

2017 HVAC

Heating, Ventilation, and Air Conditioning - Bolt EV

SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

Application
NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>
Air Conditioning Evaporator Thermal Expansion Valve Sealing Washer
Air Conditioning Refrigerant Pressure Sensor O-ring
Air Conditioning Receiver and Dehydrator Plug Seal
Liquid Line Hose Seal

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Air Conditioning and Drive Motor Cooling Compressor Bolt	22 N.m (16 lb ft)
Air Conditioning and Drive Motor Cooling Compressor Nut	22 N.m (16 lb ft)
Air Conditioning and Drive Motor Cooling Compressor Stud	10 N.m (89 lb in)
Air Conditioning Compressor Hose Bolt	22 N.m (16 lb ft)
Air Conditioning Compressor Hose Nut	22 N.m (16 lb ft)
Air Conditioning Compressor Pressure Relief Valve	7 N.m (62 lb in)
Air Conditioning Condenser hose Bolt	22 N.m (16 lb ft)
Air Conditioning condenser hose nut	22 N.m (16 lb ft)
Air Conditioning Evaporator Hose and Air Conditioning Evaporator Hose Nut	22 N.m (16 lb ft)
Air Conditioning Evaporator Hose Nut	22 N.m (16 lb ft)
Air Conditioning Evaporator Thermal Expansion Valve Bolt	7 N.m (62 lb in)
Air Inlet Duct Nut	3 N.m (27 lb in)
Blower Upper Case Screw	2.5 N.m (22 lb in)
Floor Front Air Outlet Duct Bolt	2.5 N.m (22 lb in)
Floor Rear Air Outlet Duct Nut	3 N.m (27 lb in)
Front Floor Console Bracket Bolt	2.5 N.m (22 lb in)
Front Floor Console Rear Air Duct Fastener	2.5 N.m (22 lb in)
Front Floor Console Rear Air Duct Screw	2.5 N.m (22 lb in)
Heater and Air Conditioning Evaporator and Blower Module Nut	9 N.m (80 lb in)
Heater and Air Conditioning Evaporator Case Screw	2.5 N.m (22 lb in)
Heater Case Screw	2.5 N.m (22 lb in)
Heater Coolant Heater Bracket Bolt	9 N.m (80 lb in)
Heater Coolant Heater Bracket Nut	9 N.m (80 lb in)
Heater Coolant Heater Wiring Harness Bolt	9 N.m (80 lb in)
Heater Coolant Pump Bolt	9 N.m (80 lb in)

Application	Specification
	Metric (English)
Heater Coolant Pump Bracket Bolt	9 N.m (80 lb in)
Heater Core Tube Bracket Screw	2.5 N.m (22 lb in)
Instrument Panel Outlet Air Outlet Duct Bolt	2.5 N.m (22 lb in)
Side Window Defogger Outlet Duct Bolt	2.5 N.m (22 lb in)

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
Cooling system (Heater cooling)	2.0 liters	2.12 quarts
Refrigerant Charge, R-1234yf	725 g	1.6 lbs
Total System POE Oil Capacity	120 ml	4.1 oz
Compressor ²	80 ml ¹	2.7 oz ¹
Condenser	20 ml ¹	0.7 oz ¹
Desiccant Cartridge	10 ml ¹	0.3 oz ¹
Evaporator	20 ml ¹	0.7 oz ¹
Drive Motor Battery Cooler	15 ml ¹	0.5 oz ¹
Any Line Set (Hose/Tube or Assembly) Replacement	10 ml ¹	0.3 oz ¹
Abrupt Refrigerant Loss	40 ml ³	1.4 oz ³
¹ If more than the specified amount of POE oil was drained from a component, add the equal amount of oil drained. ² The service compressor contains 80 ml (2.7 oz) of POE oil. ³ Abrupt refrigerant loss due to large leak, hose rupture, collision, or pressure relief valve opening. Conditions that allow the refrigerant to seep or bleed off over time do not cause this oil loss. Upon replacement of a component that caused a large refrigerant loss, also add the required amount of oil for the particular component.		

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number		
		United States	Korea	Europe
POE Oil (R-1234yf)	Lubricant	88862657	88862657	Refer to Electronic Parts Catalog.

DIAGNOSTIC INFORMATION AND PROCEDURES

HANDLING OF REFRIGERANT LINES AND FITTINGS

CAUTION: To avoid system damage use only R-1234yf and R-134a dedicated tools when servicing the A/C system.

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.
- Never bend a flexible hose line to a radius of less than four times the diameter of the hose.
- Never allow a flexible hose line to come within 65 mm (2 - 1/2 in) of the exhaust manifold.
- Inspect flexible hose lines regularly for leaks or brittleness.
- Replace flexible hose lines with new lines if you find signs of deterioration or leaking.
- Discharge the refrigeration system of all refrigerant before disconnecting any fitting in the refrigeration system.
- Proceed very cautiously regardless of the gauge readings.

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WARNING: For personal protection, goggles and lint-free gloves should be worn and a

clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

- Open the fittings very slowly.
- If you notice pressure when you loosen a fitting, allow the pressure to bleed off as described Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System.
- Cap or tape any refrigerant line immediately after it is opened. This will prevent the entrance of moisture and dirt, which can cause internal compressor wear or plugged lines in the condenser, the evaporator core, the expansion valve, or the compressor inlet screens.

NOTE: Use two proper wrenches to connect the fittings.

- Back up the opposing fitting to prevent distortion of the connecting lines or the components.
- Keep the sealing surfaces in perfect condition. A burr or a piece of dirt may cause a refrigerant leak.
- When seal washers are used, always install the seal washer without lubrication.
- When O-rings are used, always lightly coat the new O-ring seal with the proper viscosity and type refrigerant oil prior to installation.

LEAK TESTING

Special Tools

- **GE-41447** A/C Tracer Dye-Box of 24
- **GE-42220** Universal 12V Leak Detection Lamp
- **GE-43872** Fluorescent Dye Cleaner
- **GE-50078** Electronic Leak Detector

Equivalent regional tools. [Special Tools](#)

Refrigerant Leak Testing

Technicians repairing or servicing motor vehicle air conditioning (MVAC) systems must be trained and certified by an EPA approved organization. Certification is obtained by passing an EPA approved examination. (<http://www.epa.gov/ozone/title6/609/technicians/609certs.html>)

WARNING: Technicians must only use a SAE J2913 certified electronic leak detector when checking for leaks in an R-1234yf A/C refrigerant system. Other, non - certified, leak detection devices could serve as ignition sources in the presence of hydrocarbons or other flammable refrigerants. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

WARNING: Refer to [R-1234yf Proper Service Procedures Warning](#)

WARNING: *R1234-yf is considered a mildly flammable refrigerant and proper refrigerant leak testing should be completed to ensure safe and proper operation. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.*

CAUTION: Leak detection shall only be done with the refrigerant that is specified for the system. Do not attempt to increase pressure of the A/C refrigerant system with shop air or another type of refrigerant. Failure to follow the above guidelines could result in damage to the vehicle or its components.

NOTE: General Motors vehicles are manufactured with fluorescent dye installed in the A/C refrigerant system.

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The fluorescent dye mixes and flows with the A/C compressor oil throughout the refrigerant system.

NOTE: The only time adding additional fluorescent dye is required is after flushing the A/C system.

Verifying some passive leaks may require using **GE-50078** Electronic Leak Detector or a SAE J2913 certified electronic leak detector, even though the refrigerant system contains fluorescent dye.

Fluorescent Leak Detection

Fluorescent dye will assist in locating any leaks in the A/C system.

- Condensation on the evaporator core or the refrigerant lines may wash the compressor oil and fluorescent dye away from the actual leak. Condensation may also carry dye through the HVAC module drain.
- Leaks in the A/C system will be indicated in a light green or yellow color when using the leak detection lamp.

Use the leak detection lamp in the following areas:

- All fittings or connections that use seal washers or O-rings
- All of the A/C components
- The A/C compressor shaft seal
- The A/C hoses and pressure switches
- The HVAC module drain tube, if the evaporator core is suspected of leaking
- The service port sealing caps
- The sealing cap is the primary seal for the service ports.
- Follow the instructions supplied with **GE-42220** Universal 12V Leak Detection Lamp.
- To prevent false diagnosis in the future, thoroughly clean the residual dye from any area where leaks were found. Use a rag and the approved **GE-43872** Fluorescent Dye Cleaner.

Fluorescent Dye Injection

NOTE: Use only fluorescent dye approved by General Motors.

- Not all of the fluorescent dyes are compatible with all air conditioning oils. Some types of dye decrease the oil viscosity or may chemically react with the oil.
- **GE-41447** A/C Tracer Dye-Box of 24 can be poured directly into a removed A/C component.

NOTE: Do NOT overcharge the A/C system with dye.

- Leak detection dye requires time to work. Depending upon the leak rate, a leak may not become visible for between 15 minutes and 7 days.
- To prevent false diagnosis, thoroughly clean any residual dye from the service port with a rag and the approved **GE-43872** Fluorescent Dye Cleaner.

Electronic Leak Detector - SAE J2913 Certified

Ensure that the vehicle has at least 15 percent of the specified refrigerant charge in the A/C refrigeration system in order to perform a leak test. Refer to [Refrigerant Recovery and Recharging](#).

NOTE: Follow a continuous path in order to ensure that you will not miss any possible leaks. Test all areas of the system for leaks.

Follow the manufacturer instructions supplied with **GE-50078** Electronic Leak Detector or a SAE J2913 certified electronic leak detector.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST

This test measures the operating efficiency of the A/C system under the following conditions:

- The current ambient air temperature
- The current relative humidity

- The high side pressure of the A/C system
- The low side pressure of the A/C system
- The temperature of the air being discharged into the passenger compartment

Test Description

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

1

This step determines if the A/C system has at least the minimum refrigerant charge required to operate the system without damage.

2

This step measures the performance of the A/C system.

3

This step is to allow for vehicle variations as well as high ambient temperatures.

Step	Action	Values	Yes	No
NOTE: • The ambient air temperature must be at least 16Â°C (60Â°F). • Do not induce additional air flow across the front of the vehicle during the test. • If you were sent here from a DTC diagnostic table, clear the DTC upon completion of this test.				
1	1. Park the vehicle inside or in the shade. 2. Open the windows in order to ventilate the interior of the vehicle. 3. If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. 4. Turn OFF the ignition. 5. Install the J-43600 ACR 2000 Air Conditioning Service Center or GE-48800 CoolTech A/C Recharge Machine. 6. Record the ambient air temperature and humidity. 7. Record the low and high side STATIC pressure readings. Are both the low side and high side pressures within the specified value?	More than 16Â°C (60Â°F) - 345 kPa (50 psi) More than 24Â°C (75Â°F) - 483 kPa (70 psi) More than 33Â°C (90Â°F) - 690 kPa (100 psi)	Go to Step 2	Go to <u>Leak Testing</u>

Step	Action	Values	Yes	No
2	NOTE: Record the relative humidity and the ambient air temperature at the time of the test. 1. Close the vehicle doors and windows. 2. Open the drivers door window 12.7 - 15.2 cm (5 - 6 in). 3. Select the following HVAC control settings: • The A/C is ON. • The coldest temperature setting • The maximum blower speed • Recirculation mode • The instrument panel (I/P) outlet mode • All I/P outlets are OPEN. 4. Install thermometers in the left and right center panel air outlets. 5. Apply the parking brake. 6. Place the transaxle/transmission in one of the following positions: • PARK (Automatic) • NEUTRAL (Manual) 7. Start the engine and warm to operating temperature. 8. Operate the A/C system for 5 minutes. 9. Inspect A/C components for the following conditions: • Abnormal frost areas • Unusual noises 10. Record the following information: • The panel outlet air temperatures • The low-side pressure • The high-side pressure 11. Compare the low and high side pressures and the panel output temperatures to the A/C Performance Table below. Does all the data recorded fall within the specified ranges of the A/C Performance Table below?	-	Go to Step 5	Go to Step 3

Step	Action	Values	Yes	No
3	If the pressures and temperatures recorded do not fall within the specified ranges: 1. Continue to operate the A/C system for an additional 5 minutes. 2. Record the pressures and temperatures again. 3. Compare the low and high side pressures and the panel output temperature to the A/C Performance Table below. Does all the data recorded fall within the specified ranges of the A/C Performance Table below?	-	Go to Step 5	Go to Step 4
4	Perform the necessary repairs. Refer to A/C Diagnostics Chart. Is the action complete?	-	Go to Step 5	-
5	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to Symptoms - HVAC Systems - Automatic

A/C Performance Table

Ambient Temperature	Relative Humidity	Low Side Service Port Pressure	High Side Service Port Pressure	Maximum Left Center Discharge Air Temperature
13 - 18°C (55 - 65°F)	0 - 100%	151 - 227 kPa (22 - 33 psi)	1191 - 1467 kPa (173 - 213 psi)	7°C (43°F)
19 - 24°C (66 - 75°F)	Less than 40%	151 - 213 kPa (22 - 31 psi)	1419 - 1743 kPa (206 - 253 psi)	5°C (41°F)
	Greater than 40%	158 - 241 kPa (23 - 35 psi)	1398 - 1750 kPa (203 - 254 psi)	8°C (46°F)
25 - 29°C (76 - 85°F)	Less than 35%	158 - 220 kPa (23 - 32 psi)	1646 - 1942 kPa (239 - 282 psi)	8°C (45°F)
	35 - 50%	172 - 227 kPa (25 - 33 psi)	1646 - 1956 kPa (239 - 284 psi)	8°C (46°F)
	Greater than 50%	179 - 241 kPa (26 - 35 psi)	1660 - 1977 kPa (241 - 287 psi)	10°C (50°F)
30 - 35°C (86 - 95°F)	Less than 30%	172 - 234 kPa (25 - 34 psi)	1839 - 2177 kPa (267 - 316 psi)	9°C (48°F)
	30 - 50%	179 - 234 kPa (26 - 34 psi)	1860 - 2218 kPa (270 - 322 psi)	10°C (50°F)
	Greater than 50%	186 - 241 kPa (27 - 35 psi)	1880-2266 kPa (273 - 329 psi)	13°C (54°F)
36 - 41°C (96 - 105°F)	Less than 20%	186 - 248 kPa (27 - 36 psi)	2067 - 2397 kPa (300 - 348 psi)	12°C (52°F)
	20 - 40%	186 - 241 kPa (27 - 35 psi)	2080 - 2452 kPa (302 - 356 psi)	13°C (54°F)
	Greater than 40%	192 - 241 kPa (28 - 35 psi)	2122 - 2501 kPa (308 - 363 psi)	13°C (55°F)
42 - 46°C (106 - 115°F)	Less than 20%	206 - 261 kPa (30 - 38 psi)	2301 - 2597 kPa (334 - 377 psi)	13°C (55°F)
	Greater than 20%	206 - 254 kPa (30 - 37 psi)	2321 - 2659 kPa (337 - 386 psi)	14°C (57°F)
47 - 49°C (116 - 120°F)	Below 30%	220 - 268 kPa (32 - 39 psi)	2521 - 2831 kPa (366 - 411 psi)	17°C (61°F)

A/C DIAGNOSTICS CHART

A/C System Concern		Potential Causes
Compressor Inoperative		Electrical Wiring Issue
		No or Low Refrigerant Charge
		Compressor Internal Malfunction
		Compressor Clutch Malfunction
		A/C Pressure Sensor Malfunction
		Evaporator Air Temperature (EAT) Malfunction
		HVAC Controls Malfunction
Low Side Gauge Reading	High Side Gauge Reading	Potential Causes
Same as High Side	Same as Low Side	No or Low Refrigerant Charge
		Compressor Malfunction
		A/C Pressure Sensor Malfunction
		EAT Malfunction
		HVAC Controls Malfunction
Normal	Normal	Temperature Actuator Malfunction
		Temperature Door Malfunction
Low	Low	Low Refrigerant Charge
		Restriction between the Compressor Outlet and Low Side Port
	Low/Normal	Evaporator Freezing/EAT Malfunction
	High	Compressor Stuck at Maximum Displacement/EAT Malfunction
Normal/High	Normal/High	PAG or POE Oil Overcharge
High	Low	Restriction between the Low Side Port and Compressor Inlet
		Expansion Device Stuck Open
		Compressor has Low Displacement or Internal Malfunction
	High	Malfunctioning Cooling Fans
		Refrigerant Overcharge
		Restricted Condenser Air Flow
		Air in A/C System
NOTE: Restrictions can occur in any part of an A/C system and may result in various gauge pressure values, depending on the system design and service port locations. The use of a non-contact, infrared thermometer can help diagnose a restricted A/C system with the ability to quickly observe significant, unexpected temperature changes in components and plumbing due to debris, contamination, pinched/damaged hoses, etc.		

HEATING PERFORMANCE DIAGNOSTIC

Step	Action	Yes	No
DEFINITION: Heating system performance.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic

Step	Action	Yes	No
	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> .		
2	1. Turn ignition to on. 2. Select vent mode. 3. Select the warmest temperature setting. 4. Select Maximum blower speed. 5. Feel the temperature of the heater core inlet hose. Does the heater core inlet hose feel warm to hot?	Go to Step 3	Go to Step 9
3	1. Select the minimum blower speed. 2. Feel the temperature of the heater core inlet and outlet hoses. Does the heater core inlet hose feel warmer than the heater core outlet hose?	Go to Step 7	Go to Step 4
4	1. Install a thermometer into the center I/P panel air outlet. 2. Secure a thermometer to the heater core outlet hose. 3. Select the maximum blower speed. 4. Record the temperature at the following location. 5. Record the temperature at the following locations: • The center I/P panel air outlet • The heater core outlet hose 6. Compare the recorded temperatures. Are the two temperature readings about equal?	Go to Step 5	Go to Step 6
5	1. Inspect and repair the following areas of the vehicle for cold air leaks: • The cowl • The recirculation door • The HVAC module case 2. Perform the necessary repairs. Are the repairs complete?	Go to Step 11	-
6	1. Inspect the temperature door operation. 2. Perform any necessary repairs. Are the repairs complete?	Go to Step 11	-

Step	Action	Yes	No
7	1. Turn the ignition to off. 2. Backflush the heater core. 3. Turn the ignition to on. 4. Select the vent mode. 5. Select the minimum blower speed. 6. Select the warmest temperature setting. 7. Feel the temperature of the heater core inlet and outlet hoses. Does the heater core inlet hose feel warmer than the heater core outlet hose?	Go to Step 8	Go to Step 11
8	Replace the heater core. Heater Core Replacement Is the repair complete?	Go to Step 11	-
9	Inspect and repair the following areas: • Kinked hose • Heater valve inlet filter • Air in the coolant circuit • Inoperable heater valve Did you find and correct the condition?	Go to Step 11	Go to Step 10
10	Inspect the coolant heater control module. Is the repair complete?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

DEFROSTING INSUFFICIENT

Step	Action	Yes	No
DEFINITION: Time required to defrost the windshield is longer than normal.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Turn ignition to ON.. 2. Select the DEFROST mode. 3. Select the maximum blower speed. Does sufficient air flow from the defroster outlets?	Go to Step 3	Go to Step 6
3	WARNING: Refer to Moving Parts and Hot Surfaces Warning . 1. Select the minimum blower speed. 2. Select the maximum temperature setting. 3. Feel the temperature of the inlet and outlet hoses at the heater core. Does the inlet hose feel warmer than the outlet hose?	Go to Step 7	Go to Step 4
4	Perform the A/C system performance test. Air Conditioning (A/C) System Performance Test Is the A/C system operating within the specifications?	Go to Step 5	Go to Step 8
5	Inspect for correct operation of the air inlet door. Is the air inlet door operating correctly?	Go to Step 10	Go to Step 9

Step	Action	Yes	No
6	Repair the air delivery concern. Diagnostic Starting Point - Vehicle Is the repair complete?	Go to Step 10	-
7	Repair the heating concern. Heating Performance Diagnostic Is the repair complete?	Go to Step 10	-
8	Repair the A/C performance concern. Air Conditioning (A/C) System Performance Test Is the repair complete?	Go to Step 10	-
9	Repair the air inlet door concern. Air Inlet Housing Replacement Is the repair complete?	Go to Step 10	-
10	Operate the system in order to verify the repair. Did you find and correct the problem?	System OK	Go to Step 2

NOISE DIAGNOSIS - BLOWER MOTOR

Step	Action	Yes	No
DEFINITION: Noise originating from the blower motor.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	Inspect the air inlet grille for debris. Is debris present?	Go to Step 8	Go to Step 3
3	1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn the ignition to the accessory position. 4. Cycle the blower motor through all of the speeds and modes in order to determine where and when the noise occurs. Is a noise evident during the blower operation?	Go to Step 4	Go to Step 11
4	Inspect for excessive vibration at each blower motor speed by feeling the blower case. Is excess vibration present?	Go to Step 6	Go to Step 5
5	Listen to the blower motor at each speed. Is the blower motor making a squeaking or chirping noise?	Go to Step 9	Go to Step 11
6	1. Remove the blower motor. Refer to Blower Motor Replacement . 2. Inspect the blower motor impeller for deposits of foreign material. 3. Inspect the blower motor for deposits of foreign material. Did you find any foreign material on the blower motor or blower motor impeller?	Go to Step 8	Go to Step 7
7	Inspect the blower motor for the following conditions: - Cracked blades - A loose impeller retainer - Improper impeller alignment Did you find any of these conditions?	Go to Step 9	cardiagn.com Go to Step 10

Step	Action	Yes	No
8	Remove the foreign material. Is the action complete?	Go to Step 10	-
9	Replace the blower motor. Refer to Blower Motor Replacement . Is the repair complete?	Go to Step 11	-
10	Install the blower motor. Refer to Blower Motor Replacement . Is the action complete?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

AIR CONDITIONING COMPRESSOR OIL DIAGNOSIS

NOTE:

To avoid repeat compressor failure, always inspect the condition of the refrigerant oil and take the appropriate corrective action before installing the replacement compressor.

Condition	Corrective Action
Clean Oil no debris present	No corrective action necessary.
Clean Oil with debris present	- Inspect the suction port of the replacement compressor for presence of a suction screen. If the replacement compressor does NOT contain a suction screen, install suction screen in the line. - Replace desiccant or component containing the desiccant. - Replace desiccant filter if applicable. - Remove and inspect high pressure side filter (if applicable). - Remove, inspect, clean, or replace orifice tube. - If the system has a front orifice tube and is equipped with a filter in the rear auxiliary line, remove, inspect, clean, or replace the filter. - If the system has a front orifice tube and is not equipped with a filter in the rear auxiliary line, remove the filter in the auxiliary TXV and Install a universal inline A/C Filter P/N 89016656 (AC Delco P/N 15-10413) as close to the rear TXV as possible.
Dark brown/black and/or pungent/unusual odor with no debris present	- Replace desiccant or component containing the desiccant. - Replace desiccant filter if applicable. - Flush refrigerant system. Refer to Flushing.
Dark brown/black and/or pungent/unusual odor with debris present	- Replace desiccant or component containing the desiccant. - Replace desiccant filter if applicable. - Flush refrigerant system. Refer to Flushing. - Inspect the suction port of the replacement compressor for presence of a suction screen. If the replacement compressor does NOT contain a suction screen, install suction screen. - Remove and inspect high pressure side filter (if applicable). - Remove, inspect, clean, or replace orifice tube. - If the system has a front orifice tube and is equipped with a filter in the rear auxiliary line, remove, inspect, clean, or replace the filter. - If the system has a front orifice tube and is not equipped with a filter in the rear auxiliary line, remove the filter in the auxiliary TXV and install a universal inline A/C Filter P/N 89016656 (AC Delco P/N 15-10413) as close to the rear TXV as possible.
Oil Overcharge	Flush refrigerant system. Refer to Flushing .

Condition	Corrective Action
Refrigerant Contamination	Flush refrigerant system. Refer to Flushing .
Hybrid Polyolester Refrigerant Oil (POE) Contamination	• Flush refrigerant system. Refer to Flushing. • Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable.

NOISE DIAGNOSIS - HVAC MODULE

Step	Action	Yes	No
DEFINITION: Noise originating from the HVAC module.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Cycle through all of the following: • Blower motor speeds • HVAC modes • Temperature control settings 3. Determine the type of noise: • Scrape, pop • Tick/click, chirp or groaning • Air rush/whistle Is a scrape or pop noise evident when selecting modes or temperature settings?	Go to Step 6	Go to Step 3
3	Is a tick/click, chirping, groaning or scraping noise present, but decreases as blower motor speed is decreased?	Go to Step 6	Go to Step 4
4	Is an air rush/whistle noise evident in all modes but not all temperature settings?	Go to Step 6	Go to Step 5
5	Is an air rush/whistle noise evident only in defrost or floor mode?	Go to Step 6	Go to Step 6
6	Remove the IP carrier. Instrument Panel Assembly Replacement . Is the action complete?	Go to Step 7	-
7	1. Inspect the air flow doors for proper operation. 2. Inspect the ducts for obstructions or foreign materials. Were any of these conditions found?	Go to Step 10	Go to Step 8
8	Inspect the mode and temperature doors and seals for warping or cracking. Are the doors in normal condition?	Go to Step 11	Go to Step 9
9	Replace the appropriate door and/or seals. Is the repair complete?	Go to Step 11	-
10	Remove any obstructions or foreign material found. Is the action complete?	Go to Step 11	-
11	Install the IP Assembly. Instrument Panel Assembly Replacement . Is the action complete?	Go to Step 12	-
12	Operate the system to verify the repair. Did you find and correct the condition?	System OK	cardiagn.com Go to Step 2

ODOR DIAGNOSIS

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start Turn ignition to on. 4. Select the maximum blower speed. 5. Select the PANEL air outlet mode. 6. Select the coldest temperature setting. 7. Cycle through all of the blower speeds, modes and temperatures to define what type of odor is present. • Musty smell • Coolant smell • Oil smell Does the odor have a musty smell?	Go to Step 3	Go to Step 8
3	Inspect the HVAC filter and the air inlet grille for debris. Is debris present?	Go to Step 4	Go to Step 5
4	Remove any debris. Is the action complete?	Go to Step 15	-
5	Inspect for wet carpeting. Is the carpet wet?	Go to Step 6	Go to Step 8
6	Inspect for the following conditions: 1. Water leaks around the windshield 2. Blockage of the HVAC module drain 3. Leaks around the door seals Is a leak present?	Go to Step 7	Go to Step 15
7	Repair the leak as necessary. Is the repair complete?	Go to Step 15	-
8	Does the odor have a coolant smell?	Go to Step 9	Go to Step 12
9	Inspect the cooling system for leaks. Hybrid Cooling System Leak Test , or Cabin Heater Coolant Heater System Loss of Coolant Is a leak present?	Go to Step 10	Go to Step 12
10	Inspect for coolant leaking inside the vehicle or for a film build-up on the windshield. Is the condition present?	Go to Step 11	Go to Step 15
11	Replace the heater core. Heater Core Replacement Is the repair complete?	Go to Step 15	-
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15

Step	Action	Yes	No
13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: • Oil Leak Diagnosis • Fluid Leak Diagnosis 2. Repair any oil leaks. Is the repair complete?	Go to Step 15	-
14	A musty odor can be caused by mold or mildew build-up on the evaporator or the heater core or inside of the HVAC module. Odor Correction Is the action complete?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

CABIN HEATER COOLANT HEATER SYSTEM LOSS OF COOLANT

Step	Action	Yes	No
DEFINITION: The heater coolant heater cooling system is losing coolant either internally or externally.			
1	Inspect the coolant level. Is the coolant at the proper level?	Go to Step 13	Go to Step 2
2	Fill the cooling system to the proper level. Heater Coolant Heater Draining and Filling Is the action complete?	Go to Step 3	-
3	Overheating can cause a loss of coolant. Is the Heater Coolant Heater Cooling system overheating?	Go to Step 11	Go to Step 4
4	Visually inspect the hoses, pipes and hose clamps. Are any of the hoses, clamps or pipes leaking?	Go to Step 12	Go to Step 5
5	Visually inspect the following components: • Coolant surge tank • Coolant pressure cap • Air separator • Radiators • Coolant pumps • Coolant valves • Heater Coolant Heater Are any of the listed components leaking?	Go to Step 12	Go to Step 6
6	1. Pressure test the heater coolant heater cooling system. Cabin Heater Coolant Heater System Leak Testing 2. With the heater coolant heater cooling system pressurized, visually inspect the components listed in step 5. Are any leaks present?	Go to Step 12	Go to Step 7
7	Pressure test the coolant pressure cap. Cabin Heater Coolant Heater System Pressure Cap Testing Does the coolant pressure cap hold pressure?	Go to Step 9	Go to Step 8
8	Replace the coolant pressure cap. Is the repair complete?	Go to Step 13	cardiagn.com

Step	Action	Yes	No
9	1. Pressure test the heater coolant heater cooling system. Cabin Heater Coolant Heater System Leak Testing 2. With the cooling system pressurized, remove the heater coolant heater cooling system pressure cap. Does the heater coolant heater cooling system hold pressure?	-	Go to Step 10
10	Replace the surge tank. Heater Coolant Surge Tank Replacement Is the repair complete?	Go to Step 13	-
11	Repair the heater coolant heater cooling system overheating condition. Is the repair complete?	Go to Step 13	-
12	Repair or replace the leaking component. Refer to the appropriate repair. Is the repair complete?	Go to Step 13	-
13	Operate the system in order to verify the repair. NOTE: Do not use stop leak or any other chemicals. Only use premix Dexcool (50/50 mixture of Dexcool and deionized) Did you find and correct the condition?	System OK	Go to Step 2

CABIN HEATER COOLANT HEATER SYSTEM PRESSURE CAP TESTING

Special Tools

- **GE-46143** Radiator Cap and Surge Tank Test Adapter
- **EN-24460-A** Cooling System Pressure Tester

For equivalent regional tools, Refer to **Fastener Specifications** .

Pressure Cap Testing

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

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

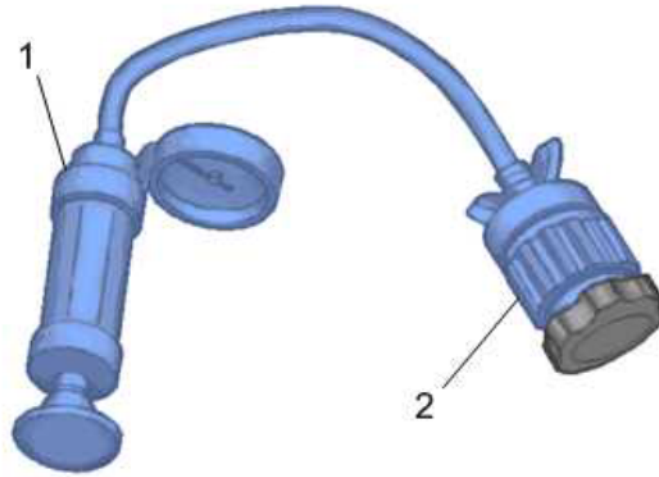


Fig. 1: Identifying Pressure Cap Tester

Courtesy of GENERAL MOTORS COMPANY

NOTE: Lubricate GE-46143 Radiator Cap and Surge Tank Test Adapter and pressure cap O-rings with coolant and press cap to seat O-ring on GE-46143 Radiator Cap and Surge Tank Test Adapter before turning to engage threads.

3. Use the **EN-24460-A** Cooling System Pressure Tester (1) with **GE-46143** Radiator Cap and Surge Tank Test Adapter (2) in order to test the pressure cap.
4. Test the pressure cap for the following conditions:
 - Pressure release when the **EN-24460-A** Cooling System Pressure Tester exceeds the pressure rating of the pressure cap.
 - Maintain the rated pressure for at least 10 seconds.

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

CABIN HEATER COOLANT HEATER SYSTEM LEAK TESTING

Special Tools

- **EN-24460-A** Cooling System Pressure Tester
- **GE-46143** Radiator Cap and Surge Tank Test Adapter

For equivalent regional tools, Refer to [Fastener Specifications](#) .

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

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

under pressure if the cap is removed too soon.

1. Remove the pressure cap.
2. Test the operation of the pressure cap. [Cabin Heater Coolant Heater System Pressure Cap Testing](#)
3. Wash the pressure cap mating surface with water.

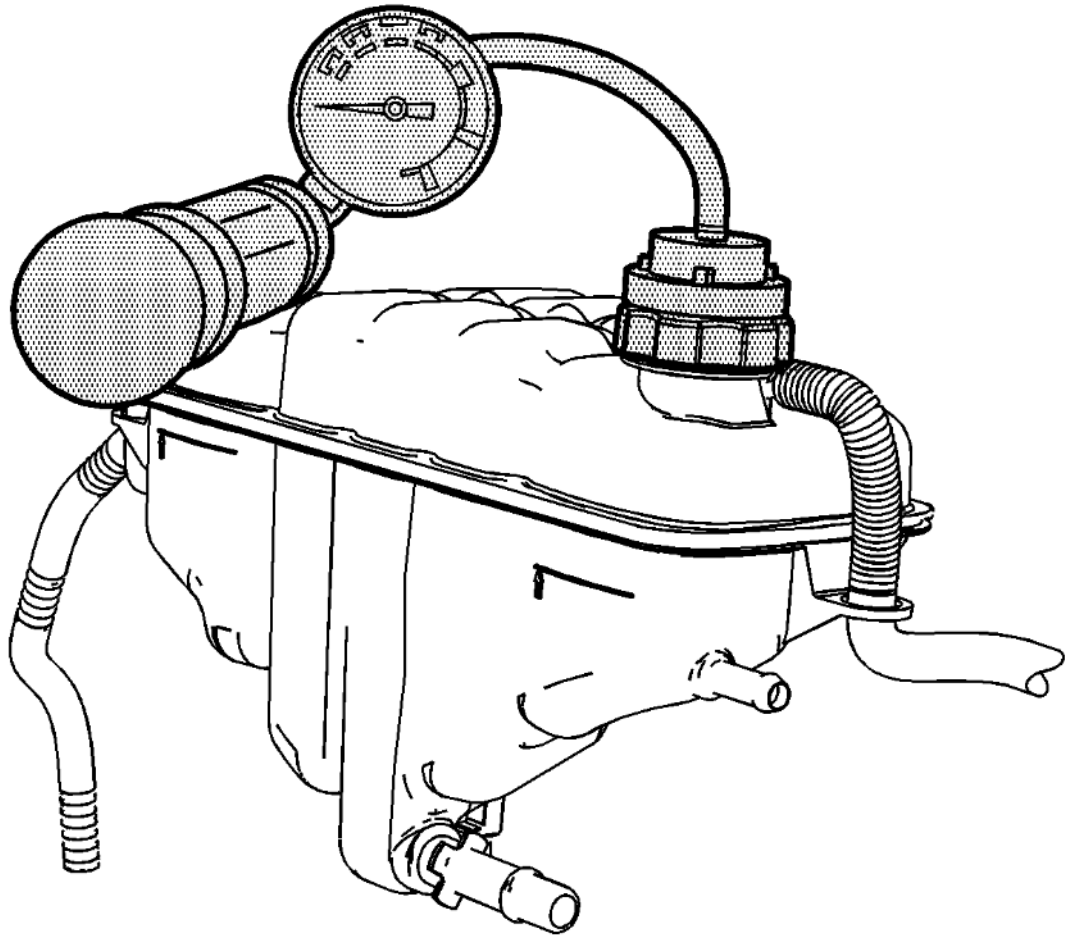


Fig. 2: Cooling System Pressure Tester Components

Courtesy of GENERAL MOTORS COMPANY

4. Use the **EN-24460-A** Cooling System Pressure Tester with the **GE-46143** Radiator Cap and Surge Tank Test Adapter in order to apply pressure to the cooling system.

Do not exceed the pressure cap rating.

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

Observe the gauge for any pressure loss.

NOTE: Do not use stop leak or any other chemicals. Only use premix Dexcool (50/50 mixture of Dexcool and deionized)

6. Repair any leaks as required.

REPAIR INSTRUCTIONS

ODOR CORRECTION

Eliminating Air Conditioning (A/C) Odor

Odors may be emitted from the air conditioning system primarily at start up in hot, humid climates. The following conditions may cause the odor:

- Debris is present in the HVAC module
- Microbial growth on the evaporator core

When the blower motor fan is turned on, the microbial growth may release an unpleasant musty odor into the passenger compartment. To remove odors of this type, the microbial growth must be eliminated. Perform the following procedure:

Deodorize the evaporator core using Deodorizing Aerosol Kit.

Perform the following steps in order to deodorize the A/C system:

1. Ensure that the plenum which draws outside air into the HVAC module is clear of debris.
2. Disable the air conditioning (A/C) compressor clutch operation by disconnecting the clutch coil electrical connector.
3. Dry the evaporator core by performing the following steps:
 1. Turn the ignition to run mode.
 2. Select the warmest temperature setting.
 3. Select the recirculation mode.
 4. Run the blower motor on high for 10 minutes.
4. Locate an area in the air conditioning duct between the blower motor and the evaporator core downstream of the blower motor.
5. Drill a 3.175 mm (0.125 in) hole where the hole will not interfere with or damage the following components:
 - The blower motor
 - The evaporator core
 - Any other operating part the of system
6. Wear safety goggles and latex gloves in order to perform the following actions:
 1. Select the maximum blower speed.
 2. Insert the deodorizer extension tube into the hole to the mark on the extension tube.
 3. Use short spray bursts and vary the direction of spray for a 2 - 3 minute period of time.
7. Shut the engine OFF. Allow the vehicle to sit for 3 - 5 minutes.
8. Seal the 3.175 mm (0.125 in) hole with body sealer or RTV gasket compound.
9. Turn the ignition to run mode.
10. Operate the blower motor on high for 15 - 20 minutes to dry.
11. Reconnect the A/C compressor clutch coil electrical connector.
12. Verify proper A/C clutch operation.

REFRIGERANT RECOVERY AND RECHARGING

Special Tools

- **GE-45037** A/C Oil Injector
- **GE-50078** Electronic Leak Detector
- **GE-50300-A** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart
- **GE-50957** Machine R-1234yf Contaminated Refrigerant
- **GE-50744** A/C R1234yf PAG Oil Injector Hose

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

General Information

R-1234yf (HFO-1234yf) - 2, 3, 3, 3 - Tetrafluoroprop-1-ene (CF₃CFCH₂), is an olefin containing hydrogen, fluorine and carbon with thermodynamic properties similar to R-134a. This refrigerant is a mildly flammable gas. It has a boiling point of -29.2Â°C, a vapor pressure of 583 kPa absolute at 20Â°C, no ozone depletion potential, and a global warming potential (GWP) of 4.

R-1234yf supply tank is white with red band to denote flammability.

In certain regions, technicians repairing or servicing motor vehicle air conditioning (MVAC) systems must be trained and certified by the appropriate regional or national regulatory agency.

- In the USA, refer to the EPA website for MVAC training requirements. <http://www.epa.gov/ozone/title6/609/technicians/609certs.html>
- In Canada, refer to the Environment Canada website for MVAC training requirements. <http://www.ec.gc.ca/ozone/default.asp?lang=En&n=943E1CAB-1#ws4E6F6835>
- In Europe, refer to Commission Regulation (EC) No 307/2008 for MVAC training requirements. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:092:0025:0027:EN:PDF>

WARNING: Refer to **R-1234yf Proper Service Procedures Warning** .

Vehicles equipped with R-1234yf refrigerant systems have unique low and high side service fittings.

The proper handling procedures should be followed for all refrigerants as designated by the refrigerant manufacturer's Material Safety Data Sheet (MSDS).

Refrigerant Recovery and Recharging

To remove, recycle and install R-1234yf from/to a vehicles refrigerant system only use **GE-50300-A** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart or refrigerant recovery recharge equipment certified to meet the requirements of SAE J2843.

To remove contaminated refrigerant from a vehicles refrigerant system use **GE-50957** Machine R-1234yf Contaminated Refrigerant or only service equipment designed for contaminated refrigerant removal and certified to meet the requirements of SAE J2851. Refrigerant recovered by this equipment cannot be reused or recycled on site and must be sent to an approved reclamation facility for reprocessing or disposal.

To prevent accidental release of refrigerant and minimize safety concerns, the installation of any refrigerant service equipment to the vehicle shall only be done with the engine off and after the refrigerant high side pressure has been reduced (approximately 2 - 3 minutes).

Open the windows and/or doors before charging the vehicle to prevent an accumulation of refrigerant in case of a major refrigerant leak.

WARNING: ***R-1234yf is heavier than air and may accumulate in low or pit areas - make sure these areas are properly ventilated. Failure to follow this precaution may cause personal injury.***

Refrigerant service equipment is required to ensure adequate refrigerant recovery to reduce emissions and provide for accurate recharging of mobile air conditioning systems. Venting refrigerant to the atmosphere is illegal in the USA and EU and may have restrictions in other regions.

WARNING: ***To prevent personal injury, avoid breathing any refrigerant vapor and lubricant mist. Servicing of R-1234yf systems shall only be done in well ventilated work areas. To remove R-1234yf refrigerant from the A/C refrigerant system, recover using SAE J2843 certified equipment. Un-controlled release of R-1234yf refrigerant in the work area may result in high concentrations of R-1234yf that can be flammable. If an accidental system discharge occurs, ventilate the work area before continuing service. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.***

WARNING: For personal protection, goggles and lint-free gloves should be worn and a clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

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WARNING: Evaporators in vehicles equipped with R-1234yf refrigerant systems must never

be repaired or replaced with an evaporator removed from another or salvage vehicle. Use only new SAE J2842 certified and labeled evaporator(s) as replacement parts. Failure to follow this guideline could pose a health and/or safety risk to the vehicle occupant(s).

CAUTION: Air Conditioning (A/C) desiccant must be replaced if the A/C refrigerant system has been open to atmosphere for more than four hours, or if the A/C refrigerant oil has been contaminated. Failure to replace the A/C desiccant will result in damage to the A/C refrigerant system.

CAUTION: Use only the refrigerant and the charge amount specified in "Refrigerant System Specifications" found in HVAC Service Manual or the vehicles under hood refrigerant label. Use of incorrect refrigerant or charge amounts may result in poor system performance and premature system failure.

CAUTION: Use only the lubricant specified for this vehicles refrigerant system. Do not mix refrigerant oils which may result in system contamination and unknown reaction by-products which may cause HVAC System failure.

To protect the refrigerant supply **GE-50300-A** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart or SAE J2843 equipment requires the refrigerant to be analyzed for purity prior to its recovery or transfer. The equipment is required to receive an acceptable reading from the integrated refrigerant identifier prior to recovery or transfer.

If an unacceptable reading is received (and the presence of foreign gases detected) the refrigerant is considered contaminated and the equipment will not allow its recovery or transfer to an onboard storage vessel. If refrigerant is contaminated use **GE-50957** Machine R-1234yf Contaminated Refrigerant or SAE J2851 compliant equipment to recover for reclamation and/or disposal at an EPA approved facility (<http://www.epa.gov/ozone/title6/608/reclamation/reclist.html>) or regional approved facility.

As a safety precaution **GE-50300-A** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart or SAE J2843 compliant equipment requires the MAC system to pass a pre-charge leak test (to detect the possibility of a gross system leak prior to charging, >0.3 g/s) prior to allowing the MAC system to be charged. The pressurized portion of this test will require the technician set the vehicles HVAC blower motor on high, A/C switch off and air distribution mode set to floor. The technician shall insert a **GE-50078** Electronic Leak Detector or J2913-compliant electronic leak detector, set to low sensitivity (14 grams/year leak rate) into the center of a floor duct outlet, as far as possible. When the technician confirms that the vehicle is set up for the pressurized leak check the **GE-50300-A** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart will install 15% of the programmed charge into the vehicles refrigerant system. The technician monitors the electronic leak detector for 5 minutes or until the detector alarms.

The equipments display will then ask the following:

1. Was this test performed? If the technician replies Yes, the display next shall ask,
2. Was a leak found? If technician replies Yes, the machine shall only allow recovery and evacuation to allow repair. If the technician replies No, the display shall continue with,
3. Is there an auxiliary evaporator? If the technician replies No the machine shall permit completion of the recharge process. If the technician replies Yes, the display shall instruct the technician to perform a leak check with **GE-50078** Electronic Leak Detector or a J2913-compliant detector at a rear evaporator outlet, then ask,
4. Was an auxiliary evaporator leak check performed? If the technician replies Yes, the display will continue with Was a leak found? and if the answer is Yes, the machine shall only allow recovery and evacuation to allow repair. If the technician replies No, the machine shall permit completion of the recharge process.

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement, the oil must be replenished. Oil can be injected into a charged system using **GE-45037** injector with **GE-50744** A/C R1234yf PAG Oil Injector Hose. For the proper quantities of oil to add to the A/C refrigerant system, refer to [Approximate Fluid Capacities](#).
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FLUSHING

Special Tools

- **GE-45268** A/C Flushing Adapter Kit
- **GE-45268-130** 1234yf Refrigerant Adapters
- **GE-50078** Enhanced Leak Detector
- **GE-50300** Air Conditioning Service Center for HFO1234yf

Equivalent regional tools. [Special Tools](#).

General Information

R-1234yf (HFO-1234yf) - 2, 3, 3, 3 - Tetrafluoroprop-1-ene (CF₃CFCH₂), is an olefin containing hydrogen, fluorine and carbon with thermodynamic properties similar to R-134a. This refrigerant is a mildly flammable gas. It has a boiling point of -29.2Â°C, a vapor pressure of 583 kPa absolute at 20Â°C, no ozone depletion potential, and a global warming potential (GWP) of 4.

Technicians repairing or servicing motor vehicle air conditioning (MVAC) must be trained and certified by an EPA approved organization. Certification is obtained by passing an EPA approved examination. (<http://www.epa.gov/ozone/title6/609/technicians/609certs.html>)

WARNING: Refer to [R-1234yf Proper Service Procedures Warning](#) .

NOTE:

- The high voltage (HV) electric air conditioning (A/C) compressor uses a polyolester (POE) refrigerant oil instead of a polyalkylene glycol (PAG) synthetic refrigerant oil. This is due to the better electrical resistance of the POE oil and its ability to provide HV isolation.
- When servicing vehicles with an electric compressor, first perform the hose flush procedure to clear the unit of residual air conditioning system oil. Failure to perform this procedure will cause contamination of the hybrid system as well as failure of the compressor. The hose flush procedure is found in the GE-50300 Instruction Manual.
- Failure to flush the GE-50300 hoses before adding refrigerant to a vehicle with an electric air conditioning compressor may result in an unacceptable amount of air conditioning oil entering the refrigerant system. It may also cause a battery energy control module hybrid battery voltage system isolation lost diagnostic trouble code (DTC P1AE7) to be set.

Flush Procedure

NOTE: Flushing is not intended to remove metal from the air conditioning system.

Flushing is intended to remove the following:

- Contaminated Air Conditioning Compressor oil
- Desiccant, following a desiccant bag failure
- Overcharge of Air Conditioning Compressor oil
- Refrigerant contamination

NOTE: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the air conditioning flush procedure.

1. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)
2. Remove the air conditioning condenser. [Air Conditioning Condenser Replacement](#)
3. Remove the air conditioning receiver and dehydrator. [Receiver and Dehydrator Replacement](#)
4. Install the air conditioning receiver and dehydrator plug without the air conditioning refrigerant desiccant. [Receiver and Dehydrator Replacement](#)

5. Install the air conditioning condenser. [Air Conditioning Condenser Replacement](#)
6. Remove the air conditioning evaporator thermal expansion valve. [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#)
7. Remove the air conditioning evaporator thermal expansion valve stud from the air conditioning evaporator thermal expansion valve.
8. Install the air conditioning evaporator thermal expansion valve stud onto the GE-45268-115 adapter.
9. Install GE-45268-115 in place of the air conditioning evaporator thermal expansion valve.
10. Remove the drive motor battery coolant cooler thermal expansion valve. [Drive Motor Battery Coolant Cooler Replacement](#)
11. Remove the drive motor battery coolant cooler thermal expansion valve stud from the drive motor battery coolant cooler thermal expansion valve.
12. Install the drive motor battery coolant cooler thermal expansion valve stud onto the GE-45268-115 adapter.
13. Install GE-45268-115 in place of the drive motor battery coolant cooler thermal expansion valve.
14. Remove the air conditioning and drive motor battery cooling compressor. [Air Conditioning and Drive Motor Battery Cooling Compressor Replacement](#)
15. If equipped, remove the screen in the end of the air conditioning condenser hose.
16. Install GE-45268-4 to the air conditioning compressor hose.
17. Install GE-45268-5 to the air conditioning condenser hose.
18. Forward flow refrigerant flushing is recommended for contaminated refrigerant or POE oil.

NOTE: The filter inside GE-45268-1 is serviceable. Remove and discard the check valve from the filter.

1. Service the filter before each flush.
 2. Connect the GE-45268-1 flush filter to the suction port of the GE-45268-4 flush adapter.
 3. Connect the blue hose from the GE-50300 Air Conditioning Service Center to the J 45268-1 flush filter adapter.
 4. Connect the red hose from the GE-50300 Air Conditioning Service Center to the GE-45268-5 flush adapter.
19. Reverse flow refrigerant flushing is recommended for desiccant cartridge failure.

NOTE: The filter inside GE-45268-1 is serviceable. Remove and discard the check valve from the filter.

1. Service the filter before each flush.
 2. Connect the J 45268-1 flush filter to the discharge port of the GE-45268-5 flush adapter.
 3. Connect the blue hose from the GE-50300 Air Conditioning Service Center to the J 45268-1 flush filter adapter.
 4. Connect the red hose from the GE-50300 Air Conditioning Service Center to the suction port of the GE-45268-4 flush adapter.
20. Install the GE-45268-10 to the air conditioning compressor to condenser hose assembly.
21. Install fitting GE-45268-128 to the filter cylinder end of GE-45268-1.
22. Connect GE-45268-1 filter to GE-45268-7 adapter.

NOTE: Close the valve on the external refrigerant tank, before starting the flush process.

23. Flush the air conditioning system. Follow the instructions supplied with the **GE-50300** Air Conditioning Service Center.
24. Remove the GE-45268-4 from the air conditioning compressor hose.
25. Remove the GE-45268-5 from the air conditioning condenser hose.

NOTE: Flushing will remove all the POE oil from the air conditioning system.

The air conditioning system must be replenished with the correct amount of POE oil.

26. If you will reinstall the removed air conditioning and drive motor battery cooling compressor, perform the following procedure:
 1. Remove the air conditioning and drive motor battery cooling compressor drain plug.
 2. Drain the POE oil from the air conditioning and drive motor battery cooling compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
 3. Install the air conditioning and drive motor battery cooling compressor drain plug and tighten to 30 N.m (22 lb ft).
 4. Add the total system capacity of POE oil to the air conditioning and drive motor battery cooling compressor. [Approximate Fluid Capacities](#)
27. If you are replacing the air conditioning and drive motor battery cooling compressor after flushing the system, perform the following procedure:
 1. Do not drain the POE oil from the air conditioning and drive motor battery cooling compressor.
 2. Deduct the amount of POE oil shipped with the air conditioning and drive motor battery cooling compressor from the amount of POE oil listed in the approximate fluid capacities table. [Approximate Fluid Capacities](#)
 3. Add the calculated amount to the compressor, as needed.

NOTE: Flushing will remove fluorescent leak detection dye from air conditioning system.

28. Remove the air conditioning condenser. [Air Conditioning Condenser Replacement](#)

NOTE: The air conditioning refrigerant desiccant is manufactured with a POE fluorescent leak detection dye wafer inside.

29. Replace the air conditioning receiver and dehydrator. [Receiver and Dehydrator Replacement](#)
30. Install the air conditioning condenser. [Air Conditioning Condenser Replacement](#)
31. Remove the GE-45268-115 in place of the air conditioning evaporator thermal expansion valve.
32. Remove the GE-45268-115 in place of the drive motor battery coolant cooler thermal expansion valve.
33. Inspect the air conditioning evaporator thermal expansion valve for debris. Clean or replace as needed. [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#)
34. Inspect the drive motor battery coolant cooler thermal expansion valve for debris. Clean or replace as needed. [Drive Motor Battery Coolant Cooler Replacement](#)
35. If equipped, Clean and install the screen in the end of the air conditioning condenser hose.
36. Install the air conditioning and drive motor battery cooling compressor. [Air Conditioning and Drive Motor Battery Cooling Compressor Replacement](#)
37. Evacuate and recharge the air conditioning system. [Refrigerant Recovery and Recharging](#)
38. Leak test the fittings using GE-50078 Enhanced Leak Detector.

HEATER COOLANT HEATER DRAINING AND FILLING

Special Tools

- GE-26568 Coolant and Battery Tester
- GE-46143 - 2 Cooling System Adapter
- GE-47716 Vac-N-Fill Coolant Refill Tool

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

WARNING: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults

before working on the high voltage cooling system could result in personal injury or death.

WARNING: Do not use a service jack in locations other than those specified to lift this vehicle. Lifting the vehicle with a jack in those other locations could cause the vehicle to slip off the jack and roll; this could cause injury or death.

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

Draining Procedure

NOTE: Draining of the cooling system or replacement of any cabin heater coolant heater system parts requires the actuation of the Hybrid/EV Battery Pack Coolant Pump Bleed Procedure in the GDS tool.

1. Turn vehicle power OFF and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle.

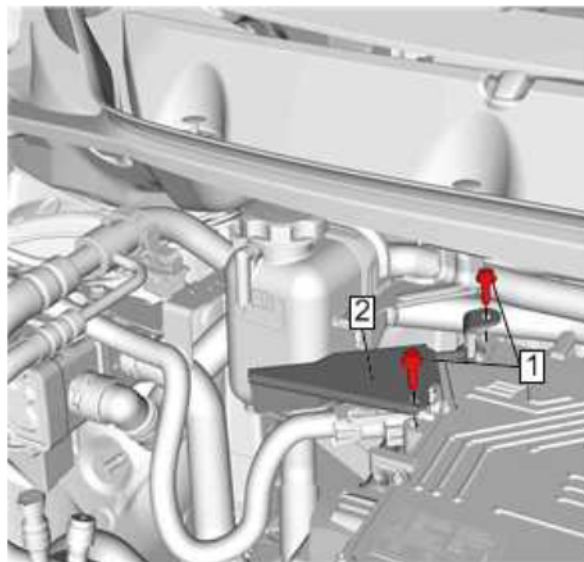


Fig. 3: Protector Securing Bolt And Protector
Courtesy of GENERAL MOTORS COMPANY

2. Remove the protector securing bolt (1) and the protector (2).

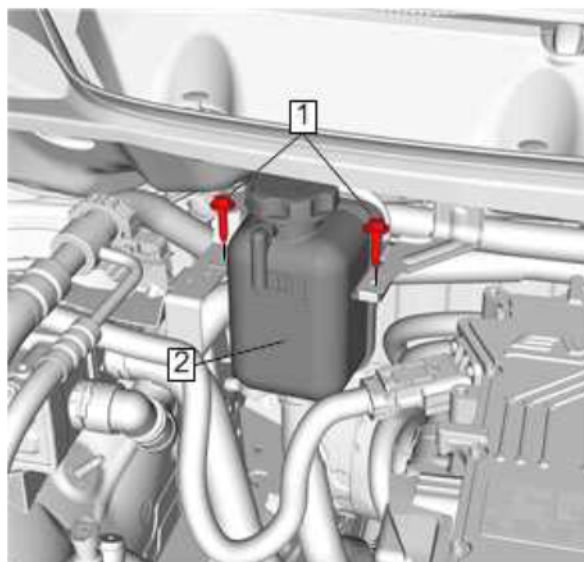


Fig. 4: Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Remove the surge tank bolt (1) and reposition the surge tank (2) forward to install the cooling system adaptor to the surge tank.
4. Remove the radiator surge tank cap.
5. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
6. Place a drain pan under the vehicle.
7. Remove the front compartment air deflector. [Front Compartment Air Deflector Replacement](#)
8. Remove the auxiliary heater outlet hose from the heater coolant pump. [Auxiliary Heater Outlet Hose Replacement](#)

Vac-N-Fill Procedure

1. Install the auxiliary heater outlet hose to the heater coolant pump. [Auxiliary Heater Outlet Hose Replacement](#)
2. Install the front compartment air deflector. [Front Compartment Air Deflector Replacement](#)
3. Turn vehicle power OFF and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle.

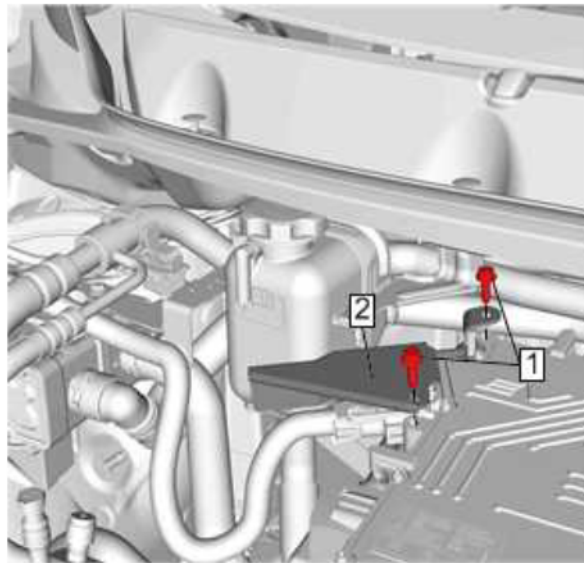


Fig. 5: Protector Securing Bolt And Protector
Courtesy of GENERAL MOTORS COMPANY

4. Remove the protector securing bolt (1) and the protector (2).

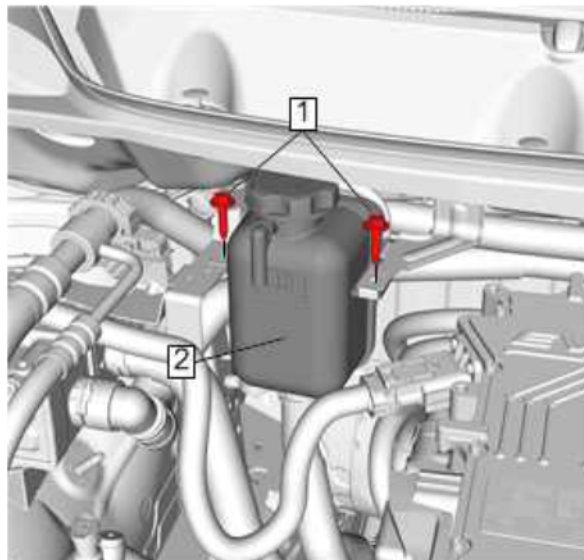


Fig. 6: Surge Tank Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Remove the surge tank bolt (1) and reposition the surge tank (2) forward to install the cooling system adaptor to the surge tank.

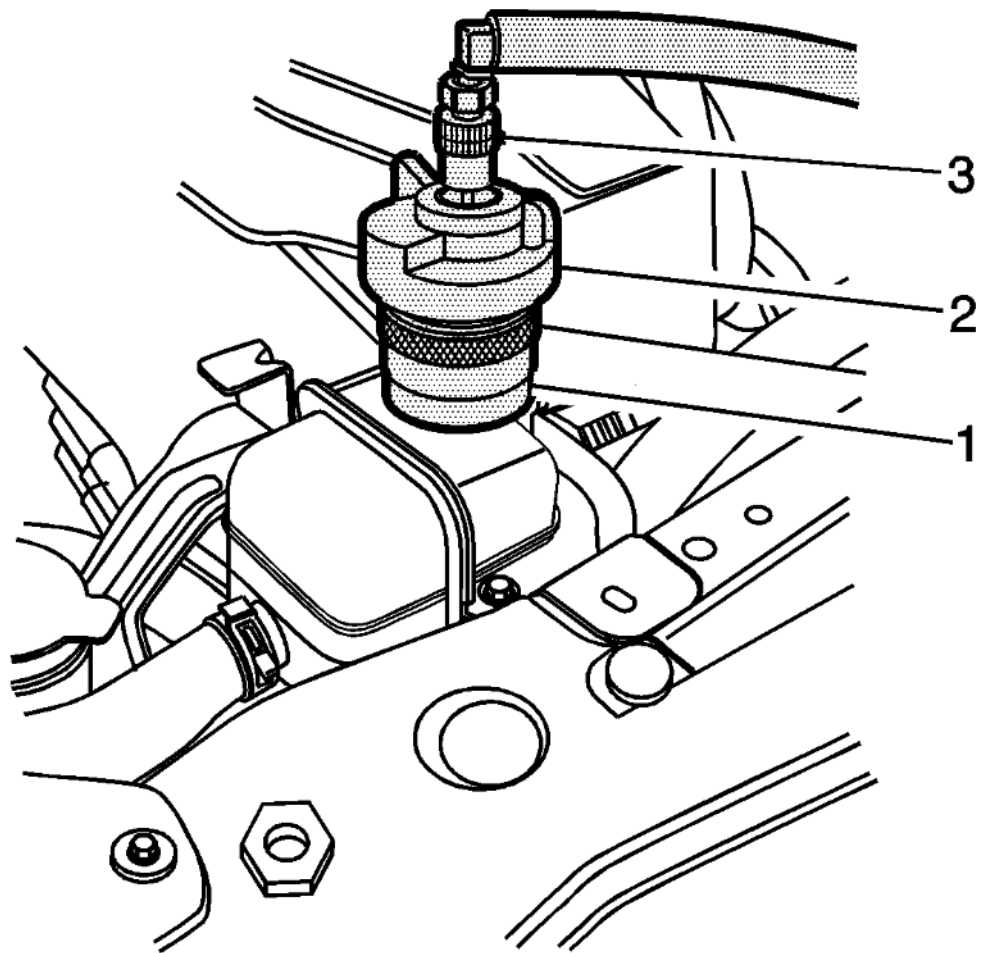


Fig. 7: Installing GE-46143-2 Adapter
Courtesy of GENERAL MOTORS COMPANY

NOTE: To prevent boiling of the coolant/water mixture in the vehicles 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.

6. Install **GE-46143-2** adapter (1).
7. Attach the Van-N-Fill cap (2) to **GE-46143-2** adapter (1).
8. Attach the vacuum gauge assembly (3) to the Vac-N-Fill cap (2).

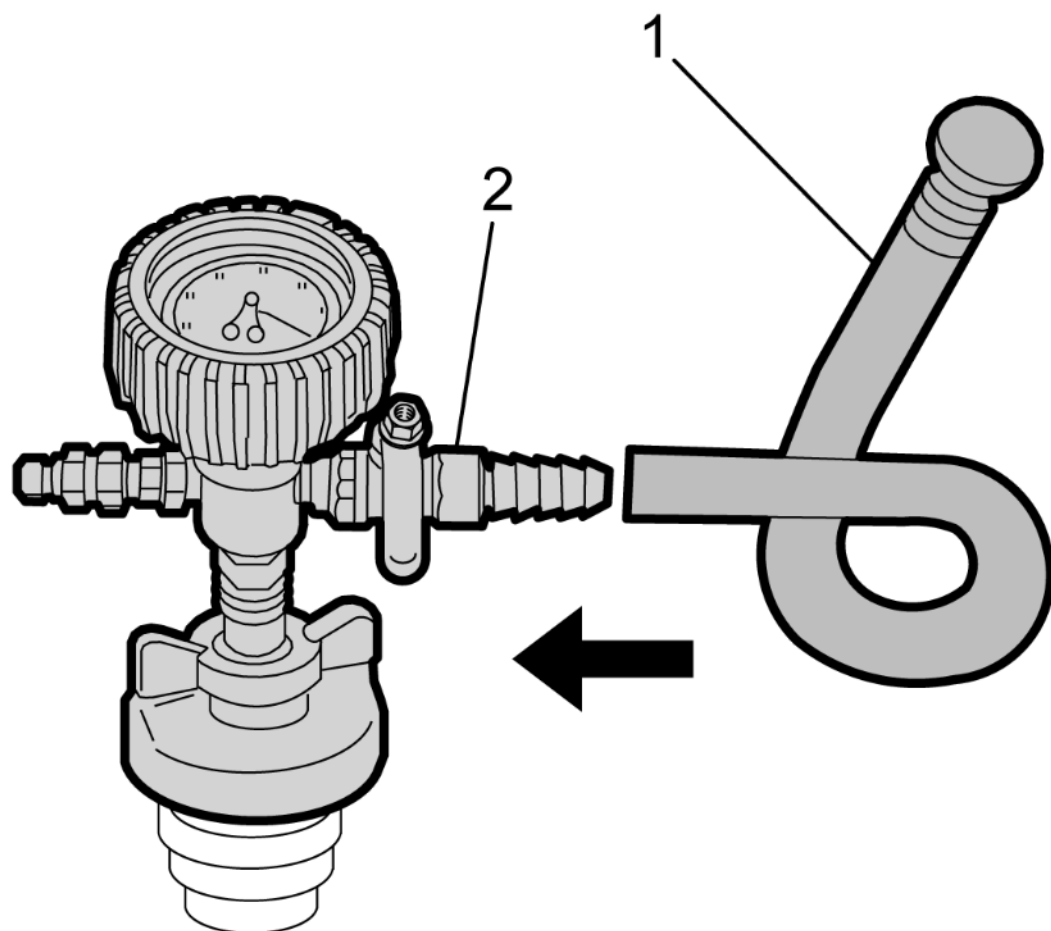


Fig. 8: Vacuum Gauge Assembly & Fill Hose
Courtesy of GENERAL MOTORS COMPANY

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

Ensure that the valve is closed.

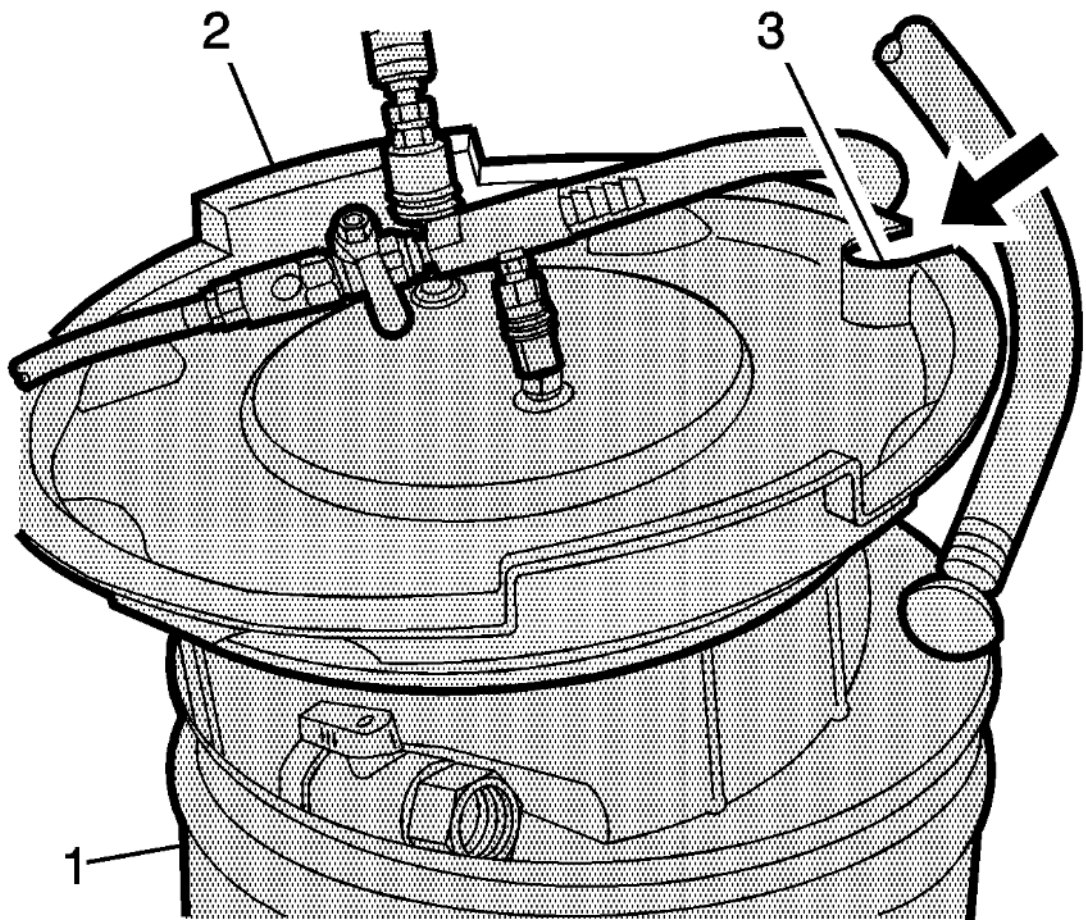


Fig. 9: Graduated Reservoir, Vacuum Tank & Cut-Out Area
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use a Pre-mixed DEXCOOLÂ® (50/50 mixture of DEXCOOLÂ® and deionized water). Always use more coolant than necessary. This will eliminate air from being drawn into the cooling system.

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

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

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

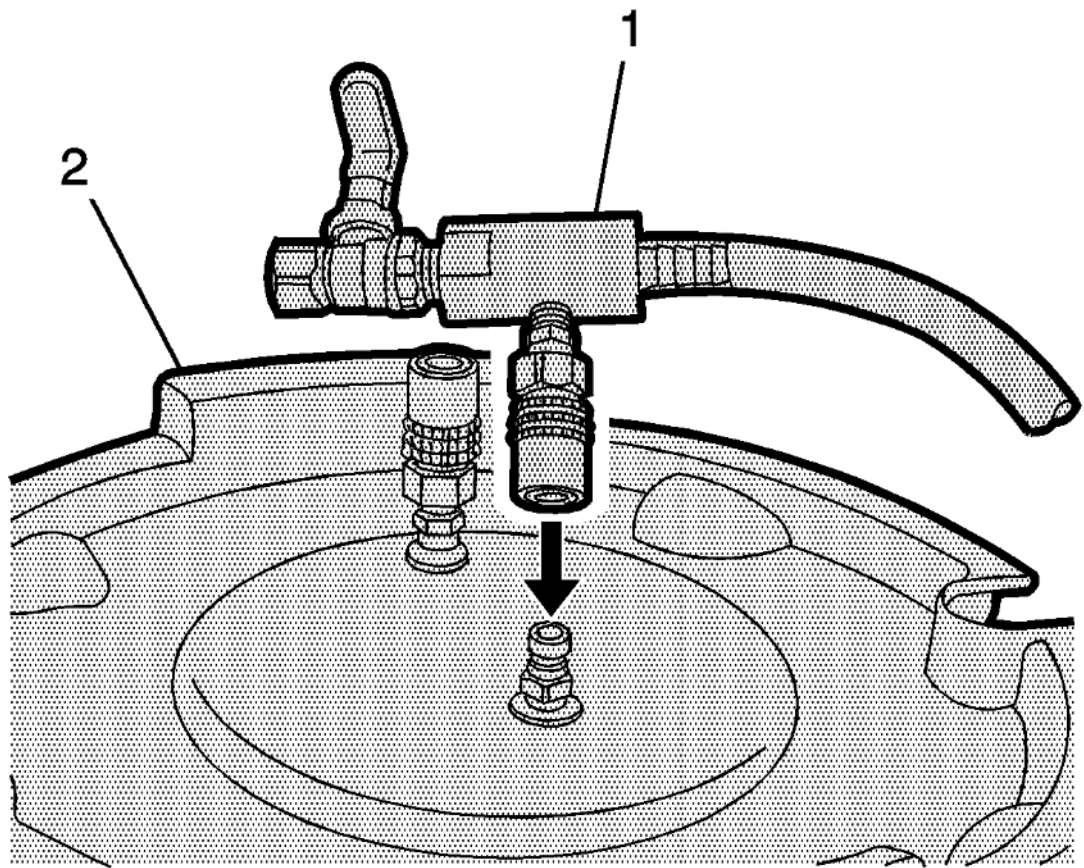


Fig. 10: Vacuum Tank & Venturi Assembly
Courtesy of GENERAL MOTORS COMPANY

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

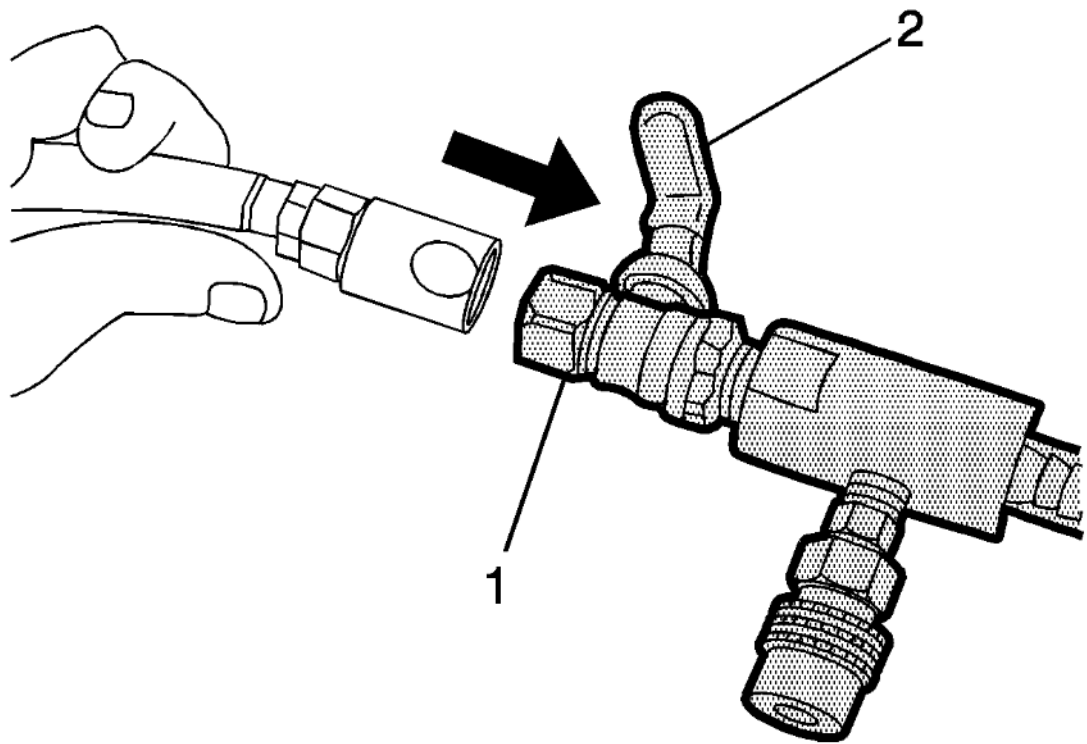


Fig. 11: Venturi Assembly & Valve
Courtesy of GENERAL MOTORS COMPANY

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

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

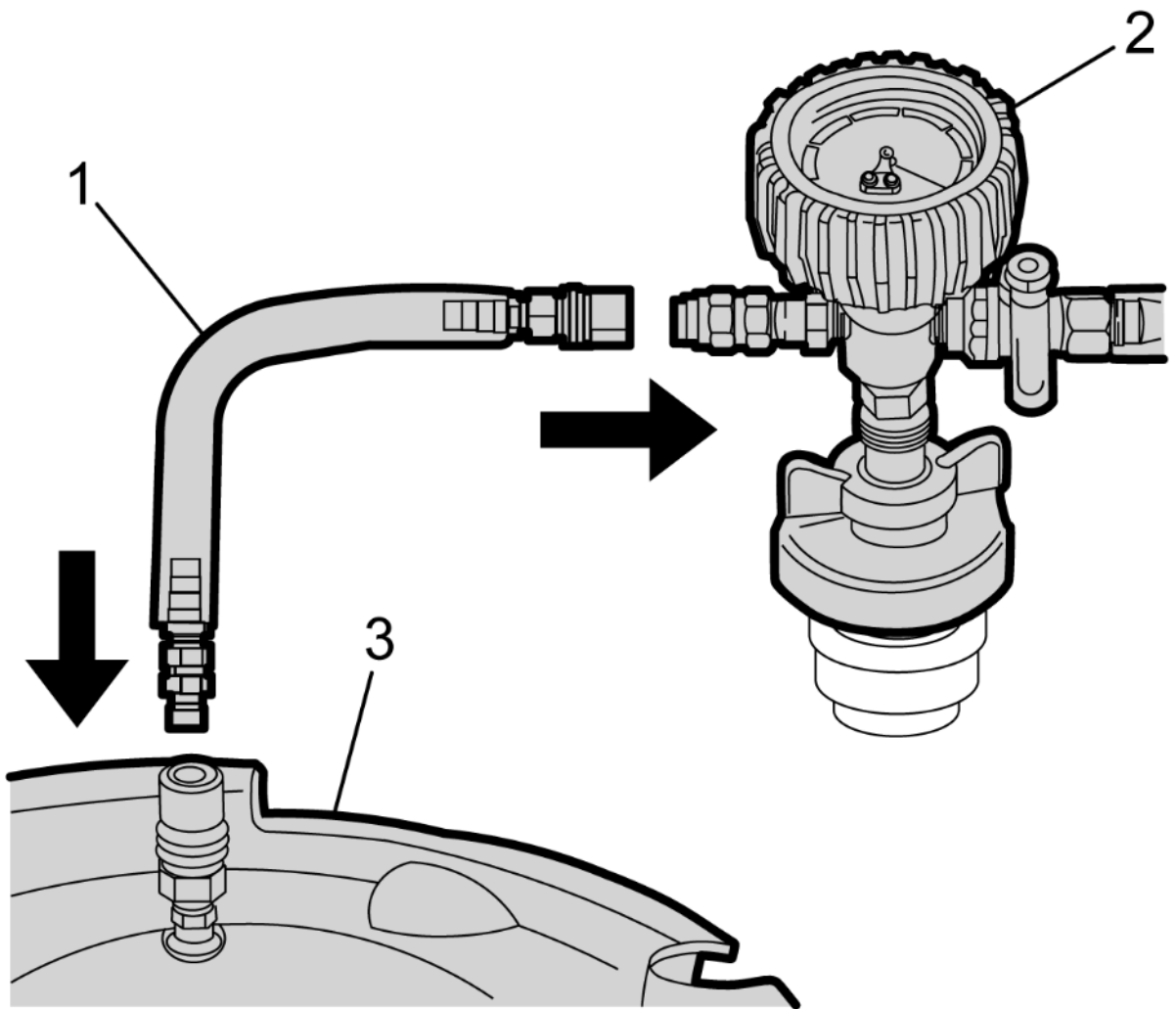


Fig. 12: Vacuum Hose, Gauge Assembly & Tank
Courtesy of GENERAL MOTORS COMPANY

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

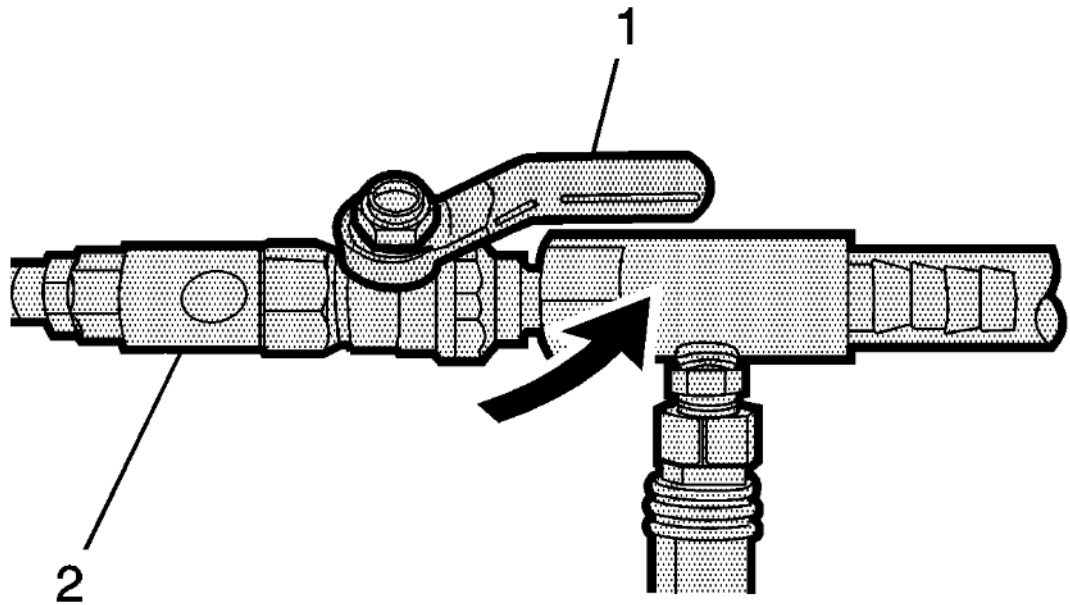


Fig. 13: Valve & Venturi Assembly

Courtesy of GENERAL MOTORS COMPANY

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

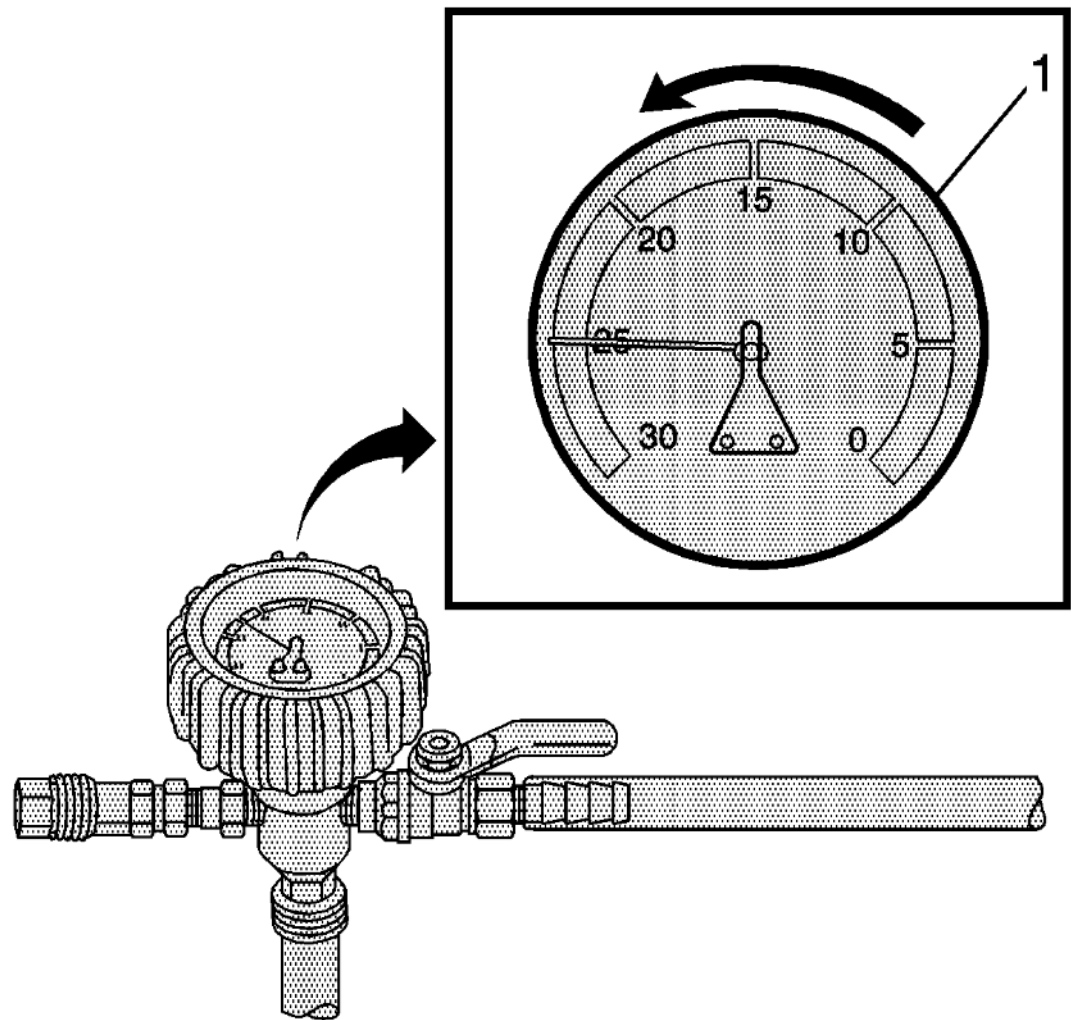


Fig. 14: Vacuum Gauge Needle

Courtesy of GENERAL MOTORS COMPANY

17. Continue to draw vacuum until the needle stops rising (1). This should be 610 - 660 mm Hg (24 - 26 in Hg).
Cooling hoses may start to collapse. This is normal due to vacuum draw.
18. To aid in the fill process, position the graduated reservoir above the coolant fill port.

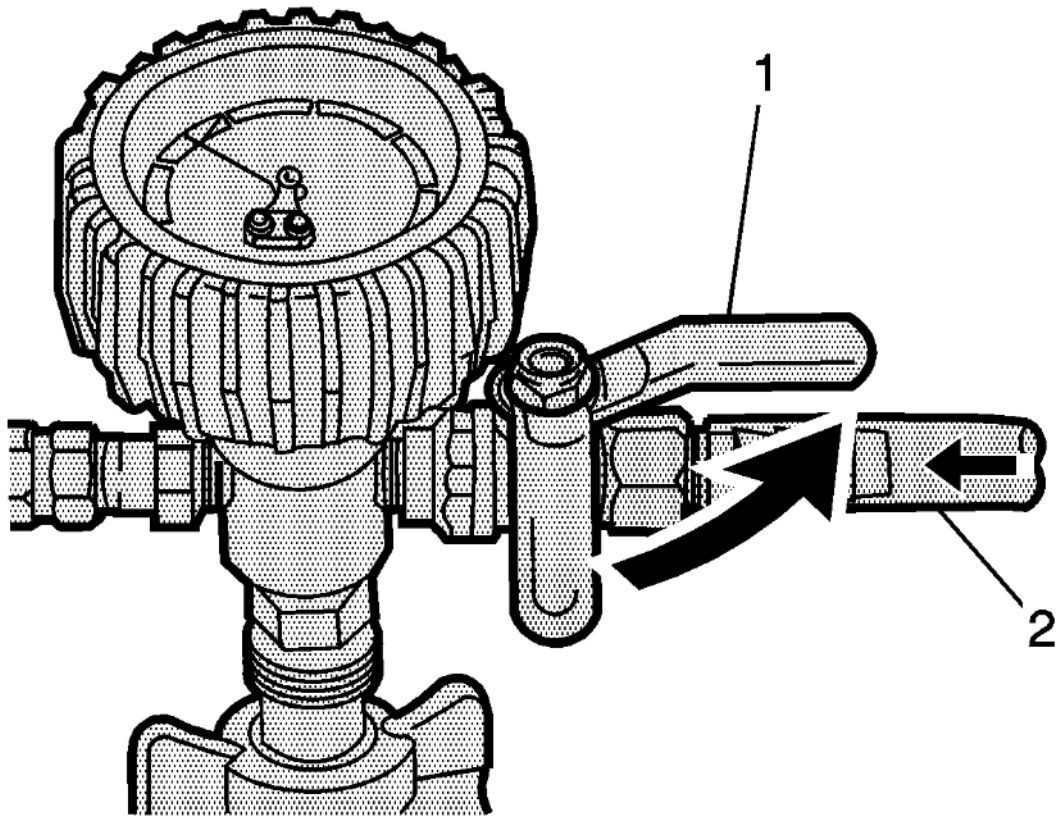


Fig. 15: Vacuum Gauge Assembly & Needle
Courtesy of GENERAL MOTORS COMPANY

19. Slowly open the valve (1) on the vacuum gauge assembly (2). When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
20. Close the valve on the venturi assembly.
21. If there is a suspected leak in the cooling system, allow the system to stabilize under vacuum and monitor for vacuum loss.

If vacuum loss is observed, refer to [Cabin Heater Coolant Heater System Loss of Coolant](#).

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

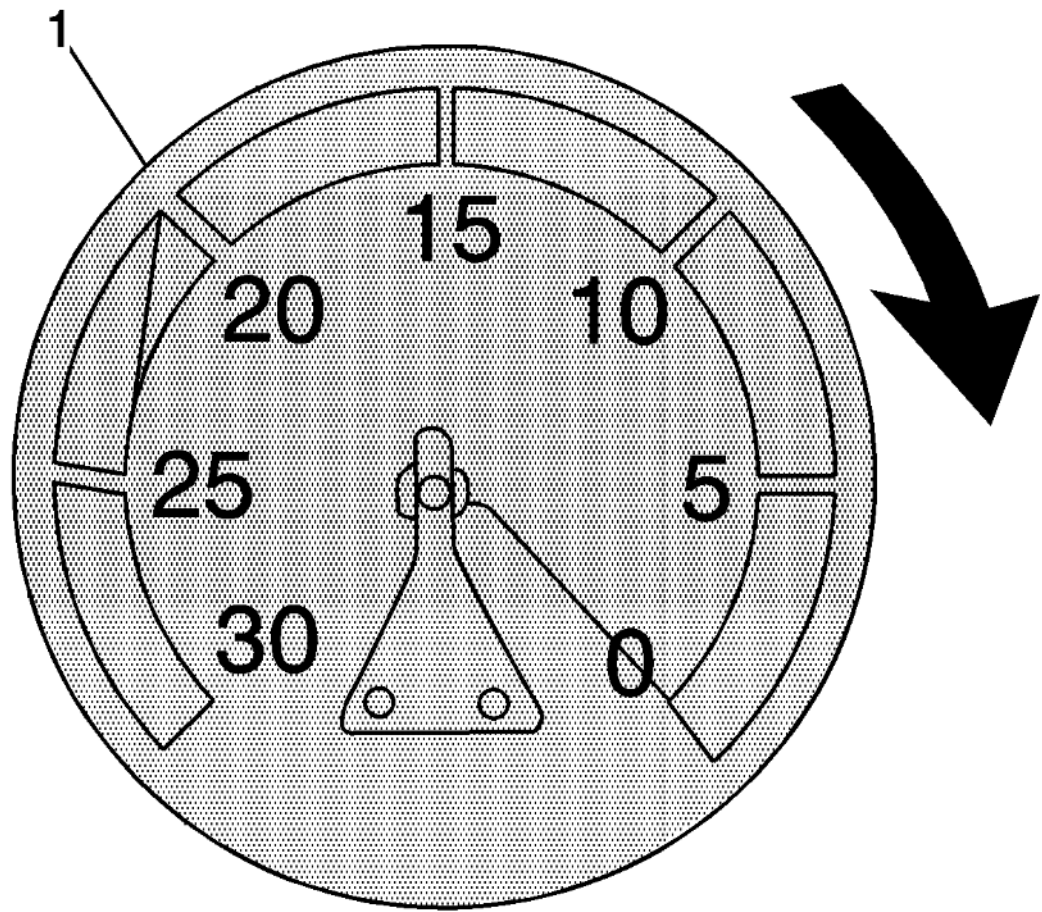


Fig. 16: Vacuum Gauge

Courtesy of GENERAL MOTORS COMPANY

23. Once the vacuum gauge (1) reaches zero, close the valve on the vacuum gauge assembly and repeat steps 15 - 21.
24. Ensure that the vehicle is in service mode. [**Power Mode Description and Operation**](#)
25. Detach the Vac-N-Fill cap from the **GE-46143-2** adapter.
26. Remove **GE-46143-2** adapter from the surge tank fill neck.

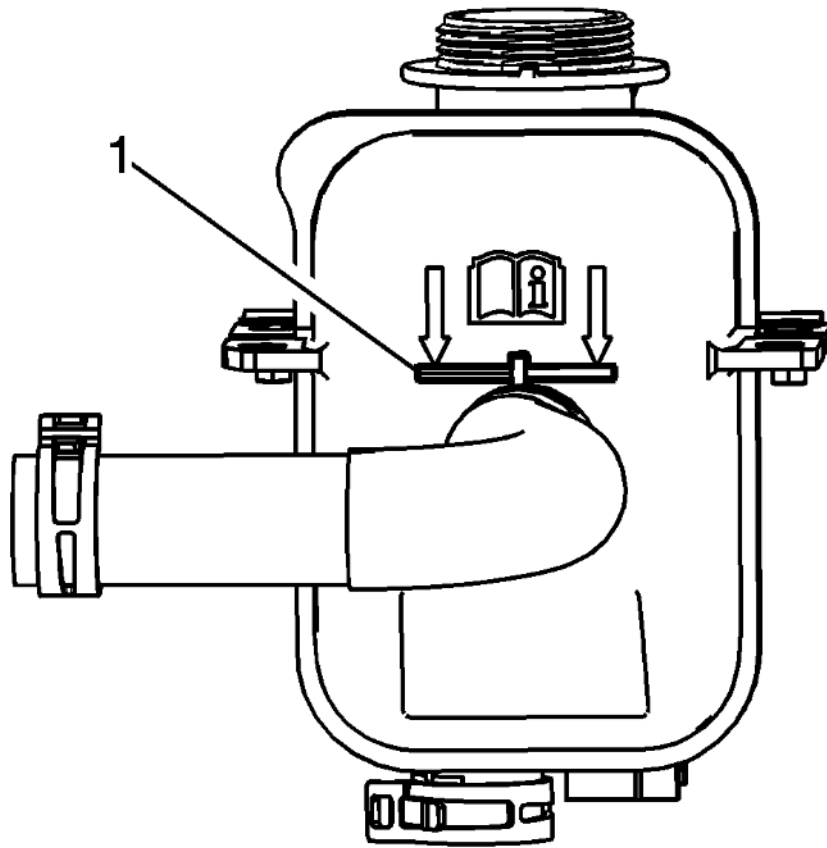


Fig. 17: Adjusting Surge Tank Coolant Level To Position Just Above Seam
 Courtesy of GENERAL MOTORS COMPANY

27. Adjust the surge tank coolant level to a position just above the seam (1).
28. Inspect the concentration of the coolant mixture using **GE-26568** tester.

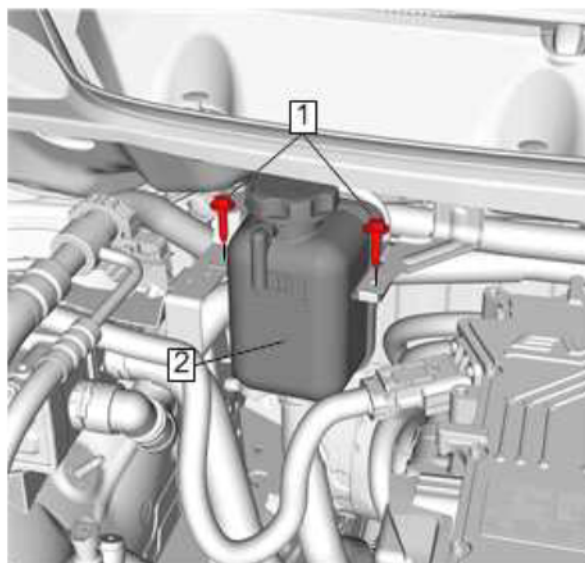


Fig. 18: Surge Tank Bolt
 Courtesy of GENERAL MOTORS COMPANY

29. Position the surge tank (2) and tighten the surge tank bolt (1) to 9 N.m (80 lb in).

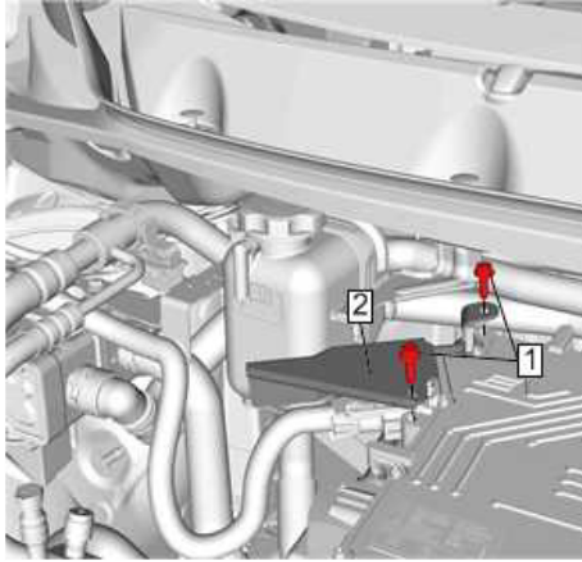


Fig. 19: Protector Securing Bolt And Protector
 Courtesy of GENERAL MOTORS COMPANY

30. Install the protector (2) and tighten the protector securing bolt (1) to 9 N.m (80 lb in).

REMOVING EXCESS COOLANT FROM SYSTEM

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

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

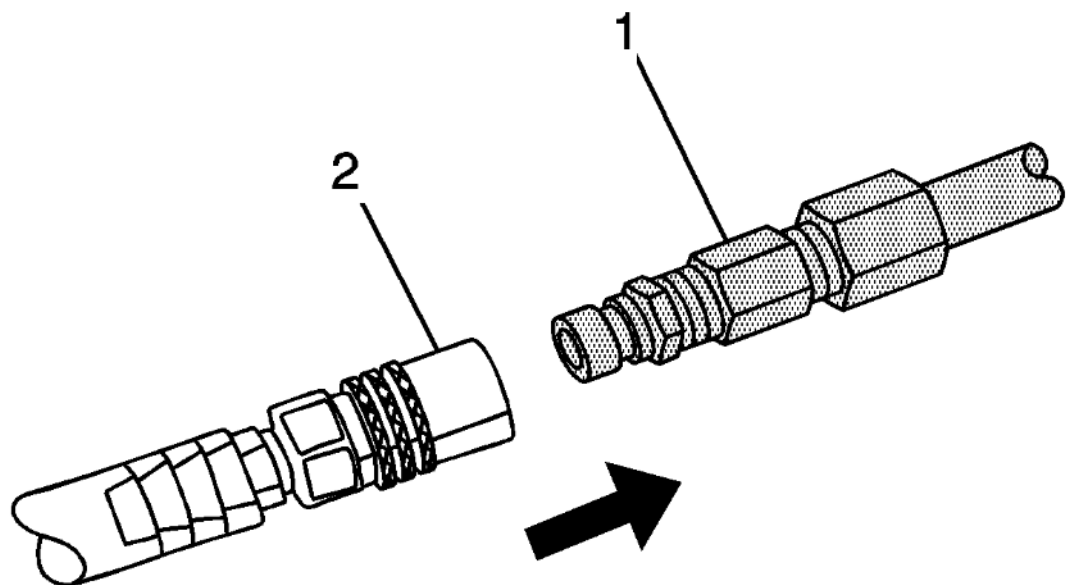


Fig. 20: Vacuum Hose & Extraction Hose
 Courtesy of GENERAL MOTORS COMPANY

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

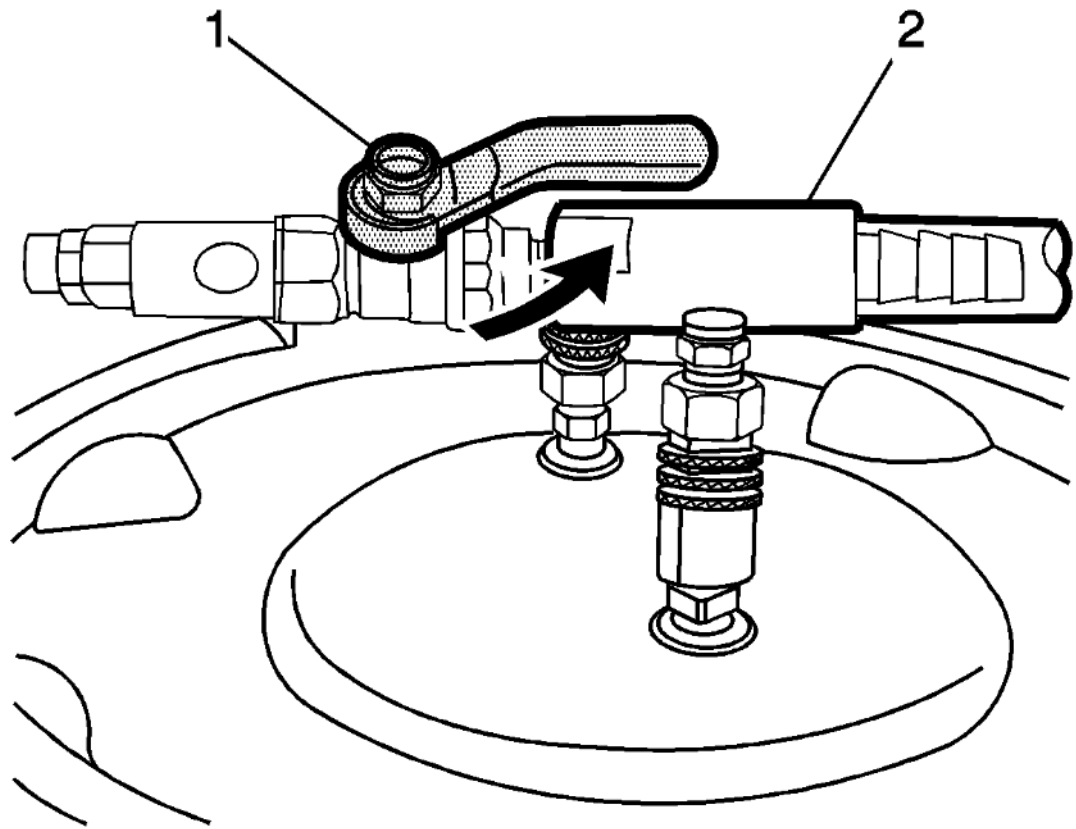


Fig. 21: Venturi Assembly & Valve

Courtesy of GENERAL MOTORS COMPANY

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

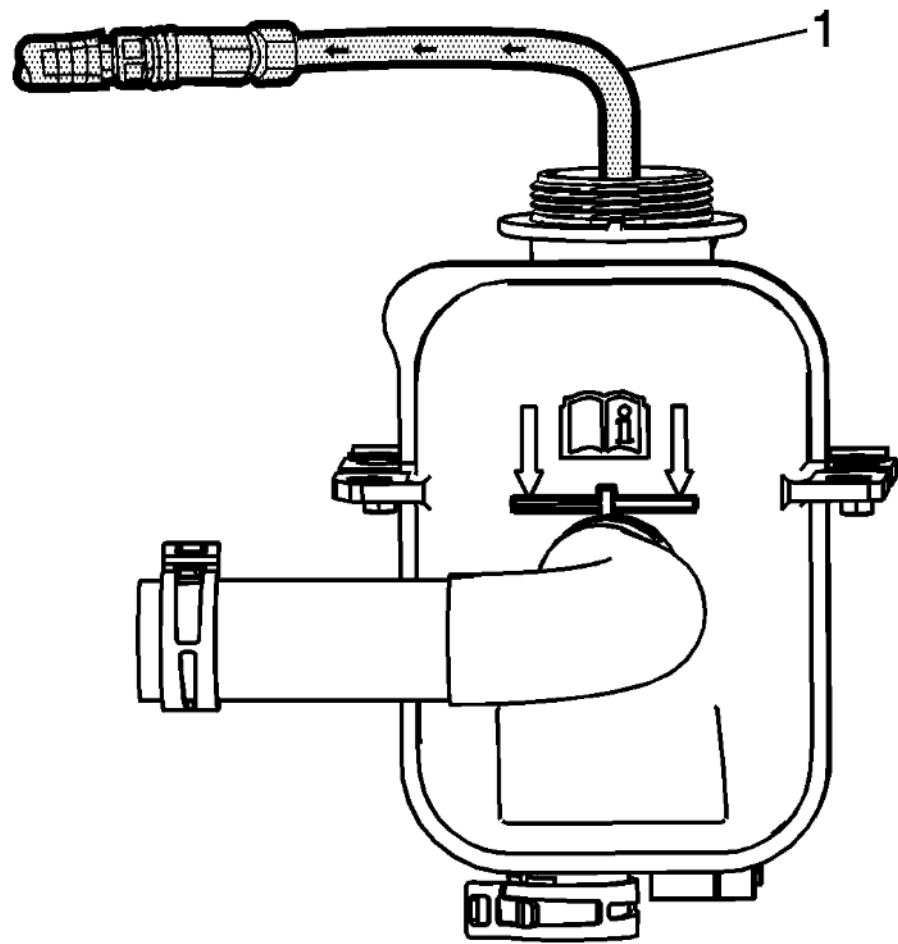


Fig. 22: Extraction Hose

Courtesy of GENERAL MOTORS COMPANY

4. Assemble the extraction hose (1) and insert into the surge tank.

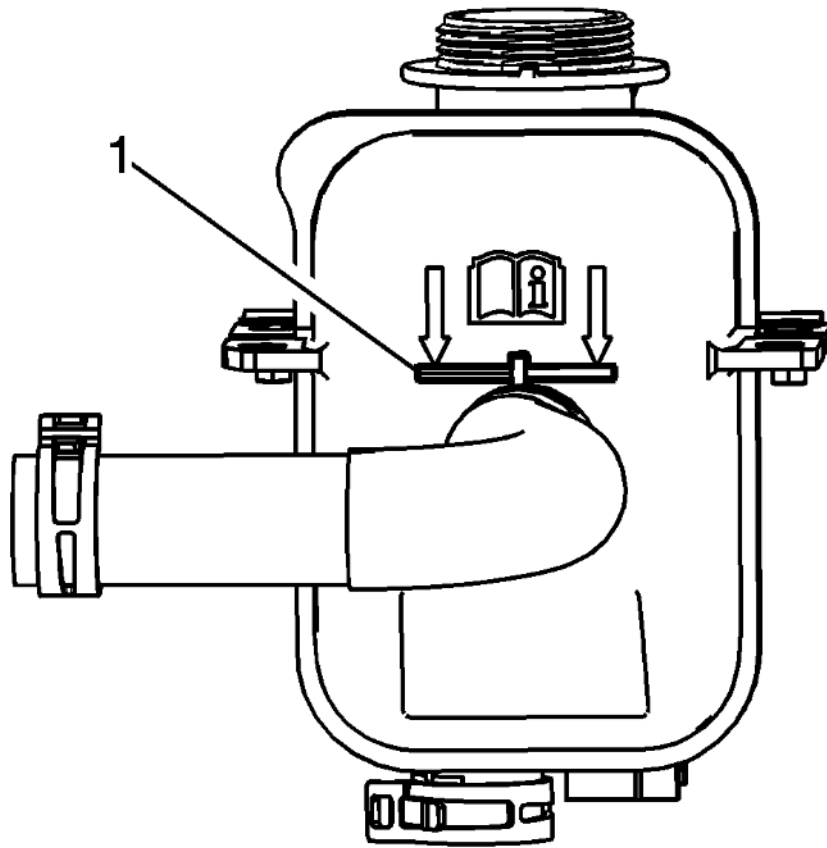


Fig. 23: Adjusting Surge Tank Coolant Level To Position Just Above Seam
Courtesy of GENERAL MOTORS COMPANY

5. Adjust the surge tank coolant level to a position just above the seam (1).
6. 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.

AIR CONDITIONING AND DRIVE MOTOR BATTERY COOLING COMPRESSOR REPLACEMENT

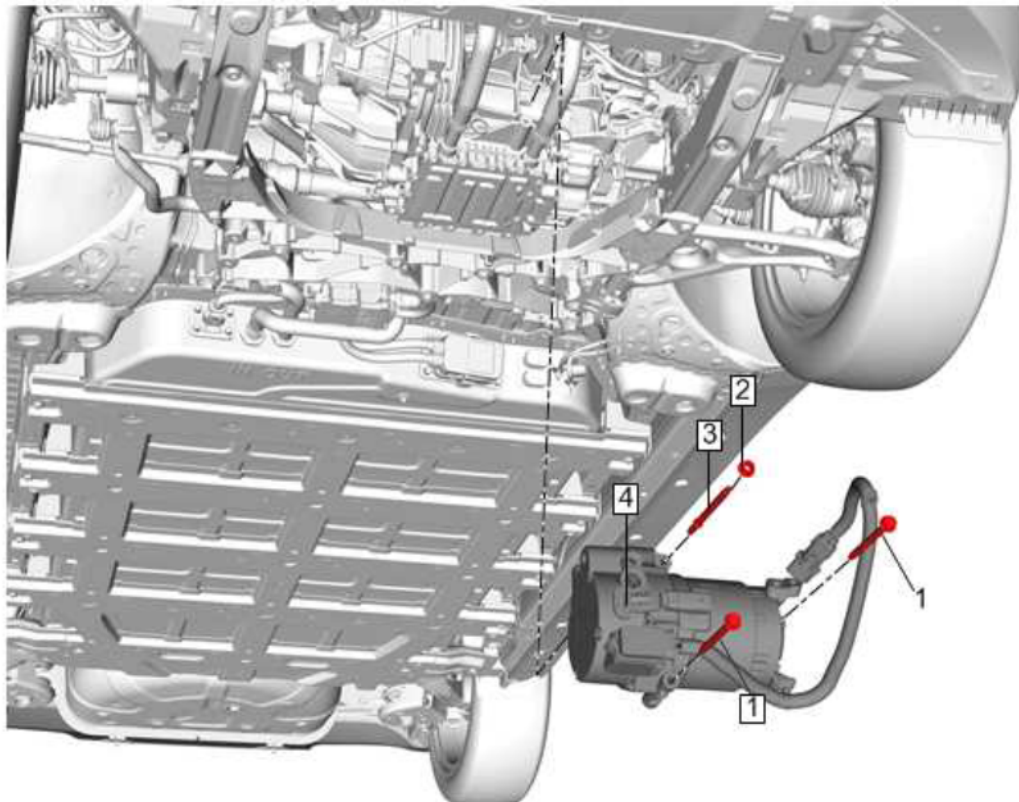


Fig. 24: Air Conditioning and Drive Motor Battery Cooling Compressor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed. The High Voltage Disabling procedure will perform the following tasks: • Identify how to disable high voltage. • Identify how to test for the presence of high voltage. • Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed. Failure to follow the procedures exactly as written may result in serious injury or death. WARNING: Do not use a service jack in locations other than those specified to lift this vehicle. Lifting the vehicle with a jack in those other locations could cause the vehicle to slip off the jack and roll; this could cause injury or death. CAUTION: This A/C system's high voltage A/C Compressor uses Polyolester (POE) refrigerant oil instead of Polyalkylene Glycol (PAG) refrigerant oil. Use only approved GM POE oil no more than two hours after removal from its sealed moisture proof packaging (reference GM POE label for proper usage) in refrigerant systems equipped with a High Voltage A/C compressor. GM POE oil is intended to be used with the GE-45037-A A/C oil injector and the GE-48997 A/C POE oil injector hose. Use of any refrigerant oil other than the approved GM POE, handled and installed per GM's requirements may result in compressor failure and/or loss of HV isolation with associated DTC's set. Preliminary Procedures 1. Disable the high voltage. High Voltage Disabling 2. Remove the air conditioning compressor hose from the compressor. Air Conditioning Compressor Hose Replacement 3. Remove the air conditioning condenser hose from the compressor. Air Conditioning Condenser Hose Replacement 4. Remove the left front wheelhouse liner. Front Wheelhouse Liner Replacement	
1	Air Conditioning and Drive Motor Cooling Compressor Bolt (Qty: 2) CAUTION: Fastener Caution Tighten 22 N.m (16 lb ft)
2	Air Conditioning and Drive Motor Cooling Compressor Nut Tighten 22 N.m (16 lb ft)
3	Air Conditioning and Drive Motor Cooling Compressor Stud Tighten 10 N.m (89 lb in)

Callout	Component Name
4	Air Conditioning and Drive Motor Cooling Compressor Procedure 1. Disconnect and unclip the high voltage compressor connector. 2. Disconnect the low voltage connector. 3. A/C compressor oil balancing is not required. The service A/C compressor contains enough oil; however, add any oil that was removed during the A/C system recovery process. Refer to Refrigerant Recovery and Recharging. 4. If replacing the A/C compressor, it is necessary to program the replacement A/C compressor. Control Module References . 5. Enable the high voltage. High Voltage Enabling

COMPRESSOR PRESSURE RELIEF VALVE REPLACEMENT

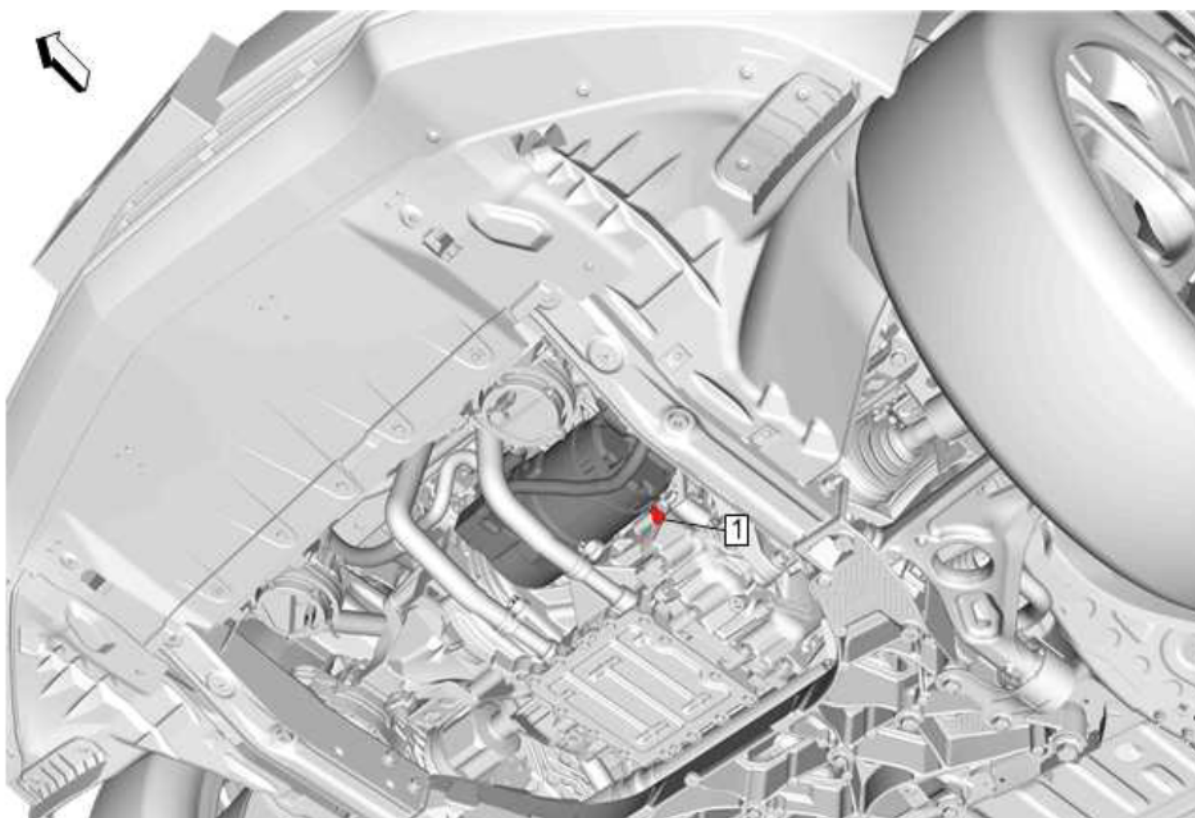


Fig. 25: Compressor Pressure Relief Valve
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Refrigerant Recovery and Recharging 2. Front Compartment Air Deflector Replacement	
1	Air Conditioning Compressor Pressure Relief Valve CAUTION: Component Fastener Tightening Caution Tighten 7 N.m (62 lb in)

AIR CONDITIONING SYSTEM SEAL REPLACEMENT

Removal Procedure

1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure.

NOTE: Cap or tape the open A/C refrigerant components immediately to prevent system contamination.

2. Cap or tape the A/C refrigerant components.

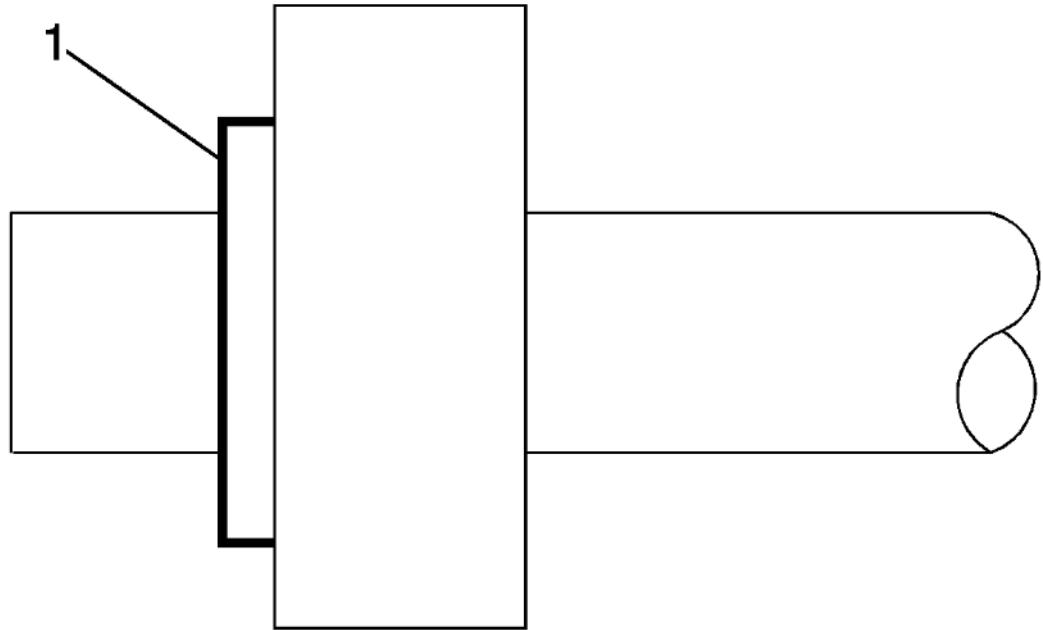


Fig. 26: A/C Refrigerant Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

3. Remove the sealing washer (1) from the A/C refrigerant component.
4. Inspect the seal washer for signs of damage to help determine the root cause of the failure.
5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.

NOTE: DO NOT reuse sealing washer.

6. DISCARD the sealing washer.

Installation Procedure

NOTE: Flat washer type seals do not require lubrication.

1. Inspect the new sealing washer for any signs of cracks, cuts, or damage.
Do not use a damaged sealing washer.
2. Remove the cap or tape from the A/C refrigerant components.

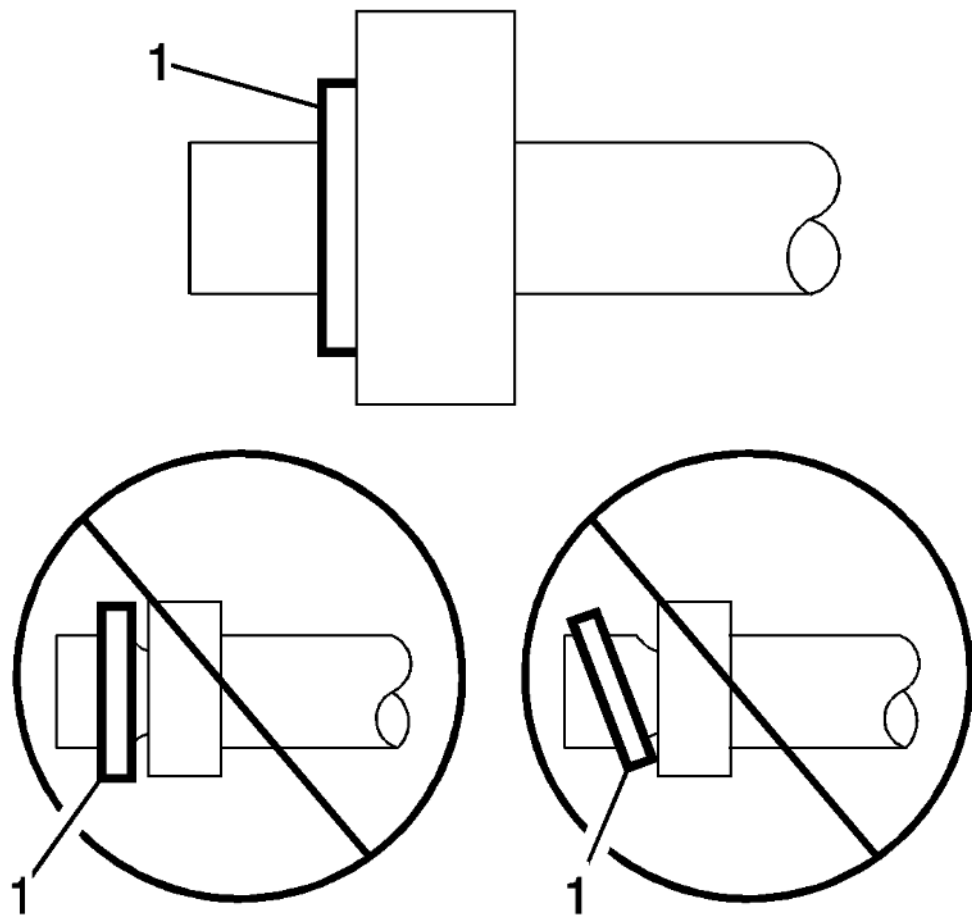


Fig. 27: Identifying Proper Seating Of A/C Refrigerant O-Ring
 Courtesy of GENERAL MOTORS COMPANY

3. Using a lint-free clean, dry cloth, clean the sealing surfaces of the A/C refrigerant components.
4. Carefully install the NEW sealing washer (1) onto the A/C refrigerant component.

The sealing washer (1) must completely bottom against the surface of the fitting.

NOTE: After tightening the A/C components, there should be a slight sealing gap of approximately 1.2 mm (3/64 in) between the A/C line and the A/C component.

5. Assemble the remaining A/C refrigerant components. Refer to the appropriate repair procedure.

AIR CONDITIONING O-RING SEAL REPLACEMENT

Removal Procedure

1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure

NOTE: Cap or tape the open A/C refrigerant components immediately to prevent system contamination.

2. Cap or tape the A/C refrigerant components.

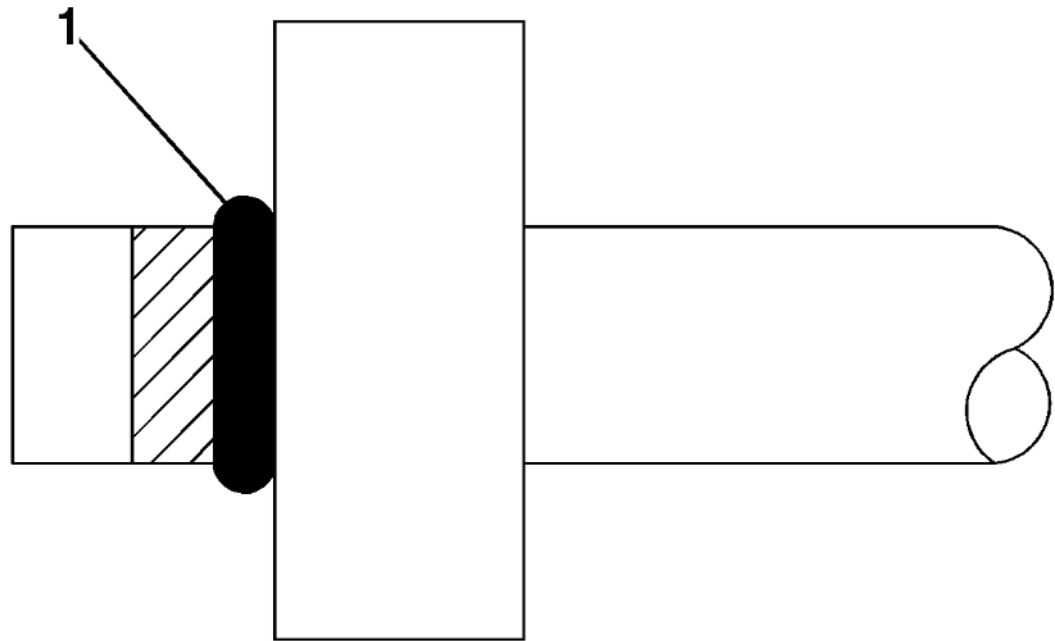


Fig. 28: O-ring seal

Courtesy of GENERAL MOTORS COMPANY

3. Remove the O-ring seal (1) from the A/C refrigerant component.
4. Inspect the O-ring seal for signs of damage to help determine the root cause of the failure.
5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.
6. DISCARD the O-ring seal.

Installation Procedure

1. Inspect the new O-ring seal for any sign of cracks, cuts, or damage.
2. Remove the cap or tape from the A/C refrigerant components.
3. Using a lint-free clean, dry cloth, carefully clean the sealing surfaces of the A/C refrigerant components.

NOTE: Use only the recommended refrigerant oil or damage to the A/C system could occur.

4. Lightly coat the new O-ring seal with the recommended refrigerant oil. [Adhesives, Fluids, Lubricants, and Sealers](#)

NOTE: DO NOT reuse O-ring seals.

5. Carefully slide the NEW O-ring seal (1) onto the A/C refrigerant component.

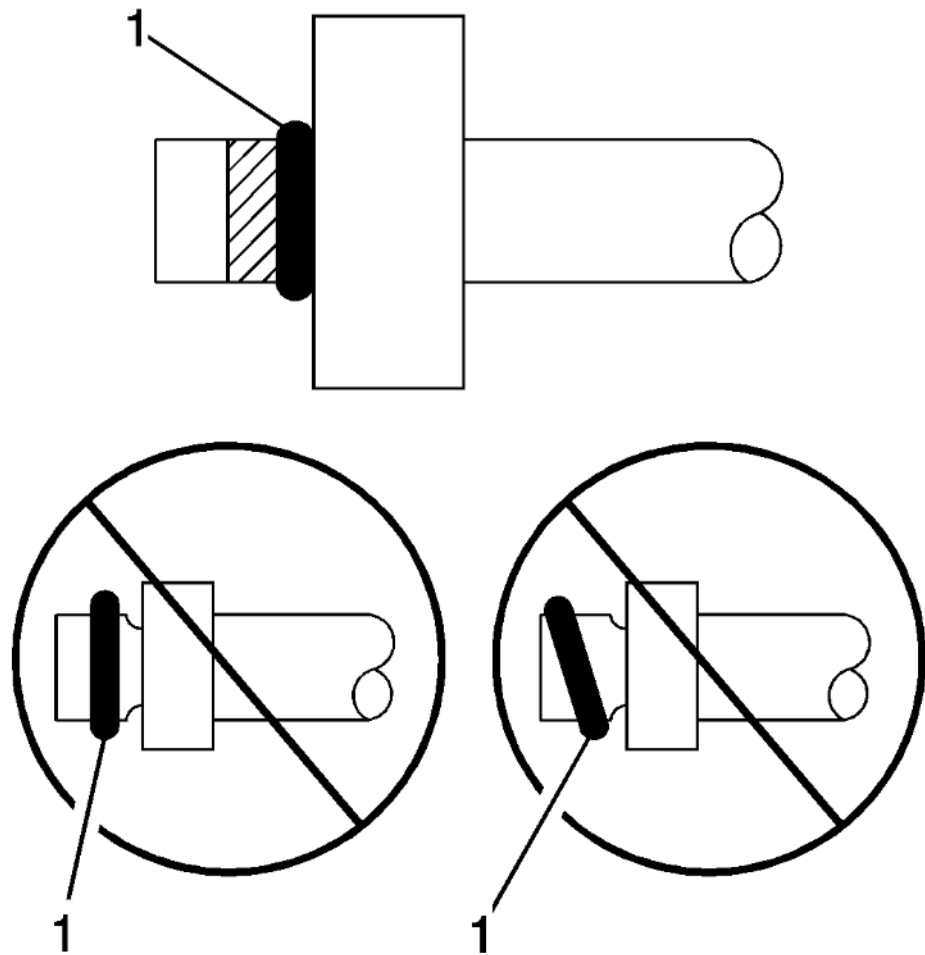


Fig. 29: Identifying Good & Bad Sealing Washer Positions
 Courtesy of GENERAL MOTORS COMPANY

6. The O-ring seal (1) must be fully seated.
7. Assemble the A/C components.

Refer to the appropriate repair procedure.

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

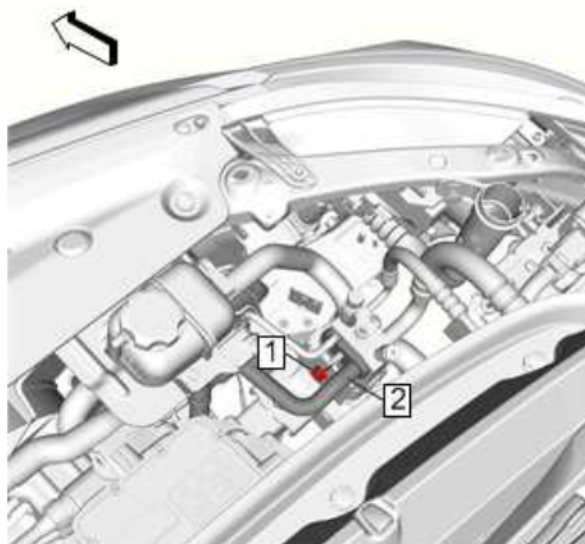


Fig. 30: Air Conditioning Compressor Hose Nut
Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose nut (1).
4. Remove the air conditioning compressor hose (2) from the air conditioning evaporator hose.
5. Raise the vehicle. **Lifting and Jacking the Vehicle**
6. Remove Front Compartment Air Deflector **Front Compartment Air Deflector Replacement**

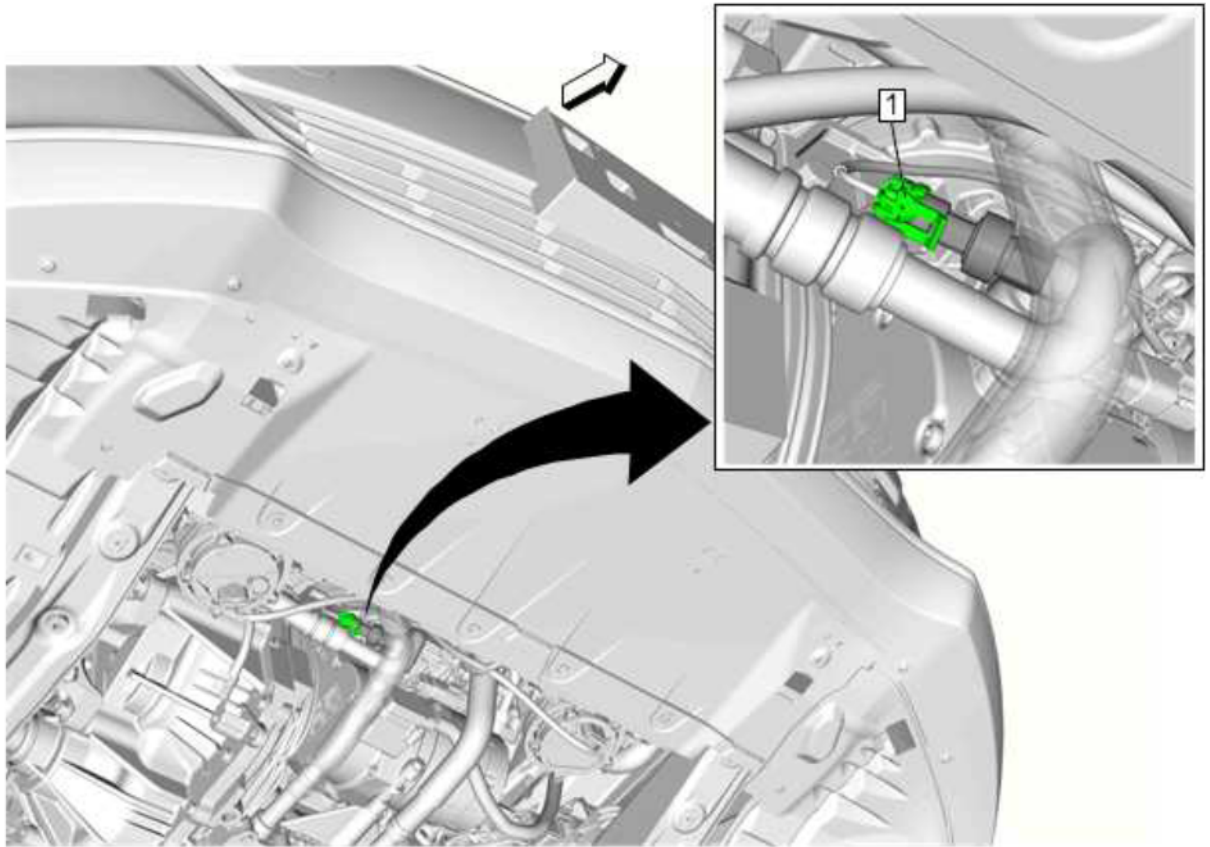


Fig. 31: Electrical Connector And Air Conditioning (A/C) Refrigerant Pressure Sensor
Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the electrical connector (1) from the air conditioning (A/C) refrigerant pressure sensor.

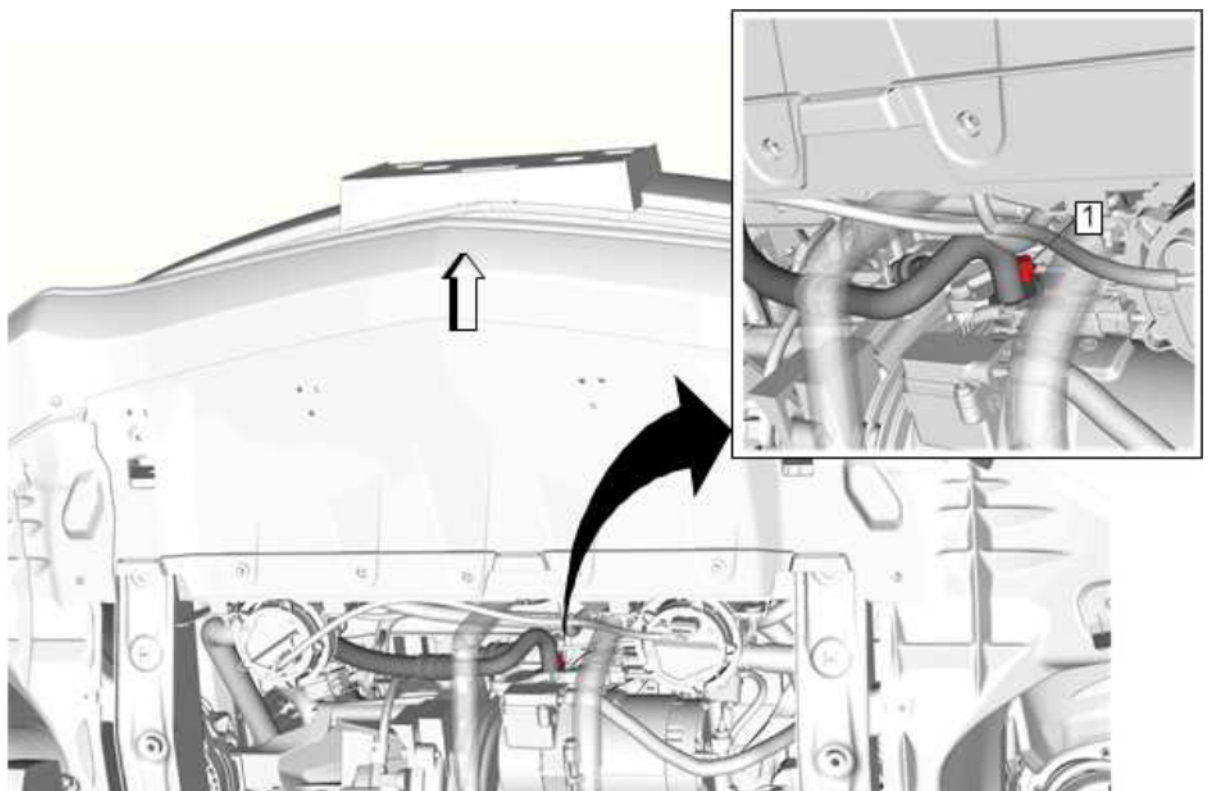


Fig. 32: Air Conditioning Compressor Hose Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Remove the air conditioning compressor hose bolt (1) from the air conditioning compressor.



Fig. 33: Air Conditioning Compressor Hose
Courtesy of GENERAL MOTORS COMPANY

9. Remove Air Conditioning Compressor Hose (1)
10. Remove the low pressure air conditioning refrigerant pressure sensor. [**Air Conditioning Refrigerant Pressure Sensor Replacement - Low Pressure**](#)

Installation Procedure

1. Install the low pressure air conditioning refrigerant pressure sensor. [**Air Conditioning Refrigerant Pressure Sensor Replacement - Low Pressure**](#)
2. Change the air conditioning sealing washer. [**Air Conditioning System Seal Replacement**](#)

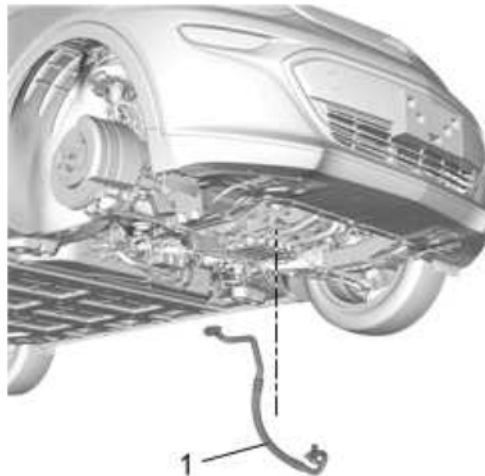


Fig. 34: Air Conditioning Compressor Hose
Courtesy of GENERAL MOTORS COMPANY

3. Position the air conditioning compressor hose (1) to the vehicle.

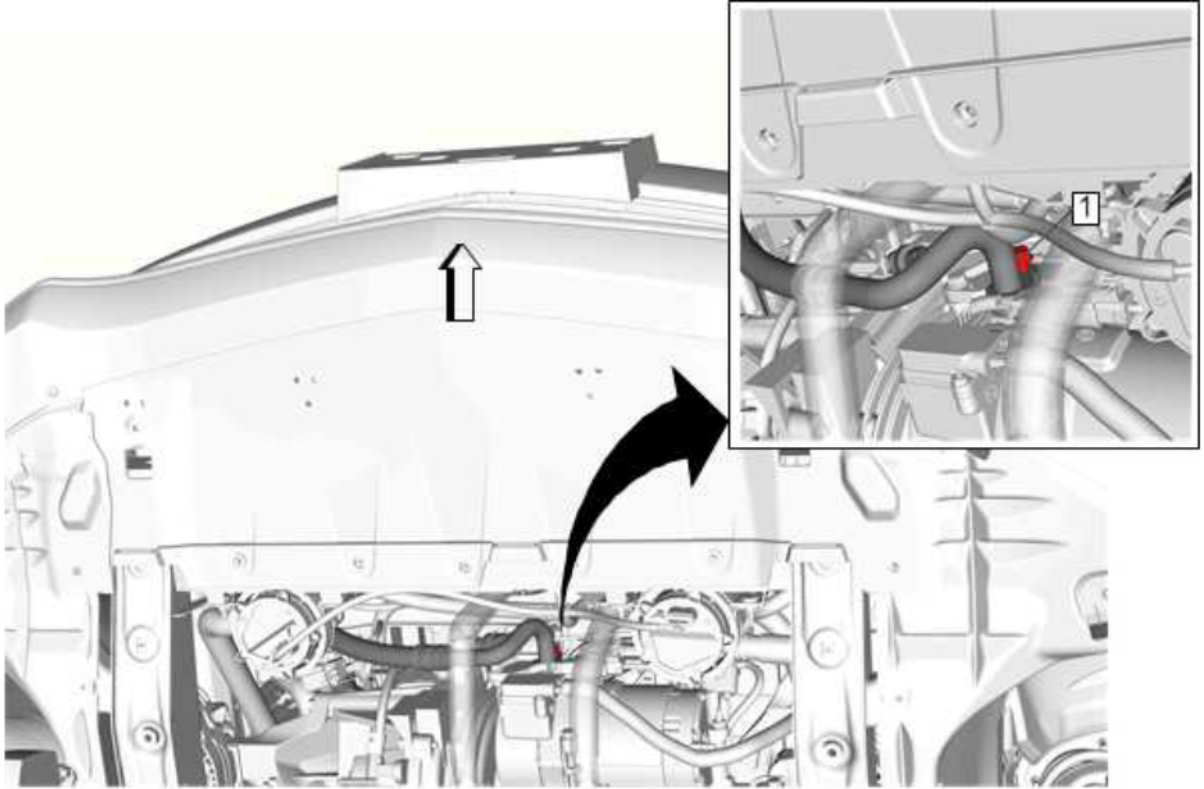


Fig. 35: Air Conditioning Compressor Hose Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

4. Install the air conditioning compressor hose bolt (1) to the air conditioning compressor and tighten to 22 N.m (16 lb ft).

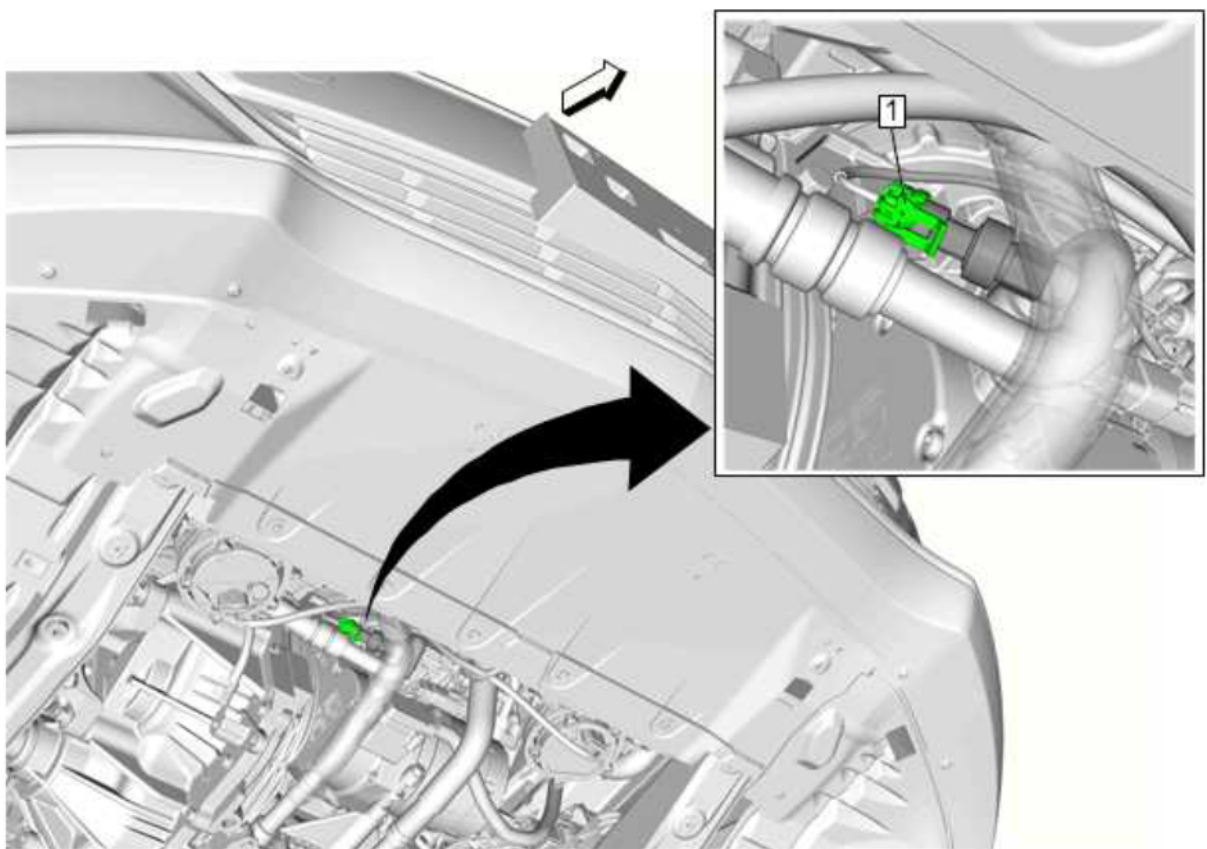


Fig. 36: Electrical Connector And Air Conditioning (A/C) Refrigerant Pressure Sensor
 Courtesy of GENERAL MOTORS COMPANY

5. Connect the electrical connector (1) to the air conditioning (A/C) refrigerant pressure sensor.
6. Install Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](http://iagn.com) iagn.com
7. Lower the vehicle.

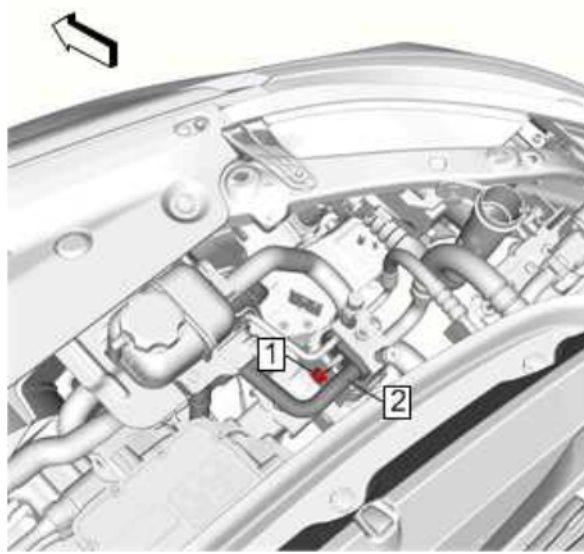


Fig. 37: Air Conditioning Compressor Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

8. Install the air conditioning compressor hose (2) to the air conditioning evaporator hose.
9. Tighten the air conditioning compressor hose nut (1) to 22 N.m (16 lb ft)
10. Evacuate and charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
11. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

AIR CONDITIONING CONDENSER HOSE REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

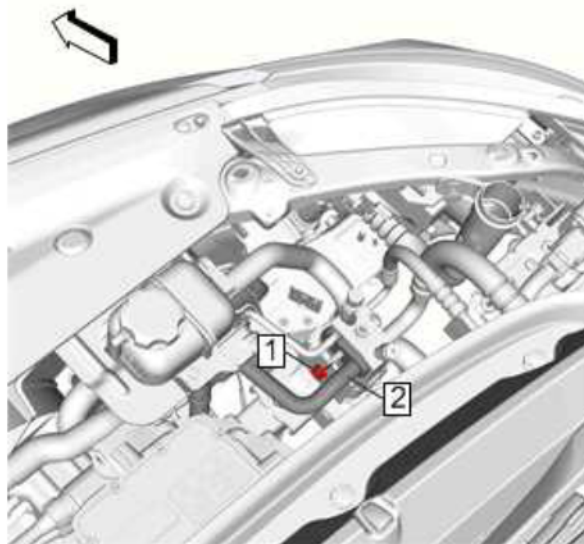


Fig. 38: Air Conditioning Compressor Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose nut (1). [Air Conditioning Compressor Hose Replacement](#)

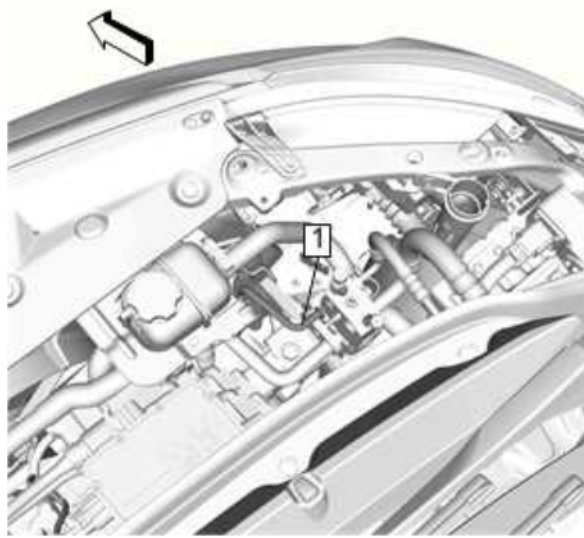


Fig. 39: Air Conditioning Condenser Hose

Courtesy of GENERAL MOTORS COMPANY

4. Remove the air conditioning condenser hose (1) from the air conditioning evaporator hose.
5. Raise the vehicle. **Lifting and Jacking the Vehicle**
6. Remove Front Compartment Air Deflector **Front Compartment Air Deflector Replacement**
7. Remove Front Bumper Fascia **Front Bumper Fascia Replacement (North America)** **Front Bumper Fascia Replacement (Europe, Korea)**

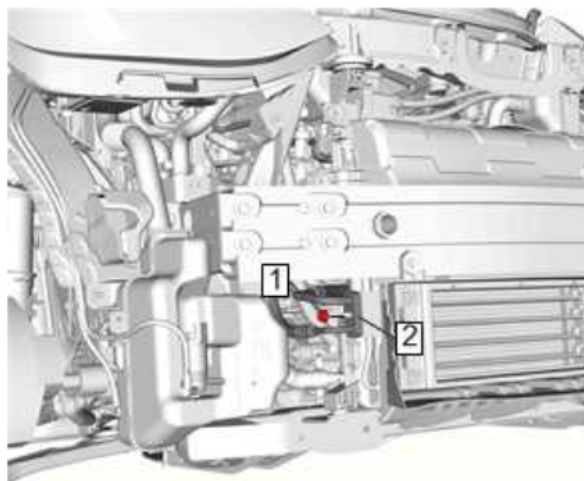


Fig. 40: Air Conditioning Condenser Hose And Nut

Courtesy of GENERAL MOTORS COMPANY

8. Remove the air conditioning condenser hose nut (1).
9. Remove the air conditioning condenser hose (2) from the air conditioning condenser.

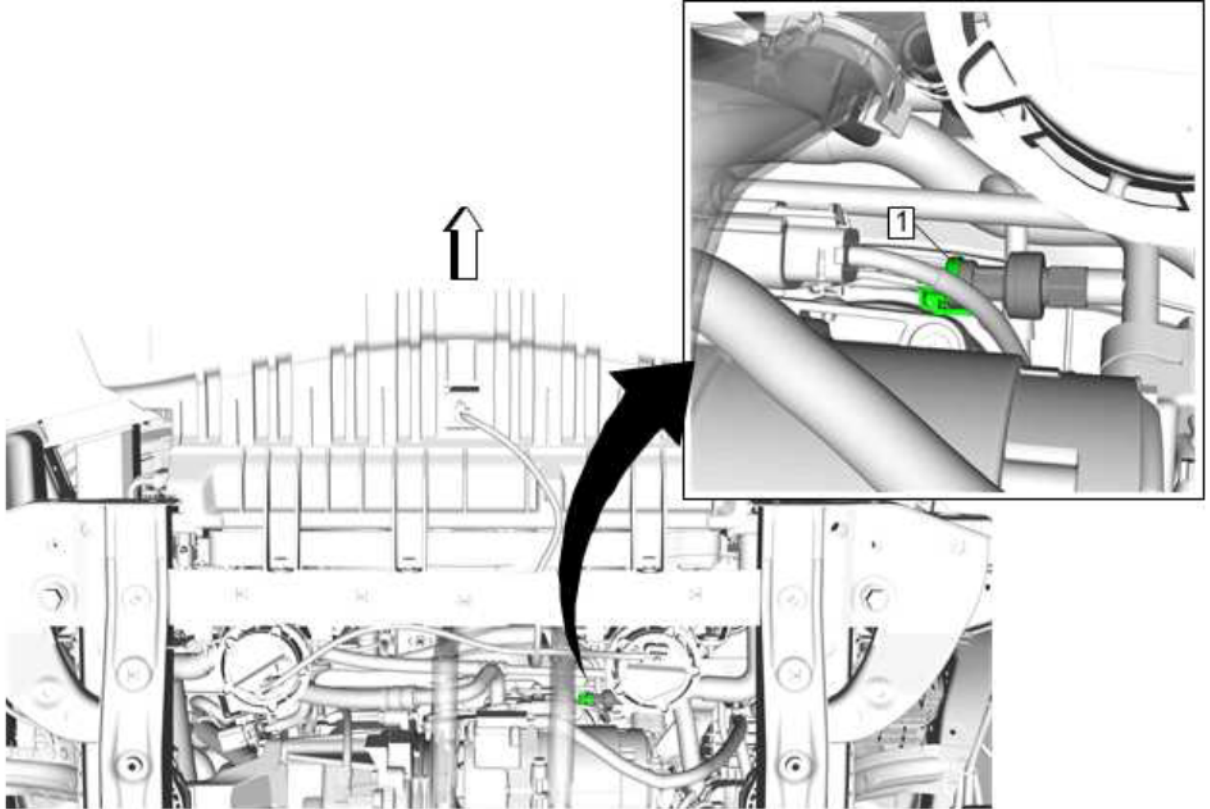


Fig. 41: Electrical Connector And Air Conditioning (A/C) Refrigerant Pressure Sensor
 Courtesy of GENERAL MOTORS COMPANY

10. Disconnect the electrical connector (1) from the air conditioning (A/C) refrigerant pressure sensor.

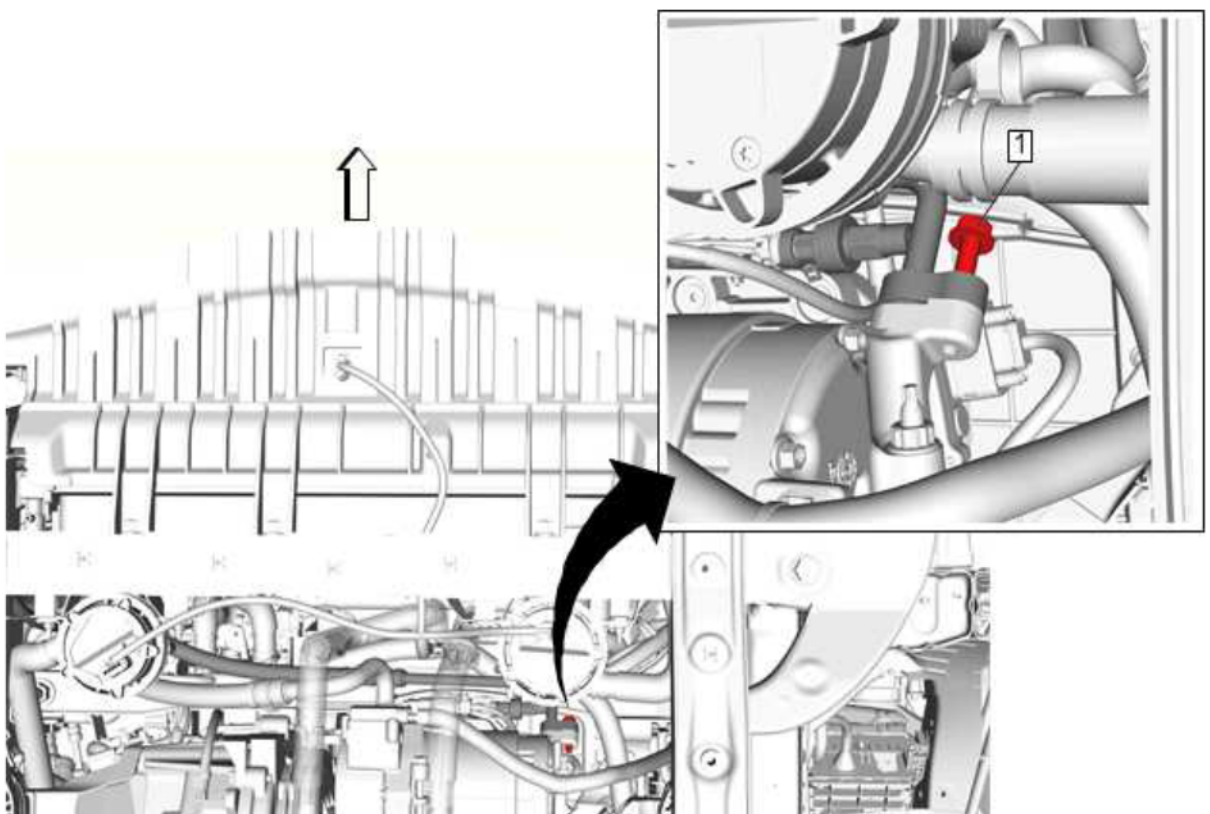


Fig. 42: Air Conditioning Condenser Hose Bolt
 Courtesy of GENERAL MOTORS COMPANY

11. Remove the air conditioning condenser hose bolt (1) from the air conditioning compressor.

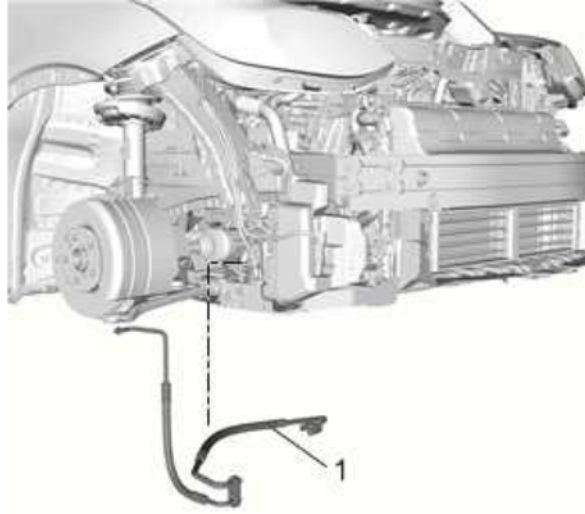


Fig. 43: Air Conditioning Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

12. Remove Air Conditioning Condenser Hose (1)
13. Remove the high pressure air conditioning refrigerant pressure sensor. [Air Conditioning Refrigerant Pressure Sensor Replacement - High Pressure](#)

Installation Procedure

1. Install the high pressure air conditioning refrigerant pressure sensor. [Air Conditioning Refrigerant Pressure Sensor Replacement - High Pressure](#)
2. Change the air conditioning sealing washer. [Air Conditioning System Seal Replacement](#)

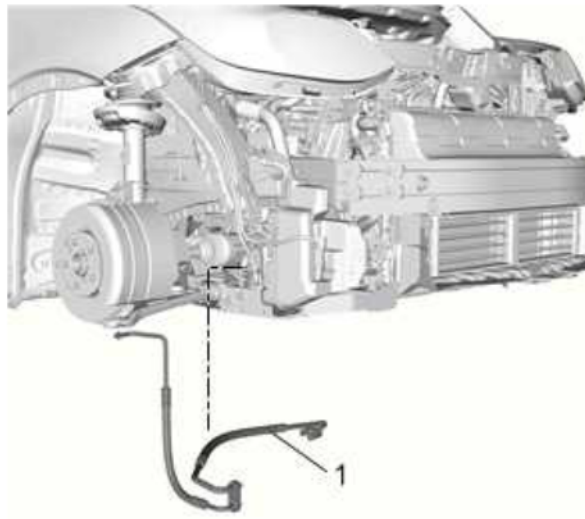


Fig. 44: Air Conditioning Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

3. Position the air conditioning condenser hose (1) to the vehicle.

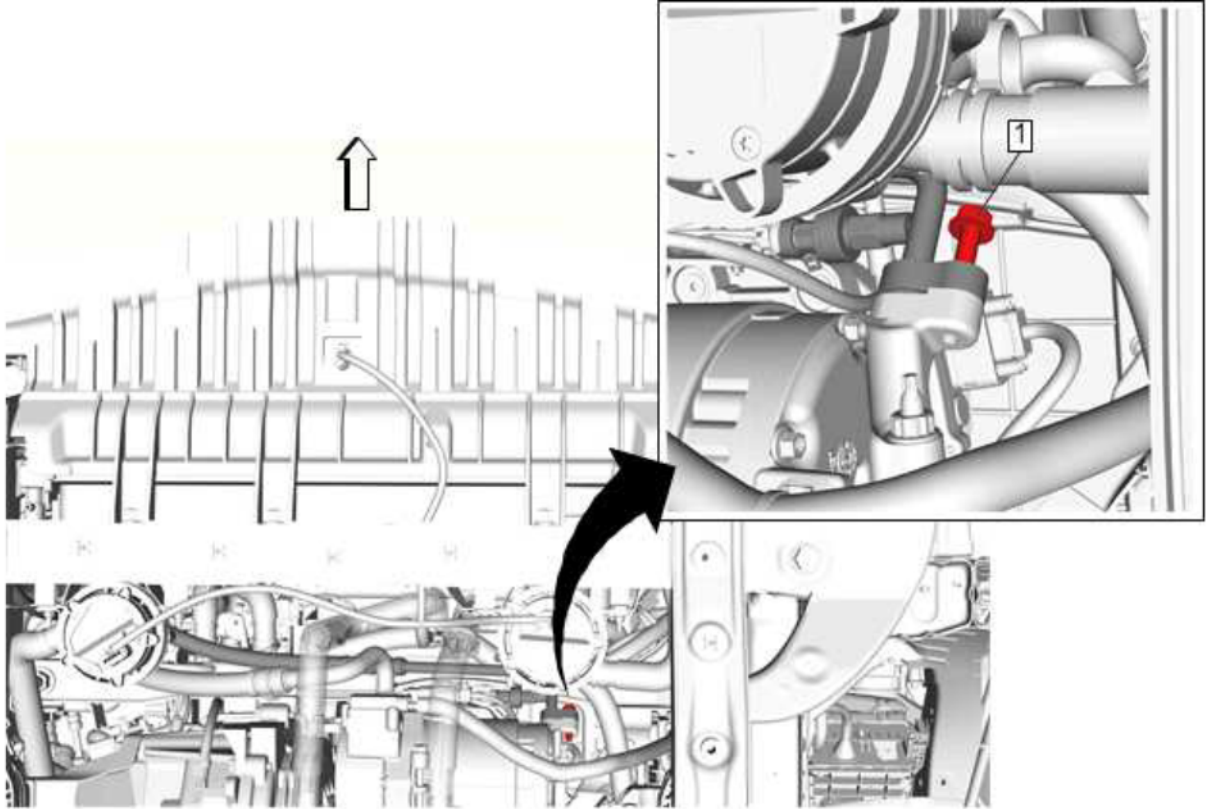


Fig. 45: Air Conditioning Condenser Hose Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Install the air conditioning condenser hose bolt (1) to the compressor and tighten to 22 N.m (16 lb ft).

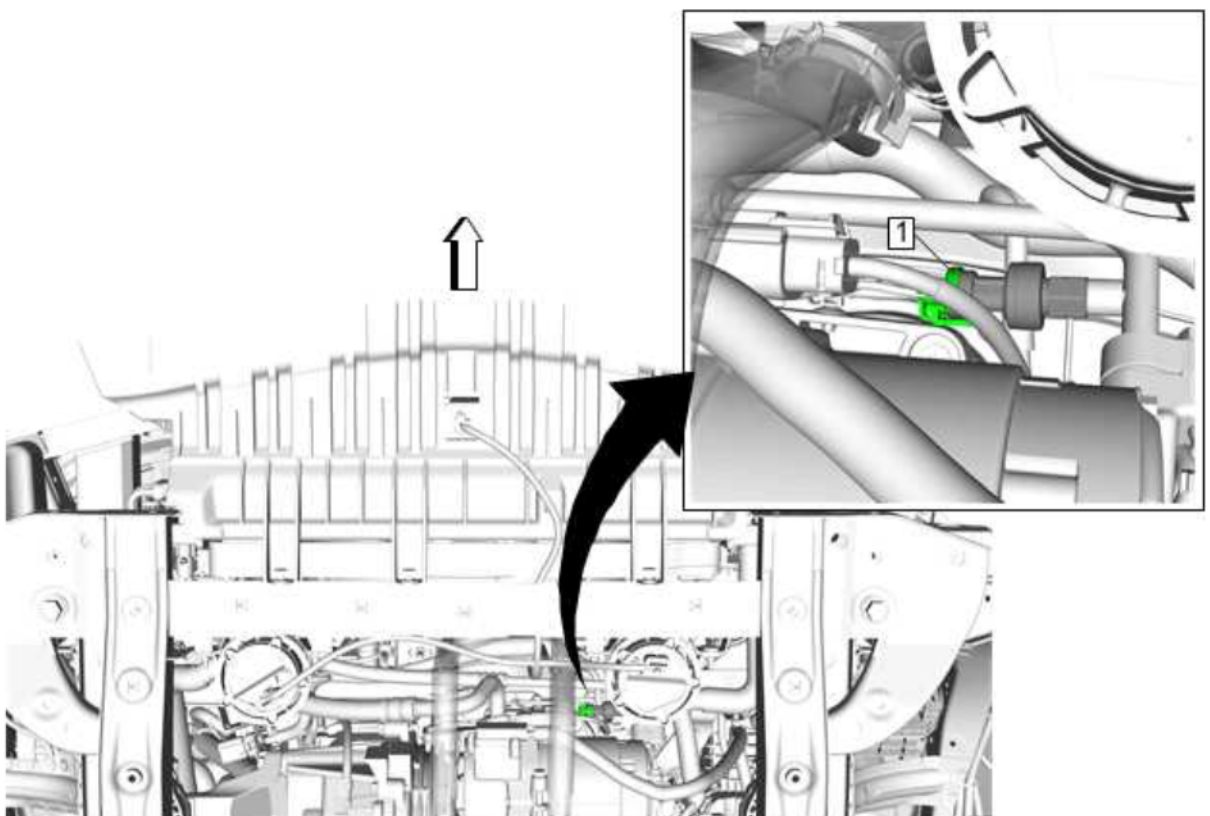


Fig. 46: Electrical Connector And Air Conditioning (A/C) Refrigerant Pressure Sensor
Courtesy of GENERAL MOTORS COMPANY

5. Connect the electrical connector (1) to the air conditioning (A/C) refrigerant pressure sensor.

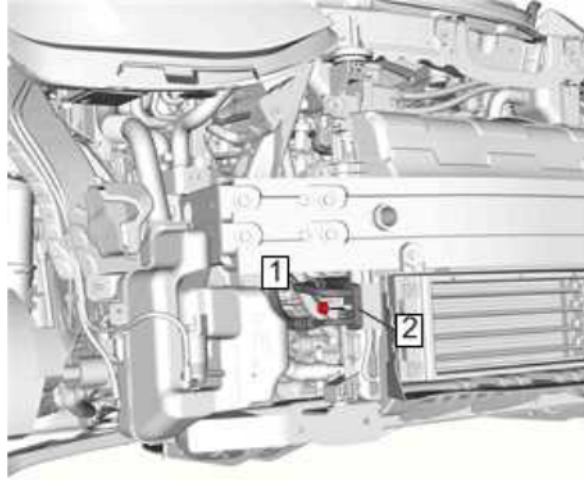


Fig. 47: Air Conditioning Condenser Hose And Nut
 Courtesy of GENERAL MOTORS COMPANY

6. Install the air conditioning condenser hose (1) to the air conditioning condenser.
7. Install the air conditioning condenser hose nut (2) and tighten to 22 N.m (16 lb ft).
8. Install Front Bumper Fascia [Front Bumper Fascia Replacement \(North America\)](#) [Front Bumper Fascia Replacement \(Europe, Korea\)](#)
9. Install Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
10. Lower the vehicle.

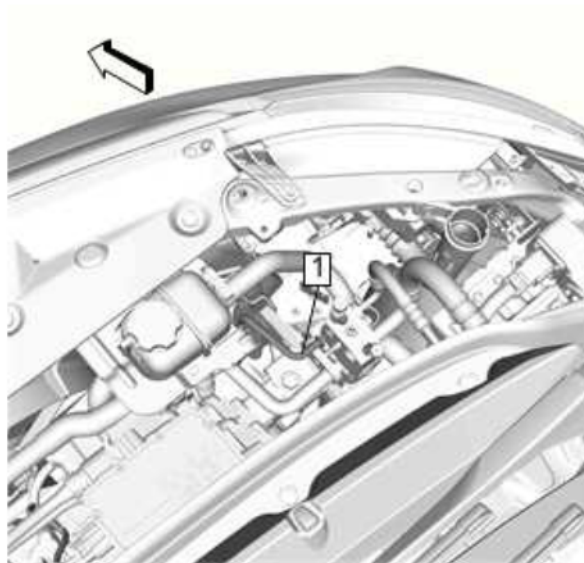


Fig. 48: Air Conditioning Condenser Hose
 Courtesy of GENERAL MOTORS COMPANY

11. Install the air conditioning condenser hose (1) to the air conditioning evaporator hose.

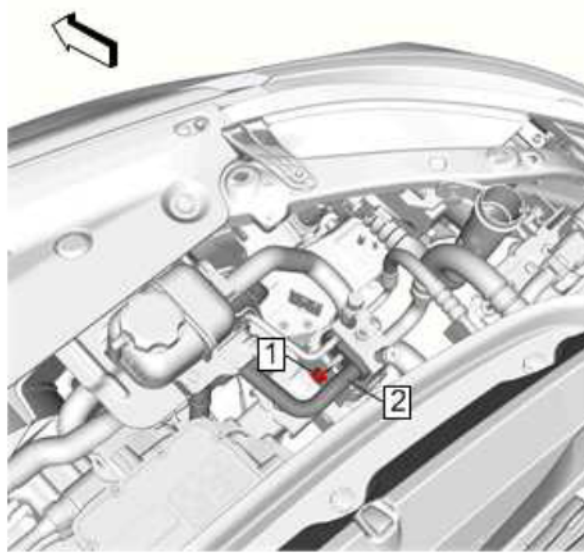


Fig. 49: Air Conditioning Compressor Hose Nut
Courtesy of GENERAL MOTORS COMPANY

12. Remove the air conditioning compressor hose nut (1). [Air Conditioning Compressor Hose Replacement](#)
13. Evacuate and charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
14. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

AIR CONDITIONING EVAPORATOR HOSE ASSEMBLY REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

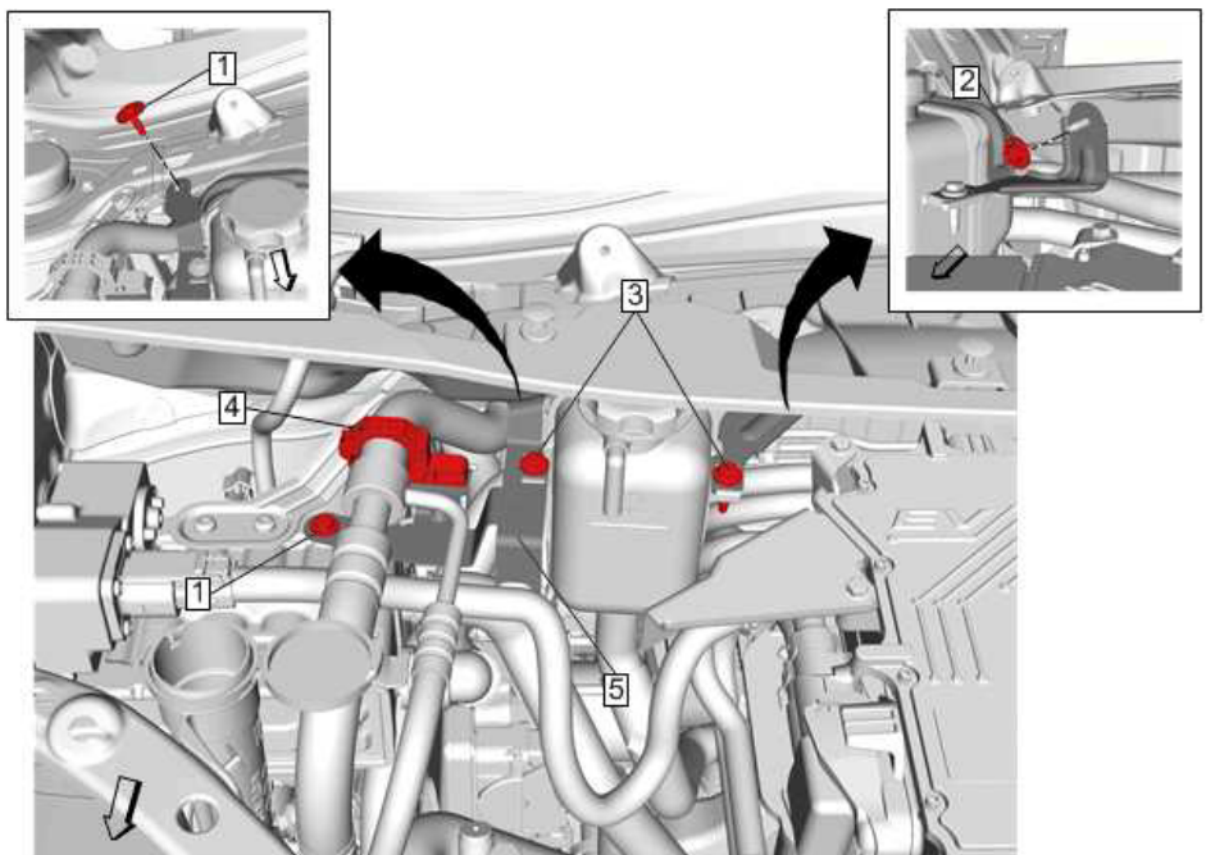


Fig. 50: Radiator Surge Tank Support Bracket (Heater)
Courtesy of GENERAL MOTORS COMPANY

3. Remove the radiator surge tank support bracket (4) - heater. [Radiator Surge Tank Support Bracket Replacement \(Heater\)](#)

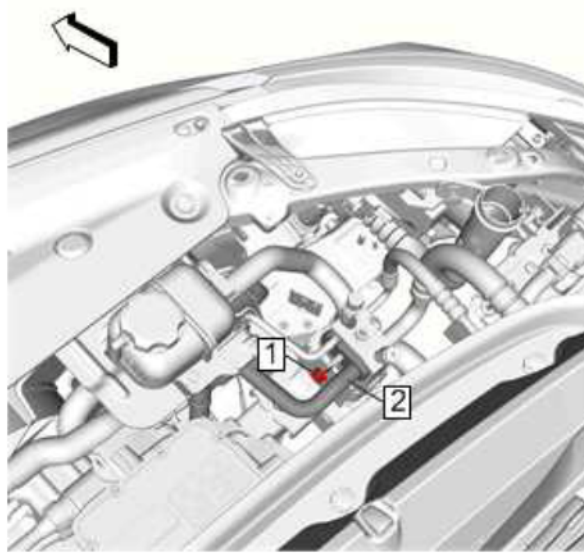


Fig. 51: Air Conditioning Compressor Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

4. Remove the air conditioning compressor hose nut (1) and reposition the compressor hose (2) and the condenser hose from the air conditioning evaporator hose. **Air Conditioning Condenser Hose Replacement**

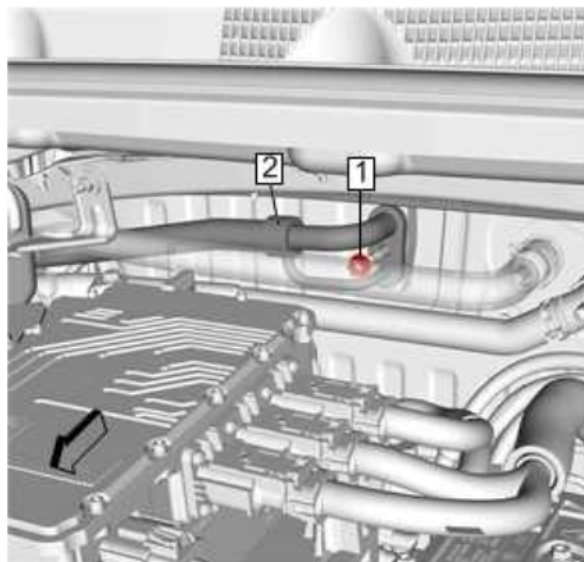


Fig. 52: Air Conditioning Evaporator Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the air conditioning evaporator hose nut (1) and remove the air conditioning evaporator hose (2) from TXV stud.

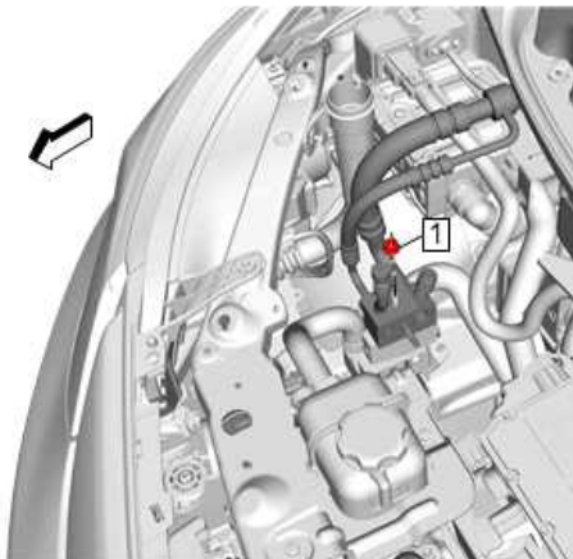


Fig. 53: Air Conditioning Evaporator Hose Nut
Courtesy of GENERAL MOTORS COMPANY

6. Remove the air conditioning evaporator hose nut (1).

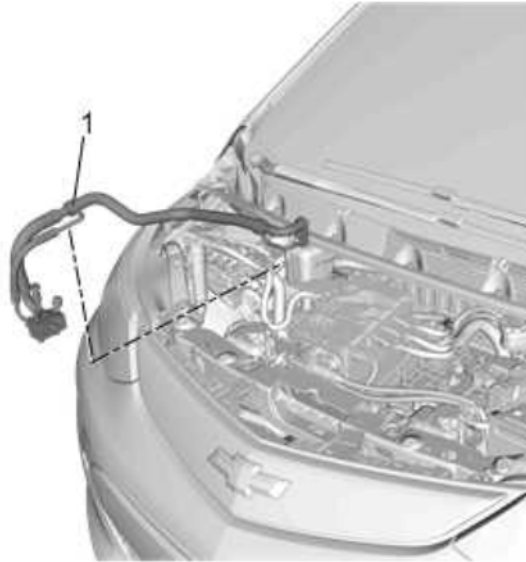


Fig. 54: Air Conditioning Evaporator Hose
Courtesy of GENERAL MOTORS COMPANY

7. Remove the air conditioning evaporator hose (1) from the vehicle.

Installation Procedure

1. Change the air conditioning sealing washer. **[Air Conditioning System Seal Replacement](#)**



Fig. 55: Air Conditioning Evaporator Hose
Courtesy of GENERAL MOTORS COMPANY

2. Position the air conditioning evaporator hose (1) to the vehicle.

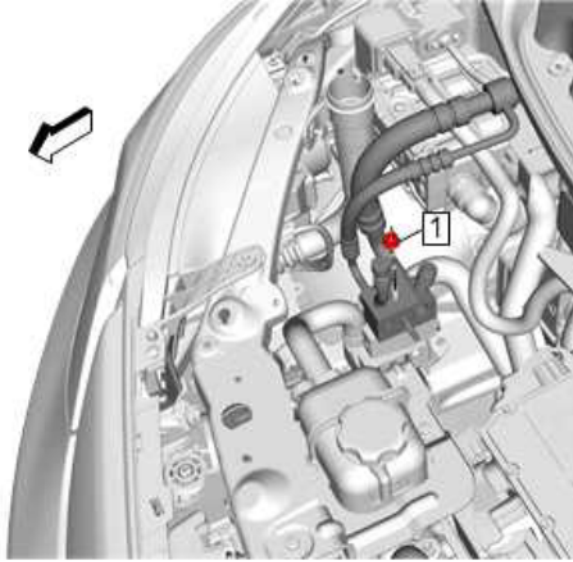


Fig. 56: Air Conditioning Evaporator Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install the air conditioning evaporator hose and the air conditioning evaporator hose nut (1) and tighten to 22 N.m (16 lb ft).

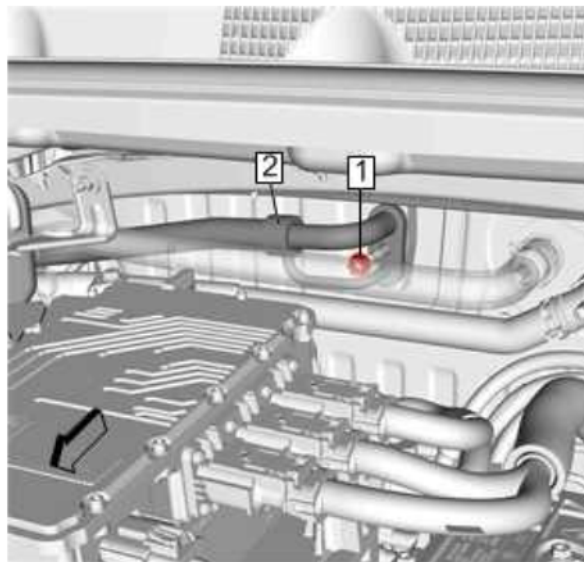


Fig. 57: Air Conditioning Evaporator Hose Nut
 Courtesy of GENERAL MOTORS COMPANY

4. Install the air conditioning evaporator hose (2) and the air conditioning evaporator hose nut (1) and tighten to 22 N.m (16 lb ft).

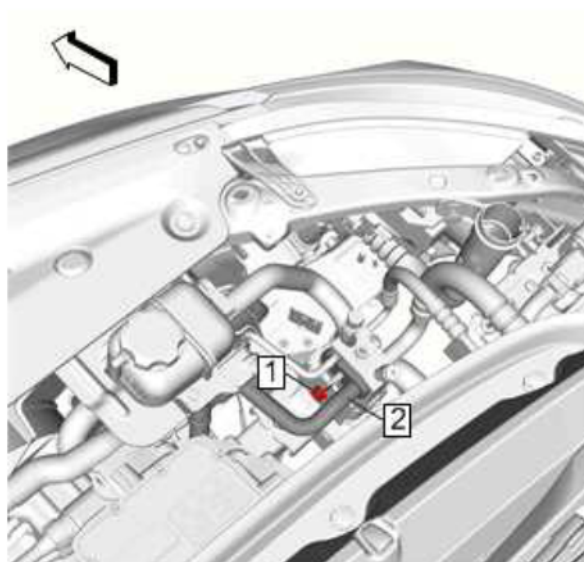


Fig. 58: Air Conditioning Compressor Hose Nut
Courtesy of GENERAL MOTORS COMPANY

5. Position the compressor hose (2) and the condenser hose to the air conditioning evaporator hose and tighten the air conditioning compressor hose nut (1). [Air Conditioning Condenser Hose Replacement](#)

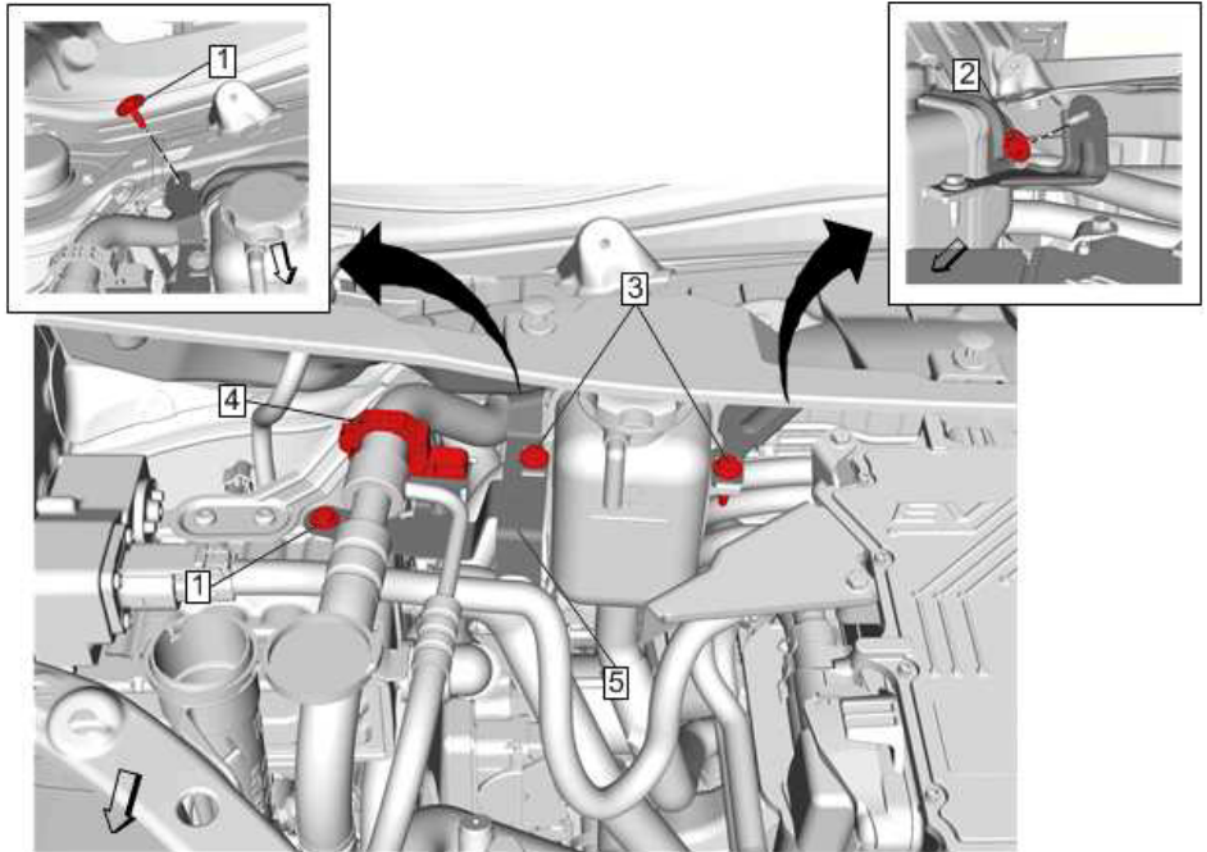


Fig. 59: Radiator Surge Tank Support Bracket (Heater)
Courtesy of GENERAL MOTORS COMPANY

6. Install the radiator surge tank support bracket (4) - heater. [Radiator Surge Tank Support Bracket Replacement \(Heater\)](#)
7. Charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
8. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

RECEIVER AND DEHYDRATOR REPLACEMENT

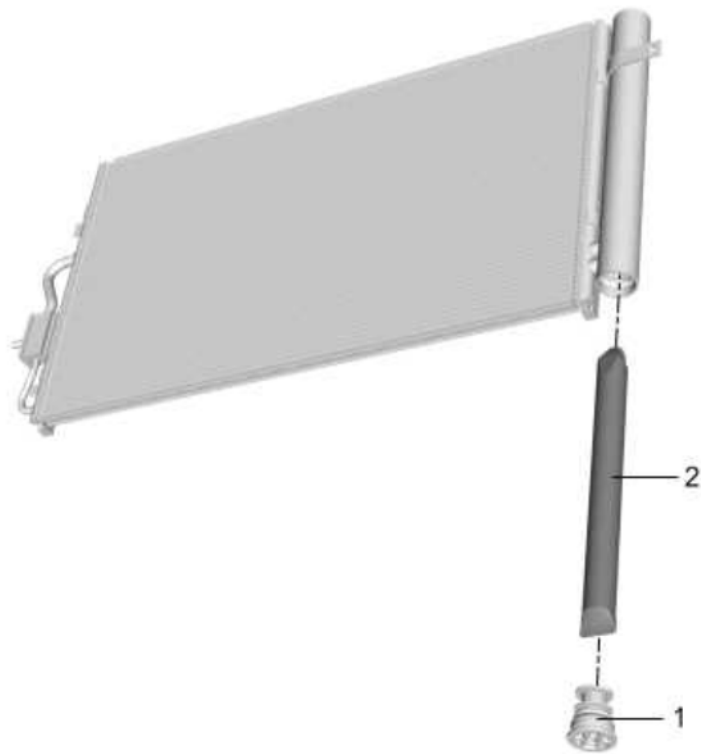


Fig. 60: Receiver and Dehydrator

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection 2. Recover the refrigerant. Refrigerant Recovery and Recharging 3. Air Conditioning Condenser Replacement	
1	Air Conditioning Receiver and Dehydrator Plug NOTE: Remove and DISCARD the old seal. Replace with NEW seal.
2	Air Conditioning Refrigerant Desiccant Procedure 1. Recharge the refrigerant. Refrigerant Recovery and Recharging 2. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

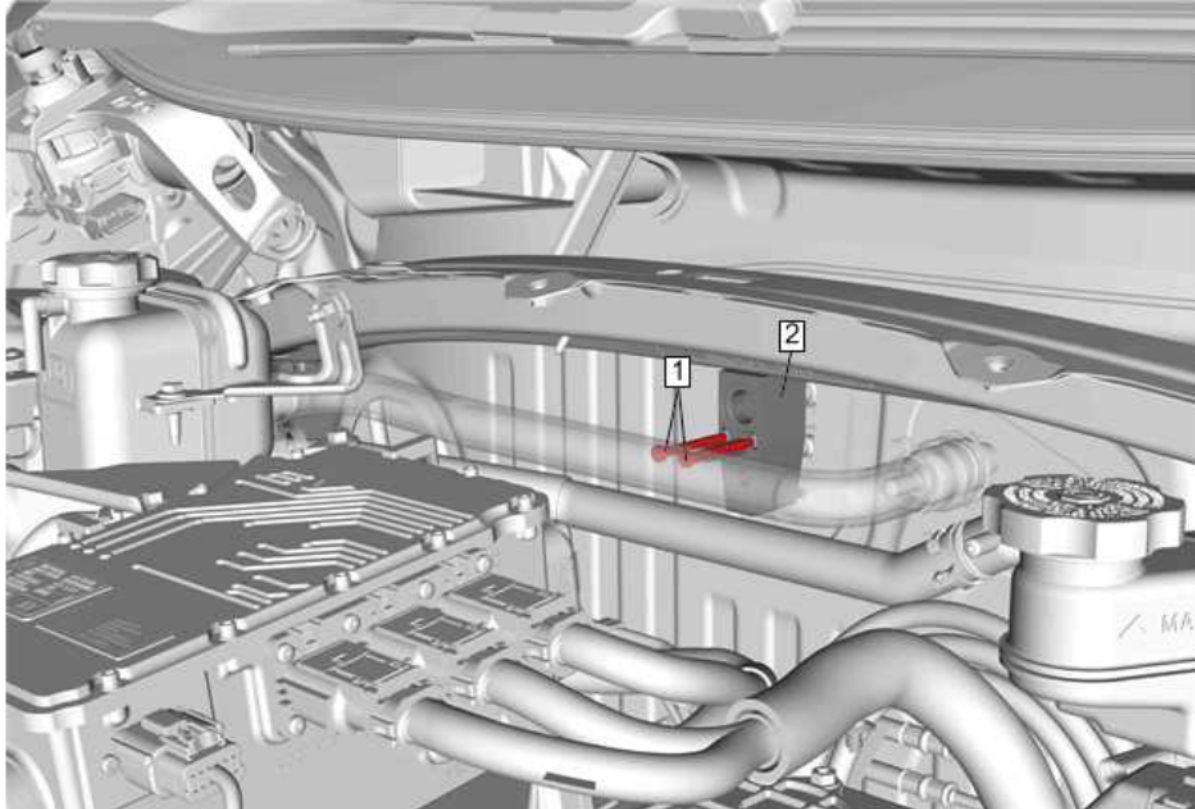


Fig. 61: Air Conditioning Evaporator Thermal Expansion Valve

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refrigerant Recovery and Recharging 2. Remove Air Conditioning Evaporator Hose@Air Conditioning Evaporator Thermal Expansion Valve Air Conditioning Evaporator Hose Assembly Replacement	
1	Air Conditioning Evaporator Thermal Expansion Valve Bolt (Qty: 2) CAUTION: Fastener Caution Tighten 7 N.m (62 lb in)
2	Air Conditioning Evaporator Thermal Expansion Valve Procedure 1. Remove and DISCARD the old sealing washers. Replace with NEW sealing washers. 2. Evacuate and charge the refrigerant system. Refrigerant Recovery and Recharging

AIR CONDITIONING REFRIGERANT PRESSURE SENSOR REPLACEMENT - LOW PRESSURE

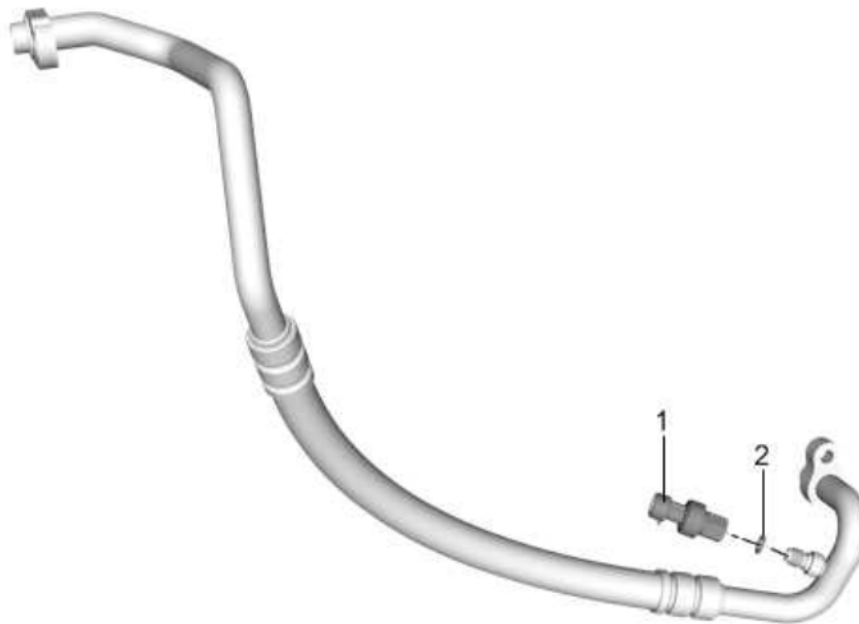


Fig. 62: Air Conditioning Refrigerant Pressure Sensor - Low Pressure

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.	
Preliminary Procedure Front Compartment Air Deflector Replacement	
1	Air Conditioning Refrigerant Pressure Sensor CAUTION: Refer to Fastener Caution . Procedure Disconnect the electrical connector.
2	Air Conditioning Refrigerant Pressure Sensor O-ring NOTE: Remove and DISCARD the O-ring and replace with NEW only. Air Conditioning O-Ring Seal Replacement Procedure Recharge the refrigerant. Refrigerant Recovery and Recharging

AIR CONDITIONING REFRIGERANT PRESSURE SENSOR REPLACEMENT - HIGH PRESSURE

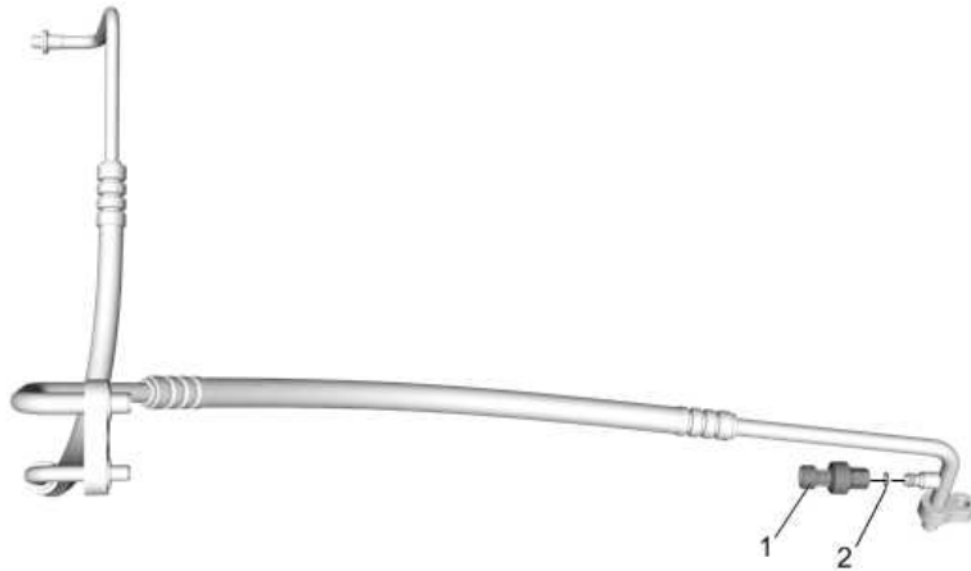


Fig. 63: Air Conditioning Refrigerant Pressure Sensor - High Pressure

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.	
Preliminary Procedure Remove the left front wheelhouse liner. Front Wheelhouse Liner Replacement	
1	Air Conditioning Refrigerant Pressure Sensor CAUTION: Refer to Fastener Caution . Procedure Disconnect the electrical connector.
2	Air Conditioning Refrigerant Pressure Sensor O-ring NOTE: Remove and DISCARD the O-ring and replace with NEW only. Air Conditioning O-Ring Seal Replacement Procedure Recharge the refrigerant. Refrigerant Recovery and Recharging

AIR CONDITIONING CONDENSER REPLACEMENT

Removal Procedure

1. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

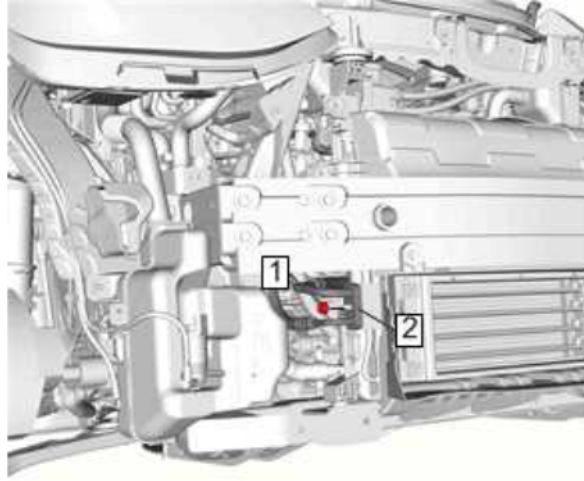


Fig. 64: Air Conditioning Condenser Hose And Nut
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Air Conditioning Condenser Hose (2)@Air Conditioning Condenser Assembly **Air Conditioning Condenser Hose Replacement**

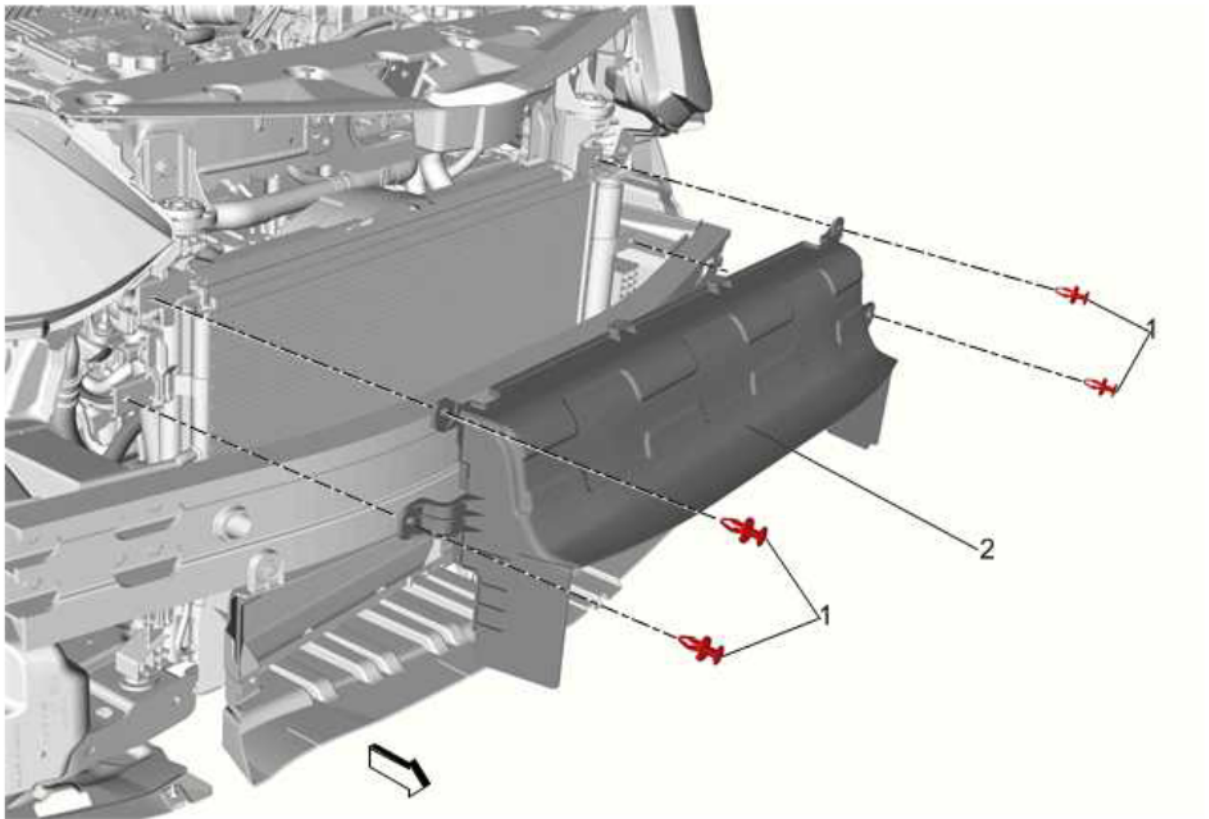


Fig. 65: Radiator Air Upper Baffle And Deflector
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Radiator Air Upper Baffle and Deflector (2)**Radiator Air Upper Baffle and Deflector Replacement**

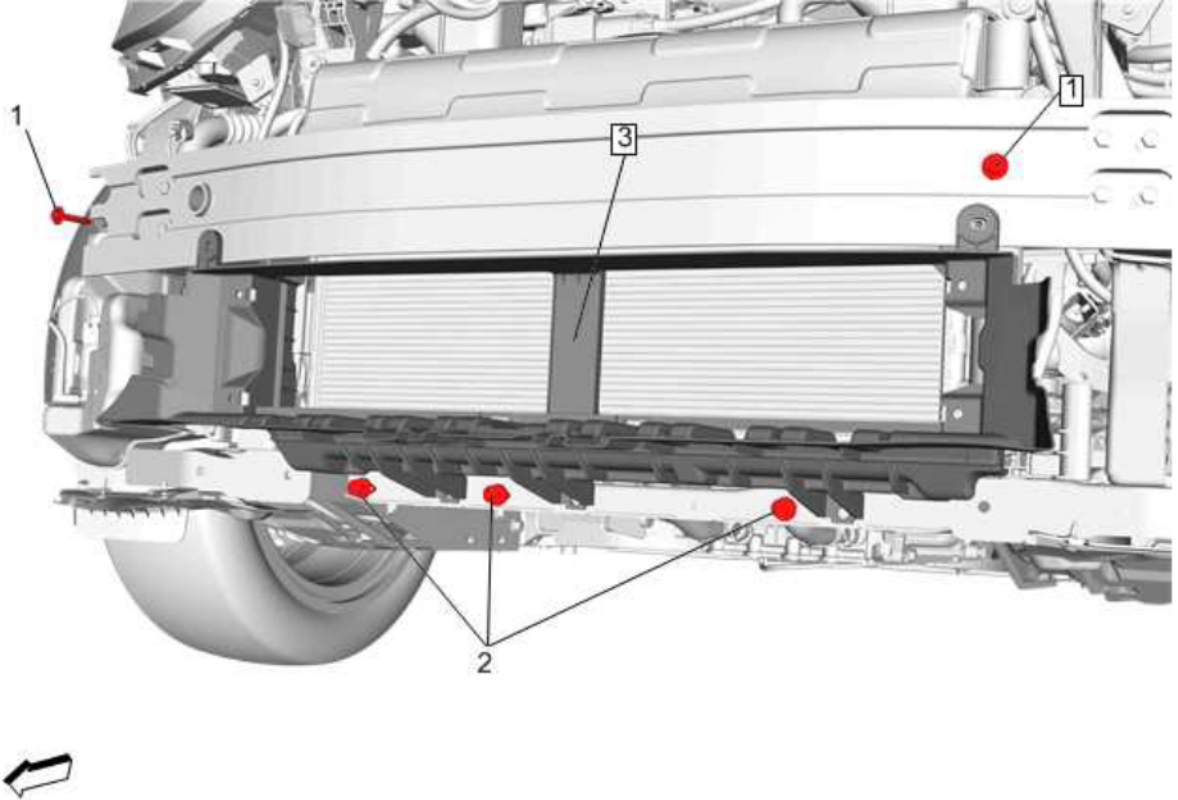


Fig. 66: Radiator Air Lower Baffle and Deflector Assembly
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Radiator Air Lower Baffle and Deflector Assembly (3) **Radiator Air Lower Baffle and Deflector Replacement**

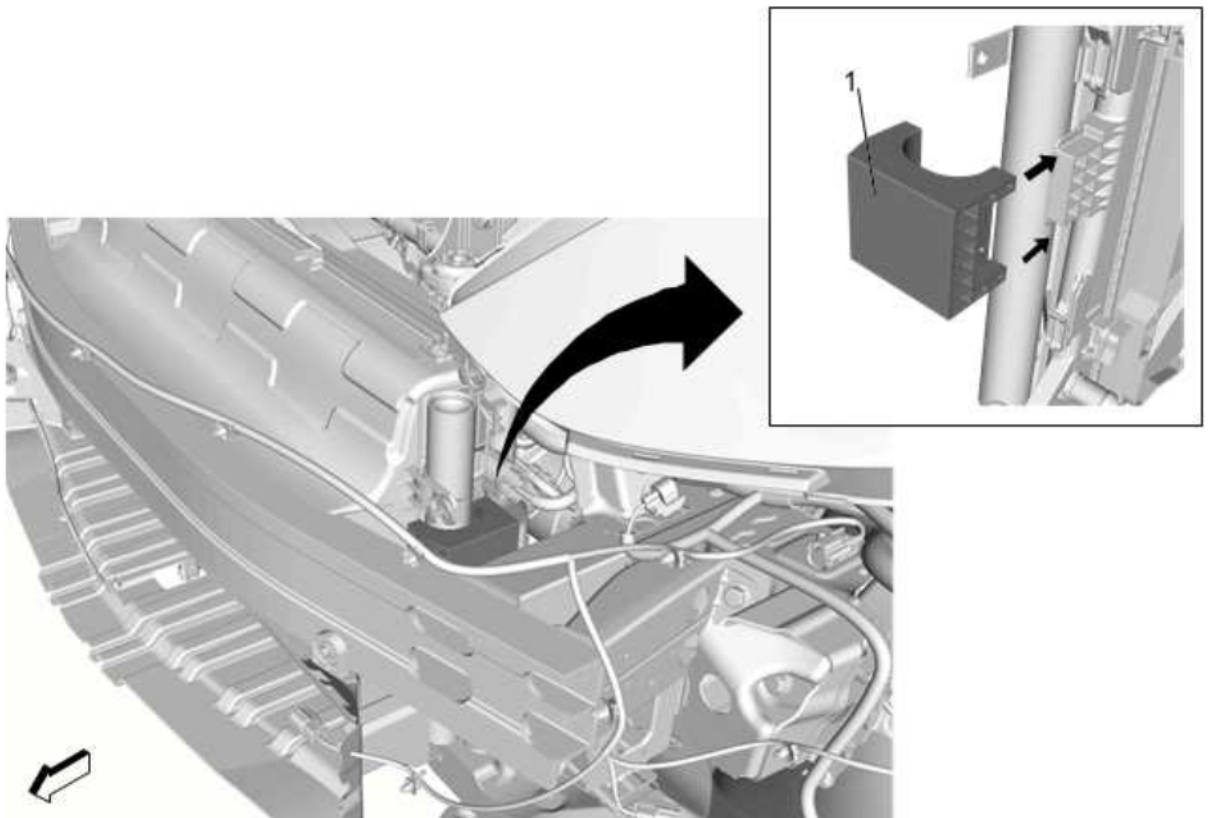


Fig. 67: Radiator Protector
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the radiator protector (1). **Radiator Protector Replacement**

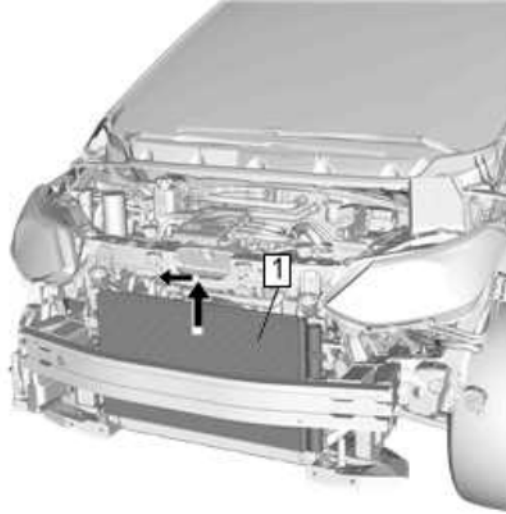


Fig. 68: Air Conditioning Condenser

Courtesy of GENERAL MOTORS COMPANY

6. Remove Air Conditioning Condenser (1) @Air Conditioning Condenser Bracket

Installation Procedure

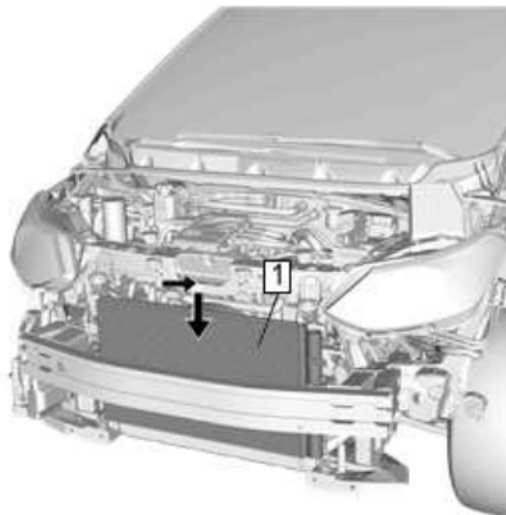


Fig. 69: Air Conditioning Condenser

Courtesy of GENERAL MOTORS COMPANY

1. Install Air Conditioning Condenser (1) @Air Conditioning Condenser Bracket

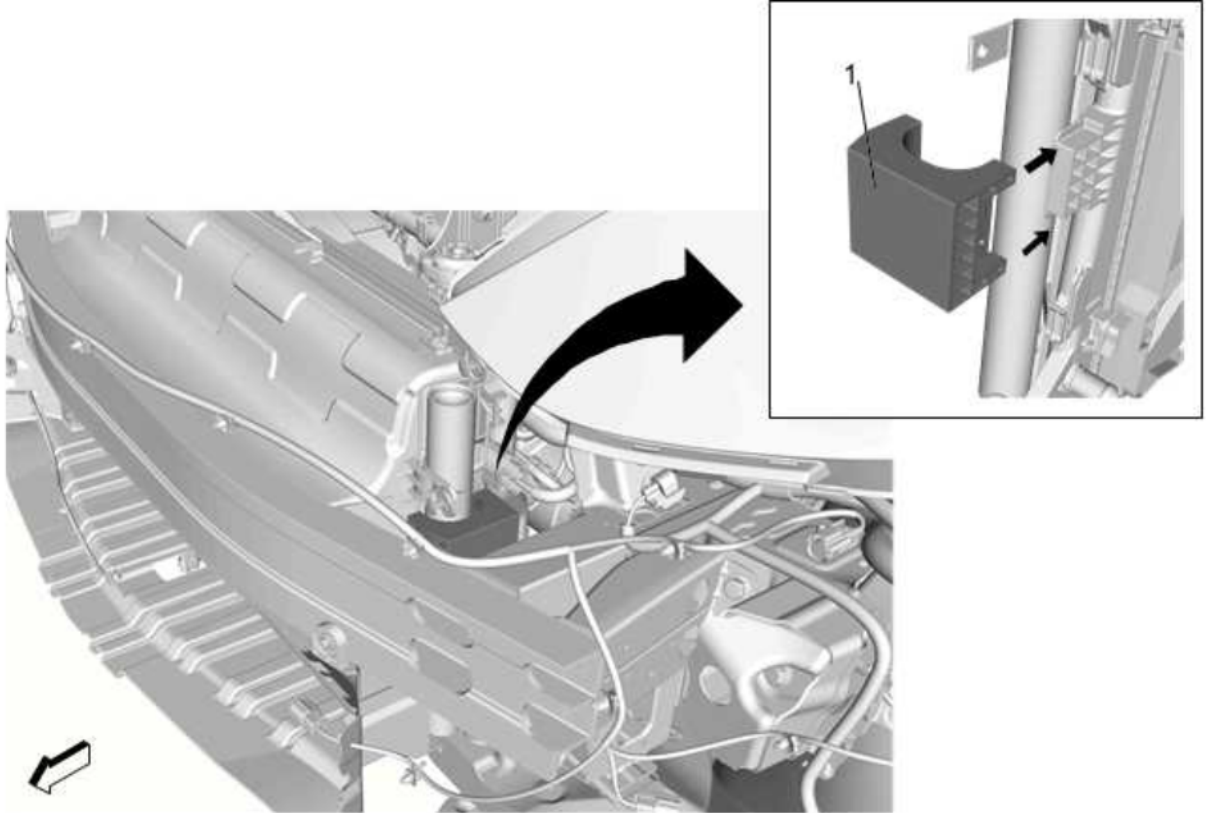


Fig. 70: Radiator Protector

Courtesy of GENERAL MOTORS COMPANY

2. Install the radiator protector (1). **Radiator Protector Replacement**

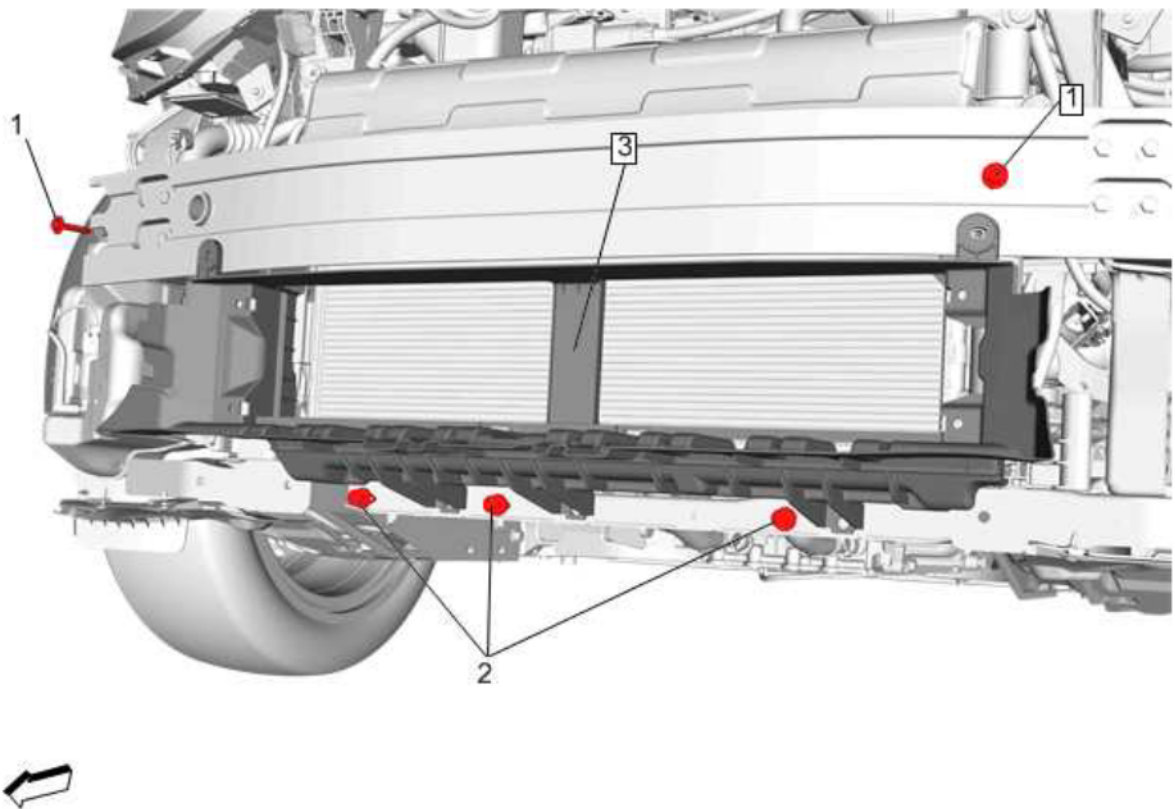


Fig. 71: Radiator Air Lower Baffle and Deflector Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Install Radiator Air Lower Baffle and Deflector Assembly (3) **Radiator Air Lower Baffle and Deflector Replacement**

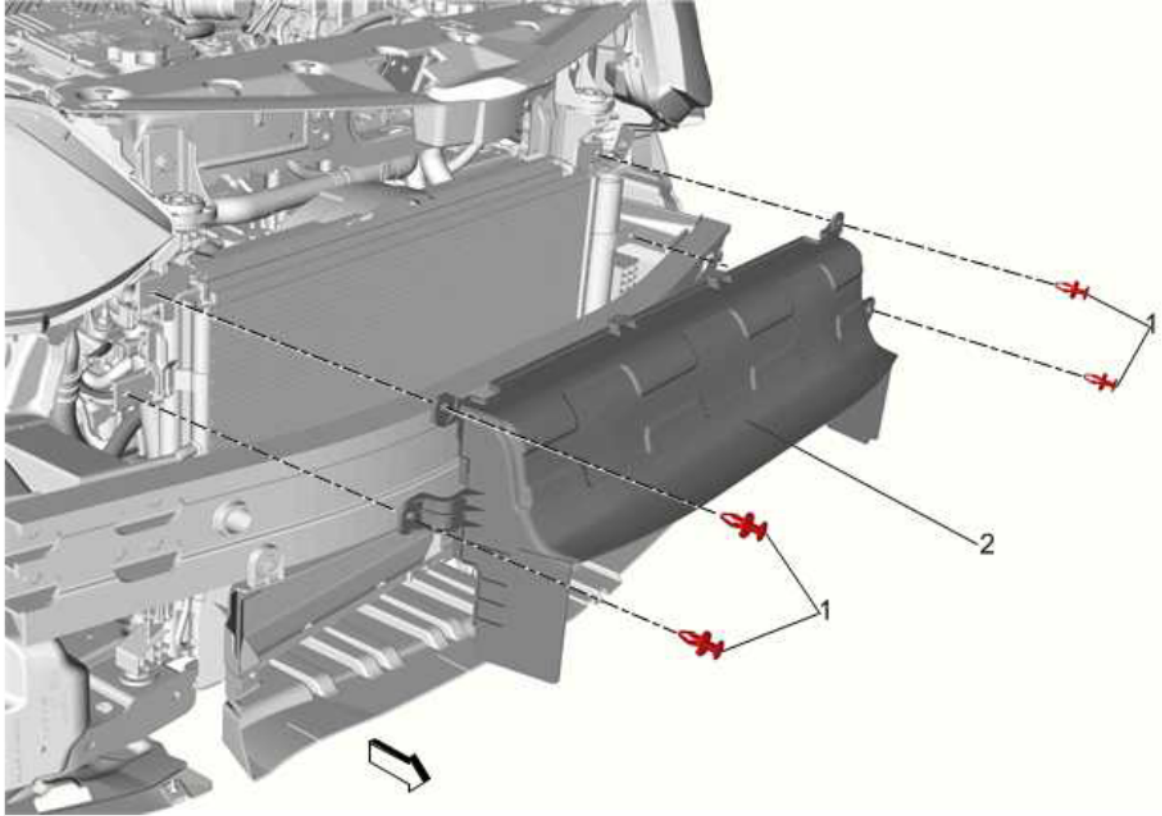


Fig. 72: Radiator Air Upper Baffle And Deflector
 Courtesy of GENERAL MOTORS COMPANY

4. Install Radiator Air Upper Baffle and Deflector (2) **Radiator Air Upper Baffle and Deflector Replacement**

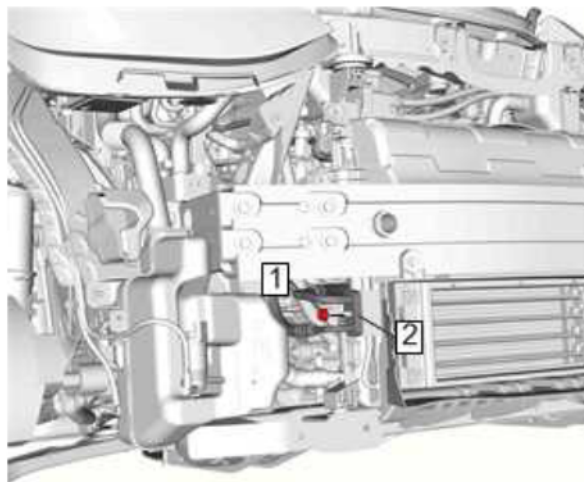


Fig. 73: Air Conditioning Condenser Hose And Nut
 Courtesy of GENERAL MOTORS COMPANY

5. Install Air Conditioning Condenser Hose (2) @Air Conditioning Condenser Assembly **Air Conditioning Condenser Hose Replacement**
6. Recharge the refrigerant. **Refrigerant Recovery and Recharging**

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REMOVAL AND INSTALLATION

Removal Procedure

1. Disconnect the battery negative cable. **Battery Negative Cable Disconnection and Connection**
2. Recover the refrigerant. **Refrigerant Recovery and Recharging**
3. Drain the cooling system. **Heater Coolant Heater Draining and Filling**
4. Remove Heater Inlet Hose@Heater Core Tube **Heater Inlet Hose Replacement**

5. Remove Heater Outlet Hose@Heater Core Tube [Heater Outlet Hose Replacement](#)
6. Remove Air Conditioning Evaporator Hose Assembly@Air Conditioning Evaporator Thermal Expansion Valve [Air Conditioning Evaporator Hose Assembly Replacement](#)

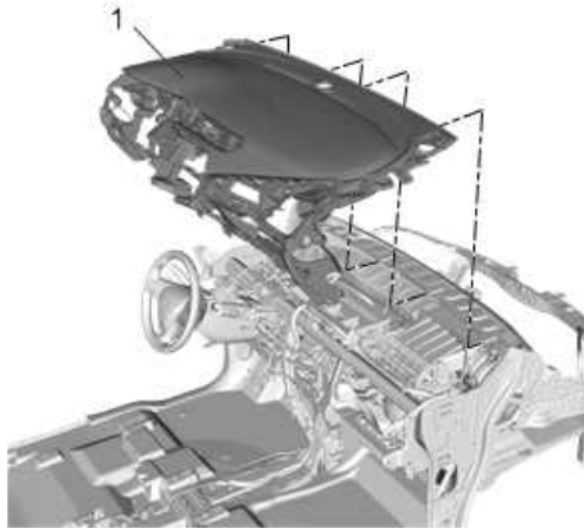


Fig. 74: Instrument Panel Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Remove Instrument Panel Assembly(1)[Instrument Panel Assembly Replacement](#)

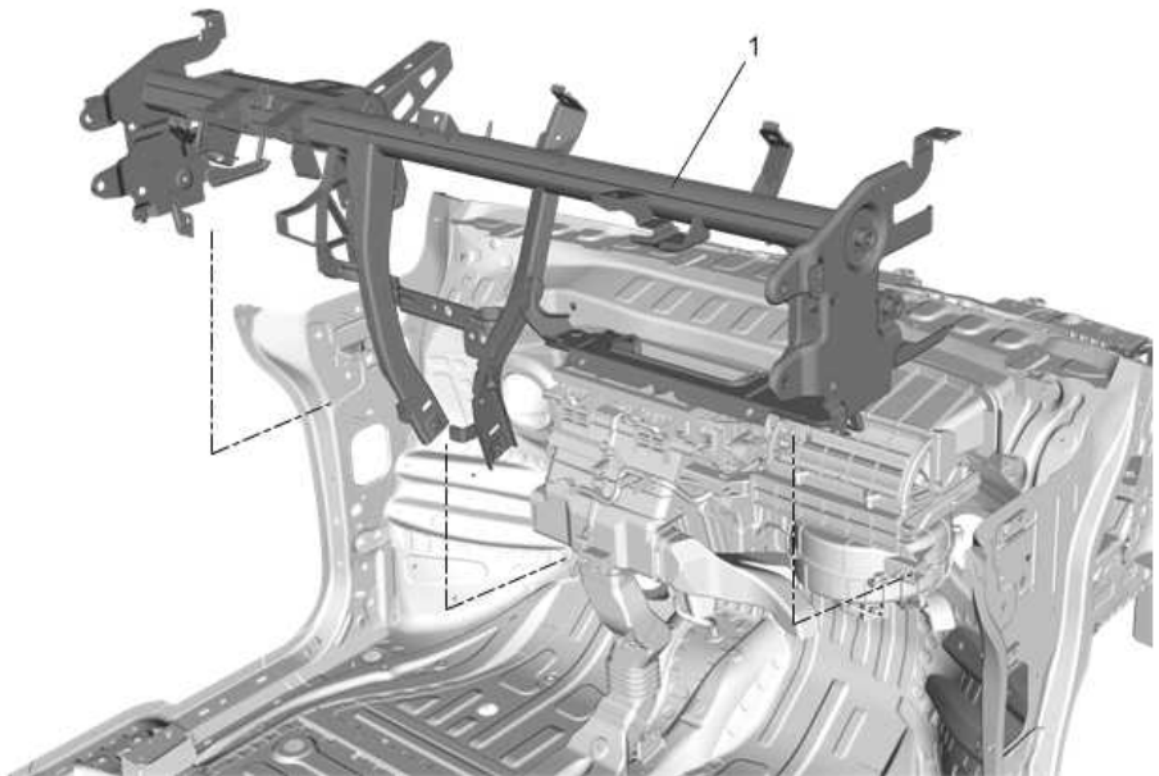


Fig. 75: Instrument Panel Tie Bar Assembly
Courtesy of GENERAL MOTORS COMPANY

8. Remove Instrument Panel Tie Bar(1) [Instrument Panel Tie Bar Replacement](#)
9. Remove Air Conditioning Evaporator and Blower Module Drain Hose [Air Conditioning Evaporator and Blower Module Drain Hose Replacement](#)
10. Remove Floor Front Air Outlet Duct [Floor Front Air Outlet Duct Replacement](#)
11. Disconnect and unclip the electrical.
12. Cap the heater core tube to prevent spillage.

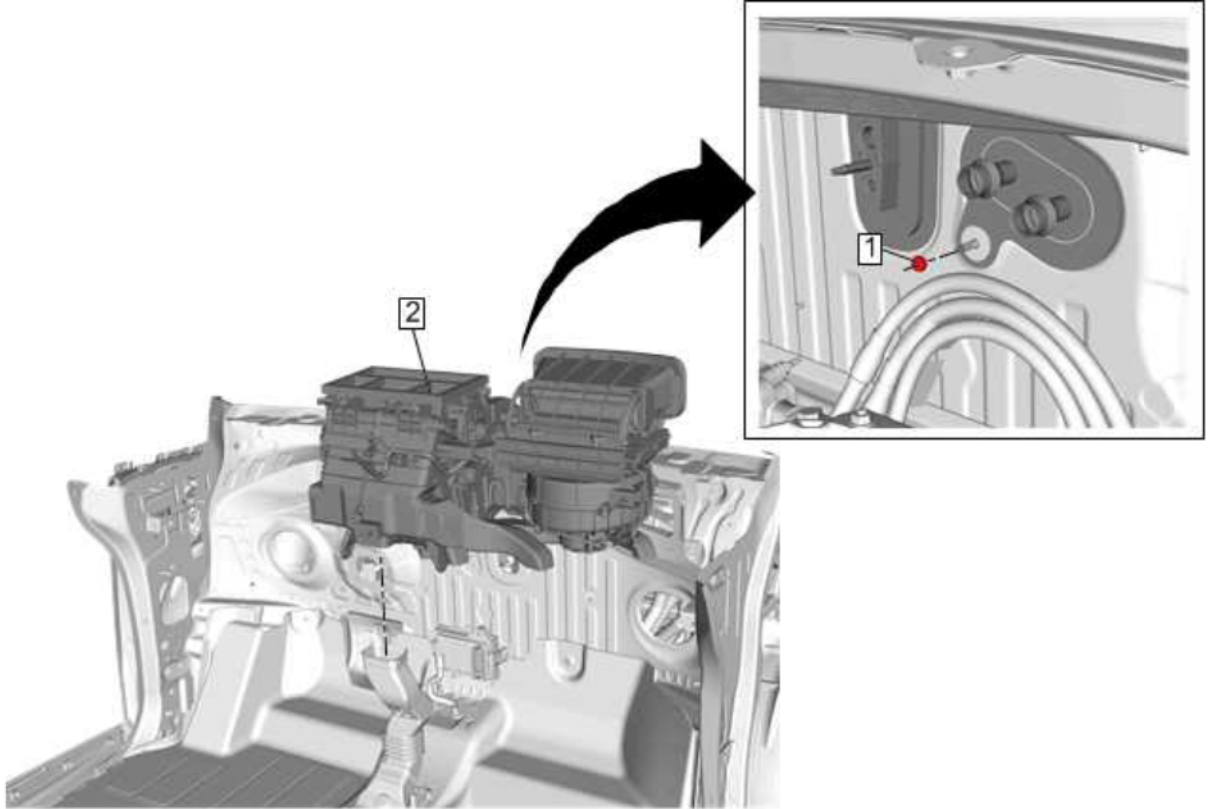


Fig. 76: Heater and Air Conditioning Evaporator and Blower Module
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [HVAC Module Drain Tube Caution](#)

13. From within the engine compartment, remove the heater and air conditioning evaporator and blower module nut (1) securing the heater and air conditioning evaporator and blower module to the cowl panel.
14. Remove Heater and Air Conditioning Evaporator and Blower Module (2)
15. Transfer components as necessary.

Installation Procedure

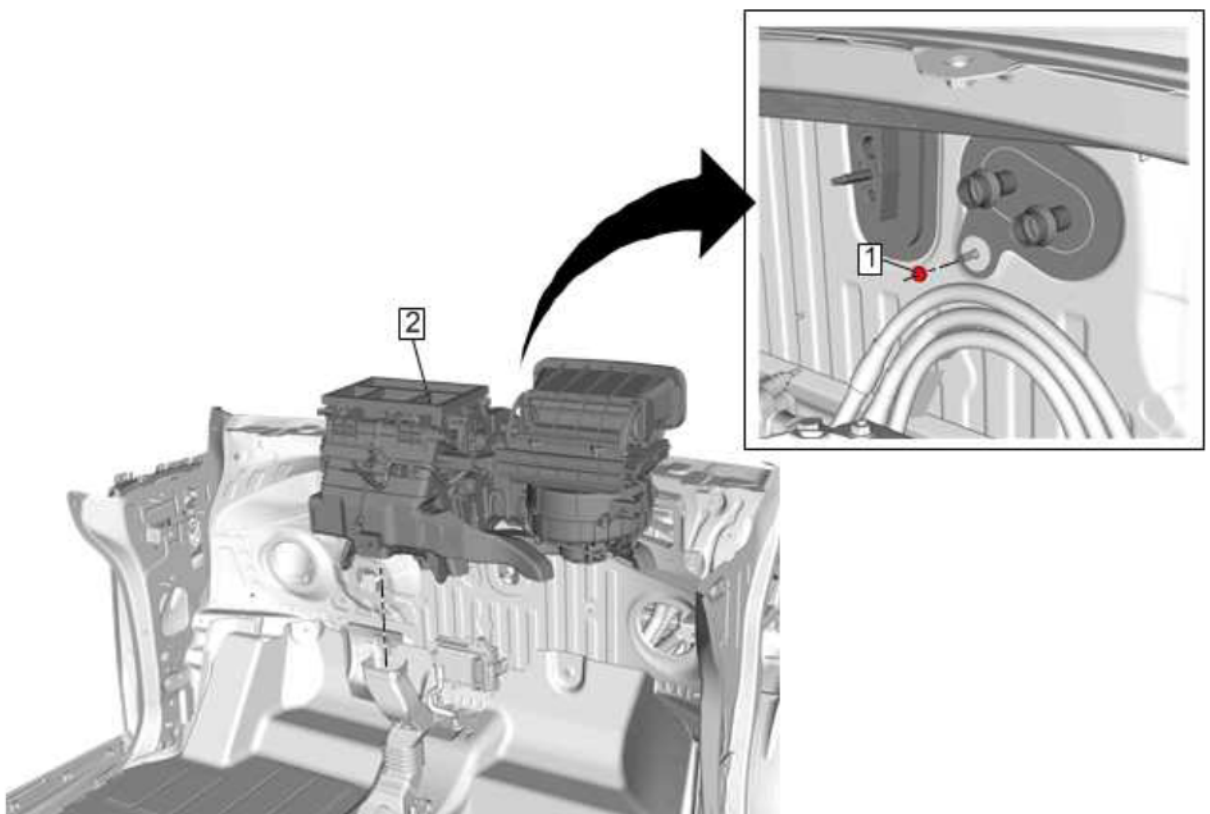


Fig. 77: Heater and Air Conditioning Evaporator and Blower Module
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#)

1. Position the Heater and Air Conditioning Evaporator and Blower Module (2) into the vehicle and temporarily support it.
2. From within the engine compartment, install the heater and air conditioning evaporator and blower module nut (1) securing the heater and air conditioning evaporator and blower module to the cowl panel, and tighten to 9 N.m (80 lb in).
3. Uncap the heater core tube.
4. Connect and clip the electrical.
5. Install Floor Front Air Outlet Duct [Floor Front Air Outlet Duct Replacement](#)
6. Install Air Conditioning Evaporator and Blower Module Drain Hose [Air Conditioning Evaporator and Blower Module Drain Hose Replacement](#)

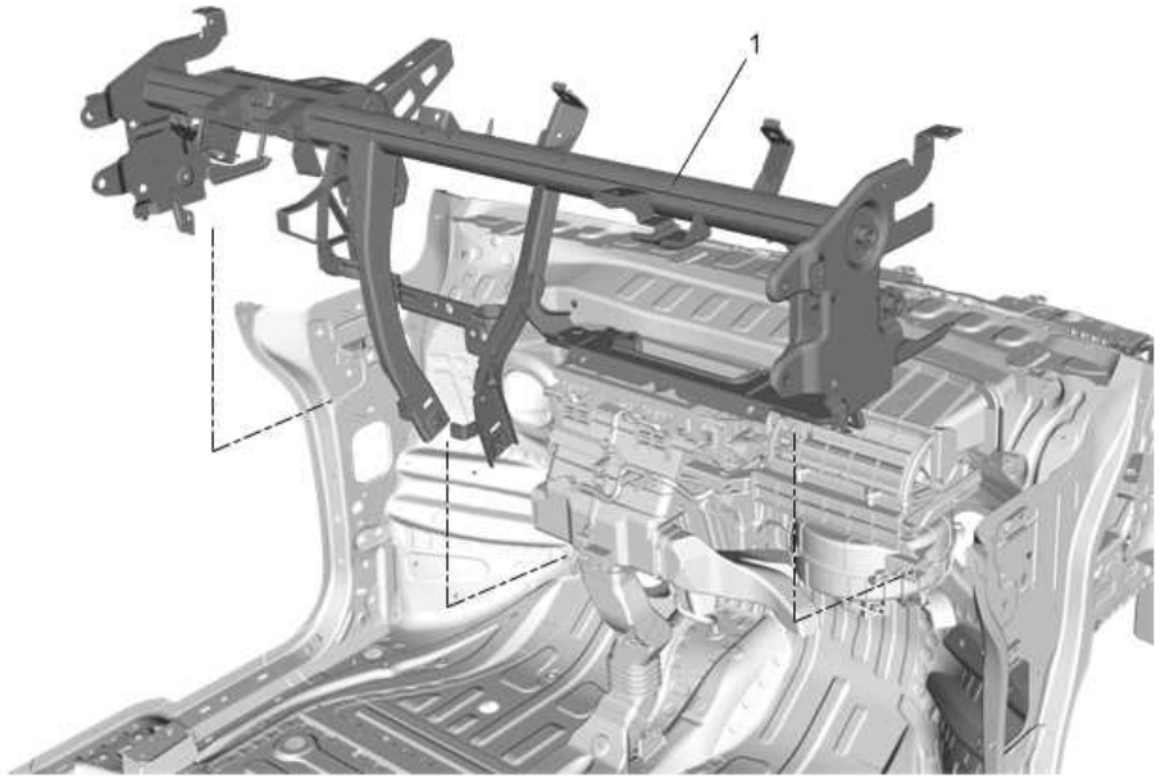


Fig. 78: Instrument Panel Tie Bar Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Install Instrument Panel Tie Bar(1) [Instrument Panel Tie Bar Replacement](#)

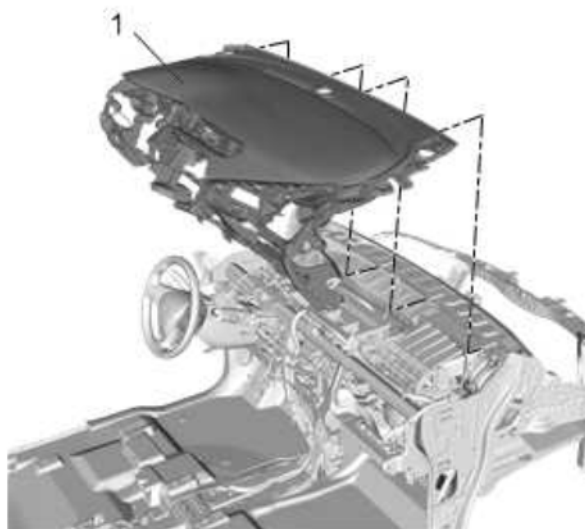


Fig. 79: Instrument Panel Assembly
Courtesy of GENERAL MOTORS COMPANY

8. Install Instrument Panel Assembly(1) [Instrument Panel Assembly Replacement](#)
9. Install Air Conditioning Evaporator Hose Assembly@Air Conditioning Evaporator Thermal Expansion Valve [Air Conditioning Evaporator Hose Assembly Replacement](#)
10. Install Heater Outlet Hose@Heater Core Tube [Heater Outlet Hose Replacement](#)
11. Install Heater Inlet Hose@Heater Core Tube [Heater Inlet Hose Replacement](#)
12. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
13. Fill the cooling system to the proper level. [Heater Coolant Heater Draining and Filling](#)
14. Evacuate and charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
15. Perform the actuator calibration procedure. [Actuator Recalibration](#)
16. Clear the DTCs.
17. Inspect for coolant leaks.
18. Inspect for refrigerant leaks.

HEATER AND AIR CONDITIONING EVAPORATOR CASE REPLACEMENT

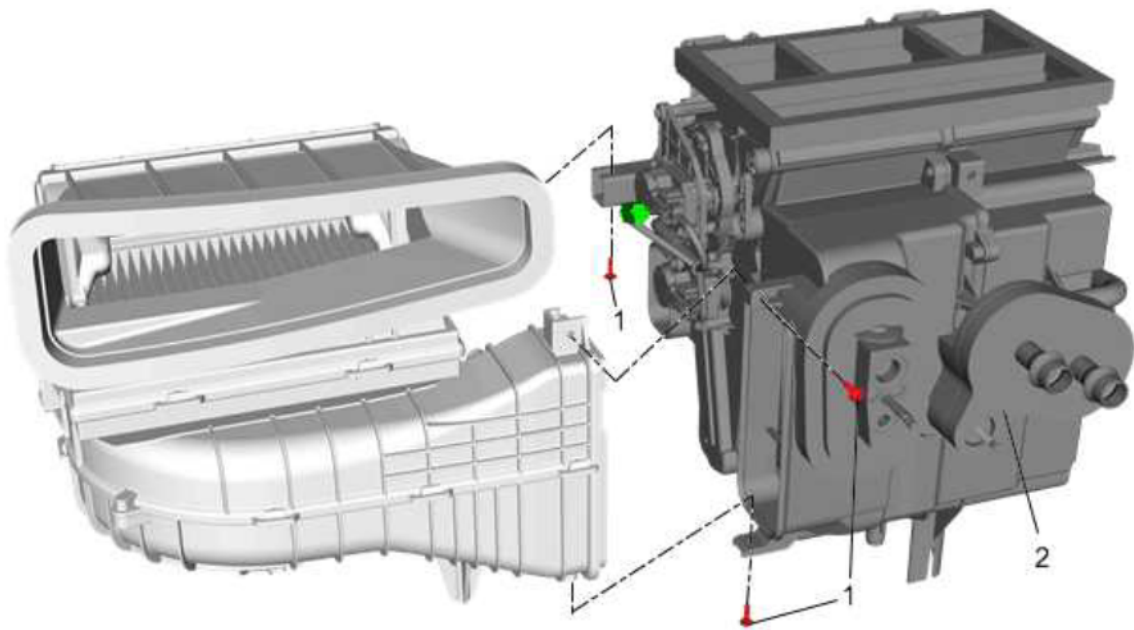


Fig. 80: Heater and Air Conditioning Evaporator Case
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the heater coolant heater system. Heater Coolant Heater Draining and Filling 2. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation	
1	Heater and Air Conditioning Evaporator Case Screw (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)

Callout	Component Name
2	Heater and Air Conditioning Evaporator Case Procedure 1. Disconnect the electrical connector. 2. Install the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation 3. Fill the heater coolant heater system. Heater Coolant Heater Draining and Filling

BLOWER LOWER CASE REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

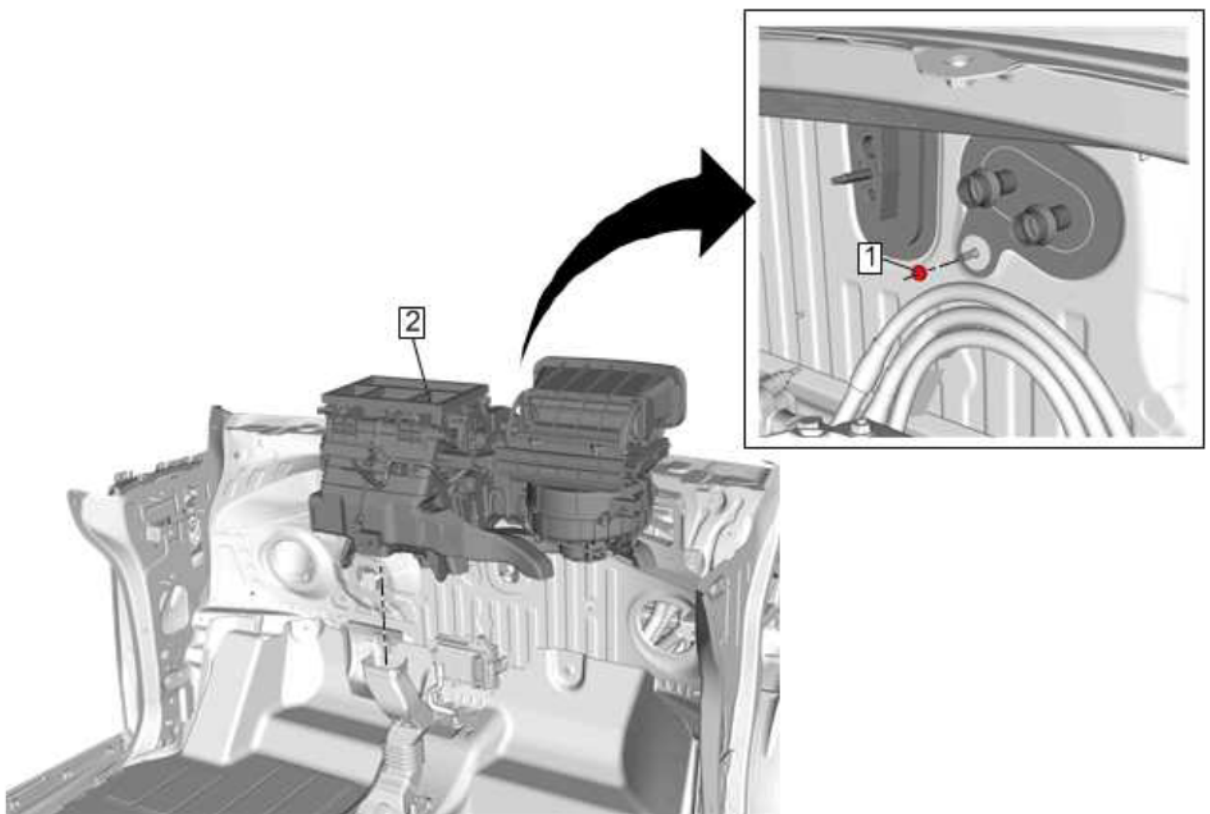


Fig. 81: Heater and Air Conditioning Evaporator and Blower Module
Courtesy of GENERAL MOTORS COMPANY

3. Remove Heater and Air Conditioning Evaporator and Blower Module (2) [Heater and Air Conditioning Evaporator and Blower Module Removal and Installation](#)

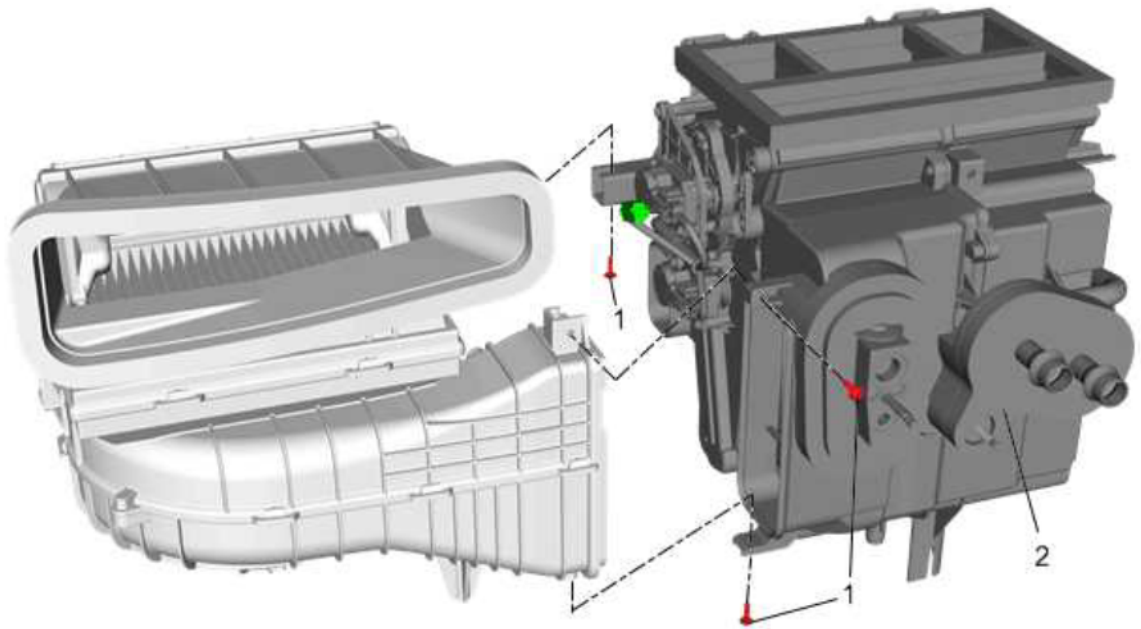


Fig. 82: Heater and Air Conditioning Evaporator Case
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Heater and Air Conditioning Evaporator Case (2) **Heater and Air Conditioning Evaporator Case Replacement**

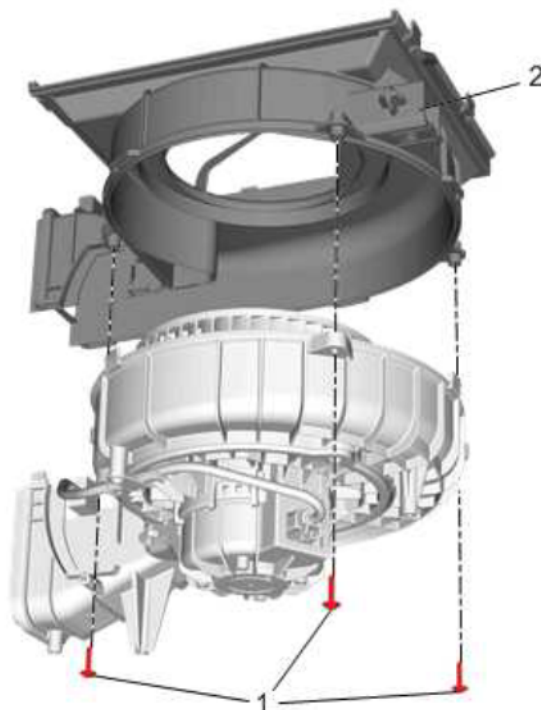


Fig. 83: Blower Upper Case
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Blower Upper Case (2) **Blower Upper Case Replacement**

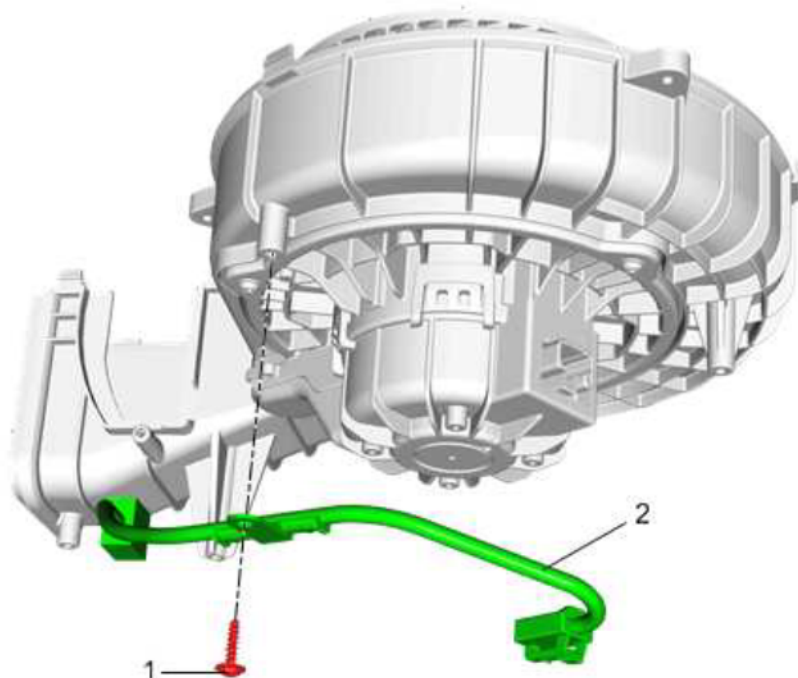


Fig. 84: Screw

Courtesy of GENERAL MOTORS COMPANY

6. Remove Screw (1)
7. Remove the electrical wiring harness (2)

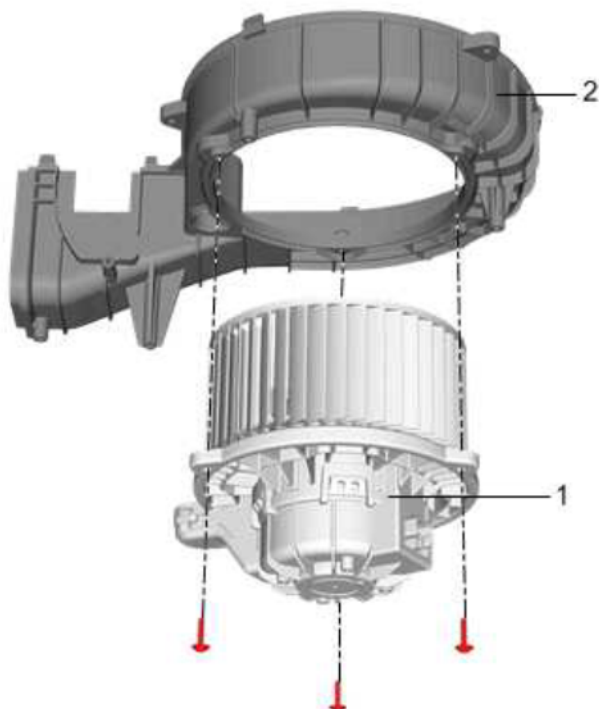


Fig. 85: Blower Motor

Courtesy of GENERAL MOTORS COMPANY

8. Remove Blower Motor (1) **Blower Motor Replacement**
9. Remove Blower Lower Case (2)

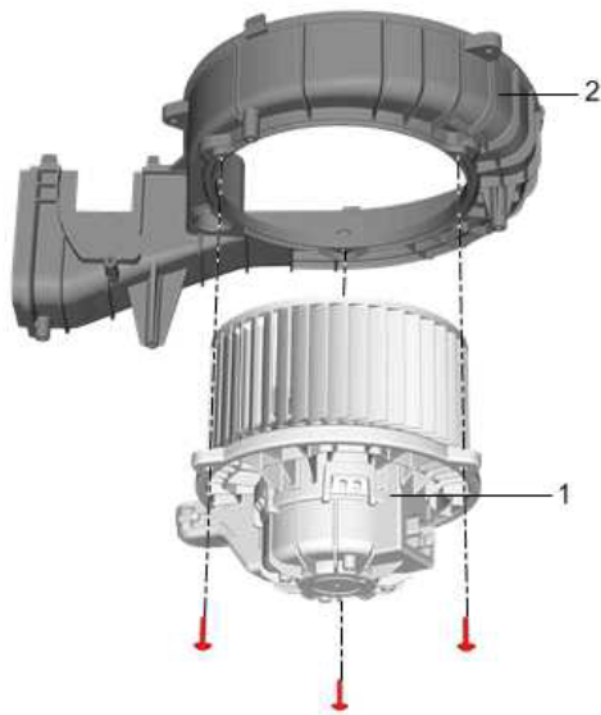


Fig. 86: Blower Motor

Courtesy of GENERAL MOTORS COMPANY

1. Install Blower Lower Case (2)
2. Install Blower Motor(1) **Blower Motor Replacement**

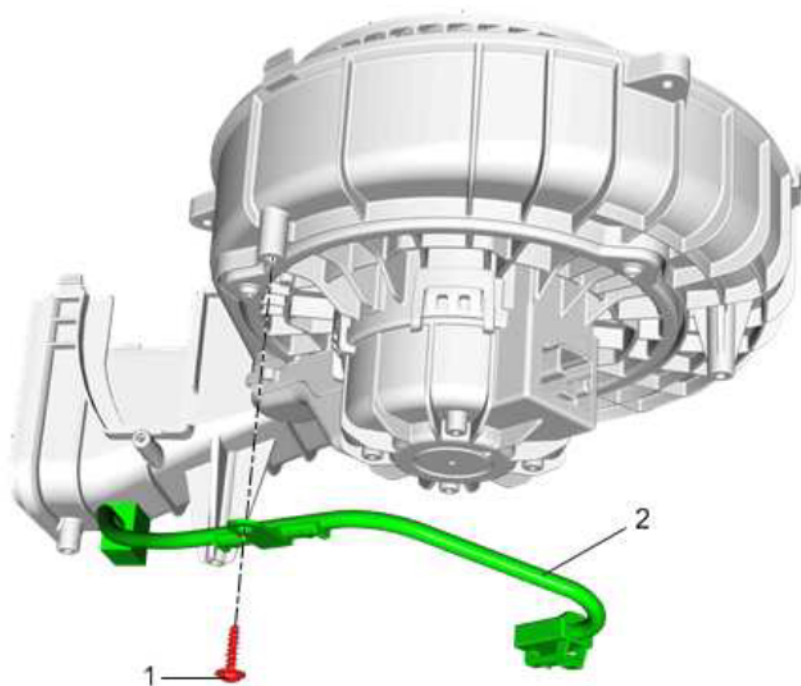


Fig. 87: Screw

Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Fastener Caution**

3. Install the electrical wiring harness (2).
4. Install Screw (1) and tighten

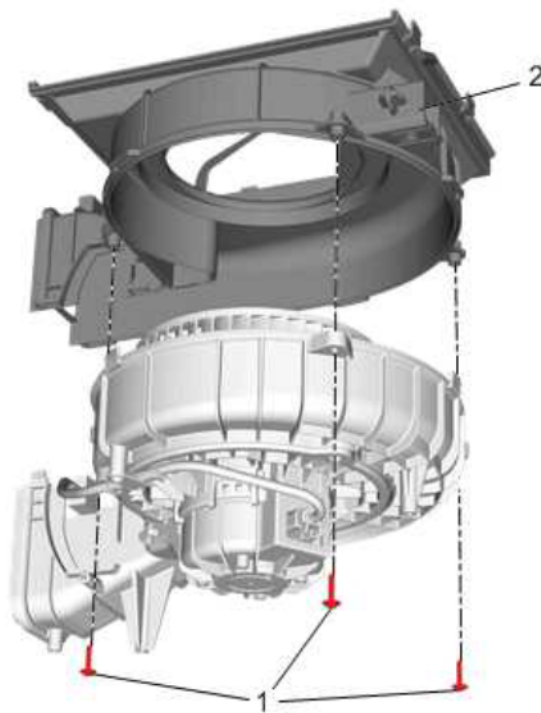


Fig. 88: Blower Upper Case

Courtesy of GENERAL MOTORS COMPANY

5. Install Blower Upper Case(2) **Blower Upper Case Replacement**

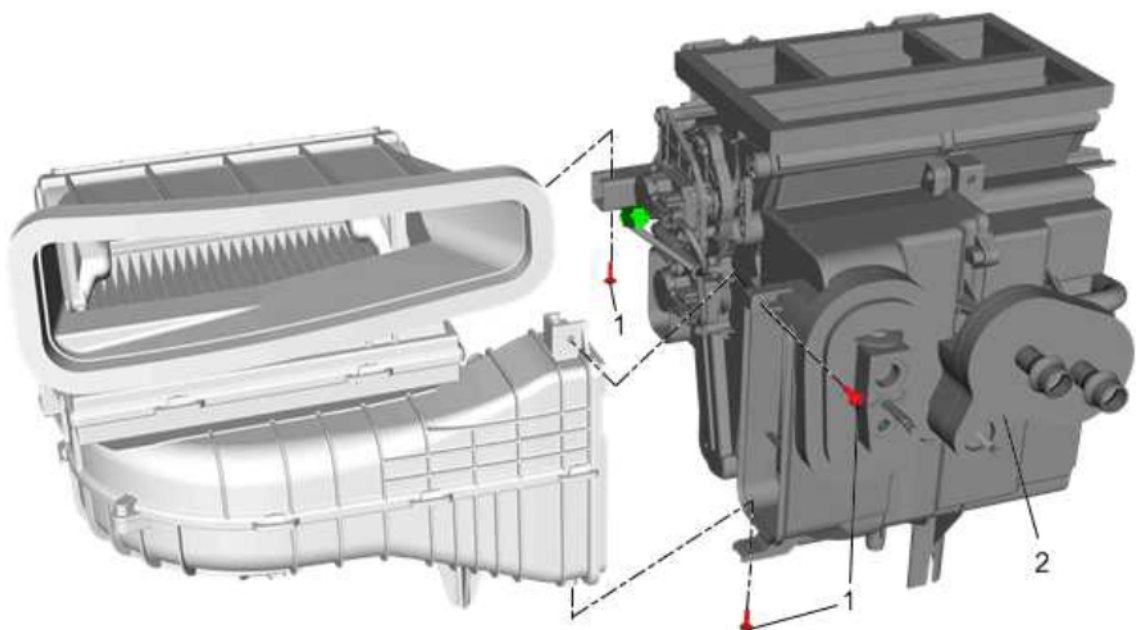


Fig. 89: Heater and Air Conditioning Evaporator Case

Courtesy of GENERAL MOTORS COMPANY

6. Install Heater and Air Conditioning Evaporator Case(2) **Heater and Air Conditioning Evaporator Case Replacement**

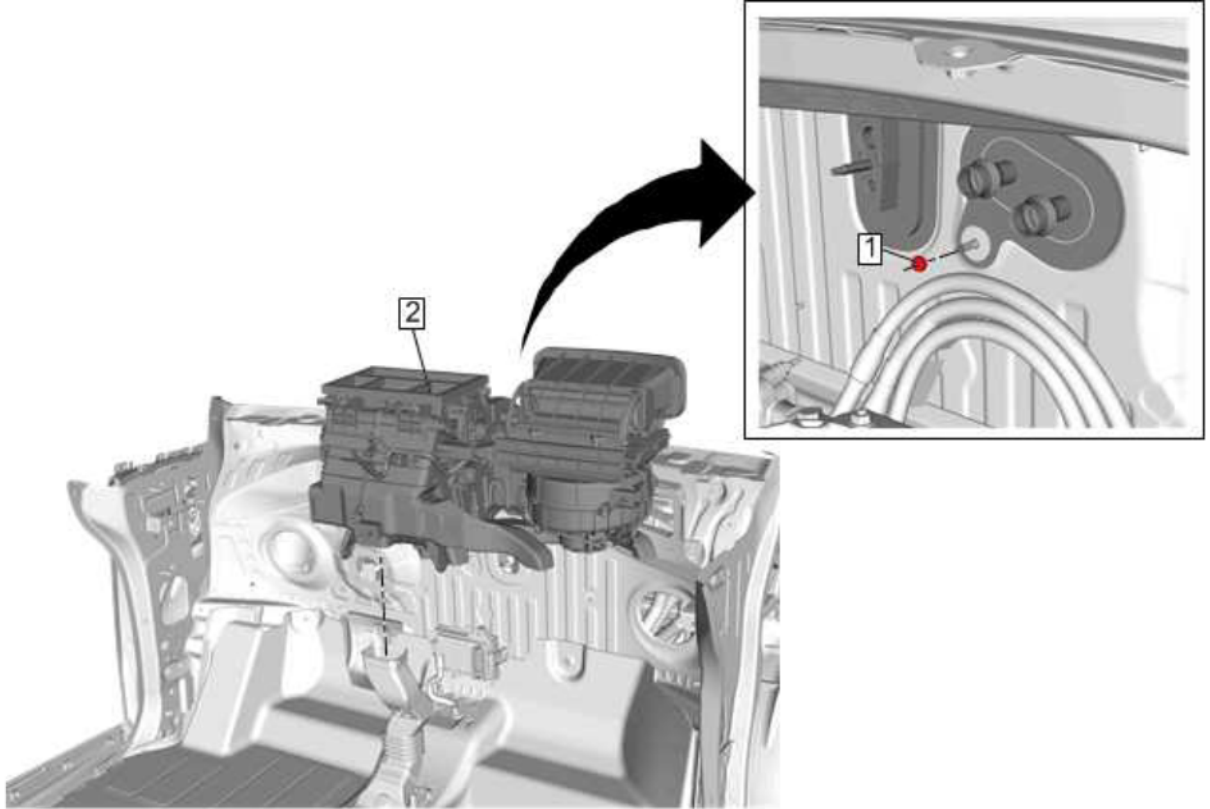


Fig. 90: Heater and Air Conditioning Evaporator and Blower Module
Courtesy of GENERAL MOTORS COMPANY

7. Install Heater and Air Conditioning Evaporator and Blower Module (2) [Heater and Air Conditioning Evaporator and Blower Module Removal and Installation](#)
8. Evacuate and charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
9. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

BLOWER UPPER CASE REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant. [Refrigerant Recovery and Recharging](#)

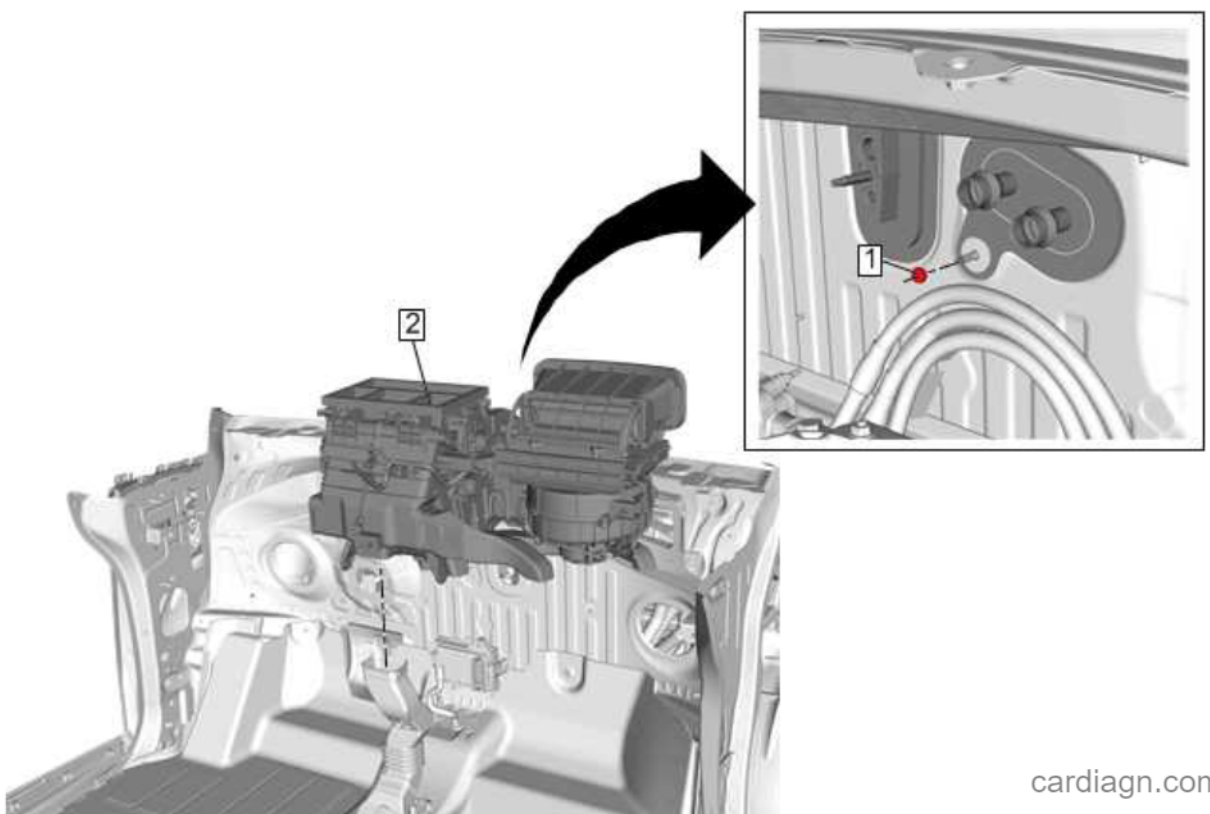


Fig. 91: Heater and Air Conditioning Evaporator and Blower Module
Courtesy of GENERAL MOTORS COMPANY

3. Remove Heater and Air Conditioning Evaporator and Blower Module(2) **Heater and Air Conditioning Evaporator and Blower Module Removal and Installation**

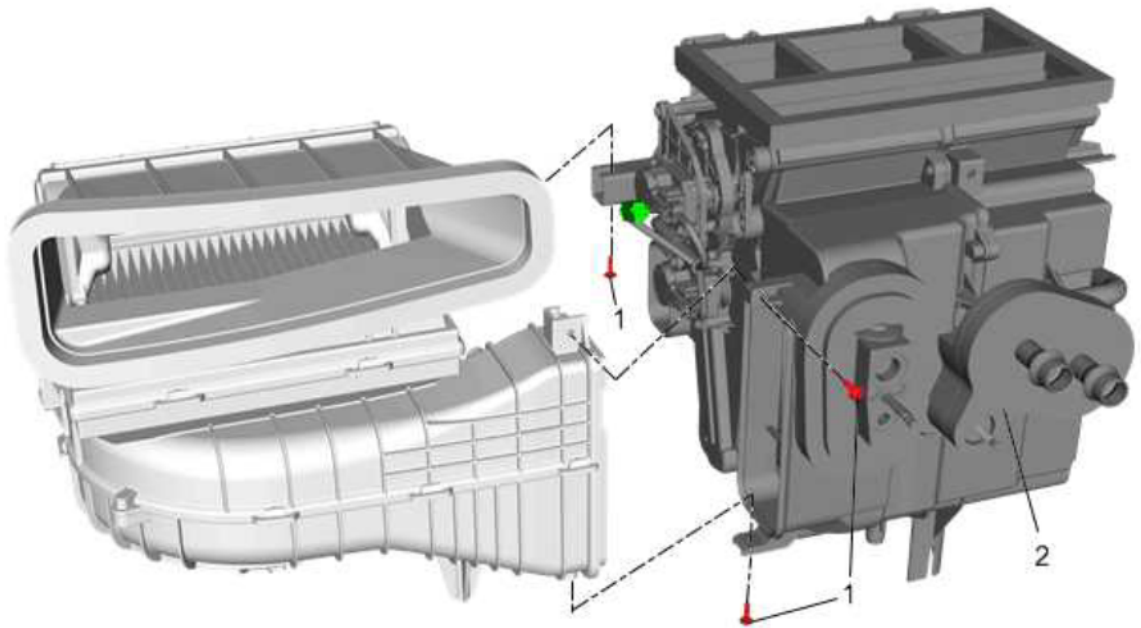


Fig. 92: Heater and Air Conditioning Evaporator Case
Courtesy of GENERAL MOTORS COMPANY

4. Remove Heater and Air Conditioning Evaporator Case (2) **Heater and Air Conditioning Evaporator Case Replacement**

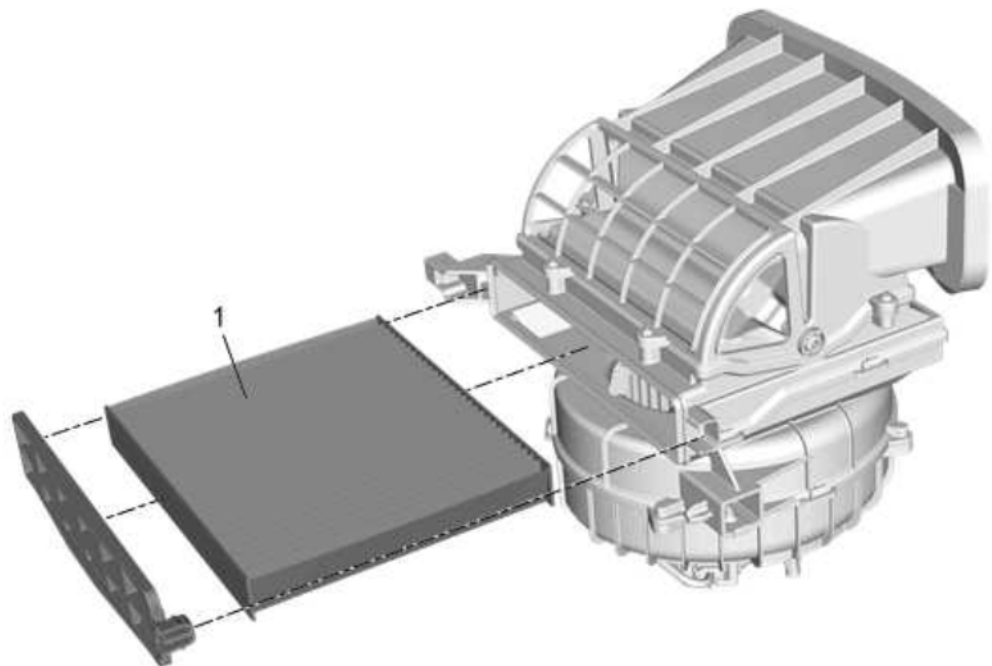


Fig. 93: Passenger Compartment Air Filter
Courtesy of GENERAL MOTORS COMPANY

5. Remove Passenger Compartment Air Filter (1) [Passenger Compartment Air Filter Replacement](#)

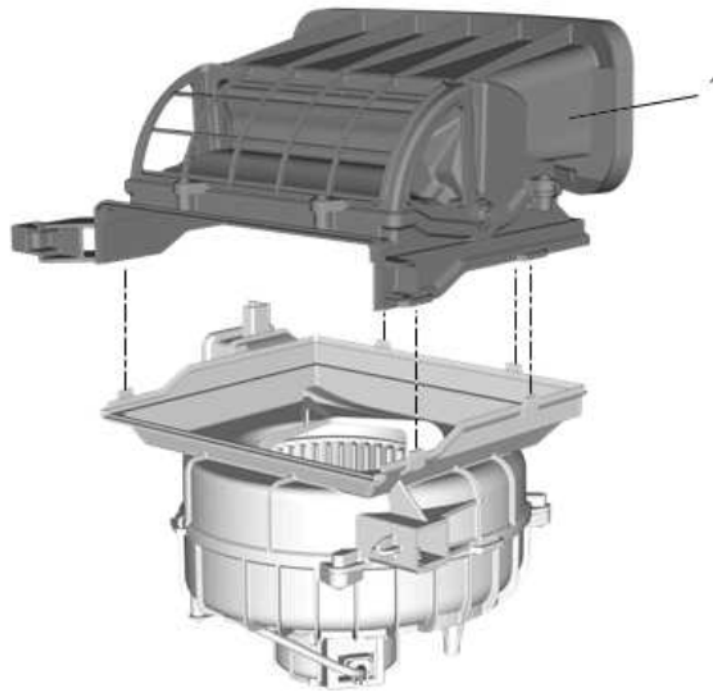


Fig. 94: Air Inlet Housing

Courtesy of GENERAL MOTORS COMPANY

6. Remove Air Inlet Housing (1) [Air Inlet Housing Replacement](#)

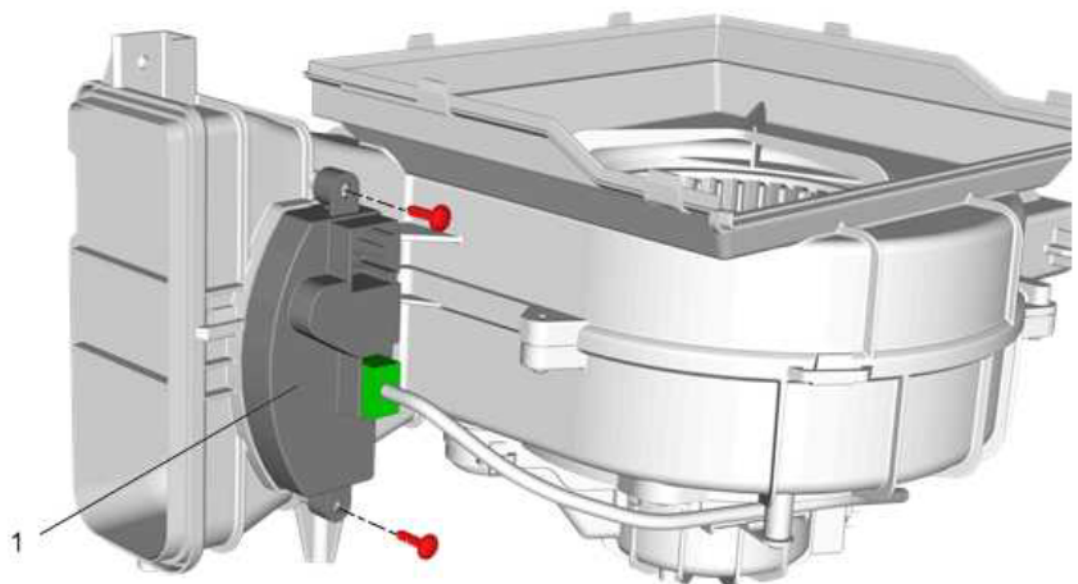


Fig. 95: Blower Motor Control Module

Courtesy of GENERAL MOTORS COMPANY

7. Remove Blower Motor Control Module (1) [Blower Motor Control Replacement \(Module Mounted\)](#)

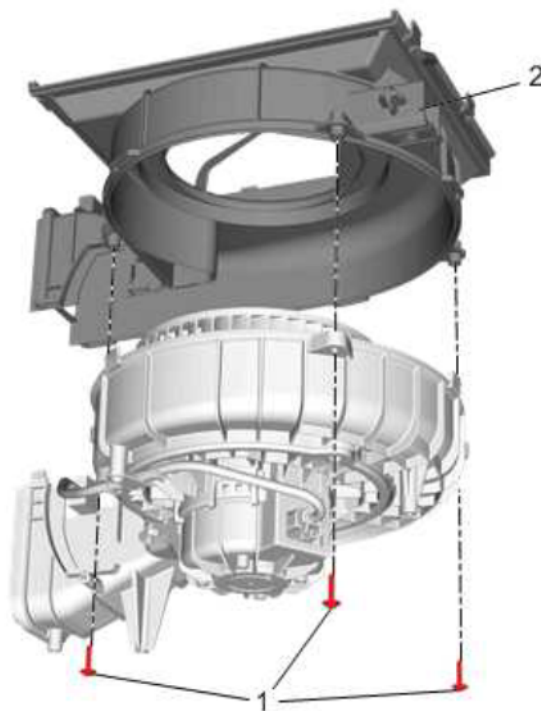


Fig. 96: Blower Upper Case

Courtesy of GENERAL MOTORS COMPANY

8. Remove Blower Upper Case Screw (1)
9. Remove Blower Upper Case(2)
10. Using the appropriate tools, release the integral retaining features.

Installation Procedure

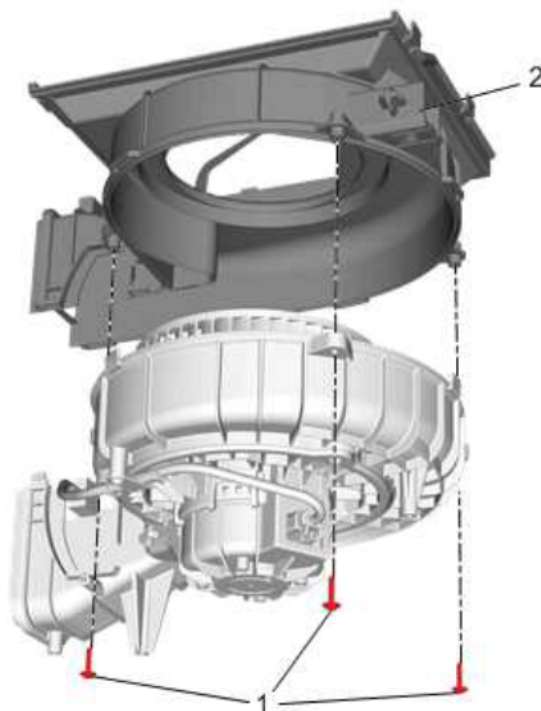


Fig. 97: Blower Upper Case

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

1. Install Blower Upper Case(2)

2. Install Blower Upper Case Screw (1) and tighten 2.5 N.m (22 lb in)

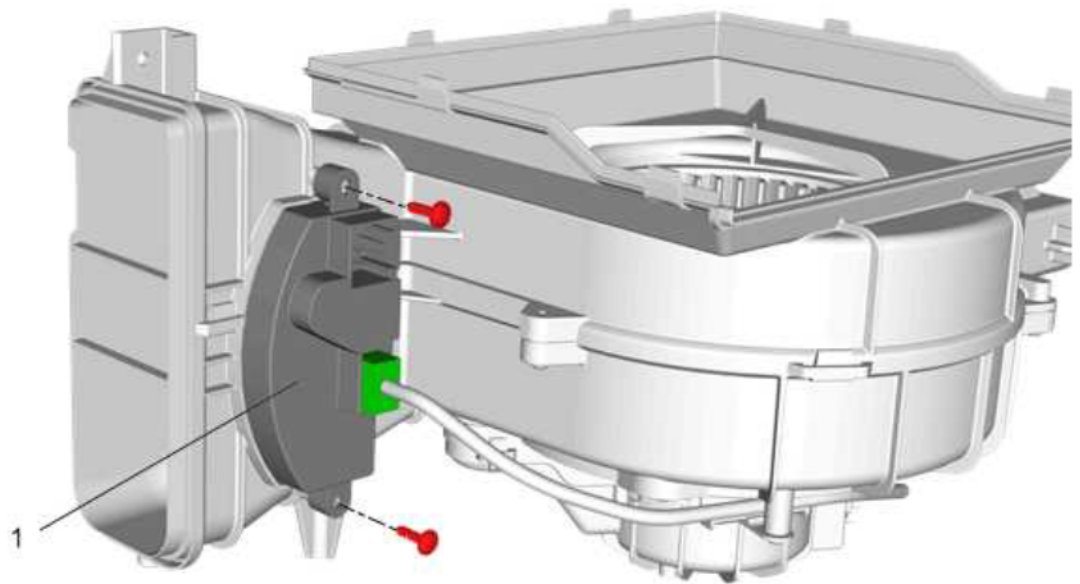


Fig. 98: Blower Motor Control Module

Courtesy of GENERAL MOTORS COMPANY

3. Install Blower Motor Control Module(1) **Blower Motor Control Replacement (Module Mounted)**

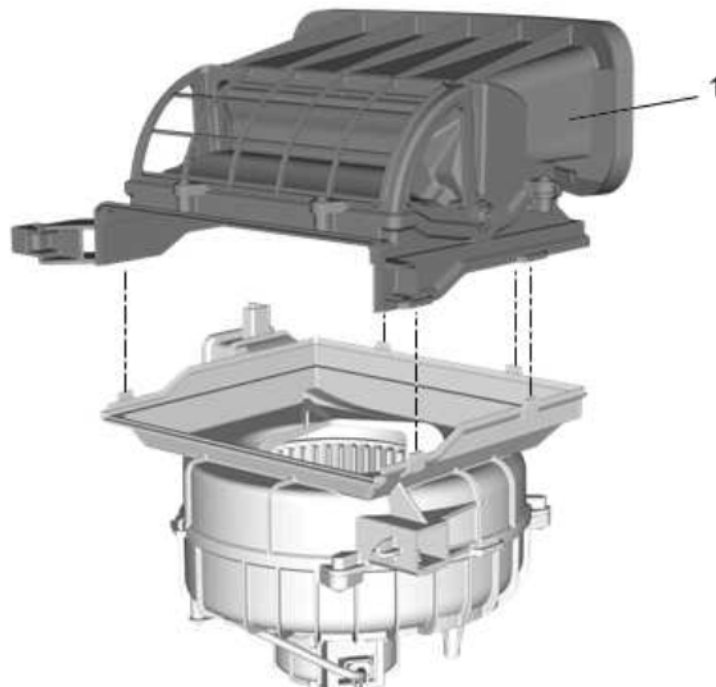


Fig. 99: Air Inlet Housing

Courtesy of GENERAL MOTORS COMPANY

4. Install Air Inlet Housing(1) **Air Inlet Housing Replacement**

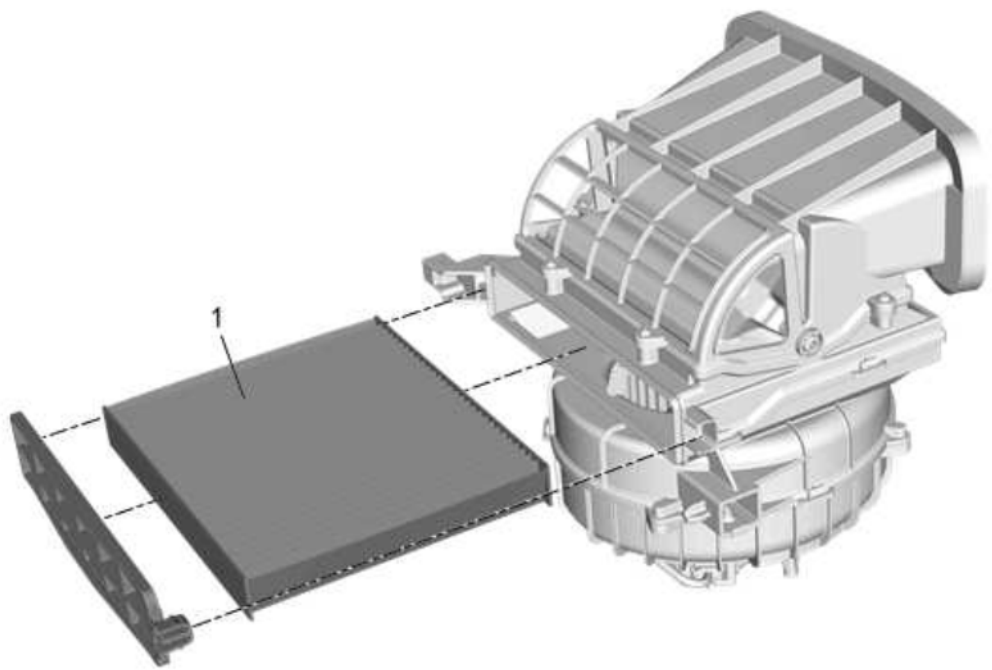


Fig. 100: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS COMPANY

5. Install Passenger Compartment Air Filter(1) [Passenger Compartment Air Filter Replacement](#)

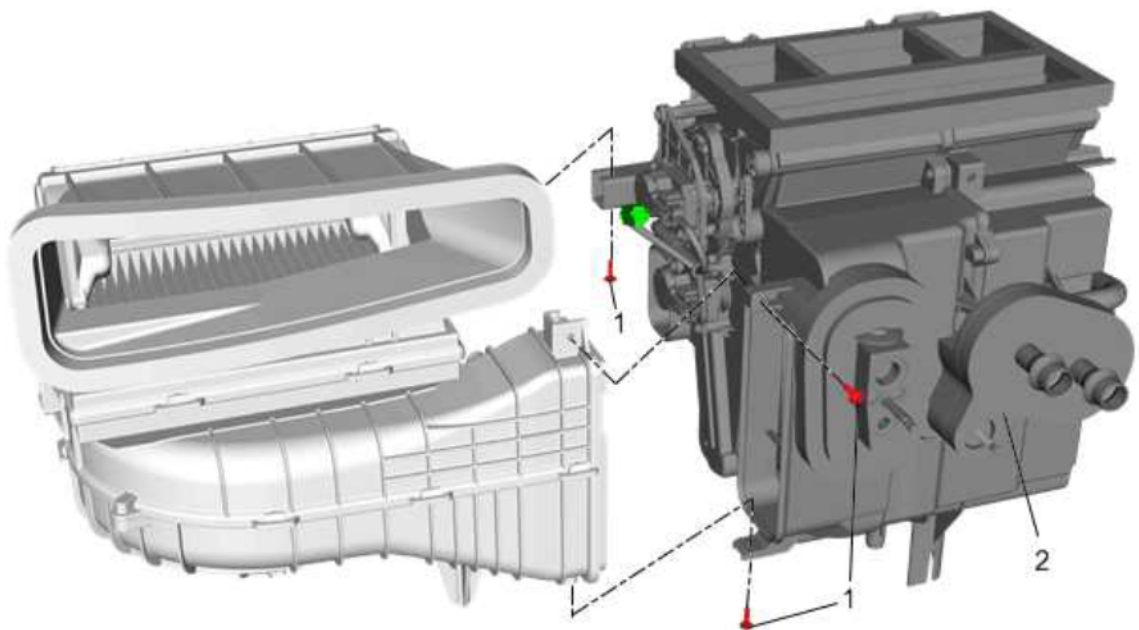


Fig. 101: Heater and Air Conditioning Evaporator Case
 Courtesy of GENERAL MOTORS COMPANY

6. Install Heater and Air Conditioning Evaporator Case(2) [Heater and Air Conditioning Evaporator Case Replacement](#)

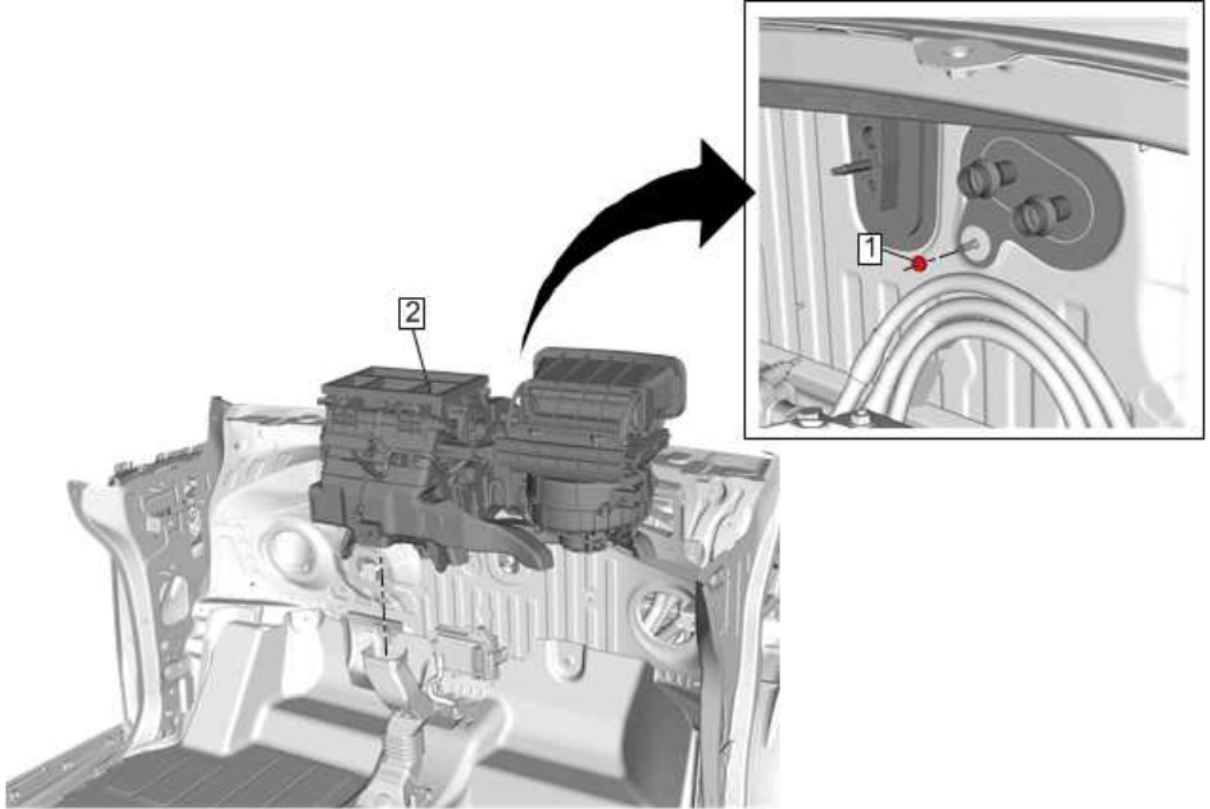


Fig. 102: Heater and Air Conditioning Evaporator and Blower Module
 Courtesy of GENERAL MOTORS COMPANY

7. Install Heater and Air Conditioning Evaporator and Blower Module(2) [Heater and Air Conditioning Evaporator and Blower Module Removal and Installation](#)
8. Evacuate and charge the refrigerant system. [Refrigerant Recovery and Recharging](#)
9. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

AIR CONDITIONING EVAPORATOR REPLACEMENT

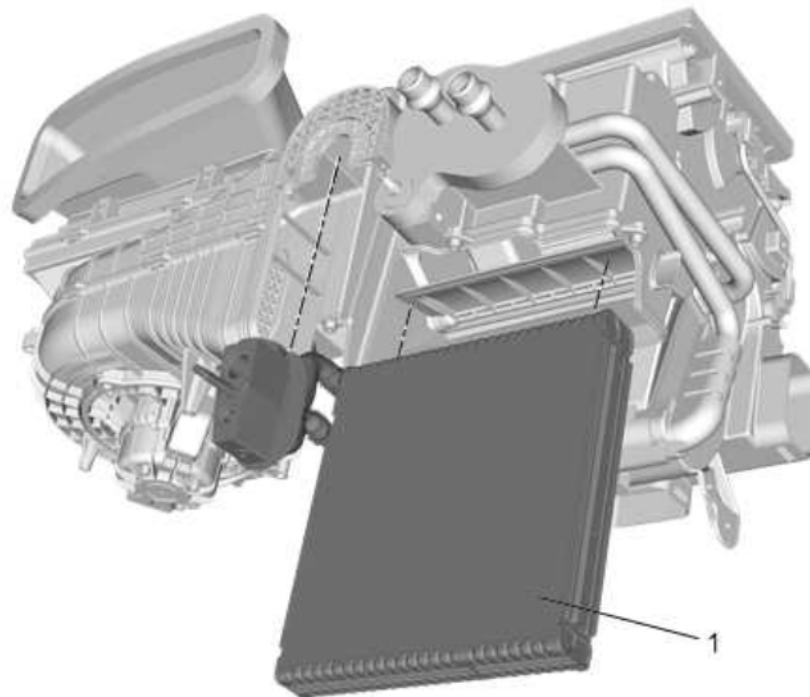


Fig. 103: Air Conditioning Evaporator
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection 2. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation 3. Heater Case Replacement	
1	Air Conditioning Evaporator Procedure 1. Transfer components as necessary. 2. Install the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation 3. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection

AIR CONDITIONING EVAPORATOR AND BLOWER MODULE DRAIN HOSE REPLACEMENT

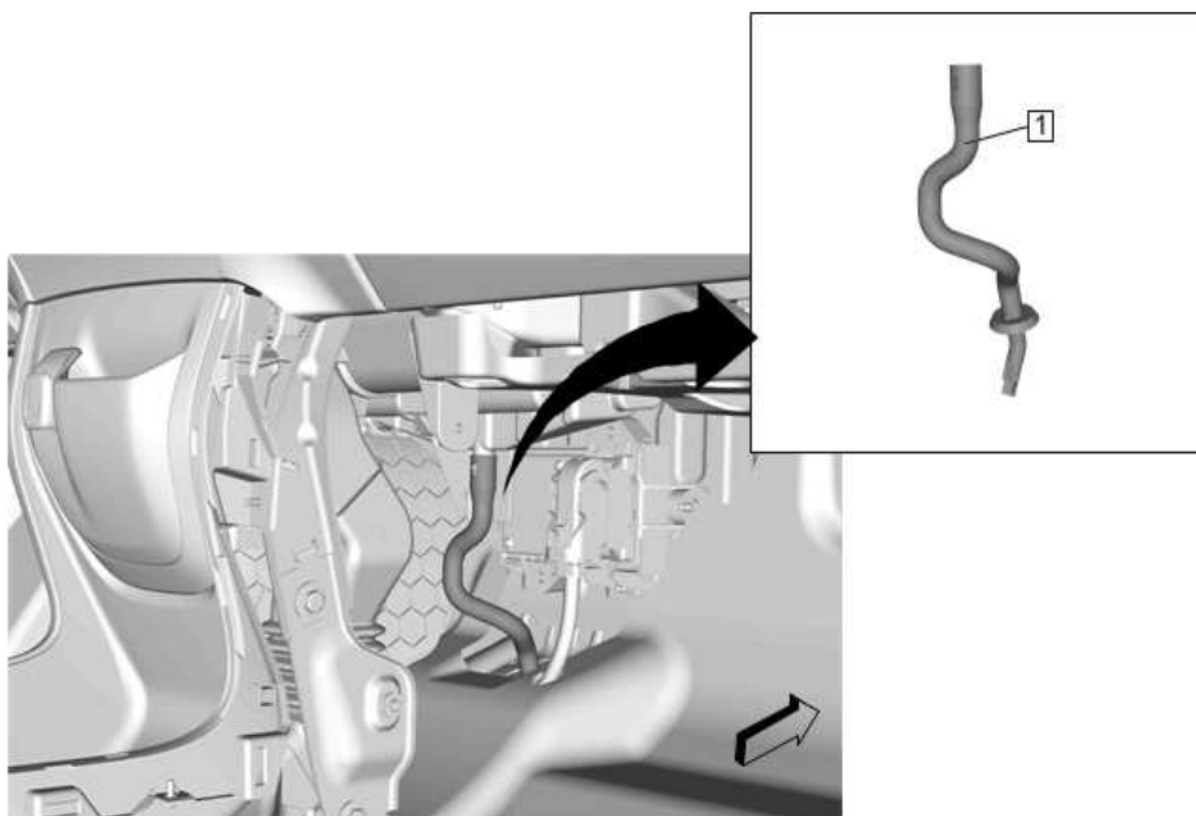


Fig. 104: Air Conditioning Evaporator and Blower Module Drain Hose
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: Refer to HVAC Module Drain Tube Caution .	
Preliminary Procedure Front Floor Console Replacement	
1	Air Conditioning Evaporator and Blower Module Drain Hose Procedure Release and pull off the drain hose from the HVAC module assembly and unsnap the drain fitting grommet from the front floor panel.

HEATER INLET HOSE REPLACEMENT

Equivalent regional tools: **Special Tools**

Removal Procedure

1. Drain the cooling system. **Heater Coolant Heater Draining and Filling**

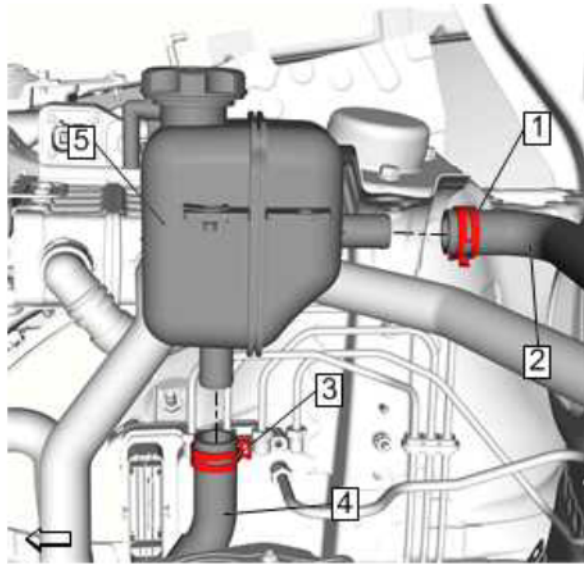


Fig. 105: Heater Coolant Surge Tank And Attaching Components
Courtesy of GENERAL MOTORS COMPANY

2. Disengage the clamp (1) and remove the heater inlet hose (2) from the heater coolant surge tank. **Heater Coolant Surge Tank Replacement**

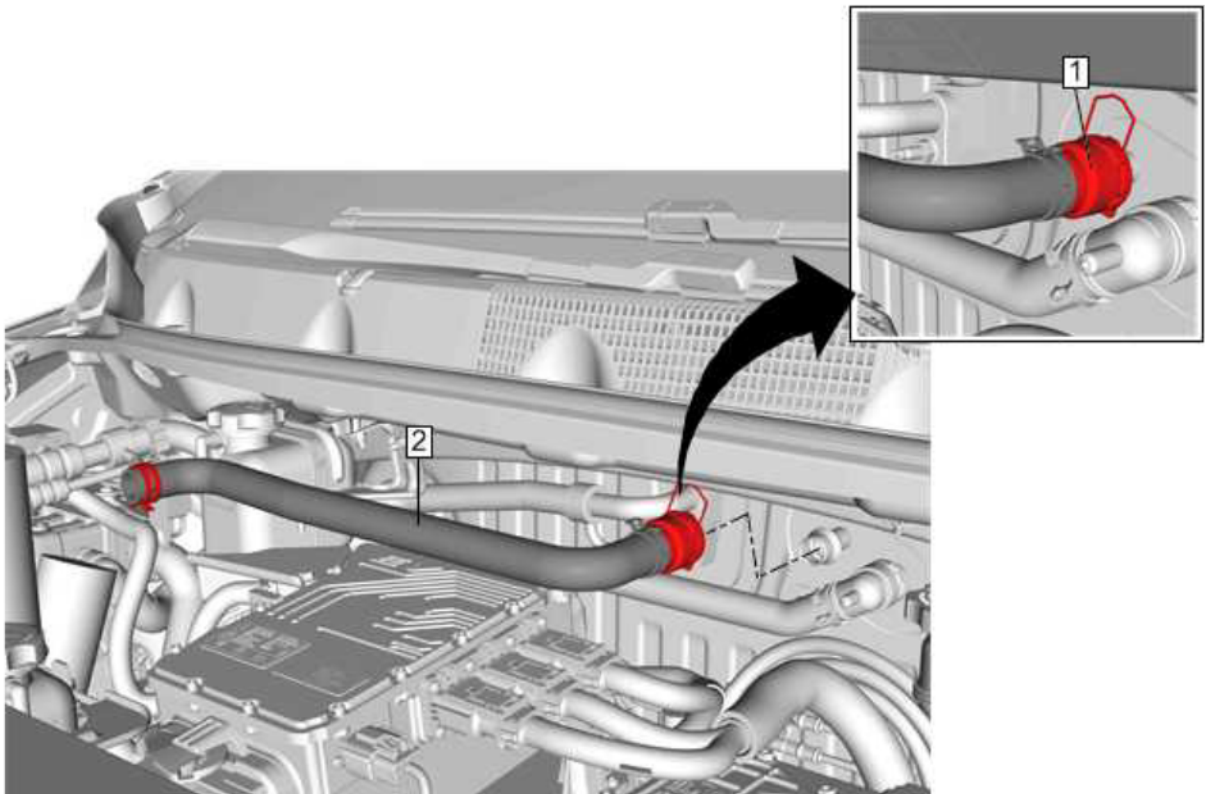


Fig. 106: Heater Inlet Hose Quick Connect And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect Heater Inlet Hose Quick Connect (1)
4. Remove Heater Inlet Hose (2)@Heater Core Inlet Tube

Installation Procedure

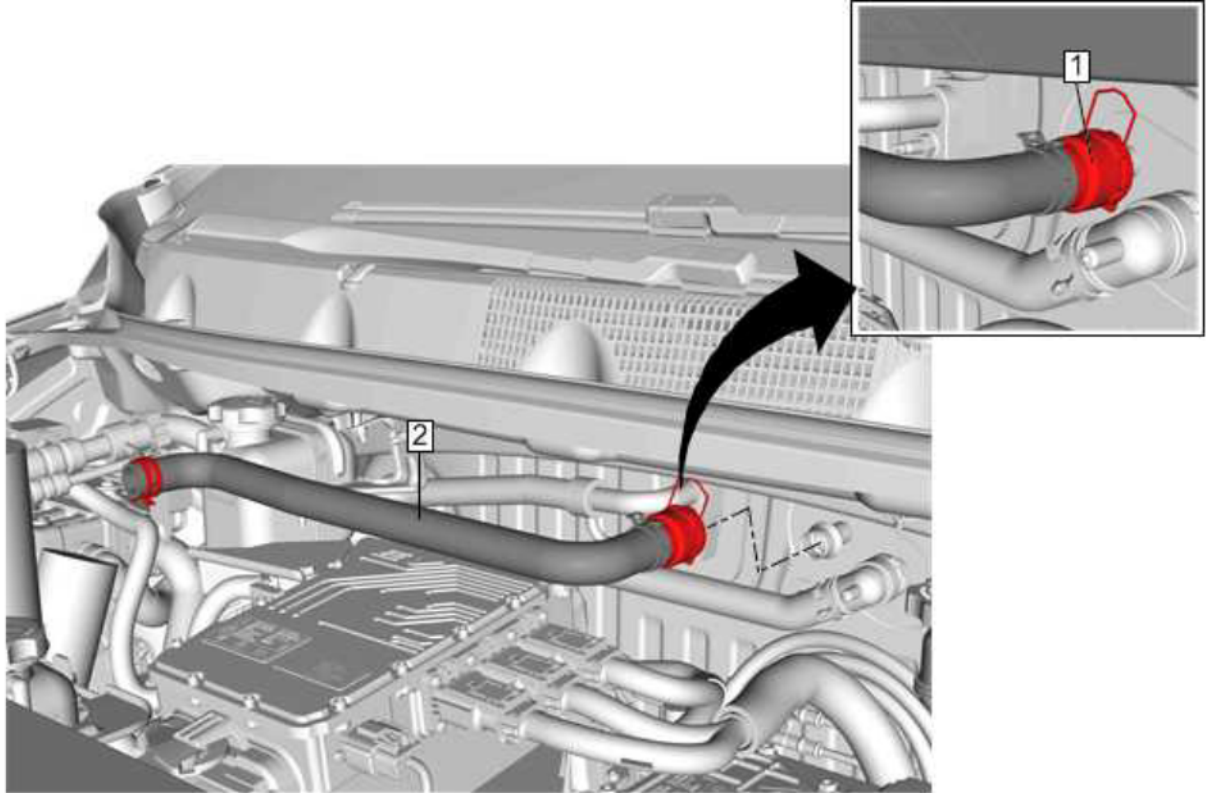


Fig. 107: Heater Inlet Hose Quick Connect And Heater Inlet Hose
 Courtesy of GENERAL MOTORS COMPANY

1. Install Heater Inlet Hose (2)@Heater Core Inlet Tube
2. Connect Heater Inlet Hose Quick Connect (1)

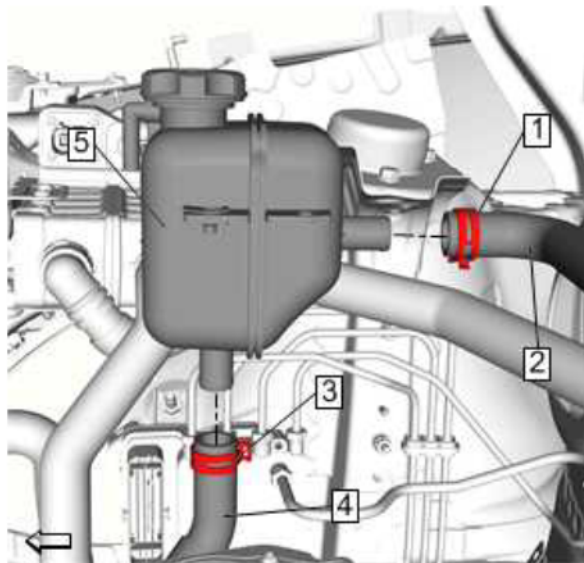


Fig. 108: Heater Coolant Surge Tank And Attaching Components
 Courtesy of GENERAL MOTORS COMPANY

3. Install the heater inlet hose (2) to the heater coolant surge tank and engage the clamp (1). **Heater Coolant Surge Tank Replacement**
4. Fill the cooling system. **Heater Coolant Heater Draining and Filling**

AUXILIARY HEATER INLET HOSE REPLACEMENT

Special Tools

- BO-38185 Hose Clamp Pliers

Equivalent regional tools: **Special Tools**

Removal Procedure

WARNING:

Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Disable the high voltage system. [High Voltage Disabling](#)
2. Drain the cooling system. [Heater Coolant Heater Draining and Filling](#)
3. Remove Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
4. Remove Front Wheelhouse Liner-Right Side [Front Wheelhouse Liner Replacement](#)

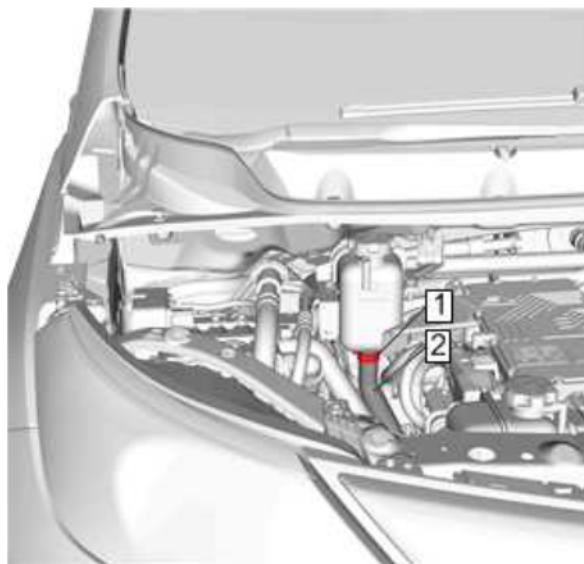


Fig. 109: Auxiliary Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage Auxiliary Heater Inlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)
Use the **BO-38185** Hose Clamp Pliers.
6. Remove Auxiliary Heater Inlet Hose(2)@Heater Coolant Surge Tank
7. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)

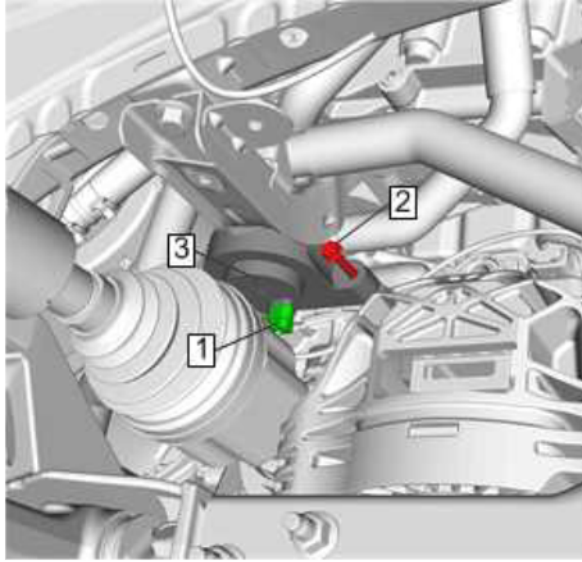


Fig. 110: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the heater coolant pump electrical connector (1).
9. Remove the heater coolant pump bolt (2).
10. Reposition the heater coolant pump on the rubber mount to access the clamp.

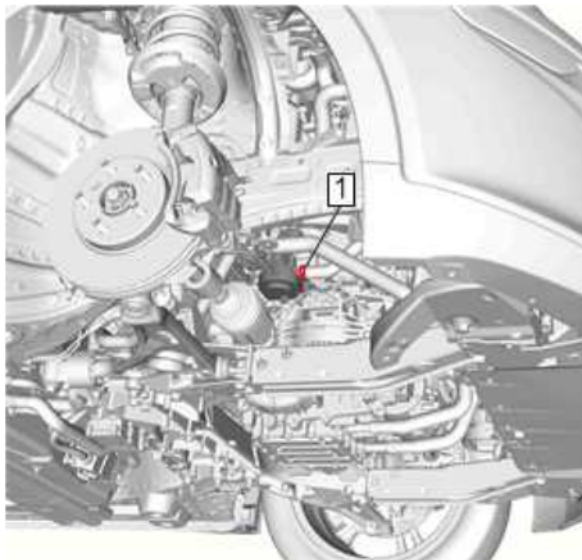


Fig. 111: Auxiliary Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

11. Disengage Auxiliary Heater Outlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)
12. Remove the auxiliary heater outlet hose from the heater coolant pump.
13. Remove the heater coolant pump with the auxiliary heater inlet hose.



Fig. 112: Auxiliary Heater Inlet Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

14. Disengage Auxiliary Heater Inlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)
15. Remove Auxiliary Heater Inlet Hose (3) @Heater Coolant Pump(2)

Installation Procedure



Fig. 113: Auxiliary Heater Inlet Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

1. Install Auxiliary Heater Inlet Hose (3)@Heater Coolant Pump (2)
2. Engage Auxiliary Heater Inlet Hose Clamp (1)[Hose Clamp Replacement Guidelines - Spring Type](#)
3. Position the heater coolant pump with the auxiliary heater inlet hose.

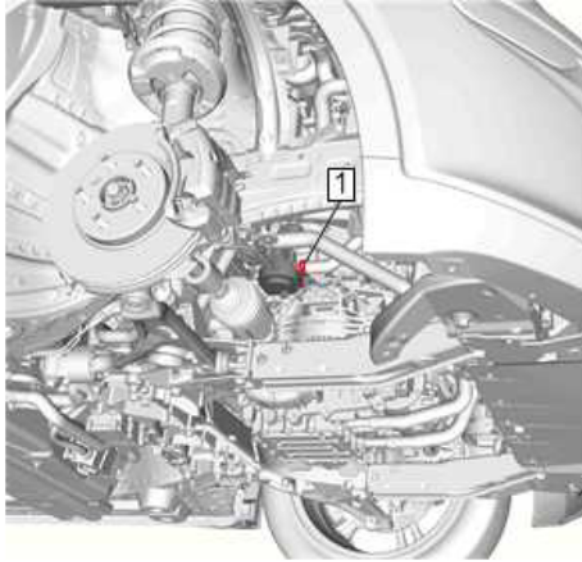


Fig. 114: Auxiliary Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Engage Auxiliary Heater Outlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)

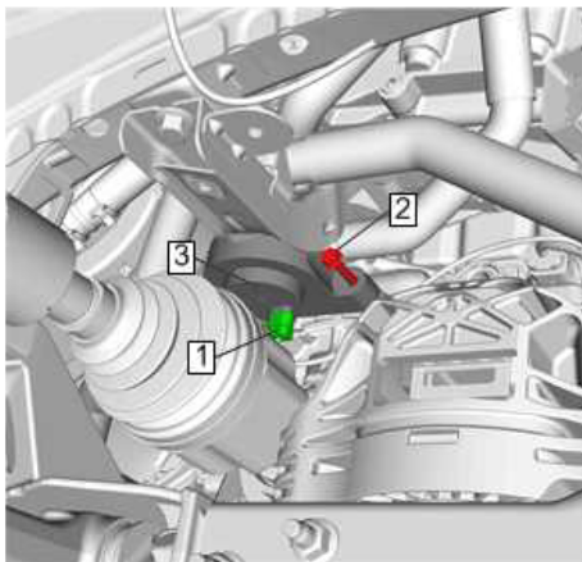
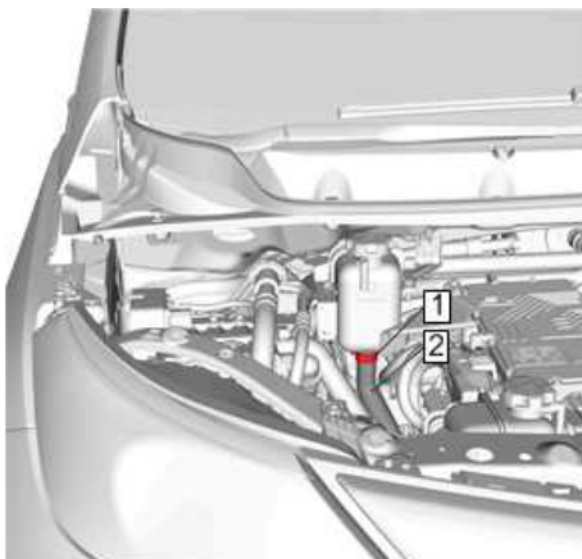


Fig. 115: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Install and tighten the heater coolant pump bolt (2) to 9 N.m (80 lb in).
 6. Connect the heater coolant pump electrical connector (1).
 7. Lower the vehicle



8. Install Auxiliary Heater Inlet Hose(2)@Heater Coolant Surge Tank
9. Engage Auxiliary Heater Inlet Hose Clamp(1) [Hose Clamp Replacement Guidelines - Spring Type](#)
10. Install Front Wheelhouse Liner-Right Side [Front Wheelhouse Liner Replacement](#)
11. Install Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
12. Fill the cooling system to the proper level. [Heater Coolant Heater Draining and Filling](#)
13. Enable the high voltage system. [High Voltage Enabling](#)
14. Start the engine and check for coolant leaks.

AUXILIARY HEATER OUTLET HOSE REPLACEMENT

Special Tools

Equivalent regional tools:[Special Tools](#)

Removal Procedure

WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Disable the high voltage system. [High Voltage Disabling](#)
2. Remove Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
3. Remove Front Wheelhouse Liner-Right Side [Front Wheelhouse Liner Replacement](#)
4. Place a drain pan beneath the vehicle.

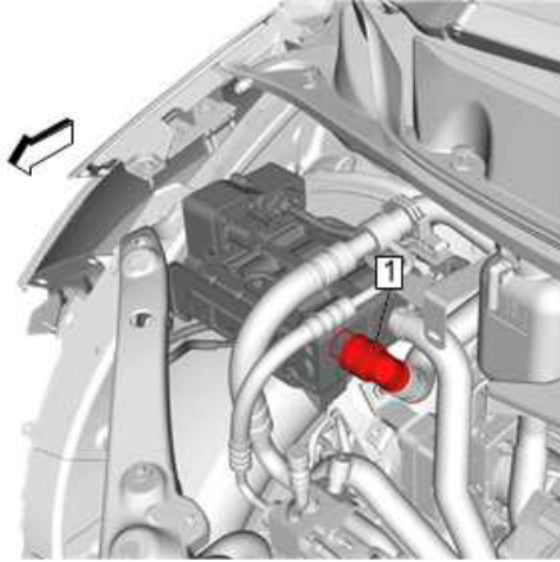


Fig. 117: Heater Outlet Hose Quick Connector
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Heater Outlet Hose Quick Connector (1) and Heater Outlet Hose @ Heater Coolant Heater **Heater Outlet Hose Replacement**

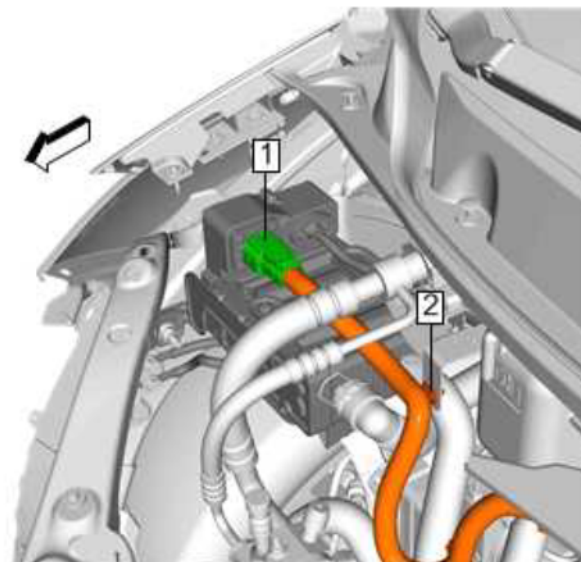


Fig. 118: High Voltage Cable Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

6. Disconnect High Voltage Cable Electrical Connector (1) @Heater Coolant Heater

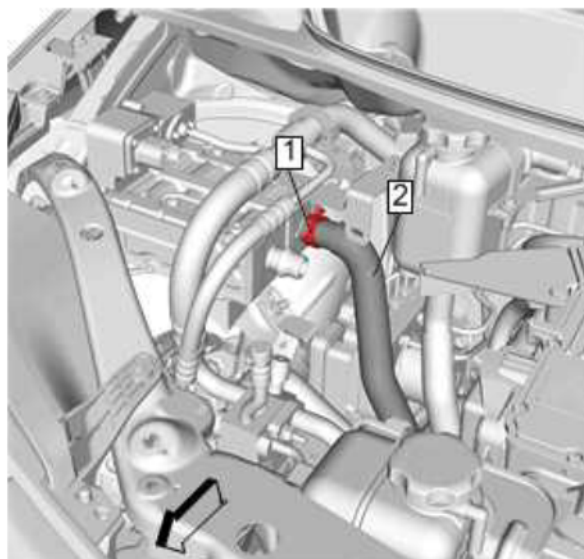


Fig. 119: Auxiliary Heater Outlet Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

7. Disengage Auxiliary Heater Outlet Hose Clamp(1) [Hose Clamp Replacement Guidelines - Spring Type](#)

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

8. Remove Auxiliary Heater Outlet Hose(2)@Heater Coolant Heater
9. Raise the vehicle. [Lifting and Jacking the Vehicle](#)

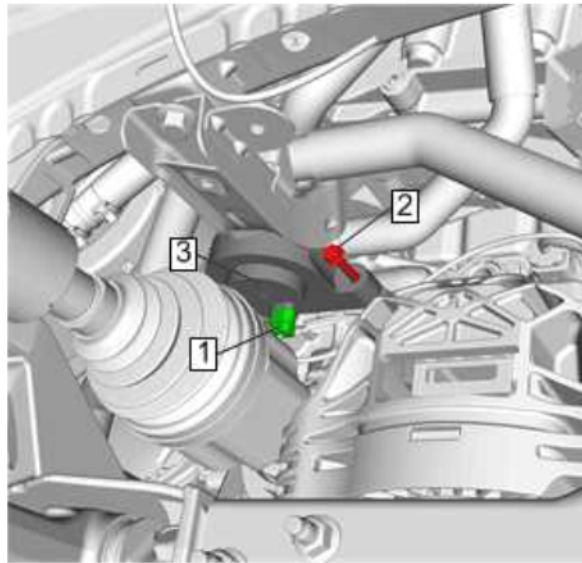


Fig. 120: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

10. Disconnect the heater coolant pump electrical connector (1).
11. Remove the heater coolant pump bolt (2).
12. Reposition the heater coolant pump on the rubber mount to access the clamp.

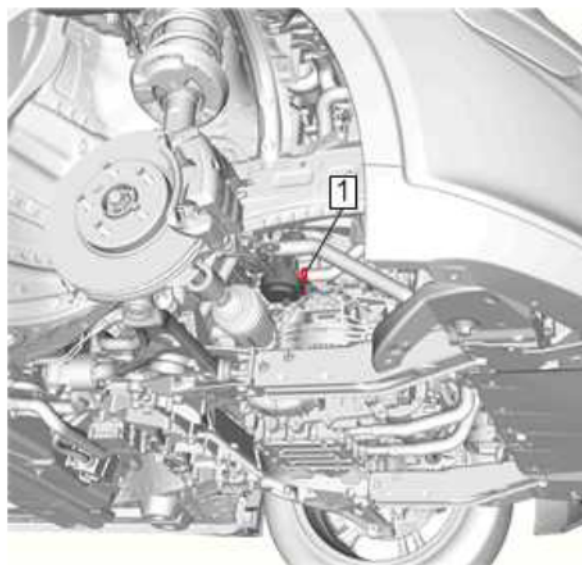


Fig. 121: Auxiliary Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

13. Disengage Auxiliary Heater Outlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)
14. Remove Auxiliary Heater Outlet Hose@Heater Coolant Pump



Fig. 122: Auxiliary Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

15. Remove Auxiliary Heater Outlet Hose (1)

Installation Procedure

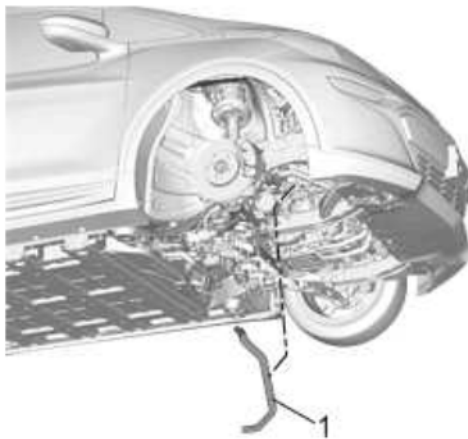


Fig. 123: Auxiliary Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Position Auxiliary Heater Outlet Hose (1)

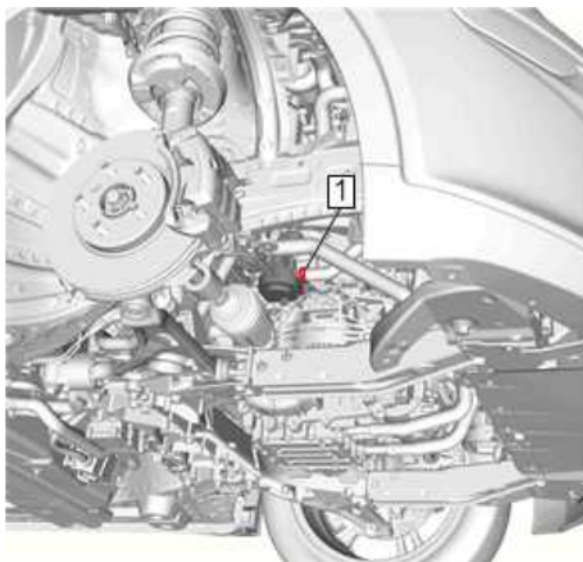


Fig. 124: Auxiliary Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

2. Remove Auxiliary Heater Outlet Hose@Heater Coolant Pump
3. Engage Auxiliary Heater Outlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)

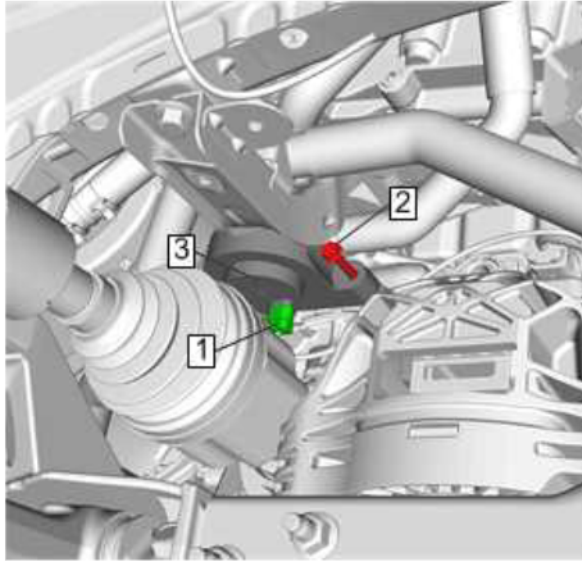


Fig. 125: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Install and tighten the heater coolant pump bolt (2) to 9 N.m (80 lb in).
5. Connect the heater coolant pump electrical connector (1).
6. Lower the vehicle.

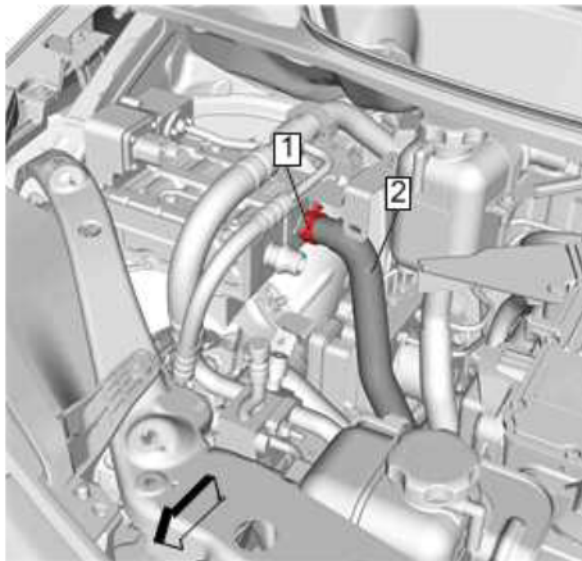


Fig. 126: Auxiliary Heater Outlet Hose And Clamp
Courtesy of GENERAL MOTORS COMPANY

7. Install Auxiliary Heater Outlet Hose(2)@ Heater Coolant Heater
8. Engage Auxiliary Heater Outlet Hose Clamp(1)[Hose Clamp Replacement Guidelines - Spring Type](#)

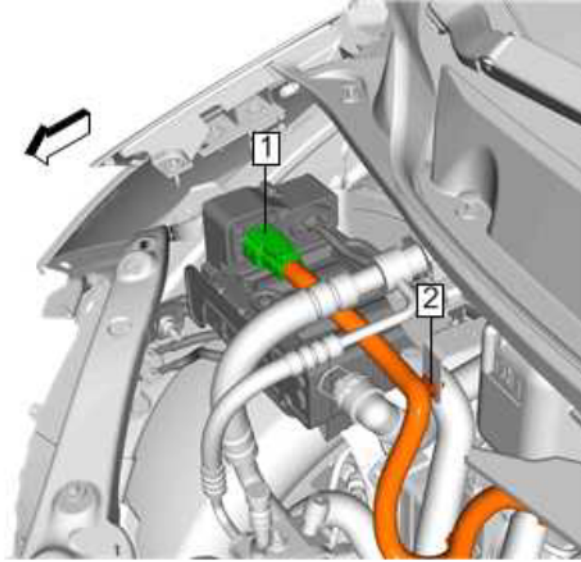


Fig. 127: High Voltage Cable Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

9. Connect High Voltage Cable Connector (1) @ Heater Coolant Heater

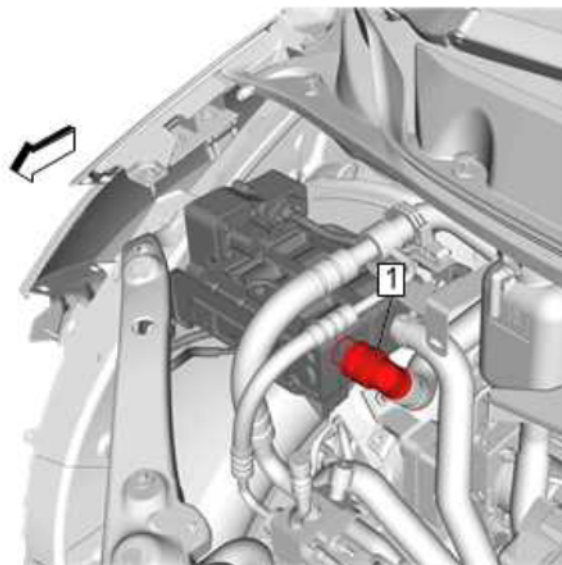


Fig. 128: Heater Outlet Hose Quick Connector
 Courtesy of GENERAL MOTORS COMPANY

10. Install Heater Outlet Hose Quick Connector (1) and Heater Outlet Hose @ Heater Coolant Heater **Heater Outlet Hose Replacement**
11. Install Front Wheelhouse Liner-Right Side **Front Wheelhouse Liner Replacement**
12. Install Front Compartment Air Deflector **Front Compartment Air Deflector Replacement**
13. Fill the cooling system to the proper level. **Heater Coolant Heater Draining and Filling**
14. Enable the high voltage system. **High Voltage Enabling**
15. Start the engine and check for coolant leaks.

HEATER OUTLET HOSE REPLACEMENT

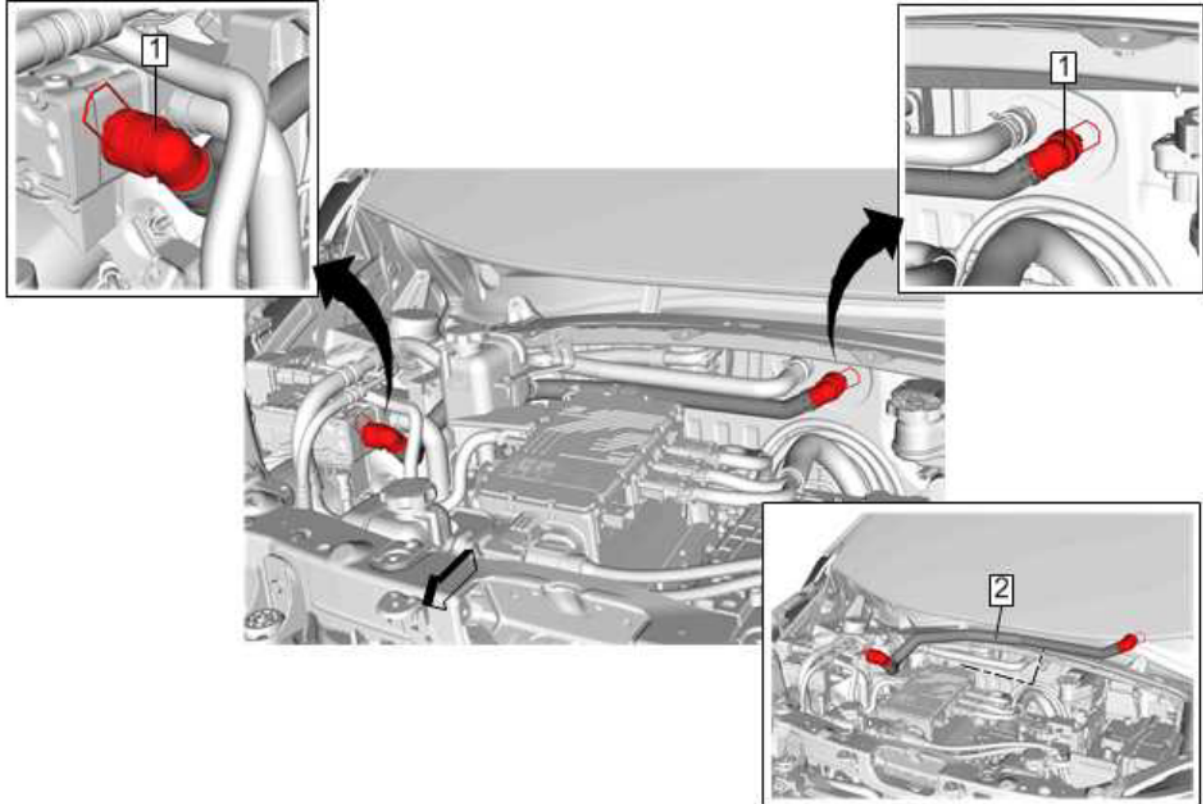


Fig. 129: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Drain the cooling system. Heater Coolant Heater Draining and Filling	
1	Heater Outlet Hose Quick Connect
2	Heater Outlet Hose Procedure 1. Fill the cooling system to the proper level. Heater Coolant Heater Draining and Filling 2. Start the engine and check for coolant leaks.

HEATER COOLANT PUMP REPLACEMENT

Special Tools

- BO-38185 Hose Clamp Pliers

Equivalent regional tools: [Special Tools](#)

Removal Procedure

WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Disable the high voltage system. [High Voltage Disabling](#)
2. Drain the cooling system. [Heater Coolant Heater Draining and Filling](#)
3. Remove Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
4. Remove Front Wheelhouse Liner-Right Side [Front Wheelhouse Liner Replacement](#)

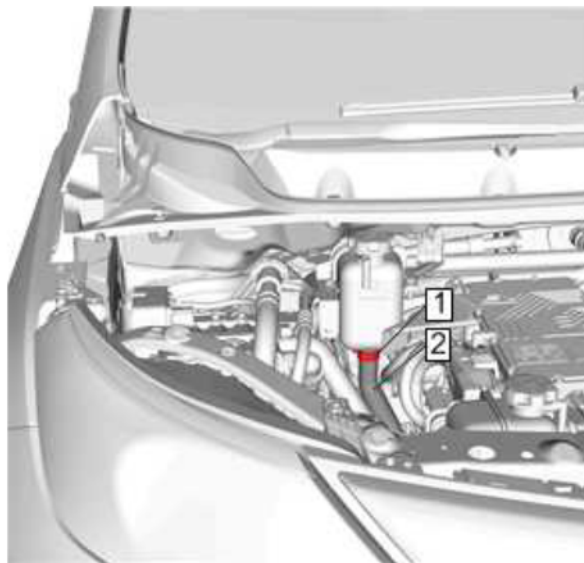


Fig. 130: Auxiliary Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Disengage Auxiliary Heater Inlet Hose Clamp (1) [Hose Clamp Replacement Guidelines - Spring Type](#)
Use the **BO-38185** Hose Clamp Pliers.
6. Remove Auxiliary Heater Inlet Hose(2)@Heater Coolant Surge Tank
7. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)

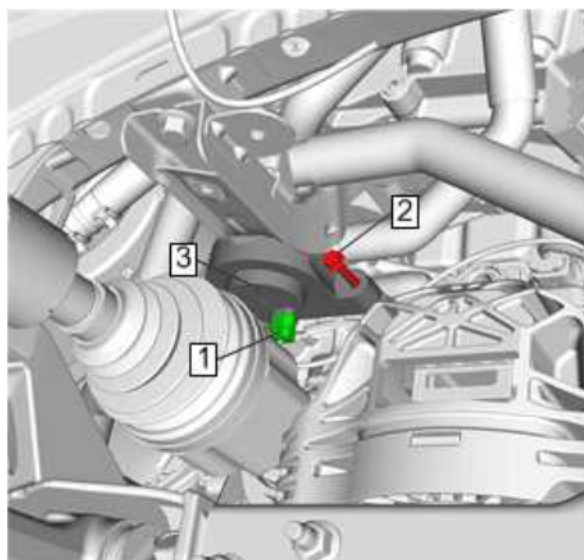


Fig. 131: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the heater coolant pump electrical connector (1).
9. Remove the heater coolant pump bolt (2).
10. Reposition the heater coolant pump on the rubber mount to access the clamp.

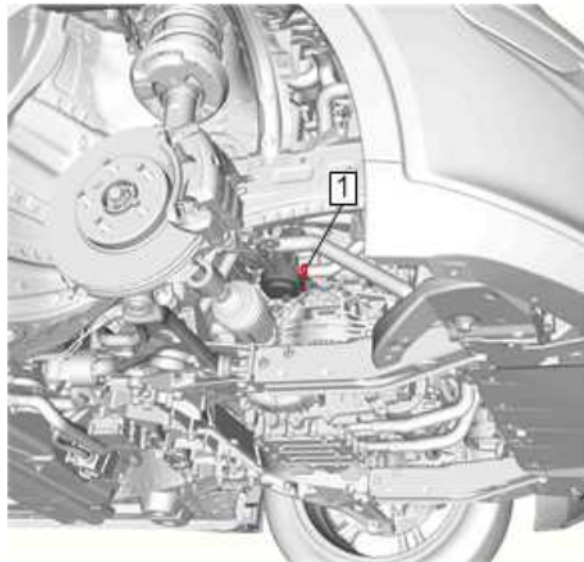


Fig. 132: Auxiliary Heater Outlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

11. Disengage Auxiliary Heater Outlet Hose Clamp (1)[Hose Clamp Replacement Guidelines - Spring Type](#)
12. Remove the auxiliary heater outlet hose from the heater coolant pump.

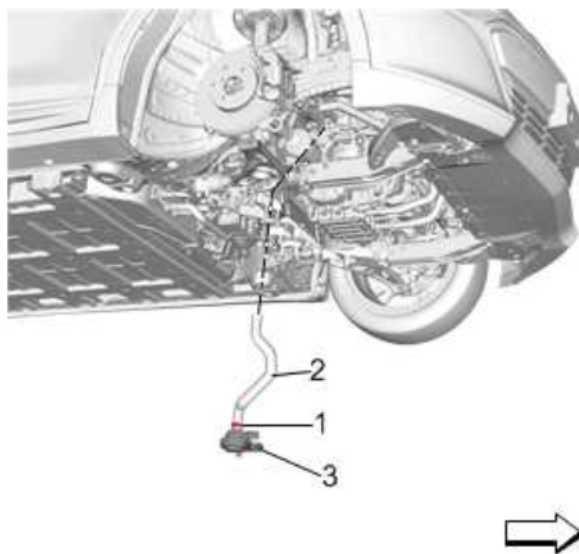


Fig. 133: Auxiliary Heater Inlet Hose Clamp And Heater Coolant Pump
Courtesy of GENERAL MOTORS COMPANY

13. Remove the heater coolant pump with the auxiliary heater inlet hose.
14. Disengage Auxiliary Heater Inlet Hose Clamp (1)[Hose Clamp Replacement Guidelines - Spring Type](#)
15. Remove Heater Coolant Pump (3)@Auxiliary Heater Inlet Hose (2)

Installation Procedure

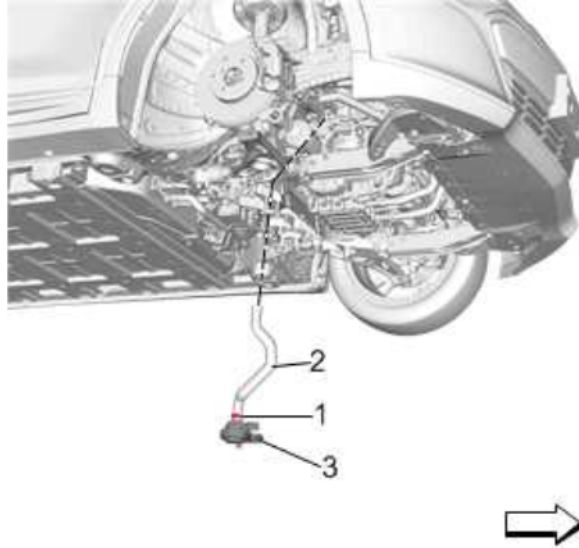


Fig. 134: Auxiliary Heater Inlet Hose Clamp And Heater Coolant Pump
 Courtesy of GENERAL MOTORS COMPANY

1. Install Heater Coolant Pump(3)@Auxiliary Heater Inlet Hose (2)
2. Engage Auxiliary Heater Inlet Hose Clamp (1)[Hose Clamp Replacement Guidelines - Spring Type](#)
3. Position the heater coolant pump with the auxiliary heater inlet hose.

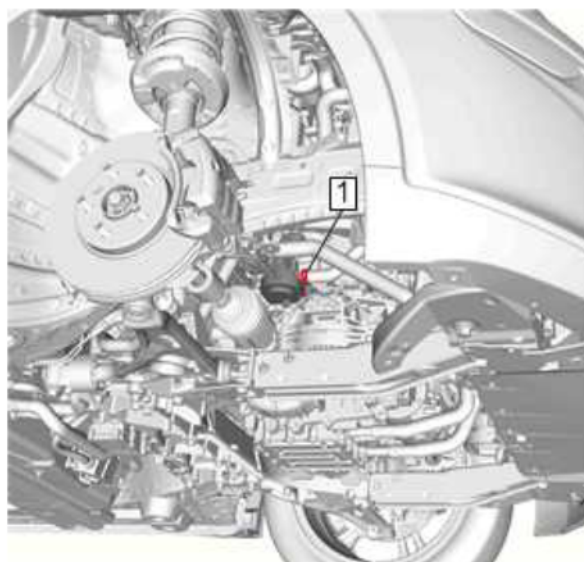


Fig. 135: Auxiliary Heater Outlet Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

4. Engage Auxiliary Heater Outlet Hose Clamp (1)[Hose Clamp Replacement Guidelines - Spring Type](#)

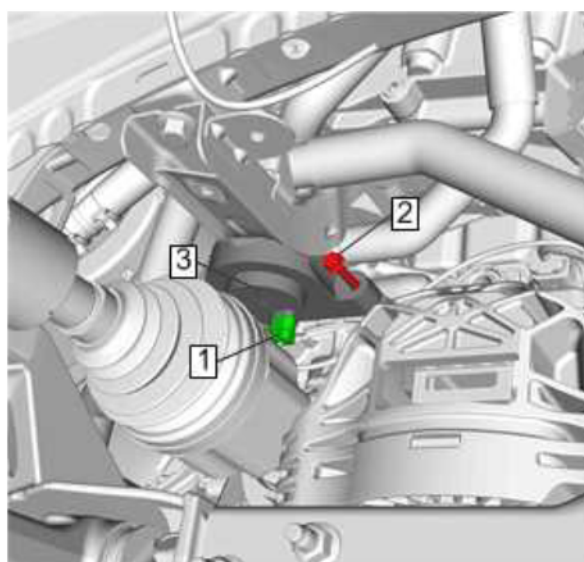


Fig. 136: Heater Coolant Pump Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Install and tighten the heater coolant pump bolt (2) to 9 N.m (80 lb in).
6. Connect the heater coolant pump electrical connector (1).
7. Lower the vehicle

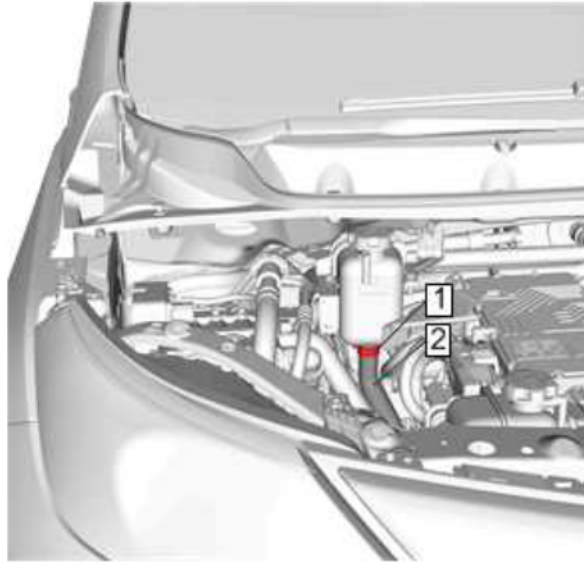


Fig. 137: Auxiliary Heater Inlet Hose Clamp
Courtesy of GENERAL MOTORS COMPANY

8. Install Auxiliary Heater Inlet Hose(2)@Heater Coolant Surge Tank
9. Engage Auxiliary Heater Inlet Hose Clamp(1)[Hose Clamp Replacement Guidelines - Spring Type](#)
10. Install Front Wheelhouse Liner-Right Side [Front Wheelhouse Liner Replacement](#)
11. Install Front Compartment Air Deflector [Front Compartment Air Deflector Replacement](#)
12. Fill the cooling system to the proper level. [Heater Coolant Heater Draining and Filling](#)
13. Enable the high voltage system. [High Voltage Enabling](#)
14. Start the engine and check for coolant leaks.

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

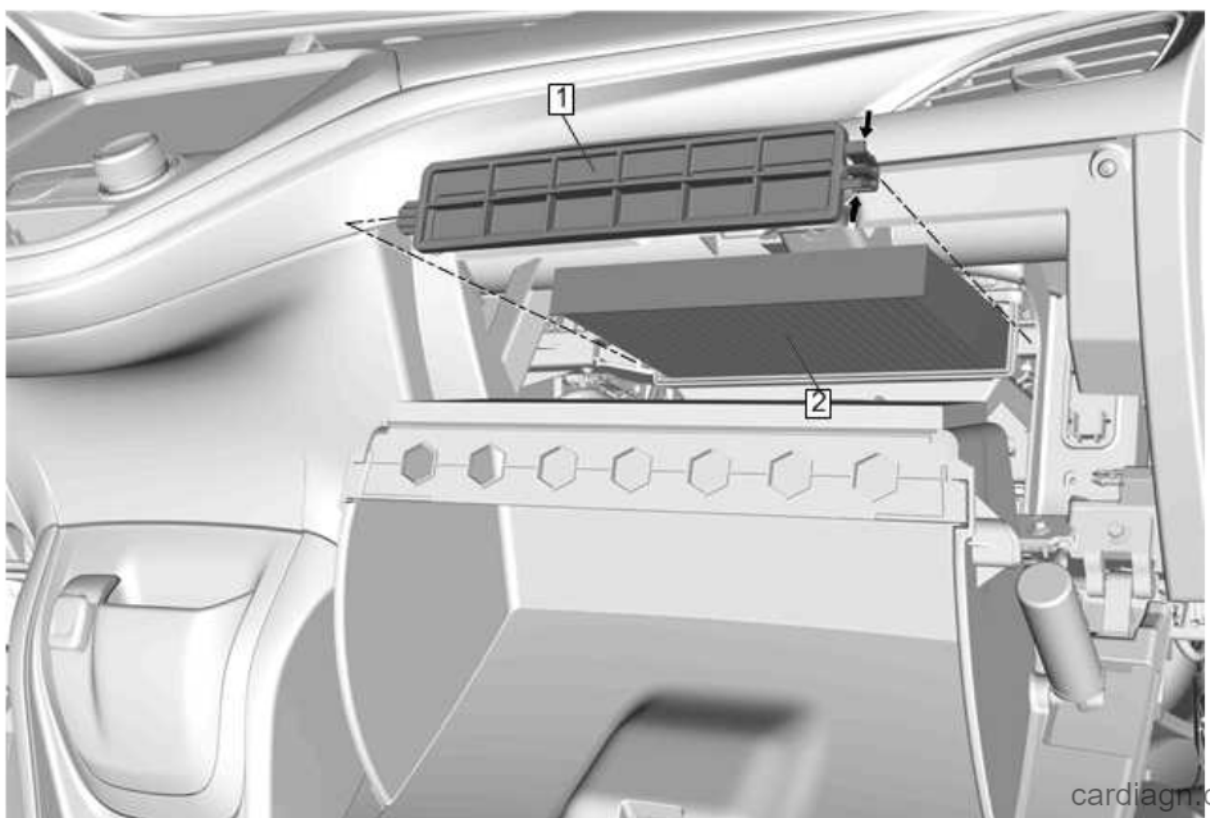


Fig. 138: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Open the instrument panel compartment door. 2. Disconnect the instrument panel compartment door dampener from the instrument panel compartment. 3. Squeeze the sides of the instrument panel compartment door and lower the instrument panel compartment door past the stops.	
1	Passenger Compartment Air Filter Cover Procedure Push the cover tab and remove the filter cover.
2	Passenger Compartment Air Filter

AIR INLET DUCT REPLACEMENT

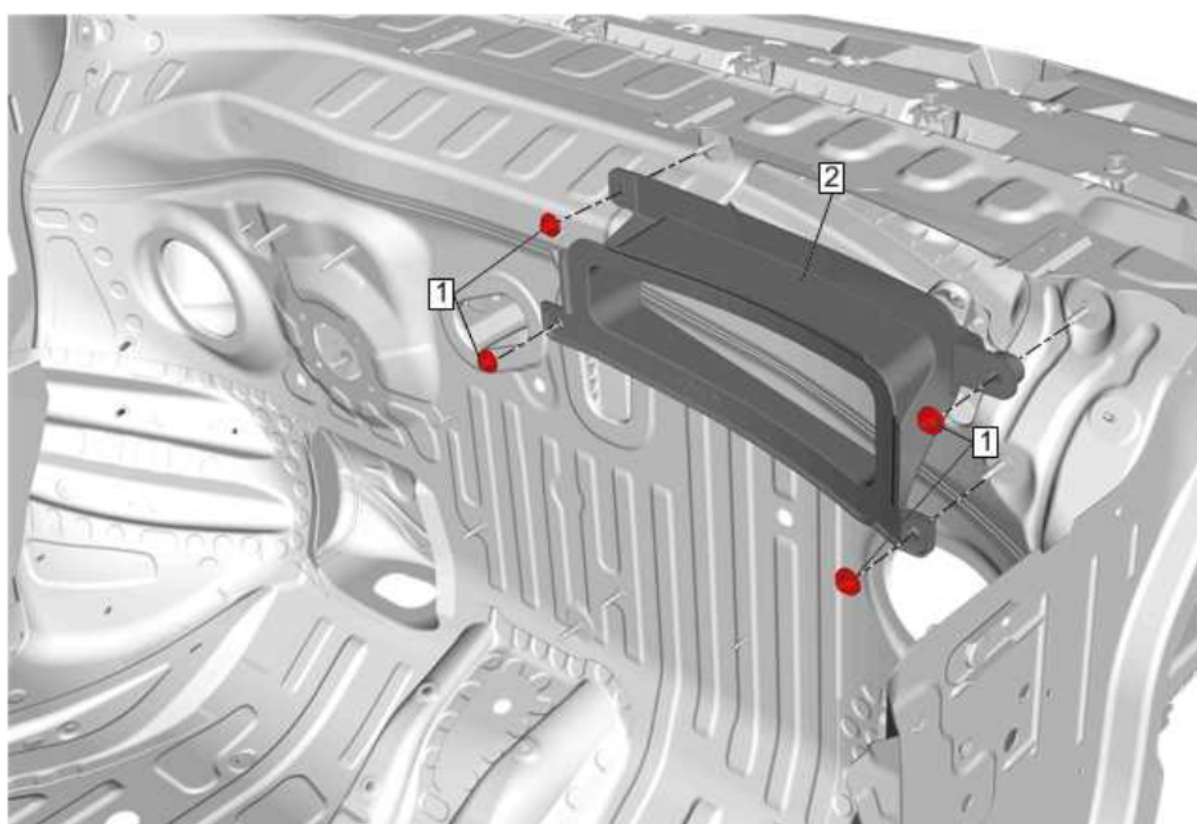


Fig. 139: Air Inlet Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection 2. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation	
1	Air Inlet Duct Nut (Qty: 4) CAUTION: Fastener Caution Tighten 3 N.m (27 lb in)

Callout	Component Name
2	Air Inlet Duct Procedure 1. Install the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation 2. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection

AIR INLET HOUSING REPLACEMENT

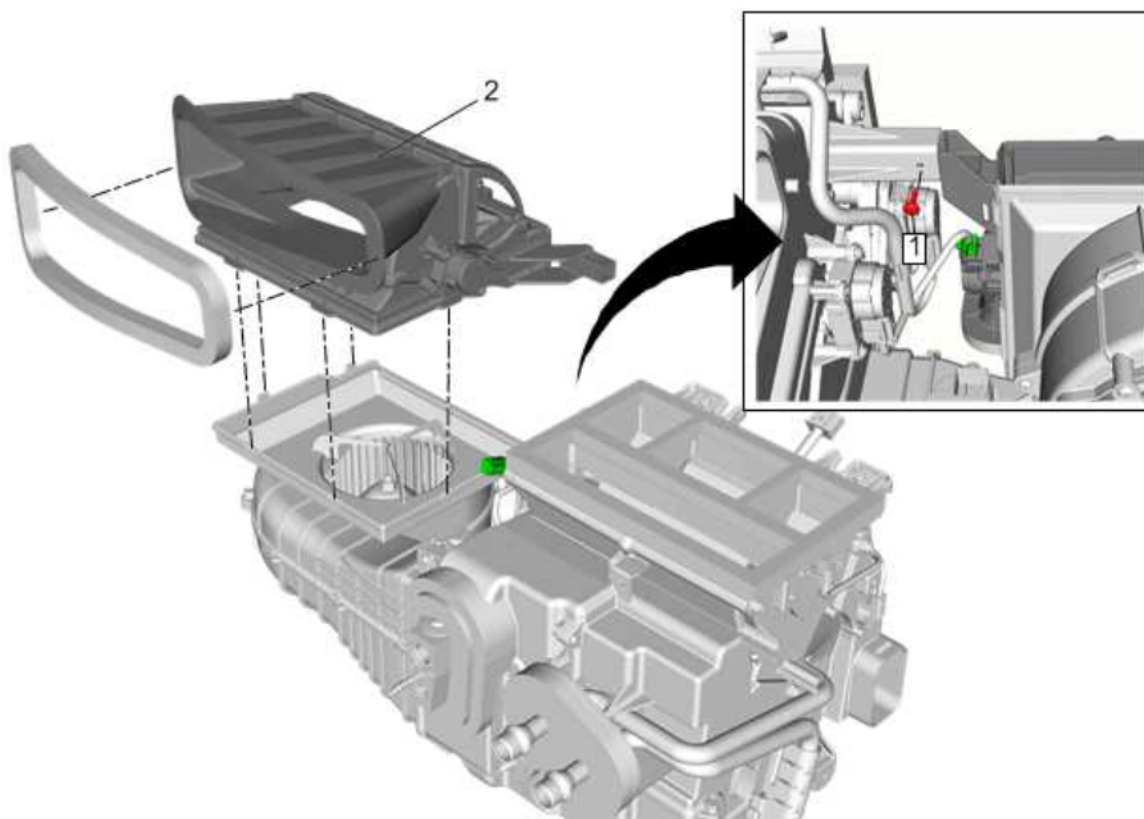


Fig. 140: Air Inlet Housing

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation 2. Passenger Compartment Air Filter Replacement	
1	Heater and Air Conditioning Evaporator Case Screw CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)

Callout	Component Name
2	Air Inlet Housing Procedure 1. Use the appropriate tool to unlatch the air inlet housing from the upper blower motor housing. 2. Install the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation

BLOWER MOTOR CONTROL REPLACEMENT (MODULE MOUNTED)

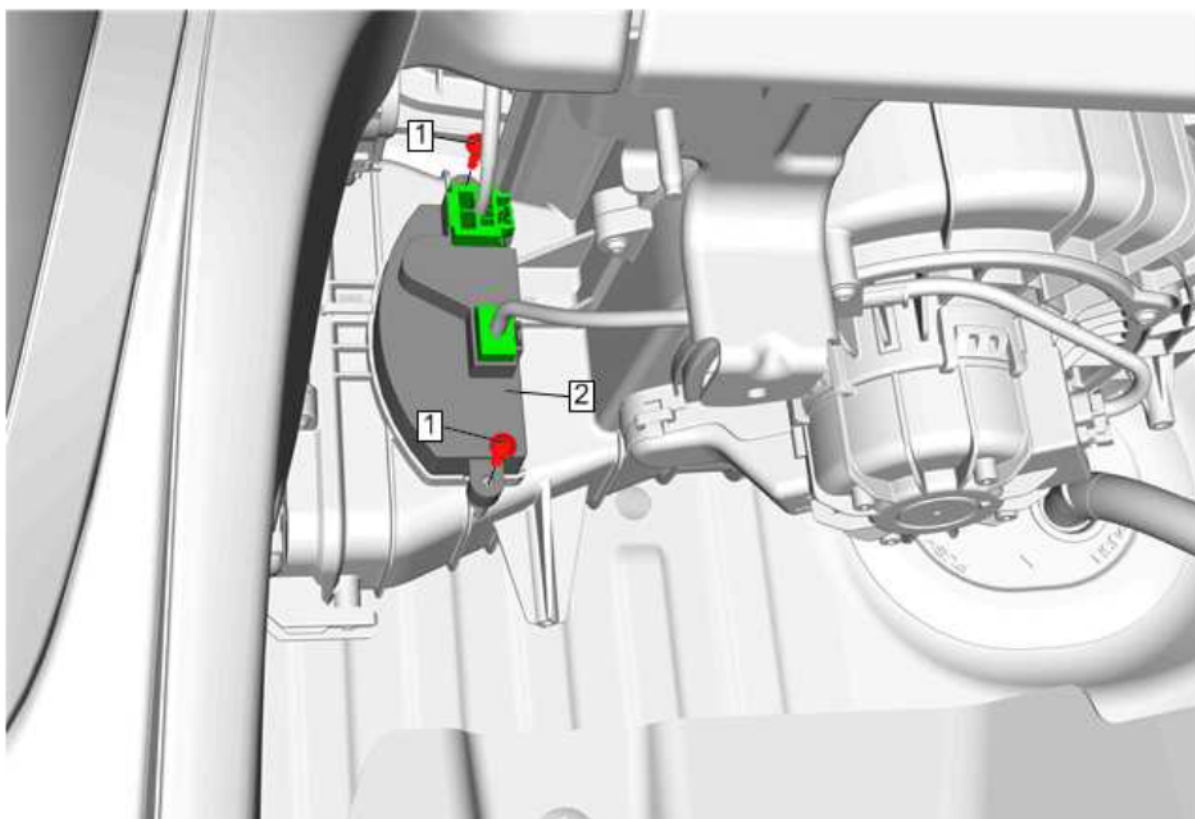


Fig. 141: Blower Motor Control (Module Mounted)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection 2. Floor Front Air Outlet Duct Replacement - Right Side	
1	Blower Motor Control Bolt (Qty: 2) CAUTION: Refer to Fastener Caution .
2	Blower Motor Control Procedure 1. Disconnect the blower motor control electrical connector. 2. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection

BLOWER MOTOR REPLACEMENT

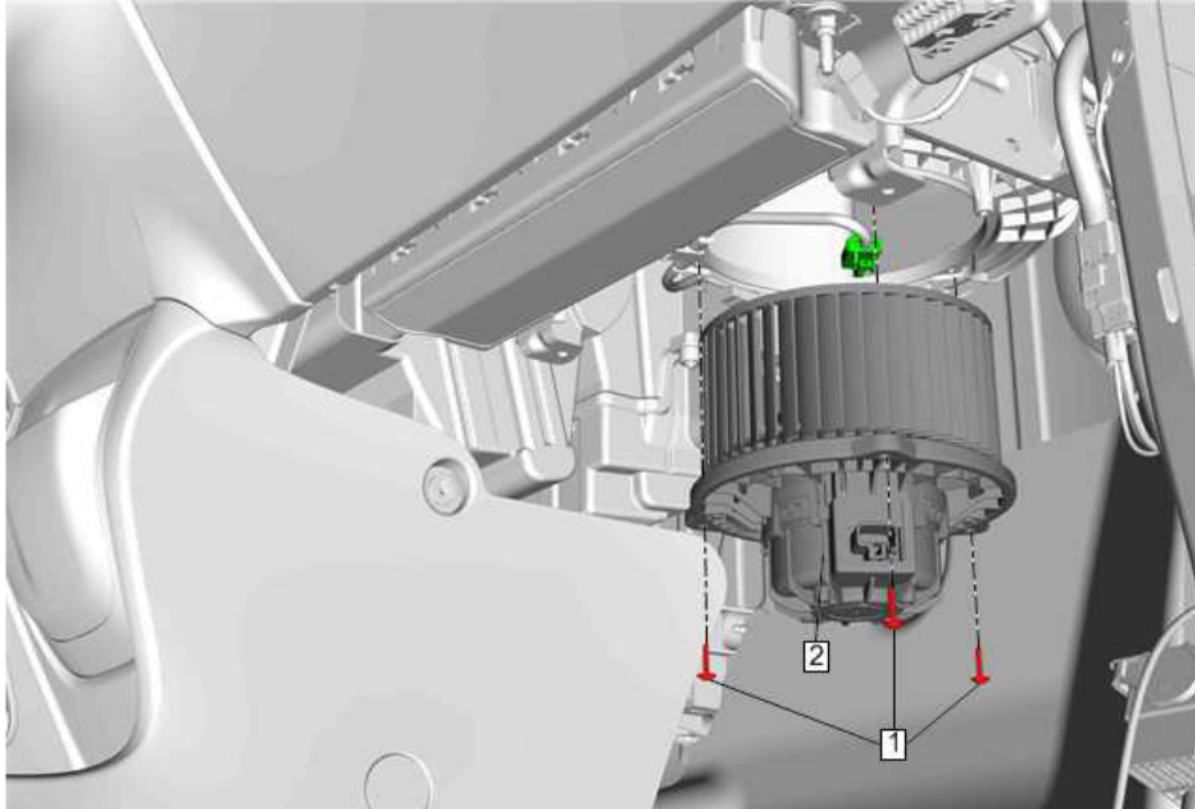


Fig. 142: Blower Motor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. <u>Battery Negative Cable Disconnection and Connection</u> 2. <u>Floor Front Air Outlet Duct Replacement - Right Side</u>	
1	Blower Motor Bolt (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> .
2	Blower Motor Procedure 1. Disconnect the blower motor electrical connector. 2. Remove the blower motor harness fastener and reposition the harness. 3. Connect the battery negative cable. <u>Battery Negative Cable Disconnection and Connection</u>

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - LEFT SIDE

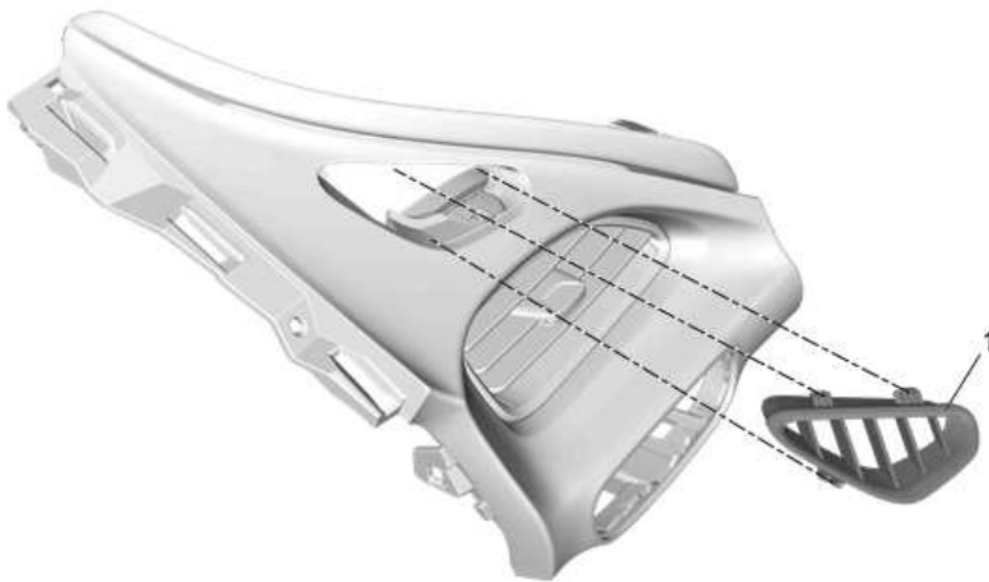


Fig. 143: Side Window Defogger Outlet Grille - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Trim Pad Replacement - Left Side</u>	
1	Side Window Defogger Outlet Grille - Left Side Procedure 1. Use a flat bladed plastic trim tool. 2. Release the plastic retaining tabs.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - RIGHT SIDE

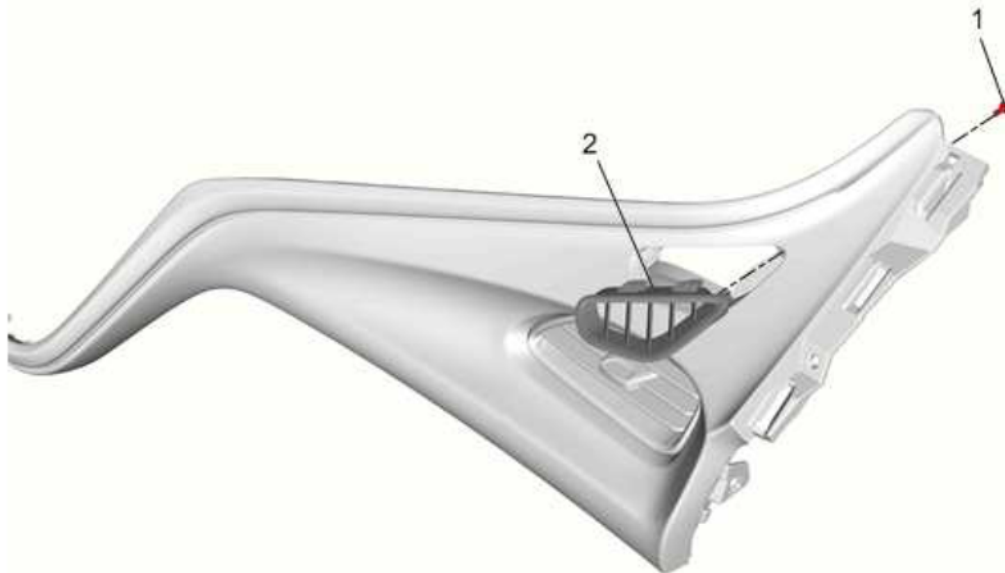


Fig. 144: Side Window Defogger Outlet Grille - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Trim Pad Replacement - Right Side</u>	
1	Side Window Defogger Outlet Grille Screw CAUTION: Refer to <u>Fastener Caution</u> .
2	Side Window Defogger Outlet Grille Procedure 1. Use a flat bladed plastic trim tool. 2. Release the plastic retaining tabs.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - LEFT SIDE

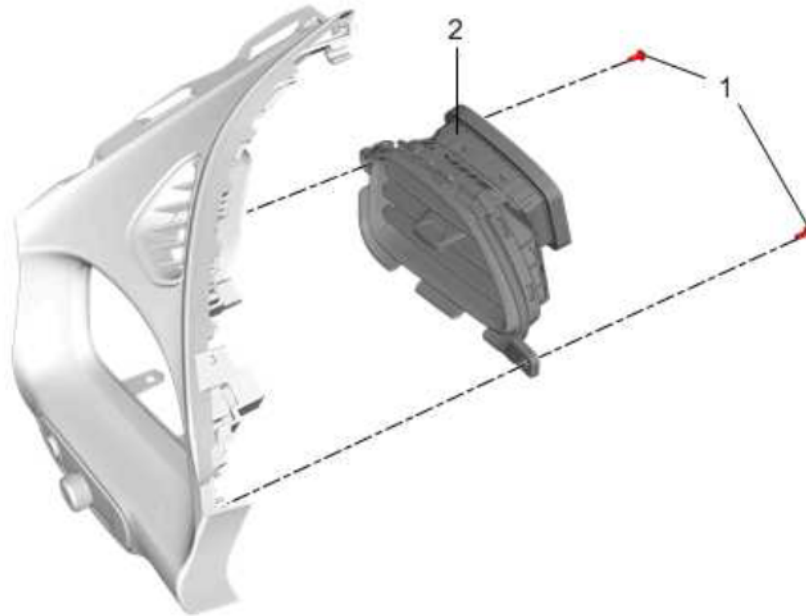


Fig. 145: Instrument Panel Outer Air Outlet - Left Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Trim Pad Replacement - Left Side</u>	
1	Instrument Panel Outer Air Outlet Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Instrument Panel Outer Air Outlet - Left Side Procedure 1. Use a flat bladed plastic trim tool. 2. Release the plastic retaining tabs.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - RIGHT SIDE

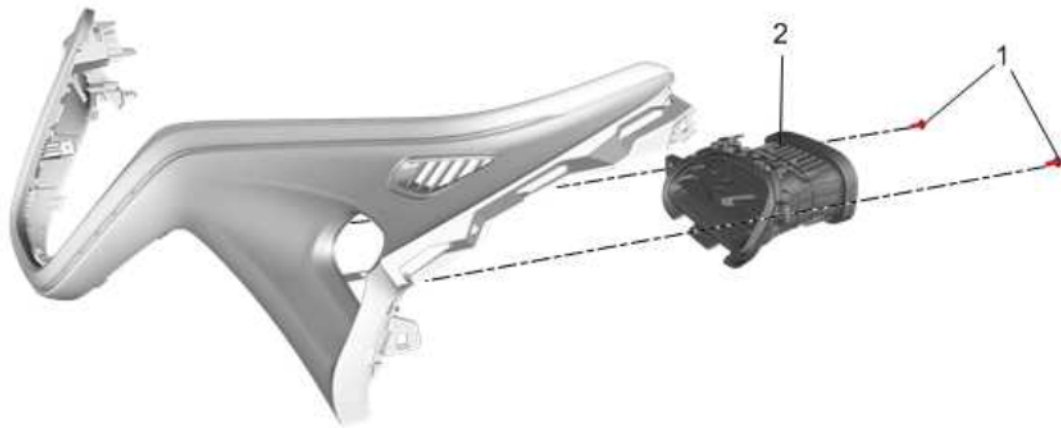


Fig. 146: Instrument Panel Outer Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Trim Pad Replacement - Right Side</u>	
1	Instrument Panel Outer Air Outlet Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Instrument Panel Outer Air Outlet - Right Side Procedure 1. Use a flat bladed plastic trim tool. 2. Release the plastic retaining tabs.

INSTRUMENT PANEL COMPARTMENT AIR DUCT REPLACEMENT

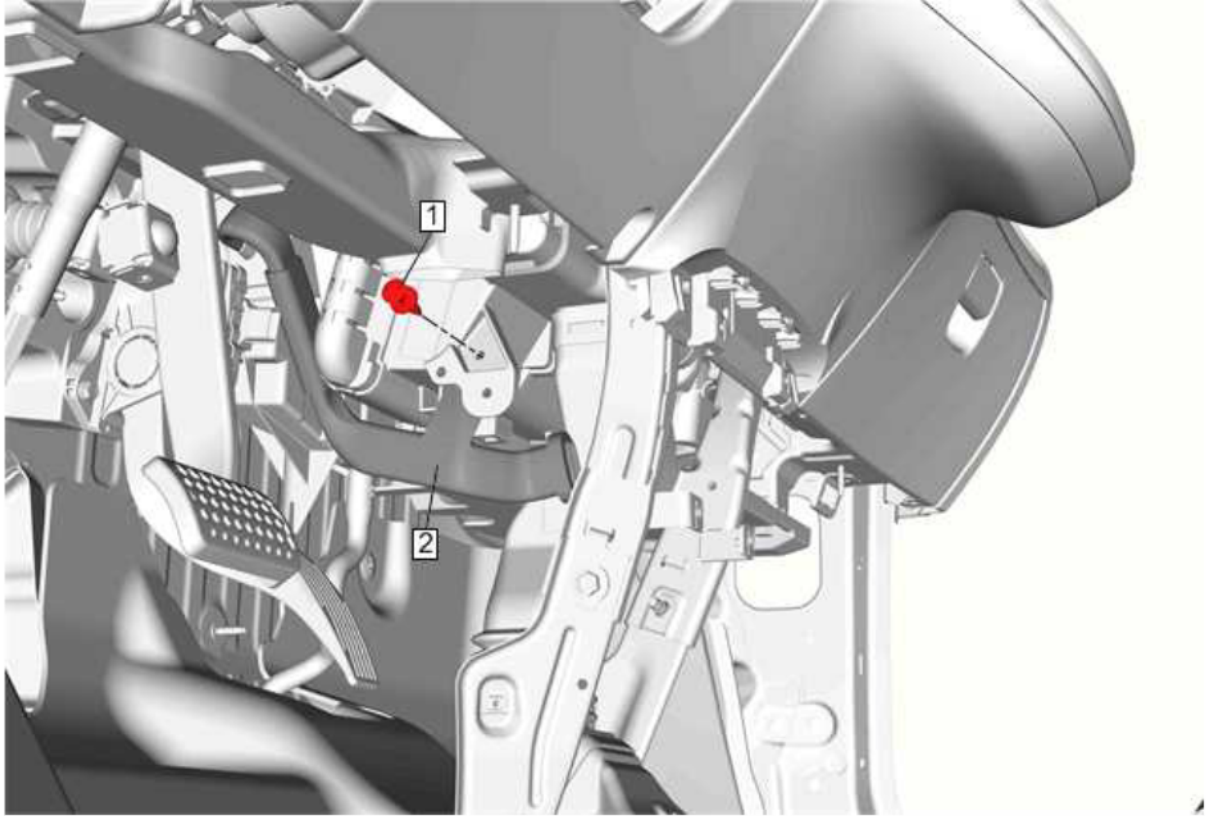


Fig. 147: Instrument Panel Compartment Air Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Floor Console Replacement</u>	
1	Instrument Panel Compartment Air Duct Push Pin CAUTION: Refer to <u>Fastener Caution</u> .
2	Instrument Panel Compartment Air Duct

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT

Removal Procedure

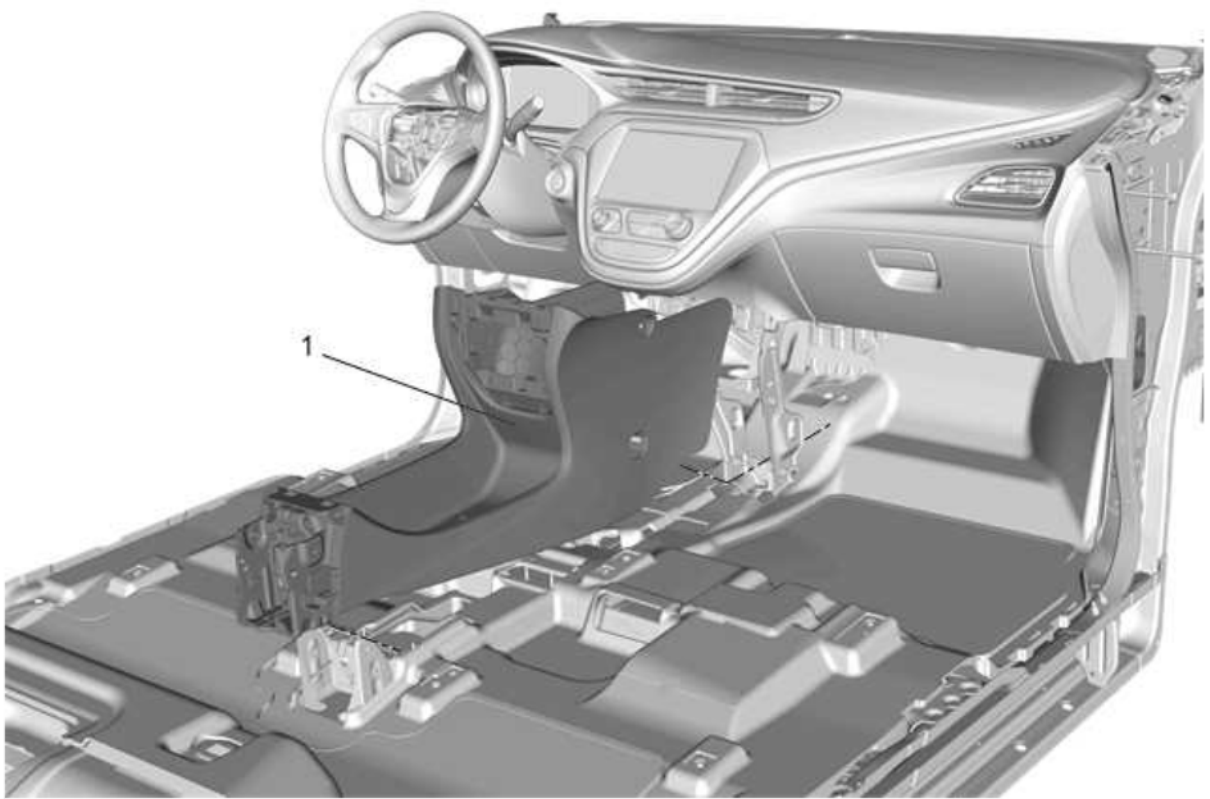


Fig. 148: Front Floor Console

Courtesy of GENERAL MOTORS COMPANY

1. Remove Front Floor Console (1) **Front Floor Console Replacement**

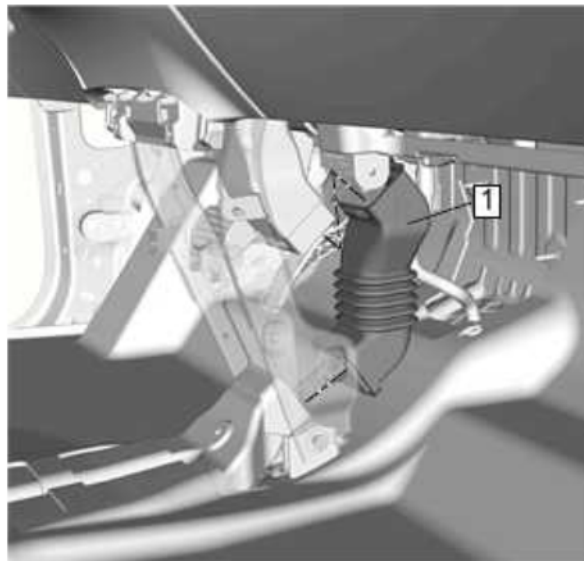


Fig. 149: Floor Front Air Outlet Duct Adapter

Courtesy of GENERAL MOTORS COMPANY

2. Remove Floor Front Air Outlet Duct Adapter(1)

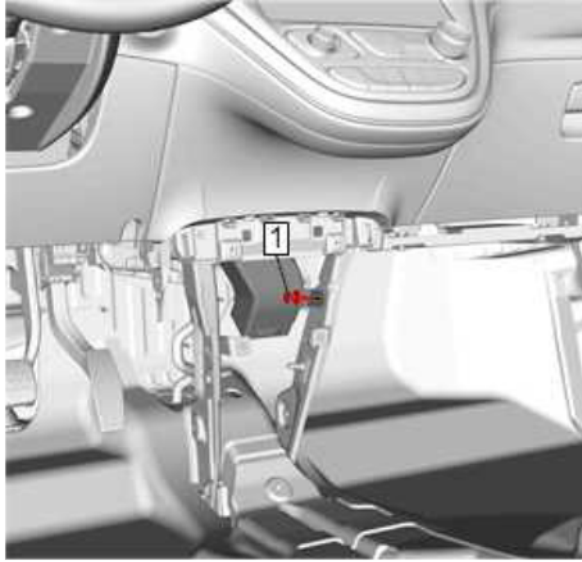


Fig. 150: Floor Front Air Outlet Duct Push Pin
Courtesy of GENERAL MOTORS COMPANY

3. Remove Push Pin(1)

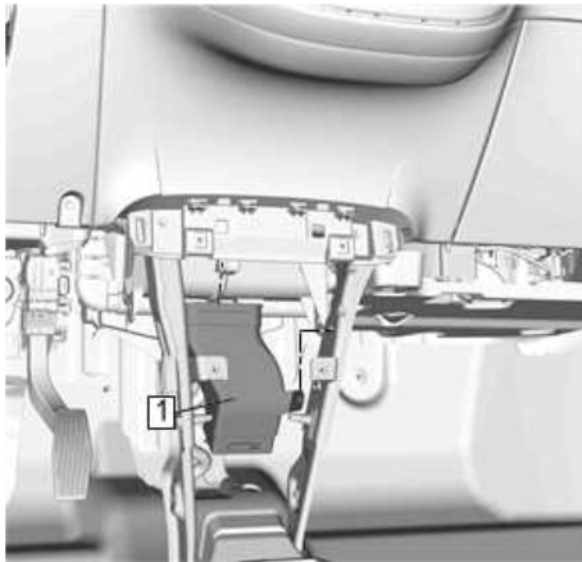
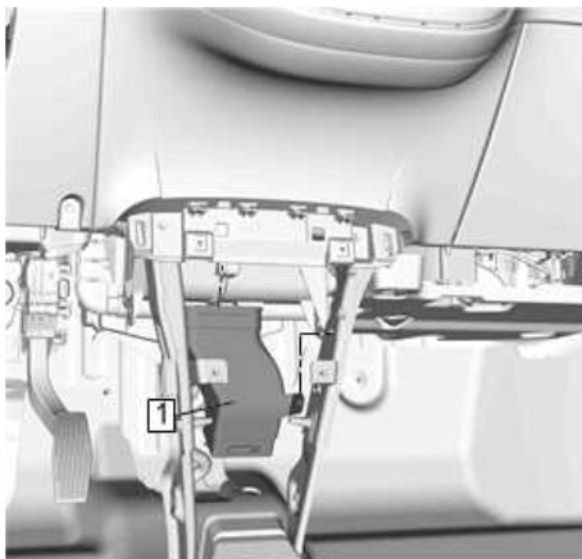


Fig. 151: Floor Front Air Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

4. Remove Floor Front Air Outlet Duct (1)

Installation Procedure



1. Install Floor Front Air Outlet Duct (1)

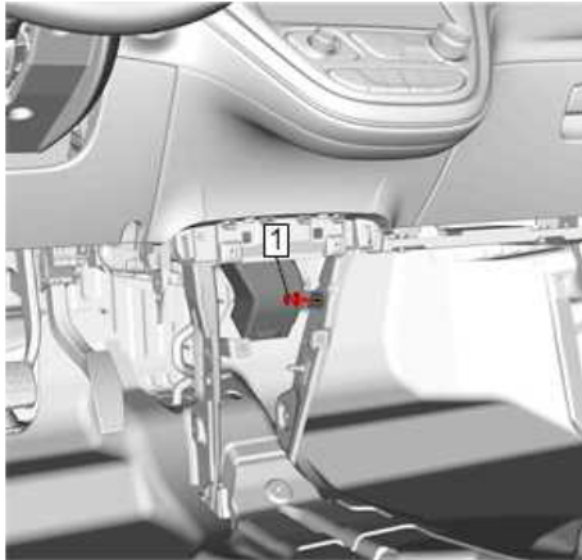


Fig. 153: Floor Front Air Outlet Duct Push Pin
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution**

2. Install Push Pin(1)

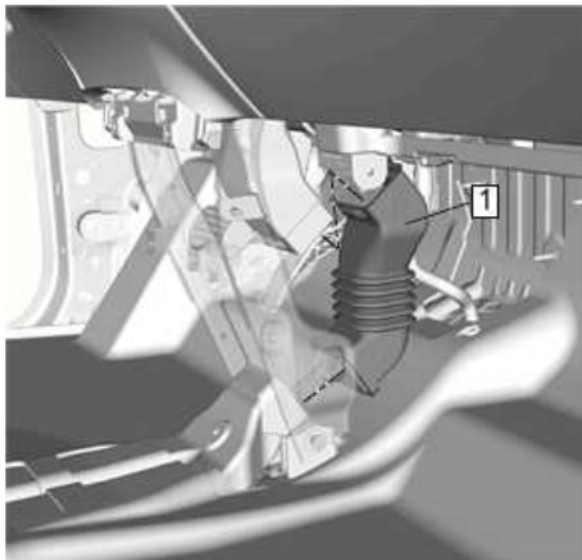


Fig. 154: Floor Front Air Outlet Duct Adapter
Courtesy of GENERAL MOTORS COMPANY

3. Install Floor Front Air Outlet Duct Adapter(1)

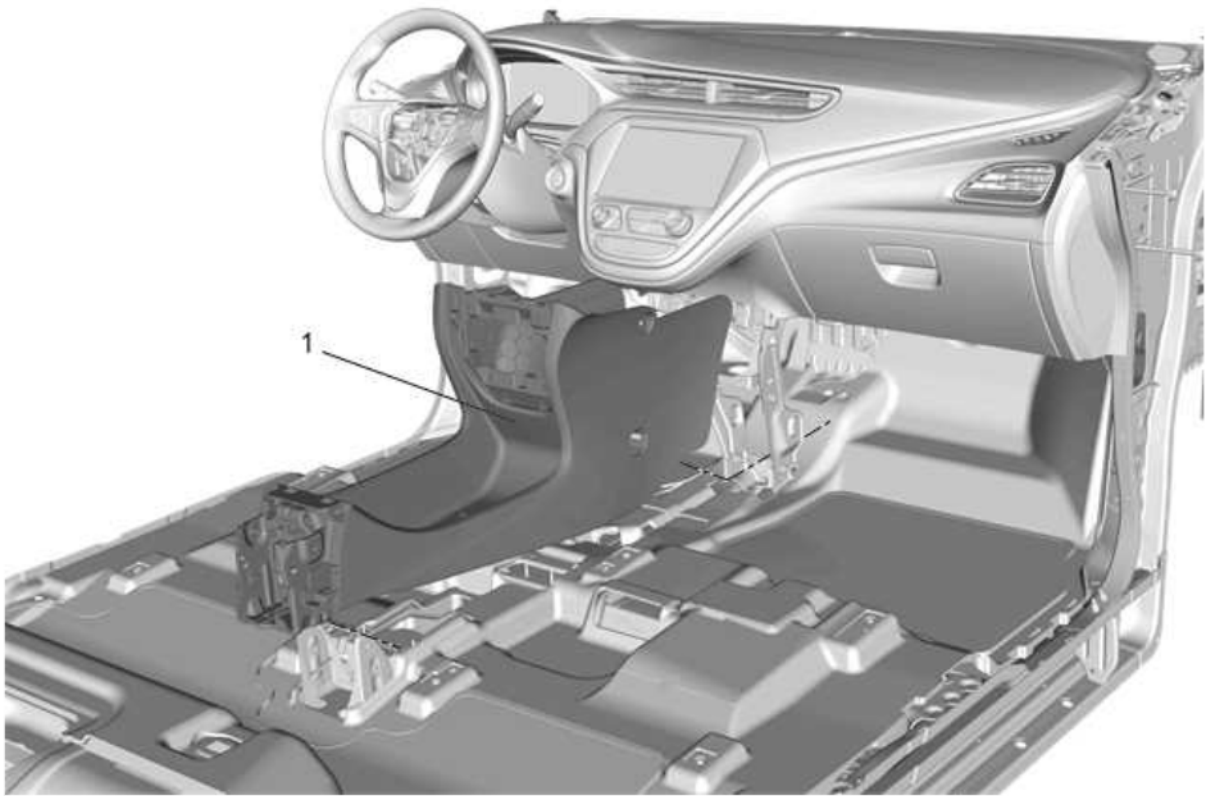


Fig. 155: Front Floor Console

Courtesy of GENERAL MOTORS COMPANY

4. Install Front Floor Console(1) **Front Floor Console Replacement**

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

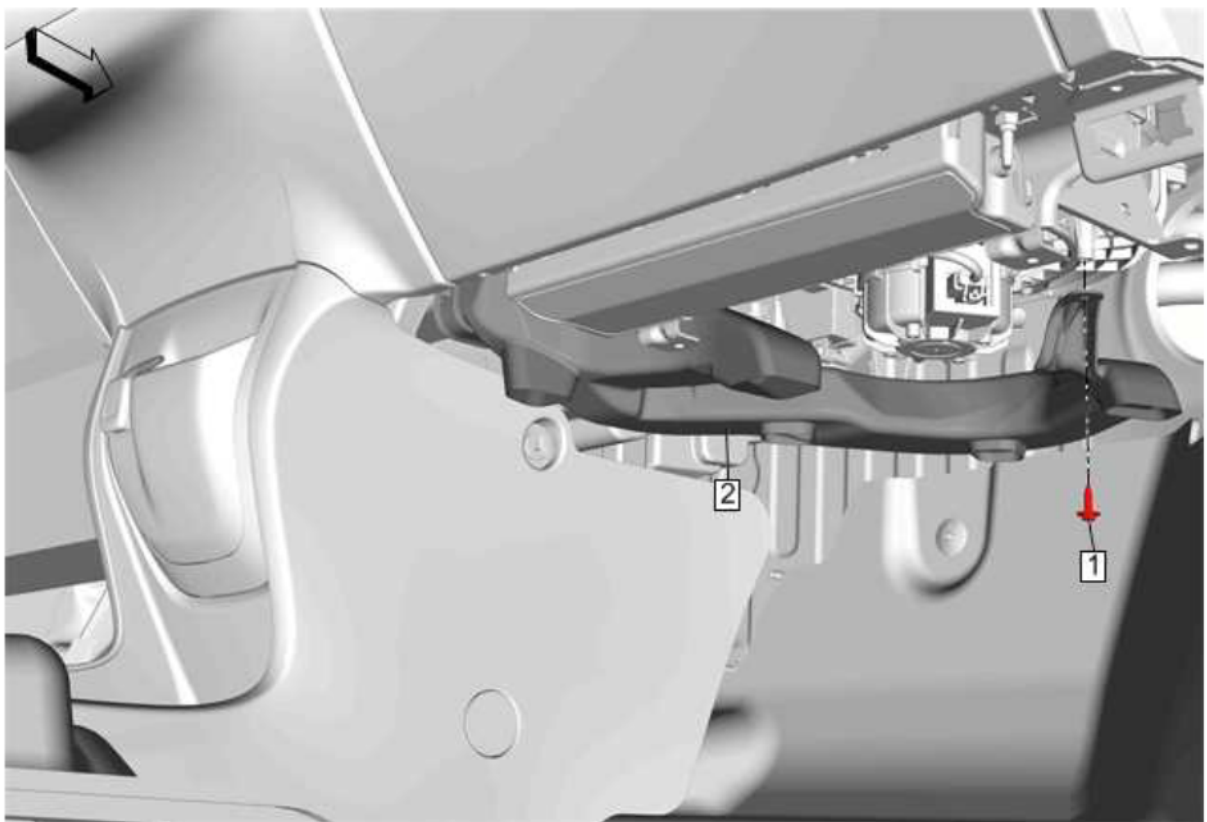


Fig. 156: Floor Front Air Outlet Duct - Right Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Instrument Panel Lower Trim Panel Insulator Replacement</u>	
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Callout	Component Name
1	Floor Front Air Outlet Duct Bolt CAUTION: <u>Fastener Caution</u> Tighten 2.5 N.m (22 lb in)
2	Floor Front Air Outlet Duct - Right Side

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

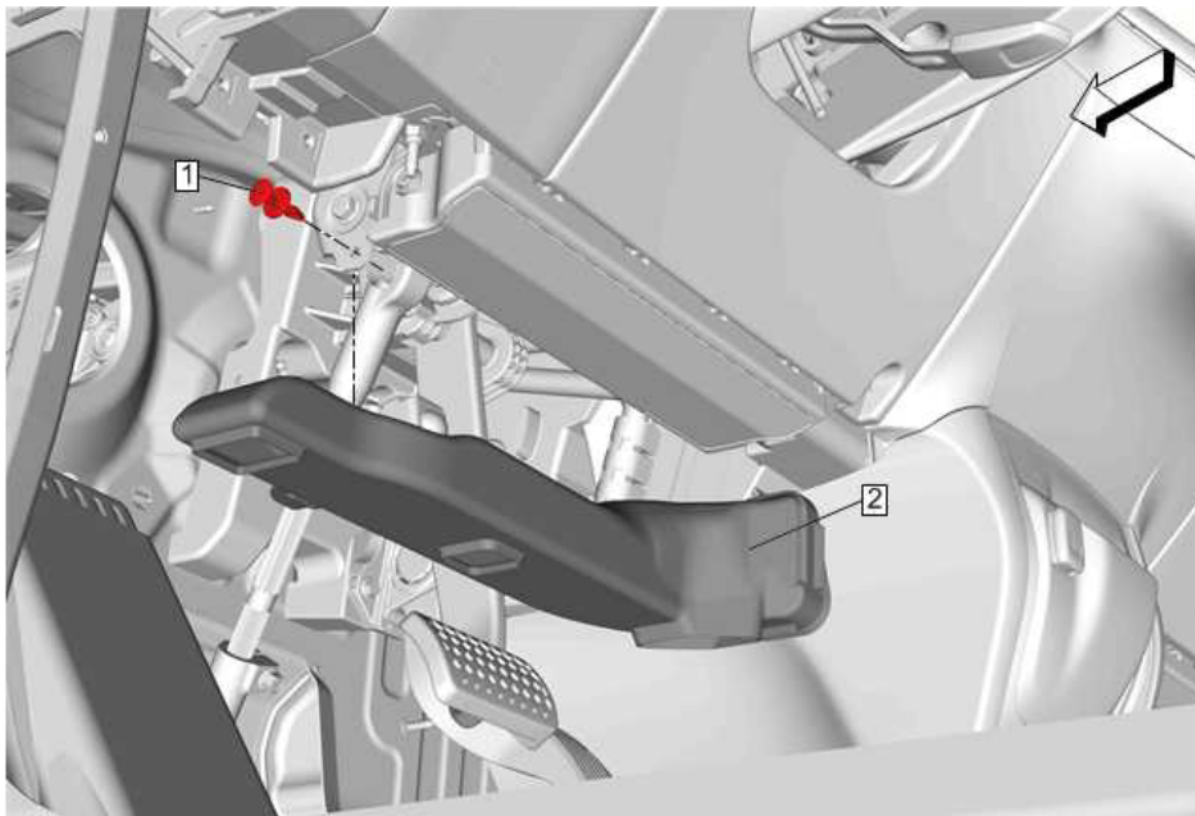


Fig. 157: Floor Front Air Outlet Duct - Left Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Floor Front Air Outlet Duct Retainer CAUTION: <u>Fastener Caution</u>
2	Floor Front Air Outlet Duct - Left Side

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT (WIRELESS CHARGING DUCT - REAR)

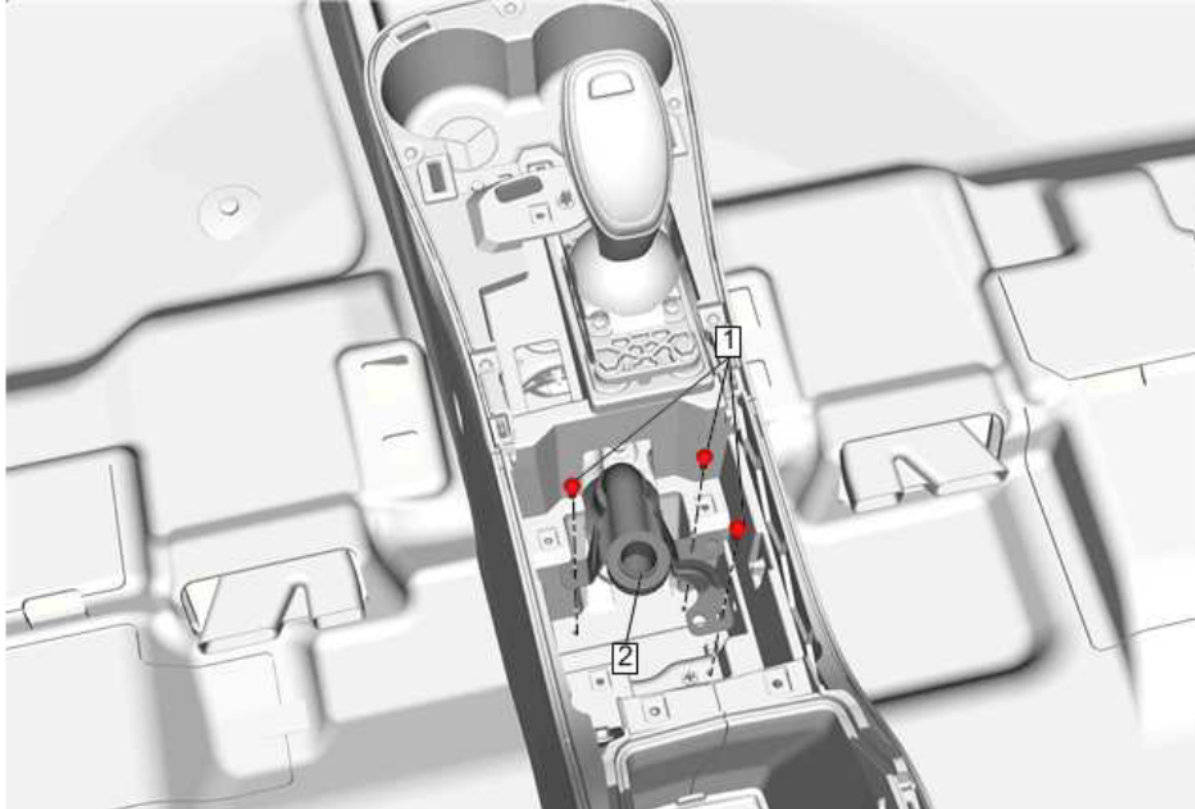


Fig. 158: Front Floor Console Rear Air Duct (Wireless Charging Duct - Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Floor Front Air Outlet Duct Replacement</u>	
1	Front Floor Console Rear Air Duct Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> Tighten 2.5 N.m (22 lb in)
2	Front Floor Console Rear Air Duct-Rear

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT (WIRELESS CHARGING DUCT - MIDDLE)

Removal Procedure

1. Disconnect the battery negative cable. **Battery Negative Cable Disconnection and Connection**

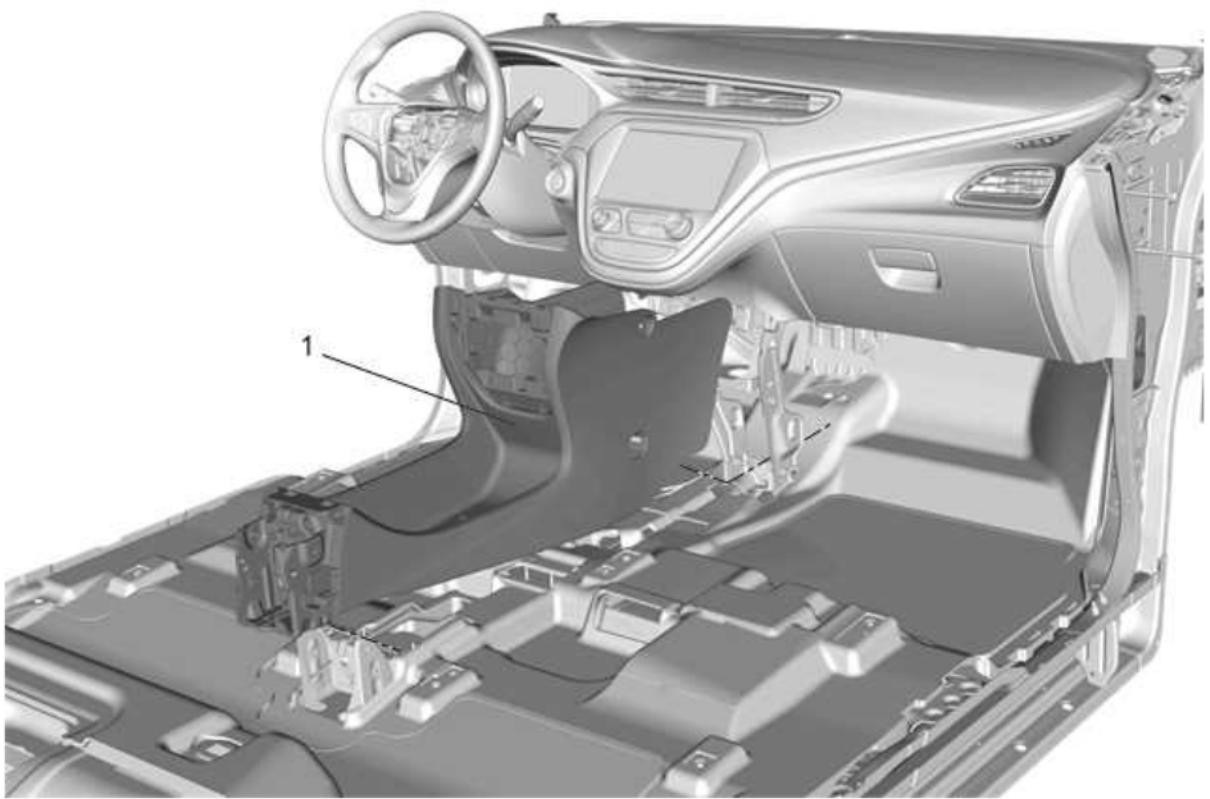


Fig. 159: Front Floor Console

Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Floor Console(1)**Front Floor Console Replacement**

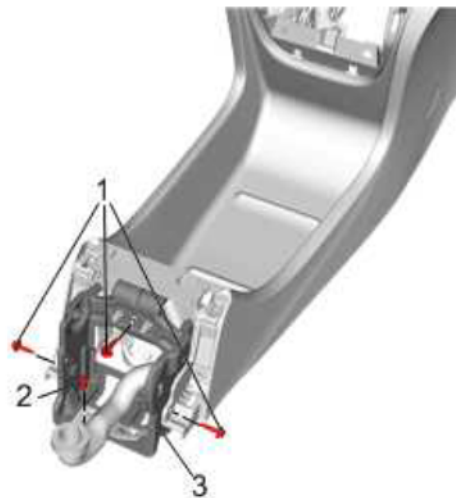


Fig. 160: Front Floor Console Bracket Bolt

Courtesy of GENERAL MOTORS COMPANY

3. Remove Front Floor Console Bracket Bolt(1)
4. Remove Front Floor Console Rear Air Duct Screw (2)
5. Remove Front Floor Console Bracket(3)

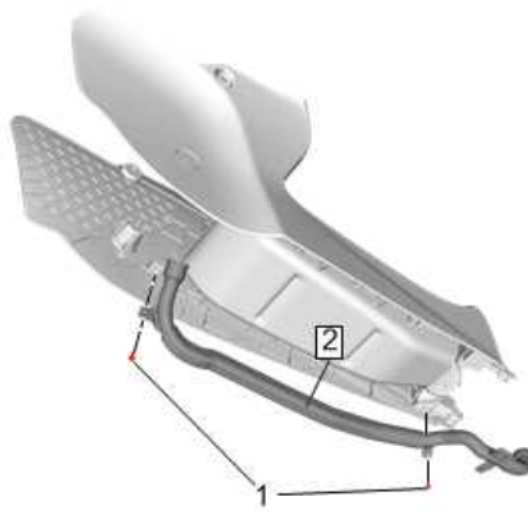


Fig. 161: Front Floor Console Rear Air Duct Screw
 Courtesy of GENERAL MOTORS COMPANY

6. Remove Front Floor Console Rear Air Duct Screw (1)
7. Remove Front Floor Console Rear Air Duct (2)

Installation Procedure

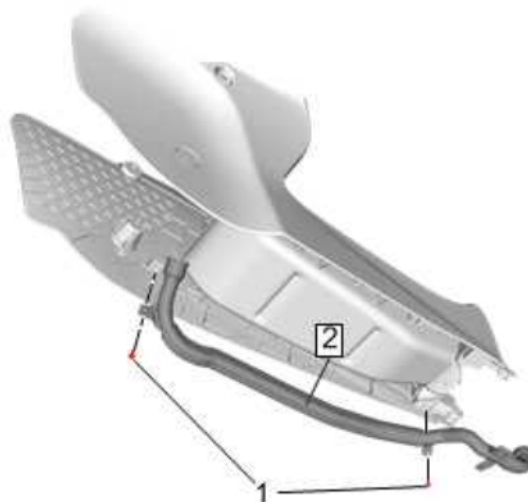


Fig. 162: Front Floor Console Rear Air Duct Screw
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution**

1. Install Front Floor Console Rear Air Duct(2)
2. Install Front Floor Console Rear Air Duct Screw (1) and tighten 2.5 N.m (22 lb in)

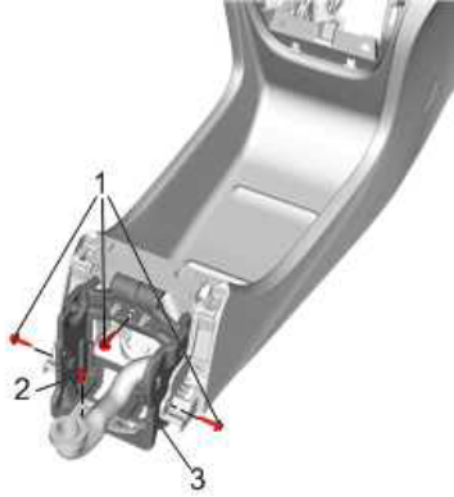


Fig. 163: Front Floor Console Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install Front Floor Console Bracket(3)
4. Install Front Floor Console Rear Air Duct Screw (2) and tighten 2.5 N.m (22 lb in)
5. Install Front Floor Console Bracket Bolt(1) and tighten 2.5 N.m (22 lb in)

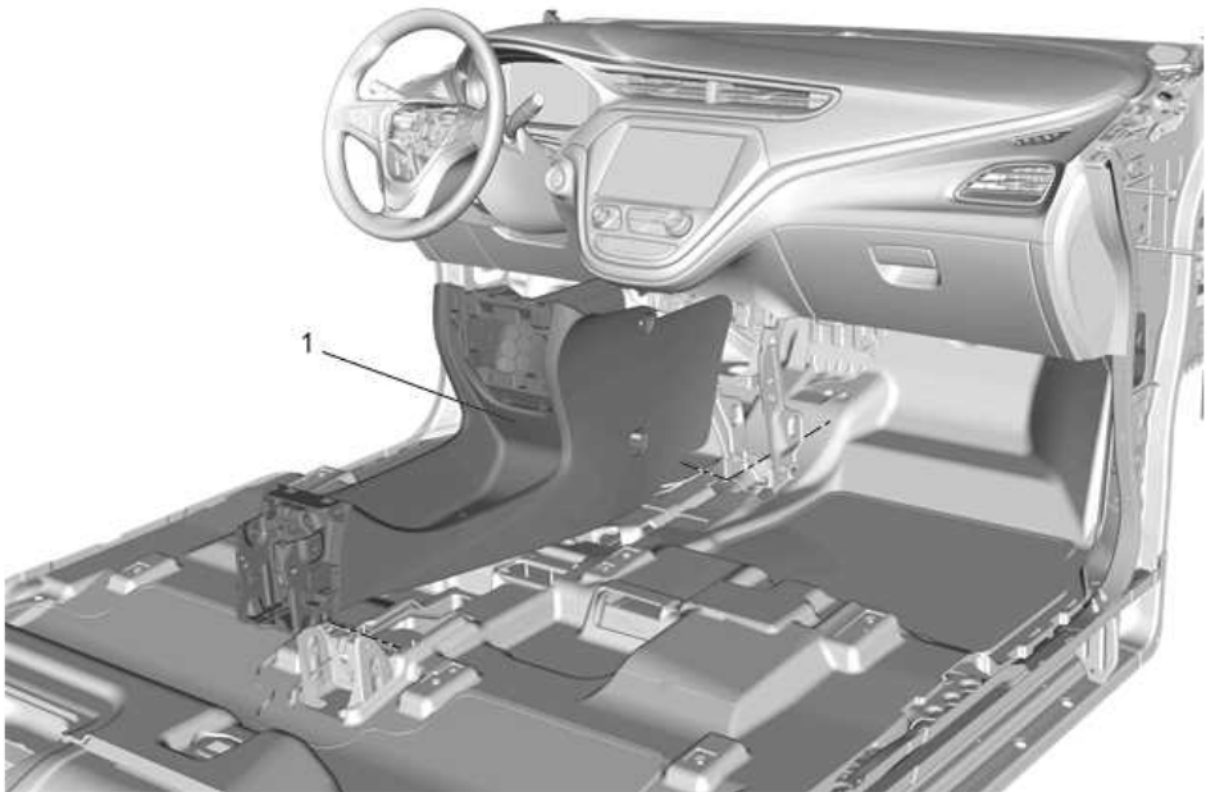


Fig. 164: Front Floor Console
Courtesy of GENERAL MOTORS COMPANY

6. Install Front Floor Console(1) [Front Floor Console Replacement](#)
7. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT (WIRELESS CHARGING DUCT - FRONT)

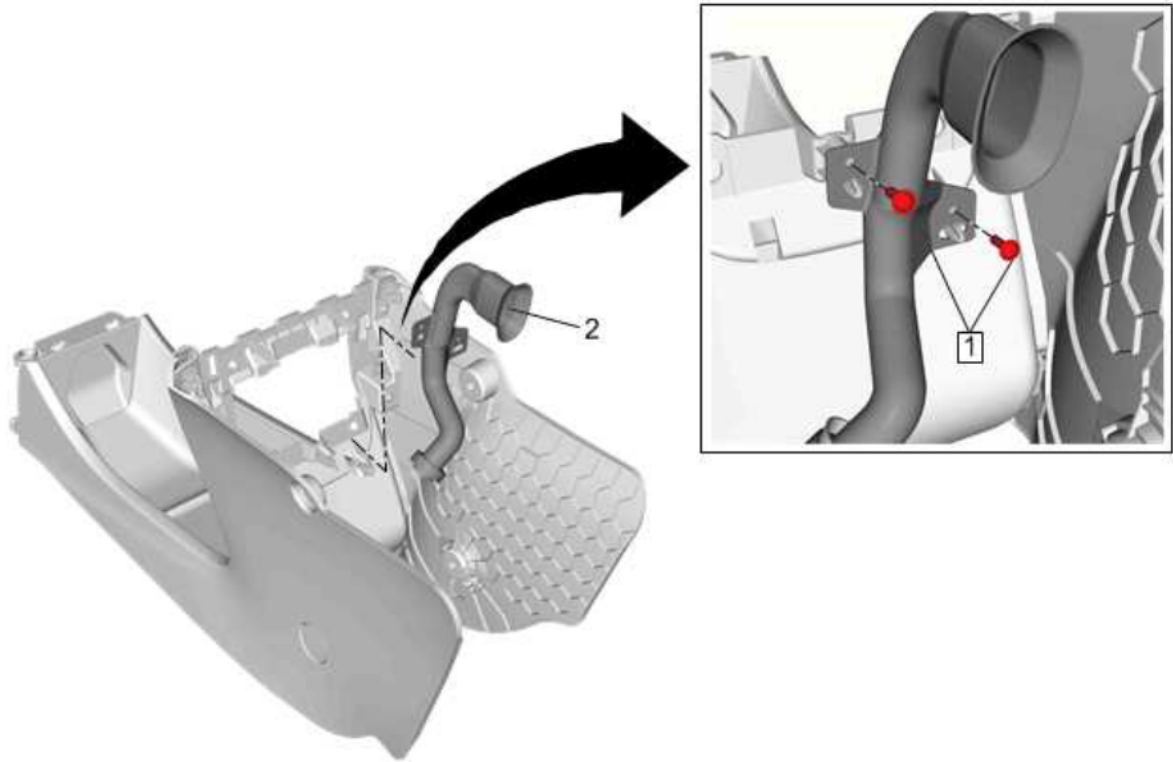


Fig. 165: Front Floor Console Rear Air Duct (Wireless Charging Duct - Front)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Floor Console Replacement	
1	Front Floor Console Rear Air Duct Fastener (Qty: 2) CAUTION: Refer to Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Front Floor Console Rear Air Duct-Front

FLOOR REAR AIR OUTLET DUCT ADAPTER REPLACEMENT

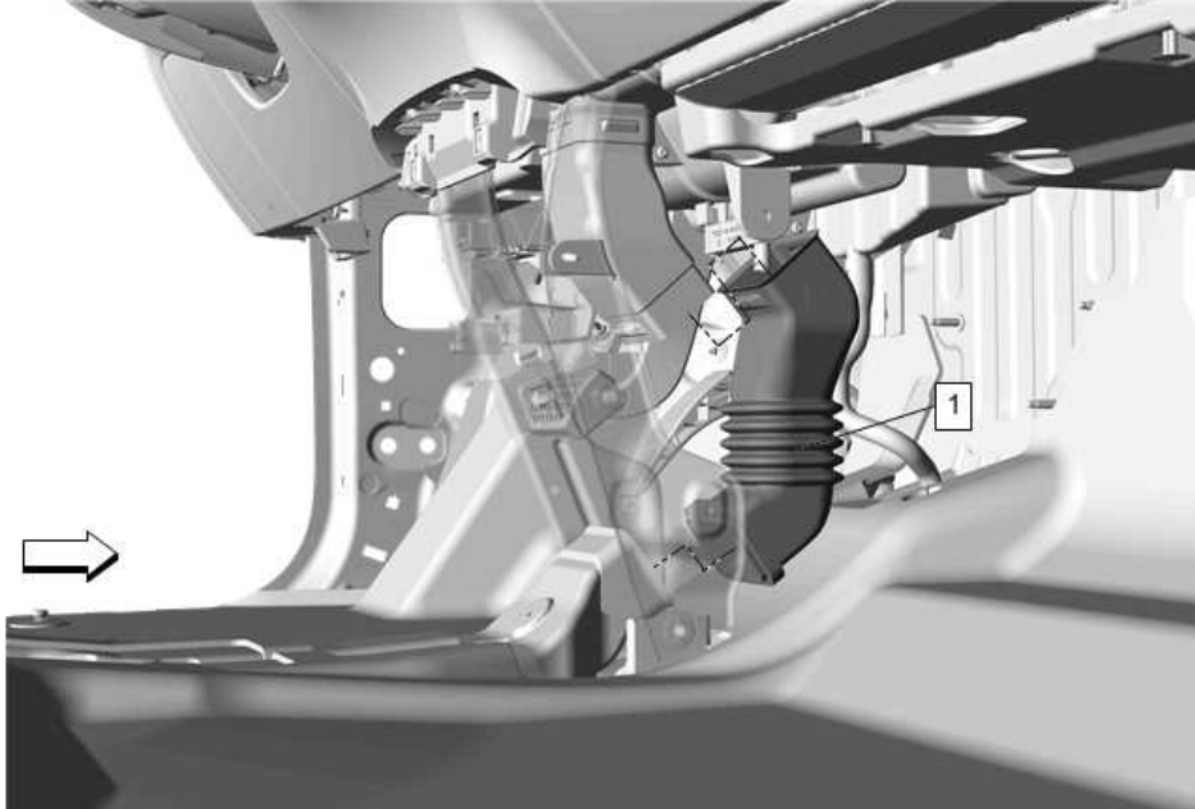


Fig. 166: Floor Rear Air Outlet Duct Adapter
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Floor Console Replacement	
1	Floor Rear Air Outlet Duct Adapter Procedure Use a flat bladed plastic tool to remove.

INSTRUMENT PANEL CENTER AIR OUTLET DUCT REPLACEMENT

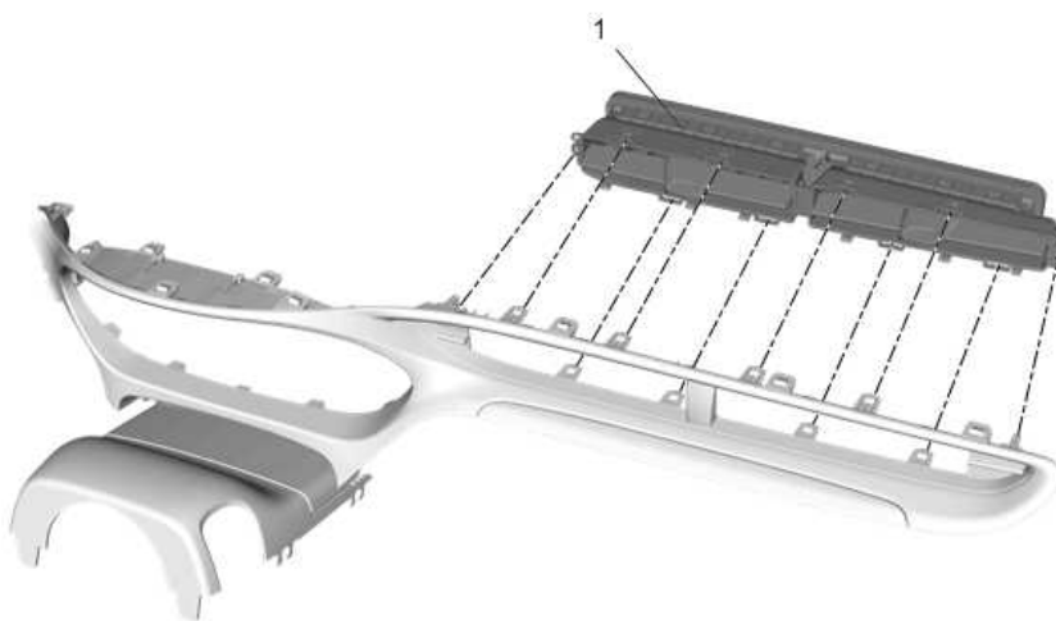


Fig. 167: Instrument Panel Center Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Steering Column Upper Trim Cover Replacement</u>	
1	Instrument Panel Center Air Outlet Duct Procedure 1. Use a flat bladed plastic trim tool. 2. Release the plastic retaining tabs.

INSTRUMENT PANEL OUTER AIR OUTLET DUCT REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [**Battery Negative Cable Disconnection and Connection**](#)
2. Remove Instrument Panel Assembly [**Instrument Panel Assembly Replacement**](#)

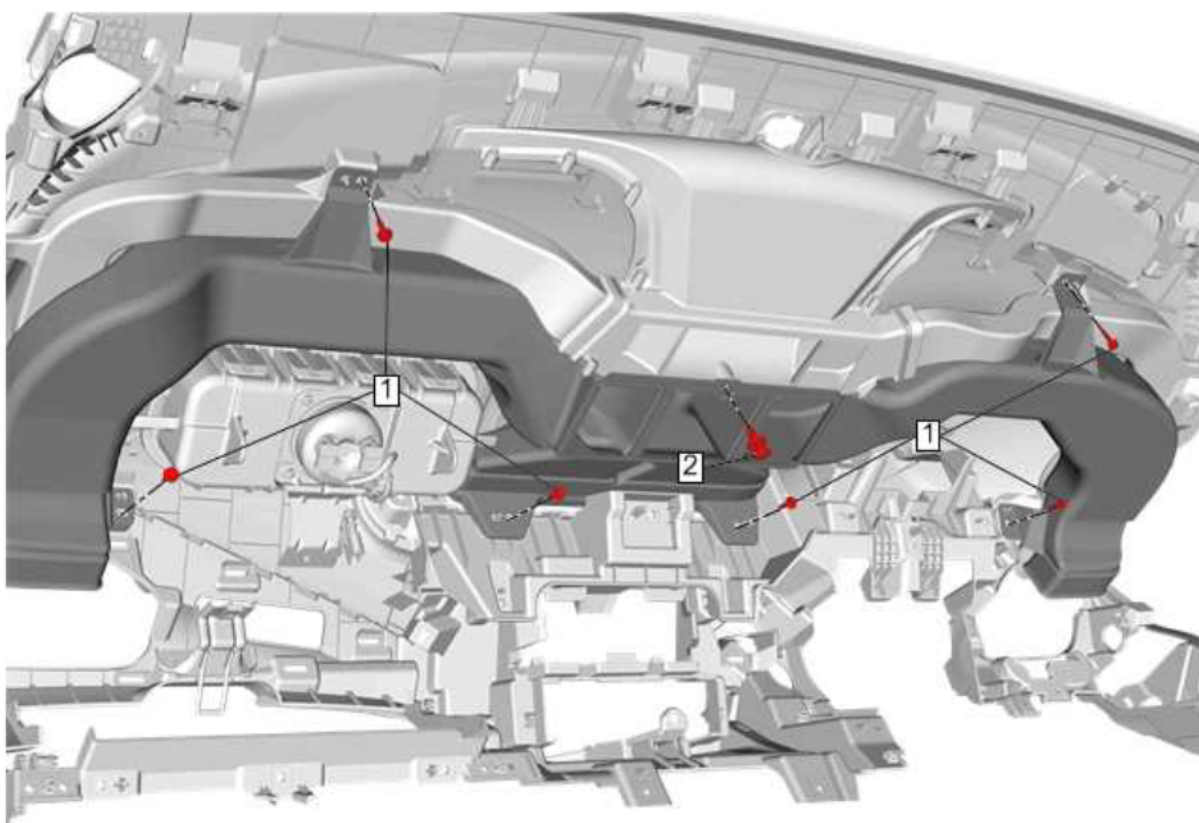


Fig. 168: Instrument Panel Outlet Air Outlet Duct Bolt And Push Pin
Courtesy of GENERAL MOTORS COMPANY

3. Remove Instrument Panel Outlet Air Outlet Duct Bolt (1)
4. Remove Instrument Panel Outlet Air Outlet Duct Push Pin (2)

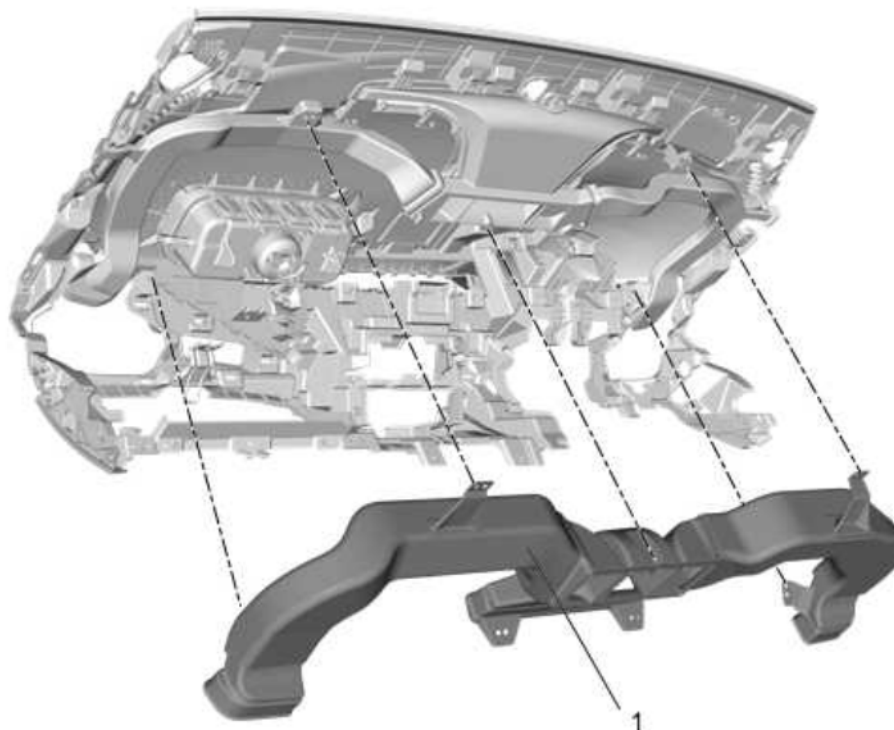


Fig. 169: Instrument Panel Outer Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Instrument Panel Outer Air Outlet Duct (1)

Installation Procedure

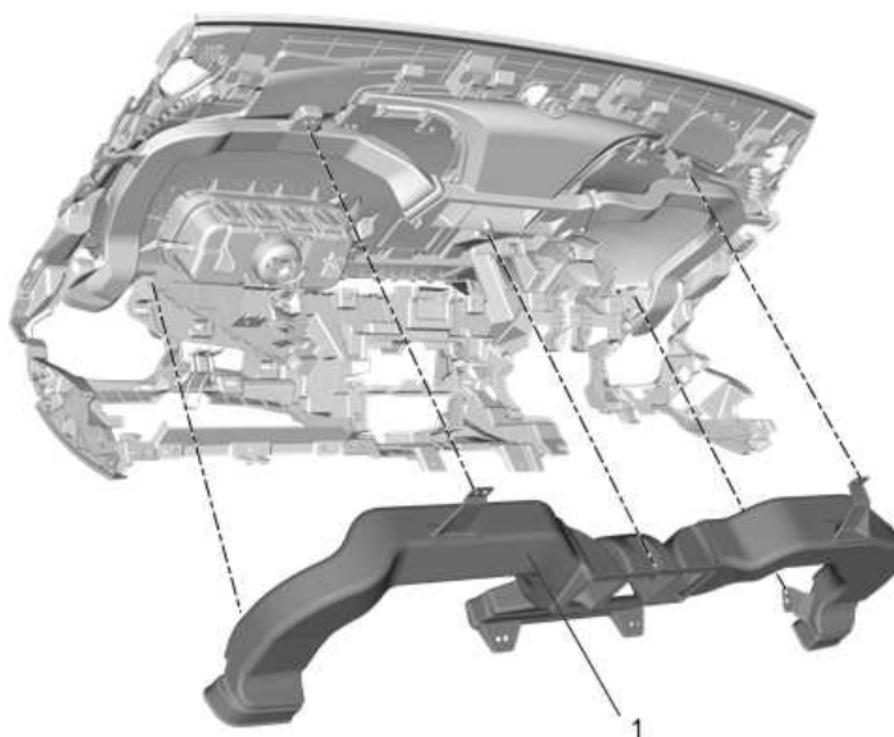


Fig. 170: Instrument Panel Outer Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

1. Install nstrument Panel Outer Air Outlet Duct (1)

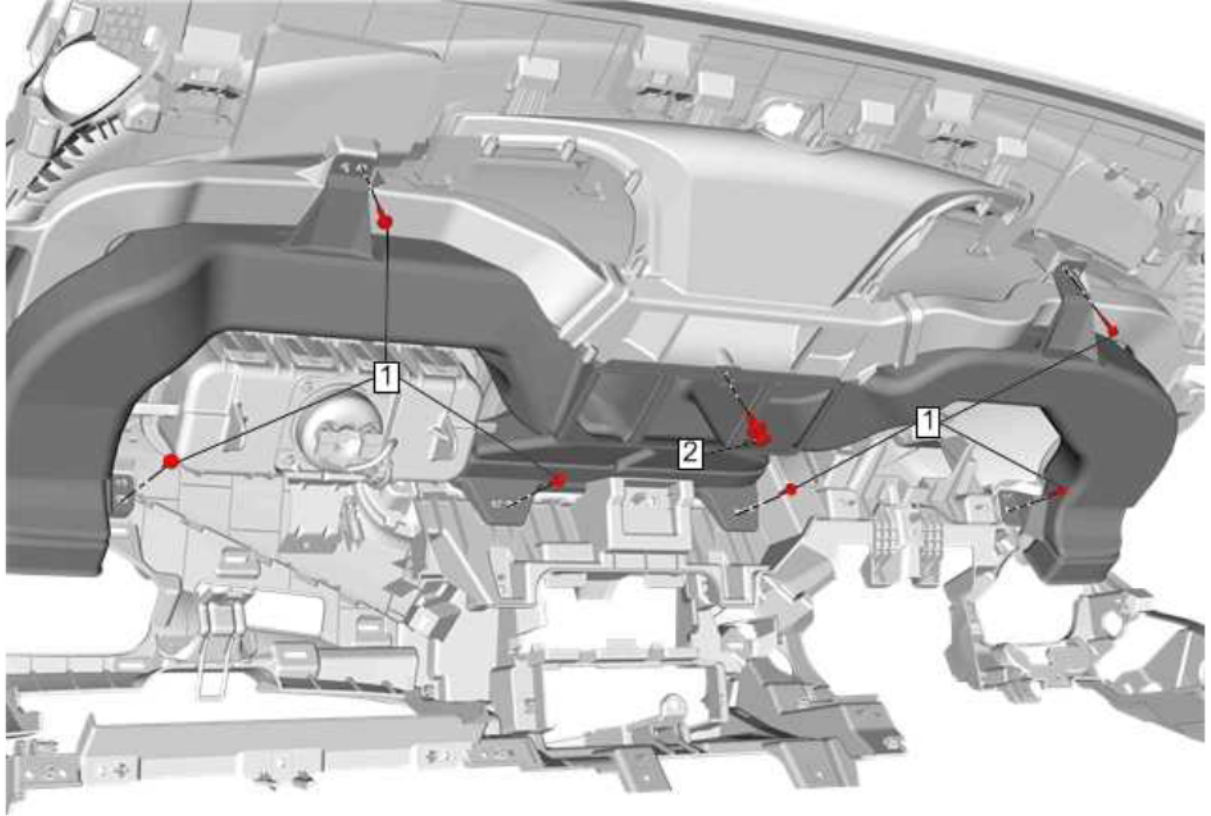


Fig. 171: Instrument Panel Outlet Air Outlet Duct Bolt And Push Pin

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

2. Install Instrument Panel Outlet Air Outlet Duct Push Pin (2)
3. Install Instrument Panel Outlet Air Outlet Duct Bolt (1) and tighten 2.5 N.m (22 lb in)
4. Install Instrument Panel Assembly Instrument Panel Assembly Replacement
5. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection

WINDSHIELD DEFROSTER OUTLET DUCT REPLACEMENT

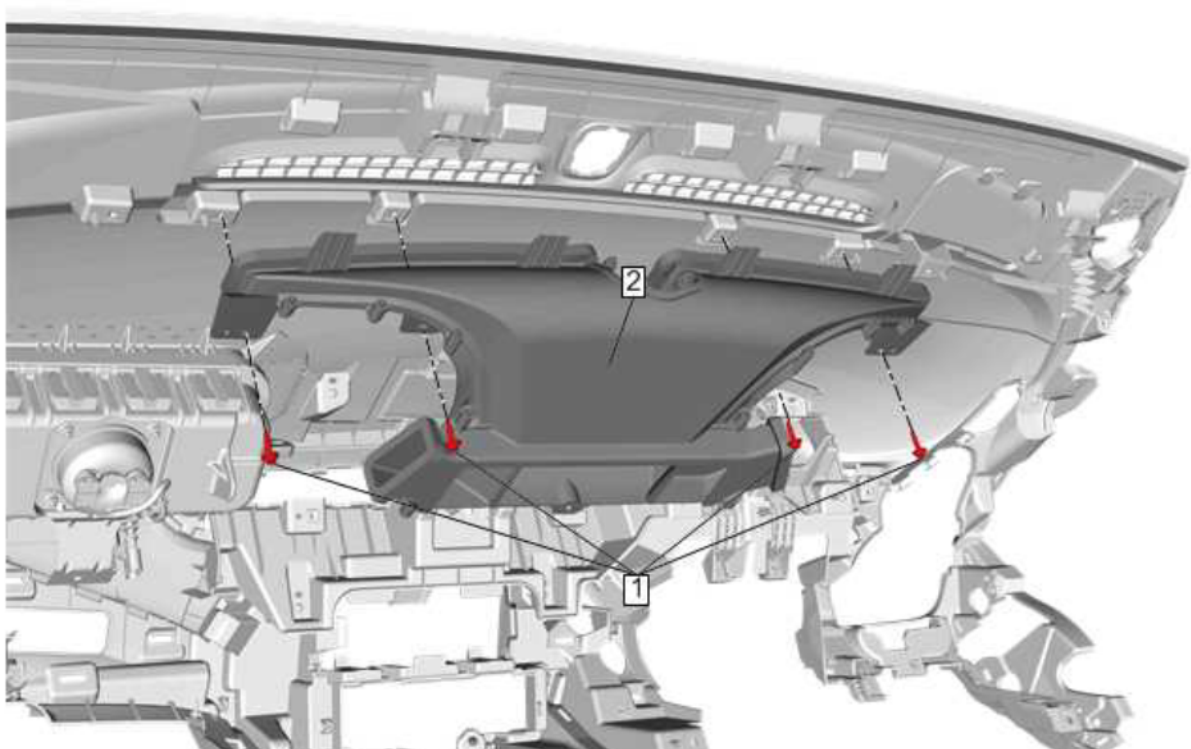


Fig. 172: Windshield Defroster Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Side Window Defogger Outlet Duct Replacement - Left Side 2. Side Window Defogger Outlet Duct Replacement - Right Side	
1	Side Window Defogger Outlet Duct Bolt (Qty: 4) CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Windshield Defroster Outlet Duct

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

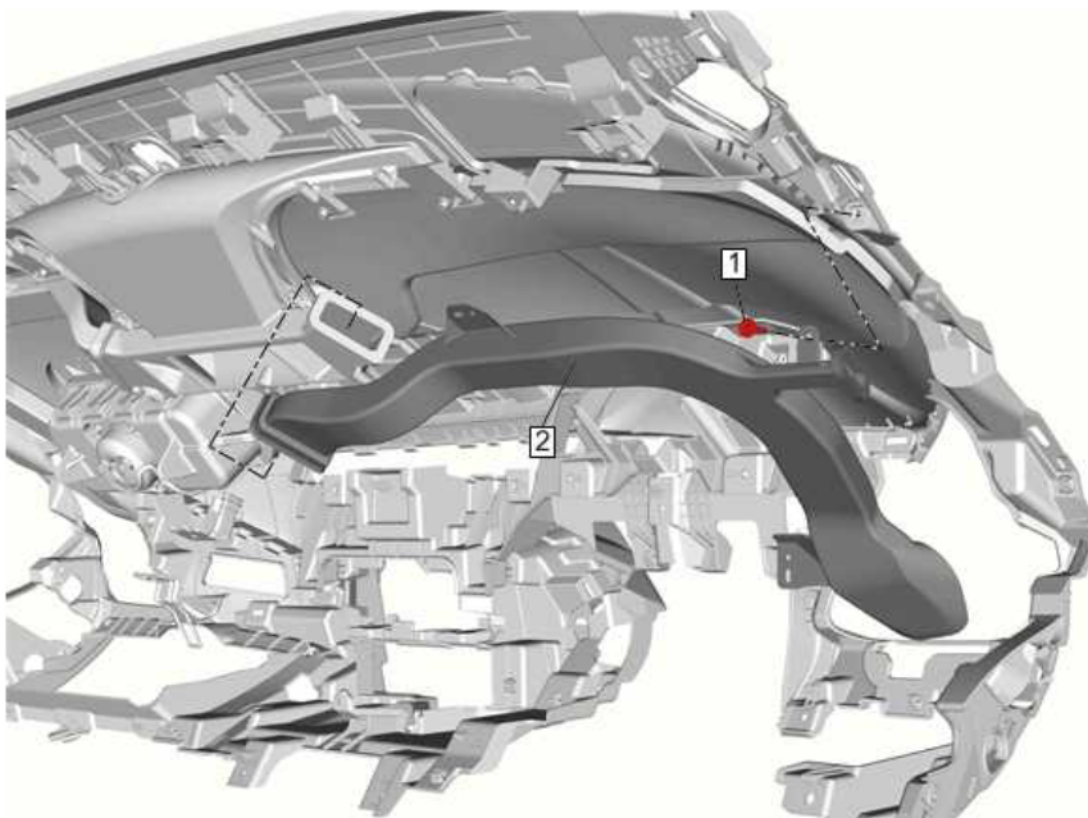


Fig. 173: NO CONTENT

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Instrument Panel Outer Air Outlet Duct Replacement	
1	Side Window Defogger Outlet Duct Bolt CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Side Window Defogger Outlet Duct - Left Side

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

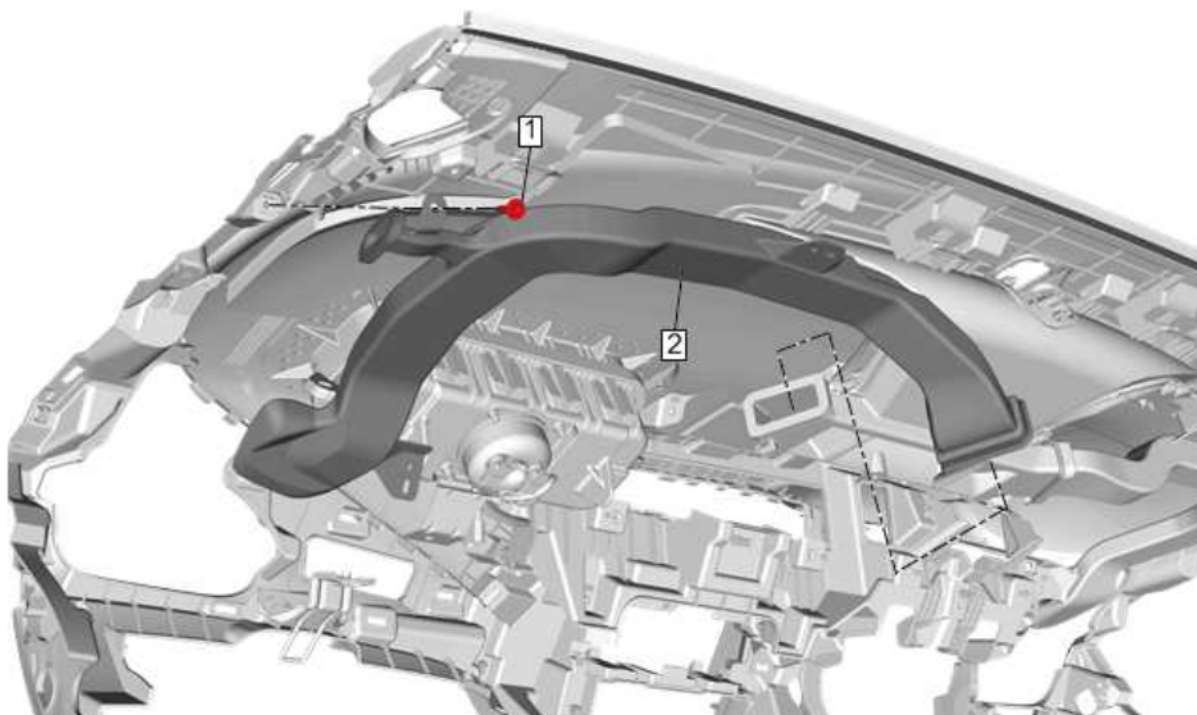


Fig. 174: Side Window Defogger Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Outer Air Outlet Duct Replacement</u>	
1	Side Window Defogger Outlet Duct Bolt CAUTION: <u>Fastener Caution</u> Tighten 2.5 N.m (22 lb in)
2	Side Window Defogger Outlet Duct - Right Side

FLOOR REAR AIR OUTLET DUCT REPLACEMENT

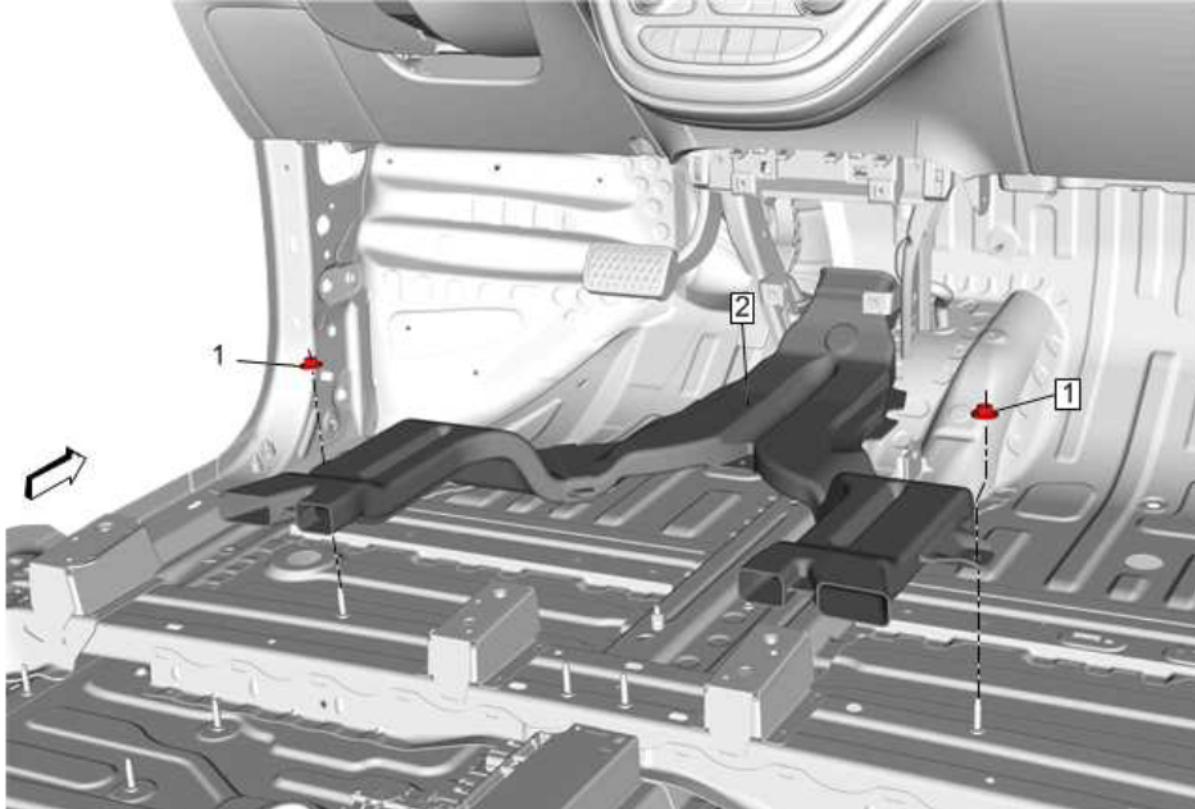


Fig. 175: Floor Rear Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Floor Panel Carpet Replacement</u>	
1	Floor Rear Air Outlet Duct Nut (Qty: 2) CAUTION: <u>Fastener Caution</u> Tighten 3 N.m (27 lb in)
2	Floor Rear Air Outlet Duct

HEATER CORE REPLACEMENT

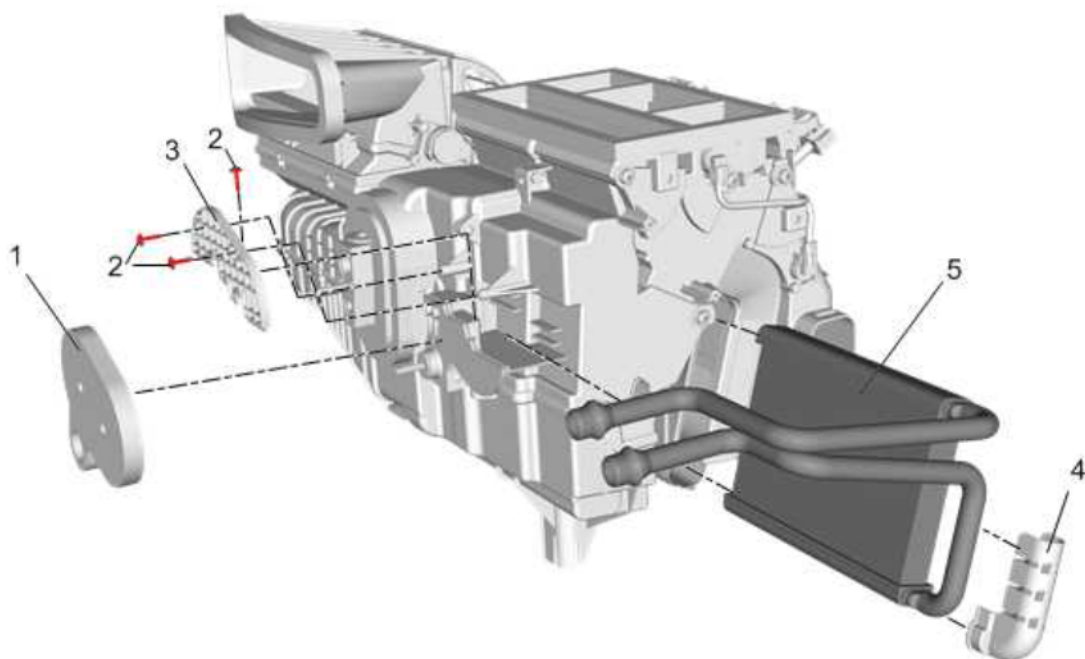


Fig. 176: Heater Core

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the heater coolant heater system. Heater Coolant Heater Draining and Filling. 2. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation	
1	Heater and Air Conditioning Evaporator Tube Seal
2	Heater Core Tube Bracket Screw (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
3	Heater Core Tube Bracket
4	Heater Core Tube Cover
5	Heater Core

HEATER COOLANT HEATER REPLACEMENT

Special Tools

BO-38185 Hose Clamp Pliers

Equivalent regional tools:[Special Tools](#)

Removal Procedure

WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

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The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Disable the high voltage system. [High Voltage Disabling](#)
2. Drain the cooling system. [Heater Coolant Heater Draining and Filling](#)

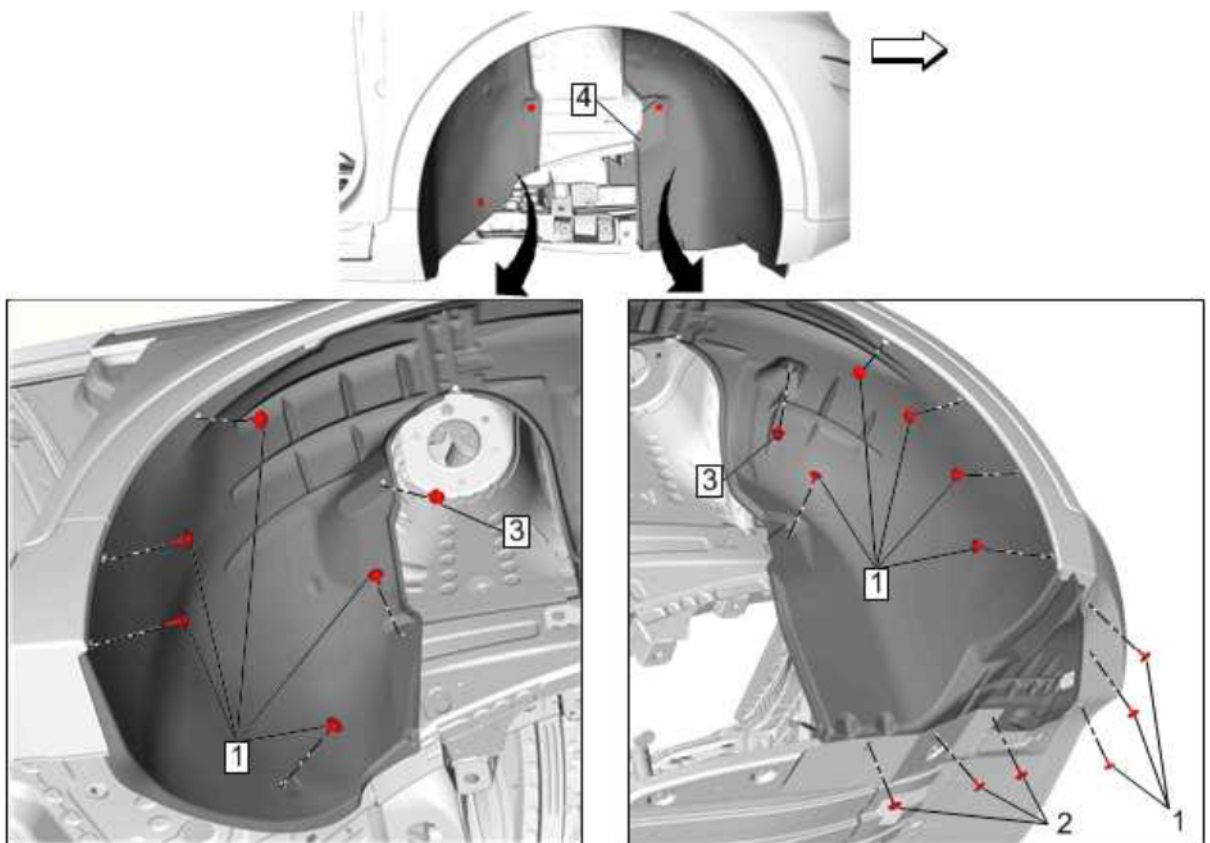


Fig. 177: Front Wheelhouse Liner
Courtesy of GENERAL MOTORS COMPANY

3. Remove Front Wheelhouse Liner(4)-Right Side [Front Wheelhouse Liner Replacement](#)



Fig. 178: Air Conditioning Evaporator Hose
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Air Conditioning Evaporator Hose(1) **Air Conditioning Evaporator Hose Assembly Replacement**

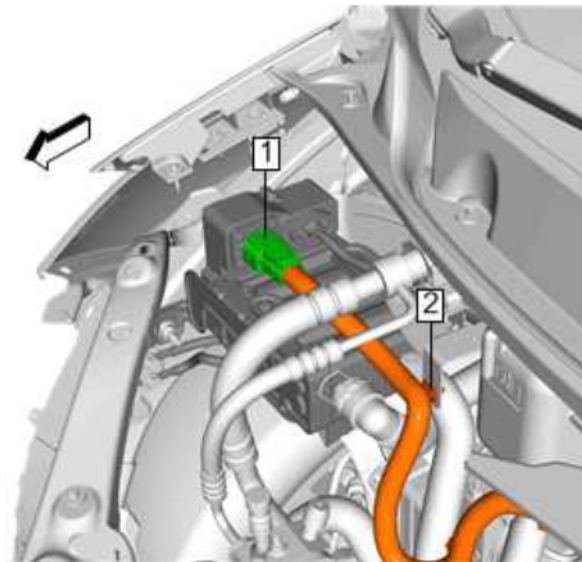


Fig. 179: High Voltage Cable Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the high voltage cable connector (1) from the heater coolant heater.
6. Unclip the cable retainer (2).

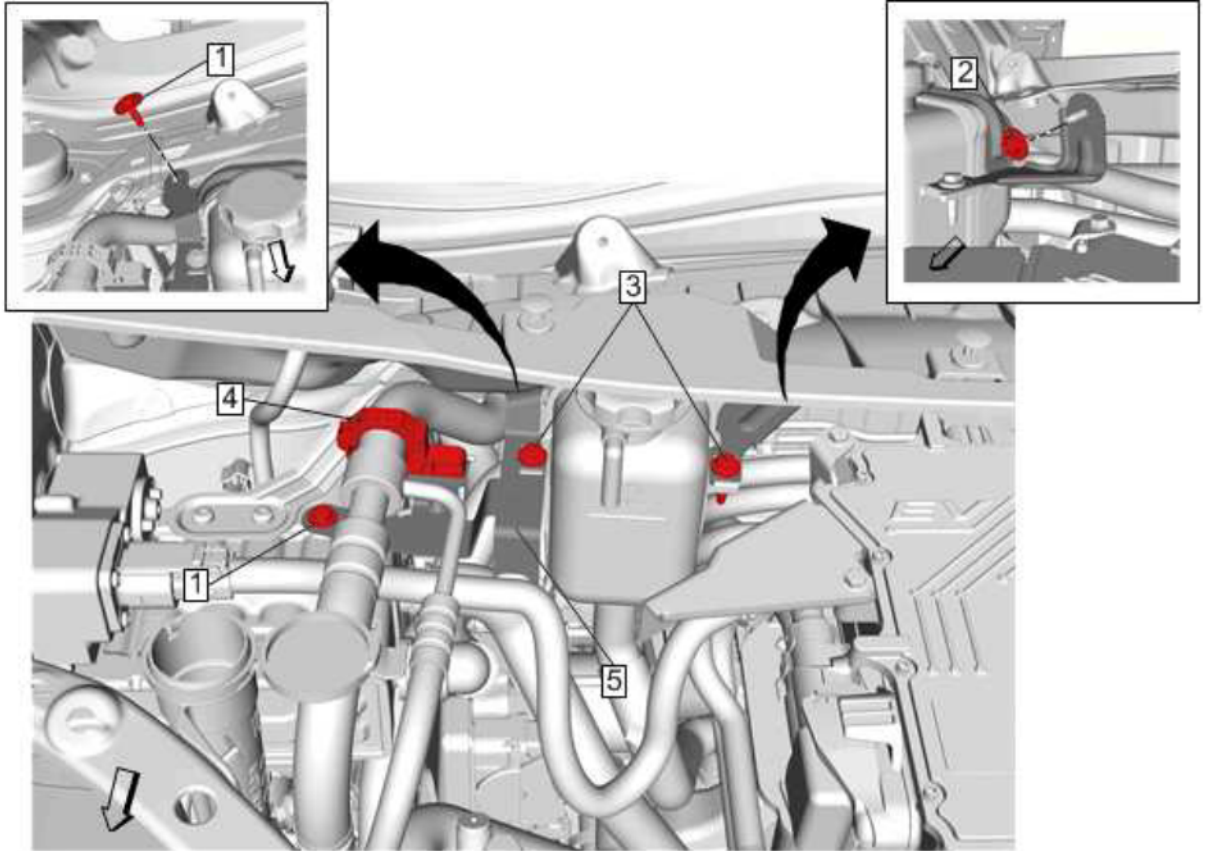


Fig. 180: Radiator Surge Tank Support Bracket (Heater)
 Courtesy of GENERAL MOTORS COMPANY

7. Remove Radiator Surge Tank Support Bracket (1) - Heater **Radiator Surge Tank Support Bracket Replacement (Heater)**

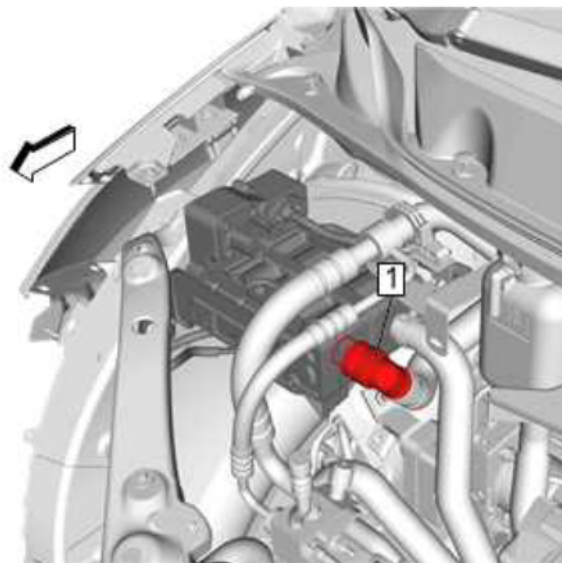


Fig. 181: Heater Outlet Hose Quick Connector
 Courtesy of GENERAL MOTORS COMPANY

8. Disconnect Heater Outlet Hose Quick Connect (1) **Heater Outlet Hose Replacement**

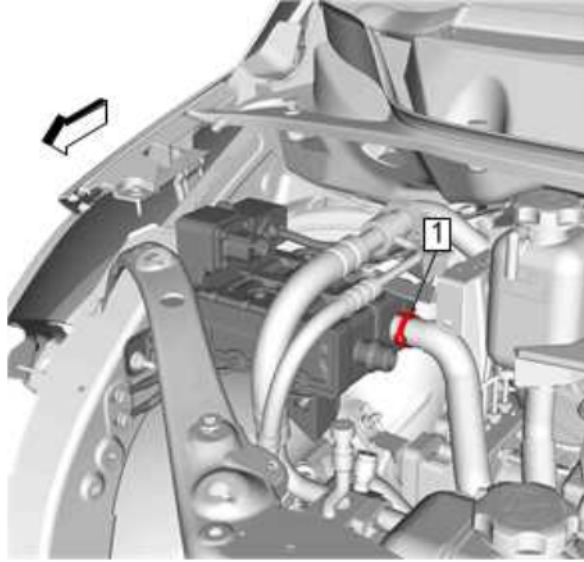


Fig. 182: Auxiliary Heater Inlet Hose Clamp
 Courtesy of GENERAL MOTORS COMPANY

9. Reposition the auxiliary heater inlet hose clamp (1) using **BO-38185** Hose Clamp Pliers. [Hose Clamp Replacement Guidelines - Spring Type](#)
10. Remove Auxiliary Heater Outlet Hose@Heater Coolant Hear [Auxiliary Heater Outlet Hose Replacement](#)

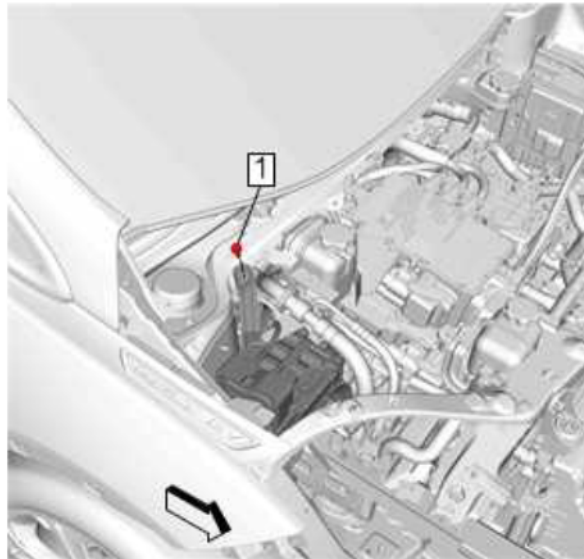


Fig. 183: Heater Coolant Heater Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

11. Remove the heater coolant heater bracket bolt (1).

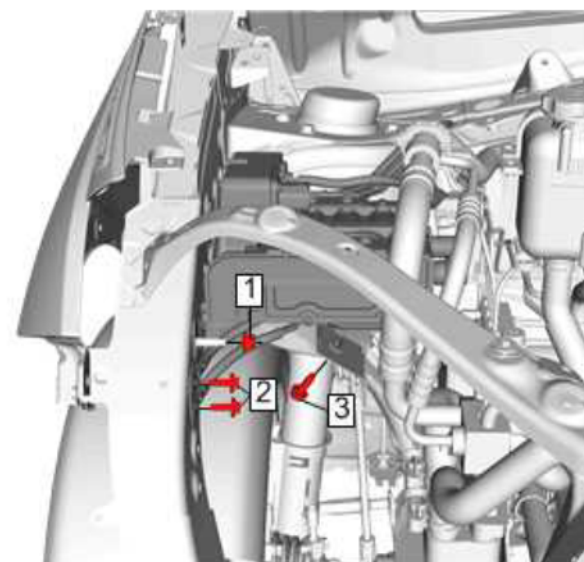


Fig. 184: Heater Coolant Heater Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

12. Remove the heater coolant heater bracket nut (1).
13. Remove the heater coolant heater wiring harness bolt (2) with the wiring harness.
14. Remove the heater coolant heater bracket bolt (3).

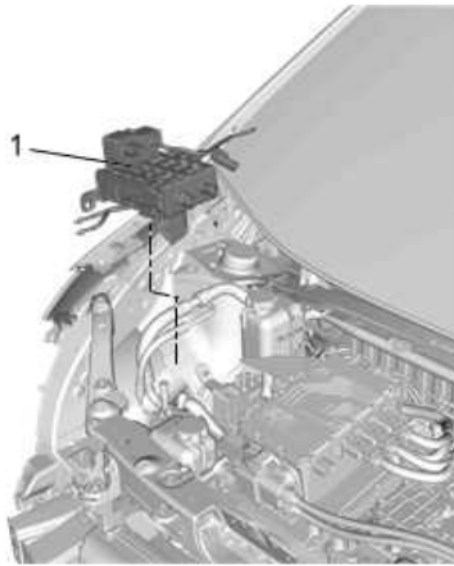


Fig. 185: Heater Coolant Heater
Courtesy of GENERAL MOTORS COMPANY

15. Disconnect the electrical connectors from the heater coolant heater.
16. Remove the heater coolant heater (1).

Installation Procedure

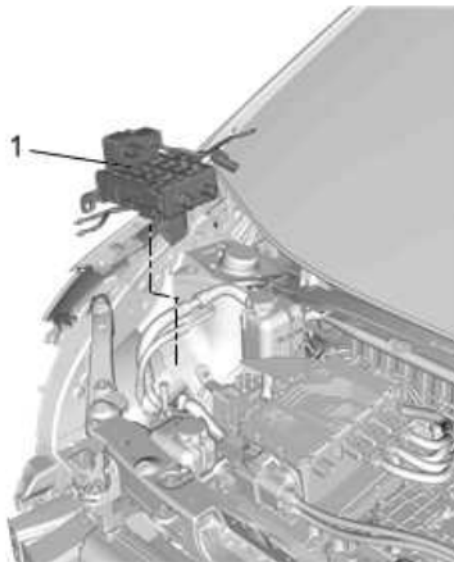


Fig. 186: Heater Coolant Heater
Courtesy of GENERAL MOTORS COMPANY

1. Position the heater coolant heater (1) to the vehicle.
2. Connect the electrical connectors from the heater coolant heater.

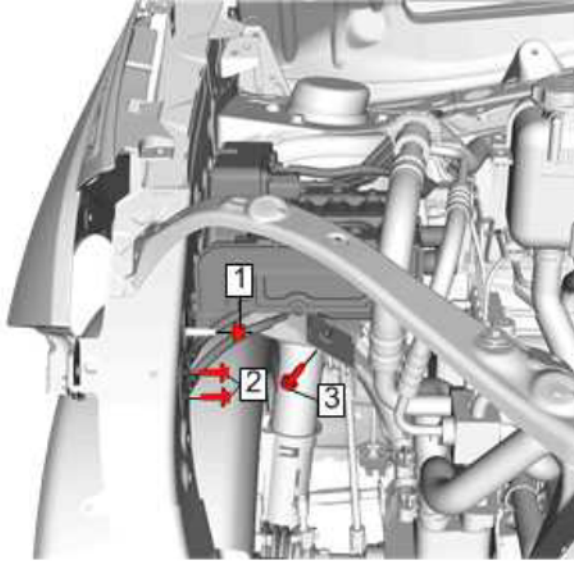


Fig. 187: Heater Coolant Heater Bracket Nut
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install the heater coolant heater bracket bolt (3) and tighten to 9 N.m (80 lb in).
4. Install the heater coolant heater wiring harness bolt (2) with the wiring harness and tighten to 9 N.m (80 lb in).
5. Install the heater coolant heater bracket nut (1) and tighten to 9 N.m (80 lb in).

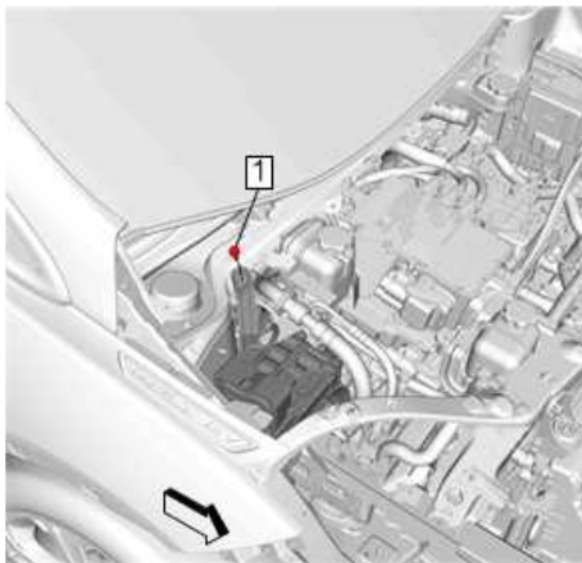


Fig. 188: Heater Coolant Heater Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

6. Install the heater coolant heater bracket bolt (1) and tighten to 9 N.m (80 lb in).

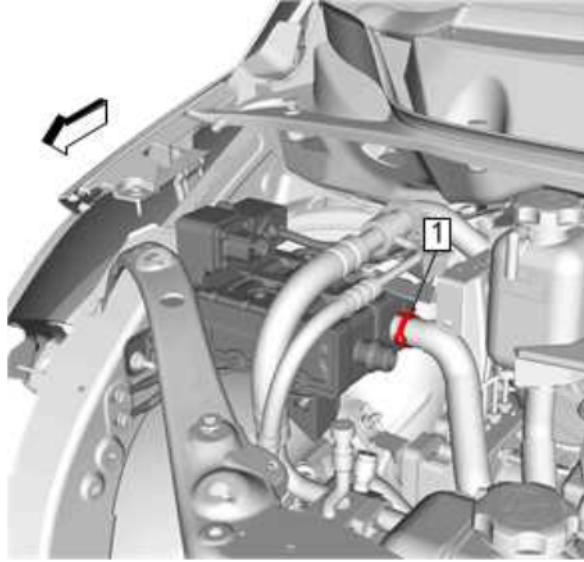


Fig. 189: Auxiliary Heater Inlet Hose Clamp

Courtesy of GENERAL MOTORS COMPANY

7. Install Auxiliary Heater Outlet Hose@Heater Coolant Heater [Auxiliary Heater Outlet Hose Replacement](#)
8. Position the auxiliary heater inlet hose clamp (1) using **BO-38185** Hose Clamp Pliers. [Hose Clamp Replacement Guidelines - Spring Type](#)

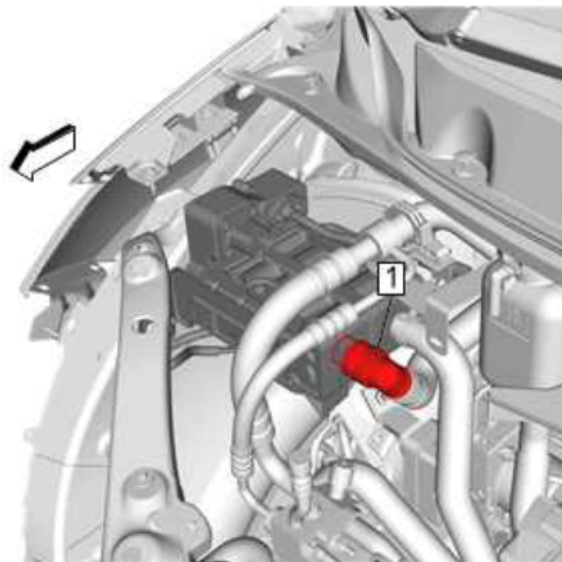


Fig. 190: Heater Outlet Hose Quick Connector

Courtesy of GENERAL MOTORS COMPANY

9. Connect Heater Outlet Hose Quick Connect (1)[Heater Outlet Hose Replacement](#)

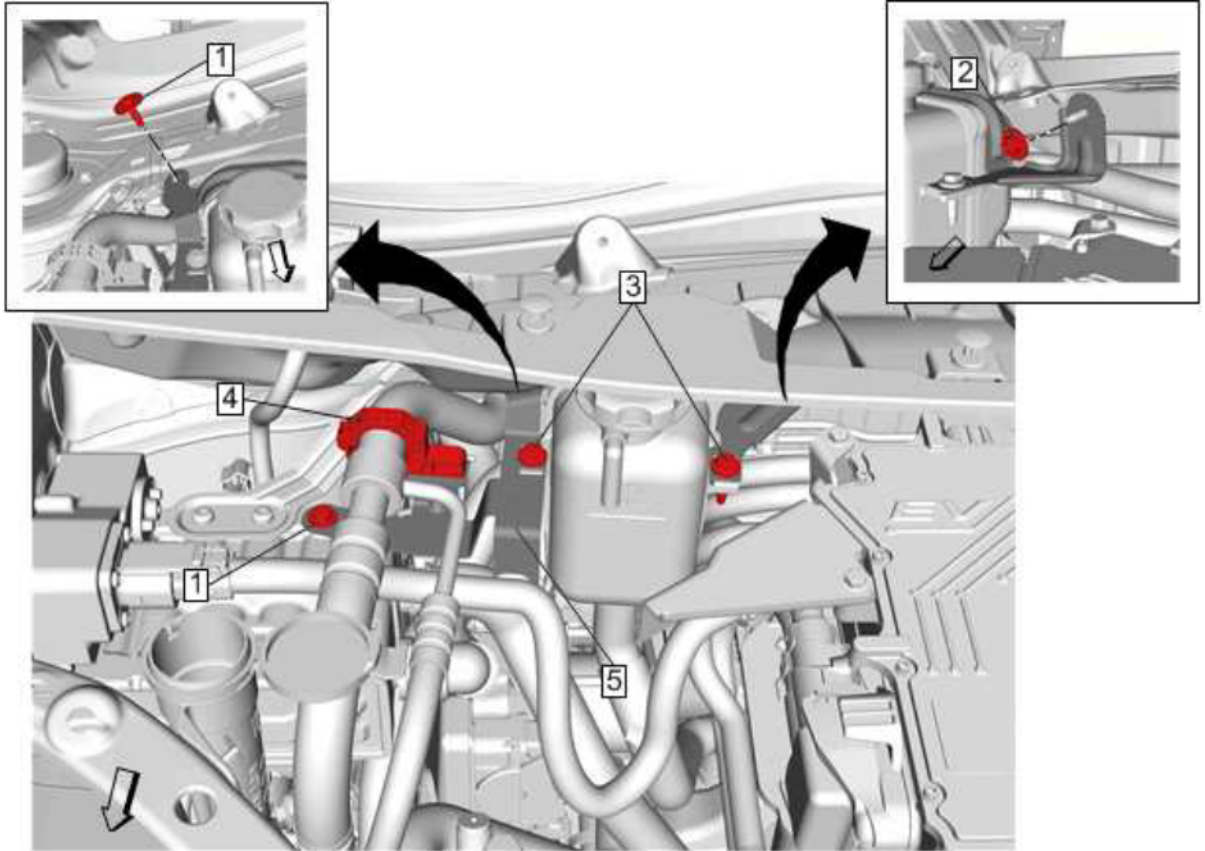


Fig. 191: Radiator Surge Tank Support Bracket (Heater)
 Courtesy of GENERAL MOTORS COMPANY

10. Install Radiator Surge Tank Support Bracket (1) - Heater **Radiator Surge Tank Support Bracket Replacement (Heater)**

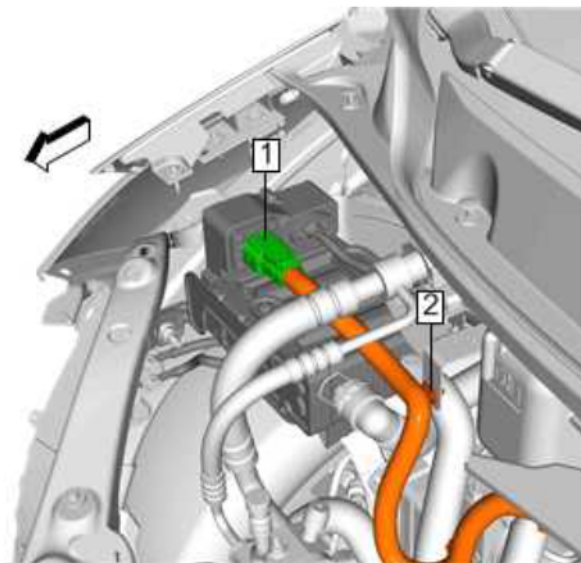


Fig. 192: High Voltage Cable Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

11. Clip the cable retainer (2).
12. Connect the high voltage cable connector (1) to the heater coolant heater.



Fig. 193: Air Conditioning Evaporator Hose
Courtesy of GENERAL MOTORS COMPANY

13. Install Air Conditioning Evaporator Hose(1) [Air Conditioning Evaporator Hose Assembly Replacement](#)

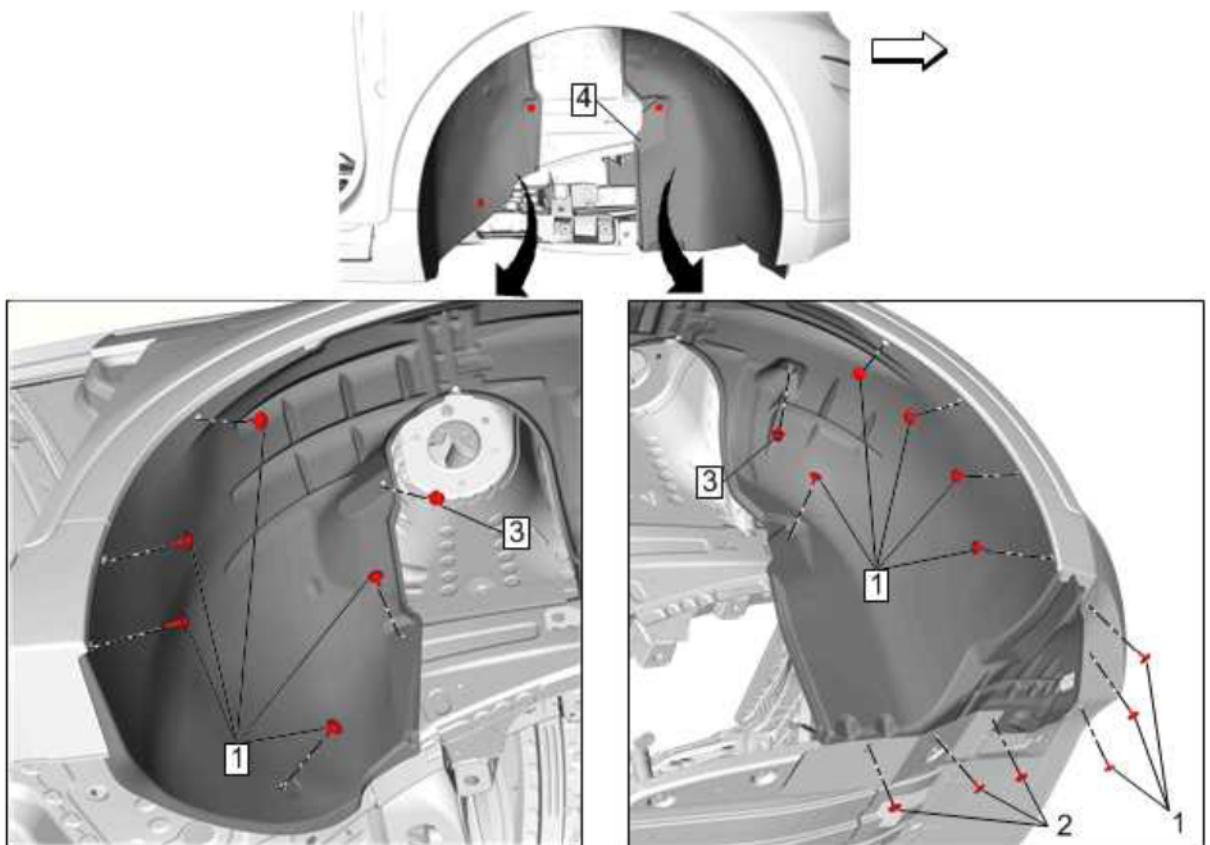


Fig. 194: Front Wheelhouse Liner
Courtesy of GENERAL MOTORS COMPANY

14. Install Front Wheelhouse Liner(4)-Right Side [Front Wheelhouse Liner Replacement](#)
15. Fill the cooling system. [Heater Coolant Heater Draining and Filling](#)
16. Enable the high voltage system. [High Voltage Enabling](#)

HEATER CASE REPLACEMENT

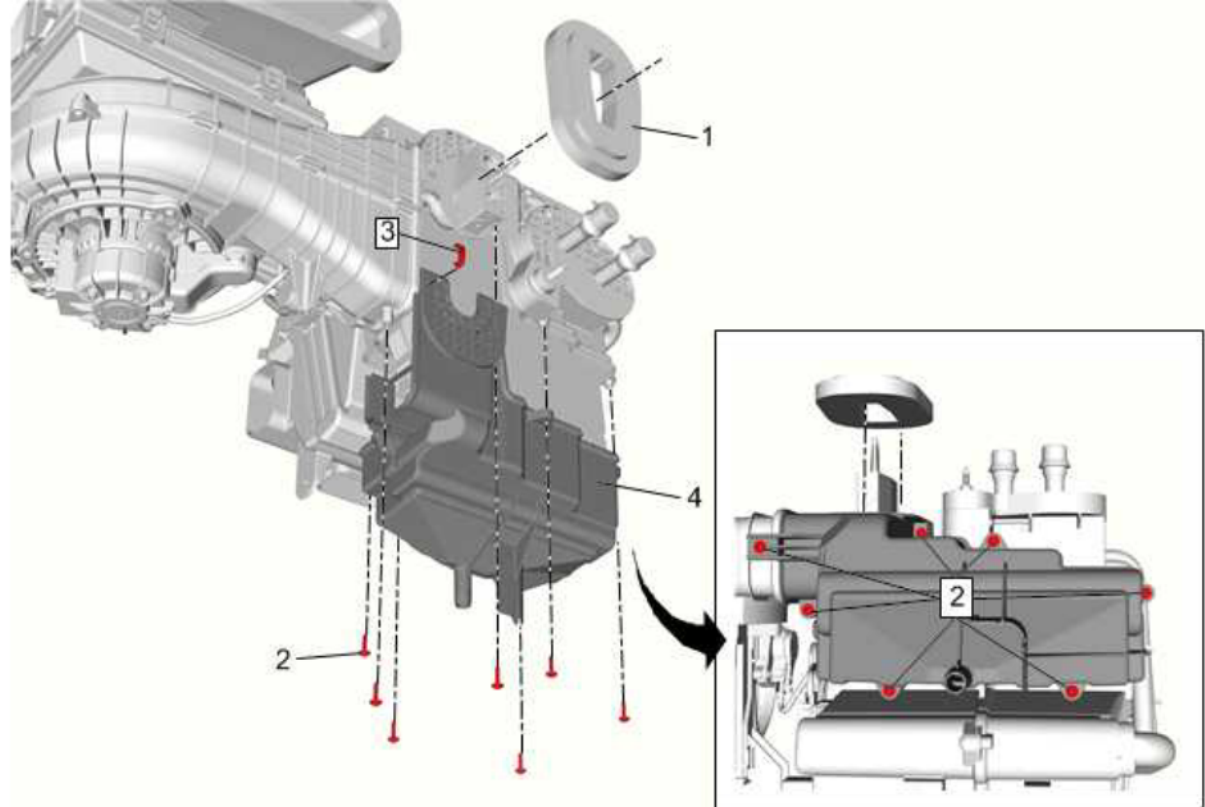


Fig. 195: Heater Case

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection 2. Remove the heater and air conditioning evaporator and blower module. Heater and Air Conditioning Evaporator and Blower Module Removal and Installation	
1	Heater and Air Conditioning Evaporator and Blower Module Seal
2	Heater Case Screw (Qty: 7) CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)
3	Heater and Air Conditioning Evaporator Case Clip
4	Heater Case Procedure Separate the heater case from the module assembly.

DESCRIPTION AND OPERATION

HEATING AND AIR CONDITIONING SYSTEM DESCRIPTION AND OPERATION

Heating

The heating system uses a high voltage heater to provide heat to the passenger compartment. The high voltage heater is used when the passenger compartment heat is requested. The high voltage heater provides different levels of heat depending on the amount of heat needed and outside temperature.

The HVAC Control Module turns on the coolant pump and monitors the temperature sensors in the passenger compartment, outside air and high voltage heater to determine the position of the coolant flow control valve and if

the high voltage heater is needed. Passenger compartment heat is provided by air flowing through the heater core. The heater core is heated by coolant from the high voltage heater.

The heating system circulates a 50/50 mixture of Dex-cool and deionized water.

Air Conditioning

The A/C system uses the refrigerant R-1234yf which is a gas at very low temperatures and can transfer heat from the passenger compartment and high voltage battery to the outside air. The A/C system is mechanically protected with the use of a high pressure relief valve on the A/C compressor. If the refrigerant pressure sensor were to fail or if the A/C system becomes restricted and the refrigerant pressure continued to rise, the high pressure relief will open and release refrigerant from the system.

The high voltage electric A/C compressor is a self contained high voltage inverter, electric motor, and direct coupled compressor. The electric A/C compressor has the ability to run and provide cooling performance while the vehicle is not running. The electronic climate control module and the Vehicle Integration Control Module (VICM) will command the electric A/C compressor to a speed necessary to maintain a desired cooling level rather than cycle the electric A/C compressor on and off.

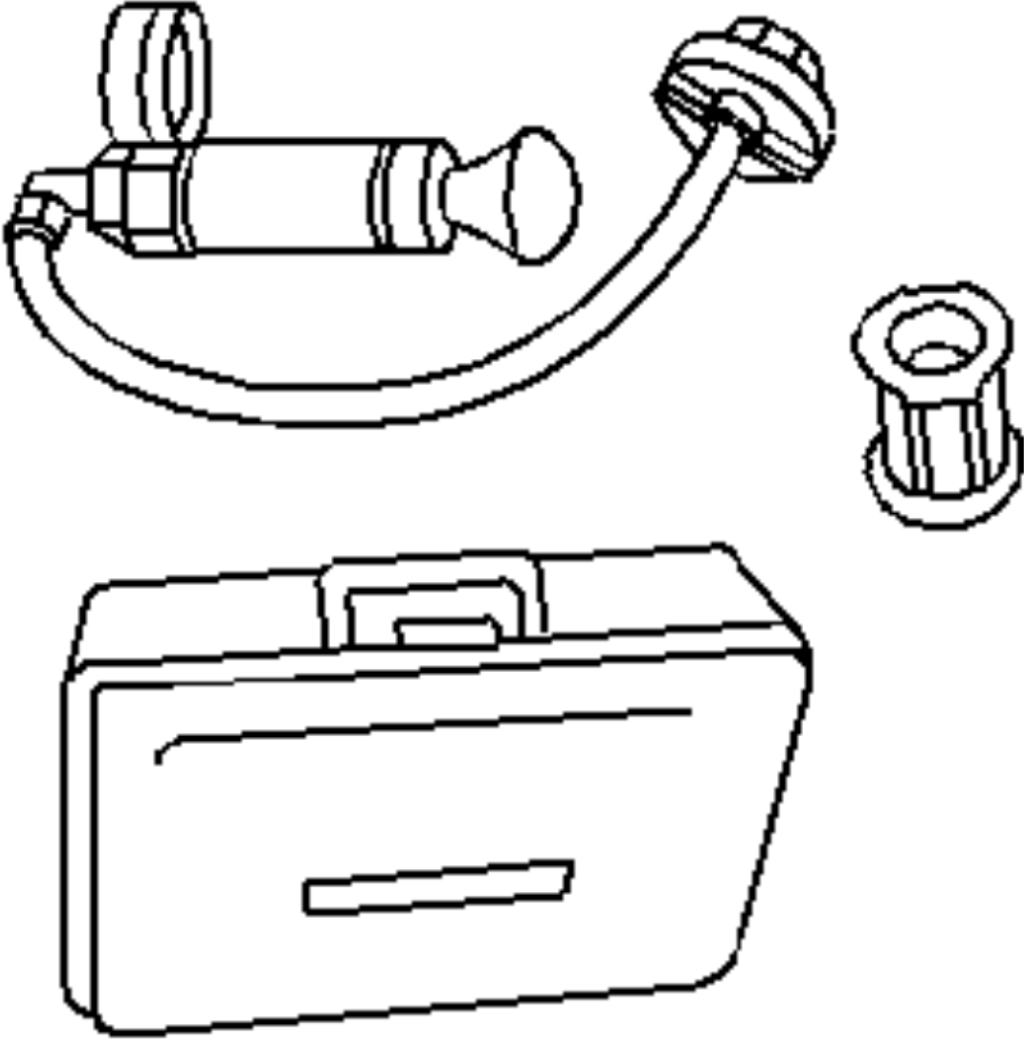
The electric A/C compressor builds pressure and adds heat to the refrigerant gas. The refrigerant gas flows from the electric A/C compressor to the condenser where heat is transferred to the outside air when the refrigerant condenses from a gas to a liquid. The liquid refrigerant then flows to a thermal expansion valve (TXV) on the battery chiller. The TXV lowers the pressure of the liquid refrigerant which makes the refrigerant expand from a liquid to a vapor. The low pressure refrigerant vapor flows into the battery chiller and begins to boil and change into a gas as the refrigerant absorbs heat from the battery coolant also flowing inside the battery chiller. The battery coolant and refrigerant are separated by several plates inside the battery chiller. The liquid refrigerant also flows to a second TXV on the evaporator. The low pressure refrigerant vapor flows from the TXV into the evaporator and begins to boil and change into a gas as the refrigerant absorbs heat from the passenger compartment air that is flowing through the outside of the evaporator. The moisture in the passenger compartment air condenses on the outside of the evaporator and flows down to the bottom of the HVAC module where it drains outside the passenger compartment through a drain hose. The low pressure refrigerant gas then flows from the battery chiller and the evaporator back to the electric A/C compressor where the cycle is repeated.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

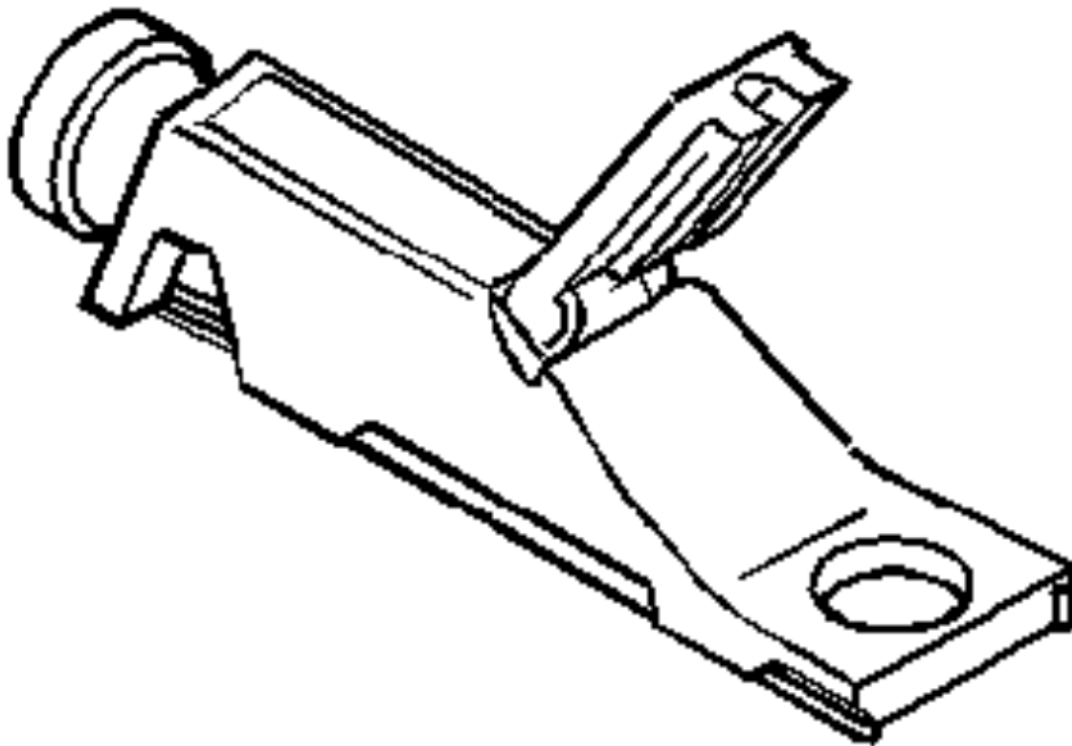
Illustration	Tool Number/ Description

Illustration	Tool Number/ Description
	BO 38185 J 38185 Hose Clamp Pliers
	EN 24460-A J 24460-A Cooling System Pressure Tester

Illustration	Tool Number/ Description
 The illustration shows a medical device consisting of a cylindrical pump unit with a handle on the right side. A tube is connected to the left side of the pump, leading to a larger, multi-ported connector. A separate, smaller connector is shown to the right of the main assembly. Below these components is a rectangular carrying case with a handle on top and a latch on the front.	

Illustration

Tool Number/
Description



GE 26568
J 26568
Coolant and
Battery Tester

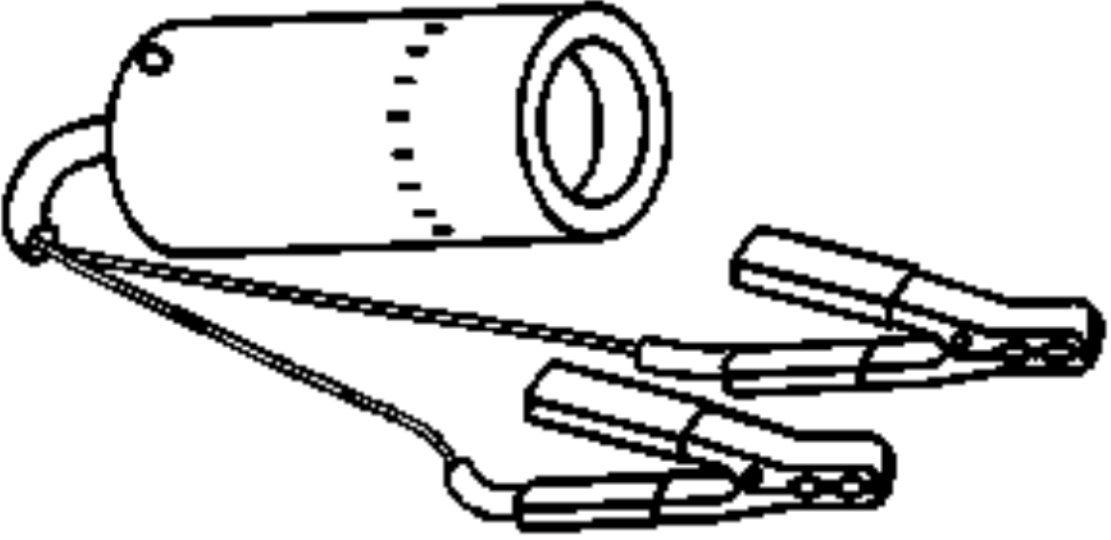
Illustration	Tool Number/ Description
	GE 42220 J 42220 Universal 12V Leak Detection Lamp

Illustration	Tool Number/ Description
	GE 43872 J 43872 Fluorescent Dye Cleaner

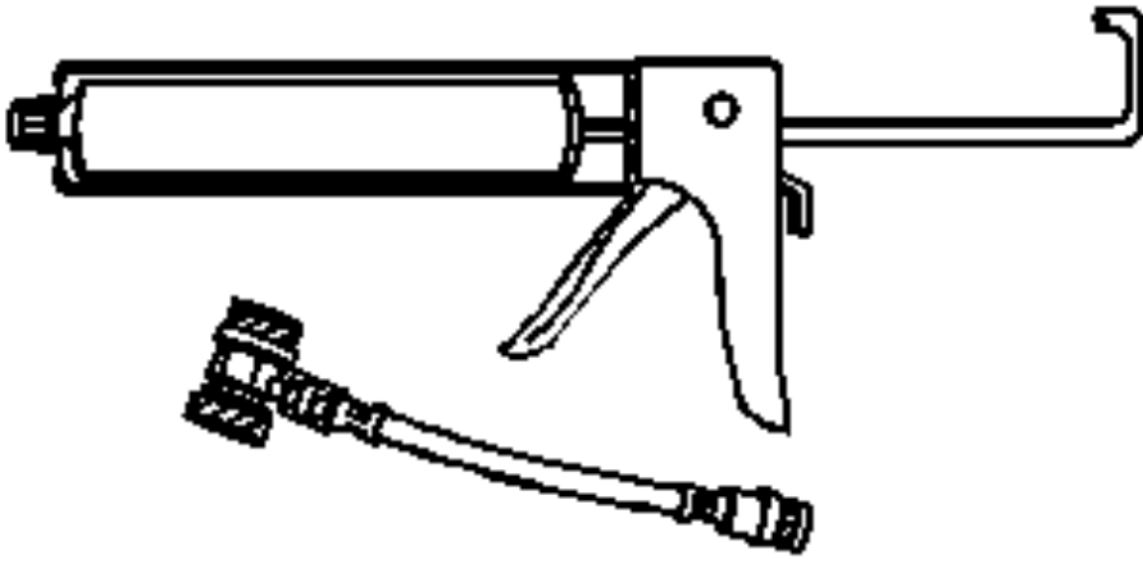
Illustration	Tool Number/ Description
	GE 45037-A J 45037-A A/C PAG/POE Oil Injector

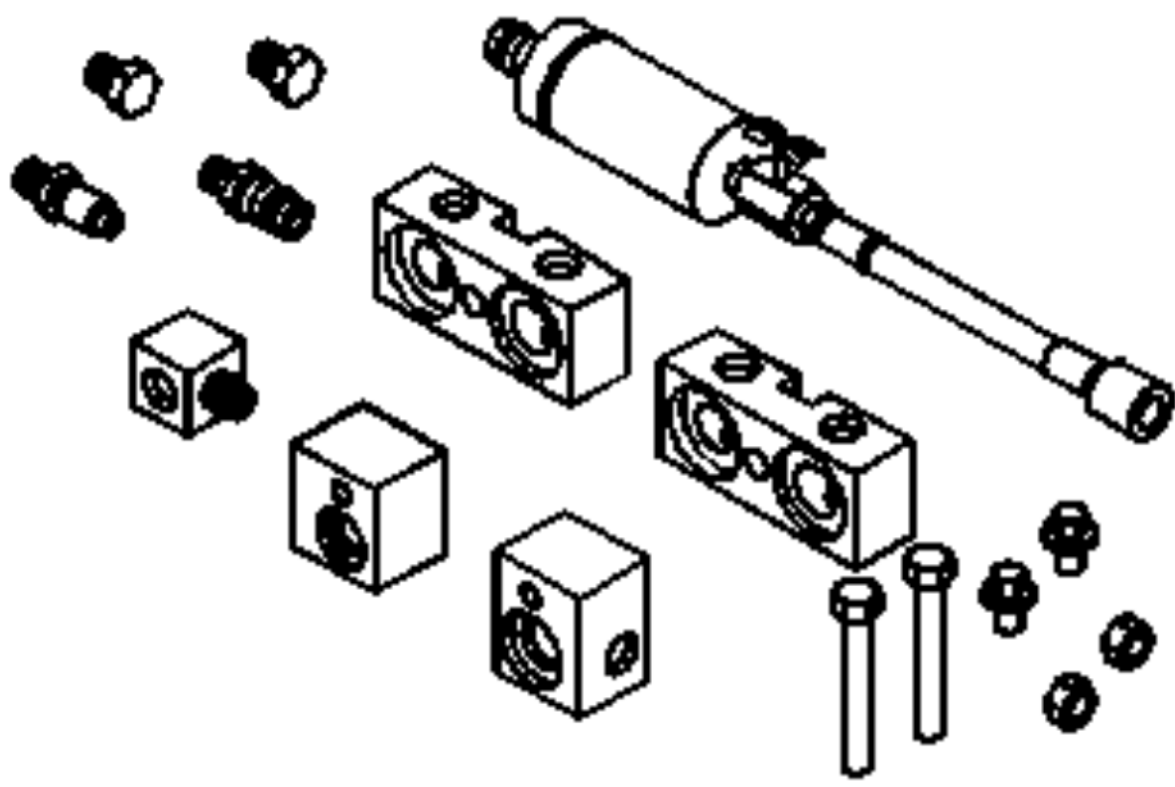
Illustration	Tool Number/ Description
	GE 45268 J 45268 Flush Adapter Kit

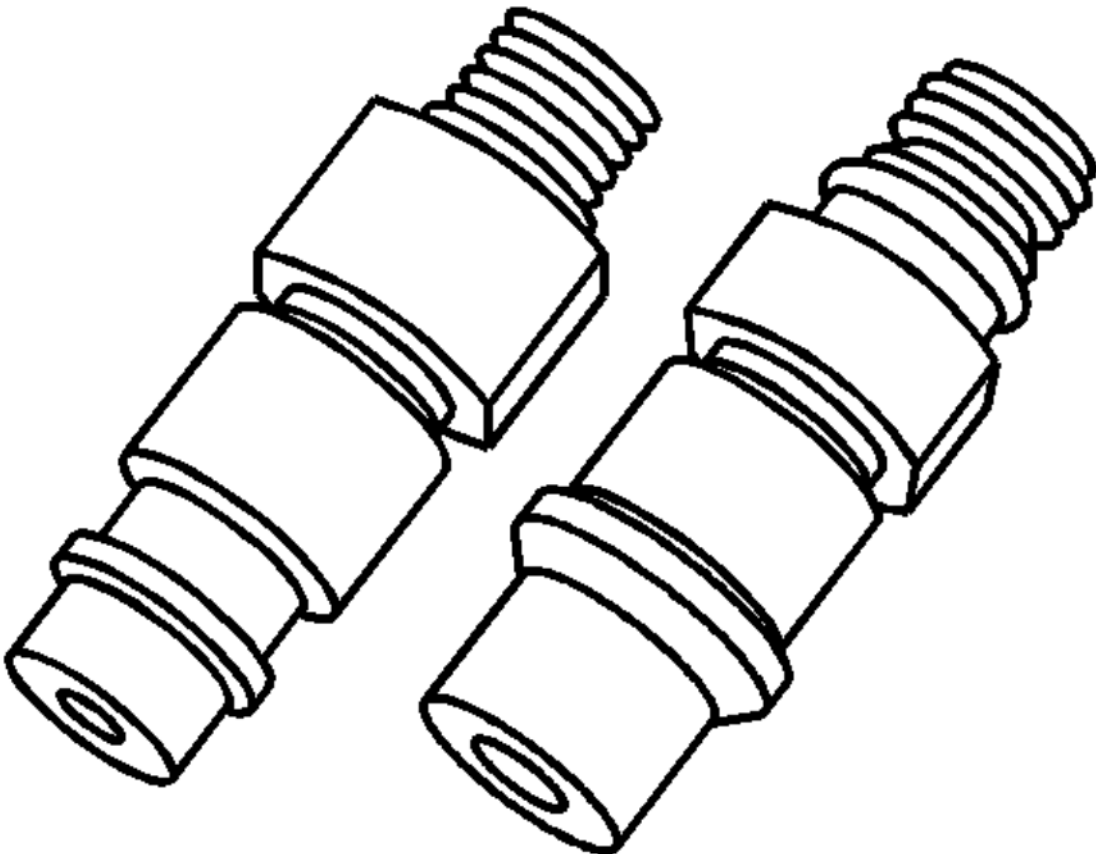
Illustration	Tool Number/ Description
	GE-45268-130 (Includes GE-45268-128 and GE-45268-129) R1234yf Flush Adapters

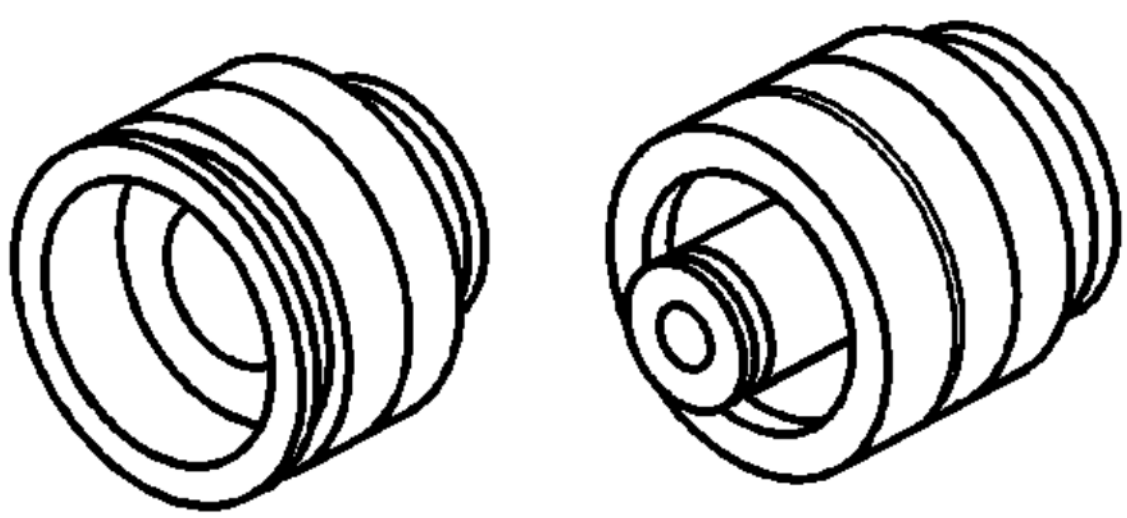
Illustration	Tool Number/ Description
	GE 46143 Cooling System Adapter

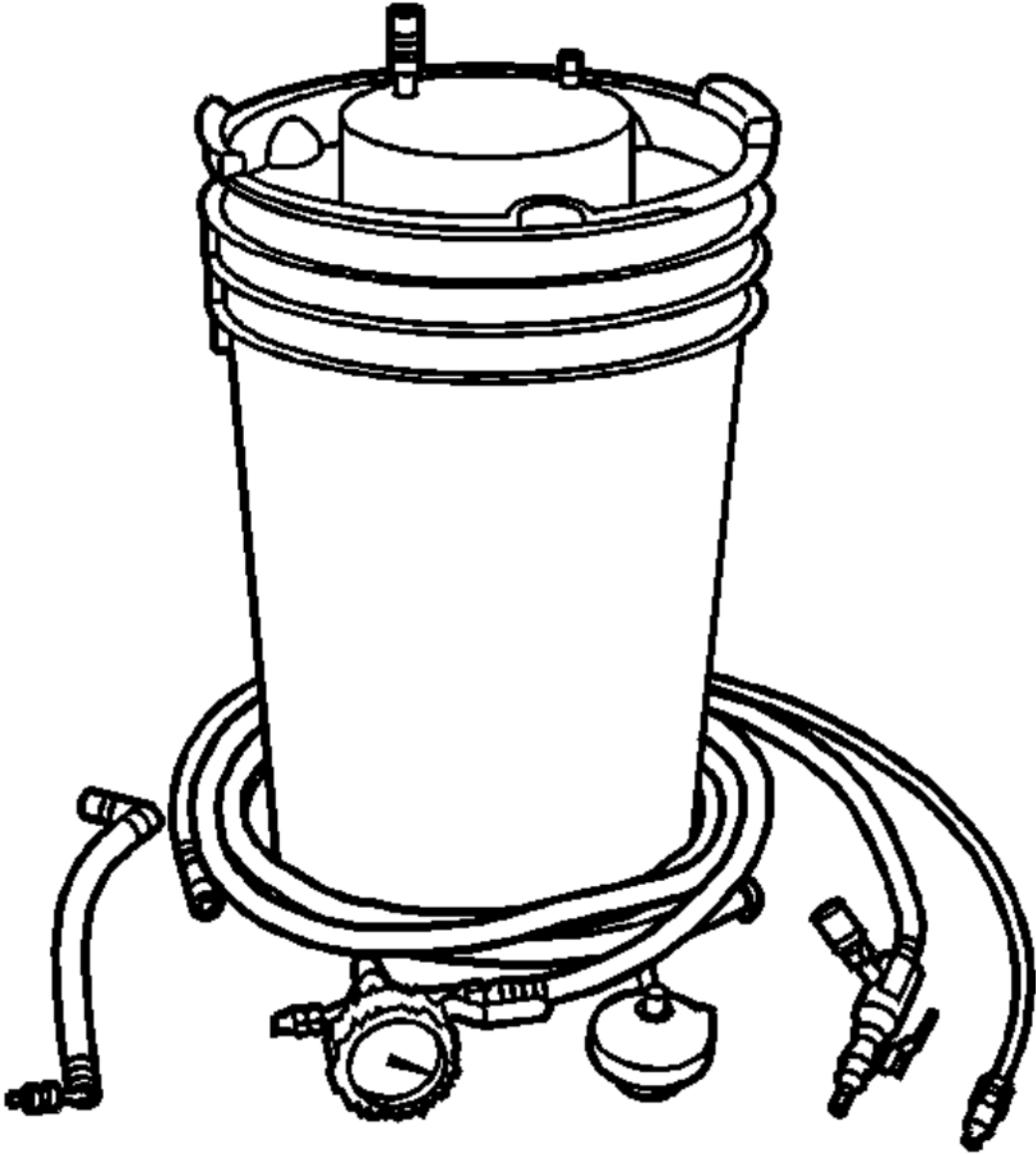
Illustration	Tool Number/ Description
	GE 47716 Vac-N-Fill Coolant Refill Tool

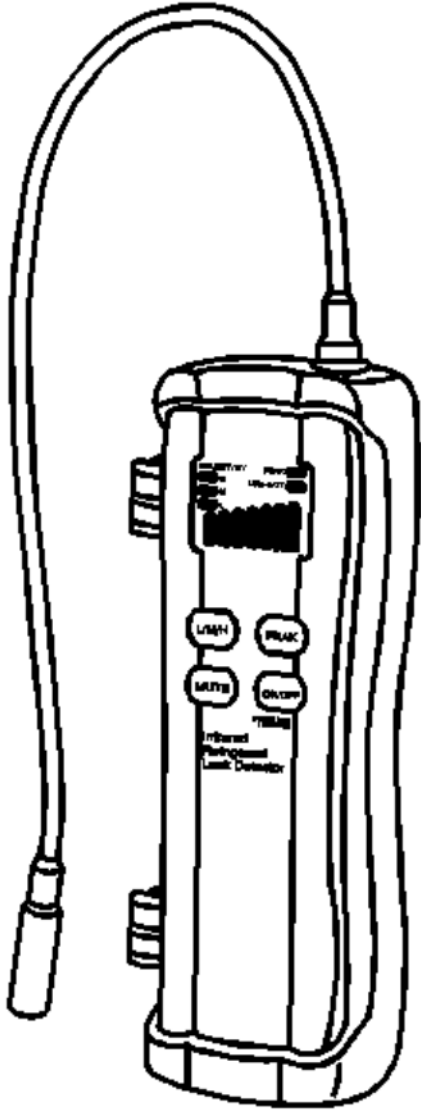
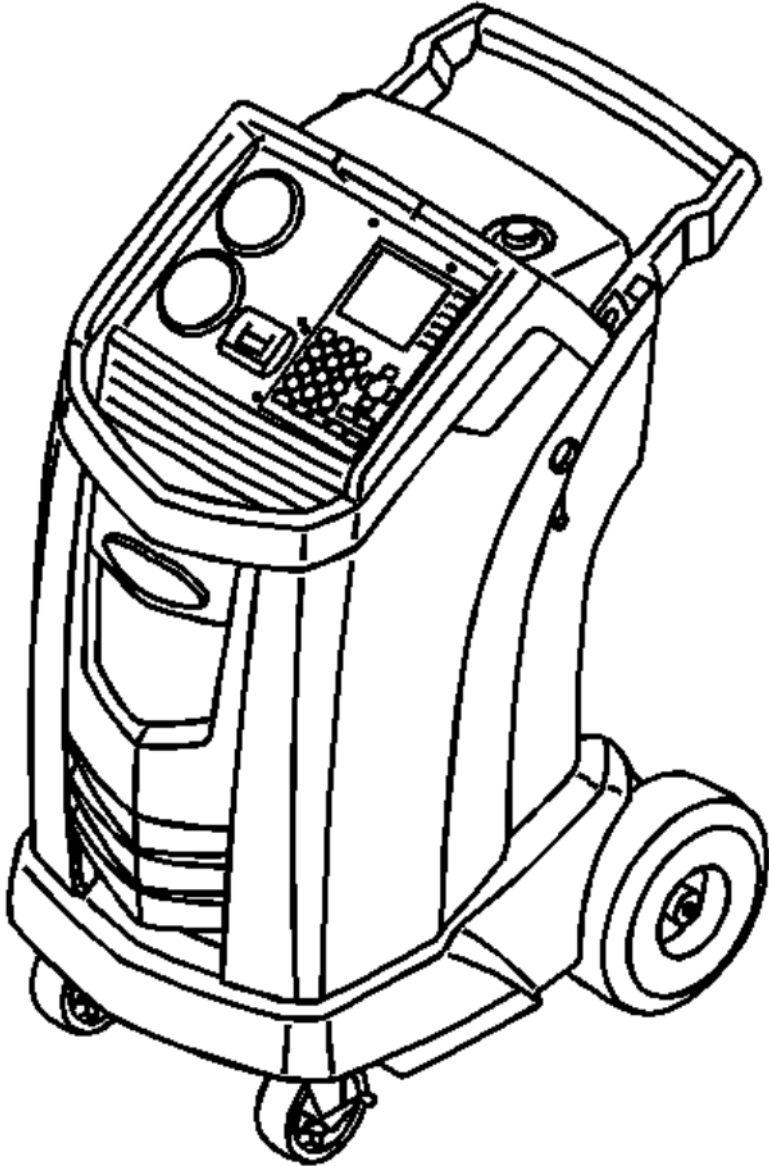
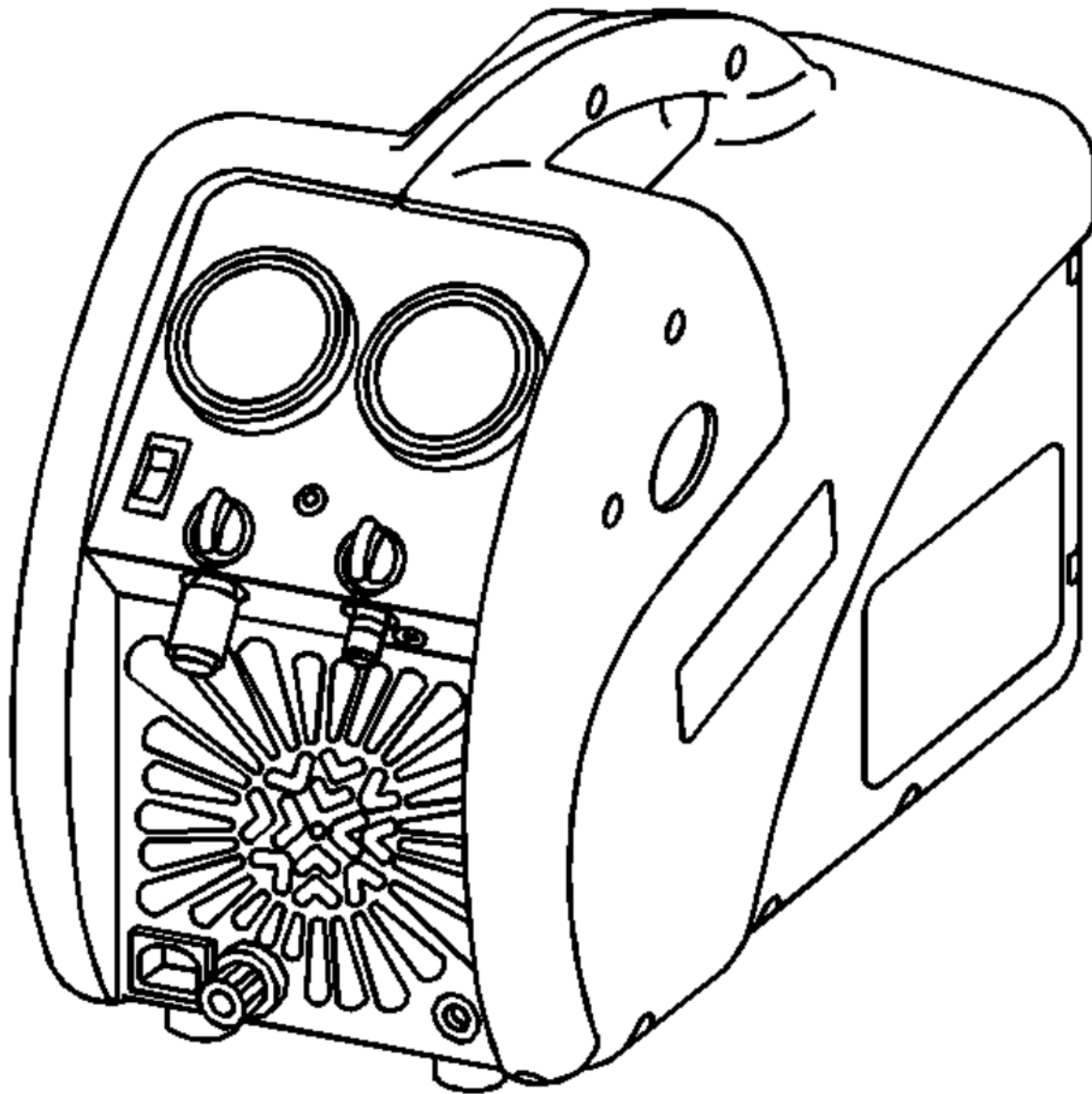
Illustration	Tool Number/ Description
	GE 50078 Electronic Leak Detector

Illustration	Tool Number/ Description
	GE 50300 R-1234yf A/C Refrigerant Recovery/Recharge Cart

Illustration

Tool Number/
Description



GE 50957
Machine R-1234yf
Contaminated
Refrigerant

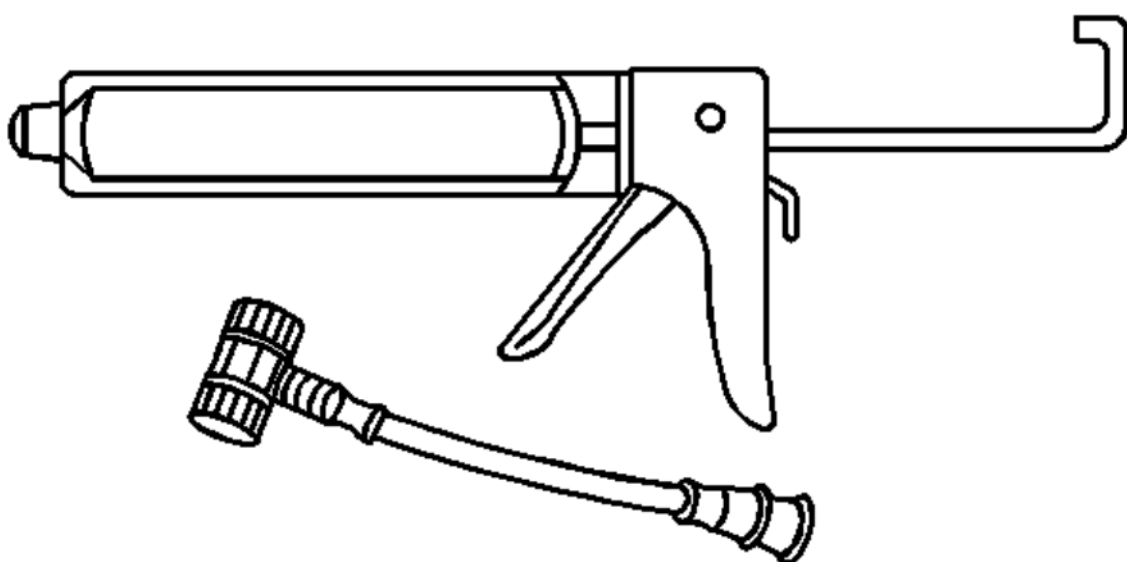
Illustration	Tool Number/ Description
	GE 50744 R-1234yf PAG Oil Injector Hose
	GE 41447 J 41447 R-134a A/C Tracer Dye - Box of 24

Illustration	Tool Number/ Description
