Service Manual: ENGINE COOLING SYSTEM

SPECIFICATIONS > FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Auxiliary Engine Oil Cooler (LTG)	10 N.m	89 lb in
Charge Air Cooler Bracket Fastener (LGX, LT1)	9 N.m	80 lb in
Charge Air Cooler Coolant Pump Fastener (LT1)	10 N.m	89 lb in
Charge Air Cooler Drain Cock	9 N.m	80 lb in
Charge Air Cooler Fastener (LT1)	9 N.m	80 lb in
Charge Air Cooler Radiator Lower Bracket Fastener (LT1)	9 N.m	80 lb in
Coolant Heater (LTG)	50 N.m	37 lb ft
Coolant Heater Cord Fastener (LTG)	10 N.m	89 lb in
Engine Coolant Air Bleed Pipe Fastener (LGX, LTG)	10 N.m	89 lb in
Engine Coolant Air Bleed Valve (LT1)	8 N.m	71 lb in
Engine Coolant Fan Bolt (LGX)	9 N.m	80 lb in
Engine Coolant Fan Shroud Fastener (LT1)	9 N.m	80 lb in
Engine Coolant Heater Fastener (LTG)	50 N.m	37 lb ft
Engine Coolant Manifold Fastener (LT1)	25 N.m	18 lb ft
Engine Coolant Thermostat Heater Shield (LTG)	5 N.m	44 lb in
Engine Coolant Thermostat Housing Fastener (LGX, LTG)	10 N.m	89 lb in
Engine Oil Cooler Adapter (LTG)	50 N.m	37 lb ft
Engine Oil Cooler Adapter Fastener Bracket (LGX)	22 N.m	16 lb ft
Engine Oil Cooler Adapter Fastener to Cylinder Head (LGX)	100 N.m	74 lb ft
Engine Oil Cooler Adapter Fastener to Engine Block (LTG)	58 N.m	43 lb ft
Engine Oil Cooler Bolt (LGX, LT1)	50 N.m	37 lb ft
Engine Oil Cooler Bolt (LTG)	10 N.m	89 lb in
Engine Oil Cooler Hose Fastener (LT1)	10 N.m	89 lb in
Engine Oil Cooler Hose Quick Connect	34 N.m	25 lb ft
Engine Oil Cooler Pipe Fastener (LGX, LTG)	10 N.m	89 lb in

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Fan Control Module Fastener (LGX, LTG)	8 N.m	71 lb in
Heater Inlet and Outlet Pipe Fastener (LGX)	9 N.m	80 lb in
Intake Manifold Vacuum Fitting (LF3)	12 N.m	106 lb in
Radiator Drain Cock	2 N.m	18 lb in
Radiator Inlet Pipe Fastener (LTG)	10 N.m	89 lb in
Radiator Surge Tank Fastener (LGX, LT1, LTG)	6 N.m	53 lb in
Radiator Upper Bracket Fastener (LGX, LT1, LTG)	9 N.m	80 lb in
Supercharger Water Manifold Fastener (LT1)	10 N.m	89 lb in
Thermostat Heater Shield Fastener	5 N.m	44 lb in
Turbocharger Coolant Feed Pipe Banjo Bolt (LTG)	35 N.m	26 lb ft
Turbocharger Coolant Feed Pipe Fasteners (LTG)	10 N.m	89 lb in
Turbocharger Coolant Return Pipe Banjo Bolt (LTG)	35 N.m	26 lb ft
Turbocharger Coolant Return Pipe Fasteners (LTG)	10 N.m	89 lb in
Water Inlet and Outlet Pipe Fasteners	9 N.m	80 lb in
Water Outlet Fastener (LGX, LT1)	10 N.m	89 lb in
Water Outlet Fastener (LTG)	12 N.m	106 lb in
Water Pump Fastener (LGX)	15 N.m	11 lb ft
Water Pump Fastener (LT1)	• First Pass - 10 N.m • Second Pass - 10 N.m • Final Pass - plus 45°	• First Pass - 89 lb in • Second Pass - 89 lb in • Final Pass - plus 45°
Water Pump Fastener (LTG)	25 N.m	18 lb ft
Water Pump Inlet Pipe Fastener (LGX)	9 N.m	80 lb in
Water Pump Pulley Fastener (LGX)	10 N.m	89 lb in

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SPECIFICATIONS > APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	US English
Cooling Systems		

2.0L (LTG) W/O V18	8.5 L	9.0 qt
3.6L (LGX) W/O KC4 &V18	8.8 L	9.3 qt
3.6L (LGX) W/KC4 W/O V18	9.895 L	10.46 qt
3.6L (LGX) W/V18	12.81 L	13.54 qt
6.2L (LT1) W/V18	13.5 L	13.79 qt

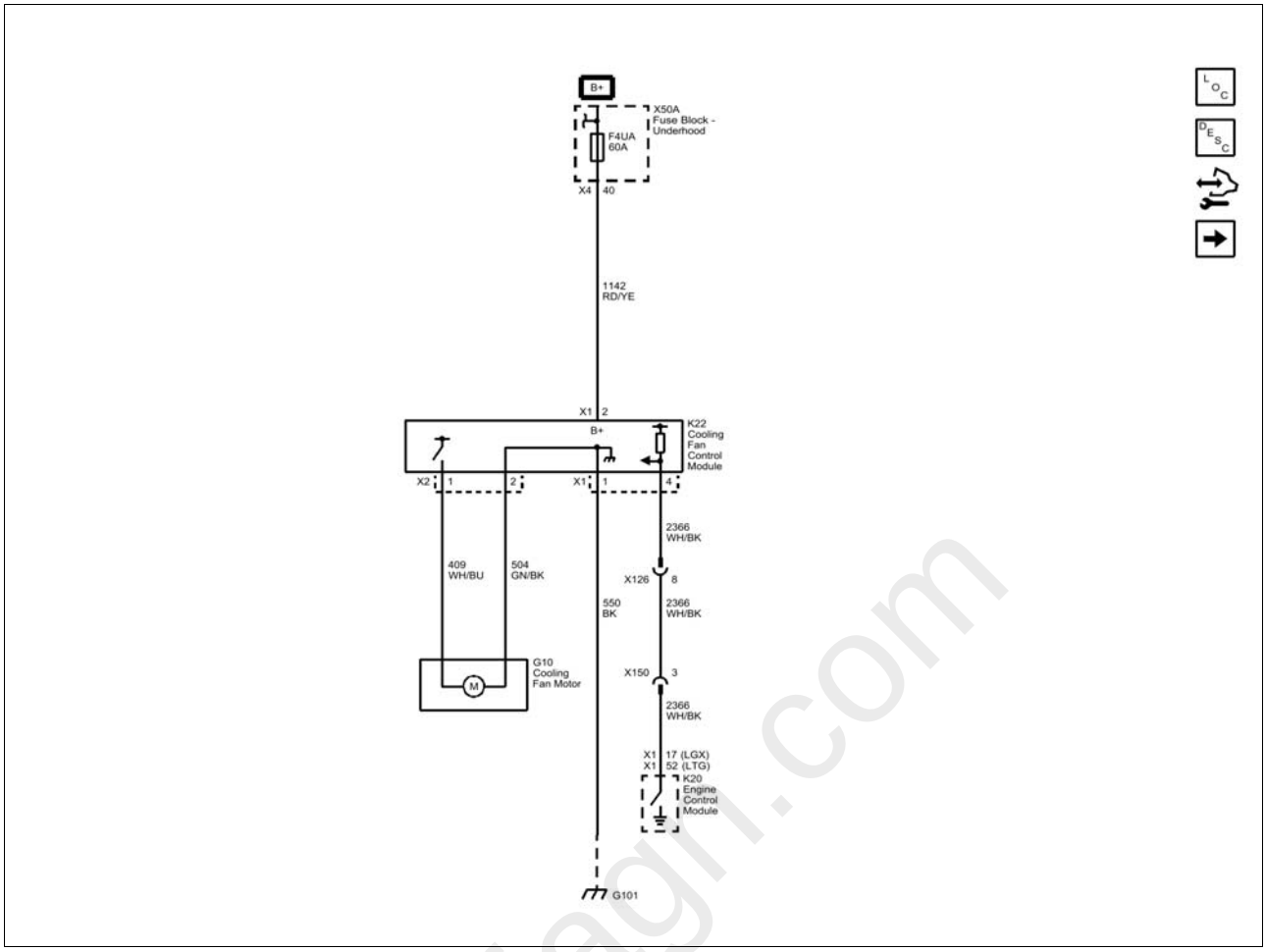
SPECIFICATIONS > ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

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

SCHEMATIC WIRING DIAGRAMS > ENGINE HEATING/COOLING WIRING SCHEMATICS > COOLING FAN (WITHOUT Y4Q)

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Fig 1: Cooling Fan (without Y4Q)

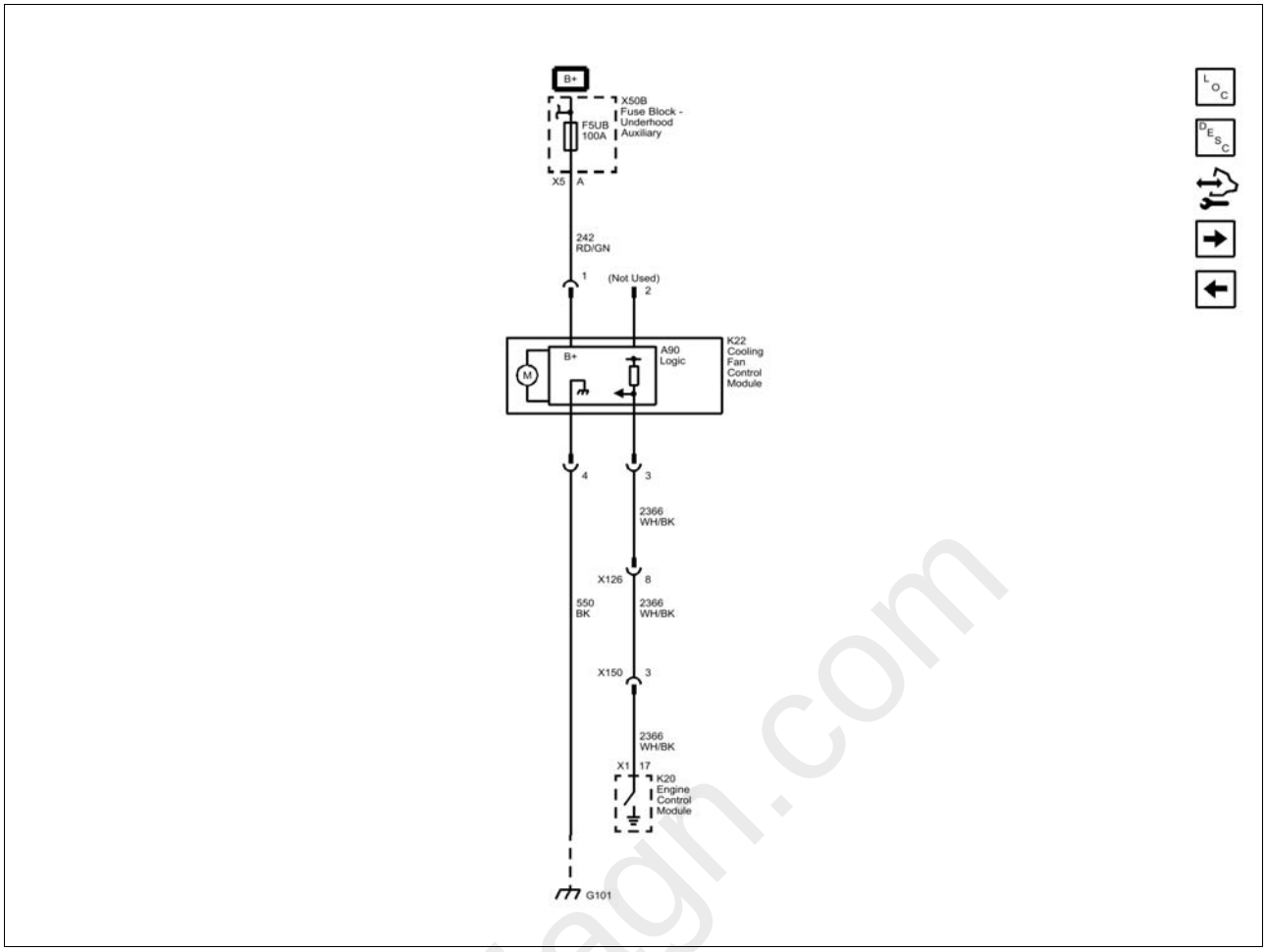


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SCHEMATIC WIRING DIAGRAMS > ENGINE HEATING/COOLING WIRING SCHEMATICS > COOLING FAN (Y4Q)

Fig 1: Cooling Fan (Y4Q)

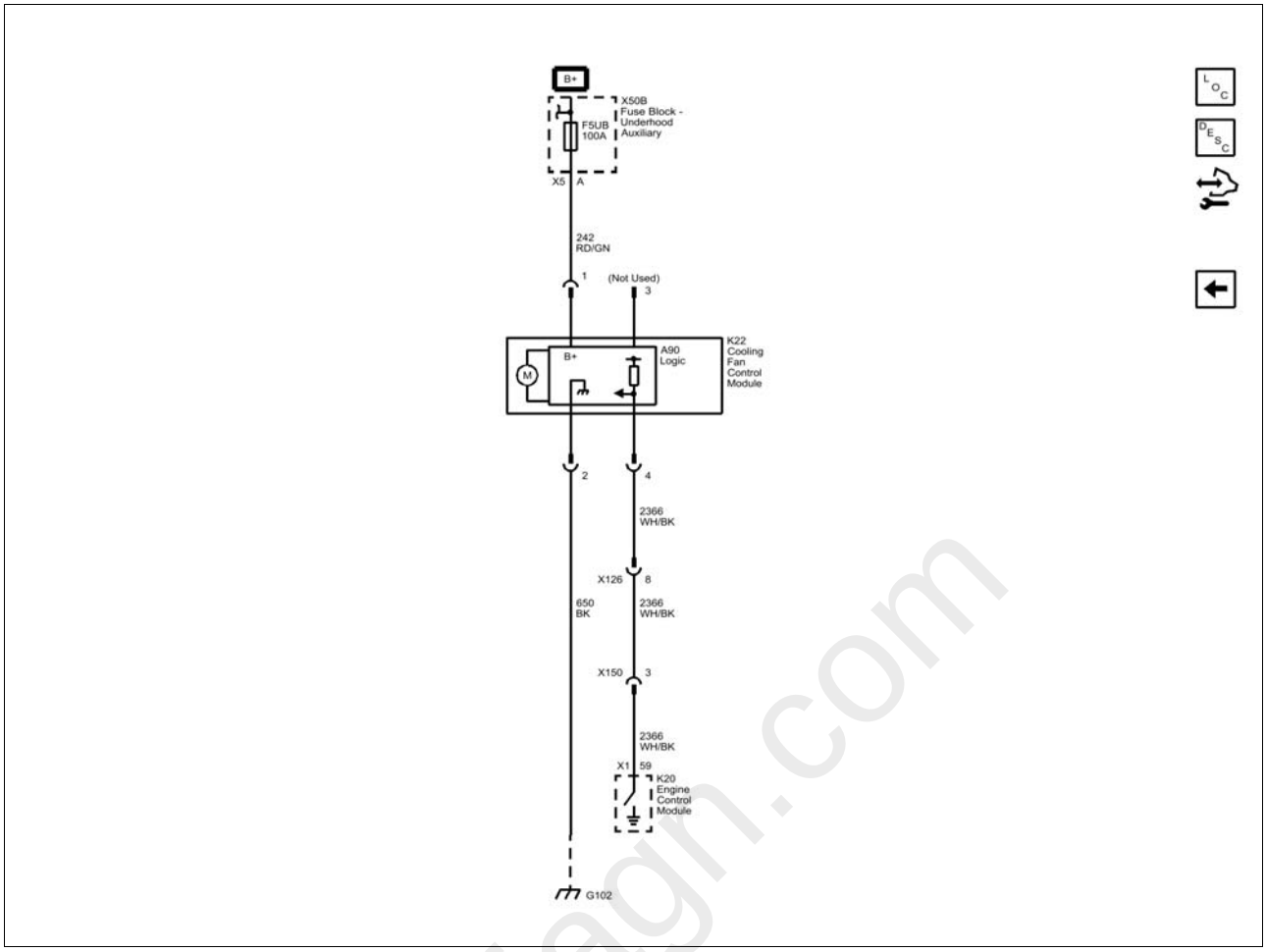


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SCHEMATIC WIRING DIAGRAMS > ENGINE HEATING/COOLING WIRING SCHEMATICS > COOLING FAN (LT1)

Fig 1: Cooling Fan (LT1)



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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > DTC DESCRIPTORS

DTC P0480

Cooling Fan Speed Control Circuit

DTC P0691

Cooling Fan Speed Output Circuit Low Voltage

DTC P0692

Cooling Fan Speed Output Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Cooling Fan Control Module B+ Supply	P0480, P0691*	P0480, P0691	-	-
Cooling Fan Control Module Ground	-	-	-	-
Cooling Fan Control Module Control	P0480, P0691	P0480, P0691	P0692	-
*Opens cooling fan fuse.				

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > 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 INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > CONDITIONS FOR RUNNING THE DTC

- The ignition voltage is greater than 11 volts.
- The DTCs run continuously once the above conditions are met.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > CONDITIONS FOR SETTING THE DTC

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > ACTION TAKEN WHEN THE DTC SETS

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > CONDITIONS FOR CLEARING THE MIL/DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > DIAGNOSTIC AIDS

- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- In order to set certain DTCs the PCM must command the Cooling Fan system On. Using the scan tool to operate the Cooling Fan will not set certain DTCs. In these cases run the vehicle until it reaches an appropriate condition for the PCM to command the Cooling Fans On.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

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Description and Operation

Cooling Fan Description and Operation

Electrical Information Reference

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

DTC Type Reference

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Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON.

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

2. Verify the G10 Cooling Fan Motor activates in each available speed when commanding the cooling fan ON with a scan tool. The cooling fan speed should increase with each command.
    1. **The cooling fan does not activate or increase in speed as commanded**

       Refer to Circuit/System Testing

    1. **The cooling fan activates and increases in speed as commanded**
3. 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.
4. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing

    1. **If the DTC does not set**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector X1 at the G10 Cooling Fan Motor.
2. Ignition ON, verify that a test lamp illuminates between the B+ circuit terminal 1 and ground.
    1. **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.

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2. Test for less than 2 Ω in the B+ circuit end to end.
    1. If 2 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

1. **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.
        1. If less than infinite resistance, repair the short to ground in the circuit.
        2. If infinite resistance, replace the G10 Cooling Fan Motor.

1. **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.*

3. Connect a DMM, set on the diode setting, between the G10 Cooling Fan Motor control circuit terminal 4 and ground.
4. Verify the DMM reading is greater than 2.5 V or displays O.L. with the cooling fan commanded OFF.
    1. **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.
            1. If less than infinite resistance, repair the short to ground in the circuit.
            2. If infinite resistance, replace the K20 Engine Control Module.

    1. **If greater than 2.5 V or displays O.L.**
5. Command the cooling fan ON to 90% with a scan tool.
6. Verify the DMM reading is less than 1 V.
    1. **If 1 V or greater**
        1. Ignition OFF.
        2. Disconnect the harness connector X1 at the K20 Engine Control Module, ignition ON.

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3. Test for less than 1 V between the G10 Cooling Fan Motor control circuit terminal 4 and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    1. 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 circuit end to end.
    1. If 2 Ω or greater, repair the open in the circuit.
    2. If less than 2 Ω, replace the K20 Engine Control Module.

1. **If less than 1 V**

7. Replace the K20 Cooling Fan Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LT1): COOLING FAN SPEED > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Engine Coolant Fan Replacement (LT1 V18) for G10 Cooling Fan Motor or K22 Cooling Fan Control Module replacement.
- Control Module References for ECM replacement, setup, and programming

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > DTC DESCRIPTORS

DTC P0480

Cooling Fan Speed Output Circuit

DTC P0691

Cooling Fan Speed Output Circuit Low Voltage

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DTC P0692

Cooling Fan Speed Output Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Cooling Fan Control Module B+ Supply	P0480, P0691*	P0480	-	-
Cooling Fan Control Module Ground	-	-	-	-
Cooling Fan Control Module Control	P0691	P0480	P0692	-
*Opens cooling fan fuse.				

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > 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 INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- The ignition voltage is greater than 11 volts.
- The DTCs run continuously once the above conditions are met.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > CONDITIONS FOR SETTING THE DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > CONDITIONS FOR CLEARING THE MIL/DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > DIAGNOSTIC AIDS

- The cooling fan will not operate when the scan tool Cooling Fan Motor Command parameter displays less than 4 %. This is a normal condition.
- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- The cooling fan Control Function operates as described below when the ignition is ON, and engine is OFF:
    - Command State 1 operates the cooling fan at approximately 18-21 %
    - Command State 2 operates the cooling fan at approximately 54 %
    - Command State 3 operates the cooling fan at approximately 67 %
    - Command State 4 operates the cooling fan at approximately 85 %
    - Command State 5 operates the cooling fan at approximately 90 %
- During normal operating conditions the ECM may initially activate the cooling fan at 4 or 5 % and then increase to the percentages indicated above, as needed, to satisfy powertrain cooling requirements. Generally, the ECM will operate the cooling fan at the specified percentages but, may scale the percentages either higher or lower in response to generator demand.
- When operating the cooling fan with a scan tool, the Commanded States 1-5 should be exercised in order, from OFF to High or High to OFF. The cooling fan control module may disable the cooling fan if a Commanded State is skipped.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

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Cooling Fan Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON.

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

2. Verify the G10 Cooling Fan Motor activates in each available speed when commanding the cooling fan ON with a scan tool. The cooling fan speed should increase with each command.
    1. **The cooling fan does not activate or increase in speed as commanded**

        Refer to Circuit/System Testing

    1. **The cooling fan activates and increases in speed as commanded**
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not

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reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

4. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing

    1. **If the DTC does not set**

5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the G10 Cooling Fan Motor, ignition ON.
2. Verify that a test lamp illuminates between the B+ circuit terminal 1and ground.
    1. **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.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.
    1. **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.
            1. If less than infinite resistance, repair the short to ground in the circuit.
            2. If infinite resistance, replace the K22 Cooling Fan Control Module.
    1. **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.*

3. Connect a DMM, set on the diode setting, between the control circuit terminal 3 and ground.
4. Verify the DMM reading is greater than 2.5 V or displays O.L. with the cooling fan commanded OFF.

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1. **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 3 and ground.
        1. If less than infinite resistance, repair the short to ground in the circuit.
        2. If infinite resistance, replace the K20 Engine Control Module.
1. **If greater than 2.5 V or displays O.L.**

5. Command the cooling fan ON with a scan tool using Command State 5.
6. Verify the DMM reading is less than 1 V.
    1. **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 3 and ground.
            1. If 1 V or greater, repair the short to voltage on the circuit.
            1. 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 circuit between the G10 Cooling Fan Motor terminal 3 and the K20 Engine Control Module terminal X1-52.
            1. If 2 Ω or greater, repair the open in the circuit.
            2. If less than 2 Ω, replace the K20 Engine Control Module.
    1. **If less than 1 V**
7. Replace the K20 Cooling Fan Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0480, P0691, OR P0692 (LTG): COOLING FAN SPEED OUTPUT CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18) for G10 Cooling Fan Motor replacement.
- Control Module References for ECM replacement, setup, and programming

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > DTC DESCRIPTORS

DTC P1258

Engine Coolant Overtemperature - Protection Mode Active

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > CIRCUIT/SYSTEM DESCRIPTION

The engine control module (ECM) uses the engine coolant temperature sensor to monitor the engine for an over-temperature condition. This condition occurs when the coolant temperature is above a calibrated value. The ECM will alternately disable 2 groups of cylinders by turning OFF the fuel injectors. By switching between the 2 groups of cylinders, the ECM is able to reduce the temperature of the coolant.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > CONDITIONS FOR RUNNING THE DTC

- The engine is operating for greater than 30 seconds.
- DTC P1258 runs continuously once the conditions above have been met.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > CONDITIONS FOR SETTING THE DTC

The ECM detects that engine coolant temperature is warmer than 132°C (270°F) for 2 seconds or greater.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > ACTION TAKEN WHEN THE DTC SETS

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > CONDITIONS FOR CLEARING THE MIL/DTC

DTC P1258 is a Type A DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

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- Cooling Fan Description and Operation
- Instrument Cluster Description and Operation
- Indicator/Warning Message Description and Operation

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

K20 Engine Control Module: Scan Tool Information for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to DTC P0480, P0691, or P0692 (LT1) DTC P0480, P0691, or P0692 (LTG) .

    1. **If no DTCs is set**

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

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

       Refer to Cooling Fan Inoperative (LT1) Cooling Fan Inoperative (LGX and LTG without Y4Q) Cooling Fan Inoperative (LGX and LTG with Y4Q) .

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

       Refer to Engine Overheating .

    1. **Engine does not overheat**
5. Operate the vehicle within the conditions that the customer experienced and verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Symptoms - Engine Cooling .

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1258: ENGINE COOLANT OVERTEMPERATURE - PROTECTION MODE ACTIVE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

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DIAGNOSTIC INFORMATION AND PROCEDURES > 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 .

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE COOLING > 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.

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- 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE COOLING > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE COOLING > SYMPTOM LIST

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

- Cooling Fan Always On (LT1) Cooling Fan Always On (LGX and LTG without Y4Q) Cooling Fan Always On (LGX and LTG with Y4Q)
- Cooling Fan Inoperative (LT1) Cooling Fan Inoperative (LGX and LTG without Y4Q) Cooling Fan Inoperative (LGX and LTG with Y4Q)
- Engine Overheating
- Loss of Coolant
- Thermostat Diagnosis
- Engine Fails To Reach Normal Operating Temperature

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > 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 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 INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > 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.
- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- In order to set certain DTCs the PCM must command the Cooling Fan system On. Using the scan

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tool to operate the Cooling Fan will not set certain DTCs. In these cases run the vehicle until it reaches an appropriate condition for the PCM to command the Cooling Fans On.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation

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

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to DTC P0480, P0691, or P0692 (LT1) .

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

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

    1. **If 0 %**

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4. Verify that the G10 Cooling Fan Motor is not operating.
    1. **If the G10 Cooling Fan Motor is operating**

       Refer to Circuit/System Testing.

    1. **If the G10 Cooling Fan Motor is not operating**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > CIRCUIT/SYSTEM TESTING

1. Ignition OFF.
2. Disconnect the harness connector at the G10 Cooling Fan Motor, ignition ON.
3. Verify that the G10 Cooling Fan Motor is not operating.
    1. **If the G10 Cooling Fan Motor is operating**
        1. Ignition OFF.
        2. Test for less than 1 V between the G10 Cooling Fan Motor harness connector terminal 1 and ground.
            1. If 1 V or greater, repair the short to voltage in the circuit.
    1. **If the G10 Cooling Fan Motor is not operating**
4. Replace the G10 Cooling Fan Motor.

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LT1) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Engine Coolant Fan Replacement (LT1 V18) for G10 Cooling Fan Motor or K22 Cooling Fan Control Module replacement.
- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > 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 INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to DTC P0480, P0691, or P0692 (LTG) .

    1. **If no DTC is set.**
3. Verify the scan tool Cooling Fan Motor Command parameter is less than 4 %.
    1. **If 4 % or greater**

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

    1. **If less than 4 %**
4. Verify that the G10 Cooling Fan Motor is not operating.
    1. **If the G10 Cooling Fan Motor is operating**

       Refer to Circuit/System Testing.

    1. **If the G10 Cooling Fan Motor is not operating**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > CIRCUIT/SYSTEM TESTING

1. Ignition OFF.
2. Disconnect the G10 Cooling Fan Motor harness connector X2 at the K22 Cooling Fan Control Module, ignition ON.
3. Verify that the G10 Cooling Fan Motor is not operating.
    1. **If the G10 Cooling Fan Motor is operating**
        1. Ignition ON.
        2. Test for less than 1 V between the G10 Cooling Fan Motor harness connector terminal 1 and ground.
            1. If 1 V or greater, repair the short to voltage in the circuit.
    1. **If the G10 Cooling Fan Motor is not operating**

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4. Replace the K22 Cooling Fan Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITHOUT Y4Q) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03) Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)
- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > 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 INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to DTC P0480, P0691, or P0692 (LTG) .

    1. **If no DTC is set.**
3. Verify the scan tool Cooling Fan Motor Command parameter is less than 4 %.
    1. **If 4 % or greater**

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

    1. **If less than 4 %**
4. Verify that the G10 Cooling Fan Motor is not operating.
    1. **If the G10 Cooling Fan Motor is operating**

Test or replace the G10 Cooling Fan Motor.

1. **If the G10 Cooling Fan Motor is not operating**

5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN ALWAYS ON (LGX AND LTG WITH Y4Q) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03) Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18) for G10 Cooling Fan Motor Replacement.
- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > 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 INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > DIAGNOSTIC AIDS

- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- In order to set certain DTCs the PCM must command the Cooling Fan system On. Using the scan tool to operate the Cooling Fan will not set certain DTCs. In these cases run the vehicle until it reaches an appropriate condition for the PCM to command the Cooling Fans On.

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

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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

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > CIRCUIT/SYSTEM VERIFICATION

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

        Refer to DTC P0480, P0691, or P0692 (LT1) .

    1. **If no DTC is set.**

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

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

       Refer to Circuit/System Testing

    1. **The cooling fan activates and increases in speed**

4. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the G10 Cooling Fan Motor.
2. Verify that a test lamp illuminates between the ground circuit terminal 2 and B+.
    1. **If the test lamp does not illuminate**
        1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
        2. Test for less than 2 Ω in the ground circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, repair the open/high resistance in the ground connection.
    1. **If the test lamp illuminates**
3. Disconnect the G10 Cooling Fan Motor harness connector X2 from the K22 Cooling Fan Control Module.
4. 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.
5. Verify the G10 Cooling Fan Motor operates.
    1. **The cooling fan does not operate**

       Replace the G10 Cooling Fan Motor.

    1. **The cooling fan operates**

       Replace the K22 Cooling Fan Control Module

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LT1) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Engine Coolant Fan Replacement (LT1 V18) for G10 Cooling Fan Motor or K22 Cooling Fan

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Control Module replacement.

- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > 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 INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > DIAGNOSTIC AIDS

- The cooling fan will not operate when the scan tool Cooling Fan Motor Command parameter displays less than 4 %. This is a normal condition.
- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- The cooling fan Control Function operates as described below when the ignition is ON, and engine is OFF:
    - Command State 1 operates the cooling fan at approximately 18-21 %
    - Command State 2 operates the cooling fan at approximately 54 %
    - Command State 3 operates the cooling fan at approximately 67 %
    - Command State 4 operates the cooling fan at approximately 85 %
    - Command State 5 operates the cooling fan at approximately 90 %
- During normal operating conditions the ECM may initially activate the cooling fan at 4 or 5 % and then increase to the percentages indicated above, as needed, to satisfy powertrain cooling requirements. Generally, the ECM will operate the cooling fan at the specified percentages but,

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may scale the percentages either higher or lower in response to generator demand.

- When operating the cooling fan with a scan tool, the Commanded States 1-5 should be exercised in order, from OFF to High or High to OFF. The cooling fan control module may disable the cooling fan if a Commanded State is skipped.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cooling Fan Description and Operation

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > CIRCUIT/SYSTEM VERIFICATION

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

        Refer to DTC P0480, P0691, or P0692 (LTG) .

    1. **If no DTC is set.**

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

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

        Refer to Circuit/System Testing

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

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector X1 at the K22 Cooling Fan Control Module.
2. Verify that a test lamp illuminates between the ground circuit terminal 1 and B+.
    1. **If the test lamp does not illuminate**
        1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
        2. Test for less than 2 Ω in the ground circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, repair the open/high resistance in the ground connection.
    1. **If the test lamp illuminates**
3. Disconnect the K22 Cooling Fan Control Module harness connector X2 from the G10 Cooling Fan Motor.
4. Connect the K22 Cooling Fan Control Module harness connector X1.

> *NOTE:*
>
> *Perform this test at the motor side of the fan module.*

5. Verify a test lamp illuminates between the K22 Cooling Fan Control Module terminal X2-2 and B+.
    1. **If the test lamp does not illuminate**

        Replace the K22 Cooling Fan Control Module.

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1. **If the test lamp illuminates**

6. Ignition ON.
7. Connect a test lamp between the K22 Cooling Fan Control Module terminal X2-1 and ground.
8. Verify the test lamp illuminates when commanding the cooling fan ON with a scan tool.
    1. **If the test lamp does not illuminate**

       Replace the K22 Cooling Fan Control Module.

    1. **If the test lamp illuminates**
9. Test or replace the G10 Cooling Fan Motor.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > COMPONENT TESTING

1. Ignition OFF.
2. Disconnect the G10 Cooling Fan Motor harness connector X2 from the K22 Cooling Fan Control Module.
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.
    1. **The cooling fan does not operate**

       Replace the G10 Cooling Fan Motor.

    1. **The cooling fan operates**
5. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITHOUT Y4Q) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03) Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)
- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > 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 INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > DIAGNOSTIC AIDS

- The cooling fan will not operate when the scan tool Cooling Fan Motor Command parameter displays less than 4 %. This is a normal condition.
- A delay or ramp up of approximately 12 seconds may occur before the cooling fan activates or changes speed when being commanded with a scan tool.
- The cooling fan Control Function operates as described below when the ignition is ON, and engine is OFF:
    - Command State 1 operates the cooling fan at approximately 18 %
    - Command State 2 operates the cooling fan at approximately 54 %
    - Command State 3 operates the cooling fan at approximately 67 %
    - Command State 4 operates the cooling fan at approximately 85 %
    - Command State 5 operates the cooling fan at approximately 90 %
- During normal operating conditions the ECM may initially activate the cooling fan at 4 or 5 % and then increase to the percentages indicated above, as needed, to satisfy powertrain cooling requirements. Generally, the ECM will operate the cooling fan at the specified percentages but, may scale the percentages either higher or lower in response to generator demand.
- When operating the cooling fan with a scan tool, the Commanded States 1-5 should be exercised in order, from OFF to High or High to OFF. The cooling fan control module may disable the cooling fan if a Commanded State is skipped.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE

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(LGX AND LTG WITH Y4Q) > REFERENCE INFORMATION

Schematic Reference

Engine Heating/Cooling Schematics

Connector End View Reference

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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

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > CIRCUIT/SYSTEM VERIFICATION

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

        Refer to DTC P0480, P0691, or P0692 (LTG) .

    1. **If no DTC is set.**

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

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

        Refer to Circuit/System Testing

    1. **The cooling fan activates and increases in speed**

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4. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector G10 Cooling Fan Motor.
2. Verify that a test lamp illuminates between the ground circuit terminal 4 and B+.
    1. **If the test lamp does not illuminate**
        1. Ignition OFF, and all vehicle systems OFF, it may take up to 2 minutes for all vehicle systems to power down.
        2. Test for less than 2 Ω in the ground circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, repair the open/high resistance in the ground connection.
    1. **If the test lamp illuminates**
3. Test or replace the G10 Cooling Fan Motor.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING FAN INOPERATIVE (LGX AND LTG WITH Y4Q) > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03) Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18) for G10 Cooling Fan Motor replacement.
- Control Module References

DIAGNOSTIC INFORMATION AND PROCEDURES > 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. Loss of Coolant . Is there a loss of coolant?	Go to **Step 2**	Go to **Step 3**
2	Fill the system to the specified level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) . Does the engine still overheat?	Go to **Step 3**	System OK

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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**
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. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) . 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 , or 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.	Go to **Step 15**	System OK

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	2. Clean any debris from the radiator core. Does the engine still overheat?		
15	Check for any blocked cooling system passages. 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. Flushing 3. Refill the coolant. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 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 (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03) Engine Coolant Fan Replacement (LT1 V18) Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18) . Does the engine still overheat?	Go to **Step 19**	System OK
19	Check for a thermostat that is stuck closed. Is the thermostat stuck closed?	Go to **Step 20**	Go to **Step 21**
20	Replace the thermostat. Engine Coolant Thermostat Housing Replacement (LGX) 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 (LGX) Water Pump Replacement (LT1) Water Pump Replacement (LTG) . Does the engine still overheat?	-	System OK

DIAGNOSTIC INFORMATION AND PROCEDURES > 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

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2	Repair any present DTCs. Refer to Diagnostic System Check - Vehicle . Is the action complete?	Go to **Step 3**	-
3	Inspect the coolant level. Is the coolant at the proper level?	Go to **Step 5**	Go to **Step 4**
4	Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 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 26**
6	Engine overheating can cause a loss of coolant. Is the engine overheating?	Go to **Step 27**	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 29**	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 28**	Go to **Step 10**
10	*WARNING:* *Refer to Moving Parts and Hot Surfaces Warning .* With the engine idling, inspect the coolant recovery system.Does the coolant recovery system 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:	Go to **Step 21**	Go to **Step 12**

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	• Coolant Reservoir • Water Pump • Throttle Body • Heater core • Radiator Are any of the hoses, clamps or pipes leaking?		
12	Visually inspect the following components: • Coolant pressure cap • Core plugs • Cylinder head gaskets • Engine block • Intake manifold • Radiator • Thermostat housing • Water pump Are any of the listed components leaking?	Go to **Step 21**	Go to **Step 13**
13	1. Pressure test the cooling system. Refer to Cooling System Leak Testing . 2. With the cooling system pressurized, visually inspect the components listed in steps 11 and 12. Are any leaks present?	Go to **Step 21**	Go to **Step 14**
14	Pressure test the coolant pressure cap. Refer to Pressure Cap Testing . Does the coolant pressure cap hold pressure?	Go to **Step 15**	Go to **Step 22**
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	Go to **Step 23**	Go to **Step 16**

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	Is coolant present?		
16	1. Add 30 ml (1 oz) of Extended Life Coolant Leak Detection Dye to the cooling system for each 15 L (4 gal) of coolant. Refer to Adhesives, Fluids, Lubricants, and Sealers , and Approximate Fluid Capacities . 2. Start the vehicle and allow the engine to reach normal operating temperature. 3. Shut the engine off. 4. Use the **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 21**	Go to **Step 17**
17	Use the **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 23**	Go to **Step 18**
18	Inspect the underside of the engine oil fill cap for a gray/white milky substance. Is a milky substance 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 a milky substance on the engine oil fluid level indicator?	Go to **Step 28**	Go to **Step 20**
20	Inspect the automatic transmission fluid for a gray/white milky substance. Is there a gray/white milky substance in the automatic transmission fluid?	Go to **Step 24**	Go to **Step 26**
21	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to **Step 31**	-
22	Replace the coolant pressure cap. Is the repair complete?	Go to **Step 31**	-
23	Replace the heater core. Refer to Heater Core Replacement . Is the repair complete?	Go to **Step 31**	-

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24	1. Remove the transmission oil cooler lines from the radiator. 2. Pressure test the cooling system. Refer to Cooling System Leak Testing . 3. Inspect the transmission oil cooler for coolant. Is coolant present?	Go to **Step 25**	Go to **Step 26**
25	Install the cooler lines to the radiator. Is the action complete?	Go to **Step 31**	-
26	Repair the engine no crank condition. Refer to Engine Will Not Crank - Crankshaft Will Not Rotate . Is the repair complete?	Go to **Step 31**	-
27	Repair the engine overheating condition. Refer to Engine Overheating . Is the repair complete?	Go to **Step 31**	-
28	Repair the engine internal coolant leak. Refer to: • Coolant in Engine Oil • Coolant in Combustion Chamber Is the repair complete?	Go to **Step 31**	-
29	Repair the engine knock. Refer to Lower Engine Noise, Regardless of Engine Speed . Is the repair complete?	Go to **Step 31**	-
30	Repair the combustion pressure in the cooling system problem. Refer to Cylinder Leakage Test . Is the repair complete?	Go to **Step 31**	-
31	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to **Step 2**

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DIAGNOSTIC INFORMATION AND PROCEDURES > THERMOSTAT DIAGNOSIS

Tools Required

- **J 24731** 188 Tempilstick
- **J 24731** 206 Tempilstick

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

1. Use a tempilstick in order to find the opening and the closing temperatures of the thermostat.
    1. **J 24731** 188 tempilstick melts at 87°C (188°F). The thermostat should begin to open at 90°C (194°F).
    2. **J 24731** 206 tempilstick melts at 97°C (206°F). The thermostat should be fully open at 107°C (225°F).
2. Replace the thermostat if it does not operate properly between this temperature range.

DIAGNOSTIC INFORMATION AND PROCEDURES > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLANT HEATER INOPERATIVE > 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 -18°C (0°F). A weather shield on the cord is provided to protect the plug when not in use.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLANT HEATER INOPERATIVE > REFERENCE INFORMATION

Electrical Information Reference

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

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLANT HEATER INOPERATIVE > CIRCUIT/SYSTEM TESTING

NOTE:

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The coolant heater cord will read Open due to an internal thermal switch if the ambient temperature is above -18°C (0°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.
    1. **If not within 30-40 Ω**

       Replace the E19 Coolant Heater.

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

       Replace the E19 Coolant Heater.

    1. **If infinite resistance**
4. Test or replace the coolant heater cord.

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLANT HEATER INOPERATIVE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic repair.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > 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**

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2	1. Diagnose and repair the cooling fan system. Refer to Cooling Fan Always On (LT1) Cooling Fan Always On (LGX and LTG without Y4Q) Cooling Fan Always On (LGX and LTG with Y4Q) . 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 proper operation. Refer to Thermostat Diagnosis . Is the thermostat operating properly?	Go to **Step 1**	Go to **Step 6**
6	1. Replace the thermostat and housing.Refer to Engine Coolant Thermostat Housing Replacement (LGX) Engine Coolant Thermostat Housing Replacement (LTG) . 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to **Step 1**	System OK

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DIAGNOSTIC INFORMATION AND PROCEDURES > PRESSURE CAP TESTING

Special Tools

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

For equivalent regional tools, Refer to Special Tools

DIAGNOSTIC INFORMATION AND PROCEDURES > PRESSURE CAP TESTING >

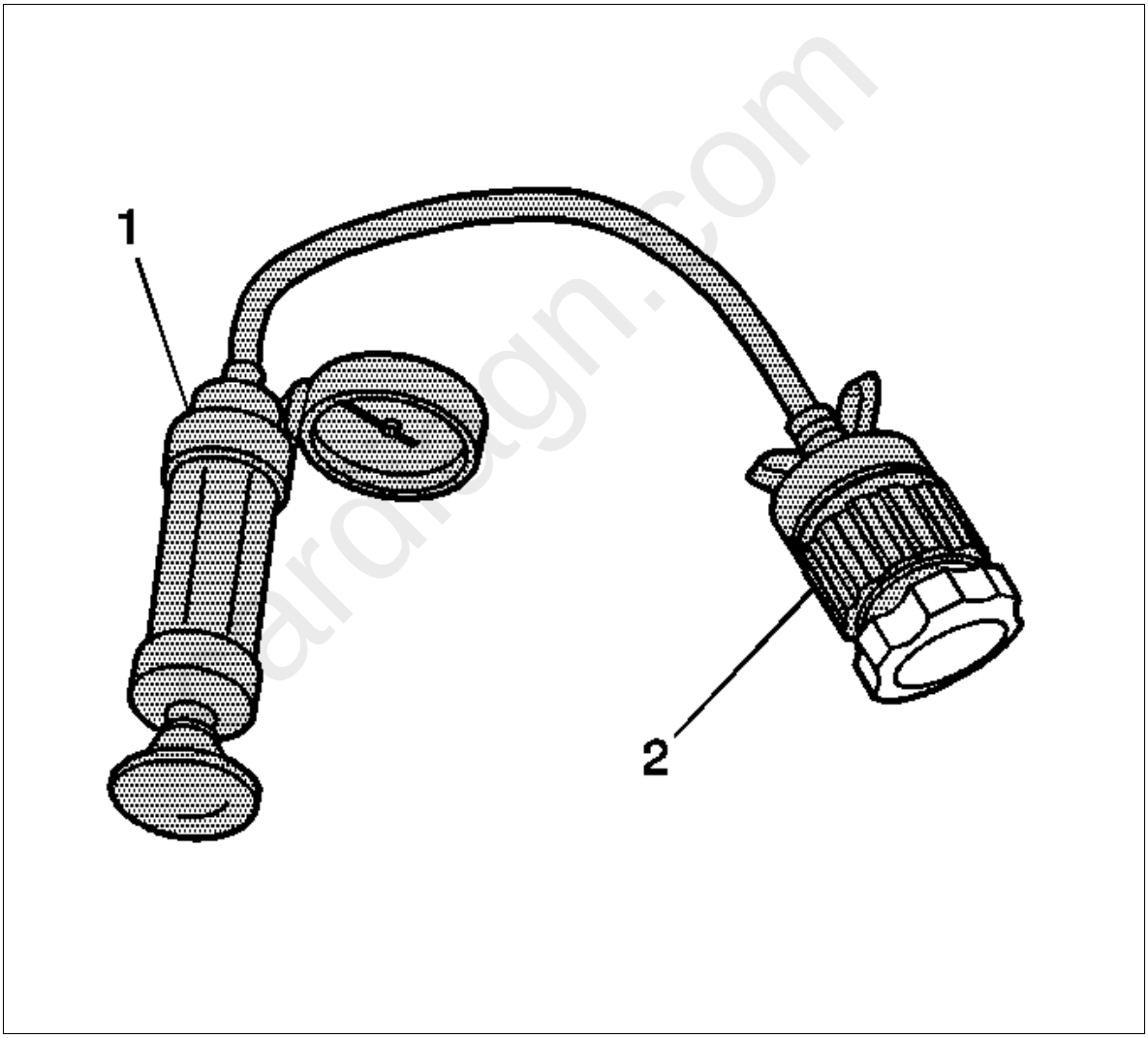
PRESSURE CAP TESTING

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 1: Pressure Cap Tester



Courtesy of GENERAL MOTORS COMPANY

NOTE:

Lubricate J-42401-1 and pressure cap o-rings with coolant and press cap to seat

o-ring on J-42401-1 before turning to engage threads.

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

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

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING SYSTEM LEAK TESTING

Special Tools

- **EN-24460-A** Cooling System Pressure Tester
- **GE-42401-3** Radiator Cap / Surge Tank Test Adapter

For equivalent regional tools, Refer to Special Tools

DIAGNOSTIC INFORMATION AND PROCEDURES > COOLING SYSTEM LEAK TESTING > COOLING SYSTEM LEAK TESTING

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.

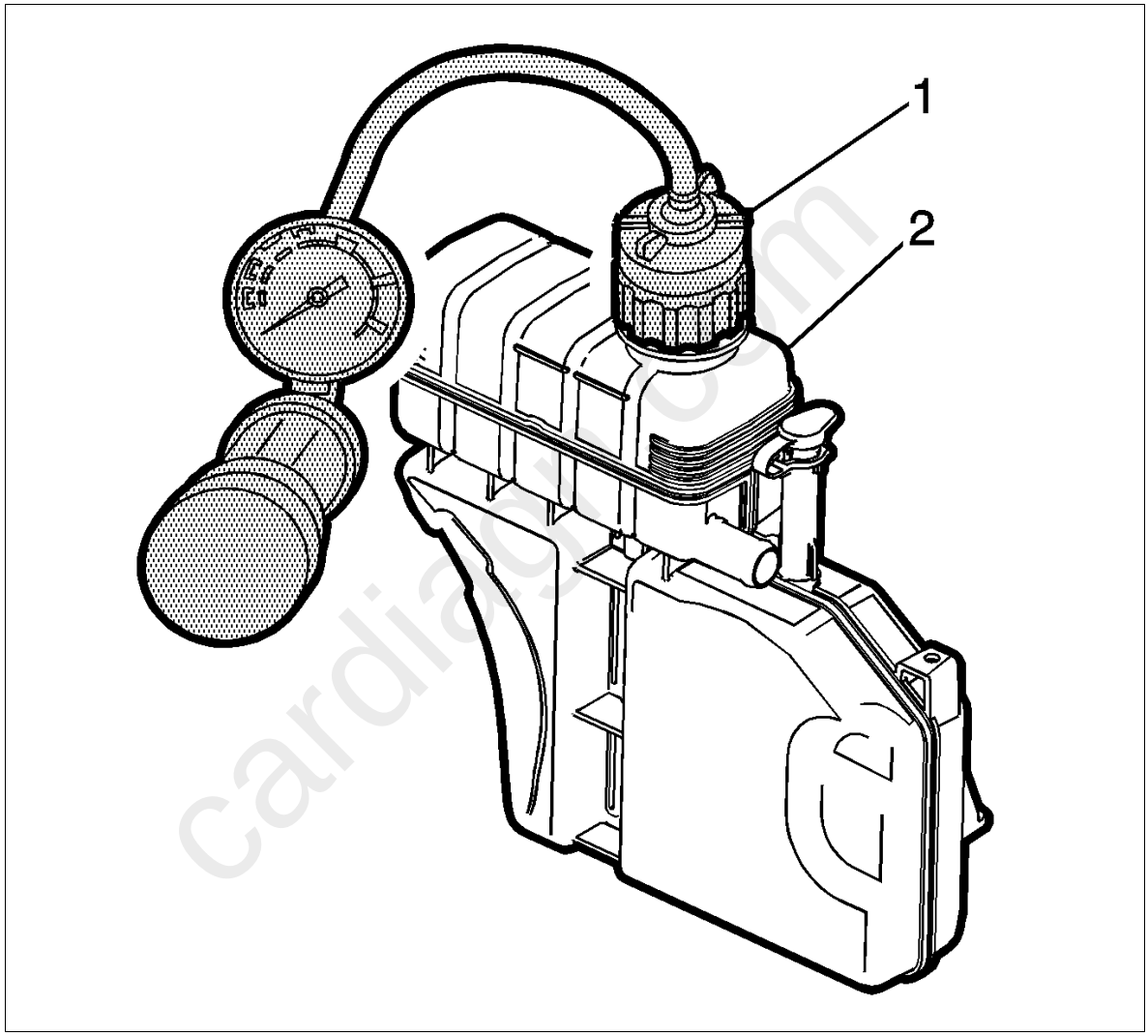
WARNING:

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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 1: Cooling System Pressure Tester



Courtesy of GENERAL MOTORS COMPANY

4. Use the **EN-24460-A** Cooling System Pressure Tester (1) with **GE-42401-3** Radiator Cap / Surge Tank Test Adapter in order to apply pressure to the cooling system (2).

   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

REPAIR INSTRUCTIONS > HOSE CLAMP REPLACEMENT GUIDELINES - SPRING TYPE > SPRING TYPE HOSE CLAMP REPLACEMENT GUIDELINES

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Fig 1: Spring Type Hose Clamps



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

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

Many spring type hose clamps within GM utilize a small amount of adhesive placed directly on the hose clamp to secure the clamp to the mating hose for manufacturing purposes. Over time the strength of the adhesive will deteriorate. It is extremely important when a technician is attempting to service a joint or

remove the hose clamp, that the clamp is not rotated or repositioned so that is tears and/or damages the hose. In this case, the hose and clamp must both be replaced.

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

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

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

REPAIR INSTRUCTIONS > HOSE CLAMP REPLACEMENT GUIDELINES - SPRING TYPE > 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.

REPAIR INSTRUCTIONS > HOSE CLAMP REPLACEMENT GUIDELINES - SPRING TYPE > 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.

REPAIR INSTRUCTIONS > HOSE CLAMP REPLACEMENT GUIDELINES - SPRING TYPE > 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.

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REPAIR INSTRUCTIONS > 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

REPAIR INSTRUCTIONS > COOLING SYSTEM DRAINING AND FILLING (GE 47716) > 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.

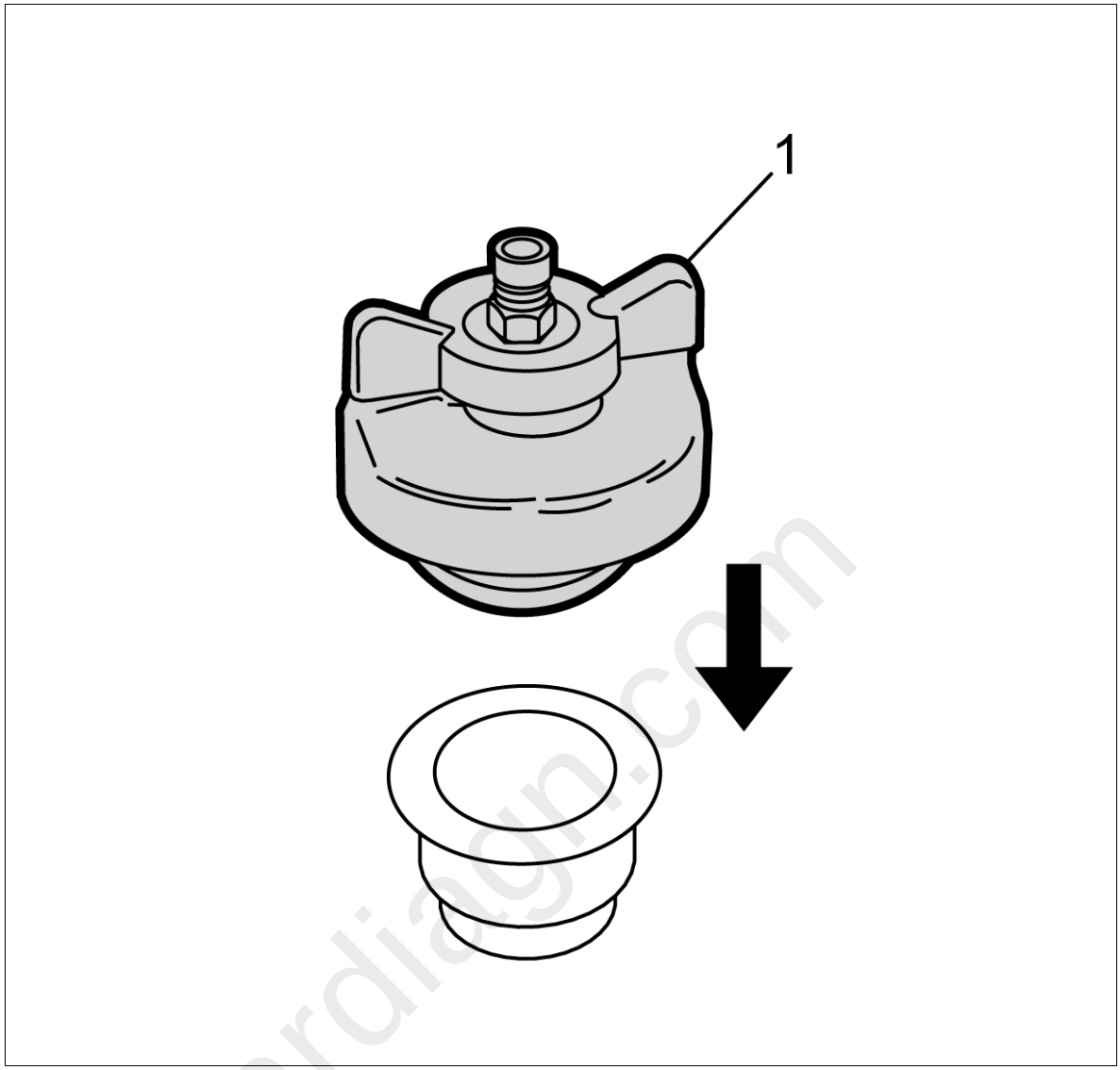
1. Remove the coolant pressure cap.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
3. Place a drain pan under the drain cock.
4. Remove the radiator drain plug. Refer to Radiator Drain Plug Replacement (LT1) Radiator Drain Plug Replacement (LGX) Radiator Drain Plug Replacement (LTG) .
5. Drain the cooling system.
6. Lower the vehicle.
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant.
    1. Normal in appearance-Follow the filling procedure.
    2. Discolored-Follow the flush procedure. Refer to Flushing .

REPAIR INSTRUCTIONS > COOLING SYSTEM DRAINING AND FILLING (GE 47716) > VAC-N-FILL PROCEDURE

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

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Fig 1: Radiator Cap & Surge Tank Test Adapter



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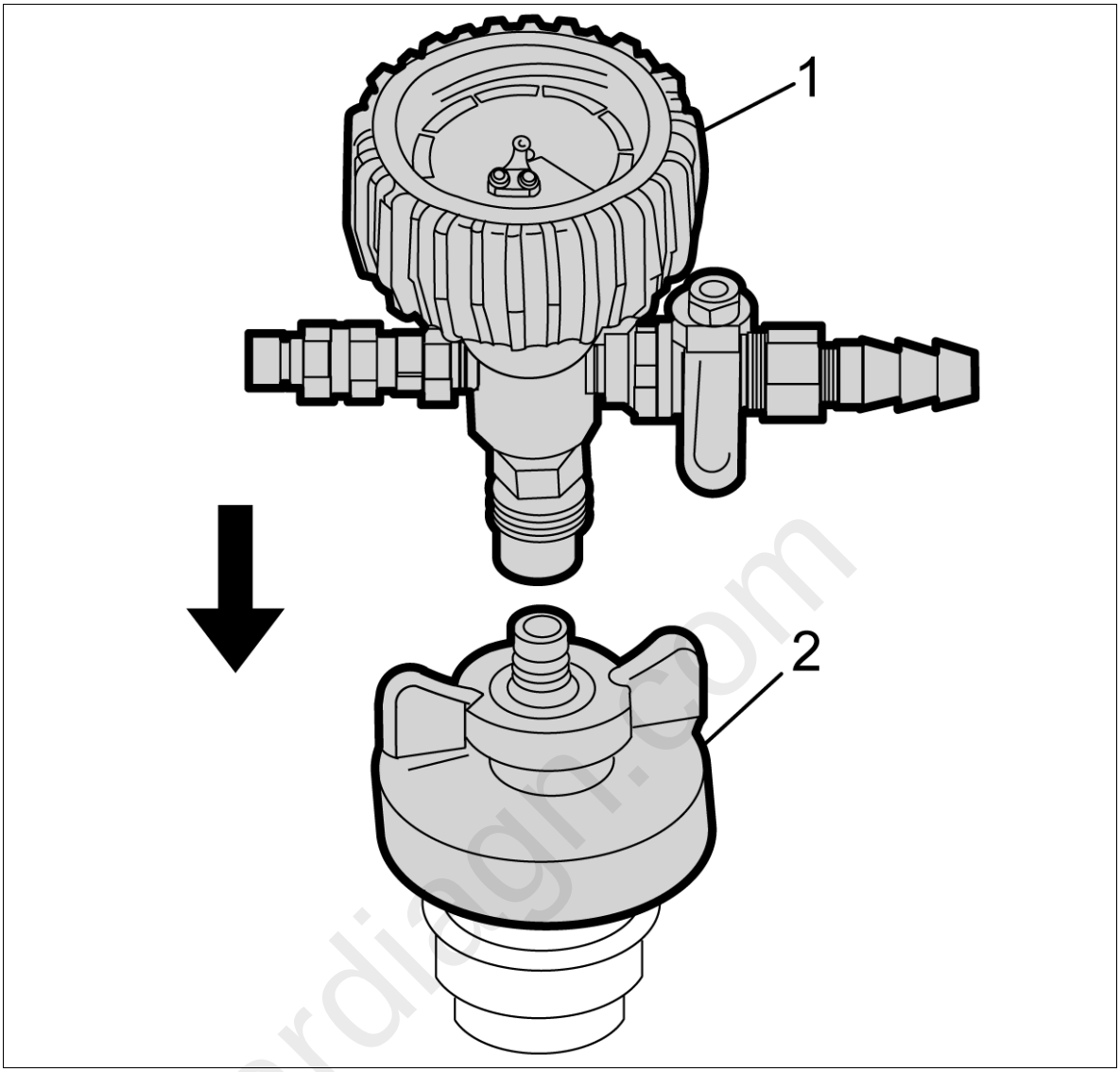
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WARNING:

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 2: Vacuum Gauge Assembly & Vac N Fill Cap

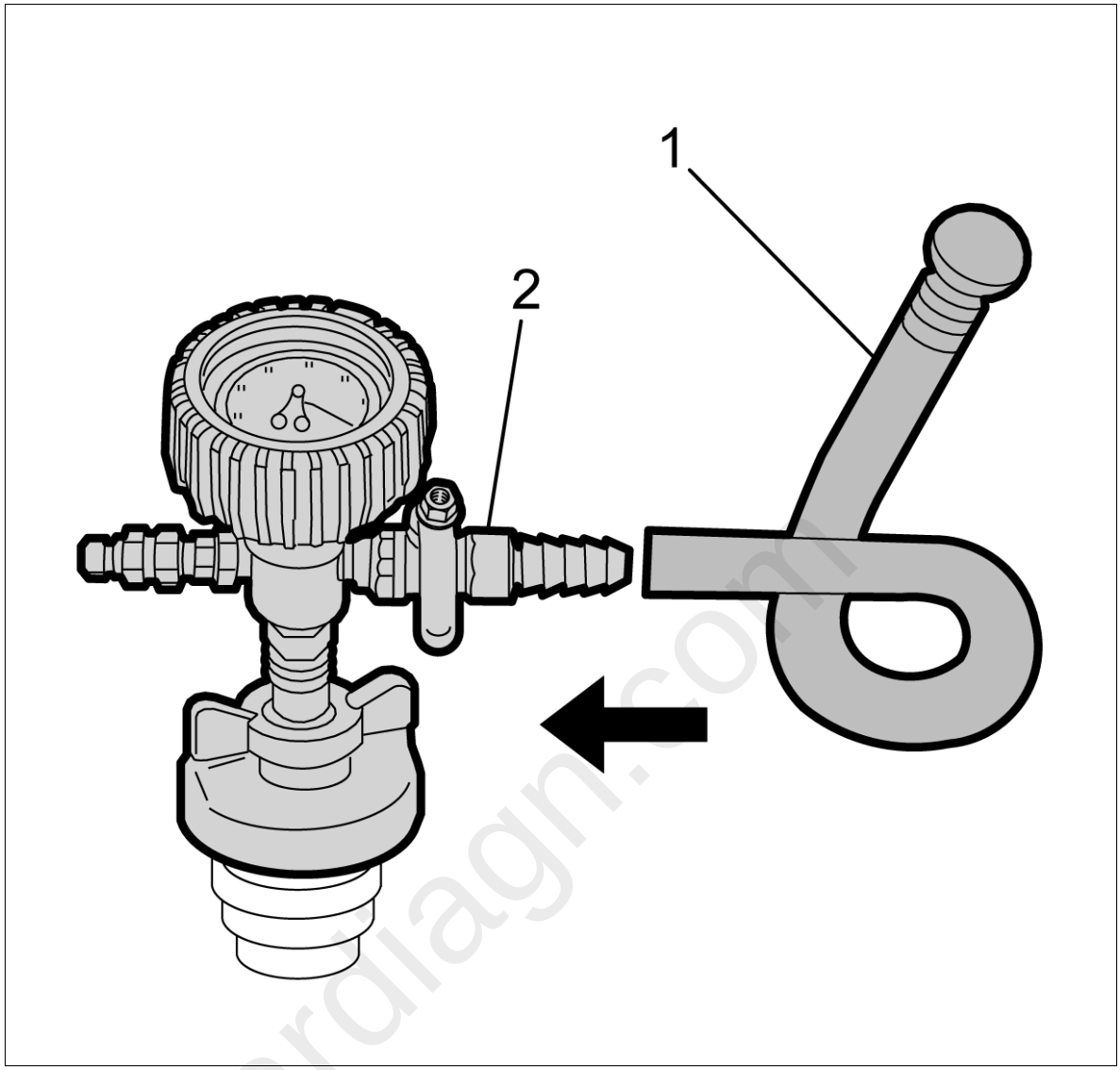


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3. Attach the vacuum gauge assembly (1) to the Vac-N-Fill cap (2).

Fig 3: Vacuum Gauge Assembly & Fill Hose



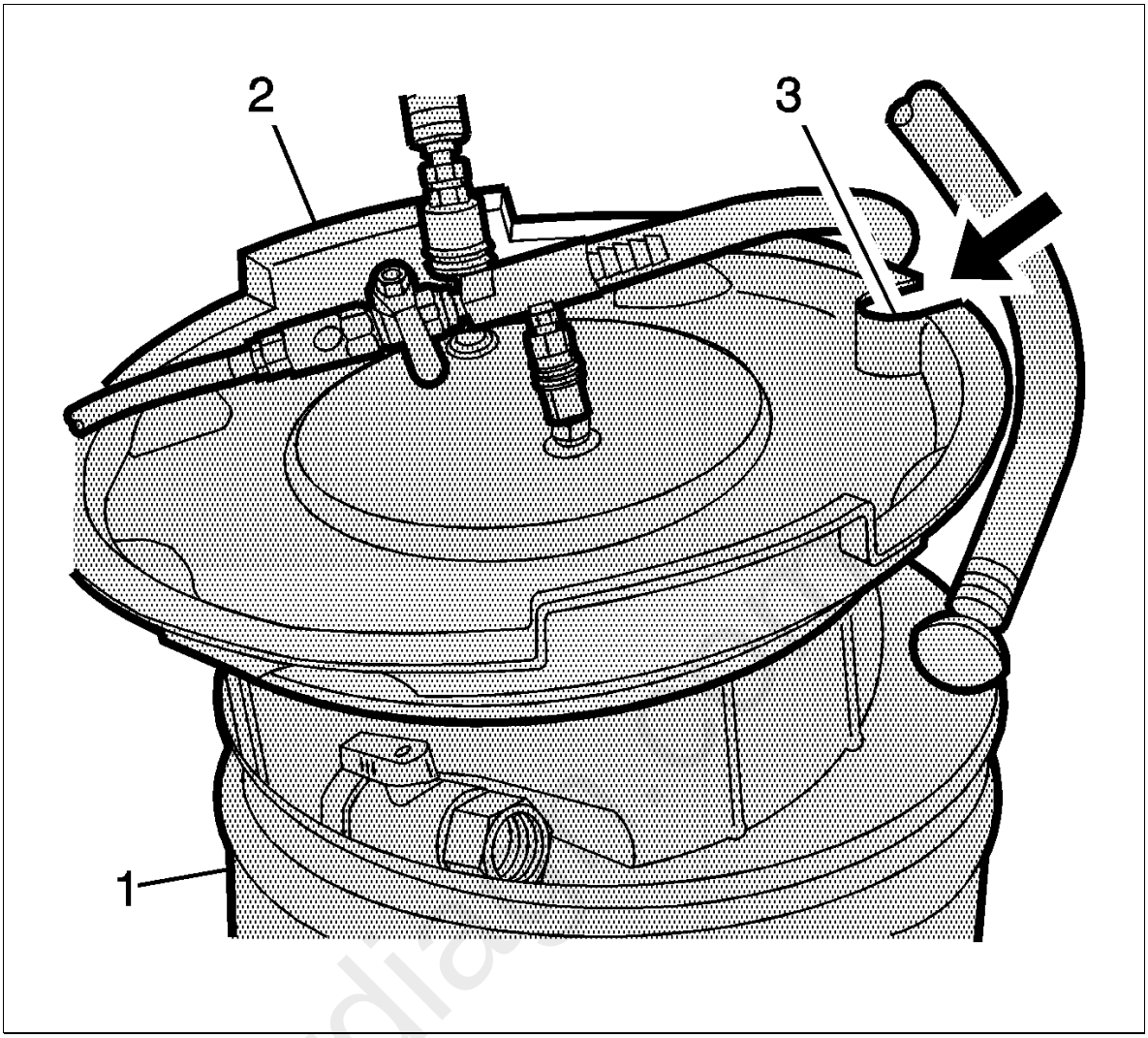
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4. Attach the fill hose (1) to the barb fitting on the vacuum gauge assembly (2).

   Ensure that the valve is closed.

Fig 4: 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.

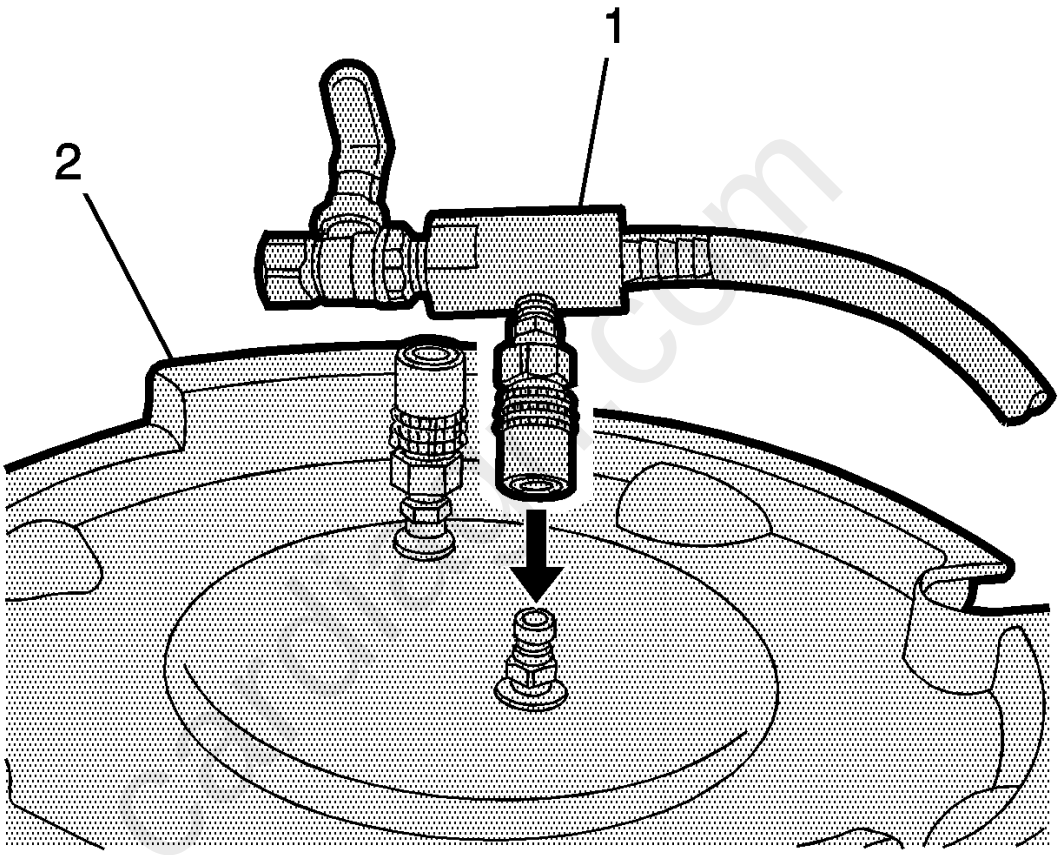
5. Pour the coolant mixture into the graduated reservoir (1).
6. Place the fill hose in the graduated reservoir (1).

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.

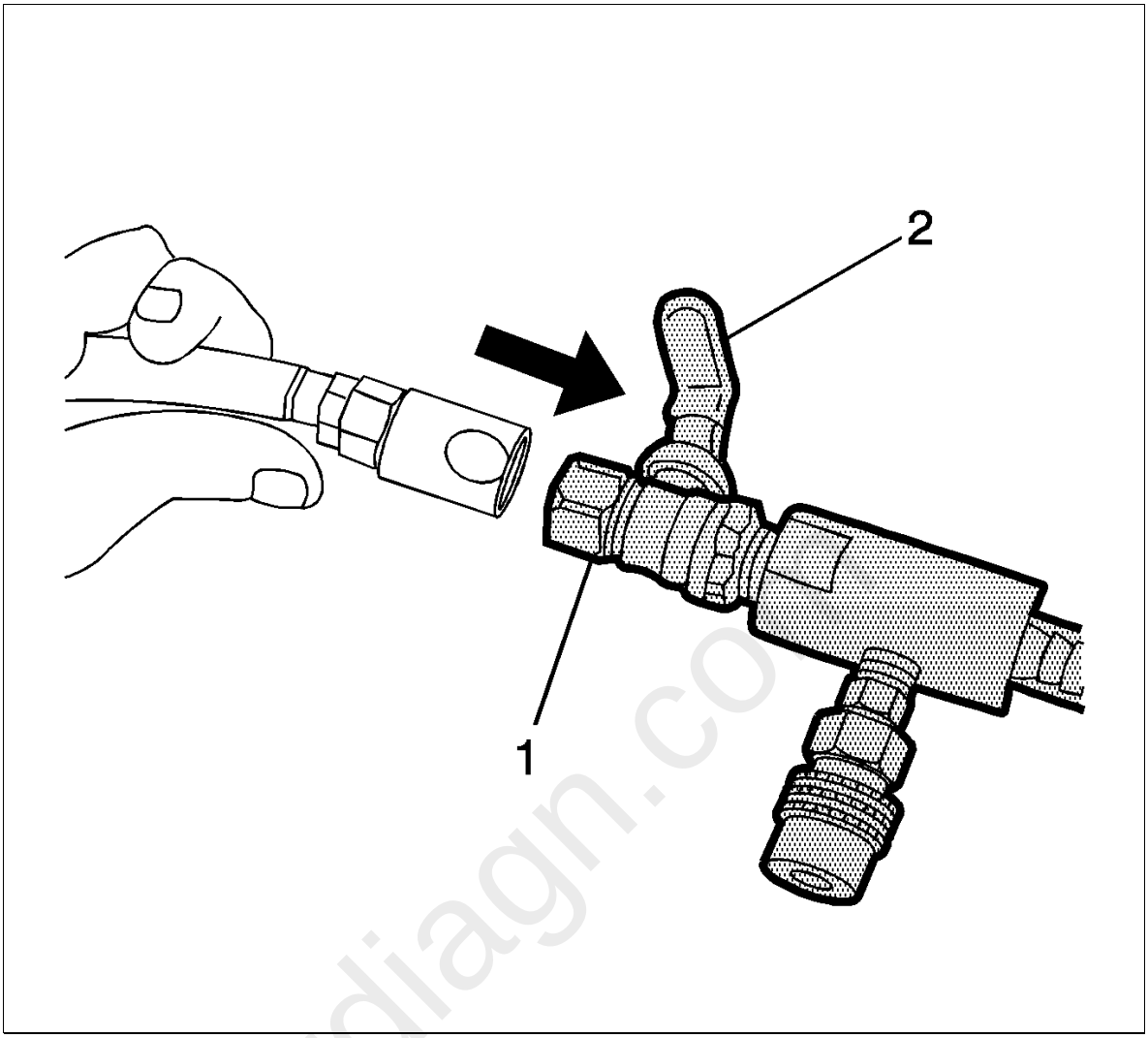
Fig 5: Vacuum Tank & Venturi Assembly



Courtesy of GENERAL MOTORS COMPANY

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

Fig 6: Venturi Assembly & Valve



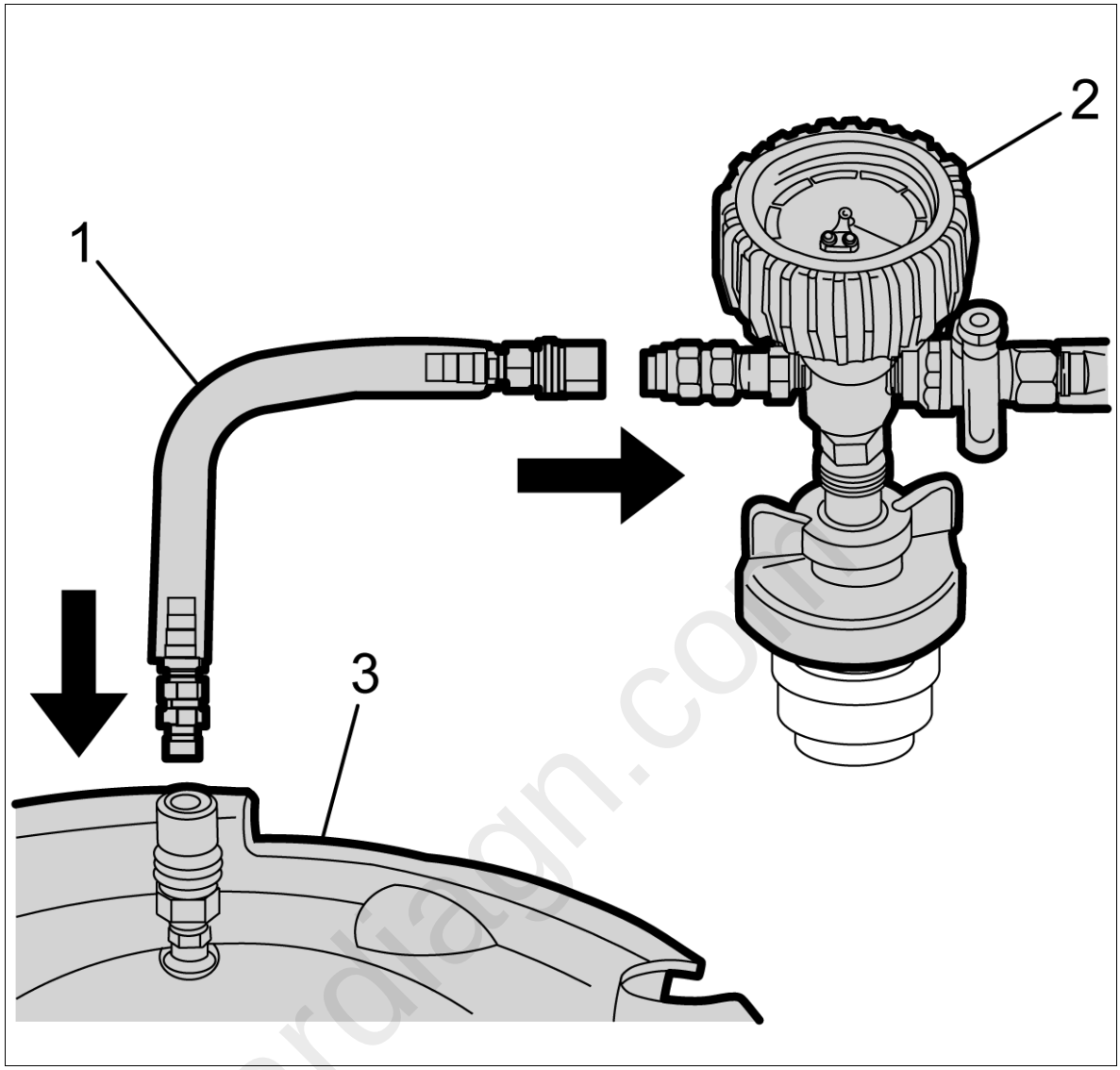
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9. Attach a shop air hose to the venturi assembly (1).

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

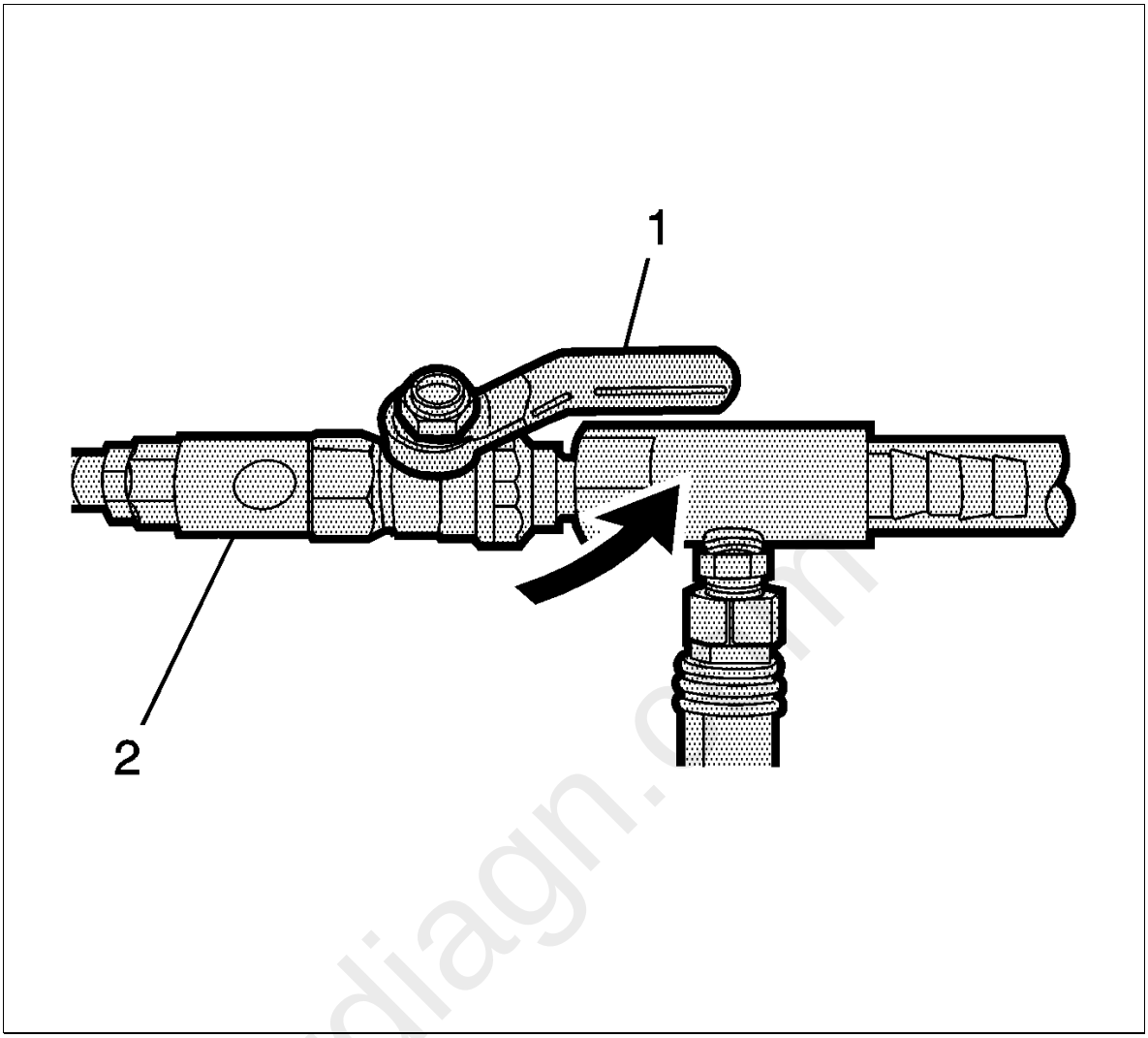
Fig 7: Vacuum Hose, Gauge Assembly & Tank



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

Fig 8: Valve & Venturi Assembly

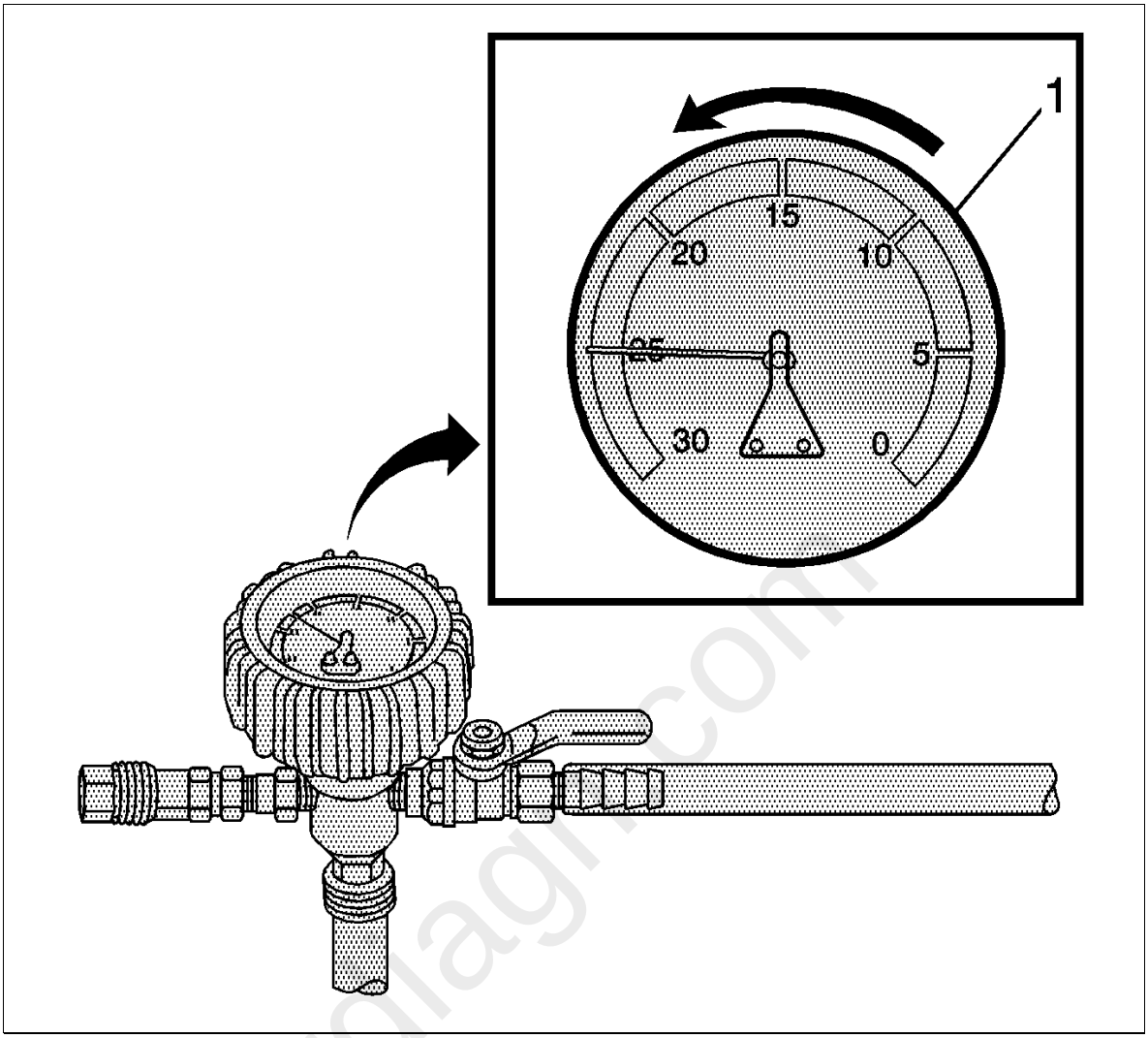


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11. Open the valve (1) on the venturi assembly (2). The vacuum gauge will begin to rise and a hissing noise will be present.

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Fig 9: Vacuum Gauge Needle



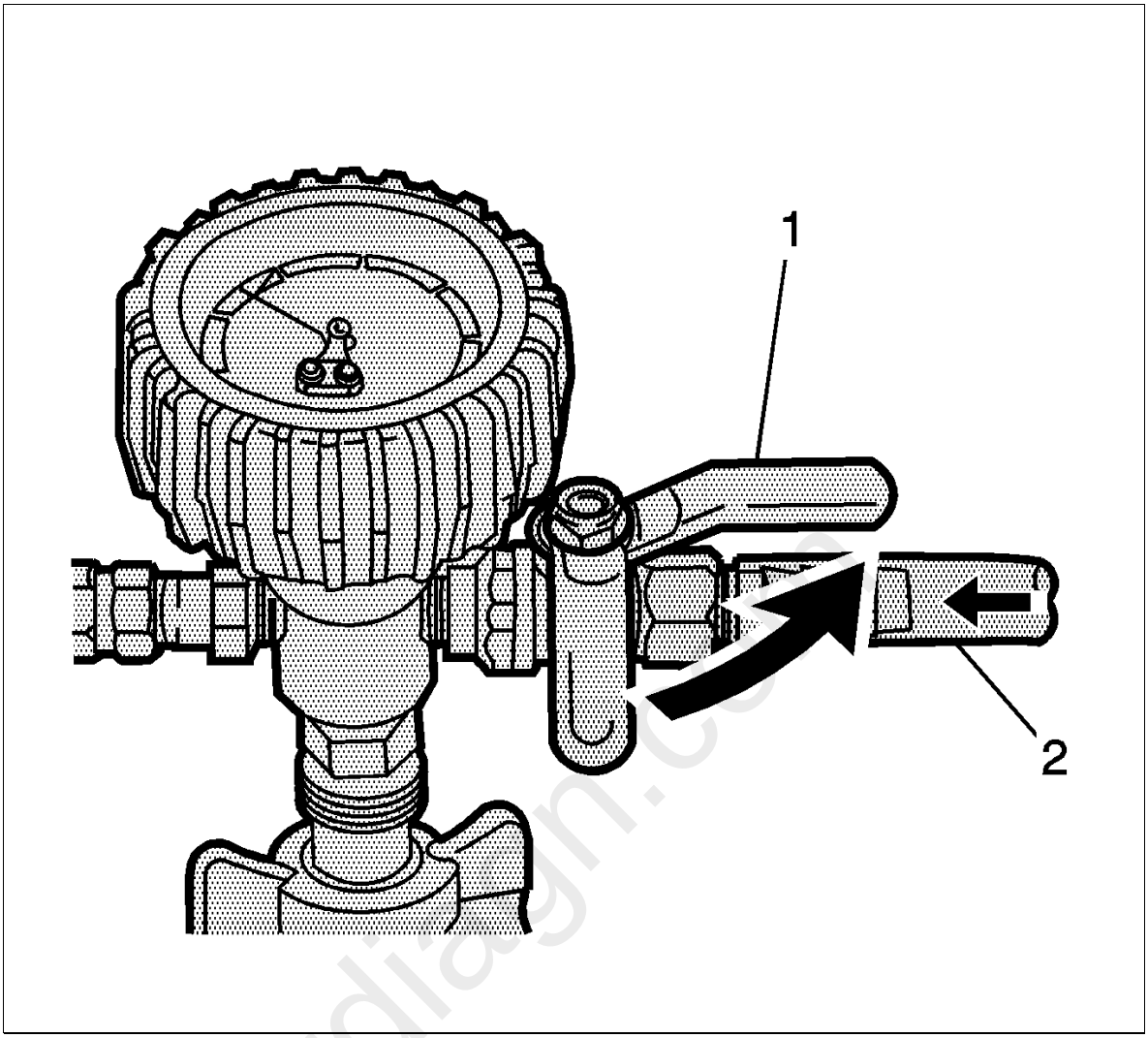
Courtesy of GENERAL MOTORS COMPANY

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 10: Vacuum Gauge Assembly & Needle

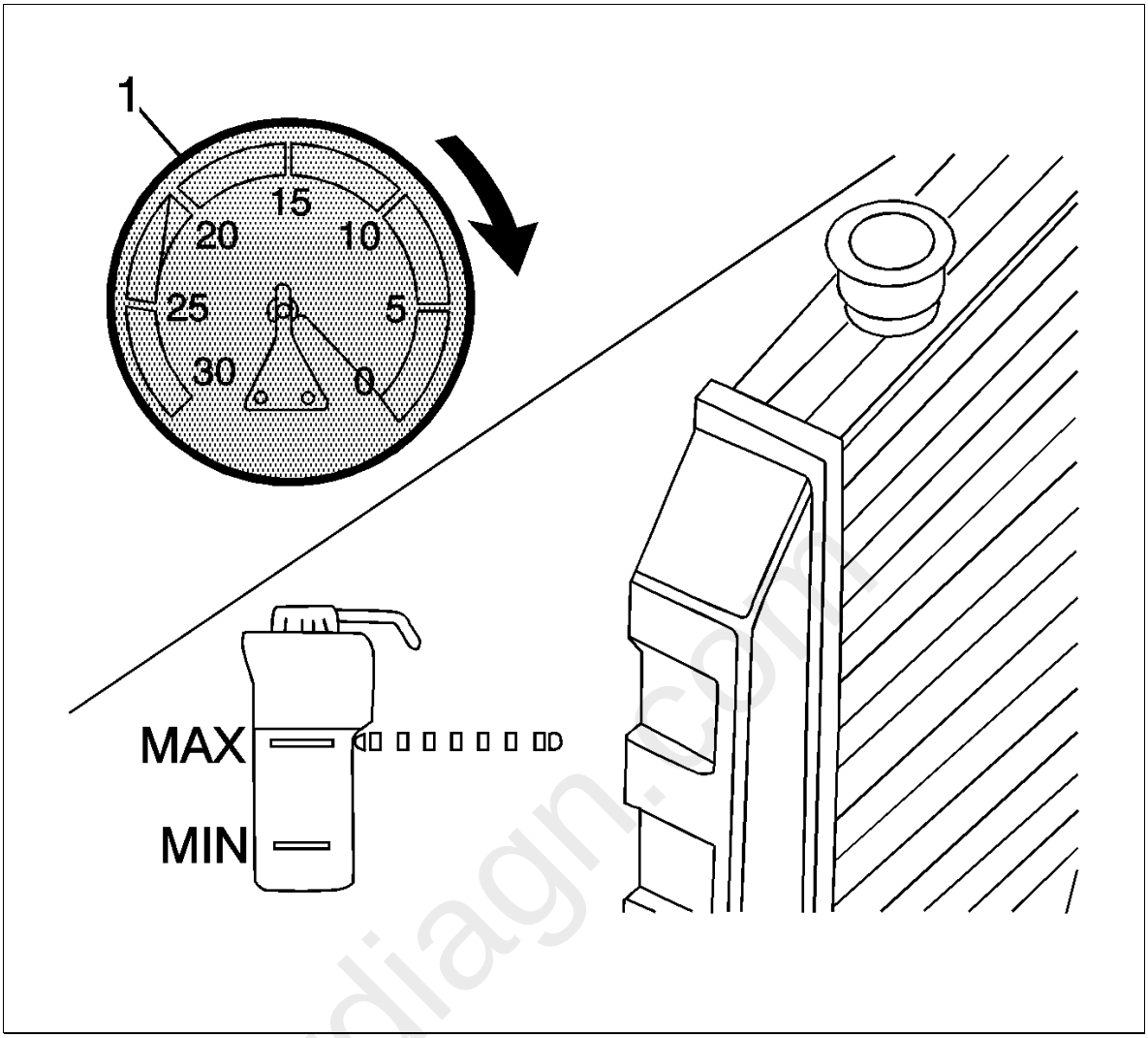


Courtesy of GENERAL MOTORS COMPANY

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 11: Vacuum Gauge At Zero



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.

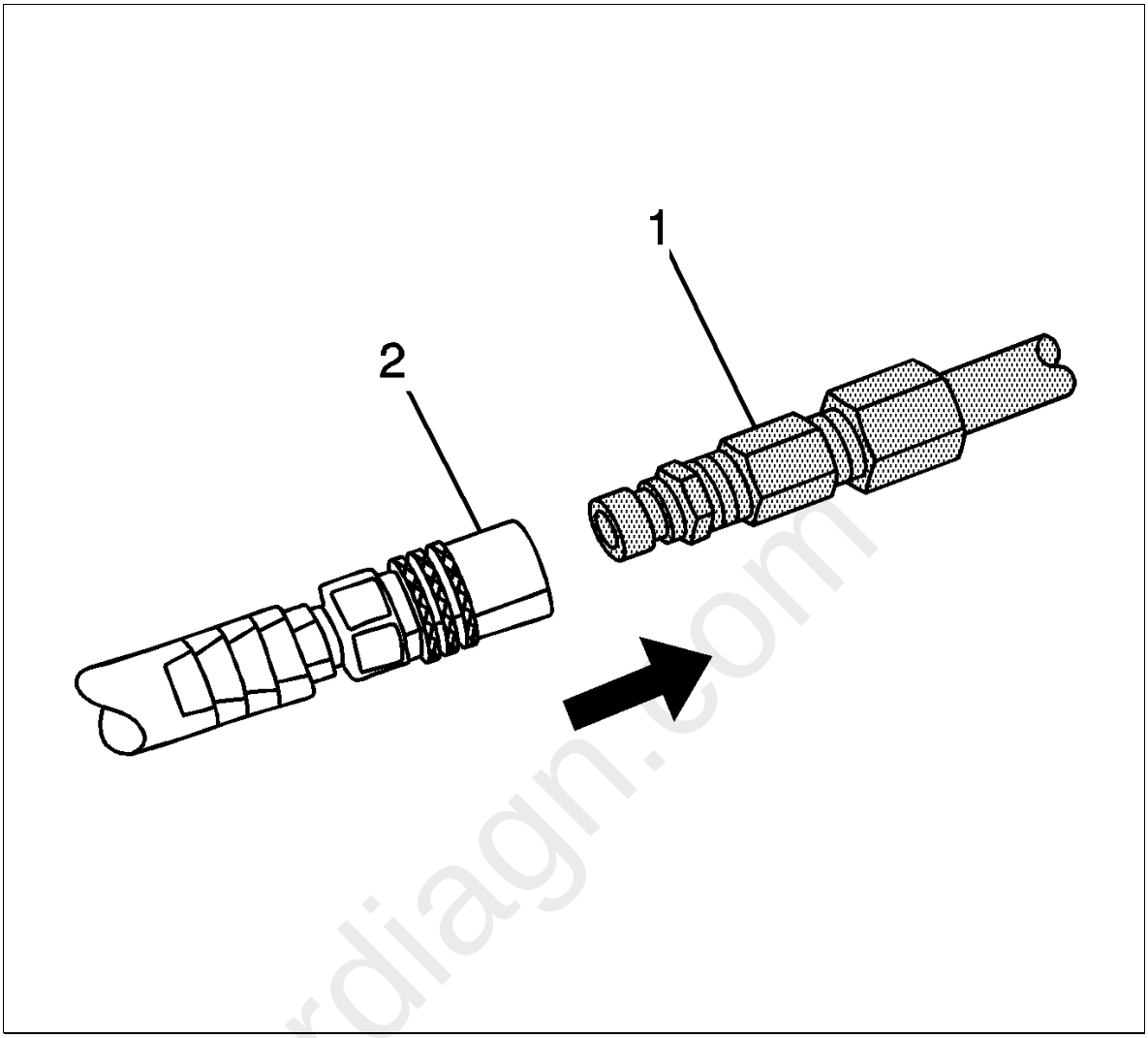
NOTE:

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

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

Fig 12: Vacuum Hose & Extraction Hose

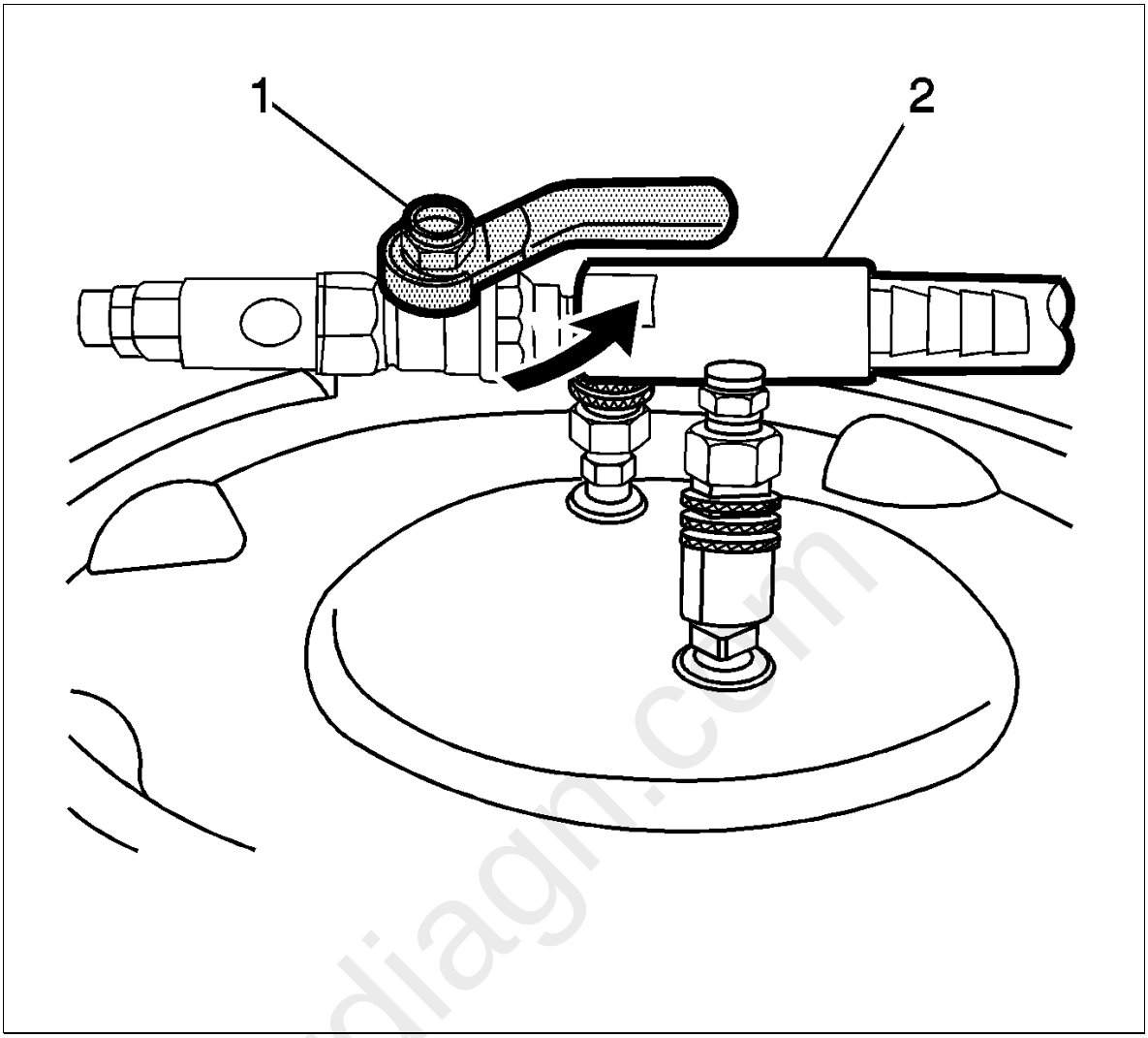


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24. Attach the extraction hose (1) to the vacuum hose (2).

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Fig 13: Venturi Assembly & Valve

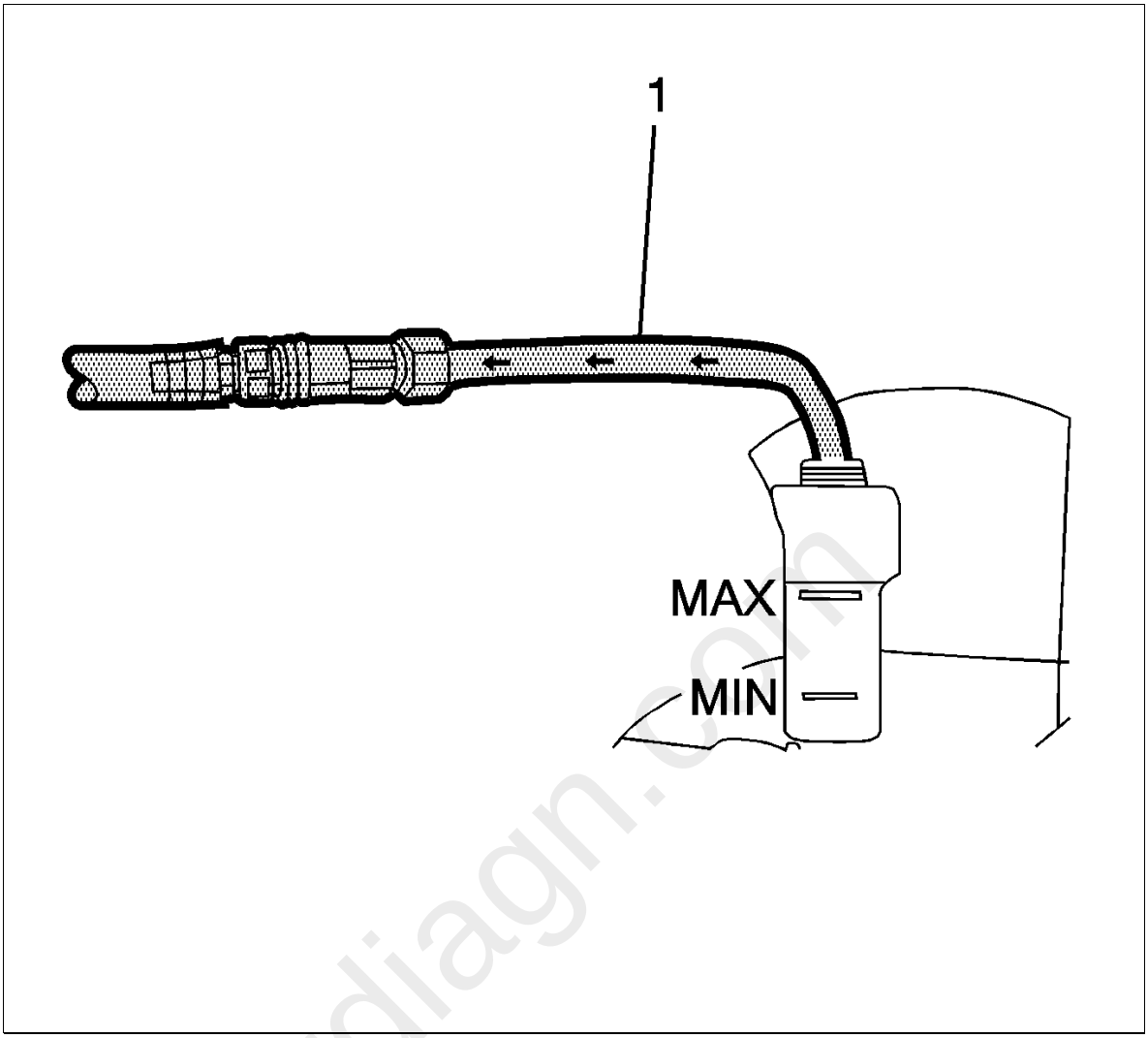


Courtesy of GENERAL MOTORS COMPANY

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

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Fig 14: Coolant Extraction Hose



Courtesy of GENERAL MOTORS COMPANY

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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 surge tank cap.

REPAIR INSTRUCTIONS > COOLING SYSTEM DRAINING AND FILLING (STATIC FILL)

Special Tools

J 26568 Coolant and Battery Fluid Tester

For equivalent regional tools Special Tools .

REPAIR INSTRUCTIONS > COOLING SYSTEM DRAINING AND FILLING (STATIC FILL) > DRAINING PROCEDURE

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

1. Remove the coolant pressure cap from the radiator.
2. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
3. Remove the front compartment air deflector if equipped. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LT1) .
4. Place a clean drain pan under the radiator drain cock.
5. Loosen the radiator drain cock.
6. Drain the cooling system.
7. Lower the vehicle.
8. Inspect the coolant.
9. Follow the appropriate procedure based on the condition of the coolant.
    1. Normal in appearance-Follow the filling procedure.
    2. Discolored-Follow the flush procedure. Flushing .
10. Tighten the radiator drain cock.
11. Install the front compartment air deflector if equipped. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LT1) .
12. Lower the vehicle.

REPAIR INSTRUCTIONS > COOLING SYSTEM DRAINING AND FILLING (STATIC FILL) > FILLING PROCEDURE

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

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

1. Slowly fill the radiator with a 50/50 coolant mixture until the coolant level is just below the radiator fill neck. Approximate Fluid Capacities .
2. Allow 30 seconds for the coolant level to stabilize and continue to fill the radiator until the level stabilizes for at least 2 minutes.
3. Start the engine and allow to the engine to idle.
4. Slowly fill the coolant mixture until the level stabilizes at the just below the top of radiator fill neck for at least 2 minutes.
5. Install the coolant pressure cap.
6. Allow the engine to idle until the engine reaches normal operating temperature.
7. Shut the engine OFF.
8. Allow the engine to cool.
9. Remove the coolant pressure cap and top off the engine coolant in the radiator.
10. Inspect the concentration of the engine coolant using the **J 26568** coolant and battery fluid tester.
11. Install coolant pressure cap.
12. Inspect and if necessary, fill the coolant reservoir bottle.
13. Rinse away any excess coolant from the engine and the engine compartment
14. Inspect the cooling system for leaks.
15. Top off the coolant reservoir if necessary.
16. Install the front compartment air deflector if equipped. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LT1) .

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REPAIR INSTRUCTIONS > FLUSHING

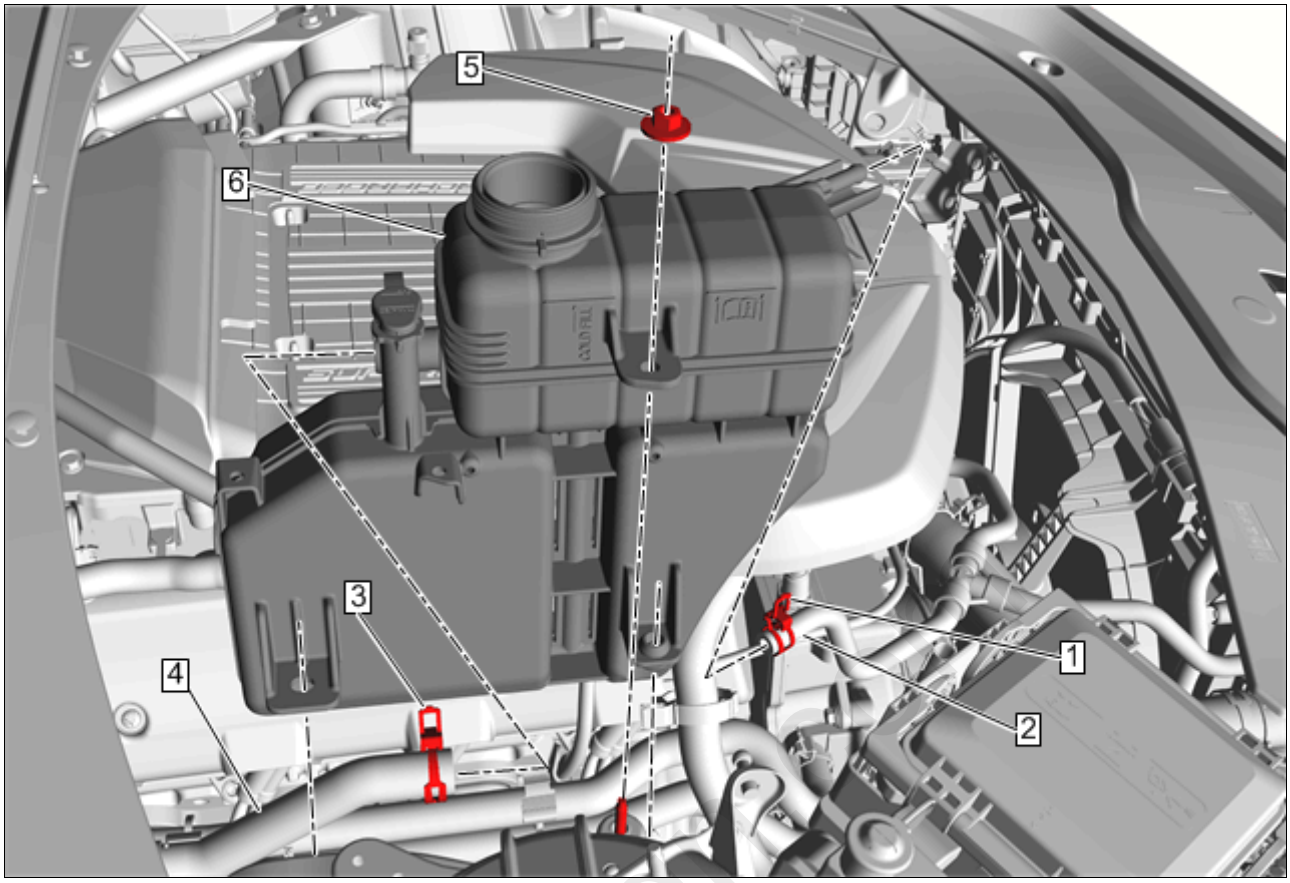
NOTE:

- *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. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) .
2. Remove the radiator surge tank. Radiator Surge Tank Replacement (LGX) Radiator Surge Tank Replacement (LT1) Radiator Surge Tank Replacement (LTG) .
3. Clean and flush the radiator surge tank with clean, drinkable water.
4. Install the radiator surge tank. Radiator Surge Tank Replacement (LGX) Radiator Surge Tank Replacement (LT1) Radiator Surge Tank Replacement (LTG) .
5. Follow the drain and fill procedure using only clean, drinkable water. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) .
6. Run the engine for 20 minutes.
7. Stop the engine.
8. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
9. Repeat the procedure if necessary, until the fluid is nearly colorless.
10. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) .

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK REPLACEMENT (LGX)

Fig 1: Radiator Surge Tank



Courtesy of GENERAL MOTORS COMPANY

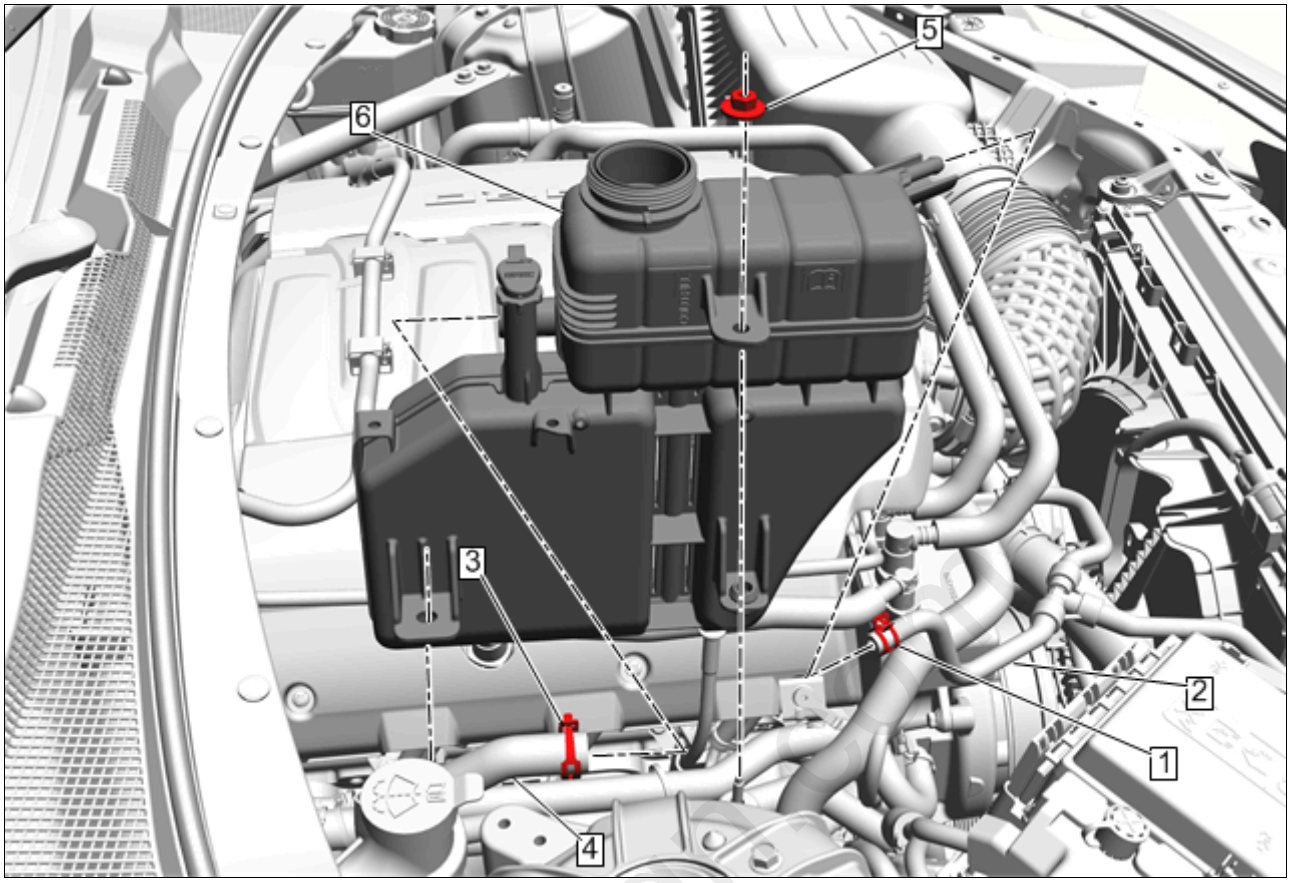
Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Remove Battery Positive Cable at Radiator Surge Tank and position aside	
1	Radiator Surge Tank Inlet Hose Clamp **Procedure** Reposition the radiator surge tank hose clamps using **BO-38185** Hose Clamp Pliers **Special Tools** **BO-38185** Hose Clamp Pliers
2	Radiator Surge Tank Inlet Hose
3	Heater Outlet Hose Clamp **Procedure** Reposition the radiator surge tank hose clamps using **BO-38185** Hose Clamp Pliers **Special Tools** **BO-38185** Hose Clamp Pliers

4	Heater Outlet Hose
5	Radiator Surge Tank Nut *CAUTION:* *Refer to Fastener Caution* **Tighten** 6 N.m (53 lb in)
6	Radiator Surge Tank Procedure 1. Fill the coolant to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK REPLACEMENT (LT1)

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Fig 1: Radiator Surge Tank



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Remove Battery Positive Cable at Radiator Surge Tank and position aside	
1	Radiator Surge Tank Inlet Hose Clamp **Procedure** Reposition the heater outlet hose clamps using **BO-38185** Hose Clamp Pliers. **Special Tools** **BO-38185** Hose Clamp Pliers Special Tools
2	Radiator Surge Tank Inlet Hose
3	Heater Outlet Hose Clamp **Procedure** Reposition the heater outlet hose clamps using **BO-38185** Hose Clamp Pliers. **Special Tools** **BO-38185** Hose Clamp Pliers

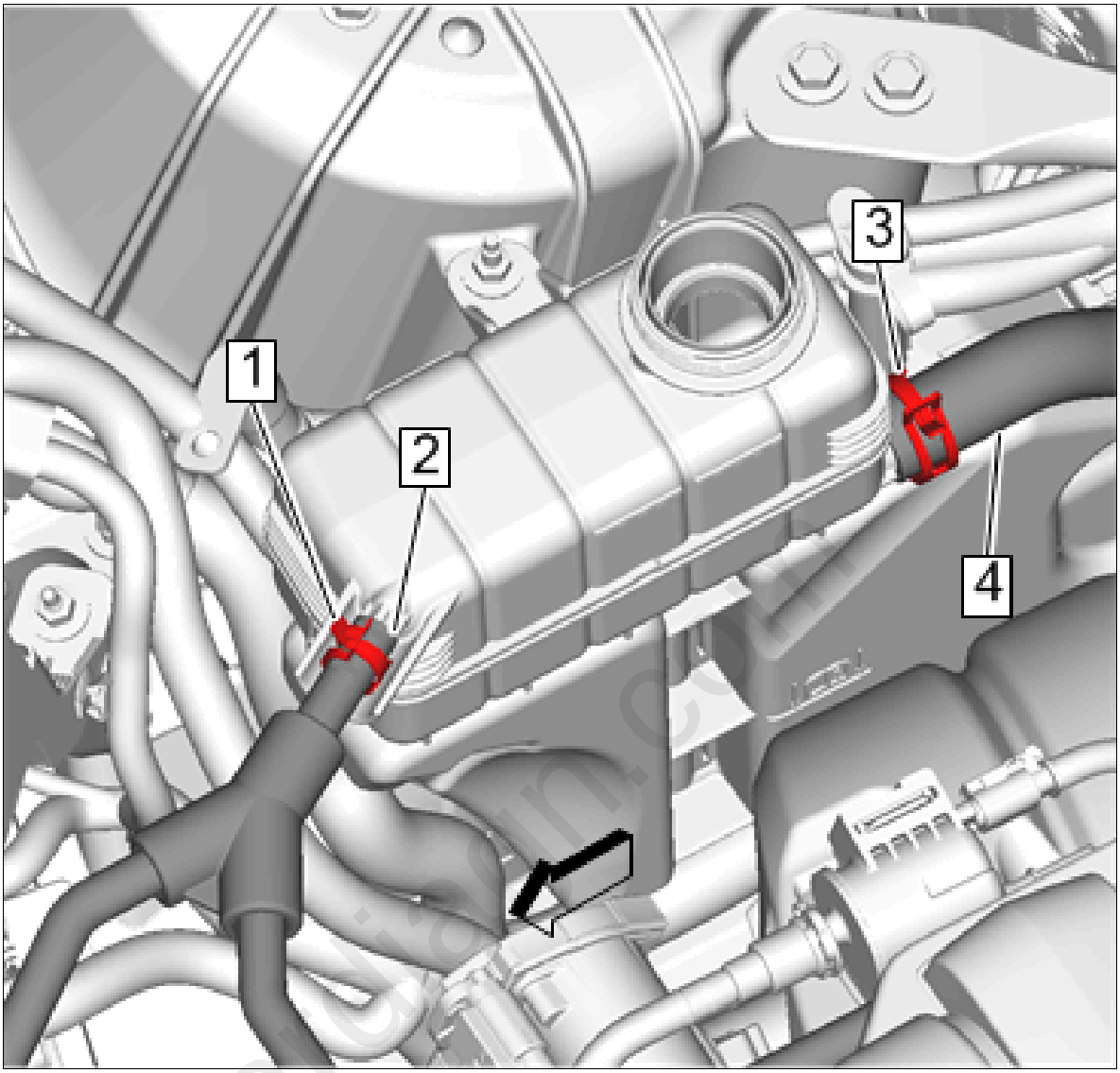
4	Heater Outlet Hose
5	Radiator Surge Tank Nut *CAUTION:* *Refer to Fastener Caution .* **Tighten** 6 N.m (53 lb in)
6	Radiator Surge Tank Procedure 1. Fill the coolant to the proper level. Refer to Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) . 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK REPLACEMENT (LTG) > REMOVAL PROCEDURE

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

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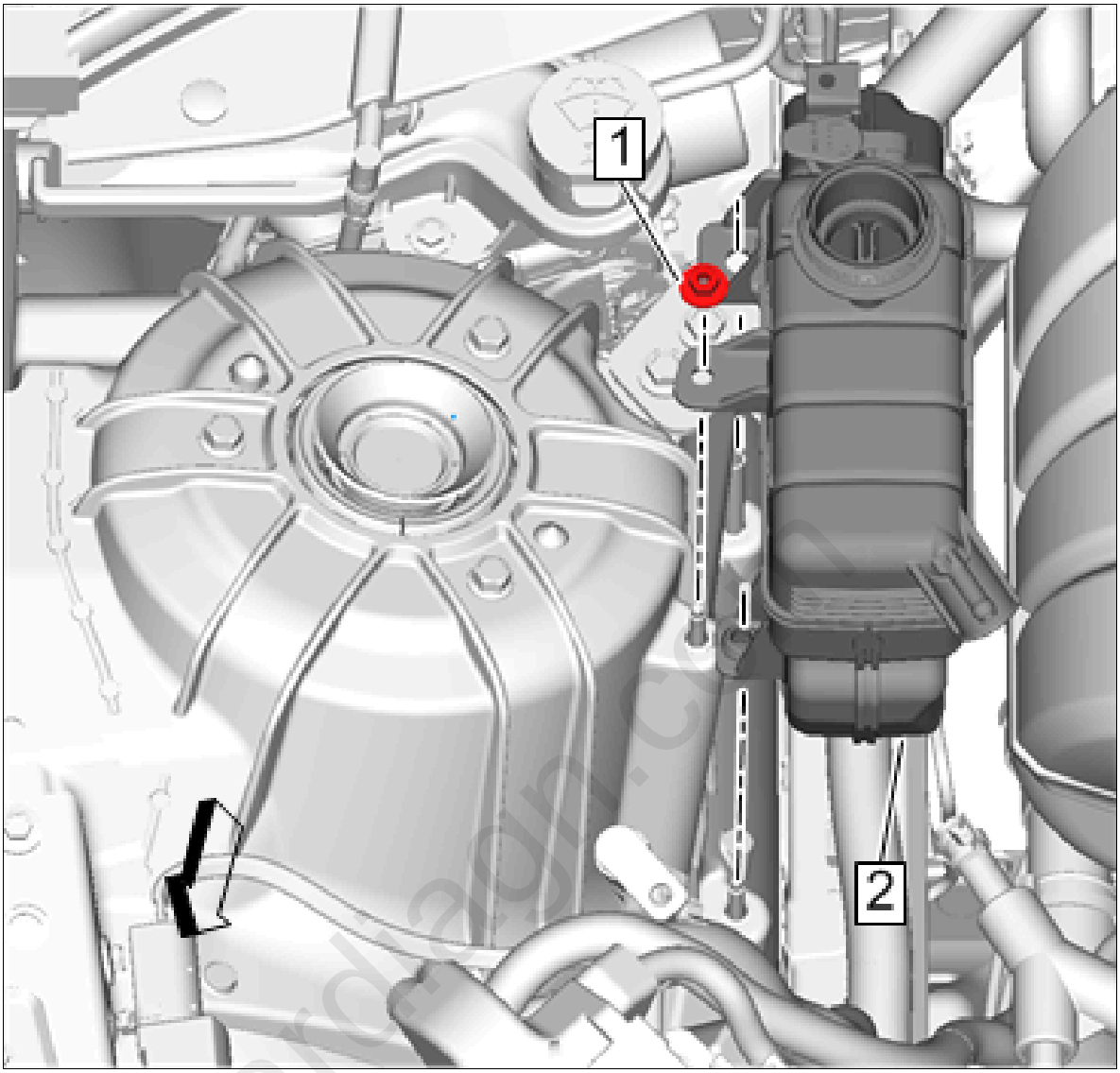
Fig 1: Radiator Surge Tank Inlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

2. Disengage Radiator Surge Tank Inlet Hose Clamp (1) at Radiator Surge Tank - Hose Clamp Replacement Guidelines - Spring Type
3. Remove Radiator Surge Tank Inlet Hose (2) at Radiator Surge Tank
4. Disengage Heater Outlet Hose Clamp (3) at Radiator Surge Tank - Hose Clamp Replacement Guidelines - Spring Type
5. Remove Heater Outlet Hose (4) at Radiator Surge Tank
6. Remove the battery positive cable and retainer from the radiator surge tank and reposition out of the way.

Fig 2: Radiator Surge Tank

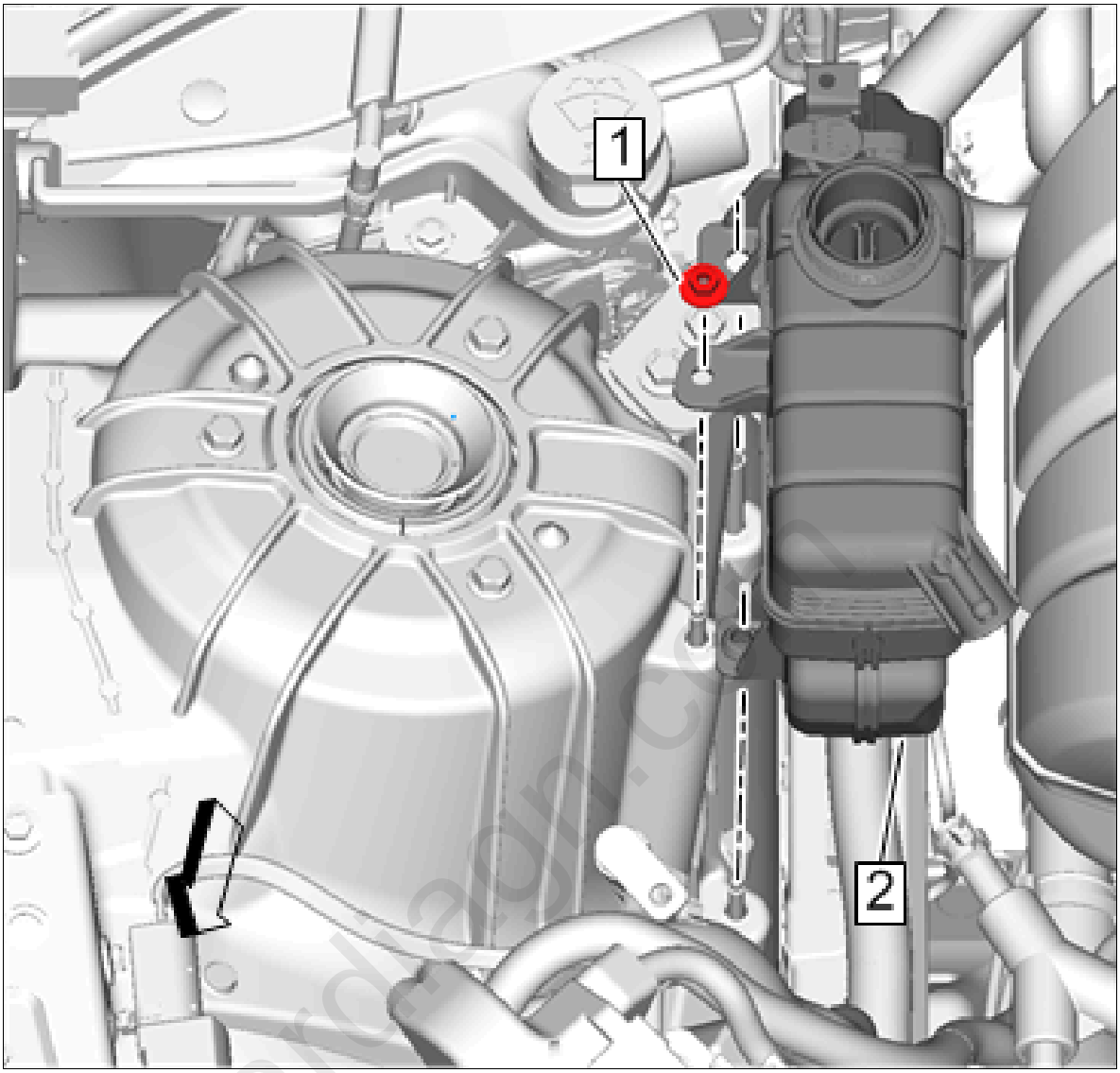


Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank Nut (1) at Radiator Surge Tank
8. Remove Radiator Surge Tank (2)

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK REPLACEMENT (LTG) > INSTALLATION PROCEDURE

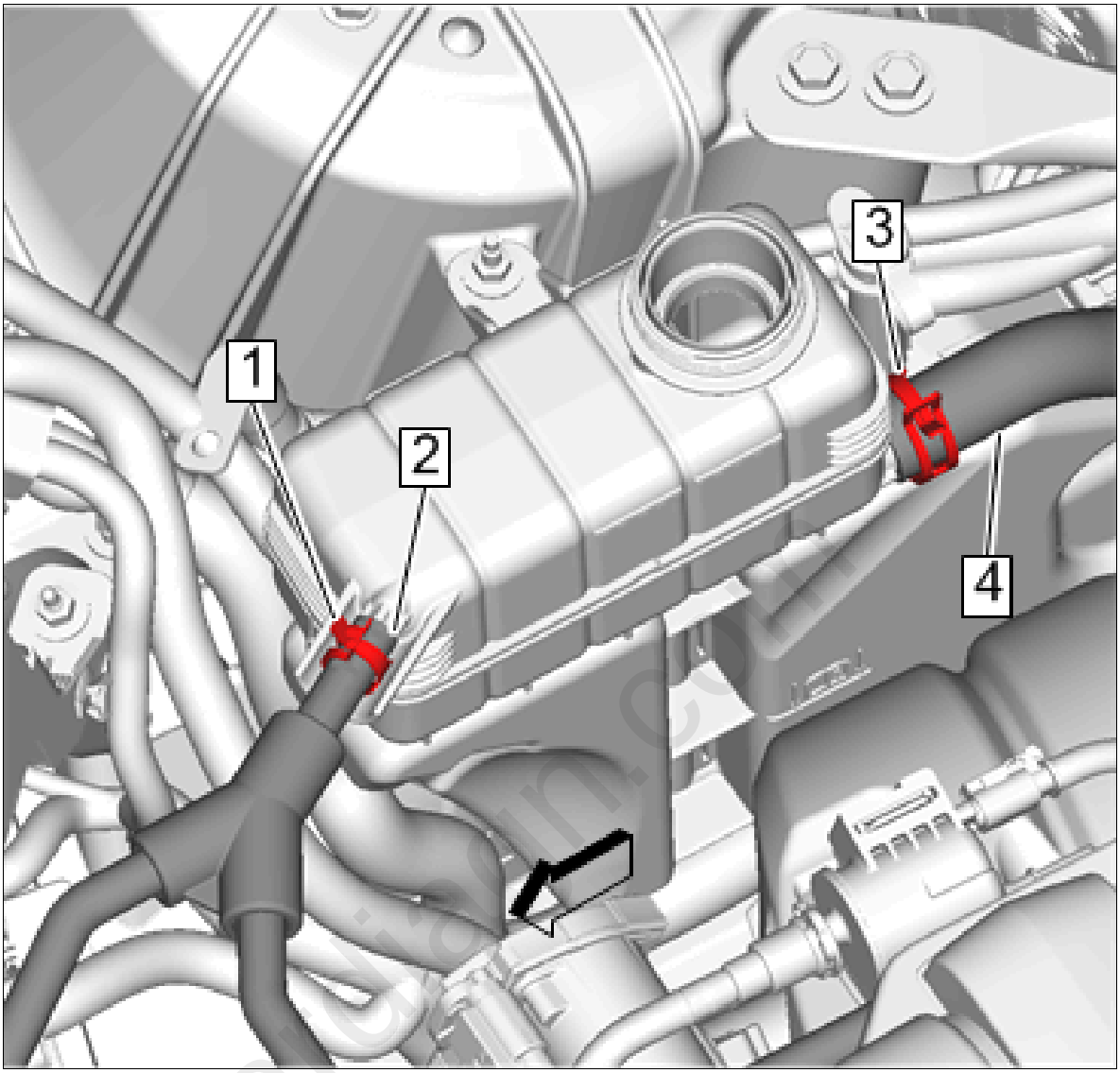
Fig 1: Radiator Surge Tank



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Surge Tank (2)
2. Install Radiator Surge Tank Nut (1) at Radiator Surge Tank and tighten to 6 N.m (53 lb in)
3. Install the battery positive cable and retainer to the radiator surge tank.

Fig 2: Heater Outlet Hose

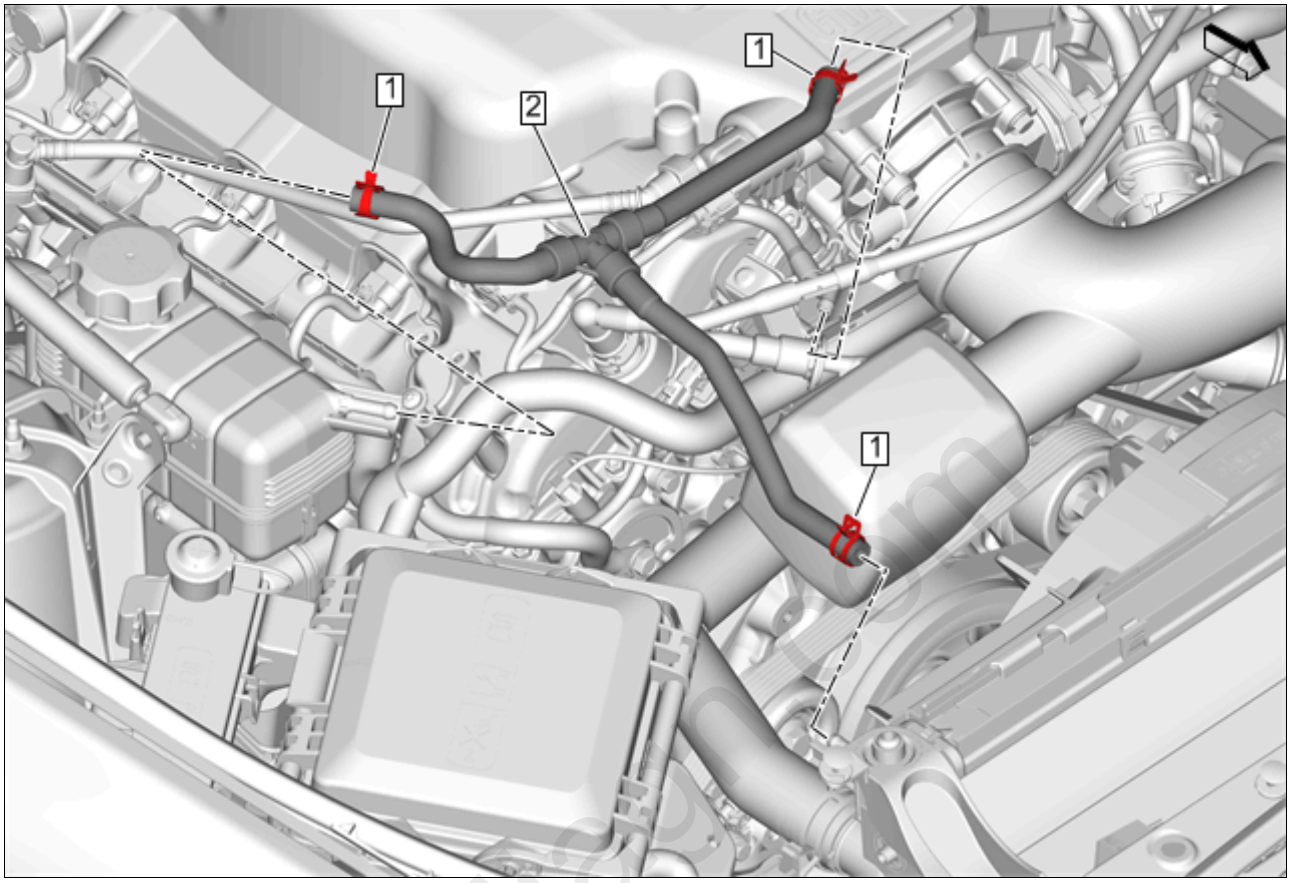


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4. Install Heater Outlet Hose (4) at Radiator Surge Tank
5. Engage Heater Outlet Hose Clamp (3) at Radiator Surge Tank - Hose Clamp Replacement Guidelines - Spring Type
6. Install Radiator Surge Tank Inlet Hose (2) at Radiator Surge Tank
7. Engage Radiator Surge Tank Inlet Hose Clamp (1) at Radiator Surge Tank Inlet Hose - Hose Clamp Replacement Guidelines - Spring Type
8. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
9. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK INLET HOSE REPLACEMENT (LGX)

Fig 1: Radiator Surge Tank Inlet Hose (LGX)

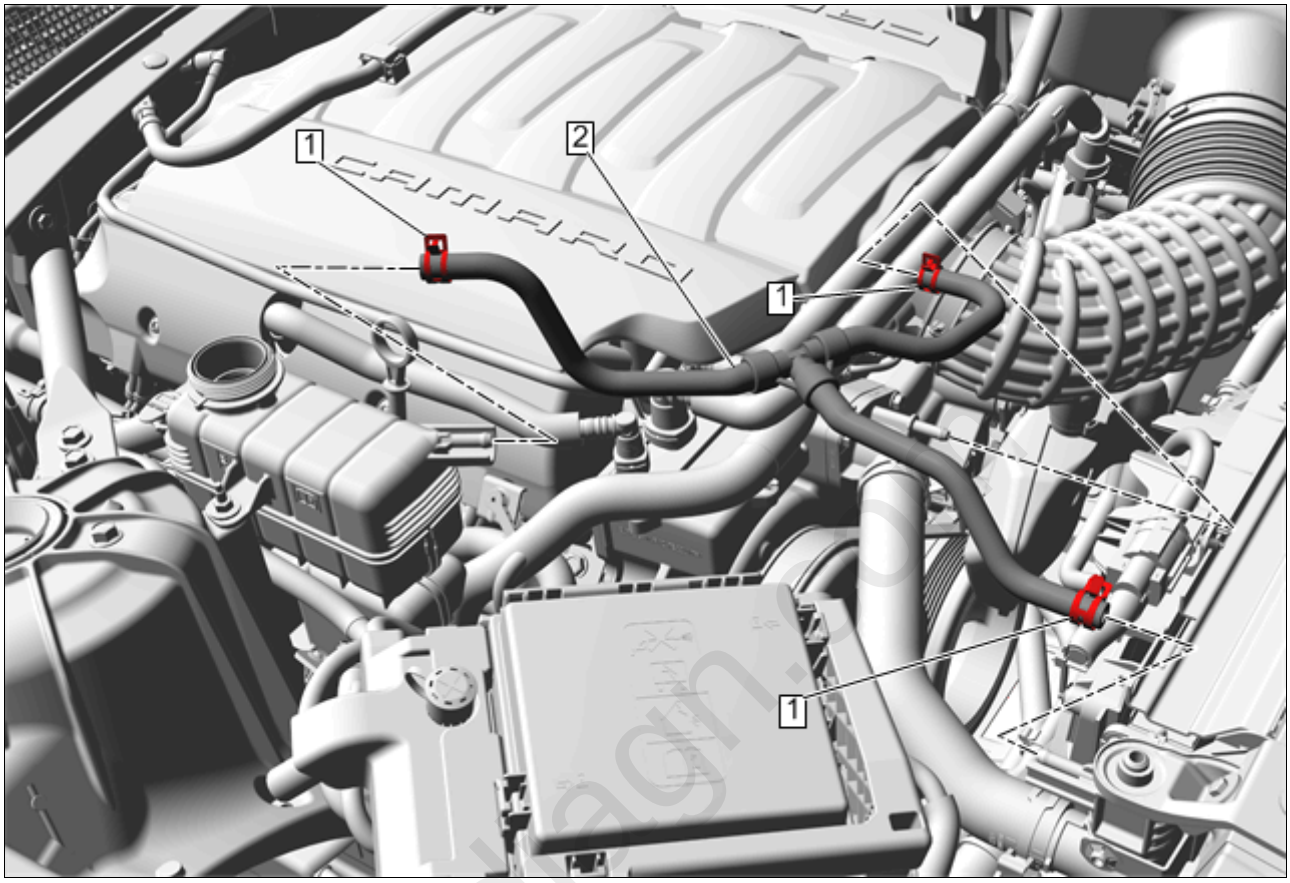


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Surge Tank Inlet Hose Clamp (Qty: 3) **Procedure** Reposition the radiator surge tank inlet hose clamps using **BO-38185** Hose Clamp Pliers **Special Tools** **BO-38185** Hose Clamp Pliers
2	Radiator Surge Tank Inlet Hose Procedure 1. Fill the coolant to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK INLET HOSE REPLACEMENT (LT1)

Fig 1: Radiator Surge Tank Inlet Hose

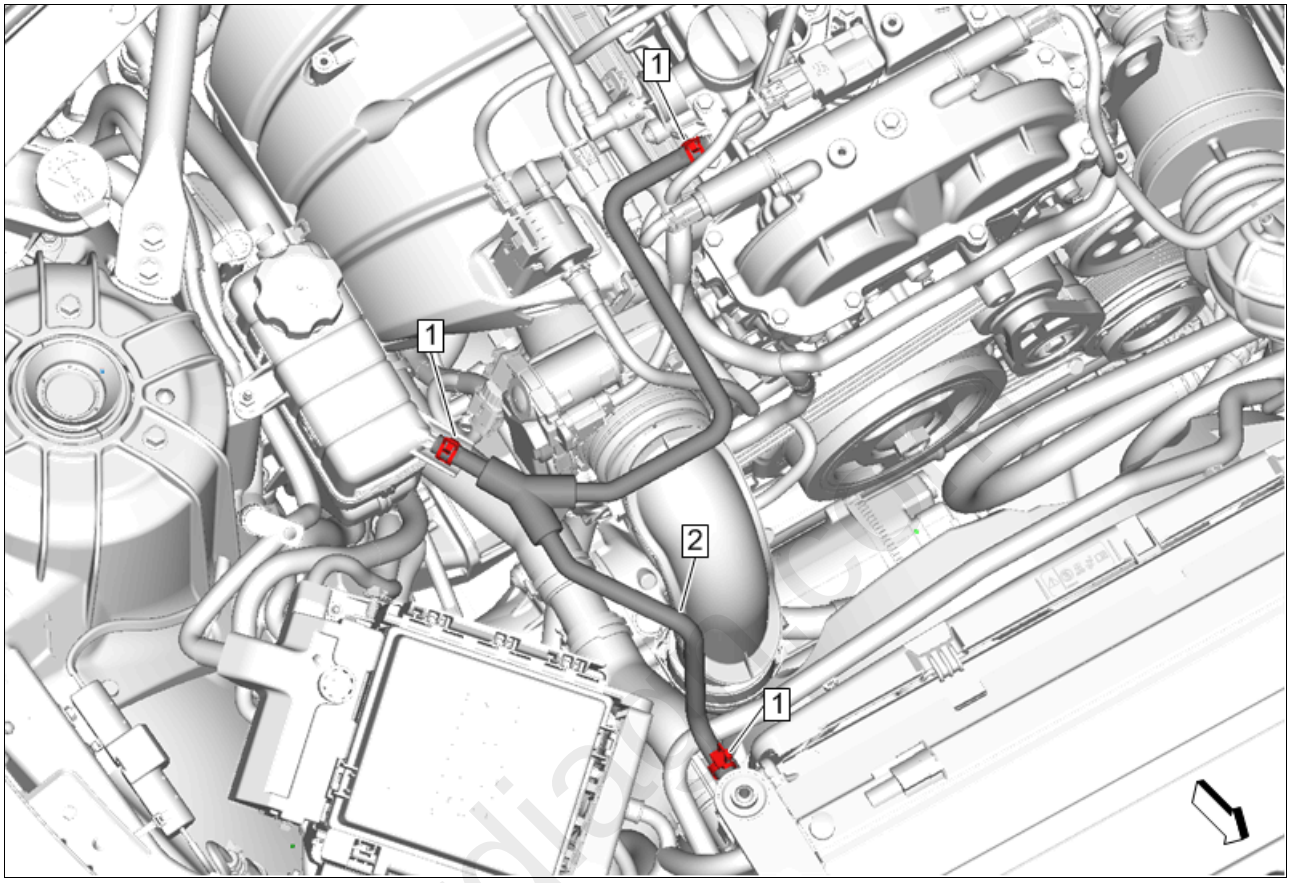


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Surge Tank Inlet Hose Clamp (Qty: 3) **Procedure** Reposition the radiator surge tank inlet hose clamps using **BO-38185** Hose Clamp Pliers. **Special Tools** **BO-38185** Hose Clamp Pliers Special Tools
2	Radiator Surge Tank Inlet Hose Procedure 1. Fill the coolant to the proper level. Refer to Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) . 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR SURGE TANK INLET HOSE REPLACEMENT (LTG)

Fig 1: Radiator Surge Tank Inlet Hose



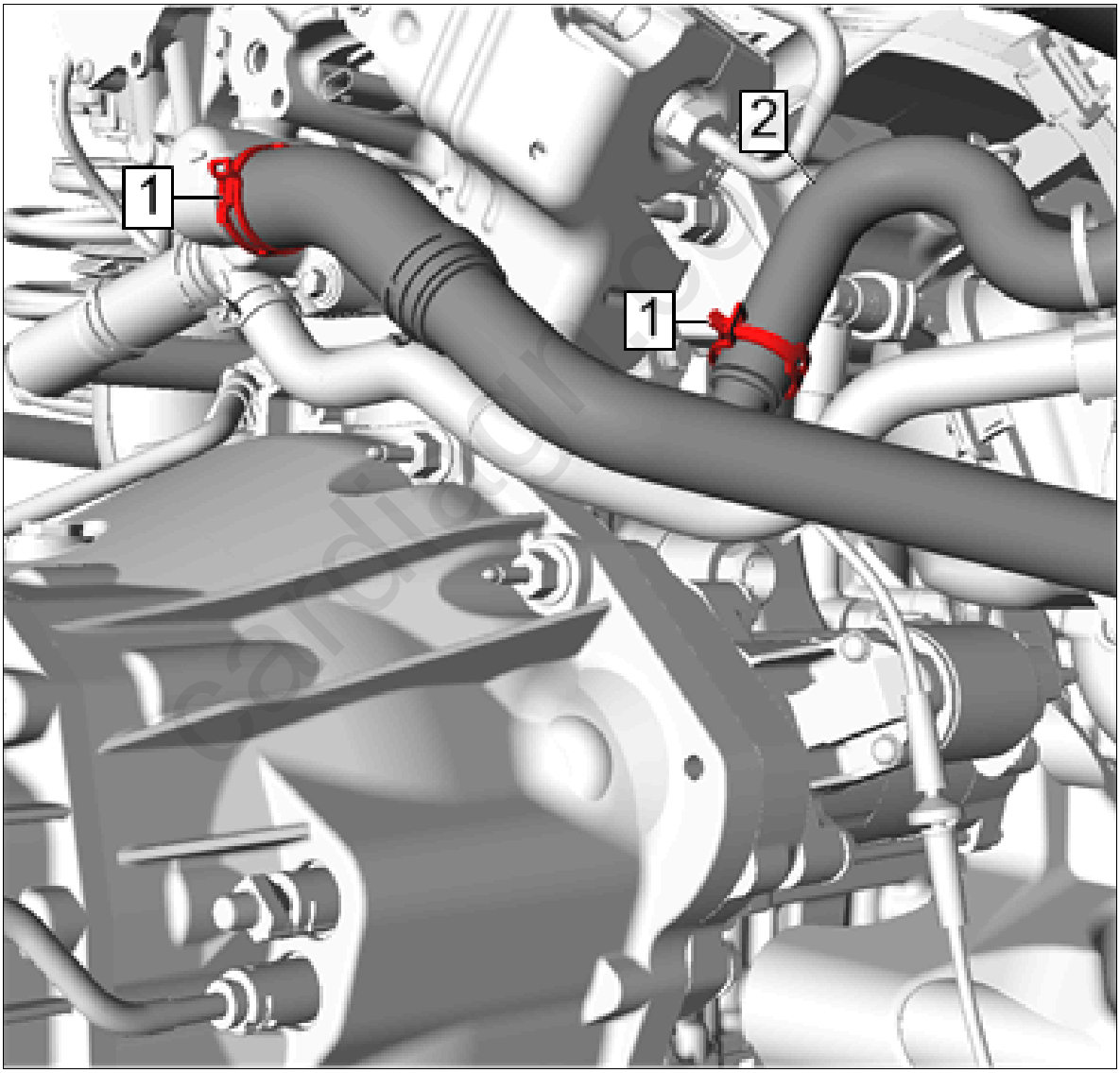
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Intake Manifold Cover Replacement	
1	Radiator Surge Tank Inlet Hose Clamp (Qty: 3) **Procedure** Hose Clamp Replacement Guidelines - Spring Type
2	Radiator Surge Tank Inlet Hose Procedure 1. Fill the cooling system to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET PIPE REPLACEMENT (LTG) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Radiator Surge Tank Replacement (LTG)
3. Remove Fuel Pump Insulator Replacement (Inner)Fuel Pump Insulator Replacement (Outer)
4. Disconnect Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)

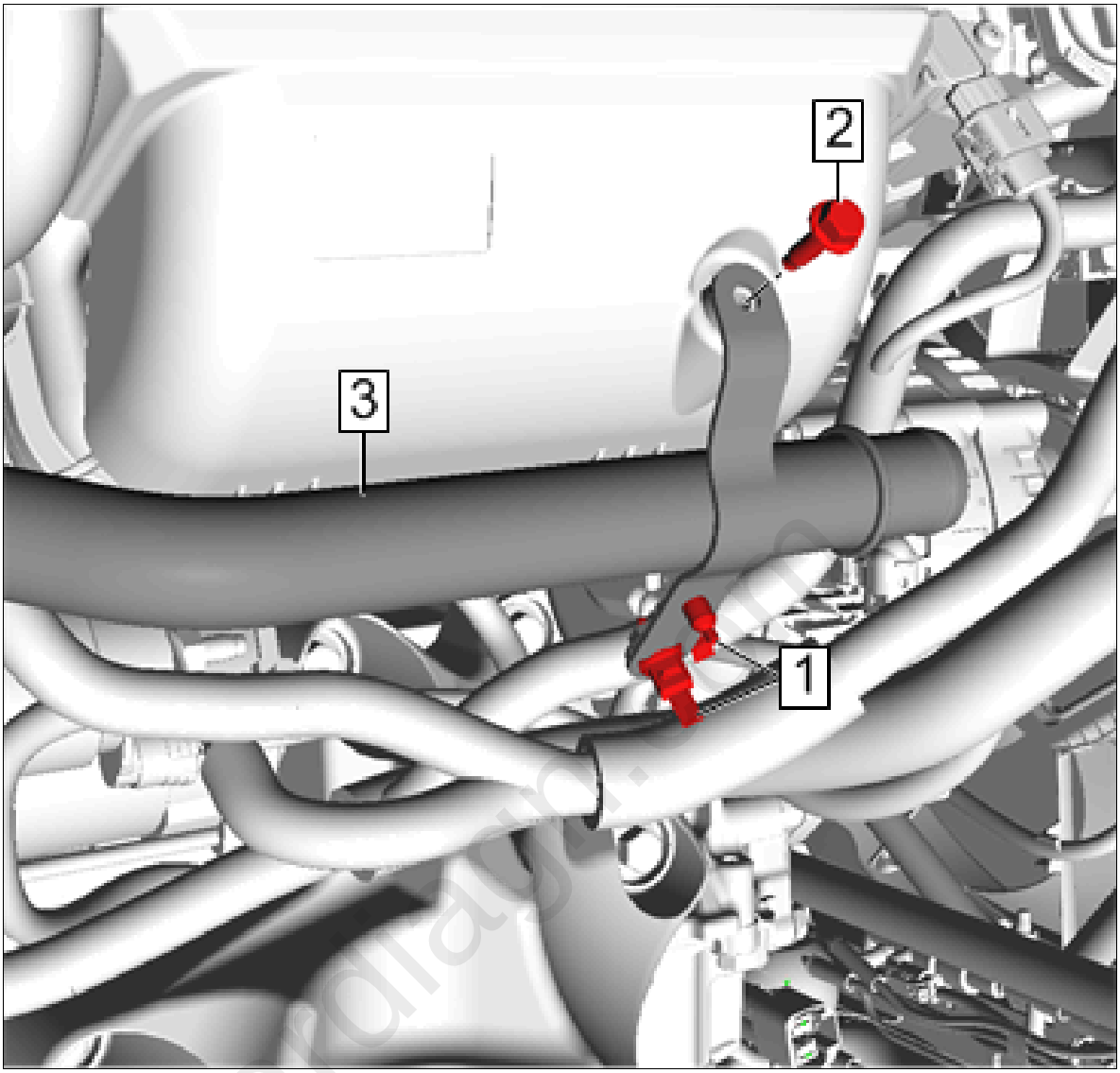
   Fig 1: Heater Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Disengage Clamp (1) (Qty: 2) - Hose Clamp Replacement Guidelines - Spring Type
6. Disconnect Heater Inlet Hose (2)

Fig 2: Radiator Inlet Pipe

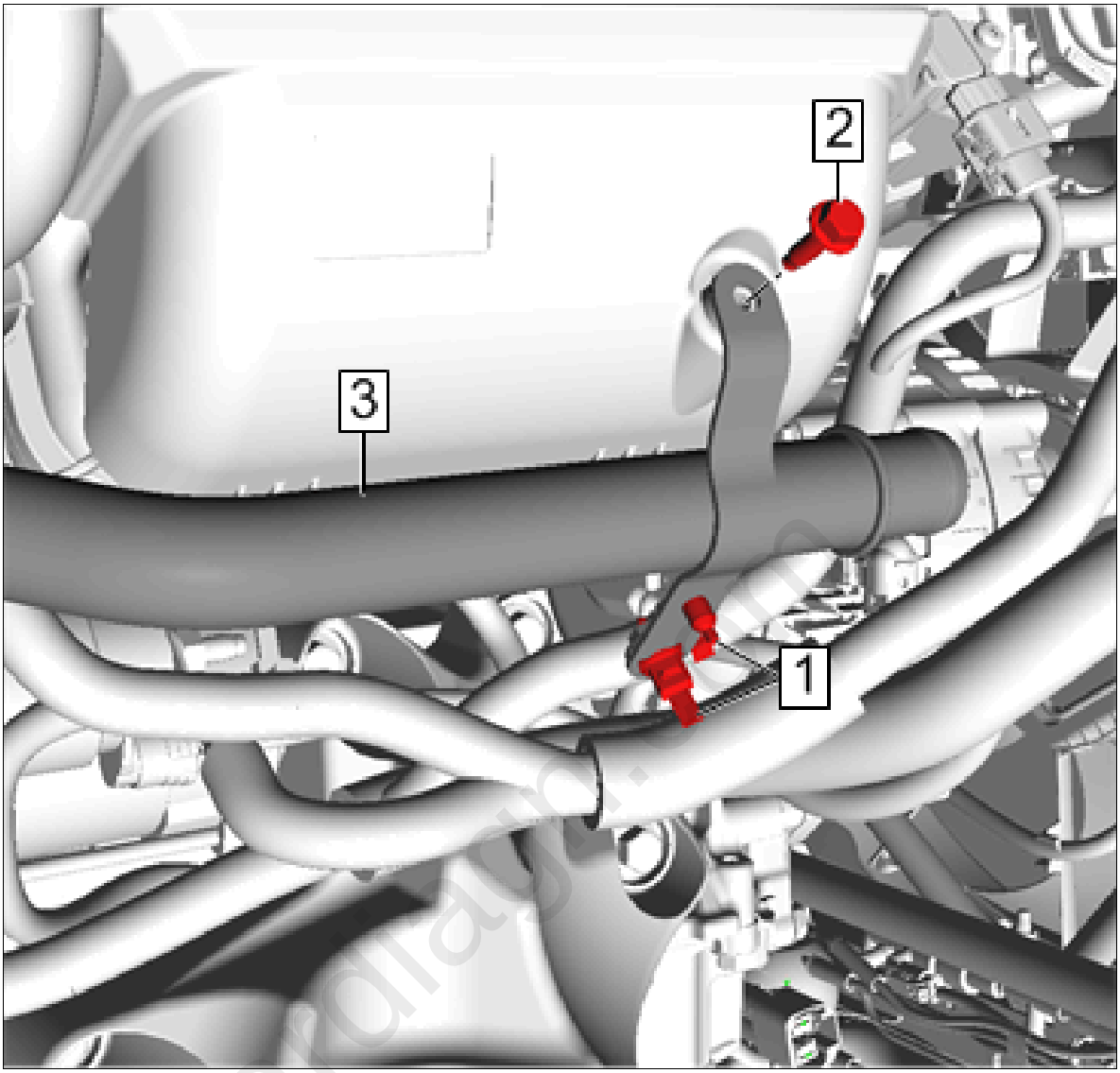


Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the engine electrical wiring harness retainers (1).
8. Remove Radiator Inlet Pipe Bolt (2)
9. Remove Radiator Inlet Pipe (3)

REPAIR INSTRUCTIONS > RADIATOR INLET PIPE REPLACEMENT (LTG) > INSTALLATION PROCEDURE

Fig 1: Radiator Inlet Pipe



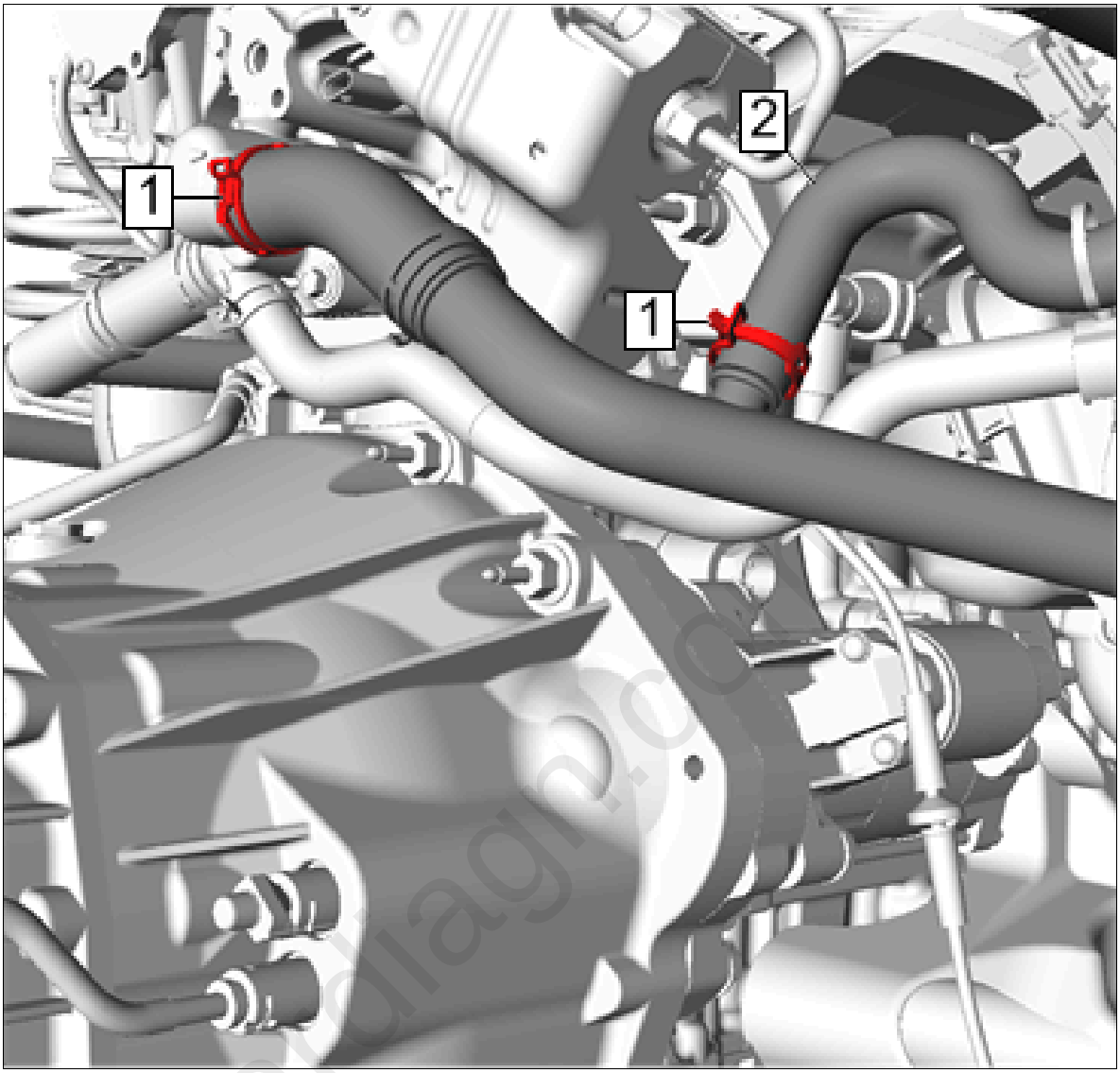
Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Pipe (3)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

2. Install Radiator Inlet Pipe Bolt (2) and tighten to 10 N.m (89 lb in)
3. Connect the engine electrical wiring harness retainers (1).

Fig 2: Heater Inlet Hose

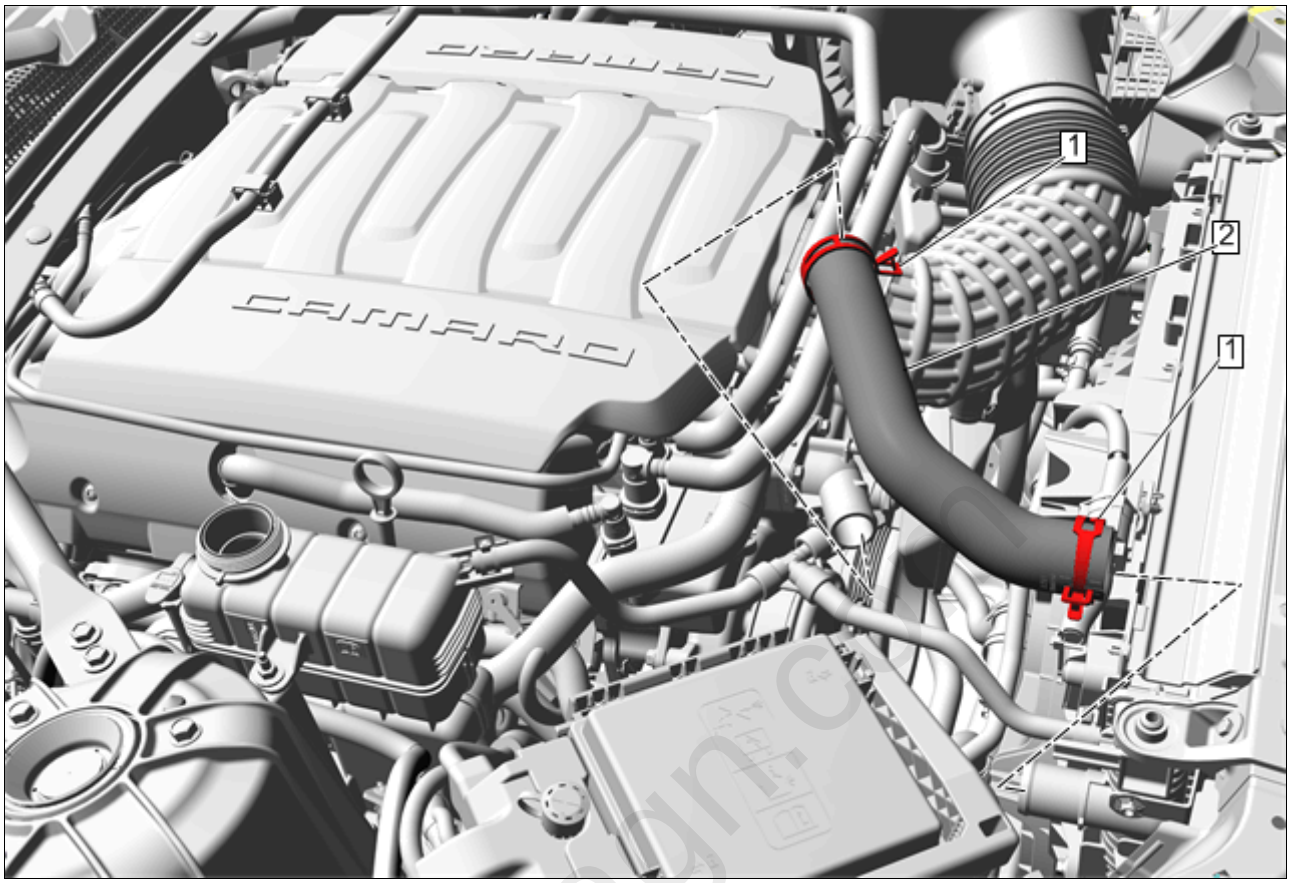


Courtesy of GENERAL MOTORS COMPANY

4. Connect Heater Inlet Hose (2)
5. Engage Clamp (1) (Qty: 2) - Hose Clamp Replacement Guidelines - Spring Type
6. Connect Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)
7. Install Fuel Pump Insulator Replacement (Inner)Fuel Pump Insulator Replacement (Outer)
8. Install Radiator Surge Tank Replacement (LTG)
9. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
10. Start the engine and check for leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LT1)

Fig 1: Radiator Inlet Hose

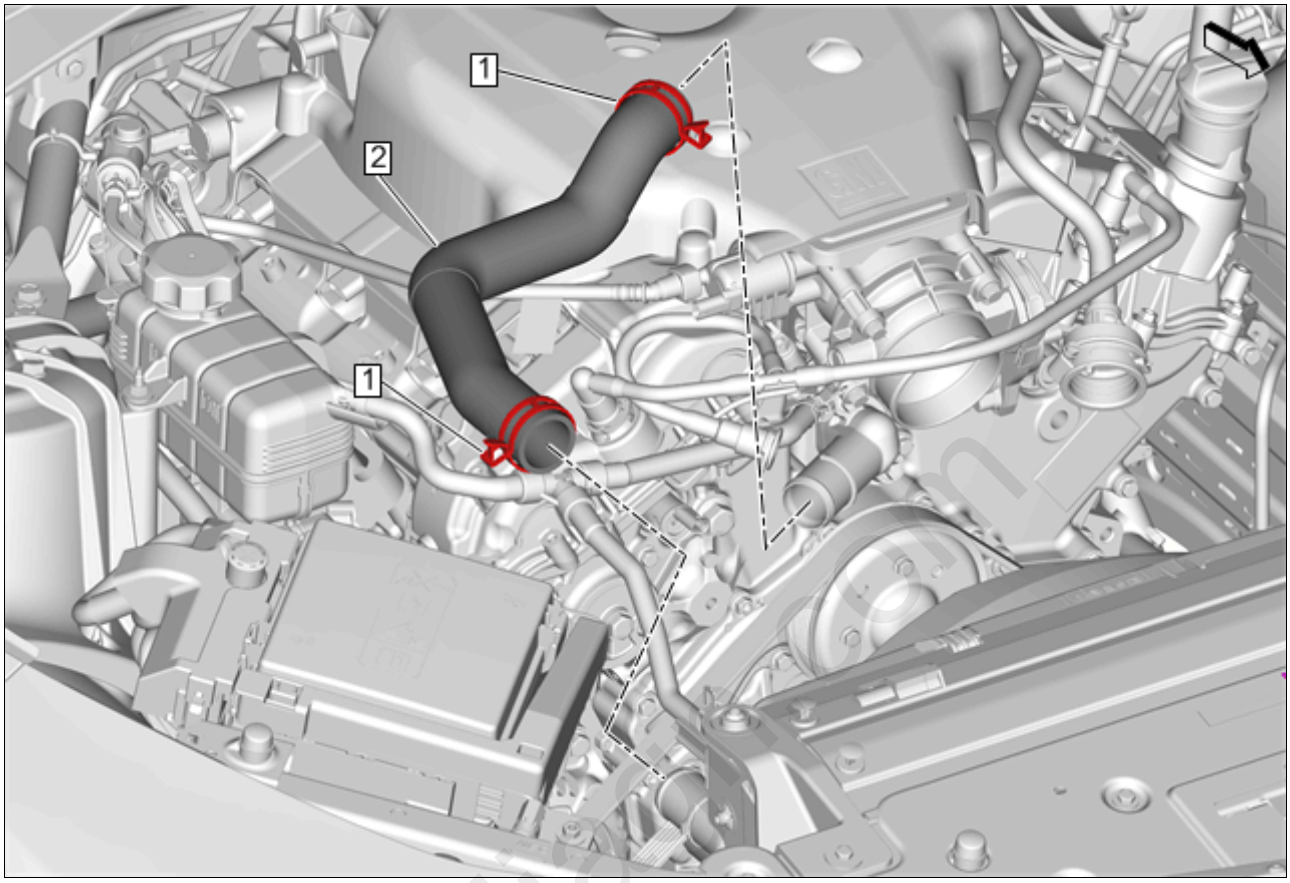


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Inlet Hose Clamp (Qty: 2) **Procedure** Reposition the radiator inlet hose clamps using **BO-38185** Hose Clamp Pliers. **Special Tools** **BO-38185** Hose Clamp Pliers Special Tools
2	Radiator Inlet Hose Procedure 1. Fill the coolant to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LGX WITHOUT V18)

Fig 1: Radiator Inlet Hose (LGX without V18)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG) Front Compartment Air Deflector Replacement (Coupe - LGX, LTG) 3. Air Cleaner Outlet Duct Replacement	
1	Radiator Inlet Hose Clamp (Qty: 2) **Procedure** Reposition the radiator surge tank inlet hose clamps using **BO-38185** Hose Clamp Pliers **Special Tools** **BO-38185** Hose Clamp Pliers

2	Radiator Inlet Hose Procedure 1. Fill the coolant to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18)

Special Tools

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

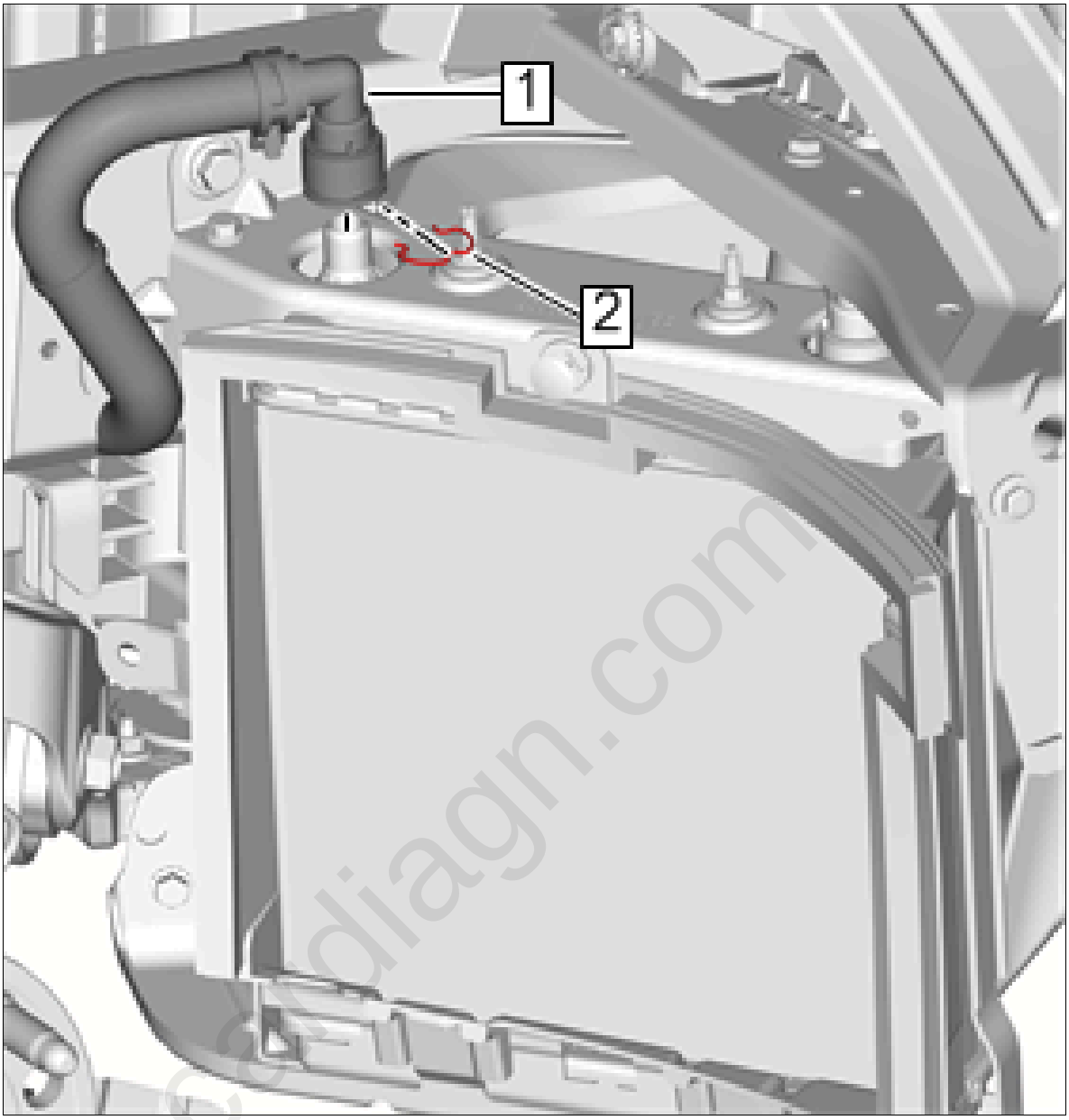
Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Intake Manifold Cover Replacement
3. Remove Front Wheelhouse Liner Replacement - Right Side

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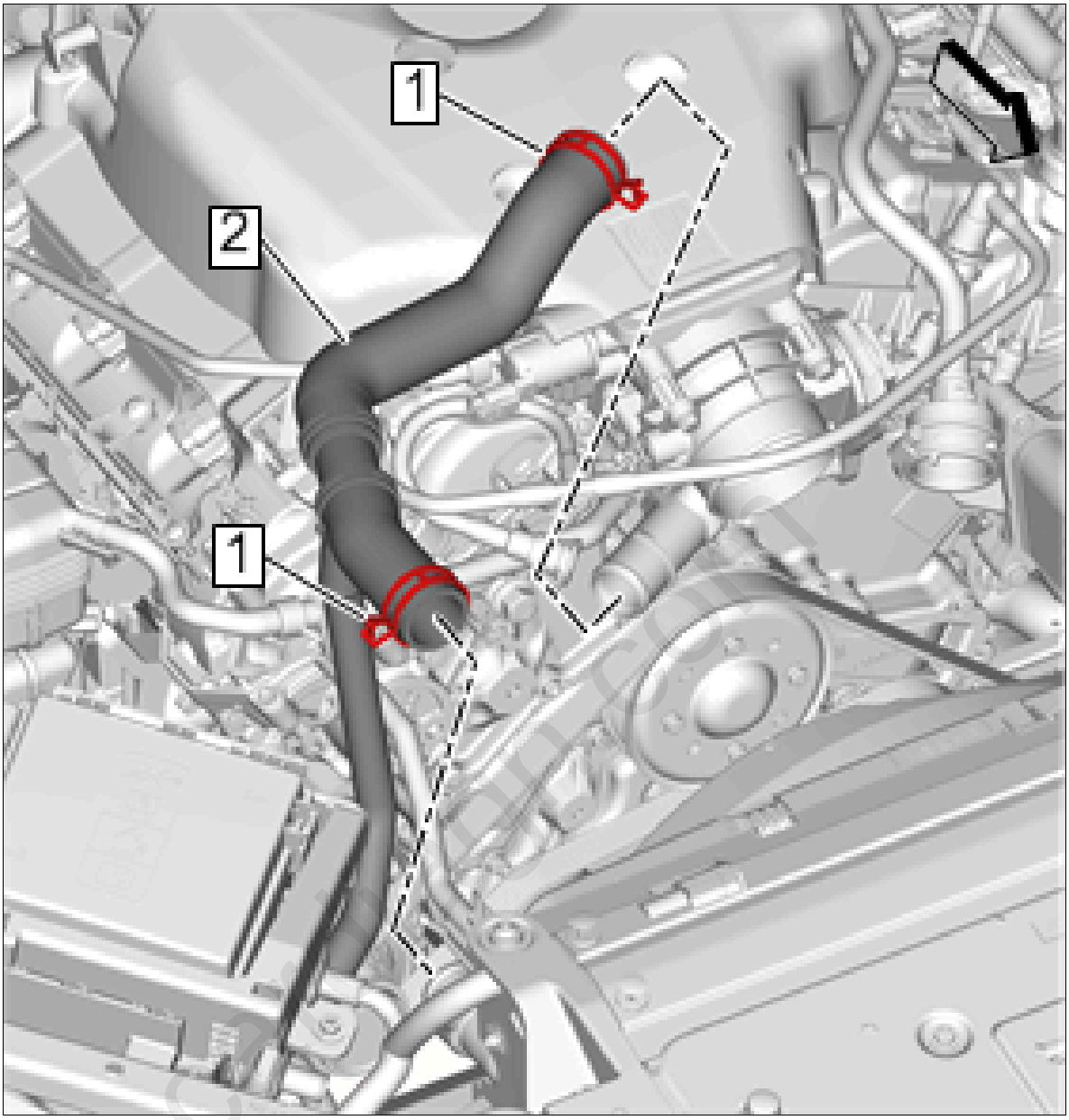
Fig 1: Radiator Inlet Hose Clip



Courtesy of GENERAL MOTORS COMPANY

4. Disengage Radiator Inlet Hose Clip (2)
5. Remove Radiator Inlet Hose (1) at Charge Air Cooler - Right Side

Fig 2: Radiator Inlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

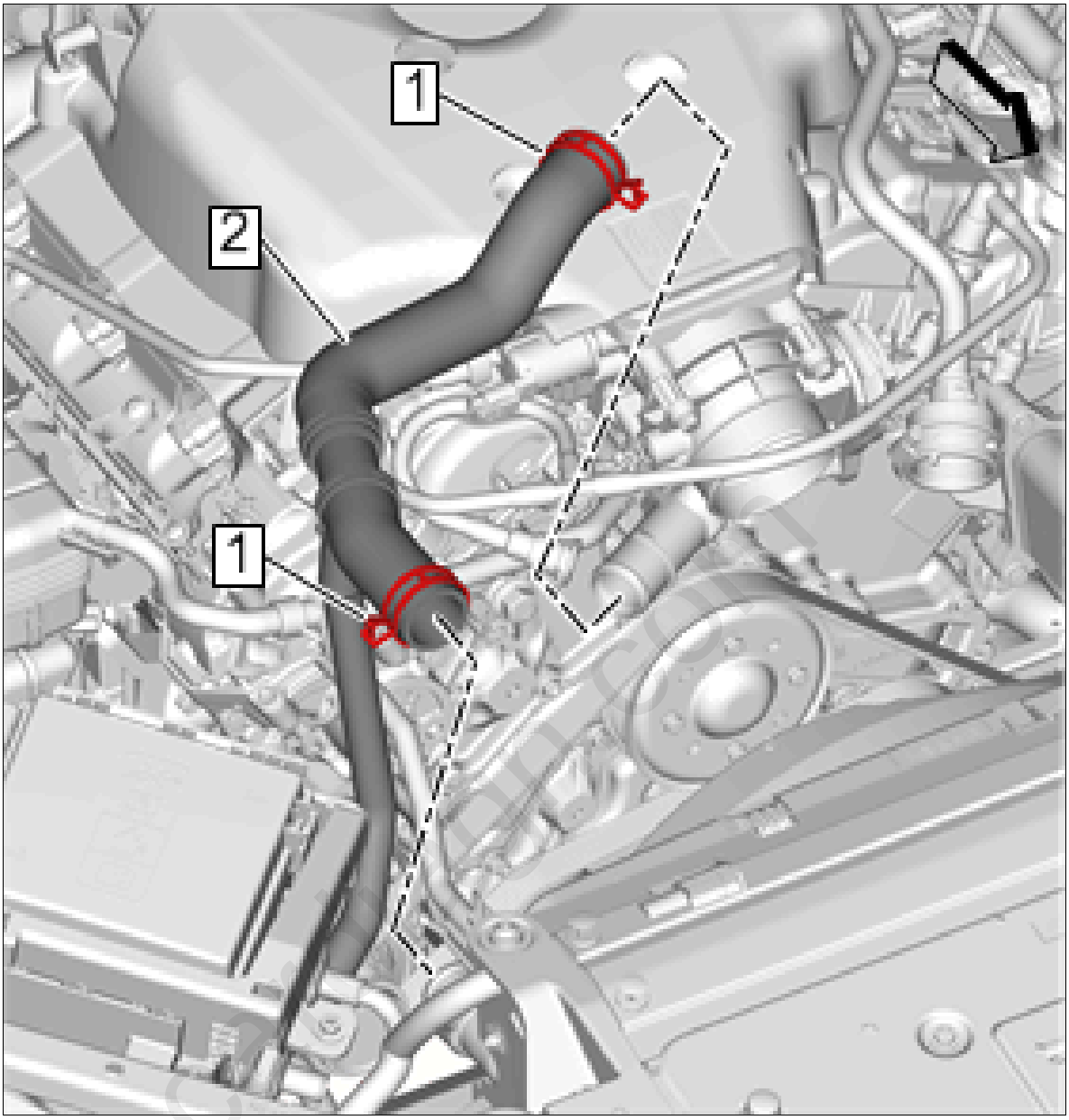
6. Disengage Radiator Inlet Hose Clamp (1) (Qty: 2)

   Use the **GE-47622** Hose Clamp Pliers.

7. Remove Radiator Inlet Hose (2)

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18) > INSTALLATION PROCEDURE

Fig 1: Radiator Inlet Hose

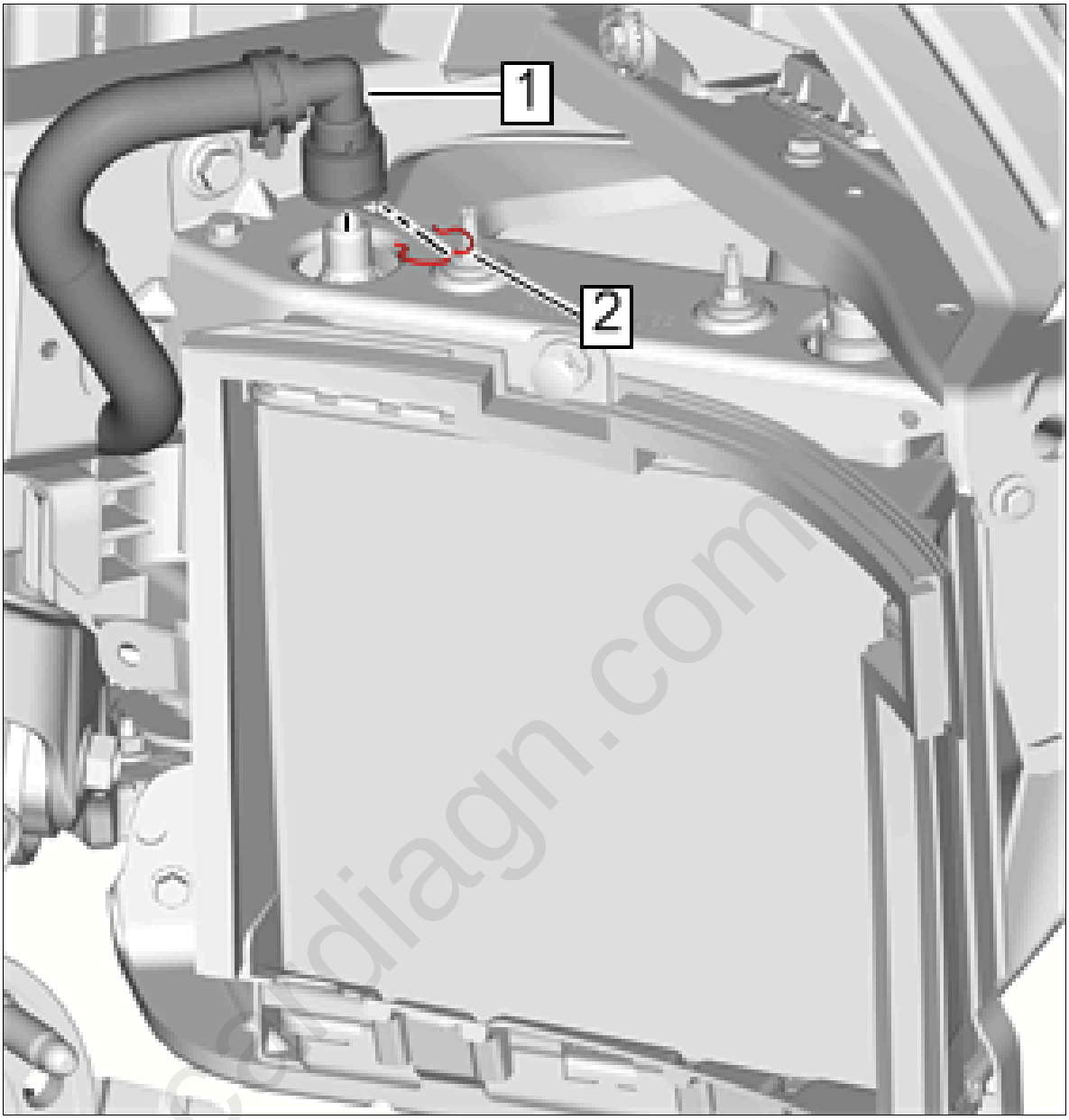


Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Hose (2)
2. Engage Radiator Inlet Hose Clamp (1) (Qty: 2)

   Use the **GE-47622** Hose Clamp Pliers.

Fig 2: Radiator Inlet Hose Clip

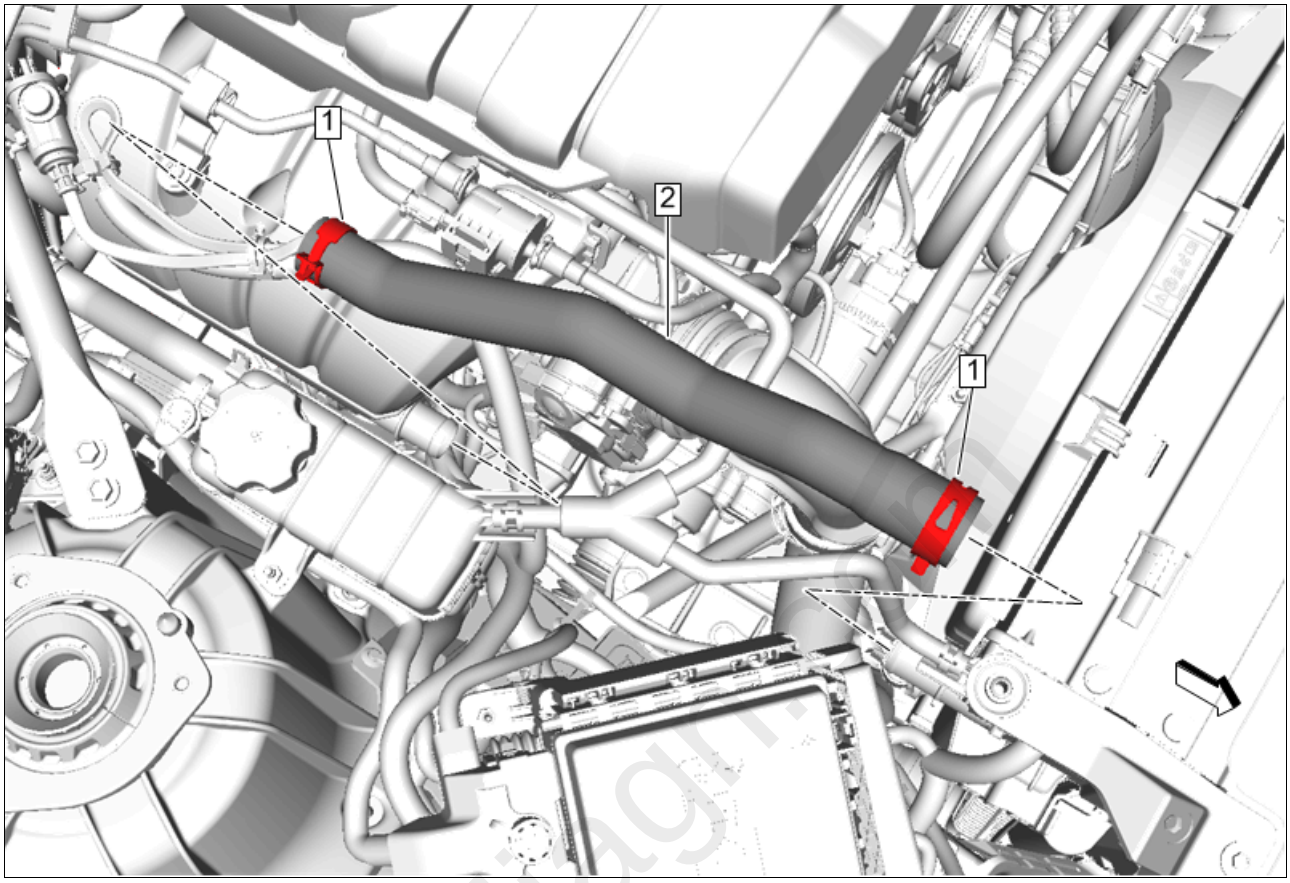


Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Inlet Hose Clip (2)
4. Engage Radiator Inlet Hose (1) at Charge Air Cooler - Right Side
5. Install Front Wheelhouse Liner Replacement - Right Side
6. Install Intake Manifold Cover Replacement
7. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
8. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LTG WITHOUT V18)

Fig 1: Radiator Inlet Hose (LTG without V18)



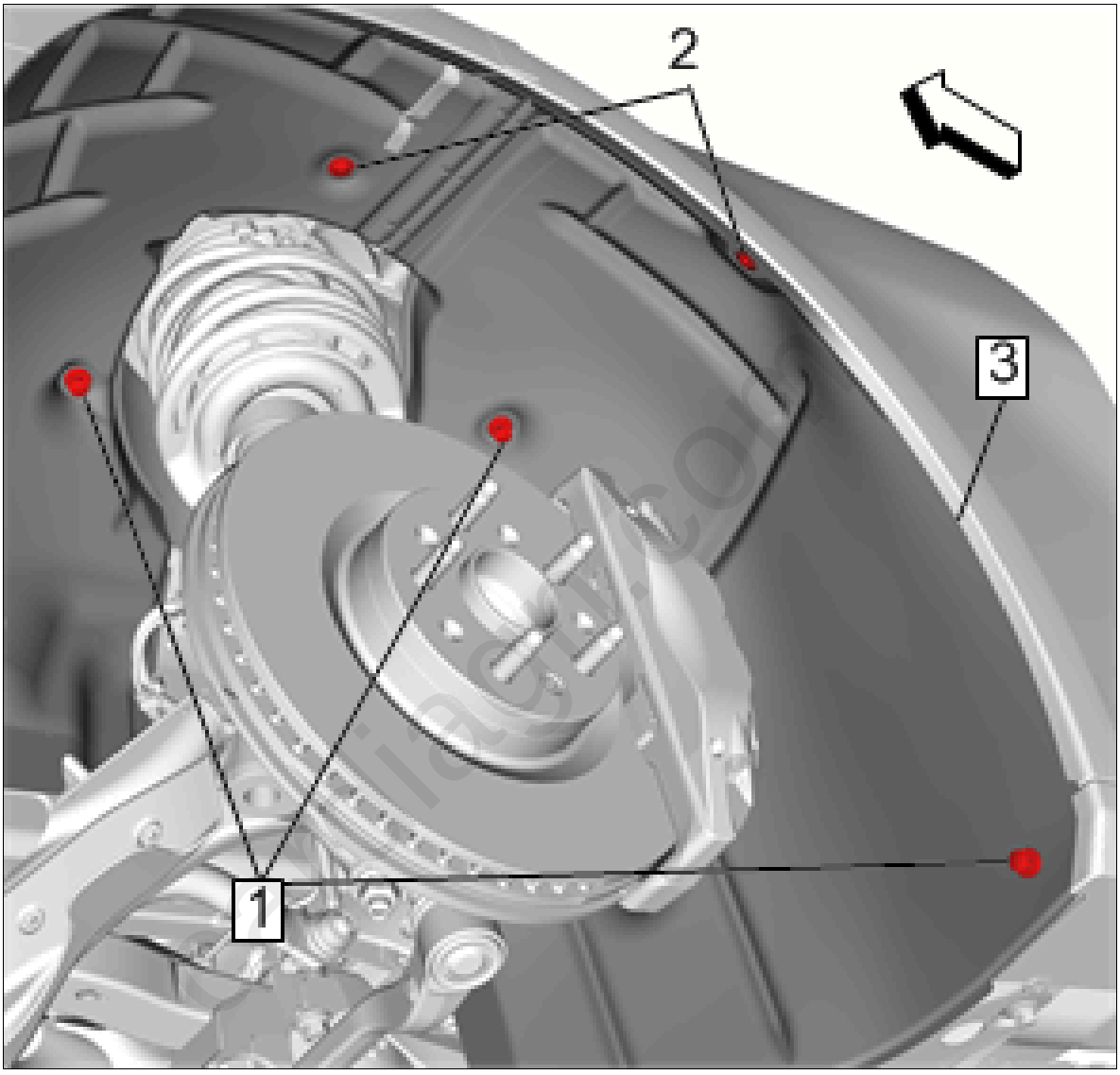
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Inlet Hose Clamp (Qty: 2) **Procedure** Hose Clamp Replacement Guidelines - Spring Type
2	Radiator Inlet Hose Procedure 1. Fill the cooling system to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LTG WITH V18) > REMOVAL PROCEDURE

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

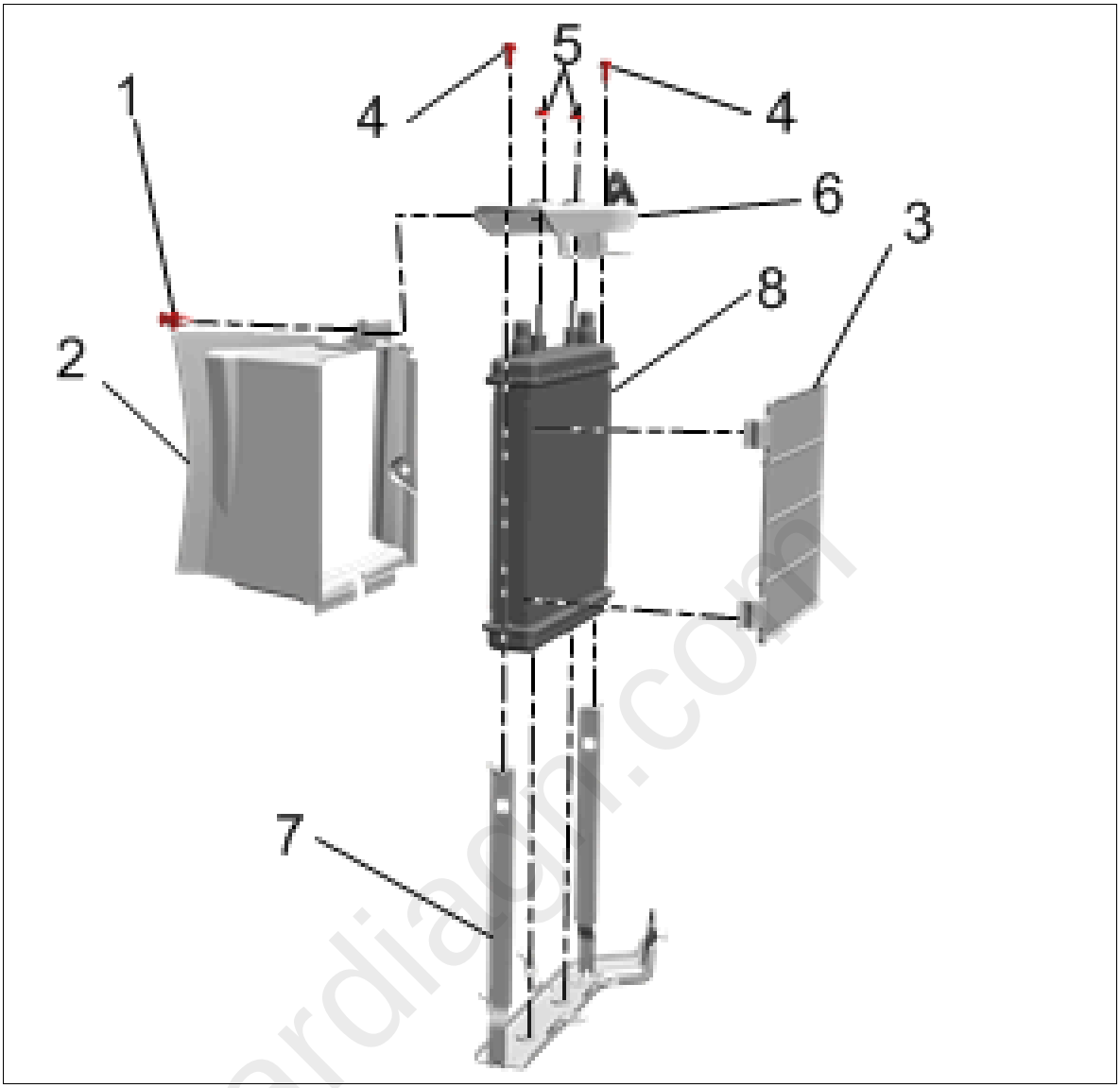
   Fig 1: Front Wheelhouse Liner Retainer



   Courtesy of GENERAL MOTORS COMPANY

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

Fig 2: Charge Air Cooler

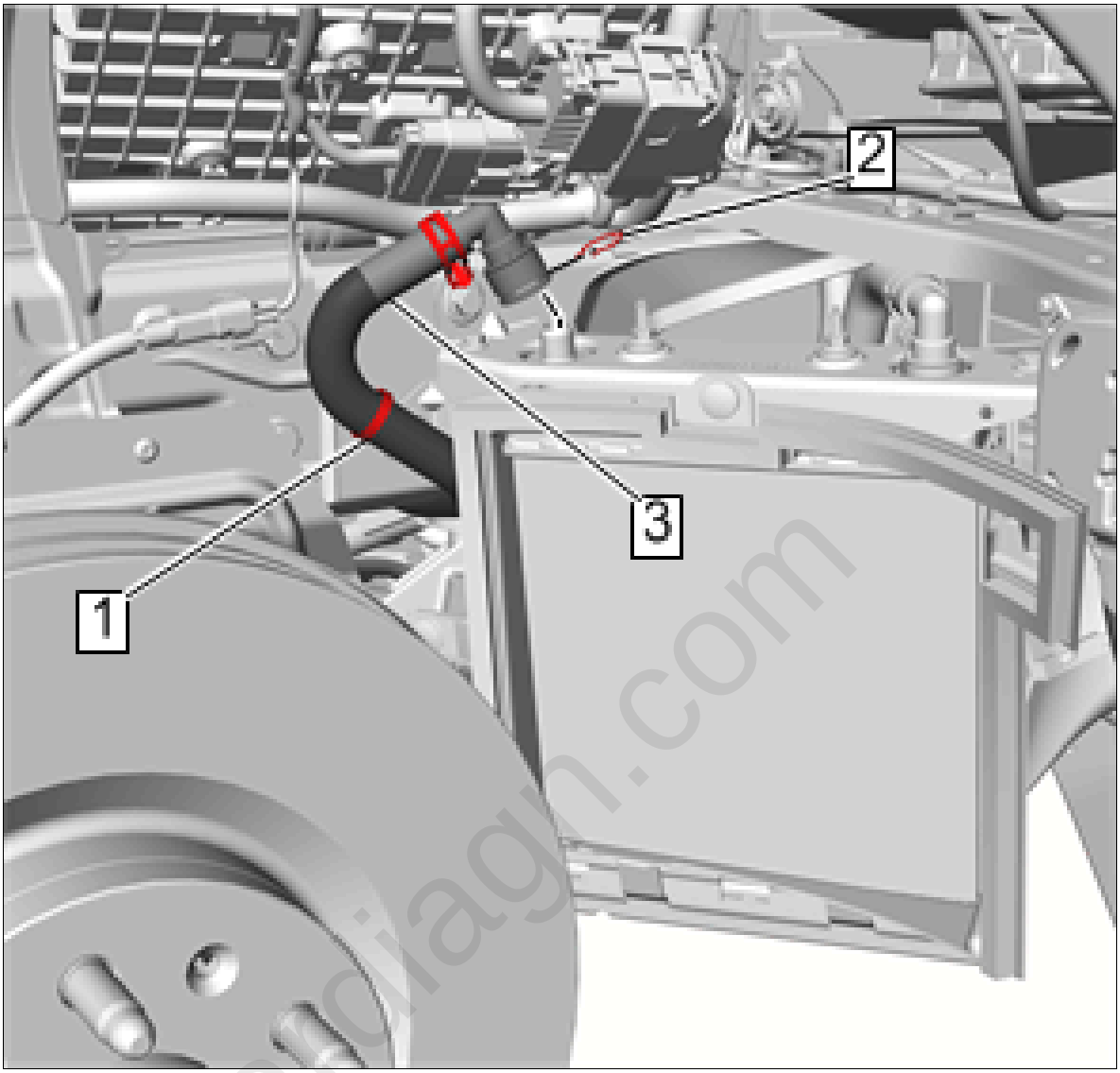


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3. Remove the charge air cooler rear duct (2) from the charge air cooler.

Fig 3: Radiator Inlet Hose Retainer

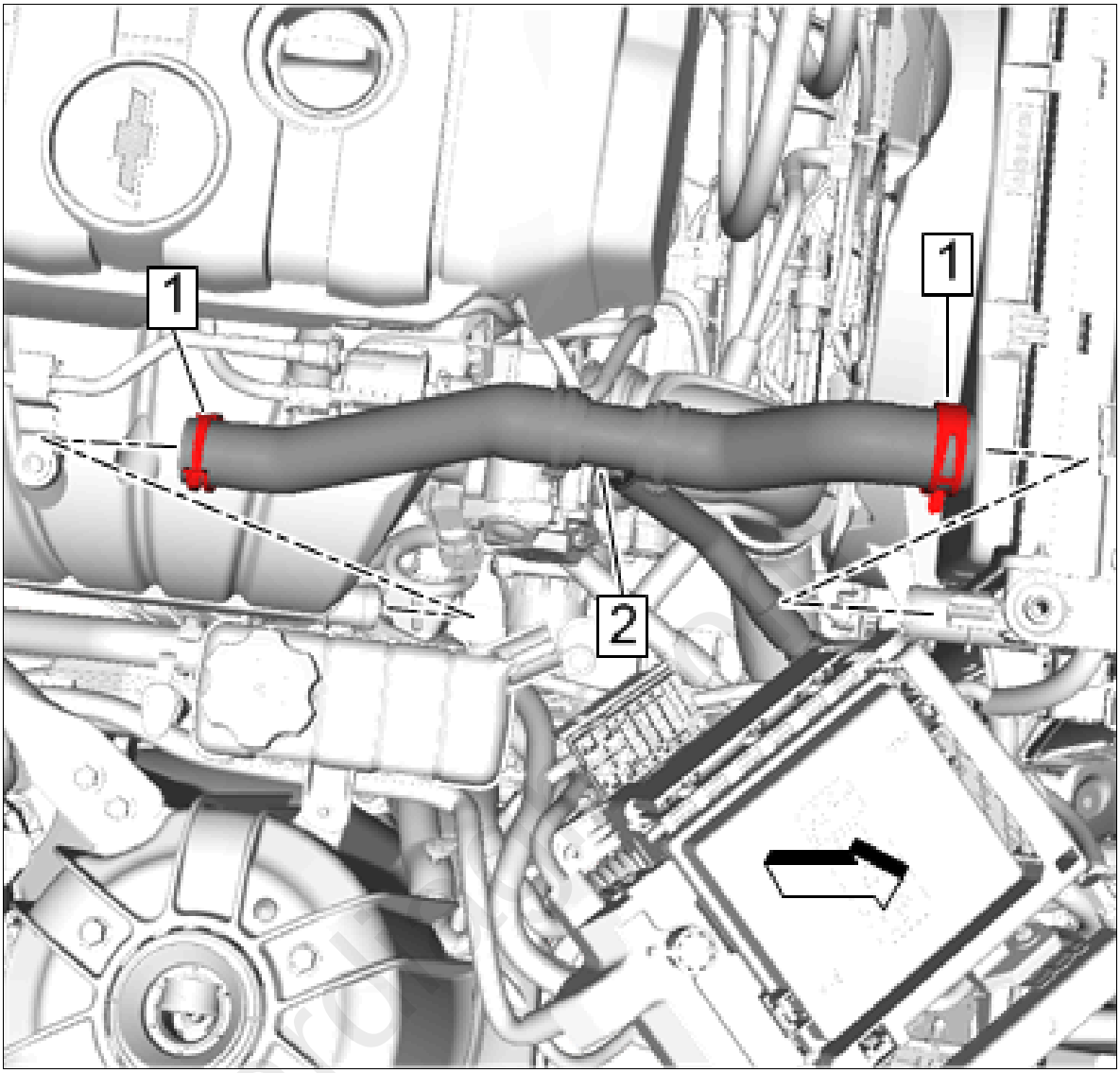


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4. Remove Radiator Inlet Hose Retainer (1)
5. Disengage Radiator Inlet Hose Retainer (2)
6. Remove Radiator Inlet Hose (3) at Charge Air Cooler - Right Side

Fig 4: Radiator Inlet Hose

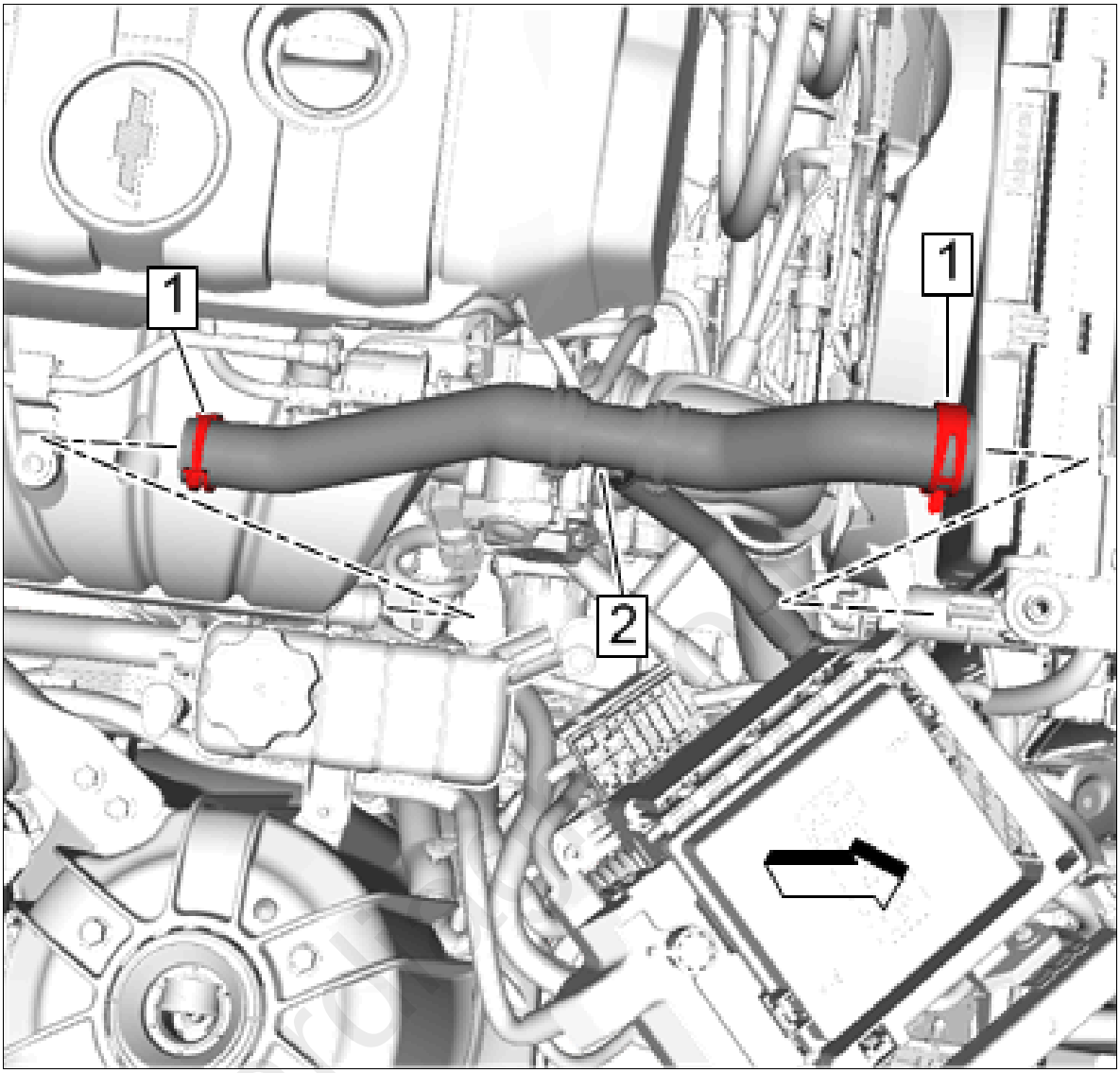


Courtesy of GENERAL MOTORS COMPANY

7. Disengage Radiator Inlet Hose Clamp (1) (Qty: 2) Hose Clamp Replacement Guidelines - Spring Type
8. Remove Radiator Inlet Hose (2)

REPAIR INSTRUCTIONS > RADIATOR INLET HOSE REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

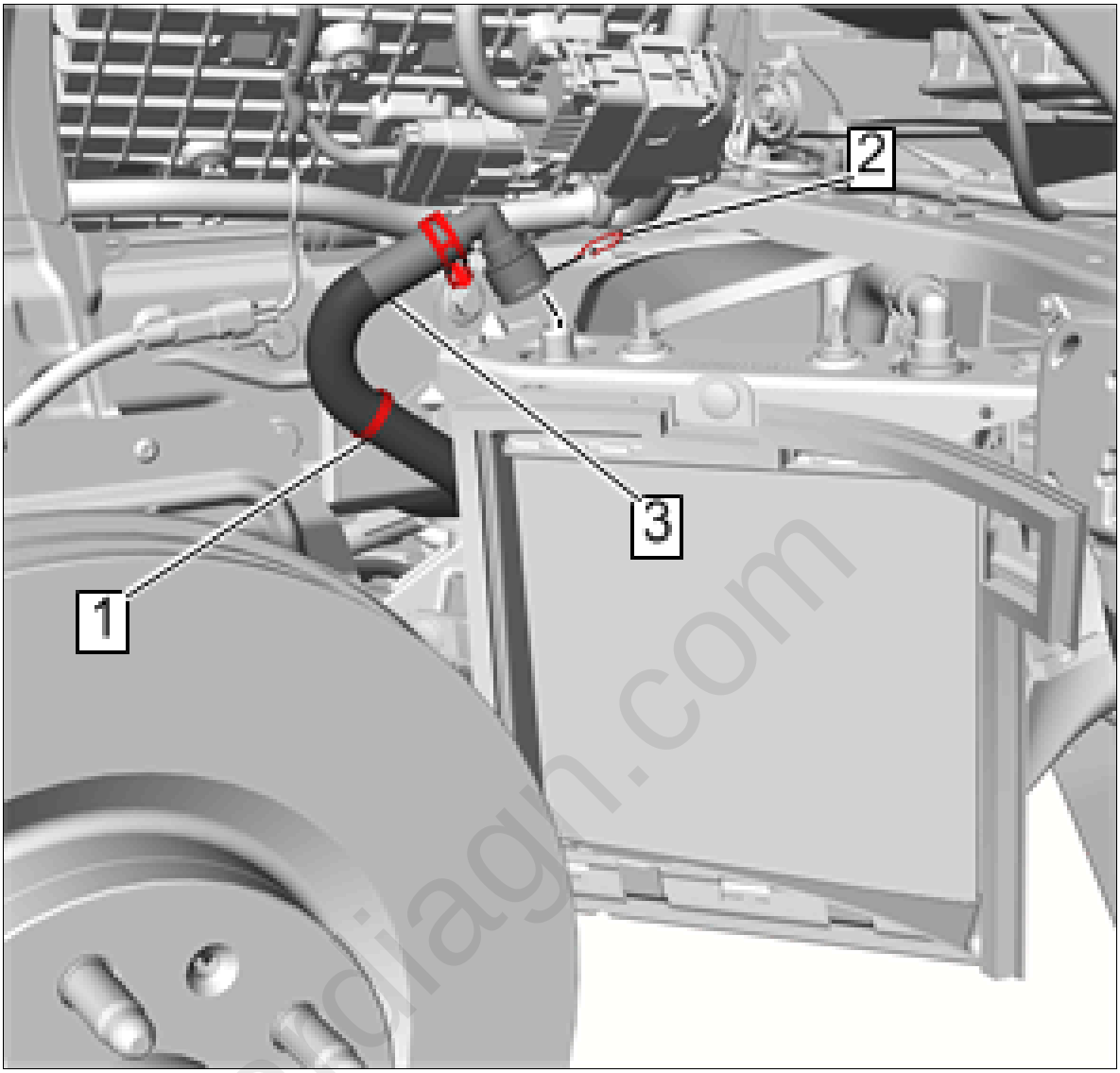
Fig 1: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Inlet Hose (2)
2. Engage Radiator Inlet Hose Clamp (1) (Qty: 2) Hose Clamp Replacement Guidelines - Spring Type

Fig 2: Radiator Inlet Hose Retainer

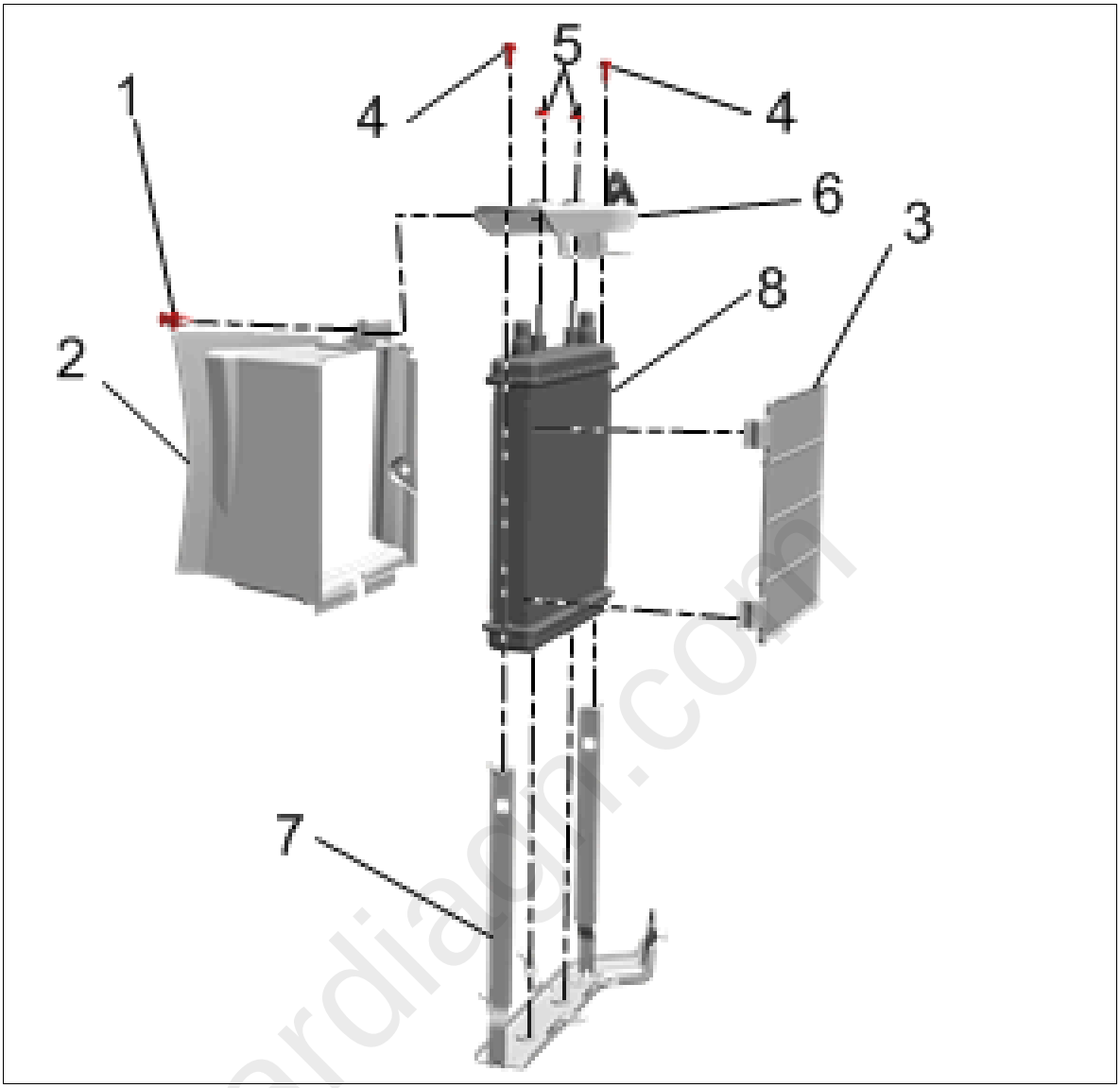


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3. Install Radiator Inlet Hose (3) at Charge Air Cooler-Right Side
4. Engage Radiator Inlet Hose Retainer (2)
5. Install Radiator Inlet Hose Retainer (1)

Fig 3: Charge Air Cooler

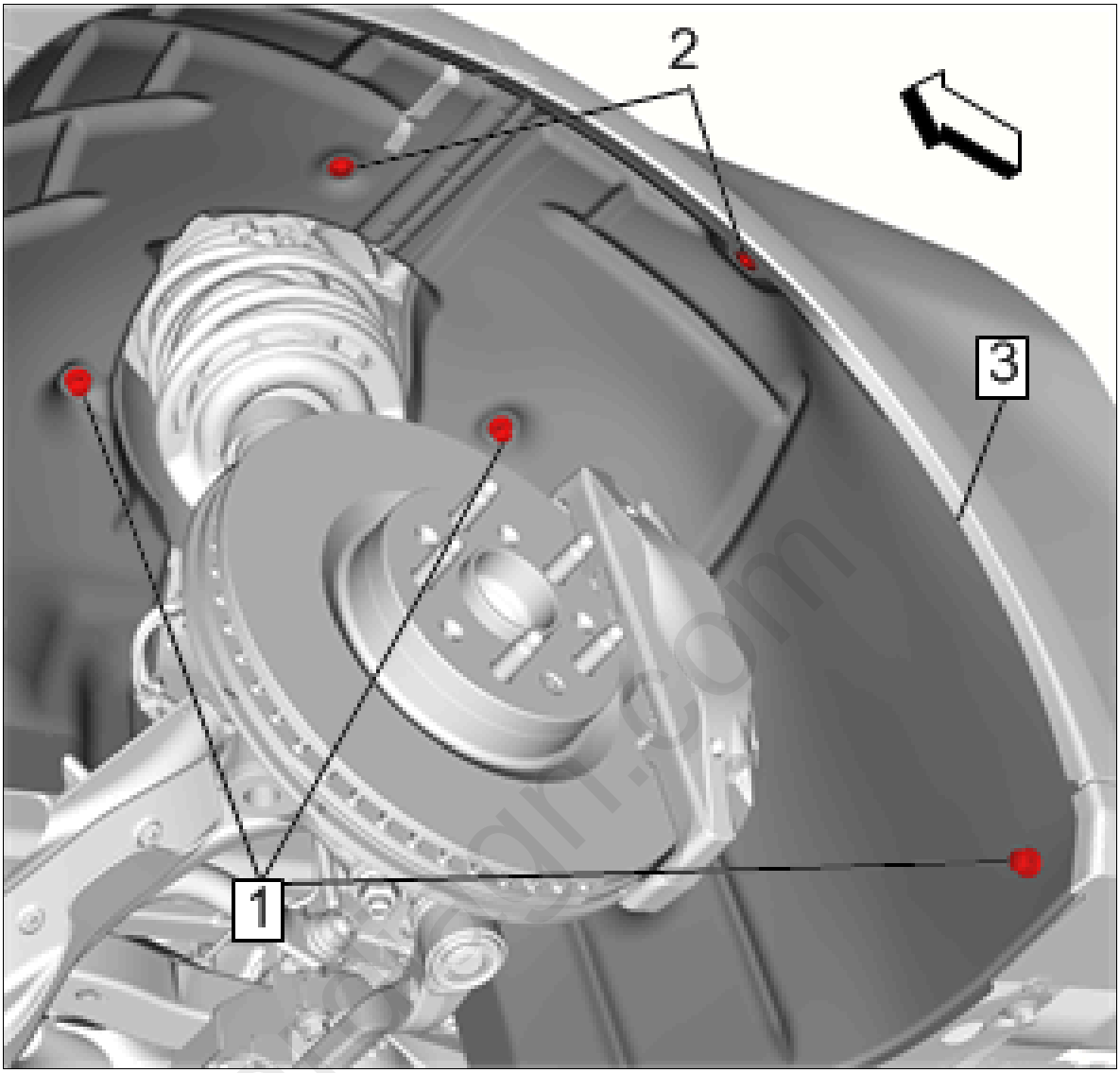


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6. Install the charge air cooler rear duct (2) to the charge air cooler.

Fig 4: Front Wheelhouse Liner Retainer



Courtesy of GENERAL MOTORS COMPANY

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

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LT1 V18)

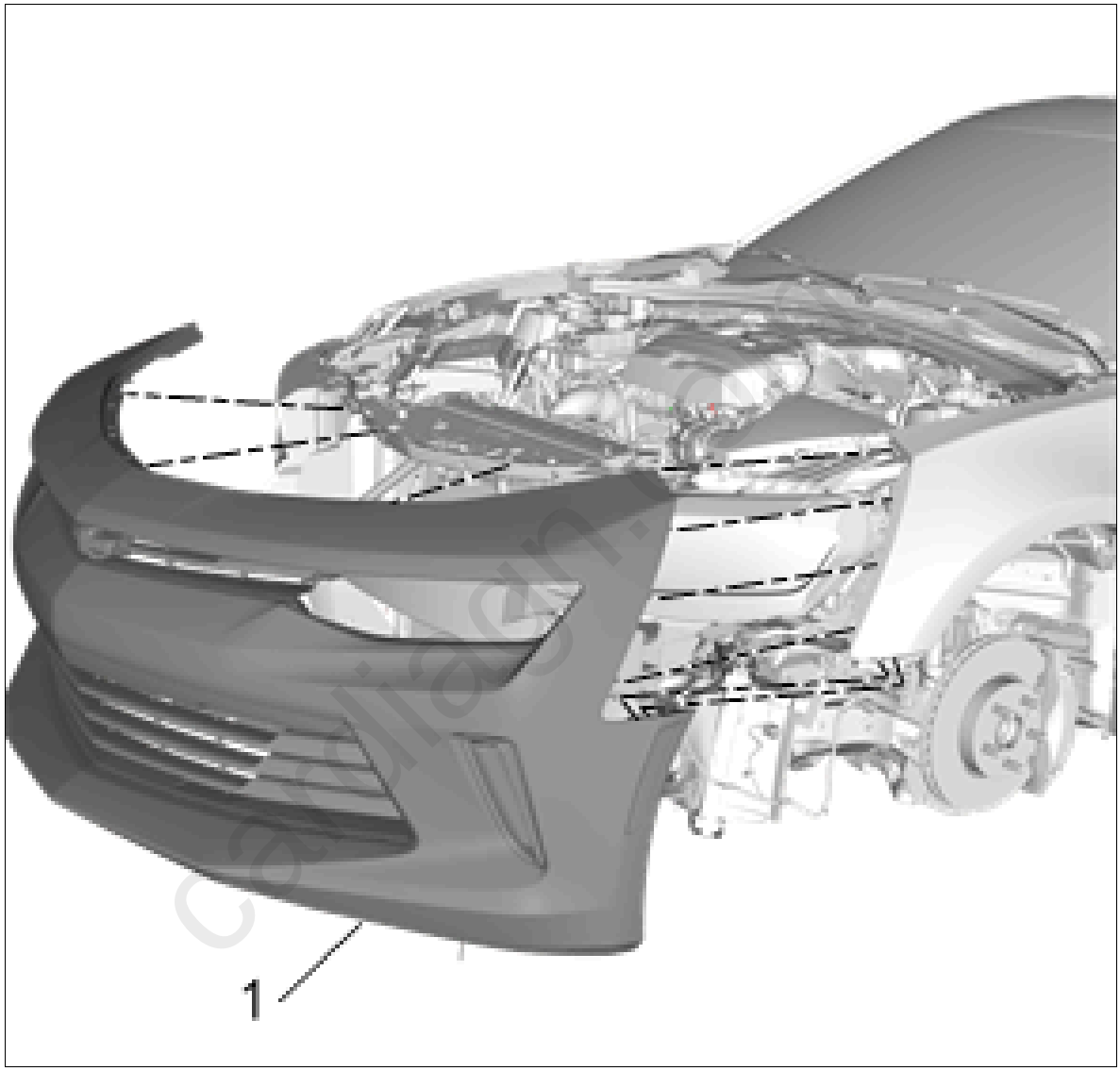
Special Tools

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

Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LT1 V18) > REMOVAL PROCEDURE

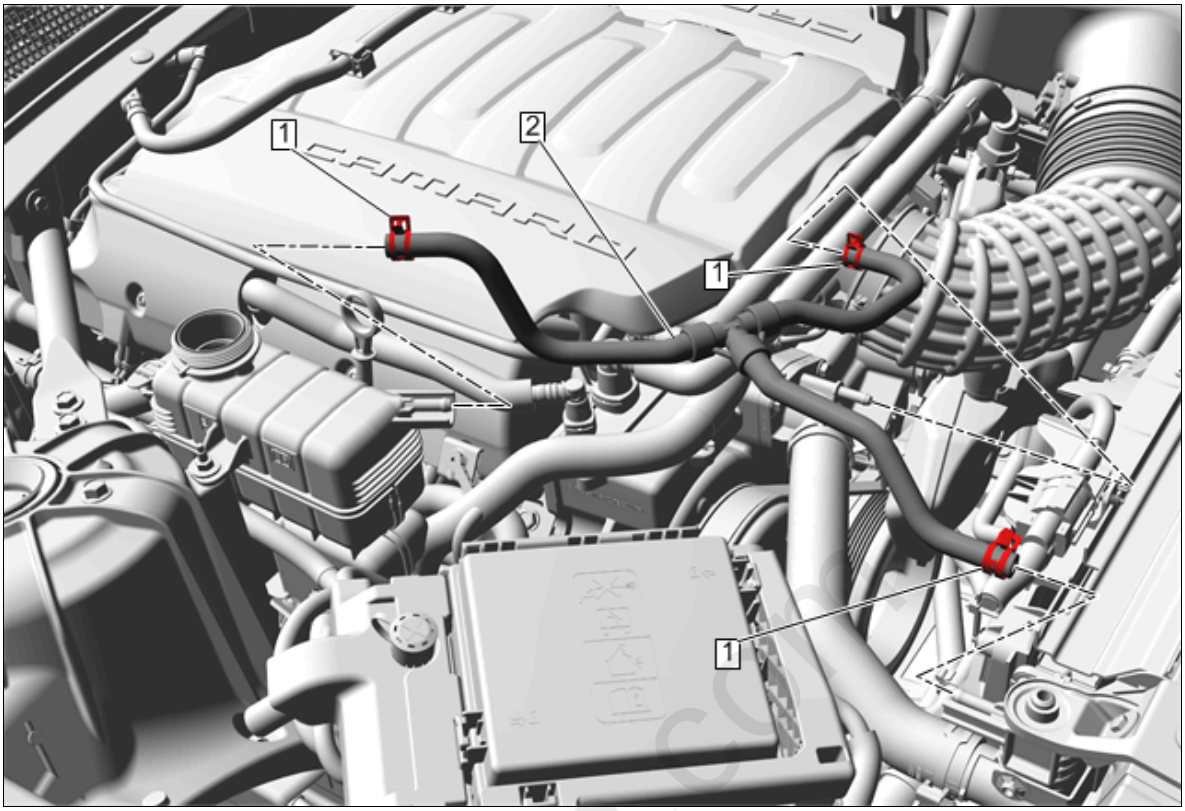
Fig 1: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

1. Remove Front Bumper Fascia (1) - Front Bumper Fascia Replacement
2. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

Fig 2: Radiator Surge Tank Inlet Hose

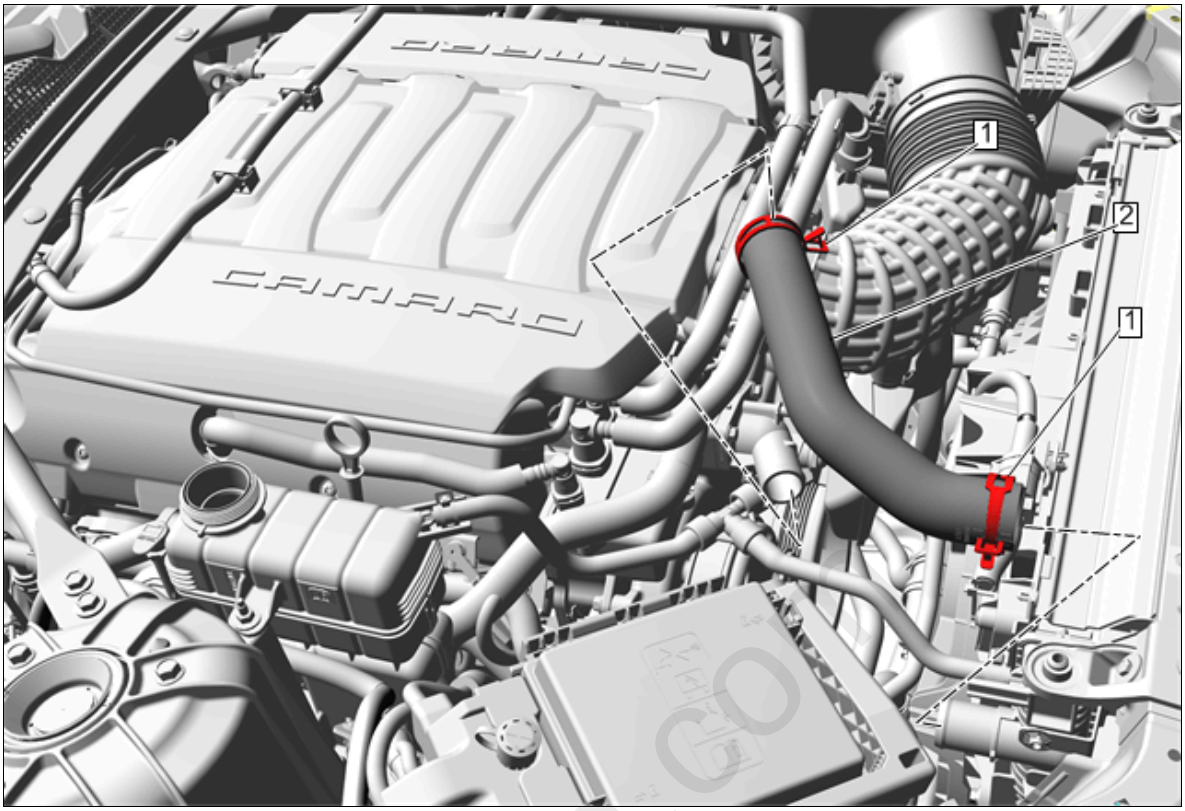


Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Surge Tank Inlet Hose (1) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LT1)

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Fig 3: Radiator Inlet Hose

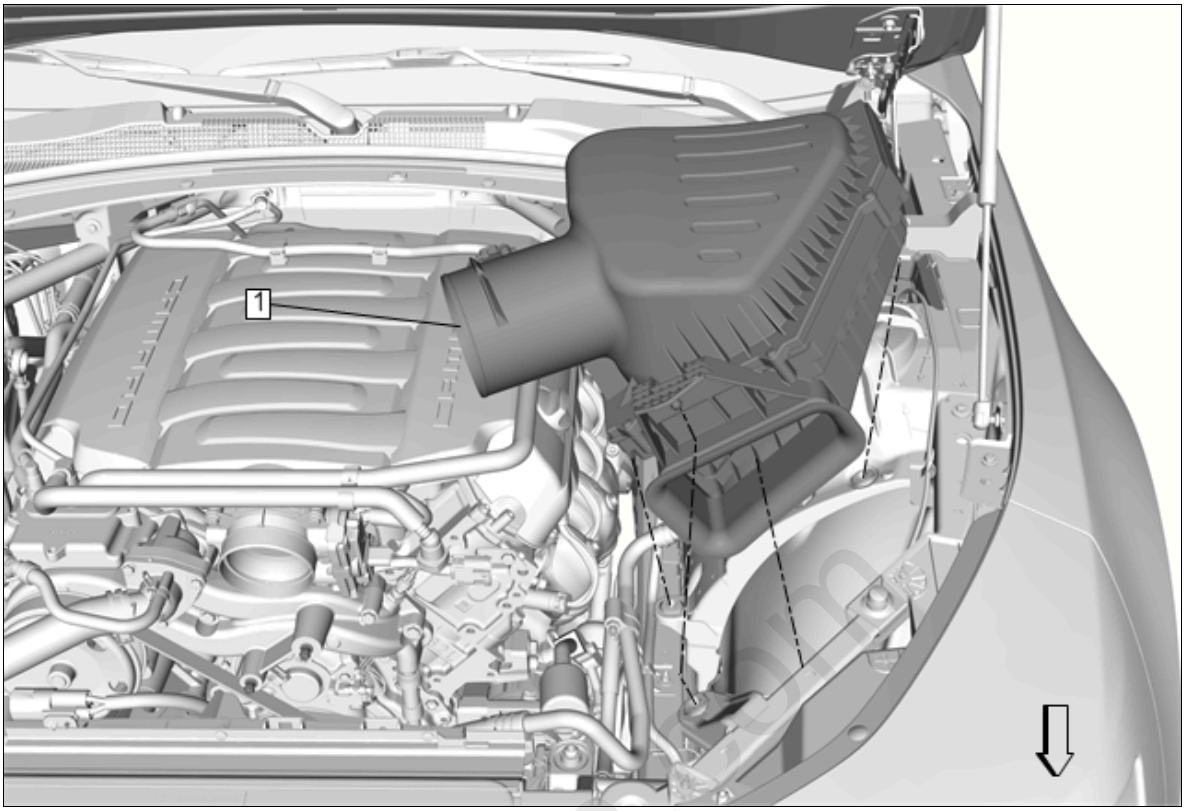


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4. Remove Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LT1)

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Fig 4: Air Cleaner Assembly

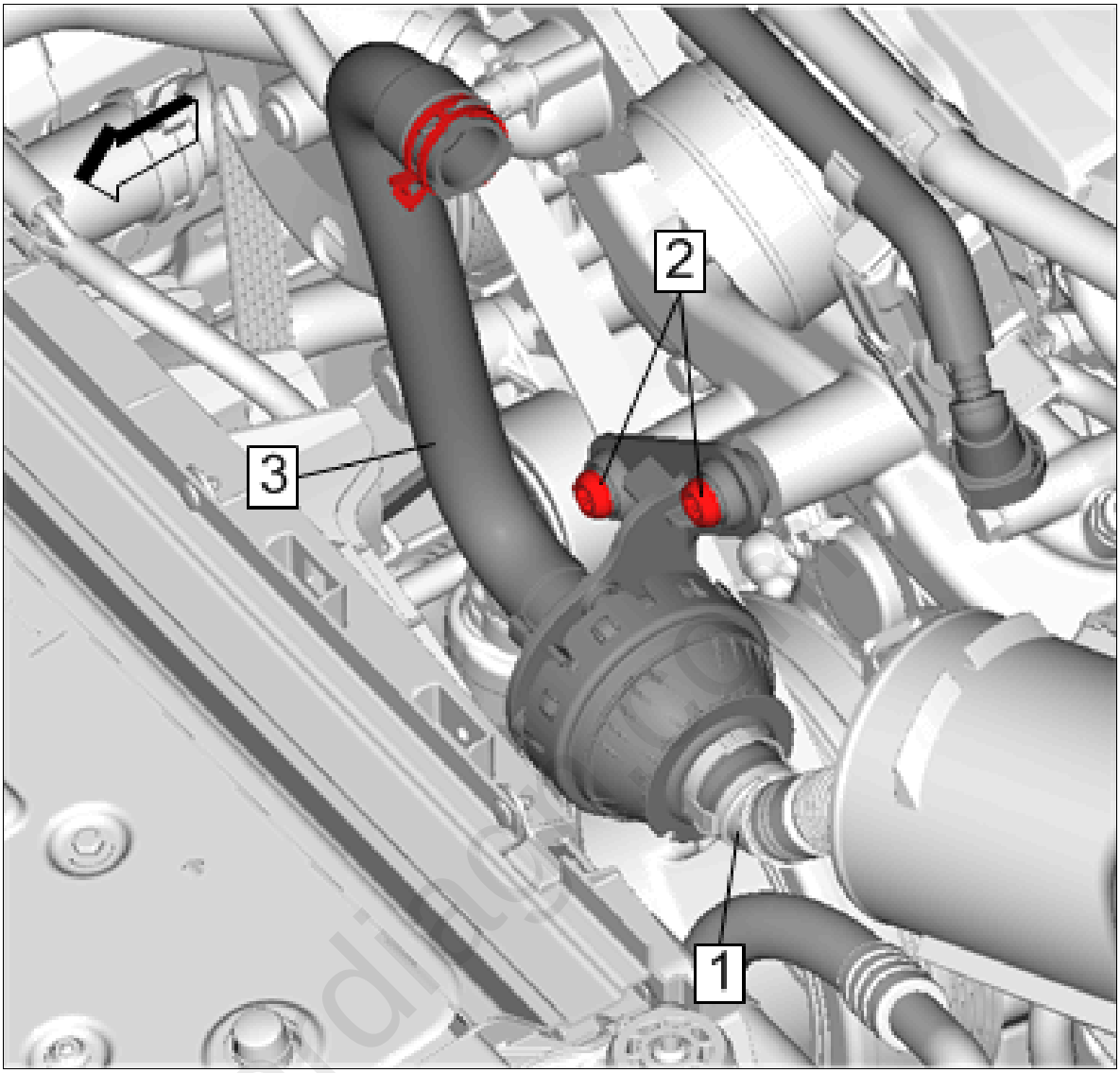


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5. Remove Air Cleaner Assembly (1) - Air Cleaner Assembly Replacement

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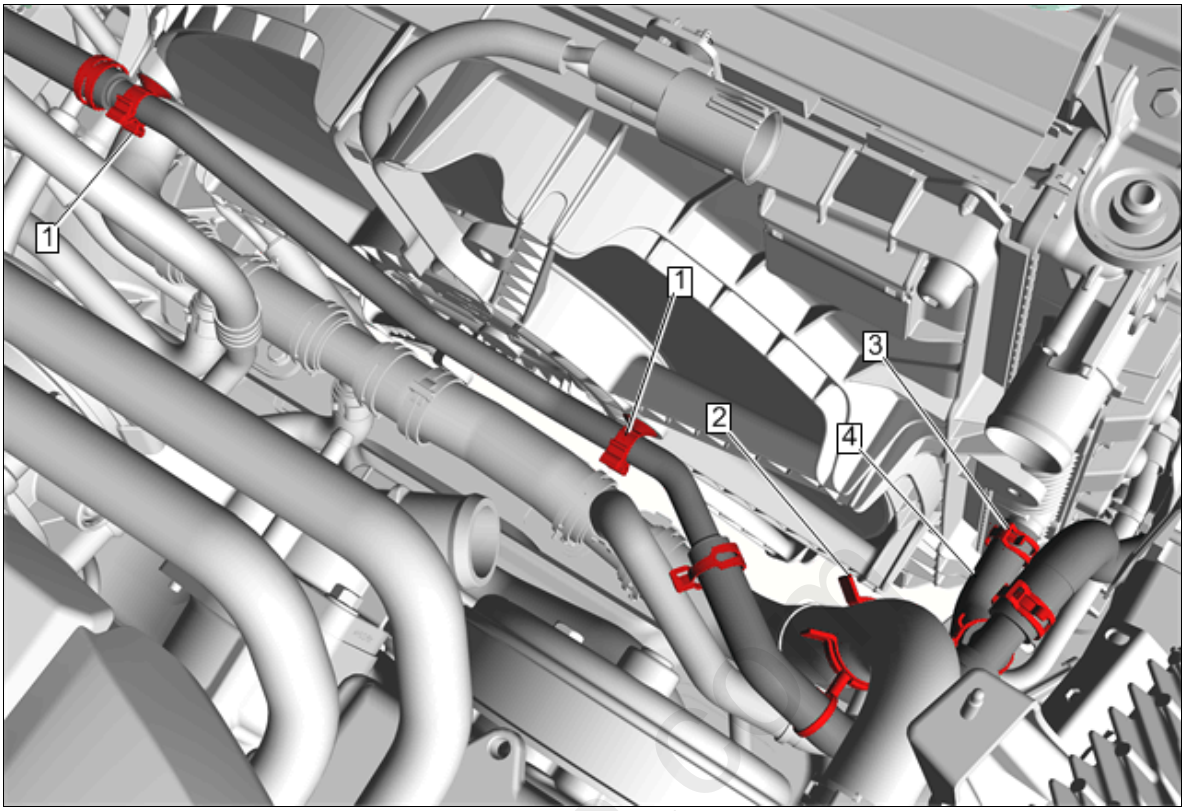
Fig 5: Air Cleaner Resonator



Courtesy of GENERAL MOTORS COMPANY

6. Remove Air Cleaner Resonator (1) - Air Cleaner Resonator Replacement (Air Cleaner Outlet Duct to Engine)Air Cleaner Resonator Replacement (Diagonal Brace to Air Cleaner Resonator)Air Cleaner Resonator Replacement (Dash to Diagonal Brace)

Fig 6: Auxiliary Radiator Inlet Hose



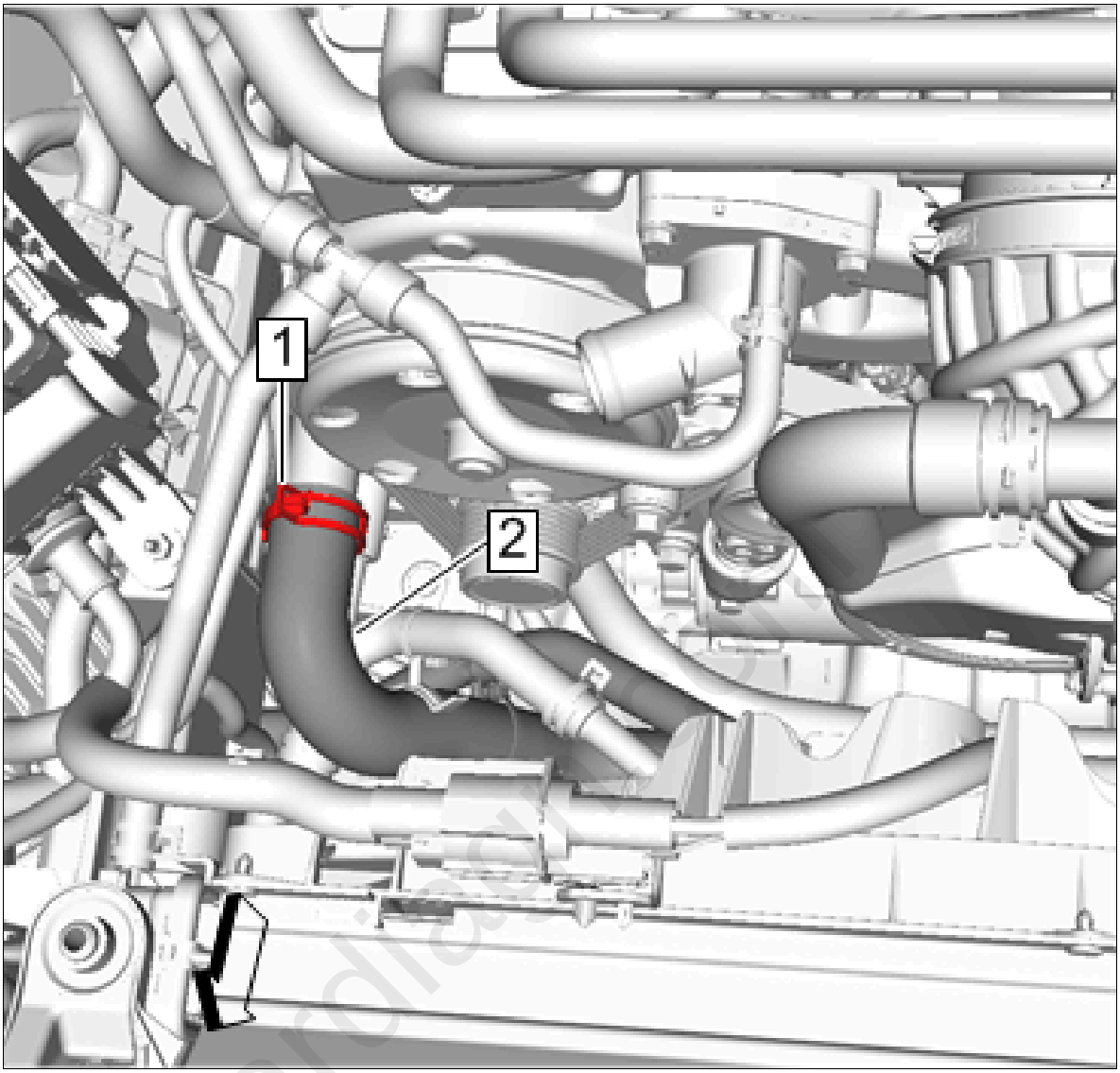
Courtesy of GENERAL MOTORS COMPANY

7. Remove Clip (1) (Qty: 2) at Engine Coolant Fan Shroud
8. Remove C -Clip (2) at Radiator Outlet Hose
9. Disengage Auxiliary Radiator Inlet Hose Clamp (3)

   Use the **BO-38185** Hose Clamp Pliers
10. Remove Auxiliary Radiator Inlet Hose (4) at Radiator

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Fig 7: Radiator Outlet Hose Clamp



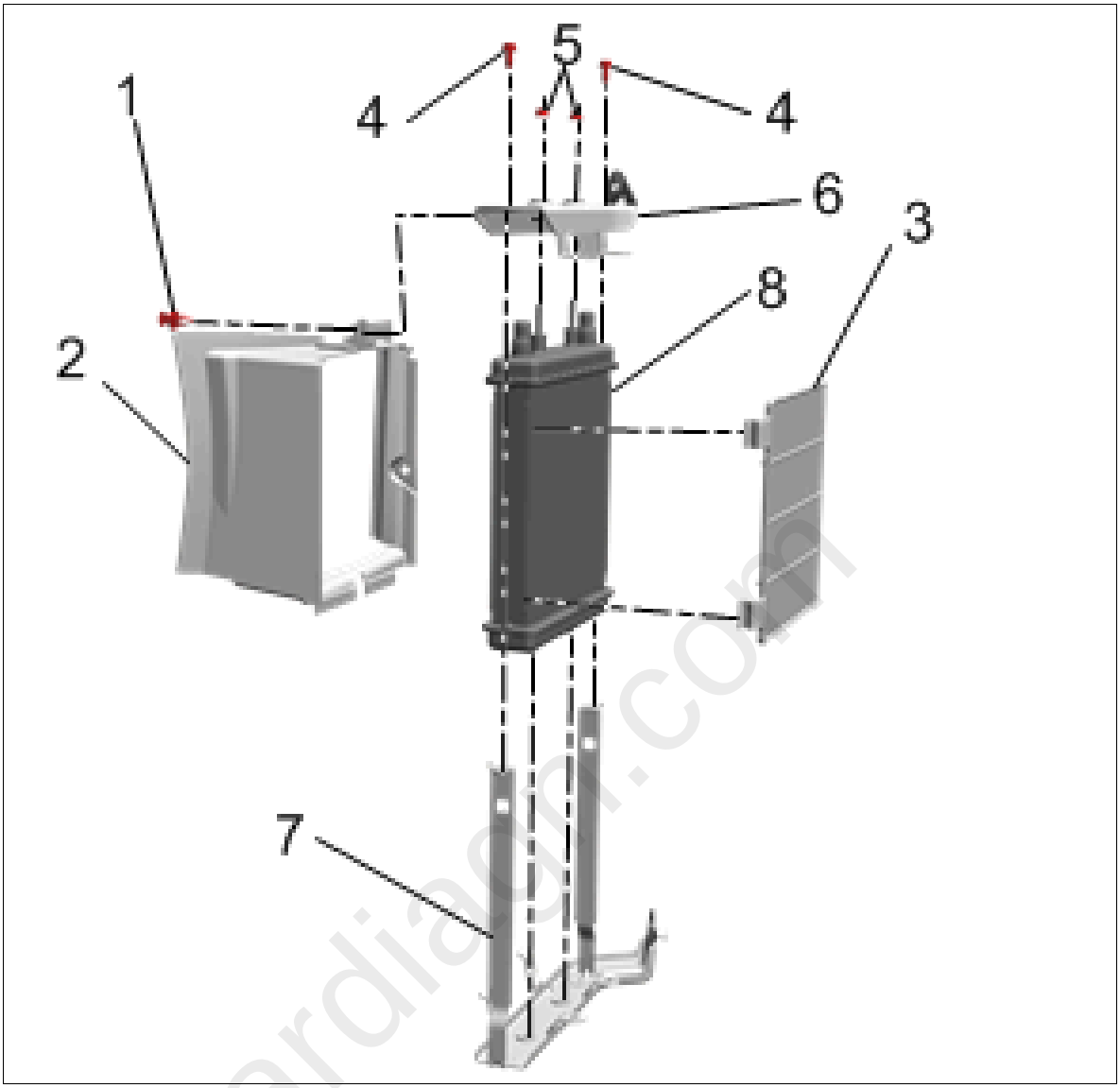
Courtesy of GENERAL MOTORS COMPANY

11. Disengage Radiator Outlet Hose Clamp (1)

    Use the **BO-38185** Hose Clamp Pliers

12. Remove Radiator Outlet Hose (2) at Water Pump Inlet Pipe

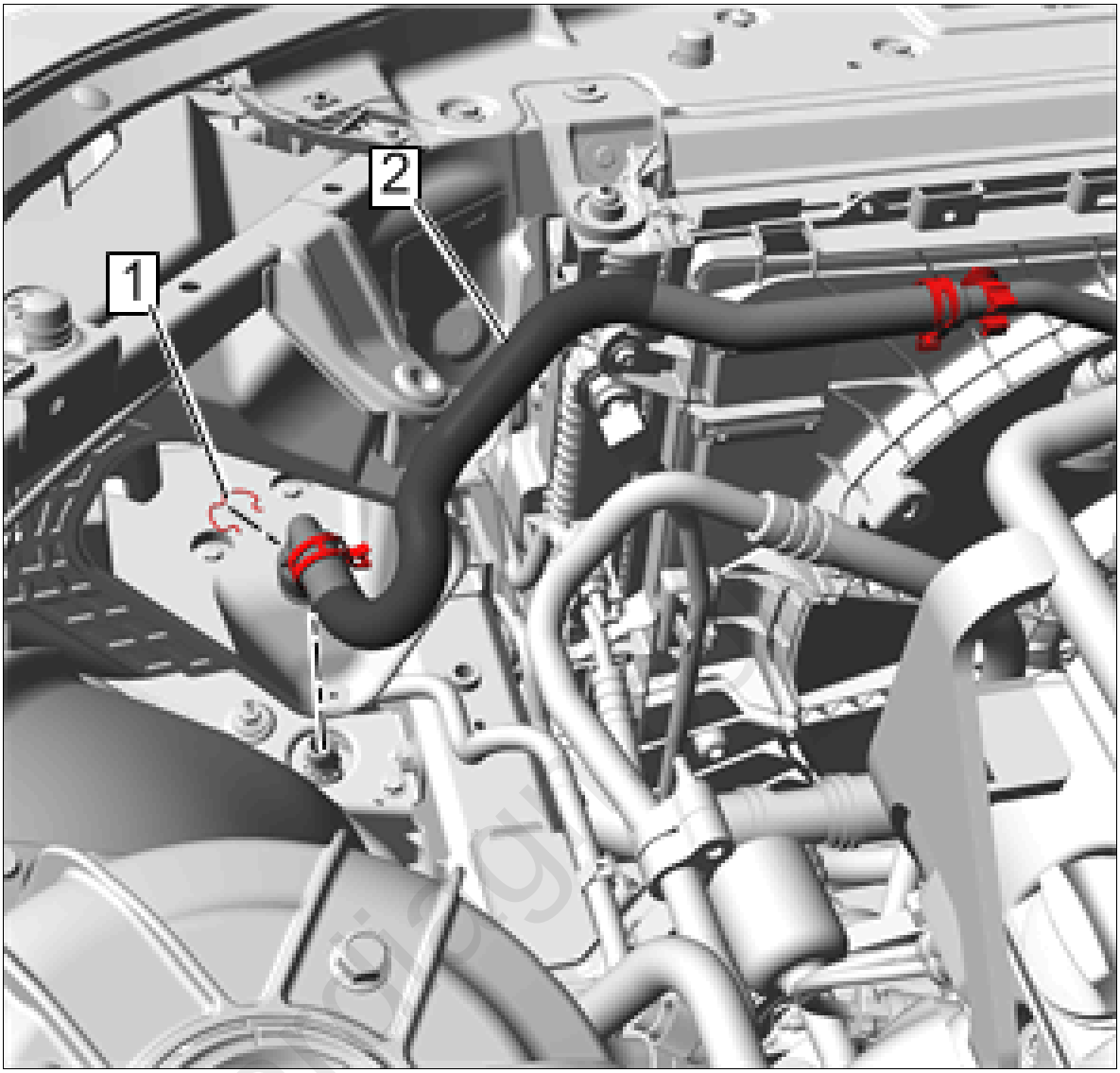
Fig 8: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

13. Remove Push Pin (1)
14. Remove Rear Duct -Left Side (2)

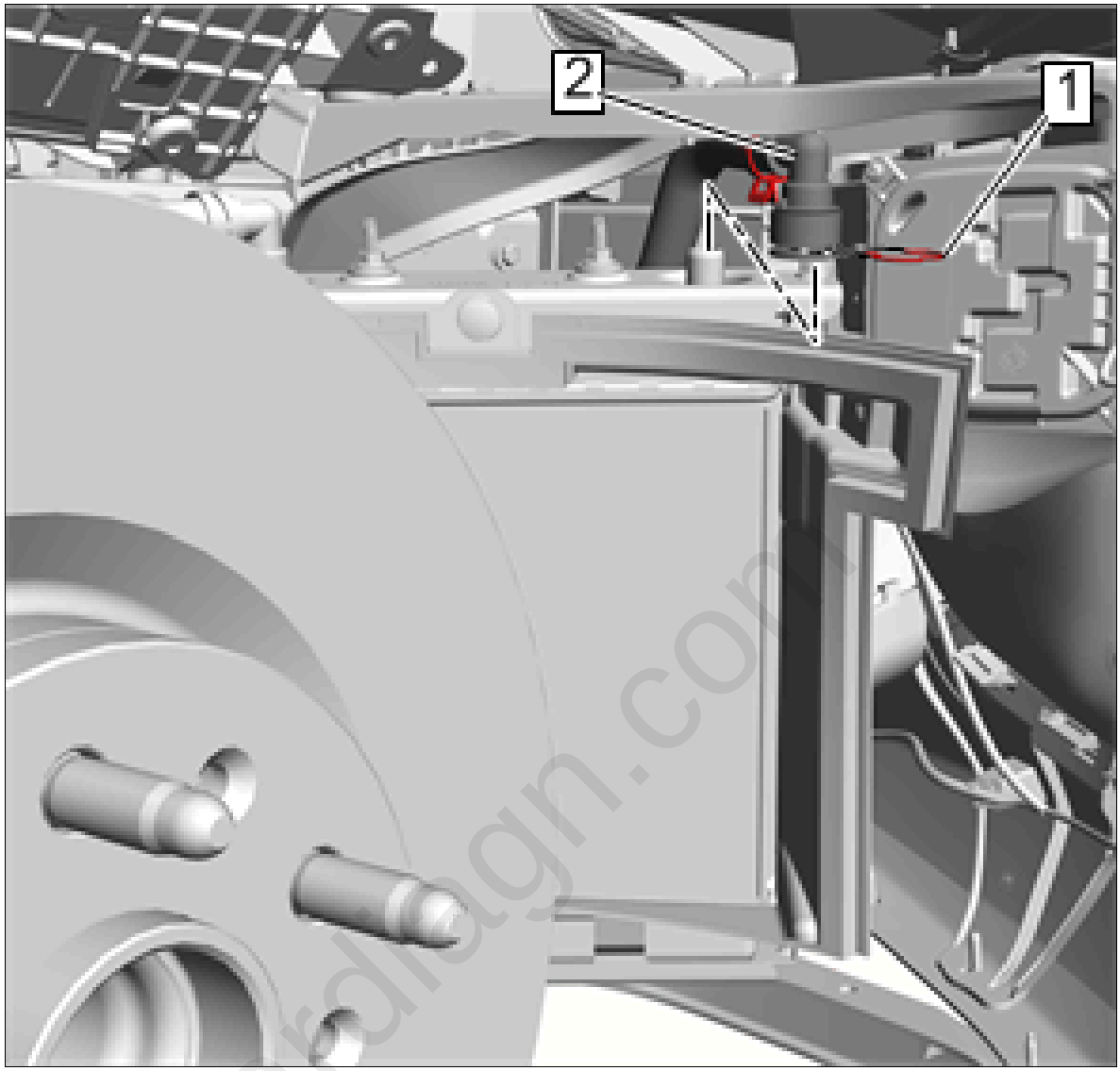
Fig 9: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

15. Remove Retainer (1) at Quick Connect Fitting
16. Remove Auxiliary Radiator Inlet Hose (2) at Auxiliary Radiator- Charge Air Cooler-Left Side

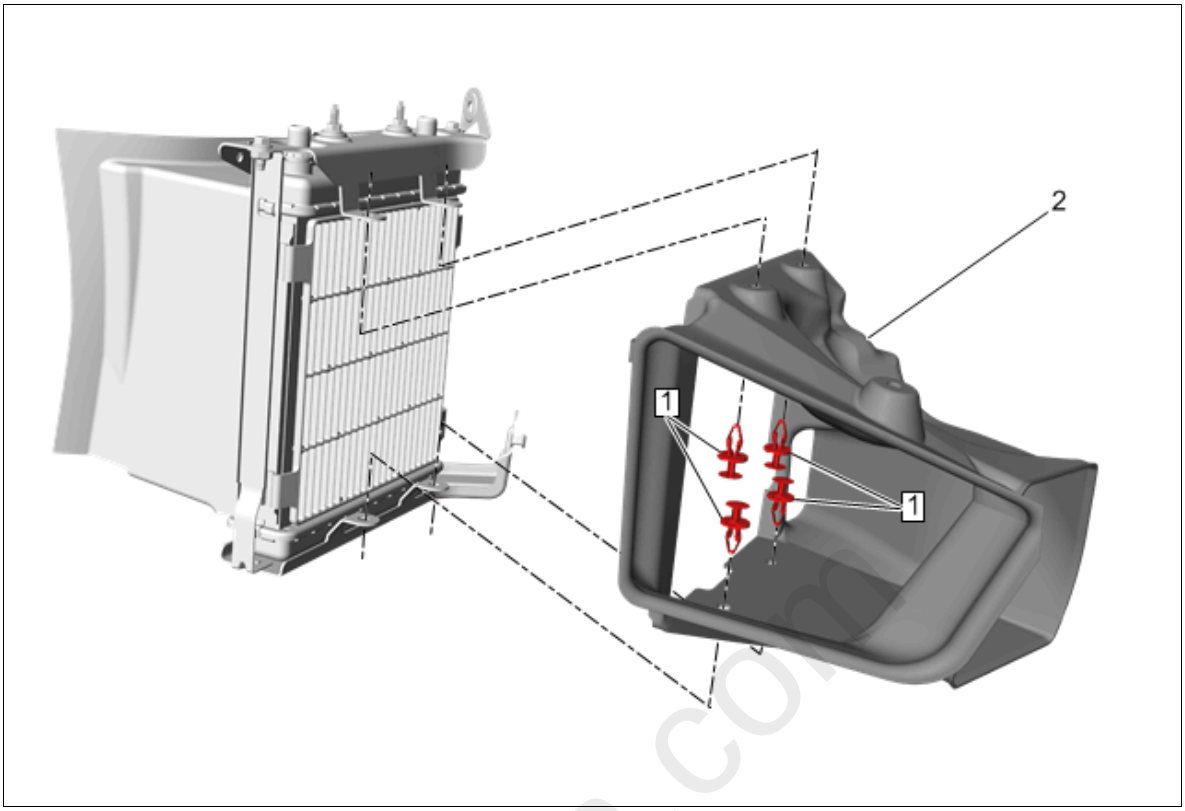
Fig 10: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

17. Remove Retainer (1) at Quick Connect Fitting
18. Remove Auxiliary Radiator Inlet Hose (2) at Auxiliary Radiator - Charge Air Cooler-Right Side

Fig 11: Radiator Air Baffle - Right Side

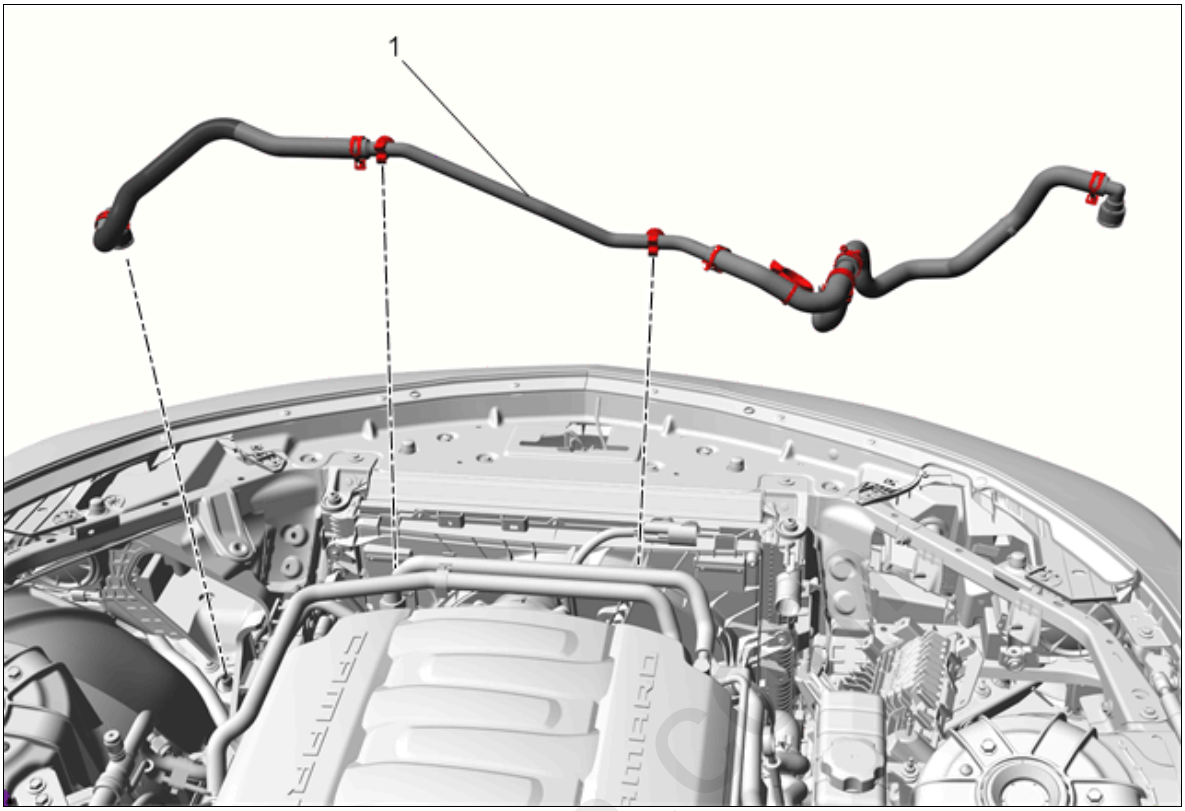


Courtesy of GENERAL MOTORS COMPANY

19. Remove Push Pin (1) (Qty: 4)
20. Remove Radiator air baffle-right side (2)

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Fig 12: Auxiliary Radiator Inlet Hose Assembly



Courtesy of GENERAL MOTORS COMPANY

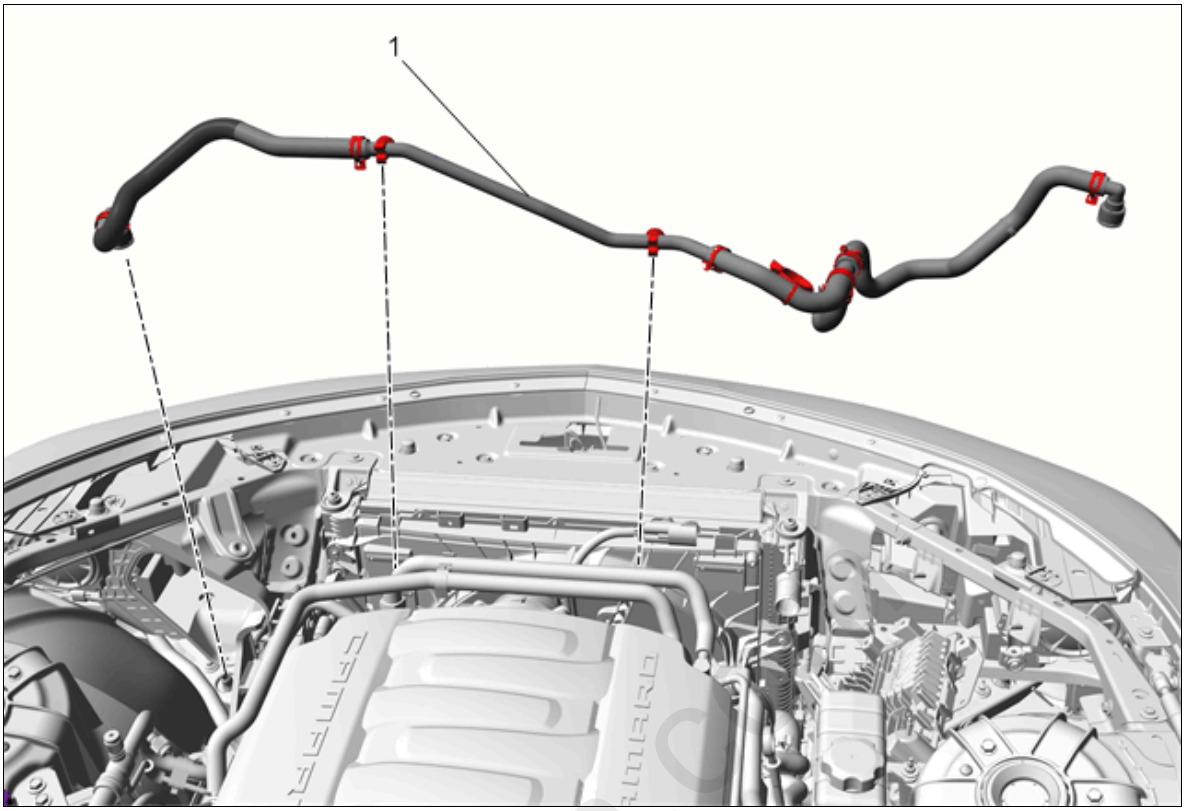
21. Remove Auxiliary Radiator Inlet Hose Assembly (1)

    Maneuver the auxiliary radiator inlet hose assembly out from the engine compartment noting the routing of the hose.

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LT1 V18) > INSTALLATION PROCEDURE

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Fig 1: Auxiliary Radiator Inlet HoseAssembly



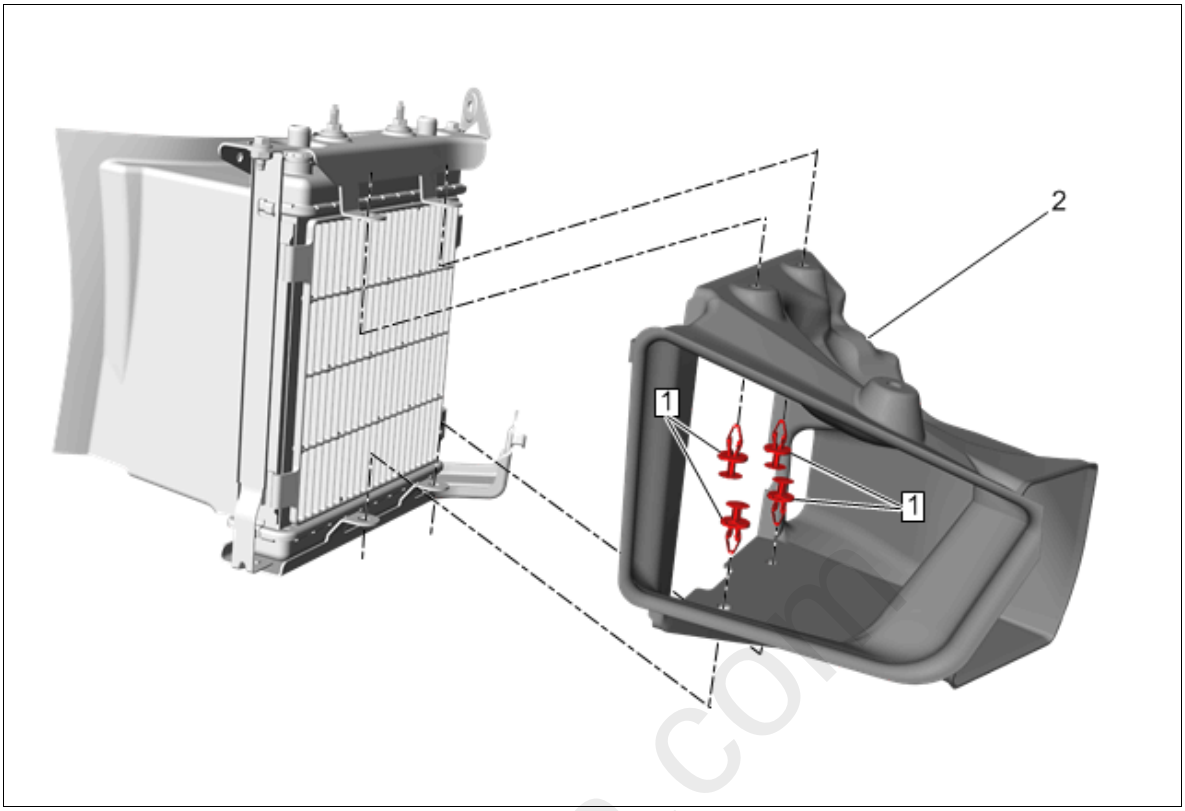
Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Radiator Inlet Hose Assembly (1)

   Maneuver the auxiliary radiator inlet hose back into the engine compartment to the original routing of the hose.

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Fig 2: Radiator Air Baffle - Right Side

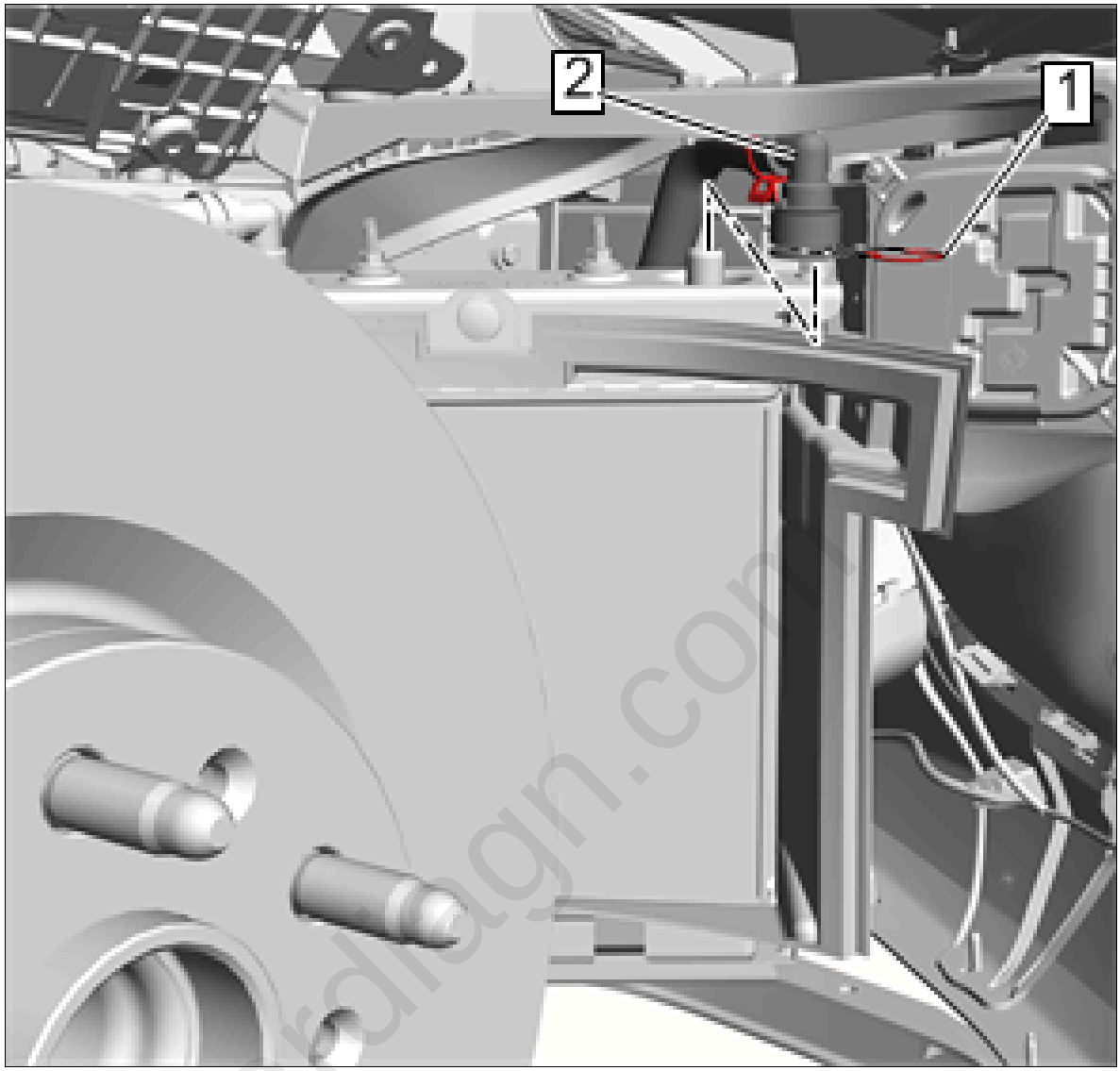


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2. Install Radiator air baffle-right side (2)
3. Install Push Pin (1) (Qty: 4)

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Fig 3: Auxiliary Radiator Inlet Hose

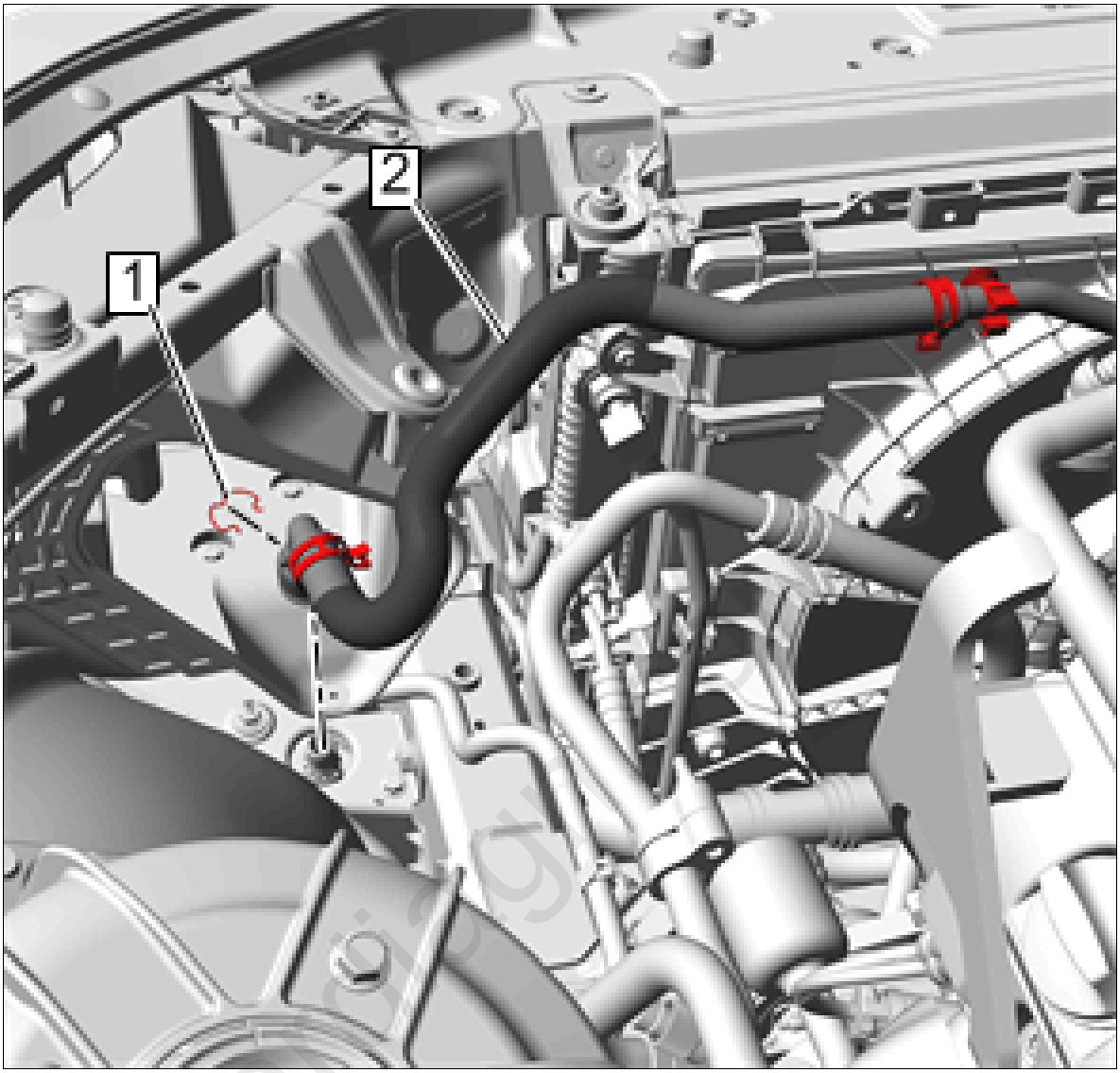


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4. Install Retainer (1) Quick Connect Fitting
5. Install Auxiliary Radiator Inlet Hose (2) at Auxiliary Radiator - Charge Air Cooler-Right Side

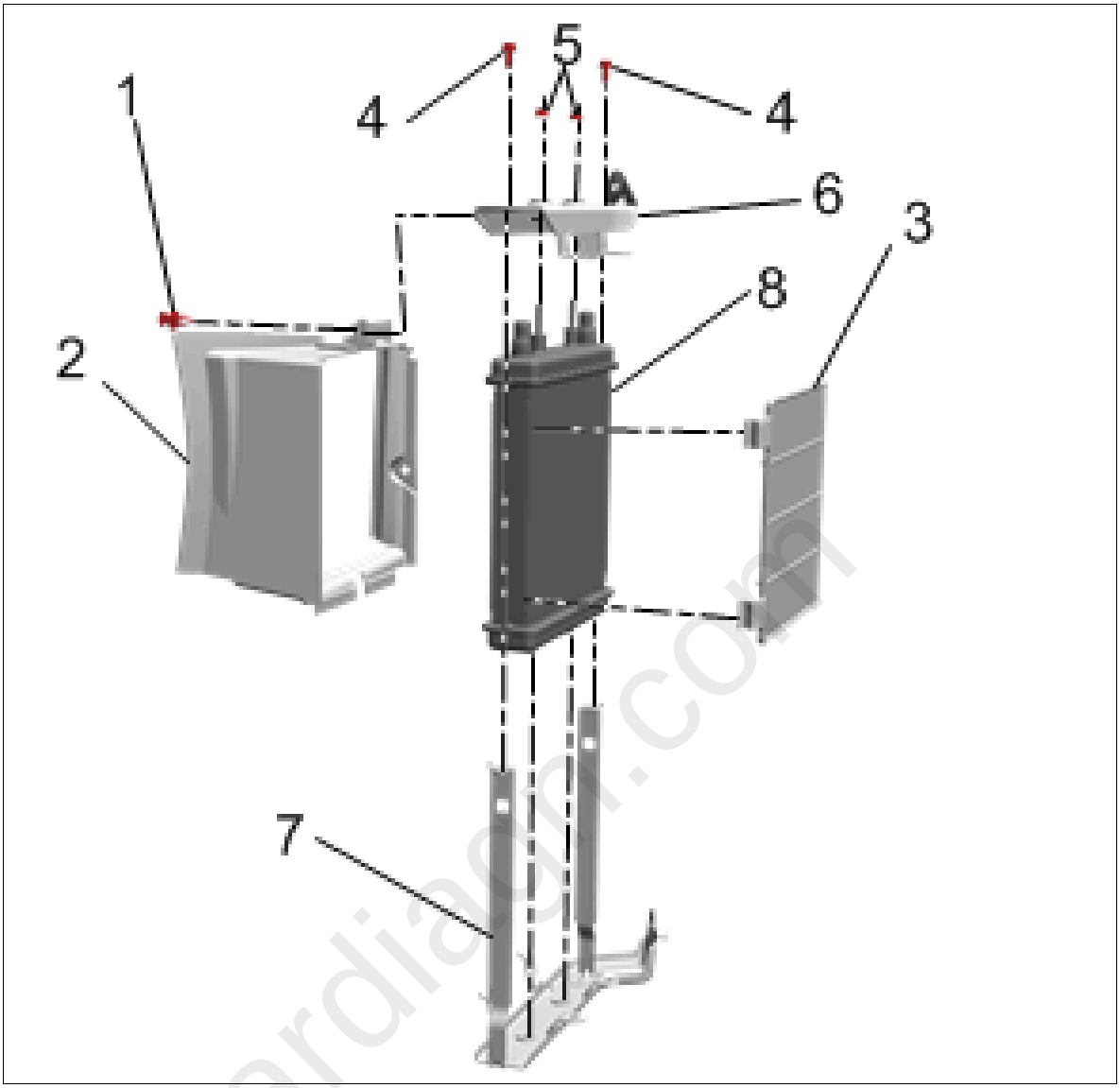
Fig 4: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

6. Install Retainer (1) at Quick Connect Fitting
7. Install Auxiliary Radiator Inlet Hose (2) at Auxiliary Radiator - Charge Air Cooler-Left Side

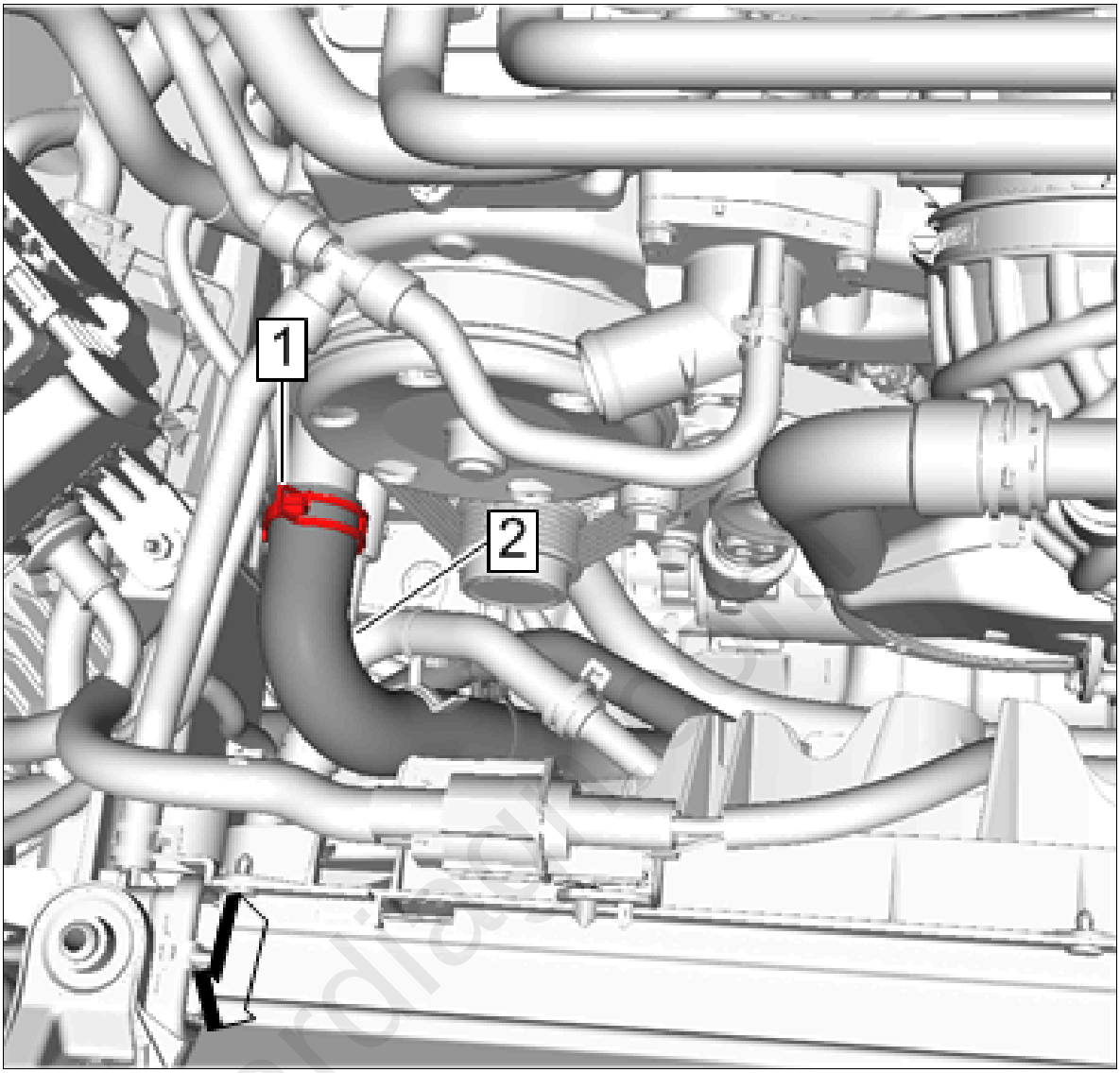
Fig 5: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

8. Install Rear Duct-Left Side (2)
9. Install Push Pin (1)

Fig 6: Radiator Outlet Hose

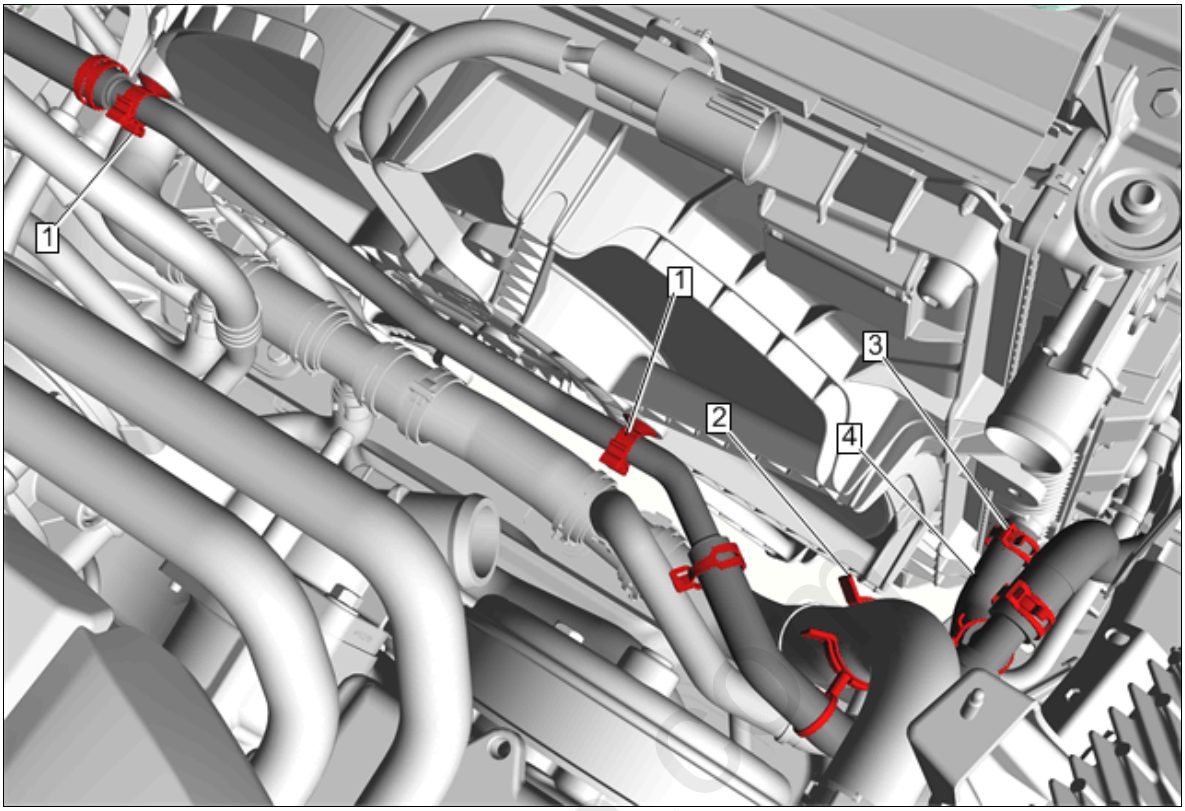


Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Outlet Hose (2) at Water Pump Inlet Pipe
11. Engage Radiator Outlet Hose Clamp (1)

    Use the **BO-38185** Hose Clamp Pliers

Fig 7: Auxiliary Radiator Inlet Hose



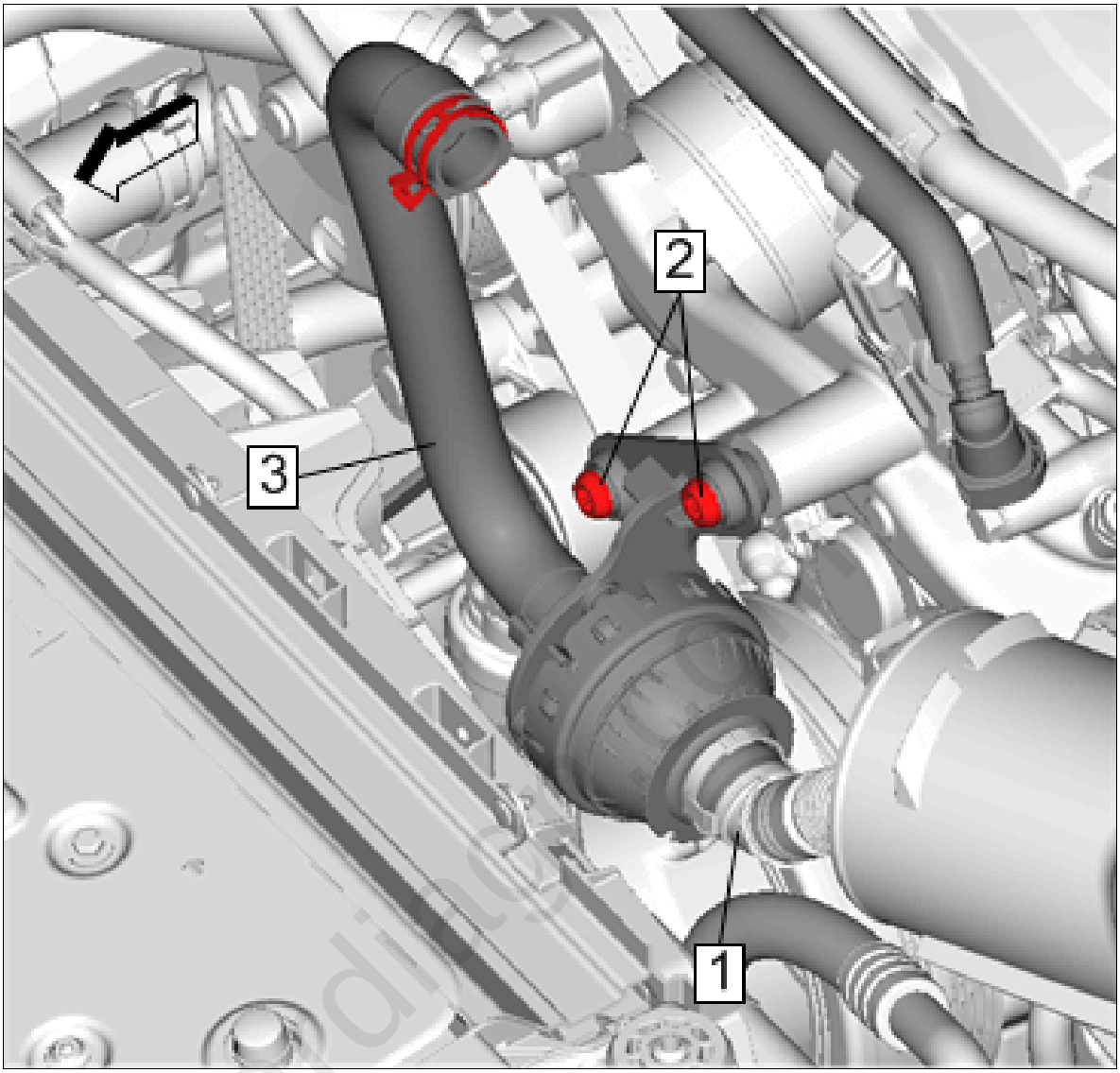
Courtesy of GENERAL MOTORS COMPANY

12. Install Auxiliary Radiator Inlet Hose (4) at Radiator
13. Engage Auxiliary Radiator Inlet Hose Clamp (3)

    Use the **GE-47622** Hose Clamp Pliers.
14. Install C - Clip (2) at Radiator Outlet Hose
15. Install Clip (1) (Qty: 2) at Engine Coolant Fan Shroud

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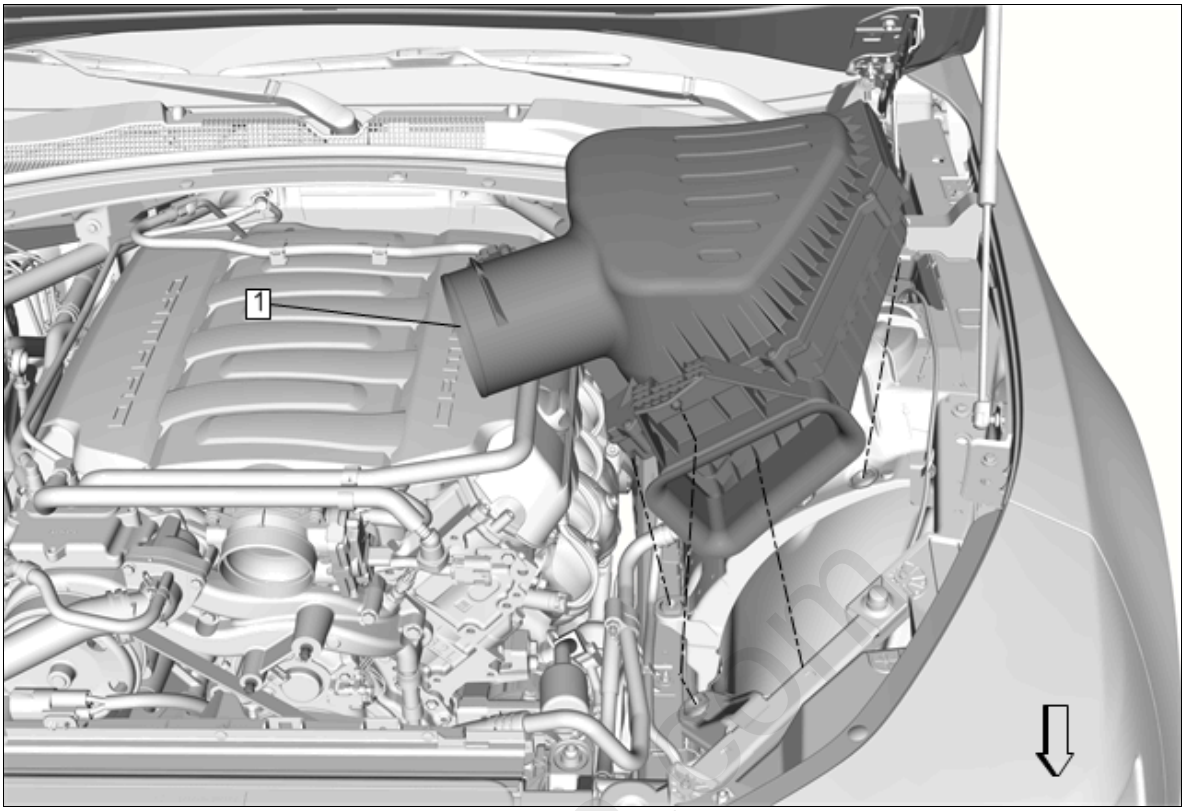
Fig 8: Air Cleaner Resonator



Courtesy of GENERAL MOTORS COMPANY

16. Install Air Cleaner Resonator (1) - Air Cleaner Resonator Replacement (Air Cleaner Outlet Duct to Engine)Air Cleaner Resonator Replacement (Diagonal Brace to Air Cleaner Resonator)Air Cleaner Resonator Replacement (Dash to Diagonal Brace)

Fig 9: Air Cleaner Assembly

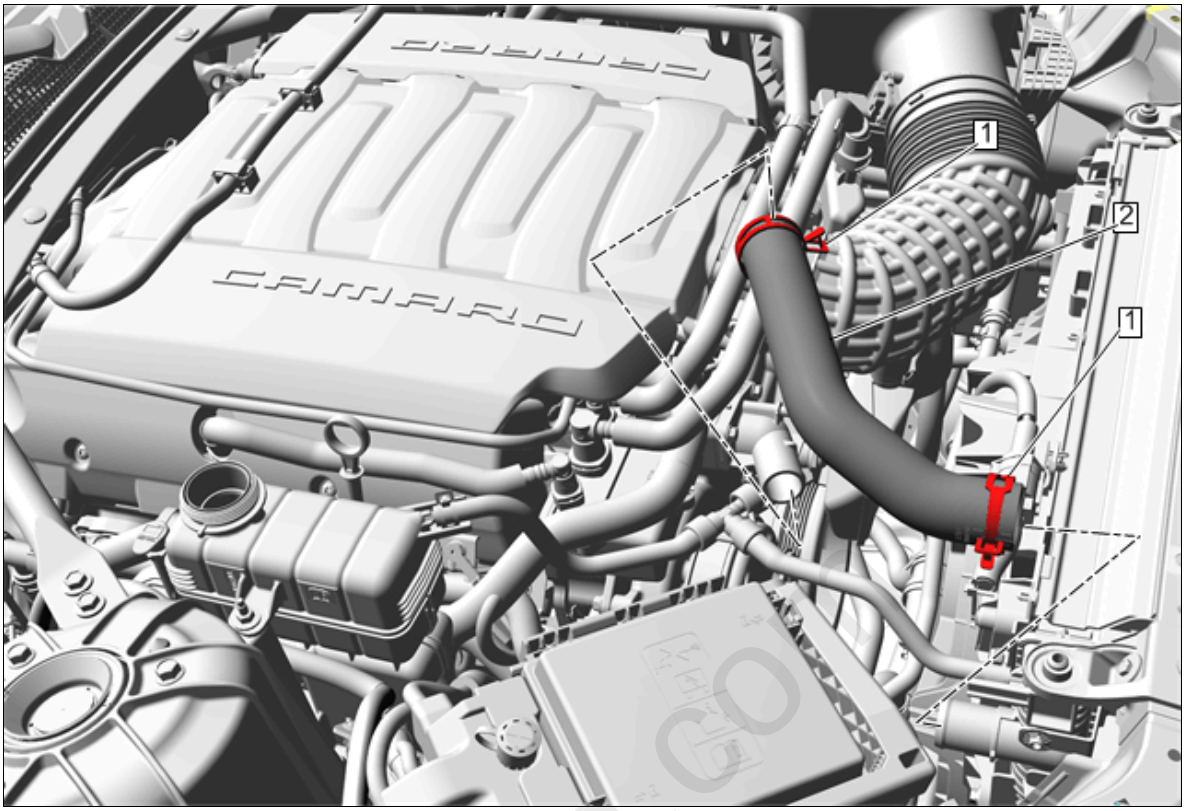


Courtesy of GENERAL MOTORS COMPANY

17. Install Air Cleaner Assembly (1) - Air Cleaner Assembly Replacement

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Fig 10: Radiator Inlet Hose

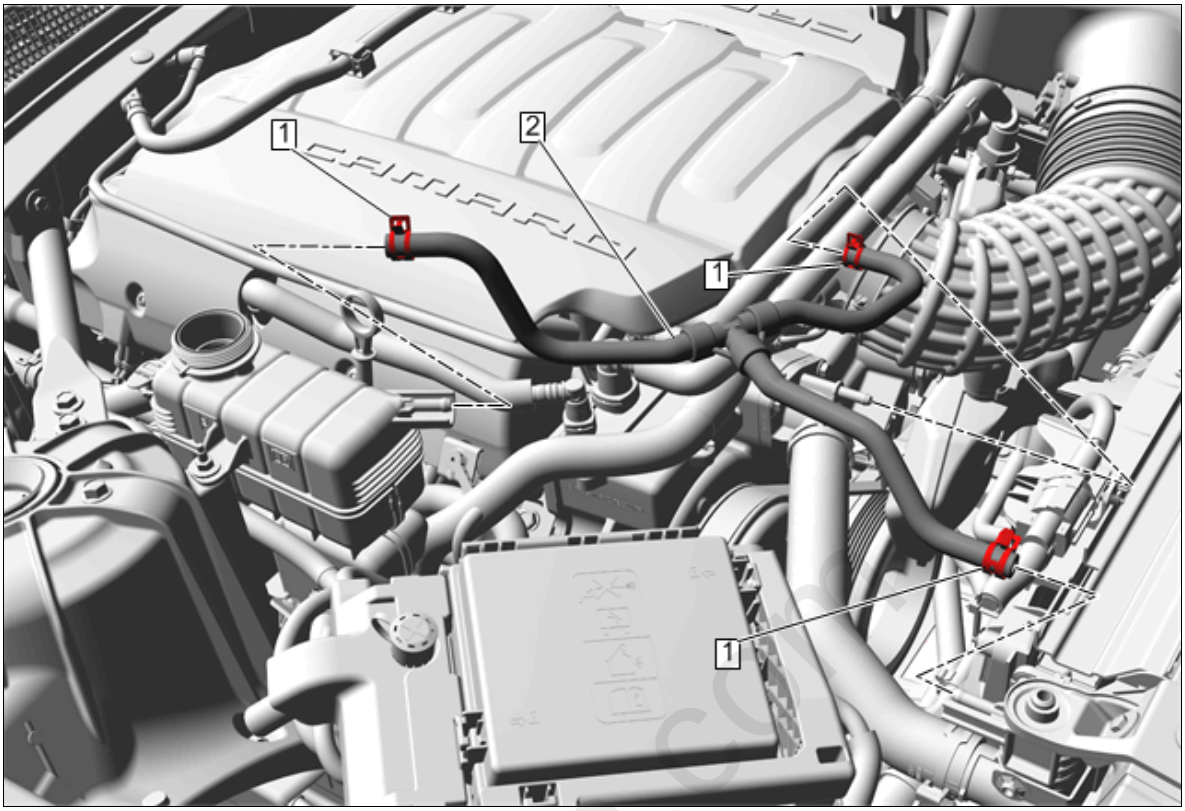


Courtesy of GENERAL MOTORS COMPANY

18. Install Radiator Inlet Hose (1) at Radiator - Radiator Inlet Hose Replacement (LT1)

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Fig 11: Radiator Surge Tank Inlet Hose

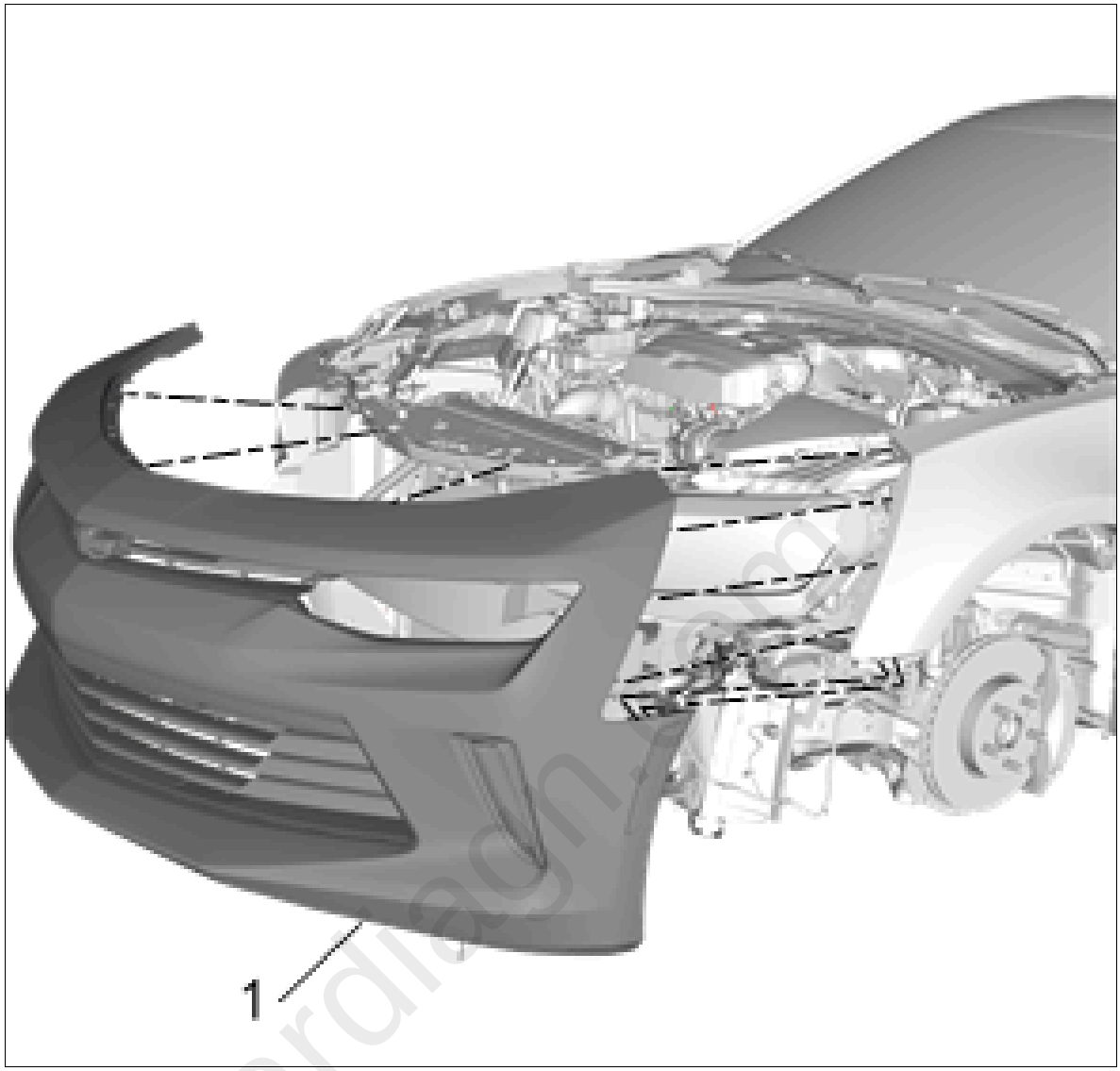


Courtesy of GENERAL MOTORS COMPANY

19. Install Radiator Surge Tank Inlet Hose (1) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LT1)

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Fig 12: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

20. Install Front Bumper Fascia (1) - Front Bumper Fascia Replacement
21. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
22. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18)

Special Tools

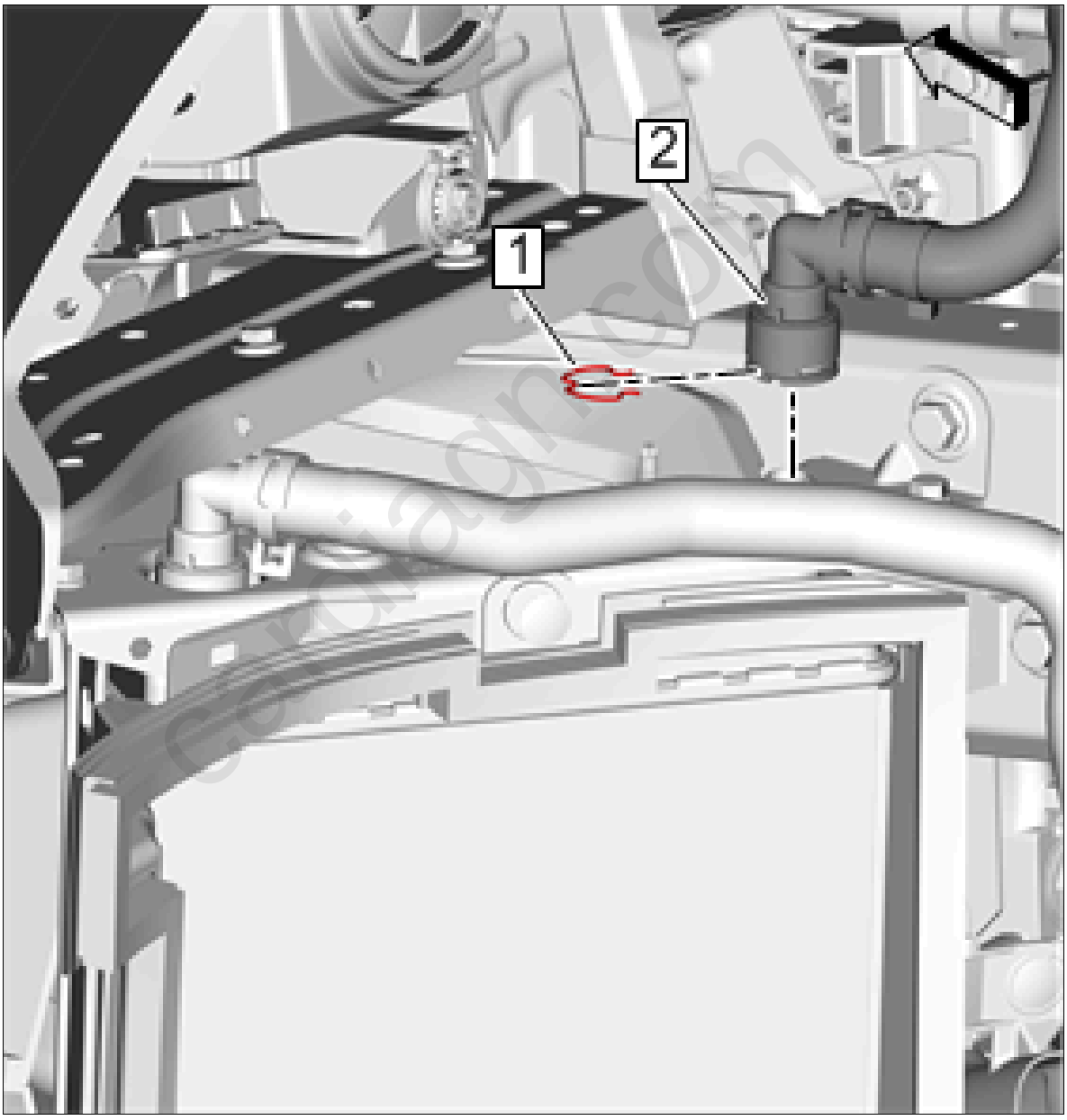
- **BO-38185** Hose Clamp Pliers
- **GE-47622** Hose Clamp Pliers.

Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Front Wheelhouse Liner Replacement - Left Side

   Fig 1: Auxiliary Radiator Inlet Hose Clip

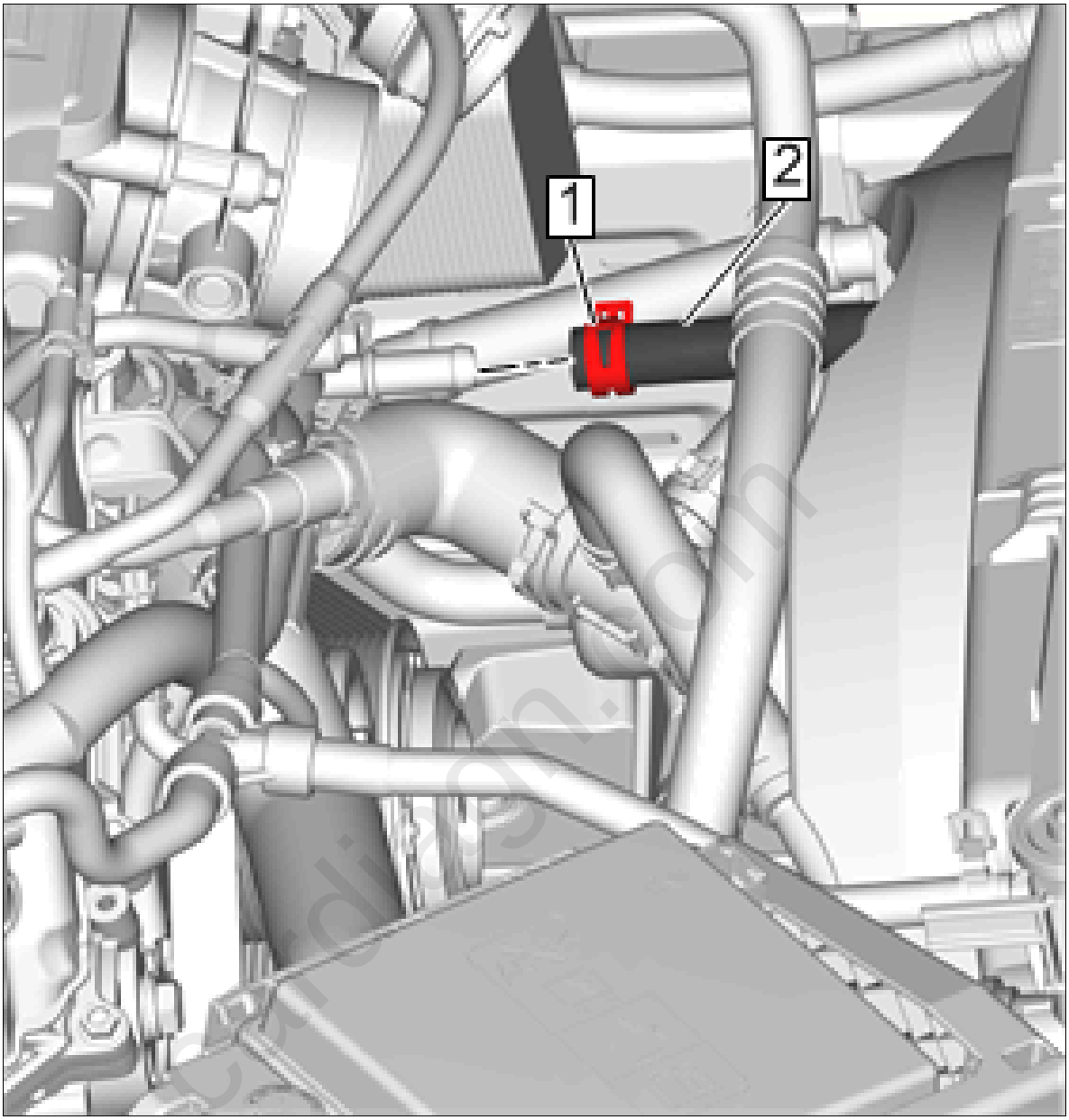


Courtesy of GENERAL MOTORS COMPANY

3. Disengage Auxiliary Radiator Inlet Hose Clip (1)
4. Remove Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler - Left Side

5. Remove Air Cleaner Outlet Duct Replacement

Fig 2: Auxiliary Radiator Inlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

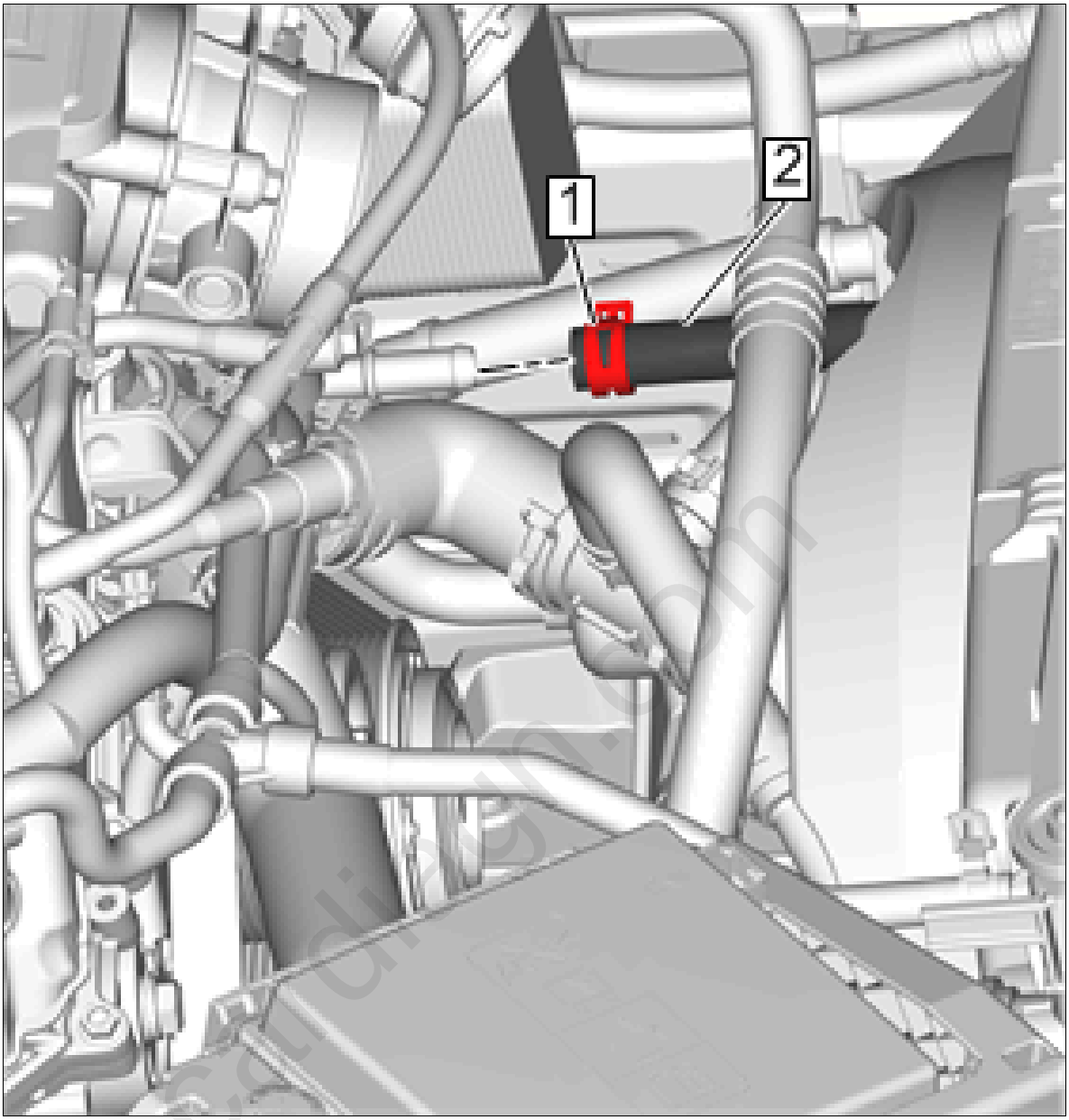
6. Disengage Auxiliary Radiator Inlet Hose Clamp (1)

   Use the **GE-47622** Hose Clamp Pliers.

7. Remove Auxiliary Radiator Inlet Hose (2) at Engine Oil Cooler Pipe

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LGX WITH V18) > INSTALLATION PROCEDURE

Fig 1: Auxiliary Radiator Inlet Hose

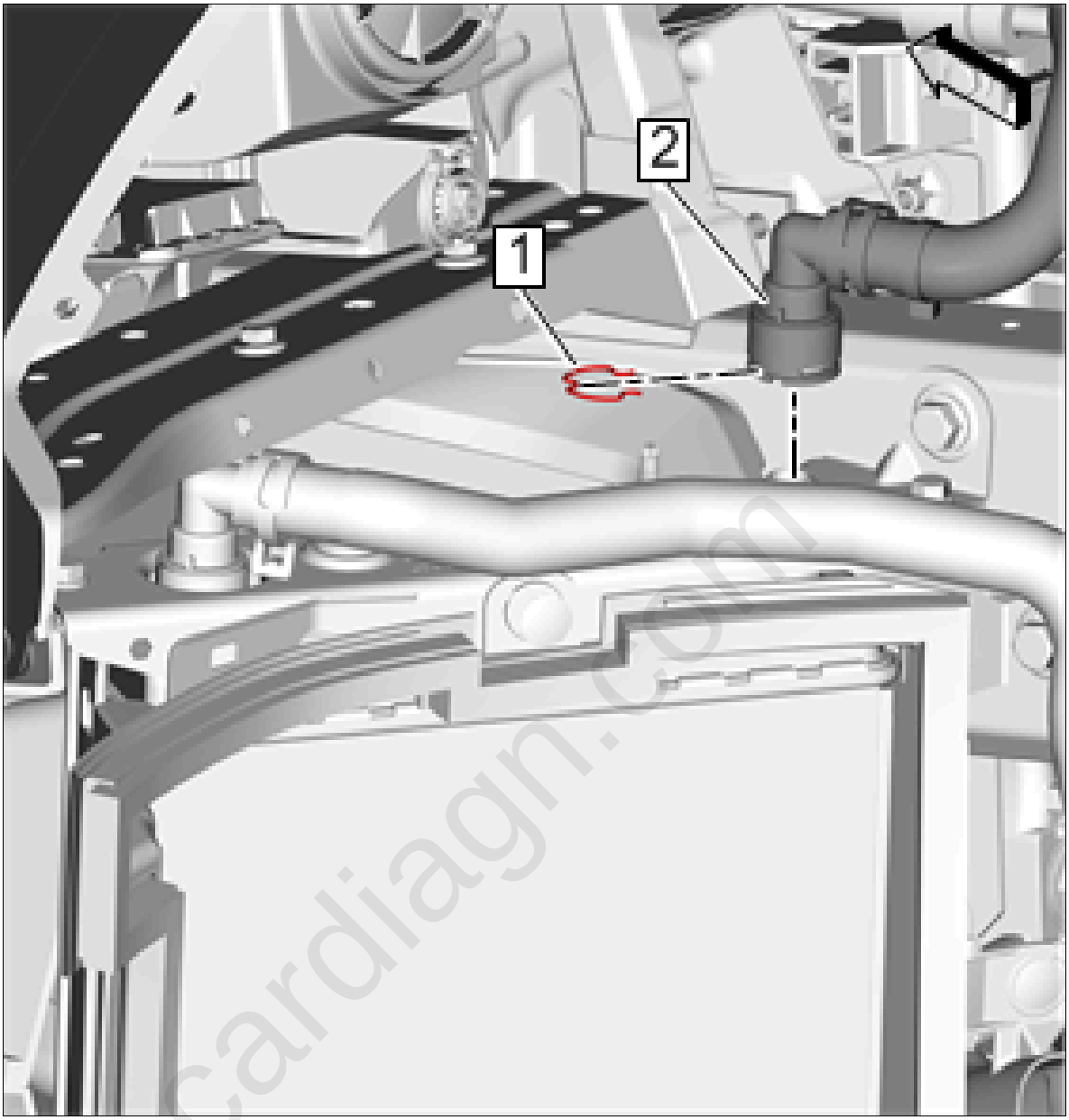


Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Radiator Inlet Hose (2) at Engine Oil Cooler Pipe
2. Engage Auxiliary Radiator Inlet Hose Clamp (1)

   Use the **GE-47622** Hose Clamp Pliers.
3. Install Air Cleaner Outlet Duct Replacement

Fig 2: Auxiliary Radiator Inlet Hose Clip



Courtesy of GENERAL MOTORS COMPANY

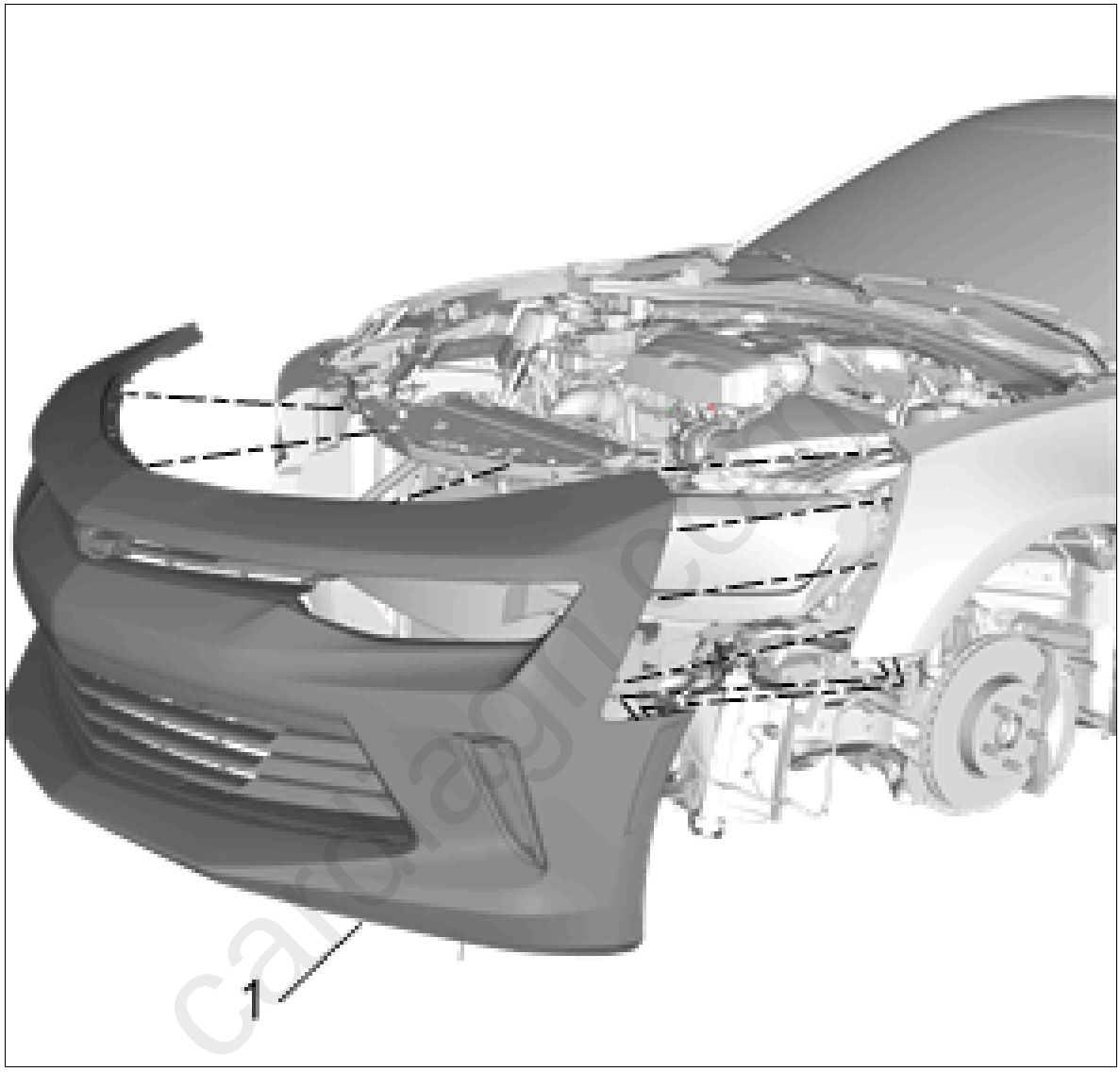
4. Install Auxiliary Radiator Inlet Hose Clip (1)
5. Engage Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler - Left Side
6. Install Front Wheelhouse Liner Replacement - Left Side
7. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
8. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LTG

WITH V18) > REMOVAL PROCEDURE

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

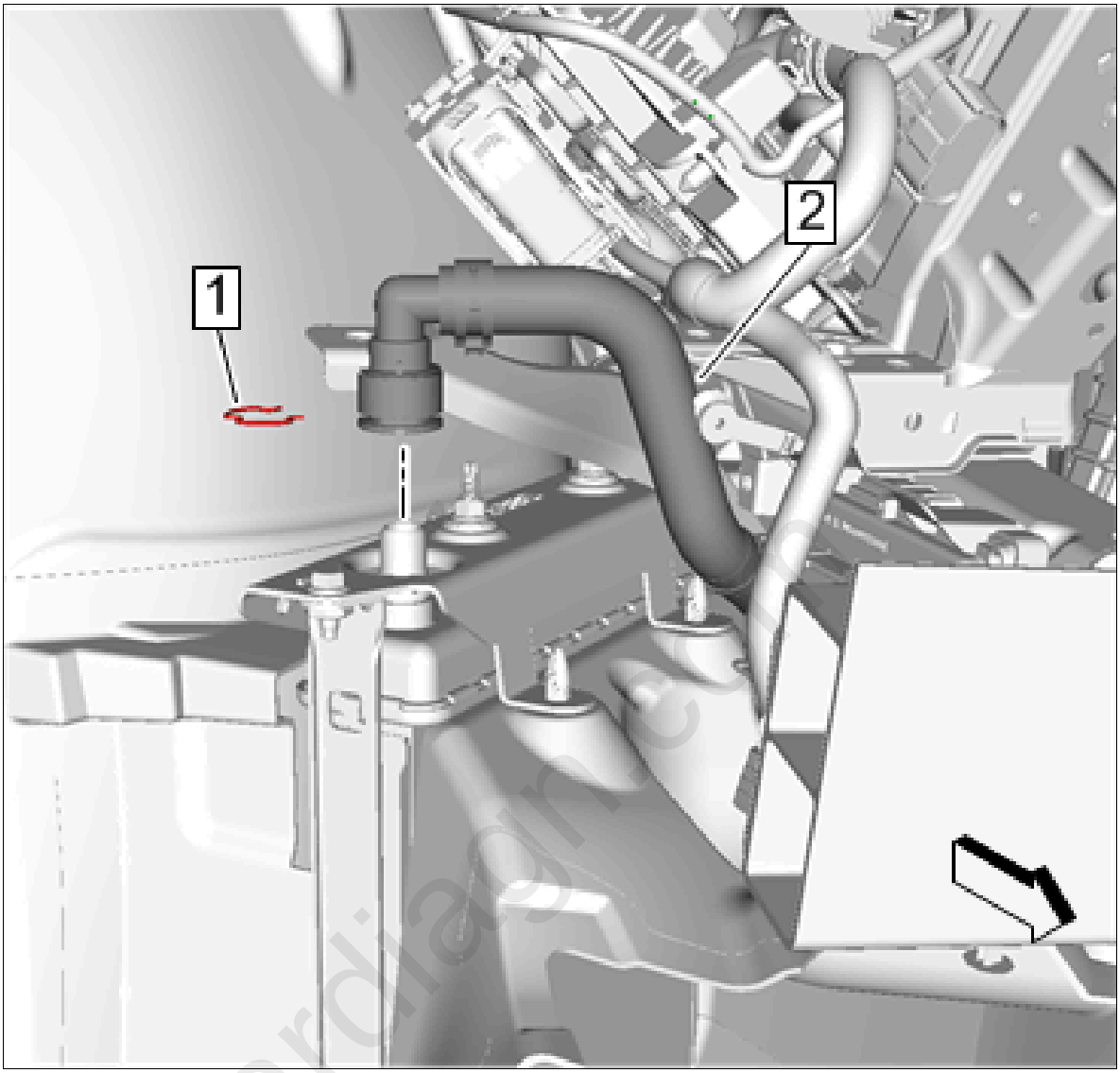
   Fig 1: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Bumper Fascia (1) - Front Bumper Fascia Replacement

Fig 2: Auxiliary Radiator Inlet Hose Retainer

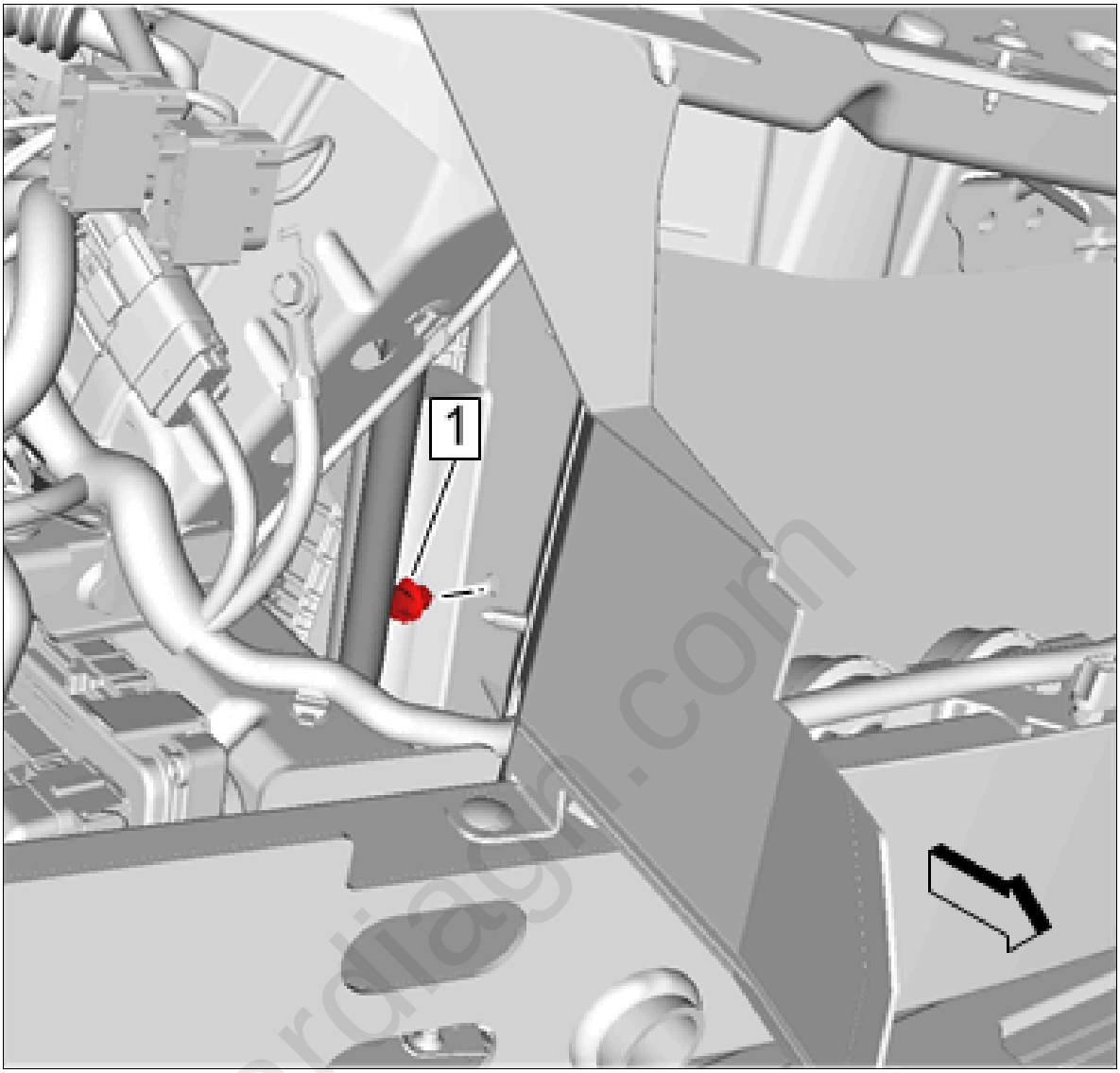


Courtesy of GENERAL MOTORS COMPANY

3. Disengage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose-Right Side

4. Remove Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler-Right Side

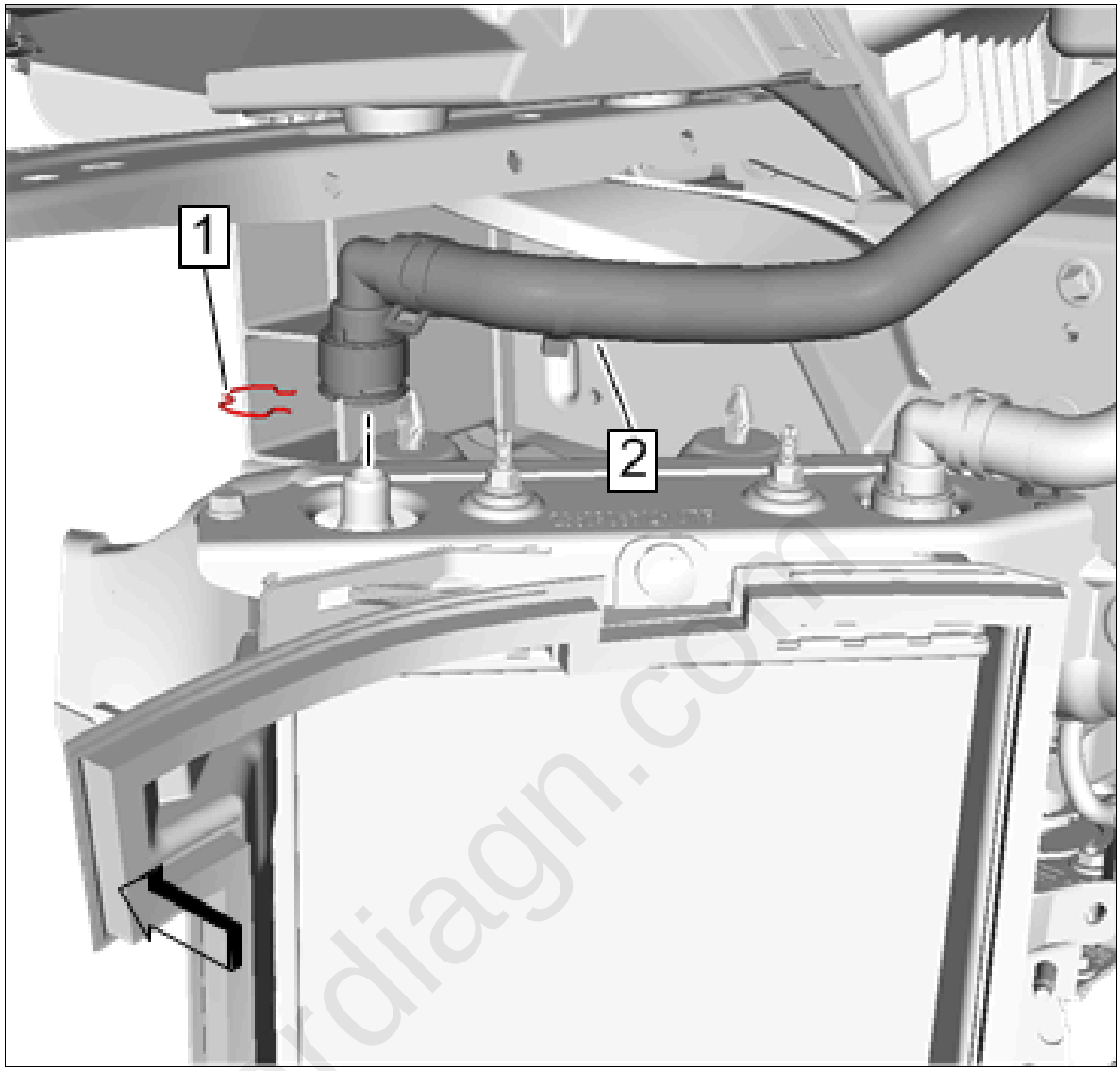
Fig 3: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

5. Remove Auxiliary Radiator Inlet Hose Retainer (1) at Radiator Air Lower Baffle

Fig 4: Auxiliary Radiator Inlet Hose Retainer

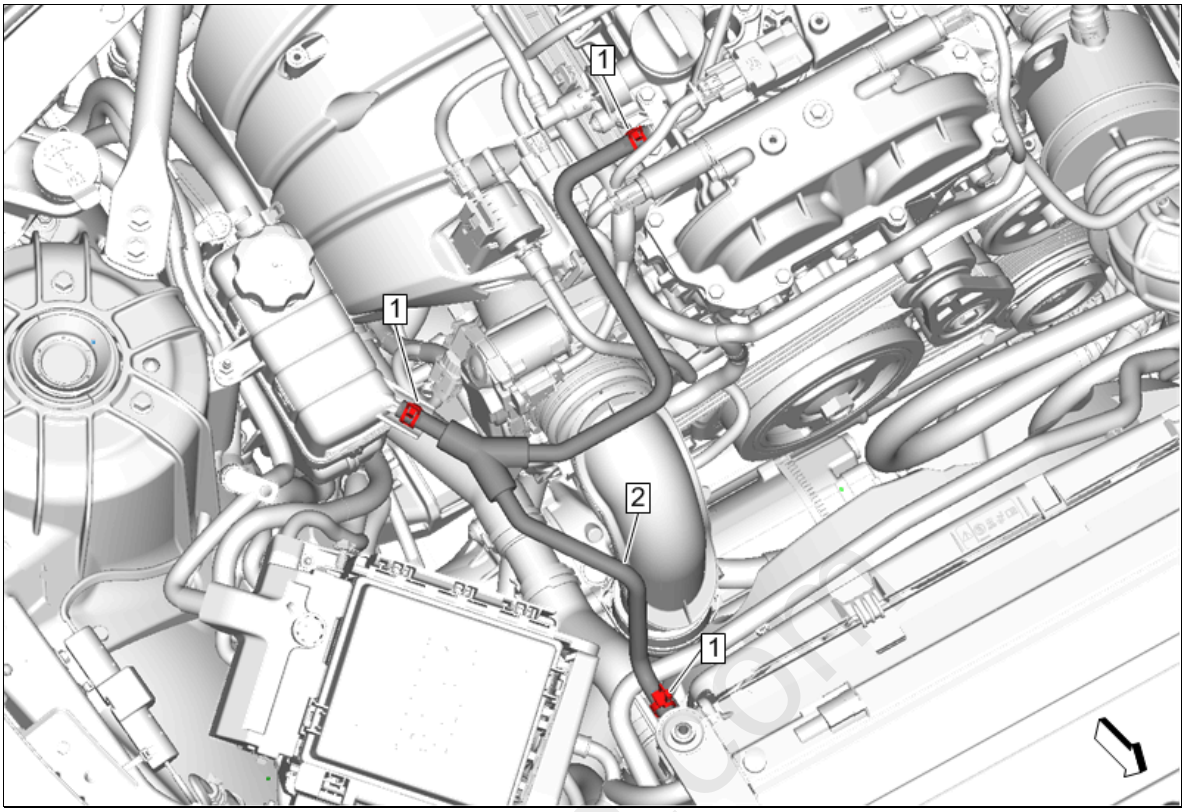


Courtesy of GENERAL MOTORS COMPANY

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6. Disengage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose-Left Side
7. Remove Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler-Left Side

Fig 5: Radiator Surge Tank Inlet Hose

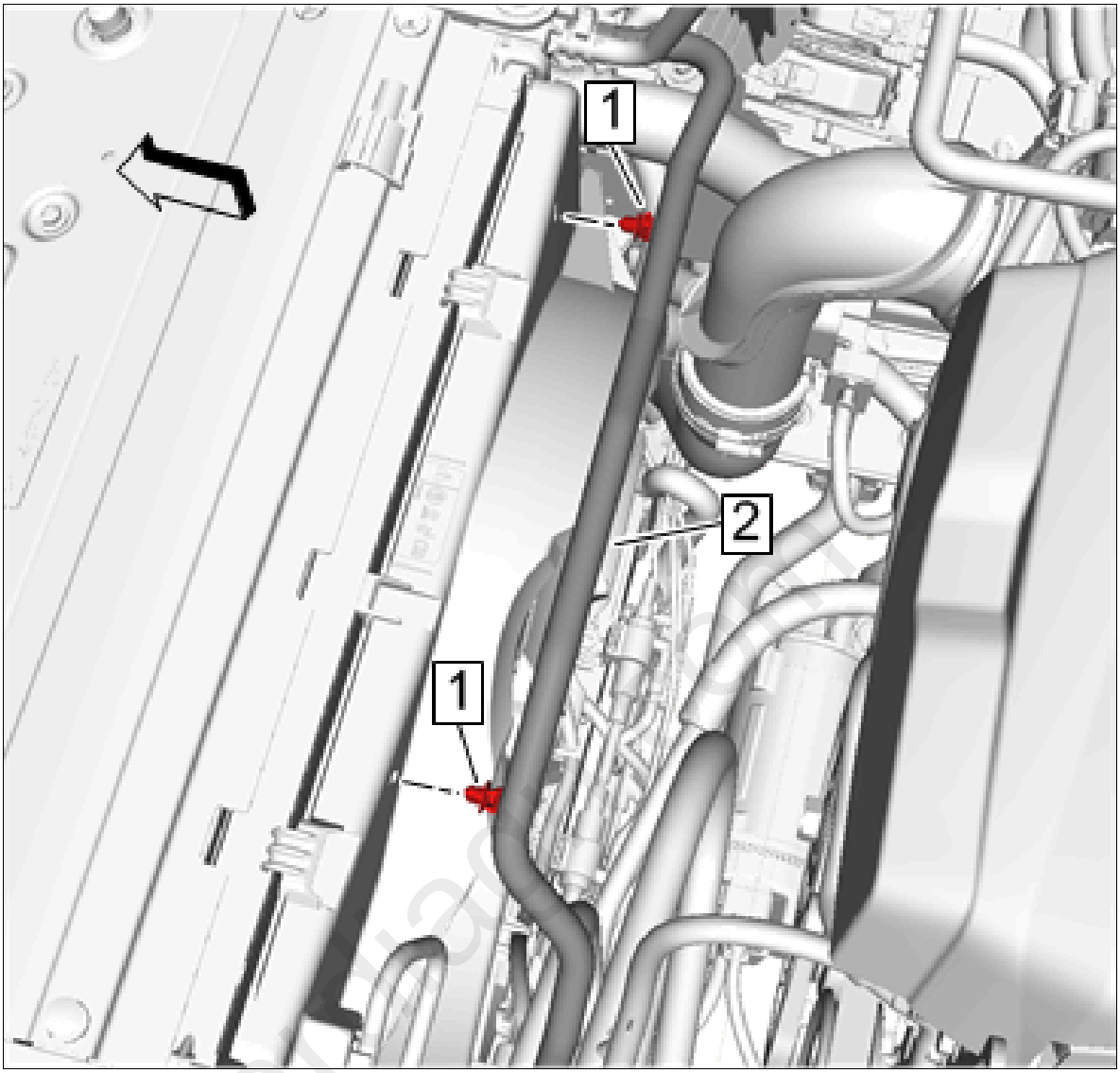


Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Surge Tank Inlet Hose (1) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)
9. Remove Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement

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Fig 6: Auxiliary Radiator Inlet Hose Retainer

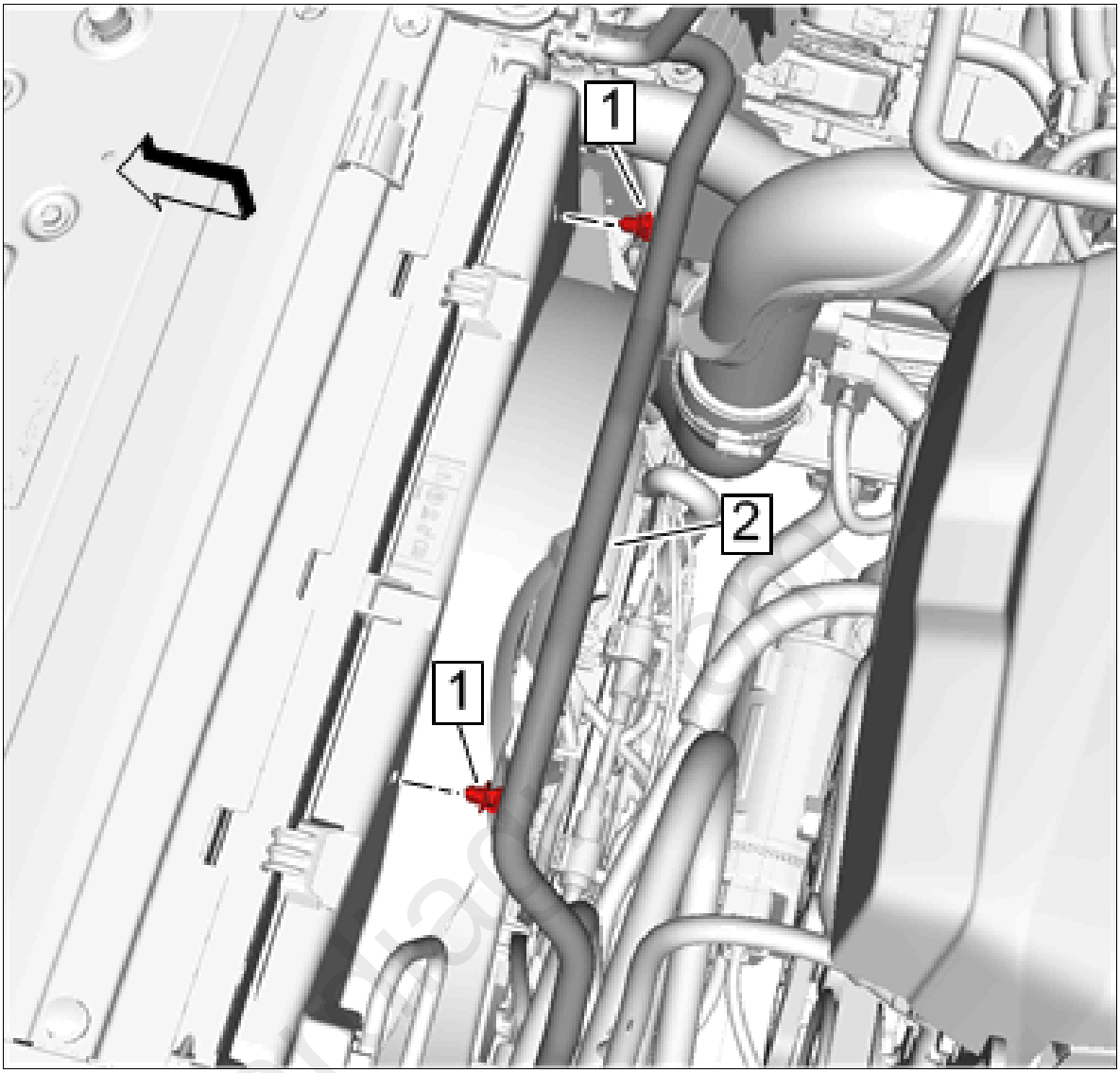


Courtesy of GENERAL MOTORS COMPANY

10. Remove Auxiliary Radiator Inlet Hose Retainer (1) (Qty: 2) at Engine Coolant Fan
11. Remove Auxiliary Radiator Inlet Hose (2)

REPAIR INSTRUCTIONS > AUXILIARY RADIATOR INLET HOSE REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

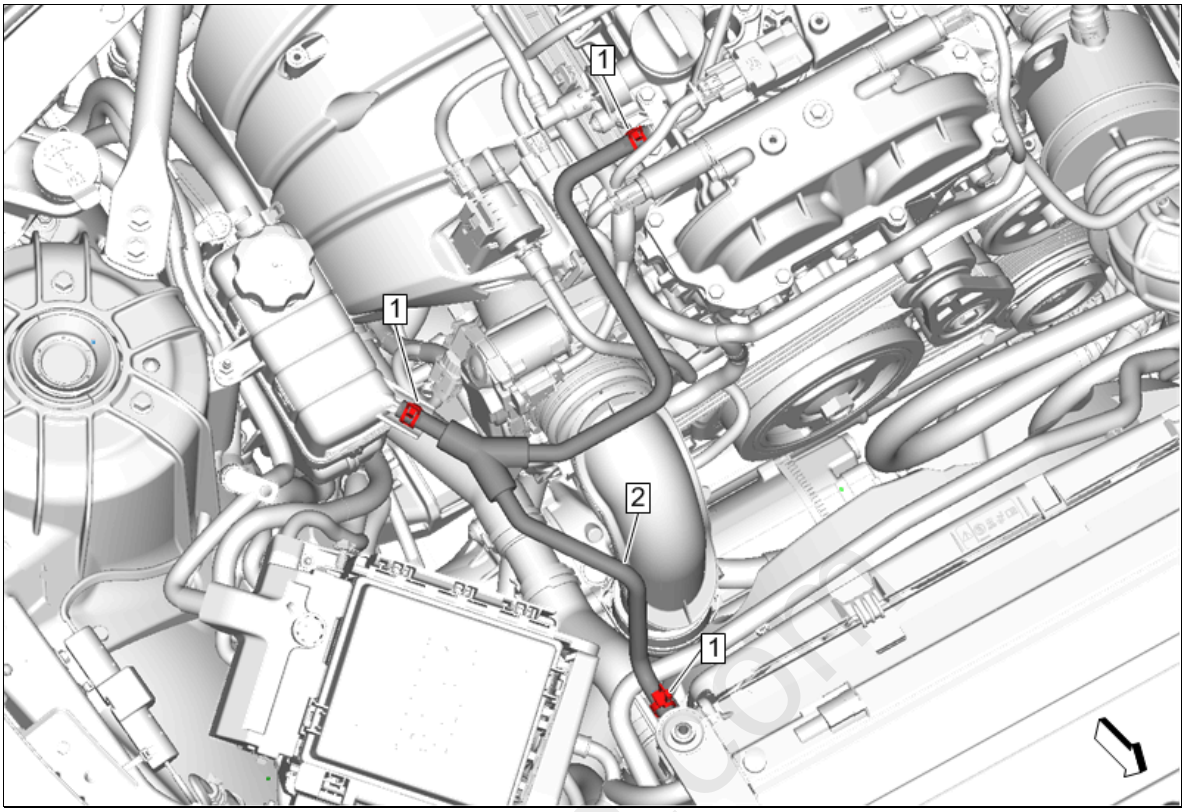
Fig 1: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Radiator Inlet Hose (2)
2. Install Auxiliary Radiator Inlet Hose Retainer (1) (Qty: 2) at Engine Coolant Fan
3. Install Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement

Fig 2: Radiator Surge Tank Inlet Hose

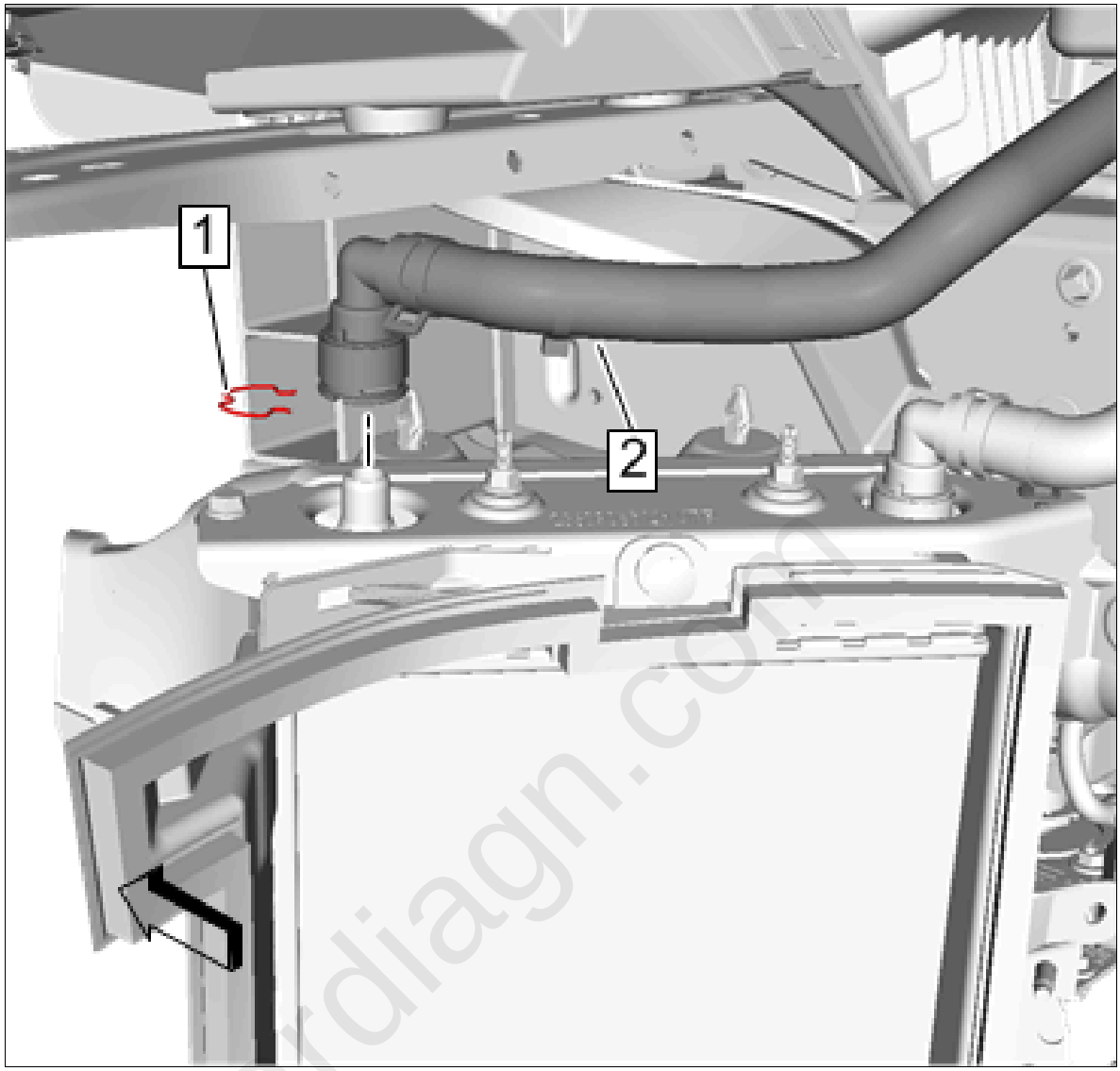


Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Surge Tank Inlet Hose (1) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)

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Fig 3: Auxiliary Radiator Inlet Hose Retainer

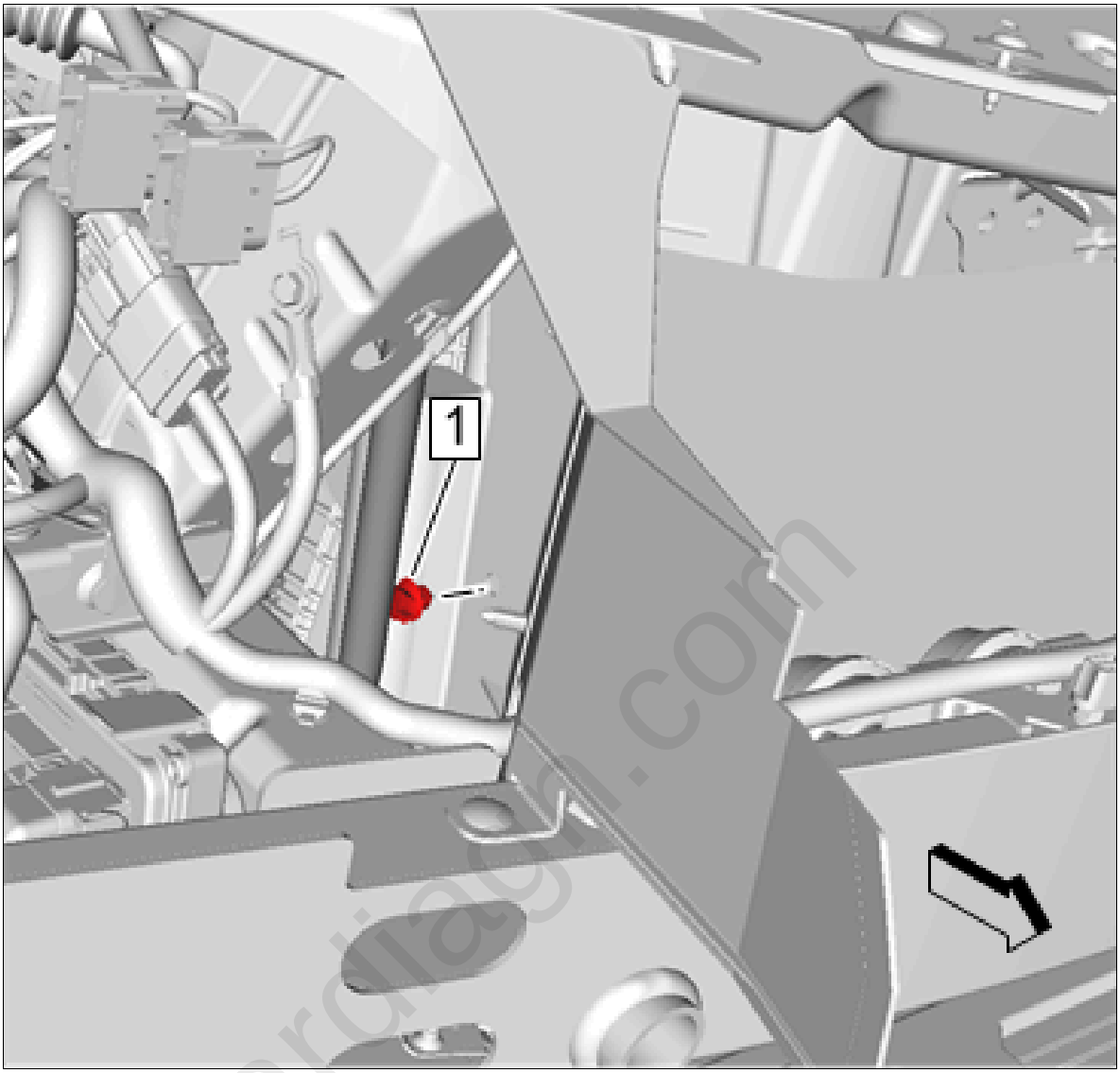


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5. Install Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler-Left Side
6. Engage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose-Left Side

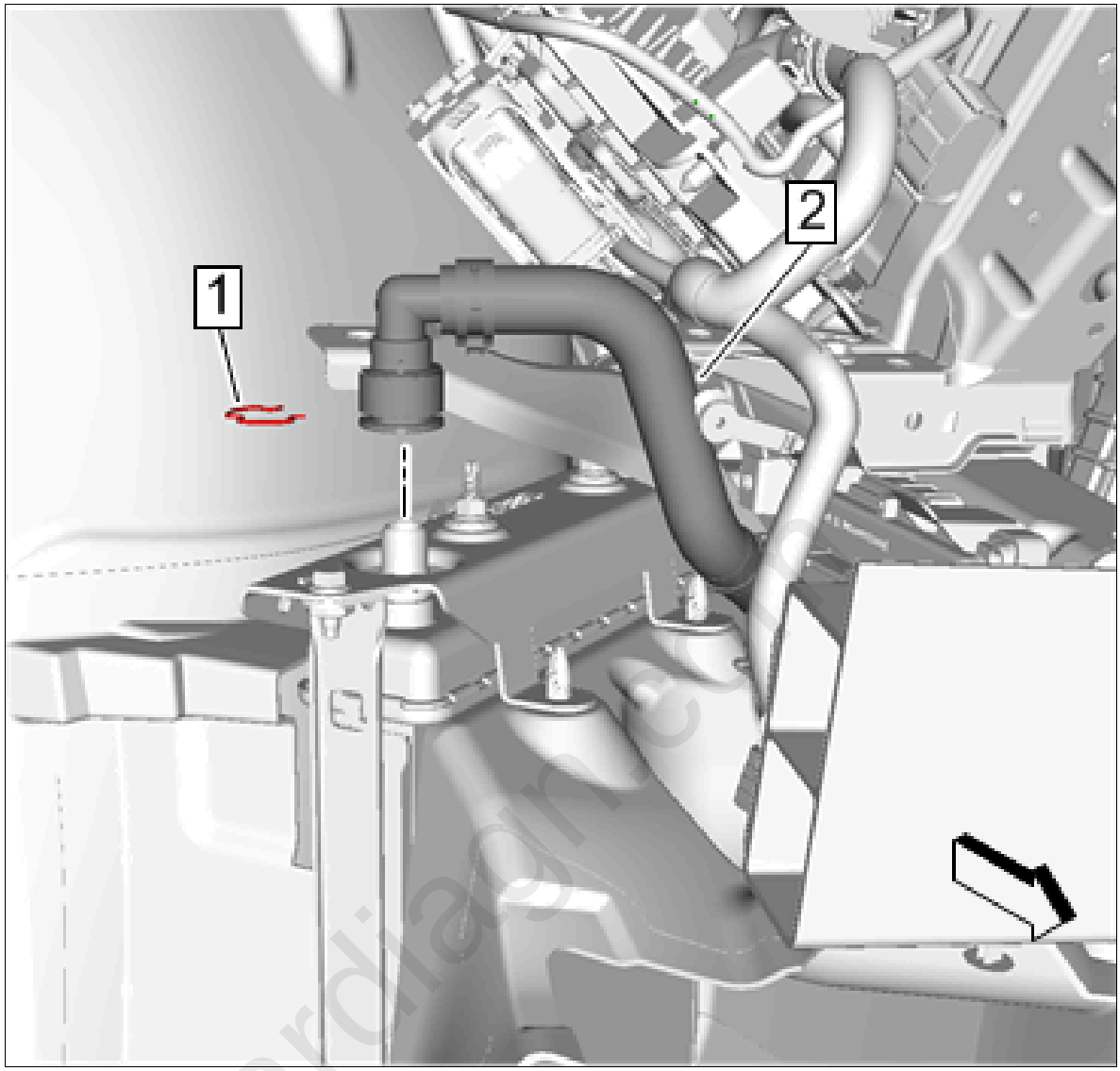
Fig 4: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

7. Install Auxiliary Radiator Inlet Hose Retainer (1) at Radiator Air Lower Baffle

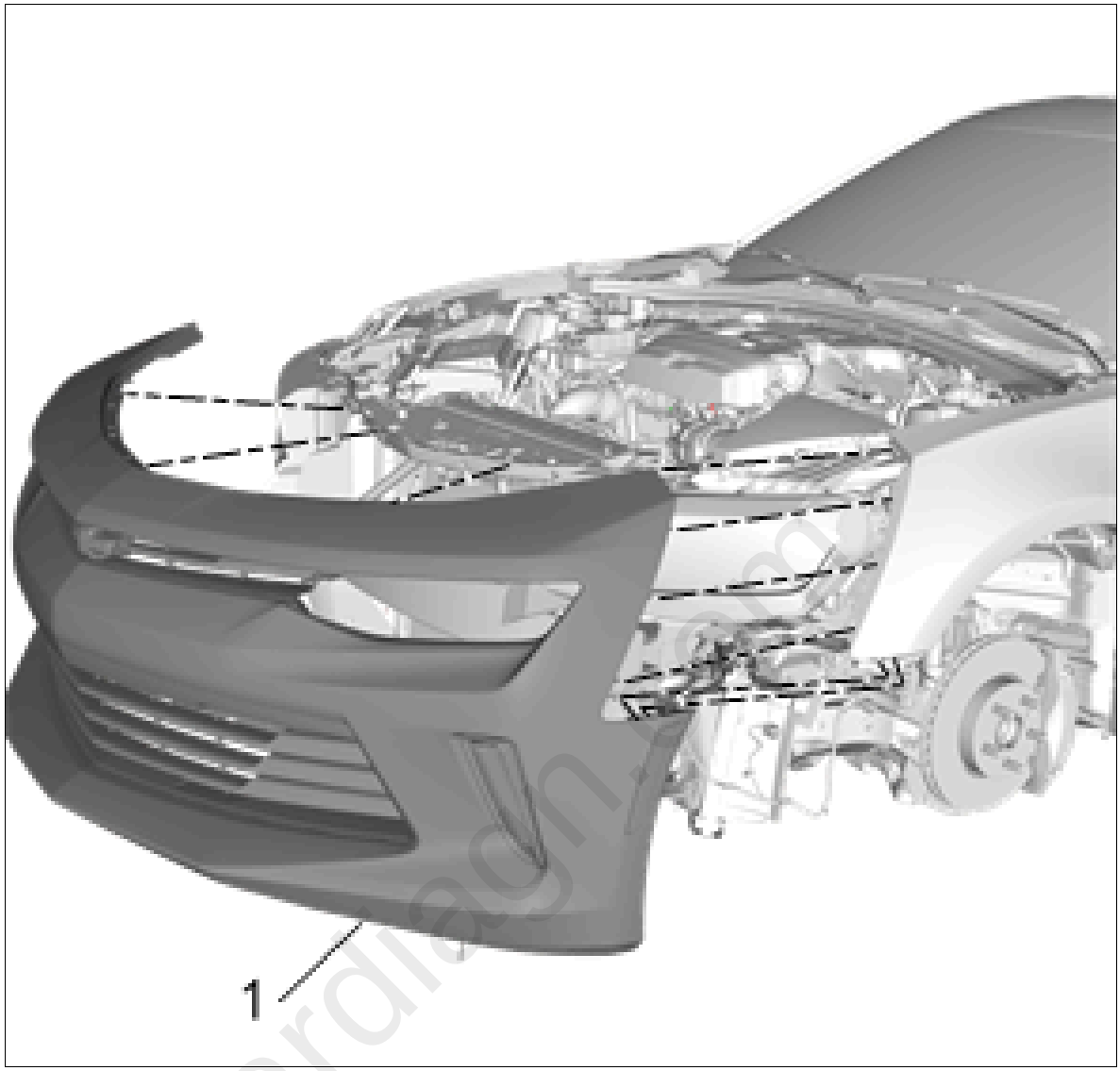
Fig 5: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

8. Install Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler-Right Side
9. Engage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose-Right Side

Fig 6: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

10. Install Front Bumper Fascia (1) - Front Bumper Fascia Replacement
11. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
12. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LT1 V18 V03)

Special Tools

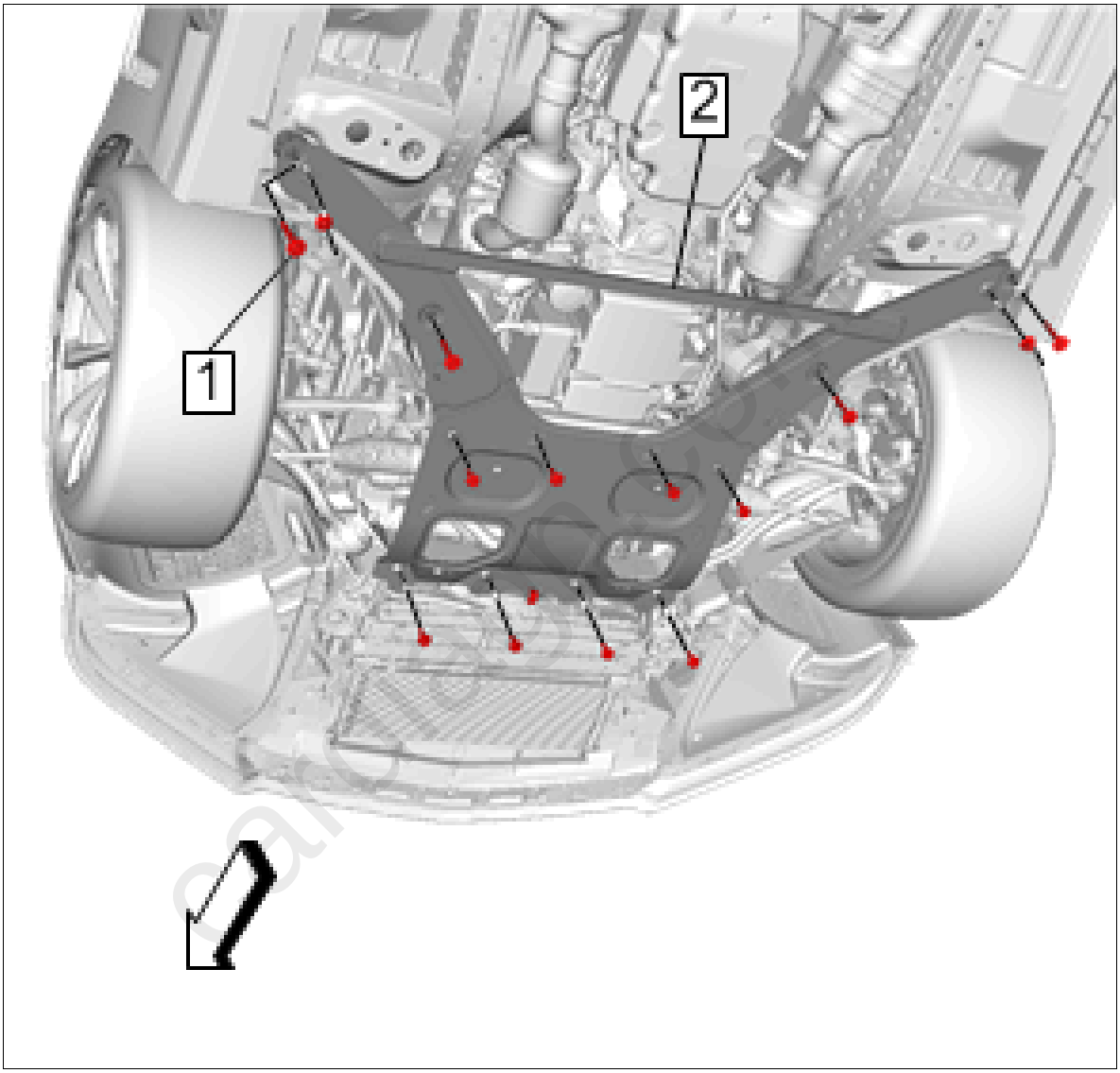
- **BO-38185** Hose Clamp Pliers
- **GE-47622** Hose Clamp Pliers.

Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LT1 V18 V03) > REMOVAL PROCEDURE

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

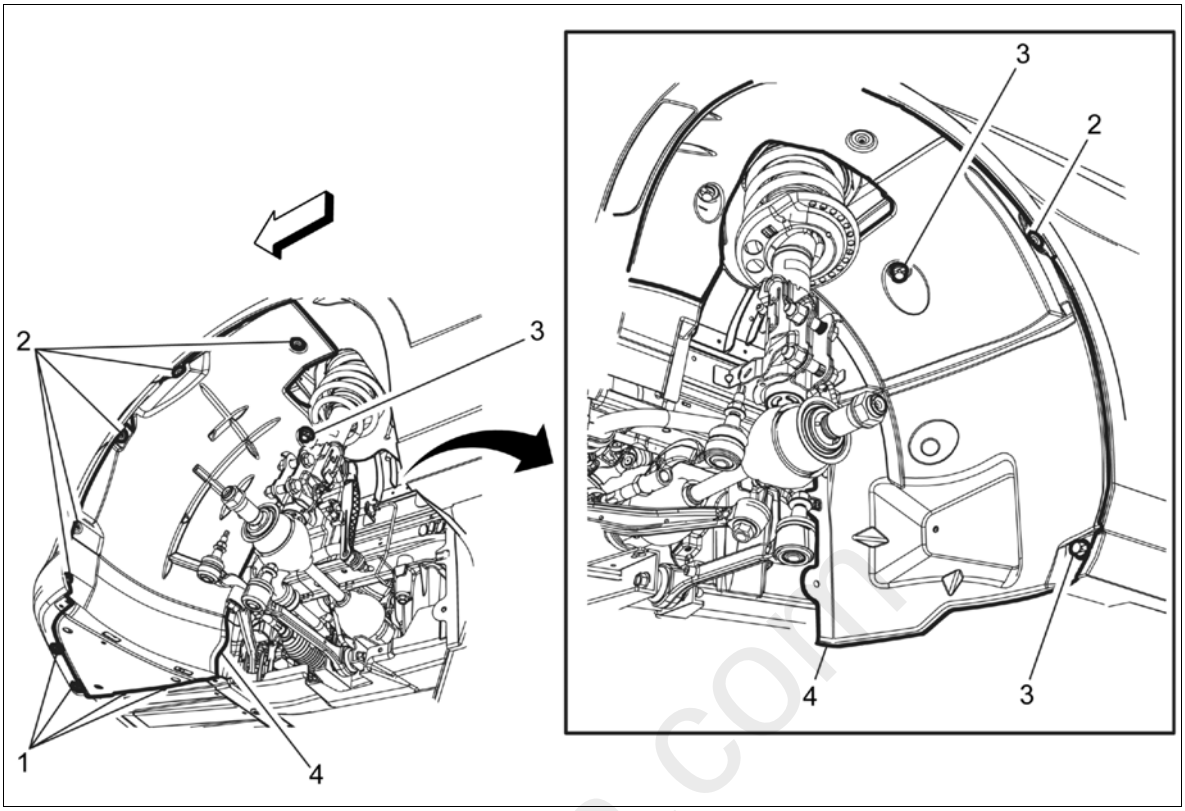
   Fig 1: Front Cradle Shear Plate Fastener



   Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Cradle Shear Plate Replacement (2)

Fig 2: Front Wheelhouse Liners

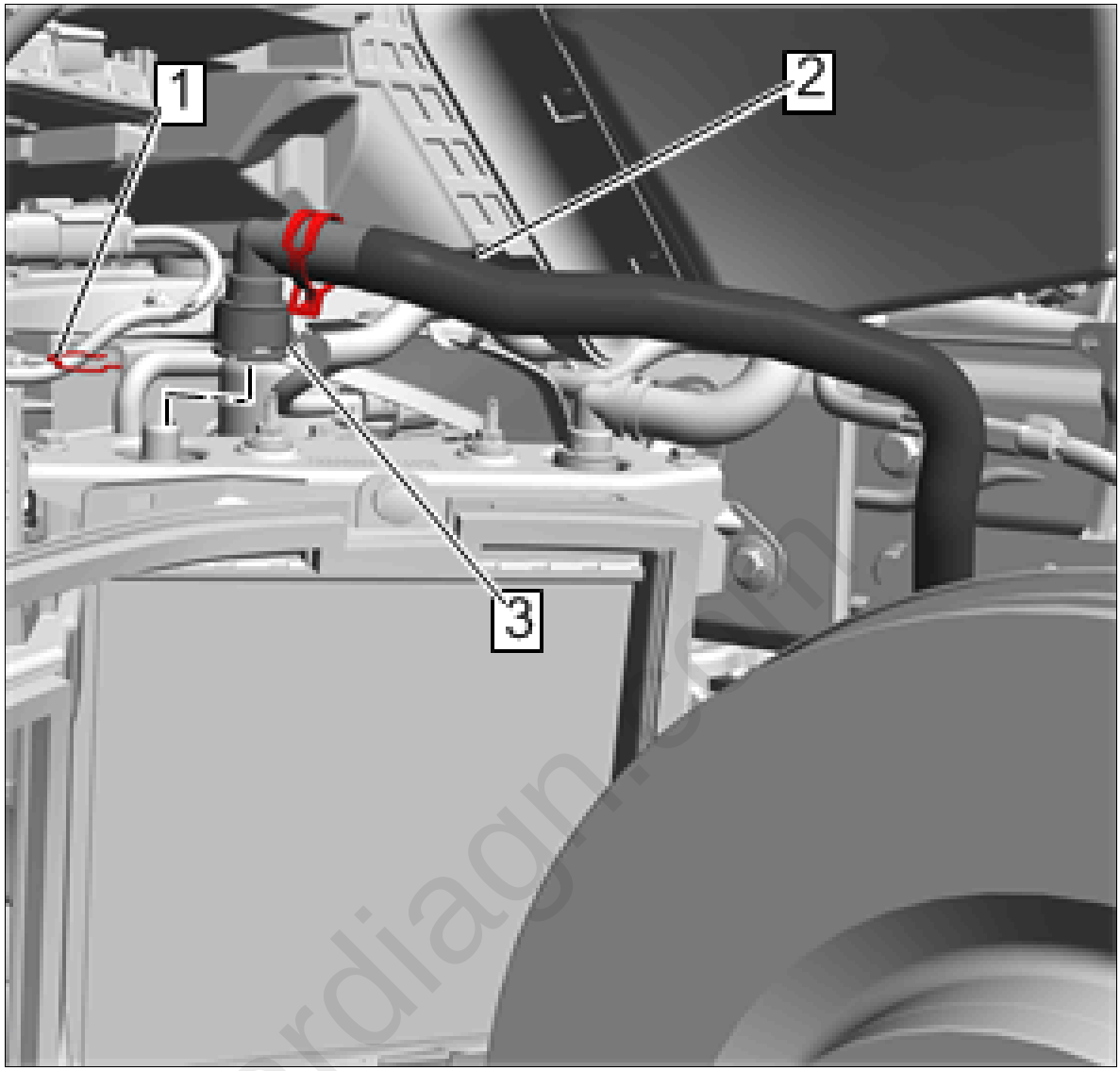


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3. Remove Front Wheelhouse Liner Replacement (4)

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Fig 3: Radiator Outlet Hose

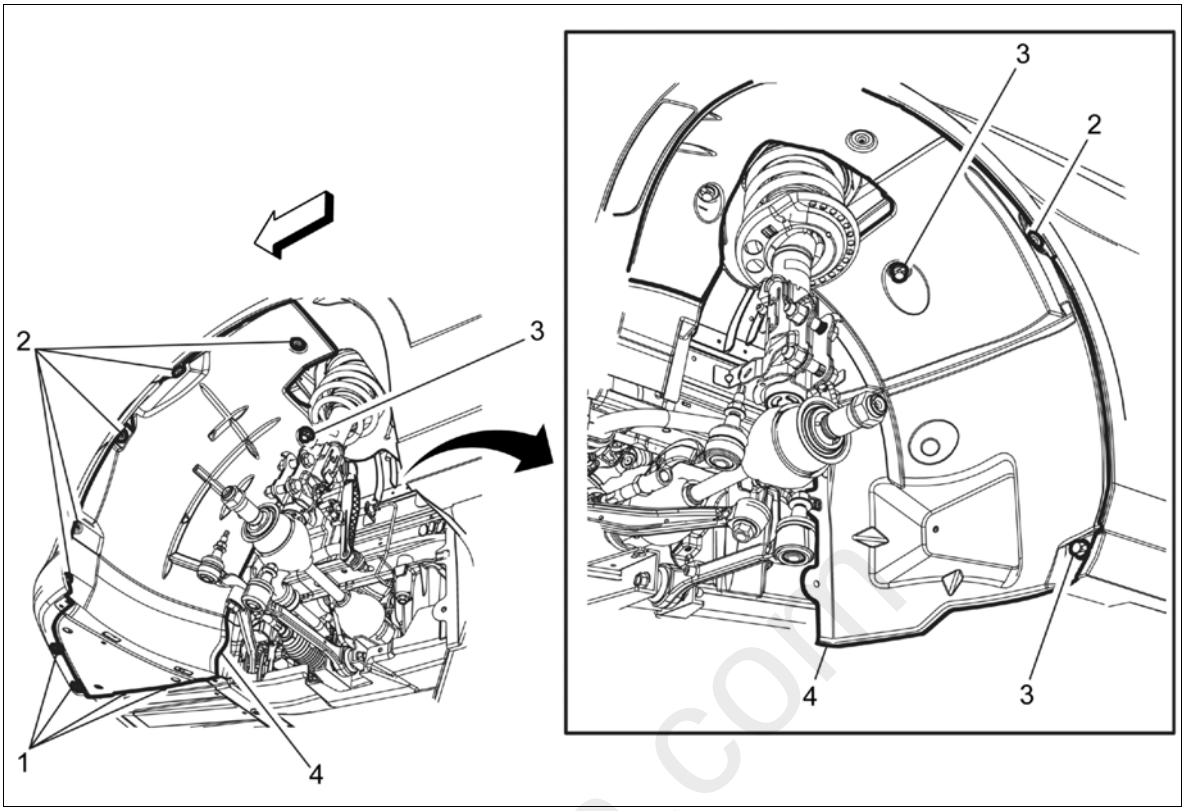


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4. Remove Retainer (1) at Quick Connect Fitting (3)
5. Remove Radiator Outlet Hose (2)

Fig 4: Front Wheelhouse Liners

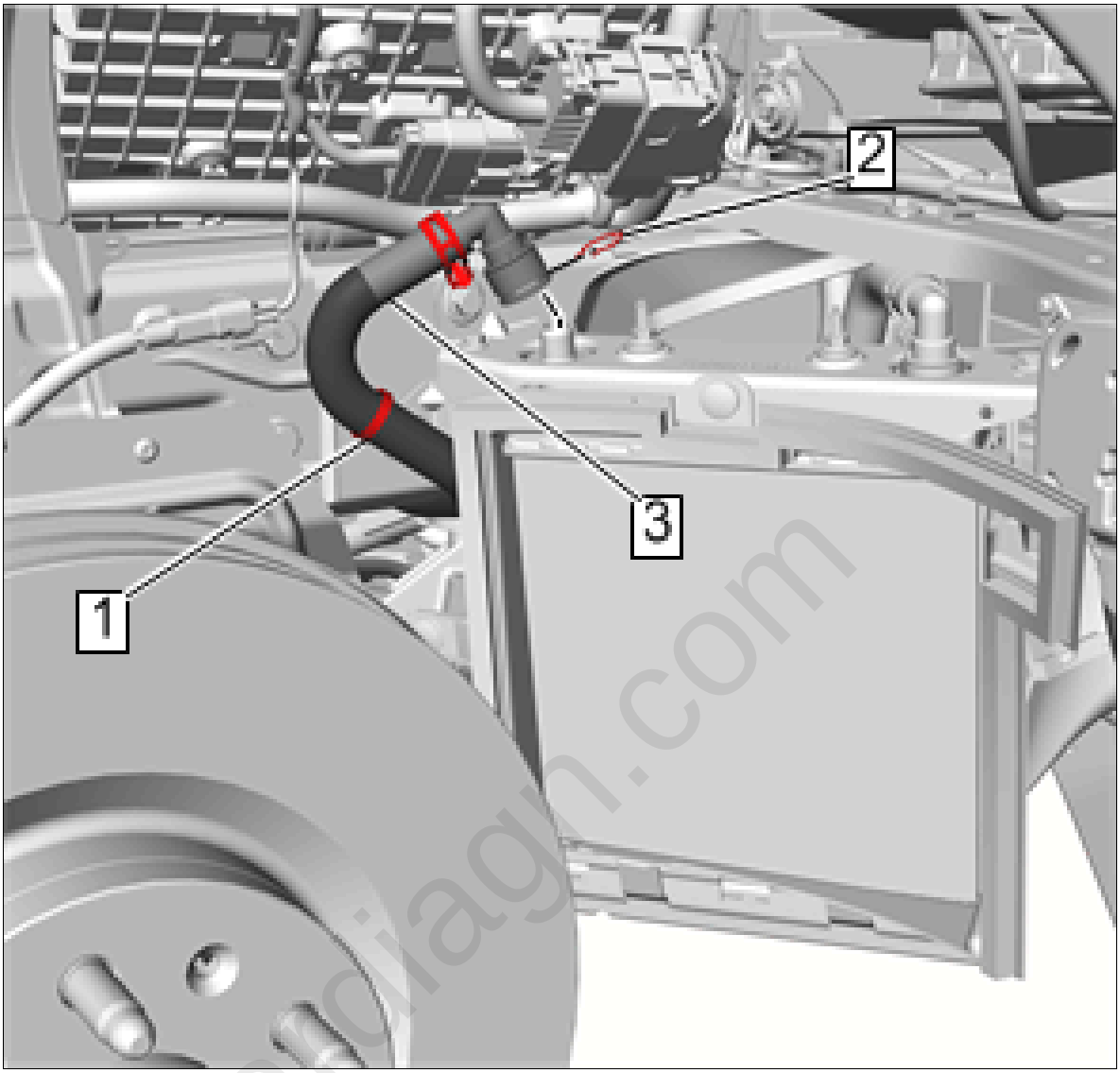


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6. Remove Front Wheelhouse Liner Replacement (4)

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Fig 5: Radiator Inlet Hose Retainer

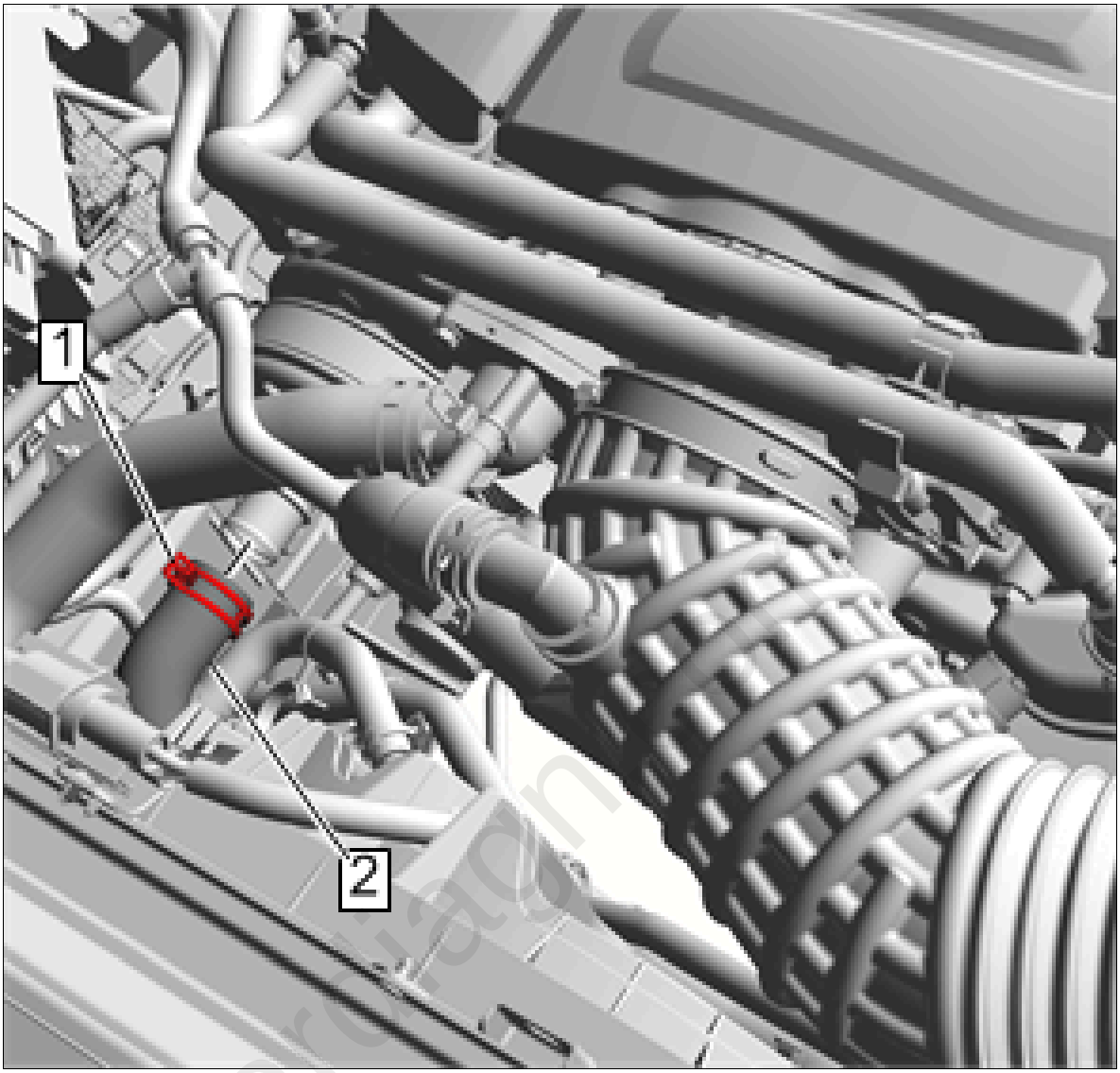


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7. Remove Retainer (1)
8. Remove the retainer from the quick connect fitting (2)
9. Remove Radiator Outlet Hose (3)
10. Remove Air Cleaner Assembly Replacement
11. Remove Air Cleaner Outlet Duct - Air Cleaner Resonator Replacement (Air Cleaner Outlet Duct to Engine)Air Cleaner Resonator Replacement (Diagonal Brace to Air Cleaner Resonator)Air Cleaner Resonator Replacement (Dash to Diagonal Brace)

Fig 6: Radiator Outlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

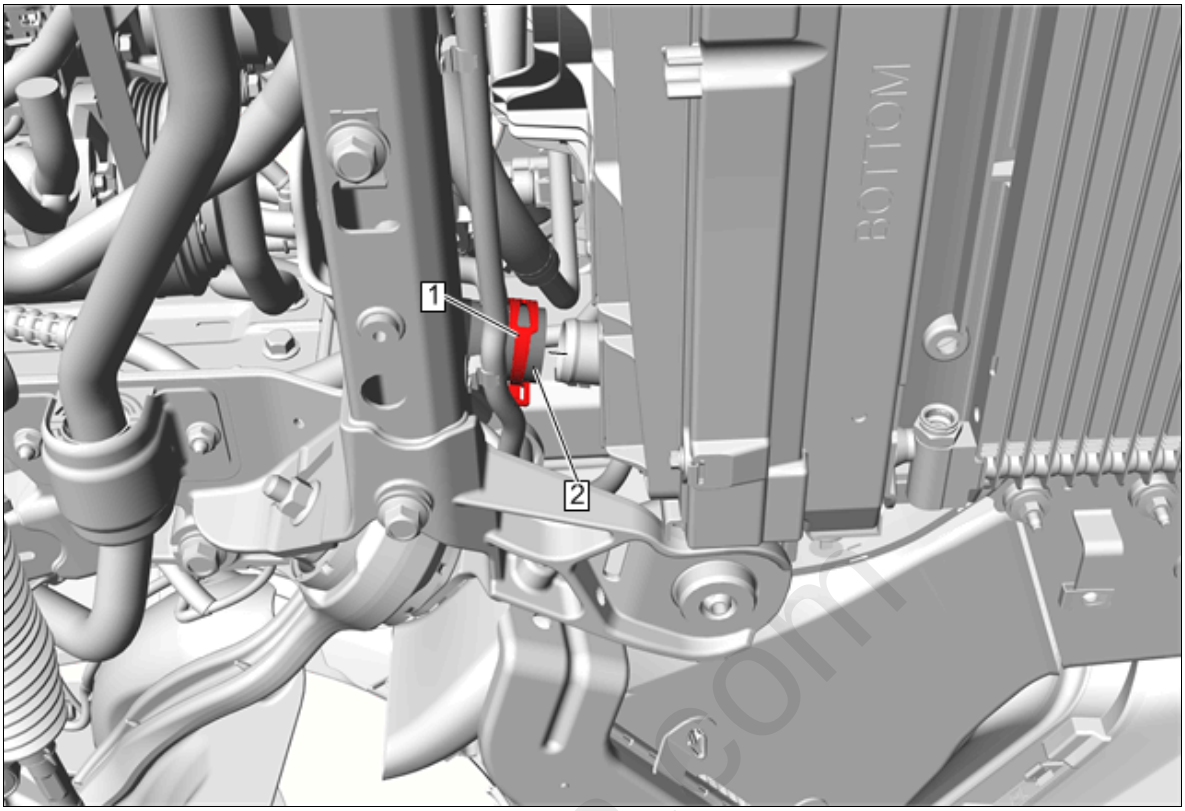
12. Disengage Radiator Outlet Hose Clamp (1)

    Use the **BO-38185** Hose Clamp Pliers

13. Remove Radiator Outlet Hose (2) at Water Pump Inlet Pipe

14. Remove Hose Clip at Engine Coolant Fan Shroud

Fig 7: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

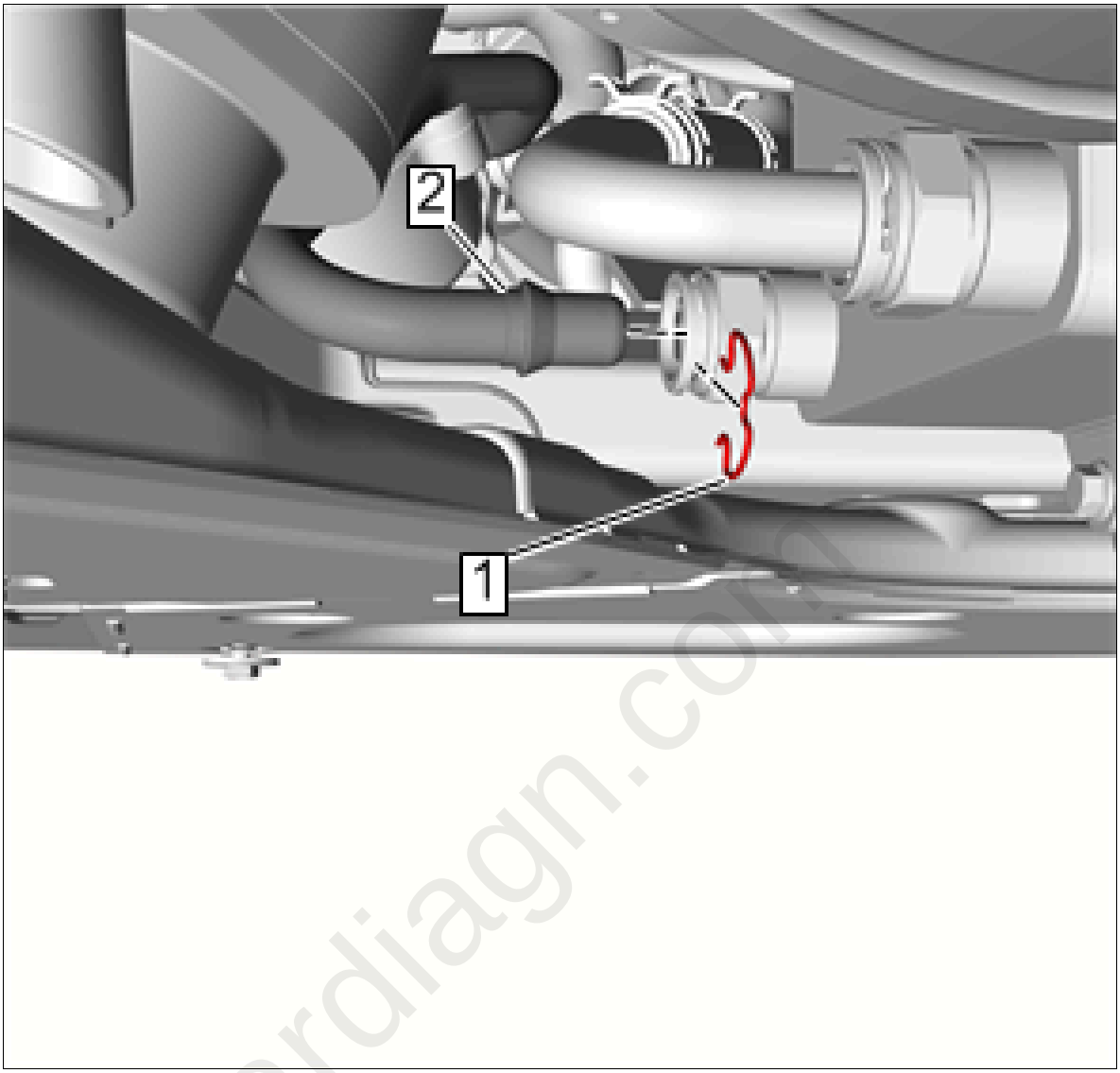
15. Disengage Radiator Outlet Hose Clamp (1)

    Use the **GE-47622** Hose Clamp Pliers.

16. Remove Radiator Outlet Hose (2) at Radiator Assembly

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Fig 8: Engine Oil Cooler Coolant Outlet Hose



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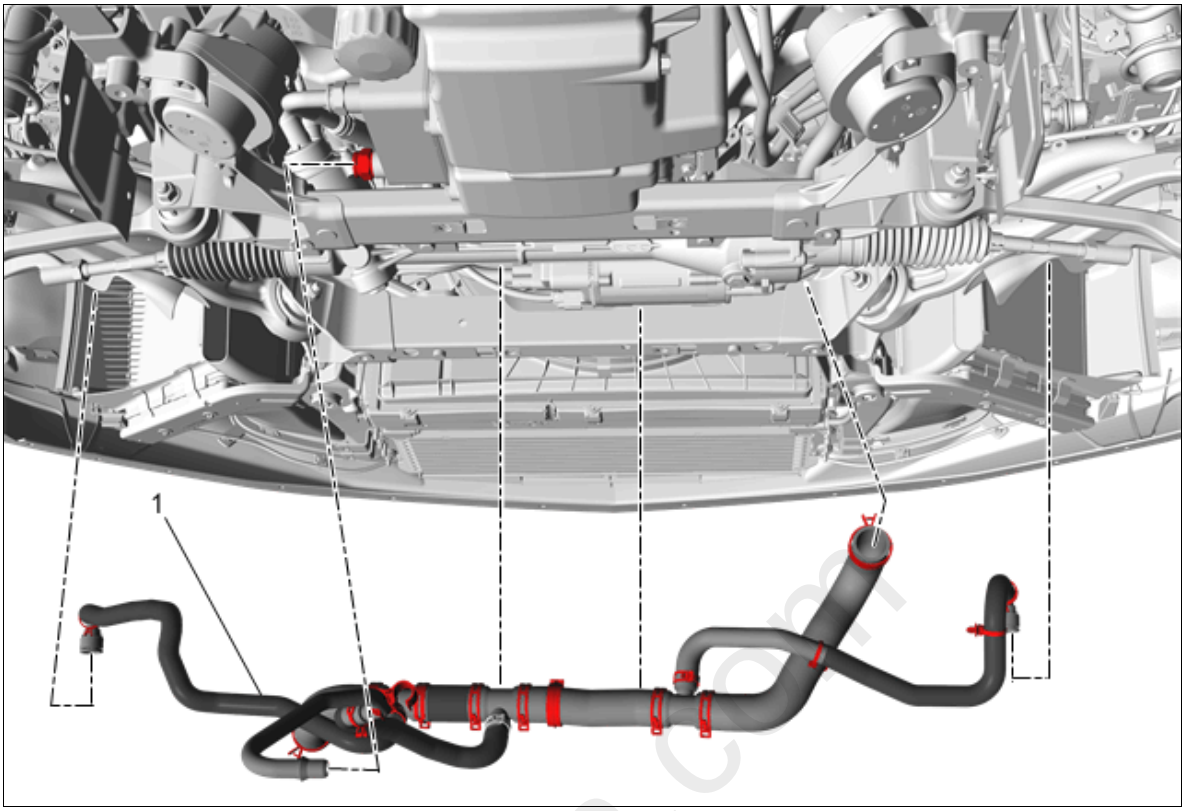
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NOTE:

The engine oil cooler pipe/hose quick connect fitting must be replaced whenever the pipe/hose is removed.

17. Remove Engine Oil Cooler Hose Connector Retainer (1)
18. Remove Engine Oil Cooler Coolant Outlet Hose (2) at Engine Oil Cooler
19. Remove Engine Oil Cooler Coolant Outlet Hose Clip
20. Replace the engine oil cooler pipe/hose quick connect fitting. Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement (LT1)

Fig 9: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

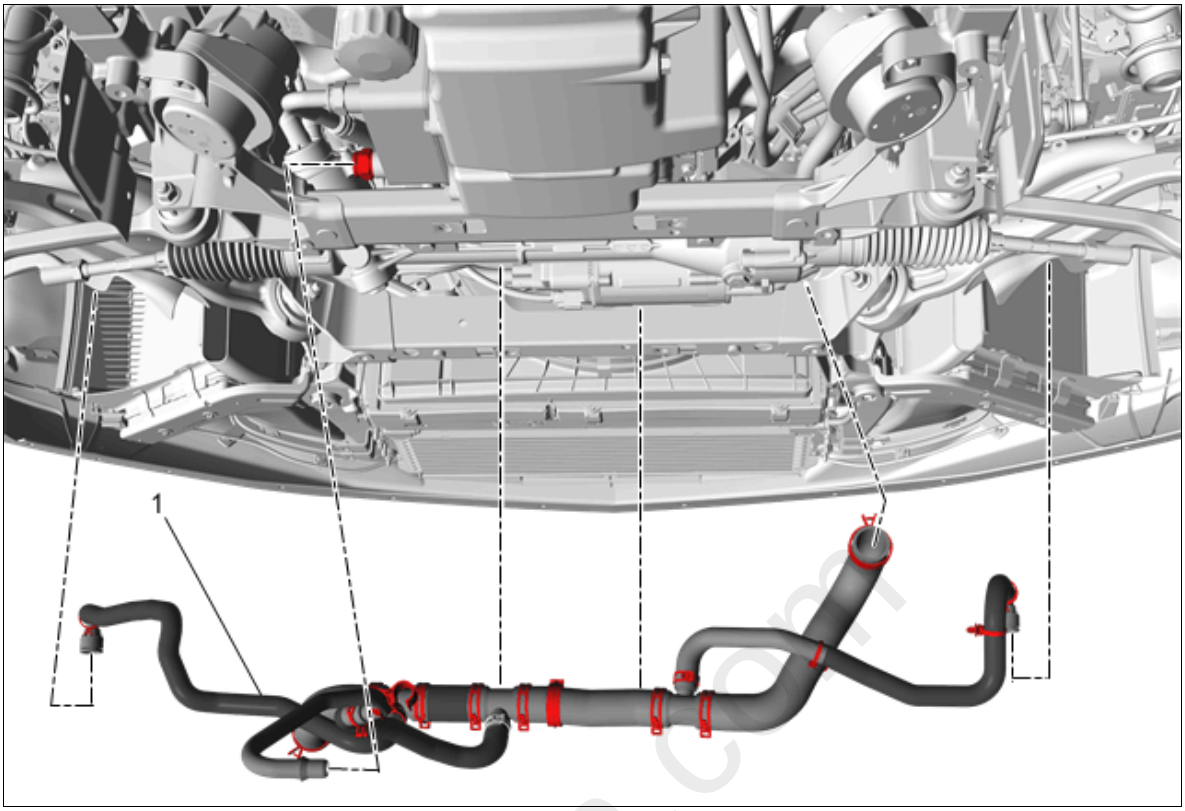
21. Remove Radiator Outlet Hose Assembly (1)

    Maneuver the radiator outlet hose assembly out from the lower engine compartment noting the routing of the hose.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LT1 V18 V03) > INSTALLATION PROCEDURE

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Fig 1: Radiator Outlet Hose



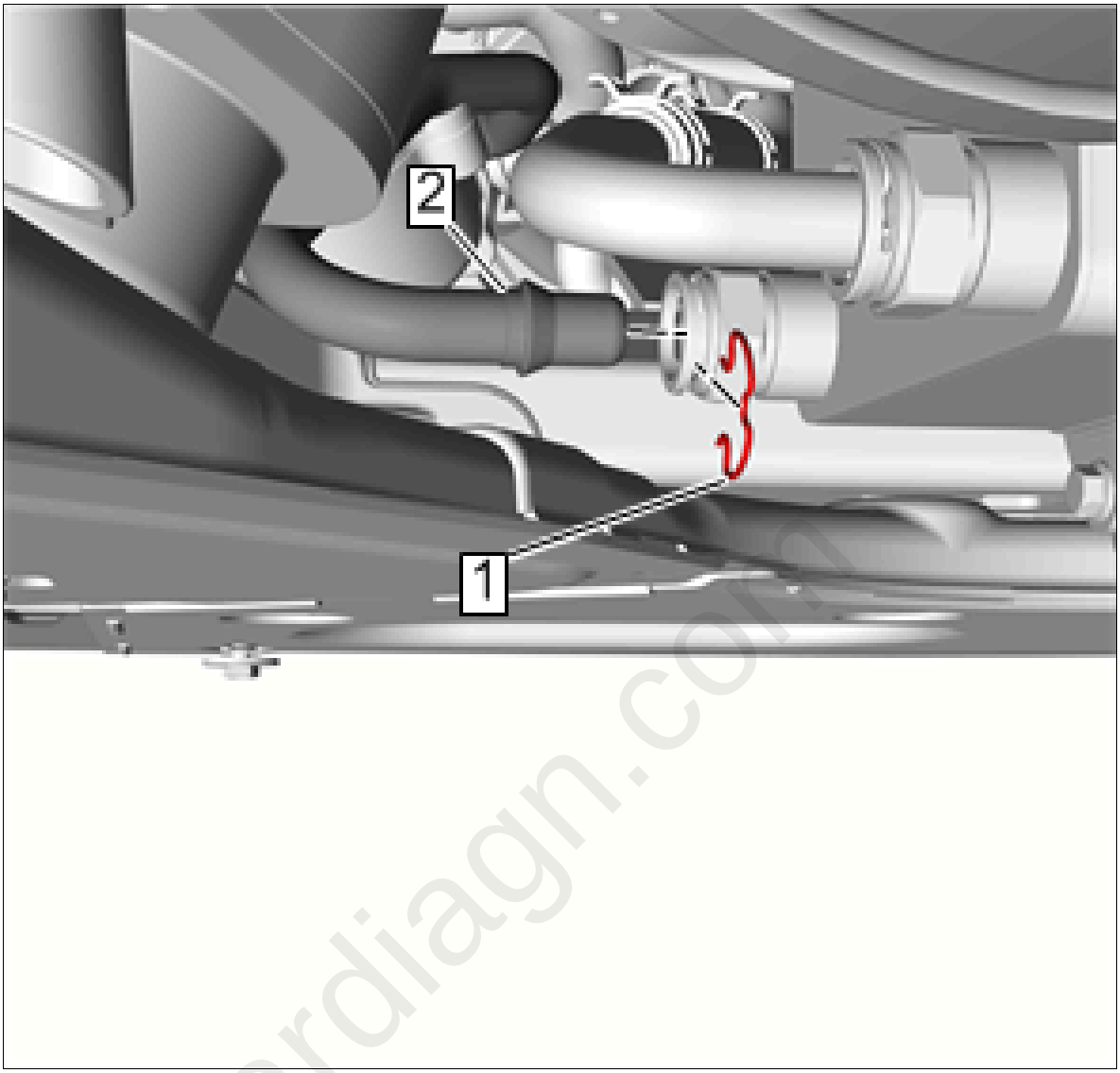
Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose Assembly (1)

   Maneuver the radiator outlet hose assembly back into the lower engine compartment to the original routing of the hose.

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Fig 2: Engine Oil Cooler Coolant Outlet Hose

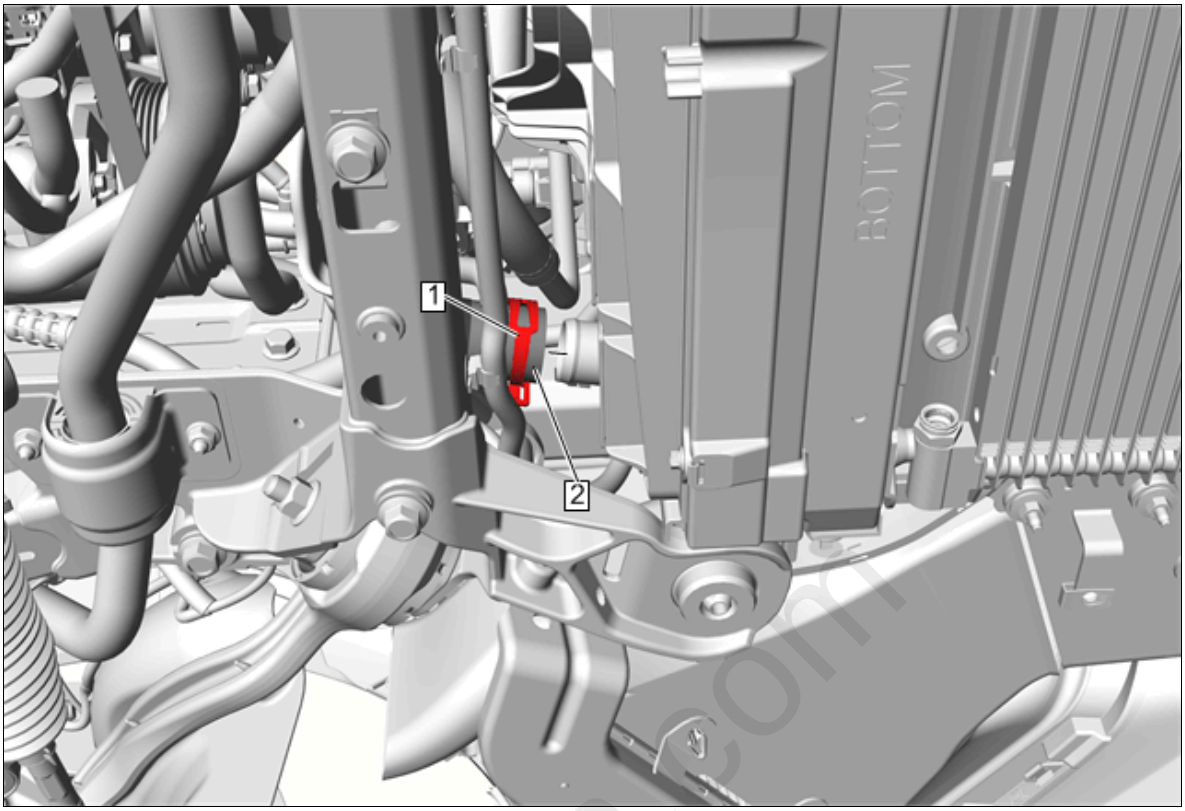


Courtesy of GENERAL MOTORS COMPANY

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2. Install Engine Oil Cooler Hose Connector Retainer (1)
3. Install Engine Oil Cooler Coolant Outlet Hose (2) at Engine Oil Cooler
4. Install Engine Oil Cooler Coolant Outlet Hose Clip

Fig 3: Radiator Outlet Hose



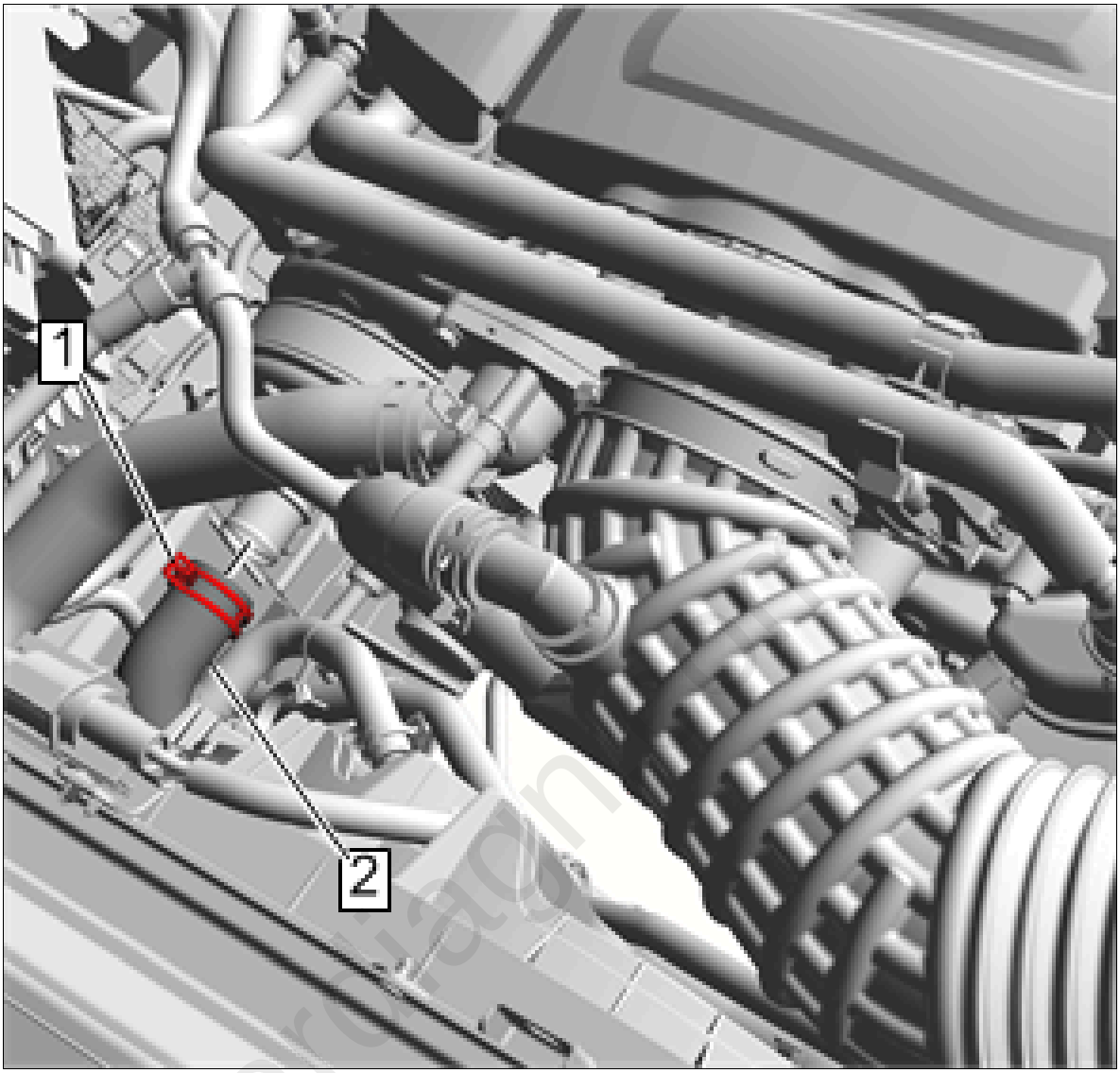
Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Outlet Hose (2) at Radiator Assembly
6. Engage Radiator Outlet Hose Clamp (1)

   Use the **GE-47622** Hose Clamp Pliers.

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Fig 4: Radiator Outlet Hose

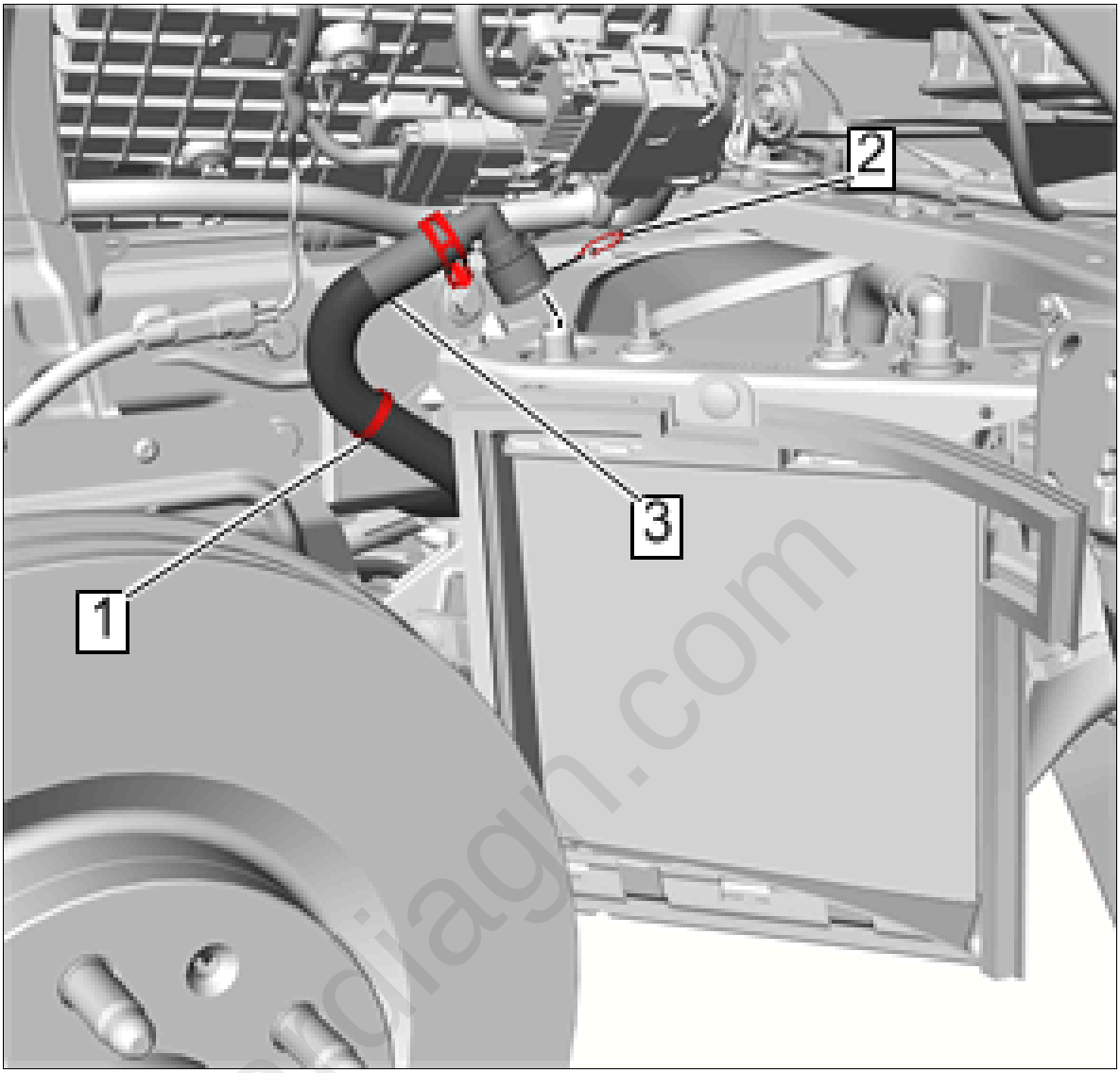


Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Outlet Hose (2) at Water Pump Inlet Pipe
8. Engage Radiator Outlet Hose Clamp (1)

   Use the **BO-38185** Hose Clamp Pliers
9. Install Hose Clip at Engine Coolant Fan Shroud

Fig 5: Radiator Inlet Hose Retainer

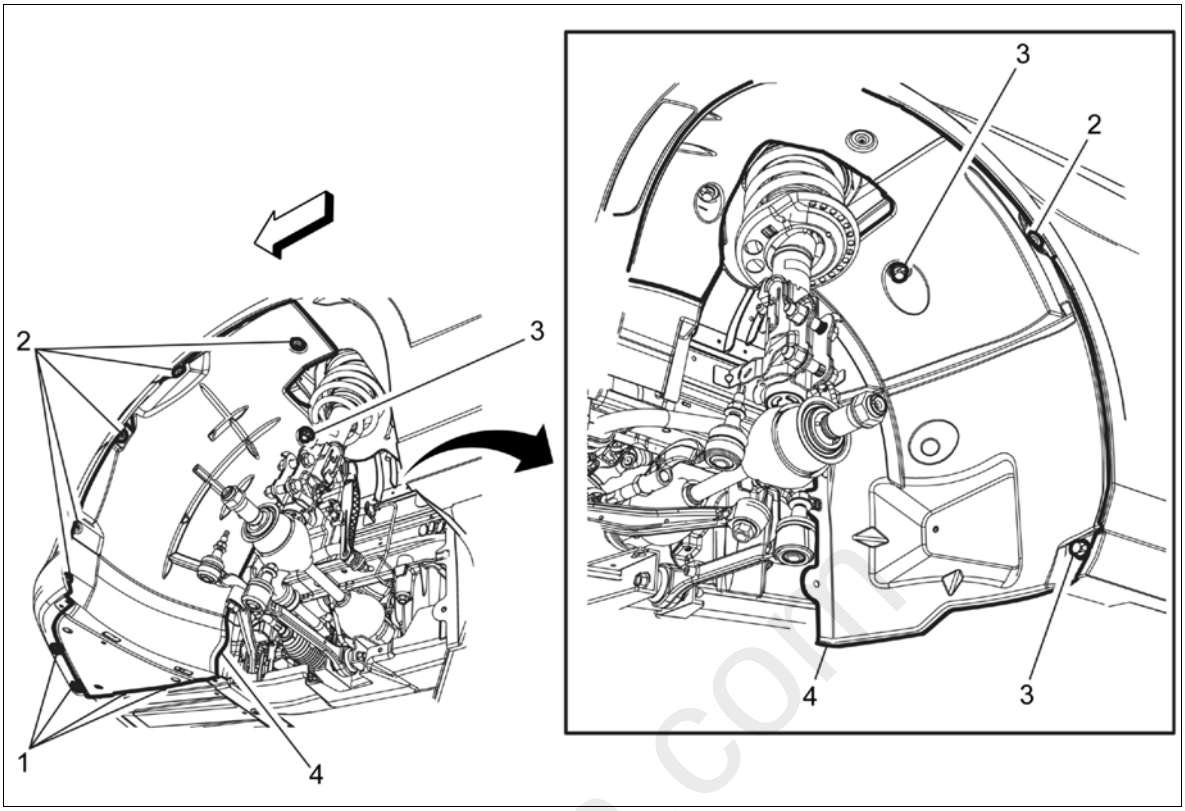


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10. Install Retainer (2) Quick Connect Fitting
11. Install Radiator Outlet Hose (3)
12. Install Retainer (1)

Fig 6: Front Wheelhouse Liners

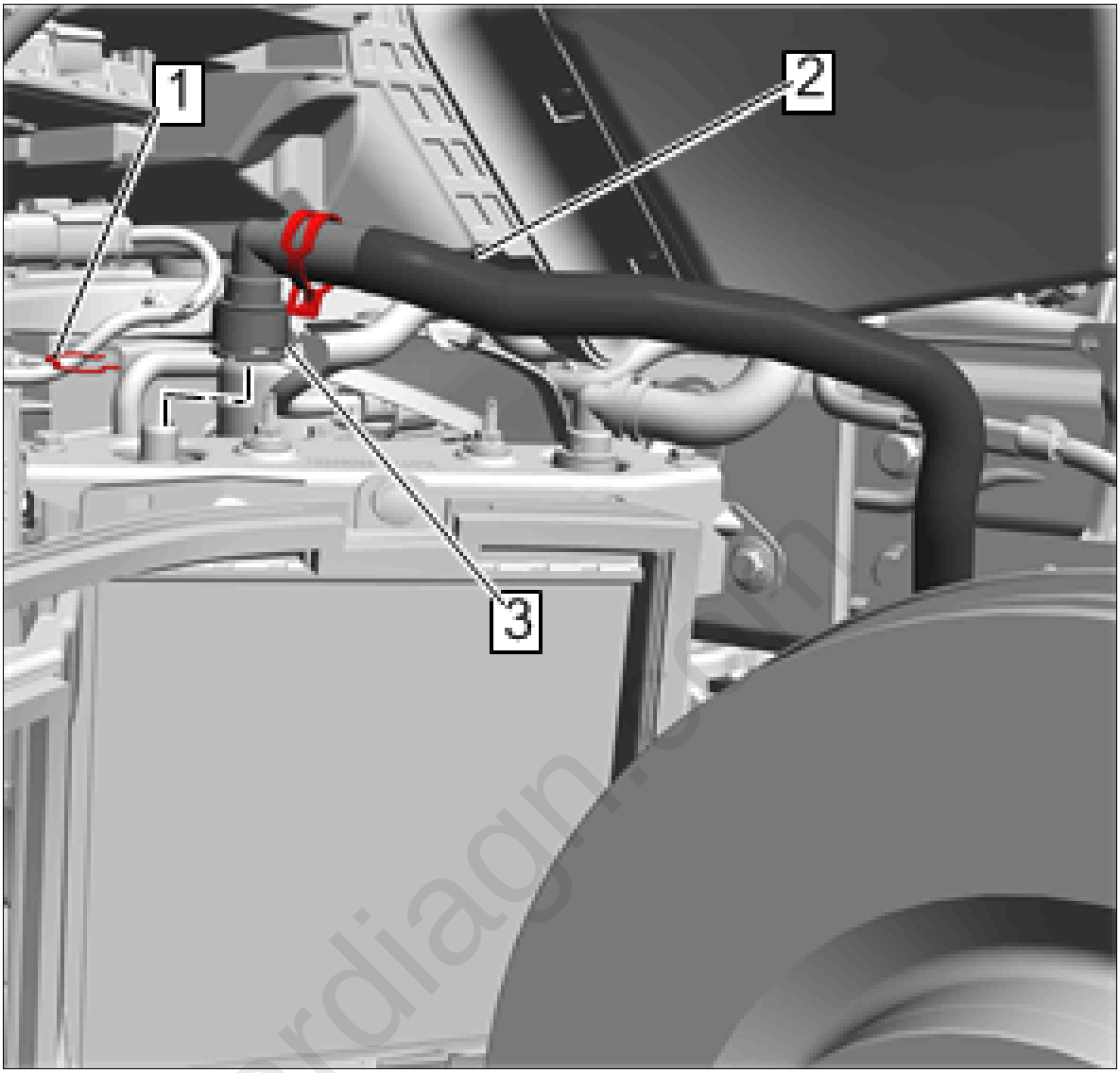


Courtesy of GENERAL MOTORS COMPANY

13. Install Front Wheelhouse Liner Replacement - Right Side (4)

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Fig 7: Radiator Outlet Hose

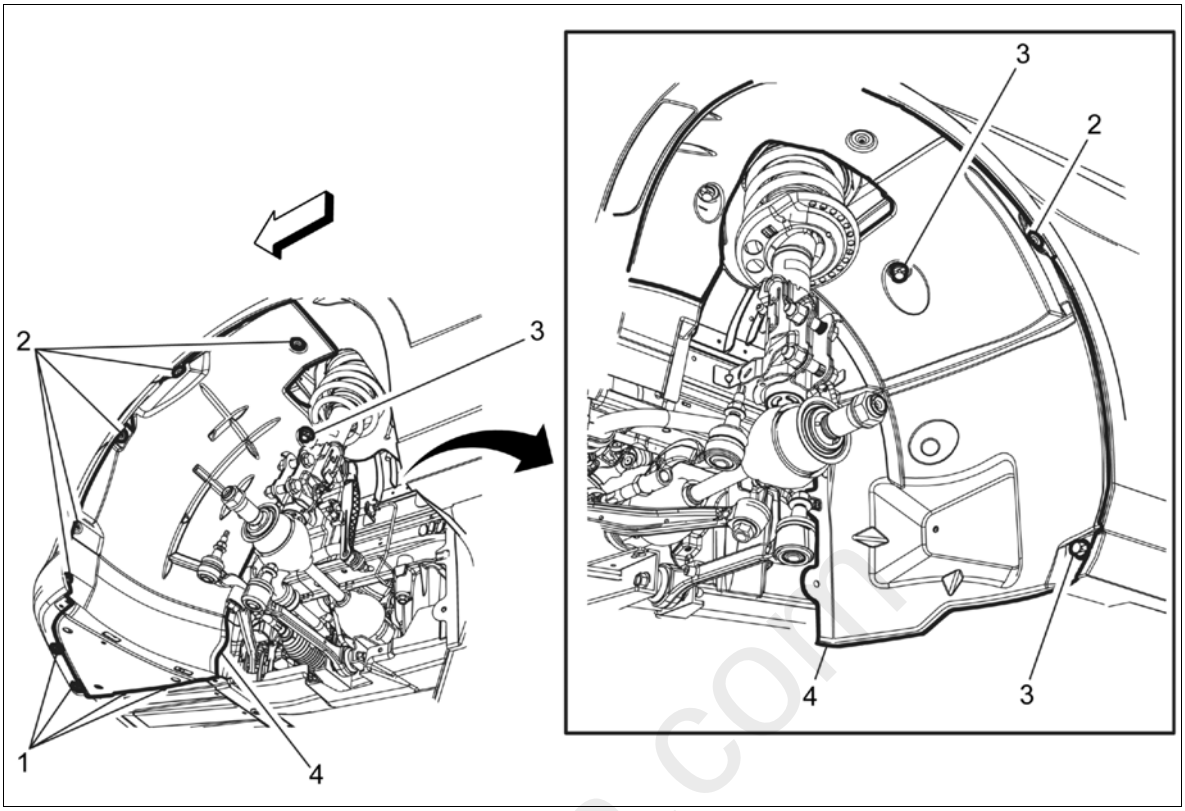


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14. Install Retainer (1) at Quick Connect Fitting (3)
15. Install Radiator Outlet Hose (2)

Fig 8: Front Wheelhouse Liners

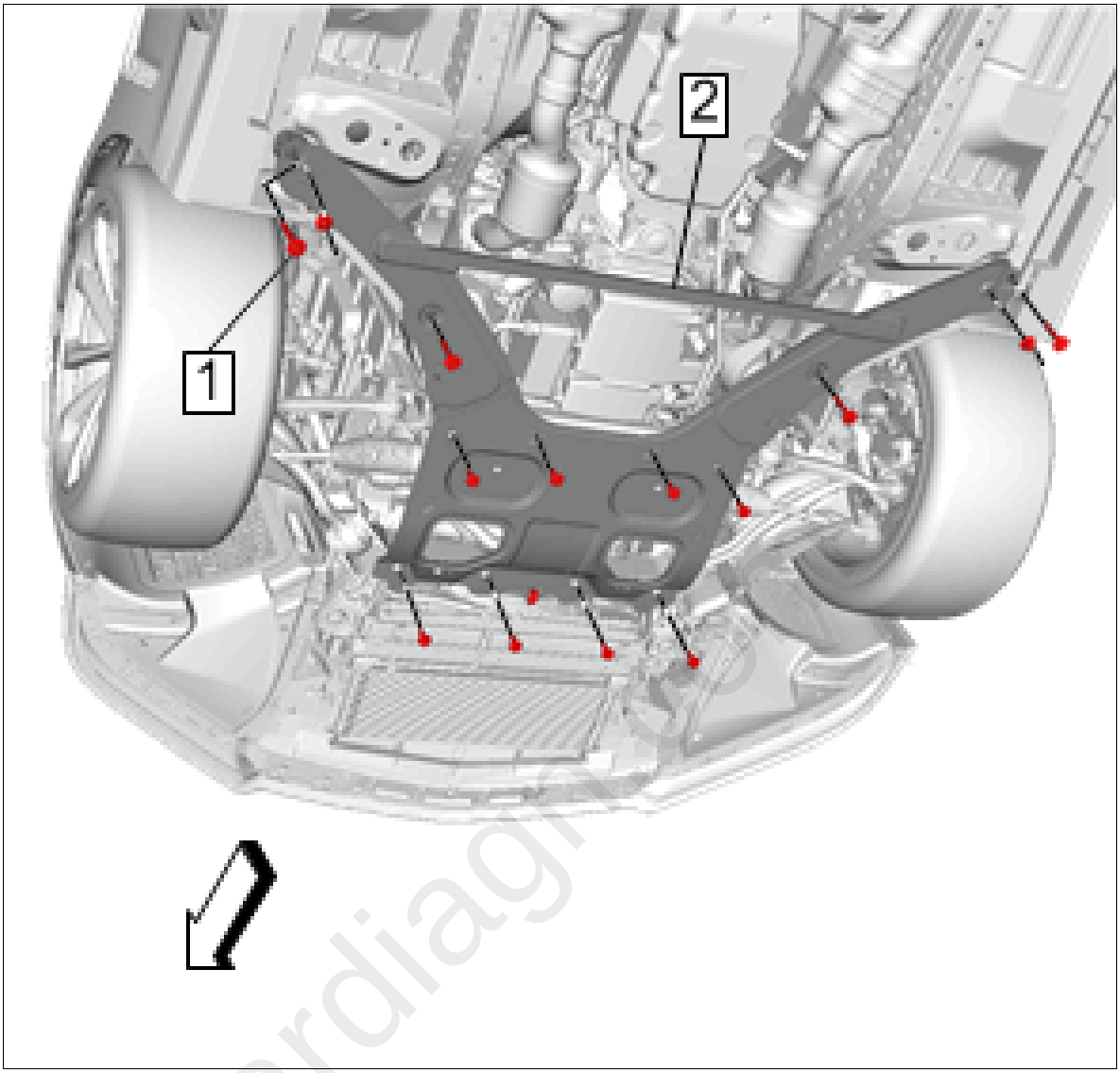


Courtesy of GENERAL MOTORS COMPANY

16. Install Front Wheelhouse Liner Replacement - Left Side (4)

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Fig 9: Front Cradle Shear Plate Fastener



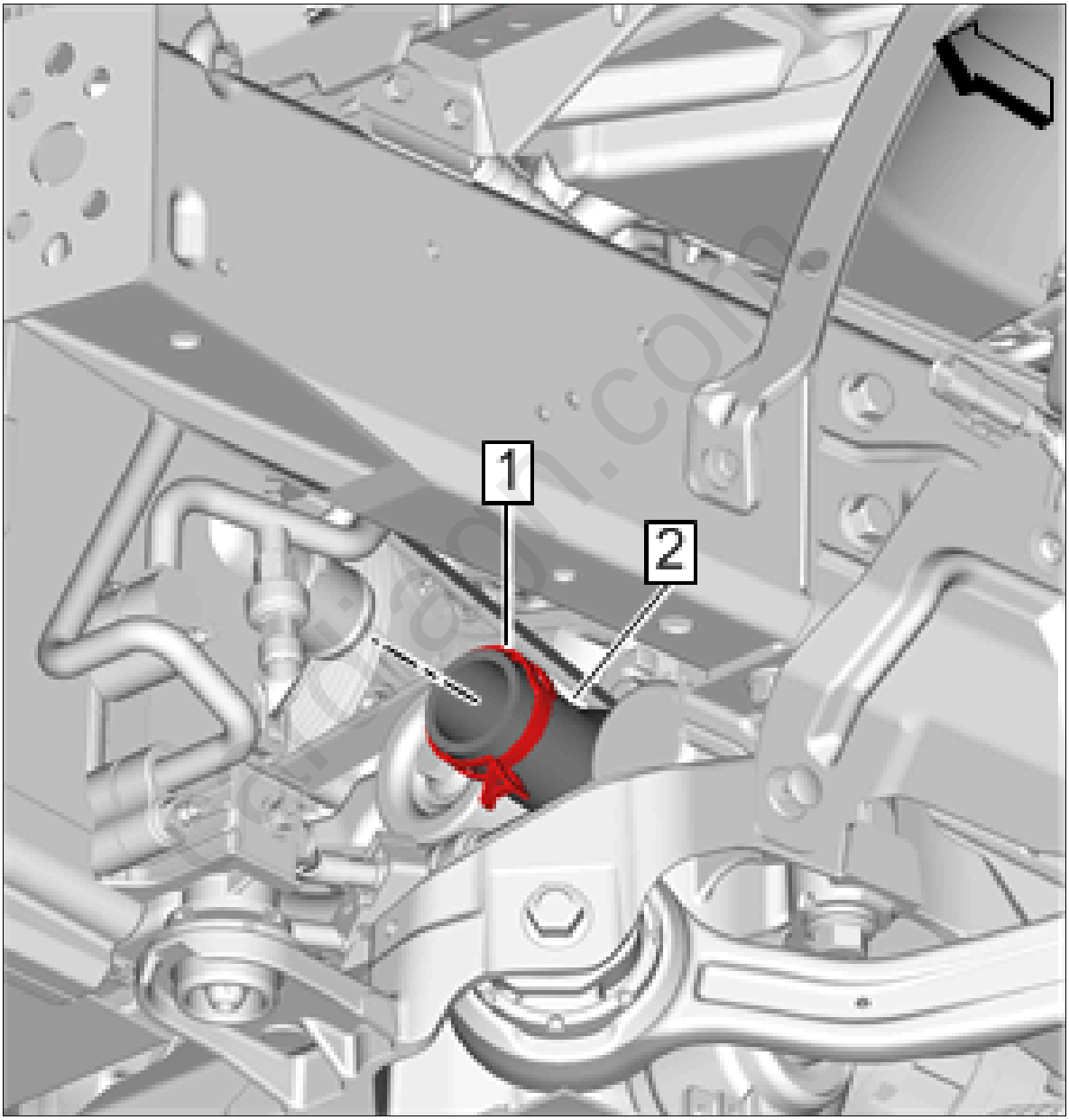
Courtesy of GENERAL MOTORS COMPANY

17. Install Front Cradle Shear Plate Replacement
18. Install Air Cleaner Outlet Duct - Air Cleaner Resonator Replacement (Air Cleaner Outlet Duct to Engine)Air Cleaner Resonator Replacement (Diagonal Brace to Air Cleaner Resonator)Air Cleaner Resonator Replacement (Dash to Diagonal Brace)
19. Install Air Cleaner Assembly Replacement
20. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
21. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITHOUT V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Air Cleaner Assembly - Air Cleaner Assembly Replacement
3. Remove Front Wheelhouse Liner - Front Wheelhouse Liner Replacement
4. Remove Front Compartment Air Deflector - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)

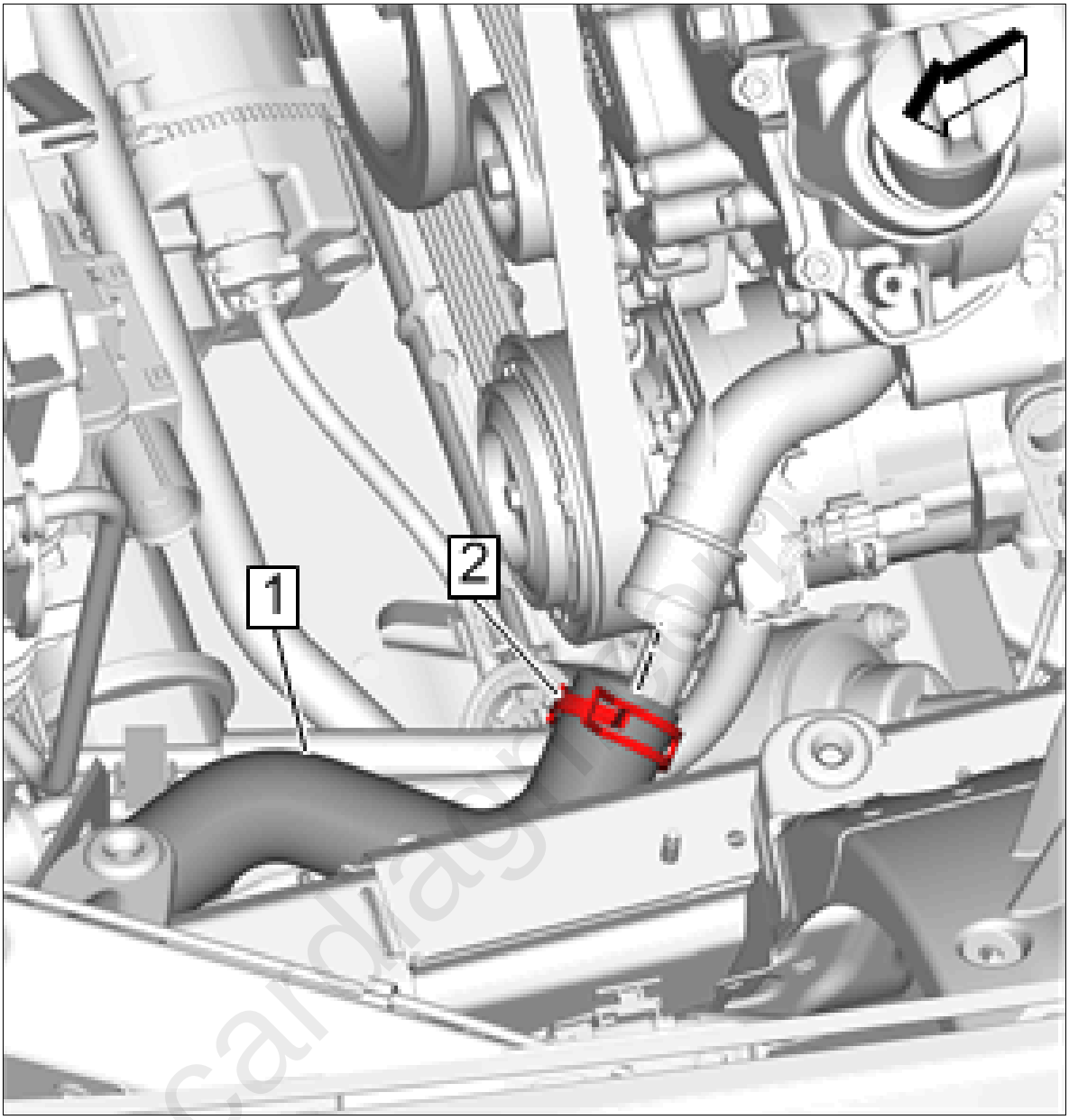
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Disengage Hose Clamp (1) at Radiator - Hose Clamp Replacement Guidelines - Spring Type
6. Remove Radiator Outlet Hose (2) at Radiator

Fig 2: Radiator Outlet Hose

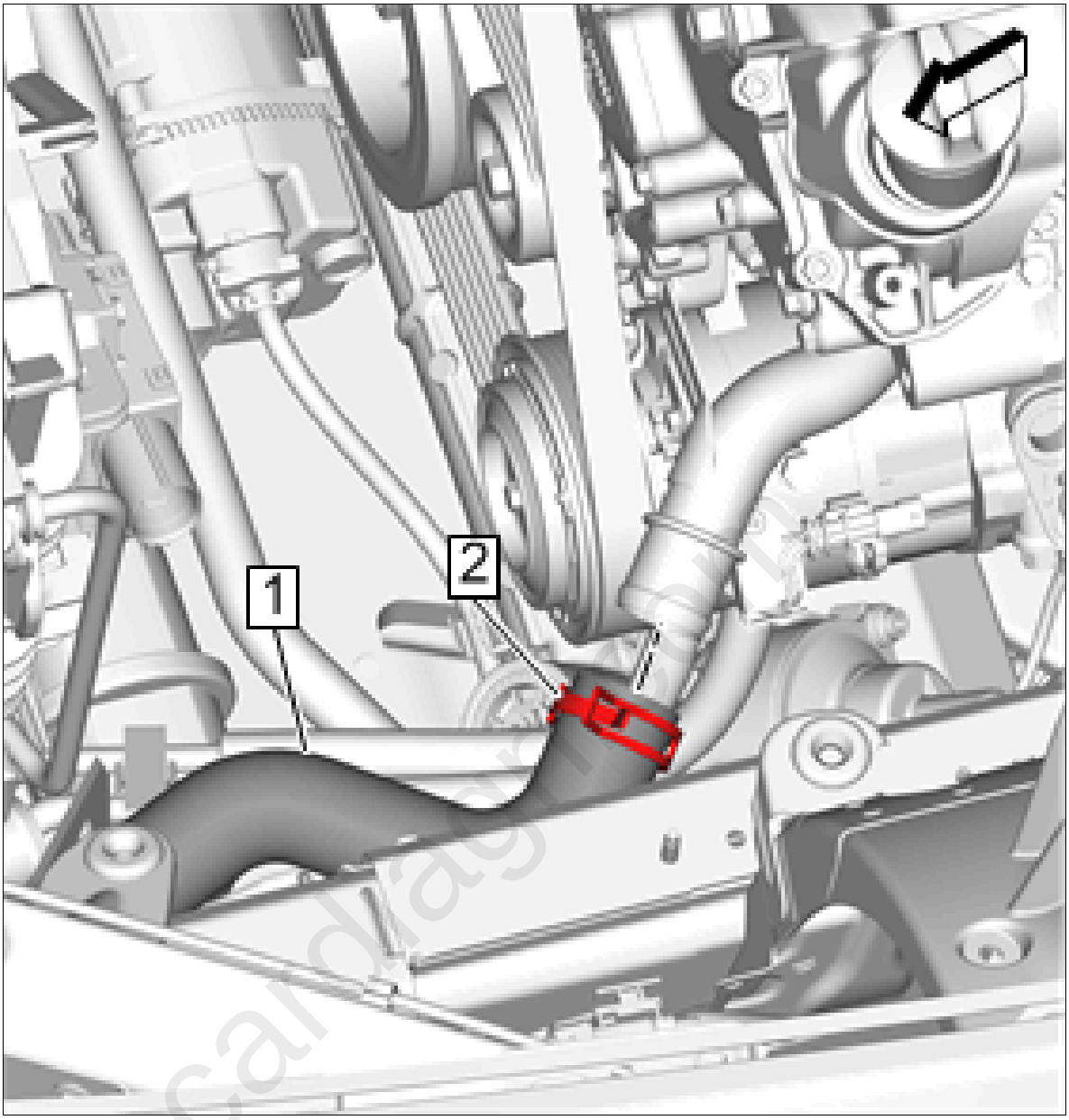


Courtesy of GENERAL MOTORS COMPANY

7. Engage Hose Clamp (2) at Water Pump Inlet Pipe - Hose Clamp Replacement Guidelines - Spring Type
8. Remove Radiator Outlet Hose (1) at Water Pump Inlet Pipe

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITHOUT V18) > INSTALLATION PROCEDURE

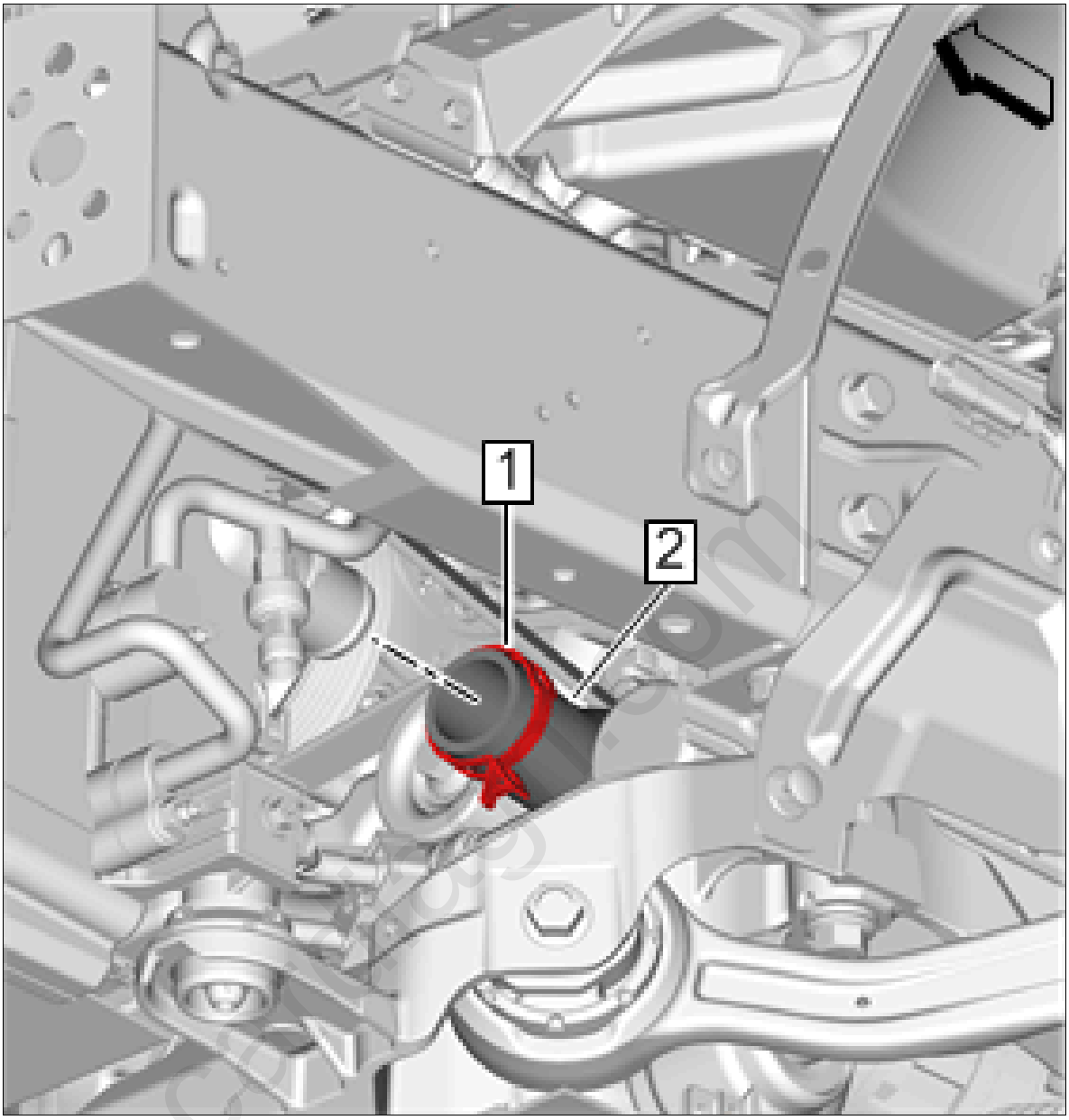
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (1) at Water Pump Inlet Pipe
2. Engage Hose Clamp (2) at Water Pump Inlet Pipe - Hose Clamp Replacement Guidelines - Spring Type

Fig 2: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Outlet Hose (2) at Radiator
4. Engage Hose Clamp (1) at Radiator - Hose Clamp Replacement Guidelines - Spring Type
5. Install Front Compartment Air Deflector - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)
6. Install Front Wheelhouse Liner - Front Wheelhouse Liner Replacement
7. Install Air Cleaner Assembly - Air Cleaner Assembly Replacement
8. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
9. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITH V18)

Special Tools

GE-47622 Hose Clamp Pliers

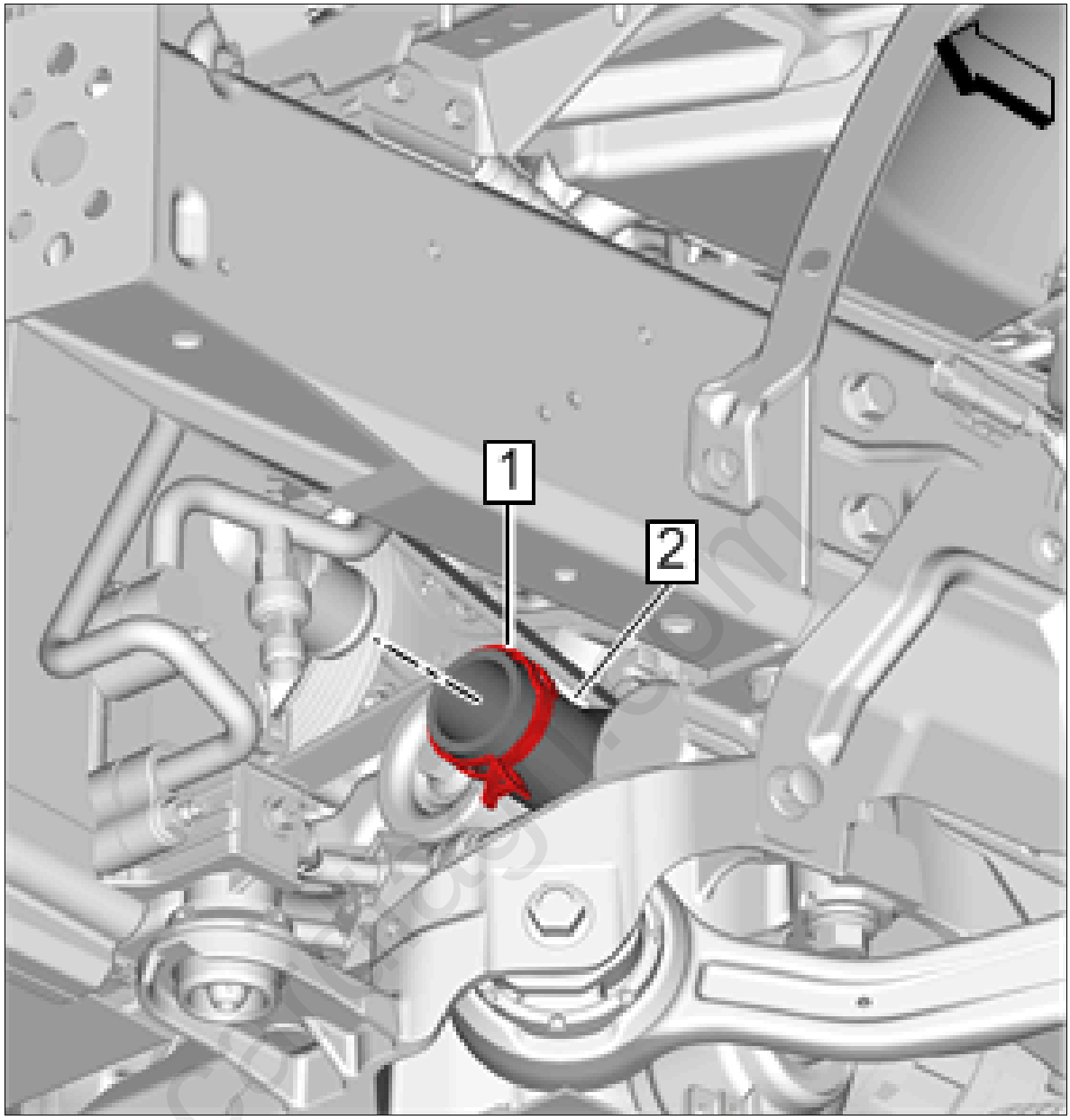
Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Air Cleaner Assembly Replacement
3. Remove Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)

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Fig 1: Radiator Outlet Hose



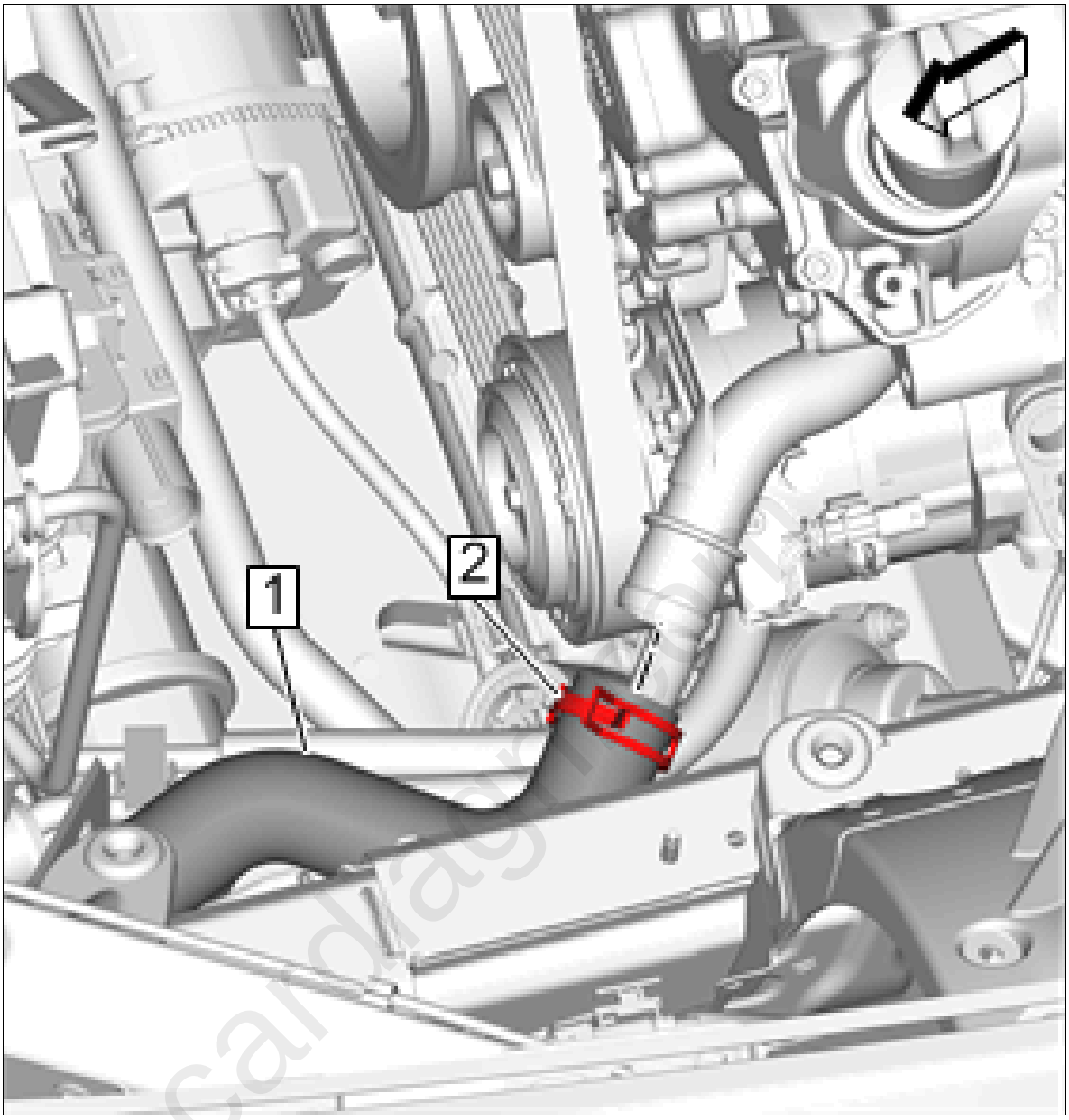
Courtesy of GENERAL MOTORS COMPANY

4. Disengage Hose Clamp (1)

   GE-47622 Hose Clamp Pliers

5. Remove Radiator Outlet Hose (2) at Radiator

Fig 2: Radiator Outlet Hose



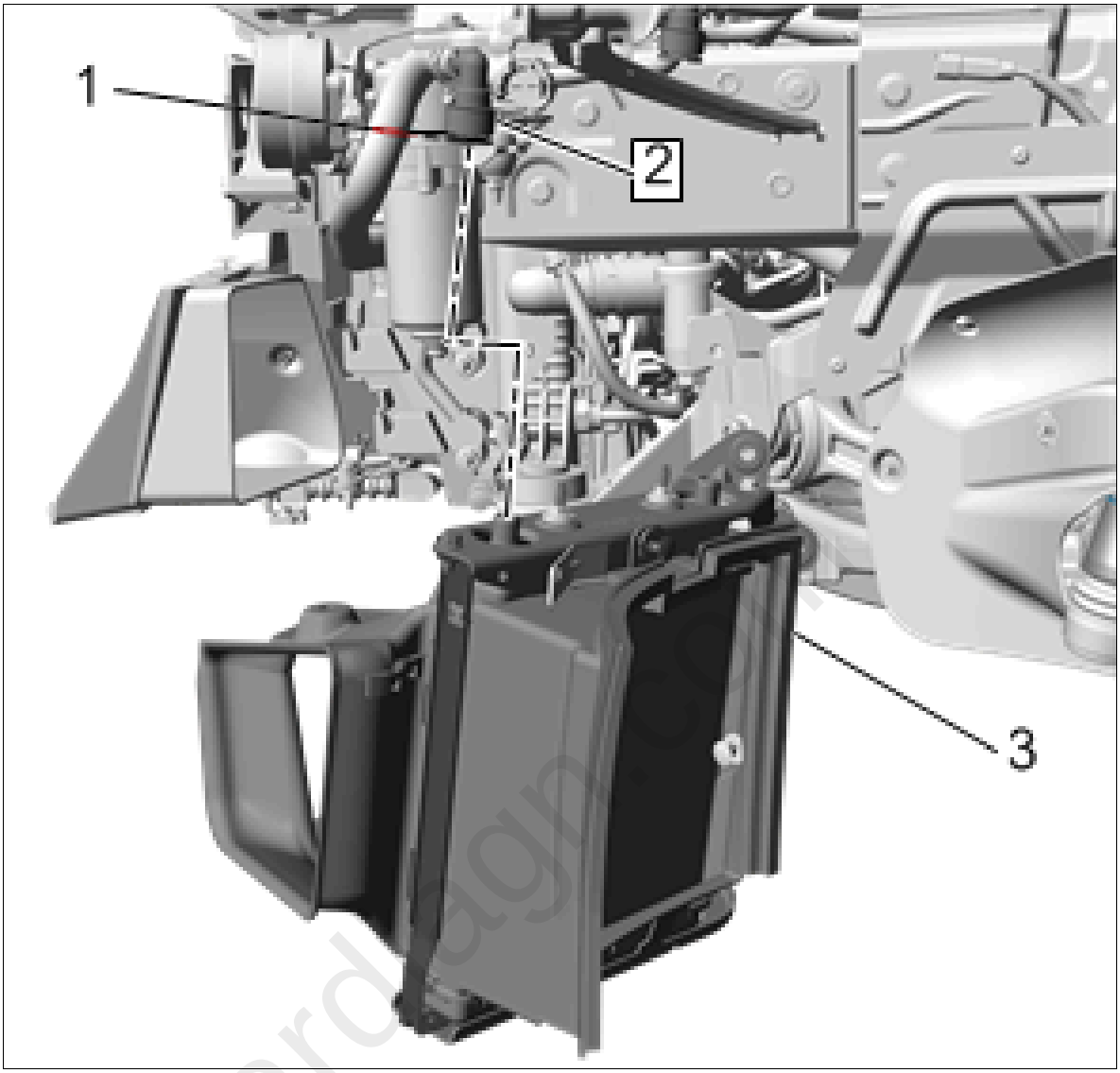
Courtesy of GENERAL MOTORS COMPANY

6. Disengage Hose Clamp (2)

   GE-47622 Hose Clamp Pliers

7. Remove Radiator Outlet Hose (1) at Water Pump Inlet Pipe

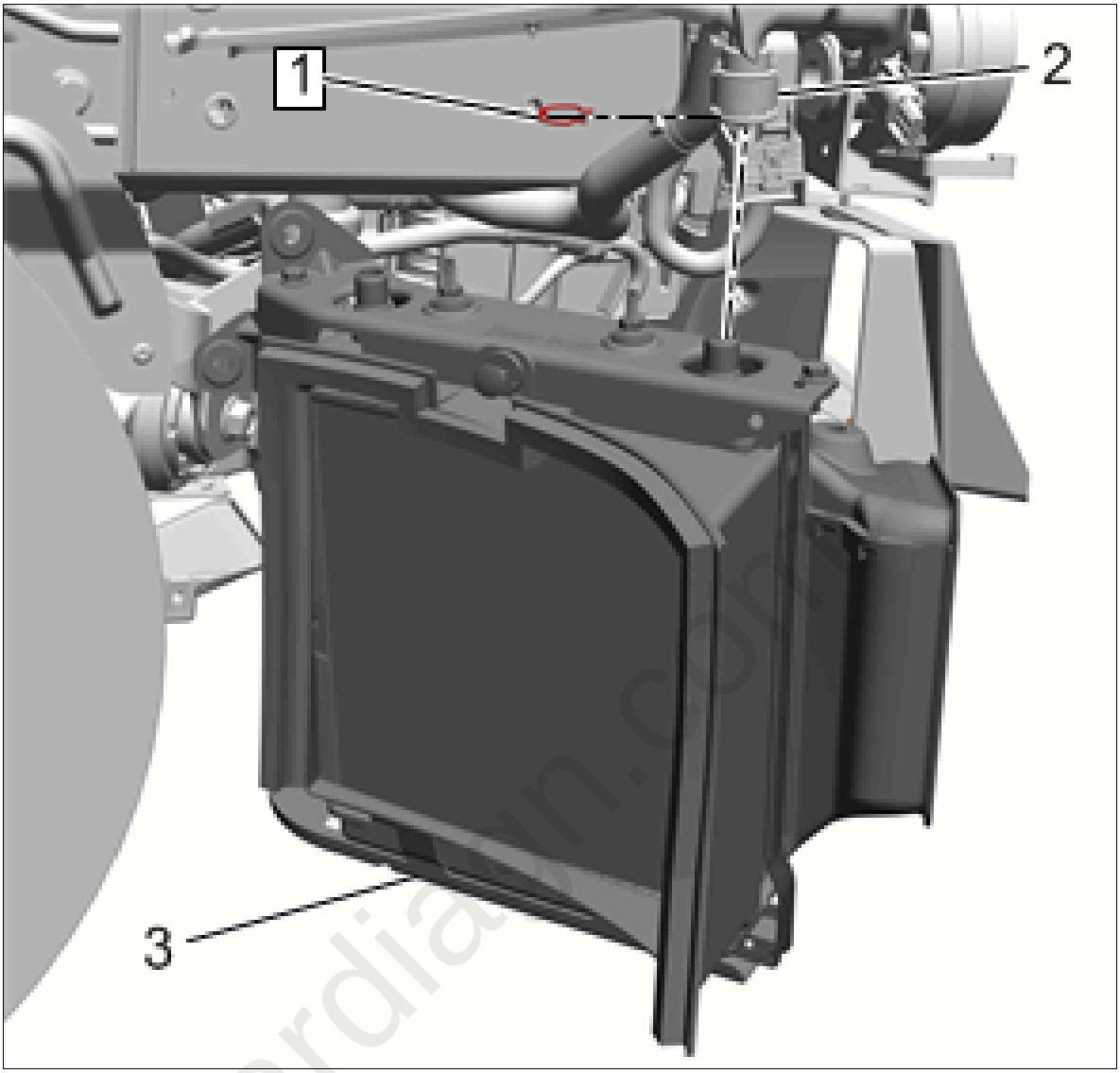
Fig 3: Charge Air Cooler Replacement - Left Side



Courtesy of GENERAL MOTORS COMPANY

8. Lower and temporary support the charge air cooler and duct assembly (3) - Charge Air Cooler Replacement - Left Side (LGX with V18)
9. Remove Radiator Outlet Hose Retainer (1)
10. Remove Radiator Outlet Hose (2)

Fig 4: Charge Air Cooler Replacement - Right Side

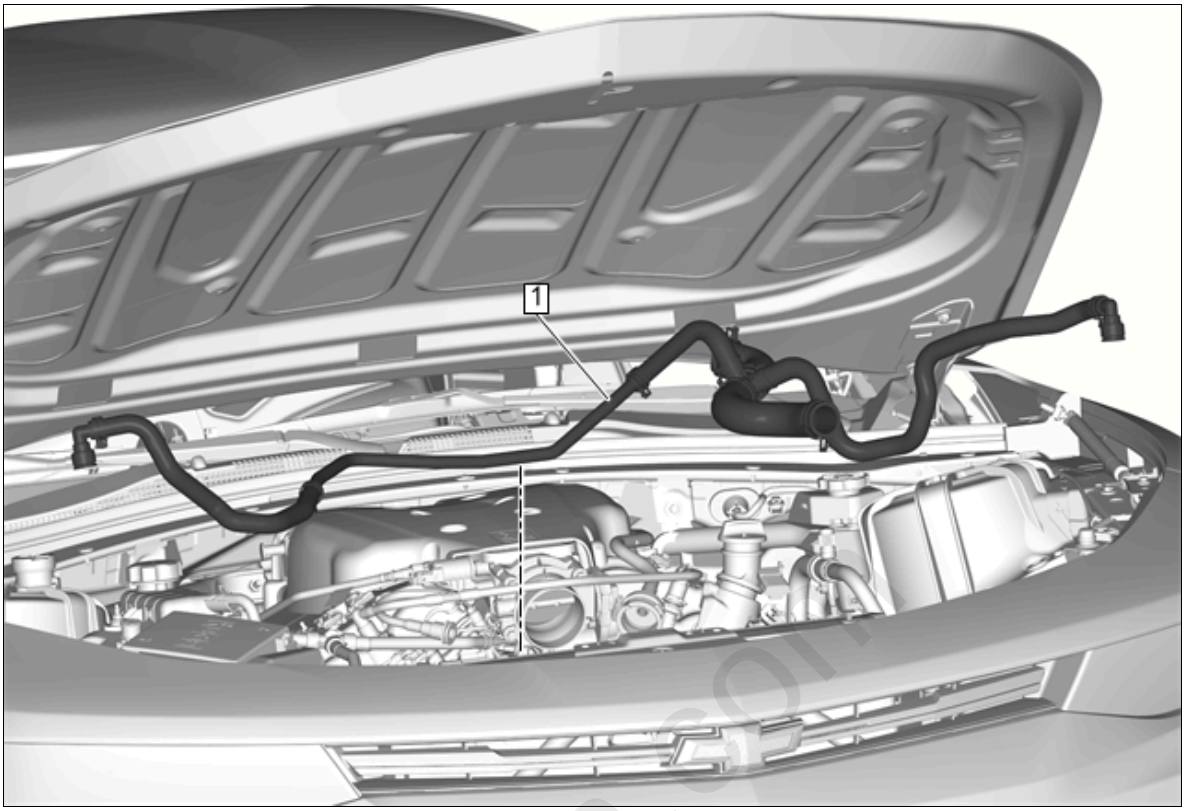


Courtesy of GENERAL MOTORS COMPANY

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11. Lower and temporary support the charge air cooler and duct assembly (3) - Charge Air Cooler Replacement - Right Side (LGX with V18, LT1)
12. Remove Radiator Outlet Hose Retainer (1)
13. Remove Radiator Outlet Hose (2)

Fig 5: Radiator Outlet Hose



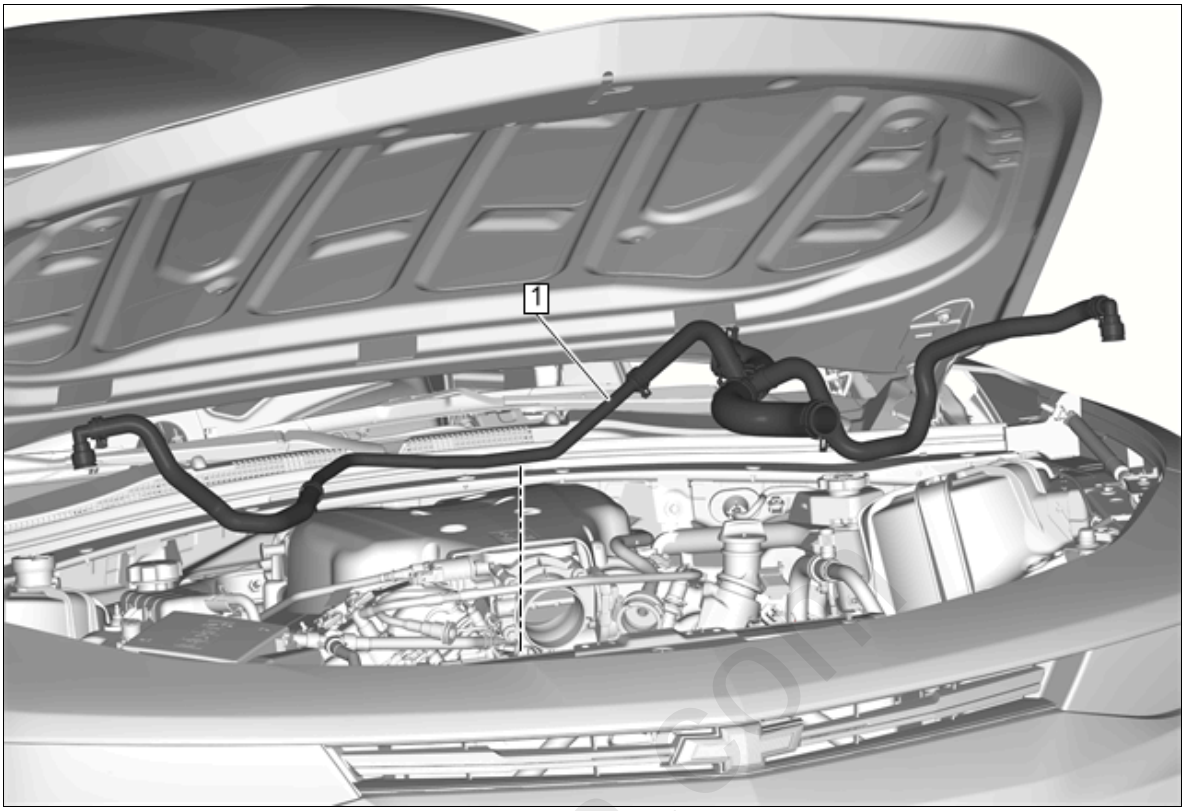
Courtesy of GENERAL MOTORS COMPANY

14. Remove the radiator outlet hose (1) from the vehicle.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITH V18) > INSTALLATION PROCEDURE

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Fig 1: Radiator Outlet Hose

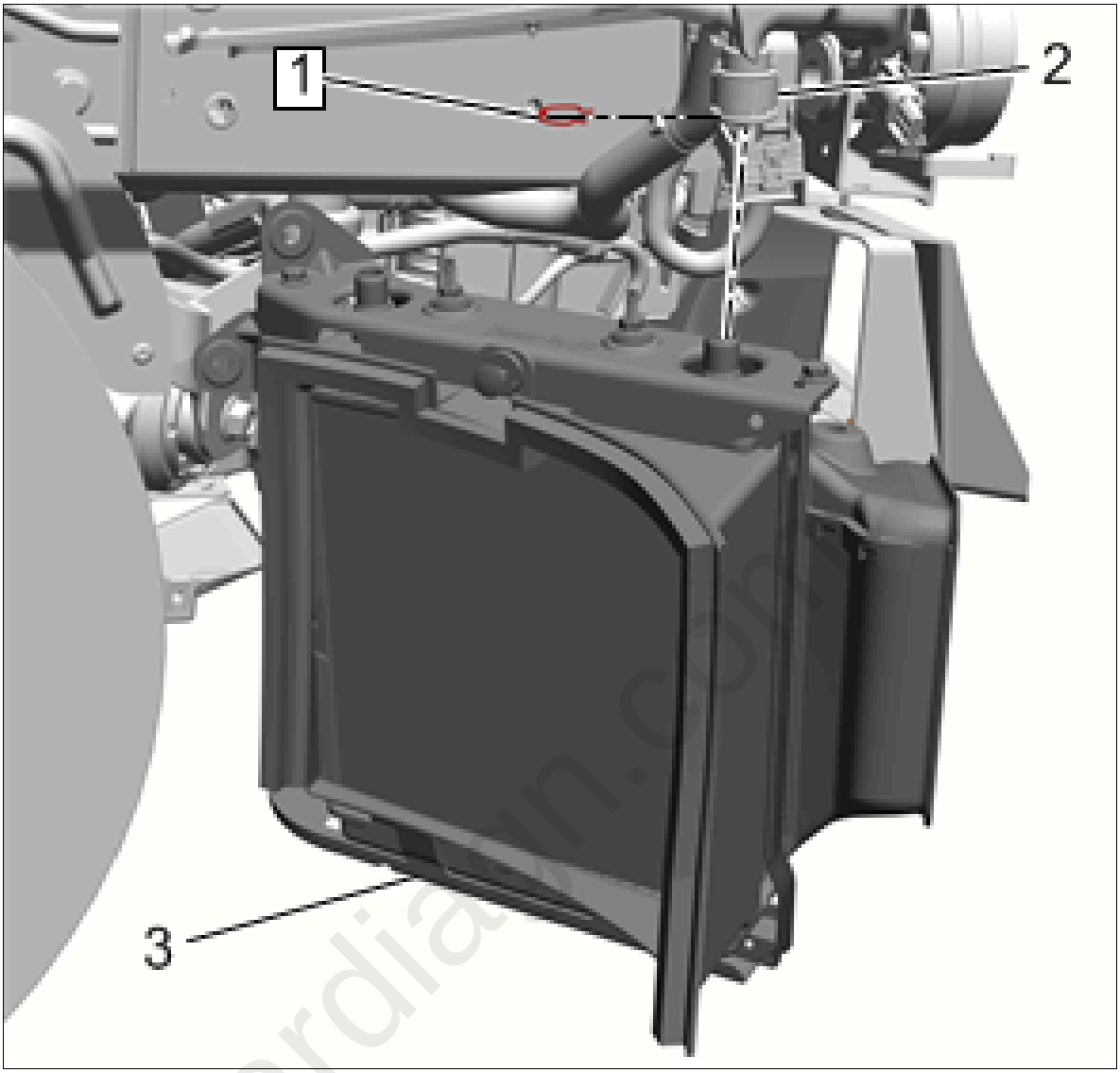


Courtesy of GENERAL MOTORS COMPANY

1. Install the radiator outlet hose (1) to the vehicle.

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Fig 2: Charge Air Cooler Replacement - Right Side

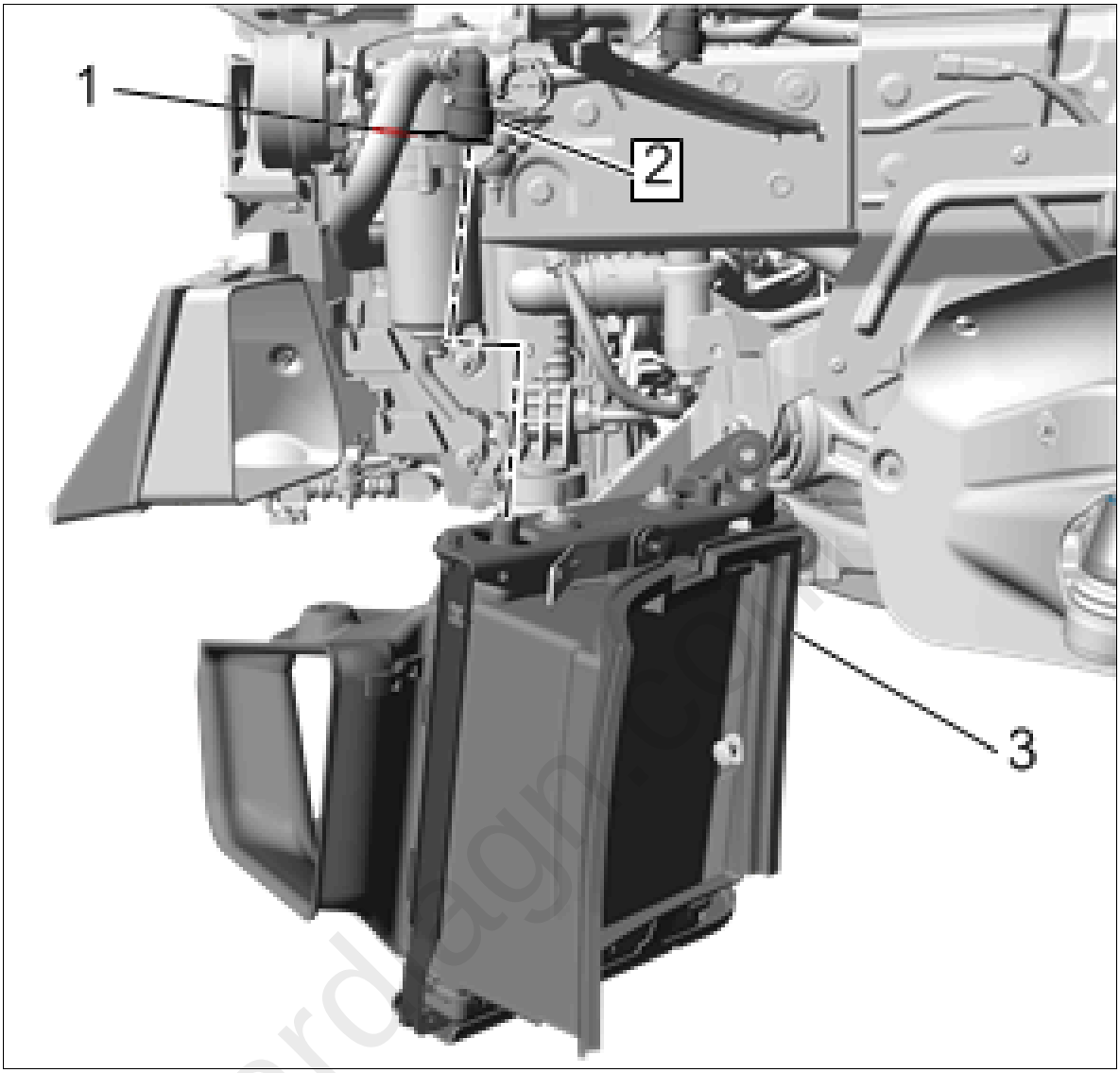


Courtesy of GENERAL MOTORS COMPANY

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2. Raise and temporary support the charge air cooler and duct assembly (3).
3. Install Radiator Outlet Hose Retainer (1)
4. Install Radiator Outlet Hose (2)
5. Install Charge Air Cooler Replacement - Right Side (LGX with V18, LT1)

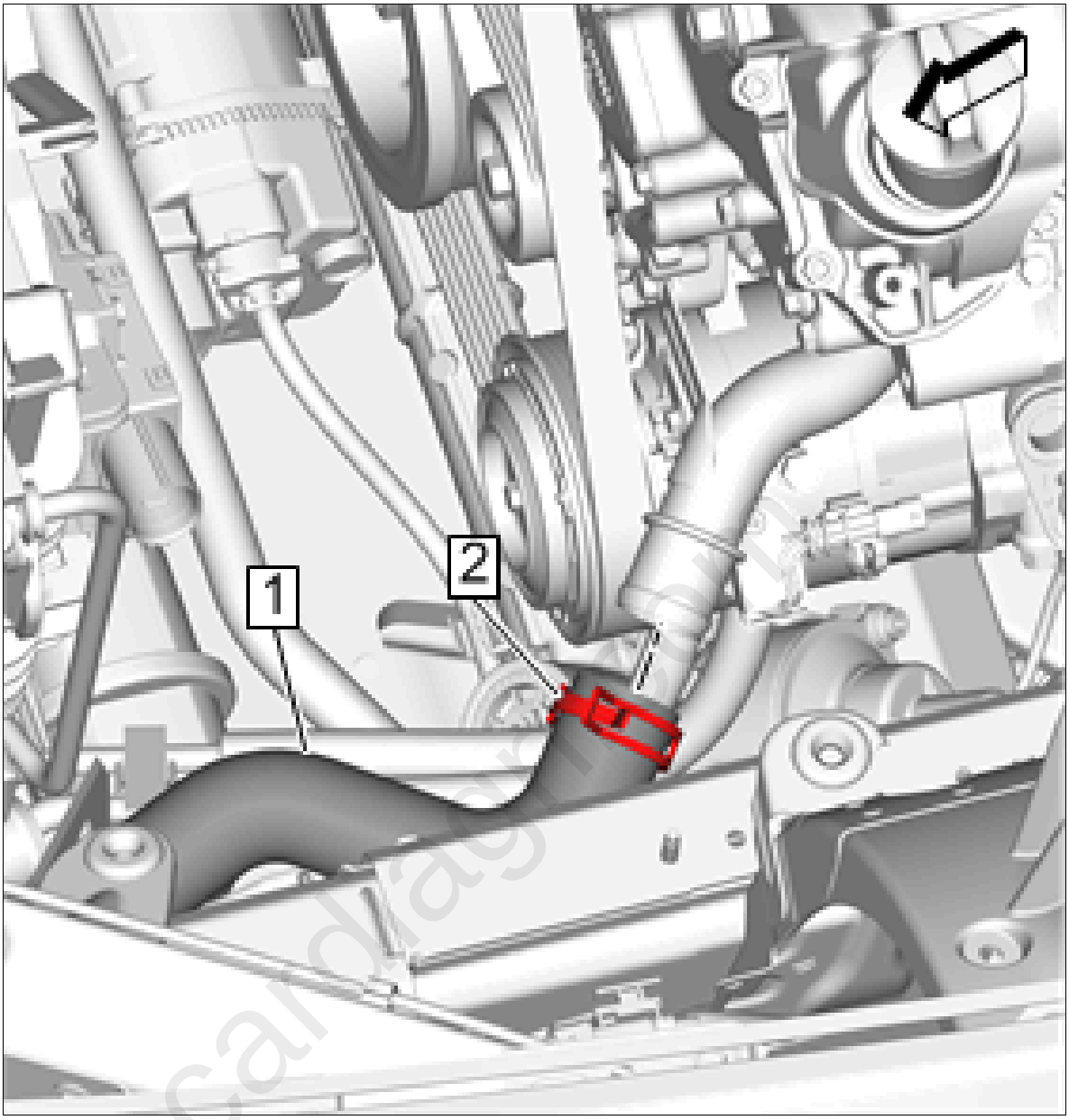
Fig 3: Charge Air Cooler Replacement - Left Side



Courtesy of GENERAL MOTORS COMPANY

6. Lower and temporary support the charge air cooler and duct assembly (3).
7. Install Radiator Outlet Hose Retainer (1)
8. Install Radiator Outlet Hose (2)
9. Install Charge Air Cooler Replacement - Left Side (LGX with V18) Charge Air Cooler Replacement - Left Side (LT1 V18)

Fig 4: Radiator Outlet Hose

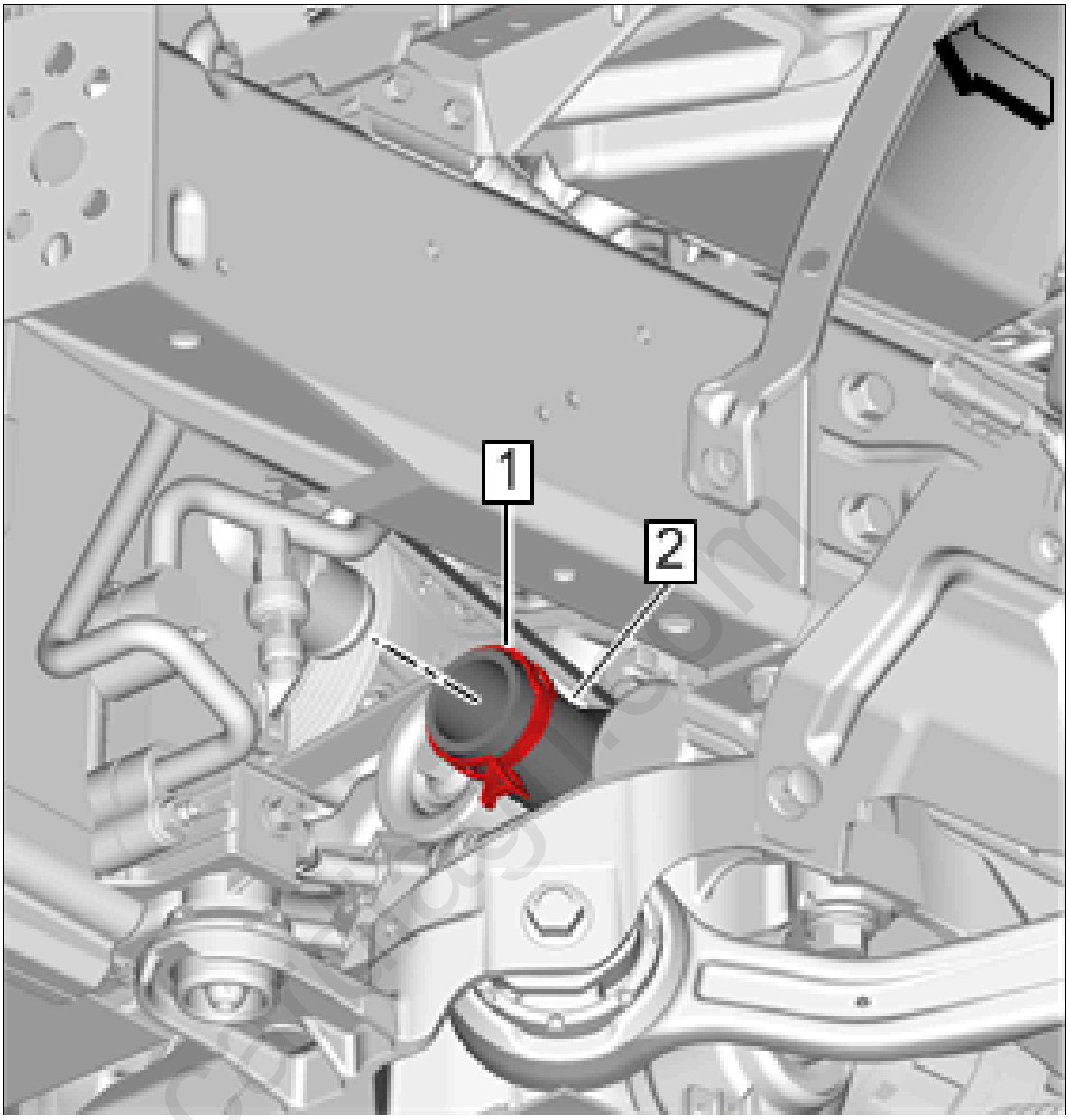


Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Outlet Hose (1) at Water Pump Inlet Pipe
11. Install Hose Clamp (2)

    GE-47622 Hose Clamp Pliers

Fig 5: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

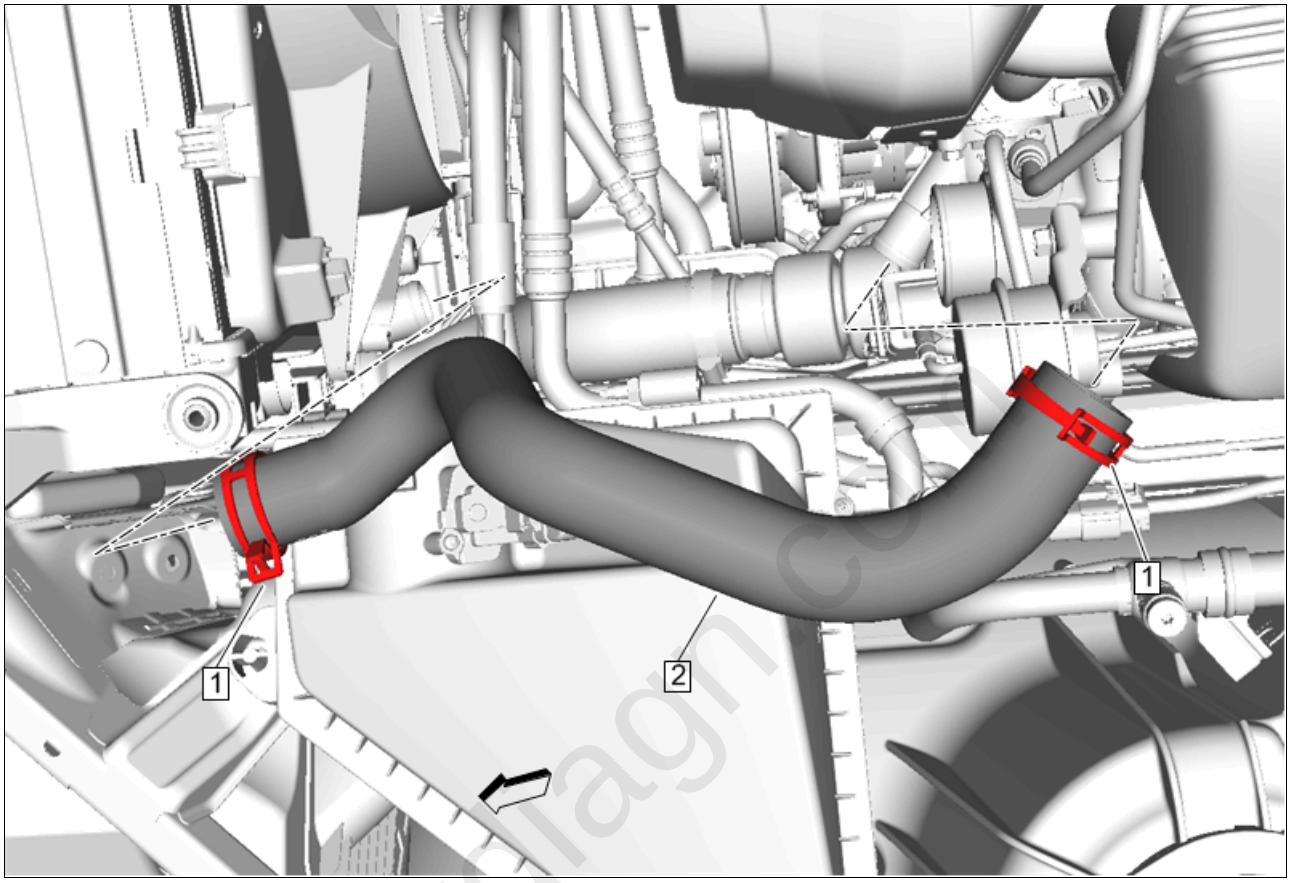
12. Install Radiator Outlet Hose (2) at Radiator
13. Install Hose Clamp (1)

    GE-47622 Hose Clamp Pliers

14. Install Air Cleaner Assembly Replacement
15. Install Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)
16. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
17. Check the cooling system for leaks. Cooling System Leak Testing .

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LTG WITHOUT V18)

Fig 1: Radiator Outlet Hose (LTG without V18)



Courtesy of GENERAL MOTORS COMPANY

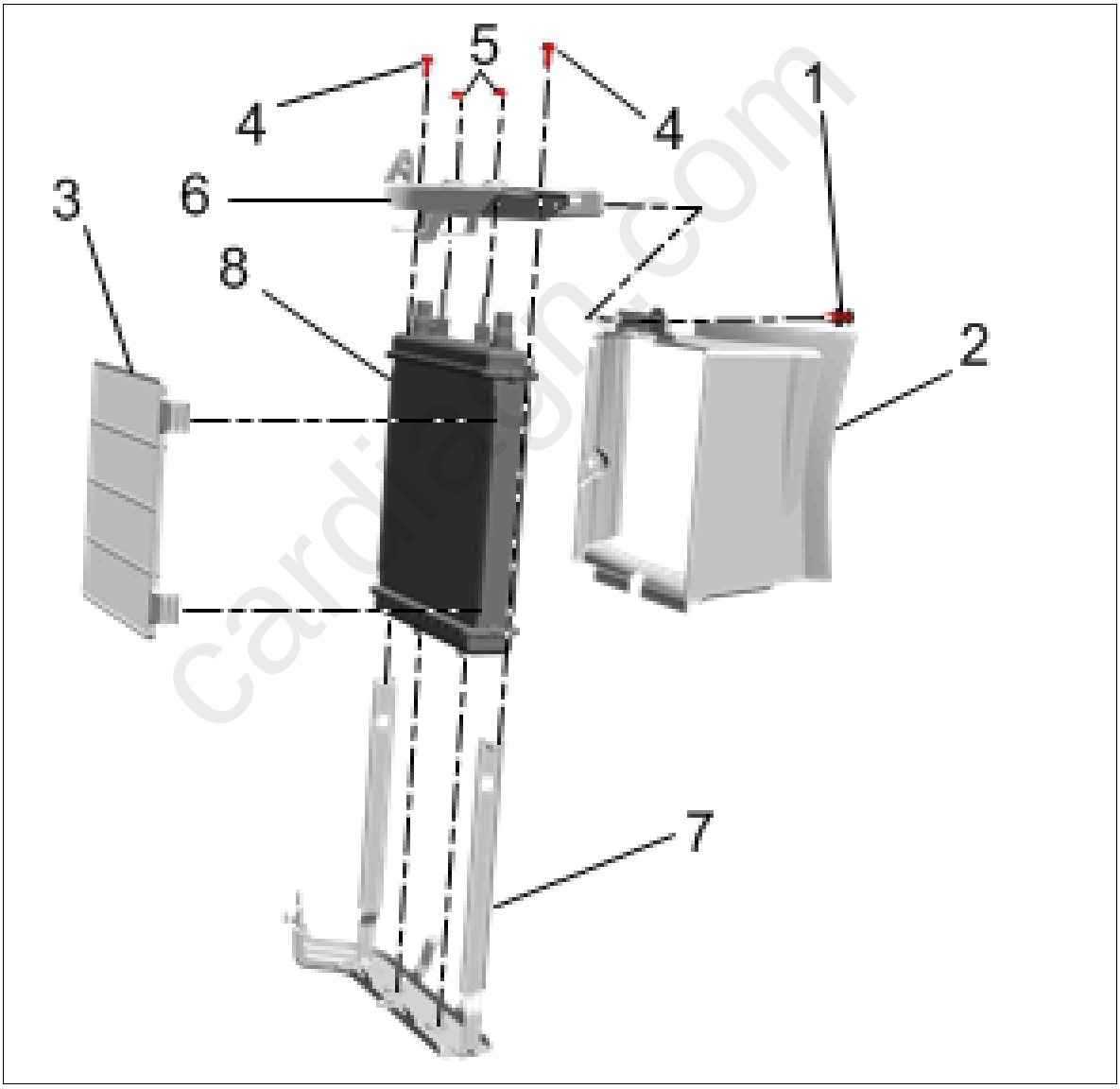
Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Air Cleaner Outlet Duct Air Cleaner Outlet Duct Replacement	
1	Radiator Outlet Hose Clamp (Qty: 2) **Procedure** Hose Clamp Replacement Guidelines - Spring Type
2	Radiator Outlet Hose Procedure 1. Fill the cooling system to the proper level. Cooling System Draining and Filling

	(GE 47716) Cooling System Draining and Filling (Static Fill) 2. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LTG WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Front Wheelhouse Liner-Left Side - Front Wheelhouse Liner Replacement

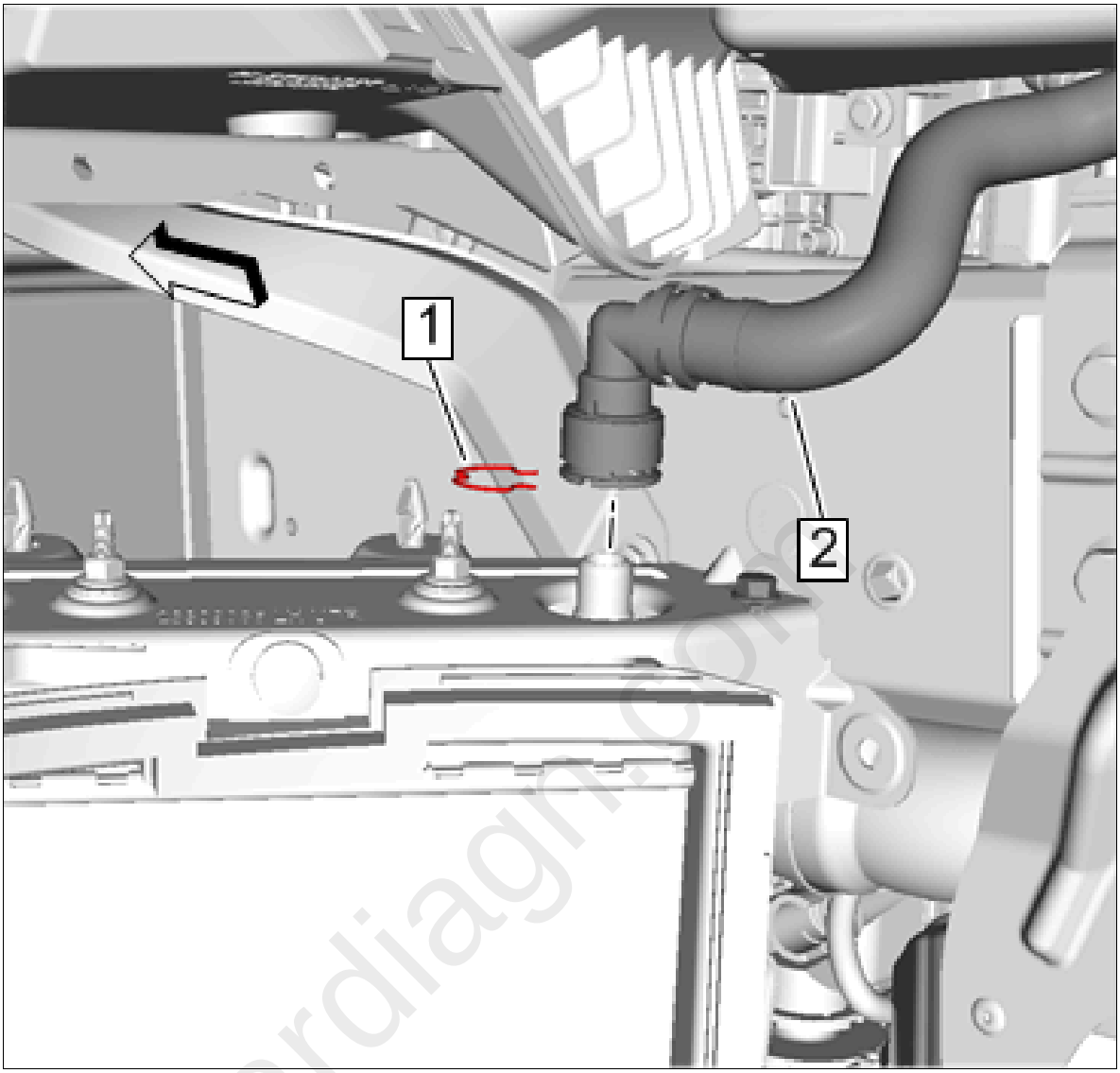
   Fig 1: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

3. Remove the charge air cooler rear duct (2) from the charge air cooler.

Fig 2: Radiator Outlet Hose

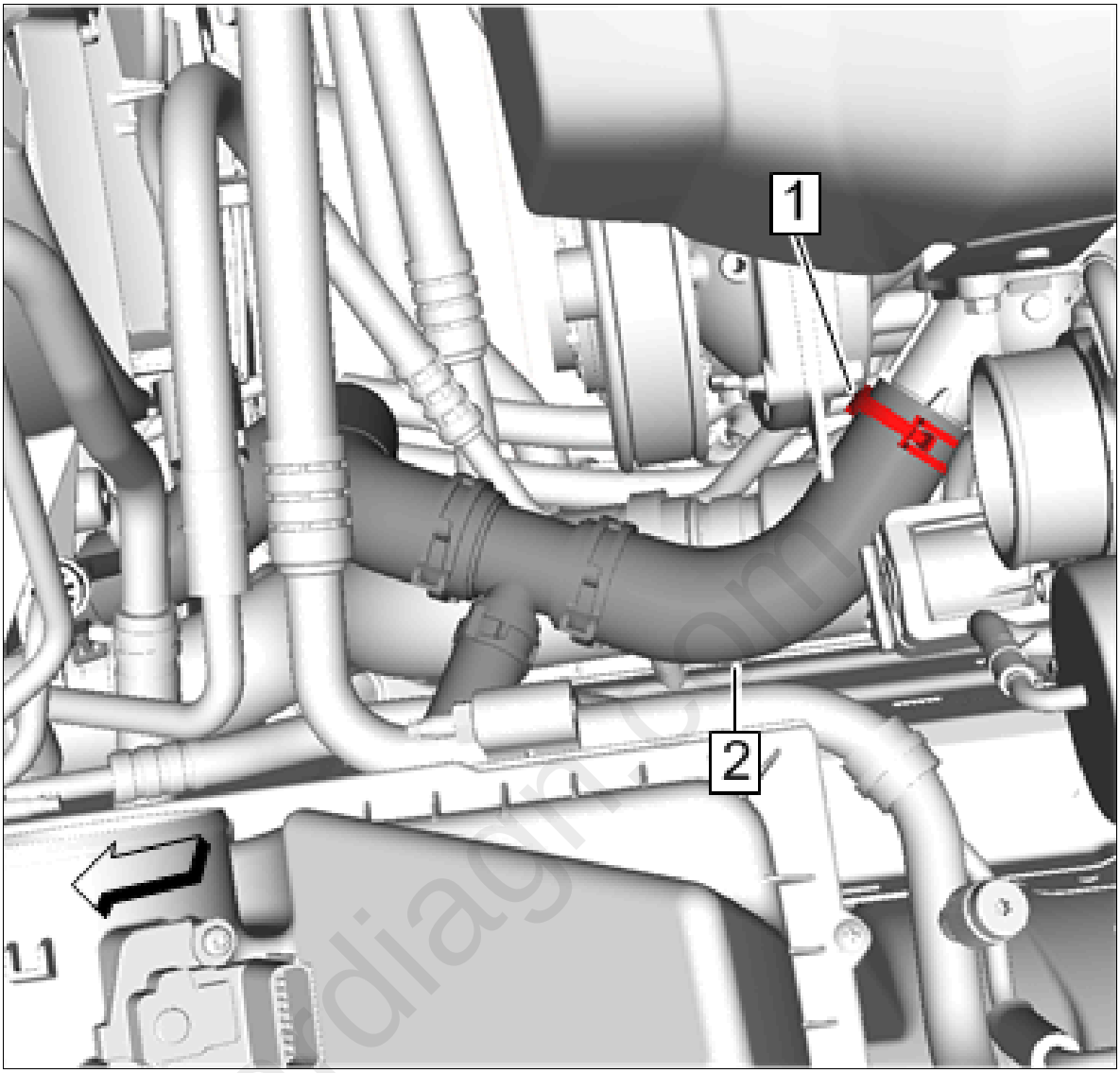


Courtesy of GENERAL MOTORS COMPANY

4. Disengage Radiator Outlet Hose Retainer (1) at Radiator Outlet Hose
5. Remove Radiator Outlet Hose (2) at Charge Air Cooler
6. Remove Air Cleaner Assembly - Air Cleaner Assembly Replacement

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Fig 3: Radiator Outlet Hose

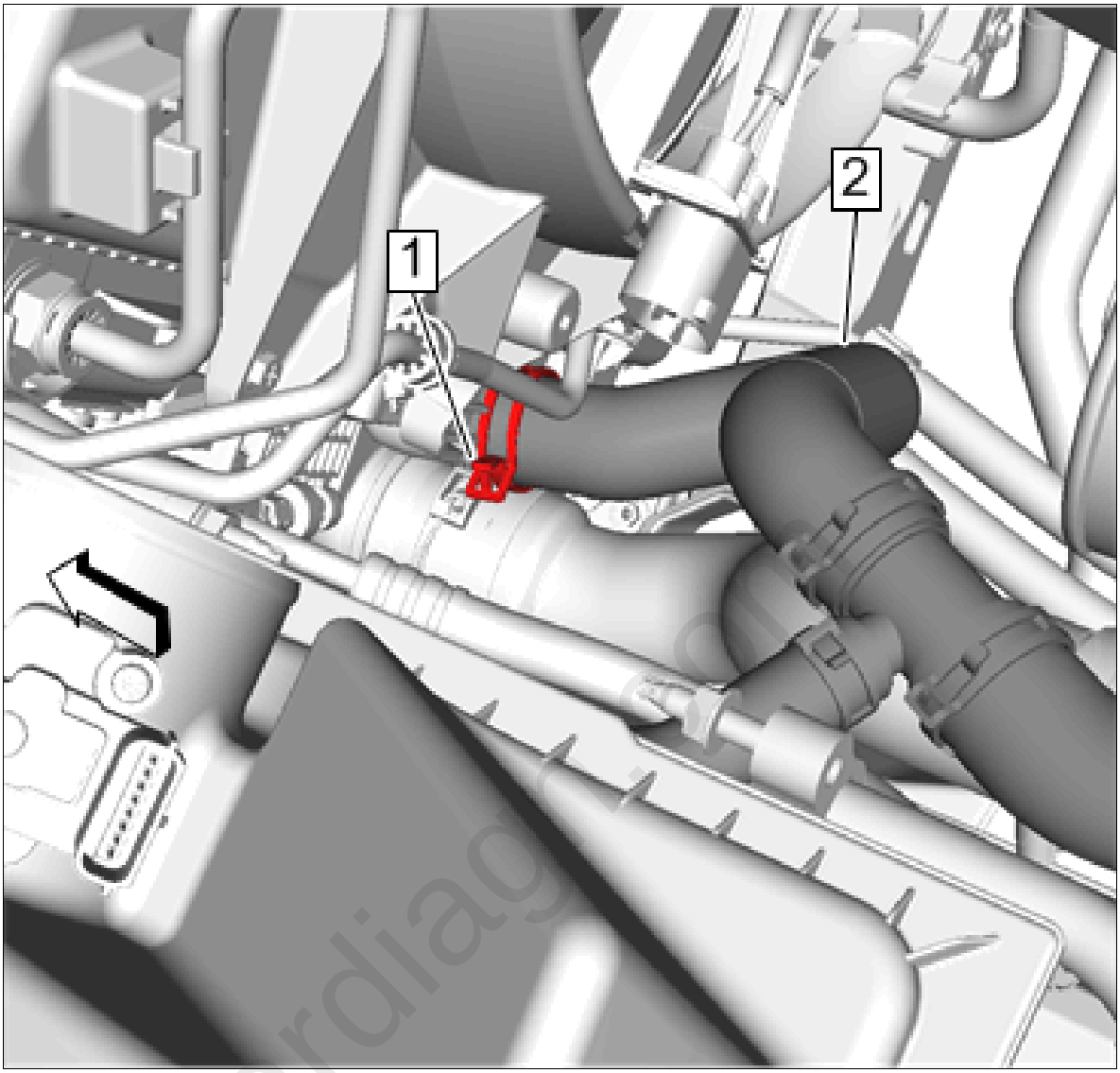


Courtesy of GENERAL MOTORS COMPANY

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7. Disengage Radiator Outlet Hose Clamp (1) at Engine Coolant Thermostat Housing - Hose Clamp Replacement Guidelines - Spring Type
8. Remove Radiator Outlet Hose (2) at Engine Coolant Thermostat Housing

Fig 4: Radiator Outlet Hose

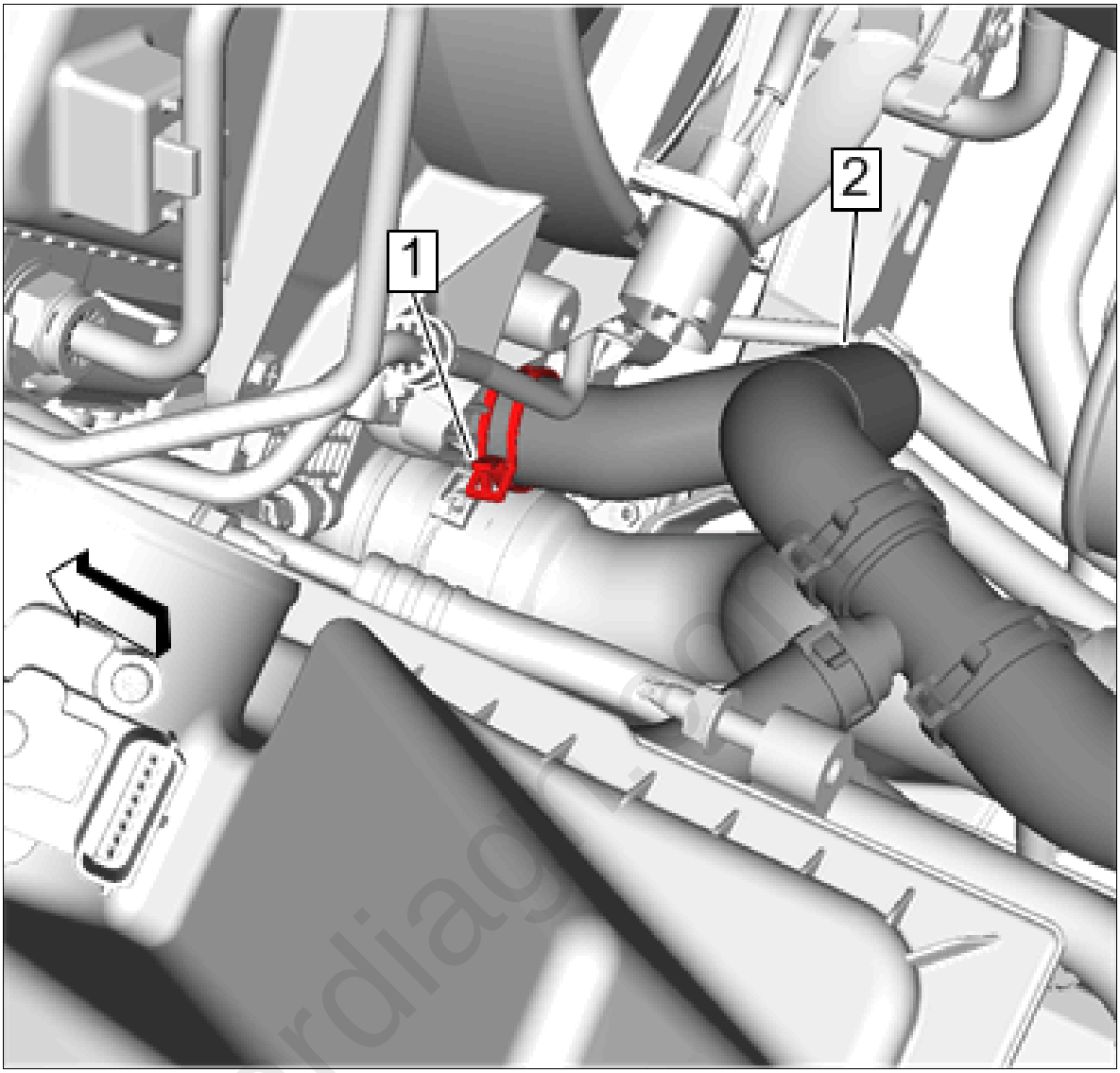


Courtesy of GENERAL MOTORS COMPANY

9. Disengage Radiator Outlet Hose Clamp (1) at Radiator - Hose Clamp Replacement Guidelines - Spring Type
10. Remove Radiator Outlet Hose (2) at Radiator
11. Remove Radiator Outlet Hose (2)

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

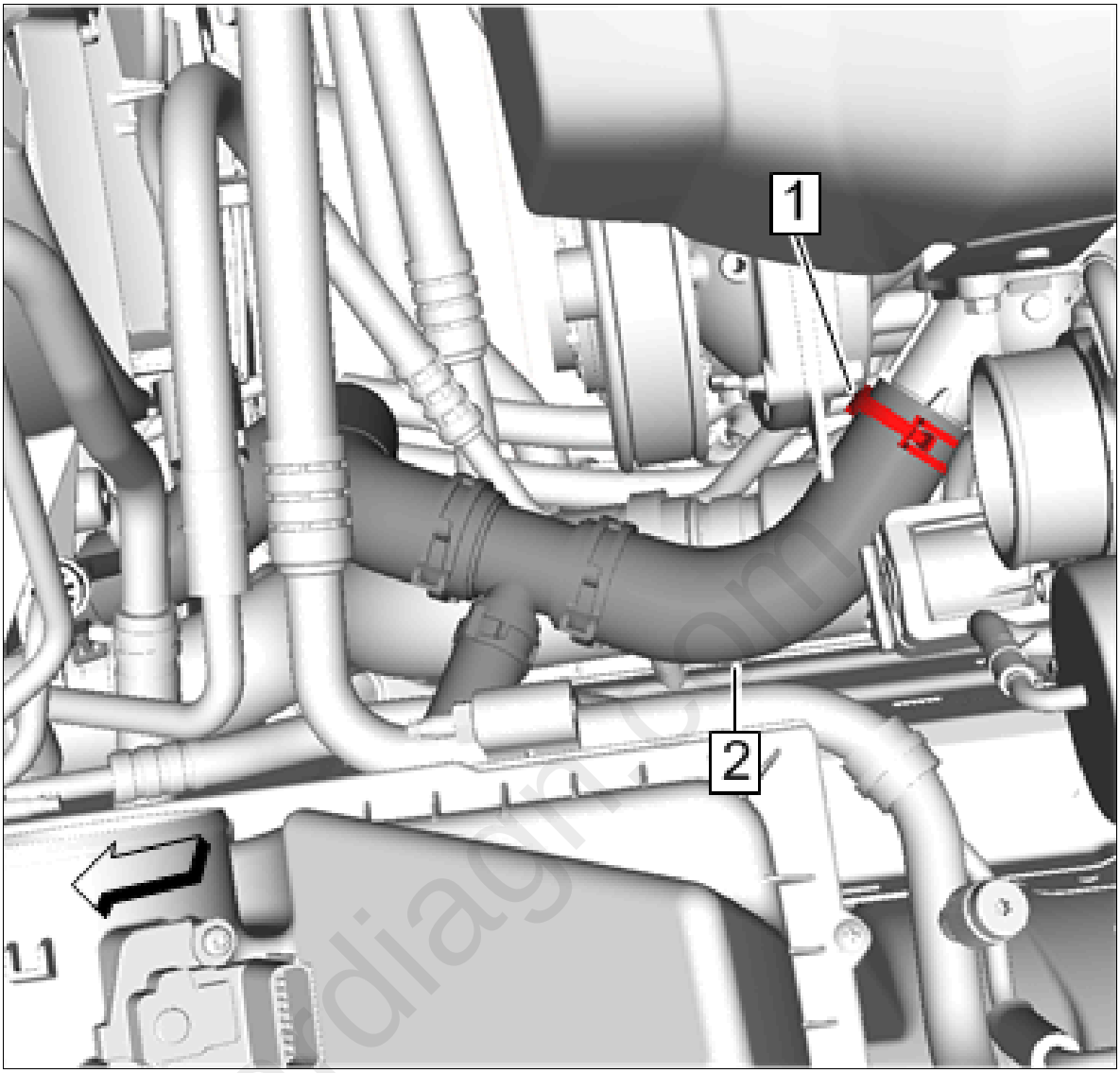
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (2)
2. Install Radiator Outlet Hose (2) at Radiator
3. Engage Radiator Outlet Hose Clamp (1) at Radiator - Hose Clamp Replacement Guidelines - Spring Type

Fig 2: Radiator Outlet Hose

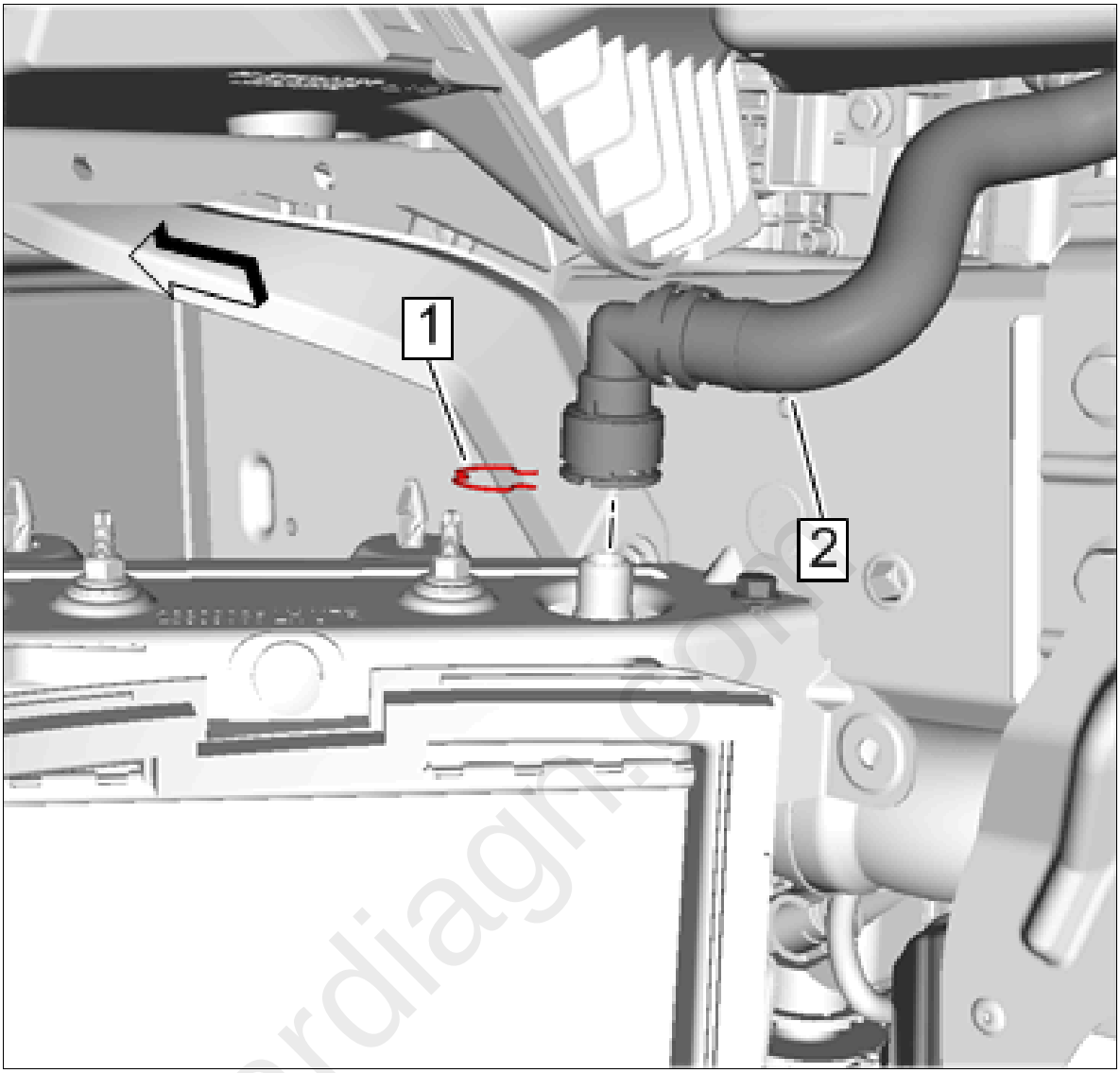


Courtesy of GENERAL MOTORS COMPANY

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4. Install Radiator Outlet Hose (2) at Engine Coolant Thermostat Housing
5. Engage Radiator Outlet Hose Clamp (1) at Engine Coolant Thermostat Housing - Hose Clamp Replacement Guidelines - Spring Type
6. Install Air Cleaner Assembly - Air Cleaner Assembly Replacement

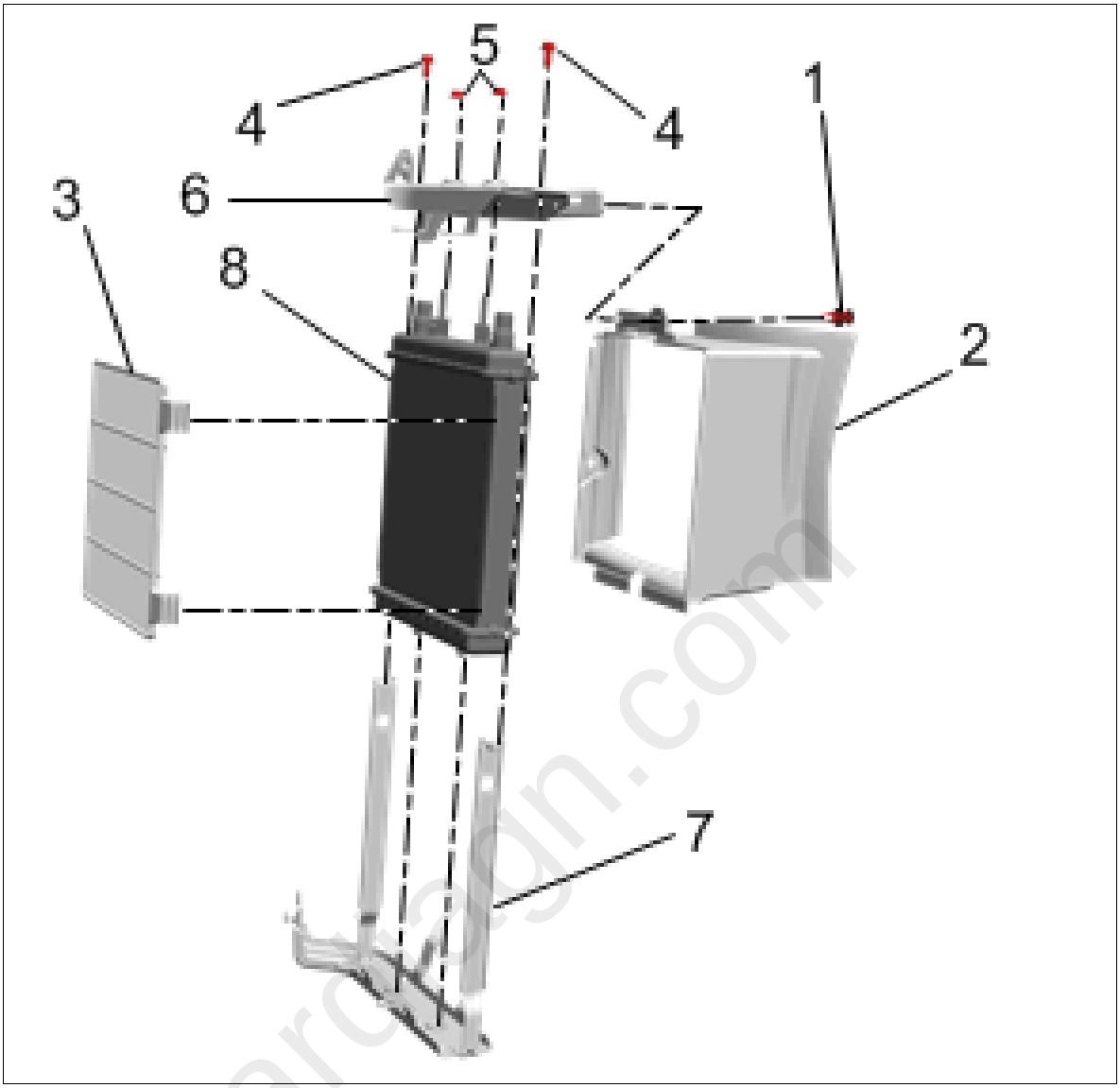
Fig 3: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Outlet Hose (2) at Charge Air Cooler
8. Engage Radiator Outlet Hose Retainer (1) at Radiator Outlet Hose

Fig 4: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

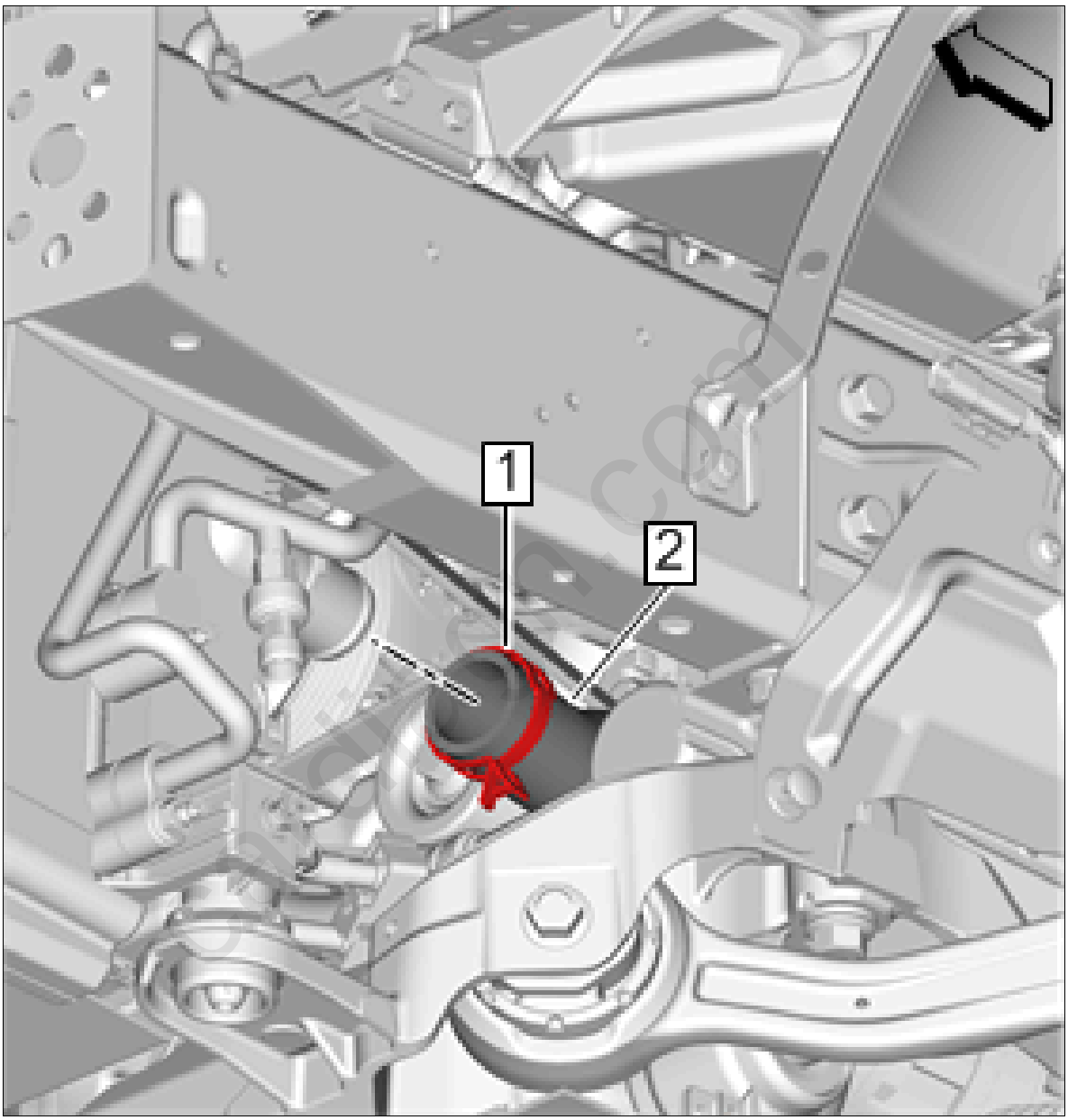
9. Install the charge air cooler rear duct (2) to the charge air cooler.
10. Install Front Wheelhouse Liner-Left Side - Front Wheelhouse Liner Replacement
11. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
12. Check the cooling system for leaks. Cooling System Leak Testing .

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITH KC4 WITHOUT V18) > REMOVAL PROCEDURE

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

2. Remove Air Cleaner Assembly - Air Cleaner Assembly Replacement
3. Remove Front Wheelhouse Liner - Front Wheelhouse Liner Replacement
4. Remove Front Compartment Air Deflector - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)

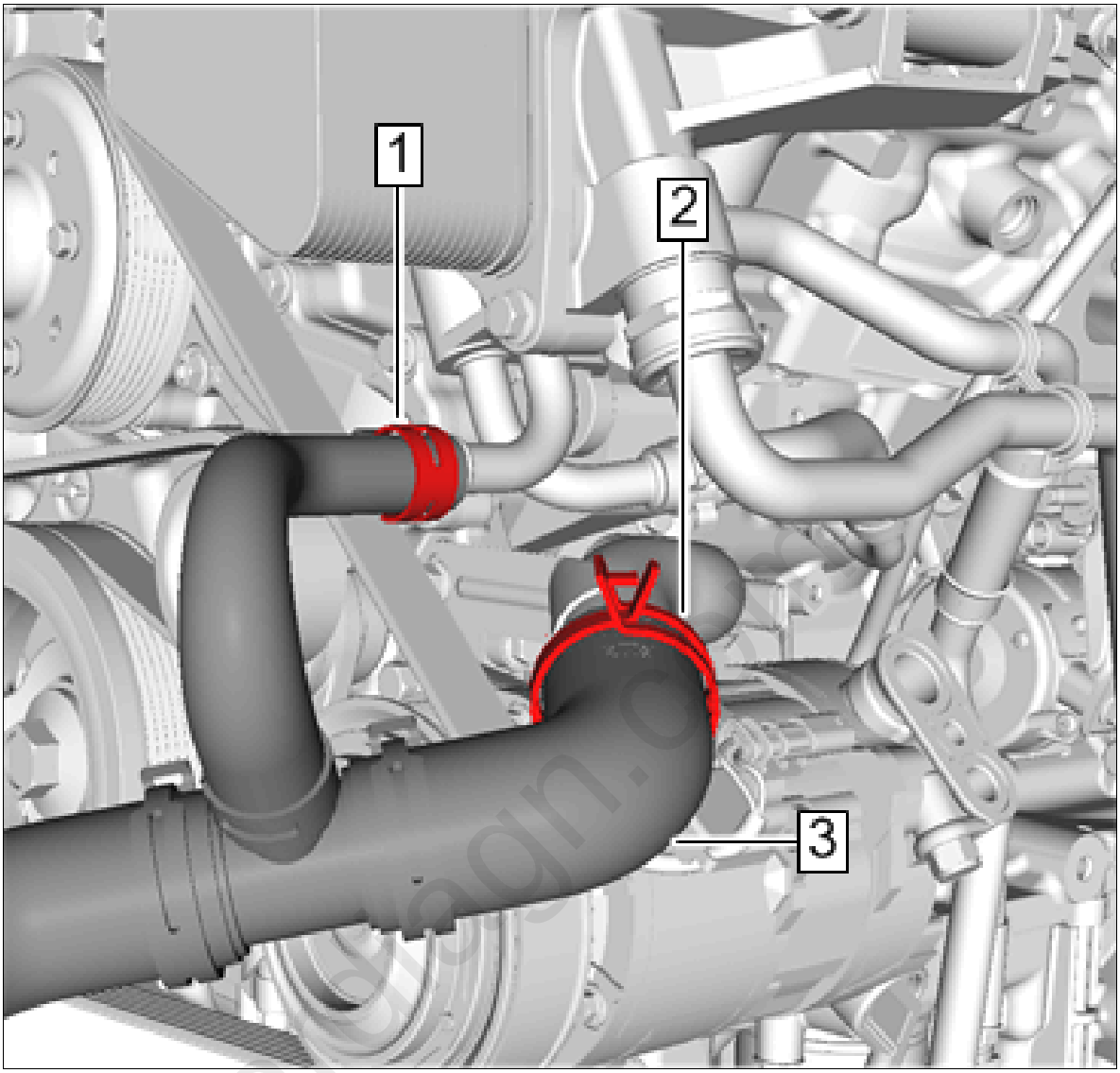
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Disengage Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type
6. Remove Radiator Outlet Hose (2) at Radiator

Fig 2: Radiator Outlet Hose

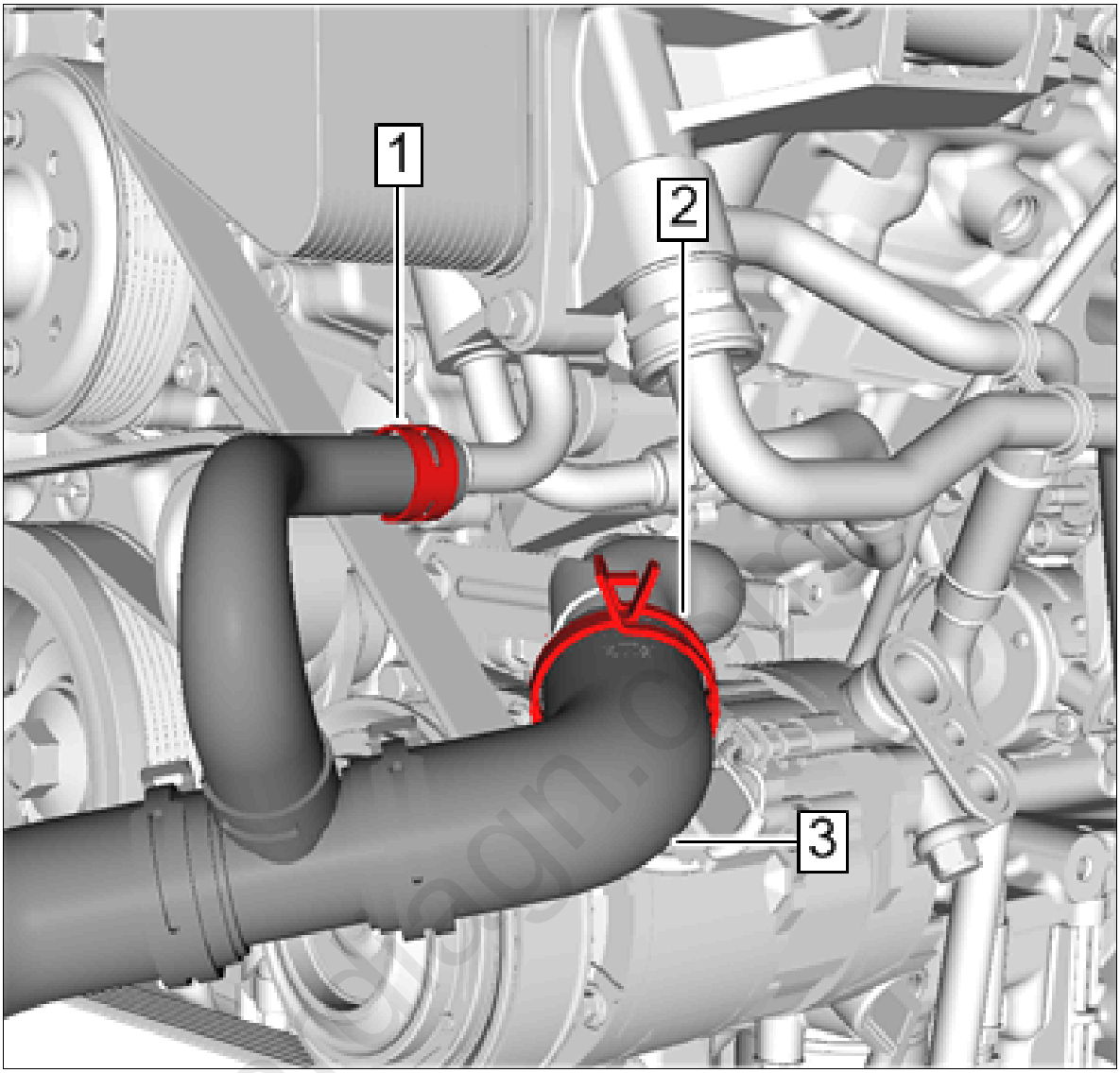


Courtesy of GENERAL MOTORS COMPANY

7. Disengage Hose Clamp (1) at Engine Oil Cooler Adapter - Hose Clamp Replacement Guidelines - Spring Type
8. Remove Radiator Outlet Hose (3) at Engine Oil Cooler Adapter
9. Disengage Hose Clamp (2) at Water Pump Inlet Pipe - Hose Clamp Replacement Guidelines - Spring Type
10. Remove Radiator Outlet Hose (3) at Water Pump Inlet Pipe

REPAIR INSTRUCTIONS > RADIATOR OUTLET HOSE REPLACEMENT (LGX WITH KC4 WITHOUT V18) > INSTALLATION PROCEDURE

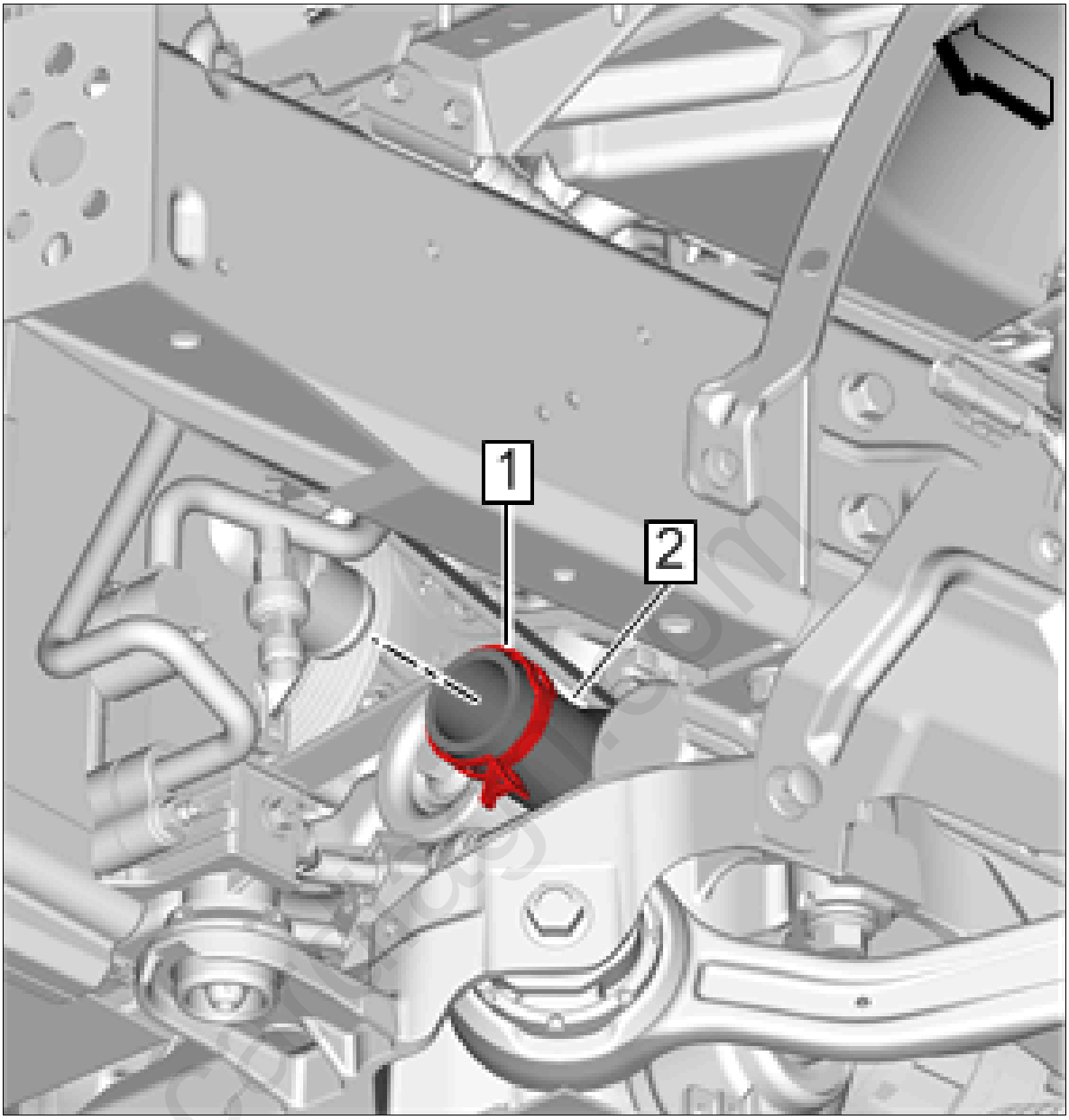
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Outlet Hose (3) at Water Pump Inlet Pipe
2. Engage Hose Clamp (2) at Water Pump Inlet Pipe - Hose Clamp Replacement Guidelines - Spring Type
3. Install Radiator Outlet Hose (3) at Engine Oil Cooler Adapter
4. Engage Hose Clamp (1) at Engine Oil Cooler Adapter - Hose Clamp Replacement Guidelines - Spring Type

Fig 2: Radiator Outlet Hose



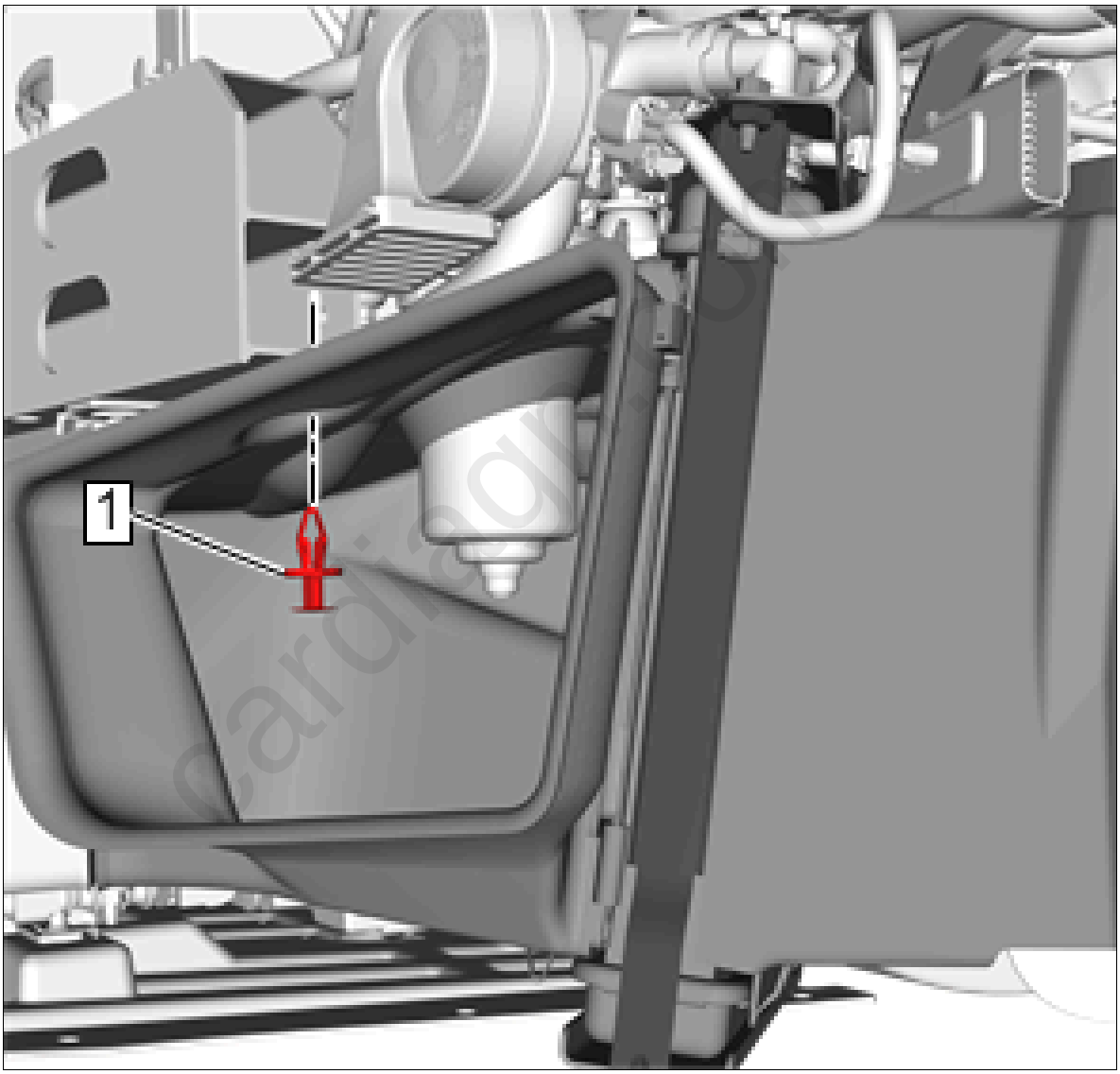
Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Outlet Hose (2) at Radiator
6. Engage Hose Clamp (1) at Radiator - Hose Clamp Replacement Guidelines - Spring Type
7. Install Front Compartment Air Deflector - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)
8. Install Front Wheelhouse Liner - Front Wheelhouse Liner Replacement
9. Install Air Cleaner Assembly - Air Cleaner Assembly Replacement
10. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
11. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LGX WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Front Bumper Fascia Replacement
3. Remove Front Brake Rotor Cooling Duct Replacement (J6G)

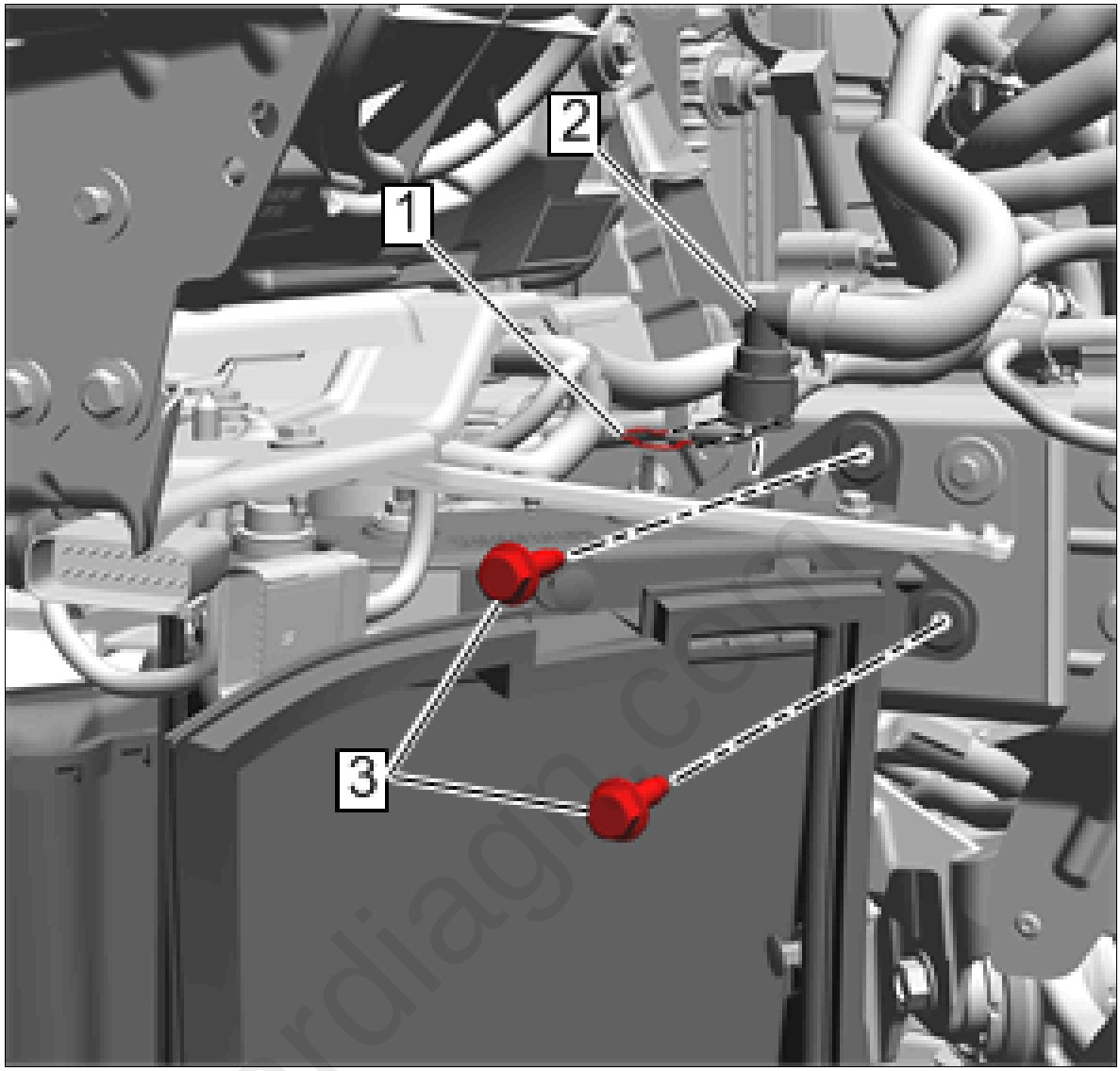
Fig 1: Push Pin



Courtesy of GENERAL MOTORS COMPANY

4. Remove Push Pin (1)

Fig 2: Auxiliary Radiator Inlet Hose Clip

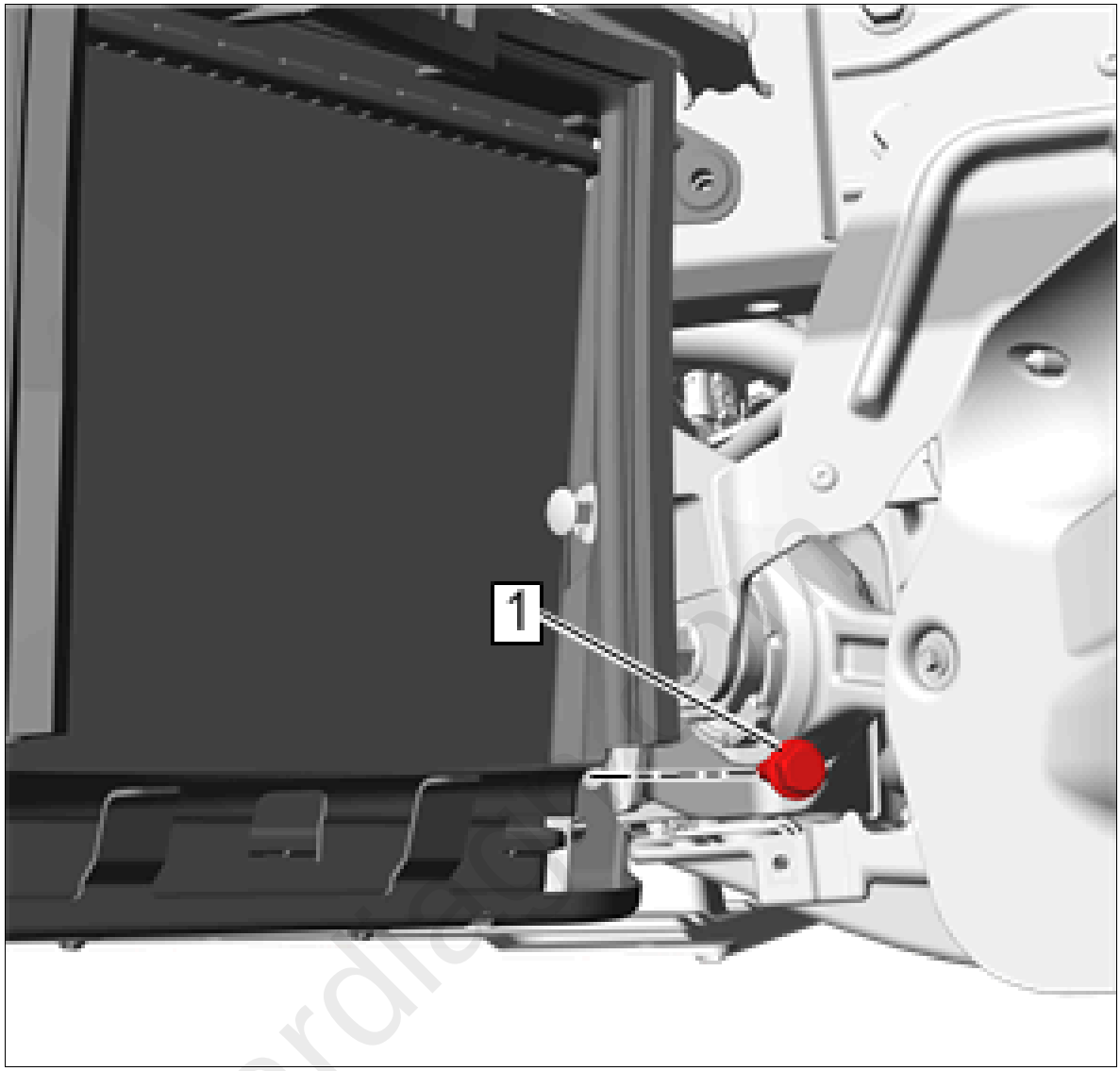


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5. Remove Auxiliary Radiator Inlet Hose Clip (1)
6. Remove Quick Connect Fitting (2)
7. Remove Charge Air Cooler Bracket Bolt (3) (Qty: 2)

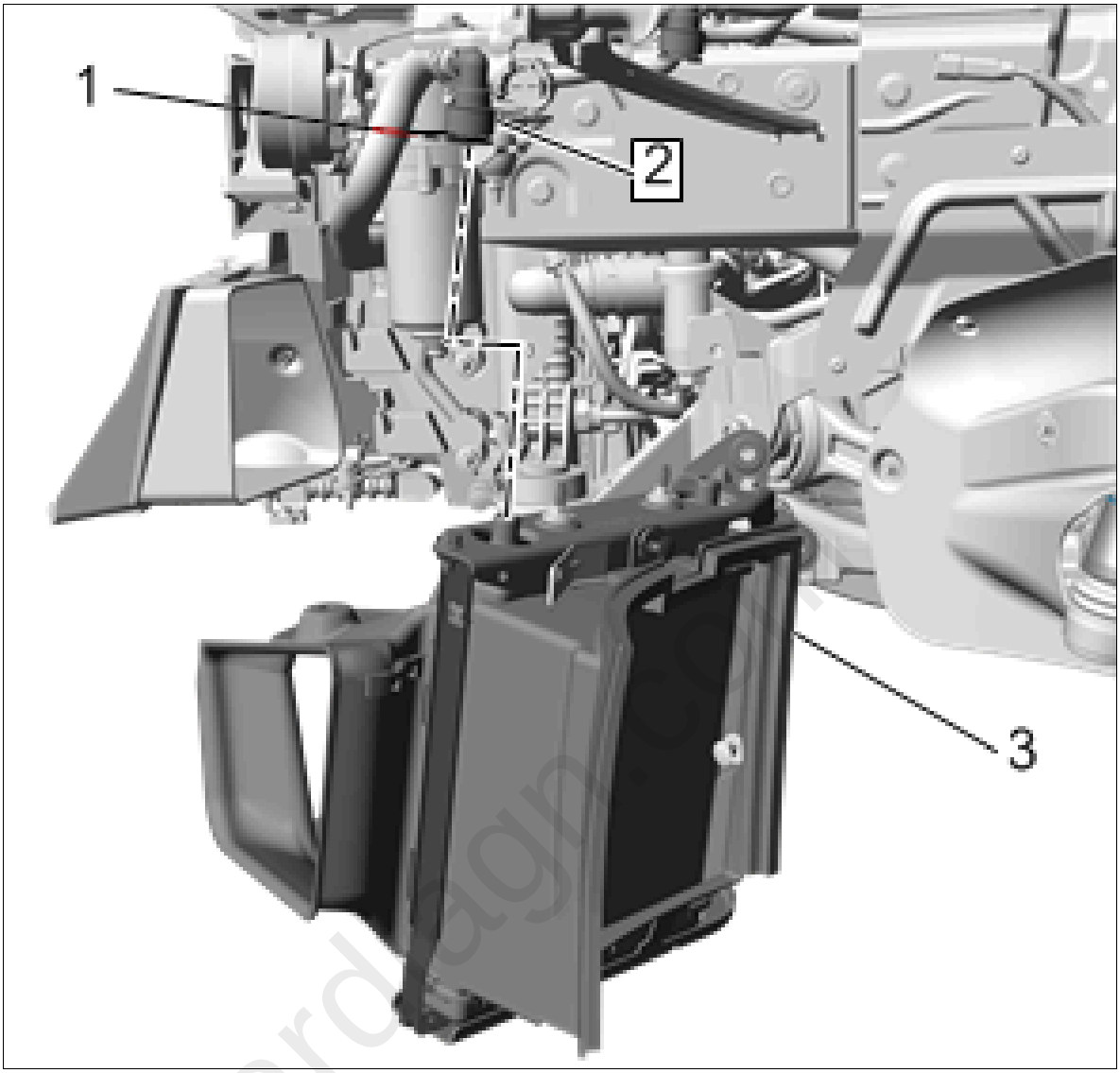
Fig 3: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

8. Remove Charge Air Cooler Bracket Bolt (1)

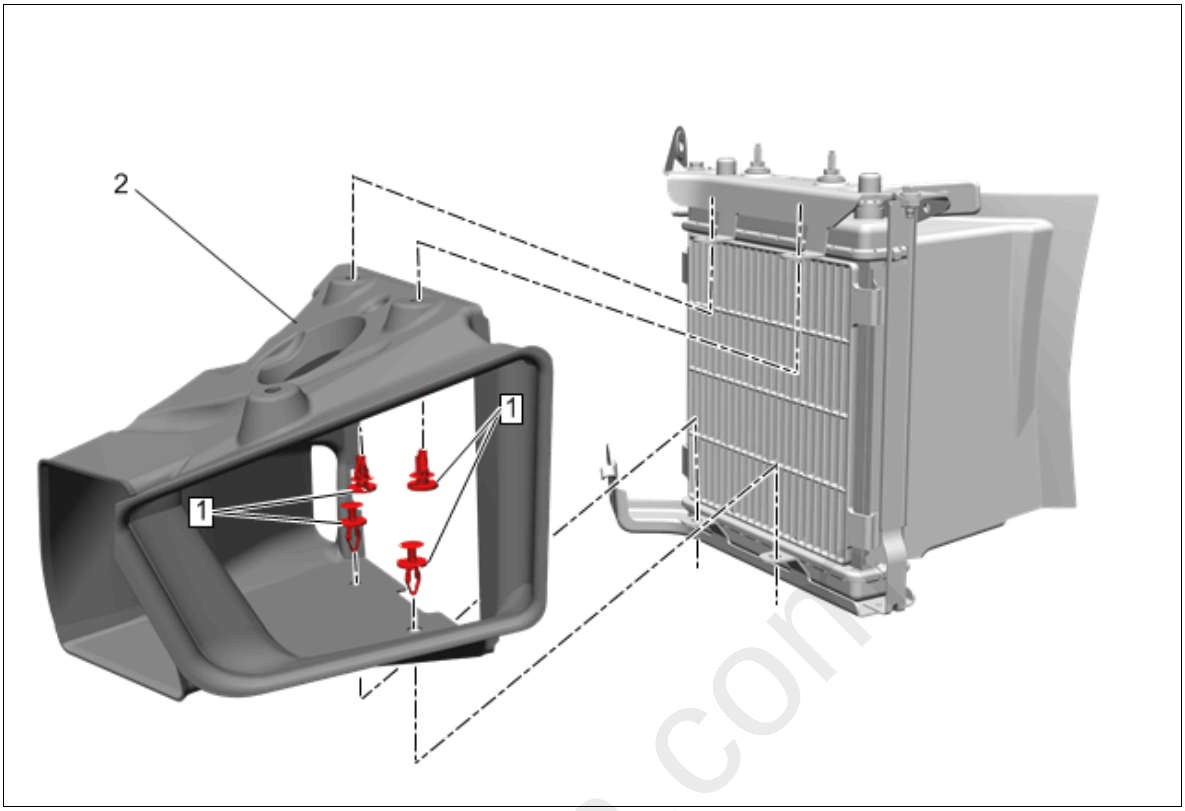
Fig 4: Charge Air Cooler Replacement - Left Side



Courtesy of GENERAL MOTORS COMPANY

9. Lower and temporary support the charge air cooler and duct assembly (3)
10. Remove Radiator Outlet Hose Retainer (1)
11. Remove Quick Connect Fitting (2)
12. Remove Charge Air Cooler Assembly (3)

Fig 5: Radiator Air Side Baffle - Left Side

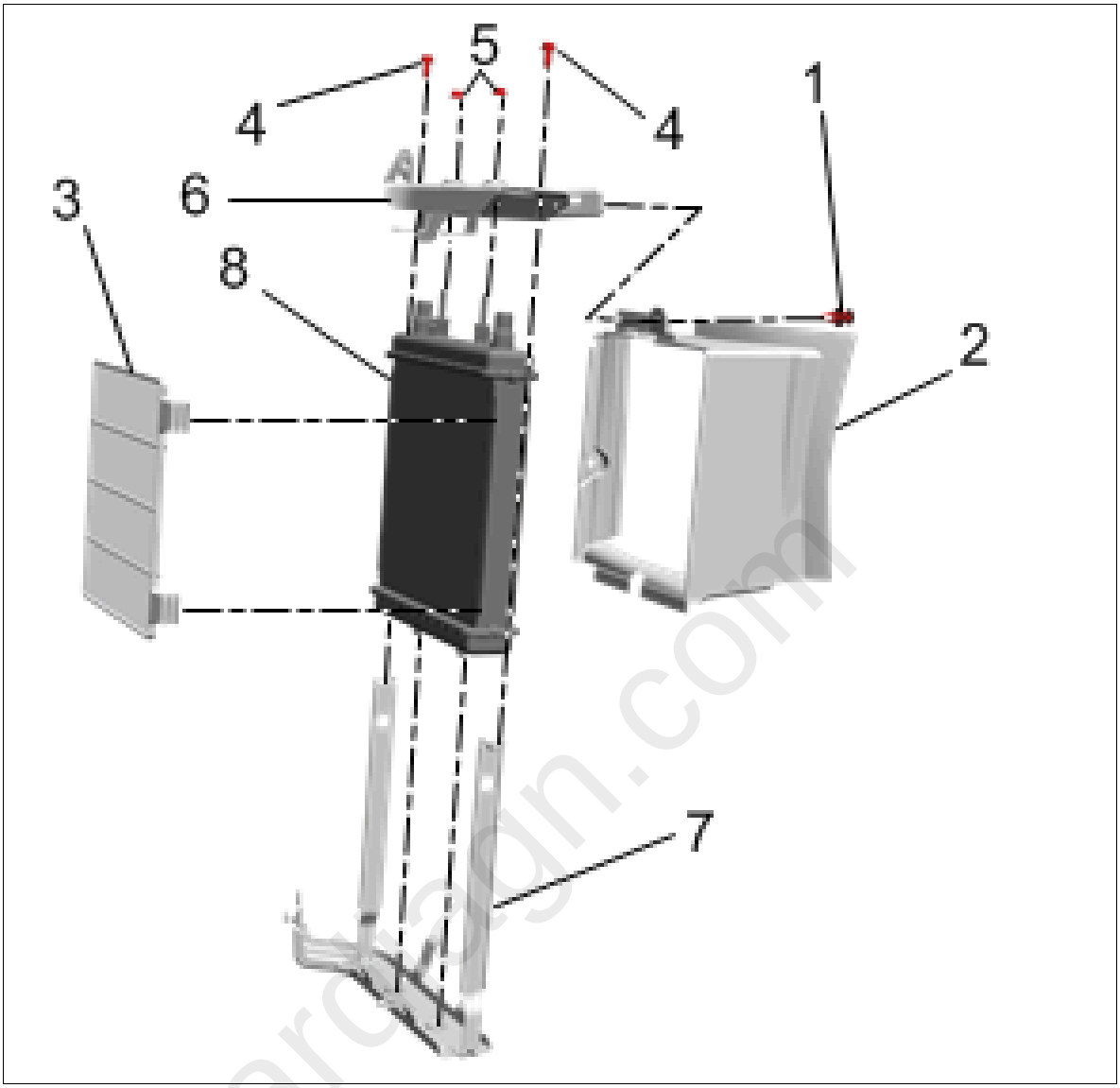


Courtesy of GENERAL MOTORS COMPANY

13. Remove Push Pin (1) (Qty: 4)
14. Remove Radiator Air Side Baffle - Left Side (2)

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Fig 6: Charge Air Cooler

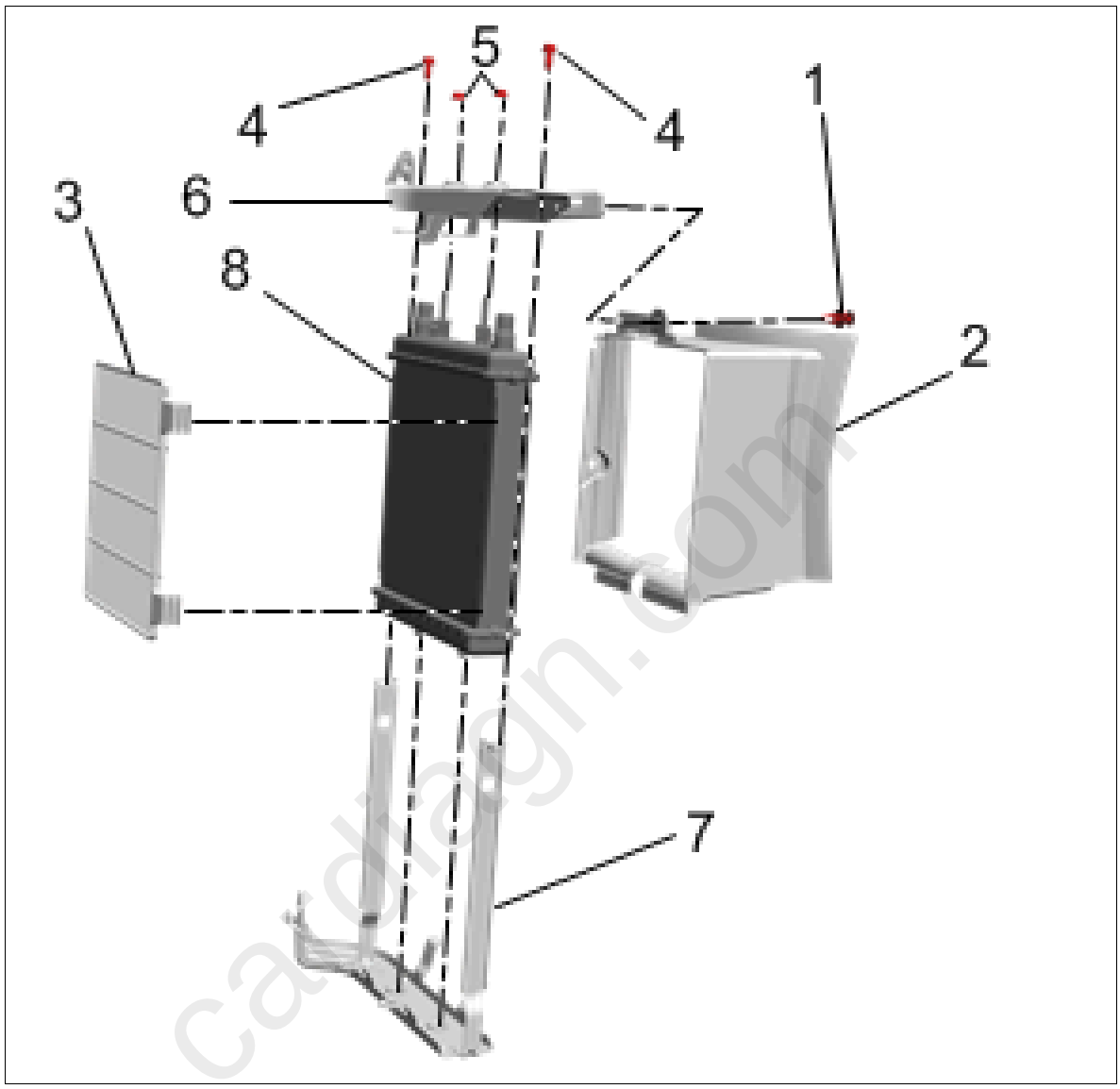


Courtesy of GENERAL MOTORS COMPANY

15. Remove Push Pin (1)
16. Remove Rear Duct (2)
17. Remove Stone Guard (3)
18. Remove Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2)
19. Remove Charge Air Cooler Upper Bracket Nut (5) (Qty: 2)
20. Remove Upper Charge Air Cooler Bracket (6)
21. Remove Lower Charge Air Cooler Bracket (7)
22. Remove Charge Air Cooler (8)

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LGX WITH V18) > INSTALLATION PROCEDURE

Fig 1: Charge Air Cooler



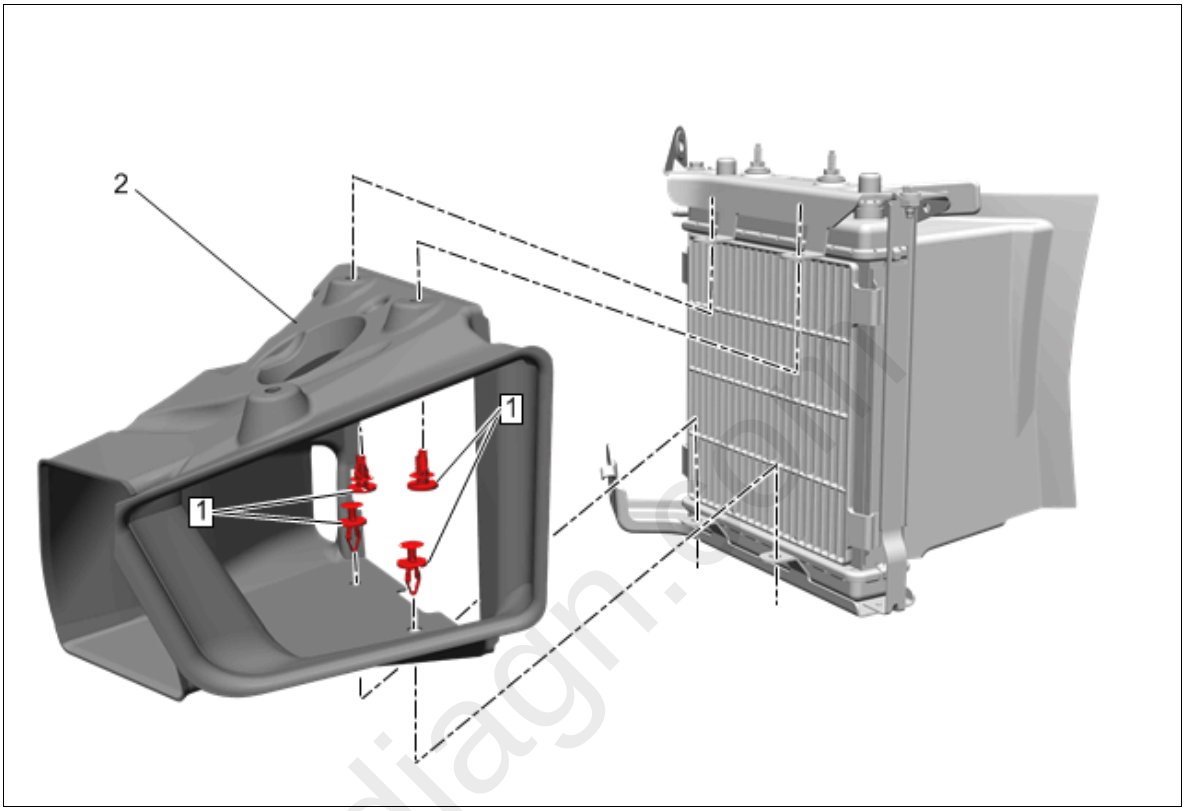
Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Component Fastener Tightening Caution .*

1. Install Charge Air Cooler (8)
2. Install Lower Charge Air Cooler Bracket (7)
3. Install Upper Charge Air Cooler Bracket (6)
4. Install Charge Air Cooler Upper Bracket Nut (5) (Qty: 2) and tighten to 9 N.m (80 lb in)

5. Install Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2) and tighten to 9 N.m (80 lb in)
6. Install Stone Guard (3)
7. Install Rear Duct (2)
8. Install Push Pin (1)

Fig 2: Radiator Air Side Baffle - Left Side

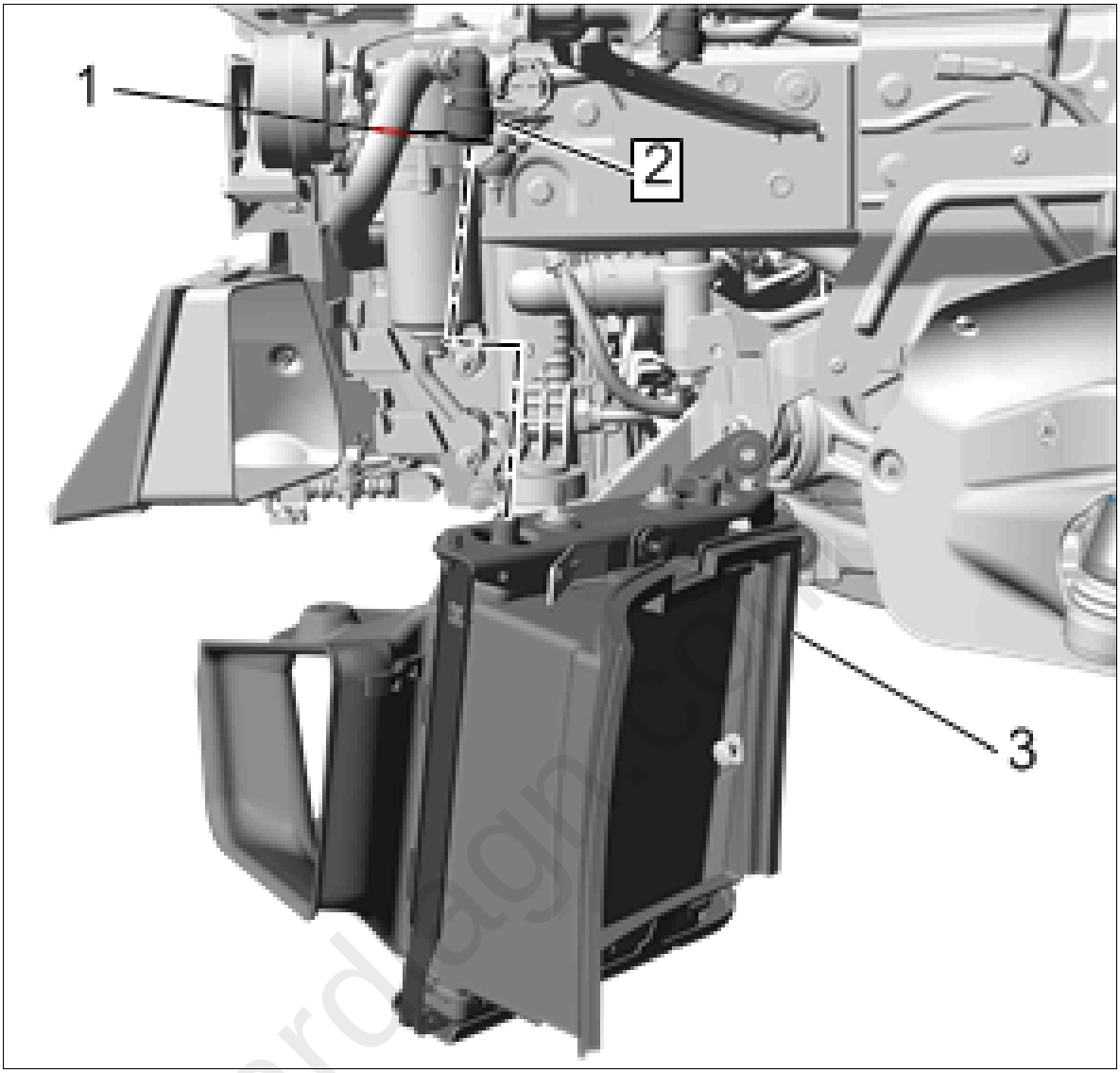


Courtesy of GENERAL MOTORS COMPANY

9. Install Push Pin (1) (Qty: 4)
10. Install Radiator Air Side Baffle - Left Side (2)

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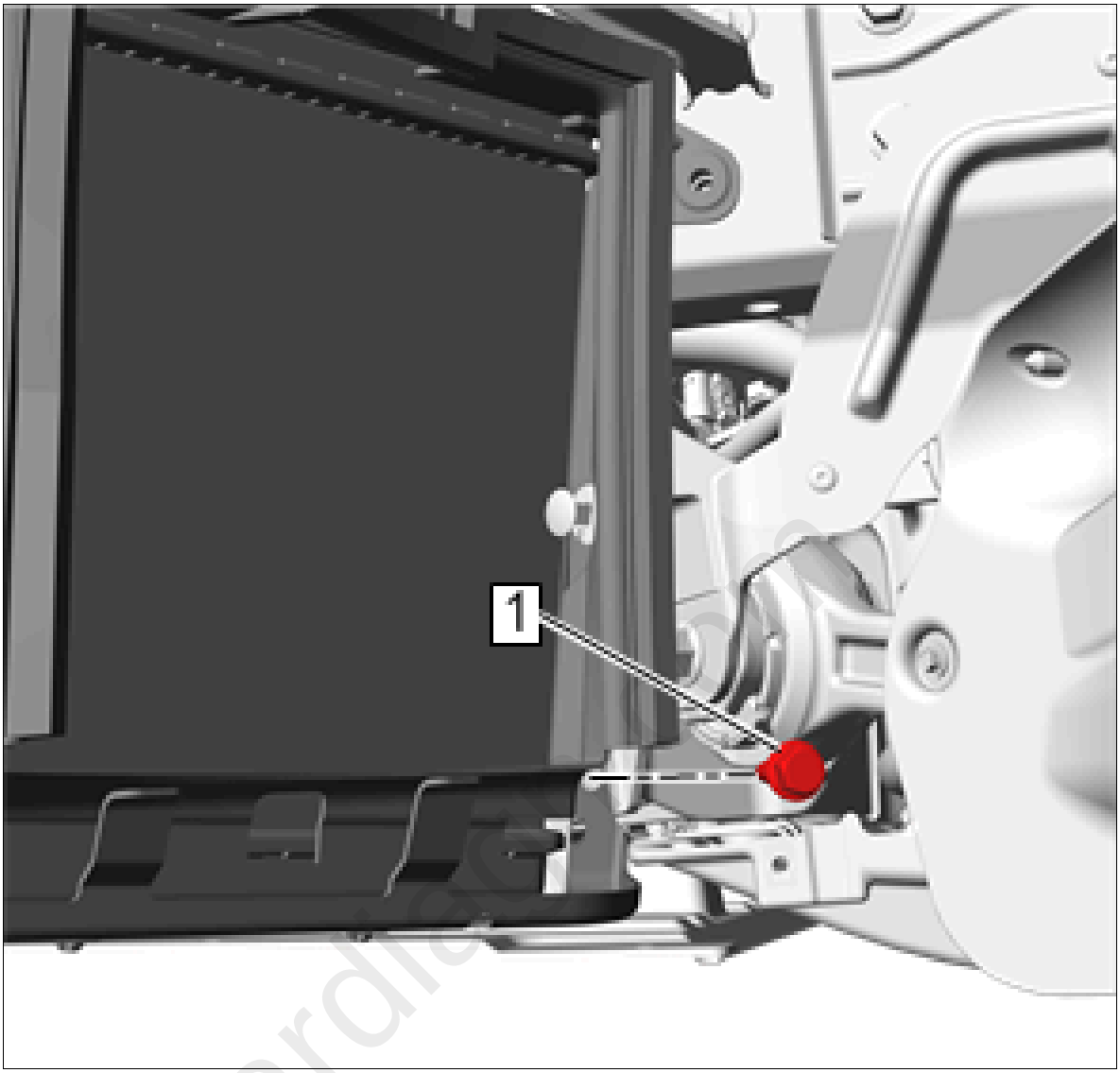
Fig 3: Charge Air Cooler Replacement - Left Side



Courtesy of GENERAL MOTORS COMPANY

11. Raise and temporary support the charge air cooler and duct assembly (3)
12. Install Radiator Outlet Hose Retainer (1)
13. Install Quick Connect Fitting (2)

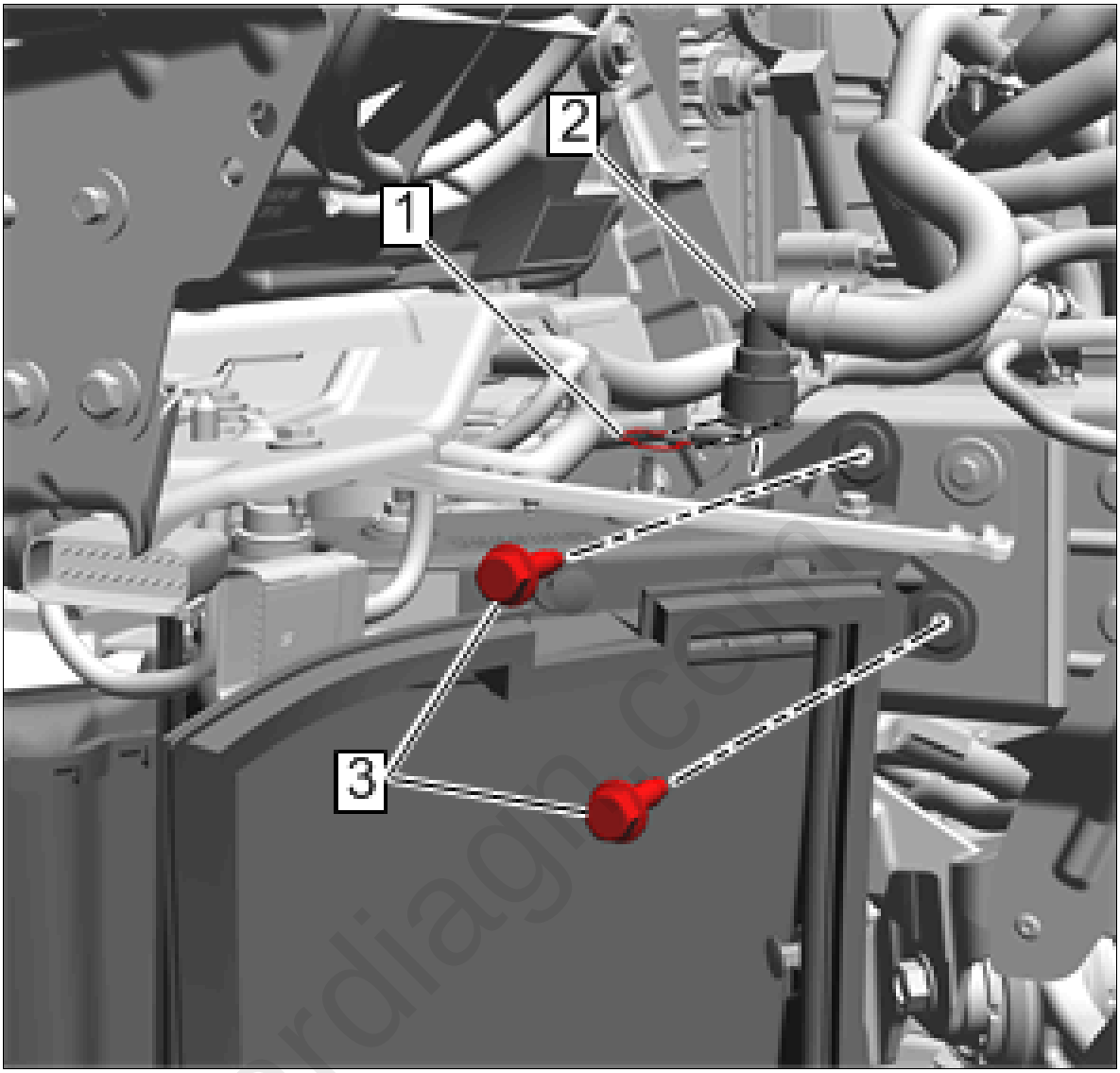
Fig 4: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

14. Install Charge Air Cooler Bracket Bolt (1) and tighten to 9 N.m (80 lb in)

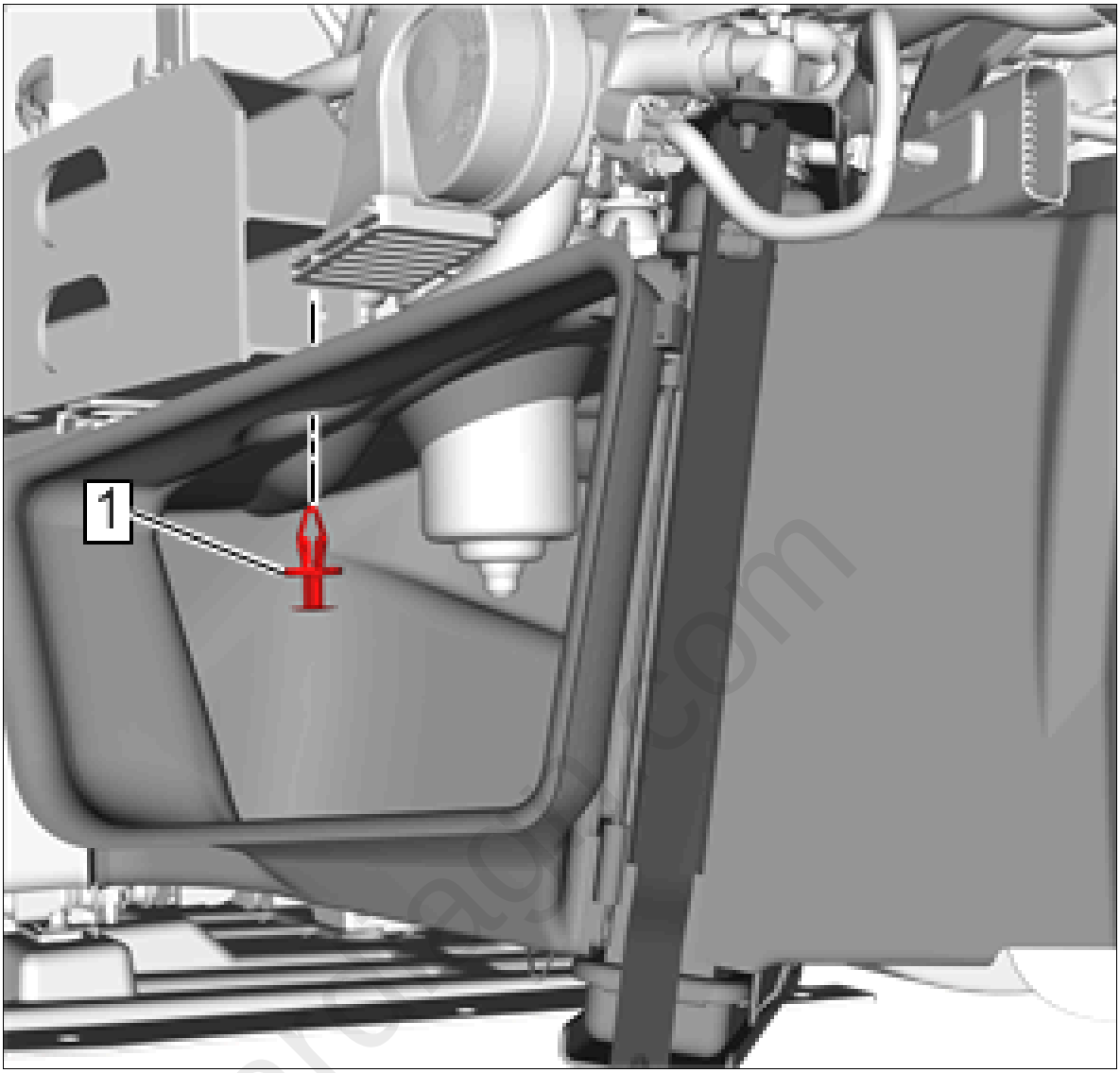
Fig 5: Auxiliary Radiator Inlet Hose Clip



Courtesy of GENERAL MOTORS COMPANY

15. Install Auxiliary Radiator Inlet Hose Clip (1)
16. Install Quick Connect Fitting (2)
17. Install Charge Air Cooler Bracket Bolt (3) (Qty: 2) and tighten to 9 N.m (80 lb in)

Fig 6: Push Pin



Courtesy of GENERAL MOTORS COMPANY

18. Install Push Pin (1)
19. Install Front Brake Rotor Cooling Duct Replacement (J6G)
20. Install Front Bumper Fascia Replacement
21. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
22. Start the engine and check for coolant leaks.

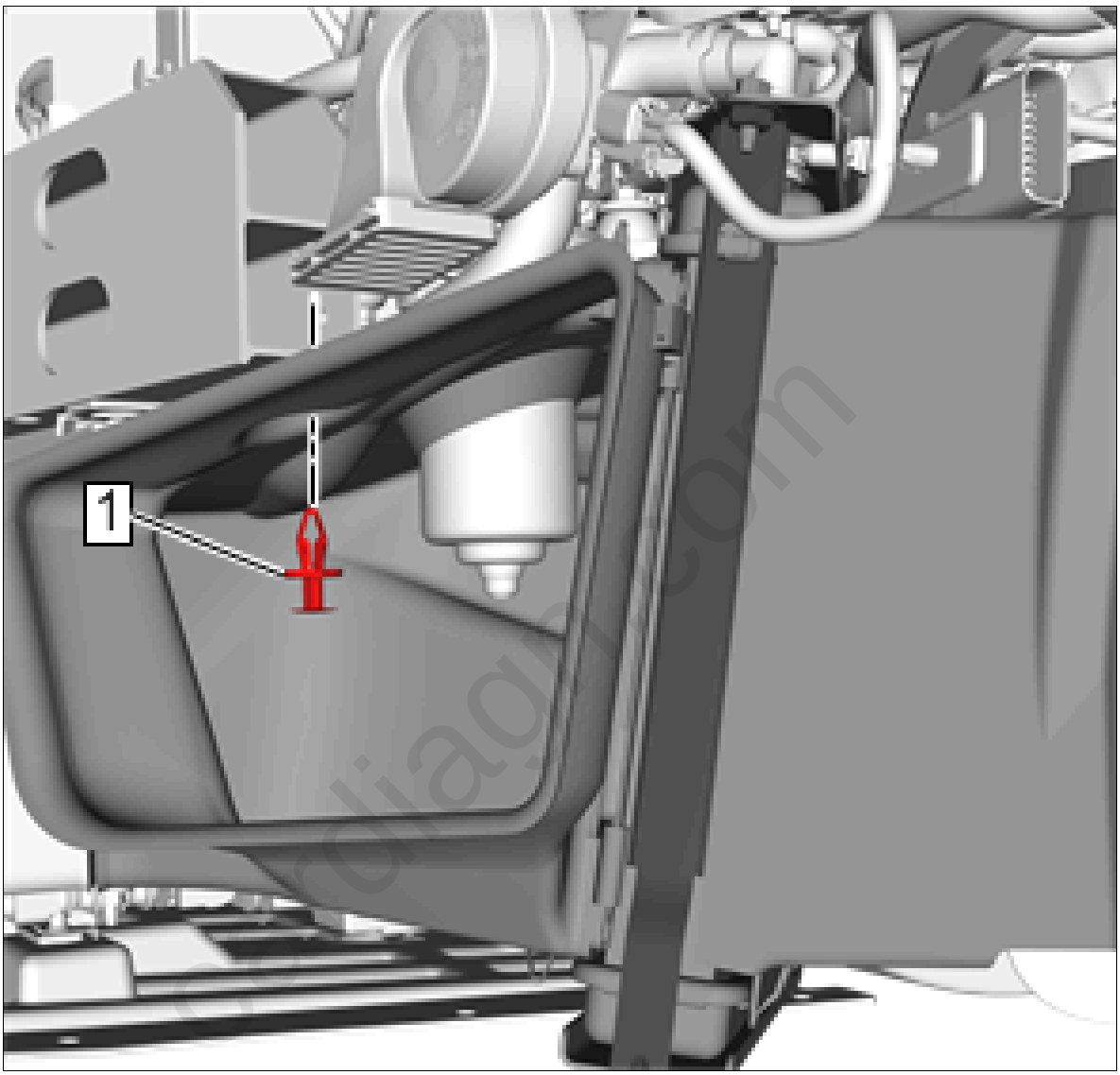
REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LT1 V18) > REMOVAL PROCEDURE

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

Draining and Filling (Static Fill)

2. Remove Front Bumper Fascia Replacement
3. Remove Front Brake Rotor Cooling Duct Replacement (J6G)

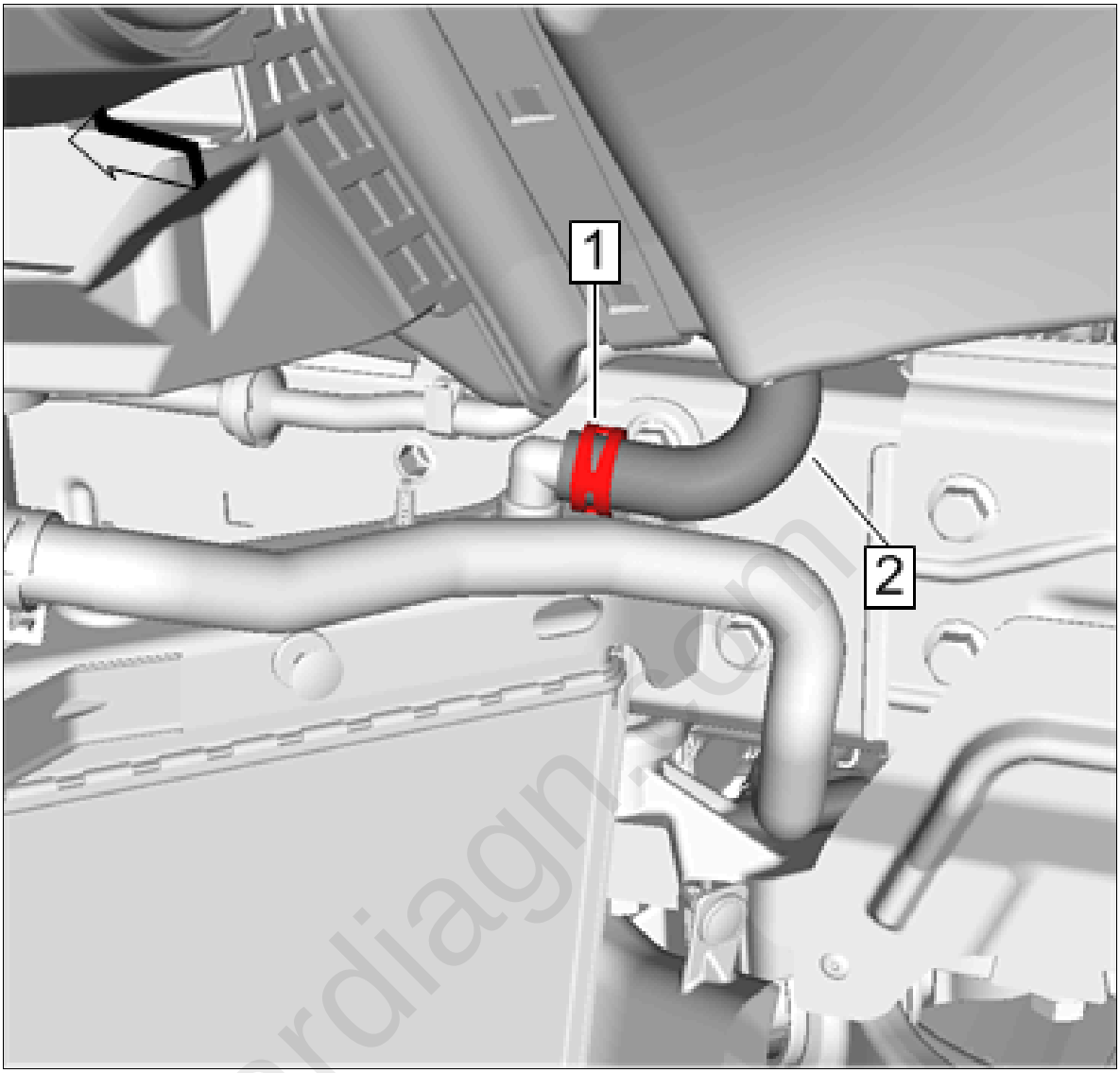
Fig 1: Push Pin



Courtesy of GENERAL MOTORS COMPANY

4. Remove Push Pin (1)

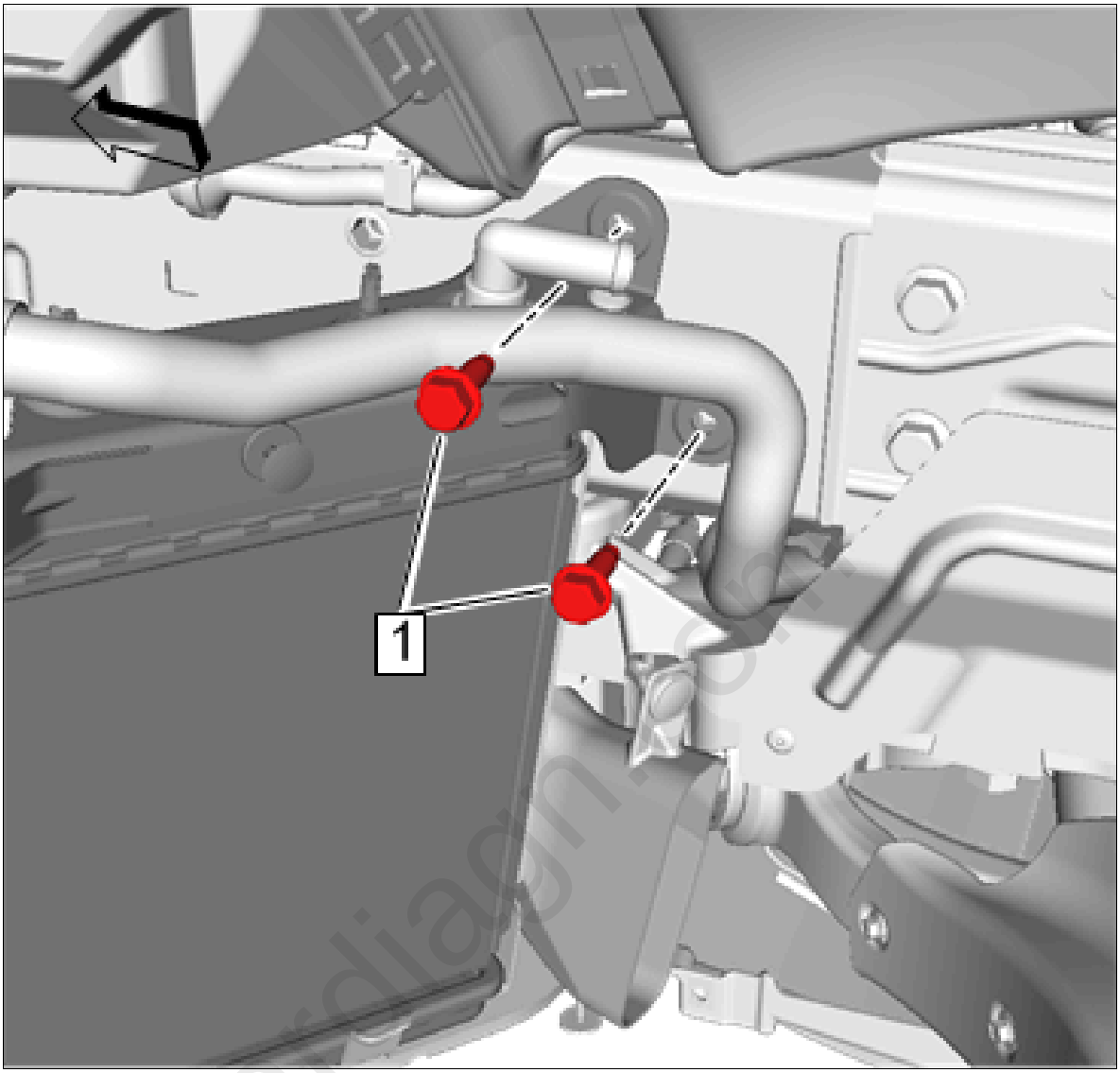
Fig 2: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Disengage Auxiliary Radiator Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type
6. Remove Auxiliary Radiator Inlet Hose (2) at Quick Connect Fitting

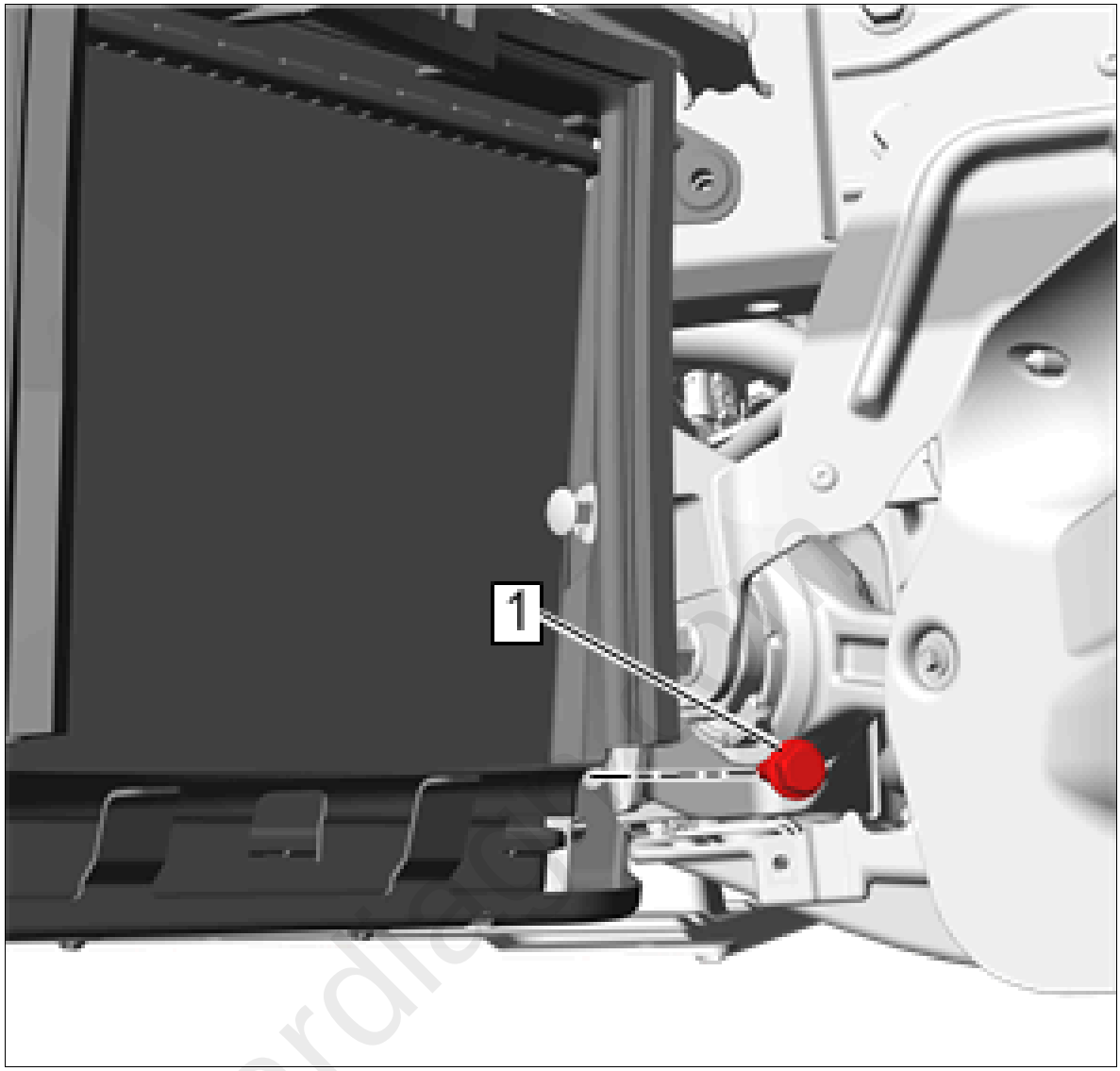
Fig 3: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

7. Remove Charge Air Cooler Bracket Bolt (1) (Qty: 2)

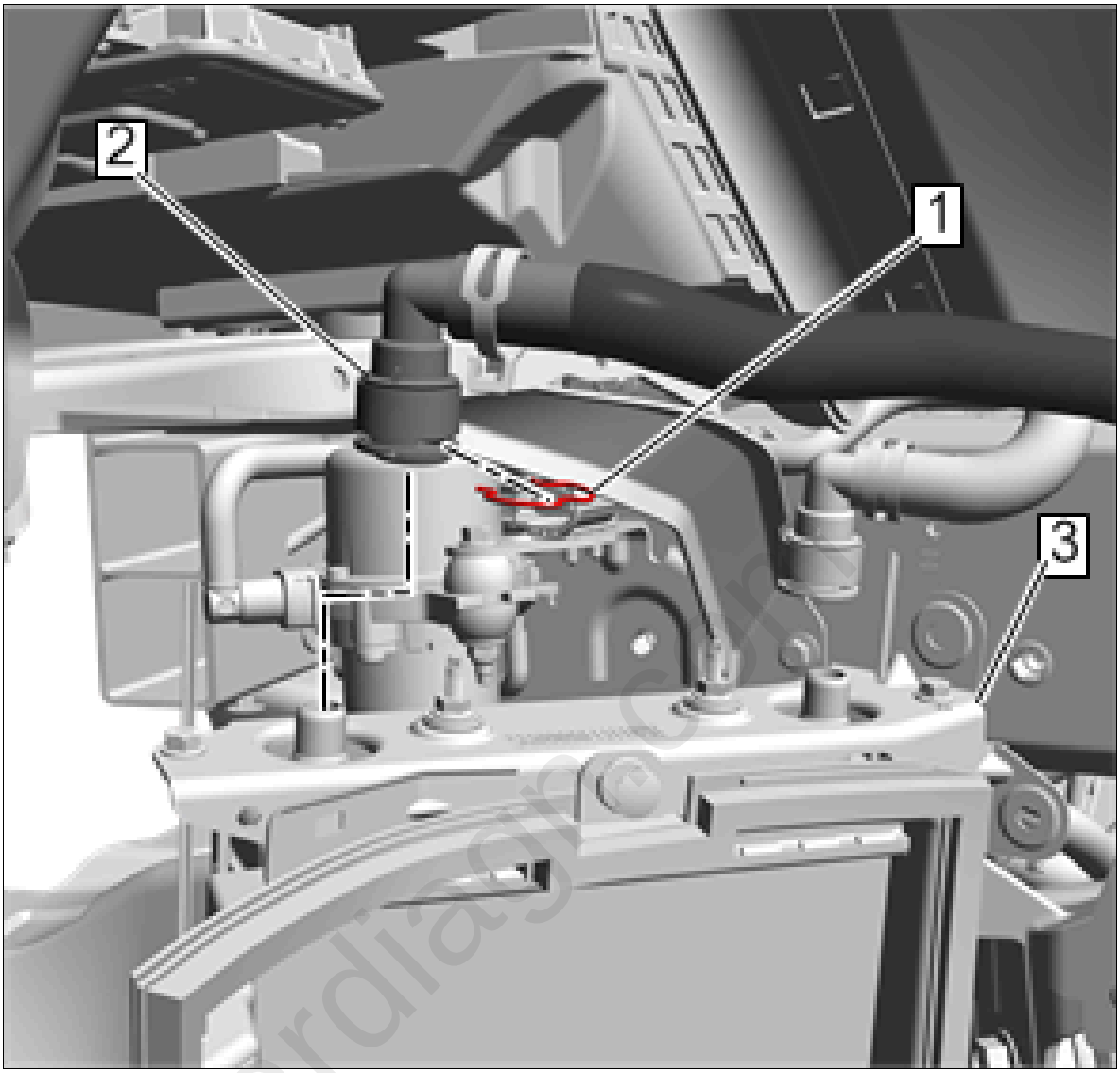
Fig 4: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

8. Remove Charge Air Cooler Bracket Bolt (1)

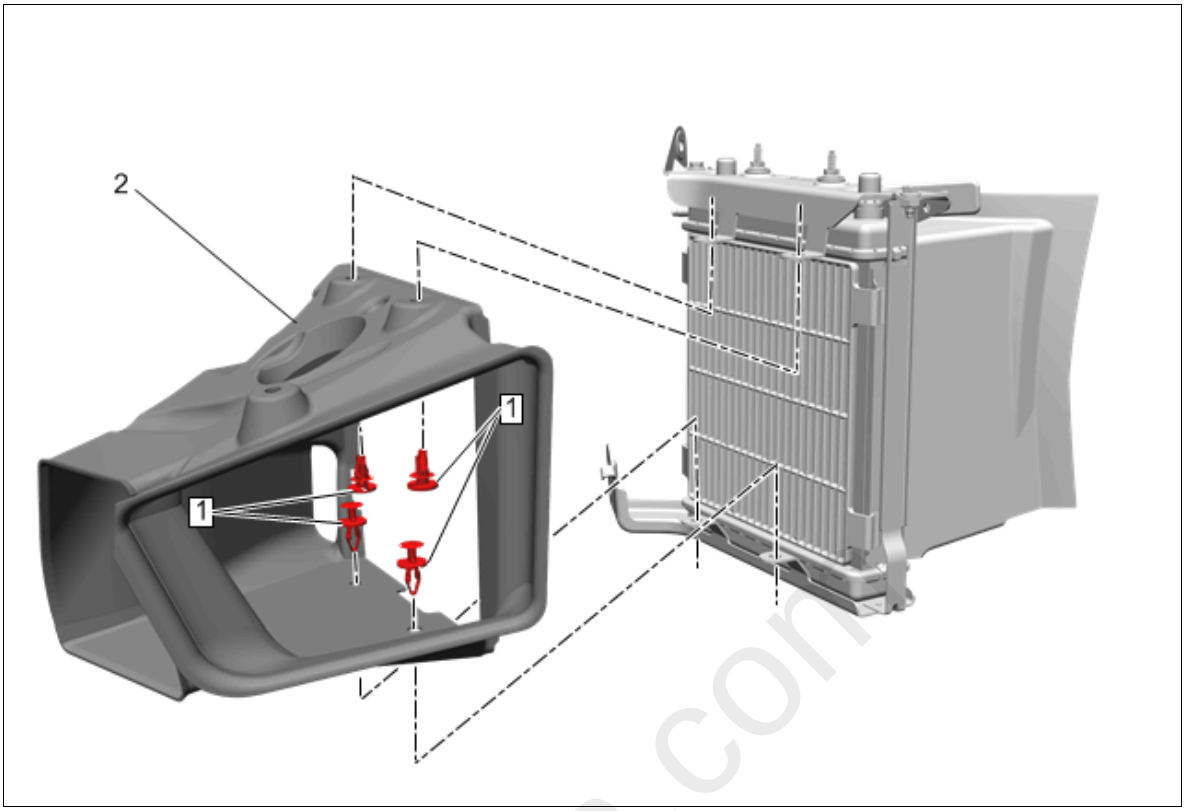
Fig 5: Charge Air Cooler Assembly



Courtesy of GENERAL MOTORS COMPANY

9. Lower and temporary support the charge air cooler and duct assembly (3)
10. Remove Radiator Outlet Hose Retainer (1)
11. Remove Quick Connect Fitting (2)
12. Remove Charge Air Cooler Assembly (3)

Fig 6: Radiator Air Side Baffle - Left Side

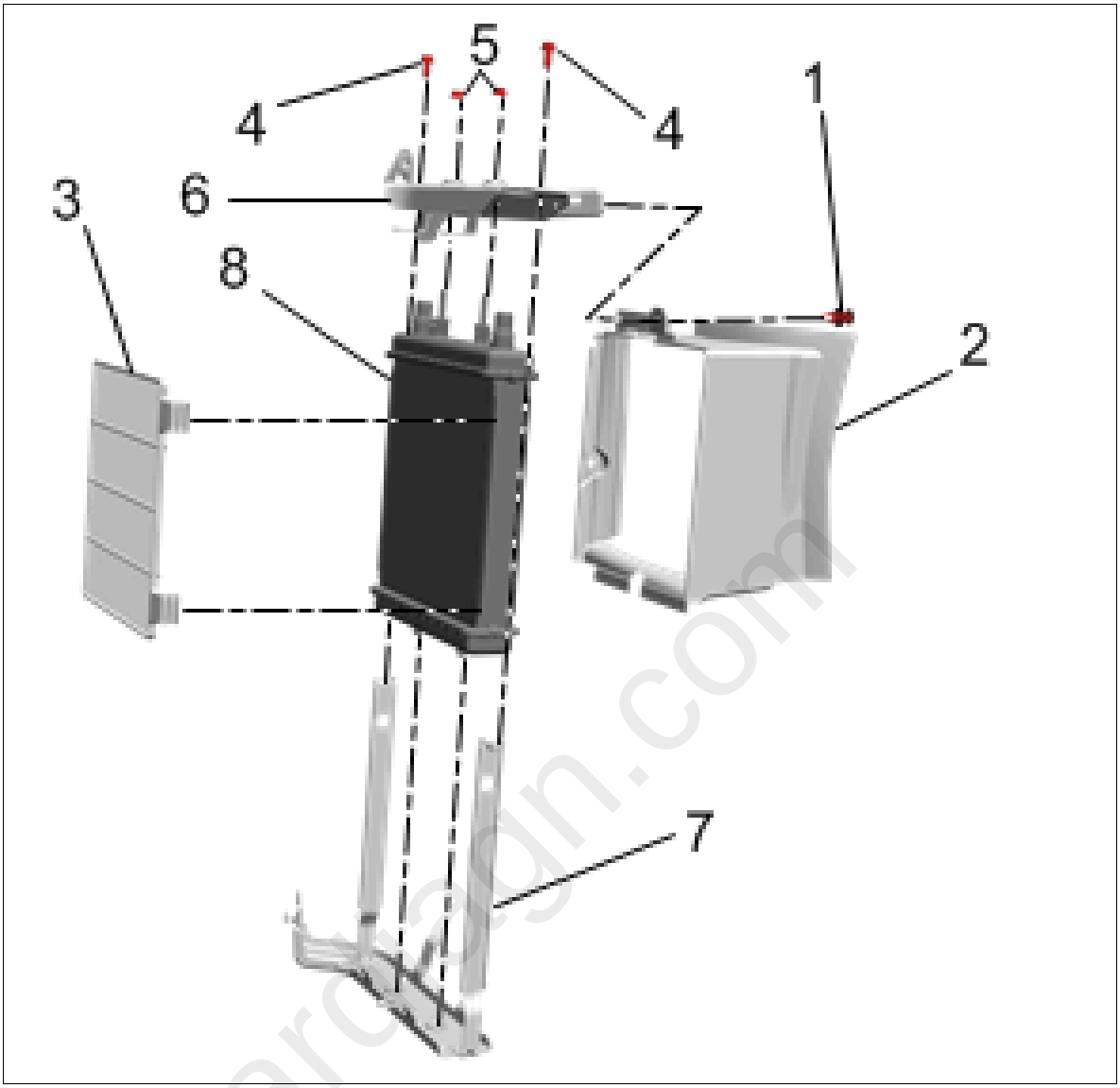


Courtesy of GENERAL MOTORS COMPANY

13. Remove Push Pin (1) (Qty: 4)
14. Remove Radiator Air Side Baffle - Left Side (2)

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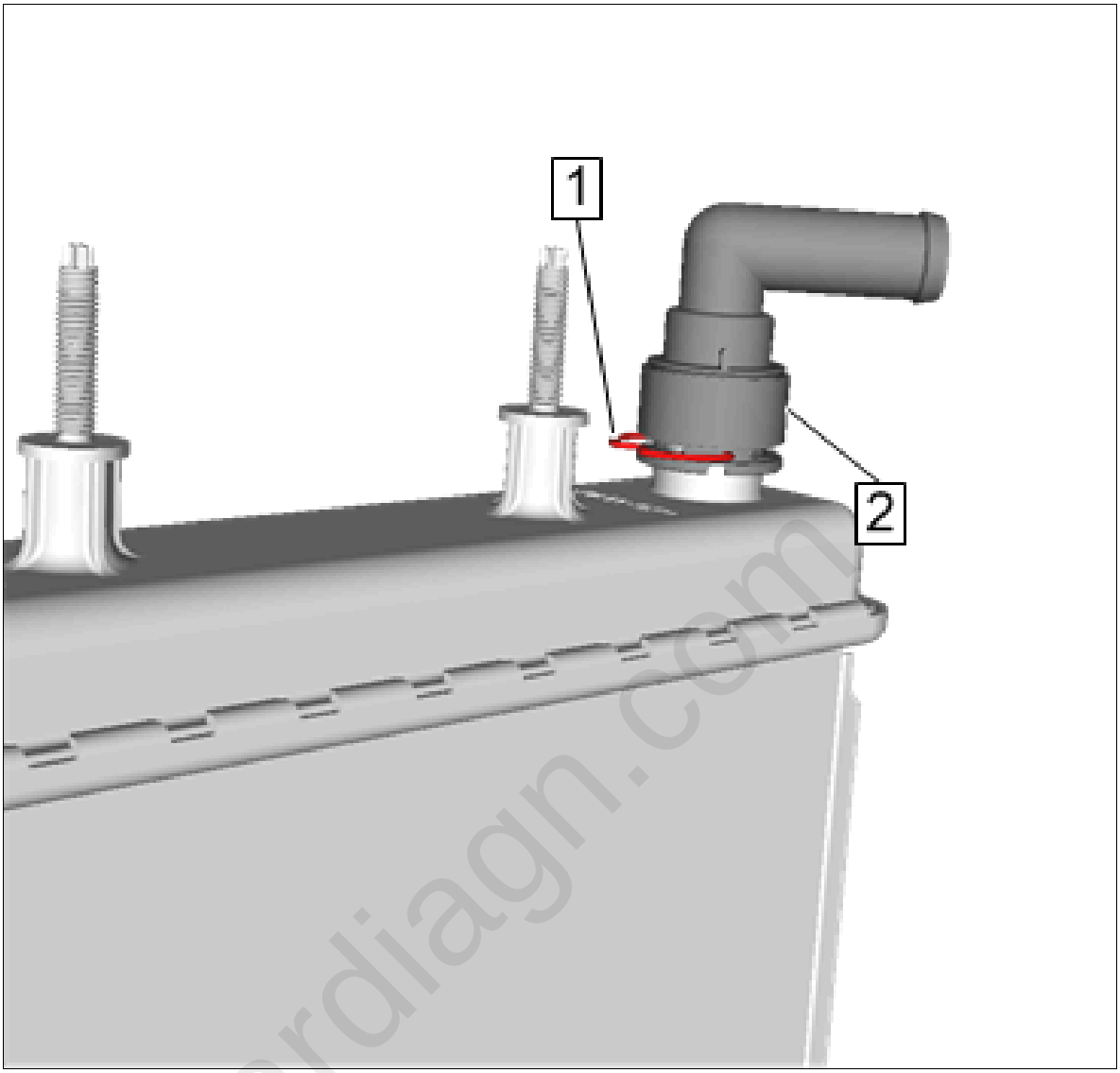
Fig 7: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

15. Remove Push Pin (1)
16. Remove Rear Duct (2)
17. Remove Stone Guard (3)
18. Remove Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2)
19. Remove Charge Air Cooler Upper Bracket Nut (5) (Qty: 2)
20. Remove Upper Charge Air Cooler Bracket (6)
21. Remove Lower Charge Air Cooler Bracket (7)
22. Remove Charge Air Cooler (8)

Fig 8: Auxiliary Radiator Inlet Hose Retainer



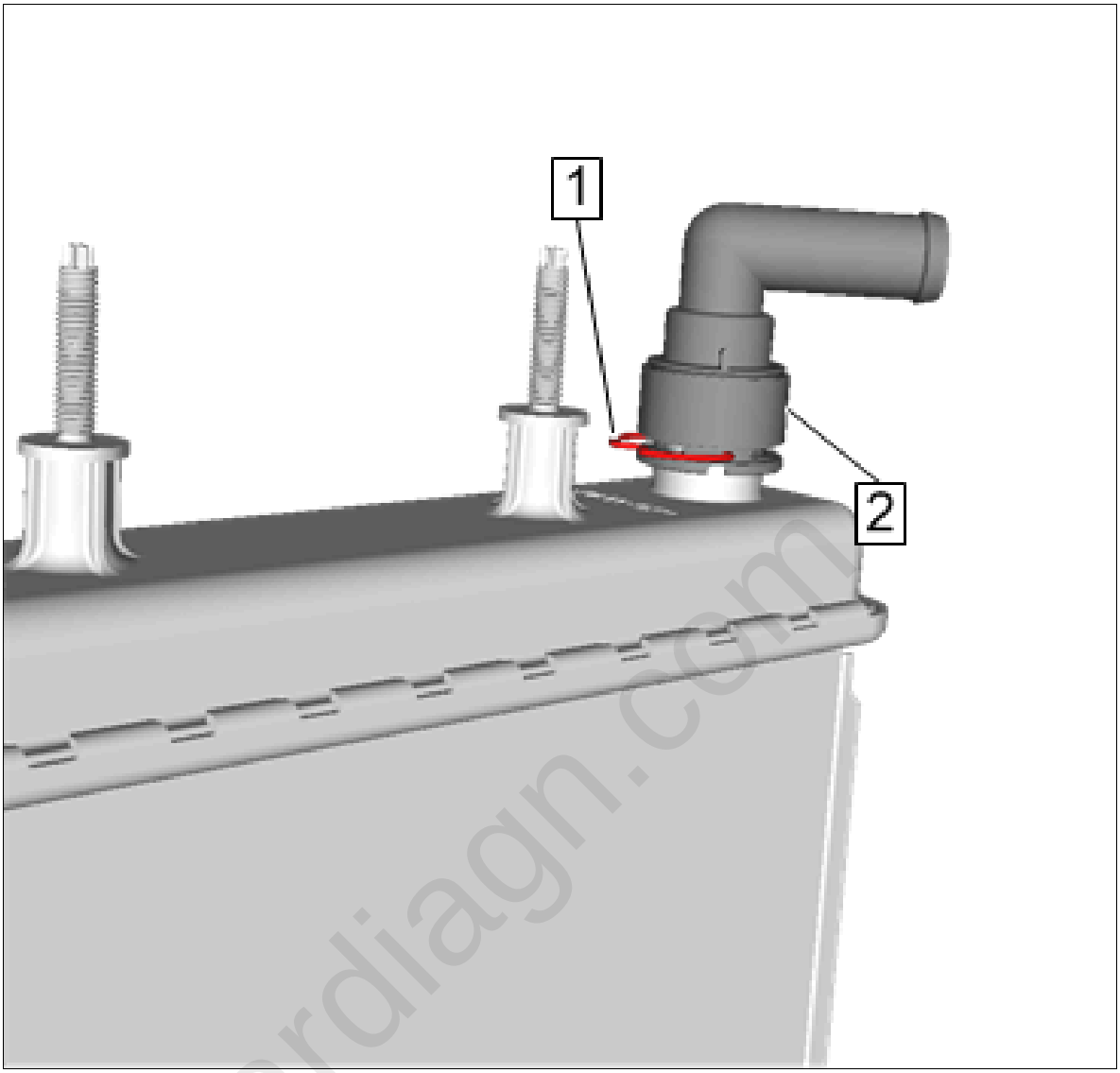
Courtesy of GENERAL MOTORS COMPANY

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23. Disengage Auxiliary Radiator Inlet Hose Retainer (1)
24. Remove Quick Connect Fitting (2) at Charge Air Cooler

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LT1 V18) > INSTALLATION PROCEDURE

Fig 1: Auxiliary Radiator Inlet Hose Retainer

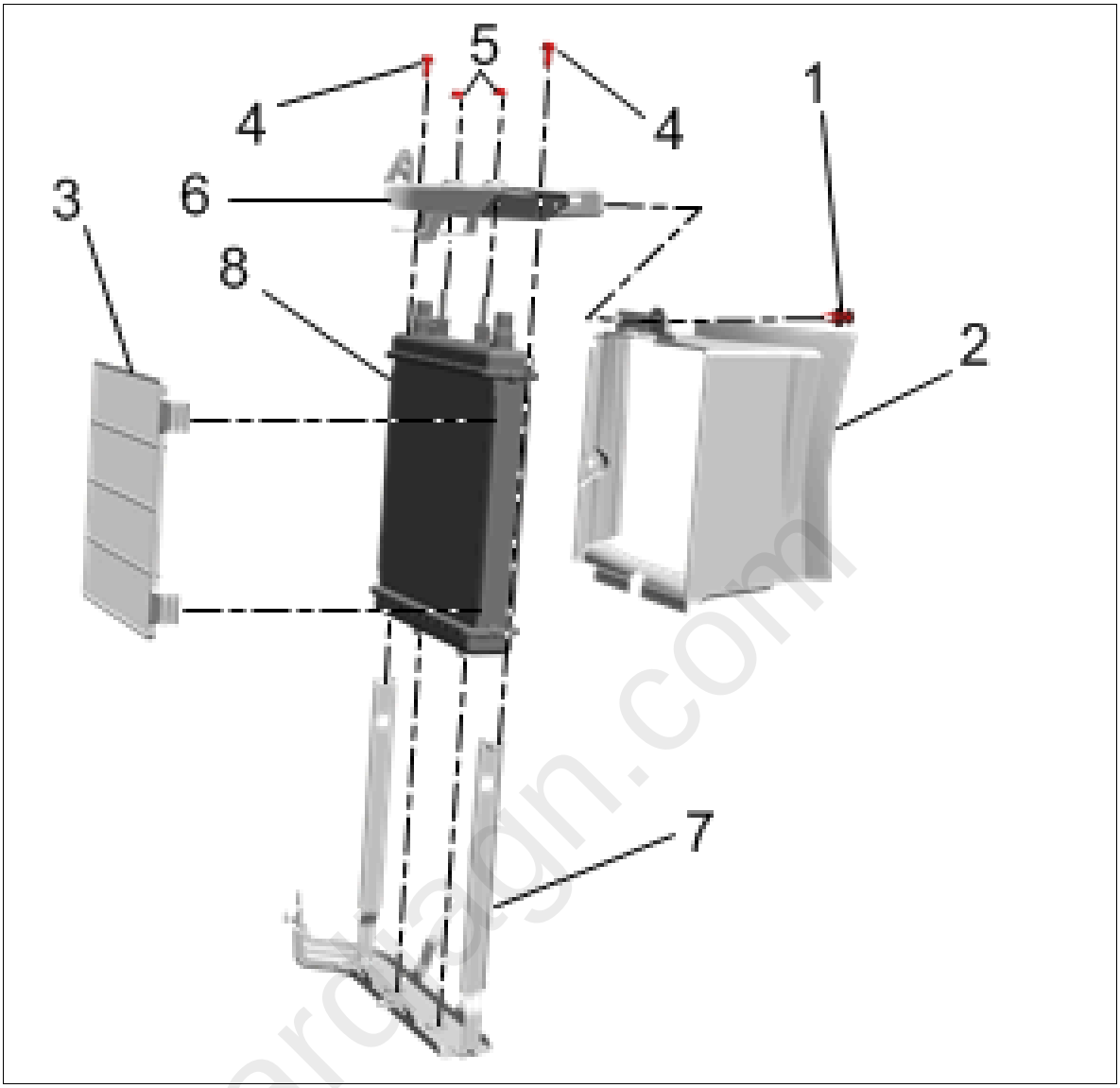


Courtesy of GENERAL MOTORS COMPANY

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1. Install Quick Connect Fitting (2) at Charge Air Cooler
2. Engage Auxiliary Radiator Inlet Hose Retainer (1)

Fig 2: Charge Air Cooler



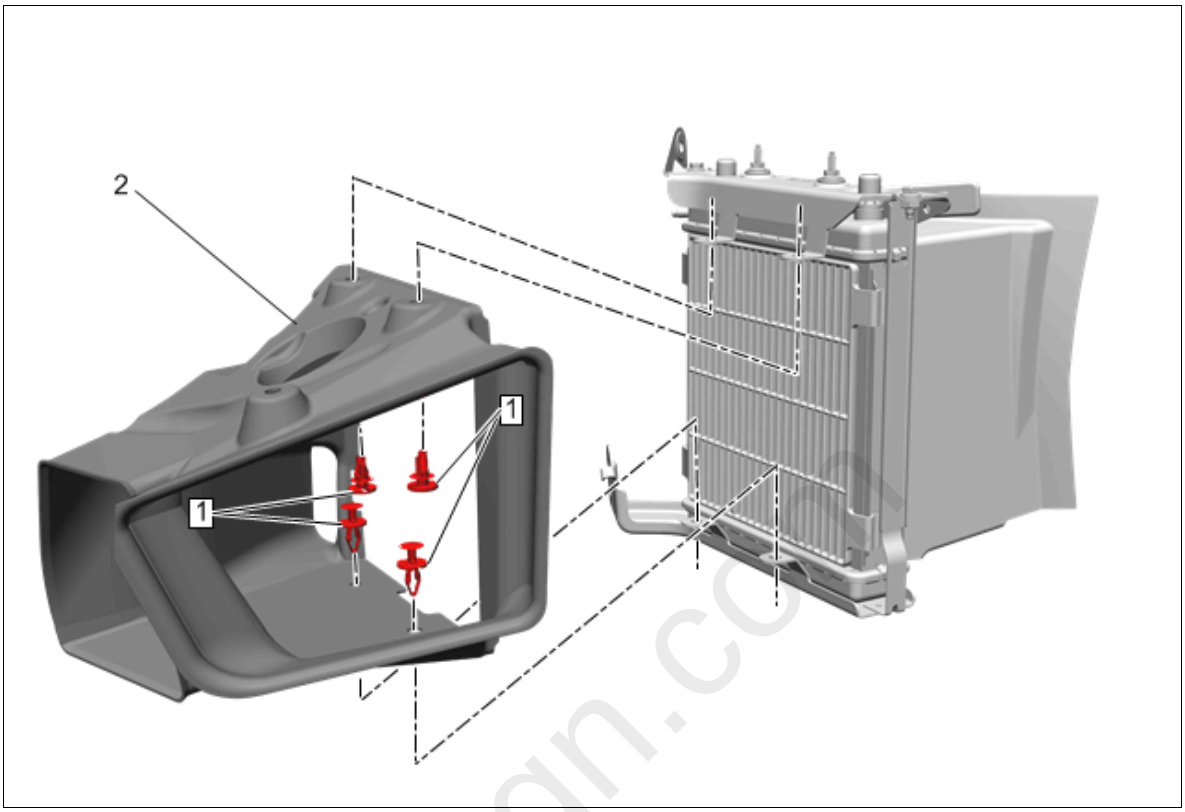
Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Component Fastener Tightening Caution .*

3. Install Charge Air Cooler (8)
4. Install Lower Charge Air Cooler Bracket (7)
5. Install Upper Charge Air Cooler Bracket (6)
6. Install Charge Air Cooler Upper Bracket Nut (5) (Qty: 2) and tighten to 9 N.m (80 lb in)
7. Install Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2) and tighten to 9 N.m (80 lb in)
8. Install Stone Guard (3)

9. Install Rear Duct (2)
10. Install Push Pin (1)

Fig 3: Radiator Air Side Baffle - Left Side

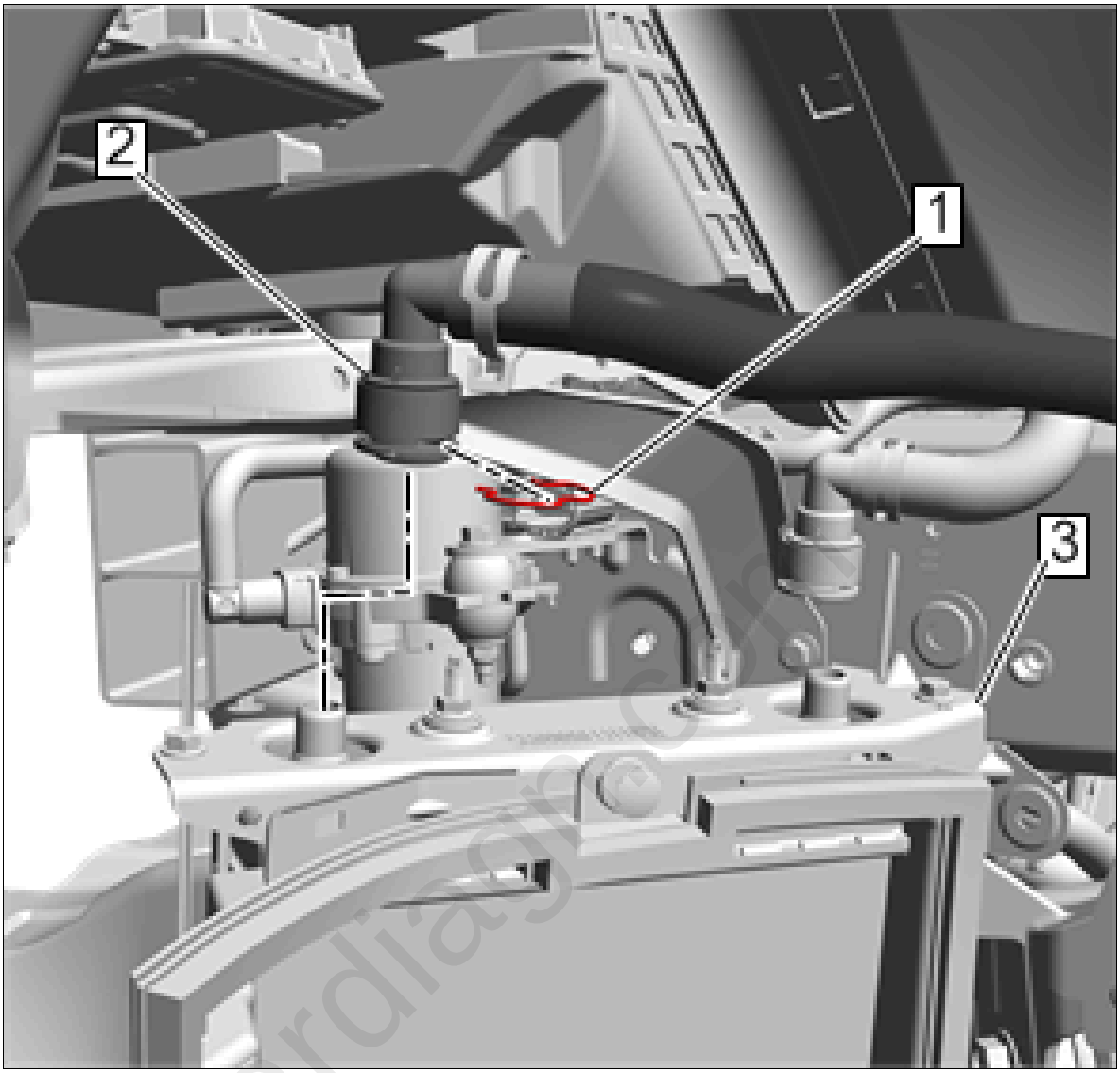


Courtesy of GENERAL MOTORS COMPANY

11. Install Push Pin (1) (Qty: 4)
12. Install Radiator Air Side Baffle - Left Side (2)

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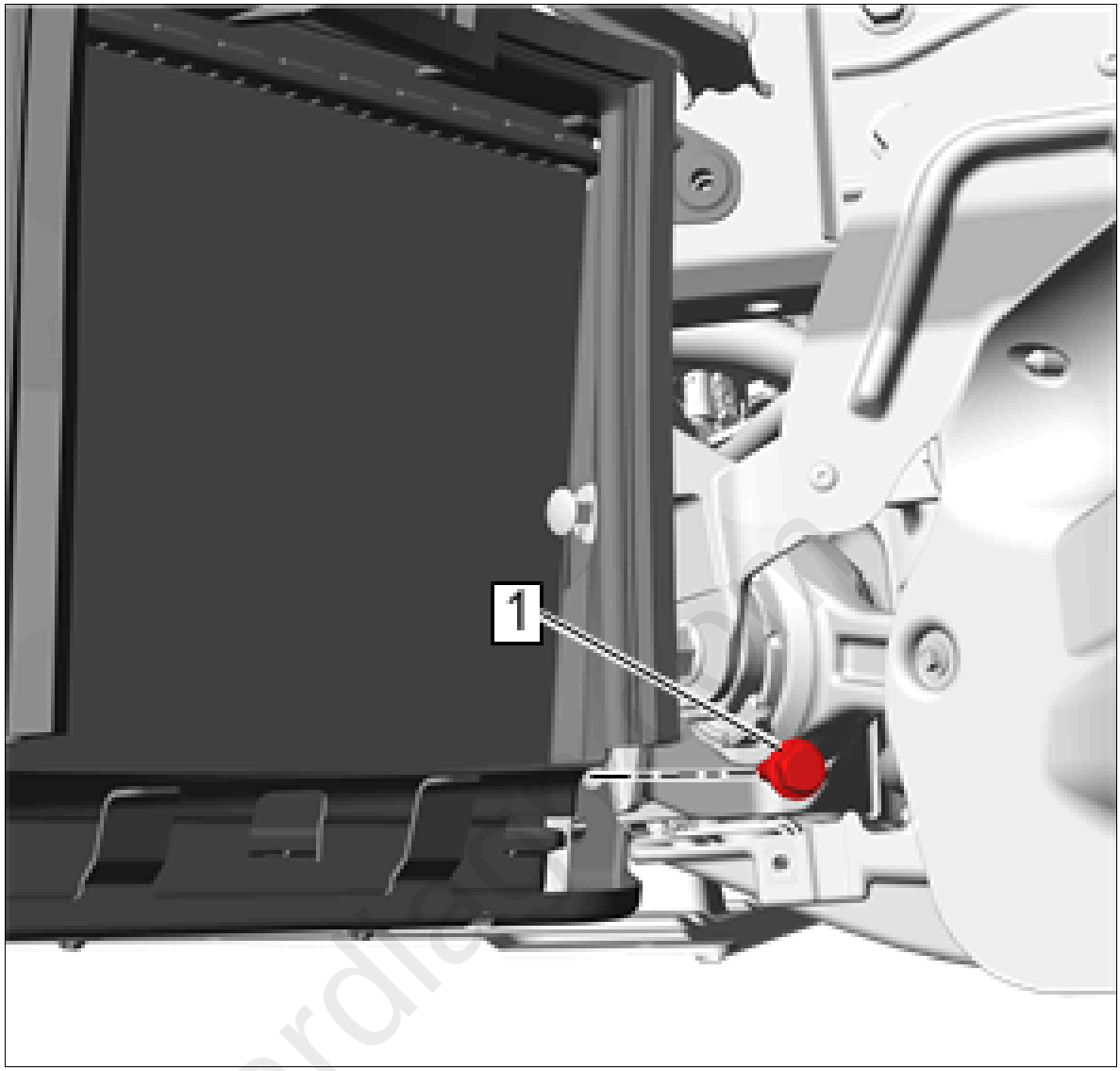
Fig 4: Radiator Outlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

13. Raise and temporary support the charge air cooler and duct assembly (3)
14. Install Radiator Outlet Hose Retainer (1)
15. Install Quick Connect Fitting (2)

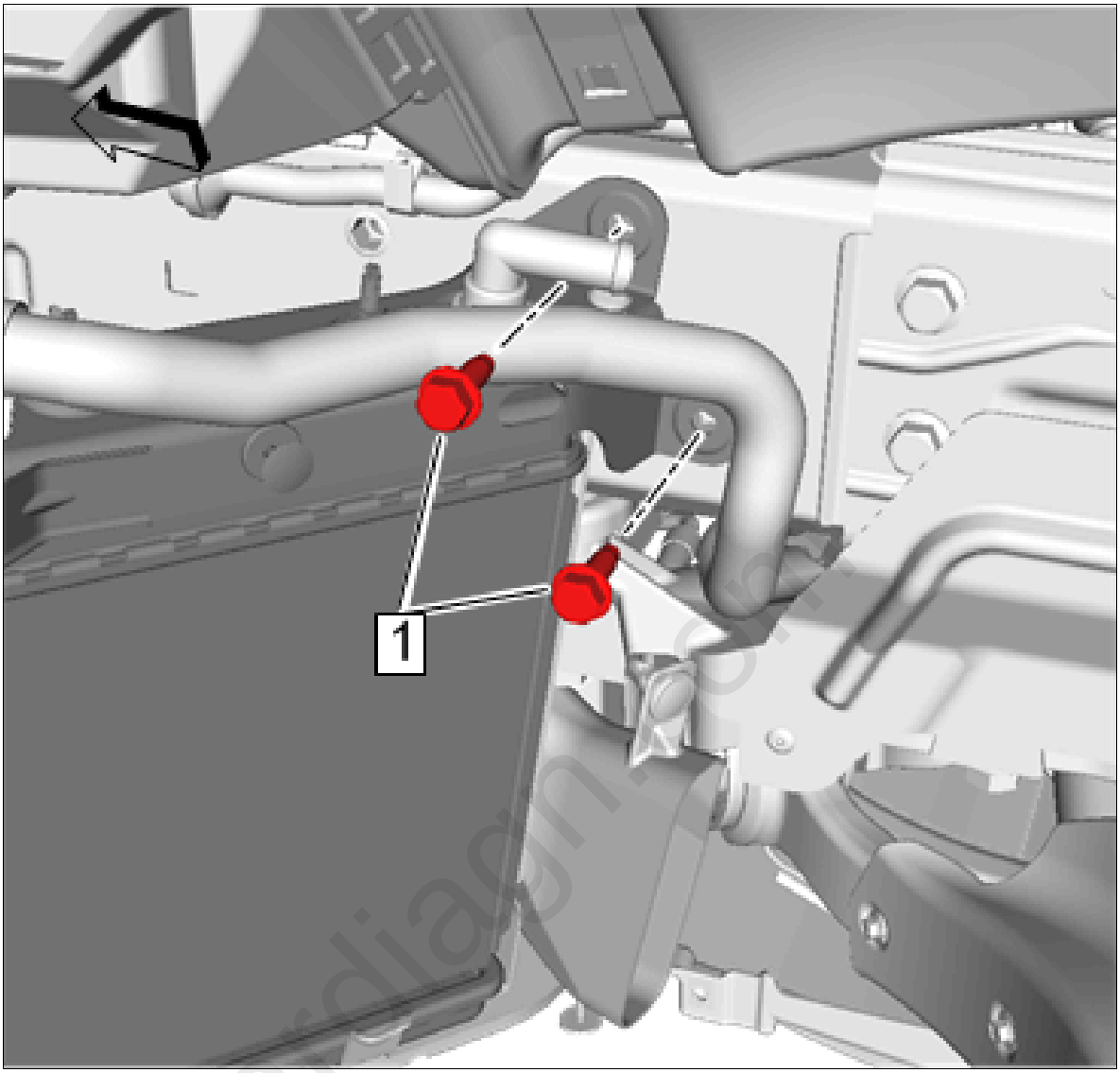
Fig 5: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

16. Install Charge Air Cooler Bracket Bolt (1) and tighten to 9 N.m (80 lb in)

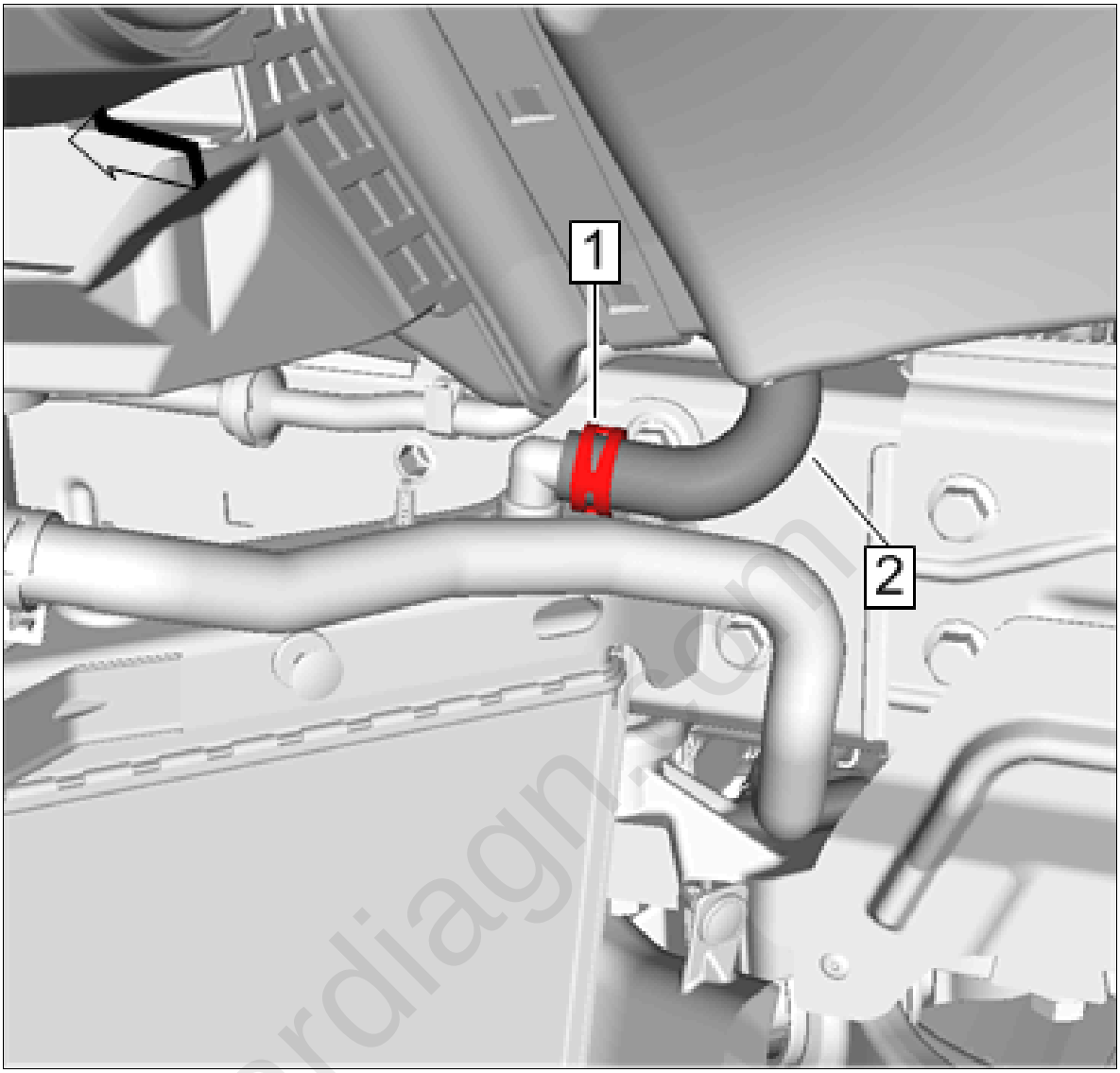
Fig 6: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

17. Install Charge Air Cooler Bracket Bolt (1) (Qty: 2) and tighten to 9 N.m (80 lb in)

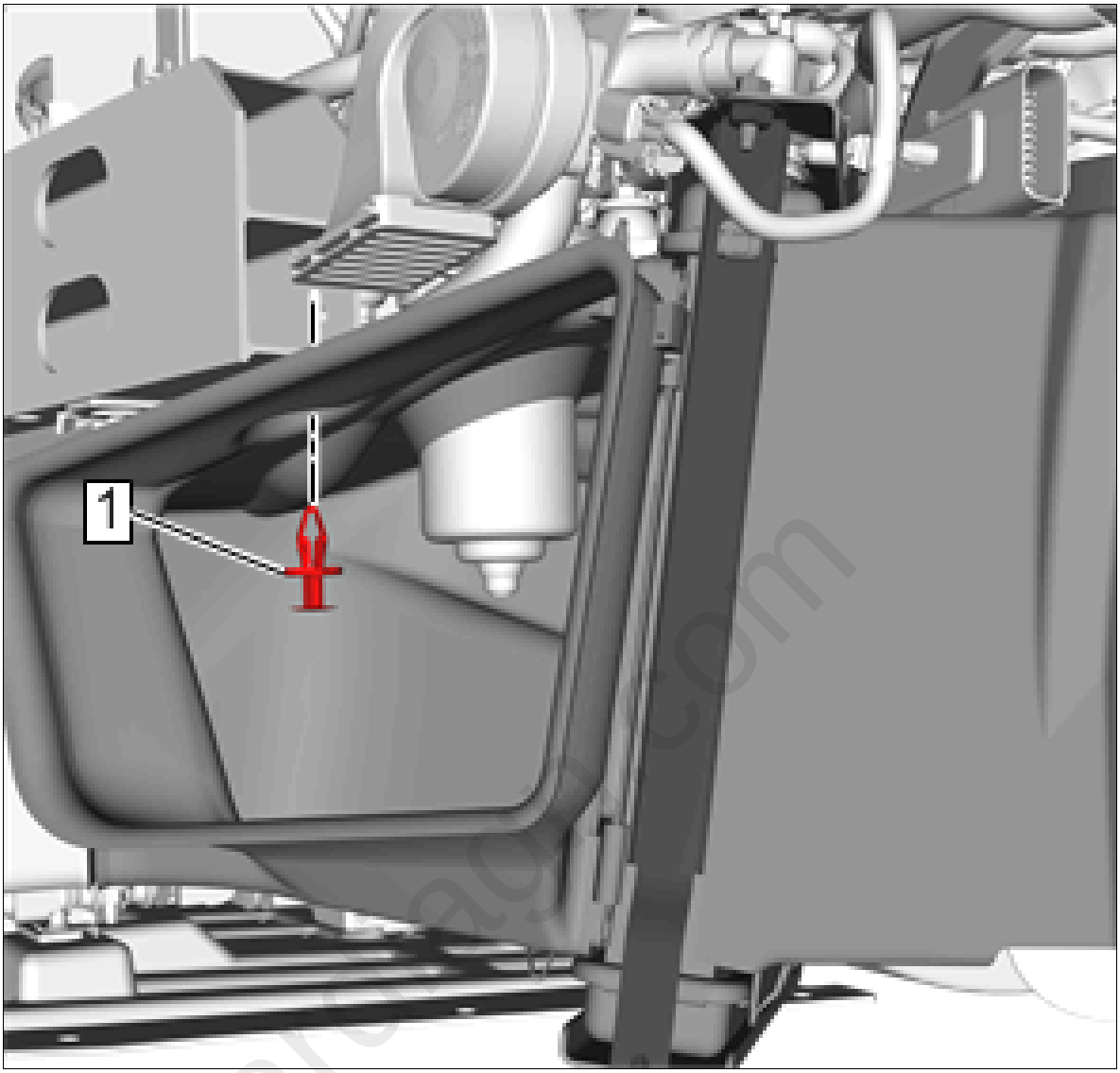
Fig 7: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

18. Install Auxiliary Radiator Inlet Hose (2) at Quick Connect Fitting
19. Engage Auxiliary Radiator Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

Fig 8: Push Pin



Courtesy of GENERAL MOTORS COMPANY

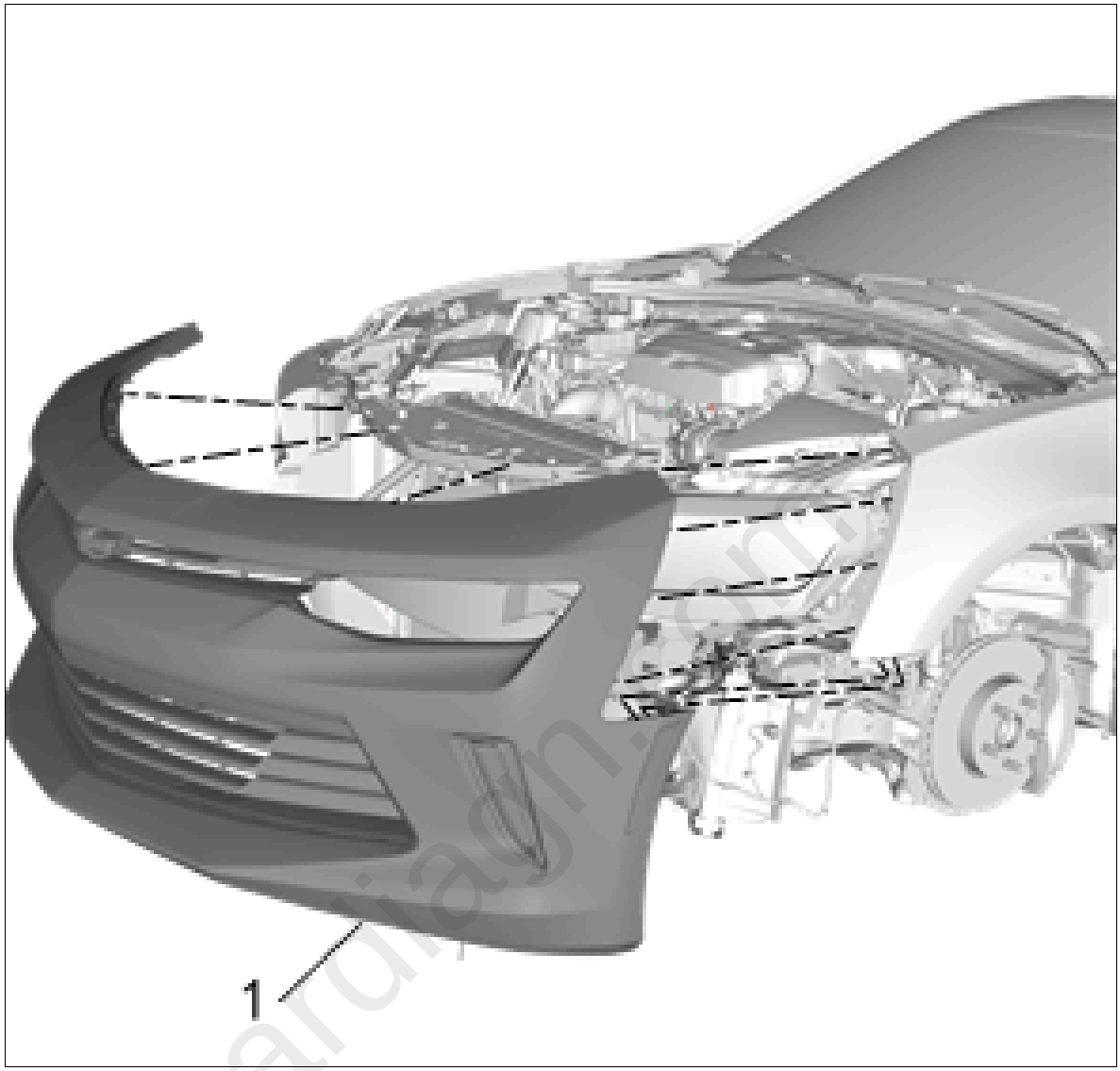
20. Install Push Pin (1)
21. Install Front Brake Rotor Cooling Duct Replacement (J6G)
22. Install Front Bumper Fascia Replacement
23. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
24. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LTG WITH V18) > REMOVAL PROCEDURE

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

Draining and Filling (Static Fill)

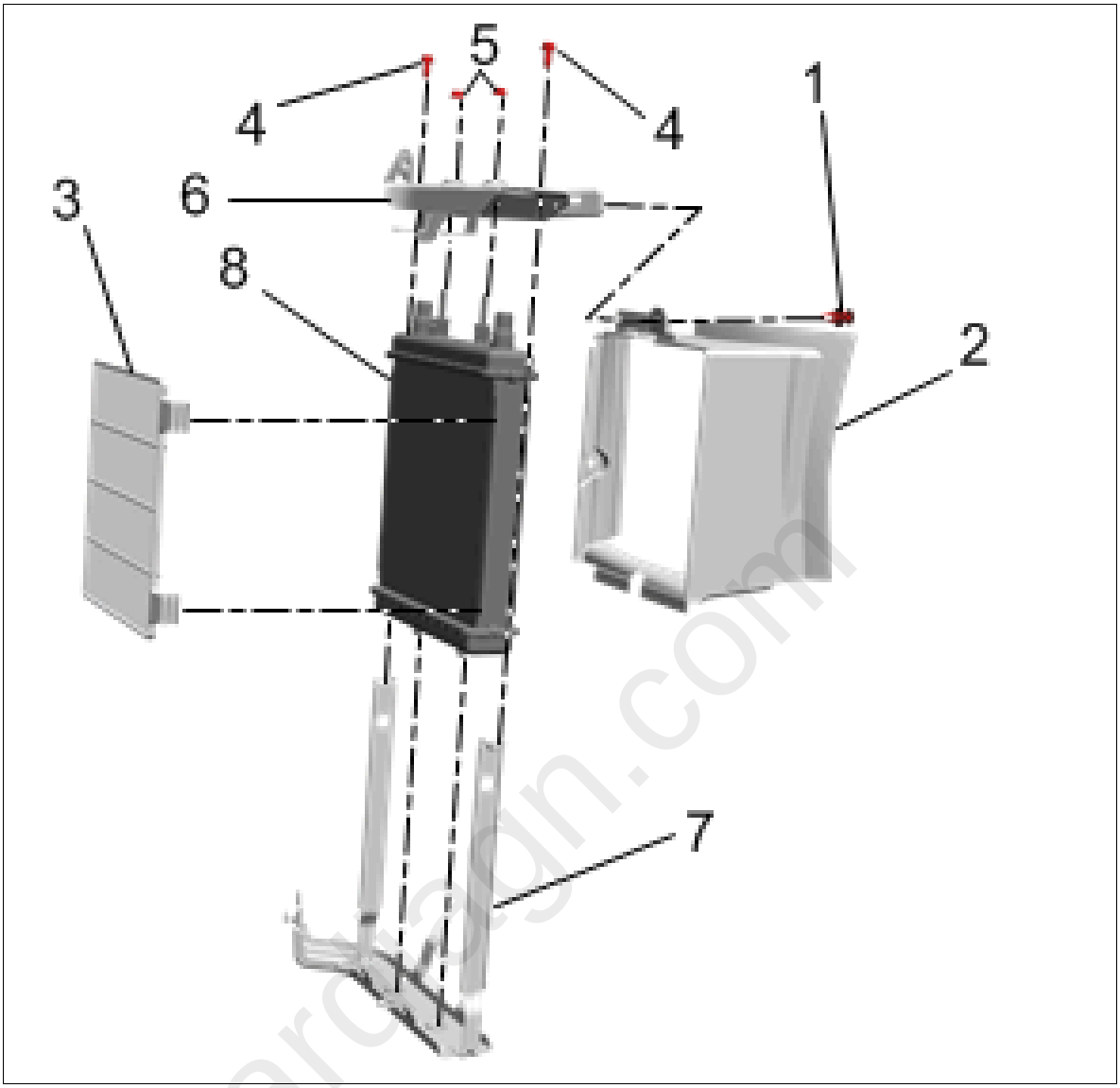
Fig 1: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Bumper Fascia (1) - Front Bumper Fascia Replacement
3. Remove Front Brake Rotor Cooling Duct-Rear - Front Brake Rotor Cooling Duct Replacement (J6G)

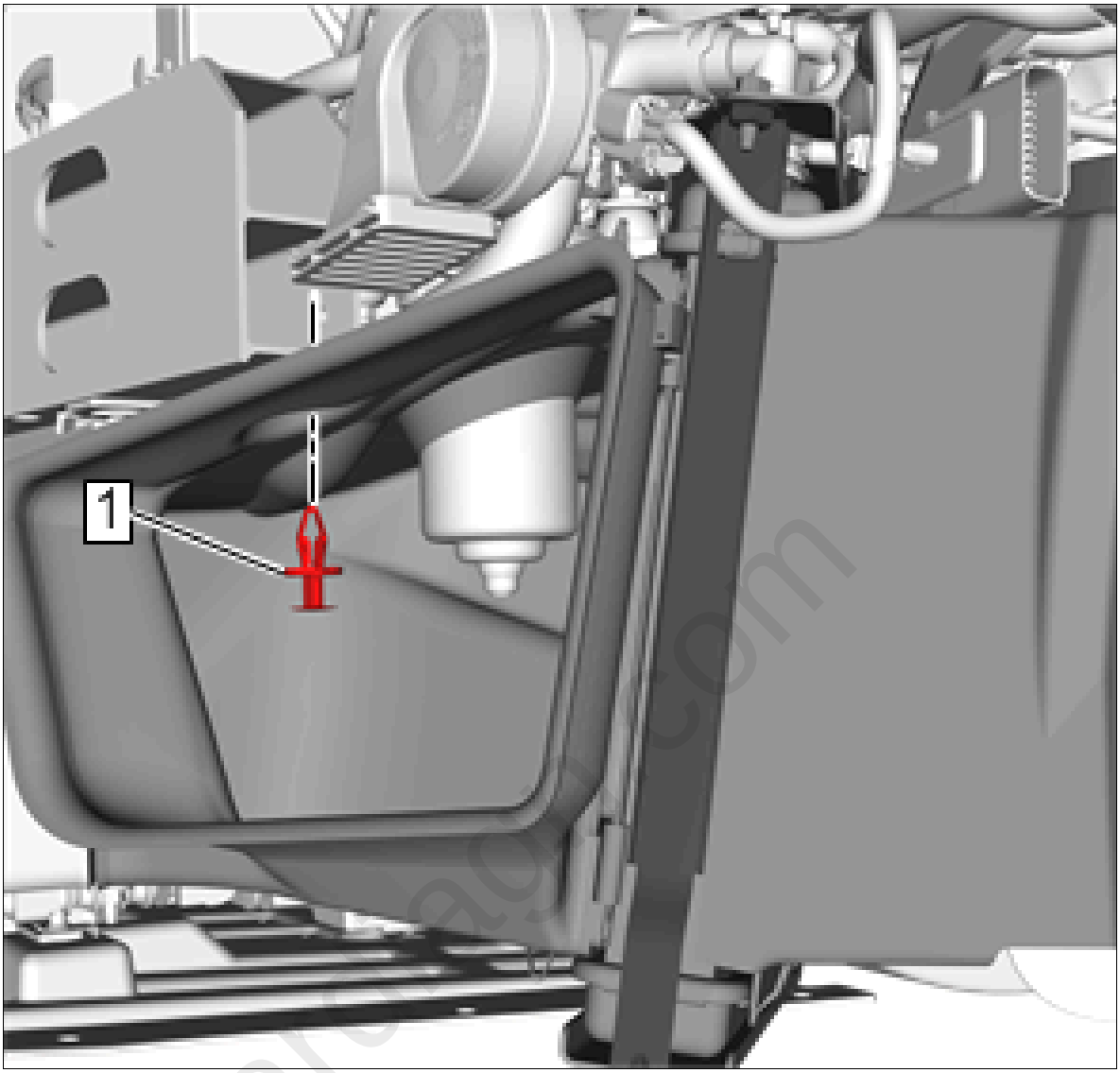
Fig 2: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

4. Remove Push Pin (1)
5. Remove Rear Duct (2)

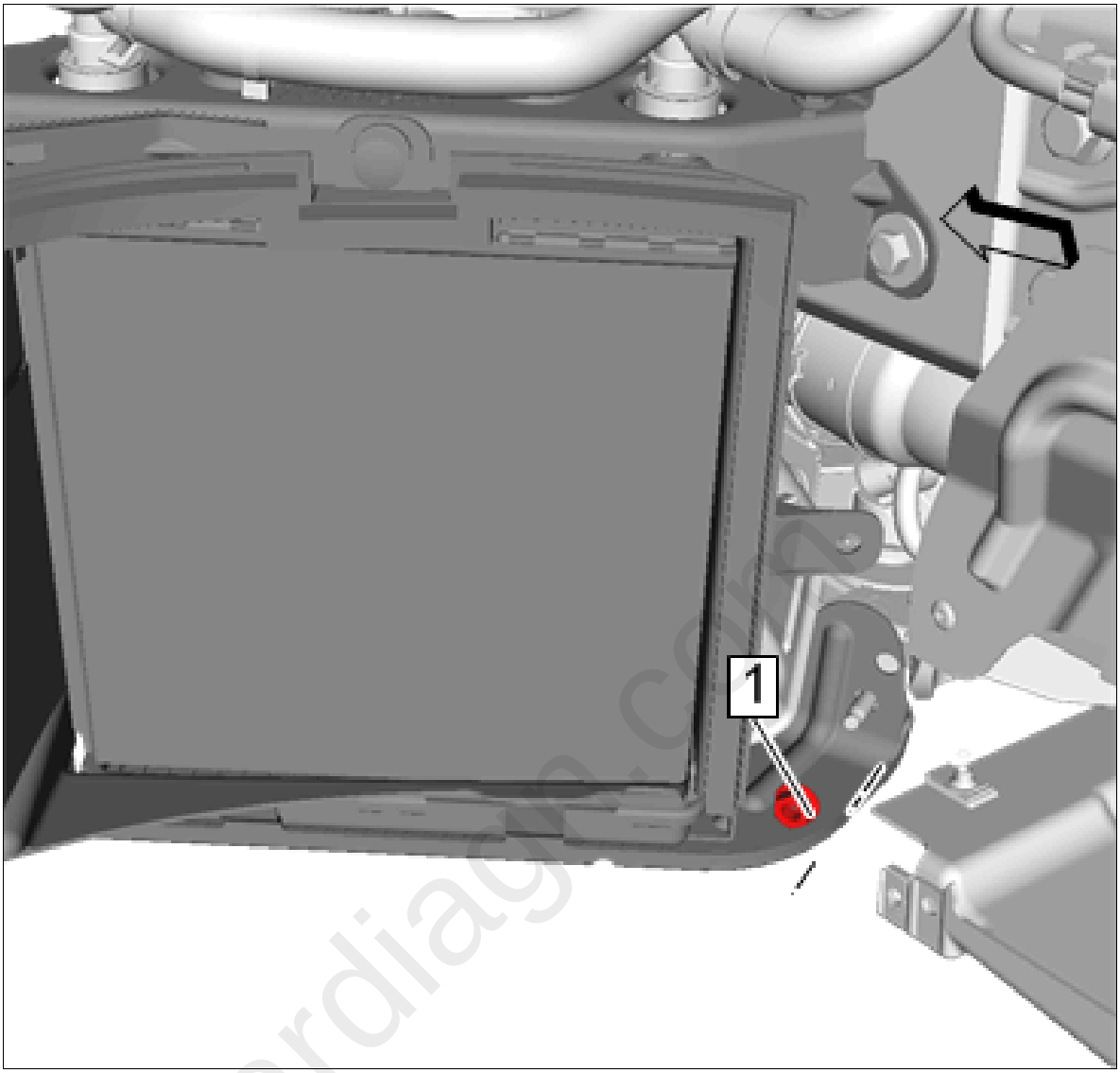
Fig 3: Push Pin



Courtesy of GENERAL MOTORS COMPANY

6. Remove Push Pin (1)

Fig 4: Charge Air Cooler Bracket Nut

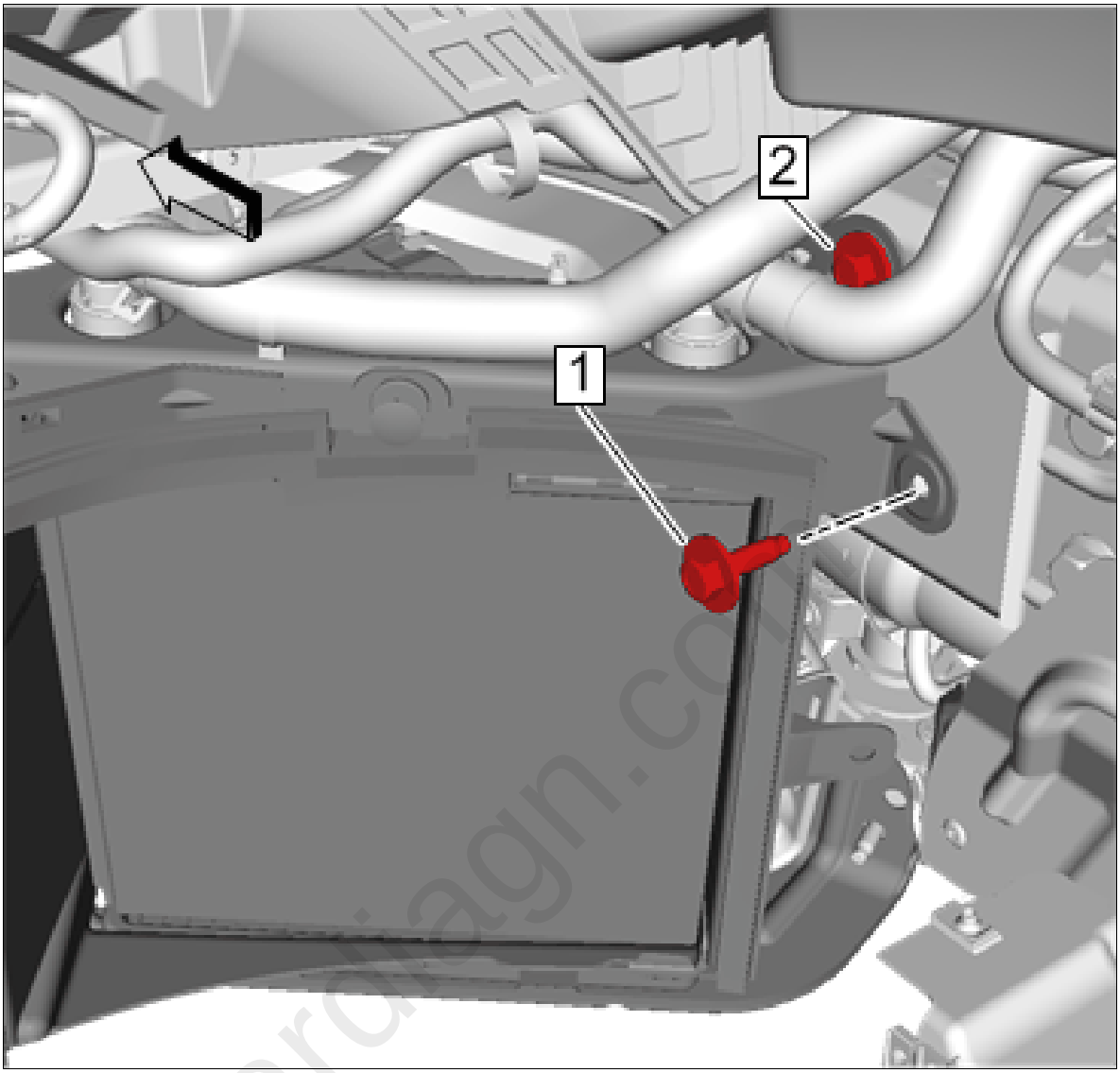


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7. Remove Charge Air Cooler Bracket Nut (1)

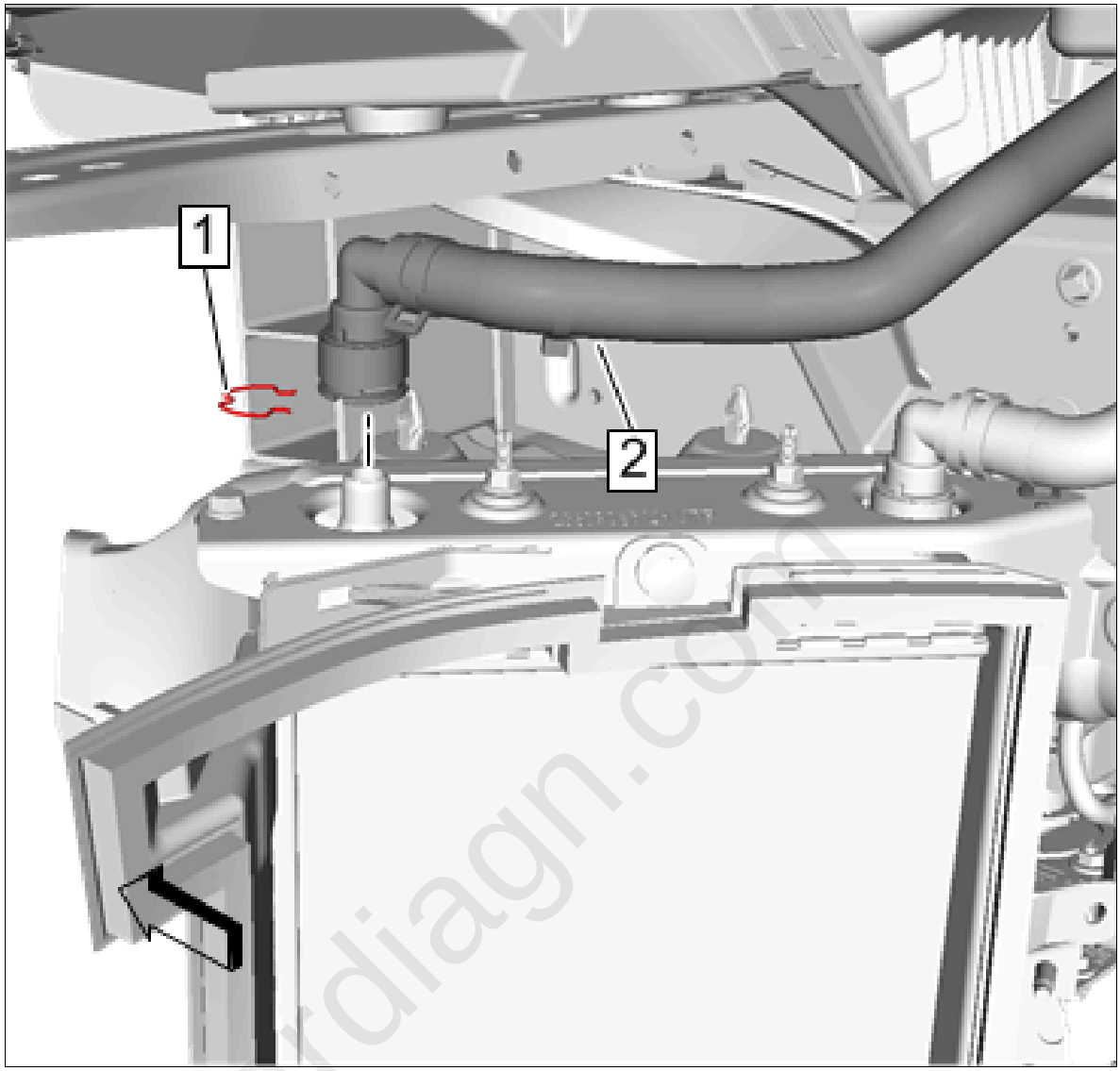
Fig 5: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

8. Remove Charge Air Cooler Bracket Bolt (1)
9. While supporting the charge air cooler, remove charge air cooler bracket bolt (2) with the charge air cooler.

Fig 6: Auxiliary Radiator Inlet Hose Retainer

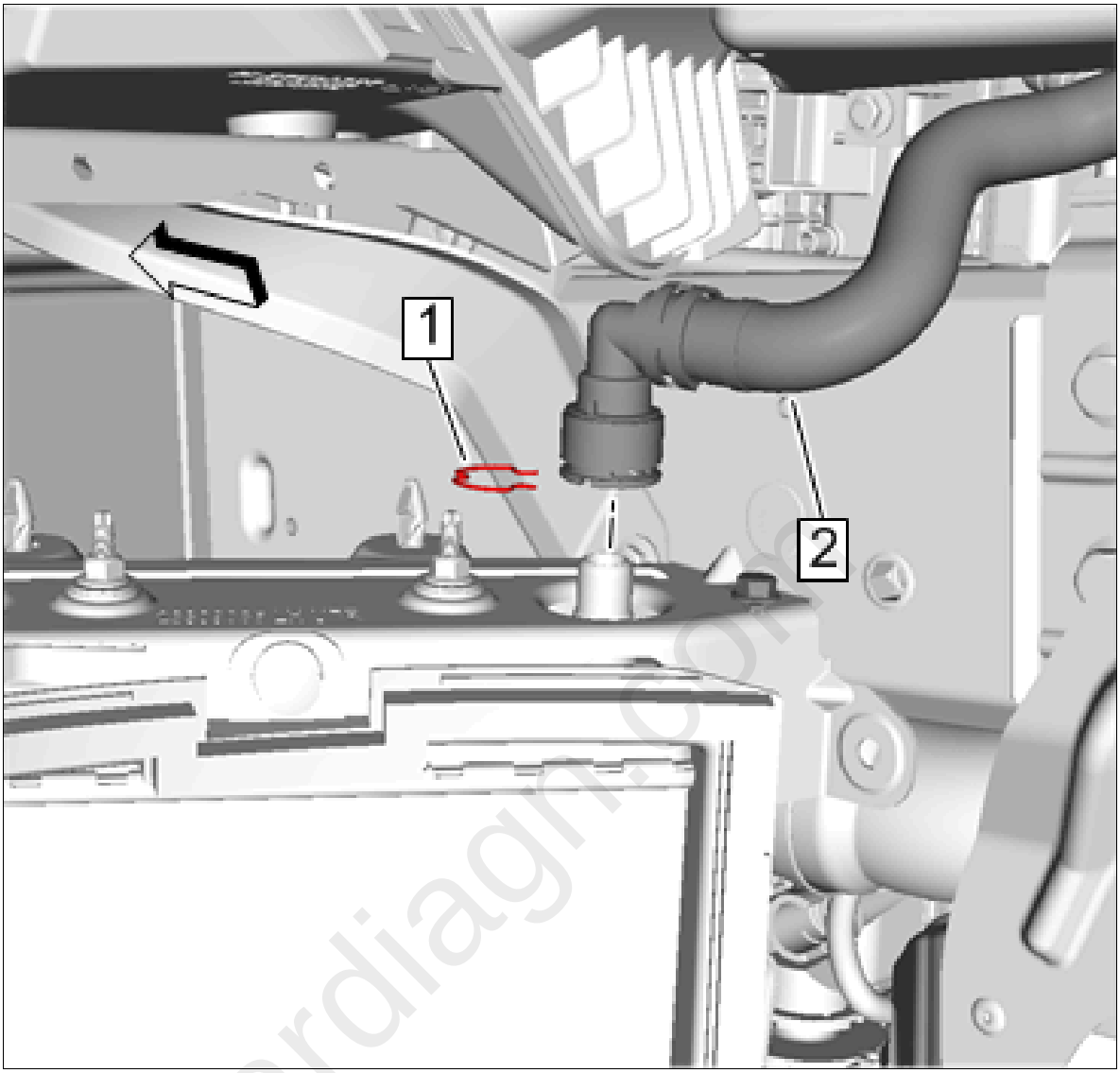


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10. Disengage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose
11. Remove Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler

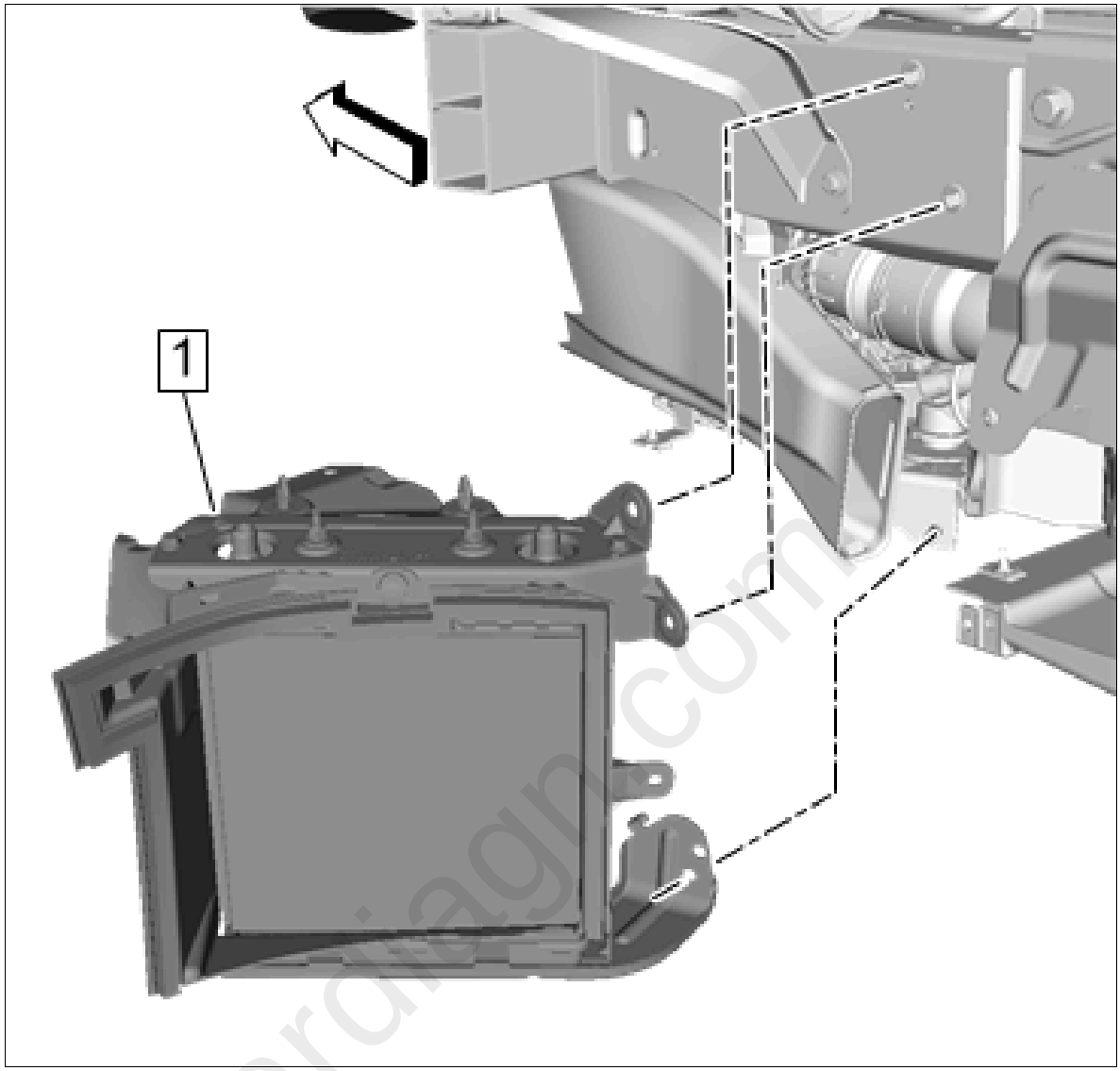
Fig 7: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

12. Disengage Radiator Outlet Hose Retainer (1) at Radiator Outlet Hose
13. Remove Radiator Outlet Hose (2) at Charge Air Cooler

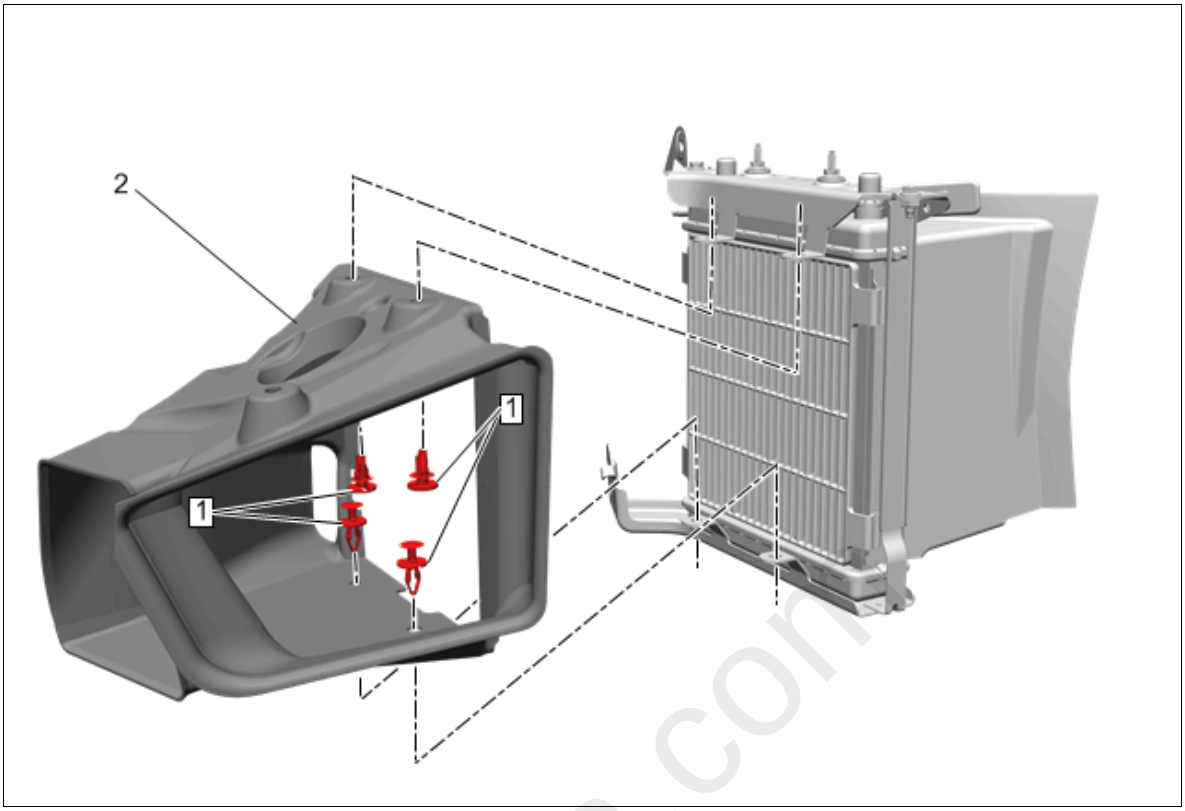
Fig 8: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

14. Remove Charge Air Cooler (1)

Fig 9: Radiator Air Side Baffle - Left Side

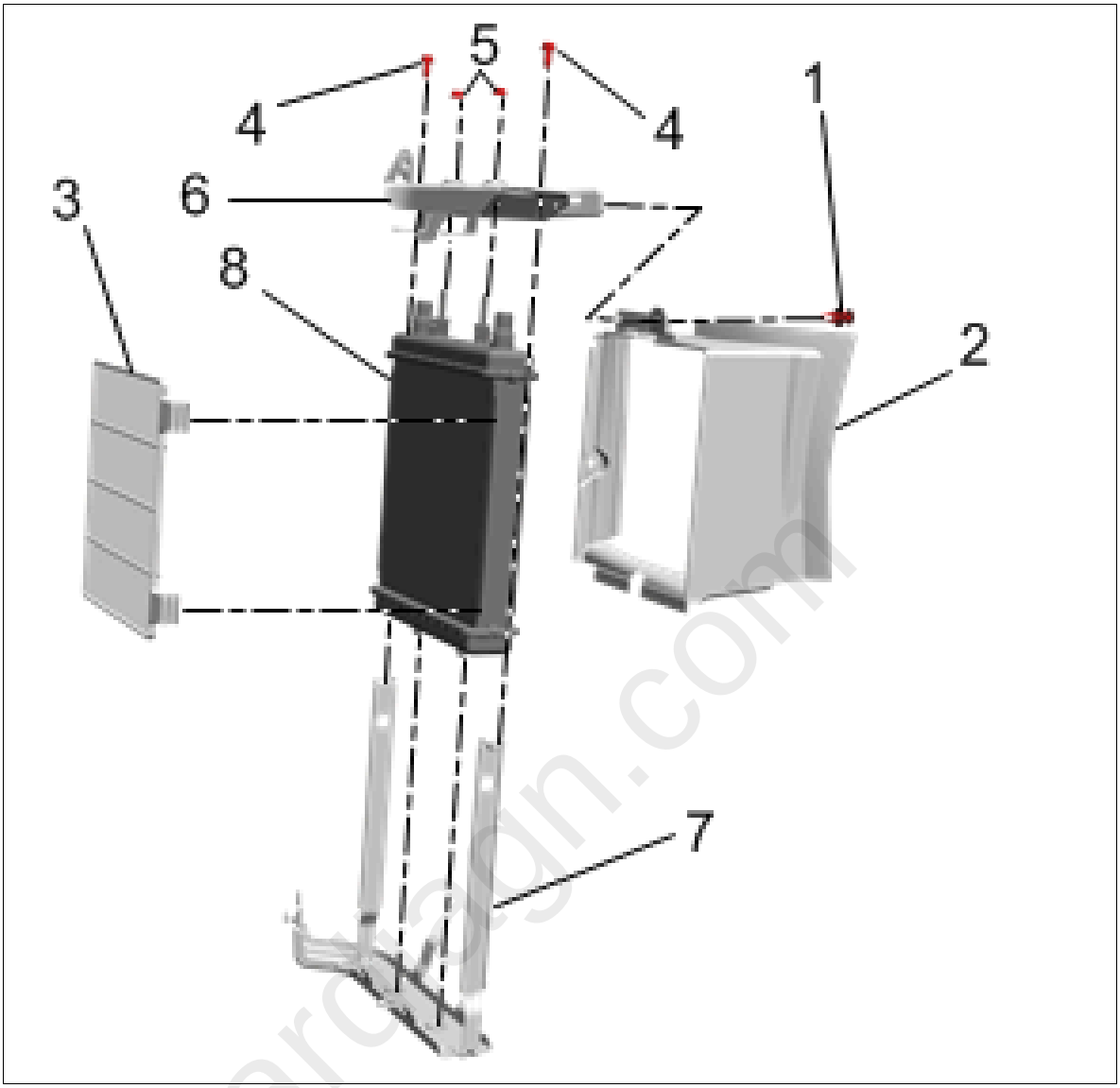


Courtesy of GENERAL MOTORS COMPANY

15. Remove Push Pin (1) (Qty: 4)
16. Remove Radiator Air Side Baffle - Left Side (2)

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Fig 10: Charge Air Cooler

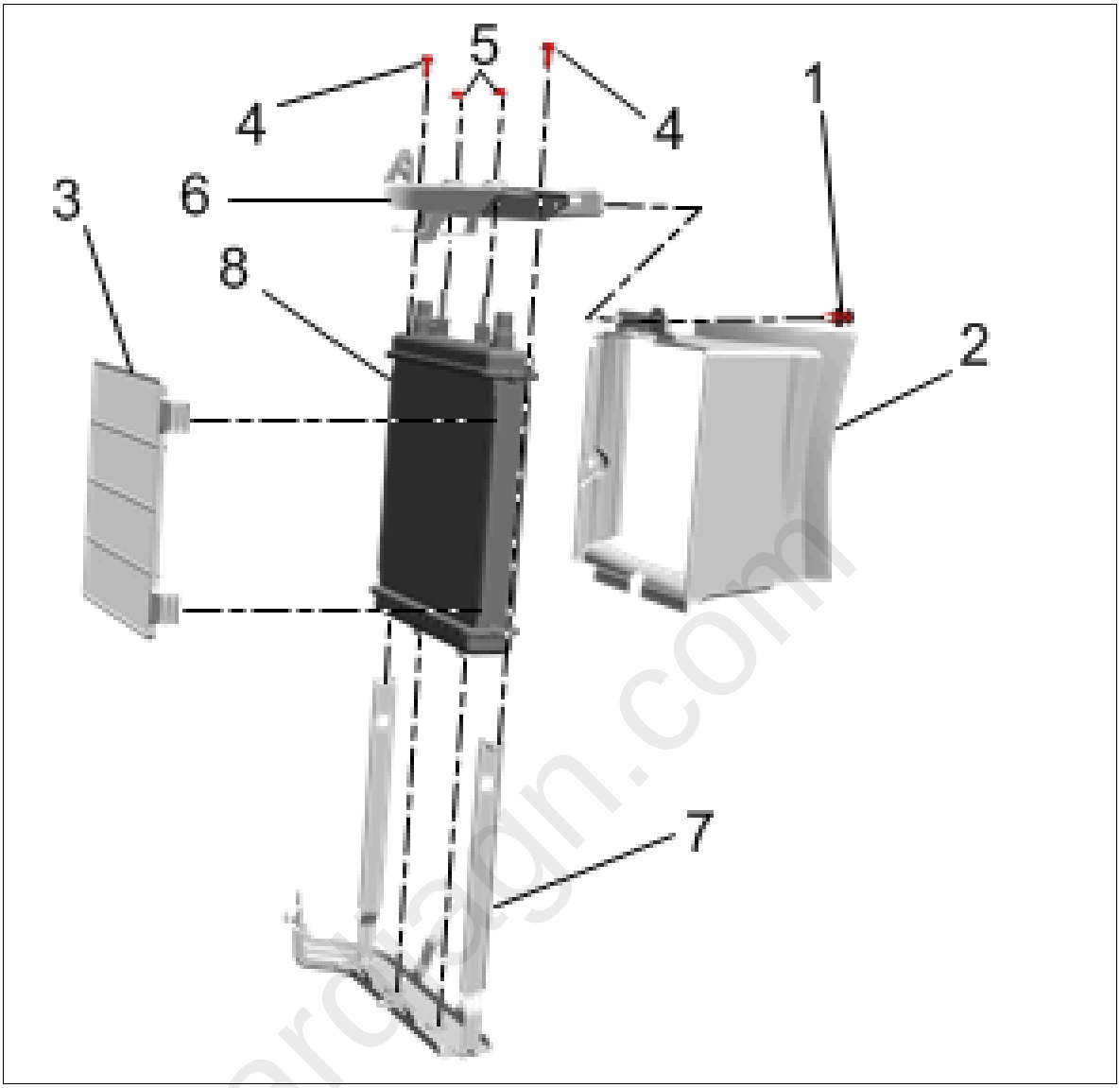


Courtesy of GENERAL MOTORS COMPANY

17. Remove Stone Guard (3)
18. Remove Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2)
19. Remove Charge Air Cooler Upper Bracket Nut (5) (Qty: 2)
20. Remove Upper Charge Air Cooler Bracket (6)
21. Remove Lower Charge Air Cooler Bracket (7)
22. Remove Charge Air Cooler (8)

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - LEFT SIDE (LTG WITH V18) > INSTALLATION PROCEDURE

Fig 1: Charge Air Cooler



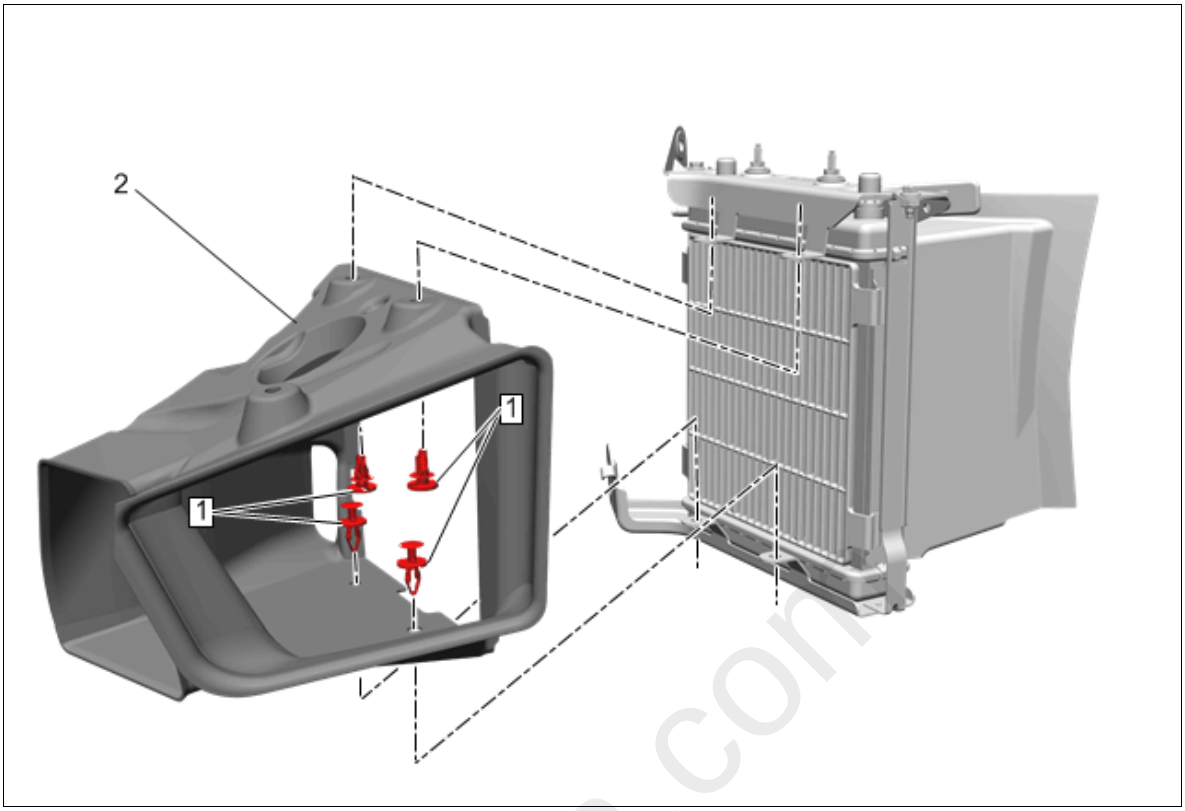
Courtesy of GENERAL MOTORS COMPANY

1. Install Charge Air Cooler (8)
2. Install Lower Charge Air Cooler Bracket (7)
3. Install Upper Charge Air Cooler Bracket (6)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

4. Install Charge Air Cooler Upper Bracket Nut (5) (Qty: 2) and tighten to 9 N.m (80 lb in)
5. Install Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2) and tighten to 9 N.m (80 lb in)
6. Install Stone Guard (3)

Fig 2: Radiator Air Side Baffle - Left Side

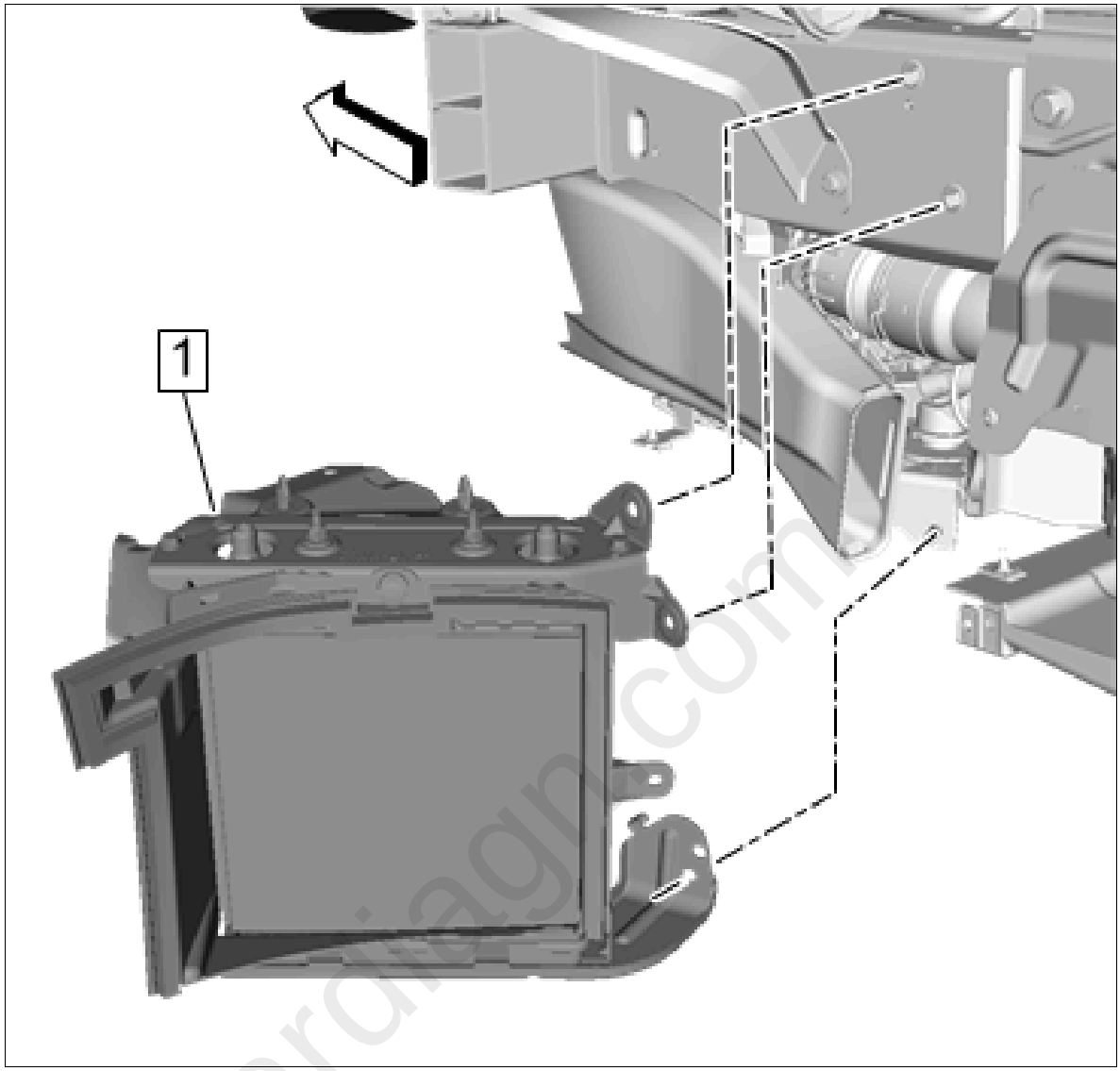


Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Air Side Baffle - Left Side (2)
8. Install Push Pin (1) (Qty: 4)

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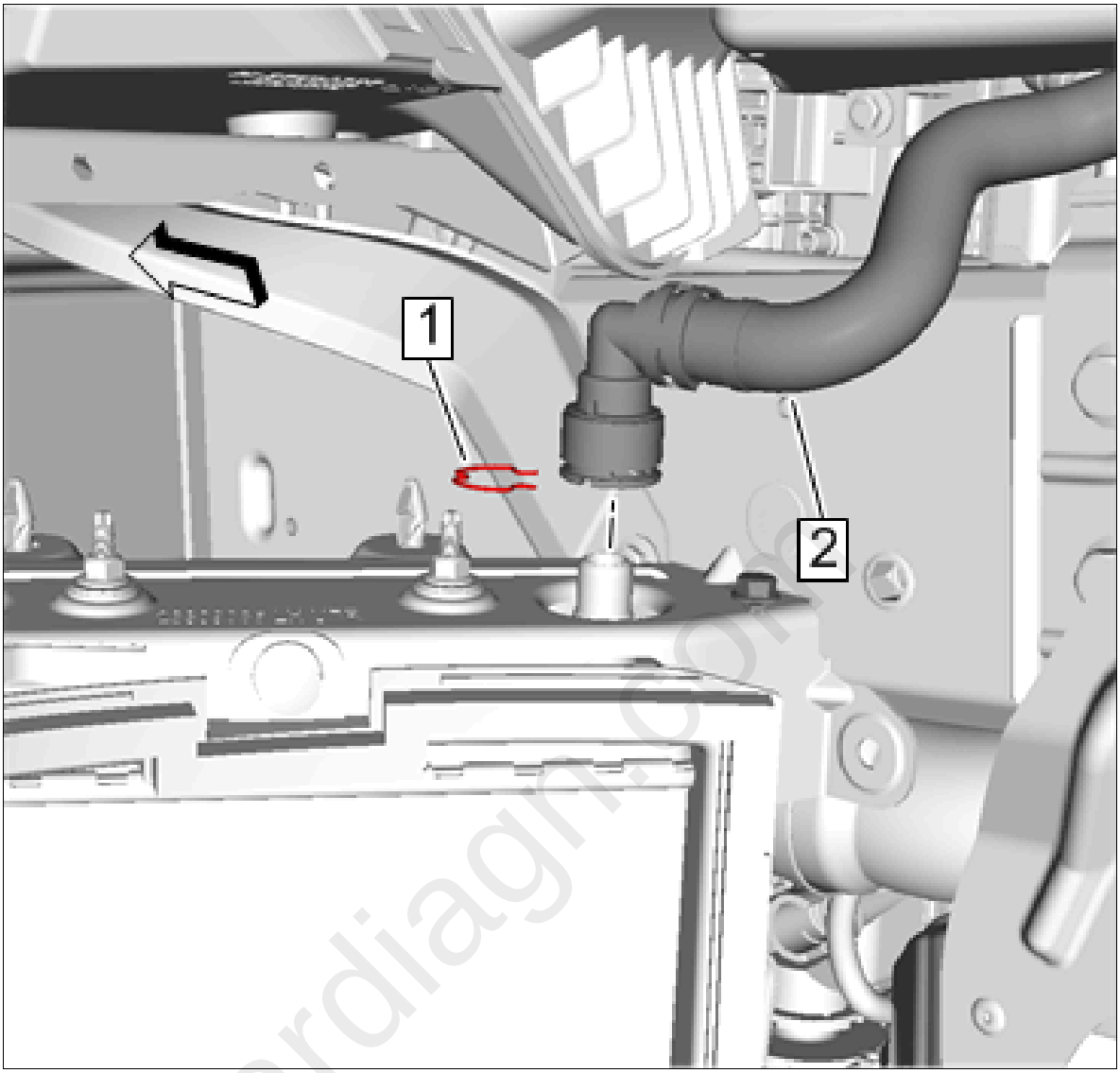
Fig 3: Charge Air Cooler And Duct Assembly



Courtesy of GENERAL MOTORS COMPANY

9. Raise and temporary support the charge air cooler and duct assembly (1).

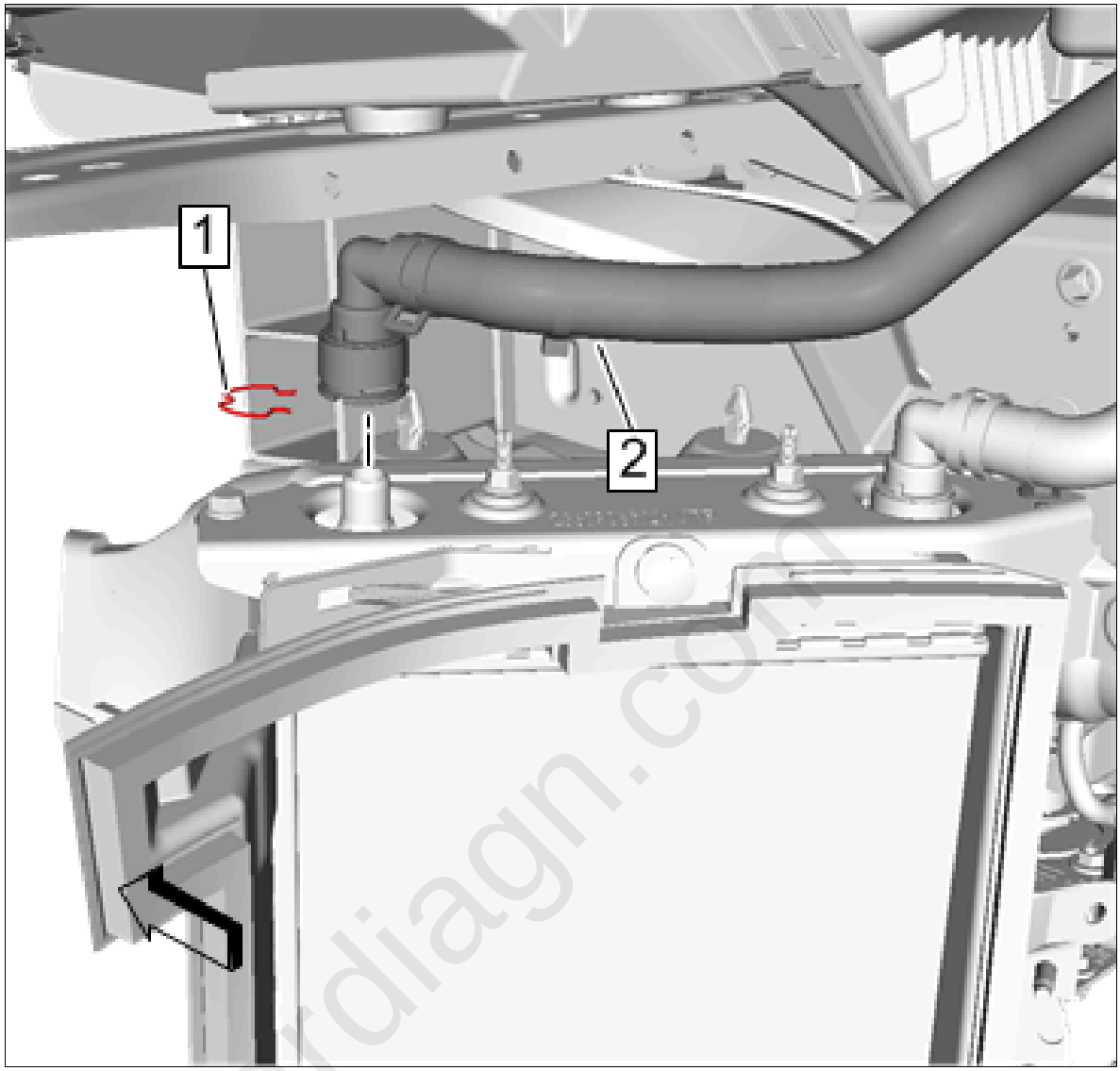
Fig 4: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Outlet Hose (2) at Charge Air Cooler
11. Engage Radiator Outlet Hose Retainer (1) at Radiator Outlet Hose

Fig 5: Auxiliary Radiator Inlet Hose Retainer

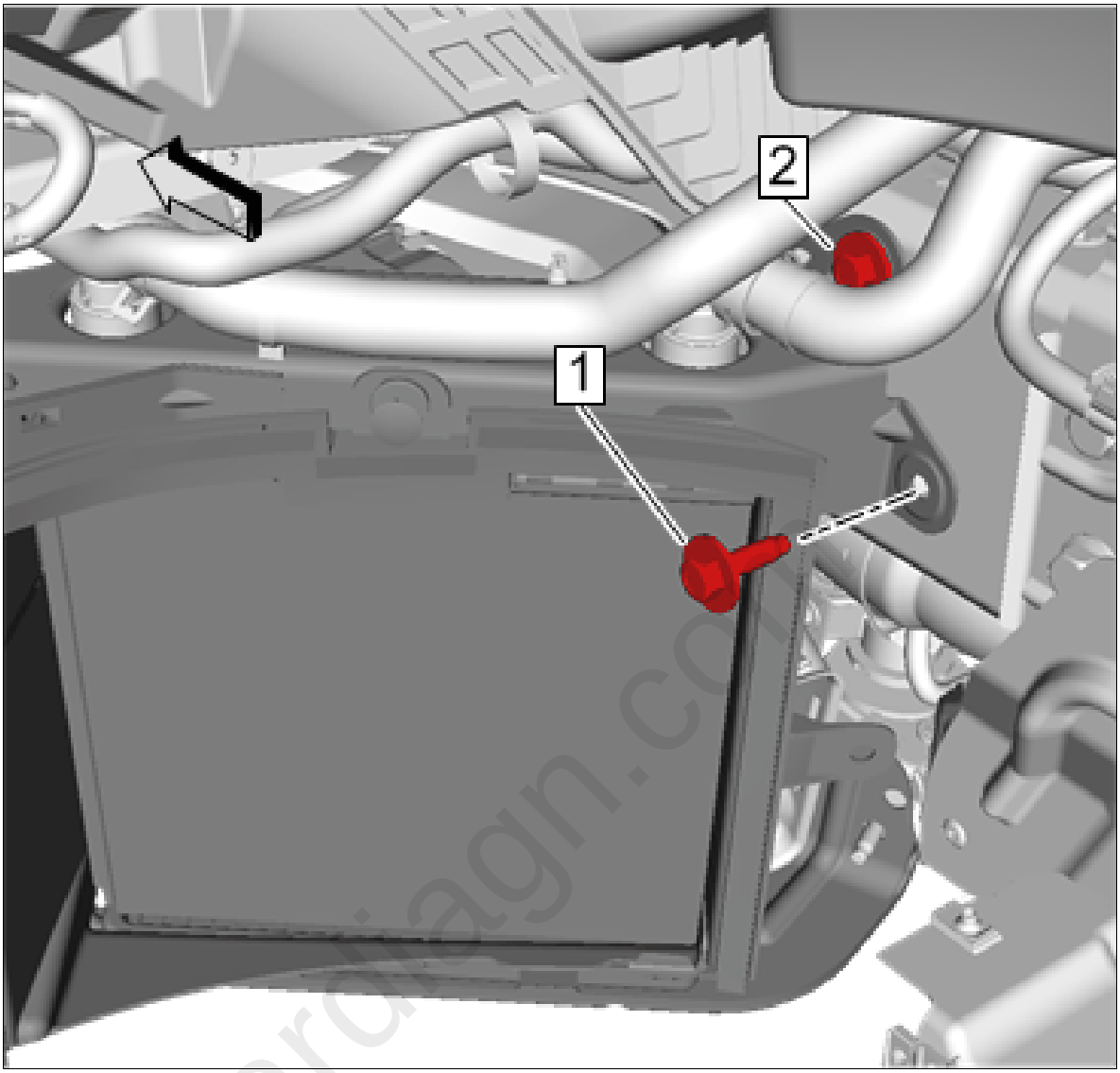


Courtesy of GENERAL MOTORS COMPANY

12. Install Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler
13. Engage Auxiliary Radiator Inlet Hose Retainer (1) at Auxiliary Radiator Inlet Hose

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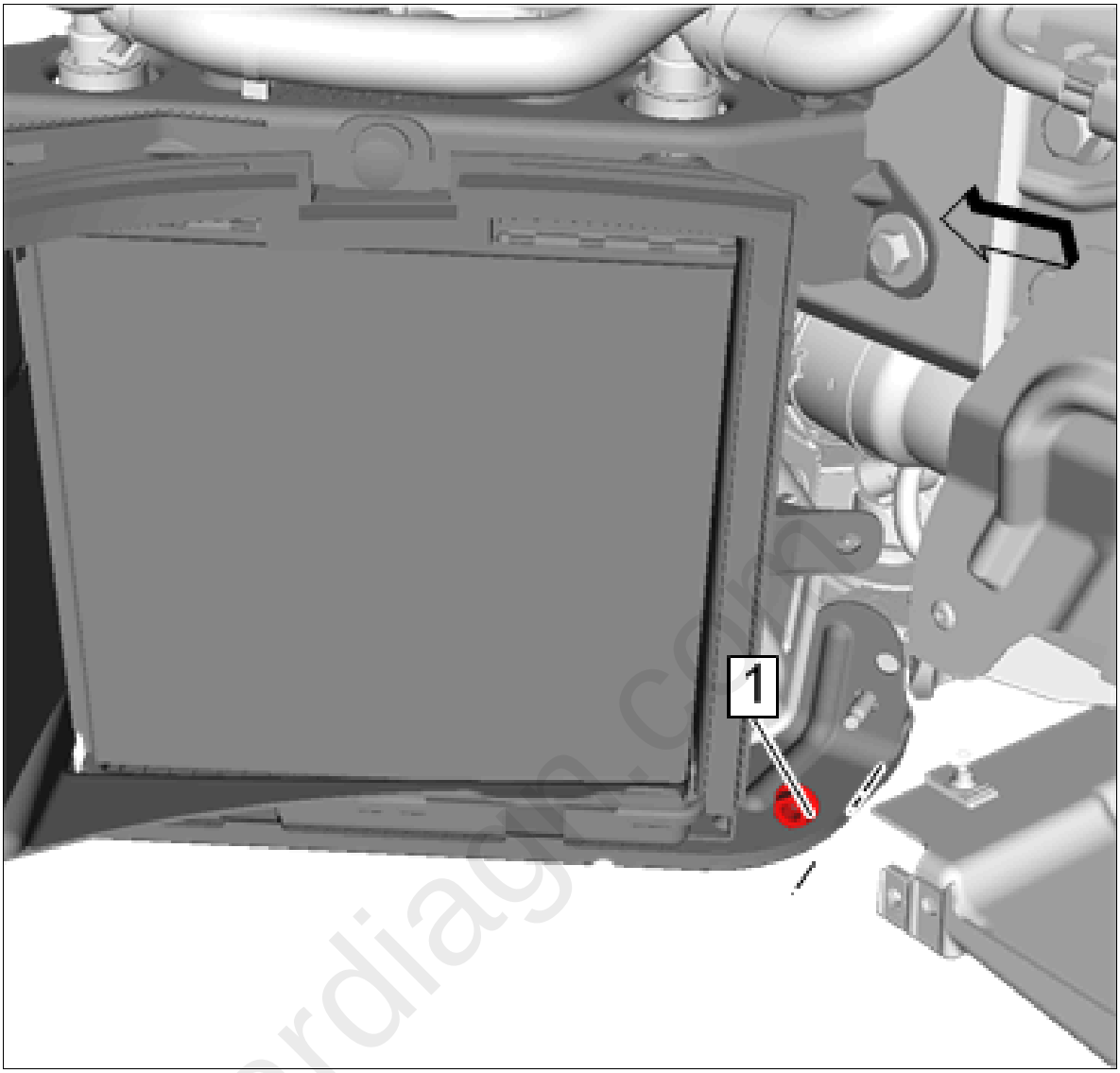
Fig 6: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

14. Install While supporting the charge air cooler, install charge air cooler bracket bolt (2) with the charge air cooler. Install and tighten 22 N.m (16 lb ft)
15. Install Charge Air Cooler Bracket Bolt (1) and tighten to 22 N.m (16 lb ft)

Fig 7: Charge Air Cooler Bracket Nut

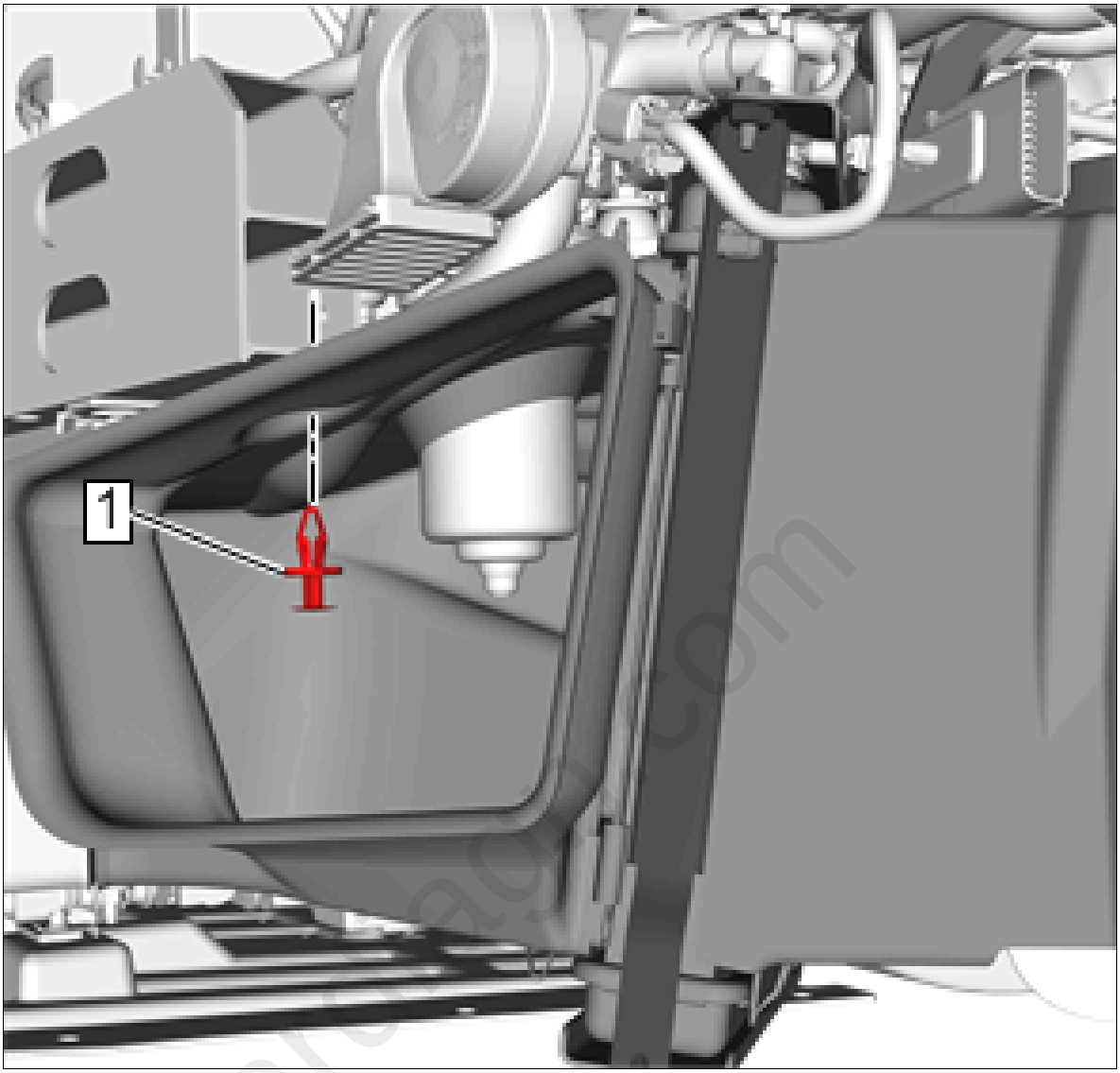


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16. Install Charge Air Cooler Bracket Nut (1) and tighten to 22 N.m (16 lb ft)

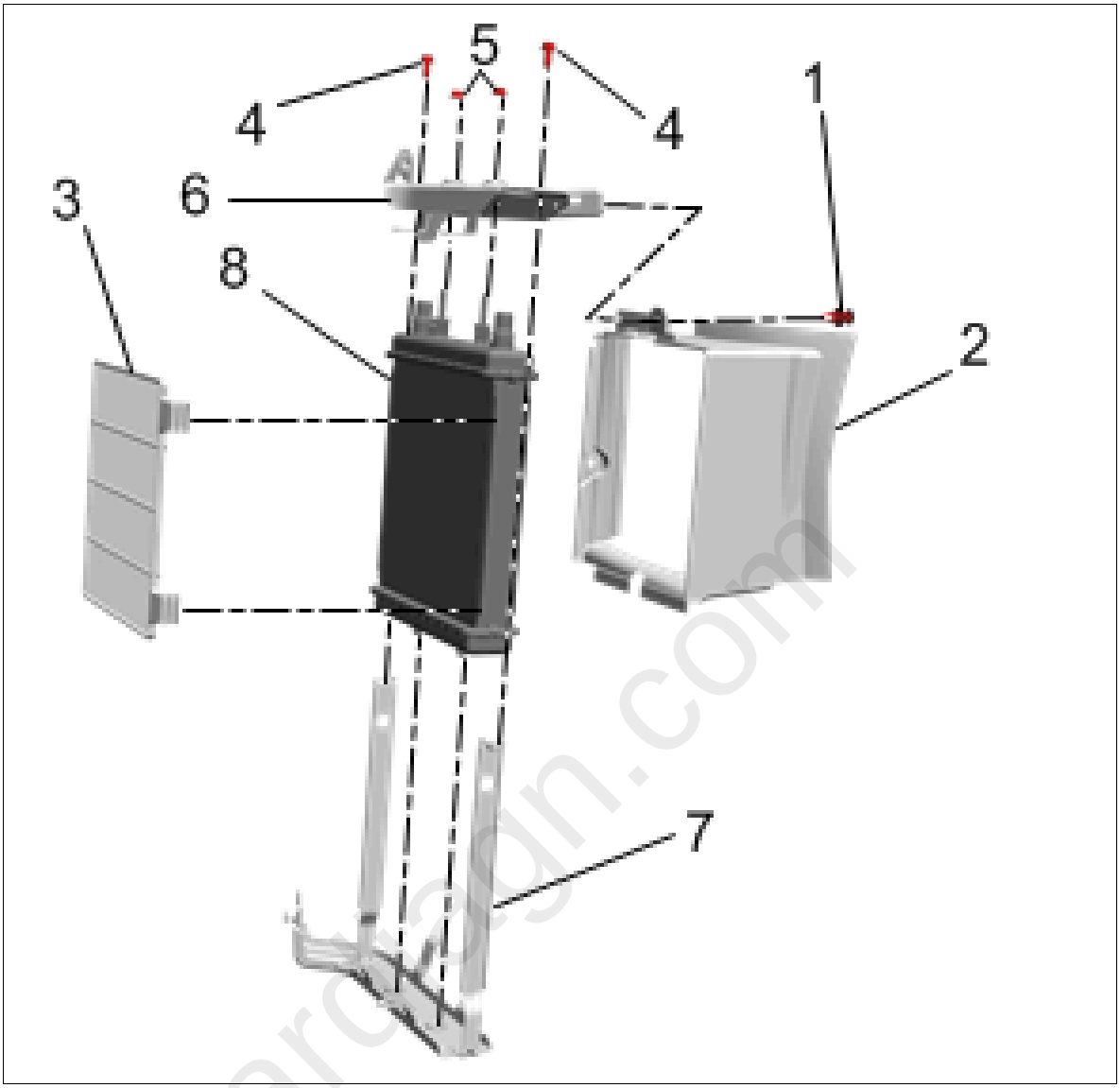
Fig 8: Push Pin



Courtesy of GENERAL MOTORS COMPANY

17. Install Push Pin (1)

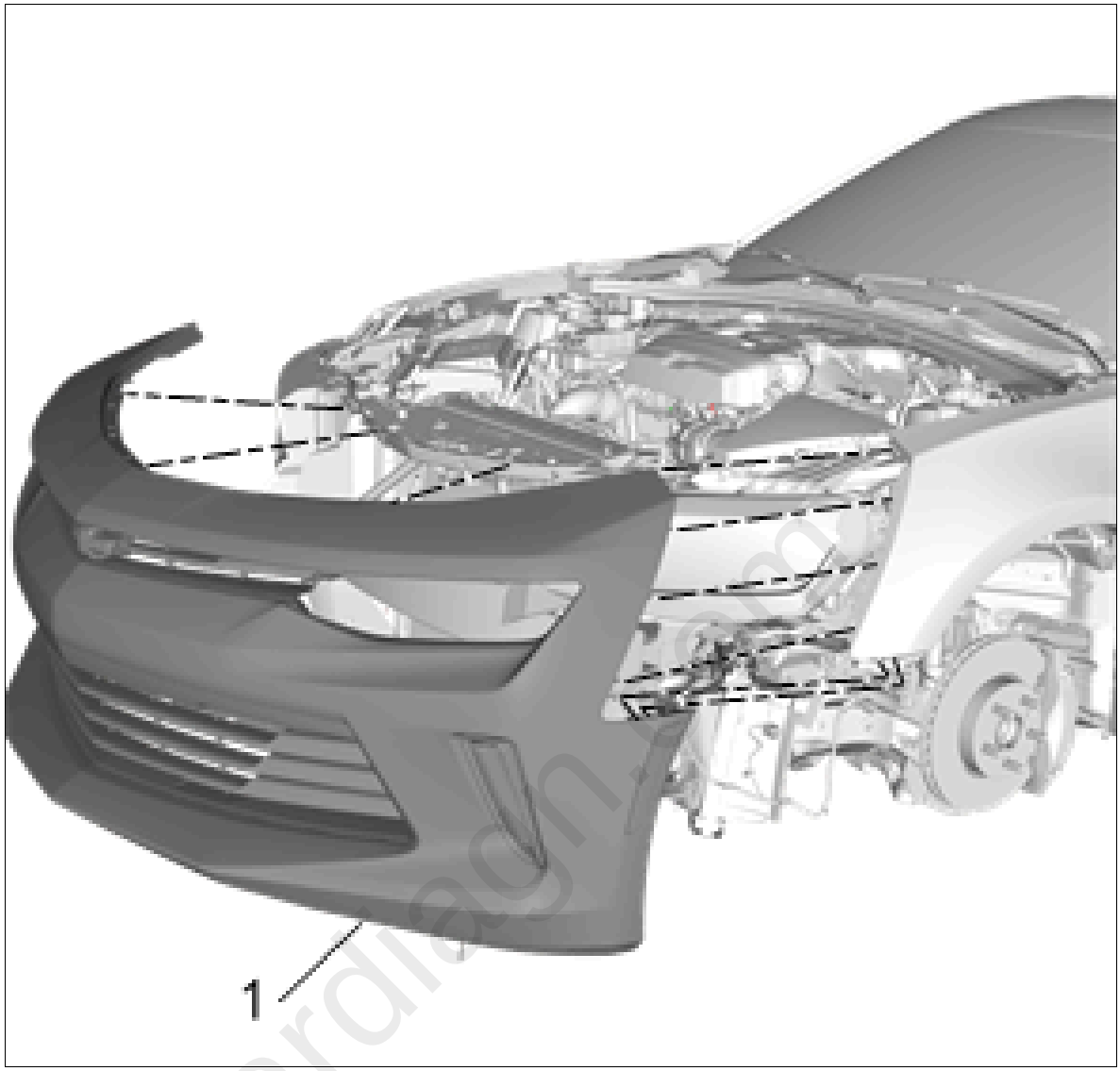
Fig 9: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

18. Install Rear Duct (2)
19. Install Push Pin (1)
20. Install Front Brake Rotor Cooling Duct- Rear - Front Brake Rotor Cooling Duct Replacement (J6G)

Fig 10: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

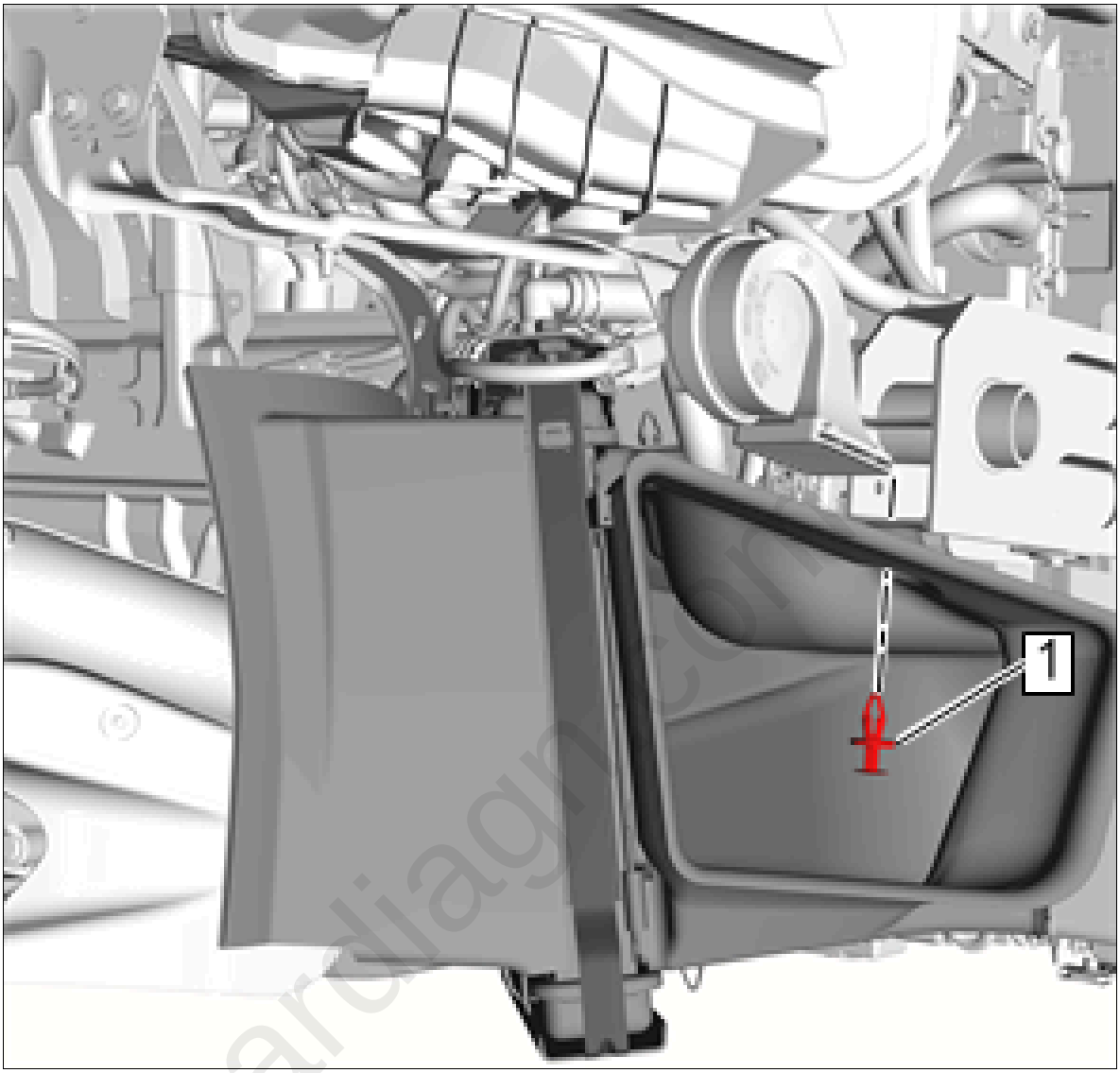
21. Install Front Bumper Fascia (1) - Front Bumper Fascia Replacement
22. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
23. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - RIGHT SIDE (LGX WITH V18, LT1) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Front Bumper Fascia Replacement

3. Remove Front Brake Rotor Cooling Duct Replacement (J6G)

Fig 1: Push Pin

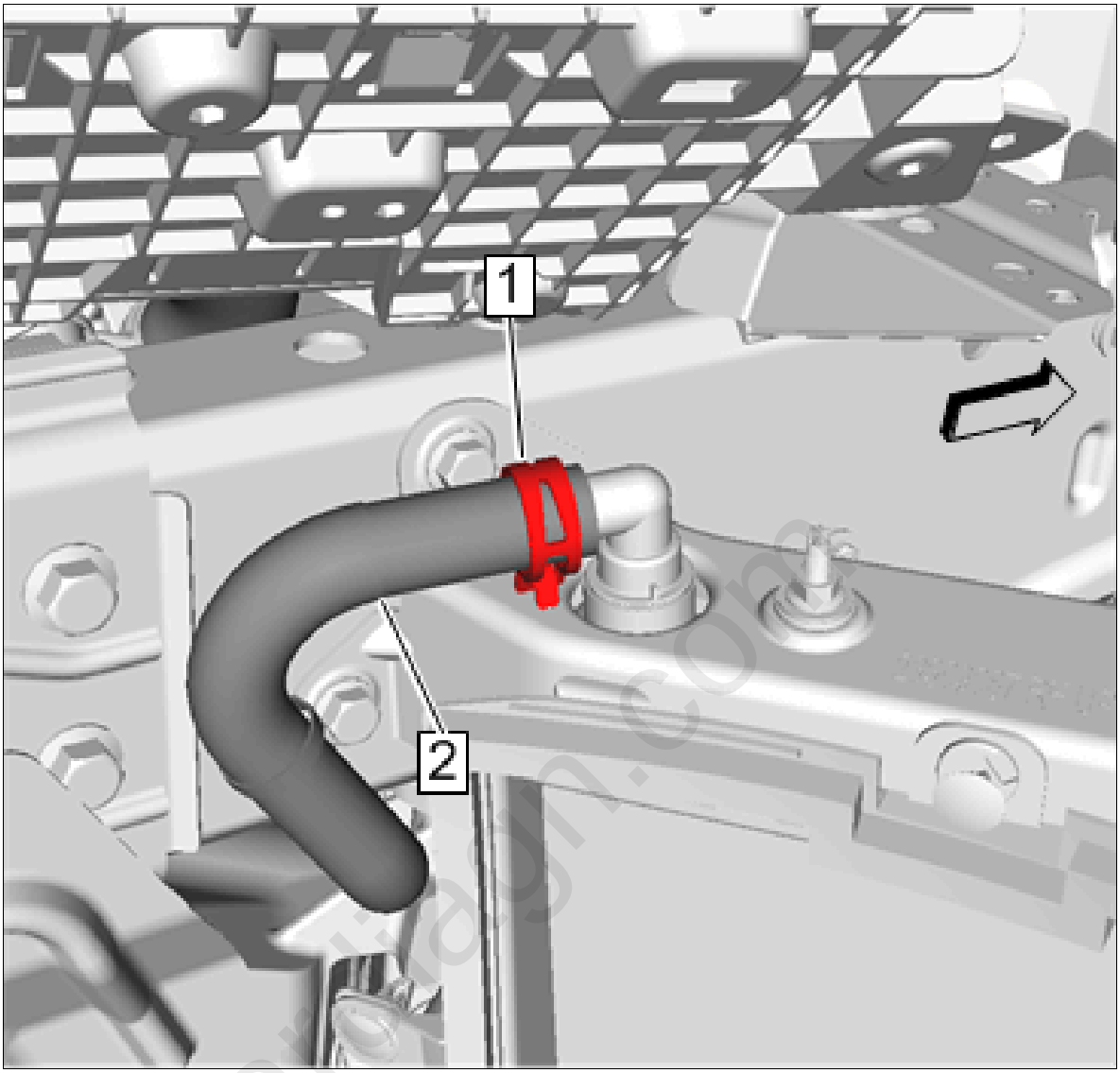


Courtesy of GENERAL MOTORS COMPANY

4. Remove Push Pin (1)

5. Disconnect and reposition harness as necessary.

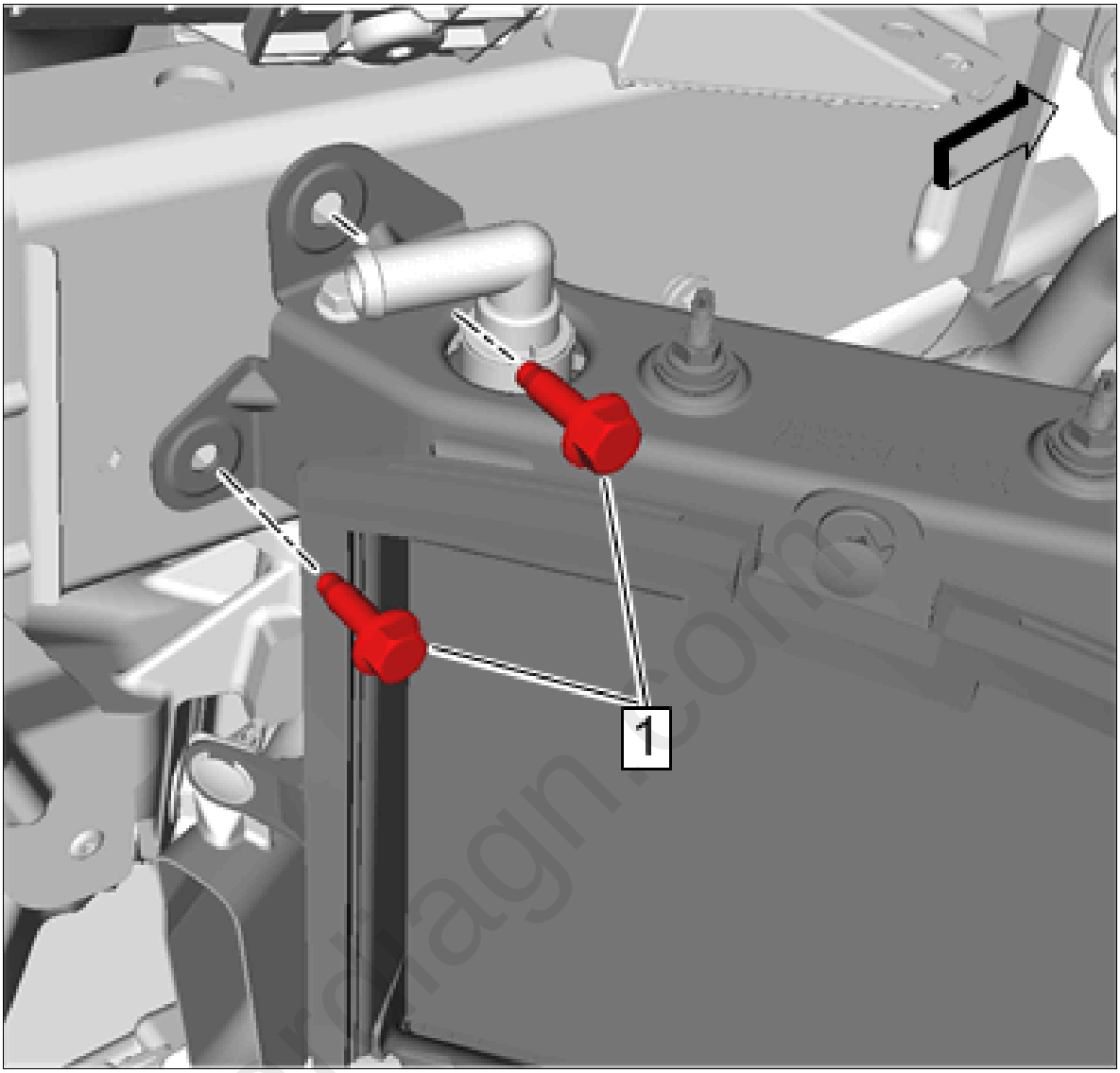
Fig 2: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

6. Disengage Radiator Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type
7. Remove Radiator Inlet Hose (2) at Quick Connect Fitting

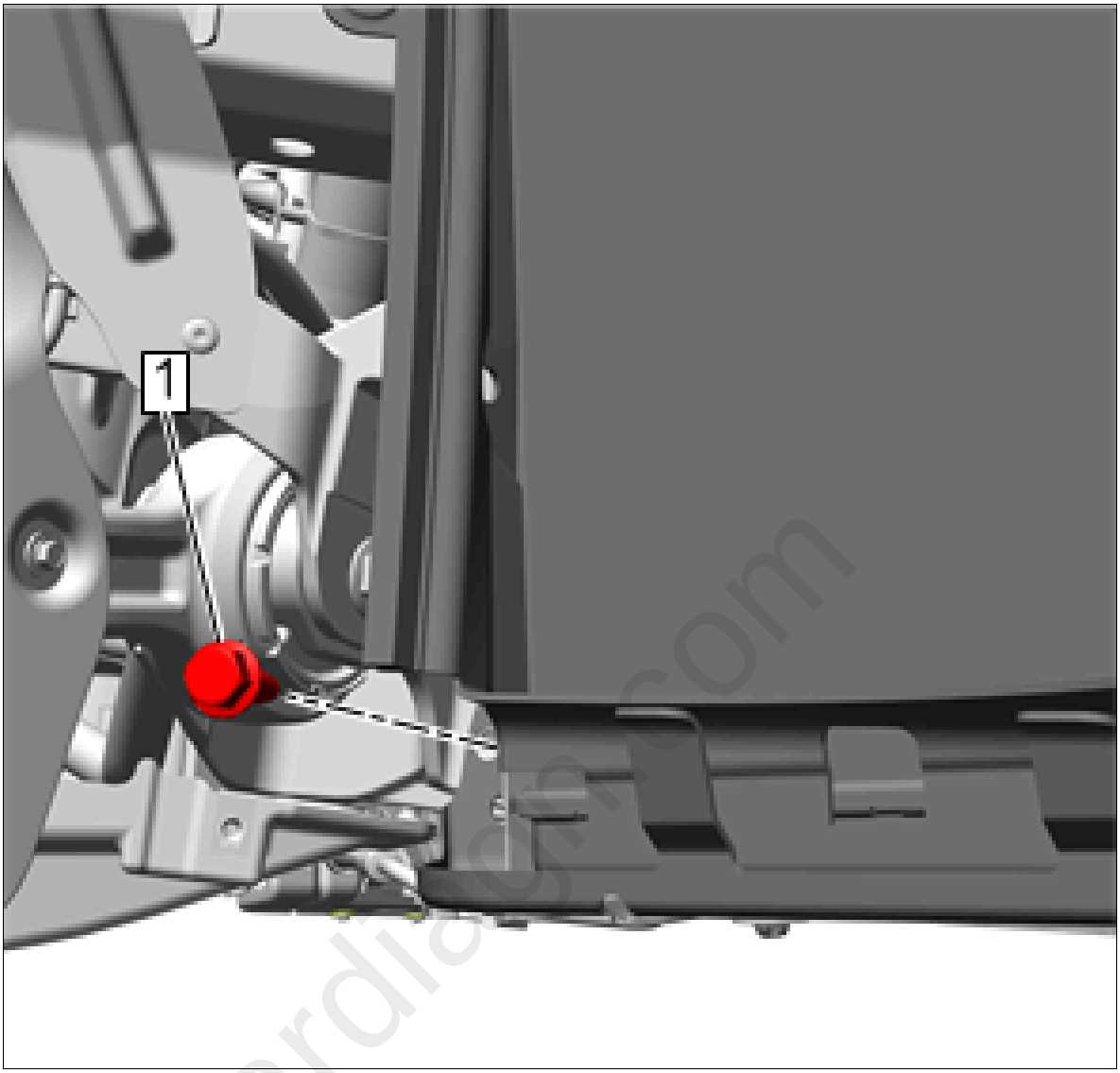
Fig 3: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

8. Remove Charge Air Cooler Bracket Bolt (1) (Qty: 2)

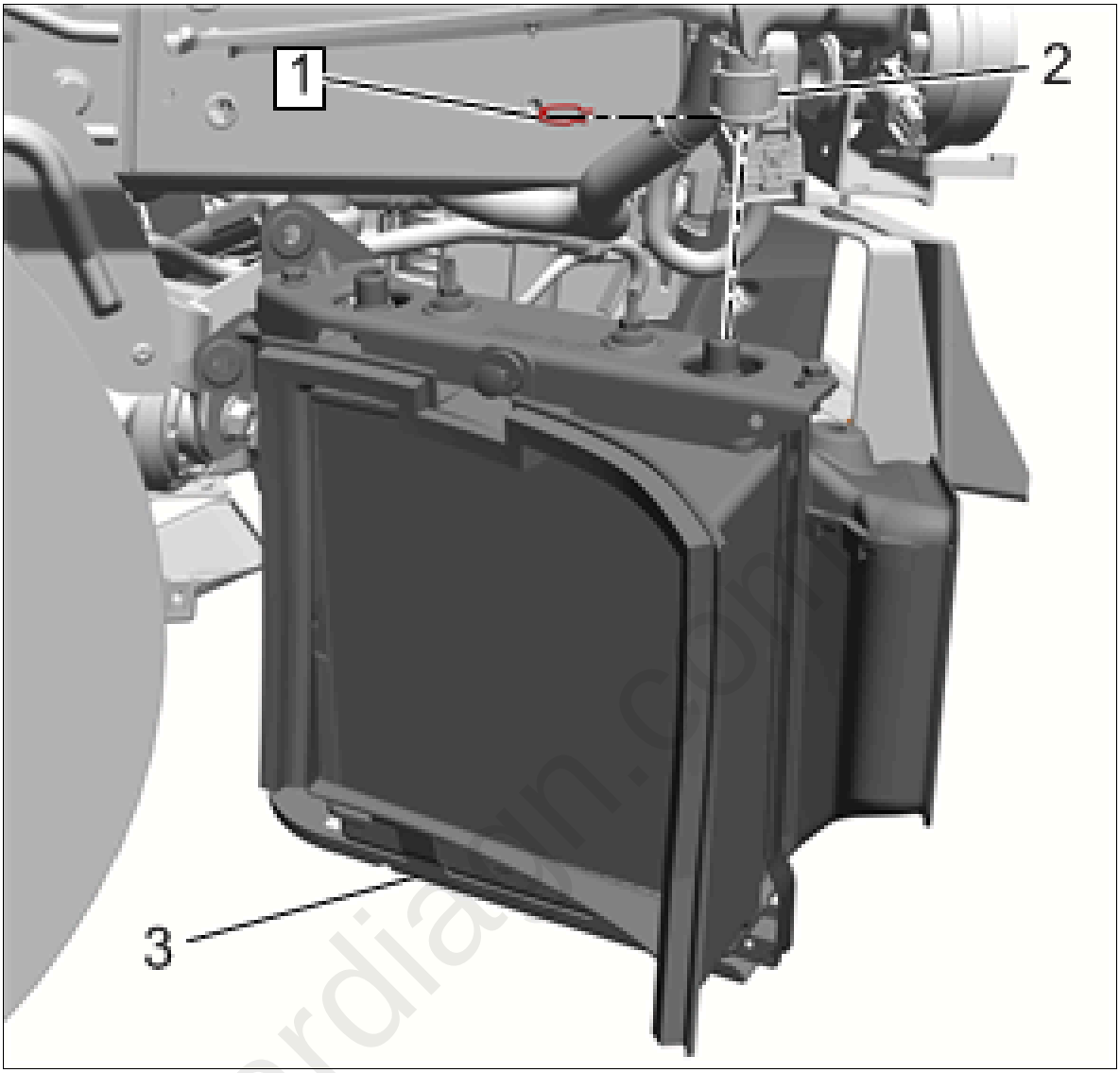
Fig 4: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

9. Remove Charge Air Cooler Bracket Bolt (1)

Fig 5: Charge Air Cooler Replacement - Right Side

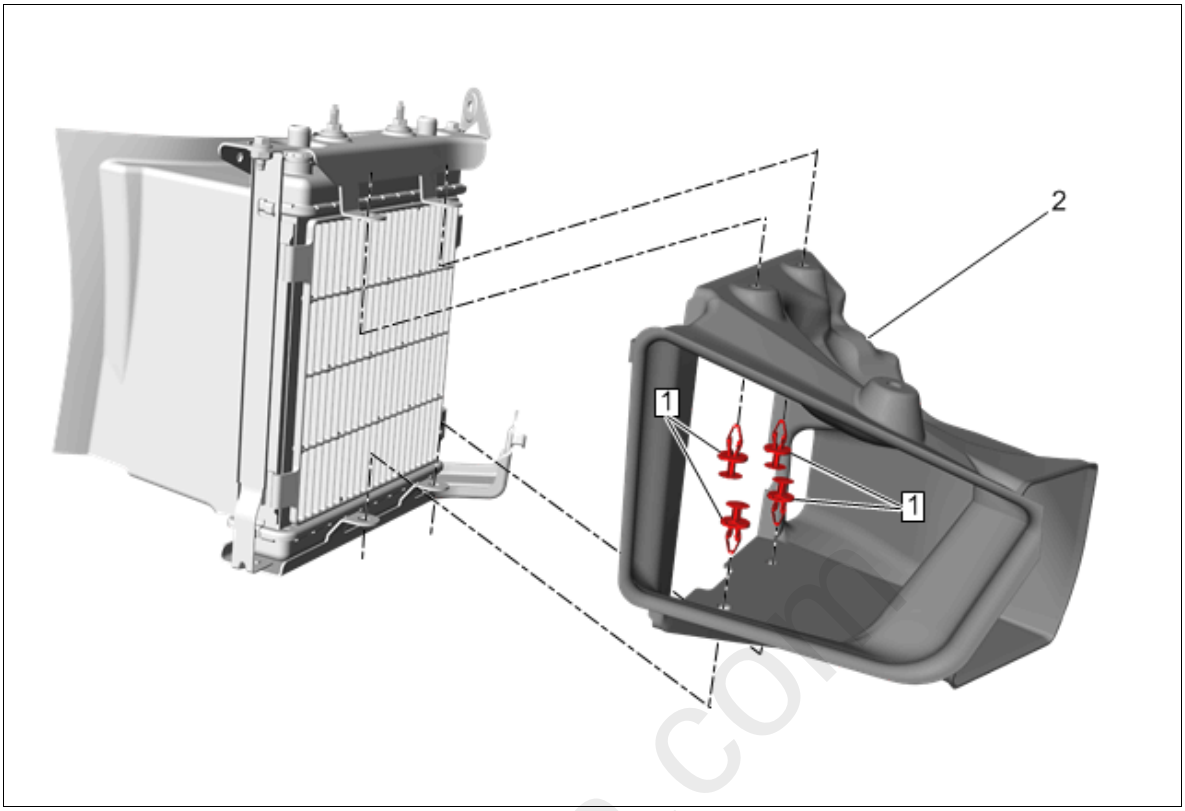


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10. Lower and temporary support the charge air cooler and duct assembly (3)
11. Remove Radiator Outlet Hose Retainer (1)
12. Remove Quick Connect Fitting (2)
13. Remove Charge Air Cooler Assembly (3)

Fig 6: Radiator Air Baffle - Right Side

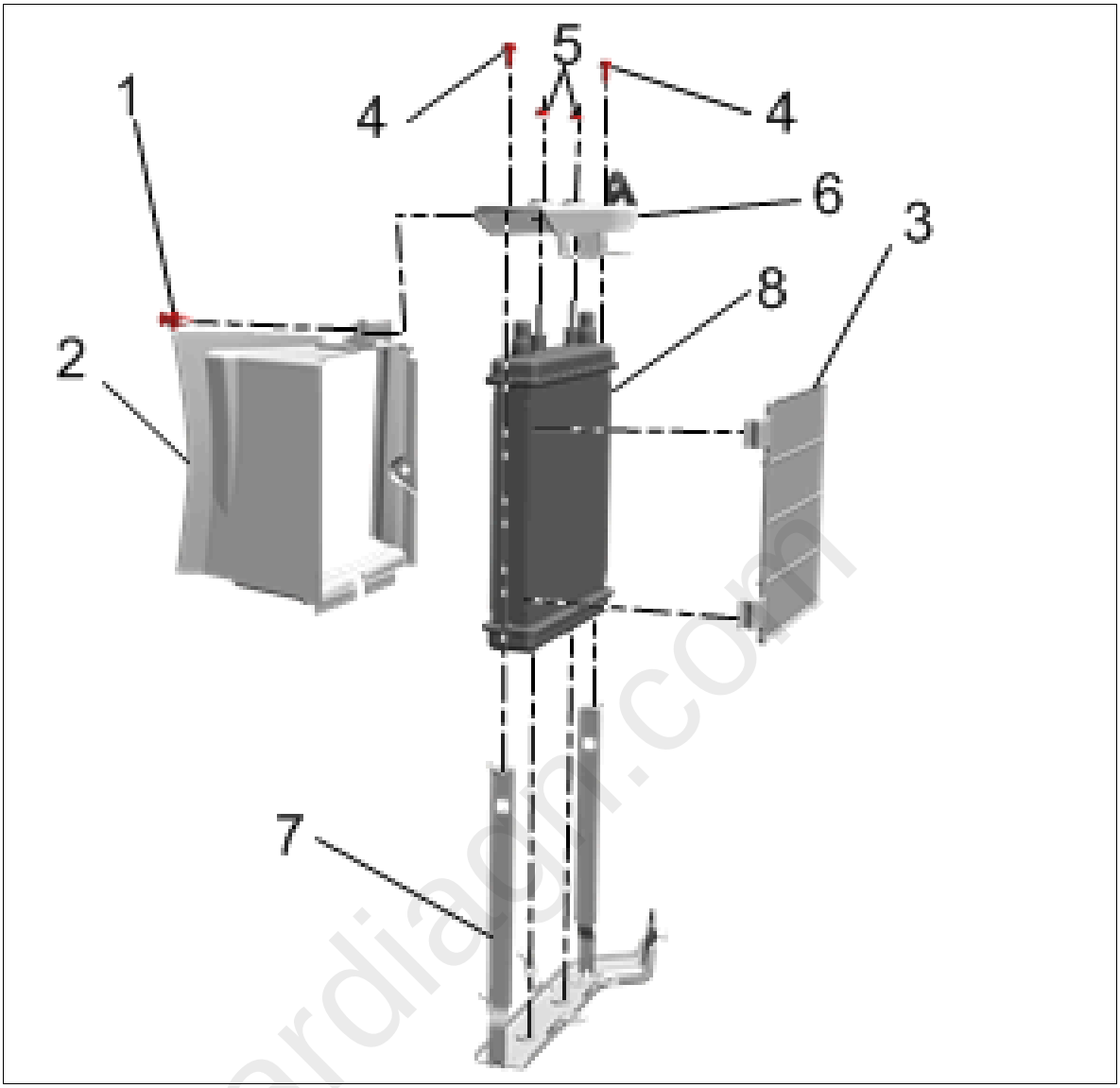


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14. Remove Radiator air baffle - right side (2)

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Fig 7: Charge Air Cooler

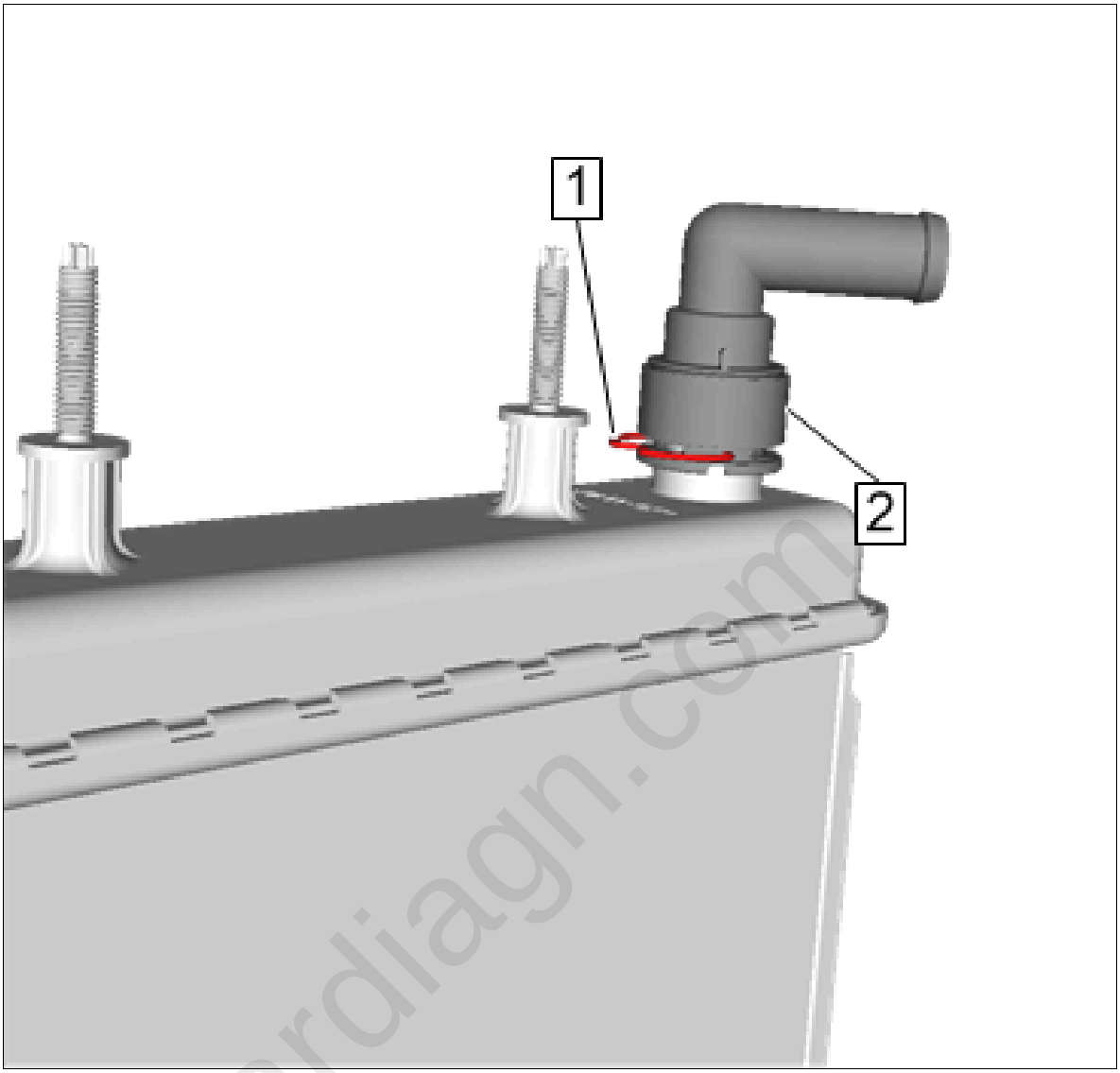


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15. Remove Push Pin (1)
16. Remove Rear Duct (2)
17. Remove Stone Guard (3) { If equipped }
18. Remove Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2)
19. Remove Charge Air Cooler Upper Bracket Nut (5) (Qty: 2)
20. Remove Upper Charge Air Cooler Bracket (6)
21. Remove Lower Charge Air Cooler Bracket (7)
22. Remove Charge Air Cooler (8)

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Fig 8: Auxiliary Radiator Inlet Hose Retainer



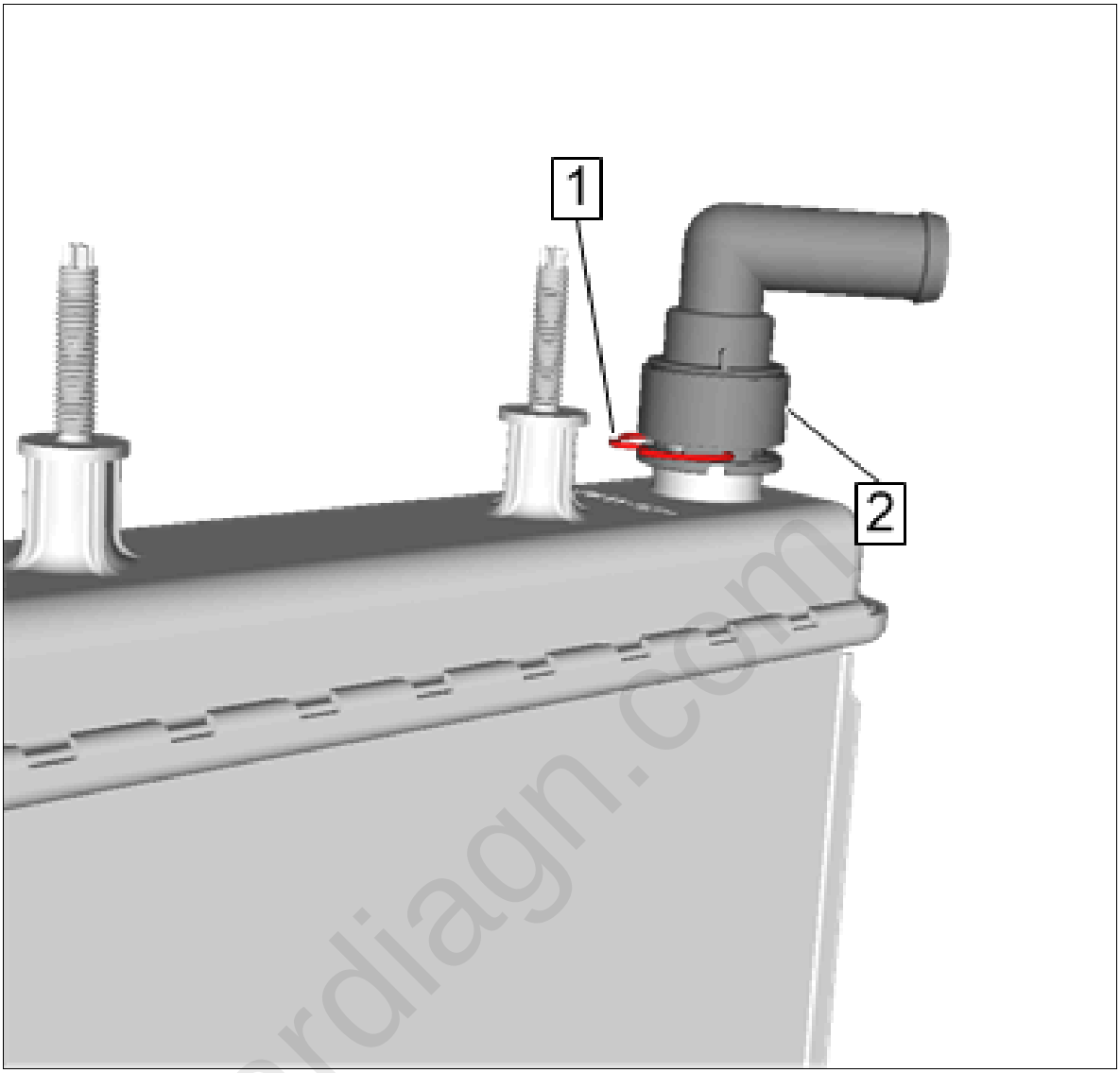
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23. Disengage Radiator Inlet Hose Retainer (1)
24. Remove Quick Connect Fitting (2)

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - RIGHT SIDE (LGX WITH V18, LT1) > INSTALLATION PROCEDURE

Fig 1: Auxiliary Radiator Inlet Hose Retainer

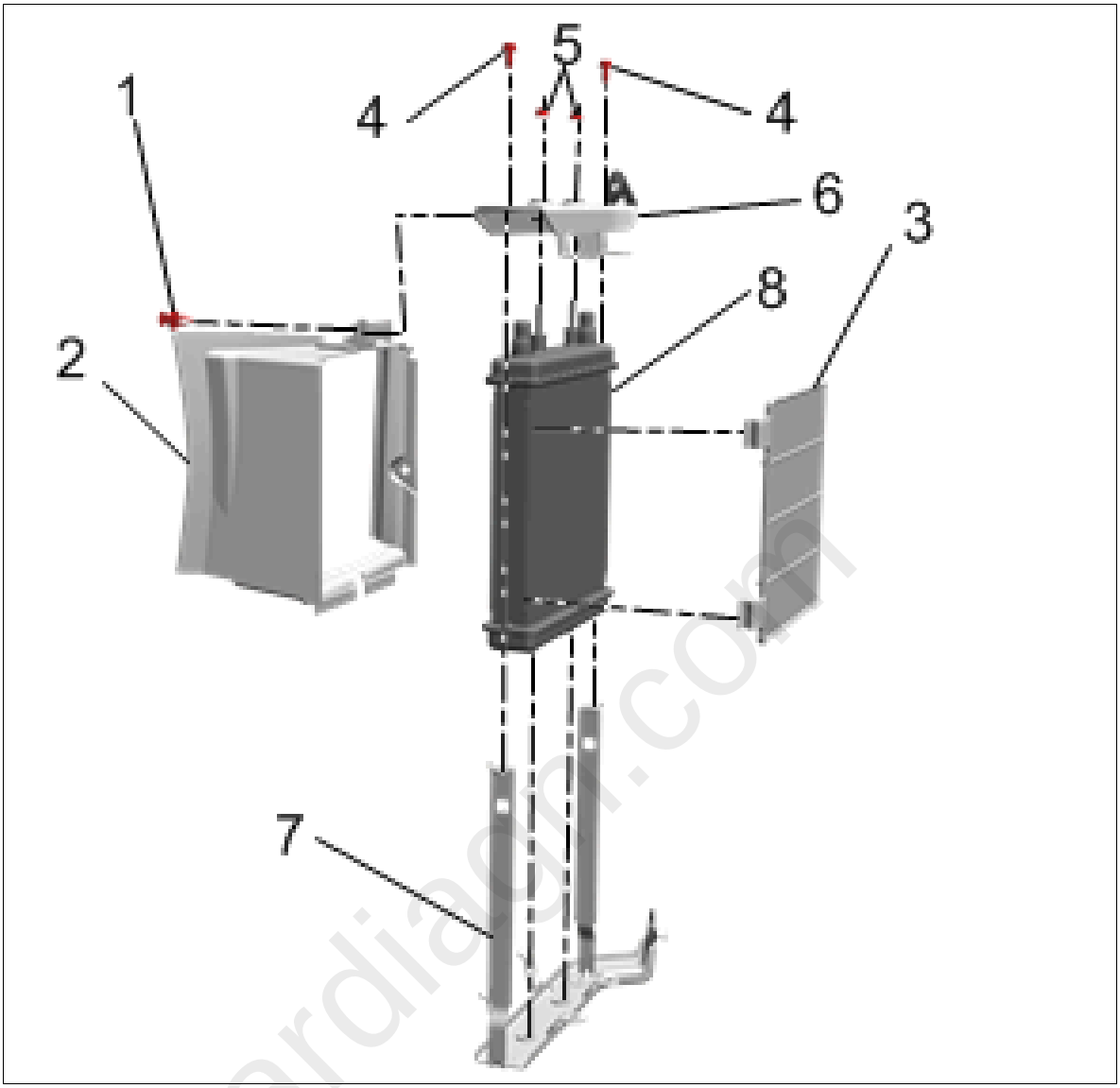


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1. Install Quick Connect Fitting (2)
2. Engage Radiator Inlet Hose Retainer (1)

Fig 2: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

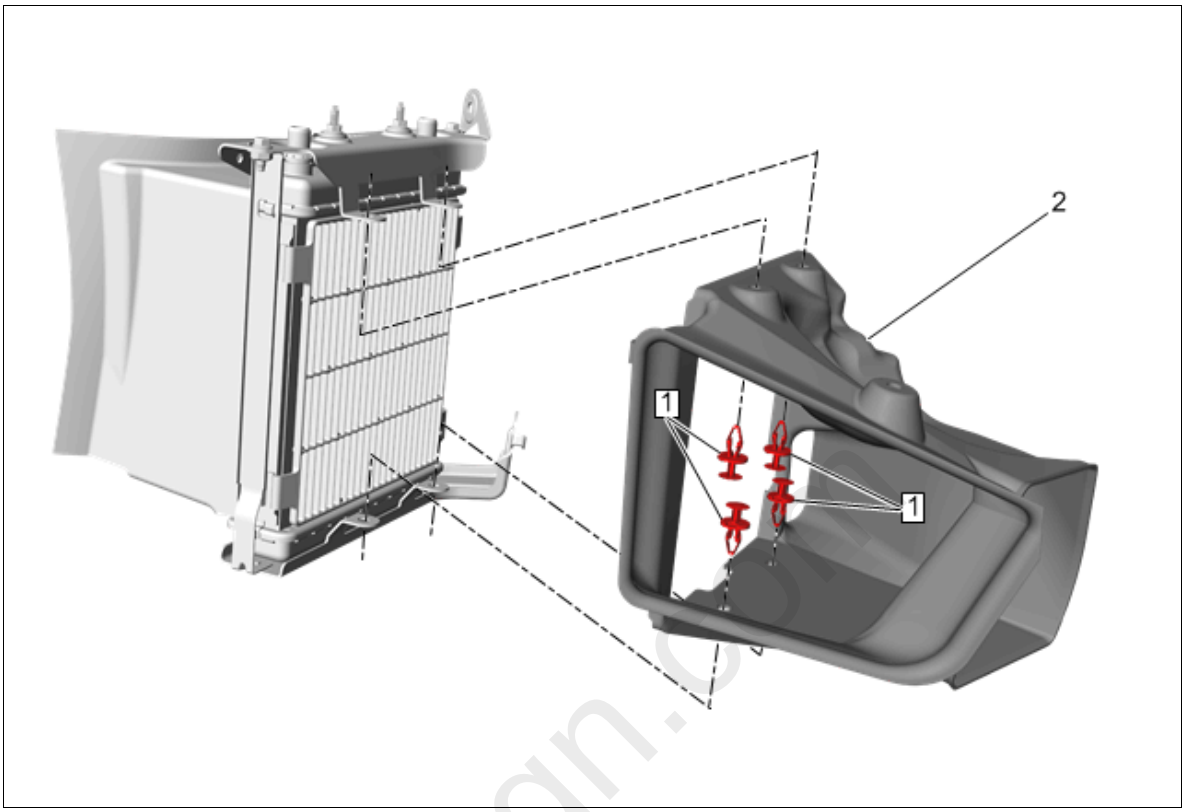
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> ⚠ *CAUTION:*
>
> *Refer to Component Fastener Tightening Caution .*

3. Install Charge Air Cooler (8)
4. Install Lower Charge Air Cooler Bracket (7)
5. Install Upper Charge Air Cooler Bracket (6)
6. Install Charge Air Cooler Upper Bracket Nut (5) (Qty: 2) and tighten to 9 N.m (80 lb in)
7. Install Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2) and tighten to 9 N.m (80 lb in)
8. Install Stone Guard (3) { If equipped }

9. Install Rear Duct (2)
10. Install Push Pin (1)

Fig 3: Radiator Air Baffle - Right Side

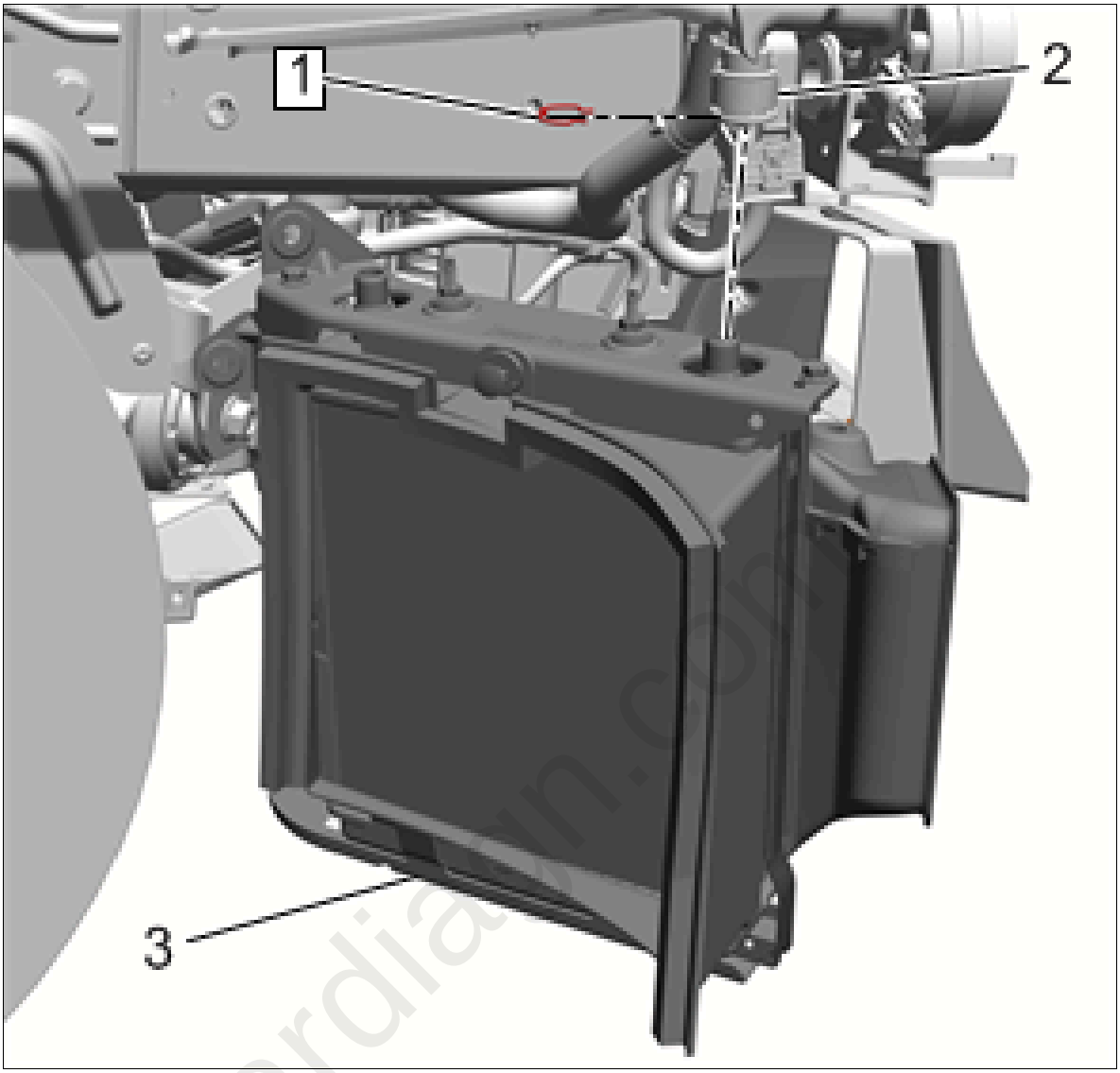


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11. Install Radiator air baffle - right side (2)

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Fig 4: Charge Air Cooler Replacement - Right Side

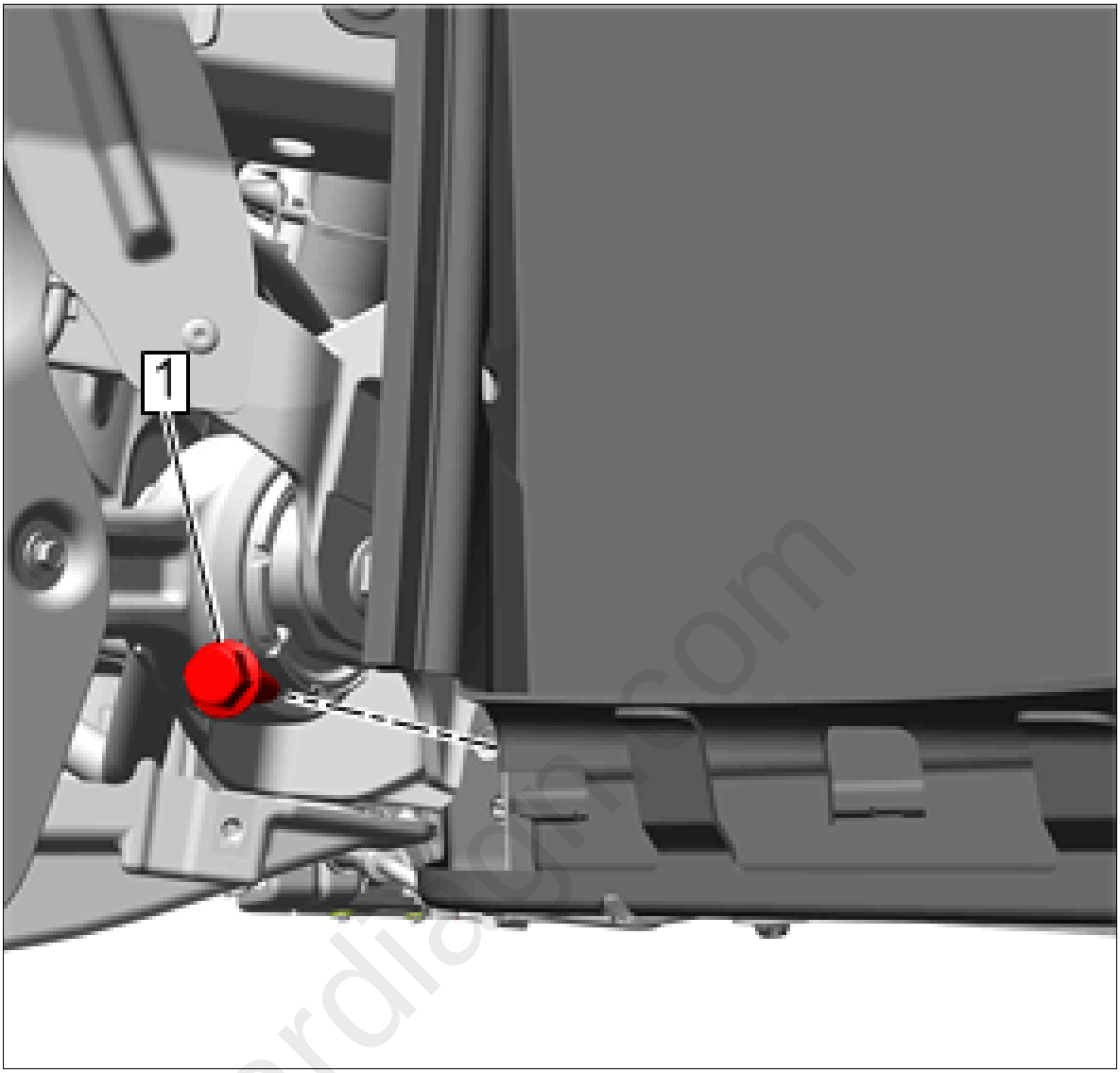


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12. Raise and temporary support the charge air cooler and duct assembly (3)
13. Install Radiator Outlet Hose Retainer (1)
14. Install Quick Connect Fitting (2)

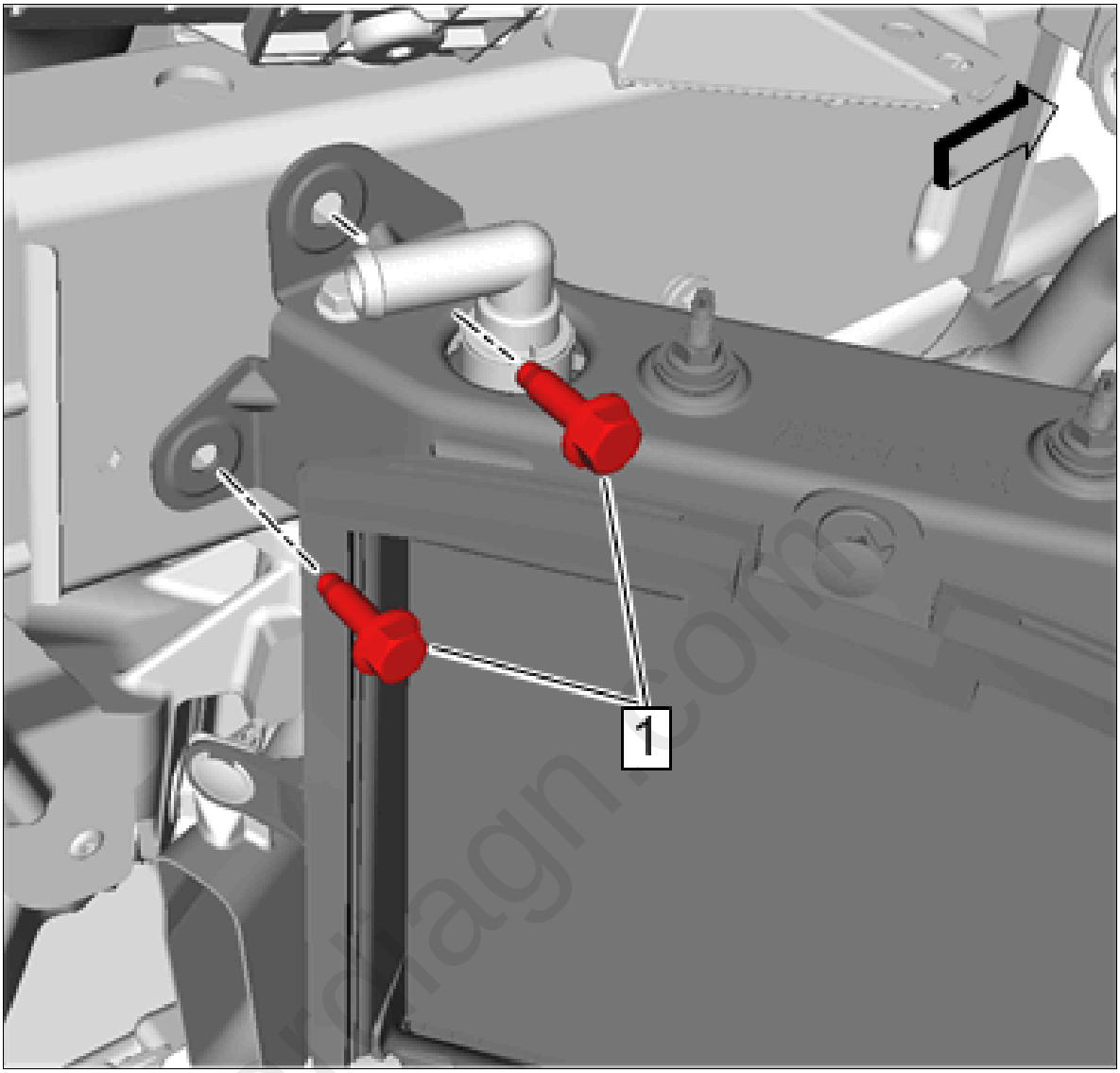
Fig 5: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

15. Install Install Charge Air Cooler Bracket Bolt (1) and tighten to 9 N.m (80 lb in)

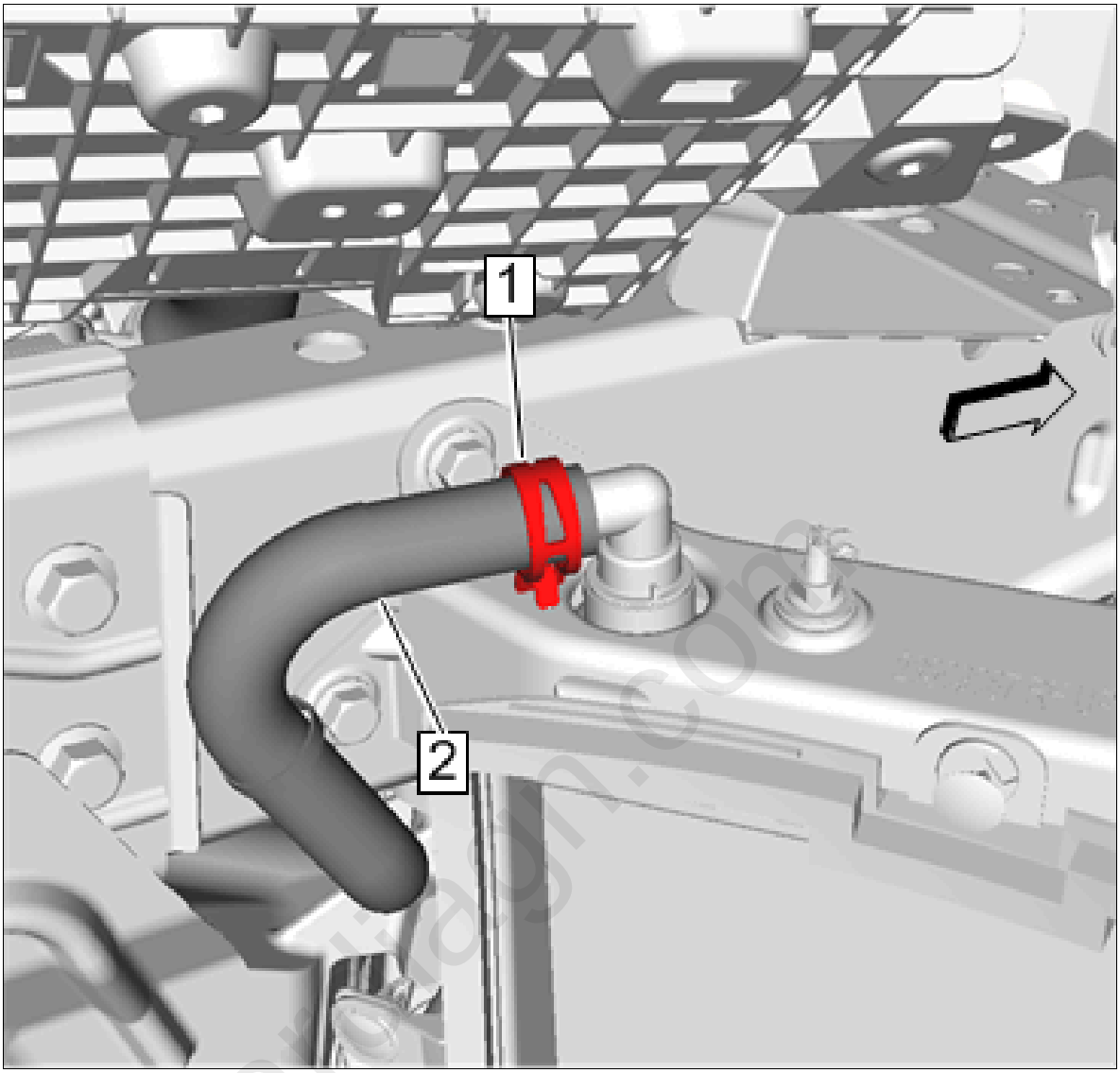
Fig 6: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

16. Install Charge Air Cooler Bracket Bolt (1) (Qty: 2) and tighten to 9 N.m (80 lb in)

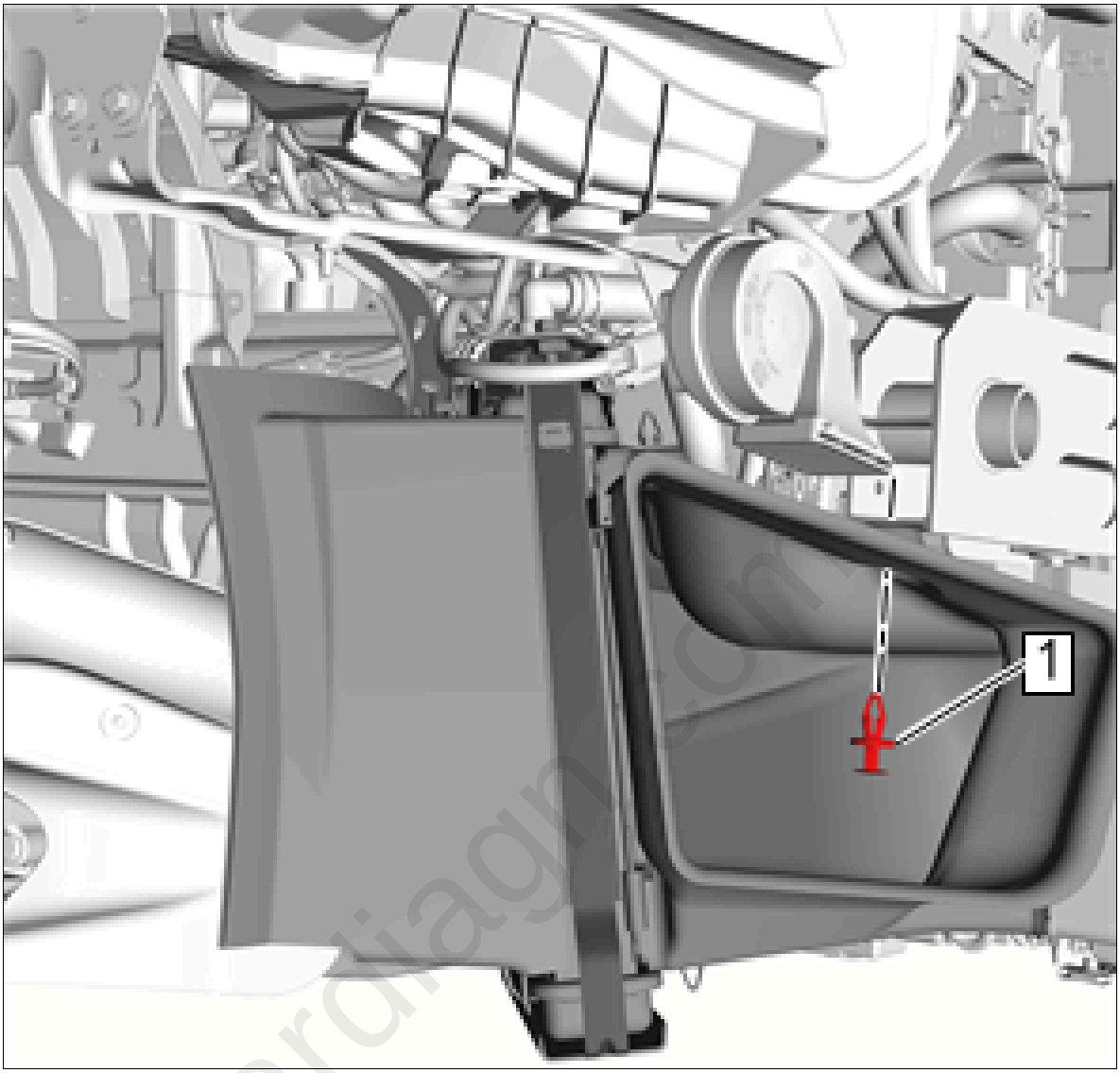
Fig 7: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

17. Remove Radiator Inlet Hose (2) at Quick Connect Fitting
18. Engage Radiator Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

Fig 8: Push Pin



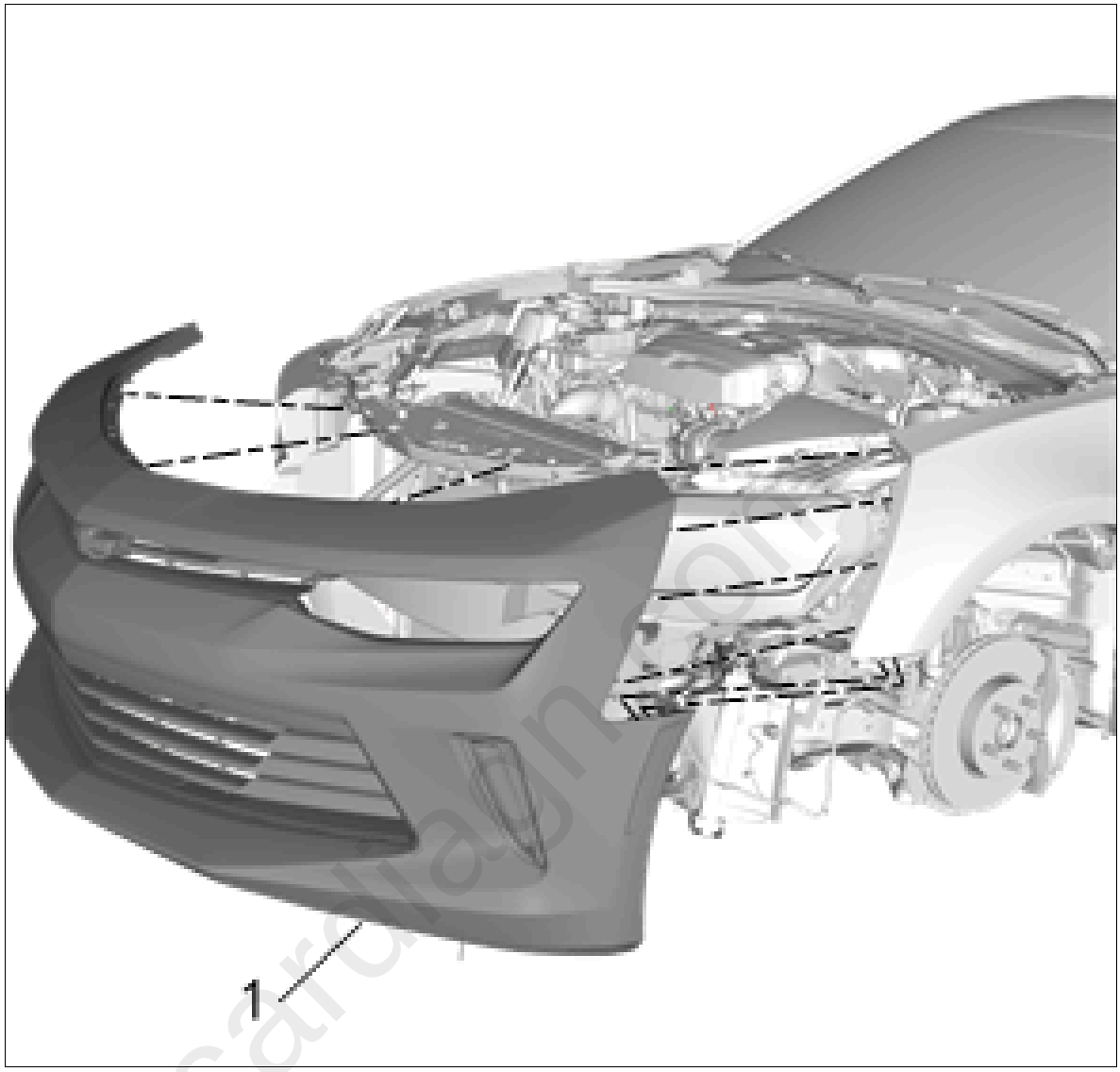
Courtesy of GENERAL MOTORS COMPANY

19. Install Push Pin (1)
20. Return the wiring harness to the proper position and connect as necessary.
21. Install Front Brake Rotor Cooling Duct Replacement (J6G)
22. Install Front Bumper Fascia Replacement
23. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
24. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - RIGHT SIDE (LTG WITH V18) > REMOVAL PROCEDURE

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

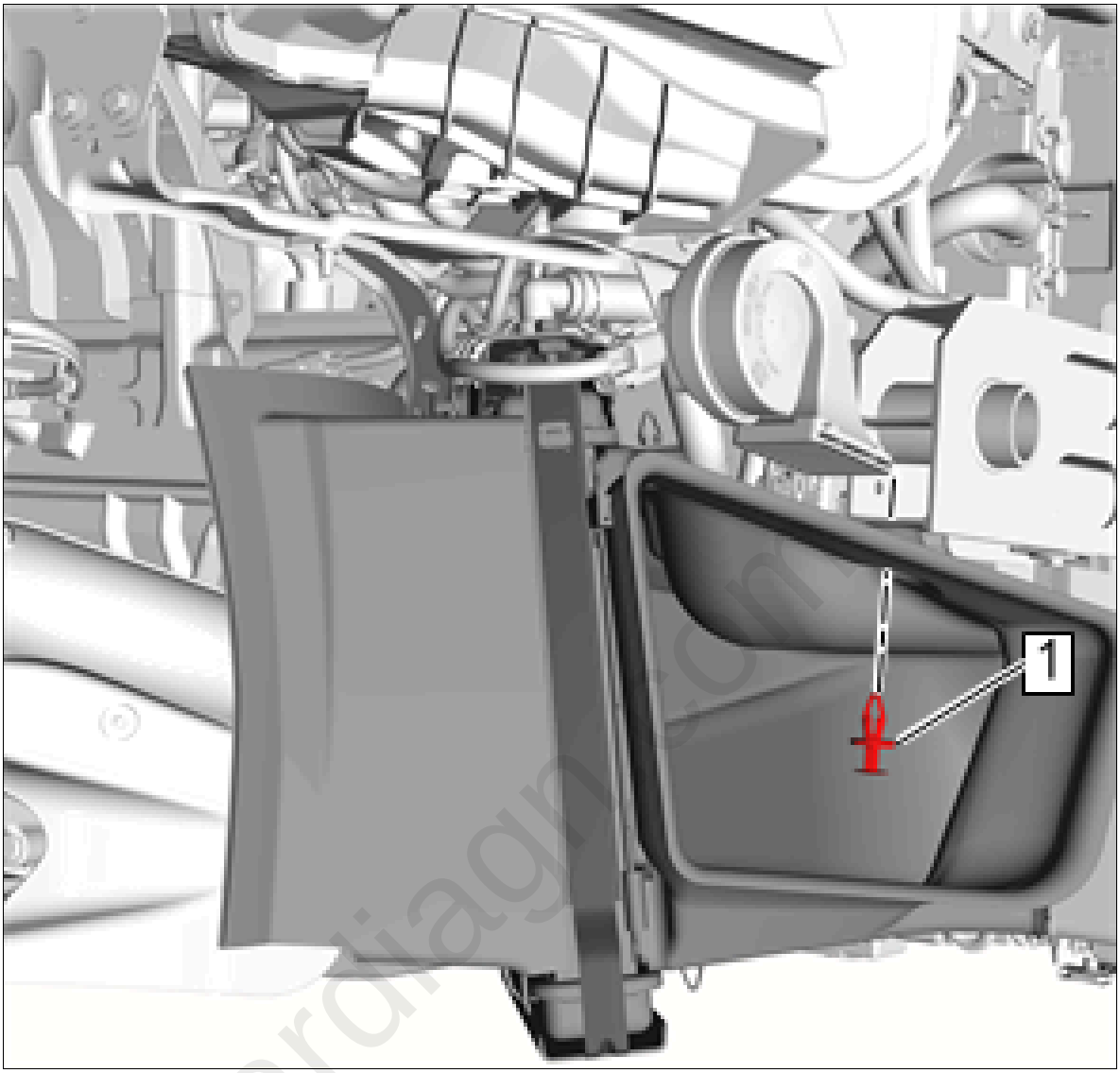
   Fig 1: Front Bumper Fascia



Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Bumper Fascia (1) - Front Bumper Fascia Replacement
3. Remove Front Brake Rotor Cooling Duct-Rear - Front Brake Rotor Cooling Duct Replacement (J6G)
4. Disconnect and reposition harness as necessary.

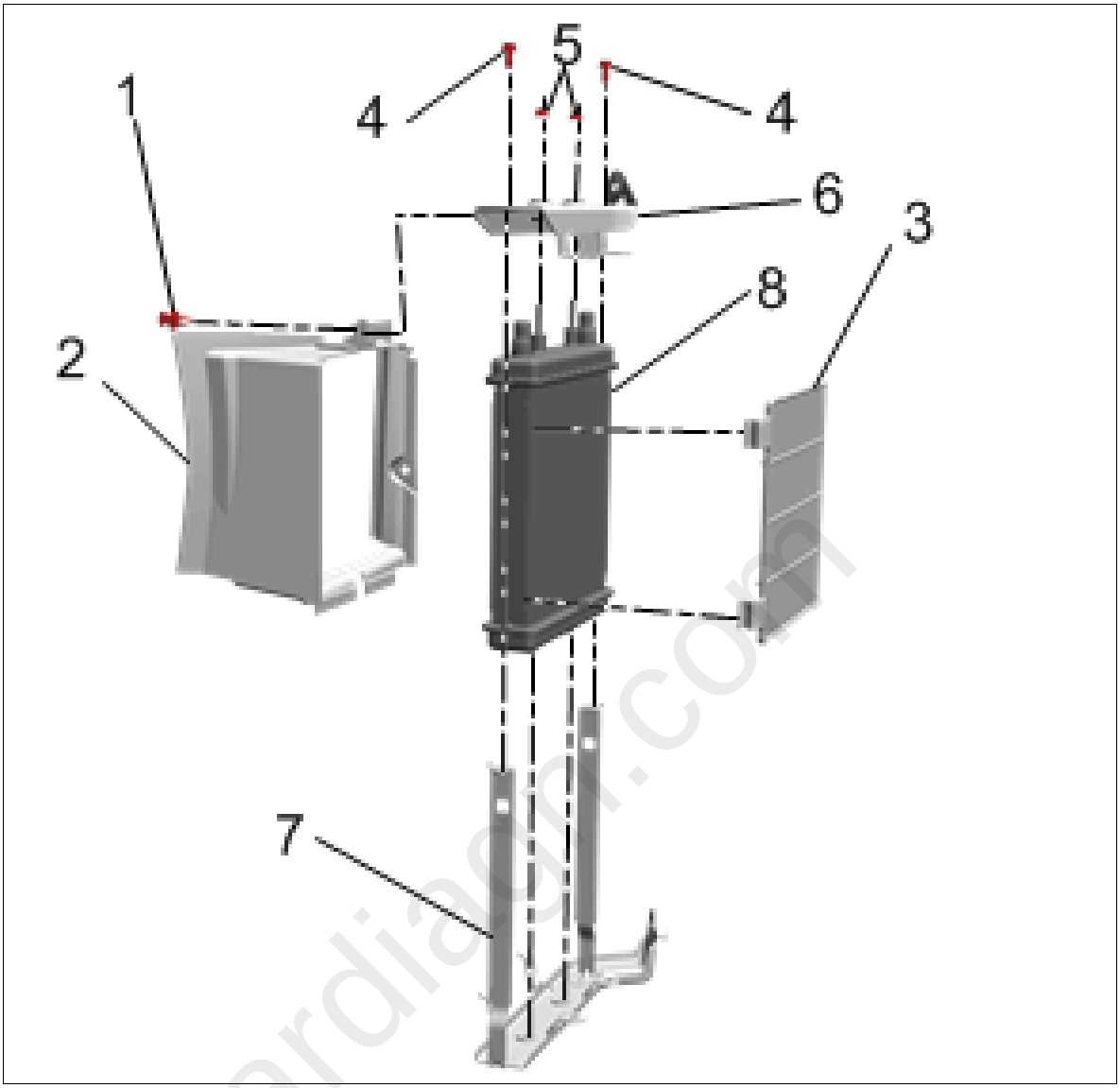
Fig 2: Push Pin



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5. Remove Push Pin (1)

Fig 3: Charge Air Cooler

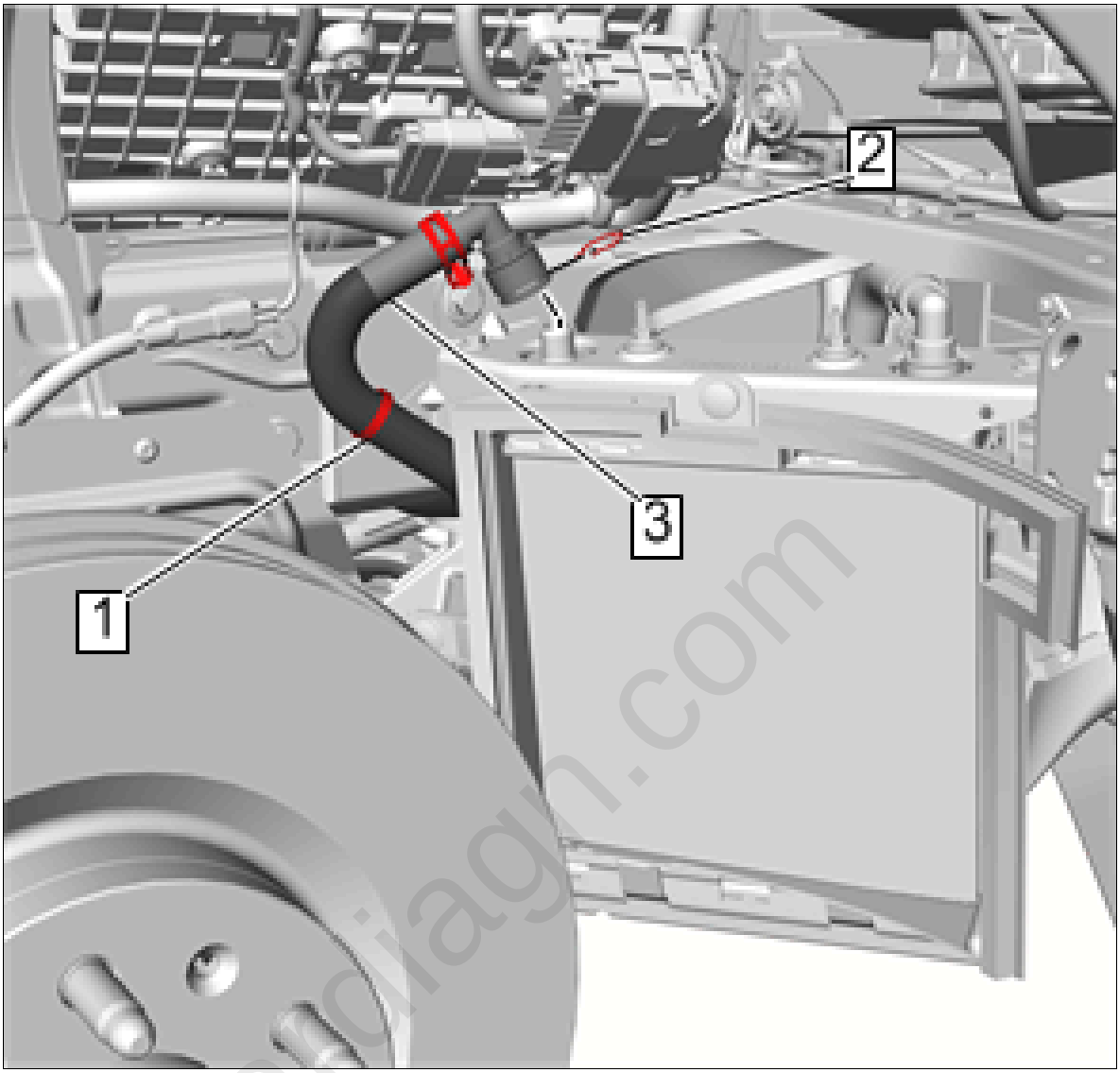


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6. Remove Push Pin (1)
7. Remove Rear Duct (2)

Fig 4: Radiator Inlet Hose Retainer

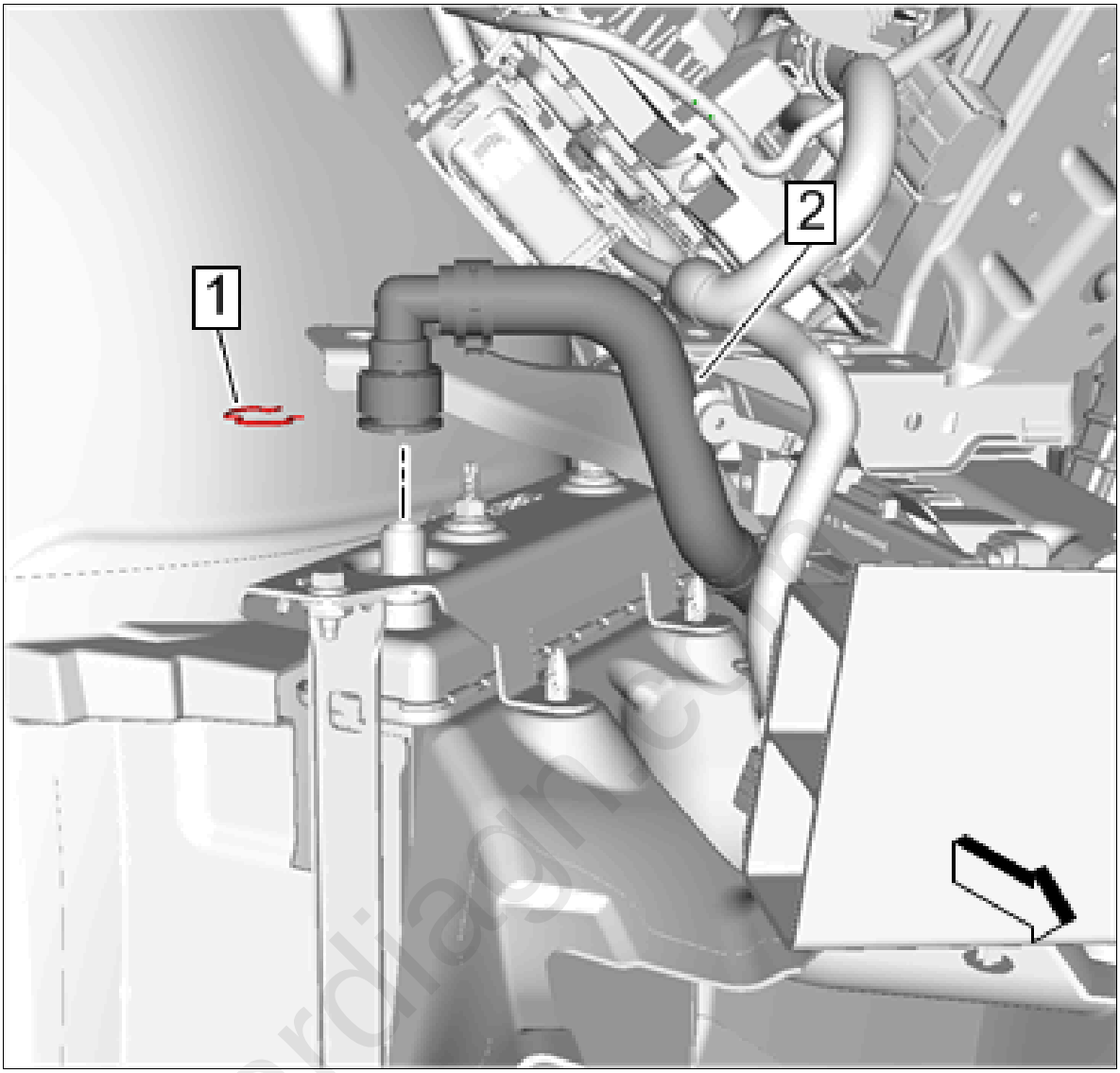


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8. Remove Radiator Inlet Hose Retainer (1)
9. Disengage Radiator Inlet Hose Retainer (2) Radiator Inlet Hose
10. Remove Radiator Inlet Hose (3)

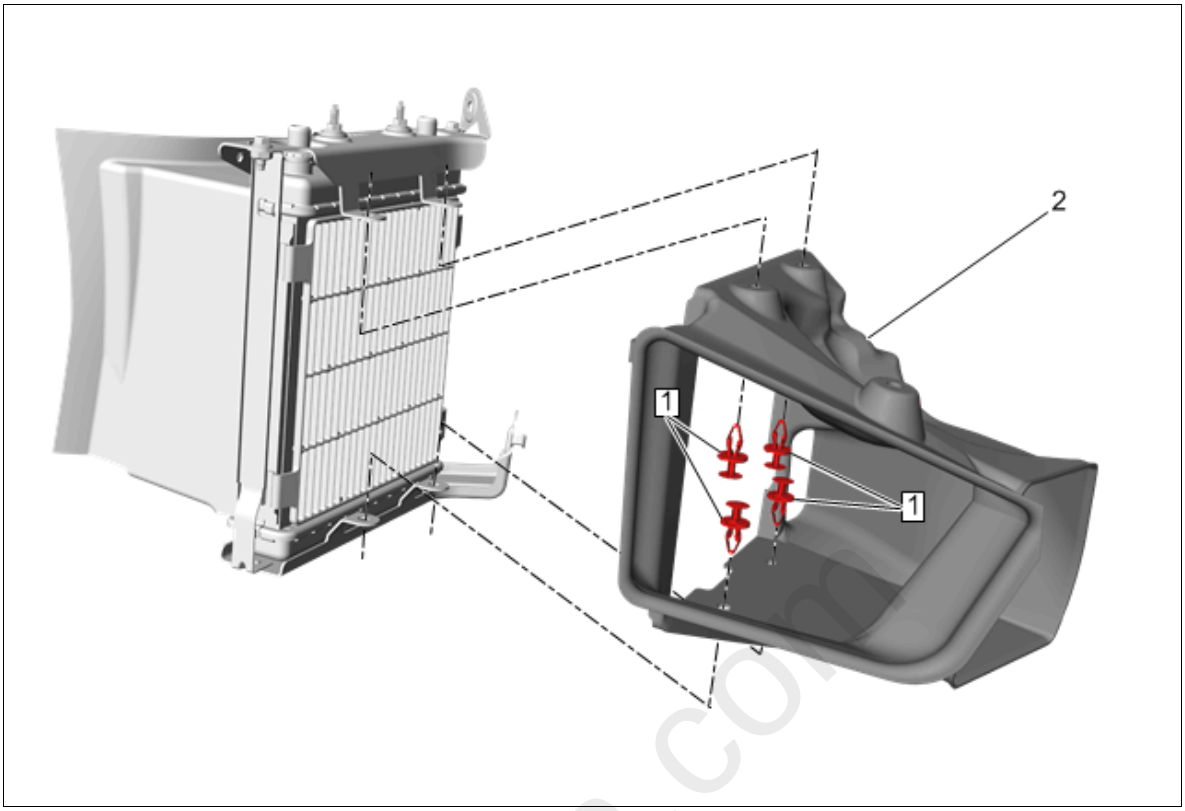
Fig 5: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

11. Disengage Auxiliary Radiator Inlet Hose Retainer (1)
12. Remove Auxiliary Radiator Inlet Hose (2)

Fig 6: Radiator Air Baffle - Right Side

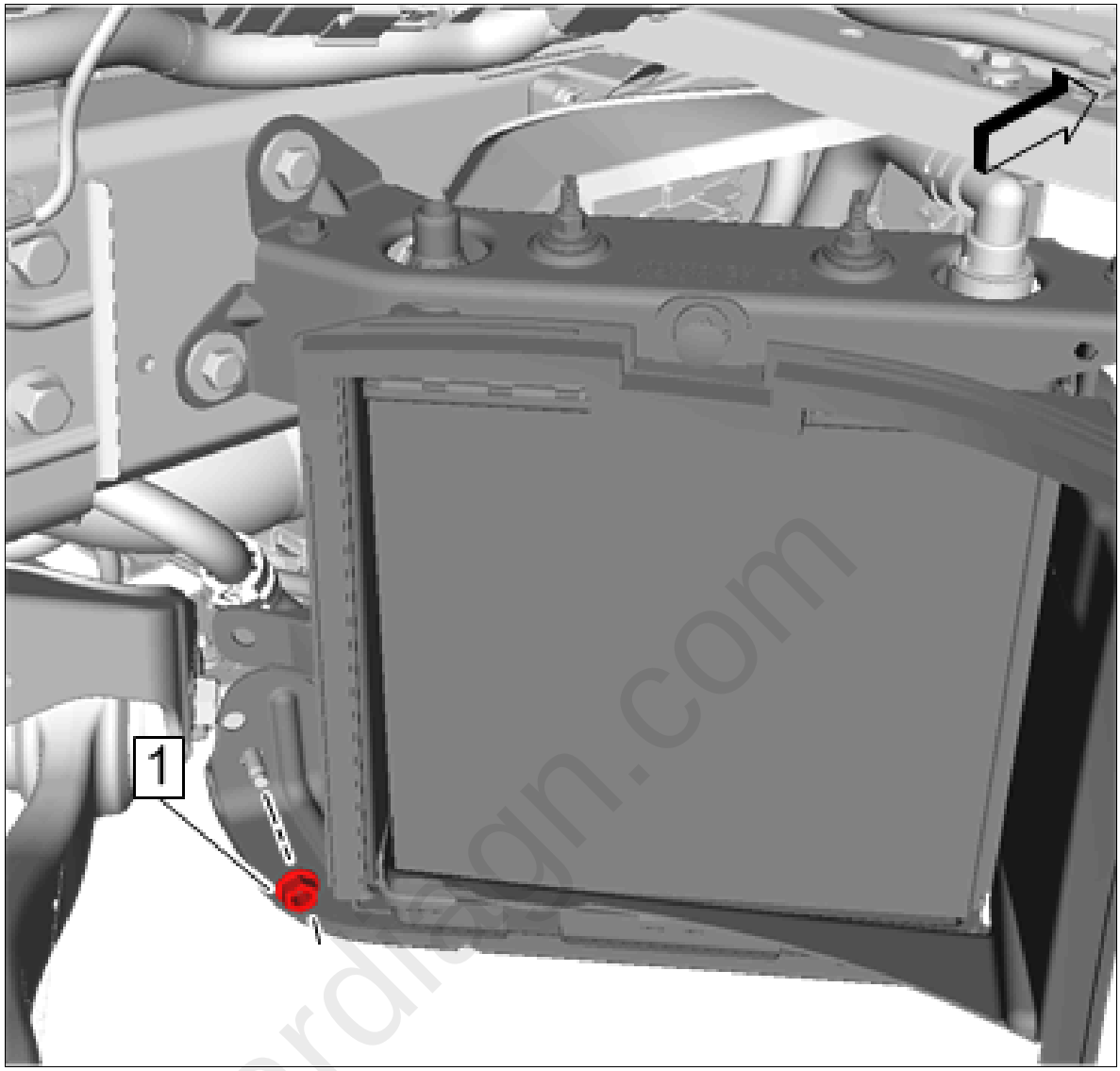


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13. Remove Push Pin (1) (Qty: 4)
14. Remove Radiator Air Side Baffle - Right Side (2)

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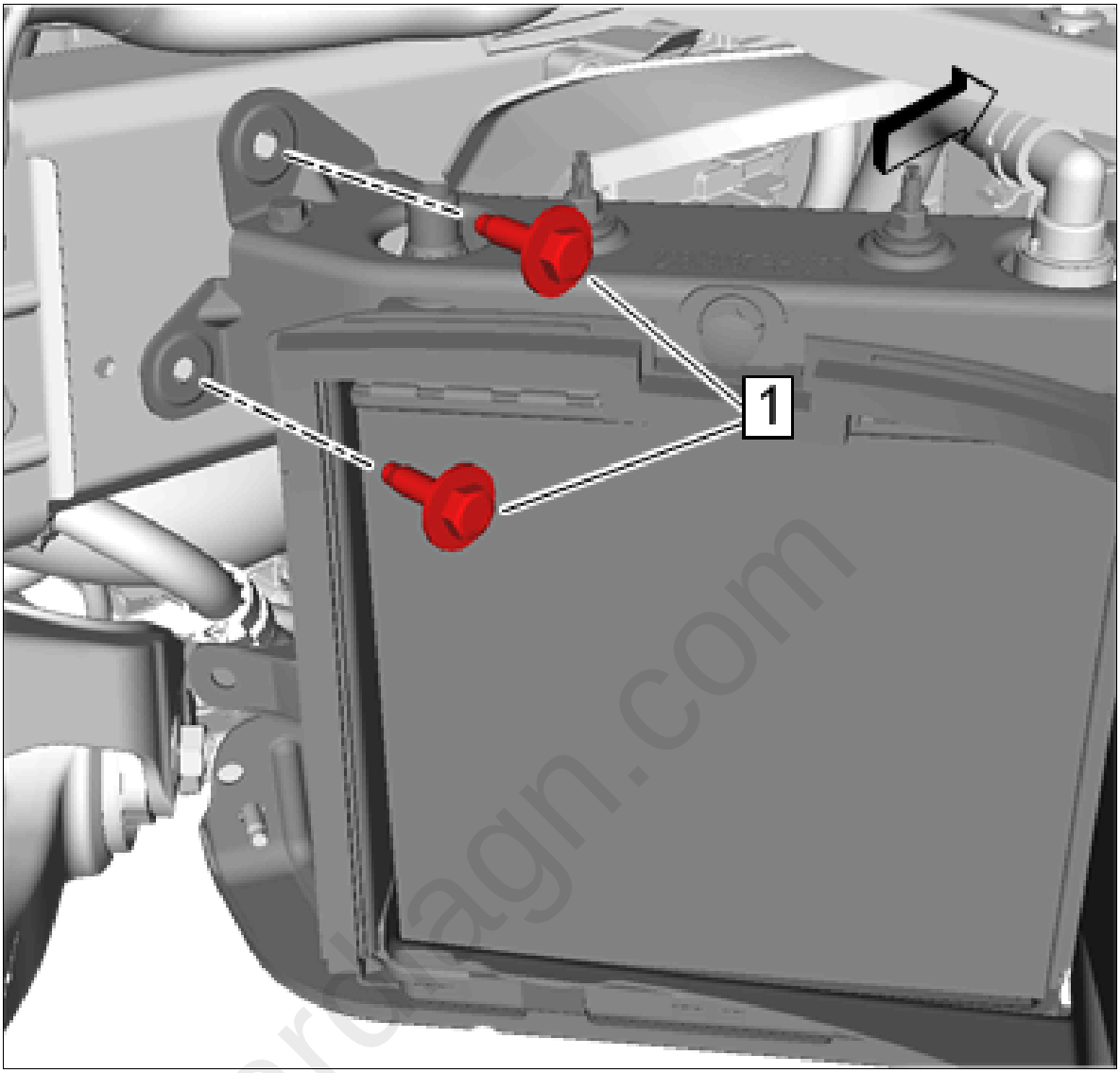
Fig 7: Charge Air Cooler Bracket Nut



Courtesy of GENERAL MOTORS COMPANY

15. Remove Charge Air Cooler Bracket Nut (1)

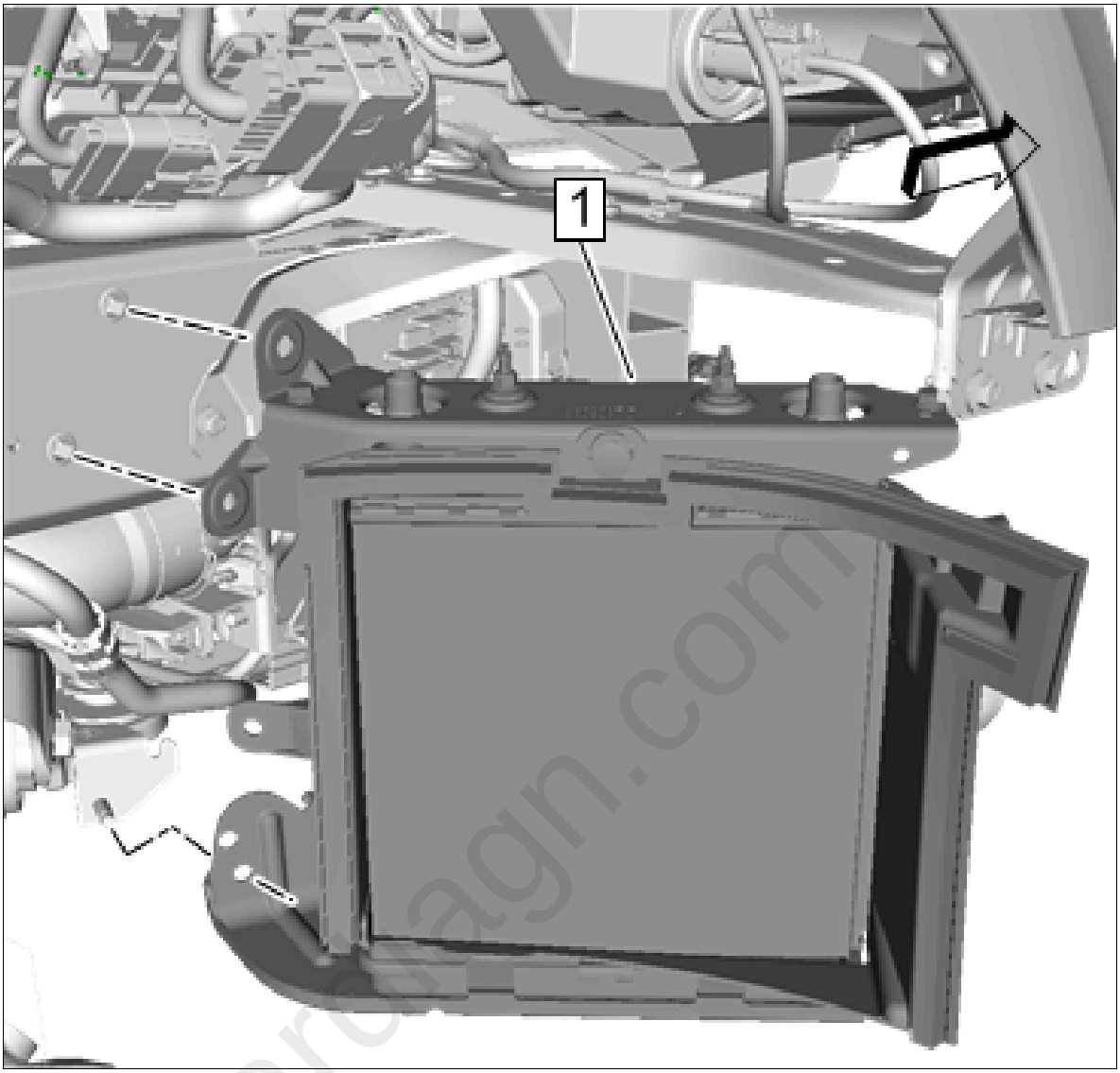
Fig 8: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

16. Remove Charge Air Cooler Bracket Bolt (1) (Qty: 2)

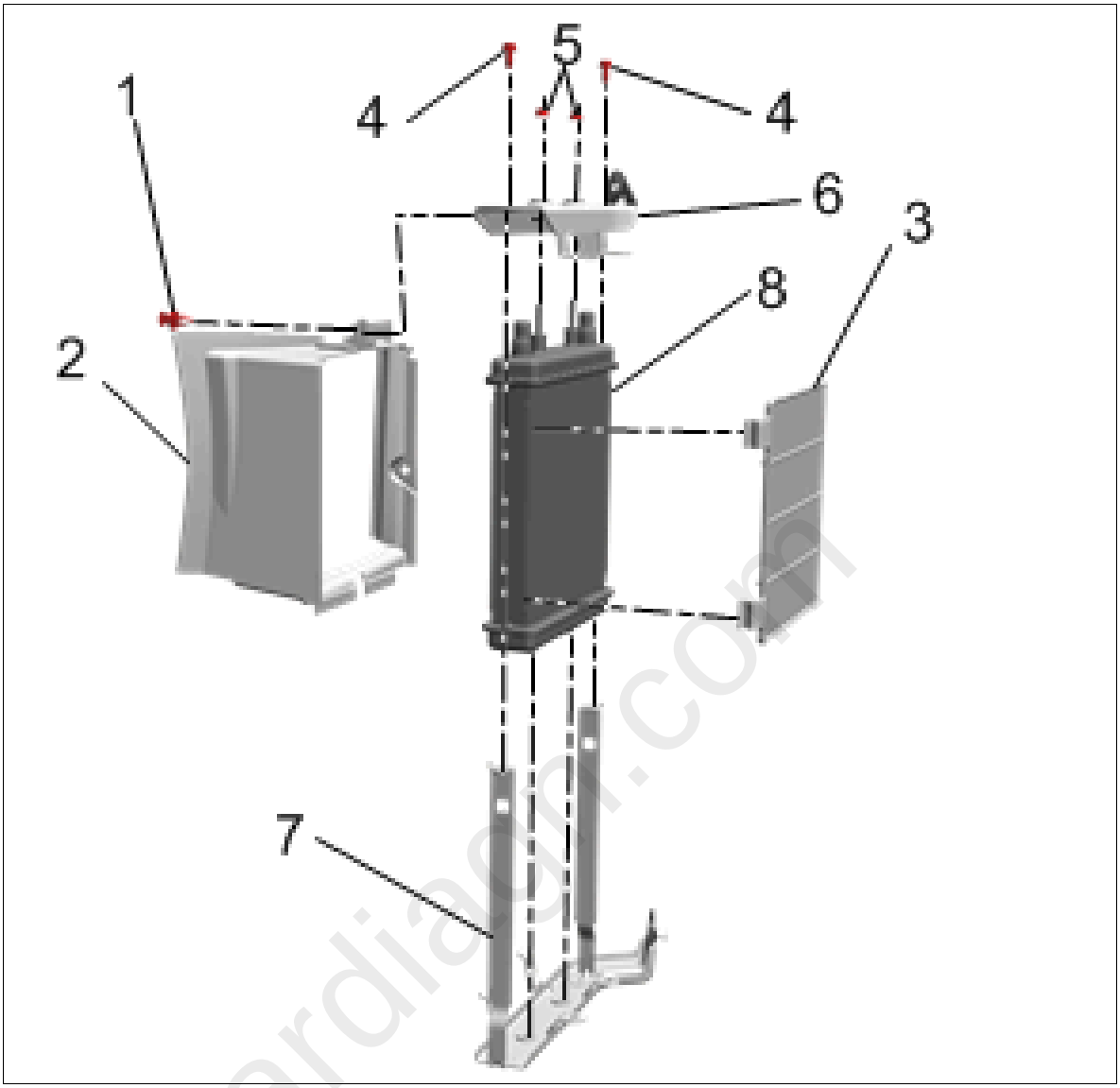
Fig 9: Charge Air Cooler - Right Side



Courtesy of GENERAL MOTORS COMPANY

17. Remove Charge Air Cooler - Right Side (1)

Fig 10: Charge Air Cooler

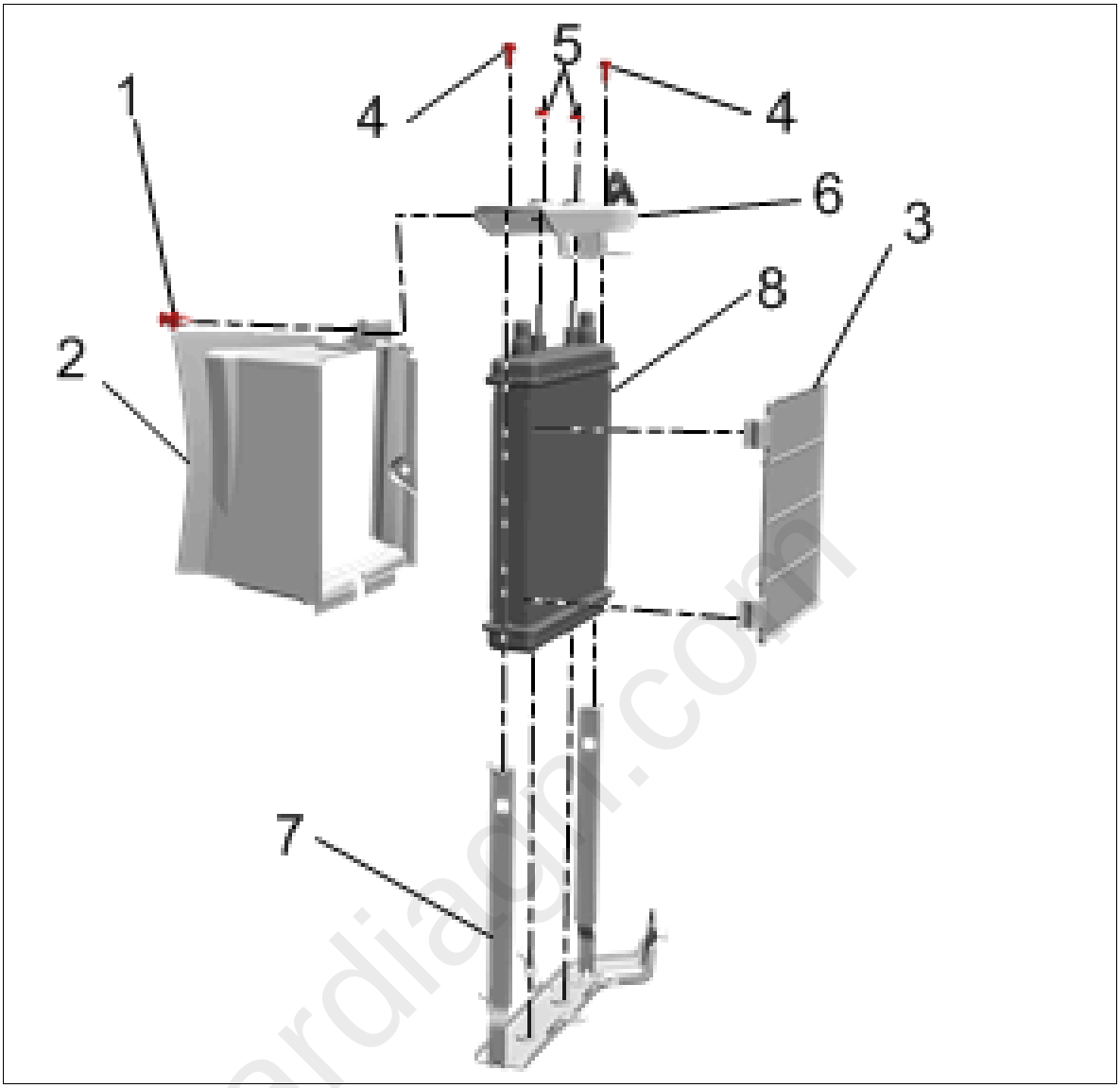


Courtesy of GENERAL MOTORS COMPANY

18. Remove Stone Guard (3) { If equipped }
19. Remove Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2)
20. Remove Charge Air Cooler Upper Bracket Nut (5) (Qty: 2)
21. Remove Upper Charge Air Cooler Bracket (6)
22. Remove Lower Charge Air Cooler Bracket (7)
23. Remove Charge Air Cooler (8)

REPAIR INSTRUCTIONS > CHARGE AIR COOLER REPLACEMENT - RIGHT SIDE (LTG WITH V18) > INSTALLATION PROCEDURE

Fig 1: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

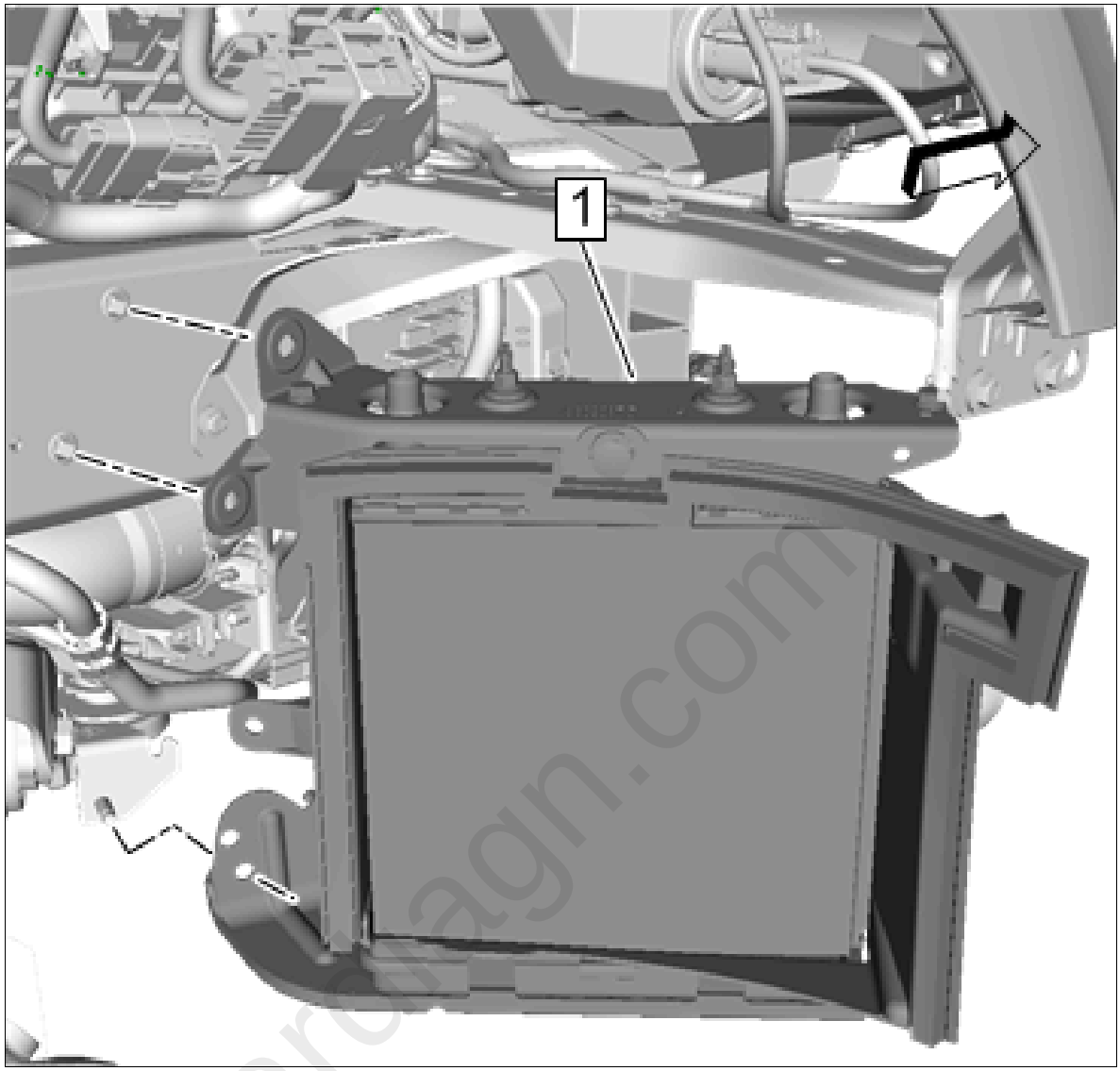
1. Install Charge Air Cooler (8)
2. Install Lower Charge Air Cooler Bracket (7)
3. Install Upper Charge Air Cooler Bracket (6)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

4. Install Charge Air Cooler Upper Bracket Nut (5) (Qty: 2) and tighten to 9 N.m (80 lb in)
5. Install Upper Charge Air Cooler Bracket Bolt (4) (Qty: 2) and tighten to 9 N.m (80 lb in)
6. Install Stone Guard (3) { If equipped }

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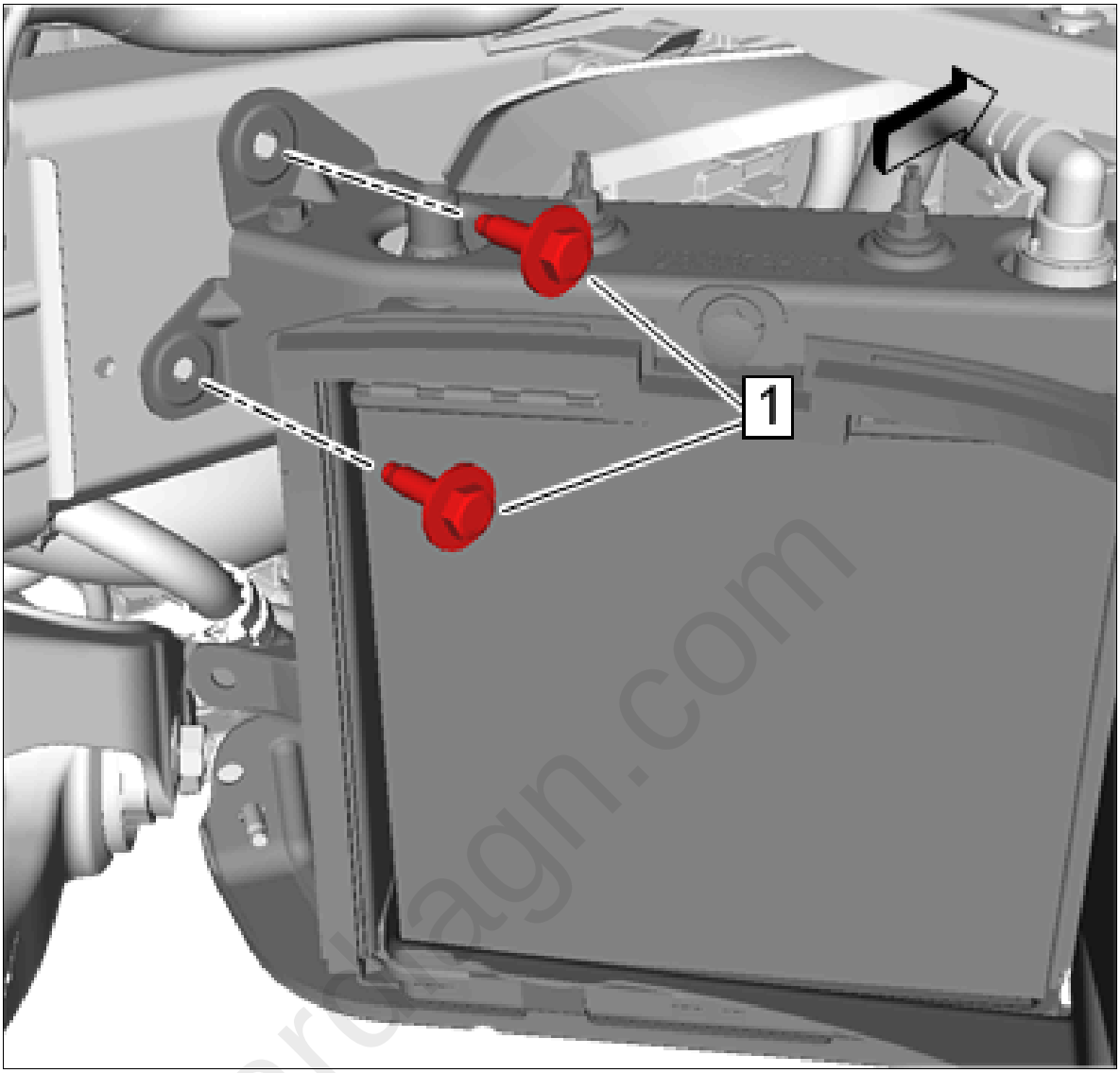
Fig 2: Charge Air Cooler - Right Side



Courtesy of GENERAL MOTORS COMPANY

7. Install Charge Air Cooler - Right Side (1)

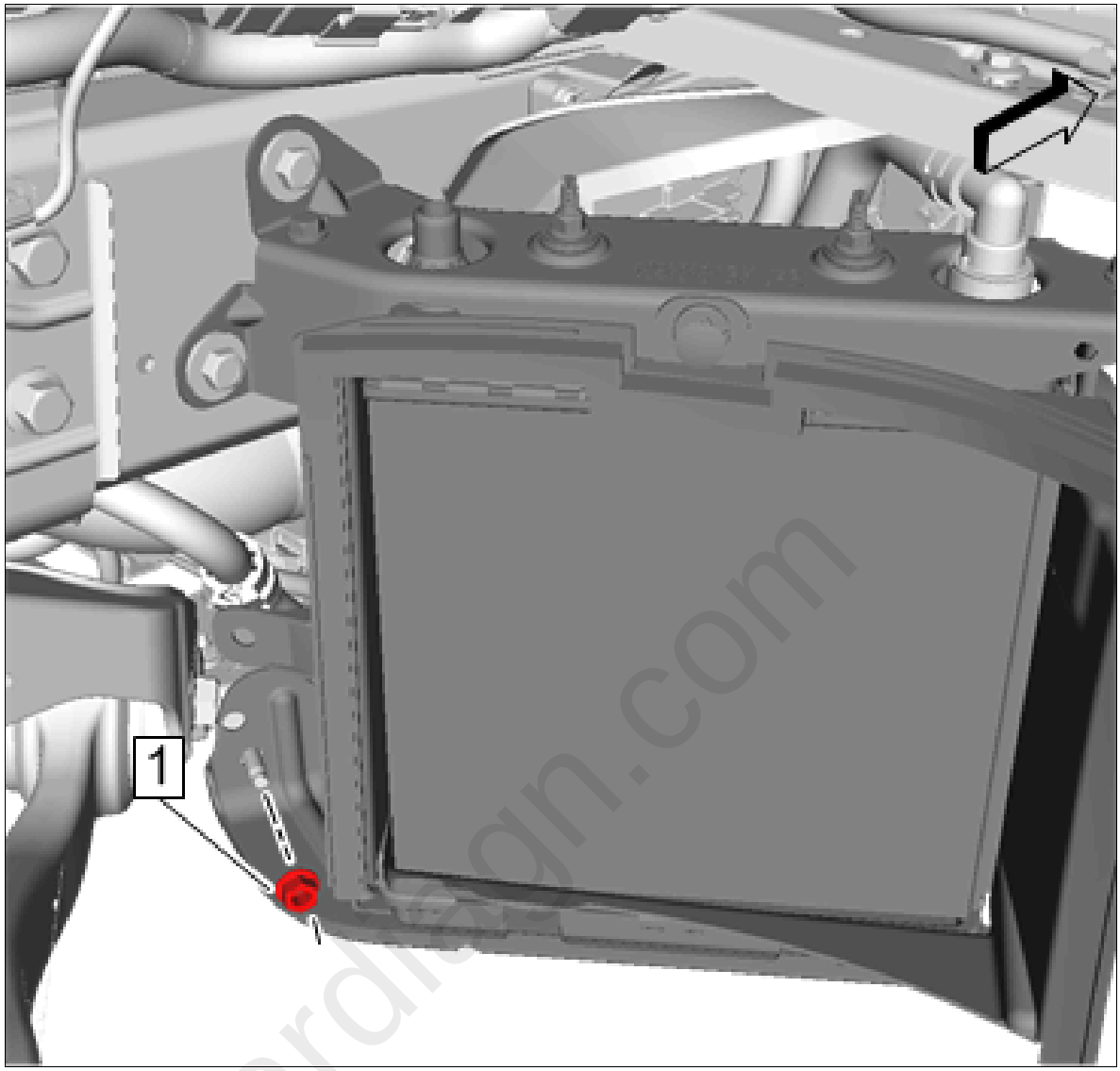
Fig 3: Charge Air Cooler Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

8. Install Charge Air Cooler Bracket Bolt (1) (Qty: 2) and tighten to 22 N.m (16 lb ft)

Fig 4: Charge Air Cooler Bracket Nut

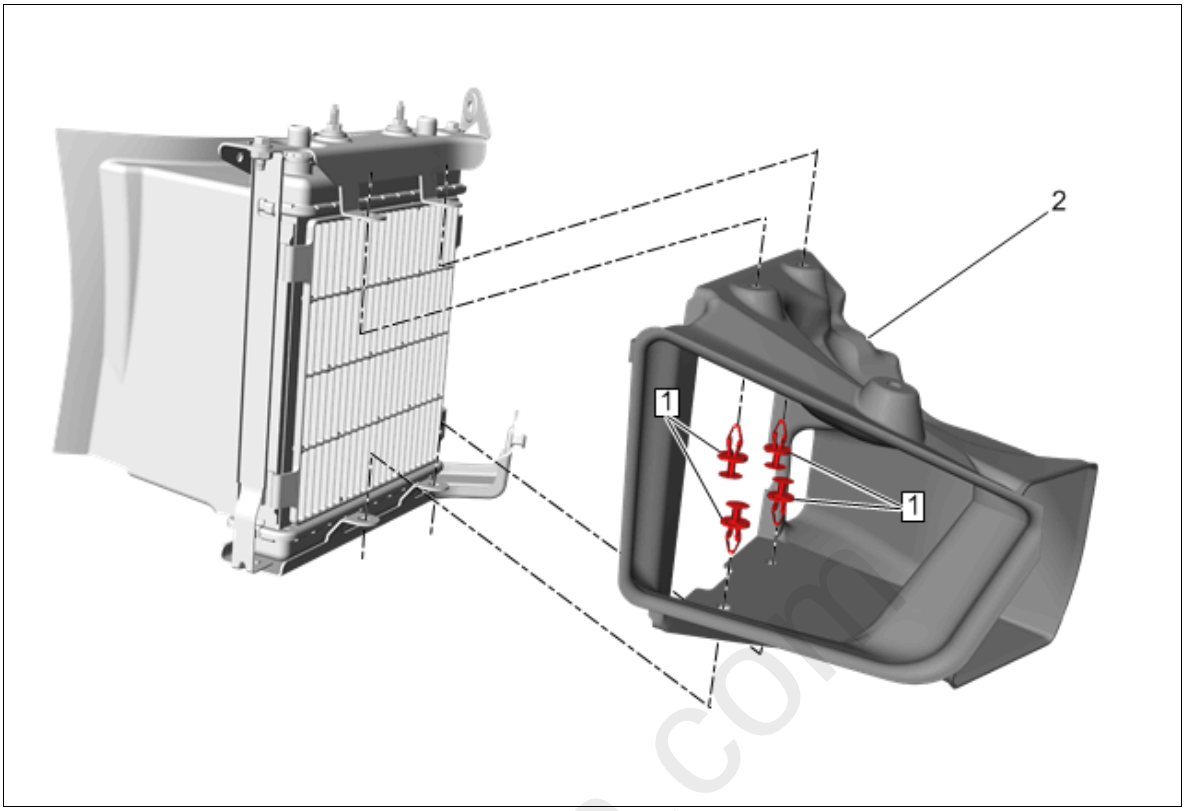


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9. Install Charge Air Cooler Bracket Nut (1) and tighten to 22 N.m (16 lb ft)

Fig 5: Radiator Air Baffle - Right Side

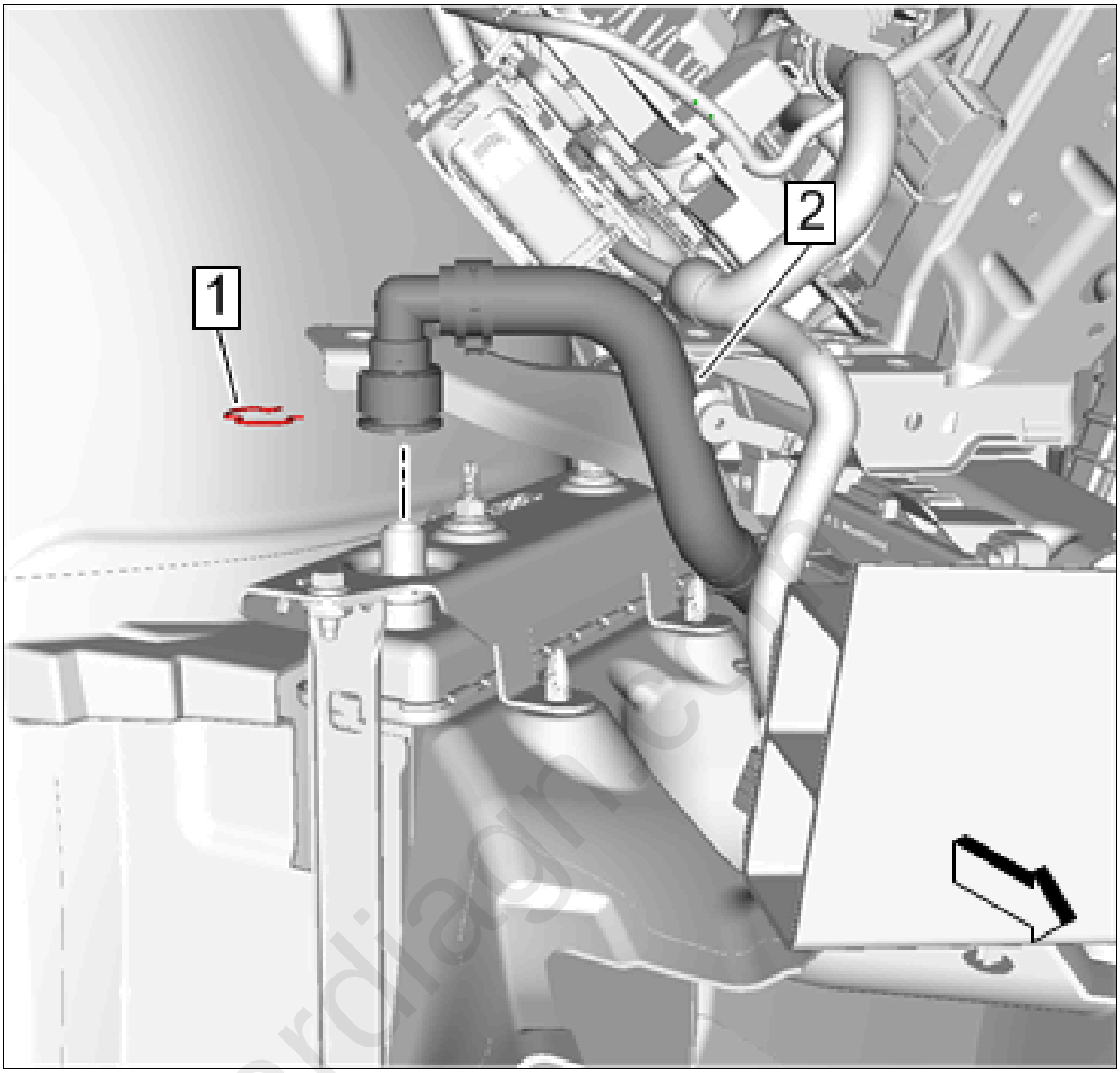


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10. Install Radiator Air Side Baffle - Right Side (2)
11. Install Push Pin (1) (Qty: 4)

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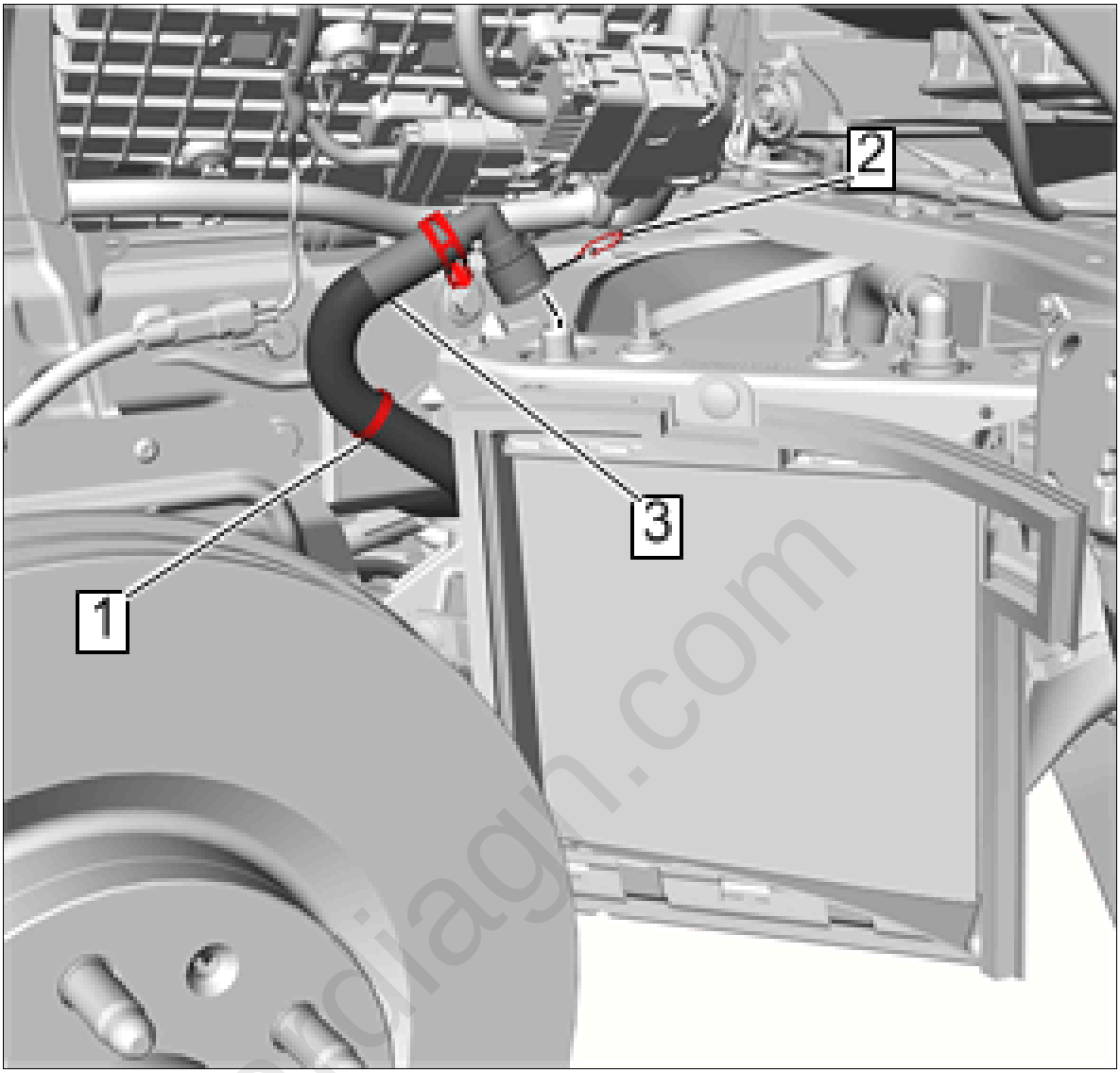
Fig 6: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

12. Install Auxiliary Radiator Inlet Hose (2)
13. Engage Auxiliary Radiator Inlet Hose Retainer (1)

Fig 7: Radiator Inlet Hose Retainer

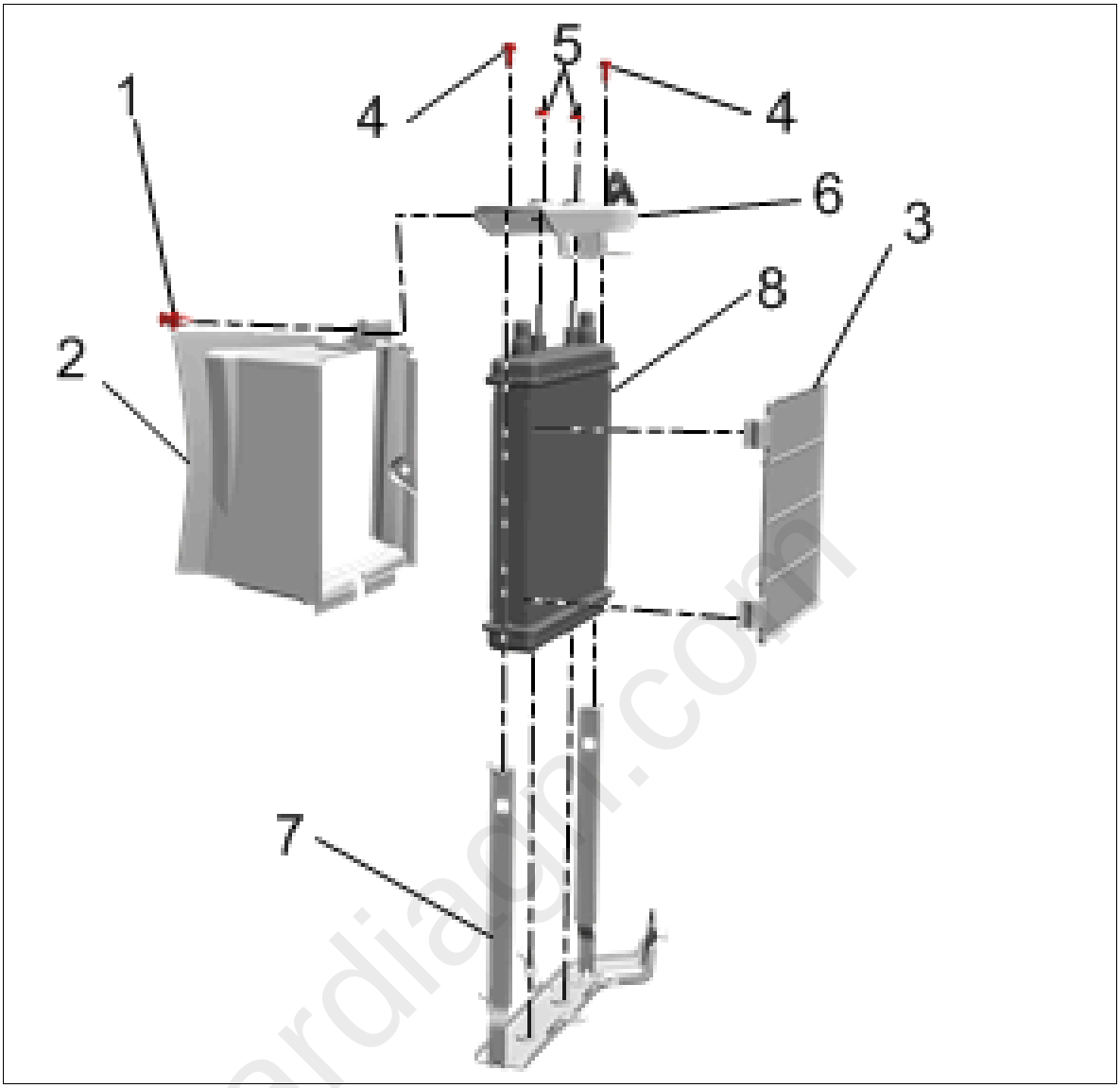


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14. Install Radiator Inlet Hose (3)
15. Engage Radiator Inlet Hose Retainer (2) Radiator Inlet Hose
16. Install Radiator Inlet Hose Retainer (1)

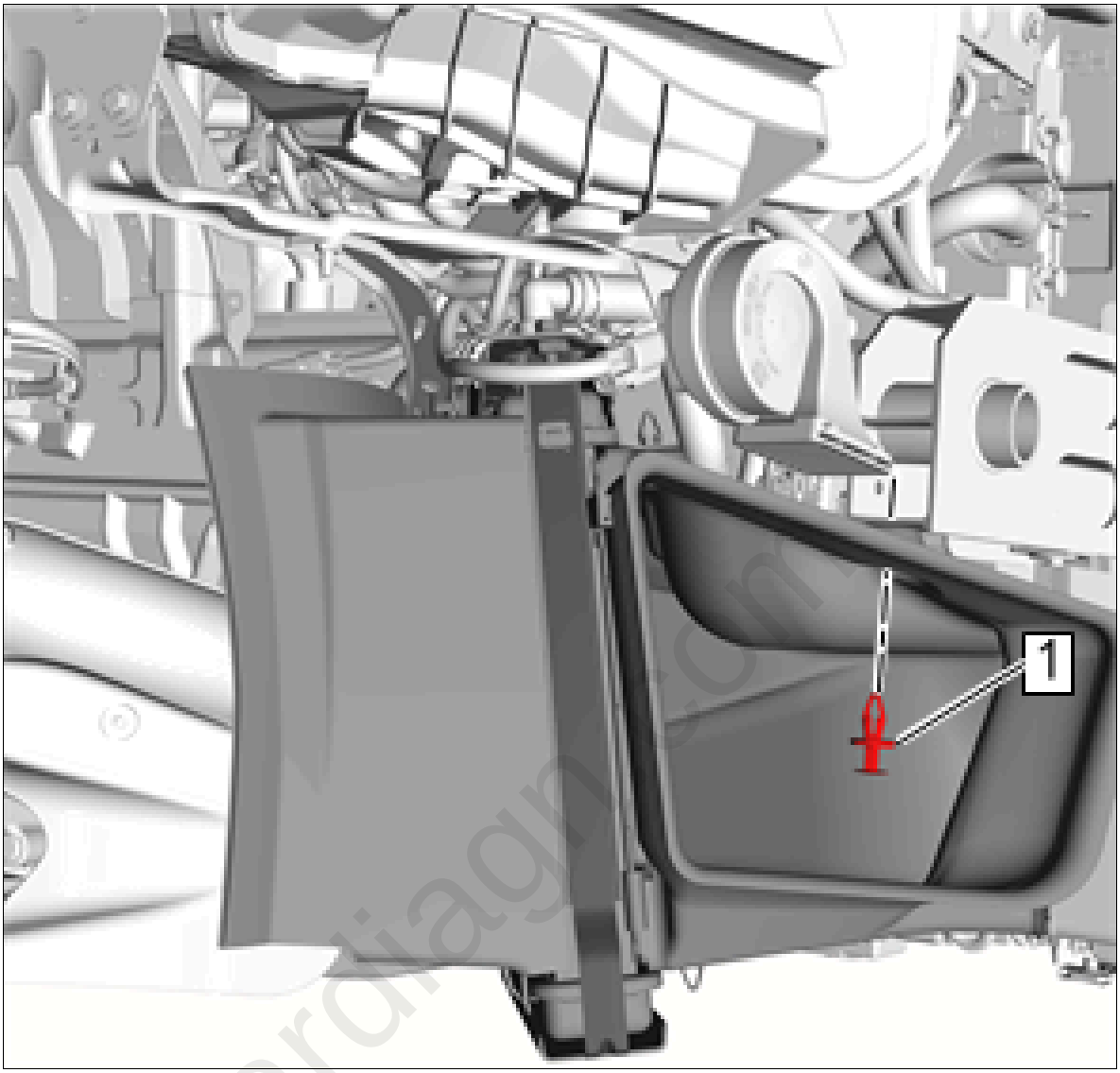
Fig 8: Charge Air Cooler



Courtesy of GENERAL MOTORS COMPANY

17. Install Rear Duct (2)
18. Install Push Pin (1)

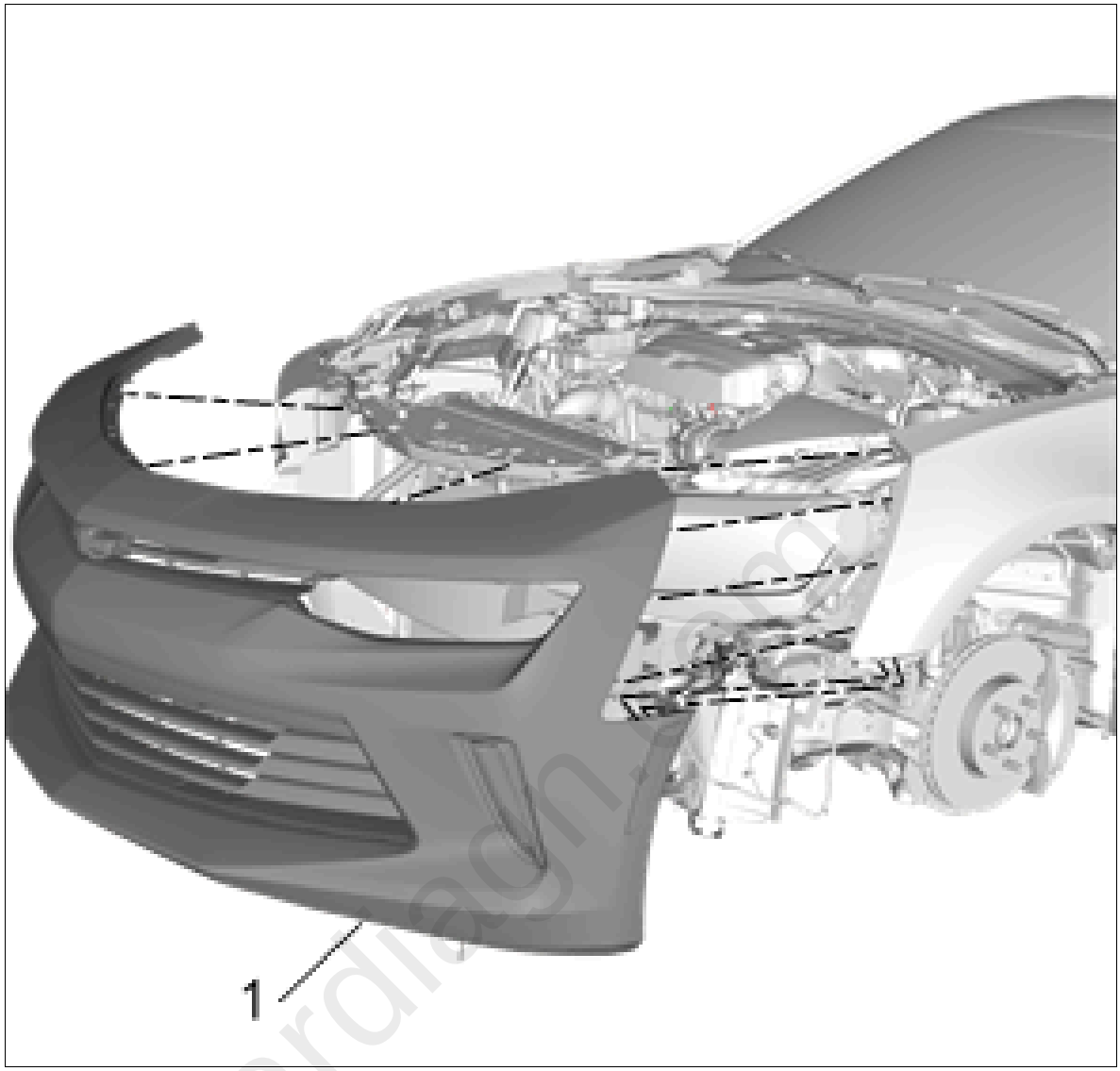
Fig 9: Push Pin



Courtesy of GENERAL MOTORS COMPANY

19. Install Push Pin (1)
20. Attach the wiring harness and connect the electrical connectors as necessary.
21. Install Front Brake Rotor Cooling Duct- Rear»Install — Front Brake Rotor Cooling Duct Replacement (J6G)

Fig 10: Front Bumper Fascia

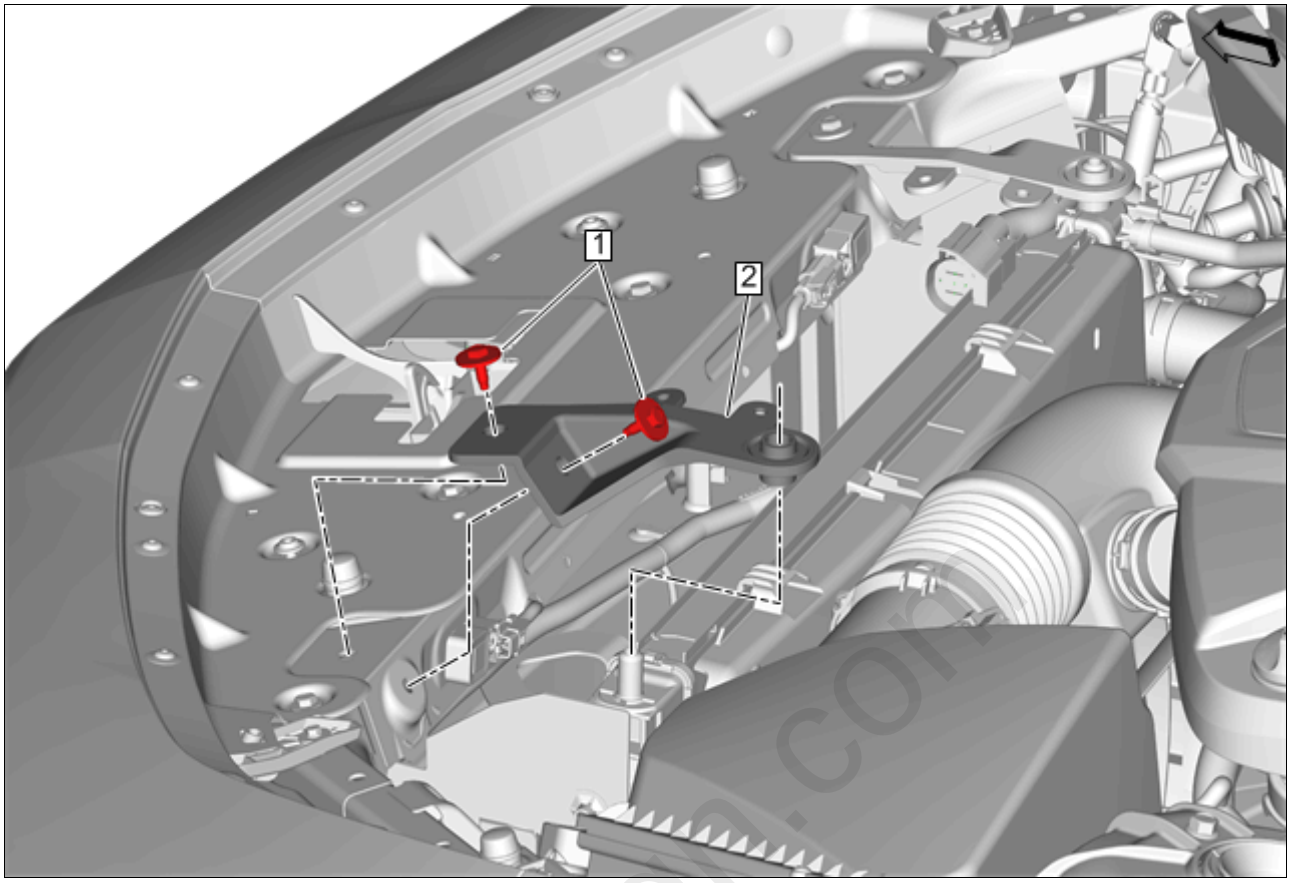


Courtesy of GENERAL MOTORS COMPANY

22. Install Front Bumper Fascia (1) - Front Bumper Fascia Replacement
23. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
24. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR UPPER BRACKET REPLACEMENT - LEFT SIDE (LGX LTG)

Fig 1: Radiator Upper Bracket - Left Side

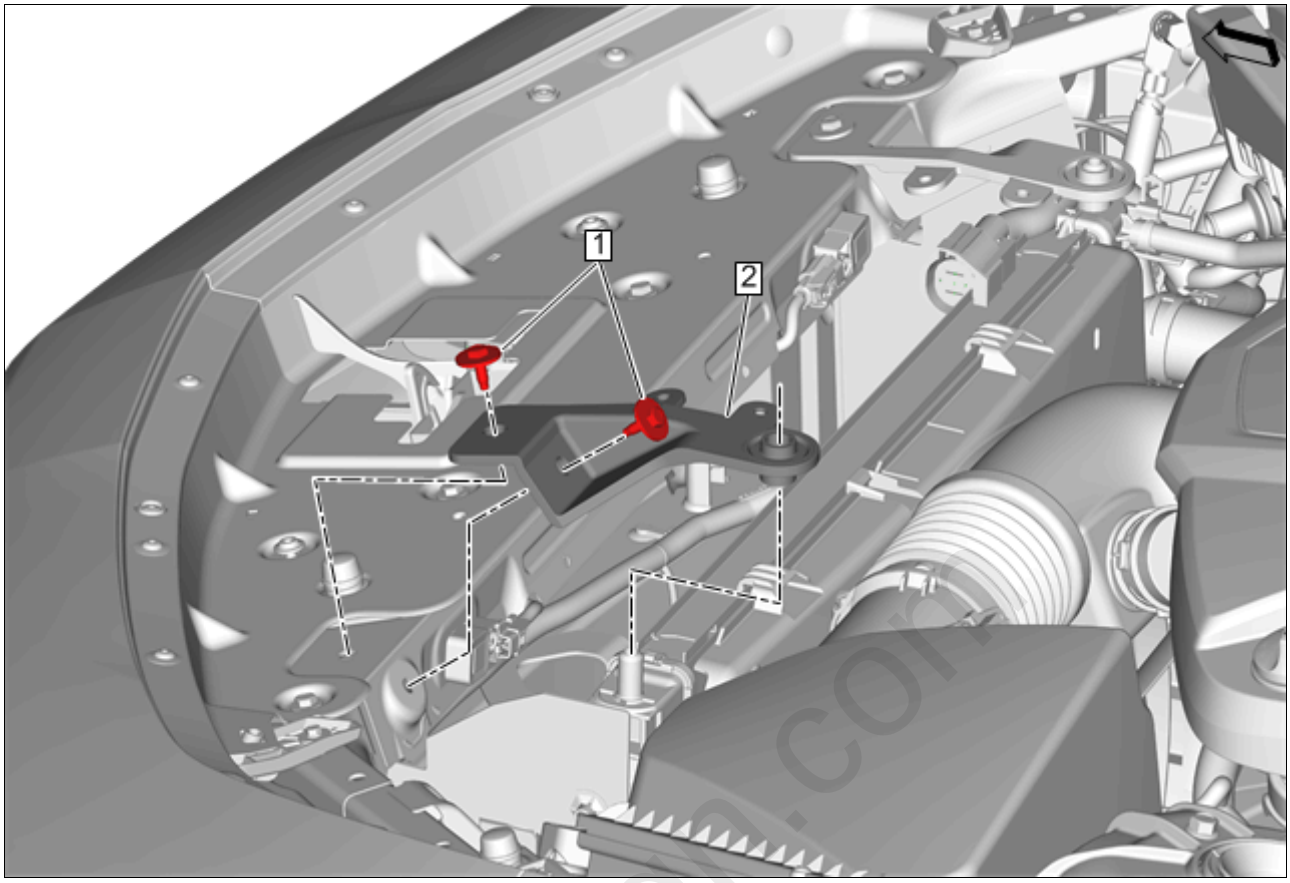


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Radiator Air Upper Baffle and Deflector Replacement (LGX) Radiator Air Upper Baffle and Deflector Replacement (LTG)	
1	Radiator Upper Mount Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Radiator Upper Bracket - Left Side

REPAIR INSTRUCTIONS > RADIATOR UPPER BRACKET REPLACEMENT - LEFT SIDE (LT1)

Fig 1: Radiator Upper Bracket - Left Side

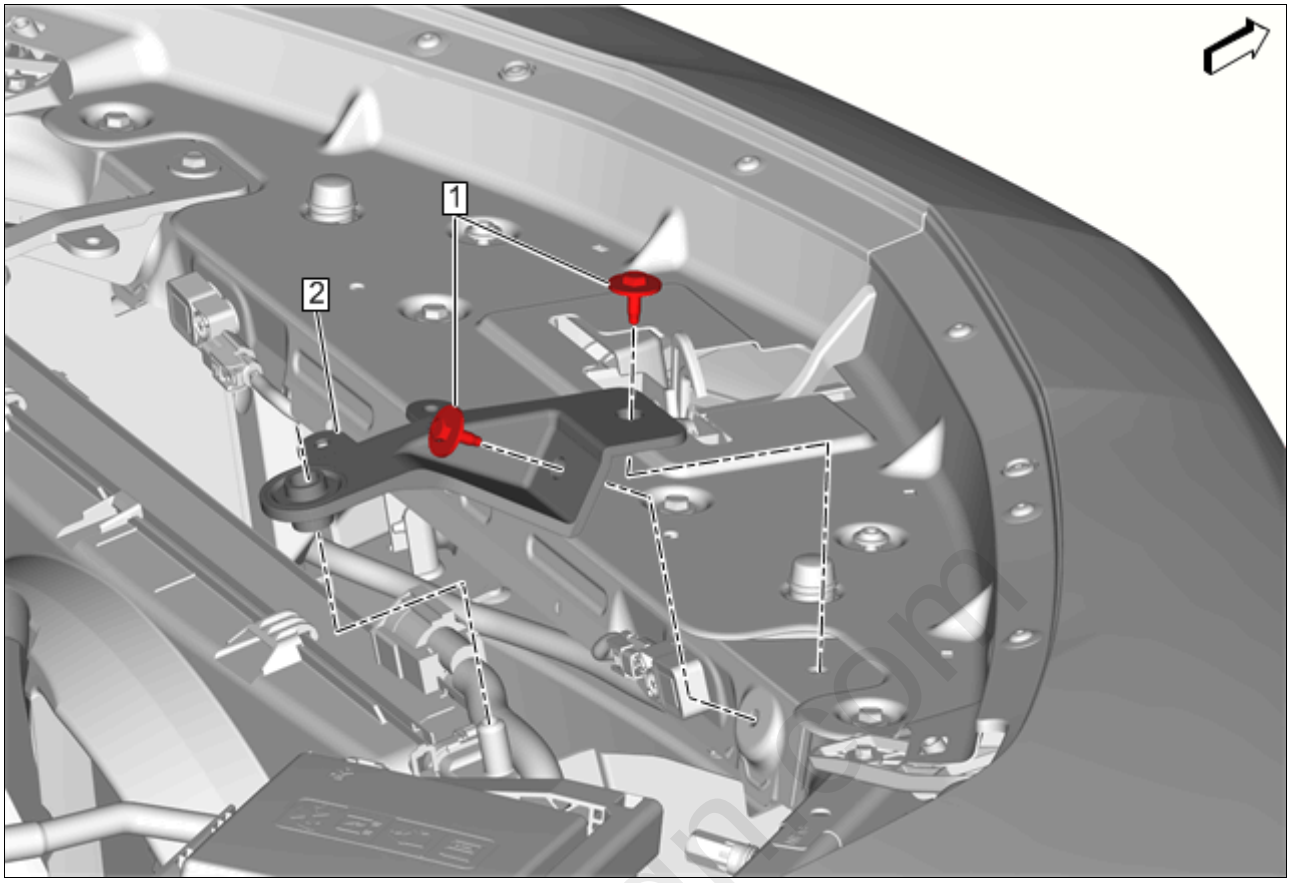


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Upper Mount Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Radiator Upper Bracket - Left Side

REPAIR INSTRUCTIONS > RADIATOR UPPER BRACKET REPLACEMENT - RIGHT SIDE (LGX LTG)

Fig 1: Radiator Upper Bracket - Right Side

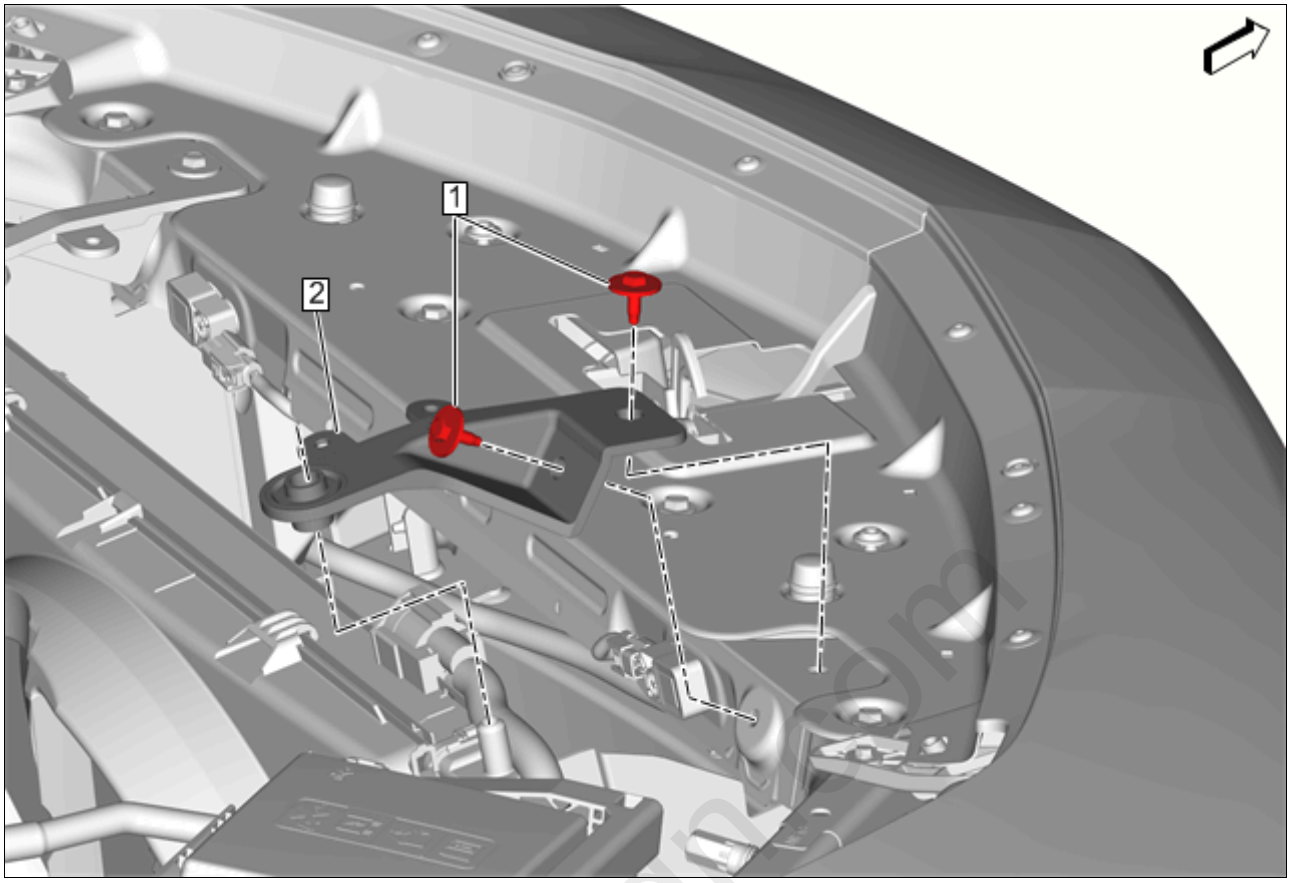


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Radiator Air Upper Baffle and Deflector Replacement (LGX) Radiator Air Upper Baffle and Deflector Replacement (LTG)	
1	Radiator Upper Mount Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Radiator Upper Bracket - Right Side

REPAIR INSTRUCTIONS > RADIATOR UPPER BRACKET REPLACEMENT - RIGHT SIDE (LT1)

Fig 1: Radiator Upper Bracket - Right Side

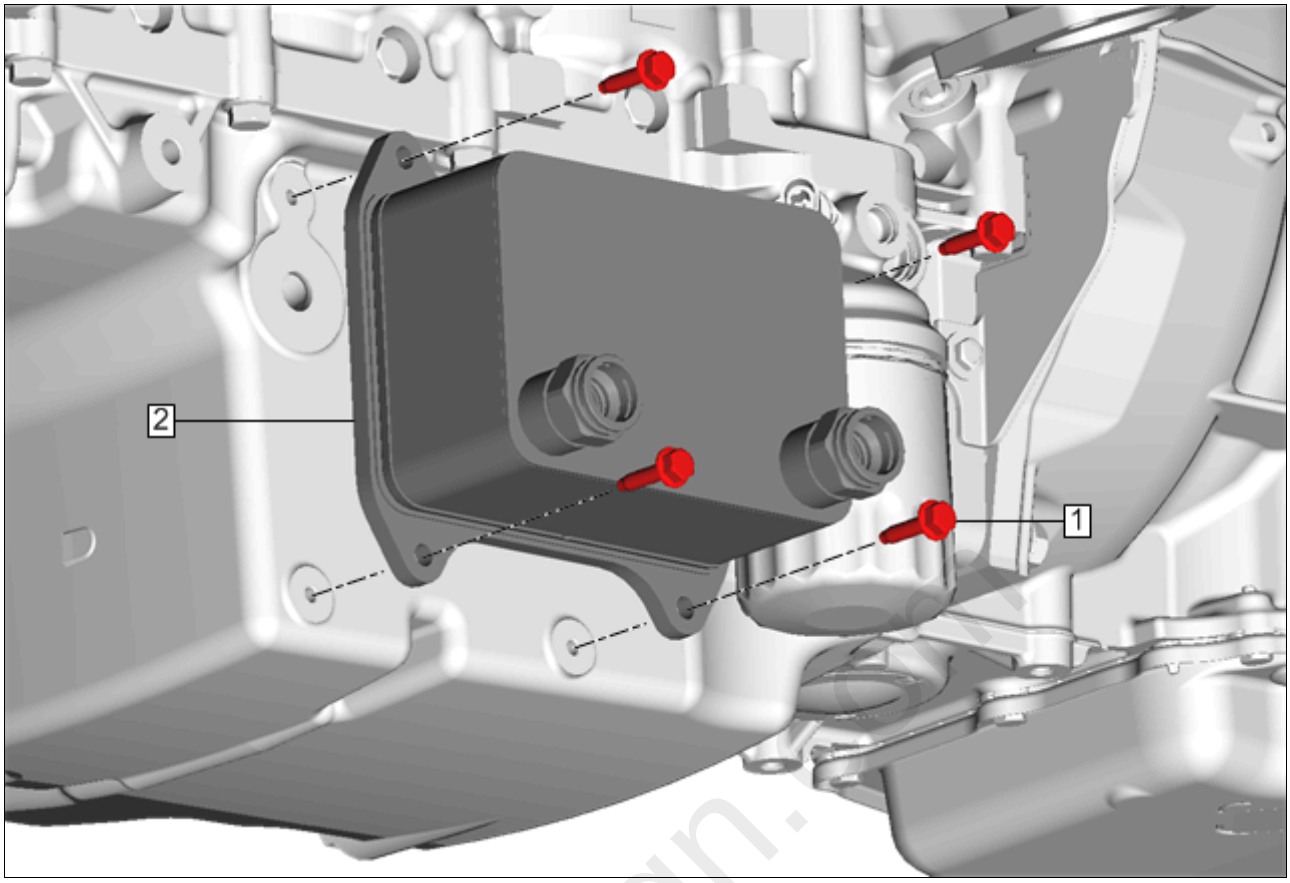


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Upper Mount Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Radiator Upper Bracket - Right Side

REPAIR INSTRUCTIONS > ENGINE OIL COOLER REPLACEMENT (LT1)

Fig 1: Engine Oil Cooler (LT1)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Drain the engine oil. Engine Oil and Oil Filter Replacement 3. Disconnect Engine Oil Cooler Hose/Pipe Replacement (LT1) at Engine Oil Cooler 4. Disconnect Radiator Outlet Hose Replacement (LT1 V18 V03) at Engine Oil Cooler	
1	Engine Oil Cooler Bolt (Qty: 4) *CAUTION:* *Refer to Fastener Caution .* **Tighten**

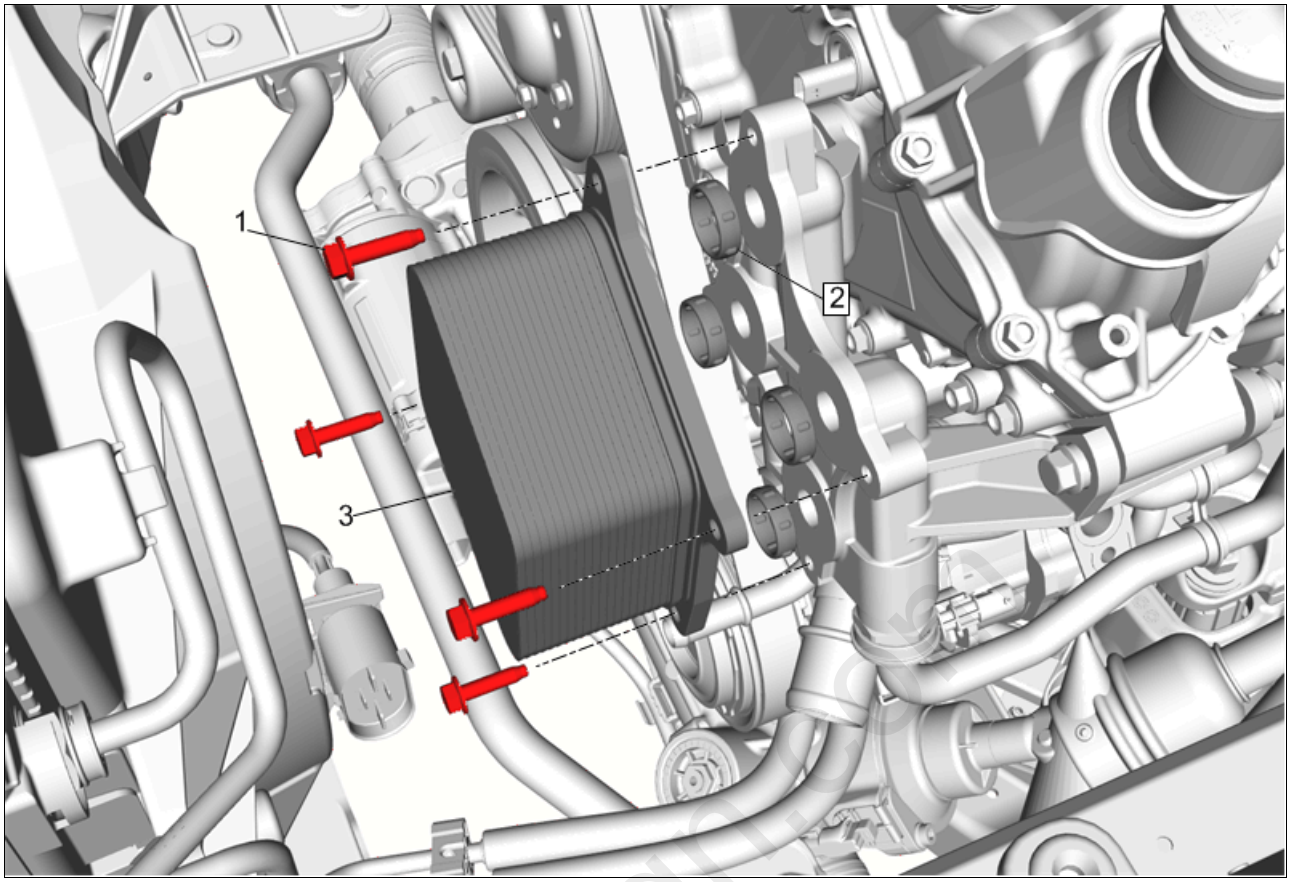
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	10 N.m (89 lb in)
2	Engine Oil Cooler *NOTE:* *Whenever the engine oil cooler lines are detached, the quick connect fitting must be replaced. Refer to Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement (LT1) .* Procedure 1. Clean the engine oil cooler housing to engine block sealing surfaces. 2. If reinstalling the existing engine oil cooler, refer to Engine Oil Cooler Cleaning and Inspection . 3. Install a NEW engine oil cooler gasket. 4. Fill the engine oil to proper level. Adhesives, Fluids, Lubricants, and Sealers , and Approximate Fluid Capacities

REPAIR INSTRUCTIONS > ENGINE OIL COOLER REPLACEMENT (LGX)

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Fig 1: Engine Oil Cooler (LGX)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Drain the engine oil. Engine Oil and Oil Filter Replacement 3. Air Cleaner Outlet Duct Replacement	
1	Engine Oil Cooler Bolt (Qty: 4) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)

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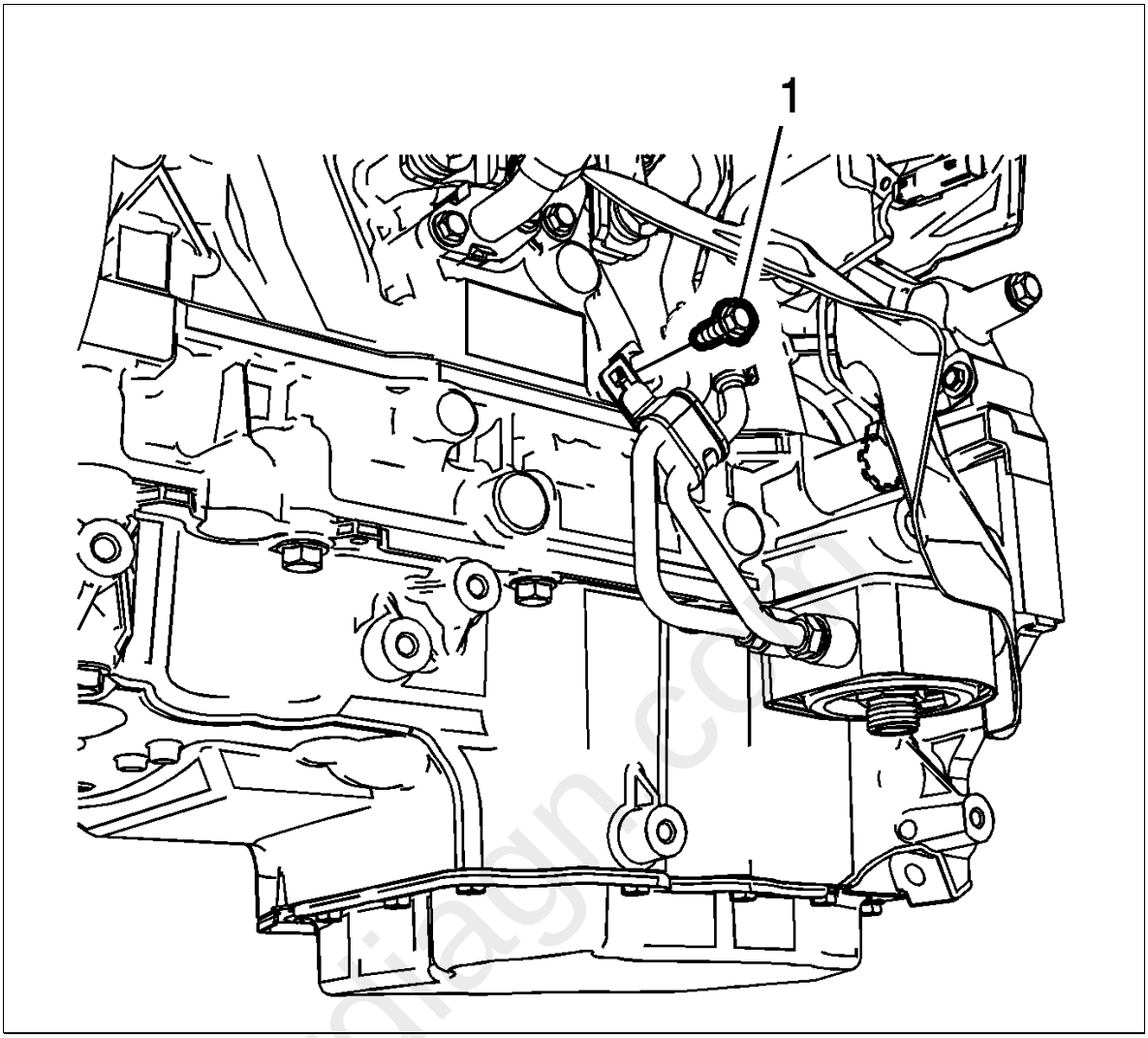
2	Engine Oil Cooler Seal (Qty: 4) **Procedure** Install NEW engine oil cooler seals.
3	Engine Oil Cooler *NOTE:* *Place rags under the cooler to catch oil and coolant.* Procedure 1. Fill the engine oil to proper level. Approximate Fluid Capacities , and Adhesives, Fluids, Lubricants, and Sealers 2. Fill the engine coolant to proper level. Adhesives, Fluids, Lubricants, and Sealers , and Approximate Fluid Capacities

REPAIR INSTRUCTIONS > 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 Fill)
2. Remove the engine oil filter. Engine Oil and Oil Filter Replacement
3. Remove the engine mount bracket. Engine Mount Bracket Replacement - Left Side

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Fig 1: Engine Oil Cooler Fastener

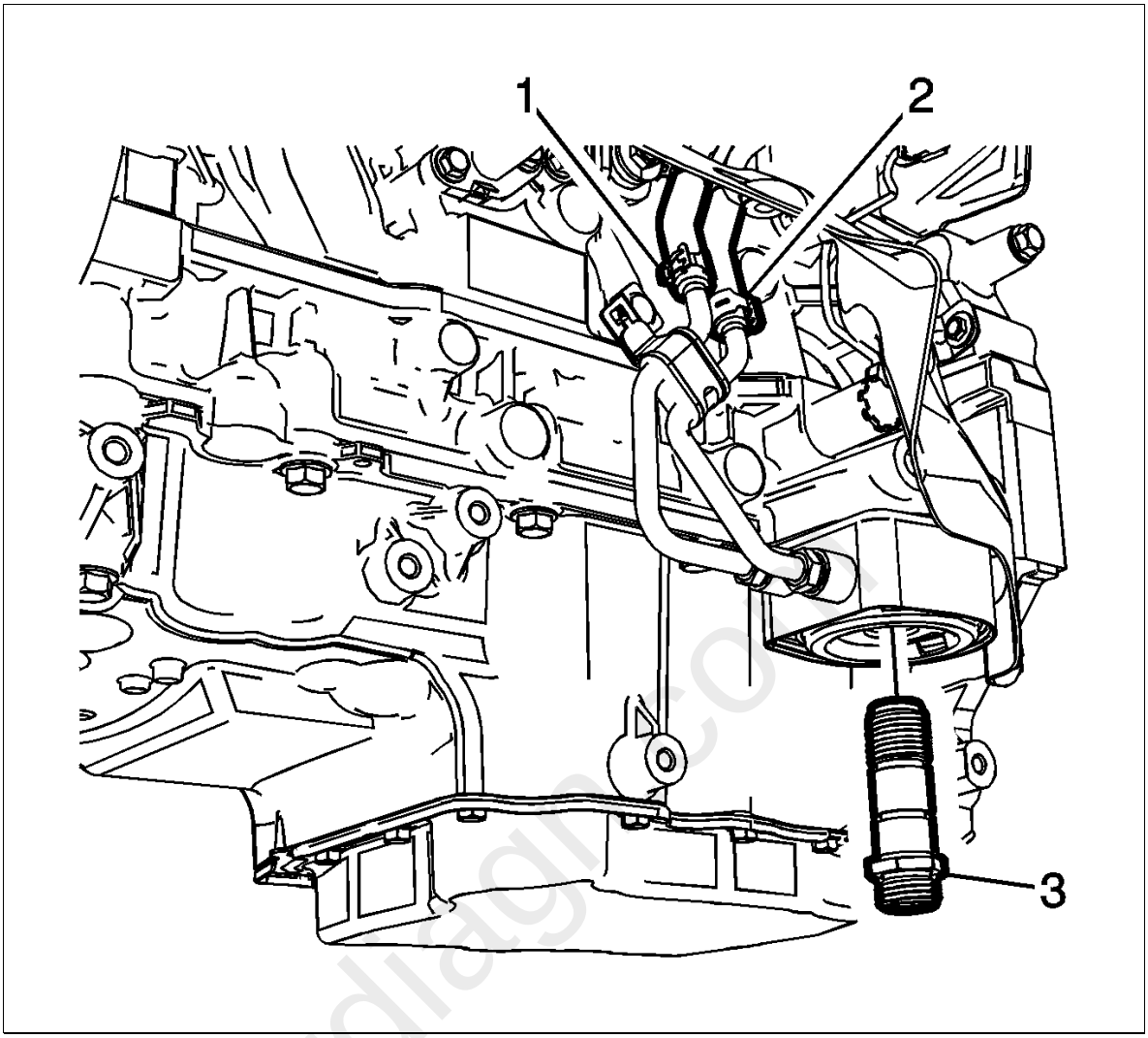


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4. Remove the engine oil cooler fastener (1).

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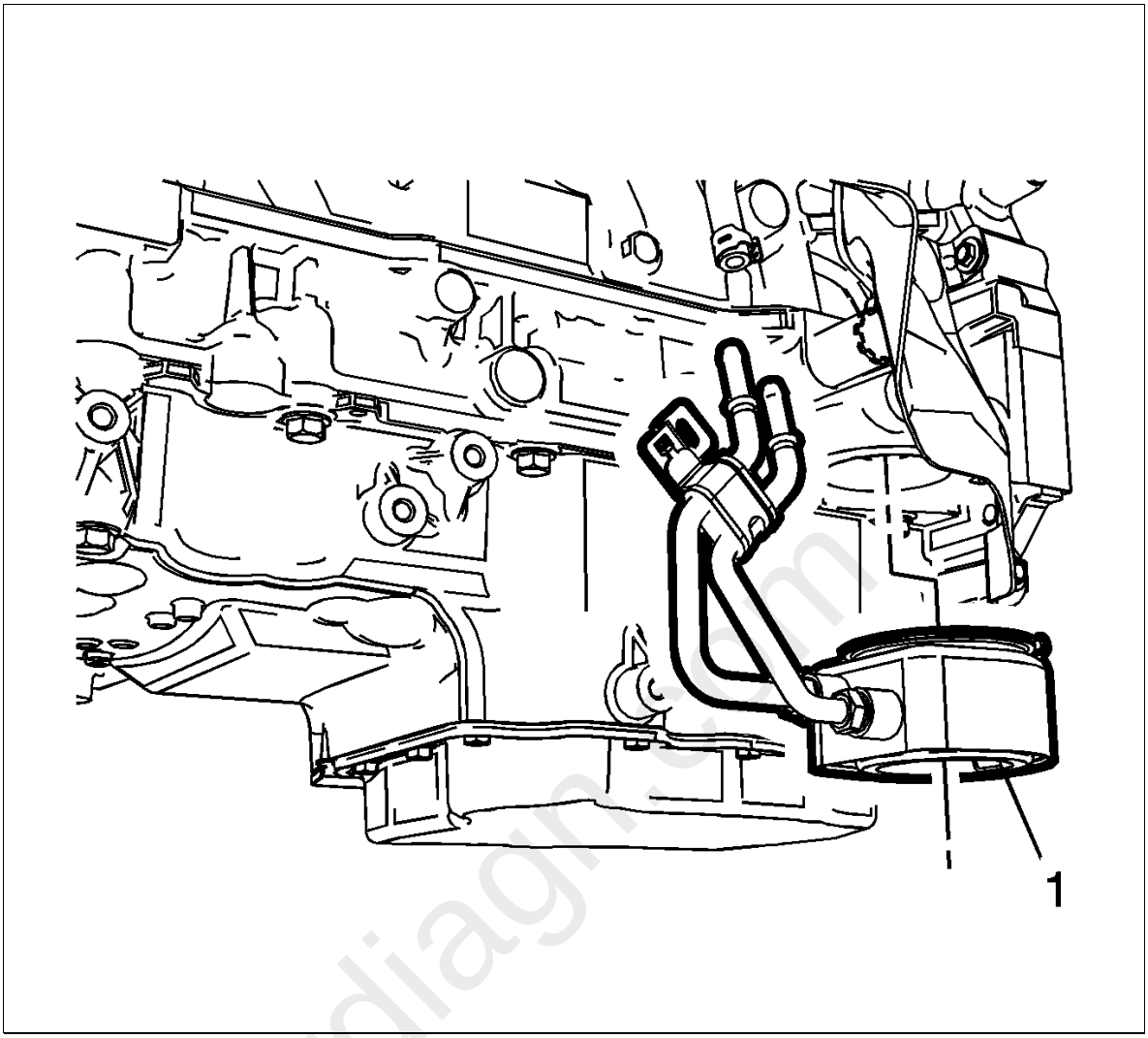
Fig 2: Engine Oil Cooler Connector



Courtesy of GENERAL MOTORS COMPANY

5. Remove the engine oil cooler hose (1) and (2).
6. Remove the engine oil cooler connector (3).

Fig 3: Engine Oil Cooler



Courtesy of GENERAL MOTORS COMPANY

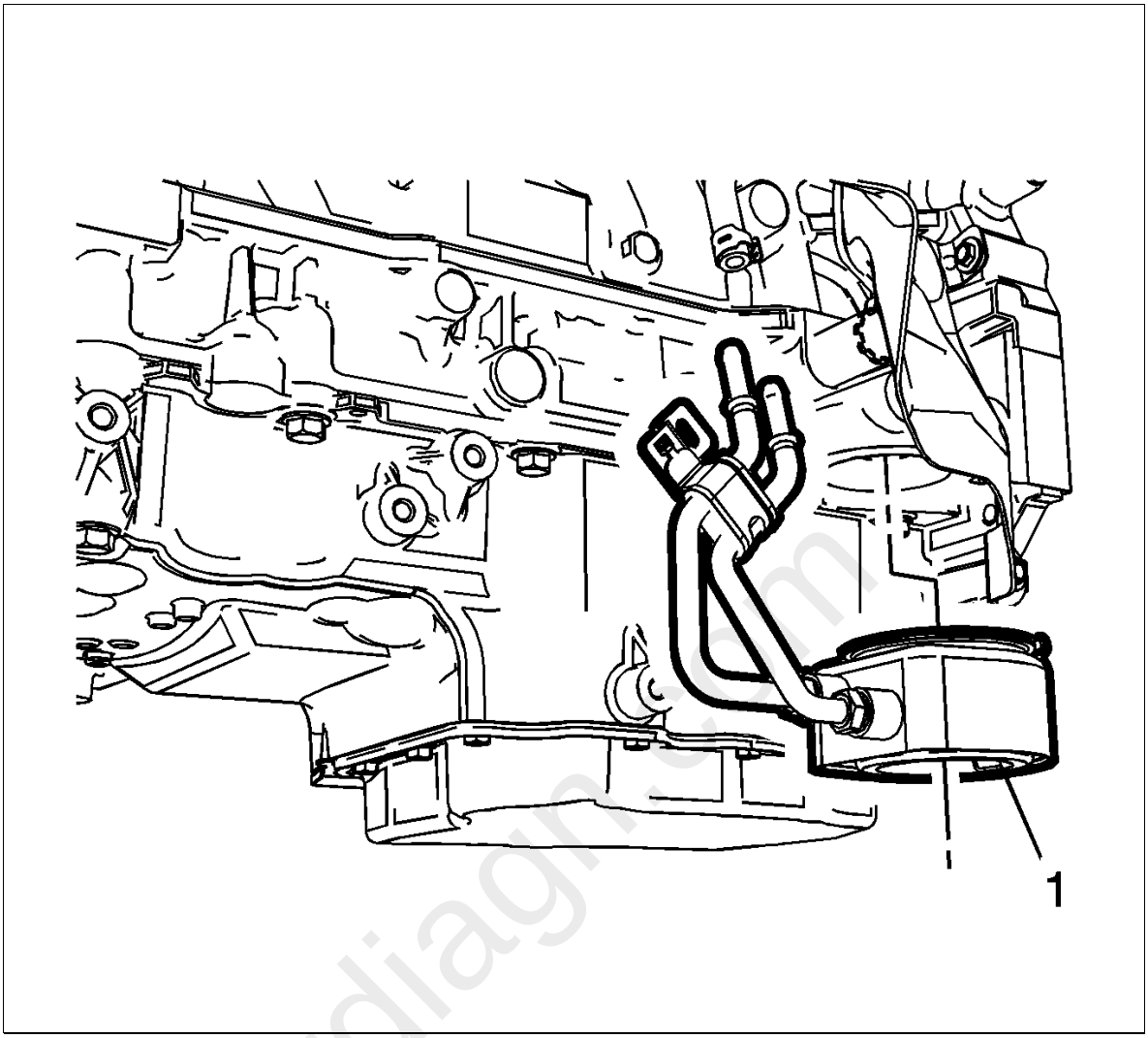
NOTE:

DISCARD the old engine oil cooler seal.

7. Remove the engine oil cooler (1).

REPAIR INSTRUCTIONS > ENGINE OIL COOLER REPLACEMENT (LTG) > INSTALLATION PROCEDURE

Fig 1: Engine Oil Cooler



Courtesy of GENERAL MOTORS COMPANY

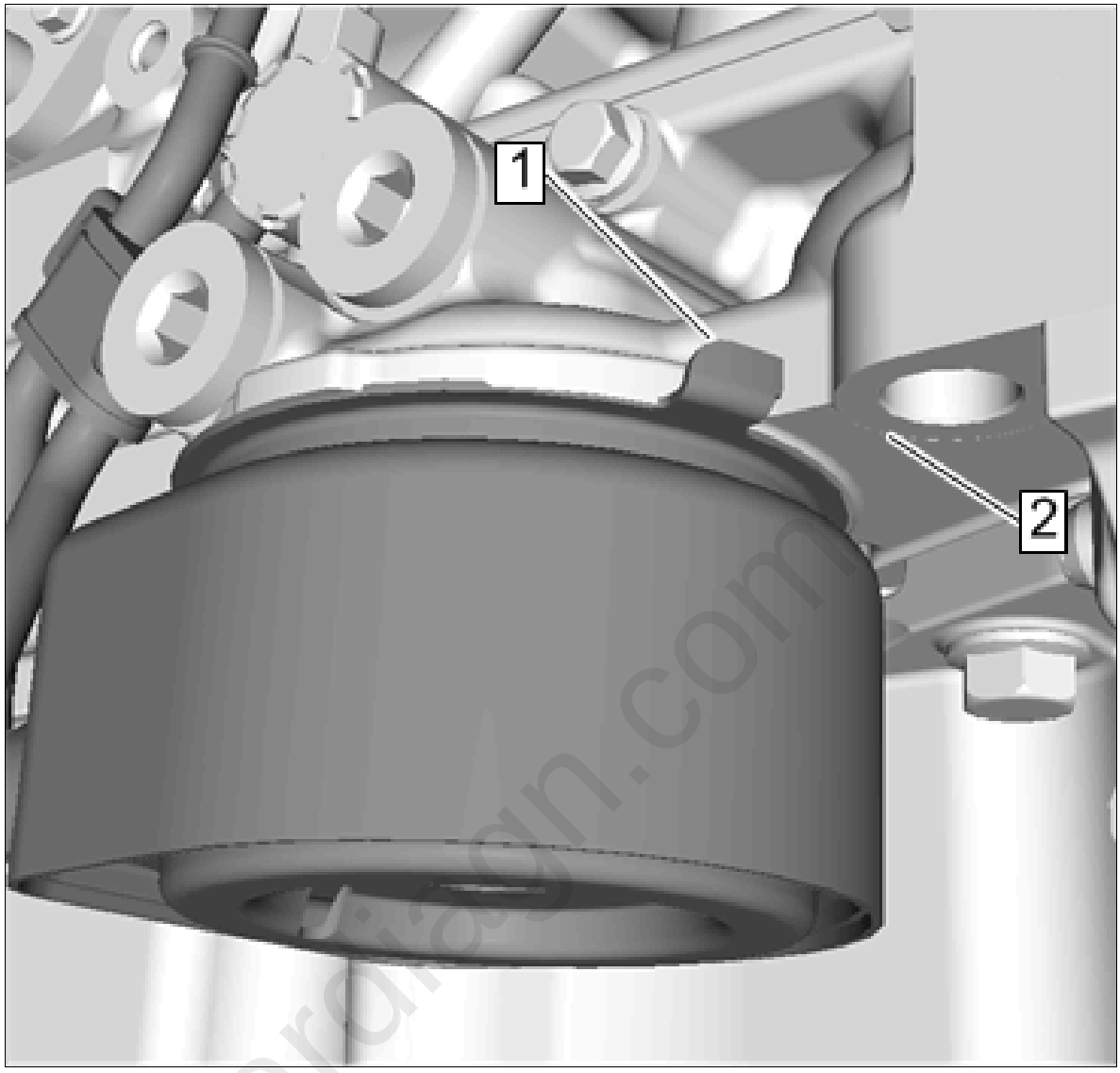
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NOTE:

A NEW engine oil cooler seal must be used whenever reinstalling the engine oil cooler.

1. Install the engine oil cooler (1).

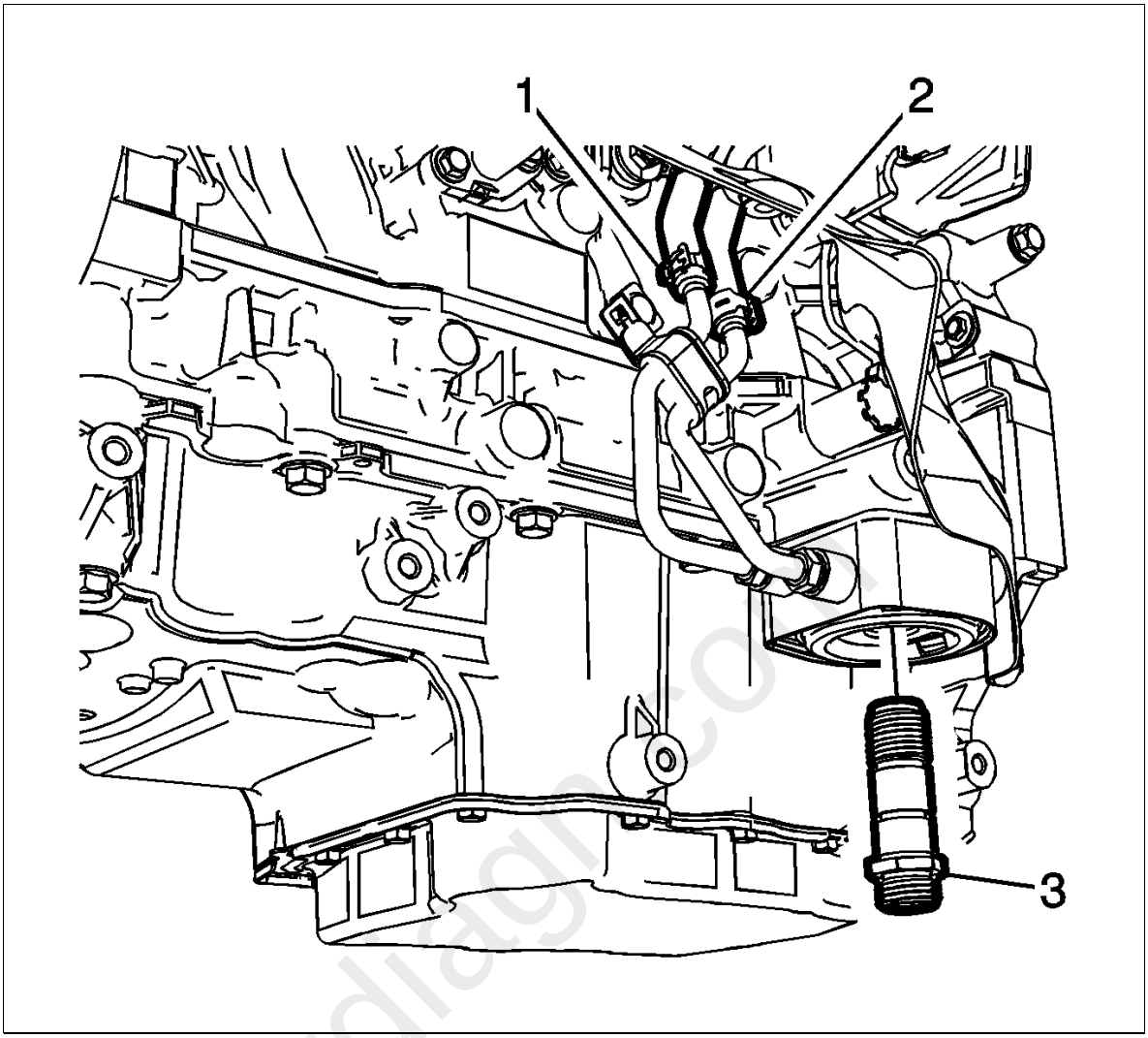
Fig 2: Engine Block



Courtesy of GENERAL MOTORS COMPANY

2. Position the engine oil cooler so that the tab (1) is against the engine block (2).

Fig 3: Engine Oil Cooler Connector



Courtesy of GENERAL MOTORS COMPANY

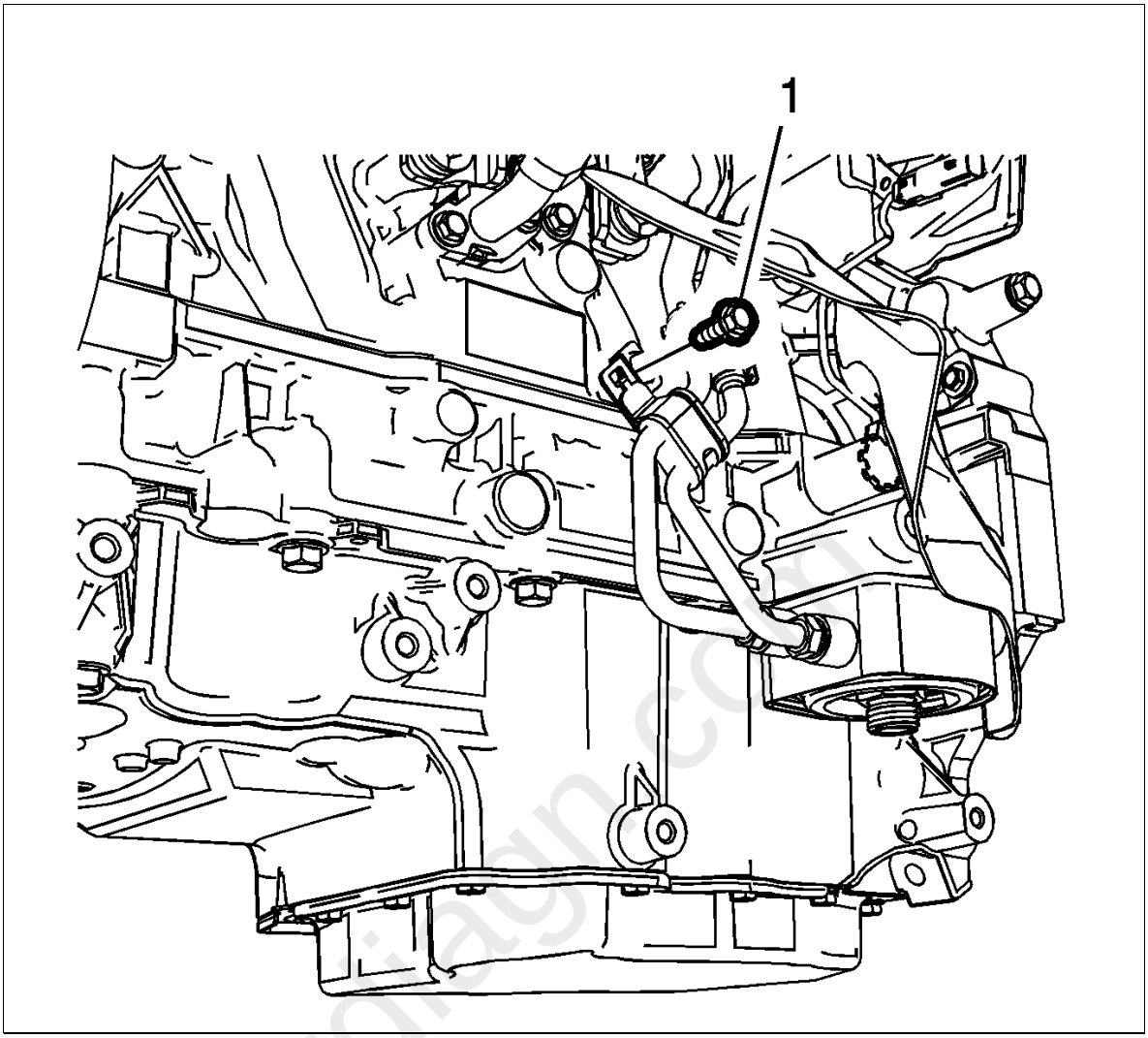
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⚠ *CAUTION:*

Refer to Component Fastener Tightening Caution .

3. Install the engine oil cooler connector (3) and tighten to 50 N.m (37 lb ft).
4. Install the oil cooler hose (1) and (2).

Fig 4: Engine Oil Cooler Fastener



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⚠ *CAUTION:*

Refer to Fastener Caution .

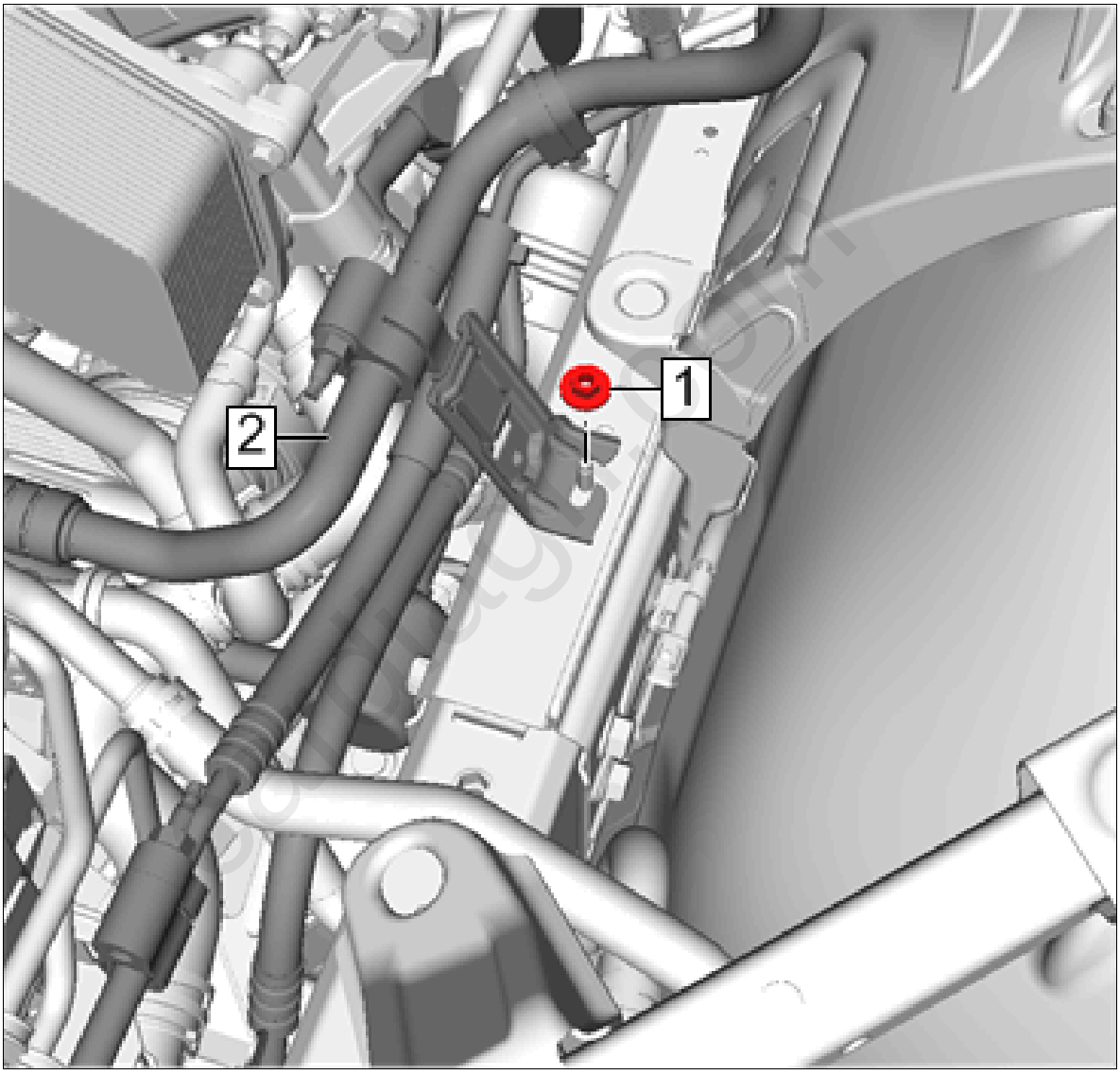
5. Install the oil cooler fastener (1) and tighten to 10 N.m (89 lb in).
6. Install the engine mount bracket. Engine Mount Bracket Replacement - Left Side
7. Install the engine oil filter. Engine Oil and Oil Filter Replacement
8. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER ADAPTER REPLACEMENT (LGX) >

REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Drain the engine oil. Engine Oil and Oil Filter Replacement
3. Remove Air Cleaner Outlet Duct Replacement
4. Remove Air Cleaner Assembly Replacement

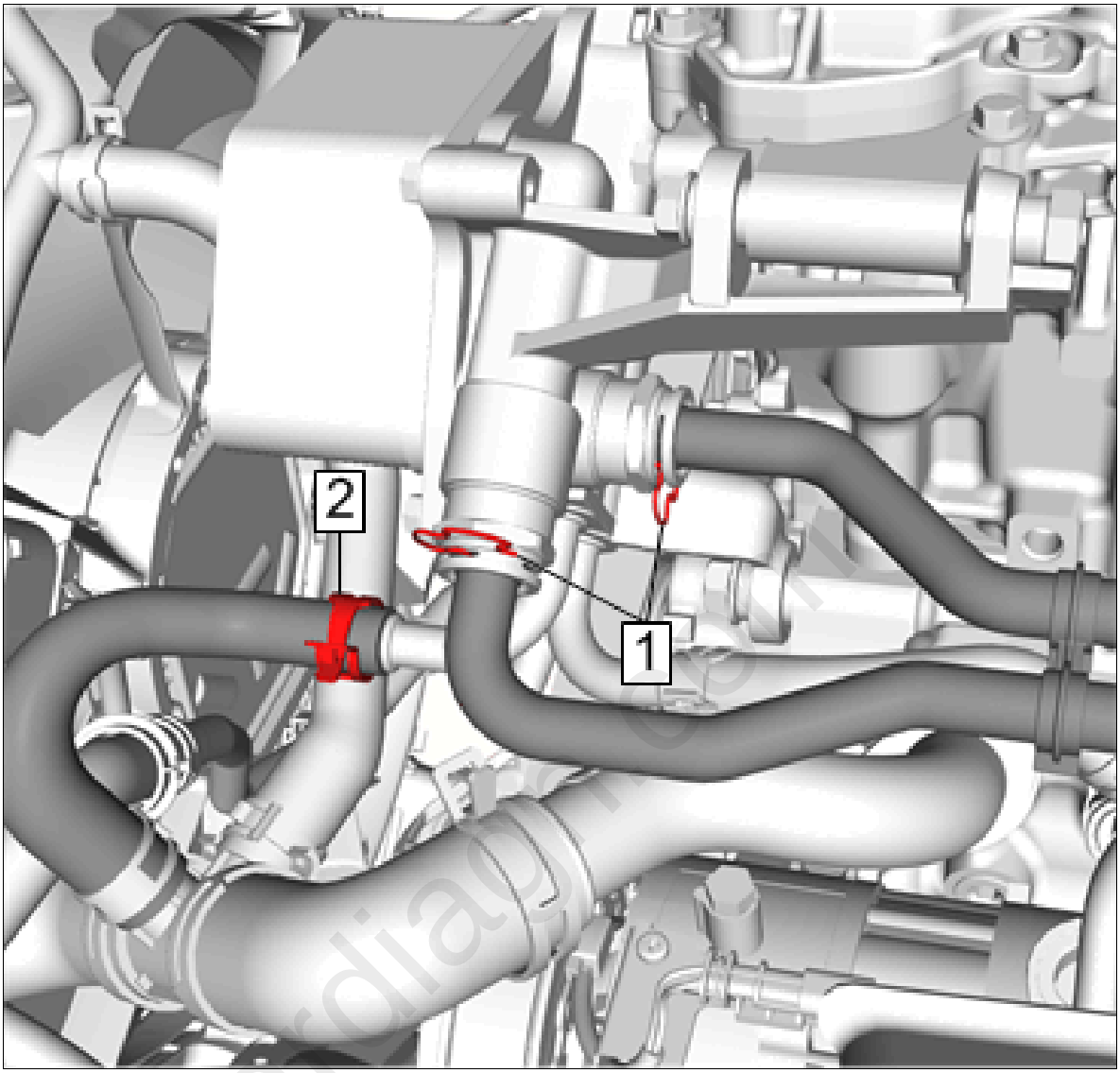
Fig 1: Air Conditioning Compressor and Condenser Hose



Courtesy of GENERAL MOTORS COMPANY

5. Remove Air Conditioning Compressor and Condenser Hose Clamp Bracket Nut (1)
6. Reposition Air Conditioning Compressor and Condenser Hose (2)

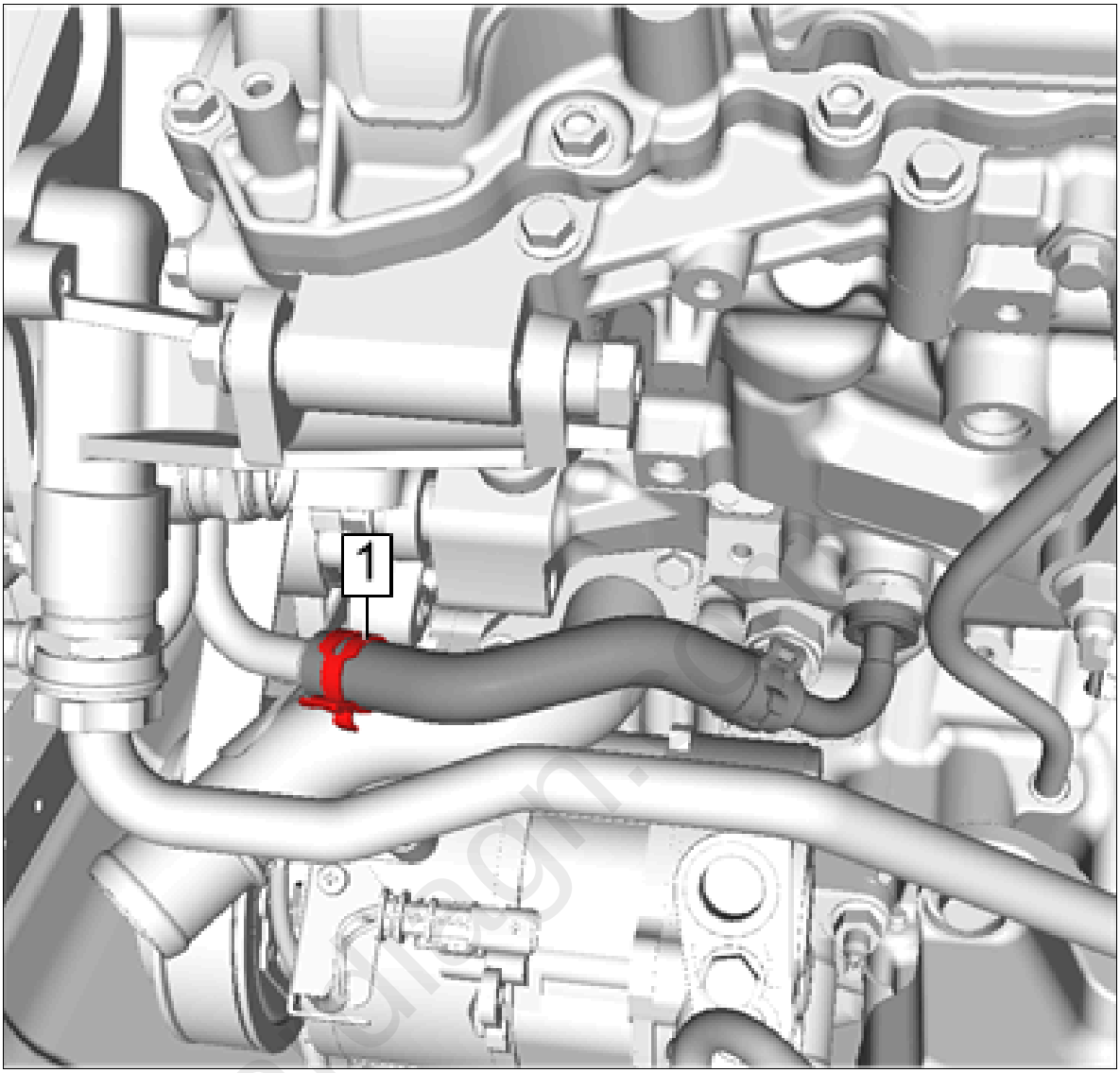
Fig 2: Engine Oil Cooler Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Oil Cooler Pipe Retainer (1) (Qty: 2)
8. Disconnect Engine Oil Cooler Outlet Hose (2)

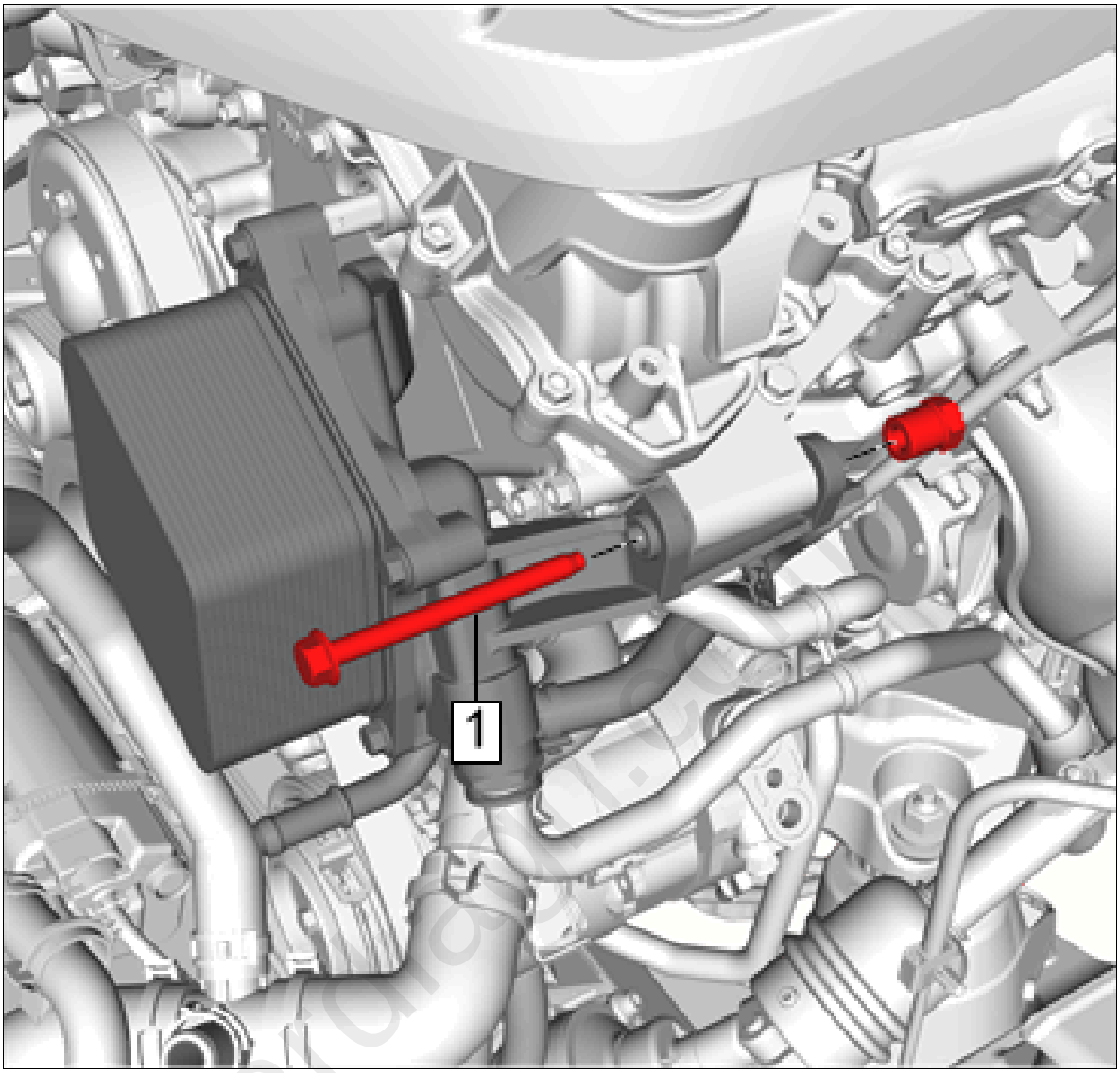
Fig 3: Engine Oil Cooler Inlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

9. Disengage Engine Oil Cooler Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

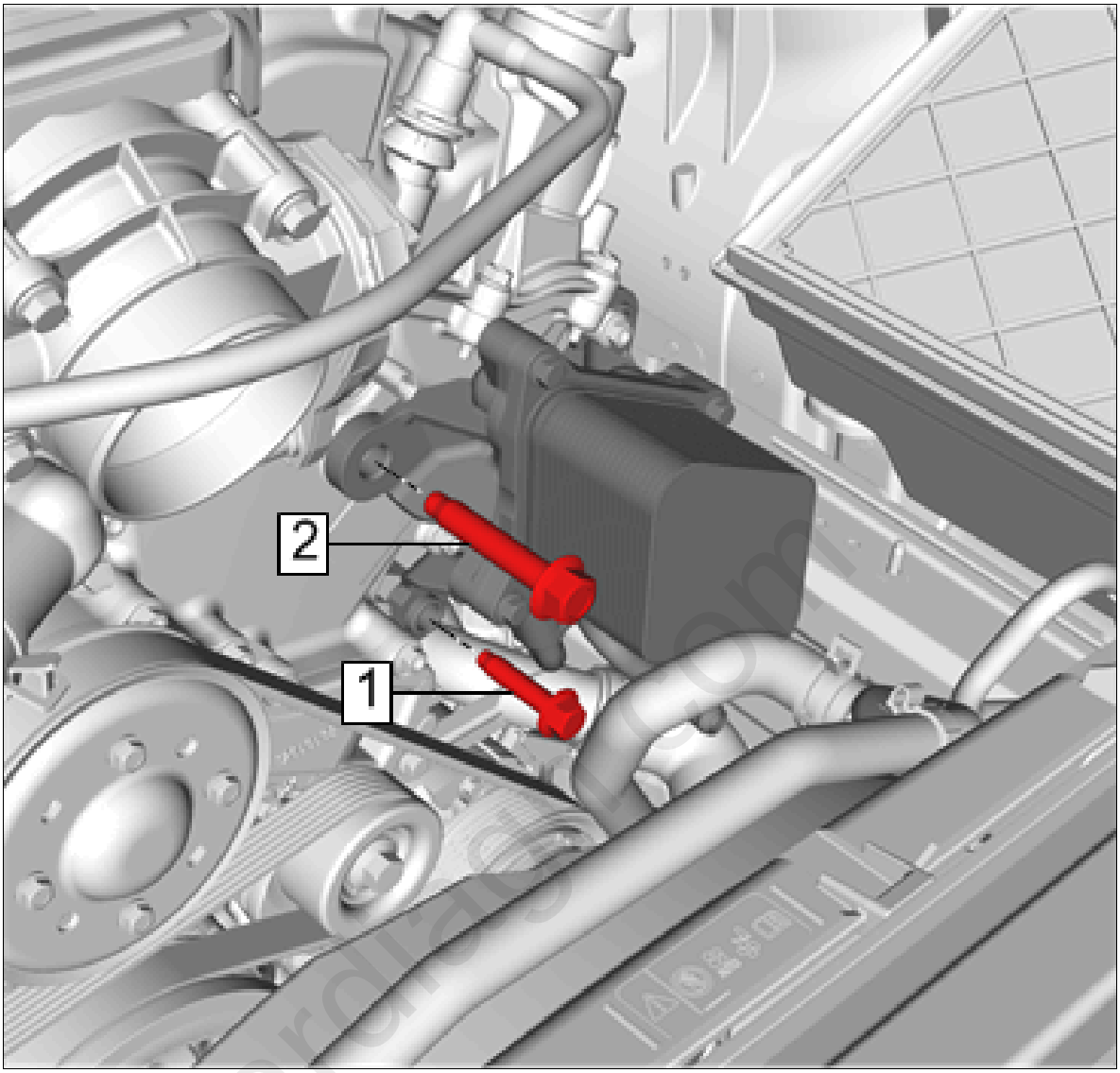
Fig 4: Engine Oil Cooler Adapter Bolt



Courtesy of GENERAL MOTORS COMPANY

10. Remove Engine Oil Cooler Adapter Bolt (1)

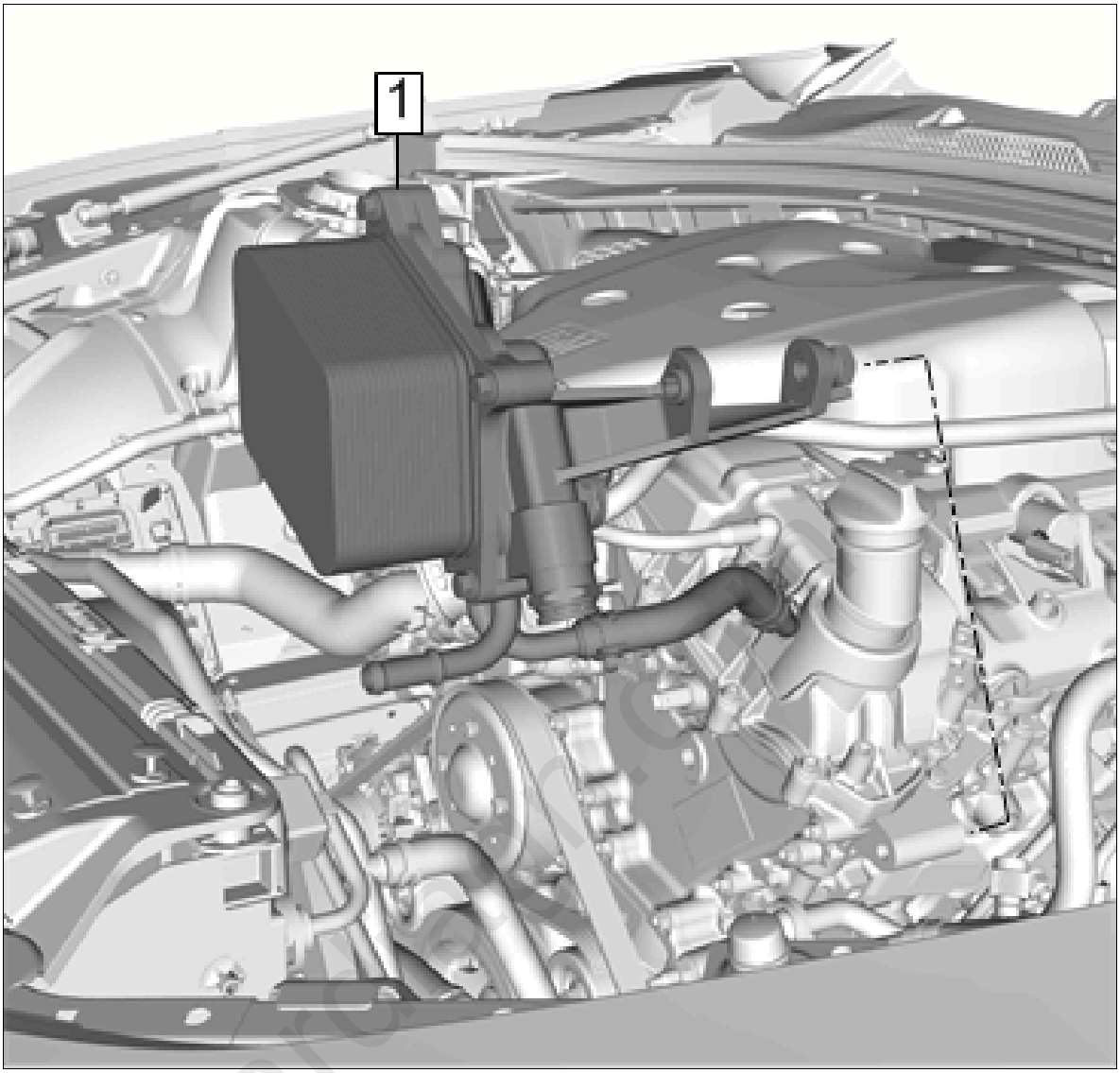
Fig 5: Engine Oil Cooler Adapter Bolt



Courtesy of GENERAL MOTORS COMPANY

11. Remove Engine Oil Cooler Adapter Bolt (1)
12. Remove Engine Oil Cooler Adapter Bolt (2)

Fig 6: Engine Oil Cooler Adapter

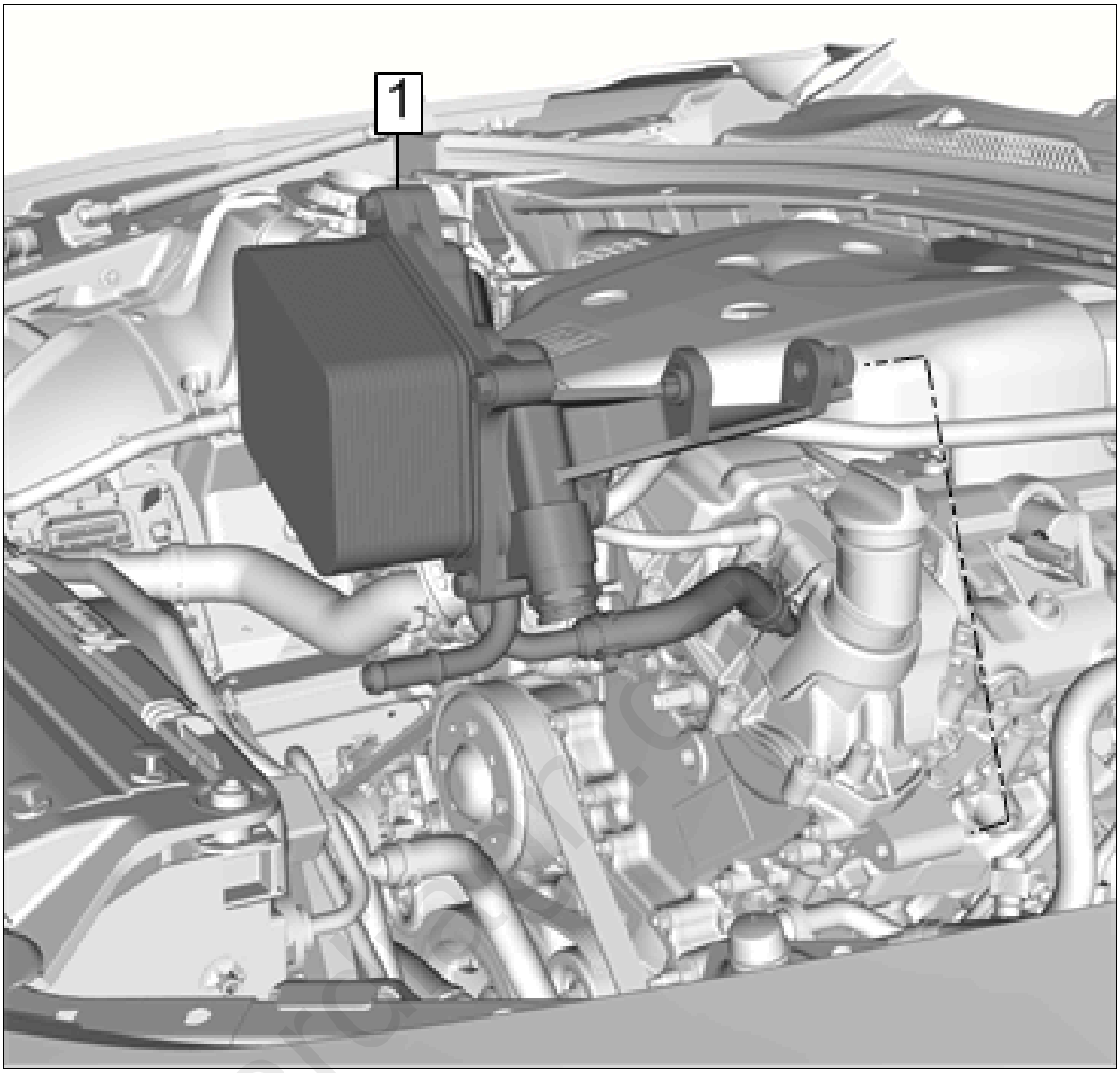


Courtesy of GENERAL MOTORS COMPANY

13. Remove Engine Oil Cooler Adapter Assembly (1)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER ADAPTER REPLACEMENT (LGX) > INSTALLATION PROCEDURE

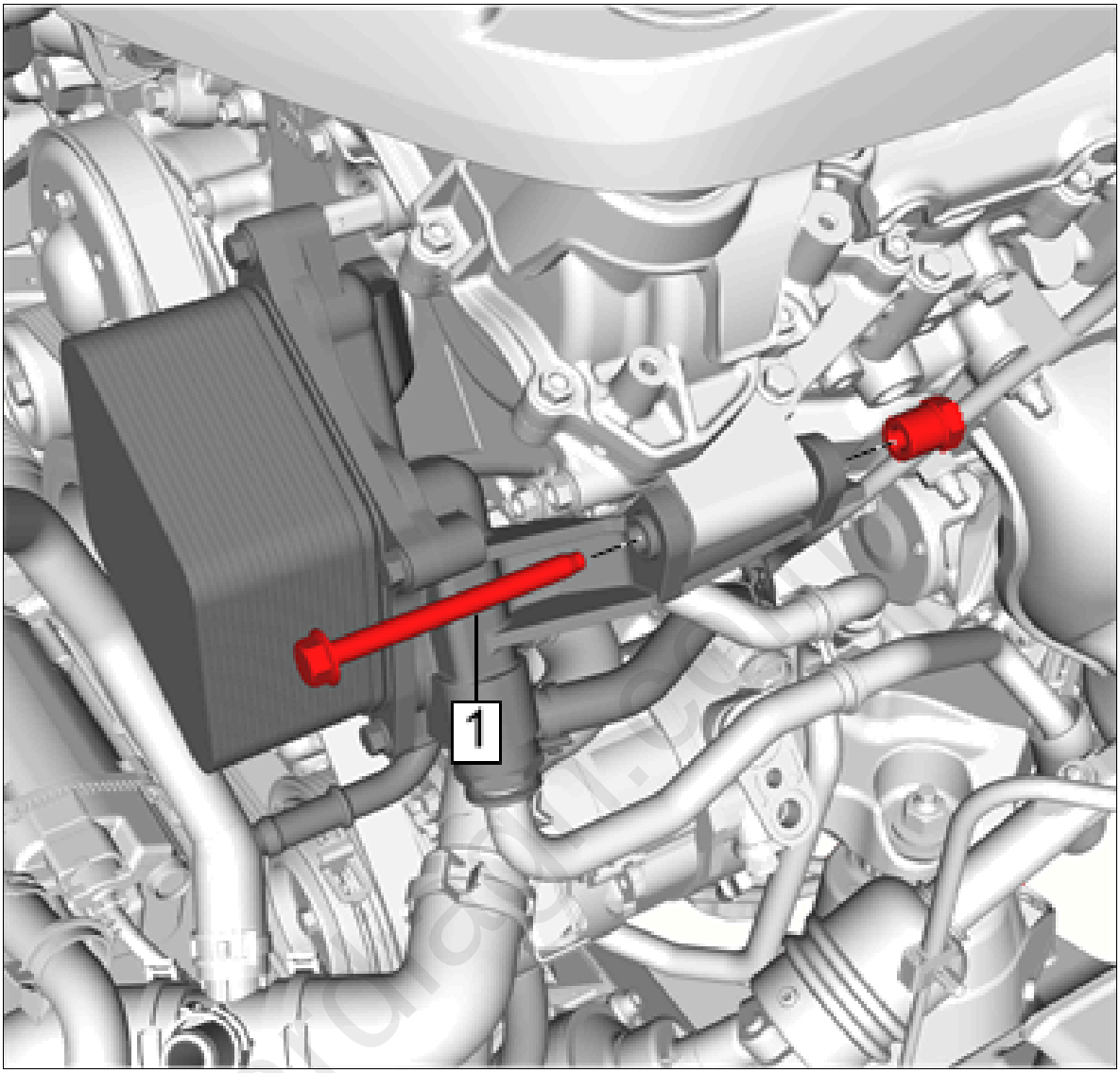
Fig 1: Engine Oil Cooler Adapter



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Oil Cooler Adapter Assembly (1)

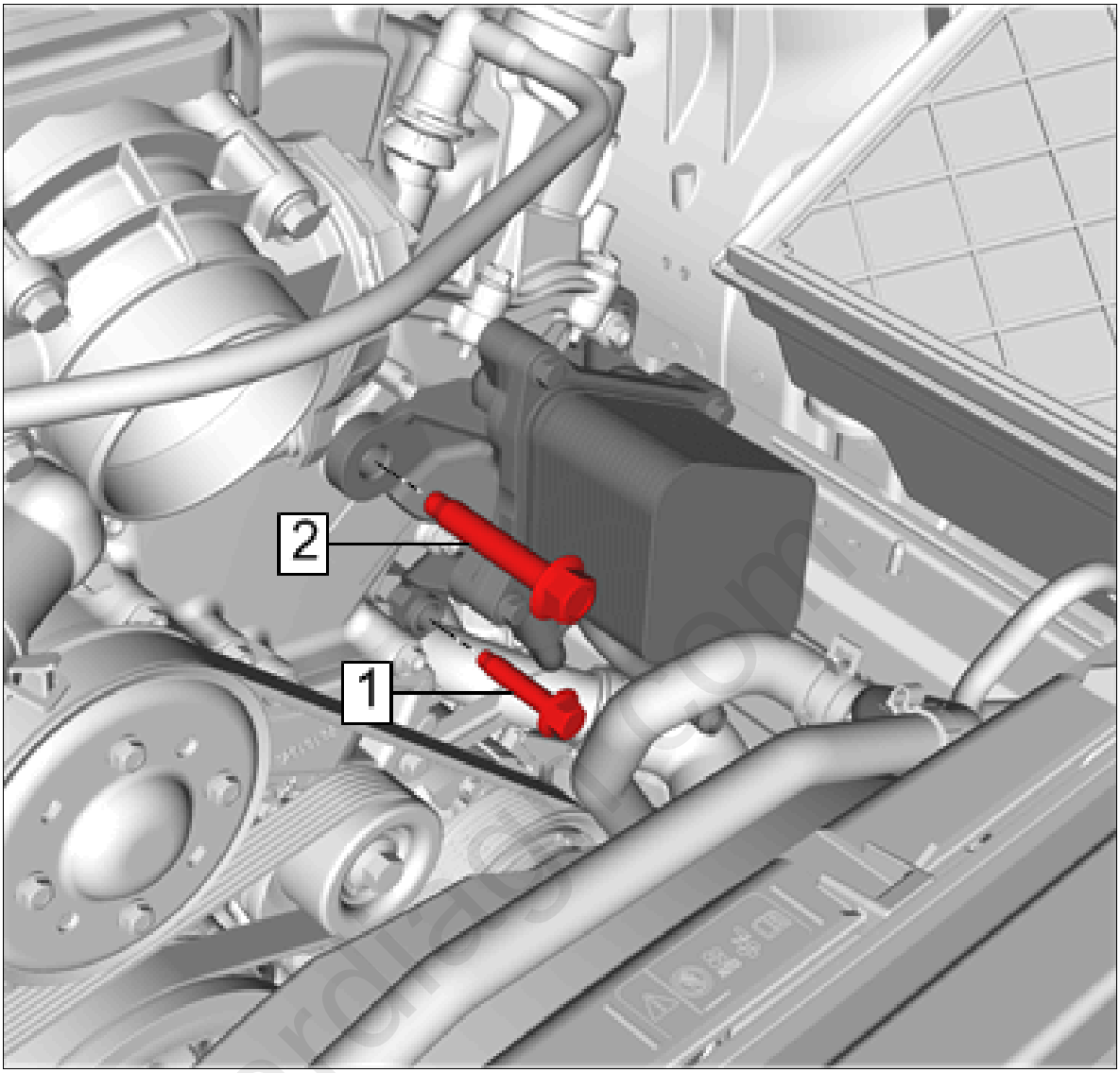
Fig 2: Engine Oil Cooler Adapter Bolt



Courtesy of GENERAL MOTORS COMPANY

2. Loosely install Engine Oil Cooler Adapter Bolt (1)

Fig 3: Engine Oil Cooler Adapter Bolt

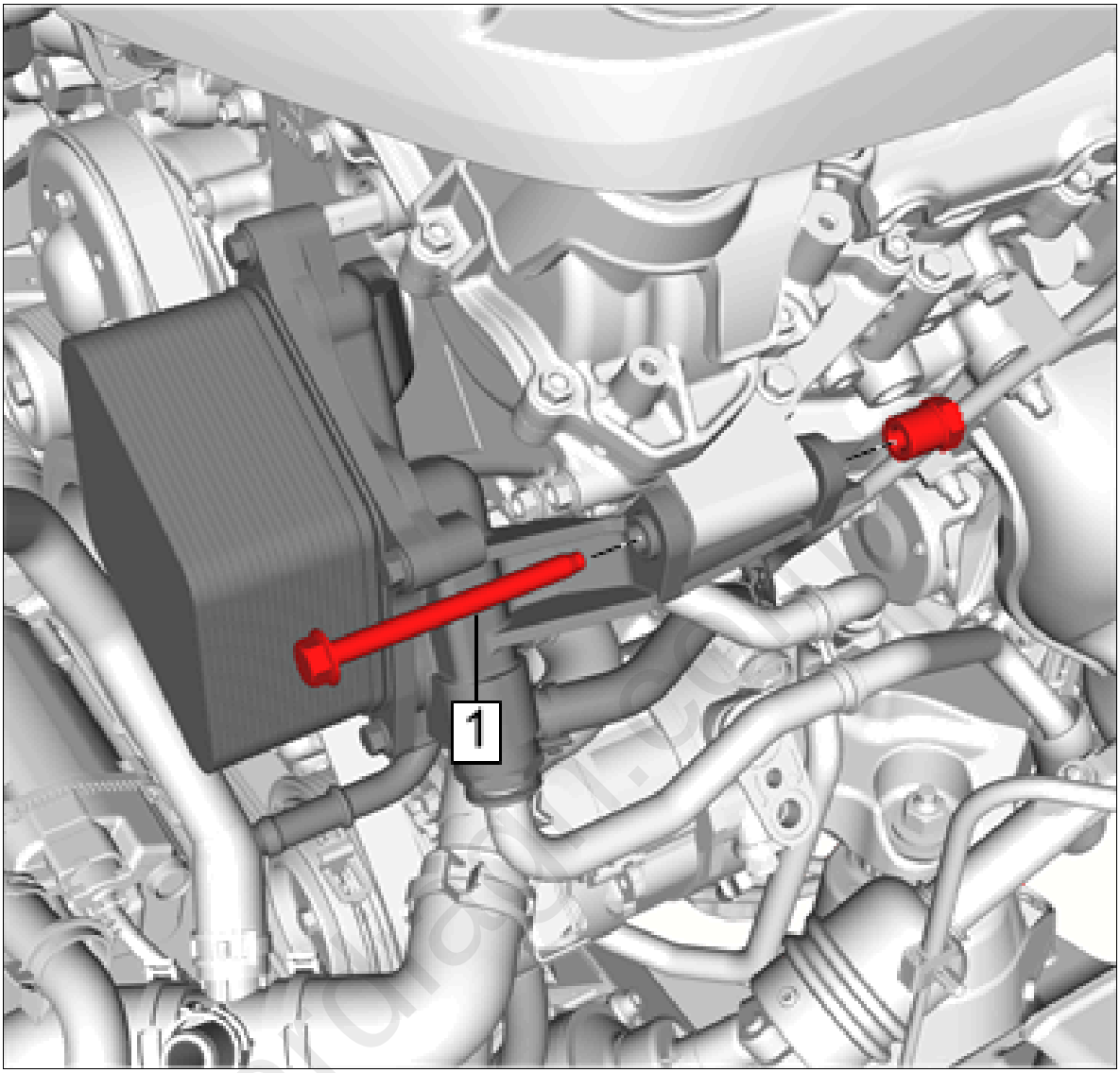


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install Engine Oil Cooler Adapter Bolt (2) and tighten to 100 N.m (74 lb ft)
4. Install Engine Oil Cooler Adapter Bolt (1) and tighten to 58 N.m (43 lb ft)

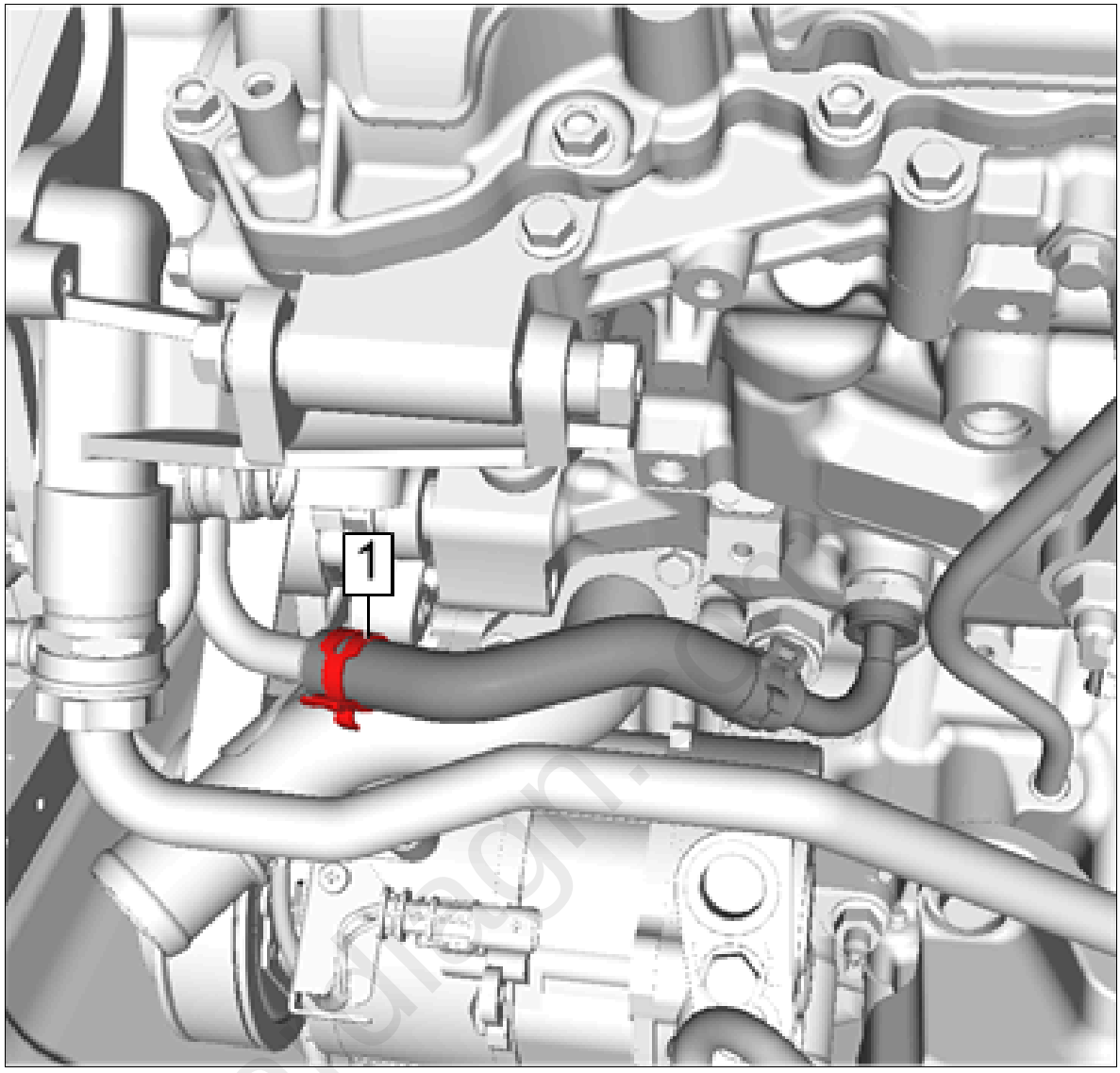
Fig 4: Engine Oil Cooler Adapter Bolt



Courtesy of GENERAL MOTORS COMPANY

5. Tighten Engine Oil Cooler Adapter Bolt (1) to 22 N.m (16 lb ft)

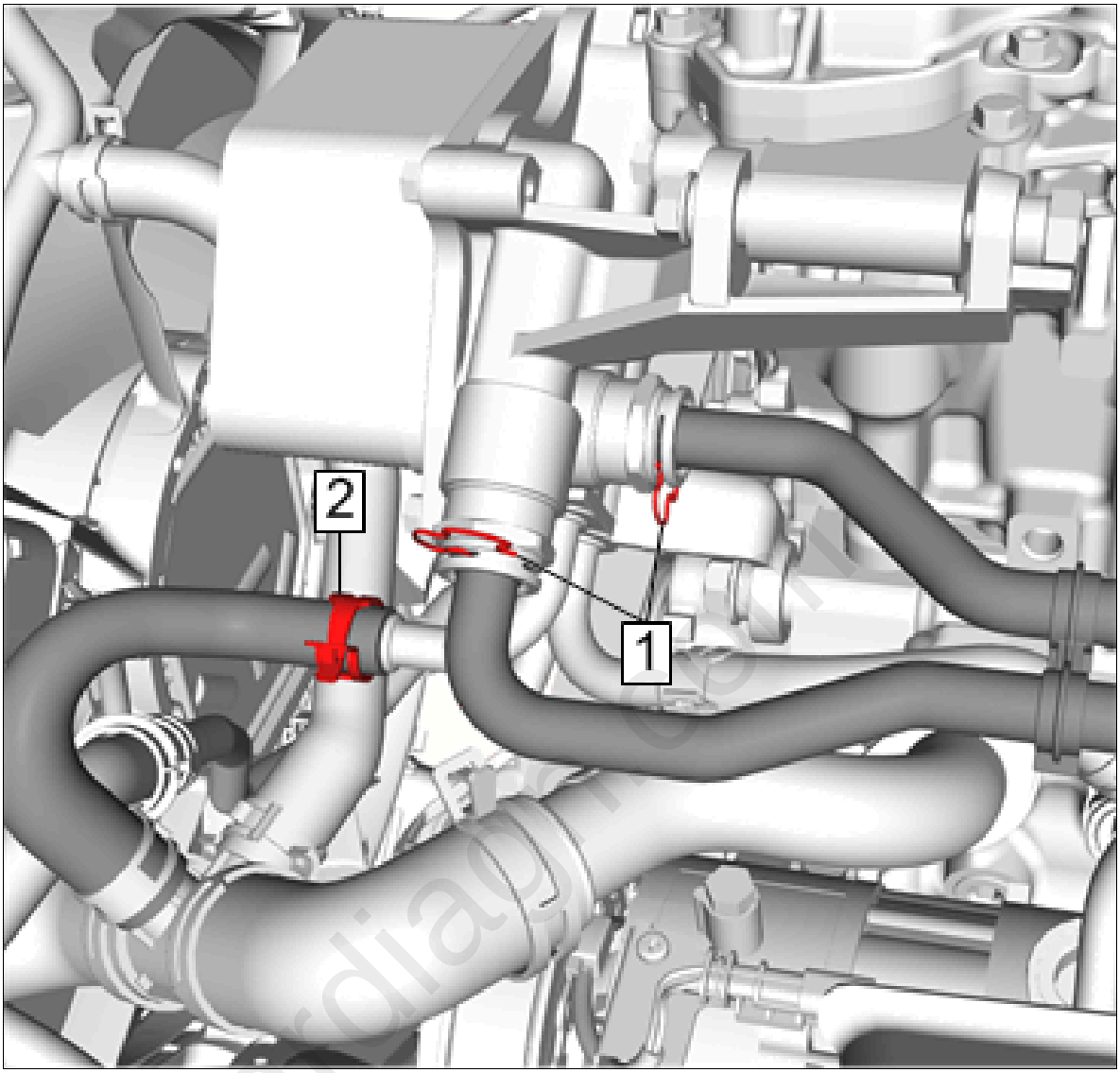
Fig 5: Engine Oil Cooler Inlet Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

6. Engage Engine Oil Cooler Inlet Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

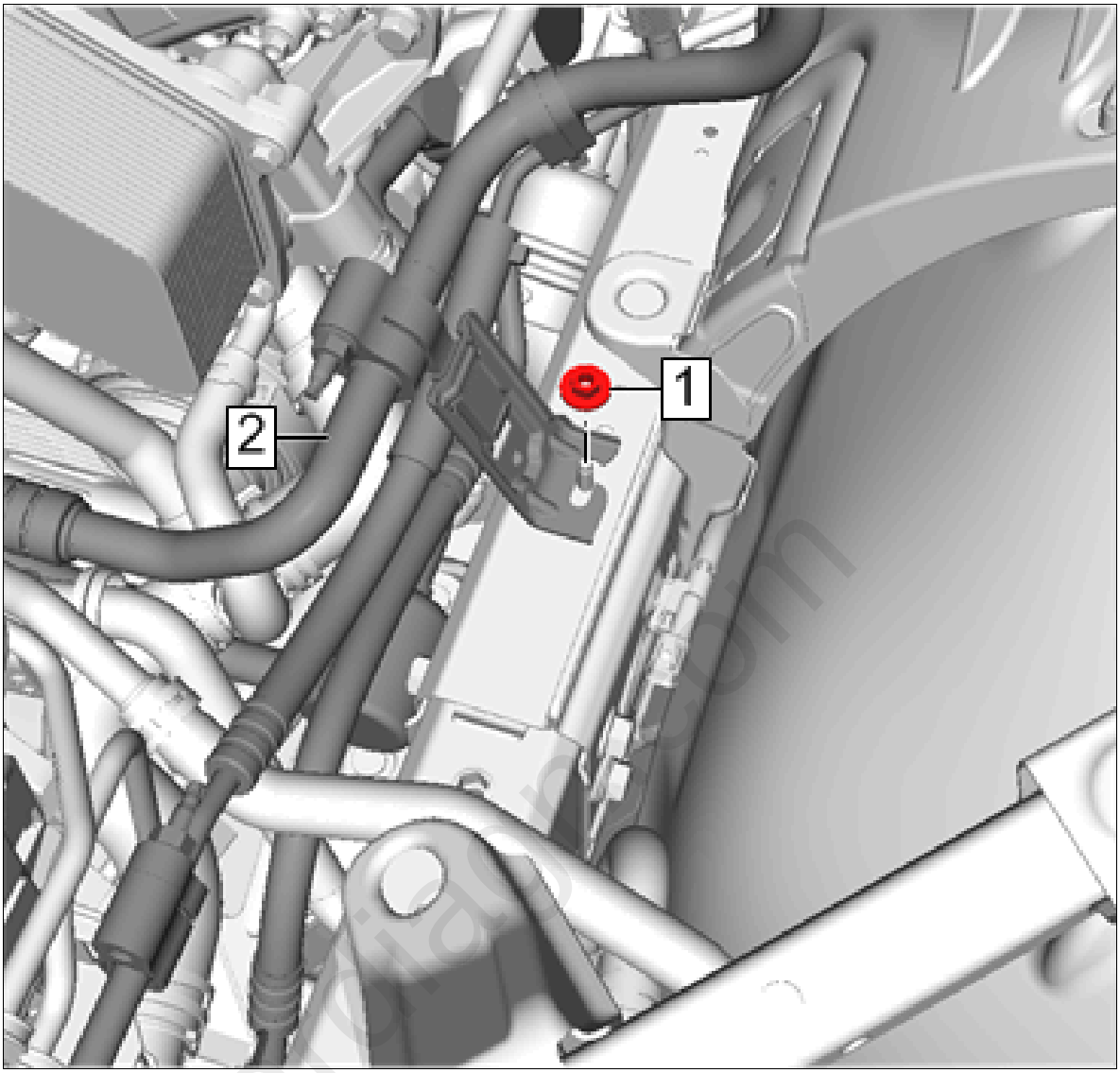
Fig 6: Engine Oil Cooler Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

7. Connect Engine Oil Cooler Outlet Hose (2)
8. Install Engine Oil Cooler Pipe Retainer (1) (Qty: 2)

Fig 7: Air Conditioning Compressor and Condenser Hose



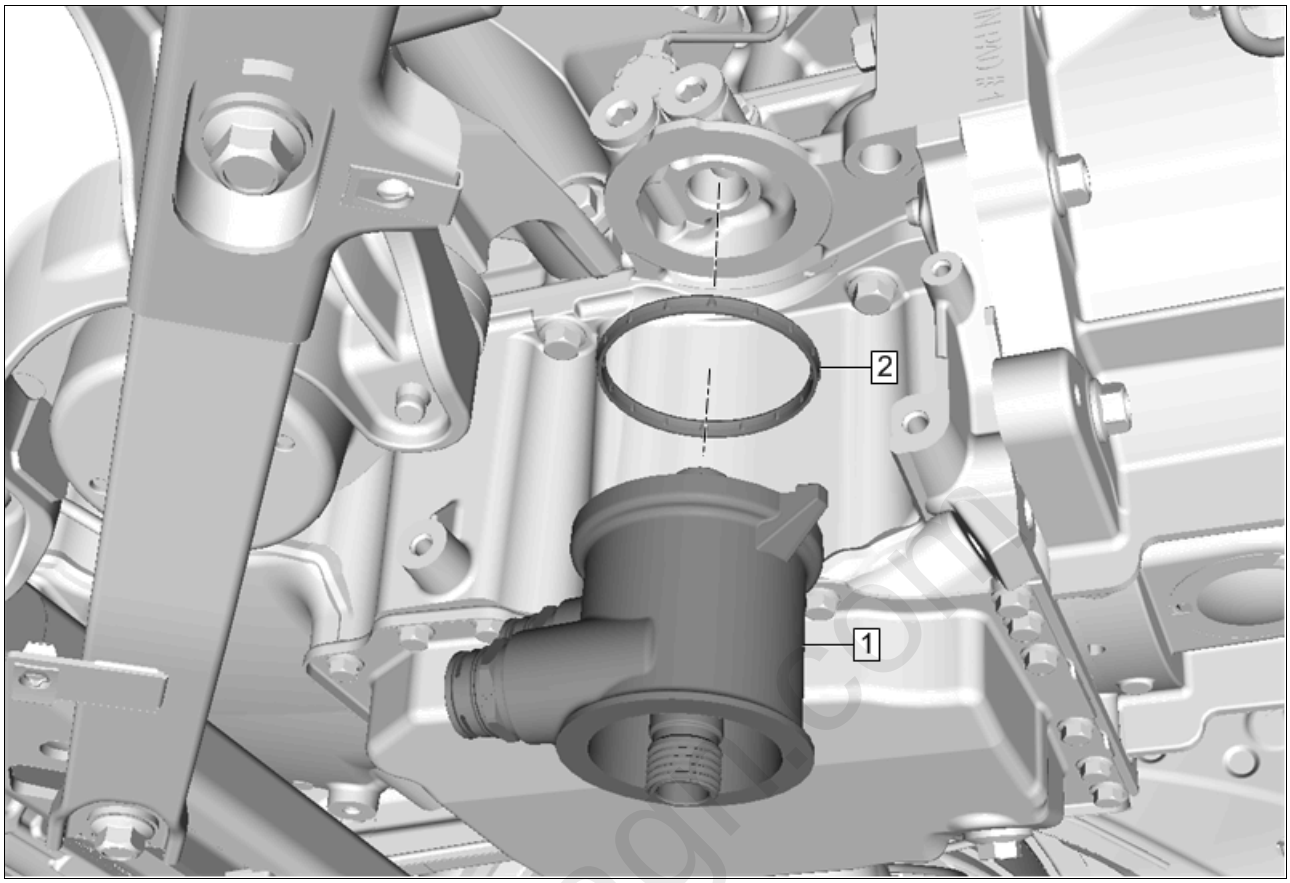
Courtesy of GENERAL MOTORS COMPANY

9. Install Air Conditioning Compressor and Condenser Hose (2)
10. Install Air Conditioning Compressor and Condenser Hose Clamp Bracket Nut (1) and tighten to 10 N.m (89 lb in)
11. Install Air Cleaner Assembly Replacement
12. Install Air Cleaner Outlet Duct Replacement
13. Check and correct the engine oil level. Engine Oil and Oil Filter Replacement
14. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER ADAPTER REPLACEMENT (LTG

WITH Y4Q)

Fig 1: Engine Oil Cooler Adapter (LTG with Y4Q)



Courtesy of GENERAL MOTORS COMPANY

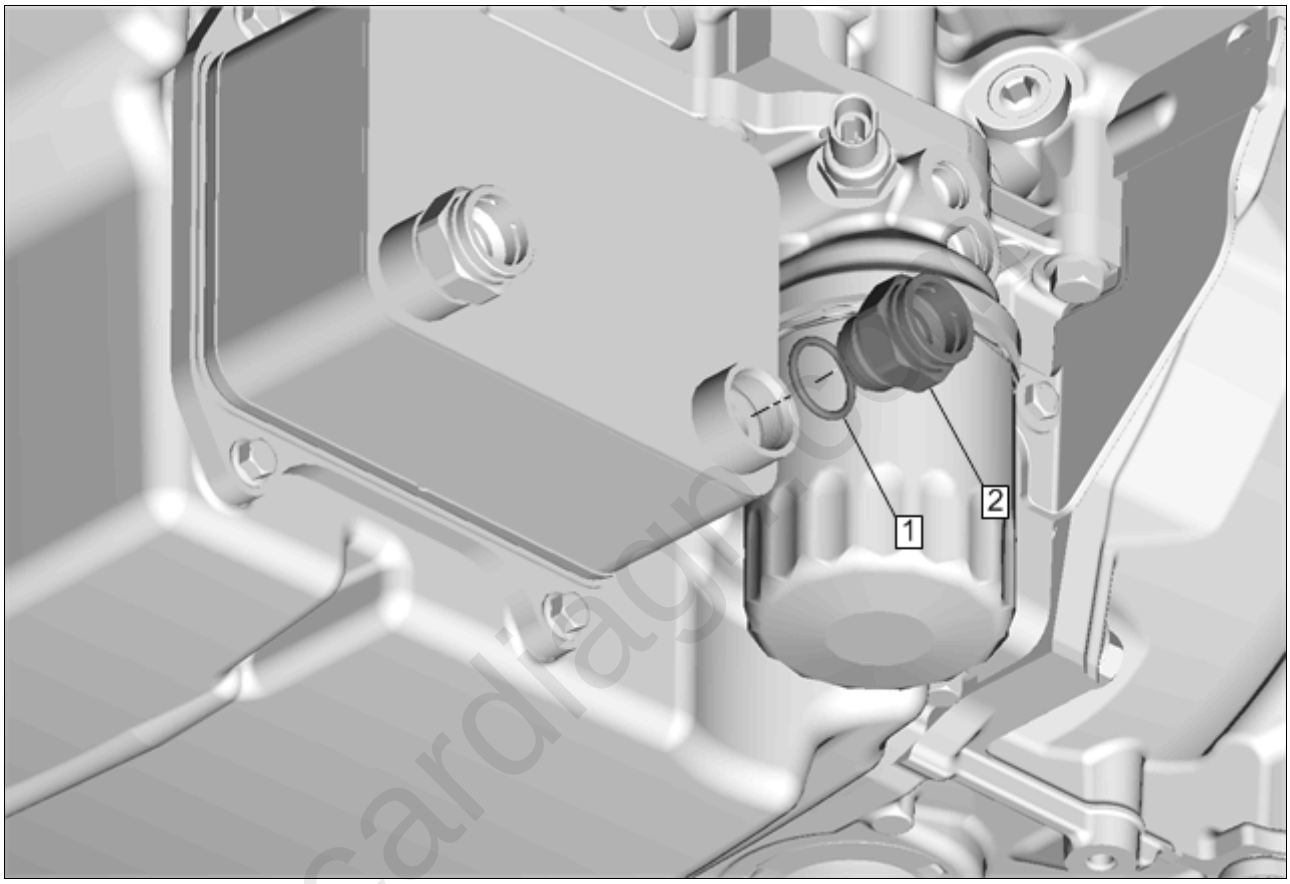
Callout	Component Name
Preliminary Procedures 1. Engine Oil and Oil Filter Replacement 2. Disconnect the engine oil cooler pipes from the engine oil cooler adapter. Engine Oil Cooler Pipe Replacement (LTG with Y4Q)	
1	Engine Oil Cooler Adapter *CAUTION:* *Refer to Component Fastener Tightening Caution .* **Tighten** 50 N.m (37 lb ft)

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2	Engine Oil Cooler Adapter Seal **Procedure** Install a NEW oil cooler adapter seal.

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE/HOSE QUICK CONNECT FITTING REPLACEMENT (LT1)

Fig 1: Engine Oil Cooler Pipe/Hose Quick Connect Fitting (LT1)



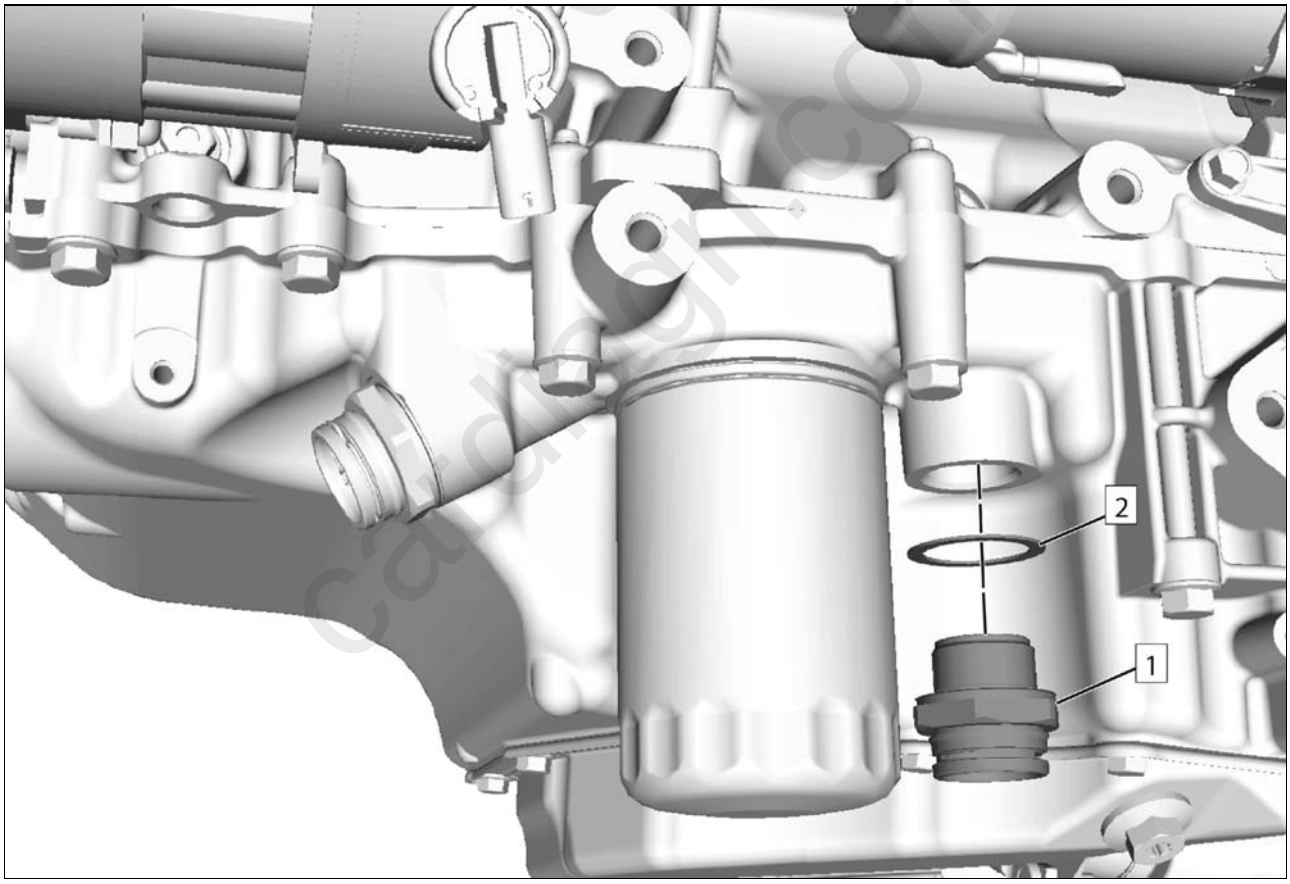
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Disconnect Engine Oil Cooler Hose/Pipe Replacement (LT1) at Engine Oil Cooler 3. Disconnect Radiator Outlet Hose Replacement (LT1 V18 V03) at Engine Oil Cooler	
1	Seal

2	Engine Oil Cooler Hose Connector *CAUTION:* *Refer to Component Fastener Tightening Caution .* **Tighten** 34 N.m (25 lb ft)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE/HOSE QUICK CONNECT FITTING REPLACEMENT (LGX)

Fig 1: Engine Oil Cooler Pipe/Hose Quick Connect Fitting (LGX, Lower)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Disconnect the engine oil cooler pipe. Engine Oil Cooler Pipe Replacement (LGX, Inlet) Engine Oil Cooler Pipe Replacement (LGX, Outlet) .	

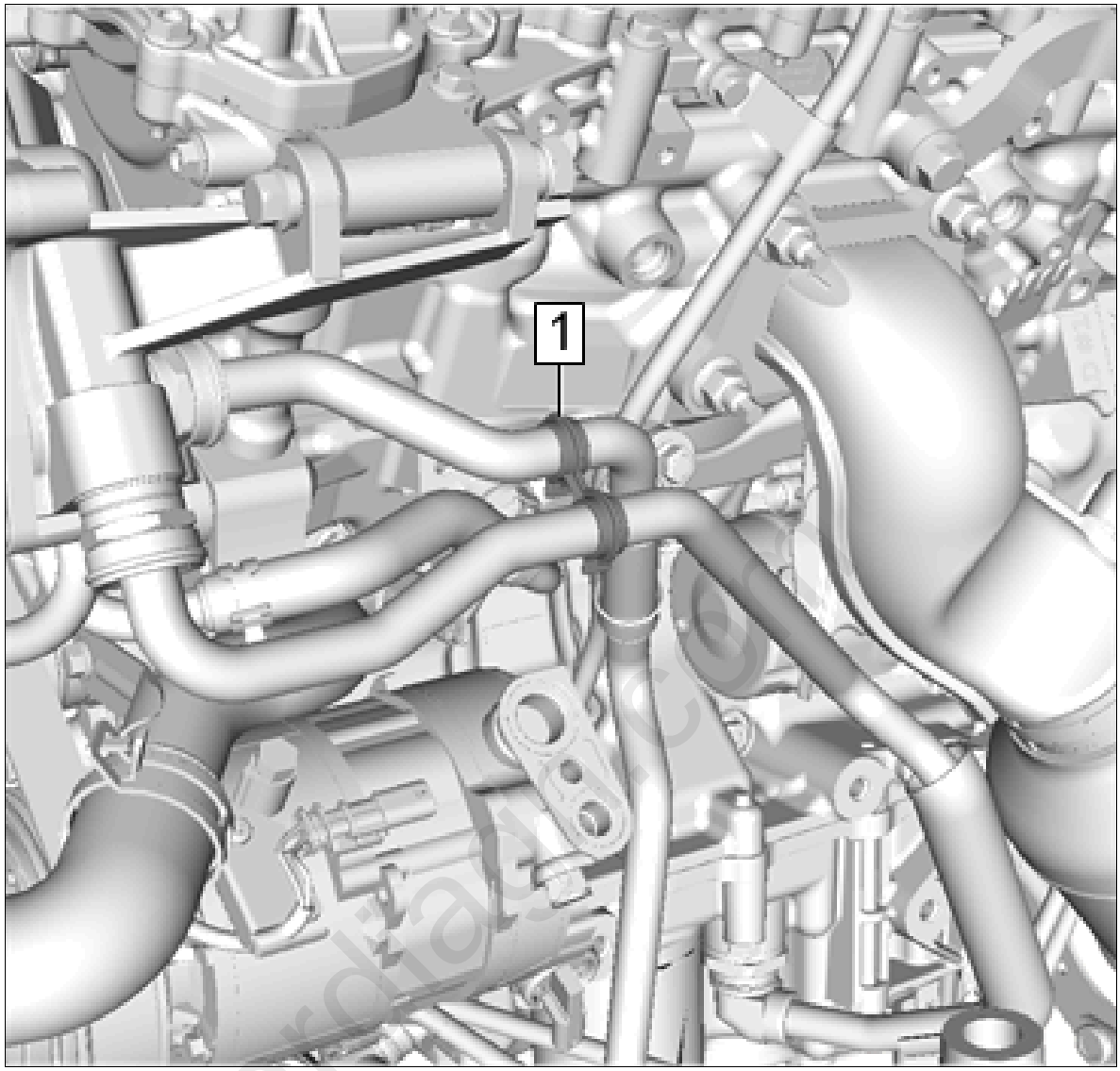
1	Engine Oil Cooler Inlet Hose Fitting *CAUTION:* *Refer to Component Fastener Tightening Caution .* **Tighten** 35 N.m (26 lb ft)
2	Inlet Hose Fitting Seal Ring **Procedure** Install NEW seal rings.

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LGX, INLET) > REMOVAL PROCEDURE

1. Remove Air Cleaner Outlet Duct Replacement
2. Remove Air Cleaner Assembly Replacement
3. Drain the engine oil. Engine Oil and Oil Filter Replacement

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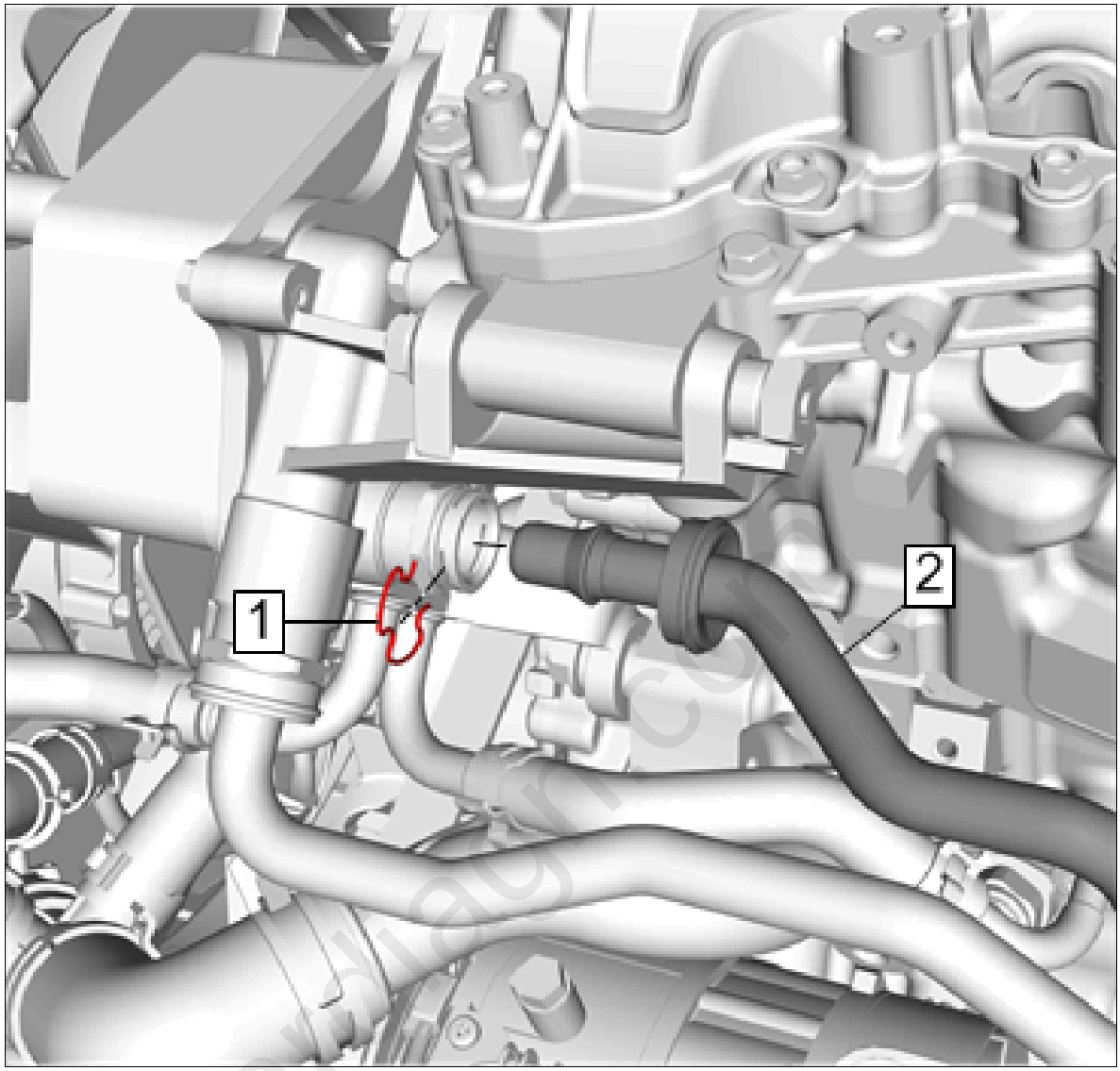
Fig 1: Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

4. Remove the retaining clip (1) from the engine oil cooler pipes.

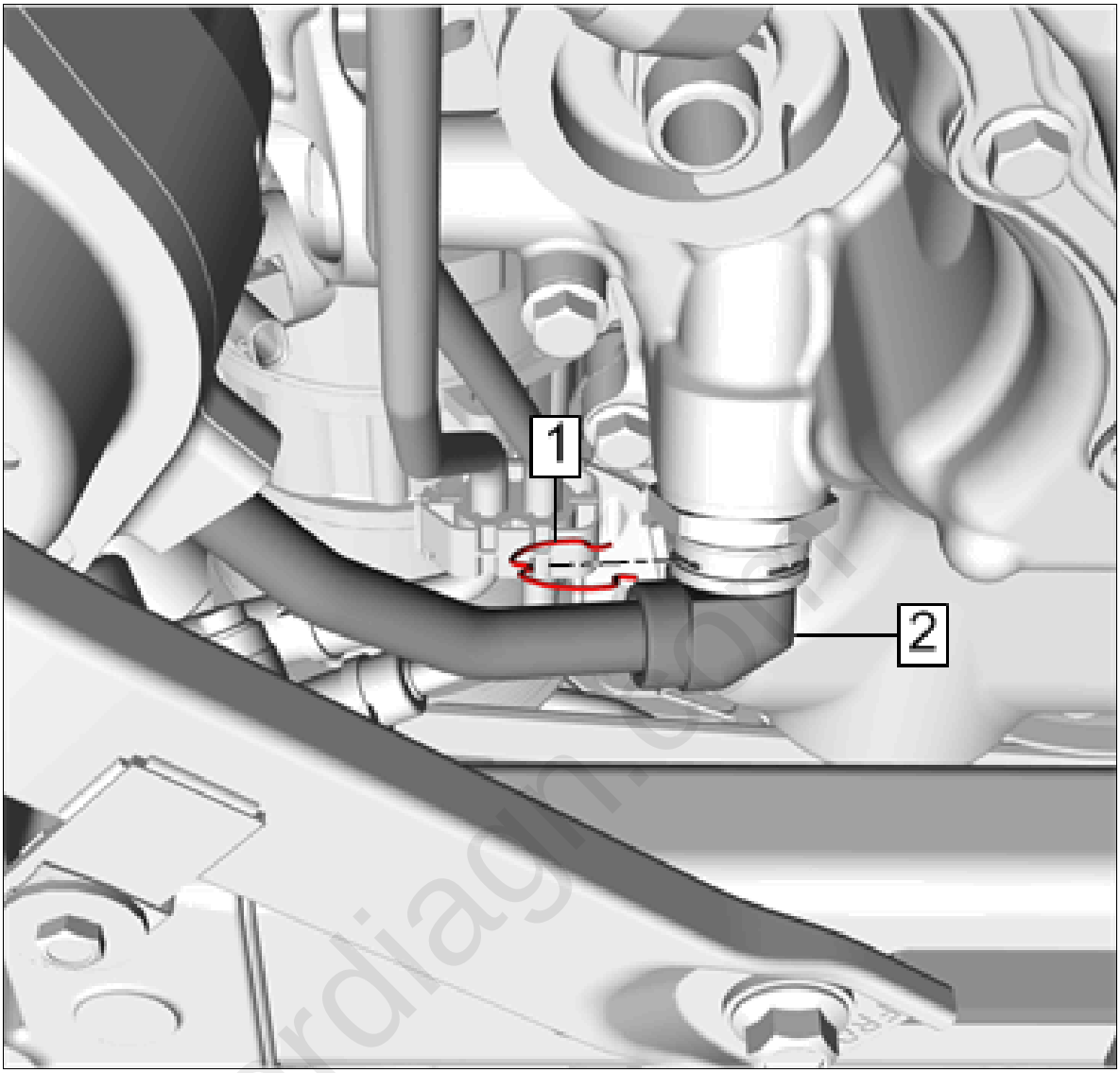
Fig 2: Engine Oil Cooler Pipe Retainers



Courtesy of GENERAL MOTORS COMPANY

5. Remove Engine Oil Cooler Pipe Retainer (1)
6. Disconnect Engine Oil Cooler Pipe (2)

Fig 3: Engine Oil Cooler Pipe Retainer

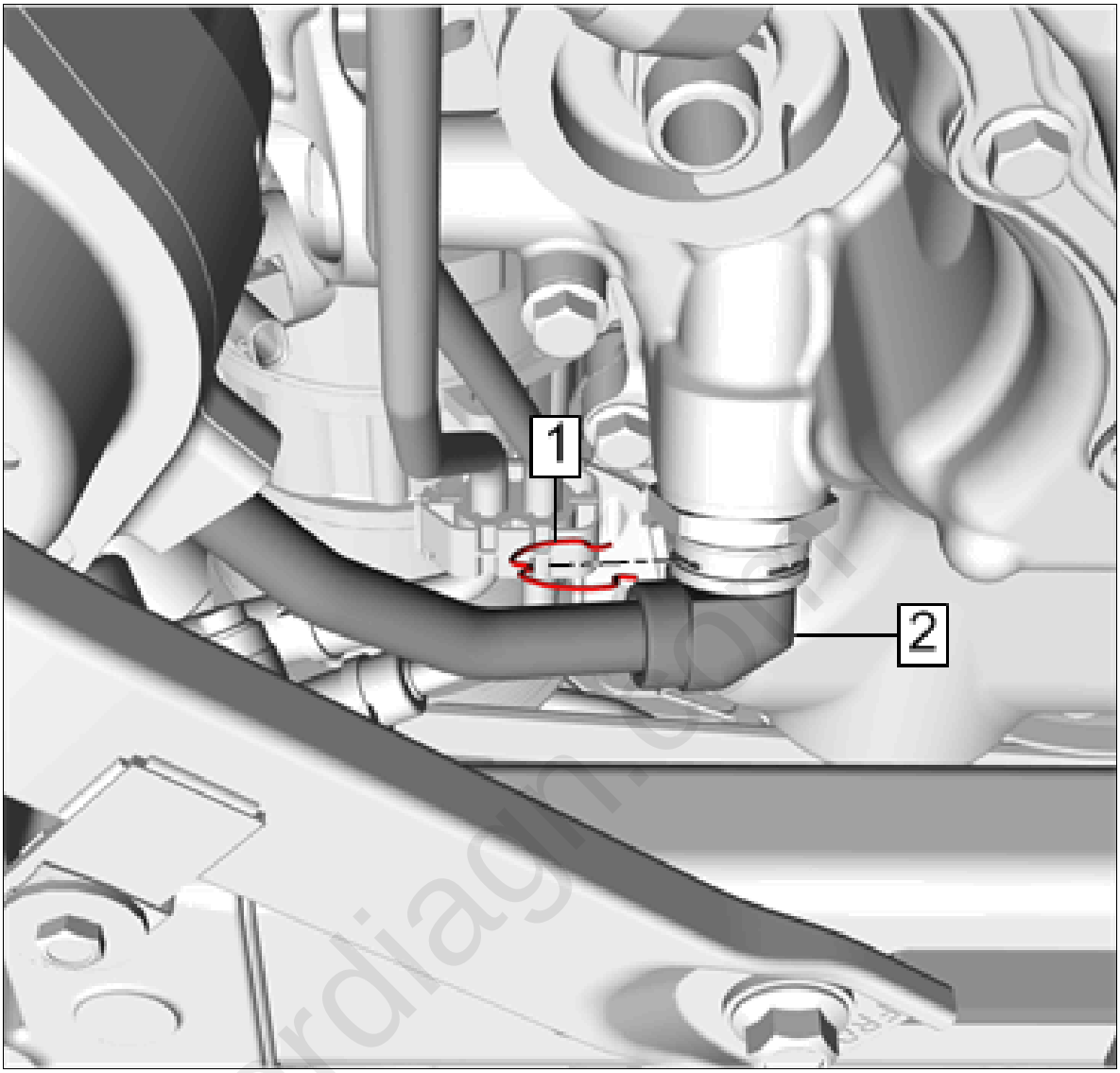


Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Oil Cooler Pipe Retainer (1)
8. Remove Engine Oil Cooler Pipe (2)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LGX, INLET) > INSTALLATION PROCEDURE

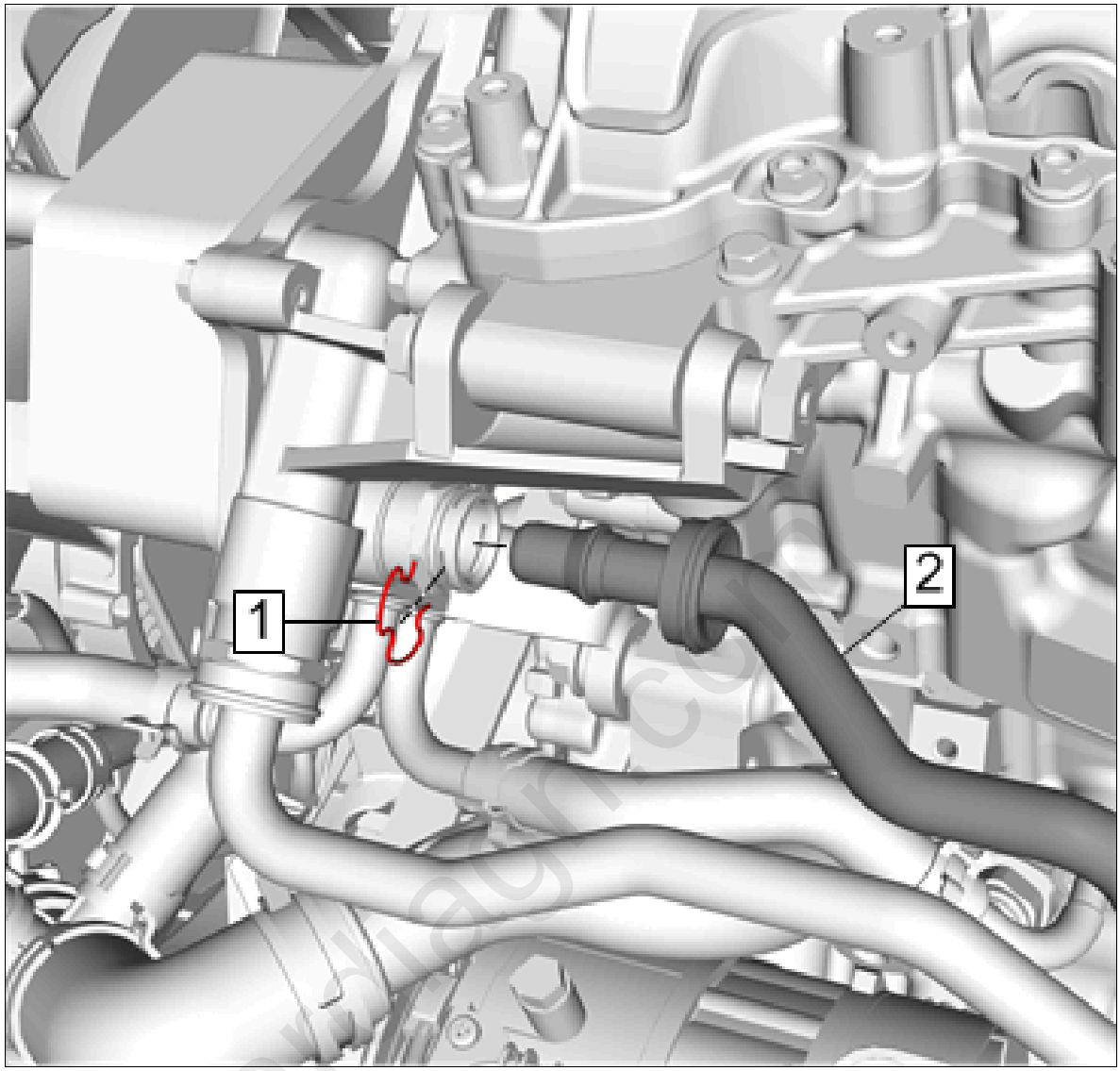
Fig 1: Engine Oil Cooler Pipe Retainer



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Oil Cooler Pipe (2)
2. Install Engine Oil Cooler Pipe Retainer (1)

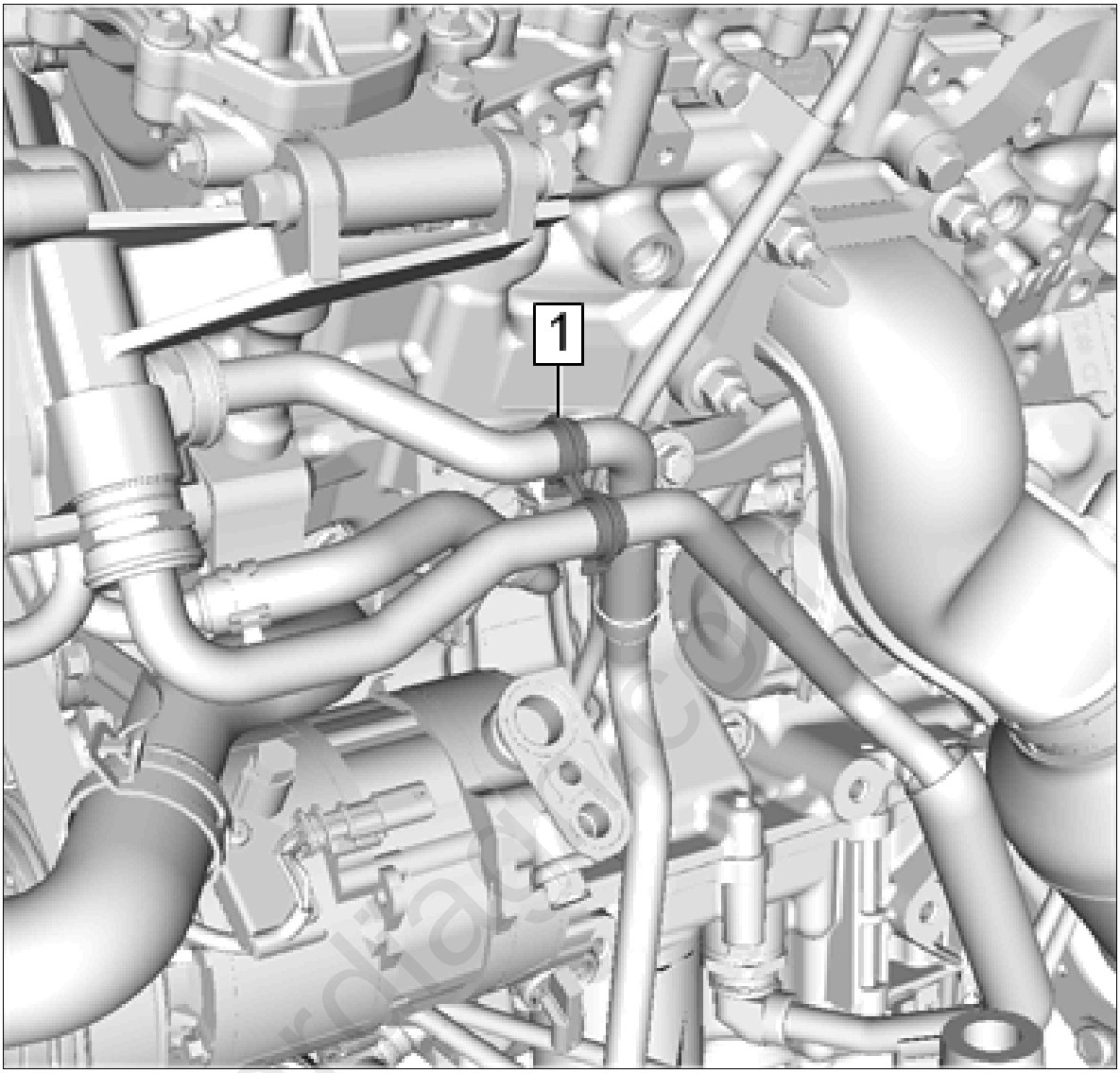
Fig 2: Engine Oil Cooler Pipe Retainers



Courtesy of GENERAL MOTORS COMPANY

3. Connect Engine Oil Cooler Pipe (2)
4. Install Engine Oil Cooler Pipe Retainer (1)

Fig 3: Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

5. Install the retaining clip (1) to the engine oil cooler pipes.
6. Install Air Cleaner Assembly Replacement
7. Install Air Cleaner Outlet Duct Replacement
8. Install a NEW oil filter. Engine Oil and Oil Filter Replacement
9. Check and correct the engine oil level. Approximate Fluid Capacities , and Adhesives, Fluids, Lubricants, and Sealers

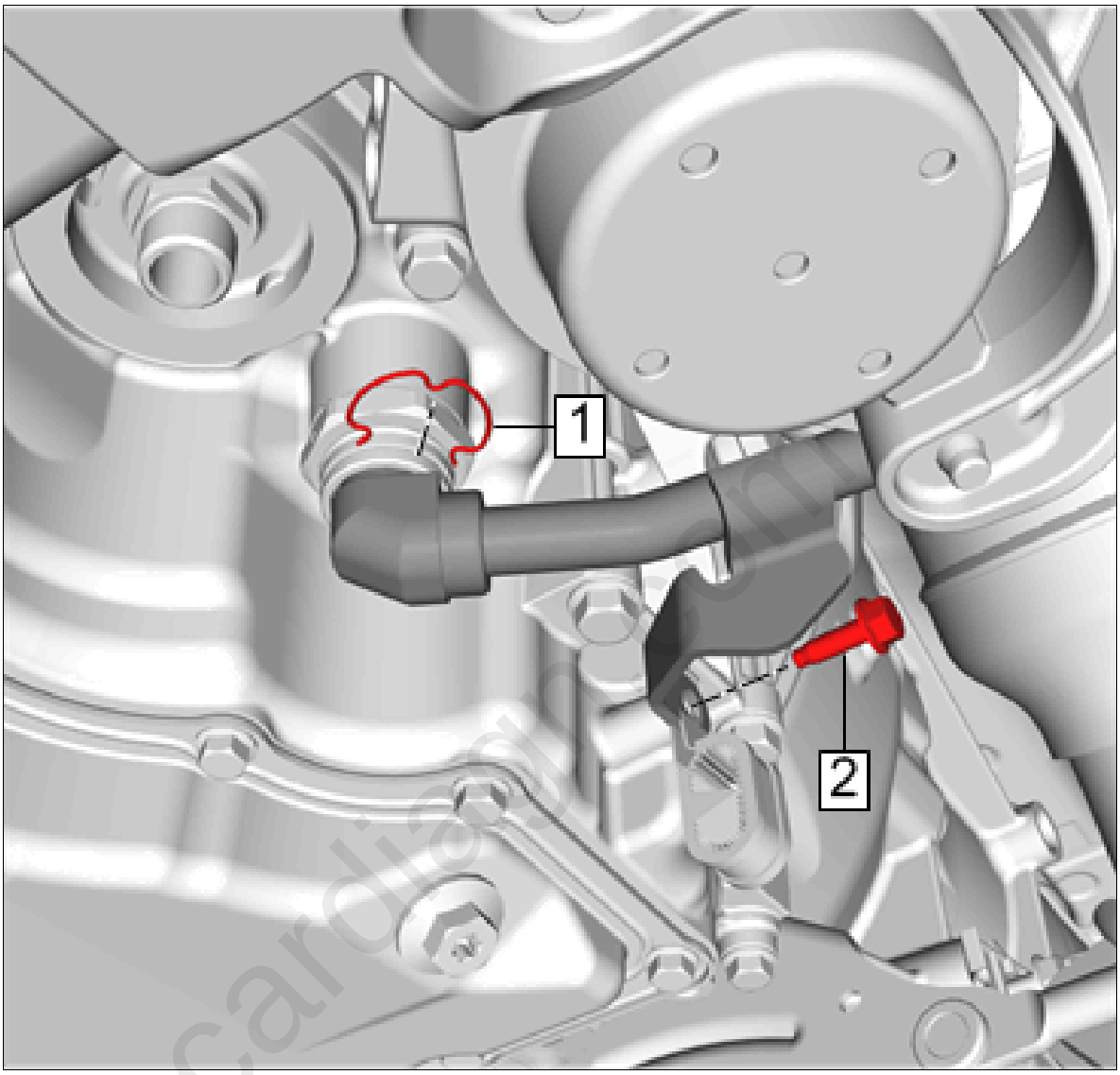
REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LGX, OUTLET) > REMOVAL PROCEDURE

1. Remove Air Cleaner Outlet Duct Replacement

2. Remove Air Cleaner Assembly Replacement

3. Drain the engine oil. Engine Oil and Oil Filter Replacement

Fig 1: Engine Oil Cooler Pipe Retainer

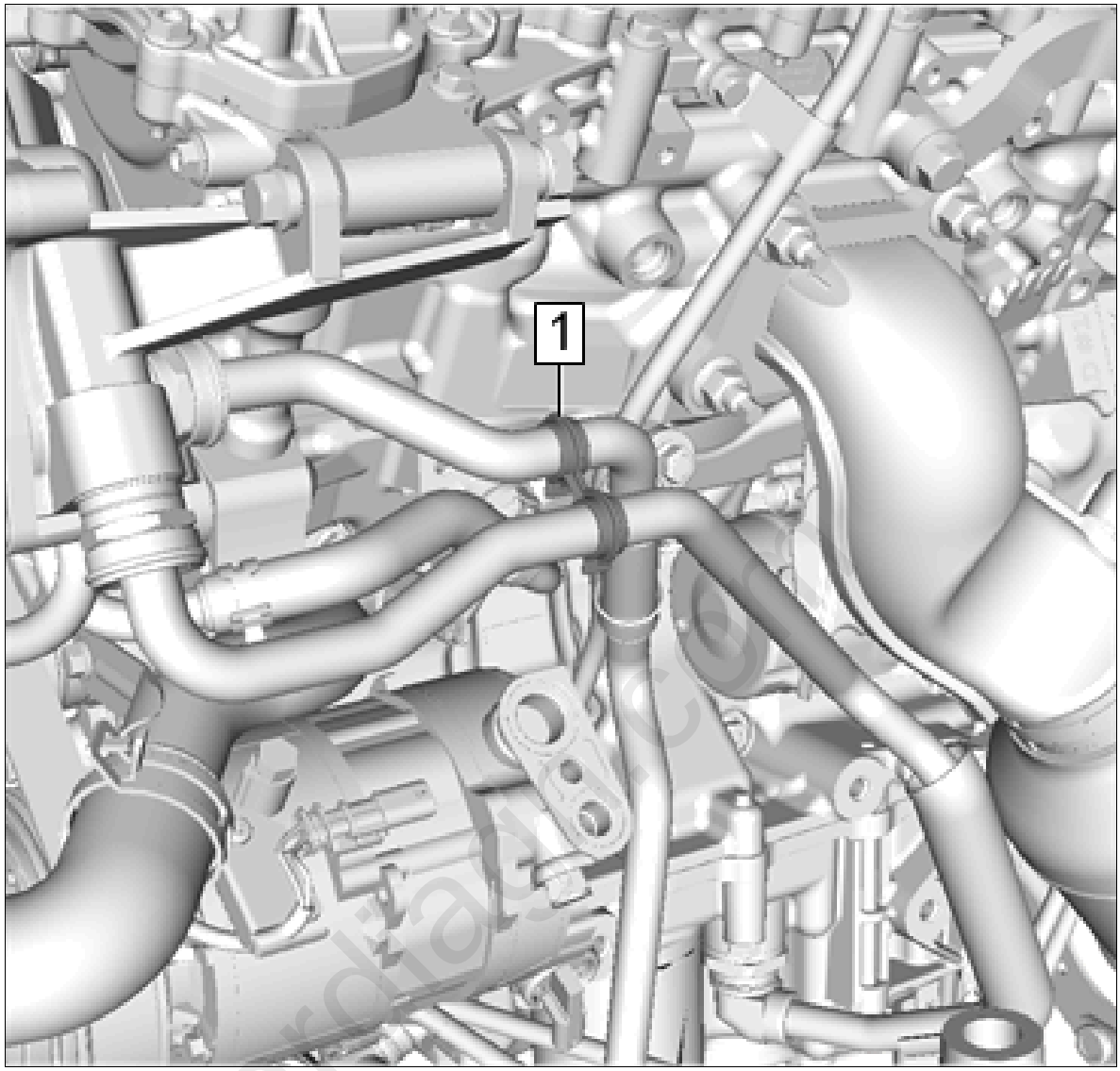


Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Oil Cooler Pipe Retainer (1)

5. Remove Engine Oil Cooler Pipe Fastener (2)

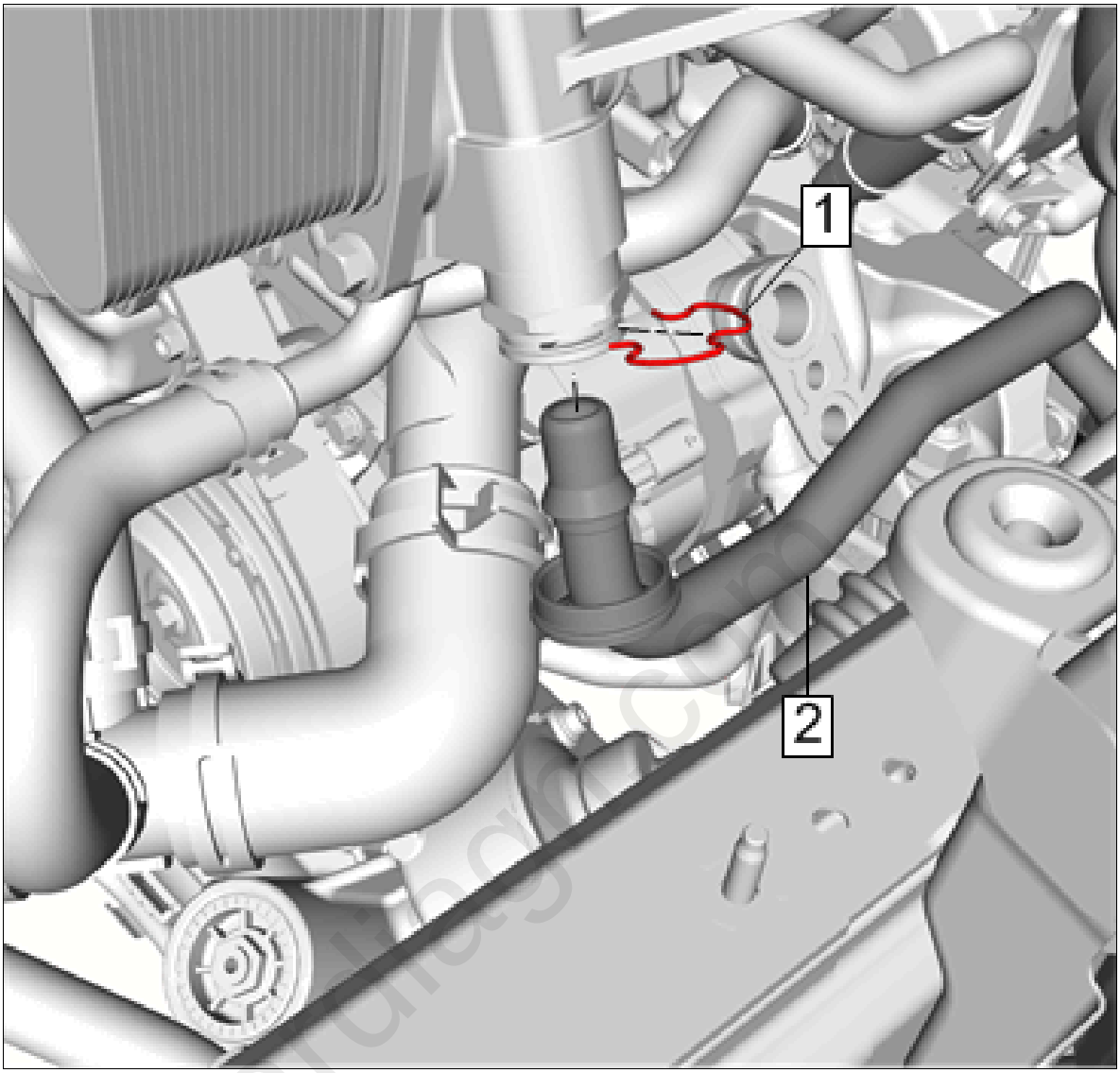
Fig 2: Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Oil Cooler Pipe Retainer Clip (1)

Fig 3: Engine Oil Cooler Pipe Retainer

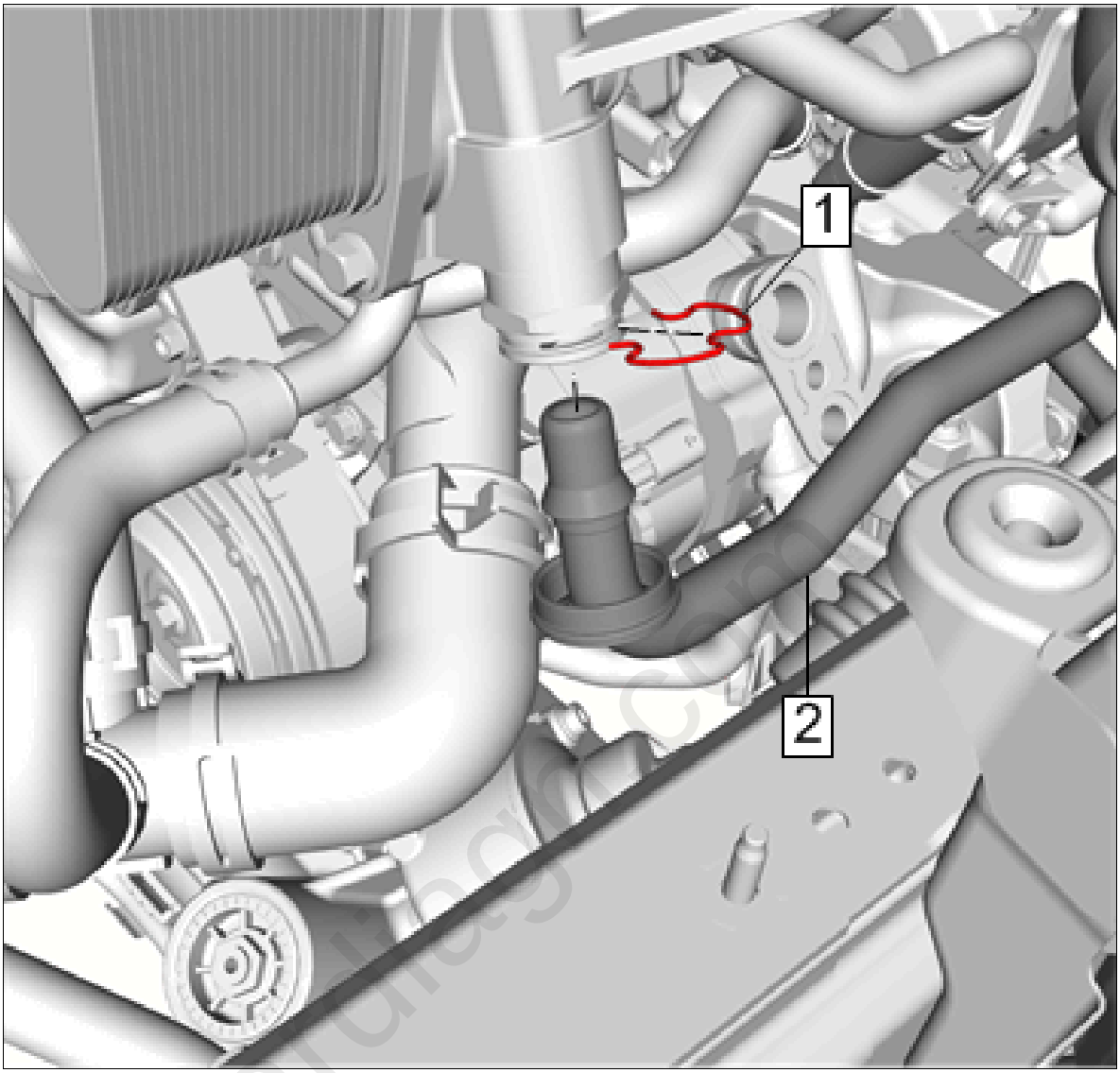


Courtesy of GENERAL MOTORS COMPANY

7. Remove Engine Oil Cooler Pipe Retainer (1)
8. Remove Engine Oil Cooler Pipe (2)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LGX, OUTLET) > INSTALLATION PROCEDURE

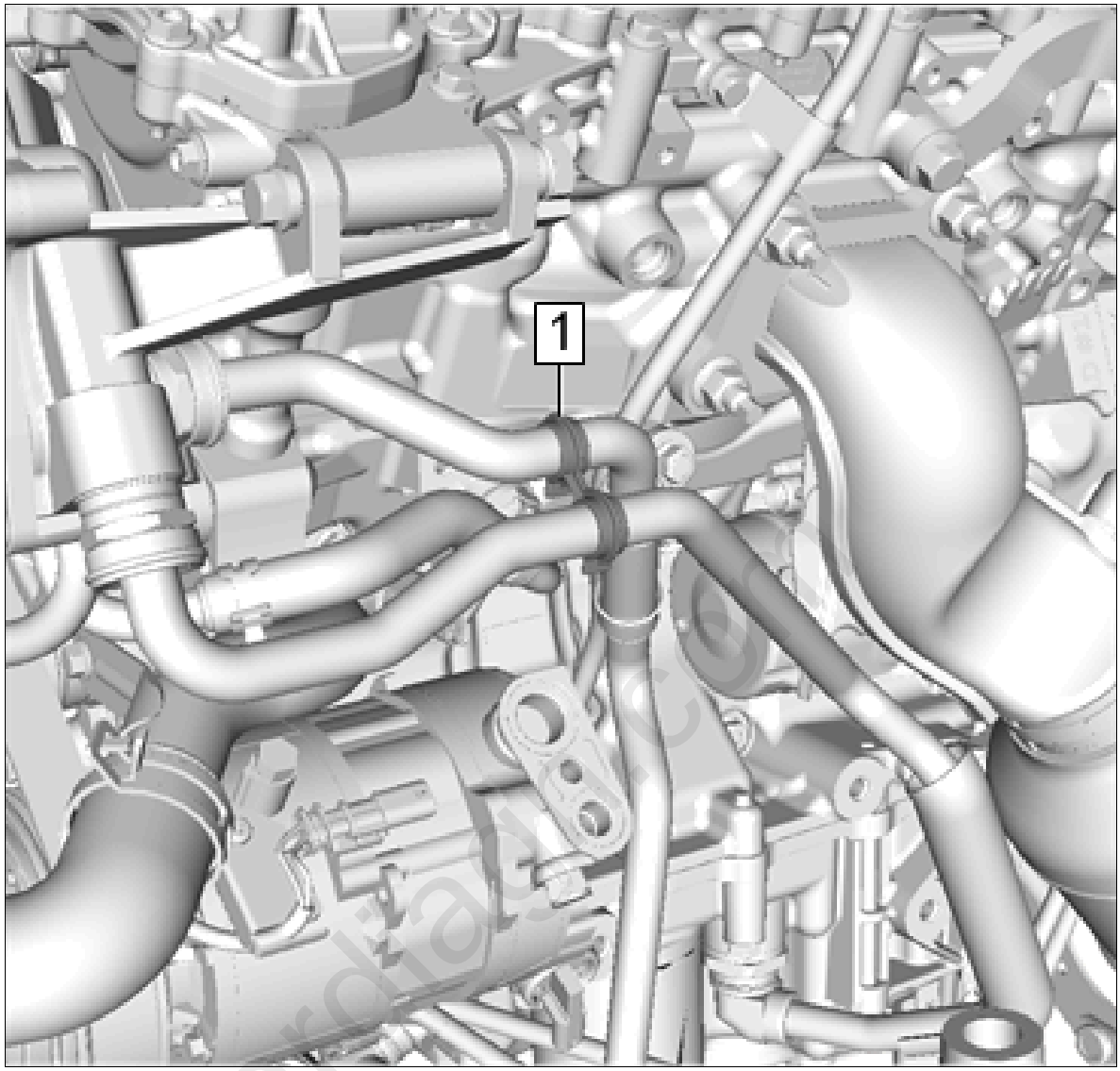
Fig 1: Engine Oil Cooler Pipe Retainer



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Oil Cooler Pipe (2)
2. Install Engine Oil Cooler Pipe Retainer (1)

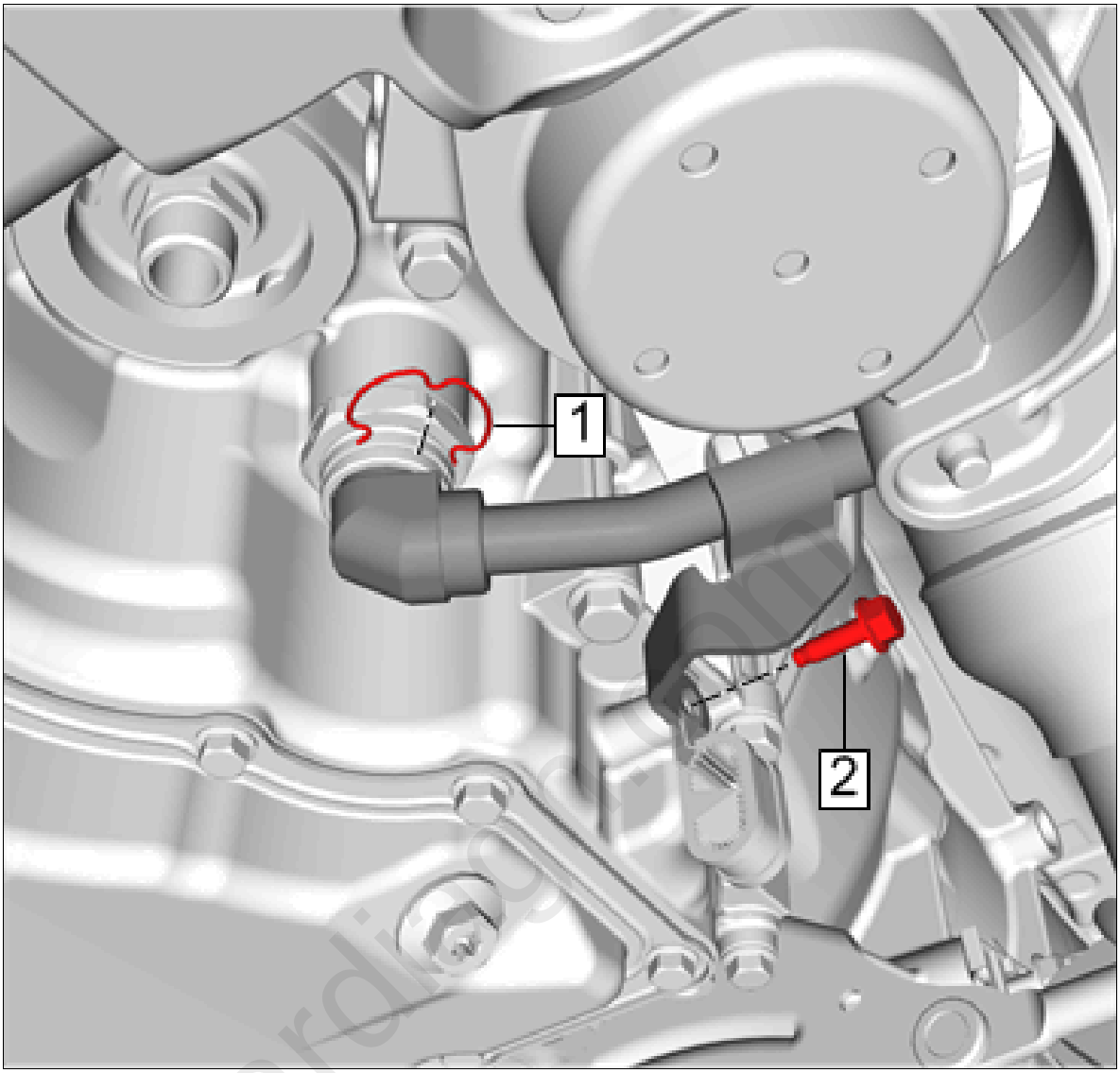
Fig 2: Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

3. Install Engine Oil Cooler Pipe Retainer Clip (1)

Fig 3: Engine Oil Cooler Pipe Retainer



Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

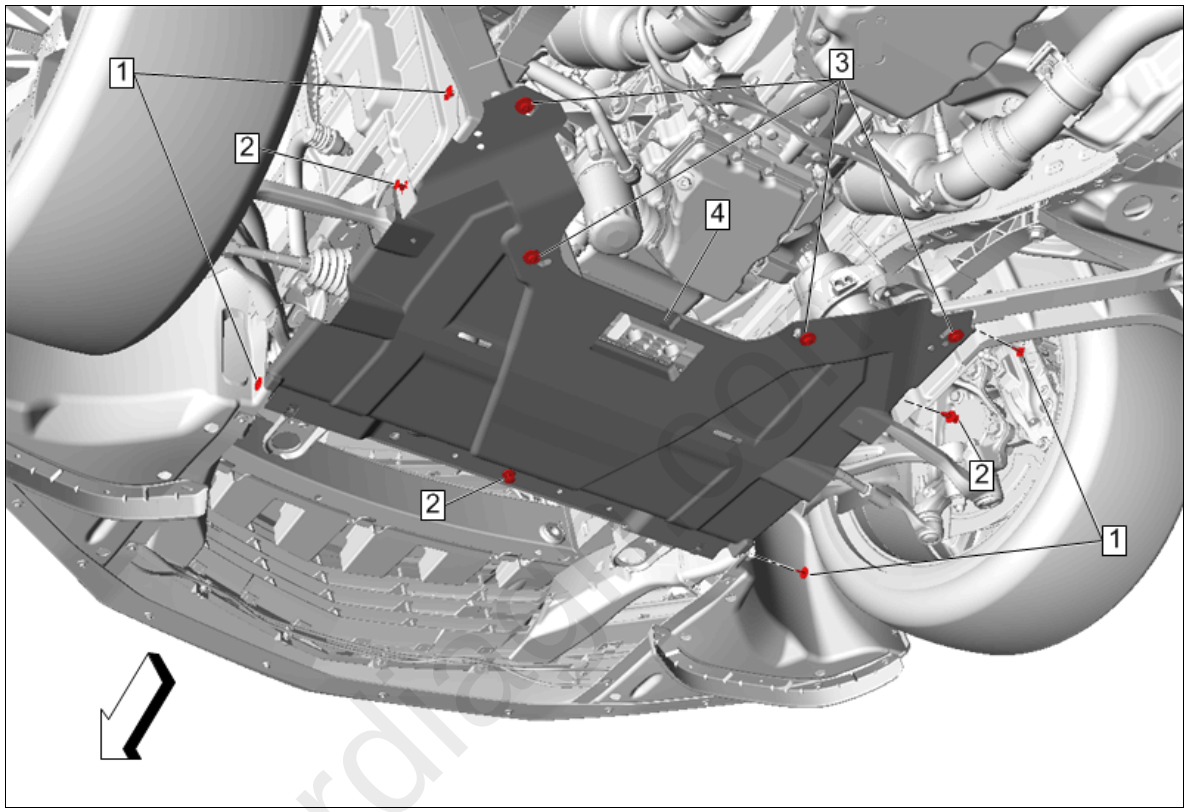
4. Install Engine Oil Cooler Pipe Fastener (2) and tighten to 10 N.m (89 lb in)
5. Install Engine Oil Cooler Pipe Retainer (1)
6. Install Air Cleaner Assembly Replacement
7. Install Air Cleaner Outlet Duct Replacement
8. Install a NEW oil filter. Engine Oil and Oil Filter Replacement
9. Check and correct the engine oil level. Approximate Fluid Capacities , and Adhesives, Fluids,

Lubricants, and Sealers

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LTG WITH Y4Q) > REMOVAL PROCEDURE

1. Drain the engine oil. Engine Oil and Oil Filter Replacement

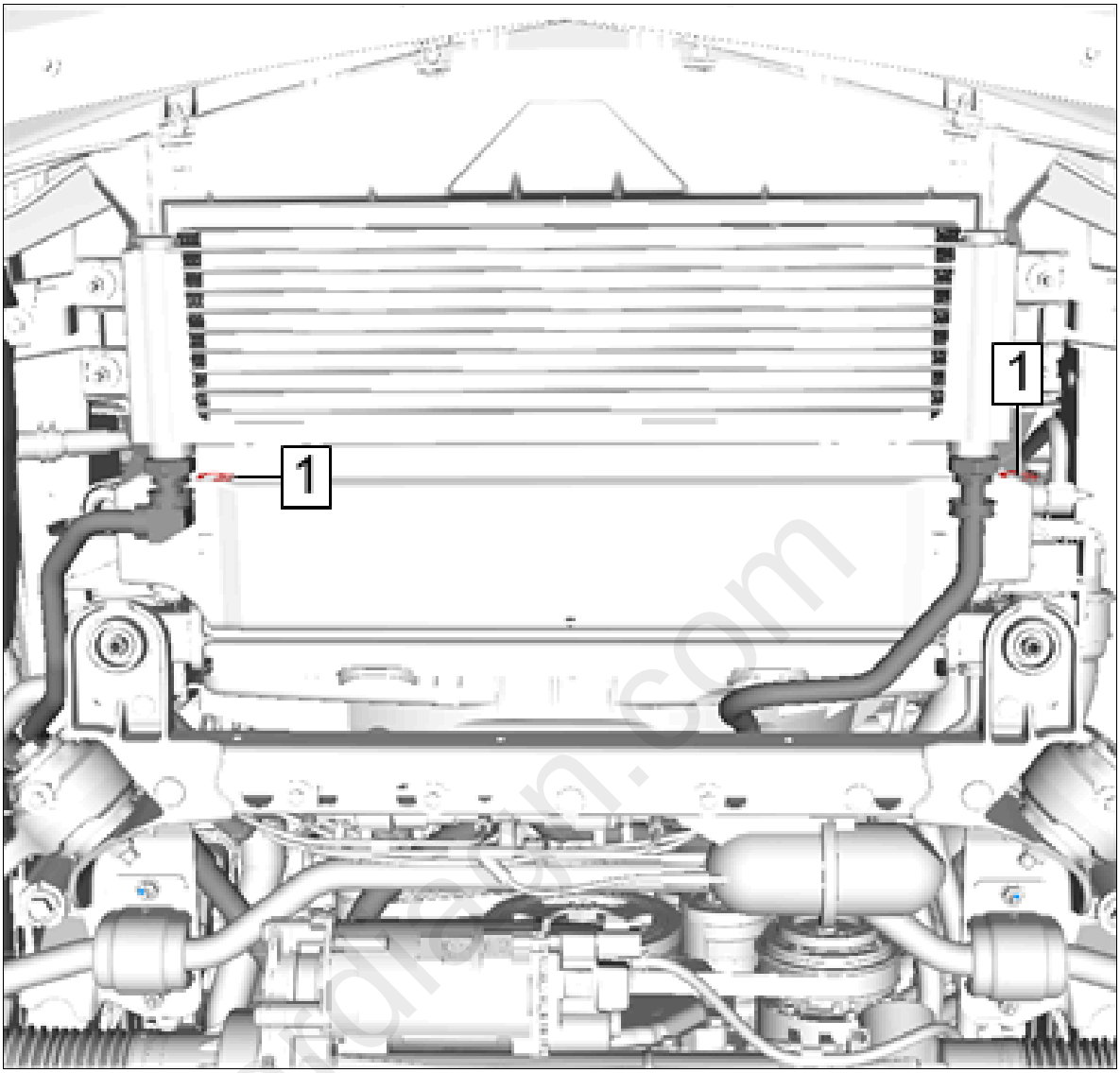
   Fig 1: Front Compartment Lower Noise Shield



   Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Compartment Lower Noise Shield (4) - Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)

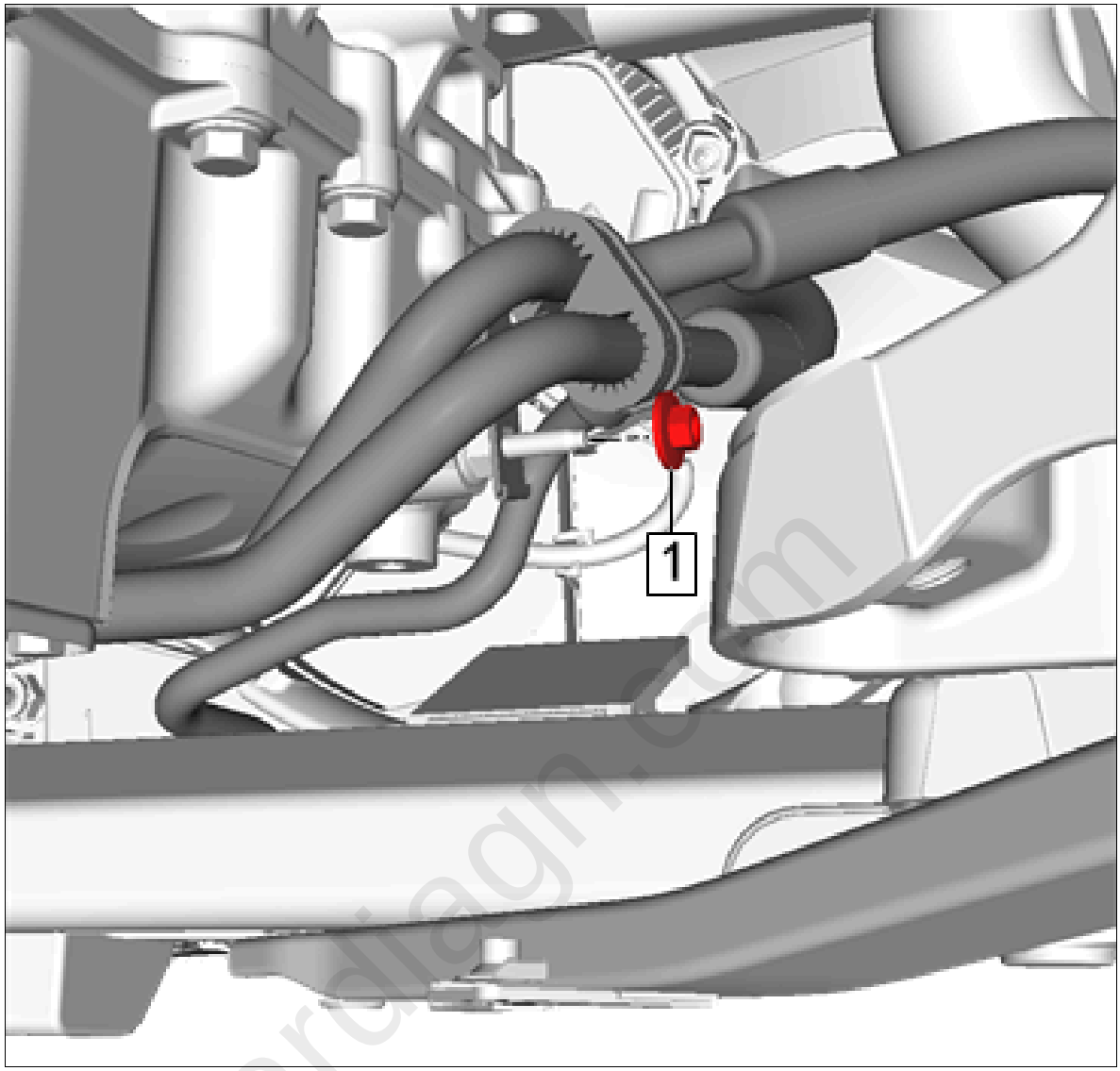
Fig 2: Engine Oil Cooler Pipe Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

3. Remove Engine Oil Cooler Pipe Retaining Clip (1) (Qty: 2)

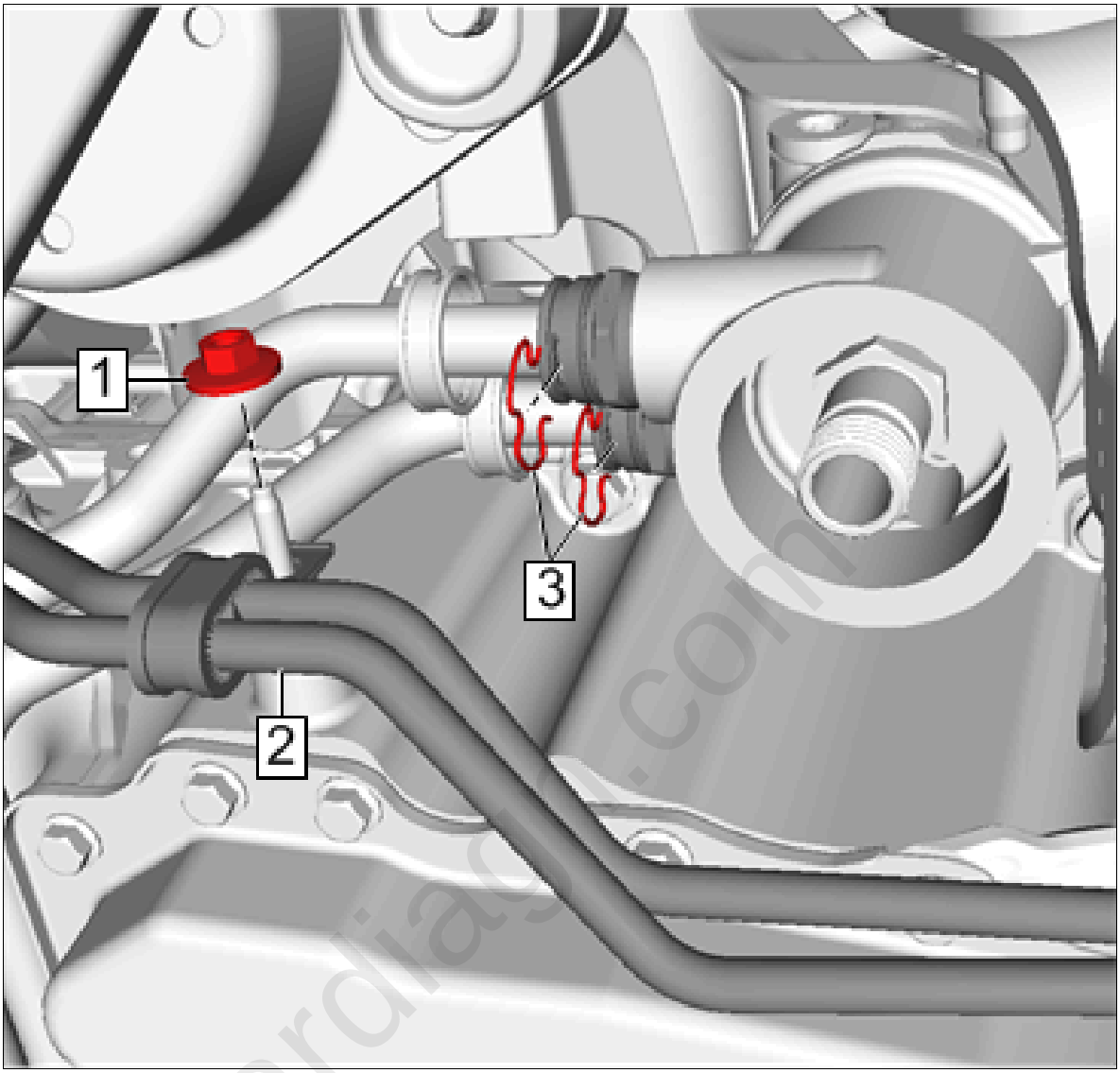
Fig 3: Engine Oil Cooler Pipe Bracket Nut



Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Oil Cooler Pipe Bracket Nut (1)

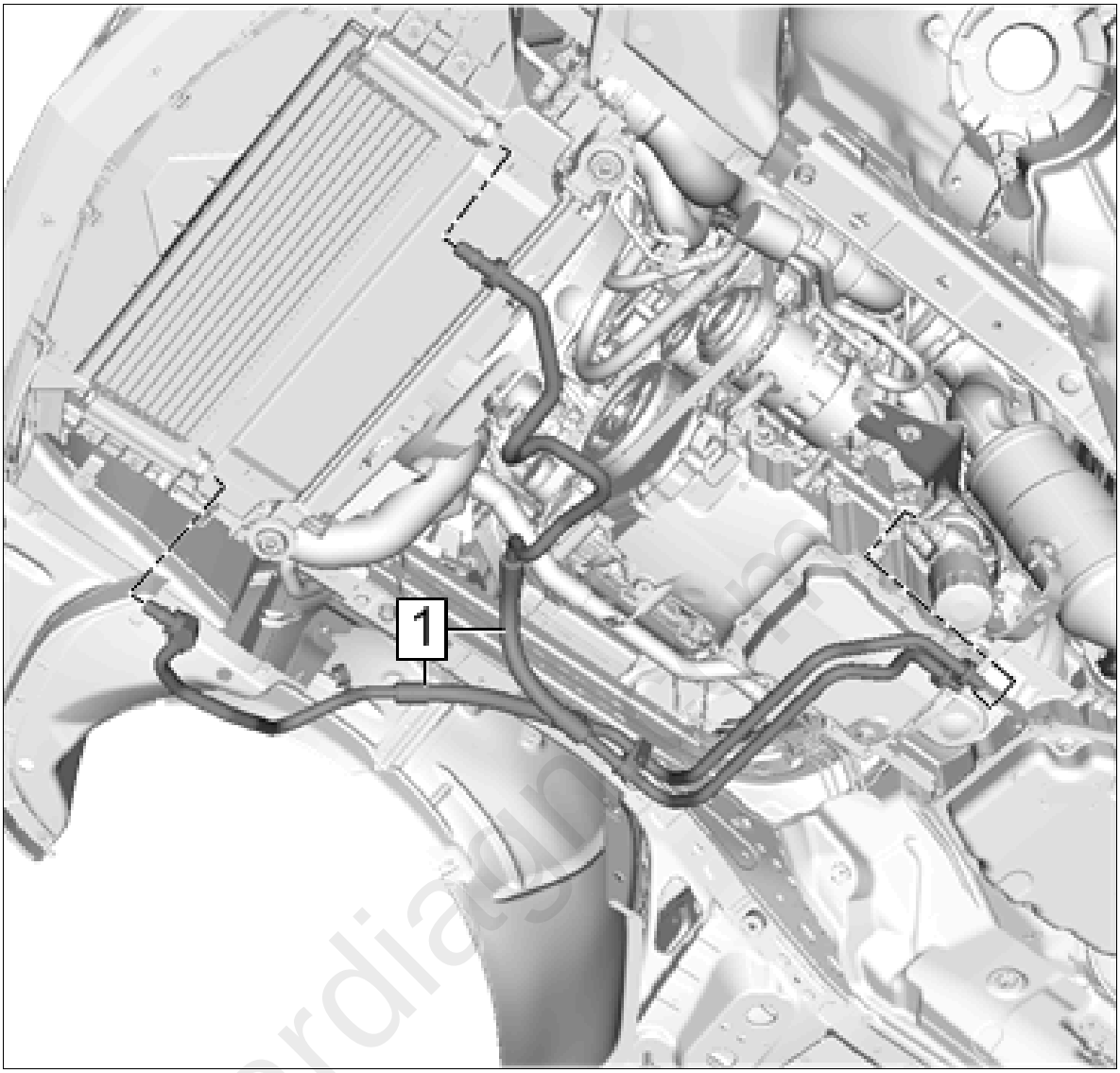
Fig 4: Transmission Fluid Cooler Pipe Bracket Nut



Courtesy of GENERAL MOTORS COMPANY

5. Remove Transmission Fluid Cooler Pipe Bracket Nut (1)
6. Remove Transmission Fluid Cooler Pipe (2) and position aside
7. Remove Engine Oil Cooler Pipe Retaining Clip (3) (Qty: 2)

Fig 5: Engine Oil Cooler Pipe Assembly

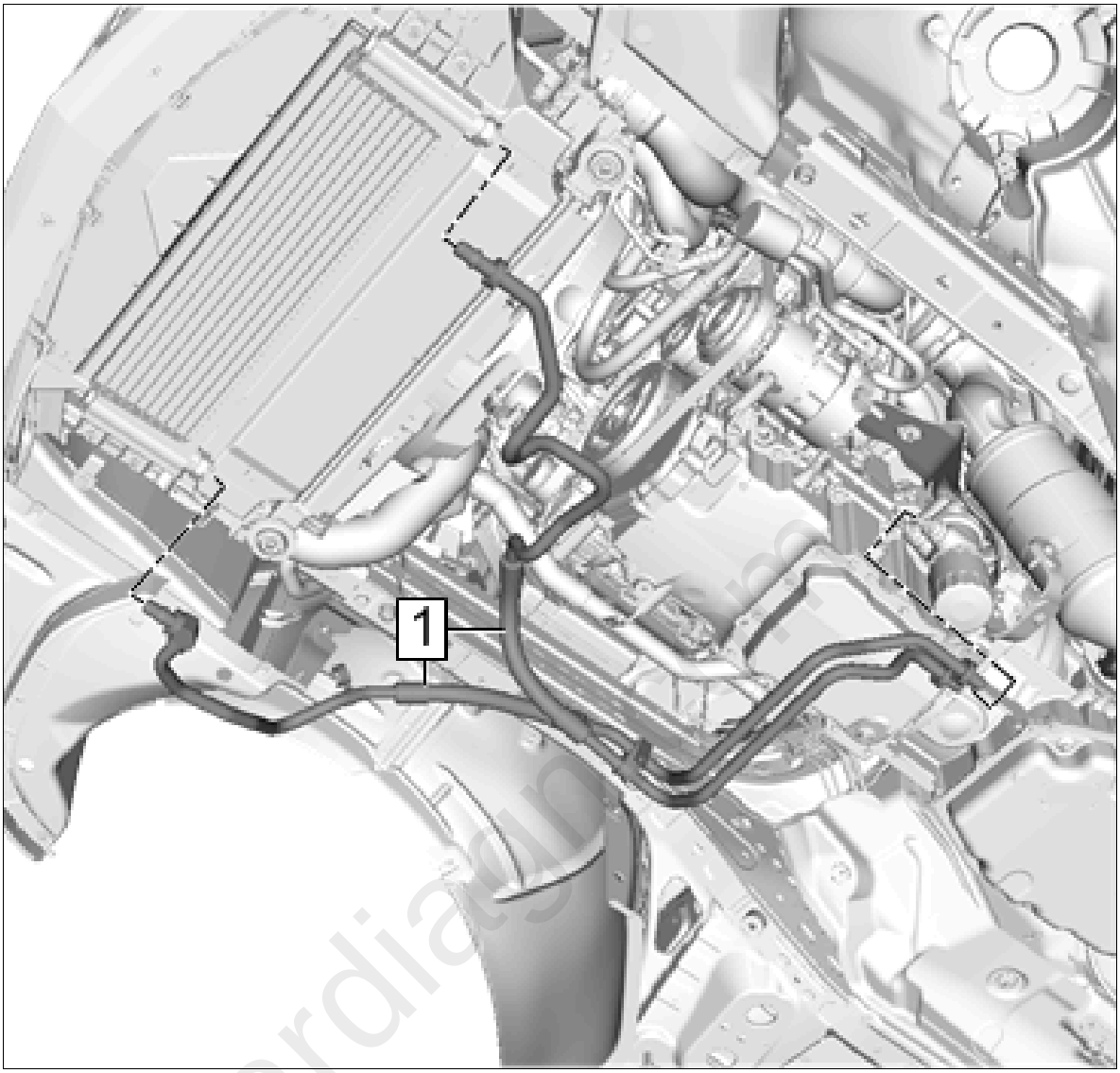


Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Oil Cooler Pipe Assembly (1)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER PIPE REPLACEMENT (LTG WITH Y4Q) > INSTALLATION PROCEDURE

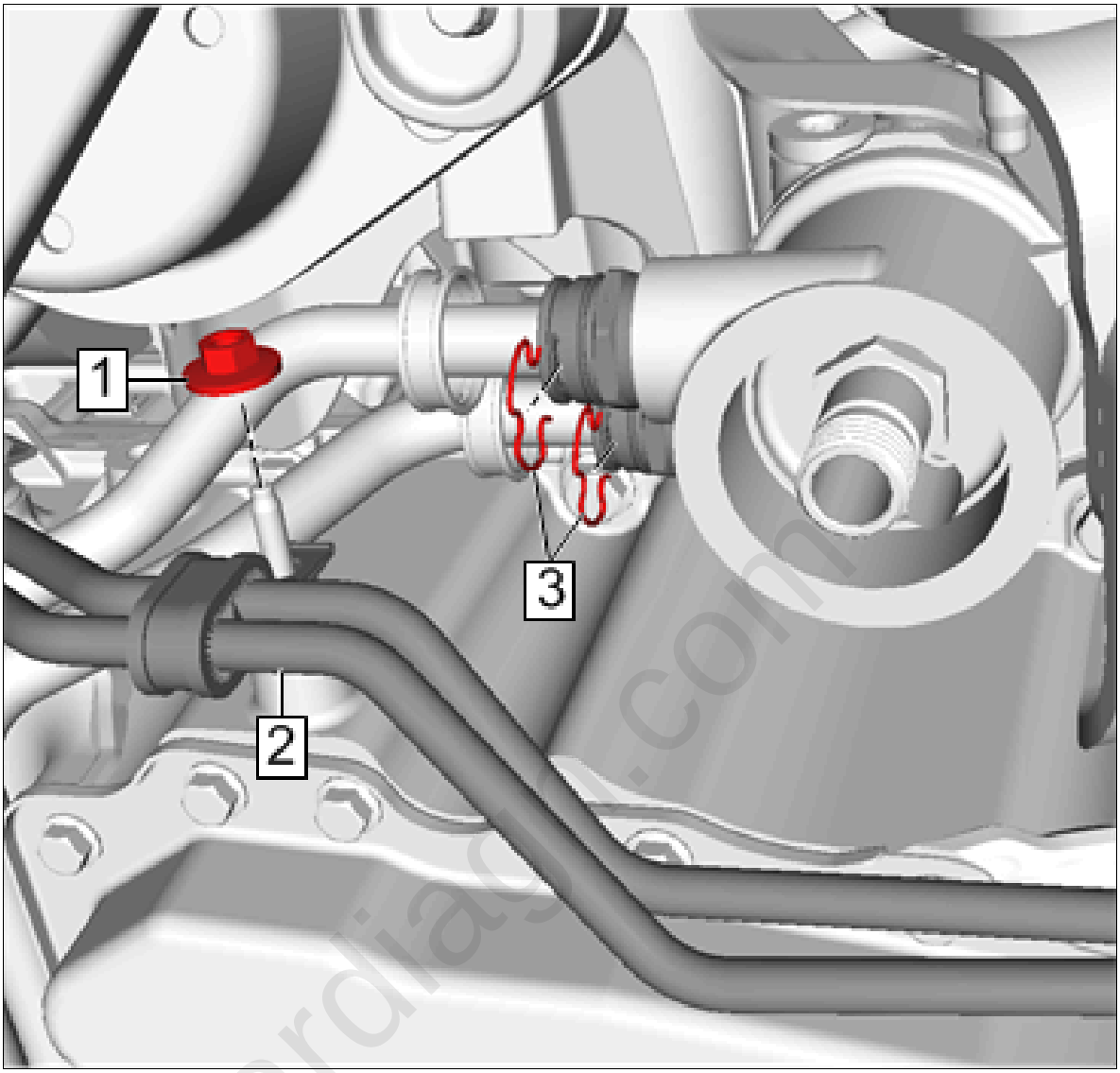
Fig 1: Engine Oil Cooler Pipe Assembly



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Oil Cooler Pipe Assembly (1)

Fig 2: Transmission Fluid Cooler Pipe



Courtesy of GENERAL MOTORS COMPANY

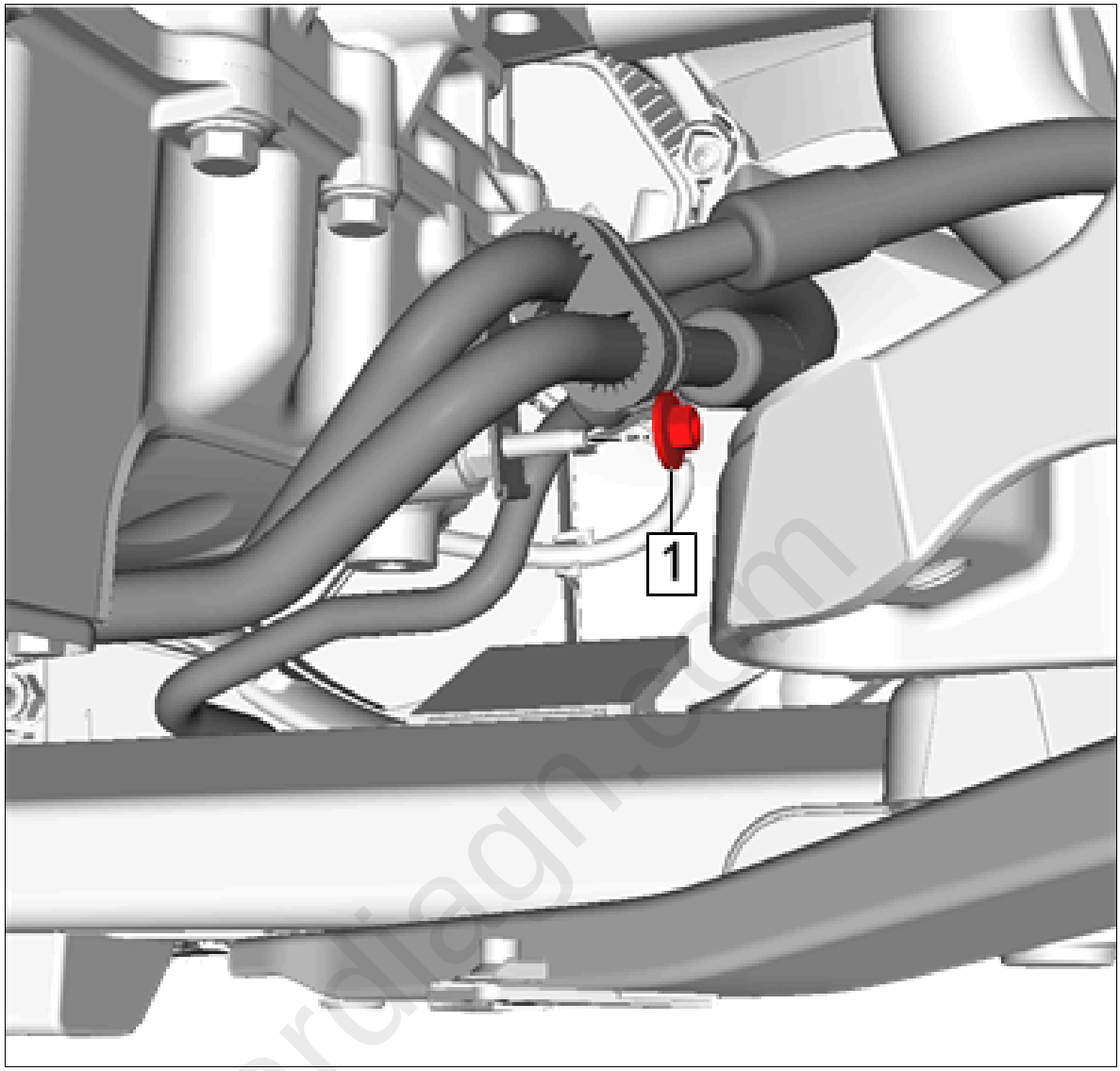
2. Engage Engine Oil Cooler Pipe Retaining Clip (3) (Qty: 2)
3. Install Transmission Fluid Cooler Pipe (2)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

4. Install Transmission Fluid Cooler Pipe Bracket Nut (1) and tighten to 10 N.m (89 lb in)

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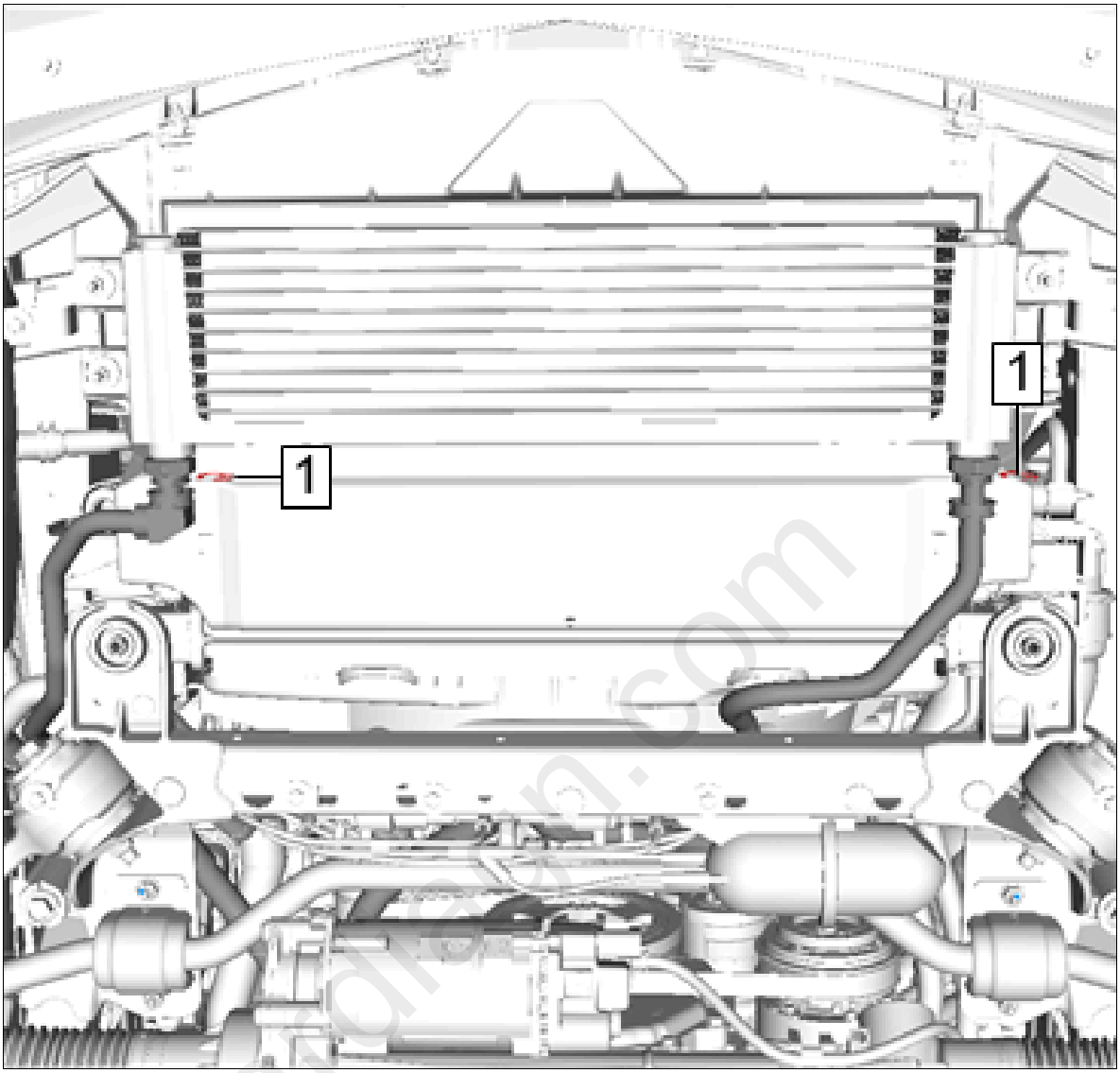
Fig 3: Engine Oil Cooler Pipe Bracket Nut



Courtesy of GENERAL MOTORS COMPANY

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

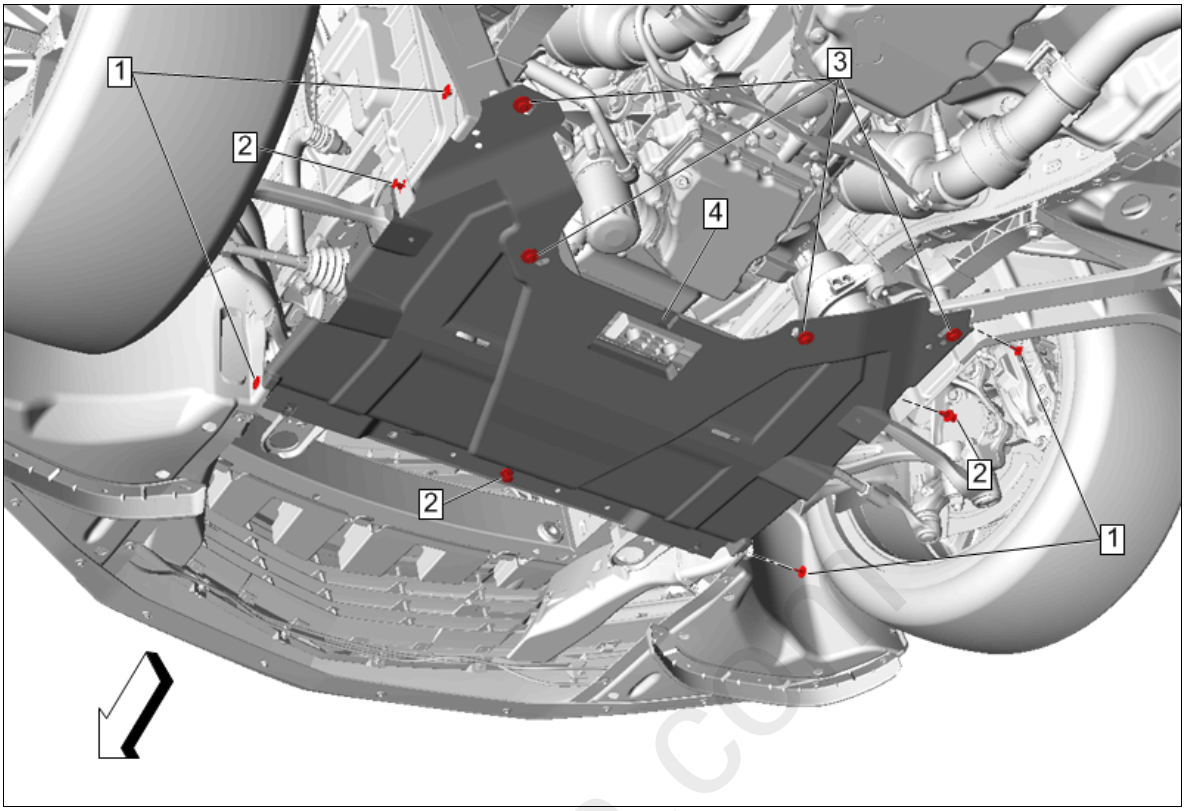
Fig 4: Engine Oil Cooler Pipe Retaining Clip



Courtesy of GENERAL MOTORS COMPANY

6. Engage Engine Oil Cooler Pipe Retaining Clip (1) (Qty: 2)

Fig 5: Front Compartment Lower Noise Shield



Courtesy of GENERAL MOTORS COMPANY

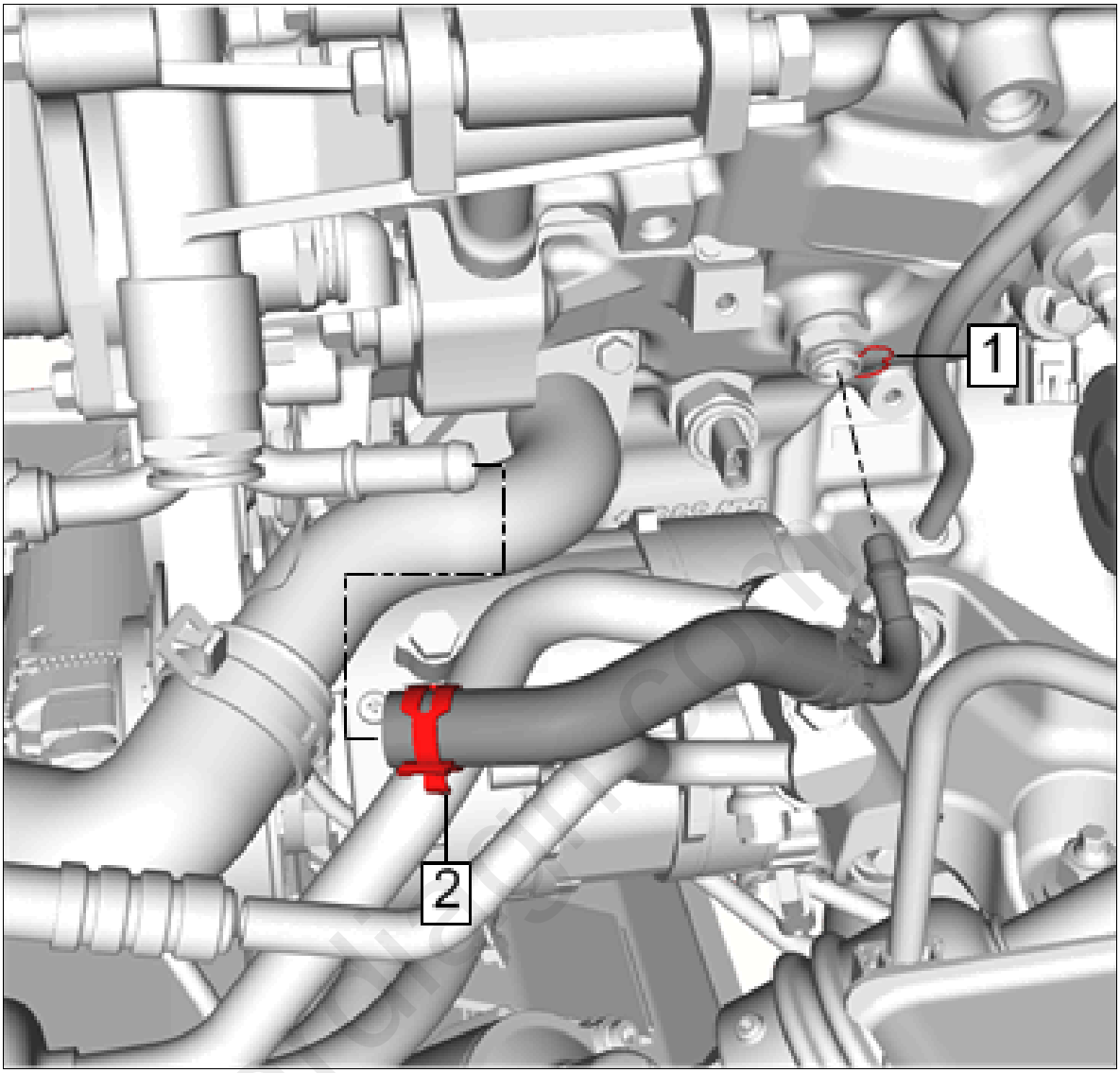
7. Install Front Compartment Lower Noise Shield(4) - Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)
8. Fill the engine oil to the proper level. Engine Oil and Oil Filter Replacement

REPAIR INSTRUCTIONS > ENGINE OIL COOLER INLET PIPE REPLACEMENT (LGX) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Air Cleaner Assembly - Air Cleaner Assembly Replacement
3. Remove Oil Level Indicator Tube - Oil Level Indicator Tube Replacement

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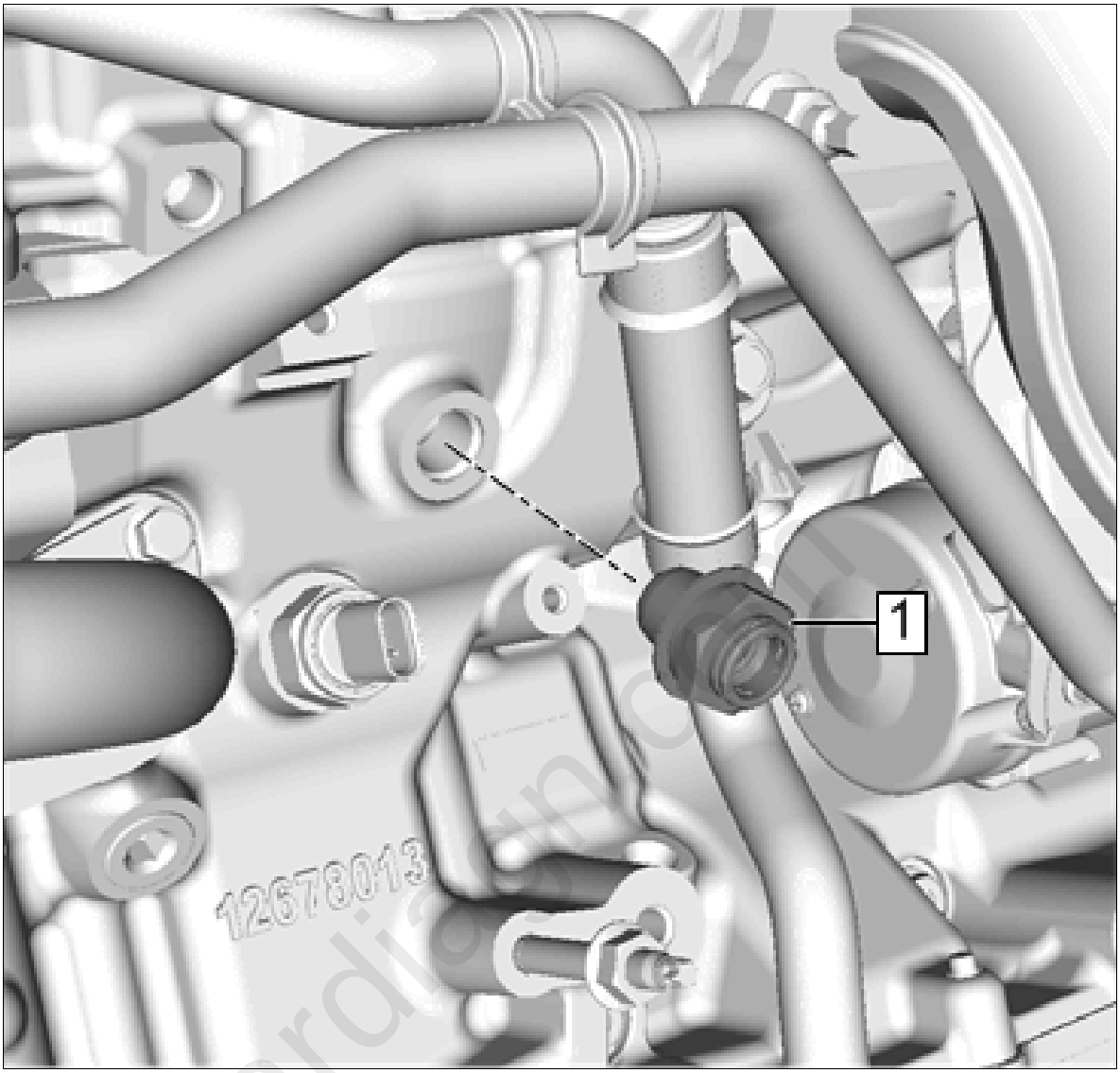
Fig 1: Engine Oil Cooler Inlet Pipe



Courtesy of GENERAL MOTORS COMPANY

4. Remove Engine Oil Cooler Inlet Pipe Retainer (1)
5. Remove Engine Oil Cooler Inlet Pipe (2)

Fig 2: Engine Oil Cooler Fitting

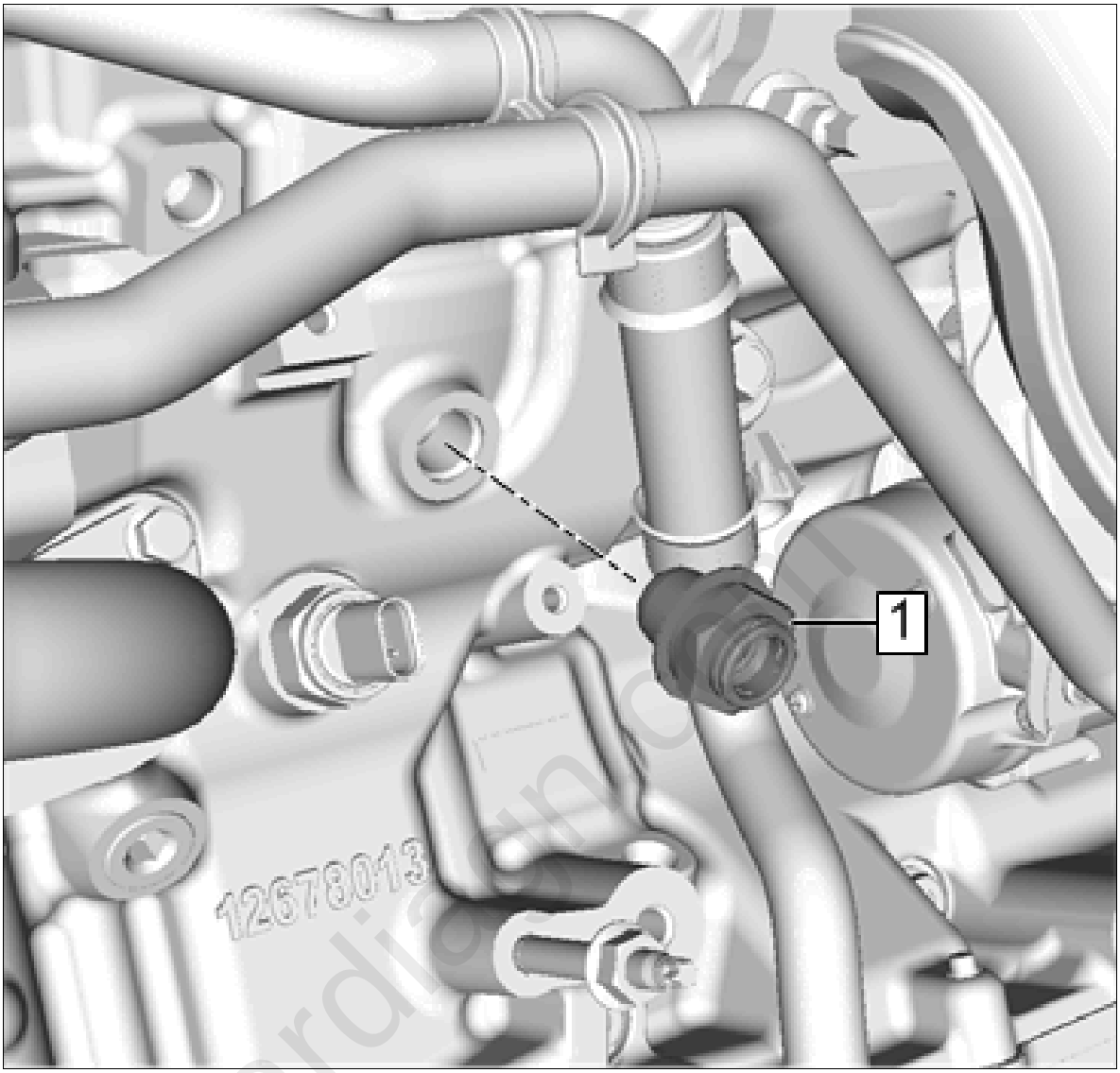


Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Oil Cooler Fitting (1) and DISCARD

REPAIR INSTRUCTIONS > ENGINE OIL COOLER INLET PIPE REPLACEMENT (LGX) > INSTALLATION PROCEDURE

Fig 1: Engine Oil Cooler Fitting



Courtesy of GENERAL MOTORS COMPANY

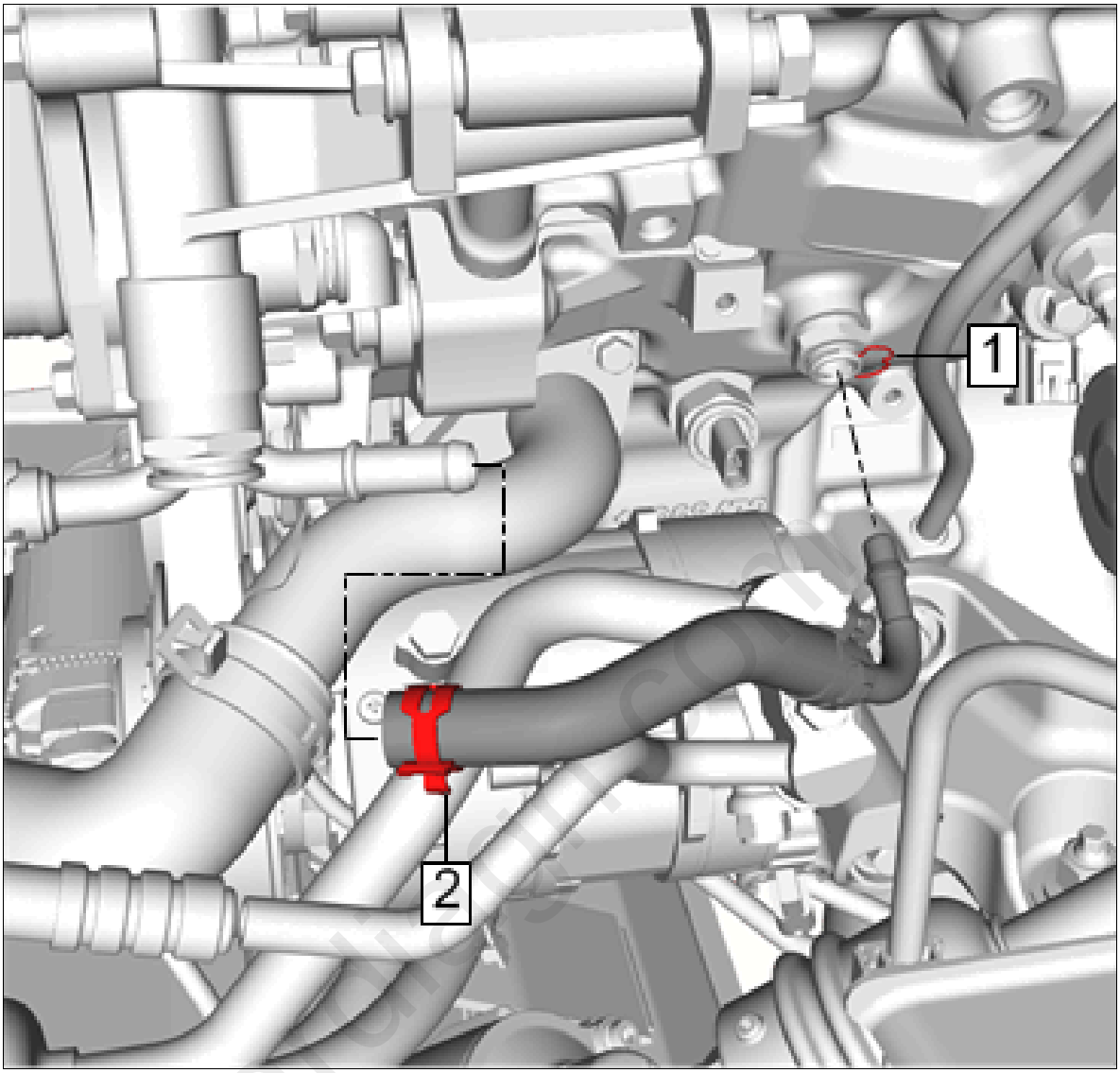
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> ⚠ *CAUTION:*
>
> *Refer to Component Fastener Tightening Caution .*

> *NOTE:*
>
> *Install a NEW engine oil cooler fitting.*

1. Remove Engine Oil Cooler Fitting (1) and tighten to 34 N.m (25 lb ft)

Fig 2: Engine Oil Cooler Inlet Pipe



Courtesy of GENERAL MOTORS COMPANY

2. Remove Engine Oil Cooler Inlet Pipe (2)
3. Remove Engine Oil Cooler Inlet Pipe Retainer (1)
4. Remove Oil Level Indicator Tube - Oil Level Indicator Tube Replacement
5. Remove Air Cleaner Assembly - Air Cleaner Assembly Replacement
6. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

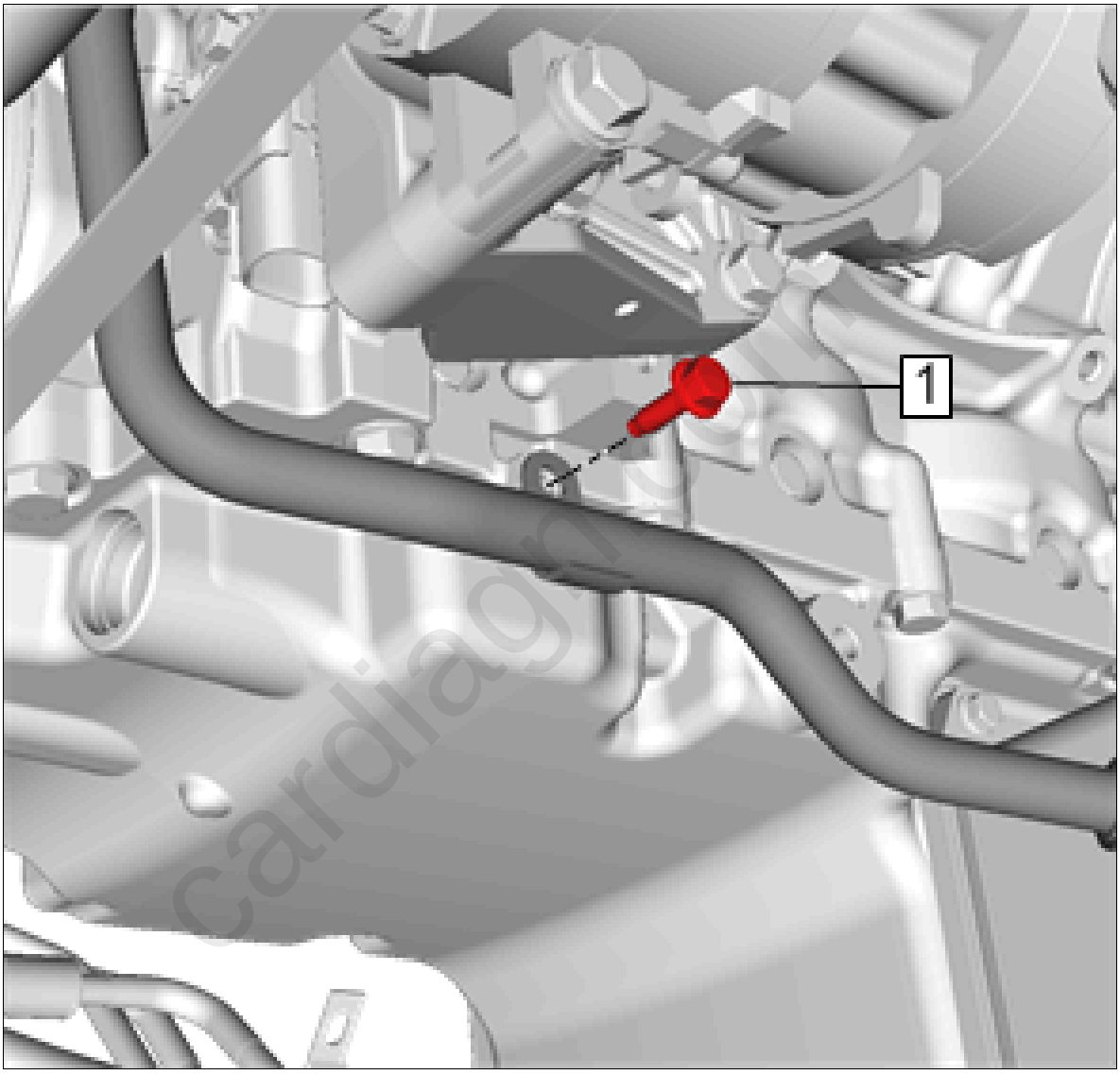
REPAIR INSTRUCTIONS > ENGINE OIL COOLER HOSE/PIPE REPLACEMENT (LT1) > REMOVAL PROCEDURE

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

Draining and Filling (Static Fill)

2. Remove Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement
3. Remove Front Cradle Shear Plate - Front Cradle Shear Plate Replacement
4. Remove Front Compartment Side Noise Shield - Front Compartment Side Noise Shield Replacement

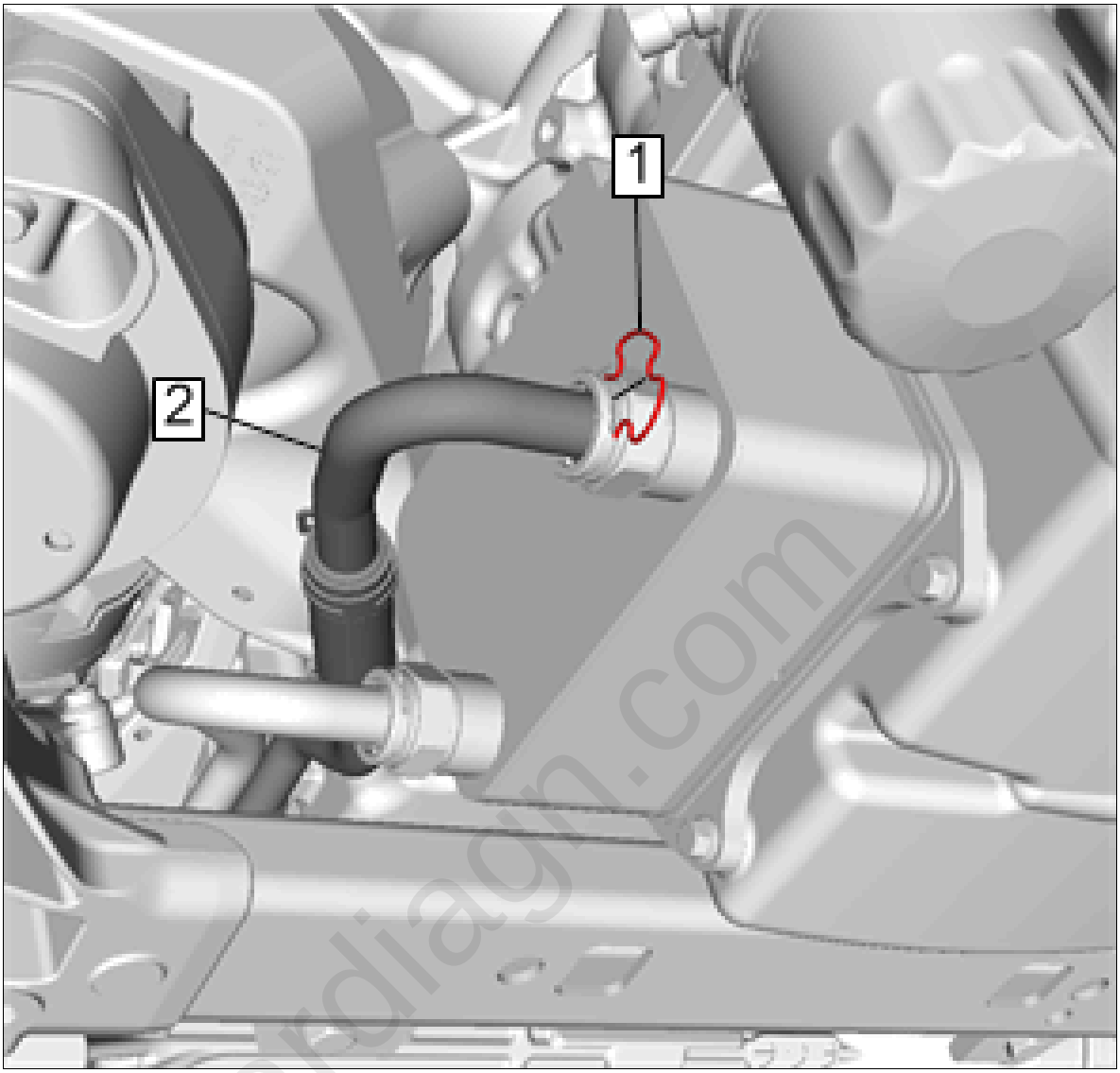
Fig 1: Engine Oil Cooler Hose Bolt



Courtesy of GENERAL MOTORS COMPANY

5. Remove Engine Oil Cooler Hose Bolt (1)

Fig 2: Engine Oil Cooler Hose



Courtesy of GENERAL MOTORS COMPANY

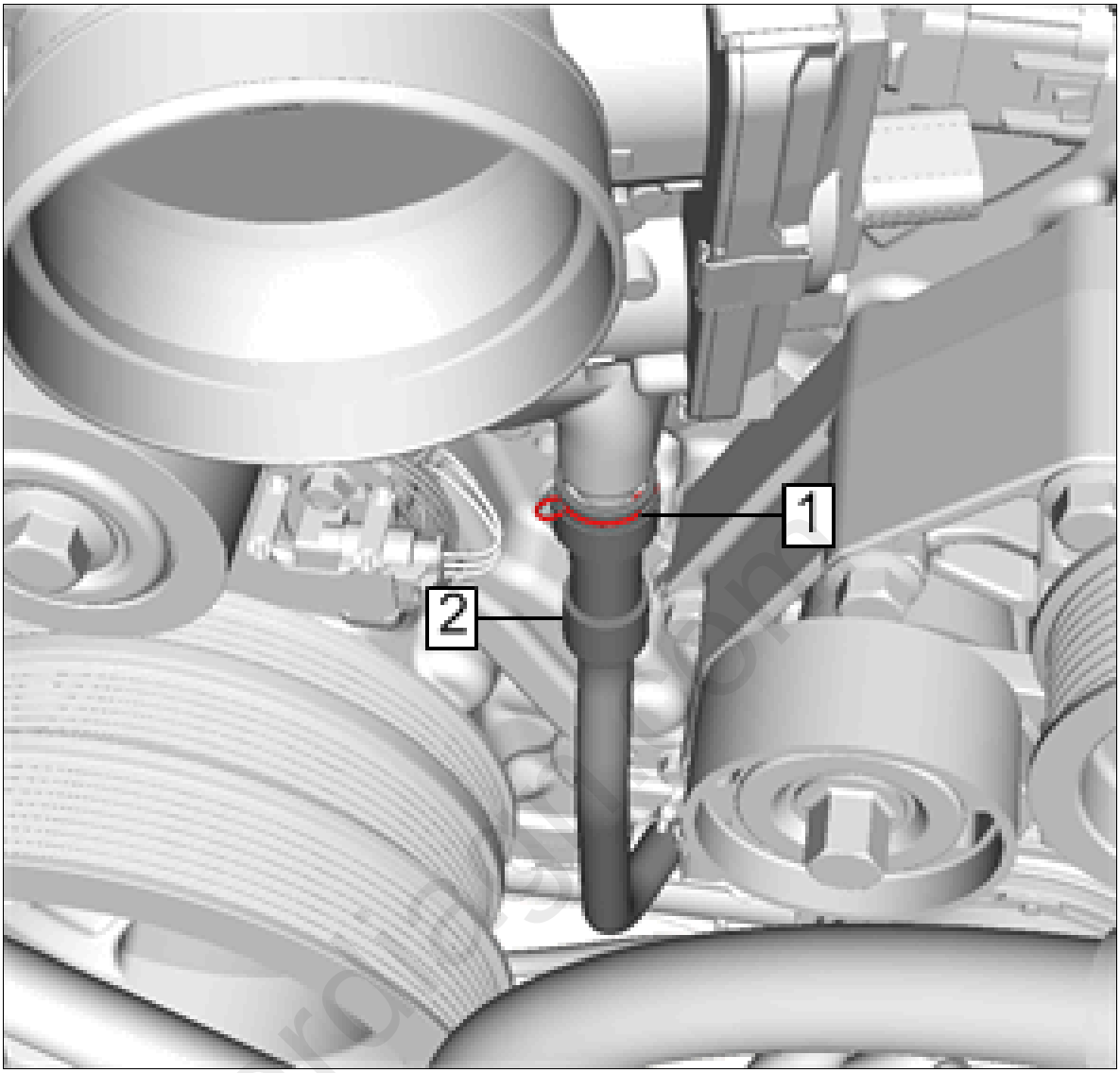
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NOTE:

Whenever the engine oil cooler lines are detached, the quick connect fitting must be replaced. Refer to Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement (LT1) .

6. Remove Engine Oil Cooler Hose Retainer (1)
7. Remove Engine Oil Cooler Hose (2)
8. Lower the vehicle.

Fig 3: Engine Oil Cooler Hose

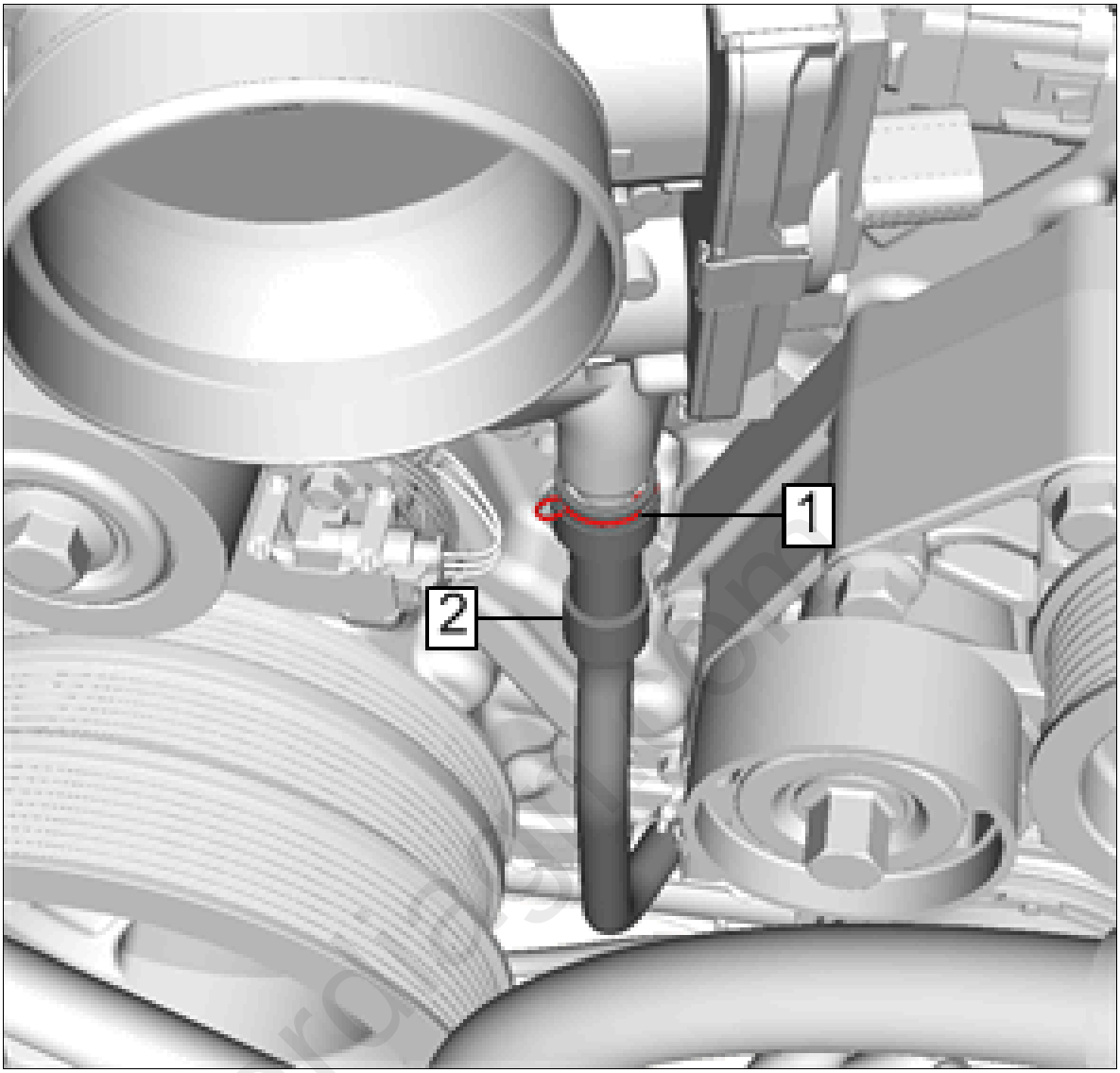


Courtesy of GENERAL MOTORS COMPANY

9. Remove Engine Oil Cooler Hose Retainer (1)
10. Remove Engine Oil Cooler Hose (2)

REPAIR INSTRUCTIONS > ENGINE OIL COOLER HOSE/PIPE REPLACEMENT (LT1) > INSTALLATION PROCEDURE

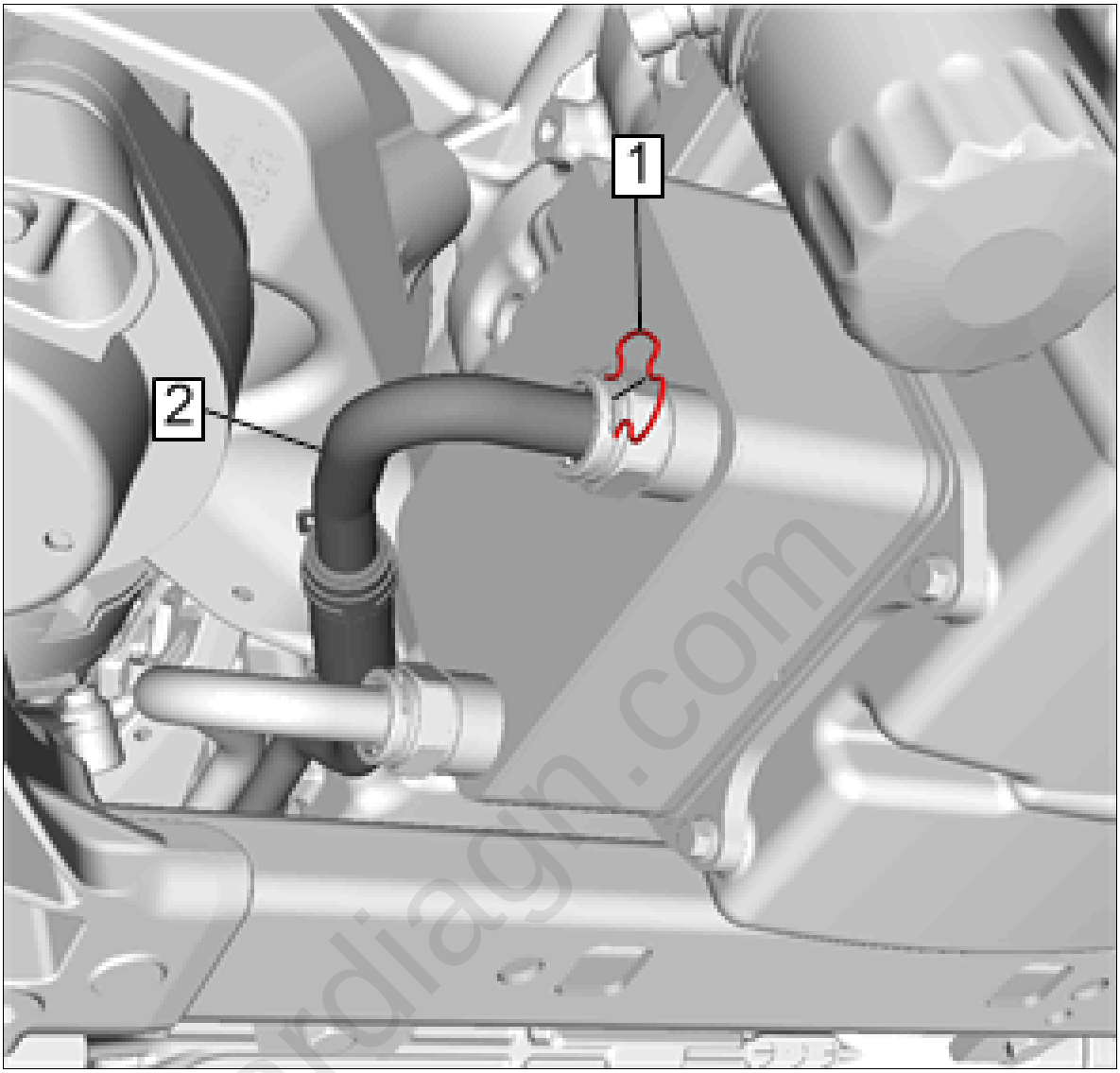
Fig 1: Engine Oil Cooler Hose



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Oil Cooler Hose (2)
2. Install Engine Oil Cooler Hose Retainer (1)
3. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

Fig 2: Engine Oil Cooler Hose



Courtesy of GENERAL MOTORS COMPANY

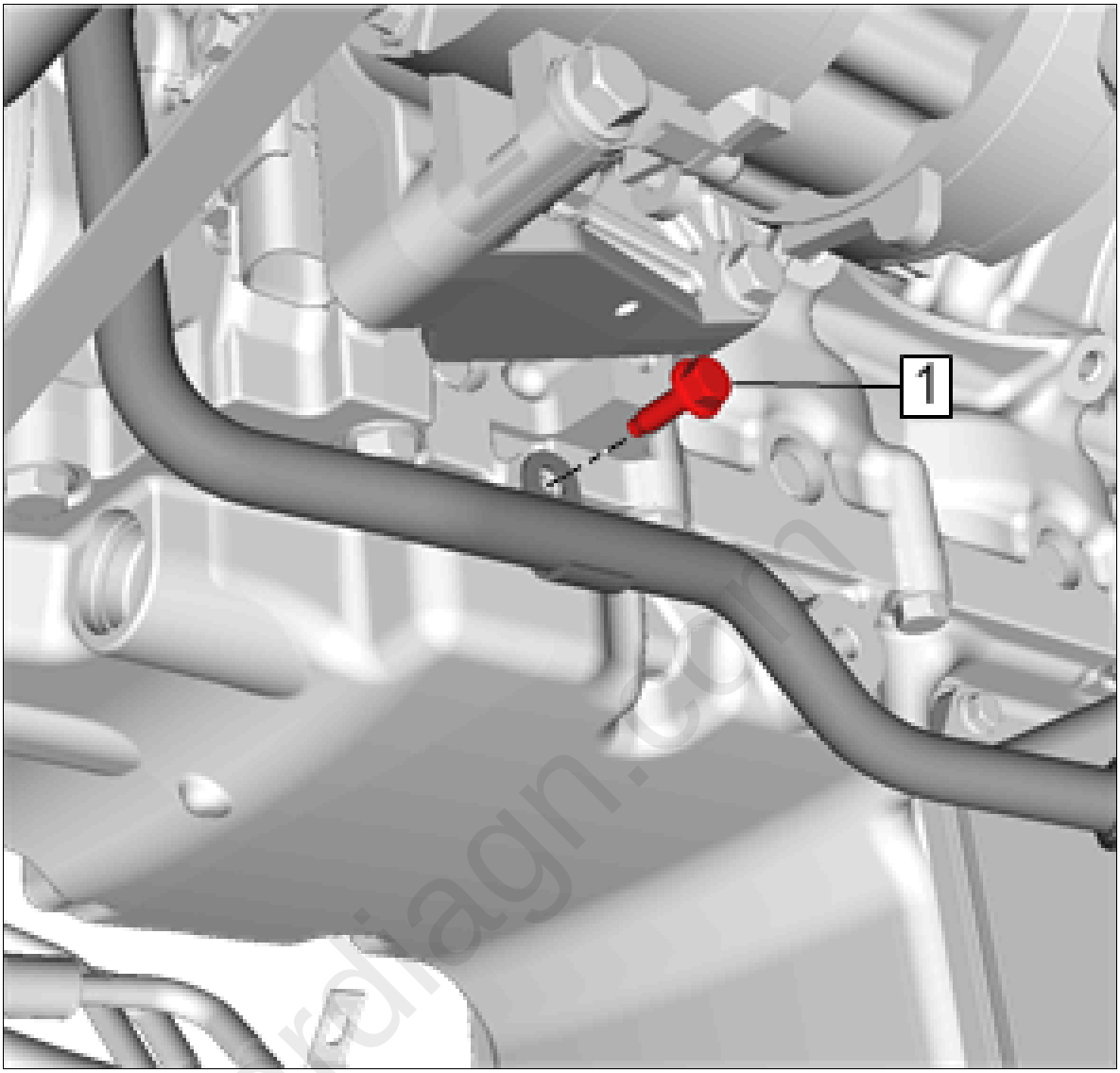
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NOTE:

Whenever the engine oil cooler lines are detached, the quick connect fitting must be replaced. Refer to Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement (LT1) .

4. Install Engine Oil Cooler Hose (2)
5. Install Engine Oil Cooler Hose Retainer (1)

Fig 3: Engine Oil Cooler Hose Bolt



Courtesy of GENERAL MOTORS COMPANY

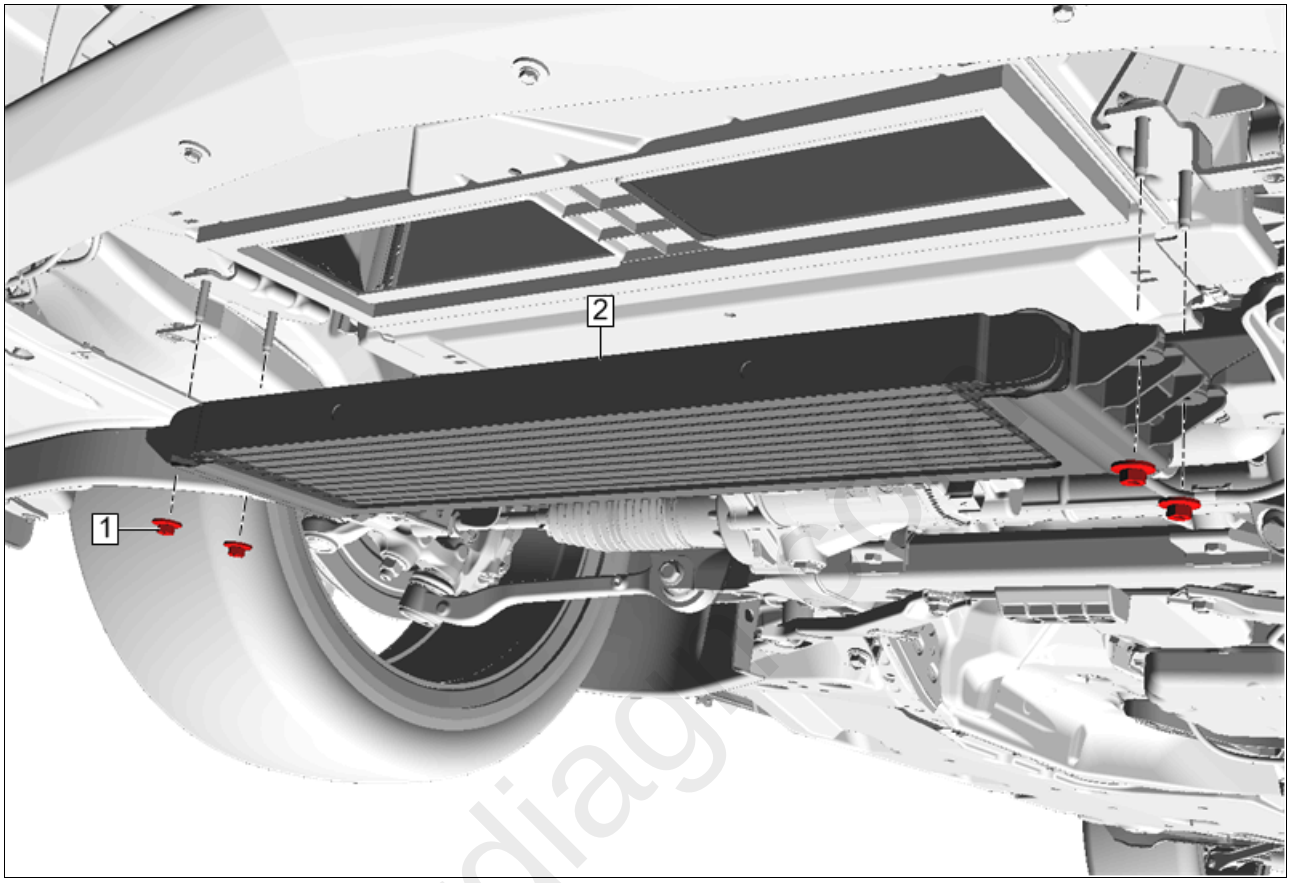
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> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

6. Tighten Engine Oil Cooler Hose Bolt (1) to 10 N.m (89 lb in)
7. Install Front Compartment Side Noise Shield - Front Compartment Side Noise Shield Replacement
8. Install Front Cradle Shear Plate - Front Cradle Shear Plate Replacement
9. Install Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement
10. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

REPAIR INSTRUCTIONS > AUXILIARY ENGINE OIL COOLER REPLACEMENT (LTG WITH Y4Q)

Fig 1: Auxiliary Engine Oil Cooler (LTG with Y4Q)



Courtesy of GENERAL MOTORS COMPANY

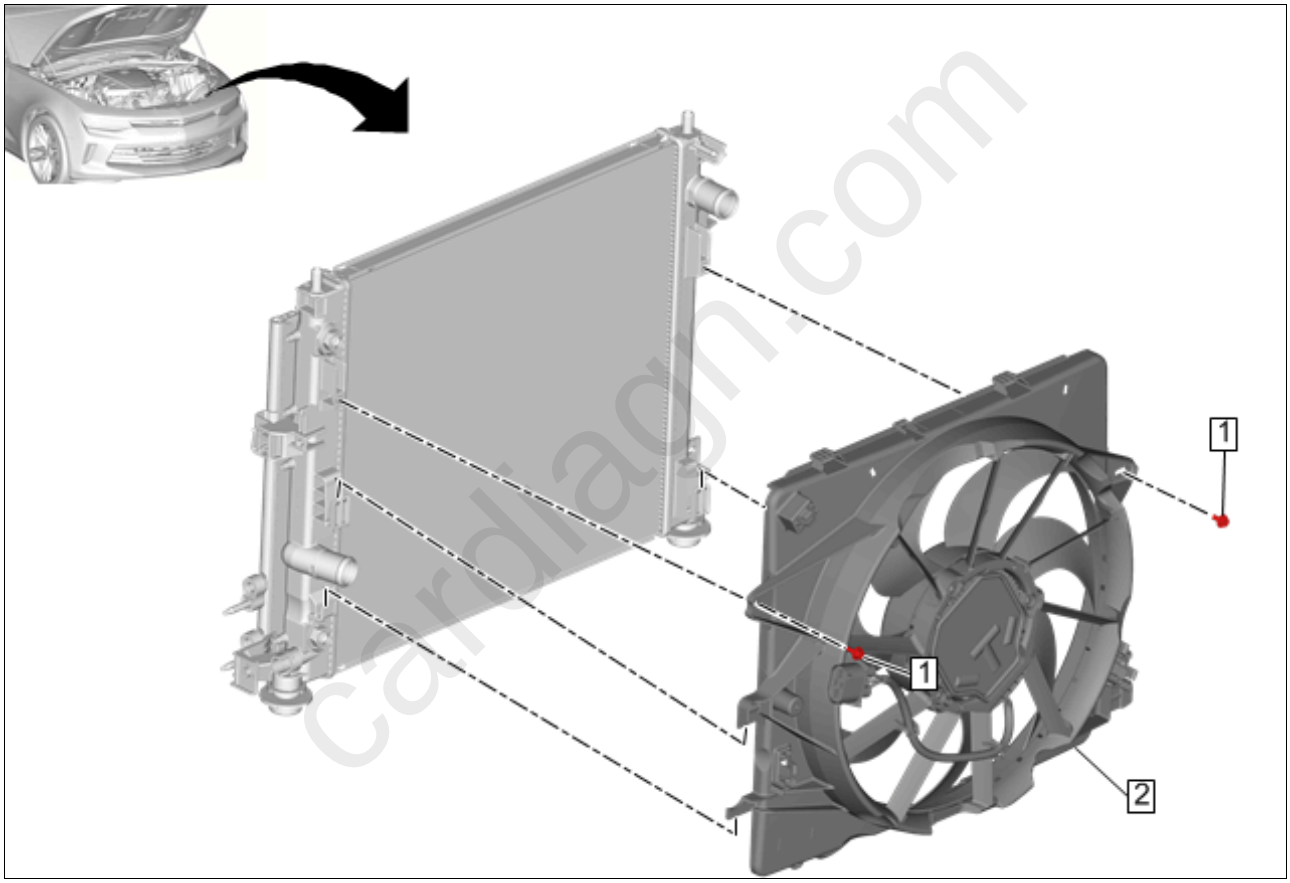
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Callout	Component Name
Preliminary Procedures 1. Drain the engine oil. Engine Oil and Oil Filter Replacement 2. Remove Front Compartment Lower Noise Shield - Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)	
1	Auxiliary Engine Oil Cooler Nut (Qty: 4) *CAUTION:* *Refer to Fastener Caution .*

	Tighten 9 N.m (80 lb in)
2	Auxiliary Engine Oil Cooler **Procedure** Disconnect the engine oil cooler pipes from the auxiliary engine oil cooler. Engine Oil Cooler Pipe Replacement (LTG with Y4Q)

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LGX WITHOUT V03)

Fig 1: Engine Coolant Fan (LGX Without V03)



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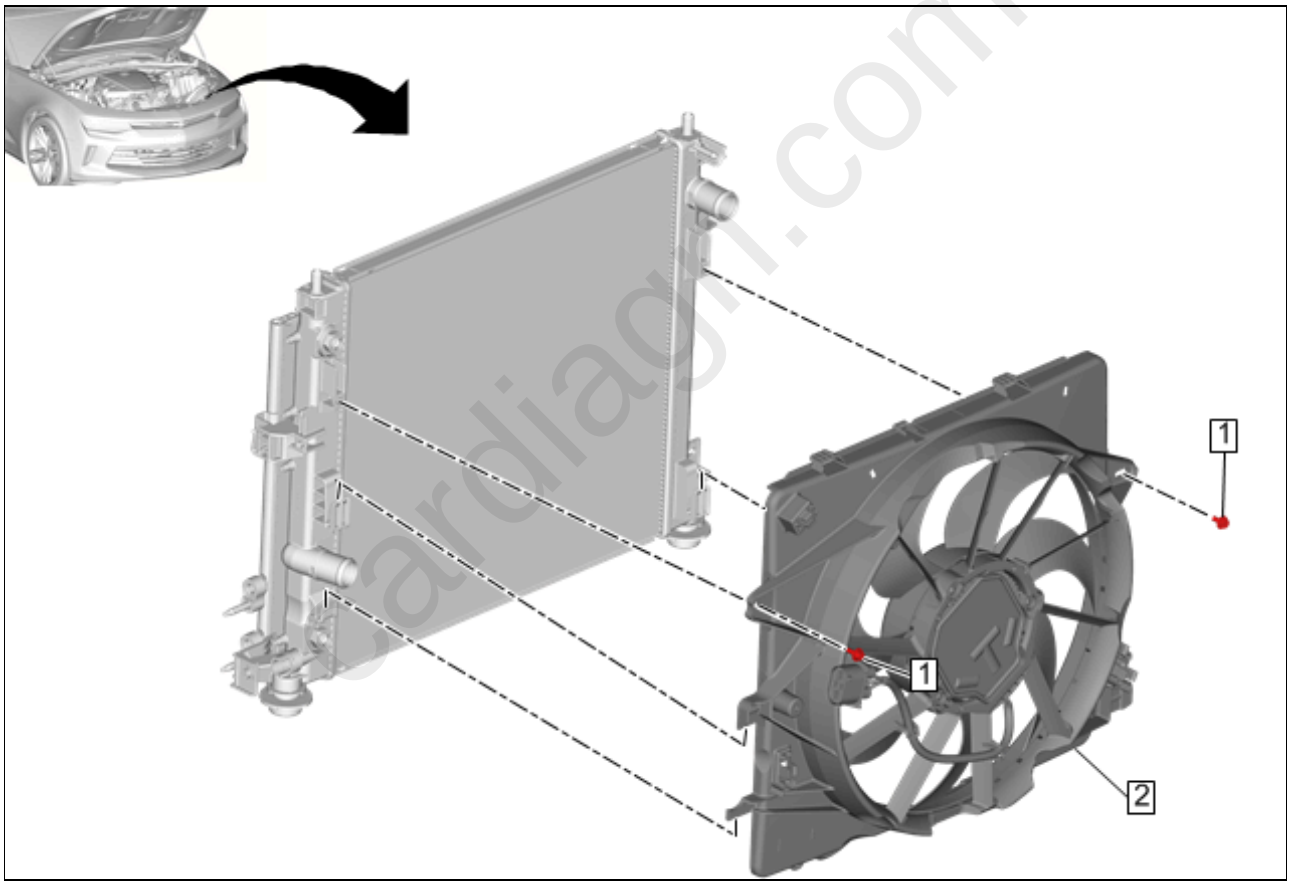
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Air Cleaner Outlet Duct Replacement 2. Disconnect the electrical connector.	

1	Engine Coolant Fan Shroud Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Engine Coolant Fan

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LGX WITH V03)

Fig 1: Engine Coolant Fan (LGX With V03)



Courtesy of GENERAL MOTORS COMPANY

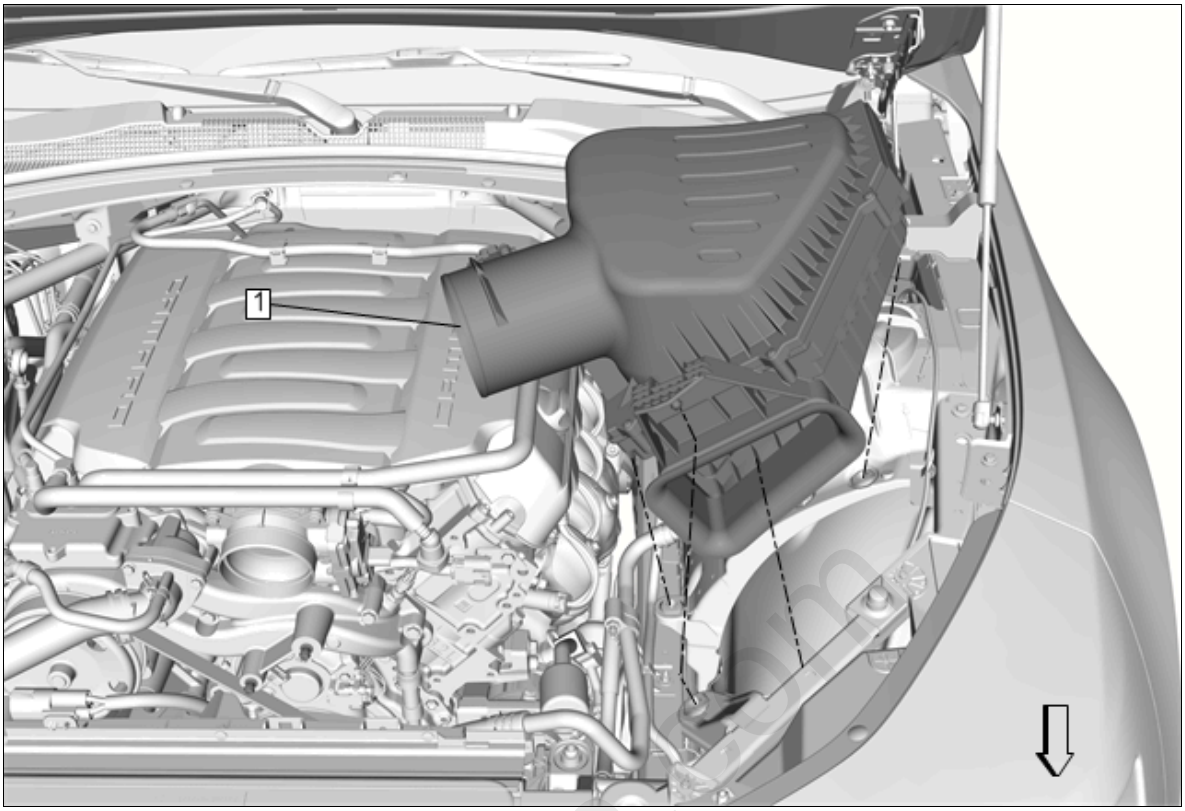
Callout	Component Name
Preliminary Procedures 1. Air Cleaner Outlet Duct Replacement	

	2. Transmission Fluid Cooler Pipe Replacement (LGX With M5T, With V03) 3. Disconnect the electrical connector. 4. Remove Radiator Air Lower Baffle Retainer at Engine Coolant Fan (2) Radiator Air Lower Baffle Replacement (LGX With V03) 5. Remove Radiator Inlet Hose at Radiator Radiator Inlet Hose Replacement (LGX without V18) Radiator Inlet Hose Replacement (LGX with V18)
1	Engine Coolant Fan Shroud Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 9 N.m (80 lb in)
2	Engine Coolant Fan

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LT1 V18) > REMOVAL PROCEDURE

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Fig 1: Air Cleaner Assembly

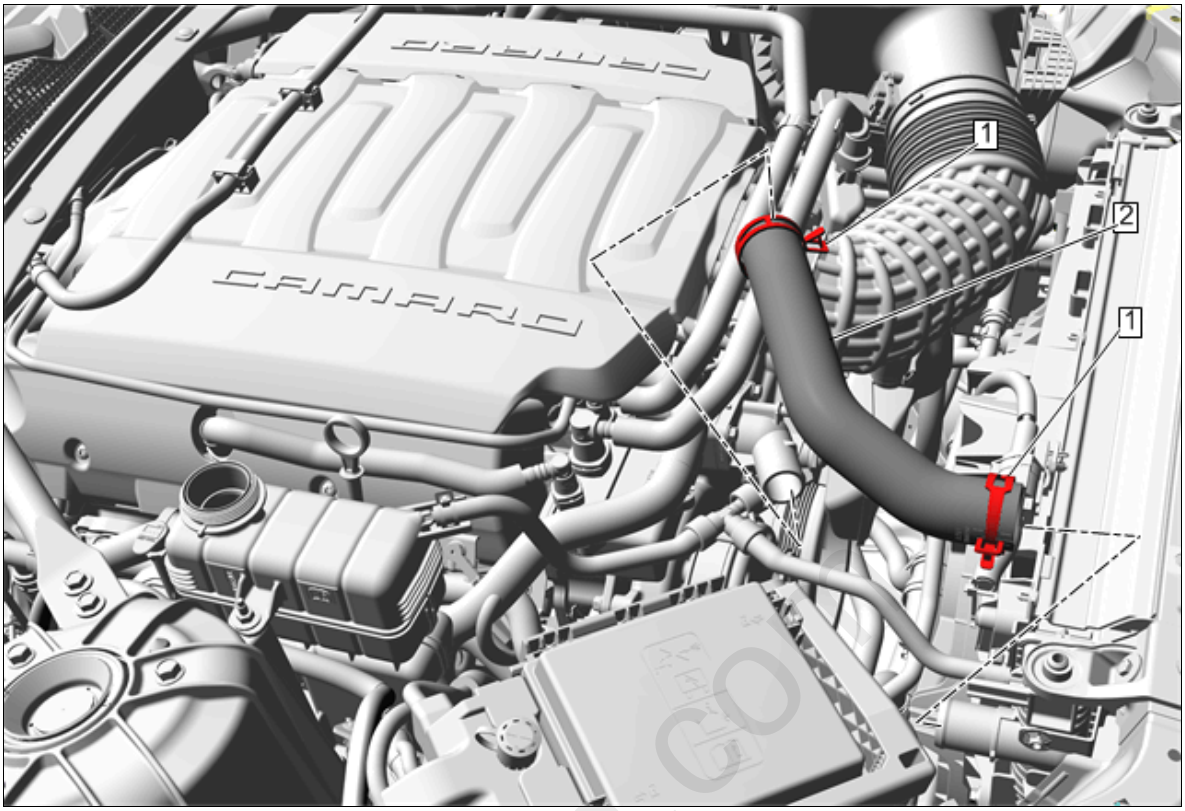


Courtesy of GENERAL MOTORS COMPANY

1. Remove Air Cleaner Assembly Replacement (1)

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Fig 2: Radiator Inlet Hose

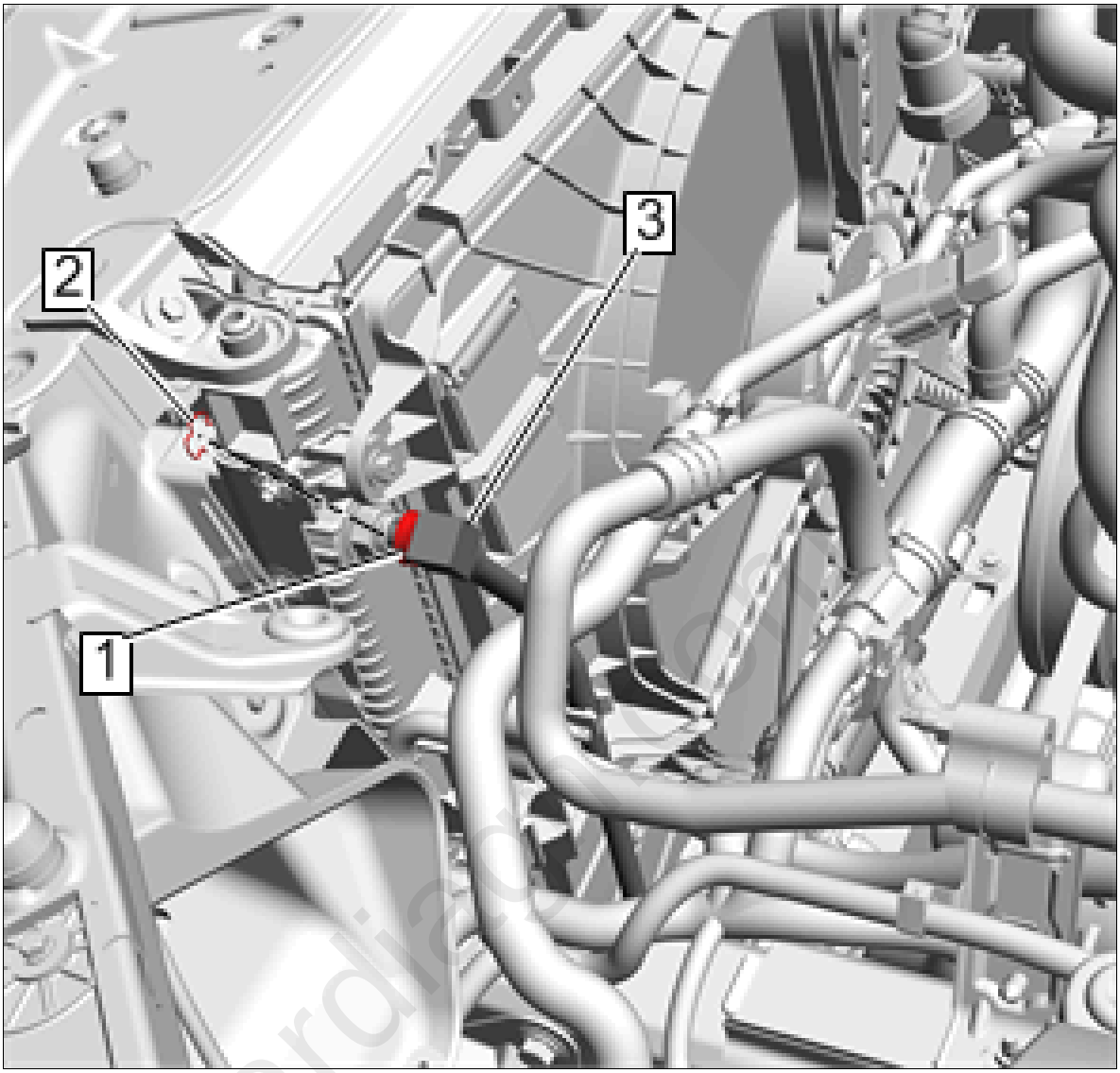


Courtesy of GENERAL MOTORS COMPANY

2. Remove Radiator Inlet Hose Replacement (LT1) (2)

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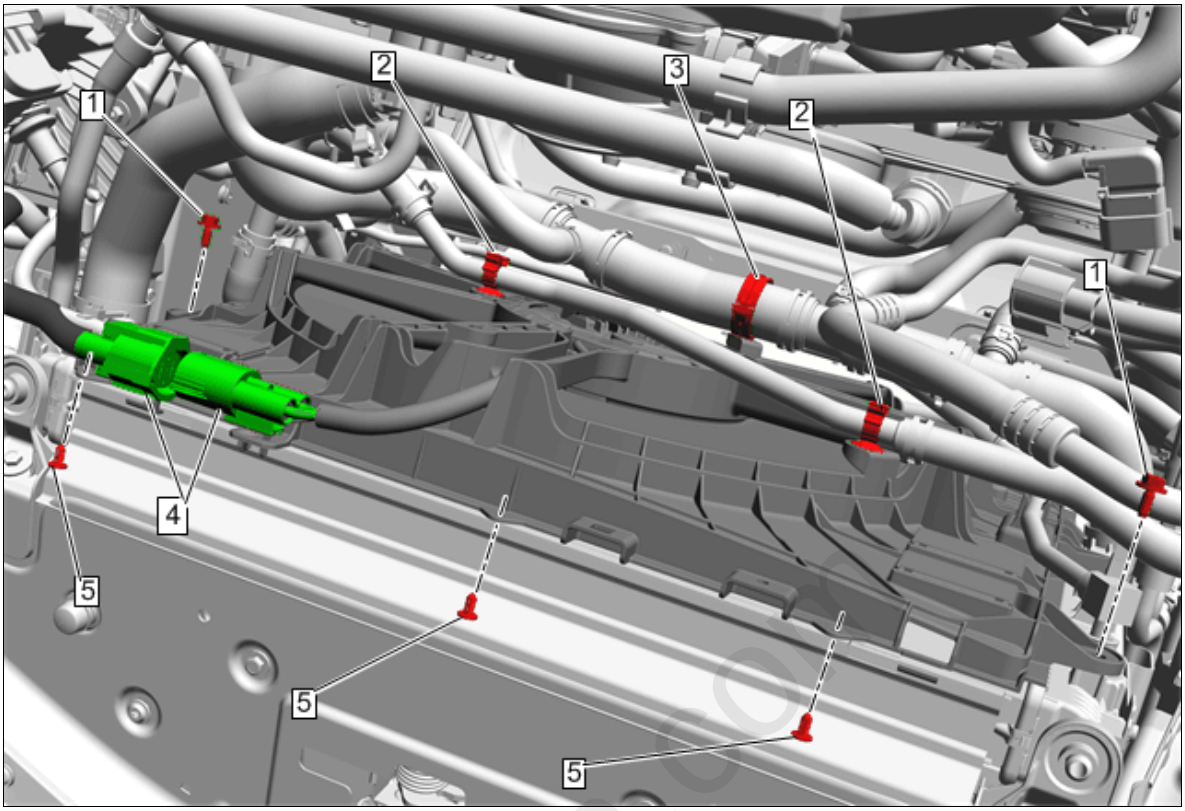
Fig 3: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

3. Slide back Transmission Fluid Cooler Pipe Connector Cap (1)
4. Remove Transmission Fluid Cooler Pipe Fitting Retainer (2)
5. Remove Transmission Fluid Cooler Inlet and Outlet Pipe (3)

Fig 4: Engine Coolant Fan Shroud Bolt

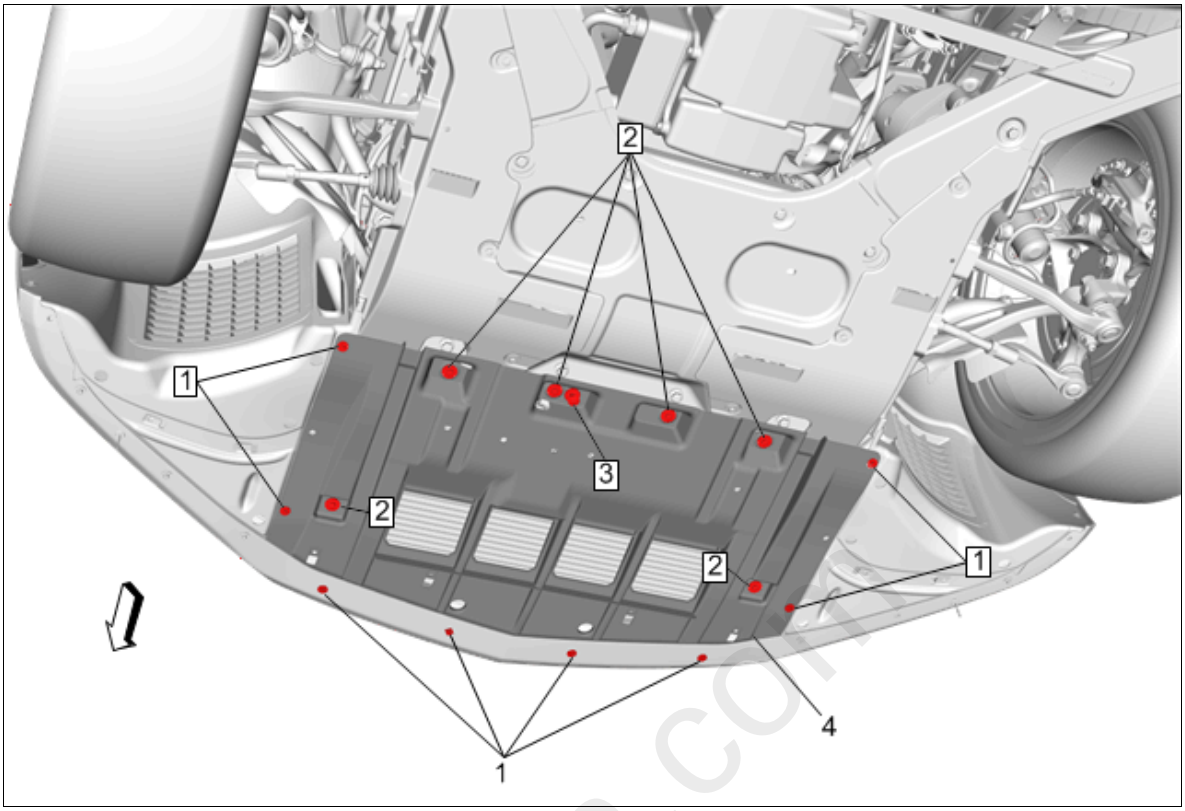


Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Fan Shroud Bolt (1) (Qty: 2)
7. Remove Auxiliary Radiator Inlet Hose Clip (2) (Qty: 2)
8. Remove Radiator Outlet Hose Clip (3)
9. Disconnect the electrical connector (4)
10. Remove Push Pin (5) (Qty: 3)

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Fig 5: Front Compartment Air Deflector (Coupe - LT1)

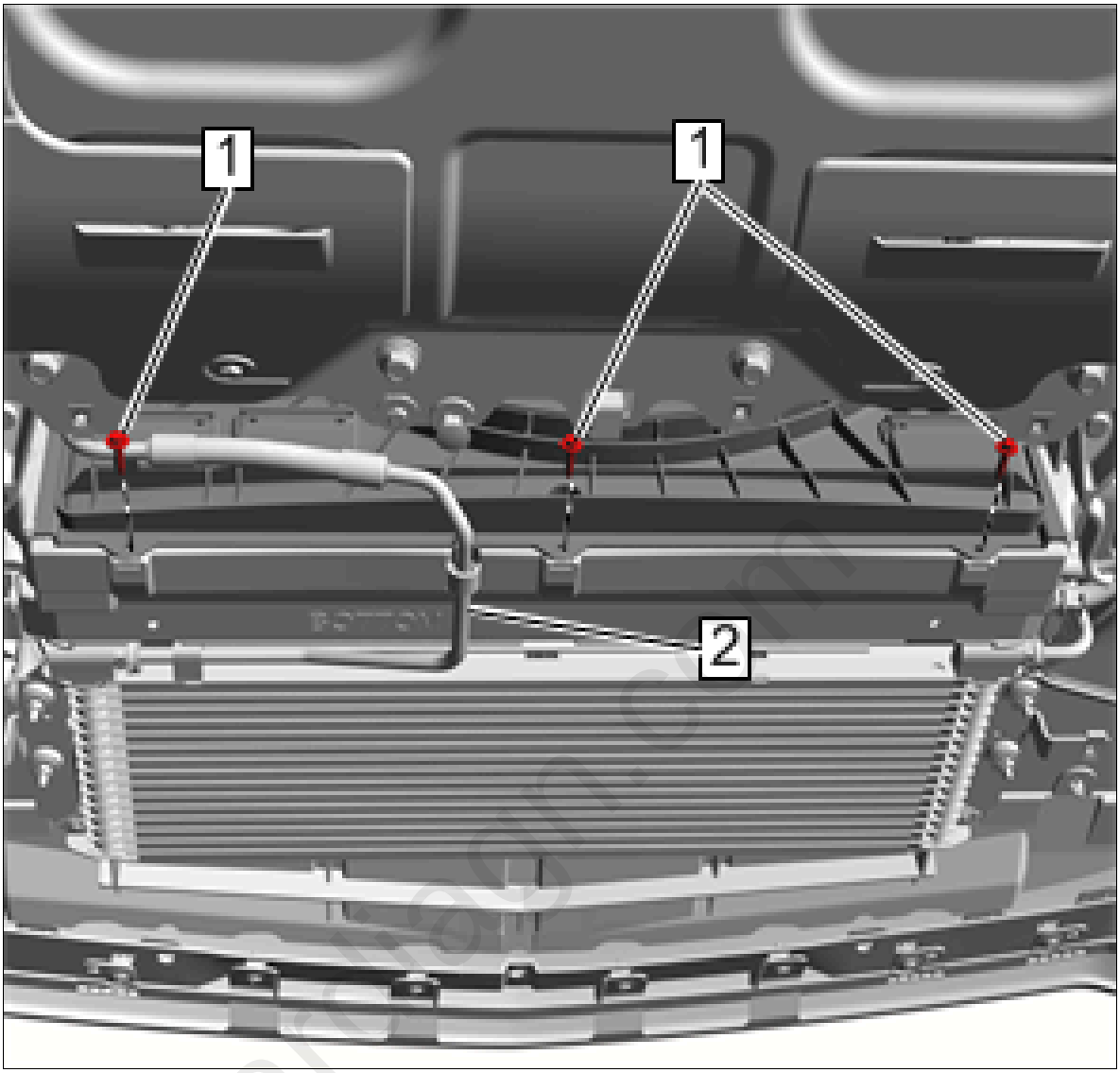


Courtesy of GENERAL MOTORS COMPANY

11. Remove Front Compartment Air Deflector Replacement (Coupe - LT1) (4)

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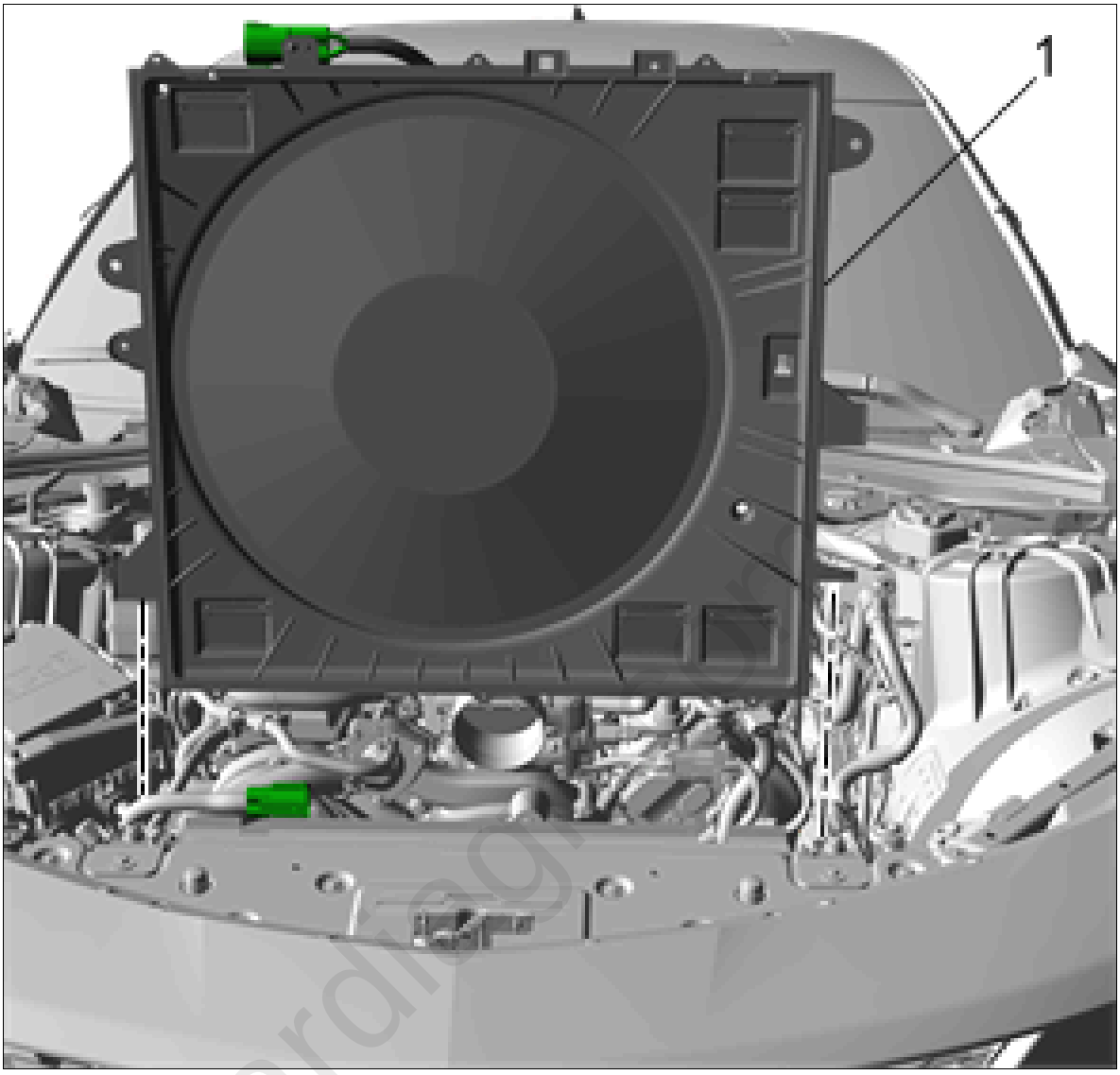
Fig 6: Engine Coolant Fan Shroud Bolt



Courtesy of GENERAL MOTORS COMPANY

12. Remove Engine Coolant Fan Shroud Bolt (1) (Qty: 3)
13. Unclip the transmission inlet and outlet pipe 2 from the engine cooling fan shroud.

Fig 7: Engine Coolant Fan Assembly

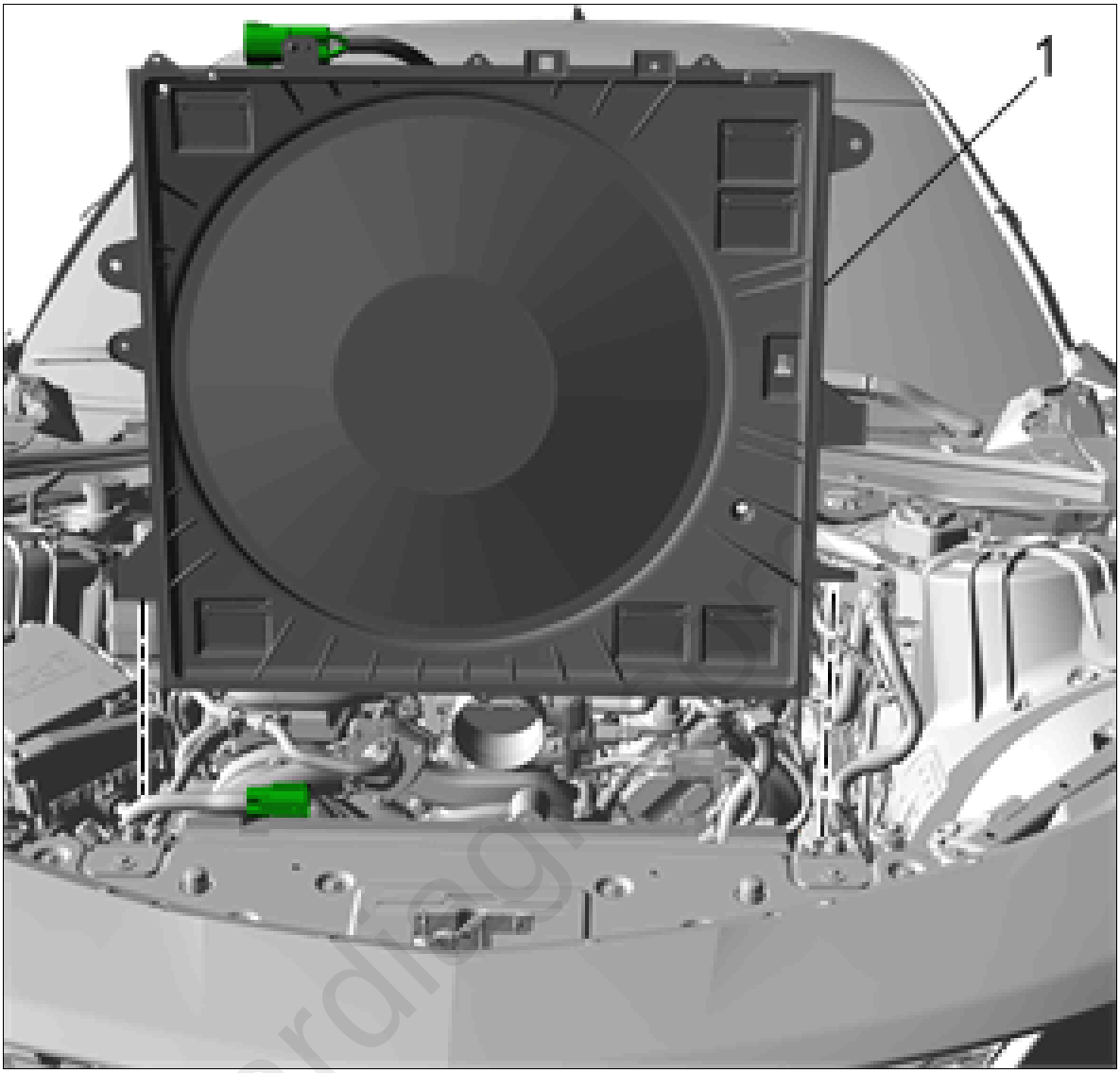


Courtesy of GENERAL MOTORS COMPANY

14. Remove Engine Coolant Fan Assembly (1)

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LT1 V18) > INSTALLATION PROCEDURE

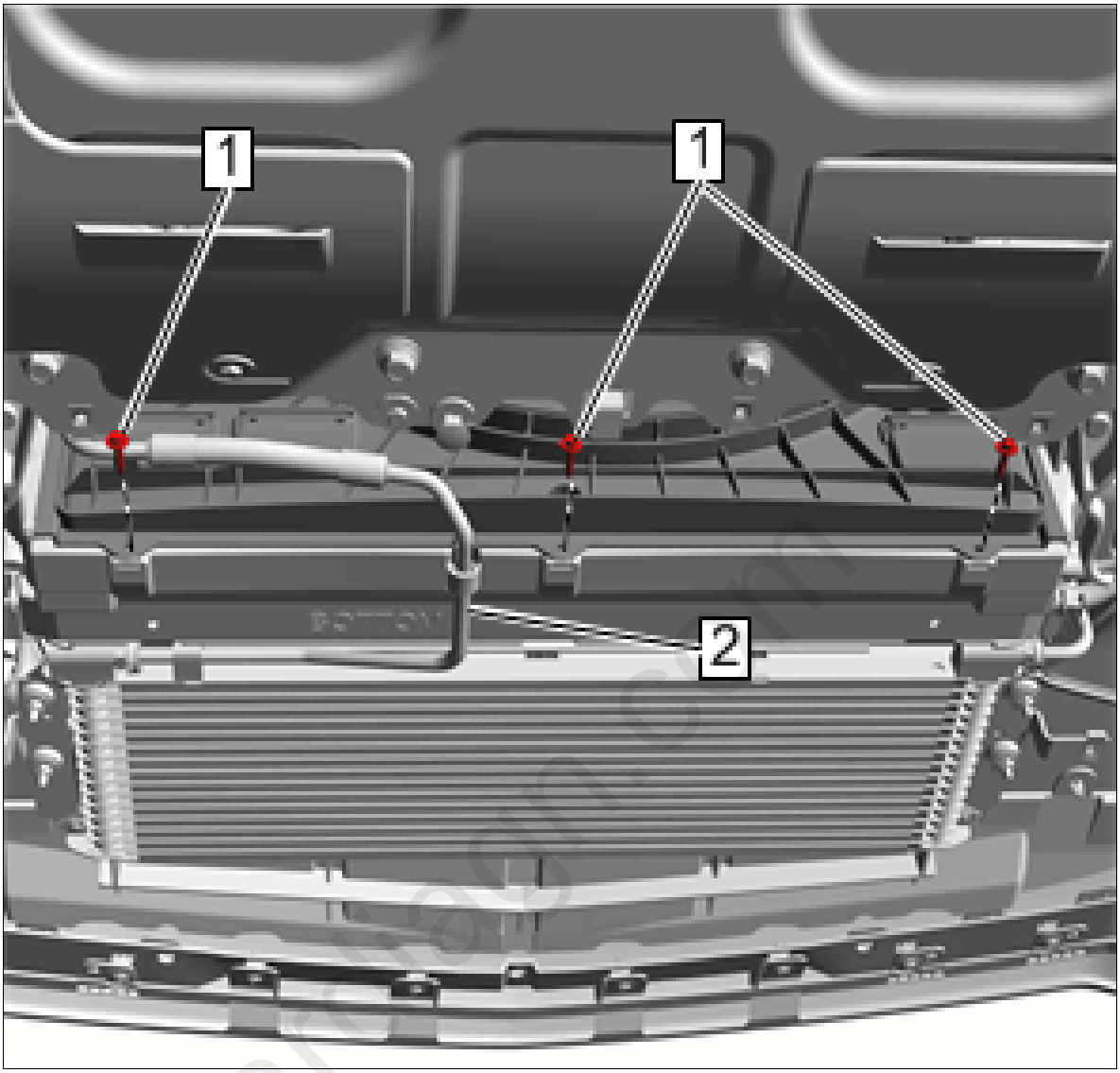
Fig 1: Engine Coolant Fan Assembly



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Fan Assembly (1)

Fig 2: Engine Coolant Fan Shroud Bolt



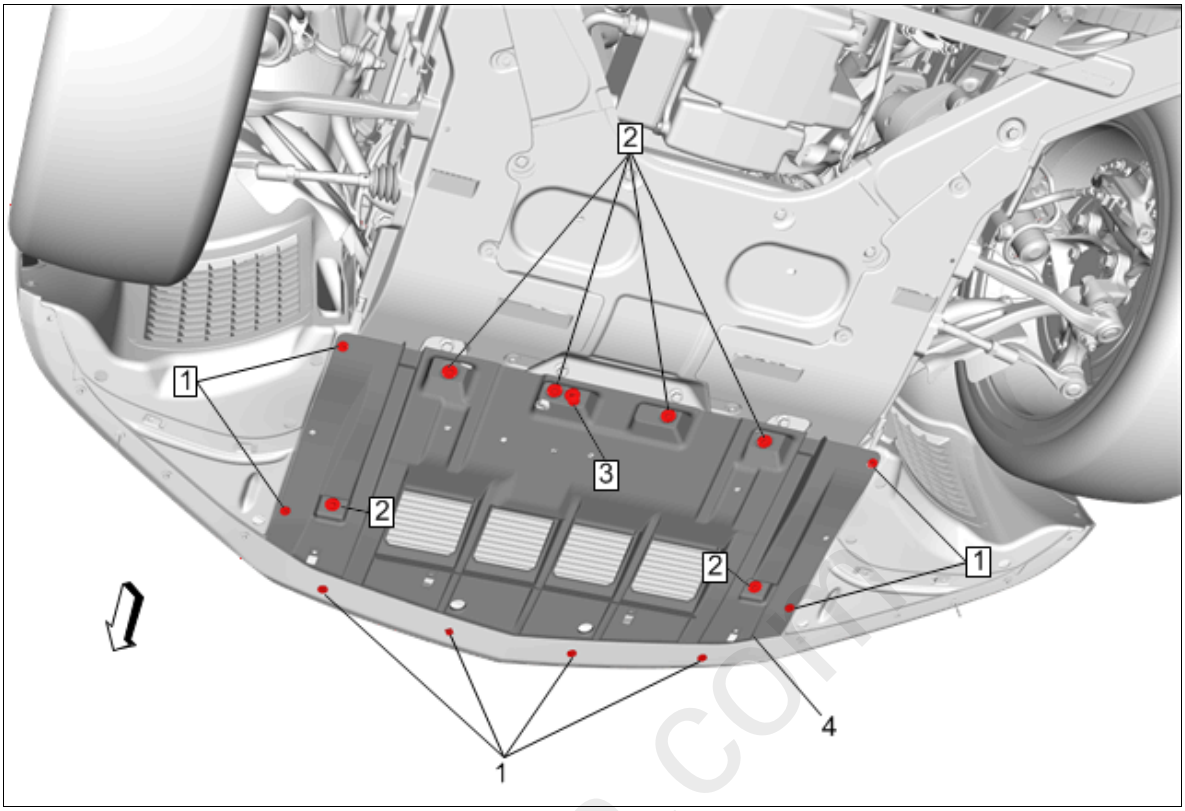
Courtesy of GENERAL MOTORS COMPANY

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> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

2. Install Engine Coolant Fan Shroud Bolt (1) (Qty: 3) and tighten to 9 N.m (80 lb in)
3. Clip the transmission inlet and outlet pipe 2 onto engine cooling fan shroud.

Fig 3: Front Compartment Air Deflector (Coupe - LT1)

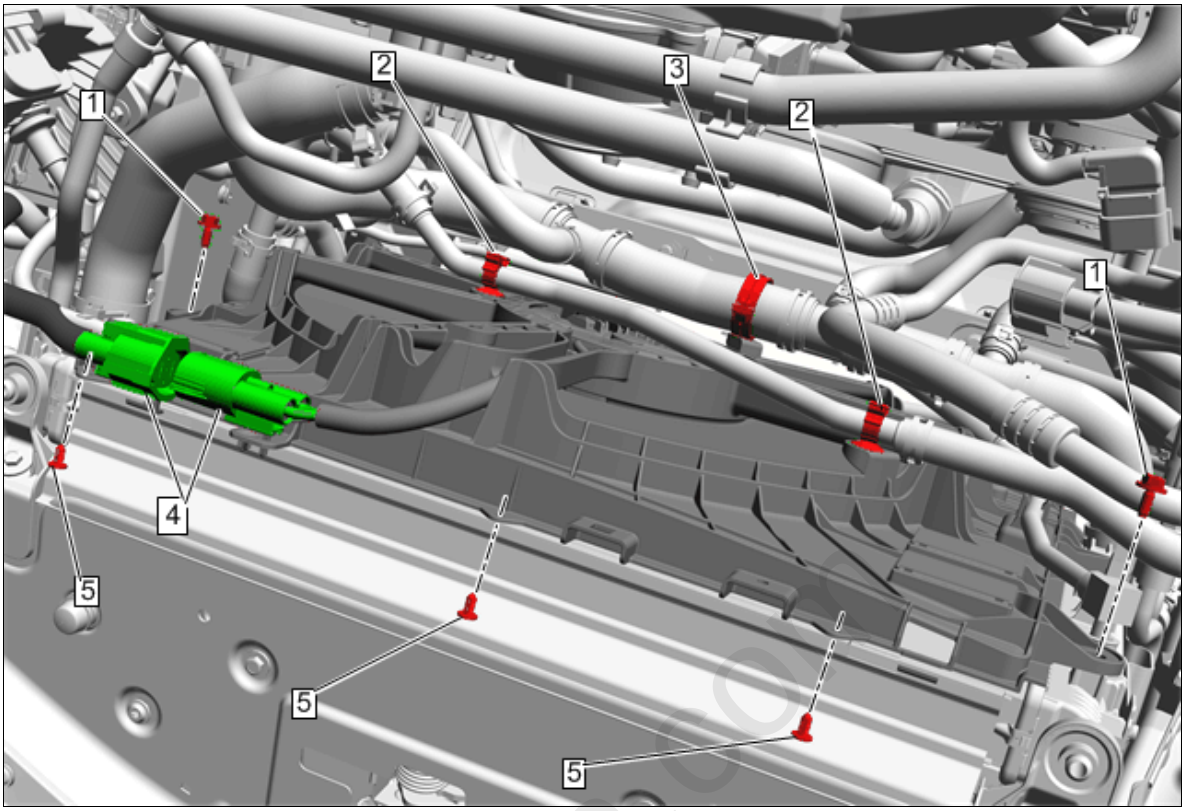


Courtesy of GENERAL MOTORS COMPANY

4. Install Front Compartment Air Deflector Replacement (Coupe - LT1) (4)

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Fig 4: Engine Coolant Fan Shroud Bolt

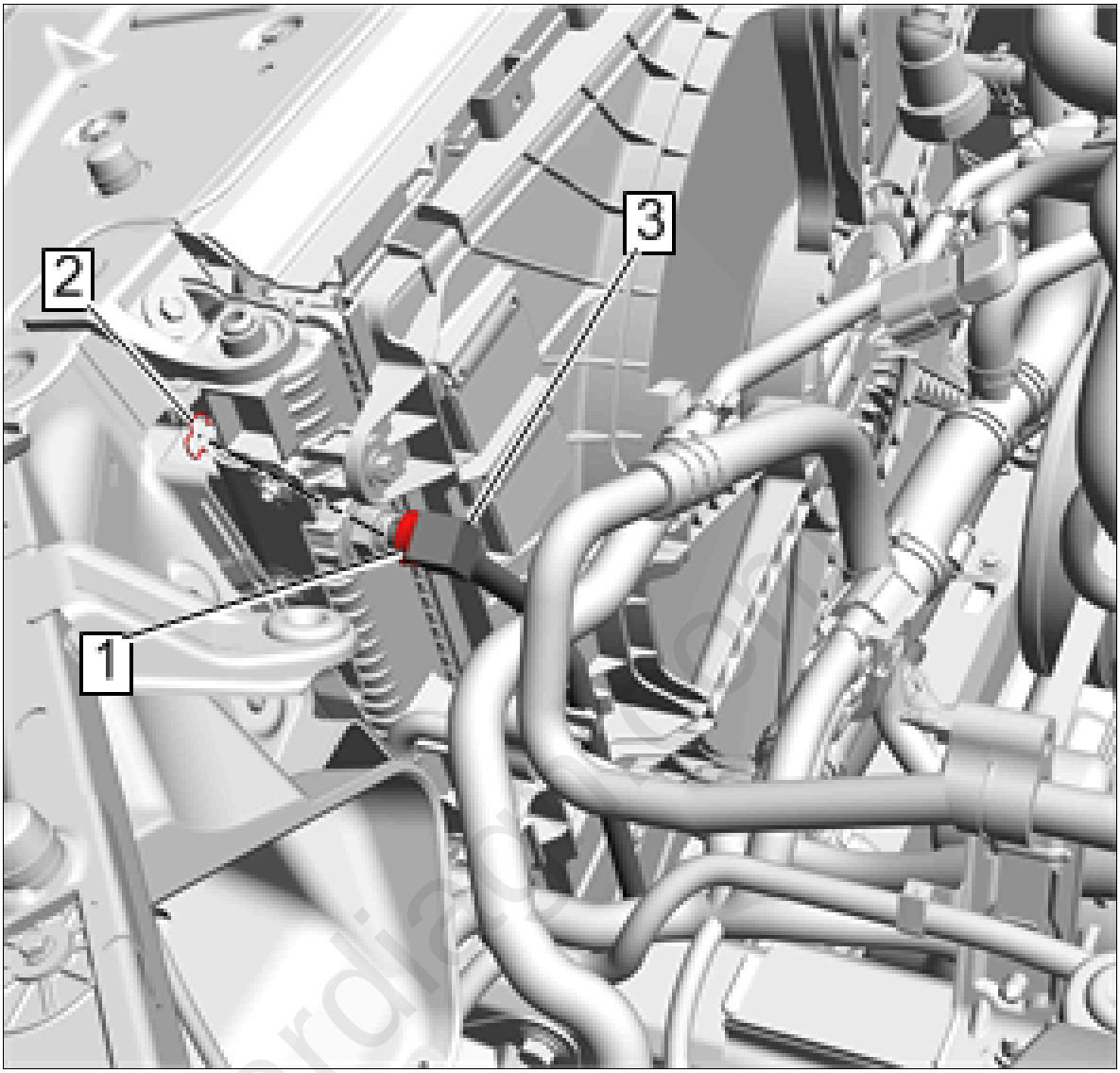


Courtesy of GENERAL MOTORS COMPANY

5. Install Engine Coolant Fan Shroud Bolt (1) (Qty: 2) and tighten to 9 N.m (80 lb in)
6. Install Auxiliary Radiator Inlet Hose Clip (2) (Qty: 2)
7. Install Radiator Outlet Hose Clip (3)
8. Connect the electrical connector (2)
9. Remove Push Pin (5) (Qty: 3)

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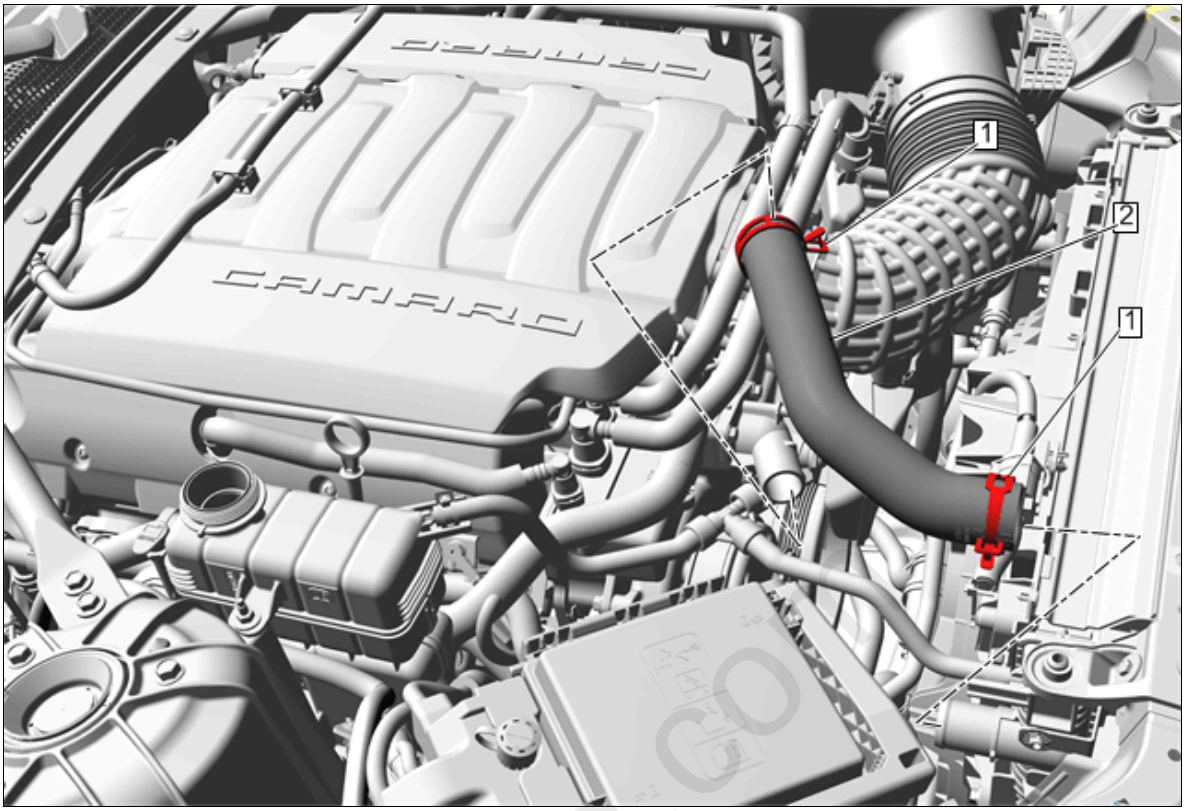
Fig 5: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

10. Install Transmission Fluid Cooler Pipe Fitting Retainer (2)
11. Install Transmission Fluid Cooler Inlet and Outlet Pipe (3)
12. Install Transmission Fluid Cooler Pipe Connector Cap (1)

Fig 6: Radiator Inlet Hose

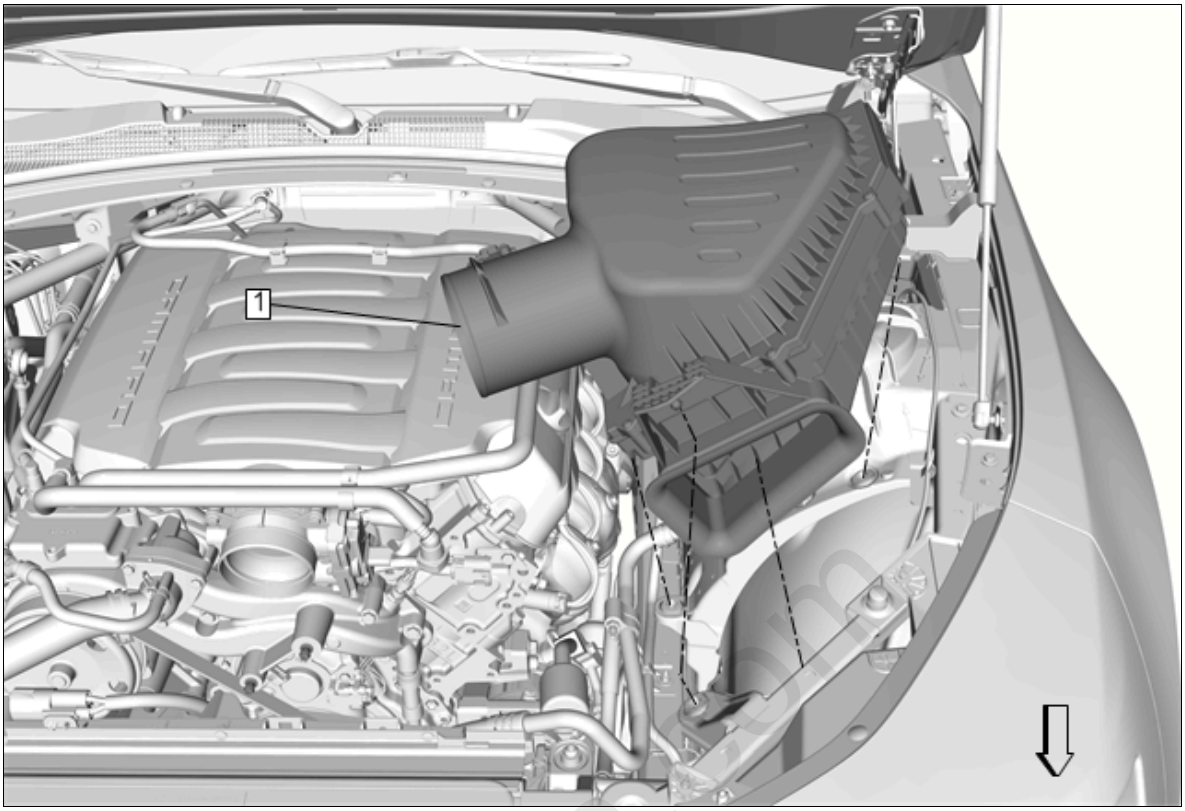


Courtesy of GENERAL MOTORS COMPANY

13. Install Radiator Inlet Hose Replacement (LT1) (2)

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Fig 7: Air Cleaner Assembly



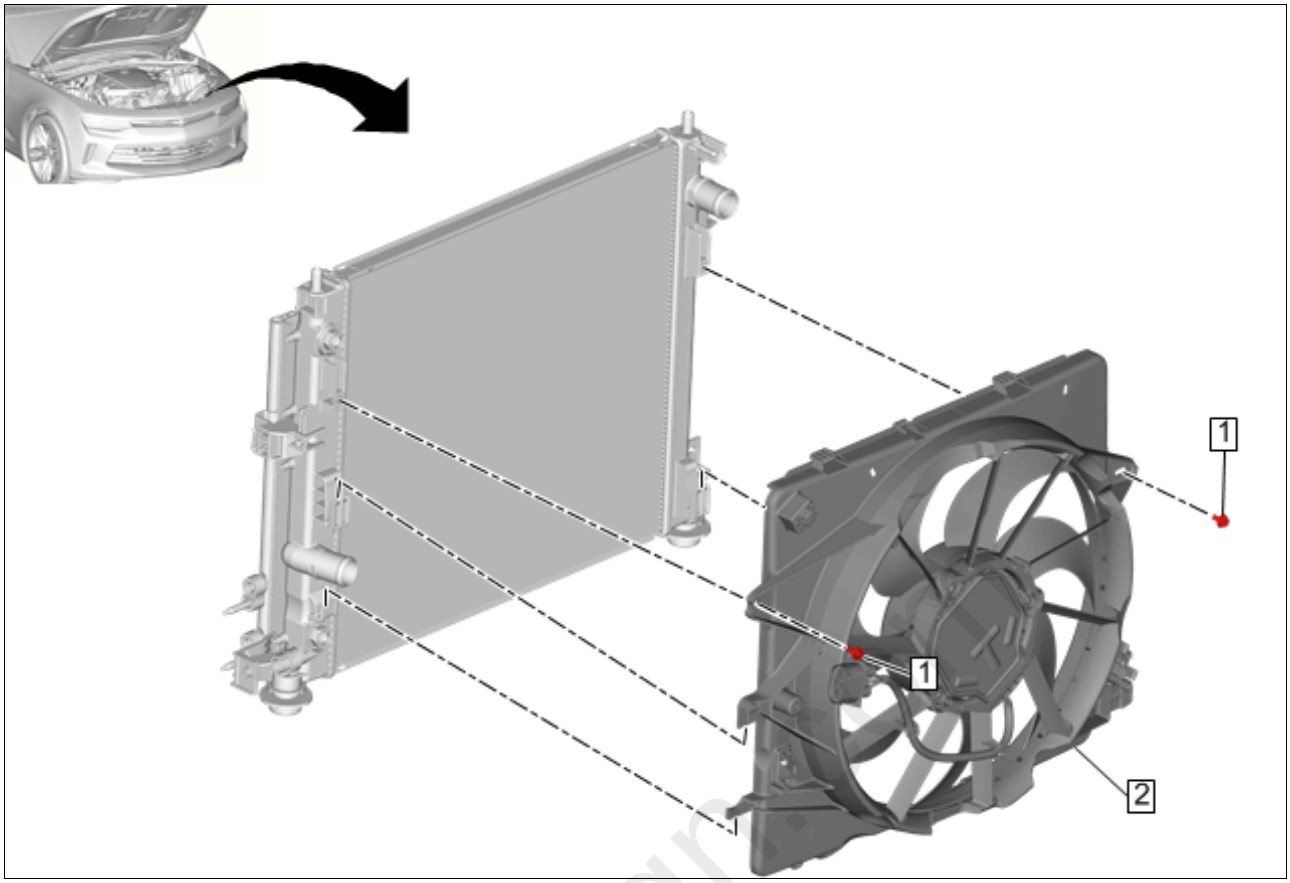
Courtesy of GENERAL MOTORS COMPANY

14. Install Air Cleaner Assembly Replacement (1)

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LTG WITHOUT V18)

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Fig 1: Engine Coolant Fan (LTG without V18)



Courtesy of GENERAL MOTORS COMPANY

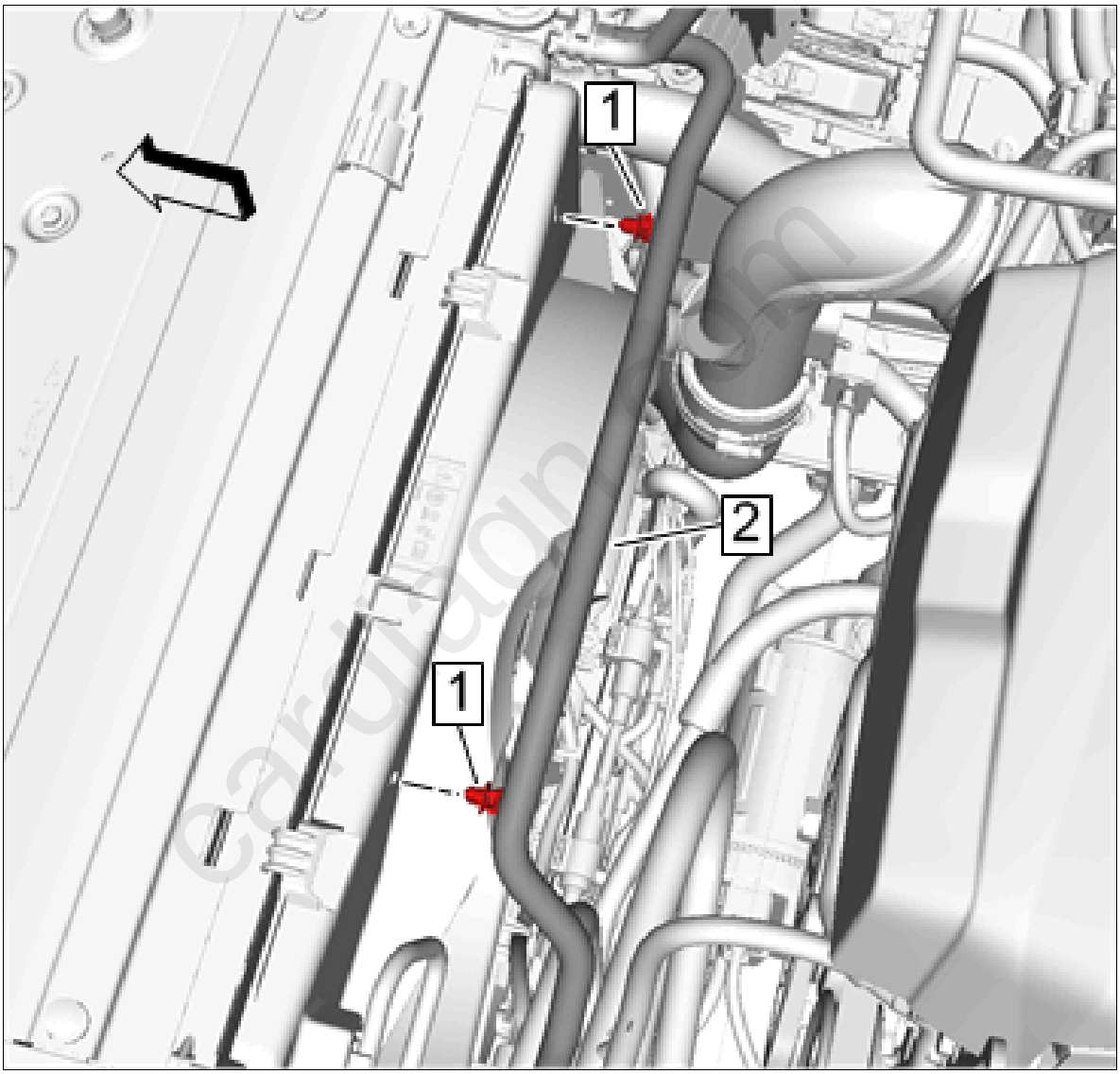
Callout	Component Name
Preliminary Procedures 1. Air Cleaner Outlet Duct Replacement 2. Remove Engine Mount Vacuum Filter at Engine Coolant Fan - Engine Mount Vacuum Filter Replacement 3. Disconnect the electrical connector.	
1	Engine Coolant Fan Shroud Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* Tighten to 5.5 N.m (49 lb in)
2	Engine Coolant Fan

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REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LTG WITH V18) > REMOVAL PROCEDURE

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

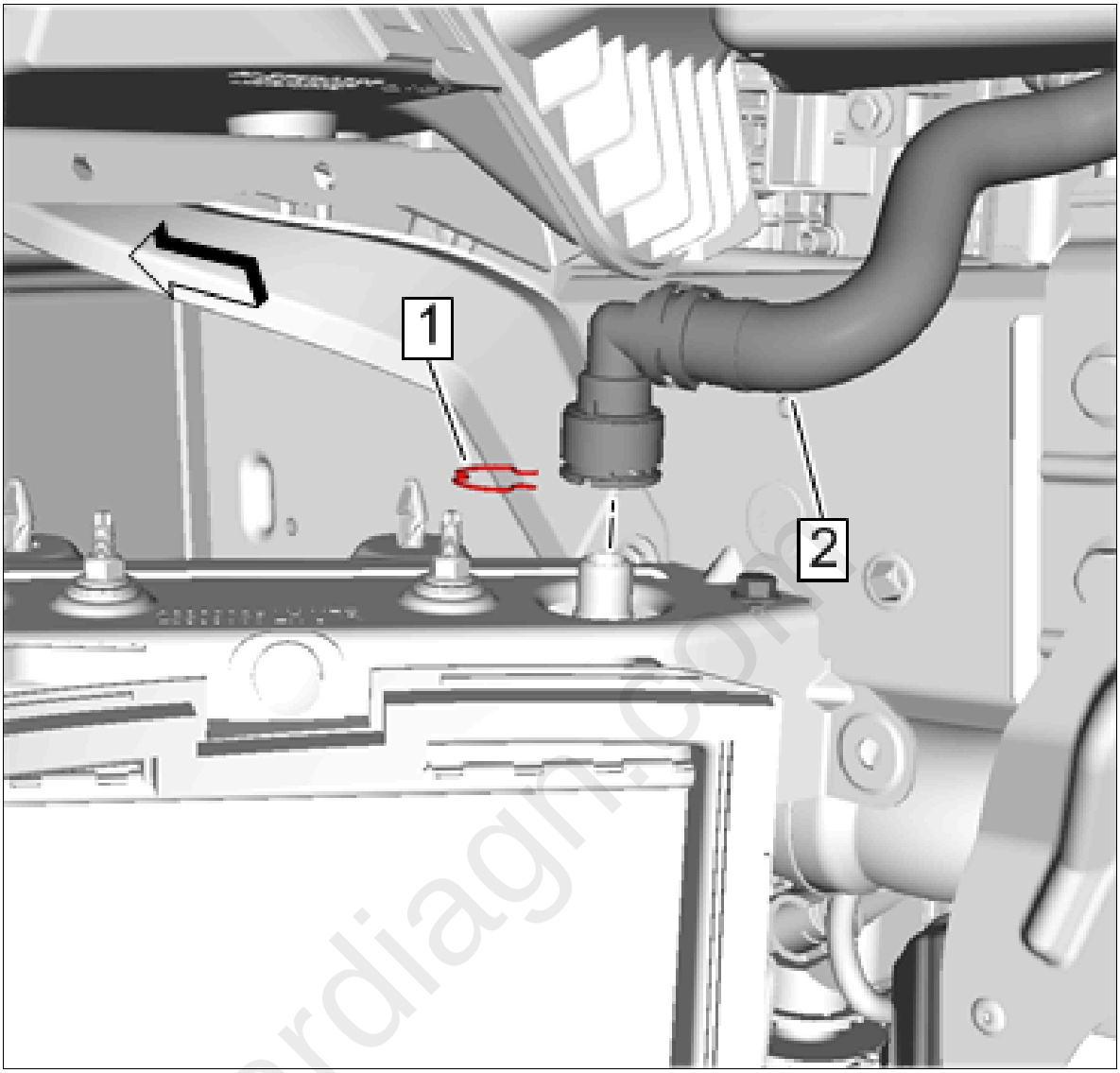
   Fig 1: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

3. Remove Auxiliary Radiator Inlet Hose Retainer (1) (Qty: 2) at Engine Coolant Fan

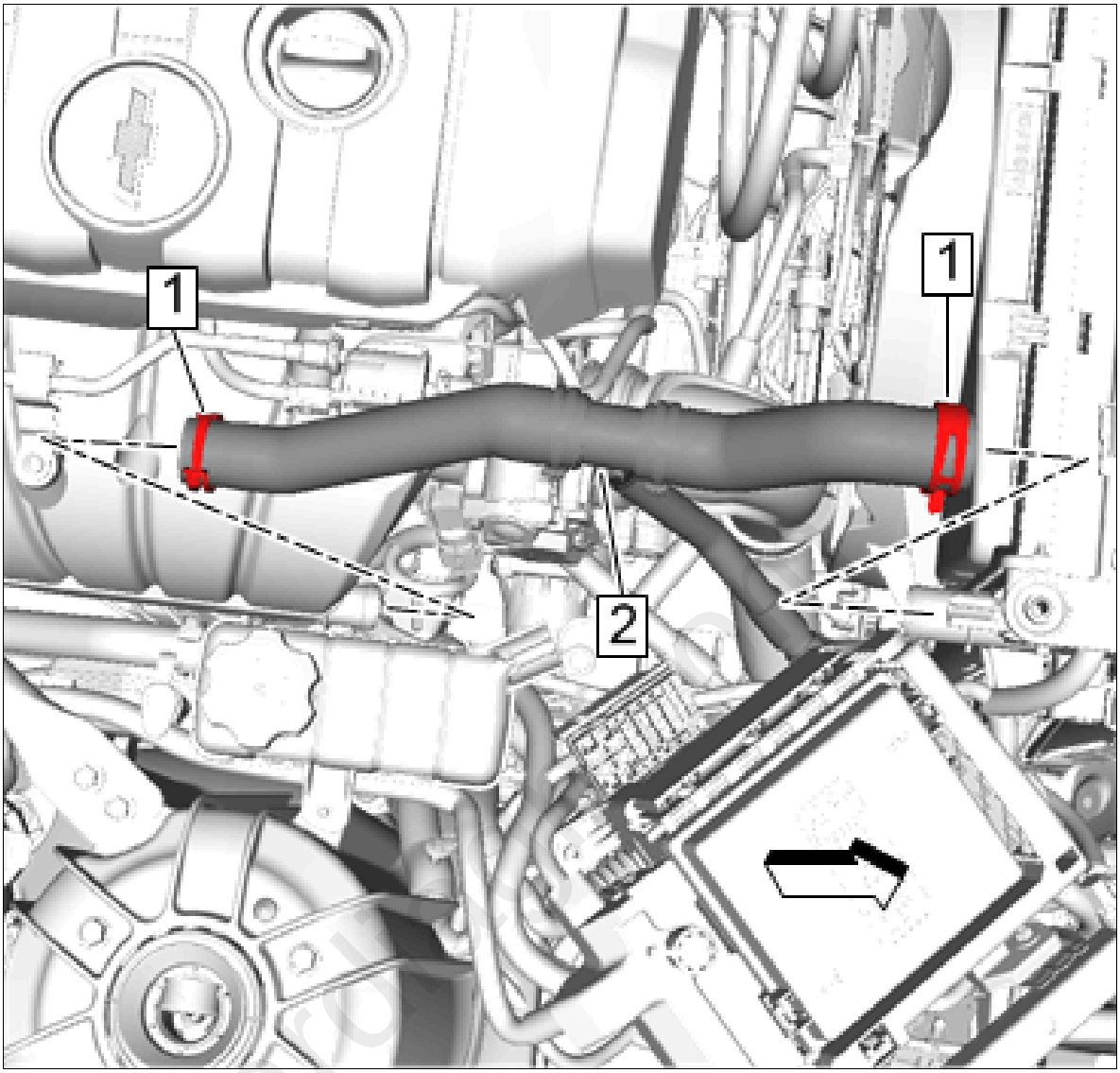
Fig 2: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

4. Remove Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler Left Side and position aside - Auxiliary Radiator Inlet Hose Replacement (LTG with V18)

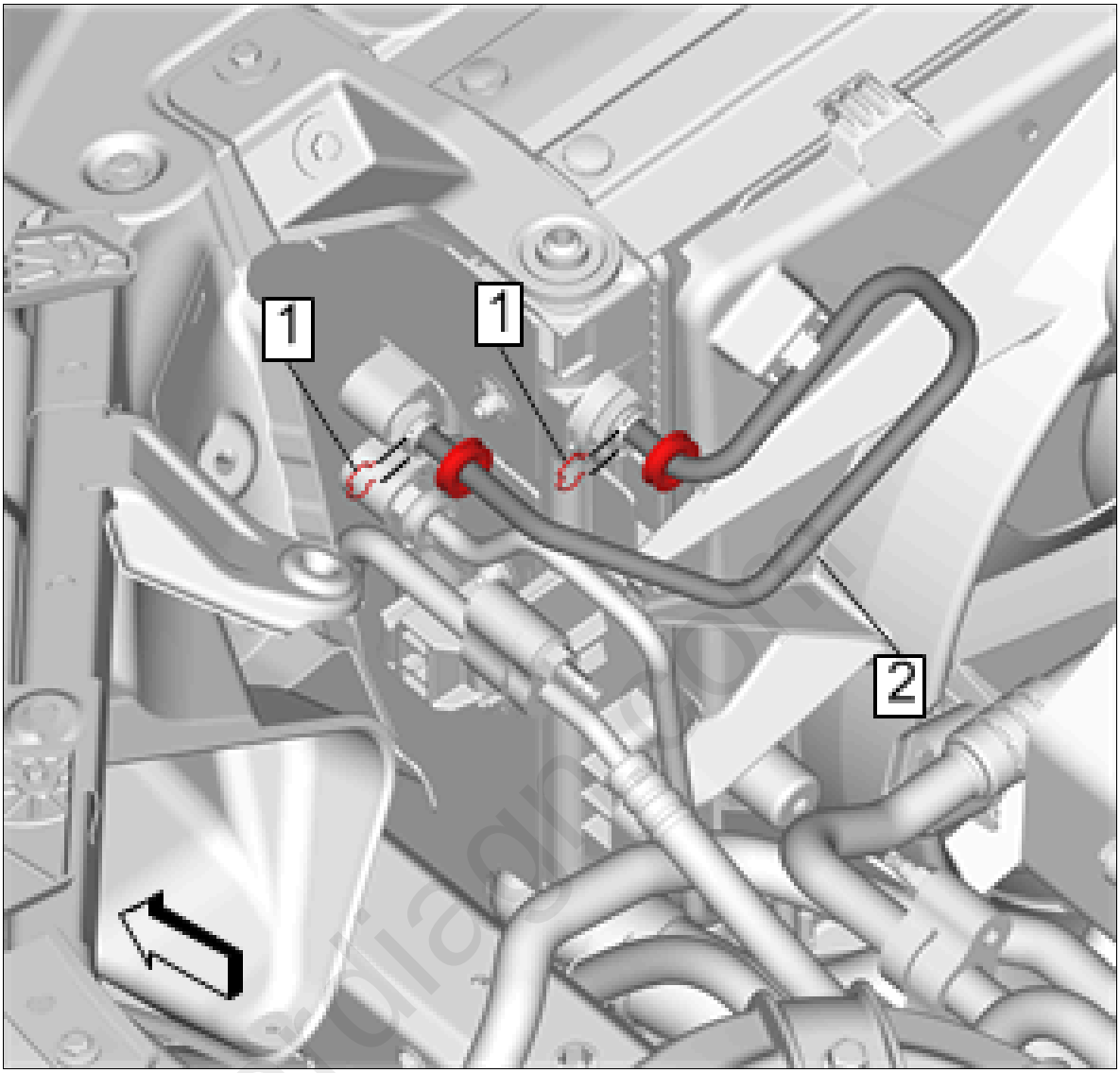
Fig 3: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG with V18)

Fig 4: Transmission Fluid Cooler Pipe

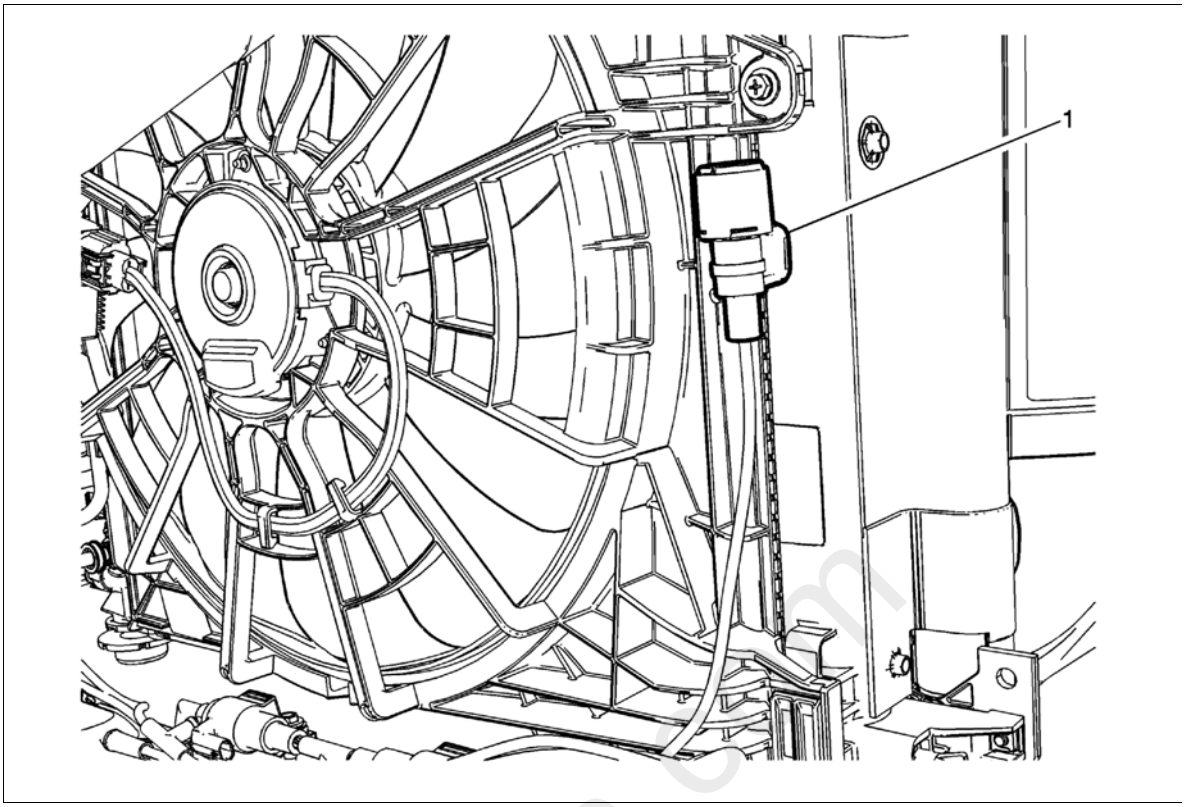


Courtesy of GENERAL MOTORS COMPANY

6. { If equipped }Remove Transmission Fluid Cooler Pipe (2) at Radiator - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)

7. Remove Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

Fig 5: Engine Mount Vacuum Filter

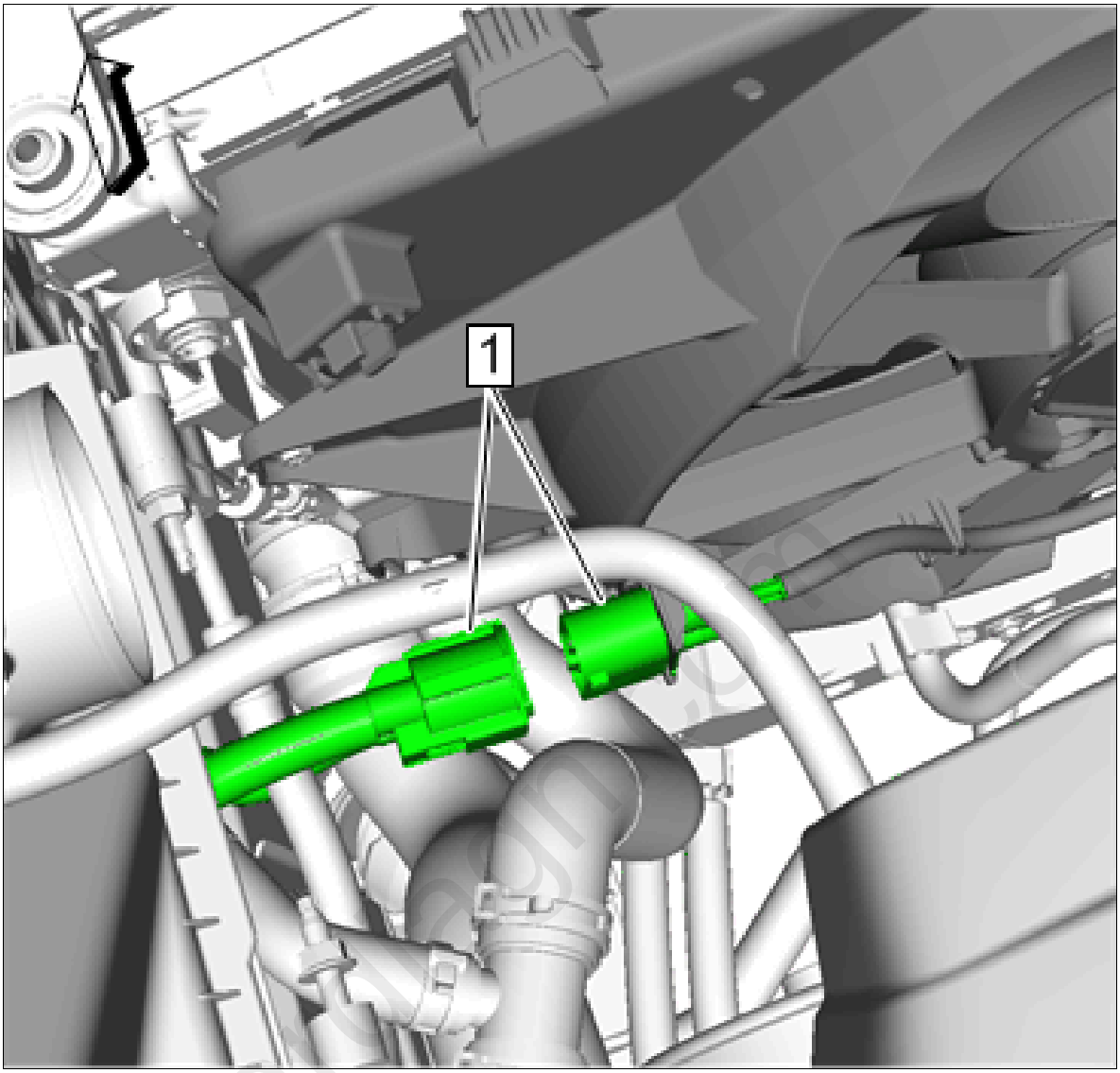


Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Mount Vacuum Filter (1) at Engine Coolant Fan - Engine Mount Vacuum Filter Replacement

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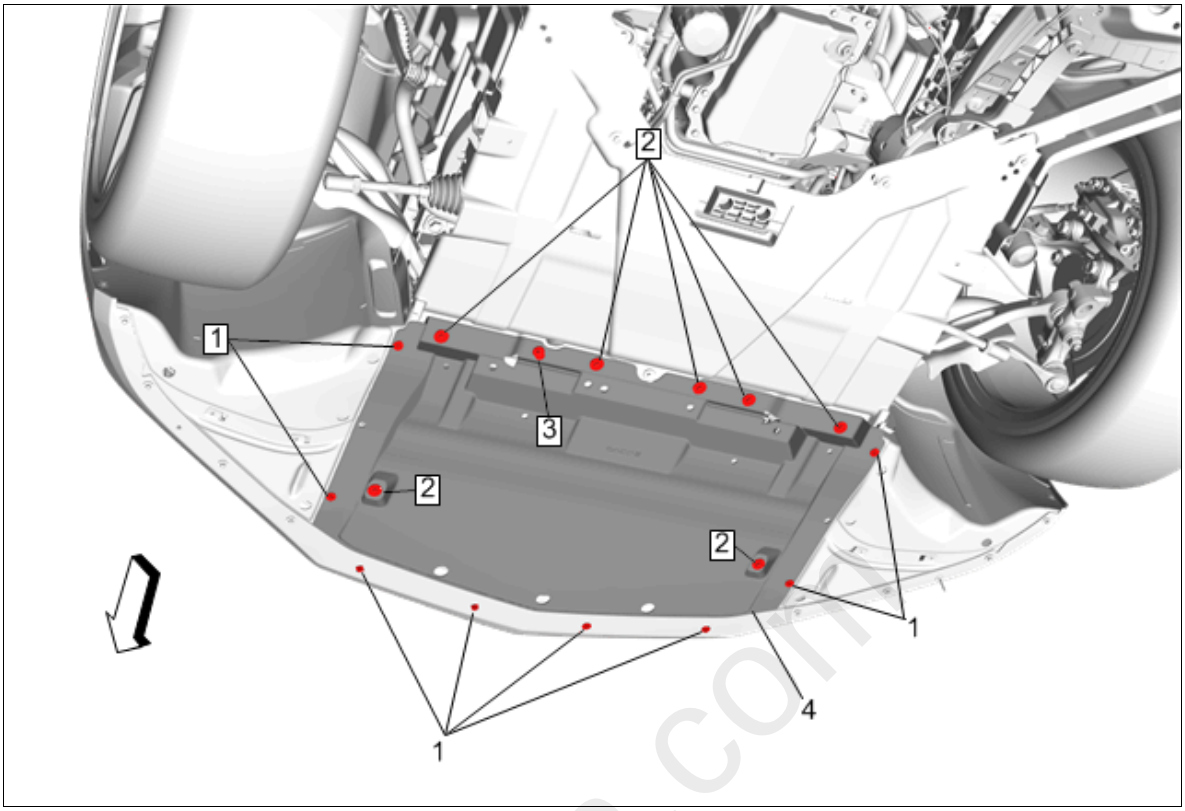
Fig 6: Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

9. Disconnect the electrical connector (1)

Fig 7: Front Compartment Air Deflector (Coupe - LGX, LTG)

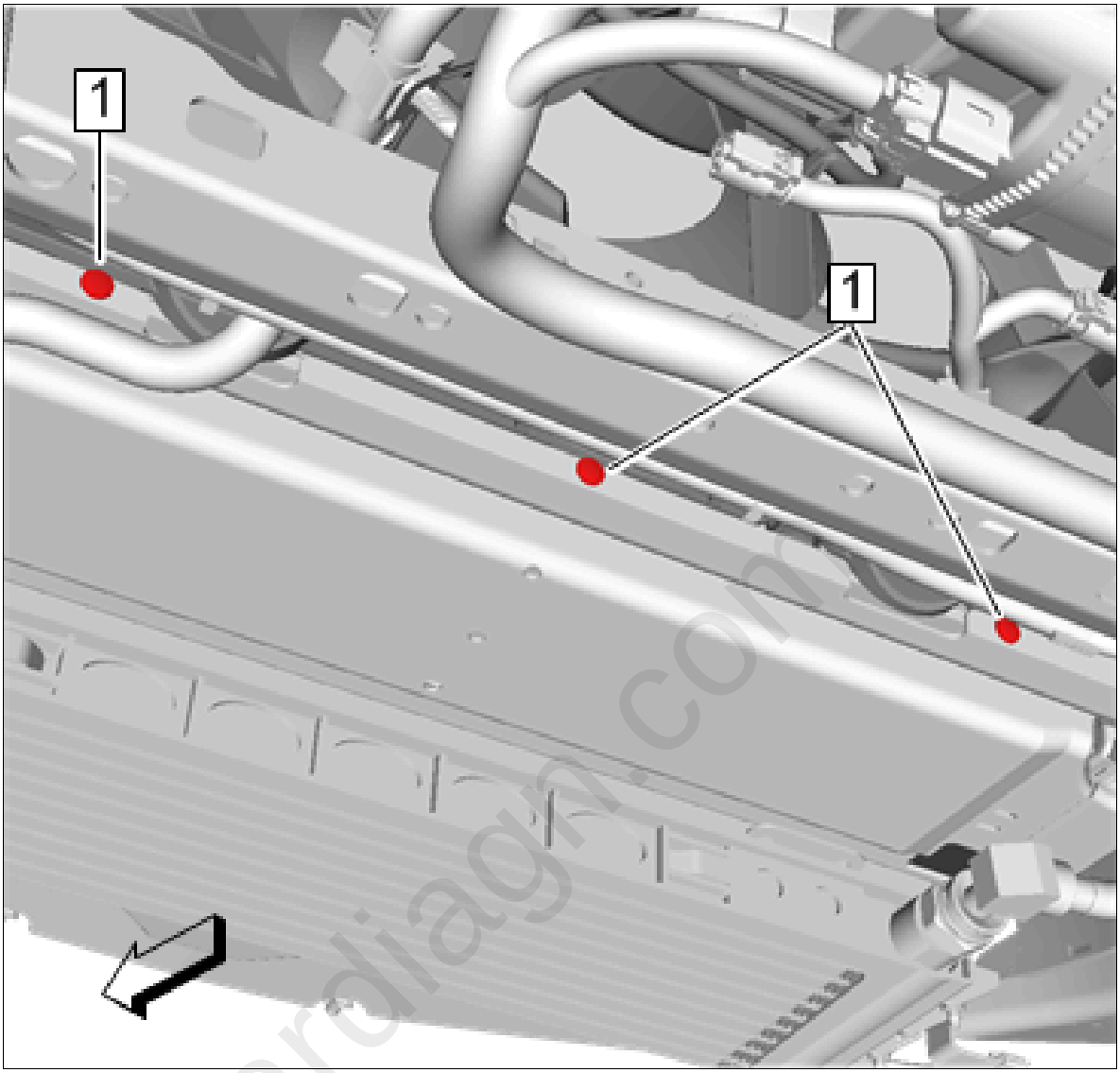


Courtesy of GENERAL MOTORS COMPANY

10. Remove Front Compartment Air Deflector (4) - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)

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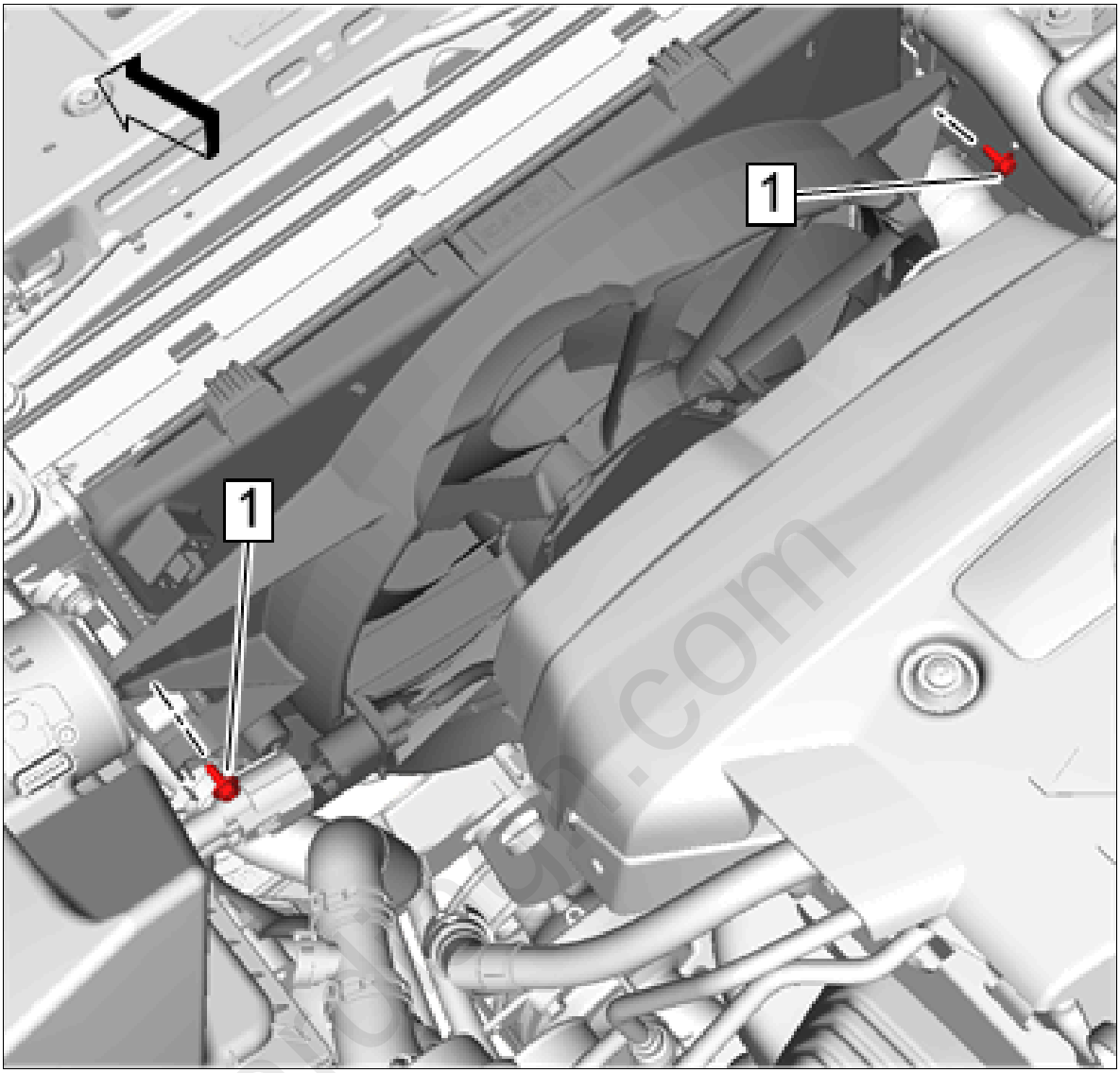
Fig 8: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

11. Remove Radiator Air Baffle Retainer (1) (Qty: 3)

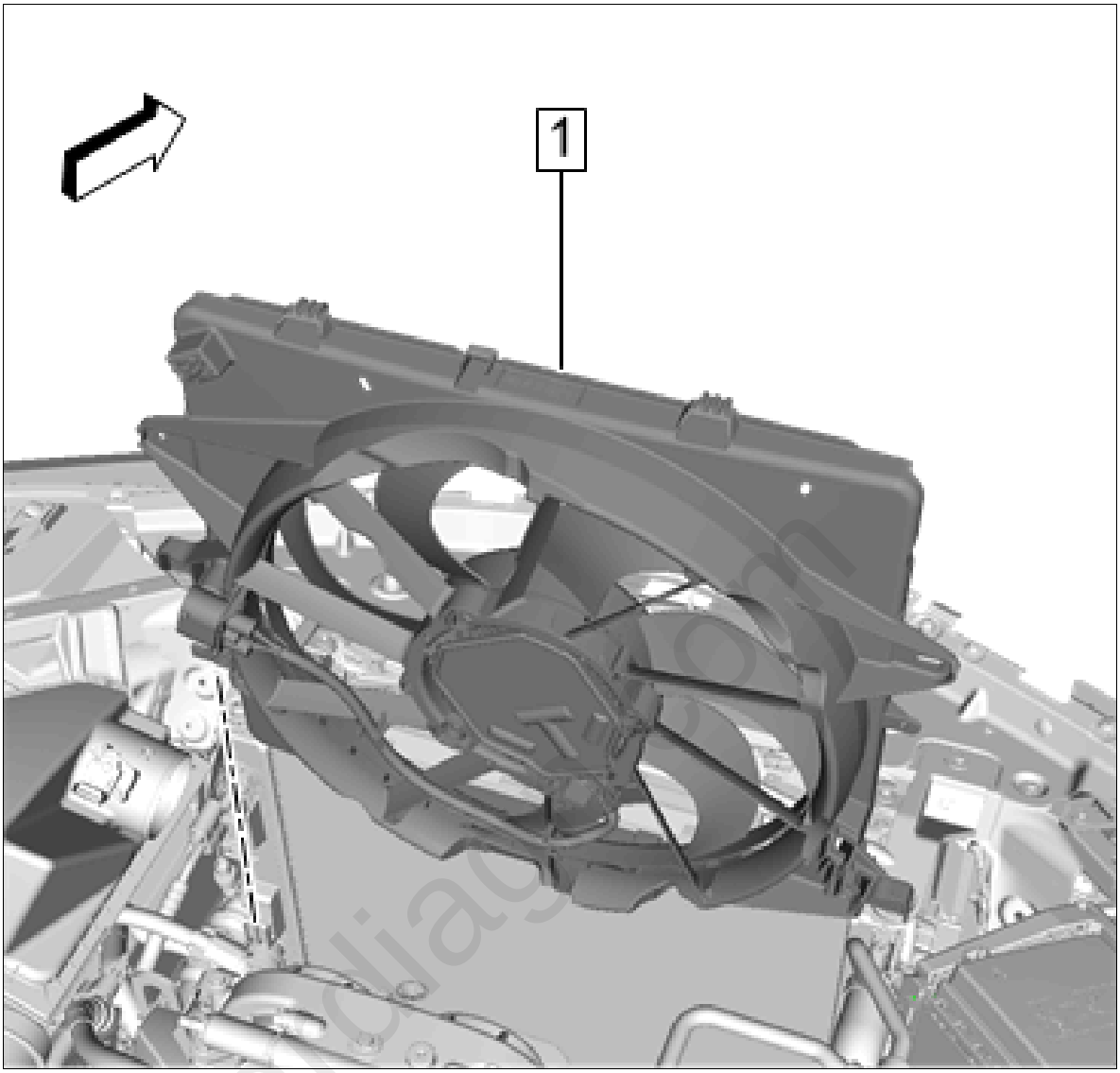
Fig 9: Engine Coolant Fan Shroud Bolt



Courtesy of GENERAL MOTORS COMPANY

12. Remove Engine Coolant Fan Shroud Bolt (1) (Qty: 2) at Radiator

Fig 10: Engine Coolant Fan Assembly

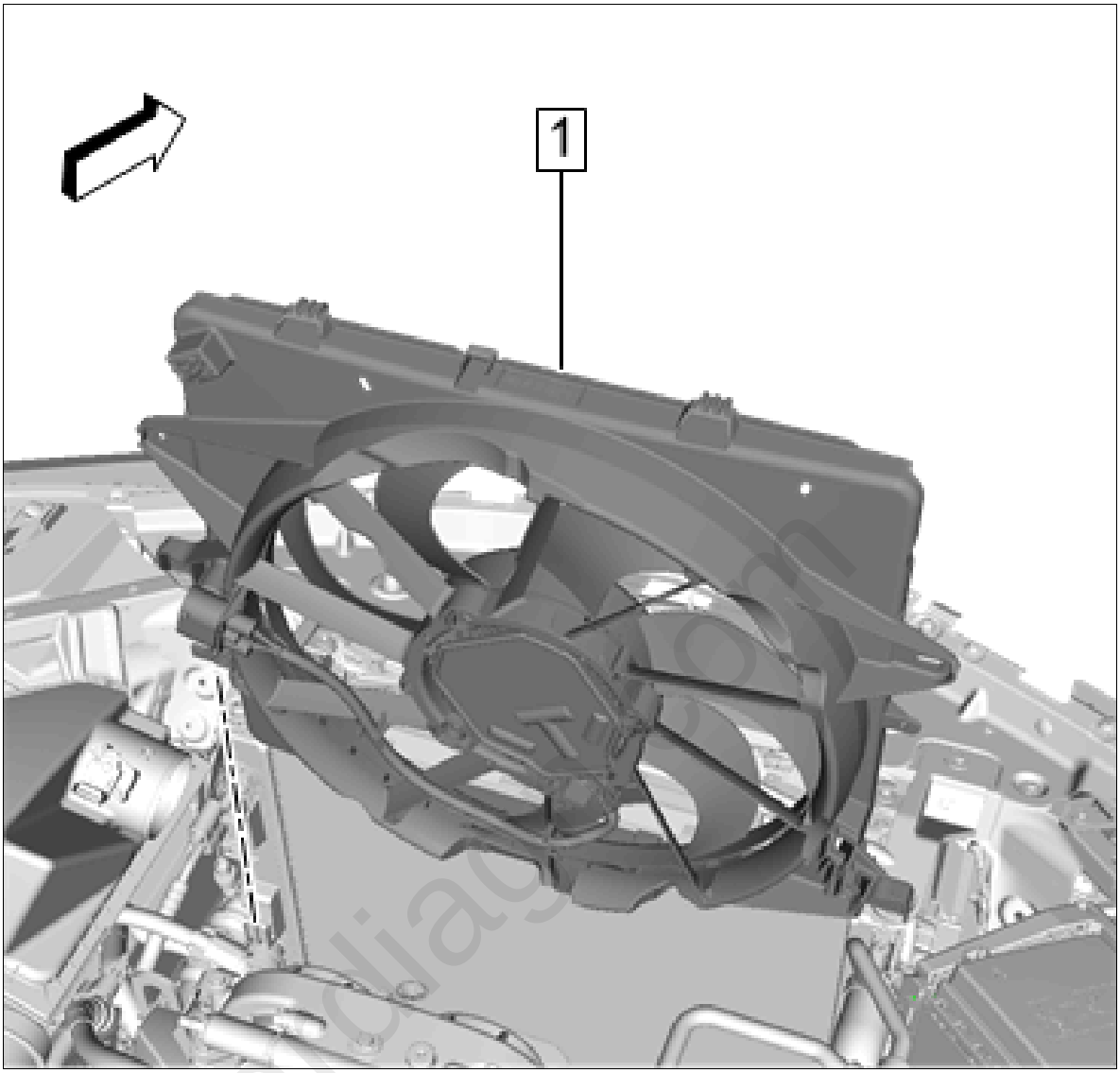


Courtesy of GENERAL MOTORS COMPANY

13. Remove Engine Coolant Fan Assembly (1)

REPAIR INSTRUCTIONS > ENGINE COOLANT FAN REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

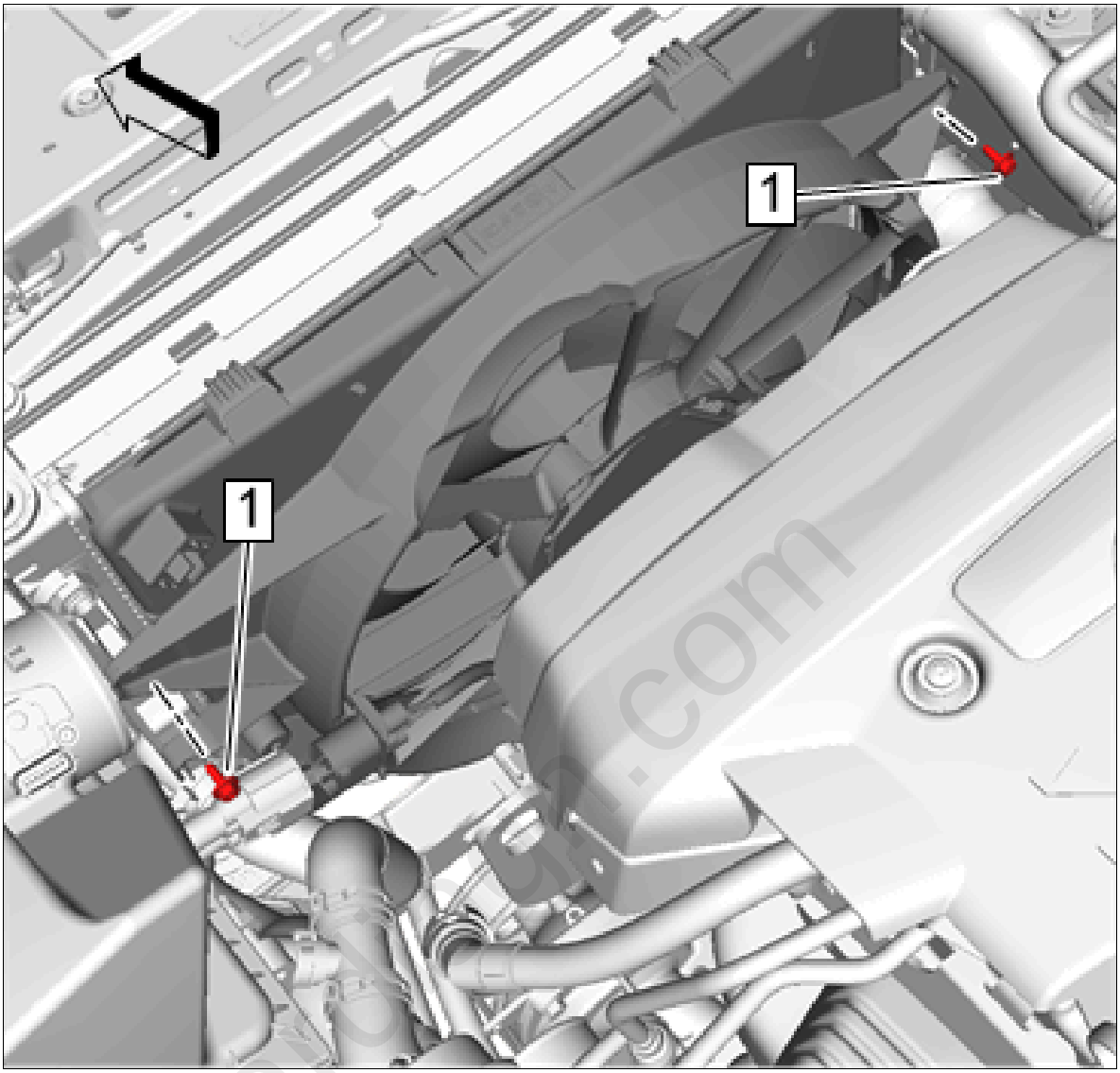
Fig 1: Engine Coolant Fan Assembly



Courtesy of GENERAL MOTORS COMPANY

1. Install Engine Coolant Fan Assembly (1)

Fig 2: Engine Coolant Fan Shroud Bolt

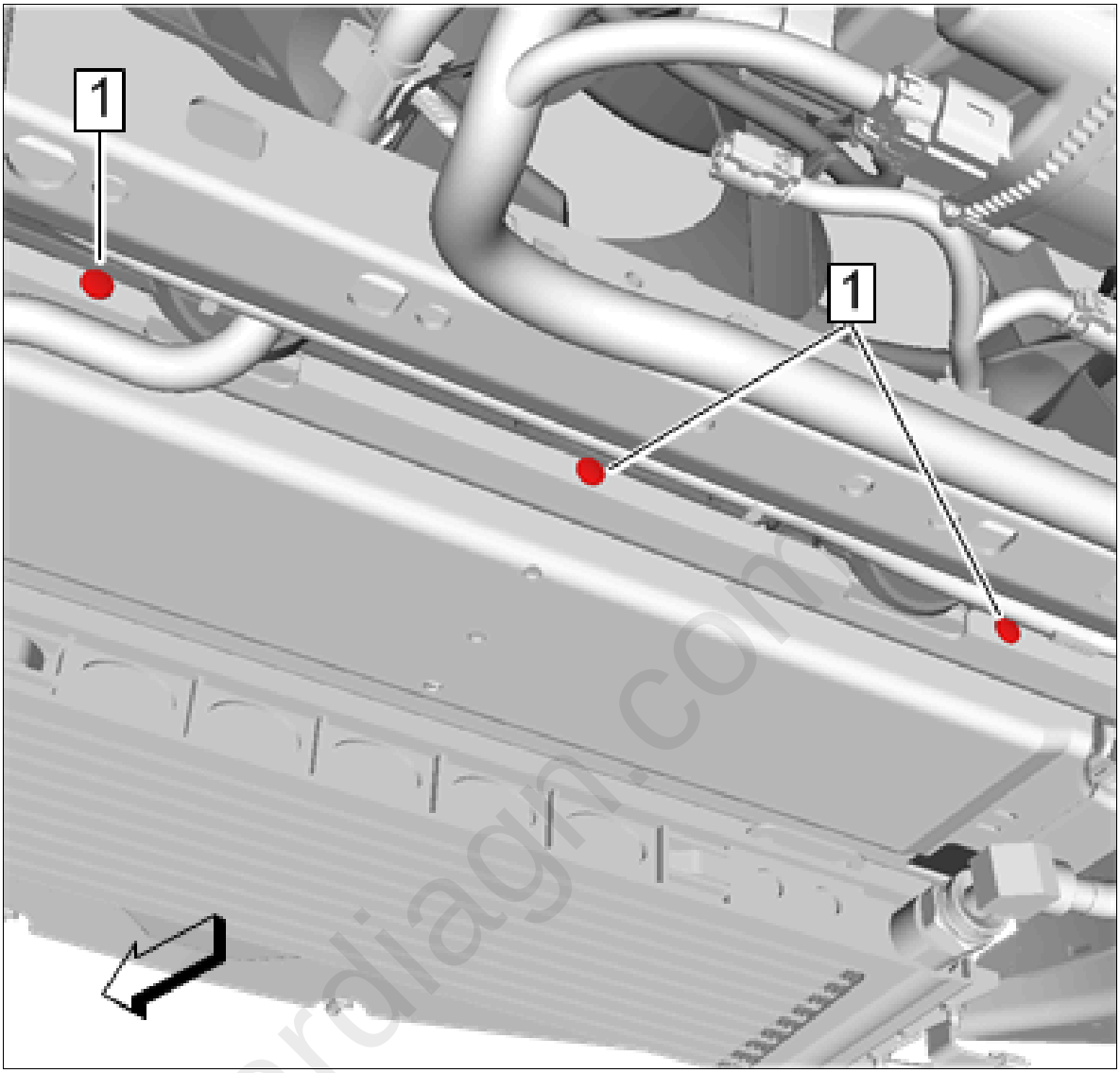


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

2. Install Engine Coolant Fan Shroud Bolt (1) (Qty: 2) at Radiator and tighten to 5.5 N.m (49 lb in)

Fig 3: Radiator Air Baffle Retainer

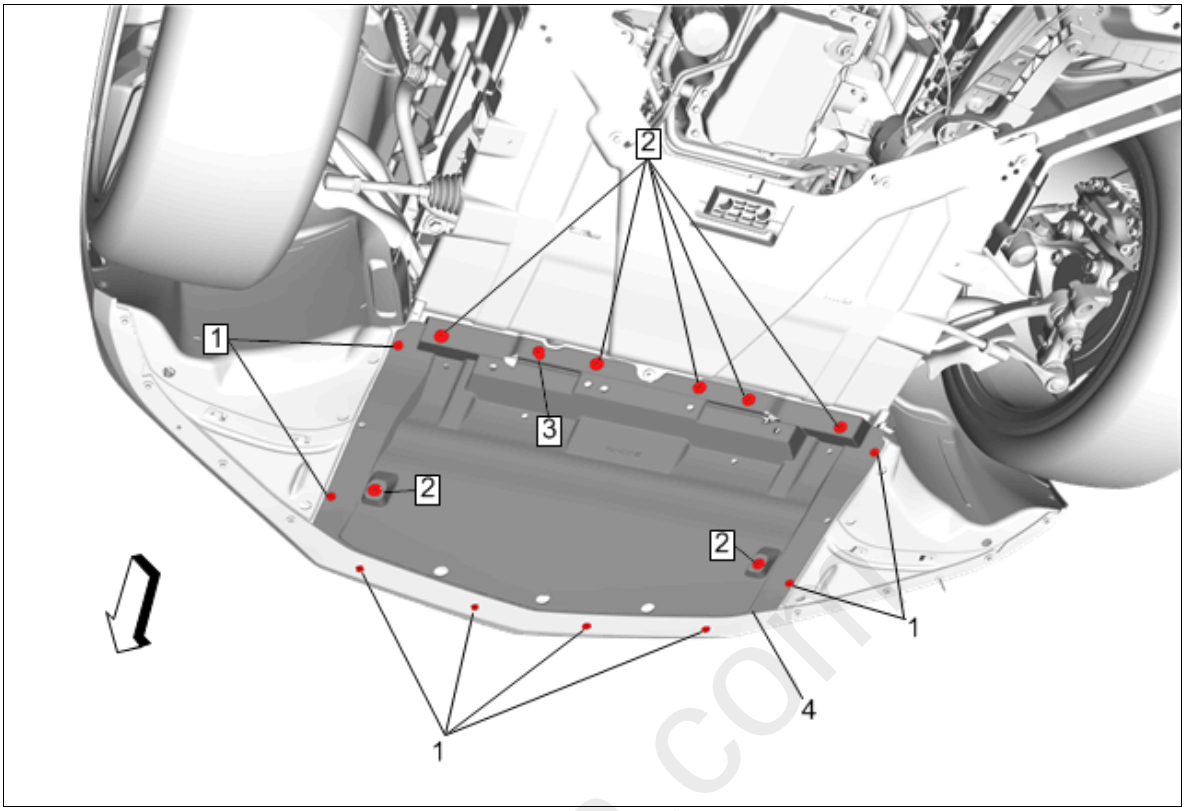


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3. Install Radiator Air Baffle Retainer (1) (Qty: 3)

Fig 4: Front Compartment Air Deflector (Coupe - LGX, LTG)

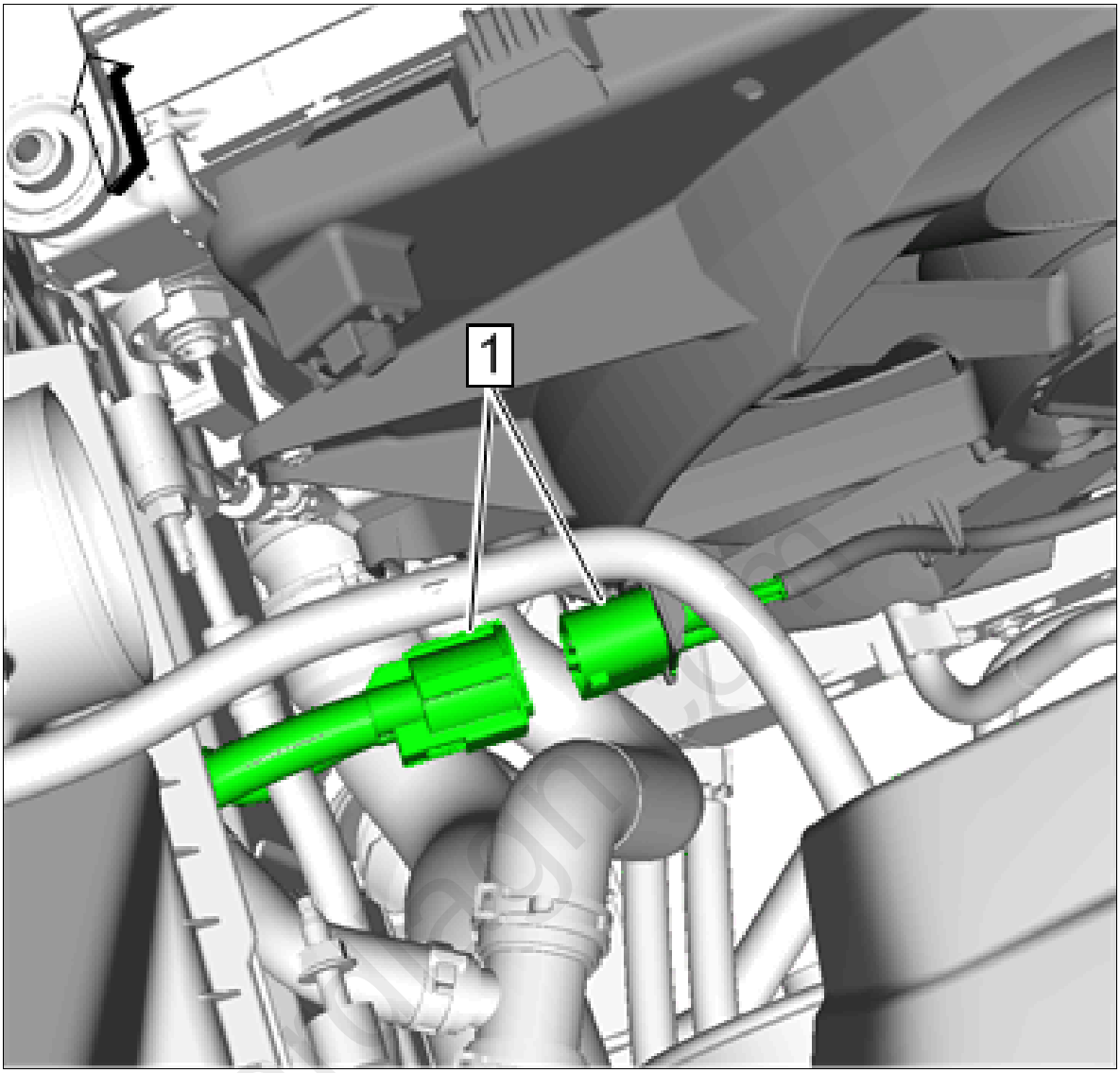


Courtesy of GENERAL MOTORS COMPANY

4. Install Front Compartment Air Deflector (4) - Front Compartment Air Deflector Replacement (Convertible - LGX, LTG)Front Compartment Air Deflector Replacement (Coupe - LGX, LTG)

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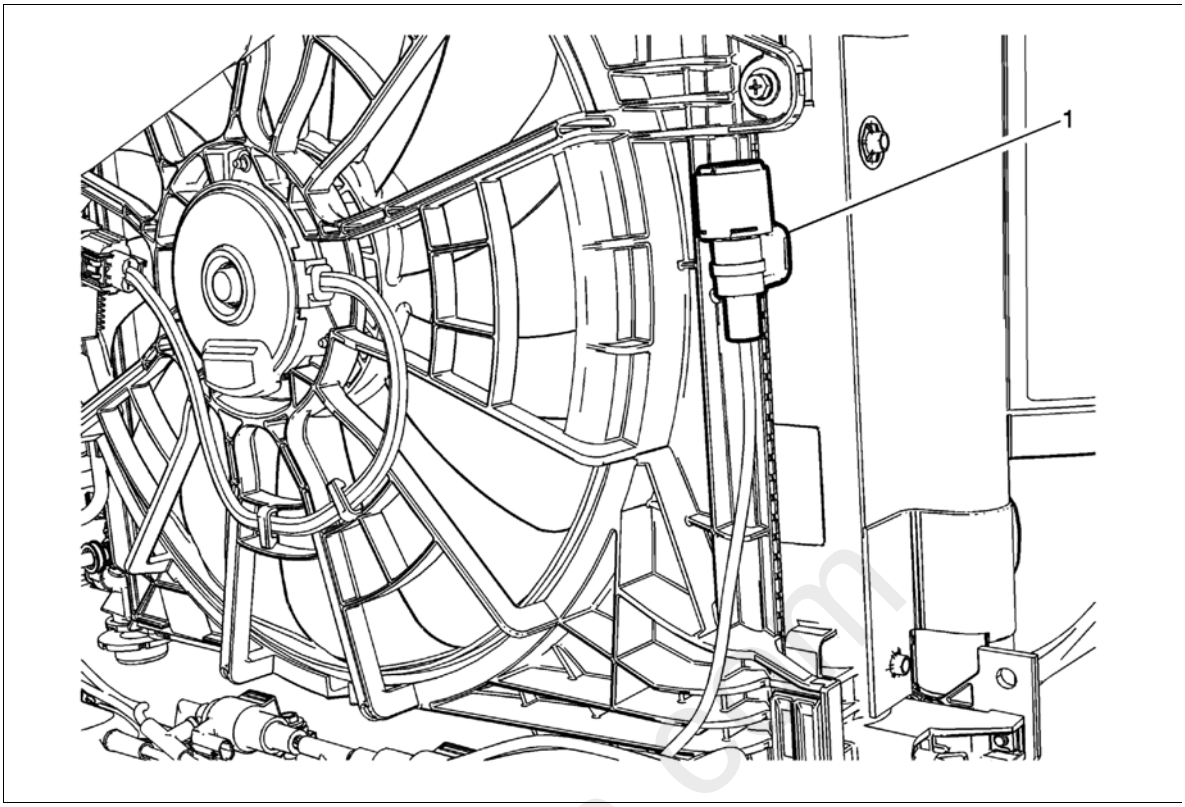
Fig 5: Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

5. Connect the electrical connector (1)

Fig 6: Engine Mount Vacuum Filter

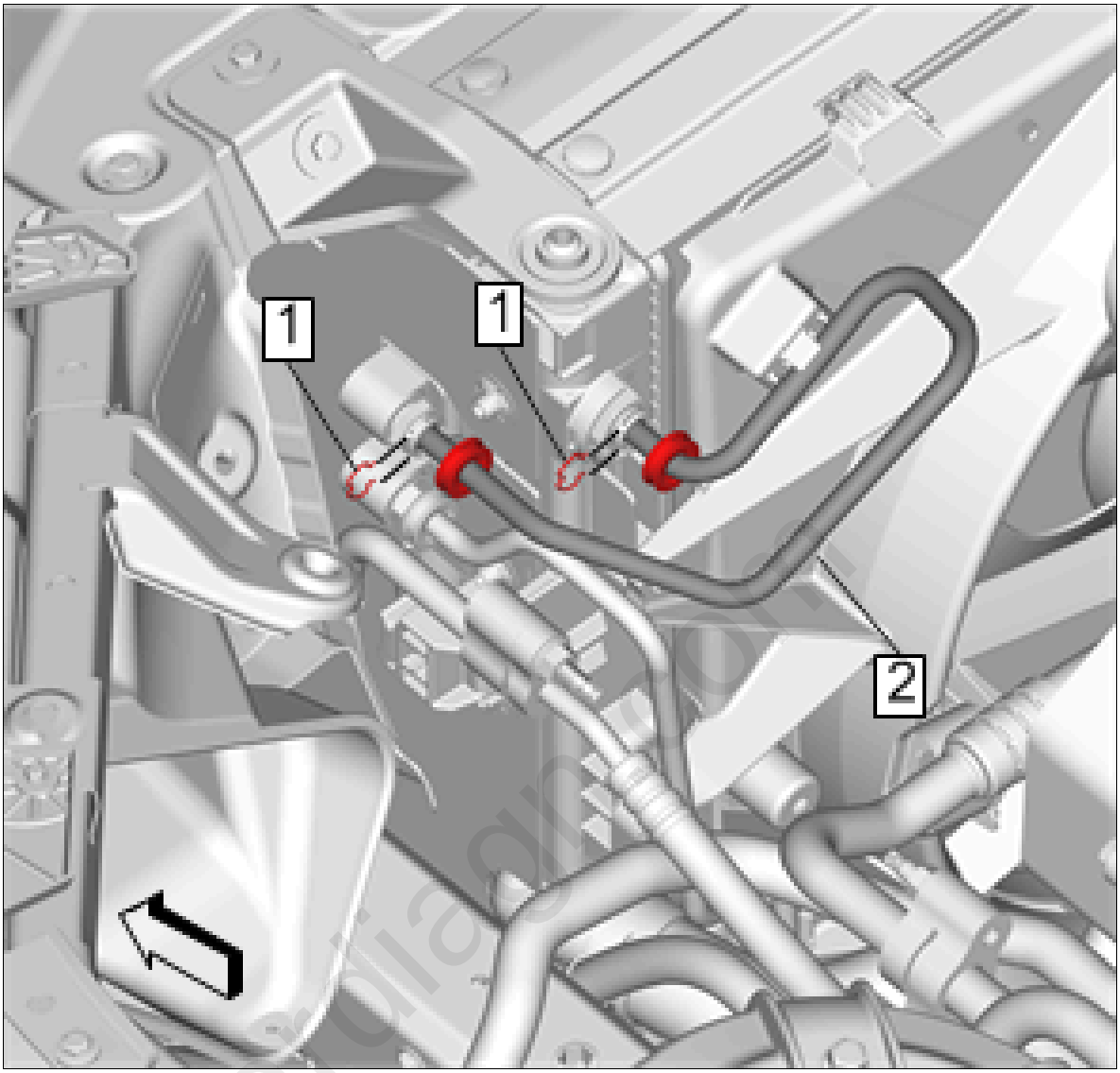


Courtesy of GENERAL MOTORS COMPANY

6. Install Engine Mount Vacuum Filter (1) at Engine Coolant Fan - Engine Mount Vacuum Filter Replacement
7. Install Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

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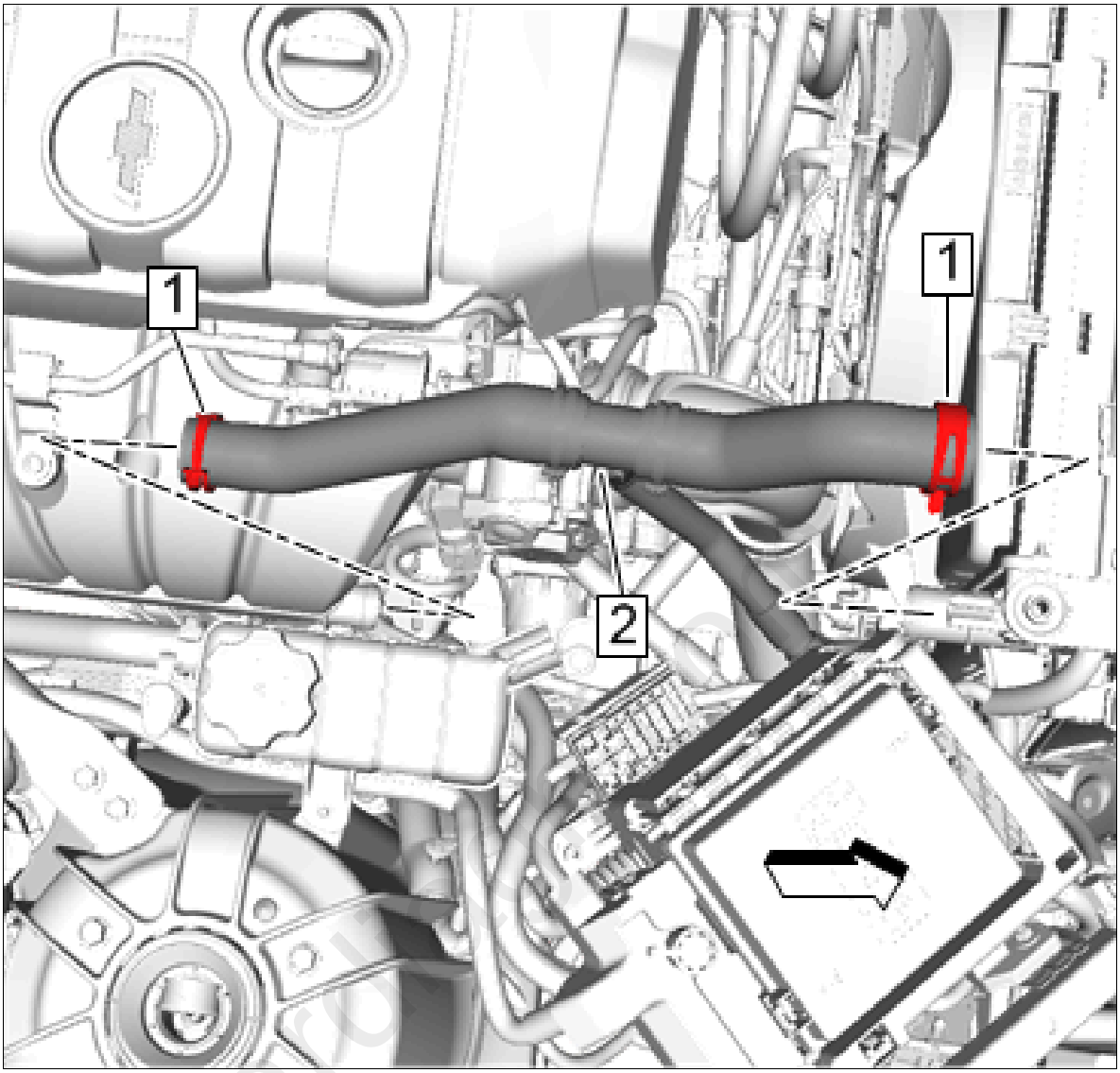
Fig 7: Transmission Fluid Cooler Pipe



Courtesy of GENERAL MOTORS COMPANY

8. { If equipped } Install Transmission Fluid Cooler Pipe (2) at Radiator - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)

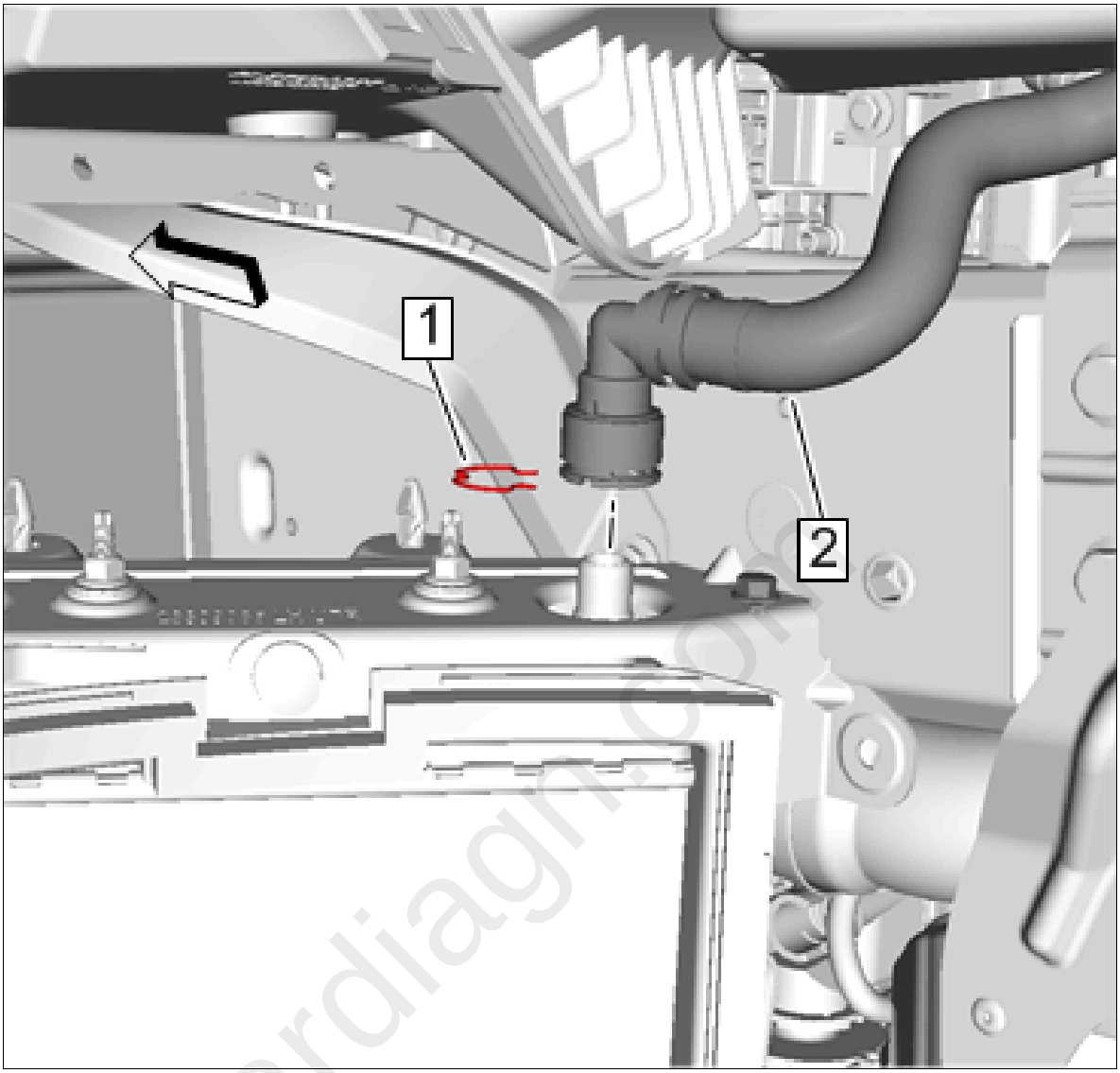
Fig 8: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

9. Install Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG with V18)

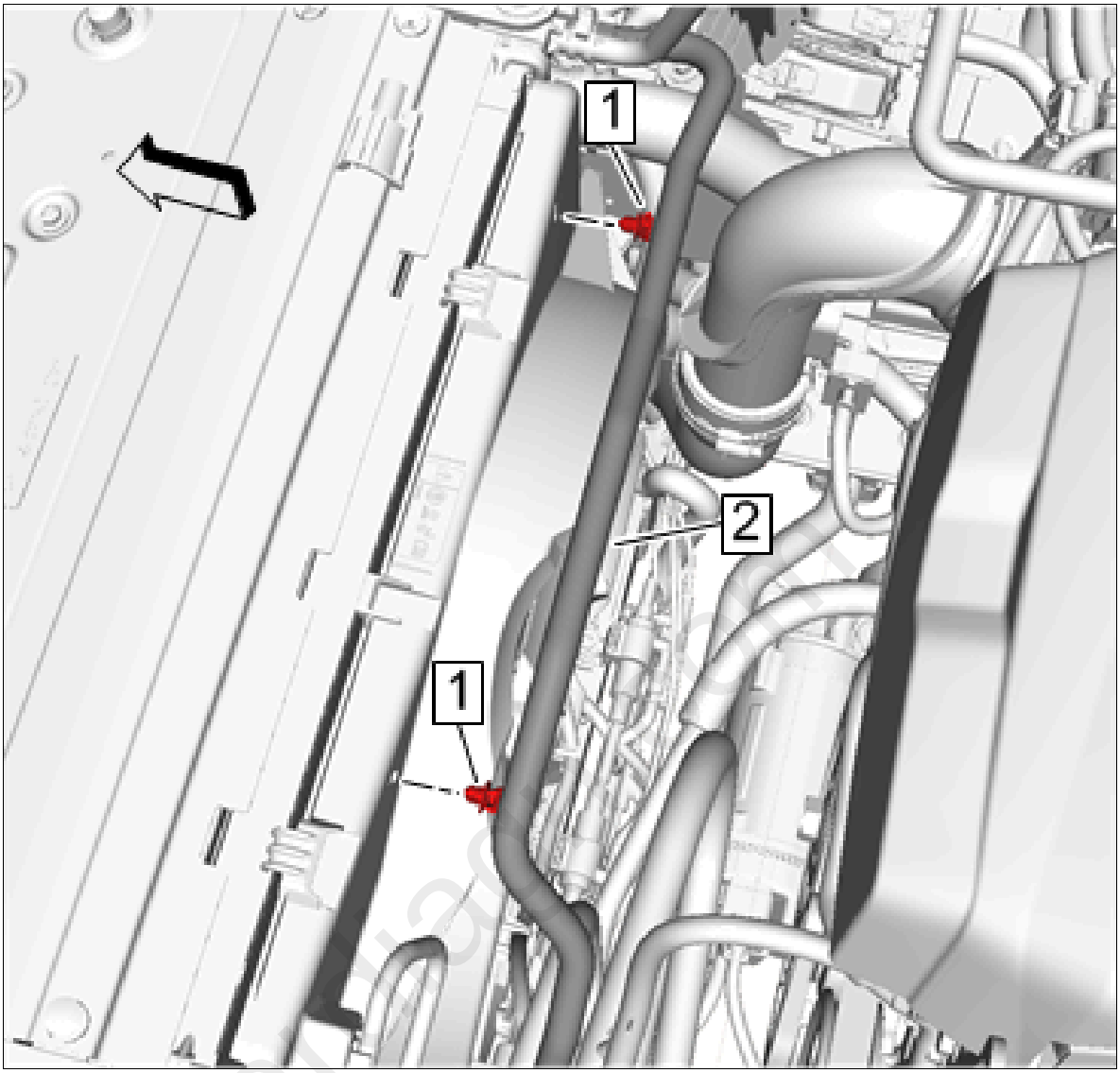
Fig 9: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

10. Install Auxiliary Radiator Inlet Hose (2) at Charge Air Cooler Left Side - Auxiliary Radiator Inlet Hose Replacement (LTG with V18)

Fig 10: Auxiliary Radiator Inlet Hose Retainer

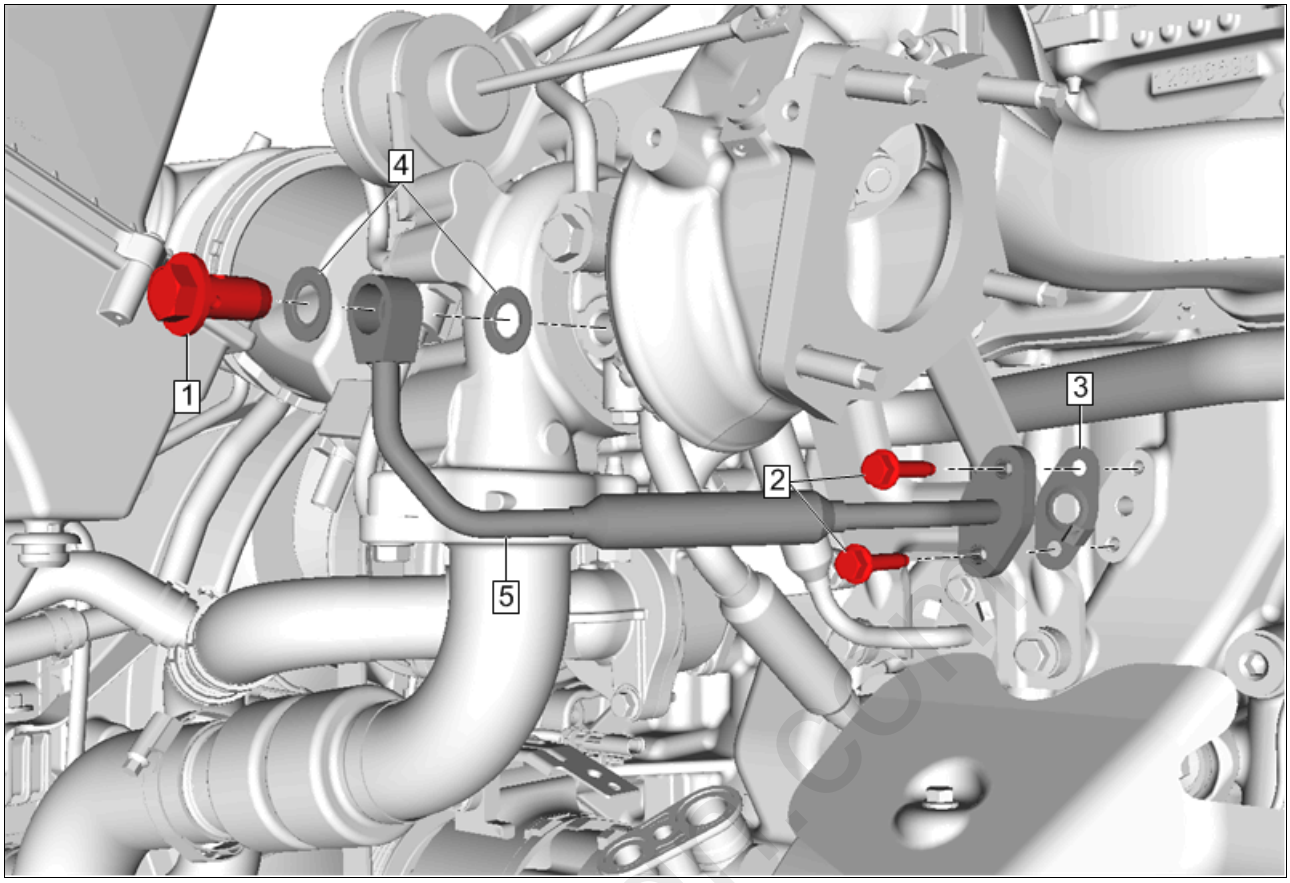


Courtesy of GENERAL MOTORS COMPANY

11. Install Auxiliary Radiator Inlet Hose Retainer (1) (Qty: 2) at Engine Coolant Fan
12. Install Air Cleaner Assembly - Air Cleaner Assembly Replacement
13. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
14. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > TURBOCHARGER COOLANT FEED PIPE REPLACEMENT (LTG WITH Y4Q)

Fig 1: Turbocharger Coolant Feed Pipe (LTG with Y4Q)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Warm Up Three-Way Catalytic Converter Replacement (LTG)	
1	Turbocharger Coolant Feed Pipe Hollow Screw *CAUTION:* *Refer to Fastener Caution .* **Tighten** 35 N.m (26 lb ft)

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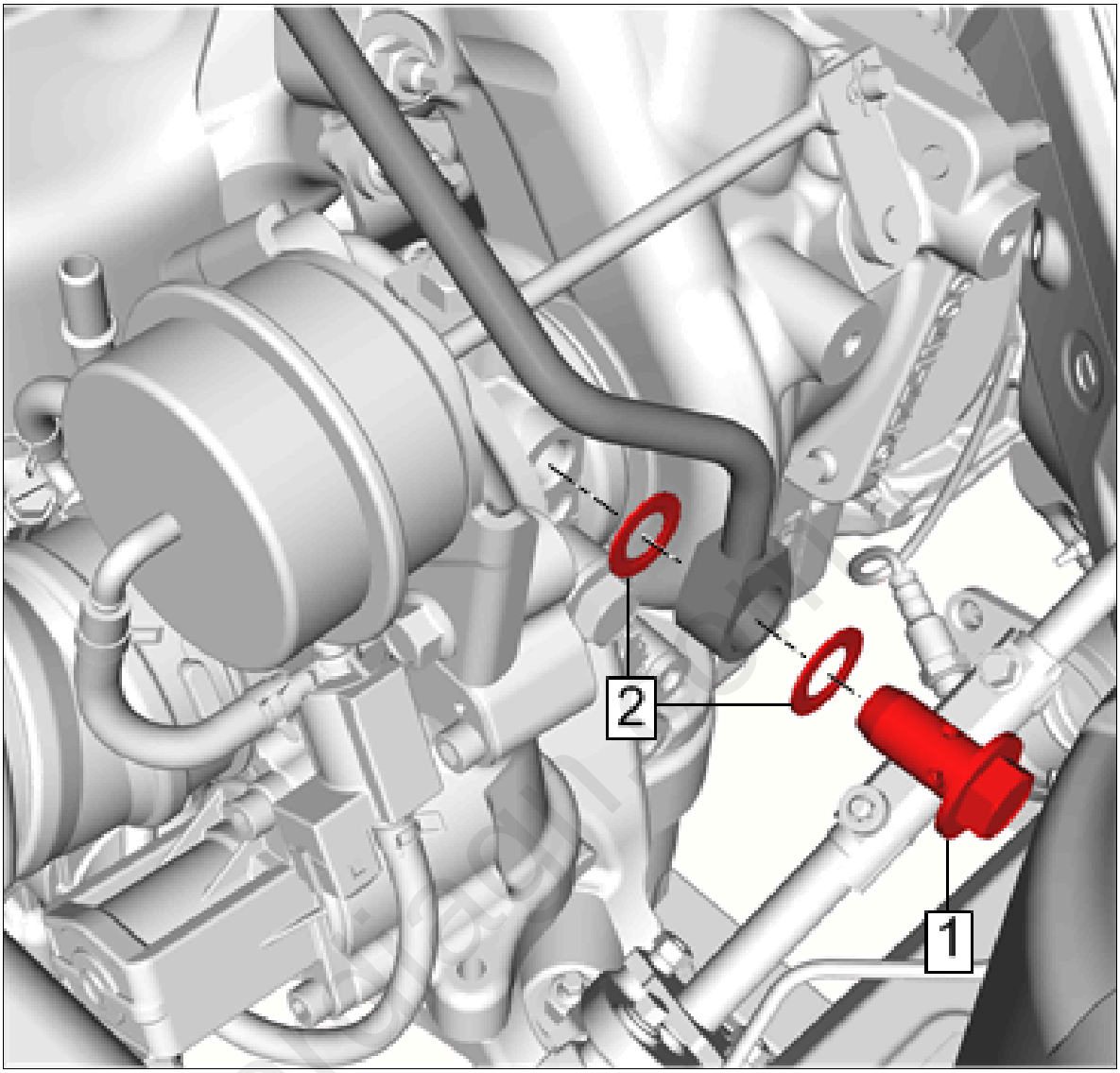
2	Turbocharger Coolant Feed Pipe Fastener (Qty: 2) **Tighten** 10 N.m (89 lb in)
3	Turbocharger Coolant Feed Pipe Gasket **Procedure** Install a NEW gasket.
4	Turbocharger Coolant Feed Pipe Hollow Screw Seal (Qty: 2) **Procedure** Install NEW sealing washers.
5	Turbocharger Coolant Feed Pipe

REPAIR INSTRUCTIONS > TURBOCHARGER COOLANT RETURN PIPE REPLACEMENT (LTG) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Intake Manifold Cover Replacement
3. Remove Turbocharger Heat Shield Replacement

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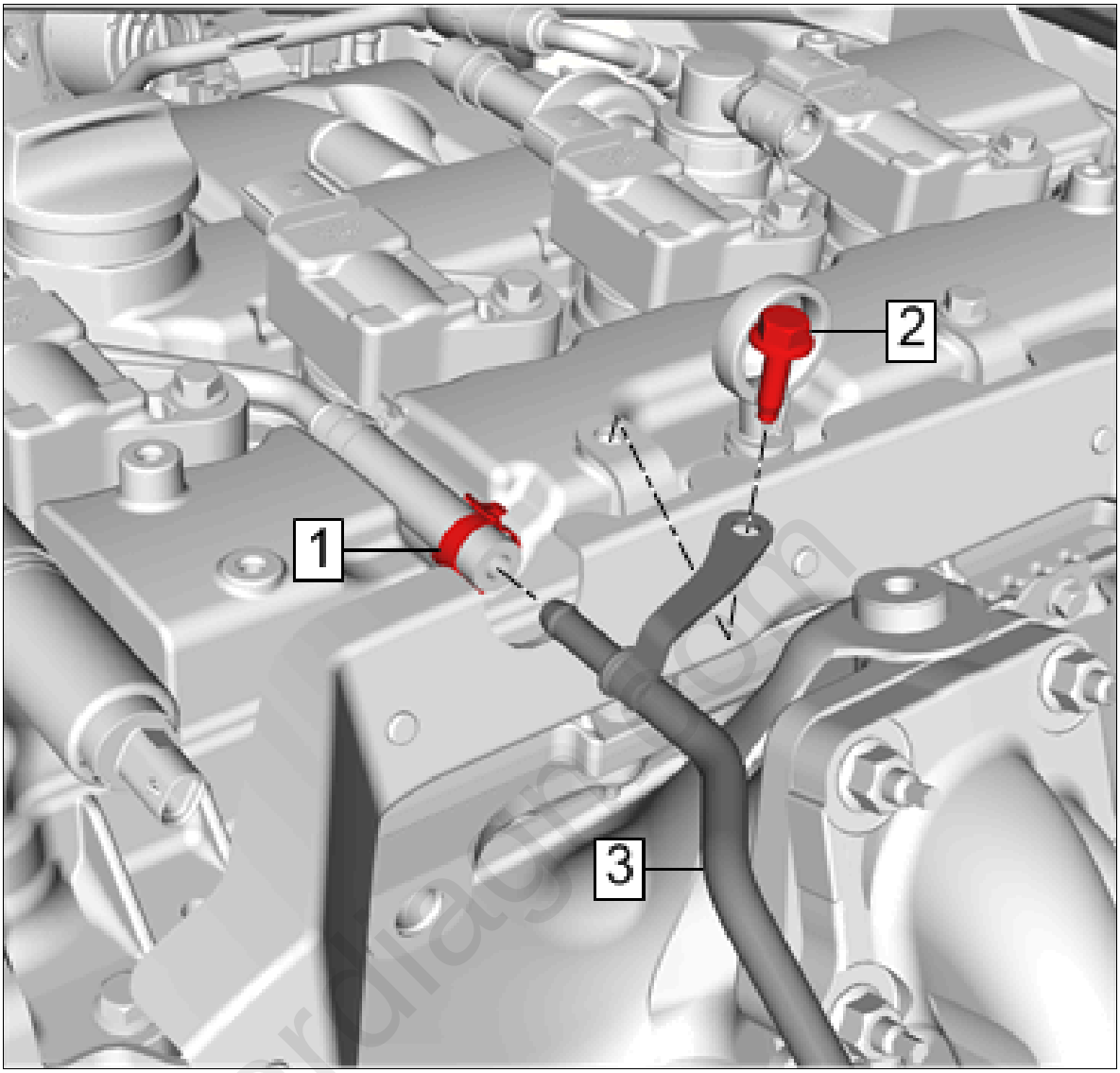
Fig 1: Coolant Return Pipe, Bolt And Washer



Courtesy of GENERAL MOTORS COMPANY

4. Remove Turbocharger Coolant Return Pipe Hollow Screw (1)
5. Remove Washer (2) (Qty; 2) and DISCARD

Fig 2: Clamp, Bolt And Pipe

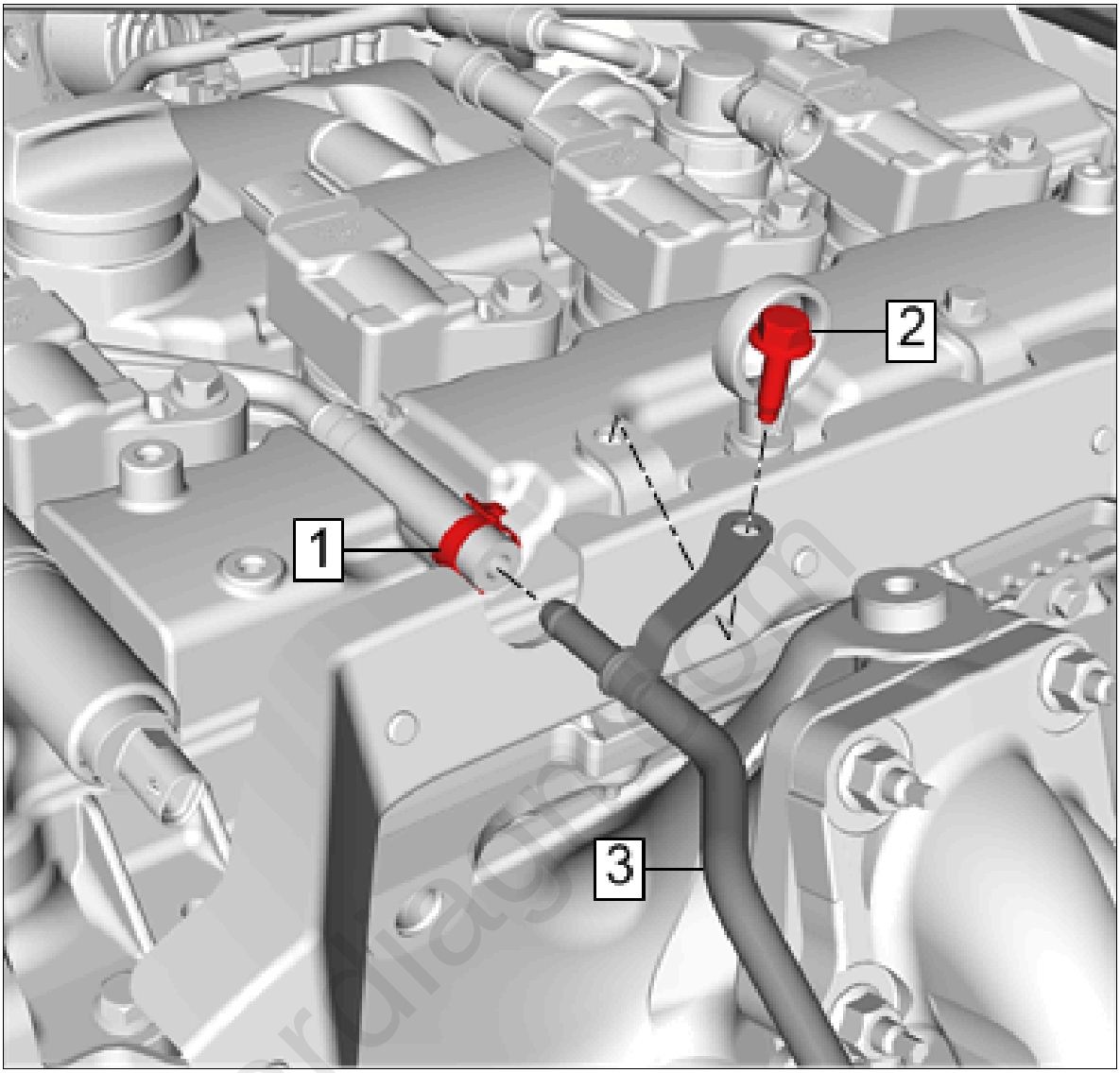


Courtesy of GENERAL MOTORS COMPANY

6. Disengage Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type
7. Remove Turbocharger Coolant Return Pipe Fastener (2)
8. Remove Turbocharger Coolant Return Pipe (3)

REPAIR INSTRUCTIONS > TURBOCHARGER COOLANT RETURN PIPE REPLACEMENT (LTG) > INSTALLATION PROCEDURE

Fig 1: Clamp, Bolt And Pipe



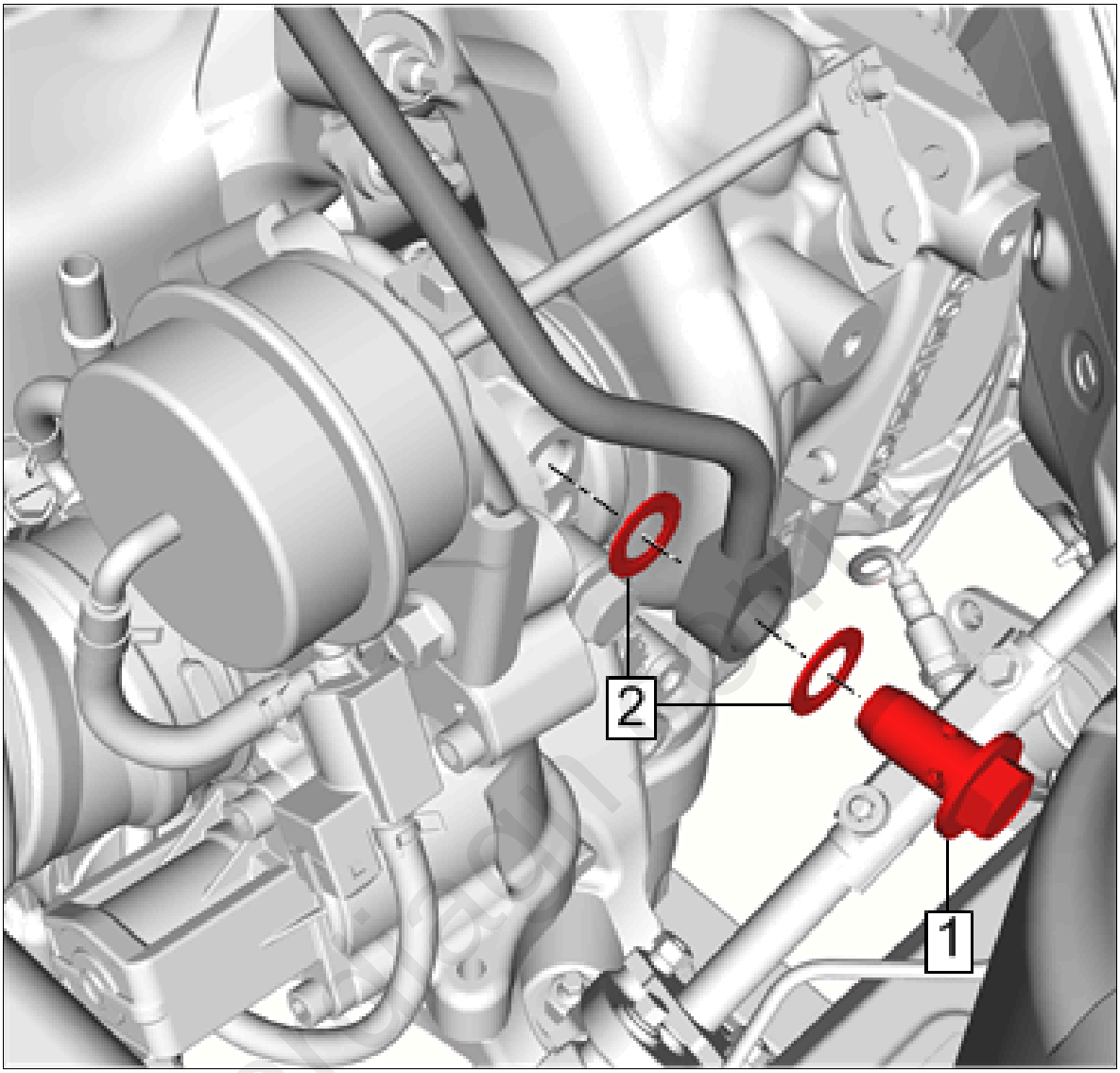
Courtesy of GENERAL MOTORS COMPANY

1. Install Turbocharger Coolant Return Pipe (3)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

2. Install Turbocharger Coolant Return Pipe Fastener (2) and tighten to 10 N.m (89 lb in)
3. Engage Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

Fig 2: Coolant Return Pipe, Bolt And Washer



Courtesy of GENERAL MOTORS COMPANY

NOTE:

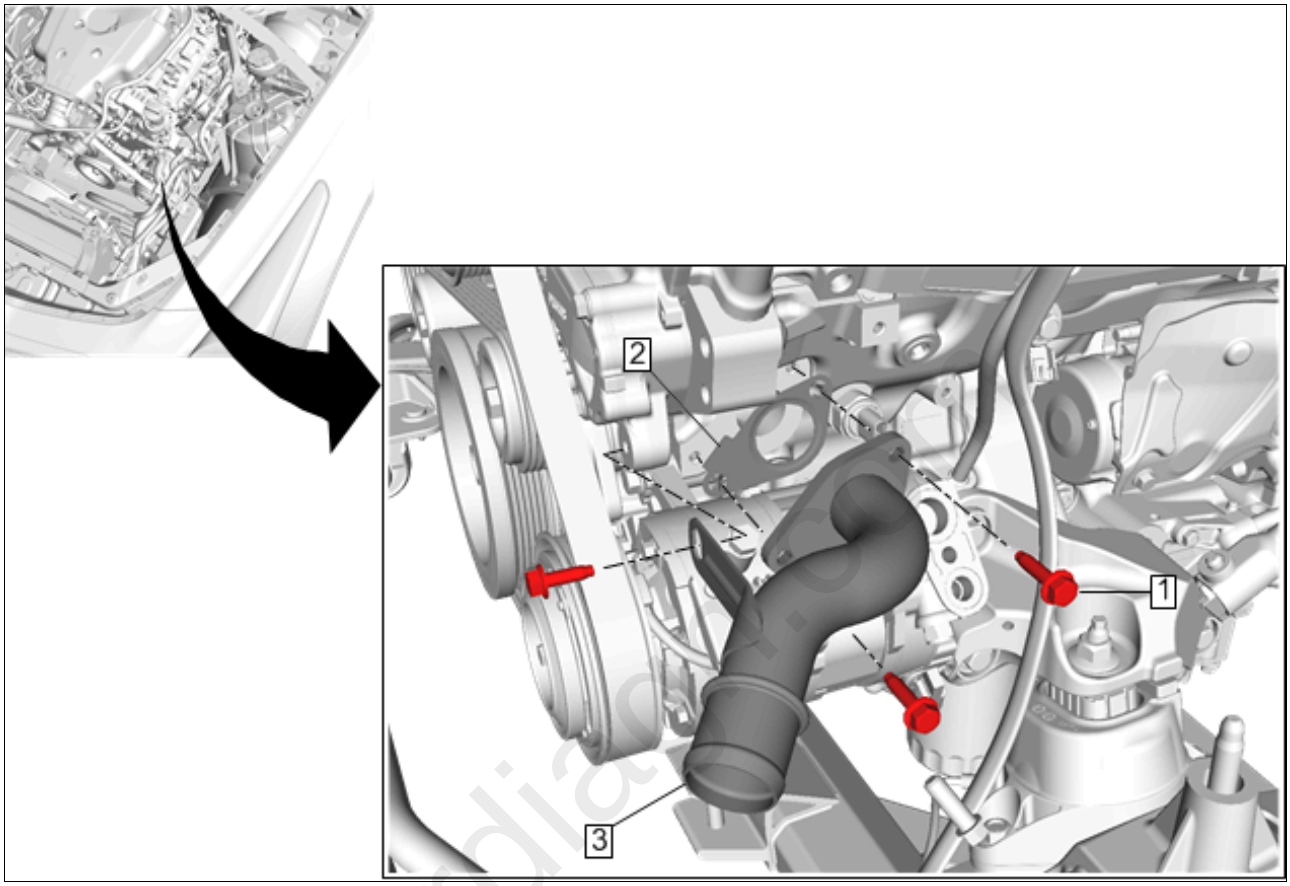
Install NEW washers.

4. Install Washer (2) (Qty: 2)
5. Install Turbocharger Coolant Return Pipe Hollow Screw (1) and tighten to 35 N.m (26 lb ft)
6. Install Turbocharger Heat Shield Replacement
7. Install Intake Manifold Cover Replacement
8. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

9. Start the engine and check for leaks.

REPAIR INSTRUCTIONS > WATER PUMP INLET PIPE REPLACEMENT (LGX)

Fig 1: Water Pump Inlet Pipe (LGX)



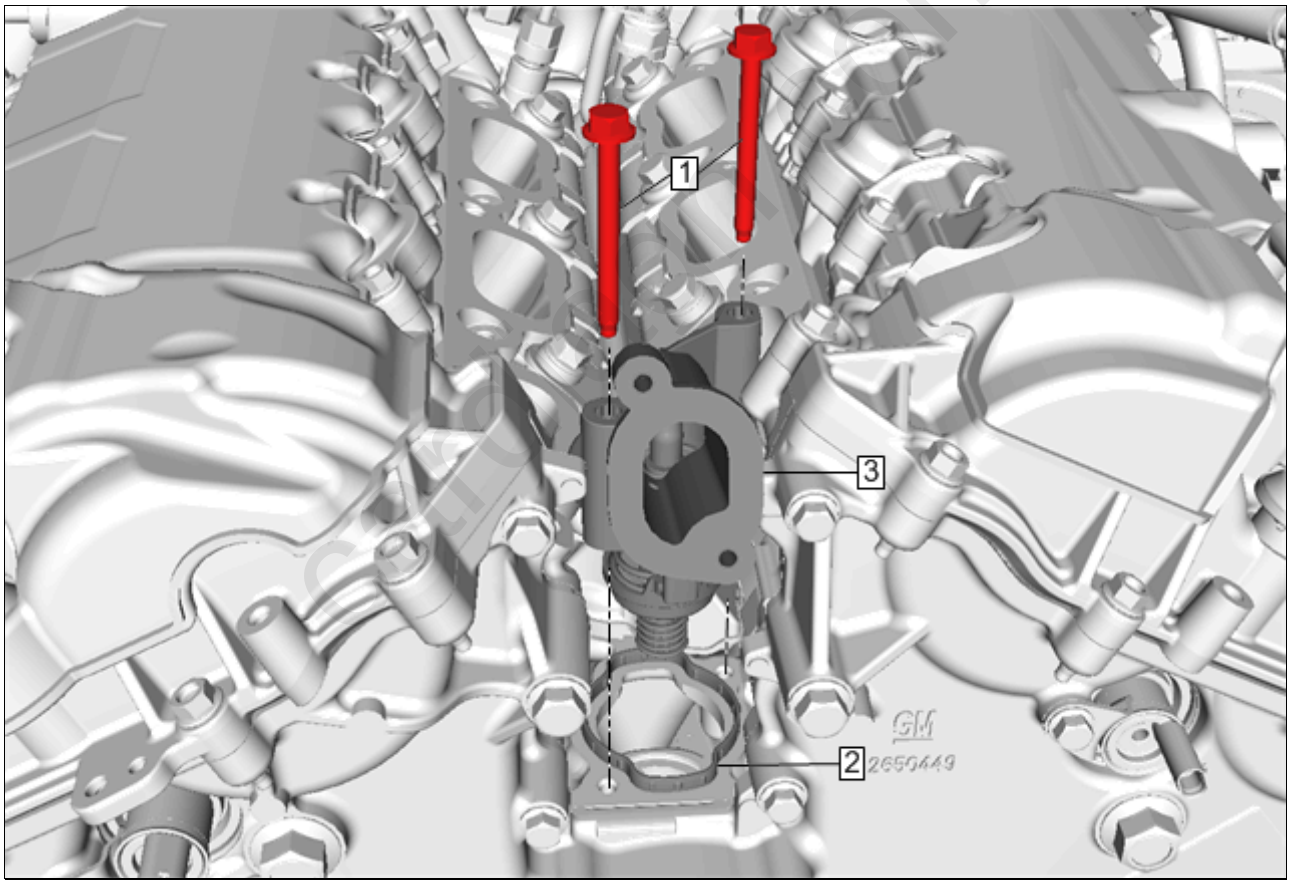
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Air Cleaner Assembly Replacement 2. Engine Oil Cooler Adapter Replacement (LGX) - If equipped 3. Disconnect Radiator Outlet Hose Replacement (LGX without V18) Radiator Outlet Hose Replacement (LGX with V18) Radiator Outlet Hose Replacement (LGX with KC4 without V18) at Water Pump Inlet Pipe	
1	Water Pump Inlet Pipe Bolt (Qty: 3) *CAUTION:*

	Refer to Fastener Caution . **Tighten** 9 N.m (80 lb in)
2	Gasket **Procedure** Install a NEW gasket.
3	Water Pump Inlet Pipe

REPAIR INSTRUCTIONS > ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (LGX)

Fig 1: Engine Coolant Thermostat Housing (LGX)



Courtesy of GENERAL MOTORS COMPANY

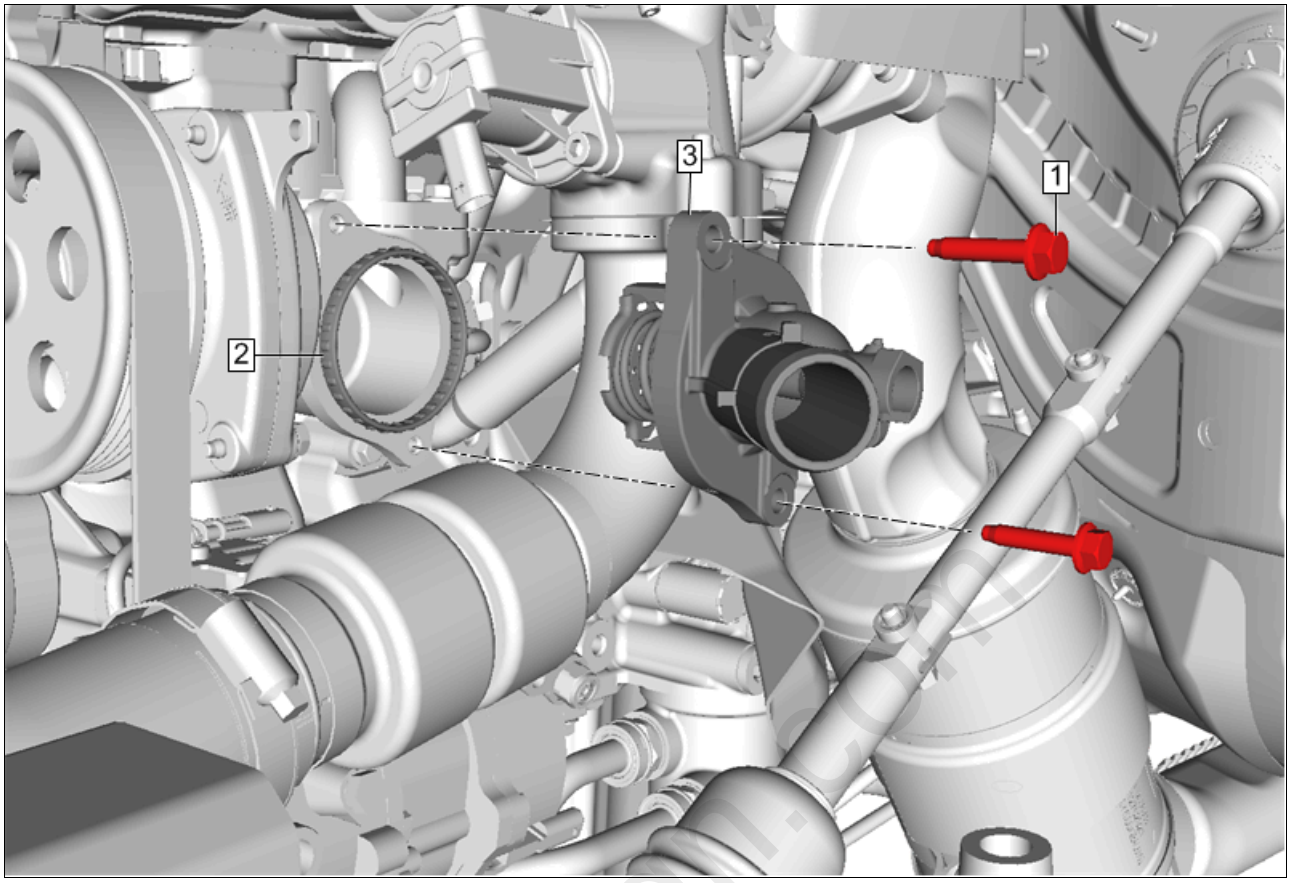
Callout	Component Name
Preliminary Procedures	

	1. Engine Coolant Air Bleed Pipe Replacement (LGX) 2. Water Outlet Replacement (LGX)
1	Engine Coolant Thermostat Housing Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)
2	Engine Coolant Thermostat Housing Seal **Procedure** Install a NEW engine coolant thermostat housing seal.
3	Engine Coolant Thermostat Housing

REPAIR INSTRUCTIONS > ENGINE COOLANT THERMOSTAT HOUSING REPLACEMENT (LTG)

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Fig 1: Engine Coolant Thermostat Housing (LTG)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Air Cleaner Outlet Duct Replacement 2. Radiator Outlet Hose Replacement (LTG without V18) Radiator Outlet Hose Replacement (LTG with V18)	
1	Engine Coolant Thermostat Housing Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)

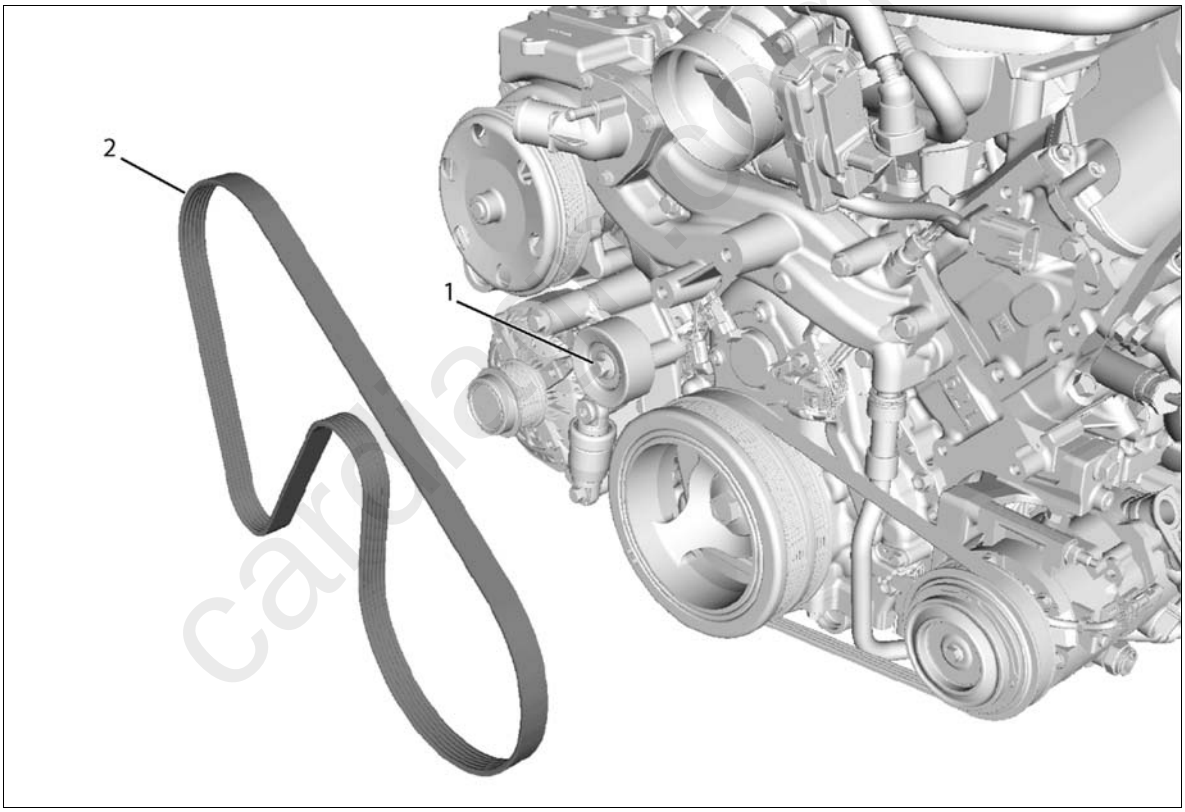
cardiagn.com

2	Engine Coolant Thermostat Housing Seal **Procedure** Install a NEW engine coolant thermostat housing seal.
3	Engine Coolant Thermostat Housing **Procedure** Clean the engine oil cooler housing to engine coolant thermostat housing sealing surfaces.

REPAIR INSTRUCTIONS > ENGINE COOLANT MANIFOLD REPLACEMENT (LT1) > REMOVAL PROCEDURE

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

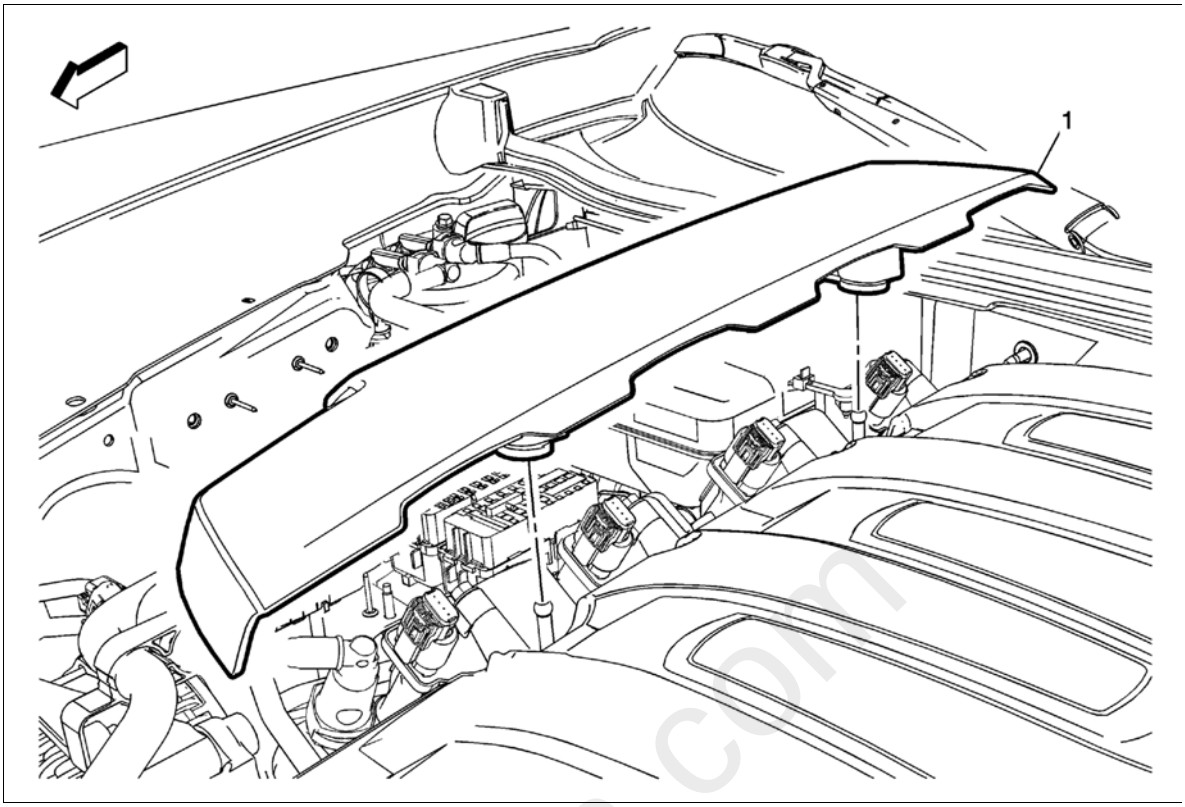
   Fig 1: Drive Belt



   Courtesy of GENERAL MOTORS COMPANY

2. Remove Drive Belt (2) - Drive Belt Replacement - Accessory

Fig 2: Intake Manifold Cover - Right Side

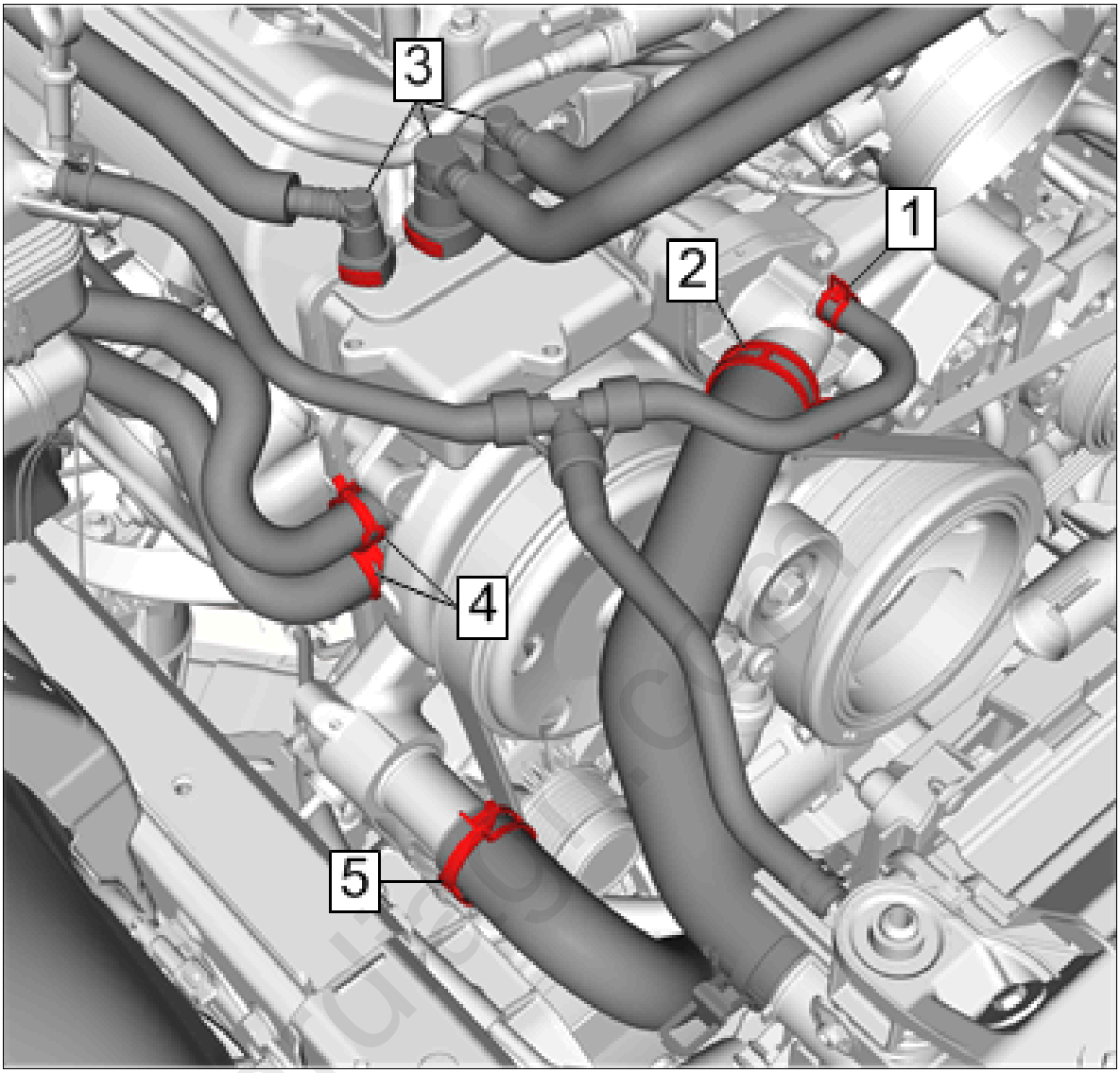


Courtesy of GENERAL MOTORS COMPANY

3. Remove Intake Manifold Cover-Right Side (1) - Intake Manifold Cover Replacement (Right)

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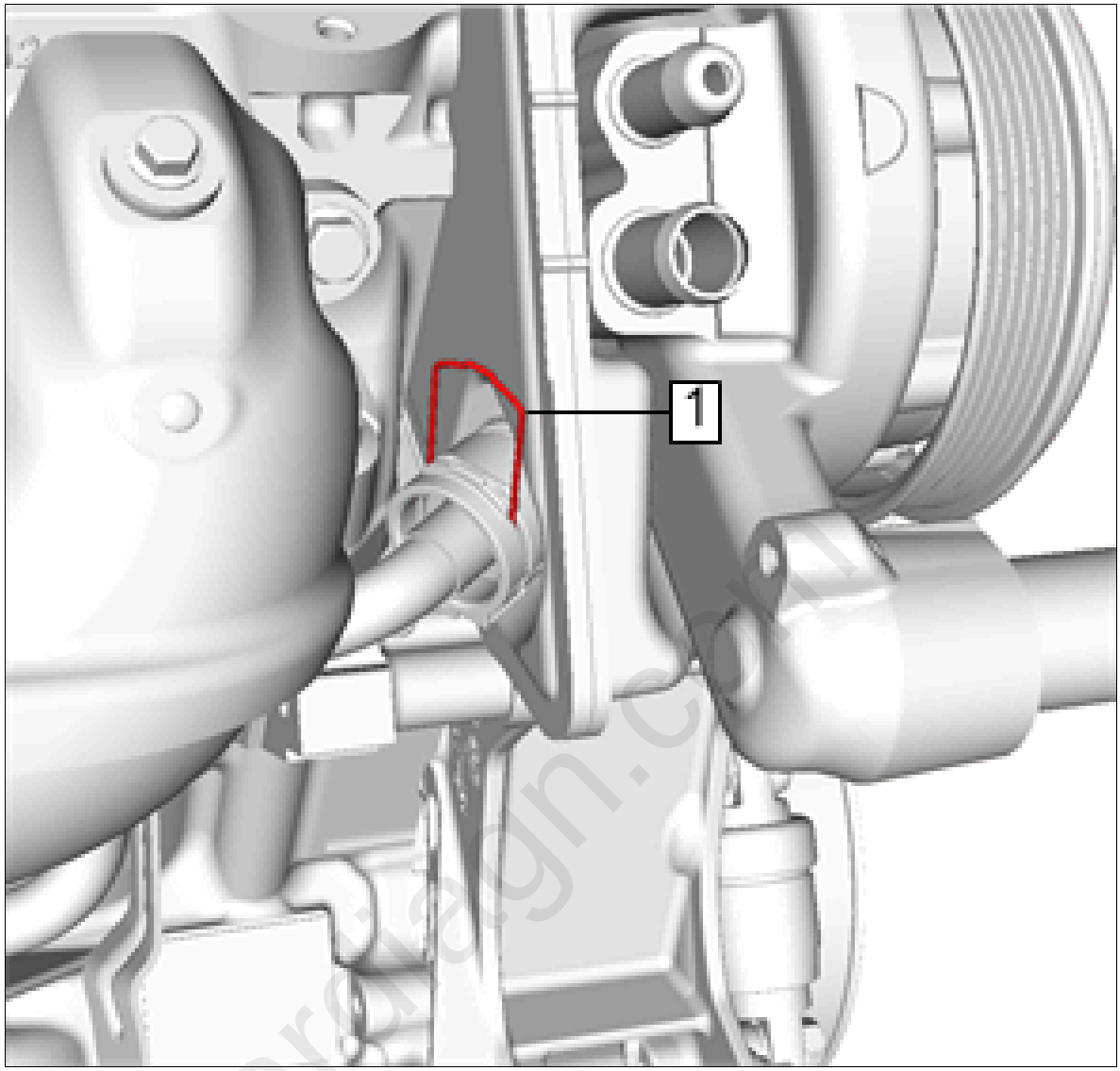
Fig 3: Radiator Surge Tank Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Radiator Surge Tank Inlet Hose (1)
5. Disconnect Radiator Inlet Hose (2)
6. Disconnect Positive Crankcase Ventilation Tube (3) (Qty: 3)
7. Disconnect Heater Inlet Hose and Heater Outlet Hose (4)
8. Disconnect Radiator Outlet Hose (5)

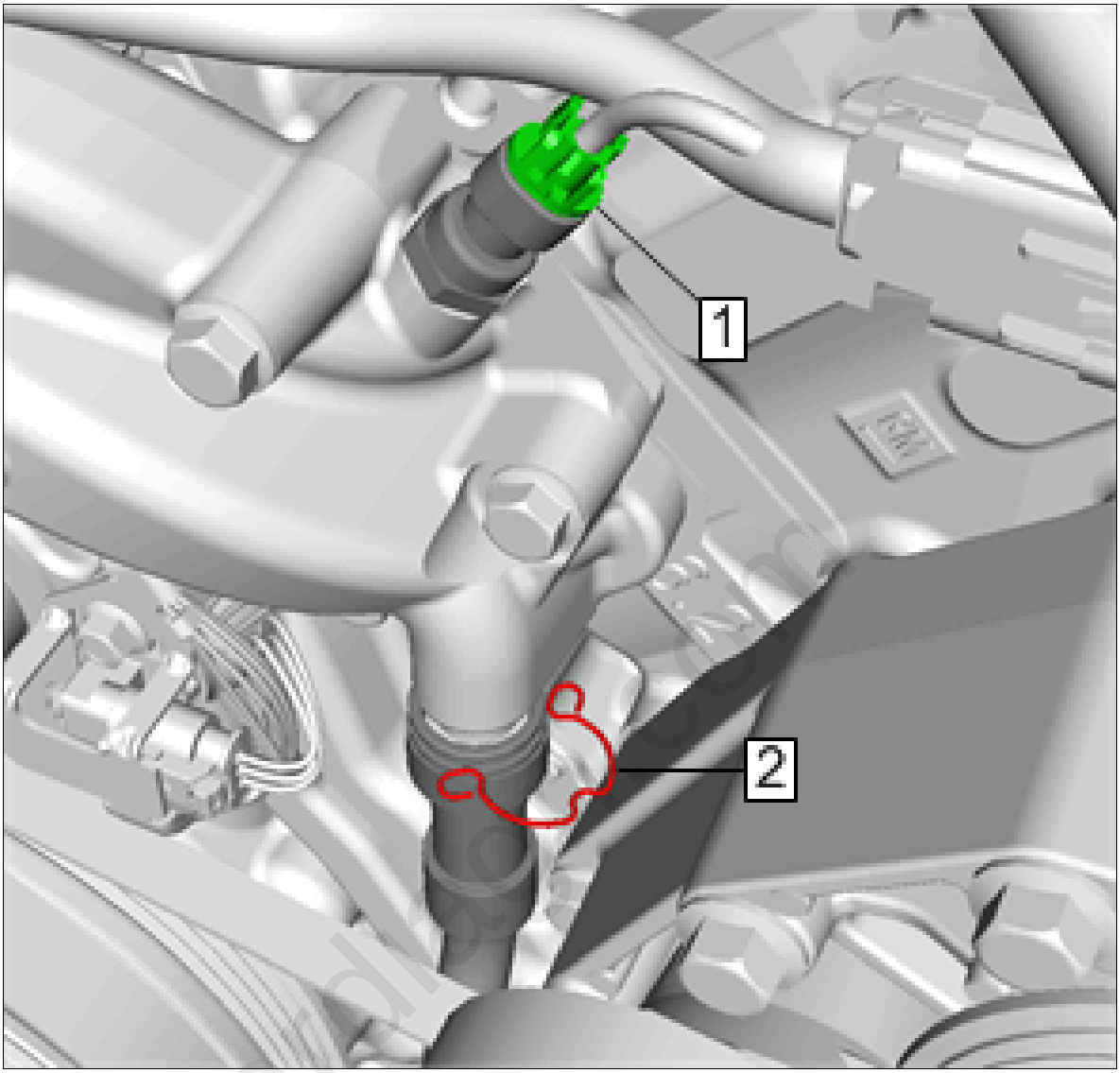
Fig 4: Positive Crankcase Ventilation Oil Separator Drain Clip



Courtesy of GENERAL MOTORS COMPANY

9. Disengage Clip (1) at Positive Crankcase Ventilation Oil Separator Drain

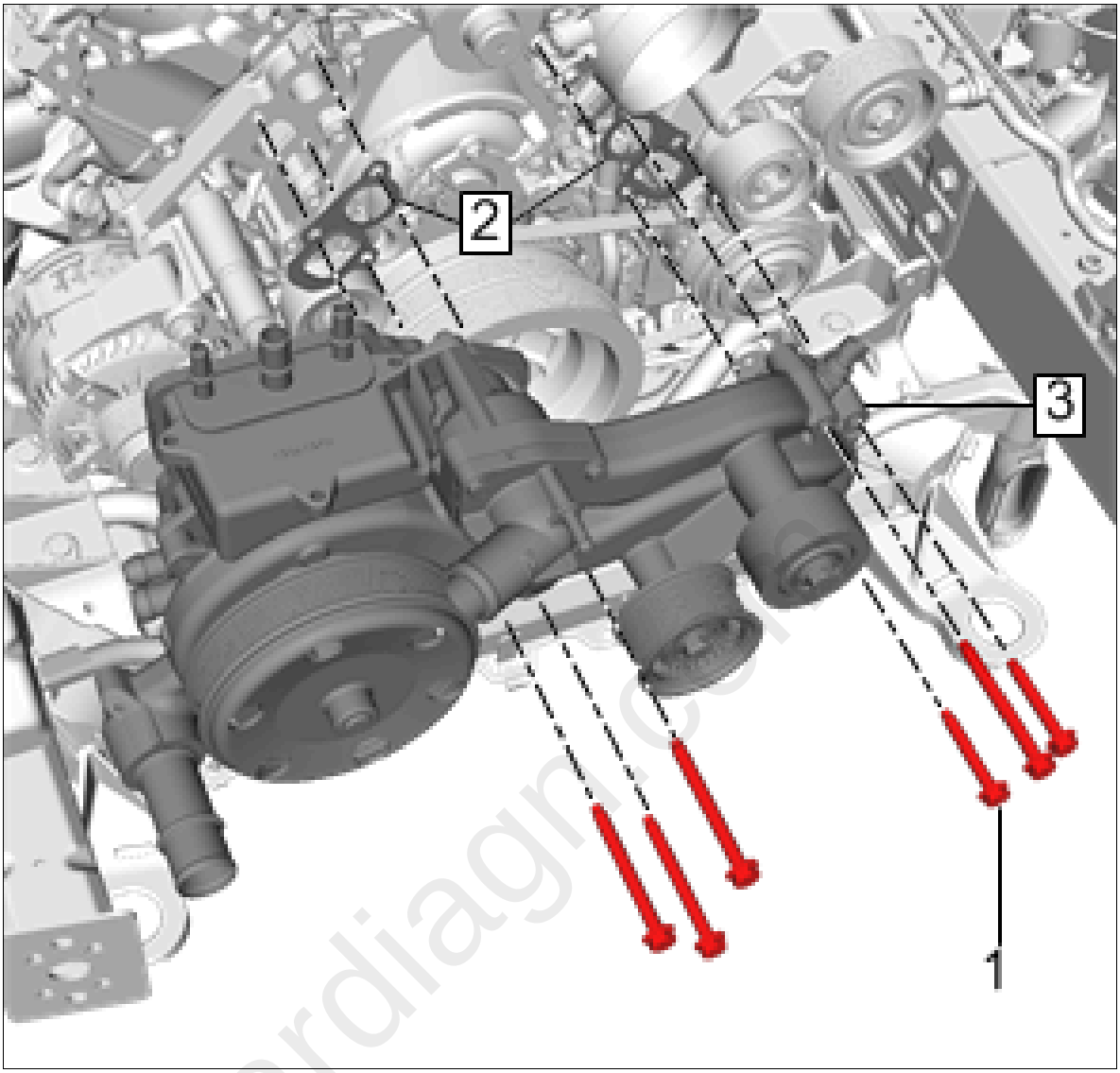
Fig 5: Engine Coolant Temperature Sensor



Courtesy of GENERAL MOTORS COMPANY

10. Disconnect Engine Coolant Temperature Sensor (1)
11. Remove Engine Oil Cooler Hose Retainer (2)

Fig 6: Engine Coolant Manifold Bolt



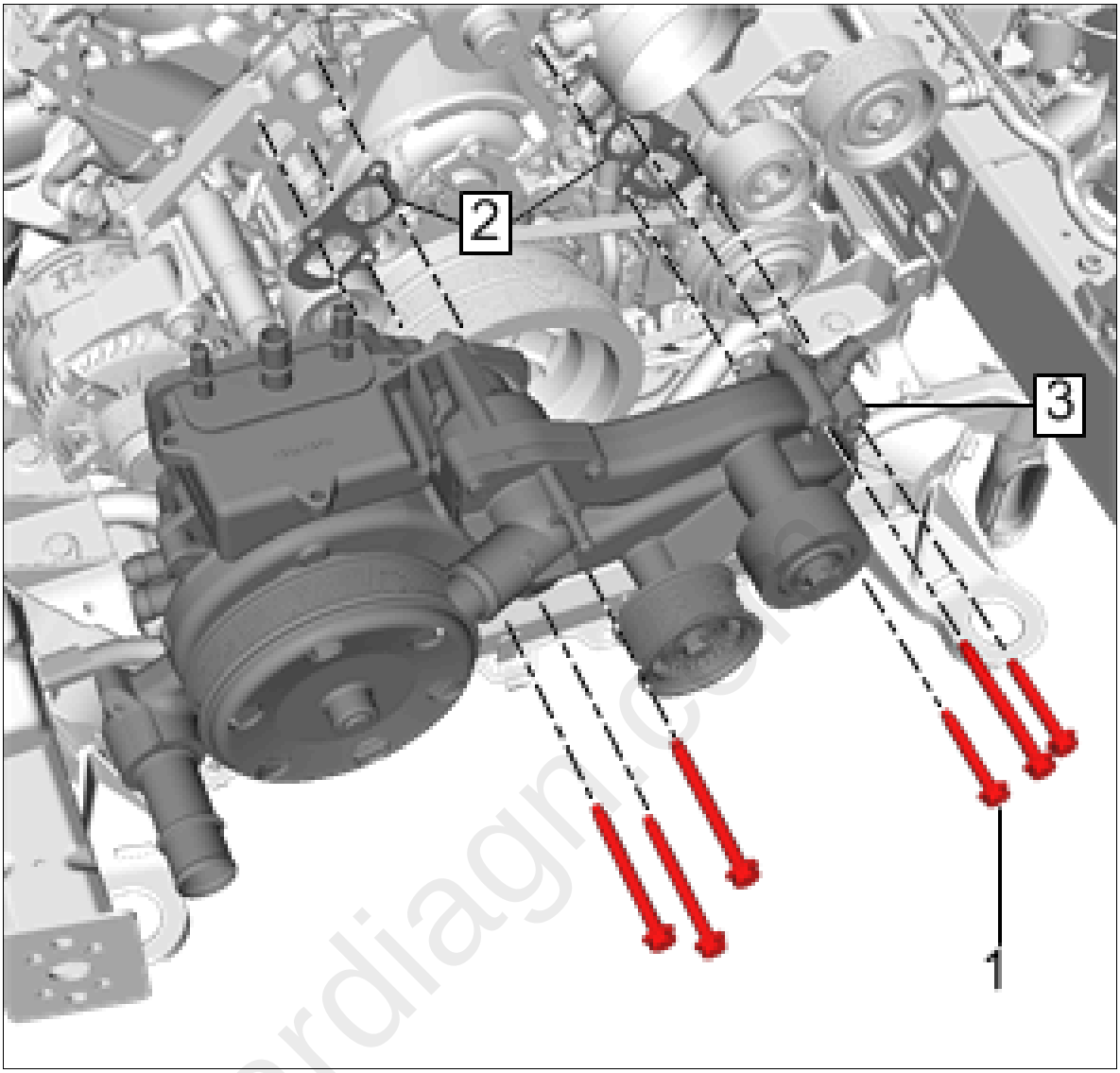
Courtesy of GENERAL MOTORS COMPANY

12. Remove Engine Coolant Manifold Bolt (1) (Qty: 6)
13. Remove Engine Coolant Manifold (3)
14. DISCARD the gasket (2)
15. Transfer components as necessary.

REPAIR INSTRUCTIONS > ENGINE COOLANT MANIFOLD REPLACEMENT (LT1) > INSTALLATION PROCEDURE

1. Clean all sealing surfaces.
2. Apply thread locking adhesive to the fasteners. Adhesives, Fluids, Lubricants, and Sealers

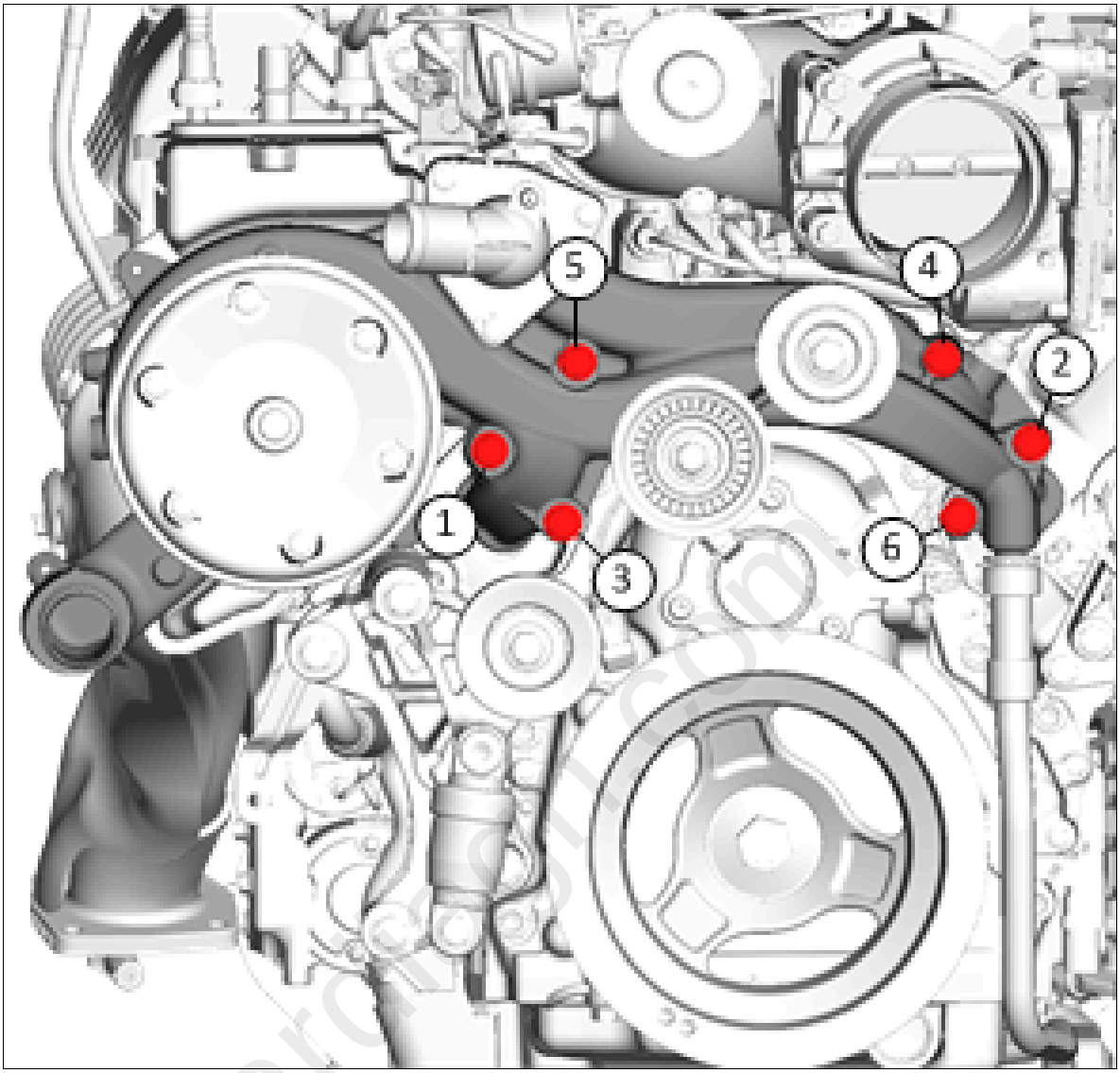
Fig 1: Engine Coolant Manifold Bolt



Courtesy of GENERAL MOTORS COMPANY

3. Install NEW gaskets (2)
4. Install Engine Coolant Manifold (3)
5. Hand tighten Engine Coolant Manifold Bolt (1) (Qty: 6)

Fig 2: Engine Coolant Manifold Bolt Tightening Sequence

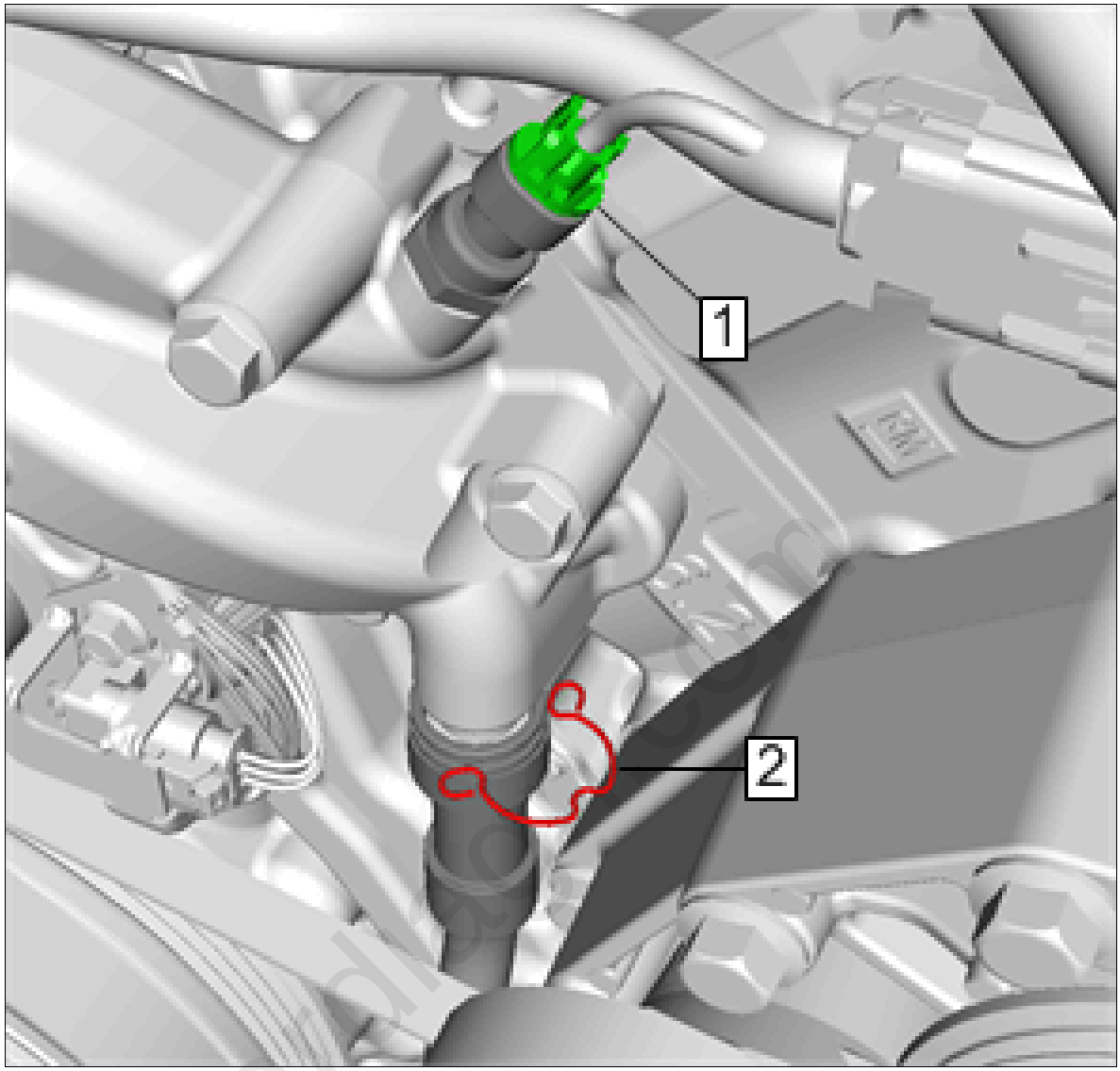


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

6. Tighten the engine coolant manifold bolts to 25 N.m (18 lb ft) in the sequence shown.

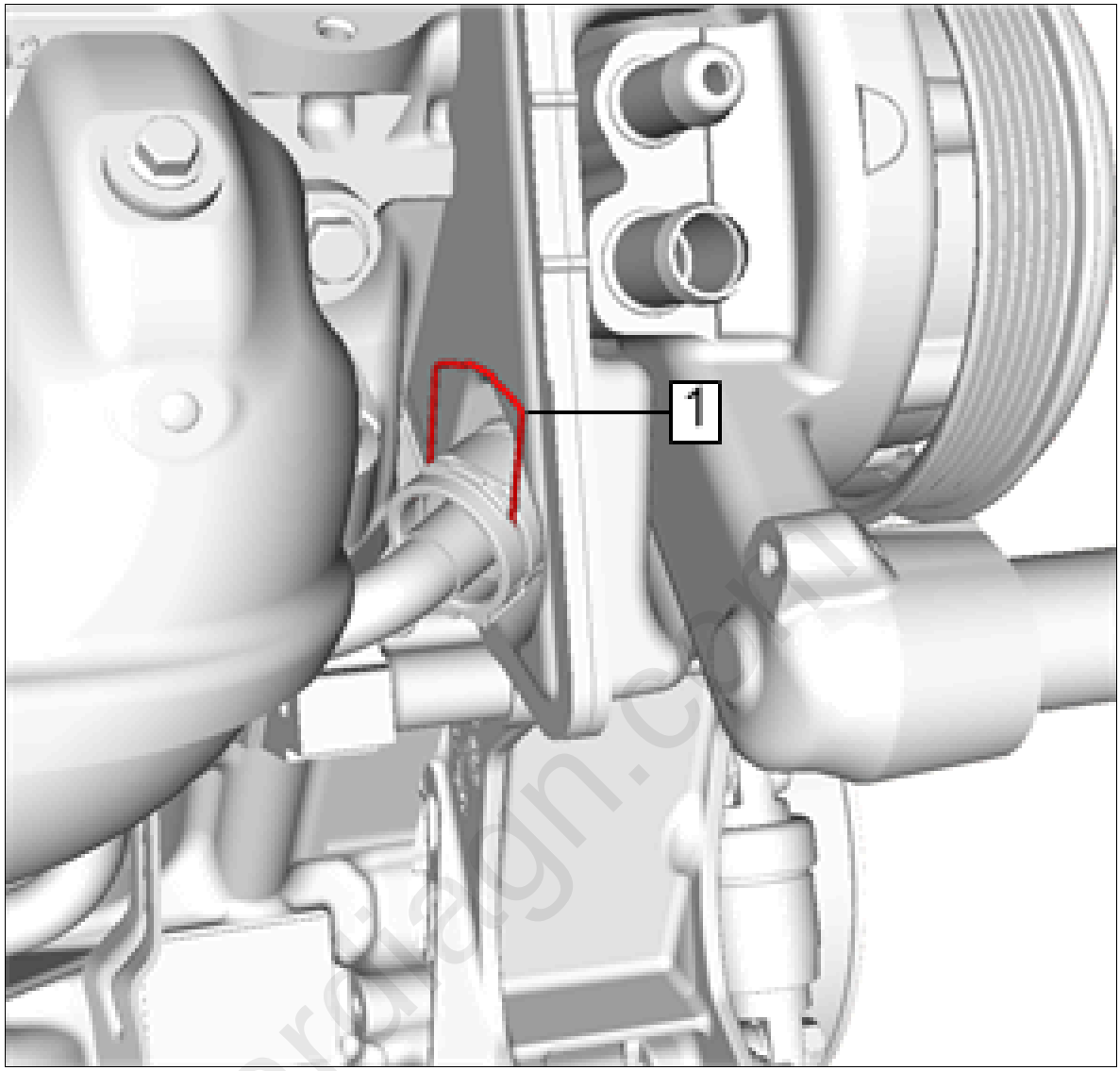
Fig 3: Engine Coolant Temperature Sensor



Courtesy of GENERAL MOTORS COMPANY

7. Install Engine Oil Cooler Hose Retainer (2)
8. Connect Engine Coolant Temperature Sensor (1)

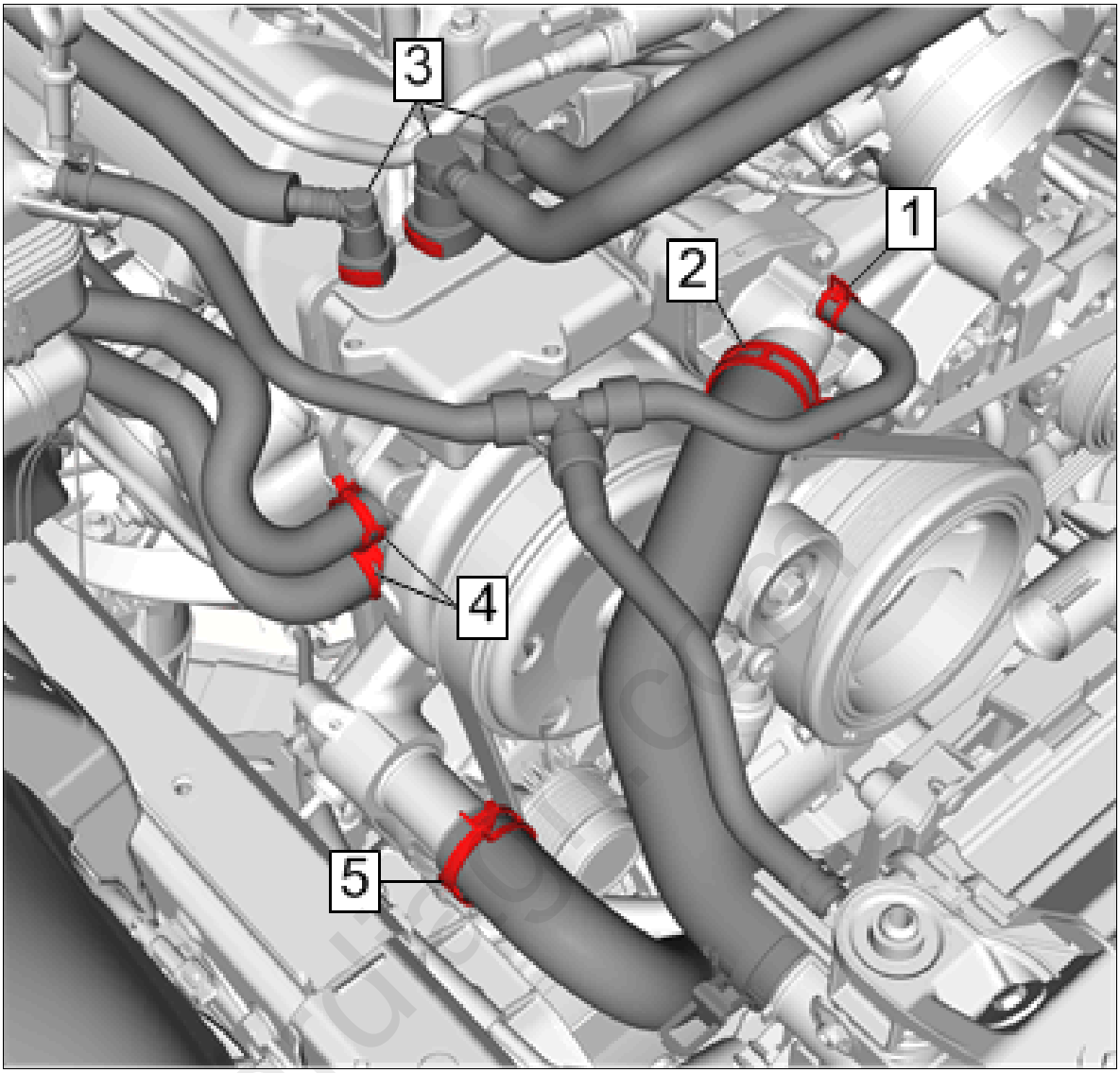
Fig 4: Positive Crankcase Ventilation Oil Separator Drain Clip



Courtesy of GENERAL MOTORS COMPANY

9. Engage Clip (1) at Positive Crankcase Ventilation Oil Separator Drain

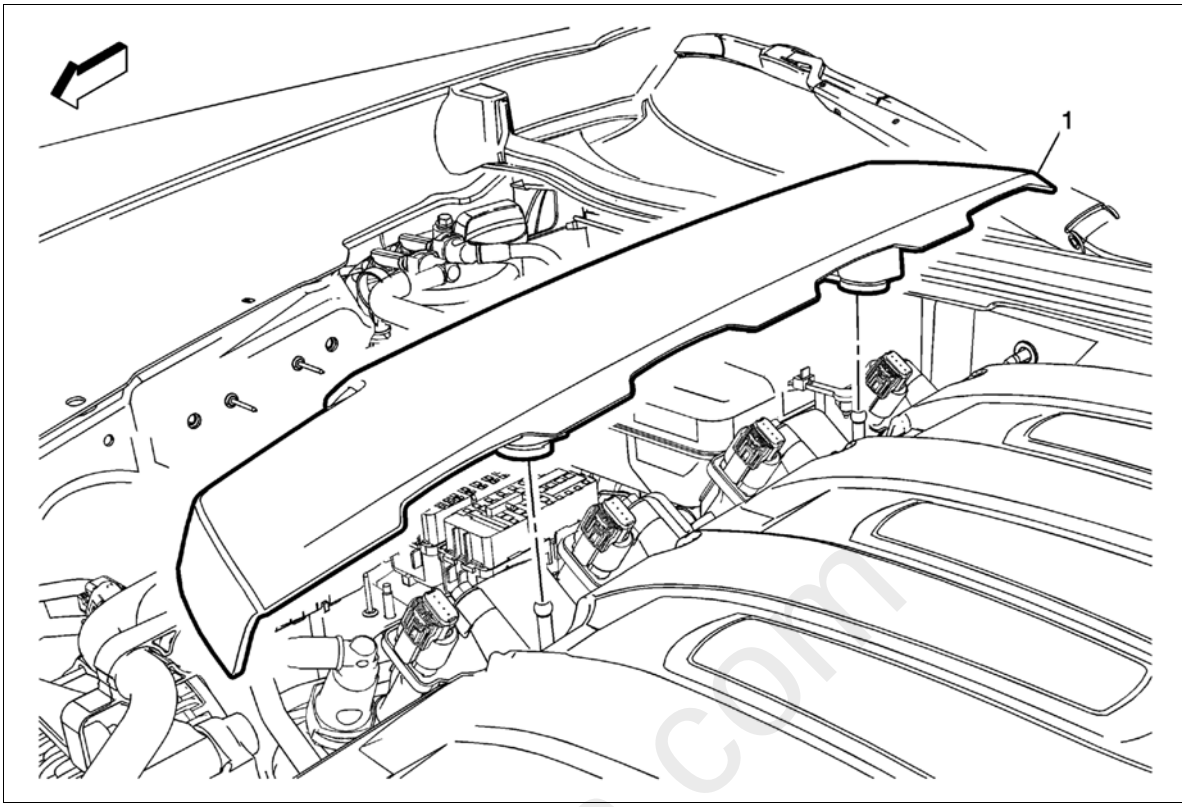
Fig 5: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

10. Connect Radiator Outlet Hose (5)
11. Connect Heater Inlet Hose and Heater Outlet Hose (4)
12. Connect Positive Crankcase Ventilation Tube (3) (Qty: 3)
13. Connect Radiator Inlet Hose (2)
14. Connect Radiator Surge Tank Inlet Hose (1)

Fig 6: Intake Manifold Cover (Right)

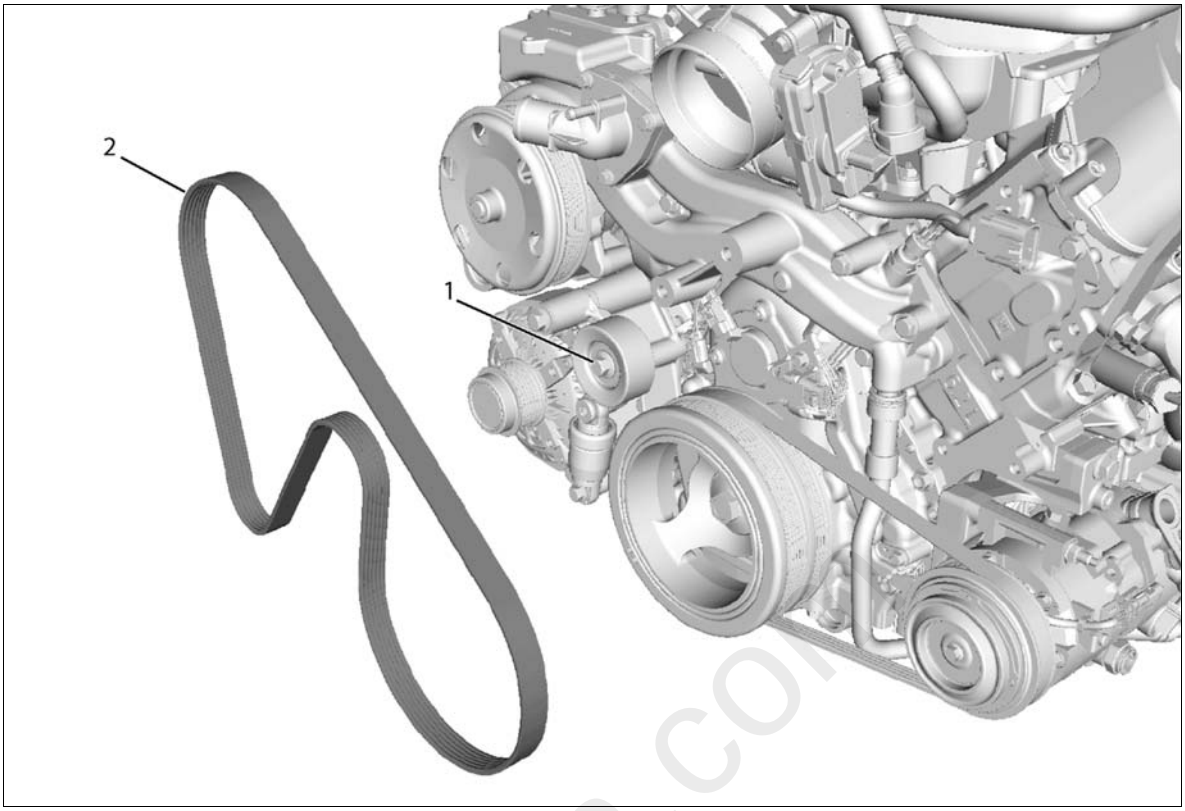


Courtesy of GENERAL MOTORS COMPANY

15. Install Intake Manifold Cover-Right Side - Intake Manifold Cover Replacement (Right)

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Fig 7: Drive Belt

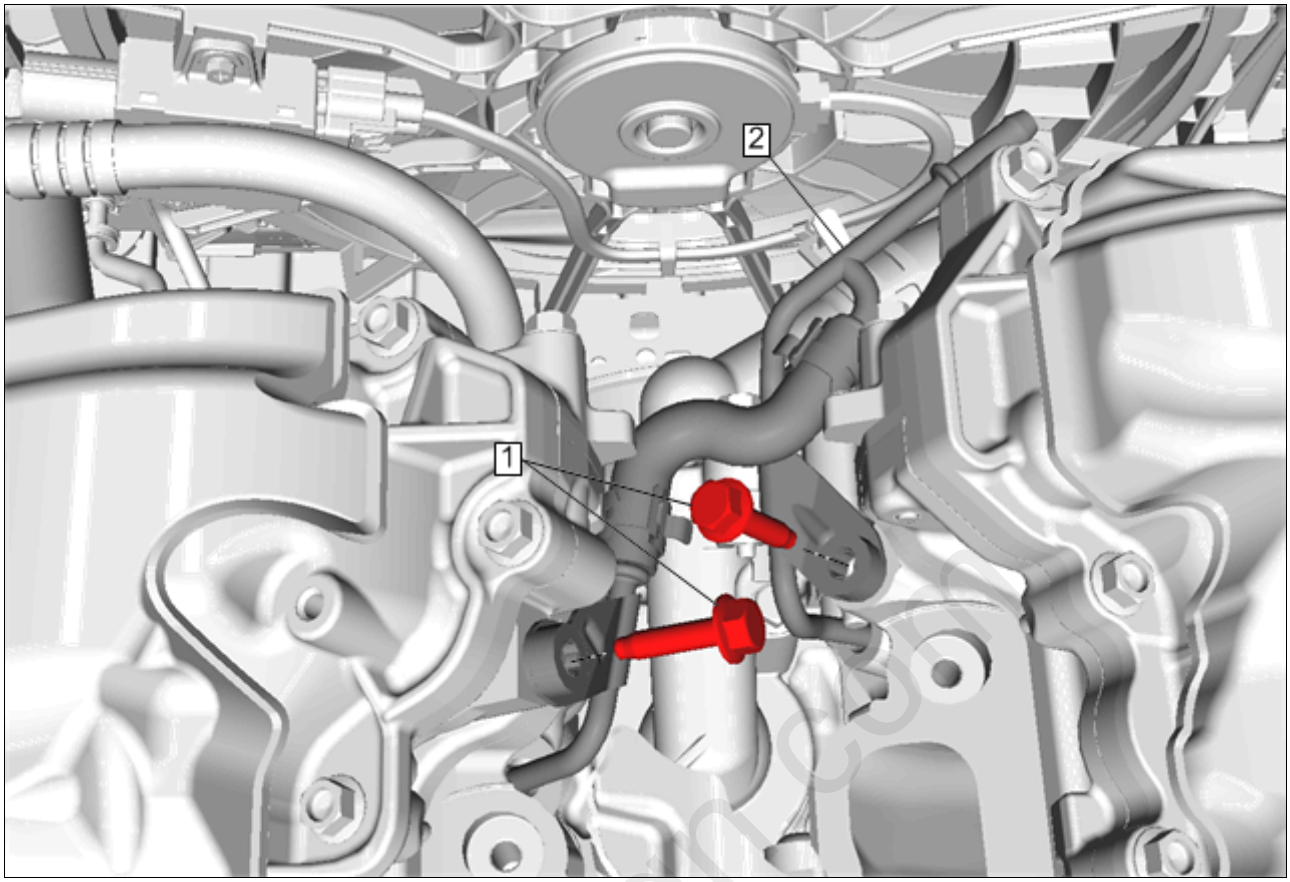


Courtesy of GENERAL MOTORS COMPANY

16. Install Drive Belt (2) Drive Belt Replacement - Accessory
17. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
18. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > ENGINE COOLANT AIR BLEED PIPE REPLACEMENT (LGX)

Fig 1: Engine Coolant Air Bleed Pipe (LGX)



Courtesy of GENERAL MOTORS COMPANY

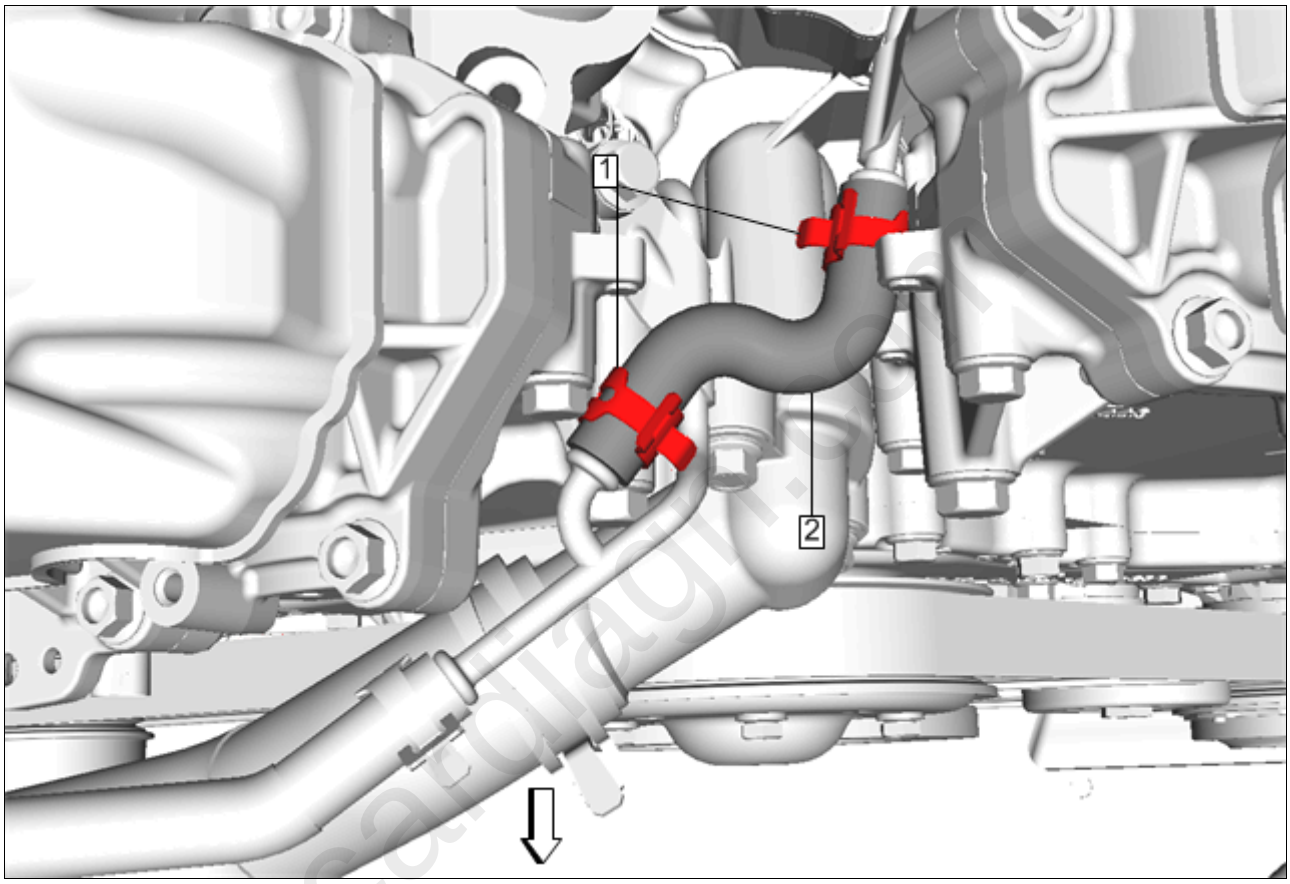
Callout	Component Name
Preliminary Procedure 1. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Intake Manifold Replacement 3. Disconnect Radiator Surge Tank Inlet Hose Replacement (LGX) at Engine Coolant Air Bleed Pipe	
1	Engine Coolant Air Bleed Pipe Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)

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2	Engine Coolant Air Bleed Pipe **Procedure** Install NEW seals.

REPAIR INSTRUCTIONS > ENGINE COOLANT AIR BLEED HOSE REPLACEMENT (LGX)

Fig 1: Engine Coolant Air Bleed Hose (LGX)



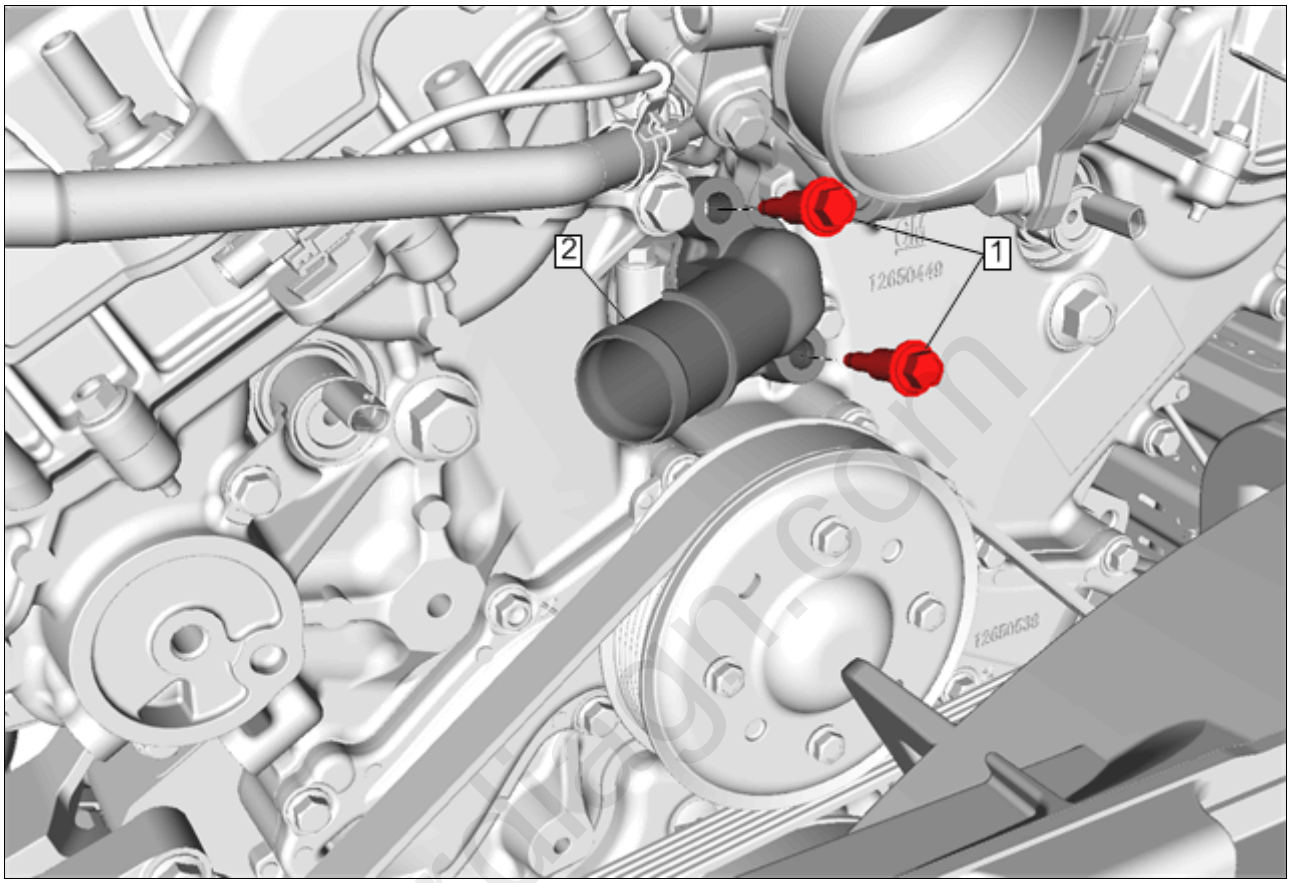
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Intake Manifold Replacement	
1	Engine Coolant Air Bleed Hose Clamp (Qty: 2) **Procedure** Hose Clamp Replacement Guidelines - Spring Type

2	Engine Coolant Air Bleed Hose

REPAIR INSTRUCTIONS > WATER OUTLET REPLACEMENT (LGX)

Fig 1: Water Outlet (LGX)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Throttle Body Assembly Replacement 2. Disconnect Radiator Inlet Hose Replacement (LGX without V18) Radiator Inlet Hose Replacement (LGX with V18) at Water Pump Inlet Pipe 3. Relocate the engine wiring harness and routing channel.	
1	Water Outlet Bolt (Qty: 2)

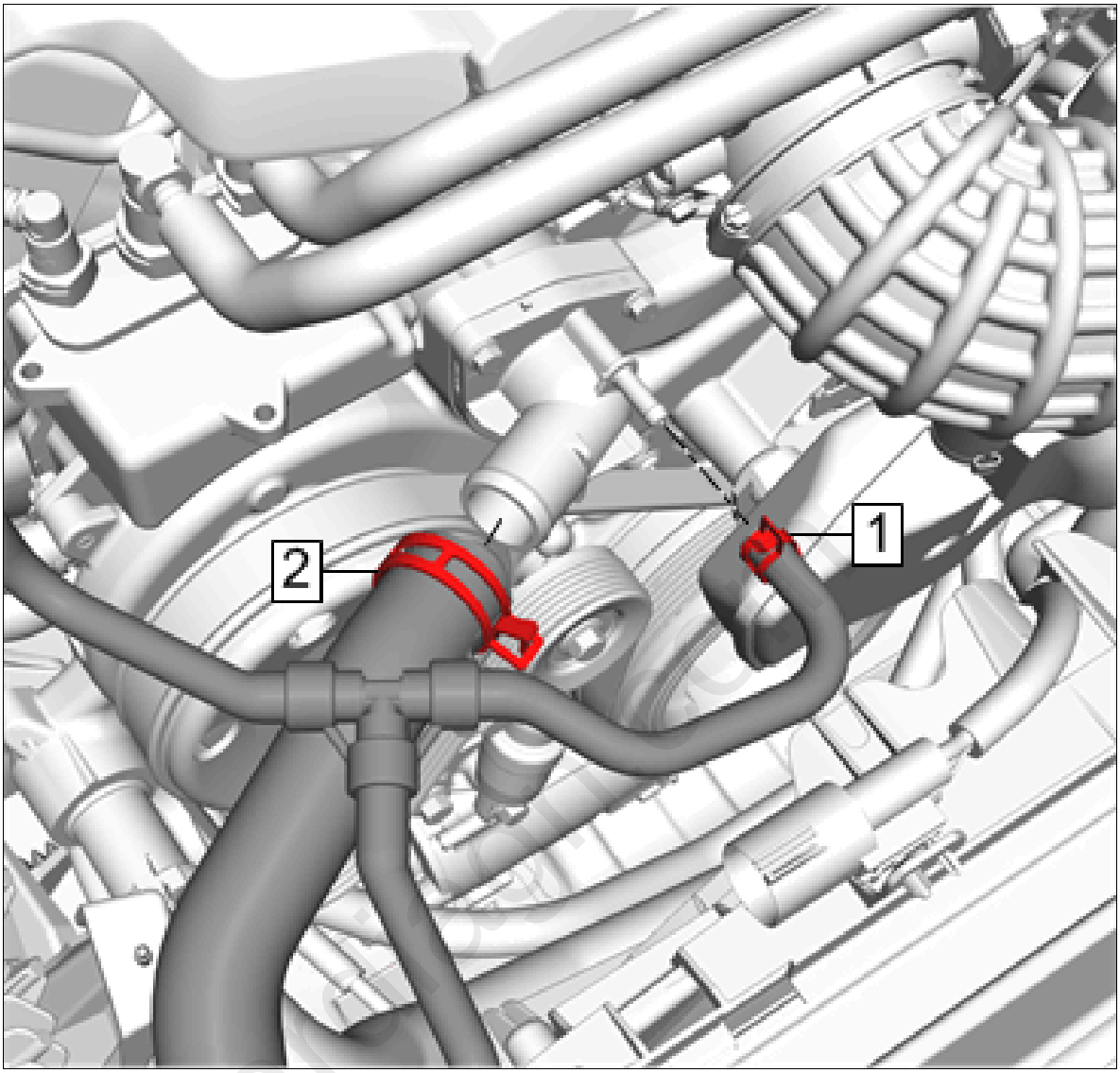
	CAUTION: *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)
2	Water Outlet **Procedure** Install a NEW seal.

REPAIR INSTRUCTIONS > WATER OUTLET REPLACEMENT (LT1) > REMOVAL PROCEDURE

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

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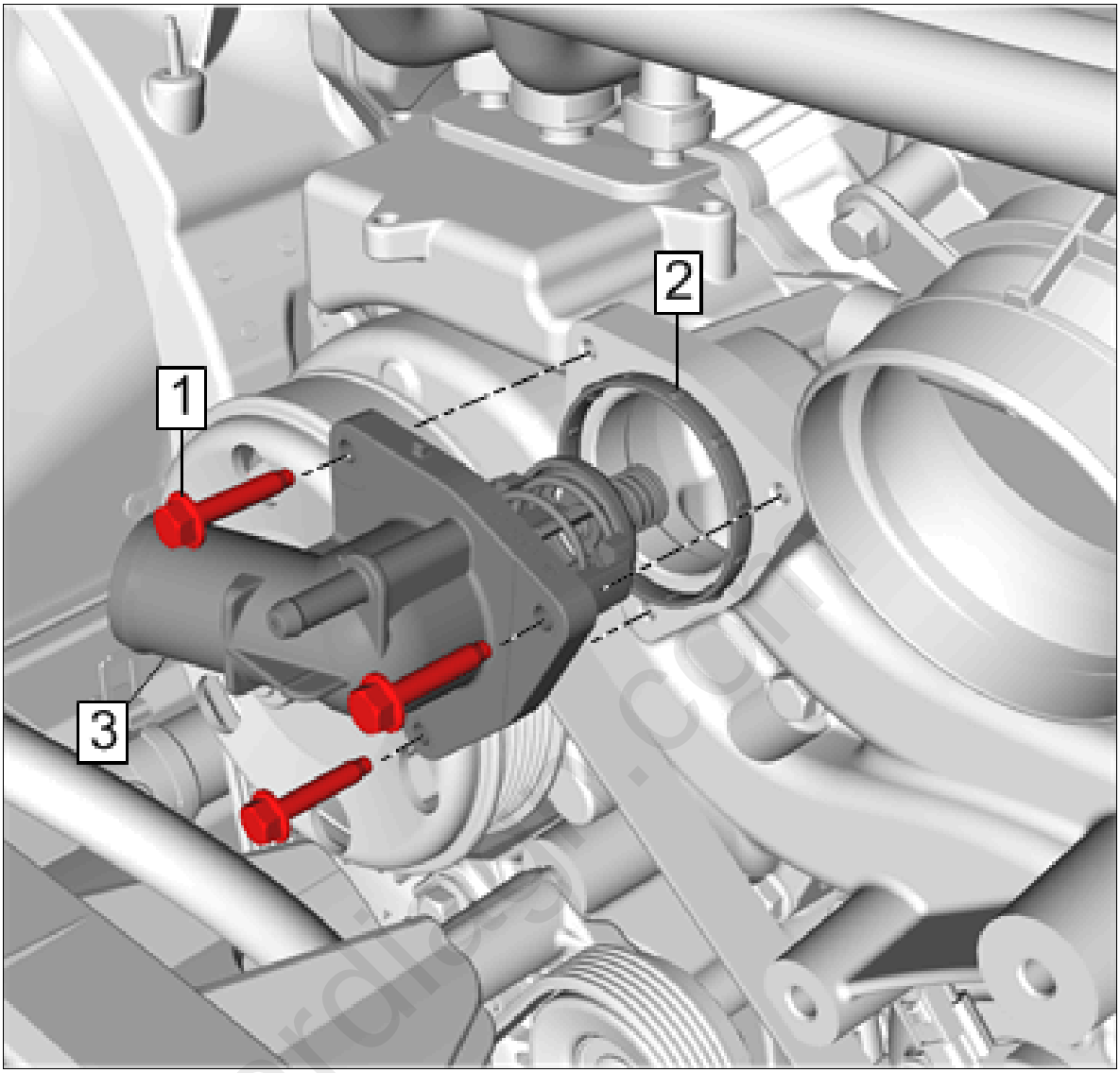
Fig 1: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

2. Disconnect Radiator Surge Tank Inlet Hose (1) at Water Outlet
3. Disconnect Radiator Inlet Hose (2) at Water Outlet

Fig 2: Water Outlet

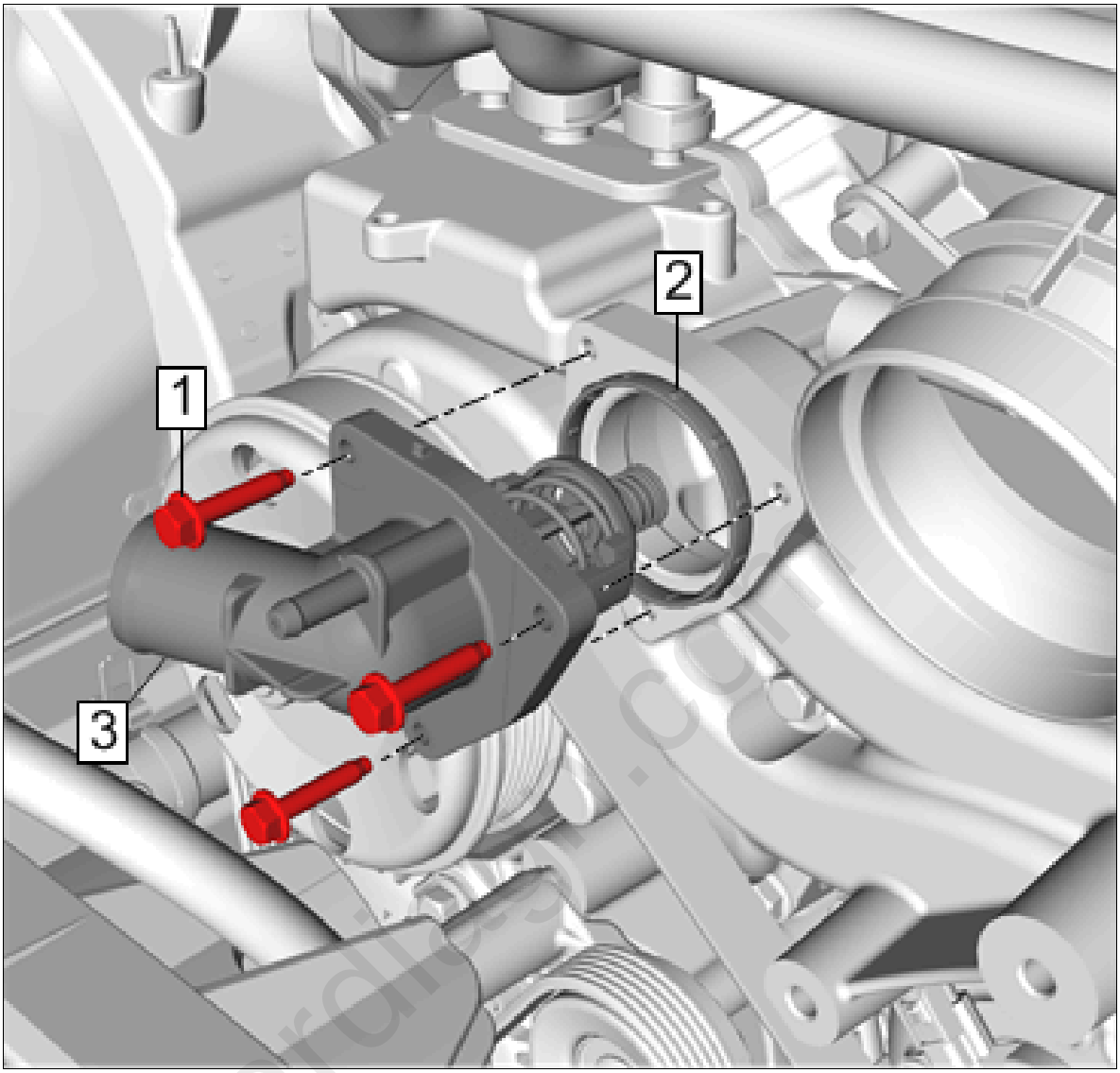


Courtesy of GENERAL MOTORS COMPANY

4. Remove Water Outlet Bolt (1) (Qty: 3)
5. Remove Water Outlet (3)
6. Remove Water Outlet O-Ring Seal (2) and DISCARD

REPAIR INSTRUCTIONS > WATER OUTLET REPLACEMENT (LT1) > INSTALLATION PROCEDURE

Fig 1: Water Outlet



Courtesy of GENERAL MOTORS COMPANY

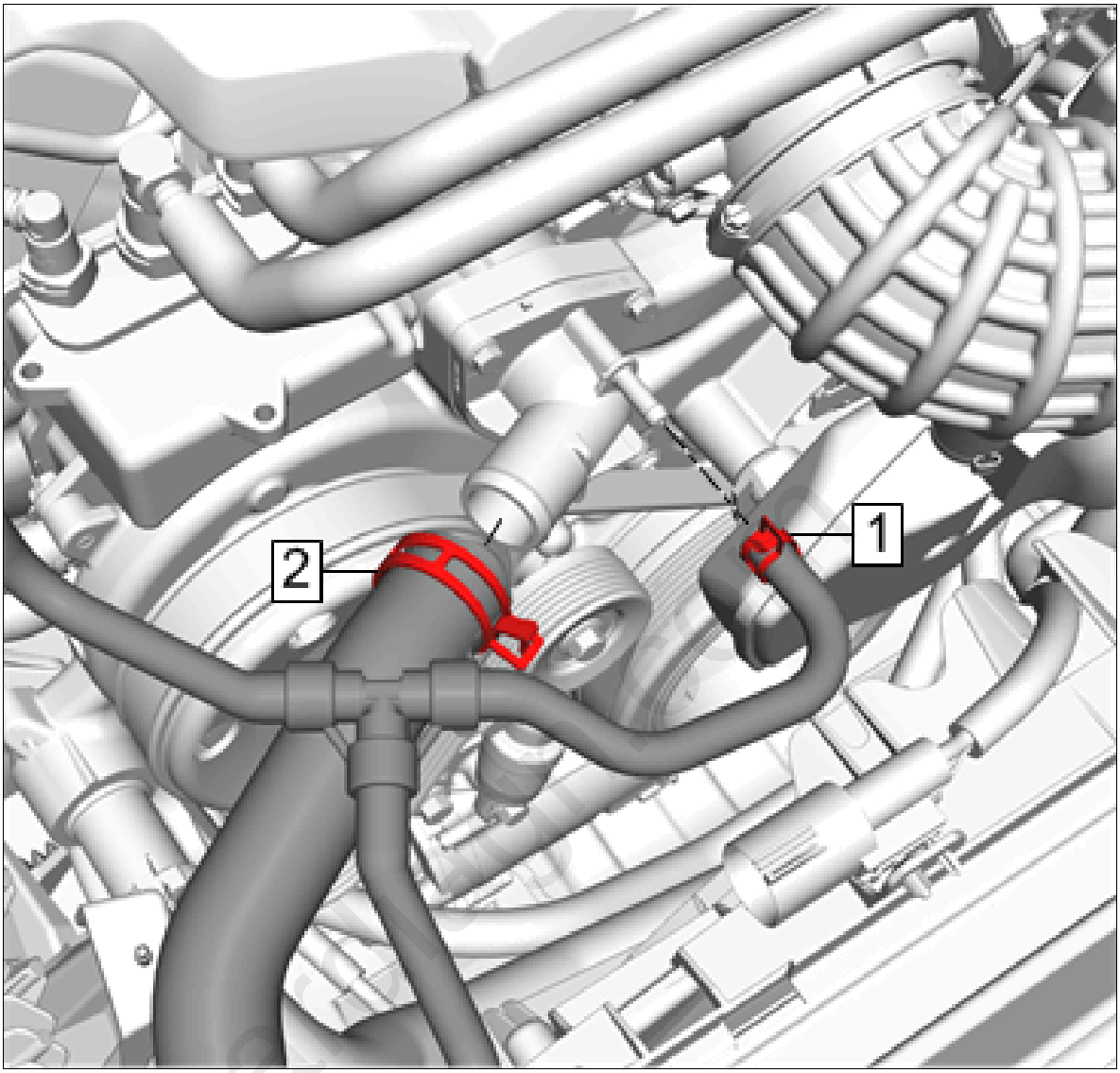
> *NOTE:*
>
> *Install a NEW water outlet O-ring seal.*

1. Install Water Outlet O-Ring Seal (2)
2. Install Water Outlet (3)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install Water Outlet Bolt (1) (Qty: 3) and tighten to 10 N.m (89 lb in)

Fig 2: Radiator Inlet Hose



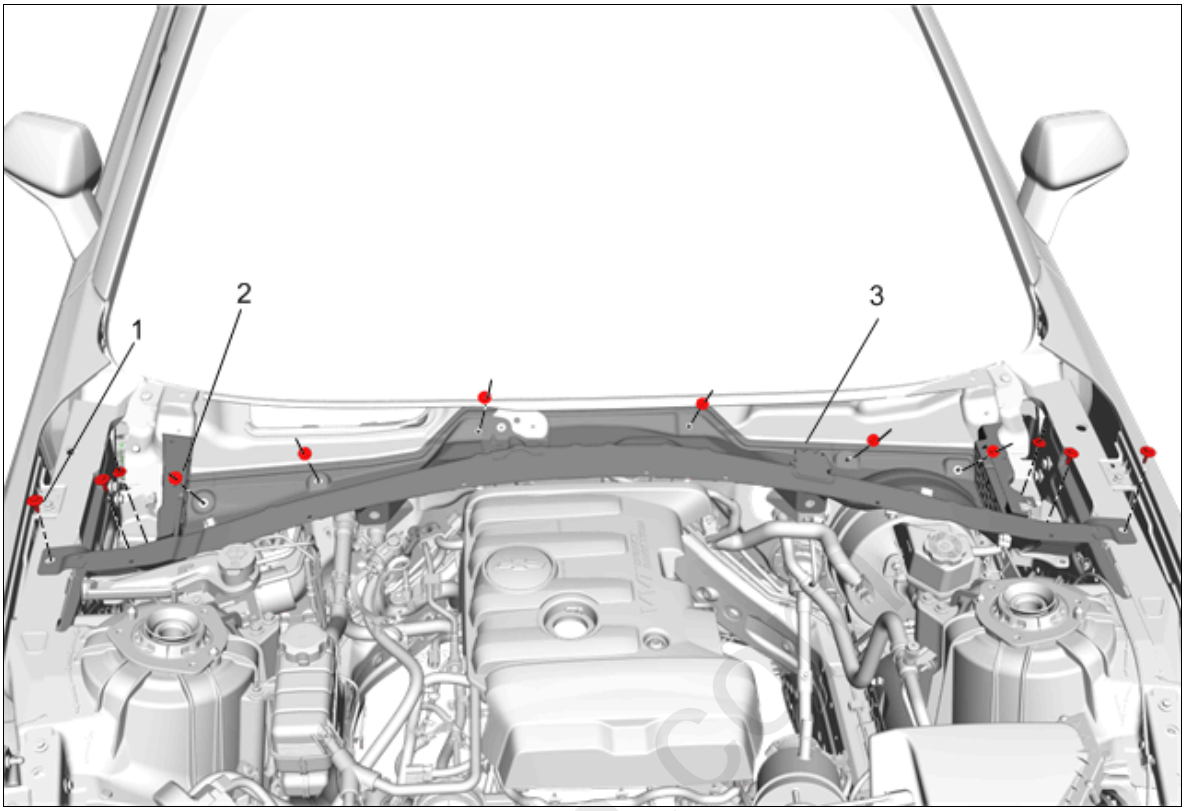
Courtesy of GENERAL MOTORS COMPANY

4. Connect Radiator Inlet Hose (2) at Water Outlet
5. Connect Radiator Surge Tank Inlet Hose (1) at Water Outlet
6. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

REPAIR INSTRUCTIONS > WATER OUTLET REPLACEMENT (LTG) > REMOVAL PROCEDURE

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

Fig 1: Plenum Front Panel

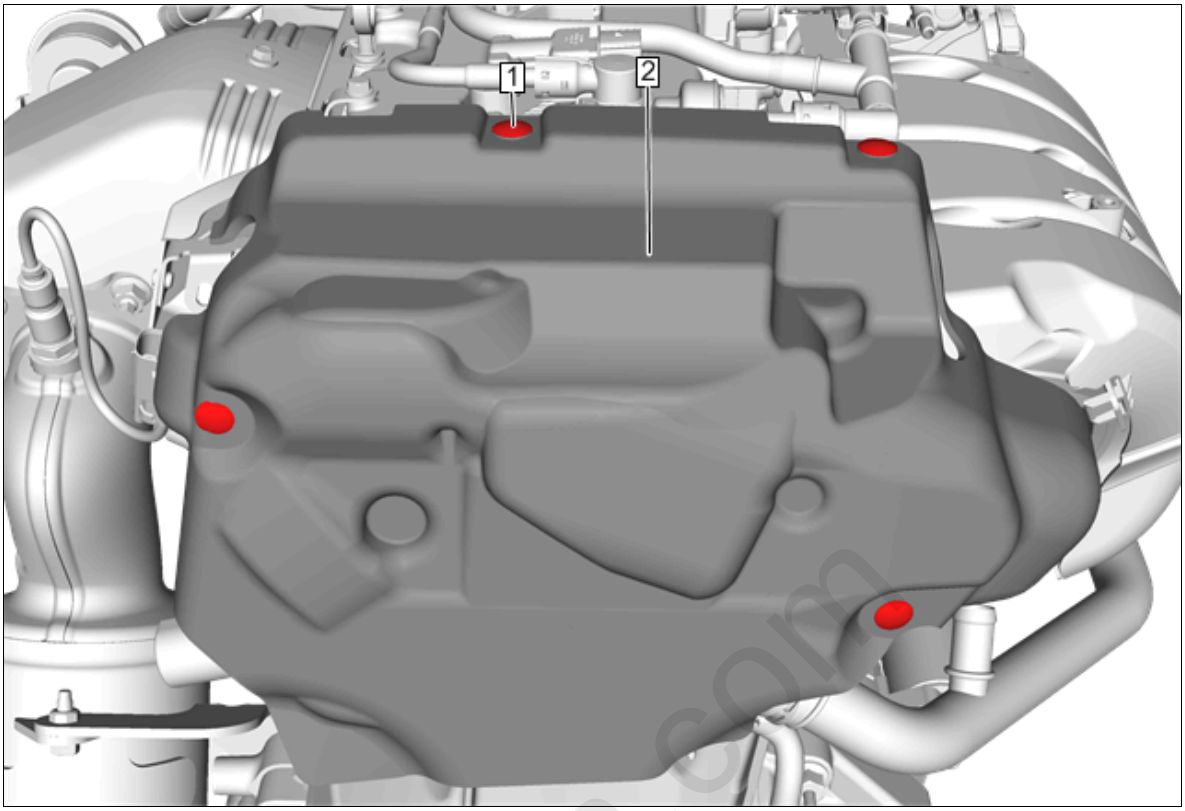


Courtesy of GENERAL MOTORS COMPANY

2. Remove Plenum Front Panel (3) - Plenum Front Panel Replacement

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Fig 2: Fuel Pump Insulator

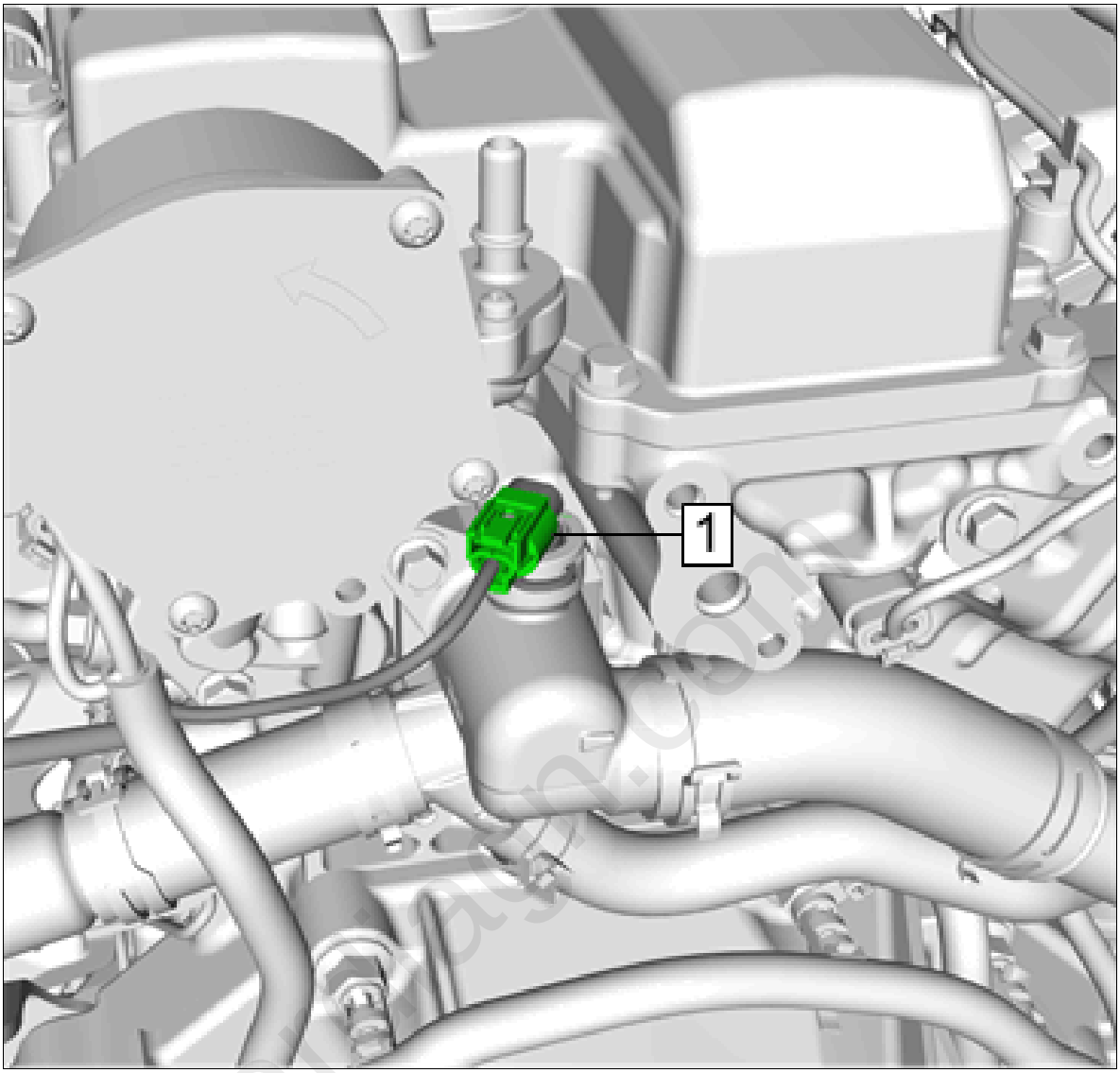


Courtesy of GENERAL MOTORS COMPANY

3. Remove Fuel Pump Insulator (2) - Fuel Pump Insulator Replacement (Inner)Fuel Pump Insulator Replacement (Outer)

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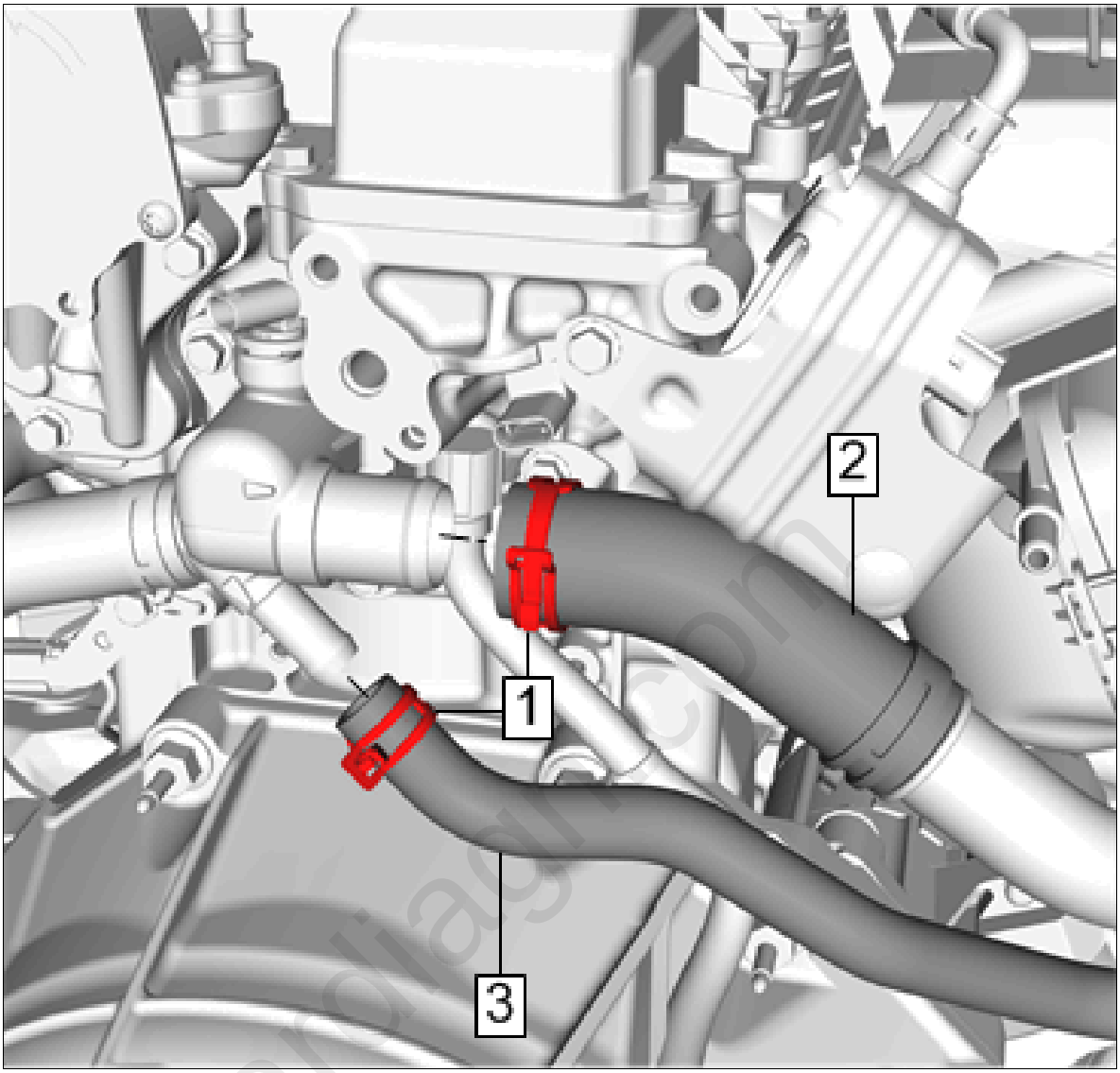
Fig 3: Engine Coolant Temperature Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

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

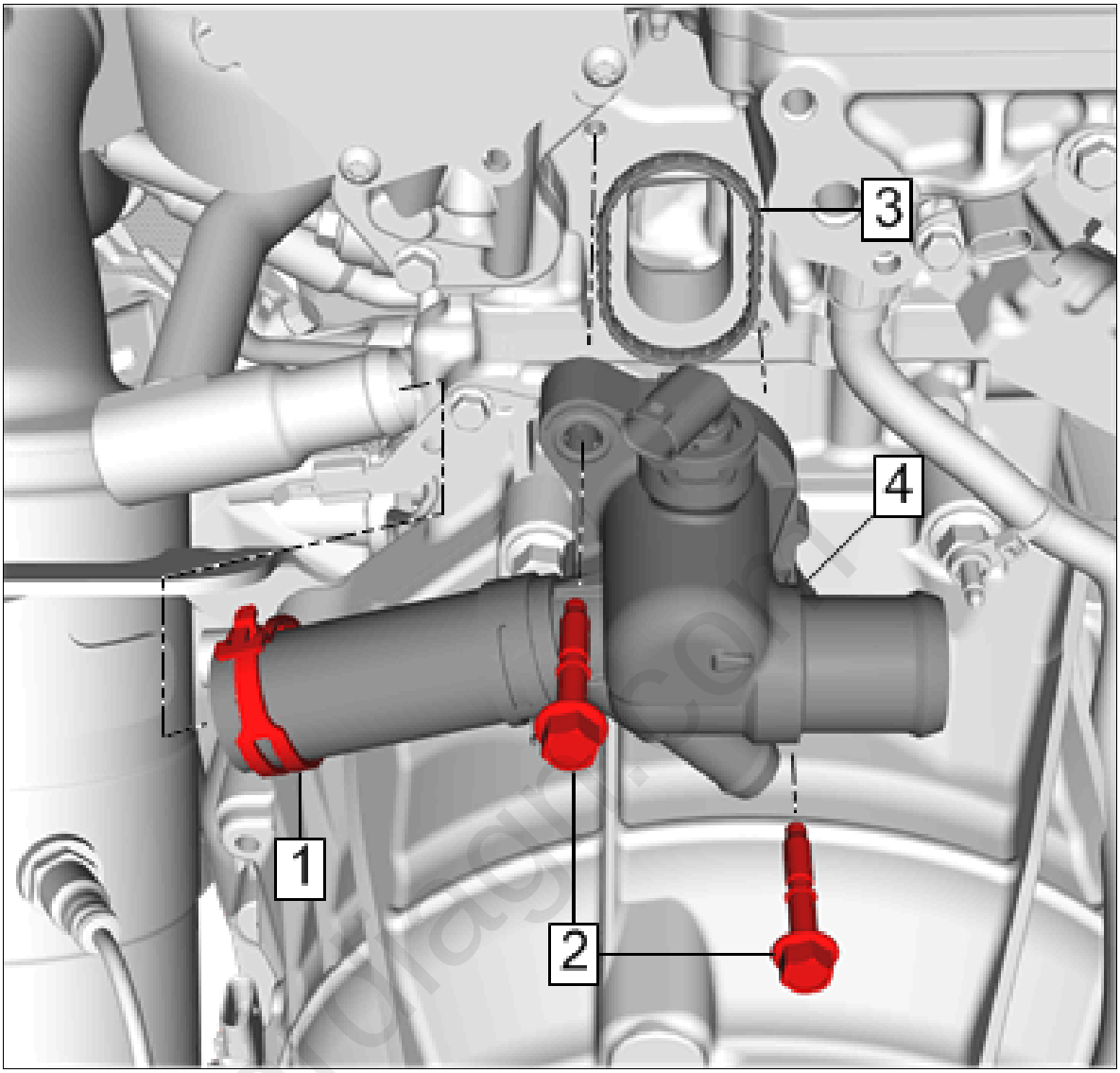
Fig 4: Auxiliary Heater Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Disengage Hose Clamp (1) (Qty: 2) - Hose Clamp Replacement Guidelines - Spring Type
6. Remove Radiator Inlet Hose (2)
7. Remove Auxiliary Heater Outlet Hose (3)

Fig 5: Water Outlet And Seal

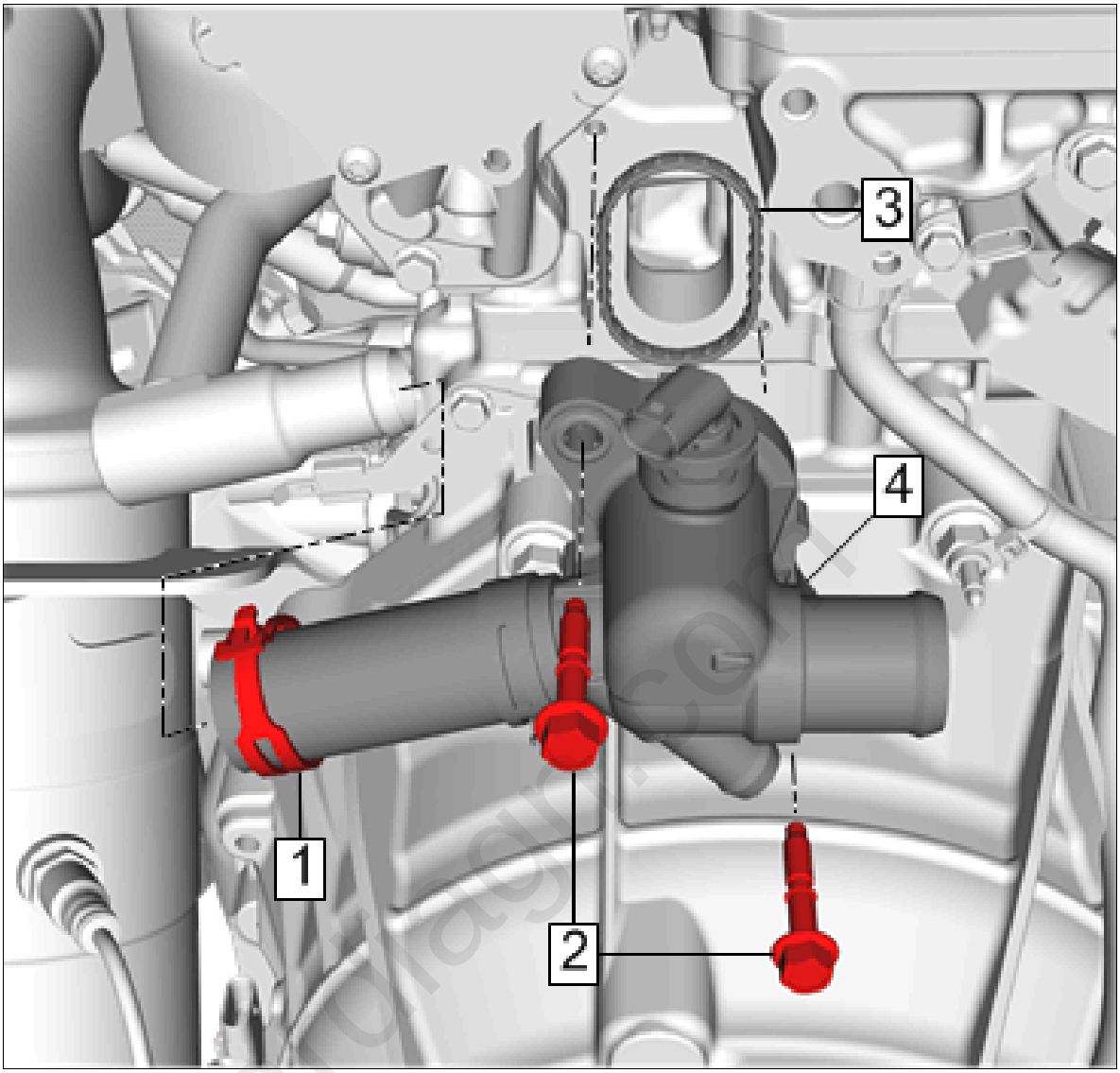


Courtesy of GENERAL MOTORS COMPANY

8. Disengage Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type
9. Remove Water Outlet Bolt (2) (Qty: 2)
10. Remove Water Outlet (4)
11. Remove Water Outlet Seal (3) and DISCARD

REPAIR INSTRUCTIONS > WATER OUTLET REPLACEMENT (LTG) > INSTALLATION PROCEDURE

Fig 1: Water Outlet And Seal



Courtesy of GENERAL MOTORS COMPANY

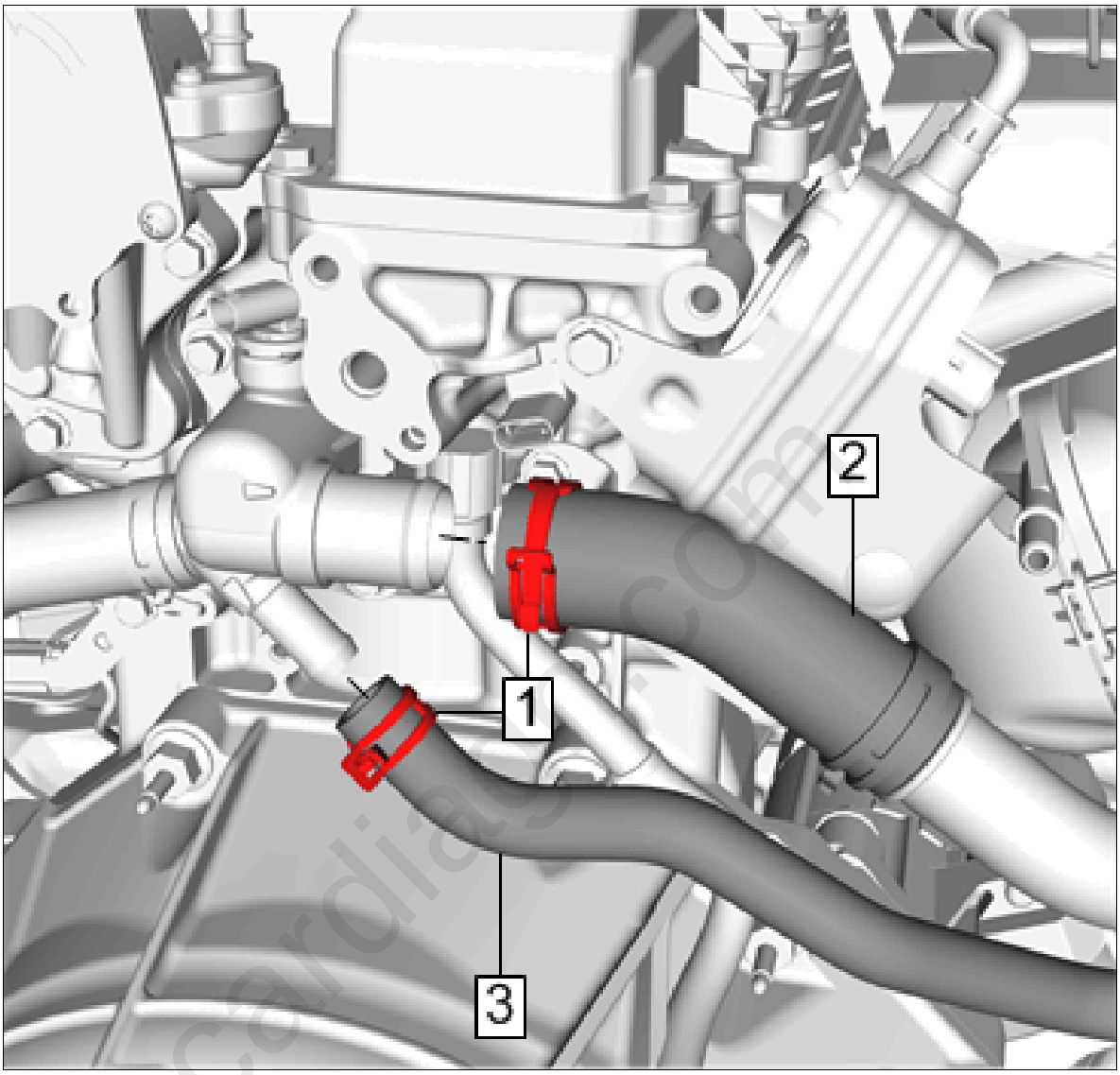
> *NOTE:*
>
> *Install a NEW seal.*

1. Install Water Outlet Seal (3)
2. Install Water Outlet (4)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install Water Outlet Bolt (2) (Qty: 2) and tighten to 10 N.m (89 lb in)
4. Engage Hose Clamp (1) - Hose Clamp Replacement Guidelines - Spring Type

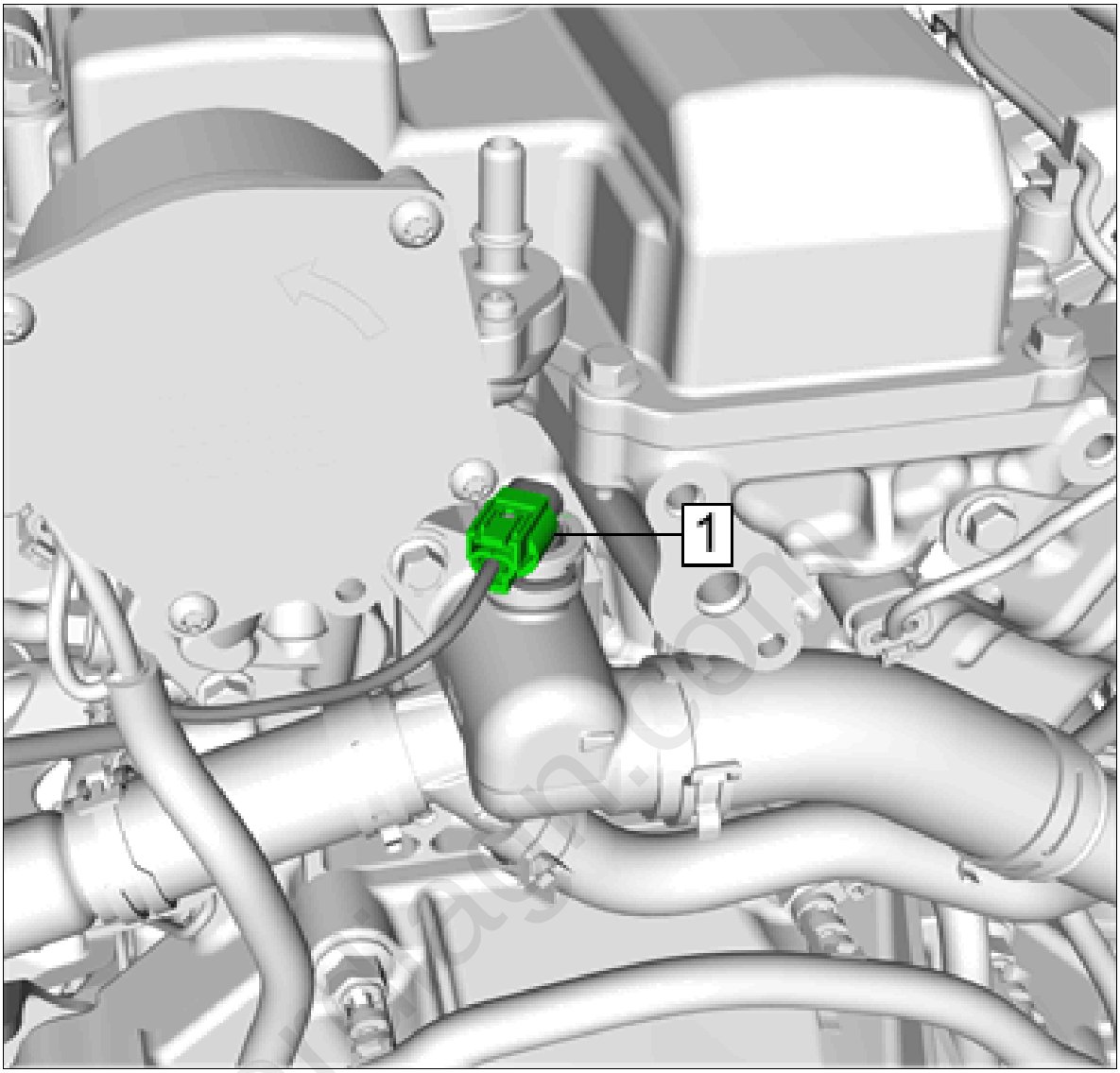
Fig 2: Auxiliary Heater Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

5. Install Auxiliary Heater Outlet Hose (3)
6. Install Radiator Inlet Hose (2)
7. Engage Hose Clamp (1) (Qty: 2) - Hose Clamp Replacement Guidelines - Spring Type

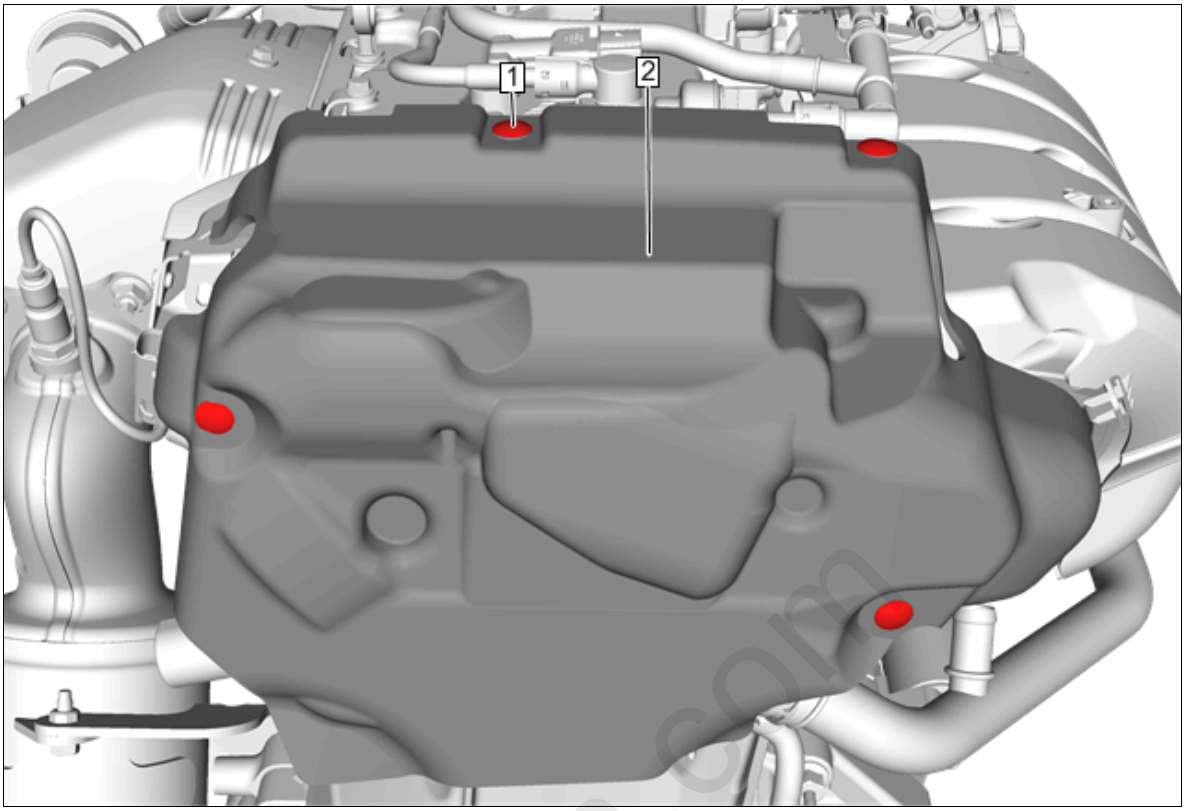
Fig 3: Engine Coolant Temperature Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

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

Fig 4: Fuel Pump Insulator

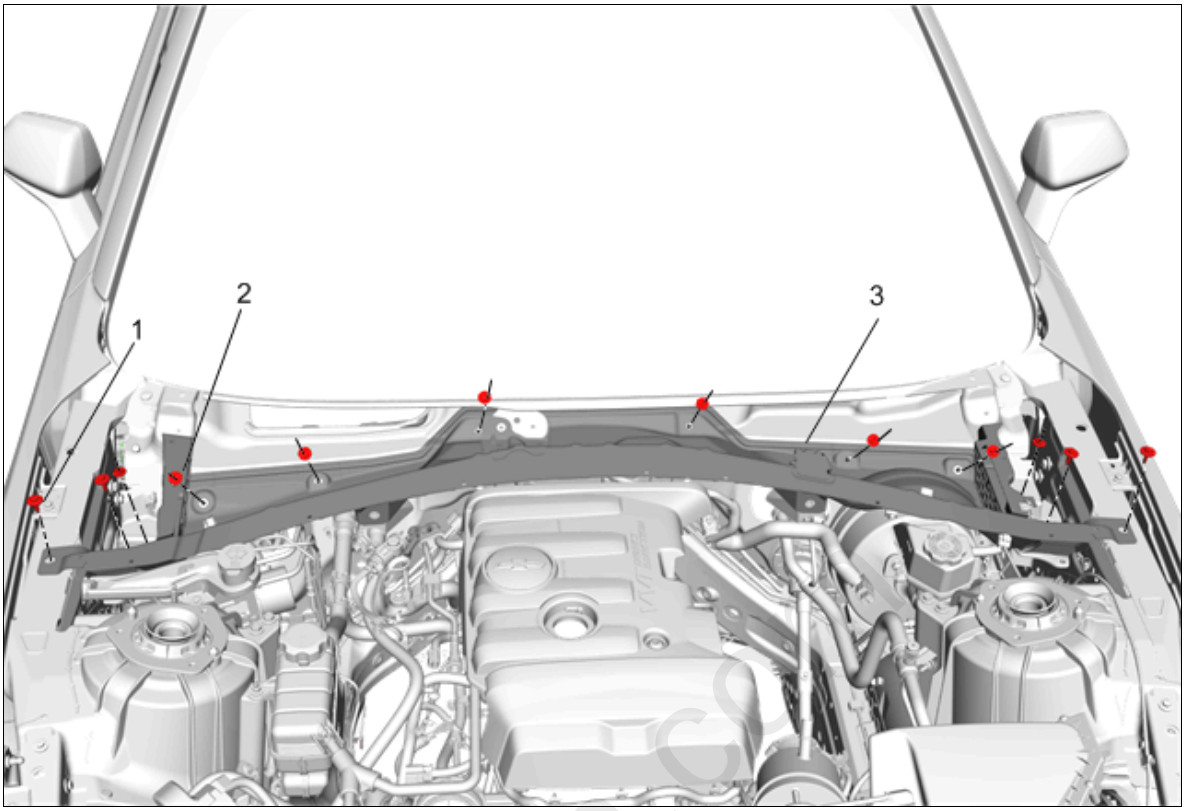


Courtesy of GENERAL MOTORS COMPANY

9. Install Fuel Pump Insulator (2) - Fuel Pump Insulator Replacement (Inner)Fuel Pump Insulator Replacement (Outer)

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Fig 5: Plenum Front Panel



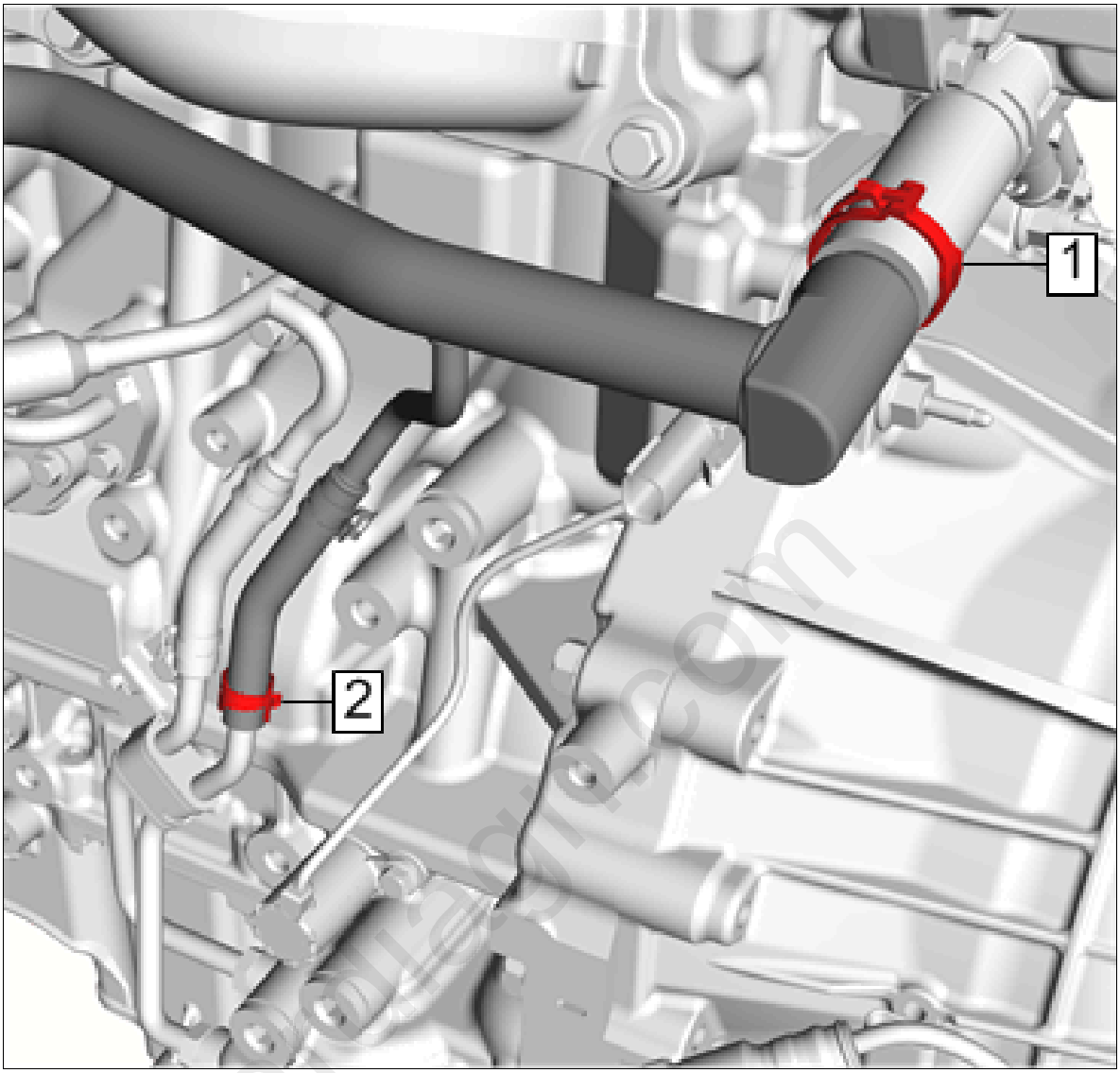
Courtesy of GENERAL MOTORS COMPANY

10. Install Plenum Front Panel (3) - Plenum Front Panel Replacement
11. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)

REPAIR INSTRUCTIONS > THERMOSTAT BYPASS PIPE REPLACEMENT (LTG WITHOUT Y4Q) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Exhaust Manifold Brace - Exhaust Manifold Brace Replacement (LTG)
3. Remove Engine Mount Bracket-Left Side - Engine Mount Bracket Replacement - Left Side

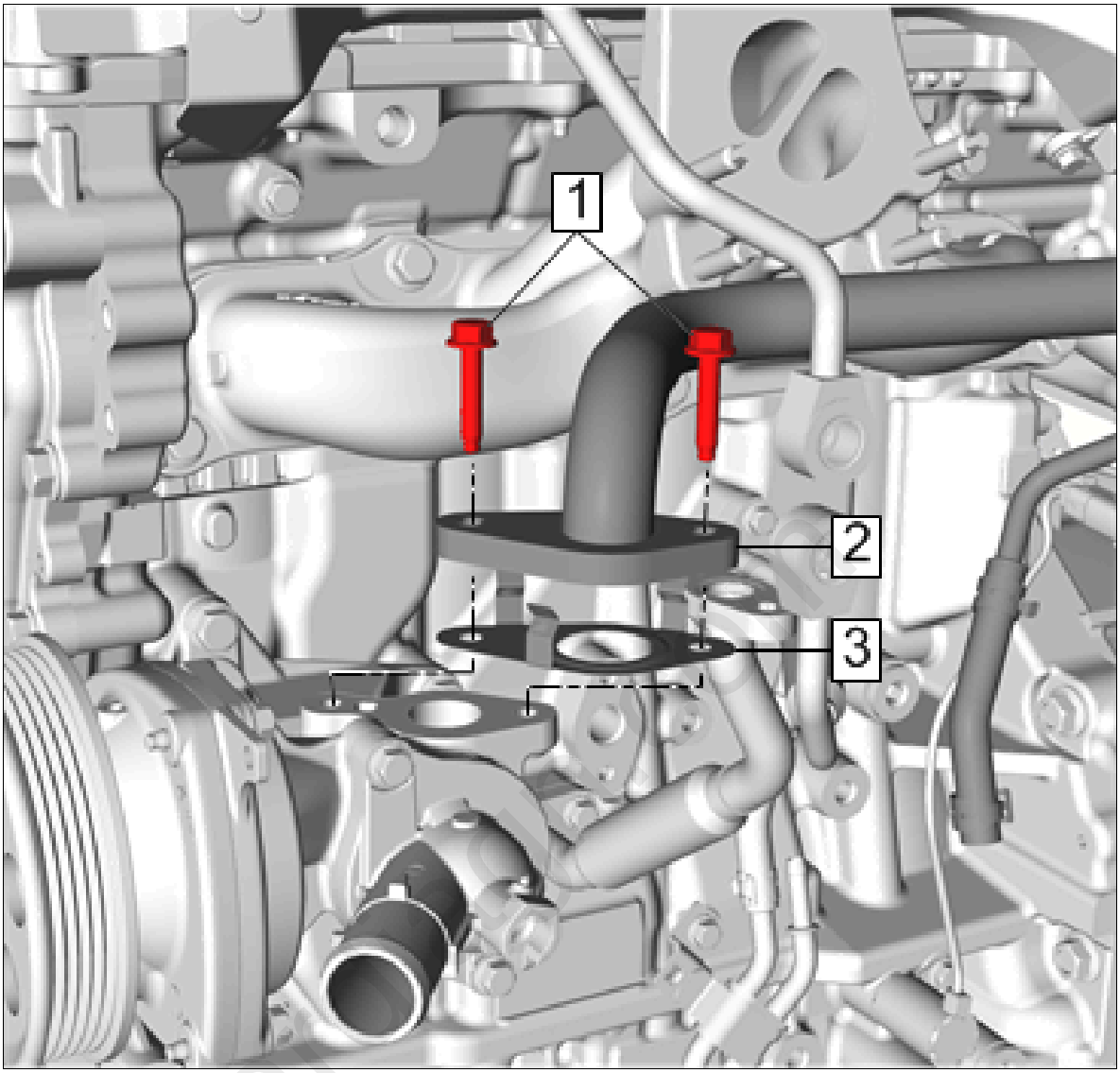
Fig 1: Clamps



Courtesy of GENERAL MOTORS COMPANY

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

Fig 2: Thermostat Bypass Pipe Gasket

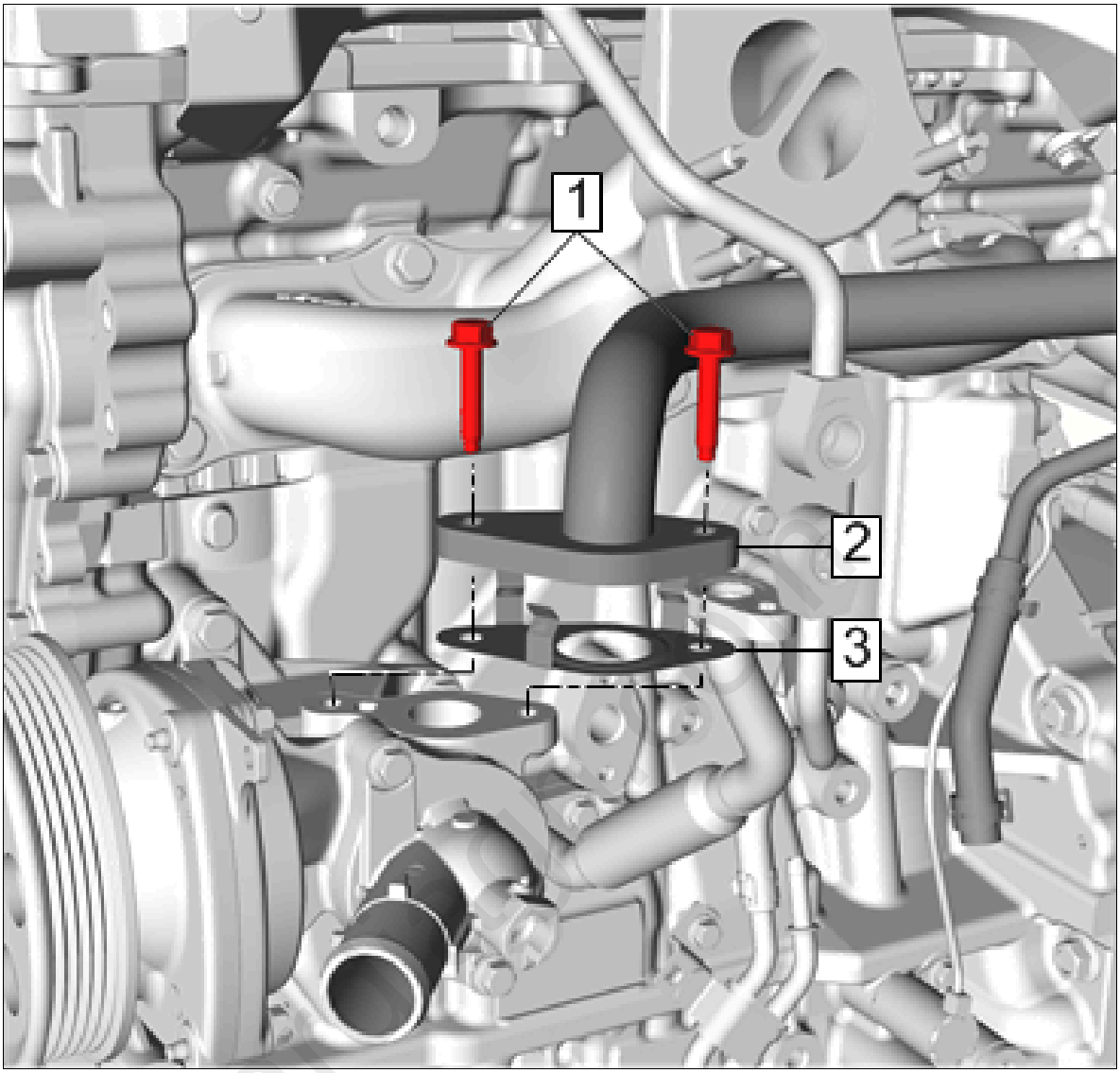


Courtesy of GENERAL MOTORS COMPANY

6. Remove Thermostat Bypass Pipe Bolt (1) (Qty: 2)
7. Remove Thermostat Bypass Pipe (2)
8. Remove Thermostat Bypass Pipe Gasket (3) and DISCARD

REPAIR INSTRUCTIONS > THERMOSTAT BYPASS PIPE REPLACEMENT (LTG WITHOUT Y4Q) > INSTALLATION PROCEDURE

Fig 1: Thermostat Bypass Pipe Gasket



Courtesy of GENERAL MOTORS COMPANY

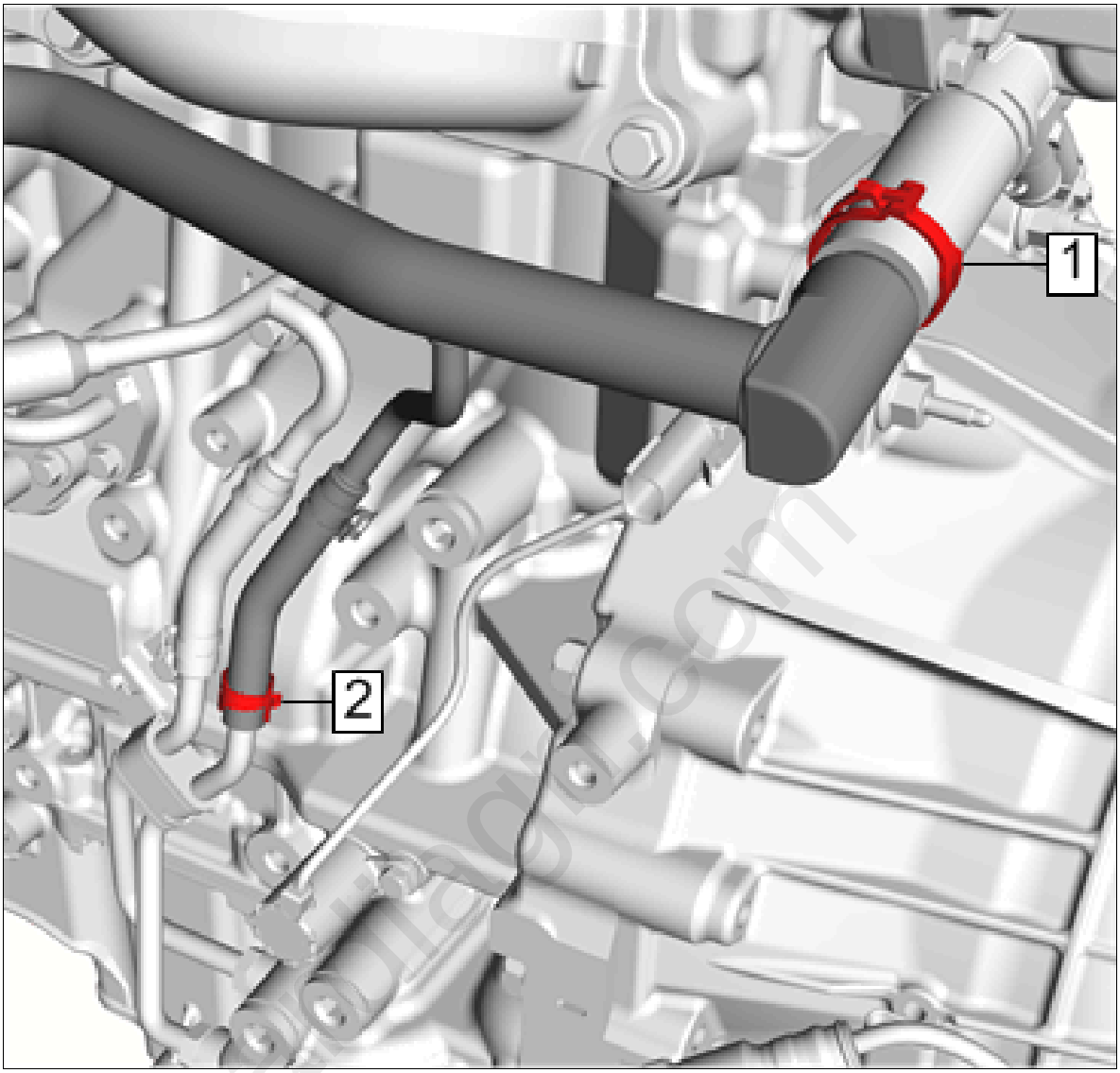
> *NOTE:*
>
> *Install a NEW thermostat bypass pipe gasket.*

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) (Qty: 2) and tighten to 10 N.m (89 lb in)

Fig 2: Clamps



Courtesy of GENERAL MOTORS COMPANY

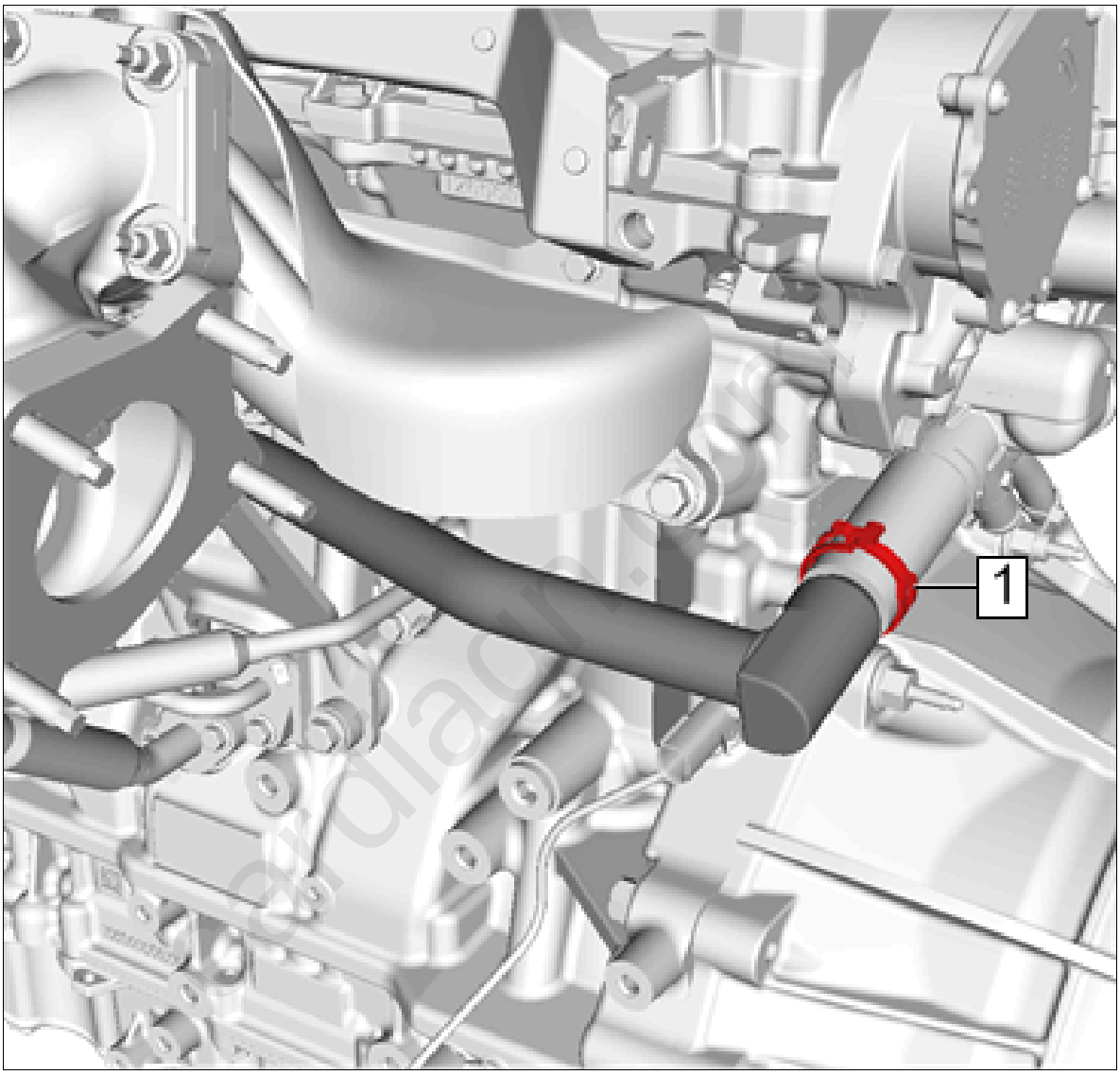
4. Engage Engine Oil Cooler Inlet Hose Clamp (2)
5. Engage Thermostat Bypass Hose Clamp (1)
6. Install Engine Mount Bracket-Left Side - Engine Mount Bracket Replacement - Left Side
7. Install Exhaust Manifold Brace - Exhaust Manifold Brace Replacement (LTG)
8. Fill the cooling system. Cooling System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

REPAIR INSTRUCTIONS > THERMOSTAT BYPASS PIPE REPLACEMENT (LTG WITH

Y4Q) > REMOVAL PROCEDURE

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

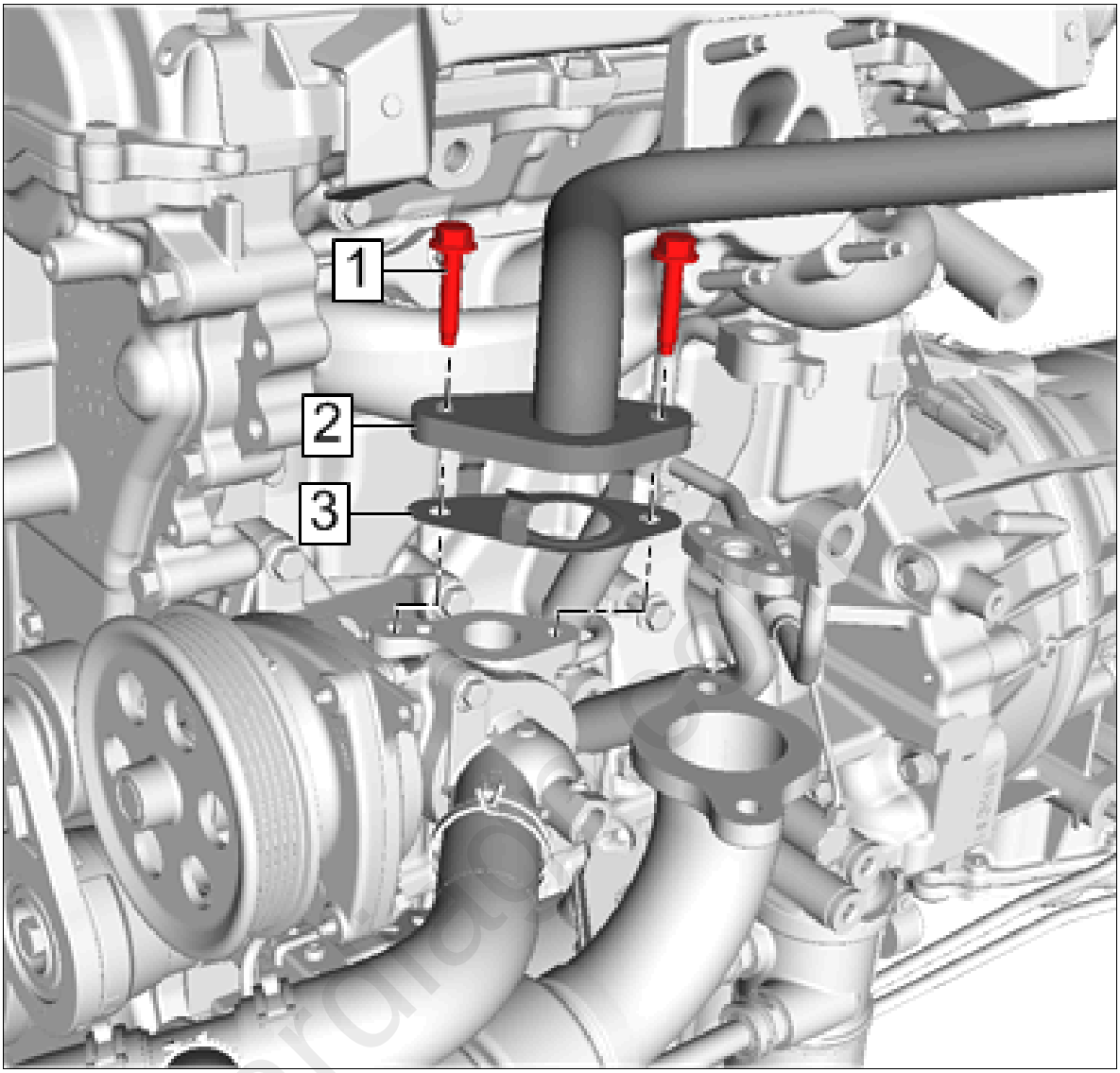
Fig 1: Thermostat Bypass Hose Clamp



Courtesy of GENERAL MOTORS COMPANY

3. Disengage Thermostat Bypass Hose Clamp (1)

Fig 2: Thermostat Bypass Pipe

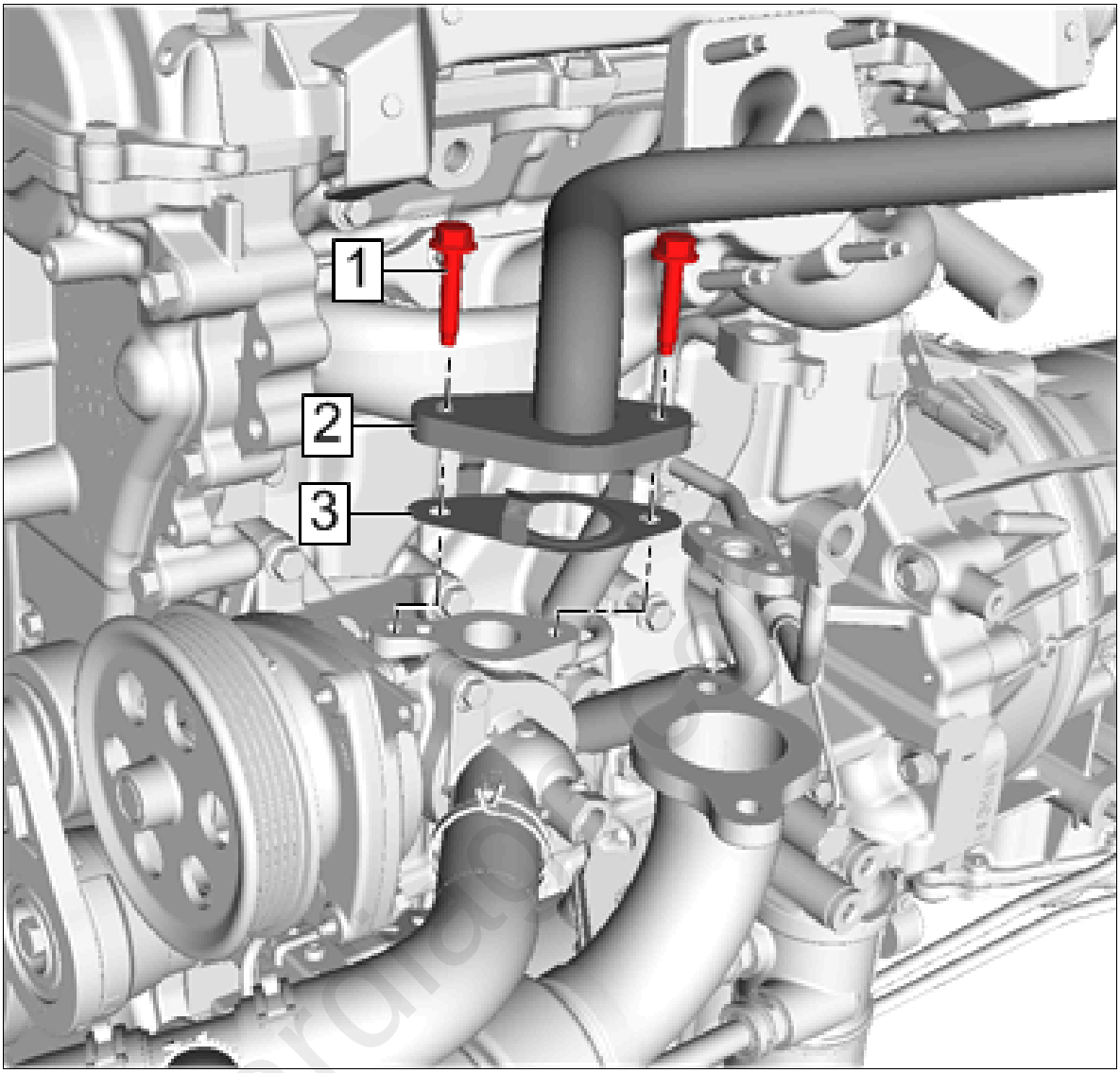


Courtesy of GENERAL MOTORS COMPANY

4. Remove Thermostat Bypass Pipe Bolt (1) (Qty: 2)
5. Remove Thermostat Bypass Pipe (2)
6. Remove Thermostat Bypass Pipe Gasket (3) and DISCARD

REPAIR INSTRUCTIONS > THERMOSTAT BYPASS PIPE REPLACEMENT (LTG WITH Y4Q) > INSTALLATION PROCEDURE

Fig 1: Thermostat Bypass Pipe



Courtesy of GENERAL MOTORS COMPANY

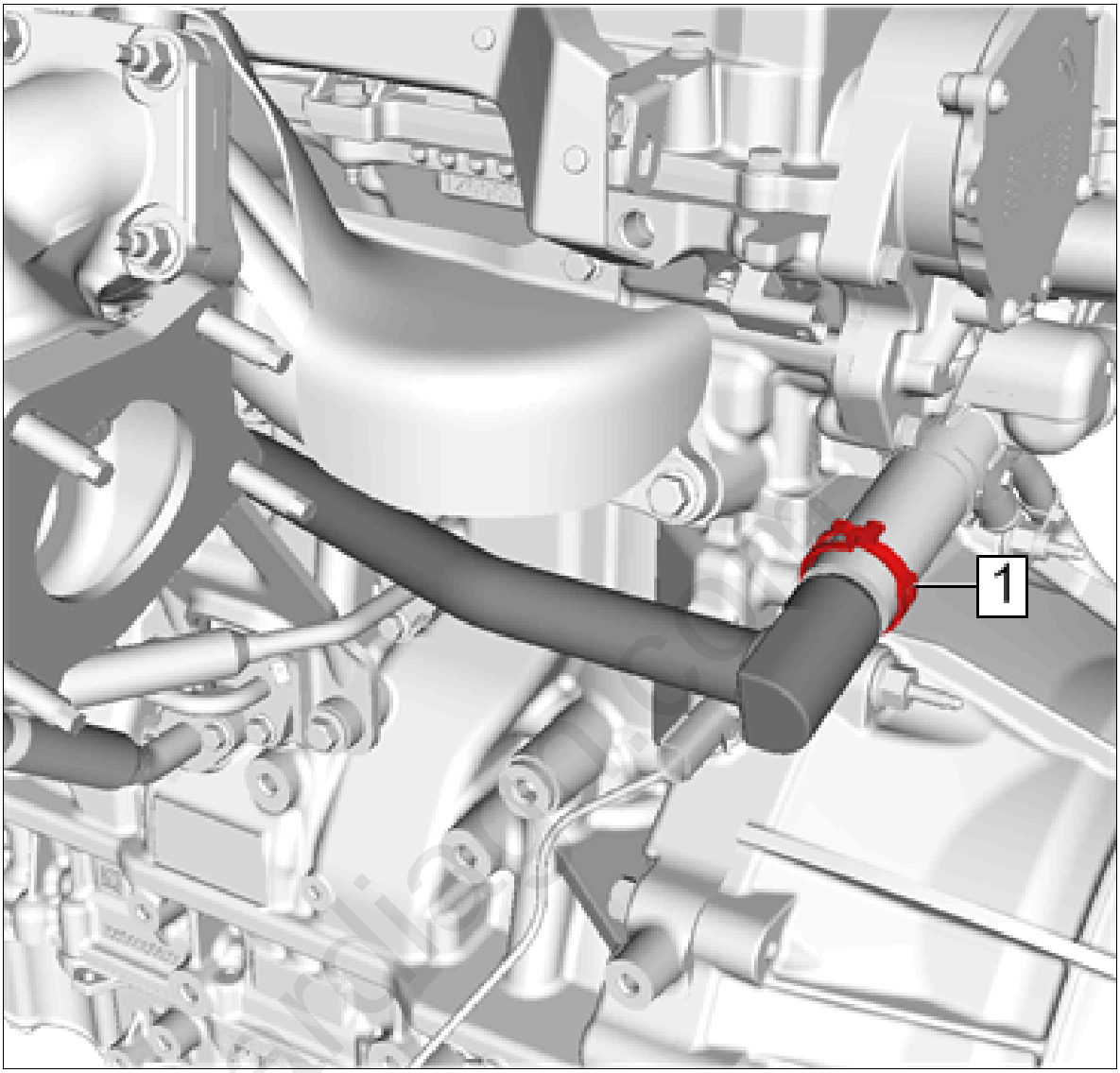
> *NOTE:*
>
> *Install a NEW thermostat bypass pipe gasket.*

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) (Qty: 2) and tighten to 10 N.m (89 lb in)

Fig 2: Thermostat Bypass Hose Clamp

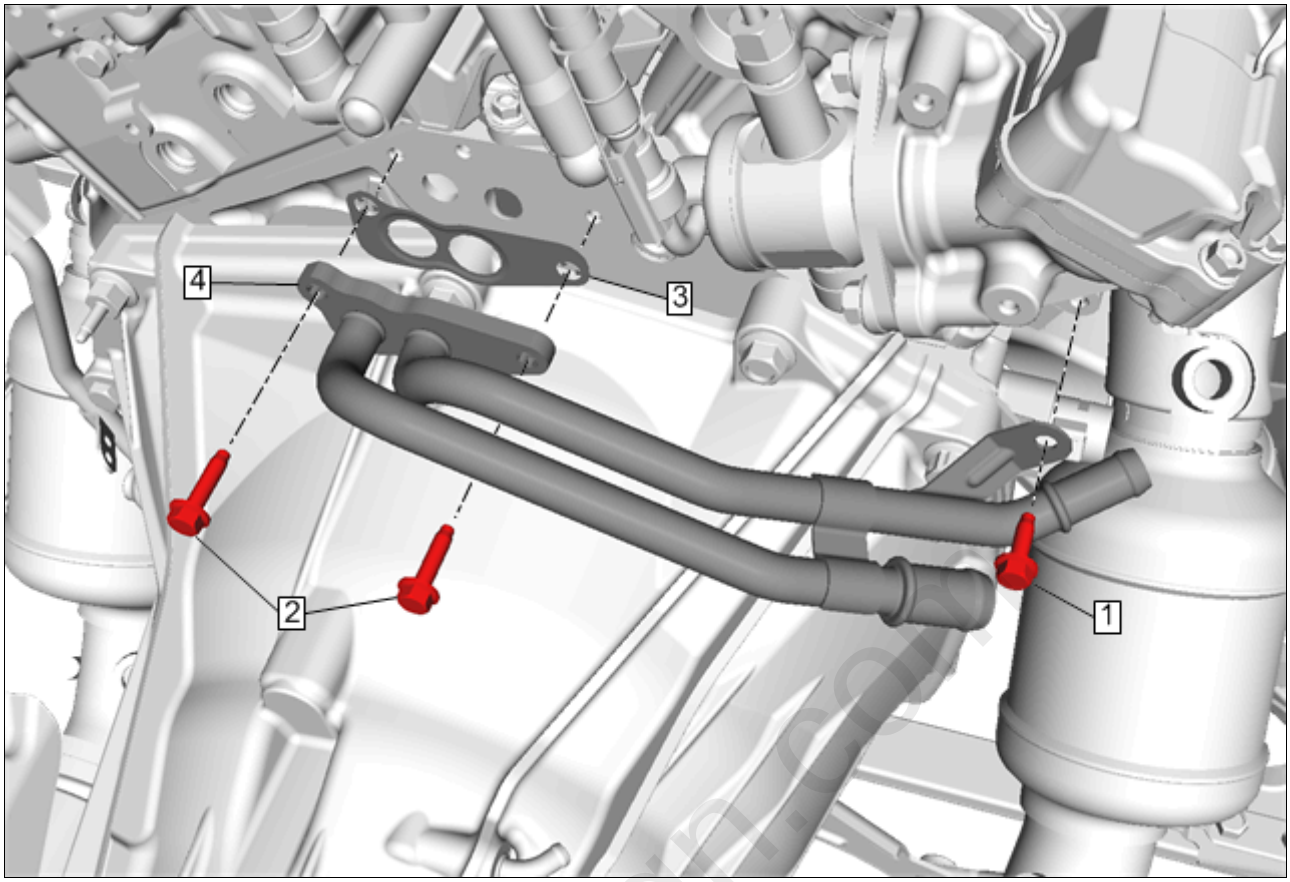


Courtesy of GENERAL MOTORS COMPANY

4. Engage Thermostat Bypass Hose Clamp (1)
5. Install Exhaust Manifold Brace Replacement (LTG)
6. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
7. Start the engine and check for leaks.

REPAIR INSTRUCTIONS > HEATER INLET AND OUTLET PIPE REPLACEMENT (LGX)

Fig 1: Heater Inlet And Outlet Pipe (LGX)



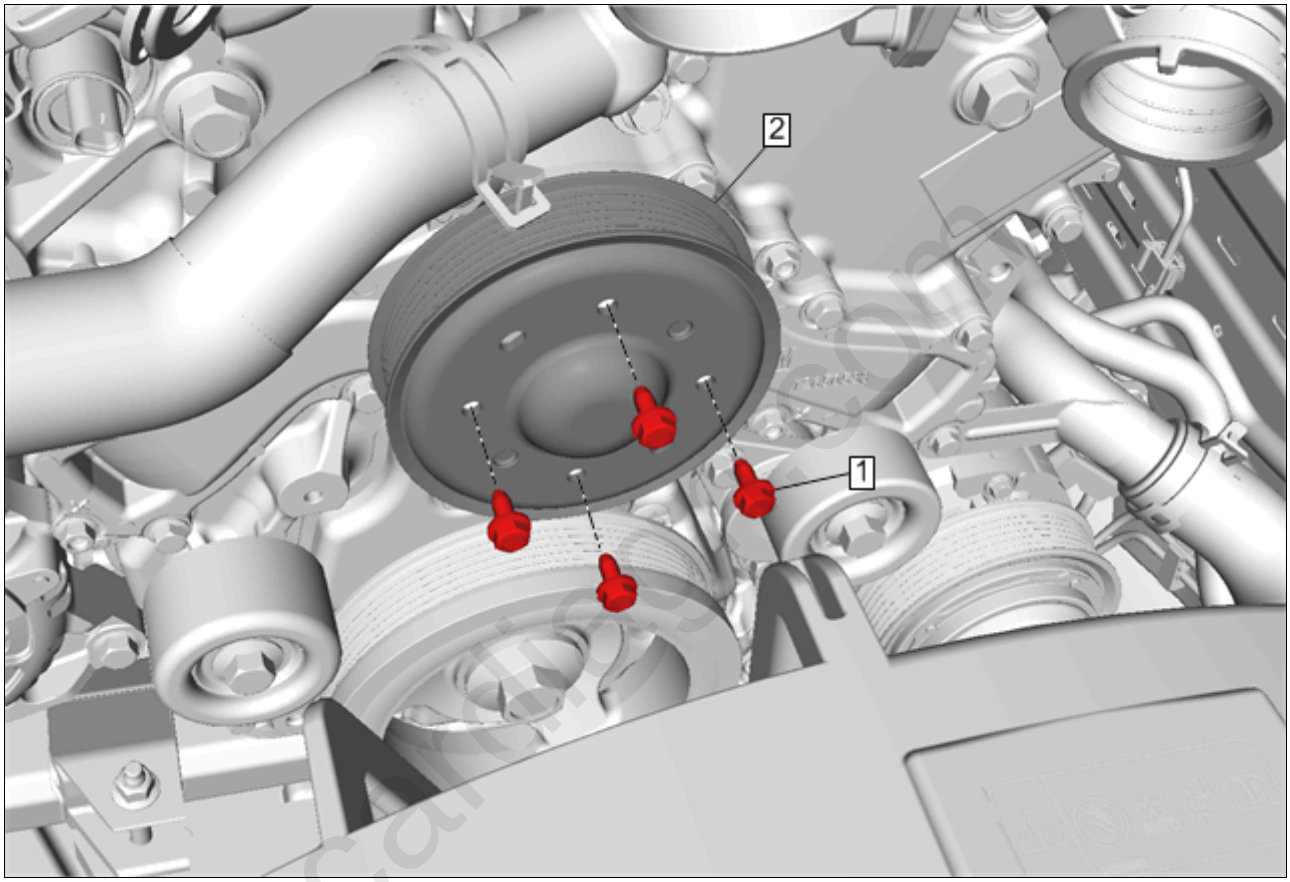
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Fuel Pipe Shield Replacement 2. Disconnect Heater Inlet Hose at Heater Inlet and Outlet Pipe - Heater Inlet Hose Replacement (LGX) 3. Disconnect Heater Outlet Hose at Heater Inlet and Outlet Pipe - Heater Outlet Hose Replacement (LGX)	
1	Heater Inlet and Outlet Pipe Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 9 N.m (80 lb in)

2	Heater Inlet and Outlet Pipe Gasket **Procedure** Install a NEW gasket.
3	Heater Inlet and Outlet Pipe

REPAIR INSTRUCTIONS > WATER PUMP PULLEY REPLACEMENT (LGX)

Fig 1: Water Pump Pulley (LGX)



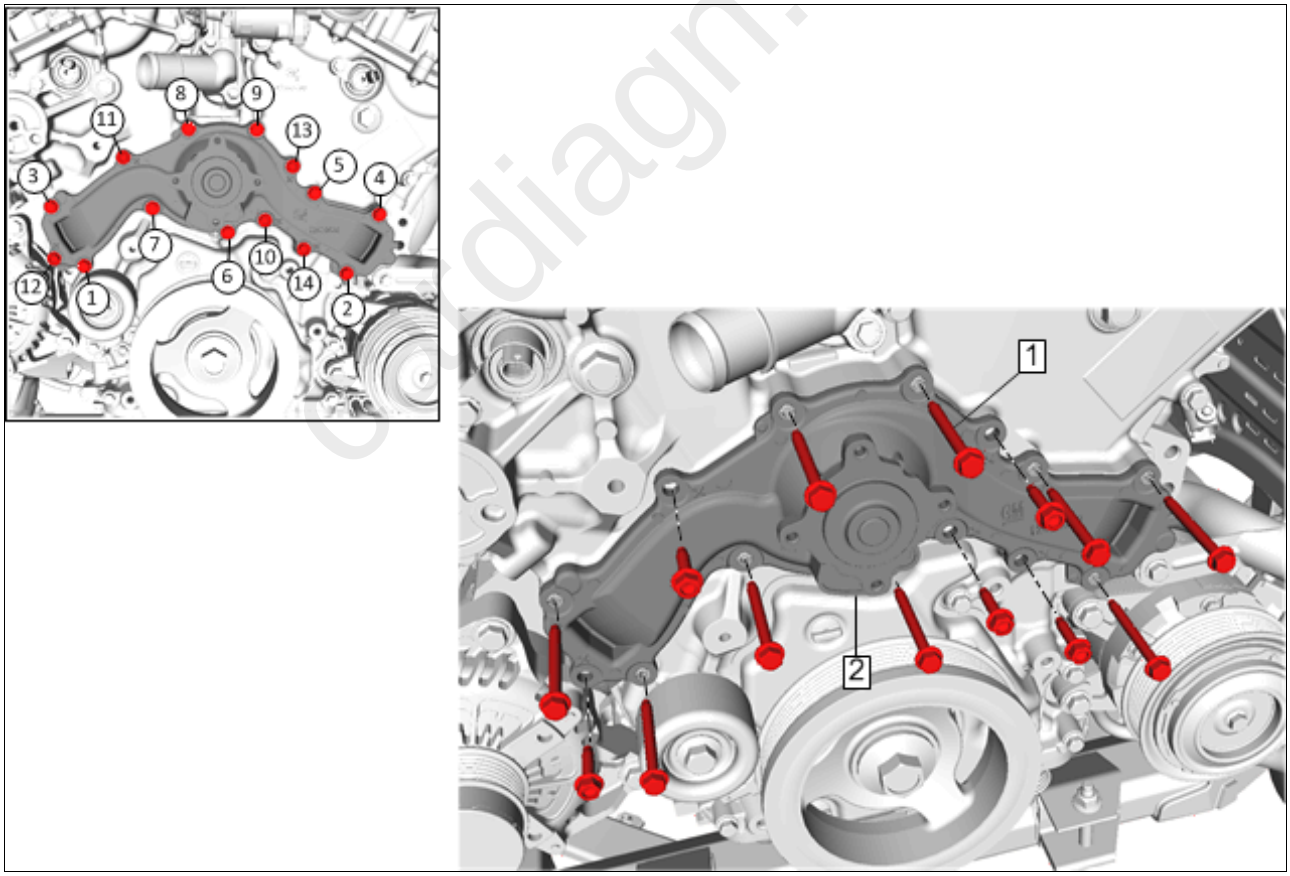
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drive Belt Replacement	
1	Water Pump Pulley Bolt (Qty: 4) *CAUTION:* *Refer to Fastener Caution .*

	Tighten 10 N.m (89 lb in)
2	Water Pump Pulley Procedure 1. Install the **EN-46104** Water Pump Pulley Holding Tool onto the water pump pulley mounting holes. 2. Remove the water pump pulley bolts. 3. Remove the **EN-46104** Water Pump Pulley Holding Tool from the water pump pulley. **Special Tools** **EN-46104** Water Pump Pulley Holding Tool For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS > WATER PUMP REPLACEMENT (LGX)

Fig 1: Water Pump (LGX)



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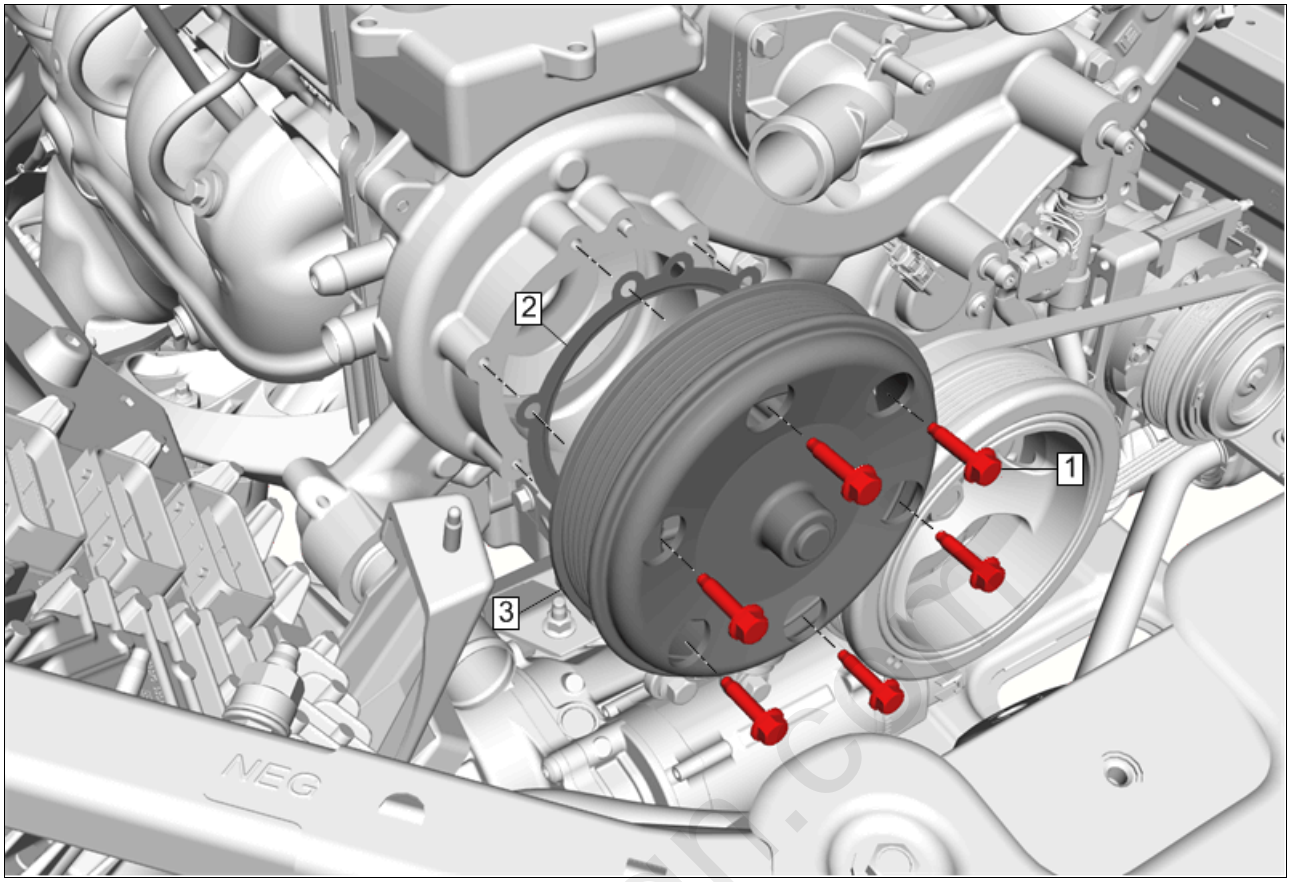
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Callout	Component Name
Preliminary Procedures 1. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Drive Belt Tensioner Replacement 3. Water Pump Pulley Replacement (LGX)	
1	Water Pump Bolt (Qty: 14) *CAUTION:* *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.* *CAUTION:* *Refer to Fastener Caution .* *NOTE:* • *Install NEW bolts.* • *Take note that there are different bolt lengths.* **Tighten in sequence** 15 N.m (11 lb ft)
2	Water Pump *NOTE:* *Install a NEW gasket.*

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REPAIR INSTRUCTIONS > WATER PUMP REPLACEMENT (LT1)

Fig 1: Water Pump (LT1)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Drive Belt Replacement - Accessory	
1	Water Pump Bolt<p01> *CAUTION:* *Refer to Fastener Caution .* **Tighten** 10 N.m (89 lb in)

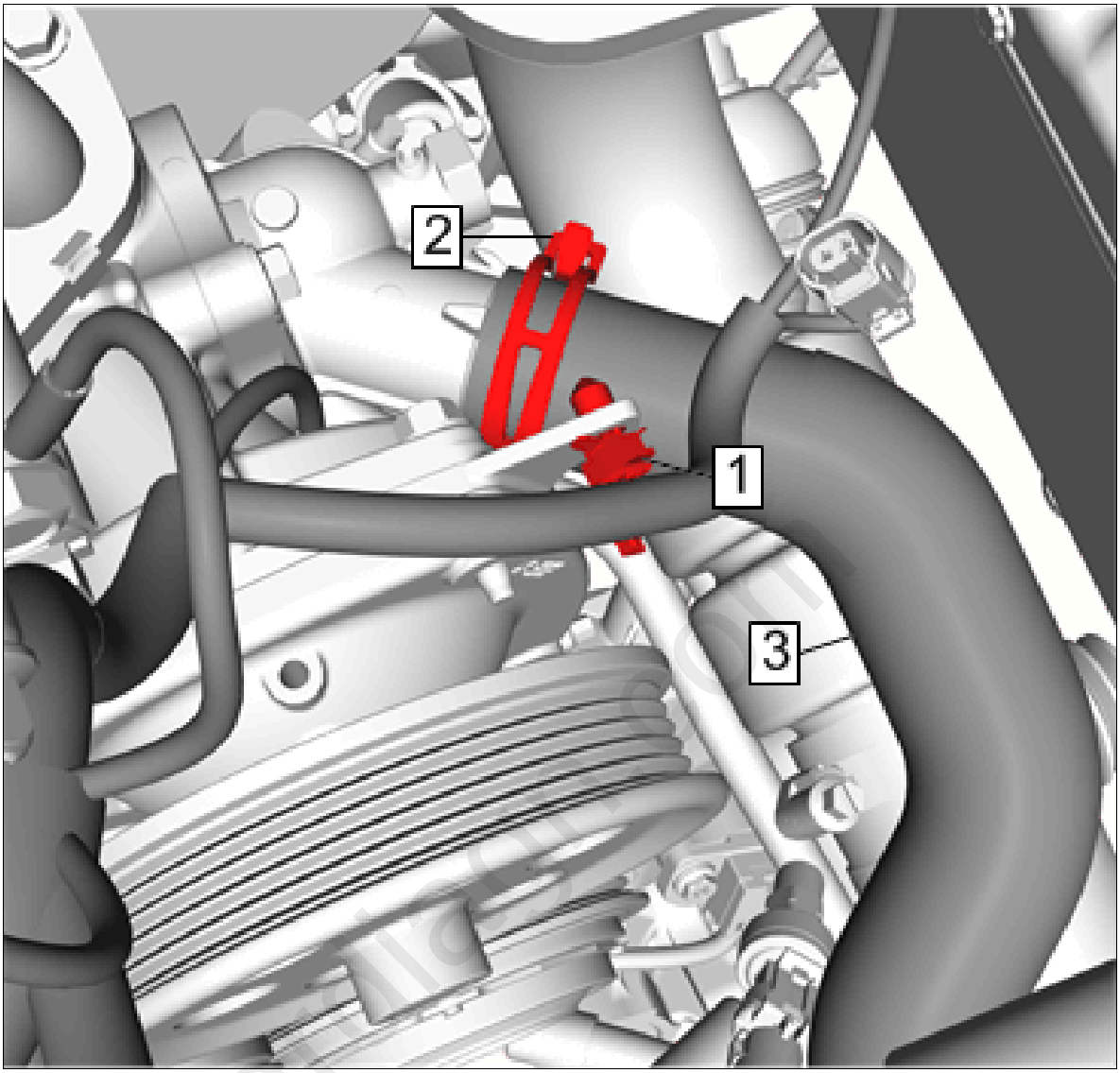
2	Water Pump Gasket **Procedure** Install a NEW water pump gasket.
3	Water Pump **Procedure** Carefully clean the water pump sealing surfaces.

REPAIR INSTRUCTIONS > WATER PUMP REPLACEMENT (LTG) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Remove Drive Belt Replacement
3. Remove Turbocharger Replacement

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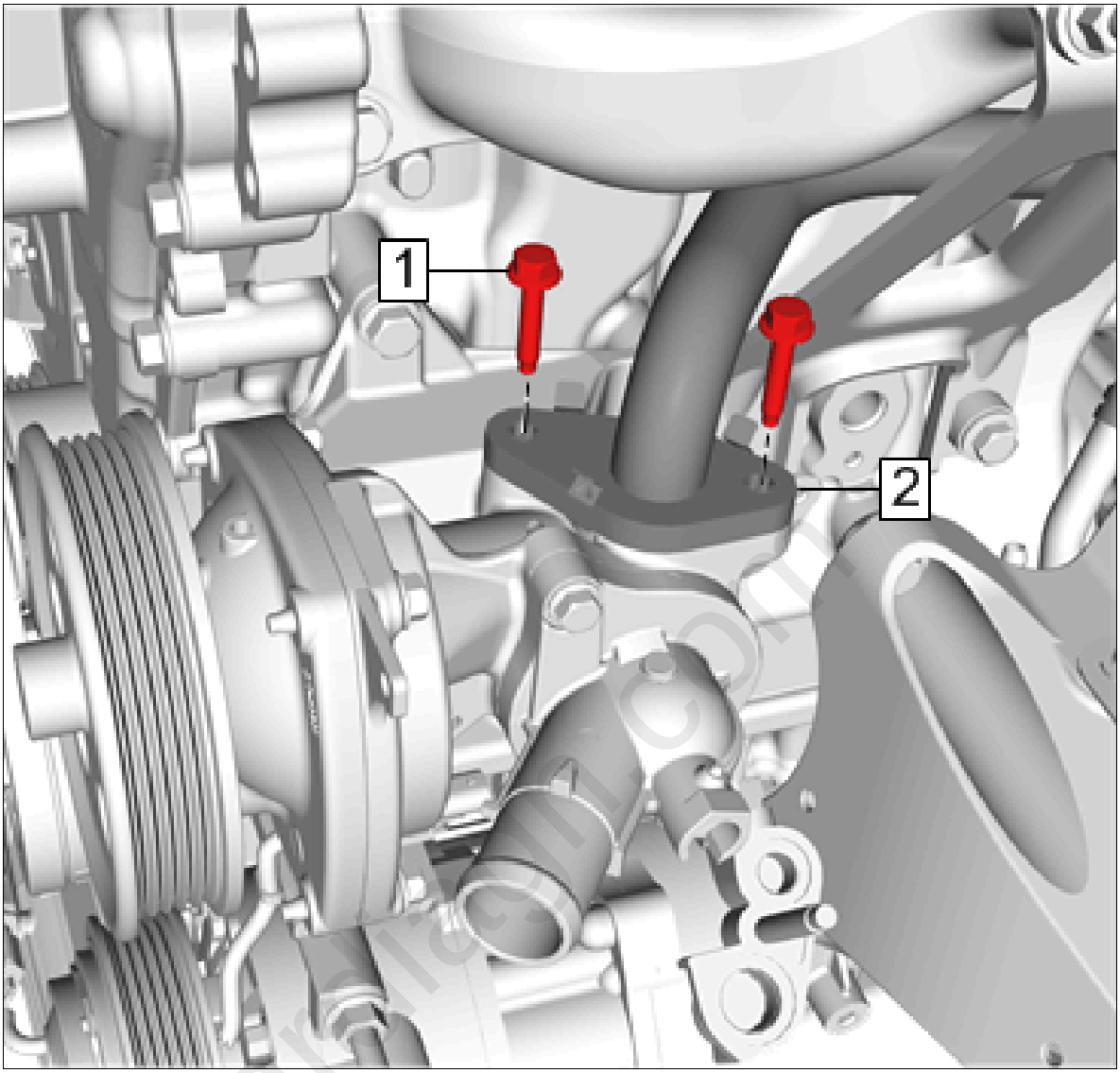
Fig 1: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Engine Wiring Harness Retainer (1)
5. Disengage Radiator Outlet Hose Clamp (2) - Hose Clamp Replacement Guidelines - Spring Type
6. Disconnect Radiator Outlet Hose (3)

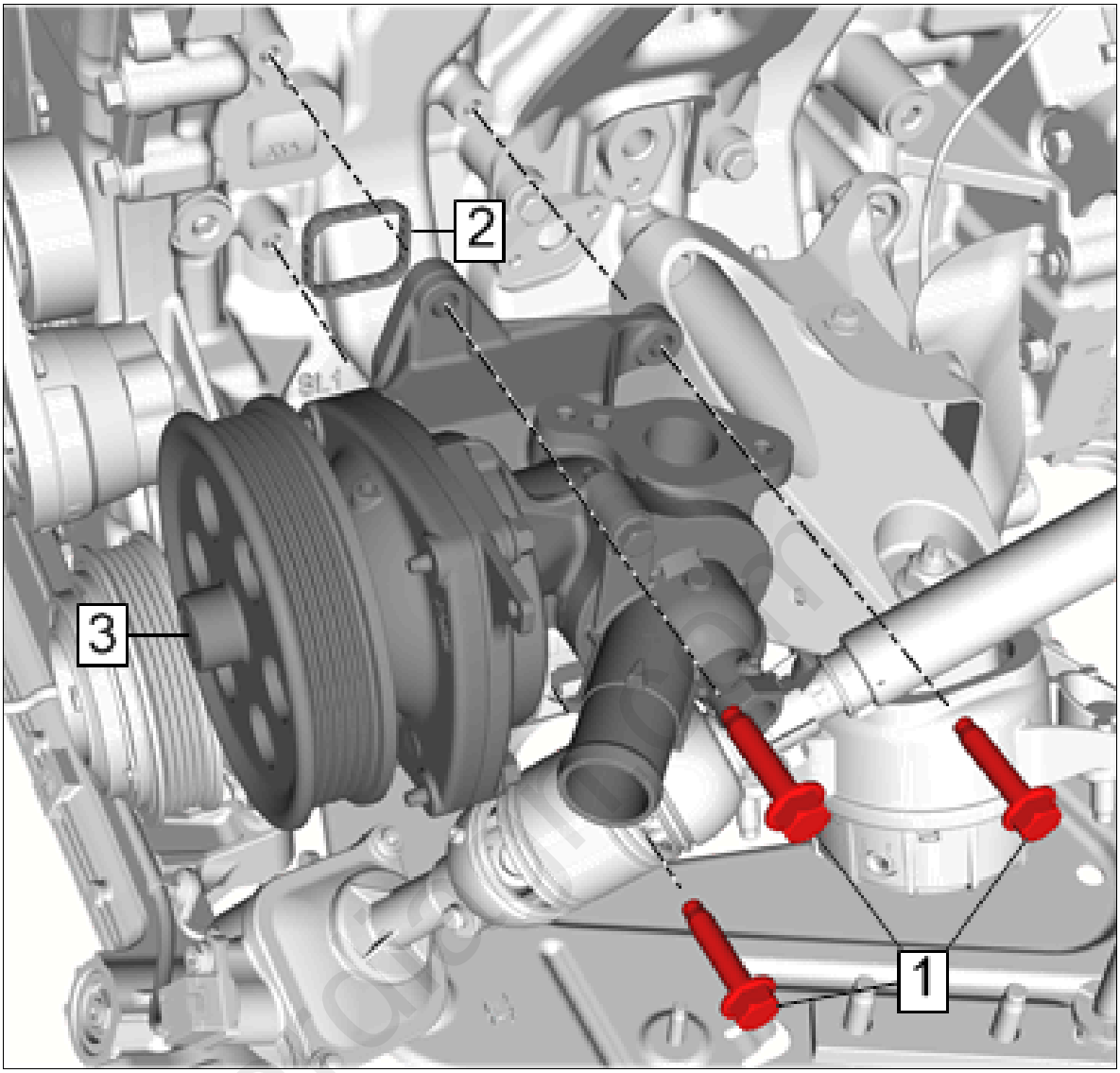
Fig 2: Thermostat Bypass Pipe Bolt



Courtesy of GENERAL MOTORS COMPANY

7. Remove Thermostat Bypass Pipe Bolt (1) (Qty: 2)
8. Remove Thermostat Bypass Pipe Gasket (2) and DISCARD

Fig 3: Water Pump Seal



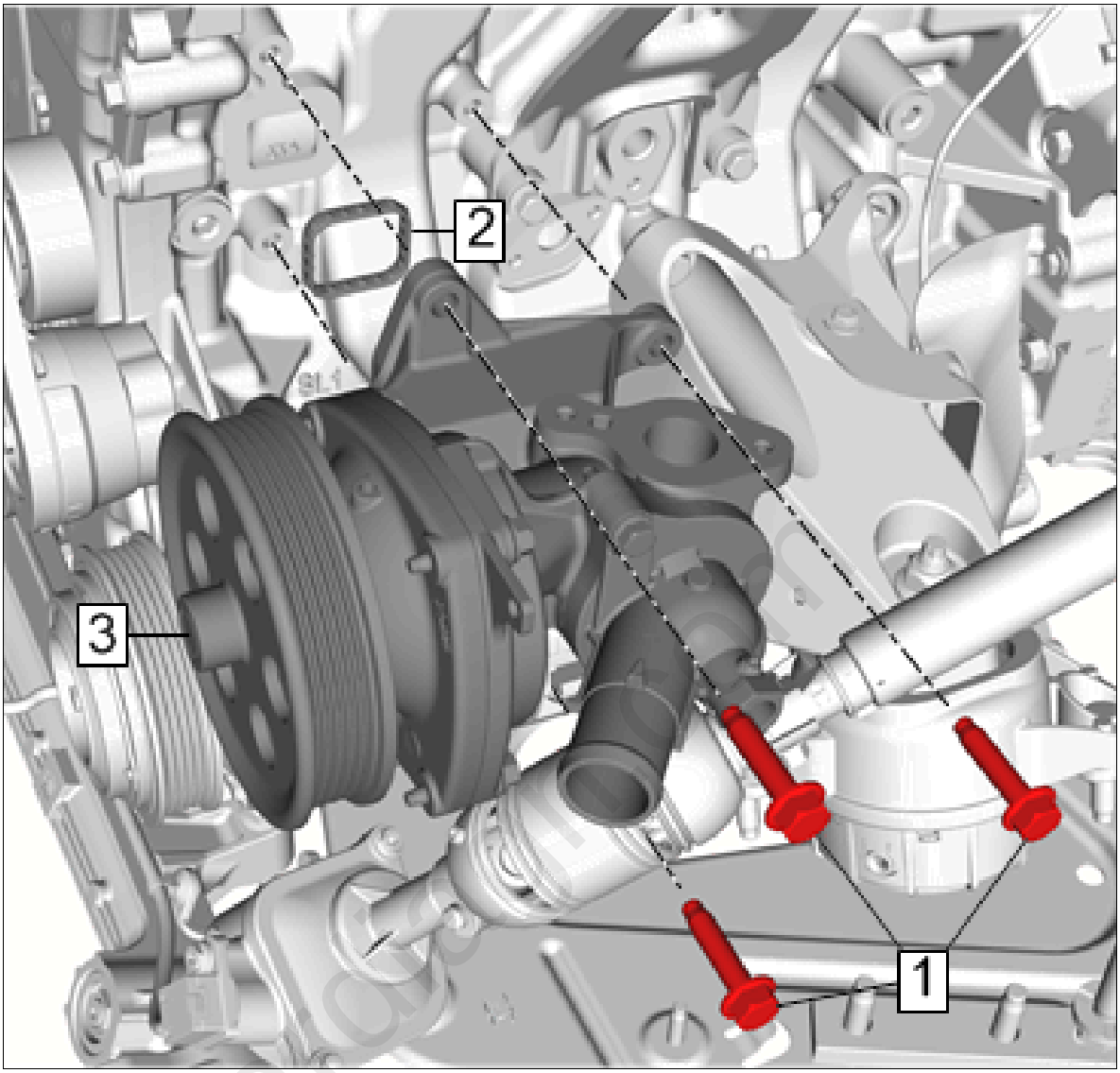
Courtesy of GENERAL MOTORS COMPANY

9. Remove Water Pump Bolt (1) (Qty: 3)
10. Remove Water Pump (3)
11. Remove Water Pump Seal (2) and DISCARD
12. Transfer components as necessary.

REPAIR INSTRUCTIONS > WATER PUMP REPLACEMENT (LTG) > INSTALLATION PROCEDURE

1. Carefully clean the water pump sealing surfaces.

Fig 1: Water Pump Seal



Courtesy of GENERAL MOTORS COMPANY

NOTE:

Install a NEW water pump seal.

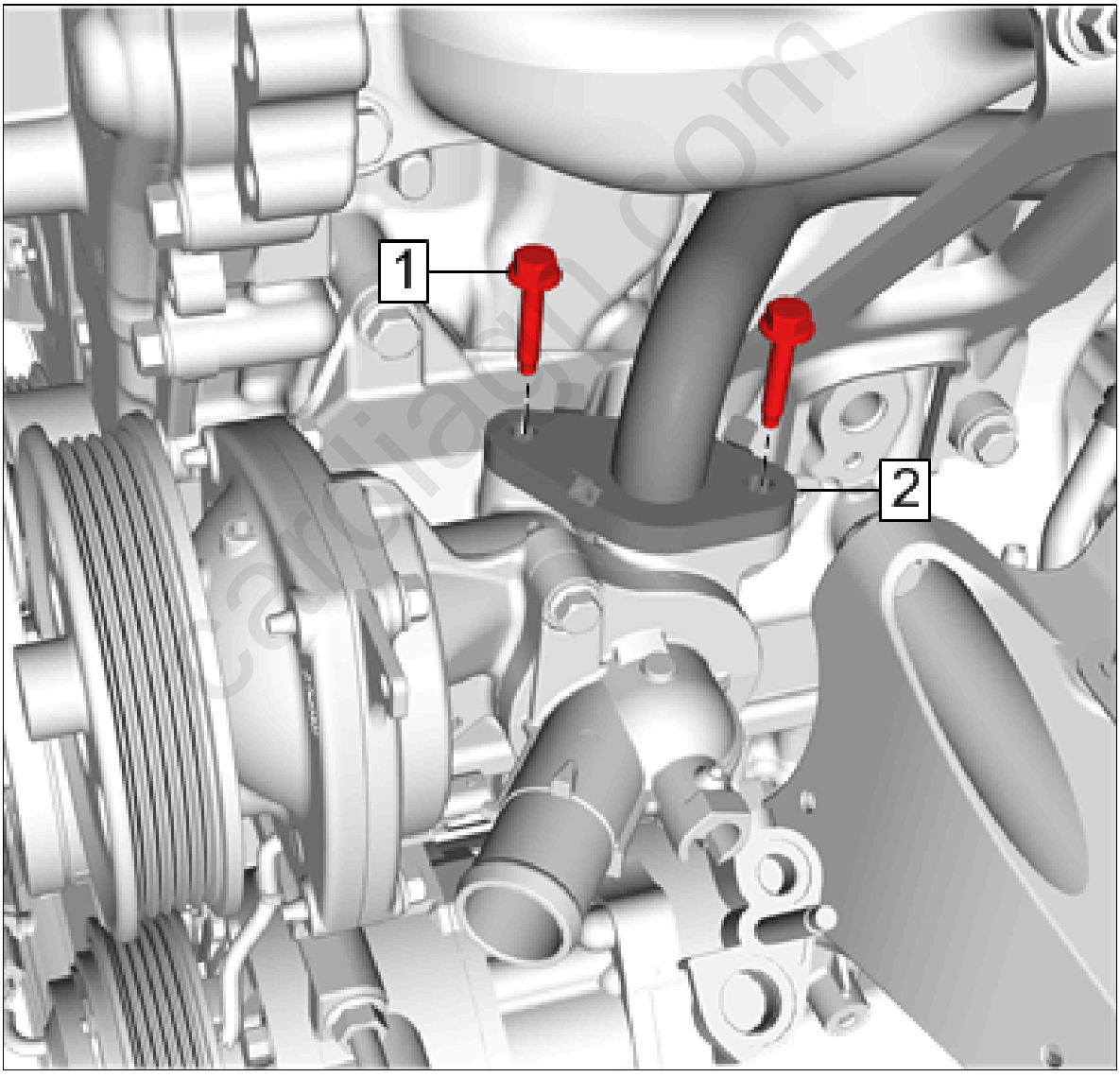
2. Install Water Pump Seal (2)
3. Install Water Pump (3)
4. Hand tighten Water Pump Bolt (1) (Qty: 3)

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

> 📌 *NOTE:*
>
> *Tighten the water pump bolts in a counter clockwise pattern beginning with the top most bolt to properly compress the water pump seal.*

5. Tighten Water Pump Bolt (1) (Qty: 3) to 25 N.m (18 lb ft)

Fig 2: Thermostat Bypass Pipe Bolt



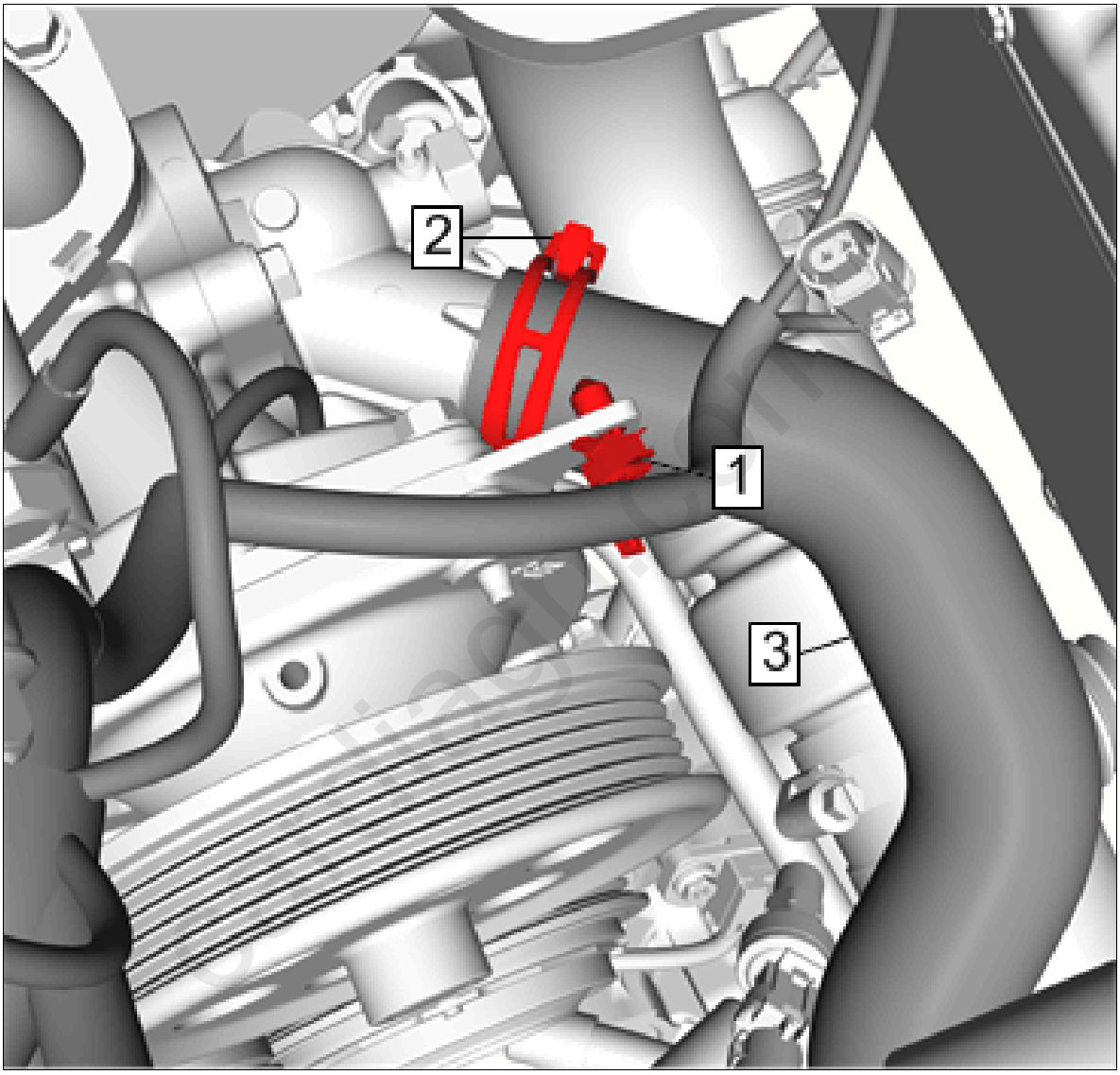
Courtesy of GENERAL MOTORS COMPANY

> 📌 *NOTE:*

Install a NEW gasket.

6. Install Thermostat Bypass Pipe Gasket (2)
7. Install Thermostat Bypass Pipe Bolt (1) (Qty: 2) and tighten to 10 N.m (89 lb in)

Fig 3: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

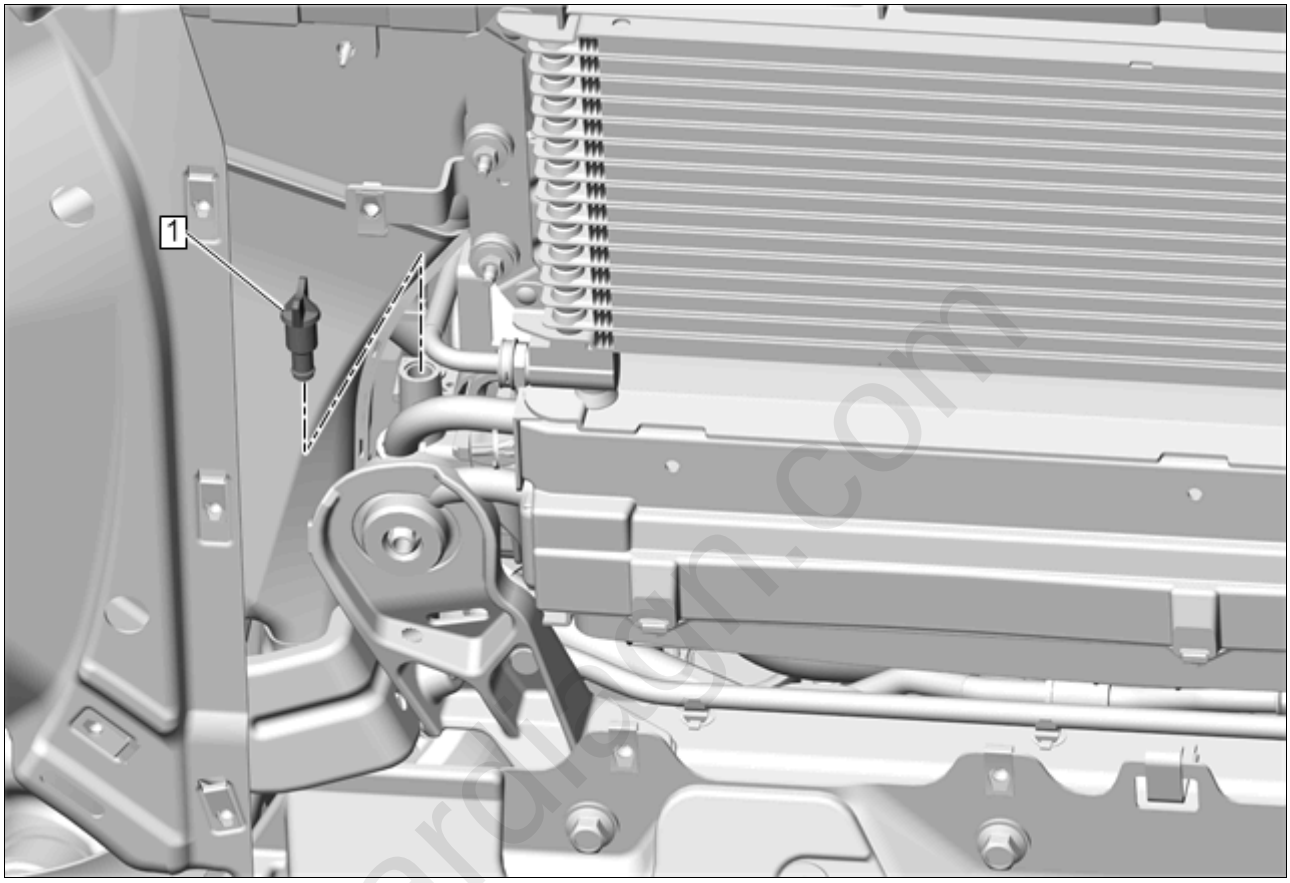
8. Connect Radiator Outlet Hose (3)
9. Engage Radiator Outlet Hose Clamp (2) - Hose Clamp Replacement Guidelines - Spring Type
10. Connect Engine Wiring Harness Retainer (1)
11. Install Turbocharger Replacement
12. Install Drive Belt Replacement
13. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System

Draining and Filling (Static Fill)

14. Start the engine and check for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR DRAIN PLUG REPLACEMENT (LT1)

Fig 1: Radiator Drain Plug (LT1)



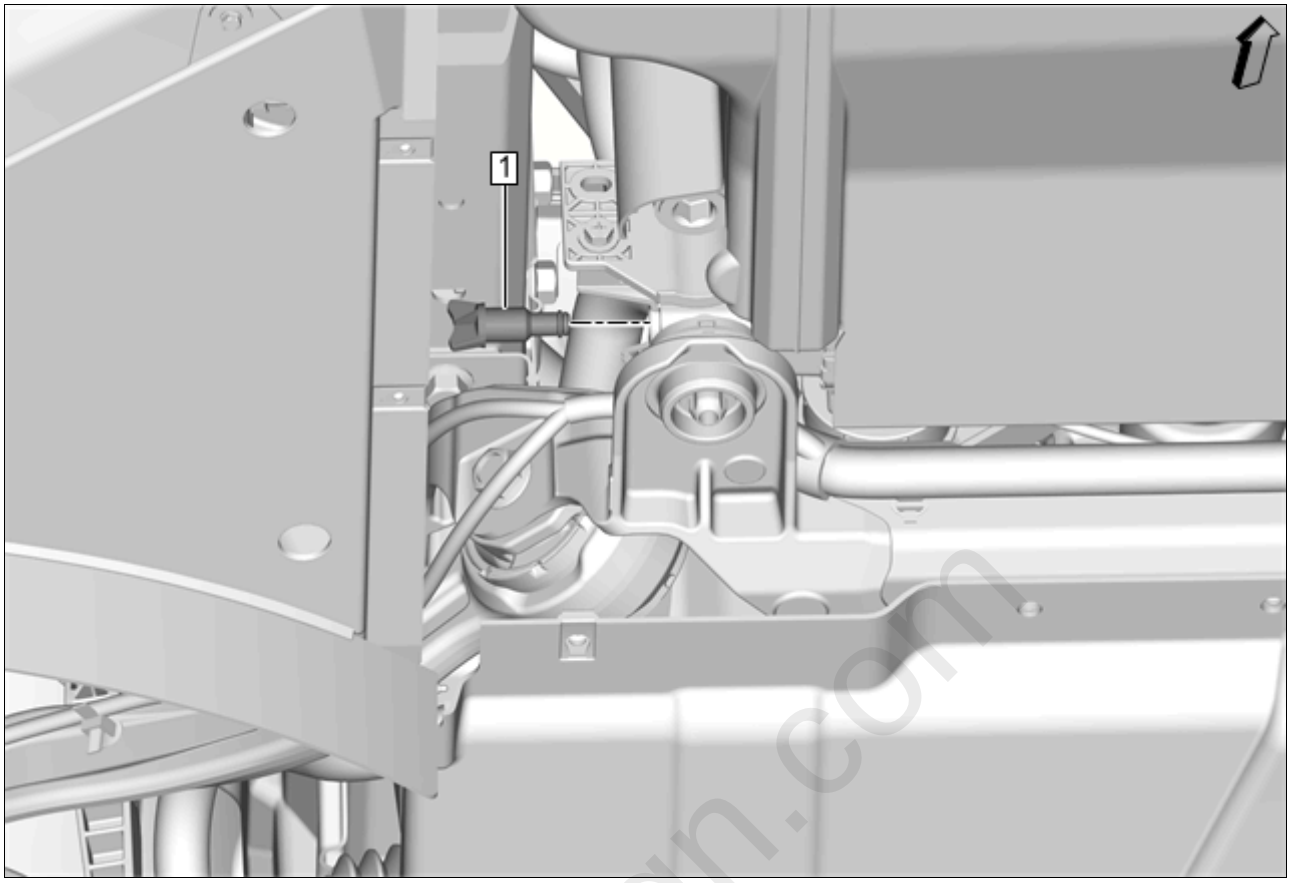
Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
Preliminary Procedure Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Drain Plug **Procedure** Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR DRAIN PLUG REPLACEMENT (LGX)

Fig 1: Radiator Drain Plug (LGX)



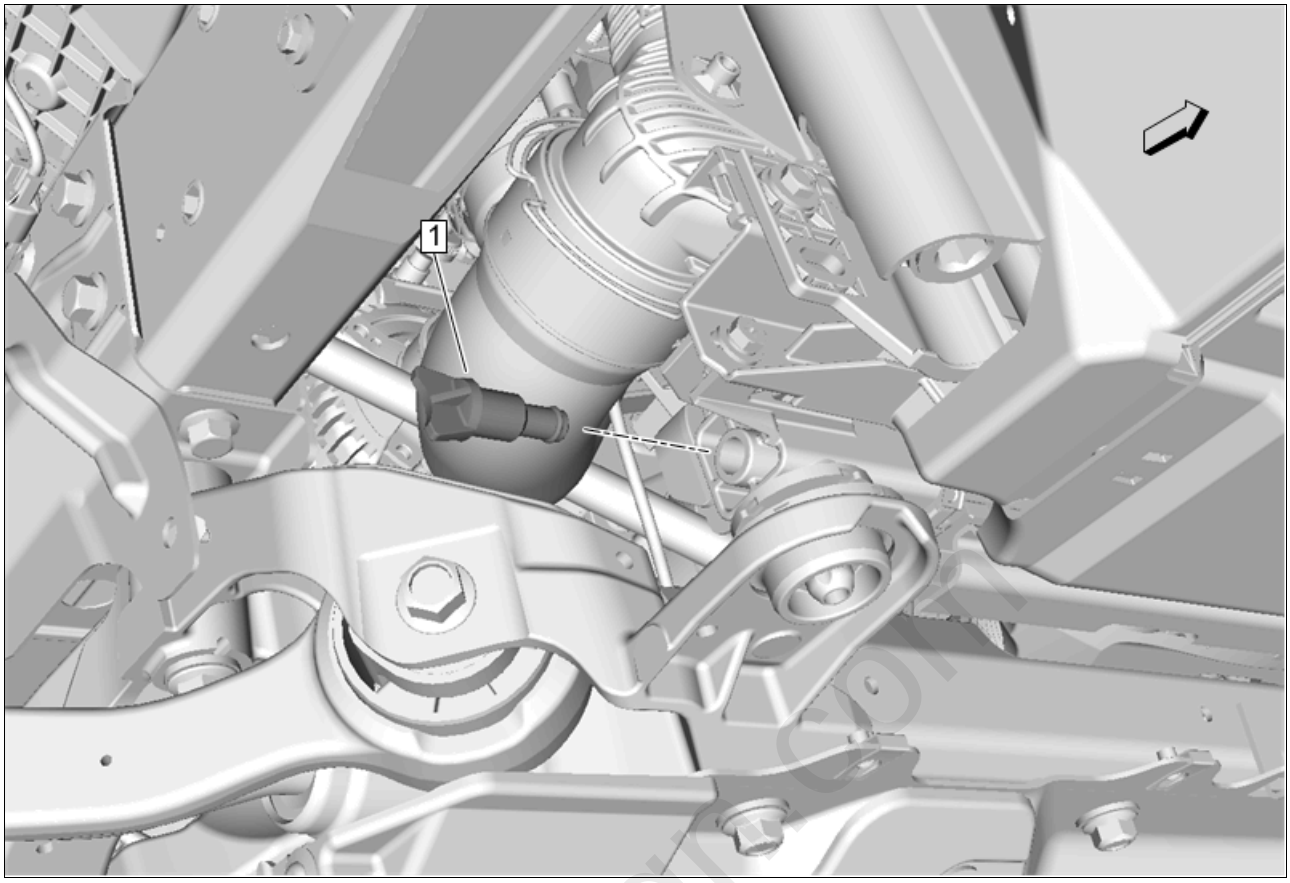
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG) Front Compartment Air Deflector Replacement (Coupe - LGX, LTG) 2. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Drain Plug **Procedure** Inspect for coolant leaks.

REPAIR INSTRUCTIONS > RADIATOR DRAIN PLUG REPLACEMENT (LTG)

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Fig 1: Radiator Drain Plug (LTG)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Front Compartment Air Deflector Replacement (Convertible - LGX, LTG) Front Compartment Air Deflector Replacement (Coupe - LGX, LTG) 2. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)	
1	Radiator Drain Plug Procedure 1. Fill the cooling system to the proper level. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill) 2. Check the cooling system for leaks.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LT1)

Special Tools

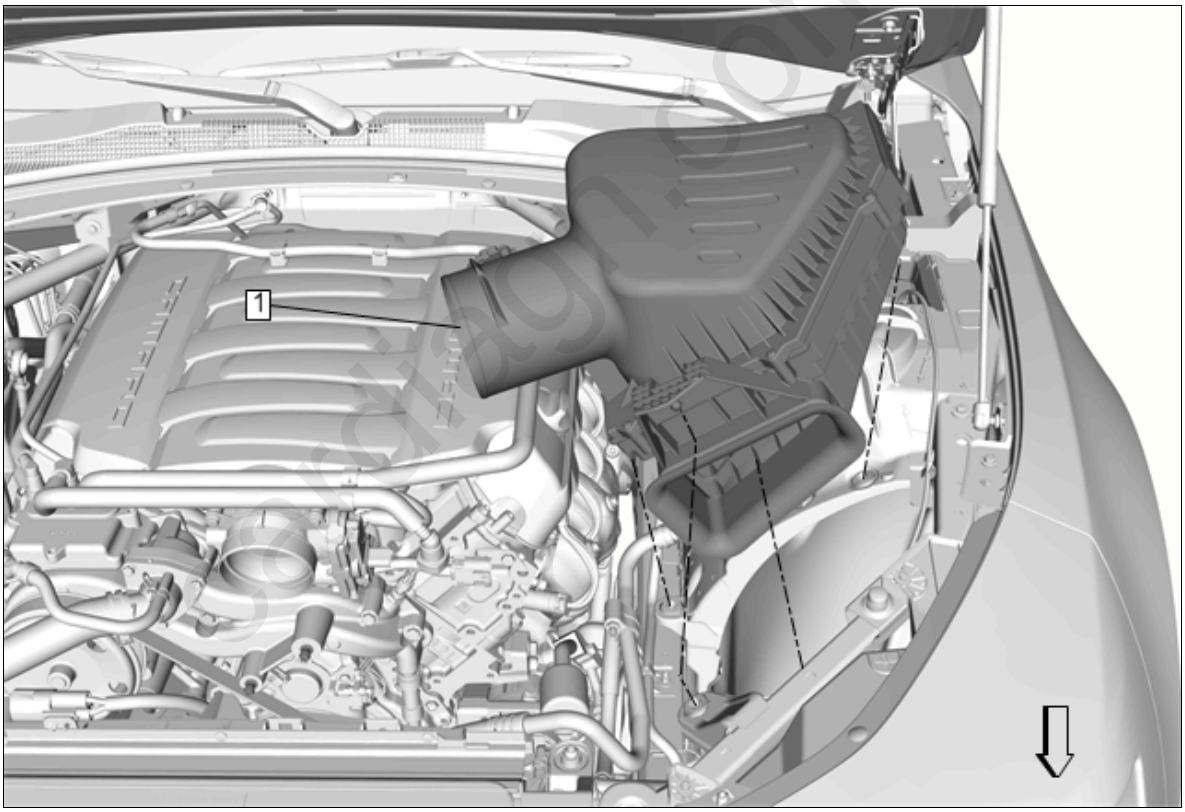
- **BO-38185** Hose Clamp Pliers
- **GE-47622** Hose Clamp Pliers.

Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LT1) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Recover the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)

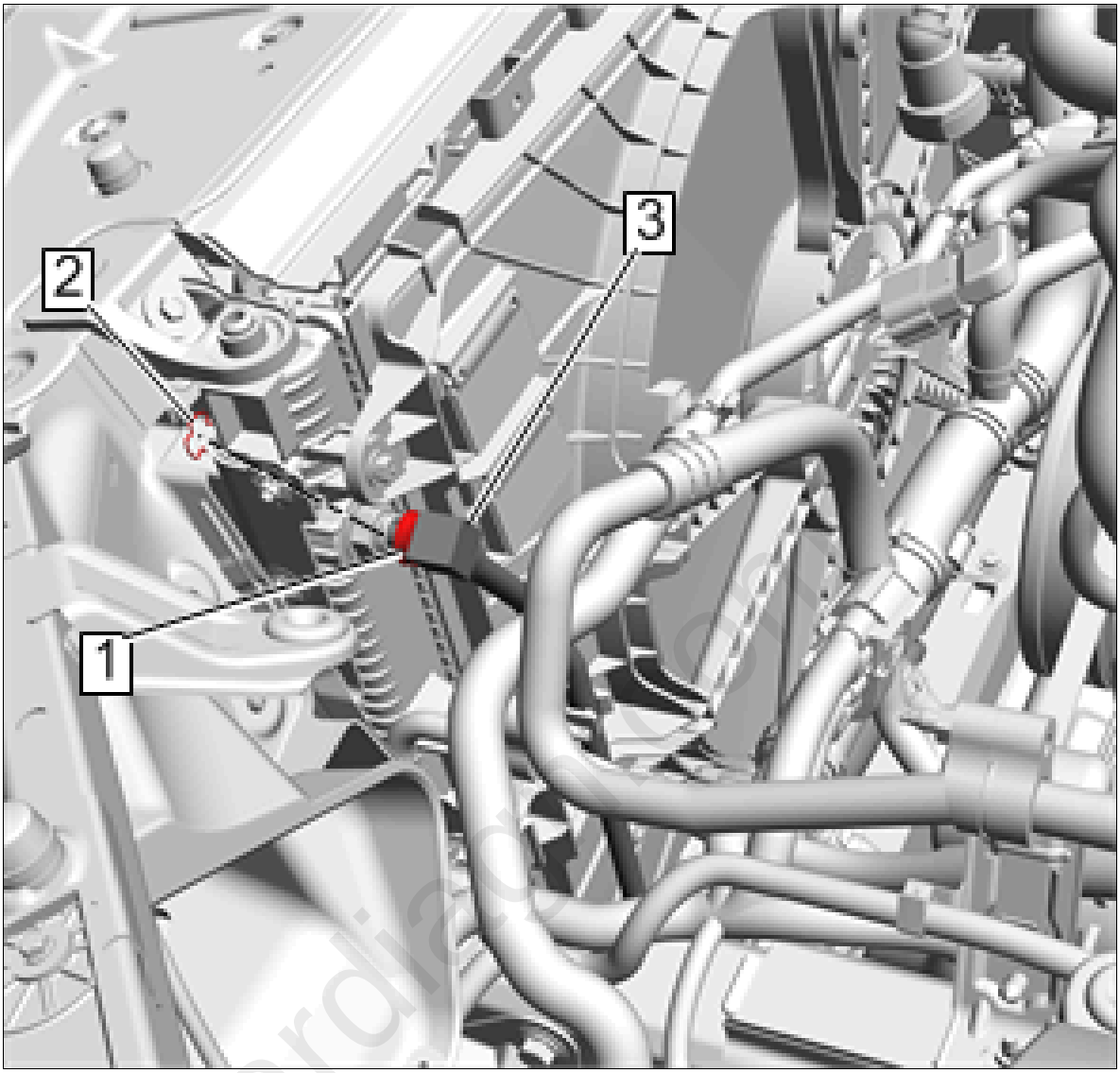
   Fig 1: Air Cleaner Assembly



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3. Remove Air Cleaner Assembly (1) - Air Cleaner Assembly Replacement

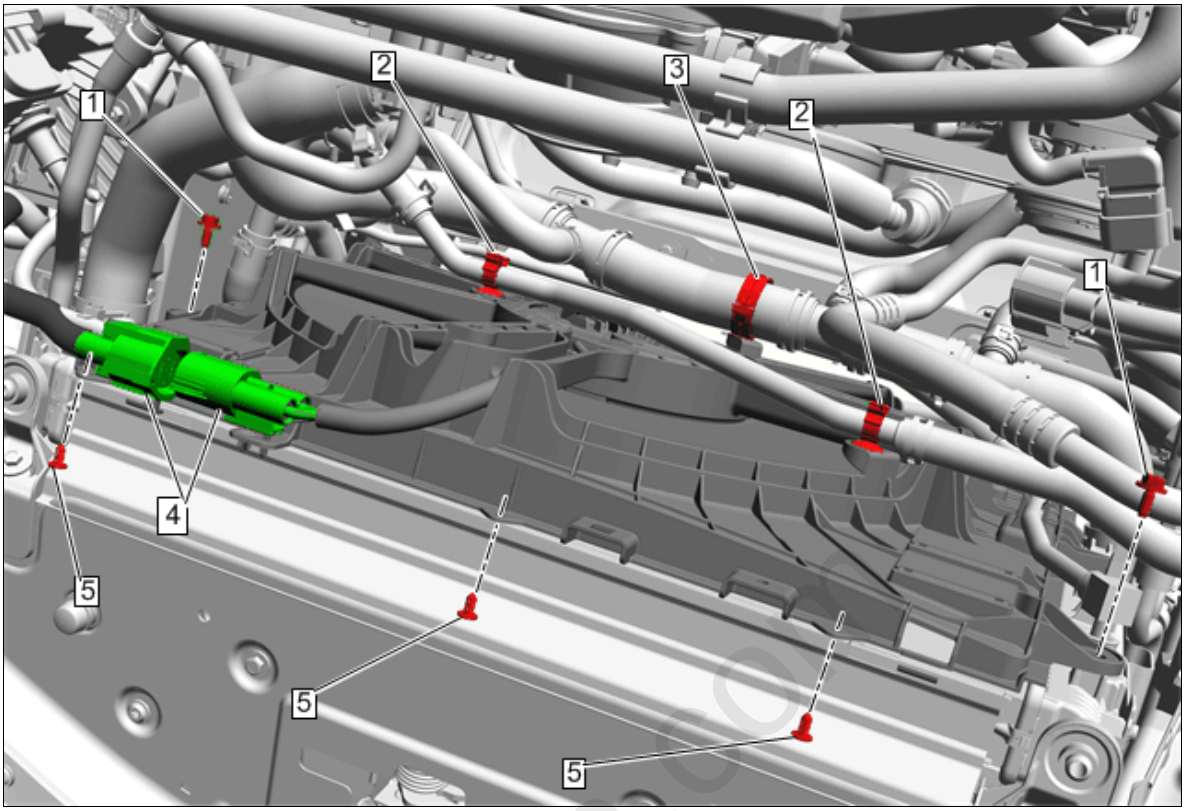
Fig 2: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

4. Slide back Transmission Fluid Cooler Pipe Connector Cap (1)
5. Remove Transmission Fluid Cooler Pipe Fitting Retainer (2)
6. Remove Transmission Fluid Cooler Inlet and Outlet Pipe (3)

Fig 3: Engine Coolant Fan Shroud Bolt

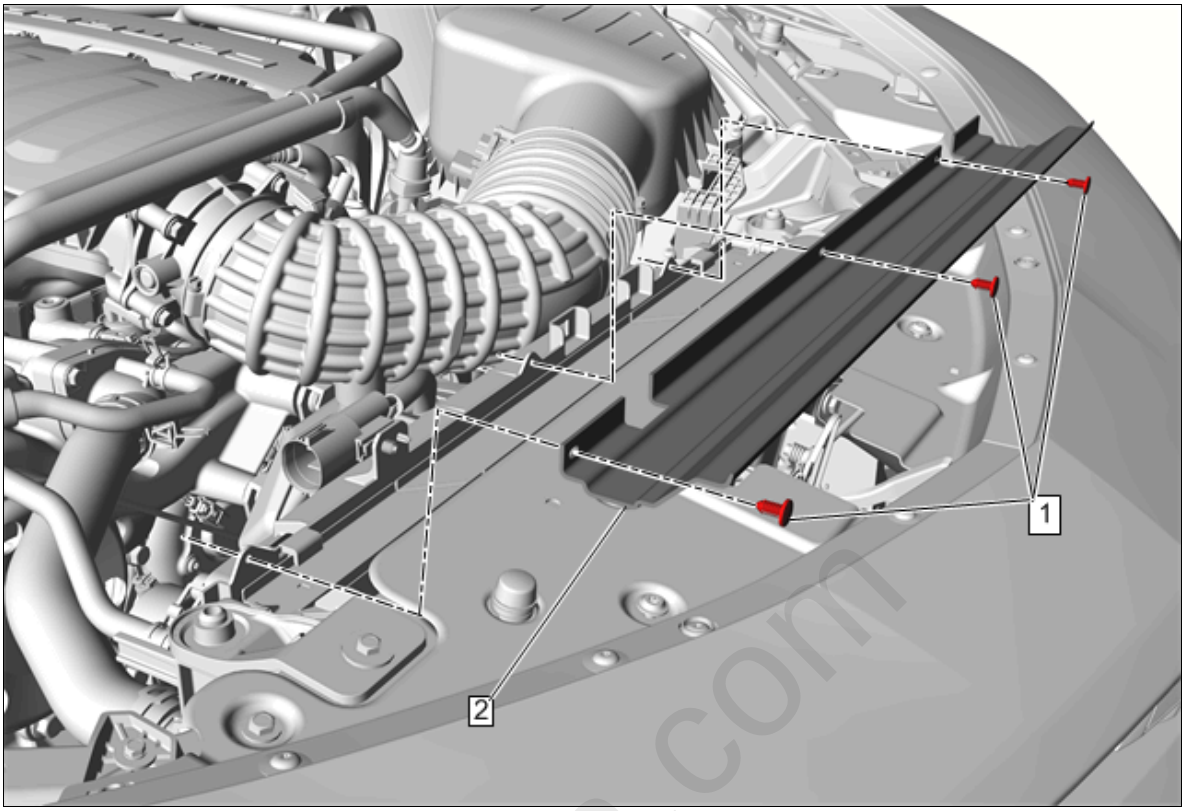


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7. Remove Auxiliary Radiator Inlet Hose Clip (2) (Qty: 2)
8. Remove Radiator Outlet Hose Clip (3)
9. Disconnect the electrical connector (4)
10. Remove Push Pin (5) (Qty: 3)

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Fig 4: Radiator Air Upper Baffle

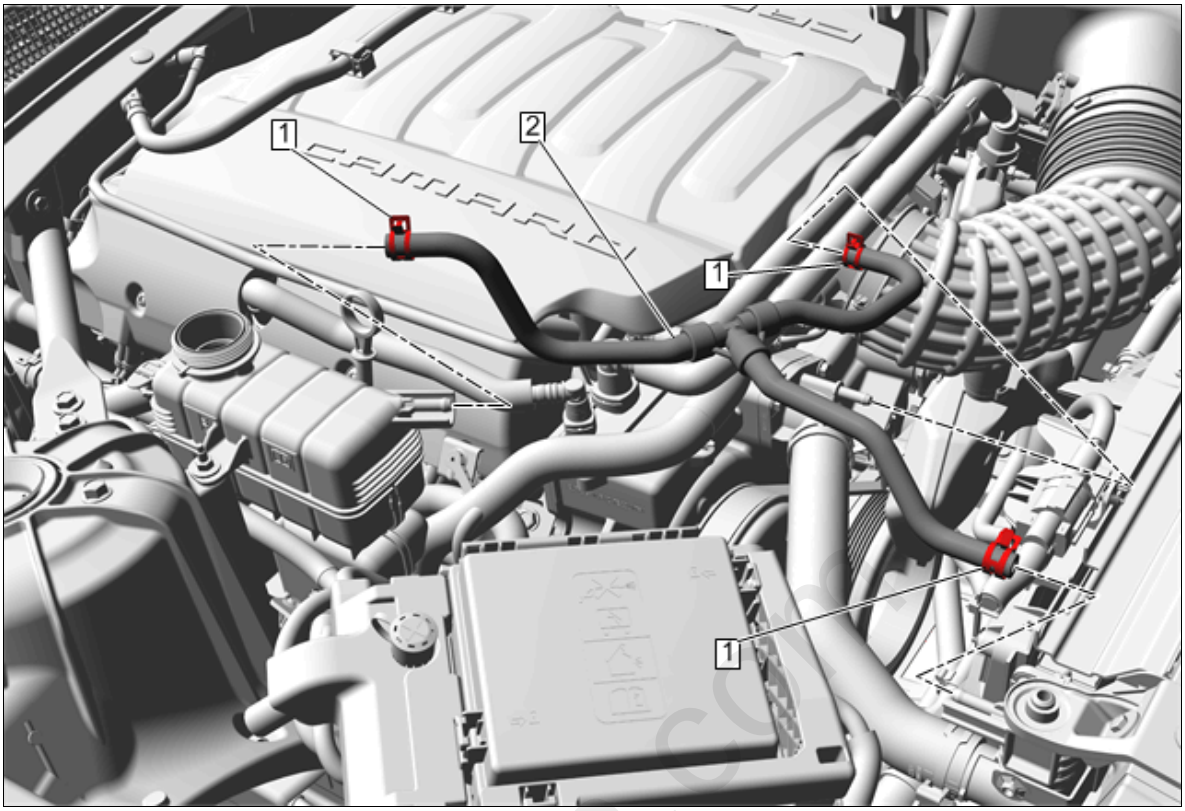


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11. Remove the radiator air upper baffle (2)

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Fig 5: Radiator Surge Tank Inlet Hose

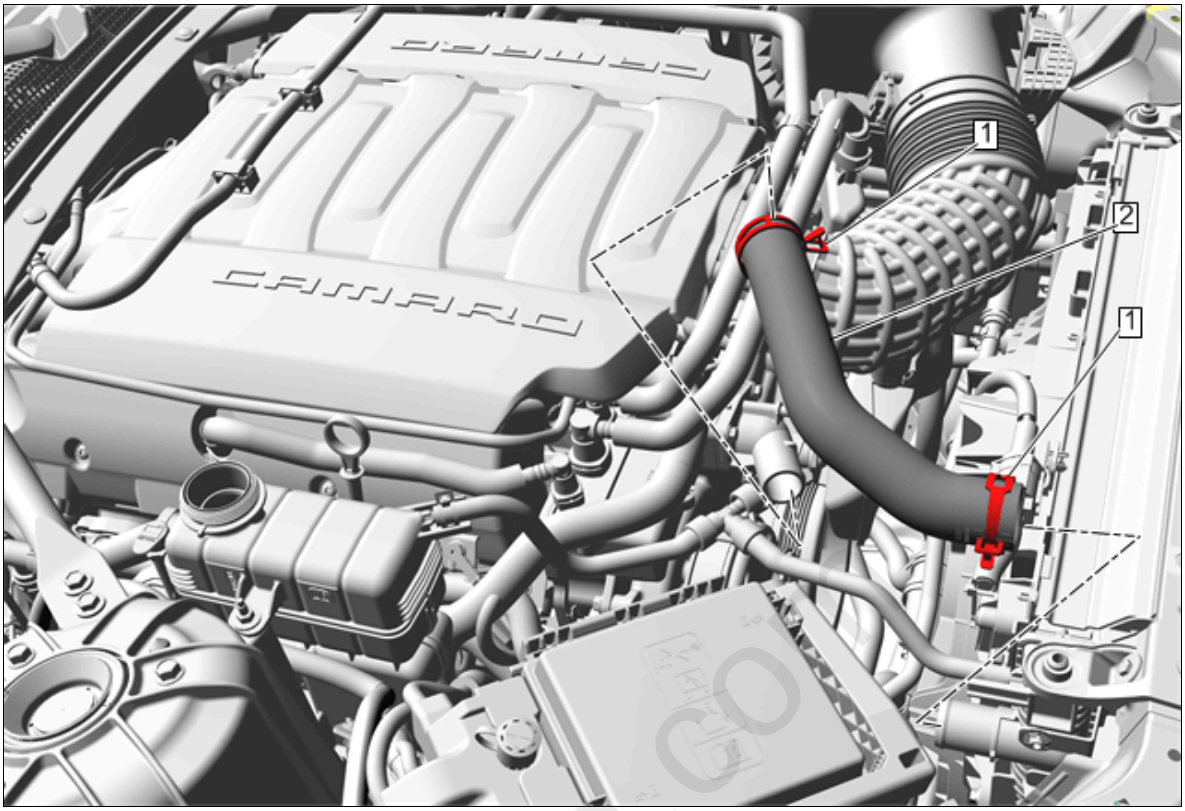


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12. Remove the surge tank inlet hose from the radiator (2) - Radiator Surge Tank Inlet Hose Replacement (LT1)

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Fig 6: Radiator Inlet Hose

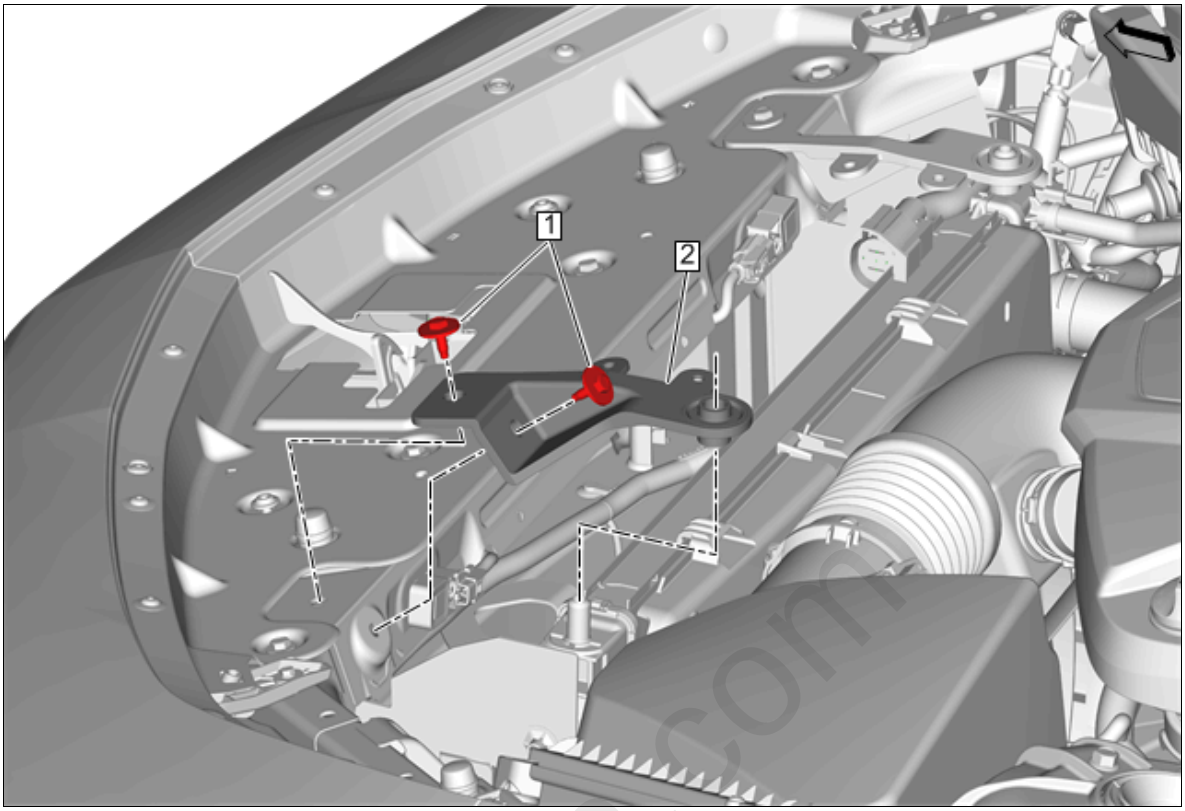


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13. Remove Radiator Inlet Hose (2) at Radiator Assembly - Radiator Inlet Hose Replacement (LT1)

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Fig 7: Radiator Upper Bracket - Left Side

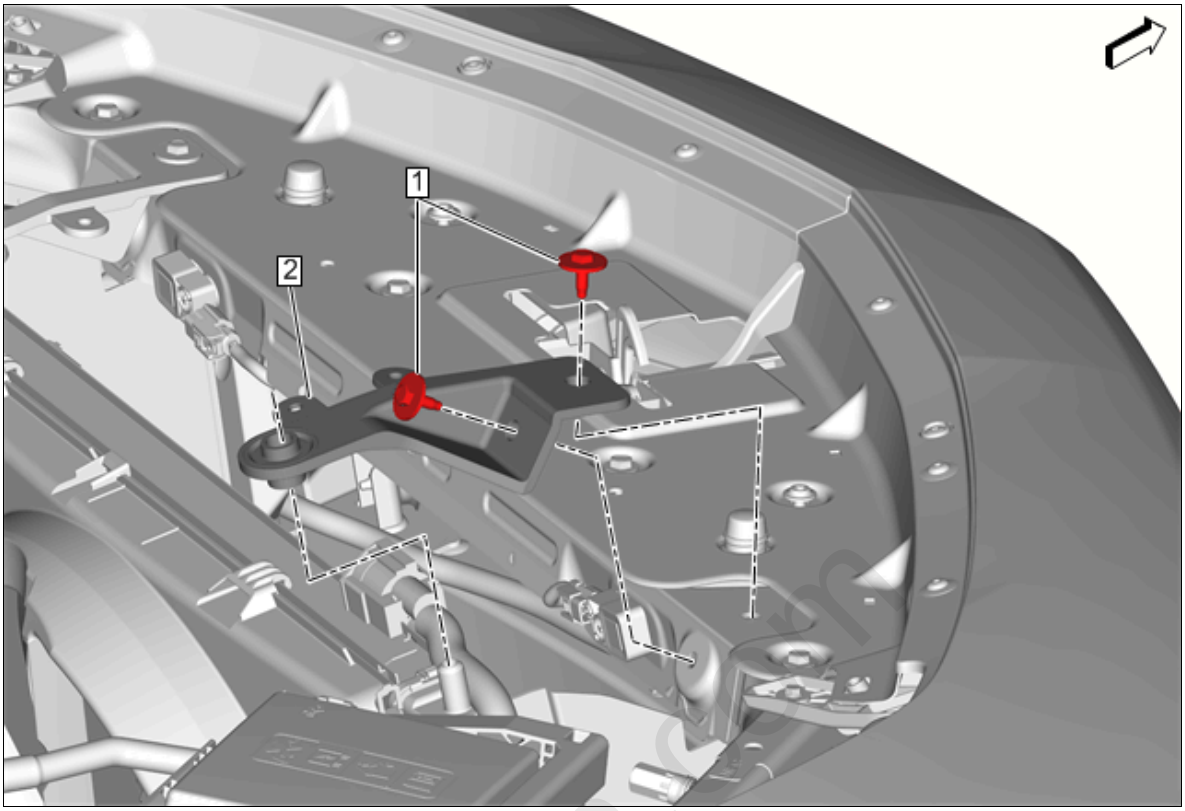


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14. Remove Radiator Upper Bracket-Left Side (2) - Radiator Upper Bracket Replacement - Left Side (LT1)

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Fig 8: Radiator Upper Bracket - Right Side

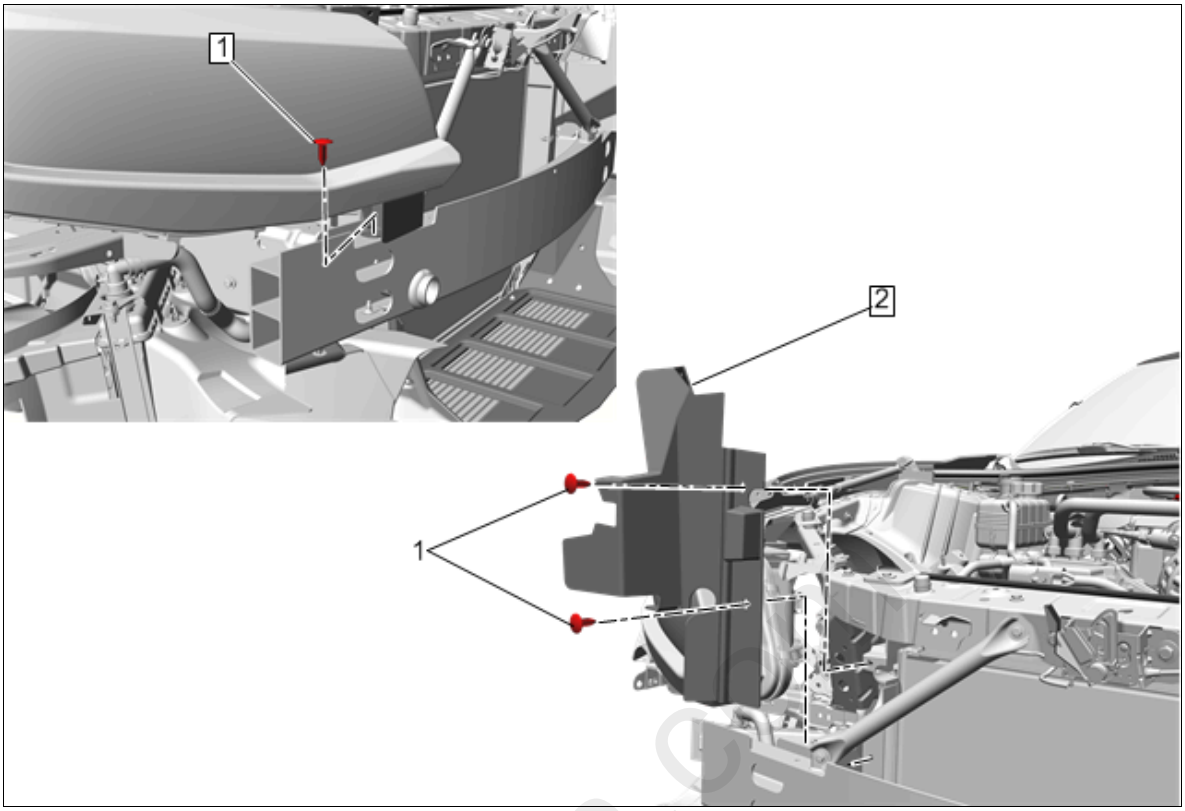


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15. Remove Radiator Upper Bracket-Right Side (2) - Radiator Upper Bracket Replacement - Right Side (LT1)

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Fig 9: Radiator Air Side Baffle-Right Side

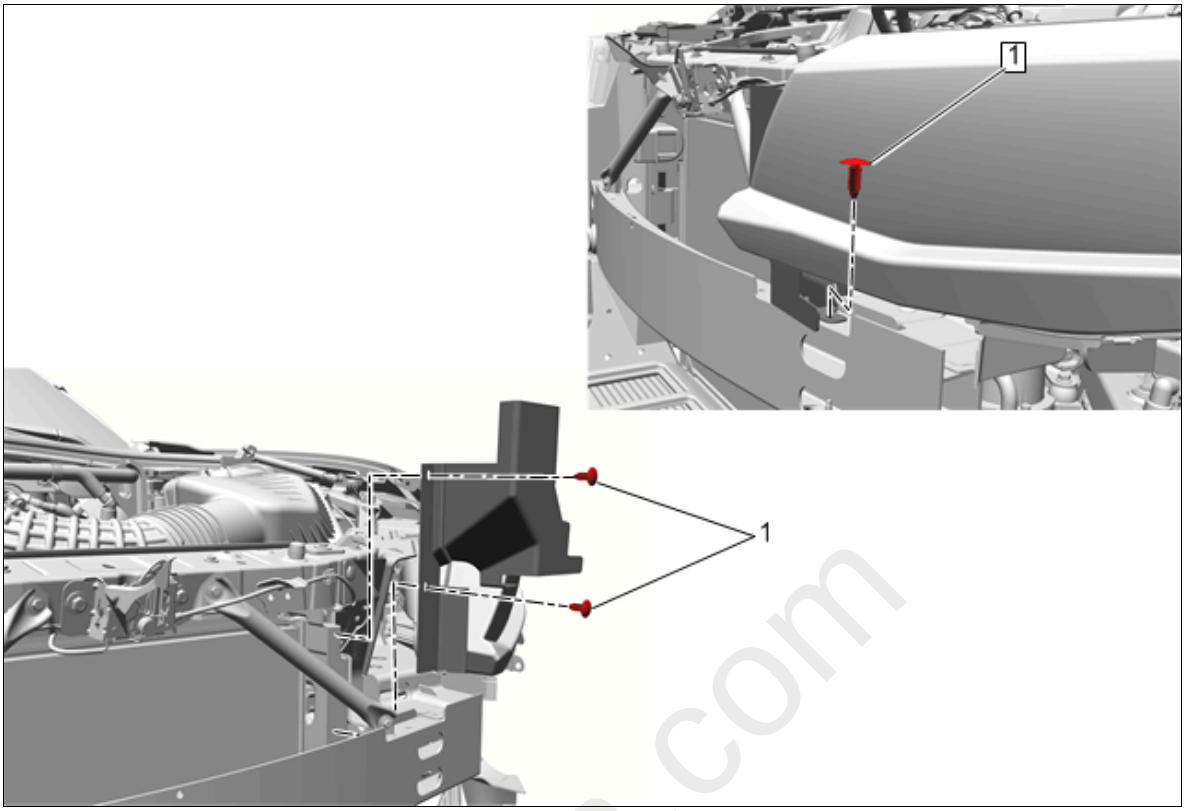


Courtesy of GENERAL MOTORS COMPANY

16. Remove Radiator Air Side Baffle-Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1)

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Fig 10: Radiator Air Side Baffle-Left Side



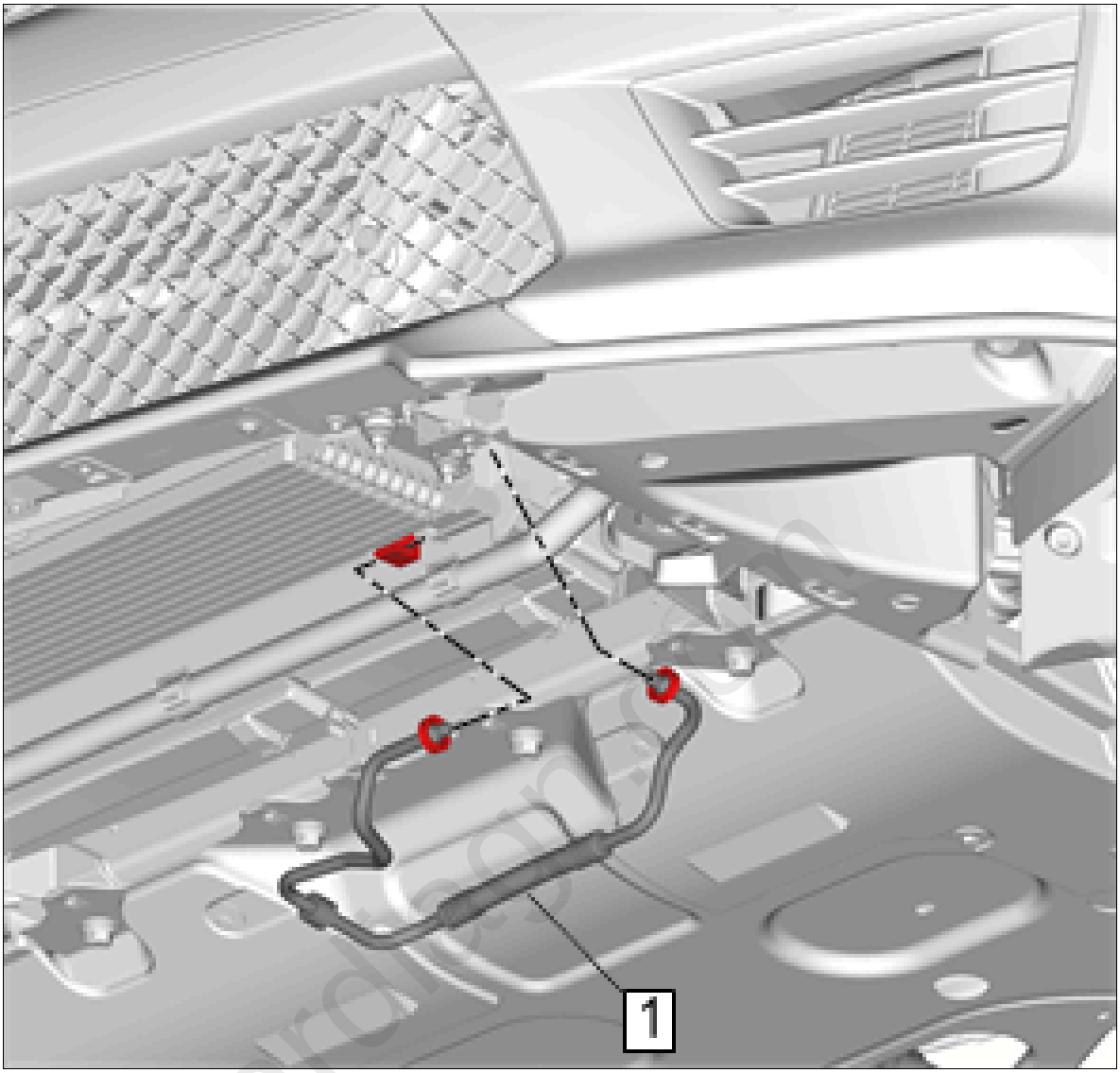
Courtesy of GENERAL MOTORS COMPANY

17. Remove Radiator Air Side Baffle-Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LT1)

18. Remove Transmission Fluid Cooler Inlet and Outlet Pipe at Transmission Fluid Auxiliary Cooler - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With MM6, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, Without KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With MM6, Without KNR)

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Fig 11: Transmission Fluid Cooler Pipe

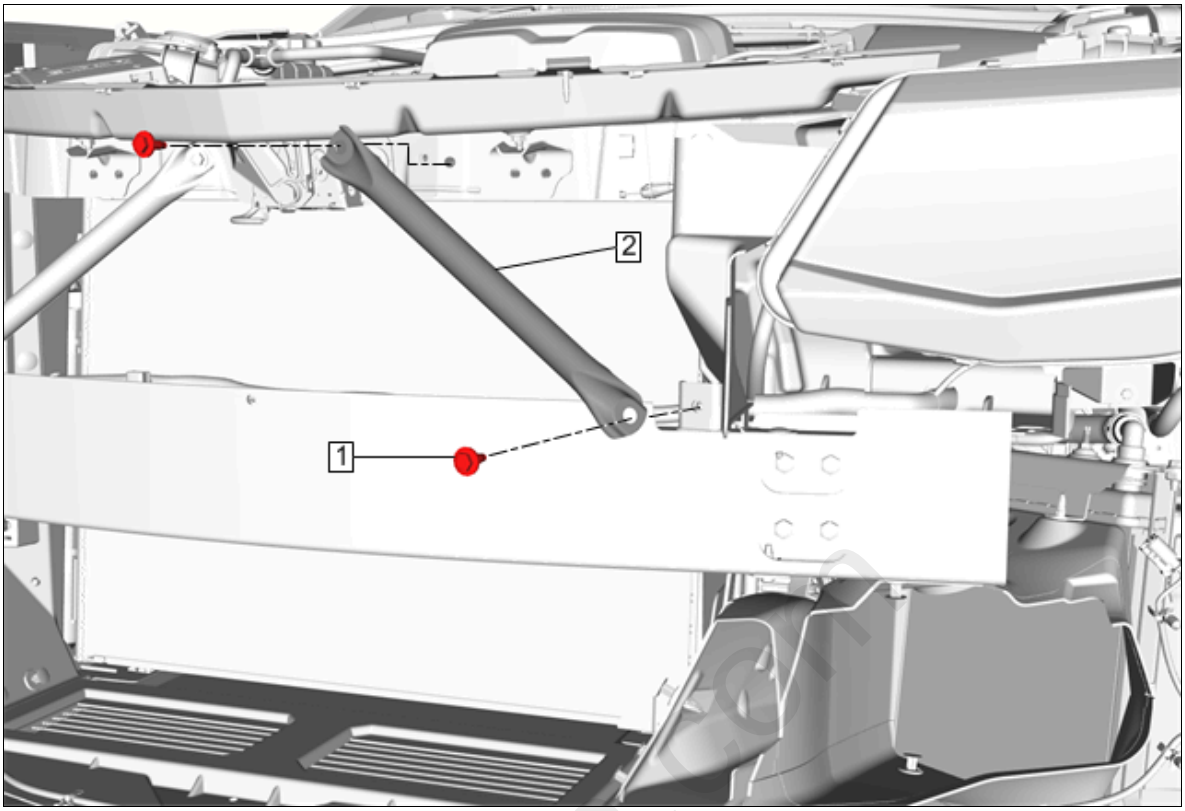


Courtesy of GENERAL MOTORS COMPANY

19. Remove Transmission Fluid Cooler Pipe (1) - Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, ATOC Jumper)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Front Jumper Left)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Mid Line Left)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Mid Line Right)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, Rear Differential Inlet Hose)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, Rear Differential Outlet Hose)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U, With KNR, Mid Line Left)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U, With KNR, Mid Line Right)

20. Un-clip the forward lamp harness from the front bumper impact bar.

Fig 12: Front End Sheet Metal Cross Brace

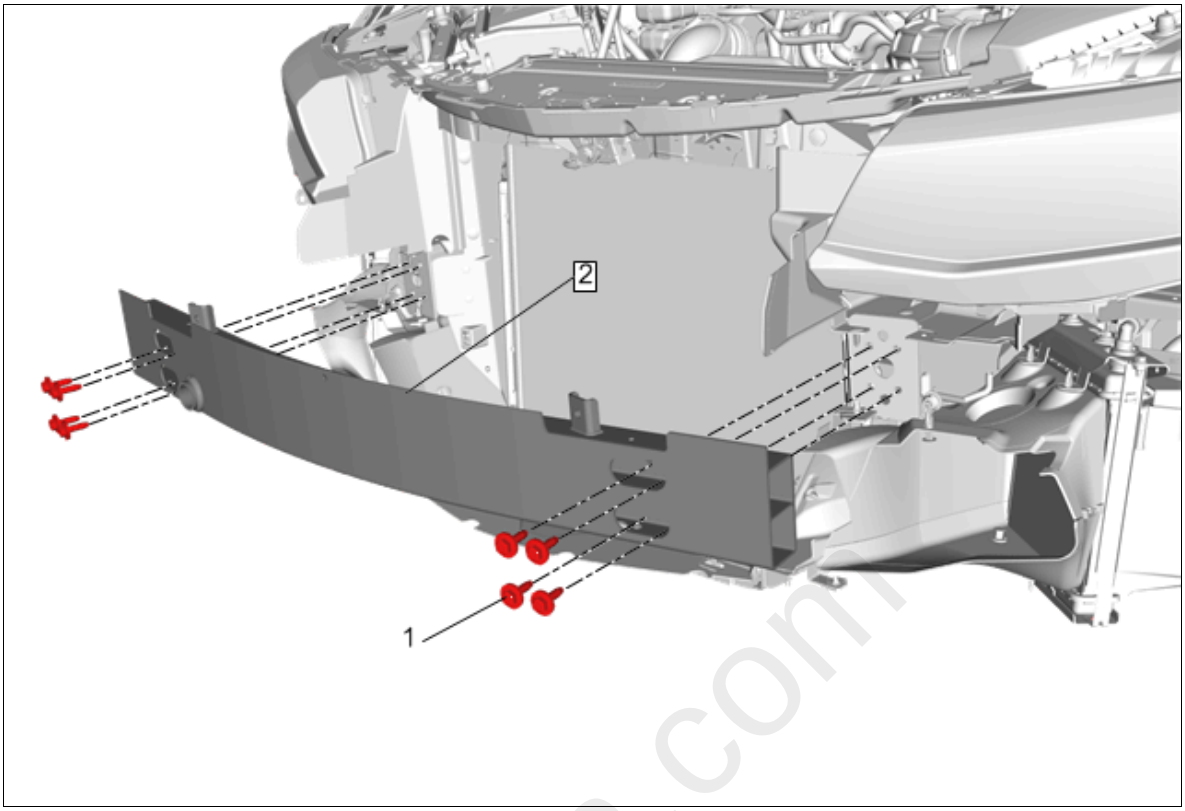


Courtesy of GENERAL MOTORS COMPANY

21. Remove Front End Sheet Metal Cross Brace Bolt Left Side (1) (Qty: 2) and Right Side at Front End Upper Tie Bar - Front End Sheet Metal Cross Brace Replacement

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Fig 13: Front Bumper Impact Bar (Without Y4Q)

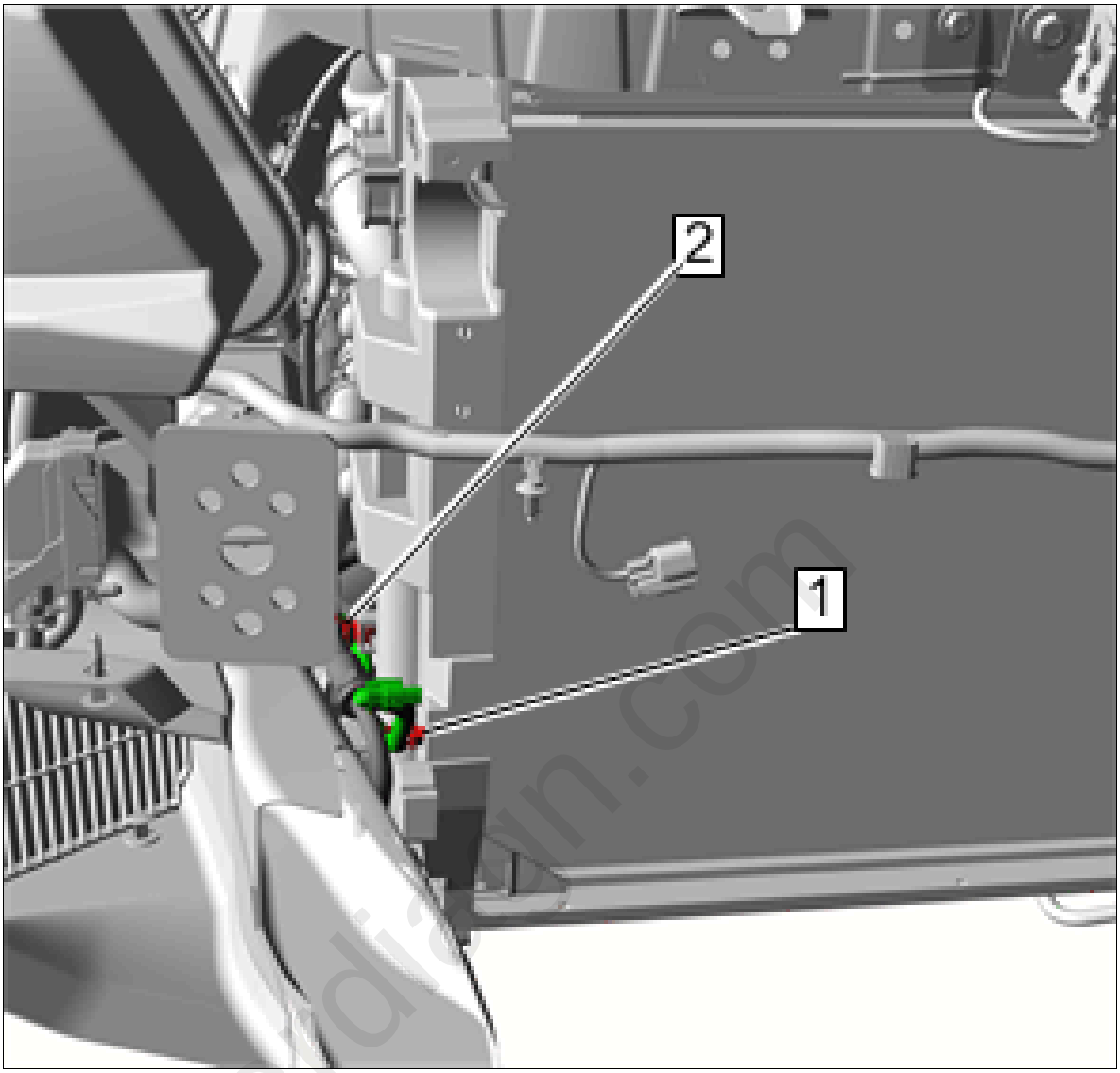


Courtesy of GENERAL MOTORS COMPANY

22. Remove Front Bumper Impact Bar (2) with Transmission Fluid Auxiliary Cooler - Front Bumper Impact Bar Replacement (Without Y4Q)

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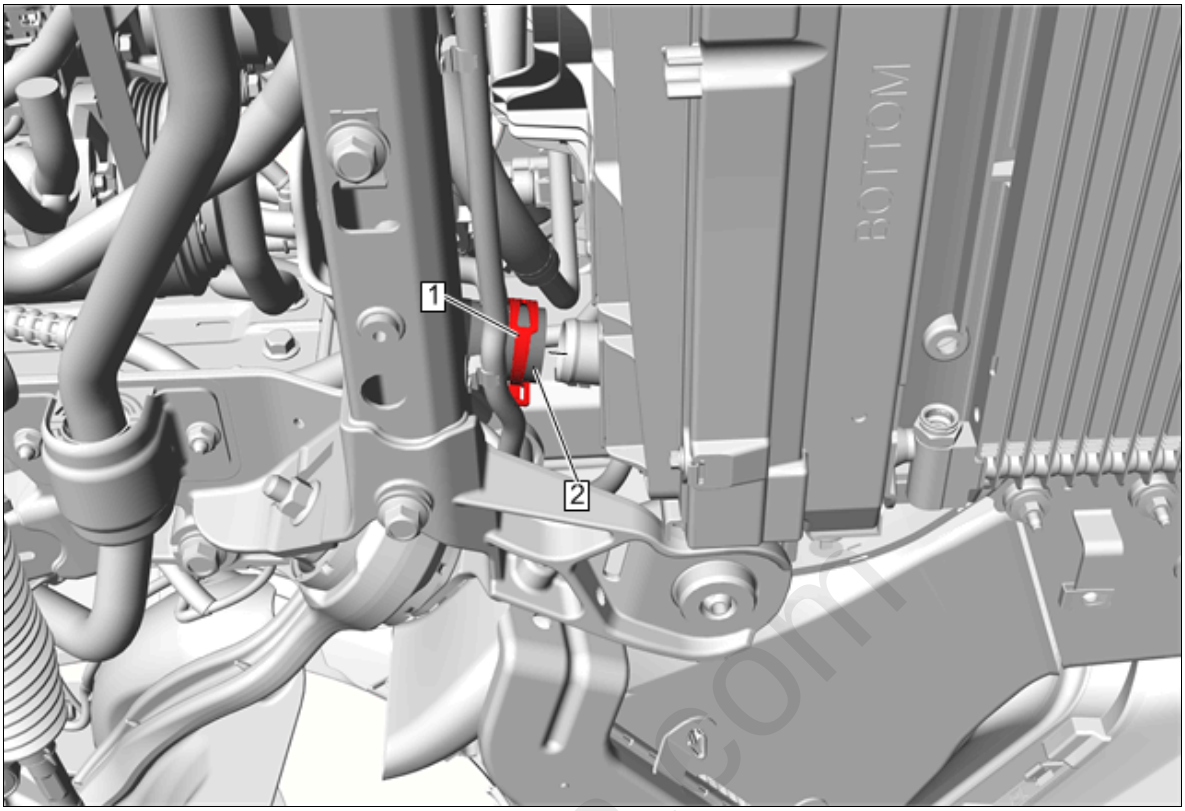
Fig 14: Transmission Fluid Cooler Inlet and Outlet Pipe Retainer



Courtesy of GENERAL MOTORS COMPANY

23. Remove Transmission Fluid Cooler Inlet and Outlet Pipe Retainer (2)
24. Remove Wiring Harness Retainer (1)

Fig 15: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

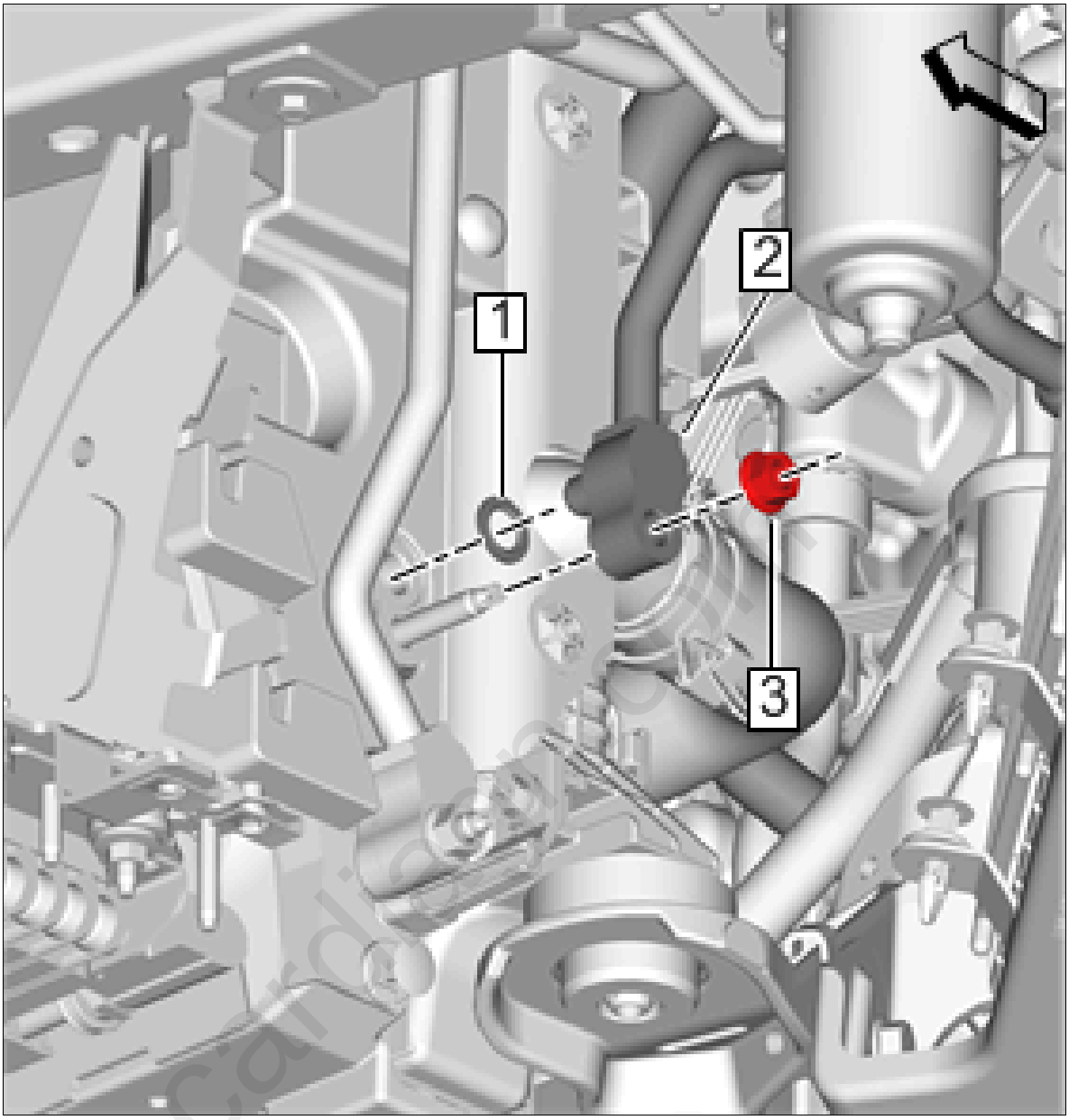
25. Disengage Radiator Outlet Hose Clamp (1)

    Use the **GE-47622** Hose Clamp Pliers.

26. Remove Radiator Outlet Hose (2) at Radiator Assembly

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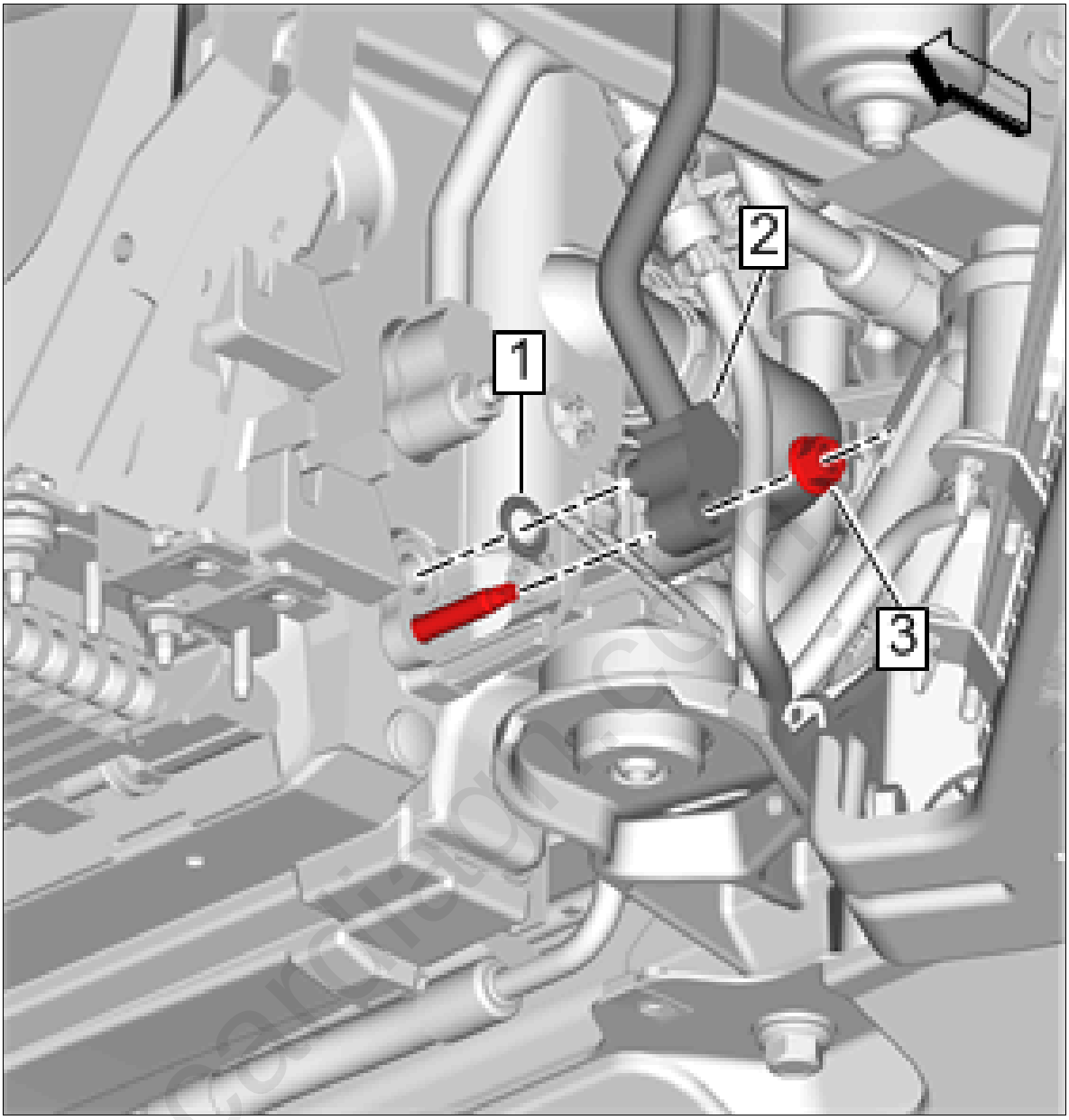
Fig 16: Air Conditioning Compressor Hose



Courtesy of GENERAL MOTORS COMPANY

27. Remove Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LT1)

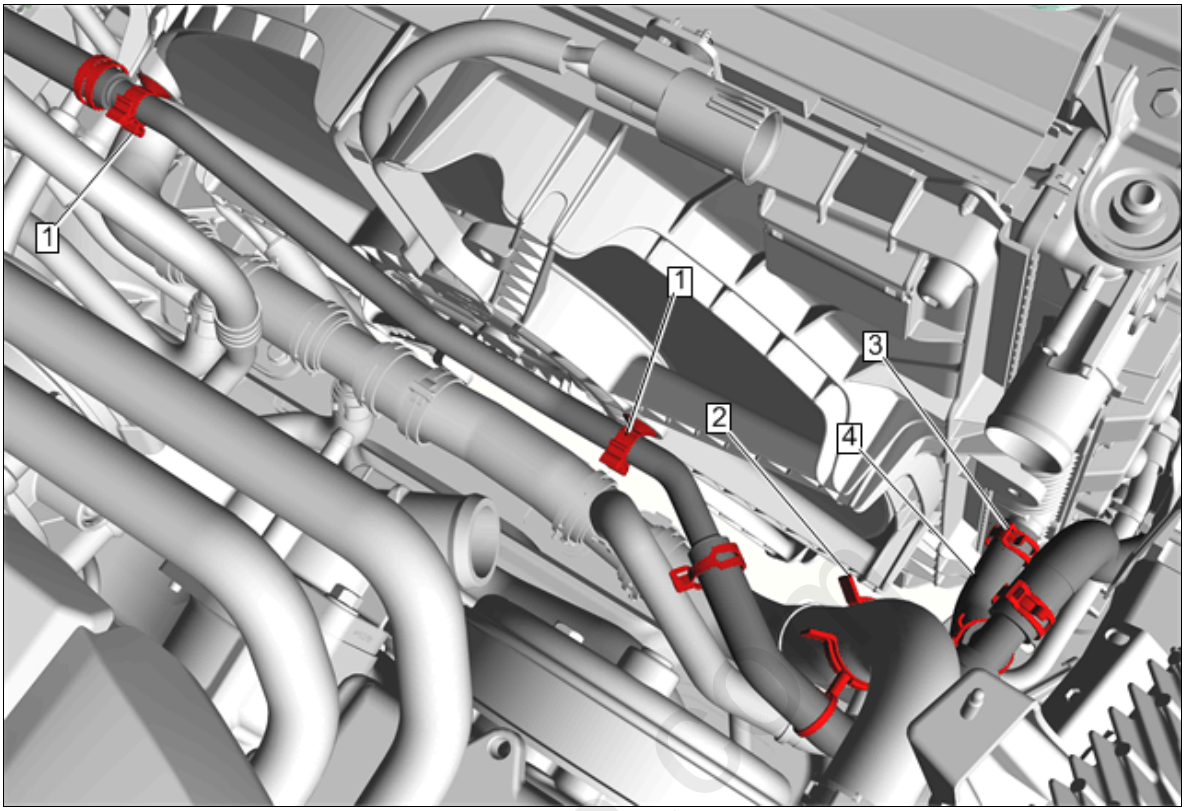
Fig 17: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

28. Remove Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LT1)

Fig 18: Auxiliary Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

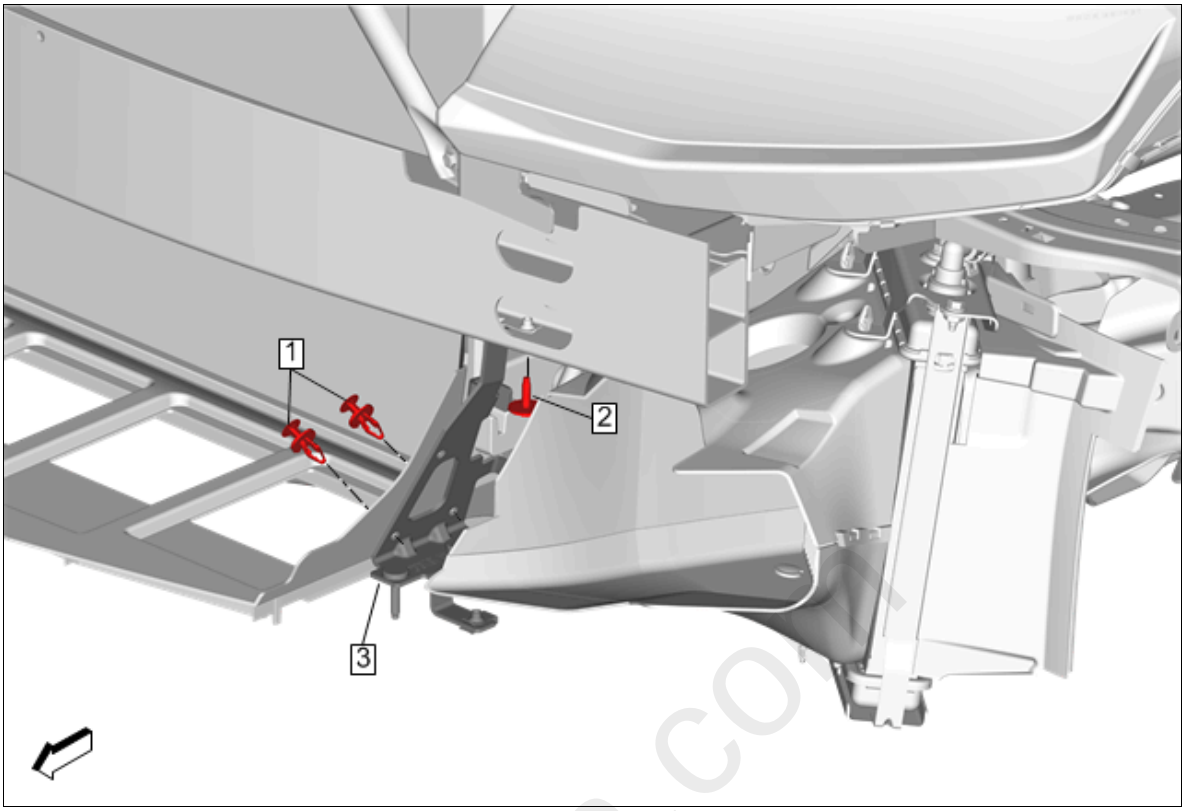
29. Disengage Auxiliary Radiator Inlet Hose Clamp (3)

    Use the **GE-47622** Hose Clamp Pliers.

30. Remove Auxiliary Radiator Inlet Hose (4) at Radiator Assembly

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Fig 19: Transmission Fluid Auxiliary Cooler Bracket

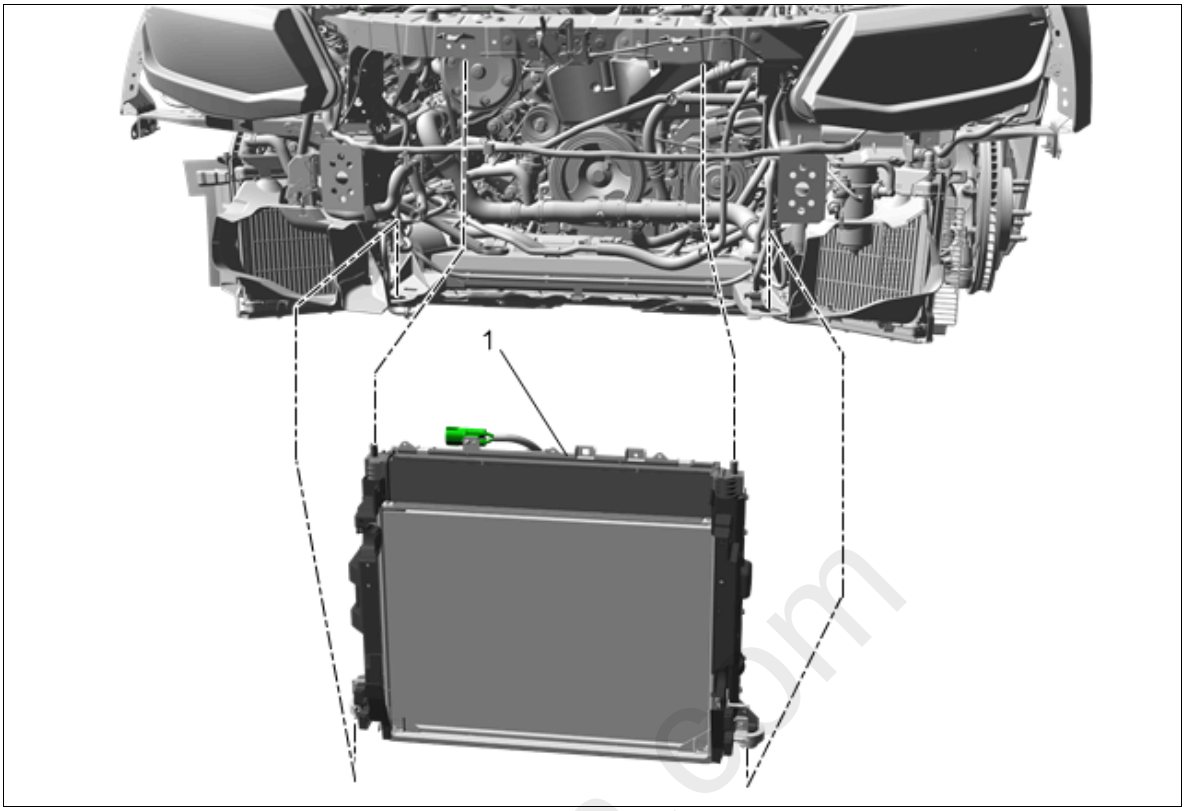


Courtesy of GENERAL MOTORS COMPANY

31. Remove Transmission Fluid Auxiliary Cooler Bracket (3) - Transmission Fluid Auxiliary Cooler Bracket Replacement (LT1 With M5U or MM)

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Fig 20: Radiator Assembly

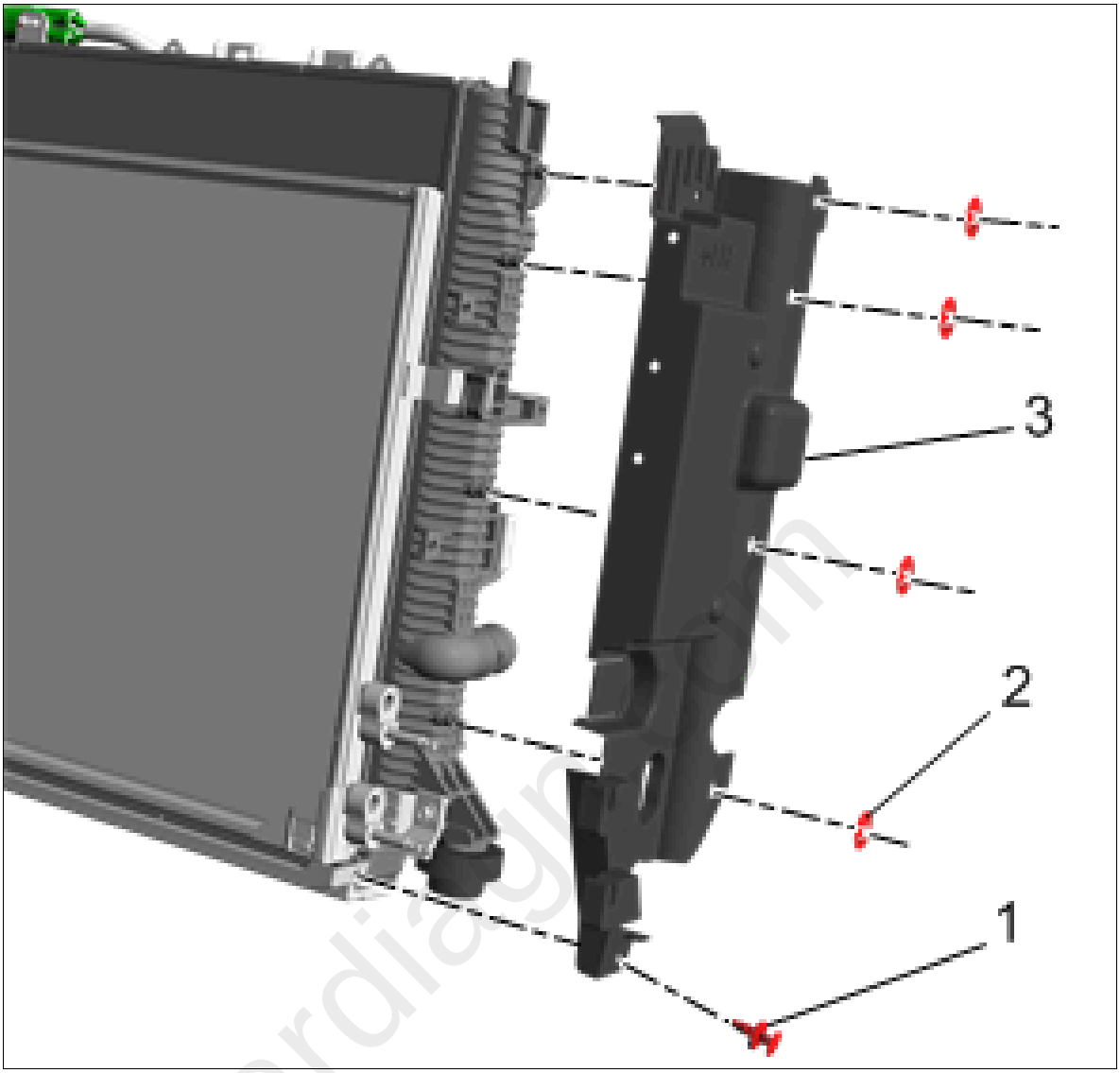


Courtesy of GENERAL MOTORS COMPANY

32. Remove Radiator Assembly (1)

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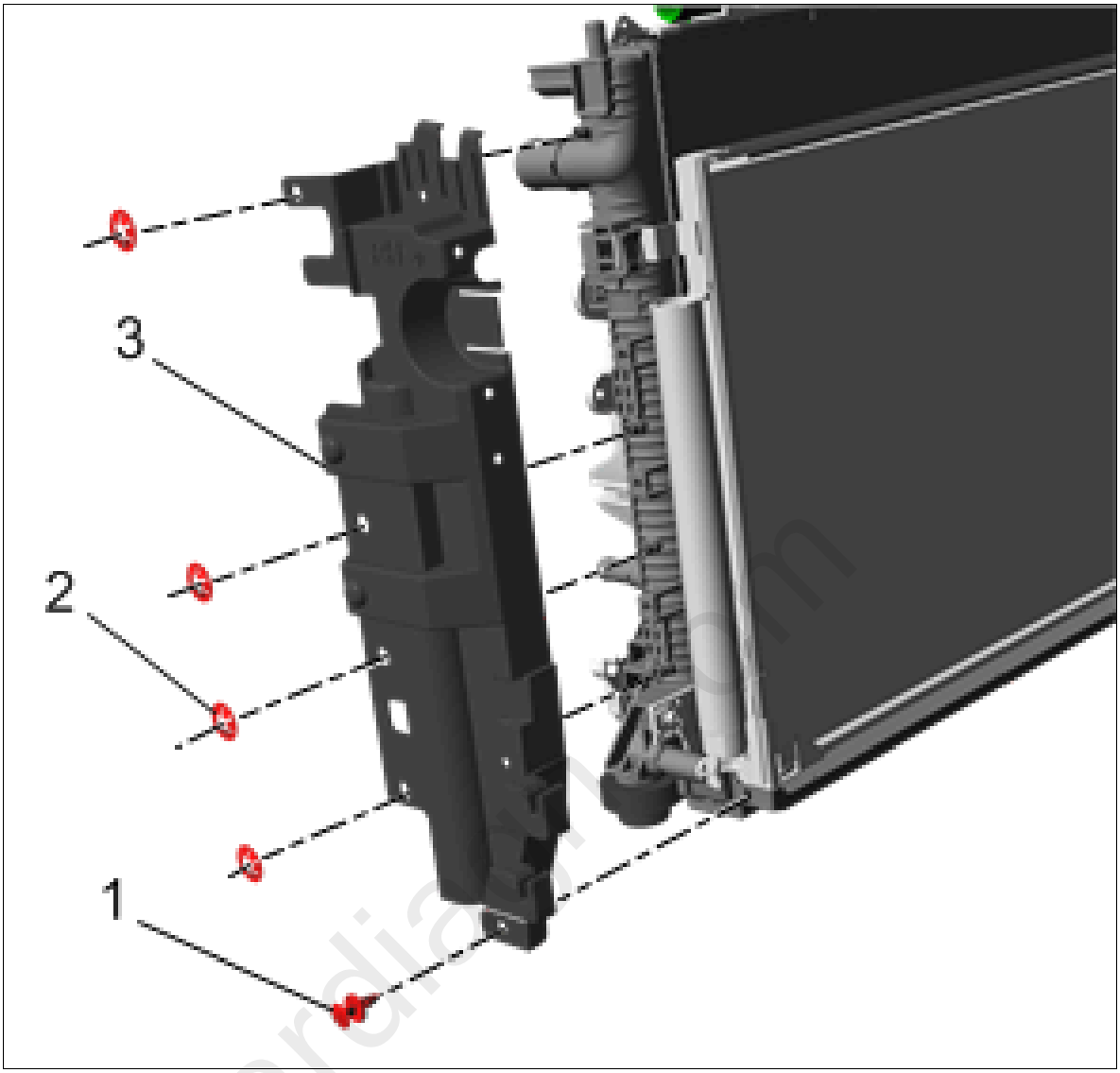
Fig 21: Radiator Air Side Seal - Left Side



Courtesy of GENERAL MOTORS COMPANY

33. Remove Push Pin (1)
34. Remove Radiator Air Baffle Retainer (2) (Qty: 4)
35. Remove Radiator Air Side Seal - Left Side (3)

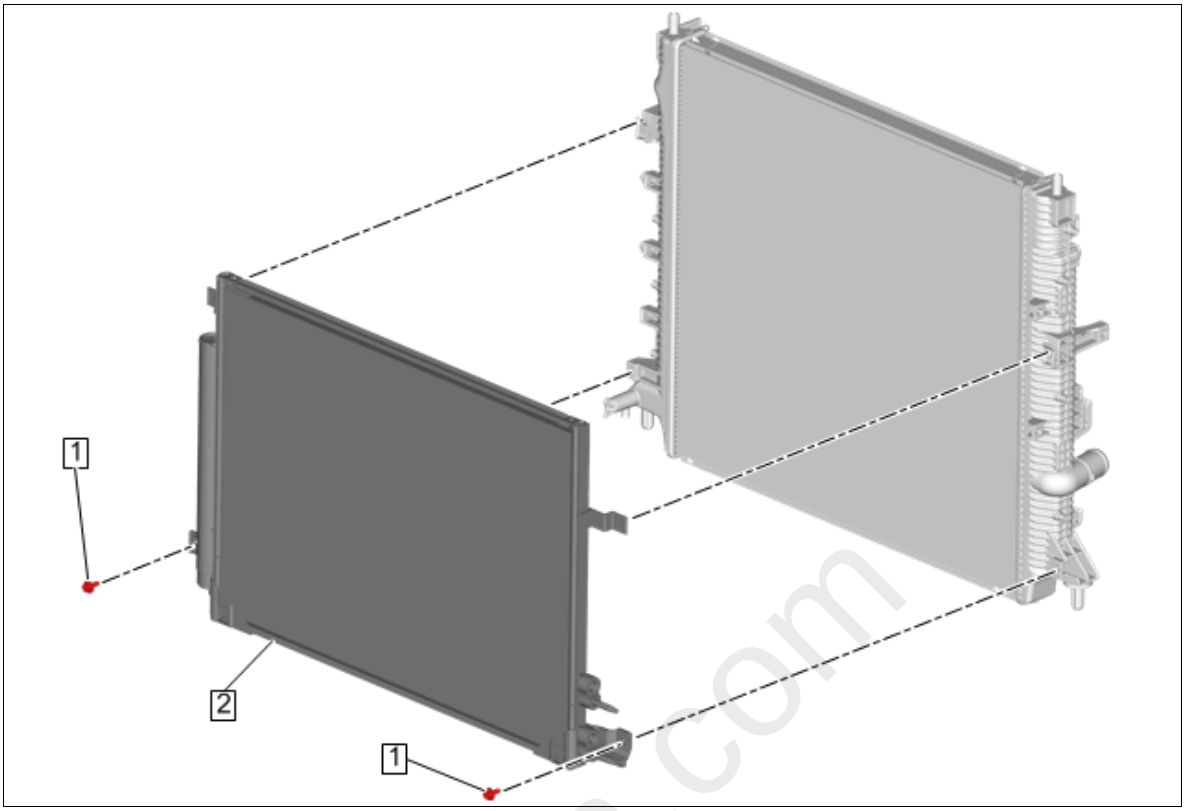
Fig 22: Radiator Air Side Seal - Right Side



Courtesy of GENERAL MOTORS COMPANY

36. Remove Push Pin (1)
37. Remove Radiator Air Baffle Retainer (2) (Qty: 4)
38. Remove Radiator Air Side Seal - Right Side (3)

Fig 23: Air Conditioning Condenser

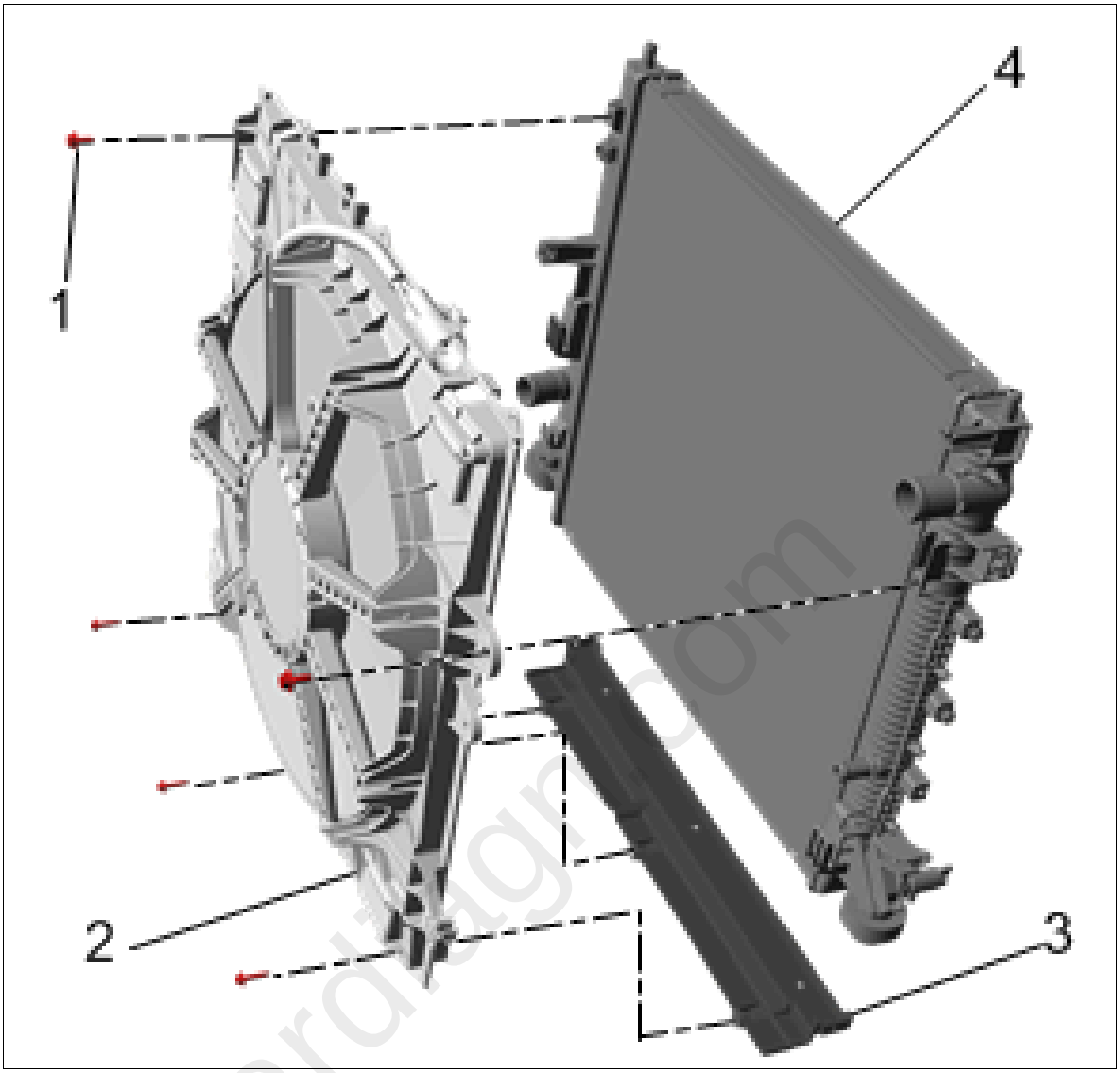


Courtesy of GENERAL MOTORS COMPANY

39. Remove Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LGX, LT1 with V18)

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Fig 24: Engine Coolant Fan

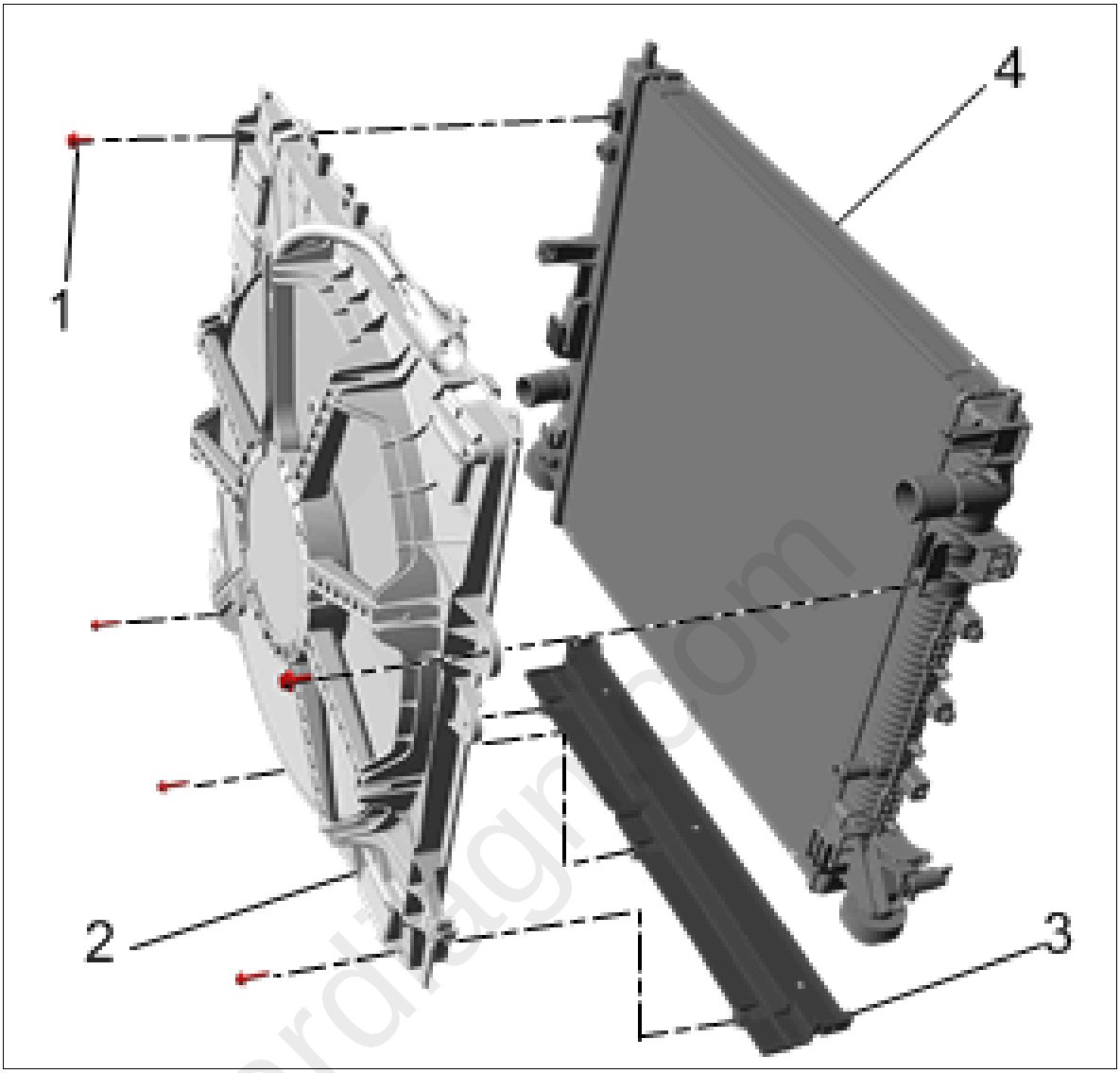


Courtesy of GENERAL MOTORS COMPANY

40. Remove Engine Coolant Fan Shroud Bolt (1) (Qty: 5)
41. Remove Engine Coolant Fan (2)
42. Remove Radiator Air Lower Sea (3) at Radiator (4)

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LT1) > INSTALLATION PROCEDURE

Fig 1: Engine Coolant Fan



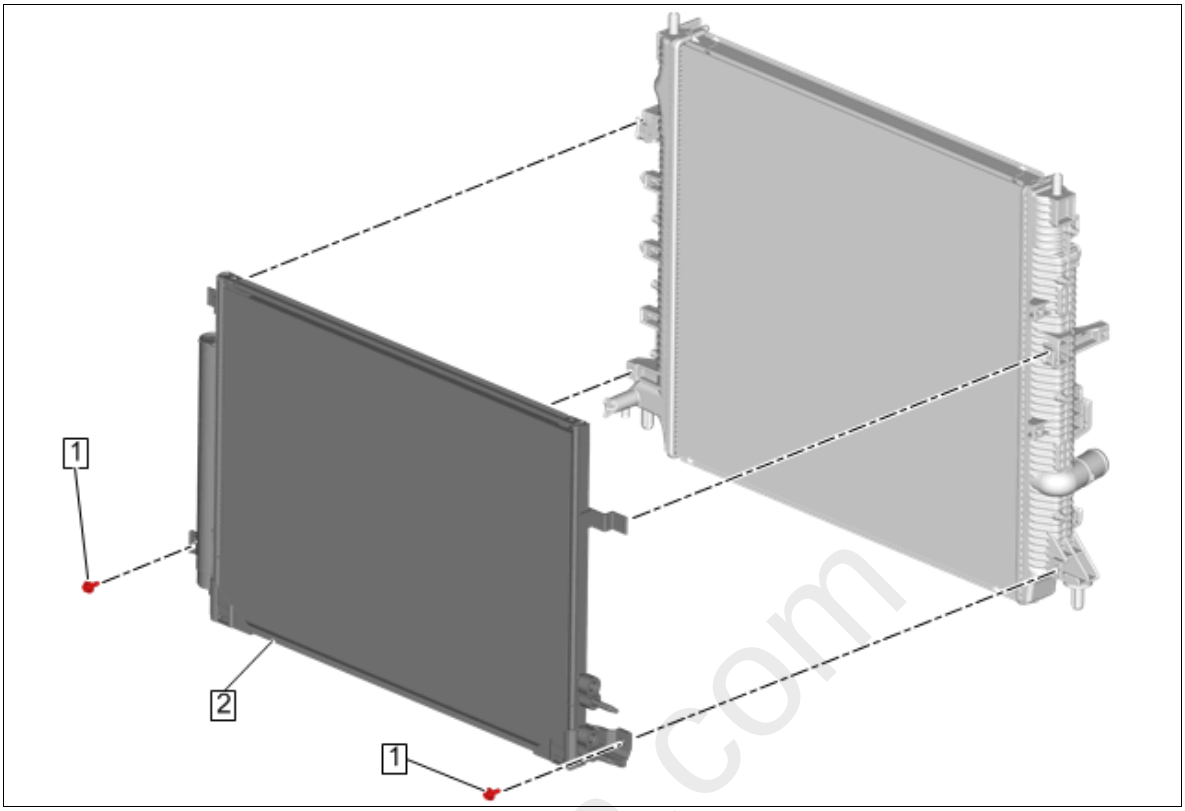
Courtesy of GENERAL MOTORS COMPANY

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> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

1. Install Radiator (4) at Radiator Air Lower Seal (3)
2. Install Engine Coolant Fan (2)
3. Install Engine Coolant Fan Shroud Bolt (1) (Qty: 5) and tighten to 9 N.m (80 lb in)

Fig 2: Air Conditioning Condenser

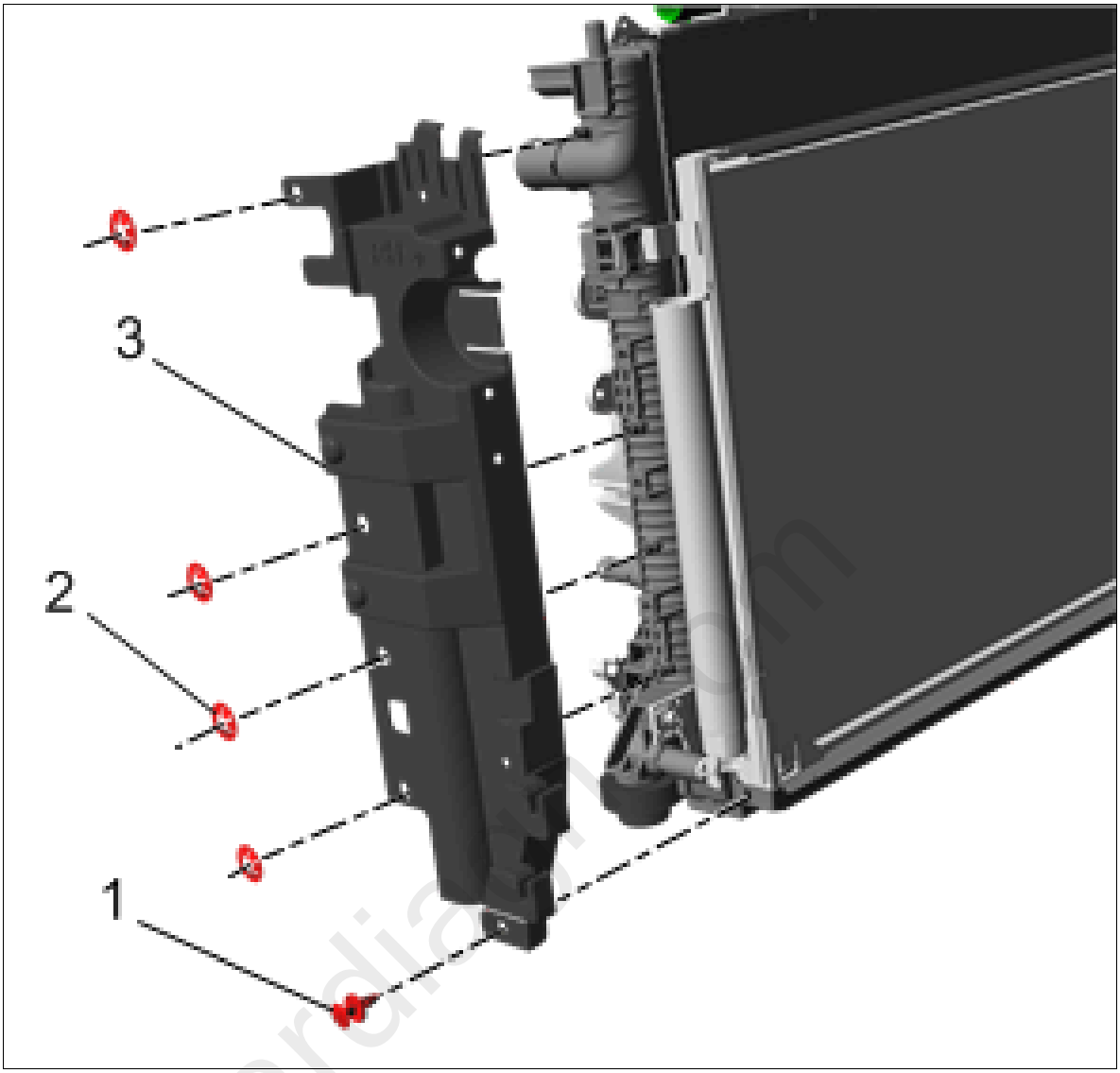


Courtesy of GENERAL MOTORS COMPANY

4. Install Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LGX, LT1 with V18)

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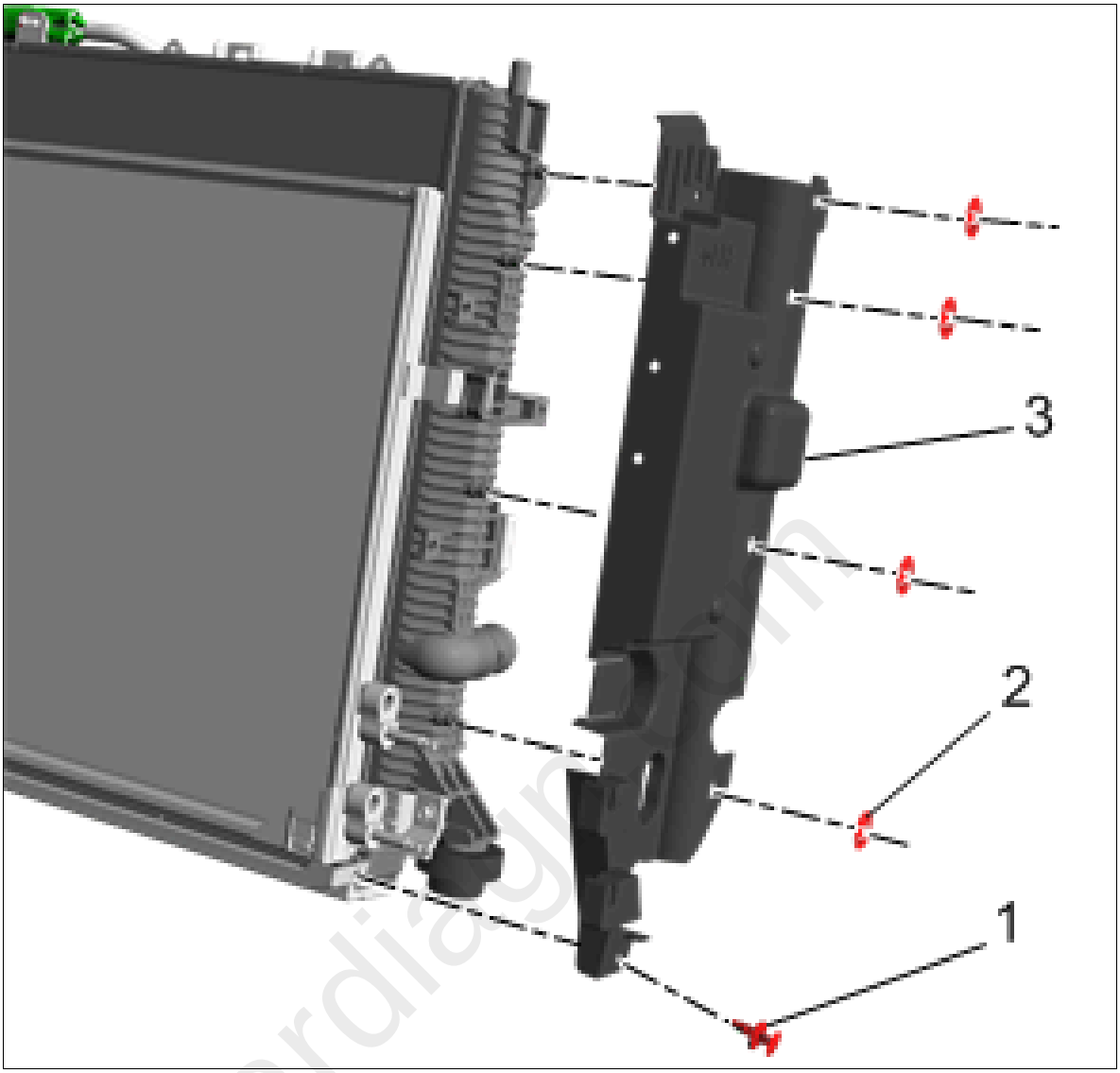
Fig 3: Radiator Air Side Seal - Right Side



Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Air Side Seal - Right Side (3)
6. Install Radiator Air Baffle Retainer (2) (Qty: 4)
7. Install Push Pin (1)

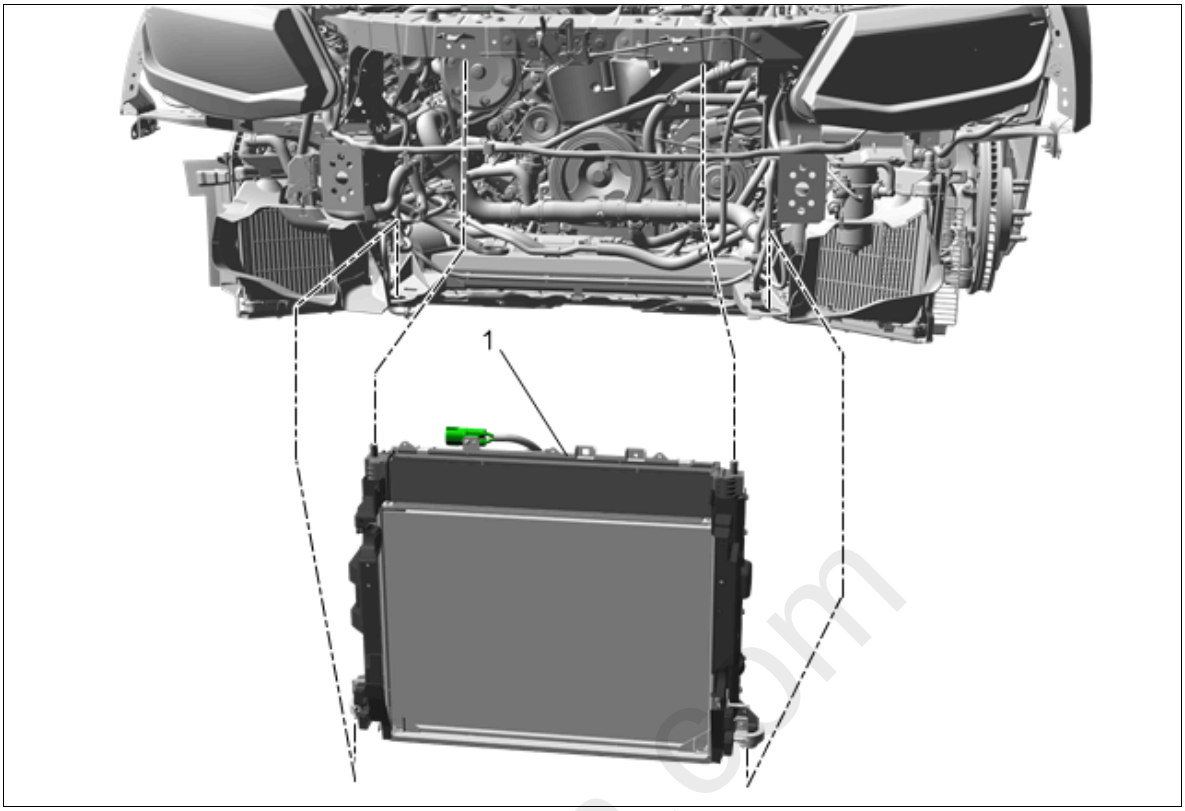
Fig 4: Radiator Air Side Seal - Left Side



Courtesy of GENERAL MOTORS COMPANY

8. Install Radiator Air Side Seal - Left Side (3)
9. Install Radiator Air Baffle Retainer (2) (Qty: 4)
10. Install Push Pin (1)

Fig 5: Radiator Assembly

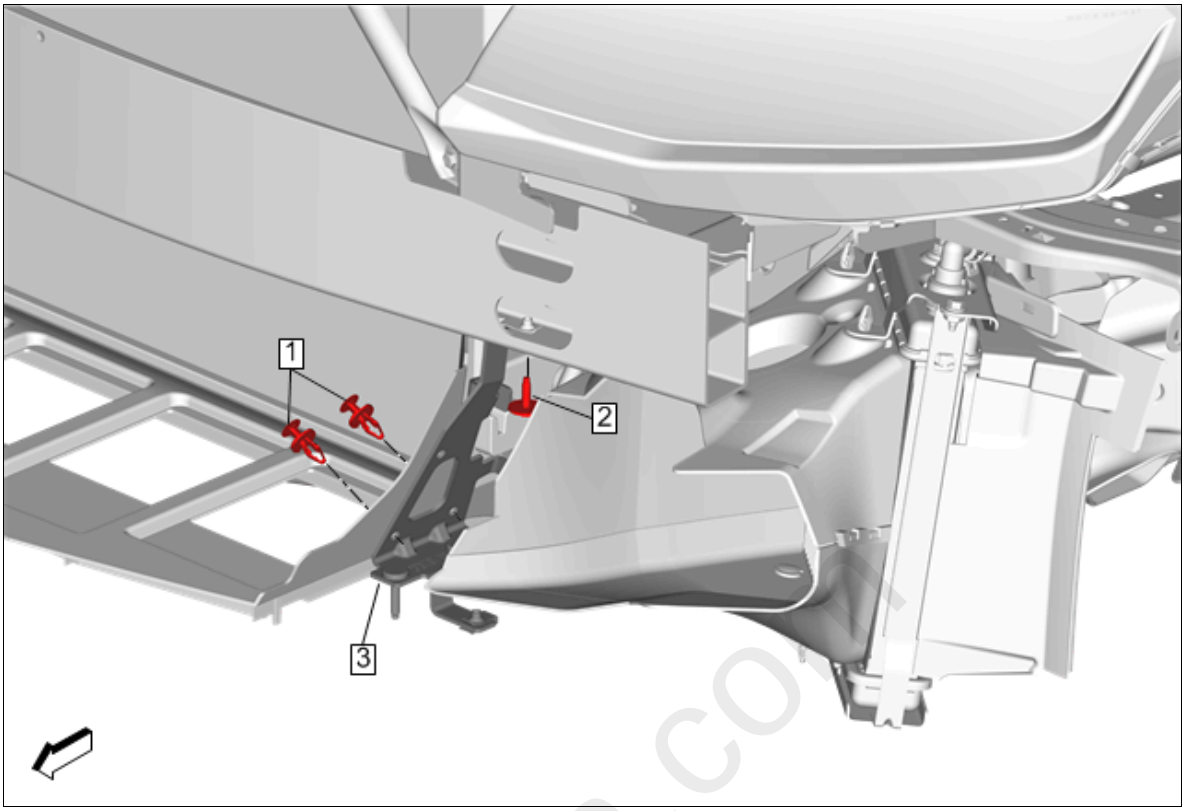


Courtesy of GENERAL MOTORS COMPANY

11. Install Radiator Assembly (1)

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Fig 6: Transmission Fluid Auxiliary Cooler Bracket

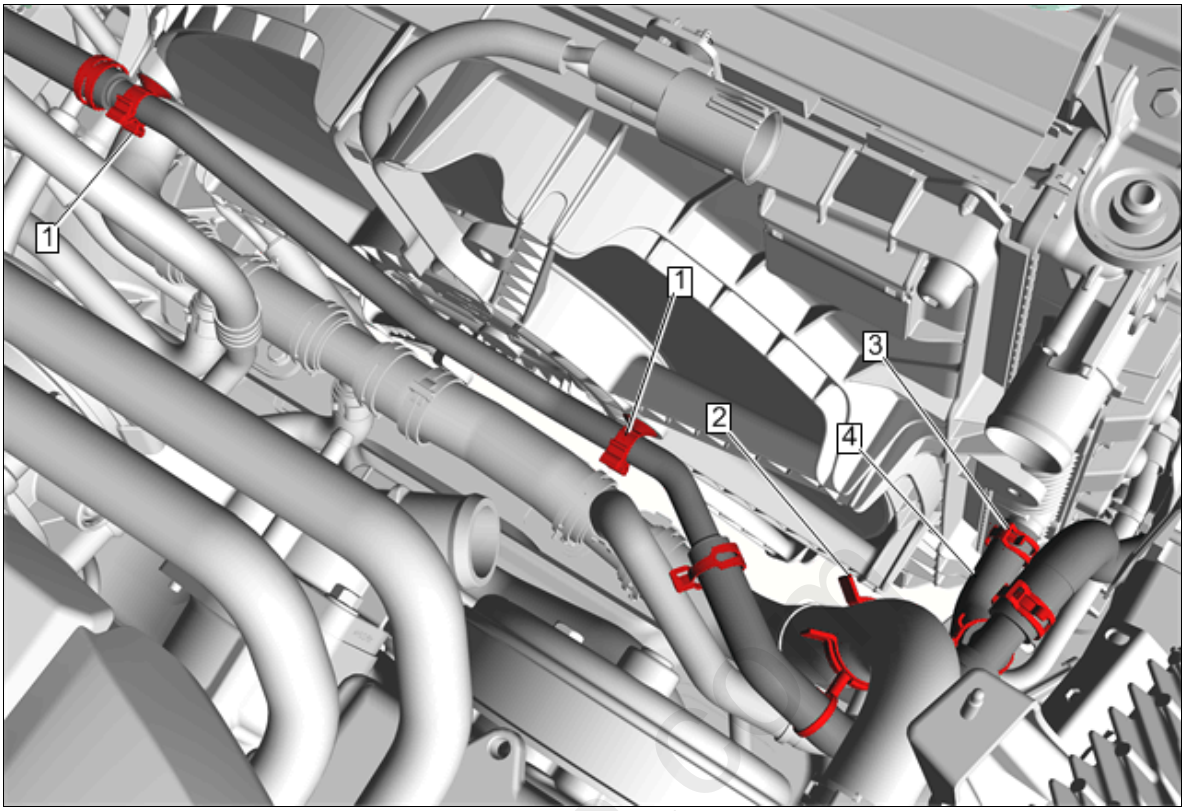


Courtesy of GENERAL MOTORS COMPANY

12. Install Transmission Fluid Auxiliary Cooler Bracket (3) - Transmission Fluid Auxiliary Cooler Bracket Replacement (LT1 With M5U or MM)

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Fig 7: Auxiliary Radiator Inlet Hose



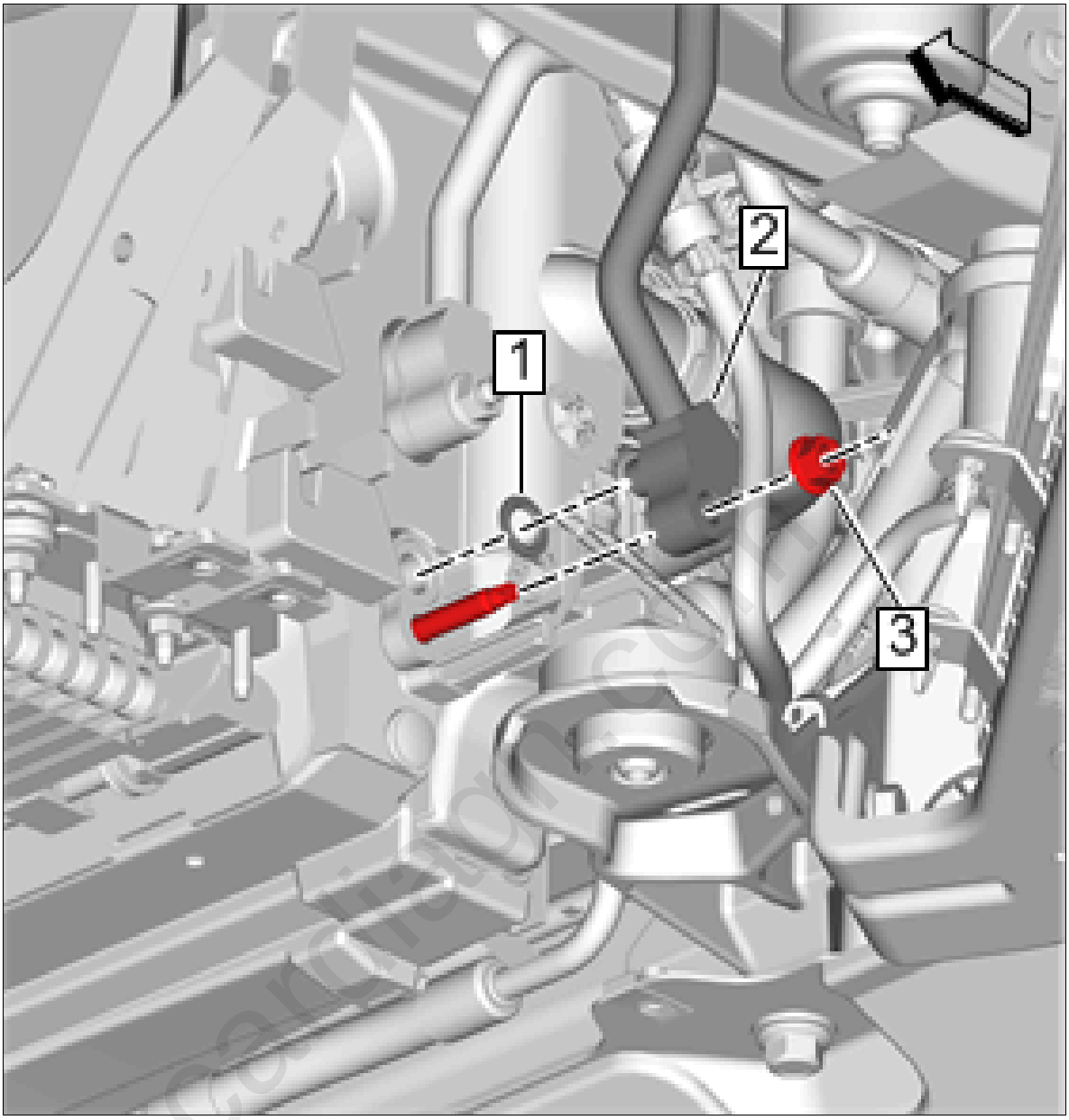
Courtesy of GENERAL MOTORS COMPANY

13. Install Auxiliary Radiator Inlet Hose (4) at Radiator Assembly
14. Engage Auxiliary Radiator Inlet Hose Clamp (3)

    Use the **GE-47622** Hose Clamp Pliers.

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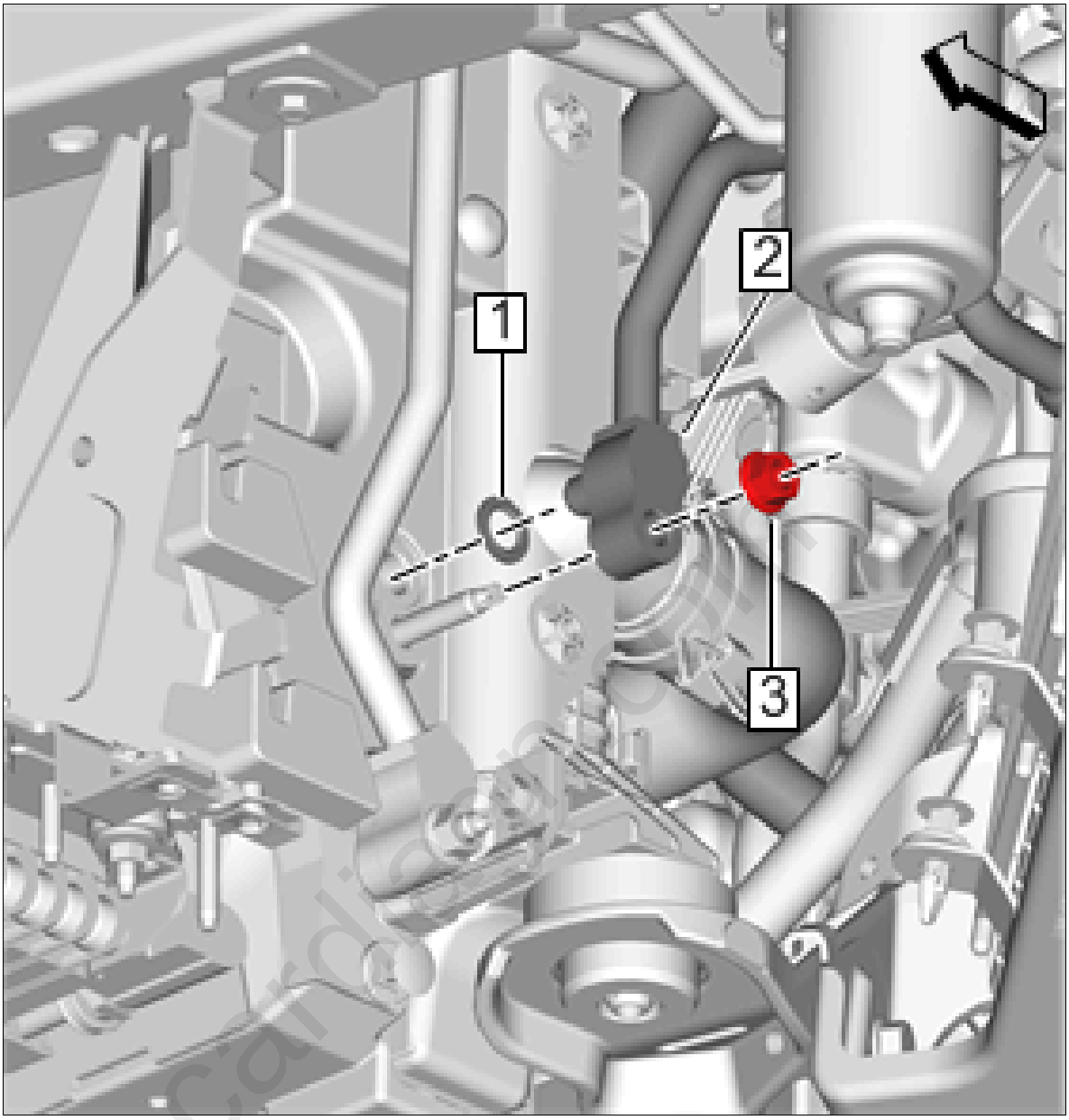
Fig 8: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

15. Install Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LT1)

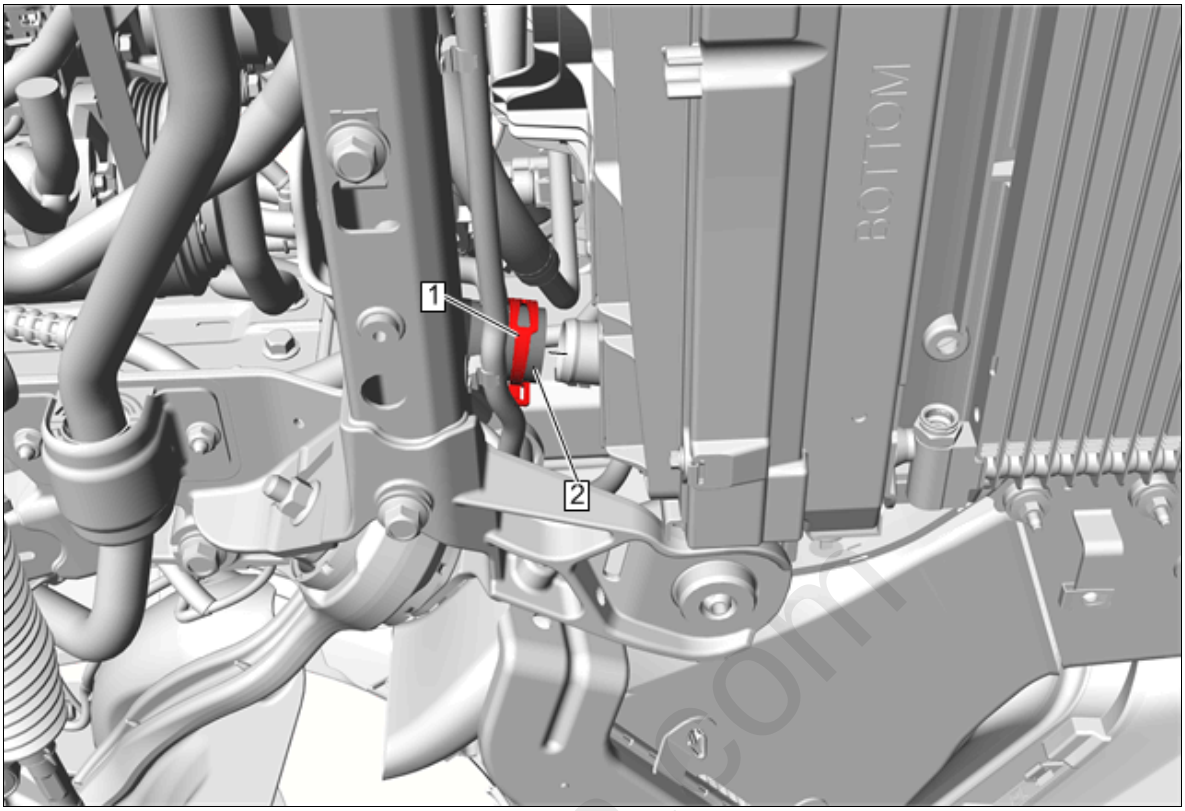
Fig 9: Air Conditioning Compressor Hose



Courtesy of GENERAL MOTORS COMPANY

16. Install Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LT1)

Fig 10: Radiator Outlet Hose



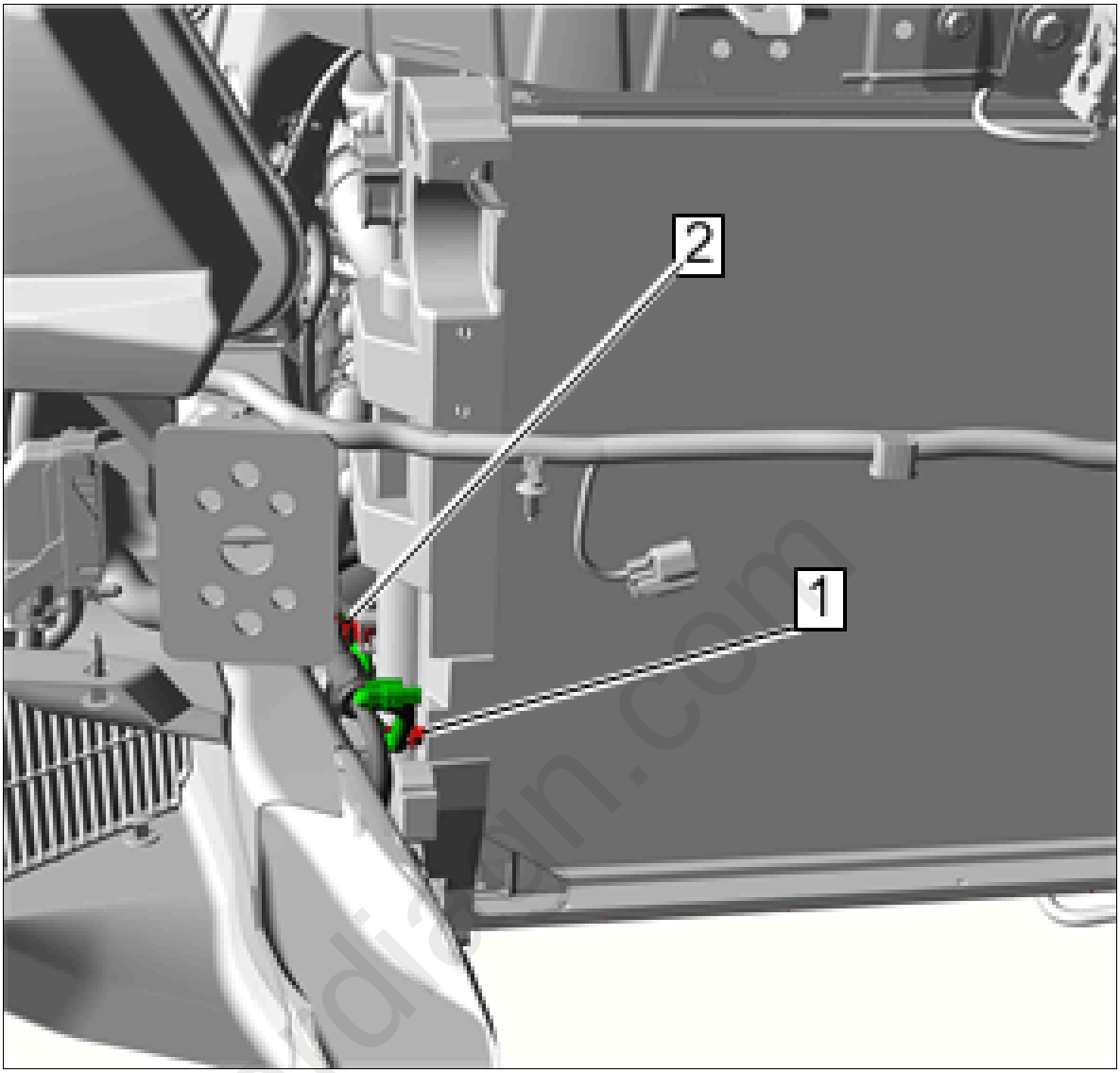
Courtesy of GENERAL MOTORS COMPANY

17. Install Radiator Outlet Hose (2) at Radiator Assembly
18. Engage Radiator Outlet Hose Clamp (1)

    Use the **GE-47622** Hose Clamp Pliers.

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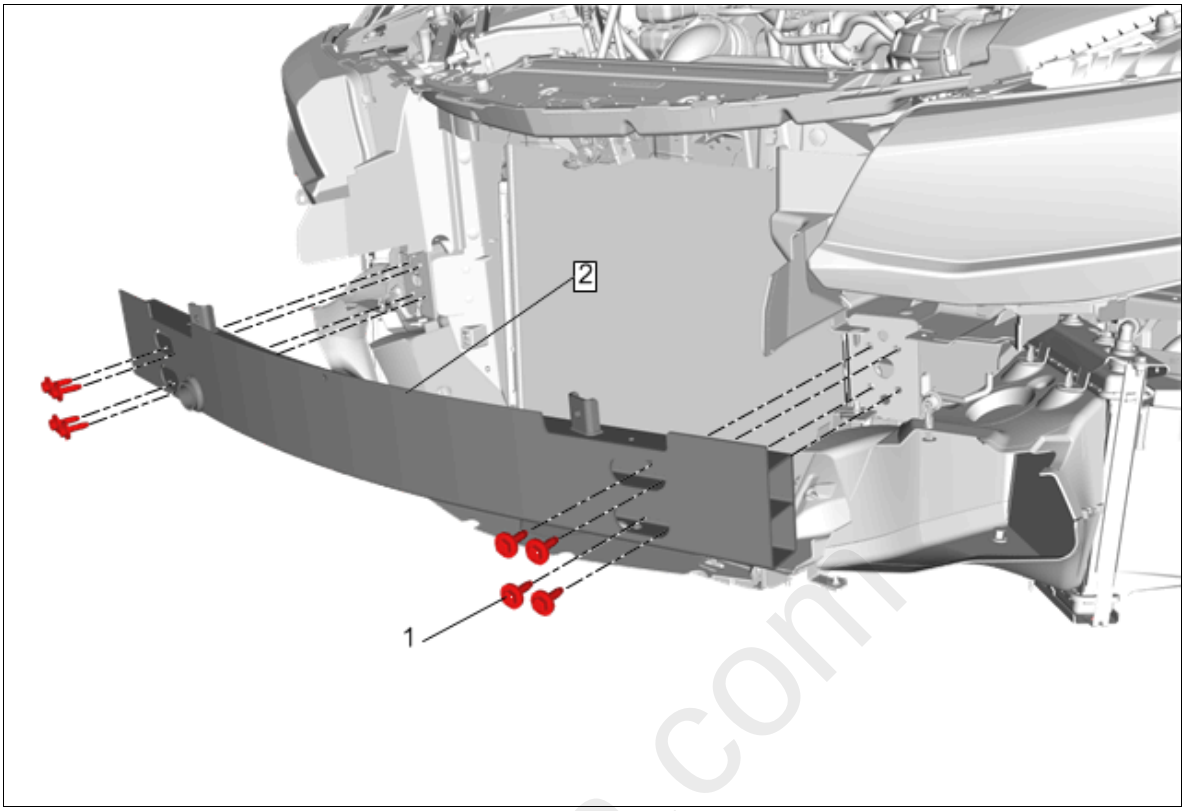
Fig 11: Transmission Fluid Cooler Inlet and Outlet Pipe Retainer



Courtesy of GENERAL MOTORS COMPANY

19. Install Transmission Fluid Cooler Inlet and Outlet Pipe Retainer (2)
20. Install Wiring Harness Retainer (1)

Fig 12: Front Bumper Impact Bar (Without Y4Q)

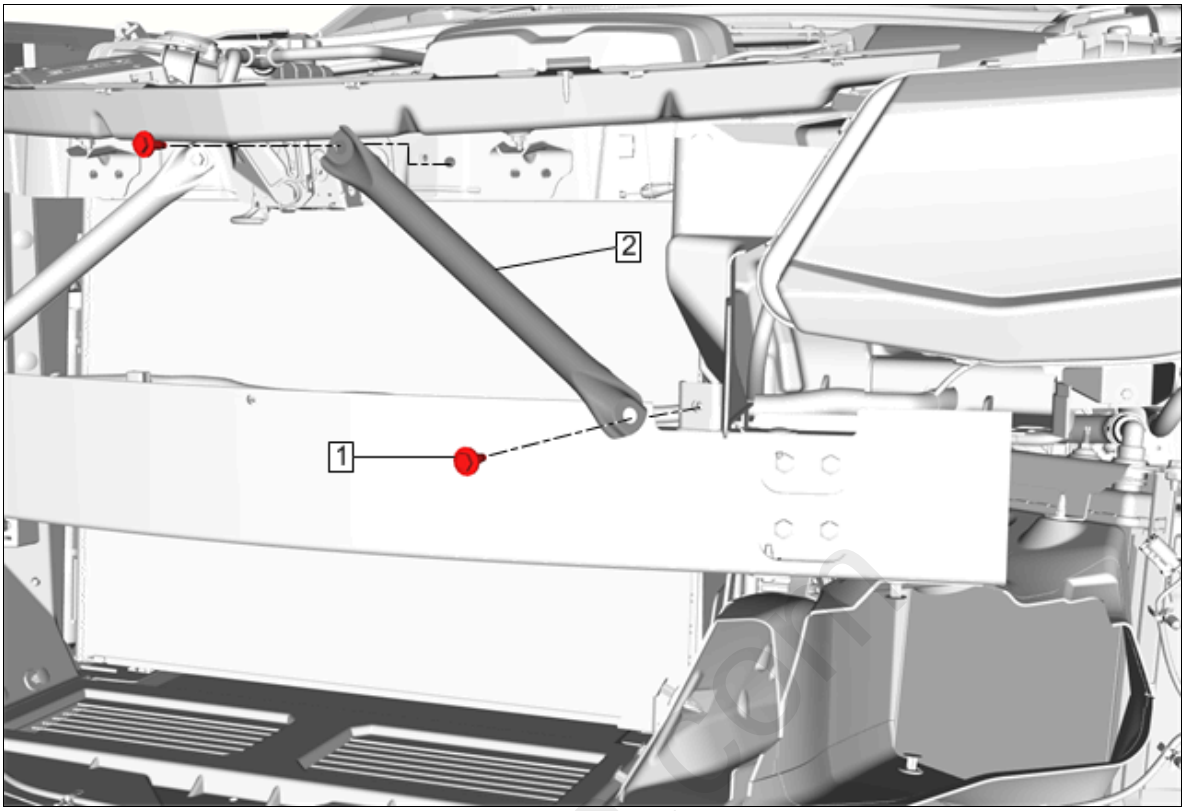


Courtesy of GENERAL MOTORS COMPANY

21. Install Front Bumper Impact Bar (2) with Transmission Fluid Auxiliary Cooler - Front Bumper Impact Bar Replacement (Without Y4Q)

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Fig 13: Front End Sheet Metal Cross Brace



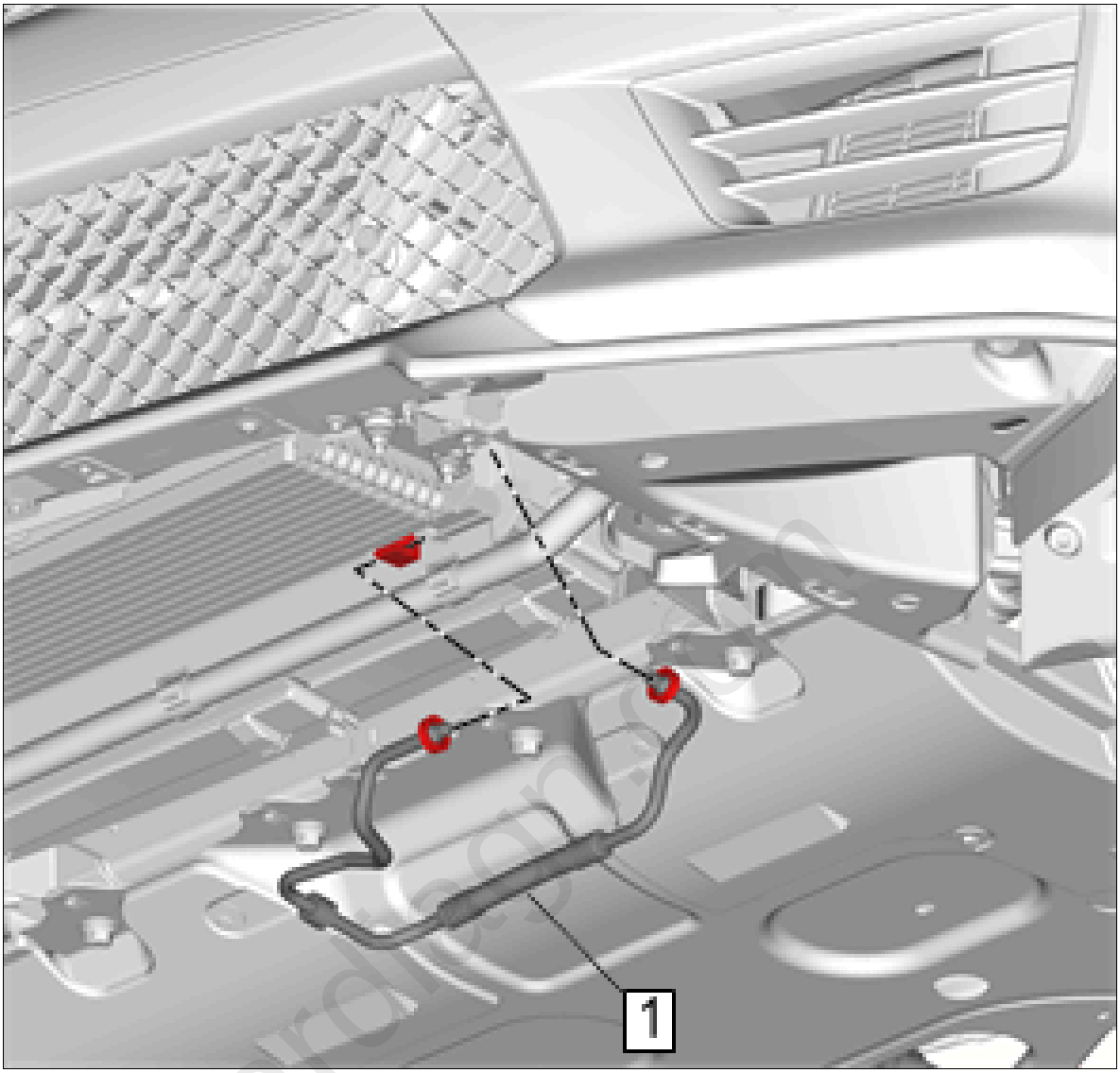
Courtesy of GENERAL MOTORS COMPANY

22. Install Front End Sheet Metal Cross Brace Bolt-Left Side (1) (Qty: 2) and Right Side at Front End Upper Tie Bar - Front End Sheet Metal Cross Brace Replacement

23. Clip the forward lamp harness to the front bumper impact bar.

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Fig 14: Transmission Fluid Cooler Pipe

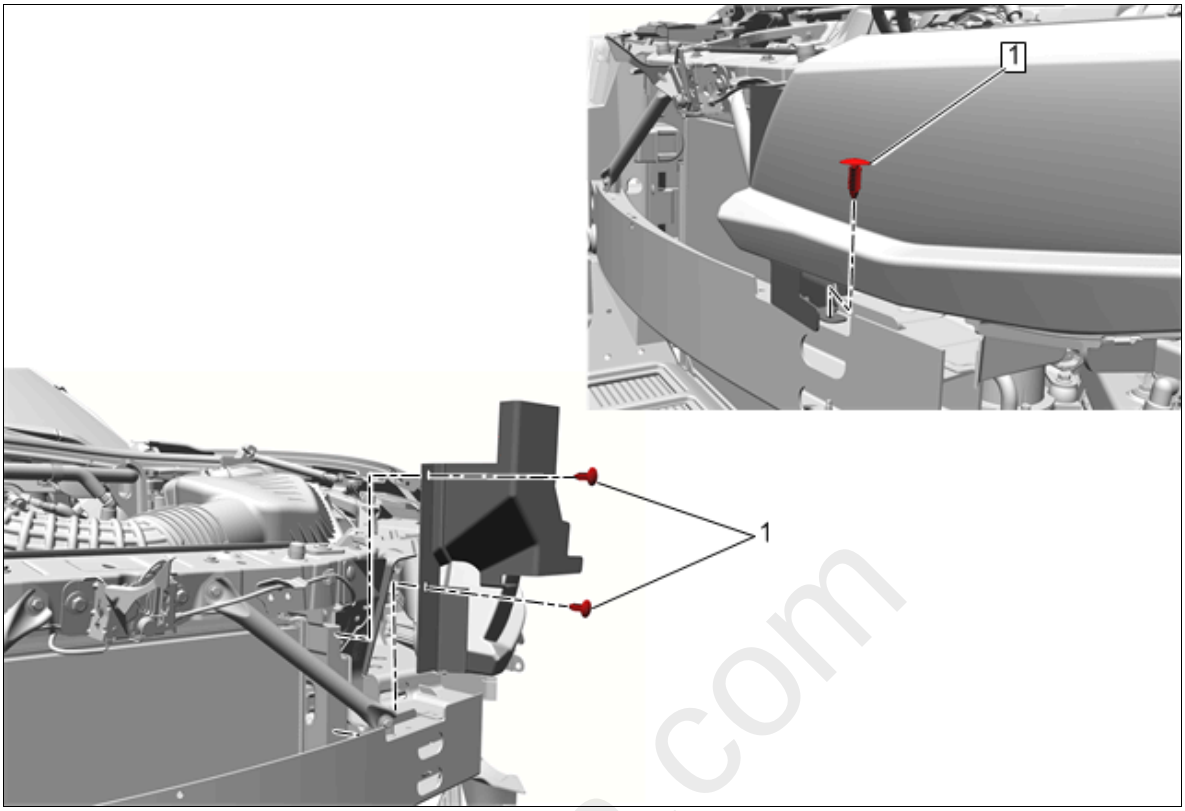


Courtesy of GENERAL MOTORS COMPANY

24. Install Transmission Fluid Cooler Pipe (1) - Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, ATOC Jumper)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Front Jumper Left)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Mid Line Left)Transmission Fluid Cooler Pipe Replacement (LT1 With MM6, With KNR, Mid Line Right)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, Rear Differential Inlet Hose)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U or MM6, With KNR, Rear Differential Outlet Hose)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U, With KNR, Mid Line Left)Transmission Fluid Cooler Pipe Replacement (LT1 With M5U, With KNR, Mid Line Right)

25. Install Transmission Fluid Cooler Inlet and Outlet Pipe at Transmission Fluid Auxiliary Cooler - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With MM6, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, Without KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With MM6, Without KNR)

Fig 15: Radiator Air Side Baffle-Left Side

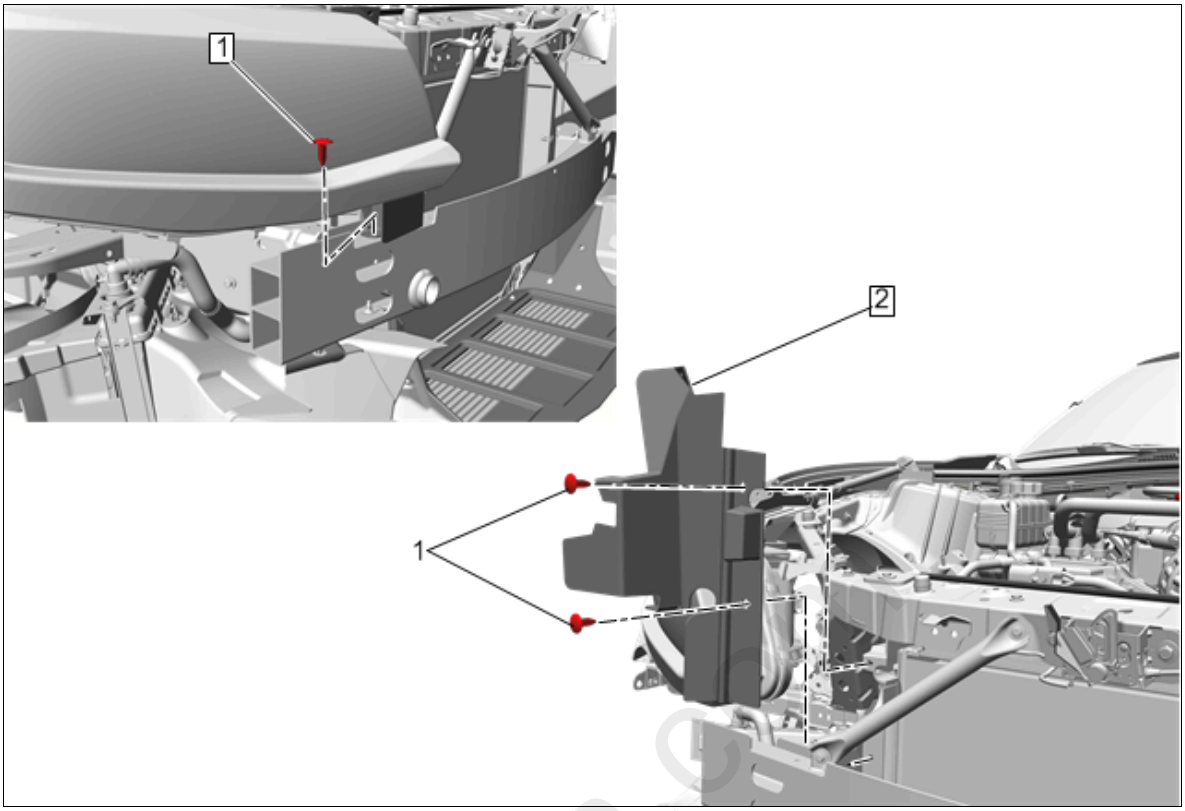


Courtesy of GENERAL MOTORS COMPANY

26. Install Radiator Air Side Baffle-Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LT1)

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Fig 16: Radiator Air Side Baffle-Right Side

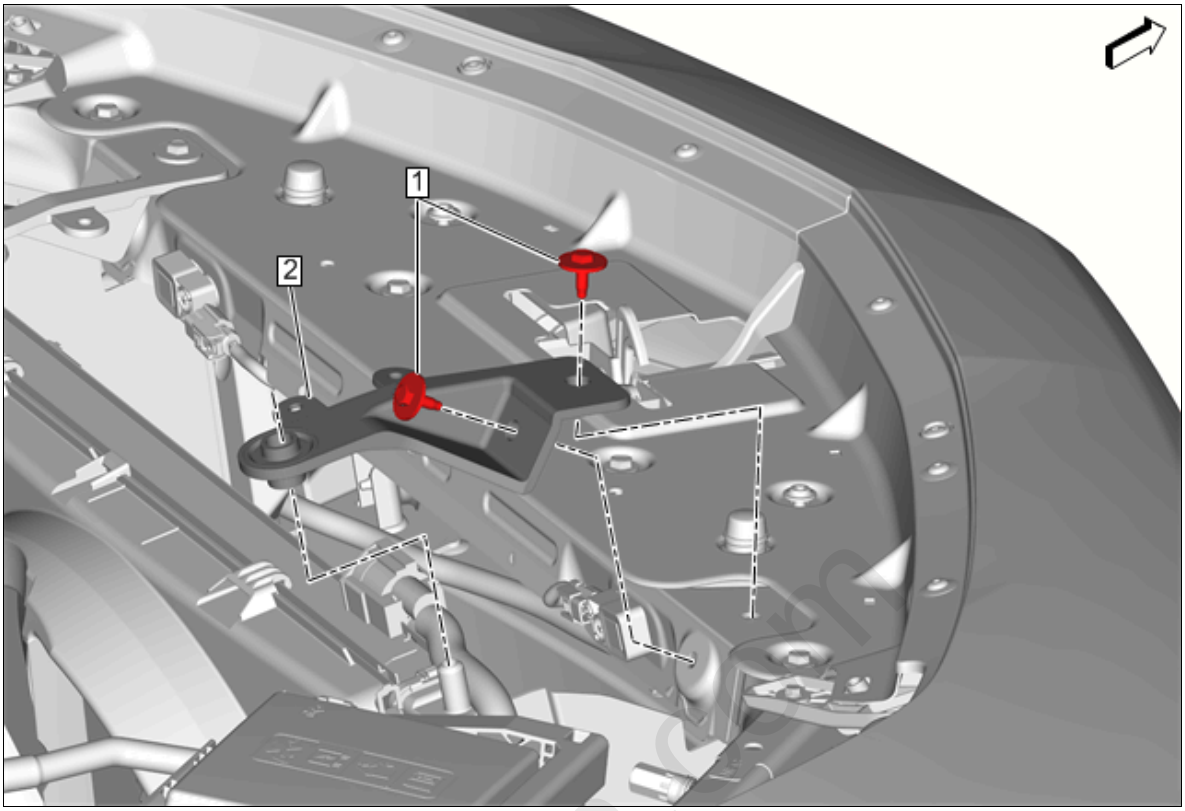


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27. Install Radiator Air Side Baffle-Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1)

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Fig 17: Radiator Upper Bracket - Right Side

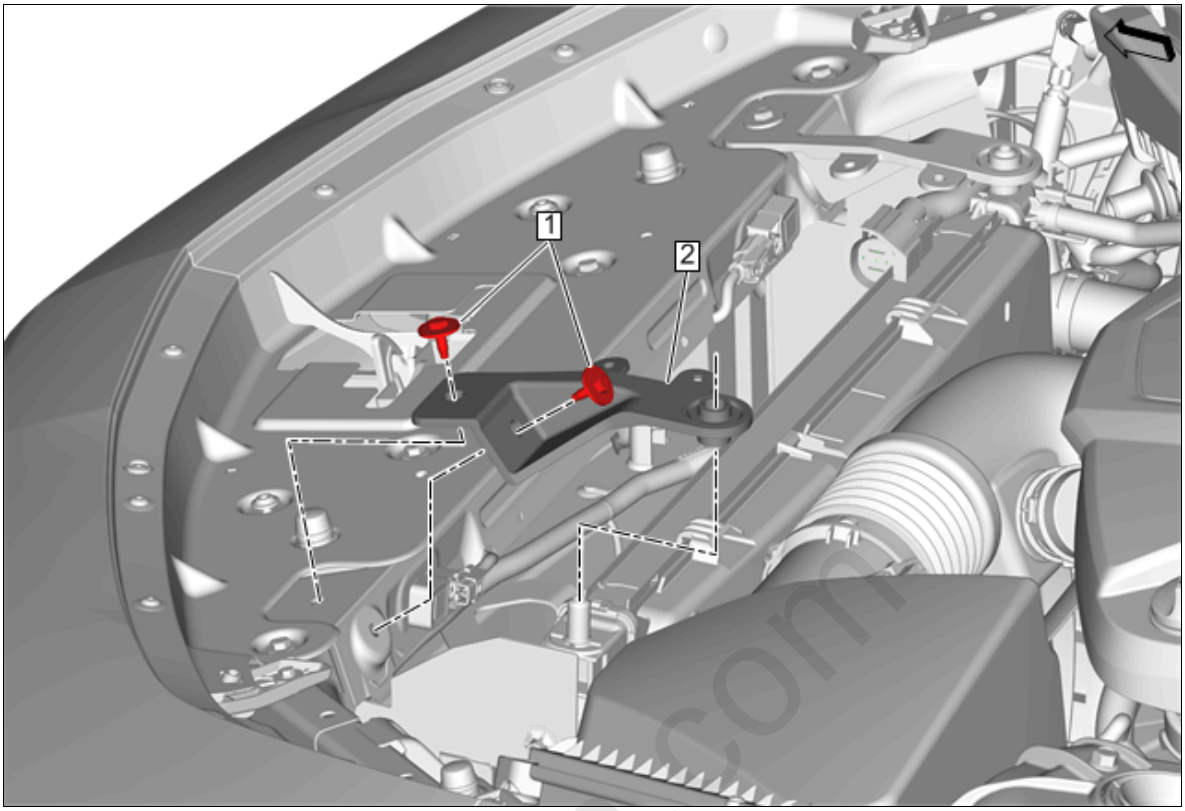


Courtesy of GENERAL MOTORS COMPANY

28. Install Radiator Upper Bracket-Right Side (2) - Radiator Upper Bracket Replacement - Right Side (LT1)

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Fig 18: Radiator Upper Bracket - Left Side

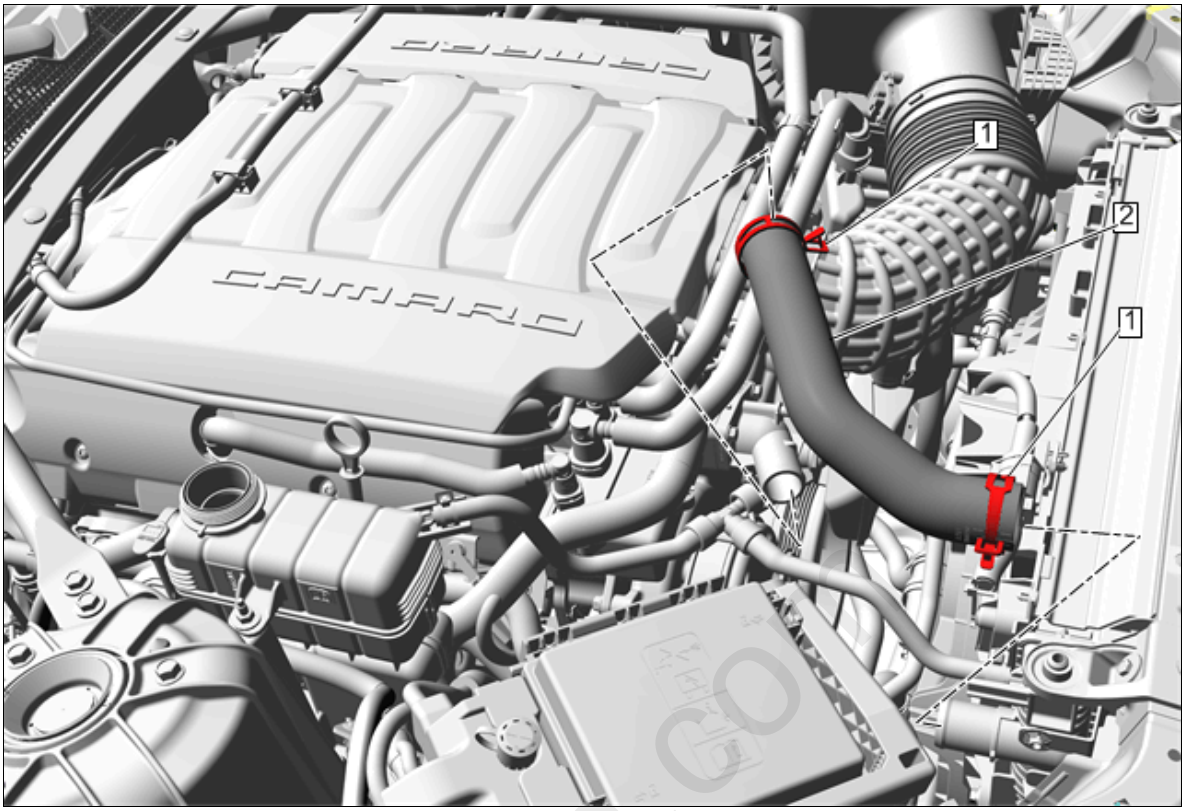


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29. Install Radiator Upper Bracket-Left Side (2) - Radiator Upper Bracket Replacement - Left Side (LT1)

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Fig 19: Radiator Inlet Hose

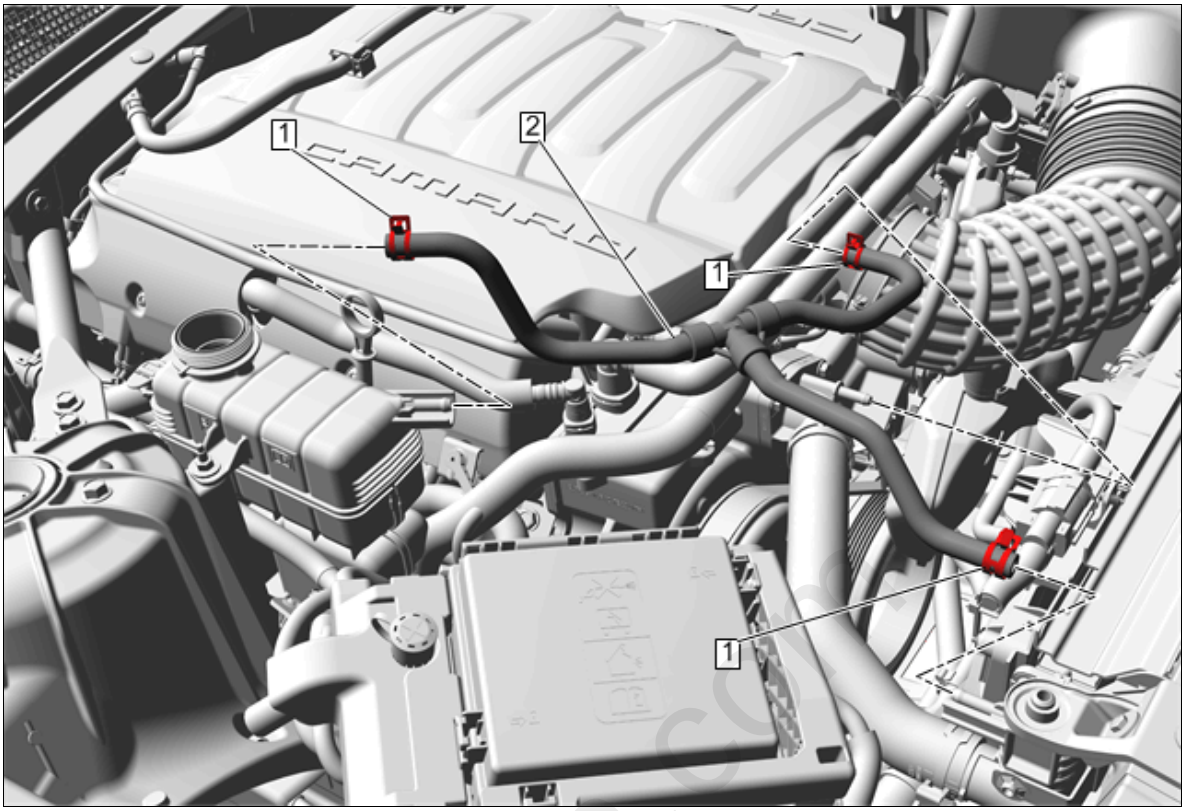


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30. Install Radiator Inlet Hose (2) at Radiator Assembly - Radiator Inlet Hose Replacement (LT1)

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Fig 20: Radiator Surge Tank Inlet Hose

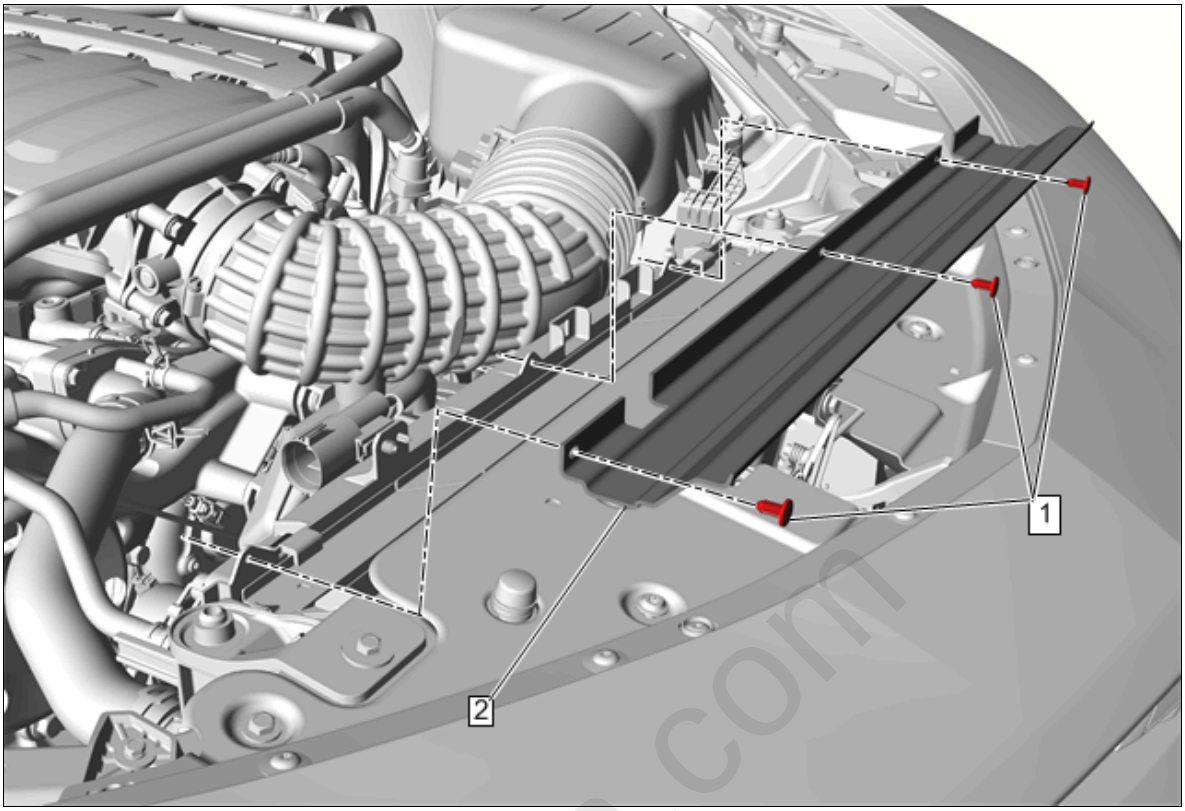


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31. Install the surge tank inlet hose to the radiator (2) - Radiator Surge Tank Inlet Hose Replacement (LT1)

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Fig 21: Radiator Air Upper Baffle

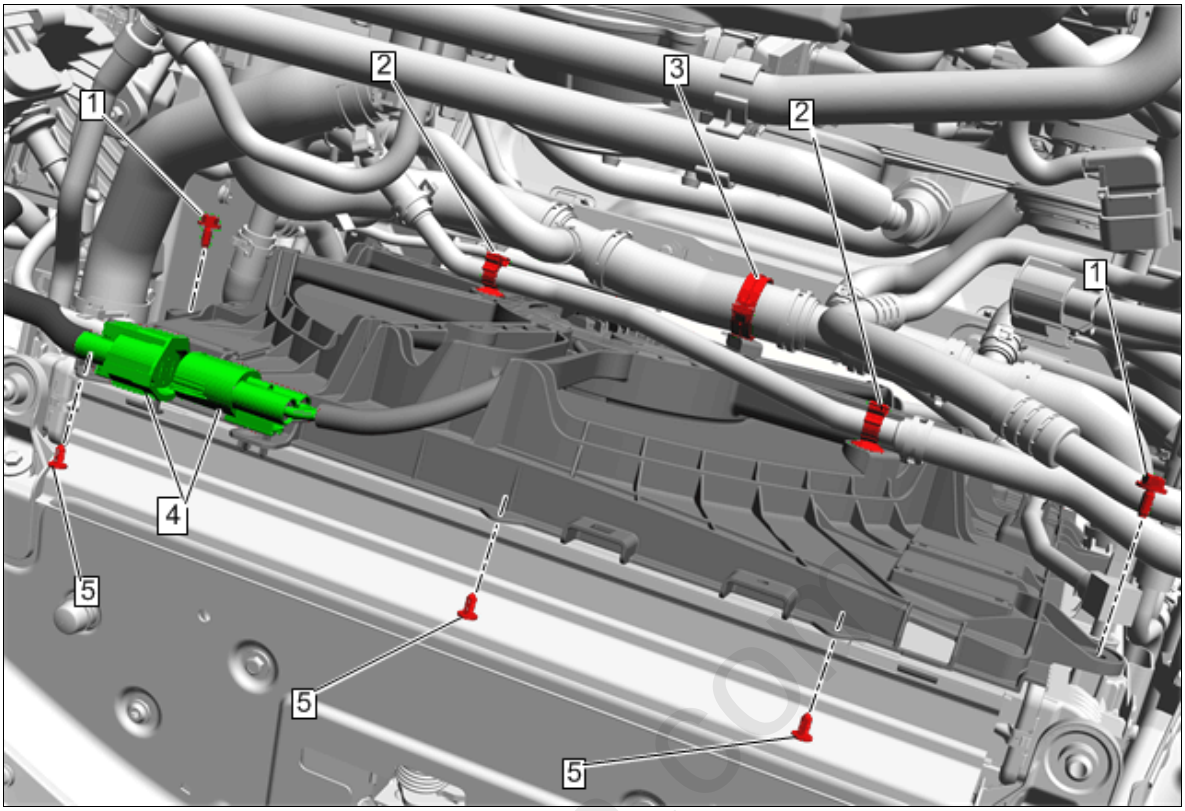


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32. Install the radiator air upper baffle (2)

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Fig 22: Engine Coolant Fan Shroud Bolt

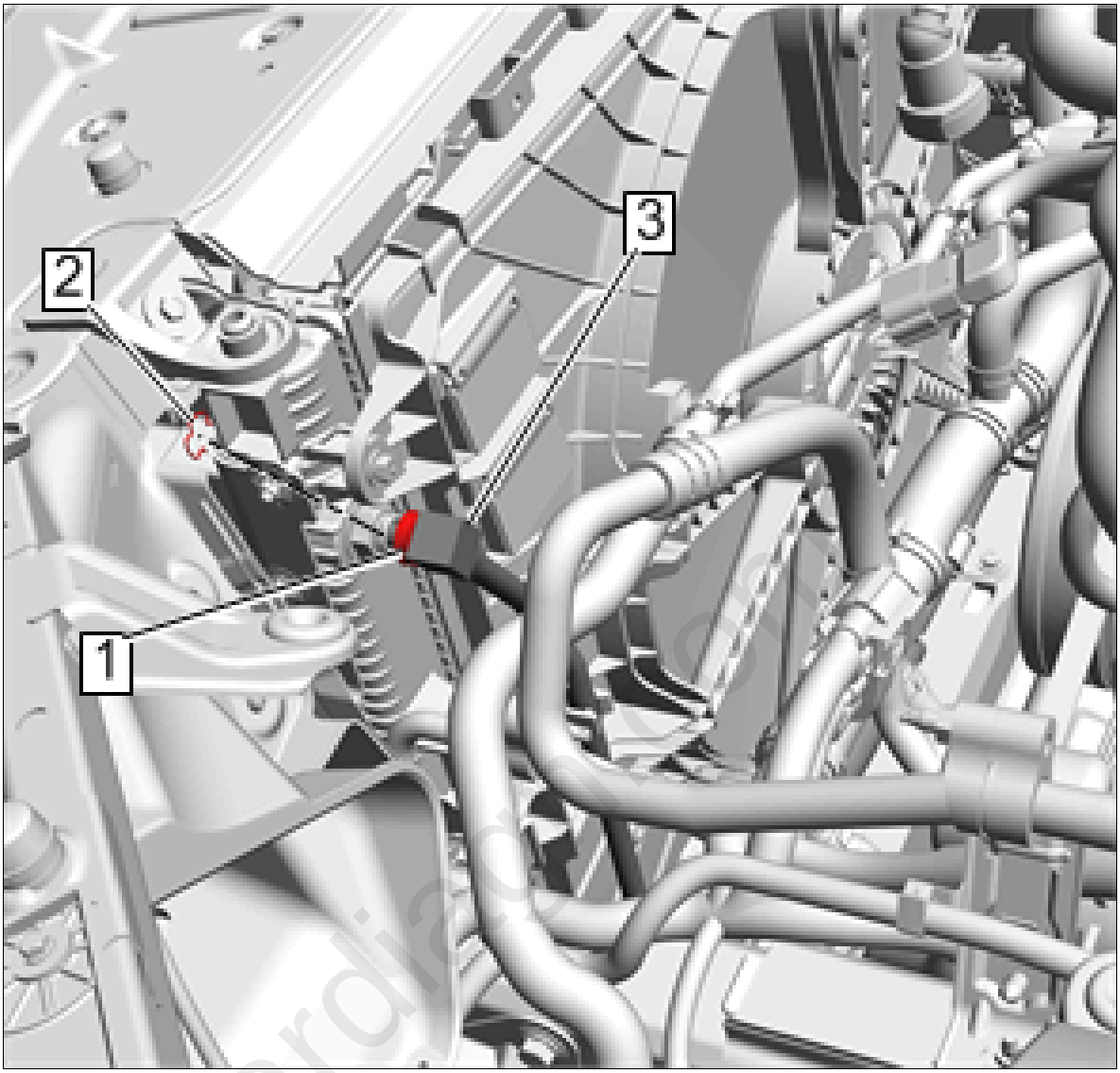


Courtesy of GENERAL MOTORS COMPANY

33. Install Push Pin (5) (Qty: 3)
34. Connect the electrical connector (4)
35. Install Radiator Outlet Hose Clip (3)
36. Install Auxiliary Radiator Inlet Hose Clip (2) (Qty: 2)

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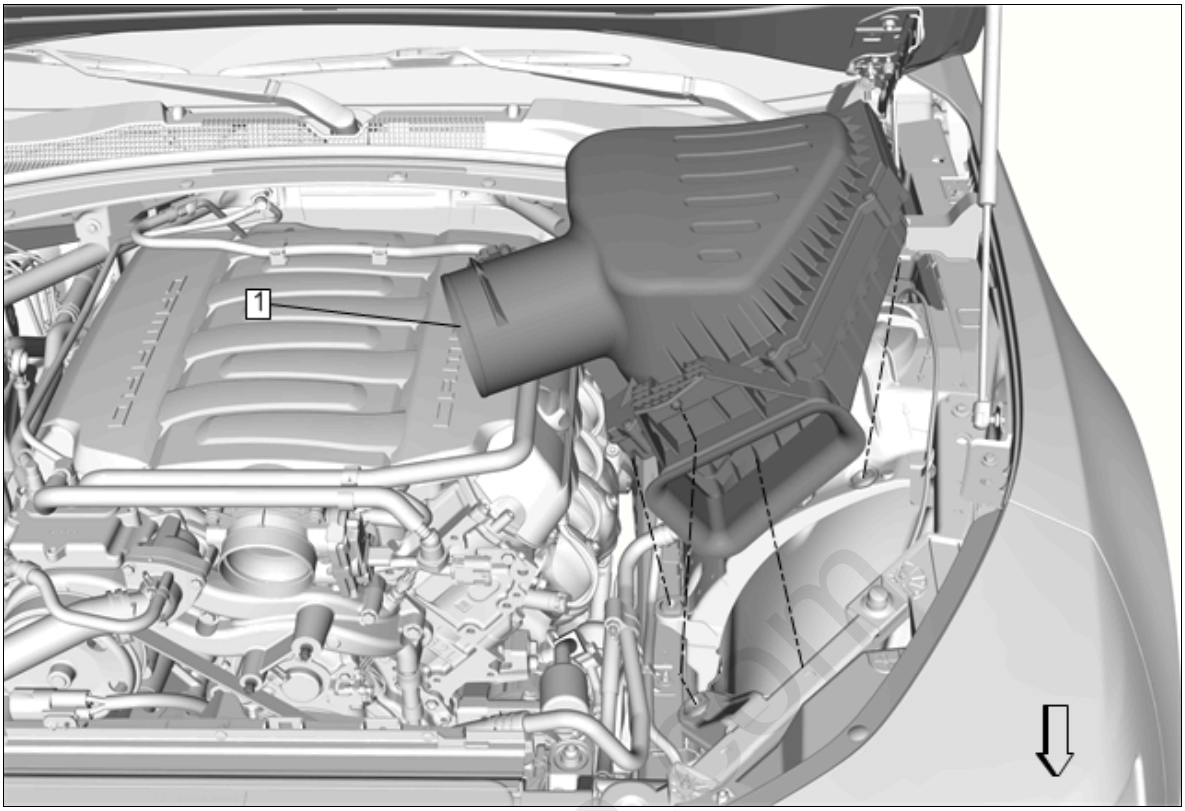
Fig 23: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

37. Install Transmission Fluid Cooler Pipe Fitting Retainer (2)
38. Install Transmission Fluid Cooler Inlet and Outlet Pipe (3)
39. Install Transmission Fluid Cooler Pipe Connector Cap (1)

Fig 24: Air Cleaner Assembly



Courtesy of GENERAL MOTORS COMPANY

40. Install Air Cleaner Assembly (1) - Air Cleaner Assembly Replacement
41. Recharge the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
42. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
43. Start the engine and check for coolant leaks.
44. Inspect for refrigerant leaks.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LGX)

Special Tools

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

Equivalent regional tools:Special Tools

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LGX) > REMOVAL PROCEDURE

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

2. Recover the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)

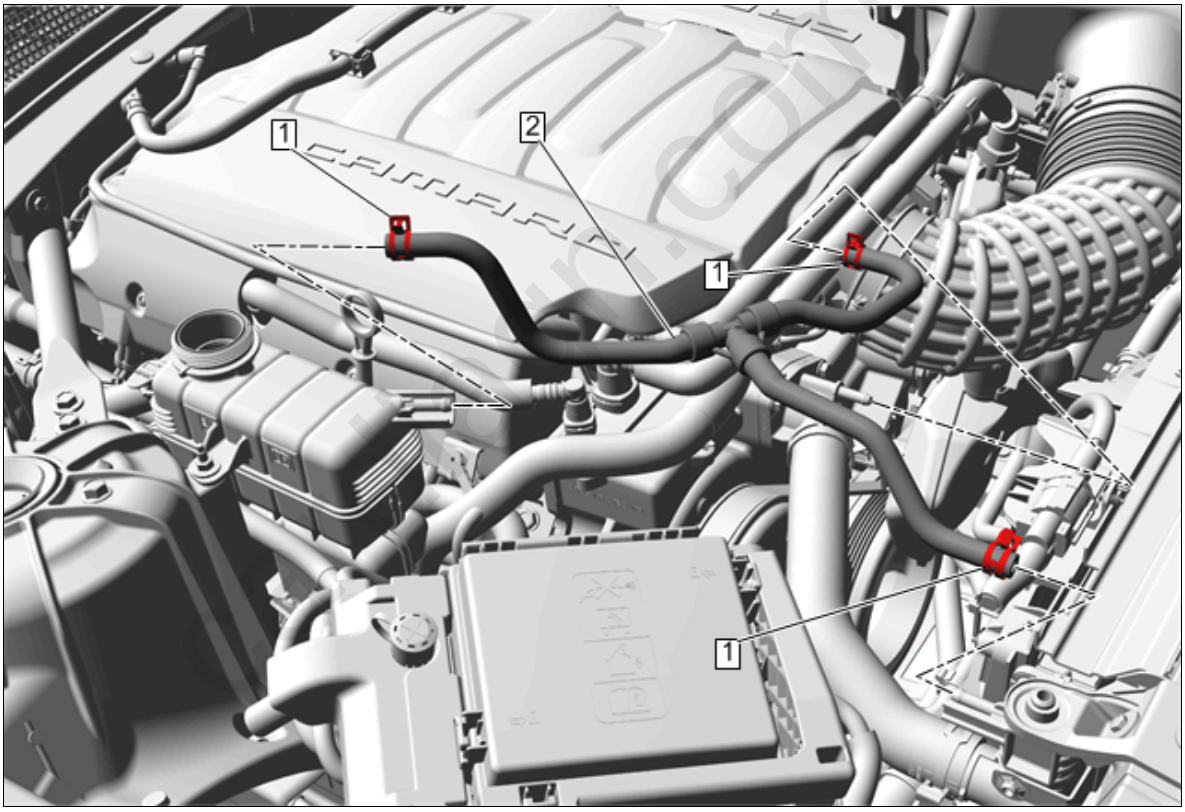
3. Remove Air Cleaner Assembly Replacement

4. Remove Air Cleaner Outlet Duct Replacement

5. Remove Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M13, With 1LE Package)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, Without V03)

6. Remove Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03)

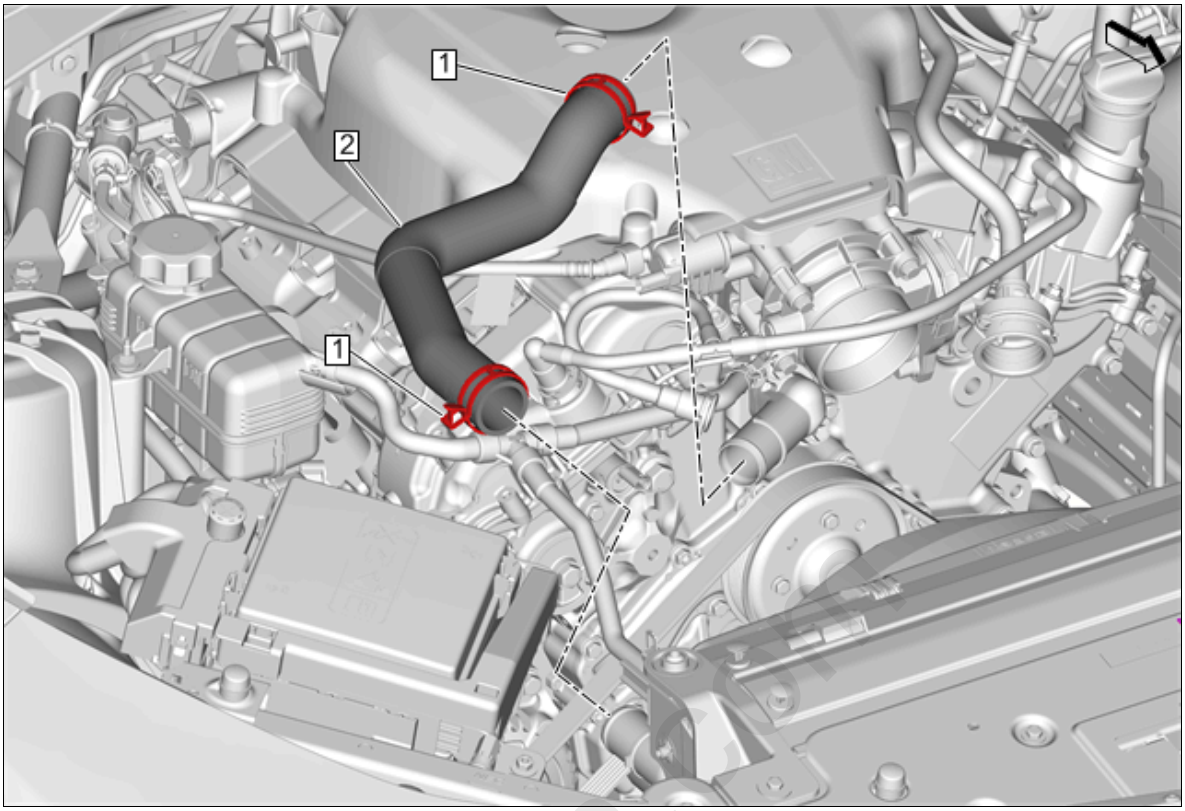
   Fig 1: Radiator Surge Tank Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LGX)

Fig 2: Radiator Inlet Hose

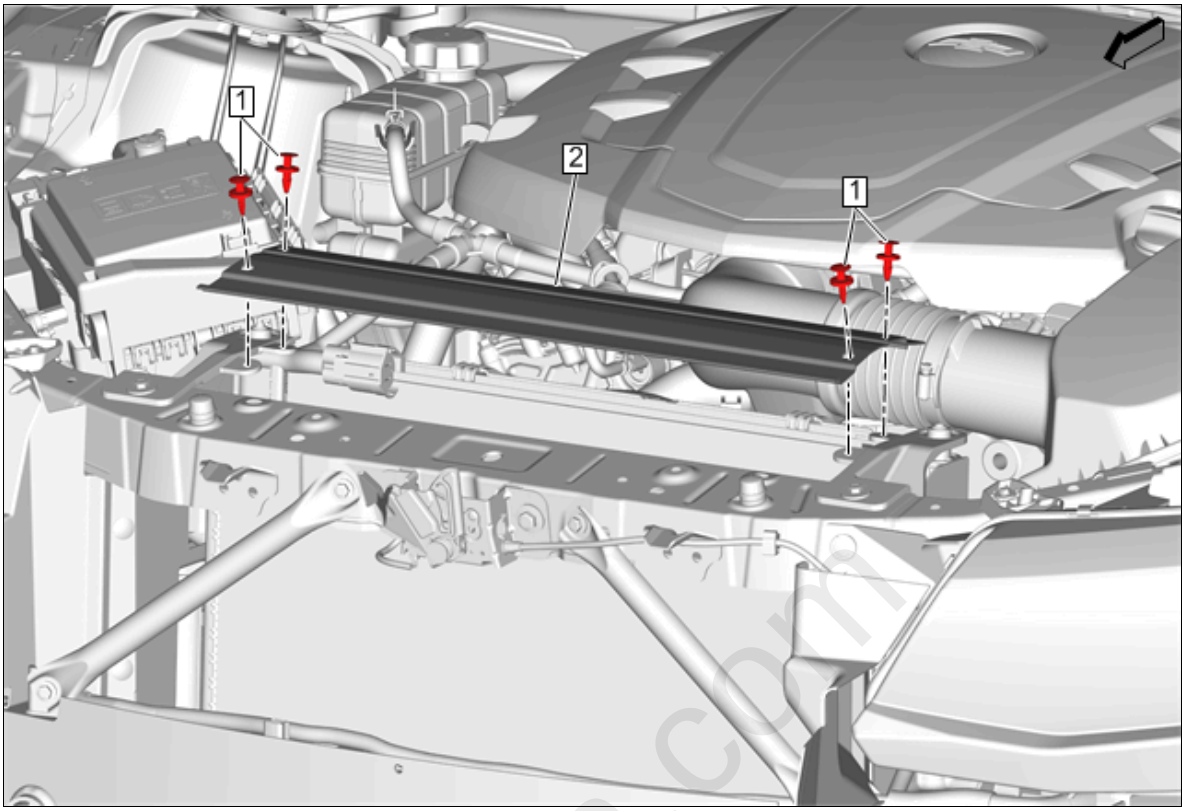


Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LGX without V18) Radiator Inlet Hose Replacement (LGX with V18)

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Fig 3: Radiator Air Upper Baffle

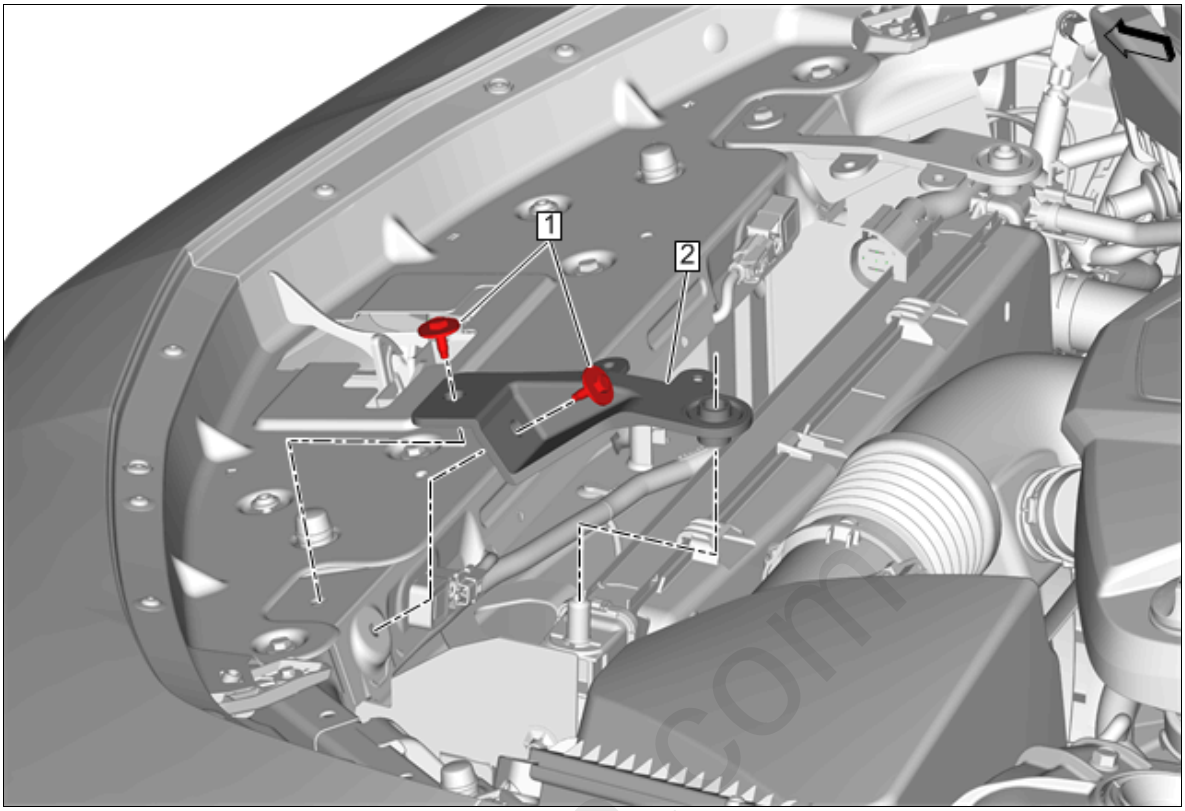


Courtesy of GENERAL MOTORS COMPANY

9. Remove Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LGX)

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Fig 4: Radiator Upper Bracket - Left Side

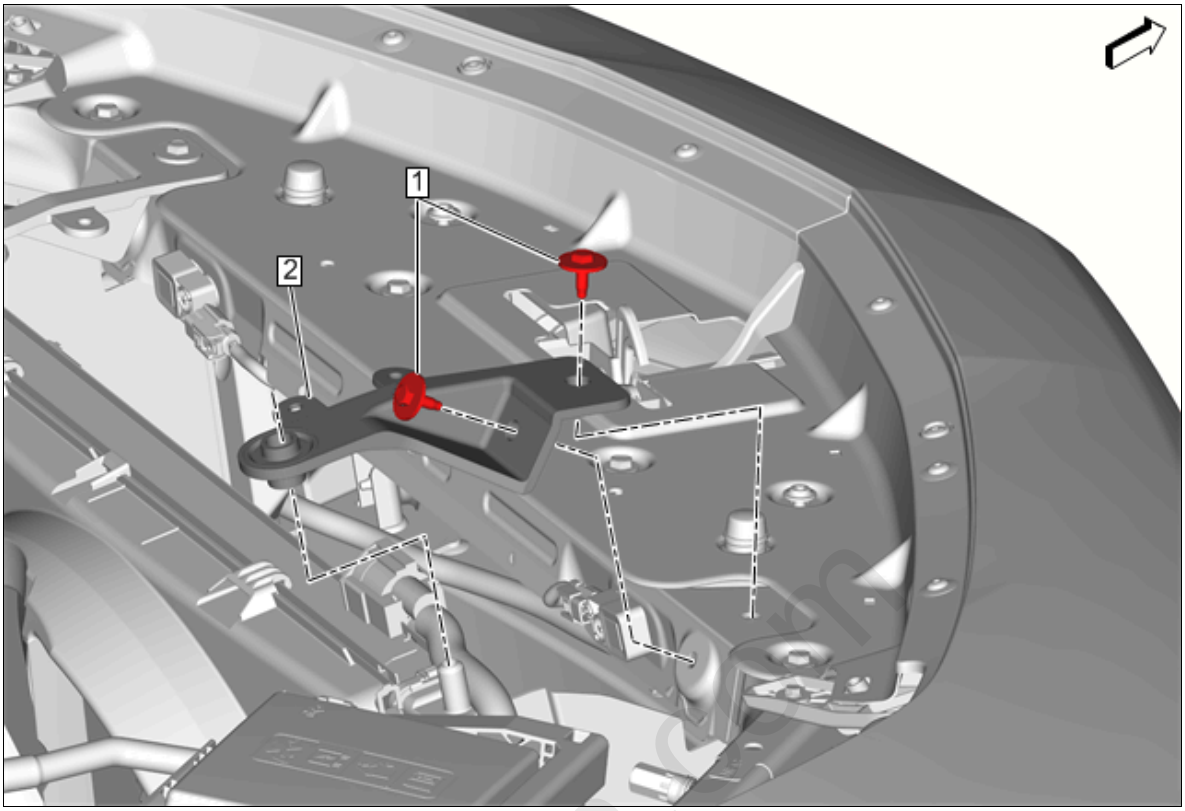


Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Upper Bracket Replacement - Left Side (LGX LTG) (2)

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Fig 5: Radiator Upper Bracket - Right Side

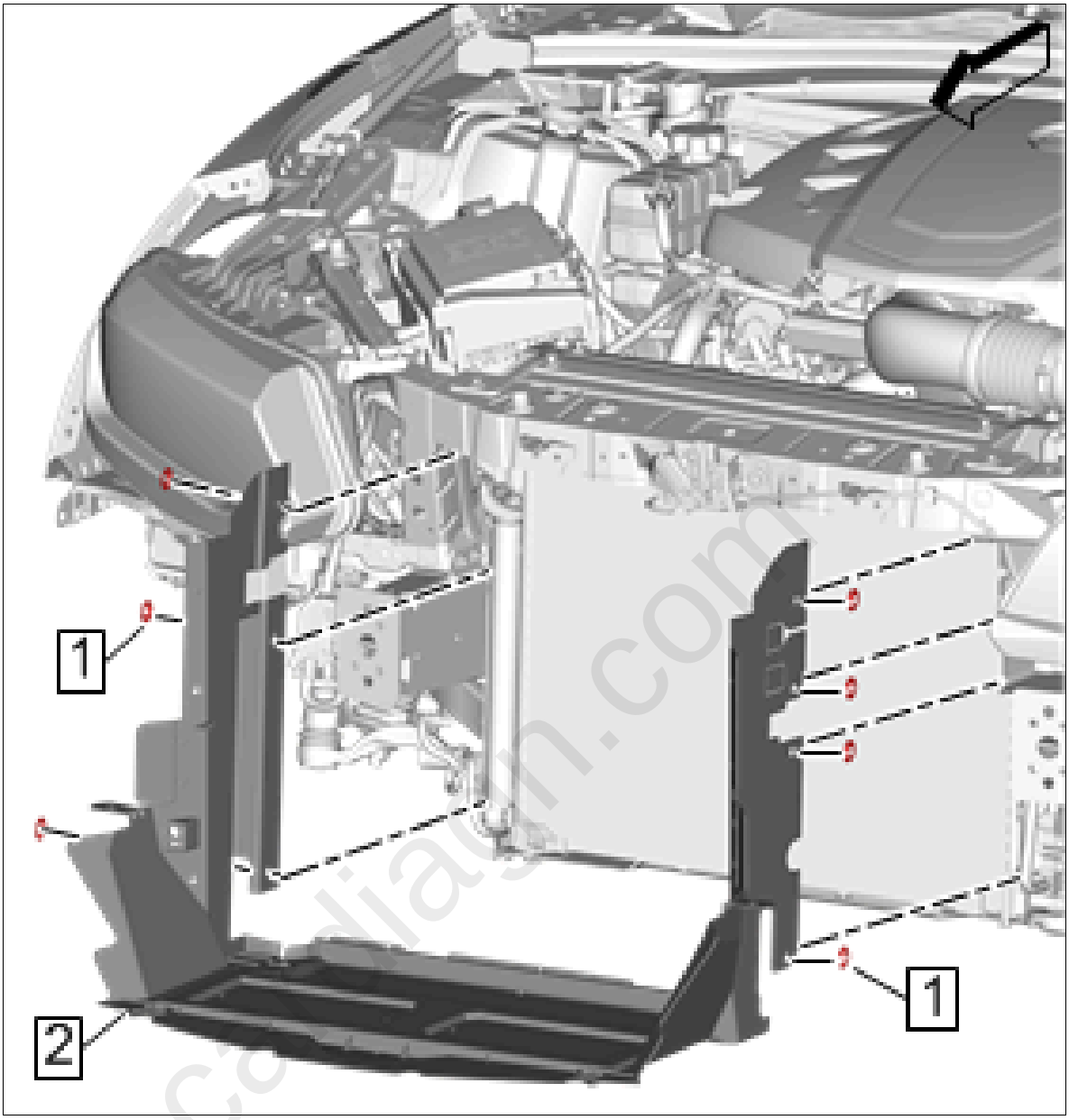


Courtesy of GENERAL MOTORS COMPANY

11. Remove Radiator Upper Bracket Replacement - Right Side (LGX LTG)

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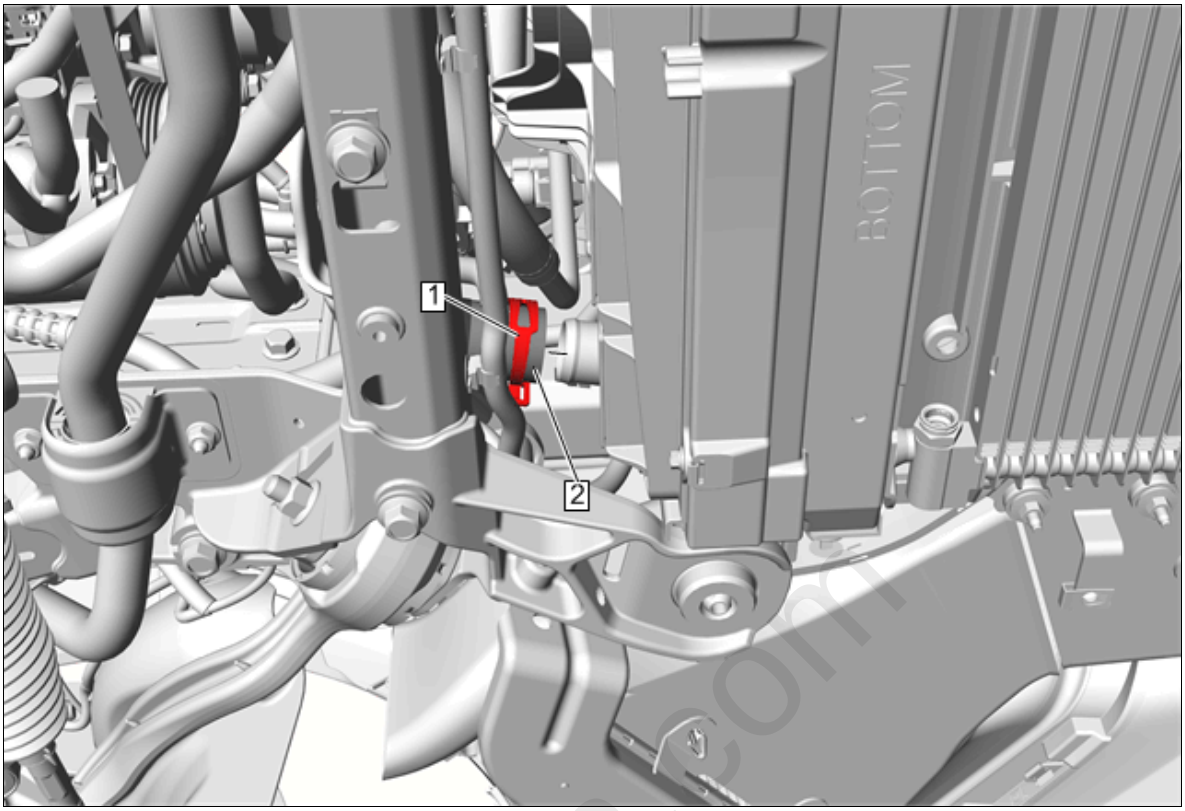
Fig 6: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

12. Remove Radiator Air Lower Baffle Replacement (LGX Without V03) Radiator Air Lower Baffle Replacement (LGX With V03) (2)

Fig 7: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

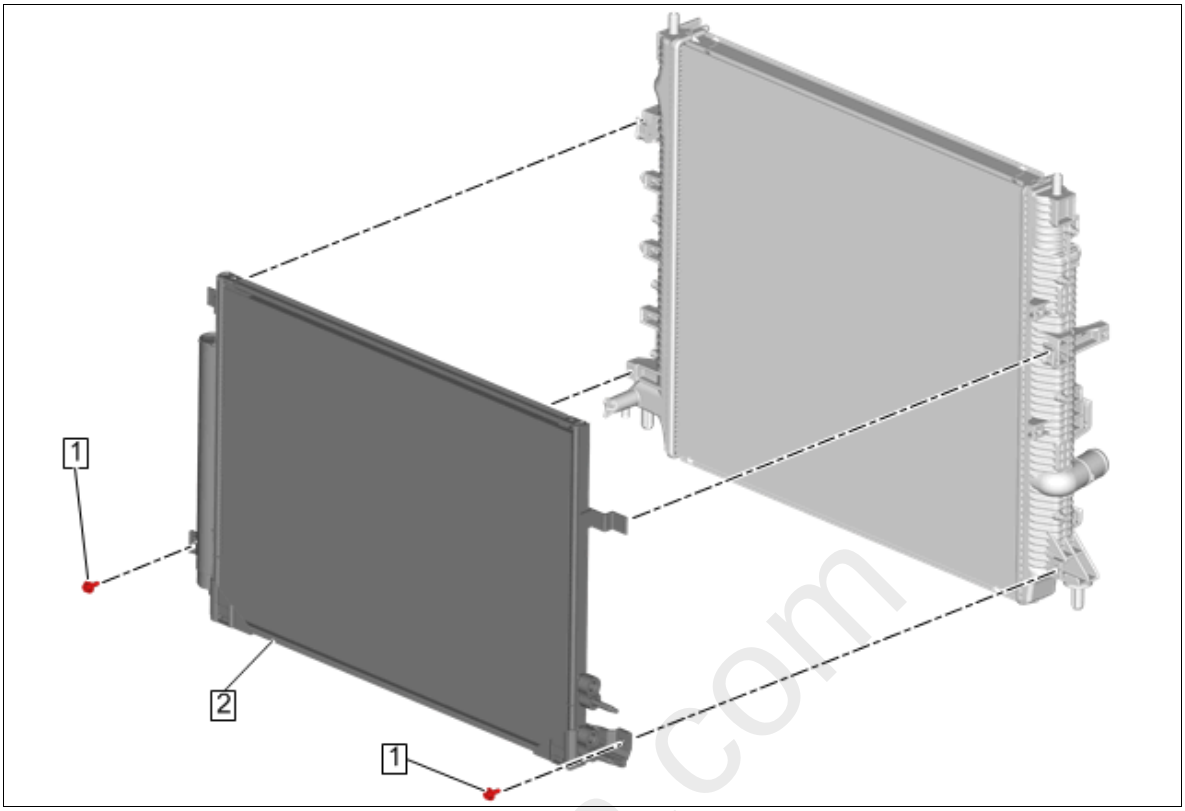
13. Disengage Radiator Outlet Hose Clamp (1)

    Use the **GE-47622** Hose Clamp Pliers.

14. Remove Radiator Outlet Hose (2) at Radiator Assembly

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Fig 8: Air Conditioning Condenser

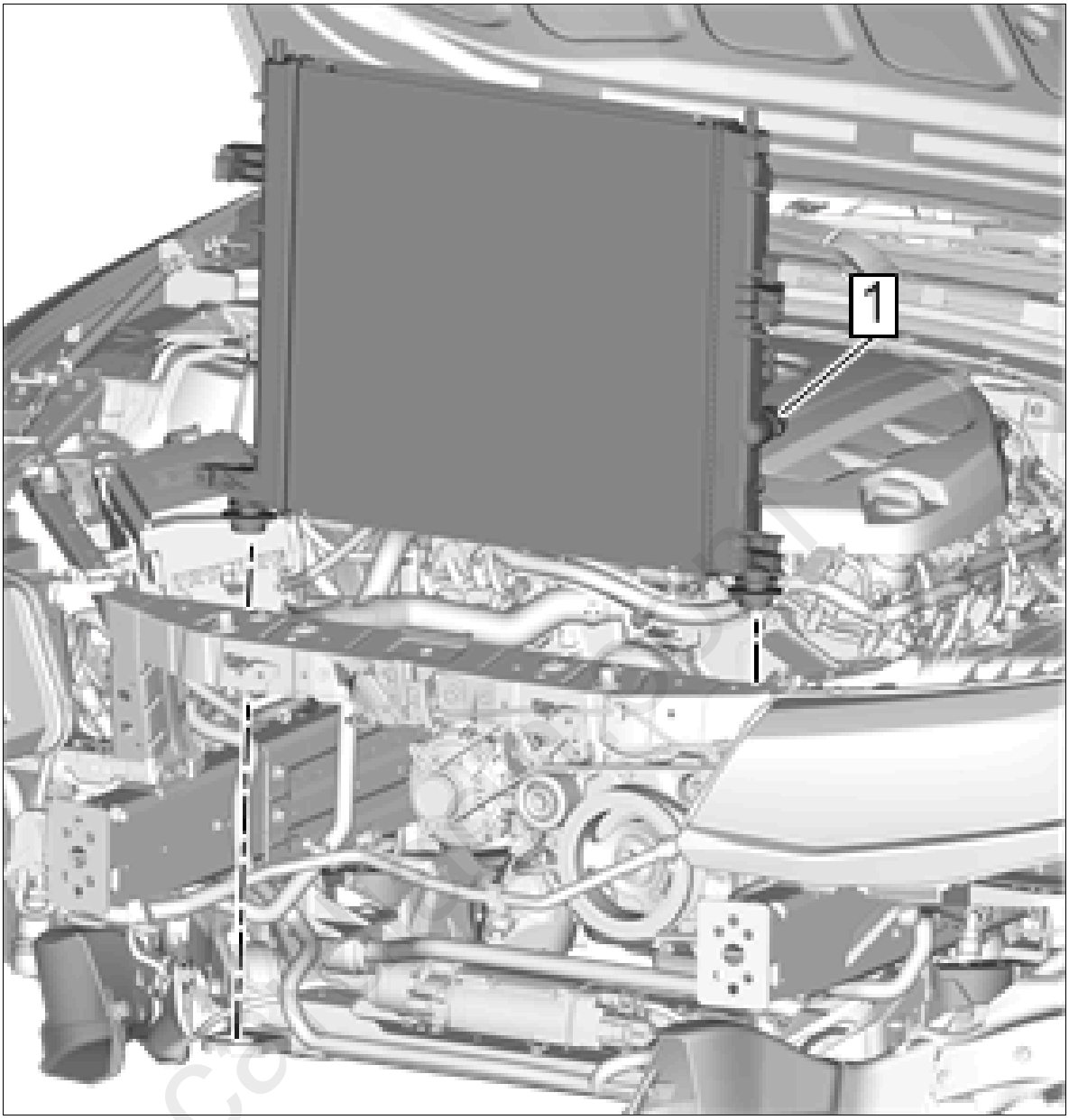


Courtesy of GENERAL MOTORS COMPANY

15. Remove Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LGX without V18)Air Conditioning Condenser Replacement (LGX, LT1 with V18)

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Fig 9: Radiator

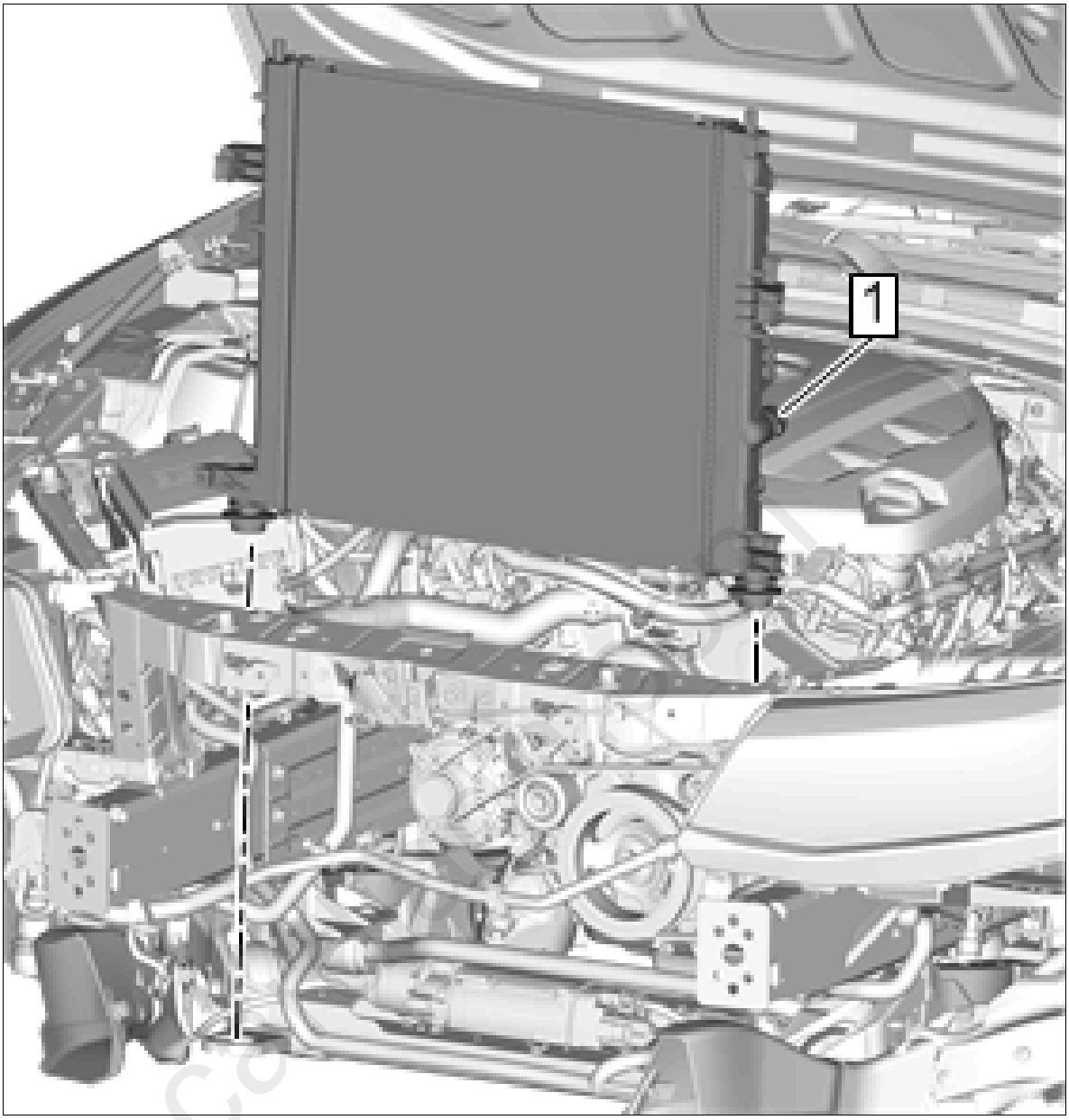


Courtesy of GENERAL MOTORS COMPANY

16. Remove Radiator (1)

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LGX) > INSTALLATION PROCEDURE

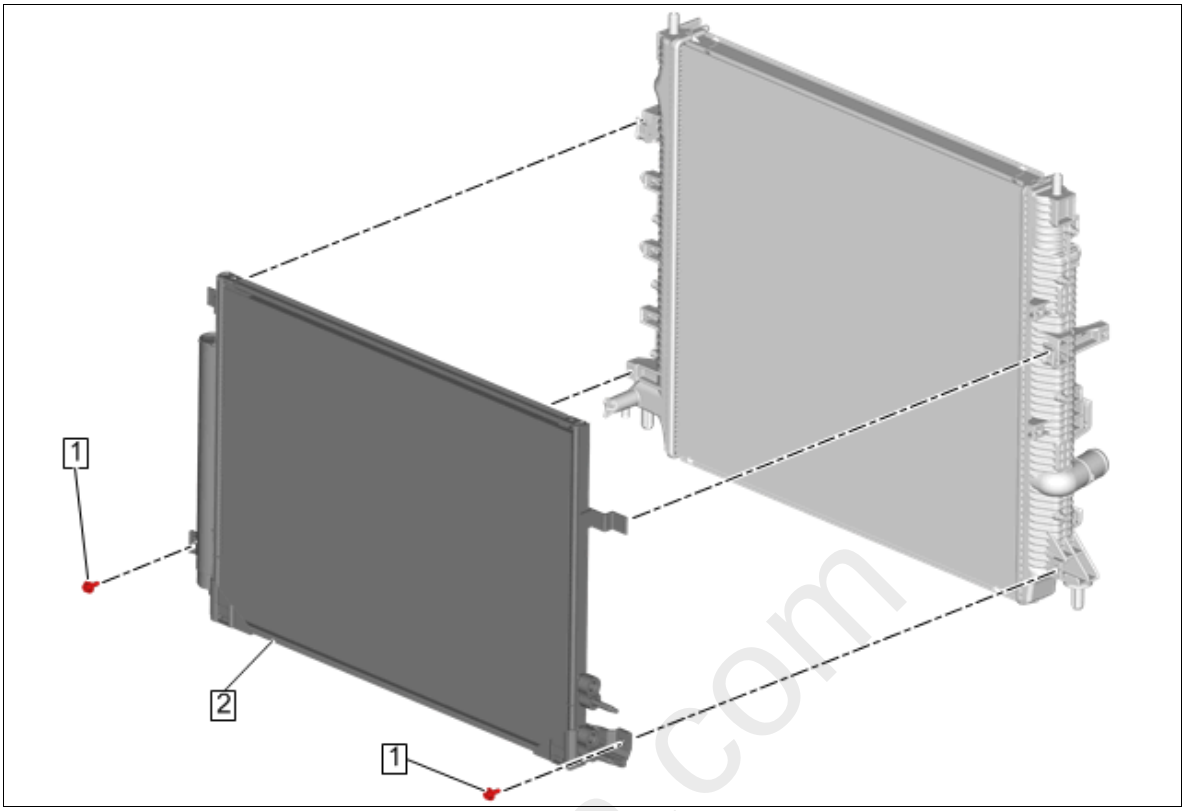
Fig 1: Radiator



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)

Fig 2: Air Conditioning Condenser

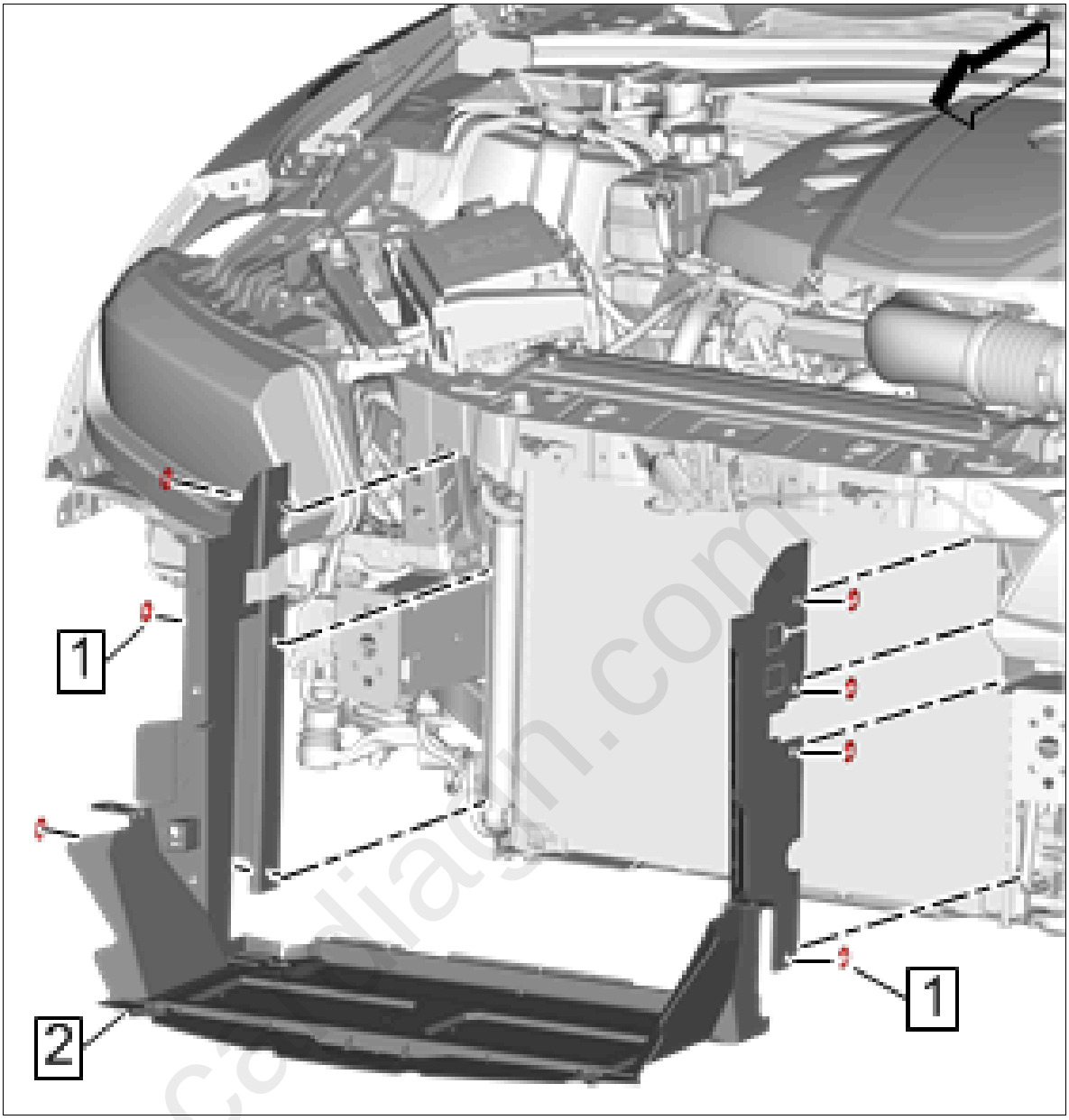


Courtesy of GENERAL MOTORS COMPANY

2. Install Air Conditioning Condenser Replacement (LGX without V18)Air Conditioning Condenser Replacement (LGX, LT1 with V18) (2)

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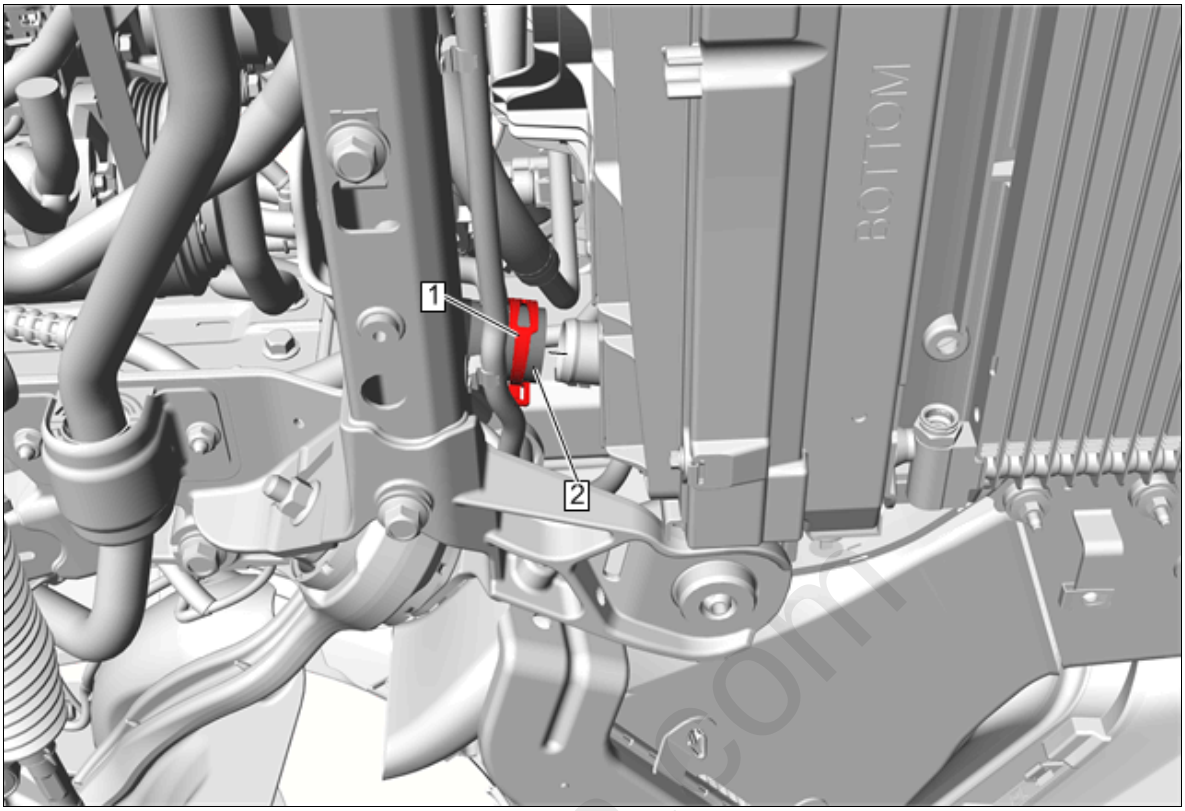
Fig 3: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Air Lower Baffle Replacement (LGX Without V03) Radiator Air Lower Baffle Replacement (LGX With V03) (2)

Fig 4: Radiator Outlet Hose



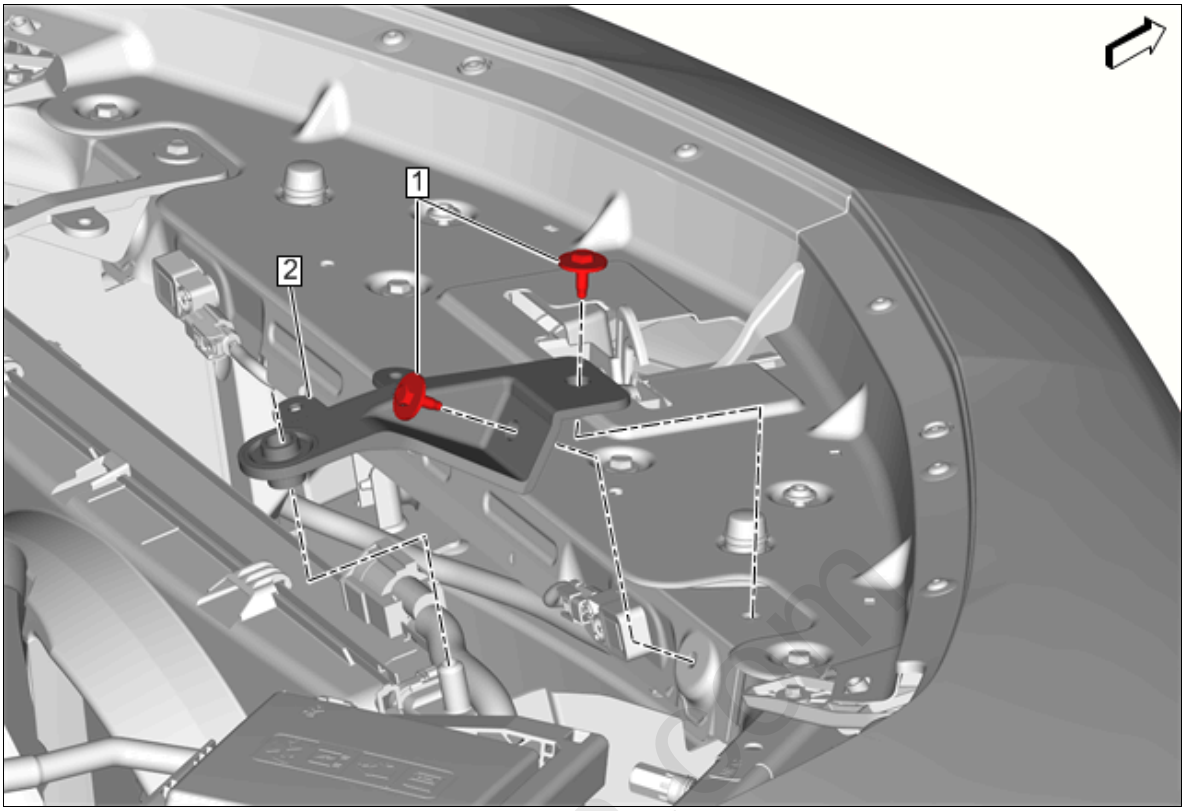
Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Outlet Hose (2) at Radiator Assembly
5. Engage Radiator Outlet Hose Clamp (1)

   Use the **GE-47622** Hose Clamp Pliers.

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Fig 5: Radiator Upper Bracket - Right Side

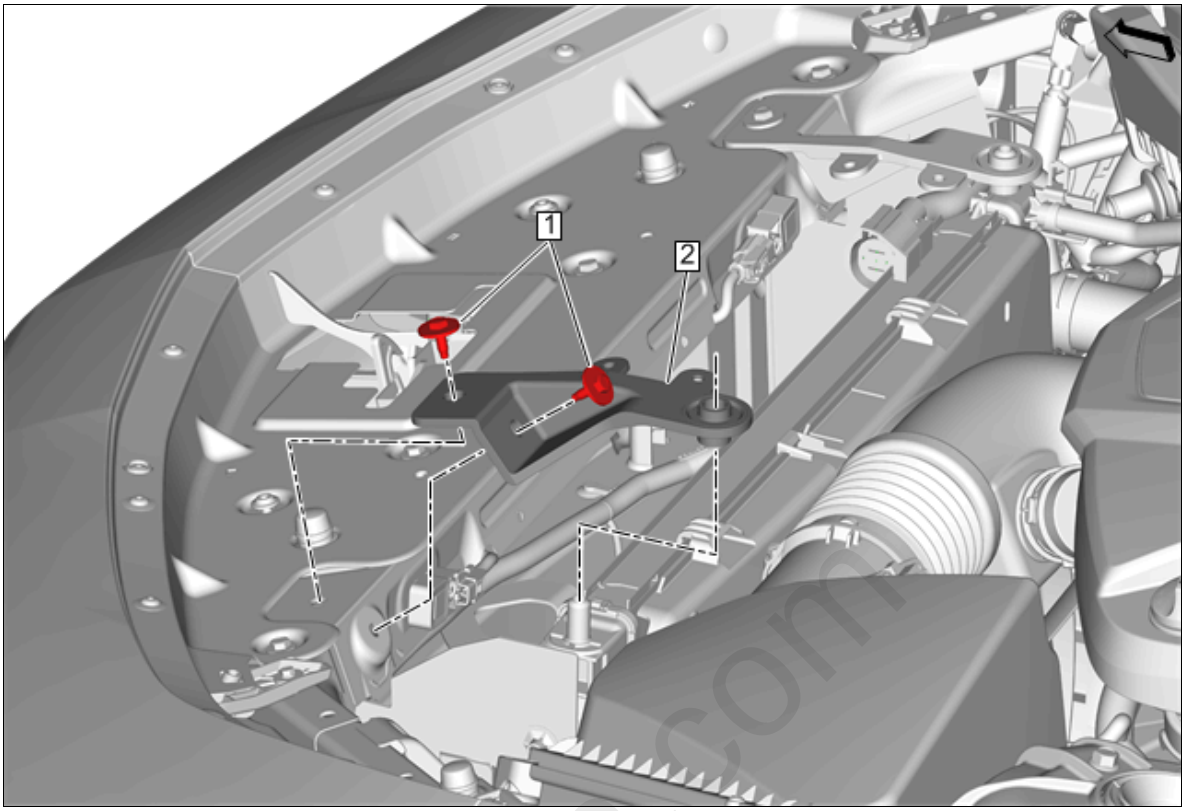


Courtesy of GENERAL MOTORS COMPANY

6. Install Radiator Upper Bracket Replacement - Right Side (LGX LTG)

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Fig 6: Radiator Upper Bracket - Left Side

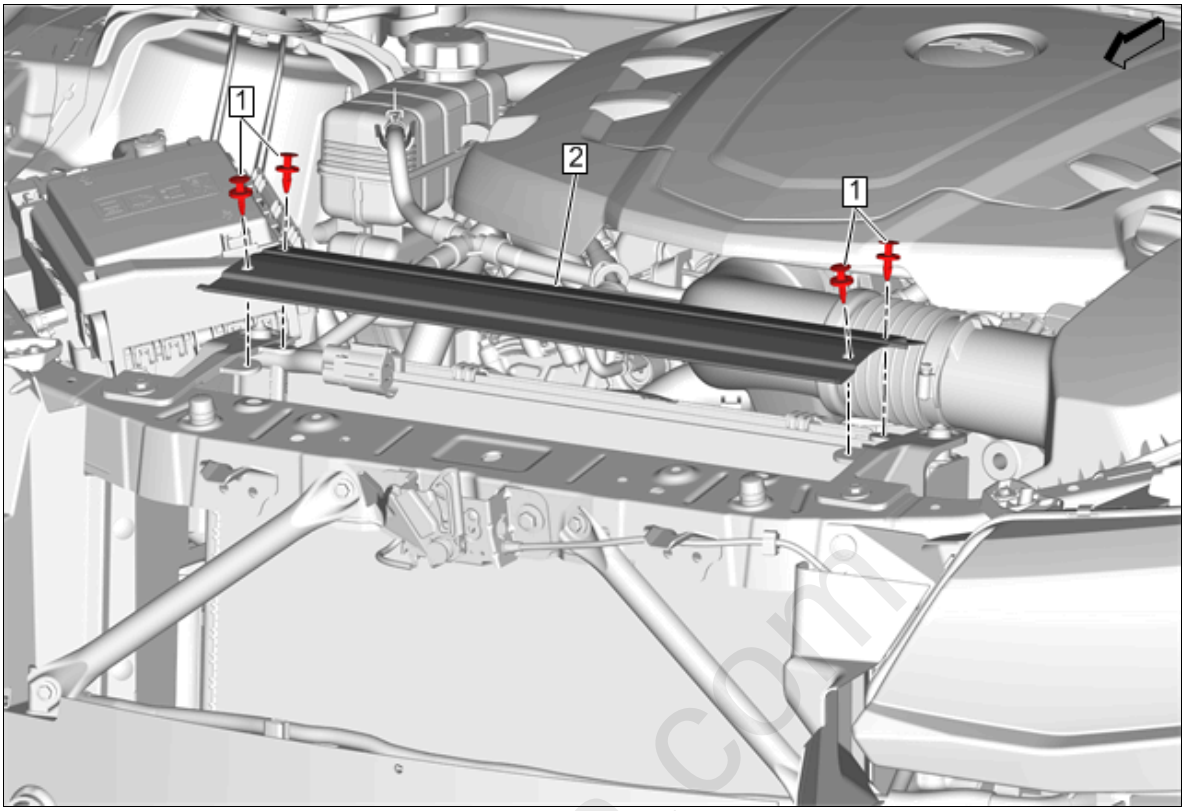


Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Upper Bracket Replacement - Left Side (LGX LTG) (2)

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Fig 7: Radiator Air Upper Baffle

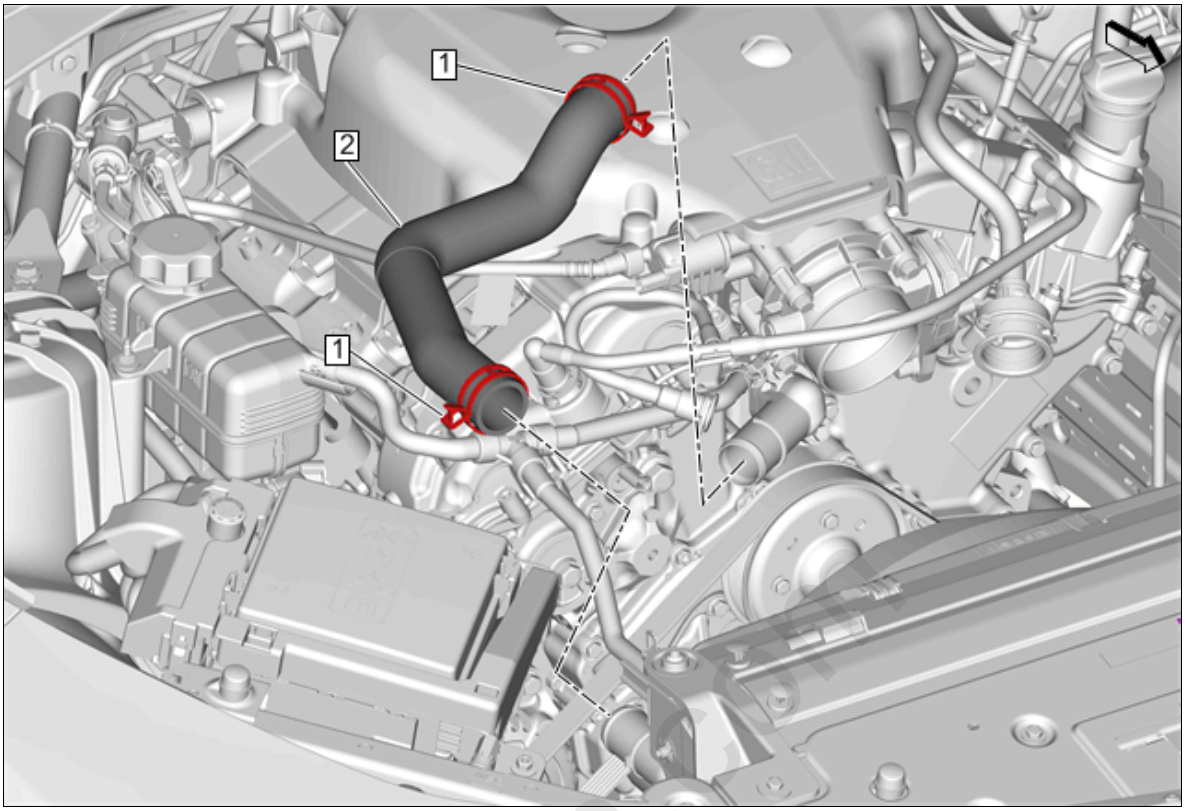


Courtesy of GENERAL MOTORS COMPANY

8. Install Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LGX)

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Fig 8: Radiator Inlet Hose

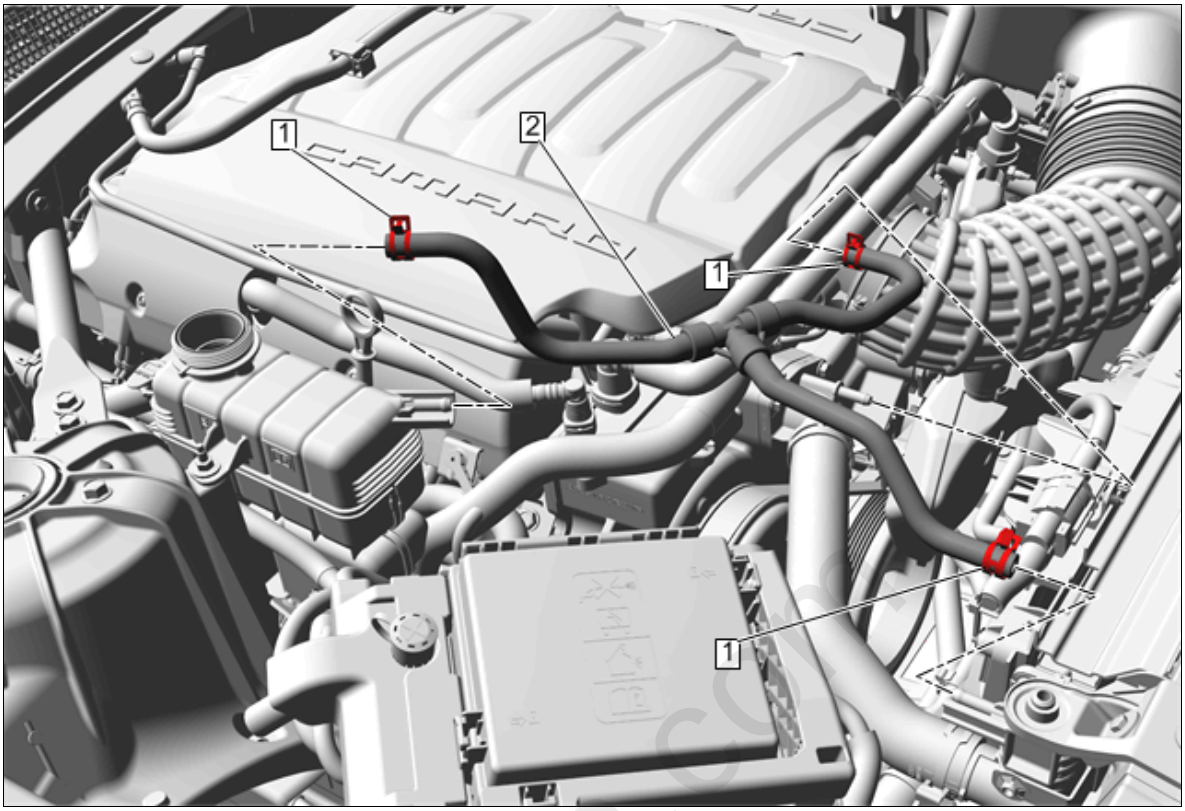


Courtesy of GENERAL MOTORS COMPANY

9. Install Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LGX without V18) Radiator Inlet Hose Replacement (LGX with V18)

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Fig 9: Radiator Surge Tank Inlet Hose



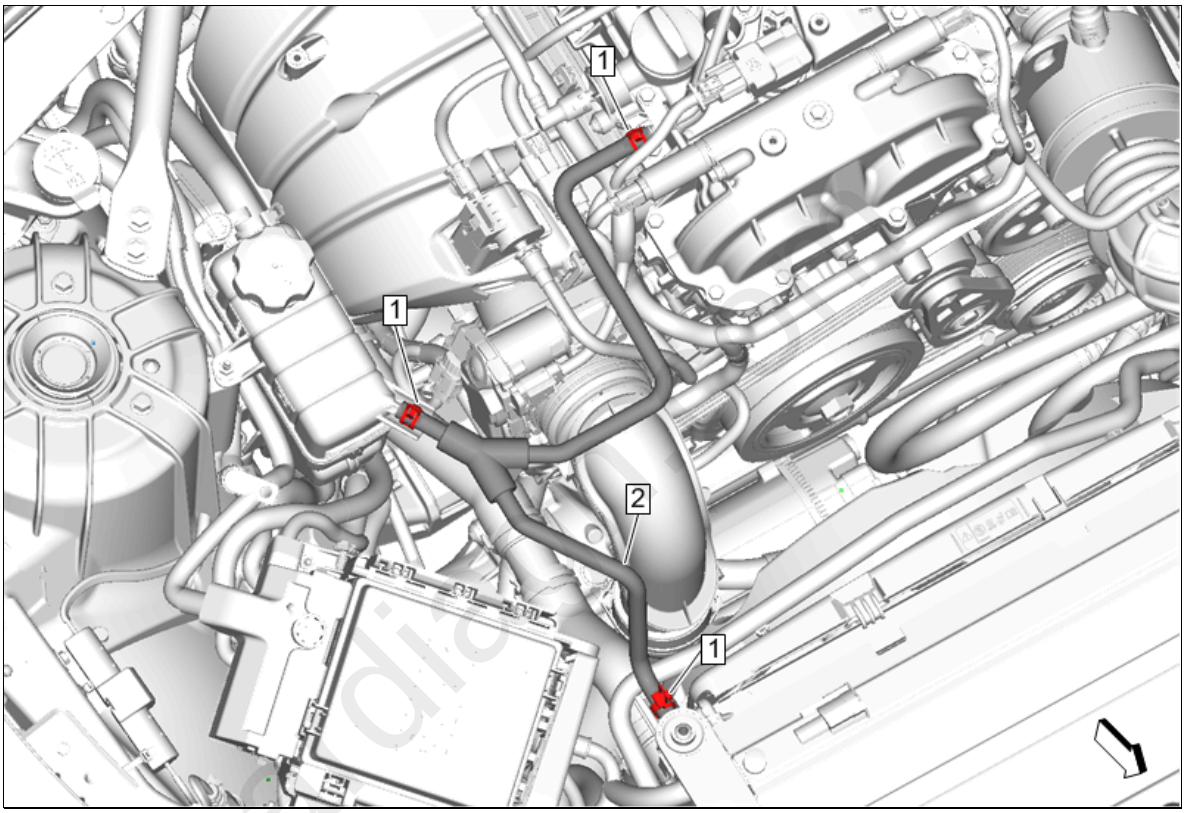
Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LGX)
11. Install Engine Coolant Fan Replacement (LGX Without V03) Engine Coolant Fan Replacement (LGX With V03)
12. Install Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M13, With 1LE Package)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, Without V03)
13. Install Air Cleaner Outlet Duct Replacement
14. Install Air Cleaner Assembly Replacement
15. Recharge the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
16. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
17. Start the engine and check for coolant leaks.
18. Inspect for refrigerant leaks.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LTG WITHOUT V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Recover the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
3. Remove Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement

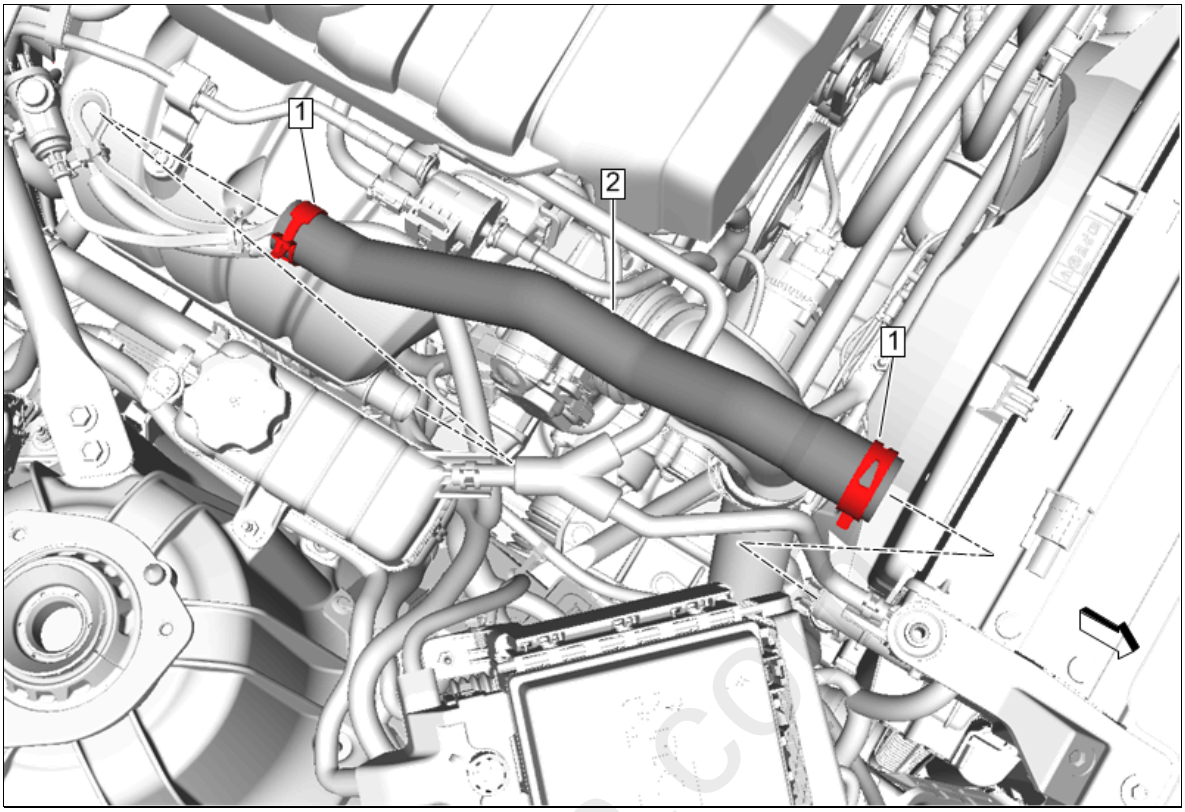
   Fig 1: Radiator Surge Tank Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)

Fig 2: Radiator Inlet Hose

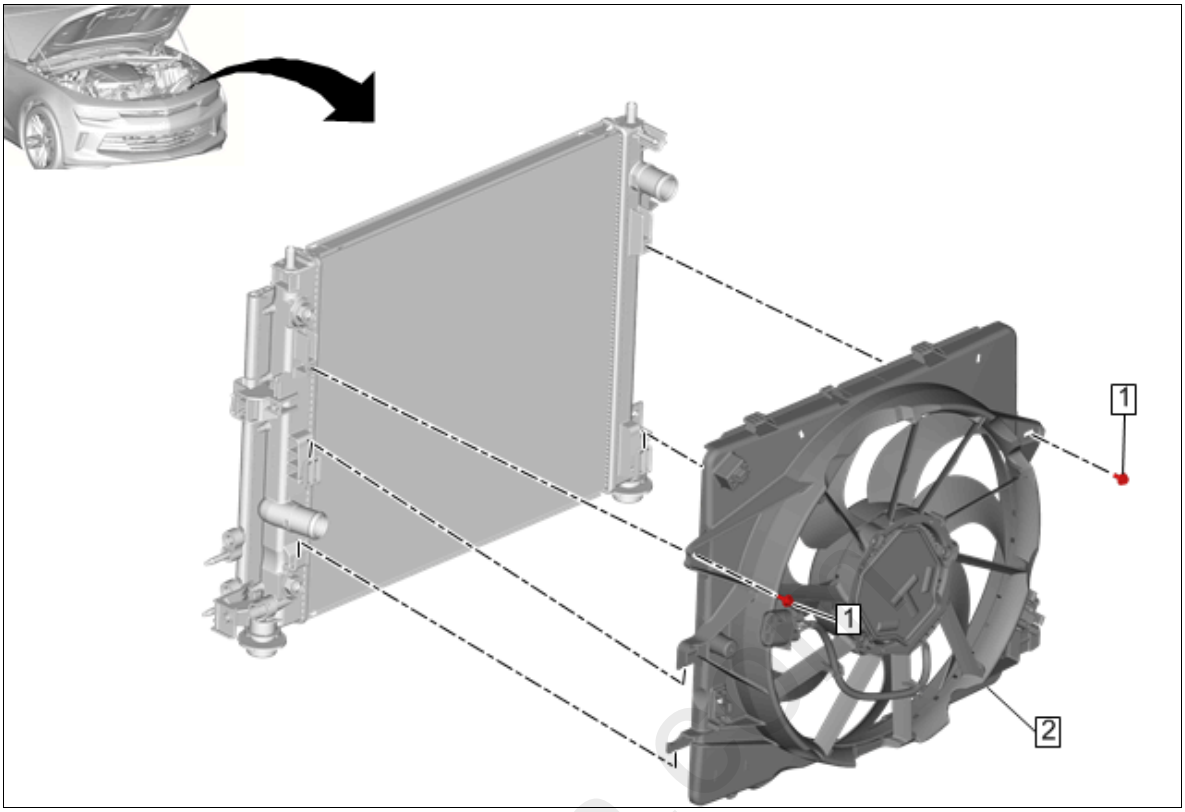


Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)

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Fig 3: Engine Coolant Fan

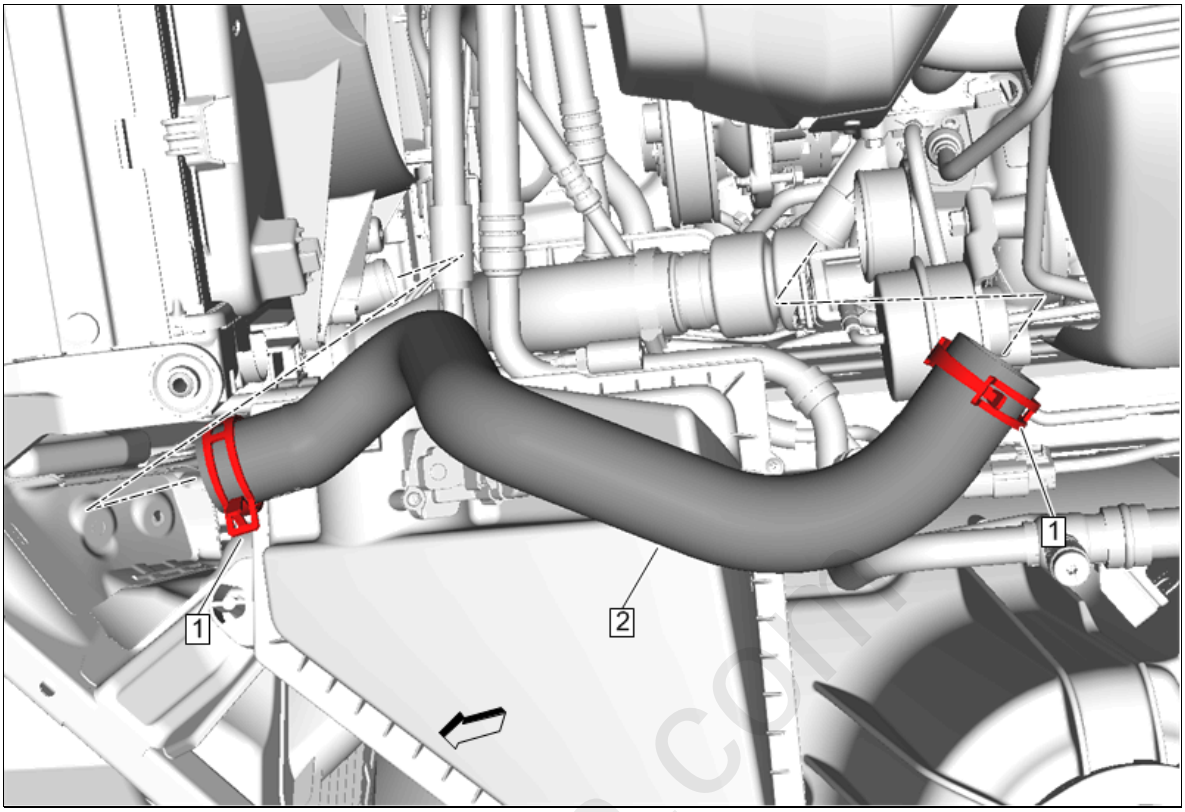


Courtesy of GENERAL MOTORS COMPANY

6. Remove Engine Coolant Fan (2) - Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)

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Fig 4: Radiator Outlet Hose

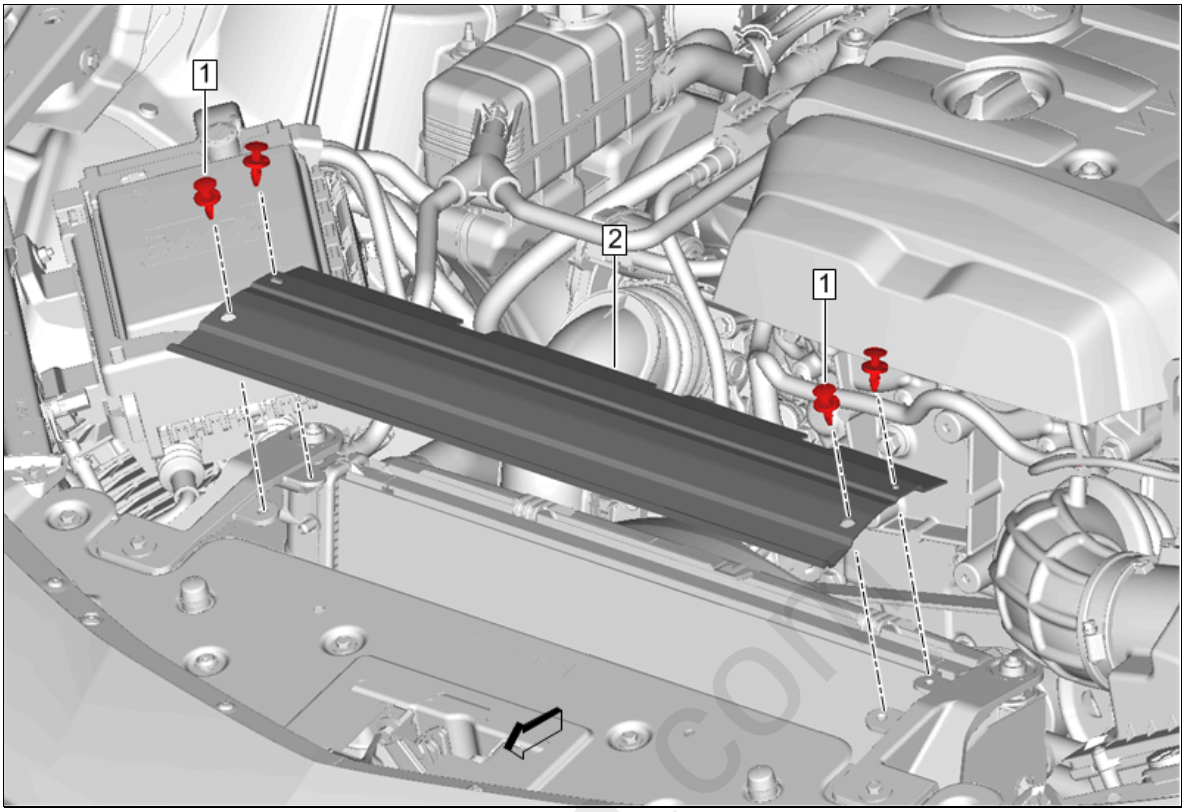


Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Outlet Hose (2) at Radiator Assembly - Radiator Outlet Hose Replacement (LTG without V18) Radiator Outlet Hose Replacement (LTG with V18)

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Fig 5: Radiator Air Upper Baffle

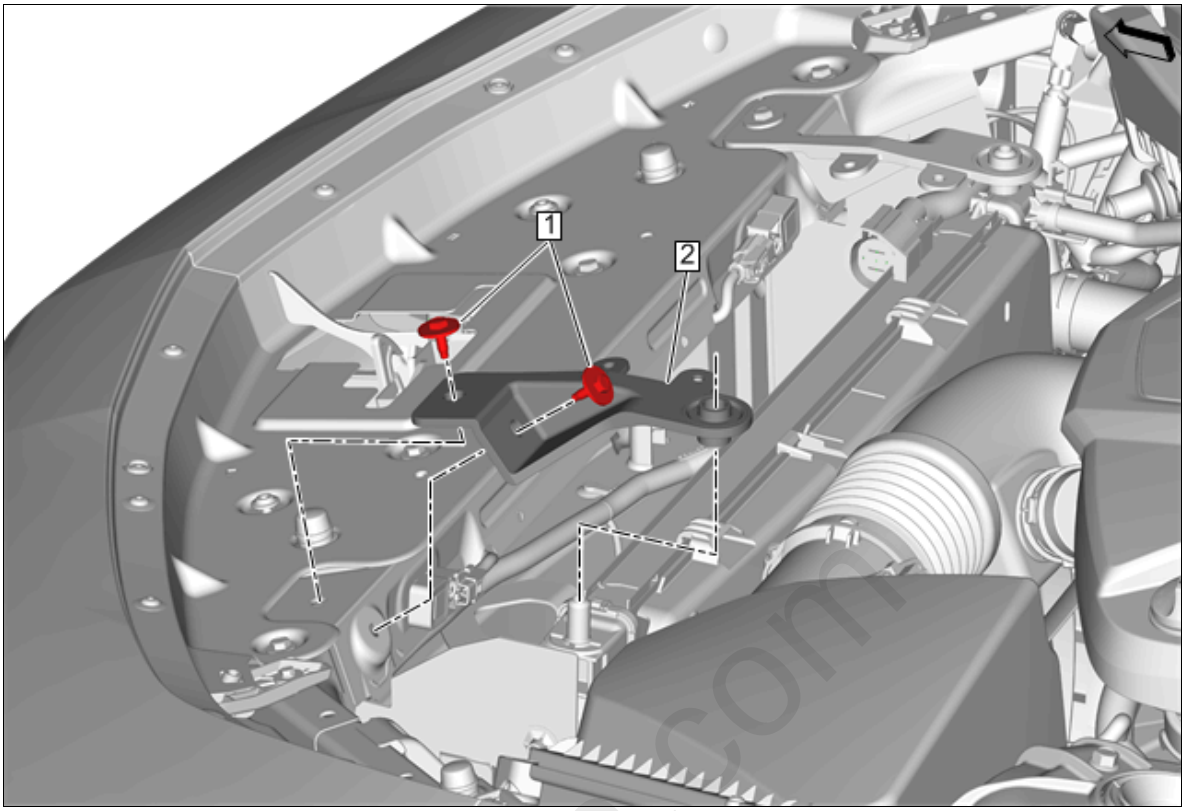


Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LTG)

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Fig 6: Radiator Upper Bracket - Left Side

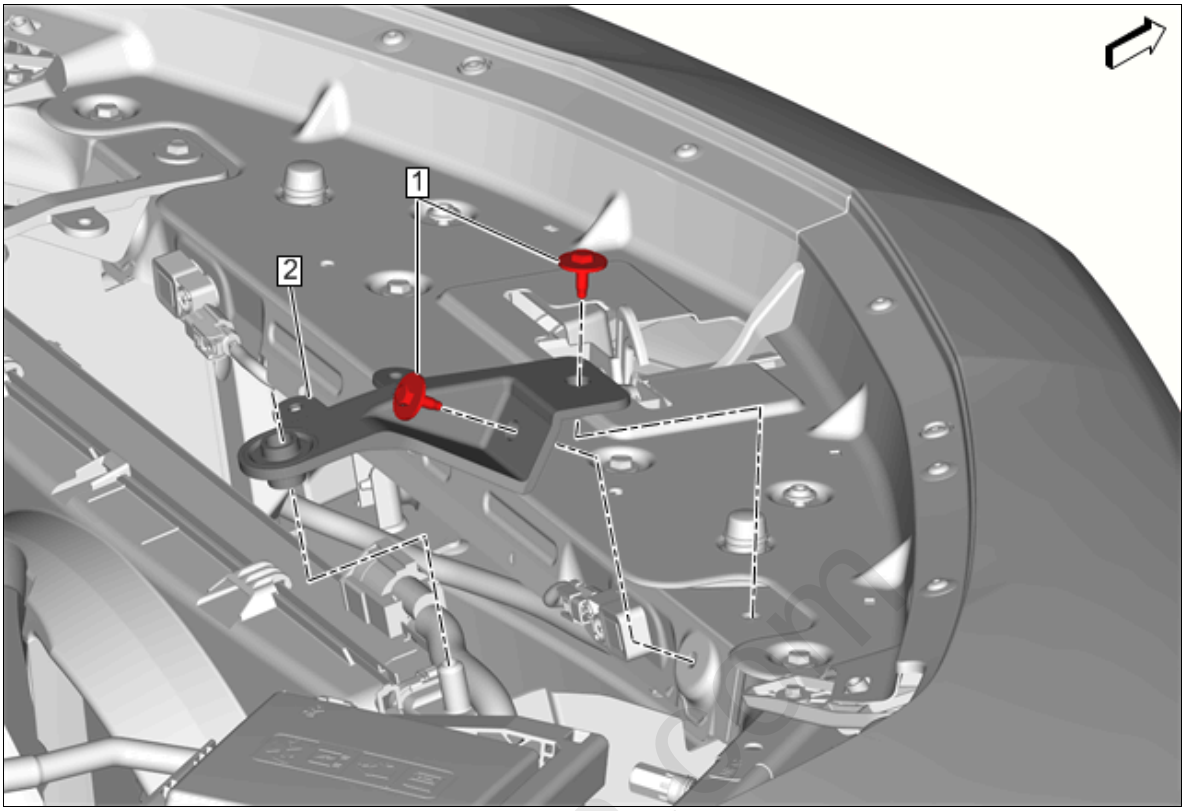


Courtesy of GENERAL MOTORS COMPANY

9. Remove Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Left Side (LGX LTG)

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Fig 7: Radiator Upper Bracket - Right Side

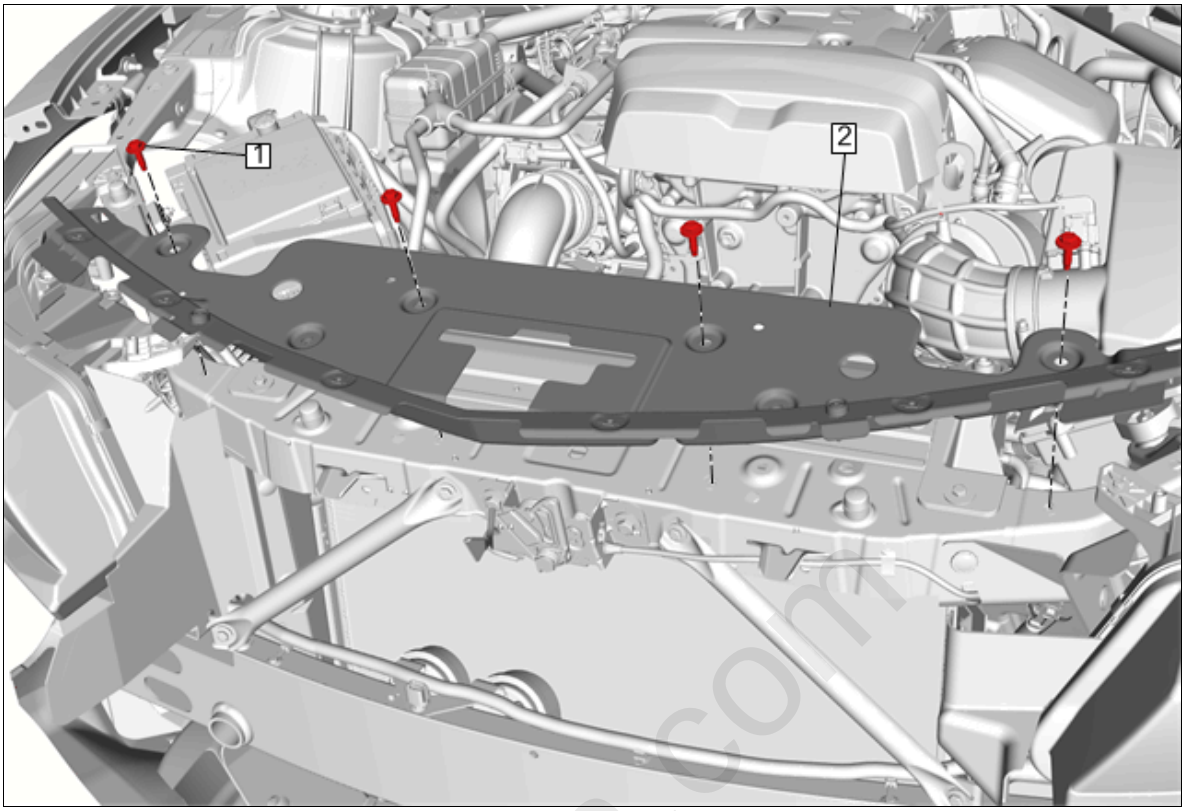


Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Right Side (LGX LTG)

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Fig 8: Front Bumper Fascia Center Support

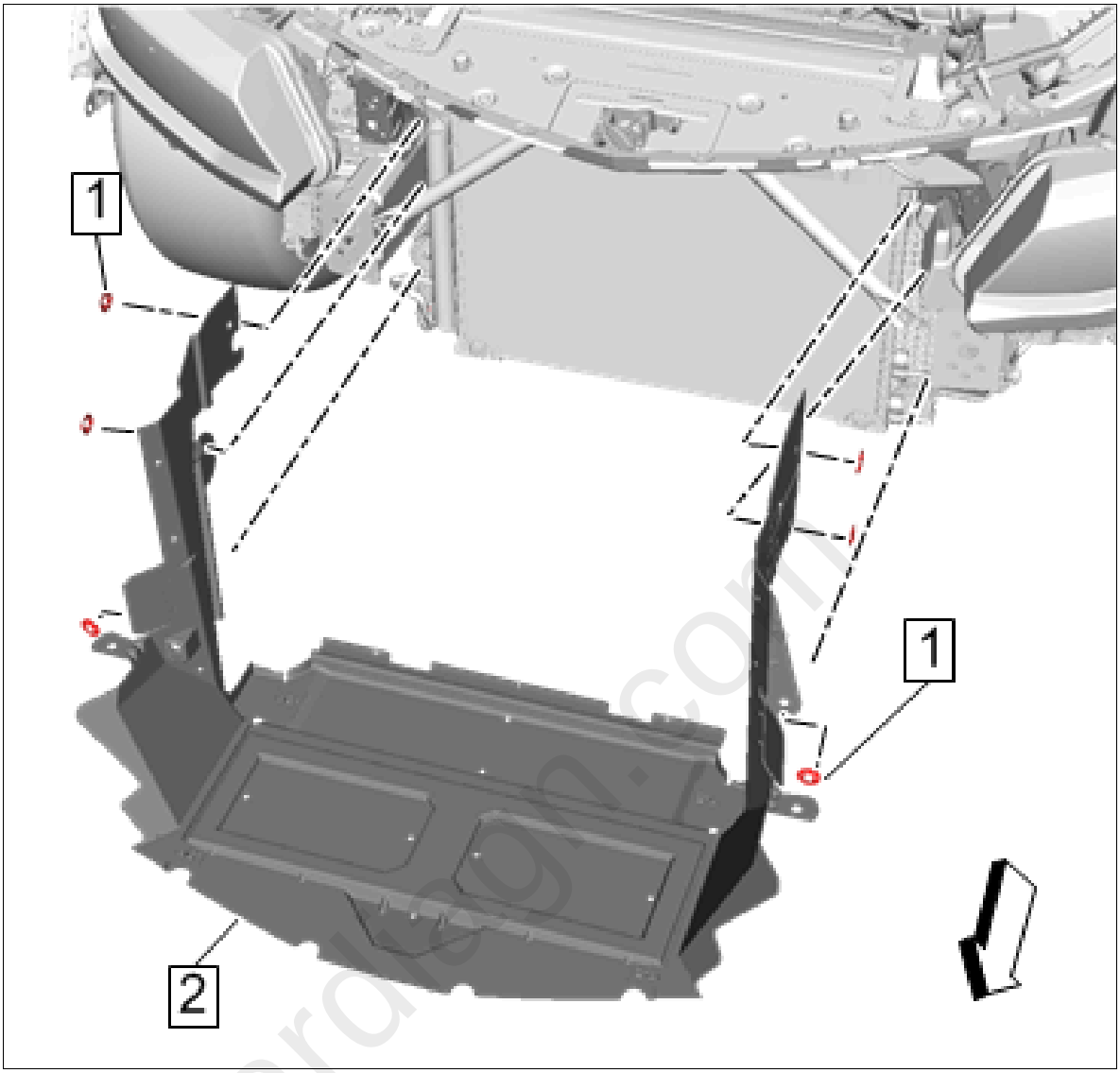


Courtesy of GENERAL MOTORS COMPANY

11. Remove Front Bumper Fascia Center Support (2) - Front Bumper Fascia Center Support Replacement

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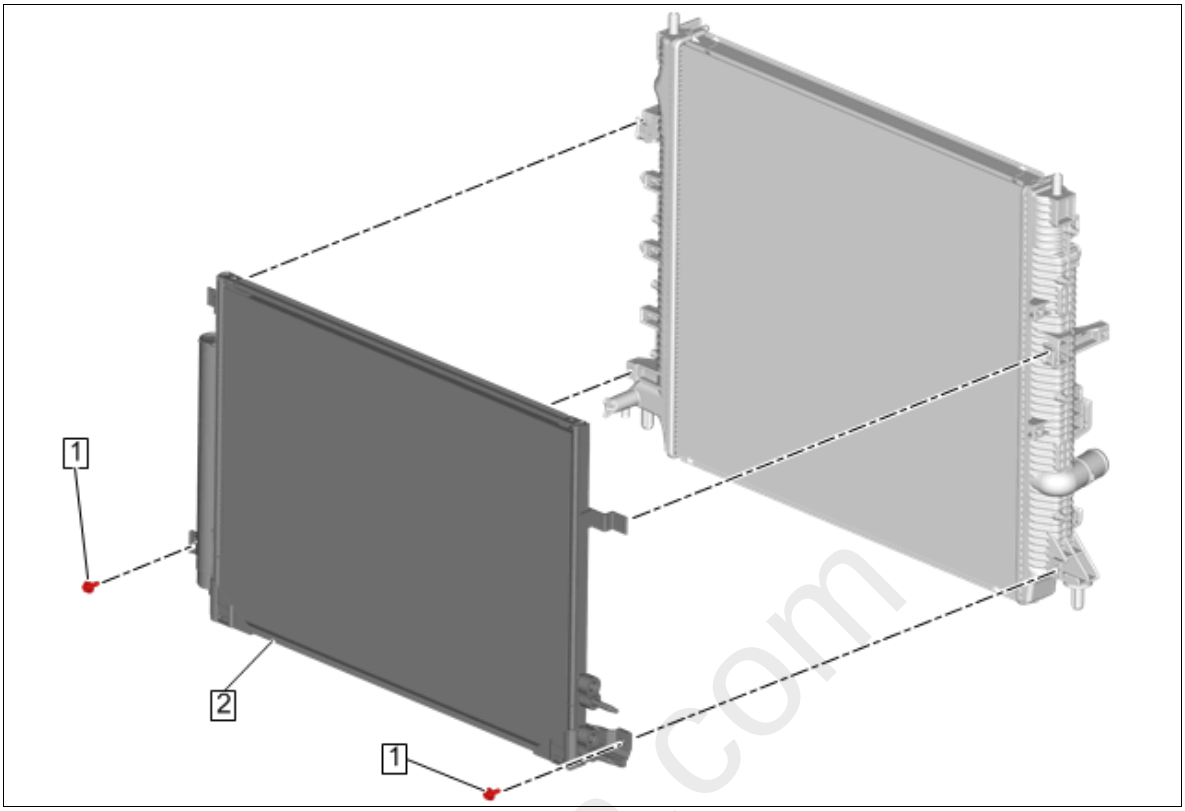
Fig 9: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

12. Remove Radiator Air Lower Baffle (2) - Radiator Air Lower Baffle Replacement (LTG without V18) Radiator Air Lower Baffle Replacement (LTG with V18)

Fig 10: Air Conditioning Condenser

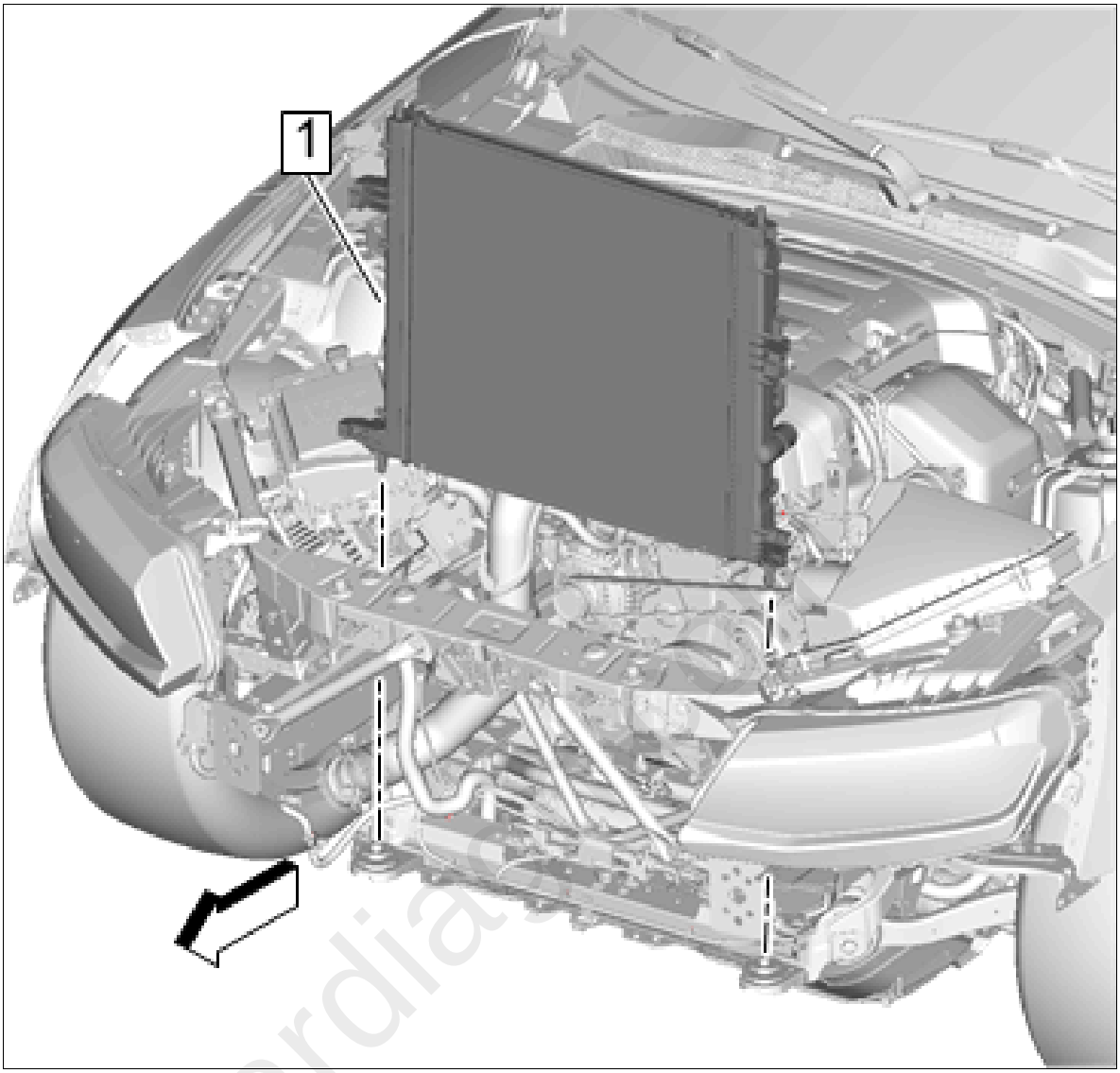


Courtesy of GENERAL MOTORS COMPANY

13. Remove Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LTG with Y4Q)Air Conditioning Condenser Replacement (LTG without Y4Q)
14. Remove Charge Air Cooler Radiator Remove — Charge Air Cooler Radiator Replacement
15. Reposition the wiring harness.

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Fig 11: Radiator

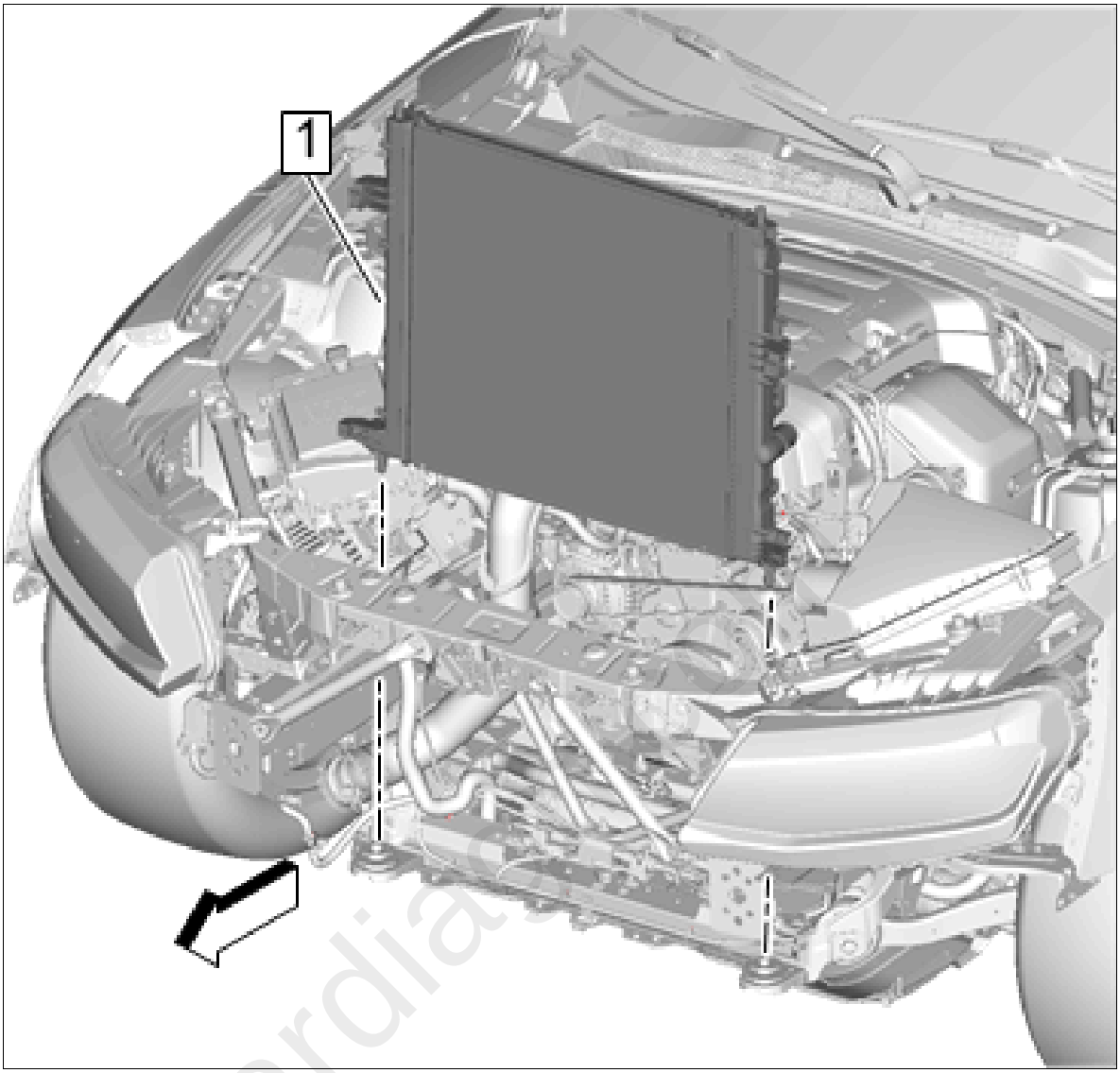


Courtesy of GENERAL MOTORS COMPANY

16. Remove Radiator (1)
17. Transfer components as necessary.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LTG WITHOUT V18) > INSTALLATION PROCEDURE

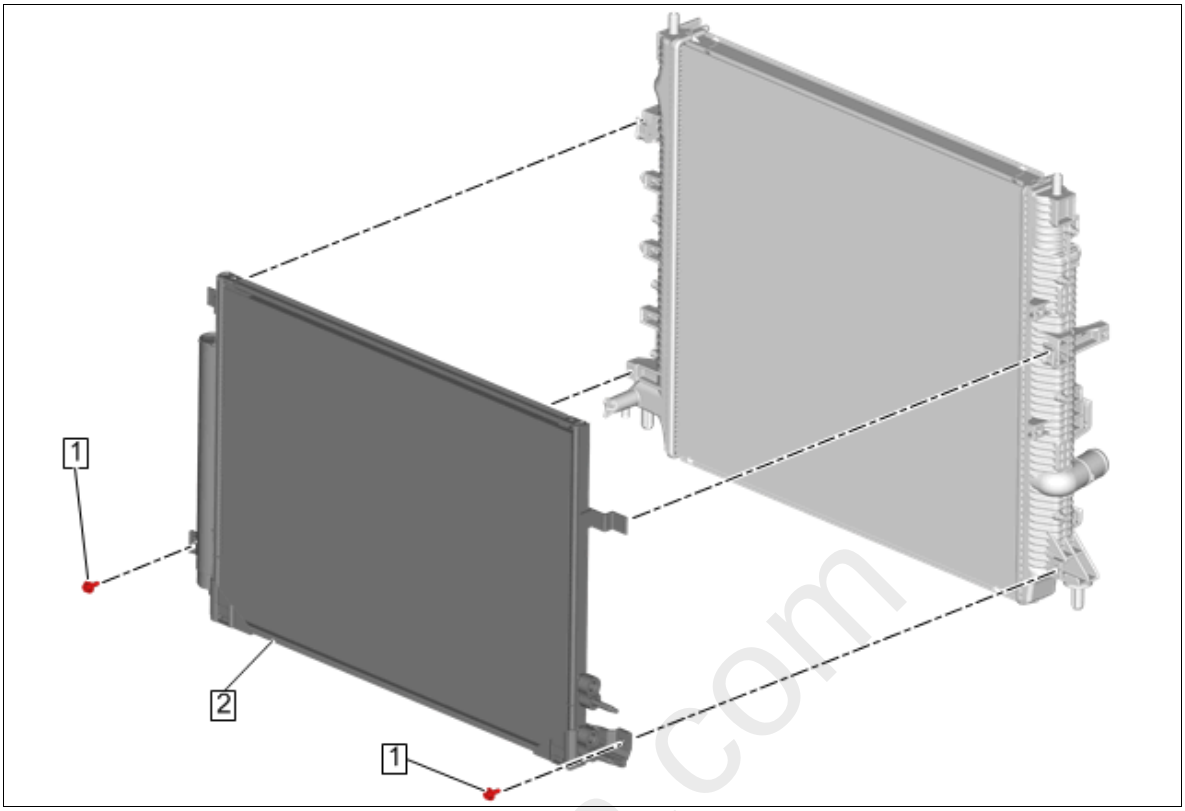
Fig 1: Radiator



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)
2. Reposition the wiring harness.
3. Install Charge Air Cooler Radiator Install - Charge Air Cooler Radiator Replacement

Fig 2: Air Conditioning Condenser

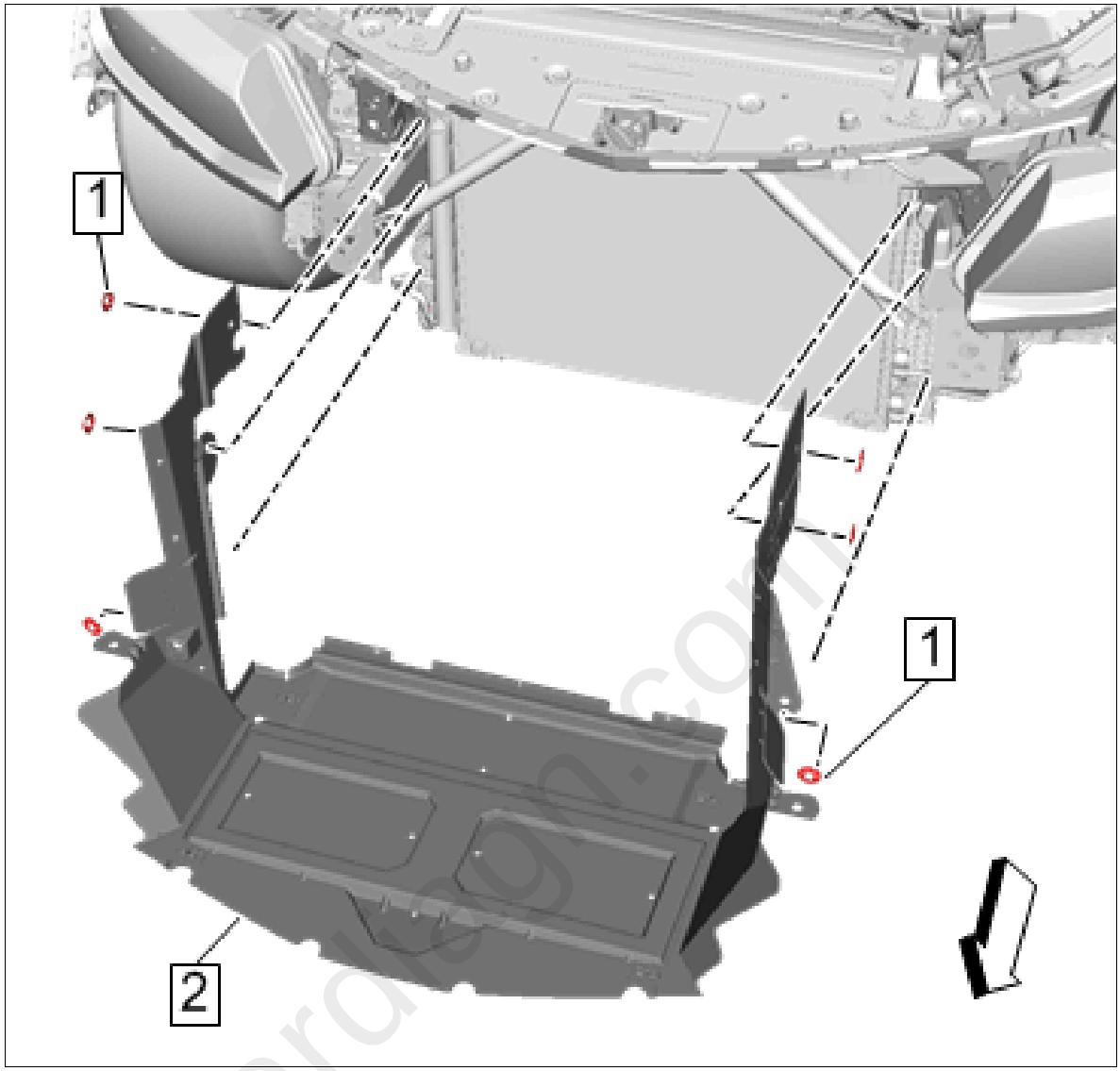


Courtesy of GENERAL MOTORS COMPANY

4. Install Air Conditioning Condenser Install - Air Conditioning Condenser Replacement (LTG with Y4Q)Air Conditioning Condenser Replacement (LTG without Y4Q)

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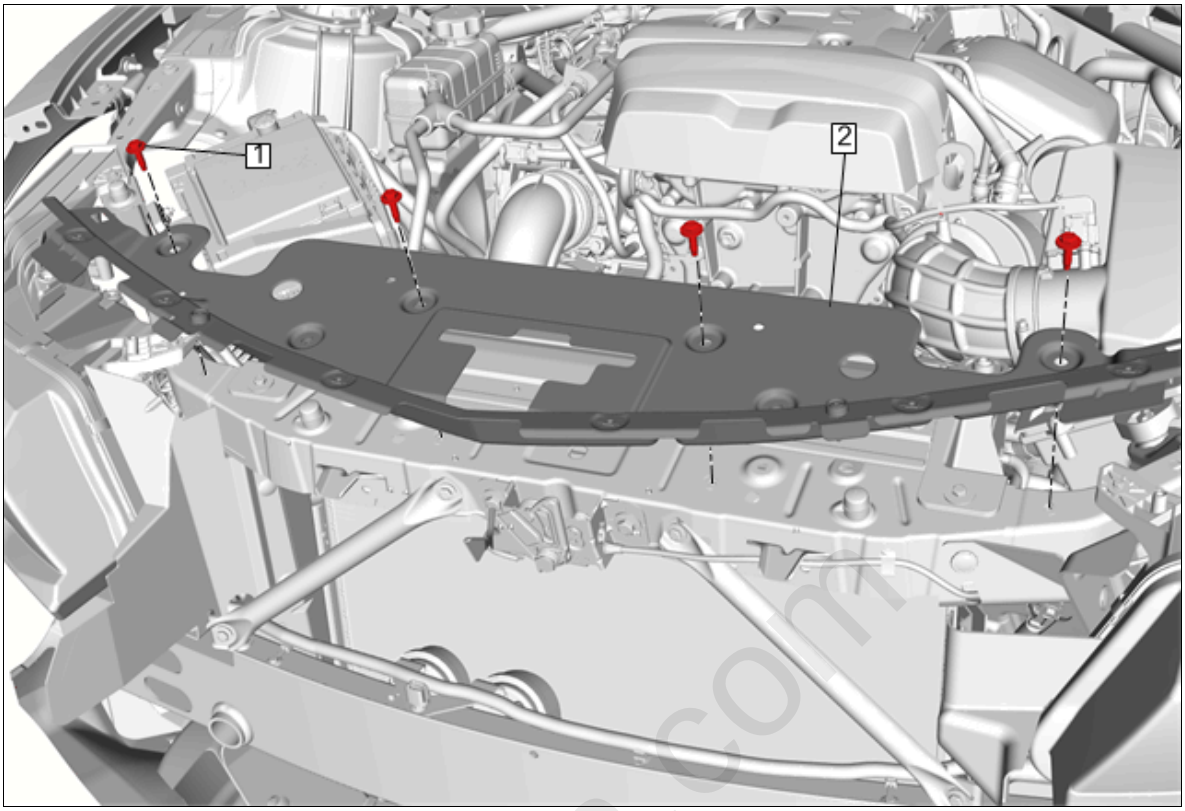
Fig 3: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Air Lower Baffle (2) - Radiator Air Lower Baffle Replacement (LTG without V18) Radiator Air Lower Baffle Replacement (LTG with V18)

Fig 4: Front Bumper Fascia Center Support

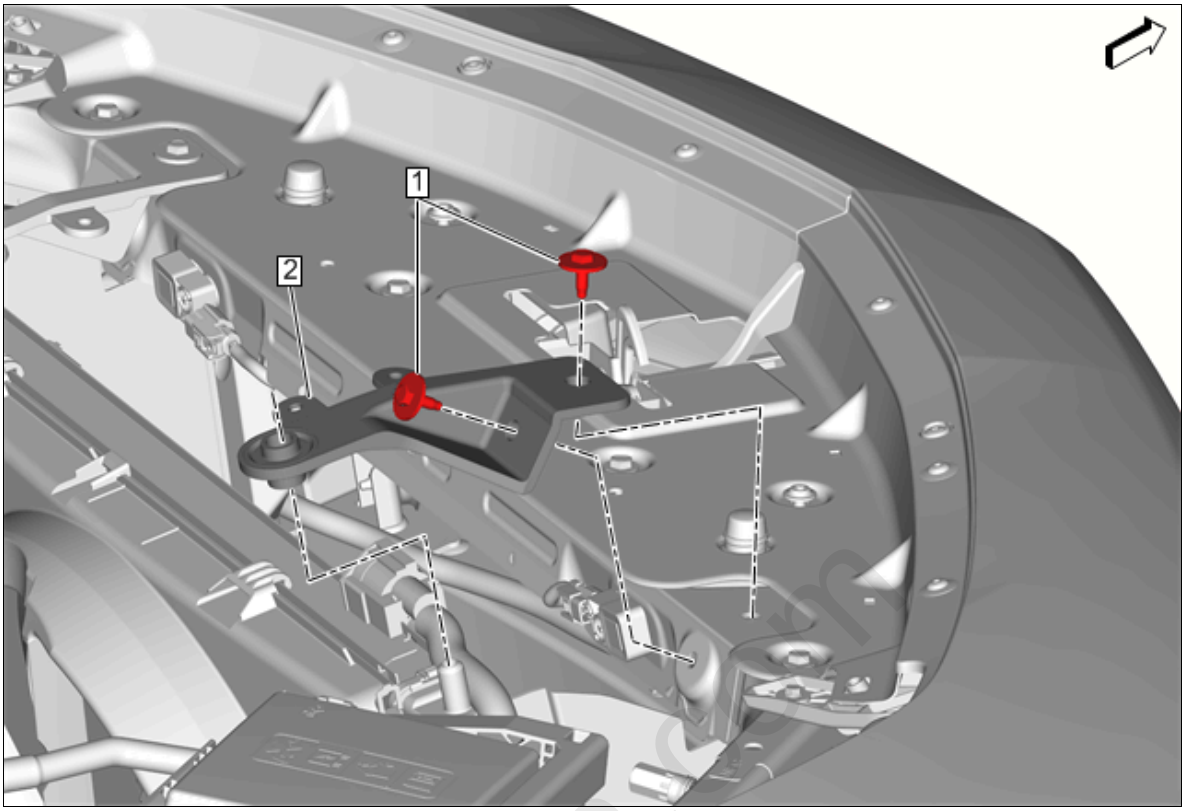


Courtesy of GENERAL MOTORS COMPANY

6. Install Front Bumper Fascia Center Support (2) - Front Bumper Fascia Center Support Replacement

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Fig 5: Radiator Upper Bracket - Right Side

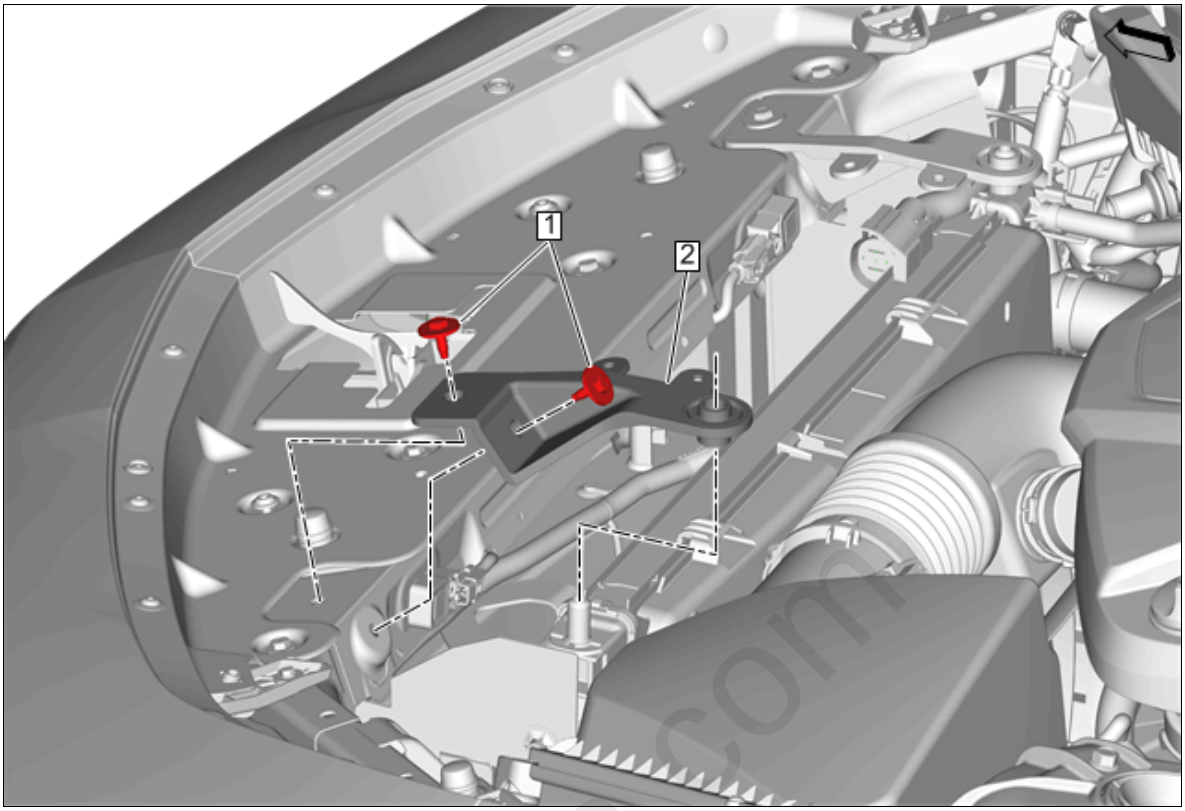


Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Right Side (LGX LTG)

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Fig 6: Radiator Upper Bracket - Left Side

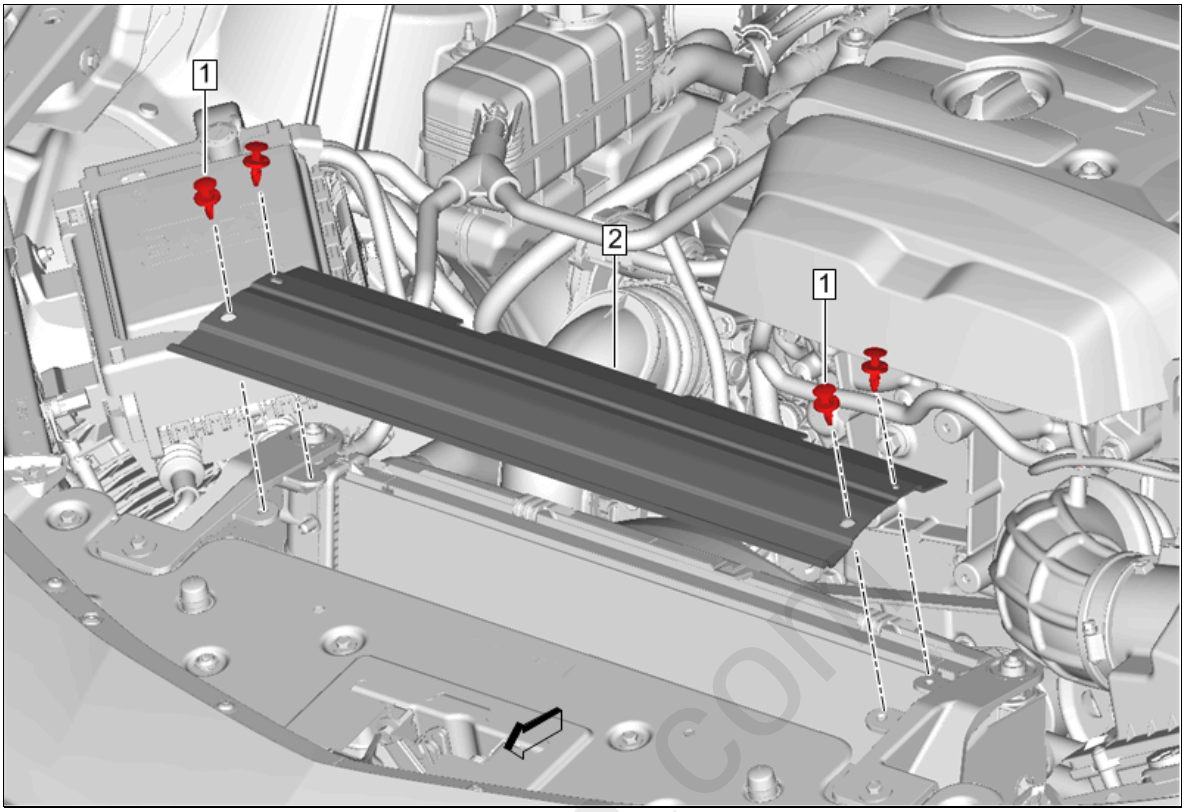


Courtesy of GENERAL MOTORS COMPANY

8. Install Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Left Side (LGX LTG)

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Fig 7: Radiator Air Upper Baffle

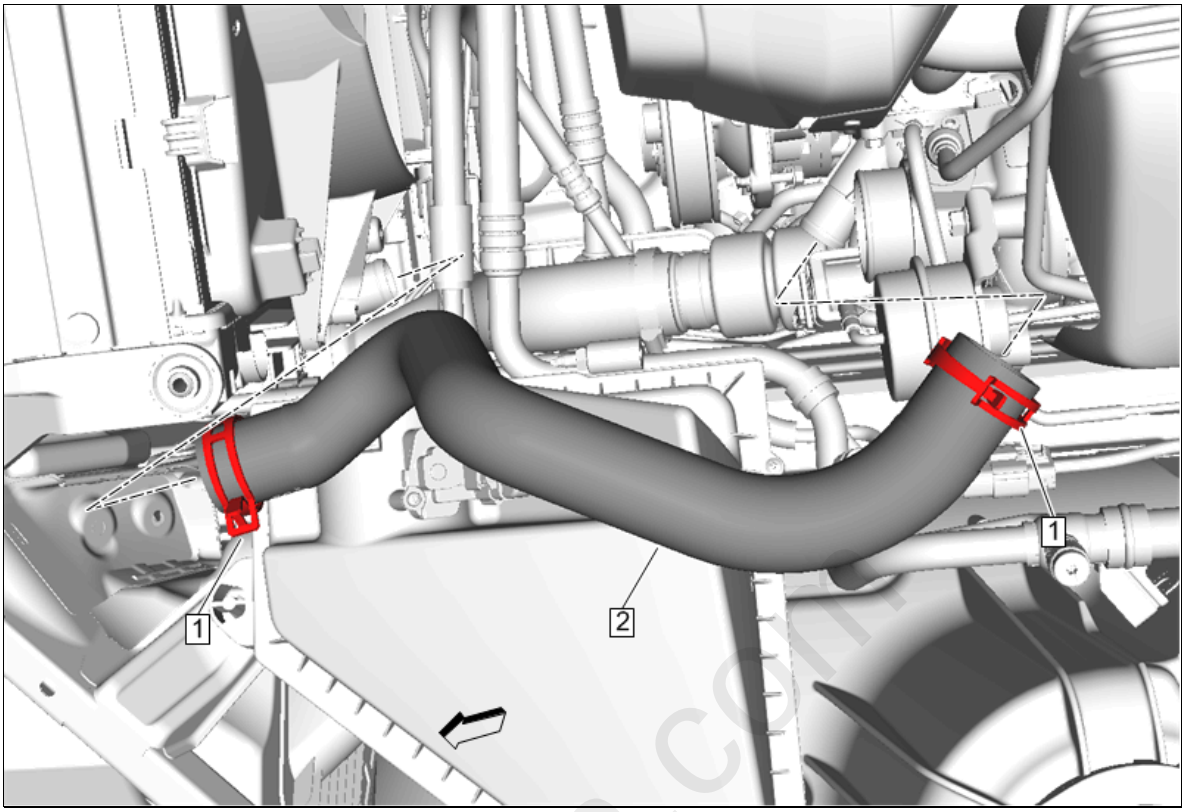


Courtesy of GENERAL MOTORS COMPANY

9. Install Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LTG)

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Fig 8: Radiator Outlet Hose

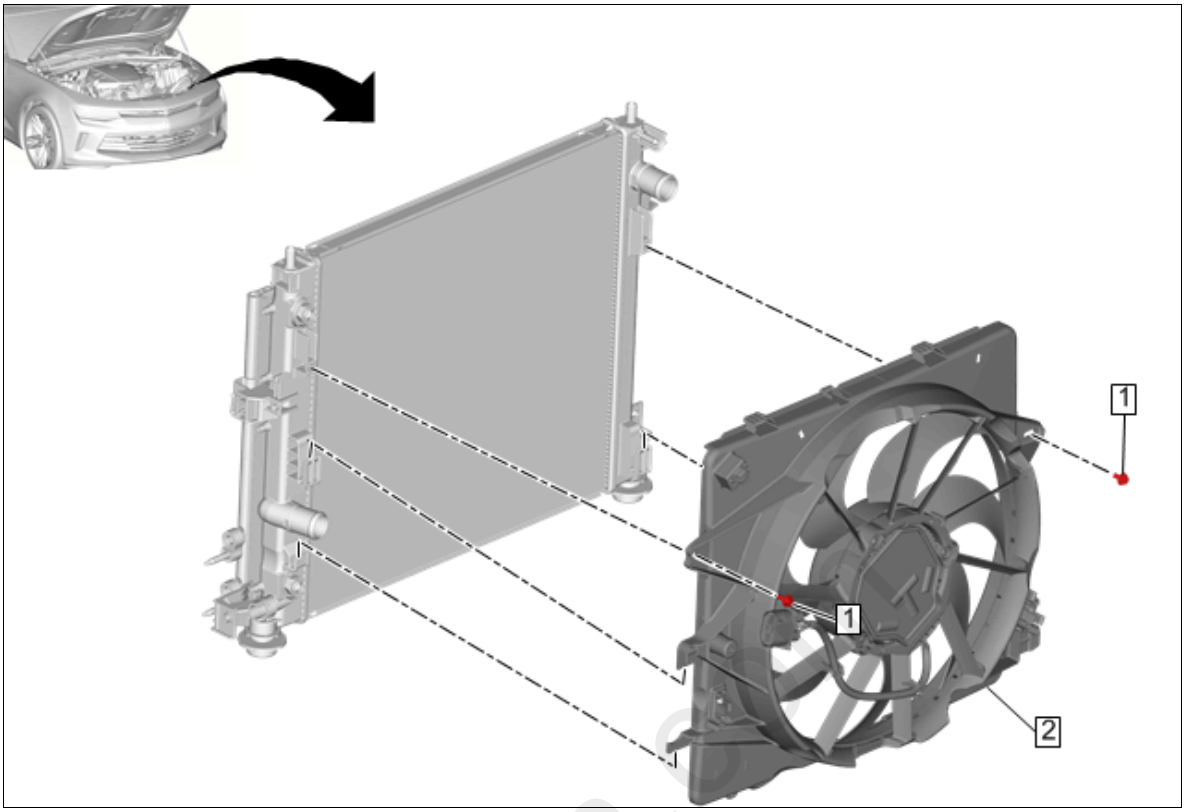


Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Outlet Hose (2) at Radiator Assembly - Radiator Outlet Hose Replacement (LTG without V18) Radiator Outlet Hose Replacement (LTG with V18)

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Fig 9: Engine Coolant Fan

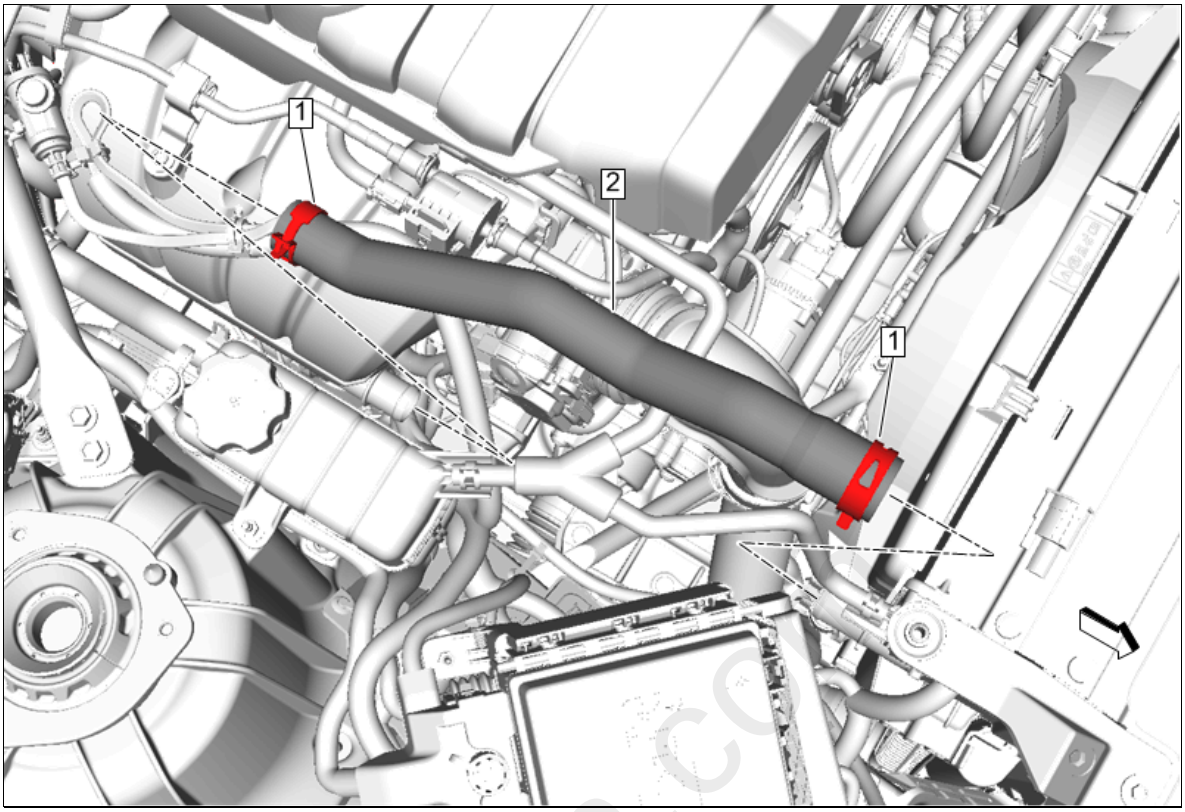


Courtesy of GENERAL MOTORS COMPANY

11. Install Engine Coolant Fan (2) - Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)

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Fig 10: Radiator Inlet Hose

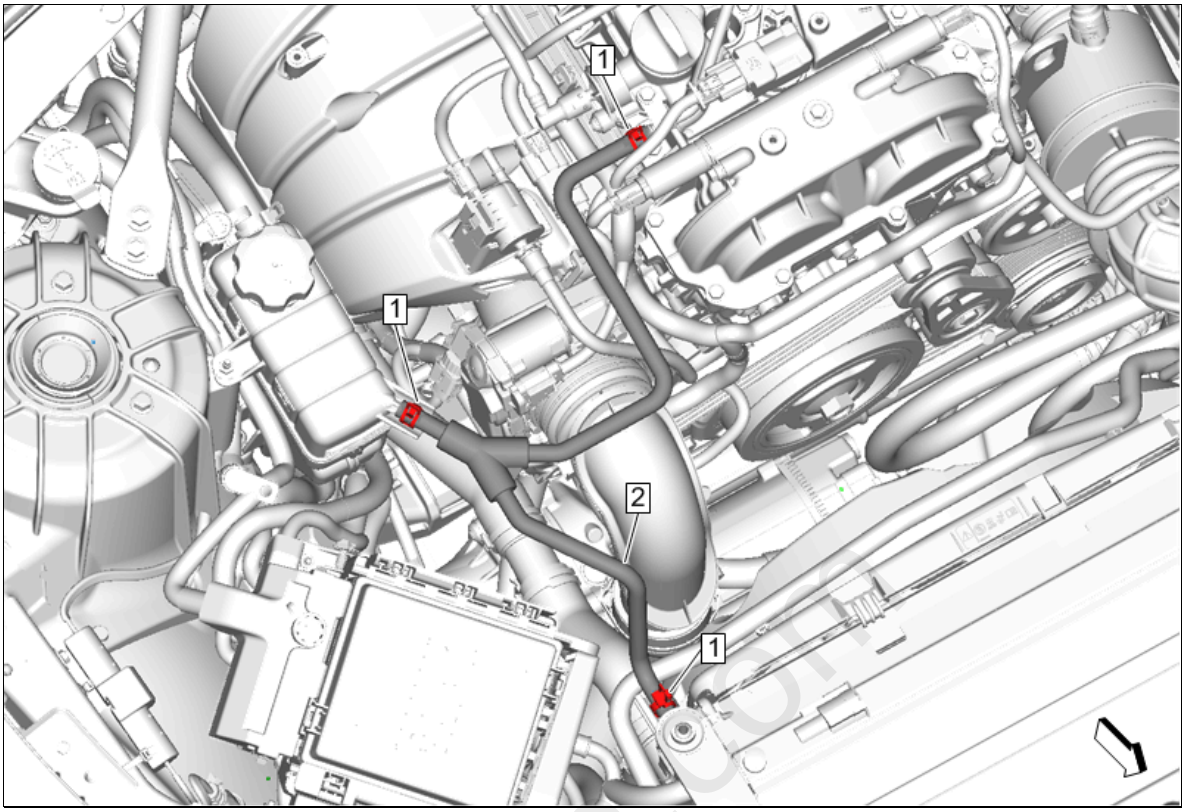


Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)

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Fig 11: Radiator Surge Tank Inlet Hose



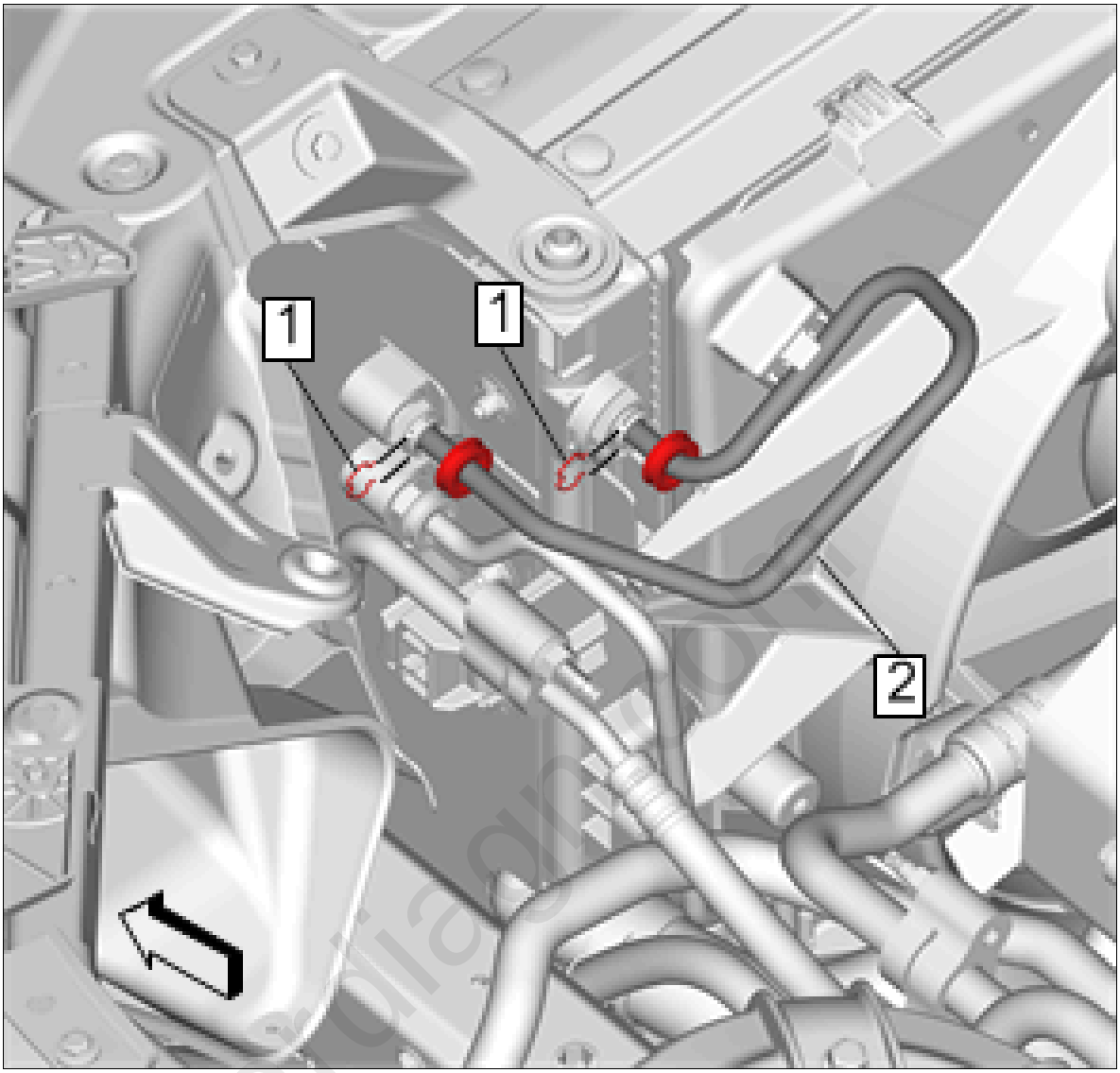
Courtesy of GENERAL MOTORS COMPANY

13. Install Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)
14. Install Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement
15. Recharge the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
16. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
17. Start the engine and check for coolant leaks.
18. Inspect for refrigerant leaks.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LTG WITH V18) > REMOVAL PROCEDURE

1. Drain the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
2. Recover the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
3. Remove Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement

Fig 1: Transmission Fluid Cooler Pipe

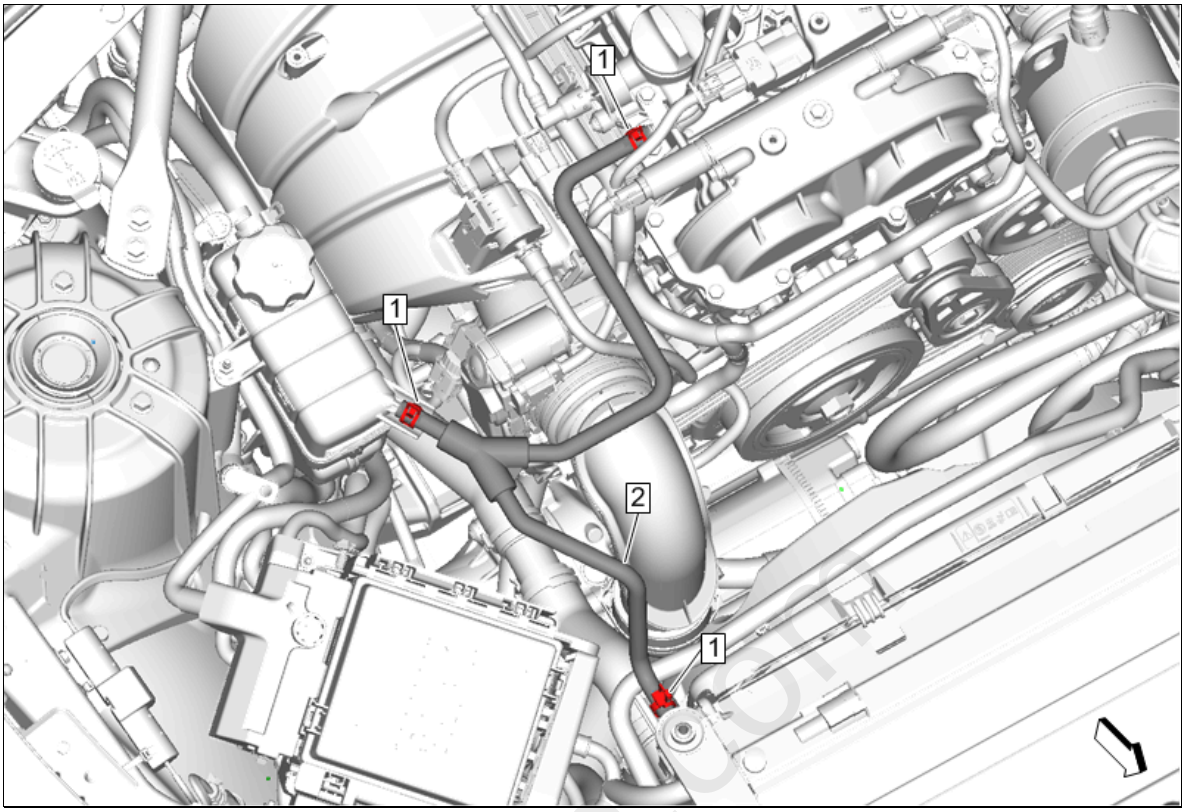


Courtesy of GENERAL MOTORS COMPANY

4. Remove Transmission Fluid Cooler Pipe (2) - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)

5. Remove Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

Fig 2: Radiator Surge Tank Inlet Hose

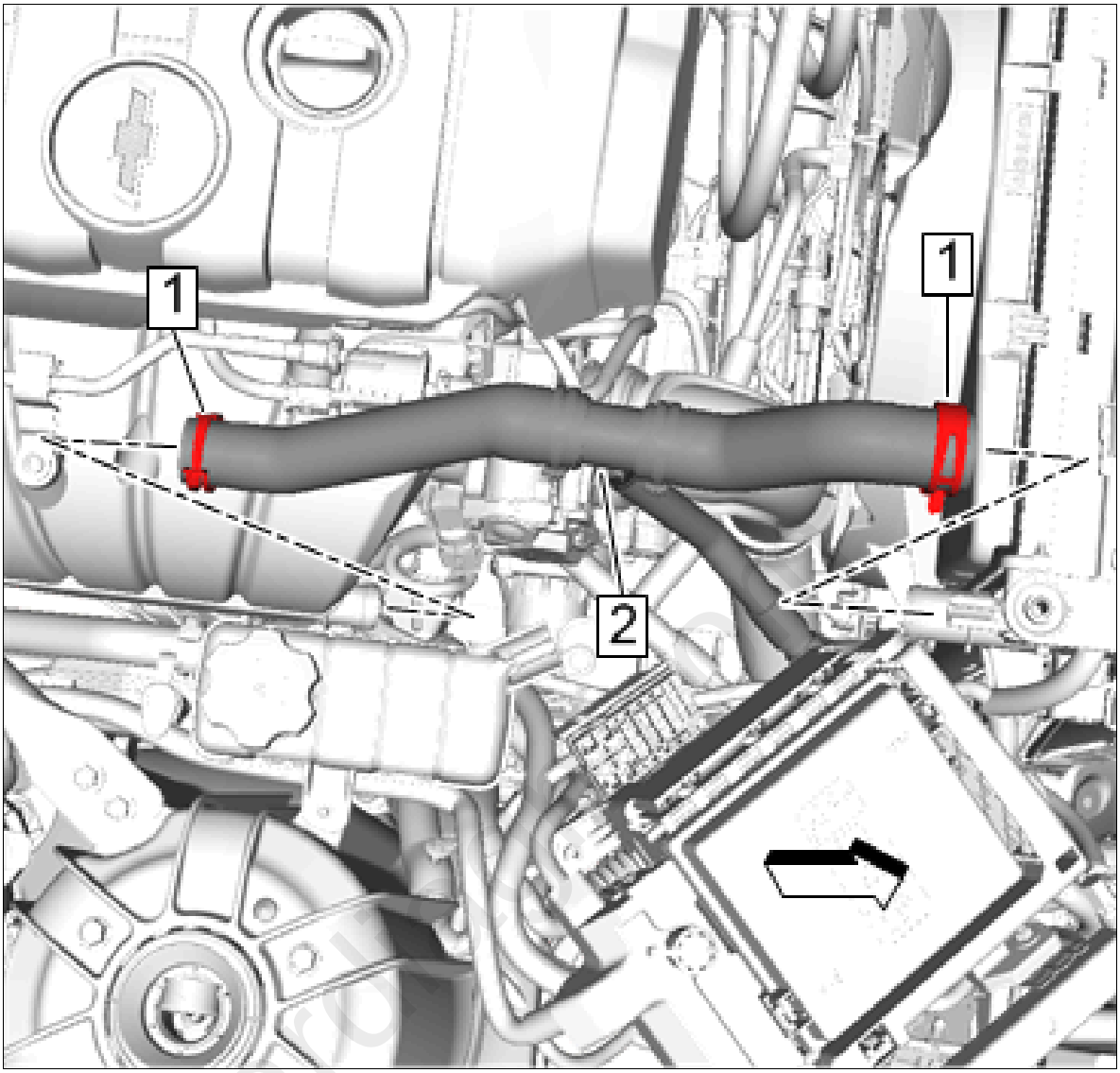


Courtesy of GENERAL MOTORS COMPANY

6. Remove Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)

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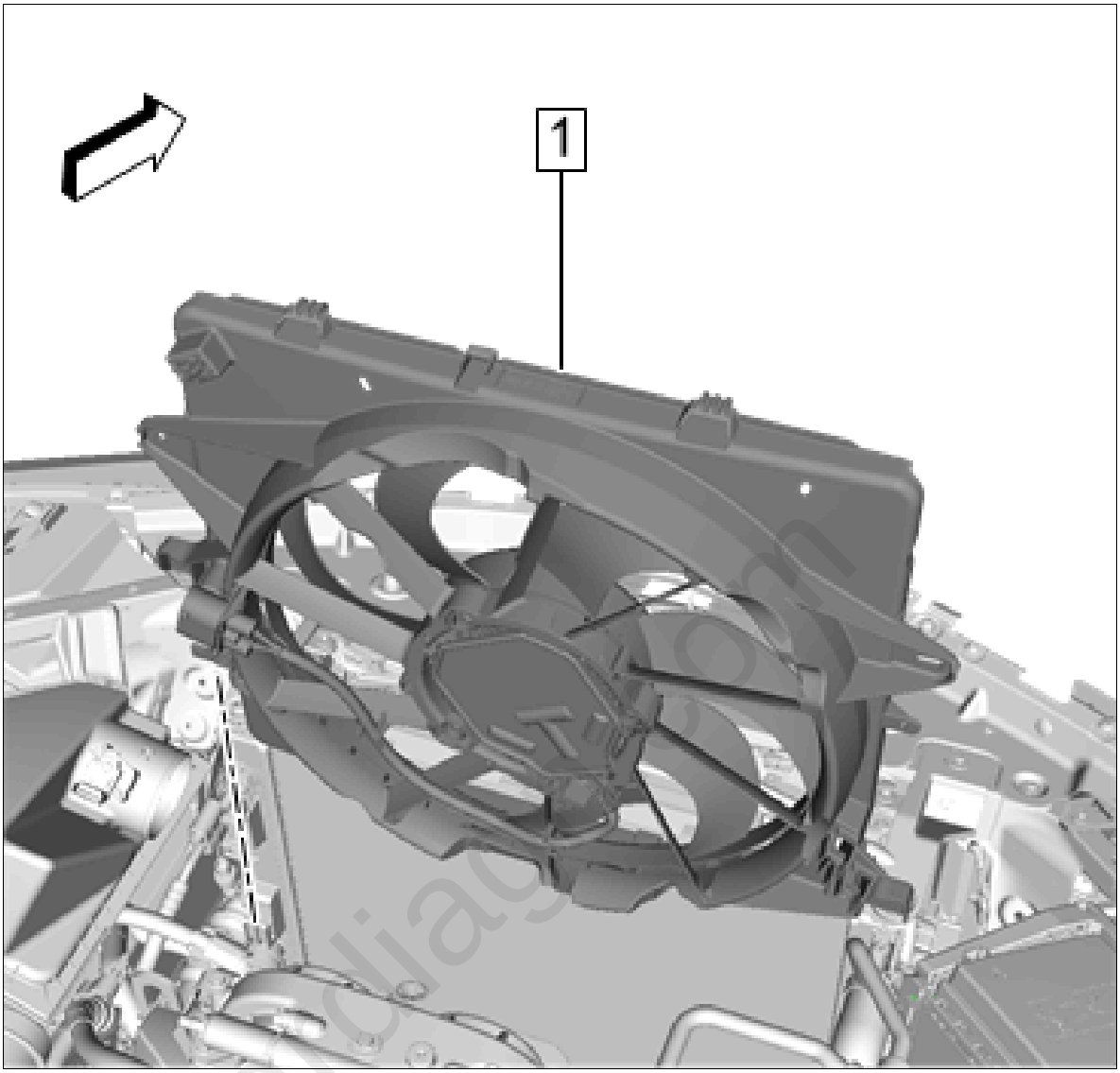
Fig 3: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)

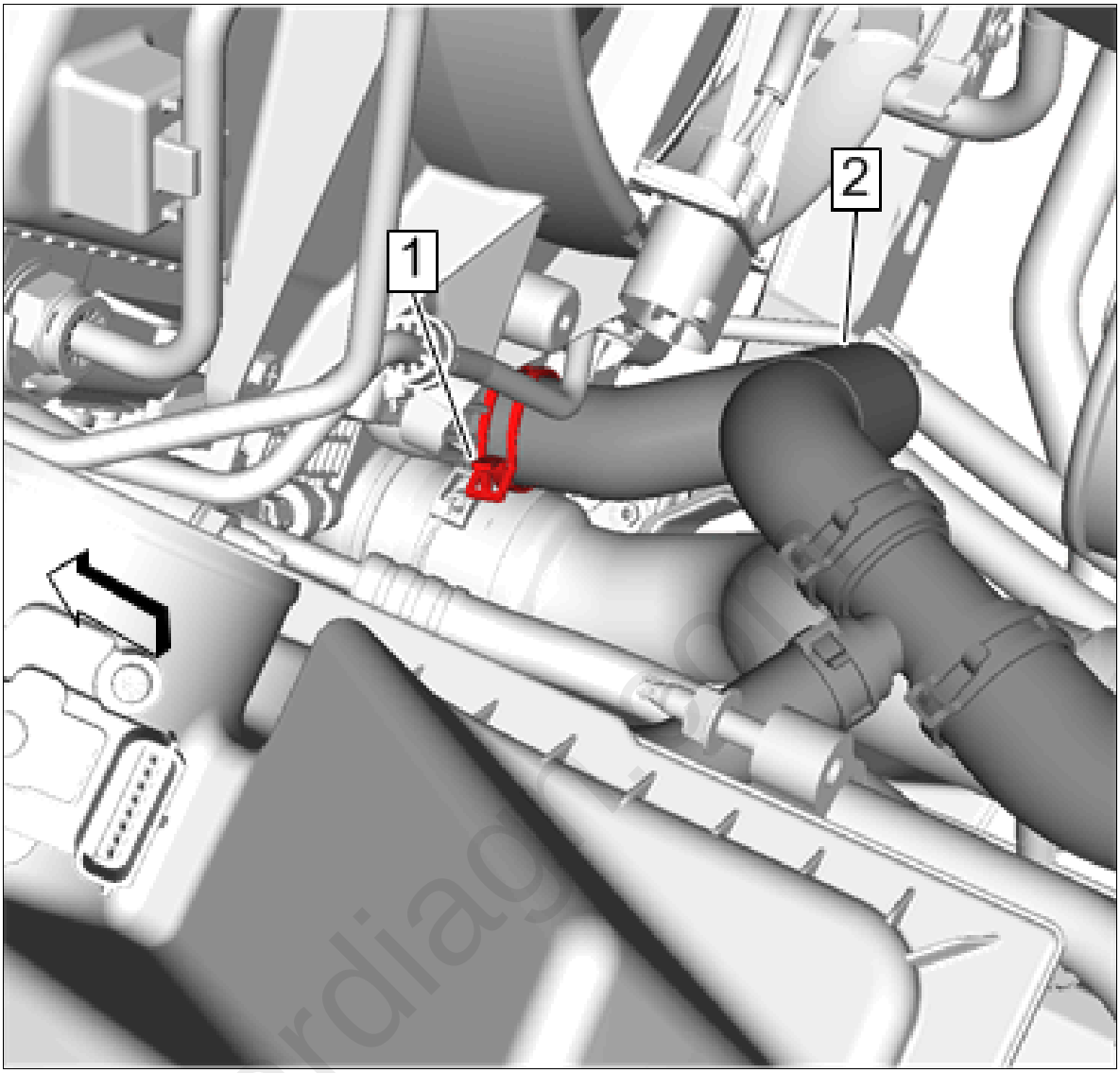
Fig 4: Engine Coolant Fan Assembly



Courtesy of GENERAL MOTORS COMPANY

8. Remove Engine Coolant Fan (1) at Radiator - Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)

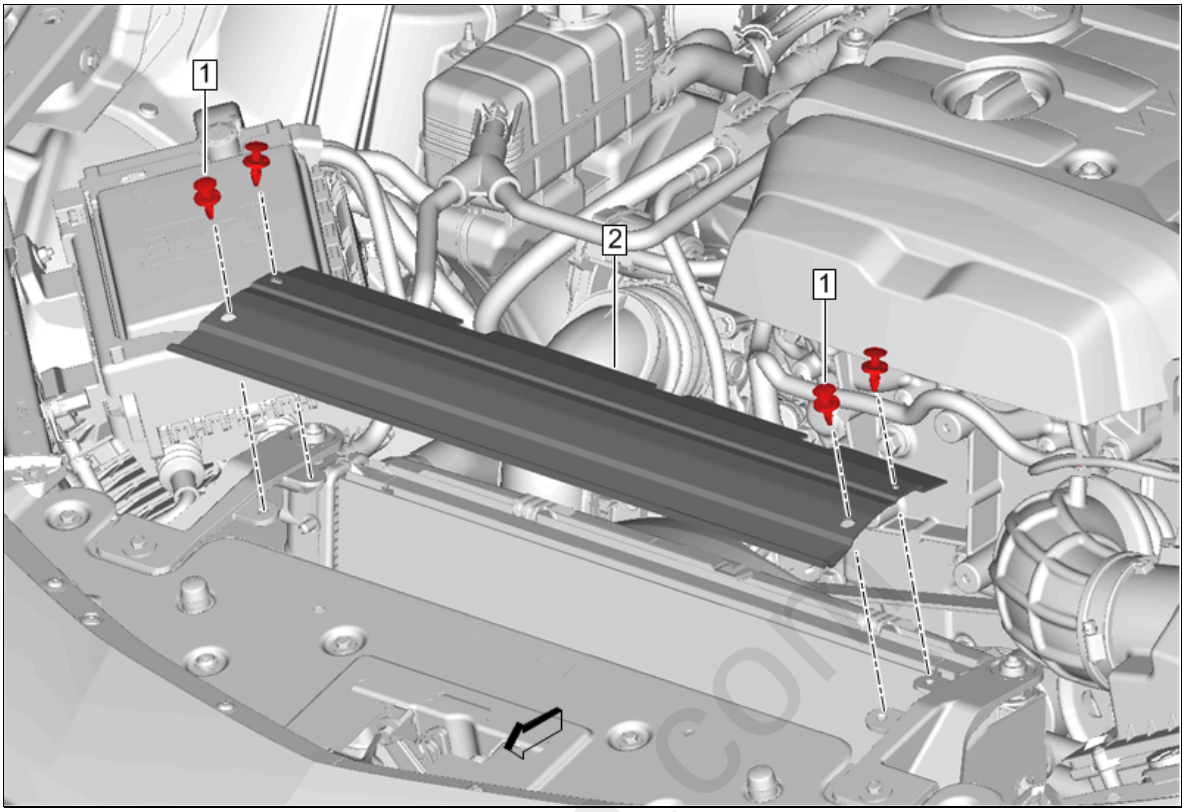
Fig 5: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

9. Remove Radiator Outlet Hose (2) at Radiator Assembly - Radiator Outlet Hose Replacement (LTG without V18) Radiator Outlet Hose Replacement (LTG with V18)

Fig 6: Radiator Air Upper Baffle

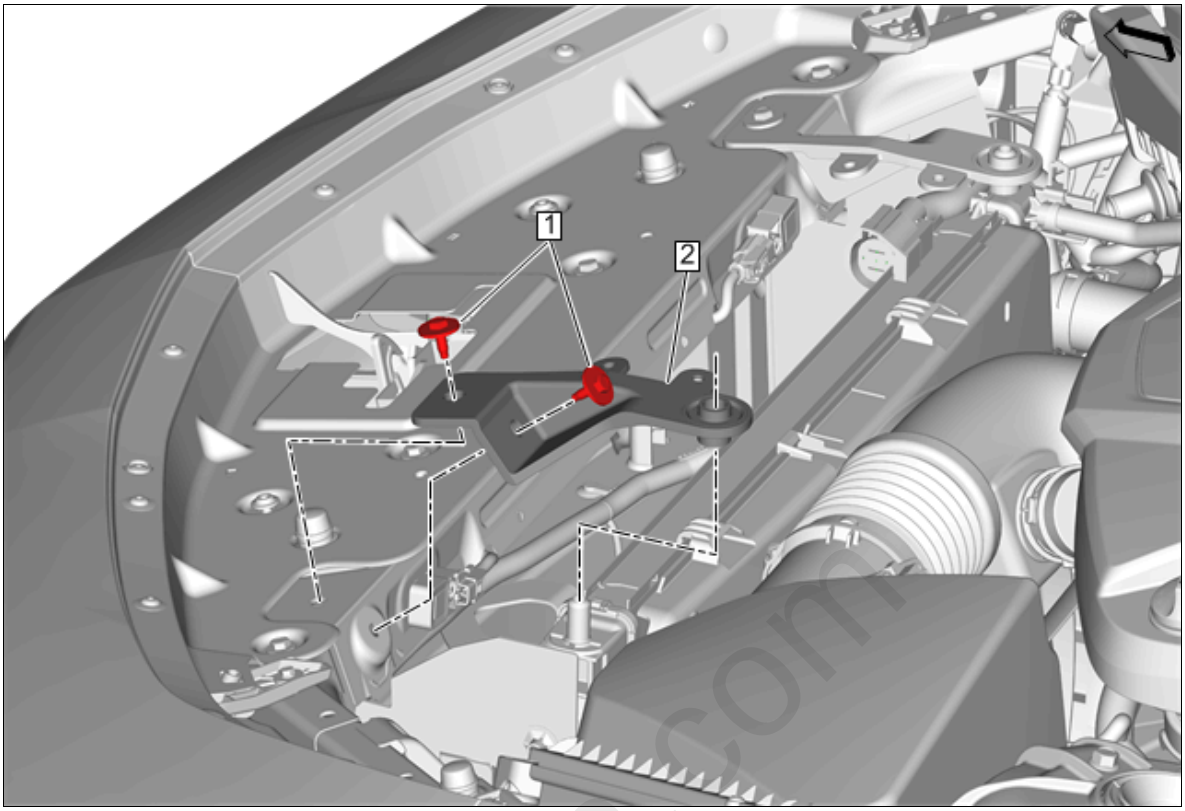


Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LTG)

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Fig 7: Radiator Upper Bracket - Left Side

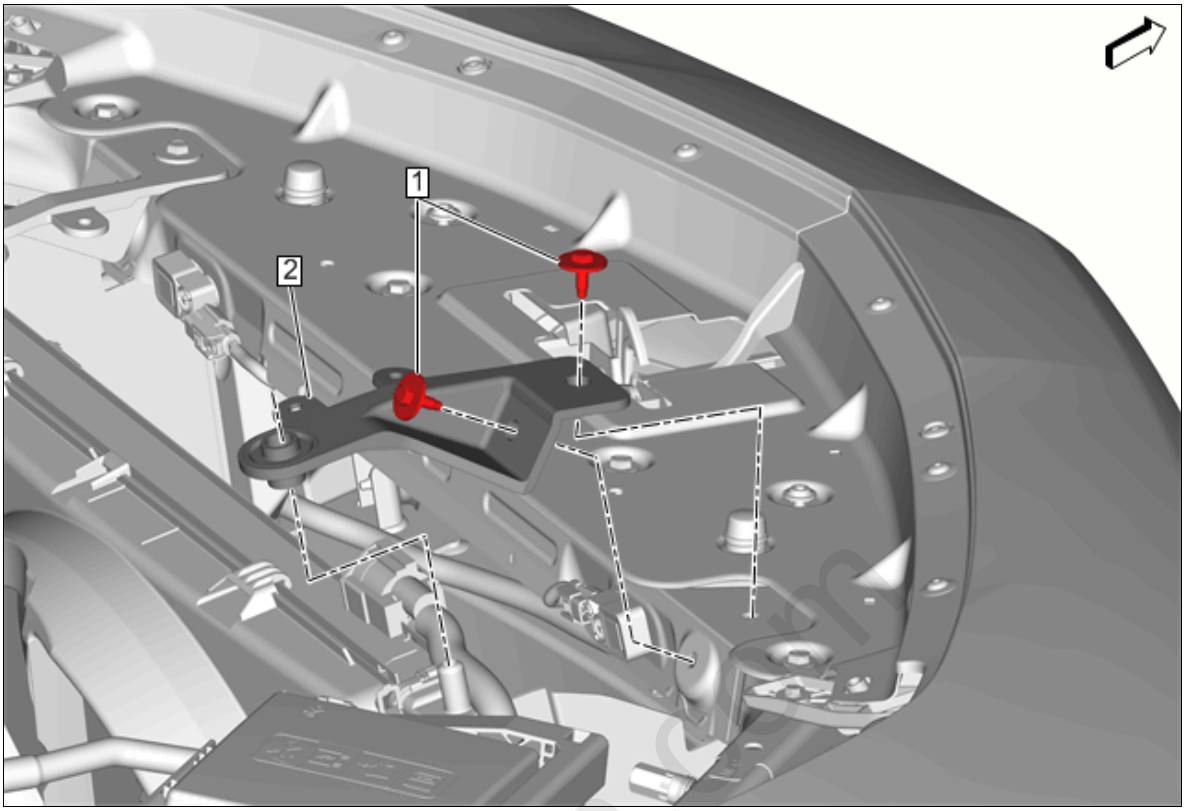


Courtesy of GENERAL MOTORS COMPANY

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

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Fig 8: Radiator Upper Bracket - Right Side

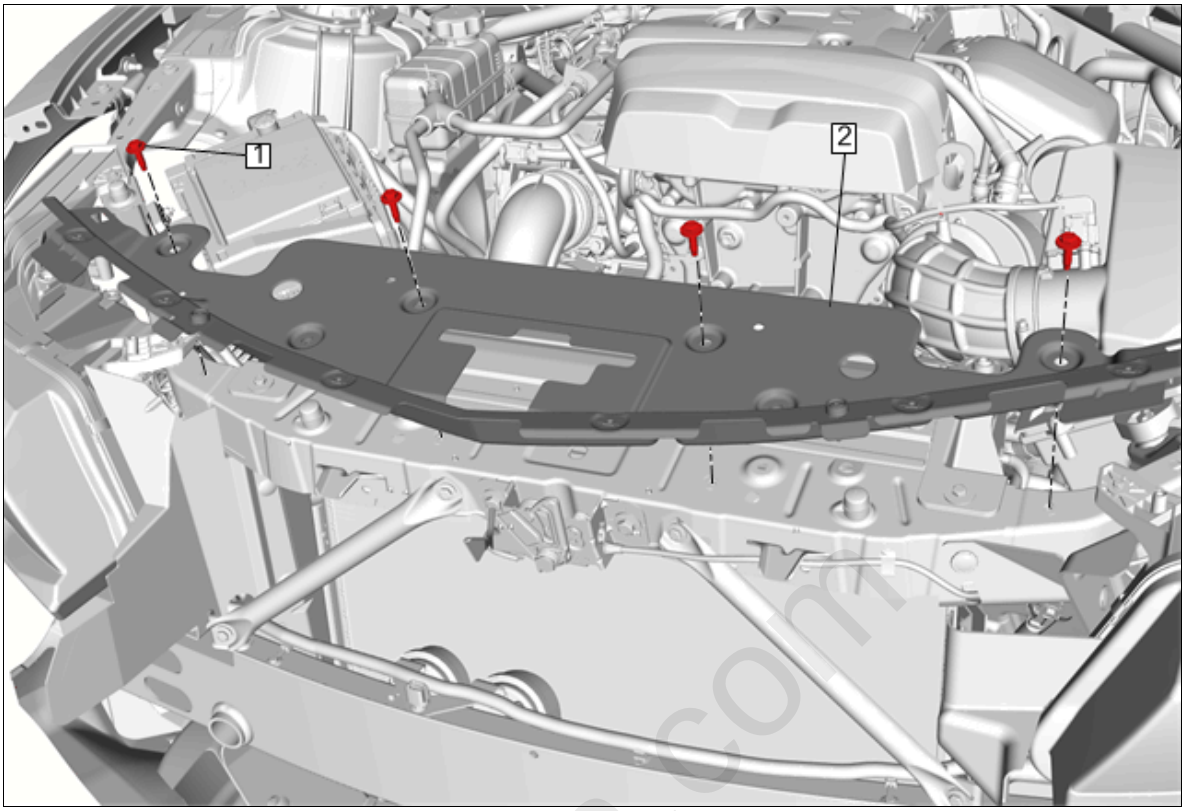


Courtesy of GENERAL MOTORS COMPANY

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

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Fig 9: Front Bumper Fascia Center Support

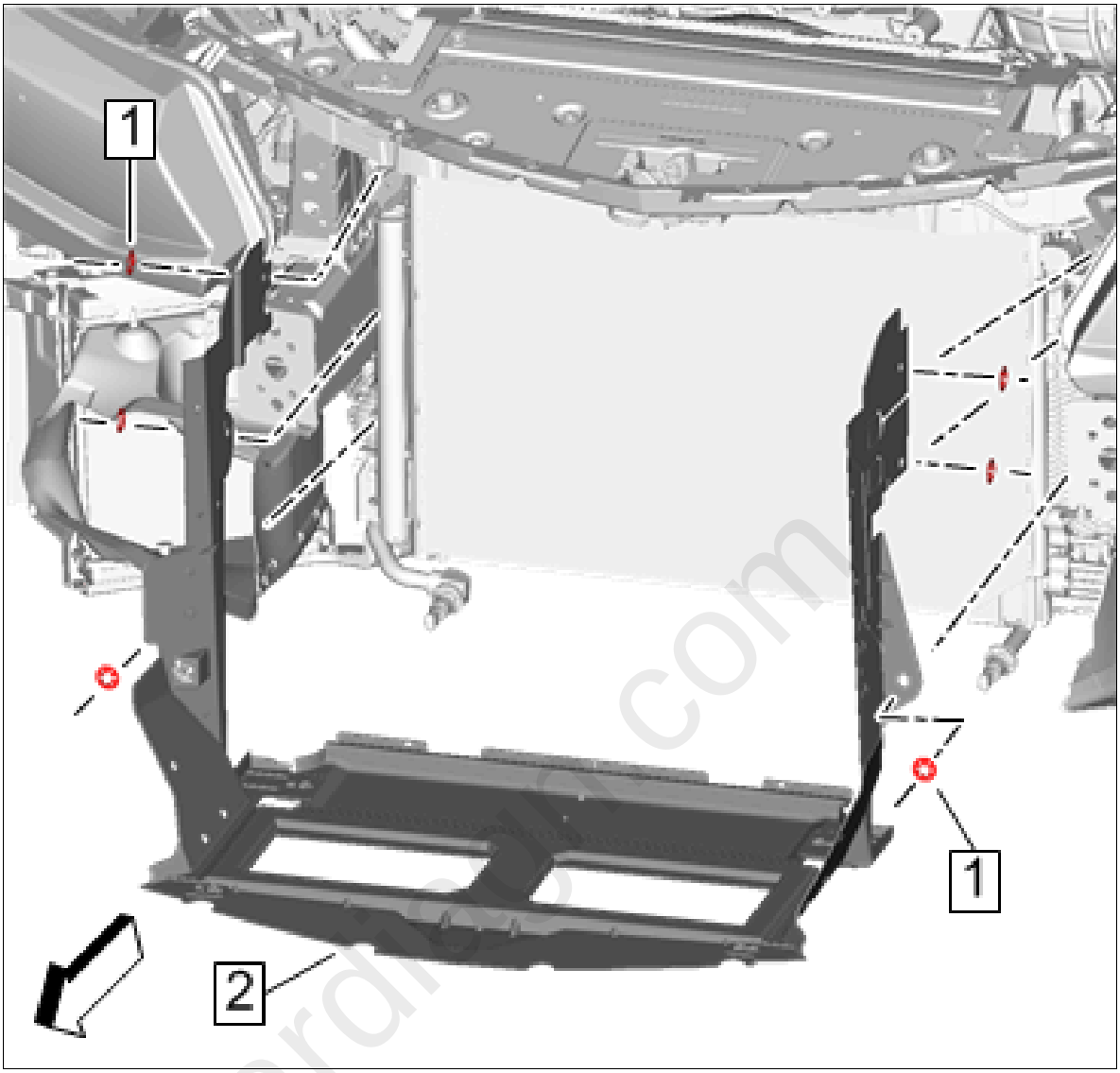


Courtesy of GENERAL MOTORS COMPANY

13. Remove Front Bumper Fascia Center Support (2) - Front Bumper Fascia Center Support Replacement

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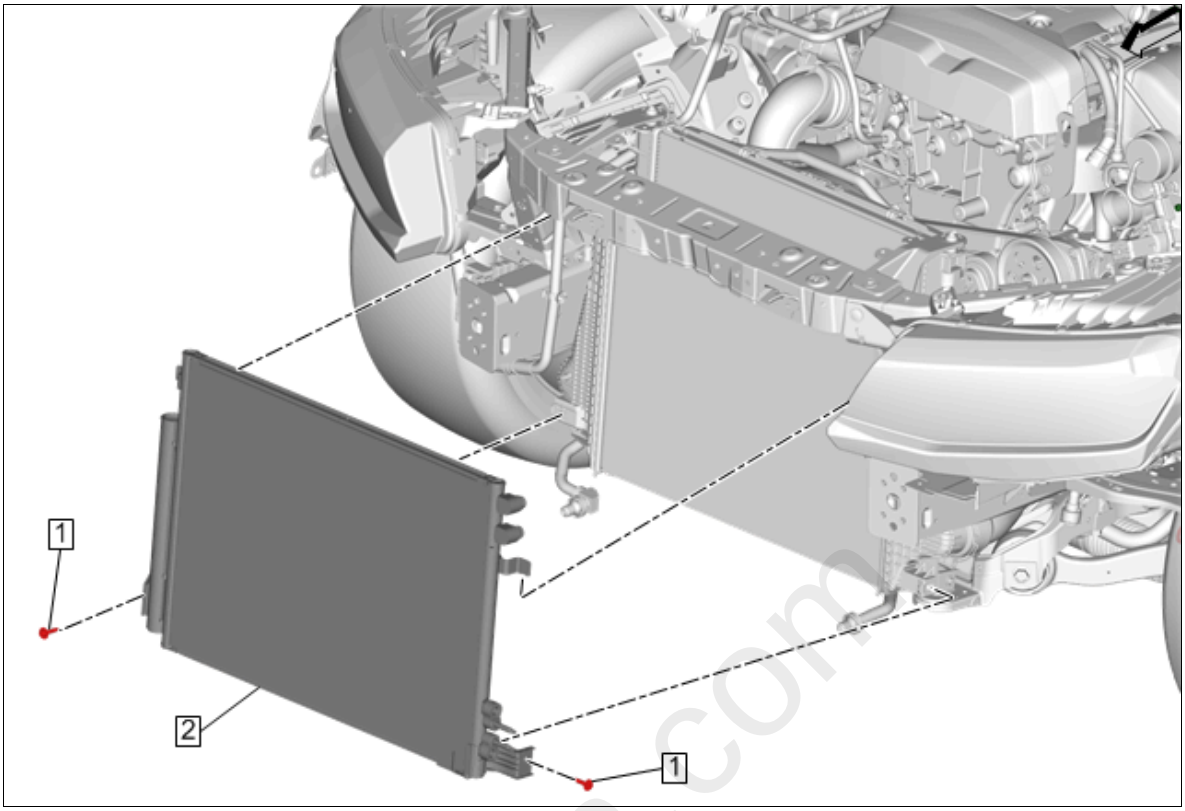
Fig 10: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

14. Remove Radiator Air Lower Baffle (2) - Radiator Air Lower Baffle Replacement (LTG without V18) Radiator Air Lower Baffle Replacement (LTG with V18)

Fig 11: Air Conditioning Condenser

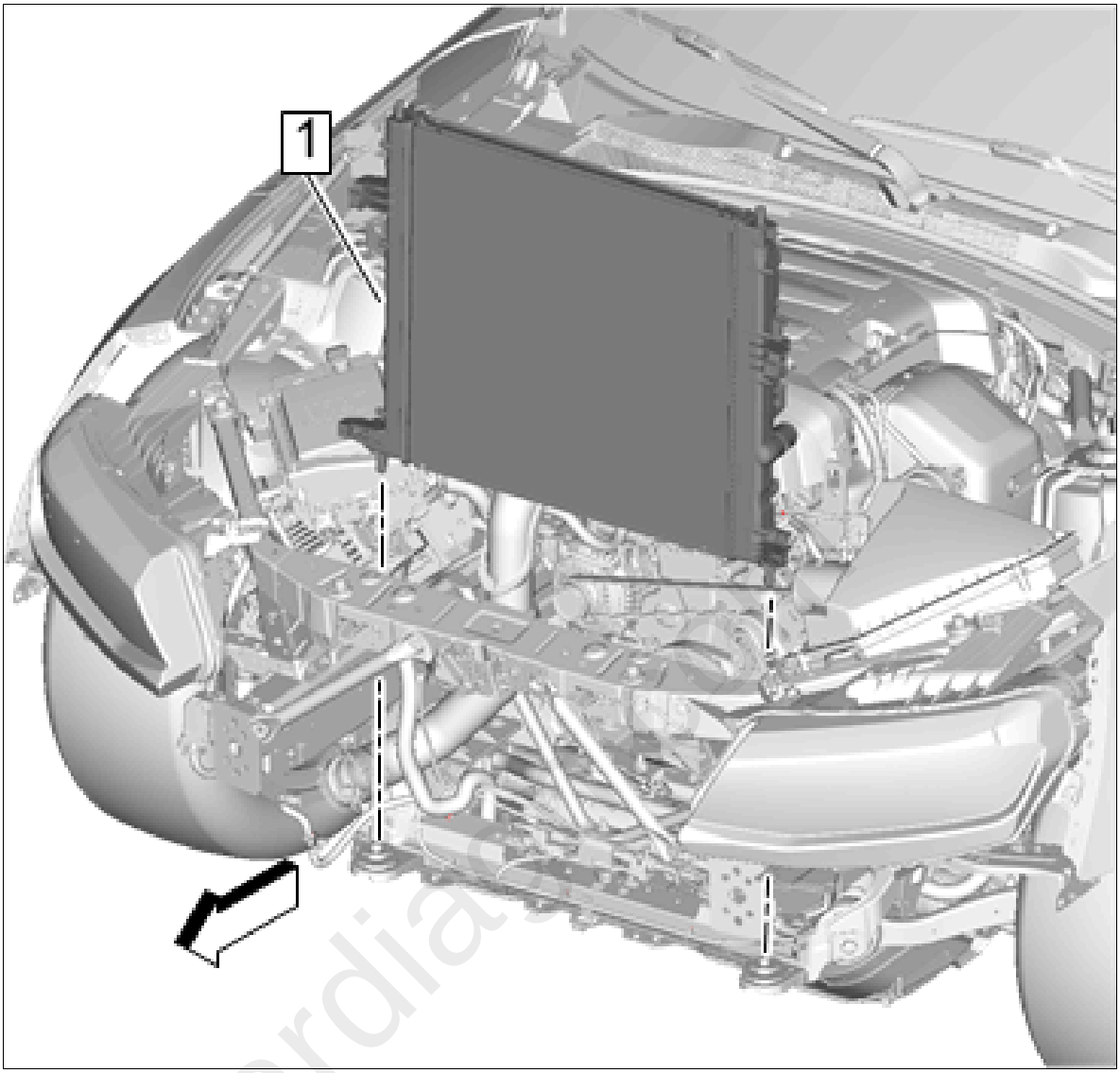


Courtesy of GENERAL MOTORS COMPANY

15. Remove Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LTG with Y4Q)Air Conditioning Condenser Replacement (LTG without Y4Q)
16. Remove Charge Air Cooler RadiatorRemove — Charge Air Cooler Radiator Replacement
17. Reposition the wiring harness.

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Fig 12: Radiator

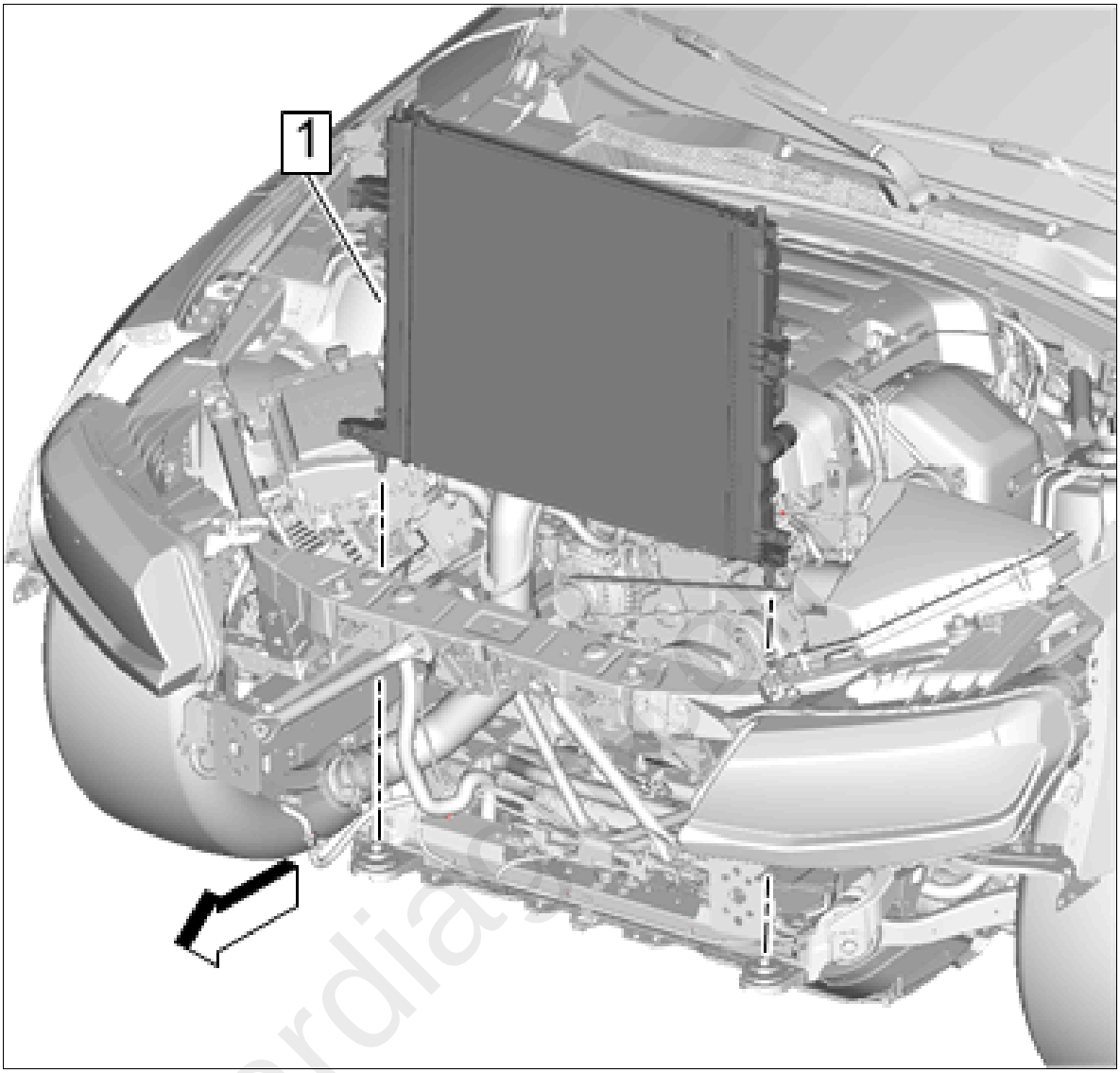


Courtesy of GENERAL MOTORS COMPANY

18. Remove Radiator (1)
19. Transfer components as necessary.

REPAIR INSTRUCTIONS > RADIATOR REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

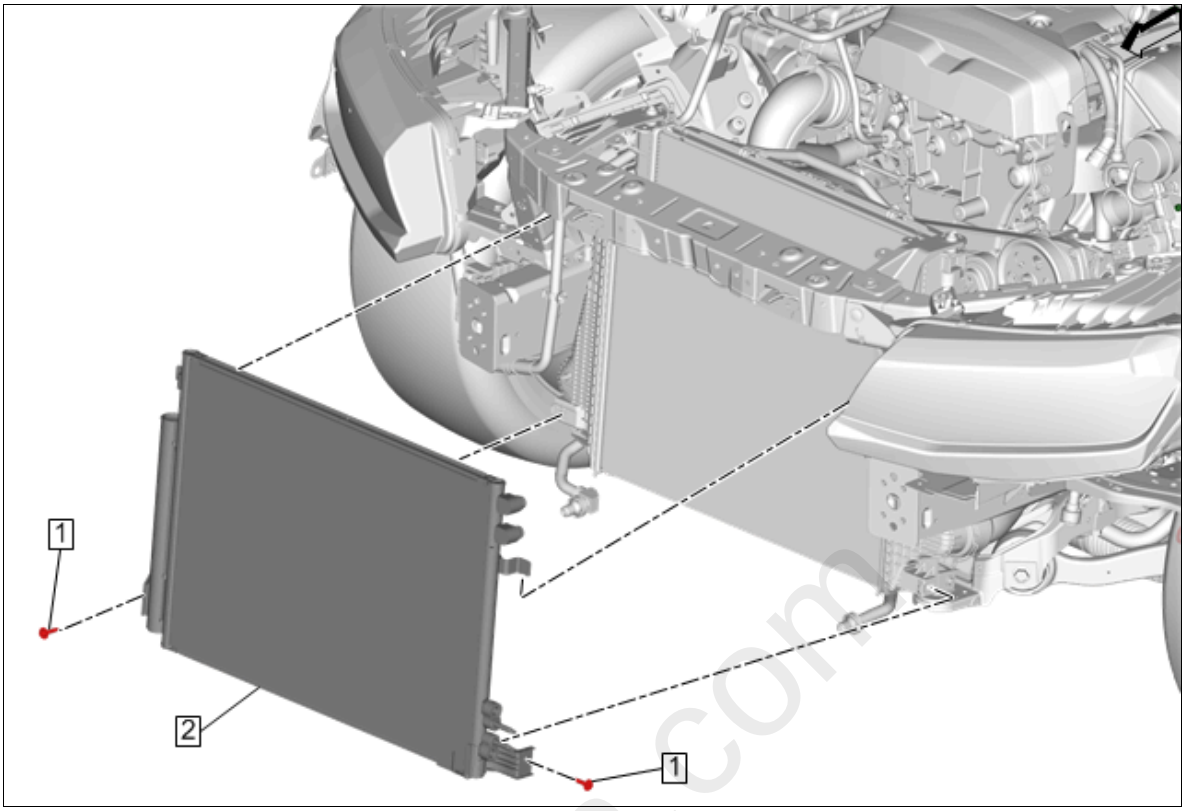
Fig 1: Radiator



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator (1)
2. Reposition the wiring harness.
3. Install Charge Air Cooler Radiator - Charge Air Cooler Radiator Replacement

Fig 2: Air Conditioning Condenser

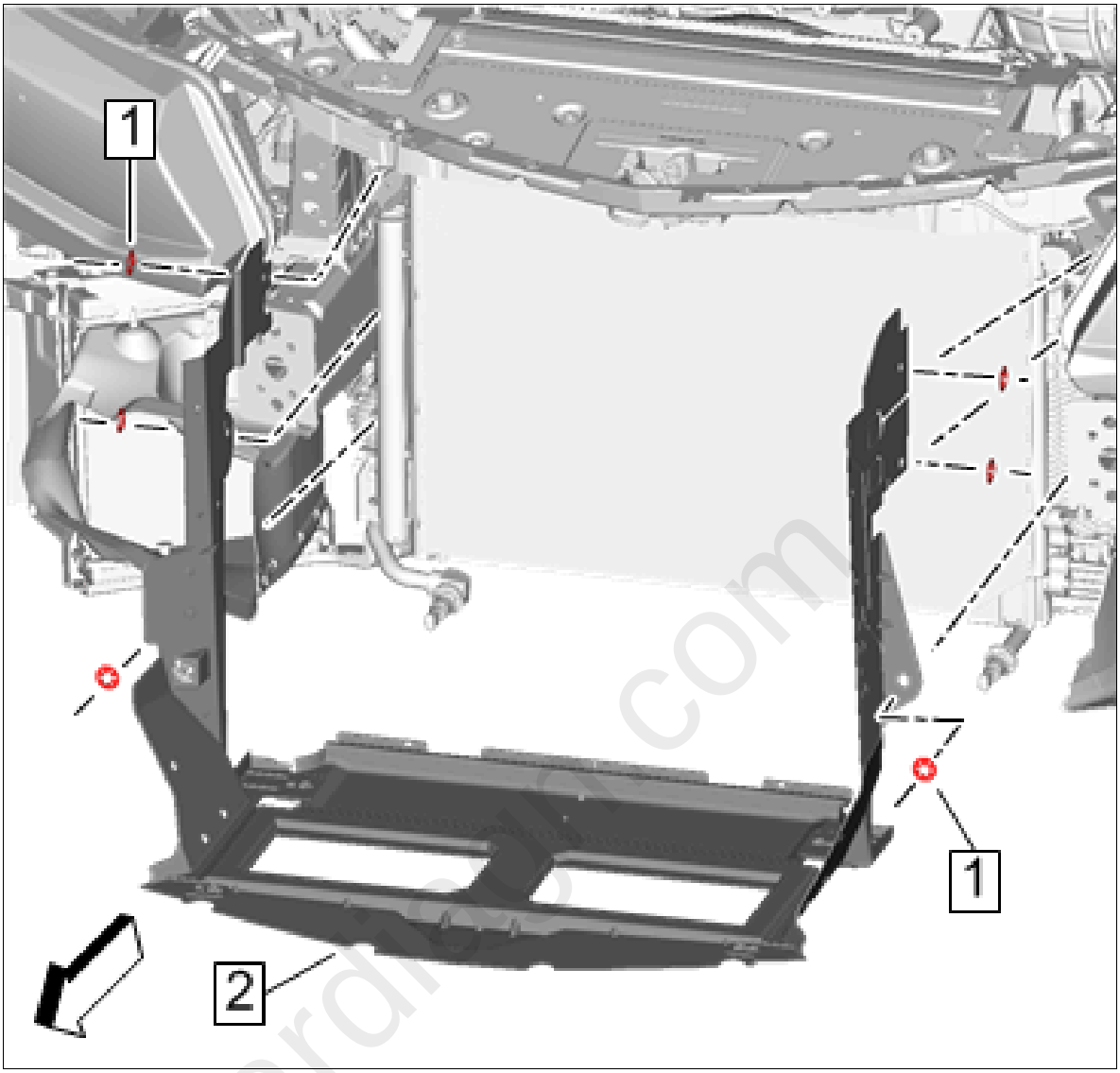


Courtesy of GENERAL MOTORS COMPANY

4. Install Air Conditioning Condenser (2) - Air Conditioning Condenser Replacement (LTG with Y4Q)Air Conditioning Condenser Replacement (LTG without Y4Q)

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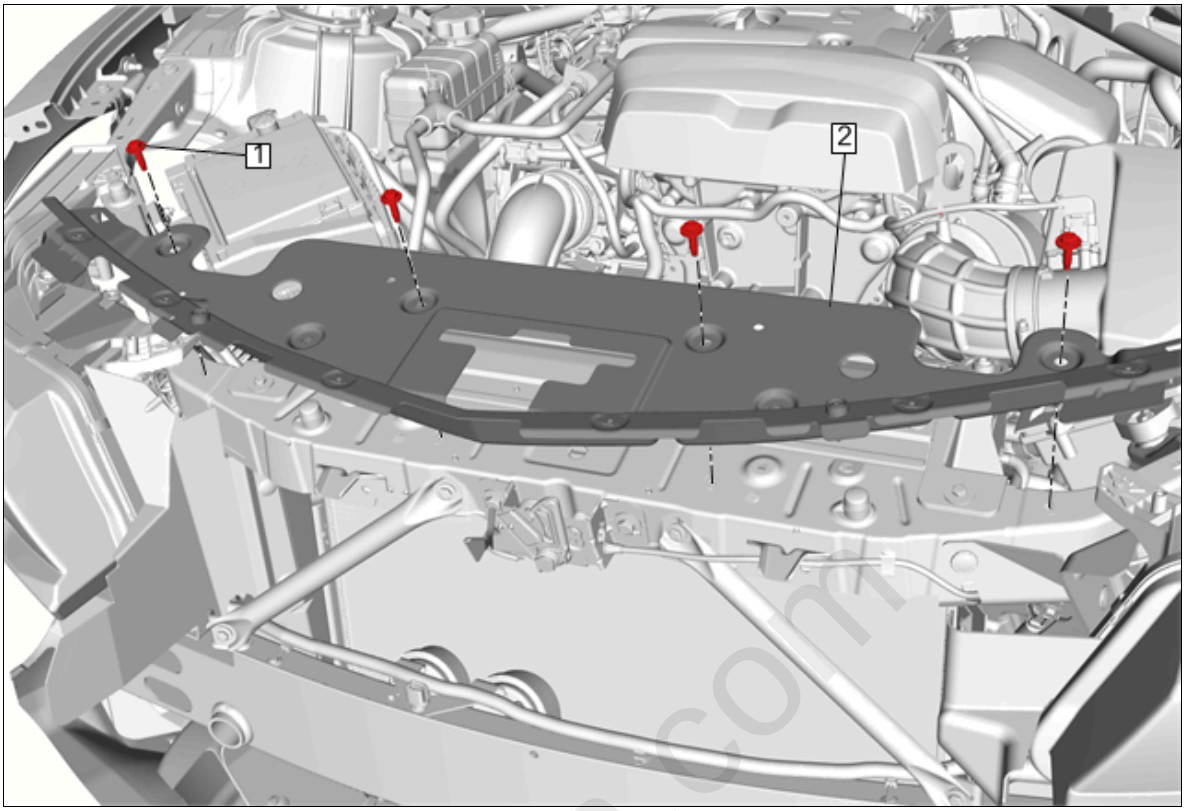
Fig 3: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Air Lower Baffle (2) - Radiator Air Lower Baffle Replacement (LTG without V18) Radiator Air Lower Baffle Replacement (LTG with V18)

Fig 4: Front Bumper Fascia Center Support

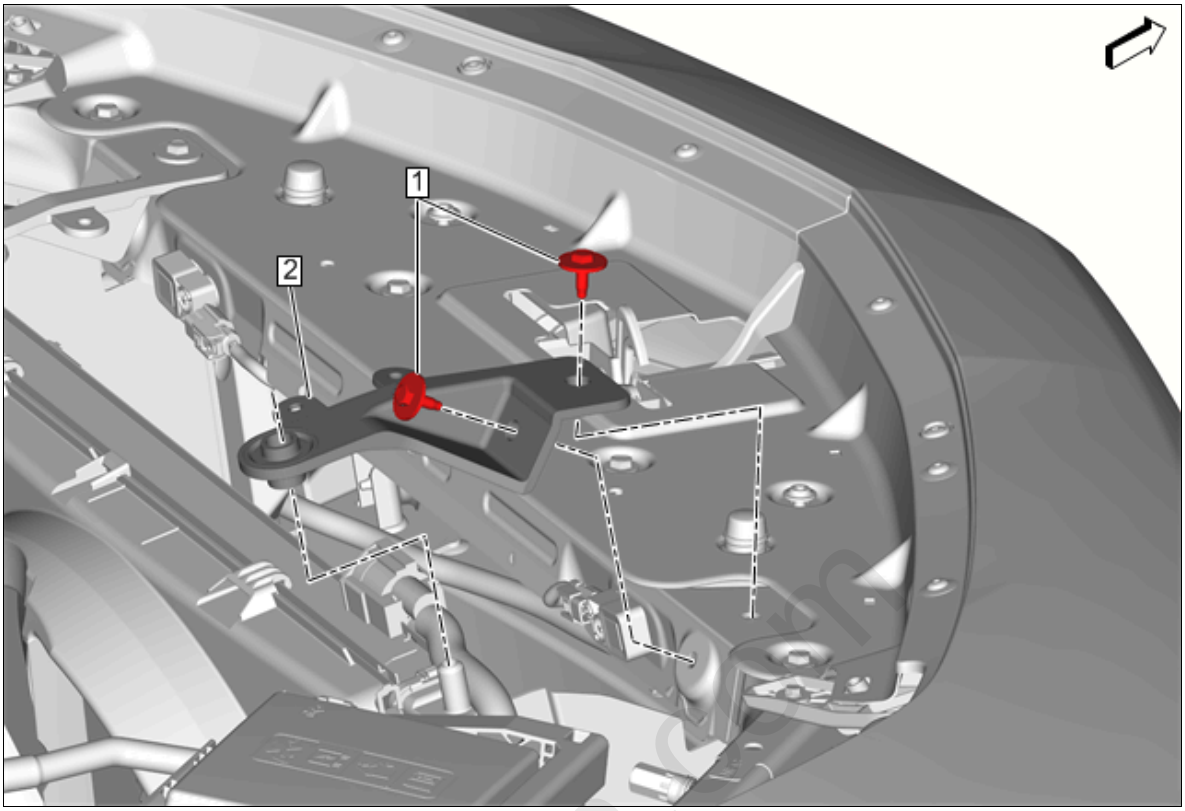


Courtesy of GENERAL MOTORS COMPANY

6. Install Front Bumper Fascia Center Support (2) - Front Bumper Fascia Center Support Replacement

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Fig 5: Radiator Upper Bracket - Right Side

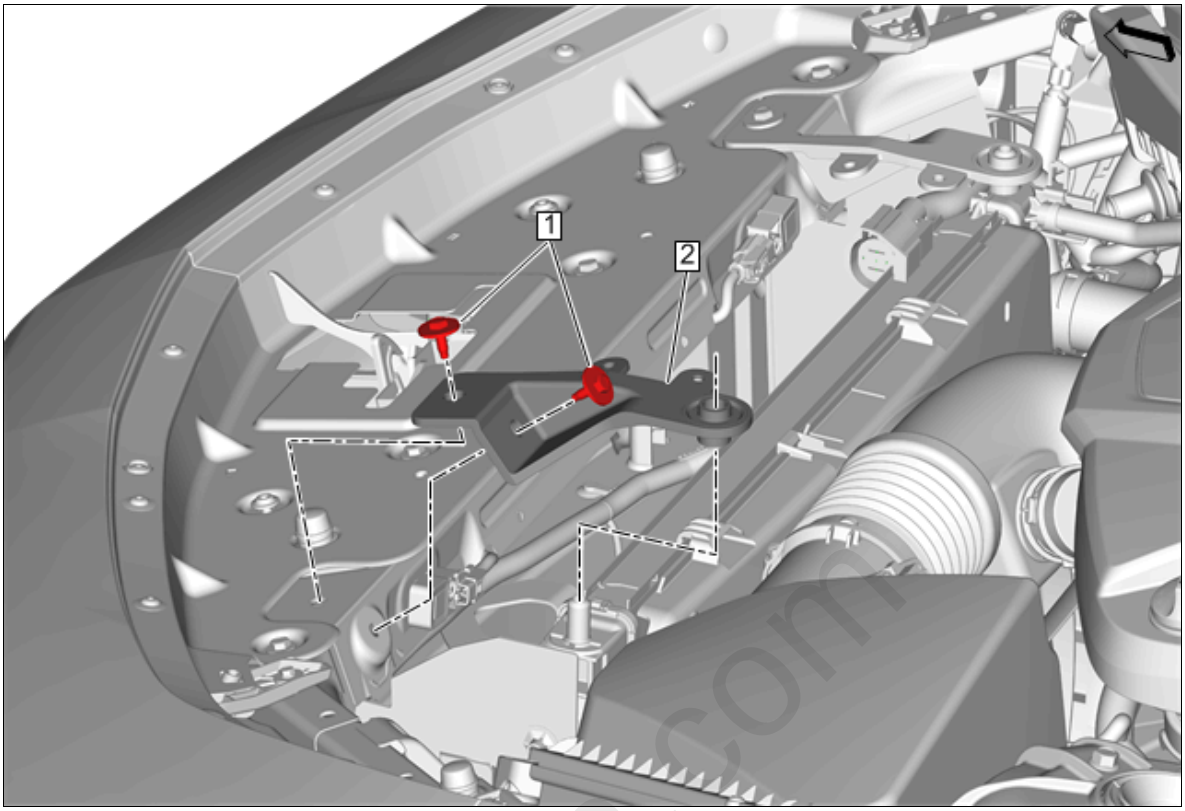


Courtesy of GENERAL MOTORS COMPANY

7. Install Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Right Side (LGX LTG)

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Fig 6: Radiator Upper Bracket - Left Side

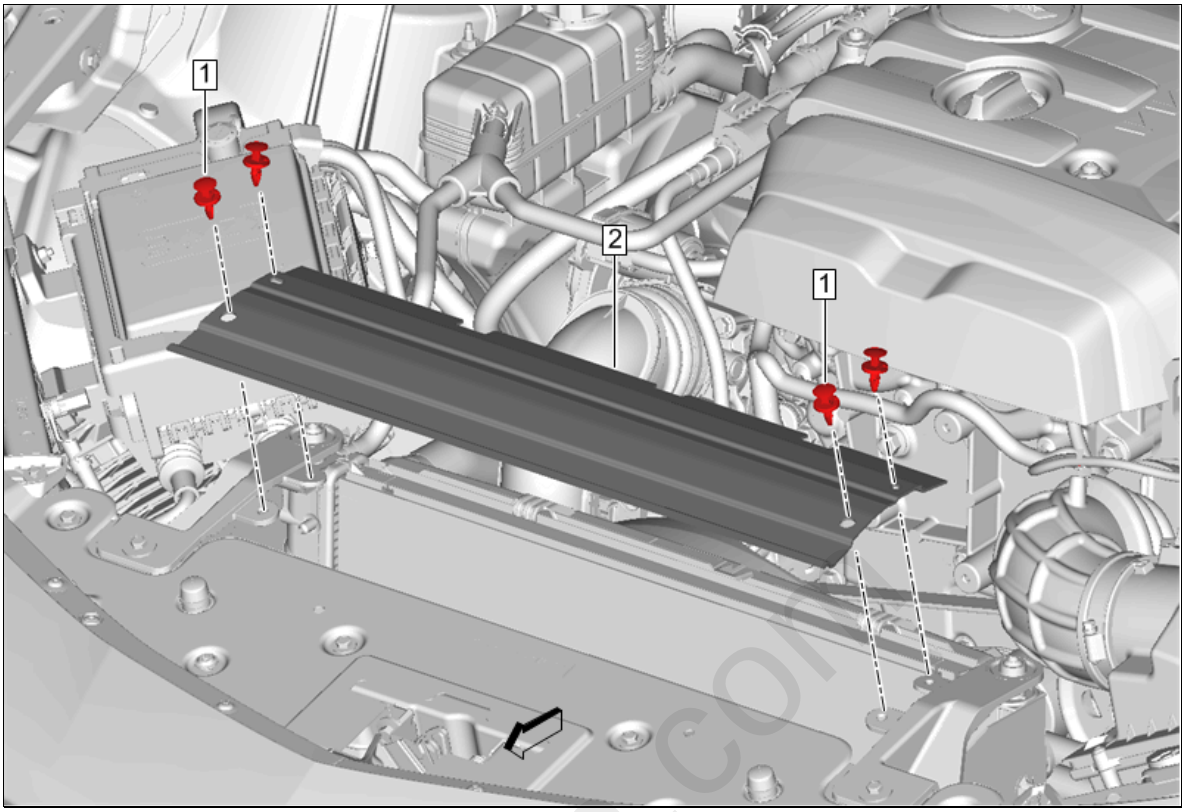


Courtesy of GENERAL MOTORS COMPANY

8. Install Radiator Upper Bracket (2) - Radiator Upper Bracket Replacement - Left Side (LGX LTG)

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Fig 7: Radiator Air Upper Baffle

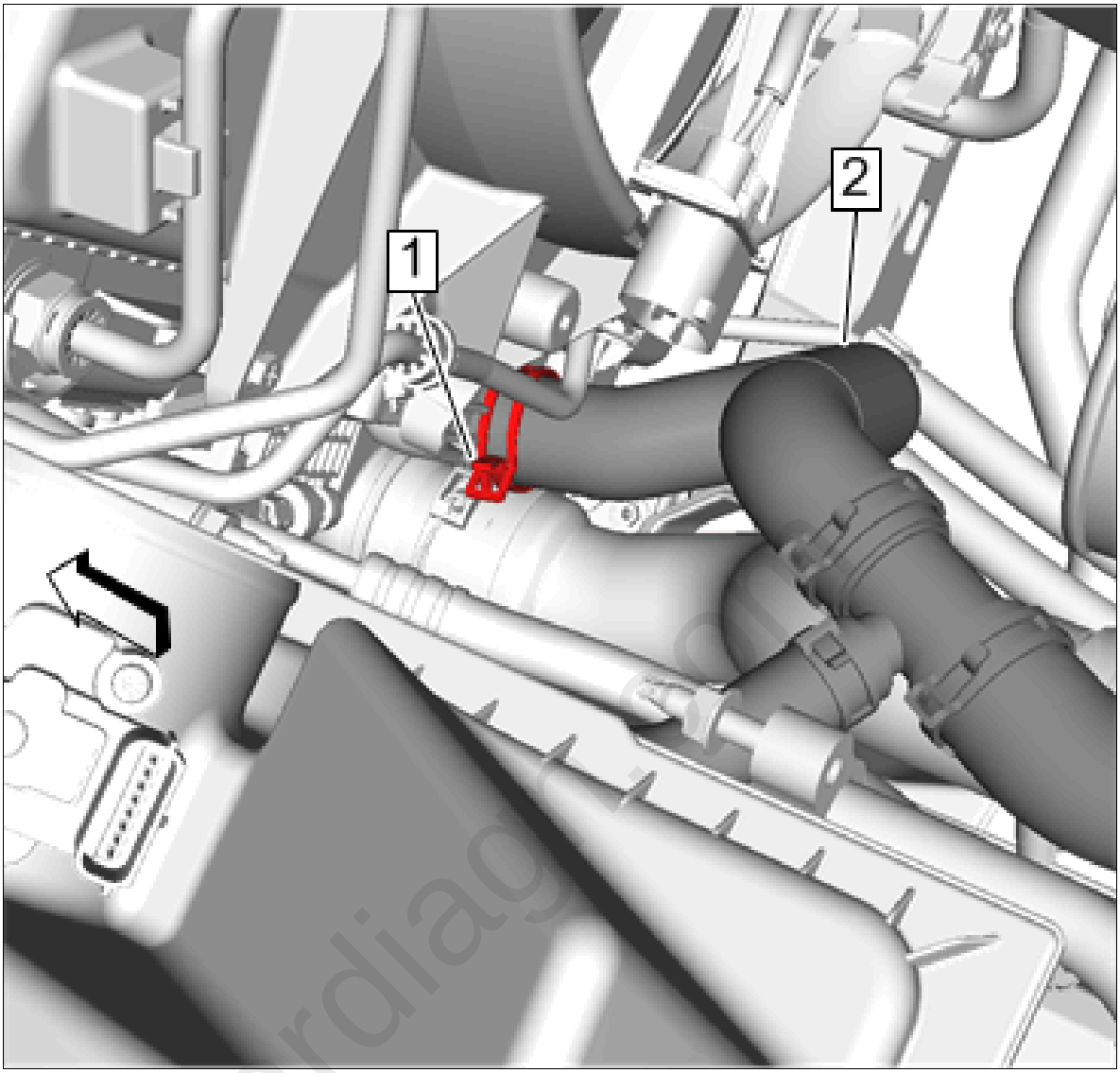


Courtesy of GENERAL MOTORS COMPANY

9. Install Radiator Air Upper Baffle (2) - Radiator Air Upper Baffle and Deflector Replacement (LTG)

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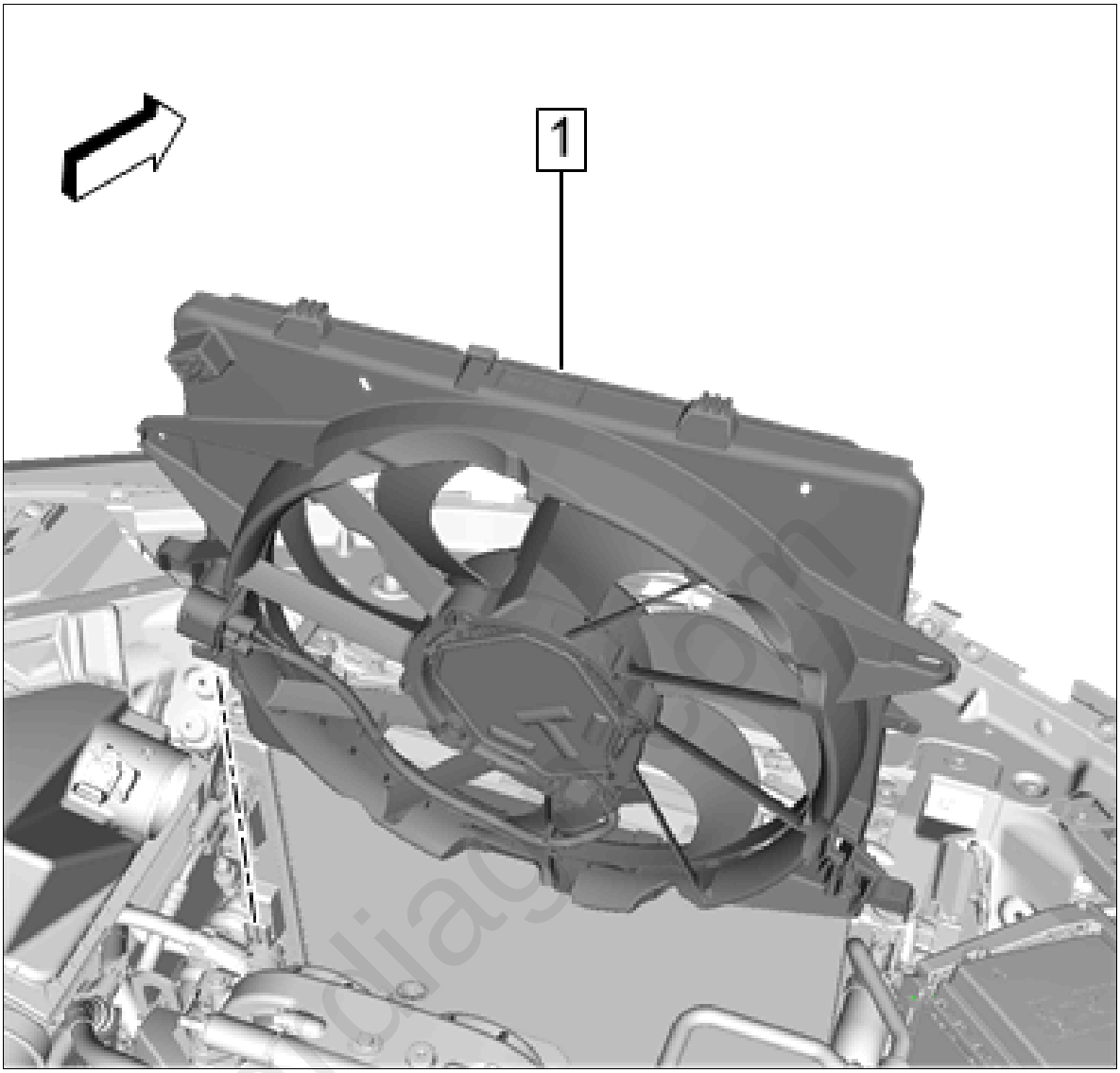
Fig 8: Radiator Outlet Hose



Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Outlet Hose (2) at Radiator Assembly - Radiator Outlet Hose Replacement (LTG without V18) Radiator Outlet Hose Replacement (LTG with V18)

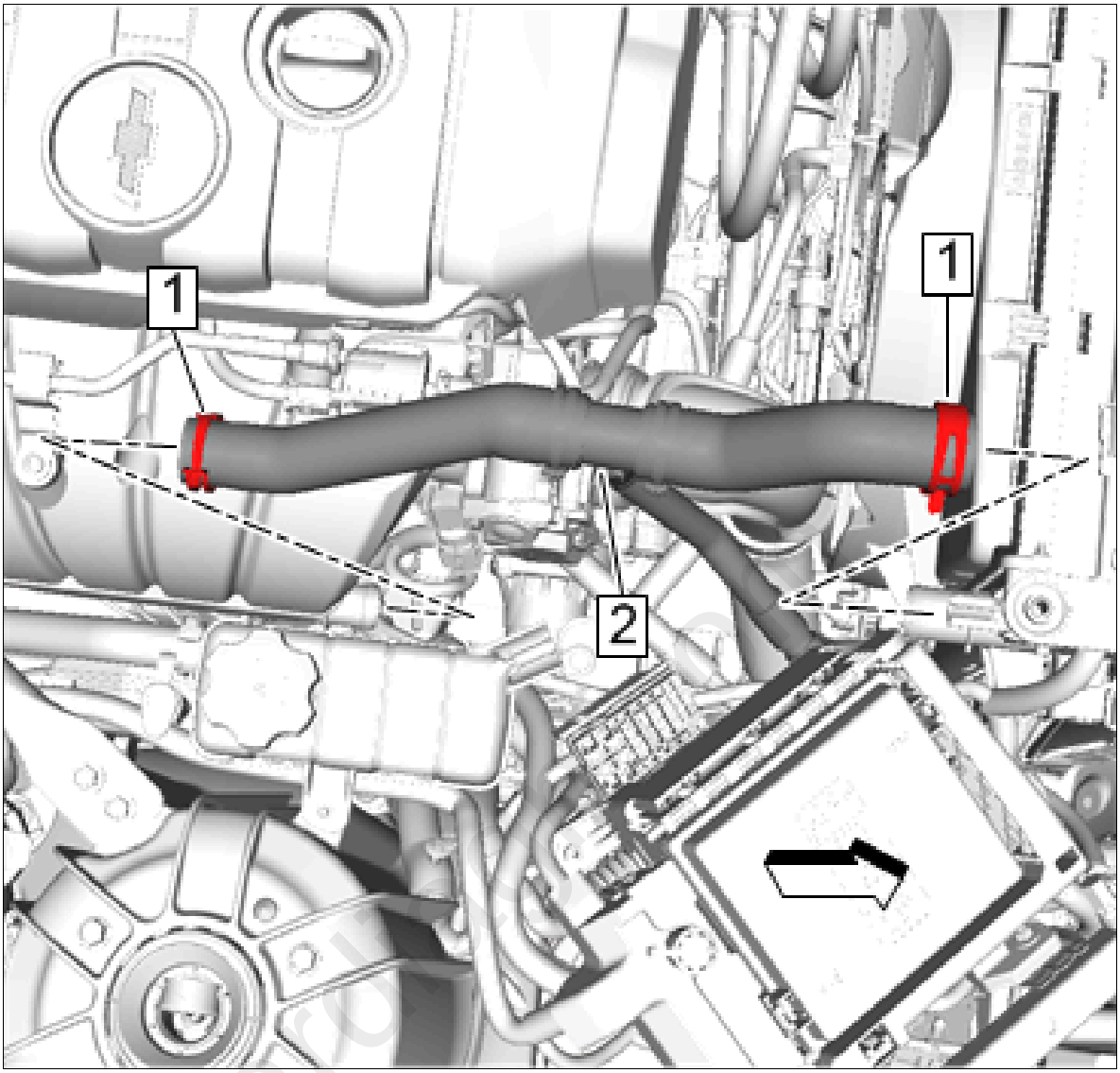
Fig 9: Engine Coolant Fan Assembly



Courtesy of GENERAL MOTORS COMPANY

11. Install Engine Coolant Fan (1) at Radiator - Engine Coolant Fan Replacement (LTG without V18) Engine Coolant Fan Replacement (LTG with V18)

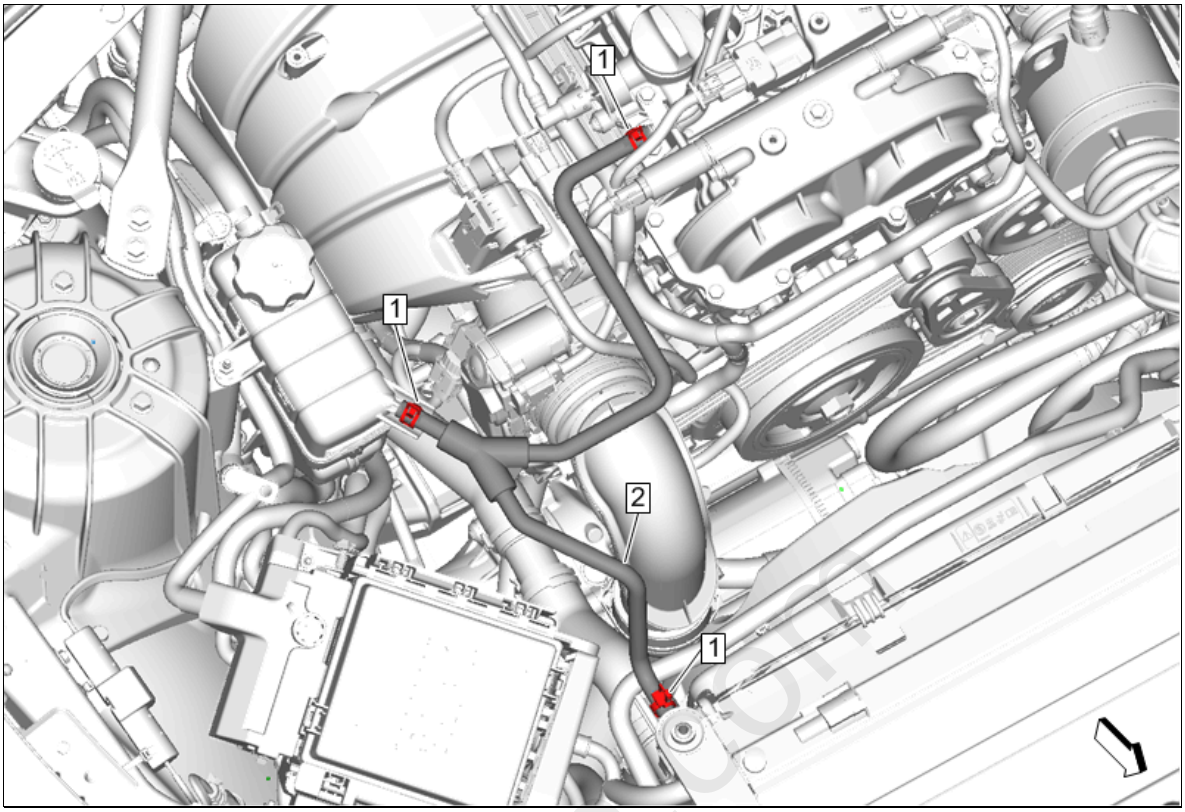
Fig 10: Radiator Inlet Hose



Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Inlet Hose (2) at Radiator - Radiator Inlet Hose Replacement (LTG without V18) Radiator Inlet Hose Replacement (LTG with V18)

Fig 11: Radiator Surge Tank Inlet Hose



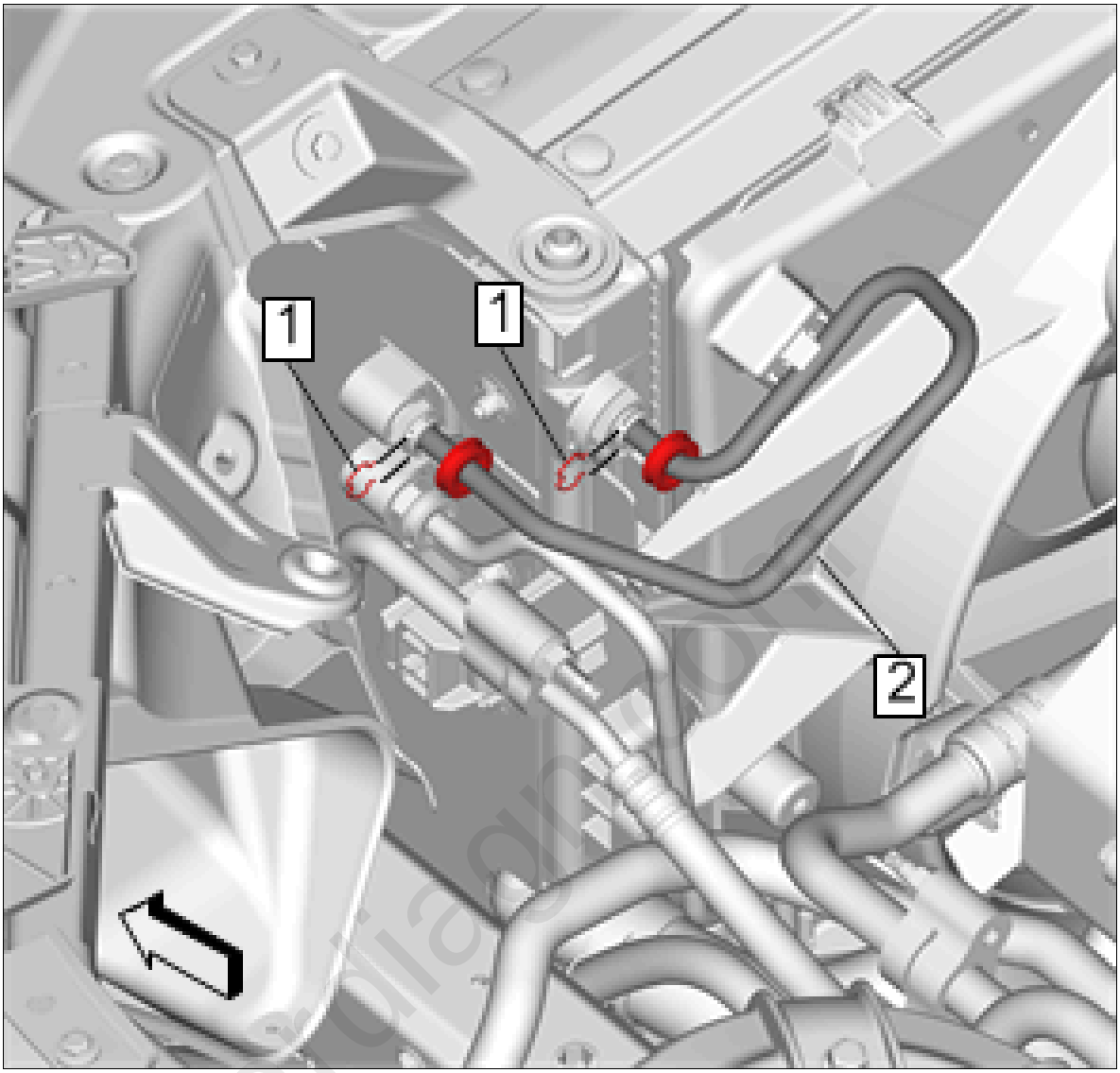
Courtesy of GENERAL MOTORS COMPANY

13. Install Radiator Surge Tank Inlet Hose (2) at Radiator - Radiator Surge Tank Inlet Hose Replacement (LTG)

14. Install Transmission Fluid Cooler Inlet and Outlet Pipe at Radiator - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

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Fig 12: Transmission Fluid Cooler Pipe

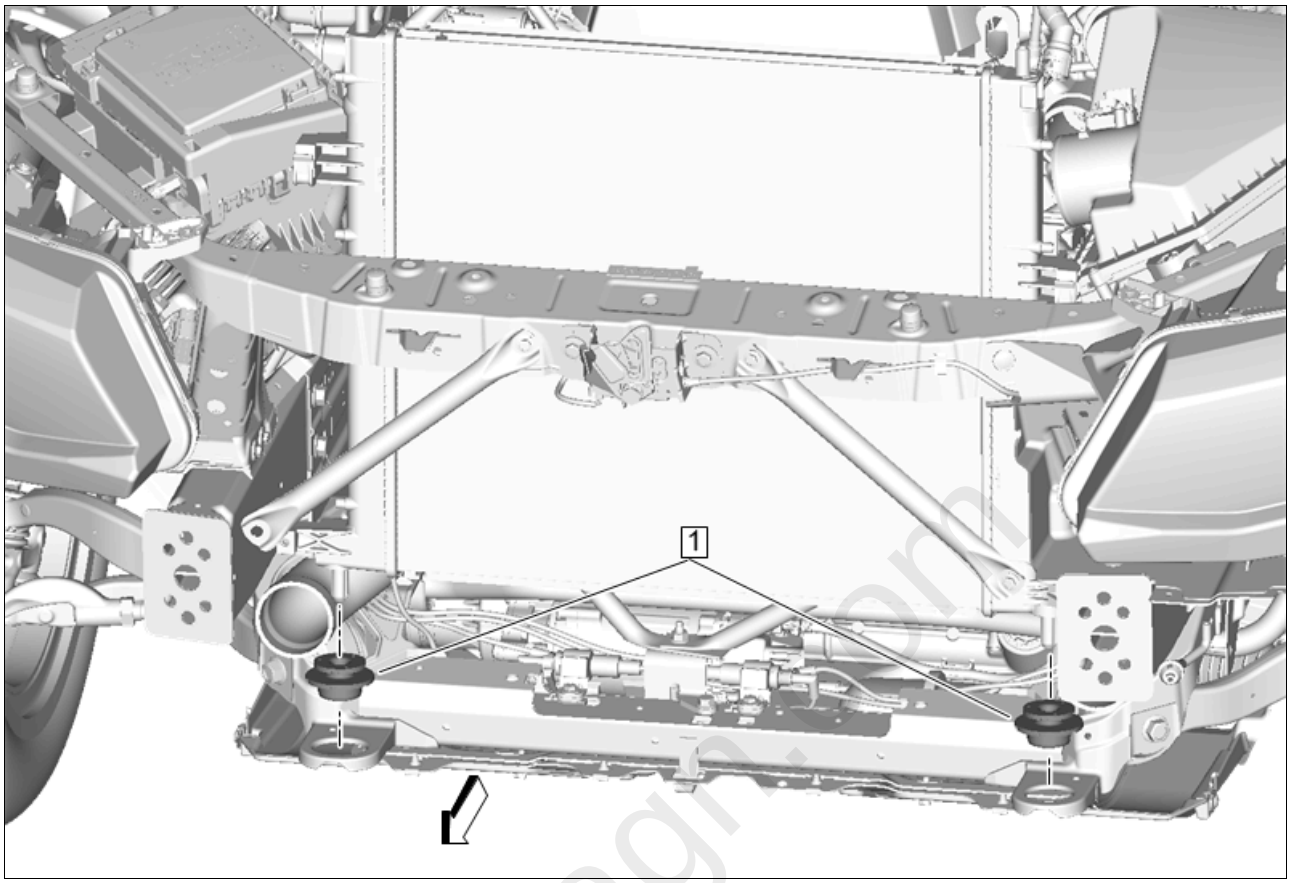


Courtesy of GENERAL MOTORS COMPANY

15. Install Transmission Fluid Cooler Pipe (2) - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)
16. Install Air Cleaner Outlet Duct - Air Cleaner Outlet Duct Replacement
17. Recharge the refrigerant. Refrigerant Recovery and Recharging (R-134a)Refrigerant Recovery and Recharging (R-1234yf)
18. Fill the cooling system. Cooling System Draining and Filling (GE 47716) Cooling System Draining and Filling (Static Fill)
19. Start the engine and check for coolant leaks.
20. Inspect for refrigerant leaks.

REPAIR INSTRUCTIONS > RADIATOR LOWER INSULATOR REPLACEMENT

Fig 1: Radiator Lower Insulator



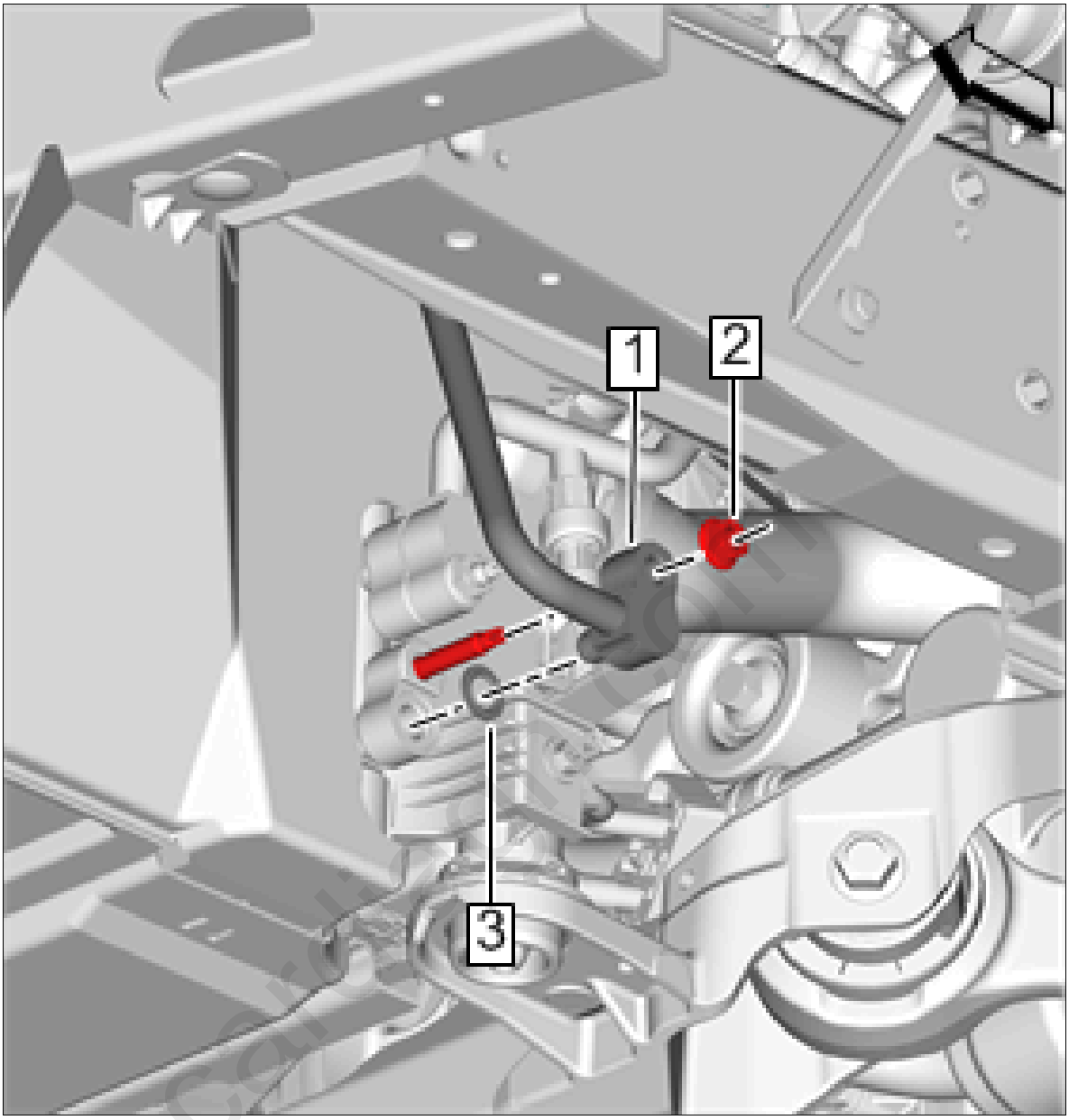
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Radiator Replacement (LT1) Radiator Replacement (LGX) Radiator Replacement (LTG without V18) Radiator Replacement (LTG with V18)	
1	Radiator Lower Insulator (Qty: 2)

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LGX WITHOUT V03) > REMOVAL PROCEDURE

1. Remove Radiator Air Side Baffle Replacement - Left Side (LGX LTG)
2. Remove Radiator Air Side Baffle Replacement - Right Side (LGX) Radiator Air Side Baffle Replacement - Right Side (LTG LT1)

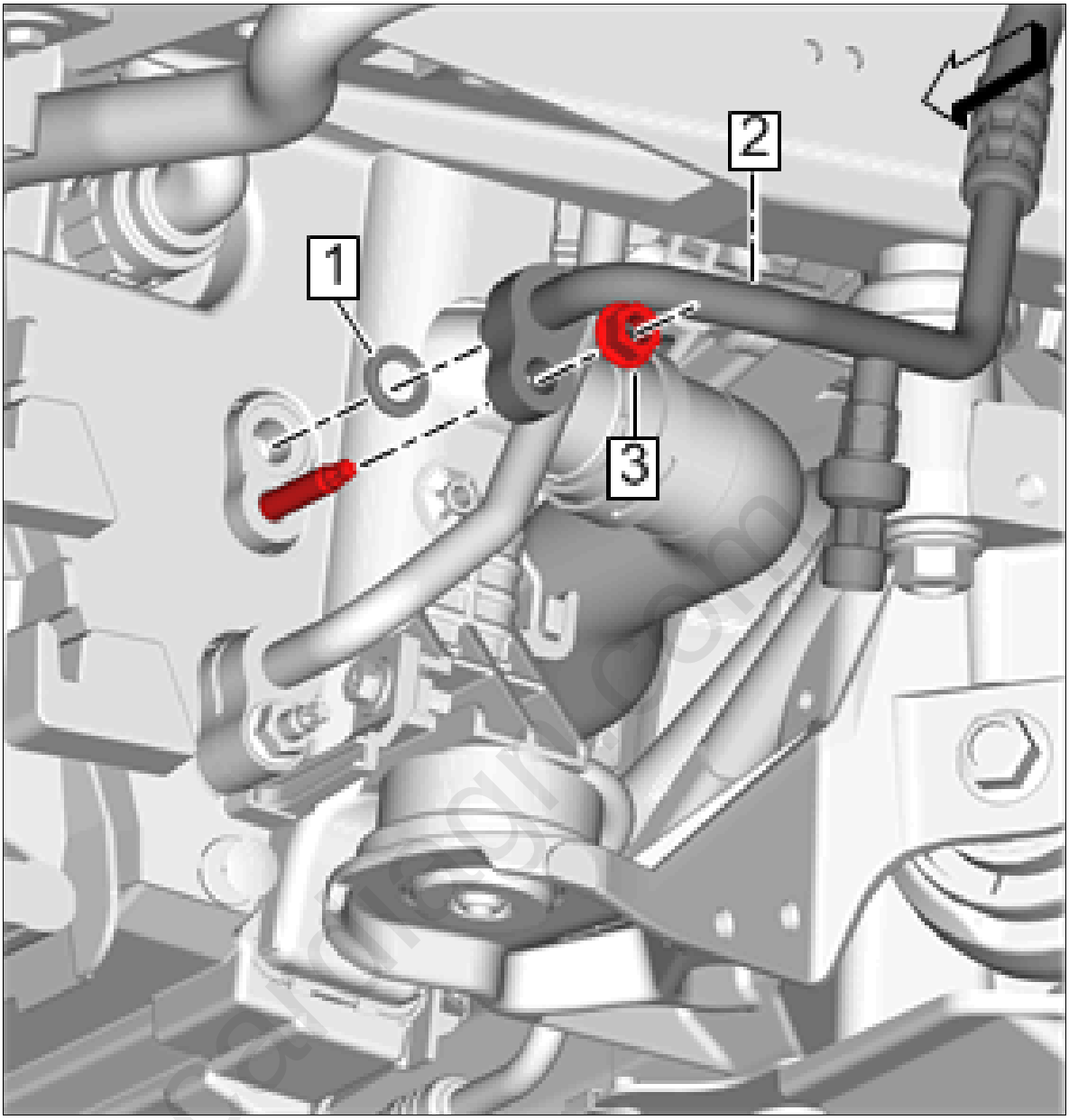
Fig 1: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

3. Remove Air Conditioning Condenser Tube (1) at Air Conditioning Condenser - Condenser Tube Replacement (LGX without V18)Condenser Tube Replacement (LGX with V18)

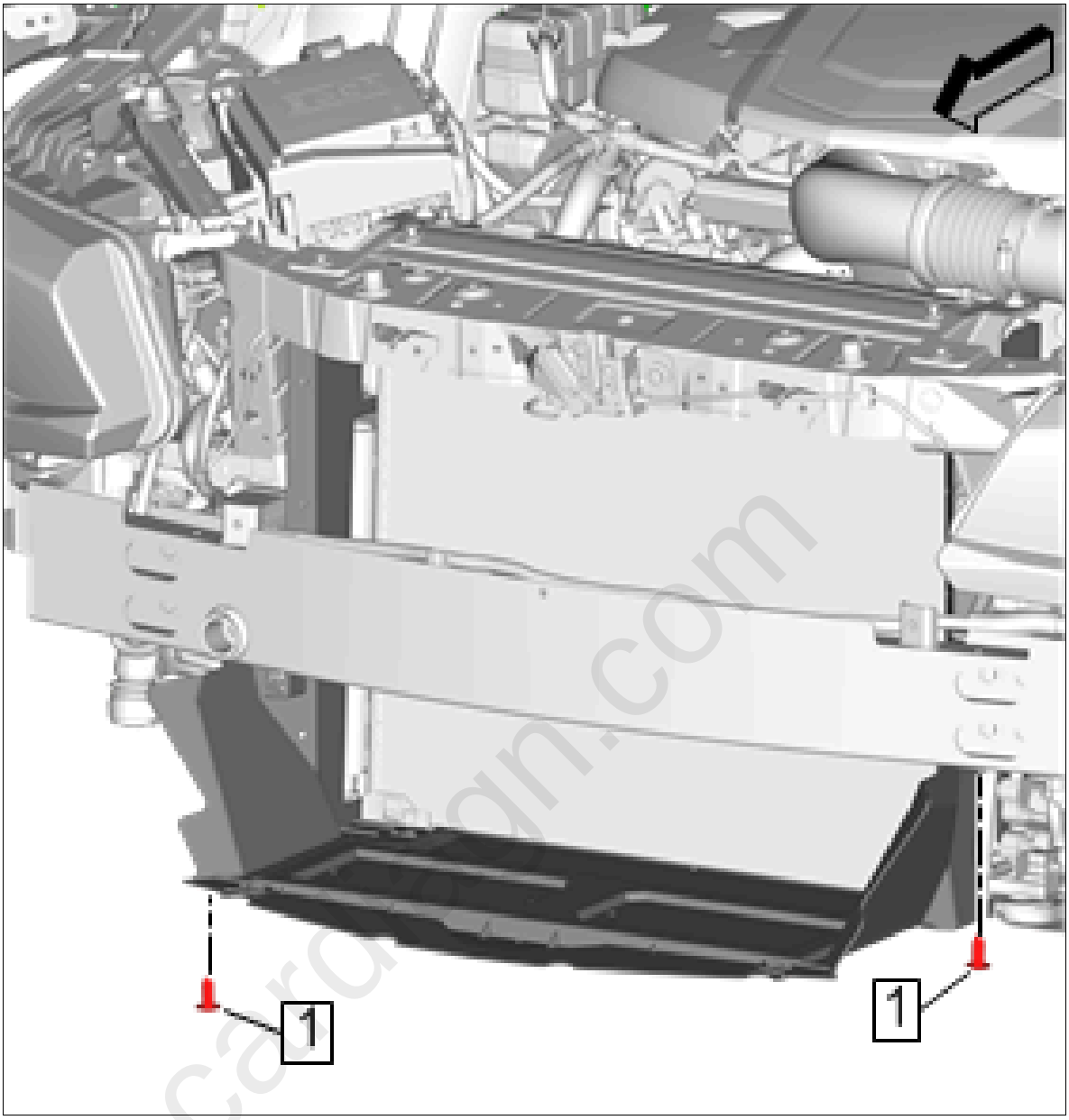
Fig 2: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

4. Remove Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LGX without J6G)Air Conditioning Compressor Hose Replacement (LGX with J6G)

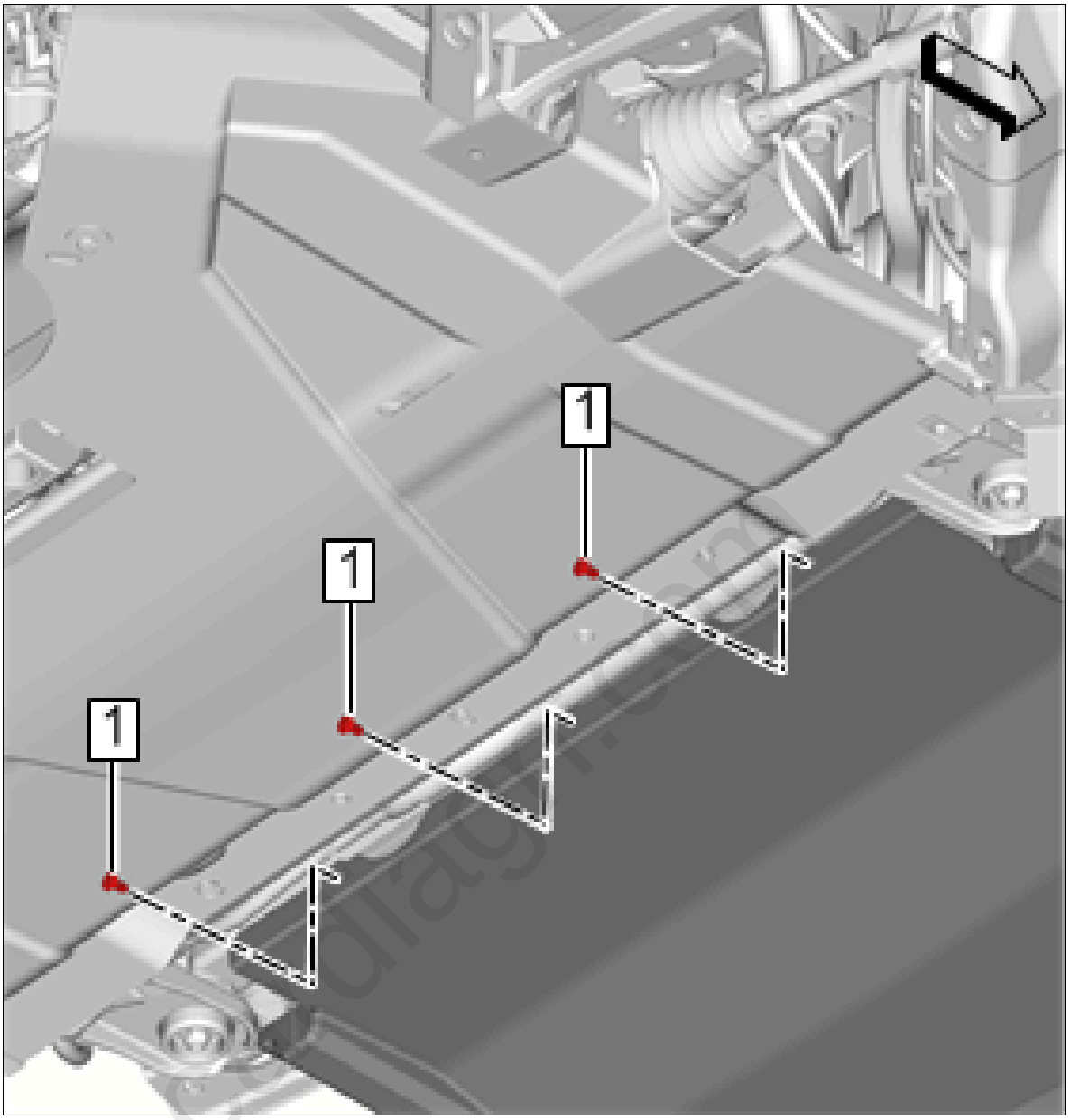
Fig 3: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Baffle Retainer (1) (Qty: 2)
6. Remove Front Bumper Impact Bar Replacement (Without Y4Q)

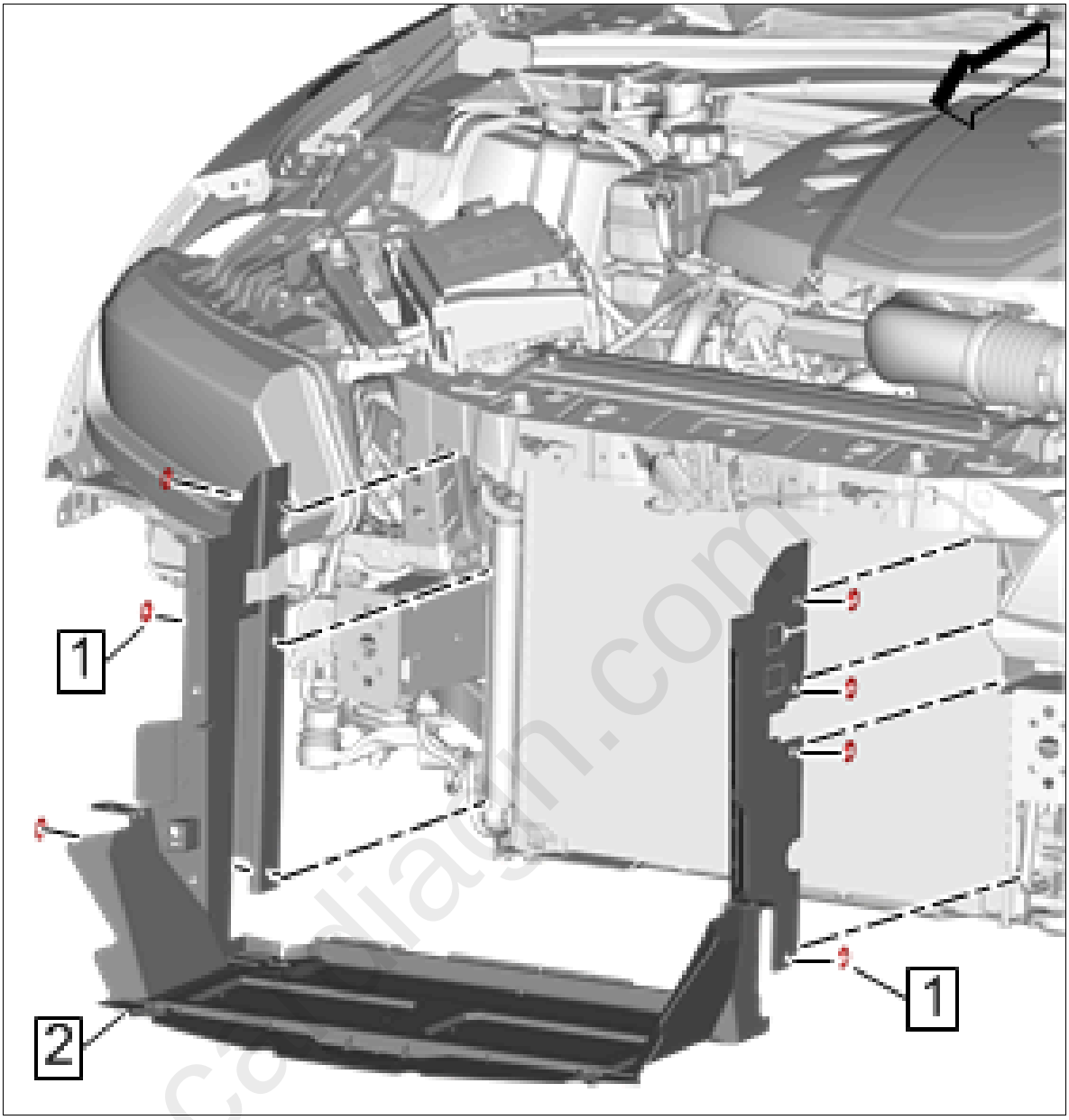
Fig 4: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Air Baffle Retainer (1) (Qty: 3)

Fig 5: Radiator Air Lower Baffle

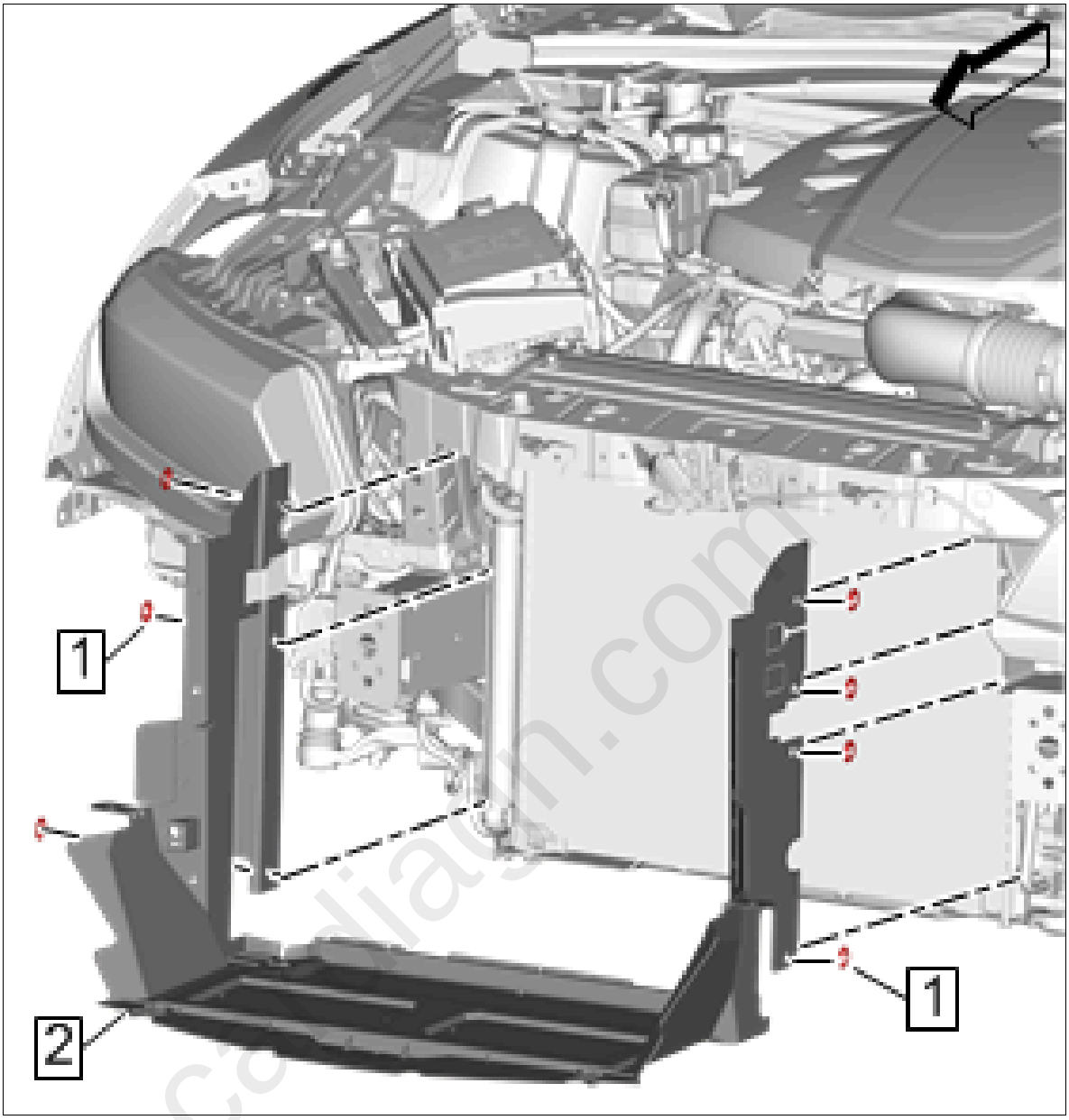


Courtesy of GENERAL MOTORS COMPANY

8. Remove Radiator Air Baffle Retainer (1) (Qty: 7)
9. Remove Radiator Air Lower Baffle

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LGX WITHOUT V03) > INSTALLATION PROCEDURE

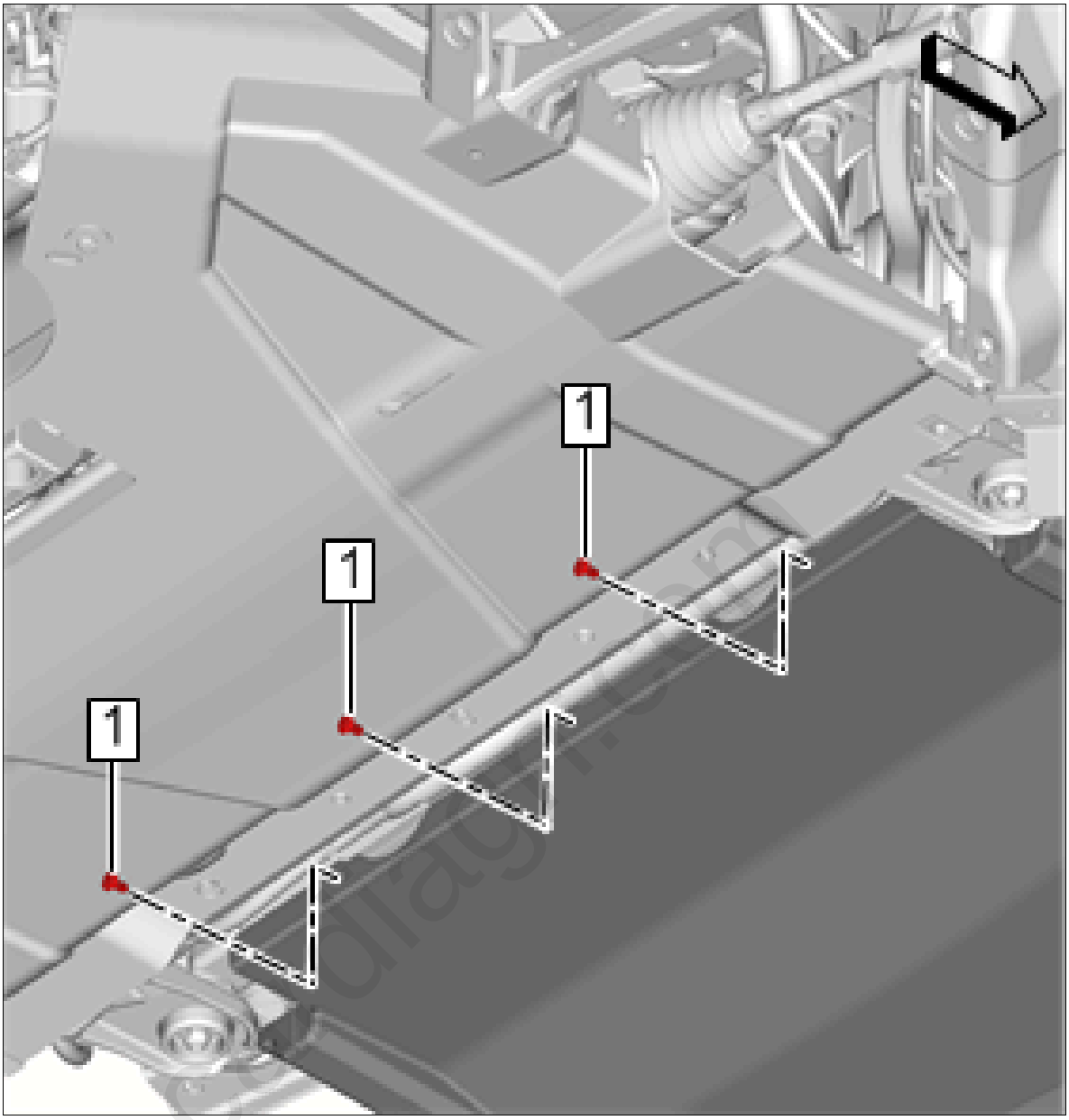
Fig 1: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Lower Baffle
2. Install Radiator Air Baffle Retainer (1) (Qty: 7)

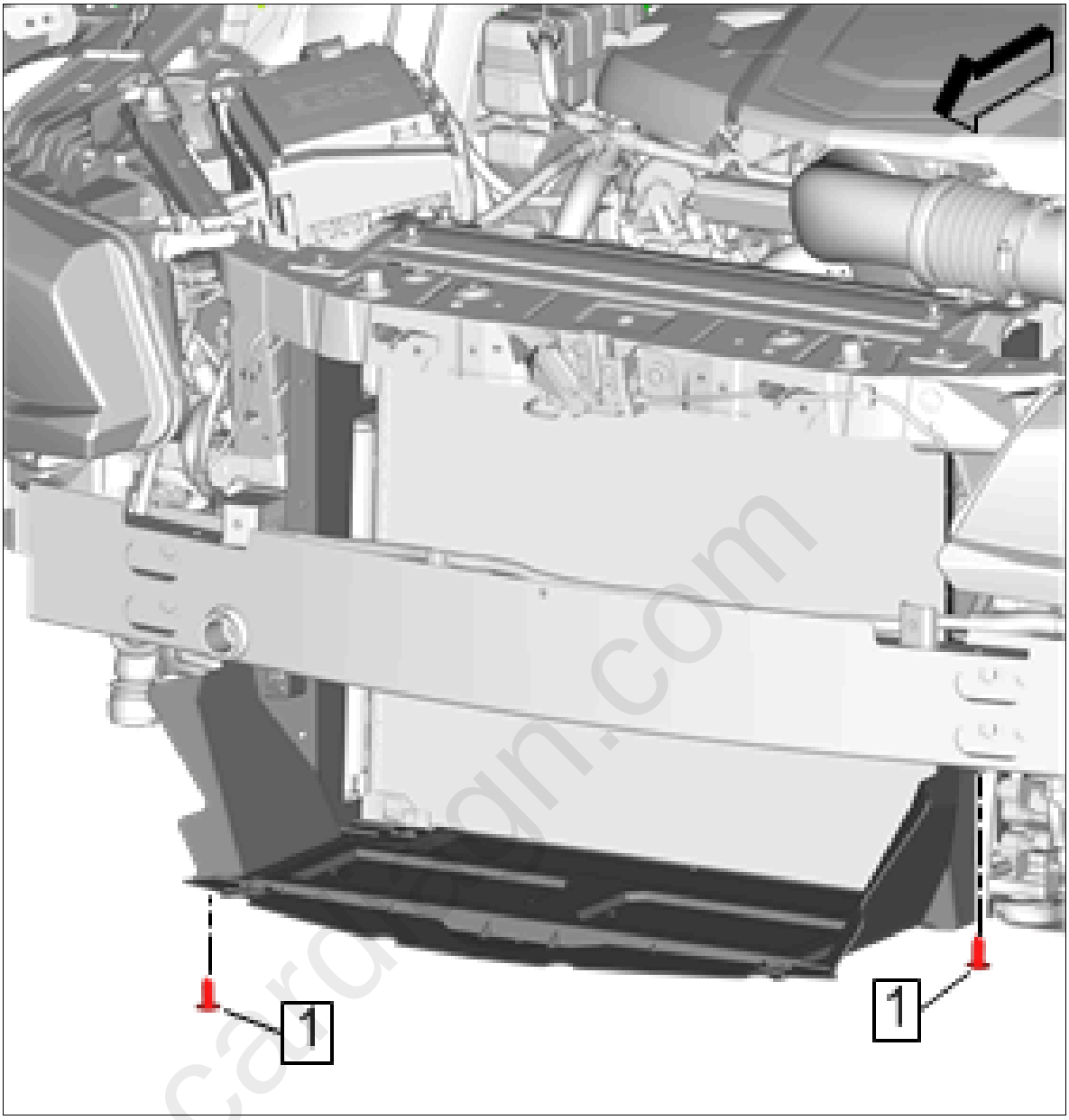
Fig 2: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Air Baffle Retainer (1) (Qty: 3)
4. Install Front Bumper Impact Bar Replacement (Without Y4Q)

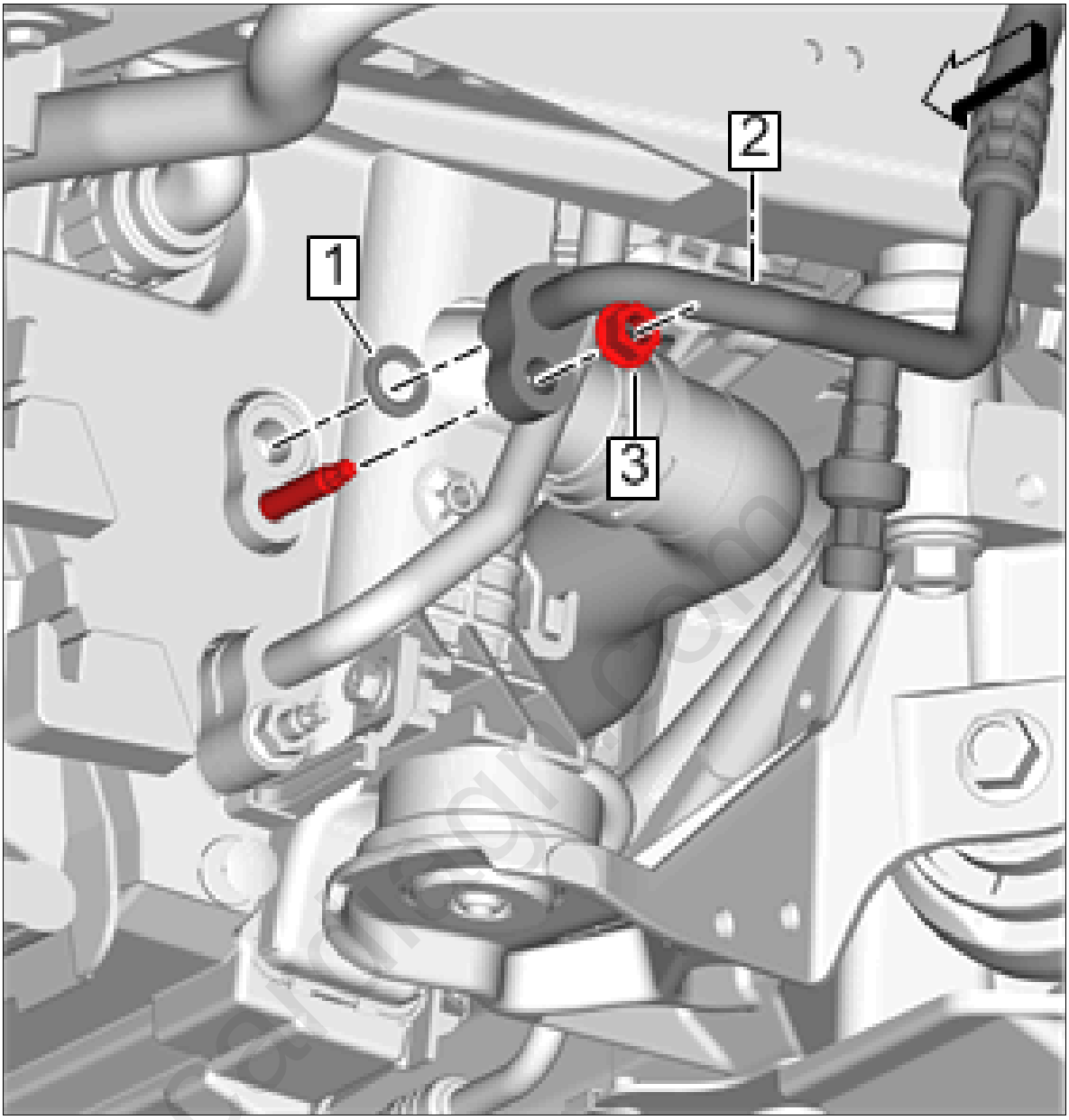
Fig 3: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Air Baffle Retainer (1) (Qty: 2)

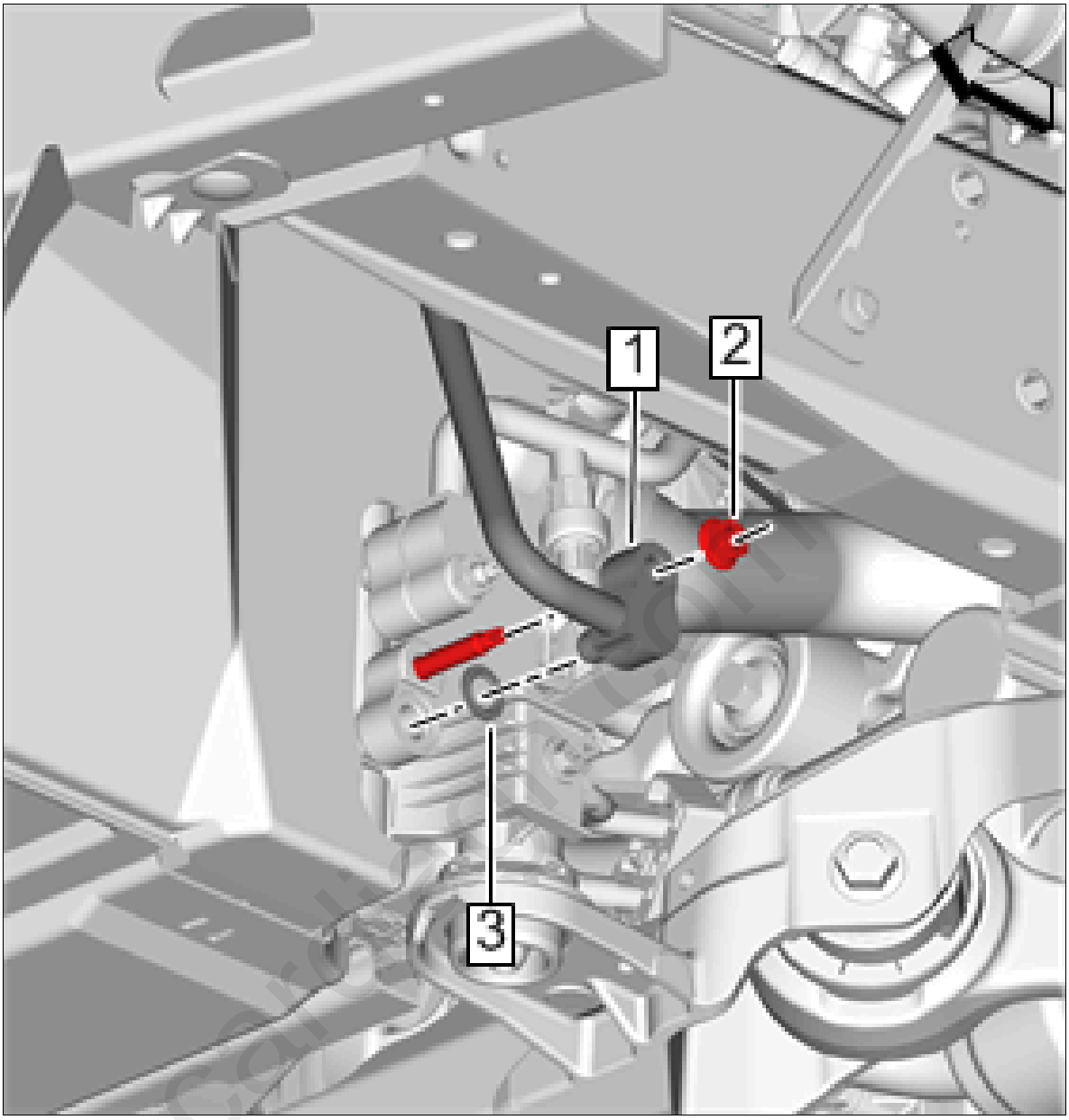
Fig 4: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

6. Install Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LGX without J6G)Air Conditioning Compressor Hose Replacement (LGX with J6G)

Fig 5: Air Conditioning Condenser Tube

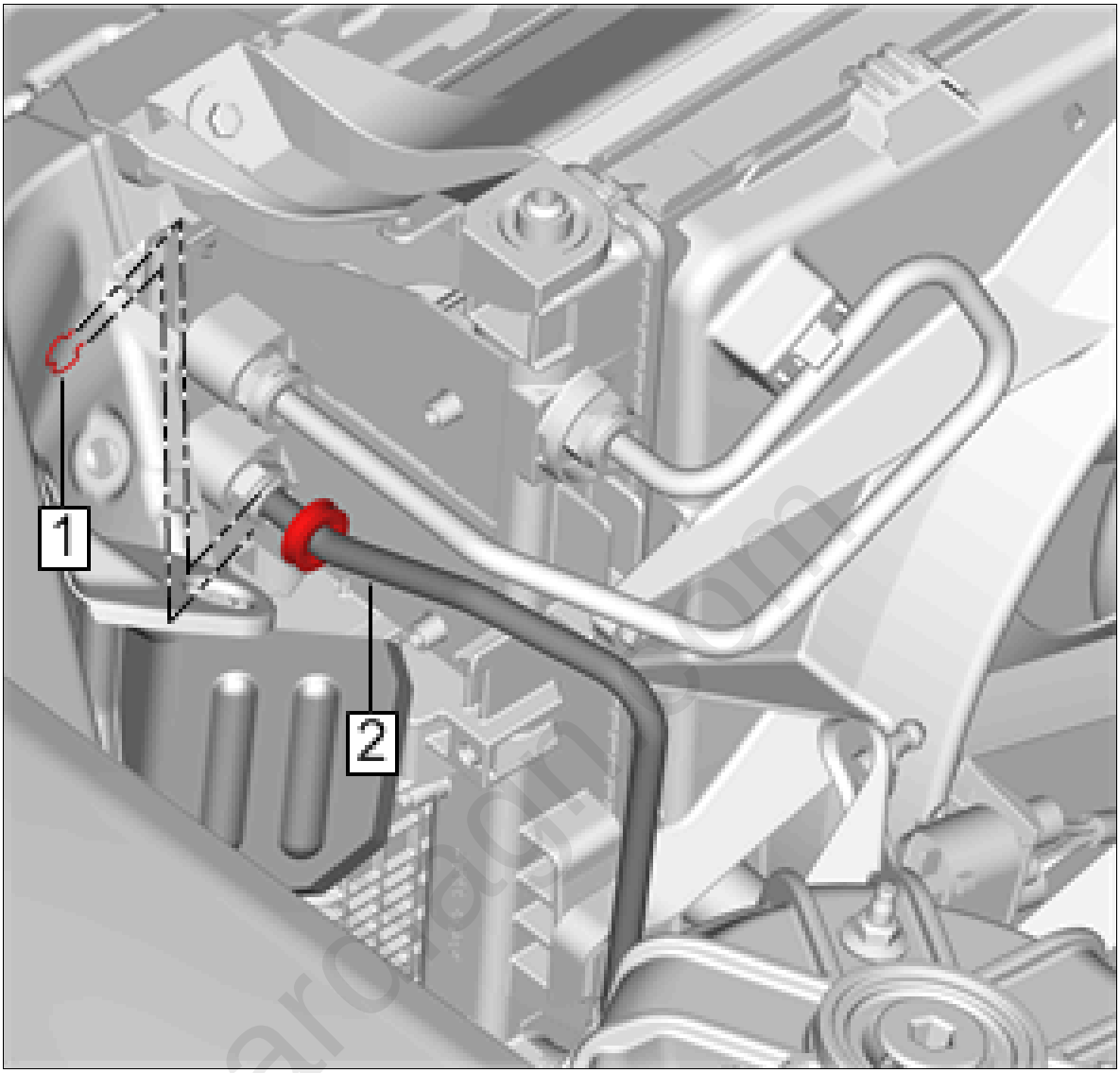


Courtesy of GENERAL MOTORS COMPANY

7. Install Air Conditioning Condenser Tube (1) at Air Conditioning Condenser - Condenser Tube Replacement (LGX without V18)
8. Install Radiator Air Side Baffle Replacement - Right Side (LGX)
9. Install Radiator Air Side Baffle Replacement - Left Side (LGX LTG)

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LGX WITH V03) > REMOVAL PROCEDURE

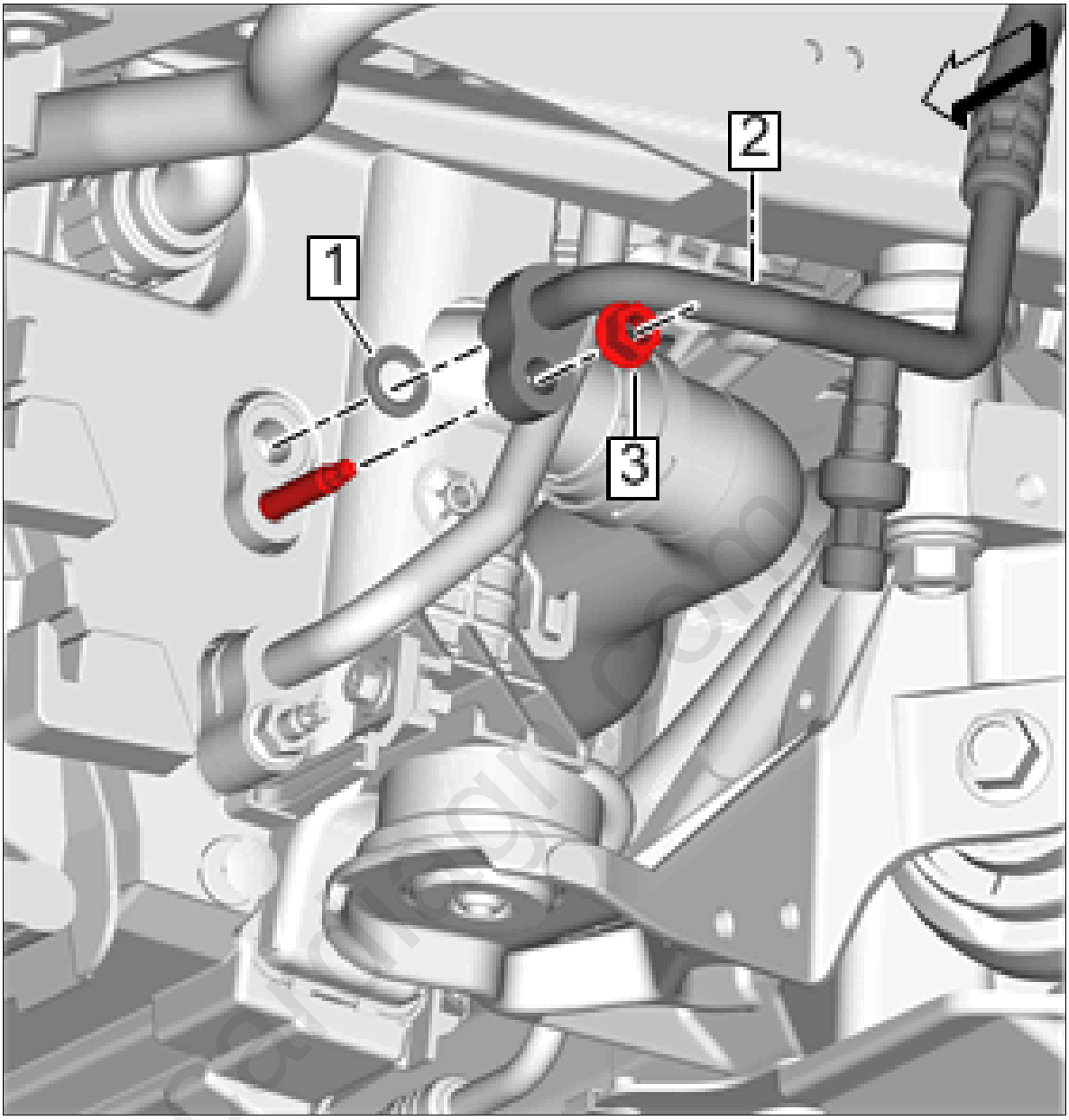
Fig 1: Transmission Fluid Cooler Inlet And Outlet Pipe Retaining Clip At Air Conditioning Condenser



Courtesy of GENERAL MOTORS COMPANY

1. Remove Transmission Fluid Cooler Inlet and Outlet Pipe (2) at Air Conditioning Condenser - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)
2. Remove Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03) at Radiator
3. Remove Radiator Air Side Baffle Replacement - Left Side (LGX LTG)
4. Remove Radiator Air Side Baffle Replacement - Right Side (LGX)
5. Remove Air Conditioning Condenser Tube - Condenser Tube Replacement (LGX without V18)Condenser Tube Replacement (LGX with V18)

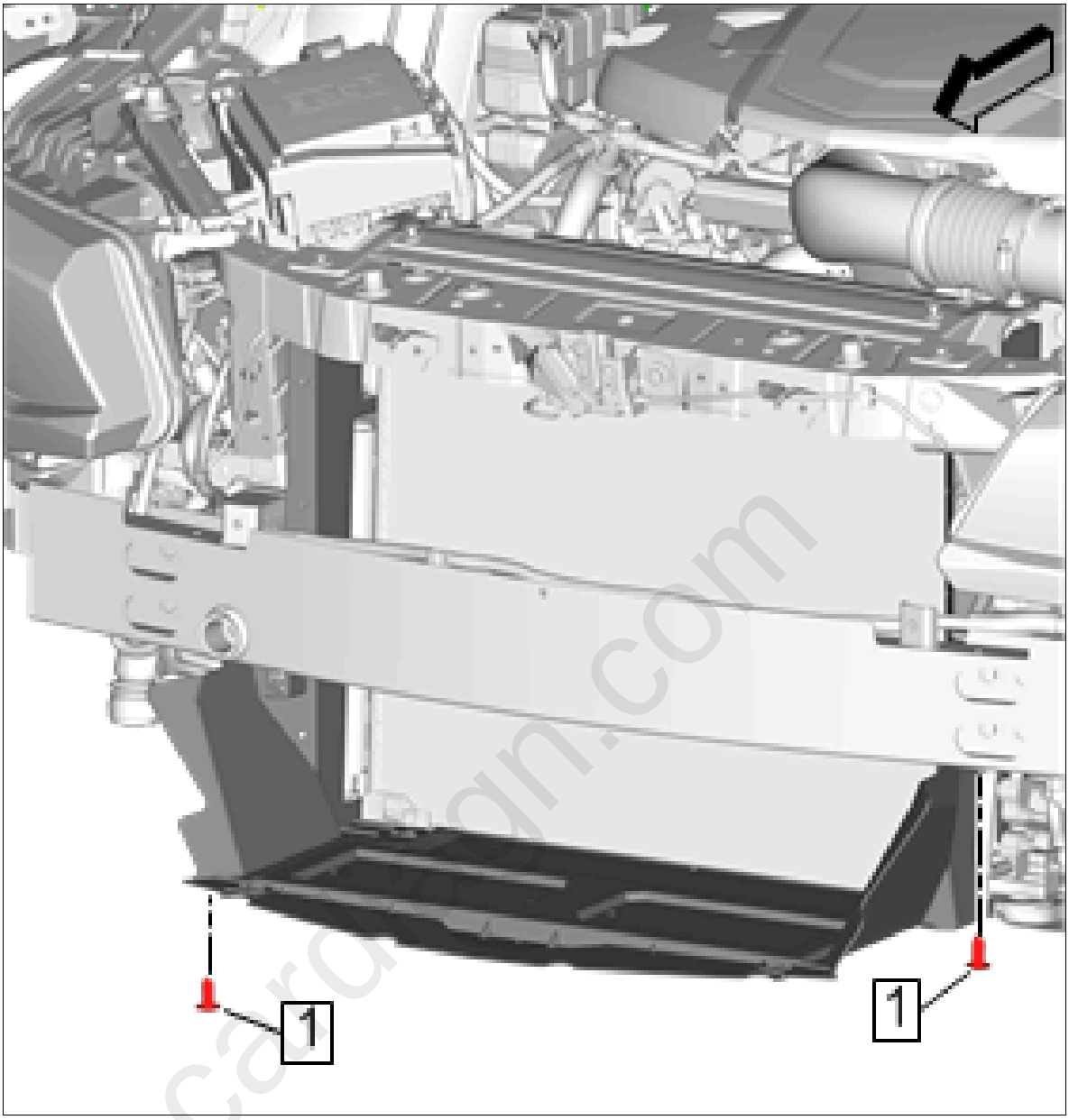
Fig 2: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

6. Remove Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LGX without J6G)Air Conditioning Compressor Hose Replacement (LGX with J6G)

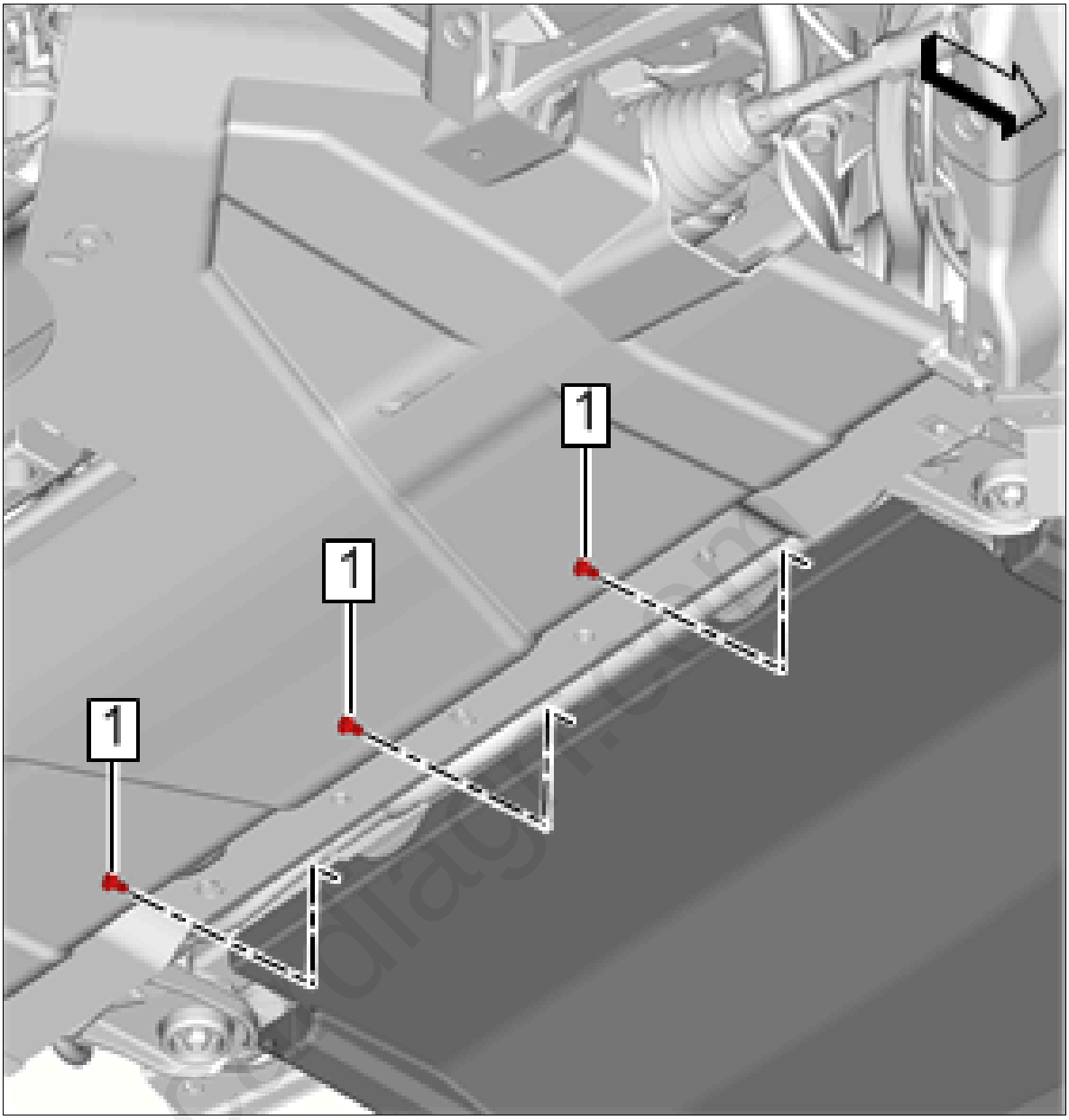
Fig 3: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Air Baffle Retainer (1) (Qty: 2)
8. Remove Front Bumper Impact Bar Replacement (Without Y4Q)

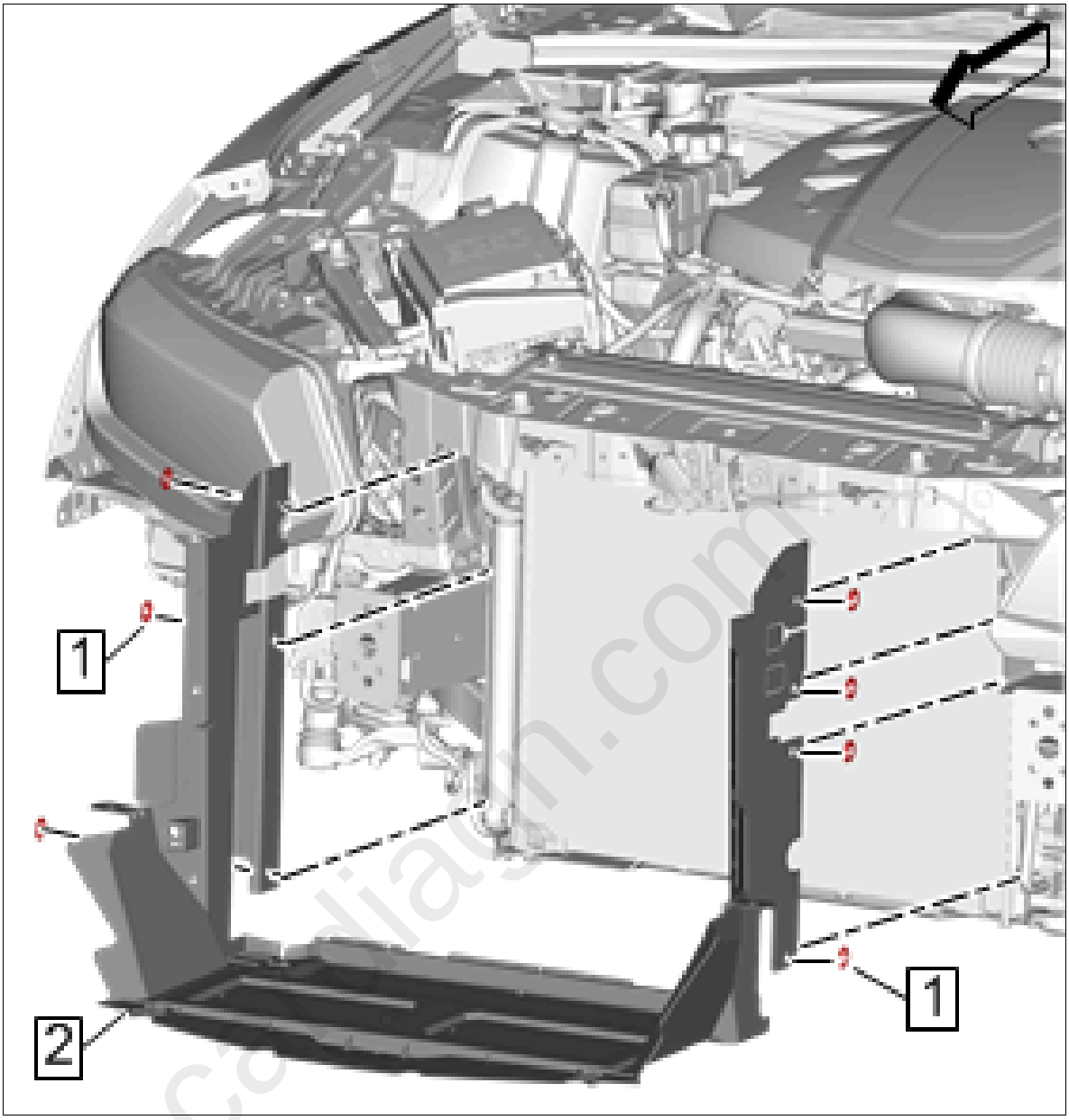
Fig 4: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

9. Remove Radiator Air Baffle Retainer (1) (Qty: 3)

Fig 5: Radiator Air Lower Baffle

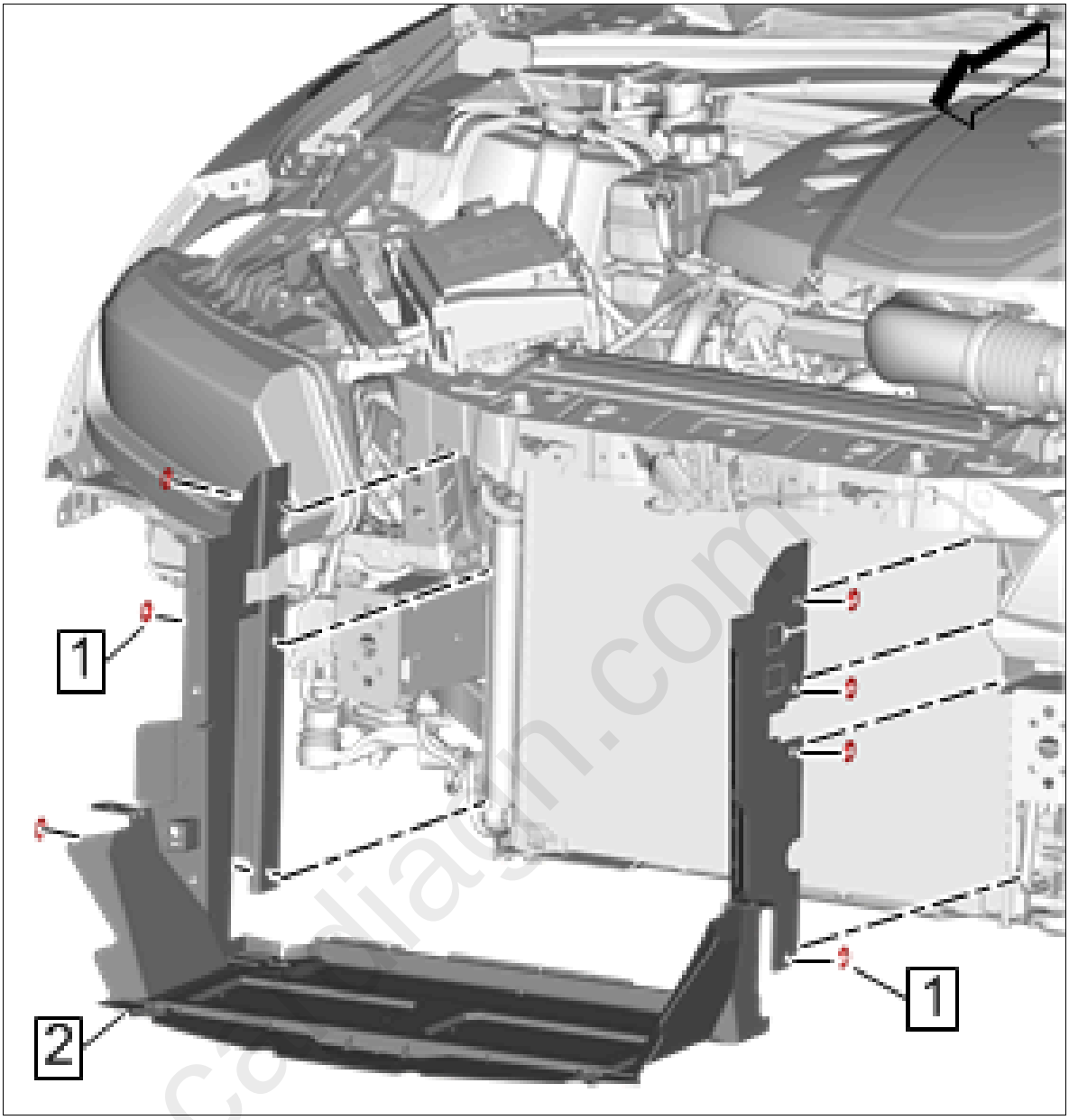


Courtesy of GENERAL MOTORS COMPANY

10. Remove Radiator Air Baffle Retainer (1) (Qty: 7)
11. Remove Radiator Air Lower Baffle

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LGX WITH V03) > INSTALLATION PROCEDURE

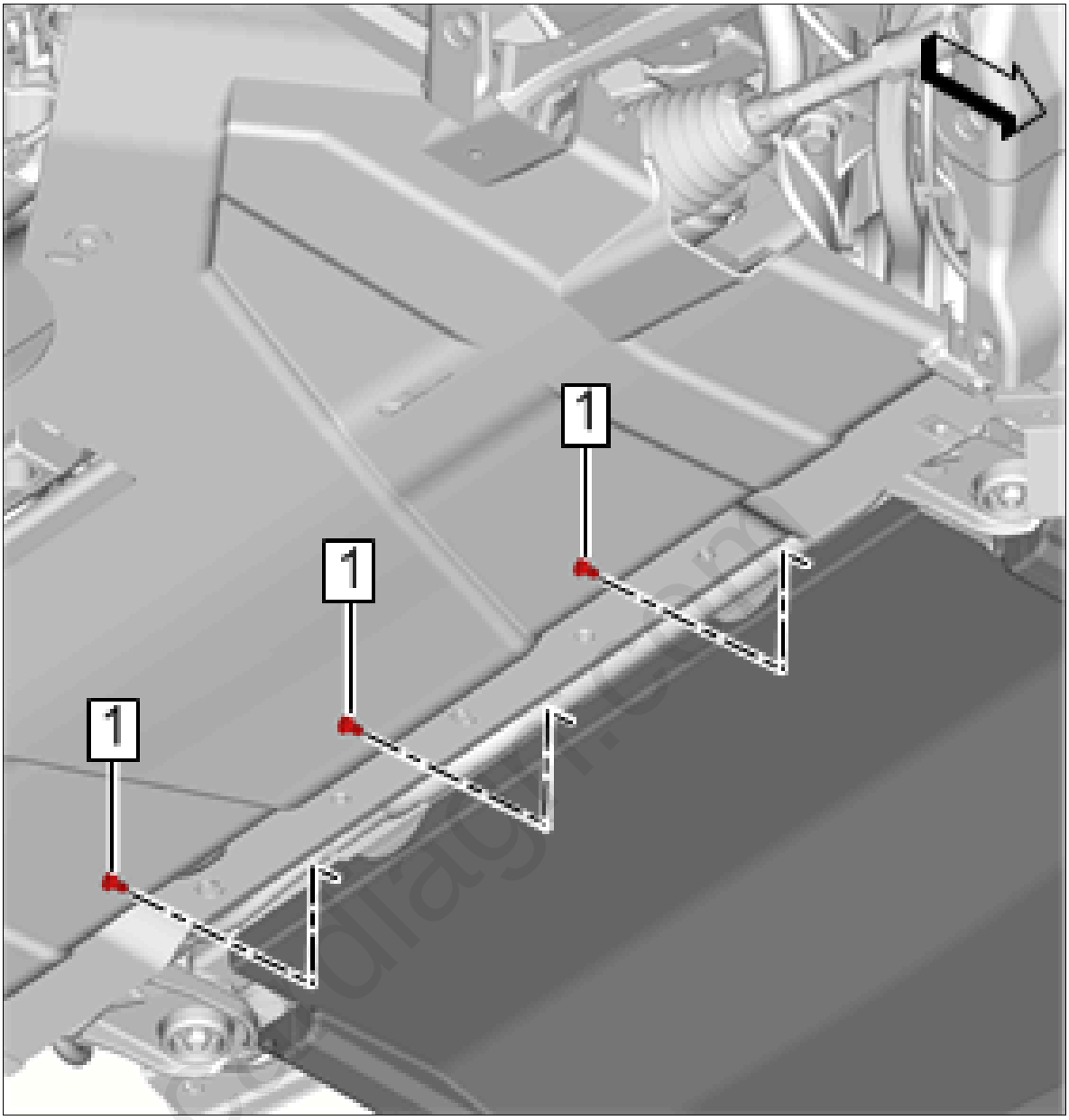
Fig 1: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Lower Baffle
2. Install Radiator Air Baffle Retainer (1) (Qty: 7)

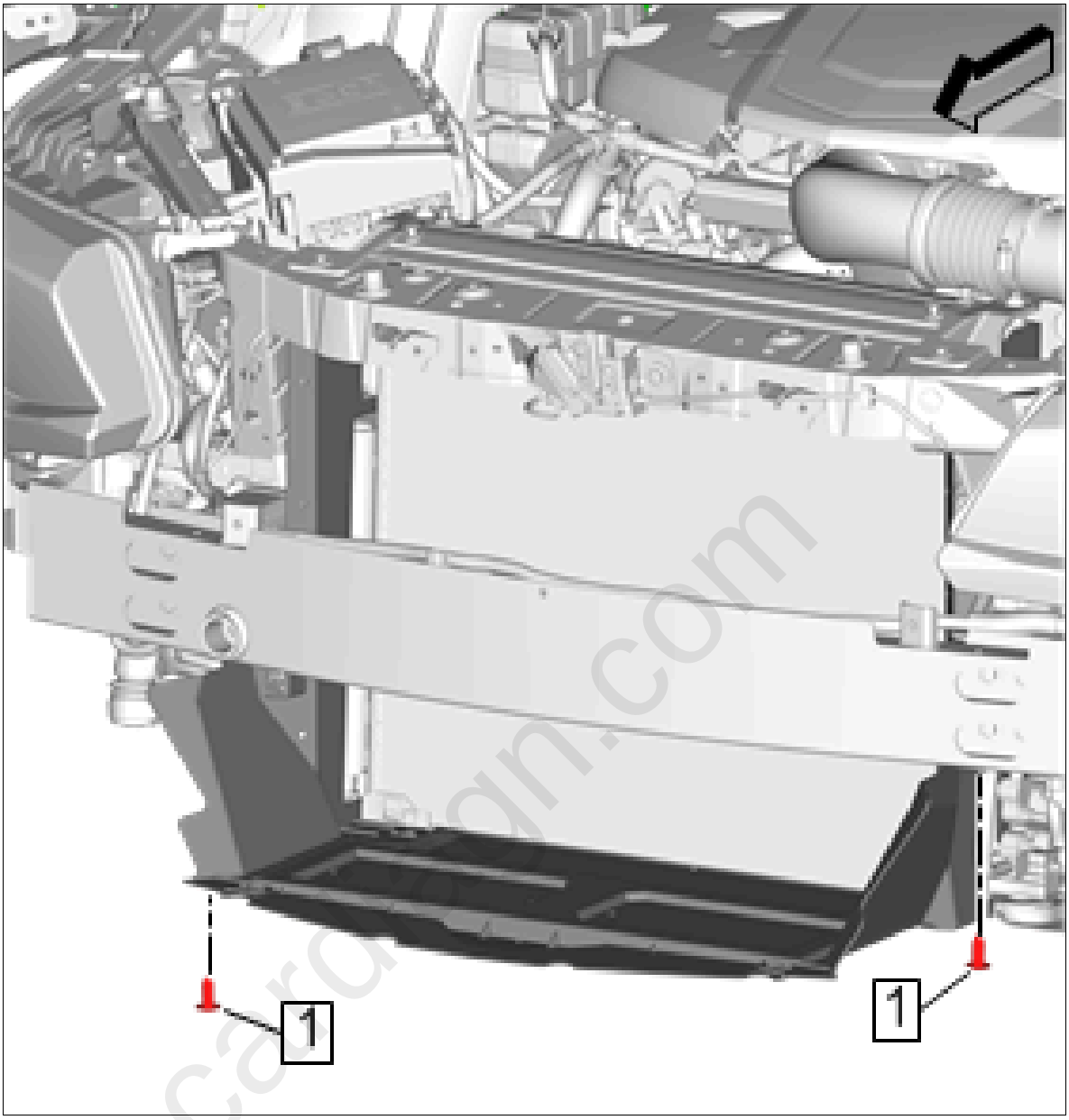
Fig 2: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Air Baffle Retainer (1) (Qty: 3)
4. Install Front Bumper Impact Bar Replacement (Without Y4Q)

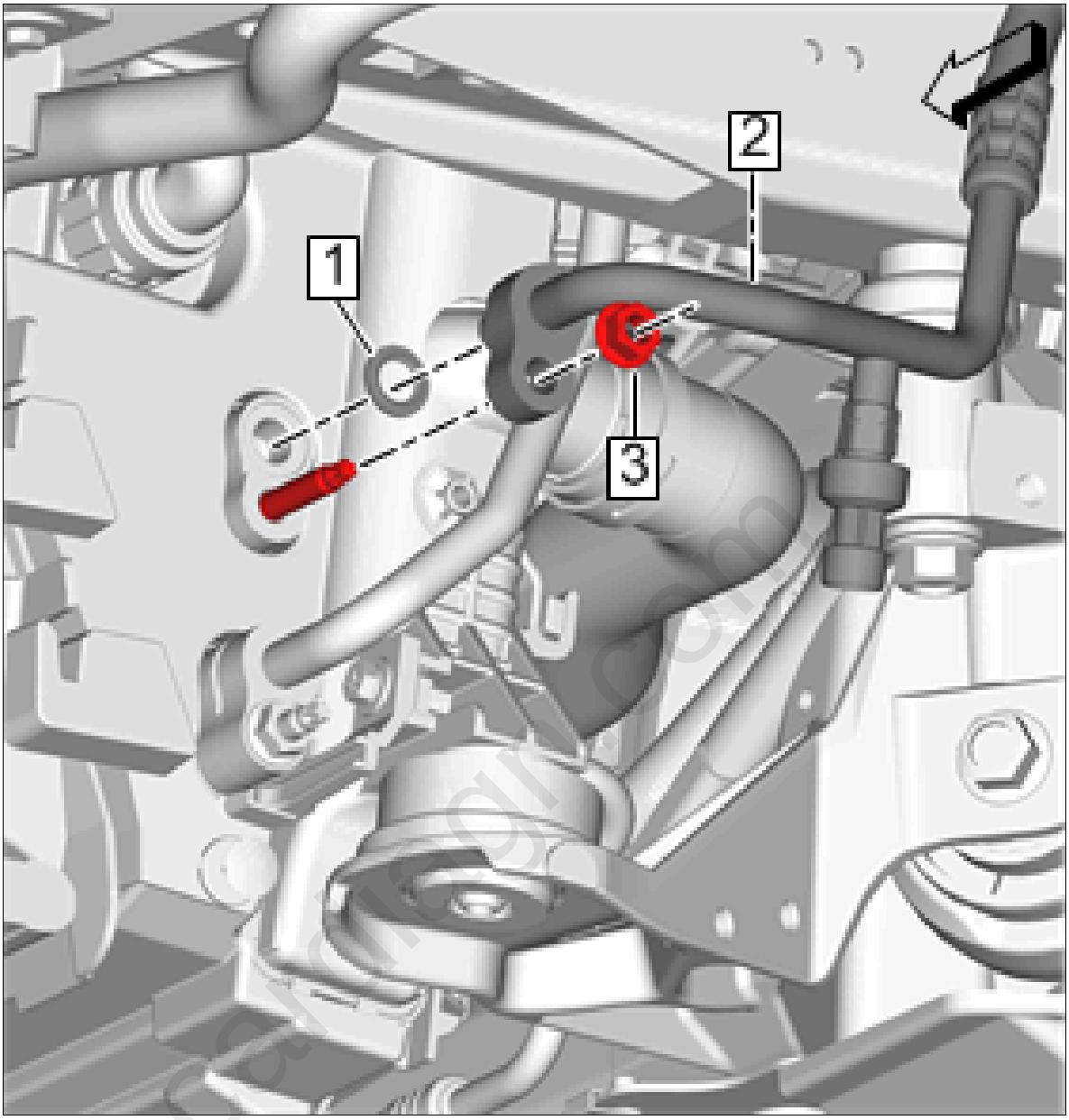
Fig 3: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

5. Install Radiator Air Baffle Retainer (1) (Qty: 2)

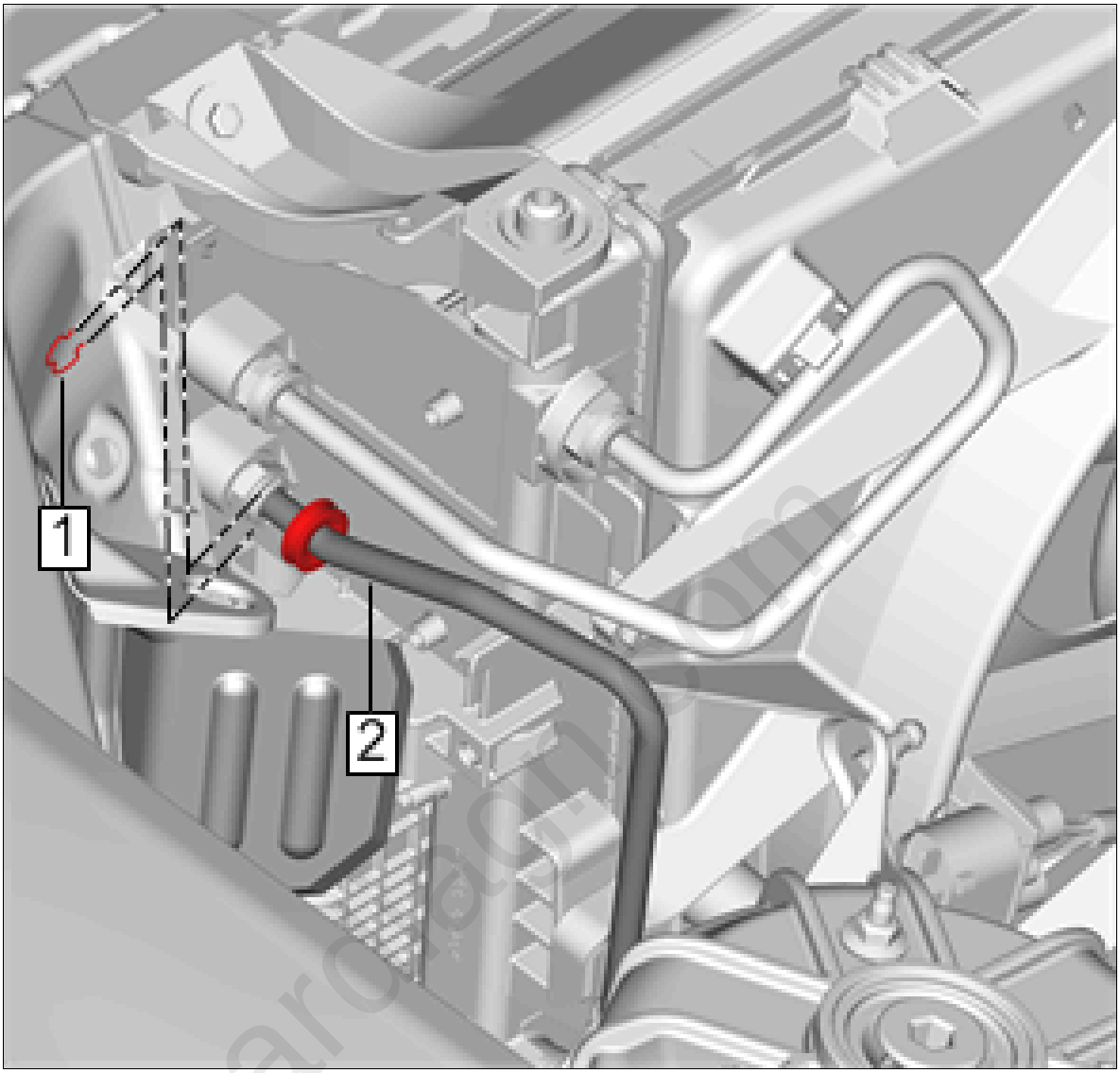
Fig 4: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

6. Install Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LGX without J6G)Air Conditioning Compressor Hose Replacement (LGX with J6G)
7. Install Air Conditioning Condenser Tube - Condenser Tube Replacement (LGX without V18)Condenser Tube Replacement (LGX with V18)
8. Install Radiator Air Side Baffle Replacement - Right Side (LGX)
9. Install Radiator Air Side Baffle Replacement - Left Side (LGX LTG)
10. Install Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03) at Radiator

Fig 5: Transmission Fluid Cooler Inlet And Outlet Pipe Retaining Clip At Air Conditioning Condenser

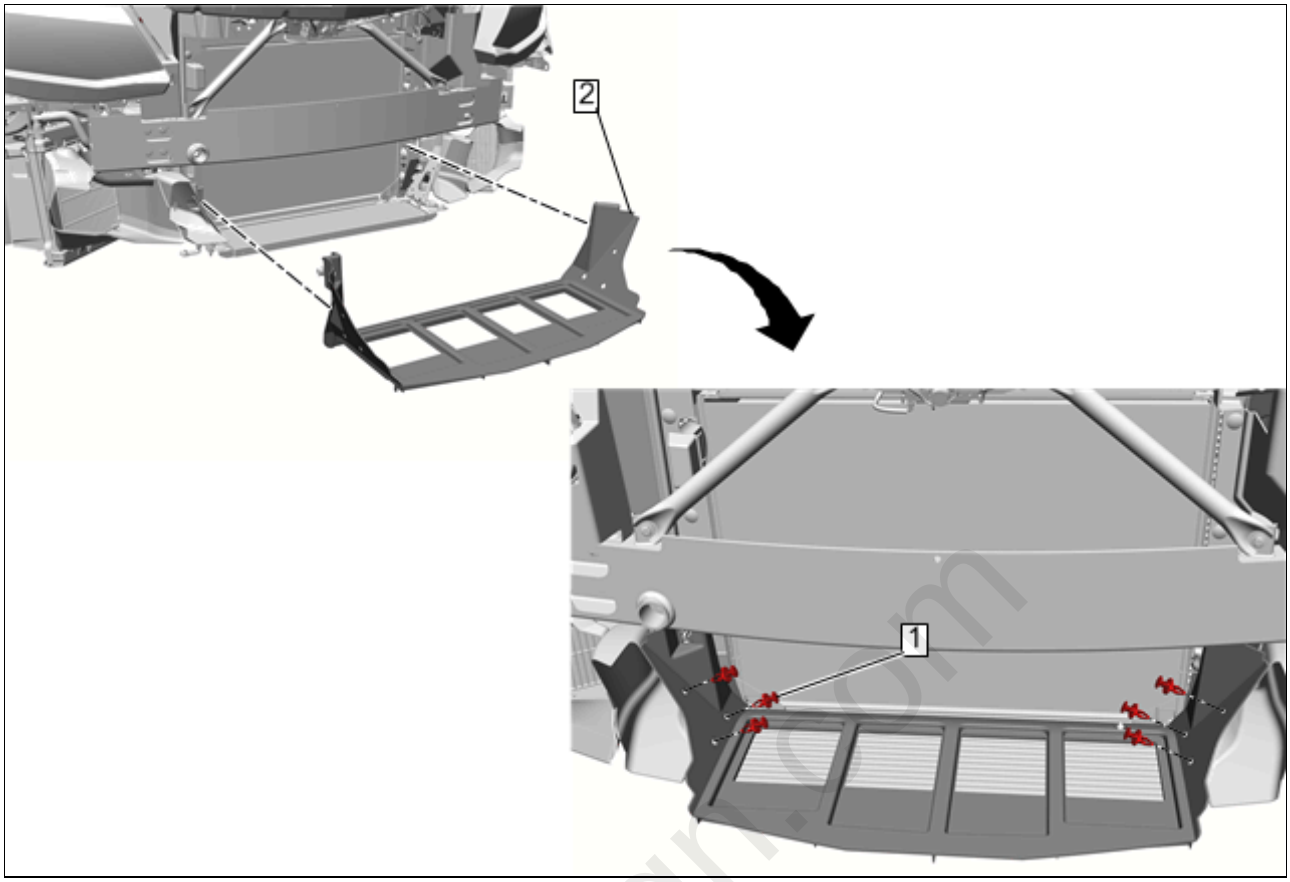


Courtesy of GENERAL MOTORS COMPANY

11. Install Transmission Fluid Cooler Inlet and Outlet Pipe (2) at Air Conditioning Condenser - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LT1)

Fig 1: Radiator Air Lower Baffle (LT1)

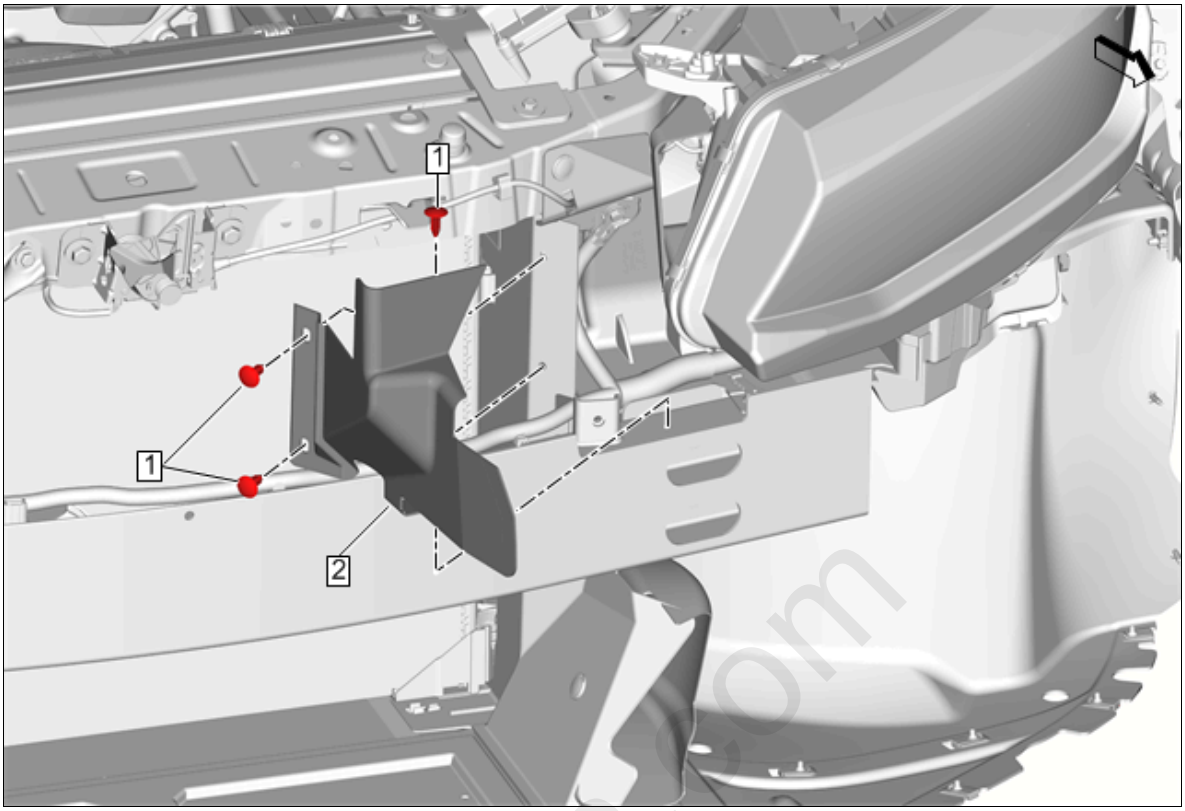


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement	
1	Radiator Air Lower Baffle Retainer (Qty: 6)
2	Radiator Air Lower Baffle Procedures 1. Remove the transmission fluid cooler pipe clip from the radiator air lower baffle. 2. Disconnect the electrical connector. 3. Transfer components as necessary.

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LTG WITHOUT V18) > REMOVAL PROCEDURE

Fig 1: Radiator Air Side Baffle - Left Side

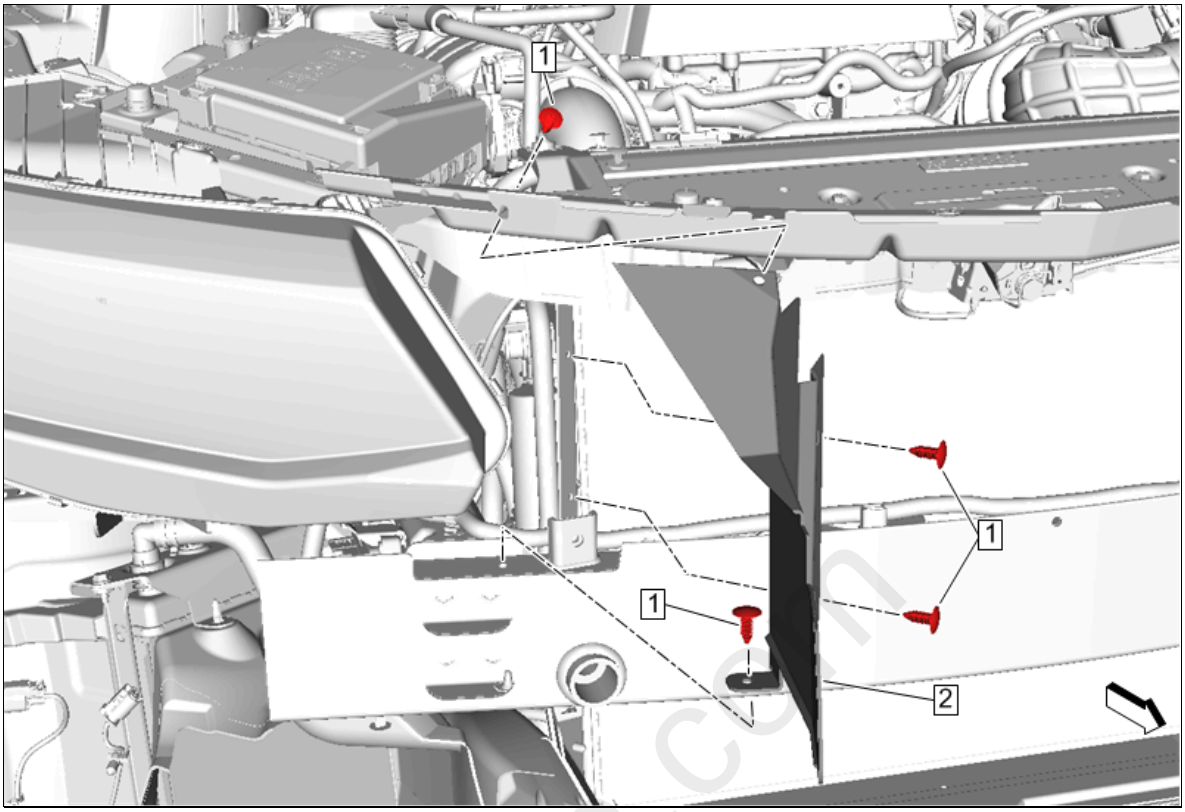


Courtesy of GENERAL MOTORS COMPANY

1. Remove Radiator Air Side Baffle - Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LGX LTG)

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Fig 2: Radiator Air Side Baffle - Right Side

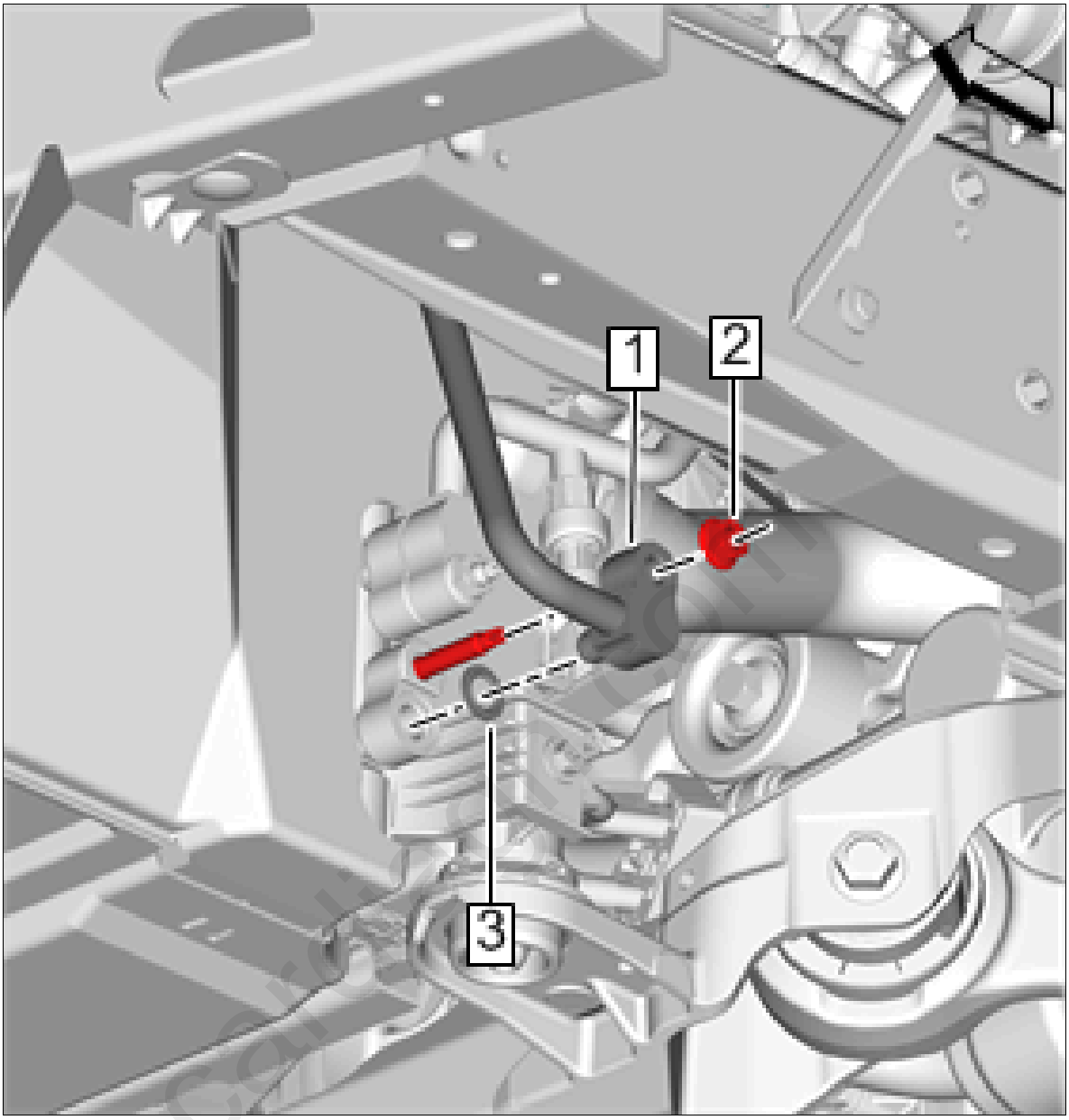


Courtesy of GENERAL MOTORS COMPANY

2. Remove Radiator Air Side Baffle - Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1) »

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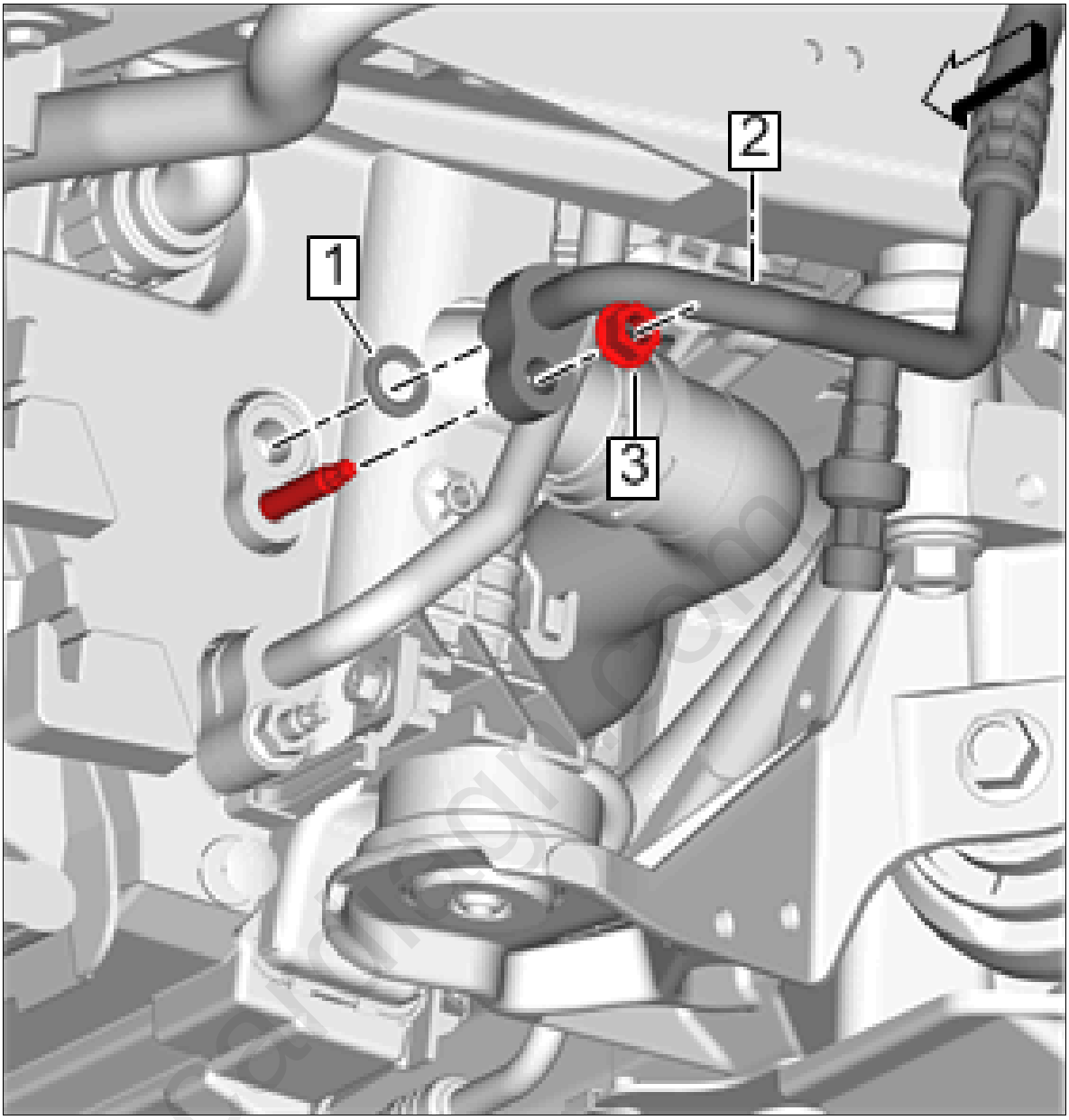
Fig 3: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

3. Remove Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LTG with Y4Q)Condenser Tube Replacement (LTG without Y4Q)

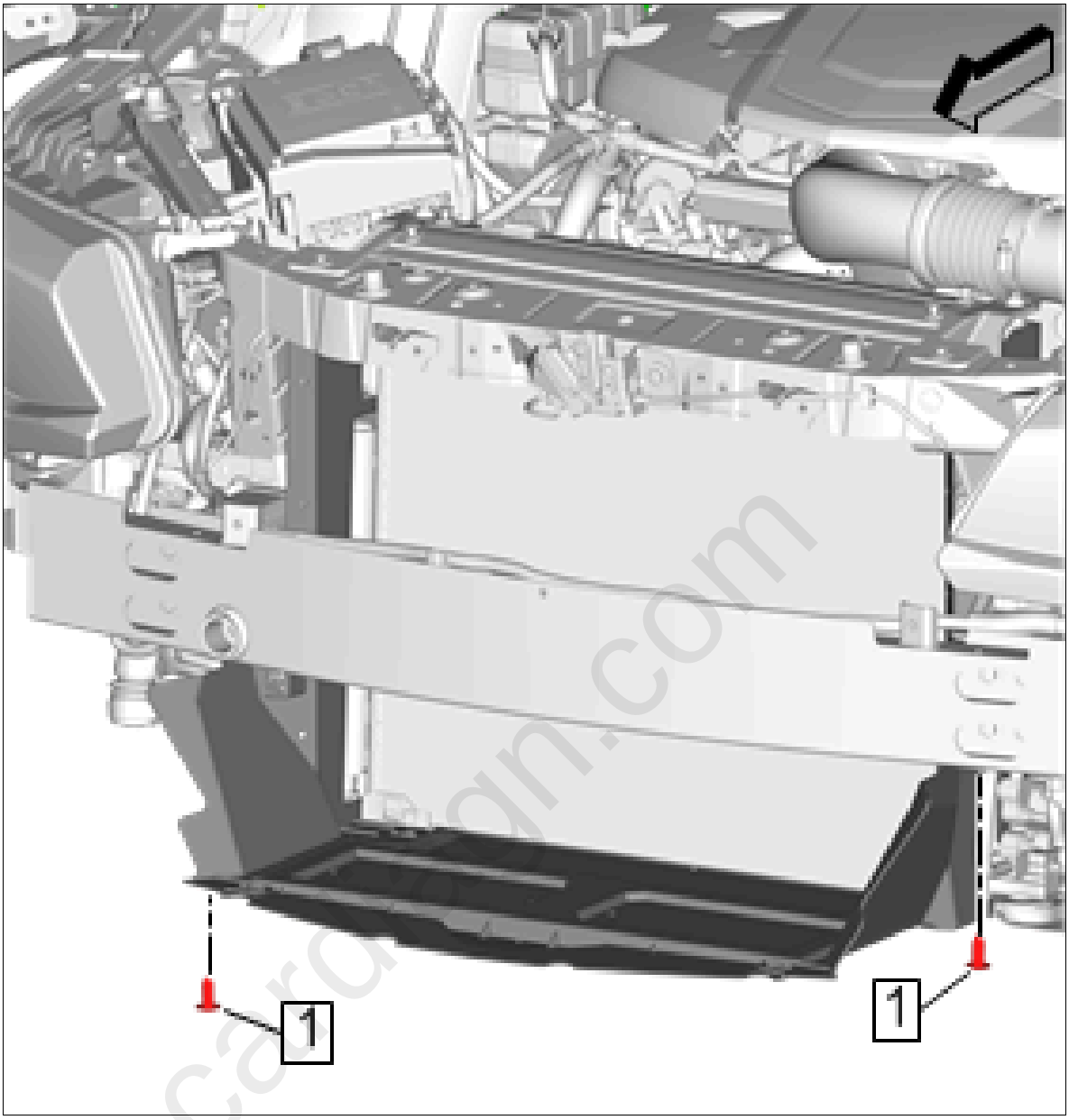
Fig 4: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

4. Remove Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LTG with Y4Q)Air Conditioning Compressor Hose Replacement (LTG without Y4Q)

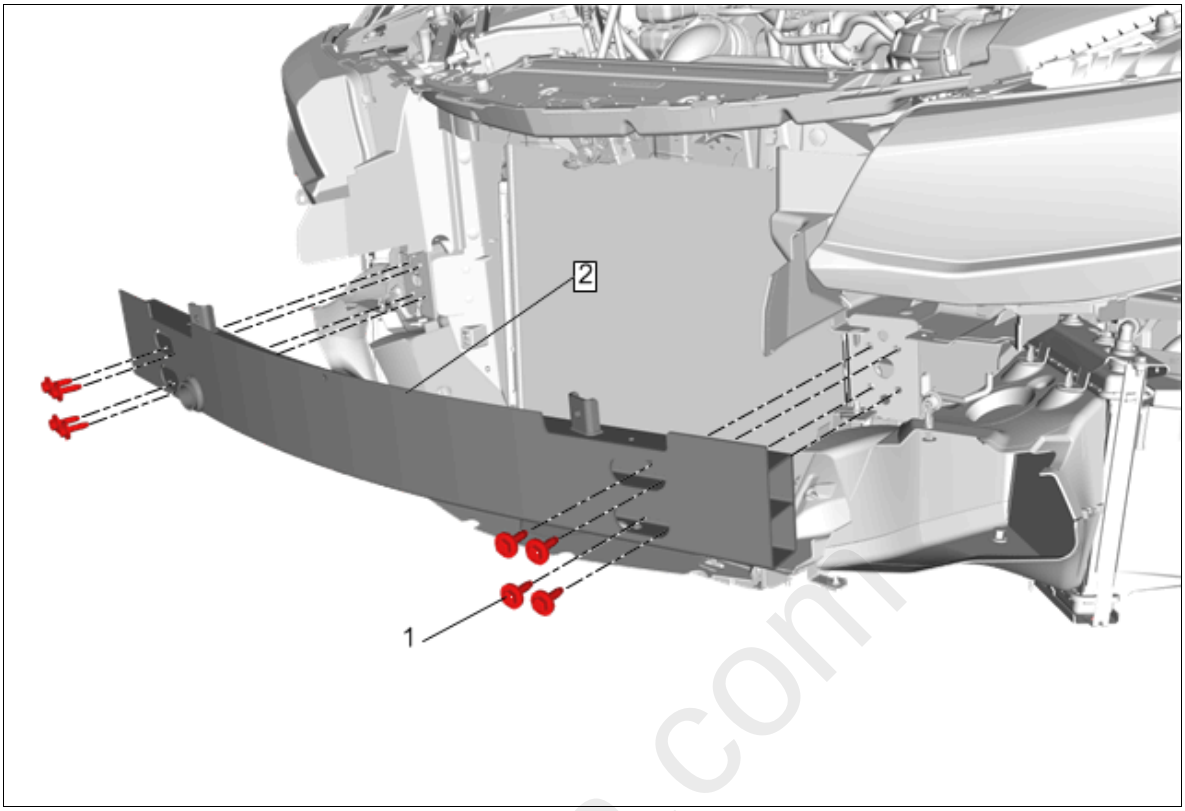
Fig 5: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

5. Remove Radiator Air Baffle Retainer (1) (Qty: 2)

Fig 6: Front Bumper Impact Bar (Without Y4Q)

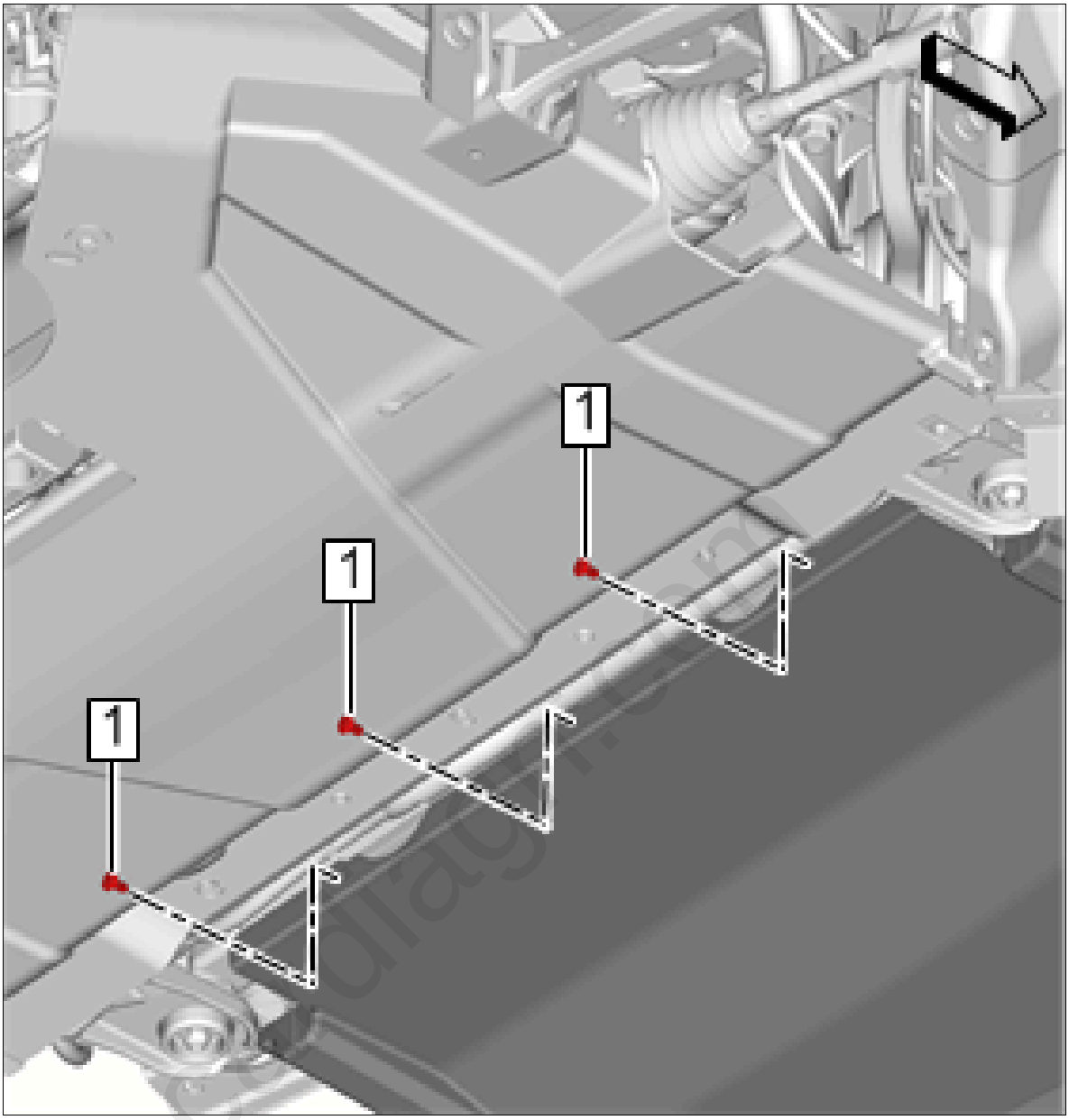


Courtesy of GENERAL MOTORS COMPANY

6. Remove Front Bumper Impact Bar (2) - Front Bumper Impact Bar Replacement (Without Y4Q)

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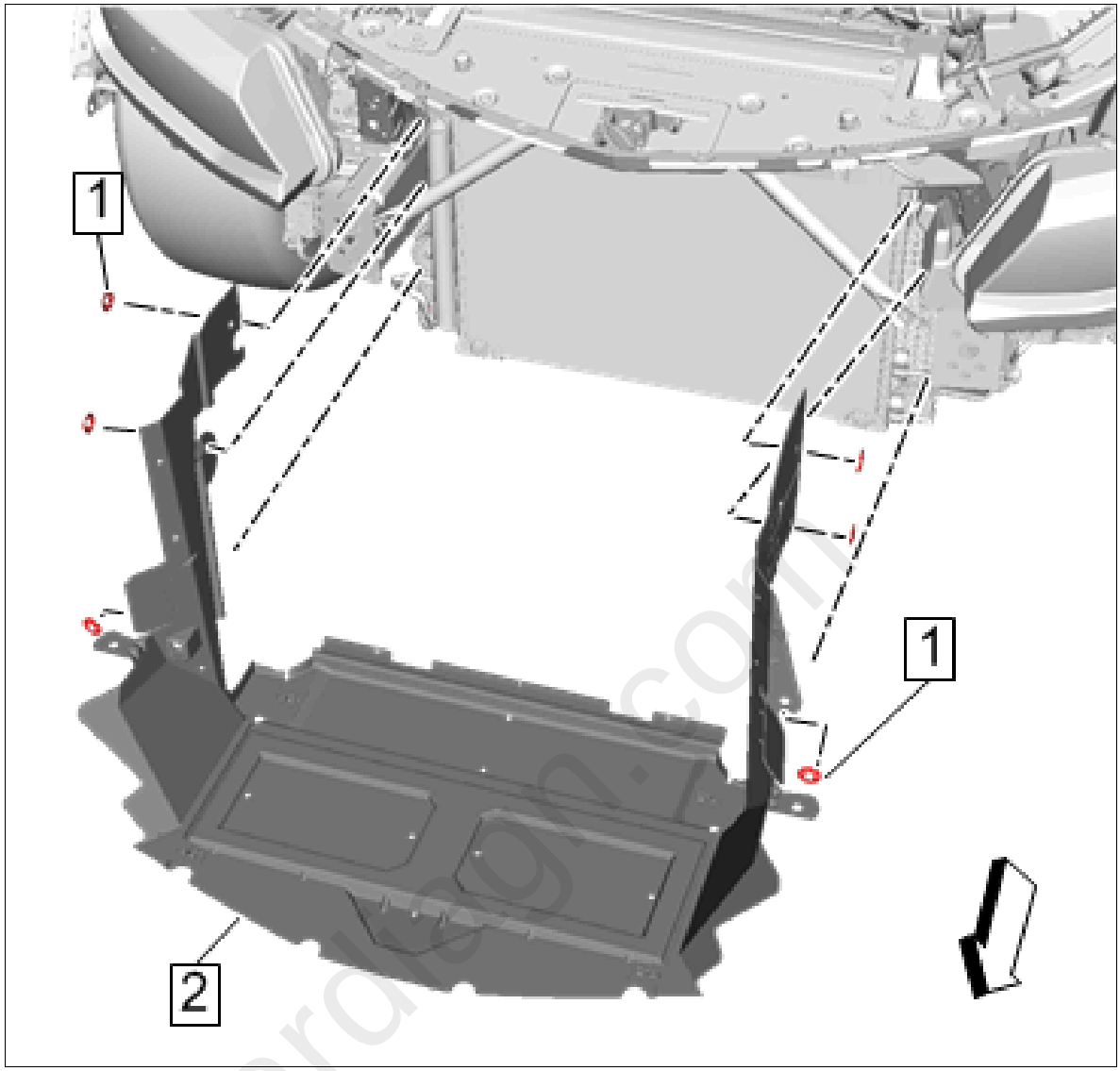
Fig 7: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Air Baffle Retainer (1) (Qty: 3)
8. Disconnect the electrical connectors.

Fig 8: Radiator Air Lower Baffle

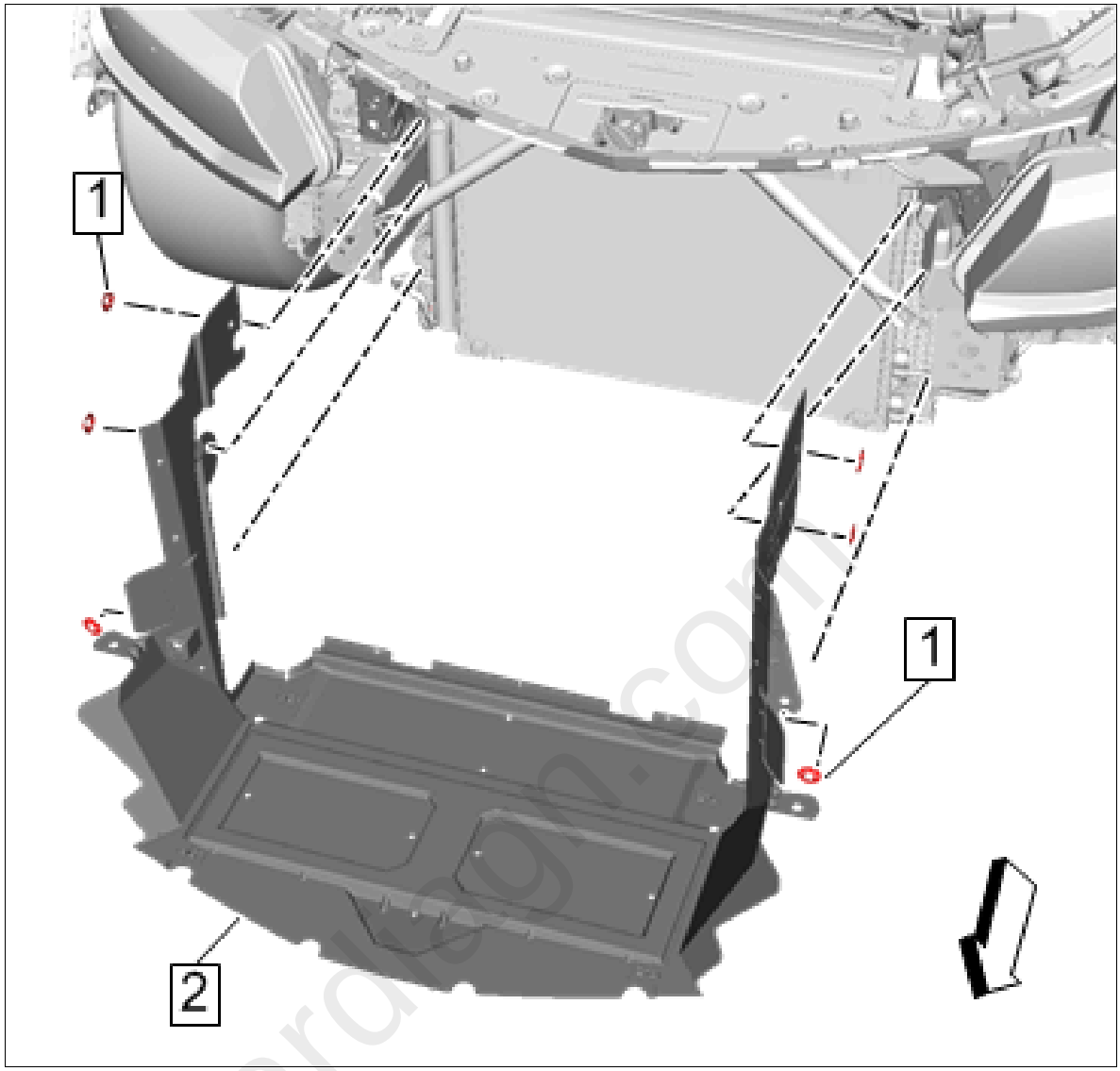


Courtesy of GENERAL MOTORS COMPANY

9. Remove Radiator Air Baffle Retainer (1) (Qty: 6)
10. Remove Radiator Air Lower Baffle (2)
11. Transfer components as necessary.

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LTG WITHOUT V18) > INSTALLATION PROCEDURE

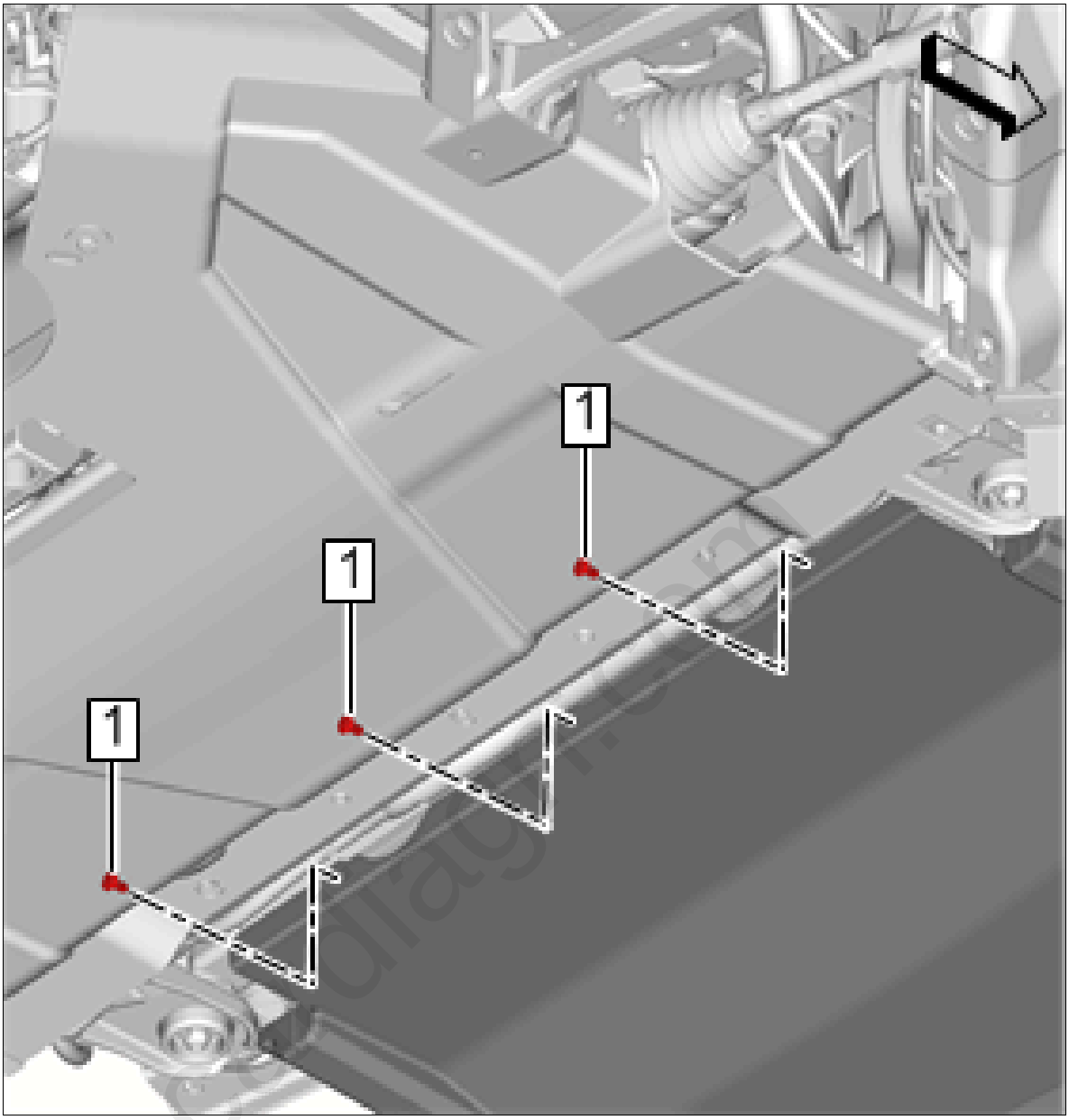
Fig 1: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Lower Baffle (2)
2. Install Radiator Air Baffle Retainer (1) (Qty: 6)
3. Connect the electrical connectors.

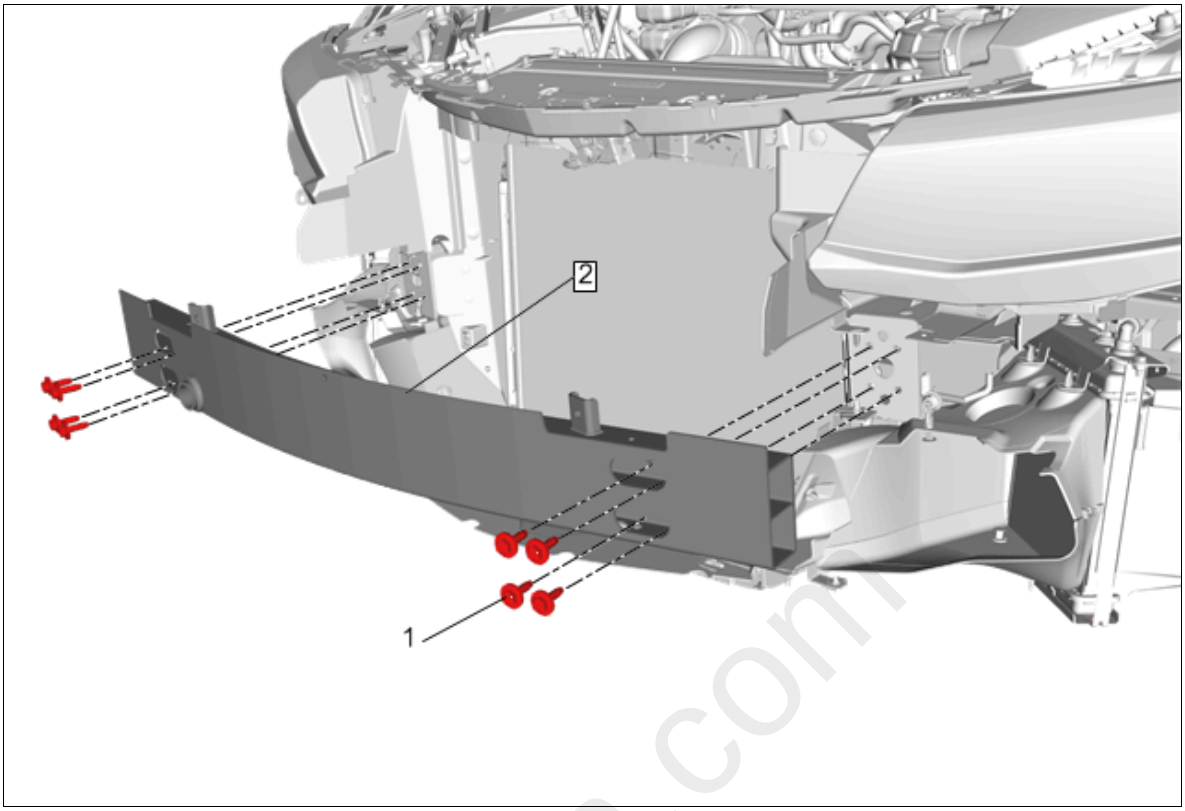
Fig 2: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Air Baffle Retainer (1) (Qty: 3)

Fig 3: Front Bumper Impact Bar (Without Y4Q)

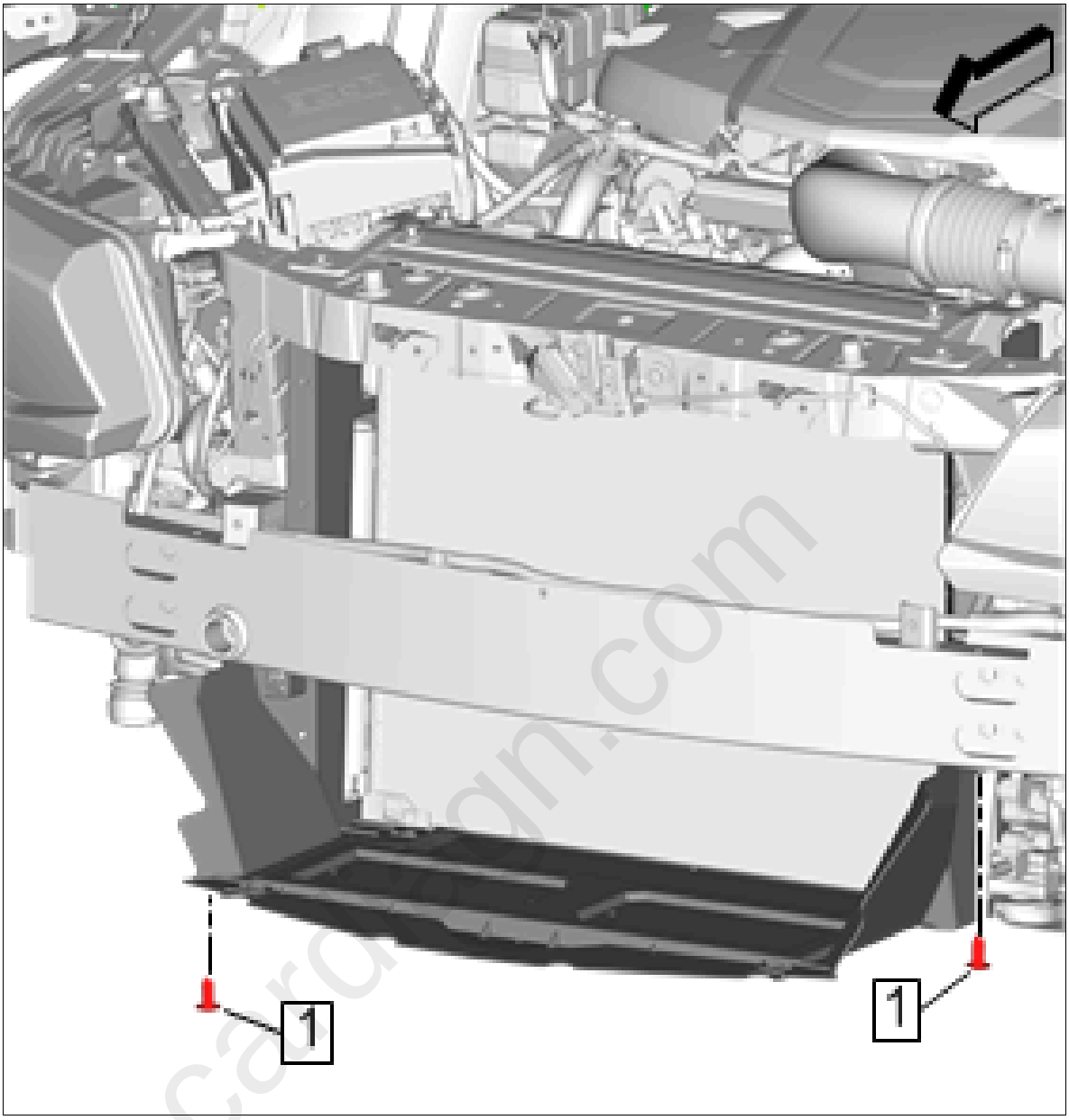


Courtesy of GENERAL MOTORS COMPANY

5. Install Front Bumper Impact Bar (2) - Front Bumper Impact Bar Replacement (Without Y4Q)

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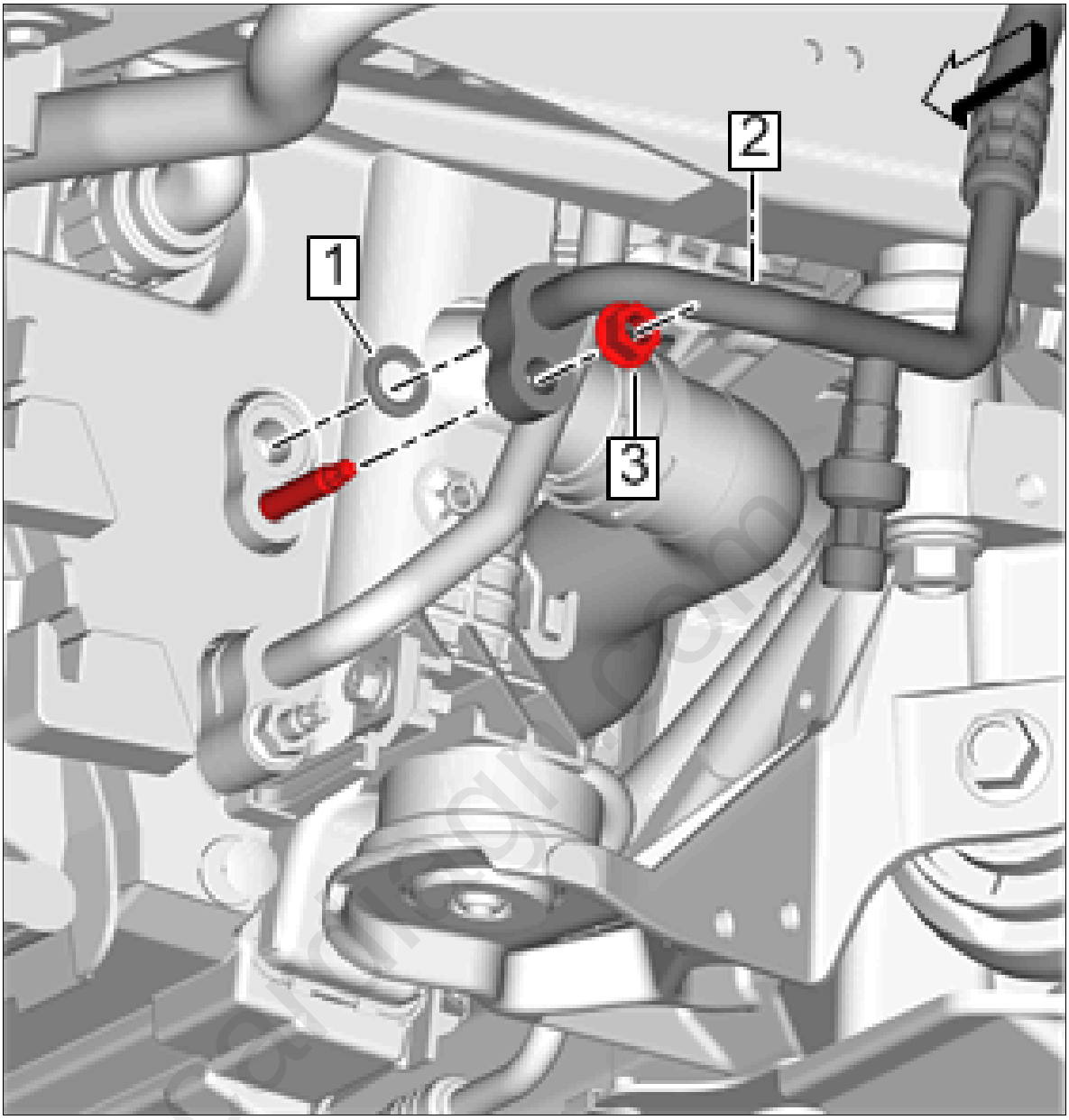
Fig 4: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

6. Install Radiator Air Baffle Retainer (1) (Qty: 2)

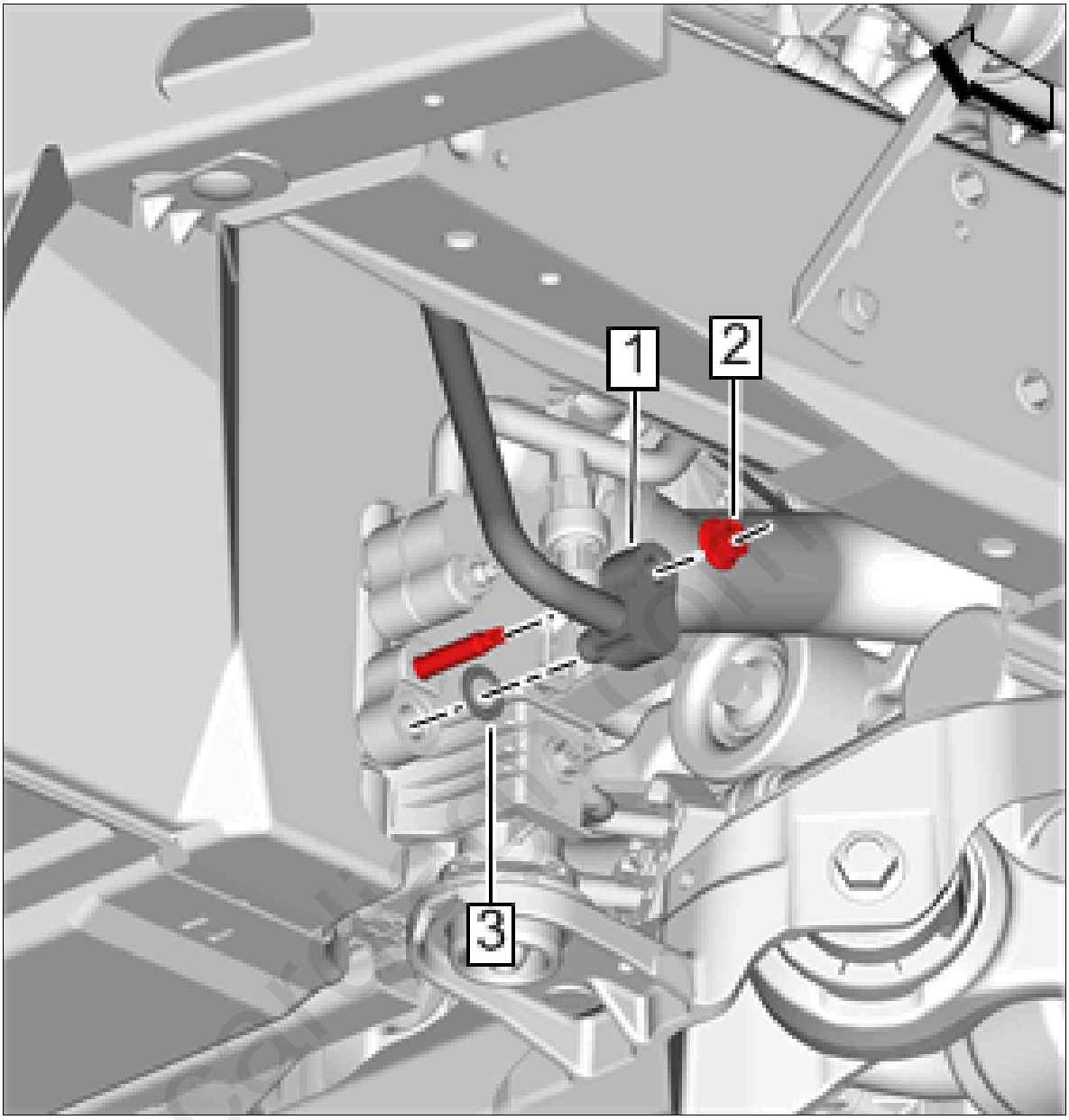
Fig 5: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

7. Install Air Conditioning Compressor Hose (2) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LTG with Y4Q)Air Conditioning Compressor Hose Replacement (LTG without Y4Q)

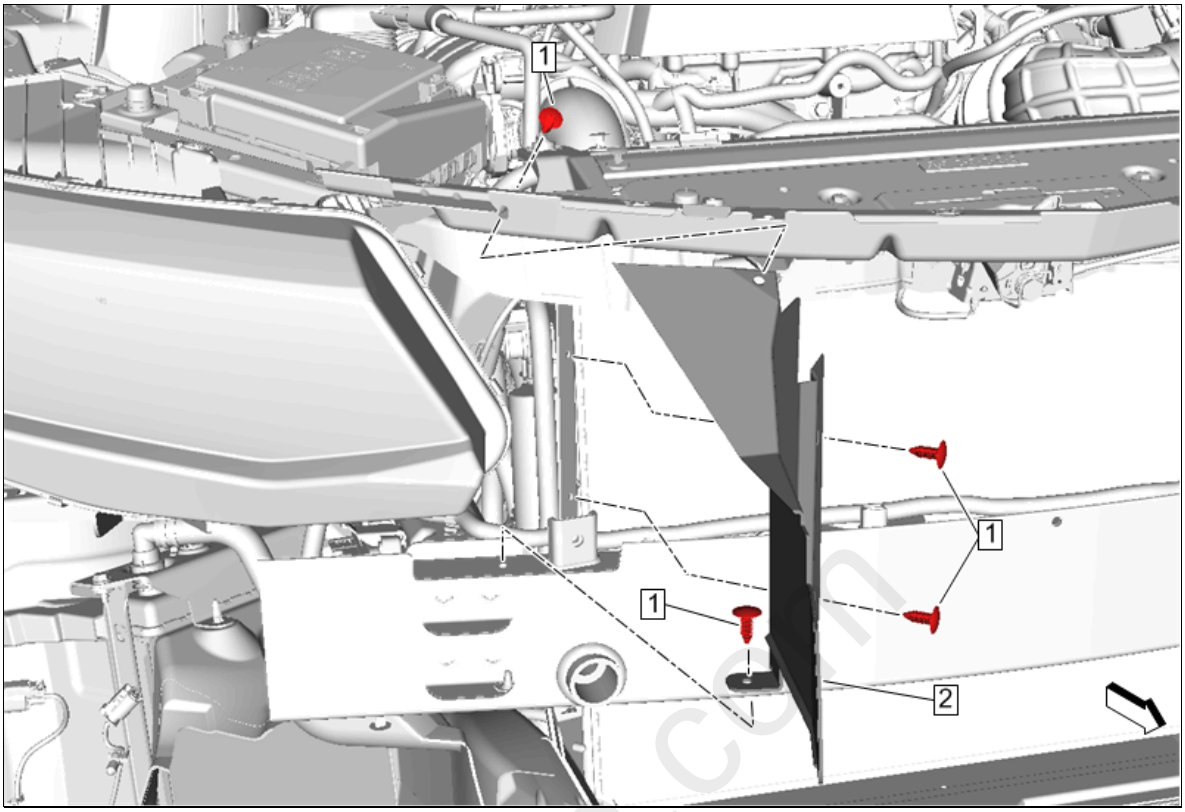
Fig 6: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

8. Install Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LTG with Y4Q)Condenser Tube Replacement (LTG without Y4Q)

Fig 7: Radiator Air Side Baffle



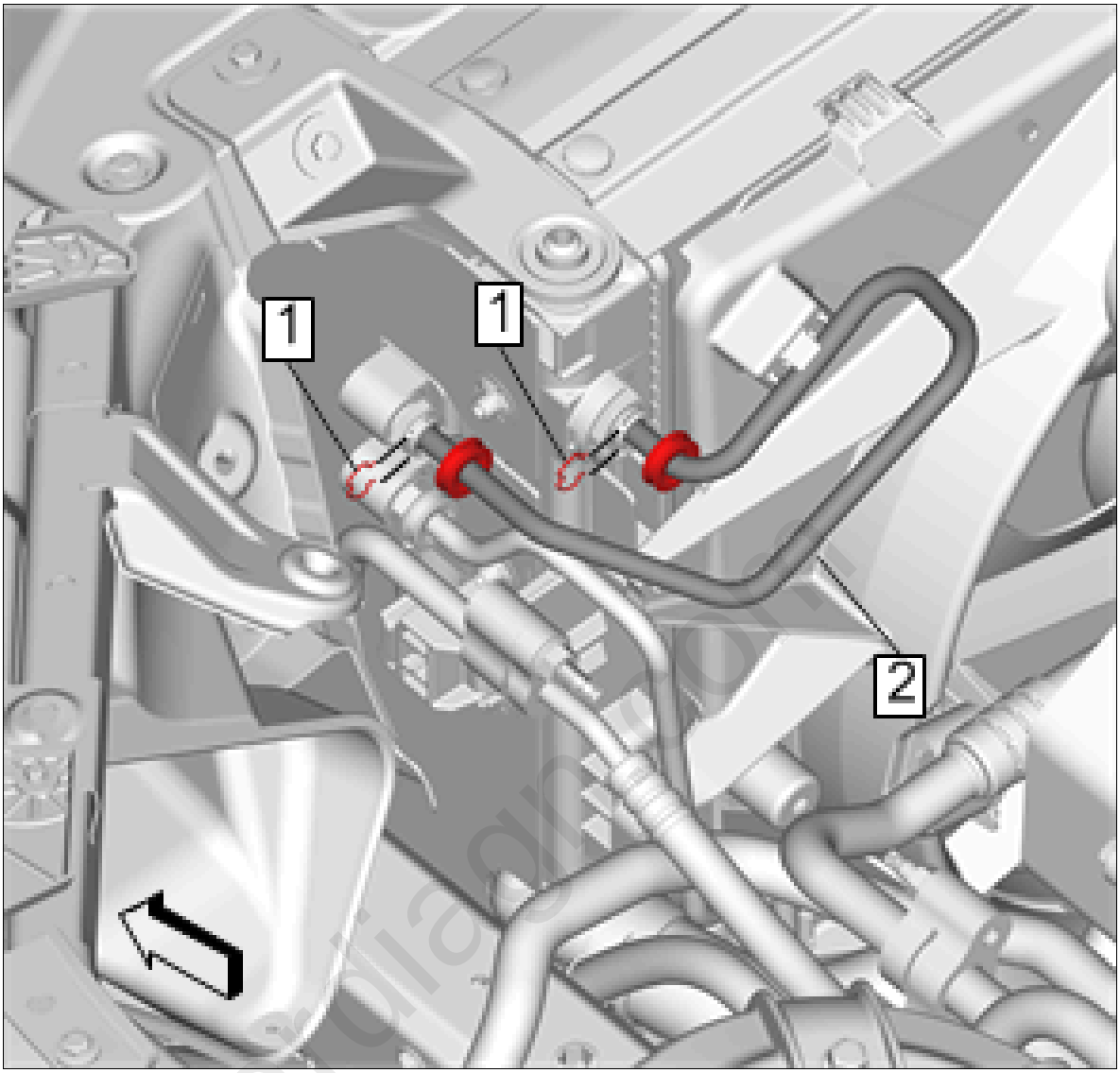
Courtesy of GENERAL MOTORS COMPANY

9. Install Radiator Air Side Baffle - Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1) »
10. Install Radiator Air Side Baffle - Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LGX LTG)

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LTG WITH V18) > REMOVAL PROCEDURE

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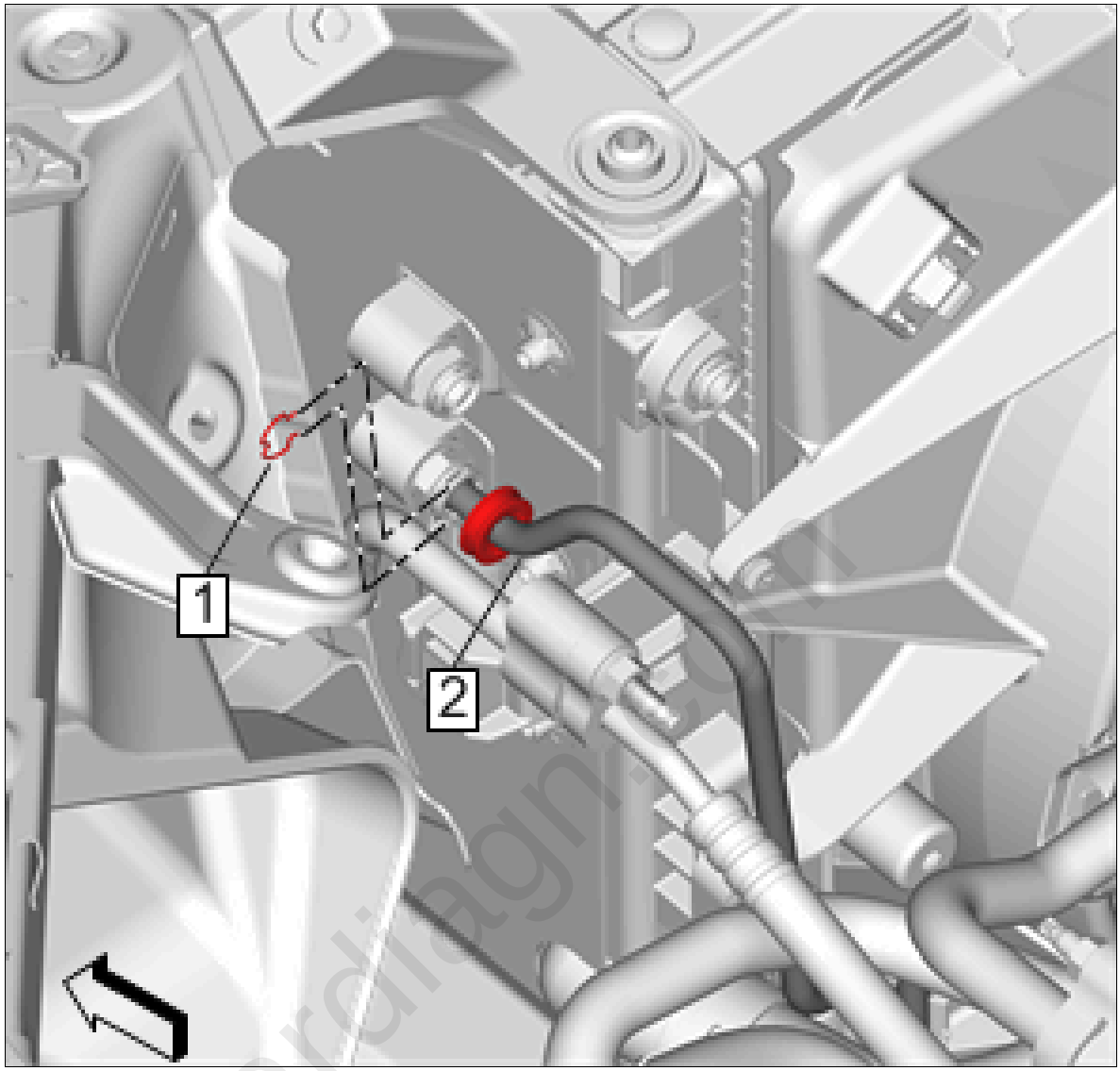
Fig 1: Transmission Fluid Cooler Pipe



Courtesy of GENERAL MOTORS COMPANY

1. Remove Transmission Fluid Cooler Pipe (2) - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)

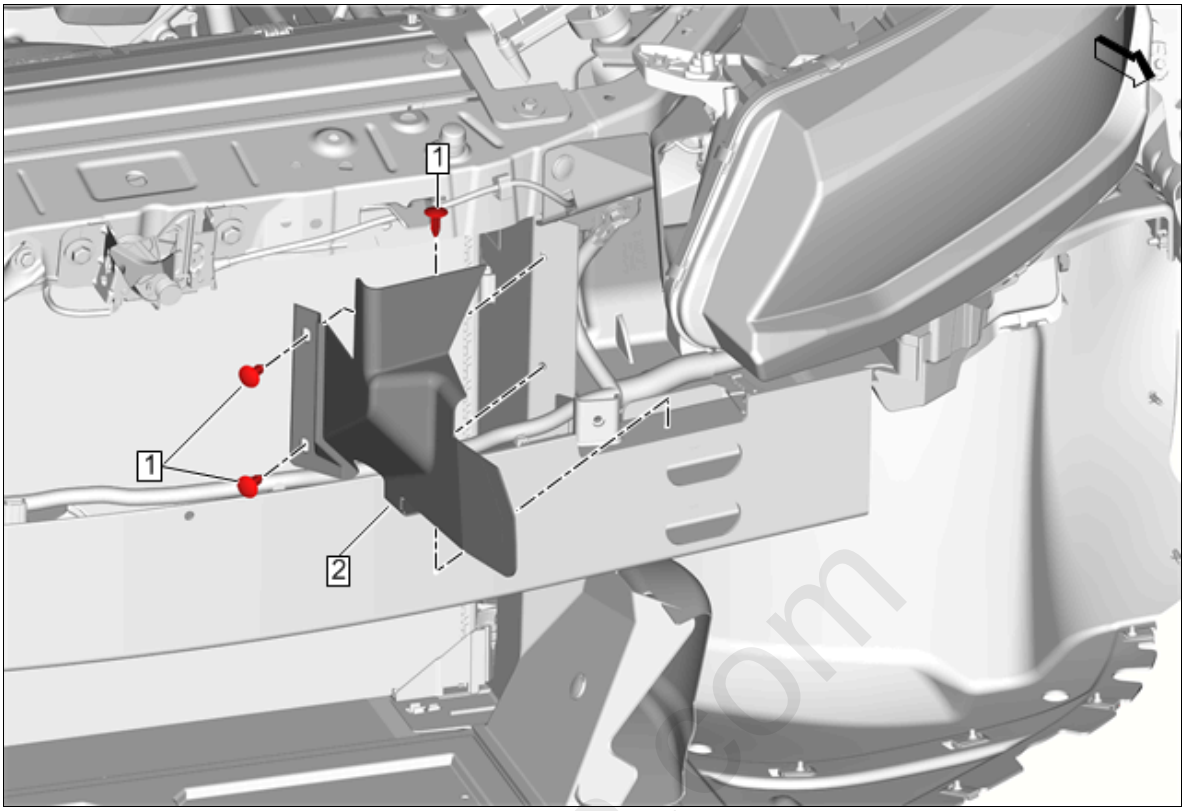
Fig 2: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

2. Remove Transmission Fluid Cooler Inlet and Outlet Pipe (2) at Air Conditioning Condenser - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

Fig 3: Radiator Air Side Baffle - Left Side

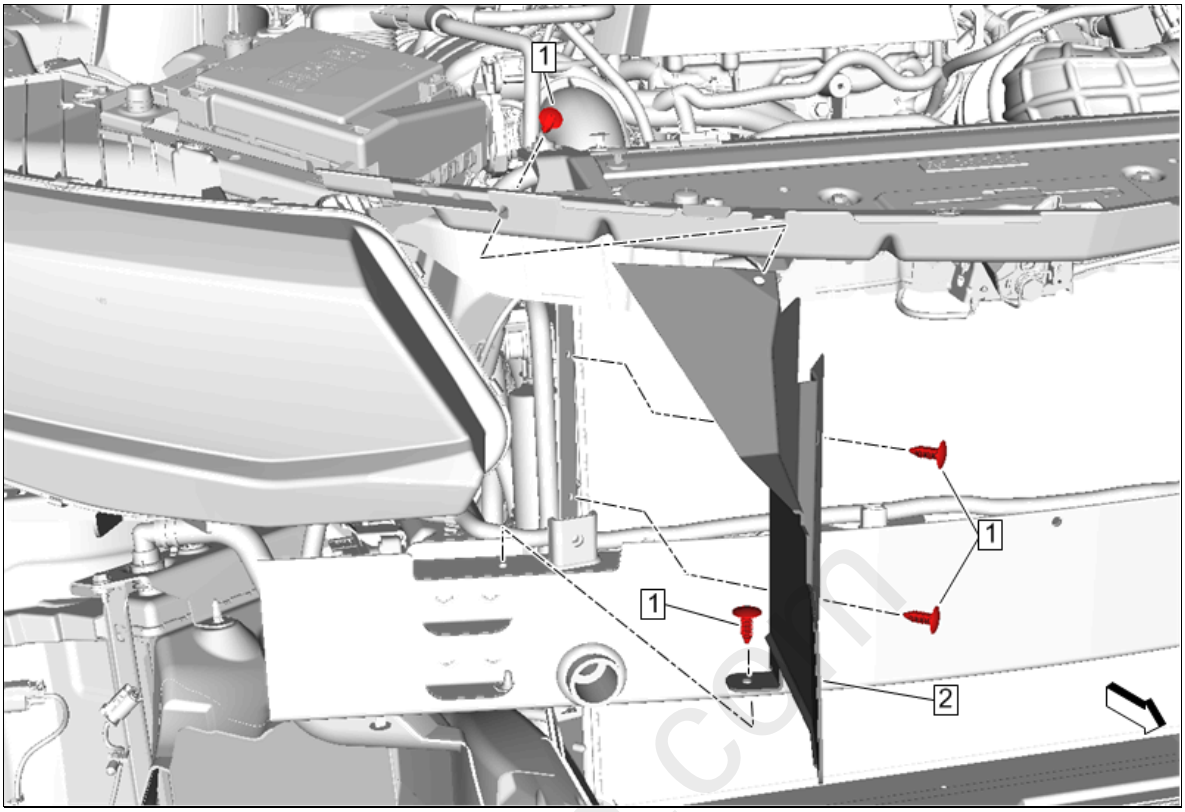


Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Air Side Baffle - Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LGX LTG)

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Fig 4: Radiator Air Side Baffle - Right Side

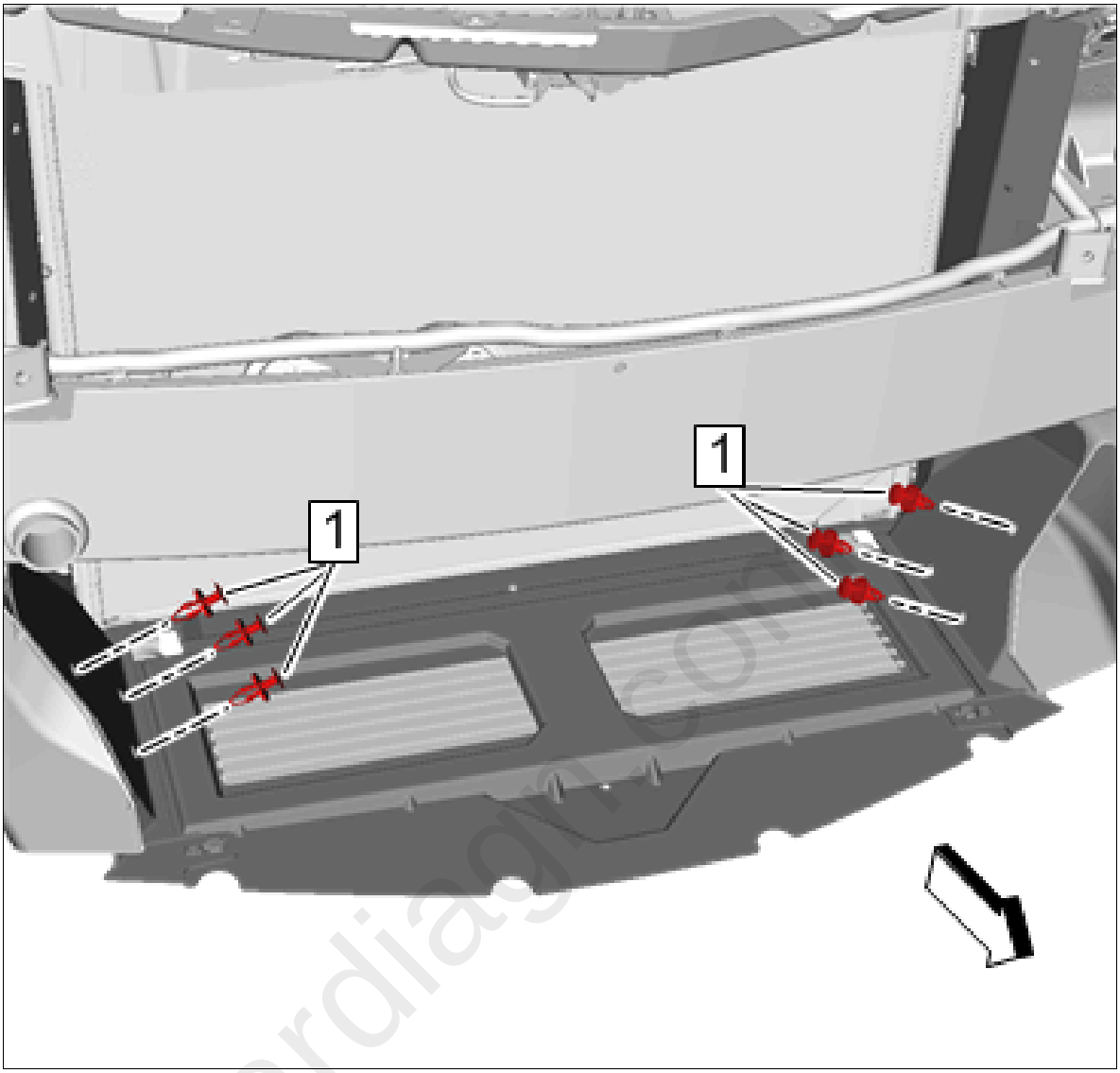


Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Air Side Baffle - Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1)

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Fig 5: Radiator Air Lower Baffle Retainer

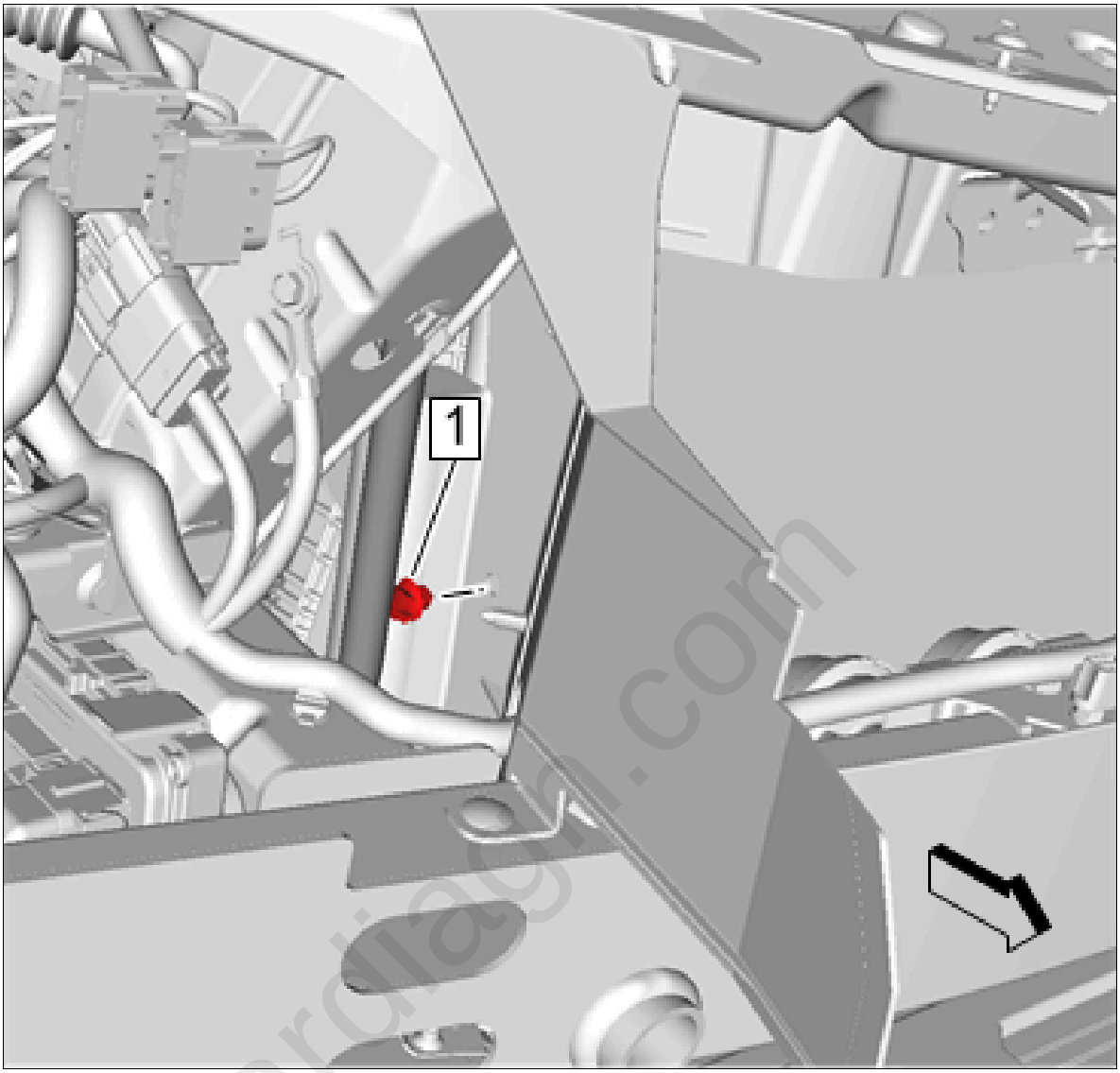


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5. Remove Radiator Air Lower Baffle Retainer (1) (Qty: 6)
6. Remove Front Brake Rotor Cooling Duct - Right Side at Radiator Air Lower Baffle - Front Brake Rotor Cooling Duct Replacement (J6G)
7. Remove Front Brake Rotor Cooling Duct - Left Side at Radiator Air Lower Baffle - Front Brake Rotor Cooling Duct Replacement (J6G)

Fig 6: Auxiliary Radiator Inlet Hose Retainer

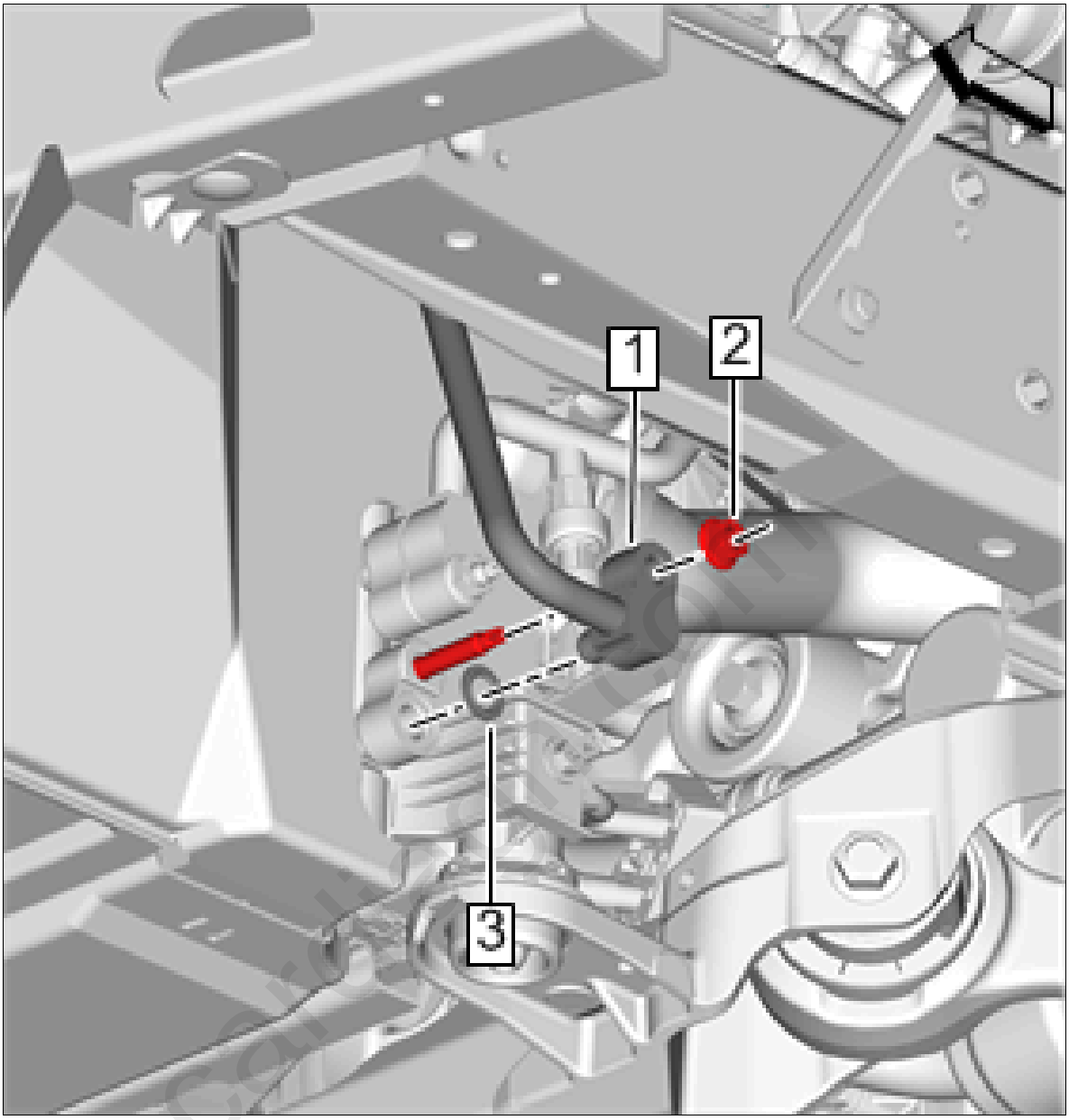


Courtesy of GENERAL MOTORS COMPANY

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8. Remove Auxiliary Radiator Inlet Hose Retainer (1) at Radiator Air Lower Baffle

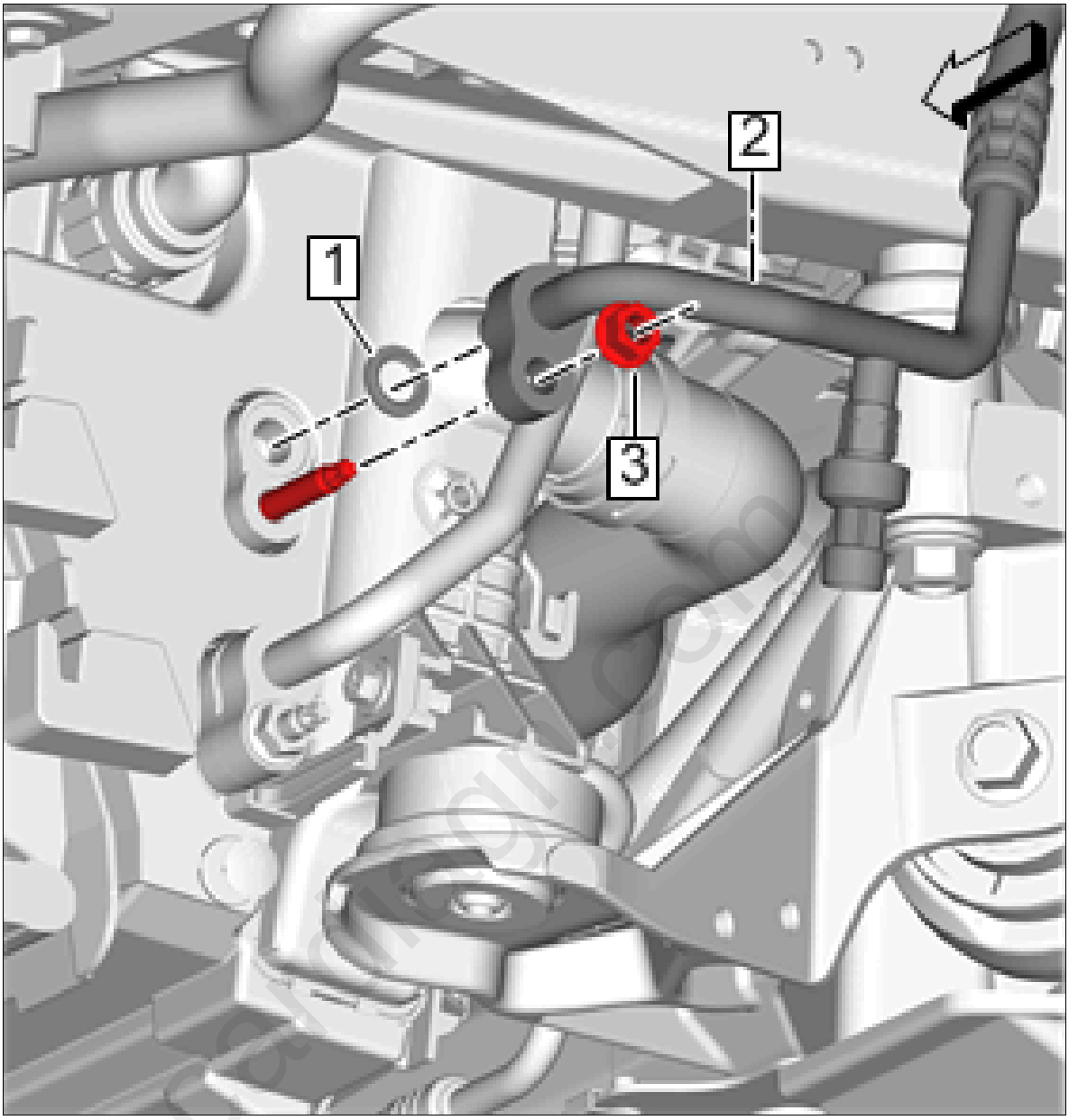
Fig 7: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

9. Remove Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LTG with Y4Q)Condenser Tube Replacement (LTG without Y4Q)

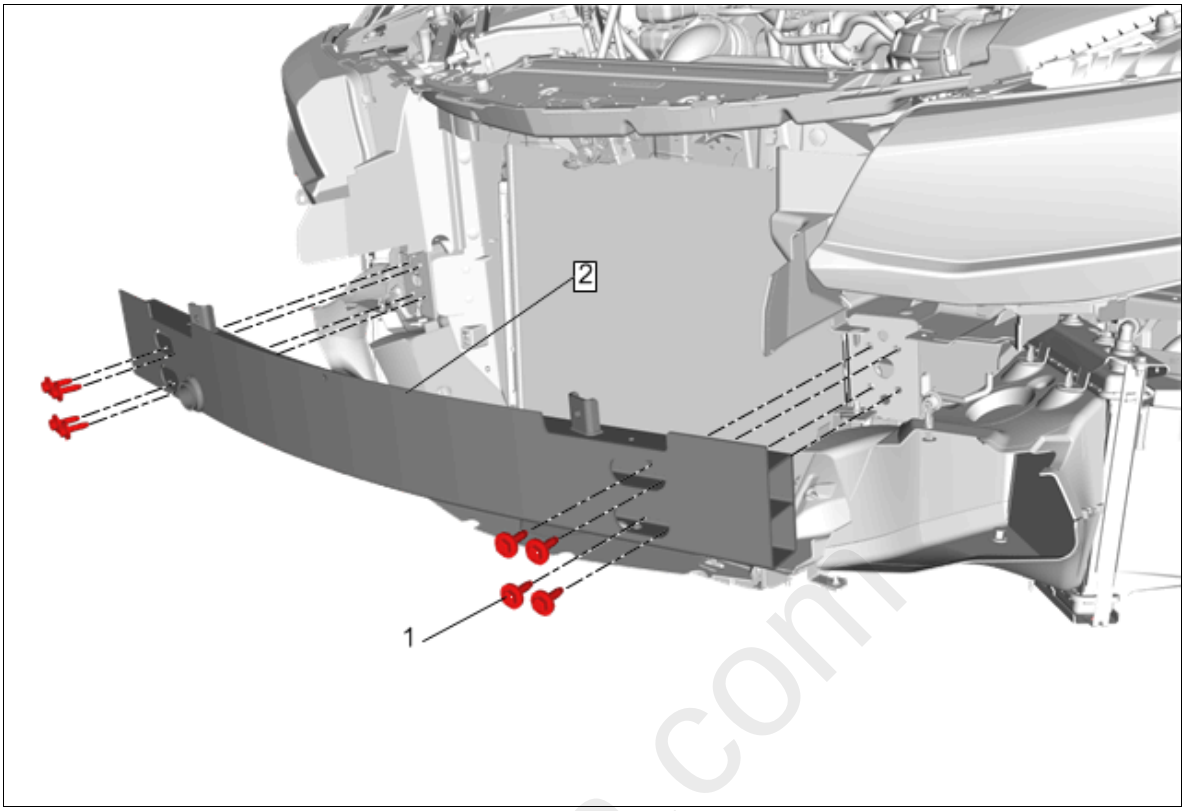
Fig 8: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

10. Remove Air Conditioning Compressor Hose (1) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LTG with Y4Q)Air Conditioning Compressor Hose Replacement (LTG without Y4Q)

Fig 9: Front Bumper Impact Bar (Without Y4Q)

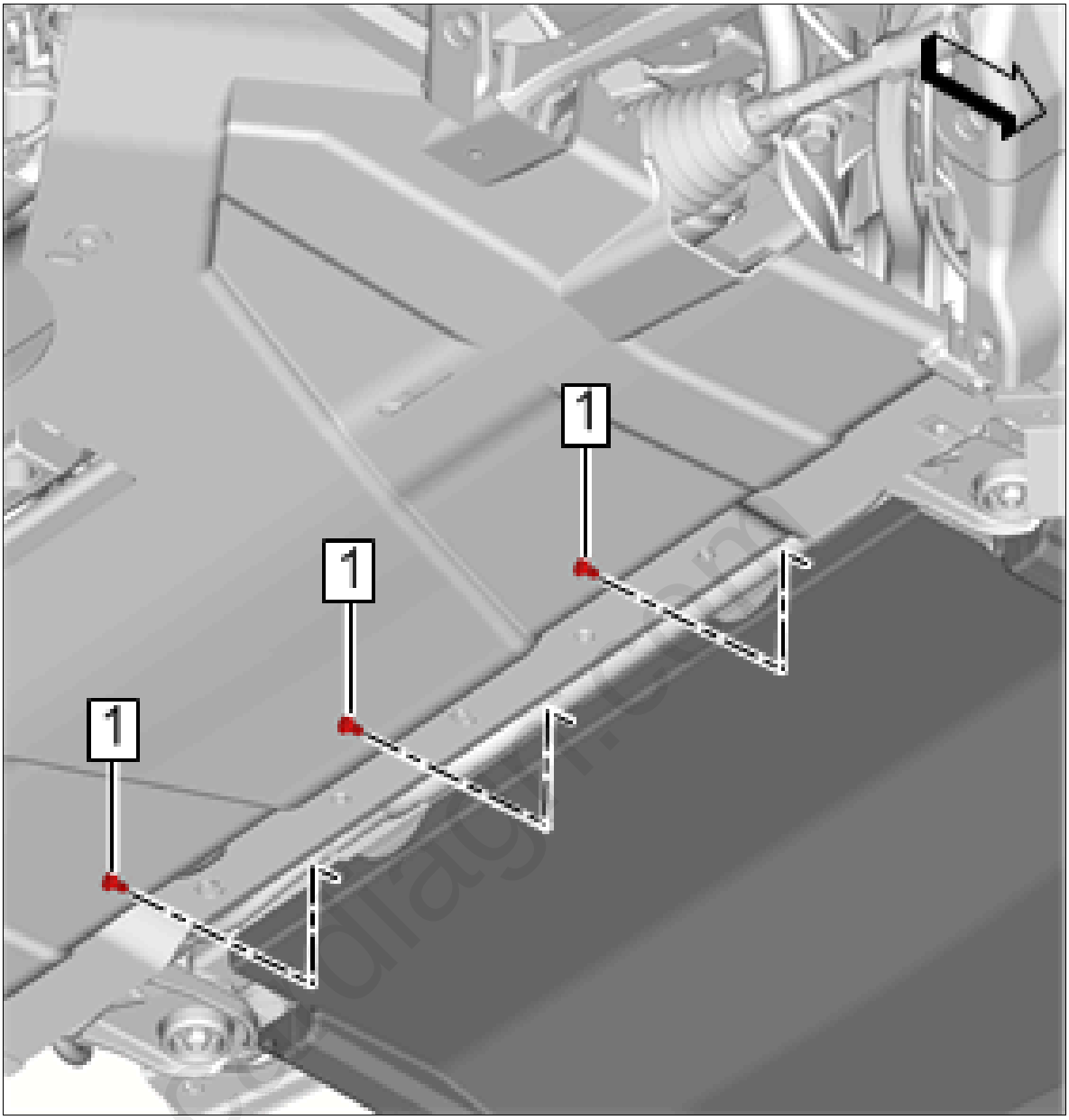


Courtesy of GENERAL MOTORS COMPANY

11. Remove Front Bumper Impact Bar (2) - Front Bumper Impact Bar Replacement (Without Y4Q)
12. Remove Auxiliary Engine Oil Cooler - Auxiliary Engine Oil Cooler Replacement (LTG with Y4Q)

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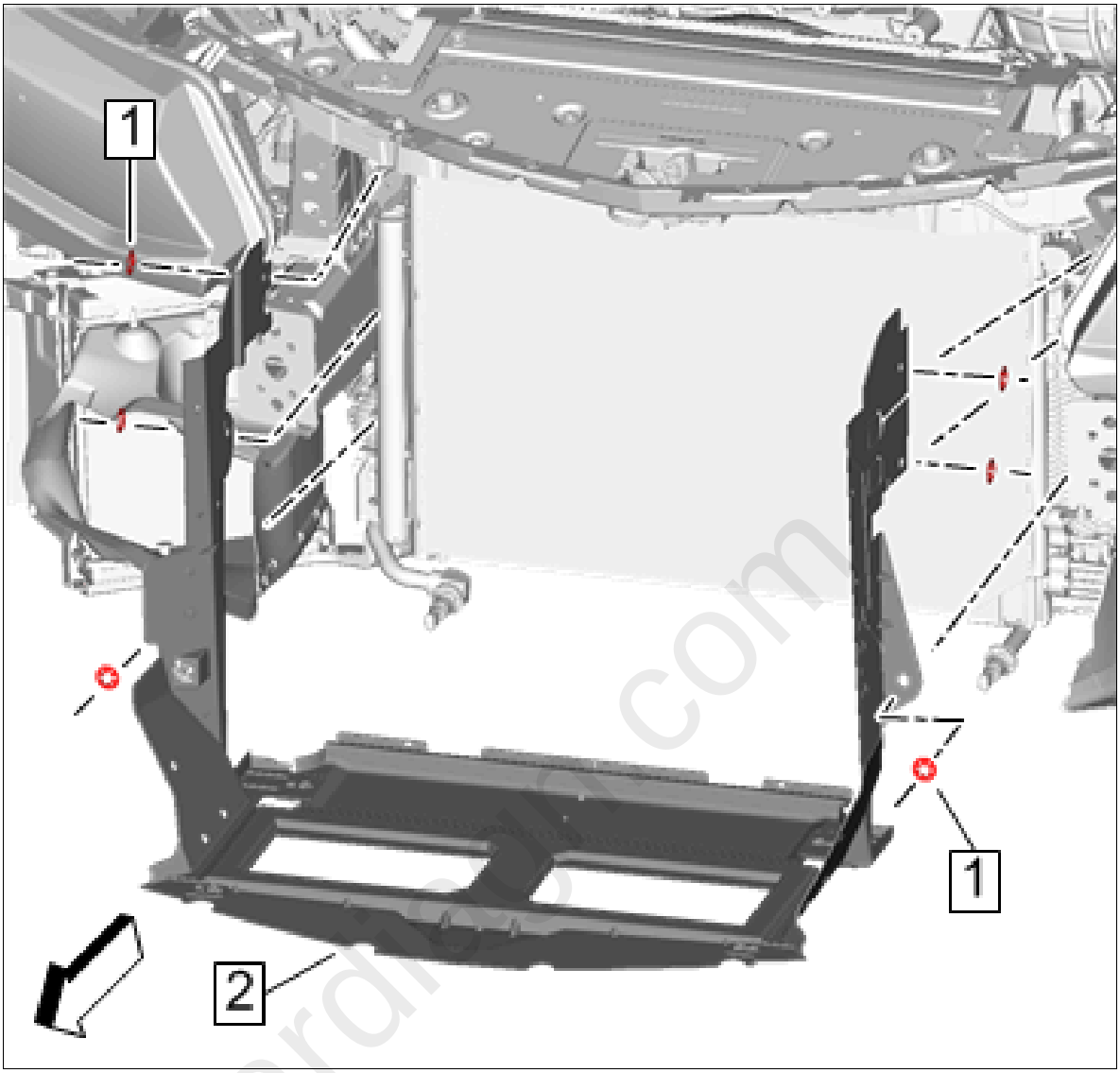
Fig 10: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

13. Remove Radiator Air Baffle Retainer (1) (Qty: 3)
14. Disconnect the electrical connectors and detach the wiring harness as necessary.

Fig 11: Radiator Air Lower Baffle

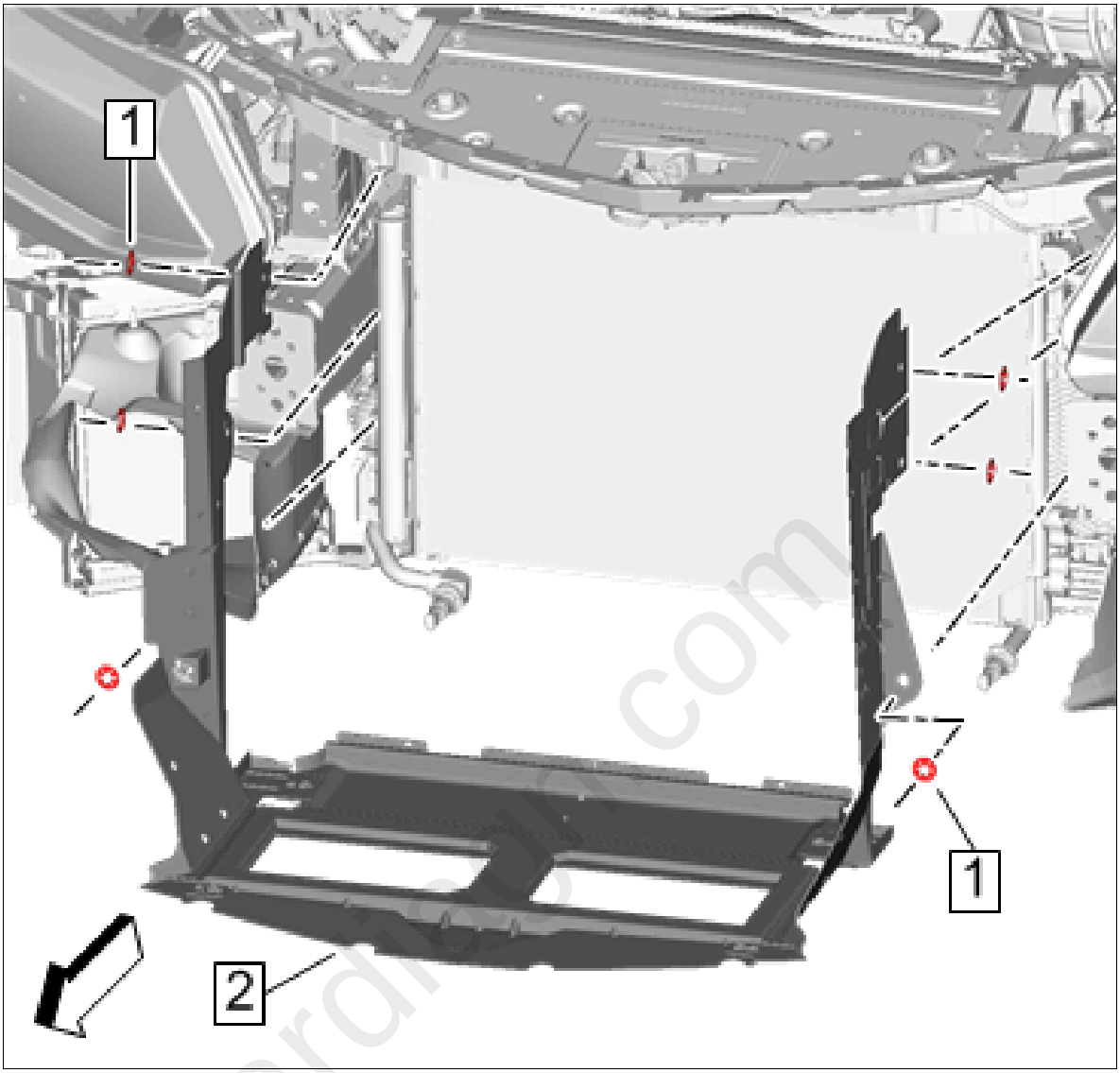


Courtesy of GENERAL MOTORS COMPANY

15. Remove Radiator Air Baffle Retainer (1) (Qty: 6)
16. Remove Radiator Air Lower Baffle (2)
17. Transfer components as necessary.

REPAIR INSTRUCTIONS > RADIATOR AIR LOWER BAFFLE REPLACEMENT (LTG WITH V18) > INSTALLATION PROCEDURE

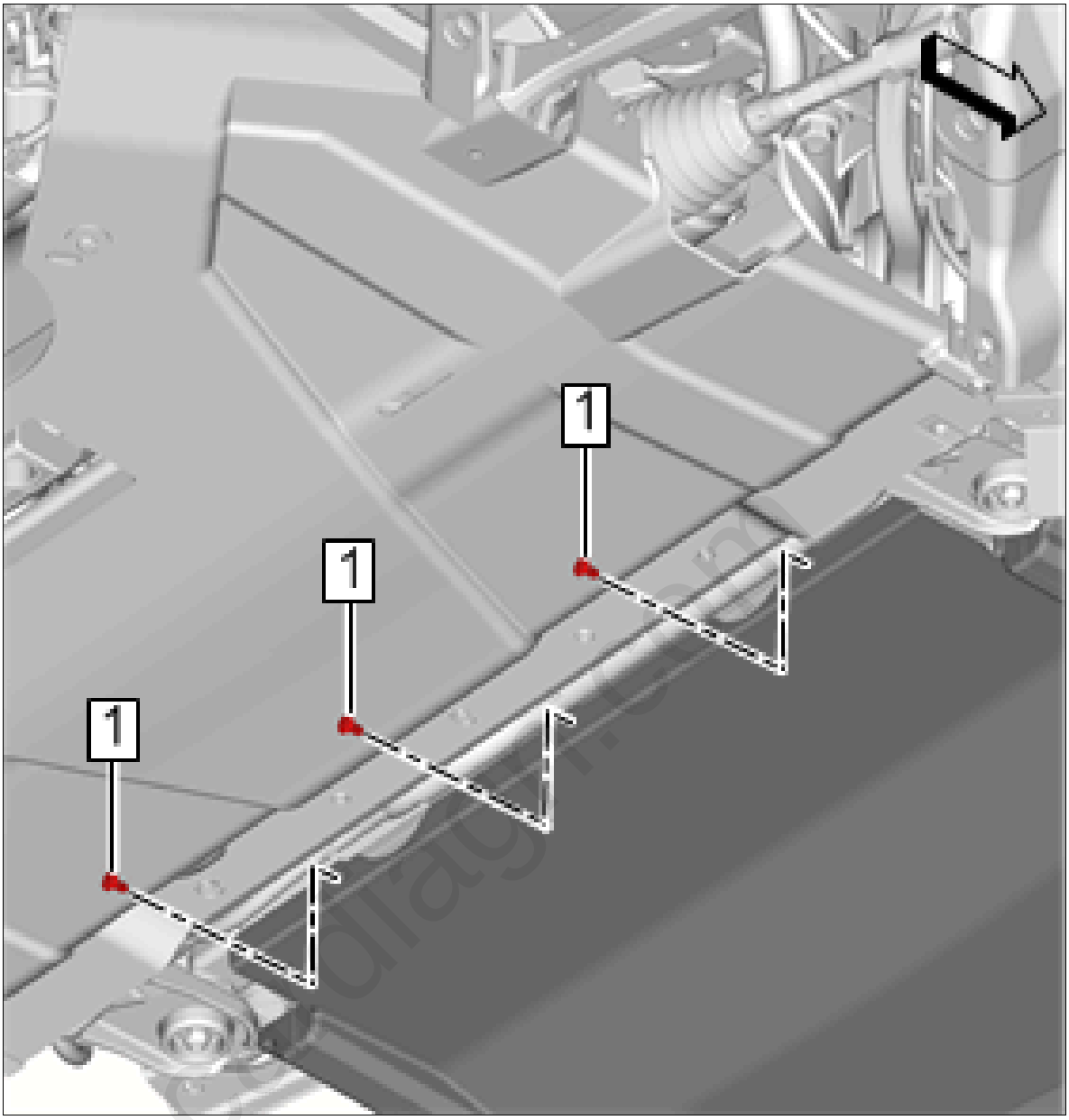
Fig 1: Radiator Air Lower Baffle



Courtesy of GENERAL MOTORS COMPANY

1. Install Radiator Air Lower Baffle (2)
2. Install Radiator Air Baffle Retainer (1) (Qty: 6)
3. Attach the wiring harness and connect the electrical connectors as necessary.

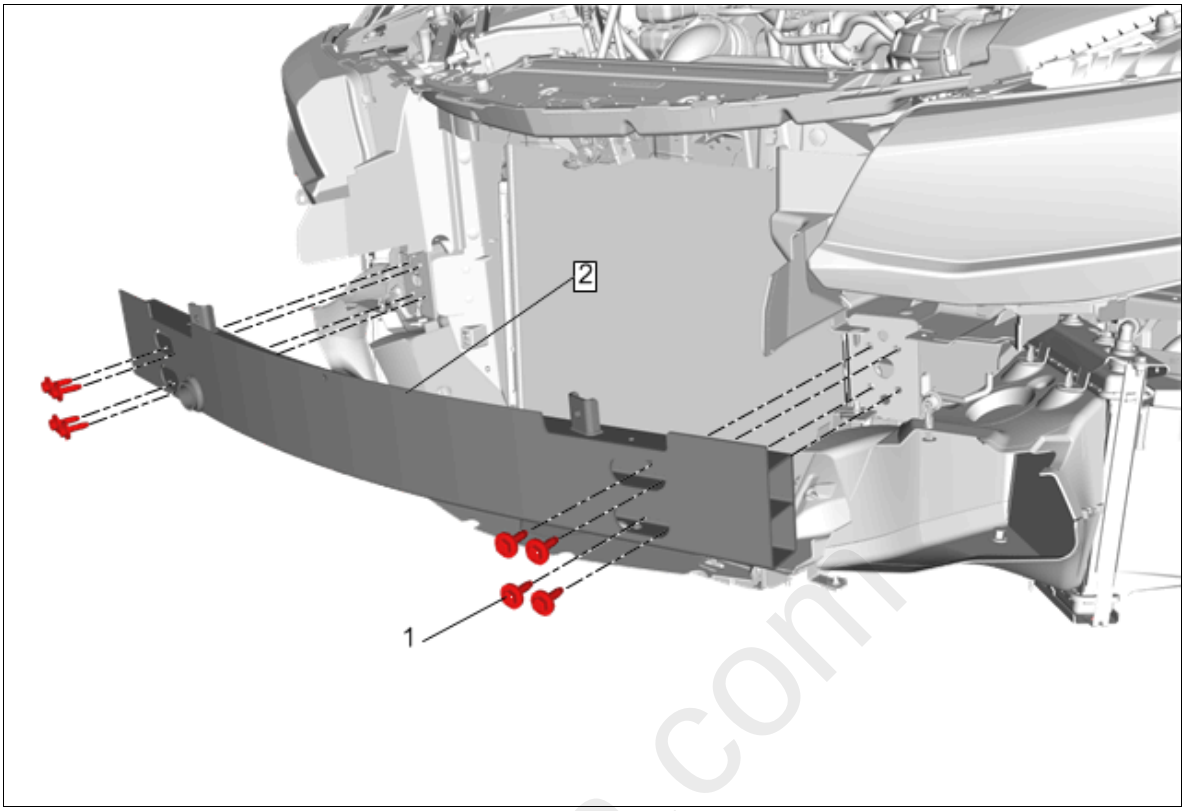
Fig 2: Radiator Air Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Air Baffle Retainer (1) (Qty: 3)
5. Install Auxiliary Engine Oil Cooler - Auxiliary Engine Oil Cooler Replacement (LTG with Y4Q)

Fig 3: Front Bumper Impact Bar (Without Y4Q)

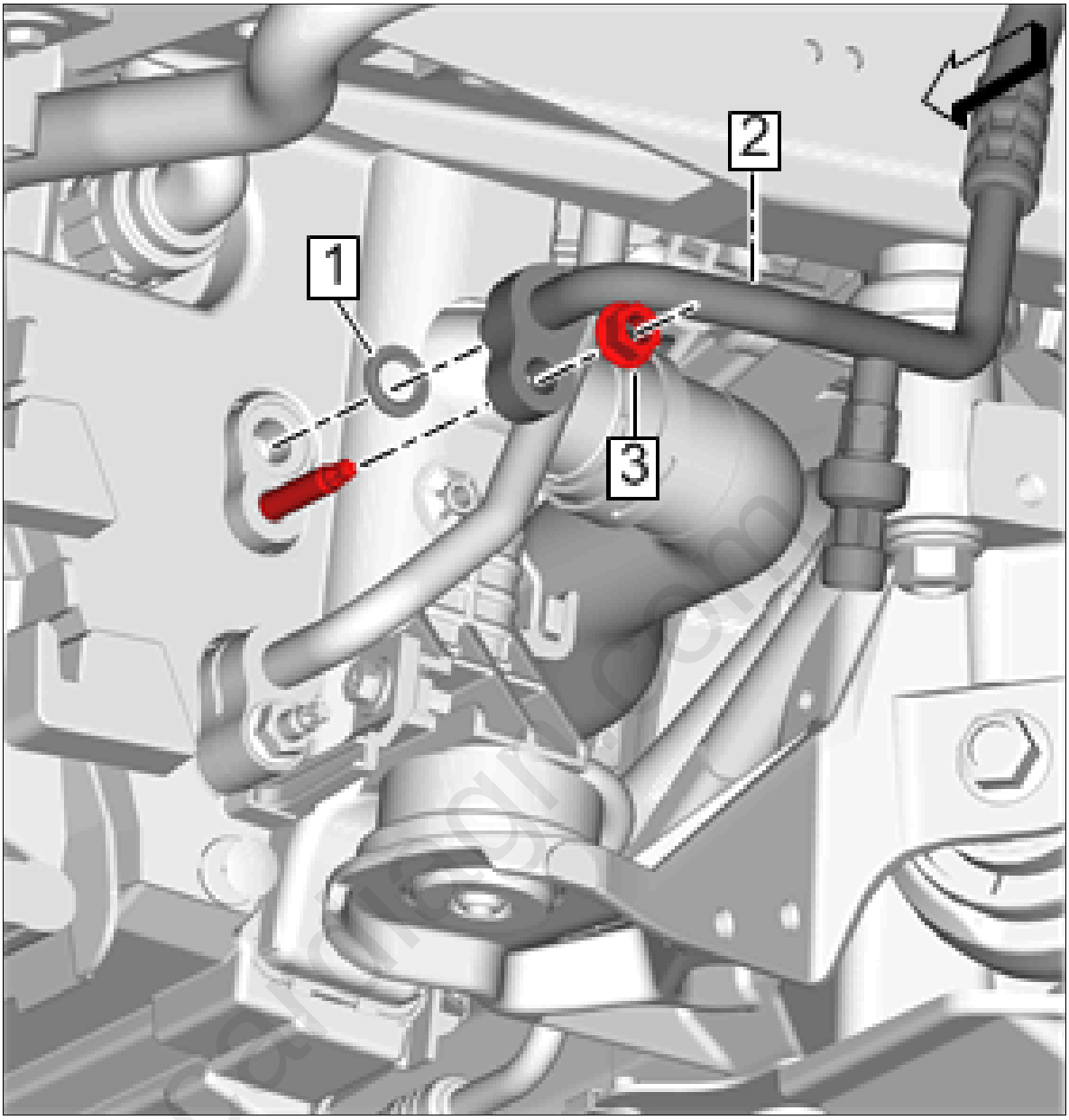


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6. Install Front Bumper Impact Bar (2) - Front Bumper Impact Bar Replacement (Without Y4Q)

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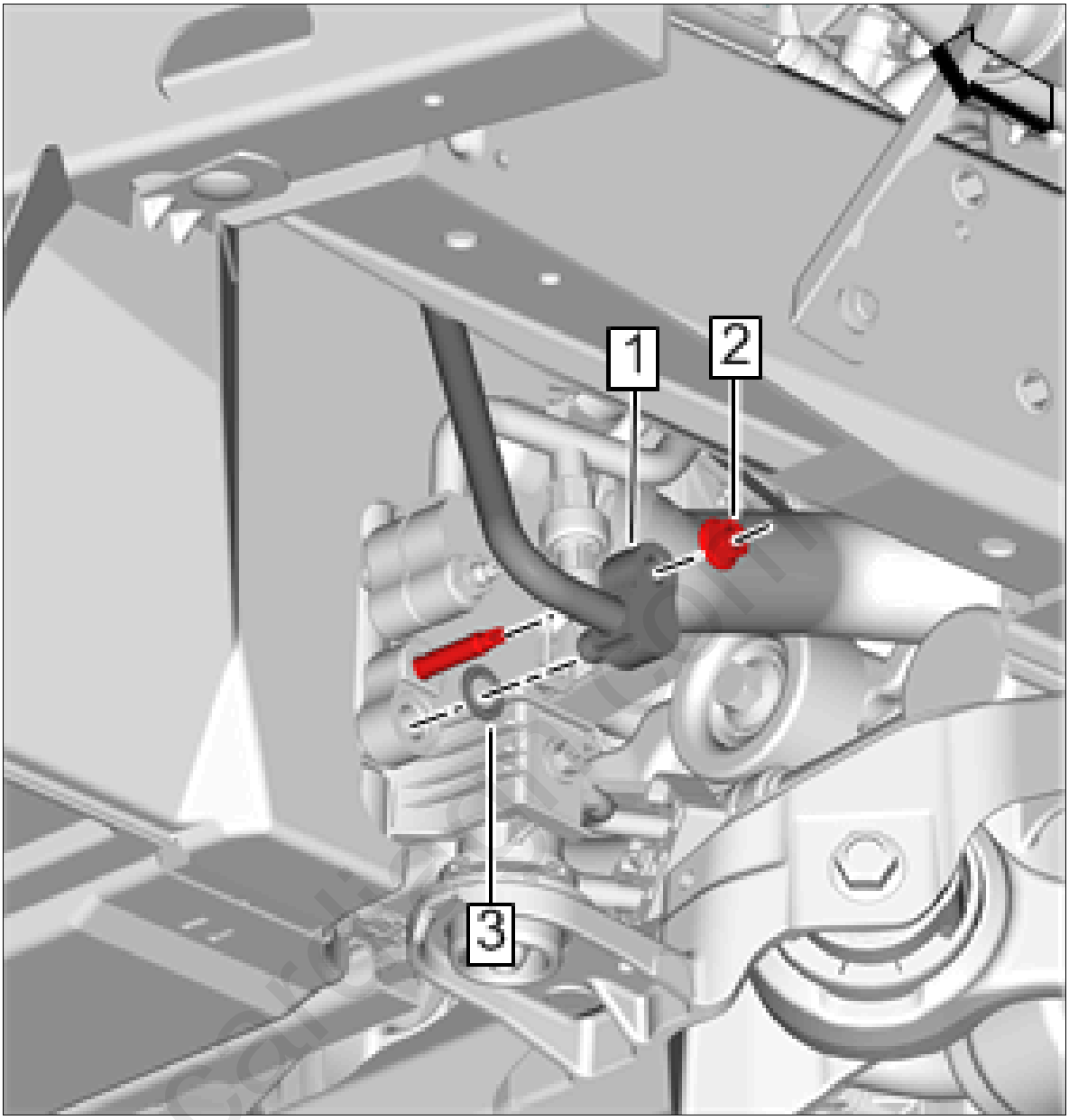
Fig 4: Air Conditioning Condenser Hose Nut



Courtesy of GENERAL MOTORS COMPANY

7. Install Air Conditioning Compressor Hose (1) at Air Conditioning Condenser - Air Conditioning Compressor Hose Replacement (LTG with Y4Q)Air Conditioning Compressor Hose Replacement (LTG without Y4Q)

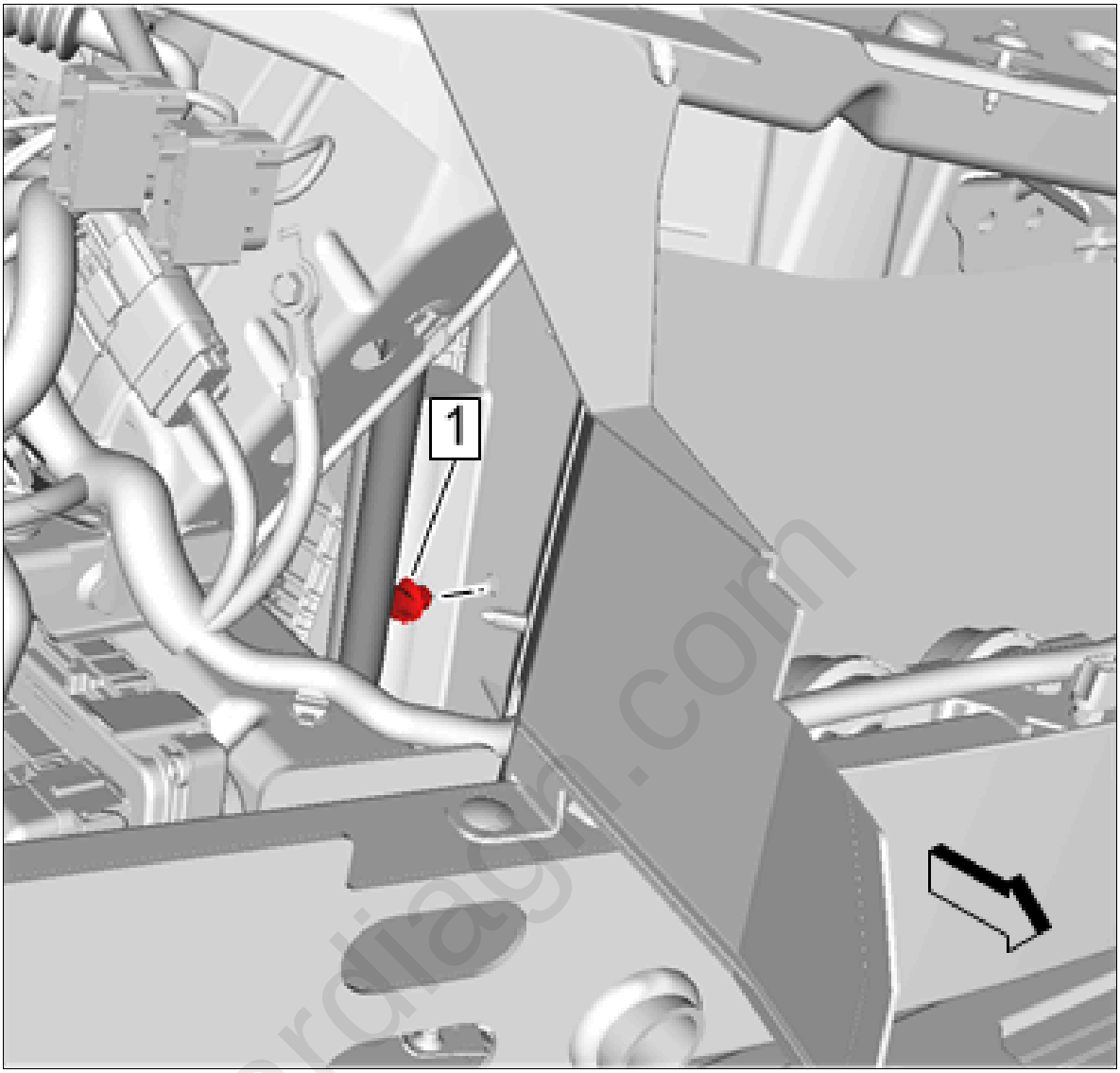
Fig 5: Air Conditioning Condenser Tube



Courtesy of GENERAL MOTORS COMPANY

8. Install Air Conditioning Condenser Tube (2) at Air Conditioning Condenser - Condenser Tube Replacement (LTG with Y4Q)Condenser Tube Replacement (LTG without Y4Q)

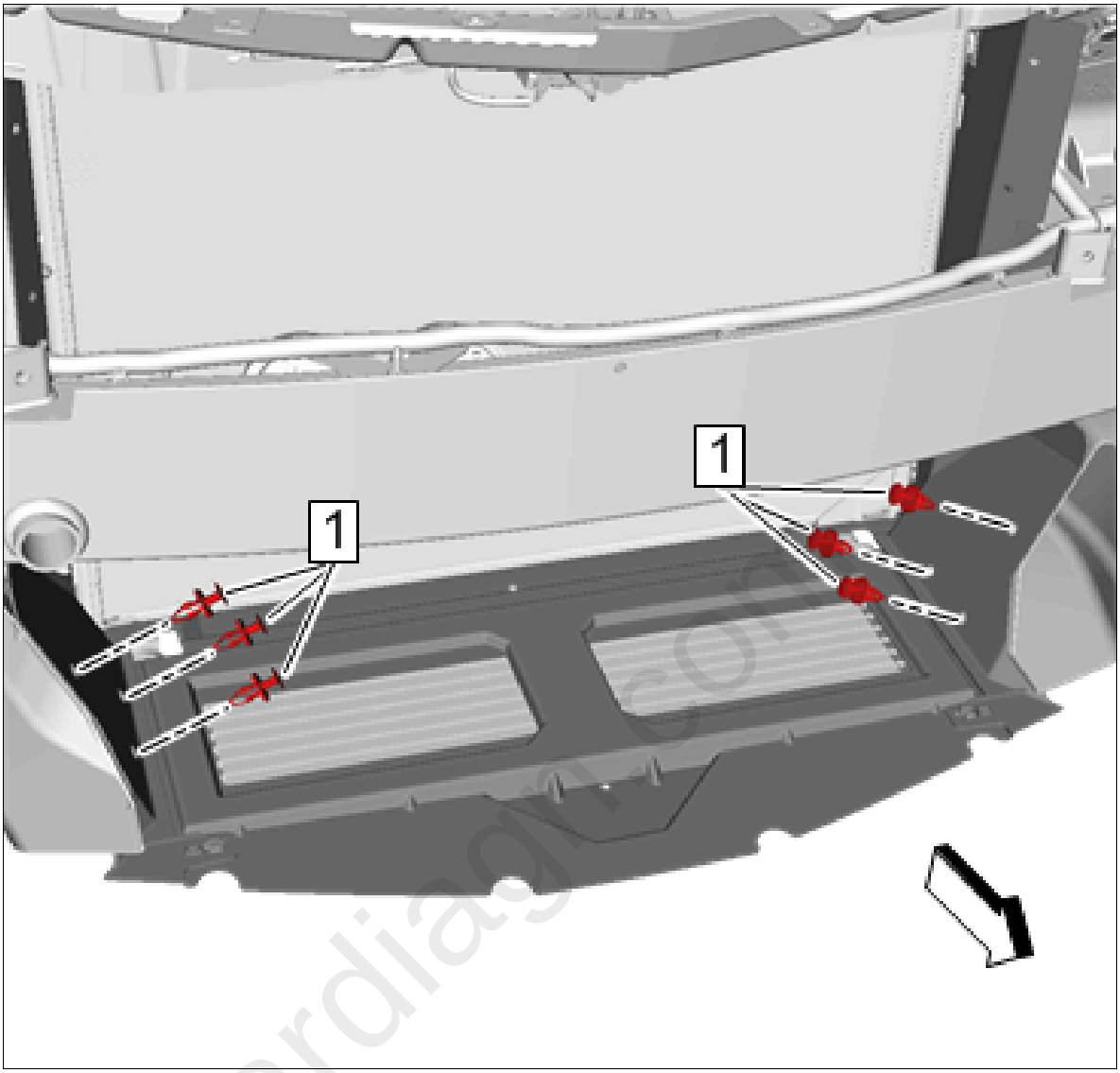
Fig 6: Auxiliary Radiator Inlet Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

9. Install Auxiliary Radiator Inlet Hose Retainer (1) at Radiator Air Lower Baffle
10. Install Front Brake Rotor Cooling Duct - Left Side at Radiator Air Lower Baffle - Front Brake Rotor Cooling Duct Replacement (J6G)
11. Install Front Brake Rotor Cooling Duct - Right Side at Radiator Air Lower Baffle - Front Brake Rotor Cooling Duct Replacement (J6G)

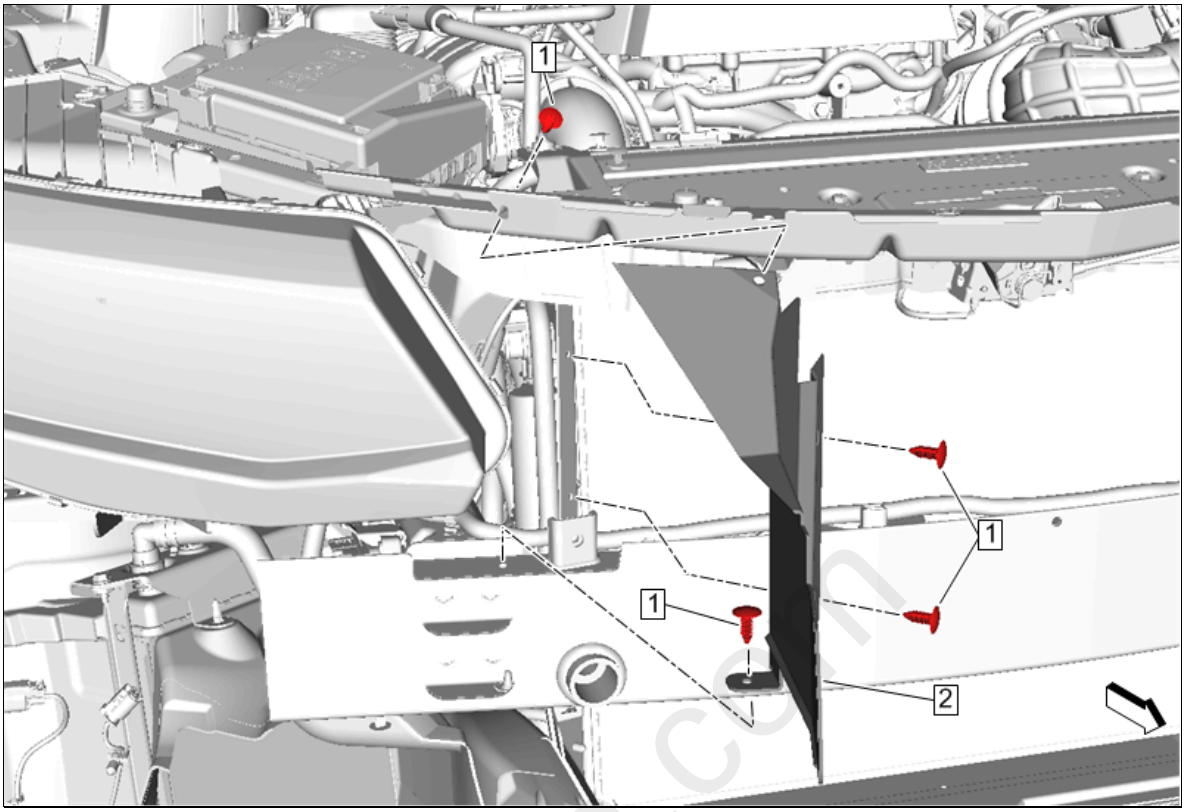
Fig 7: Radiator Air Lower Baffle Retainer



Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Air Lower Baffle Retainer (1) (Qty: 6)

Fig 8: Radiator Air Side Baffle - Right Side

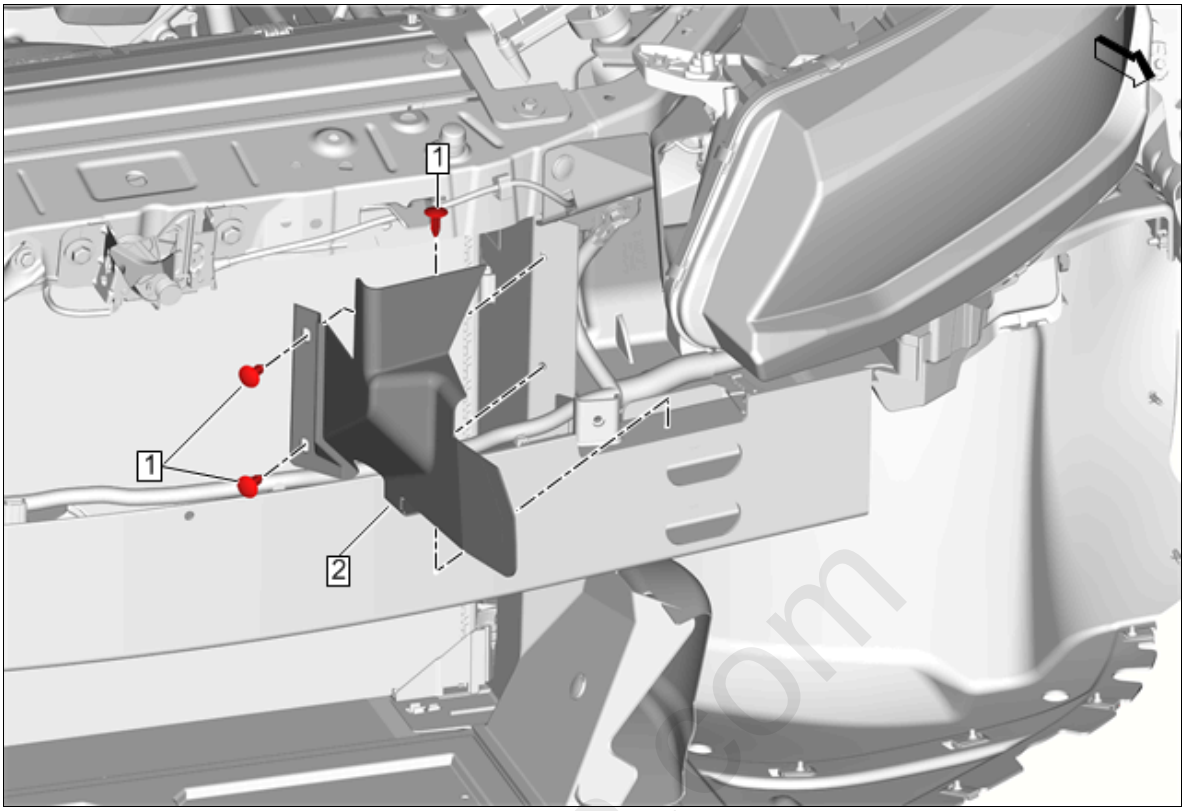


Courtesy of GENERAL MOTORS COMPANY

13. Install Radiator Air Side Baffle - Right Side (2) - Radiator Air Side Baffle Replacement - Right Side (LTG LT1)

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Fig 9: Radiator Air Side Baffle - Left Side

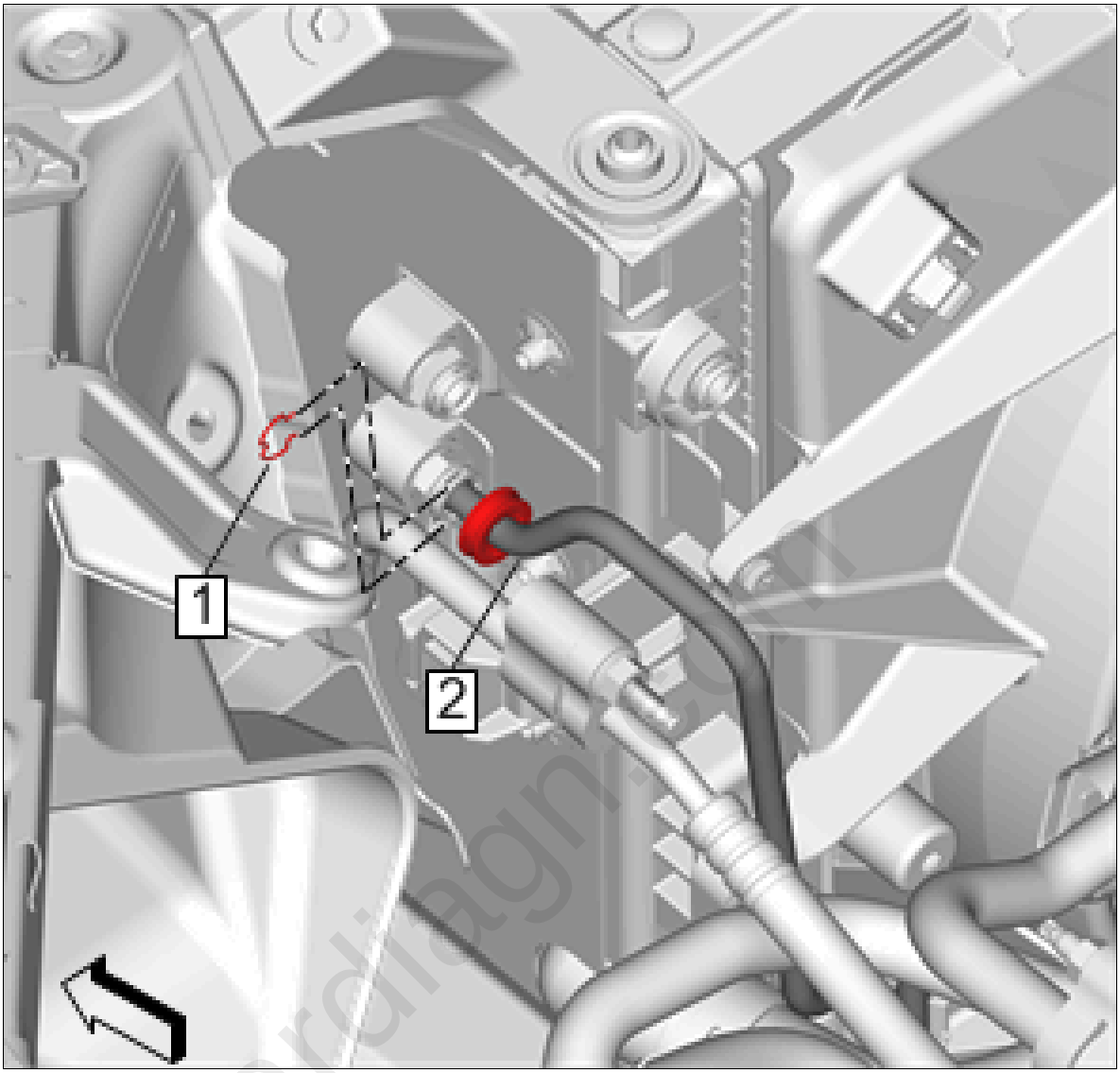


Courtesy of GENERAL MOTORS COMPANY

14. Install Radiator Air Side Baffle - Left Side (2) - Radiator Air Side Baffle Replacement - Left Side (LGX LTG)

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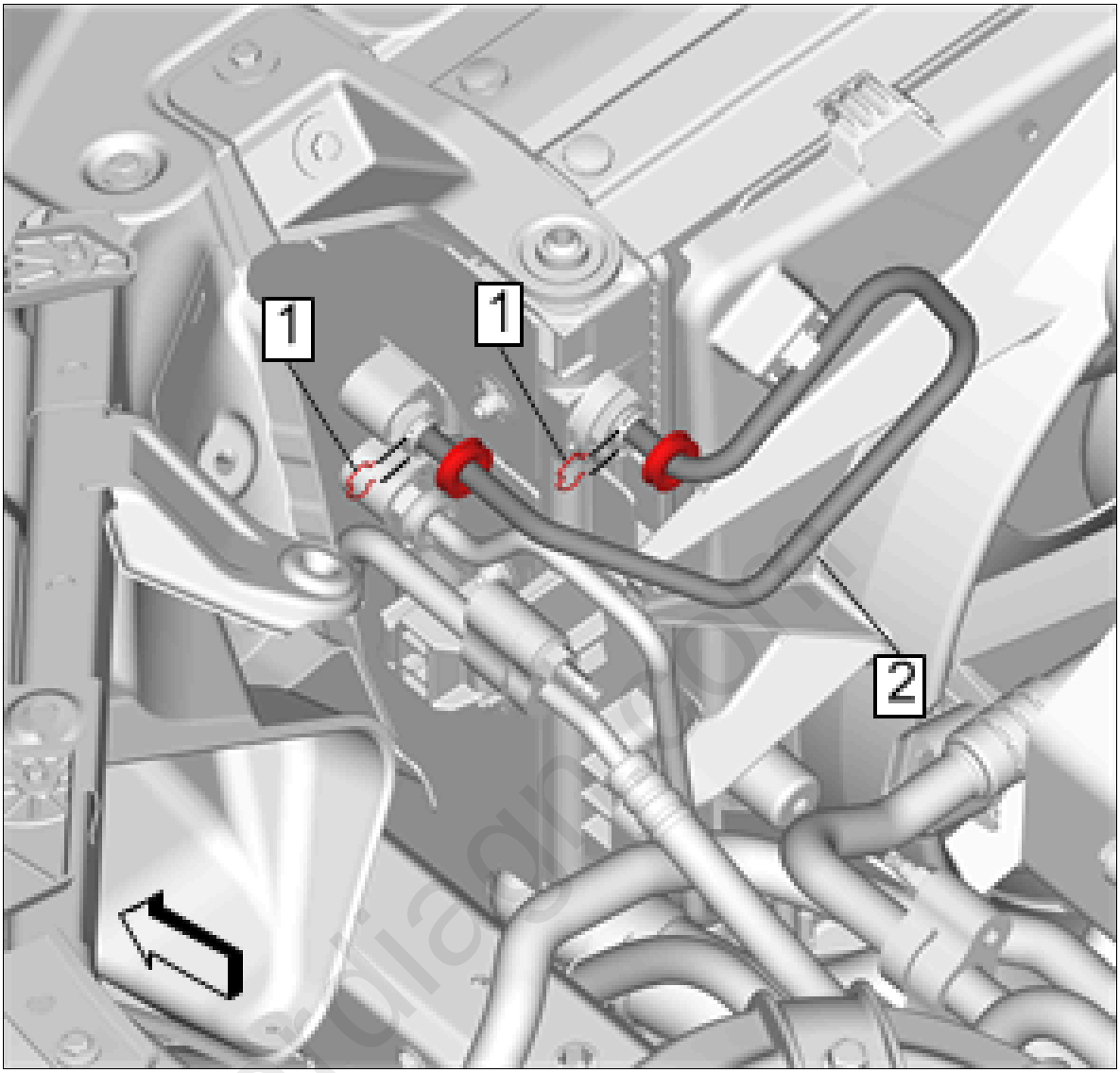
Fig 10: Transmission Fluid Cooler Inlet and Outlet Pipe



Courtesy of GENERAL MOTORS COMPANY

15. Install Transmission Fluid Cooler Inlet and Outlet Pipe (2) at Air Conditioning Condenser - Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

Fig 11: Transmission Fluid Cooler Pipe

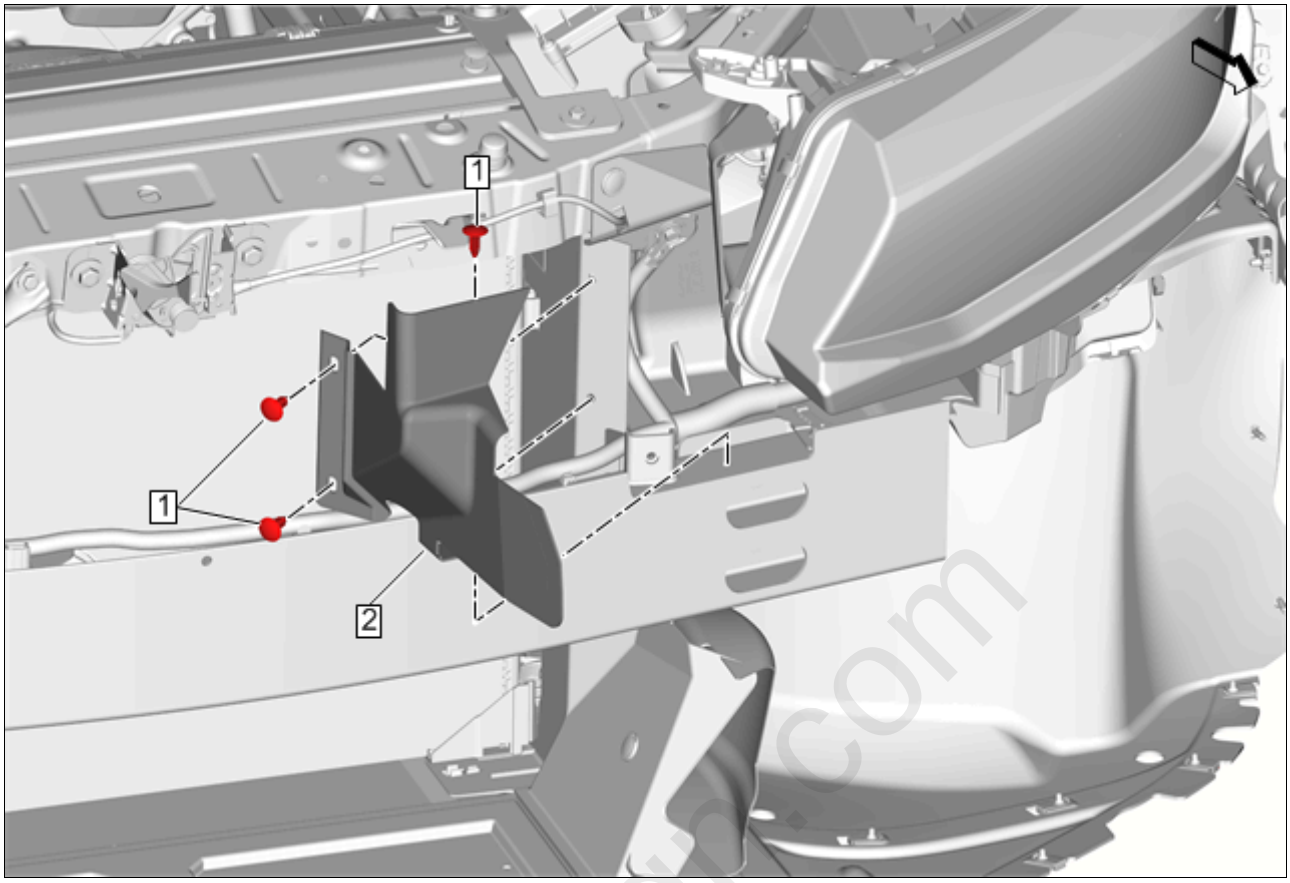


Courtesy of GENERAL MOTORS COMPANY

16. Install Transmission Fluid Cooler Pipe (2) - Transmission Fluid Cooler Pipe Replacement (LTG With M5T, With V03)

REPAIR INSTRUCTIONS > RADIATOR AIR SIDE BAFFLE REPLACEMENT - LEFT SIDE (LGX LTG)

Fig 1: Radiator Air Side Baffle - Left Side (LGX LTG)

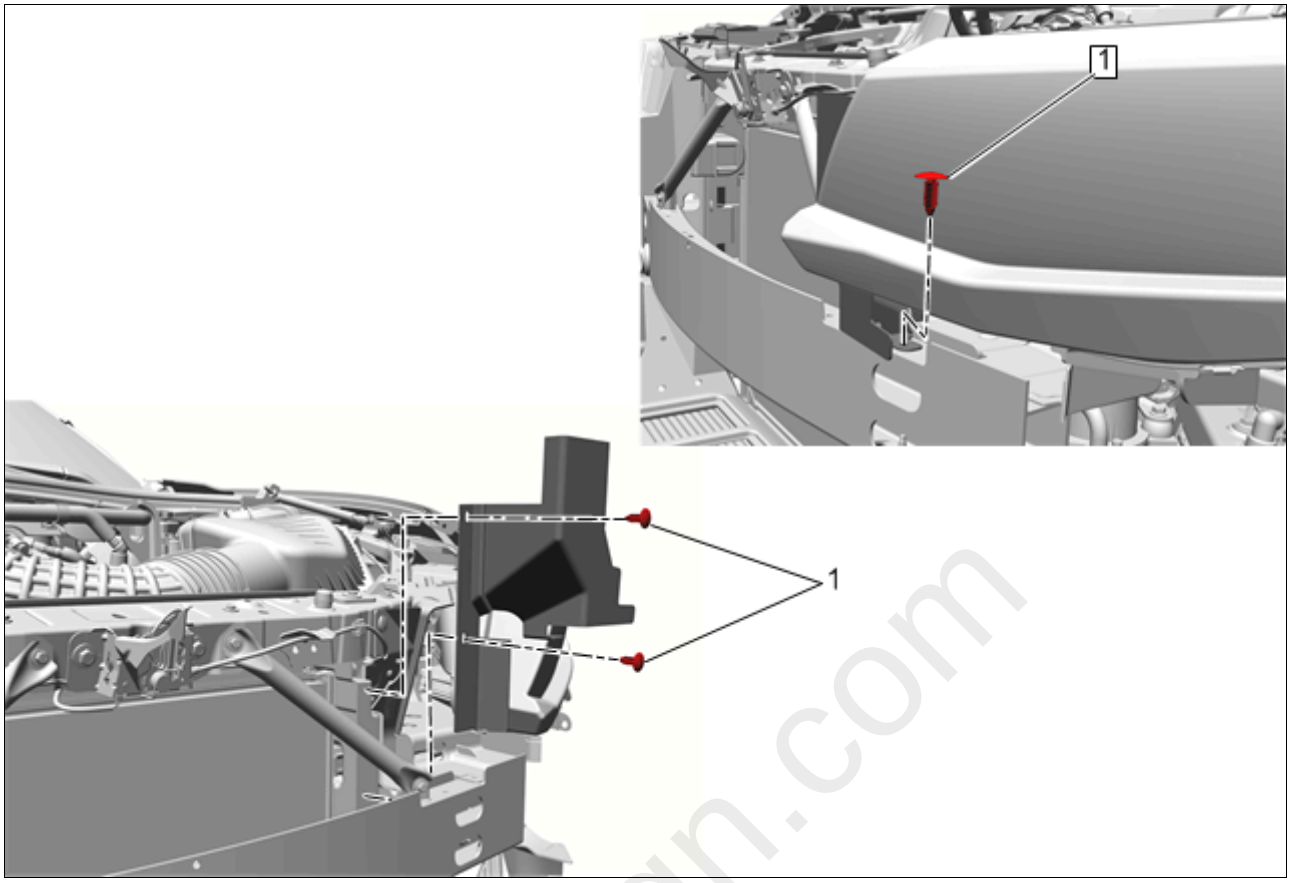


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement	
1	Radiator Air Baffle Retainer (Qty: 3)
2	Radiator Air Baffle

REPAIR INSTRUCTIONS > RADIATOR AIR SIDE BAFFLE REPLACEMENT - LEFT SIDE (LT1)

Fig 1: Radiator Air Side Baffle - Left Side (LT1)



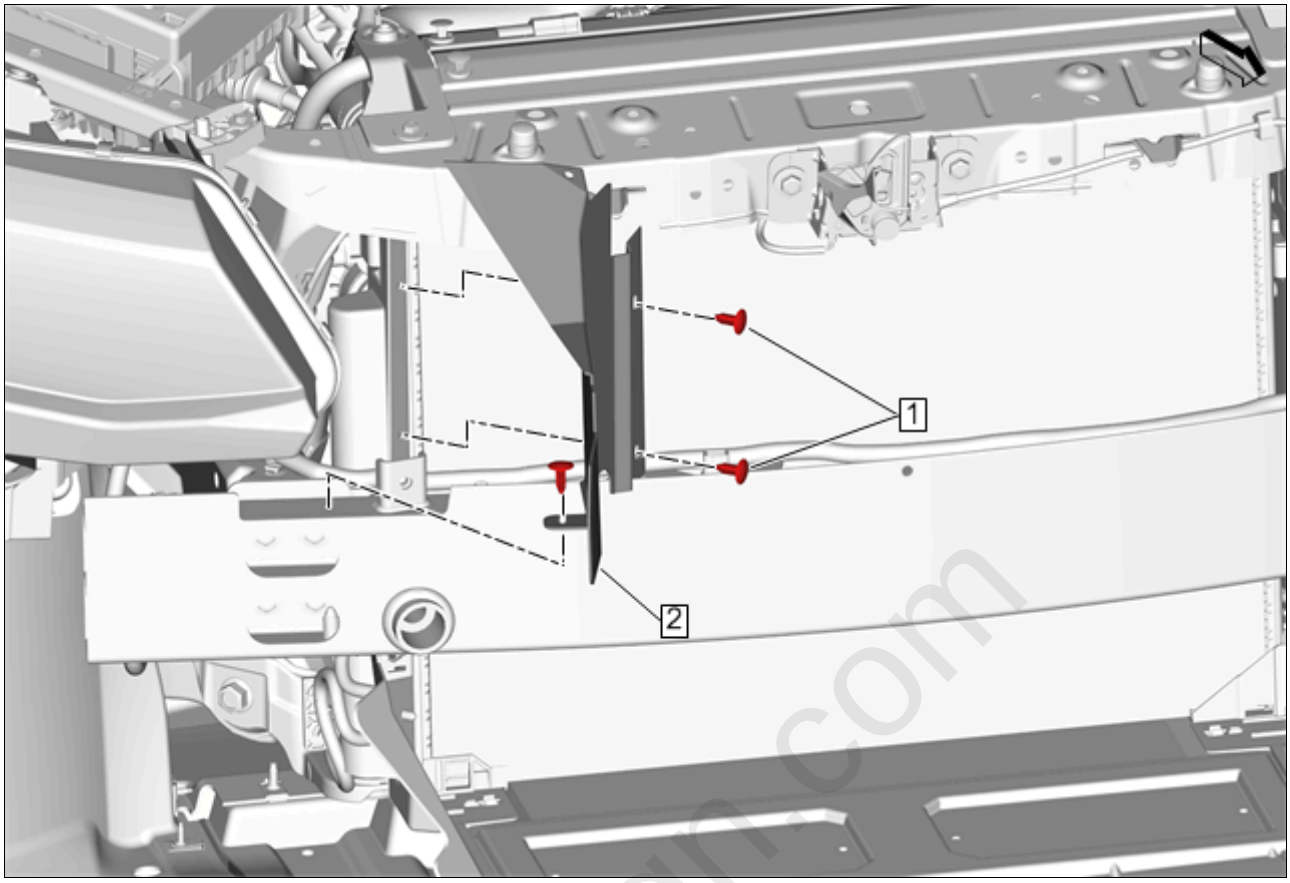
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement	
1	Radiator Air Side Baffle Retainer (Qty: 3)
2	Radiator Air Side Baffle - Left Side

REPAIR INSTRUCTIONS > RADIATOR AIR SIDE BAFFLE REPLACEMENT - RIGHT SIDE (LGX)

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Fig 1: Radiator Air Side Baffle - Right Side (LGX)

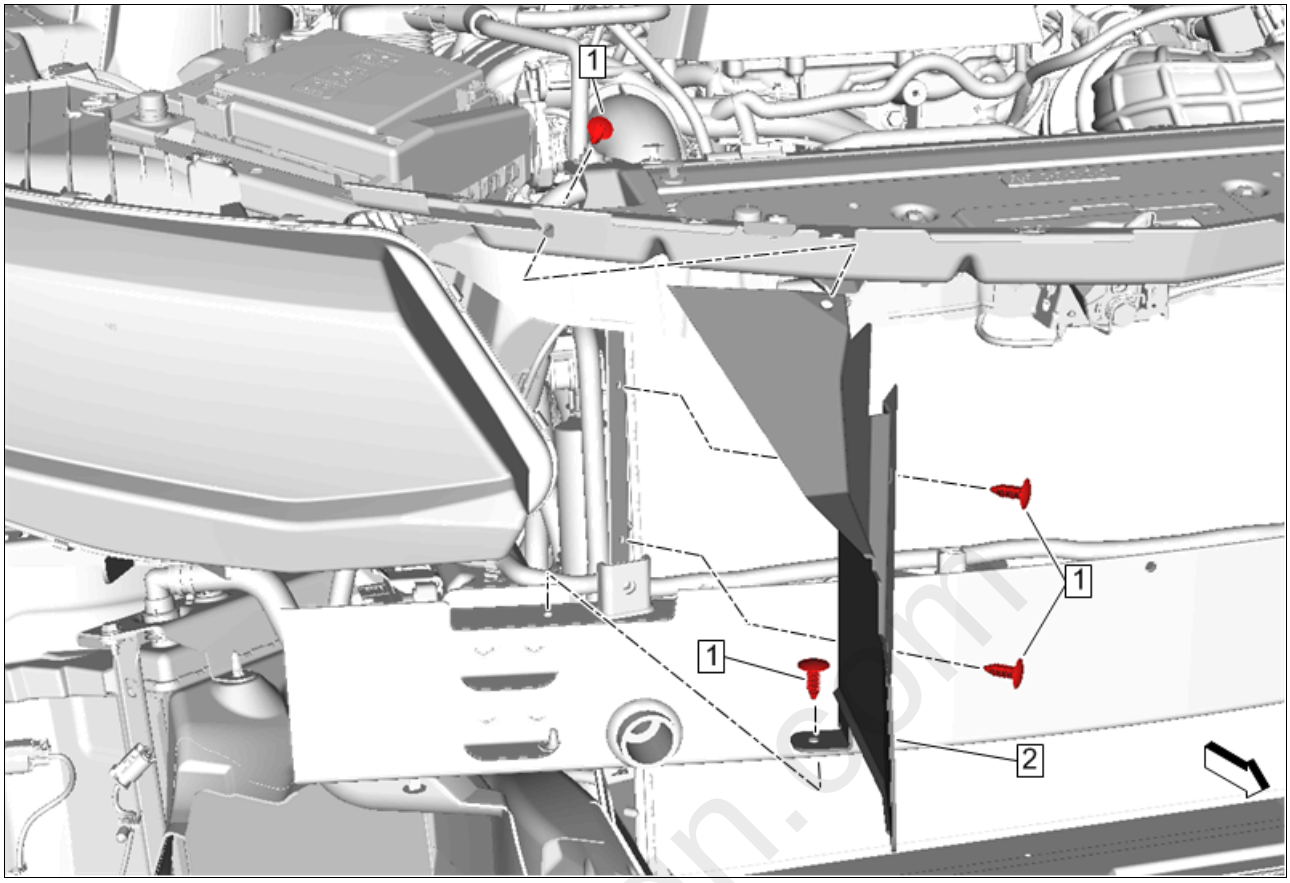


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement	
1	Radiator Air Baffle Retainer (Qty: 3)
2	Radiator Air Baffle

REPAIR INSTRUCTIONS > RADIATOR AIR SIDE BAFFLE REPLACEMENT - RIGHT SIDE (LTG LT1)

Fig 1: Radiator Air Side Baffle - Right Side (LTG LT1)

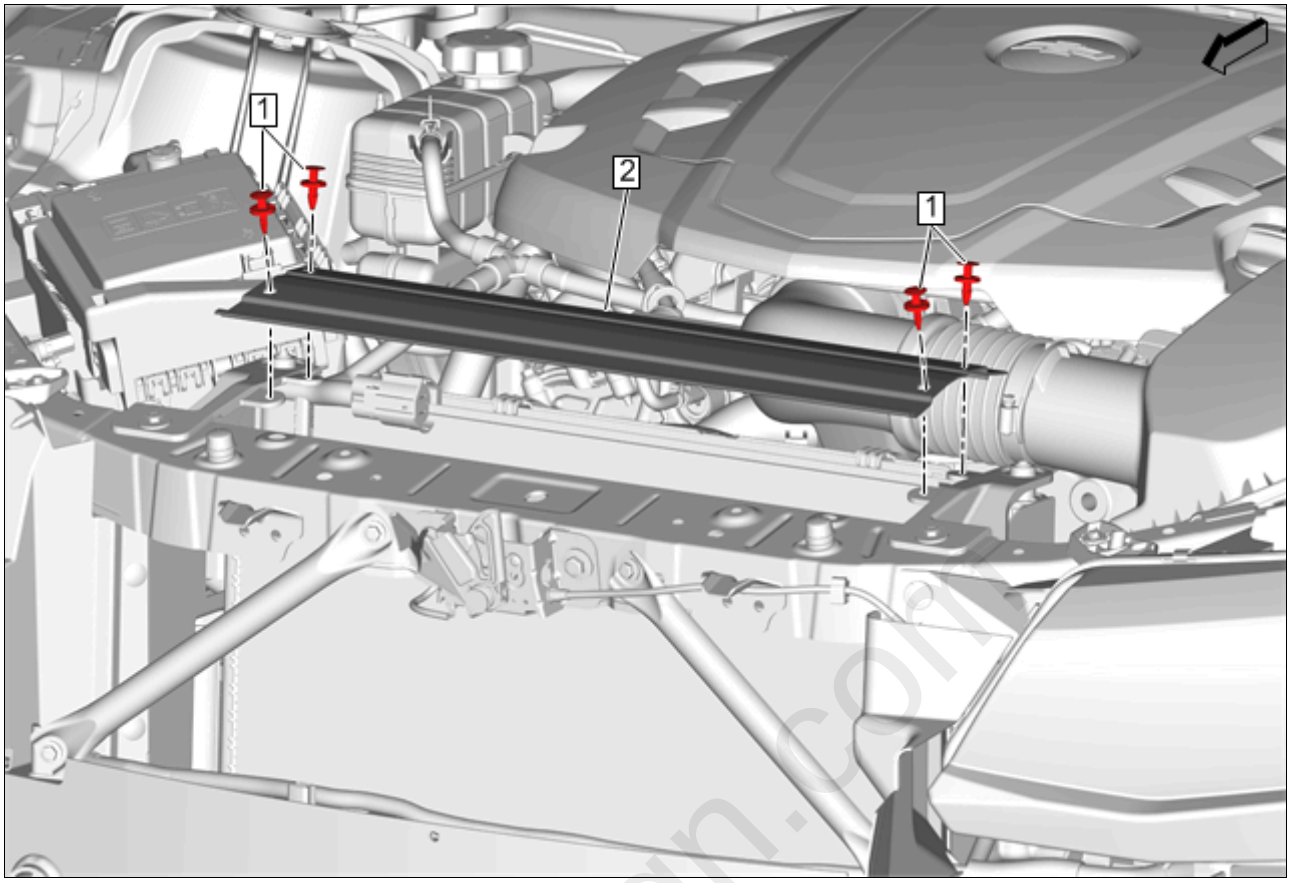


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement	
1	Radiator Air Baffle Retainer (Qty: 4)
2	Radiator Air Baffle

REPAIR INSTRUCTIONS > RADIATOR AIR UPPER BAFFLE AND DEFLECTOR REPLACEMENT (LGX)

Fig 1: Radiator Air Upper Baffle And Deflector (LGX)



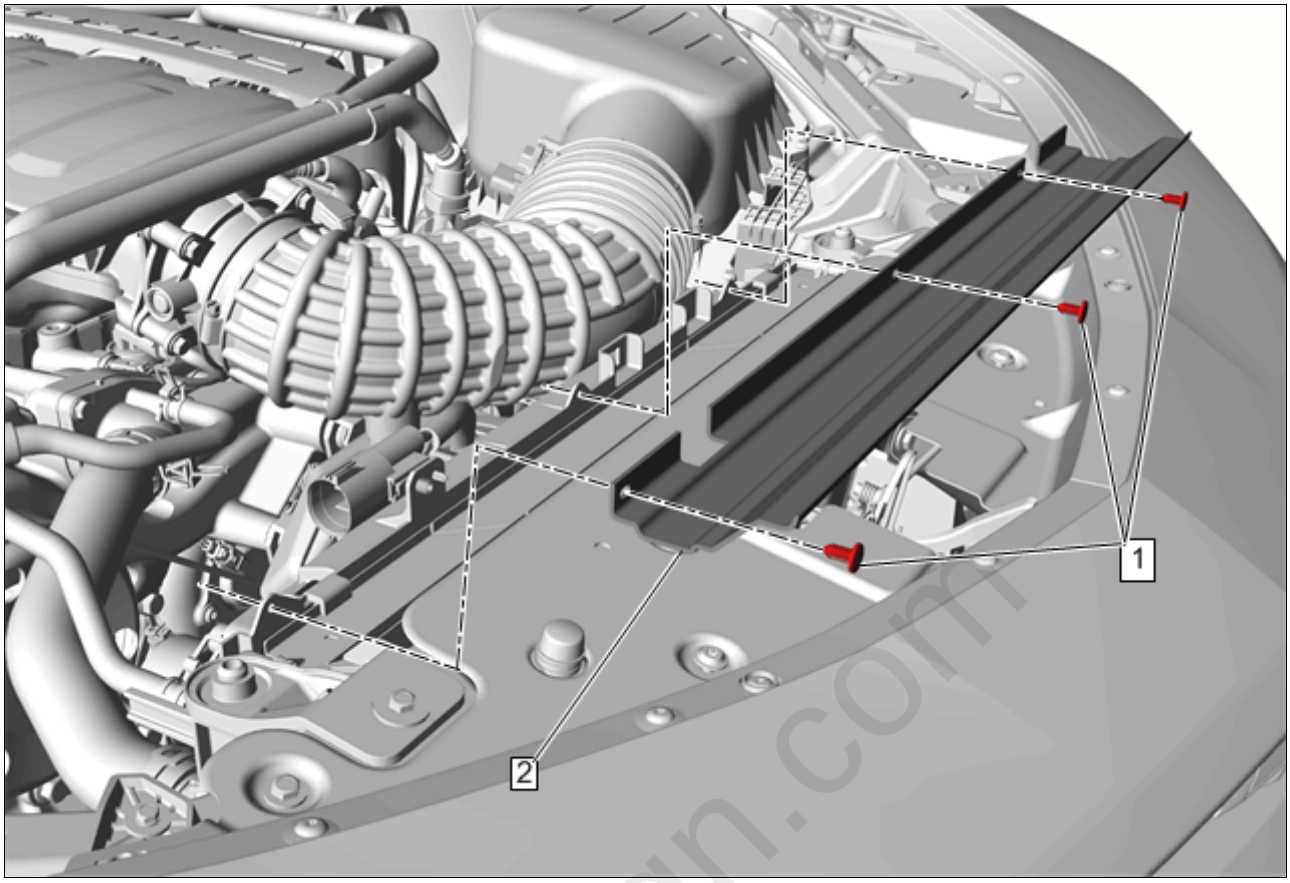
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Air Upper Deflector Retainer (Qty: 4)
2	Radiator Air Upper Baffle

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REPAIR INSTRUCTIONS > RADIATOR AIR UPPER BAFFLE AND DEFLECTOR REPLACEMENT (LT1)

Fig 1: Radiator Air Upper Baffle And Deflector (LT1)



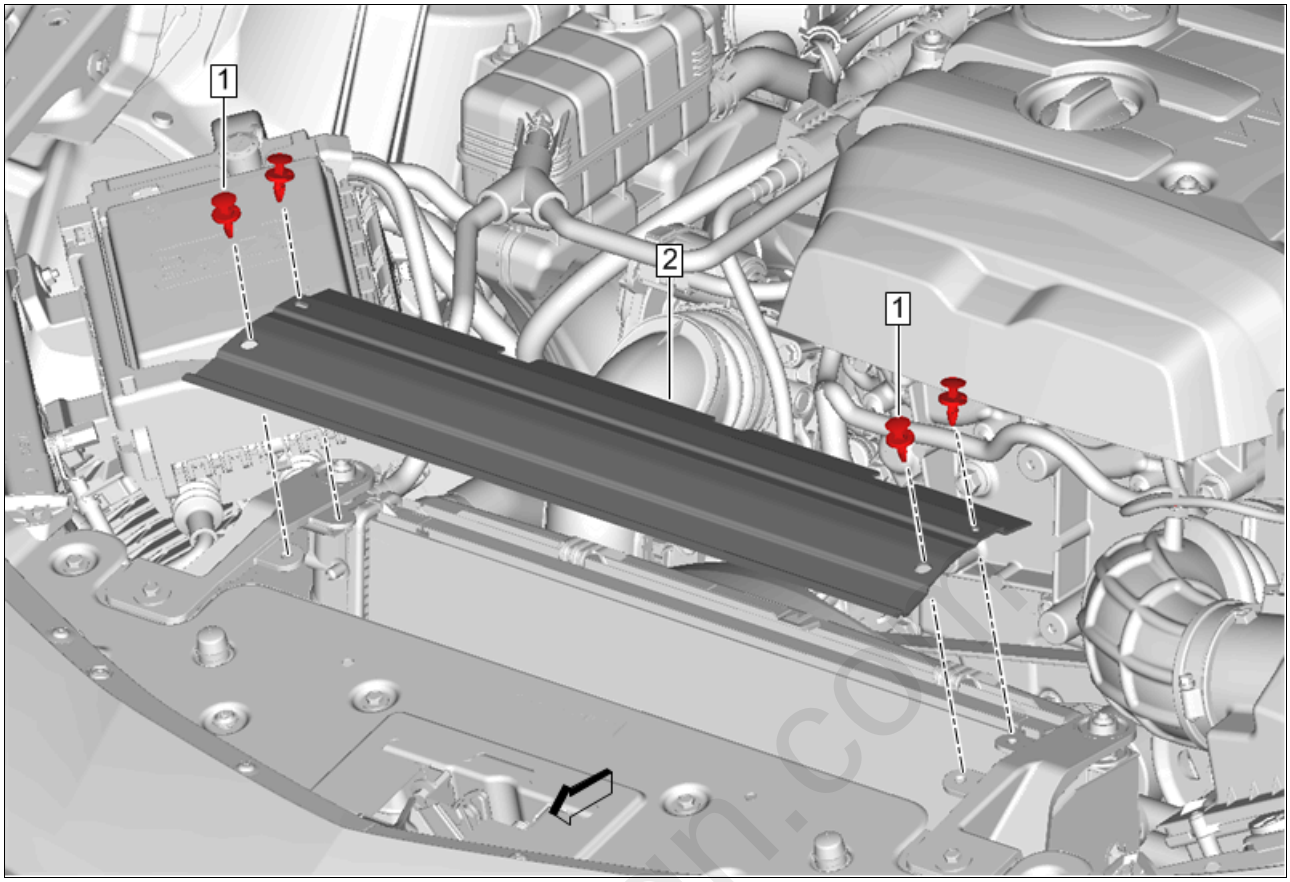
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Air Upper Deflector Retainer (Qty: 3)
2	Radiator Air Upper Baffle **Procedure** Maneuver the radiator air upper baffle from underneath the front bumper fascia center support.

REPAIR INSTRUCTIONS > RADIATOR AIR UPPER BAFFLE AND DEFLECTOR REPLACEMENT (LTG)

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Fig 1: Radiator Air Upper Baffle



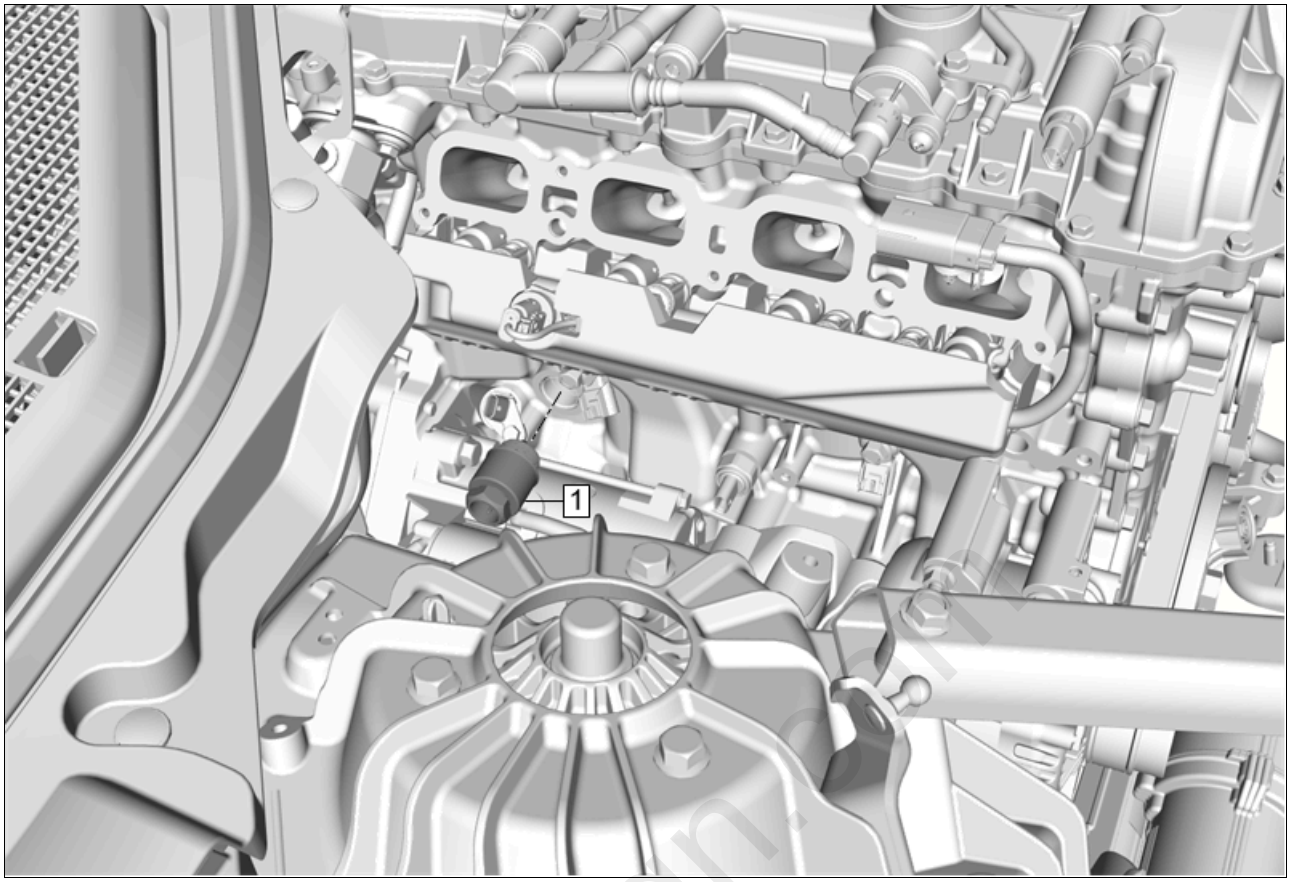
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Radiator Air Upper Deflector Retainer (Qty: 4)
2	Radiator Air Upper Baffle

REPAIR INSTRUCTIONS > COOLANT HEATER REPLACEMENT (LTG)

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Fig 1: Coolant Heater (LTG)



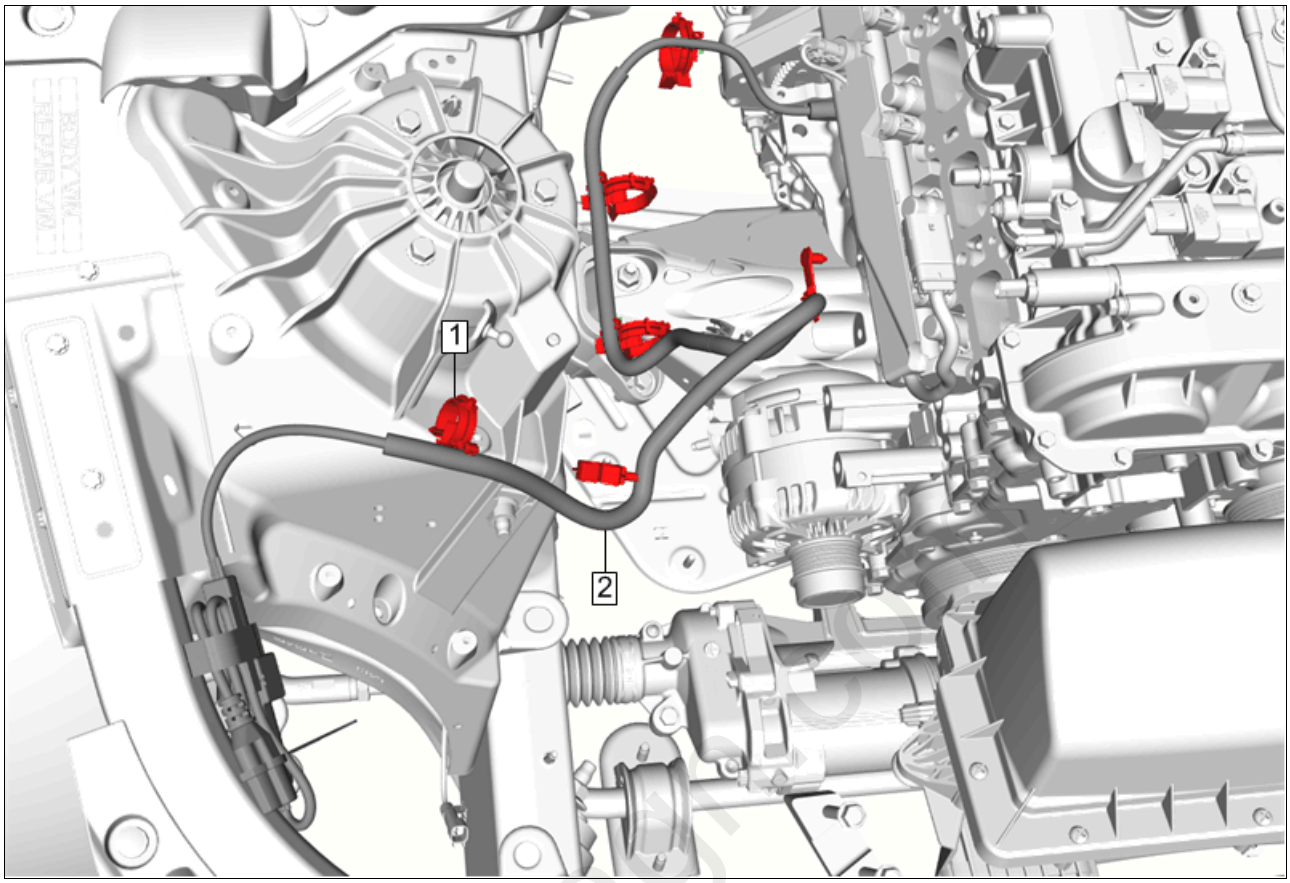
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. 2. Coolant Heater Cord Replacement (LTG)	
1	Coolant Heater *CAUTION:* *Refer to Component Fastener Tightening Caution .* **Tighten** 50 N.m (37 lb ft)

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REPAIR INSTRUCTIONS > COOLANT HEATER CORD REPLACEMENT (LTG)

Fig 1: Coolant Heater Cord (LTG)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
1	Coolant Heater Cord Retaining Clip (Qty: 6)
2	Coolant Heater Cord

DESCRIPTION AND OPERATION > COOLING FAN DESCRIPTION AND OPERATION > COOLING FAN CONTROL

The engine cooling fan system is composed of 1 electric cooling fan, fan motor and 1 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 allows the cooling fan to operate at variable speeds.

The cooling fan speed is effected by many different conditions and the ECM will adjust the duty cycle from 0-100 percent based on cooling system requirements. The scan tool output control is only capable

of operating the cooling fan increments, between 10-90 percent. 90 percent is considered high speed fan. When multiple cooling fan speed requests are received, the ECM operates the fan at the highest of speed requests. The ECM commands the fans ON under the following conditions:

- The engine coolant temperature is warmer than a predetermined temperature.
- The engine oil temperature is warmer than a predetermined temperature.
- The A/C pressure reaches a predetermined pressure.
- If the engine coolant temperature at key-off is warmer than a predetermined value, or the A/C pressure is greater than a predetermined value, the cooling fan will operate at a low speed. The fan will shut OFF if the temperature or pressure drops below the predetermined value, but will only operate for 2 minutes, regardless of the coolant temperature or A/C pressure.

DESCRIPTION AND OPERATION > COOLING SYSTEM DESCRIPTION AND OPERATION > COOLING FAN CONTROL - VARIABLE SPEED SINGLE FAN SYSTEM

LGX/LTG Engine

The engine cooling fan is a variable speed fan. The engine control module (ECM) controls the fan speed by sending a pulse width modulated 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.

Cooling fan speed is effected by many different conditions and can be adjusted from 10% to 100% duty cycle (PWM), 91% is considered high speed fan. When multiple cooling fan speed requests are received the ECM uses the highest cooling fan speed of all the requests. The ECM commands the cooling fan ON under the following conditions:

- Cooling fan duty cycle starts when engine coolant temperature reaches approximately 91°C (196°F) and reaches high speed at temperatures above 109°C (228°F).
- Cooling fan duty cycle starts when A/C pressure reaches approximately 725 kPa (105 psi) and reaches high speed at A/C pressures above 2100 kPa (305 psi).
- After the vehicle is shut OFF if the engine coolant temperature at key-off is greater than 113°C (235°F) or the A/C pressure is greater than 2300 kPa (334 psi) the cooling fan duty cycle is set to 55%, low speed. If the coolant temperature drops below 107°C (225°F) and the A/C pressure drops below 1800 kPa (261 psi) the fan will shut OFF. The fan will automatically shut OFF after 300 seconds. regardless of coolant temperature.

LT1/LF4 Engine

Cooling fan speed is effected by many different conditions and can be adjusted from 20% to 99% duty cycle (PWM), 90% is considered high speed fan. When multiple cooling fan speed requests are received the ECM uses the highest cooling fan speed of all the requests. The ECM commands the cooling fan ON under the following conditions:

- Cooling fan duty cycle starts when engine coolant temperature reaches approximately 101°C (214°F) and reaches high speed at temperatures above 109°C (228°F).
- Cooling fan duty cycle starts when A/C pressure reaches approximately 975 kPa (141 psi) and reaches high speed at A/C pressures above 2100 kPa (305 psi).

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- At transmission oil temperatures above approximately 112°C (234°F) the cooling fan duty cycle will be commanded to high speed.
- After the vehicle is shut OFF if the engine coolant temperature at key-off is greater than 113°C (235°F) or the A/C pressure is greater than 2300 kPa (334 psi) the cooling fan duty cycle is set to 55%, low speed. If the coolant temperature drops below 107°C (225°F) and the A/C pressure drops below 1800 kPa (261 psi) the fan will shut OFF. The fan will automatically shut OFF after 300 seconds. regardless of coolant temperature.

DESCRIPTION AND OPERATION > COOLING SYSTEM DESCRIPTION AND OPERATION > COOLING SYSTEM

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the system cools slowly or not at all. This allows the engine to warm quickly.

Cooling Cycle

Coolant is drawn from the radiator outlet and into the water pump inlet by the water pump. Some coolant will then be pumped from the water pump, to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost.

Coolant is also pumped through the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

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 to the thermostat. The flow of coolant will either be stopped at the thermostat until the engine is warmed, or it will flow through the thermostat and 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-COOL and clean drinkable water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

Radiator

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a downflow tube and fin design. This is a brazed tube with convoluted louvered fin design. Separate tubes and fins are stacked together with a manifold at each end. The entire assembly is then brazed forming a homogeneous unified structure. The fins allow for efficient heat transfer from the coolant to the atmosphere. The inlet and outlet tanks are molded with a high temperature, glass reinforced nylon plastic. The tank and gasket is supplied as an assembly with silicone gasket attached to the tank. 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 which is located in the bottom left of the lower tank. The

drain cock includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core absorb heat from the coolant passing through the tubes. As air passes between the fins, it absorbs heat and cools the coolant.

During vehicle use, the coolant heats and expands. The coolant that is displaced by this expansion flows into the overflow tank. As the coolant circulates, air is allowed to exit. Coolant without bubbles absorbs heat much better than coolant with bubbles.

Pressure Cap

The pressure cap is a cap that seals and pressurizes the cooling system. It contains a blow off or pressure valve and a vacuum or atmospheric valve. The pressure valve is held against its seat by a spring and protects the radiator by relieving pressure if it exceeds 20 psi. The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, could cause the radiator hoses to collapse.

The pressure cap allows pressure in the cooling system to build up. As the pressure builds, the boiling point of the coolant goes up as well. Therefore, the coolant can be safely run at a temperature higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat moves from the radiator to the cooler passing air. However, if the pressure exceeds the strength of the spring, the pressure valve rises so that the excess pressure can escape. When the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the cooling system. This equalizes the pressure in the cooling system with atmospheric pressure, thus preventing the radiator hoses from collapsing.

Coolant Recovery System

The coolant recovery system consists of a plastic coolant recovery reservoir and overflow tube. The recovery reservoir is also called a recovery tank or expansion tank. It is partially filled with coolant and is connected to the radiator fill neck with the overflow tube. Coolant can flow back and forth between the radiator and the reservoir.

In effect, a cooling system with a coolant recovery reservoir is a closed system. When the pressure in the cooling system gets too high, it will open the pressure valve in the pressure cap. This allows the coolant, which has expanded due to being heated, to flow through the overflow tube and into the recovery reservoir. As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum opens the vacuum valve in the pressure cap, allowing some of the coolant in the reservoir to be siphoned back into the radiator. Under normal operating conditions, no coolant is lost. Although the coolant level in the recovery reservoir goes up and down, the radiator and cooling system are kept full. An advantage to using a coolant recovery reservoir is that it eliminates almost all air bubbles from the cooling system. Coolant without bubbles absorbs heat much better than coolant with bubbles.

Charge Air Cooling System (LTG)

The charge air cooling system's function is to reduce the temperature of the air charge that is heated during the turbocharging process, which improves the efficiency and performance of the Powertrain. The charge air cooling system is an air-to-air system that uses a separate charge air cooling radiator located between the condenser and the radiator to cool the air charge. Filtered air from the air induction system is compressed in the turbocharger, by an exhaust air driven turbine in the turbocharger. That compressed filtered air is then forced down the charge air cooler duct, through the charge air cooler radiator where it is cooled, and then proceeds up to the engine intake manifold, for use by the engine.

Air Baffles and Seals

The cooling system uses deflectors, air baffles and air seals to increase system cooling. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle to flow through the radiator and increase cooling. Air baffles are also used to direct airflow into the radiator and increase cooling. Air seals prevent air from bypassing the radiator and A/C condenser. Air seals also prevent recirculation of the air for better hot weather cooling and A/C condenser performance.

Transmission Oil Cooler

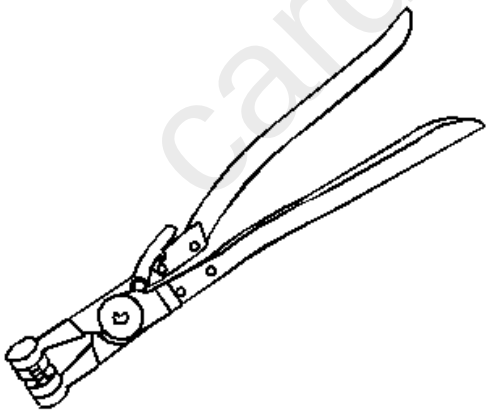
The transmission oil cooler is a heat exchanger. It is located inside the lower tank of the radiator. The transmission fluid temperature is regulated by the temperature of the engine coolant that surrounds the oil cooler as the transmission fluid passes through the cooler.

The transmission oil pump, pumps the fluid through the transmission oil cooler feed line to the oil cooler. The fluid then flows through the cooler while the engine coolant absorbs heat from the fluid. The fluid is then pumped through the transmission oil cooler return line, to the transmission.

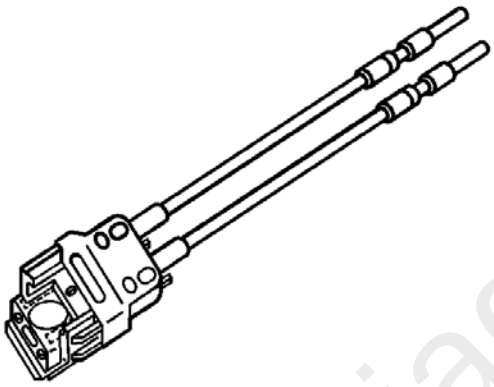
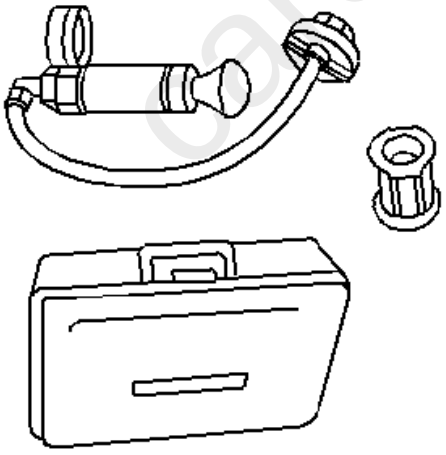
Auxiliary Transmission Oil Cooler

The auxiliary transmission oil cooler is an oil-to-air heat exchanger located in front of the A/C condenser. The transmission oil temperature is regulated by the airflow passing over this heat exchanger. The oil out of the transmission is plumbed through the transmission oil cooler pipes/hoses to the cooler then directed back to the transmission. This cooler helps provided additional cooling for performance driving conditions.

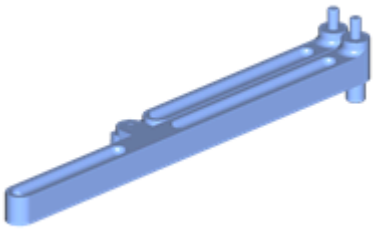
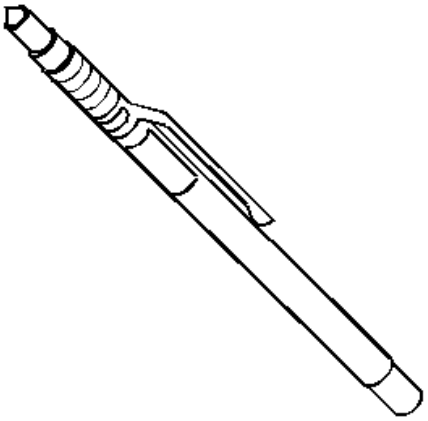
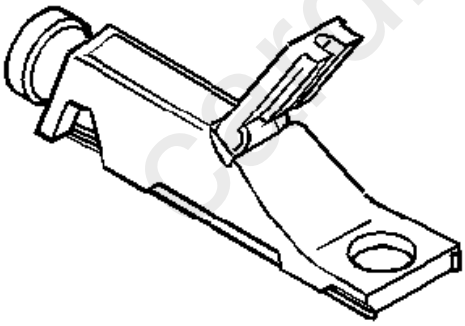
SPECIAL TOOLS AND EQUIPMENT > SPECIAL TOOLS

Illustration	Tool Number/ Description
	BO 38185 J 38185 Hose Clamp Pliers

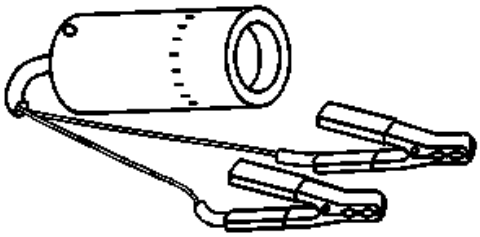
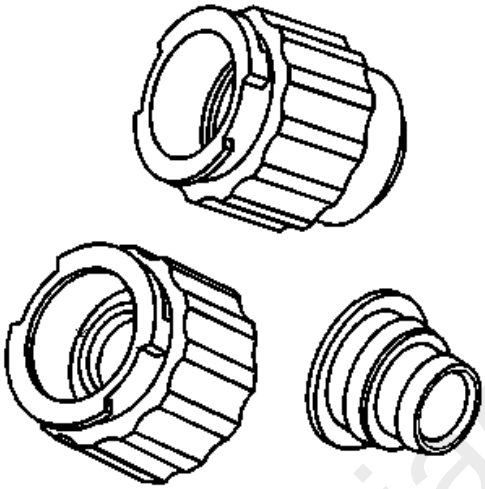
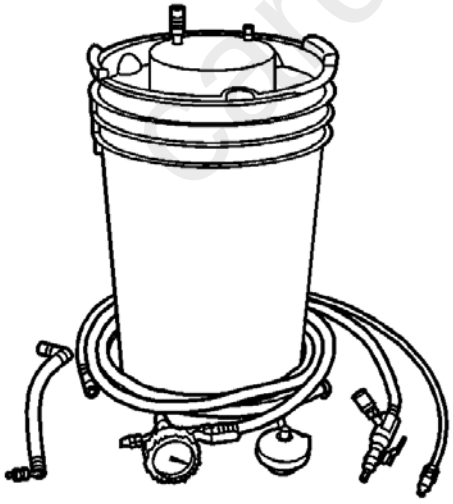
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	EL 35616-F J 35616-F Connector Test Adapter Kit
	EL 36169-HD J 36169 Heavy Duty Fused Jumper
	EN 24460-A J 24460-01 Cooling System Pressure Tester

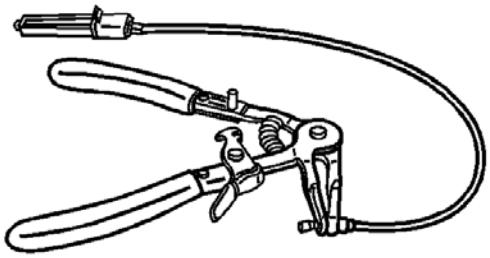
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	EN 46104 J 46104 Water Pump Pulley Holding Tool
	GE 24731 J 24731 Tempilstick
	GE 26568 J 26568 Coolant and Battery Fluid Tester

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	GE 42220 J 42220 Universal 12V Leak Detection Lamp
	GE 42401-A J 42401 Radiator Cap and Surge Tank Test Adapter
	GE 47716 Vac N Fill Coolant Refill Tool

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	GE 47622 Hose Clamp Pliers

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