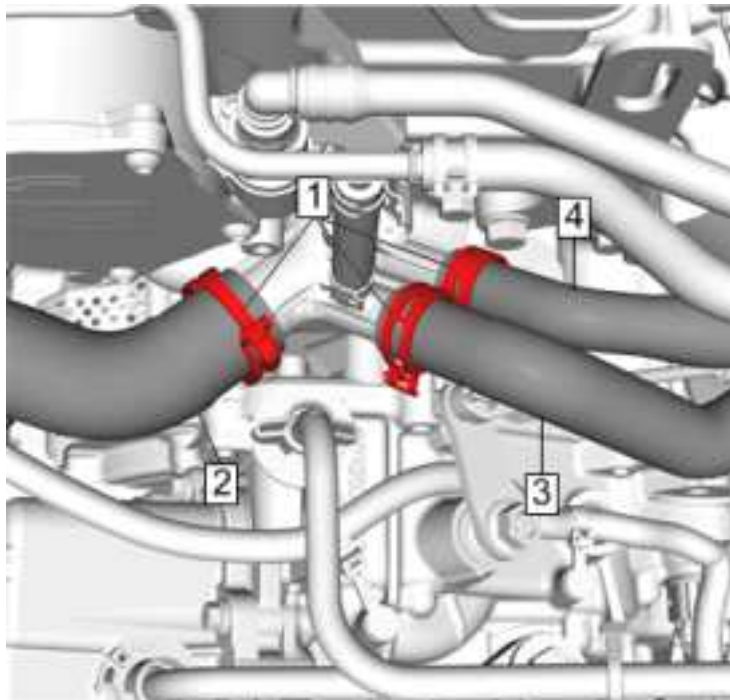


Fig. 236: Hoses And Clamps
Courtesy of GENERAL MOTORS COMPANY

5. Disengage Hose Clamp (1) - [3x]
6. Remove Radiator Inlet Hose (2).
7. Remove Heater Inlet Hose (3).
8. Remove Heater Outlet Hose (4).

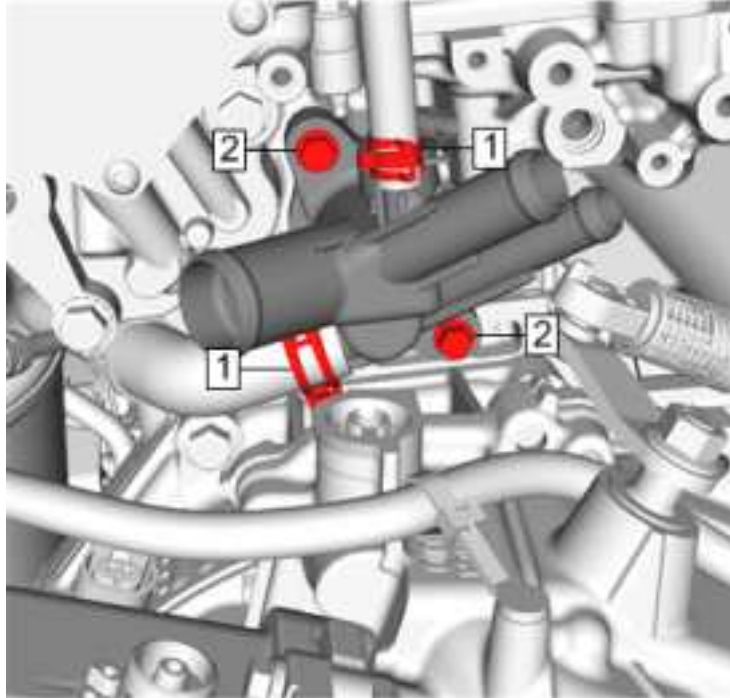


Fig. 237: Water Outlet

Courtesy of GENERAL MOTORS COMPANY

9. Disengage Hose Clamp (1) - [2x]
10. Remove Water Outlet Bolt (2) - [2x]

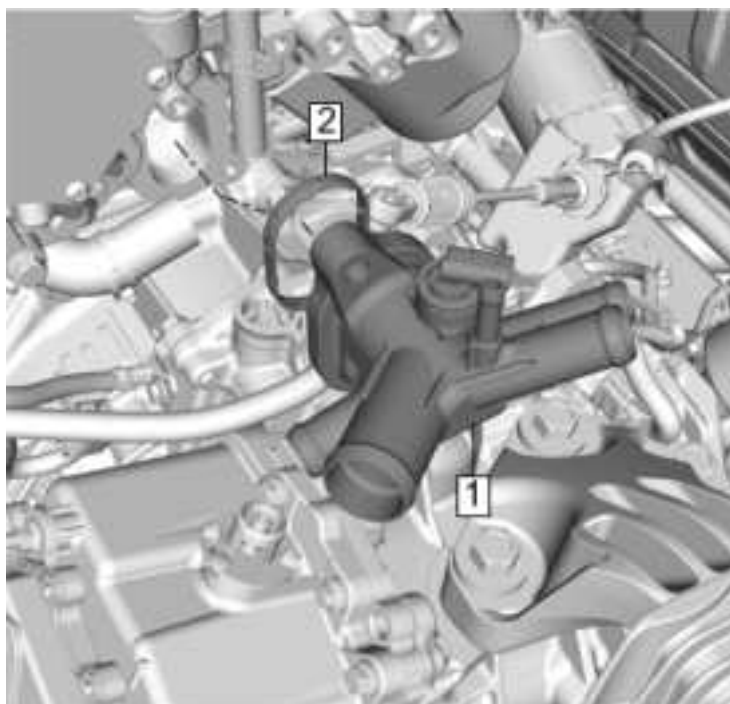


Fig. 238: Water Outlet Seal

Courtesy of GENERAL MOTORS COMPANY

11. Remove Water Outlet (1).
12. Remove Water Outlet Seal (2) and DISCARD

Installation Procedure

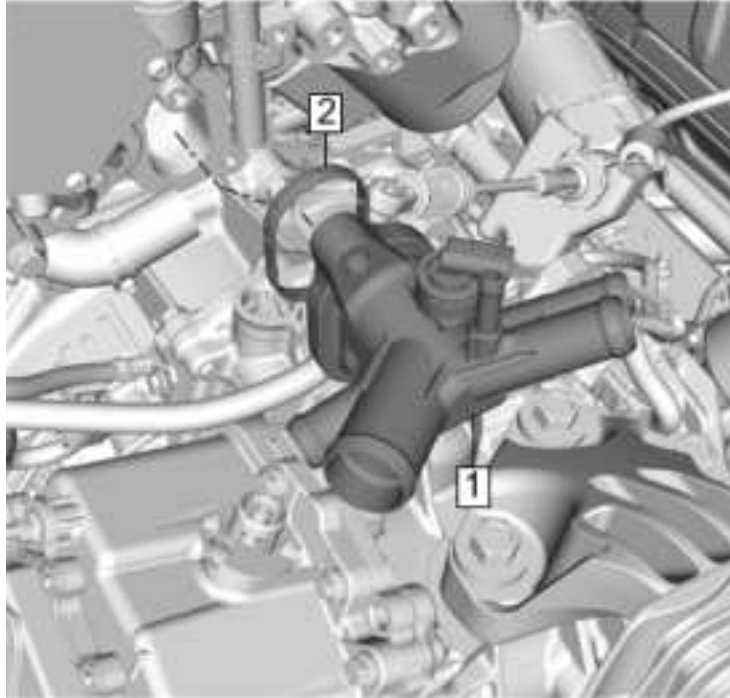


Fig. 239: Water Outlet Seal

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW seal.

1. Install Water Outlet Seal (2).
2. Install Water Outlet (1).

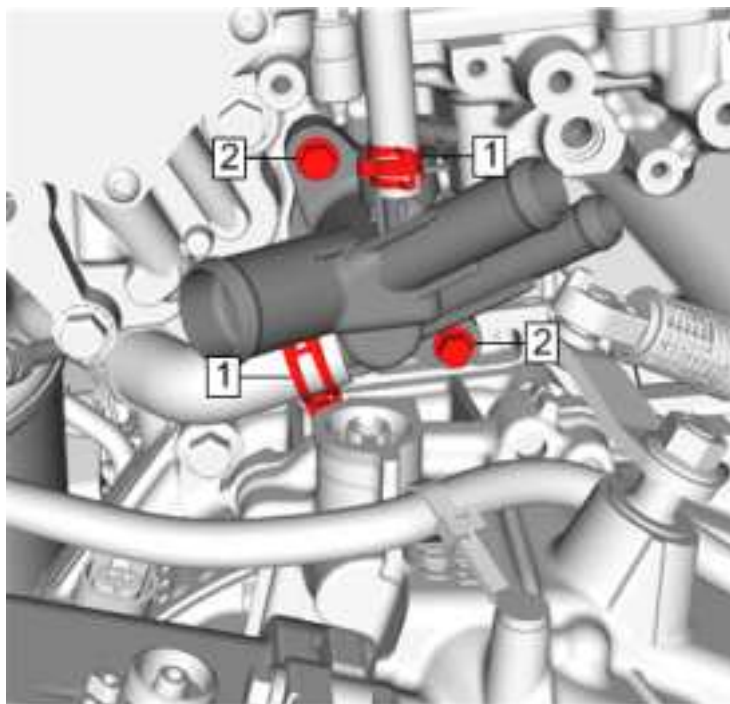


Fig. 240: Water Outlet

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

3. Install Water Outlet Bolt (2) and tighten [2x] 10 N.m (89 lb in)
4. Engage Hose Clamp (1) - [2x]

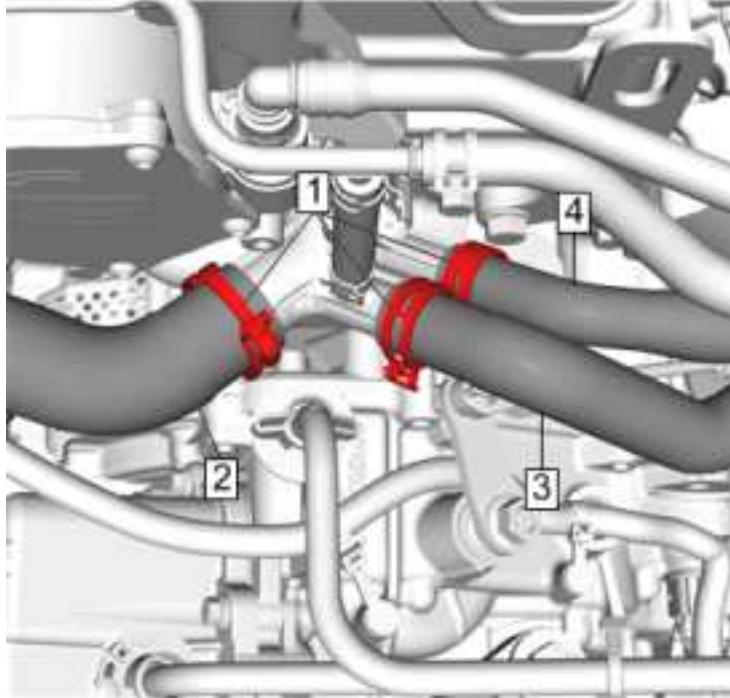


Fig. 241: Hoses And Clamps

Courtesy of GENERAL MOTORS COMPANY

5. Connect Heater Outlet Hose (4).
6. Connect Heater Inlet Hose (3).
7. Connect Radiator Inlet Hose (2).
8. Engage Hose Clamp (1) - [3x]

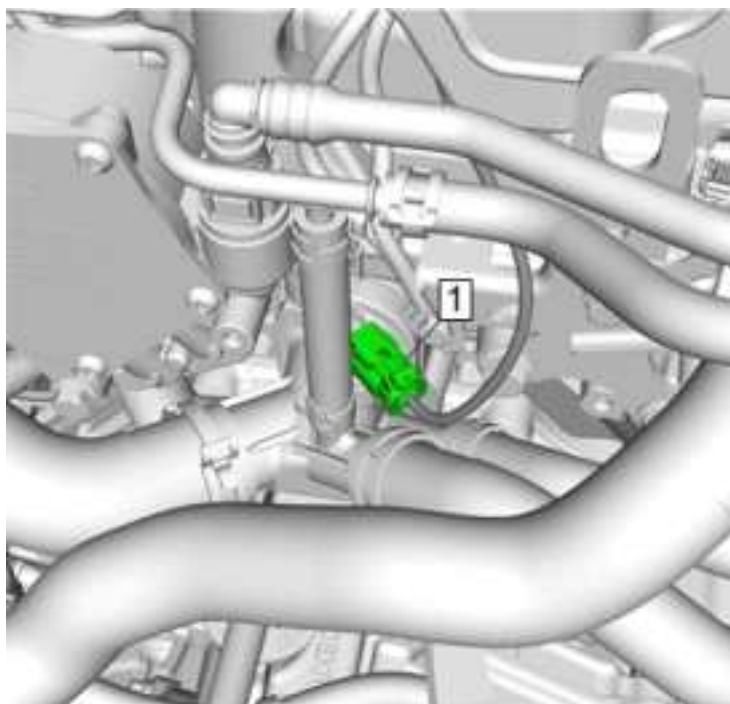


Fig. 242: Engine Coolant Temperature Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

9. Connect Engine Coolant Temperature Sensor Electrical Connector (1).

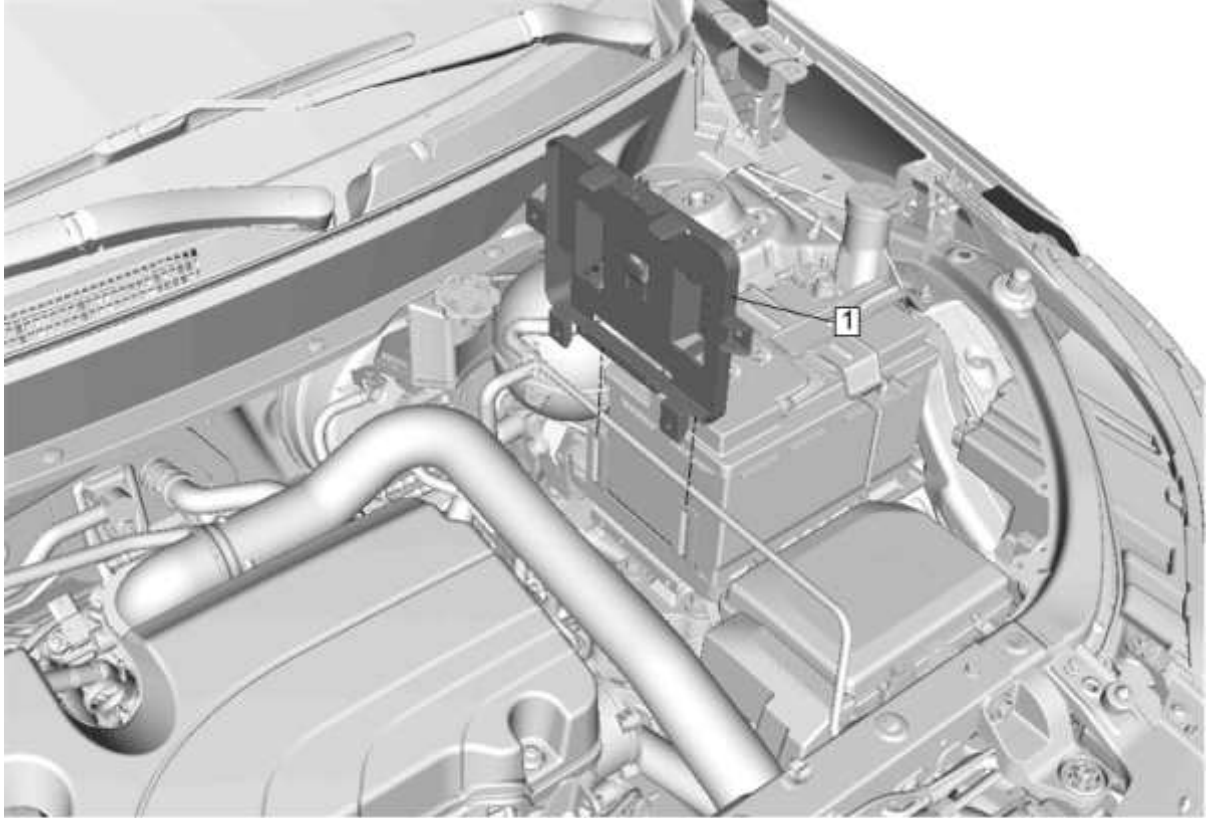


Fig. 243: Engine Control Module Bracket
Courtesy of GENERAL MOTORS COMPANY

10. Install Engine Control Module Bracket (1) - [Engine Control Module Bracket Replacement](#)
11. Install - [Charge Air Cooler Outlet Air Tube Replacement](#)
12. Fill the cooling system. Reference [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).

WATER OUTLET REPLACEMENT (LTG)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

NOTE: Reposition the engine control module with the wiring harness attached.

2. Remove Engine Control Module - and position aside - [Engine Control Module Replacement](#)
3. Remove Battery Tray - [Battery Tray Replacement](#)

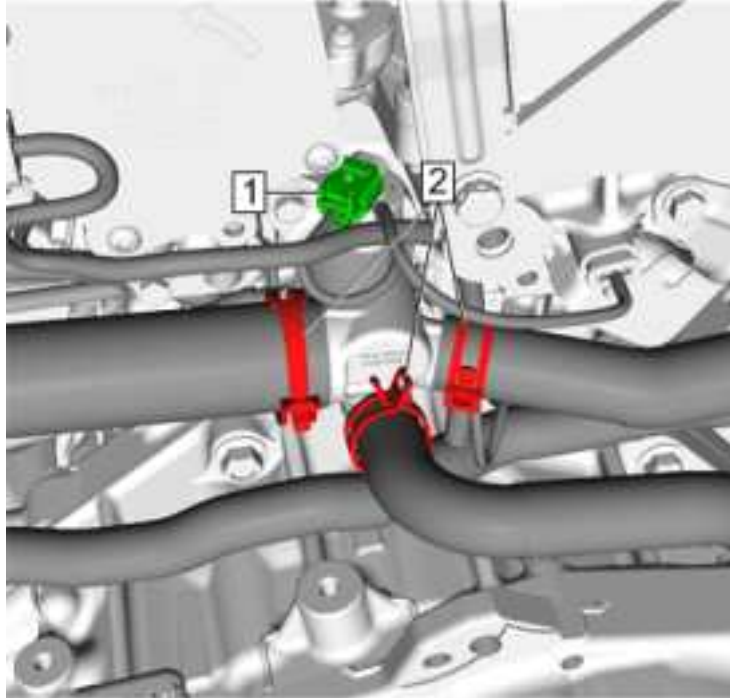


Fig. 244: Engine Coolant Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Engine Coolant Temperature Sensor (1).
5. Disengage Hose Clamp (2) - [3x] - **Hose Clamp Replacement Guidelines - Spring Type**

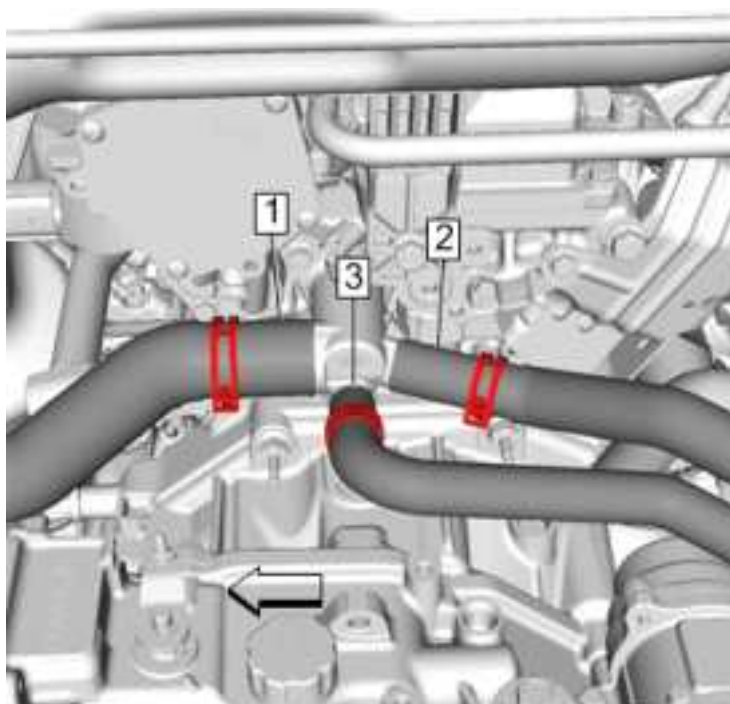


Fig. 245: Radiator Inlet Hose And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

6. Disconnect Radiator Inlet Hose (1) @ Water Outlet.
7. Disconnect Heater Inlet Hose (2) @ Water Outlet.
8. Disconnect Heater Water Auxiliary Pump Inlet Hose (3) @ Water Outlet.

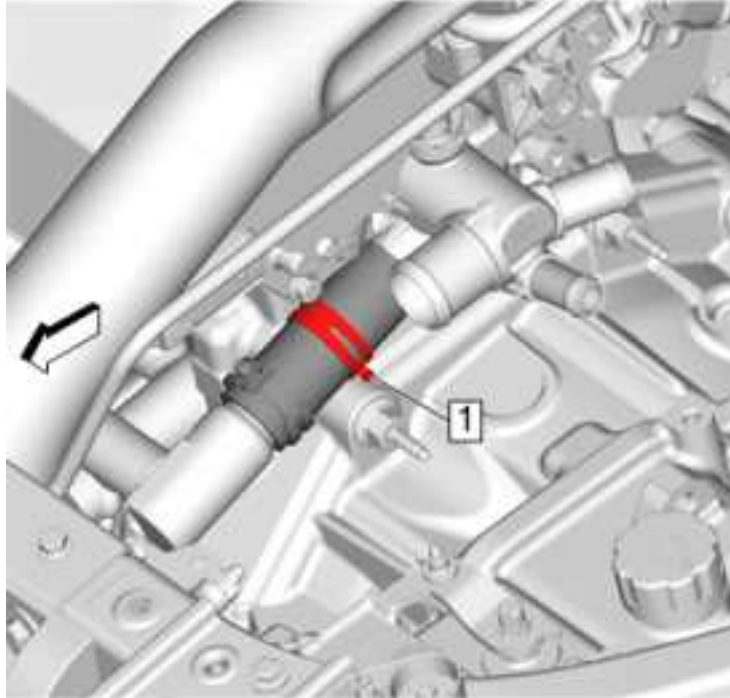


Fig. 246: Thermostat Bypass Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

9. Disengage Thermostat Bypass Hose Clamp (1) @ Water Outlet - **Hose Clamp Replacement Guidelines - Spring Type**

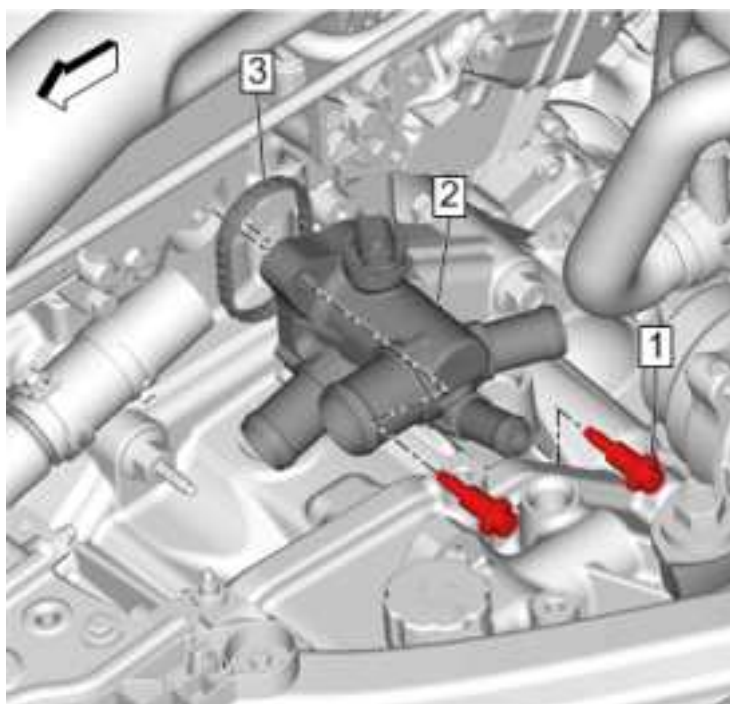


Fig. 247: Water Outlet, Bolt And Seal
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Separate the thermostat bypass hose from the water outlet during removal.

10. Remove Water Outlet Bolt (1) - [2x]
11. Remove Water Outlet (2).
12. Remove Water Outlet Seal (3) and DISCARD

Installation Procedure

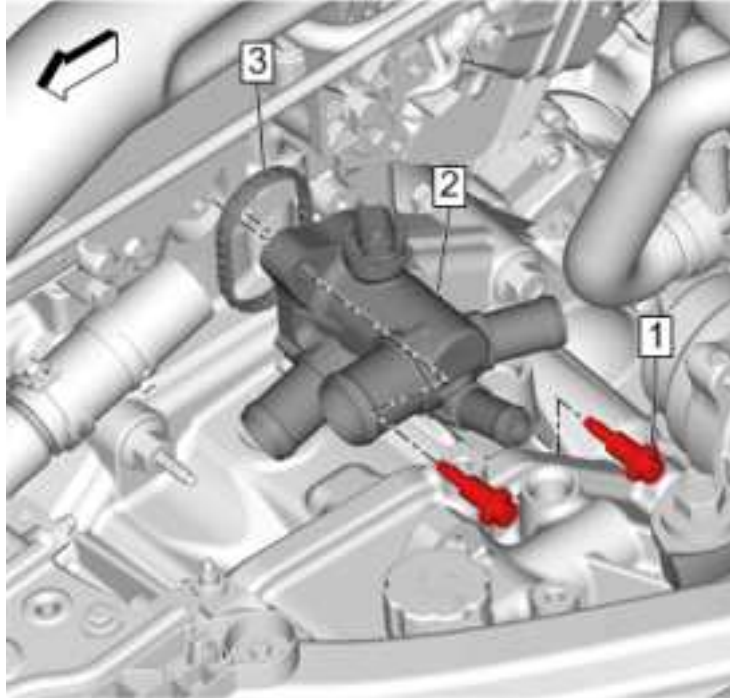


Fig. 248: Water Outlet, Bolt And Seal

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install the thermostat bypass hose onto the water outlet during installation.

1. Install NEW Water Outlet Seal (3).
2. Install Water Outlet (2).

CAUTION: Refer to [Fastener Caution](#) .

3. Install Water Outlet Bolt (1) and tighten [2x] 10 N.m (89 lb in)

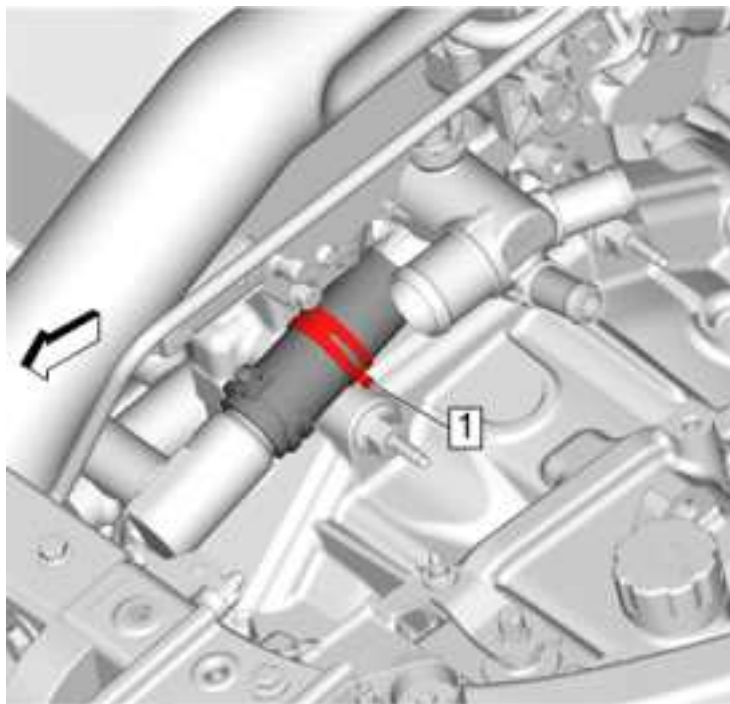


Fig. 249: Thermostat Bypass Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

4. Engage Thermostat Bypass Hose Clamp (1) @ Water Outlet - [Hose Clamp Replacement Guidelines - Spring Type](#)

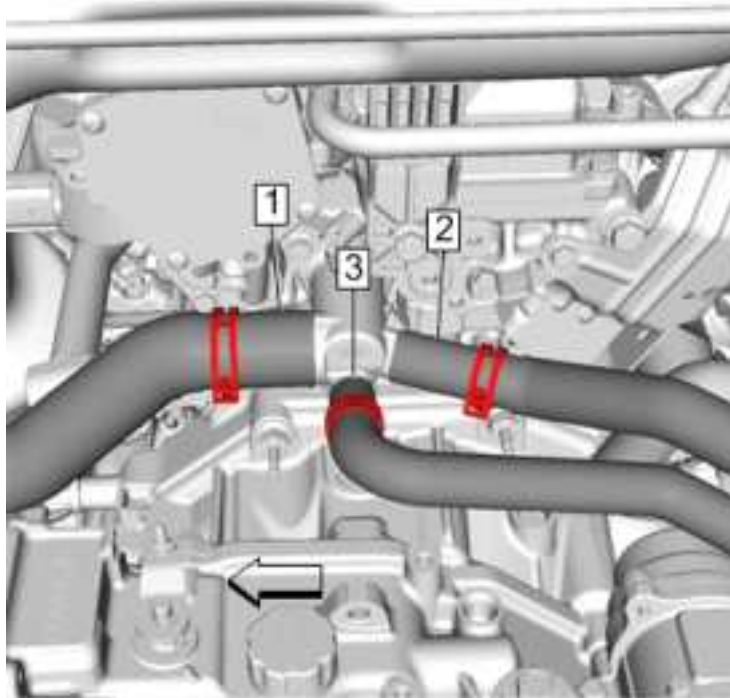


Fig. 250: Radiator Inlet Hose And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Connect Heater Water Auxiliary Pump Inlet Hose (3) @ Water Outlet.
6. Connect Heater Inlet Hose @ (2) Water Outlet.
7. Connect Radiator Inlet Hose (1) @ Water Outlet.

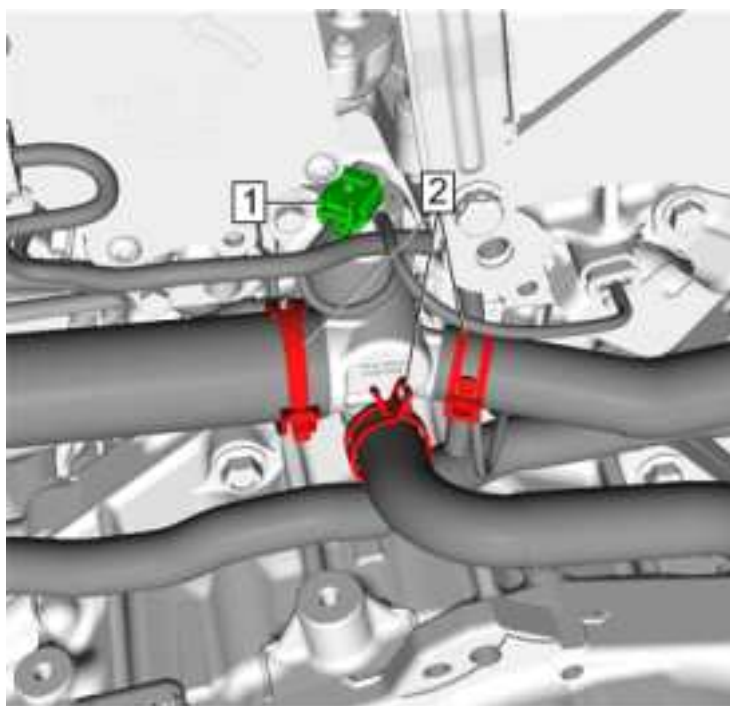


Fig. 251: Engine Coolant Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

8. Engage Hose Clamp (2) - [3x] [Hose Clamp Replacement Guidelines - Spring Type](#)
9. Connect Engine Coolant Temperature Sensor (1).
10. Install Battery Tray - [Battery Tray Replacement](#)
11. Install Engine Control Module - [Engine Control Module Replacement](#)
12. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
13. Start the engine and check for leaks.

WATER OUTLET REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

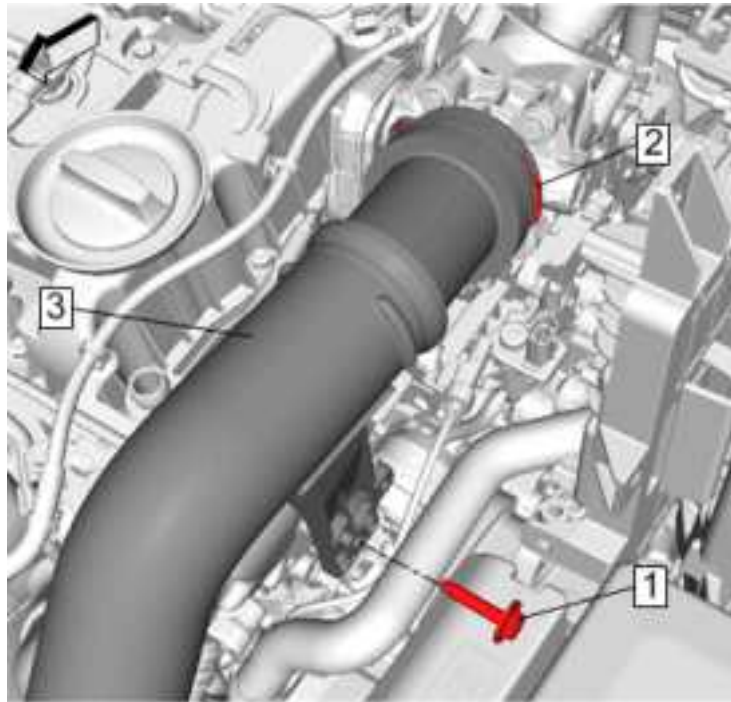


Fig. 252: Charge Air Cooler Outlet Air Tube
Courtesy of GENERAL MOTORS COMPANY

2. Remove Charge Air Cooler Outlet Air Tube (3) - [Charge Air Cooler Outlet Air Tube Replacement](#)

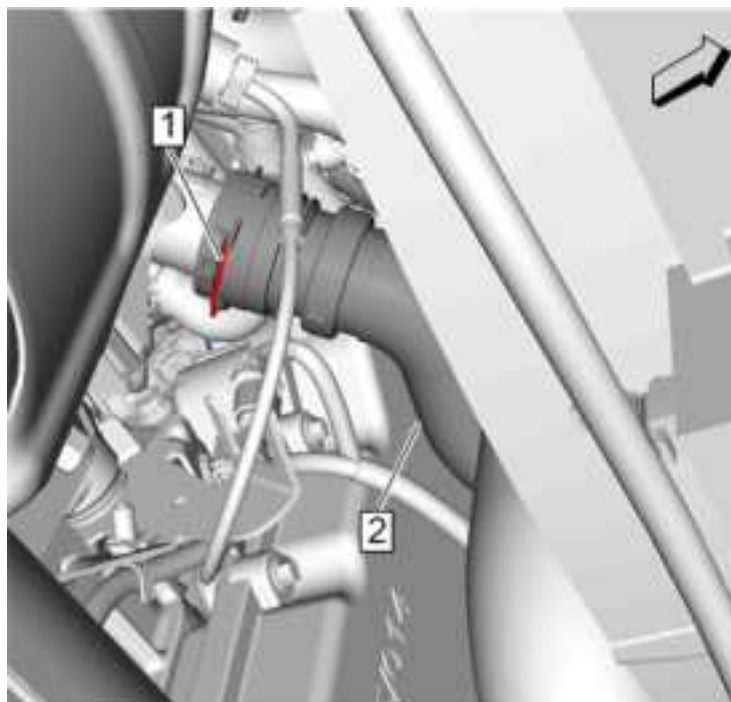


Fig. 253: Radiator Inlet Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Inlet Hose (2) @ Water Outlet - [Radiator Inlet Hose Replacement \(LH7\)](#)

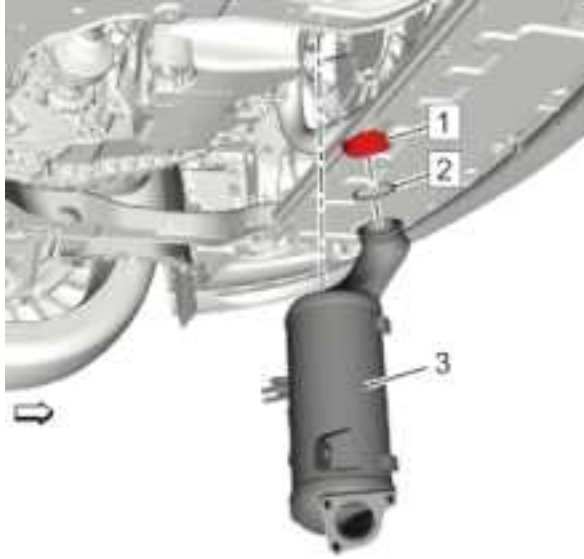


Fig. 254: Catalytic Converter, Clamp And Gasket
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Oxidation Catalytic Converter (3) - [Oxidation Catalytic Converter Replacement \(LH7\)](#)

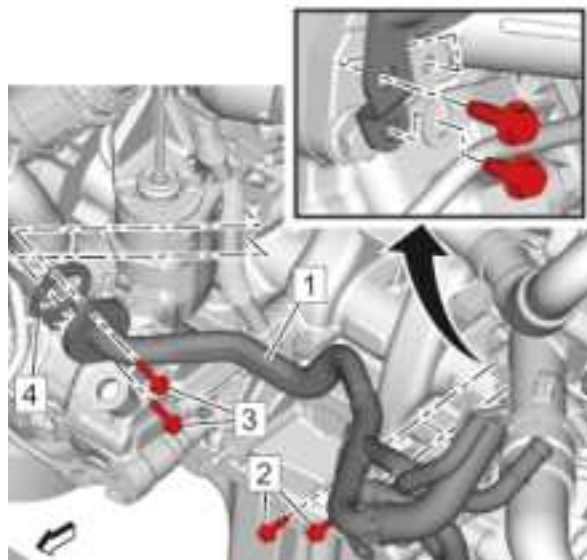


Fig. 255: Thermostat Bypass Pipe, Bracket And Bolts
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Thermostat Bypass Pipe (1) - [Thermostat Bypass Pipe Replacement \(LH7\)](#)
6. Remove Power Brake Booster Inlet Hose Connector Fitting - [Power Brake Booster Inlet Hose Connector Fitting Replacement](#)

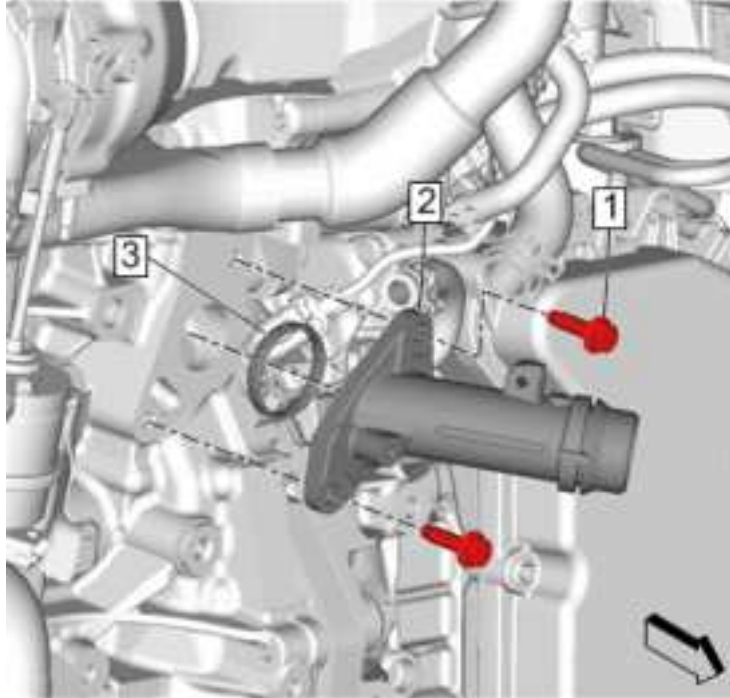


Fig. 256: Water Outlet, Bolt And Seal

Courtesy of GENERAL MOTORS COMPANY

7. Remove Water Outlet Bolt (1) - [2x]
8. Remove Water Outlet (2).
9. Remove Water Outlet Seal (3) and DISCARD

Installation Procedure

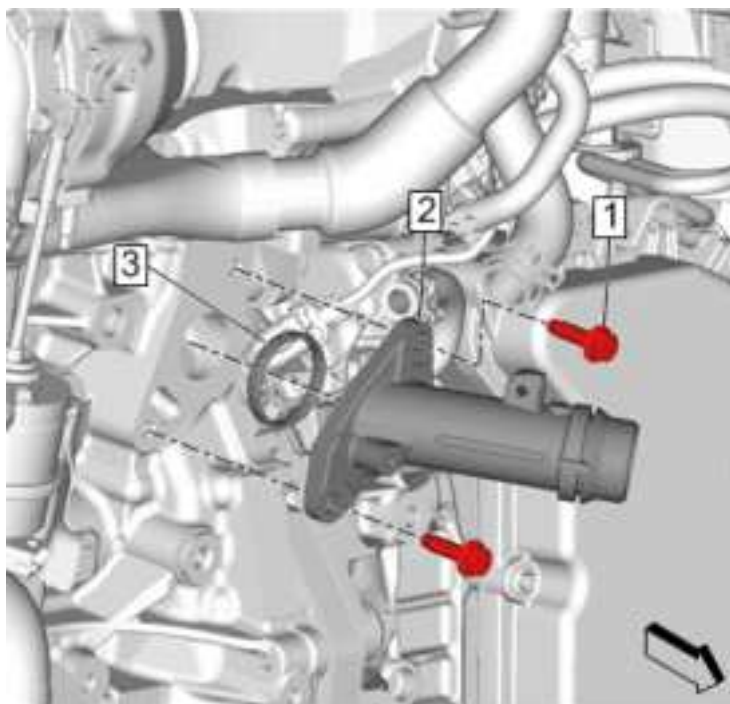


Fig. 257: Water Outlet, Bolt And Seal

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Water Outlet Seal (3).
2. Install Water Outlet (2).

CAUTION: Refer to [Fastener Caution](#) .

3. Install Water Outlet Bolt (1) and tighten [2x] 25 N.m (18 lb ft)
4. Install Power Brake Booster Inlet Hose Connector Fitting - [Power Brake Booster Inlet Hose Connector Fitting Replacement](#)

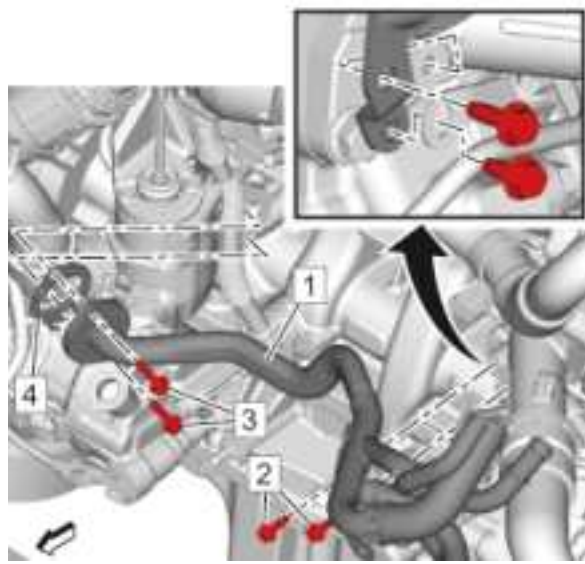


Fig. 258: Thermostat Bypass Pipe, Bracket And Bolts
 Courtesy of GENERAL MOTORS COMPANY

5. Install Thermostat Bypass Pipe (1) - [Thermostat Bypass Pipe Replacement \(LH7\)](#)

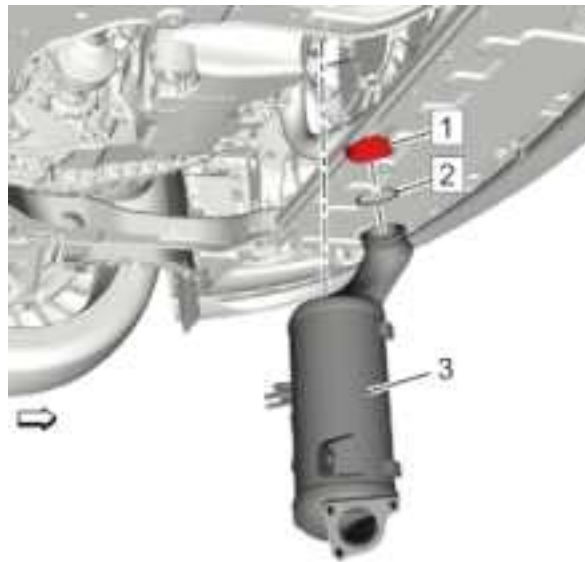


Fig. 259: Catalytic Converter, Clamp And Gasket
 Courtesy of GENERAL MOTORS COMPANY

6. Install Oxidation Catalytic Converter (3) - [Oxidation Catalytic Converter Replacement \(LH7\)](#)

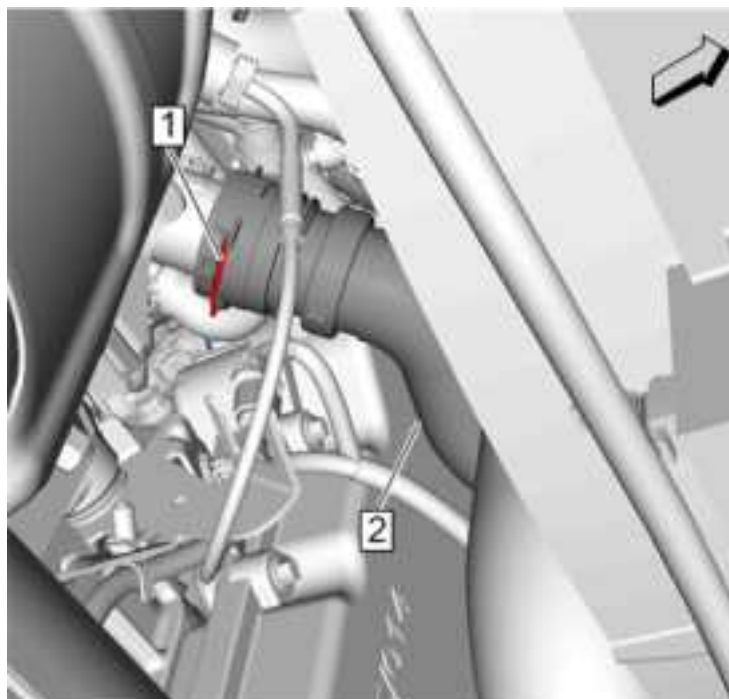


Fig. 260: Radiator Inlet Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Inlet Hose (2) @ Water Outlet - **Radiator Inlet Hose Replacement (LH7)**

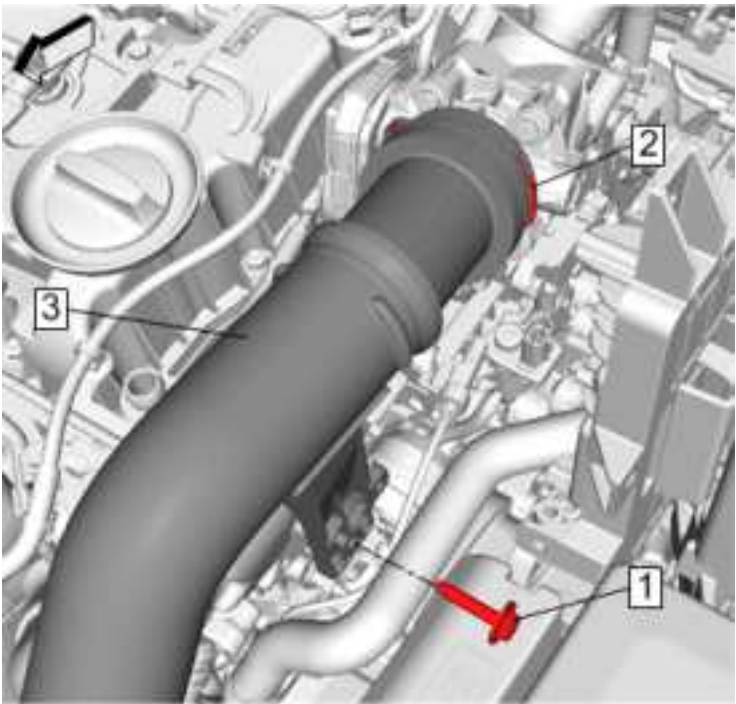


Fig. 261: Charge Air Cooler Outlet Air Tube
Courtesy of GENERAL MOTORS COMPANY

8. Install Charge Air Cooler Outlet Air Tube (3) - **Charge Air Cooler Outlet Air Tube Replacement**
9. Fill the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**

THERMOSTAT BYPASS PIPE REPLACEMENT (LYX)

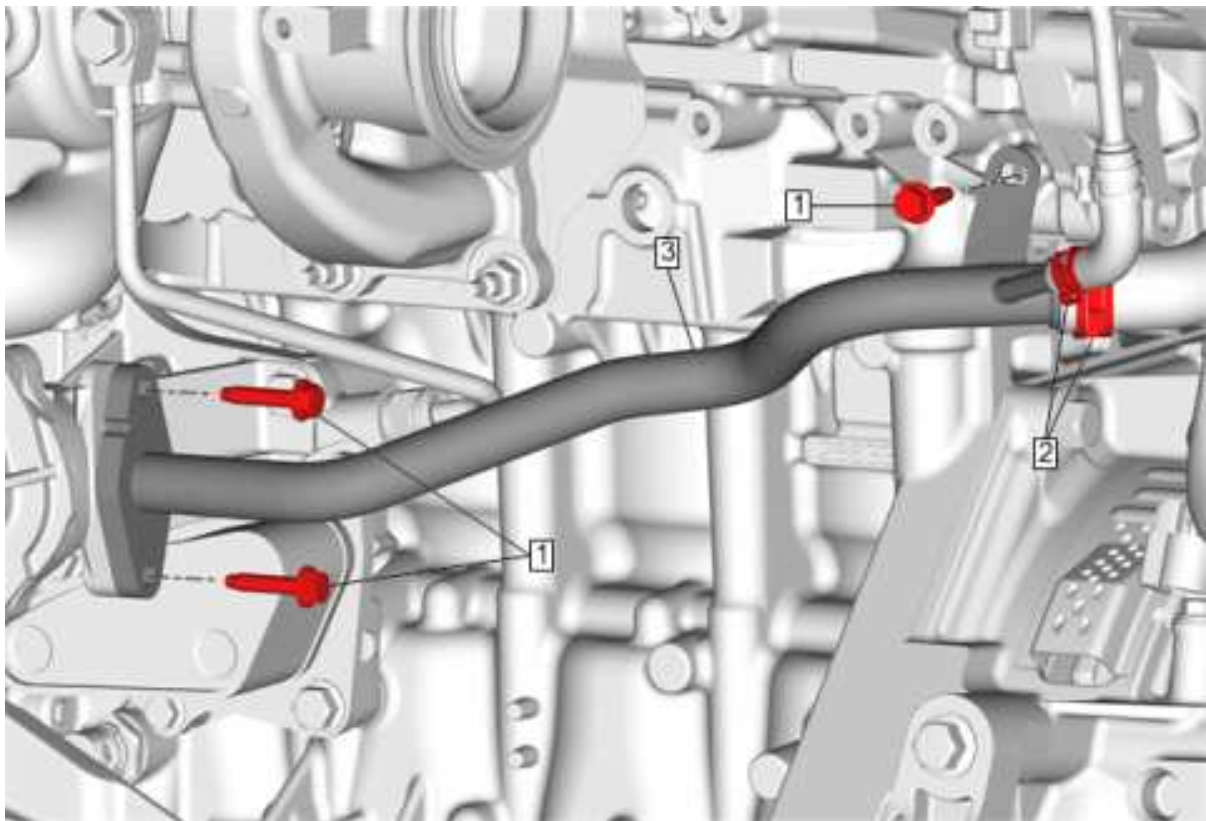


Fig. 262: Thermostat Bypass Pipe
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. <u>Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static).</u> 2. <u>Warm Up Three-Way Catalytic Converter Replacement (LYX).</u>	
1	Thermostat Bypass Pipe Bolt [3x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 N.m (89 lb in)
2	Clamp [2x]
3	Thermostat Bypass Pipe Procedure Install a NEW gasket.

THERMOSTAT BYPASS PIPE REPLACEMENT (LTG)

Removal Procedure

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)
2. Remove Exhaust Manifold Brace - Exhaust Manifold Brace Replacement (LTG)

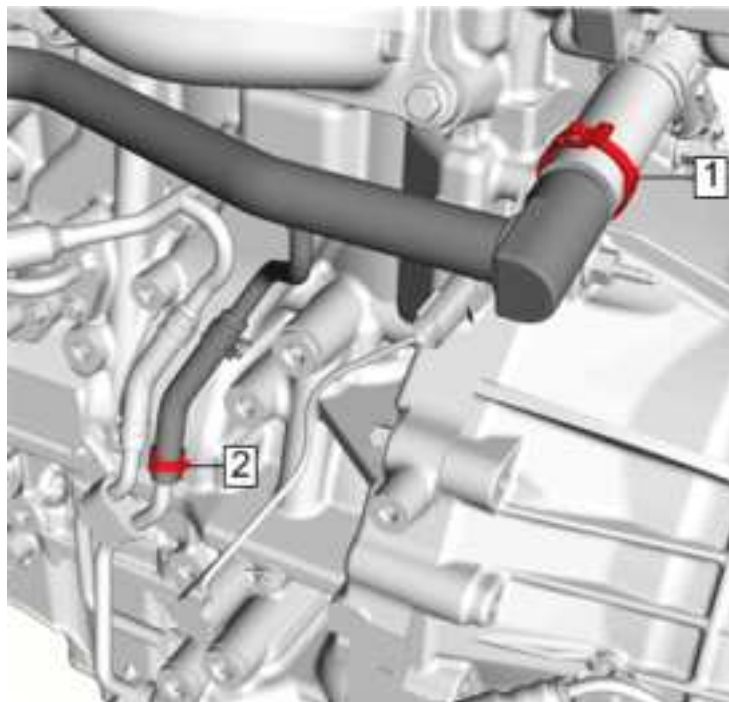


Fig. 263: Clamps

Courtesy of GENERAL MOTORS COMPANY

3. Disengage Thermostat Bypass Hose Clamp (1).
4. Disengage Engine Oil Cooler Inlet Hose Clamp (2).

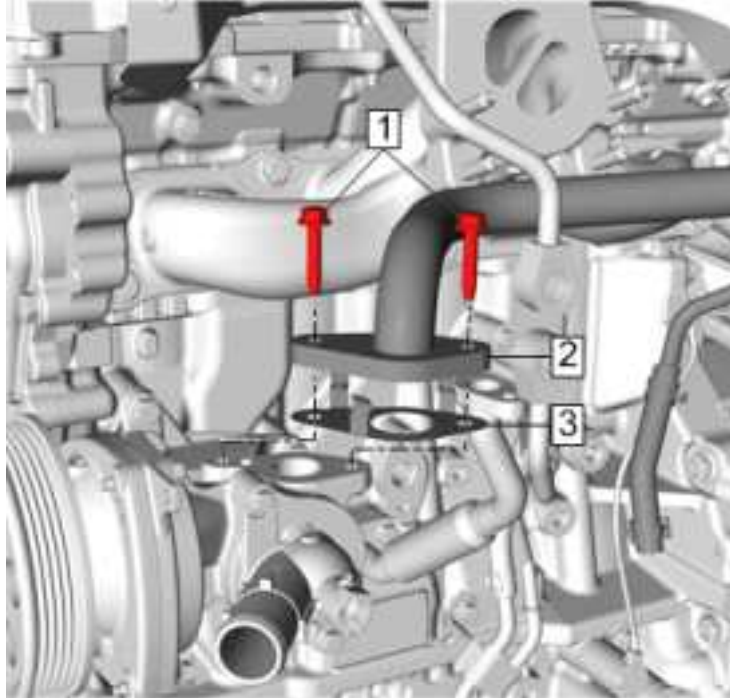


Fig. 264: Thermostat Bypass Pipe, Bolts And Gasket
Courtesy of GENERAL MOTORS COMPANY

5. Remove Thermostat Bypass Pipe Bolt (1) - [2x]
6. Remove Thermostat Bypass Pipe (2)
7. Remove Thermostat Bypass Pipe Gasket (3) and DISCARD

Installation Procedure

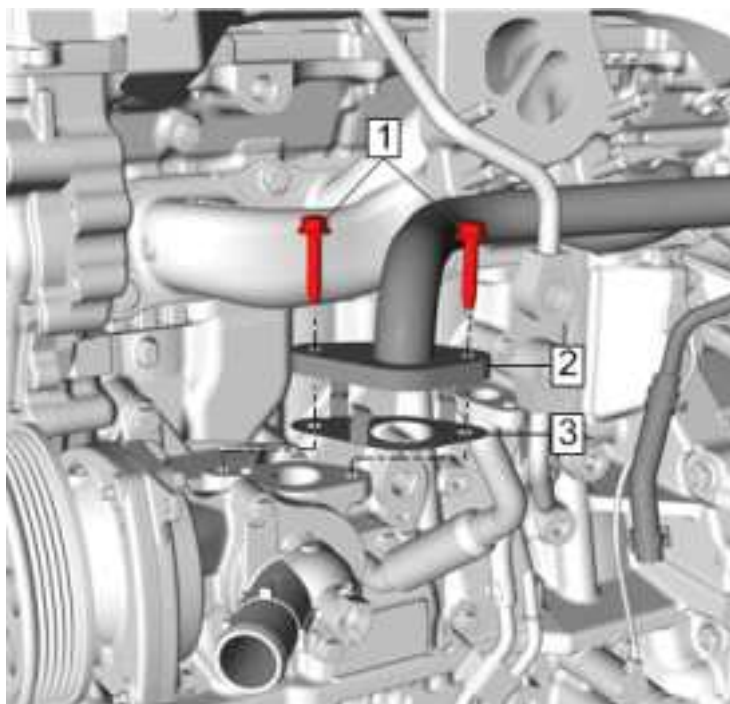


Fig. 265: Thermostat Bypass Pipe, Bolts And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** thermostat bypass pipe gasket.

1. Install Thermostat Bypass Pipe Gasket (3).
2. Install Thermostat Bypass Pipe (2).

CAUTION: Refer to **Fastener Caution** .

3. Install Thermostat Bypass Pipe Bolt (1) and tighten [2x] 10 N.m (89 lb in)

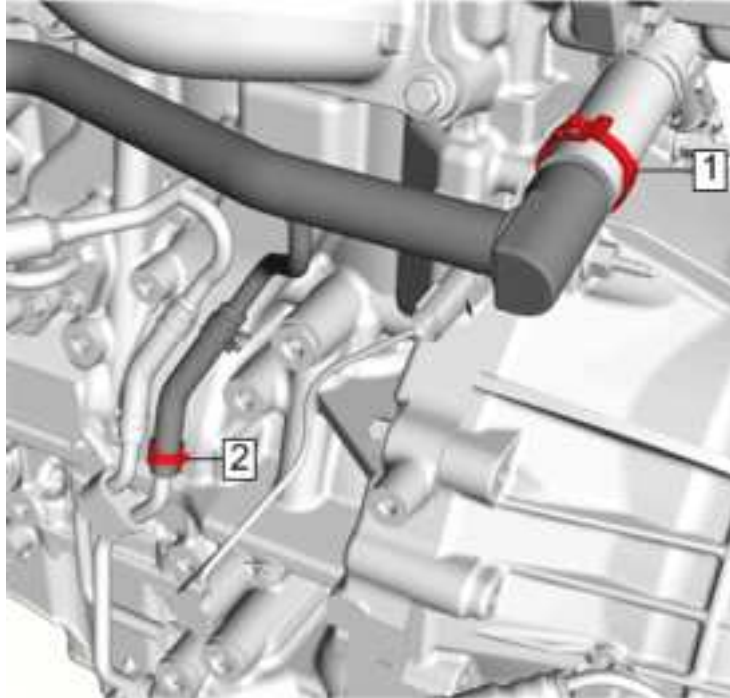


Fig. 266: Clamps

Courtesy of GENERAL MOTORS COMPANY

4. Engage Engine Oil Cooler Inlet Hose Clamp (2).
5. Engage Thermostat Bypass Hose Clamp (1).
6. Install Exhaust Manifold Brace - [Exhaust Manifold Brace Replacement \(LTG\)](#)
7. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
8. Start the engine and check for leaks.

THERMOSTAT BYPASS PIPE REPLACEMENT (LH7)

Removal Procedure

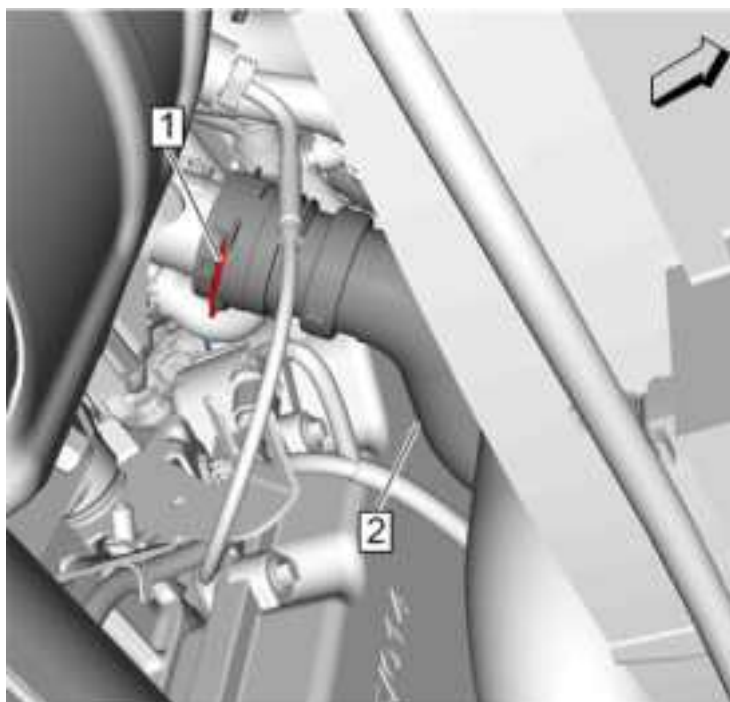


Fig. 267: Radiator Inlet Hose Retainer

Courtesy of GENERAL MOTORS COMPANY

1. Remove Radiator Inlet Hose (2) @ Water Outlet - [Radiator Inlet Hose Replacement \(LH7\)](#)
2. Remove Oxidation Catalytic Converter - [Oxidation Catalytic Converter Replacement \(LH7\)](#)
3. Remove Charge Air Cooler Outlet Air Tube - [Charge Air Cooler Outlet Air Tube Replacement](#)

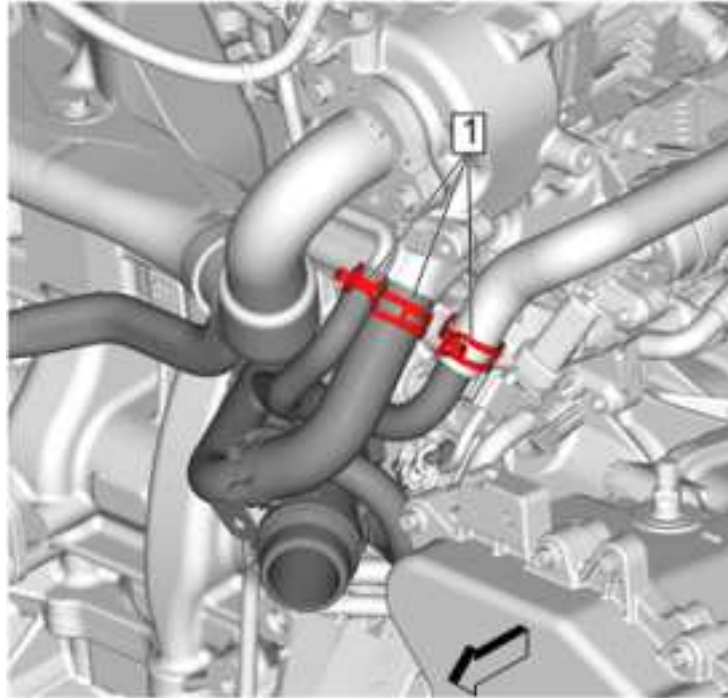


Fig. 268: Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

4. Remove Hose Clamp (1) - [3x] [Hose Clamp Replacement Guidelines - Spring Type](#)

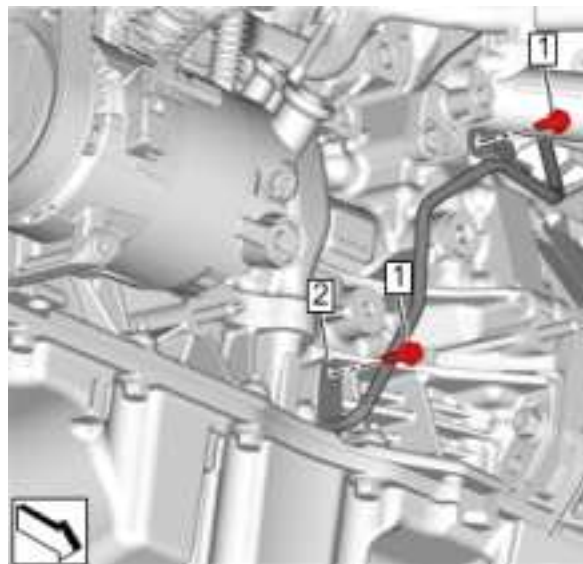


Fig. 269: Power Brake Booster Inlet Hose Connector Fitting Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove Power Brake Booster Inlet Hose Connector Fitting Bolt (1) - [2x] [Power Brake Booster Inlet Hose Connector Fitting Replacement](#)
6. Power Brake Booster Inlet Hose Connector Fitting (2) - Position aside

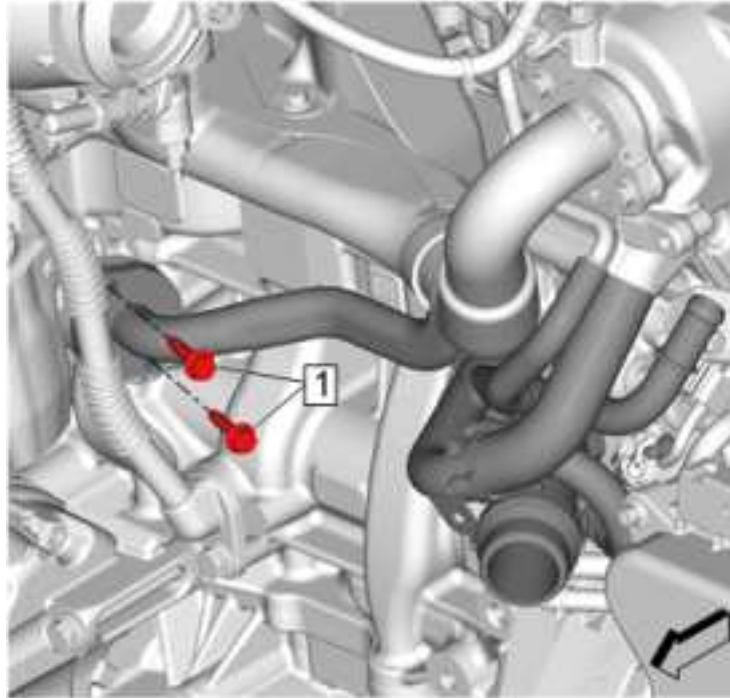


Fig. 270: Thermostat Bypass Pipe Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Remove Thermostat Bypass Pipe Bolt (1) - [2x]

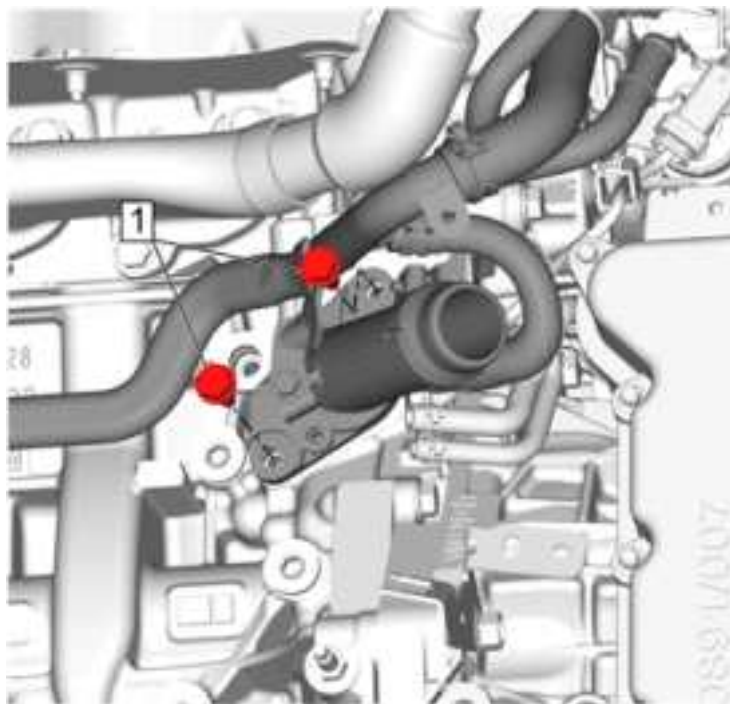


Fig. 271: Water Outlet Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Remove Water Outlet Bolt (1) - [2x]

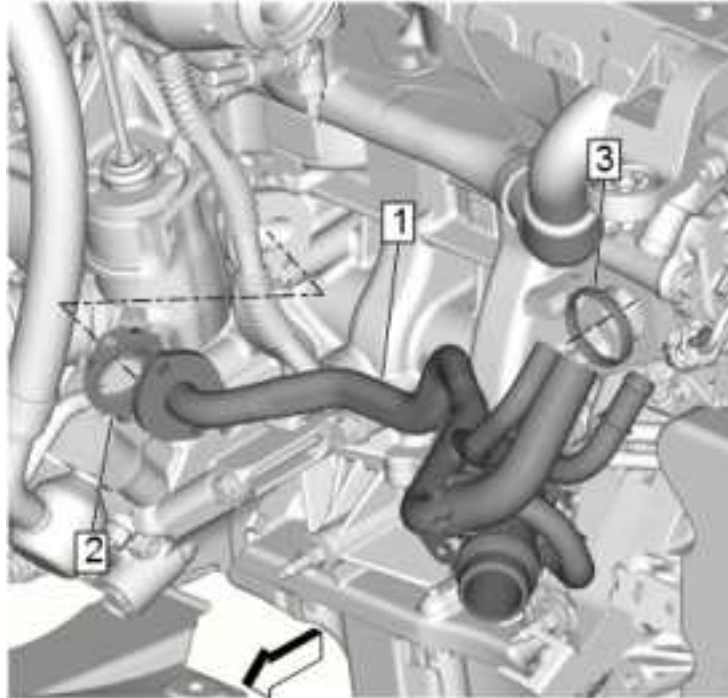


Fig. 272: Water Outlet Seal, Thermostat By-Pass Pipe And Water Outlet
Courtesy of GENERAL MOTORS COMPANY

9. Remove the thermostat by-pass pipe and the water outlet (1) as an assembly.
10. Remove Thermostat Bypass Pipe Gasket (2) and DISCARD
11. Remove Water Outlet Seal (3) and DISCARD

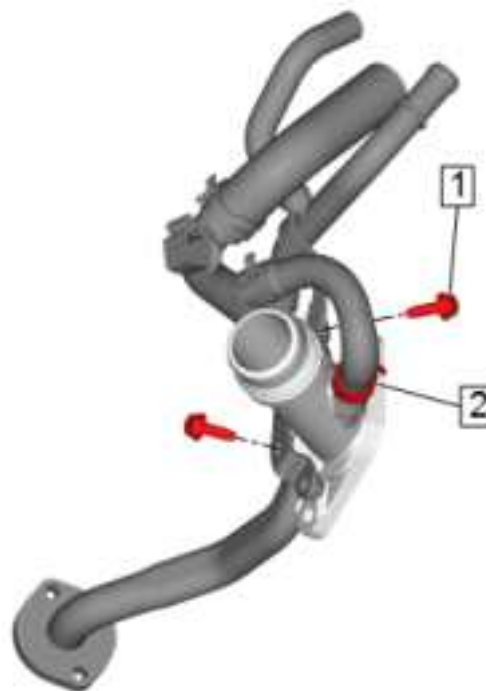


Fig. 273: Thermostat Bypass Pipe Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

12. Remove Thermostat Bypass Pipe Bracket Bolt (1) - [2x]
13. Remove Hose Clamp (2) - [Hose Clamp Replacement Guidelines - Spring Type](#)

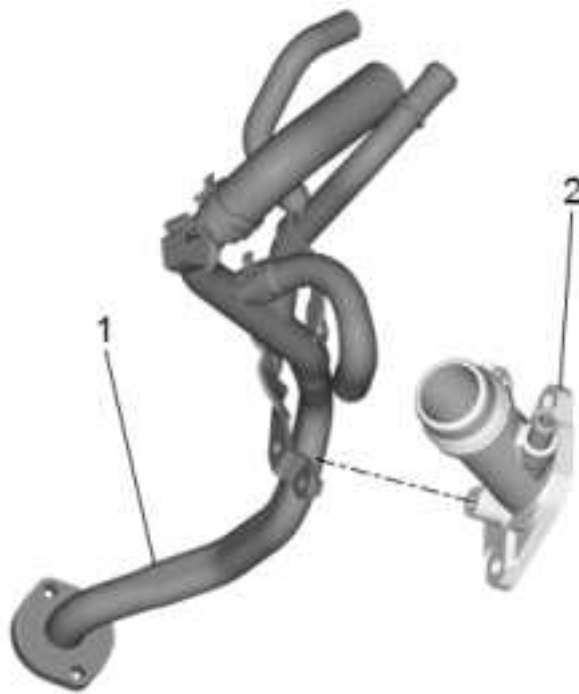


Fig. 274: Thermostat Bypass Pipe And Water Outlet
Courtesy of GENERAL MOTORS COMPANY

14. Separate the thermostat bypass pipe (1) from the water outlet (2).
15. Transfer components as necessary.

Installation Procedure

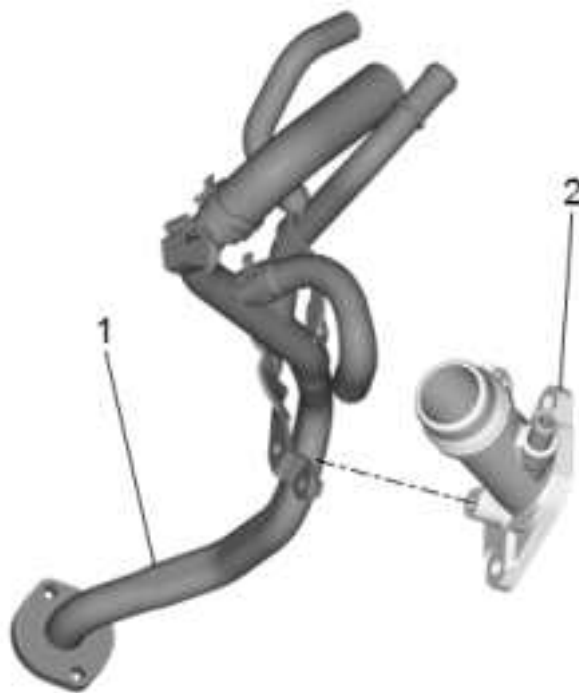


Fig. 275: Thermostat Bypass Pipe And Water Outlet
Courtesy of GENERAL MOTORS COMPANY

1. Join the thermostat bypass pipe (1) to the water outlet (2).

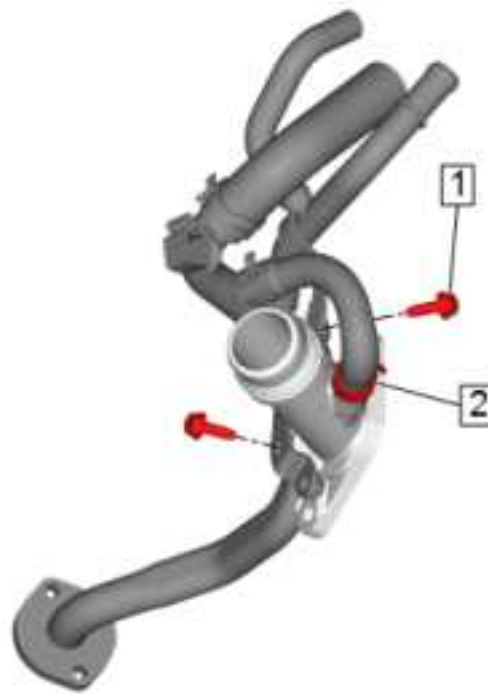


Fig. 276: Thermostat Bypass Pipe Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution**

2. Install Thermostat Bypass Pipe Bracket Bolt (1) and tighten [2x] 10 N.m (89 lb in)
3. Install Hose Clamp (2) - **Hose Clamp Replacement Guidelines - Spring Type**

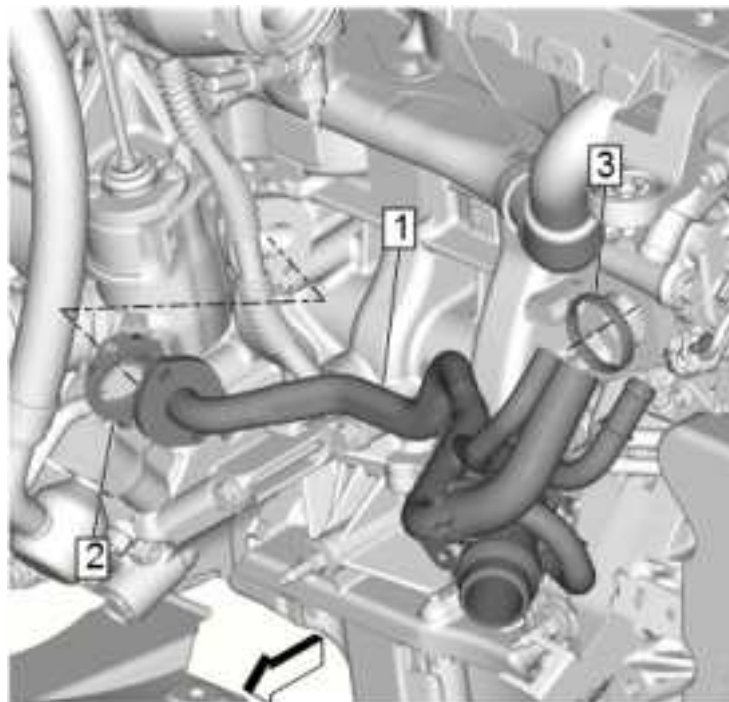


Fig. 277: Water Outlet Seal, Thermostat By-Pass Pipe And Water Outlet
 Courtesy of GENERAL MOTORS COMPANY

4. Install New Water Outlet Seal (3).
5. Install a NEW Thermostat Bypass Pipe Gasket (2).
6. Install the thermostat by-pass pipe and the water outlet (1) as an assembly.

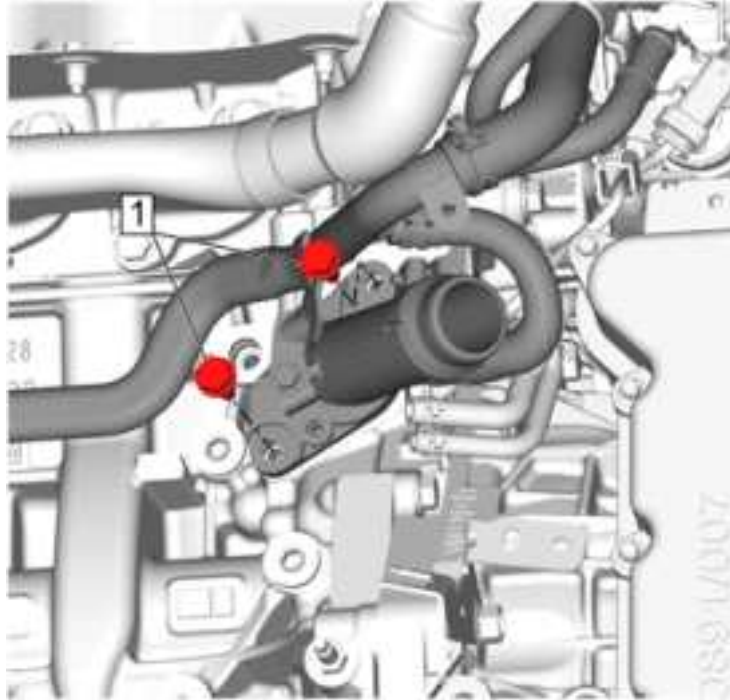


Fig. 278: Water Outlet Bolt

Courtesy of GENERAL MOTORS COMPANY

7. Install Water Outlet Bolt (1) [2x] - [Water Outlet Replacement \(LH7\)](#)

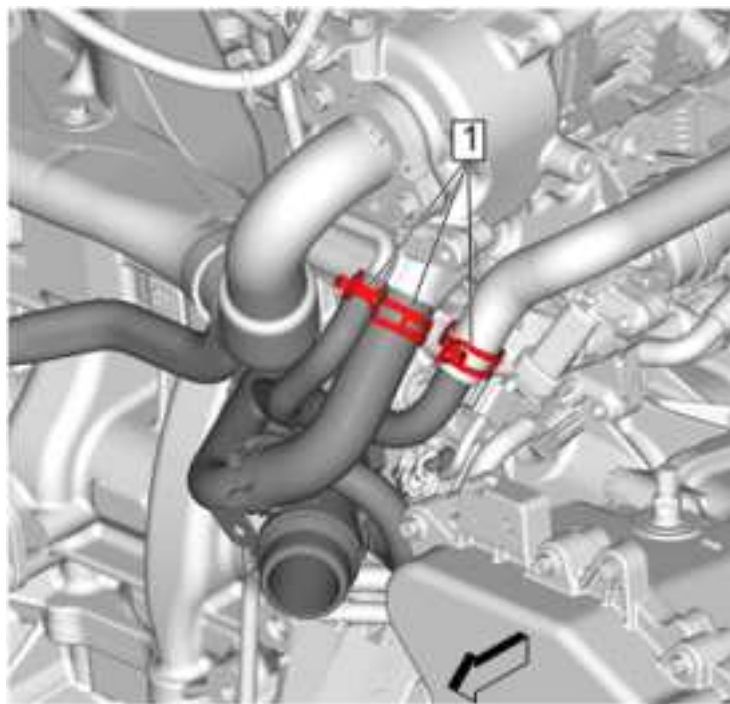


Fig. 279: Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

8. Install Thermostat Bypass Pipe Bolt (1) and tighten [2x] 10 N.m (89 lb in)

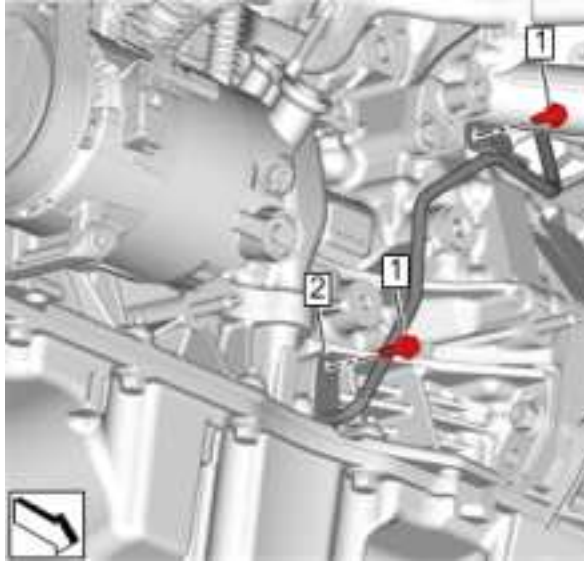


Fig. 280: Power Brake Booster Inlet Hose Connector Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Install Power Brake Booster Inlet Hose Connector Fitting (2)
10. Install Power Brake Booster Inlet Hose Connector Fitting Bolt (1) - [2x] - [Power Brake Booster Inlet Hose Connector Fitting Replacement](#)
11. Install Hose Clamp (1) - [3x] - [Hose Clamp Replacement Guidelines - Spring Type](#)
12. Install Charge Air Cooler Outlet Air Tube - [Charge Air Cooler Outlet Air Tube Replacement](#)
13. Install Oxidation Catalytic Converter - [Oxidation Catalytic Converter Replacement \(LH7\)](#)

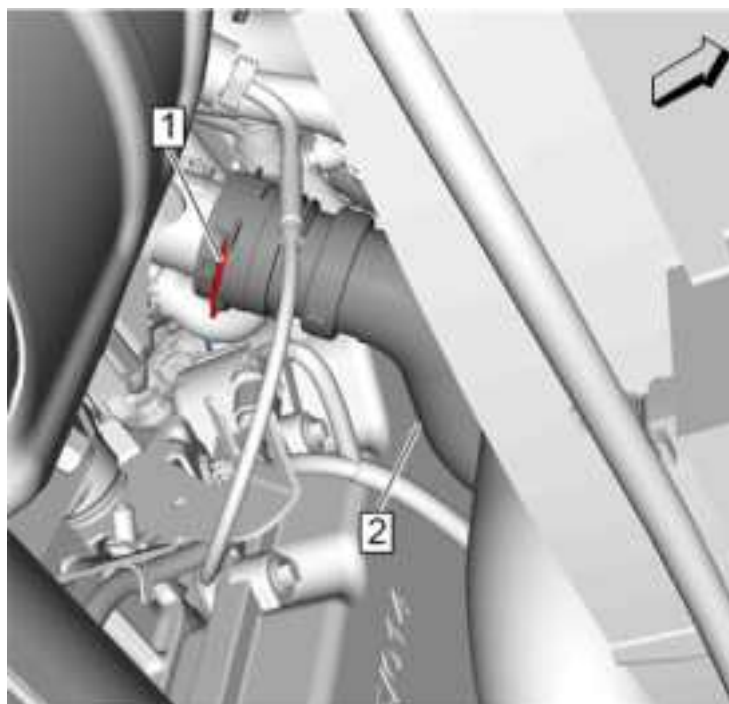


Fig. 281: Radiator Inlet Hose Retainer
Courtesy of GENERAL MOTORS COMPANY

14. Remove Radiator Inlet Hose (2) @ Water Outlet - [Radiator Inlet Hose Replacement \(LYX\)](#)[Radiator Inlet Hose Replacement \(LH7\)](#)[Radiator Inlet Hose Replacement \(LTG with KL9\)](#)

WATER PUMP REPLACEMENT (LTG)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
2. Remove the drive belt. Refer to [Drive Belt Replacement](#) .
3. Remove the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(LTG\)](#) .

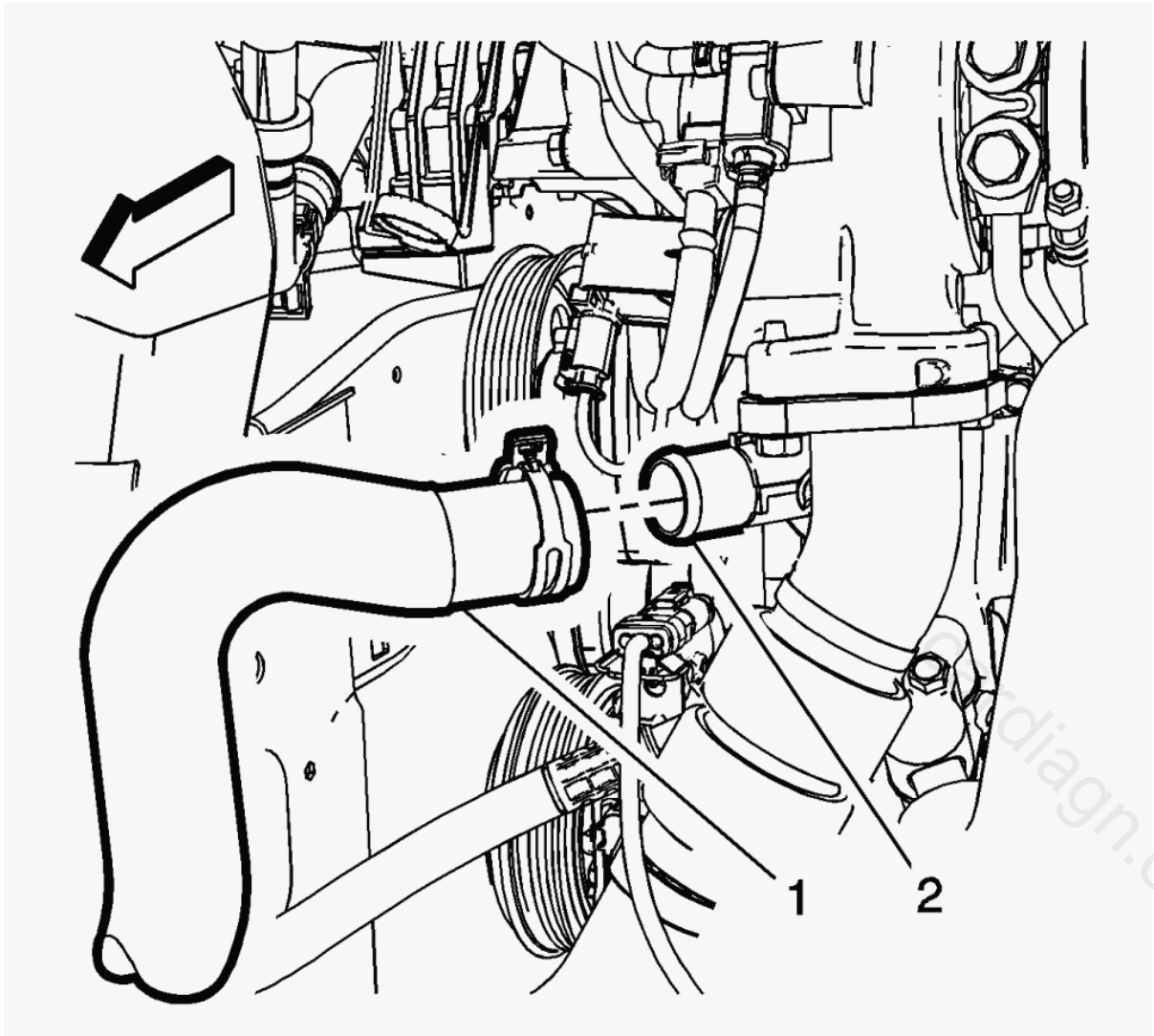


Fig. 282: Radiator Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

4. Using the BO-38185 hose clamp pliers, remove the radiator outlet hose (1) from the water outlet (2).

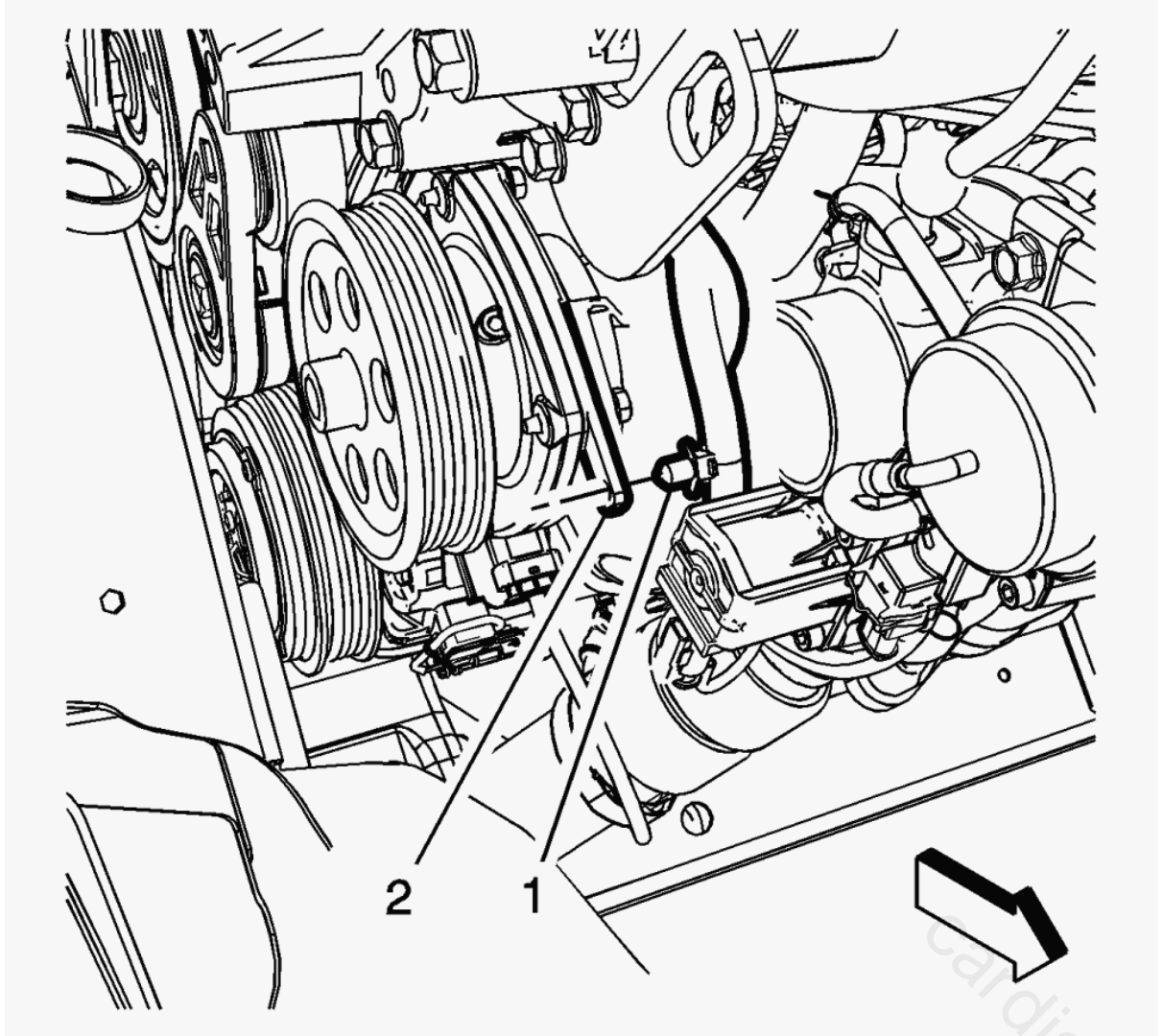


Fig. 283: Engine Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

5. Remove the engine harness retainer (1) from the water pump (2).

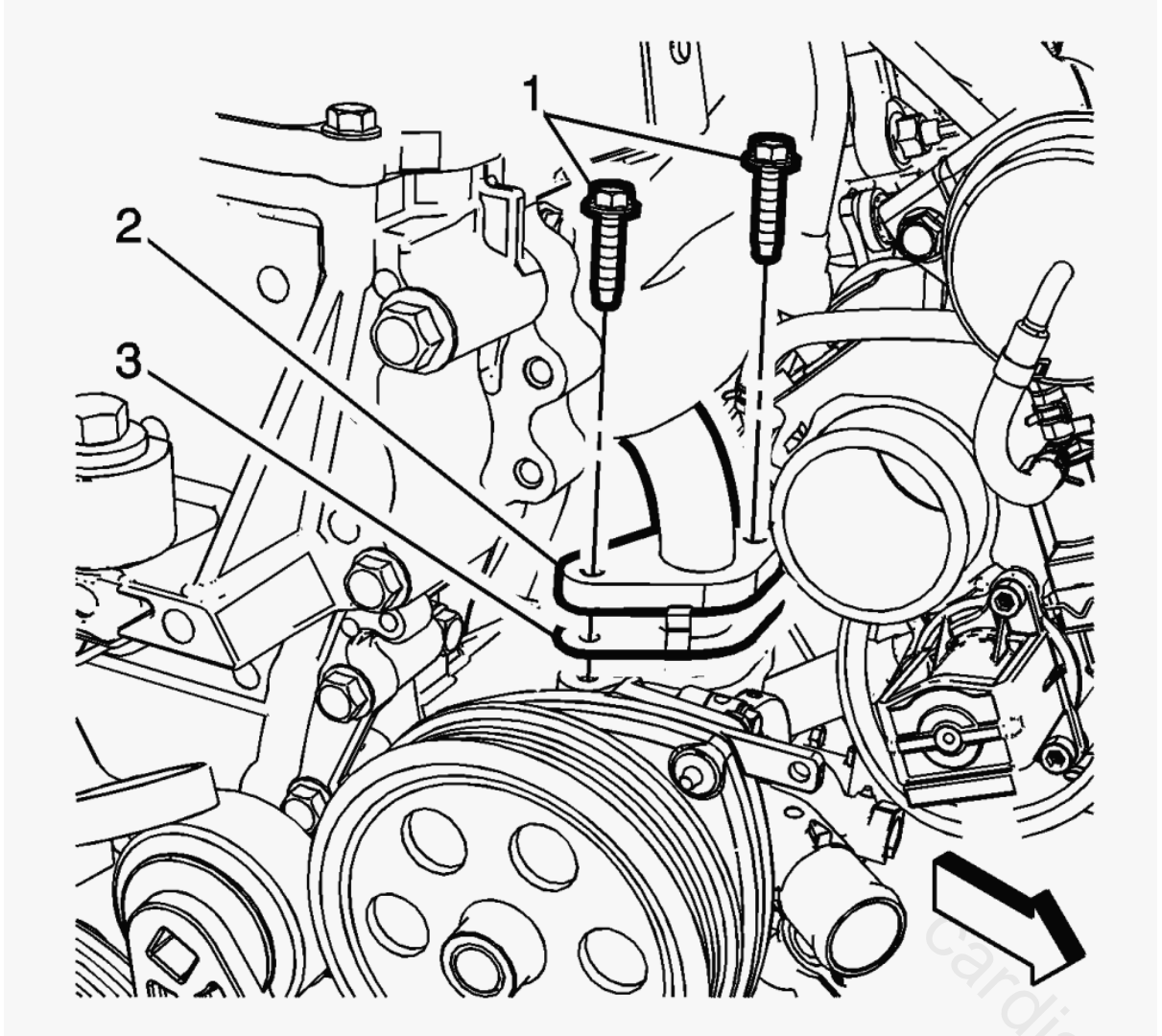


Fig. 284: Thermostat Bypass Pipe Fasteners

Courtesy of GENERAL MOTORS COMPANY

6. Remove the thermostat bypass pipe fasteners (1) and remove the thermostat bypass pipe (2) from the water pump.
7. Discard the thermostat bypass pipe gasket (3).

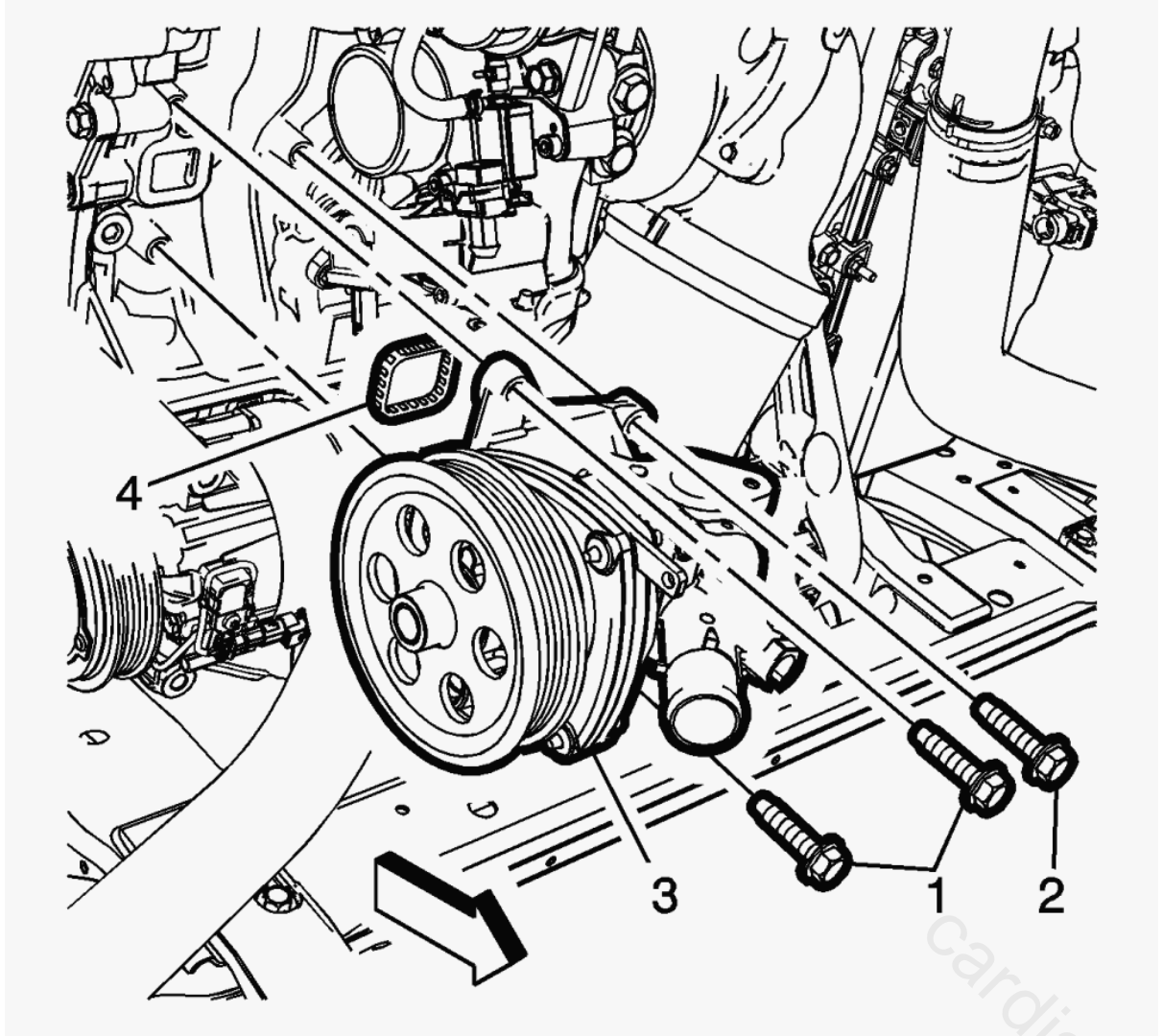


Fig. 285: Water Pump Fasteners

Courtesy of GENERAL MOTORS COMPANY

8. Remove the water pump fasteners (1) and (2) remove the water pump (3).
9. Discard the water pump seal (4).

Installation Procedure

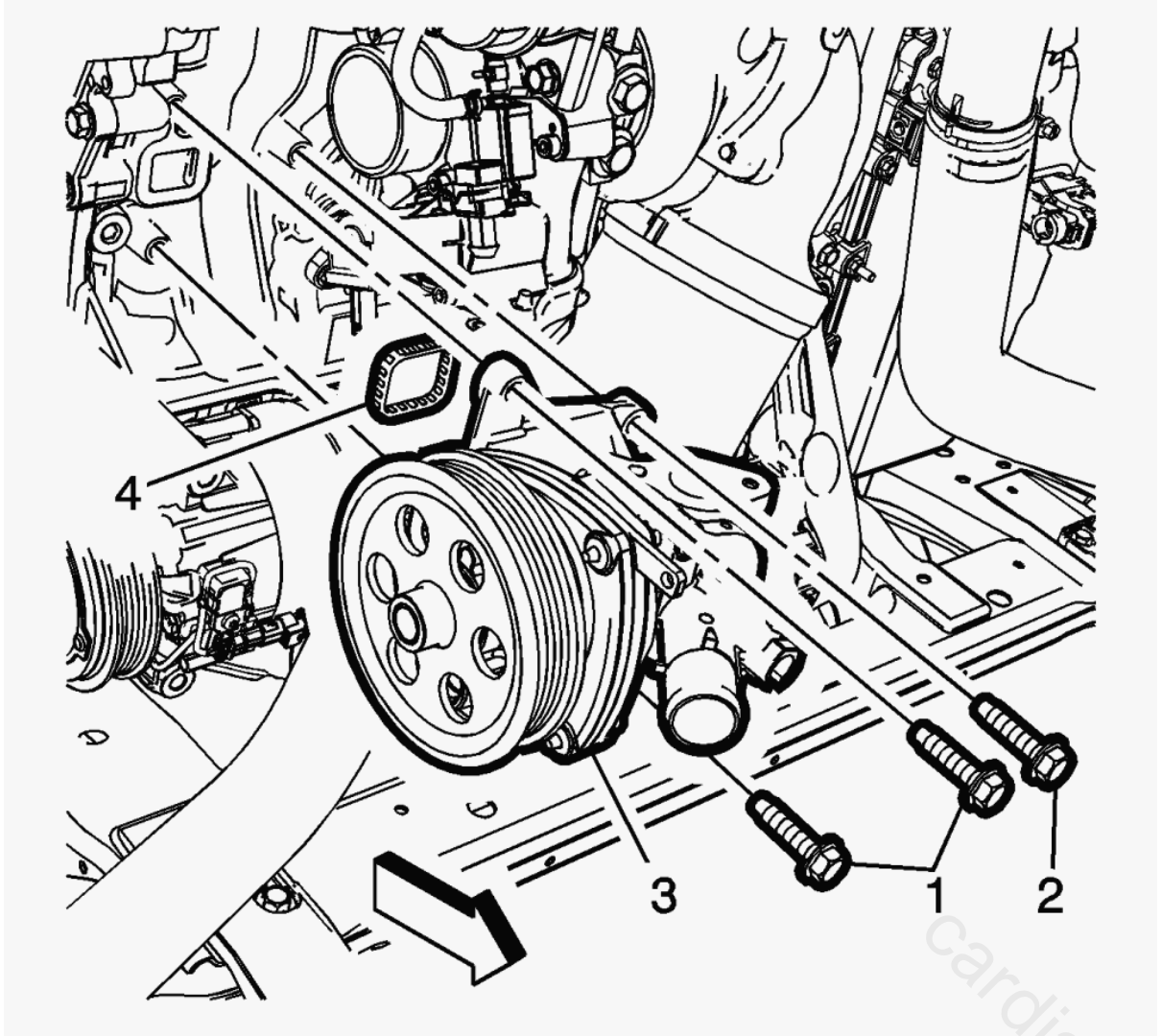


Fig. 286: Water Pump Fasteners

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

1. Install the water pump (3) into position with a NEW water pump seal (4) and hand tighten the bolts.
2. Tighten (1) bolts to 25 N.m (18 lb ft).
3. Tighten (2) bolt to 25 N.m (18 lb ft).

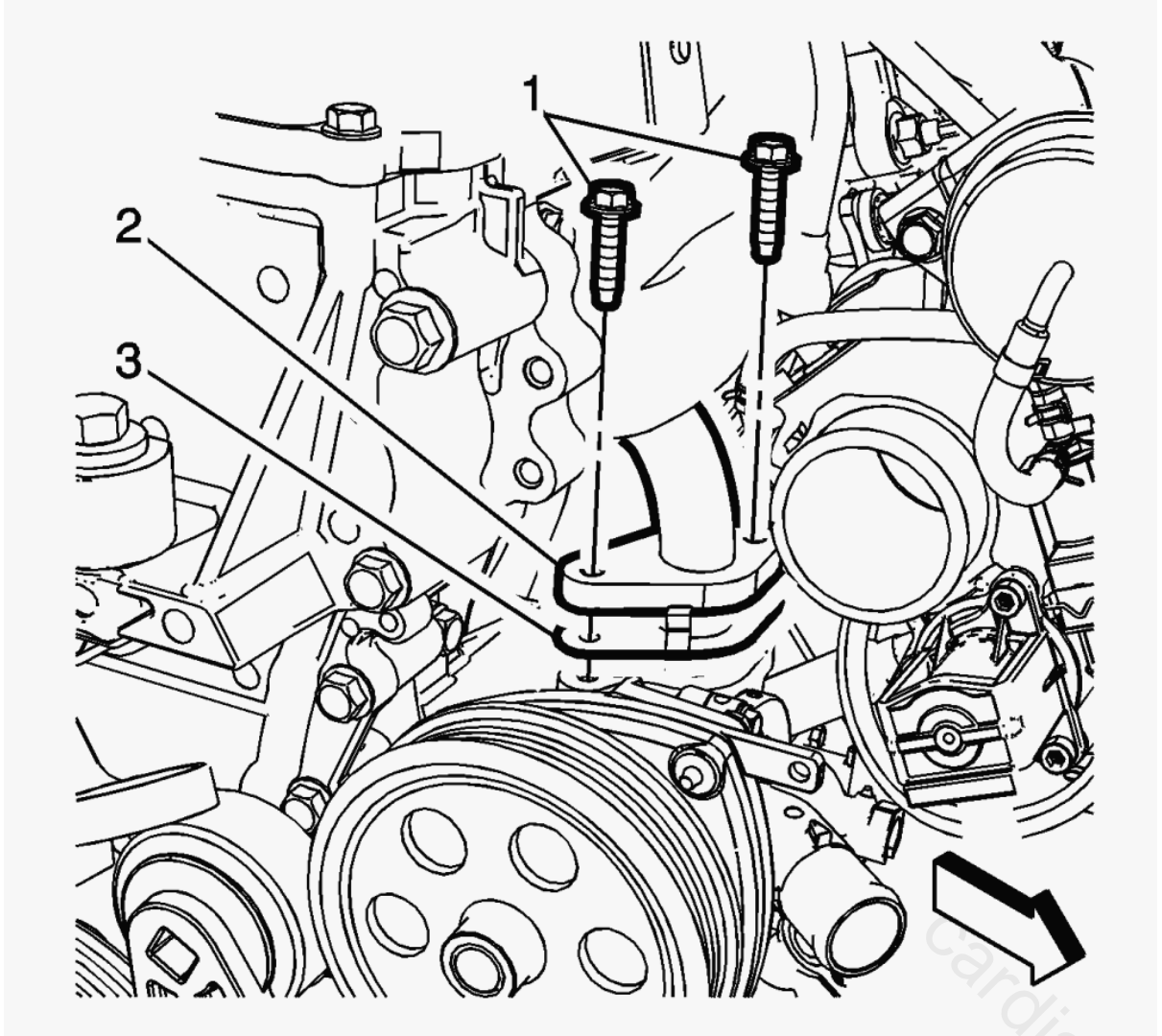


Fig. 287: Thermostat Bypass Pipe Fasteners

Courtesy of GENERAL MOTORS COMPANY

4. Install the thermostat bypass pipe (2) to the water pump with a NEW gasket (3) and tighten the fasteners (1) to 10 N.m (89 lb in).

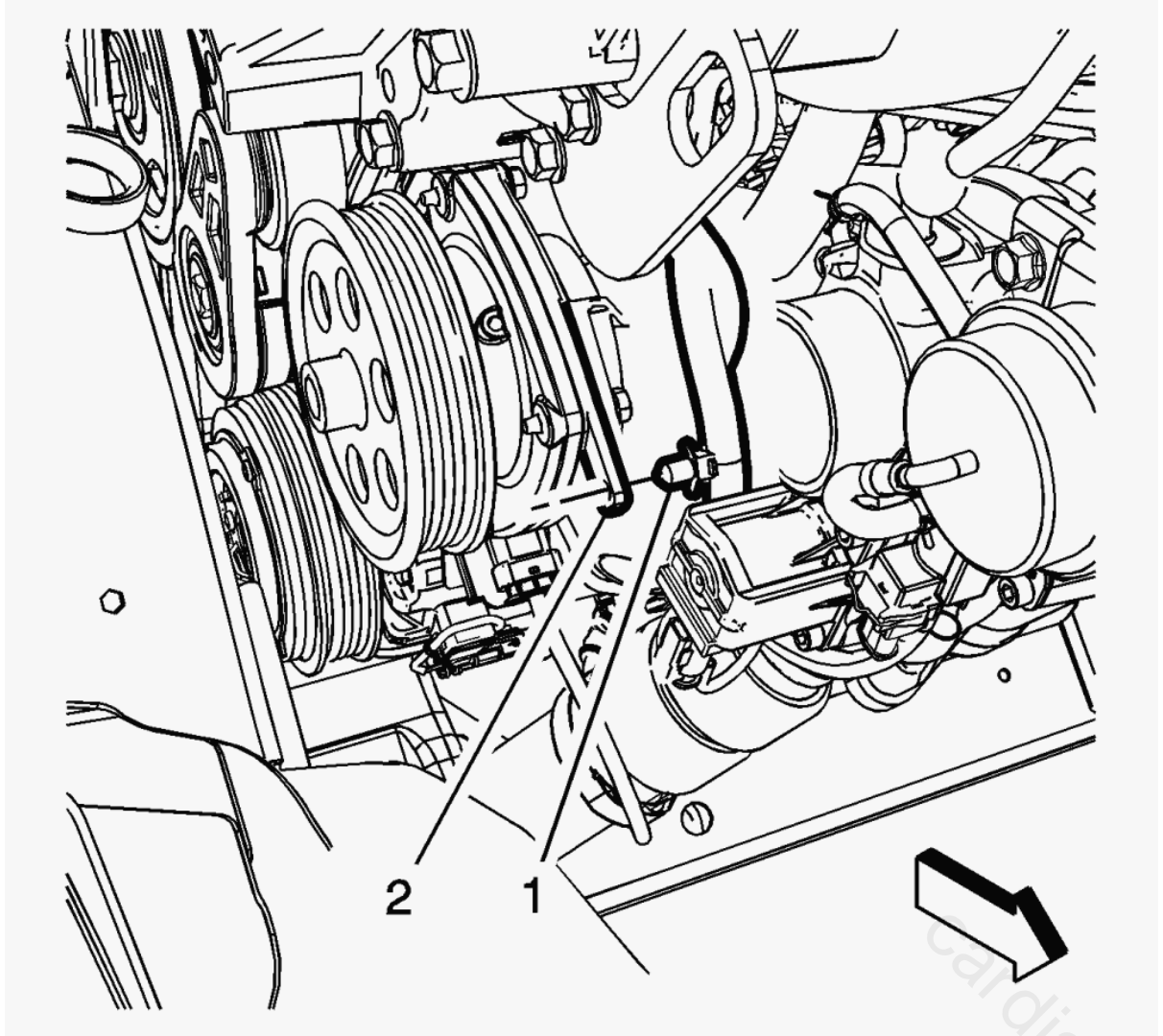


Fig. 288: Engine Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

5. Install the engine wiring harness retainer (1) to the water pump (2).

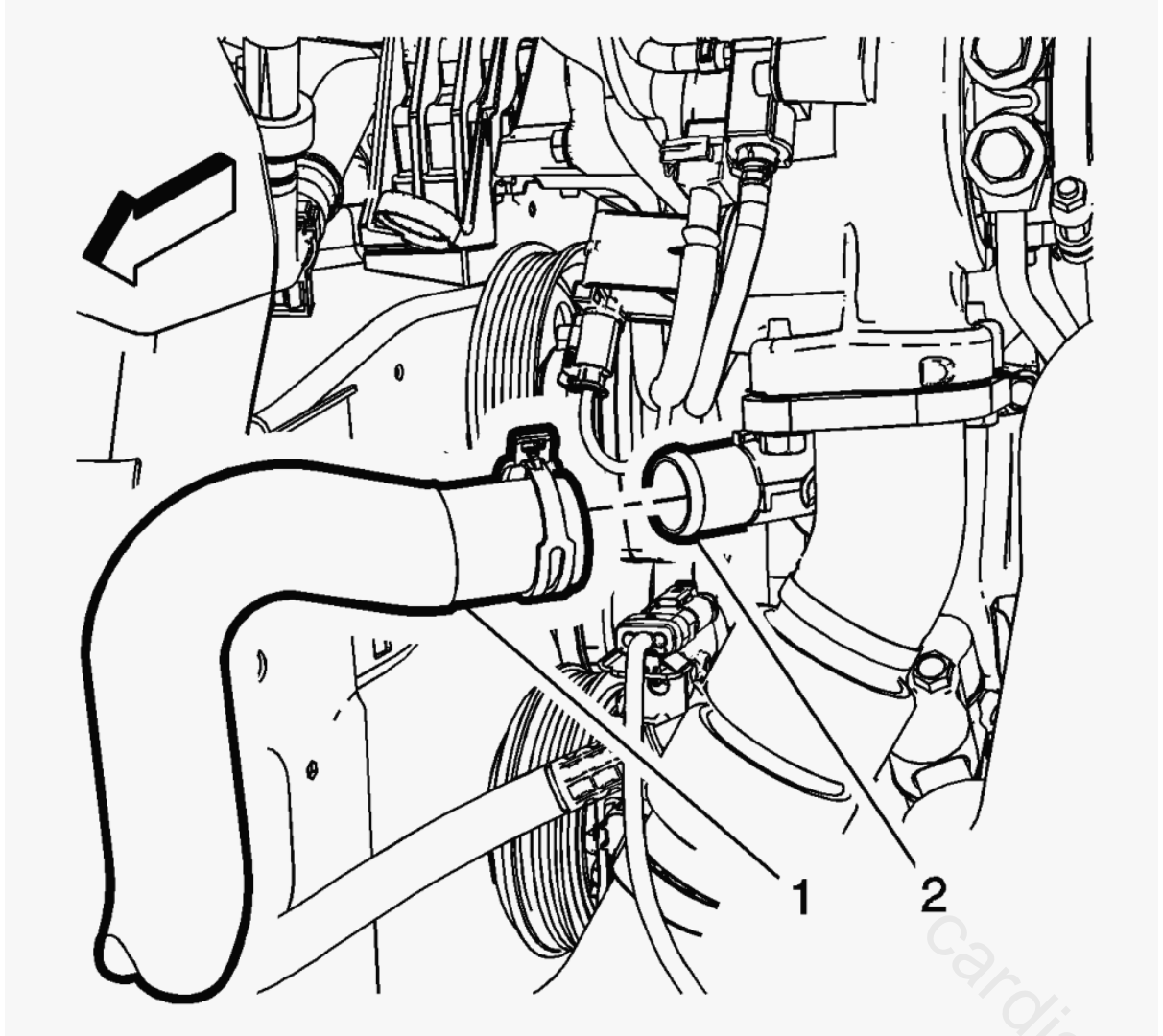


Fig. 289: Radiator Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

6. Using the BO-38185 hose clamp pliers, install the radiator outlet hose (1) to the water outlet (2).
7. Install the drive belt. Refer to [Drive Belt Replacement](#).
8. Install the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(LTG\)](#).
9. Fill the cooling system. Refer to [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#).
10. Start the engine and check for coolant leaks.

WATER PUMP REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

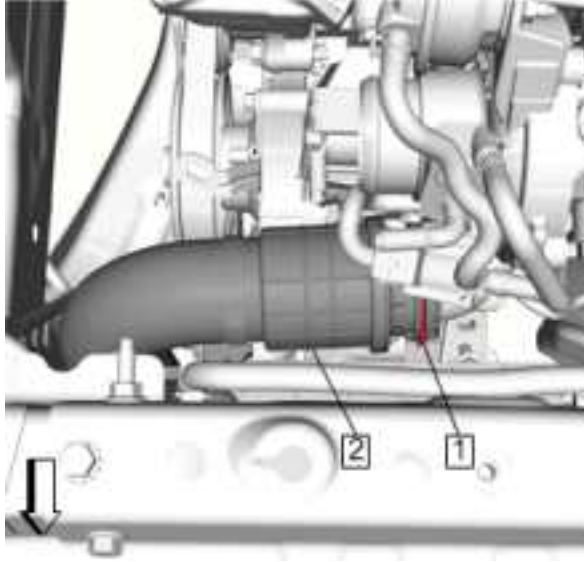


Fig. 290: Retainer Spring

Courtesy of GENERAL MOTORS COMPANY

2. Remove Charge Air Cooler Inlet Air Tube (2) - **Charge Air Cooler Inlet Air Tube Replacement**

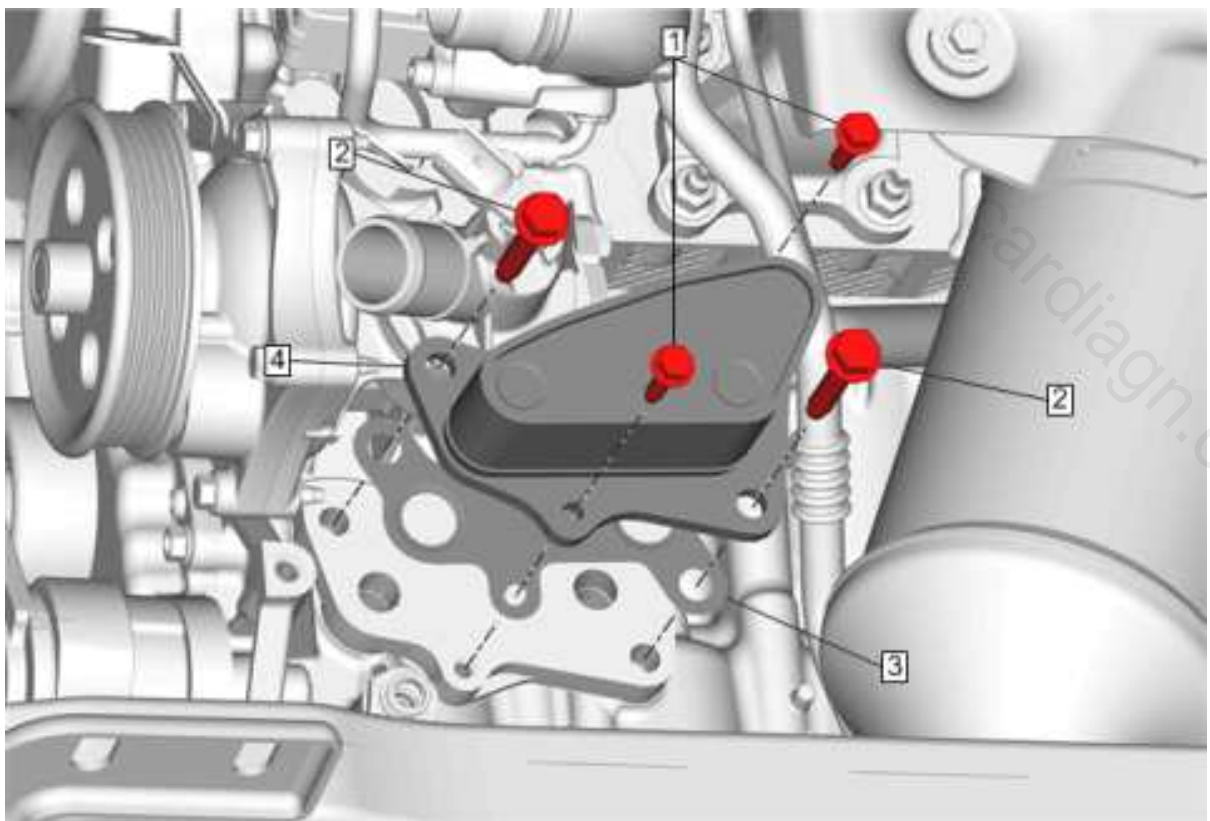


Fig. 291: Engine Oil Cooler

Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Oil Cooler (4) -

Engine Oil Cooler Replacement (LYX)

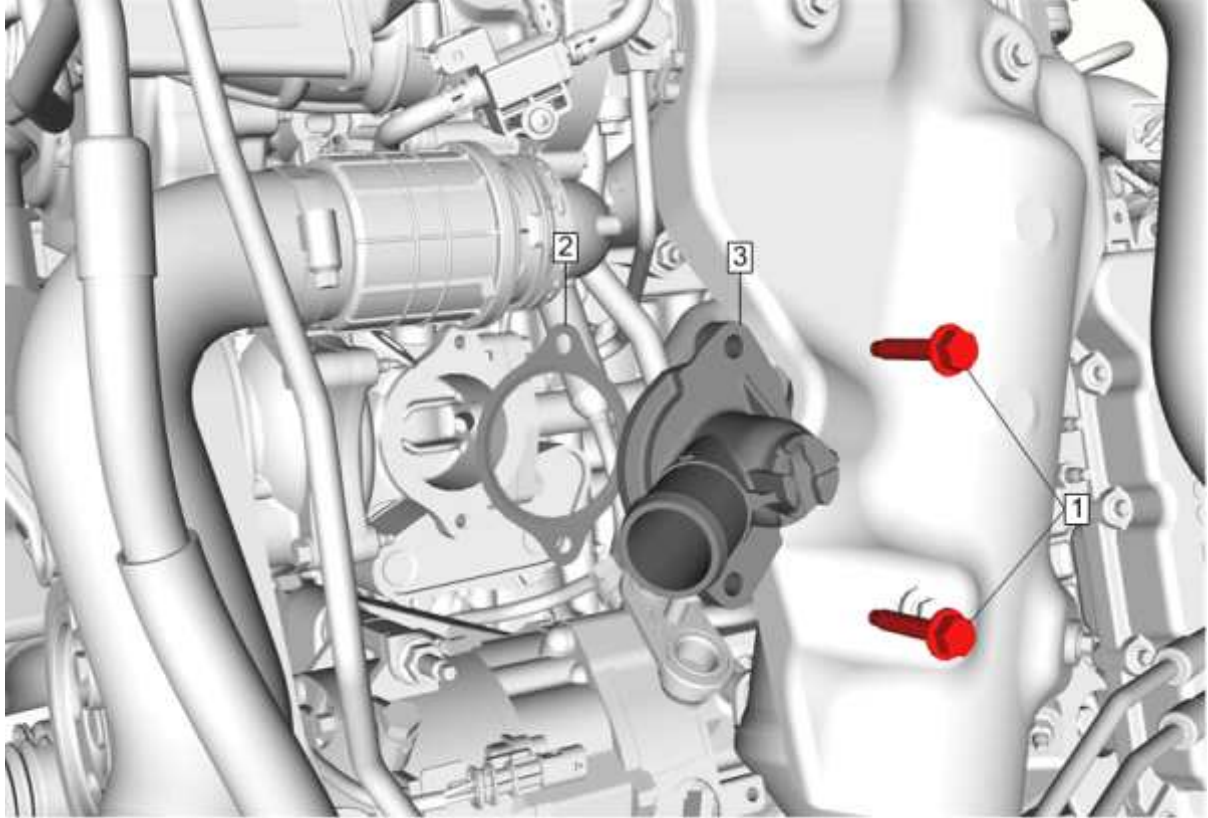


Fig. 292: Engine Coolant Thermostat Housing
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Coolant Thermostat Housing (3) - **Engine Coolant Thermostat Housing Replacement (LYX)**

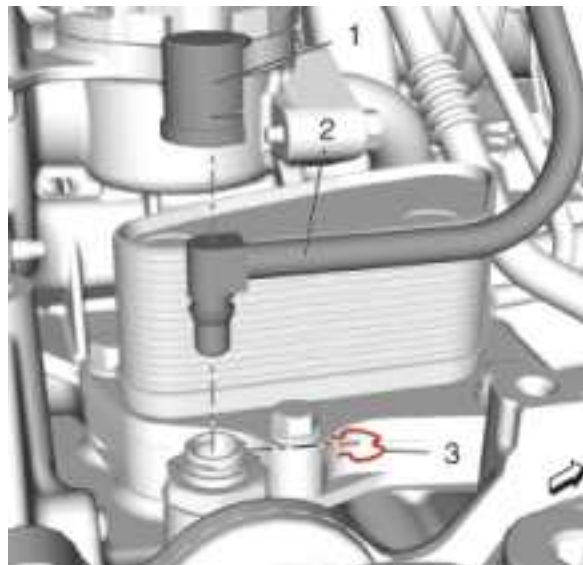


Fig. 293: Turbocharger Oil Feed Pipe, Clip And Retainer
 Courtesy of GENERAL MOTORS COMPANY

5. Reposition Turbocharger Oil Feed Pipe (2) - **Turbocharger Oil Feed Pipe Replacement**

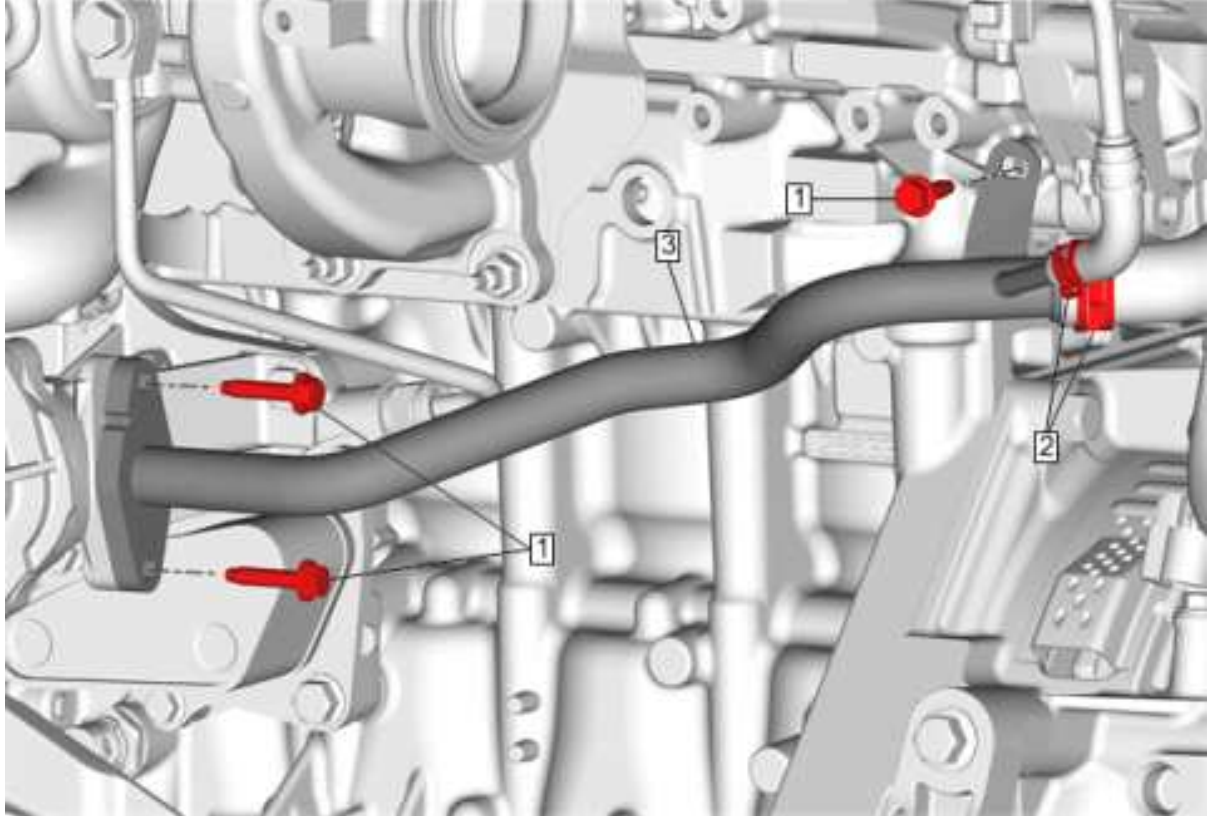


Fig. 294: Thermostat Bypass Pipe

Courtesy of GENERAL MOTORS COMPANY

6. Disconnect Thermostat Bypass Pipe (3) @ Water Pump [Thermostat Bypass Pipe Replacement \(LYX\)](#)

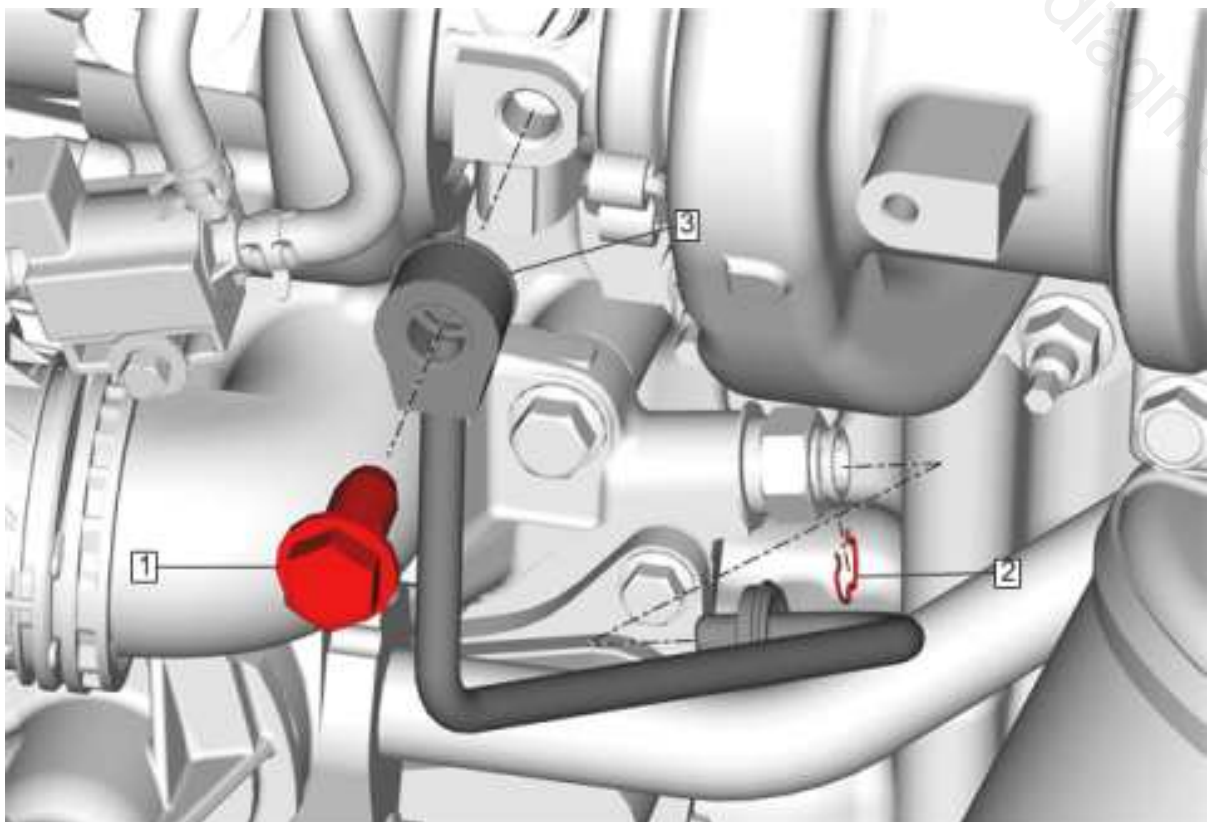


Fig. 295: Turbocharger Coolant Feed Pipe

Courtesy of GENERAL MOTORS COMPANY

7. Remove Turbocharger Coolant Feed Pipe (3) - [Turbocharger Coolant Feed Pipe Replacement \(LYX\)](#)

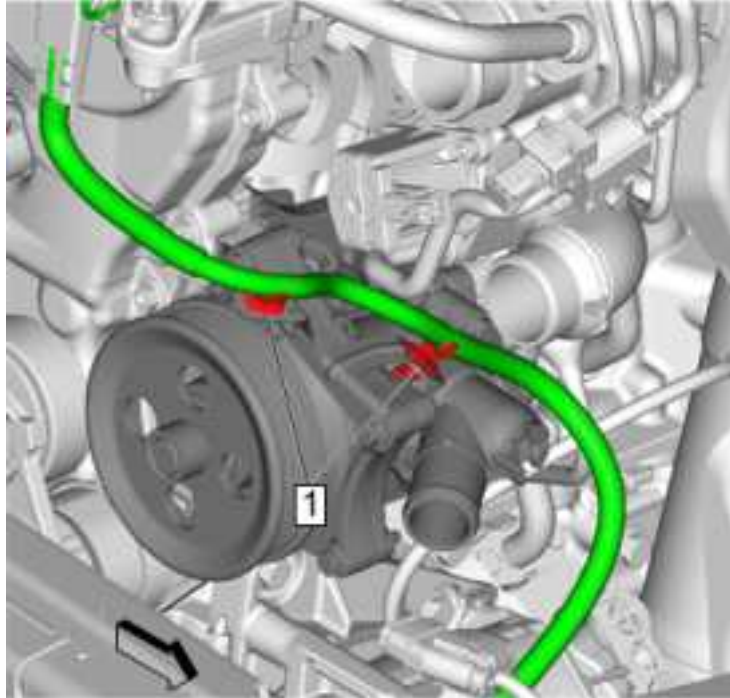


Fig. 296: Engine Wiring Harness Retainers

Courtesy of GENERAL MOTORS COMPANY

8. Separate Engine Wiring Harness Retainer (1) @ Engine Wiring Harness Bracket - [2x]

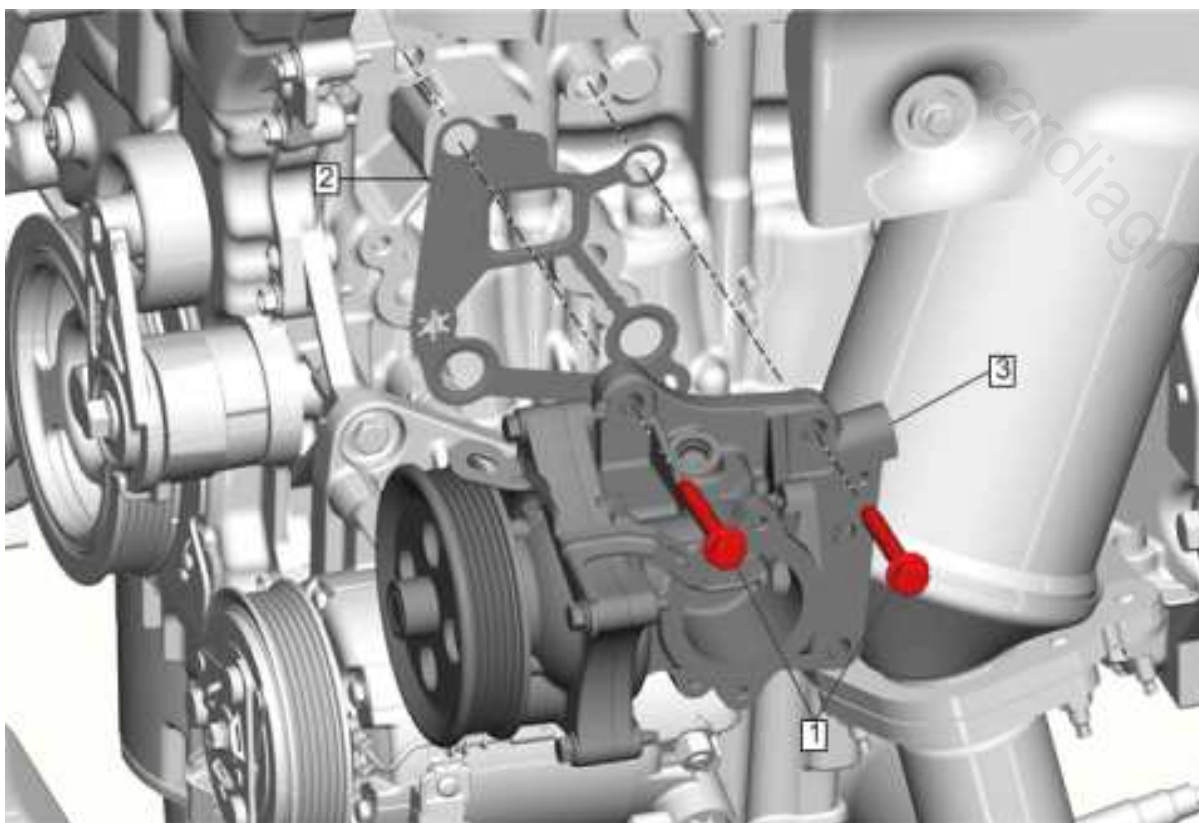


Fig. 297: Water Pump Bolt

Courtesy of GENERAL MOTORS COMPANY

9. Remove Water Pump Bolt (1) - [2x]
10. Remove Water Pump (3).
11. Remove Water Pump Gasket (2) and DISCARD

Installation Procedure

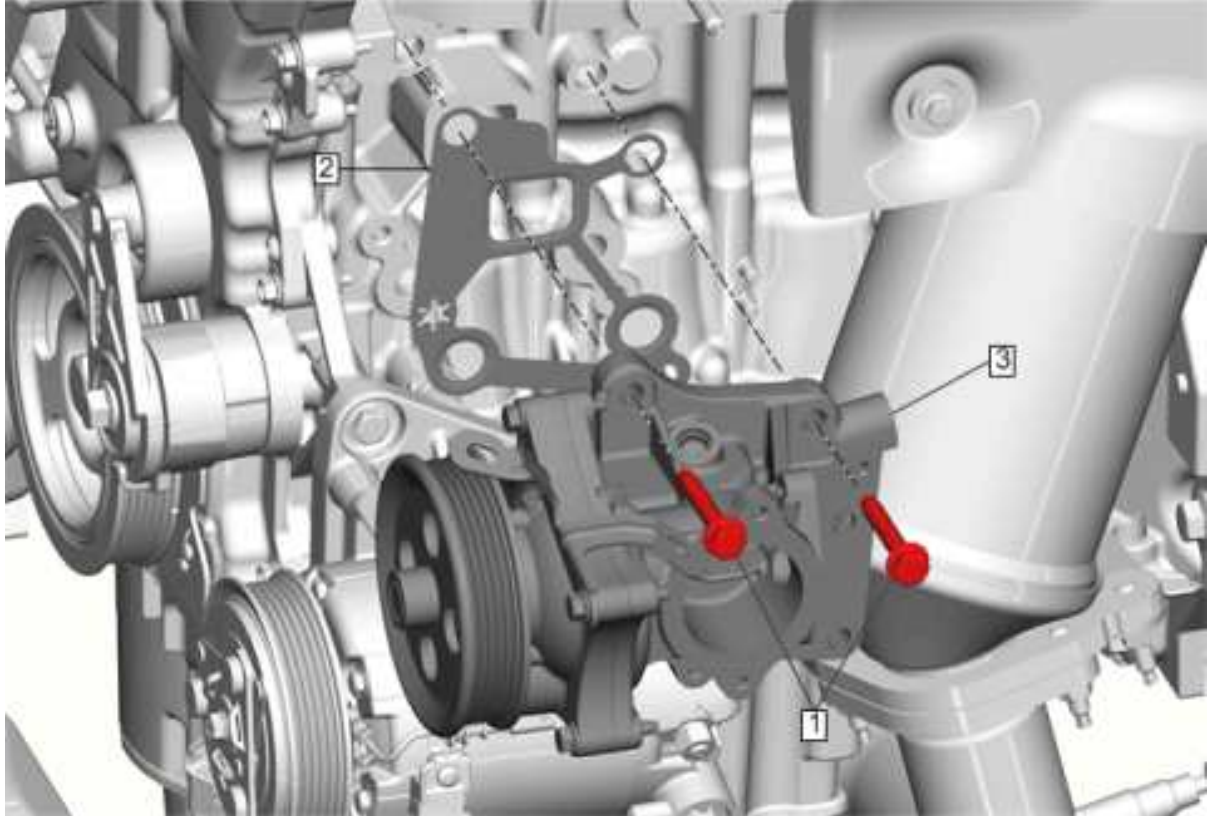


Fig. 298: Water Pump Bolt

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Water Pump Gasket (2).
2. Install Water Pump (3).

CAUTION: Refer to [Fastener Caution](#) .

3. Install Water Pump Bolt (1) and tighten [2x] 25 N.m (18 lb ft)

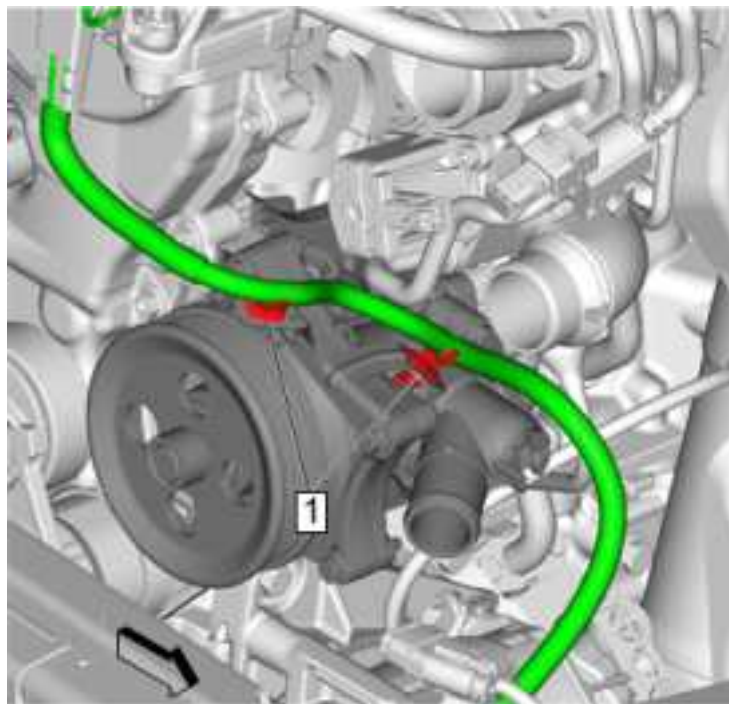


Fig. 299: Engine Wiring Harness Retainers

Courtesy of GENERAL MOTORS COMPANY

4. Install Engine Wiring Harness Retainer (1) @ Engine Wiring Harness Bracket - [2x]

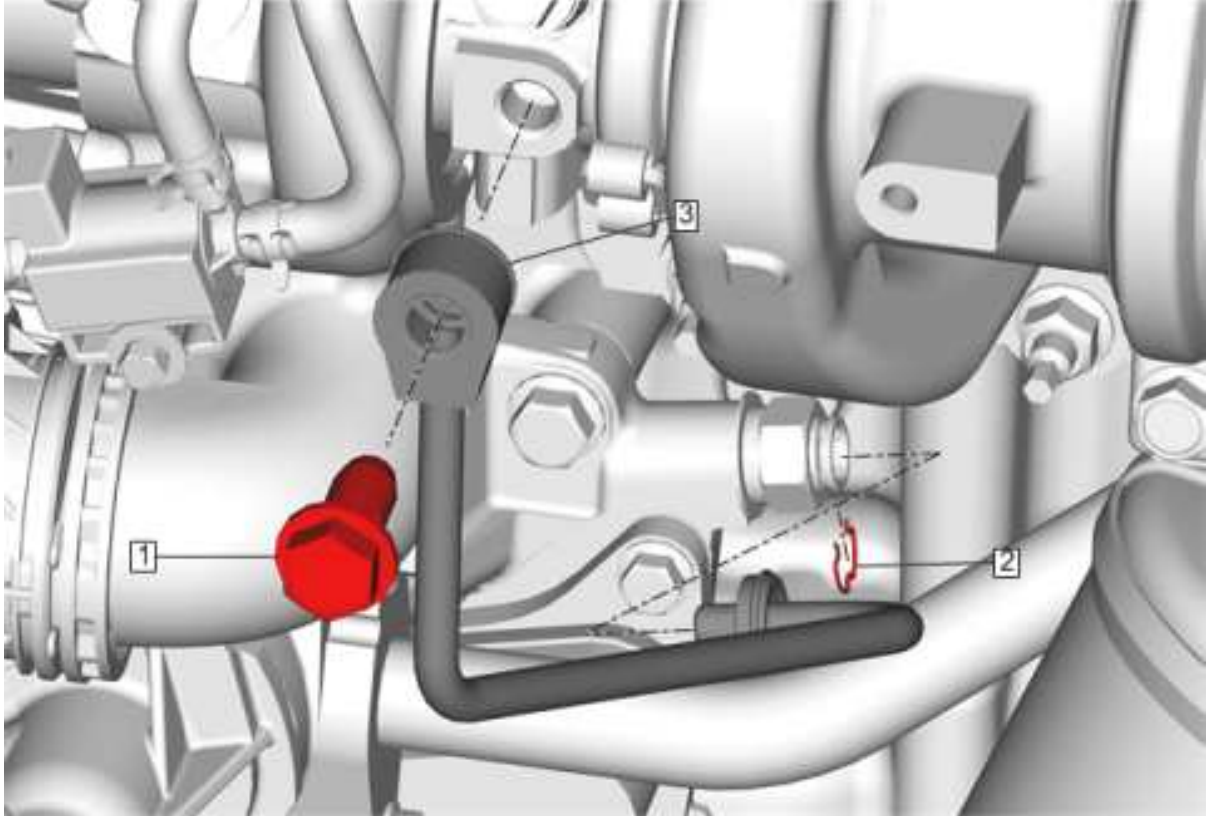


Fig. 300: Turbocharger Coolant Feed Pipe
 Courtesy of GENERAL MOTORS COMPANY

5. Install Turbocharger Coolant Feed Pipe (3) - [Turbocharger Coolant Feed Pipe Replacement \(LYX\)](#)

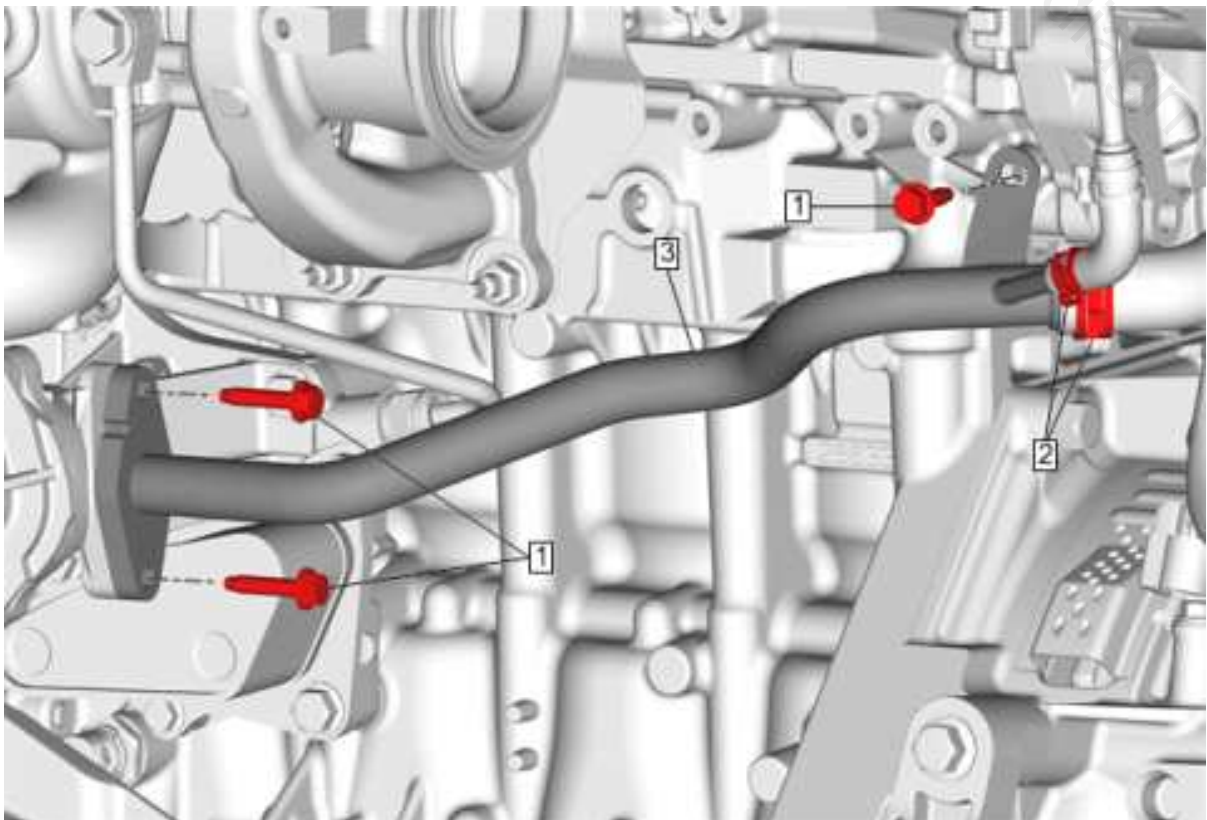


Fig. 301: Thermostat Bypass Pipe
 Courtesy of GENERAL MOTORS COMPANY

6. Connect Thermostat Bypass Pipe (3) @ Water Pump - [Thermostat Bypass Pipe Replacement \(LYX\)](#)

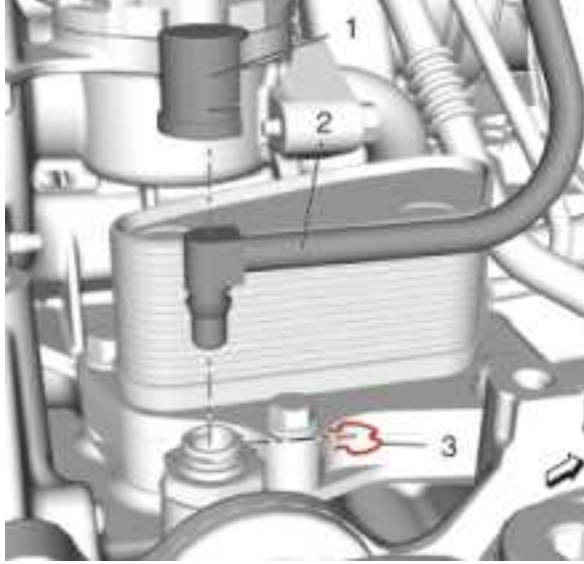


Fig. 302: Turbocharger Oil Feed Pipe, Clip And Retainer
 Courtesy of GENERAL MOTORS COMPANY

7. Install Turbocharger Oil Feed Pipe (2) - [Turbocharger Oil Feed Pipe Replacement](#)

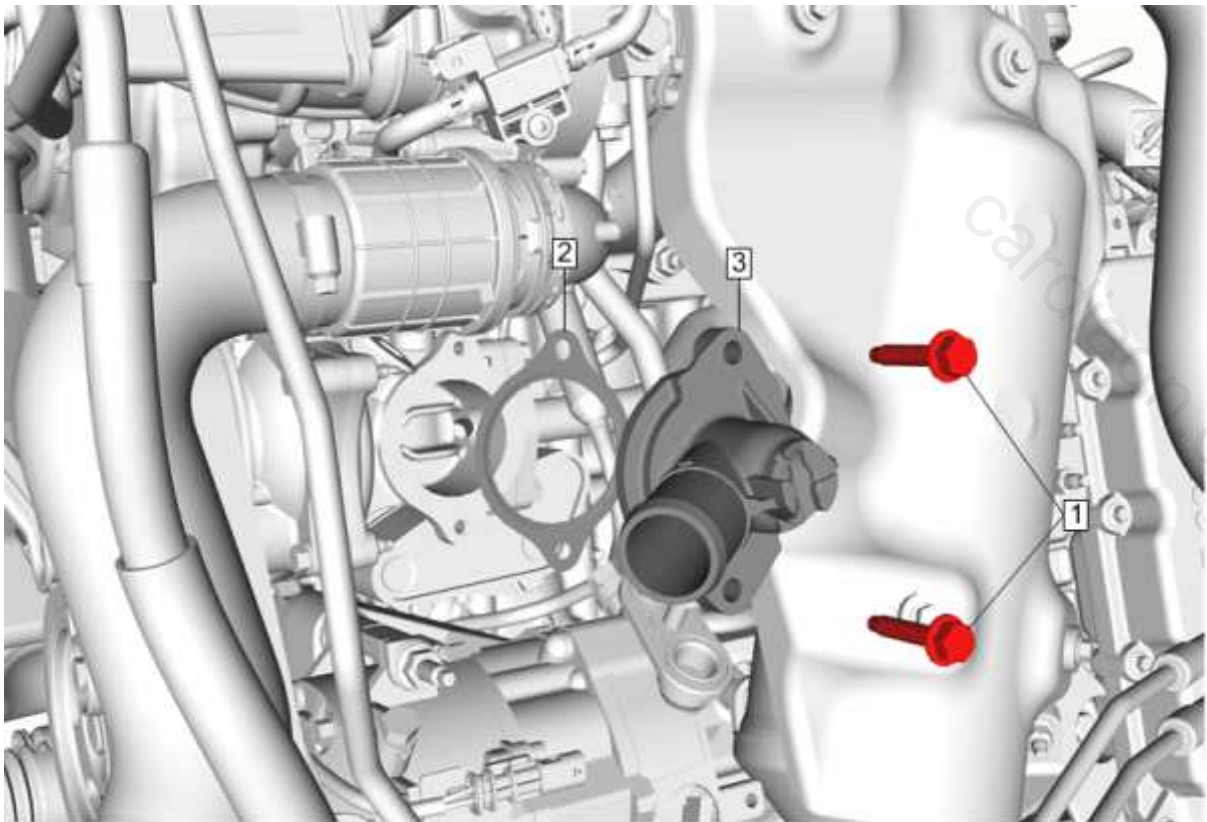


Fig. 303: Engine Coolant Thermostat Housing
 Courtesy of GENERAL MOTORS COMPANY

8. Install Engine Coolant Thermostat Housing (3) - [Engine Coolant Thermostat Housing Replacement \(LYX\)](#)

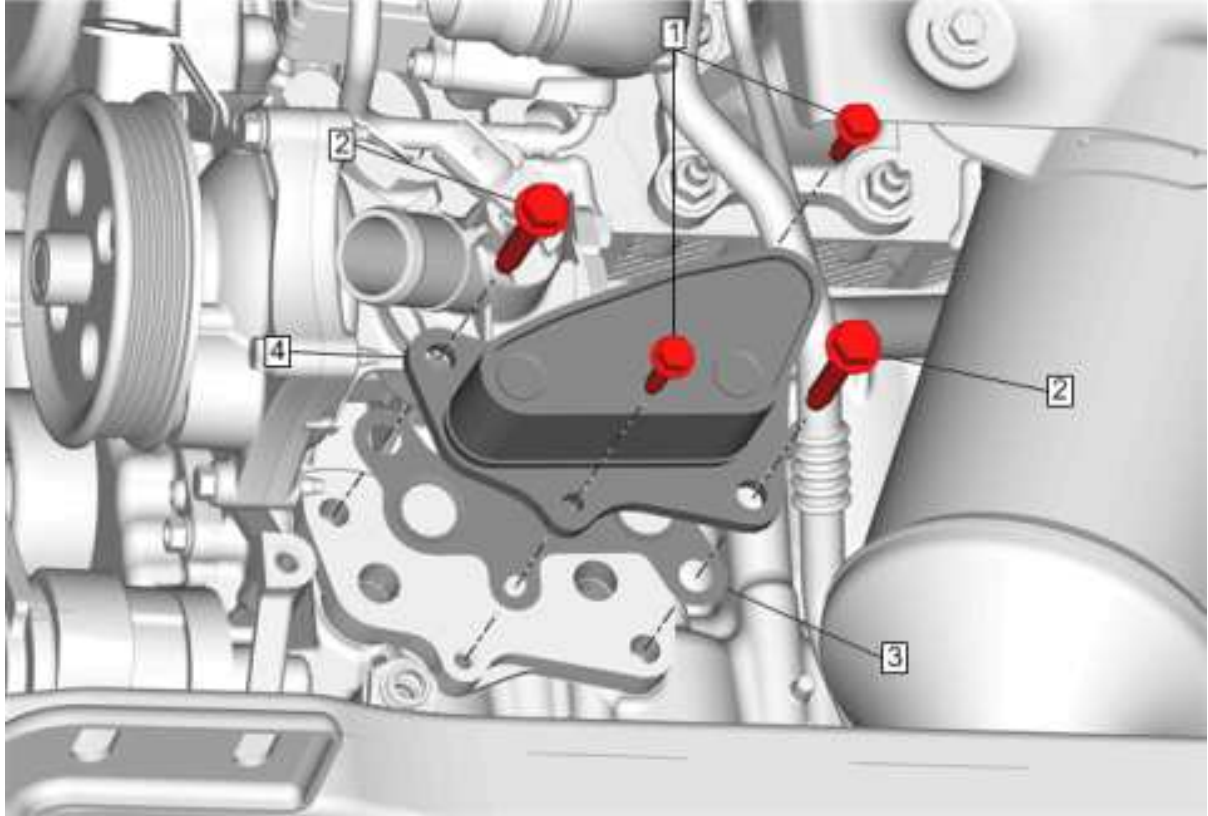


Fig. 304: Engine Oil Cooler

Courtesy of GENERAL MOTORS COMPANY

9. Install Engine Oil Cooler (4) -

Engine Oil Cooler Replacement (LYX).

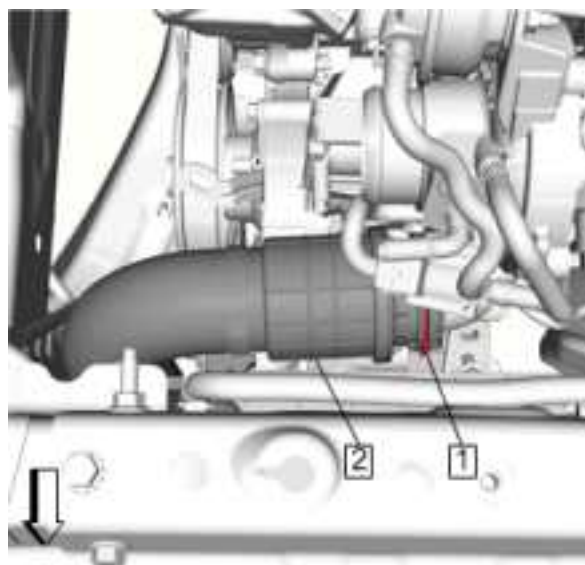


Fig. 305: Retainer Spring

Courtesy of GENERAL MOTORS COMPANY

10. Install Charge Air Cooler Inlet Air Tube (2) - **Charge Air Cooler Inlet Air Tube Replacement**
11. Fill the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**
12. Start the engine and check for leaks.

WATER PUMP REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**
2. Remove Air Cleaner Outlet Duct - **Air Cleaner Outlet Duct Replacement**

3. Remove Air Cleaner Assembly - [Air Cleaner Assembly Replacement](#)
4. Remove Oxidation Catalytic Converter - [Oxidation Catalytic Converter Replacement \(LH7\)](#)
5. Remove Charge Air Cooler Inlet Air Tube - [Charge Air Cooler Inlet Air Tube Replacement](#)
6. Remove Radiator Outlet Hose@Water Pump - [Radiator Outlet Hose Replacement \(LH7\)](#)
7. Remove Generator and Air Conditioning Compressor Belt - [Generator and Air Conditioning Compressor Belt Replacement](#)

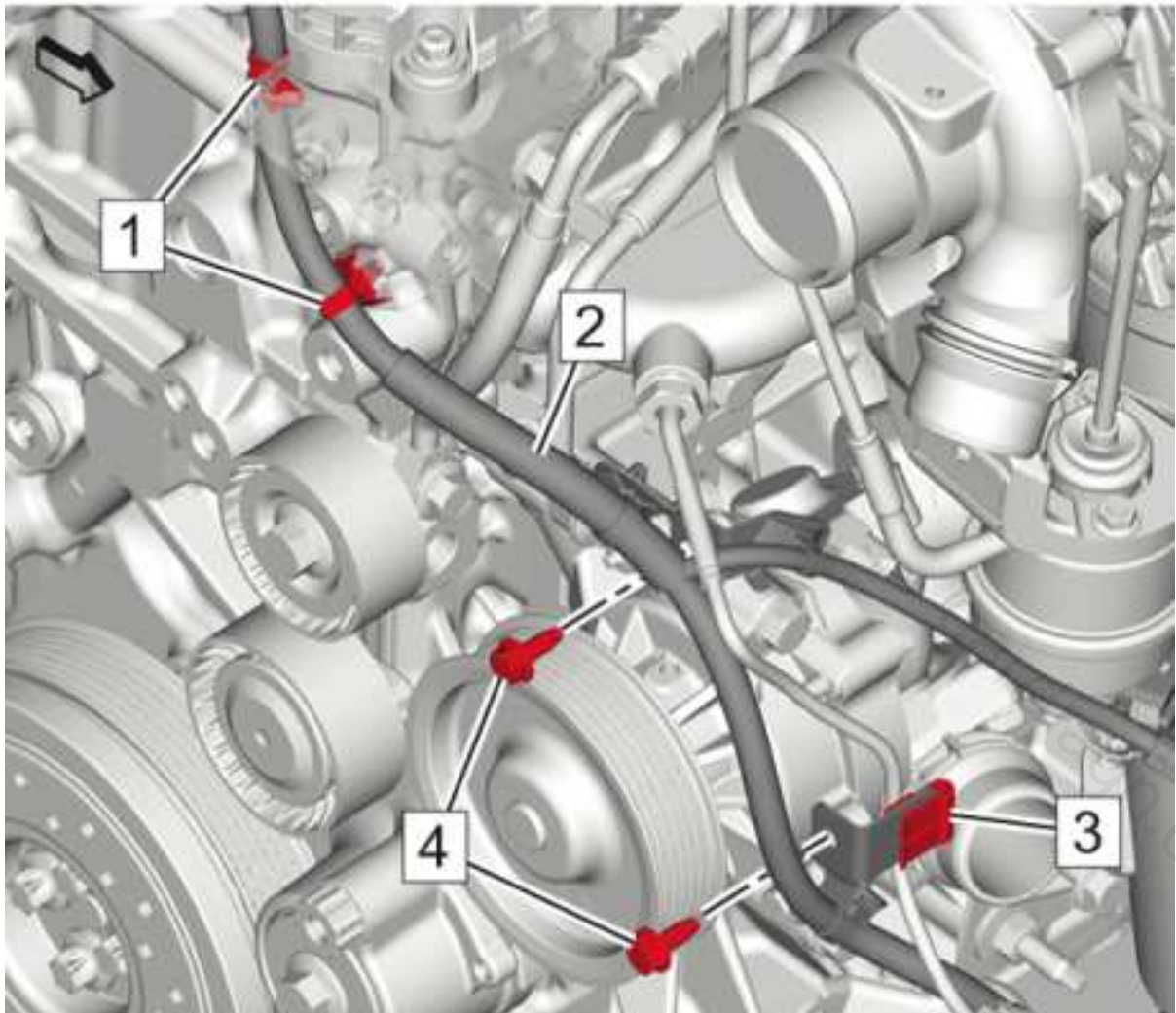


Fig. 306: Wiring Harness Clip And Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Unclip Wiring Harness Clip (1) - [2x]
9. Remove the 2 engine control module and engine wiring harness bracket bolts (4).
10. Unclip Retainer (3).
11. Lay the engine control module wiring harness (2) aside.



Fig. 307: Turbocharger Coolant Feed Pipe Hollow Screw And Seal Rings
 Courtesy of GENERAL MOTORS COMPANY

12. Remove the turbocharger coolant feed pipe hollow screw (2) and DISCARD the 2 seal rings (3). Hang the turbocharger coolant feed pipe (1) aside.



Fig. 308: Thermostat Bypass Pipe Bolt
 Courtesy of GENERAL MOTORS COMPANY

13. Remove Thermostat Bypass Pipe Bolt (1) - [2x]

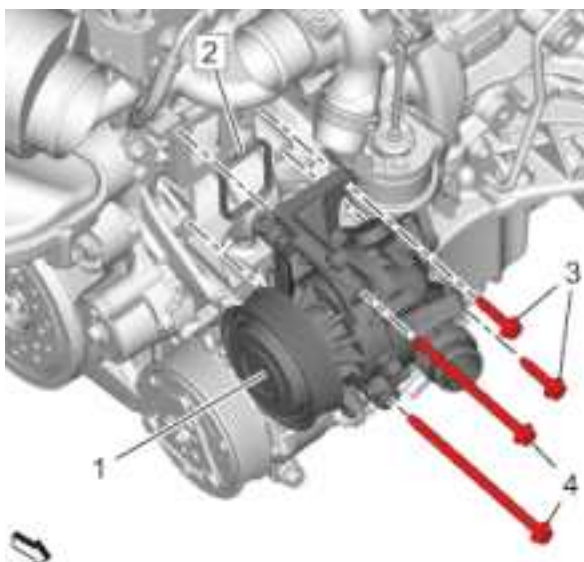


Fig. 309: Gasket, Water Pump And Bolts
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Take note that there are different bolt lengths.

14. Remove the water pump bolts. (3, 4) [4x]
15. Remove the water pump. (1)
16. Remove and DISCARD the gasket. (2)

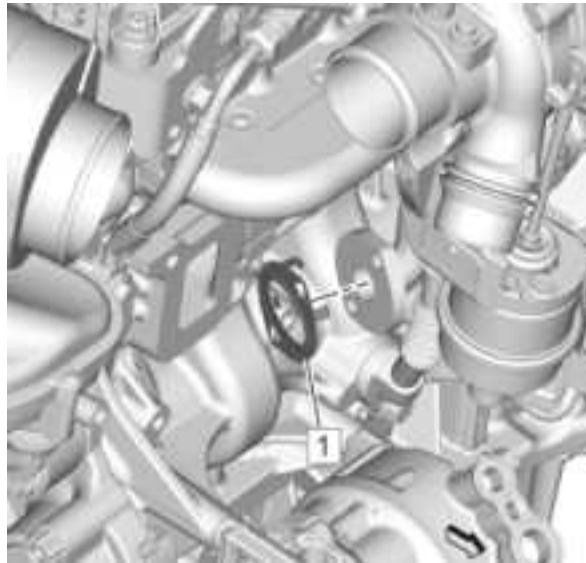


Fig. 310: Thermostat Bypass Pipe Gasket
Courtesy of GENERAL MOTORS COMPANY

17. Remove Thermostat Bypass Pipe Gasket (1) and DISCARD

Installation Procedure

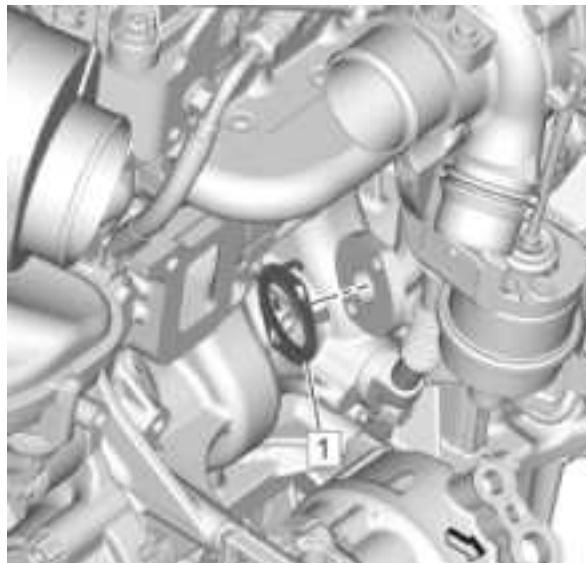


Fig. 311: Thermostat Bypass Pipe Gasket
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW Thermostat Bypass Pipe Gasket (1)
2. Clean the sealing surfaces of the water pump and the engine block.

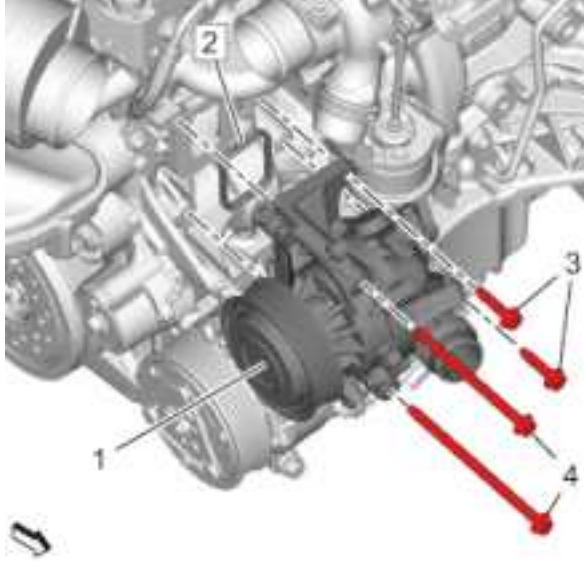


Fig. 312: Gasket, Water Pump And Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Install a NEW water pump gasket. (2)
4. Install the water pump. (1)

CAUTION: Fastener Caution

NOTE: Take note that there are different bolt lengths.

5. Install Water Pump Bolt (3, 4) and tighten [4x] 25 N.m (18 lb ft).



Fig. 313: Thermostat Bypass Pipe Bolt

Courtesy of GENERAL MOTORS COMPANY

6. Install Thermostat Bypass Pipe Bolt (1) and tighten [2x] - Thermostat Bypass Pipe Replacement



Fig. 314: Turbocharger Coolant Feed Pipe Hollow Screw And Seal Rings
Courtesy of GENERAL MOTORS COMPANY

7. Reposition the turbocharger coolant feed pipe (1) and install the turbocharger coolant feed pipe hollow screw (2) with 2 NEW seal rings (3). Tighten the turbocharger coolant feed pipe hollow screw. **Turbocharger Coolant Feed Pipe Replacement (LH7)**

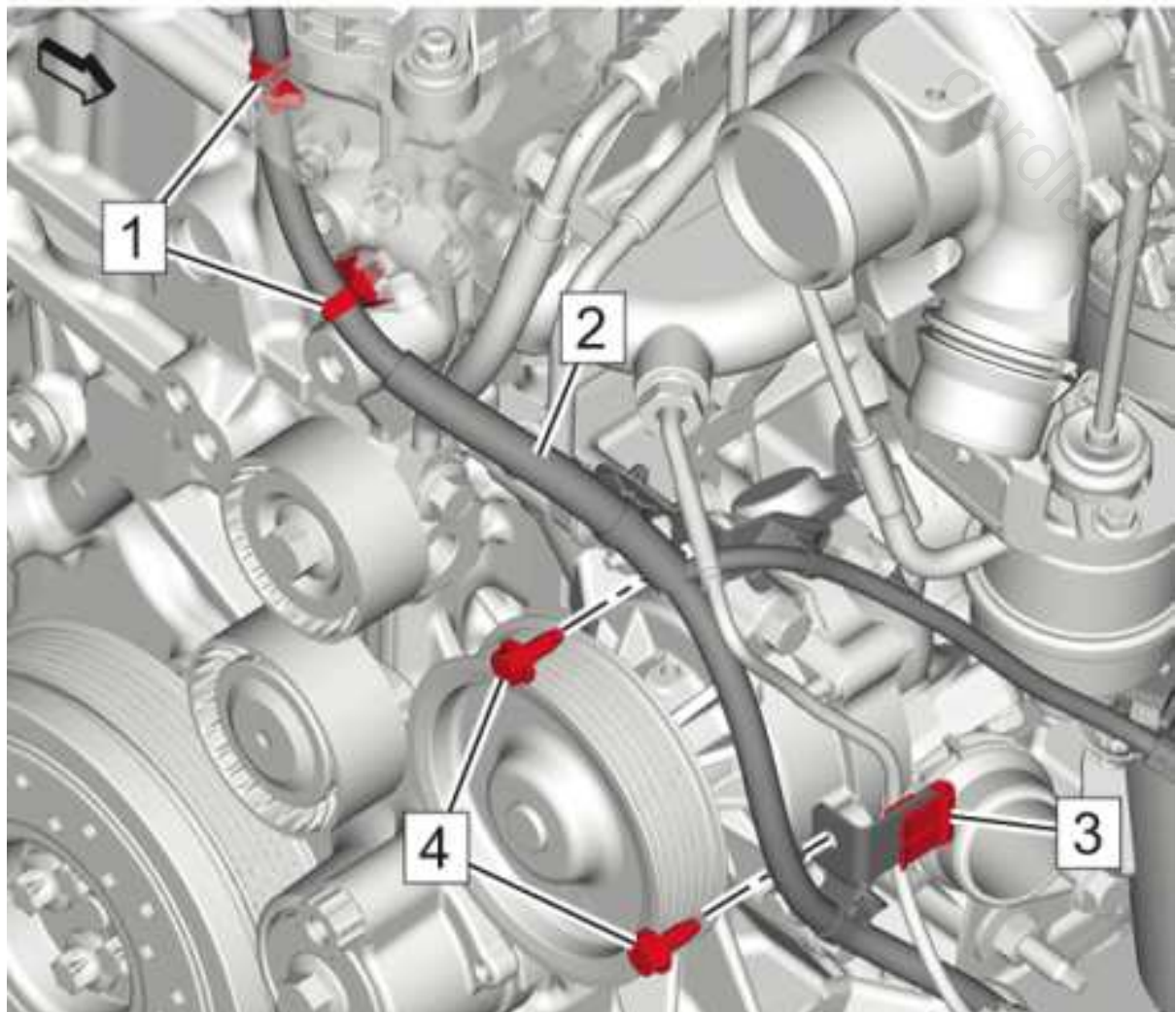


Fig. 315: Wiring Harness Clip And Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Reposition the engine control module wiring harness (2).
9. Install Retainer (3).

10. Install the 2 engine control module and engine wiring harness bracket bolts (4) and tighten to 9 N.m (80 lb in).
11. Clip in the 2 wiring harness clips (1).
12. Install Generator and Air Conditioning Compressor Belt - [Generator and Air Conditioning Compressor Belt Replacement](#)
13. Install Radiator Outlet Hose@Water Pump - [Radiator Outlet Hose Replacement \(LH7\)](#)
14. Install Charge Air Cooler Inlet Air Tube - [Charge Air Cooler Inlet Air Tube Replacement](#)
15. Install Oxidation Catalytic Converter - [Oxidation Catalytic Converter Replacement \(LH7\)](#)
16. Install Air Cleaner Assembly - [Air Cleaner Assembly Replacement](#)
17. Install Air Cleaner Outlet Duct - [Air Cleaner Outlet Duct Replacement](#)
18. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

WATER PUMP HOUSING REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)
2. Remove Air Cleaner Assembly - [Air Cleaner Assembly Replacement](#)

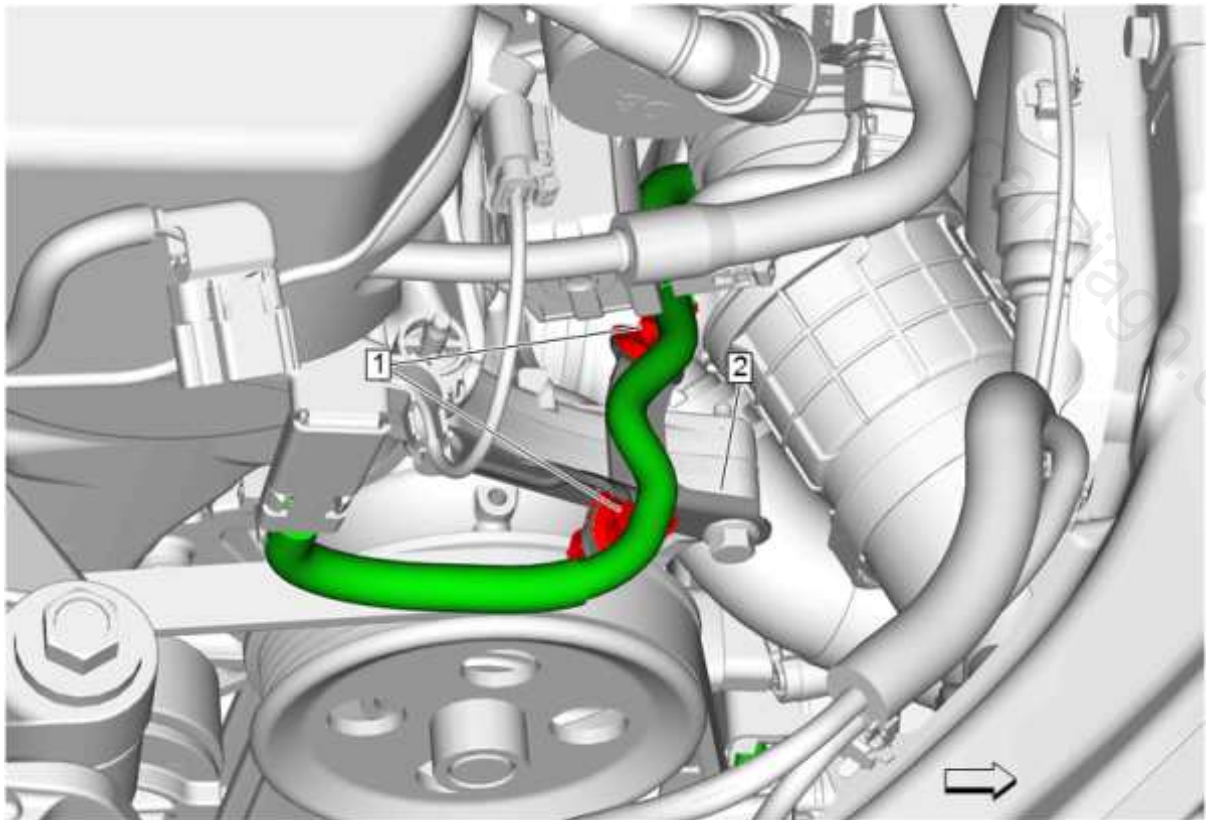


Fig. 316: Engine Wiring Harness Retainer
Courtesy of GENERAL MOTORS COMPANY

3. Separate Engine Wiring Harness Retainer (1) @ Engine Wiring Harness Bracket (2) - [2x]

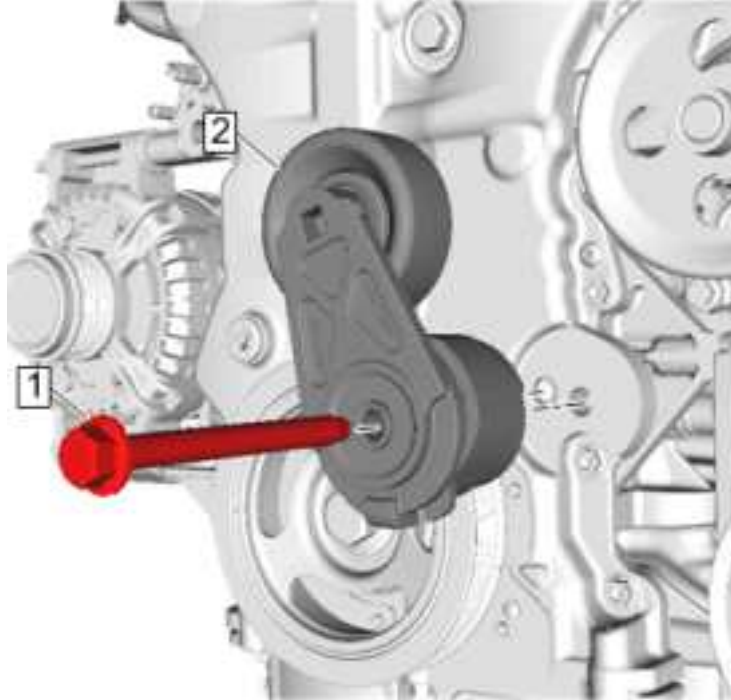


Fig. 317: Drive Belt Tensioner

Courtesy of GENERAL MOTORS COMPANY

4. Remove Drive Belt Tensioner (2) - **Drive Belt Tensioner Replacement**

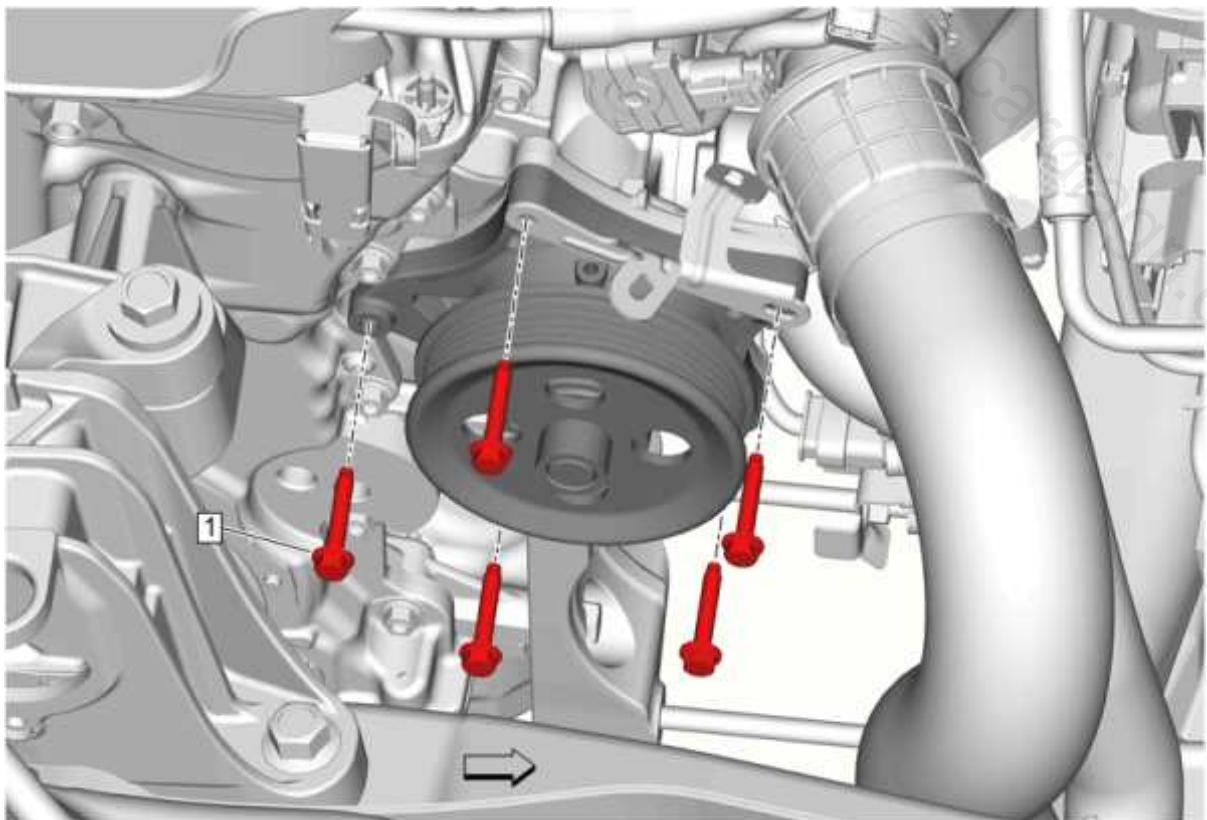


Fig. 318: Water Pump Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove Water Pump Bolt (1) - [5x]

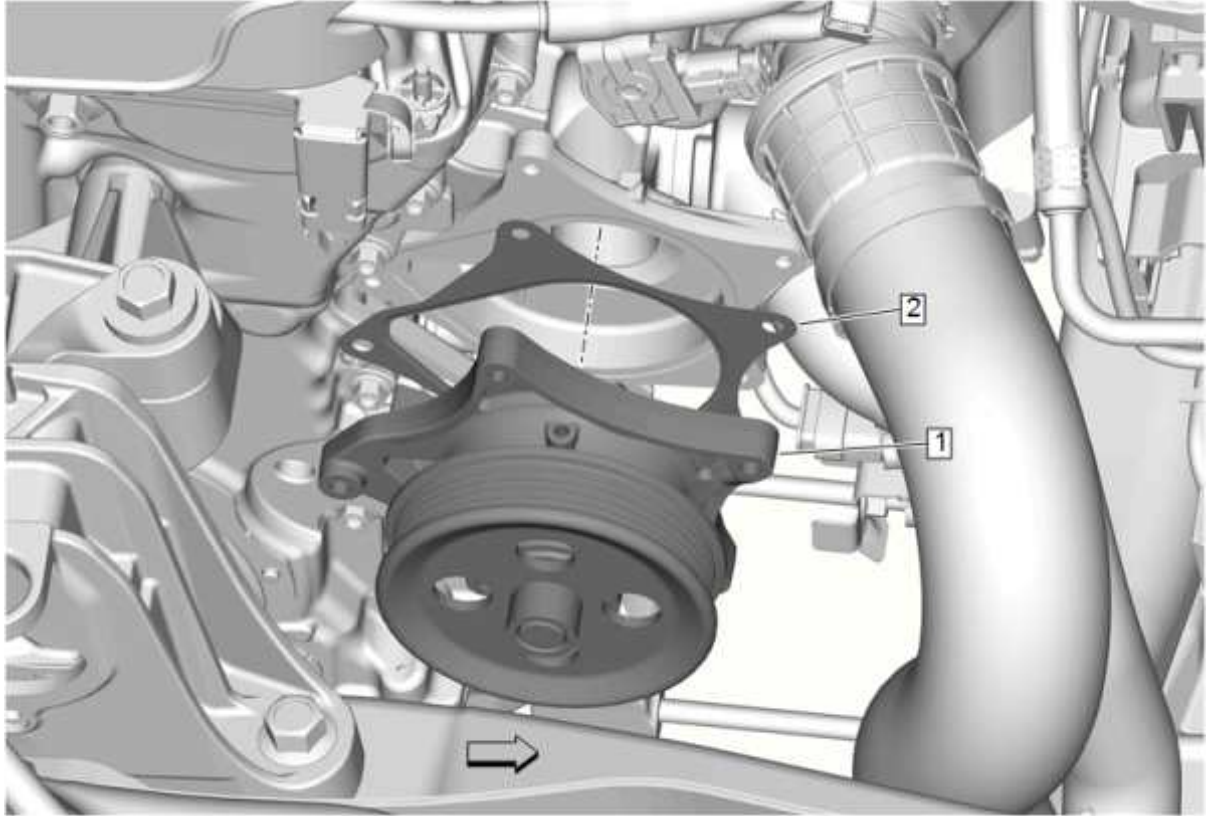


Fig. 319: Water Pump Housing

Courtesy of GENERAL MOTORS COMPANY

6. Remove Water Pump Housing (1).
7. Remove Water Pump Housing Gasket (2) and DISCARD

Installation Procedure

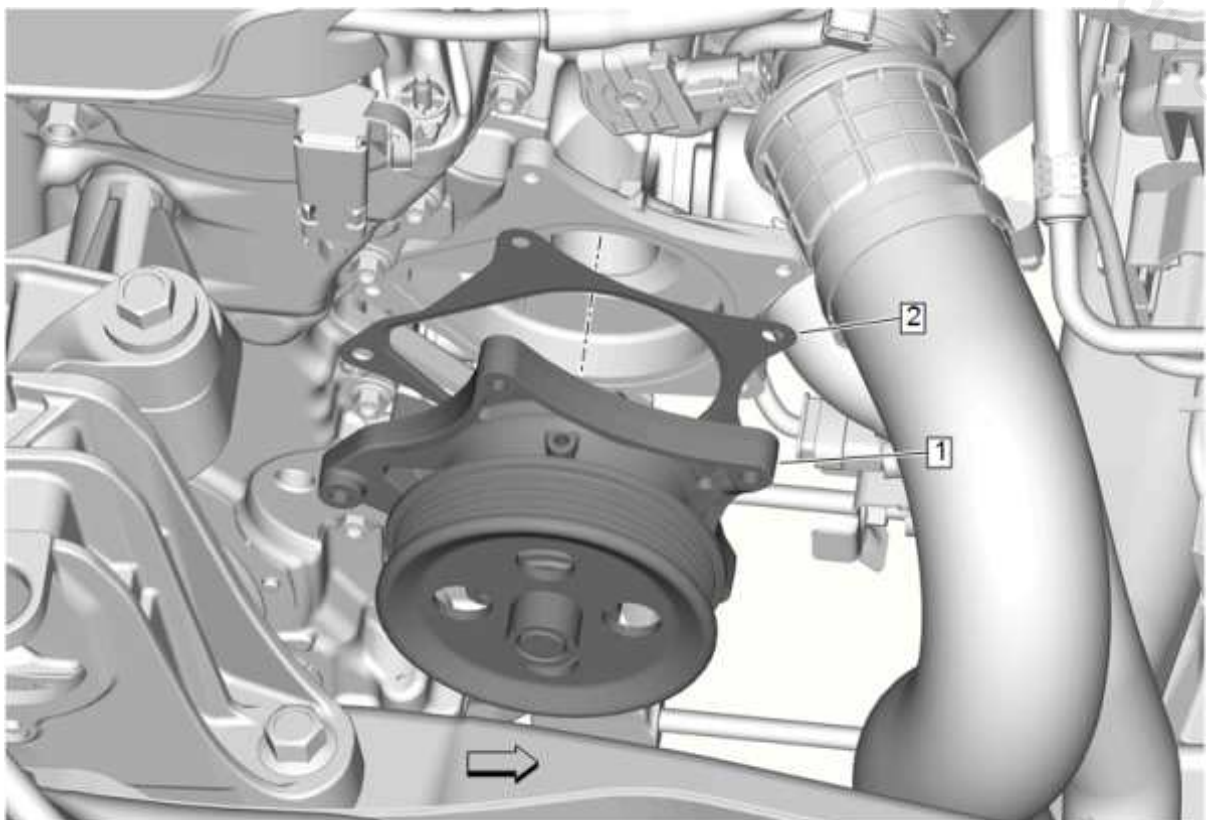


Fig. 320: Water Pump Housing

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Water Pump Housing Gasket (2).
2. Install Water Pump Housing (1).

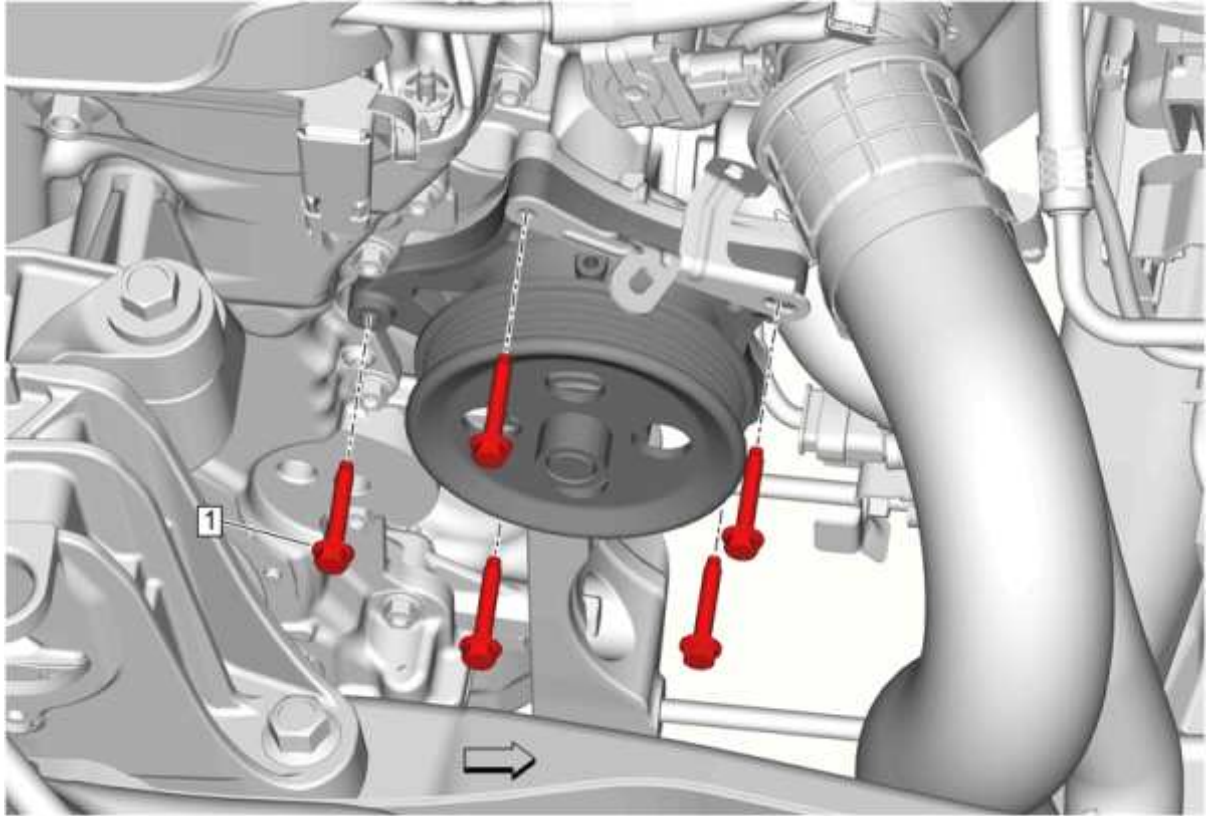


Fig. 321: Water Pump Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

3. Install Water Pump Bolt (1) and tighten [5x] 10 N.m (89 lb in)

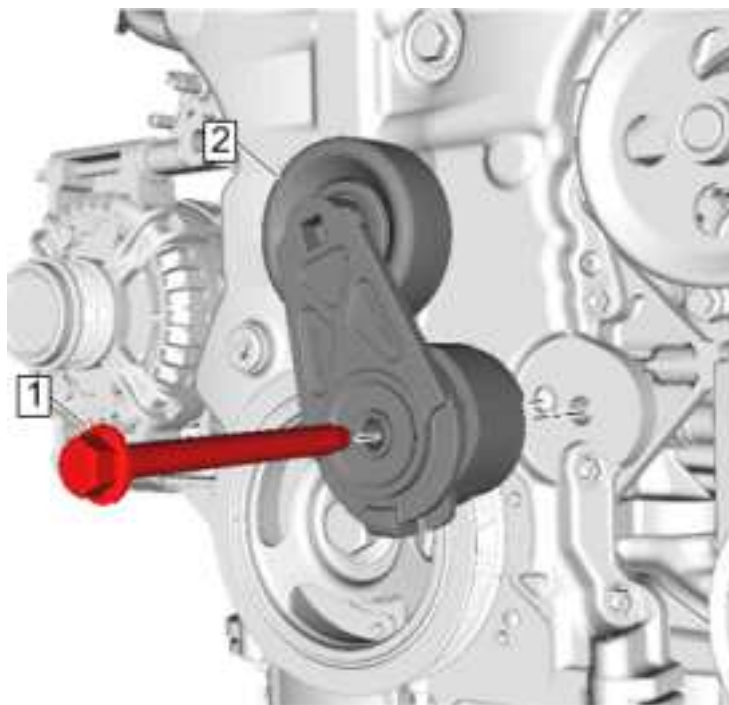


Fig. 322: Drive Belt Tensioner

Courtesy of GENERAL MOTORS COMPANY

4. Install Drive Belt Tensioner (2) - [Drive Belt Tensioner Replacement](#)

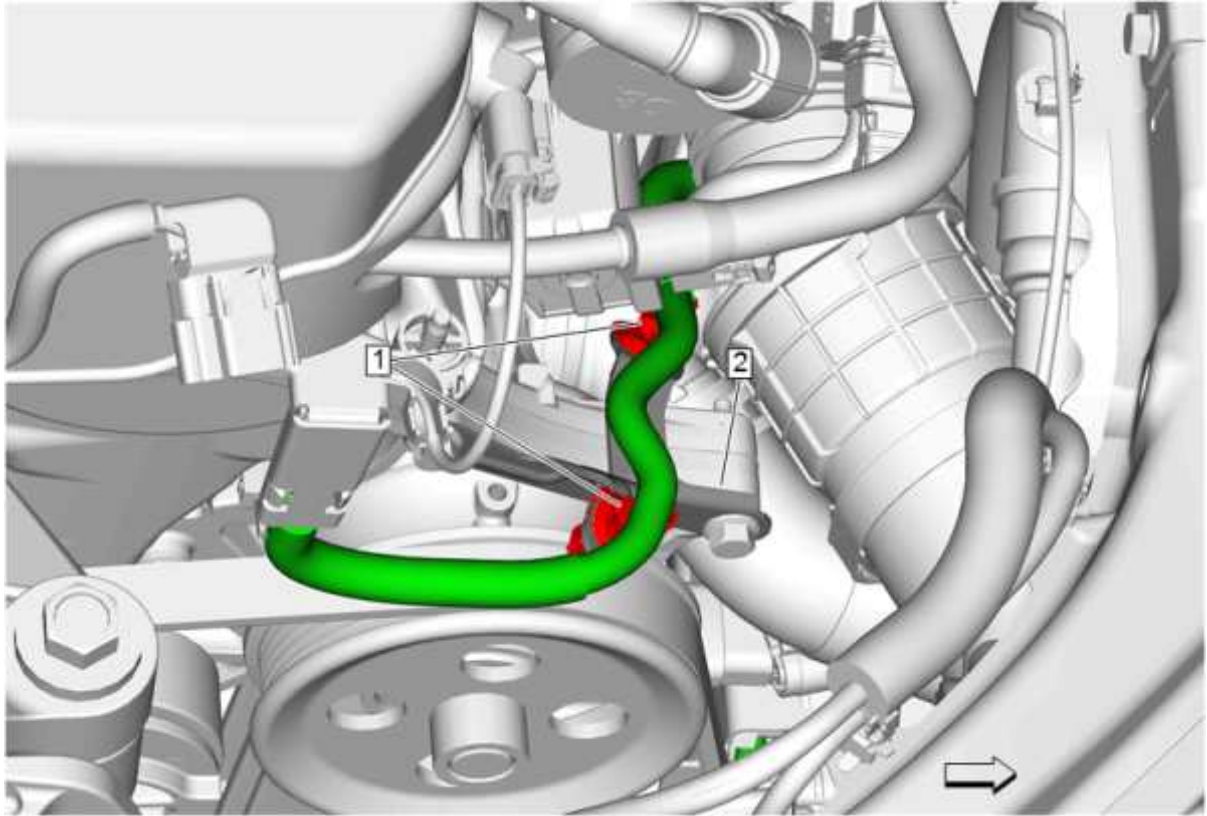


Fig. 323: Engine Wiring Harness Retainer
 Courtesy of GENERAL MOTORS COMPANY

5. Install Engine Wiring Harness Retainer (1) @ Engine Wiring Harness Bracket (2) - [2x]
6. Install Air Cleaner Assembly - [Air Cleaner Assembly Replacement](#)
7. Fill the cooling system. [Cooling System Draining and Filling.\(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
8. Start the engine and check for leaks.

AUXILIARY WATER PUMP REPLACEMENT (LYX WITH KL9)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)

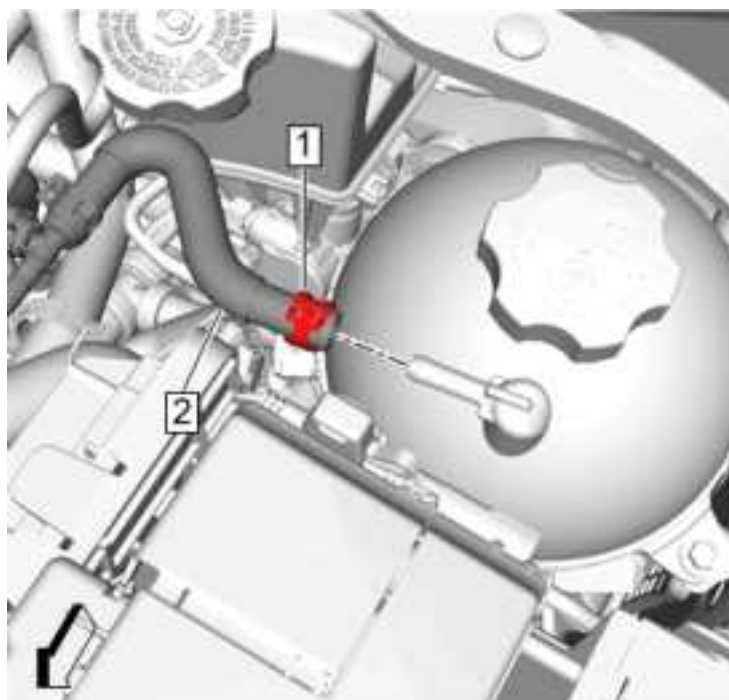


Fig. 324: Engine Coolant Air Bleed Hose
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - [Engine Coolant Air Bleed Hose Replacement \(Turbocharger Coolant Return pipe to Water Outlet, LYX\)](#)[Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX\)](#)

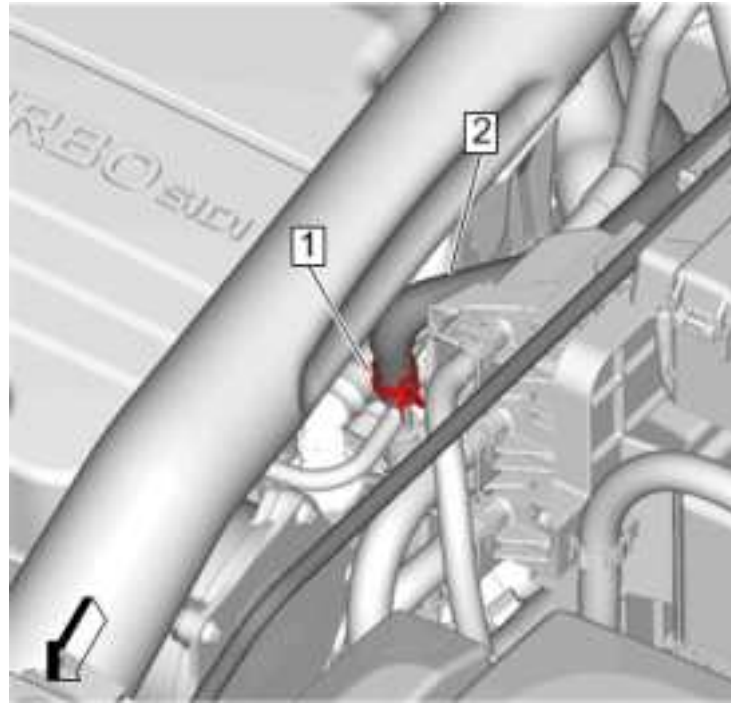


Fig. 325: Engine Coolant Air Bleed Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Coolant Air Bleed Hose (2) @ Turbocharger Coolant Return Pipe - [Engine Coolant Air Bleed Hose Replacement \(Turbocharger Coolant Return pipe to Water Outlet, LYX\)](#)[Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX\)](#)

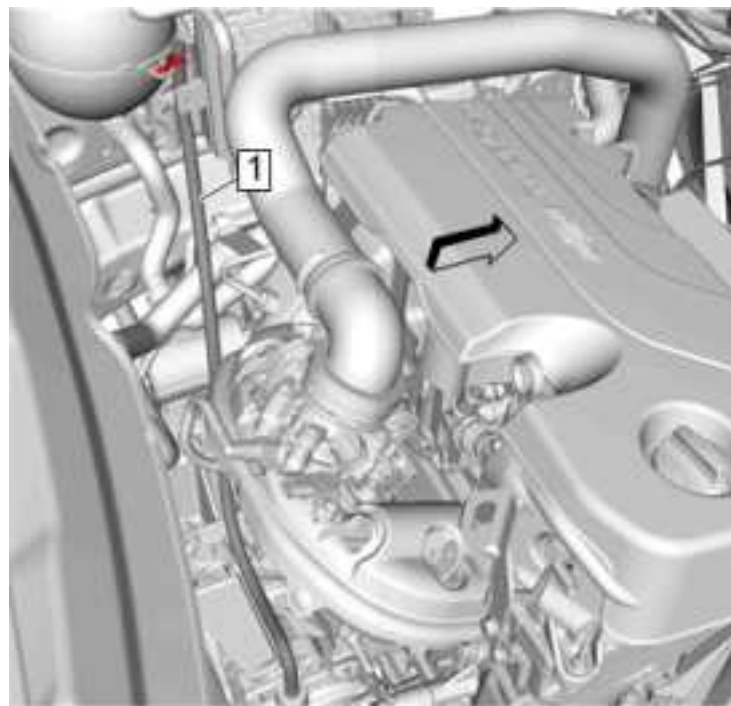


Fig. 326: Power Transfer Unit Vent Hose
Courtesy of GENERAL MOTORS COMPANY

4. Remove { If equipped } Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - [Power Transfer Unit Vent Hose Replacement](#)
5. Wiring Harnesses - Reposition

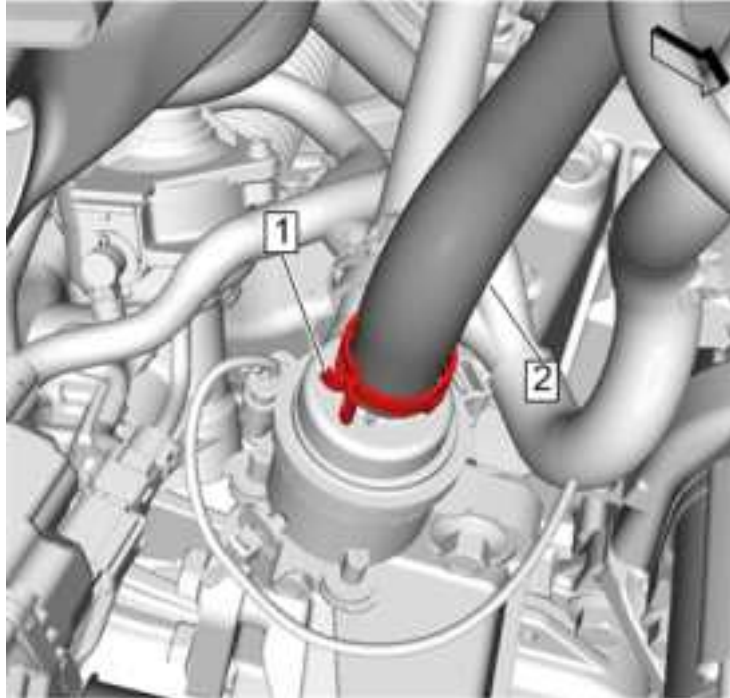


Fig. 327: Heater Water Auxiliary Pump Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

6. Remove Heater Water Auxiliary Pump Inlet Hose (2) @ Auxiliary Water Pump - **Heater Water Auxiliary Pump Inlet Hose Replacement (LYX with KL9)**

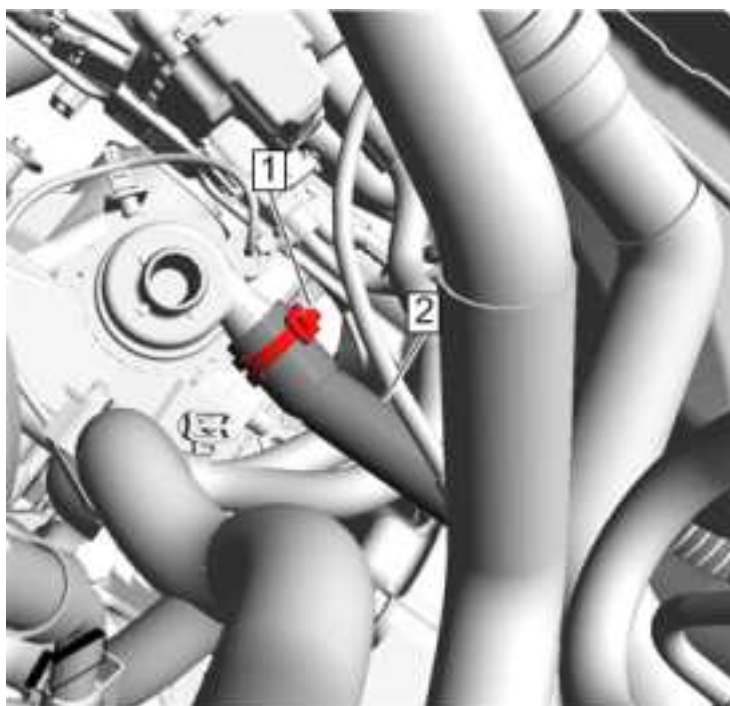


Fig. 328: Auxiliary Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

7. Remove Auxiliary Heater Outlet Hose (2) @ Auxiliary Water Pump - **Auxiliary Heater Outlet Hose Replacement (LYX with KL9)**

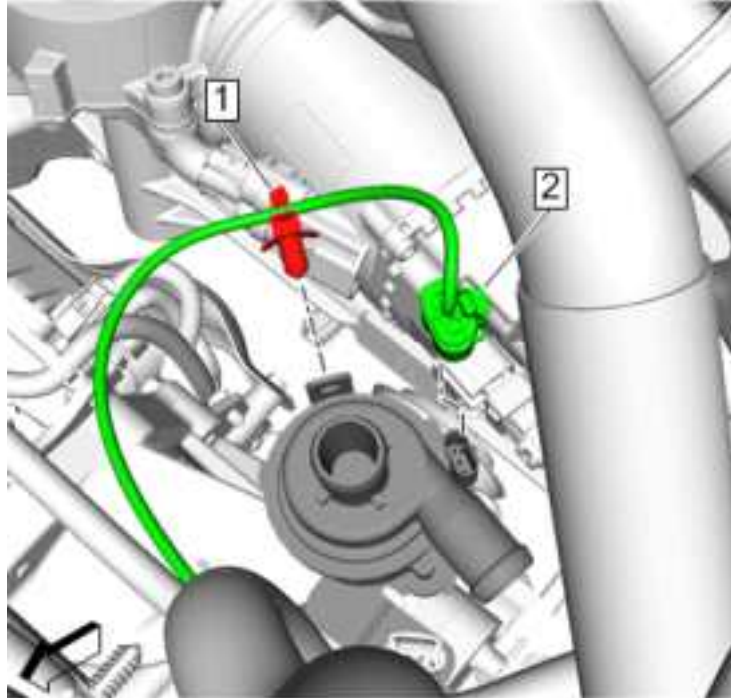


Fig. 329: Engine Wiring Harness Retainer And Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump
9. Disconnect Electrical Connector (2) @ Auxiliary Water Pump

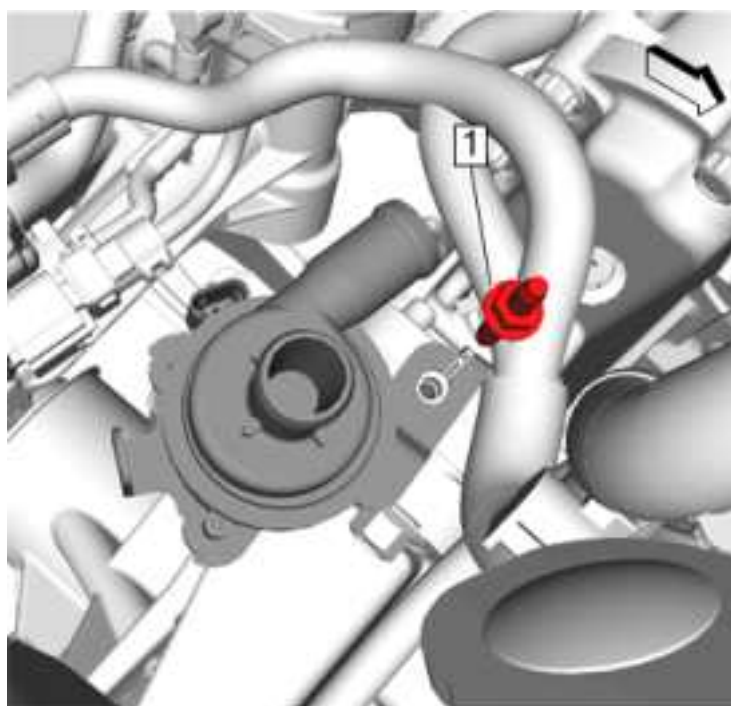


Fig. 330: Auxiliary Water Pump Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

10. Remove Auxiliary Water Pump Bracket Bolt (1) @ Auxiliary Water Pump

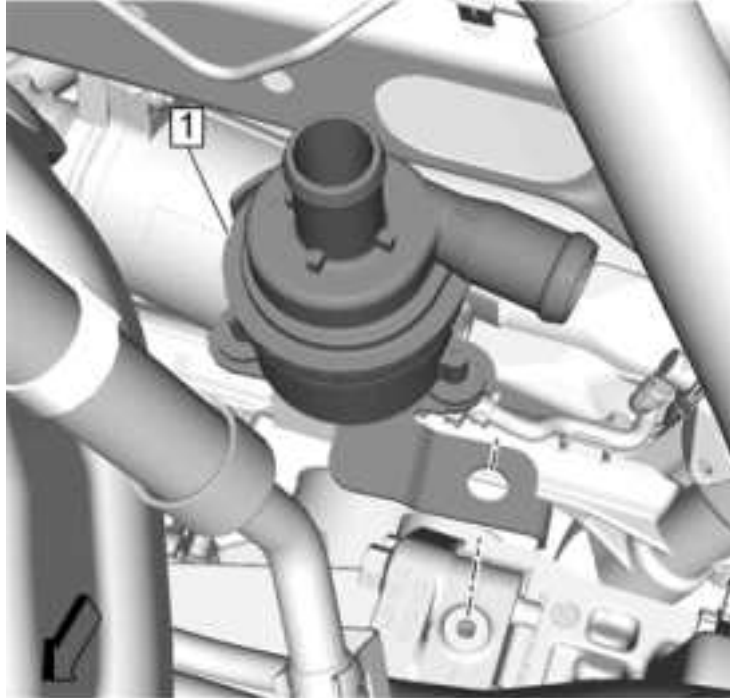


Fig. 331: Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

11. Remove Auxiliary Water Pump (1).

Installation Procedure

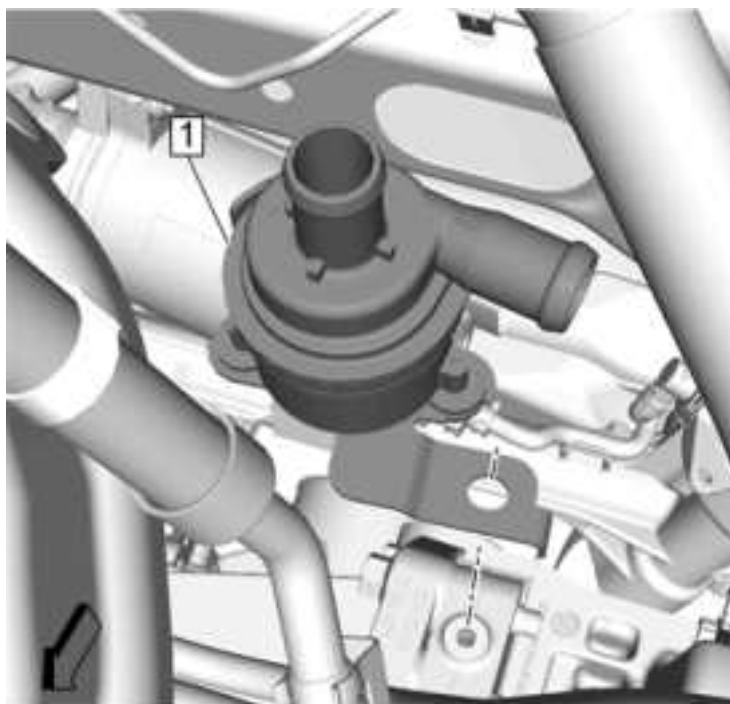


Fig. 332: Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Water Pump (1).

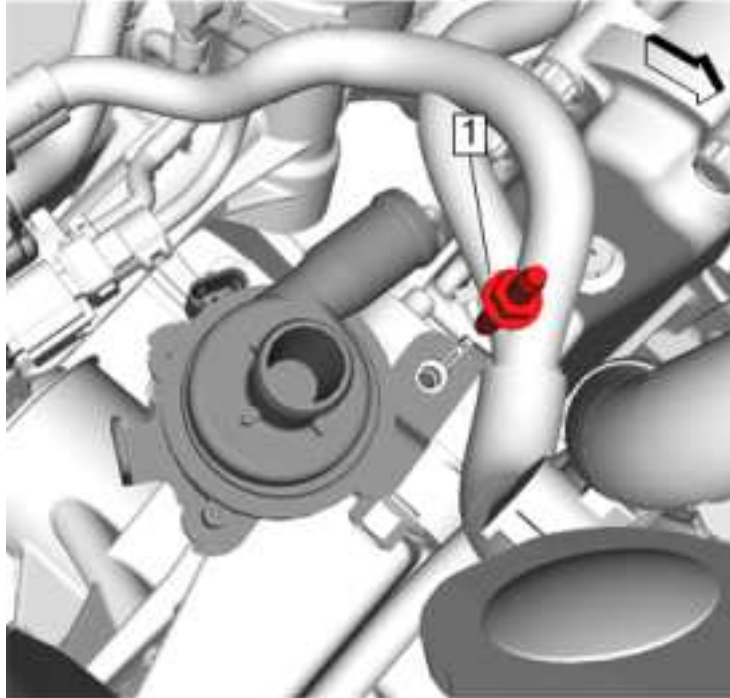


Fig. 333: Auxiliary Water Pump Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install Auxiliary Water Pump Bracket Bolt (1) @ Auxiliary Water Pump and tighten 9 N.m (80 lb in)

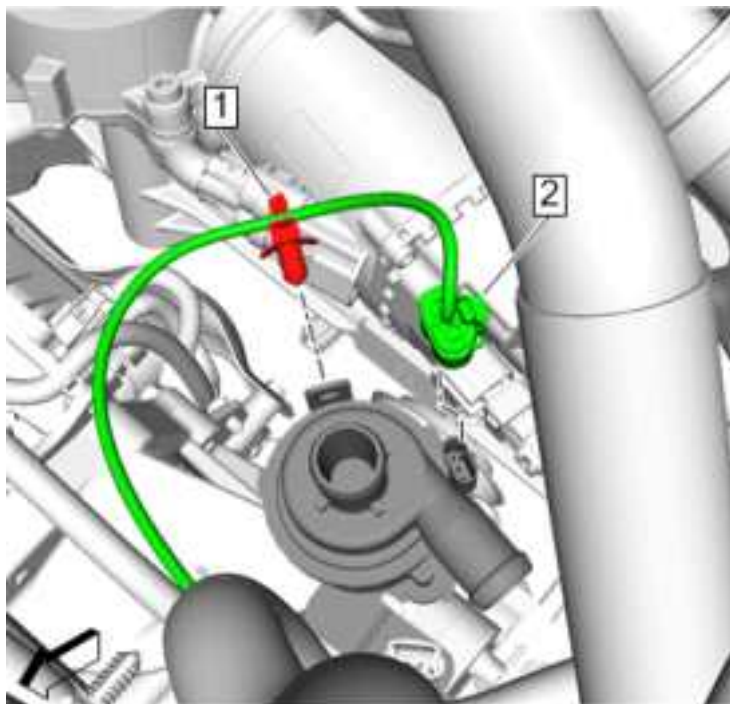


Fig. 334: Engine Wiring Harness Retainer And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

3. Connect Electrical Connector (2) @ Auxiliary Water Pump
4. Install Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump

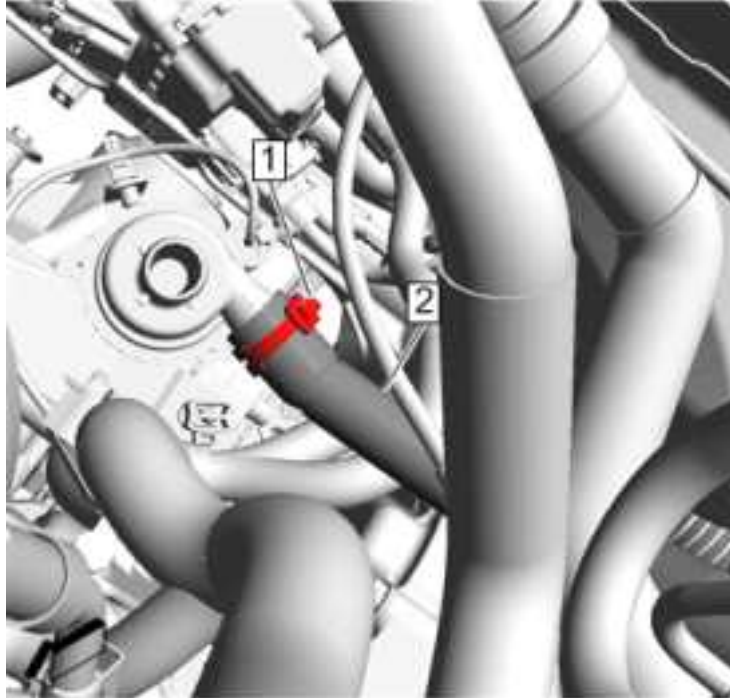


Fig. 335: Auxiliary Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

5. Install Auxiliary Heater Outlet Hose (2) @ Auxiliary Water Pump - **Auxiliary Heater Outlet Hose Replacement (LYX with KL9)**

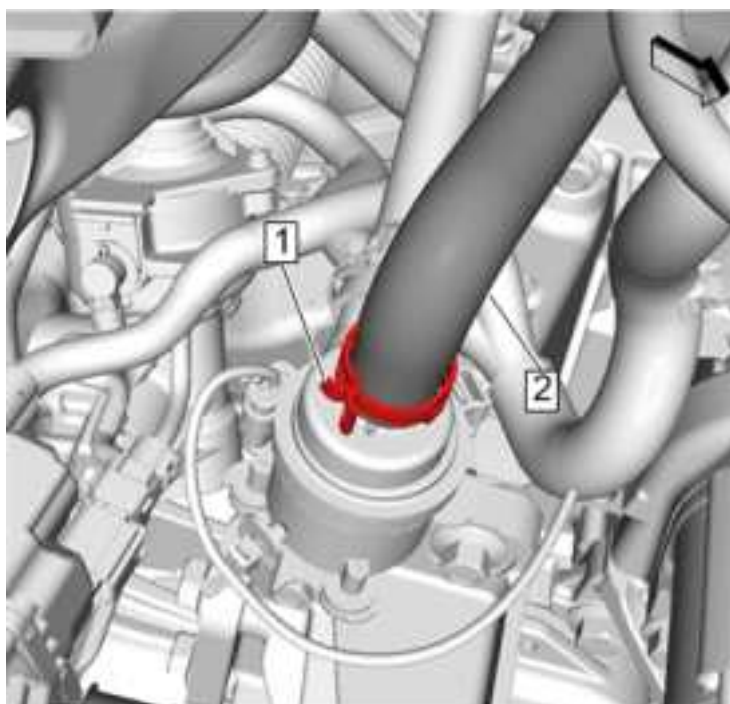


Fig. 336: Heater Water Auxiliary Pump Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Heater Water Auxiliary Pump Inlet Hose (2) @ Auxiliary Water Pump - **Heater Water Auxiliary Pump Inlet Hose Replacement (LYX with KL9)**
7. Wiring Harnesses - Reposition

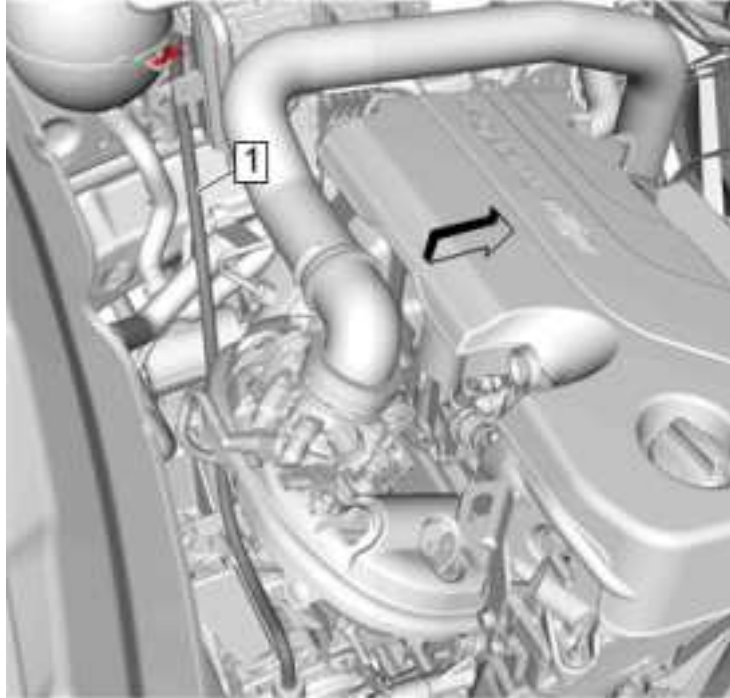


Fig. 337: Power Transfer Unit Vent Hose

Courtesy of GENERAL MOTORS COMPANY

8. Install {If equipped} Power Transfer Unit Vent Hose (1) @ Radiator Surge Tank - **Power Transfer Unit Vent Hose Replacement**

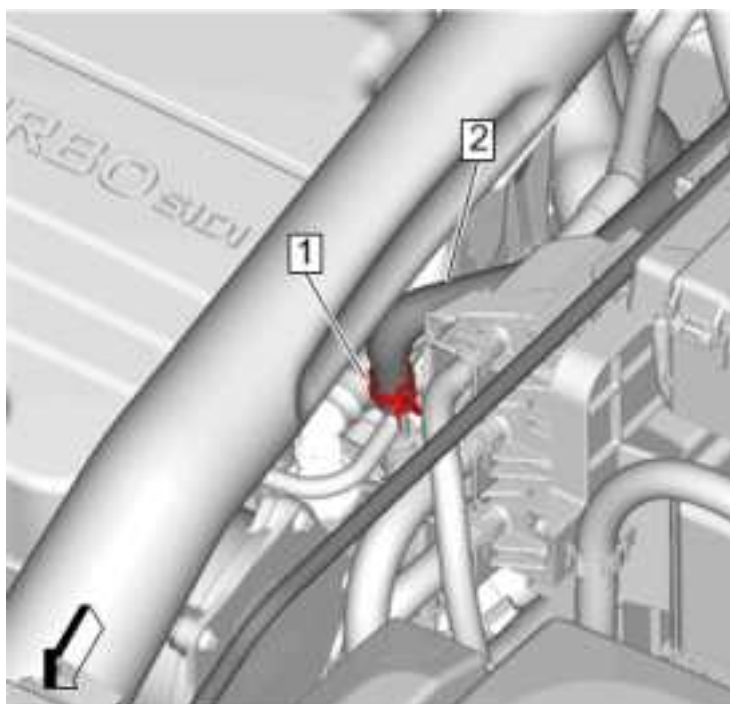


Fig. 338: Engine Coolant Air Bleed Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

9. Install Engine Coolant Air Bleed Hose (2) @ Turbocharger Coolant Return Pipe - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX) Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)**

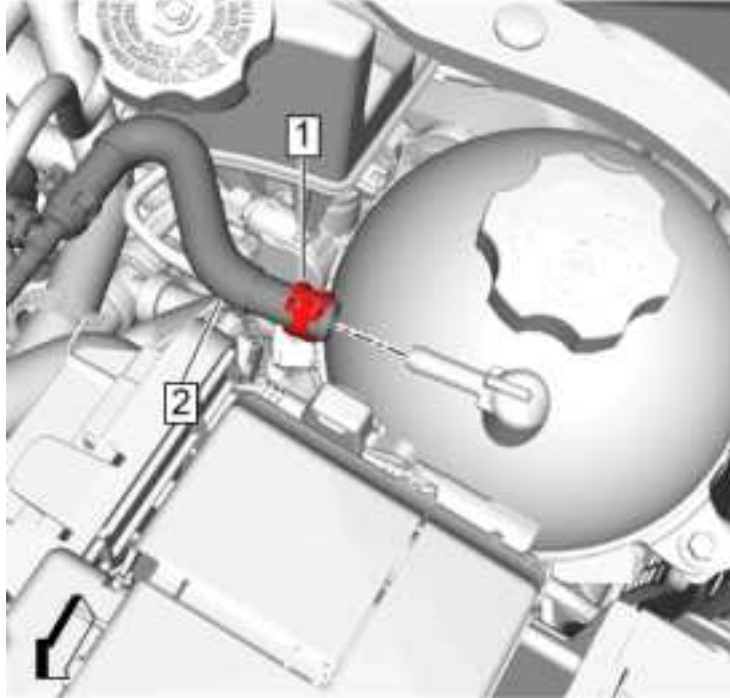


Fig. 339: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

10. Install Engine Coolant Air Bleed Hose (2) @ Radiator Surge Tank - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX)Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)**
11. Fill the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**
12. Check the cooling system for leaks.

AUXILIARY WATER PUMP REPLACEMENT (LH7 EQUINOX)

Removal Procedure

1. Drain the cooling system. **Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static)**
2. Remove Intake Manifold Cover - **Intake Manifold Cover Replacement**
3. Remove Heater Inlet Hose - **Heater Inlet Hose Replacement (LH7 Equinox)**

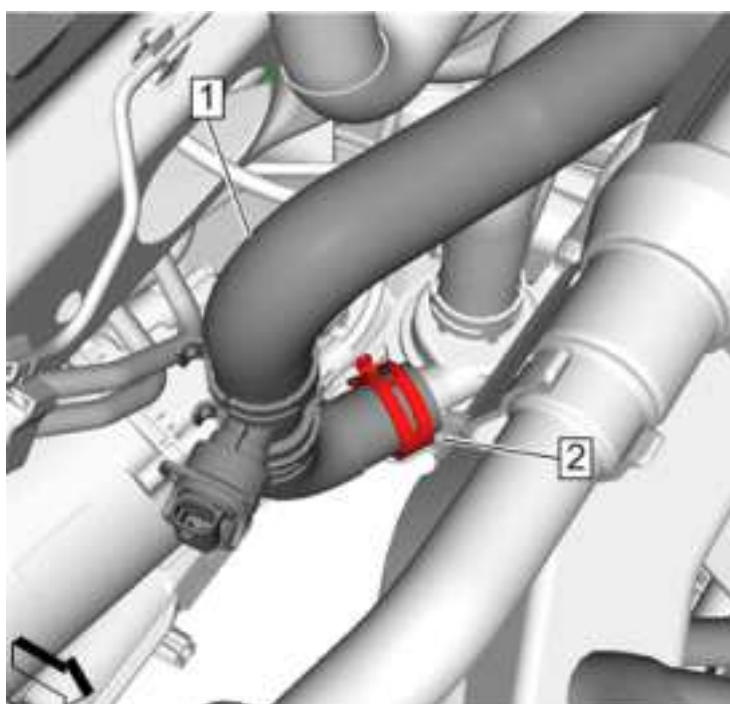


Fig. 340: Heater Water Auxiliary Pump Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Disengage Heater Water Auxiliary Pump Hose Clamp (2) - [Hose Clamp Replacement Guidelines - Spring Type](#)
5. Remove Heater Water Auxiliary Pump Hose (1) @ Auxiliary Water Pump - [Heater Water Auxiliary Pump Hose Replacement \(LH7 Equinox\)](#)

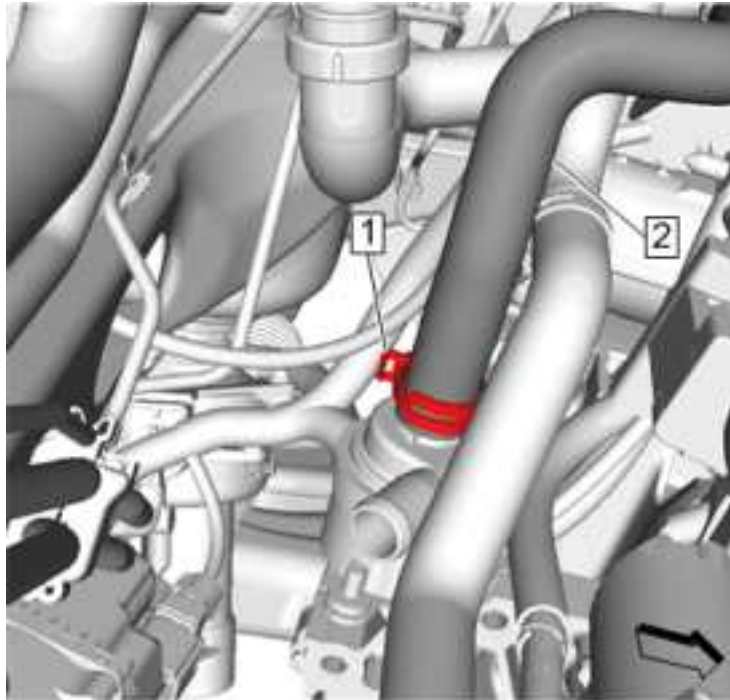


Fig. 341: Heater Water Auxiliary Pump Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Disengage Heater Water Auxiliary Pump Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
7. Remove Heater Water Auxiliary Pump Inlet Hose (2) @ Auxiliary Water Pump

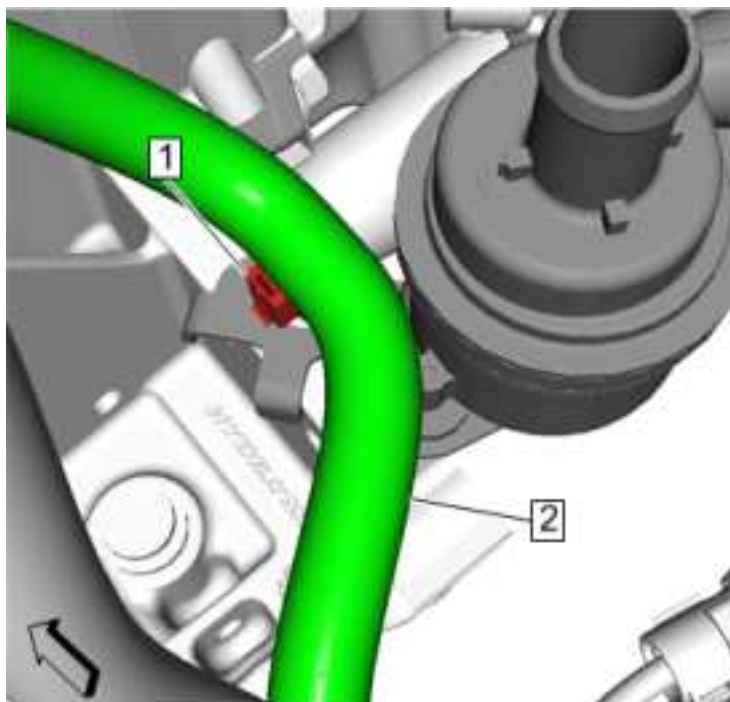


Fig. 342: Engine Wiring Harness Retainer
Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump
9. Reposition the wiring harness. (2)

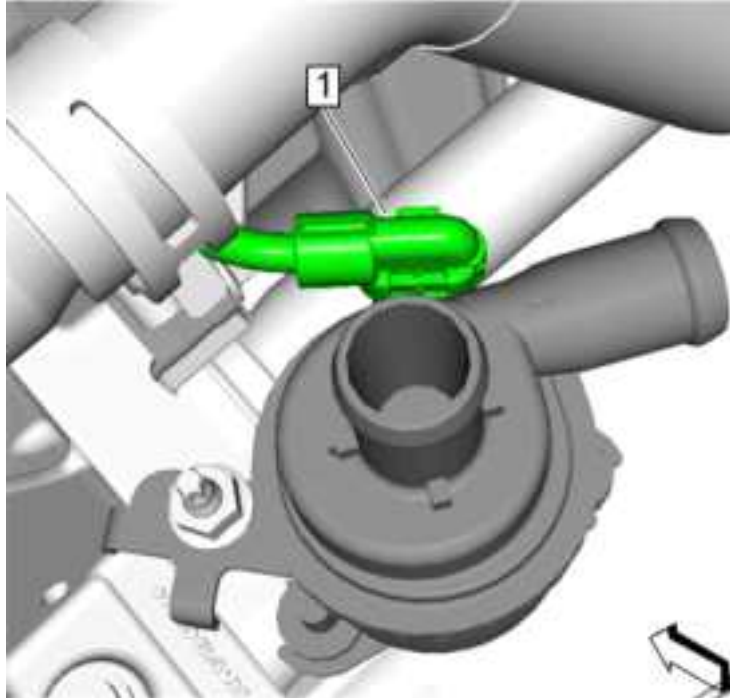


Fig. 343: Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

10. Disconnect Electrical Connector@Auxiliary Water Pump

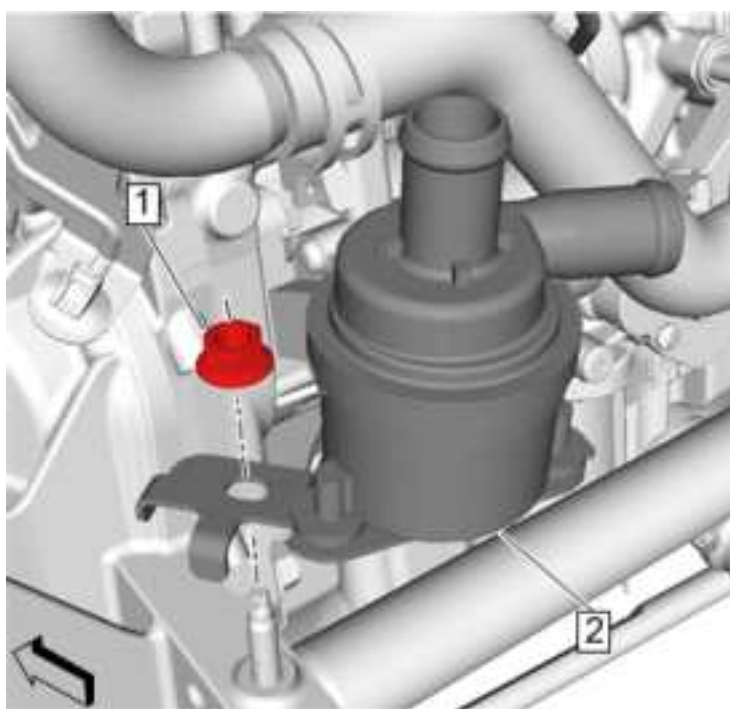


Fig. 344: Auxiliary Water Pump And Bracket Nut

Courtesy of GENERAL MOTORS COMPANY

11. Remove Auxiliary Water Pump Bracket Nut (1)
12. Remove Auxiliary Water Pump (2)

Installation Procedure

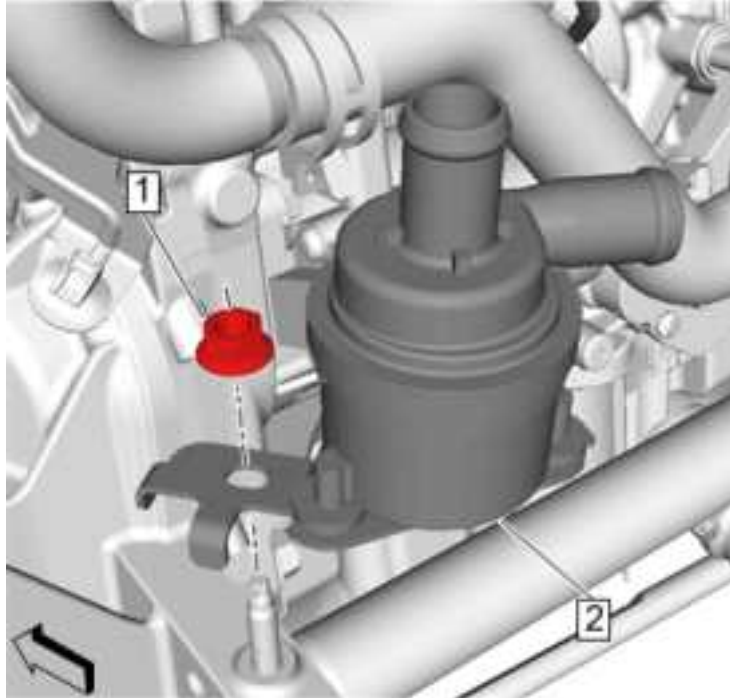


Fig. 345: Auxiliary Water Pump And Bracket Nut
 Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Water Pump (2)

CAUTION: Refer to [Fastener Caution](#) .

2. Install Auxiliary Water Pump Bracket Nut (1) and tighten 22 N.m (16 lb ft)

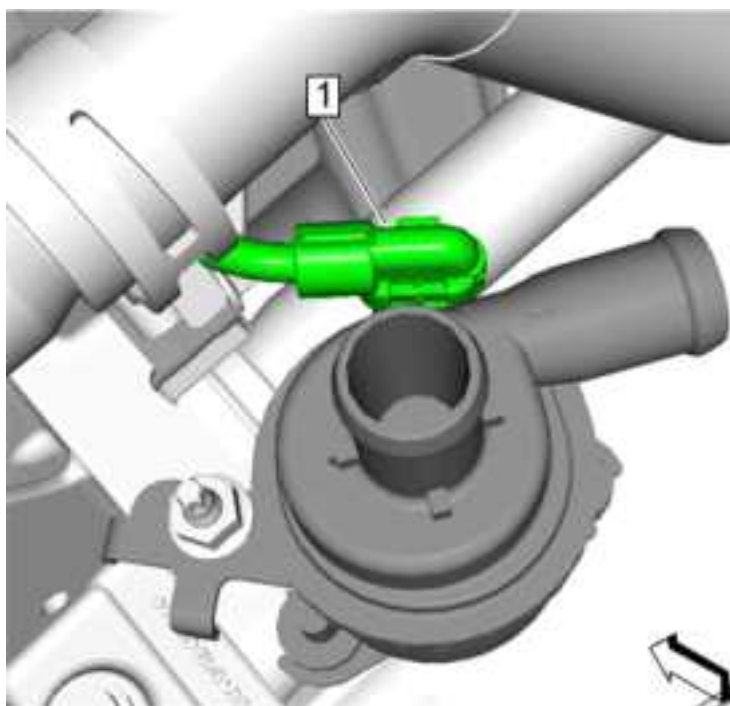


Fig. 346: Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

3. Connect Electrical Connector (1) @ Auxiliary Water Pump

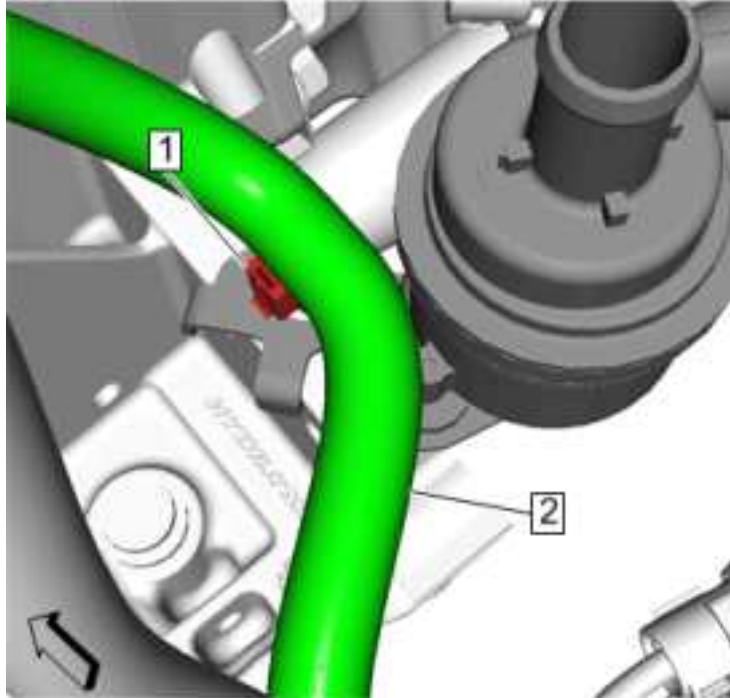


Fig. 347: Engine Wiring Harness Retainer
Courtesy of GENERAL MOTORS COMPANY

4. Reposition the wiring harness. (2)
5. Install Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump.

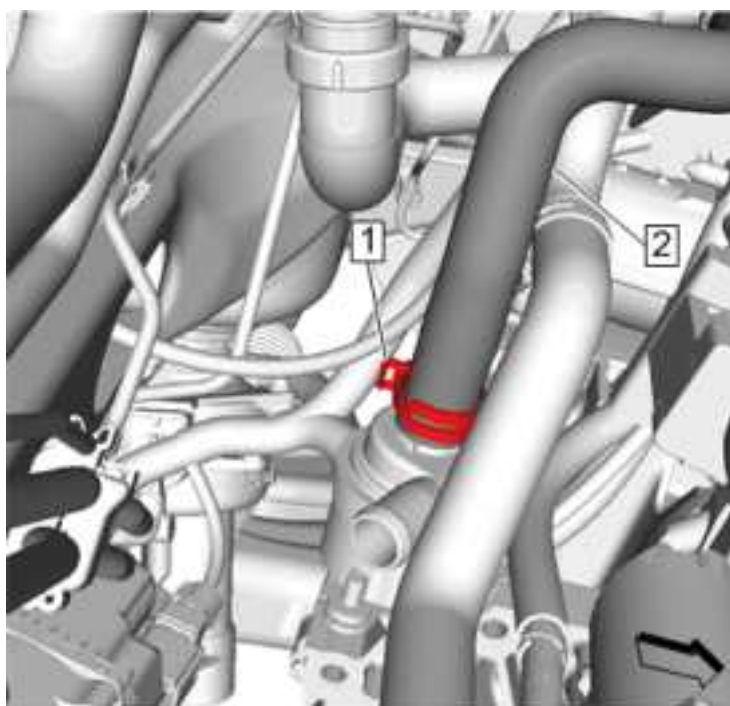


Fig. 348: Heater Water Auxiliary Pump Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Install Heater Water Auxiliary Pump Inlet Hose (2) @ Auxiliary Water Pump.
7. Engage Heater Water Auxiliary Pump Inlet Hose Clamp (1) - **Hose Clamp Replacement Guidelines - Spring Type**

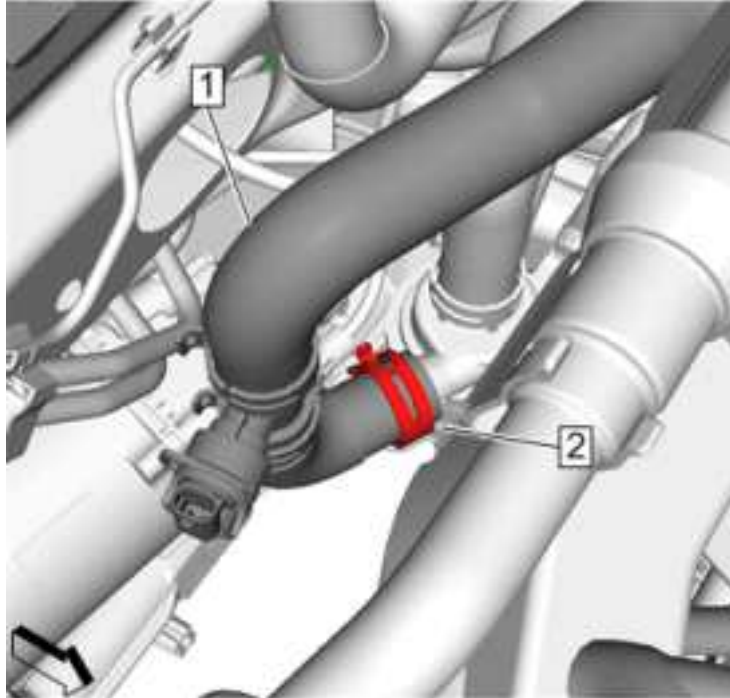


Fig. 349: Heater Water Auxiliary Pump Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

8. Install Heater Water Auxiliary Pump Hose (1) @ Auxiliary Water Pump - [Heater Water Auxiliary Pump Hose Replacement \(LH7 Equinox\)](#)
9. Engage Heater Water Auxiliary Pump Hose Clamp (2) - [Hose Clamp Replacement Guidelines - Spring Type](#)
10. Install Heater Inlet Hose - [Heater Inlet Hose Replacement \(LH7 Equinox\)](#)
11. Install Intake Manifold Cover - [Intake Manifold Cover Replacement](#)
12. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
13. Check the cooling system for leaks.

AUXILIARY WATER PUMP REPLACEMENT (LTG WITH KL9)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
2. Reposition Engine Coolant Air Bleed Hose - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG\)](#)
3. Reposition Power Transfer Unit Vent Hose - [Power Transfer Unit Vent Hose Replacement](#)
4. Reposition Wiring Harnesses.

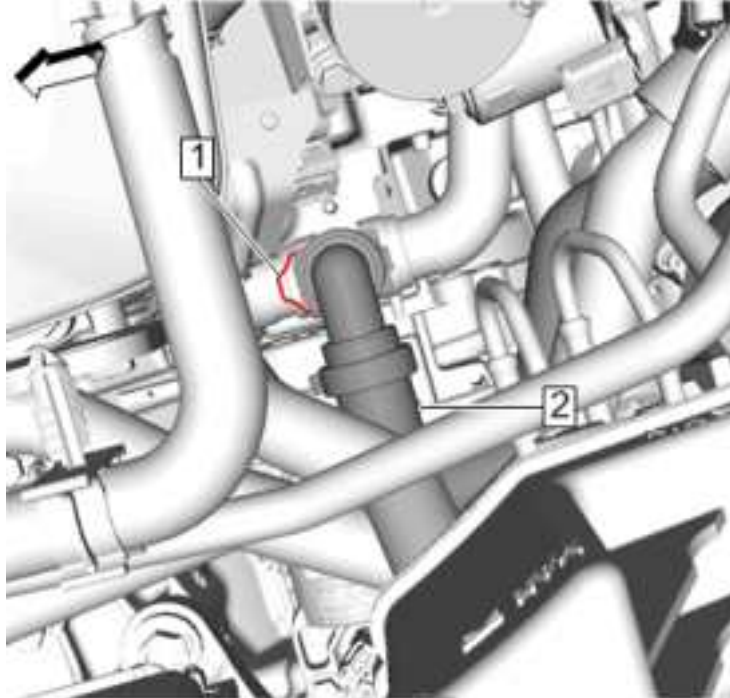


Fig. 350: Heater Water Auxiliary Pump Hose
Courtesy of GENERAL MOTORS COMPANY

5. Remove Heater Water Auxiliary Pump Hose (2) @ Heater Water Auxiliary Pump Inlet Hose - and position aside - **Heater Water Auxiliary Pump Hose Replacement (LTG with KL9)**.
6. Remove Heater Water Auxiliary Pump Inlet Hose **Heater Water Auxiliary Pump Inlet Hose Replacement (LTG with KL9)**.
7. Remove Auxiliary Heater Outlet Hose - **Auxiliary Heater Outlet Hose Replacement (LTG with KL9)**.

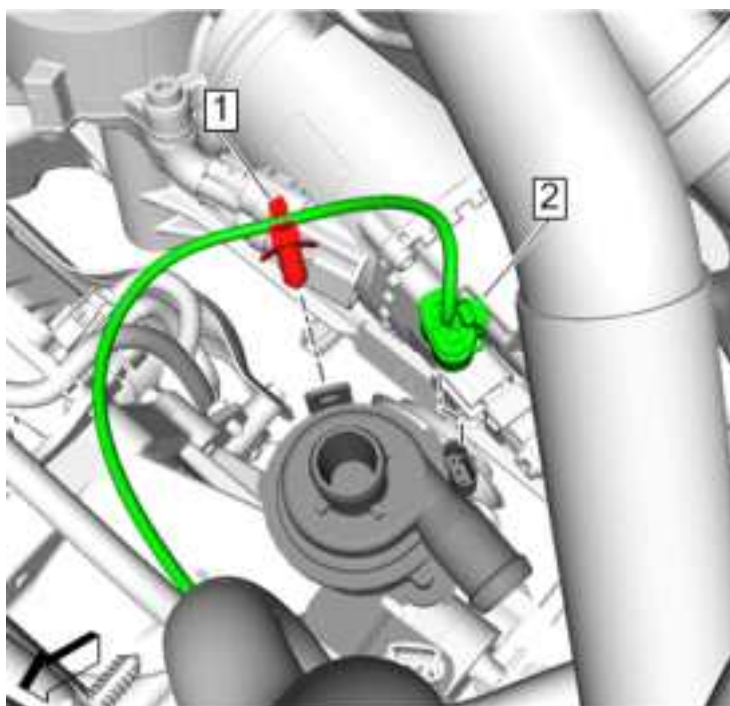


Fig. 351: Engine Wiring Harness Retainer And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump
9. Disconnect Electrical Connector (2) @ Auxiliary Water Pump

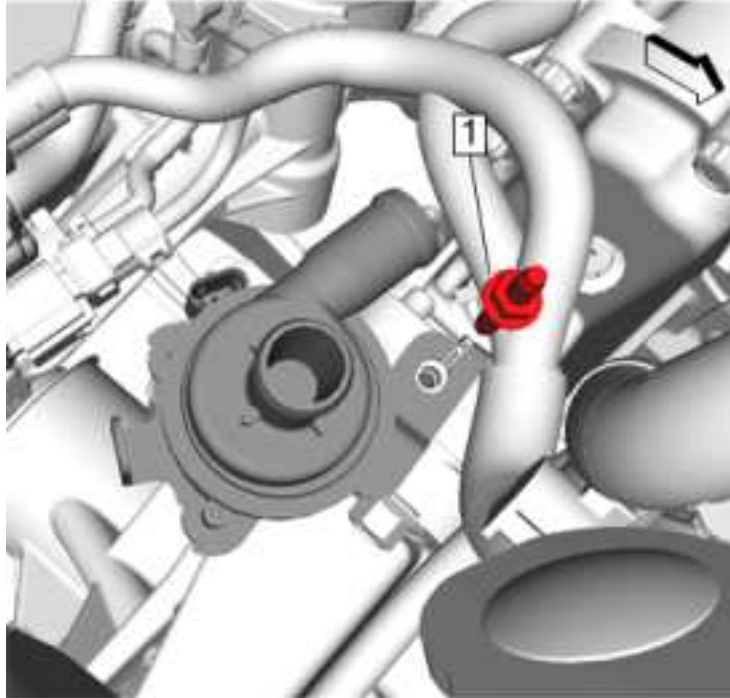


Fig. 352: Auxiliary Water Pump Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Remove Auxiliary Water Pump Bracket Bolt (1) @ Auxiliary Water Pump.

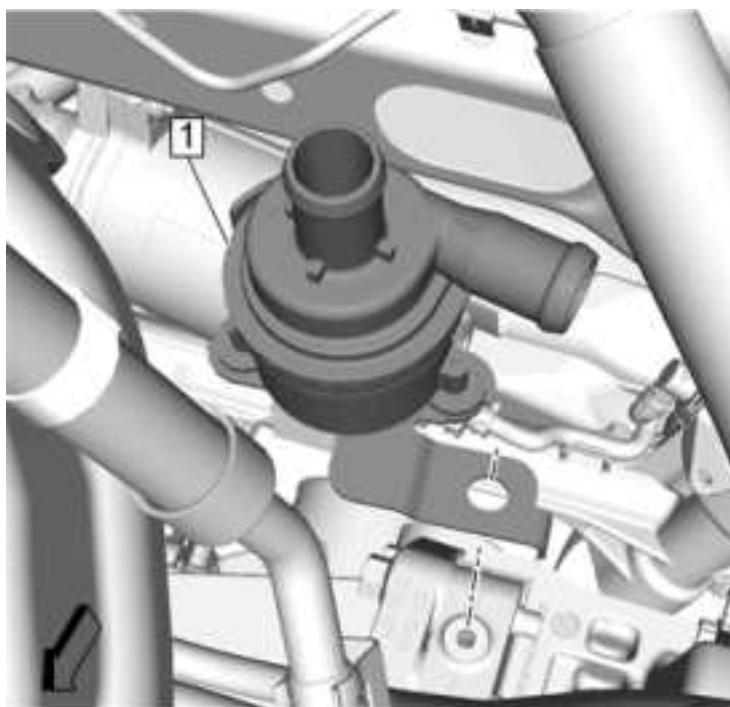


Fig. 353: Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

11. Remove Auxiliary Water Pump (1).

Installation Procedure

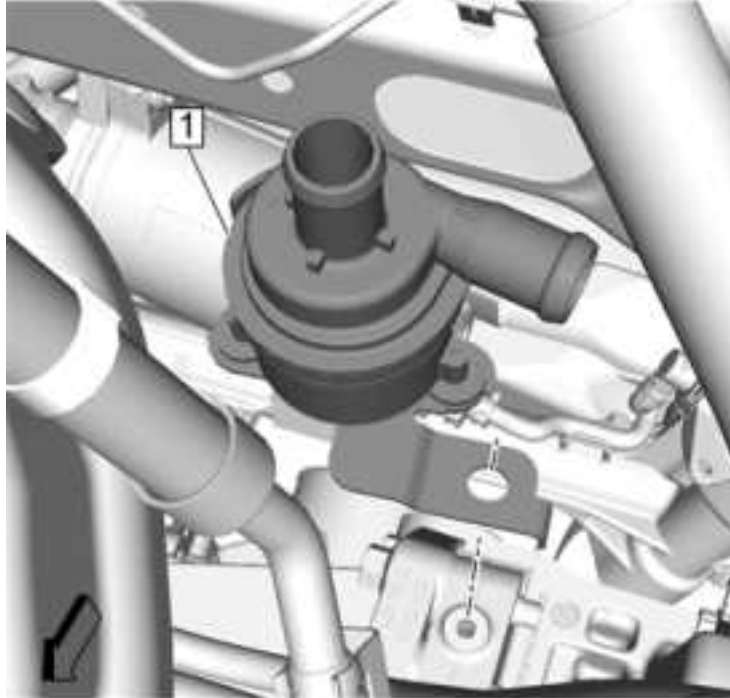


Fig. 354: Auxiliary Water Pump

Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Water Pump (1).

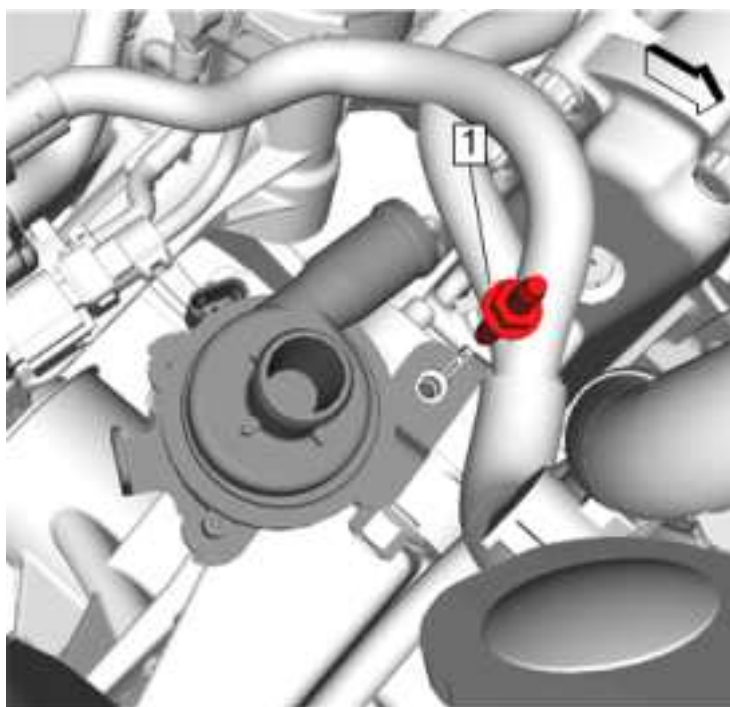


Fig. 355: Auxiliary Water Pump Bracket Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install Auxiliary Water Pump Bracket Bolt (1) @ Auxiliary Water Pump and tighten 22 N.m (16 lb ft)

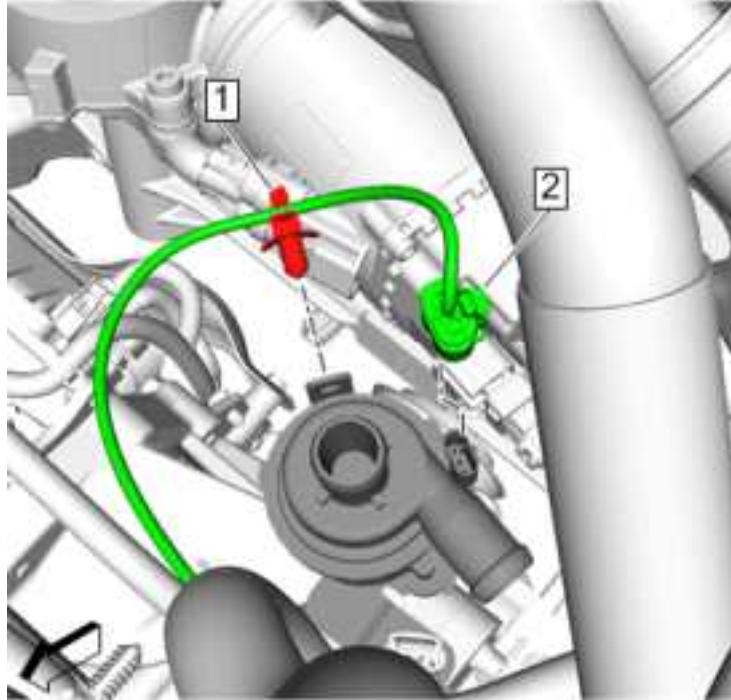


Fig. 356: Engine Wiring Harness Retainer And Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

3. Connect Electrical Connector (2) @ Auxiliary Water Pump
4. Install Engine Wiring Harness Retainer (1) @ Auxiliary Water Pump
5. Install Auxiliary Heater Outlet Hose [Auxiliary Heater Outlet Hose Replacement \(LTG with KL9\)](#)
6. Install Heater Water Auxiliary Pump Inlet Hose - [Heater Water Auxiliary Pump Inlet Hose Replacement \(LTG with KL9\)](#)

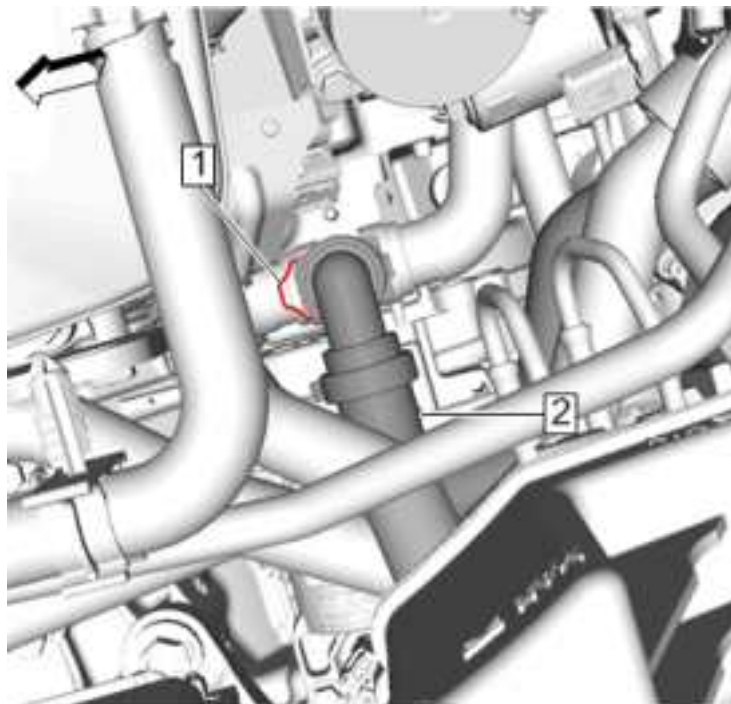


Fig. 357: Heater Water Auxiliary Pump Hose
 Courtesy of GENERAL MOTORS COMPANY

7. Install Heater Water Auxiliary Pump Hose (2) @ Heater Water Auxiliary Pump Inlet Hose - [Heater Water Auxiliary Pump Hose Replacement \(LTG with KL9\)](#)
8. Position the wiring harness.
9. Install Power Transfer Unit Vent Hose - [Power Transfer Unit Vent Hose Replacement](#)
10. Install Engine Coolant Air Bleed Hose - [Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG\)](#)
11. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)

12. Check the cooling system for leaks.

AUXILIARY WATER PUMP REPLACEMENT (LH7 TERRAIN)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
2. Lower the vehicle.
3. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)

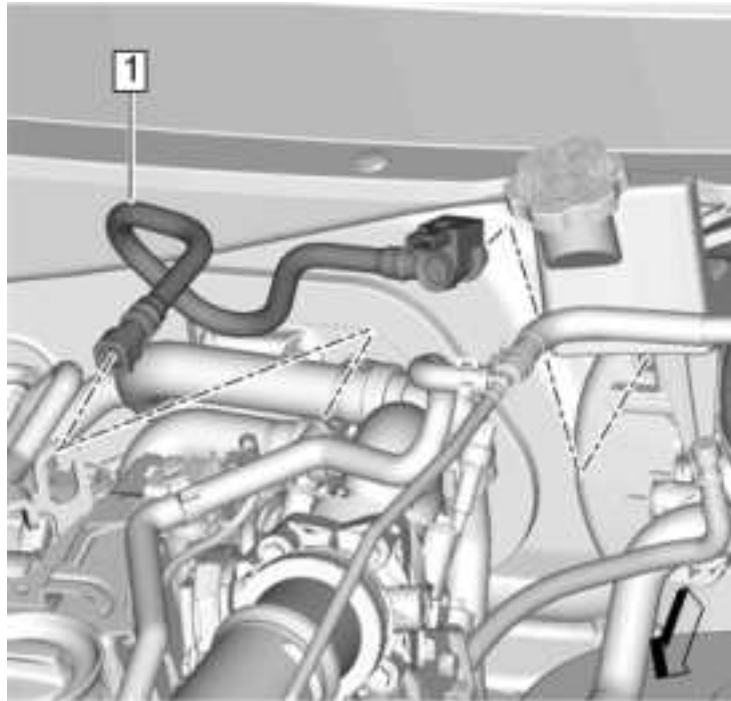


Fig. 358: Power Brake Booster Vacuum Pipe

Courtesy of GENERAL MOTORS COMPANY

4. Remove Power Brake Booster Vacuum Pipe (1). [Power Brake Booster Vacuum Pipe Replacement \(LH7\)](#)

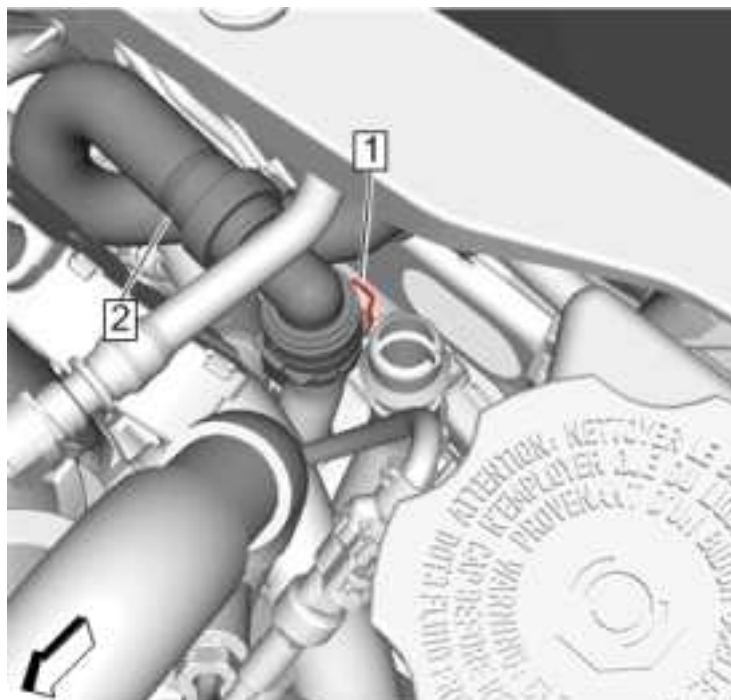


Fig. 359: Auxiliary Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

5. Remove Auxiliary Heater Outlet Hose (2) - [Auxiliary Heater Outlet Hose Replacement \(LH7 Terrain\)](#)

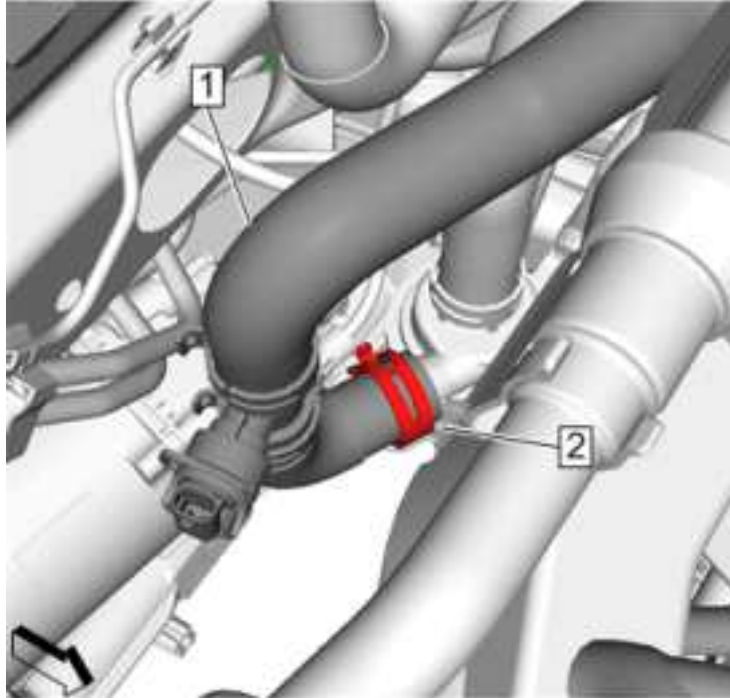


Fig. 360: Heater Water Auxiliary Pump Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

6. Remove Heater Water Auxiliary Pump Hose (1) @ Auxiliary Water Pump - **Heater Water Auxiliary Pump Hose Replacement (LH7 Terrain)**

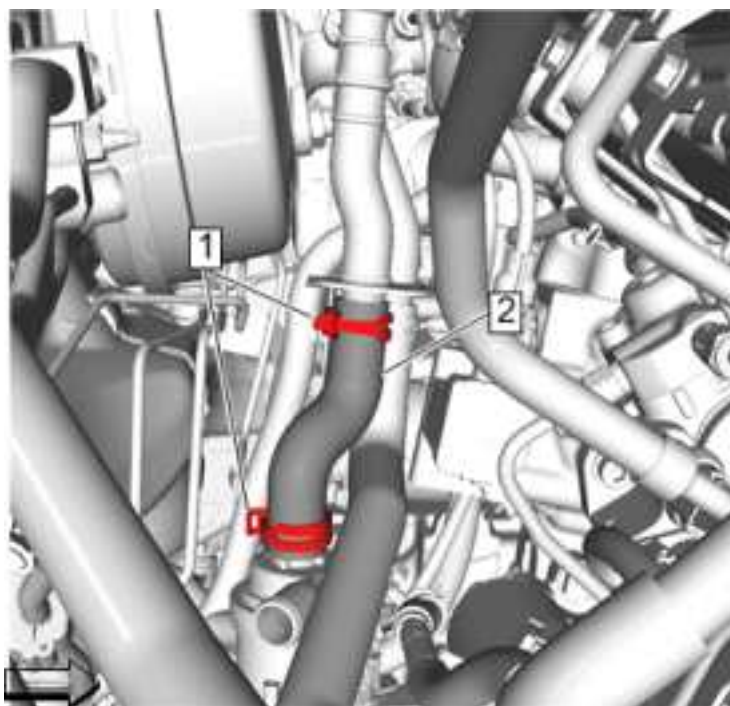


Fig. 361: Heater Water Auxiliary Pump Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

7. Remove Heater Water Auxiliary Pump Inlet Hose (2) @ Heater Inlet and Outlet Bracket - **Heater Water Auxiliary Pump Inlet Hose Replacement (LH7 Terrain)**

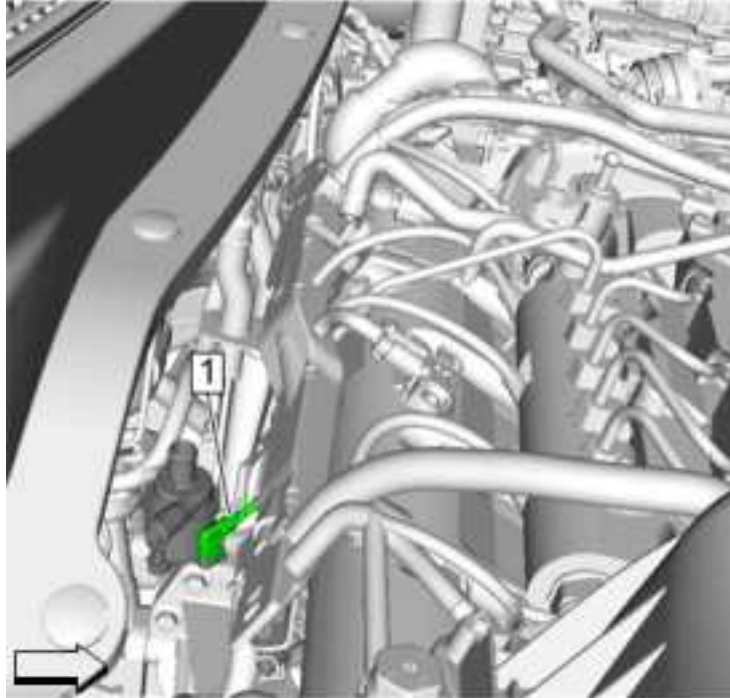


Fig. 362: Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

8. Remove Electrical Connector (1) @ Auxiliary Water Pump.

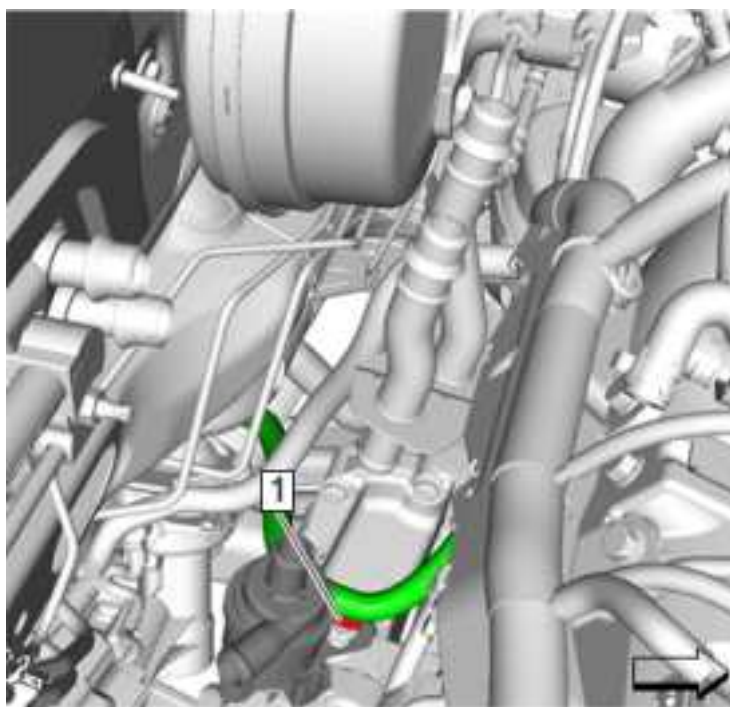


Fig. 363: Engine Wiring Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Wiring Harness Retainer (1).

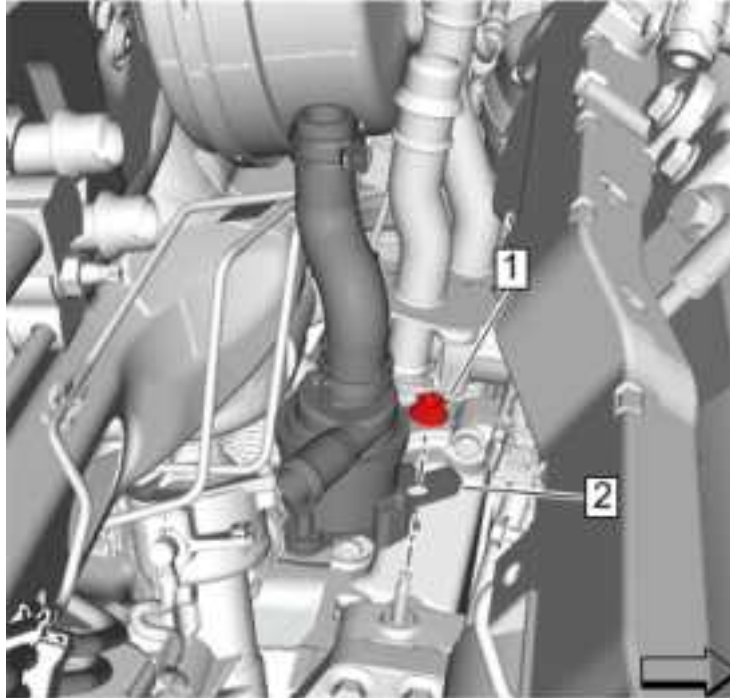


Fig. 364: Auxiliary Water Pump Bracket Nut And Auxiliary Water Pump
Courtesy of GENERAL MOTORS COMPANY

10. Remove Auxiliary Water Pump Bracket Nut (1).
11. Remove Auxiliary Water Pump (2).

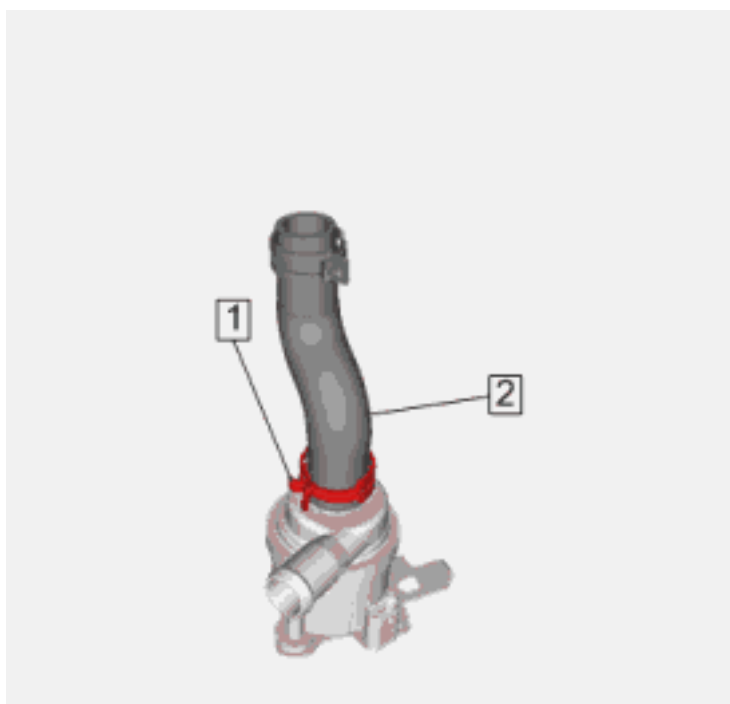


Fig. 365: Heater Water Auxiliary Pump Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

12. Disengage Heater Water Auxiliary Pump Inlet Hose Clamp (1) - **Hose Clamp Replacement Guidelines - Spring Type**
13. Remove Heater Water Auxiliary Pump Hose (2) @ Auxiliary Water Pump.

Installation Procedure

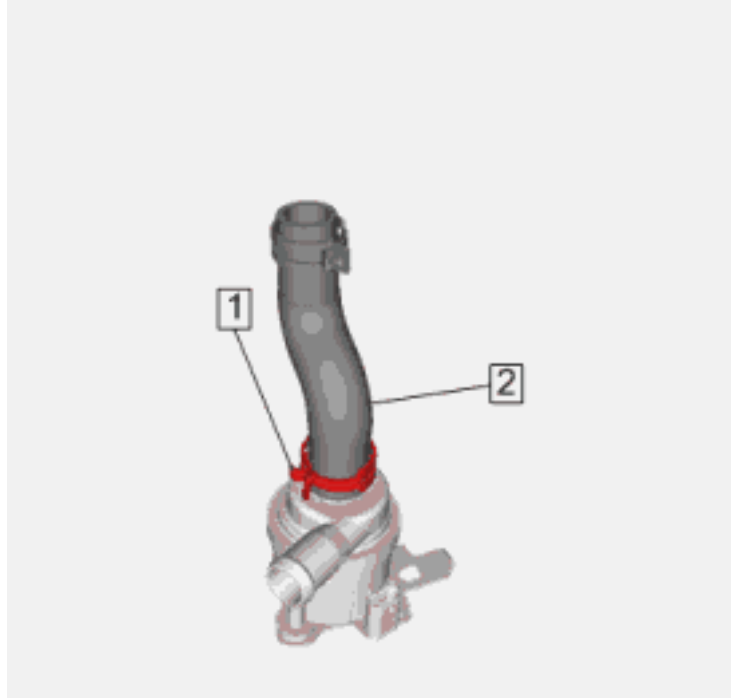


Fig. 366: Heater Water Auxiliary Pump Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

1. Install Heater Water Auxiliary Pump Hose (2) @ Auxiliary Water Pump
2. Engage Heater Water Auxiliary Pump Inlet Hose Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)

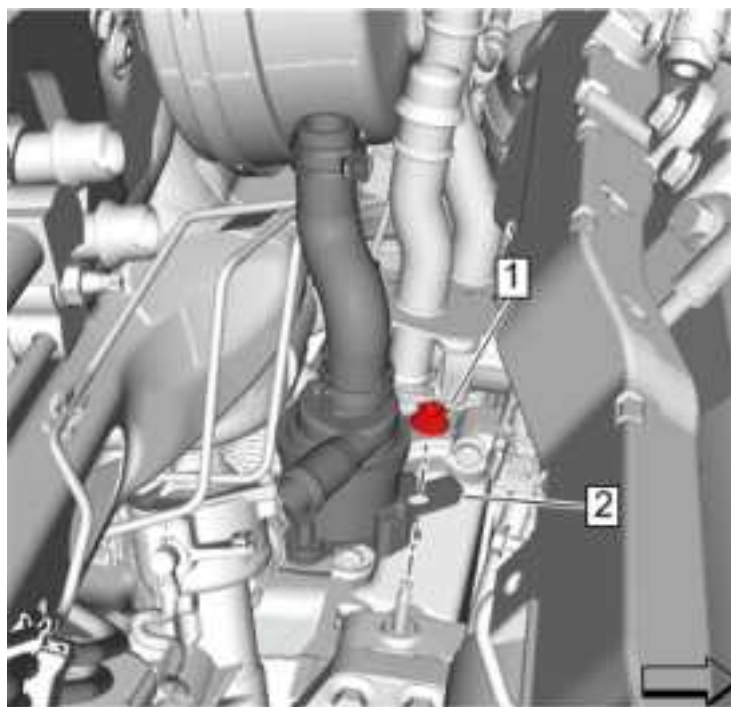


Fig. 367: Auxiliary Water Pump Bracket Nut And Auxiliary Water Pump

Courtesy of GENERAL MOTORS COMPANY

3. Install Auxiliary Water Pump (2)

CAUTION: Refer to [Fastener Caution](#) .

4. Install Auxiliary Water Pump Bracket Nut (1) and tighten 22 N.m (16 lb ft)

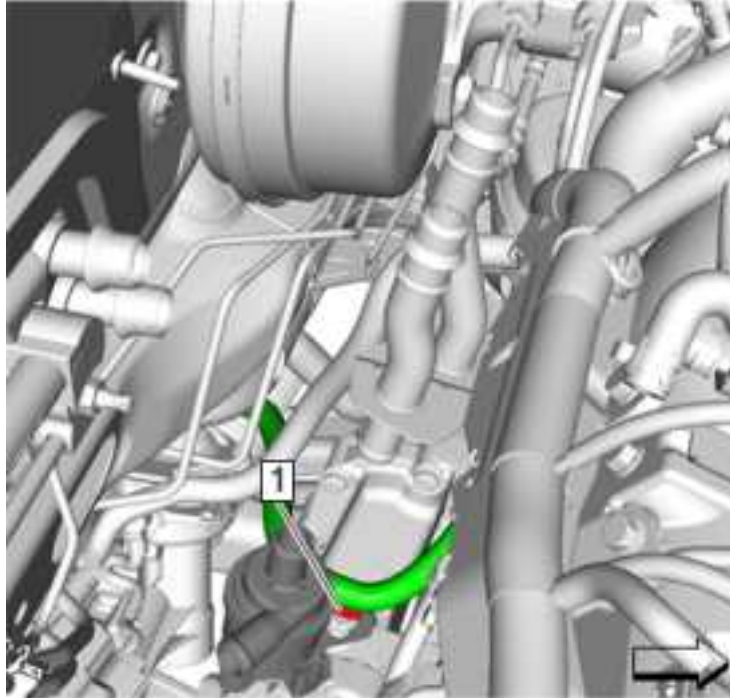


Fig. 368: Engine Wiring Harness Retainer
Courtesy of GENERAL MOTORS COMPANY

5. Install Engine Wiring Harness Retainer (1)

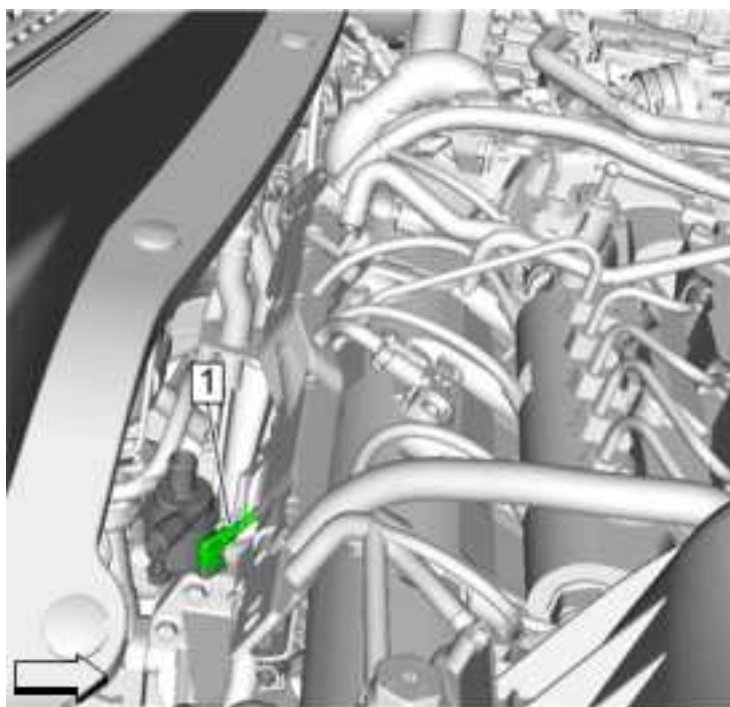


Fig. 369: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

6. Install Electrical Connector (1) @ Auxiliary Water Pump

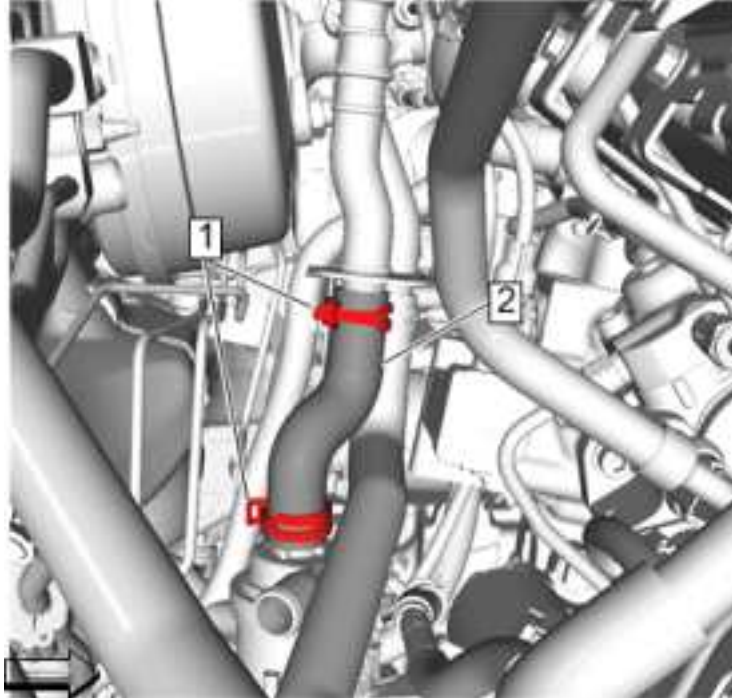


Fig. 370: Heater Water Auxiliary Pump Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

7. Install Heater Water Auxiliary Pump Inlet Hose (2) @ Heater Inlet and Outlet Bracket - **Heater Water Auxiliary Pump Inlet Hose Replacement (LH7 Terrain)**

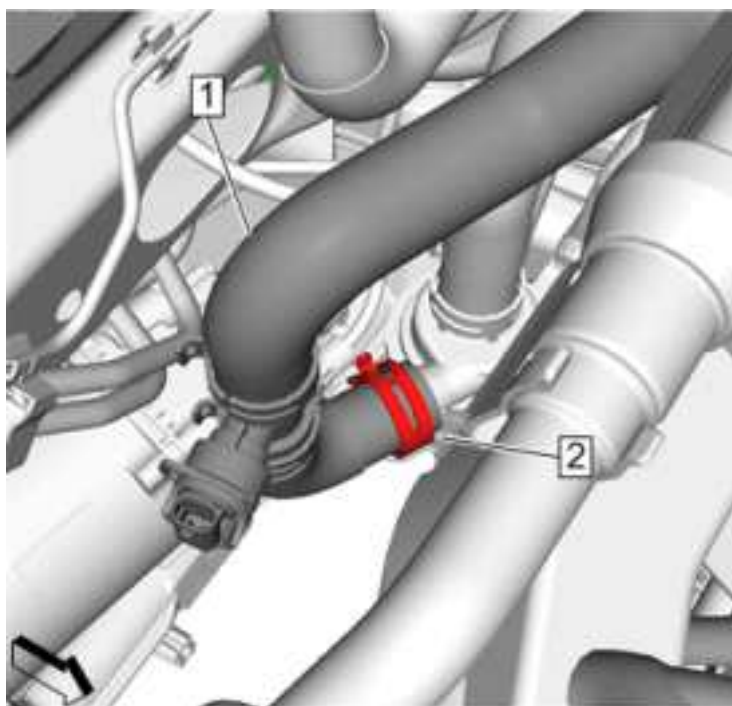


Fig. 371: Heater Water Auxiliary Pump Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

8. Install Heater Water Auxiliary Pump Hose (1) @ Auxiliary Water Pump - **Heater Water Auxiliary Pump Hose Replacement (LH7 Terrain)**

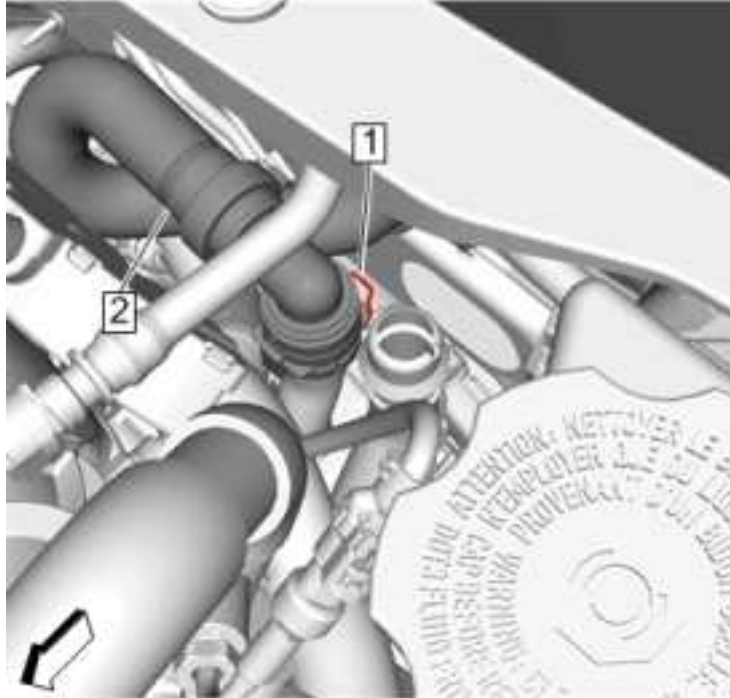


Fig. 372: Auxiliary Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

9. Install Auxiliary Heater Outlet Hose (2) - [Auxiliary Heater Outlet Hose Replacement \(LH7 Terrain\)](#)

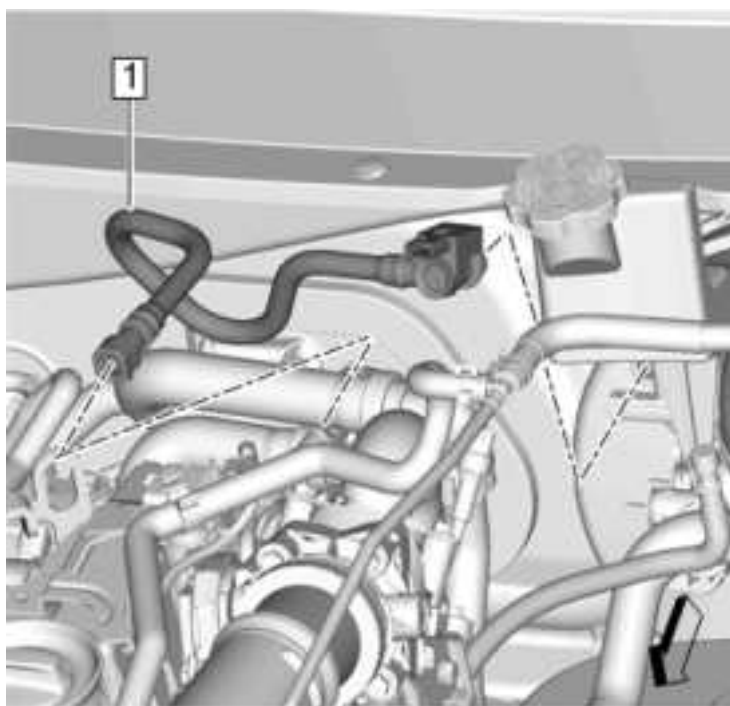


Fig. 373: Power Brake Booster Vacuum Pipe

Courtesy of GENERAL MOTORS COMPANY

10. Install Power Brake Booster Vacuum Pipe (1) [Power Brake Booster Vacuum Pipe Replacement \(LH7\)](#)
11. Install Intake Manifold Cover - [Intake Manifold Cover Replacement](#)
12. Fill the cooling system to the proper level. [Cooling System Draining and Filling \(GE 47716\) Cooling System Draining and Filling \(Static\)](#)
13. Check the cooling system for leaks.

ENGINE COOLANT TEMPERATURE SENSOR REPLACEMENT (LH7)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)
2. Lower the vehicle.
3. Remove Intake Manifold Cover - [Intake Manifold Cover Replacement](#)

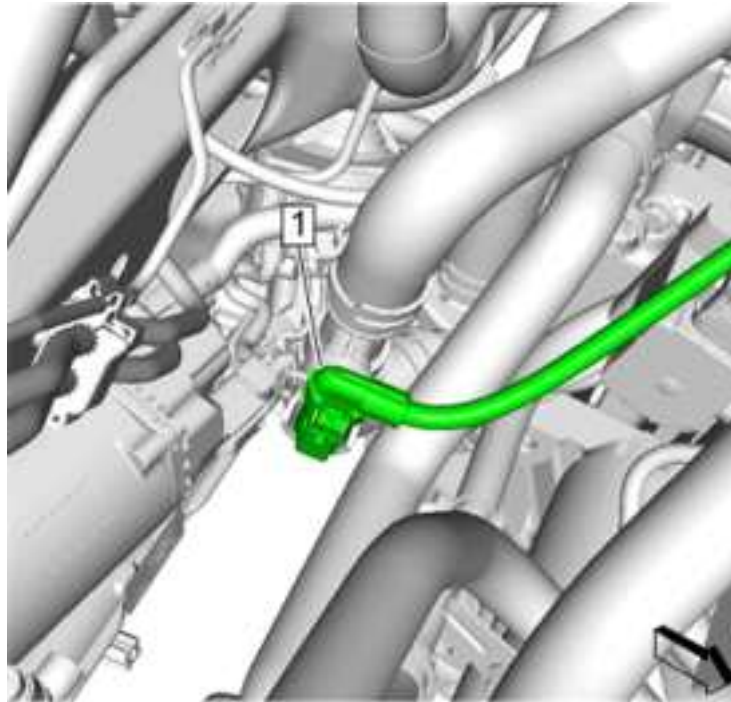


Fig. 374: Engine Coolant Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Engine Coolant Temperature Sensor Electrical Connector (1) @ Engine Coolant Temperature Sensor.

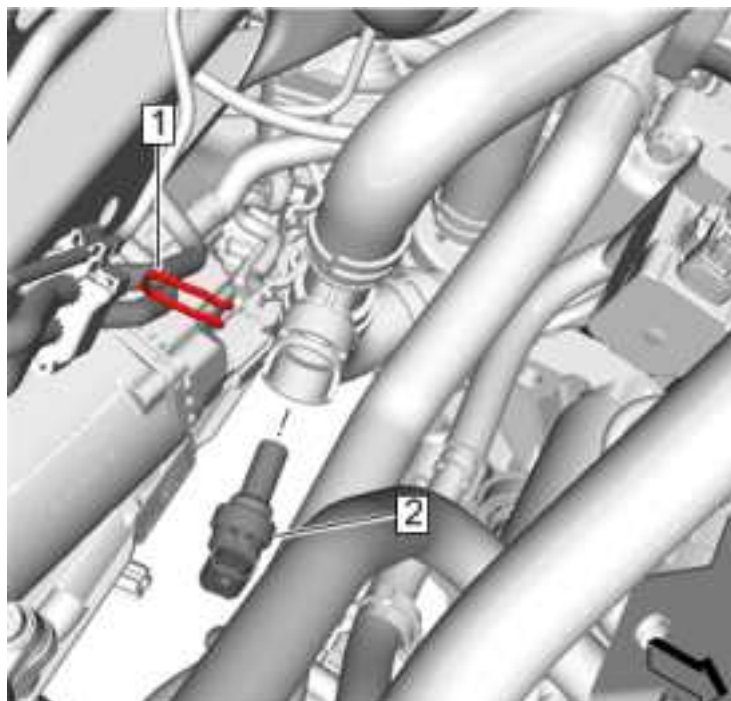


Fig. 375: Engine Coolant Temperature Sensor Retainer
Courtesy of GENERAL MOTORS COMPANY

5. Remove Engine Coolant Temperature Sensor Retainer (1)
6. Remove Engine Coolant Temperature Sensor (2) @ Heater Water Auxiliary Pump Hose

Installation Procedure

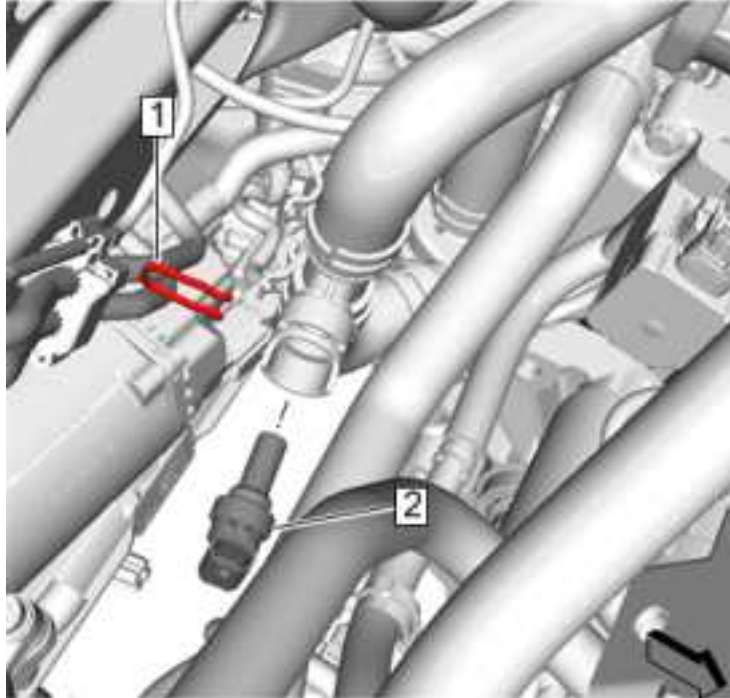


Fig. 376: Engine Coolant Temperature Sensor Retainer
 Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Temperature Sensor (2) @ Heater Water Auxiliary Pump Hose
2. Install Engine Coolant Temperature Sensor Retainer (1).

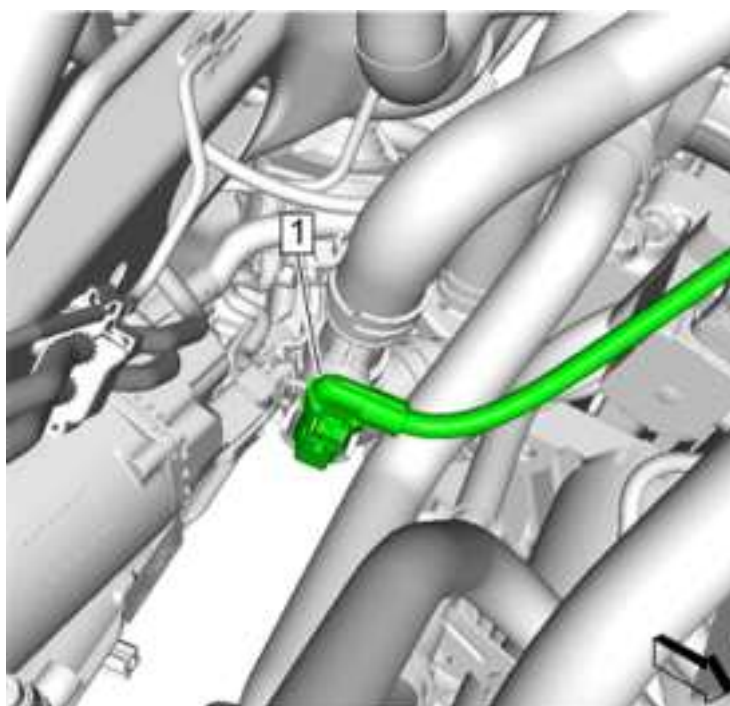


Fig. 377: Engine Coolant Temperature Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

3. Connect Engine Coolant Temperature Sensor Electrical Connector (1) @ Engine Coolant Temperature Sensor
4. Install Intake Manifold Cover - **Intake Manifold Cover Replacement**
5. Fill the cooling system. **Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static)**
6. Check the cooling system for leaks.

RADIATOR DRAIN COCK REPLACEMENT

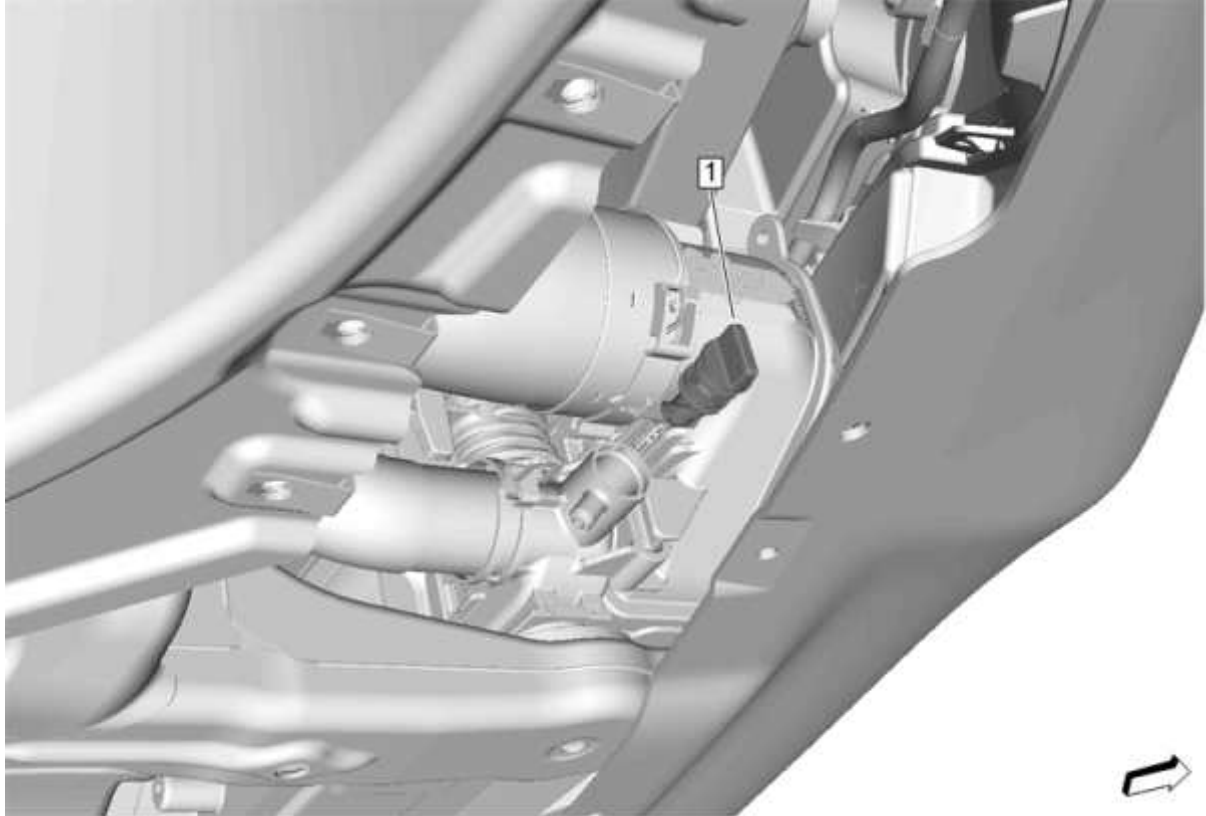


Fig. 378: Radiator Drain Cock

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Underbody Front Air Deflector Replacement (Equinox)</u> <u>Underbody Front Air Deflector Replacement (Terrain)</u> - Place a drain pan under the vehicle. - Attach a rubber hose to the radiator drain port to guide the coolant into the drain pan.	
1	Radiator Drain Cock CAUTION: Refer to <u>Fastener Caution</u> . Procedures - Remove the drain pan. - Fill the cooling system. <u>Cooling System Draining and Filling (GE 47716)</u><u>Cooling System Draining and Filling (Static)</u> - Start the engine and check for coolant leaks.

RADIATOR REPLACEMENT (LYX)

Removal Procedure

- Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)
- Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

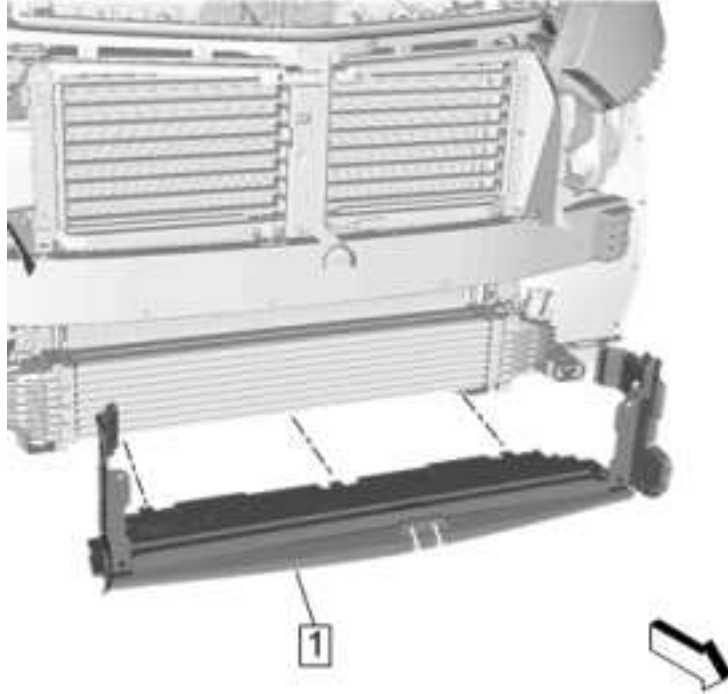


Fig. 379: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

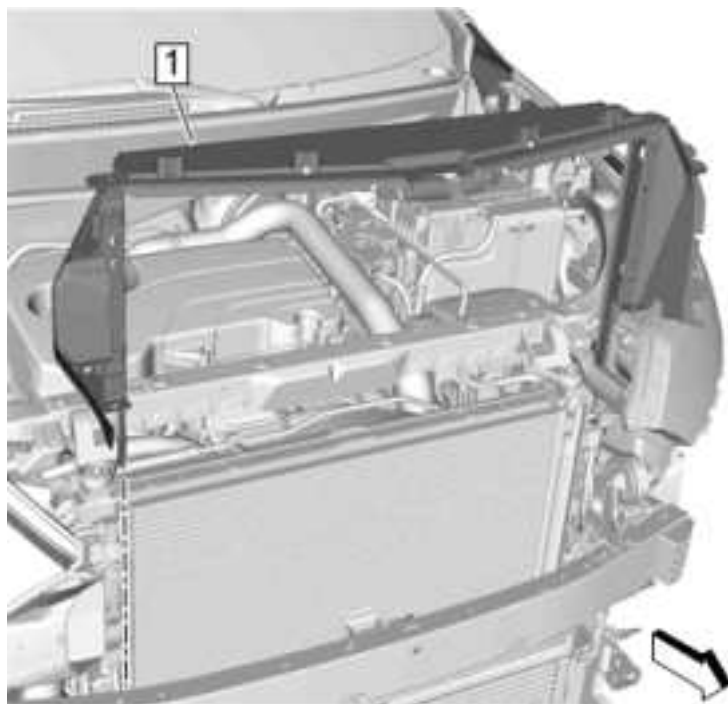


Fig. 380: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)
5. Disconnect the electrical connectors.
6. Remove Air Conditioning Condenser - [Air Conditioning Condenser Replacement](#)
7. Remove Charge Air Cooler - [Charge Air Cooler Replacement](#)

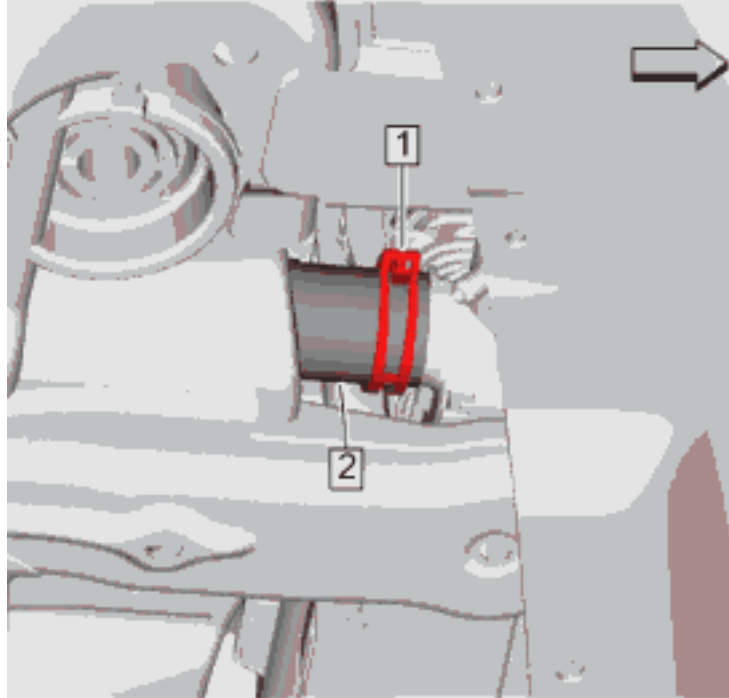


Fig. 381: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Outlet Hose (2) @ Radiator **Radiator Outlet Hose Replacement (LYX)**

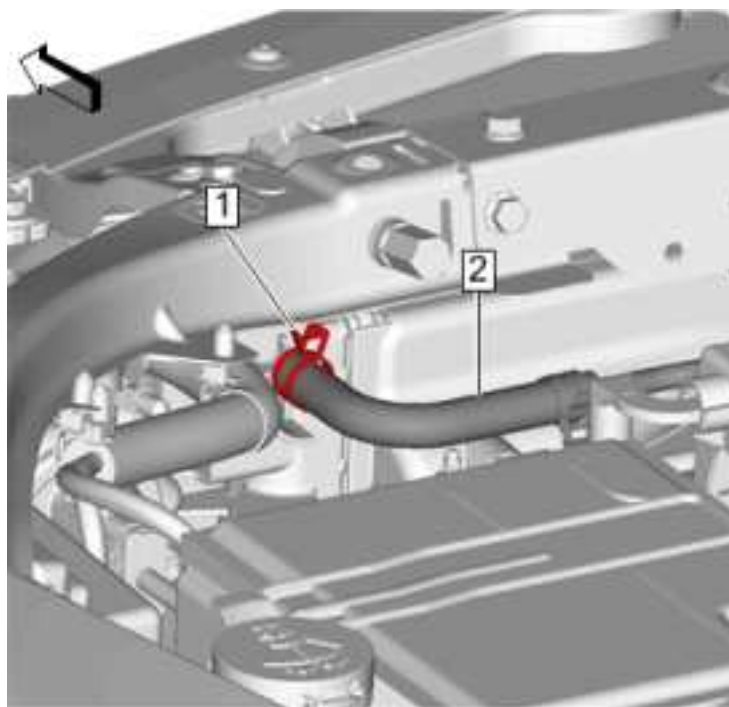


Fig. 382: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Turbocharger Coolant Return pipe to Water Outlet, LYX)****Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX)**

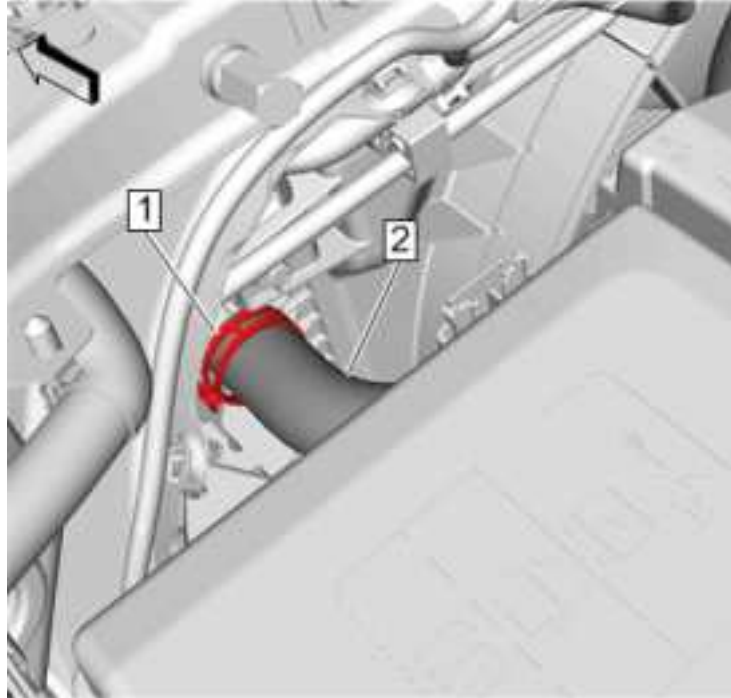


Fig. 383: Radiator Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Inlet Hose (2) @ - Radiator **Radiator Inlet Hose Replacement (LYX)**

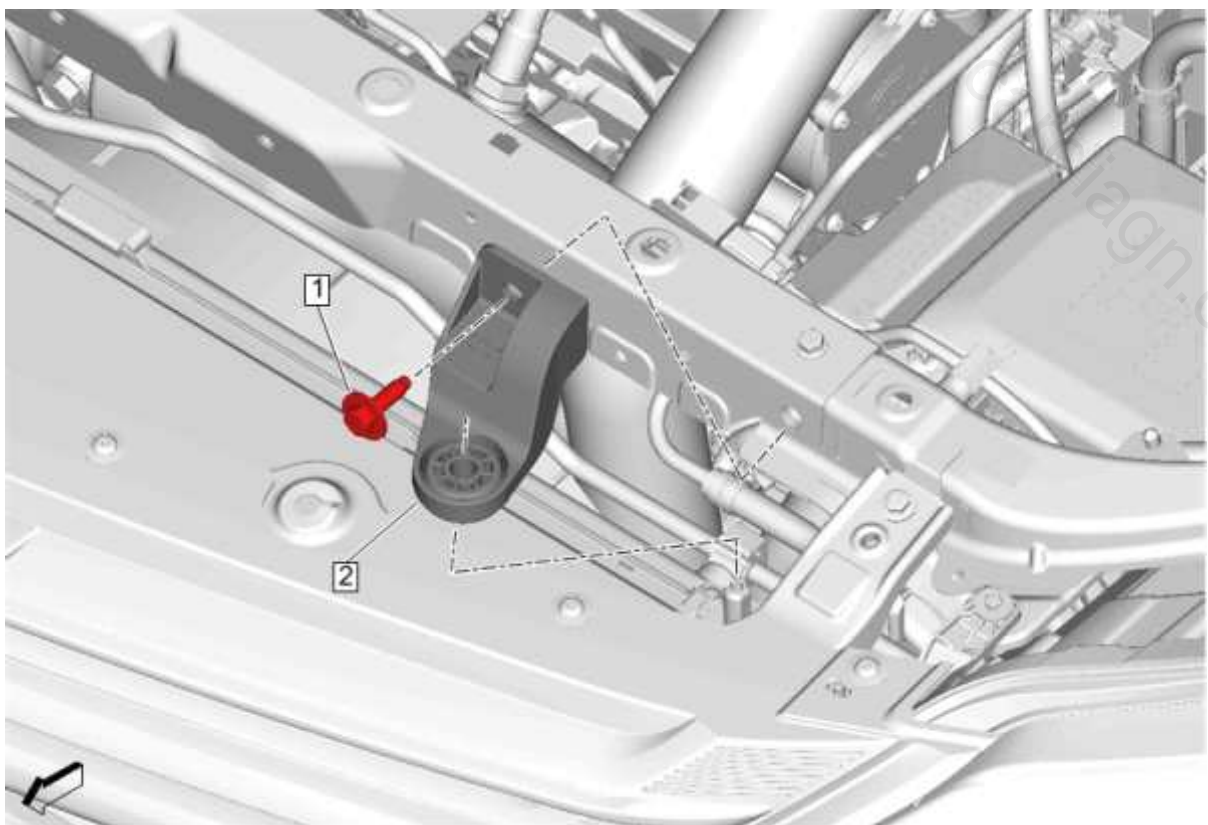


Fig. 384: Radiator Upper Bracket-Left Side

Courtesy of GENERAL MOTORS COMPANY

11. Remove Radiator Upper Bracket - Left Side (2) - **Radiator Upper Bracket Replacement - Left Side**

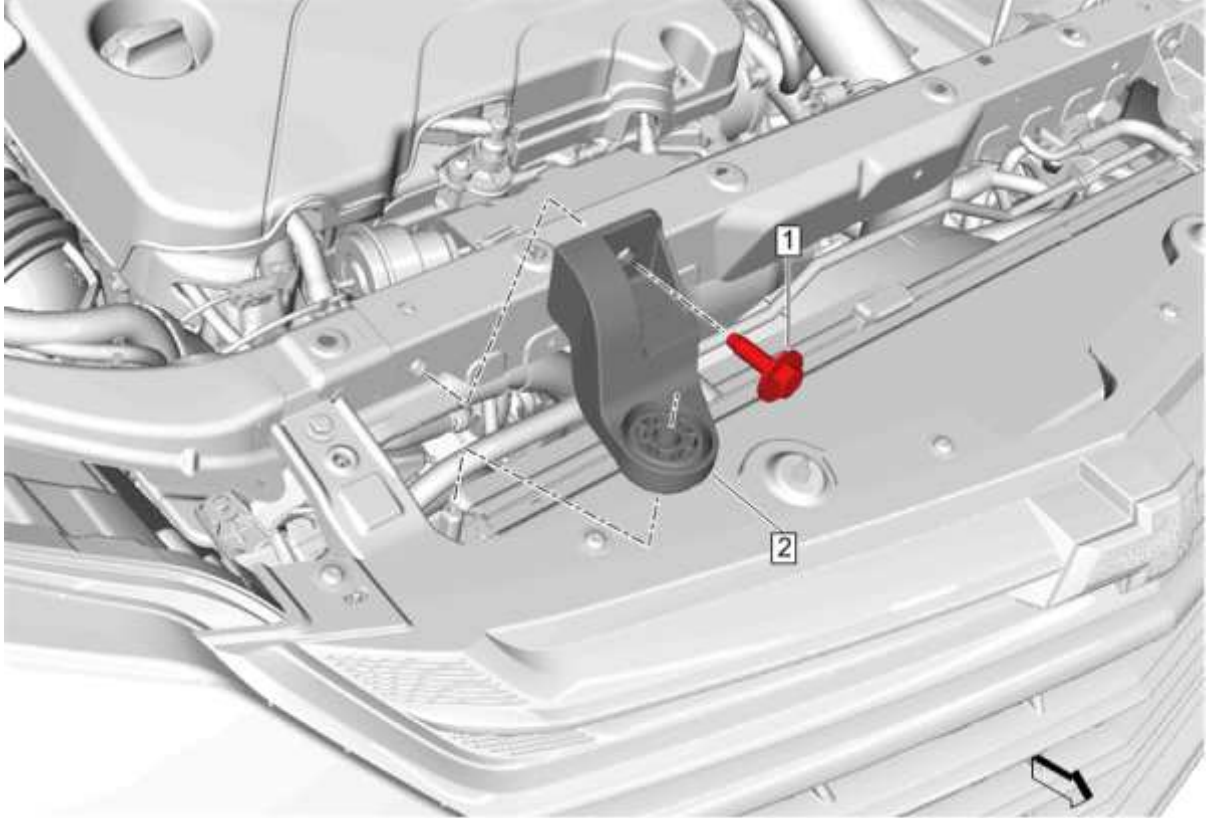


Fig. 385: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

12. Remove Radiator Upper Bracket - Right Side (2) - **Radiator Upper Bracket Replacement - Right Side**

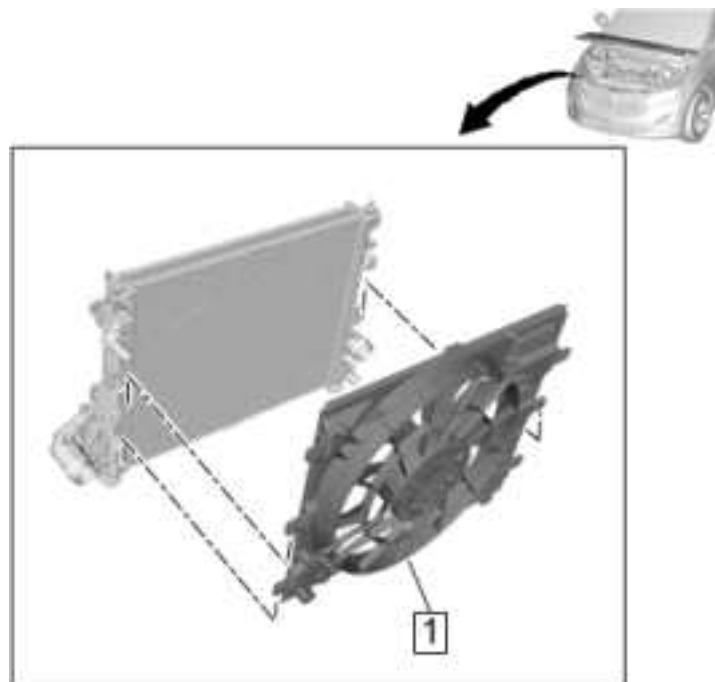


Fig. 386: Engine Coolant Fan
 Courtesy of GENERAL MOTORS COMPANY

13. Remove Engine Coolant Fan (1) @ Radiator - **Engine Coolant Fan Replacement (LYX)**

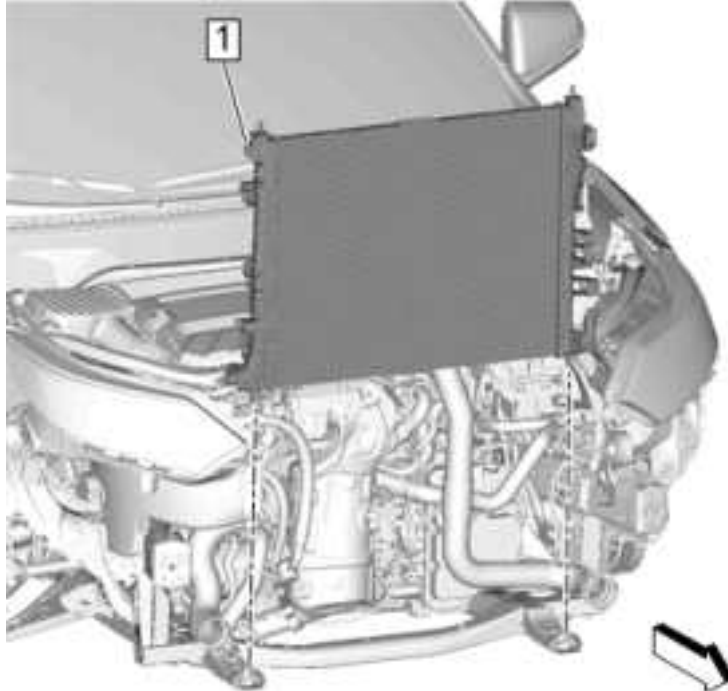


Fig. 387: Radiator

Courtesy of GENERAL MOTORS COMPANY

14. Remove Radiator (1)
15. Transfer components as necessary.

Installation Procedure

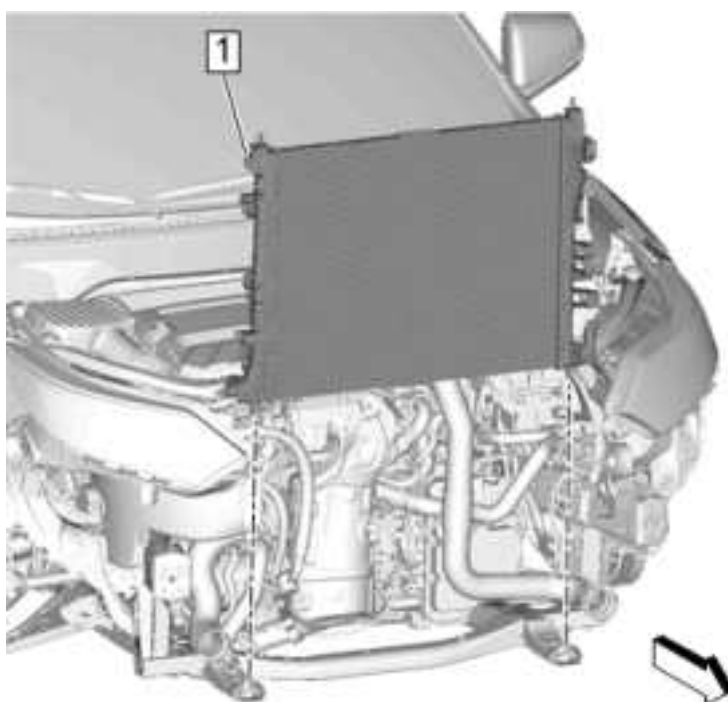


Fig. 388: Radiator

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)

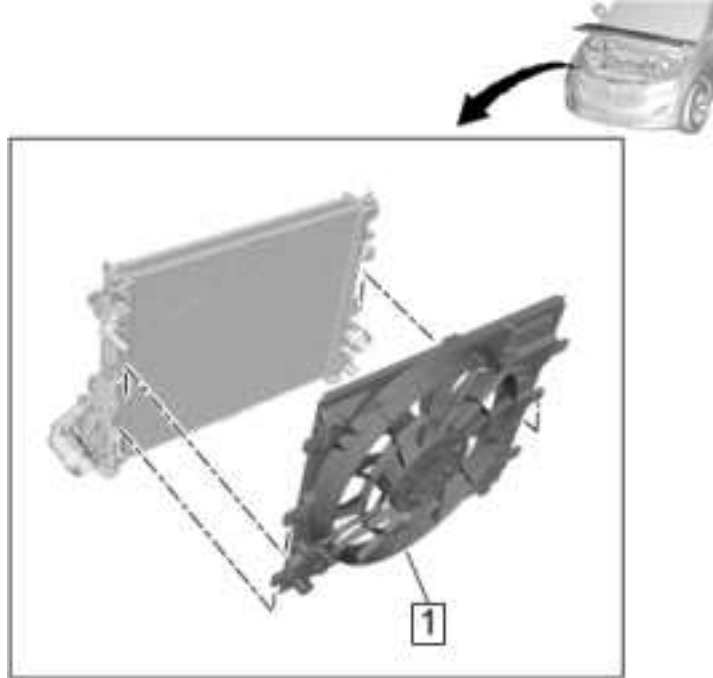


Fig. 389: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

2. Install Engine Coolant Fan (1) @ Radiator - [Engine Coolant Fan Replacement \(LYX\)](#)

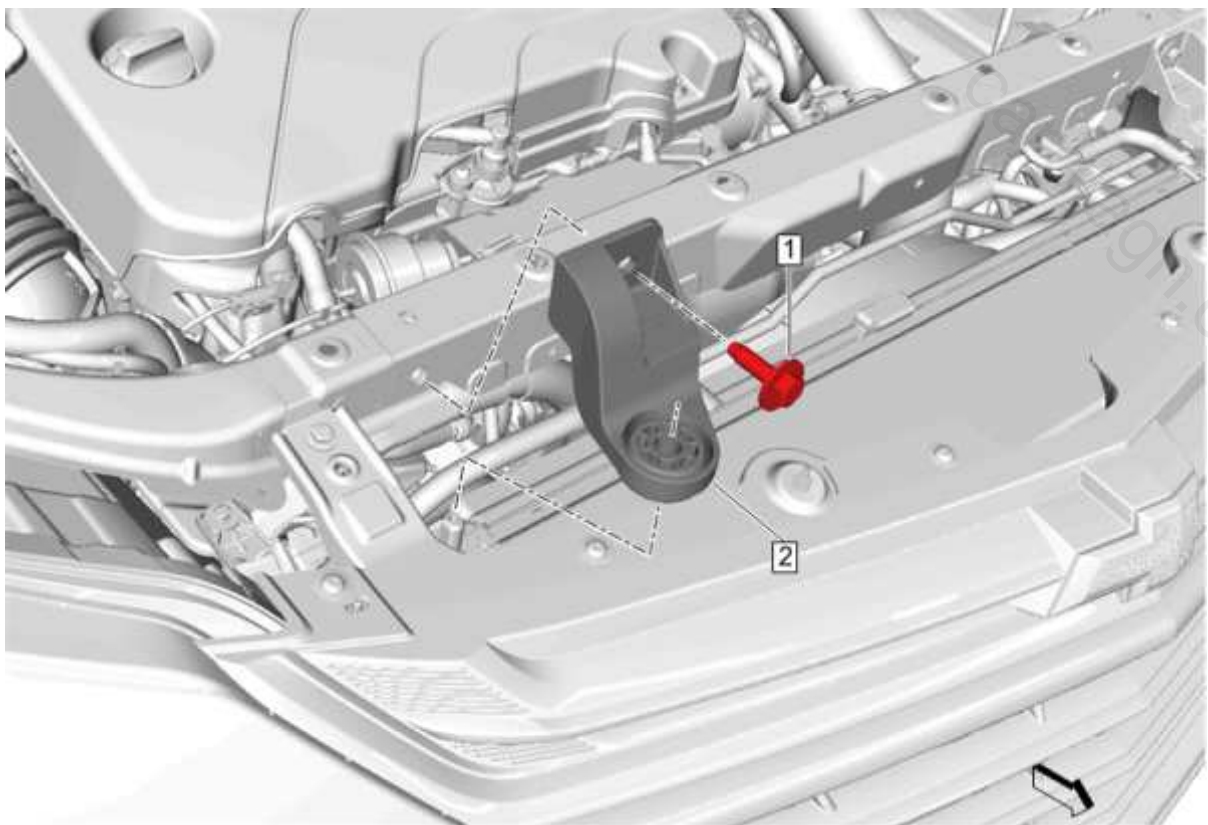


Fig. 390: Radiator Upper Bracket-Right Side

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Upper Bracket-Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)

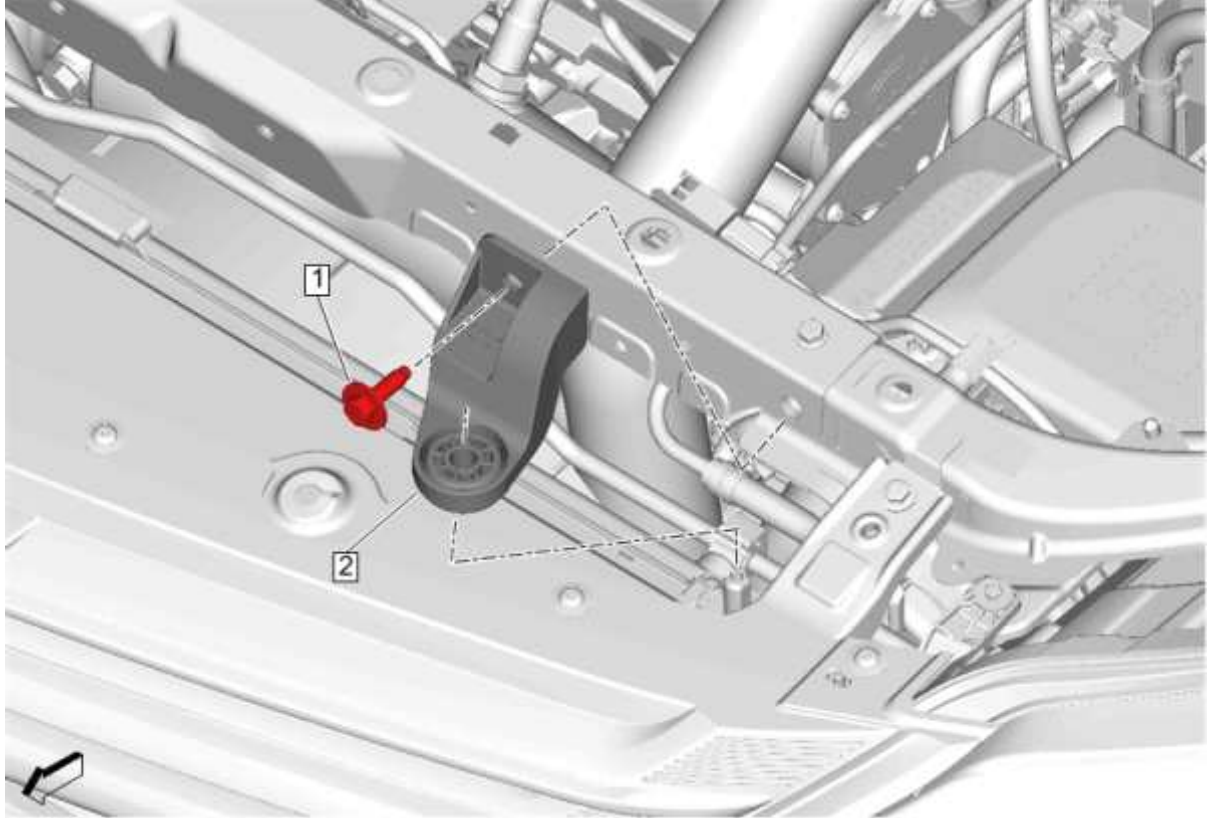


Fig. 391: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Upper Bracket-Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

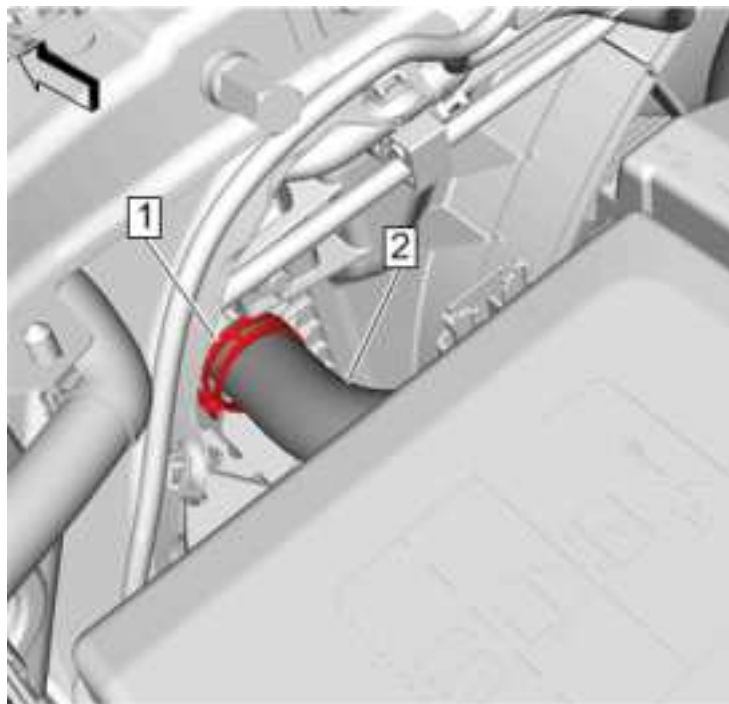


Fig. 392: Radiator Inlet Hose
 Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Inlet Hose (2) @ Radiator - [Radiator Inlet Hose Replacement \(LYX\)](#)

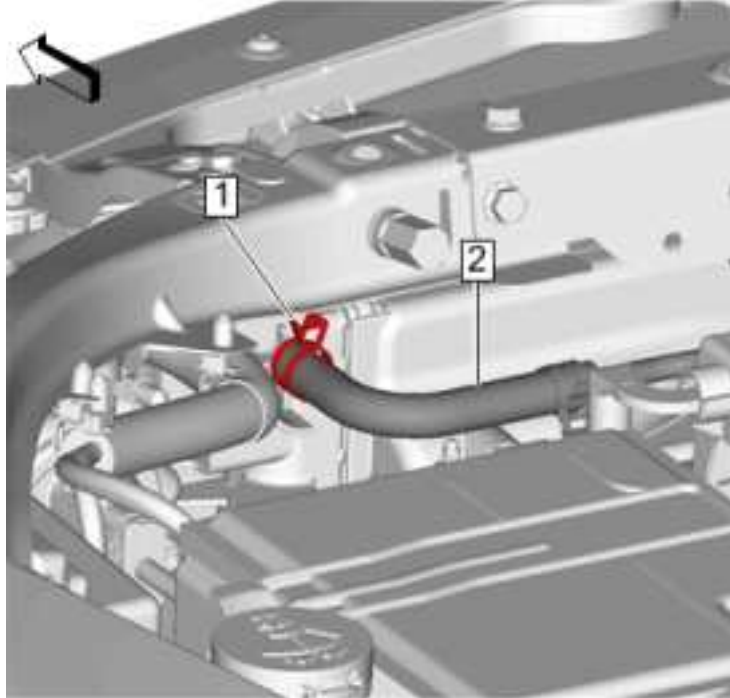


Fig. 393: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - [Engine Coolant Air Bleed Hose Replacement \(Turbocharger Coolant Return pipe to Water Outlet, LYX\)](#)[Engine Coolant Air Bleed Hose Replacement \(Radiator Surge Tank to Turbocharger Coolant Return Pipe to Radiator, LYX\)](#)

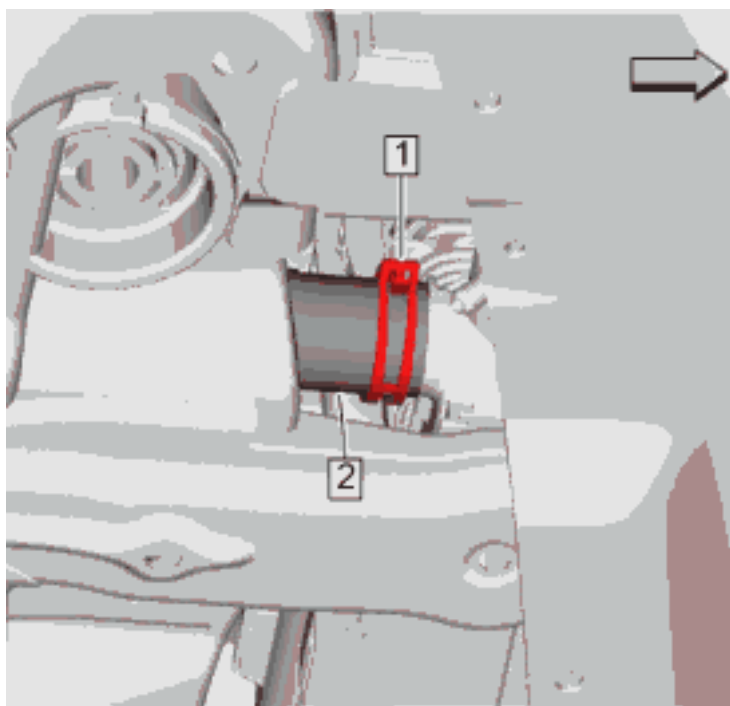


Fig. 394: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Outlet Hose (2) @ Radiator - [Radiator Outlet Hose Replacement \(LYX\)](#)
8. Install Charge Air Cooler - [Charge Air Cooler Replacement](#)
9. Install Air Conditioning Condenser - [Air Conditioning Condenser Replacement](#)
10. Connect the electrical connectors.

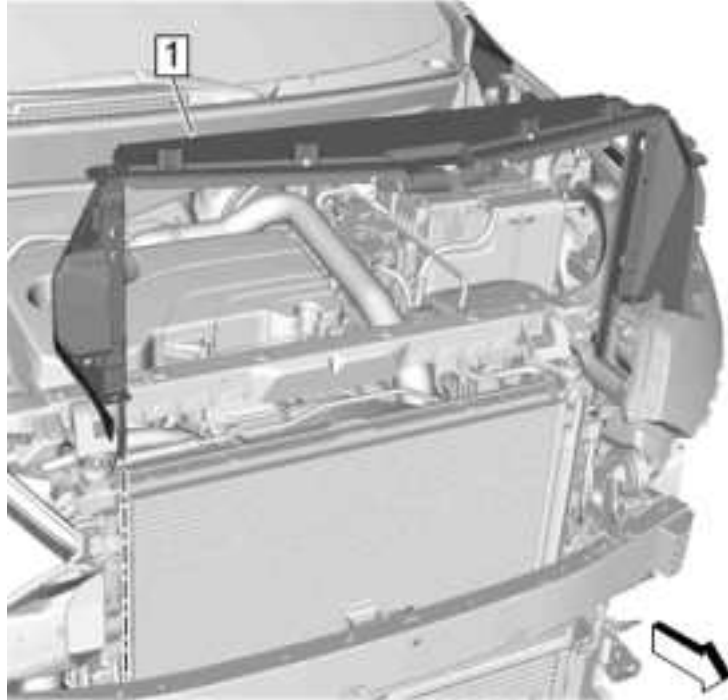


Fig. 395: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)

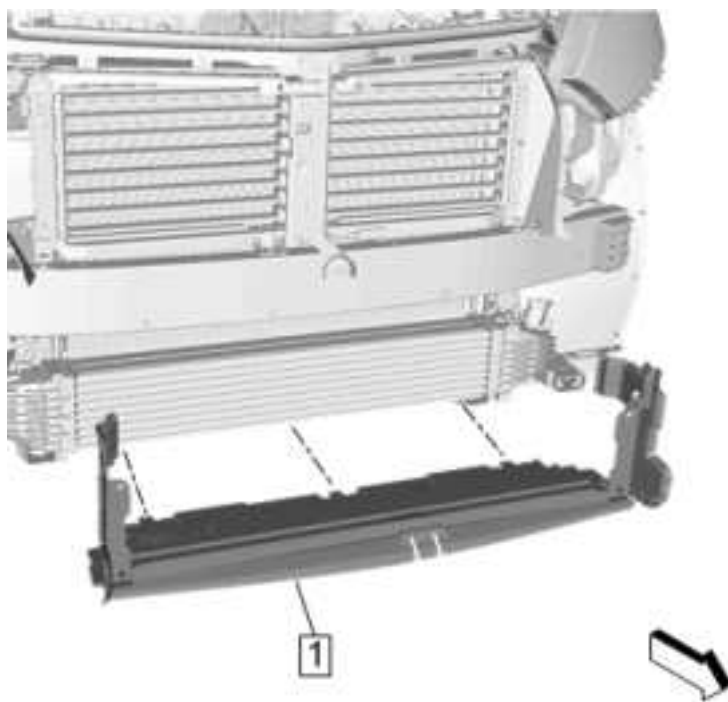


Fig. 396: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)
13. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
14. Start the engine and check for coolant leaks.
15. Install Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\) Front Bumper Fascia Replacement \(Terrain\)](#)

RADIATOR REPLACEMENT (LTG)

Removal Procedure

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\) Front Bumper Fascia Replacement \(Terrain\)](#)

2. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

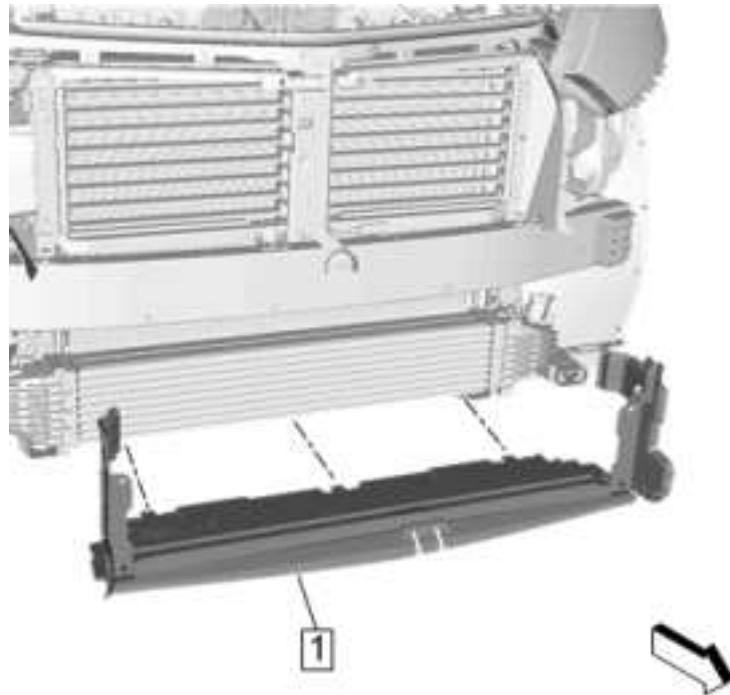


Fig. 397: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

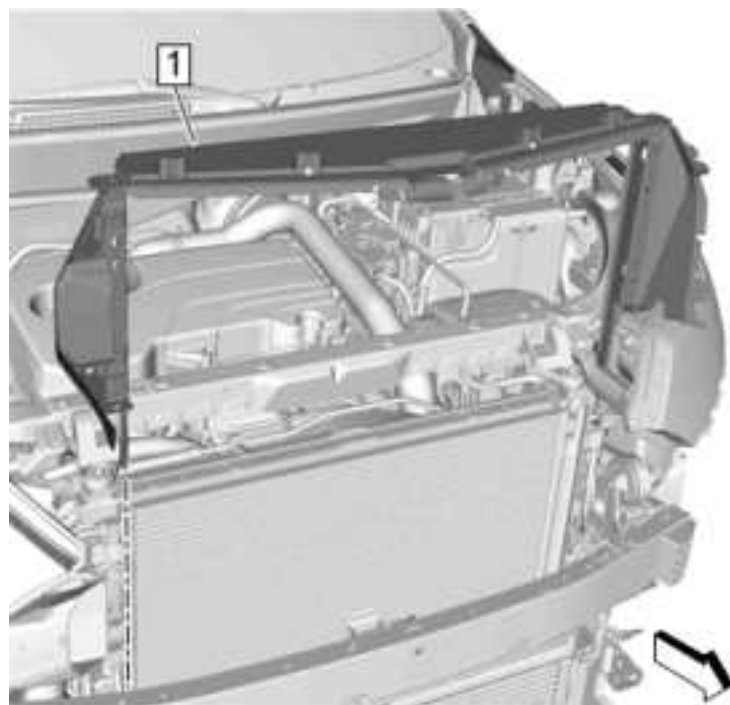


Fig. 398: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)
5. Disconnect the electrical connectors.
6. Remove Air Conditioning Condenser - [Air Conditioning Condenser Replacement](#)

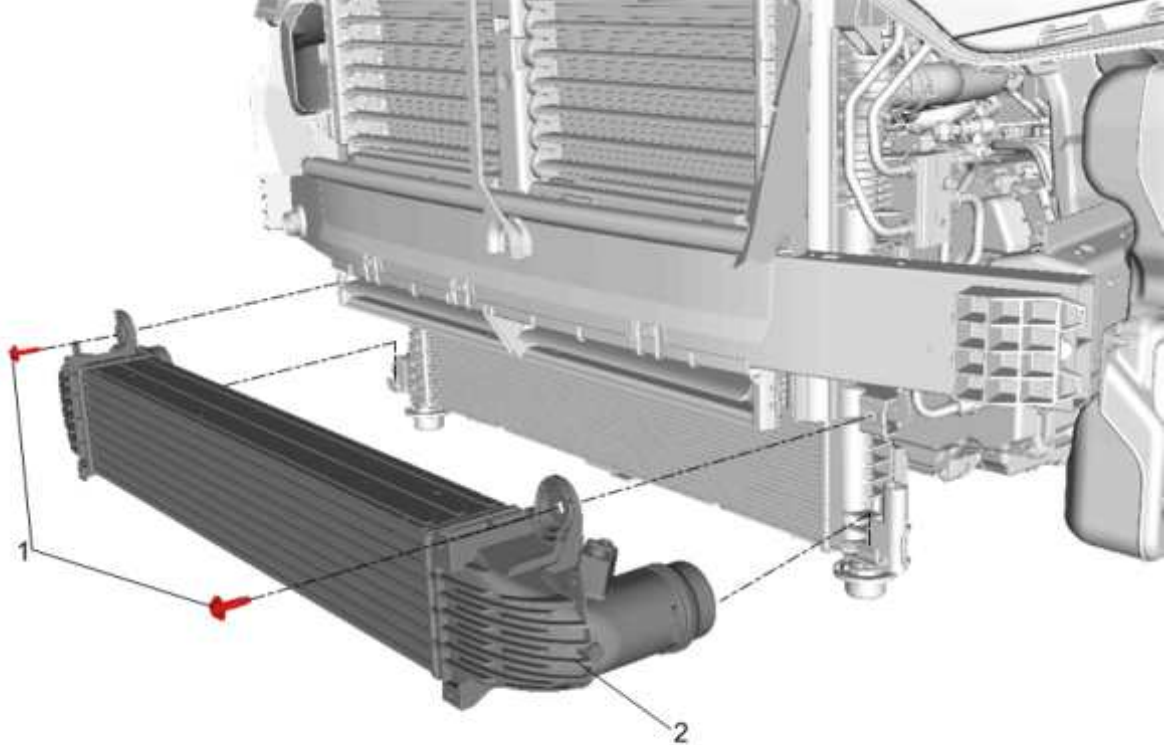


Fig. 399: Charge Air Cooler

Courtesy of GENERAL MOTORS COMPANY

7. Remove Charge Air Cooler (2) [Charge Air Cooler Replacement](#)

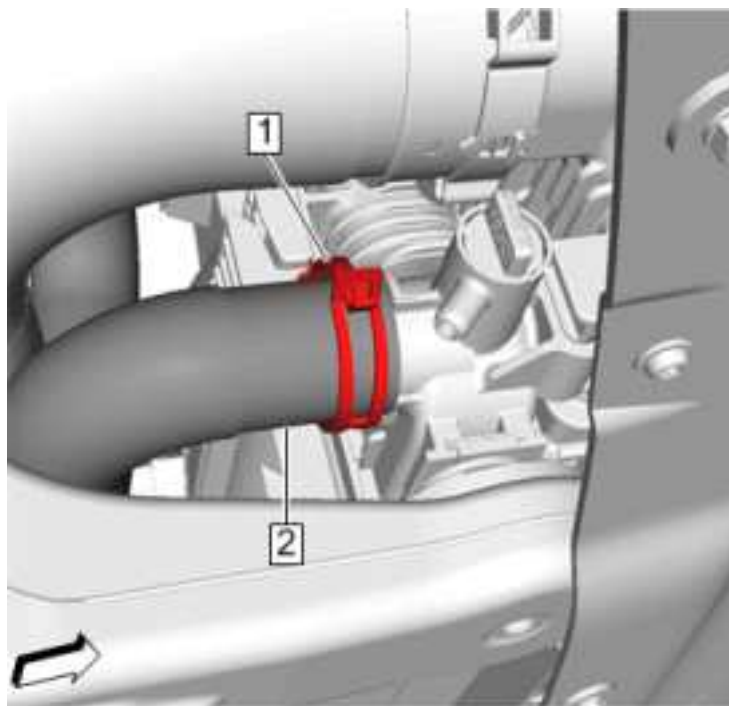


Fig. 400: Radiator Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Outlet Hose (2) @ Radiator - [Radiator Outlet Hose Replacement \(LTG with KL9\)](#)

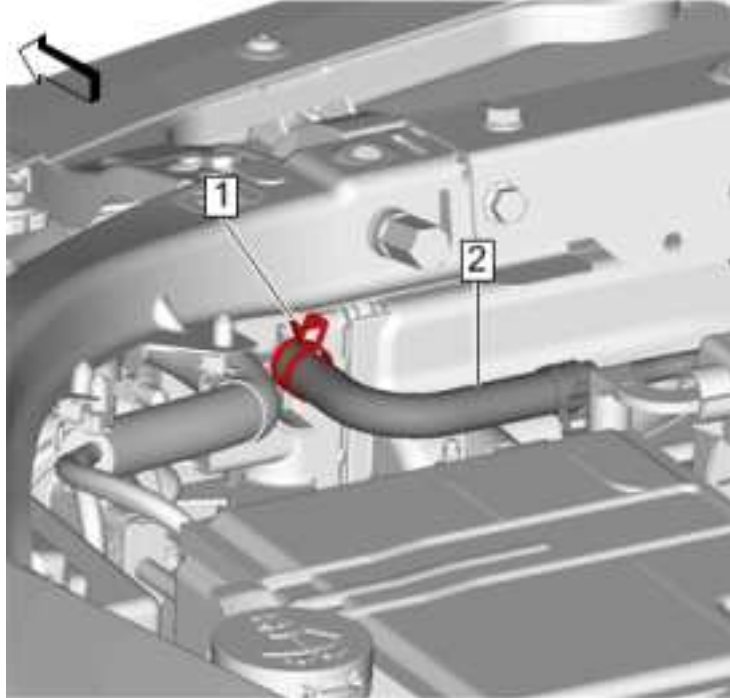


Fig. 401: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG)**

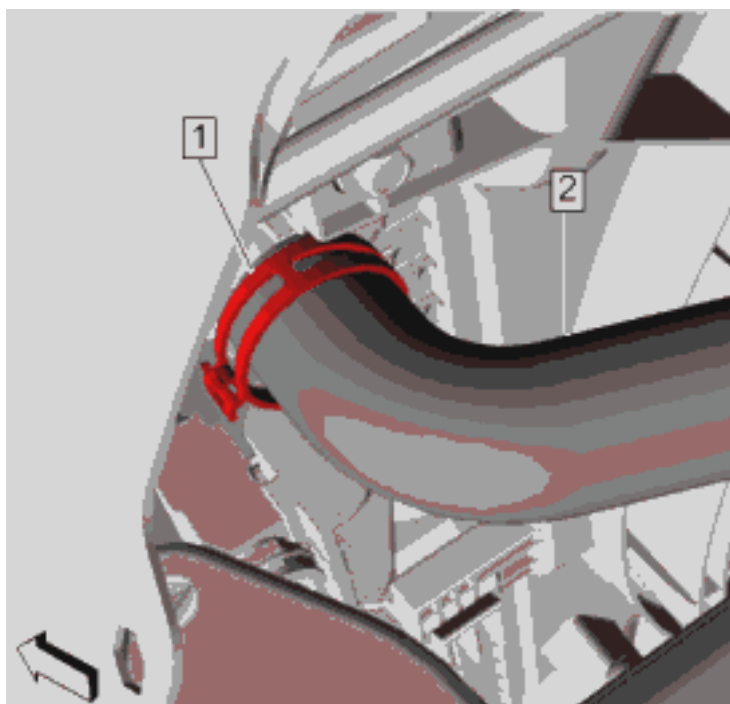


Fig. 402: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Inlet Hose (2) @ - Radiator - **Radiator Inlet Hose Replacement (LTG with KL9)**

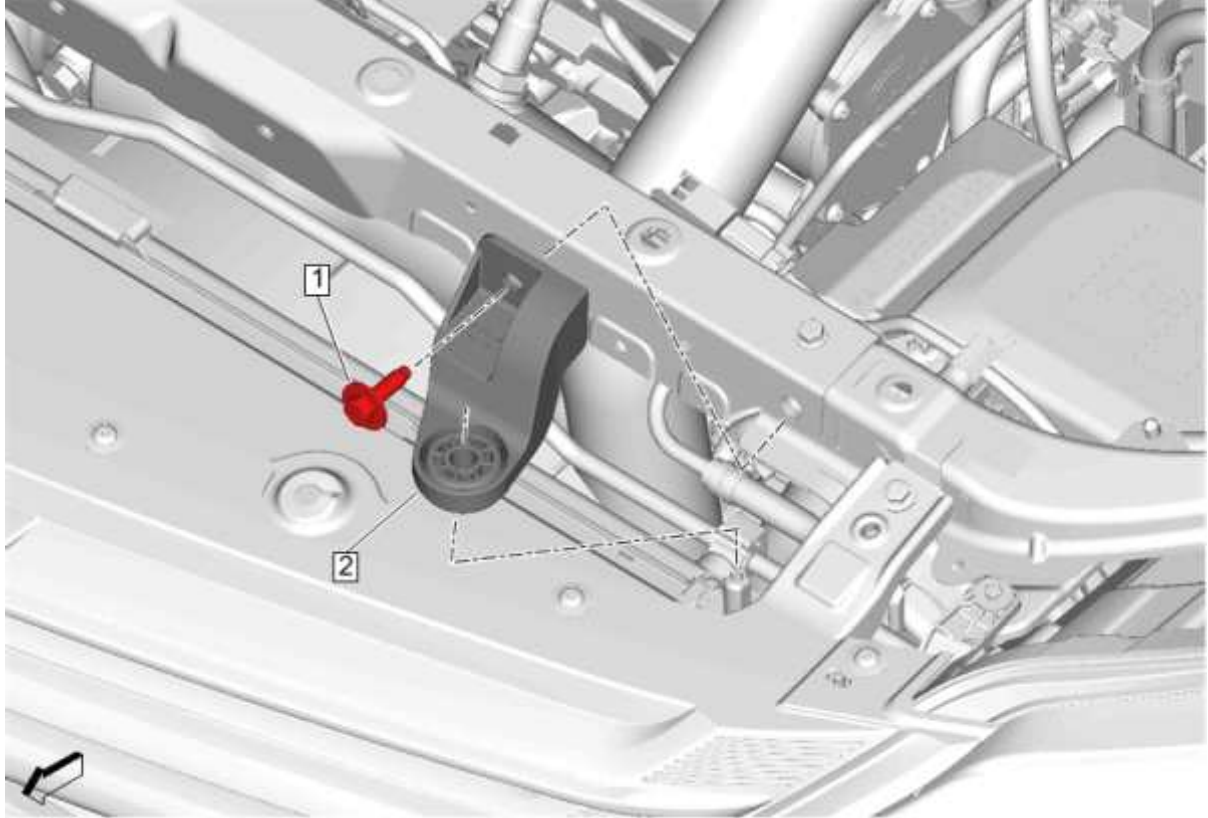


Fig. 403: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

11. Remove Radiator Upper Bracket - Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

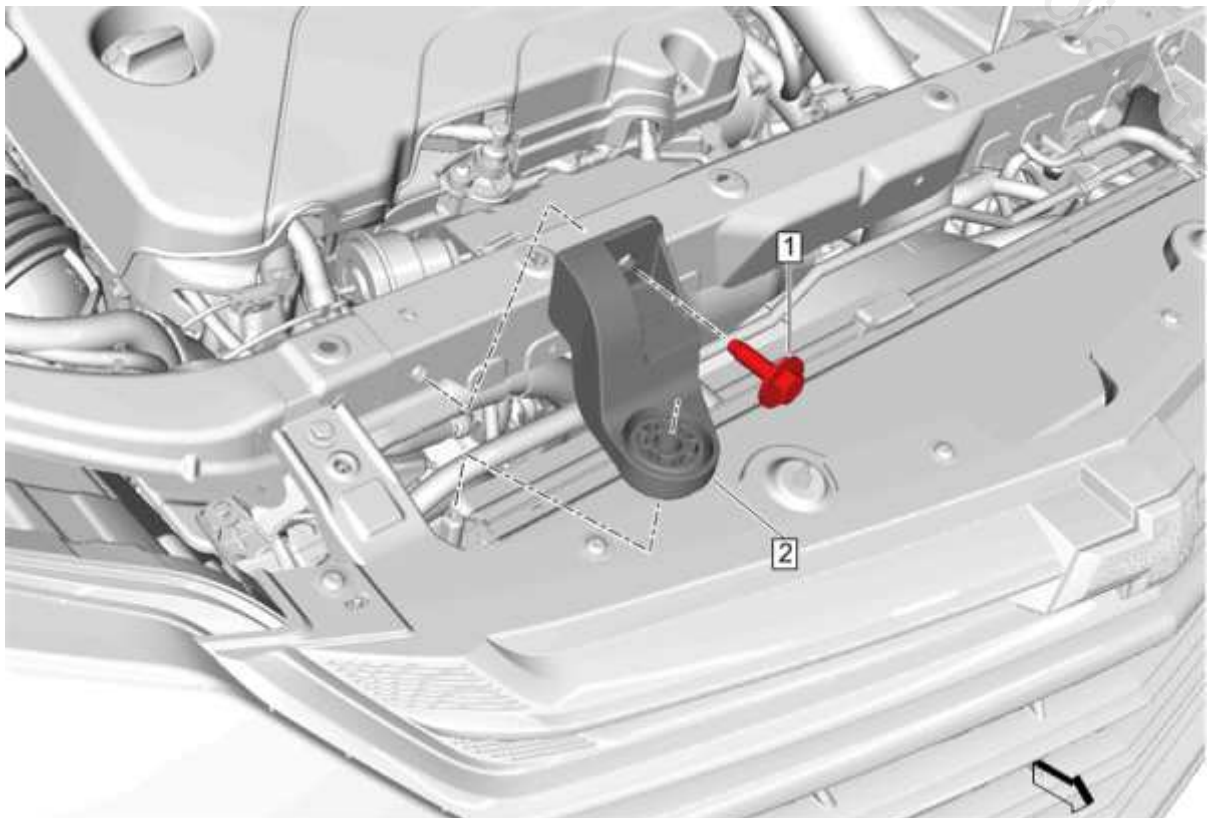


Fig. 404: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

12. Remove Radiator Upper Bracket - Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)

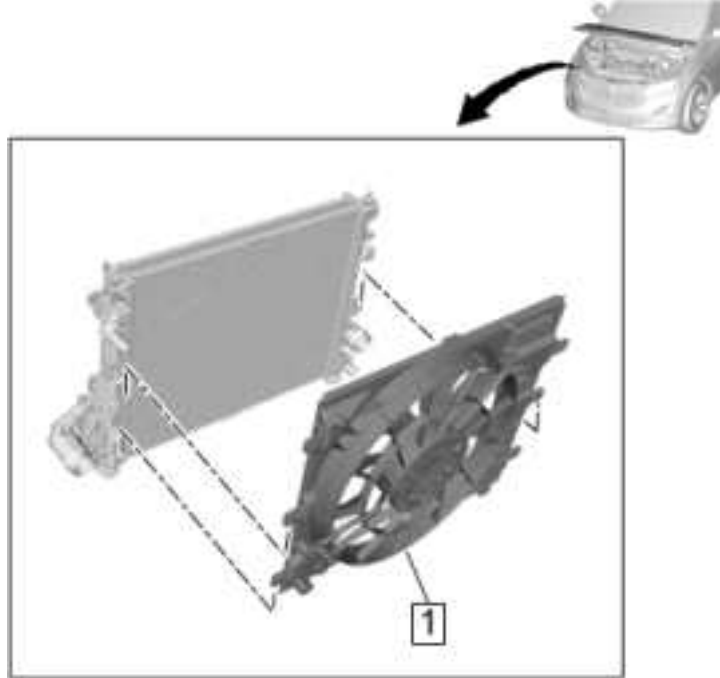


Fig. 405: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

13. Remove Engine Coolant Fan (1) @ Radiator - **Engine Coolant Fan Replacement (LTG)**

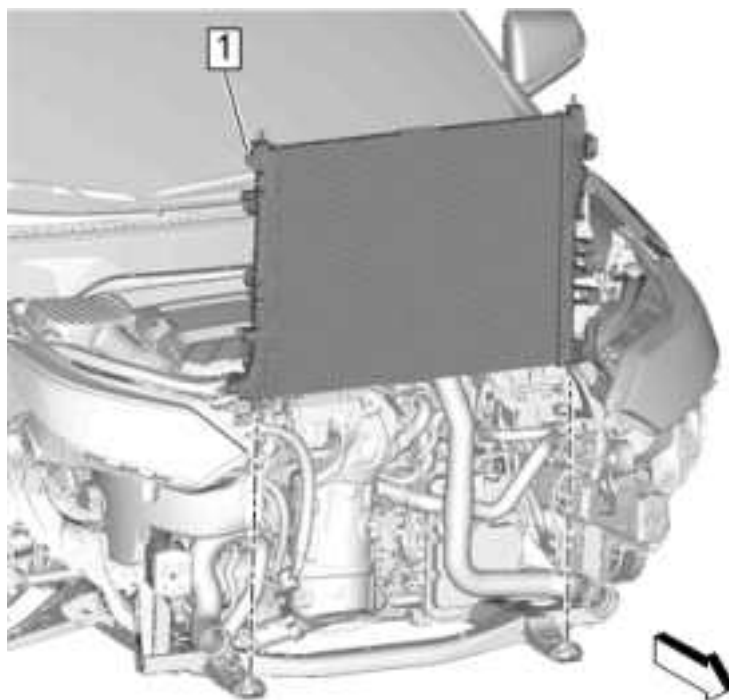


Fig. 406: Radiator

Courtesy of GENERAL MOTORS COMPANY

14. Remove Radiator (1)
15. Transfer components as necessary.

Installation Procedure

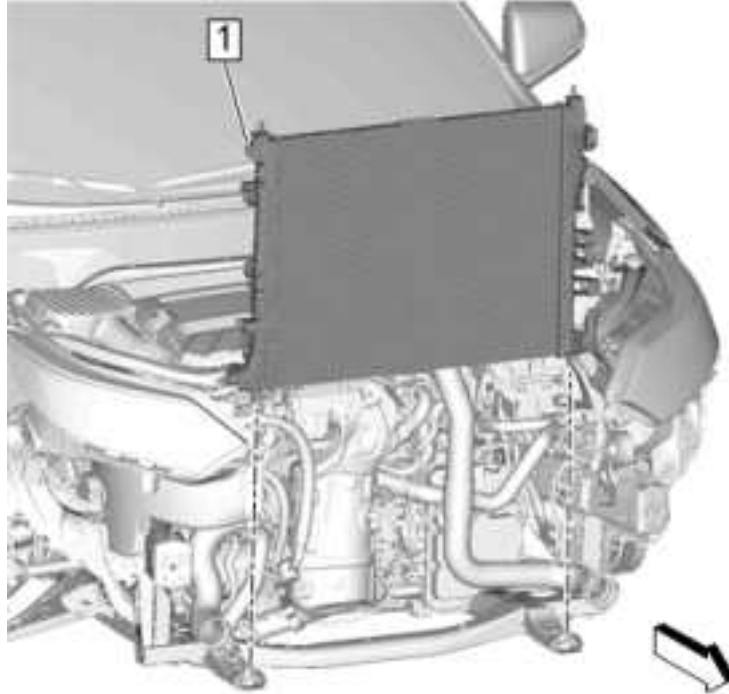


Fig. 407: Radiator

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)

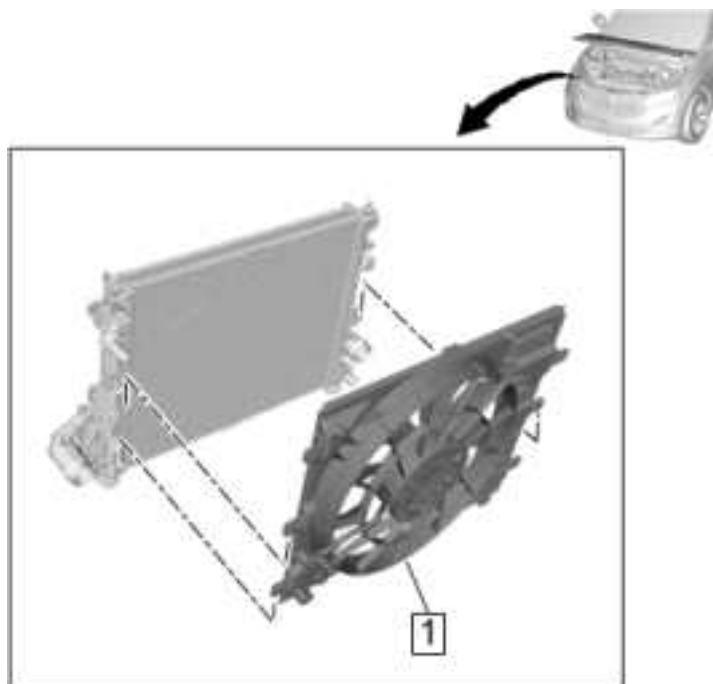


Fig. 408: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

2. Install Engine Coolant Fan (1) @ Radiator - **Engine Coolant Fan Replacement (LTG)**

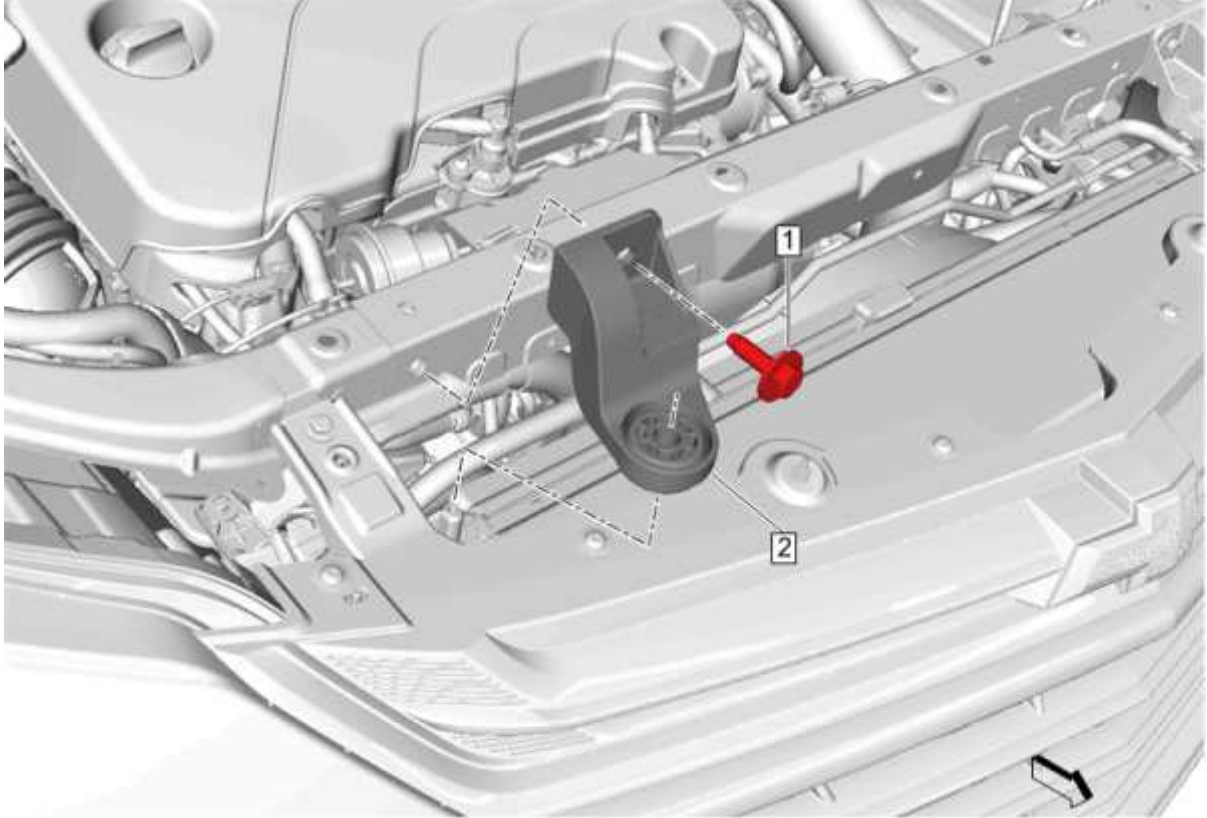


Fig. 409: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Upper Bracket - Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)

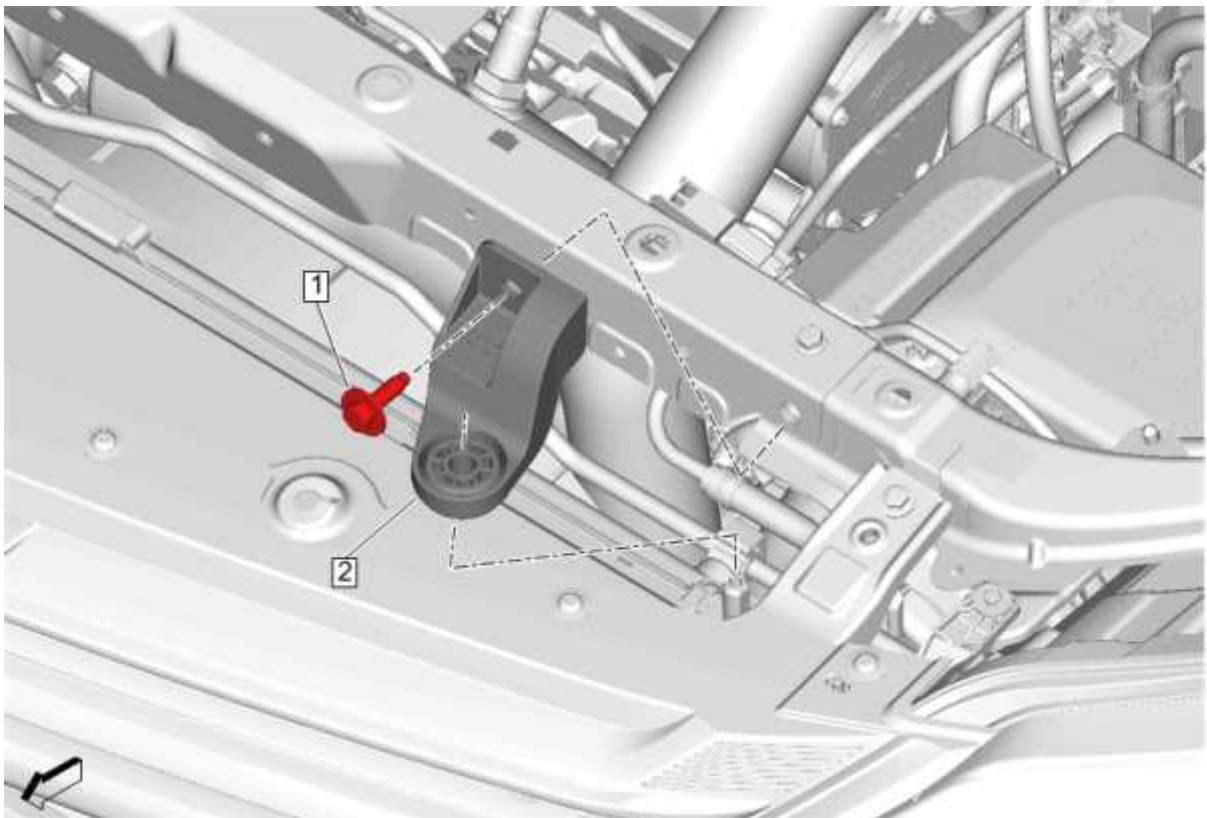


Fig. 410: Radiator Upper Bracket-Left Side
 Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Upper Bracket - Left Side (2) - [Radiator Upper Bracket Replacement - Left Side](#)

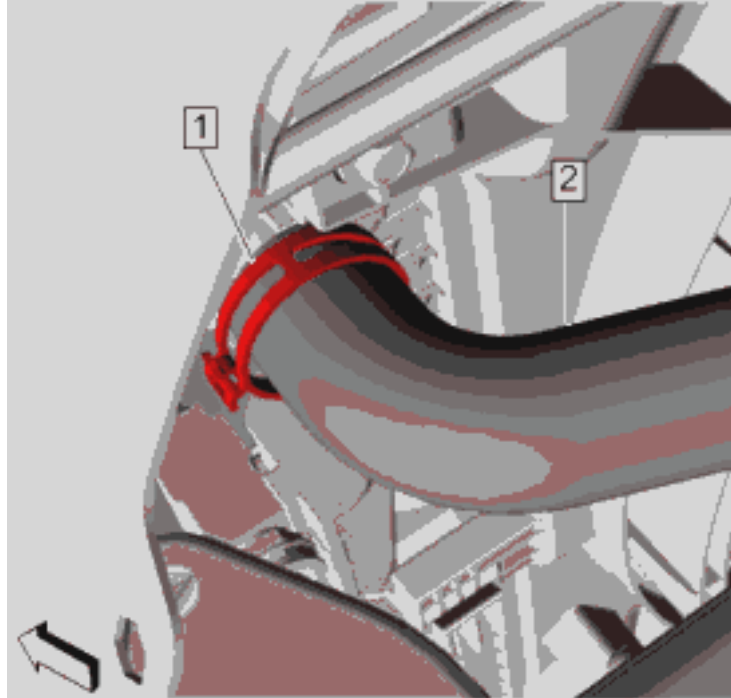


Fig. 411: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Inlet Hose (2) @ Radiator - **Radiator Inlet Hose Replacement (LTG with KL9)**

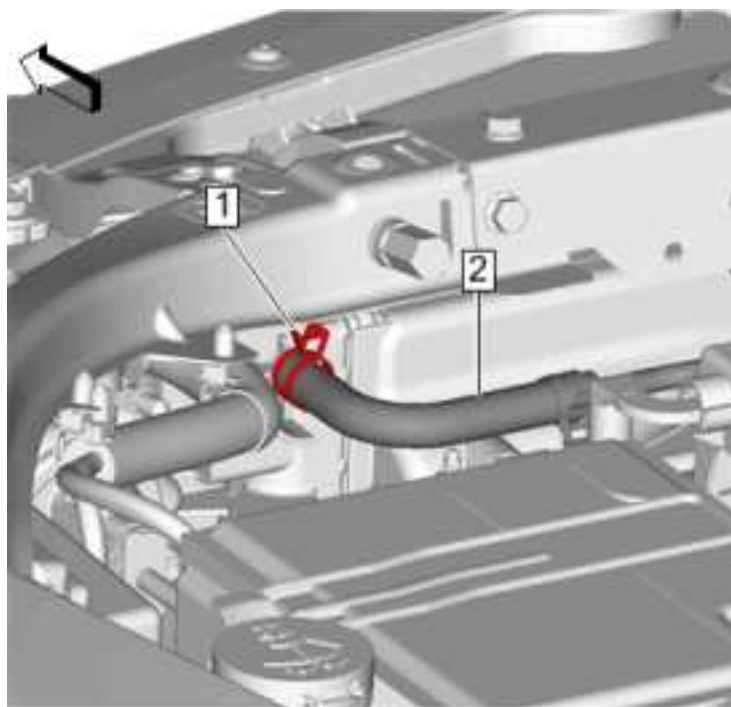


Fig. 412: Engine Coolant Air Bleed Hose

Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Radiator to Engine Coolant Air Bleed Pipe LTG)**

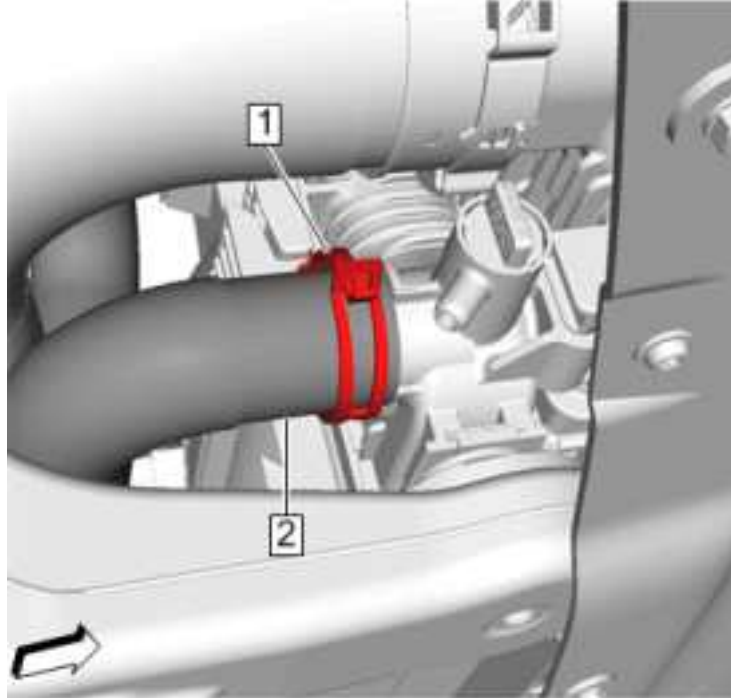


Fig. 413: Radiator Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Outlet Hose (2) @ Radiator - [Radiator Outlet Hose Replacement \(LTG with KL9\)](#)

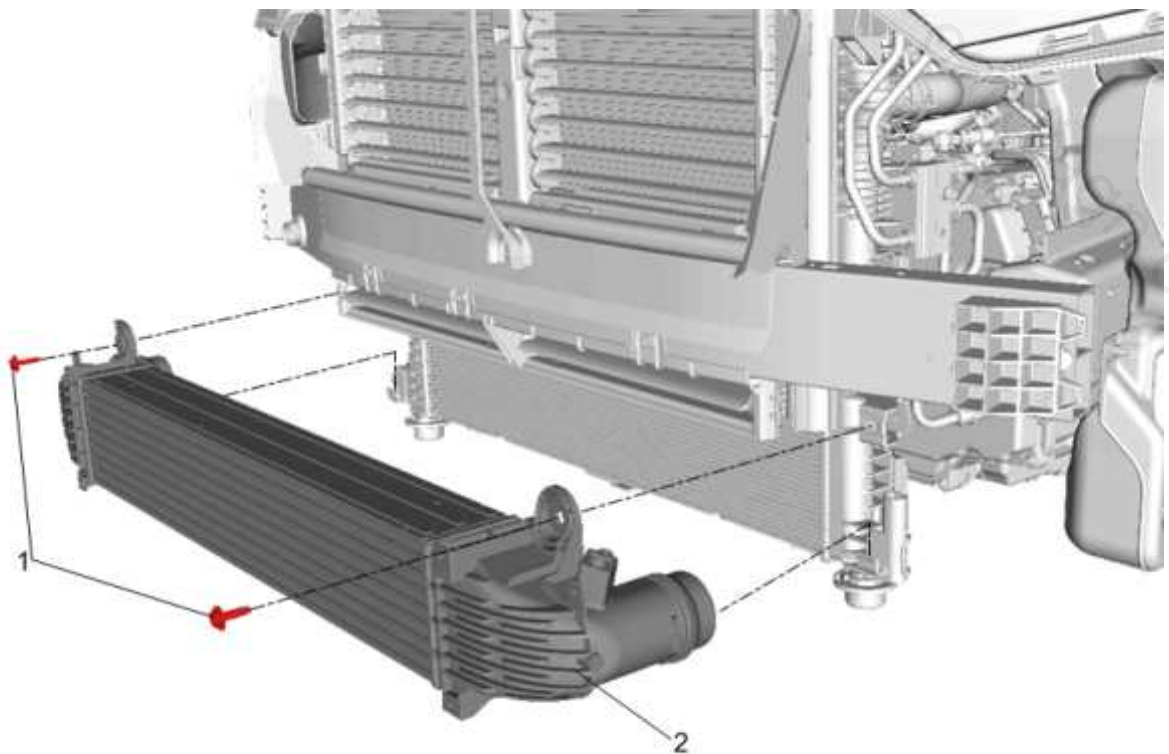


Fig. 414: Charge Air Cooler

Courtesy of GENERAL MOTORS COMPANY

8. Install Charge Air Cooler (2) - [Charge Air Cooler Replacement](#)
9. Install Air Conditioning Condenser - [Air Conditioning Condenser Replacement](#)
10. Connect the electrical connectors.

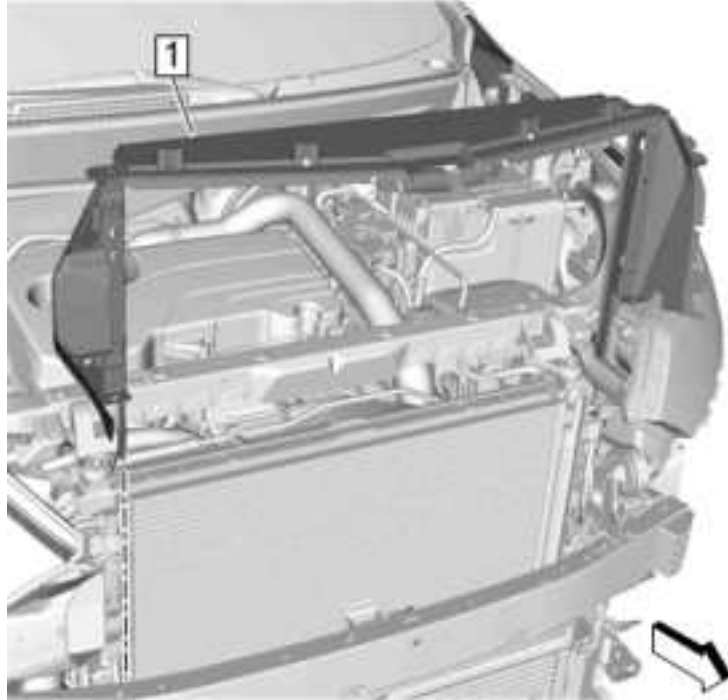


Fig. 415: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)

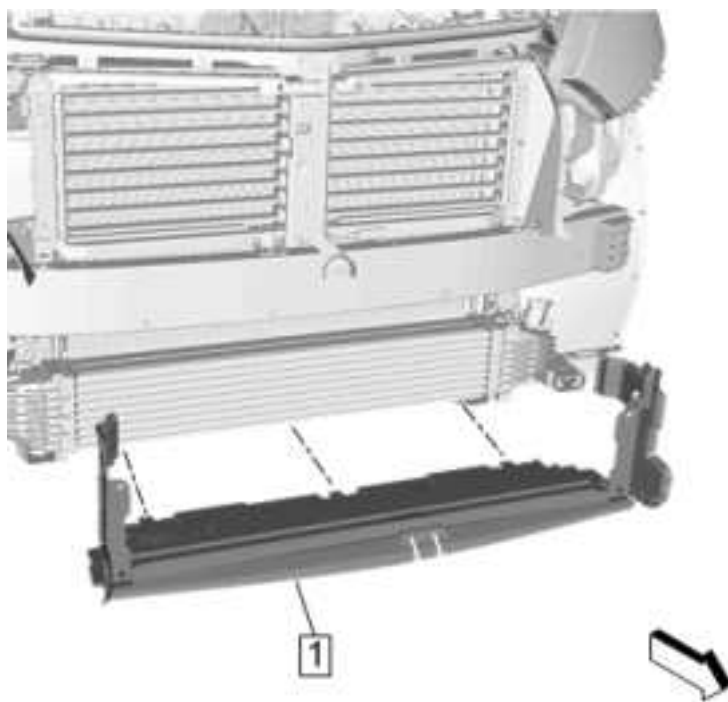


Fig. 416: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)
13. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
14. Start the engine and check for coolant leaks.
15. Install Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

RADIATOR REPLACEMENT (LH7)

Removal Procedure

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

2. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#)

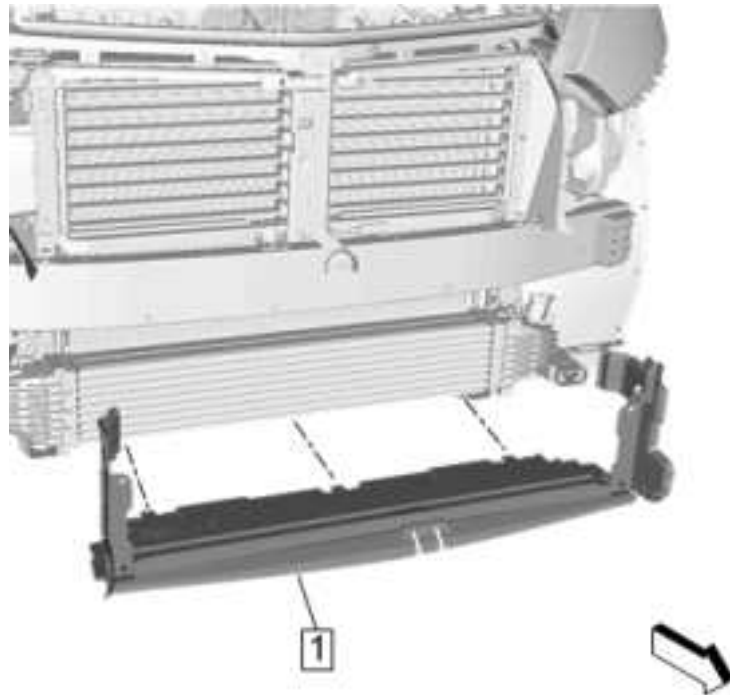


Fig. 417: Radiator Air Lower Baffle
Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)

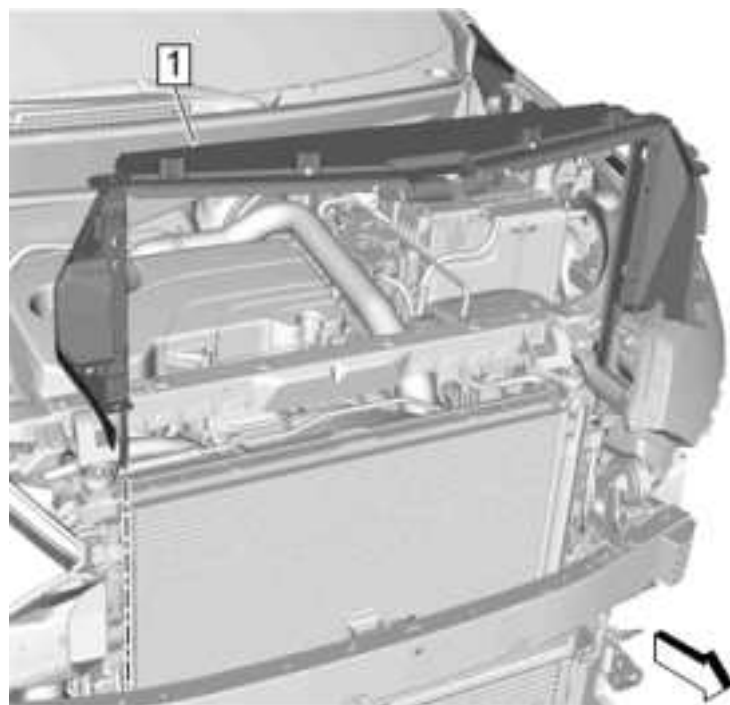


Fig. 418: Radiator Air Upper Baffle
Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)
5. Disconnect the electrical connectors.
6. Remove Air Conditioning Condenser - [Air Conditioning Condenser Replacement](#)
7. Remove Charge Air Cooler - [Charge Air Cooler Replacement](#)

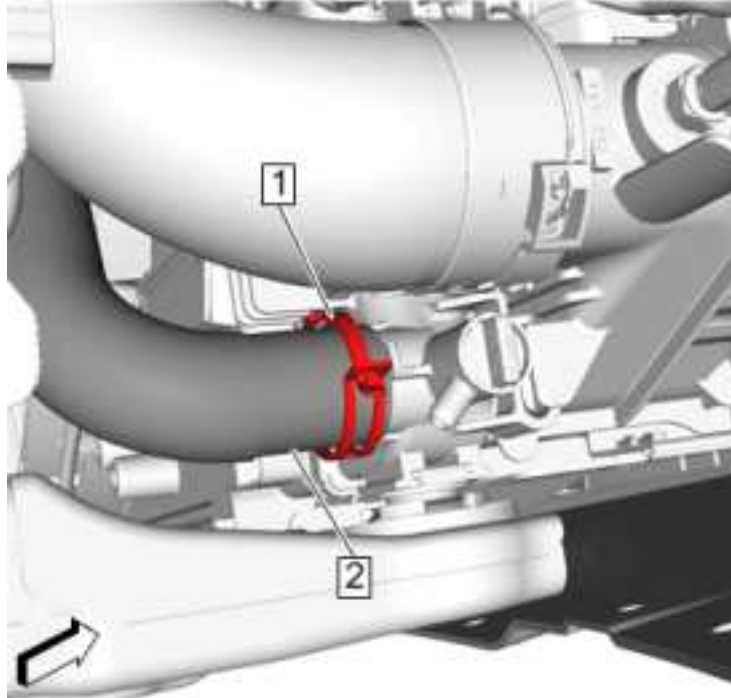


Fig. 419: Radiator Outlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Outlet Hose (2) @ Radiator **Radiator Outlet Hose Replacement (LH7)**

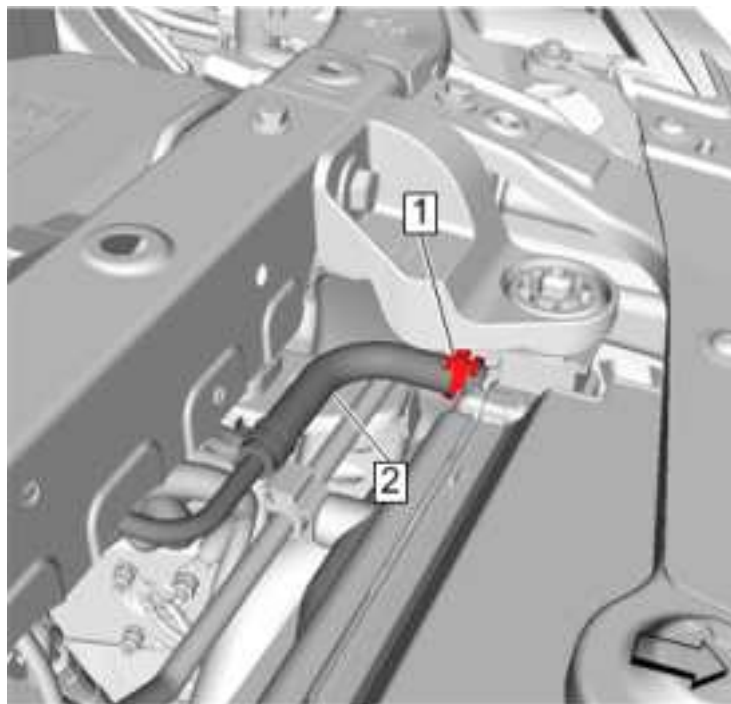


Fig. 420: Engine Coolant Air Bleed Hose And Clamp

Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**

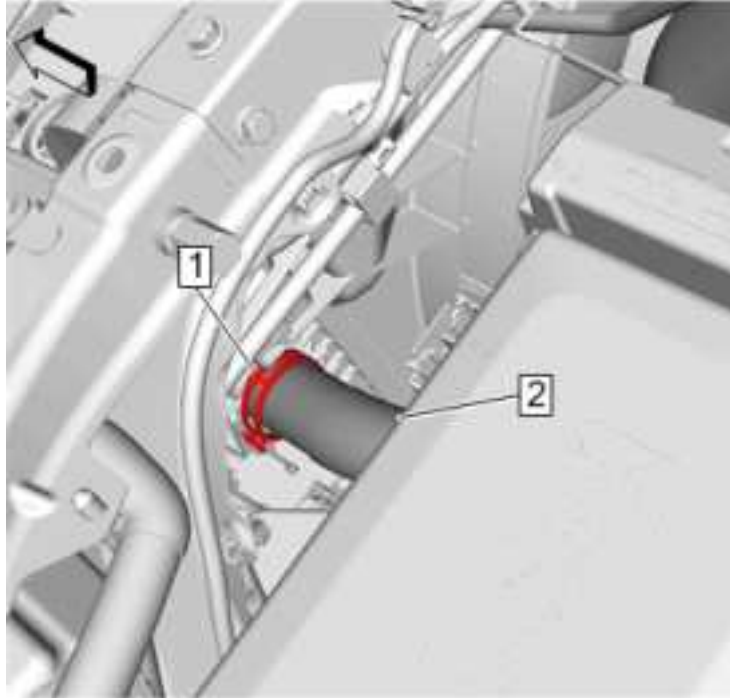


Fig. 421: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Inlet Hose (2) @ - Radiator - **Radiator Inlet Hose Replacement (LH7)**

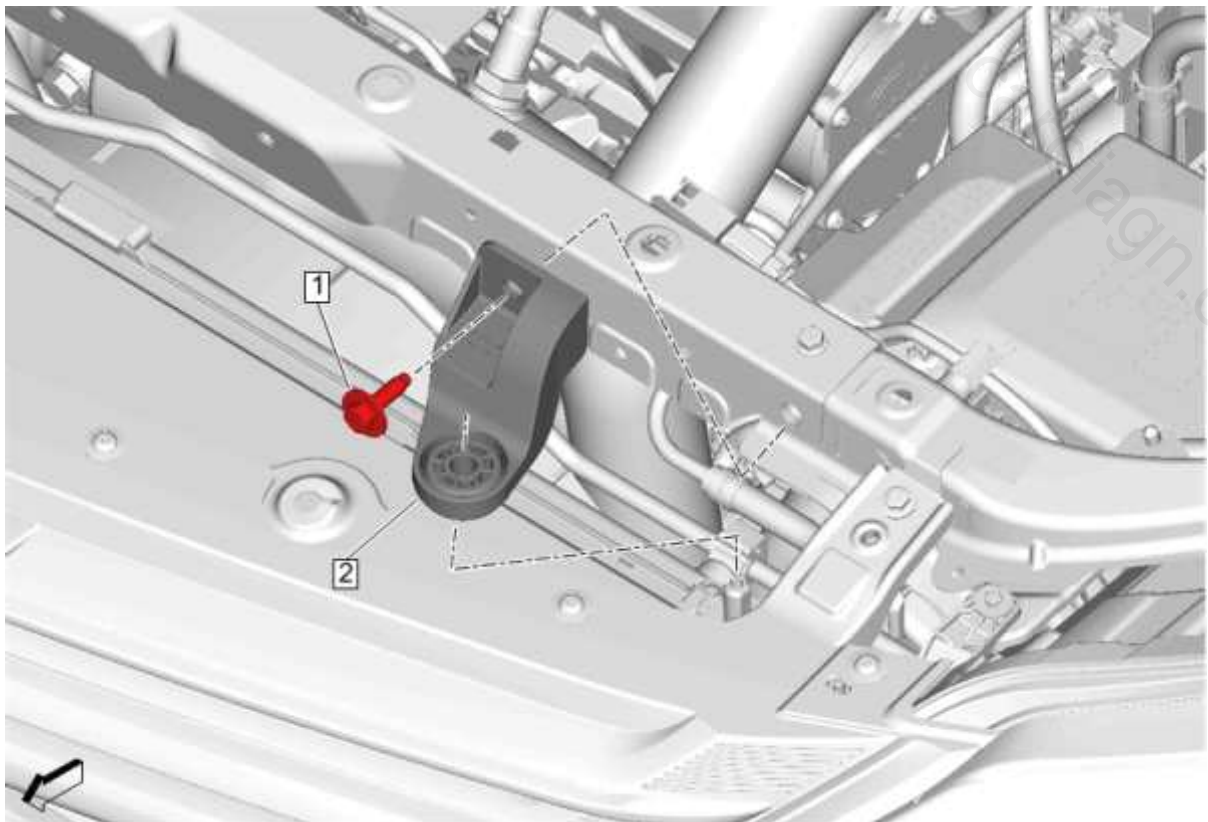


Fig. 422: Radiator Upper Bracket-Left Side

Courtesy of GENERAL MOTORS COMPANY

11. Remove Radiator Upper Bracket-Left Side (2) - **Radiator Upper Bracket Replacement - Left Side**

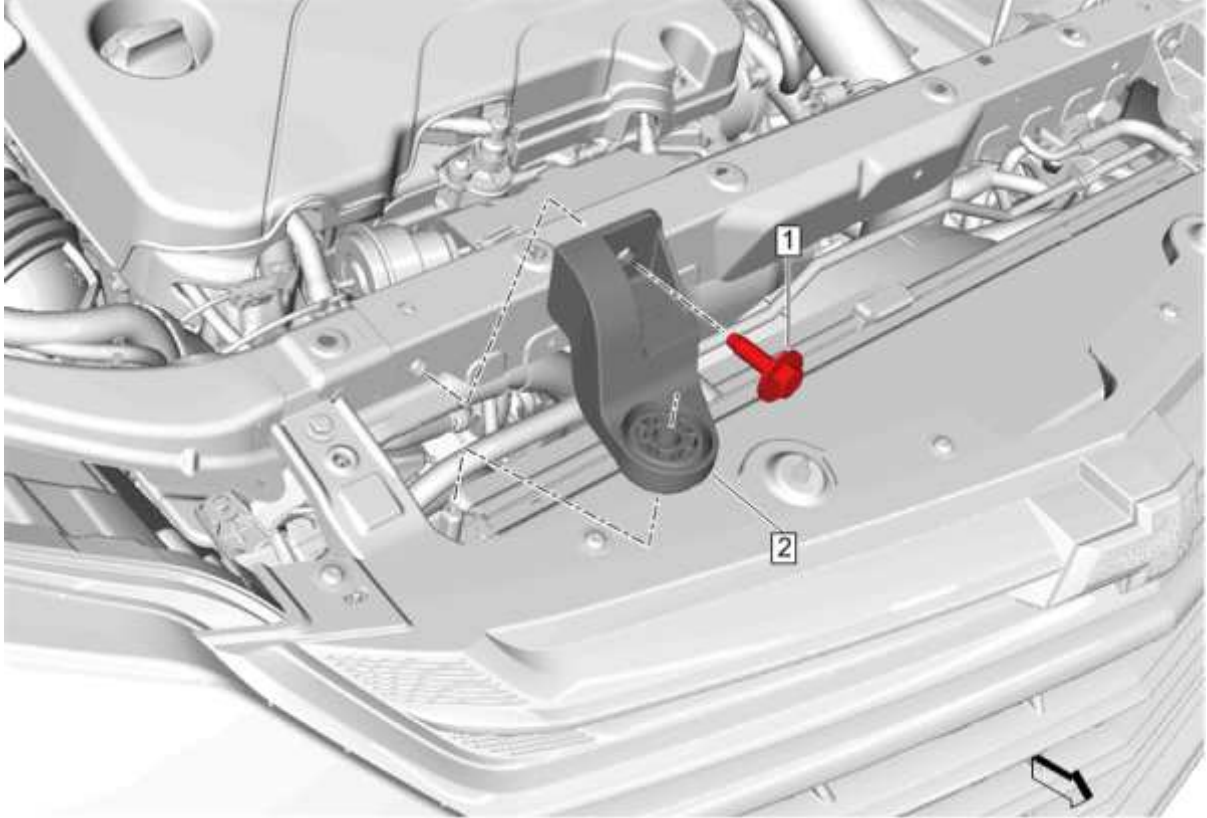


Fig. 423: Radiator Upper Bracket-Right Side
 Courtesy of GENERAL MOTORS COMPANY

12. Remove Radiator Upper Bracket-Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)

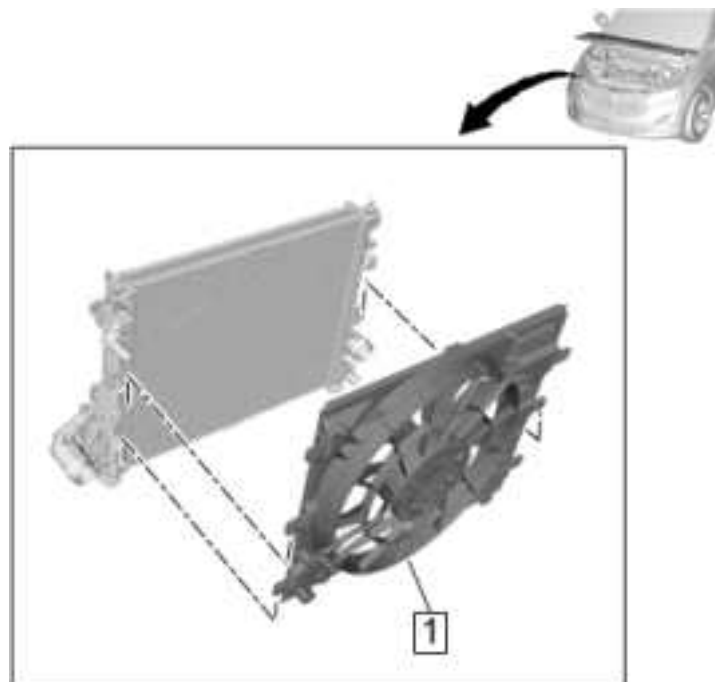


Fig. 424: Engine Coolant Fan
 Courtesy of GENERAL MOTORS COMPANY

13. Remove Engine Coolant Fan (1) @ Radiator - [Engine Coolant Fan Replacement \(LH7\)](#)

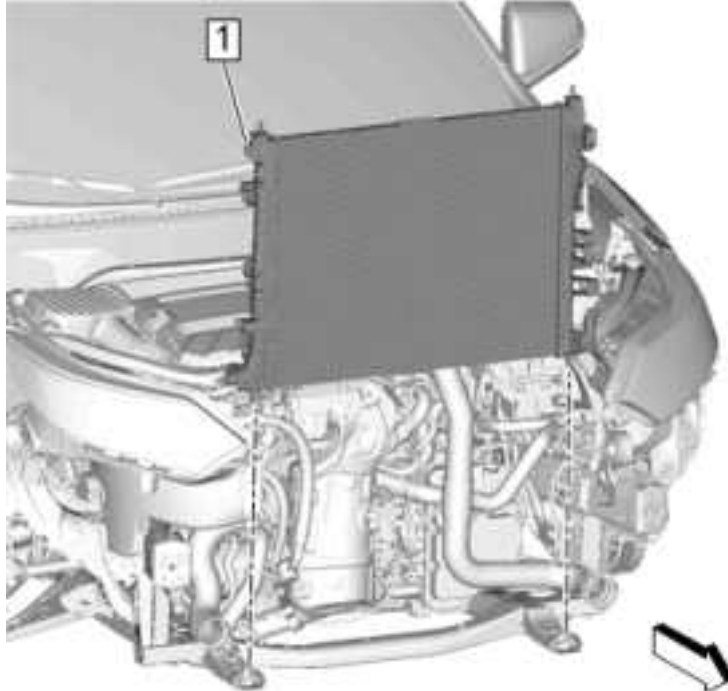


Fig. 425: Radiator

Courtesy of GENERAL MOTORS COMPANY

14. Remove Radiator (1)
15. Transfer components as necessary.

Installation Procedure

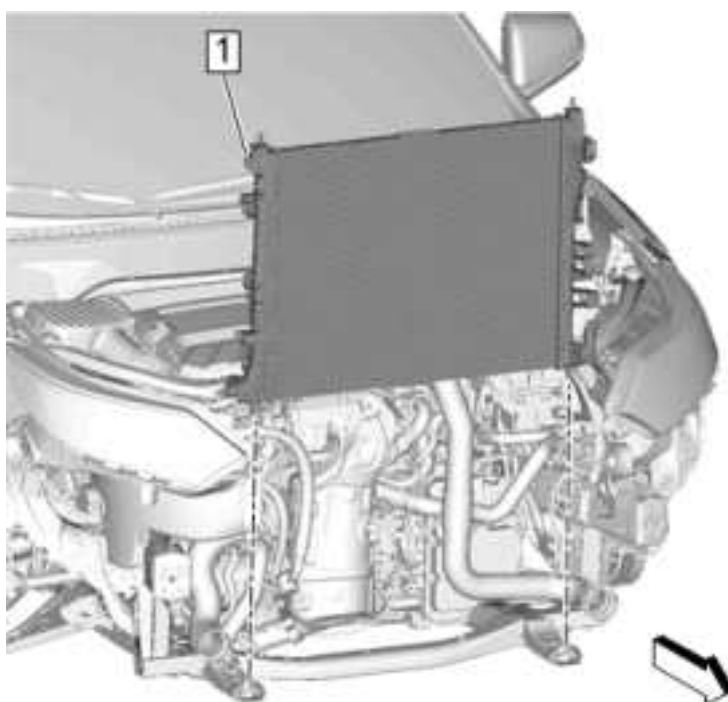


Fig. 426: Radiator

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)

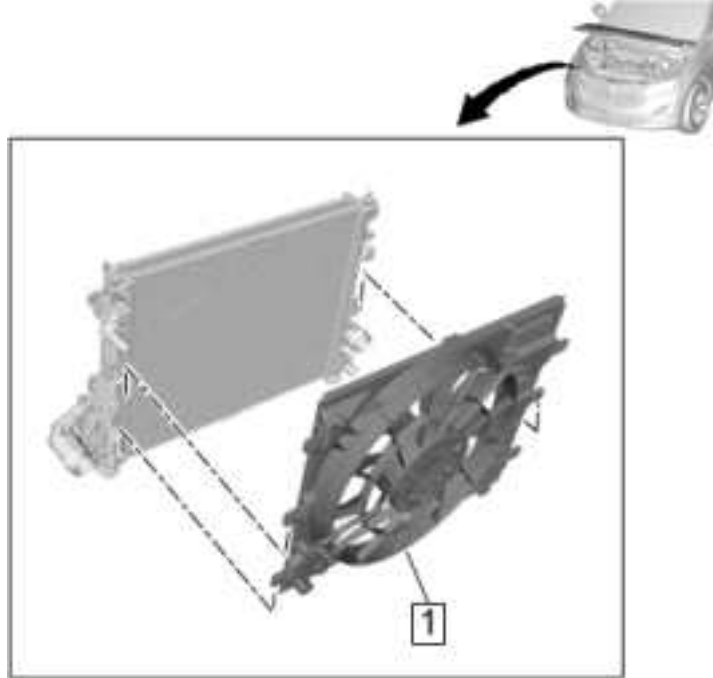


Fig. 427: Engine Coolant Fan

Courtesy of GENERAL MOTORS COMPANY

2. Install Engine Coolant Fan (1) @ Radiator - [Engine Coolant Fan Replacement \(LH7\)](#)

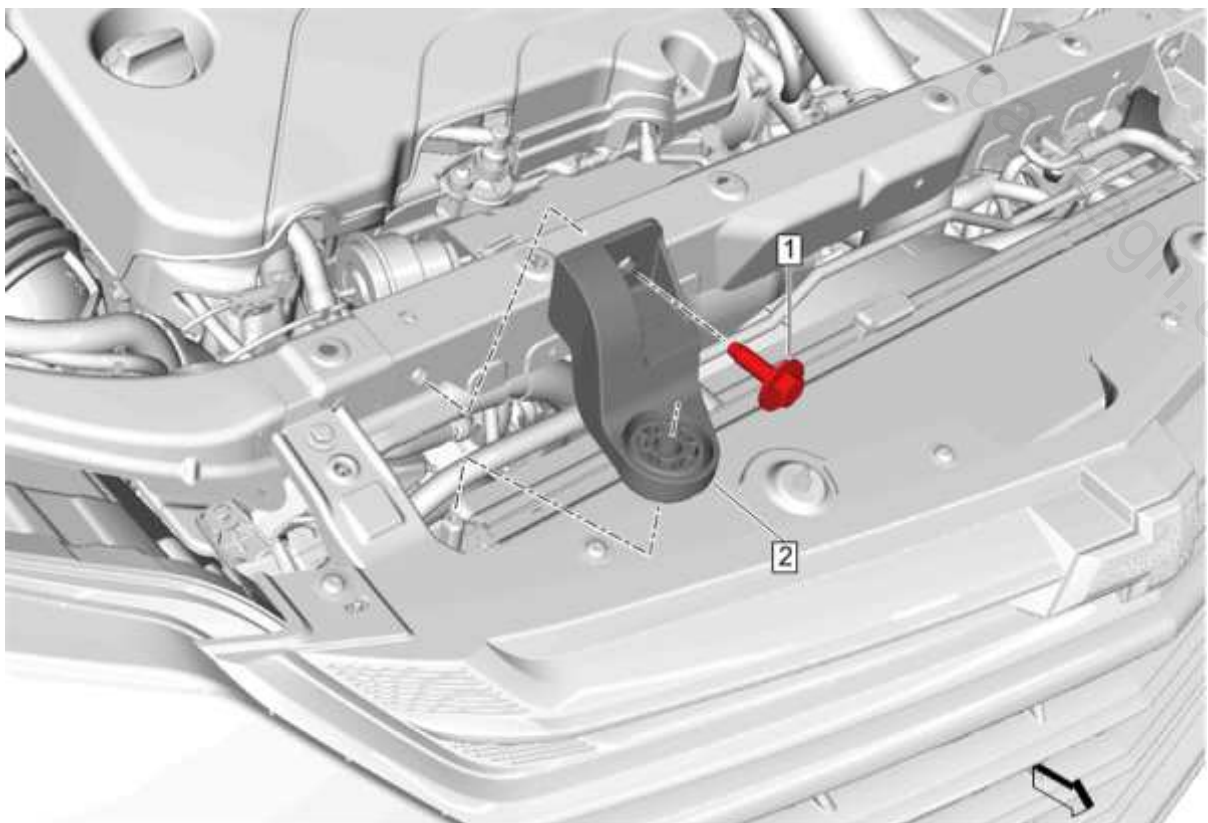


Fig. 428: Radiator Upper Bracket-Right Side

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Upper Bracket - Right Side (2) - [Radiator Upper Bracket Replacement - Right Side](#)

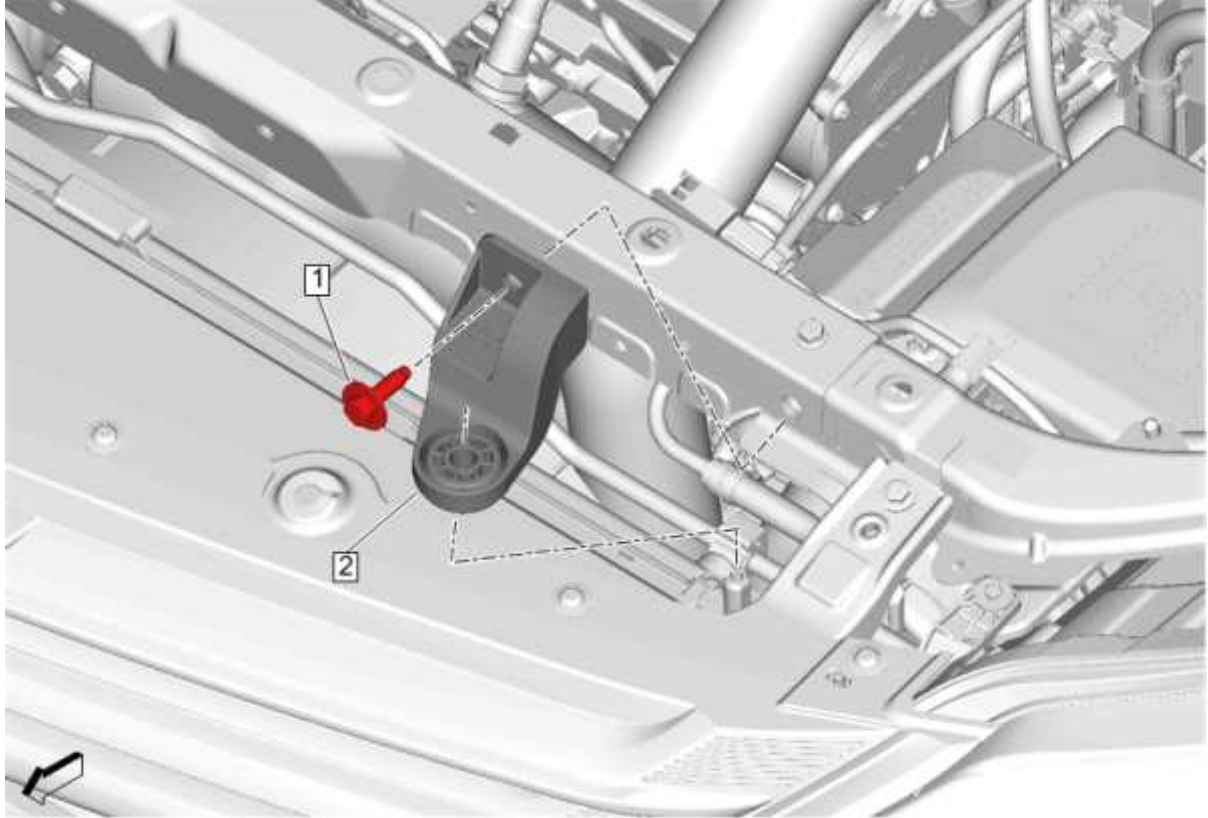


Fig. 429: Radiator Upper Bracket-Left Side

Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Upper Bracket - Left Side (2) - [**Radiator Upper Bracket Replacement - Left Side**](#)

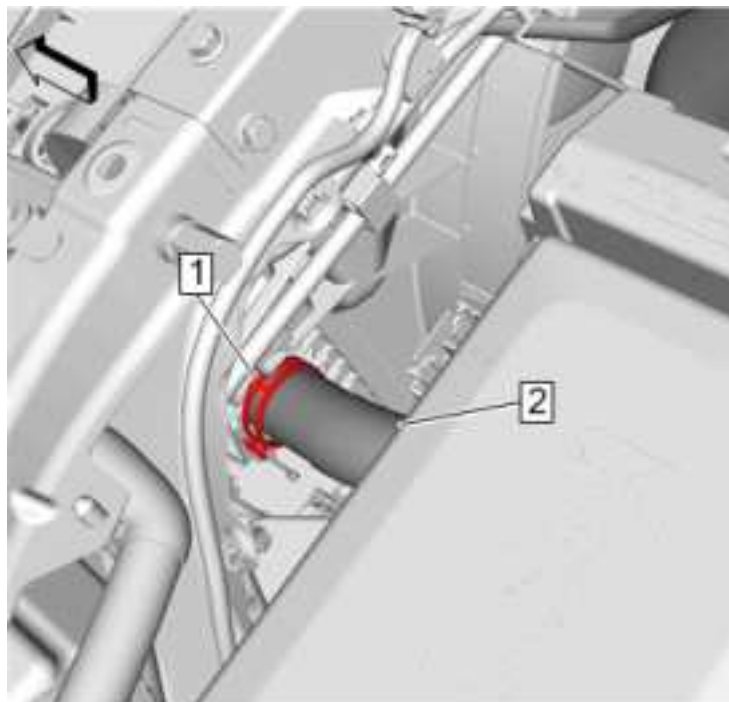


Fig. 430: Radiator Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Inlet Hose (2) @ Radiator - [**Radiator Inlet Hose Replacement \(LH7\)**](#)

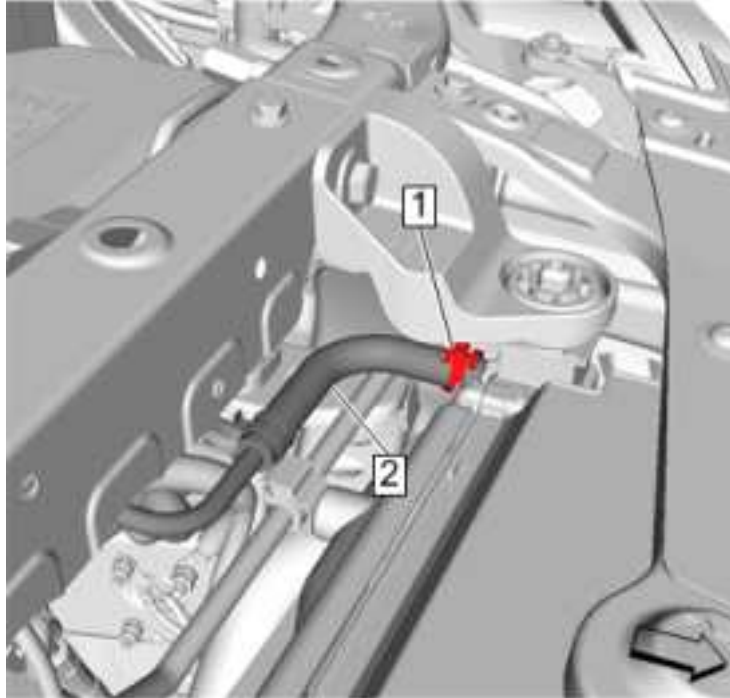


Fig. 431: Engine Coolant Air Bleed Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Coolant Air Bleed Hose (2) @ Radiator - **Engine Coolant Air Bleed Hose Replacement (Radiator Surge Tank to Exhaust Gas Recirculation Cooler Housing and Radiator LH7)**

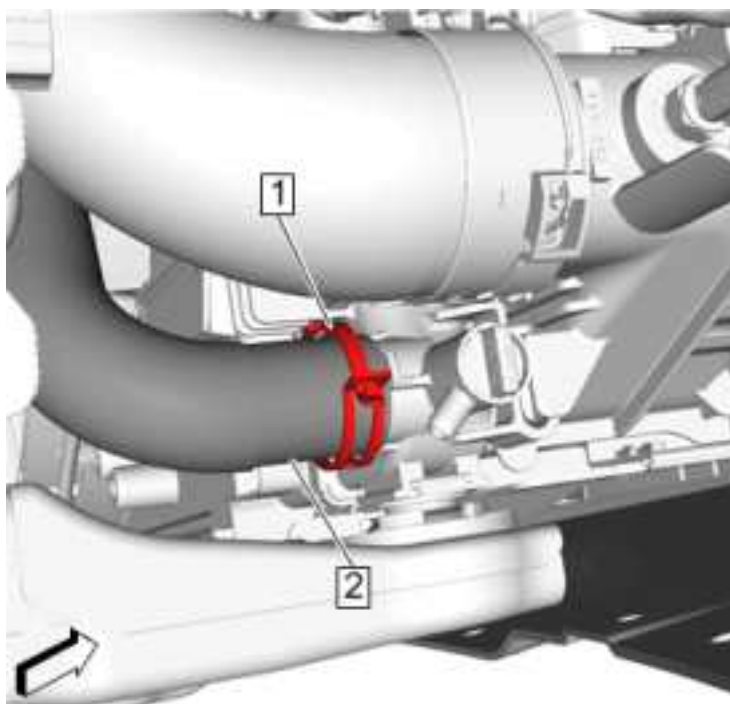


Fig. 432: Radiator Outlet Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Outlet Hose (2) @ Radiator - **Radiator Outlet Hose Replacement (LH7)**
8. Install Charge Air Cooler - **Charge Air Cooler Replacement**
9. Install Air Conditioning Condenser - **Air Conditioning Condenser Replacement**
10. Connect the electrical connectors.

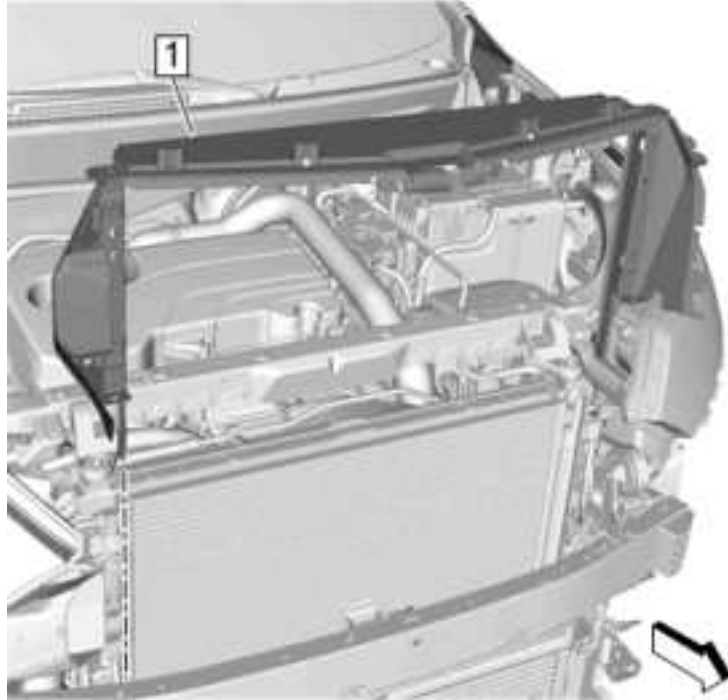


Fig. 433: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Air Upper Baffle (1) - [Radiator Air Upper Baffle Replacement \(LH7 LTG LYX\)](#)

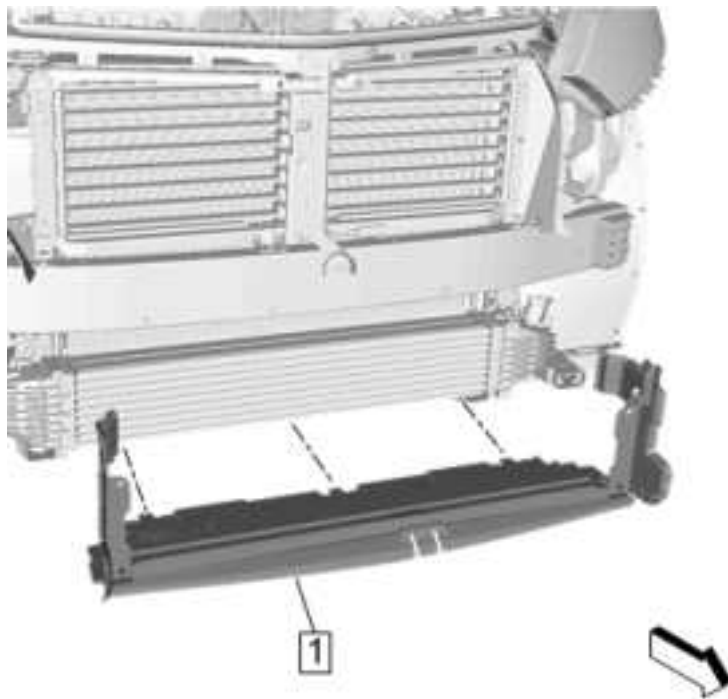


Fig. 434: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Air Lower Baffle (1) - [Radiator Air Lower Baffle Replacement \(LH7 LTG LYX\)](#)
13. Fill the cooling system. [Cooling System Draining and Filling \(GE 47716\)Cooling System Draining and Filling \(Static\)](#)
14. Start the engine and check for coolant leaks.
15. Install Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\) Front Bumper Fascia Replacement \(Terrain\)](#)

RADIATOR LOWER INSULATOR REPLACEMENT

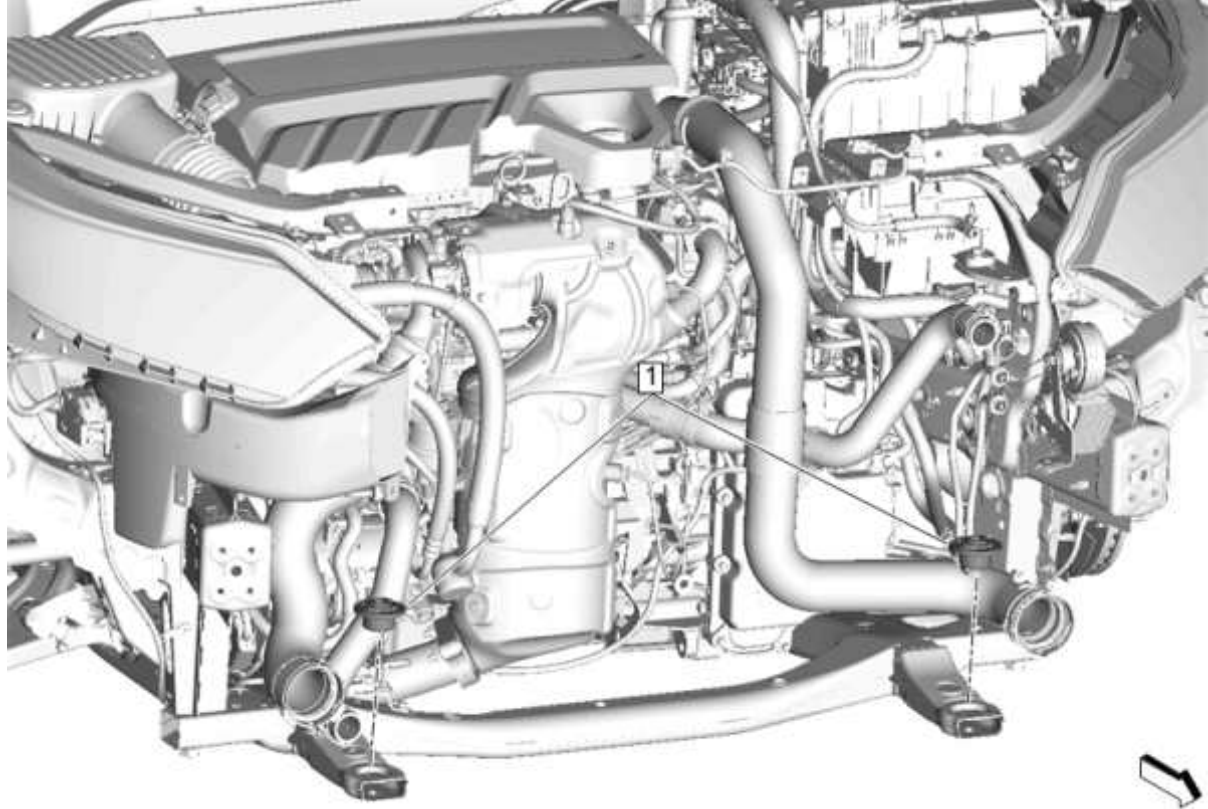


Fig. 435: Radiator Lower Insulator

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Radiator - Radiator Replacement (LYX) Radiator Replacement (LTG) Radiator Replacement (LH7)	
1	Radiator Lower Insulator [2x]

RADIATOR AIR LOWER BAFFLE REPLACEMENT (LH7/ LTG/LYX)

Removal Procedure

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#).
2. Disconnect the electrical connectors.

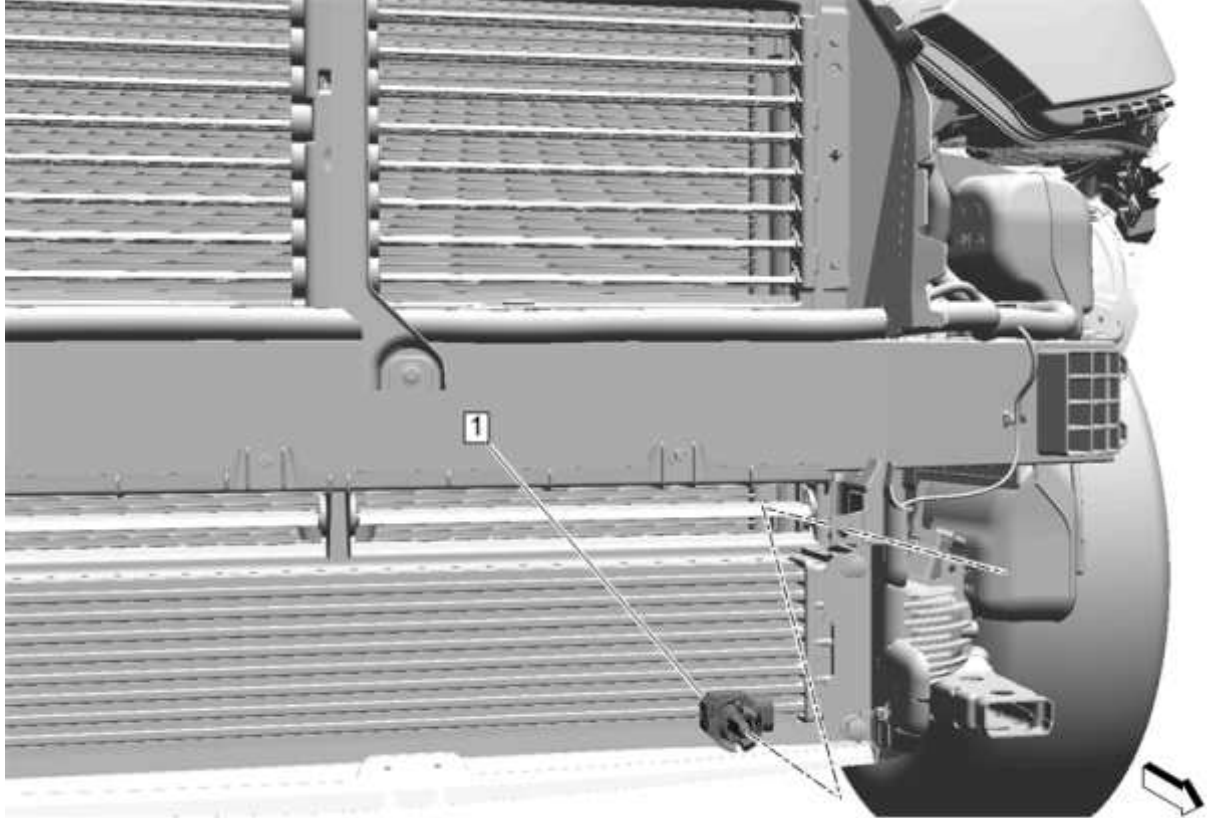


Fig. 436: Ambient Air Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Ambient Air Temperature Sensor (1) - [Ambient Air Temperature Sensor Replacement](#)
4. Remove {If equipped} Front Bumper Secondary Shutter - [Front Bumper Secondary Shutter Replacement](#)

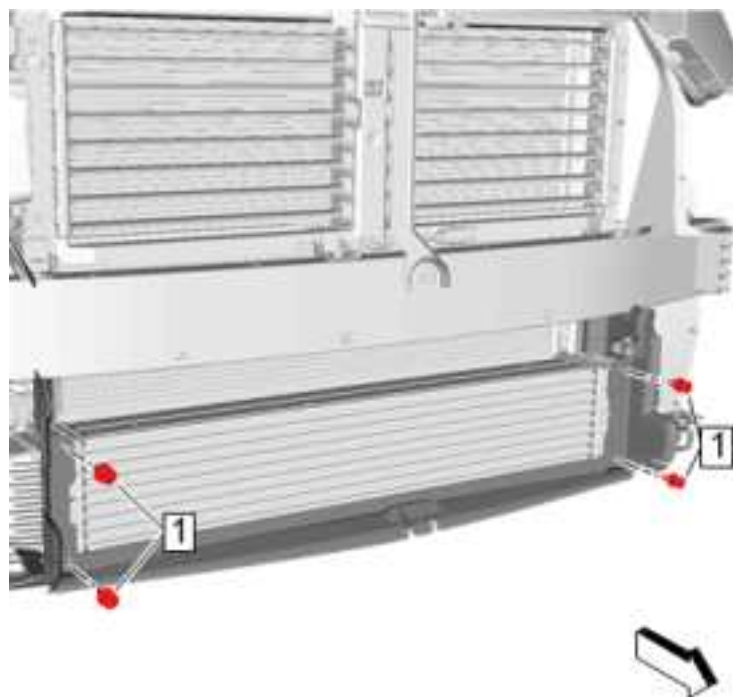


Fig. 437: Radiator Air Lower Baffle Retainer
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Lower Baffle Retainer (1) - [4x]

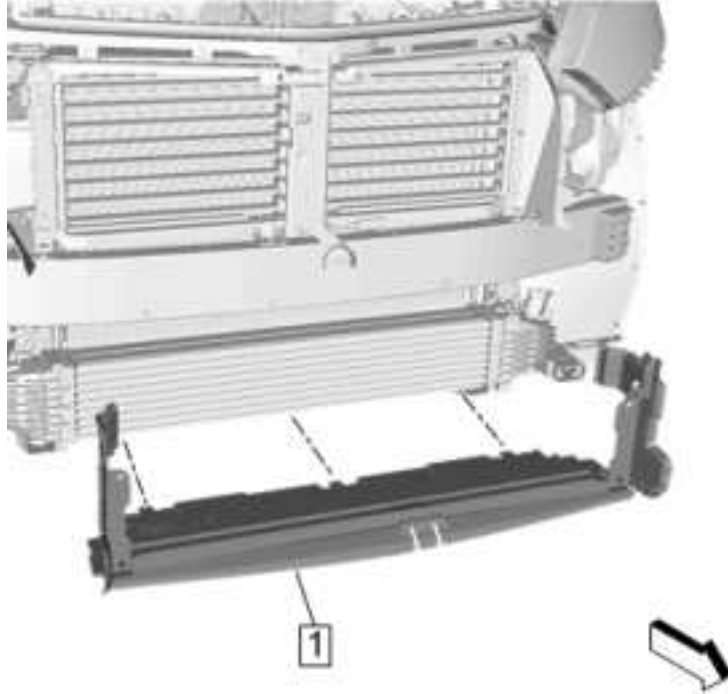


Fig. 438: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

6. Remove Radiator Air Lower Baffle (1).

Installation Procedure

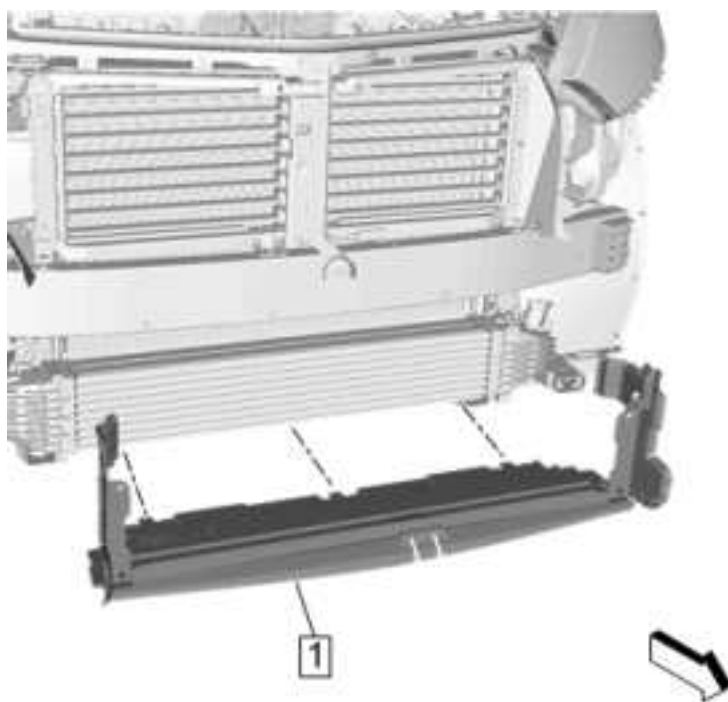


Fig. 439: Radiator Air Lower Baffle

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Lower Baffle (1)

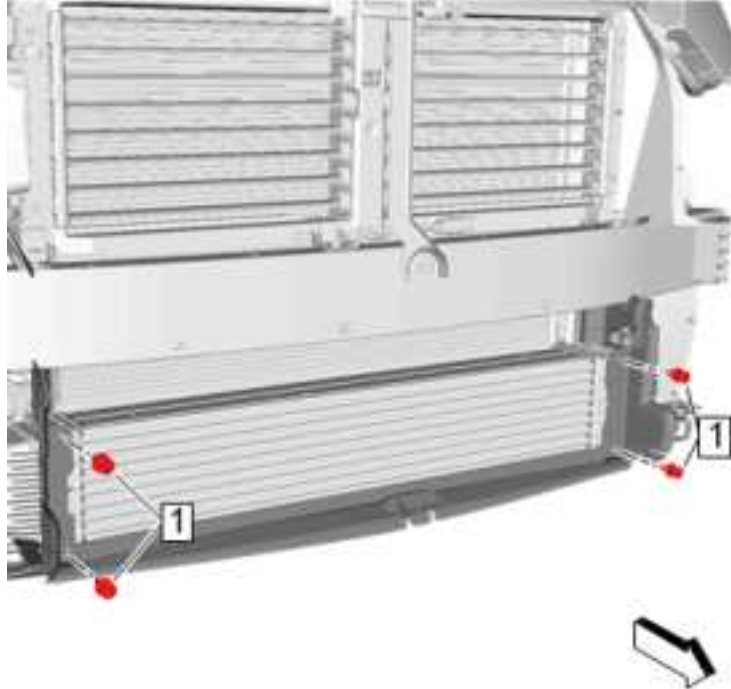


Fig. 440: Radiator Air Lower Baffle Retainer
Courtesy of GENERAL MOTORS COMPANY

2. Install Radiator Air Lower Baffle Retainer (1) - [4x]
3. Install {If equipped} Front Bumper Secondary Shutter - [Front Bumper Secondary Shutter Replacement](#)

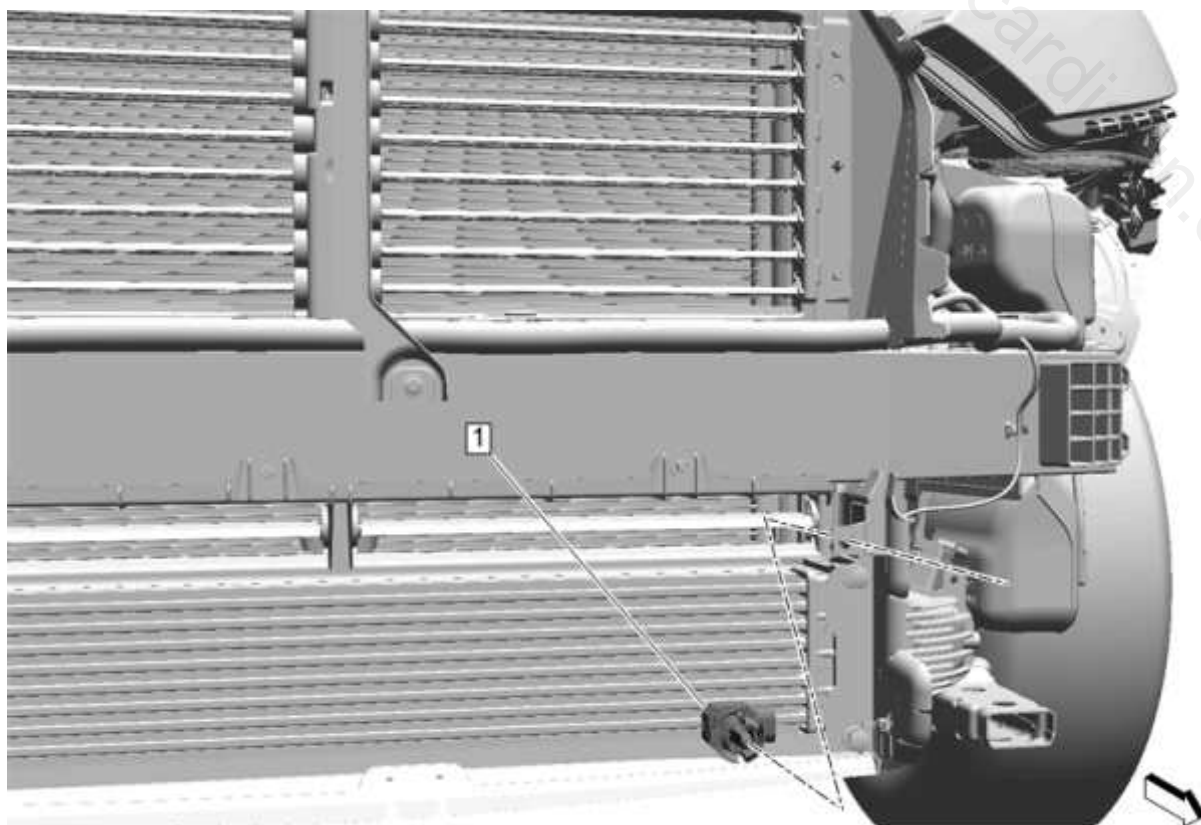


Fig. 441: Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

4. Install Ambient Air Temperature Sensor (1) - [Ambient Air Temperature Sensor Replacement](#)
5. Connect the electrical connectors.
6. Install Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

RADIATOR AIR UPPER BAFFLE REPLACEMENT (LH7/LTG/LYX)

Removal Procedure

1. Remove Front Bumper Fascia - [Front Bumper Fascia Replacement \(Equinox\)](#) [Front Bumper Fascia Replacement \(Terrain\)](#)

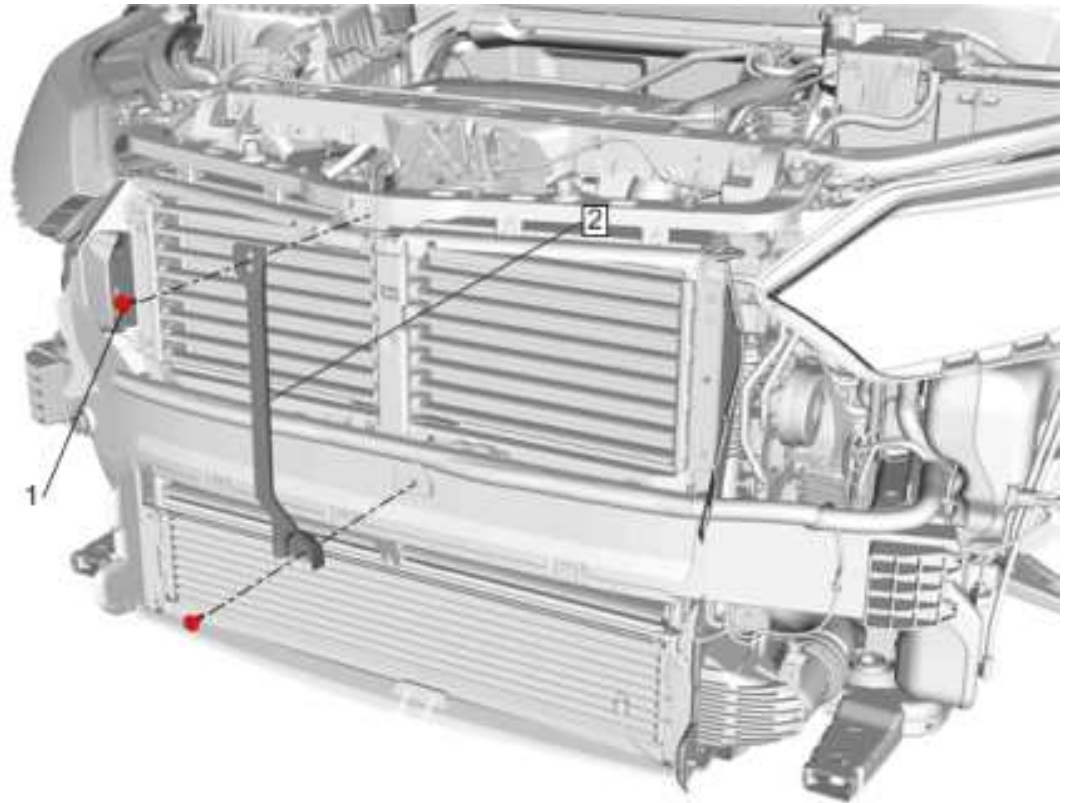


Fig. 442: Front Bumper Fascia Support Brace
Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Bumper Fascia Support Brace (2) - [Front Bumper Fascia Support Brace Replacement](#)

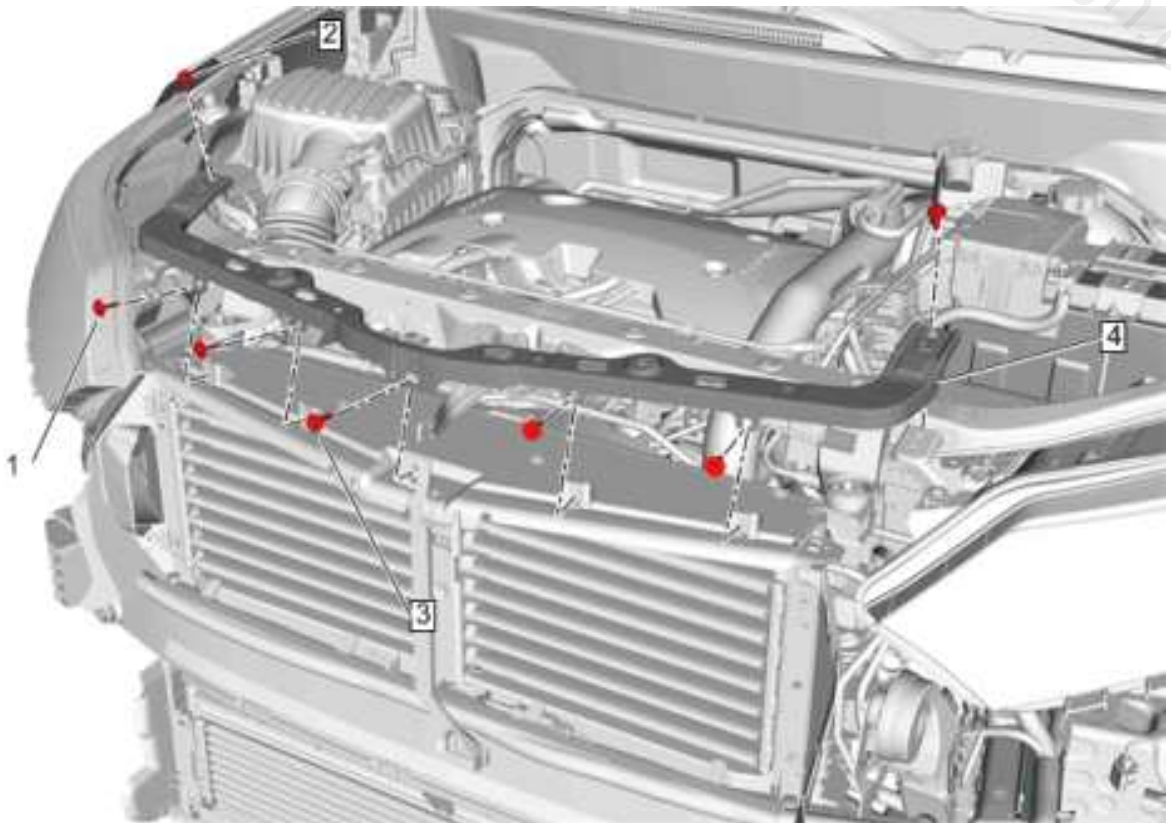


Fig. 443: Front Bumper Fascia Center Support
Courtesy of GENERAL MOTORS COMPANY

3. Remove Front Bumper Fascia Center Support (3) - [Front Bumper Fascia Center Support Replacement](#)
4. Disconnect the electrical connectors.

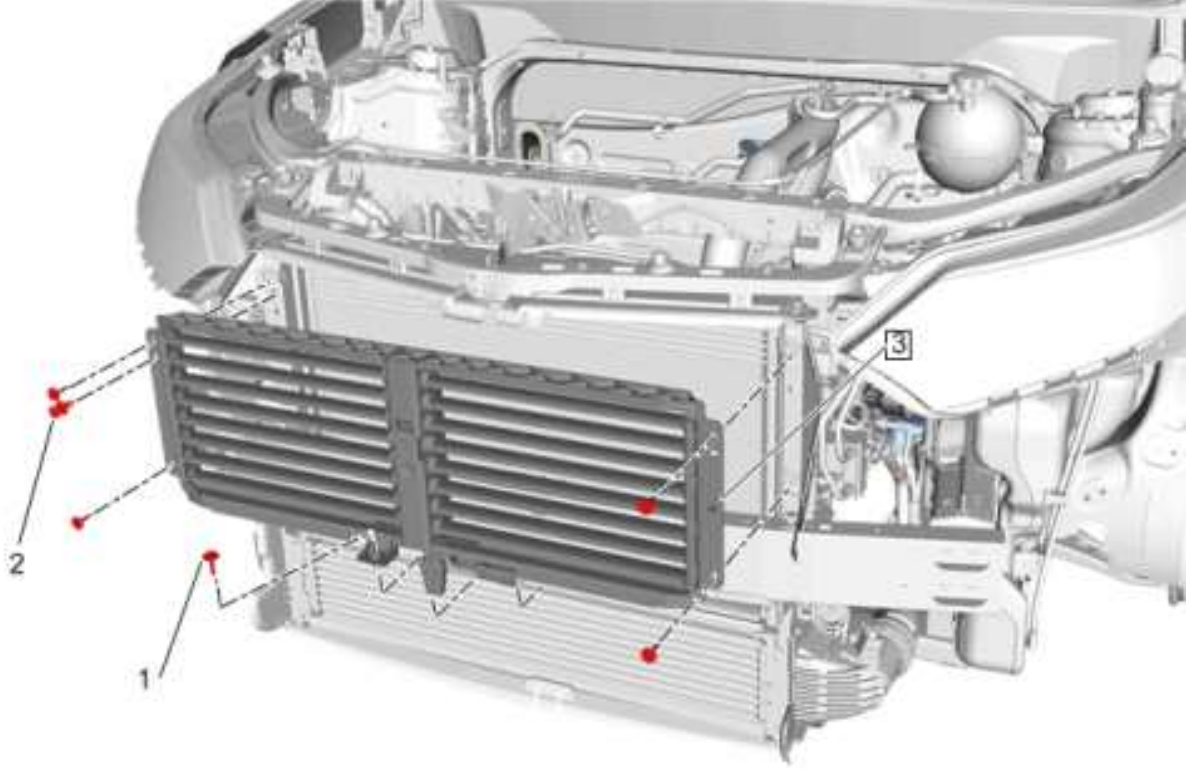


Fig. 444: Front Bumper Shutter
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Front Bumper Shutter (2) - **Front Bumper Shutter Replacement**

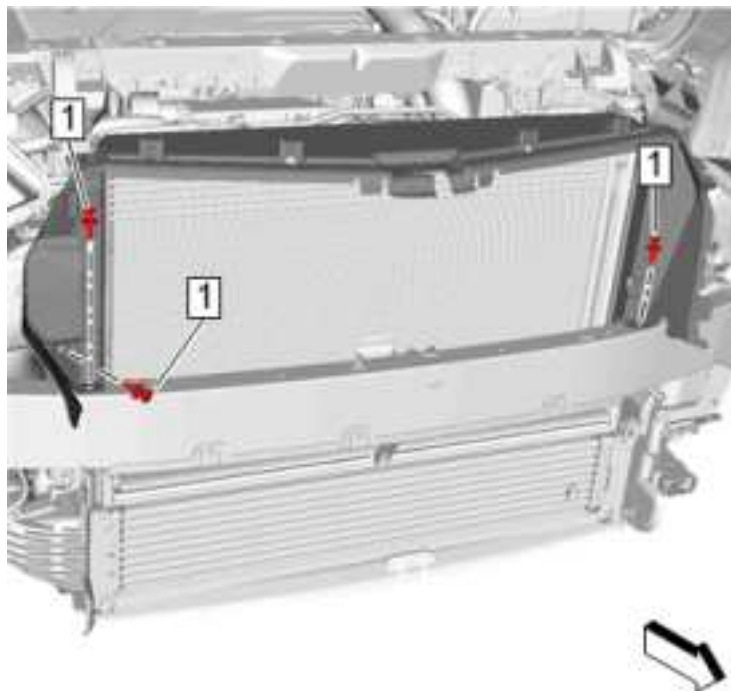


Fig. 445: Radiator Air Upper Baffle Retainer
 Courtesy of GENERAL MOTORS COMPANY

6. Remove Radiator Air Upper Baffle Retainer (1) - [3x]

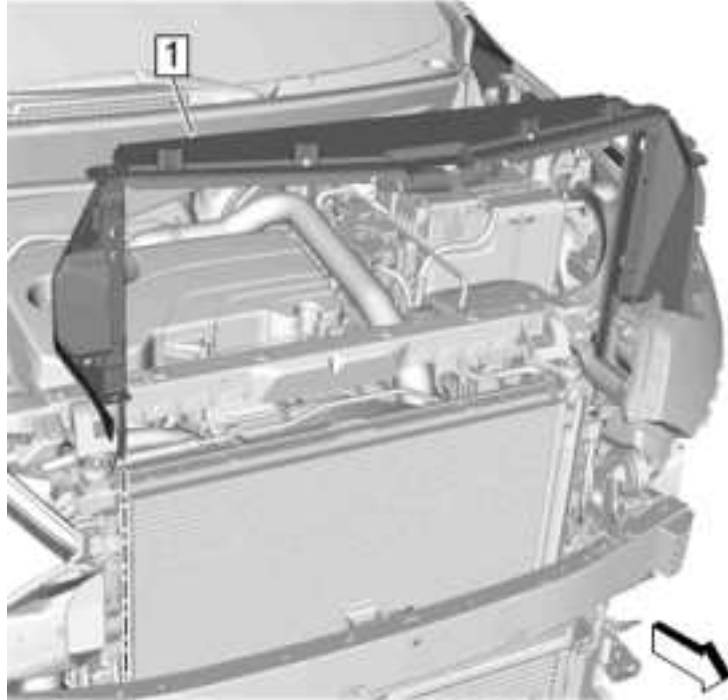


Fig. 446: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Air Upper Baffle (1)

Installation Procedure

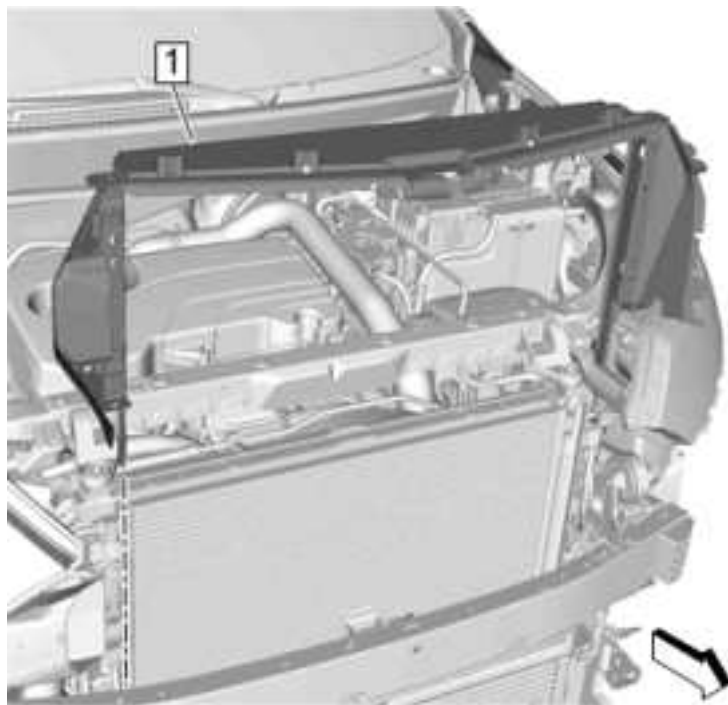


Fig. 447: Radiator Air Upper Baffle

Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Upper Baffle (1)

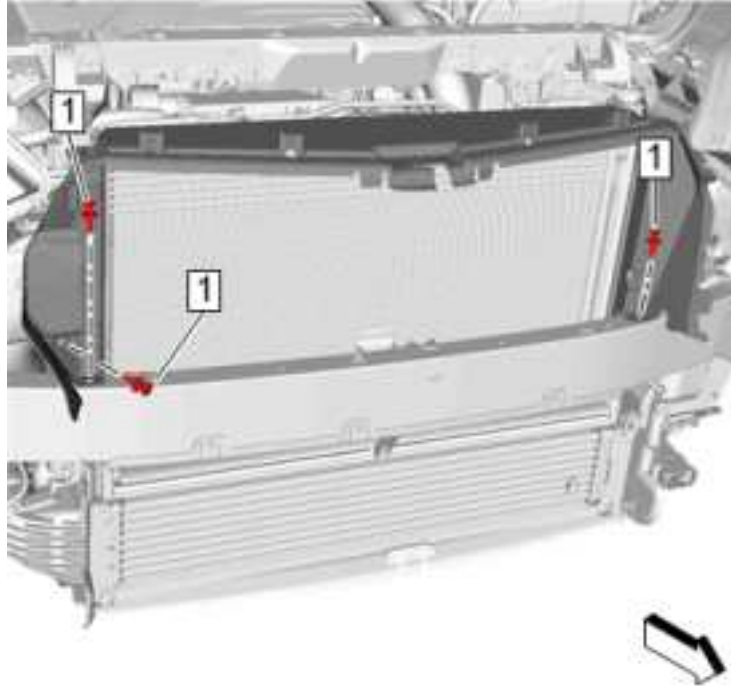


Fig. 448: Radiator Air Upper Baffle Retainer
 Courtesy of GENERAL MOTORS COMPANY

2. Install Radiator Air Upper Baffle Retainer (1) - [3x]

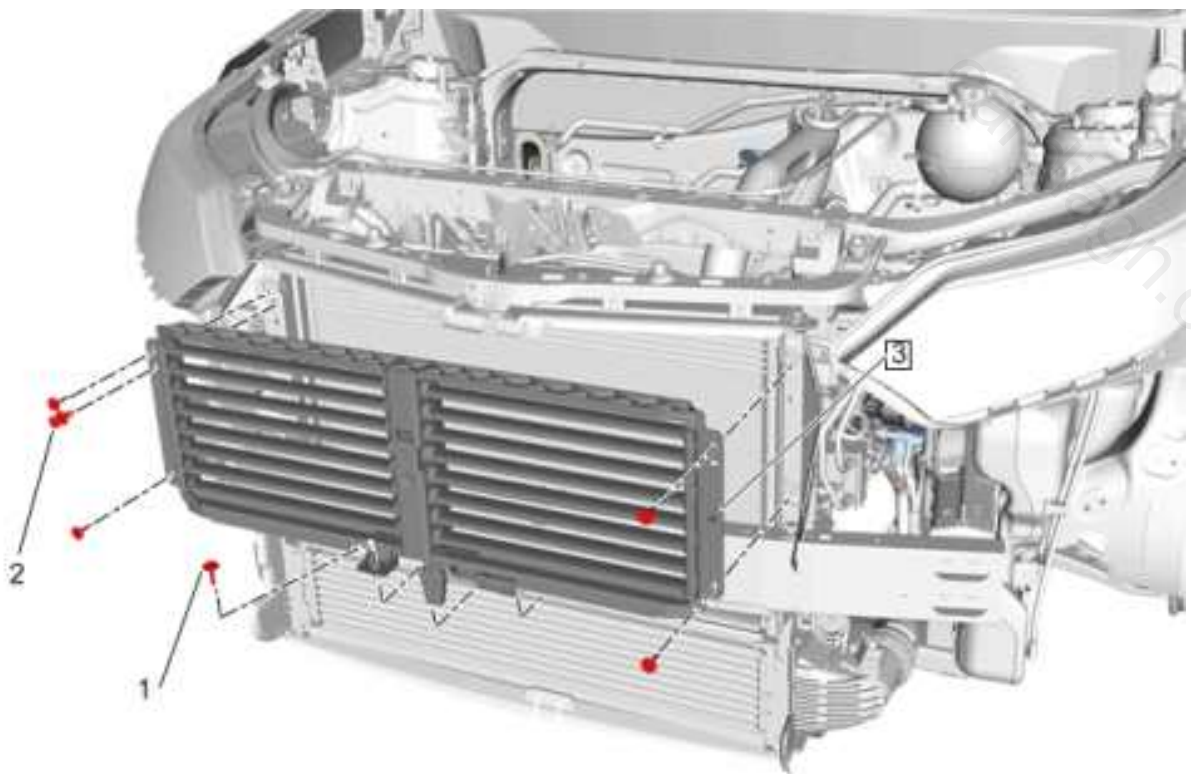


Fig. 449: Front Bumper Shutter
 Courtesy of GENERAL MOTORS COMPANY

3. Install Front Bumper Shutter (2) - [Front Bumper Shutter Replacement](#)
4. Connect the electrical connectors.

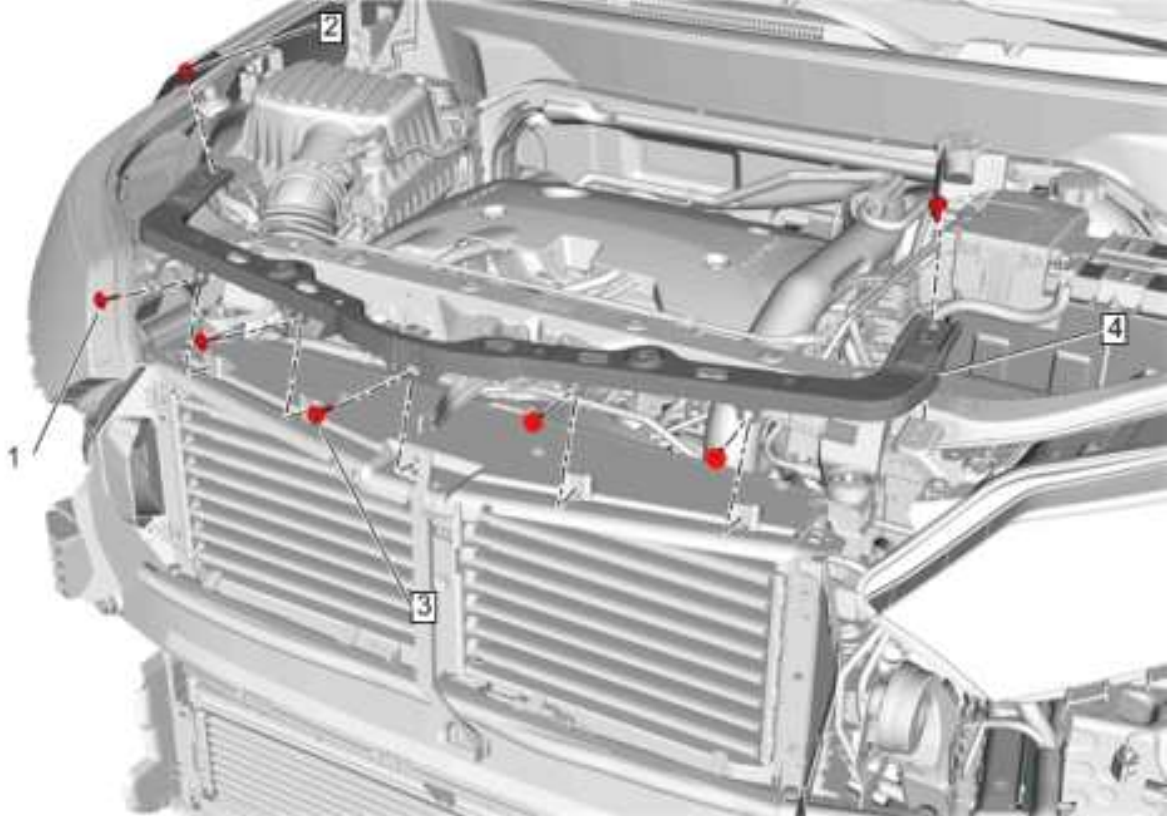


Fig. 450: Front Bumper Fascia Center Support
 Courtesy of GENERAL MOTORS COMPANY

5. Install Front Bumper Fascia Center Support (3) - **Front Bumper Fascia Center Support Replacement**

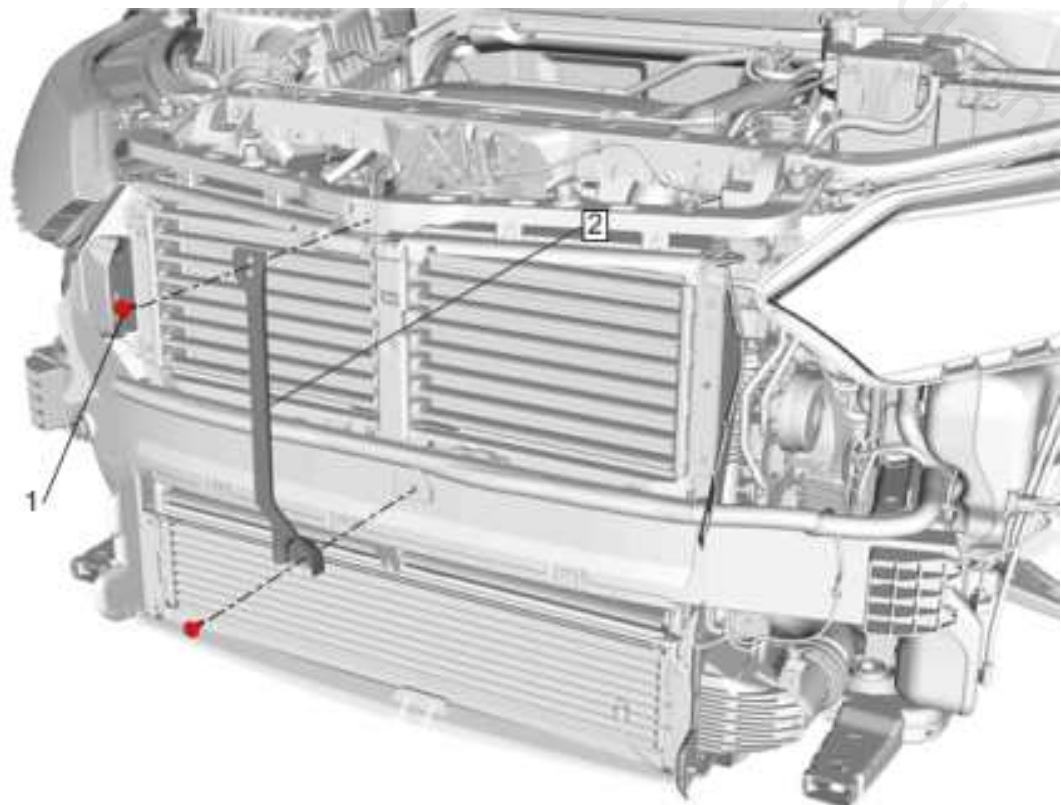


Fig. 451: Front Bumper Fascia Support Brace
 Courtesy of GENERAL MOTORS COMPANY

6. Install Front Bumper Fascia Support Brace (2) - **Front Bumper Fascia Support Brace Replacement**
7. Install Front Bumper Fascia - **Front Bumper Fascia Replacement (Equinox)** **Front Bumper Fascia Replacement (Terrain)**

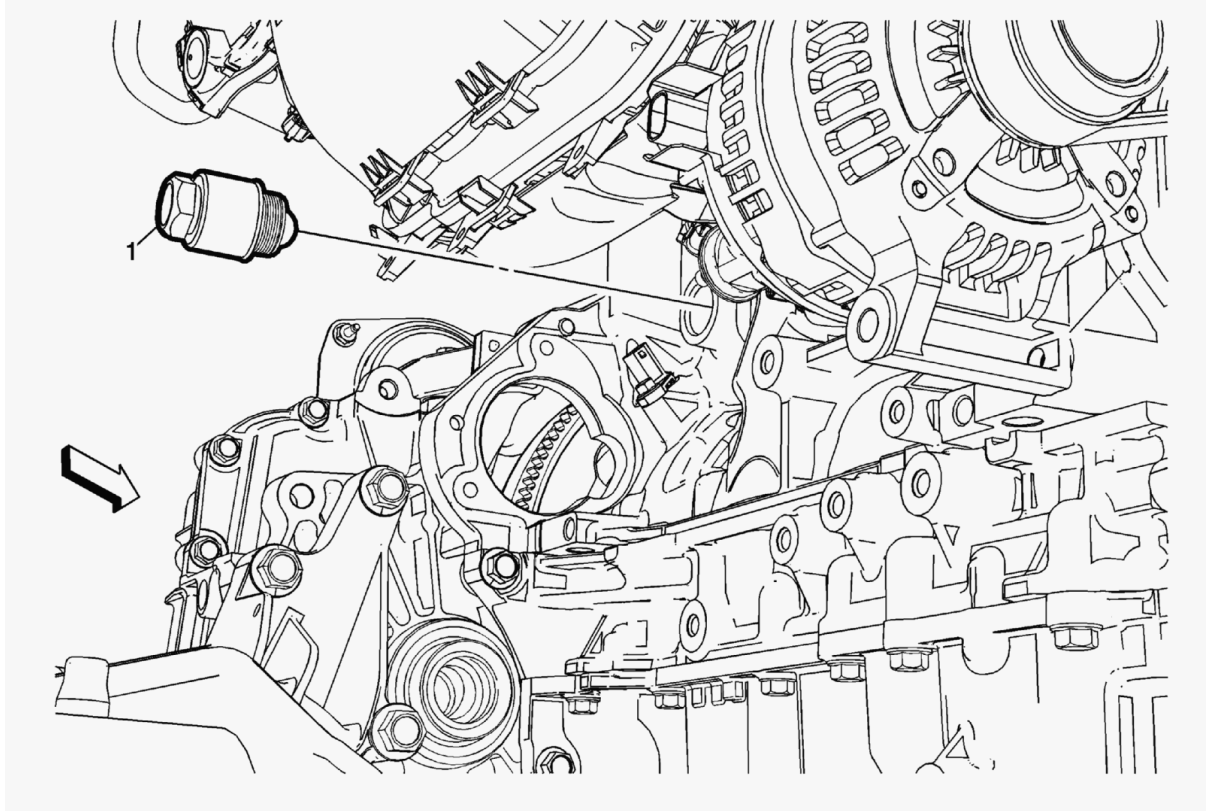


Fig. 452: Coolant Heater (LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to Cooling System Draining and Filling (GE 47716)Cooling System Draining and Filling (Static). 2. Remove the starter. Refer to Starter Replacement (LTG - All Wheel Drive) Starter Replacement (LTG - Front Wheel Drive) .	
1	Engine Coolant Heater CAUTION: Refer to Component Fastener Tightening Caution . Procedure Disconnect the engine coolant heater cord. Tighten 50 N.m (37 lb ft)

COOLANT HEATER REPLACEMENT (LYX)

Removal Procedure

1. Drain the cooling system. [Cooling System Draining and Filling \(GE 47716\)](#)[Cooling System Draining and Filling \(Static\)](#).
2. Remove Starter - [Starter Replacement \(LYX - All Wheel Drive\)](#) [Starter Replacement \(LYX - Front Wheel Drive\)](#)

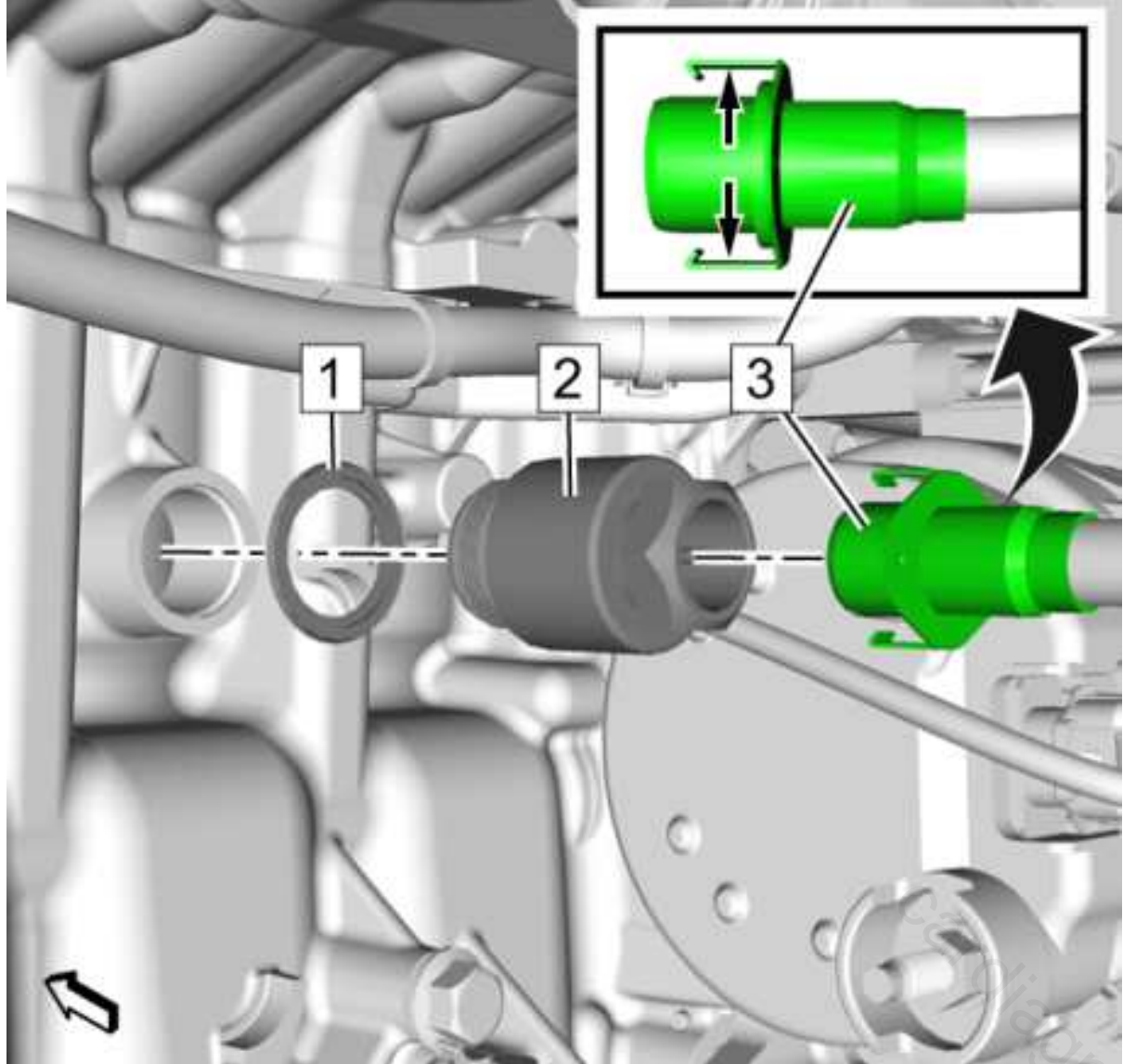


Fig. 453: Engine Coolant Heater, Seal And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the electrical connector. (3)
4. Remove Engine Coolant Heater (2)
5. Remove Engine Coolant Heater Seal (1) and DISCARD

Installation Procedure

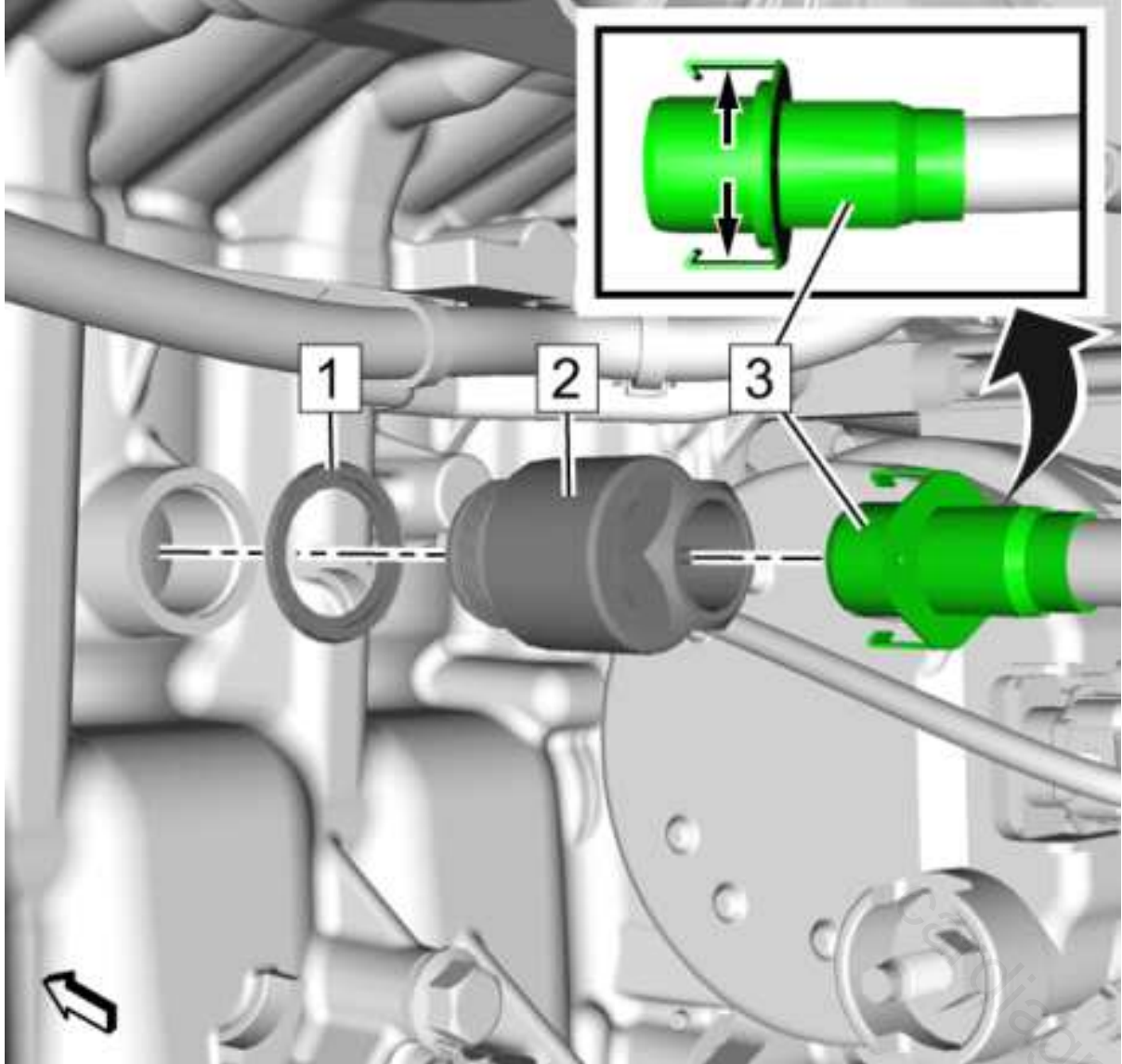


Fig. 454: Engine Coolant Heater, Seal And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Engine Coolant Heater Seal (1).

CAUTION: Fastener Caution

2. Install Engine Coolant Heater (2) and tighten 50 N.m (37 lb ft)
3. Connect the electrical connector. (3)
4. Install Starter - Starter Replacement (LYX - All Wheel Drive) Starter Replacement (LYX - Front Wheel Drive)
5. Fill the cooling system. Cooling System Draining and Filling.(GE 47716)Cooling System Draining and Filling (Static)
6. Inspect for coolant leaks.

COOLANT HEATER CORD REPLACEMENT (LYX)

Removal Procedure

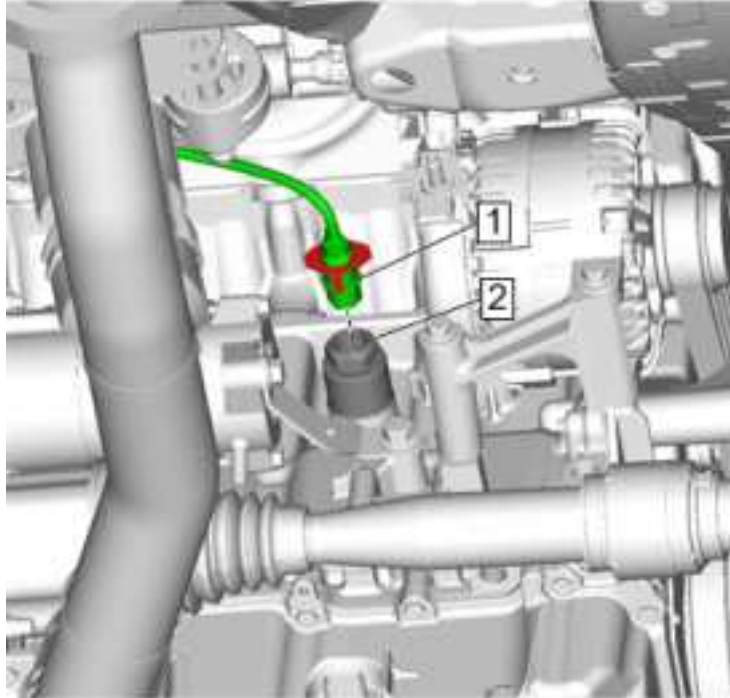


Fig. 455: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

1. Disconnect Coolant Heater Cord (1) @ Coolant Heater (2)

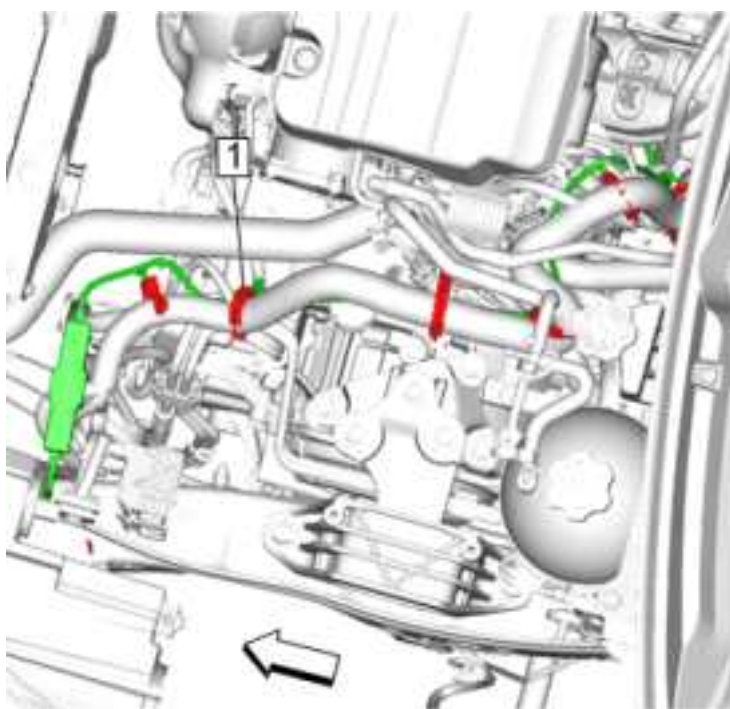


Fig. 456: Coolant Heater Cord Clip

Courtesy of GENERAL MOTORS COMPANY

2. Separate Coolant Heater Cord Clip (1) @ Wiring Harness - [7x]

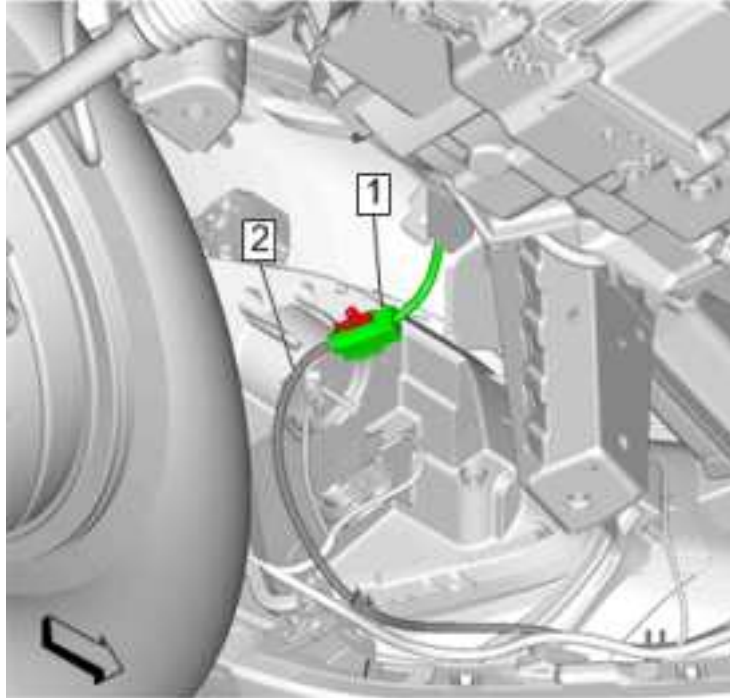


Fig. 457: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

3. Disconnect Coolant Heater Cord (1) @ Engine Coolant Heater Wiring Extension Harness (2).
4. Remove Coolant Heater Cord.

Installation Procedure

1. Install Coolant Heater Cord.

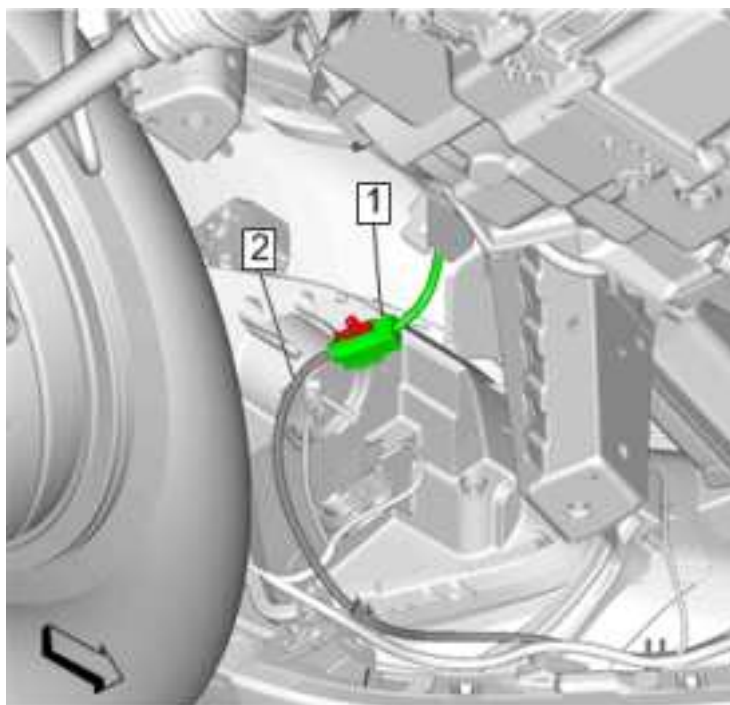


Fig. 458: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

2. Connect Coolant Heater Cord (1) @ Engine Coolant Heater Wiring Extension Harness (2).

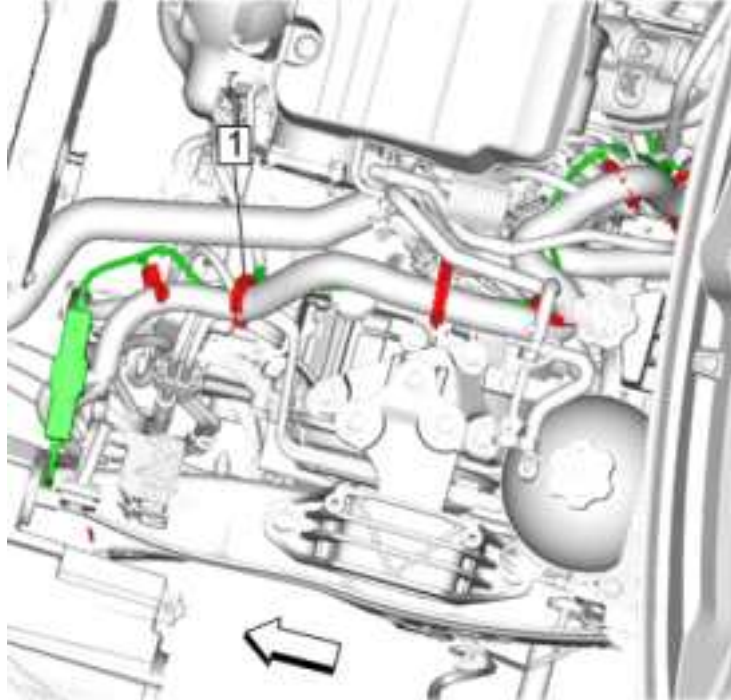


Fig. 459: Coolant Heater Cord Clip

Courtesy of GENERAL MOTORS COMPANY

3. Install Coolant Heater Cord Clip (1) @ Wiring Harness.[7x]

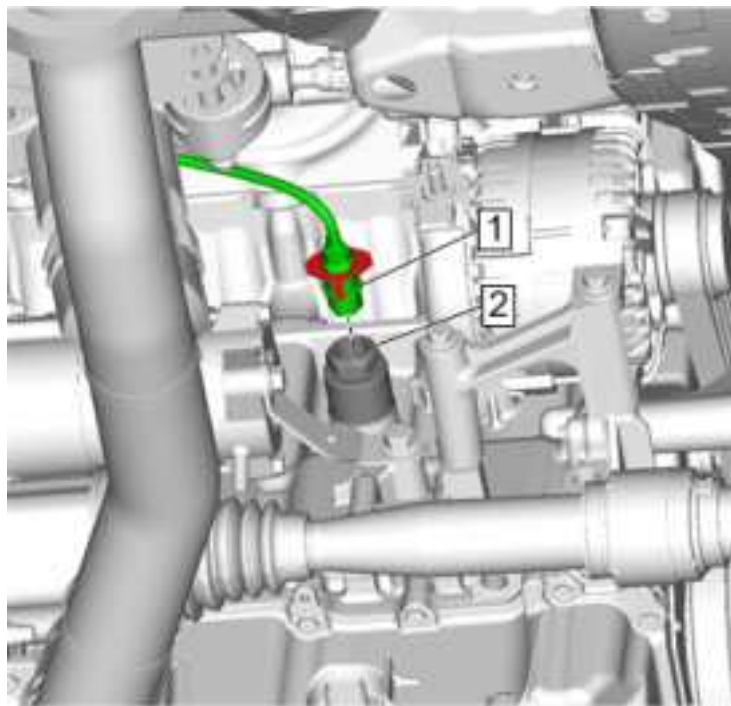


Fig. 460: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

4. Connect Coolant Heater Cord (1) @ Coolant Heater (2).

COOLANT HEATER CORD REPLACEMENT (LTG)

Removal Procedure

1. Remove Starter - Starter Replacement (LTG - All Wheel Drive) Starter Replacement (LTG - Front Wheel Drive)

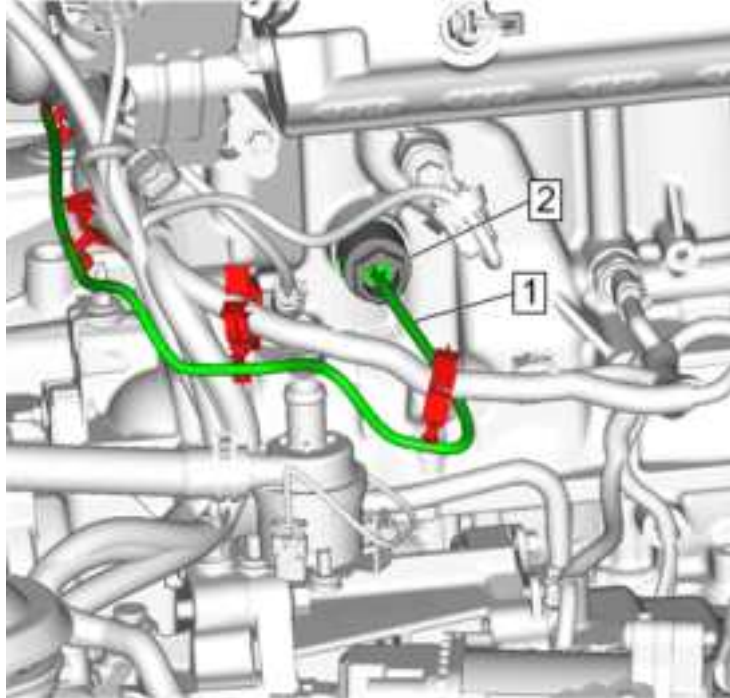


Fig. 461: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect Coolant Heater Cord (1) @ Coolant Heater (2)

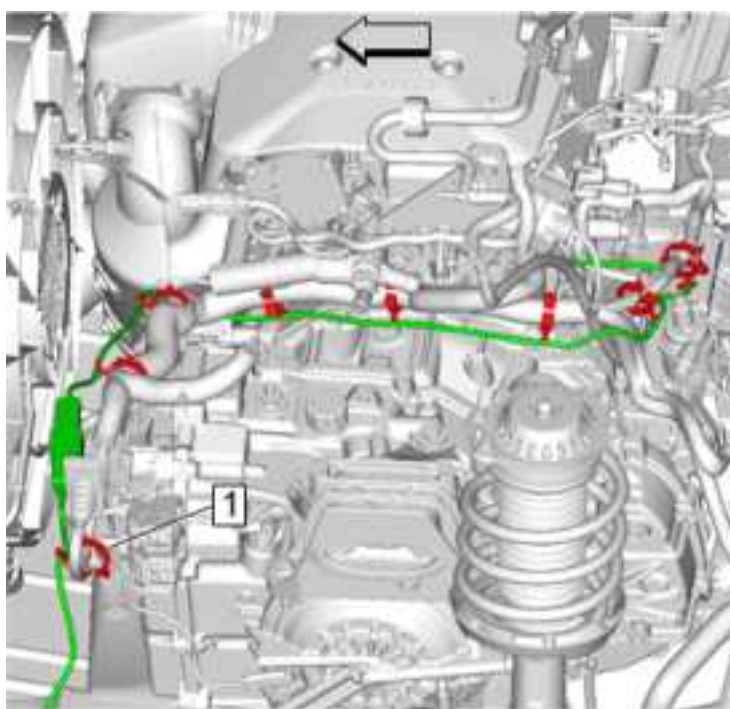


Fig. 462: Coolant Heater Cord Clip

Courtesy of GENERAL MOTORS COMPANY

3. Separate Coolant Heater Cord Clip (1) @ Wiring Harness - [8x]

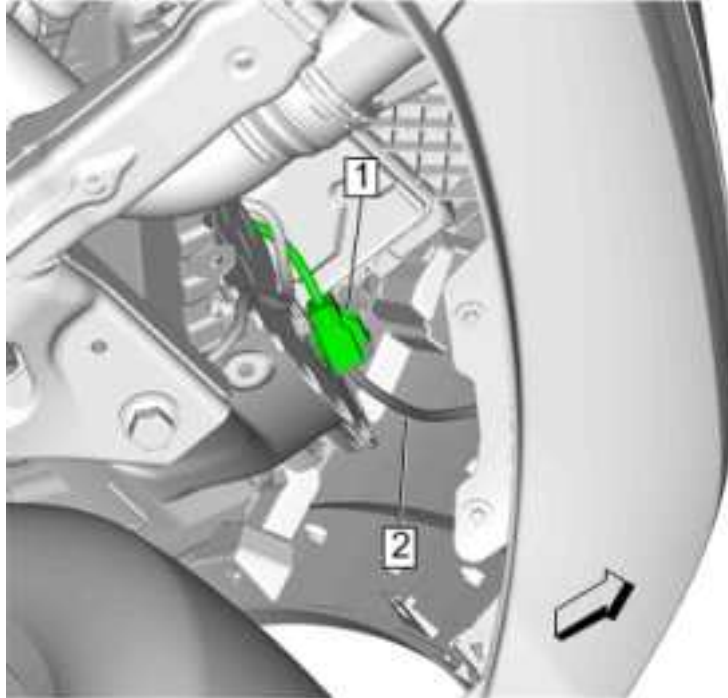


Fig. 463: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Coolant Heater Cord (1) @ Engine Coolant Heater Wiring Extension Harness (2).
5. Remove Coolant Heater Cord

Installation Procedure

1. Install Coolant Heater Cord.

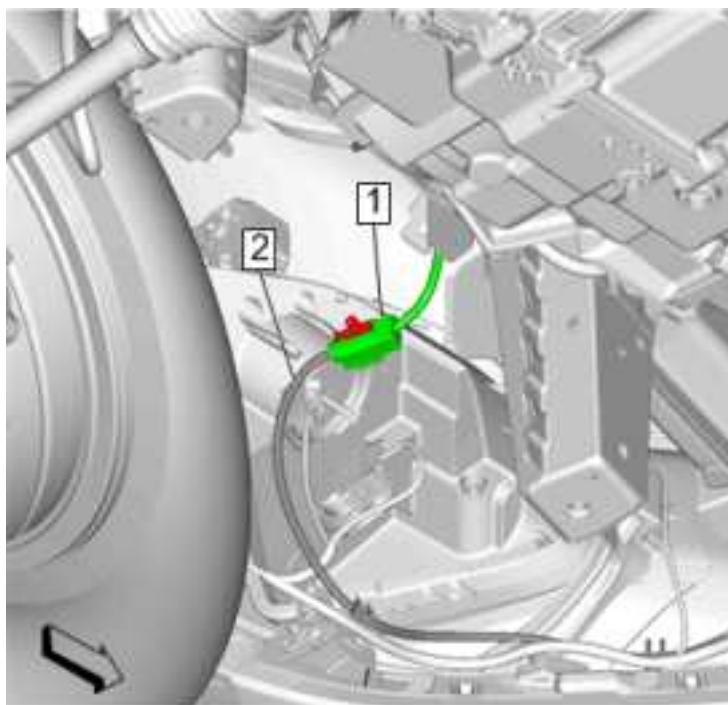


Fig. 464: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

2. Connect Coolant Heater Cord (1) @ Engine Coolant Heater Wiring Extension Harness (2).

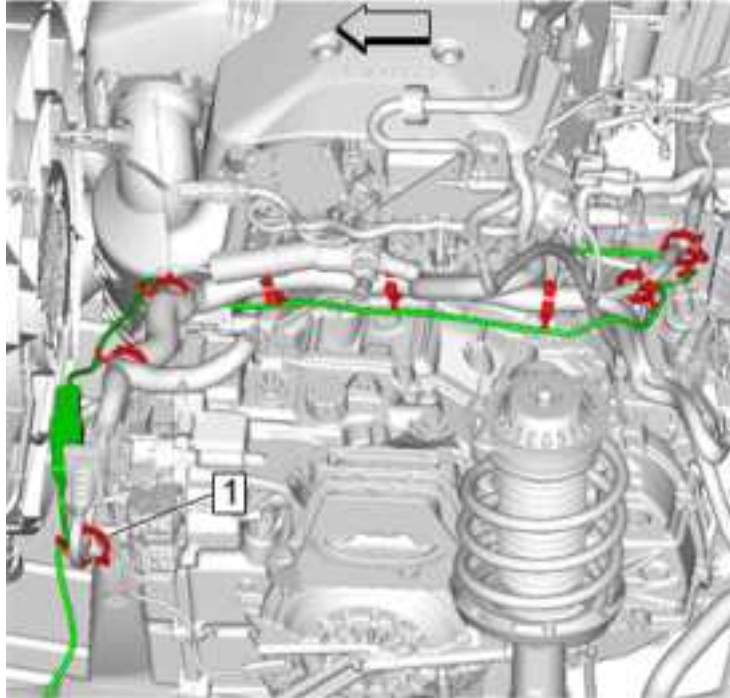


Fig. 465: Coolant Heater Cord Clip

Courtesy of GENERAL MOTORS COMPANY

3. Connect Coolant Heater Cord Clip (1) @ Wiring Harness - [8x]

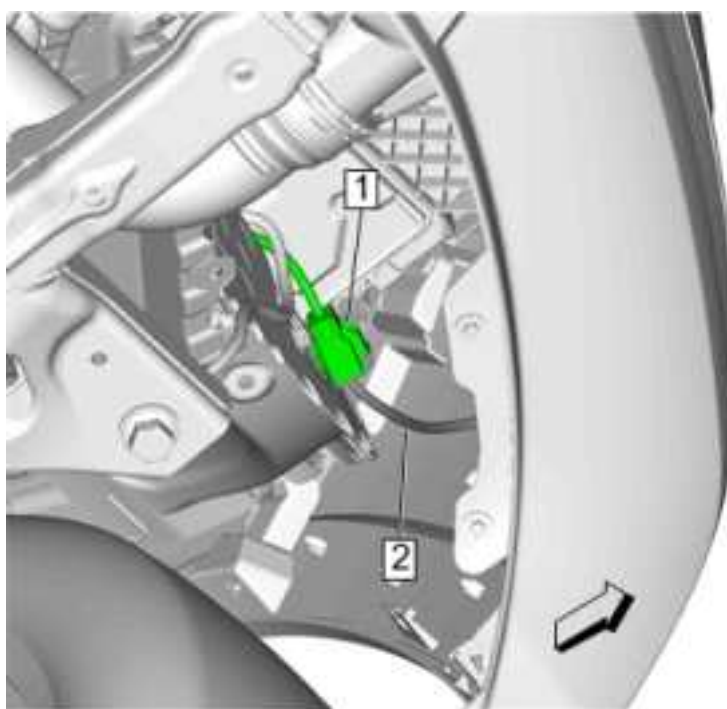


Fig. 466: Coolant Heater Cord

Courtesy of GENERAL MOTORS COMPANY

4. Connect Coolant Heater Cord (1) @ Coolant Heater (2)
5. Install Starter - Starter Replacement (LTG - All Wheel Drive) Starter Replacement (LTG - Front Wheel Drive)

ENGINE COOLANT HEATER WIRING EXTENSION HARNESS REPLACEMENT

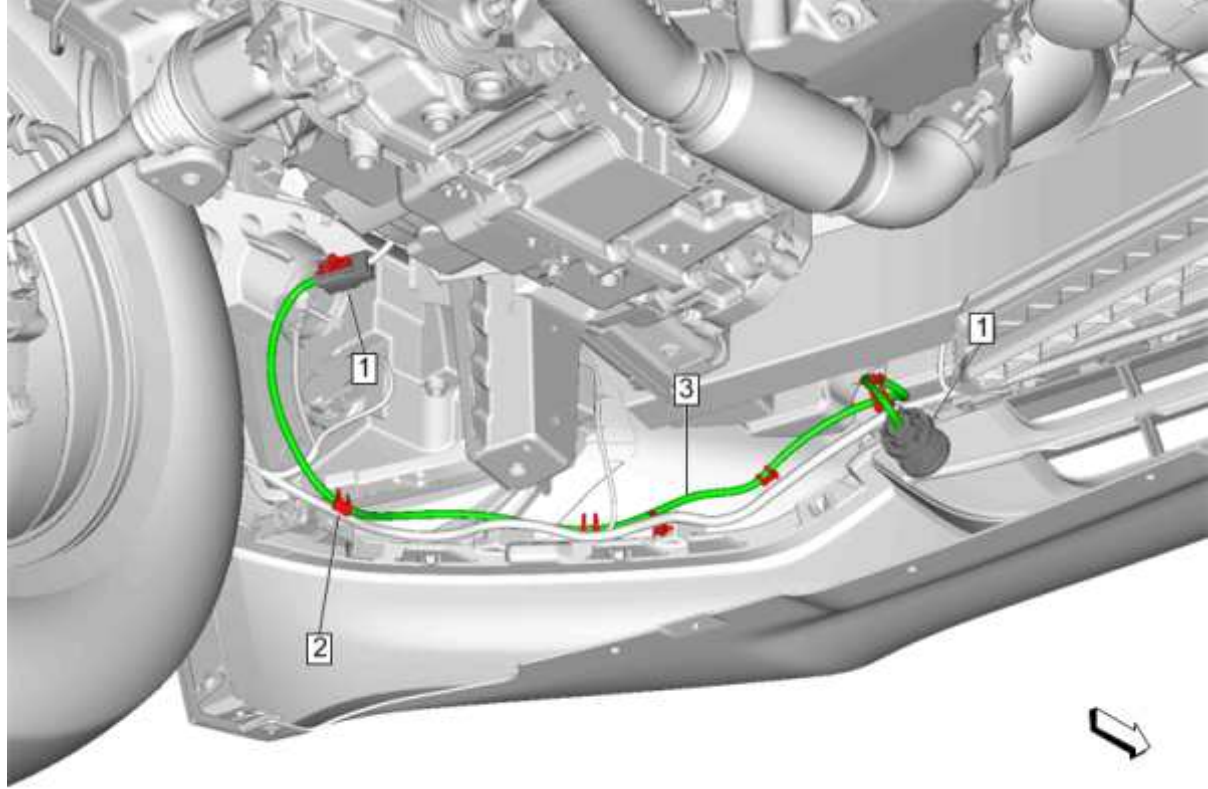


Fig. 467: Engine Coolant Heater Wiring Extension Harness
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Engine Coolant Heater Wiring Extension Harness Electrical Connector [2x]
2	Engine Coolant Heater Wiring Extension Harness Double Tie Strap Clip [6x]
3	Engine Coolant Heater Wiring Extension Harness

DESCRIPTION AND OPERATION

COOLING FAN DESCRIPTION AND OPERATION

Cooling Fan Control

The engine cooling fan system is composed of one electric cooling fan and a cooling fan control module. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control module. The cooling fan control module varies the voltage drop across the cooling fan motor in relation to the pulse width modulated signal, allowing the cooling fan to operate at variable speeds. The cooling fan speed is effected by many different operating conditions and the ECM will adjust the duty cycle based on cooling system requirements.

This system is unique in that the ECM will not operate the cooling fan at every speed within a 0 - 90 percent range. The cooling fan calibration is designed to operate the cooling fan at 5 specific percentages in order to avoid the speed regions that create undesirable noise and vibration. During normal operating conditions the ECM may initially activate the cooling fan at 4 or 5 % and then increase to the desired percentages to satisfy powertrain cooling requirements. Generally, the ECM will operate the cooling fan at specific percentages but, may scale the percentages either higher or lower in response to generator demand. The percentages at which the cooling fan operates may vary between vehicle lines and engines.

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. The scan tool output control is only capable of operating the cooling fan in the speed percentages allowed by the ECM. When multiple cooling fan speed requests are received, the ECM operates the fan at the highest of the speed requests. The ECM commands the fan(s) 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 Electronic Component Description and Operation

Coolant Heater

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. A weather shield on the cord is provided to protect the plug when not in use.

Engine or Radiator Coolant Temperature Sensor

The engine coolant temperature (ECT) sensor or radiator coolant temperature (RCT) sensor is a variable resistor that measures the temperature of the engine or radiator coolant. The ECM supplies 5 V to the sensor signal circuit and a ground for the low reference circuit.

Engine Coolant Thermostat Heater

The ECM controls the pulse width modulated (PWM) thermostat heater circuit. The engine coolant thermostat heater helps control coolant flow and regulates the engine operating temperature. The ignition relay supplies 12 V to the thermostat through a fuse. The ECM controls the engine coolant thermostat heater by grounding the control circuit with a solid state device called a driver. The driver is equipped with a feedback circuit that is pulled-up to a voltage. The ECM can determine if the control circuit is open, shorted to ground, or shorted to a voltage by monitoring the feedback voltage.

Electronic Coolant Pump

The switchable water pump is always ON in the default position. When commanded, an actuator disengages a clutch that decouples the pump from the engine. An Engine Material Sensor has been introduced on the engine head for the switchable water pump control and engine protection purposes. The engine metal temperature (EMT) sensor is present only if the switchable water pump is present in the specific application.

Engine Metal Temperature Sensor/Cylinder Head Temperature Sensor

The cylinder head temperature sensor is a variable resistor that measures the temperature of the cylinder head. The engine control module (ECM) supplies 5 V to the cylinder head temperature sensor signal circuit and a ground for the low reference circuit.

Electro-Viscous (EV) Fan Clutch

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.

COOLING SYSTEM DESCRIPTION AND OPERATION

The cooling systems 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 to the thermostat. The flow of coolant will be stopped at the thermostat until the engine is warmed; while the thermostat is closed the water pump circulates coolant through the engine block and heater core. An electric auxiliary water pump is used on the heater core outlet circuit to aid in flow through the heater loop with KL9. This auxiliary water pump is enabled when the heater control is set to request heat, and the vehicle is in the STOP mode of the AUTOSTOP feature. Coolant is returned to the water pump through the engine bypass and the heater core outlet hose. This provides the passenger compartment with heat and defrost.

After the thermostat opens, the coolant is pumped through the water pump outlet and into the engine block and heater core. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

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.

From the cylinder heads, the coolant is then forced into the radiator where it is cooled and the coolant cycle is completed.

Operation of the cooling system requires proper functioning of all cooling system components. The cooling system consists of the following components:

Coolant

The engine coolant is a solution made up of a 50/50 mixture of DEX-COOLÂ® 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 consisting of a core and 2 tanks. The aluminum core is a tube and fin cross-flow 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 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.

Thermostat

The thermostat controls the flow of coolant and is mounted to the cylinder head. The thermostat contains a wax pellet that expands and contracts based on the coolant temperature, which will mechanically move the main spring and a sealing disc to control the flow of coolant. It is assisted by electric power in order to open the main valve earlier than original opening temperature.

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. The increased coolant volume flows into the surge tank. As the coolant circulates, any air is allowed to bubble out. Coolant without air bubbles absorbs heat much better than coolant with bubbles.

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.

LTG, LYX, LH7 Engine

The transmission oil cooler is an air-to-oil heat exchanger integrated with the A/C condenser, occupying the top seven rows. Transmission fluid is supplied to the cooler inlet, where it passes through a series of tubes and is returned to the transmission sump. Transmission fluid temperature is regulated by air passing through the cooler fins, between the tubes, carrying away heat to the atmosphere.

A temperature/pressure fluid bypass valve is mounted to the end of the cooler. By design, transmission fluid bypasses the cooler to provide quick transmission warm-up where efficient shift schedules can be achieved. As the transmission fluid achieves proper operating temperature, the thermostatic bypass valve closes, and fluid is routed through the cooler to manage fluid temperature. When a pressure drop (due to cooler blockage) is present, the bypass valve will open to bypass the cooler, returning the fluid to the transmission sump.

SPECIAL TOOLS AND EQUIPMENT**SPECIAL TOOLS**

Illustration	Tool Number/ Description
	BO 38185 J 38185 Hose Clamp Pliers

Illustration	Tool Number/ Description
	EL 35616-F J 35616-F Terminal Test Kit

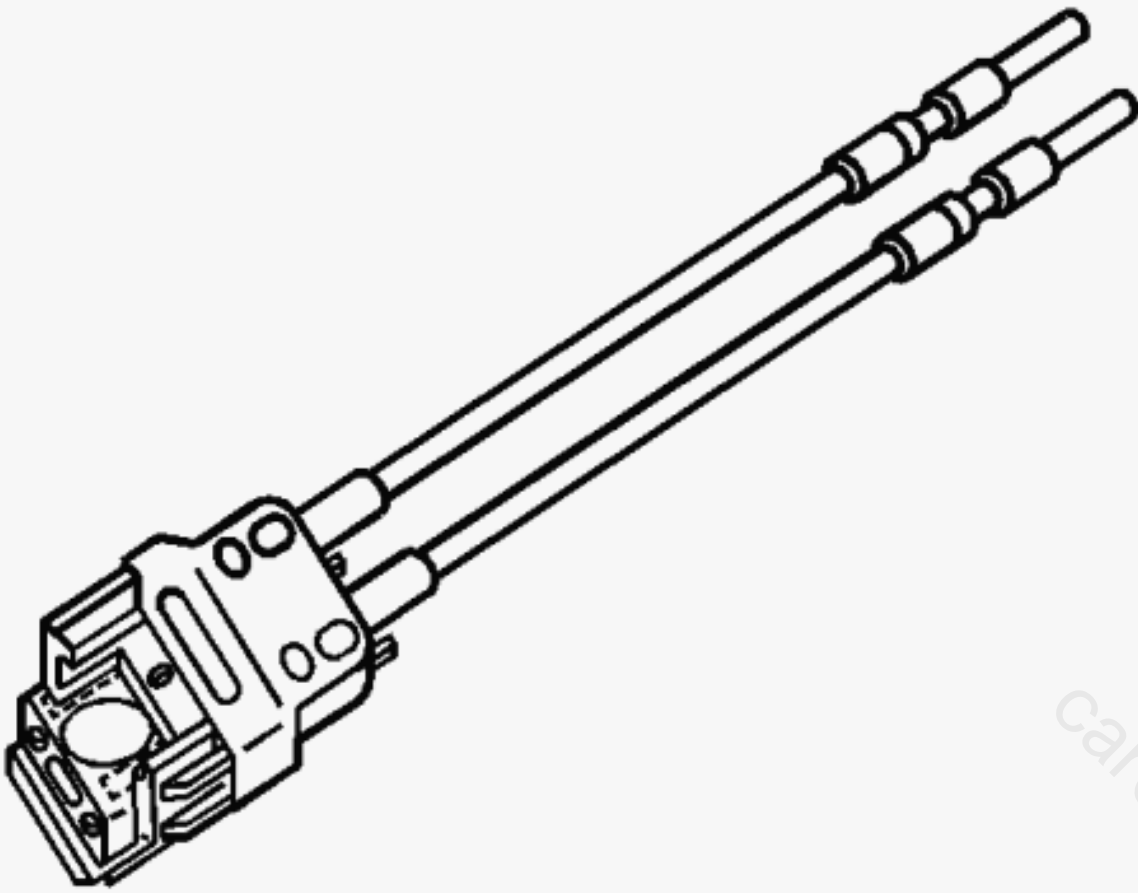
Illustration	Tool Number/ Description
	EL 36169- HD J 36169-HD Heavy Duty Fused Jumper
	EN 24460- A J 24460-01 Cooling System Pressure Tester

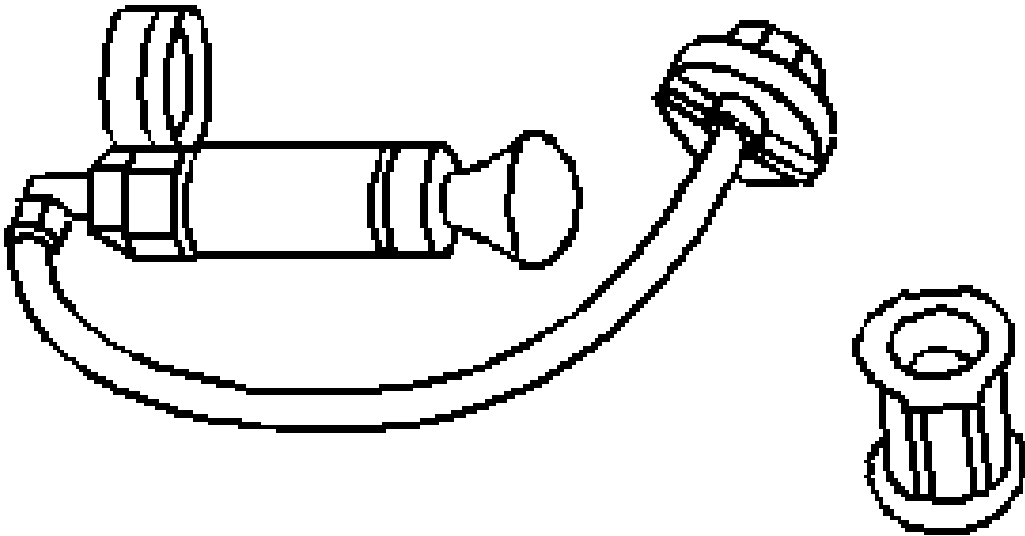
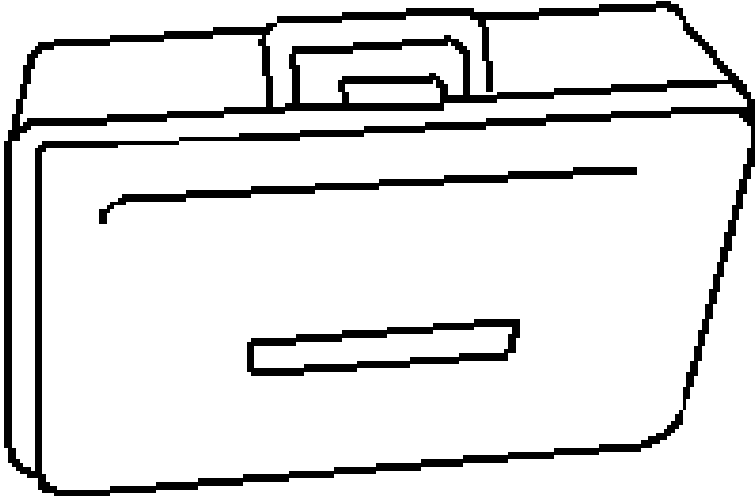
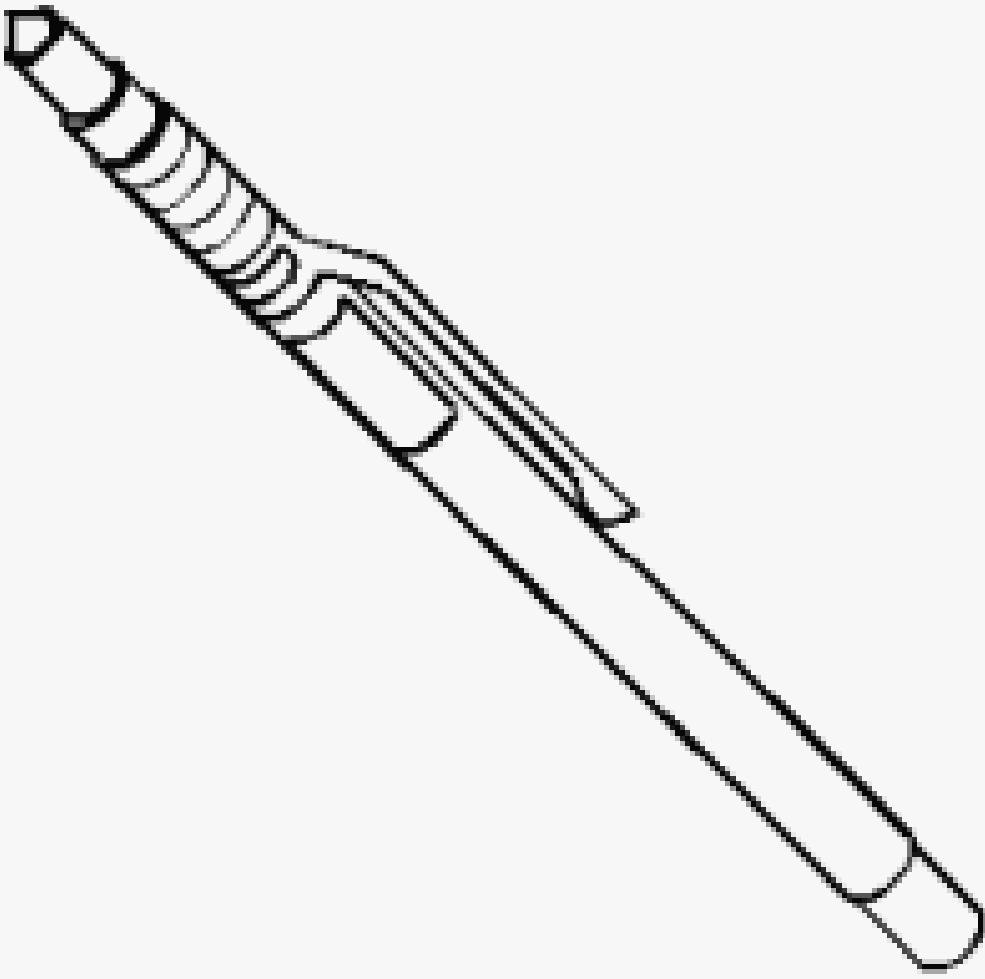
Illustration	Tool Number/ Description
  cardiagn.com	

Illustration	Tool Number/ Description
	GE 24731 J 24731 Tempilstick

--

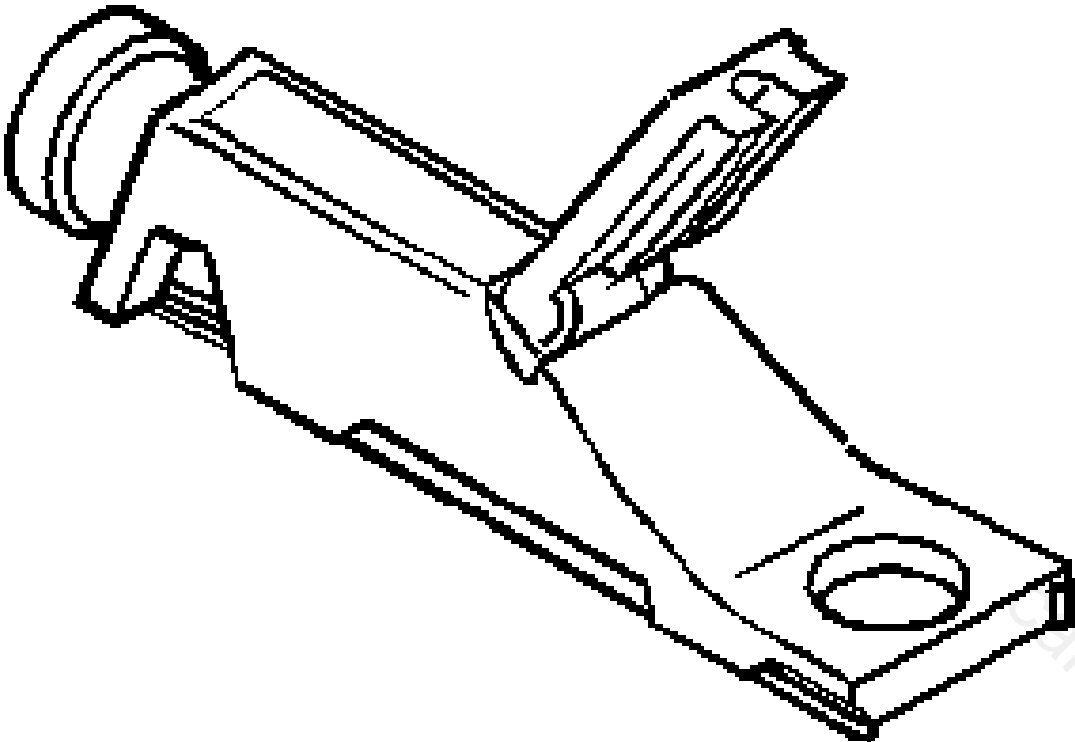
Illustration	Tool Number/ Description
	GE 26568 J 26568 Coolant and Battery Fluid Tester

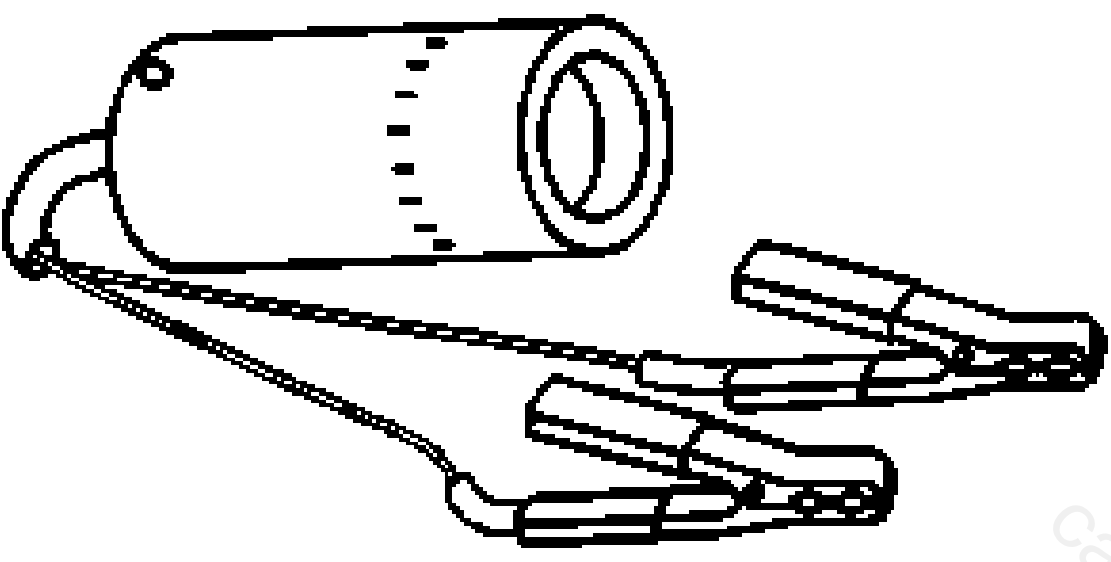
Illustration	Tool Number/ Description
	GE 42220 J 42220 Universal 12V Leak Detection Lamp
	GE 42401 - A J 42401 Radiator Cap and Surge Tank Test Adapter

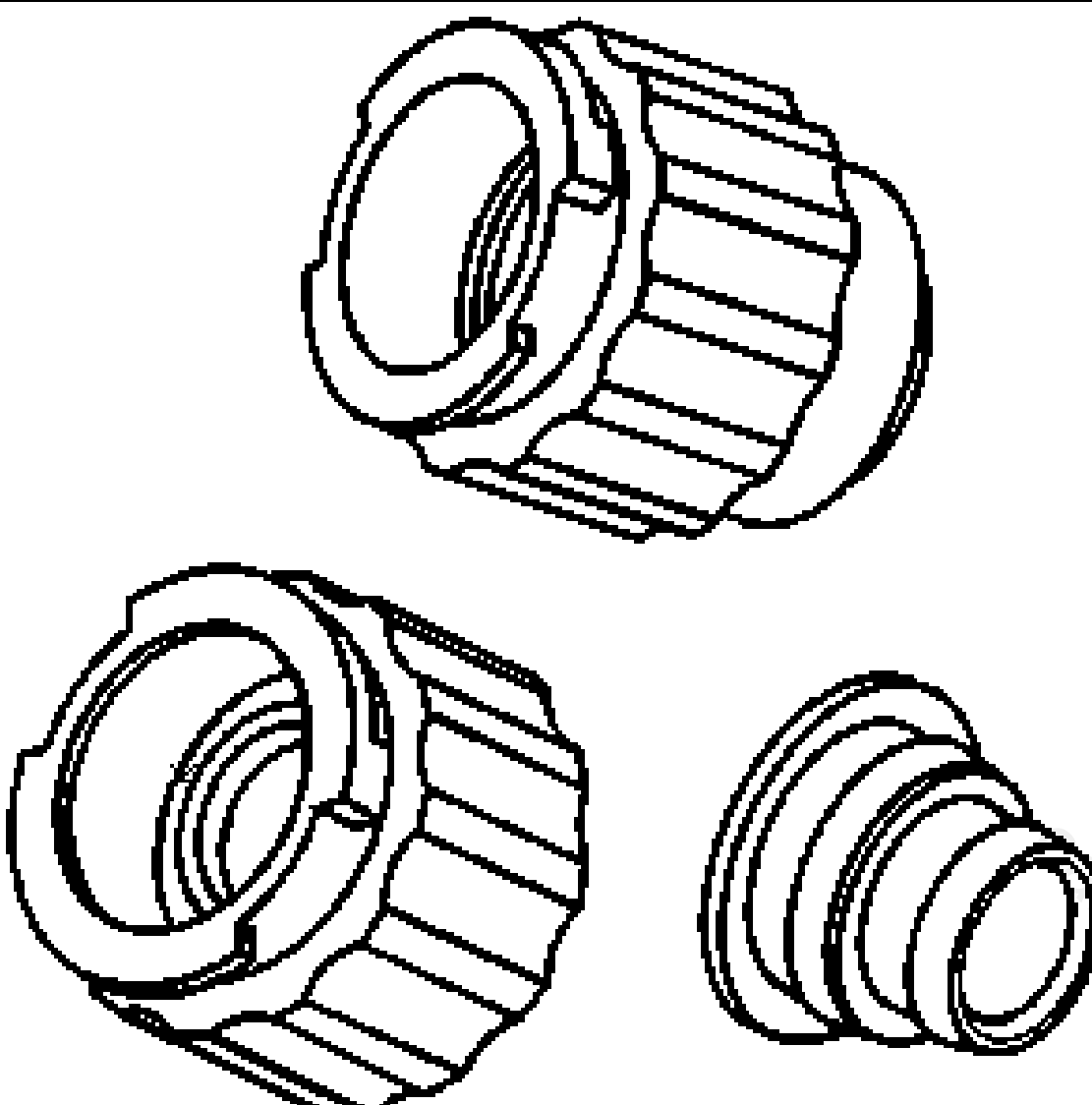
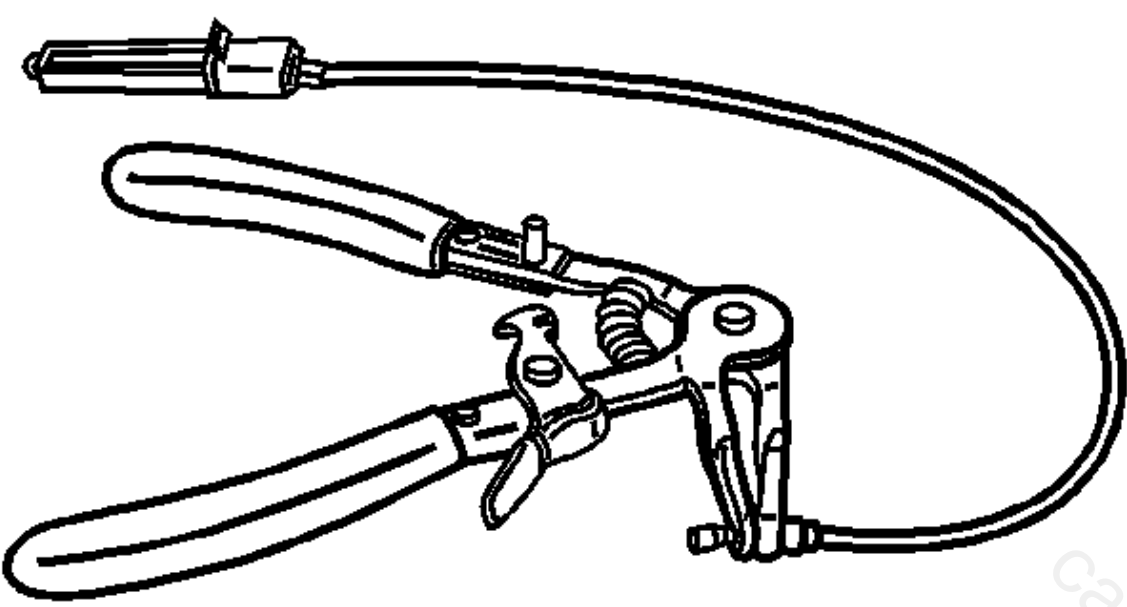
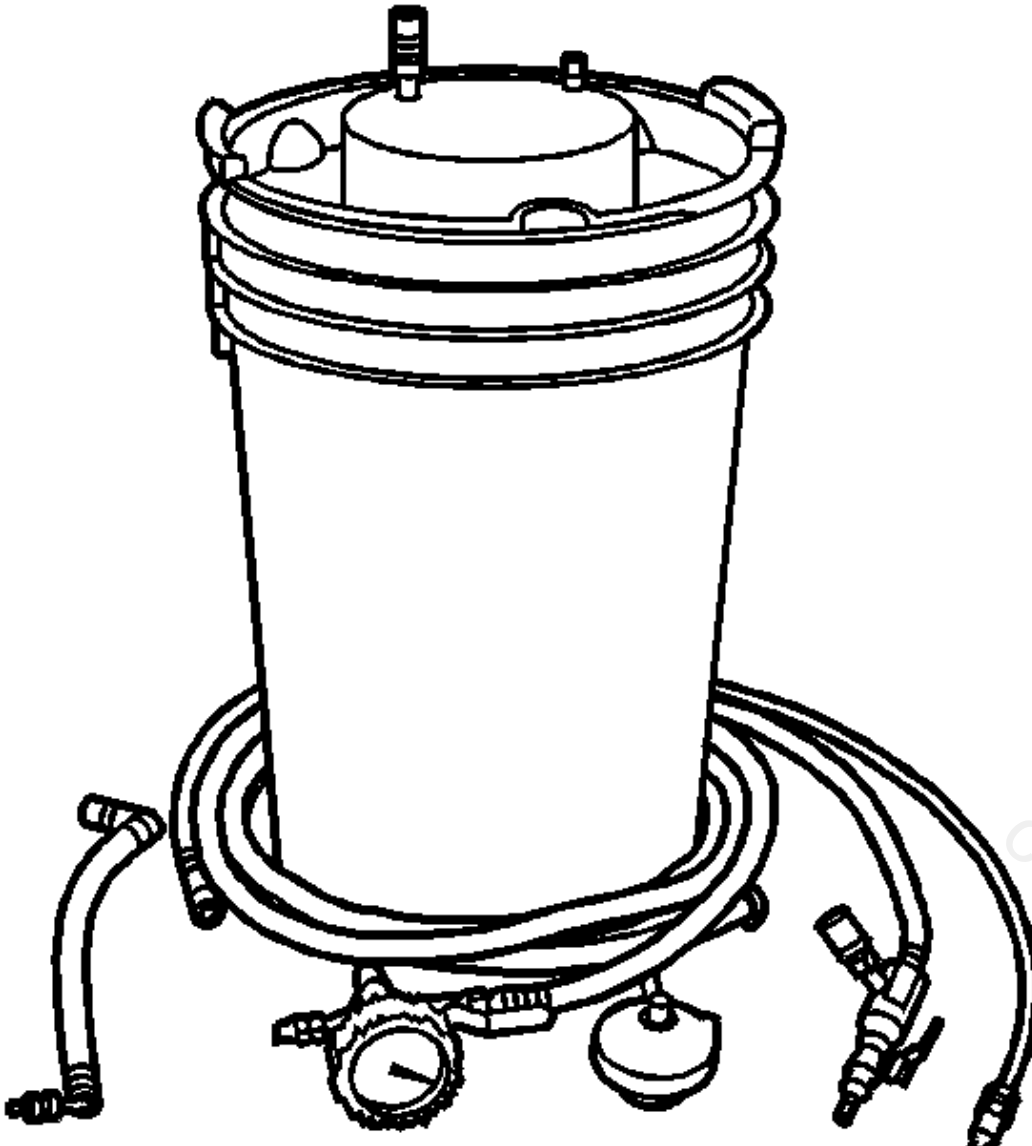
Illustration	Tool Number/ Description
 The illustration shows three mechanical components. The top component is a large flange nut with a wide, flat flange and a threaded body. The bottom-left component is a large flange washer with a wide, flat flange and a central hole. The bottom-right component is a small lock washer with a central hole and a threaded body. A faint watermark 'rdiagn.com' is visible across the bottom-right component.	

Illustration	Tool Number/ Description
	GE 47622 Hose Clamp Pliers

--

Illustration	Tool Number/ Description
	GE 47716 Vac N Fill Coolant Refill Tool