

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

2006 ENGINE

Engine Cooling - Equinox & Torrent

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Condenser to Radiator Bolts	9 N.m	80 lb in
Coolant Heater	50 N.m	37 lb ft
Cooling Fan Motor Bolts	6 N.m	53 lb in
CRFM Bracket Bolts	10 N.m	89 lb in
Fan Shroud to Radiator Bolts	9 N.m	80 lb in
Heater Inlet Pipe Nut	25 N.m	18 lb ft
Heater Outlet Pipe to Throttle Body Bolt	10 N.m	89 lb in
Heater Outlet Pipe to Throttle Body Nut	10 N.m	89 lb in
Heater Outlet Pipe to Upper Intake Manifold Nut	25 N.m	18 lb ft
Manifold Absolute Pressure (MAP) Sensor Bracket Bolt	10 N.m	89 lb in
Surge Tank to Body Bolts	9 N.m	80 lb in
Thermal Bypass Fitting Bolt	12 N.m	106 lb in
Thermal Bypass Pipe Bolt	10 N.m	89 lb in
Thermostat Housing Bolt	25 N.m	18 lb ft
Water Pump Bolt	10 N.m	89 lb in
Water Pump Pulley Bolt	25 N.m	18 lb ft

SCHEMATIC AND ROUTING DIAGRAMS

ENGINE COOLING SCHEMATICS

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

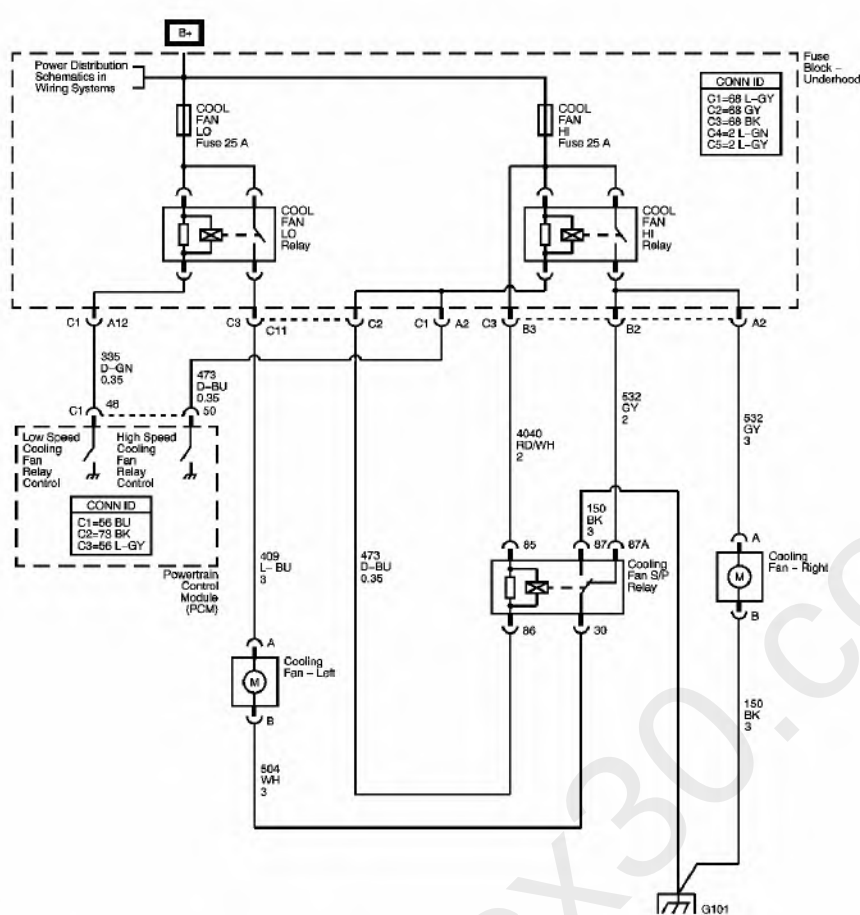


Fig. 1: Engine Cooling Schematics
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

COOLING SYSTEM COMPONENT VIEWS

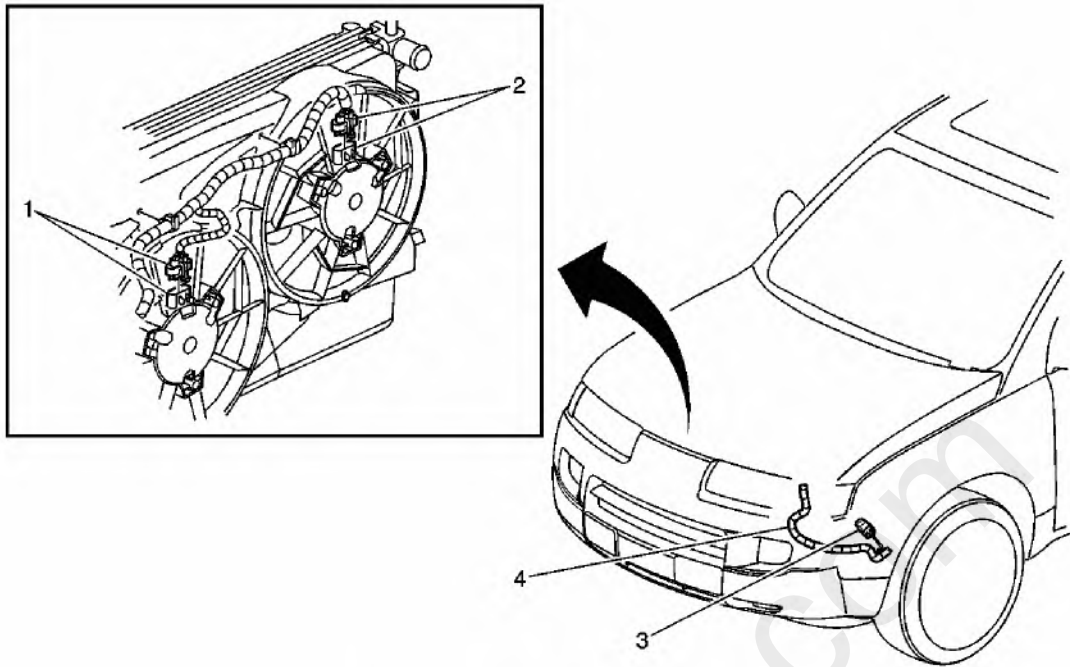


Fig. 2: Engine Cooling System Components (w/L66)
 Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Cooling Fan - Left
2	Cooling Fan - Right
3	Cooling Fan S/P Relay
4	Forward Lamp Harness

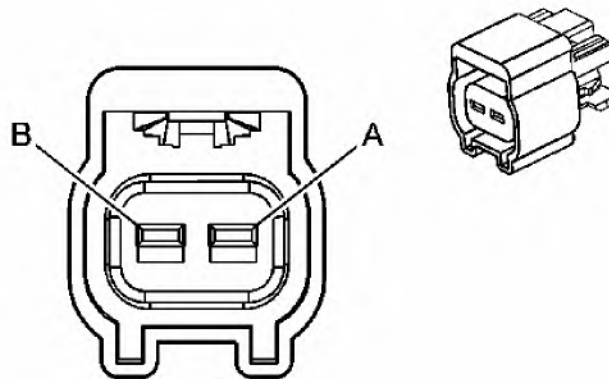
COOLING SYSTEM CONNECTOR END VIEWS

Cooling Fan - Left



2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

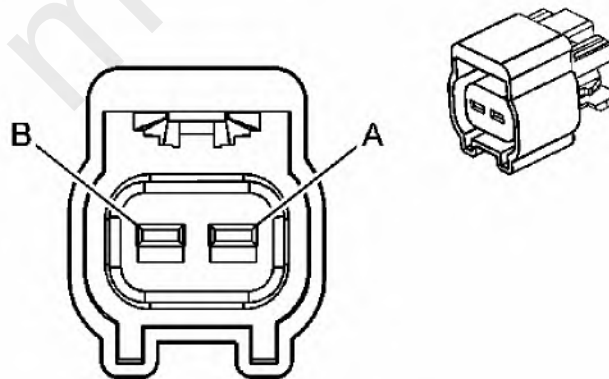


Connector Part Information

- OEM: 13517349
- Service: See Catalog
- 2-Way F GT 280 Series Sealed (BK)

Pin	Wire Color	Circuit No.	Function
A	WH	504	Cooling Fan Motor Low Reference
B	L-BU	409	Cooling Fan Motor Supply Voltage (Low)

Cooling Fan - Right



Connector Part Information

- OEM: 13517349
- Service: See Catalog
- 2-Way F GT 280 Series Sealed (BK)

Pin	Wire Color	Circuit No.	Function
A	BK	150	Ground
			Cooling Fan Motor Supply Voltage

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

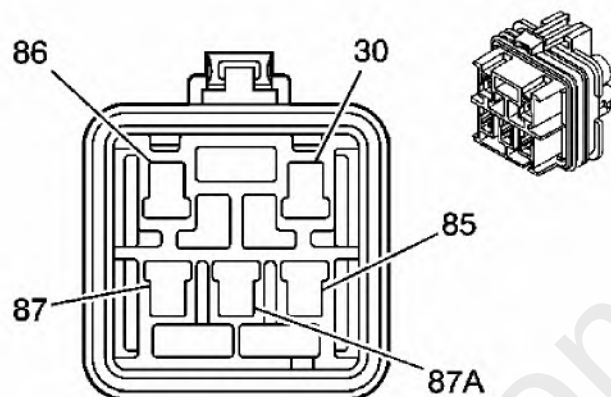
B

GY

532

(High)

Cooling Fan S/P Relay



Connector Part Information

- **OEM: 12110539**
- **Service: 15306045**
- **5-Way F Metri-Pack 280 Series, Flexlock (BK)**

Pin	Wire Color	Circuit No.	Function
30	WH	504	Cooling Fan Motor Low Reference
85	RD/WH	4040	Battery Positive Voltage
86	D-BU	473	High Speed Cooling Fan Relay Control
87	BK	150	Ground
87A	GY	532	Cooling Fan Motor Supply Voltage (High)

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC P0480 or P0481	** MULTIPLE VALUES **
DTC P1258	Engine Coolant Over Temperature - Fuel Disabled

DIAGNOSTIC STARTING POINT - ENGINE COOLING

Begin the system diagnosis with the diagnostic system check. Refer to **Diagnostic System**

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

Check - Vehicle in Vehicle DTC Information. The Diagnostic System Check - Vehicle will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuits
- The identification of any stored DTCs and their status

The use of the Diagnostic System Check - Vehicle will identify the correct procedure for diagnosing the system and where the procedure is located.

SCAN TOOL OUTPUT CONTROLS

Powertrain Control (LNJ/3.4L) Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
Fans Low Speed	Engine Outputs	The scan tool displays a commanded state of On or Off. This allows you to communicate with the PCM and activate or deactivate the cooling fan relay, manually turning the fan On and Off.
Fans High Speed	Engine Outputs	The scan tool displays a commanded state of On or Off. This allows you to communicate with the PCM and activate or deactivate the cooling fan relays, manually turning the fans On and Off.

SCAN TOOL DATA LIST

Use the Scan Tool Data Display Values and Definitions Information in order to assist in diagnosing the HVAC Control Module problems. Compare the vehicles actual scan tool data with the typical data display value table information. Use the data information in order to aid in understanding the nature of the problem when the vehicle does not match with the typical data display values.

The scan tool data values were taken from a known good vehicle under the following conditions:

- The ignition switch is in the ON position.
- The engine is running at idle.
- The vehicle is in PARK.
- The doors are closed.
- The windows are closed.
- The A/C is ON.
- The ambient air temperatures are at 22-27°C (70-80°F).

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

Body Control Module (BCM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27°C (70-80°F)			
Battery 1	HVAC Data	Volts	Battery Voltage
Low Coolant	Switch Inputs	Yes / No	No

Powertrain Control Module (PCM) - (LNJ/3.4L)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27°C (70-80°F)			
FC Relay 1 Command	General Info Outputs	On/Off	Varies
FC Relay 2 Command	General Info Outputs	On/Off	Varies
ECT	Engine Data	C/F	C/F

SCAN TOOL DATA DEFINITIONS

Battery Voltage 1

The scan tool displays 0-12 volts of battery voltage at the BCM.

ECT

The scan tool displays -40 to +151°C (-40 to +304°F). The engine coolant temperature (ECT) sensor is mounted in the coolant stream. The powertrain control module (PCM) applies 5 volts to the ECT sensor signal circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold and the internal resistance is high, the PCM monitors a high signal voltage and interprets it as a cold engine. As the sensor warms and the internal resistance decreases, the voltage signal decreases and the PCM interprets the lower voltage as a warm engine.

FC Relay 1, FC Relay 2 Command

The scan tool displays On or Off. This parameter indicates the state of the driver circuit for this device.

DTC P0480 OR P0481

Circuit Description

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

- P0480 is for the low speed cooling fan relay control circuit.
- P0481 is for the high speed cooling fan relay control circuit.

Battery positive voltage is supplied to the cooling fan low relay from the COOL FAN LO fuse. The powertrain control module (PCM) controls the cooling fan low relay by grounding the low speed cooling fan relay control circuit via an internal solid state device called a driver.

Battery positive voltage is supplied to the cooling fan high relay and the cooling fan s/p relay from the COOL FAN HI fuse. The powertrain control module (PCM) controls the relays by grounding the high speed cooling fan relay control circuit.

When the PCM is commanding a relay on, the voltage potential of the control circuit should be low, near 0 volts. When the PCM is commanding the control circuit to a relay, the voltage potential of the circuit should be high, near battery voltage. If the fault detection circuit senses a voltage other than what is expected, the DTC will set.

The PCM will monitor the control circuit for the following:

- A short to ground
- A short to voltage
- An open circuit
- An open relay coil
- An internally shorted or excessively low resistance relay coil

When the PCM detects any of the above conditions, the DTC will set and the affected driver will be disabled.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC P0480 Cooling Fan Relay 1 Control Circuit
- DTC P0481 Cooling Fan Relay 2 Control Circuit

Conditions for Running the DTC

- The ignition is ON.
- System voltage is between 9-18 volts.
- The relay control circuit is transitioned from OFF to ON or ON to OFF.

Conditions for Setting the DTC

- The PCM detects an open, a short to ground or a short to voltage on the cooling fan

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

relay control circuit.

- The above conditions are present for at least 30 seconds.

Action Taken When the DTC Sets

- The PCM will illuminate the malfunction indicator lamp (MIL) during the second consecutive trip in which the diagnostic test has been run and failed.
- The PCM will store conditions which were present when the DTC set as Freeze Frame and Failure Records data.

Conditions for Clearing the MIL/DTC

- The PCM will turn OFF the MIL during the third consecutive trip in which the diagnostic has been run and passed.
- The History DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using the scan tool.

Diagnostic Aids

- If the condition is not present, refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- Review the Freeze/Failure Records vehicle mileage since the diagnostic test last failed. This may help determine how often the condition that caused the DTC to be set occurs.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Listen for an audible click when the cooling fan low relay operates. Command both the ON and OFF states. Repeat the commands as necessary.

3: Listen for an audible click when the cooling fan high and cooling fan s/p relays operate. Command both the ON and OFF states. Repeat the commands as necessary.

4: Tests for voltage at the coil side of the cooling fan low relay. The COOL FAN LO fuse supplies battery positive voltage to the coil side of the cooling fan LOW relay.

DTC P0480 or P0481

Step	Action	Yes	No
Schematic Reference: Engine Cooling Schematics			
Connector End View Reference: Cooling System Connector End Views			
1	Did you perform the Diagnostic System Check - Vehicle?		Go to Diagnostic System Check - Vehicle in

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

		Go to Step 2	Vehicle DTC Information
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the Fans High Speed ON and OFF. Does the low cooling fan turn ON and OFF with each command?	Go to Step 3	Go to Step 4
3	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. 1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the Fan Control High Speed ON and OFF. Do the cooling fan high and the cooling fan s/p relay turn ON and OFF with each command?	Go to Diagnostic Aids	Go to Step 6
4	1. Turn OFF the ignition. 2. Disconnect the cooling fan low relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the cooling fan low relay with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to Step 5	Go to Step 16
5	1. Connect a test lamp between the control circuit of the cooling fan low relay and the battery positive voltage circuit of the cooling fan low relay. 2. With a scan tool, command the Fans Low Speed ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to Step 12	Go to Step 9

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

6	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. 1. Turn OFF the ignition. 2. Disconnect the cooling fan s/p relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the cooling fan s/p relay with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to Step 7	Go to Step 16
7	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. 1. Connect a test lamp between the control circuit of the cooling fan s/p relay and the battery positive voltage circuit of the cooling fan s/p relay. 2. With a scan tool, command the Fans High Speed ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to Step 14	Go to Step 8
8	1. Turn Off the ignition. 2. Disconnect the cooling fan high relay. 3. Turn ON the ignition with the engine OFF. 4. Connect a test lamp between the control circuit of the cooling fan high relay and the battery positive voltage circuit of the cooling fan high relay. 5. With a scan tool, command the Fans High Speed ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to Step 13	Go to Step 9
9	Does the test lamp remain illuminated with each command?	Go to Step 11	Go to Step 10
	IMPORTANT:		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

10	The S/P relay is located under the front bumper on the drivers side of the vehicle. Test the control circuit of the appropriate relay for a short to voltage or an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 15
11	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Test the control circuit of the appropriate relay for a short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 15
12	Inspect for poor connections at the cooling fan low relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 17
13	Inspect for poor connections at the cooling fan high relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 18
14	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Inspect for poor connections at the cooling fan s/p relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 19
15	Inspect for poor connections at the harness connector of the powertrain control module (PCM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 21	Go to Step 20
16	Repair the battery positive voltage circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 21	-

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

17	Replace the cooling fan low relay. Did you complete the replacement?	Go to Step 21	-
18	Replace the cooling fan high relay. Did you complete the replacement?	Go to Step 21	-
19	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Replace the cooling fan s/p relay. Did you complete the replacement?	Go to Step 21	-
20	Replace the PCM. Refer to Control Module References in Computer/Integrating Systems for replacement, setup, and programming. Did you complete the replacement?	Go to Step 21	-
21	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 2	System OK

DTC P1258**Circuit Description**

The powertrain control module (PCM) uses the engine coolant temperature (ECT) sensor to monitor the engine for an over temperature condition. This condition occurs when the coolant temperature is above 128°C (262°F). When an over temperature condition is present, DTC P1258 will set. The PCM will disable two groups of cylinders by turning OFF the fuel injectors. By switching between the two groups of cylinders, the PCM is able to reduce the temperature of the coolant.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P1258 Engine Coolant Over Temperature - Fuel Disabled

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

- The PCM detects an engine metal over temperature.
- The above condition is present for at least 8 seconds.

Action Taken When the DTC Sets

- The PCM will illuminate the malfunction indicator Lamp (MIL) during the first trip in which the diagnostic test has been run and failed.
- The PCM will signal the instrument panel cluster (IPC) to turn ON the Service Engine Soon indicator.
- The PCM will alternately disable two groups of cylinders by turning OFF the fuel injectors.
- The PCM will store conditions which were present when the DTC set as Freeze Frame and File Records data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The PCM will turn the MIL OFF after three consecutive trips that the diagnostic has been run and passed.
- The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using the scan tool Clear DTC Information function.

DTC P1258

Step	Action	Yes	No
Connector End View Reference: Cooling System Connector End Views			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u> in Vehicle DTC Information
2	Check the engine cooling fans for proper operation. Are the engine cooling fans operative?	Go to <u>Engine Overheating</u>	Go to <u>Symptoms - Engine Cooling</u>

SYMPTOMS - ENGINE COOLING

IMPORTANT: Review the system operation in order to familiarize yourself with the system functions. Refer to Cooling System Description and Operation.

Visual/Physical Inspection

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

- Inspect for aftermarket devices which could affect the operation of the Cooling System. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the surge tank reservoir for the proper coolant level.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Symptom List

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

- **Cooling Fan Always On**
- **Cooling Fan Inoperative**
- **Loss of Coolant**
- **Coolant Heater Inoperative**
- **Engine Fails To Reach Normal Operating Temperature**
- **Engine Overheating**

COOLING FAN ALWAYS ON

Cooling Fan Always On

Step	Action	Yes	No
Schematic Reference: <u>Engine Cooling Schematics</u> , <u>HVAC Schematics</u> in HVAC Systems - Manual Connector End View Reference: <u>Cooling System Connector End Views</u> DEFINITION: One or both engine cooling fan motors run continuously in high or low speed.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u> in Vehicle DTC Information
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the Fans Low Speed ON and OFF.		Go to <u>Testing for Intermittent Conditions and Poor</u>

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	Are one or both cooling fans ON?	Go to Step 3	Connections in Wiring Systems
3	Are both cooling fans running continuously?	Go to Step 4	Go to Step 6
4	Are both cooling fans running continuously in high speed?	Go to Step 5	Go to Step 7
5	Test the low reference circuit of the A/C refrigerant pressure sensor for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 18	Go to Step 14
6	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Remove the cool fan S/P relay. Did the right cooling fan turn OFF?	Go to Step 10	Go to Step 8
7	Remove the cool fan LOW relay. Did the cooling fans turn OFF?	Go to Step 12	Go to Step 9
8	Remove the cool fan HI relay. Did the right cooling fan turn OFF?	Go to Step 13	Go to Step 11
9	Repair the short to voltage in the left cooling fan motor supply voltage circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 18	-
10	Repair the short to voltage in the left cooling fan low reference circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 18	-
11	Repair the short to voltage in the right cooling fan motor supply voltage circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 18	-
12	Inspect for poor connections at the cool fan LOW relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Repairs. Did you find and correct the condition?	Go to Step 18	Go to Step 15
	Inspect for poor connections at the cool fan		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

13	HI relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Repairs. Did you find and correct the condition?	Go to Step 18	Go to Step 16
14	Inspect for poor connections at the A/C refrigerant pressure sensor. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Repairs. Did you find and correct the condition?	Go to Step 18	Go to Step 17
15	Replace the cool fan LOW relay. Did you complete the replacement?	Go to Step 18	-
16	Replace the cool fan HI relay. Did you complete the replacement?	Go to Step 18	-
17	Replace the A/C refrigerant pressure sensor. Refer to Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement. Did you complete the replacement?	Go to Step 18	-
18	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

COOLING FAN INOPERATIVE

Cooling Fan Inoperative

Step	Action	Yes	No
Schematic Reference: <u>Engine Cooling Schematics</u> Connector End View Reference: <u>Cooling System Connector End Views</u> DEFINITION: One or both cooling fan motors are inoperative in either high, low, or both speeds.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to Diagnostic System Check - Vehicle in Vehicle DTC Information
2	Test the cool fan LOW, cool fan HIGH and cool fan S/P relay control circuits for an open. Did you find and correct the condition?	Go to Step 29	Go to Step 3
	1. Install a scan tool.		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

3	2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the Fans Low Speed ON and OFF. Do the low speed engine cooling fans turn ON and OFF with each command?	Go to Step 4	Go to Step 5
4	IMPORTANT: A 3 second delay occurs before the PCM changes the cooling fan speed. With a scan tool, command the Fans High Speed ON and OFF. Do the high speed engine cooling fans turn ON and OFF with each command?	Go to Testing for Intermittent Conditions and Poor Connections in Wiring Systems	Go to Step 12
5	IMPORTANT: Do NOT remove the 20-amp fused jumper wire connected during this step. Use a second 20-amp fused jumper wire while performing the following steps. 1. Disconnect the cooling fan LOW relay. 2. Connect the first 20-amp fused jumper between the battery positive voltage circuit of the cooling fan LOW relay and the cooling fan motor supply voltage circuit of the cooling fan LOW relay. Do both cooling fans operate in low speed?	Go to Step 14	Go to Step 6
6	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. 1. Disconnect the cooling fan S/P relay. 2. Connect the second 20-amp fused jumper between the left cooling fan motor low reference circuit of the cooling fan HIGH relay and the right cooling fan motor supply voltage circuit of the cooling fan HIGH relay. Do both cooling fans operate in low speed?	Go to Step 15	Go to Step 7

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

7	Reconnect the second 20-amp fused jumper between the battery positive voltage circuit of the cooling fan HIGH relay and the cooling fan motor supply voltage circuit of the cooling fan HIGH relay. Does the right cooling fan operate in high speed?	Go to Step 10	Go to Step 8
8	1. Install the cooling fan HIGH relay. 2. Disconnect the right cooling fan electrical connector. 3. Reconnect the second 20-amp fused jumper wire from the cooling fan motor supply voltage circuit of the right cooling fan electrical connector to the cooling fan motor ground circuit of the right cooling fan electrical connector. Does the left cooling fan operate in high speed?	Go to Step 17	Go to Step 9
9	Reconnect the second 20-amp fused jumper wire from the cooling fan motor supply voltage circuit of the right cooling fan electrical connector to a good ground. Does the left cooling fan operate in high speed?	Go to Step 21	Go to Step 22
10	1. Install the cooling fan HIGH relay. 2. Disconnect the left cooling fan electrical connector. 3. Reconnect the second 20-amp fused jumper wire from cooling fan motor supply voltage circuit of the left cooling fan electrical connector to the cooling fan low reference circuit of the left cooling fan electrical connector. Does the right cooling fan operate in high speed?	Go to Step 18	Go to Step 11
	Reconnect the second 20-amp fused jumper wire from battery positive voltage to the left cooling fan low reference circuit of the left		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

11	cooling fan electrical connector. Does the right cooling fan operate in high speed?	Go to Step 19	Go to Step 23
12	Does the right cooling fan operate in high speed?	Go to Step 13	Go to Step 16
13	1. Disconnect the cooling fan HIGH relay. 2. Connect a 20-amp fused jumper between the left cooling fan low reference circuit of the cooling fan HIGH relay and the ground circuit of the cooling fan HIGH relay. Does the left cooling fan operate properly in high speed?	Go to Step 15	Go to Step 20
14	Inspect for poor connections at the cooling fan LOW relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 29	Go to Step 24
15	Inspect for poor connections at the cooling fan HIGH relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 29	Go to Step 25
16	Inspect for poor connections at the cooling fan S/P relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 29	Go to Step 26
17	Inspect for poor connections at the harness connector of the right cooling fan. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 29	Go to Step 27
18	Inspect for poor connections at the harness connector of the left cooling fan. Refer to Testing for Intermittent Conditions and		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 29	Go to Step 28
19	Repair the left cooling fan motor supply voltage circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 29	-
20	Repair the left cooling fan motor ground circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 29	-
21	Repair the right cooling fan motor ground circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 29	-
22	Repair the right cooling fan motor supply voltage circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 29	-
23	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Repair the left cooling fan low reference circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	Go to Step 29	-
24	Replace the cooling fan LOW relay. Did you complete the replacement?	Go to Step 29	-
25	Replace the cooling fan HIGH relay. Did you complete the replacement?	Go to Step 29	-
26	IMPORTANT: The S/P relay is located under the front bumper on the drivers side of the vehicle. Replace the cooling fan S/P relay. Did you complete the replacement?	Go to Step 29	-
27	Replace the right cooling fan. Refer to Cooling Fan Motor Replacement - Electric . Did you complete the replacement?	Go to Step 29	-
28	Replace the left cooling fan. Refer to Cooling Fan Motor Replacement - Electric .		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	Did you complete the replacement?	Go to Step 29	-
29	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

ENGINE OVERHEATING

Engine Overheating

Step	Action	Value(s)	Yes	No
DEFINITION: The engine temperature lamp comes on and stays on, the temperature gauge shows hot or coolant overflows from the coolant recovery reservoir onto the ground while the engine is running.				
1	Check for a loss of coolant. Has there been a loss of coolant?	-	Go to Step 2	Go to Step 3
2	Refer to Loss of Coolant . Does the engine still overheat?	-	Go to Step 3	System OK
3	Check for a loss of system pressure. Use the J 24460-01 Cooling System Pressure Tester. See Special Tools . Has there been a loss of system pressure?	-	Go to Step 4	Go to Step 5
4	Correct the system pressure. Does the engine still overheat?	-	Go to Step 5	System OK
5	1. Check for low coolant protection. 2. Make sure that the solution is at the specified temperature. Is there low coolant protection?	-37°C (-34°F)	Go to Step 6	Go to Step 7
6	Correct as necessary. Does the engine still overheat?	-	Go to Step 7	System OK
7	1. Check the accessory drive belt tension. 2. Check the tensioner. Refer to Drive Belt Tensioner Diagnosis in Engine Mechanical - 3.4L. Is the tensioner working properly and the tension correct?	-	Go to Step 9	Go to Step 8
8	Replace the tensioner. Refer to Drive Belt Tensioner Diagnosis in Engine Mechanical - 3.4L. Does the engine still overheat?	-	Go to Step 9	System OK

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

9	Check to see if the timing is retarded by a malfunctioning powertrain control module (PCM). Is the timing retarded by a malfunctioning PCM?	-	Go to Step 10	Go to Step 11
10	Correct as necessary. Does the engine still overheat?	-	Go to Step 11	System OK
11	Check to see if any of the radiator fins are obstructed. Are any of radiator fins obstructed?	-	Go to Step 12	Go to Step 13
12	1. Remove or relocate any add-on parts that block air to the radiator. 2. Remove any debris from the radiator fins. Does the engine still overheat?	-	Go to Step 13	System OK
13	Check to see if any of the cooling system passages are blocked by rust or scale. Are any of the cooling system passages blocked by rust or scale?	-	Go to Step 14	Go to Step 15
14	1. Drain the cooling system. Refer to <u>Draining and Filling Cooling System (Static Fill)</u> or <u>Draining and Filling Cooling System (GE 47716 Fill)</u> . 2. Flush the cooling system. Refer to <u>Coolant System Flushing</u> . 3. Repair as necessary. Does the engine still overheat?	-	Go to Step 15	System OK
15	Check for a pinched or kinked coolant recovery reservoir hose. Is the surge tank hose pinched or kinked?	-	Go to Step 16	Go to Step 17
16	Replace or reroute the hose as necessary. Refer to <u>Surge Tank Hose/Pipe Replacement - Inlet</u> . Does the engine still overheat?	-	Go to Step 17	System OK
17	Check for an inoperative cooling fan. Refer to <u>Cooling Fan Inoperative</u> in Engine Cooling.	-	Go to Step	Go to Step

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	Are there any inoperative cooling fans?		18	19
18	Repair or replace the electric cooling fans as necessary. Refer to Cooling Fan Motor Replacement - Electric . Does the engine still overheat?	-	Go to Step 19	System OK
19	Check for a loose, damaged, and/or missing deflector. Are there any loose, damaged, or missing deflectors?	-	Go to Step 20	Go to Step 21
20	Replace the deflectors. Does the engine still overheat?	-	Go to Step 21	System OK
21	Check to see if the thermostat is stuck in the closed position. Is the thermostat stuck in the closed position?	-	Go to Step 22	Go to Step 23
22	Replace the thermostat. Refer to Thermostat Replacement . Does the engine still overheat?	-	Go to Step 23	System OK
23	Check for a faulty coolant pump. Is the coolant pump faulty?	-	Go to Step 24	Go to Step 25
24	Replace the water pump. Refer to Water Pump Replacement . Does the engine still overheat?	-	Go to Step 25	System OK
25	Check for an incorrect radiator. Is the radiator correct?	-	Go to Step 26	-
26	Install the correct radiator. Refer to Radiator Replacement . Does the engine still overheat?	-	-	System OK

LOSS OF COOLANT

Loss of Coolant

Step	Action	Yes	No
DEFINITION: The cooling system is losing coolant either internally or externally.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - Engine Cooling
2	Repair any present DTCs. Refer to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information. Is the action complete?	Go to Step 3	-
	Inspect the coolant level.		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

3	Is the coolant at the proper level?	Go to Step 6	Go to Step 4
4	Fill the cooling system to the proper level. Refer to Draining and Filling Cooling System (Static Fill) or Draining and Filling Cooling System (GE 47716 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	With the engine idling, inspect the coolant recovery system. Does the coolant recovery system discharge coolant while the engine is idling?	Go to Step 15	Go to Step 11
11	Visually inspect the hoses, pipes and hose clamps at the following locations: • Coolant surge tank • Heater core • Radiator		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	Are any of the hoses, clamps or pipes leaking?	Go to Step 20	Go to Step 12
12	Visually inspect the following components: • The coolant pressure cap • The core plugs • The cylinder head gaskets • The engine block • The intake manifold • The radiator • The thermostat housing • The water pump Are any of the listed components leaking?	Go to Step 20	Go to Step 13
13	1. Pressure test the cooling system. 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 20	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 16	Go to Step 21
15	Pressure test the coolant pressure cap. Refer to Pressure Cap Testing. Does the coolant pressure cap hold pressure?	Go to Step 30	Go to Step 21
16	Inspect for the following conditions: • A coolant smell inside of the vehicle • Coolant in the HVAC module drain tube • Coolant on the vehicle floor covering near the HVAC module Is coolant present?	Go to Step 22	Go to Step 17
	Inspect the underside of the engine oil fill cap for a gray/white milky substance.		

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

17	Is there a milky substance on under the oil fill cap?	Go to Step 18	Go to Step 19
18	Inspect the engine oil fluid level indicator for a gray/white milky substance. Is there a milky substance on the engine oil fluid level indicator?	Go to Step 28	Go to Step 19
19	Inspect the automatic transmission oil fluid level indicator, if equipped, for a gray/white milky substance. Is there a milky substance on the automatic transmission fluid level indicator?	Go to Step 23	Go to Step 31
20	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to Step 31	-
21	Replace the coolant pressure cap. Is the repair complete?	Go to Step 31	-
22	Replace the heater core. Refer to Heater Core Replacement in Heating, Ventilation and Air Conditioning. Is the repair complete?	Go to Step 31	-
23	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 24	Go to Step 25
24	1. Replace the radiator. Refer to Radiator Replacement . 2. Service the automatic transmission. Refer to Engine Coolant/Water in Transmission in Automatic Transmission - AF33-5. Is the repair complete?	Go to Step 31	-
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 in Engine Mechanical -		-

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

	3.4L. Is the repair complete?	Go to Step 31	
27	Repair the engine overheating condition. Is the repair complete?	Go to Step 31	-
28	Repair the engine internal coolant leak. Refer to Coolant in Combustion Chamber in Engine Mechanical - 3.4L. Is the repair complete?	Go to Step 31	-
29	Repair the engine knock. Refer to Lower Engine Noise, Regardless of Engine Speed in Engine Mechanical - 3.4L. Is the repair complete?	Go to Step 31	-
30	Repair the combustion pressure in the cooling system problem. Refer to Cylinder Leakage Test in Engine Mechanical - 3.4L. 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

THERMOSTAT DIAGNOSIS

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

Thermostat Test Procedure Using Tempilsticks**Tools Required**

J 24731 Tempilstick. See **Special Tools**.

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

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

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

COOLANT HEATER INOPERATIVE

Coolant Heater Inoperative

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to Diagnostic System Check - Vehicle in Vehicle DTC Information
2	Test the engine coolant heater power supply cord for an open or short to ground. Refer to Circuit Testing in Wiring Systems. Did you find a condition?	Go to Step 3	Go to Step 4
3	Replace the engine coolant heater power supply cord. Refer to Coolant Heater Cord Replacement . Did you complete the repair?	Go to Step 6	-
4	Inspect for poor connections at the harness connector of the engine coolant heater. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 6	Go to Step 5
5	Replace the engine coolant heater. Refer to Coolant Heater Replacement . Did you complete the repair?	Go to Step 6	-
6	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE

Engine Fails To Reach Normal Operating Temperature

Step	Action	Yes	No
1	1. Ensure that the cooling system is full. 2. Allow the engine/radiator cap to cool. 3. Start the engine. 4. Turn the air conditioning system off. 5. Inspect the engine cooling fans.		
	Is either engine cooling fan on?	Go to Step 2	Go to Step 3

2006 Chevrolet Equinox LT

2006 ENGINE Engine Cooling - Equinox & Torrent

2	1. Diagnose and repair the cooling fan system. Refer to Cooling Fan Always On. 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 Scan Tool coolant temperature?	Go to Step 5	Go to Step 4
4	1. Diagnose and repair the coolant temperature gage system. Refer to Engine Coolant Temperature Gage Inaccurate or Inoperative in Instrument Panel, Gages, and Console. 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to Step 5	System OK
5	CAUTION: As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the pressure cap while the engine is hot and pressure is high will cause the solution to boil instantaneously - possibly with explosive force - spewing the solution over the engine, fenders and the person removing the cap. Inspect the thermostat for proper operation. Is the thermostat operating properly?	Go to Step 1	Go to Step 6
6	1. Replace the thermostat. Refer to Thermostat Replacement. 2. Verify the customer complaint. Does the engine still fail to reach normal operating temperature?	Go to Step 1	System OK

PRESSURE CAP TESTING

Tools Required

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

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

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

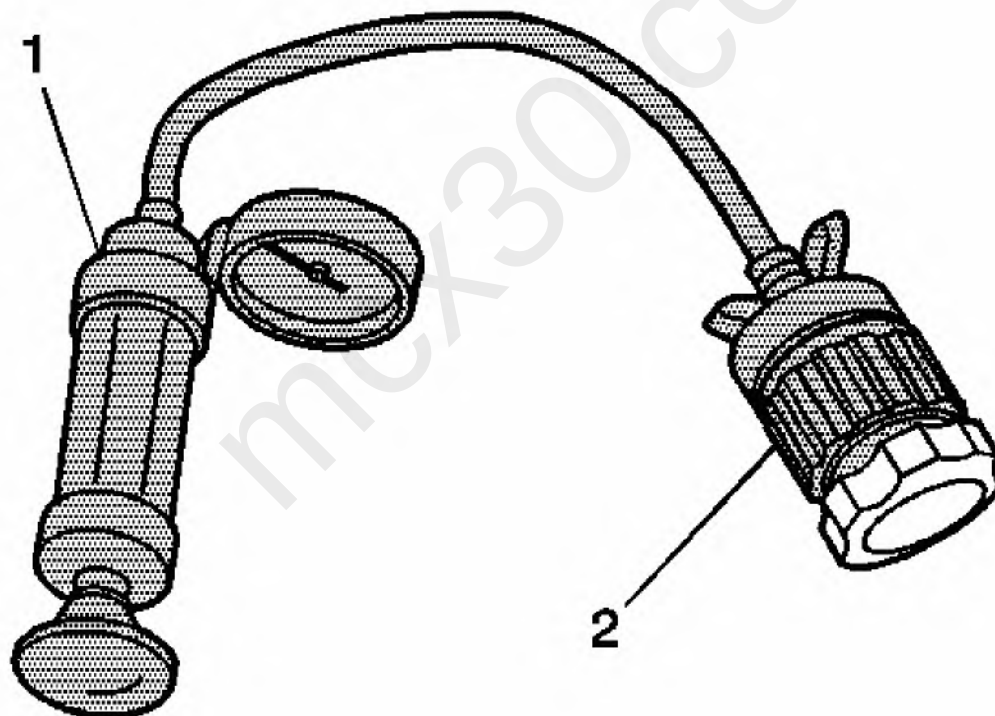


Fig. 3: Pressure Testing Radiator Cap
Courtesy of GENERAL MOTORS CORP.

3. Use the **J 24460-01** (1) with **J 42401** (2) in order to test the pressure cap. See **Special Tools**.
4. Test the pressure cap for the following conditions:
 - Pressure release when the **J 24460-01** exceeds the pressure rating of the pressure

cap. See **Special Tools**.

- Maintain the rated pressure for at least 10 seconds.

Note the rate of pressure loss.

5. Replace the pressure cap under the following conditions:

- The pressure cap does not release pressure which exceeds the rated pressure of the cap.
- The pressure cap does not hold the rated pressure.

COOLING SYSTEM LEAK TESTING

Tools Required

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

CAUTION: 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.

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

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

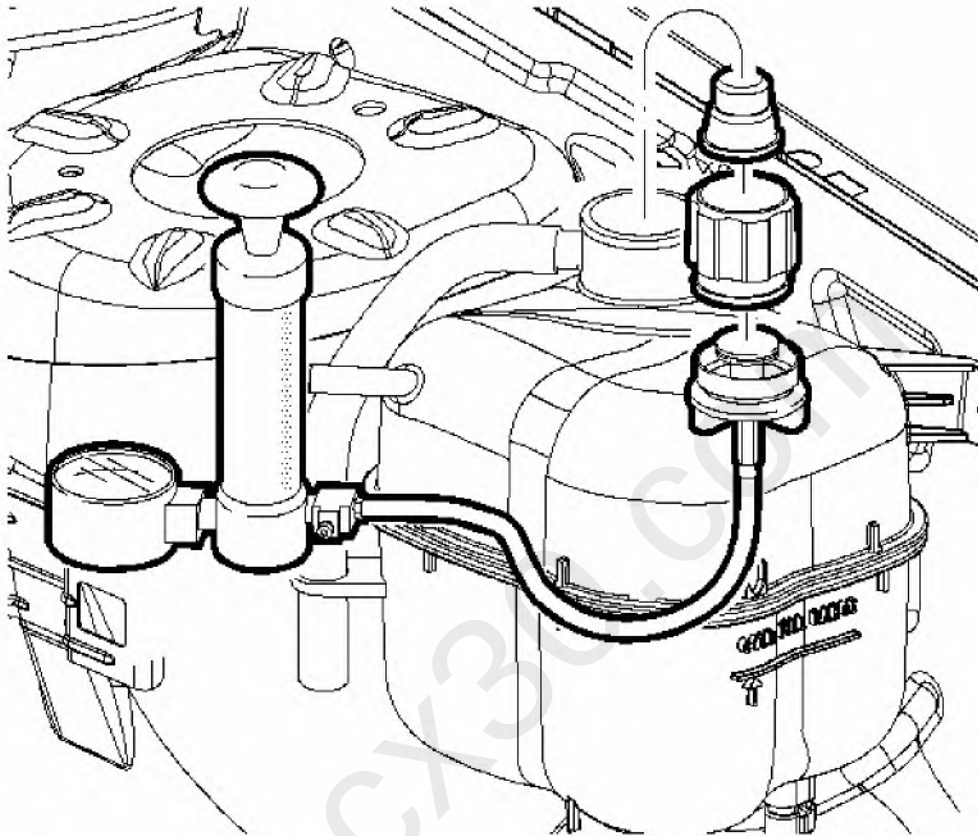


Fig. 4: View Of SA9141E & J 42401
Courtesy of GENERAL MOTORS CORP.

4. Use the **J 24460-01** with **J 42401** in order to apply pressure to the cooling system. See **Special Tools**.
 - Wet the O-rings on the Surge Tank Pressure Test Adapter J 42401-2 (insert) with water or clean coolant and insert into tank.
 - Wet the rubber gasket of the cap adapter J 42401-3 (cap) and install on surge tank.

IMPORTANT: Do not exceed the pressure cap rating.

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

Observe the gage for any pressure loss.

6. Repair any leaks as required.

REPAIR INSTRUCTIONS

DRAINING AND FILLING COOLING SYSTEM (STATIC FILL)

Draining Procedure

CAUTION: In order to avoid personal injury, do not remove the cap or open the cooling system drains from a hot system. Allow the system to cool first.

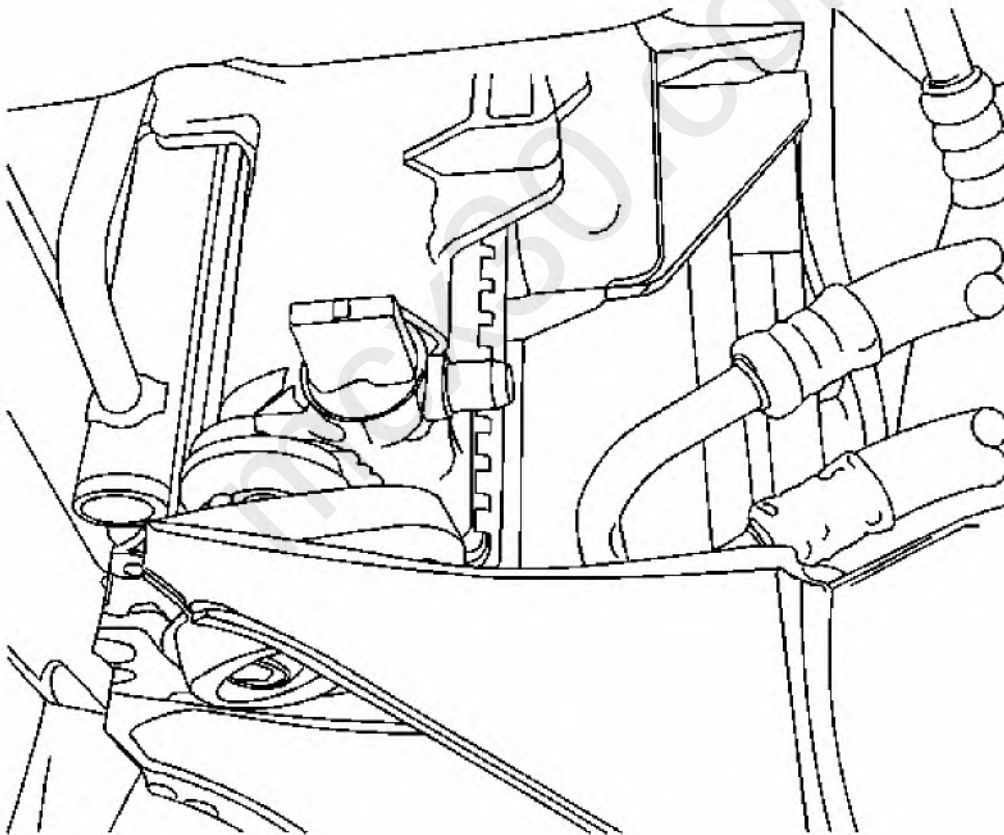


Fig. 5: Radiator Drain Cock
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: A 7.6 liter (8 qt) coolant container will be needed.

1. Place the coolant container under the radiator drain valve located at the bottom of the

left radiator end tank.

2. Open the drain valve to start the flow of coolant. Coolant will drain slowly until the surge tank cap is removed.

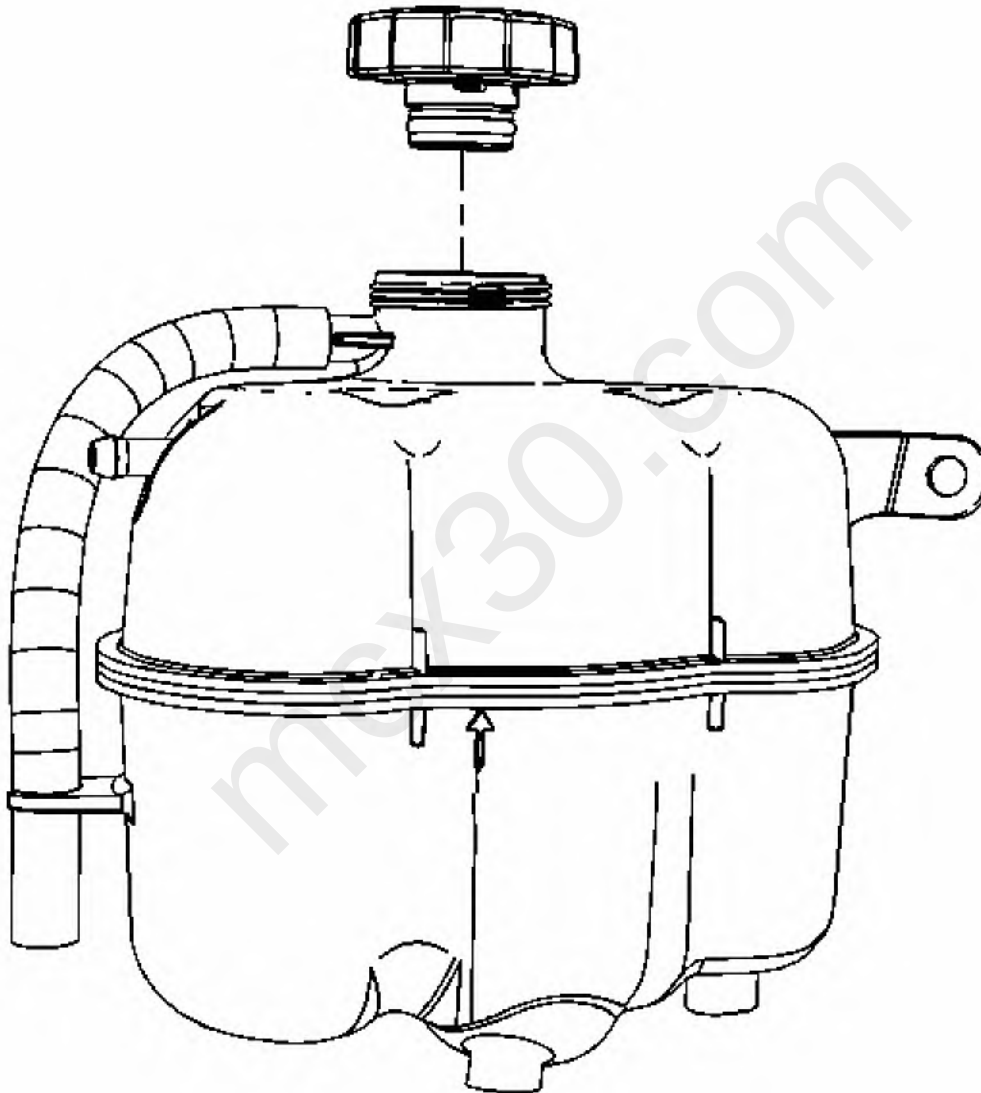


Fig. 6: Surge Tank Cap
Courtesy of GENERAL MOTORS CORP.

3. Remove the surge tank cap from the surge tank. Allow the coolant to drain from the system.

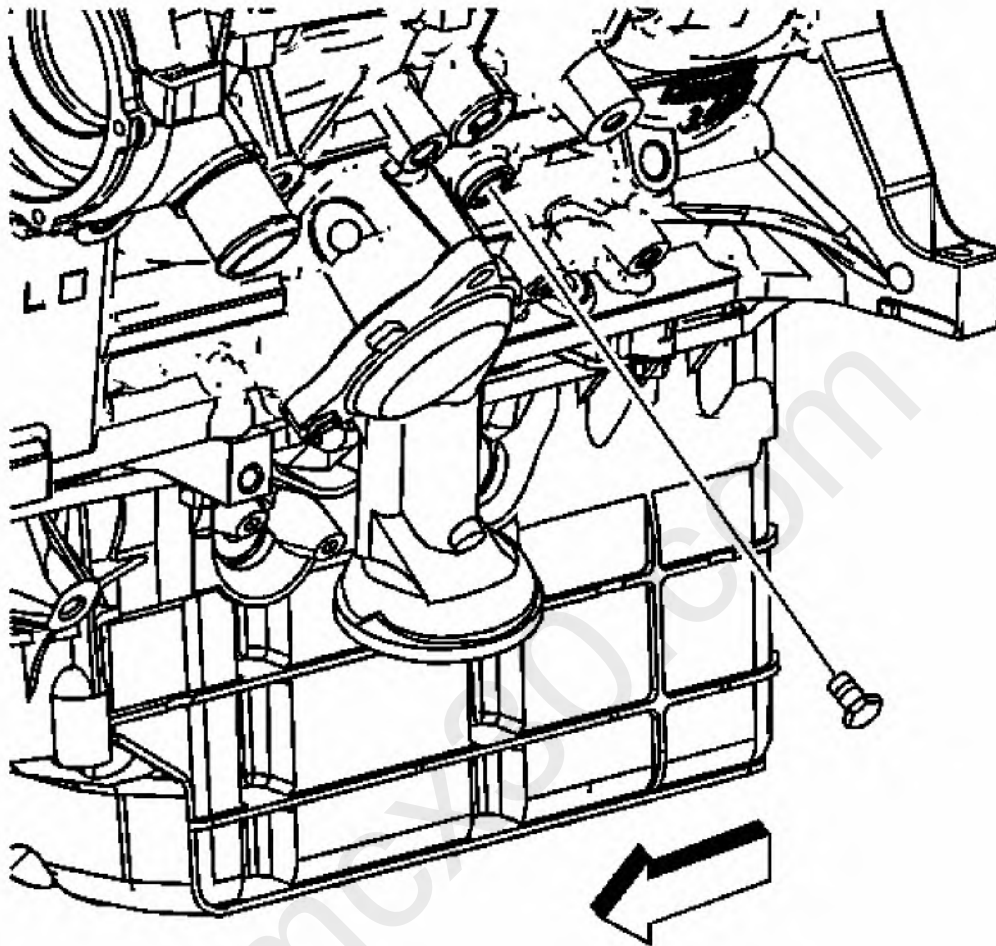


Fig. 7: Removing Coolant Drain Plug From Left Side
Courtesy of GENERAL MOTORS CORP.

4. Additional coolant can be drained from the engine by removing the engine block drain plug.
5. Follow the appropriate procedure based on the condition of the coolant.
 - Normal in appearance-follow the filling procedure.
 - Discolored-follow the flush procedure. Refer to **Coolant System Flushing**.

Filling Procedure

IMPORTANT: When the radiator is drained, a minimum of 5 liters (5.28 qts) of coolant is typically drained from the cooling system. During the fill procedure, a minimum of 5 liters (5.28 qts) of coolant should

be added to the cooling system before the vehicle is returned to the customer.

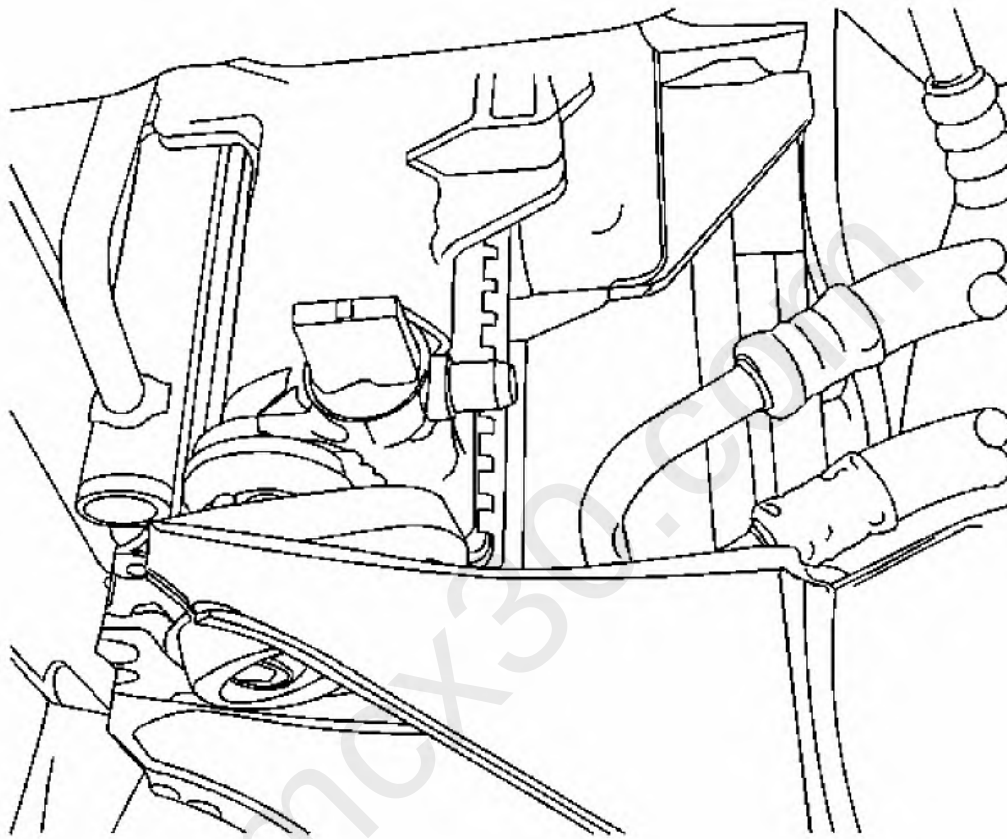


Fig. 8: Radiator Drain Cock
Courtesy of GENERAL MOTORS CORP.

1. Close the drain valve on the left radiator end tank.

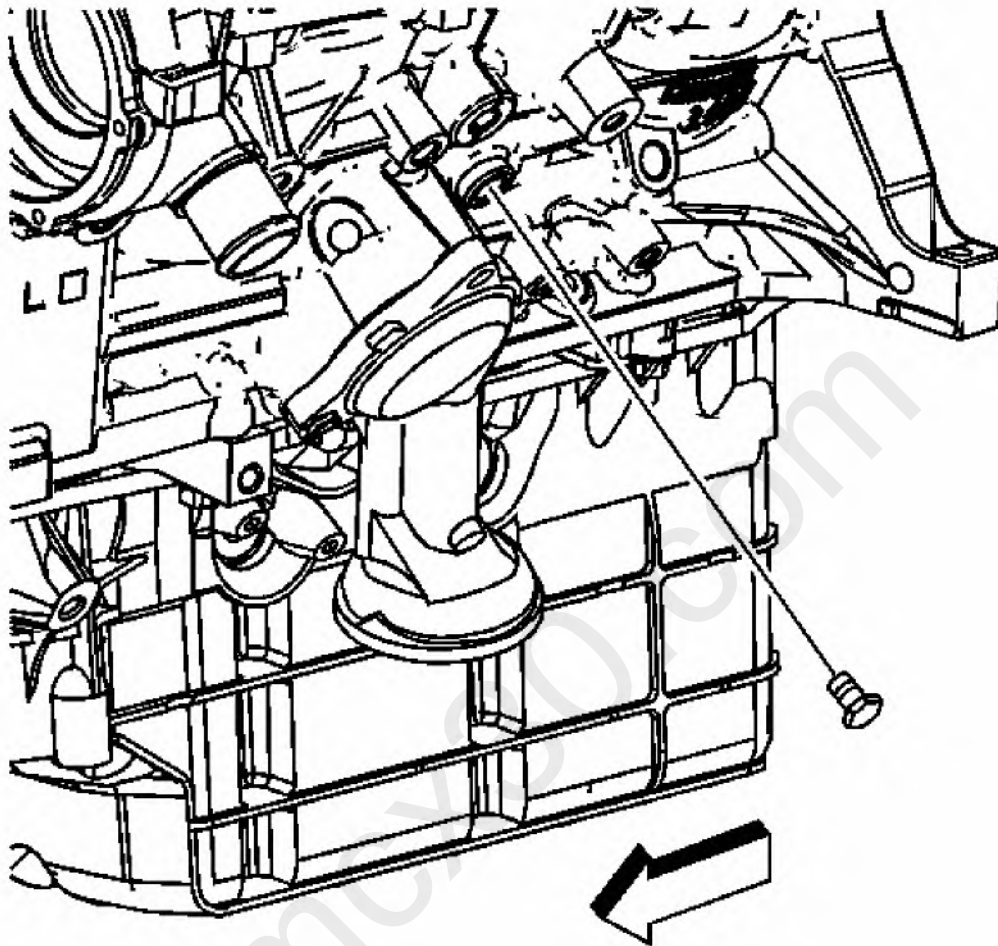


Fig. 9: Removing Coolant Drain Plug From Left Side
Courtesy of GENERAL MOTORS CORP.

2. Install the engine block drain plug, if removed.
3. Open the air bleed screw on the water pump tower.

NOTE: All entrapped air must be purged from the powertrain cooling system before the final coolant level can be determined. Proper coolant level is critical to avoid engine damage.

IMPORTANT: The vehicle must be level when filling the cooling system.

4. Slowly add a mixture of 50/50 DEX-COOL antifreeze and clean water to the surge tank. Refer to **Capacities - Approximate Fluid** in General Information for cooling

system capacity.

1. As the system begins to fill, watch for coolant at the water pump tower.
2. As coolant begins to seep from the air bleed, close the air bleed screw.
3. Once the bleed screw is closed, continue to add coolant until a minimum of 5 liters (5.28 qts) is added to the cooling system. Start the engine and run at idle to add the remaining coolant.
5. Install the surge tank cap.
6. Run the engine and cycle the vehicle from idle to 3,000 RPM in 30 second intervals until the engine cooling fans come ON.
7. Return the engine to idle, idle for 30 seconds then turn the engine OFF.
8. Allow the vehicle to cool.
9. Add coolant to the surge tank until the level is approximately 25 mm (1 in) above the top of the Cold Fill Range at the surge tank seam.
10. Install the surge tank cap.

DRAINING AND FILLING COOLING SYSTEM (GE 47716 FILL)

Tools Required

- **J 26568** Coolant and Battery Fluid Tester. See **Special Tools**.
- **GE-47716** Vac N Fill Coolant Refill Tool. See **Special Tools**.
- **J 42401** Radiator Pressure Adapter. See **Special Tools**.

Draining Procedure

CAUTION: In order to avoid personal injury, do not remove the cap or open the cooling system drains from a hot system. Allow the system to cool first.

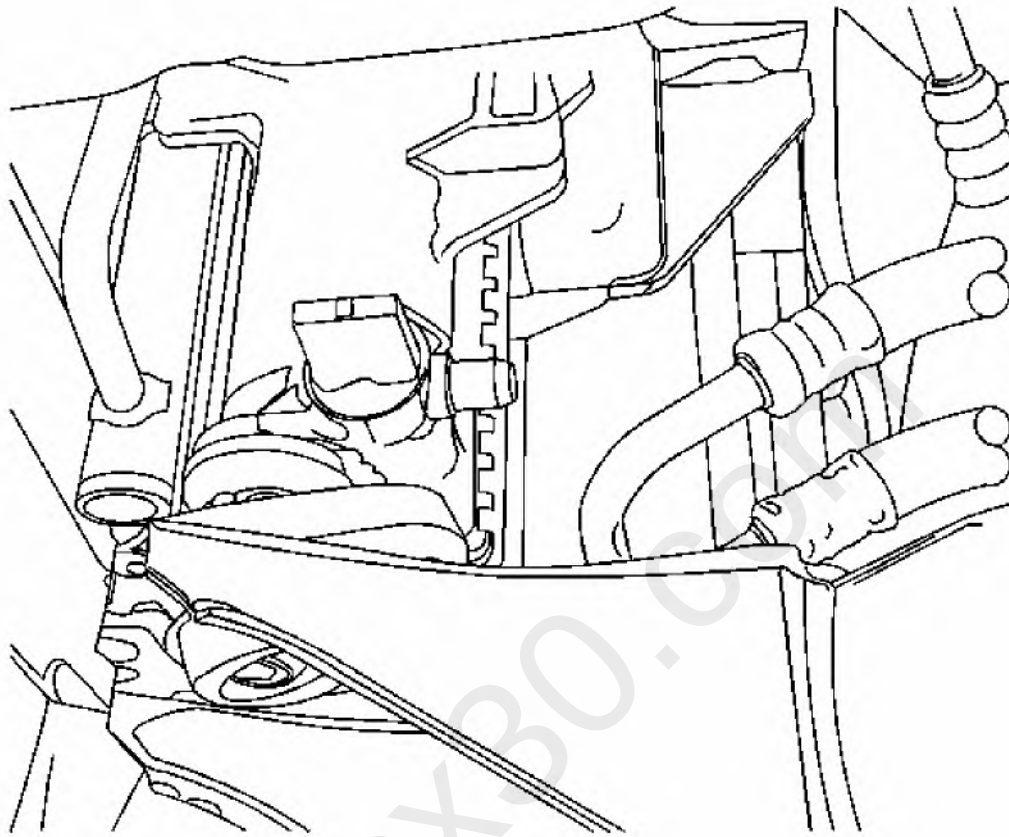


Fig. 10: Radiator Drain Cock
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: A 7.6 liter (8 qt) coolant container will be needed.

1. Place the coolant container under the radiator drain cock located at the bottom of the right radiator end tank.
2. Open the drain valve to start the flow of coolant. Coolant will drain slowly until the surge tank cap is removed.

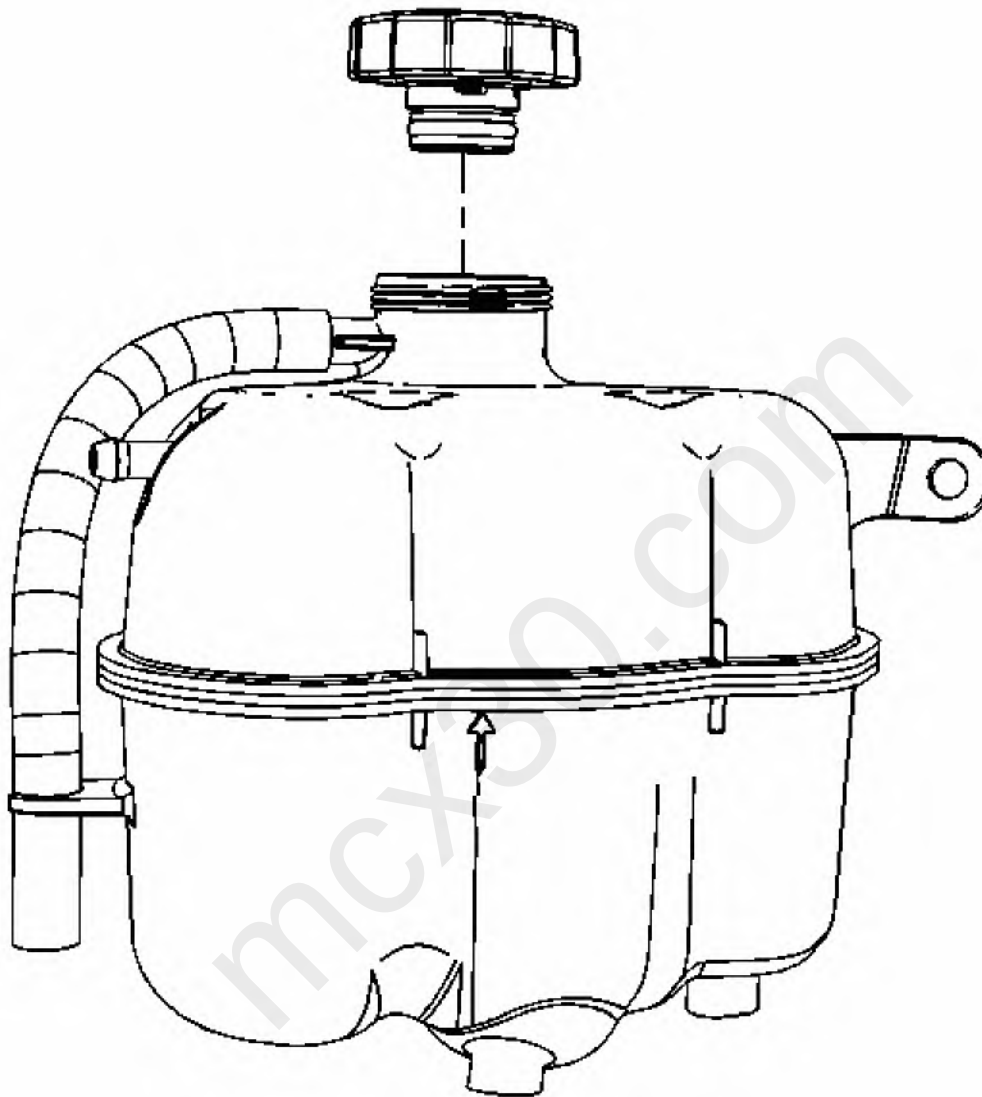


Fig. 11: Surge Tank Cap
Courtesy of GENERAL MOTORS CORP.

3. Remove the surge tank cap from the surge tank. Allow the coolant to drain from the system.
4. Close the drain valve once the coolant has drained from the radiator.

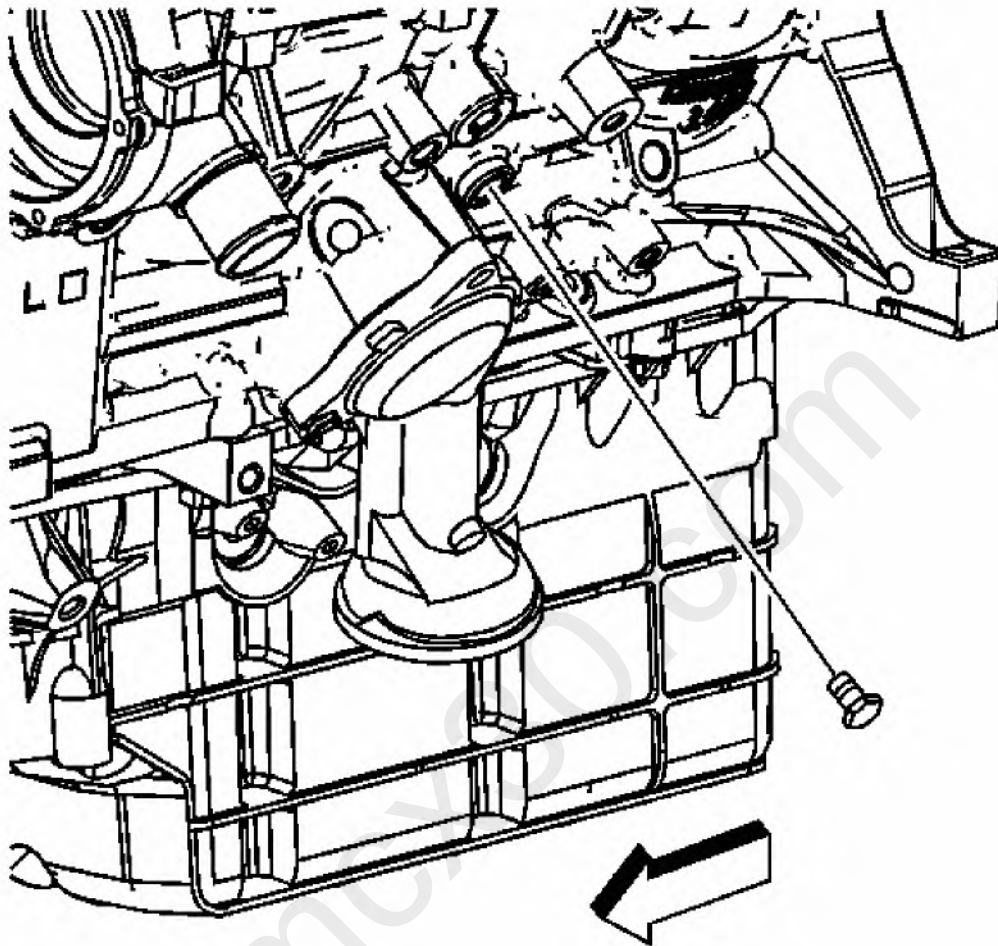


Fig. 12: Removing Coolant Drain Plug From Left Side
Courtesy of GENERAL MOTORS CORP.

5. Additional coolant can be drained from the engine by removing the engine block drain plug.
6. Install the engine block drain plug once the coolant has drained from the engine.
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant.
 - Normal in appearance-follow the filling procedure.
 - Discolored-follow the flush procedure. Refer to **Coolant System Flushing**.

Vac-N-Fill Procedure

CAUTION: 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.

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

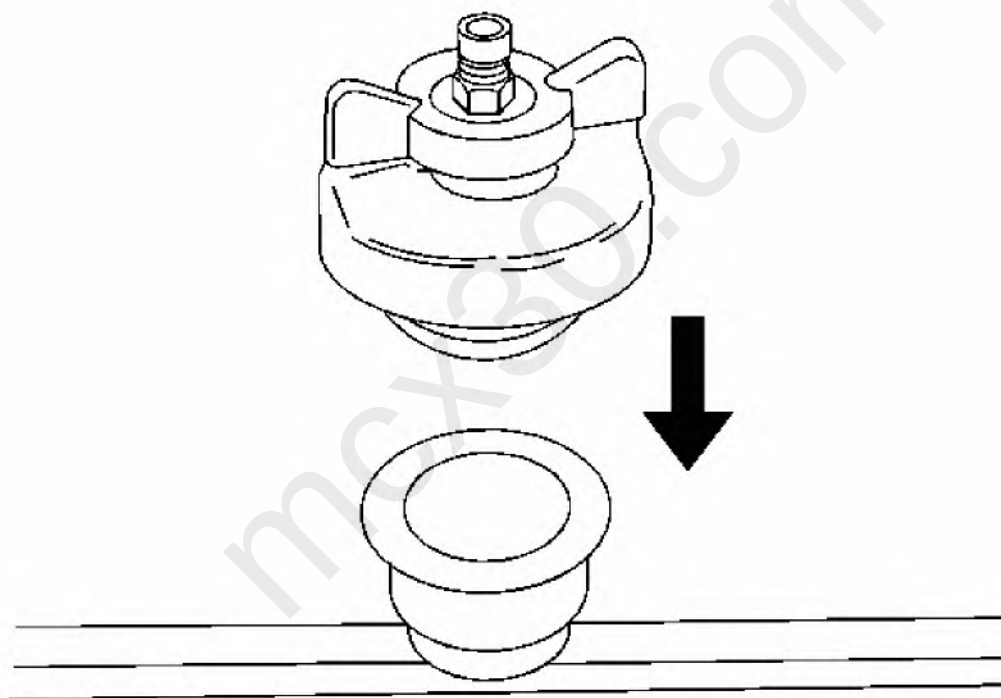


Fig. 13: Vac N Fill Cap
Courtesy of GENERAL MOTORS CORP.

1. Install J-42401-2 into the surge tank fill neck.
2. Install J-42401-3 to the surge tank fill neck.
3. Attach the Vac N Fill cap to the J-42401-3.

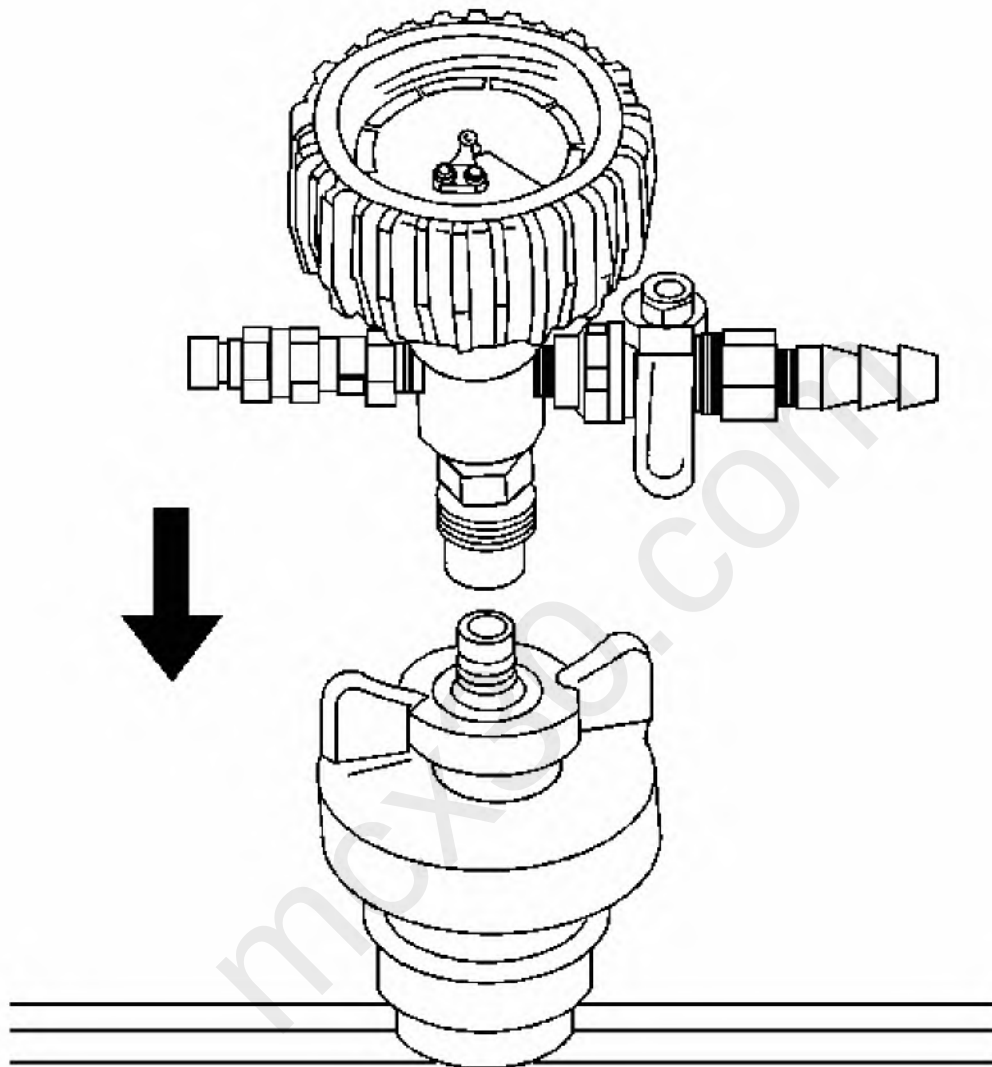


Fig. 14: Vacuum Gage Assembly
Courtesy of GENERAL MOTORS CORP.

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

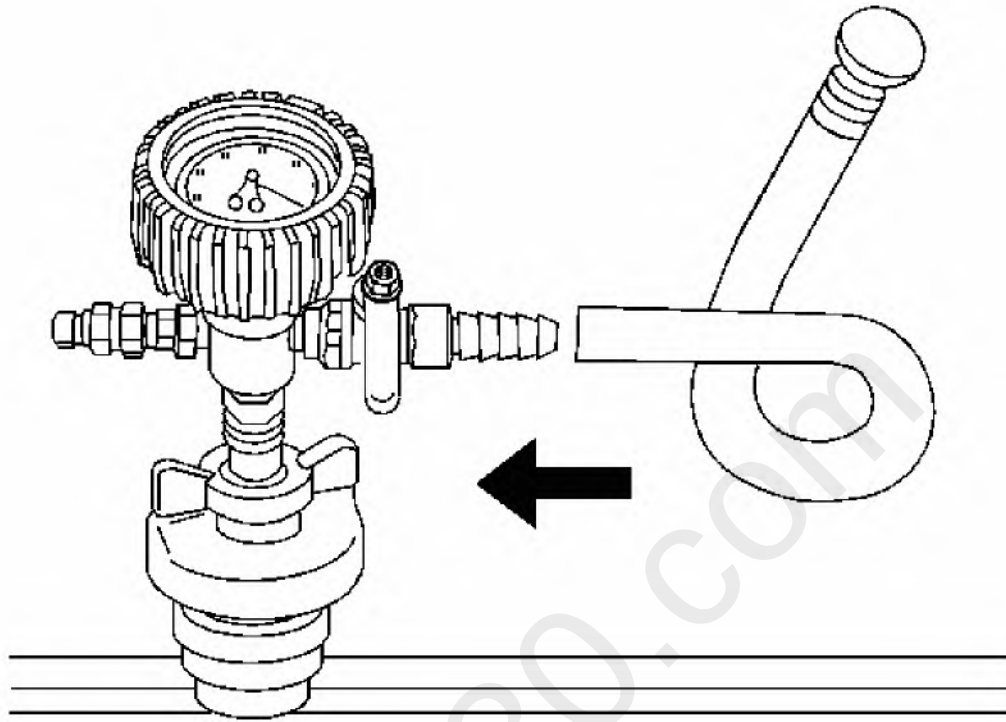


Fig. 15: Fill Hose

Courtesy of GENERAL MOTORS CORP.

5. Attach the fill hose to the barb fitting on the vacuum gauge assembly.

Ensure that the valve is closed.

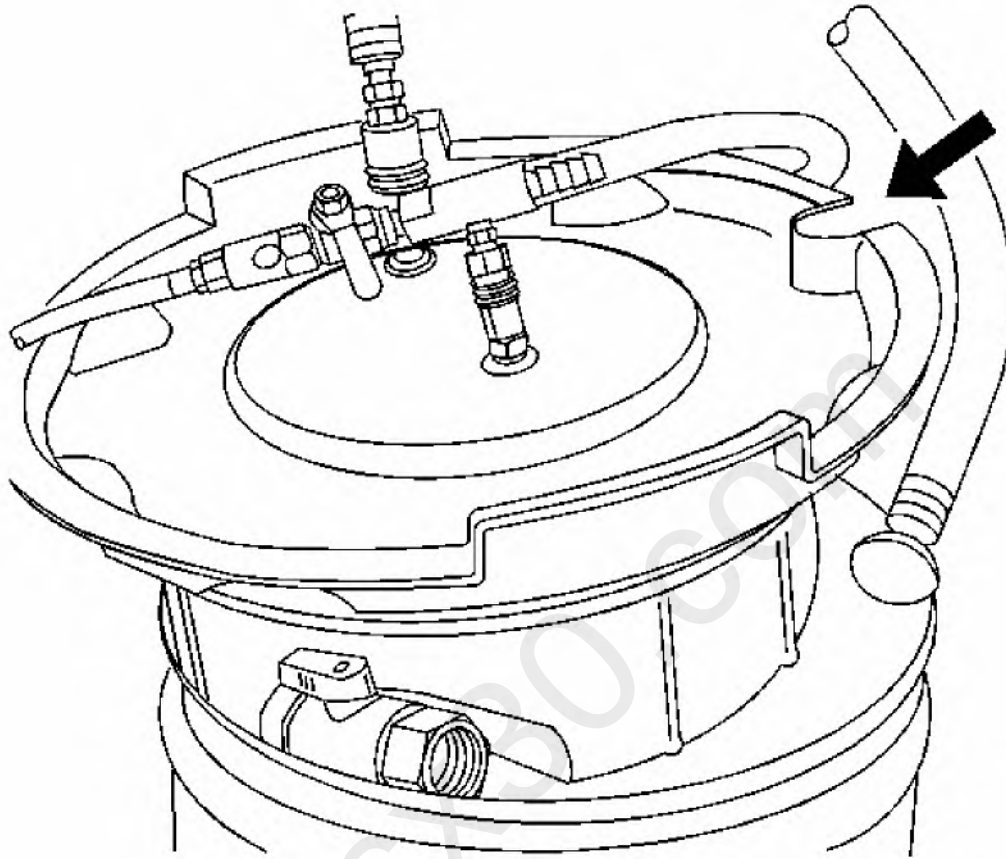


Fig. 16: Graduated Reservoir
Courtesy of GENERAL MOTORS CORP.

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

Always use more coolant than necessary. This will eliminate air from being drawn into the cooling system.

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

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

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

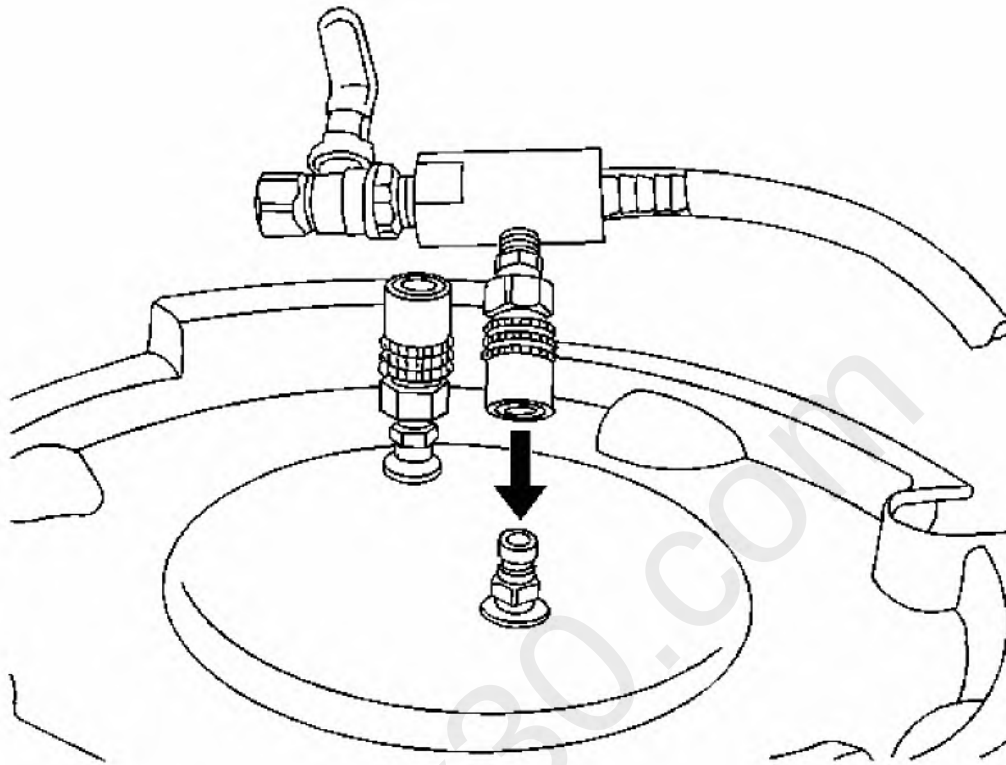


Fig. 17: Venturi Assembly
Courtesy of GENERAL MOTORS CORP.

9. Attach the venturi assembly to the vacuum tank.

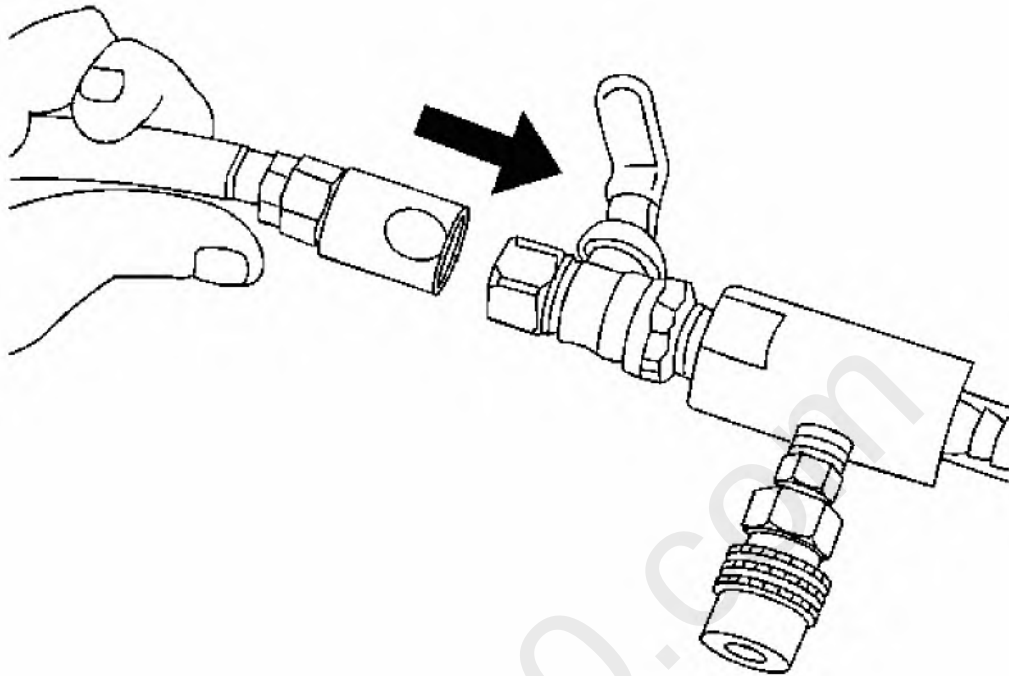


Fig. 18: Shop Air Hose
Courtesy of GENERAL MOTORS CORP.

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

Ensure the valve on the venturi assembly is closed.

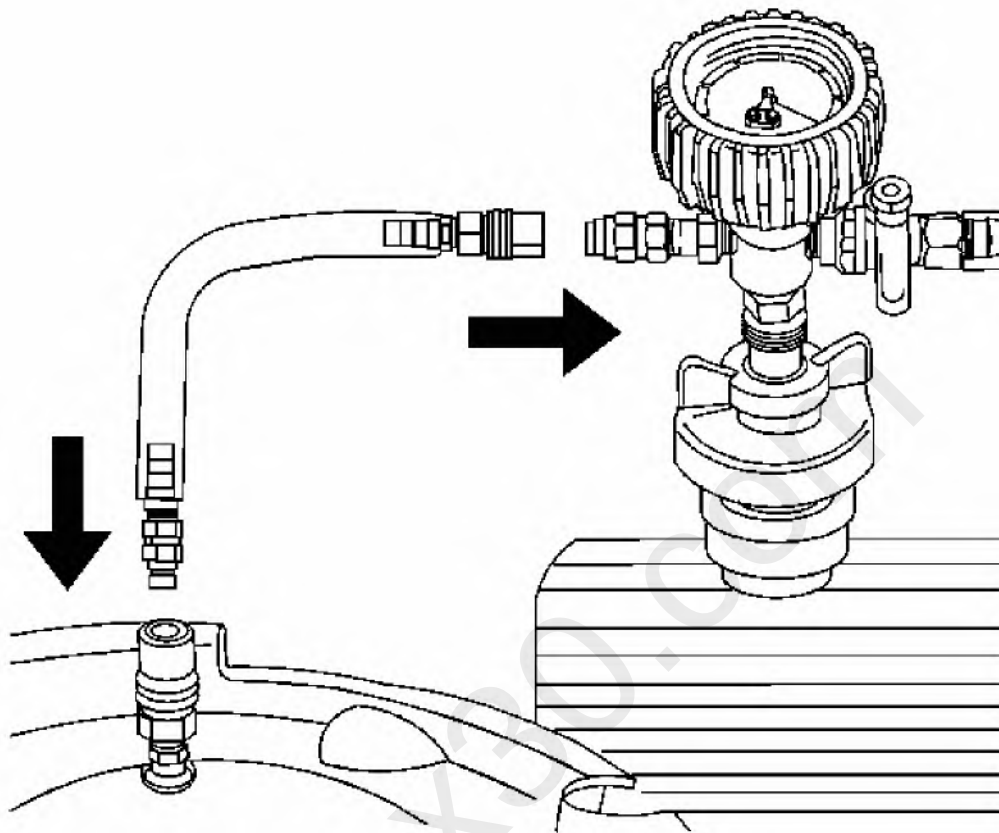


Fig. 19: Vacuum Hose
Courtesy of GENERAL MOTORS CORP.

11. Attach the vacuum hose to the vacuum gauge assembly and the vacuum tank.

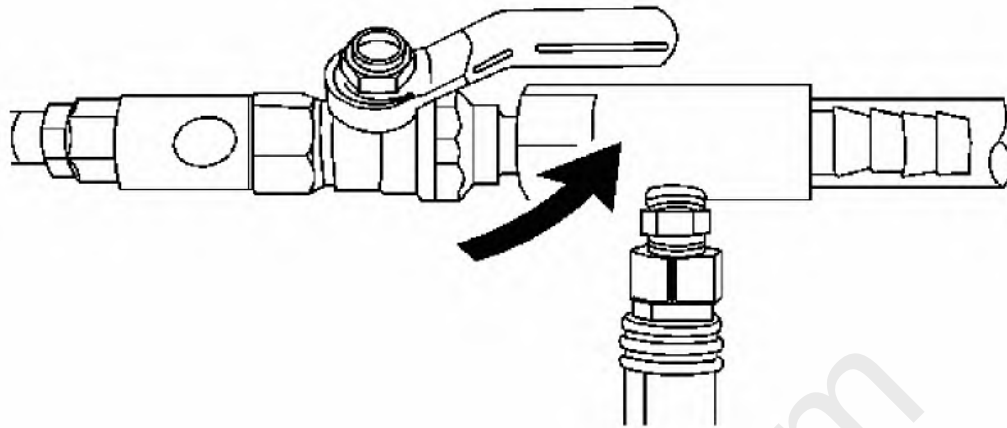


Fig. 20: Valve On Venturi Assembly
Courtesy of GENERAL MOTORS CORP.

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

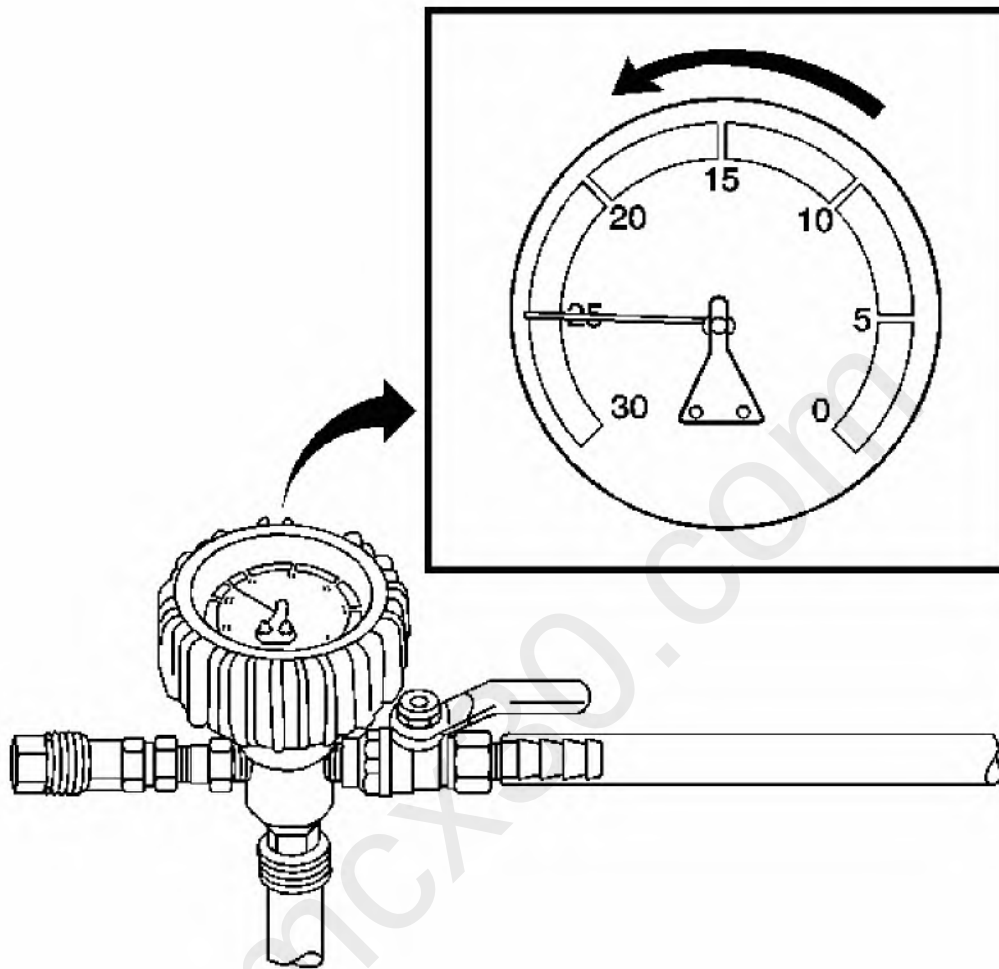


Fig. 21: Observing Vacuum Gauge
Courtesy of GENERAL MOTORS CORP.

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

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

14. To aid in the fill process, position the graduated reservoir above the surge tank.

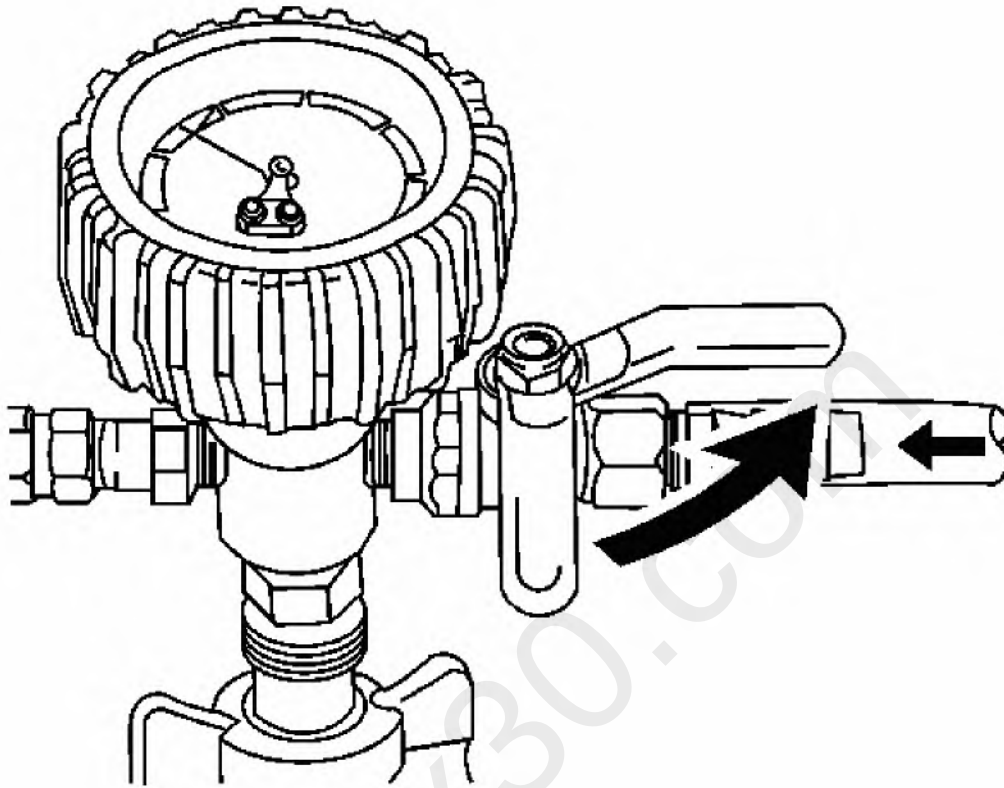


Fig. 22: Valve On Vacuum Gage Assembly
Courtesy of GENERAL MOTORS CORP.

15. Slowly open the valve on the vacuum gauge assembly. When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
16. Close the valve on the venturi assembly.
17. If there is a suspected leak in the cooling system, allow the system to stabilize under vacuum and monitor for vacuum loss.

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

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

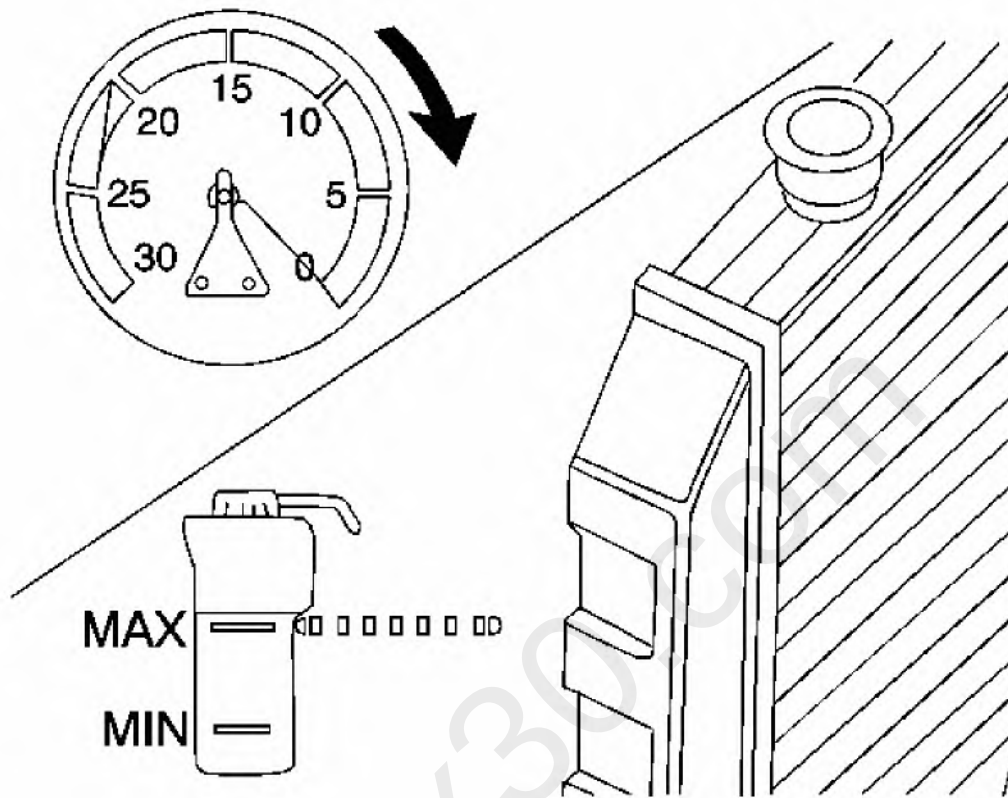


Fig. 23: Vacuum Gage Reading
Courtesy of GENERAL MOTORS CORP.

19. Once the vacuum gauge reaches zero, close the valve on the vacuum gauge assembly and repeat steps 12-18.

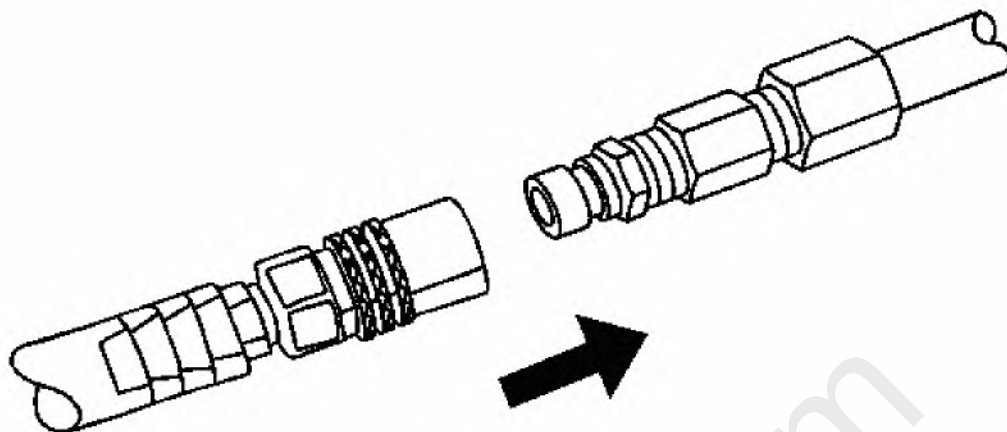


Fig. 24: Extraction Hose
Courtesy of GENERAL MOTORS CORP.

20. Detach the Vac N Fill cap from the J-42401-3.
21. Remove J-42401-2 from the surge tank fill neck.
22. Add coolant to the system as necessary.
23. Inspect the concentration of the coolant mixture using **J 26568** . See Special Tools.

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

24. Detach the vacuum hose from the vacuum gauge assembly.
25. Attach the extraction hose to the vacuum hose.

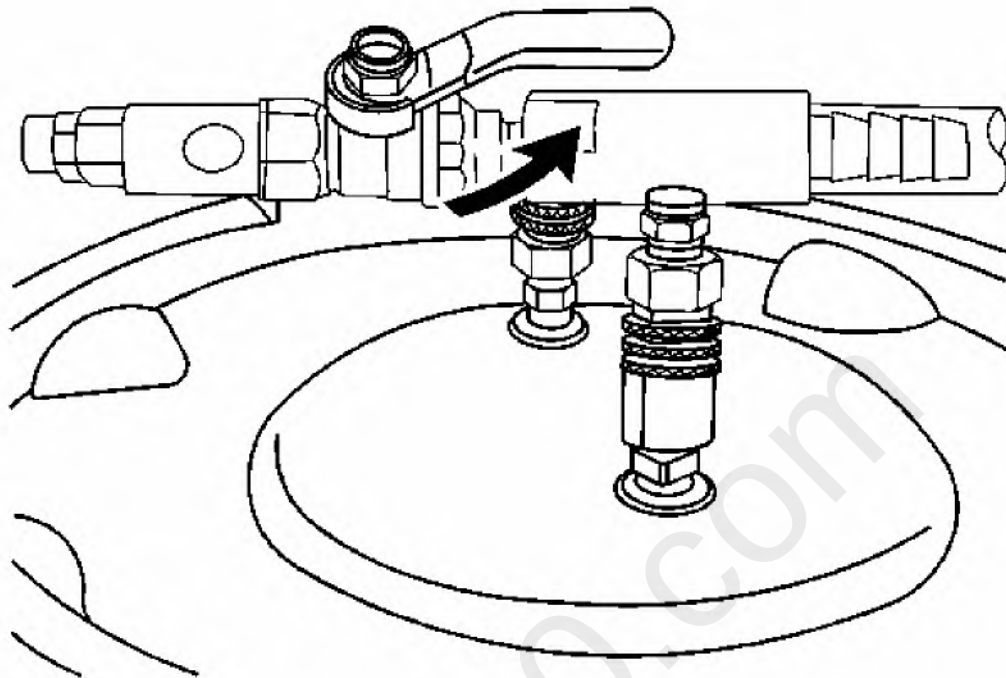


Fig. 25: Opening The Valve On The Venturi Assembly
Courtesy of GENERAL MOTORS CORP.

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

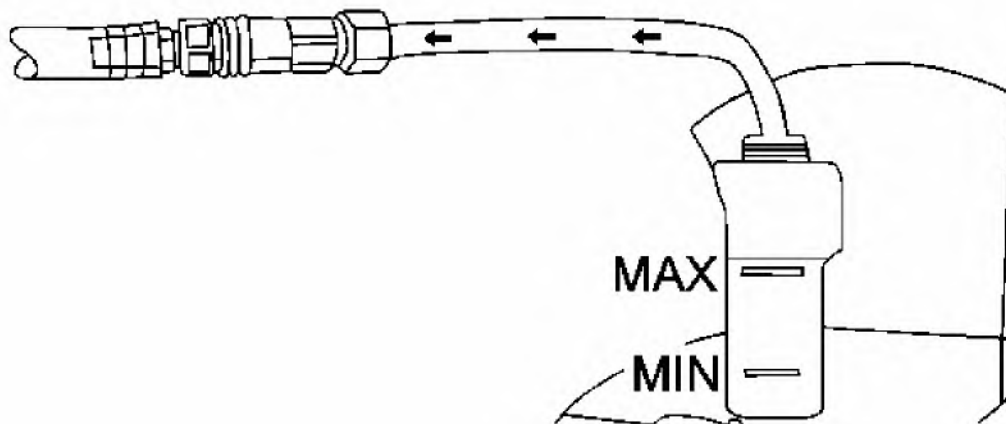


Fig. 26: Drawing Out Coolant
Courtesy of GENERAL MOTORS CORP.

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

COOLANT SYSTEM FLUSHING

Flushing

IMPORTANT: Do not use a chemical flush.

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

Various methods and equipment can be used to flush the cooling system. If special equipment is used, such as a back flusher, follow the manufacturer's instruction. Always remove the thermostat before flushing the cooling system.

When the cooling system becomes contaminated, the cooling system should be flushed thoroughly to remove the contaminants before the engine is seriously damaged.

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

SURGE TANK REPLACEMENT

Tools Required

GE-47716 1617 Vac N Fill Coolant Refill Tool. See **Special Tools**.

Removal Procedure

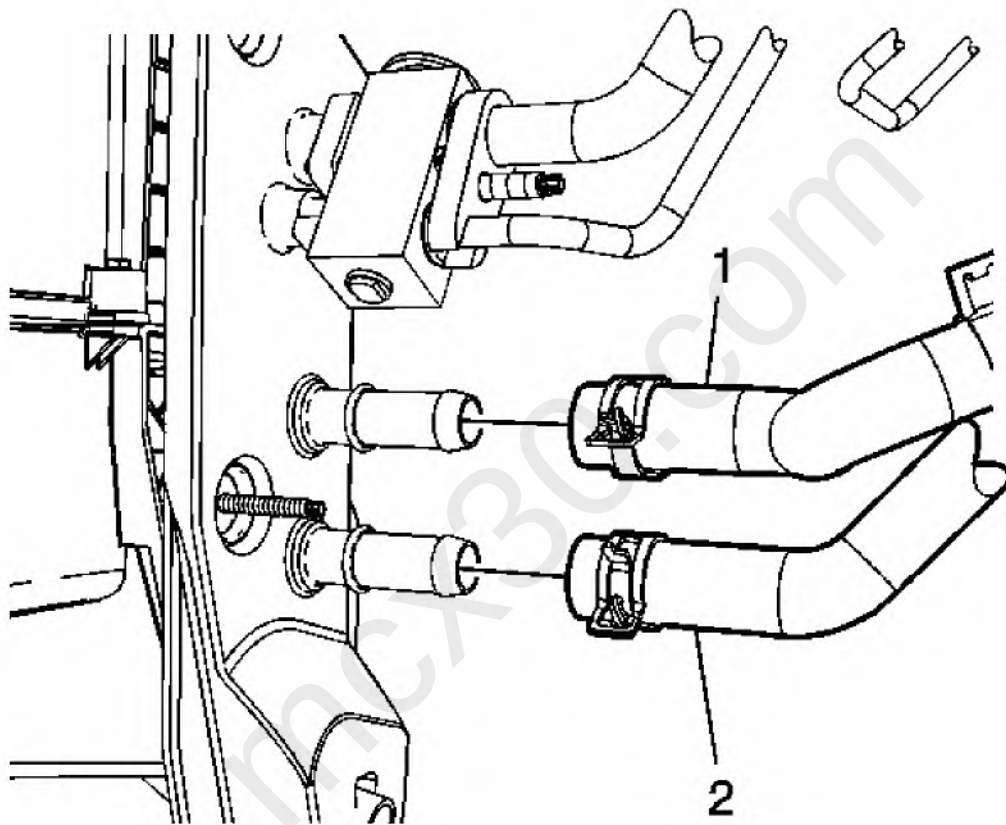


Fig. 27: Heater Hoses At Heater Core
Courtesy of GENERAL MOTORS CORP.

1. Drain the engine coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Remove the heater outlet hose clamp from the heater core.
3. Remove the heater outlet hose (1) from the heater core.

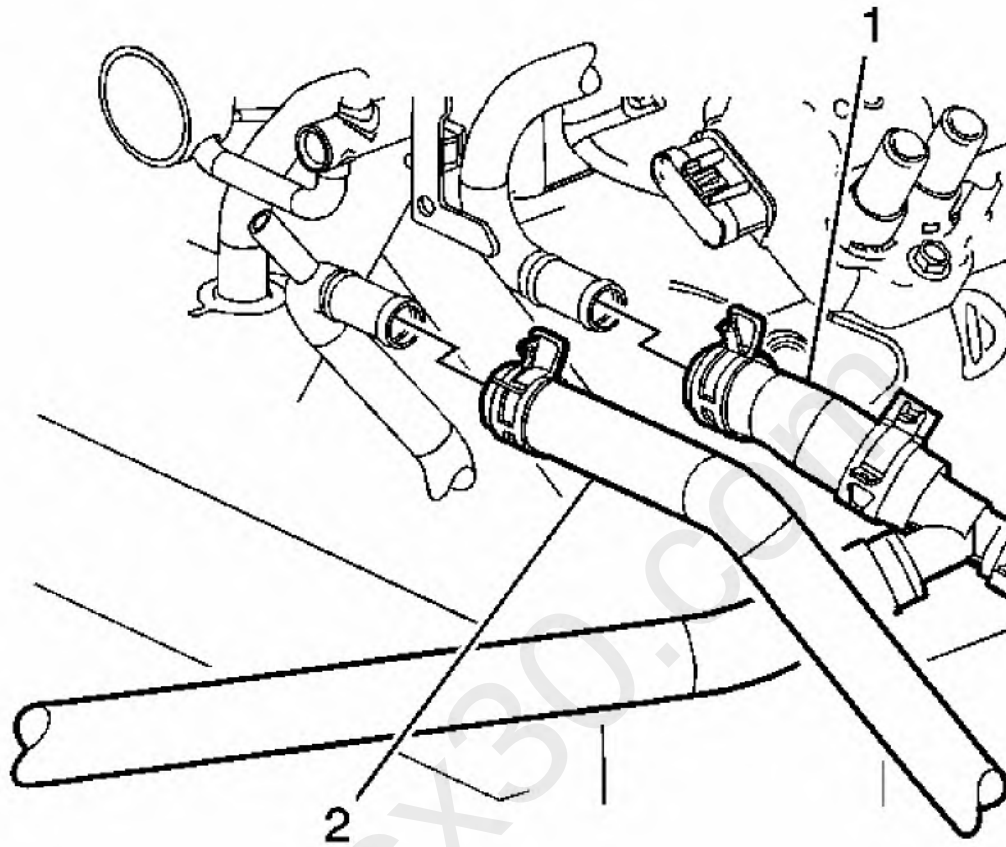


Fig. 28: Heater Hoses At Engine
Courtesy of GENERAL MOTORS CORP.

4. Remove the heater outlet hose clamp from the engine.
5. Remove the heater outlet hose (1) from the engine.
6. Position the loose end of the heater inlet hose outboard to ease in the removal of the surge tank.

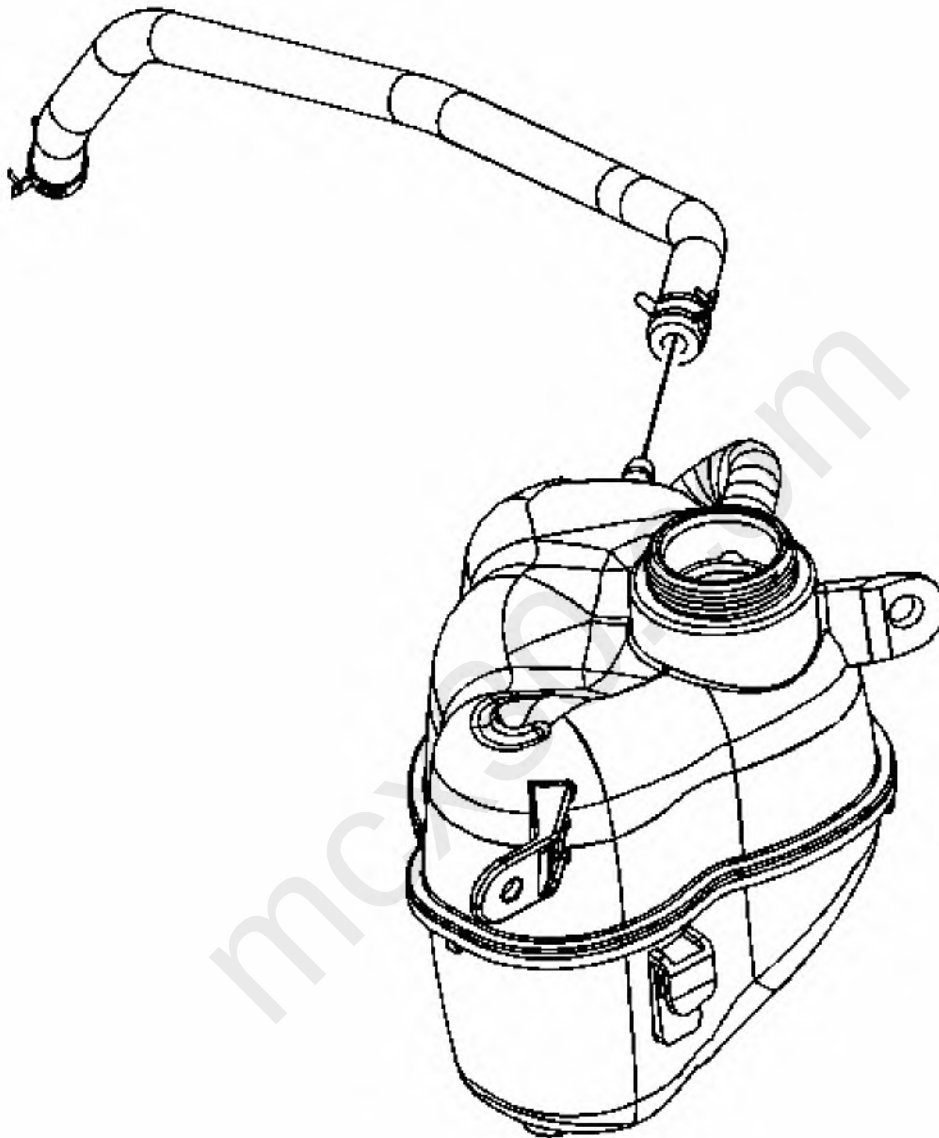


Fig. 29: Surge Tank Inlet Hose & Surge Tank
Courtesy of GENERAL MOTORS CORP.

7. Remove the surge tank inlet hose clamp from the surge tank.
8. Disconnect the surge tank inlet hose from the surge tank.

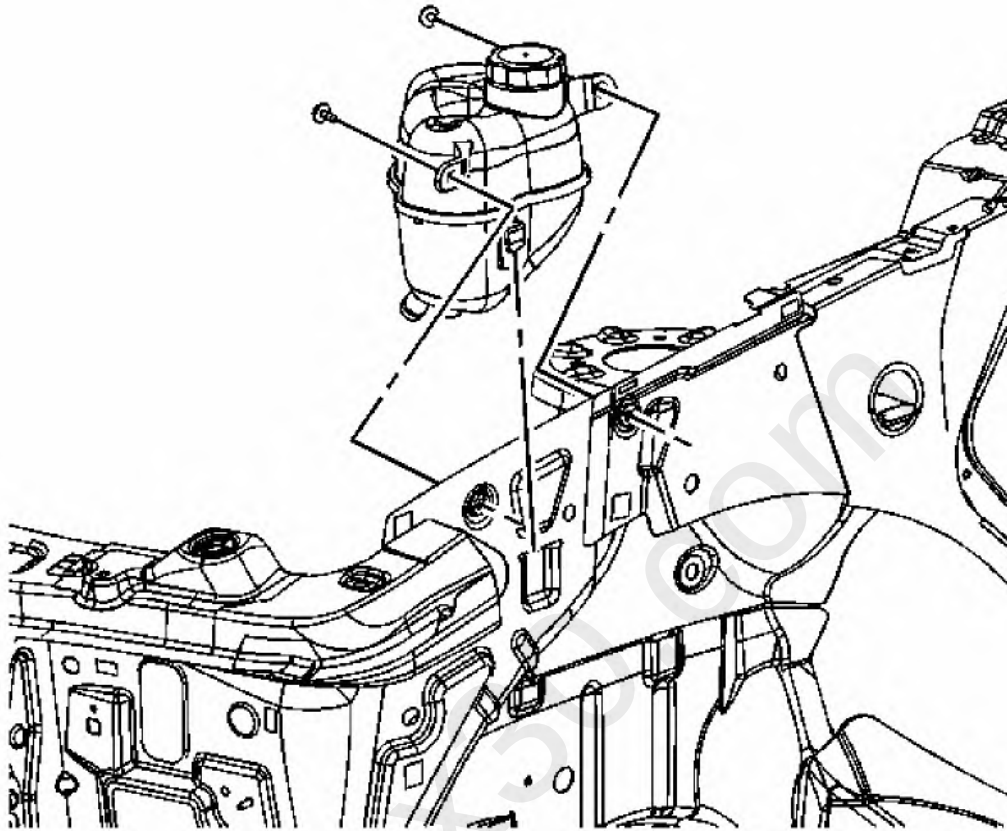


Fig. 30: Surge Tank

Courtesy of GENERAL MOTORS CORP.

9. Remove the surge tank bolts from the surge tank.
10. Lift the surge tank to gain access to the heater outlet hose.
11. Remove the heater outlet hose clamp from the surge tank.
12. Remove the heater outlet hose from the surge tank.
13. Remove the surge tank from the vehicle.

Installation Procedure

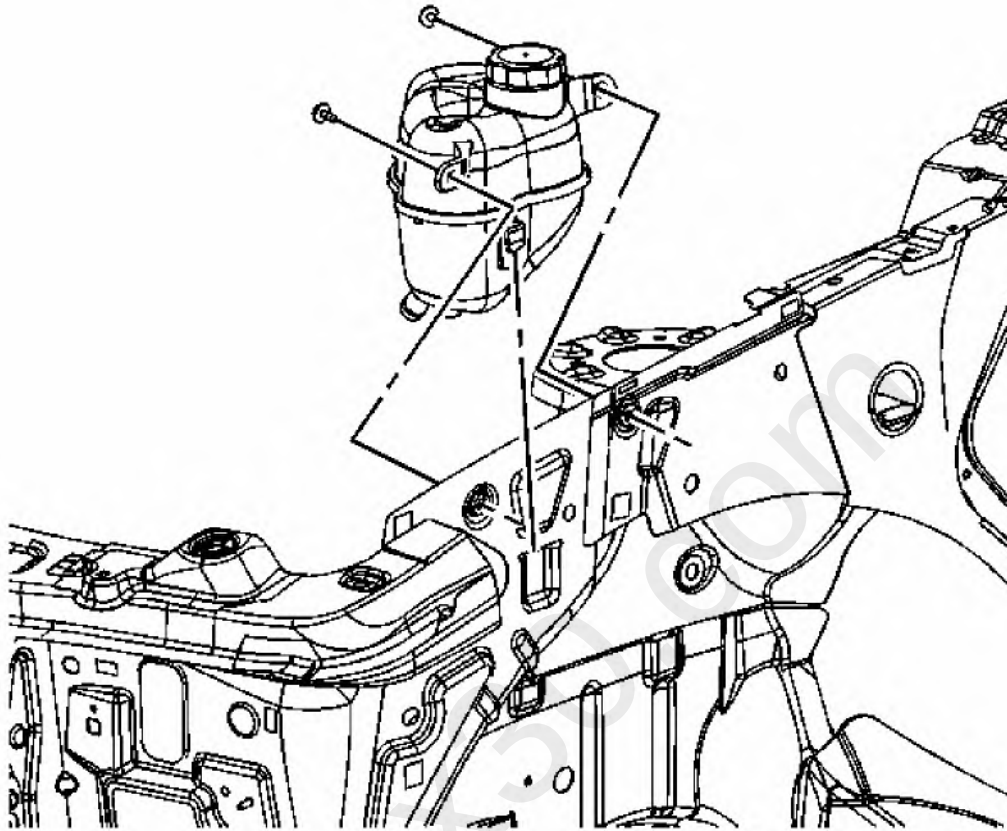


Fig. 31: Surge Tank

Courtesy of GENERAL MOTORS CORP.

1. Install the heater outlet hose to the surge tank.
2. Install the surge tank to the vehicle.

NOTE: Refer to Fastener Notice

3. Install the surge tank bolts to the surge tank.

Tighten: Tighten the bolts to 9 N.m (80 lb in).

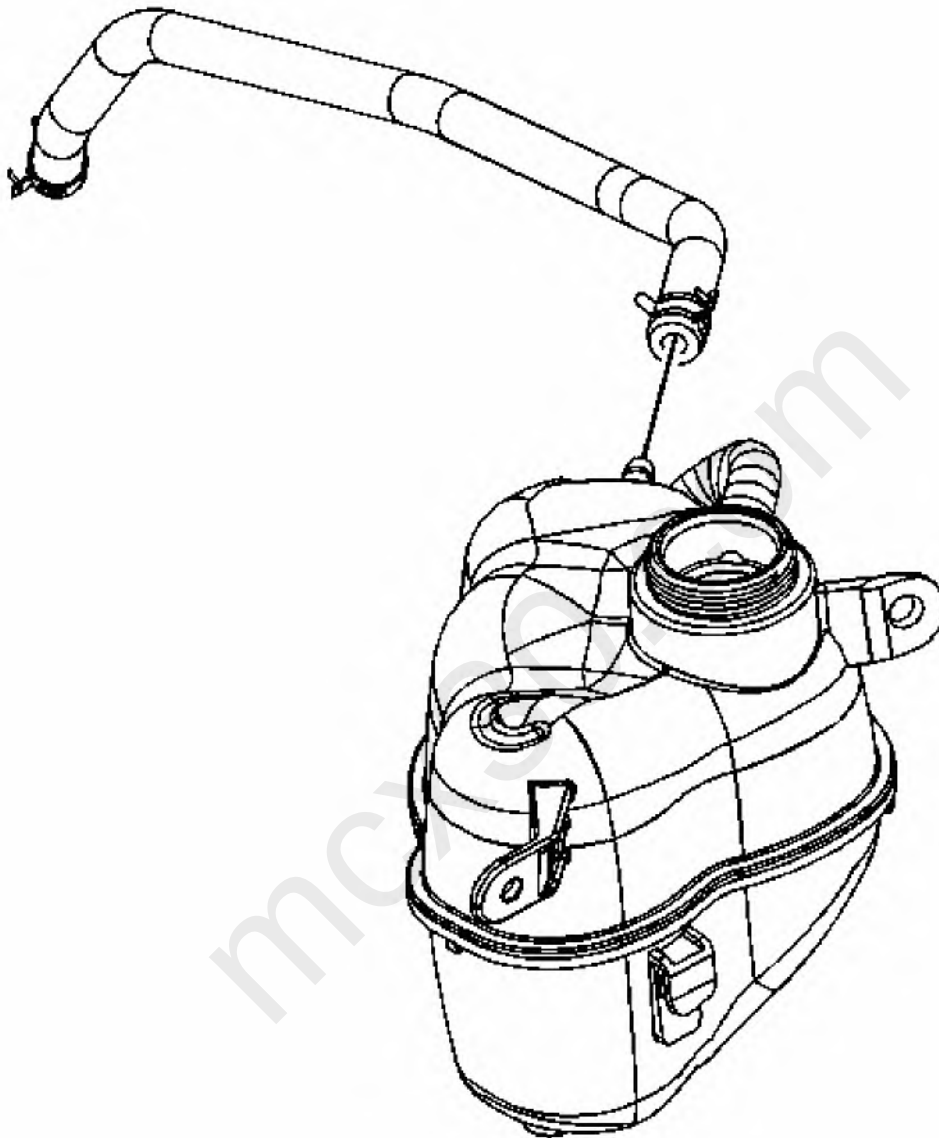


Fig. 32: Surge Tank Inlet Hose & Surge Tank
Courtesy of GENERAL MOTORS CORP.

4. Connect the surge tank inlet hose to the surge tank.
5. Install the surge tank inlet hose clamp to the surge tank.

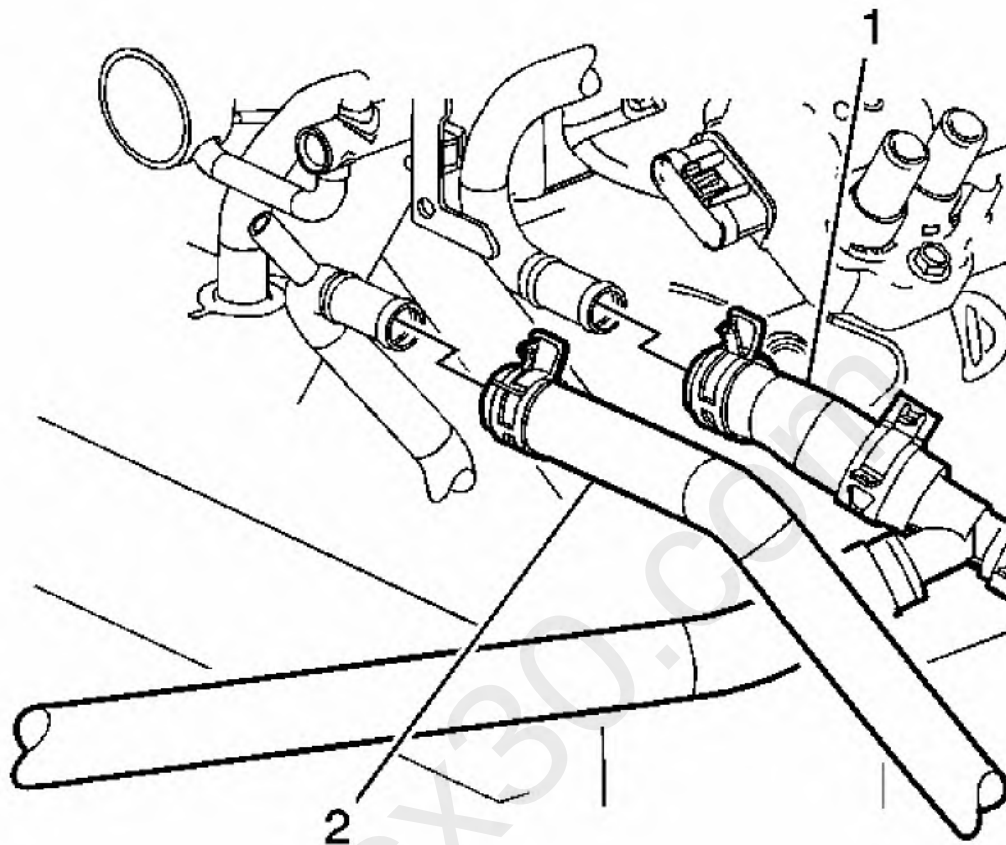


Fig. 33: Heater Hoses At Engine
Courtesy of GENERAL MOTORS CORP.

6. Install the heater outlet hose (1) to the engine.
7. Install the heater outlet hose clamp to the engine.

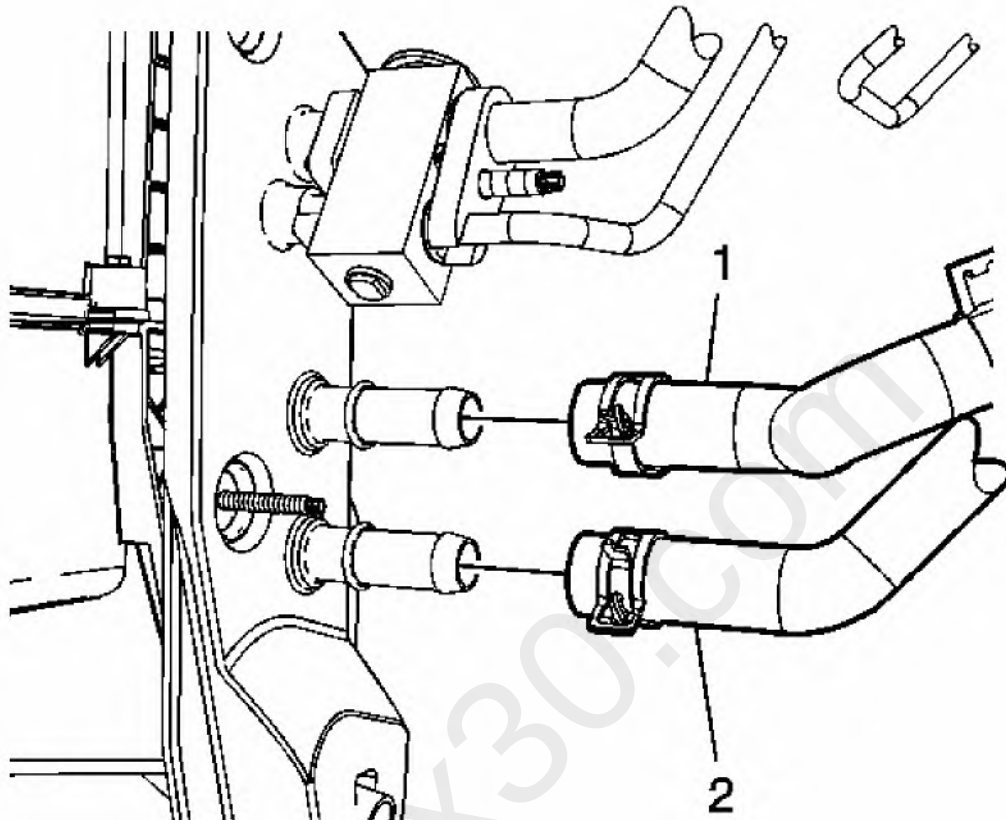


Fig. 34: Heater Hoses At Heater Core
Courtesy of GENERAL MOTORS CORP.

8. Install the heater outlet hose (1) to the heater core.
9. Install the heater outlet hose clamp to the heater core.
10. Fill the engine coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

SURGE TANK HOSE/PIPE REPLACEMENT - INLET

Removal Procedure

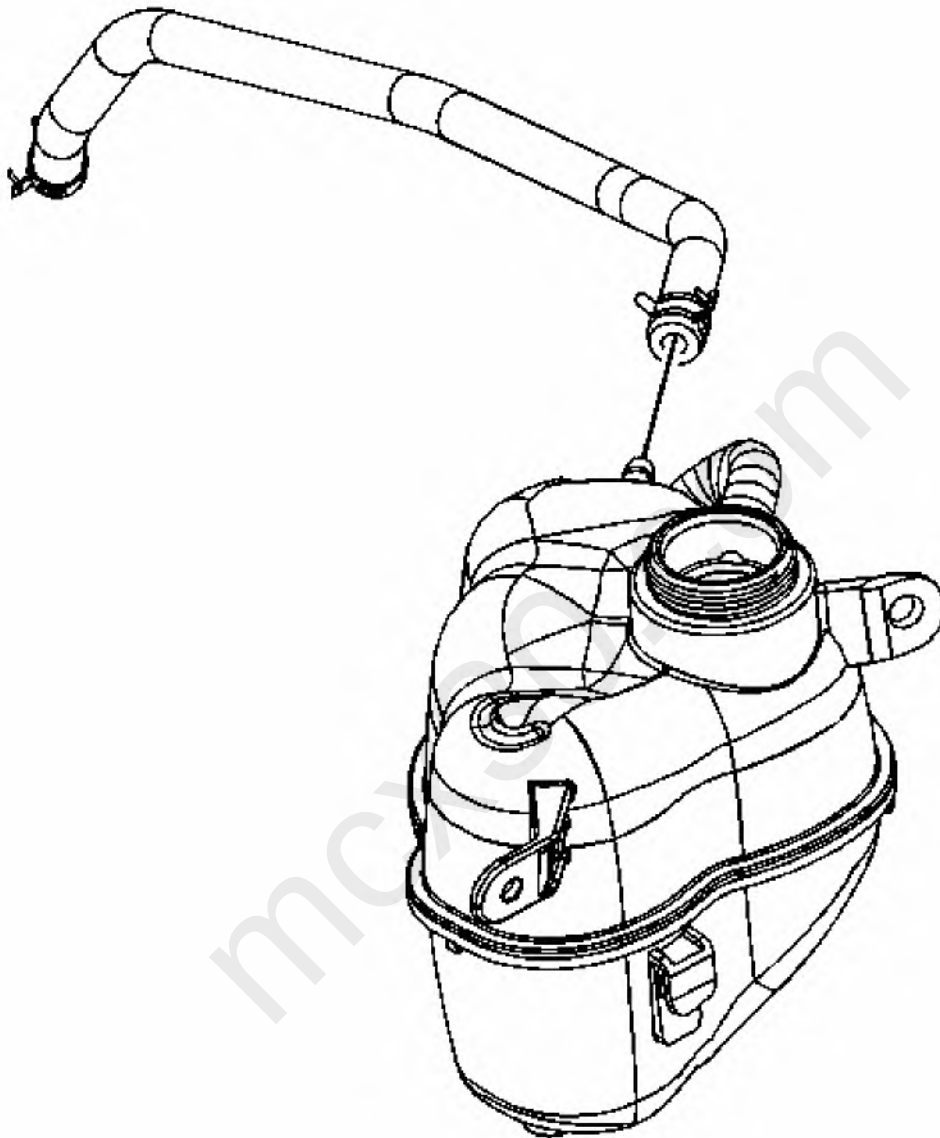


Fig. 35: Surge Tank Inlet Hose & Surge Tank
Courtesy of GENERAL MOTORS CORP.

1. Remove the surge tank inlet hose clamp from the surge tank.
2. Remove the surge tank inlet hose from the surge tank.

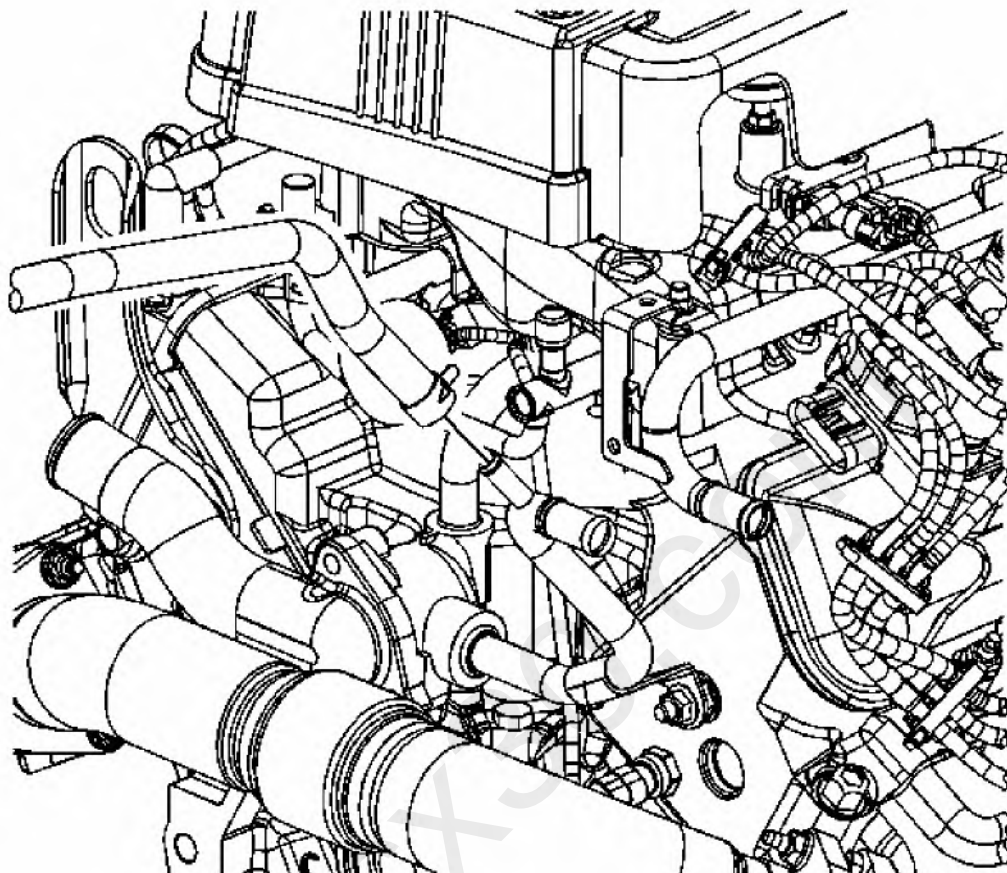


Fig. 36: Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS CORP.

3. Remove the surge tank inlet hose clamp from the engine.
4. Remove the surge tank inlet hose from the engine.

Installation Procedure

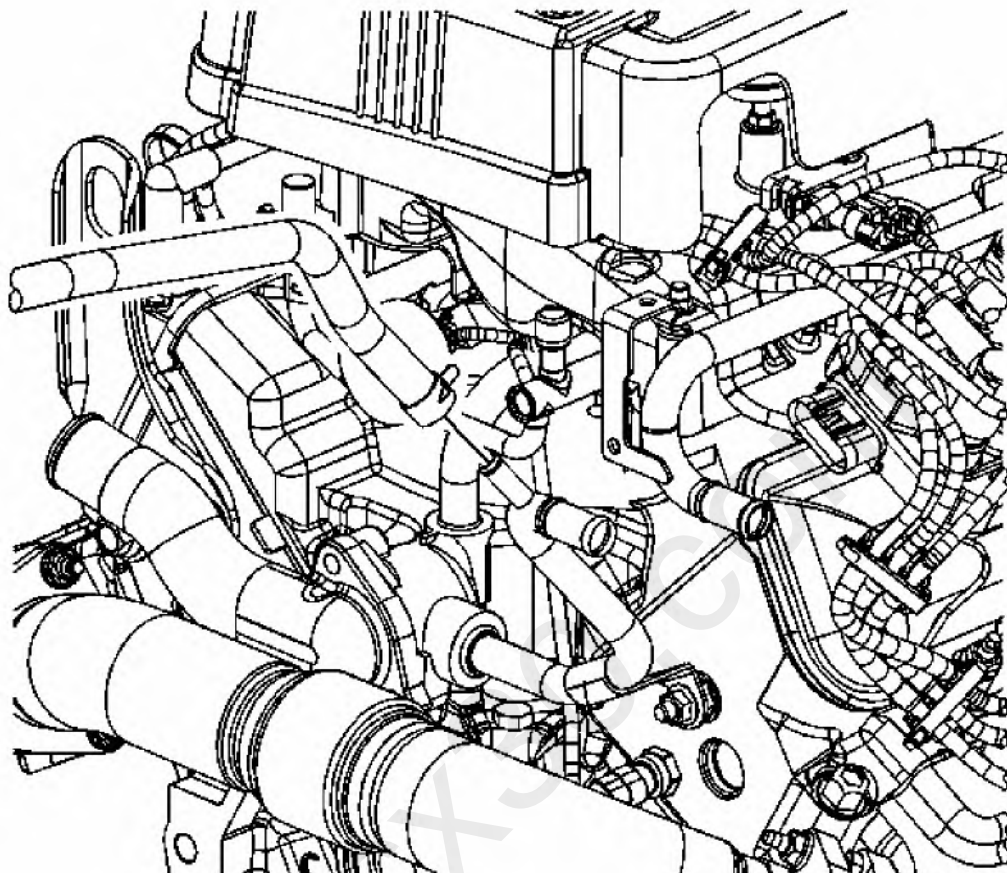


Fig. 37: Surge Tank Inlet Hose
Courtesy of GENERAL MOTORS CORP.

1. Install the surge tank inlet hose to the engine.
2. Install the surge tank inlet hose clamp to the engine.

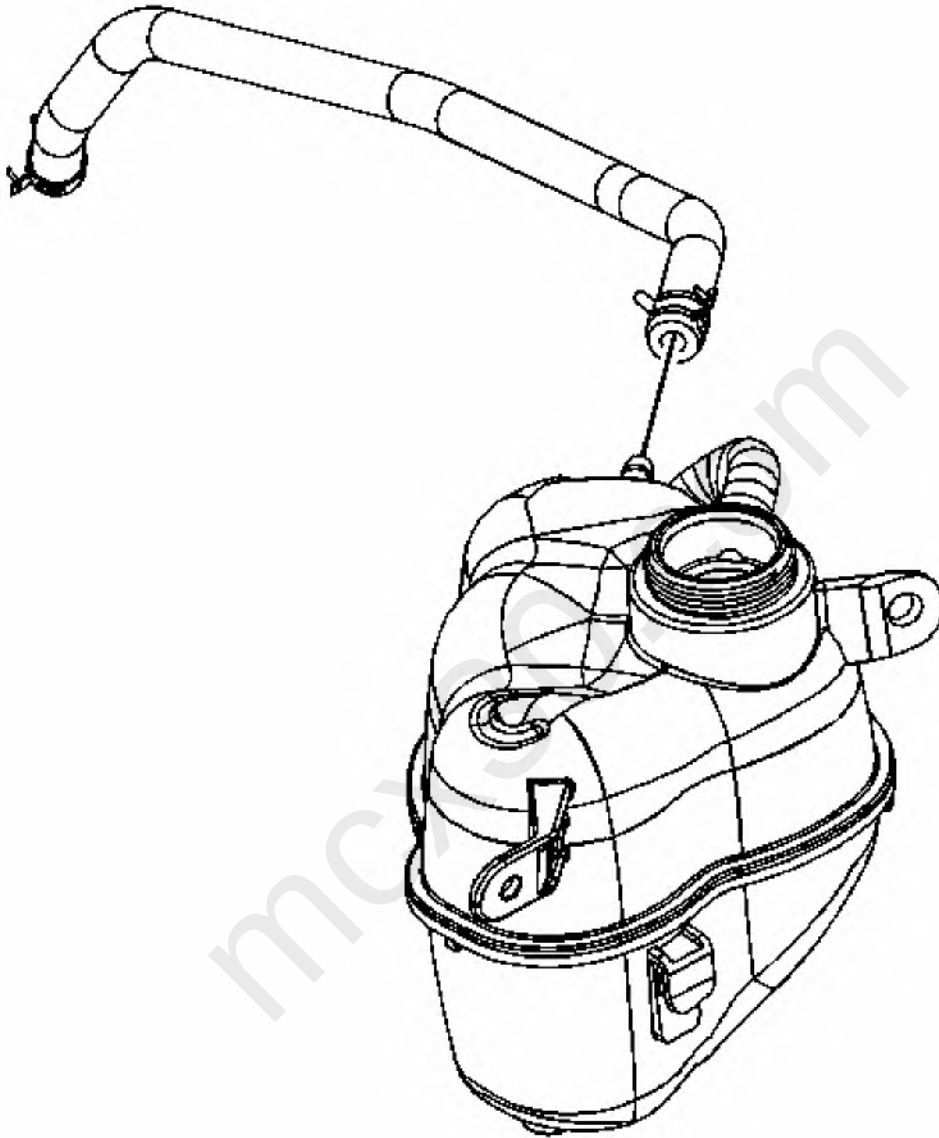


Fig. 38: Surge Tank Inlet Hose & Surge Tank
Courtesy of GENERAL MOTORS CORP.

3. Install the surge tank inlet hose to the surge tank.
4. Install the surge tank inlet hose clamp to the surge tank.

RADIATOR HOSE REPLACEMENT - INLET

Removal Procedure

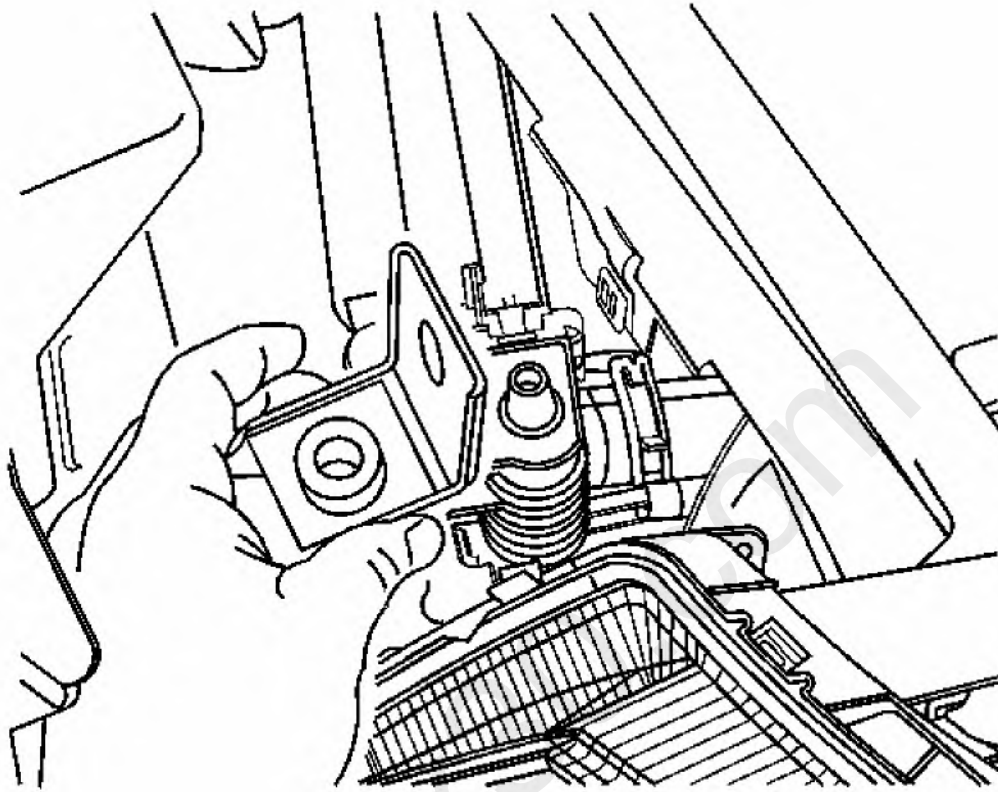


Fig. 39: View Of Upper Radiator Bracket
Courtesy of GENERAL MOTORS CORP.

1. Drain the coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Remove the upper fascia retainers from the radiator support.
3. Remove the upper radiator bracket bolt from the radiator support.
4. Remove the upper radiator bracket from the radiator.
5. Remove the radiator inlet hose clamp from the radiator.

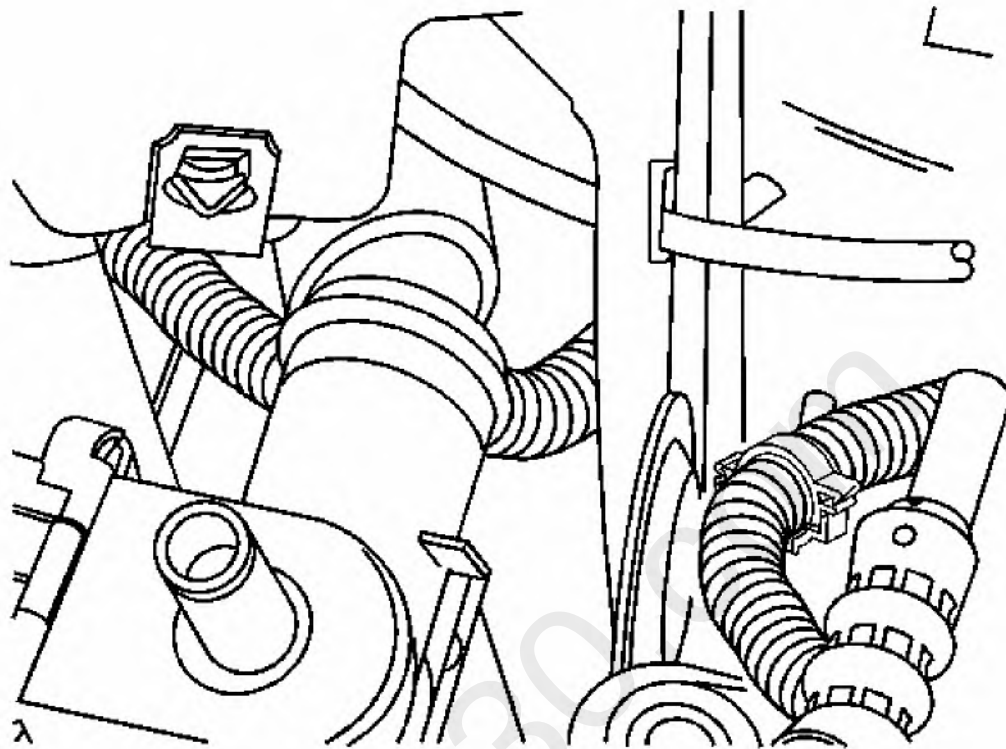


Fig. 40: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

6. Remove the radiator inlet hose from the radiator.

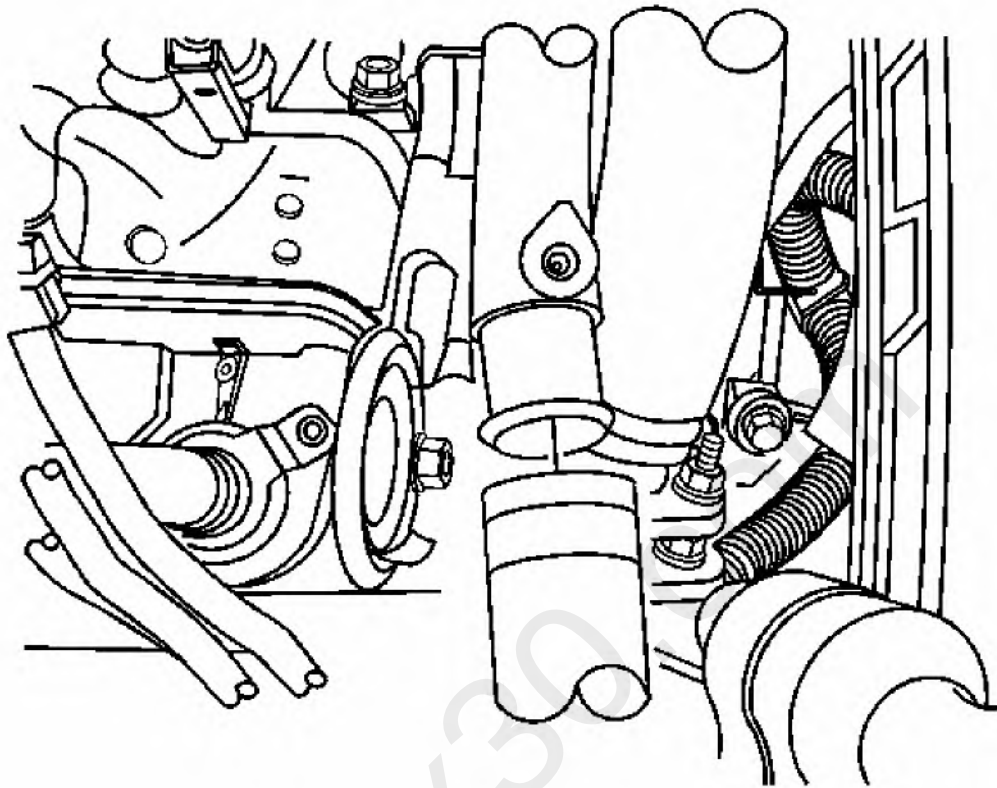


Fig. 41: Removing/Installing Radiator Inlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

7. Remove the radiator inlet hose clamp from the engine.
8. Remove the radiator inlet hose from the engine.

Installation Procedure

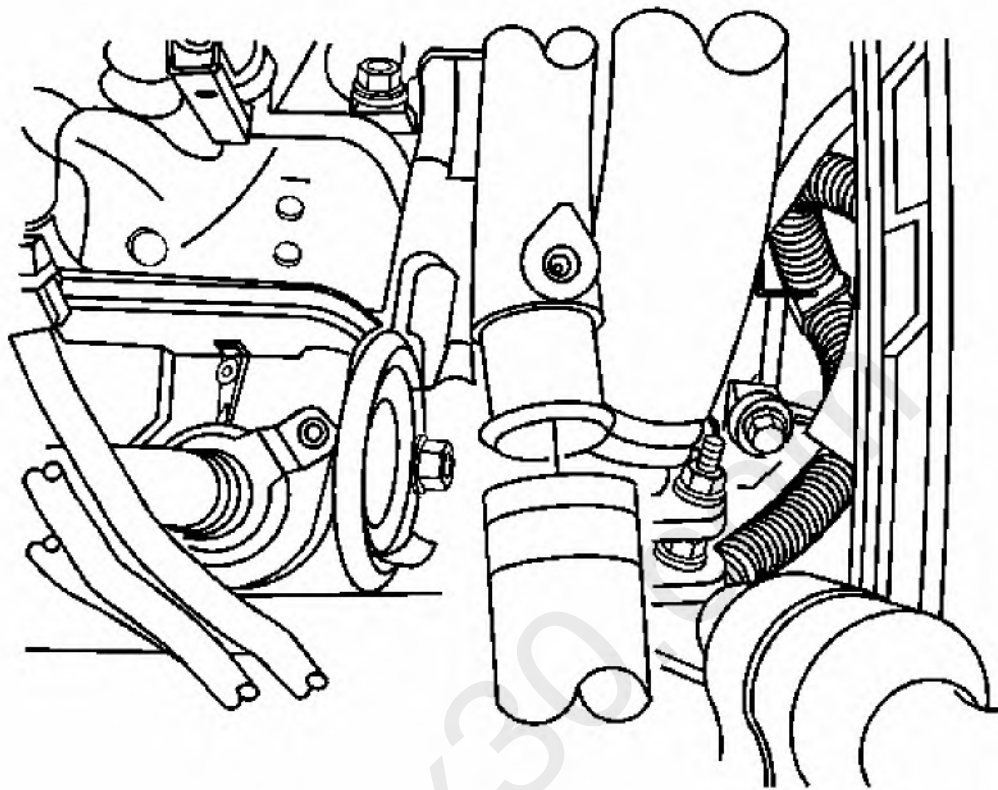


Fig. 42: Removing/Installing Radiator Inlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

1. Install the radiator inlet hose to the engine.
2. Install the radiator inlet hose clamp to the engine.

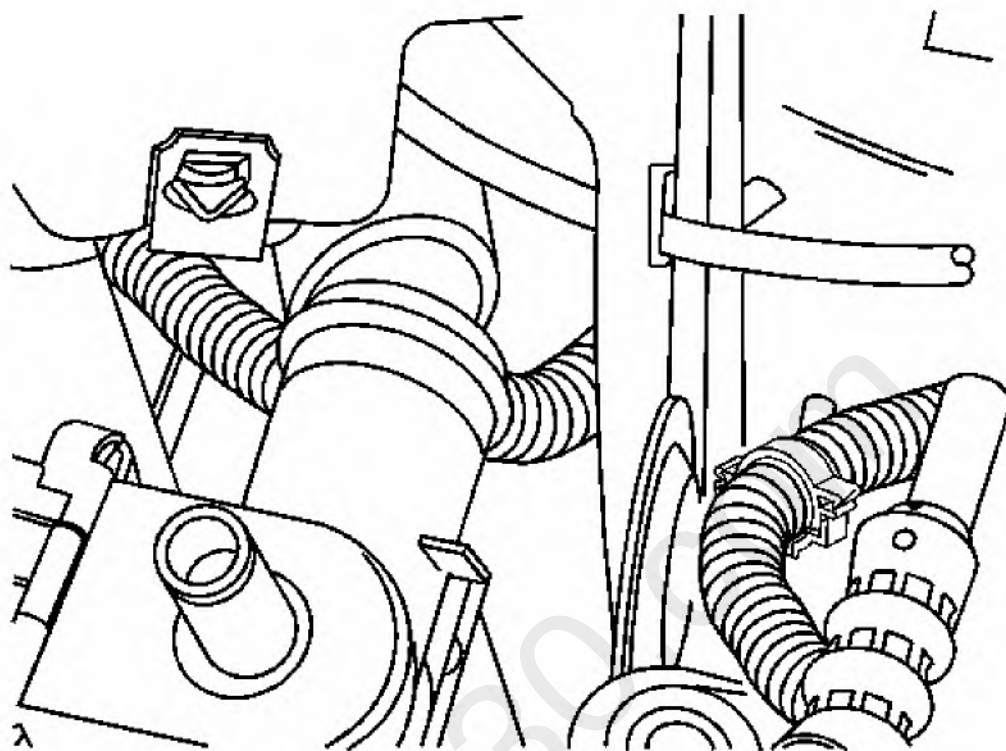


Fig. 43: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

3. Install the radiator inlet hose to the radiator.

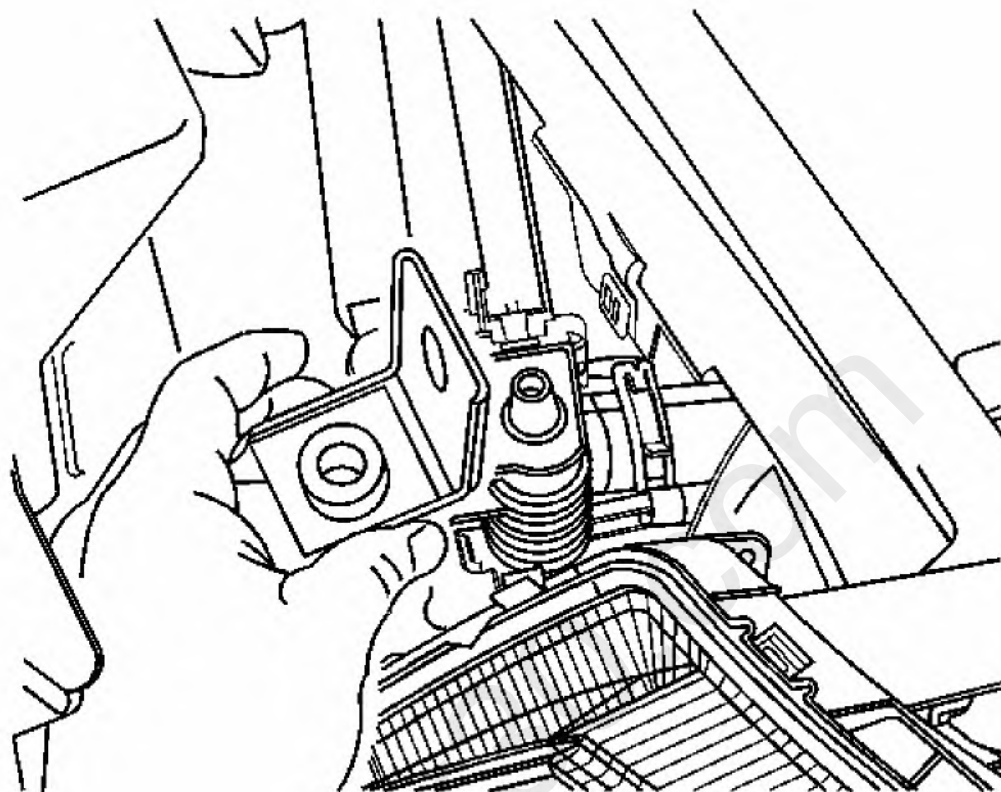


Fig. 44: View Of Upper Radiator Bracket
Courtesy of GENERAL MOTORS CORP.

4. Install the radiator inlet hose clamp to the radiator.
5. Install the upper radiator bracket to the radiator.

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Install the upper radiator bracket bolt to the radiator support.

Tighten: Tighten the bolt to 8 N.m (71 lb in).

7. Install the upper fascia retainers to the radiator support.
8. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

RADIATOR HOSE REPLACEMENT - OUTLET

Removal Procedure

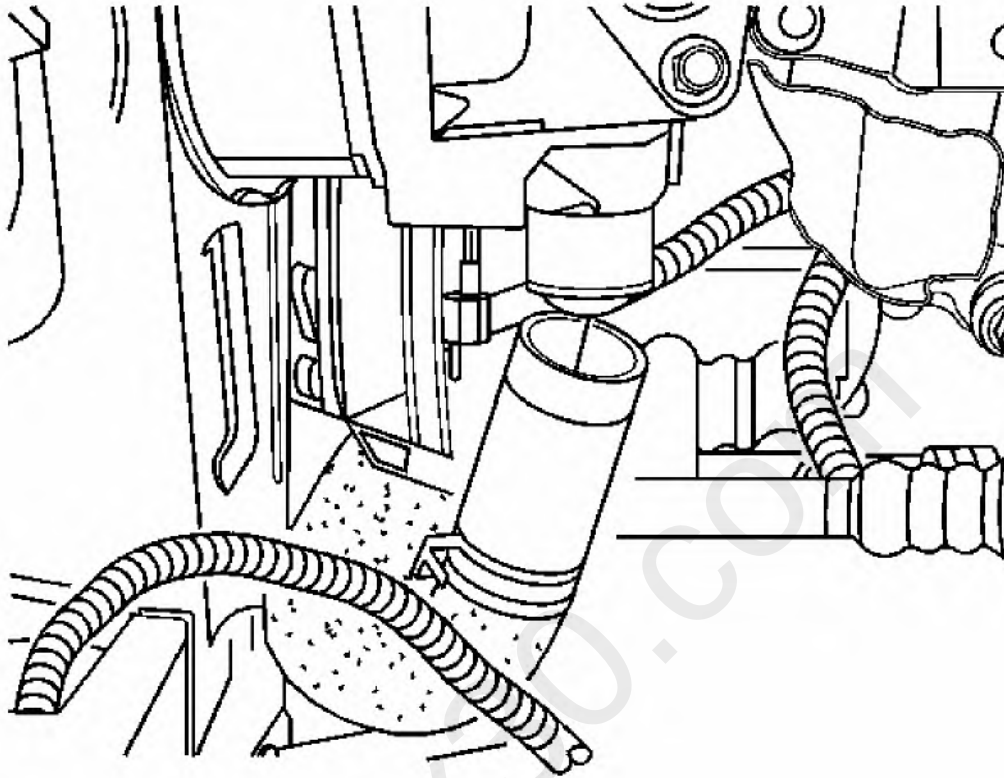


Fig. 45: Removing/Installing Radiator Outlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

1. Drain the coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Remove the radiator outlet hose clamp from the engine.
3. Remove the radiator outlet hose from the engine.

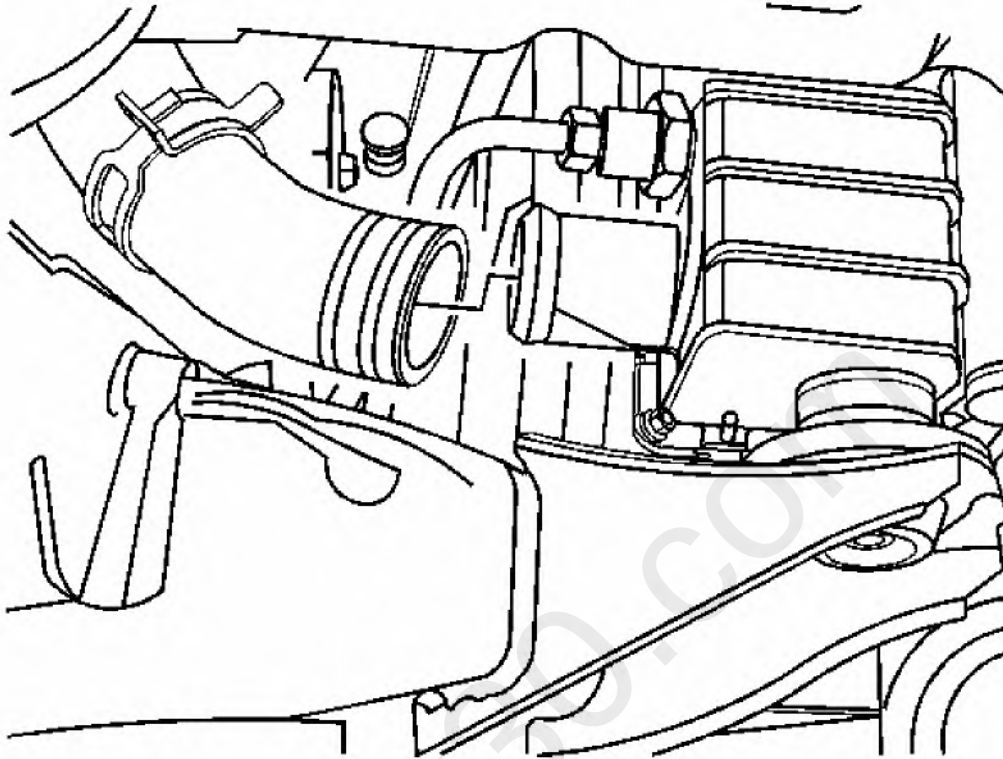


Fig. 46: Removing/Installing Radiator Outlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
5. Remove the radiator outlet hose clamp from the radiator.
6. Remove the radiator outlet hose from the radiator.

Installation Procedure

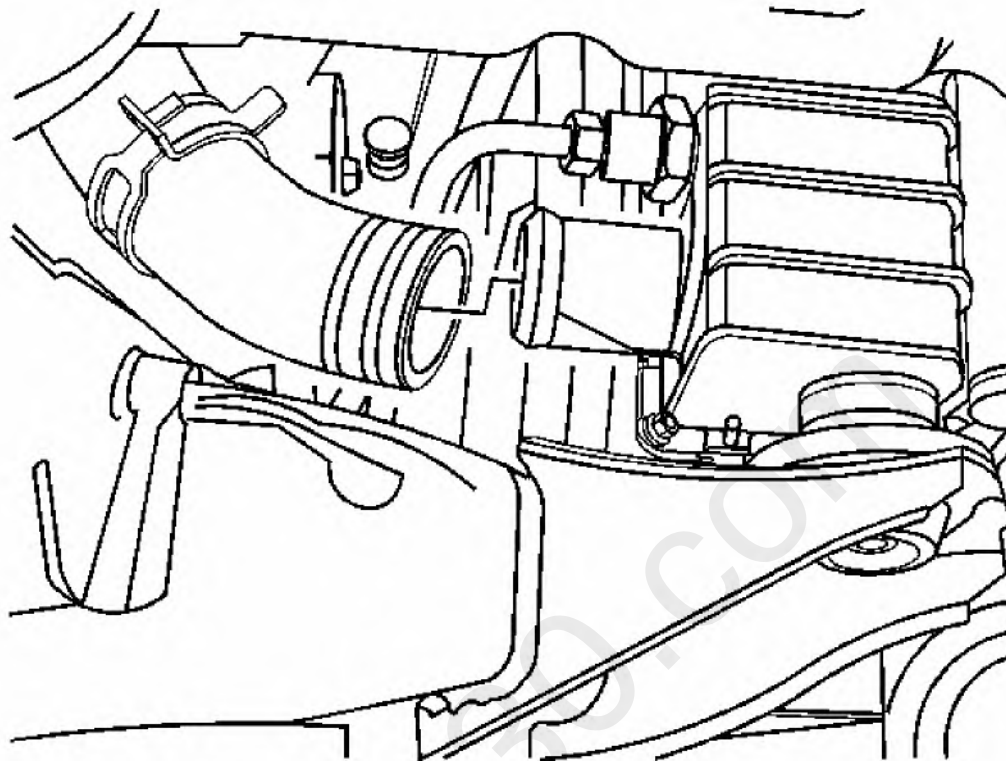


Fig. 47: Removing/Installing Radiator Outlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

1. Install the radiator outlet hose to the radiator.
2. Install the radiator outlet hose clamp to the radiator.
3. Lower the vehicle.

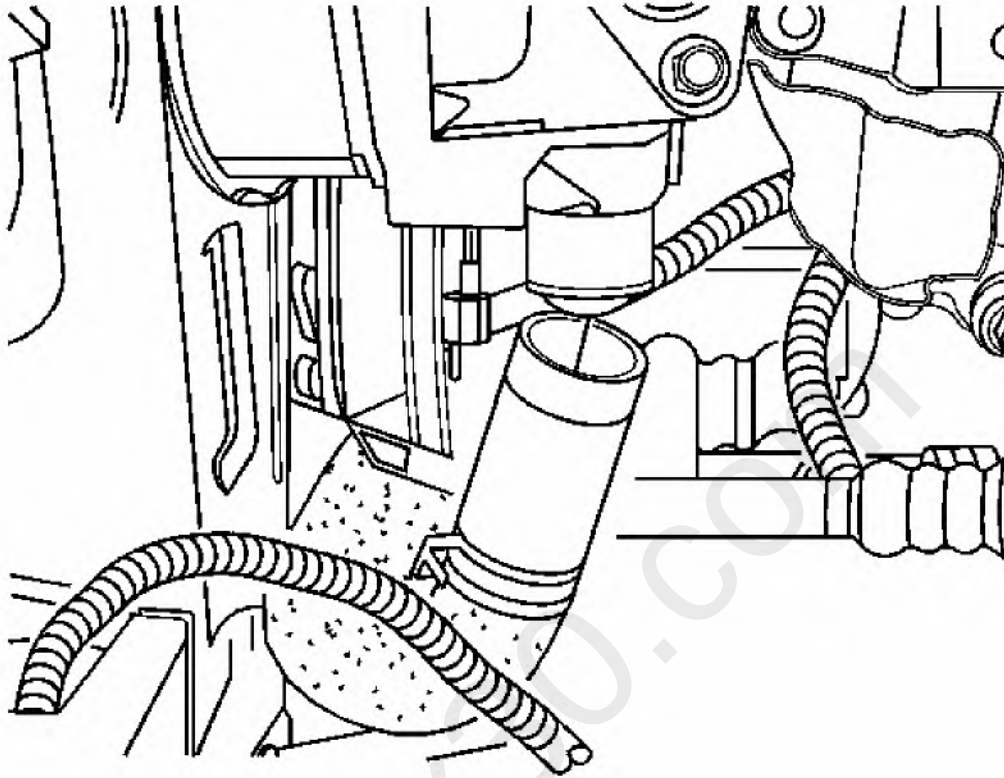


Fig. 48: Removing/Installing Radiator Outlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

4. Install the radiator outlet hose to the engine.
5. Install the radiator outlet hose clamp to the engine.
6. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

COOLING FAN MOTOR REPLACEMENT - ELECTRIC

Tools Required

GE-47827 Socket. See **Special Tools**.

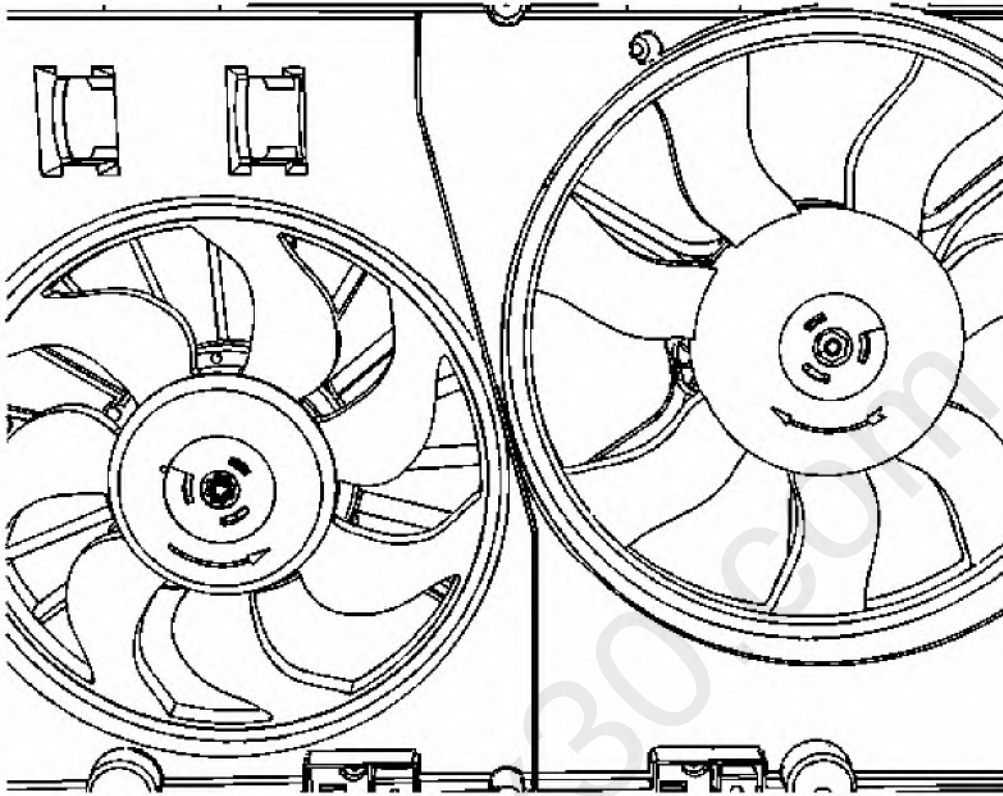


Fig. 49: View Of Cooling Fans
Courtesy of GENERAL MOTORS CORP.

This vehicle is equipped with counter-rotating engine cooling fans. The right hand fan will require the use of **GE-47827** for fan blade removal. See **Special Tools**. The left hand fan blade can be removed using a normal six point socket.

Removal Procedure

CAUTION: An electric fan under the hood can start up even when the engine is not running and can injure you. Keep hands, clothing and tools away from any underhood electric fan.

CAUTION: To help avoid personal injury or damage to the vehicle, a bent, cracked, or damaged fan blade or housing should always be replaced.

CAUTION: Before servicing any electrical component, the ignition key

must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

1. Remove the fan shroud assembly from the vehicle. Refer to Cooling Fan and Shroud Replacement.

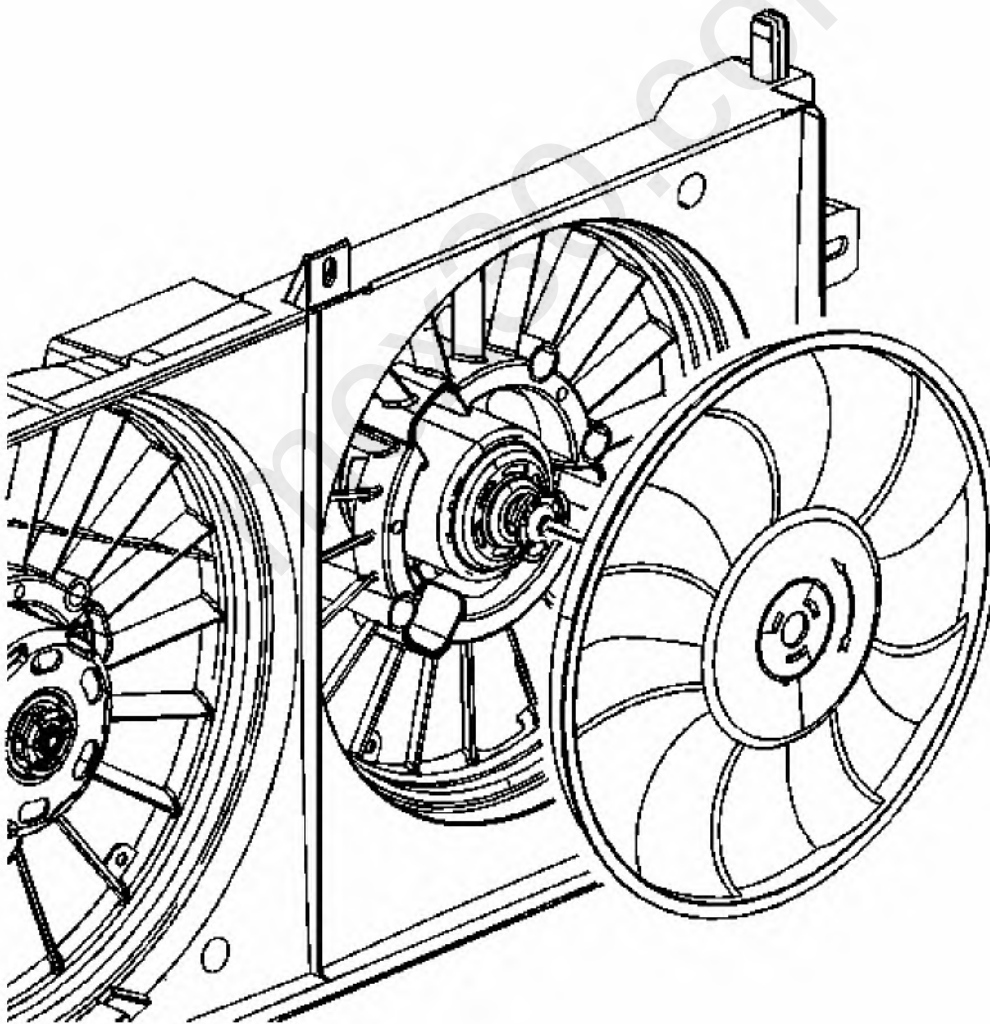


Fig. 50: Fan Shroud Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Hold the fan blade to prevent rotation.

2. Using **GE-47827** , or a six point socket, turn the fan motor drive plate in the opposite direction of the arrow stamped on the fan blade. See **Special Tools**.
3. Remove and discard the fan blade.

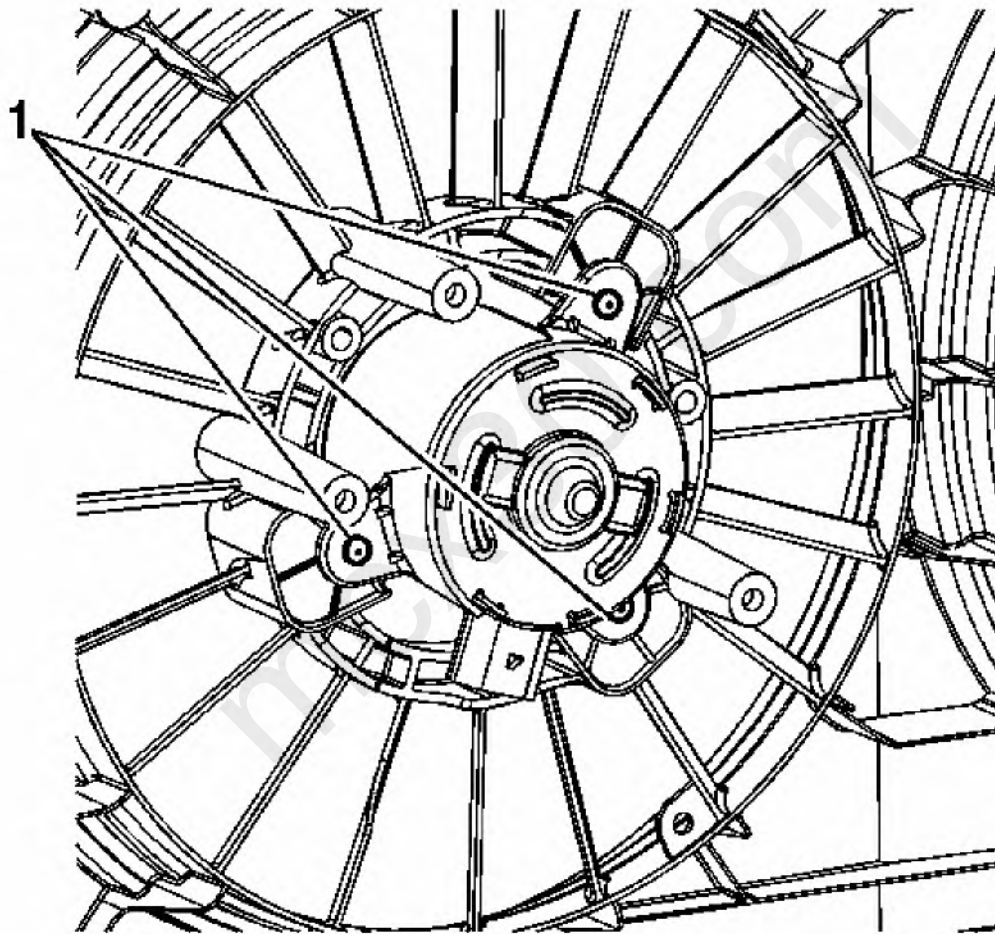


Fig. 51: Fan Blade

Courtesy of GENERAL MOTORS CORP.

NOTE: Failure to tape off all of the entry points to the cooling fan motor will allow debris to enter and damage the motor.

IMPORTANT: When reusing the fan motor tape off the front and rear entry points of the fan motor before drilling the rivets.

4. Center punch each of the rivets (1) from the rear of the motor.
5. Drill the head of the rivets (1) from the fan motor using a 6.35 mm (0.25 in) drill bit.

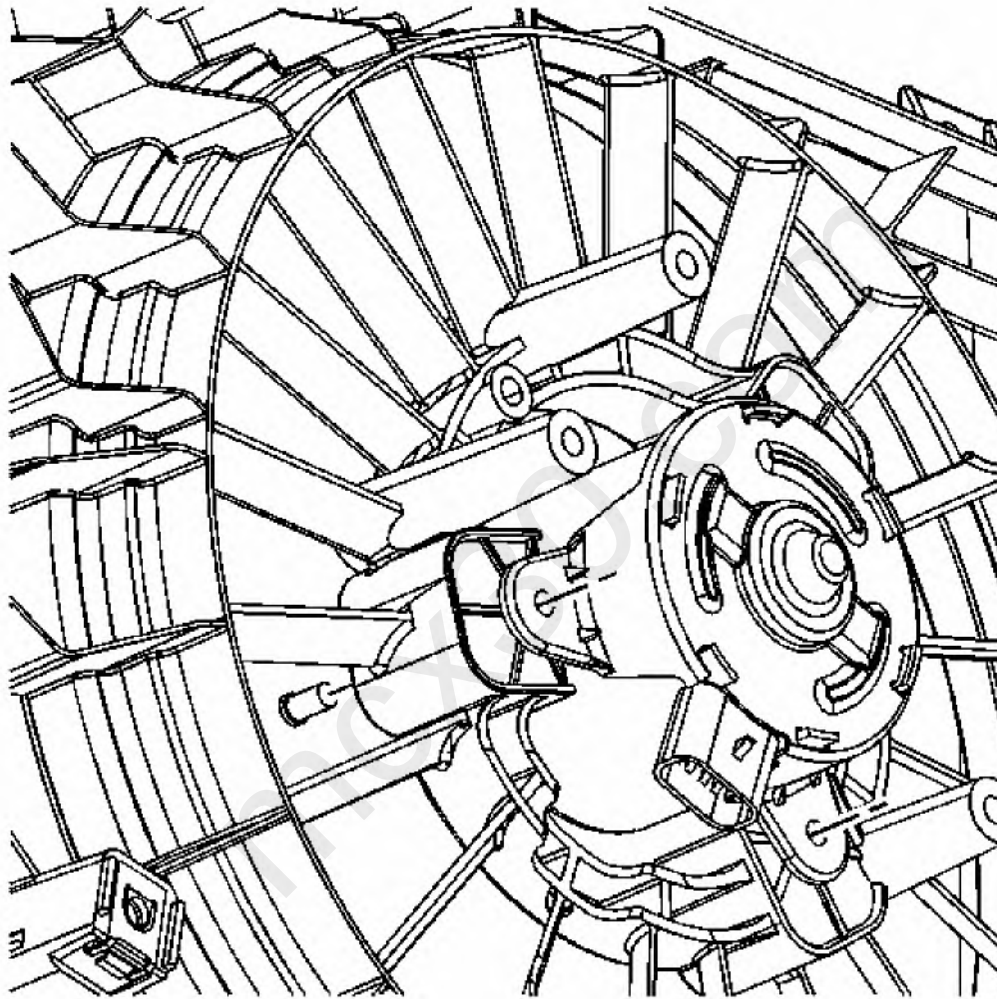


Fig. 52: Fan Rivets

Courtesy of GENERAL MOTORS CORP.

6. Tap the rivets out of the fan shroud.

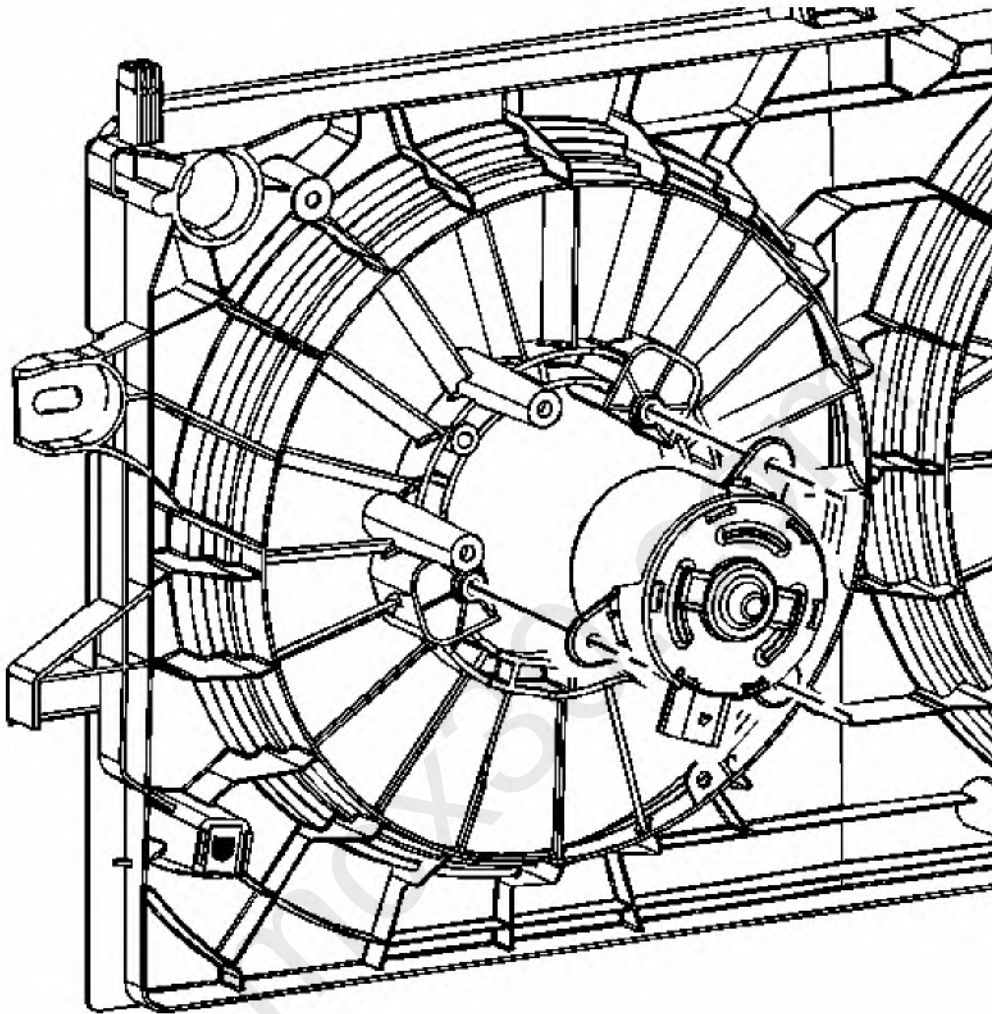


Fig. 53: The Fan Motor & The Fan Shroud
Courtesy of GENERAL MOTORS CORP.

7. Remove the fan motor from the fan shroud.

IMPORTANT: Blow off any excess debris from the fan motor.

8. Remove the tape covering the entry points from the fan motor.

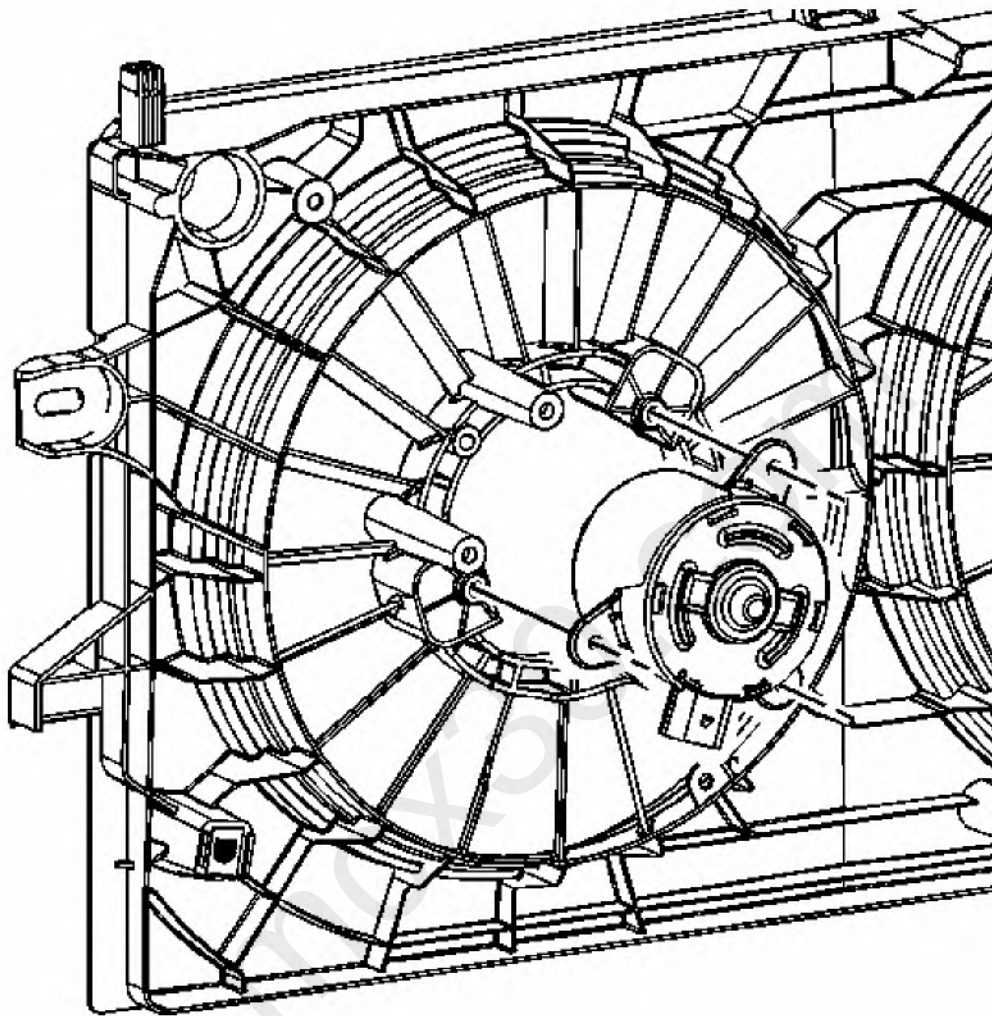


Fig. 54: The Fan Motor & The Fan Shroud
Courtesy of GENERAL MOTORS CORP.

1. Install the engine cooling fan motor to the fan shroud.

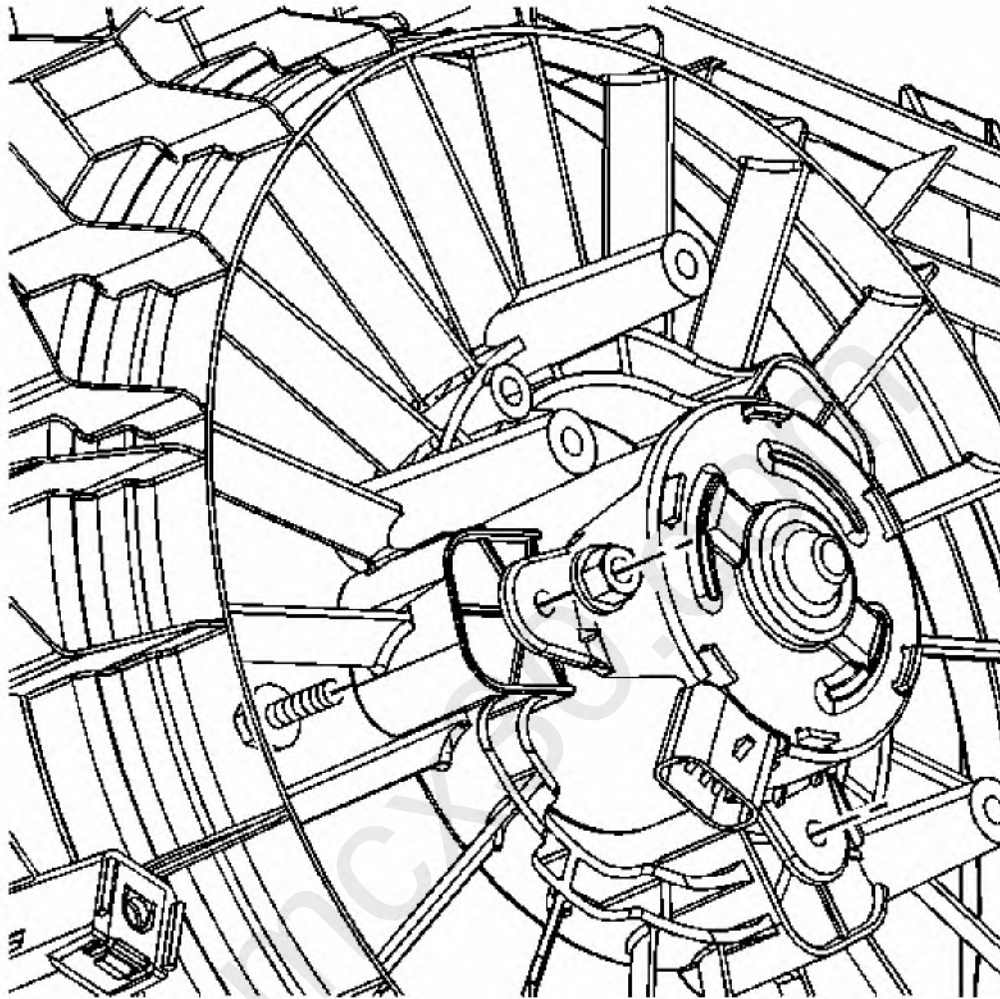


Fig. 55: Installing Cooling Fan Motor Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the fan motor to the fan shroud and insert the bolts from the front side.

2. Install the cooling fan motor bolts.

NOTE: Refer to Fastener Notice .

3. Install the cooling fan motor nuts.

Tighten: Tighten the nuts to 6 N.m (53 lb in).

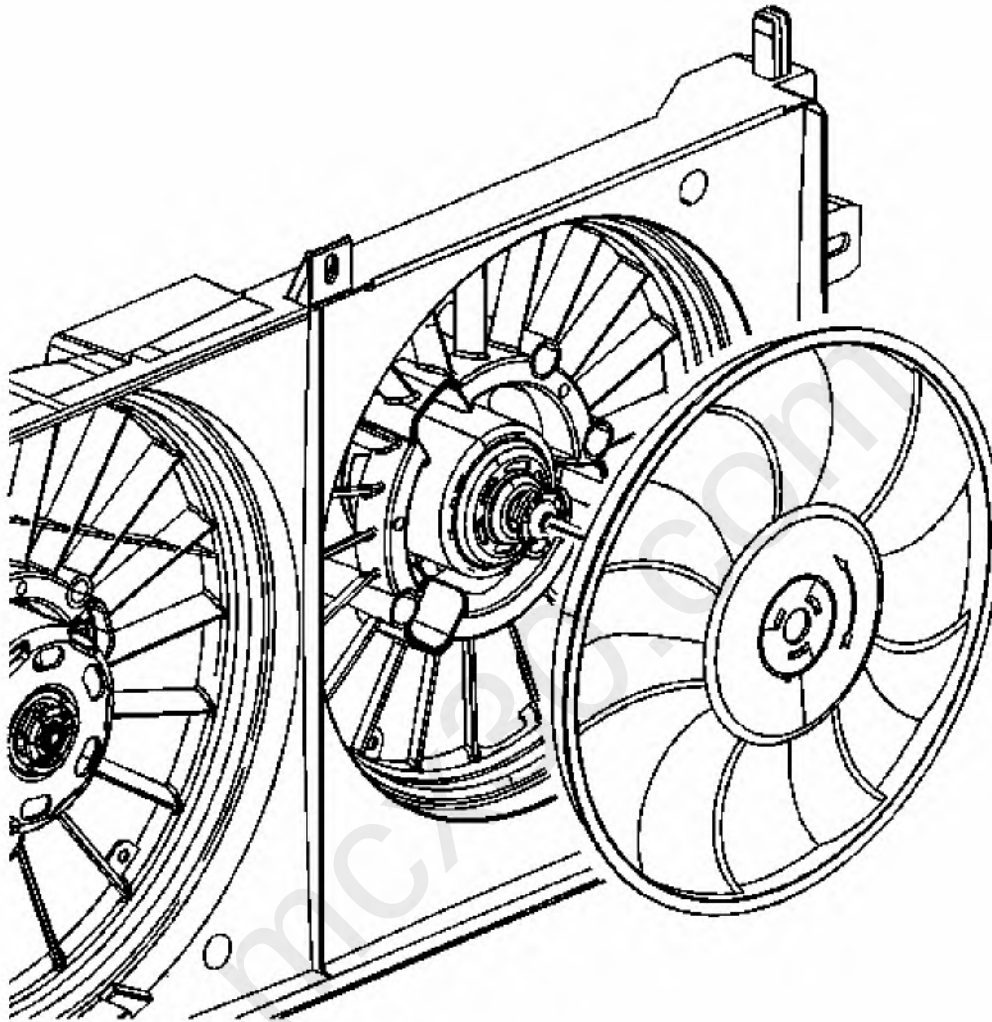


Fig. 56: Fan Shroud Assembly
Courtesy of GENERAL MOTORS CORP.

NOTE: Failure to heat the fan hub in hot tap water before installation will result in cooling fan failure due to cracking. Allowing the heated fan to cool for more than one minute prior to installation will also result in failure due to cracking.

IMPORTANT: Using hot tap water at a minimum of 49°C (120°F), hold the new fan blade hub under the running water for a minimum of 60 seconds to heat the fan blade to the temperature of the water.

Immediately after heating, position the fan blade on the fan motor drive plate.

4. Install the new engine cooling fan blade.
5. Using the **GE-47827** , or a six point socket, turn the fan motor drive plate in the same direction of the arrow on the fan blade until the fan motor drive plate engages to the fan blade. See **Special Tools**.
6. Rotate the cooling fan blade to ensure proper rotation.
7. Install the fan shroud assembly to the vehicle. Refer to **Cooling Fan and Shroud Replacement**.

COOLING FAN AND SHROUD REPLACEMENT

Tools Required

GE-47716 1617 Vac N Fill Coolant Refill Tool. See **Special Tools**.

Removal Procedure

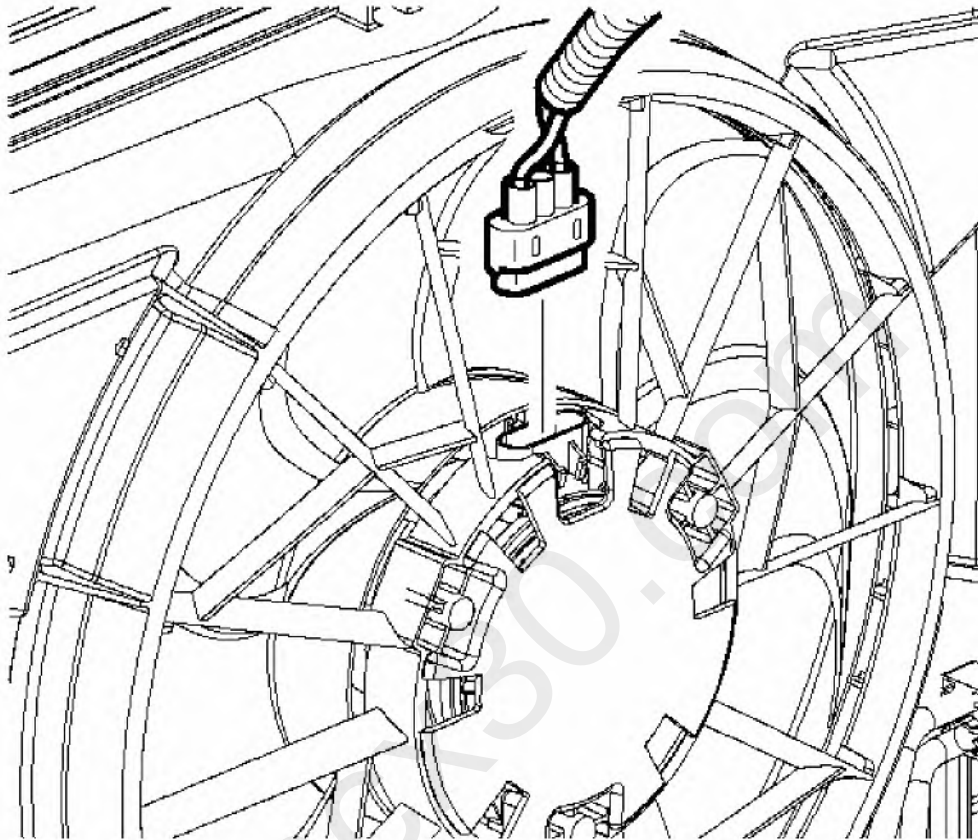


Fig. 57: View Of Cooling Fan & Shroud (L61)
Courtesy of GENERAL MOTORS CORP.

1. Remove the front fascia. Refer to **Fascia Replacement - Front Bumper (Equinox)** or **Fascia Replacement - Front Bumper (Torrent)** .
2. Drain the coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
3. Disconnect the electrical connectors from the fan motors.
4. Unclip the wire harness from the fan assembly.

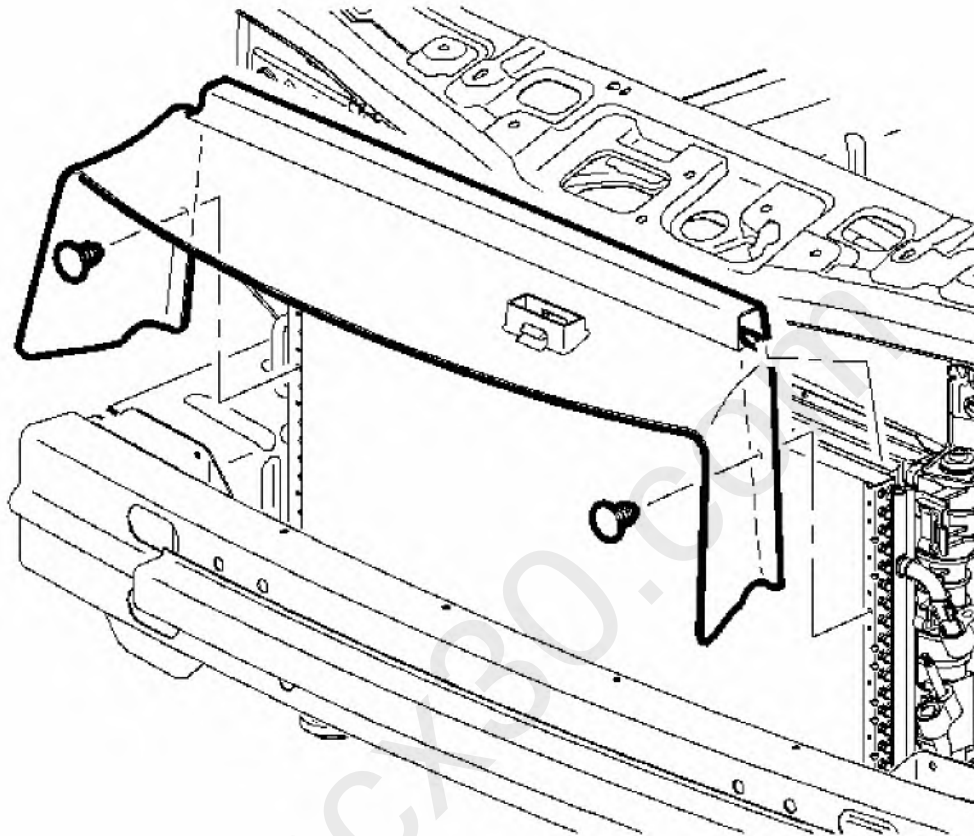


Fig. 58: View Of CRFM Closeout/Splash Panel To Condenser
Courtesy of GENERAL MOTORS CORP.

5. Remove the condenser radiator fan module (CRFM) closeout panel retainers from the condenser.
6. Remove the CRFM closeout panel from the condenser.
7. Remove the front impact bar. Refer to **Impact Bar Replacement - Front Bumper**

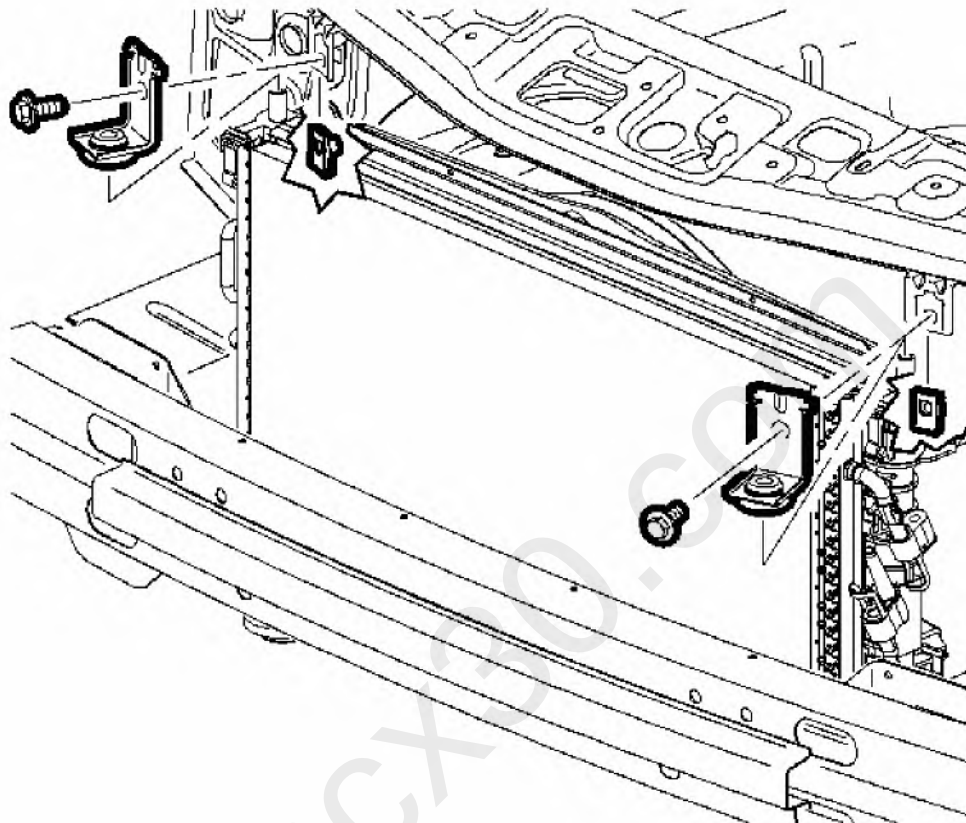


Fig. 59: View Of CRFM Mounting Brackets To The Radiator Support
Courtesy of GENERAL MOTORS CORP.

8. Remove the CRFM mounting bracket bolts from the radiator support.
9. Remove the CRFM mounting brackets from the radiator support.

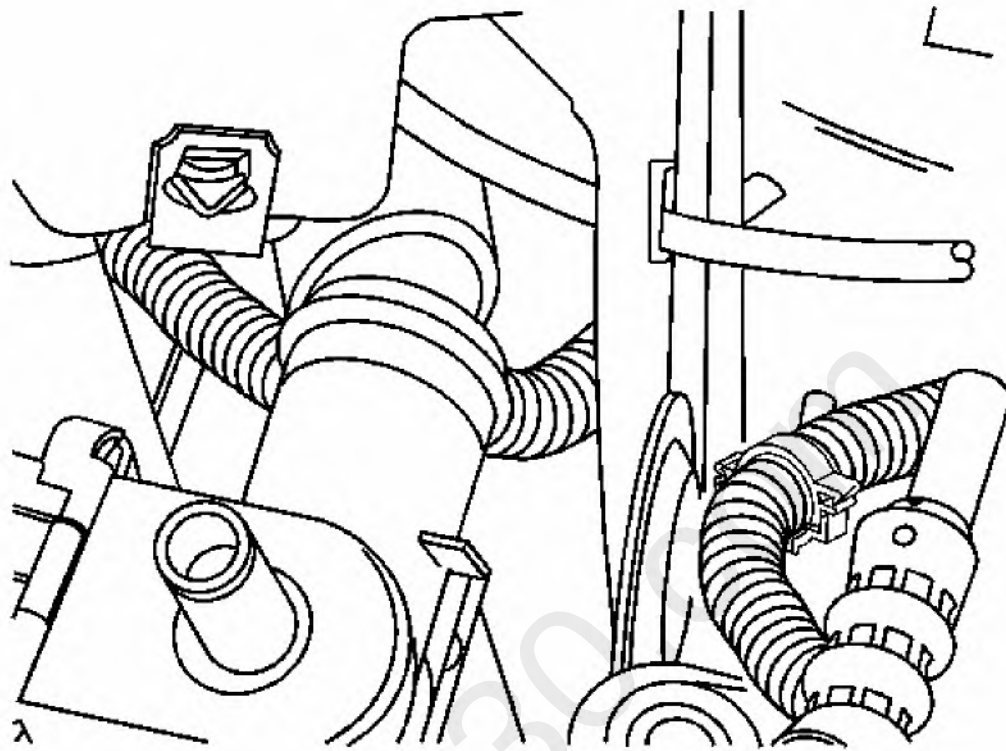


Fig. 60: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

10. Remove the radiator inlet hose clamp from the radiator.
11. Remove the radiator inlet hose from the radiator.

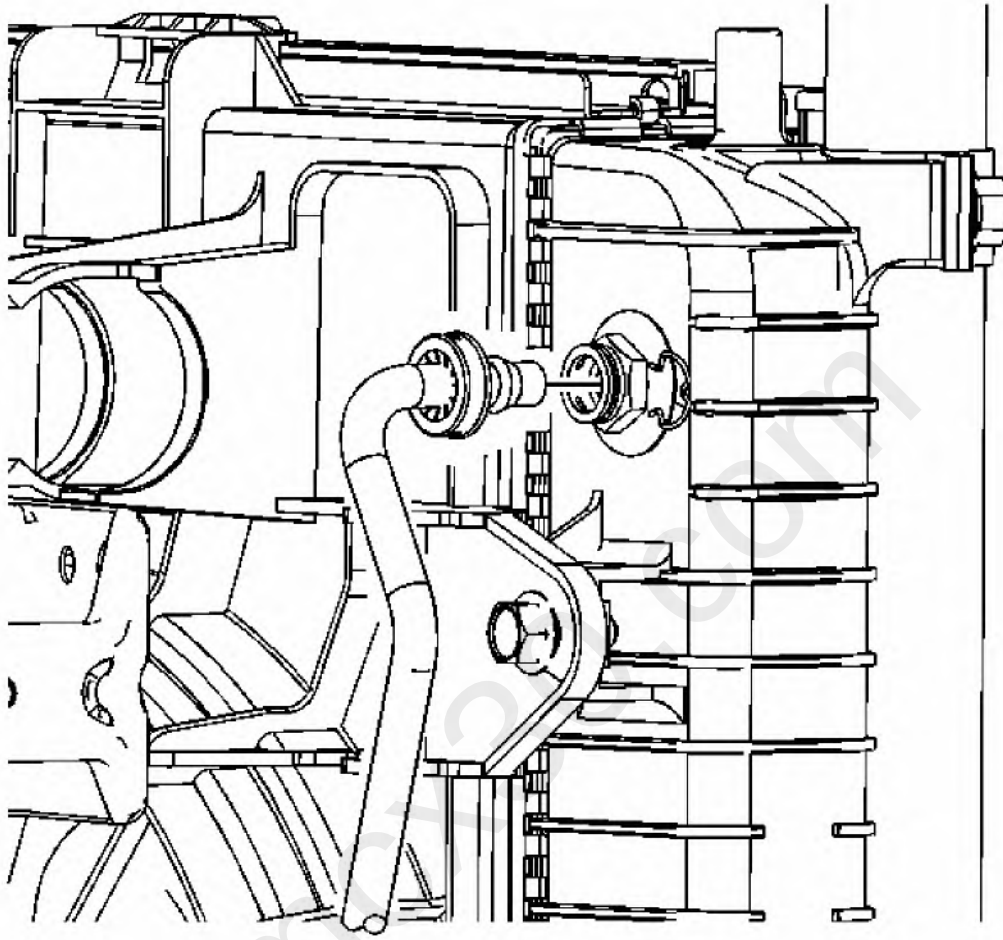


Fig. 61: View Of Transmission Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

12. Disconnect the transmission cooler lines from the radiator.
13. Unclip the transmission cooler lines from the fan assembly.

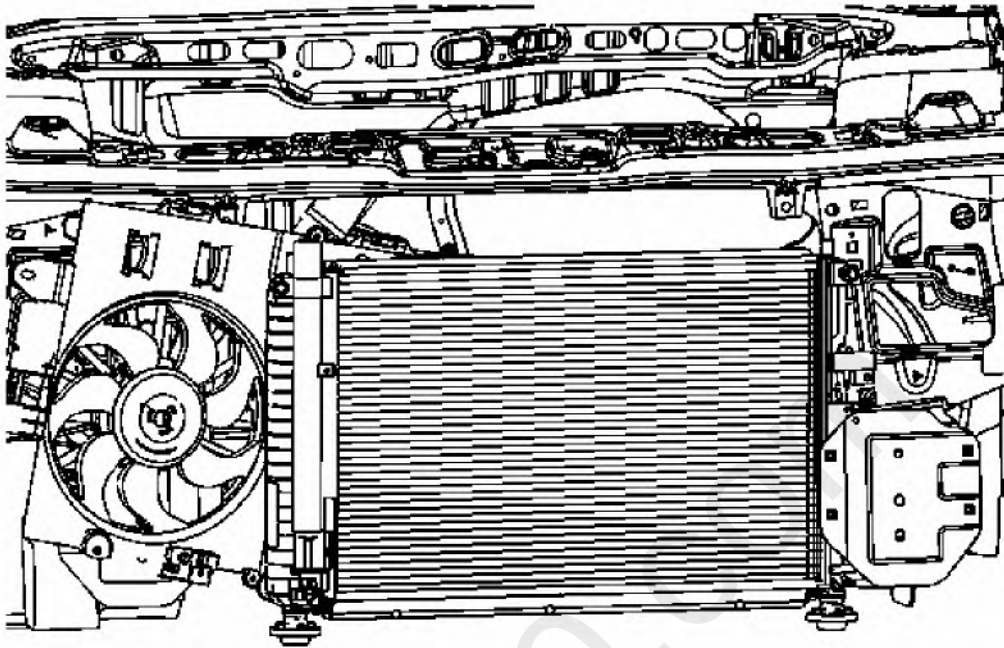


Fig. 62: View Of Fan Assembly
Courtesy of GENERAL MOTORS CORP.

14. Remove the fan assembly bolts from the radiator.
15. Remove the fan assembly from the radiator.
16. Position the condenser and radiator assembly forward of the right hand front impact bar bracket.
17. Remove the fan assembly from the vehicle.

Installation Procedure

1. Install the fan assembly to the vehicle.
2. Return the condenser and radiator assembly to the mounted position.

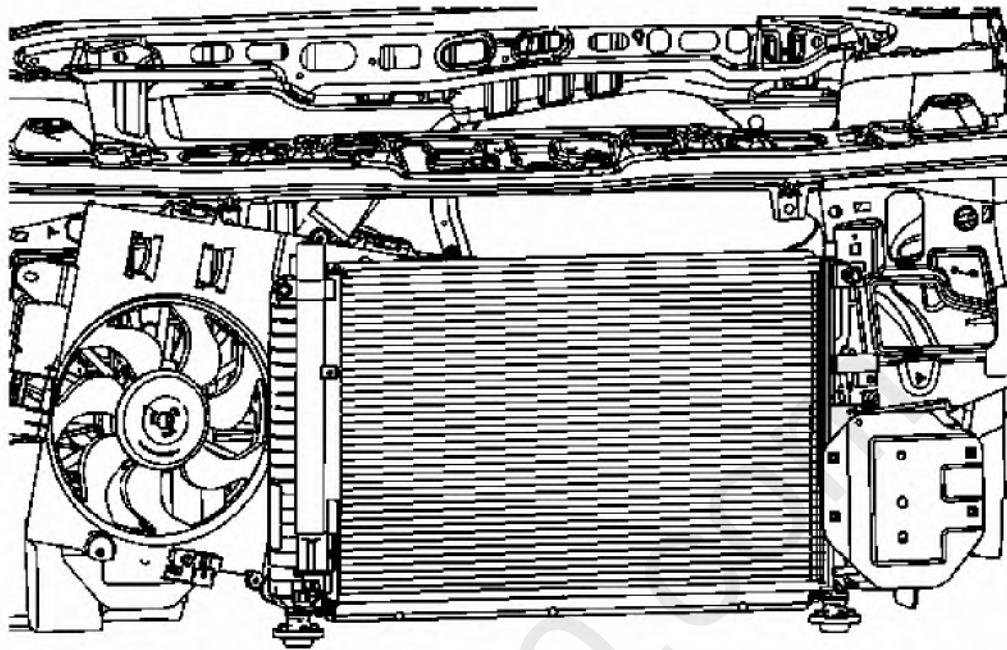


Fig. 63: View Of Fan Assembly
Courtesy of GENERAL MOTORS CORP.

3. Install the fan assembly to the radiator by guiding the lower tabs into the corresponding hooks on the radiator.

NOTE: **Refer to Fastener Notice.**

4. Install the fan assembly bolts to the radiator.

Tighten: Tighten the bolts to 9 N.m (80 lb in).

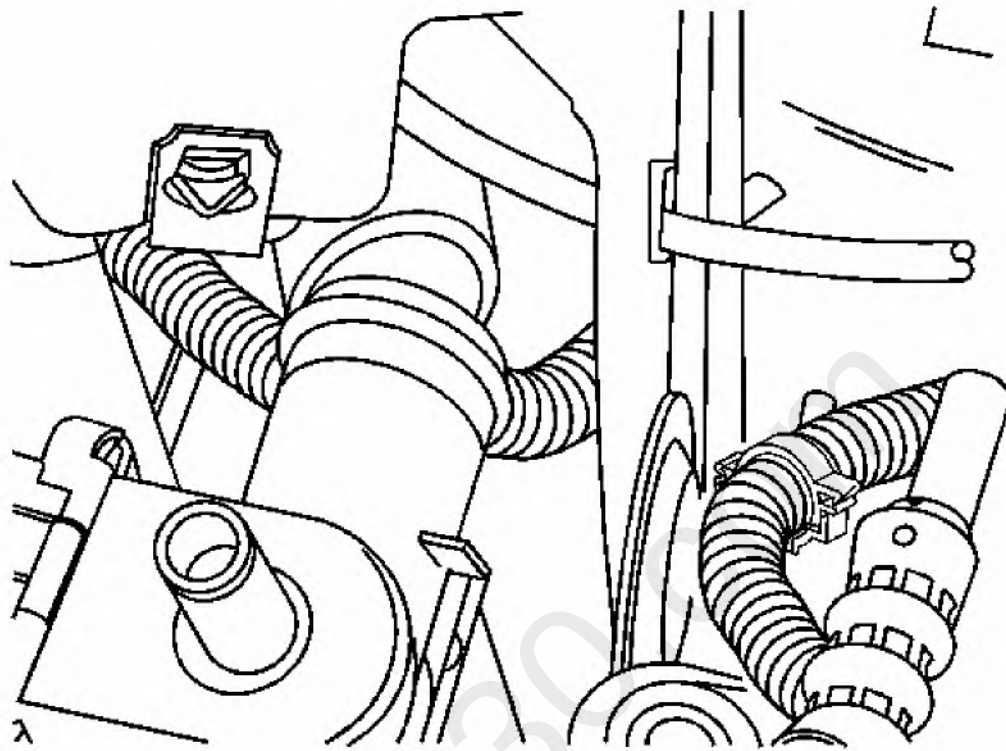


Fig. 64: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

5. Install the radiator inlet hose to the radiator.
6. Install the radiator inlet hose clamp to the radiator.

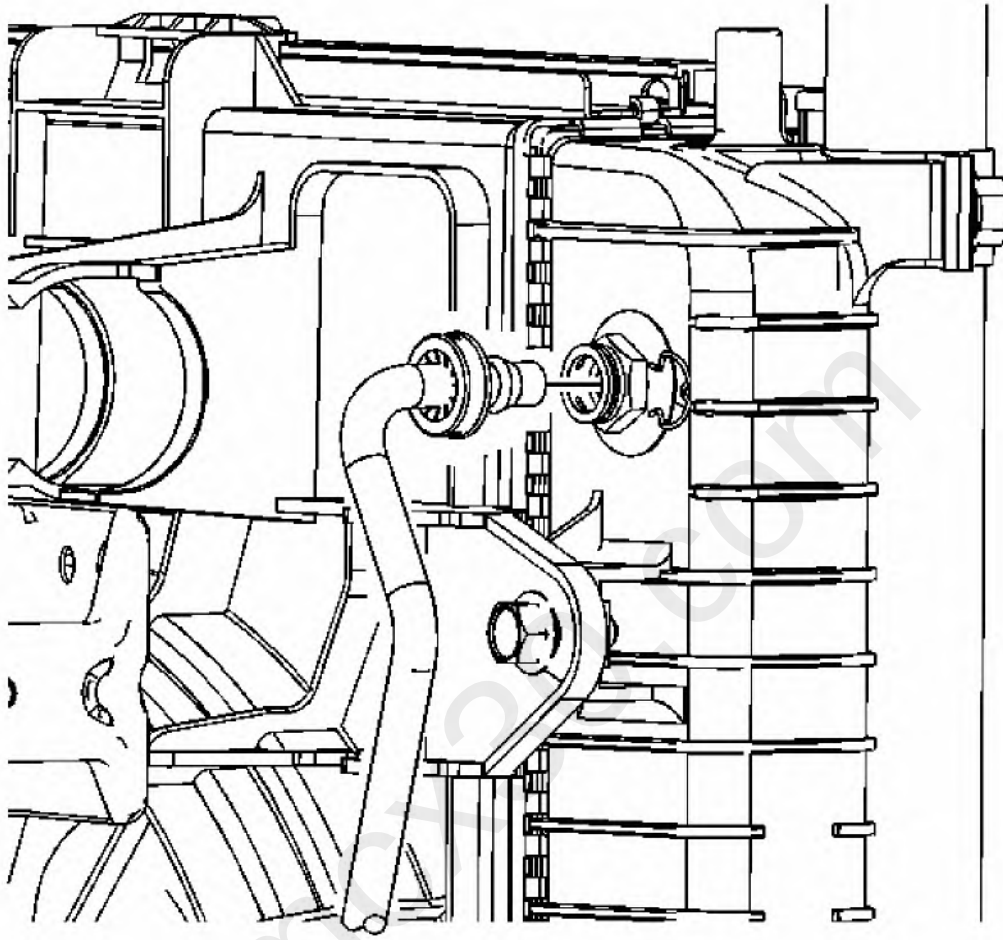


Fig. 65: View Of Transmission Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

7. Clip the transmission cooler lines to the fan assembly.
8. Connect the transmission cooler lines to the radiator.

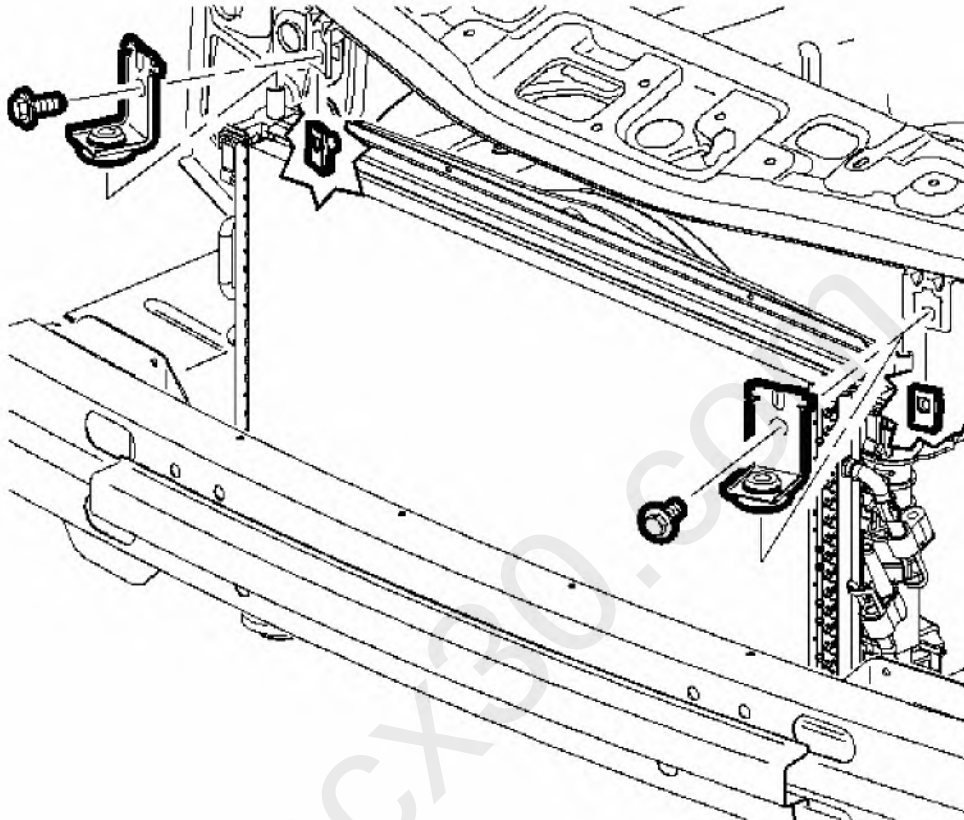


Fig. 66: View Of CRFM Mounting Brackets To The Radiator Support
Courtesy of GENERAL MOTORS CORP.

9. Install the CRFM mounting brackets to the radiator support.
10. Install the CRFM mounting bracket bolts to the radiator support.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

11. Install the front impact bar. Refer to **Impact Bar Replacement - Front Bumper** .

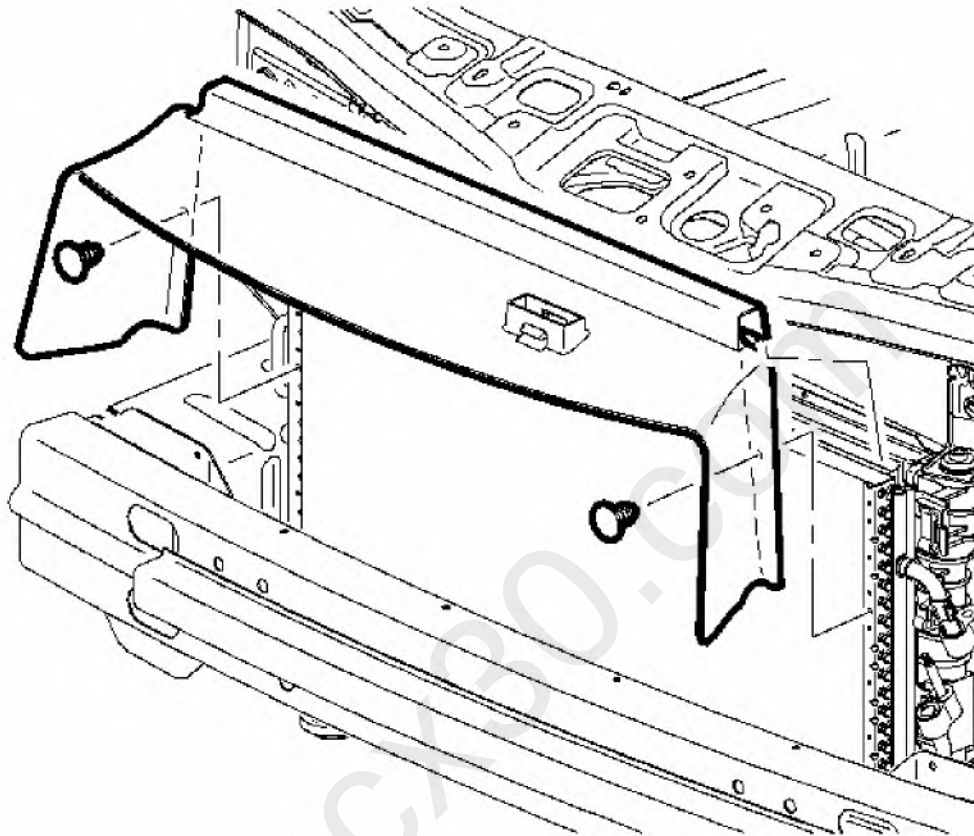


Fig. 67: View Of CRFM Closeout/Splash Panel To Condenser
Courtesy of GENERAL MOTORS CORP.

12. Install the CRFM closeout panel to the condenser.
13. Install the CRFM closeout panel retainers to the condenser.

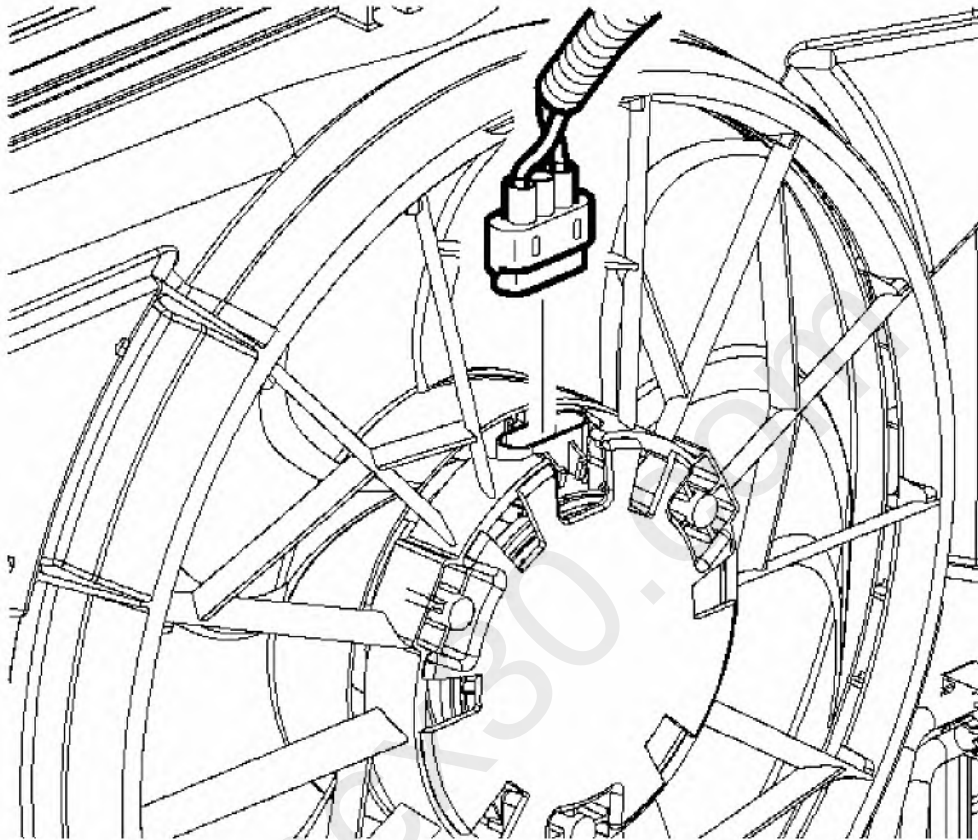


Fig. 68: View Of Cooling Fan & Shroud (L61)
Courtesy of GENERAL MOTORS CORP.

14. Clip the engine wire harness to fan assembly.

NOTE: **Refer to Compressor Hose Clearance to the Exhaust Gas Recirculation (EGR) Pipe Notice.**

15. Install the electrical connectors to the fan motors.
16. Install the front fascia. Refer to **Fascia Replacement - Front Bumper (Equinox)** or **Fascia Replacement - Front Bumper (Torrent)**.
17. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

THERMAL BYPASS FITTING REPLACEMENT

Removal Procedure

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

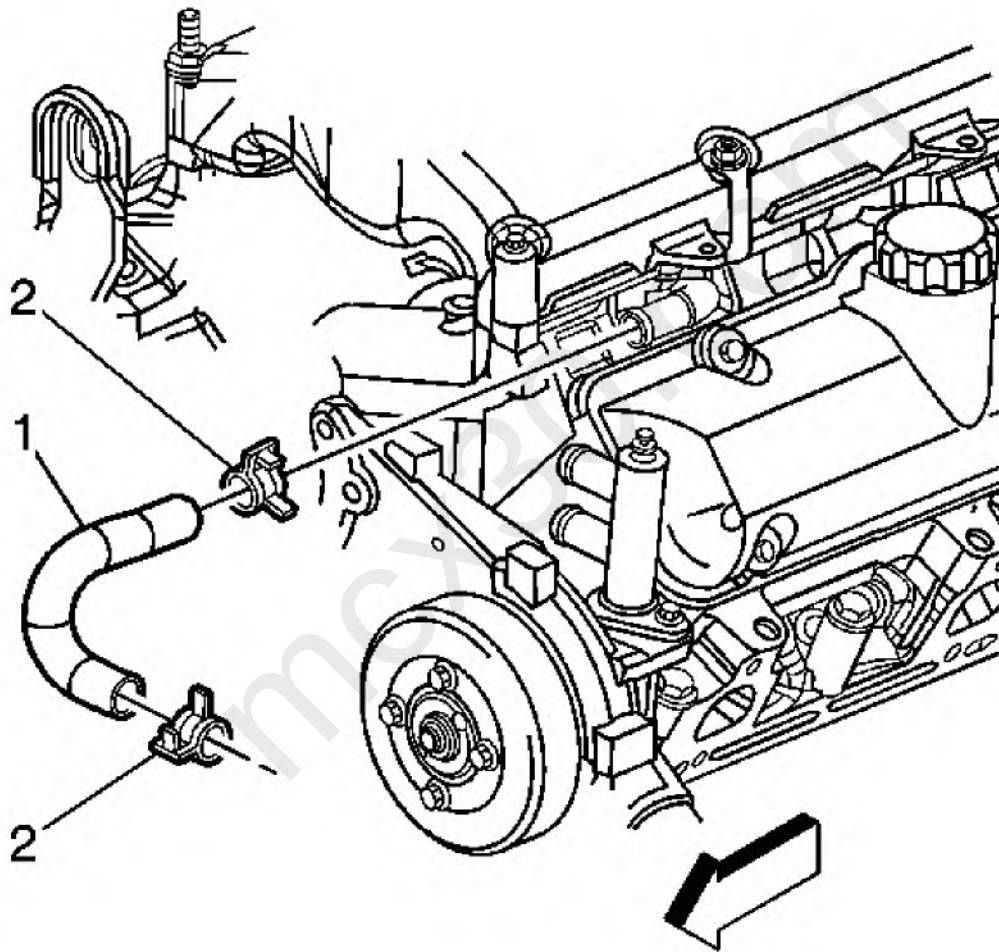


Fig. 69: View Of Thermal Bypass Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

2. Release and slide the thermal bypass pipe hose clamp (2) away from the thermal bypass fitting.
3. Remove the thermal bypass hose (1) from the thermal bypass fitting.

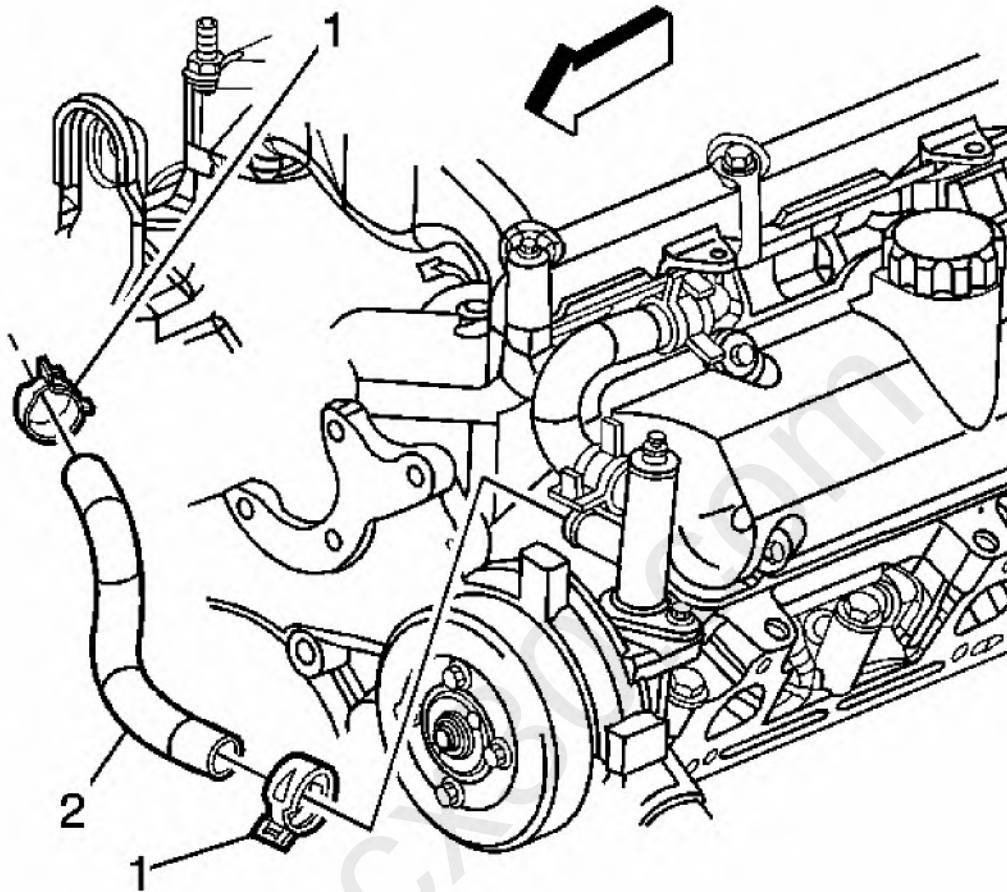


Fig. 70: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

4. Release and slide the heater outlet hose clamp (1) away from the thermal bypass fitting.
5. Remove the heater outlet hose (2) from the thermal bypass fitting.

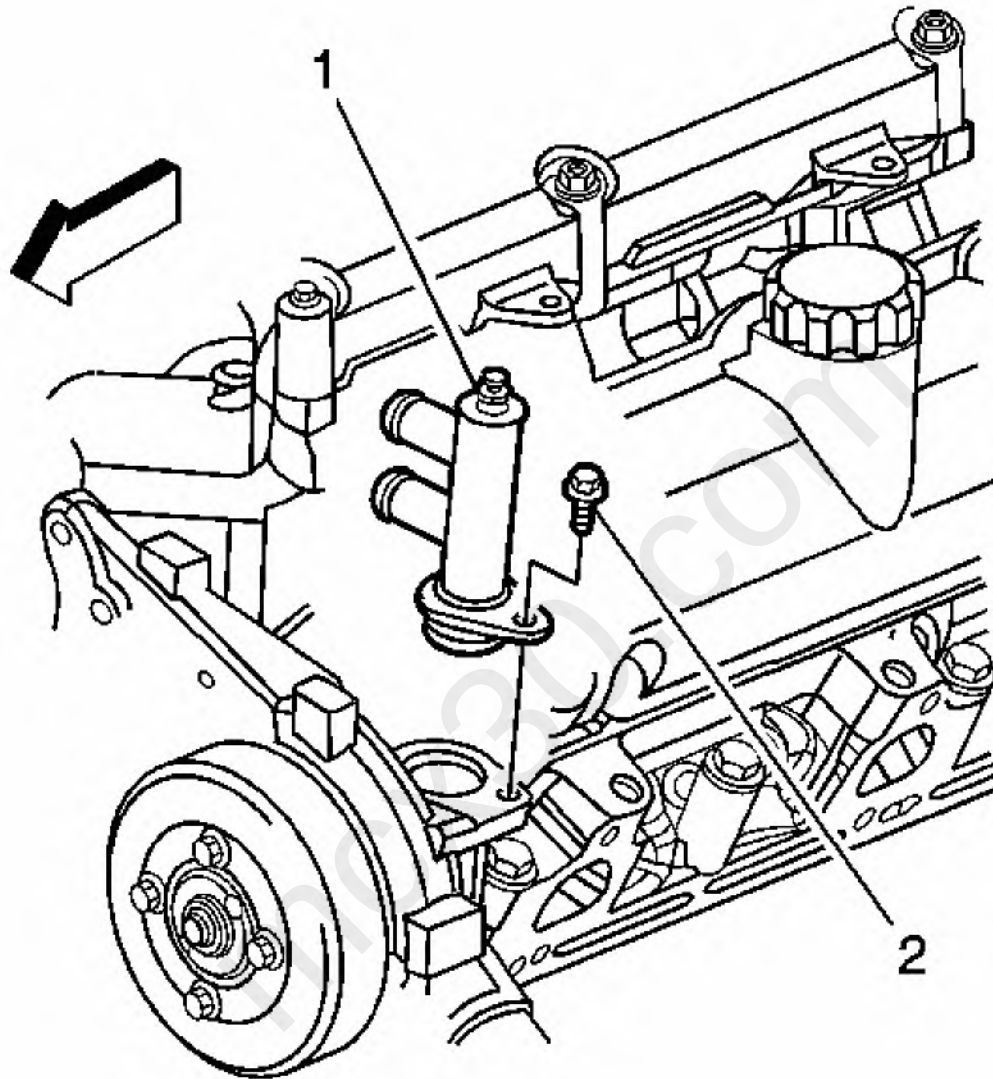


Fig. 71: View Of Thermal Bypass Fitting & Bolt
Courtesy of GENERAL MOTORS CORP.

6. Remove the thermal bypass fitting bolt (2).
7. Remove the thermal bypass fitting (1).
8. Remove the seal from the thermal bypass fitting.

Installation Procedure

1. Install a new seal to the thermal bypass fitting.
2. Apply engine coolant to the thermal bypass fitting seal to ease installation.

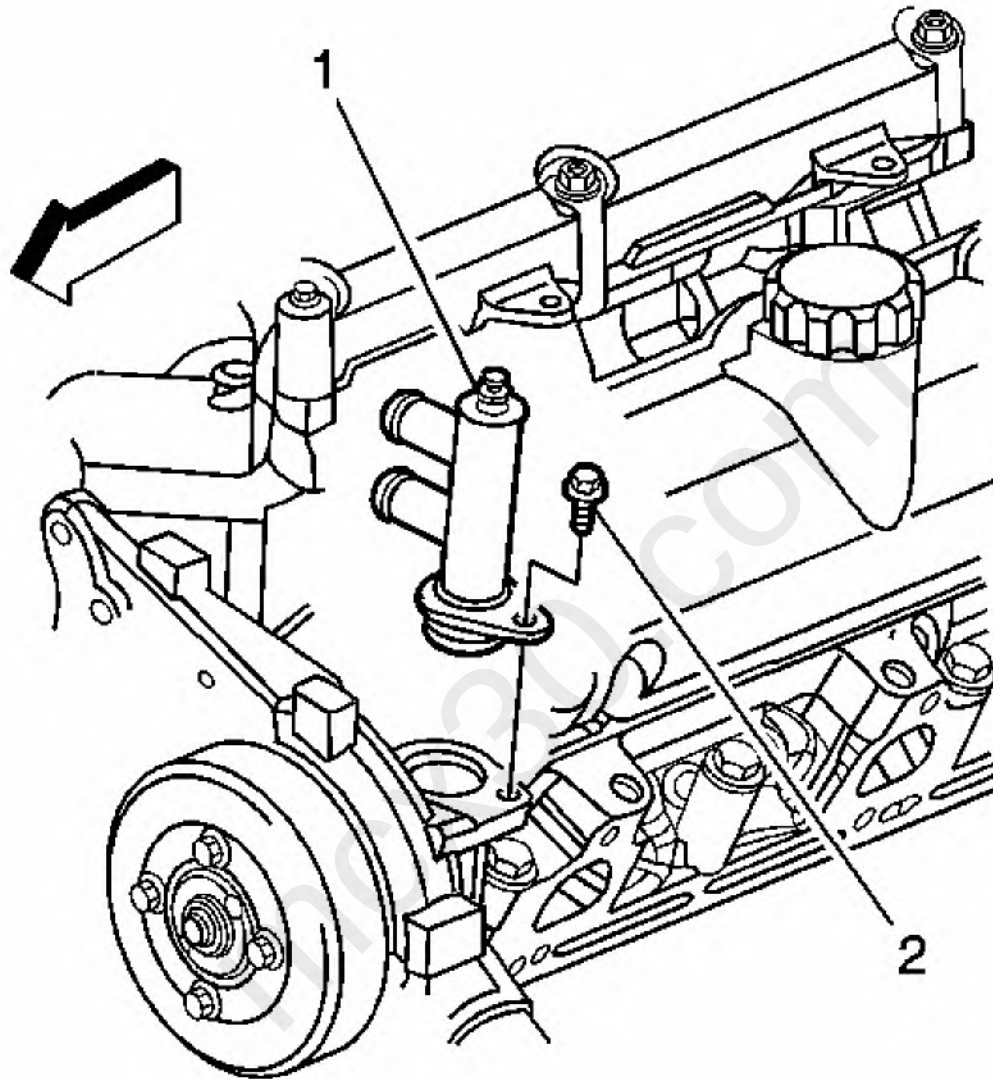


Fig. 72: View Of Thermal Bypass Fitting & Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the thermal bypass fitting (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the thermal bypass fitting bolt (2).

Tighten: Tighten the bolt to 12 N.m (106 lb in).

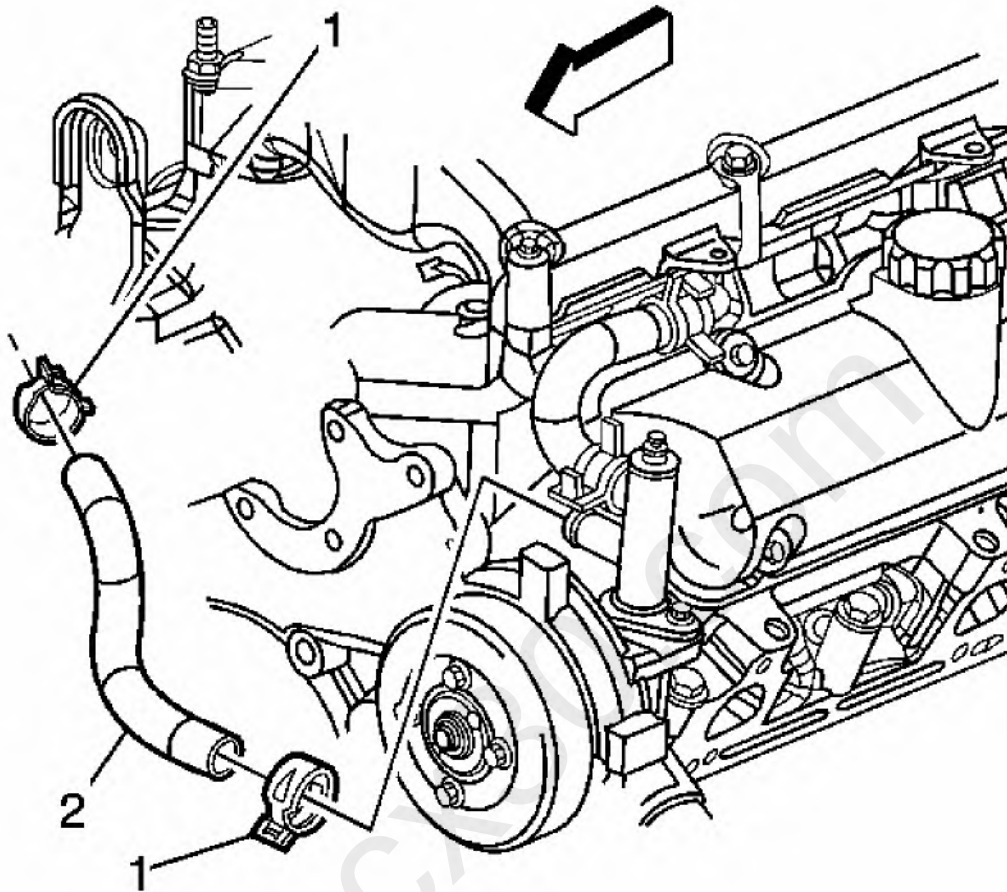


Fig. 73: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

5. Install the heater outlet hose (2) to the thermal bypass fitting.
6. Position the heater outlet hose clamp (1) over the thermal bypass fitting.

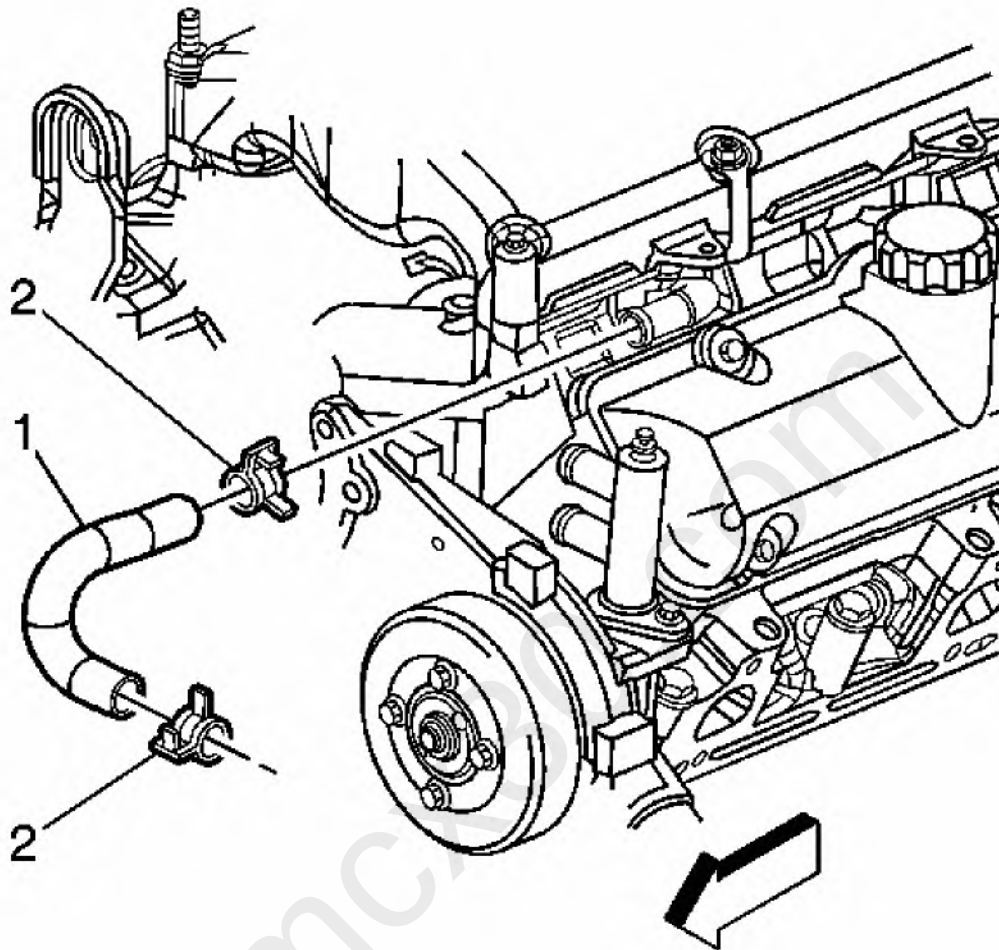


Fig. 74: View Of Thermal Bypass Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

7. Install the thermal bypass hose (1) to the thermal bypass fitting.
8. Position the thermal bypass pipe hose clamp (2) over the thermal bypass fitting.
9. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

THERMAL BYPASS HOSE REPLACEMENT

Removal Procedure

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

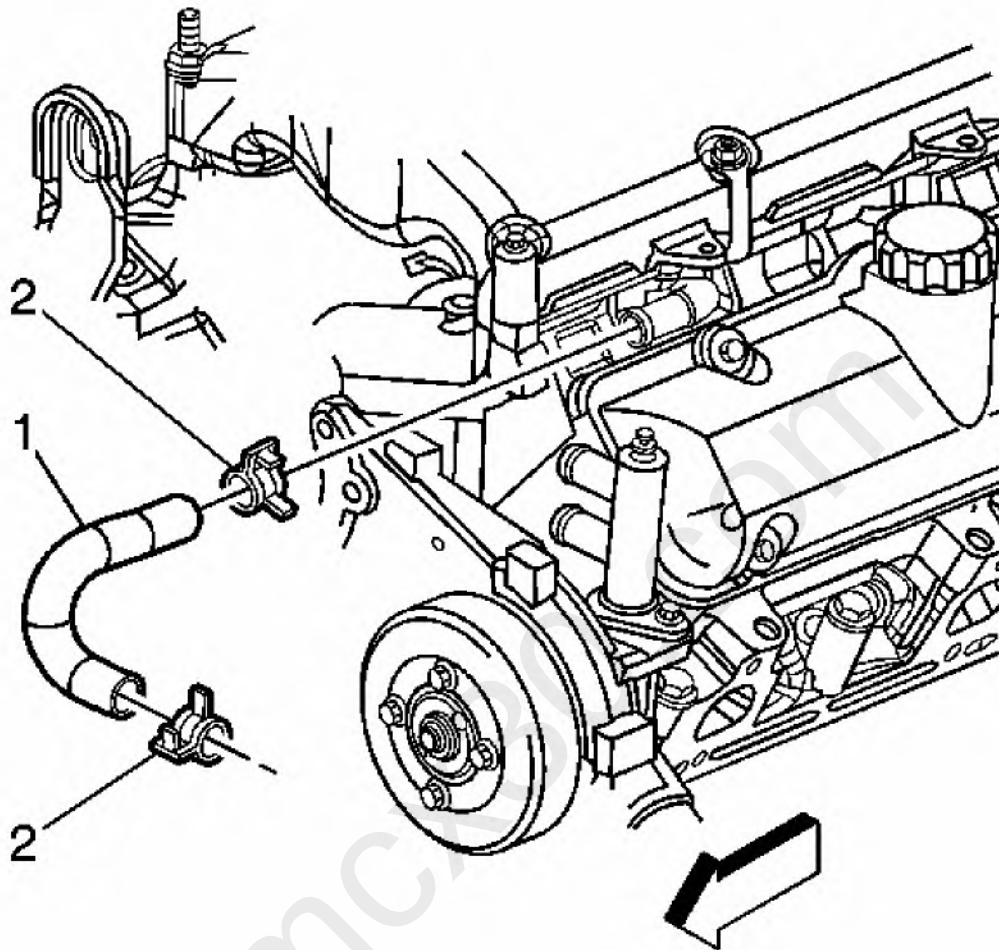


Fig. 75: View Of Thermal Bypass Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

2. Release and slide the thermal bypass pipe hose clamps (2) away from the hose connections.
3. Remove thermal bypass hose (1).

Installation Procedure

1. Apply engine coolant to the bypass hose in order to ease installation.

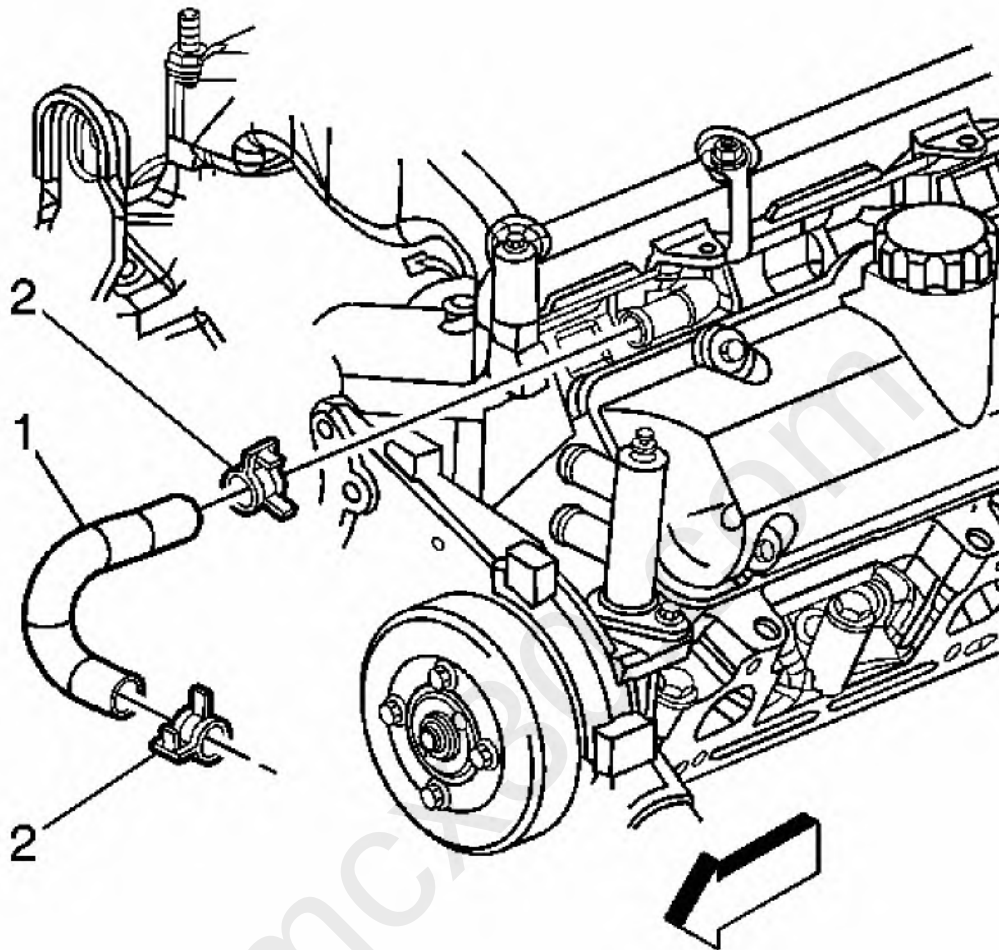


Fig. 76: View Of Thermal Bypass Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

2. Install the thermal bypass pipe hose (1).
3. Position the thermal bypass pipe hose clamps (2) over the hose end connections.
4. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

THERMAL BYPASS PIPE REPLACEMENT

Tools Required

J 21882 Oil Suction Pipe Installer. See **Special Tools**.

Removal Procedure

1. Drain the engine coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Remove the upper intake manifold. Refer to **Intake Manifold Replacement - Upper** in Engine Mechanical - 3.4L.
3. Remove the thermal bypass hose. Refer to **Thermal Bypass Hose Replacement**.

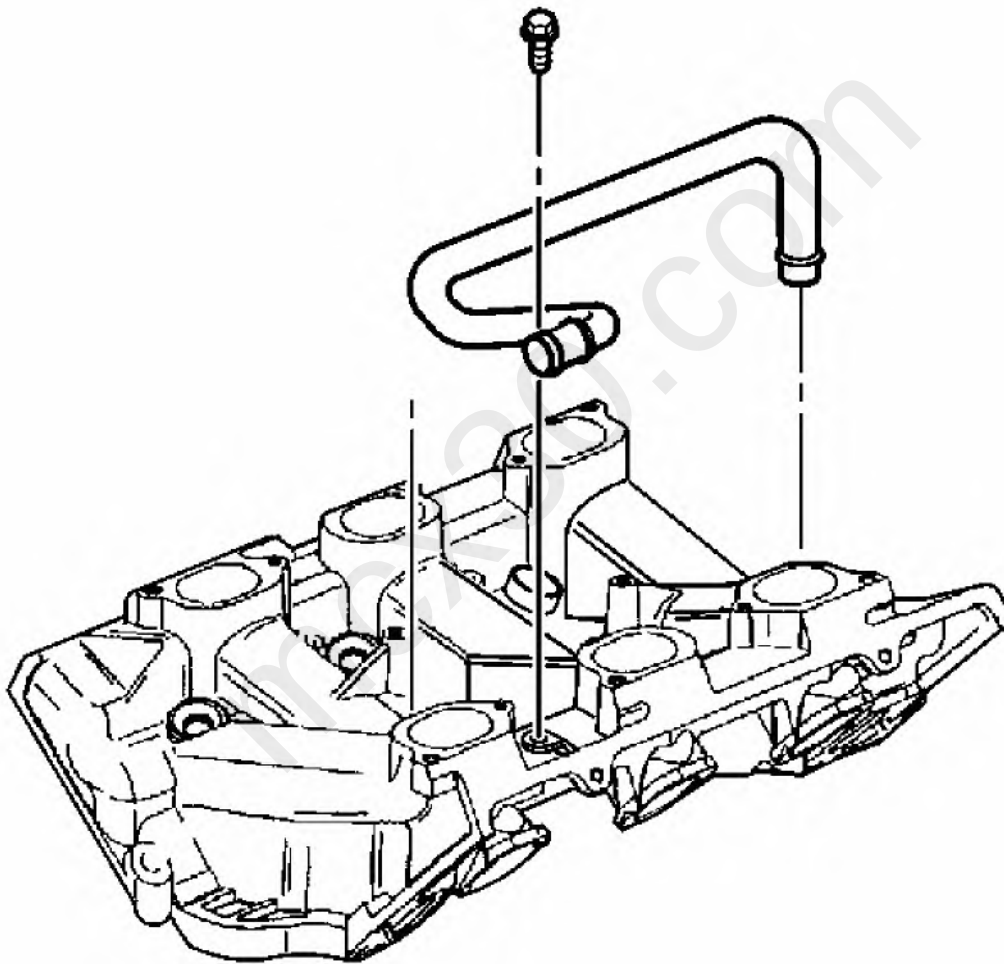


Fig. 77: Identifying Intake Manifold Coolant Pipe
Courtesy of GENERAL MOTORS CORP.

4. Remove the thermal bypass pipe bolt.
5. Remove the thermal bypass pipe.

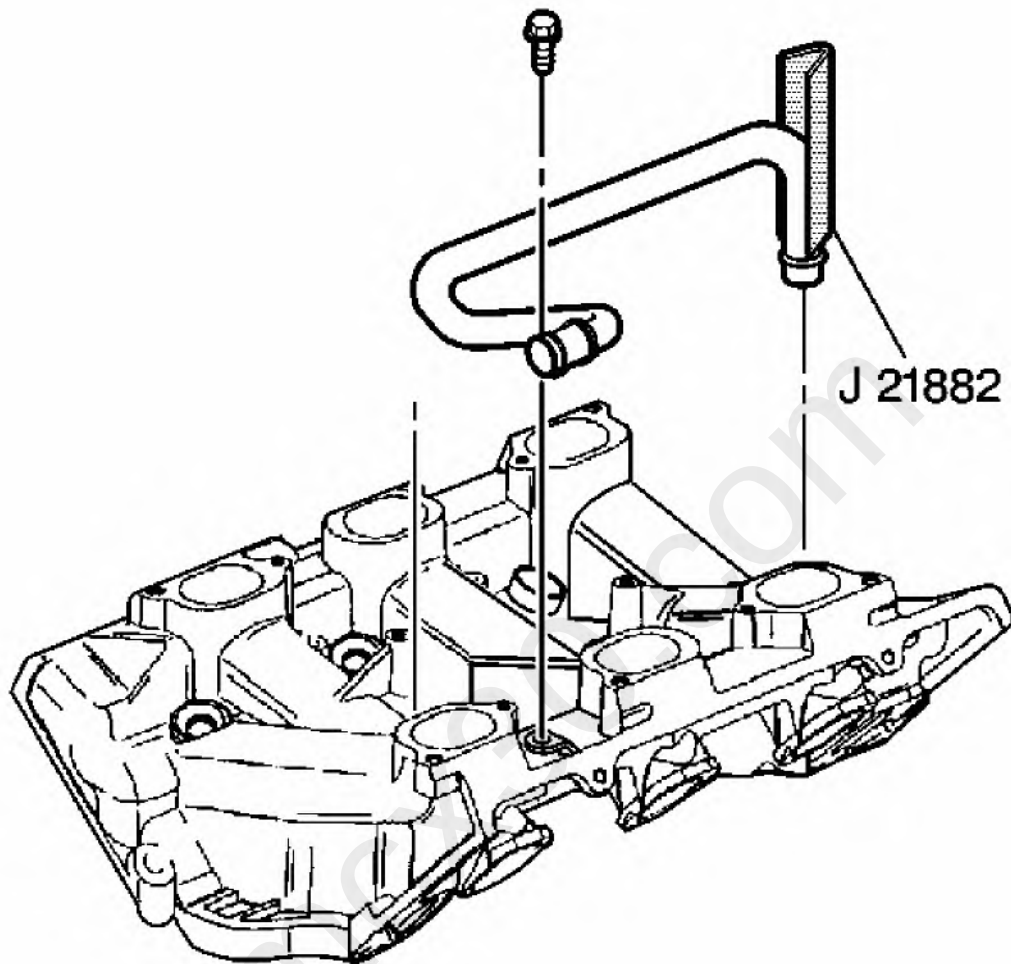


Fig. 78: View Of J 21882

Courtesy of GENERAL MOTORS CORP.

1. Apply sealant GM P/N 12345493 (Canadian P/N 10953488) or equivalent to the end of the thermal bypass pipe where the pipe is pressed into the intake manifold.
2. Install the thermal bypass pipe using **J 21882** . See Special Tools.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the thermal bypass pipe bolt.

Tighten: Tighten the bolt to 10 N.m (89 lb in).

4. Install the thermal bypass hose. Refer to Thermal Bypass Hose Replacement.

5. Install the upper intake manifold. Refer to **Intake Manifold Replacement - Upper** in Engine Mechanical - 3.4L.
6. Fill the engine with coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

THERMOSTAT HOUSING REPLACEMENT

Removal Procedure

1. Remove the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 3.4L.
2. Drain the coolant until the coolant level is below the thermostat. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
3. Remove the crossover exhaust pipe. Refer to **Exhaust Crossover Pipe Replacement** in Engine Exhaust.
4. Remove the radiator hose from the thermostat housing. Refer to **Radiator Hose Replacement - Inlet**.

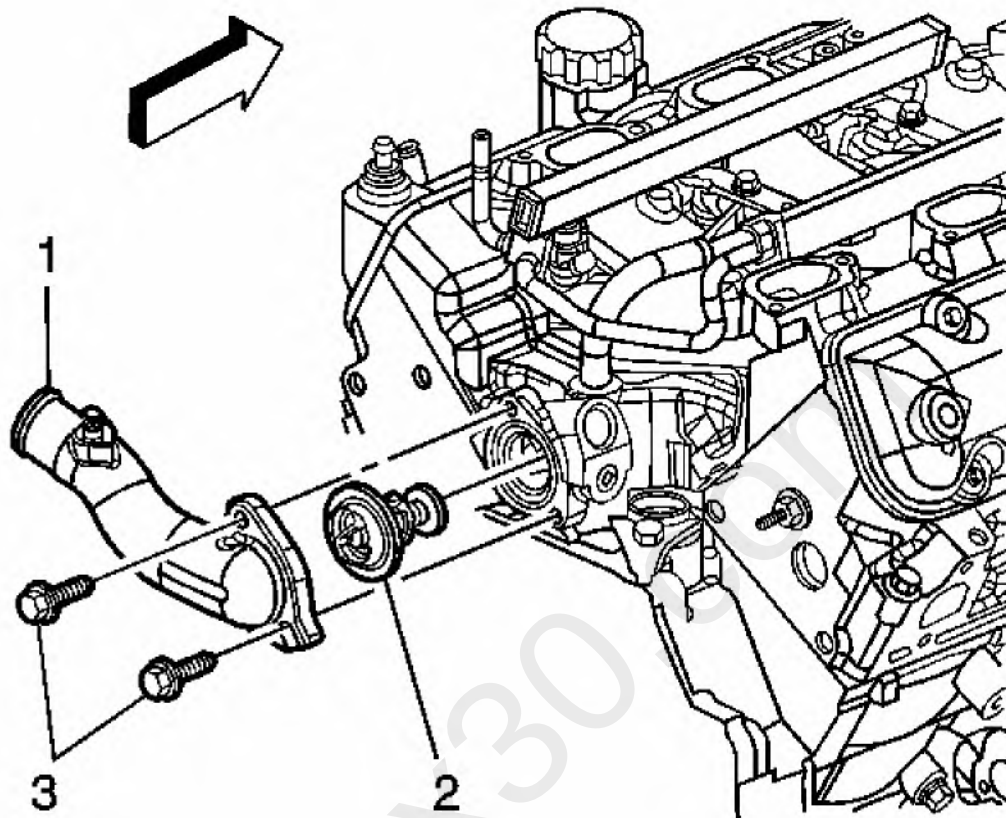


Fig. 79: View Of Thermostat, Housing & Housing Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the thermostat housing bolts (2) and clean any sealer from the bolt threads.
6. Remove the thermostat housing (1).
7. Remove the thermostat (3).
8. Clean the mating surfaces.

Installation Procedure

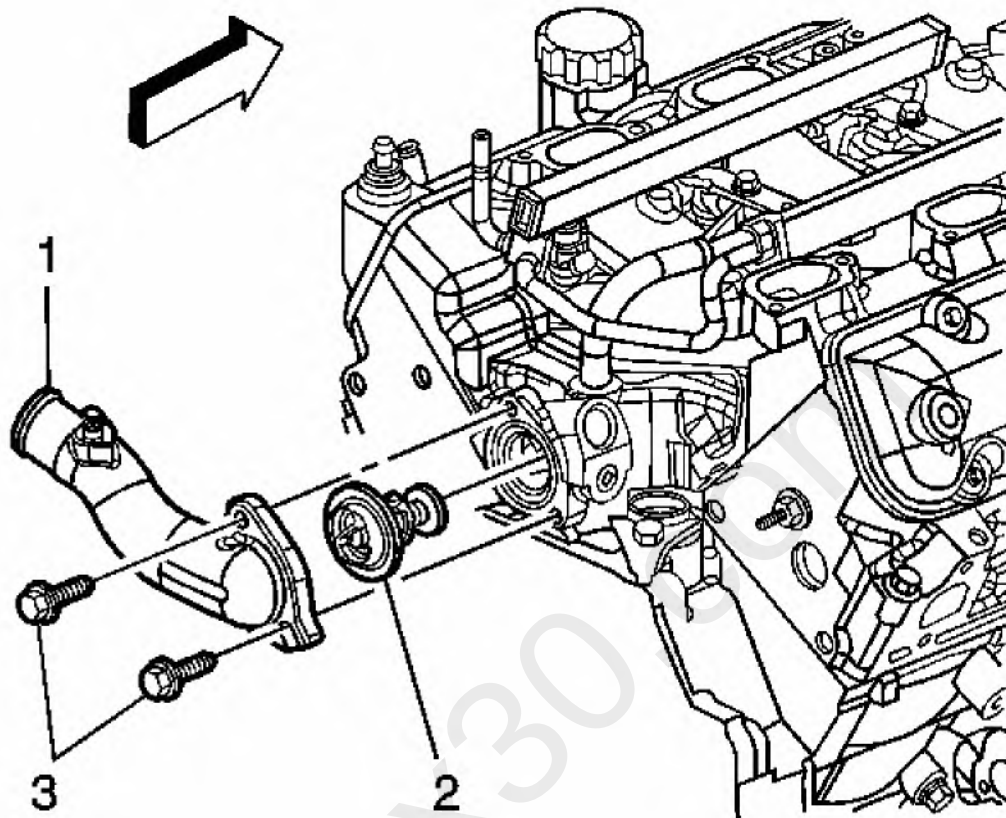


Fig. 80: View Of Thermostat, Housing & Housing Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the thermostat (3).
2. Install the thermostat housing (1).
3. Install RTV sealer, GM P/N 12378478 (Canadian P/N 88900041) or the equivalent, to the thermostat housing bolt threads.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the thermostat housing bolts (2).

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

5. Install the radiator hose to the thermostat housing. Refer to Radiator Hose Replacement - Inlet.
6. Install the crossover exhaust pipe. Refer to Exhaust Crossover Pipe Replacement in

Engine Exhaust.

7. Install the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 3.4L.
8. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
9. Inspect the cooling system for leaks. Repair as necessary.

THERMOSTAT REPLACEMENT

Removal Procedure

1. Remove the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 3.4L.
2. Drain the coolant until the coolant level is below the thermostat. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
3. Remove the crossover exhaust pipe. Refer to **Exhaust Crossover Pipe Replacement** in Engine Exhaust.
4. Remove the radiator hose from the thermostat housing. Refer to **Radiator Hose Replacement - Inlet**.

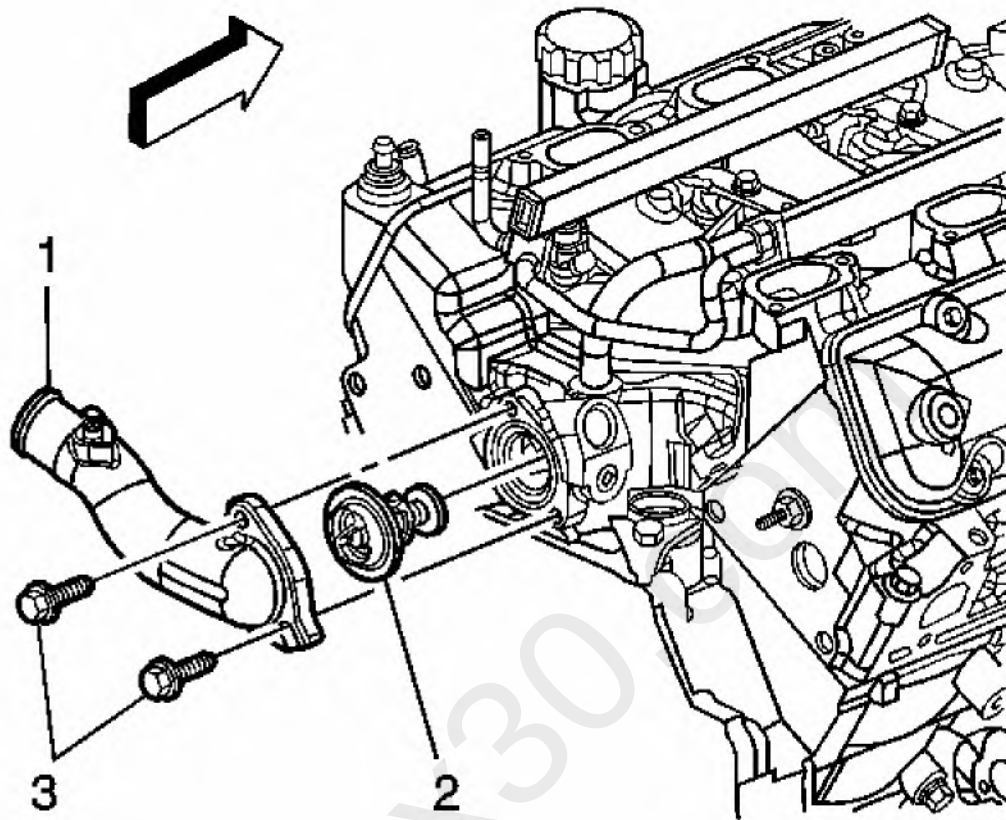


Fig. 81: View Of Thermostat, Housing & Housing Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the thermostat housing bolts (2) and clean any sealer from the bolt threads.
6. Remove the thermostat housing (1).
7. Remove the thermostat (3).
8. Clean the mating surfaces.

Installation Procedure

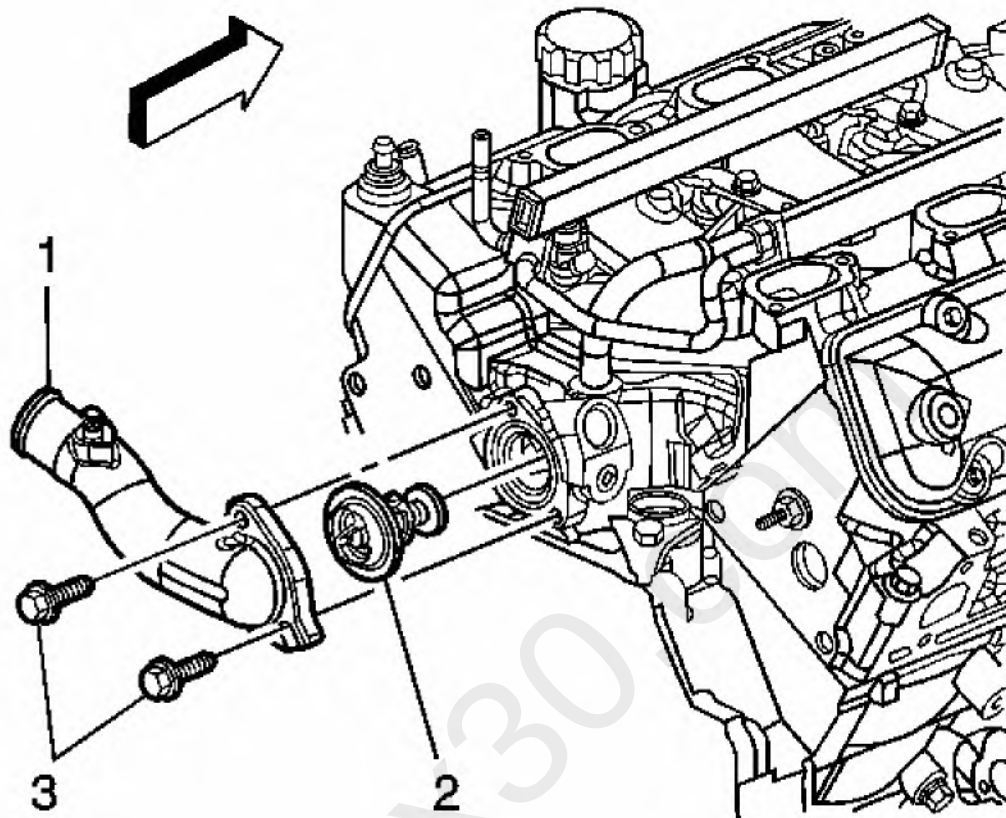


Fig. 82: View Of Thermostat, Housing & Housing Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the thermostat (3).
2. Install the thermostat housing (1).
3. Install RTV sealer, GM P/N 12378478 (Canadian P/N 88900041) or the equivalent, to the thermostat housing bolt threads.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the thermostat housing bolts (2).

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

5. Install the radiator hose to the thermostat housing. Refer to Radiator Hose Replacement - Inlet.
6. Install the crossover exhaust pipe. Refer to Exhaust Crossover Pipe Replacement in

Engine Exhaust.

7. Install the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 3.4L.
8. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
9. Inspect the cooling system for leaks. Repair as necessary.

HEATER PIPE REPLACEMENT - INLET

Removal Procedure

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

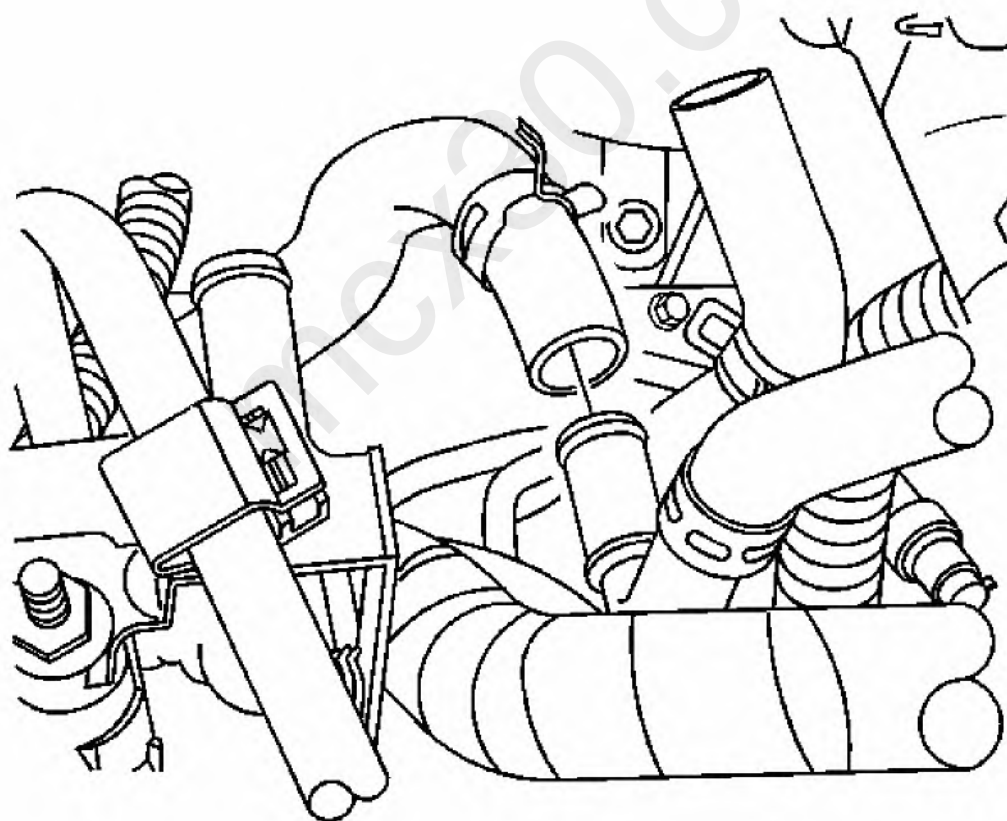


Fig. 83: Disconnecting/Connecting Heater Core Inlet Hose At Heater Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

2. Release and slide the heater core inlet hose clamp away from the heater inlet pipe

connection.

3. Disconnect the heater core inlet hose from the heater inlet pipe.

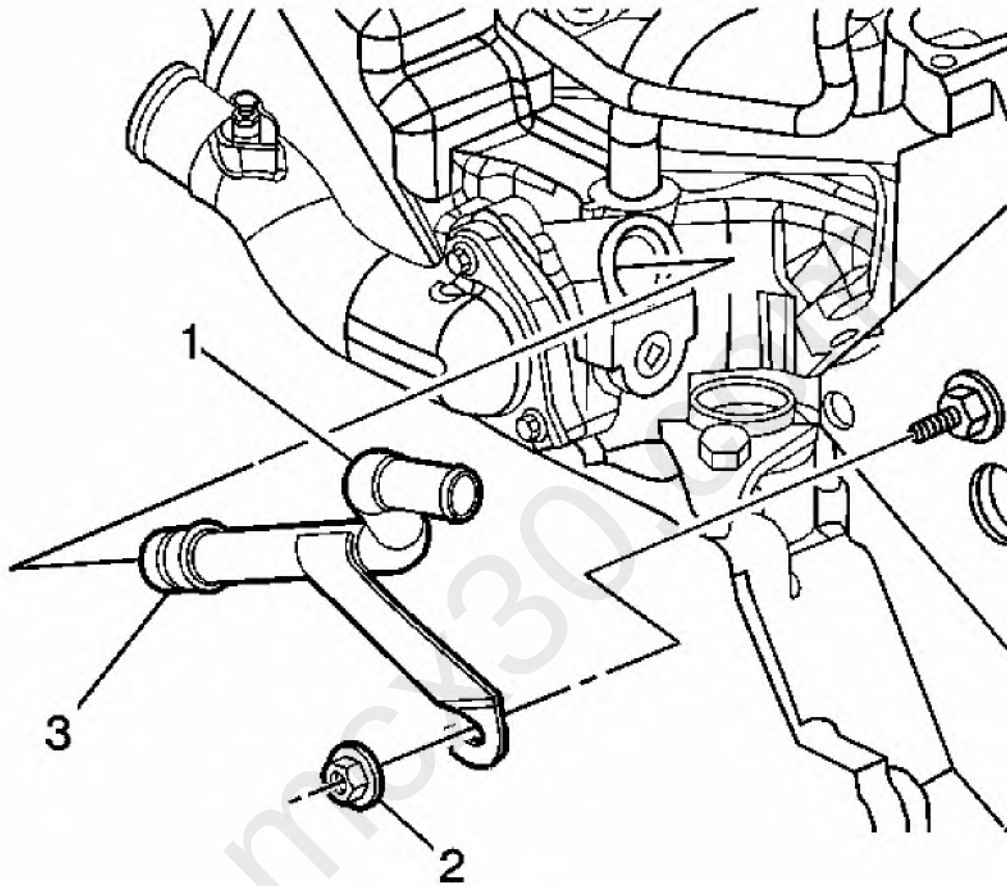


Fig. 84: View Of Heater Inlet Pipe, Nut & Seal
Courtesy of GENERAL MOTORS CORP.

4. Remove the heater inlet pipe nut (2).
5. Remove the heater inlet pipe (1).
6. Remove the seal (3) from the heater inlet pipe (1).

Installation Procedure

1. Install a new seal (3) to the heater inlet pipe (1).
2. Apply engine coolant to the heater inlet pipe seal (3).

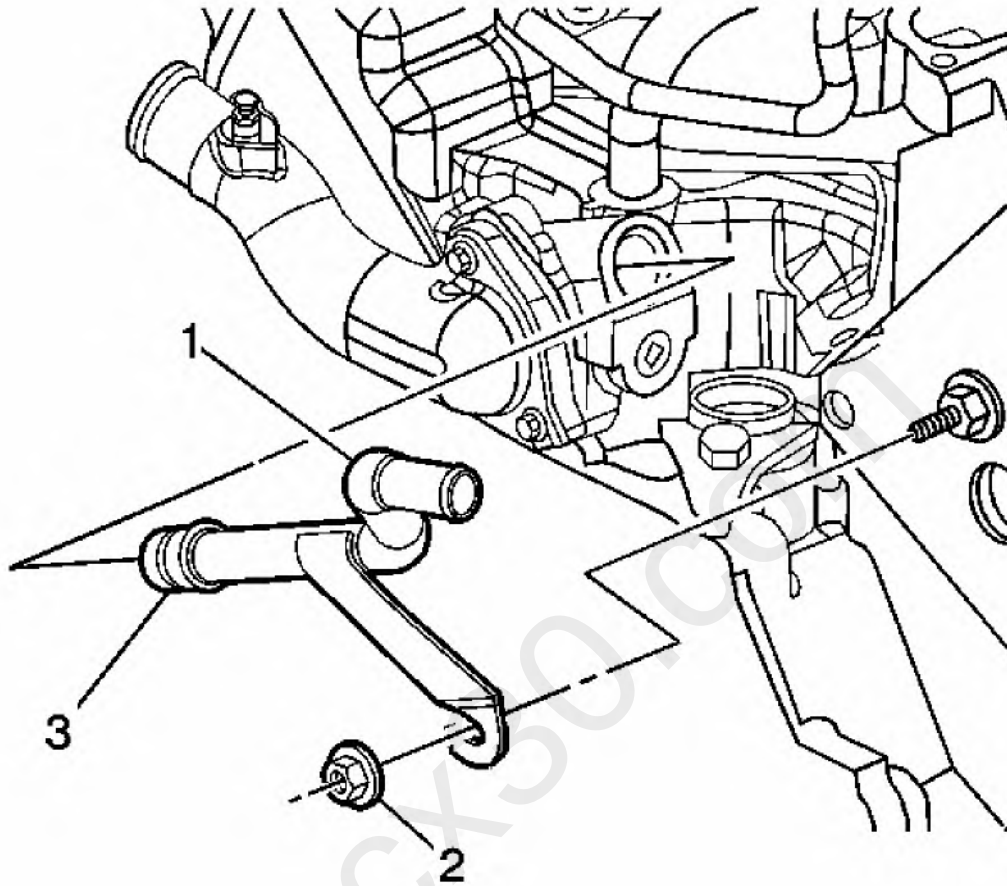


Fig. 85: View Of Heater Inlet Pipe, Nut & Seal
Courtesy of GENERAL MOTORS CORP.

3. Install the heater outlet pipe (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the heater inlet pipe nut (2).

Tighten: Tighten the nut to 25 N.m (18 lb ft).

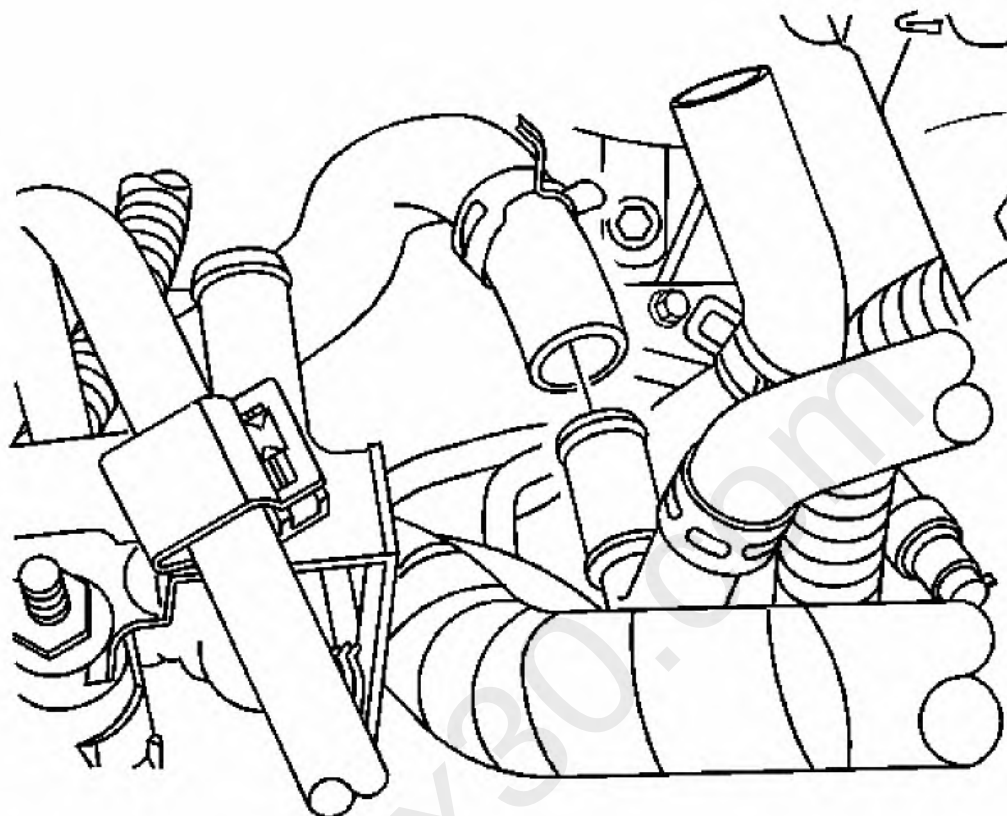


Fig. 86: Disconnecting/Connecting Heater Core Inlet Hose At Heater Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

5. Connect the heater core inlet hose to the heater inlet pipe.
6. Position the heater core inlet hose clamp over the heater inlet pipe connection.
7. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

HEATER PIPE REPLACEMENT - OUTLET

Removal Procedure

1. Remove the injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Controls - 3.4L.
2. Drain the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
3. Remove the air cleaner air intake duct. Refer to **Air Cleaner Intake Duct Replacement** in Engine Controls - 3.4L.

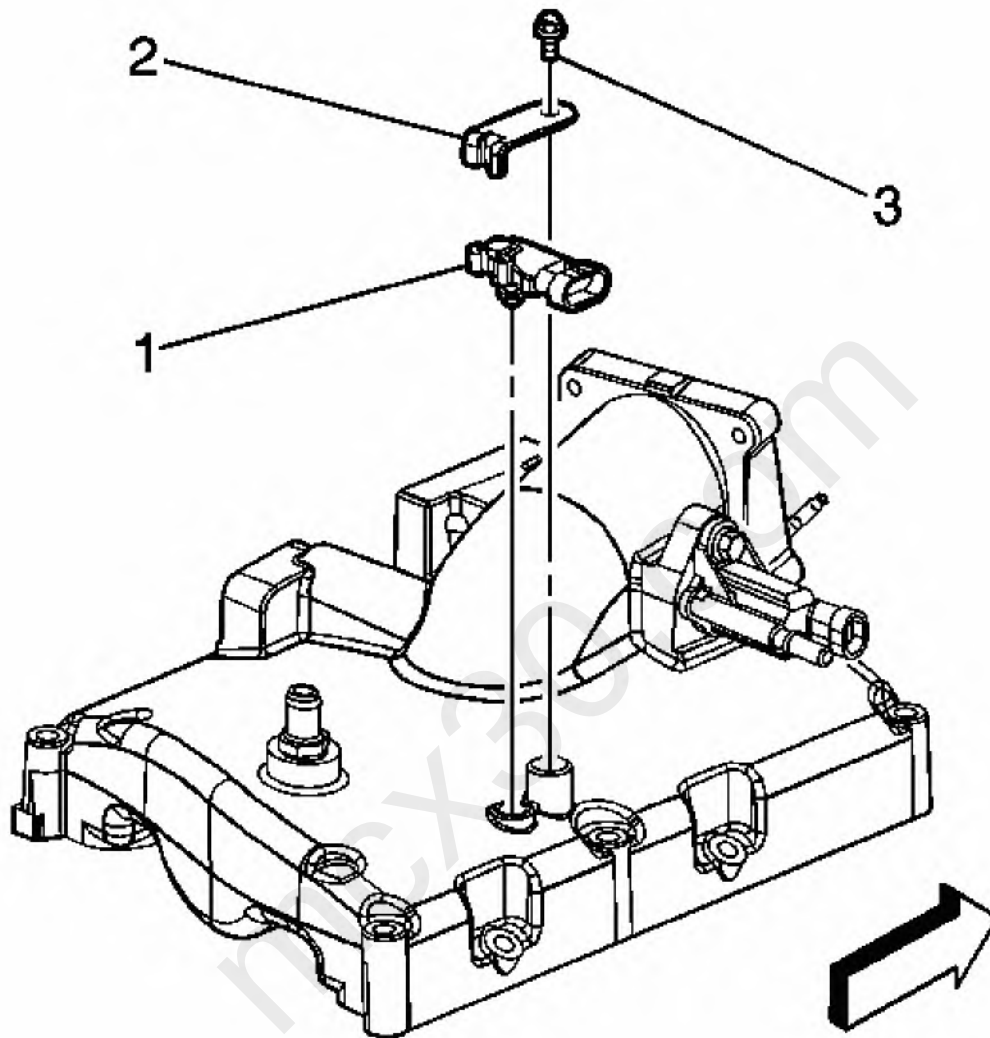


Fig. 87: View Of MAP Sensor, Bracket & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the manifold absolute pressure (MAP) sensor bolt (3) and bracket (2).
5. Rotate the MAP sensor out of the way of the heater outlet pipe.
6. Disconnect the evaporative emissions (EVAP) pipe from the EVAP canister purge solenoid. Refer to **Quick Connect Fitting(s) Service (Plastic Collar)** in Engine Controls - 3.4L.
7. Disconnect the electrical connector from the EVAP canister purge solenoid.
8. Disconnect the exhaust gas recirculation (EGR) valve electrical connector.

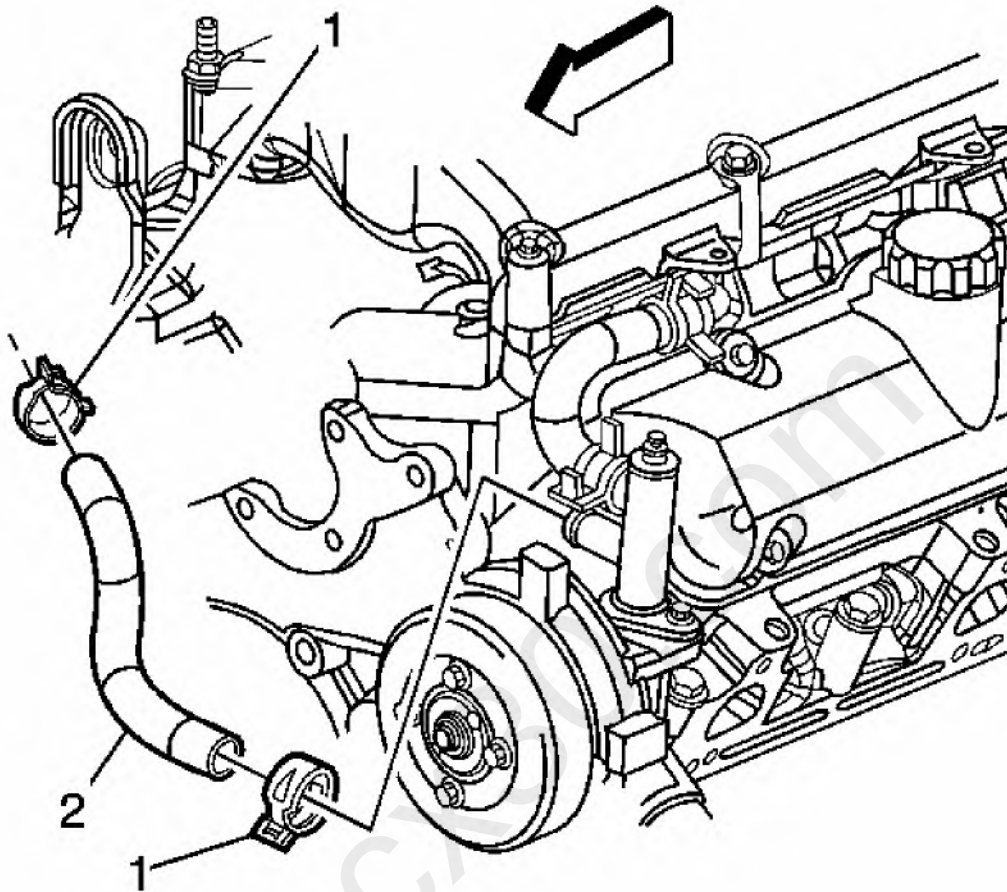


Fig. 88: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

9. Release and slide the heater outlet hose clamp (1) away from the heater outlet pipe connection.
10. Disconnect the heater outlet hose (2) from the heater outlet pipe.

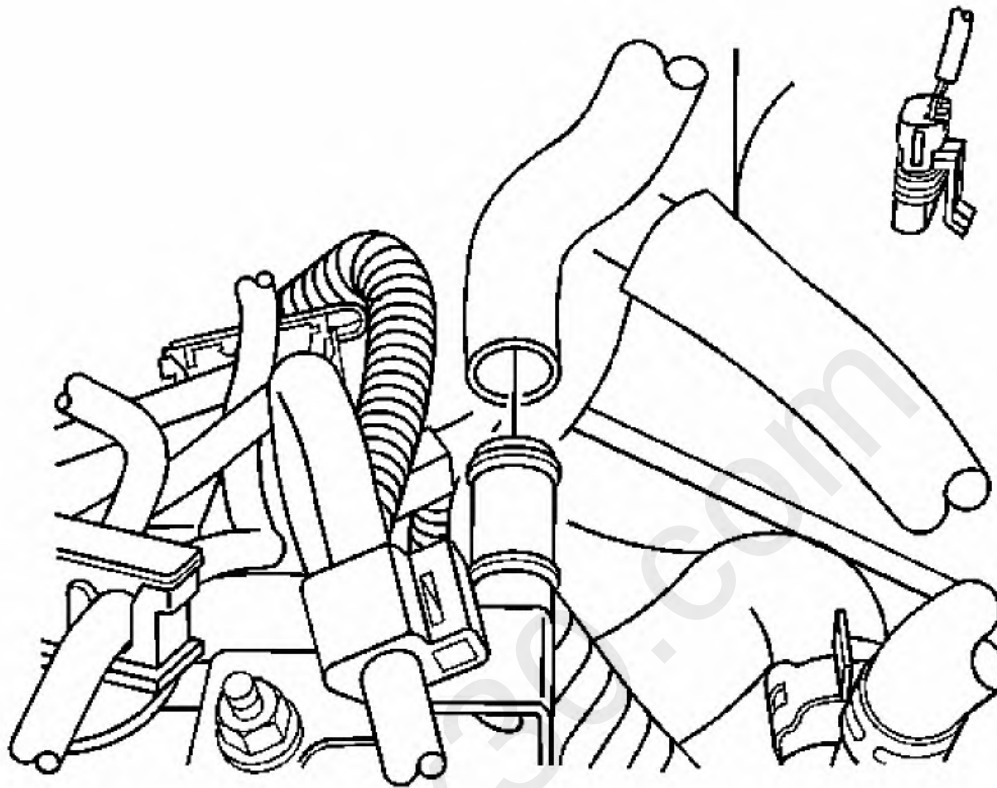


Fig. 89: Removing/Installing Heater Outlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

11. Release and slide the heater core outlet hose clamp away from the heater outlet pipe connection.
12. Disconnect the heater core outlet hose from the heater outlet pipe.

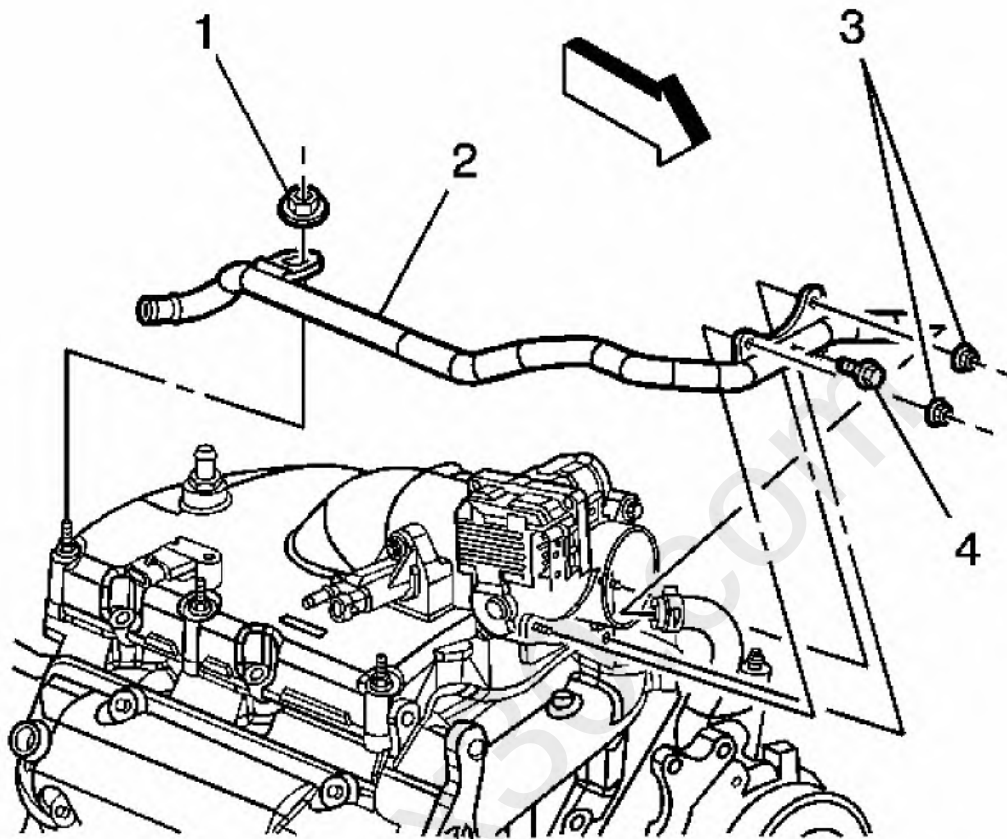


Fig. 90: View Of Heater Outlet Pipe, Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

13. Remove the heater outlet pipe nut (1) securing the heater outlet pipe (2) to the intake manifold.
14. Remove the two nuts (3) and bolt (4) securing the heater outlet pipe to the throttle body.
15. Remove the heater outlet pipe (2) from the engine.

Installation Procedure

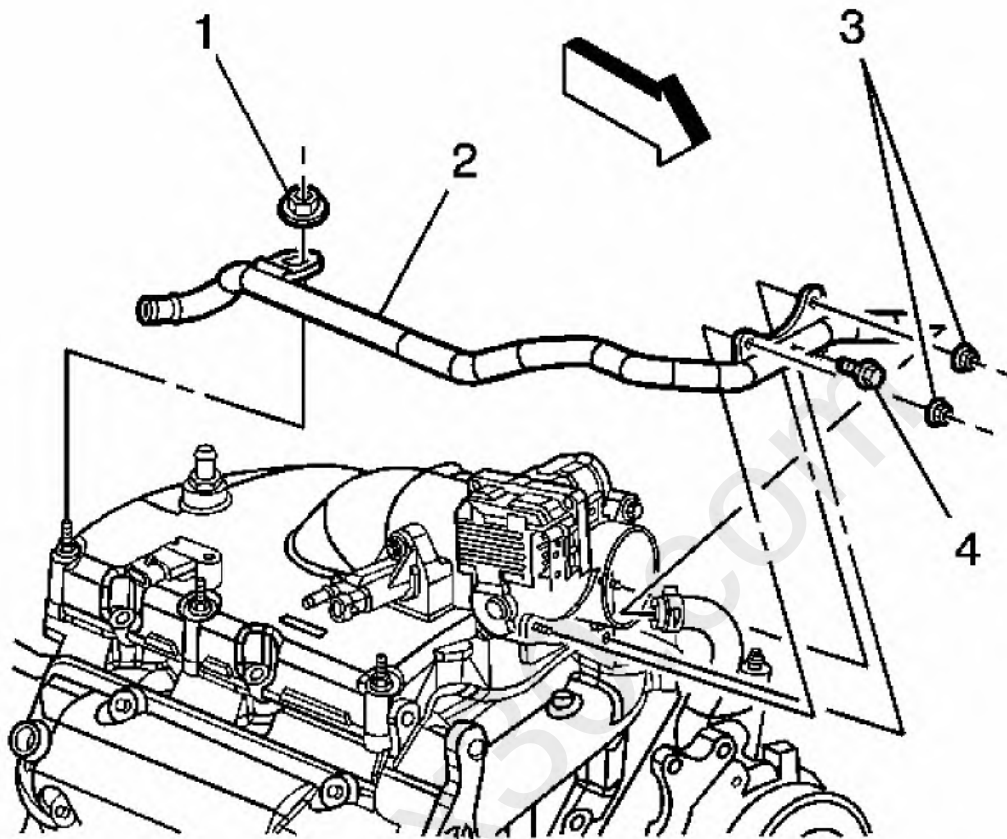


Fig. 91: View Of Heater Outlet Pipe, Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the heater outlet pipe (2) to the engine.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the heater outlet pipe nut (1) securing the heater outlet pipe (2) to the intake manifold.

Tighten: Tighten the nut to 25 N.m (18 lb ft).

3. Install the heater outlet pipe to the throttle body nuts (3) and bolt (4).

Tighten: Tighten the nuts and bolt to 10 N.m (89 lb in).

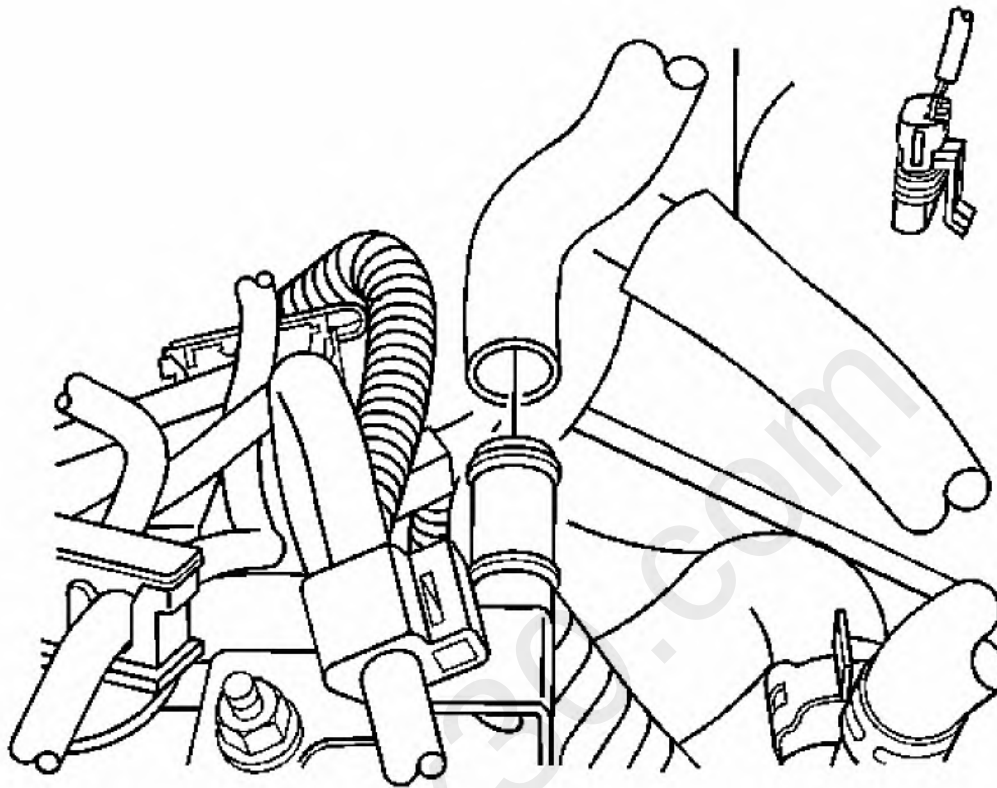


Fig. 92: Removing/Installing Heater Outlet Hose At Engine
Courtesy of GENERAL MOTORS CORP.

4. Connect the heater core outlet hose to the heater outlet pipe.
5. Position the heater core outlet hose clamp over the heater outlet pipe connection.

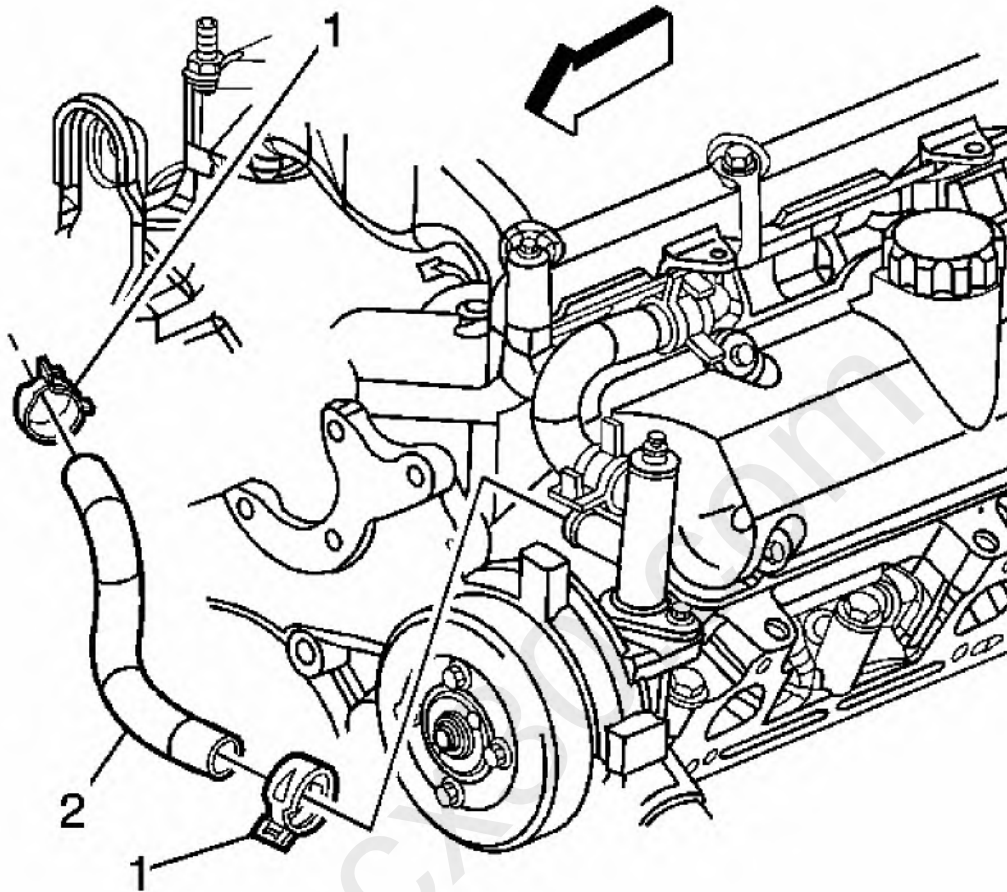


Fig. 93: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

6. Connect the heater outlet hose (2) to the heater outlet pipe.
7. Position the heater outlet hose clamp (1) over the heater outlet pipe connection.
8. Connect the electrical connector to the EGR valve.
9. Connect the electrical connector to the EVAP canister purge solenoid.
10. Connect the EVAP pipe to the EVAP canister purge solenoid. Refer to **Quick Connect Fitting(s) Service (Plastic Collar)** in Engine Controls - 3.4L.

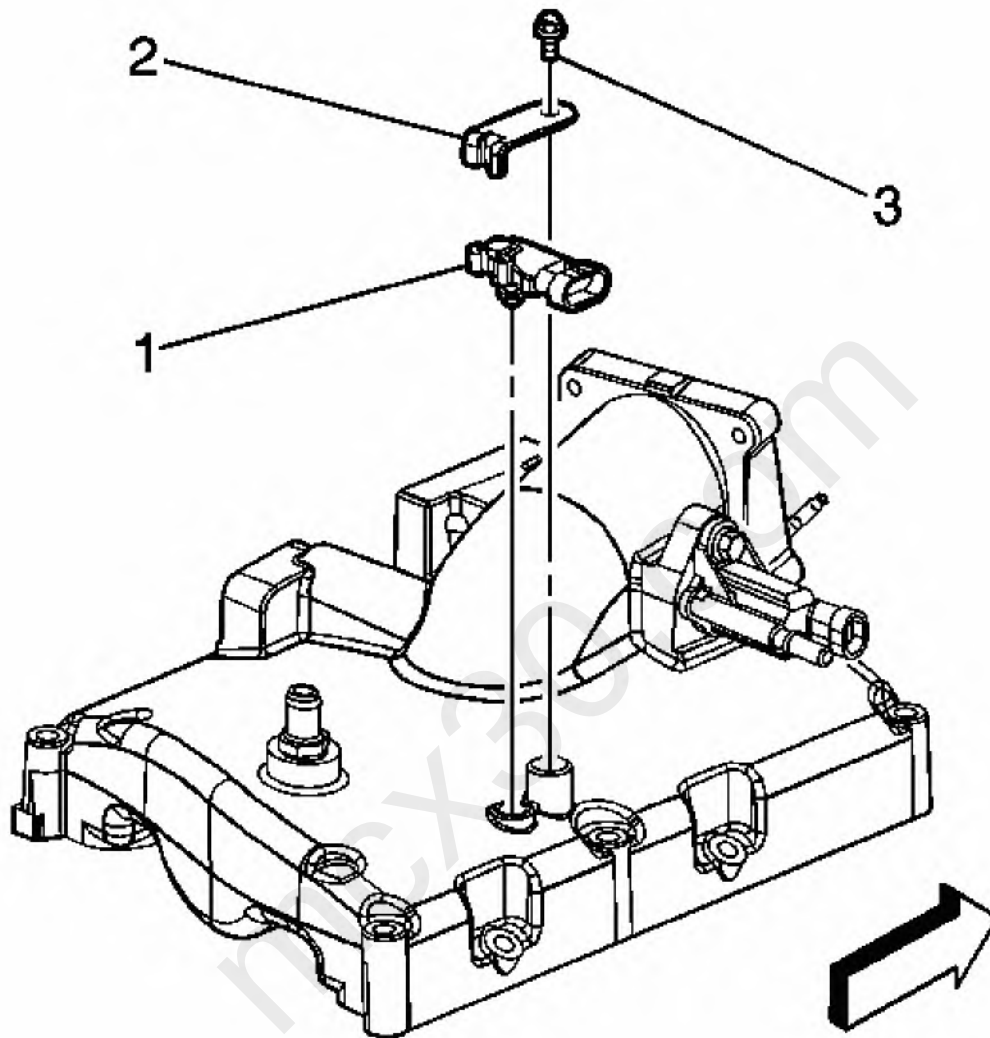


Fig. 94: View Of MAP Sensor, Bracket & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

11. Reposition the MAP sensor.
12. Install the MAP sensor bracket (2) and bolt (3).

Tighten: Tighten the bolt to 10 N.m (89 lb in).

13. Install the air cleaner air intake duct. Refer to **Air Cleaner Intake Duct Replacement** in Engine Controls - 3.4L.
14. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

15. Install the injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Controls - 3.4L.

HEATER HOSE REPLACEMENT - OUTLET

Removal Procedure

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

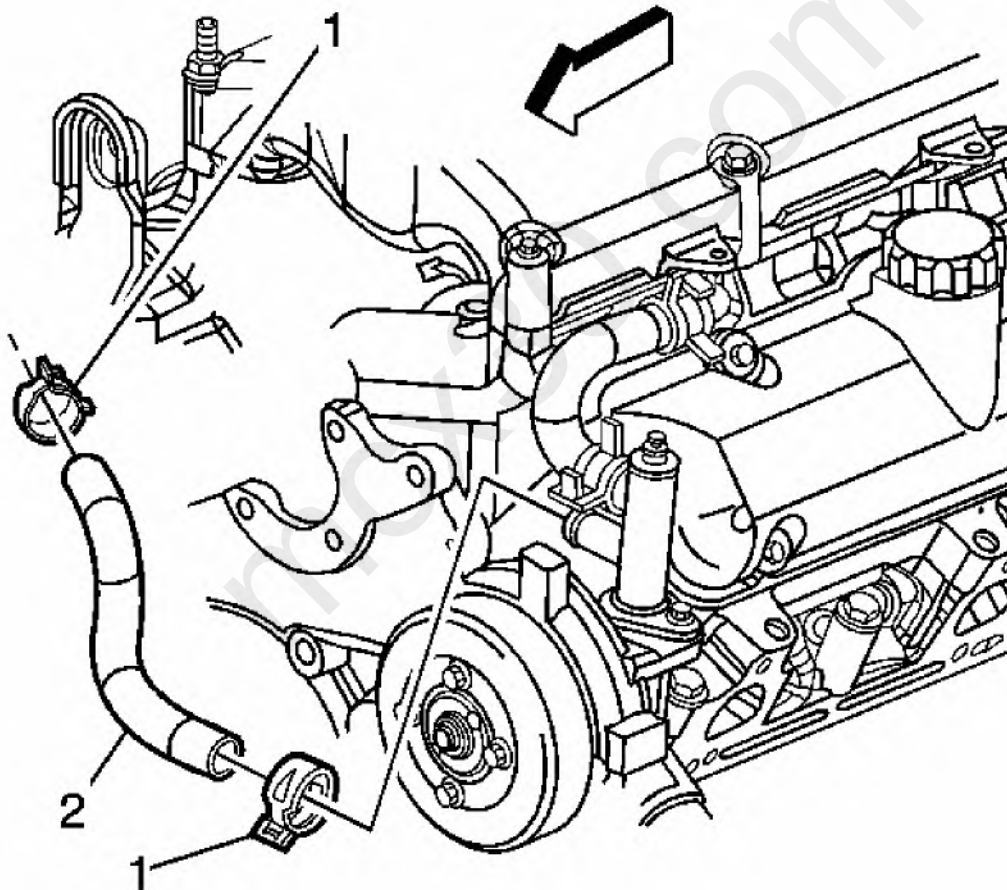


Fig. 95: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

2. Remove the heater outlet hose clamps (1).
3. Remove the heater outlet hose (2).

Installation Procedure

1. Apply engine coolant to the heater outlet hose in order to ease installation.

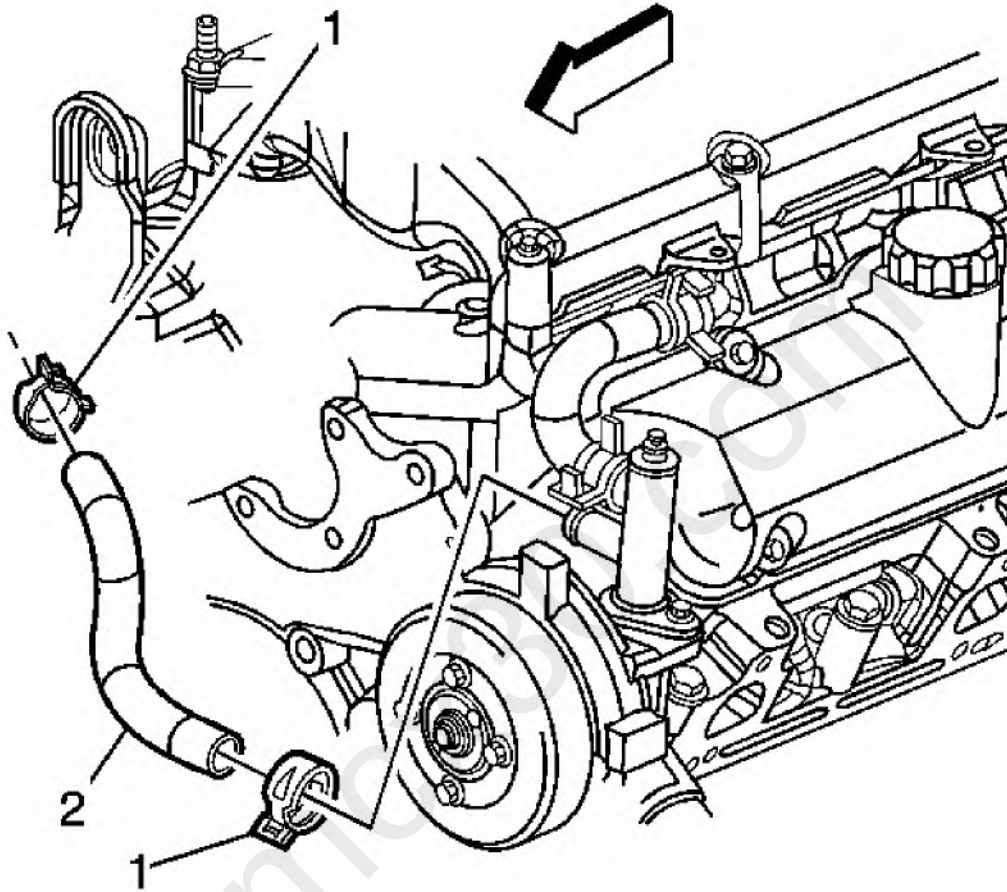


Fig. 96: View Of Heater Outlet Hose & Clamp
Courtesy of GENERAL MOTORS CORP.

2. Install the heater outlet hose (2).
3. Install the heater outlet hose clamps (1).
4. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

WATER PUMP REPLACEMENT

Tools Required

J 39914 Serpentine Belt Tensioner Unloader

Removal Procedure

1. Drain the cooling system until the coolant is below the level of the water pump. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

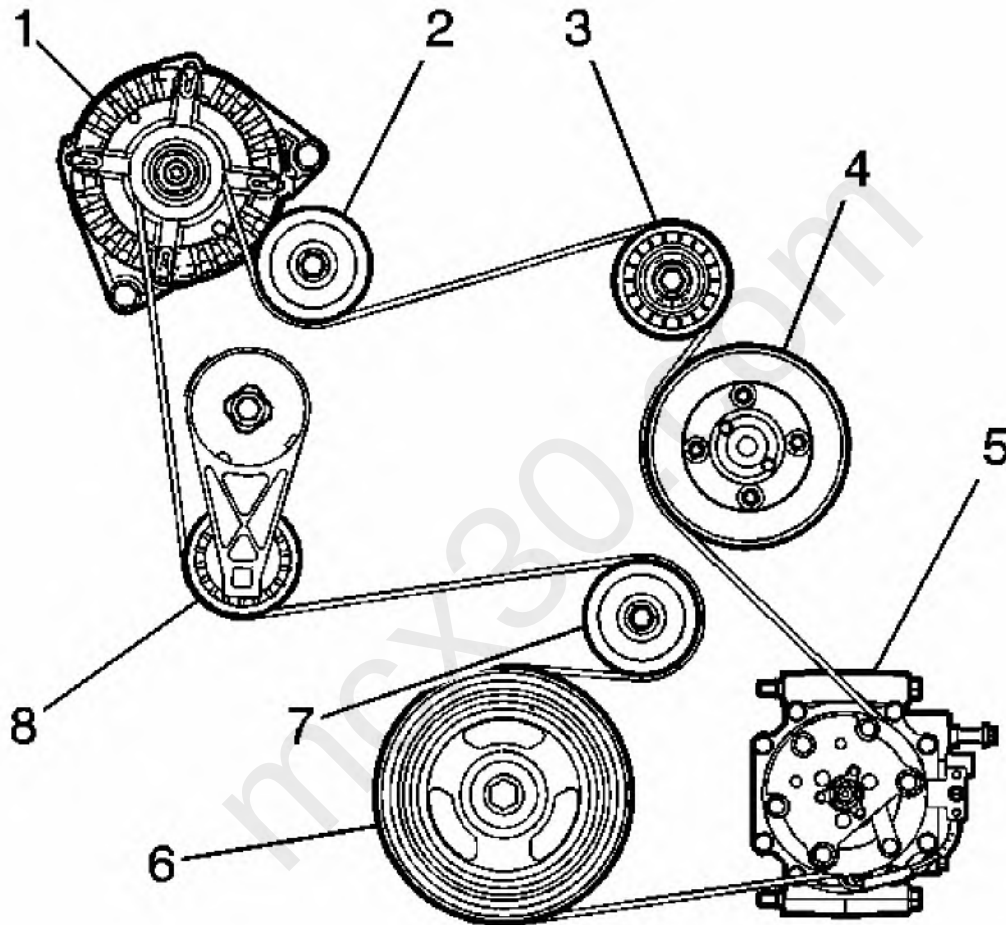


Fig. 97: View Of Drive Belt Routing
Courtesy of GENERAL MOTORS CORP.

2. Loosen the water pump pulley bolts (4).
3. Using the **J 39914** rotate the drive belt tensioner (8) to release the tension on the drive belt.
4. Remove the drive belt from the right idler pulley (2).
5. Carefully release the **J 39914** to relieve the drive belt tensioner spring tension.
6. Remove the **J 39914** from the drive belt tensioner (8).

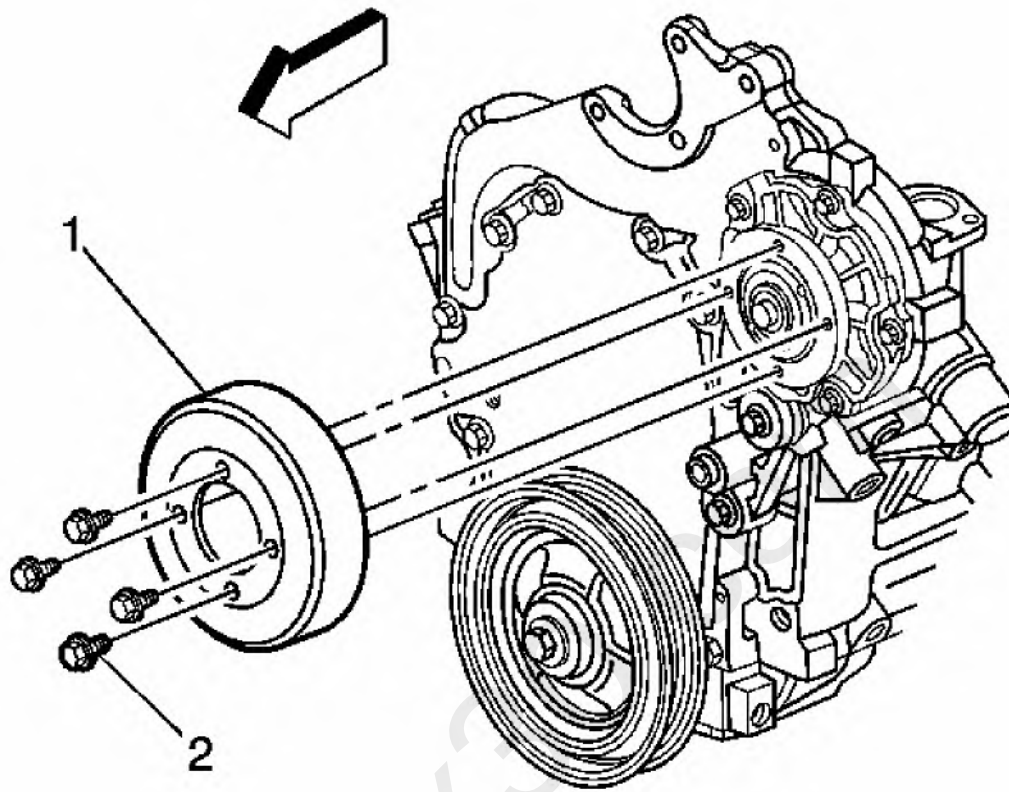


Fig. 98: View Of Water Pump Pulley & Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the water pump pulley bolts (2).
8. Remove the water pump pulley (1).

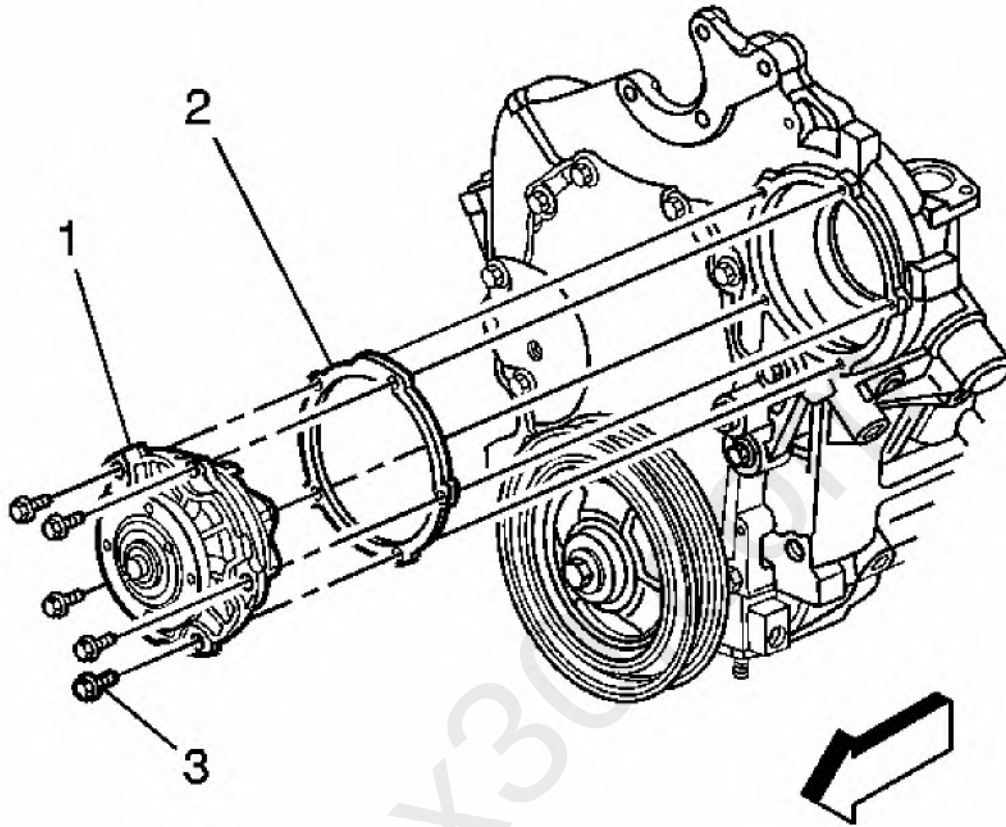


Fig. 99: View Of Water Pump, Gasket & Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the water pump bolts (3).
10. Remove the water pump (1).
11. Remove the water pump gasket (2).
12. Clean the water pump mating surfaces.

Installation Procedure

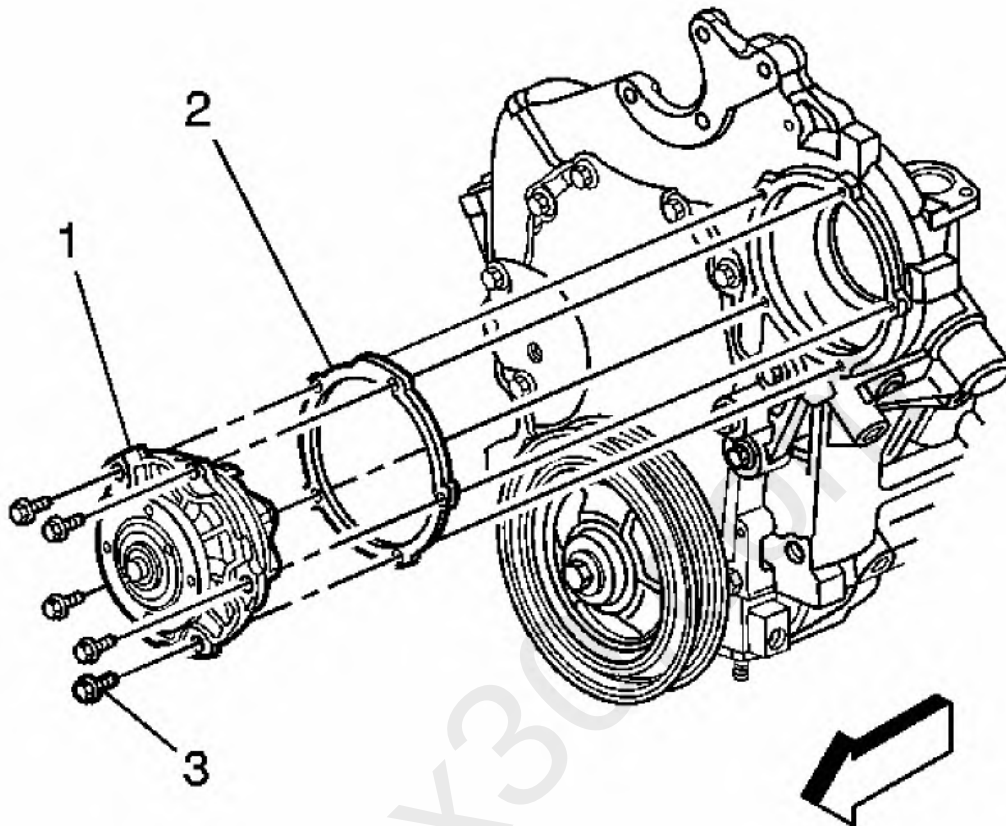


Fig. 100: View Of Water Pump, Gasket & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the water pump gasket (2).
2. Install the water pump (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the water pump bolts (3).

Tighten: Tighten the bolts to 10 N.m (89 lb in).

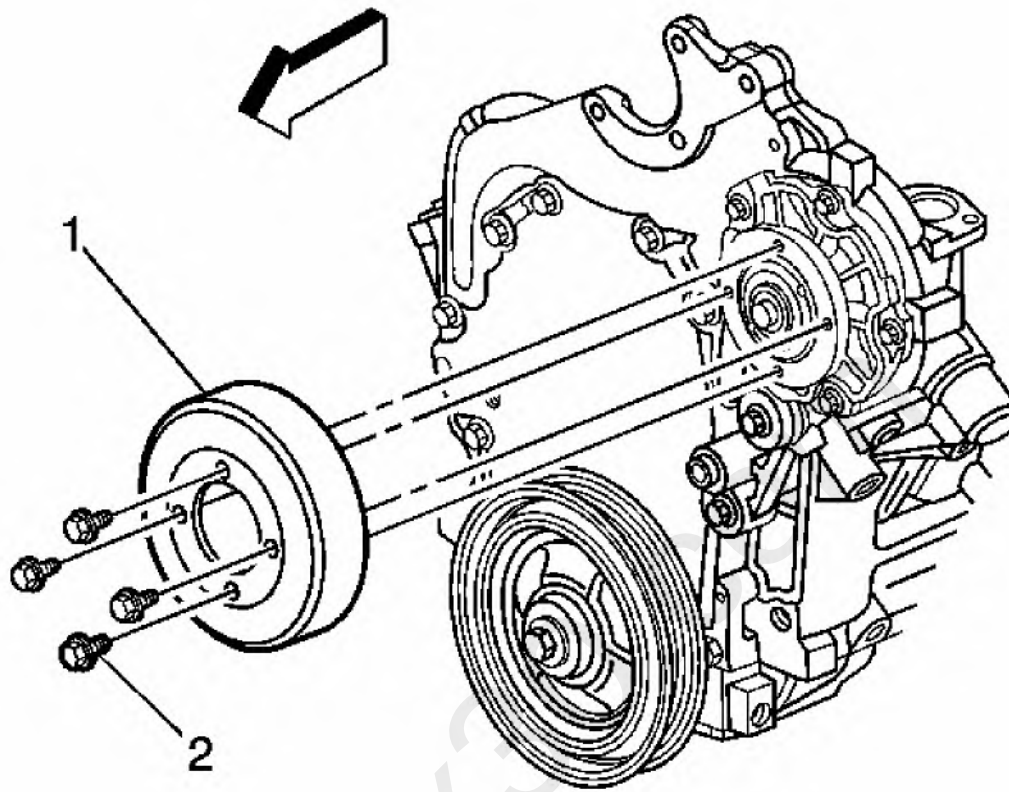


Fig. 101: View Of Water Pump Pulley & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the water pump pulley (1). Loosely install the pulley bolts (2).

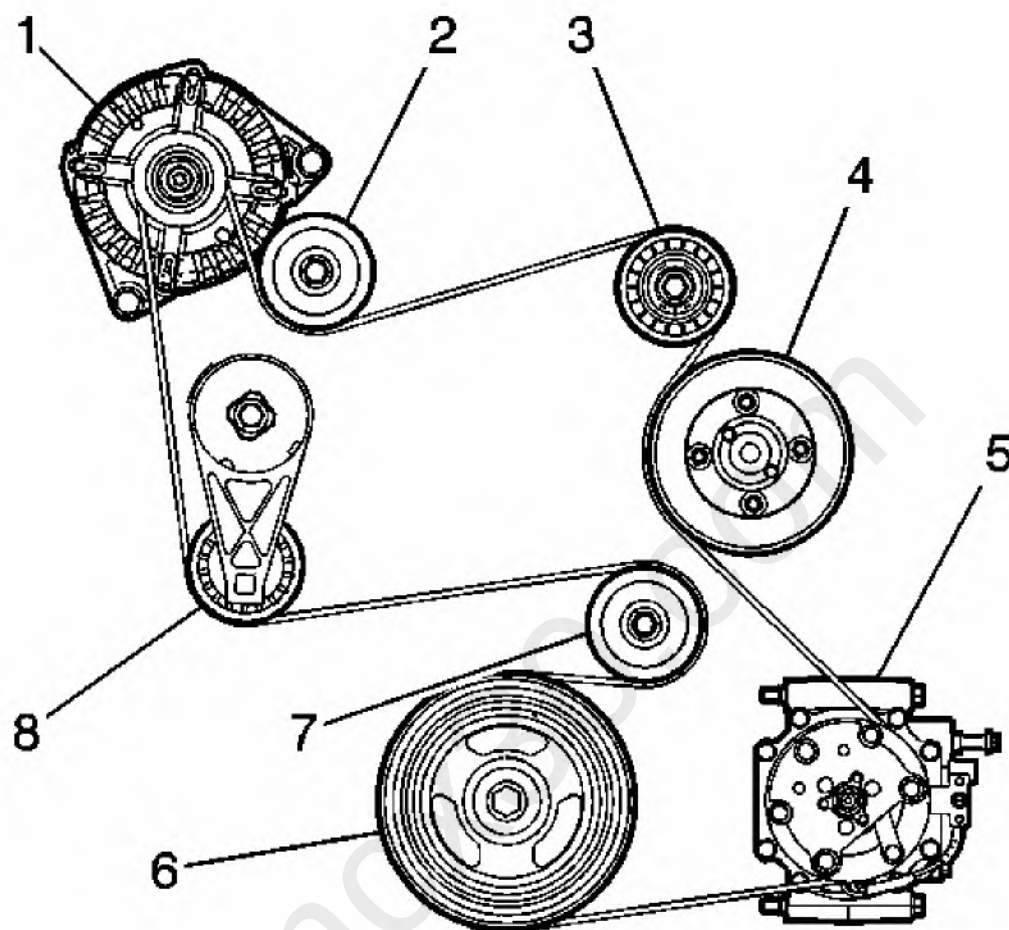


Fig. 102: View Of Drive Belt Routing
Courtesy of GENERAL MOTORS CORP.

5. Insure the drive belt is properly centered on all the pulleys except the right idler pulley (3).
6. Using the **J 39914** rotate the drive belt tensioner away from the drive belt.
7. Install the drive belt to the right idler pulley (2).
8. Carefully release the **J 39914** allowing the drive belt tensioner (8) to come in contact with the drive belt.
9. Remove the **J 39914** from the drive belt tensioner (8).
10. Inspect the drive belt to insure the belt is properly centered on all the pulleys (1- 8).
11. Tighten the water pump pulley bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

12. Fill the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
13. Inspect the cooling system for leaks.

DRAIN COCK REPLACEMENT

Tools Required

GE-47716 1617 Vac N Fill Coolant Refill Tool. See **Special Tools**.

Removal Procedure

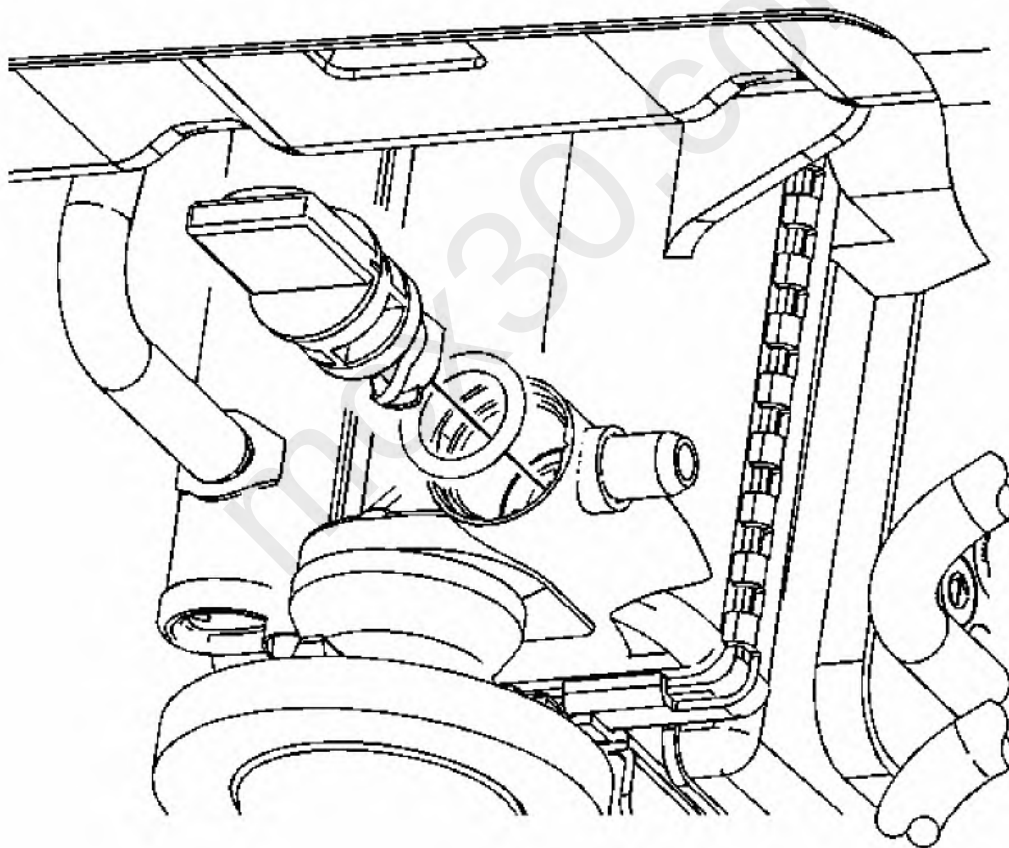


Fig. 103: View Of Drain Cock
Courtesy of GENERAL MOTORS CORP.

1. Drain the radiator. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Unscrew the drain plug from the radiator end tank.

3. Remove and discard the O-ring.

Installation Procedure

1. Install the new O-ring.

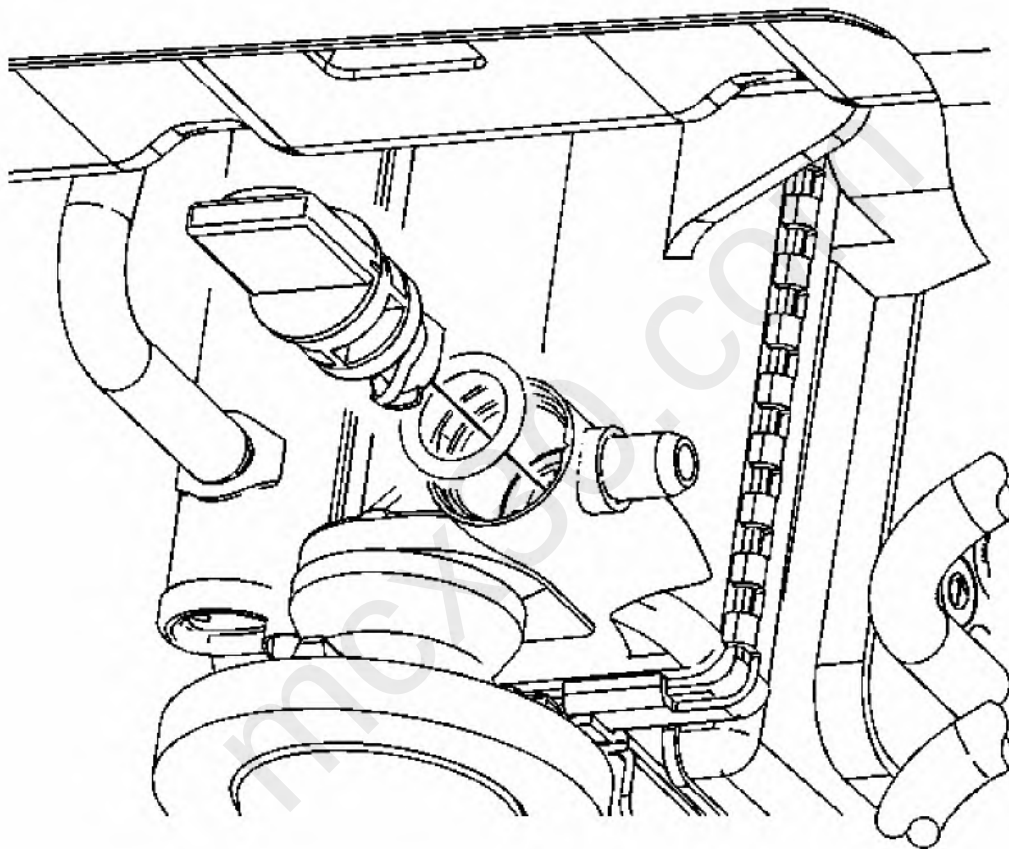


Fig. 104: View Of Drain Cock
Courtesy of GENERAL MOTORS CORP.

2. Install and tighten the drain plug into the end tank drain hole.
3. Fill the radiator. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.

RADIATOR REPLACEMENT

Tools Required

GE-47716 1617 Vac N Fill Coolant Refill Tool. See **Special Tools**.

Removal Procedure

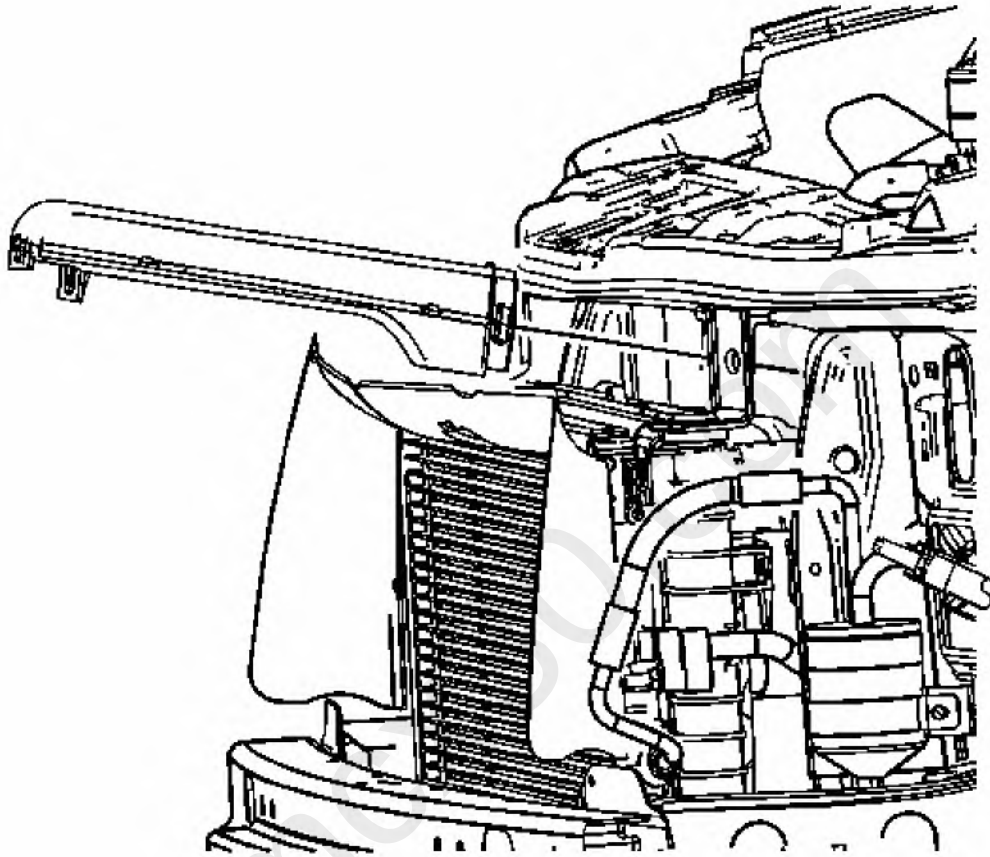


Fig. 105: View Of Battery Box Air Inlet Duct
Courtesy of GENERAL MOTORS CORP.

1. Drain the cooling system. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (GE 47716 Fill)**.
2. Remove the front fascia. Refer to **Fascia Replacement - Front Bumper (Equinox)** or **Fascia Replacement - Front Bumper (Torrent)** .
3. Remove the battery box air inlet duct.

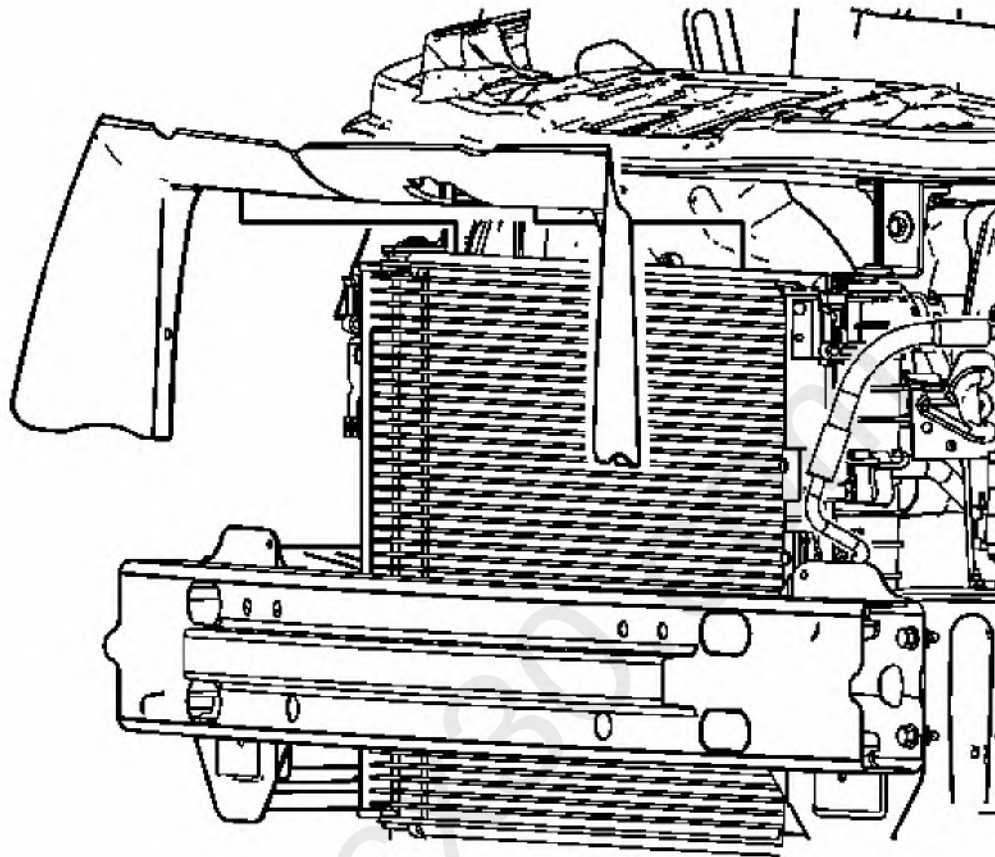


Fig. 106: View Of CRFM Closeout Panel
Courtesy of GENERAL MOTORS CORP.

4. Remove the condenser radiator fan module (CRFM) closeout panel retainers from the condenser.
5. Remove the CRFM closeout panel from the condenser.
6. Remove the fan assembly bolts from the radiator.
7. Lift the fan assembly to disengage the lower retention tabs.
8. Position the fan assembly away from the radiator.
9. Remove the front impact bar. Refer to **Impact Bar Replacement - Front Bumper** .

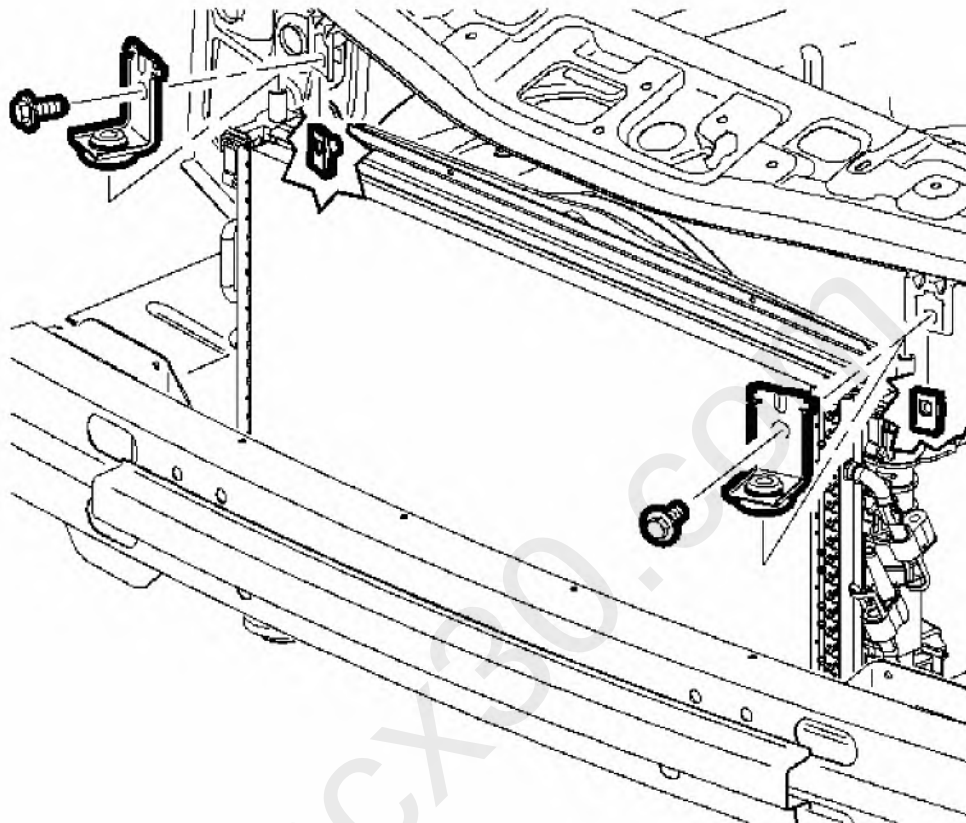


Fig. 107: View Of CRFM Mounting Brackets To The Radiator Support
Courtesy of GENERAL MOTORS CORP.

10. Remove the CRFM bracket bolts from the radiator support.
11. Remove the CRFM brackets from the radiator.

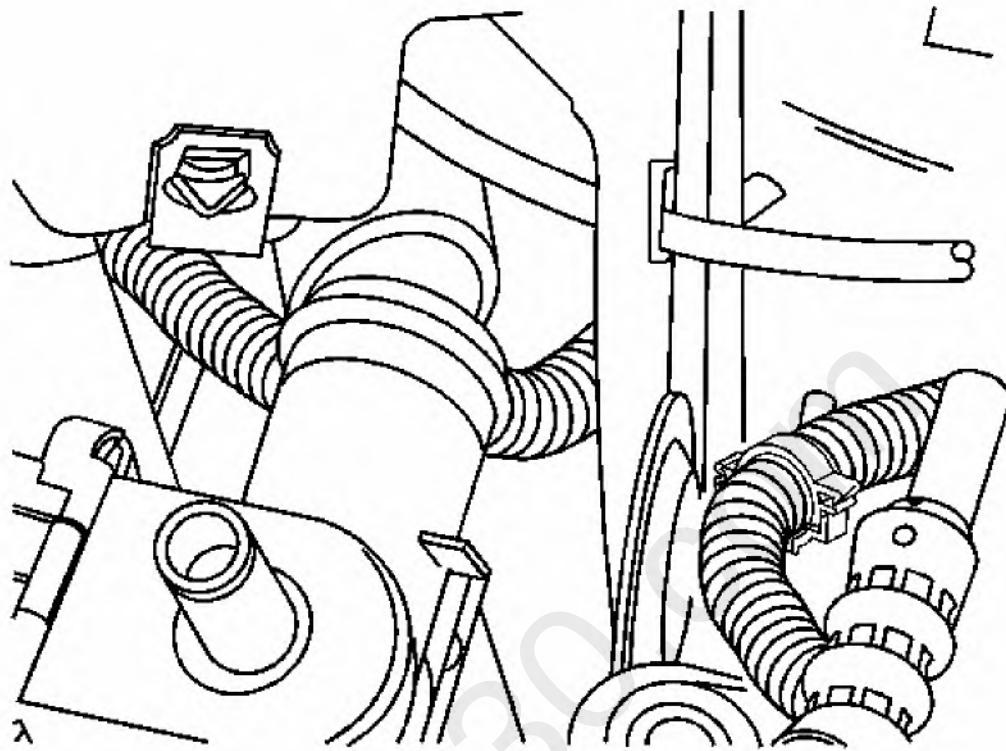


Fig. 108: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

12. Remove the radiator inlet hose clamp from the radiator.
13. Remove the radiator inlet hose from the radiator.

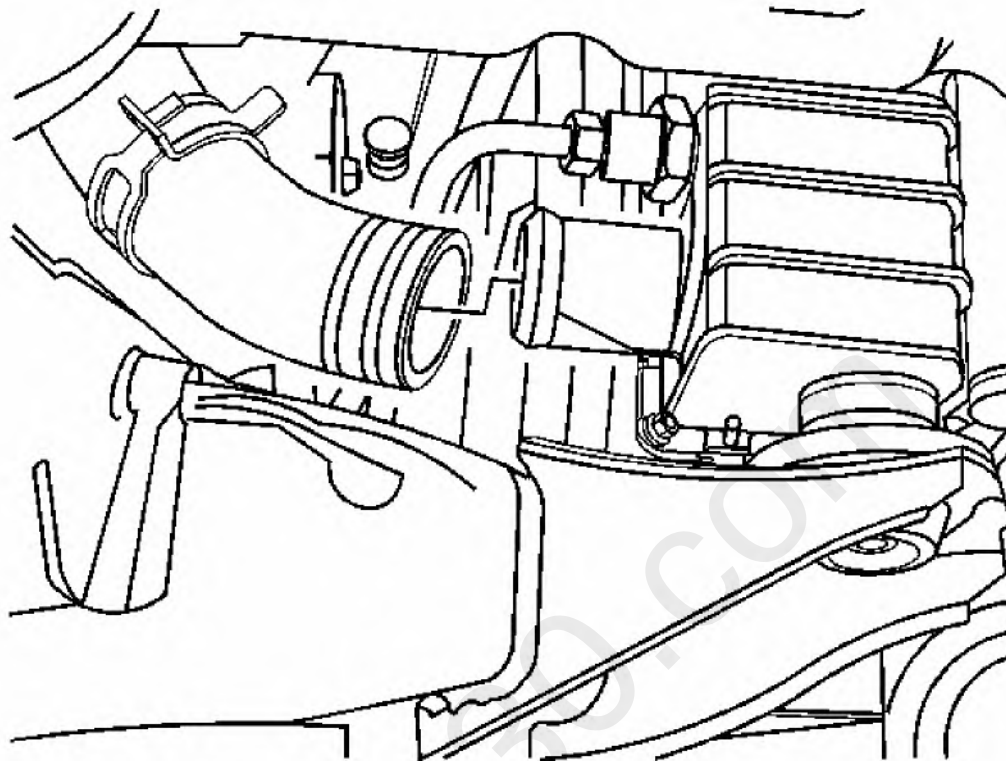


Fig. 109: Removing/Installing Radiator Outlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

14. Remove the radiator outlet hose clamp from the radiator.
15. Remove the radiator outlet hose from the radiator.

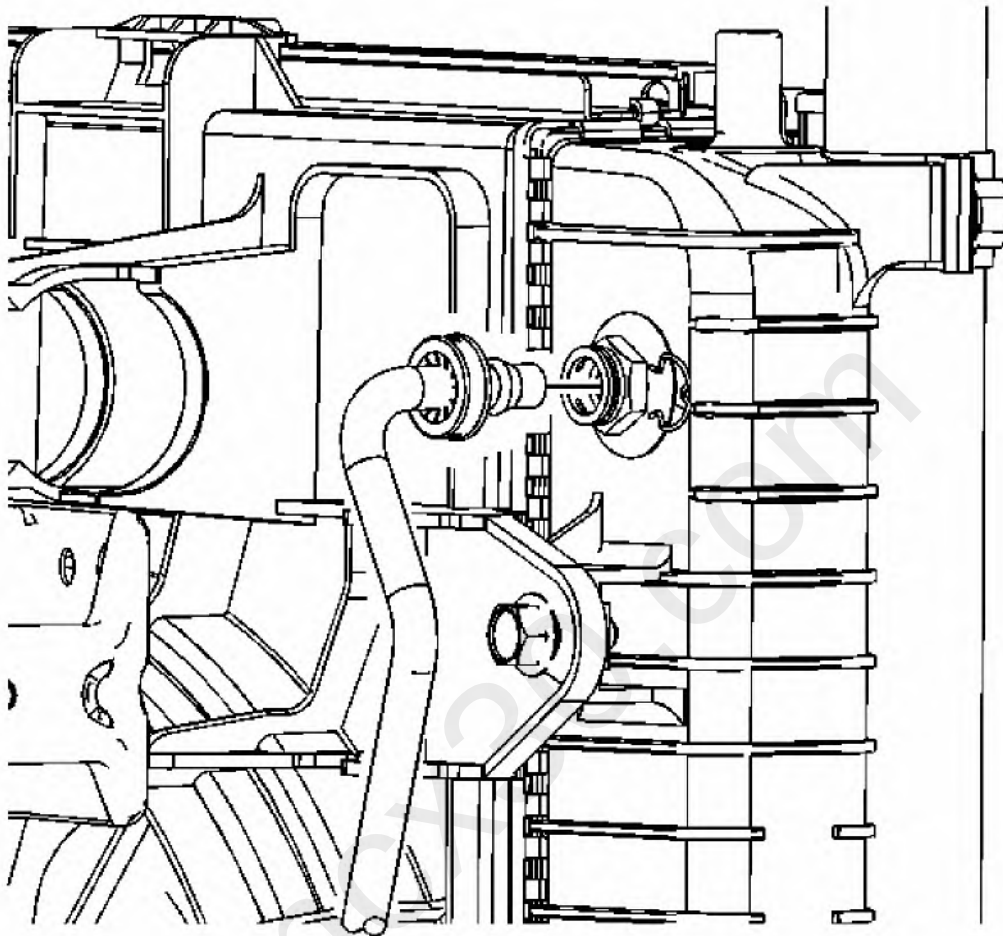


Fig. 110: View Of Transmission Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

16. Disconnect the transmission cooler liners from the radiator.

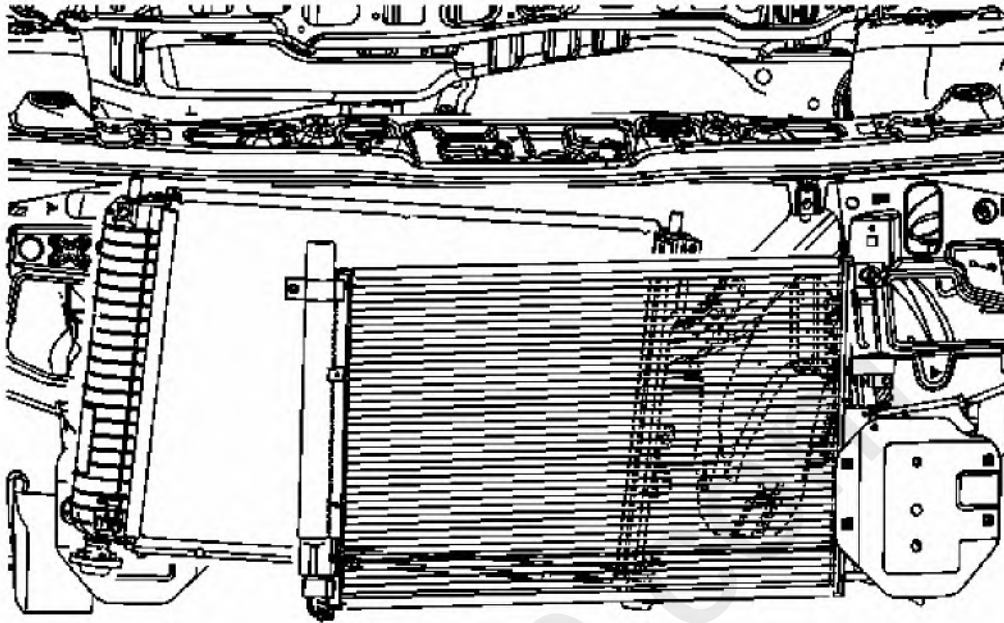


Fig. 111: View Of Radiator & Condenser
Courtesy of GENERAL MOTORS CORP.

17. Remove the bolts retaining the condenser to the radiator.
18. Position the condenser and radiator assembly forward of the right hand front impact bar bracket.

IMPORTANT: Be sure to properly support the condenser after radiator removal to prevent damage to the condenser and the A/C lines.

19. Separate the condenser from the radiator.
20. Remove the radiator from the vehicle.

Installation Procedure

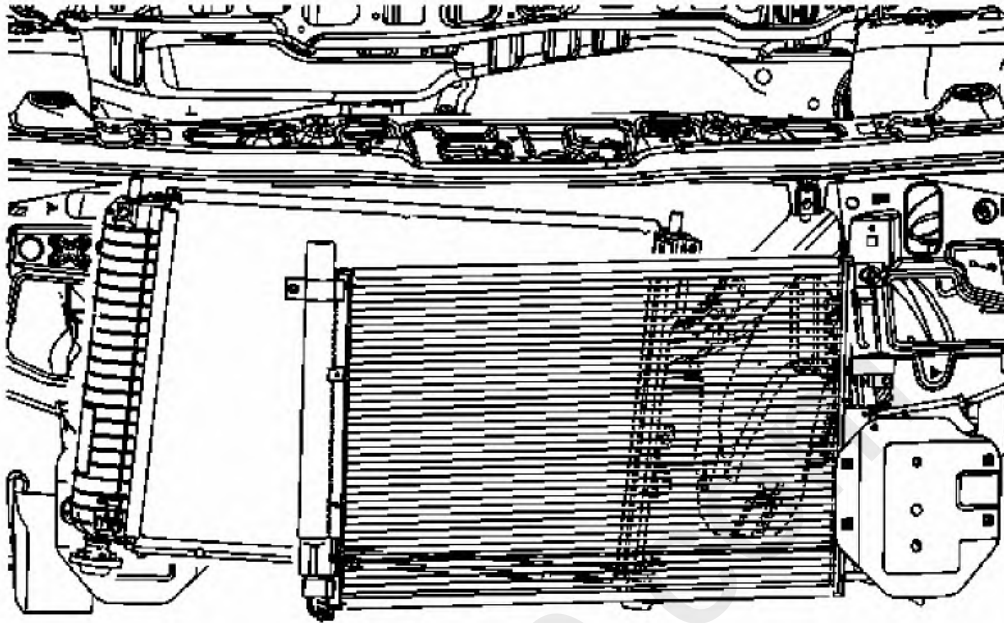


Fig. 112: View Of Radiator & Condenser
Courtesy of GENERAL MOTORS CORP.

1. Install the radiator to the vehicle.

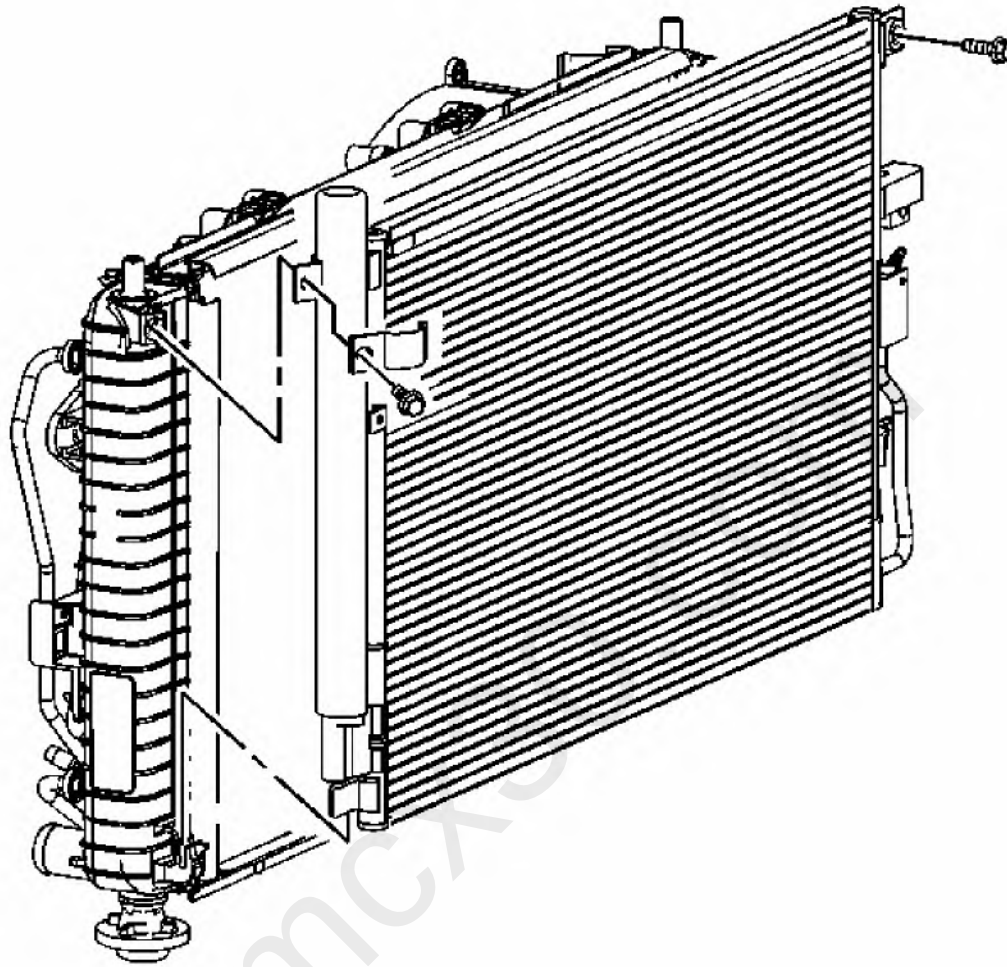


Fig. 113: View Of Condenser
Courtesy of GENERAL MOTORS CORP.

2. Install the condenser to the radiator.

NOTE: Refer to Fastener Notice.

3. Install the bolts to retain the top of the condenser to the radiator.

Tighten: Tighten the bolts to 9 N.m (80 lb in).

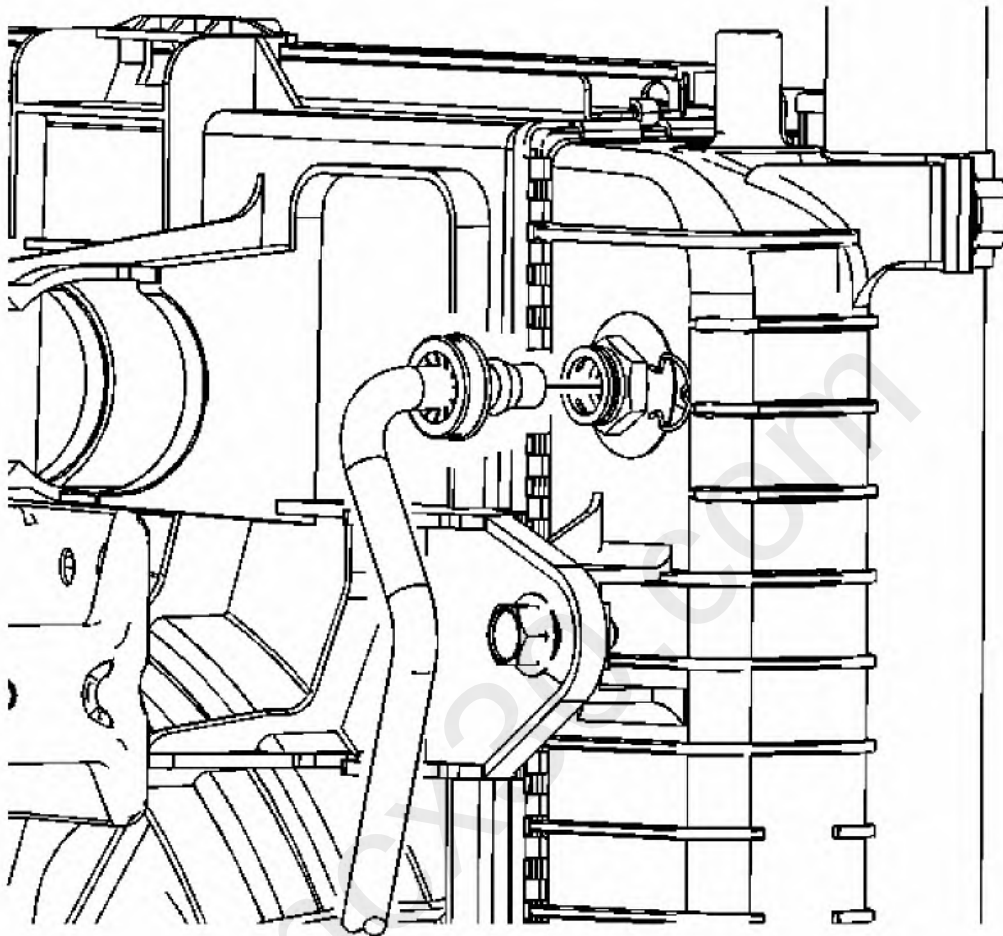


Fig. 114: View Of Transmission Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

4. Connect the transmission cooler liners to the radiator.

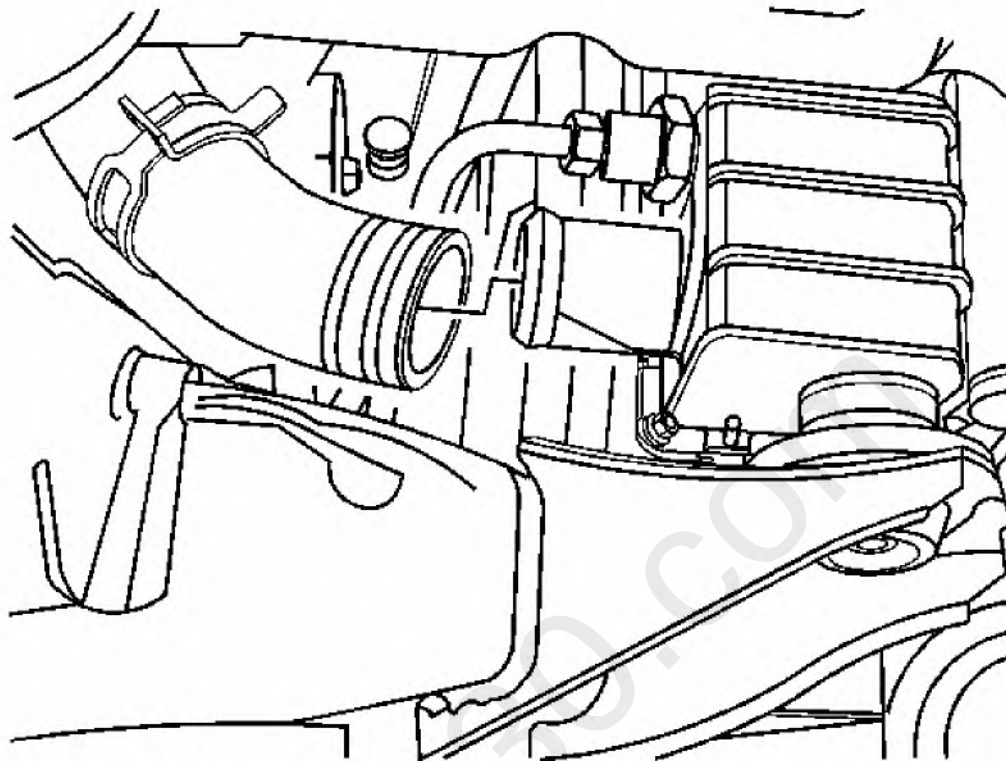


Fig. 115: Removing/Installing Radiator Outlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

5. Install the radiator outlet hose to the radiator.
6. Install the radiator outlet hose clamp to the radiator.

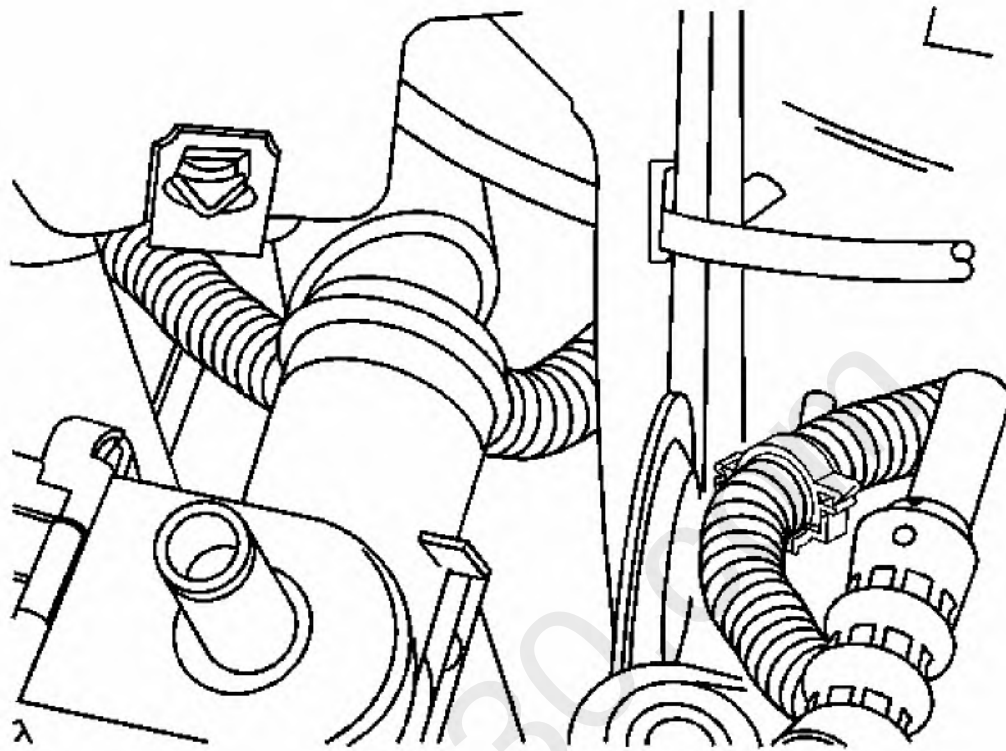


Fig. 116: Removing/Installing Radiator Inlet Hose At Radiator
Courtesy of GENERAL MOTORS CORP.

7. Install the radiator inlet hose to the radiator.
8. Install the radiator inlet hose clamp to the radiator.