

2017 HVAC

Heating, Ventilation, and Air Conditioning - Impala

SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

NOTE:

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

Application
Air Conditioning System Sealing Washer

Reusable Threaded Fastener Tightening Specifications

NOTE:

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

Application	Specification
	Metric (English)
A/C Compressor Bolt @ Back of Compressor (LFX)	58 N.m (43 lb ft)
A/C Compressor Bolt @ Front of Compressor (LFX)	22 N.m (16 lb ft)
A/C Compressor Heat Shield Bolt	7.5 N.m (66 lb in)
A/C Compressor Nut (LFX)	58 N.m (43 lb ft)
A/C Compressor Stud	9 N.m (80 lb in)
Air Conditioning Compressor Bolt (LCV)	22 N.m 16 lb ft)
Air Conditioning Compressor Hose Assembly Bolt	22 N.m (16 lb ft)
Air Conditioning Compressor Hose Assembly Nut	22 N.m (16 lb ft)
Air Conditioning Compressor Nut (LCV)	22 N.m (16 lb ft)
Air Conditioning Evaporator Hose Assembly Nut	22 N.m (16 lb ft)
Air Conditioning Refrigerant Pressure Sensor	6 N.m (53 lb in)
Heater Outlet Hose Bracket Bolt	22 N.m (16 lb ft)
HVAC Module Assembly Bolt	6 N.m (53 lb in)
Receiver and Dehydrator Plug	12 N.m (106 lb in)
Thermal Expansion Valve Bolt	6 N.m (53 lb in)

APPROXIMATE FLUID CAPACITIES

Refrigerant System Capacities

Application	Specification	
	Metric	English
Abrupt Refrigerant Loss	60 ml ¹	2.0 oz ¹
Compressor Replacement		
NOTE: Compressor failure can occur if the oil removed during refrigerant recovery is not replaced. The service compressor is precharged with the following specified amount of PAG oil. Refer to the instruction sheet included with the service compressor.	41 ml ²	1.4 oz ²

Application	Specification	
	Metric	English
Condenser Replacement	30 ml ²	1.0 oz ²
Evaporator Replacement	90 ml ²	3.0 oz ²
Any Line Set (Hose/Tube or Tube Assembly) Replacement	30 ml ²	1.0 oz ²
Total System PAG Oil Capacity	150.0 ml	5.1 oz
R-134a		
Refrigerant Charge	0.68 kg	1.50 lb
¹ 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. ² If more than the specified amount of PAG oil was drained from a component, add the amount drained.		

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
PAG Oil	Lubricant	88901445	88900060

DIAGNOSTIC INFORMATION AND PROCEDURES

HANDLING OF REFRIGERANT LINES AND FITTINGS

CAUTION: To avoid system damage use only 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.

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 mineral base 525 viscosity refrigerant oil prior to installation.

SYMPTOMS - HEATING, VENTILATION, AND AIR CONDITIONING

NOTE: The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic Starting Point - Vehicle** before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set
 - The control modules can communicate via the serial data link
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Symptoms - HVAC Systems - Automatic**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to **Checking Aftermarket Accessories**.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Verify the A/C compressor clutch turns freely and is not seized.
- The A/C compressor will not operate in cold outside air temperatures.
- The following could cause window fogging:
 - Wet carpet or mats
 - High humidity
 - Interior water leak
 - Blocked A/C evaporator drain tube
 - Maximum passenger capacity
 - Blocked body pressure relief valves
- Inspect the air distribution system for causes of reduced air flow:
 - Obstructed or dirty passenger compartment air filter, if equipped
 - Blocked or damaged air inlet or outlet vents

Intermittent

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

Symptom List

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

- **Leak Testing**
- **Noise Diagnosis - HVAC Module**
- **Noise Diagnosis - Air Conditioning (A/C) System**
- **Noise Diagnosis - Blower Motor**
- **Odor Diagnosis**

LEAK TESTING

Special Tools

- **GE-41447** R-134A A/C Tracer Dye - Box of 24
- **GE-42220** Universal 12V Leak Detection Lamp

- **GE-43872** Fluorescent Dye Cleaner
- **GE-46297** A/C Dye Injector Kit
- **GE-46297 - 12** Replacement Dye Cartridges
- **GE-50078** Electric Leak Detector

Equivalent regional tools: **Special Tools**

Refrigerant Leak Testing

NOTE: All A/C system repairs must be verified using electronic leak detection. Dye detection may take up 2 or 3 days to be reliable.

NOTE: General Motors vehicles are now manufactured with fluorescent dye installed directly into the air conditioning (A/C) system.

The fluorescent dye mixes and flows with the air conditioning oil throughout the refrigerant system.

Verifying some passive leaks may require using the **GE-50078** Electric Leak Detector, even though the A/C system contains fluorescent dye.

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

Visual Inspection

Visually trace the entire refrigerant system and look for signs of lubricant leakage, damage, and corrosion on all lines hoses and components (Oil can be an indication of a leak). Each questionable area should be checked for leaks using an electric leak detector.

Fluorescent Leak Detector

NOTE: Always use UV protective eyewear when working with UV light.

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

NOTE: Air conditioning oil is water soluble.

- Condensation on the evaporator core or the refrigerant lines may wash the air conditioning 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 the **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.

- **GE-41447 R-134A A/C Tracer Dye - Box of 24 can be poured directly into a removed A/C component.**
- **GE-46297 - 12 Replacement Dye Cartridges is injected into the low side port using GE-46297 A/C Dye Injector Kit.**

- 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.
- R-134A 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.

NOTE: Do NOT overcharge the A/C system with dye. Use only one 7.39 ml (0.25 oz) charge.

- To prevent false diagnosis, thoroughly clean any residual dye from the service port with a rag and the approved fluorescent dye cleaner **GE-43872** Fluorescent Dye Cleaner.

Electric Leak Detector

WARNING: Do not operate the detector in a combustible atmosphere since its sensor operates at high temperatures or personal injury and/or damage to the equipment may result.

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. **Refrigerant Recovery and Recharging** for recharging the A/C system.

NOTE: Electronic leak detectors are sensitive to the following items:

- Windshield washing solutions
- Many solvents and cleaners
- Some adhesives used in the vehicle

Clean and dry all surfaces in order to prevent a false warning. Liquids will damage the detector.

Do not use:

- Soap solutions (not effective for leak detection)
- Shop air (will introduce contamination to the refrigerant system)

Air movement from the engine cooling fan can affect the detectors ability to detect leaks. Always leak test with engine off and if possible after engine has reached normal operating temperature.

- All fittings and components should be checked.
- Take care not to contaminate the probe tip if the part being tested is contaminated.
- No cleaners containing solvents should be used prior to using electronic leak detector.
- Always follow the refrigerant system around in a continuous path so that no areas of potential leaks are missed. Move the tip along the refrigerant system at a rate of no more than 3 inches per second and a distance of 3/8 inch from the surface being tested. If a leak is found, always continue to test the remainder of the system.

Follow the instructions supplied with the **GE-50078** Electric 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 16°C (60°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 16°C (60°F) - 345 kPa (50 psi) More than 24°C (75°F) - 483 kPa (70 psi) More than 33°C (90°F) - 690 kPa (100 psi)	Go to Step 2	Go to Leak Testing

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 - Manual

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%	175 - 200 kPa (25 - 30 psi)	500 - 850 kPa (70 - 125 psi)	5°C (40°F)
19 - 24°C (66 - 75°F)	Less than 40%	175 - 240 kPa (25 - 35 psi)	690 - 1100 kPa (100 - 160 psi)	5°C (40°F)
	Greater than 40%	175 - 240 kPa (25 - 35 psi)	690 - 1100 kPa (100 - 160 psi)	7°C (45°F)
25 - 29°C (76 - 85°F)	Less than 35%	175 - 240 kPa (25 - 35 psi)	1000 - 1300 kPa (145 - 190 psi)	10°C (50°F)
	35 - 60%	175 - 240 kPa (25 - 35 psi)	1000 - 1340 kPa (145 - 195 psi)	10°C (50°F)
	Greater than 60%	175 - 280 kPa (25 - 40 psi)	1000 - 1370 kPa (145 - 200 psi)	10°C (50°F)
30 - 35°C (86 - 95°F)	Less than 30%	175 - 280 kPa (25 - 40 psi)	1240 - 1590 kPa (180 - 230 psi)	13°C (55°F)
	30 - 50%	175 - 280 kPa (25 - 40 psi)	1240 - 1620 kPa (180 - 235 psi)	13°C (55°F)
	Greater than 50%	175 - 280 kPa (25 - 40 psi)	1240-1650 kPa (180 - 240 psi)	13°C (55°F)
36 - 41°C (96 - 105°F)	Less than 20%	240 - 320 kPa (35 - 45 psi)	1500 - 1860 kPa (215 - 270 psi)	15°C (60°F)
	20 - 40%	240 - 320 kPa (35 - 45 psi)	1500 - 1900 kPa (215 - 275 psi)	15°C (60°F)
	Greater than 40%	240 - 320 kPa (35 - 45 psi)	1500 - 1900 kPa (215 - 275 psi)	15°C (60°F)
42 - 46°C (106 - 115°F)	Less than 20%	280 - 350 kPa (40 - 50 psi)	1765 - 2100 kPa (255 - 305 psi)	18°C (65°F)
	Greater than 20%	280 - 350 kPa (40 - 50 psi)	1765 - 2100 kPa (255 - 305 psi)	18°C (65°F)
47 - 49°C (116 - 120°F)	Below 30%	320 - 380 kPa (45 - 55 psi)	2000 - 2240 kPa (290 - 325 psi)	20°C (70°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 , or Symptoms - HVAC Systems - Manual

Step	Action	Yes	No
2	1. Start the engine. 2. Allow the engine to idle. Does the engine reach a normal operating temperature?	Go to Step 3	Go to Step 9
3	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . 1. Select the FLOOR mode. 2. Select the minimum blower speed. 3. Select the warmest temperature setting. 4. Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater 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 PANEL mode. 4. Select the maximum blower speed. 5. Select the warmest temperature setting. 6. Record the temperature at the following locations: • The center I/P PANEL air outlet • The heater core outlet hose 7. Compare the recorded temperatures. Are the 2 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 10	-
6	1. Inspect the temperature door operation. Refer to <u>Diagnostic System Check - Vehicle</u> . 2. Perform any necessary repairs. Are the repairs complete?	Go to Step 10	-

Step	Action	Yes	No
7	1. Turn OFF the engine. 2. Backflush the heater core. 3. Start the engine. 4. Select the FLOOR mode. 5. Select the minimum blower speed. 6. Select the warmest temperature setting. 7. Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 8	Go to Step 10
8	Replace the heater core. Refer to Heater Core Replacement. Is the repair complete?	Go to Step 10	-
9	Repair the low engine temperature concern. Refer to Engine Fails To Reach Normal Operating Temperature. Is the repair complete?	Go to Step 10	-
10	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 , or Symptoms - HVAC Systems - Manual
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. Refer to 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
6	Repair the air delivery concern. Refer to Diagnostic Starting Point - Vehicle . Is the repair complete?	Go to Step 10	-

Step	Action	Yes	No
7	Repair the heating concern. Refer to Heating Performance Diagnostic . Is the repair complete?	Go to Step 10	-
8	Repair the A/C performance concern. Refer to Air Conditioning (A/C) System Performance Test . Is the repair complete?	Go to Step 10	-
9	Repair the air inlet door concern. Refer to Air Inlet Assembly 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
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Manual or 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 ON the ignition, with the engine OFF. 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	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

Condition	Corrective Action
CAUTION: Always ensure the correct PAG or POE oil is used during A/C servicing of R-134a or R-1234YF systems. Failure to use the correct PAG or POE oil could cause A/C performance issues and/or A/C system failure.	
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.	
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.
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.
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. - 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.
Oil Overcharge	Flush refrigerant system.
Refrigerant Contamination	Flush refrigerant system.

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

NOISE DIAGNOSIS - AIR CONDITIONING (A/C) SYSTEM

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic , or Symptoms - HVAC Systems - Manual
2	1. A/C system noises can be generally categorized into 3 areas: • Screeching, squealing, chirping noises • Moaning noises • Vibration/rattle noises 2. Start the engine. 3. Ensure that the A/C is ON. Is a screeching, squealing noise heard when the A/C is engaged?	Go to Step 3	Go to Step 9
3	With the engine OFF, inspect the drive belt for excessive wear. Refer to Drive Belt Falls Off and Excessive Wear Diagnosis . Is the drive belt excessively worn?	Go to Step 18	Go to Step 4
4	Inspect the drive belt tension. Refer to Drive Belt Tensioner Diagnosis . Is the drive belt tension correct?	Go to Step 19	Go to Step 5
5	Inspect the drive belt for excessive oil coverage. Is the drive belt covered with oil?	Go to Step 17	Go to Step 6
6	1. Start the engine. 2. Ensure that the A/C is ON. 3. Inspect the compressor and the clutch. Is the compressor locked up?	Go to Step 24	Go to Step 7
7	Is the A/C compressor clutch slipping?	Go to Step 23	Go to Step 8
8	Using a stethoscope, listen to the A/C compressor for any abnormal noises. Is the compressor causing an abnormal noise?	Go to Step 15	Go to Step 10
9	Does a moaning noise exist when the A/C clutch is engaged?	Go to Step 10	Go to Step 12
10	Listen to the A/C compressor components and mounting for noise concerns using a stethoscope. Are any of these components loose, damaged or excessively worn?	Go to Step 20	Go to Step 11

Step	Action	Yes	No
11	1. Idle the engine. 2. Engage the A/C compressor clutch. 3. Using a stethoscope, move around the entire refrigerant plumbing system, inspecting for any abnormal noises caused by component ground-out. Are any of the A/C components grounding out and causing a noise?	Go to Step 22	Go to Step 13
12	Does a vibration or rattle noise exist when the A/C clutch is engaged?	Go to Step 13	Go to Step 14
13	Does the noise stop when the A/C clutch is disengaged?	Go to Step 15	Go to Step 14
14	1. Idle the engine in PARK with the A/C compressor clutch engaged. 2. Using a stethoscope, move around the entire A/C system testing for any abnormal noises caused by a component. Do any of the A/C components cause an abnormal noise?	Go to Step 21	Go to Step 25
15	Verify that the A/C system is properly charged. Refer to Approximate Fluid Capacities . Is the A/C system properly charged?	Go to Step 26	Go to Step 16
16	Recharge the A/C system to specification. Refer to Refrigerant Recovery and Recharging . Is the abnormal compressor noise still present?	Go to Step 25	Go to Step 26
17	Repair the oil leak. Refer to the appropriate repair procedure in Engine Mechanical. Is the repair complete?	Go to Step 26	-
18	Replace the A/C drive belt. Refer to Drive Belt Replacement . Is the replacement complete?	Go to Step 26	-
19	Replace the A/C drive belt tensioner. Refer to Drive Belt Tensioner Replacement . Is the replacement complete?	Go to Step 26	-
20	Repair or replace the A/C compressor mounting component. Is the repair complete?	Go to Step 26	-
21	Repair or replace the component which is causing the moaning concern as needed. Is the repair complete?	Go to Step 26	-
22	Correctly route or insulate the A/C component. Is the repair complete?	Go to Step 26	-
23	Replace the A/C compressor. Refer to Air Conditioning Compressor Replacement (LFX) Air Conditioning Compressor Replacement (LCV) . Is the replacement complete?	Go to Step 26	-
24	Replace the A/C compressor. Refer to Air Conditioning Compressor Replacement (LFX) Air Conditioning Compressor Replacement (LCV) . Is the replacement complete?	Go to Step 26	-
25	The concern may be caused by an engine related component. Refer to Vibration Analysis - Engine . Did you find and correct the condition?	Go to Step 26	-
26	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

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 , or Symptoms - HVAC Systems - Manual
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. Refer to Instrument Panel Carrier 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 carrier. Refer to Instrument Panel Carrier 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	Go to Step 2

ODOR DIAGNOSIS

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic , or Symptoms - HVAC Systems - Manual
2	1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start the engine. 4. Allow the engine to idle at normal operating temperature. 5. Select the maximum blower speed. 6. Select the PANEL air outlet mode. 7. Select the coldest temperature setting. 8. 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. Refer to Passenger Compartment Air Filter Replacement . Is the 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 14
6	Inspect for the following conditions: • Water leaks around the windshield • Blockage of the HVAC module drain • Leaks around the door seals Is the leak present?	Go to Step 7	Go to Step 14
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. Refer to Loss of Coolant . Is the 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. Refer to 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 for engine oil leaks • Fluid Leak Diagnosis for the transmission leaks 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 inside of the HVAC module. Refer to 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

REPAIR INSTRUCTIONS

ODOR CORRECTION

Eliminating Air Conditioning 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 that draws outside air into the HVAC module is clear of debris.
2. Disable the A/C compressor clutch operation by disconnecting the clutch coil electrical connector.
3. Dry the evaporator core by performing the following steps:
 1. Start the engine.
 2. Select the maximum 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. Start the engine.
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 clutch operation.
13. Using the scan tool enable the afterblow. Refer to [Afterblow Enabling](#).

REFRIGERANT RECOVERY AND RECHARGING

WARNING: To prevent personal injury, avoid breathing A/C Refrigerant and lubricant vapor or mist. Work in a well ventilated area. To remove refrigerant from the A/C System, use service equipment designed for recovery that is certified to meet the requirements of the appropriate SAE Standards. If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant, refrigerant recovery, and lubricant manufacturers.

WARNING: For personal protection, goggles with side protection and lint-free gloves (insulated against heat loss and impermeable to refrigerant) must 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 may result. The exposed area should be flushed immediately with cold water and prompt medical attention should be obtained.

CAUTION: You must replace the desiccant 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 desiccant will result in damage to the A/C refrigerant system.

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

CAUTION: Do not lubricate A/C line seal washers as mineral oil will damage the seal and cause leaks. Use only 525 viscosity mineral oil to lubricate o-rings as well as fitting threads for the prevention of fitting seizure.

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.

The air conditioning service station is a complete air conditioning service center for refrigerant. The service station recovers, recycles, evacuates and recharges air conditioning refrigerant quickly, accurately and automatically. The unit has a display screen that contains the function controls and displays prompts that will lead the technician through the recover, recycle, evacuate and recharge operations. Air conditioning refrigerant is recovered into and charged out of an internal storage vessel.

The air conditioning service station has a built in air conditioning refrigerant identifier that will test for contamination, prior to recovery and will notify the technician if there are foreign gases present in the air conditioning system. If foreign gases are present, the station will not recover the refrigerant from the air conditioning system.

For information on the actual equipment, please refer to the manual of the equipment in question.

Always recharge the air conditioning system with the proper amount of refrigerant. [Approximate Fluid Capacities](#)

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the air conditioning system during the recovery process or due to component replacement, the oil must be replenished. Oil can be injected into a charged system. For the proper quantities of oil

to add to the air conditioning refrigerant system, refer to [Approximate Fluid Capacities](#).

FLUSHING (R-134-A)

Special Tools

- **GE-41447** Air Conditioning Tracer Dye-Box of 24
- **BO-42220** Universal 12V Leak Detection Lamp
- **GE-45268** Air Conditioning Flush Adapter Kit

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

General Information

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

Forward Flushing Setup

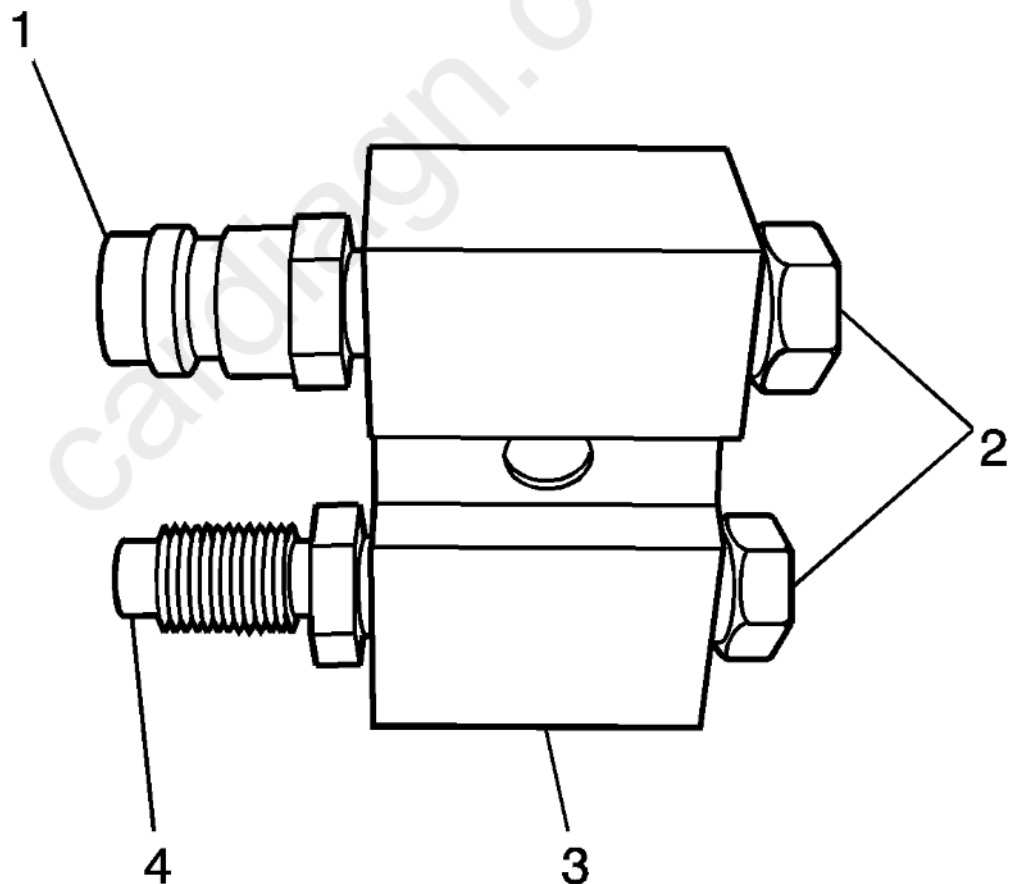


Fig. 1: Identifying J 45268-2, J 45268-7, J 45268-8, & J 45268-9

Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Forward flow refrigerant flushing is recommended for contaminated refrigerant or Air Conditioning Compressor oil.

- Inspect and lubricate GE-45268 adapter kit fitting O-rings. [Air Conditioning O-Ring Seal Replacement](#).

1. Install both **GE-45268-9** fitting O-ring onto **GE-45268-10** adapter.
2. Install **GE-45268-8** fitting O-ring onto suction side of **GE-45268-10** adapter.
3. Install **GE-45268-7** fitting O-ring onto discharge side of **GE-45268-10** adapter.

Reverse Flushing Setup

NOTE:

- Reverse flow refrigerant flush is recommended for desiccant bag failure. Replace condenser/receiver dehydrator assembly when air conditioning flush is complete and perform the following procedure:
- Inspect and lubricate GE - 45268 adapter kit fitting O-rings. [Air Conditioning O-Ring Seal Replacement](#).

1. Install both **GE - 45268-9** fitting O-ring onto **GE - 45268-10** adapter.
2. Install **GE - 45268-7** fitting O-ring onto suction side of **GE - 45268-10** adapter.
3. Install **GE - 45268-8** fitting O-ring onto discharge side of **GE - 45268-10** adapter.

Flush Procedure

NOTE:

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

1. Recover the refrigerant. [Refrigerant Recovery and Recharging](#).
2. Remove the thermal expansion valve. [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#).
3. Install the thermal expansion valve stud onto **GE-45268-115** adapter.
4. Install new sealing washers onto evaporator core. [Air Conditioning System Seal Replacement](#)
5. Install **GE-45268-115** adapter in place of the TXV, using an oversized seal washer.

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

6. Install the air conditioning evaporator thermal expansion valve bolt and tighten to 4.5 N.m (40 lb in).
7. Install new washers onto liquid line and suction hose. [Air Conditioning System Seal Replacement](#).
8. Connect liquid line and suction hose to **GE - 45268-115** adapter using an oversized seal washer.
9. Install the thermal expansion valve block fitting nut and tighten to 19 N.m (14 lb ft).
10. Remove the air conditioning compressor. [Air Conditioning Compressor Replacement \(LFX\)](#)[Air Conditioning Compressor Replacement \(LCV\)](#)
11. Remove the air conditioning refrigerant filter. [Receiver and Dehydrator Replacement \(LFX\)](#)[Receiver and Dehydrator Replacement \(LCV\)](#)

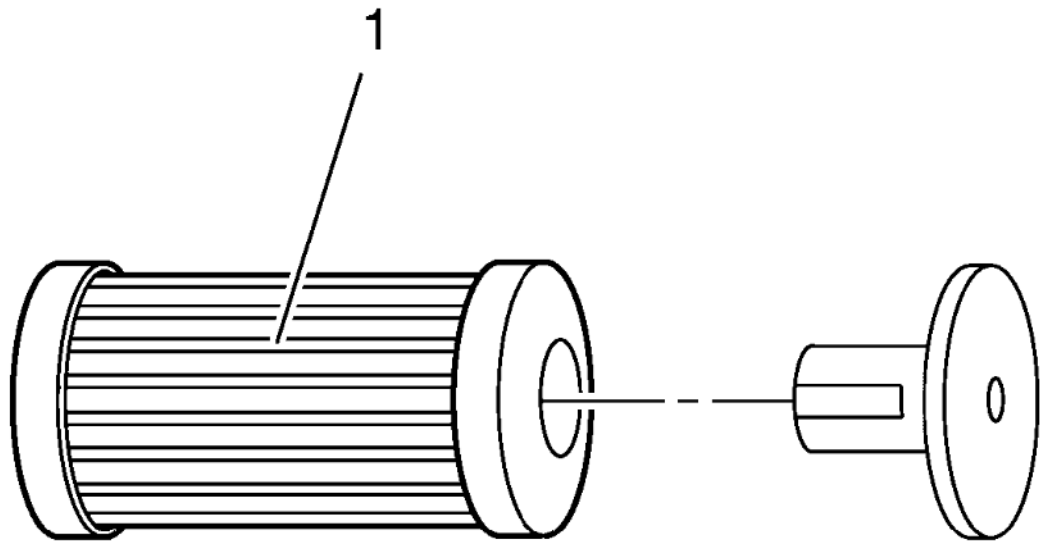


Fig. 2: A/C Refrigerant Filter

Courtesy of GENERAL MOTORS COMPANY

NOTE: The filter inside GE-45628-1 adapter is serviceable. Remove and discard check valve from the filter.

12. Service the filter before each flush.

NOTE: Assure that suction and discharge ports on J-45268-10 correspond to suction and discharge ports on compressor hose assembly.

13. Install new sealing washers onto air conditioning compressor and condenser hose. Refer to [Air Conditioning O-Ring Seal Replacement](#). Assure that suction and discharge ports on GE-45268-10 adapter correspond to suction and discharge ports on air conditioning compressor to condenser hose.
14. Install GE-45268-10 filter adapter to the air conditioning compressor to condenser hose.
15. Connect GE-45268-1 filter to J-45268-7 adapter.
16. Connect blue hose from air conditioning filling device to GE-45268 adapter.
17. Connect red hose from air conditioning filling device to GE-45268 adapter.
18. Disconnect blue hose from air conditioning filling device to GE-45268-1 adapter.
19. Disconnect GE-45268-1 adapter from GE-45268-10 adapter.
20. Remove GE-45268-10 adapter from the air conditioning compressor to condenser hose.

NOTE: Flushing will remove all PAG oil from the air conditioning system. The air conditioning system must be replenished with the correct amount of PAG oil.

21. If you will reinstall the removed air conditioning compressor, perform the following procedure:

- Remove the air conditioning compressor drain plug.
- Drain PAG oil from the air conditioning compressor. Rotate compressor input shaft to assist in draining the PAG oil from compressor.
- Add the total system capacity of PAG oil to air conditioning compressor. Refer to [Approximate Fluid Capacities](#).
- Add one bottle of **GE-41447** Air Conditioning Tracer Dye.
- Install the air conditioning compressor drain plug and tighten to 14 N.m (10 lb ft).

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

22. Install the air conditioning compressor. Refer to [Air Conditioning Compressor Replacement \(LFX\)Air Conditioning Compressor Replacement \(LCV\)](#).
23. Install new air conditioning refrigerant filter. Refer to [Receiver and Dehydrator Replacement \(LFX\)Receiver and Dehydrator Replacement \(LCV\)](#).
24. Remove the TXV block fitting nut.
25. Disconnect liquid line and suction line from **GE-45268-115** adapter.
26. Remove the TXV bolts retaining **GE - 45268-115** adapter.
27. Remove **GE - 45268-115** adapter.
28. Inspect the TXV for debris. Clean or replace as needed.
29. Install the TXV. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#).
30. Evacuate and recharge the air conditioning system. Refer to [Refrigerant Recovery and Recharging](#).
31. Leak test fittings using **BO-42220** lamp.

AIR CONDITIONING COMPRESSOR OIL BALANCING

Draining Procedure

NOTE: Drain and measure as much of the refrigerant oil as possible from the rear head ports of the REMOVED compressor.

1. Drain the refrigerant oil from the crankcase and rear head ports into a clean, graduated container.



Fig. 3: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS COMPANY

2. Rotate the compressor shaft to assist in draining the compressor.
3. Measure and record the amount of oil drained from the removed compressor.

This measurement will be used during installation of the replacement compressor.

4. Inspect oil drained from removed compressor. [Air Conditioning Compressor Oil Diagnosis](#)
5. Properly discard the used refrigerant oil.
6. Clean the graduated cylinder.

NOTE: Drain and measure as much of the refrigerant oil as possible from the rear head ports of the NEW compressor.

7. Remove the drain bolt and drain the refrigerant oil from the crankcase and rear head ports into a clean, graduated container.
8. Rotate the compressor shaft to assist in draining the compressor.

Balancing Procedure



Fig. 4: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- The refrigerant oil in the A/C system must be balanced during compressor replacement.
- The replacement compressor is shipped with the total system capacity of refrigerant oil.
- If additional A/C components are replaced during compressor replacement, add the PAG oil directly to the A/C compressor to compensate the A/C system.

1. Refer to the amount of refrigerant oil recorded during the compressor removal. **Approximate Fluid Capacities**
2. If the amount of oil recorded from the removed compressor is less than or equal to 41 ml (1.4 fl. oz), add 75 ml of the new PAG oil back into the new compressor through the compressor suction port.
3. If the amount of oil recorded from the removed compressor is greater than 41 ml (1.4 fl. oz), add the equivalent amount of the new PAG oil back into the new compressor through the compressor suction port.
4. Rotate the clutch driver three times to lubricate the internal compressor components.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LFX)

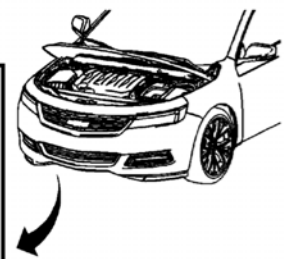
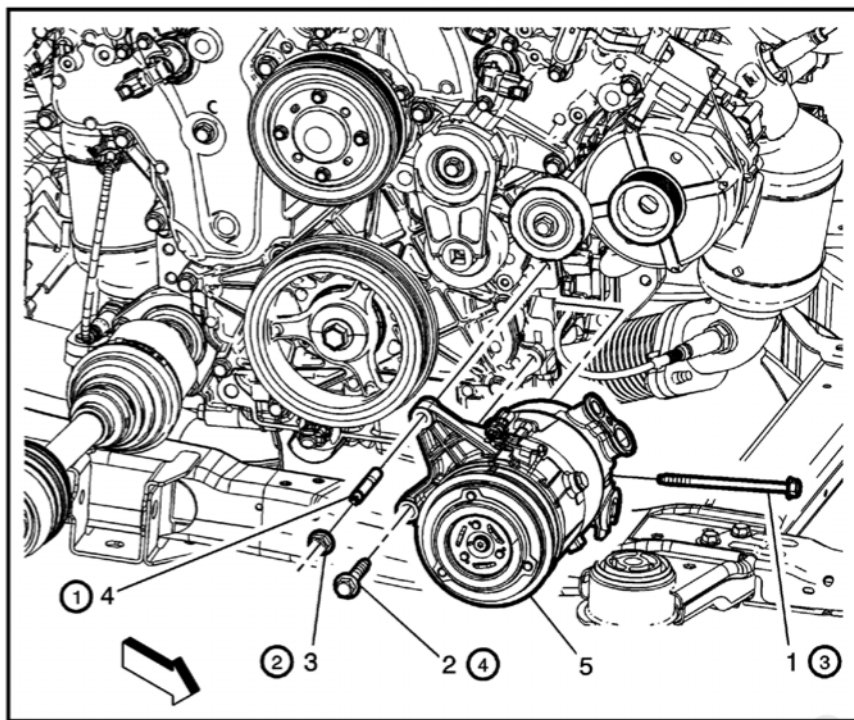


Fig. 5: Air Conditioning Compressor Components (LFX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 3. Remove the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement. 4. Remove the right front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement. 5. Remove the drive belt from the compressor. Refer to Drive Belt Replacement. 6. Disconnect the A/C compressor electrical connector. 7. Remove the air conditioning compressor hose from the compressor. Refer to Air Conditioning Compressor Hose Replacement (LFX).	
1	A/C Compressor Bolt CAUTION: Refer to Fastener Caution . Tighten 58 N.m (43 lb ft) NOTE: Tighten the A/C compressor mounting fasteners in sequence.
2	A/C Compressor Bolt Tighten 22 N.m (16 lb ft) NOTE: Tighten the A/C compressor mounting fasteners in sequence.

Callout	Component Name
3	A/C Compressor Nut Tighten 58 N.m (43 lb ft) NOTE: Tighten the A/C compressor mounting fasteners in sequence.
4	A/C Compressor Stud Tighten 9 N.m (80 lb in) NOTE: Tighten the A/C compressor mounting fasteners in sequence.
5	A/C Compressor Procedure 1. Remove and discard sealing washers. Refer to Air Conditioning System Seal Replacement. 2. When replacing the A/C compressor, balance the compressor oil. Refer to Air Conditioning Compressor Oil Balancing.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LCV)

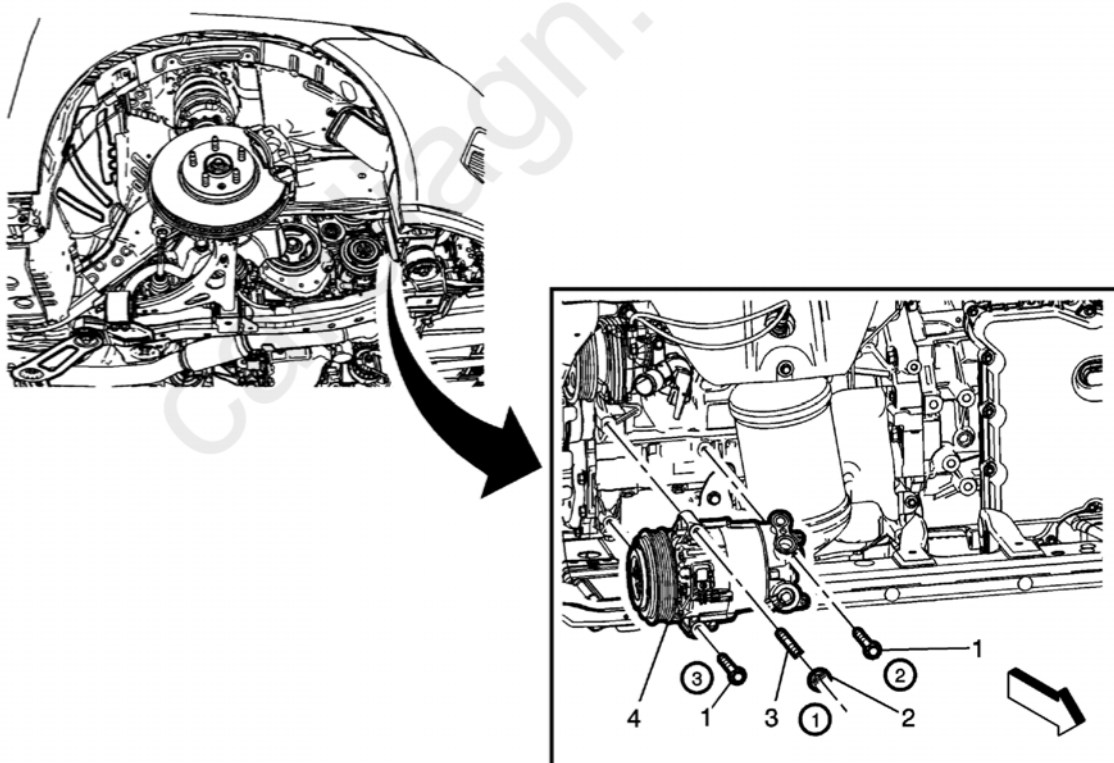


Fig. 6: Air Conditioning Compressor & Mounting Components (LCV)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 3. Remove the drive belt from the compressor. Refer to Drive Belt Replacement. 4. Disconnect the air conditioning compressor electrical connector. 5. Remove the air conditioning compressor and condenser hose from the compressor. Refer to Air Conditioning Compressor Hose Replacement (LCV). 6. Remove the right front compartment splash shield. Refer to Front Compartment Splash Shield Replacement. 7. Remove the right front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement. 8. Remove the air conditioning compressor heat shield. Refer to Air Conditioning Compressor Heat Shield Replacement.	
1	Air Conditioning Compressor Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . NOTE: Tighten the air conditioning compressor mounting fasteners in sequence. Tighten 22 N.m (16 lb ft)
2	Air Conditioning Compressor Nut Tighten 22 N.m (16 lb ft)
3	Air Conditioning Compressor Stud Tighten 9 N.m (80 lb in)
4	Air Conditioning Compressor Procedure 1. Remove and discard the old sealing washers and replace with NEW sealing washers. Refer to Air Conditioning System Seal Replacement. 2. When replacing the air conditioning compressor, balance the compressor oil. Refer to Air Conditioning Compressor Oil Balancing.

AIR CONDITIONING COMPRESSOR HEAT SHIELD REPLACEMENT

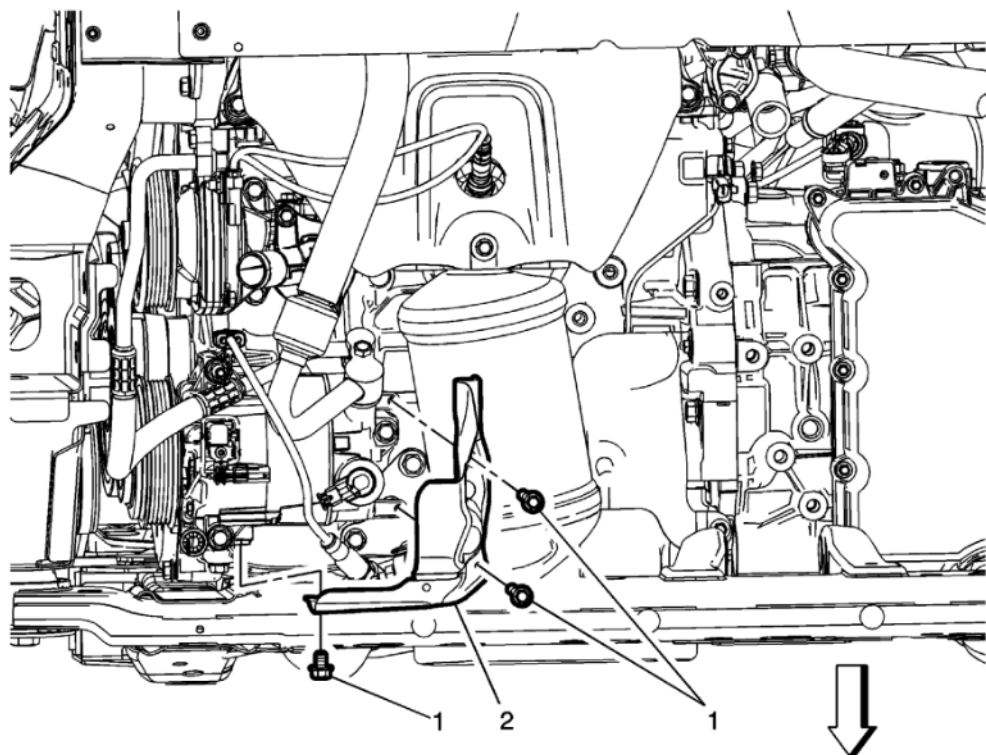


Fig. 7: Air Conditioning Compressor Heat Shield (LKW)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	A/C Compressor Heat Shield Bolt (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 7.5 N.m (66 lb in)
2	A/C Compressor Heat Shield

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.

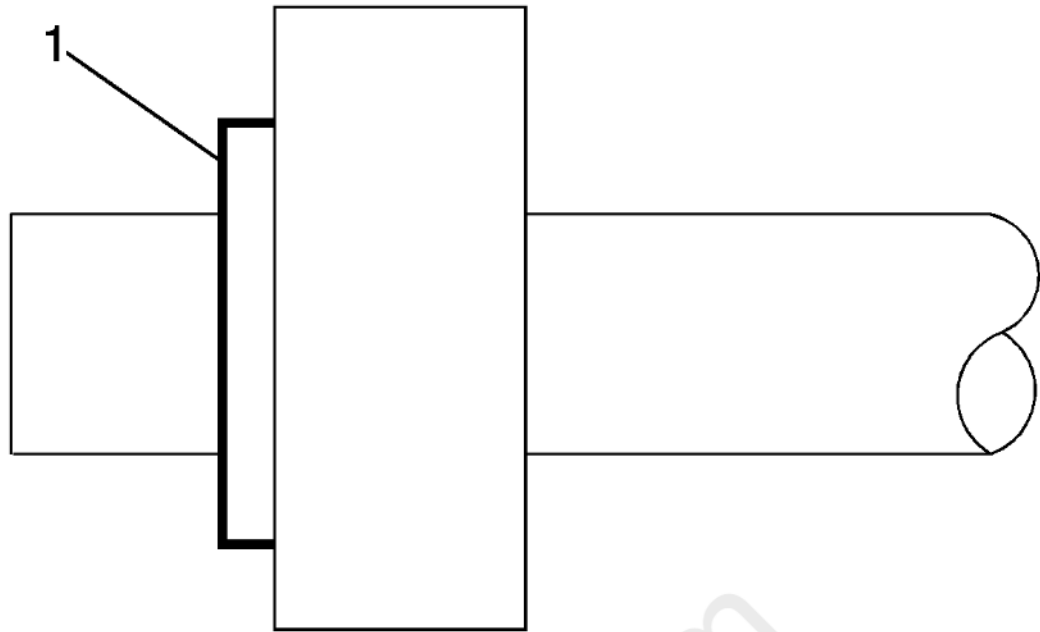


Fig. 8: A/C Refrigerant Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

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.

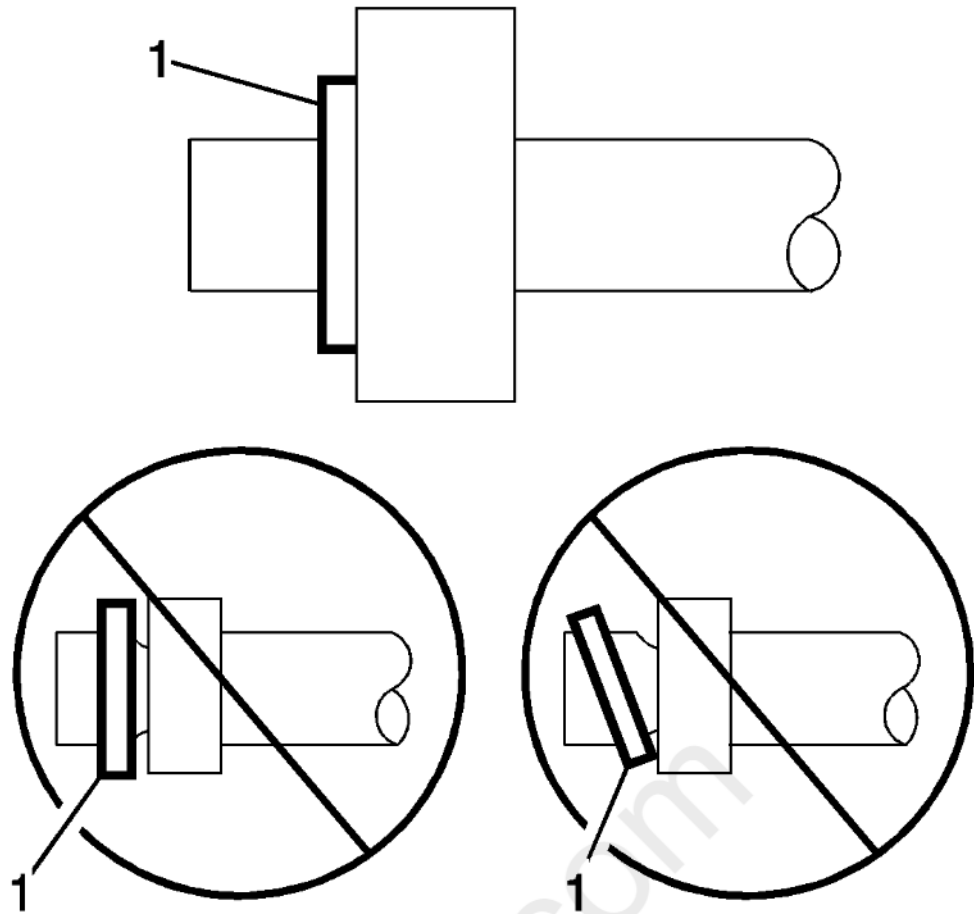


Fig. 9: Identifying Proper Seating Of A/C Refrigerant O-Ring
Courtesy of GENERAL MOTORS COMPANY

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.

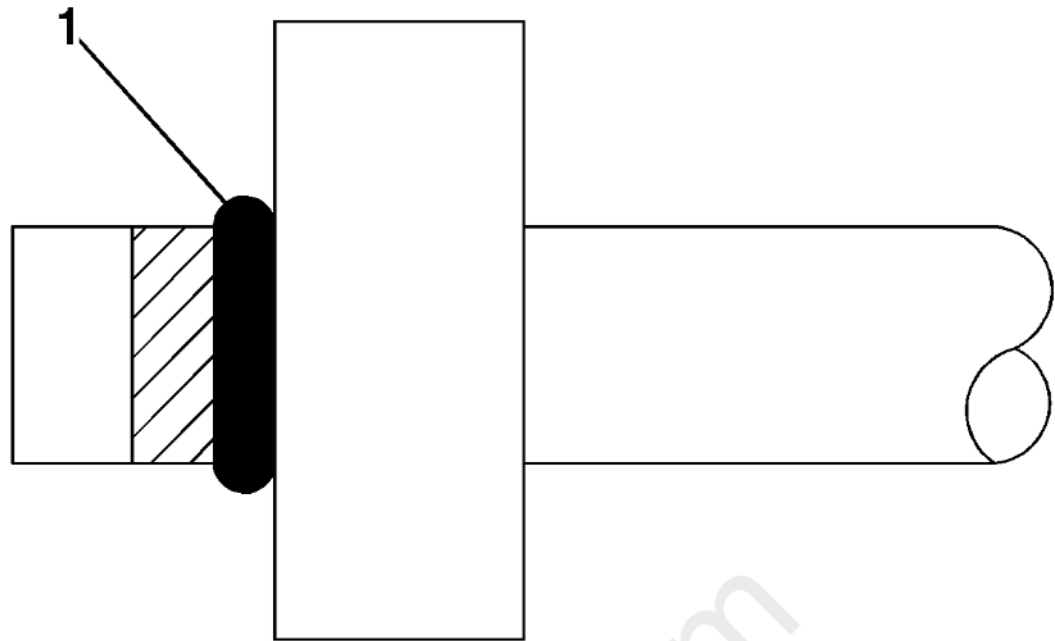


Fig. 10: O-ring seal

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.

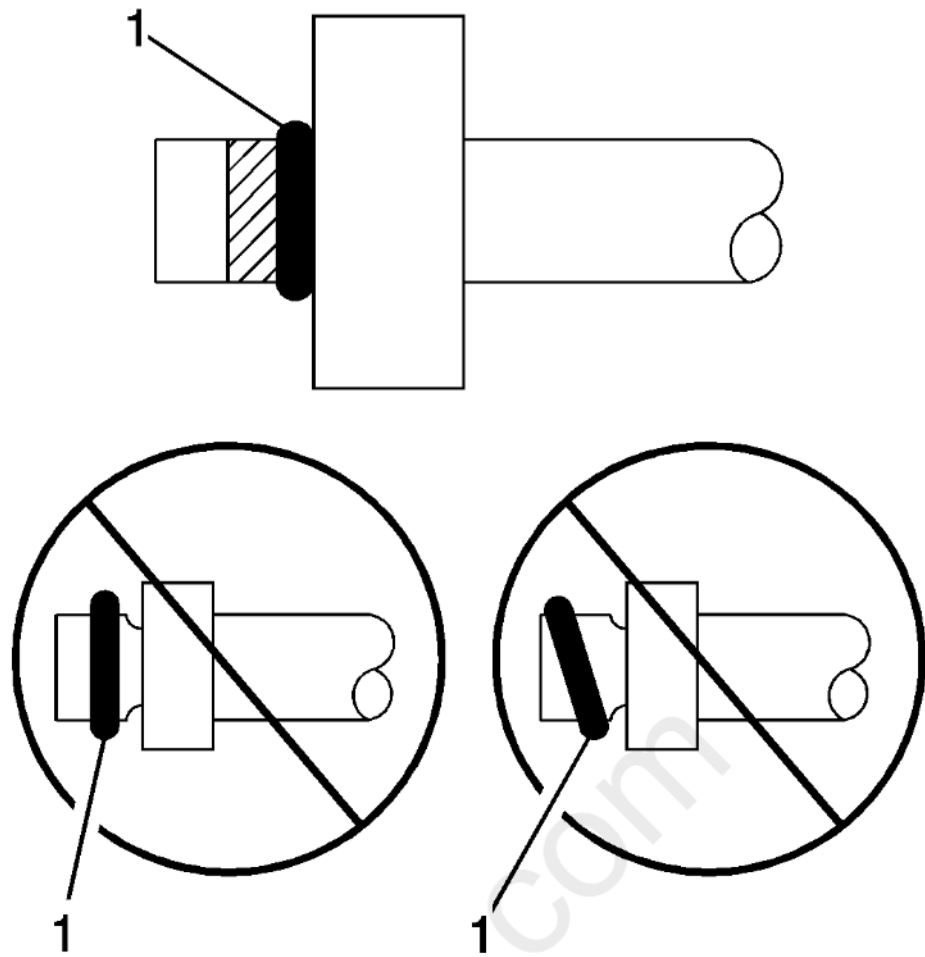


Fig. 11: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS COMPANY

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 (LFX)

Removal Procedure

1. Recover the refrigerant from the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
2. Remove the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#).

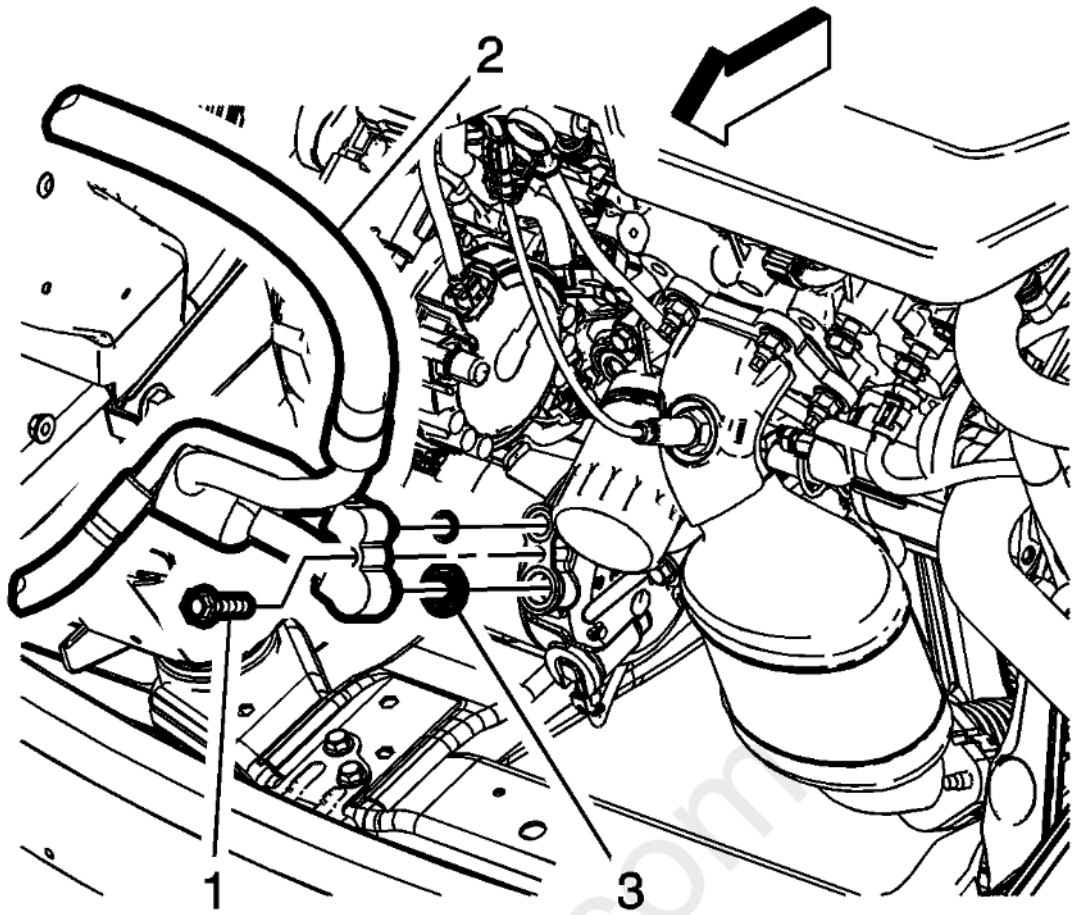


Fig. 12: A/C Compressor Hose, Bolt & Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose bolt (1) from the compressor.
4. Remove the air conditioning compressor hose (2) from the compressor.
5. Remove and discard the sealing washers (3).

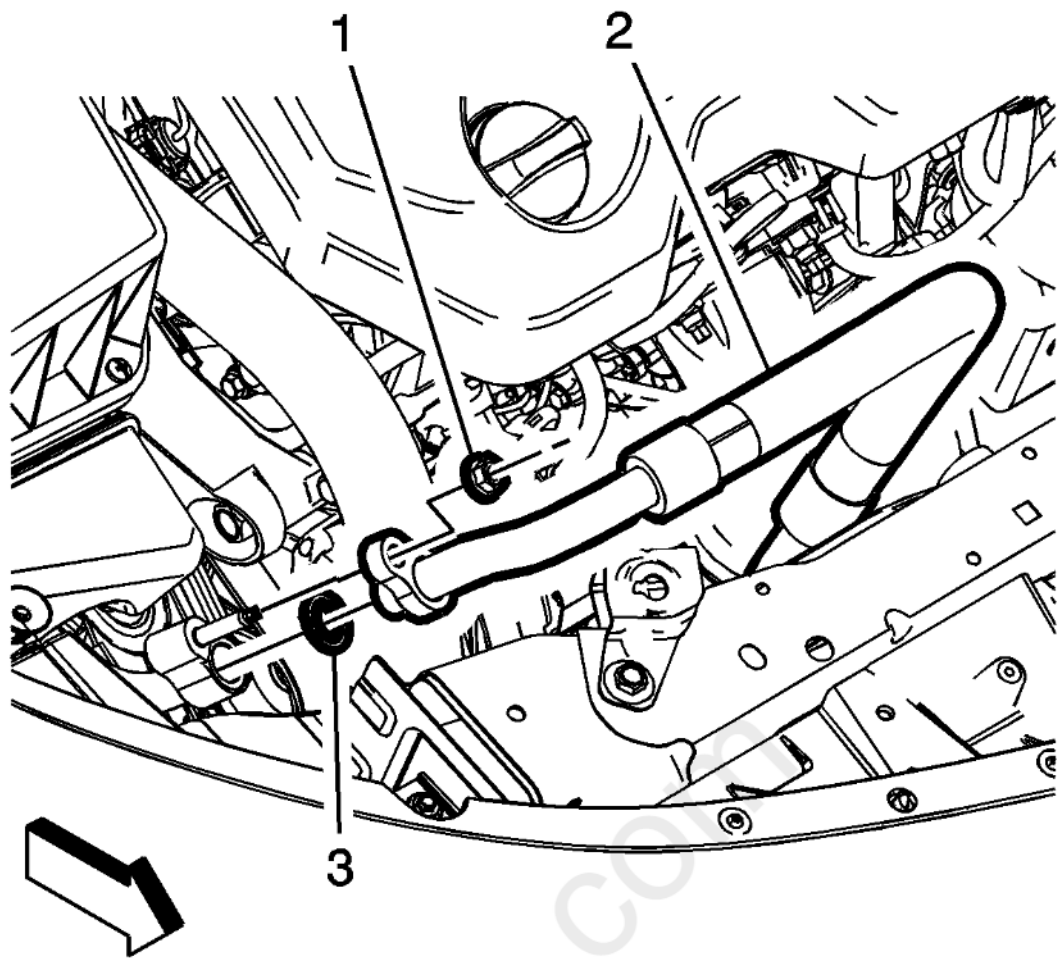


Fig. 13: A/C Compressor Hose, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

6. Remove the air conditioning compressor hose nut (1) at the air conditioning evaporator hose.
7. Remove the air conditioning compressor hose (2) from air conditioning evaporator hose.
8. Remove and discard the sealing washer (3).

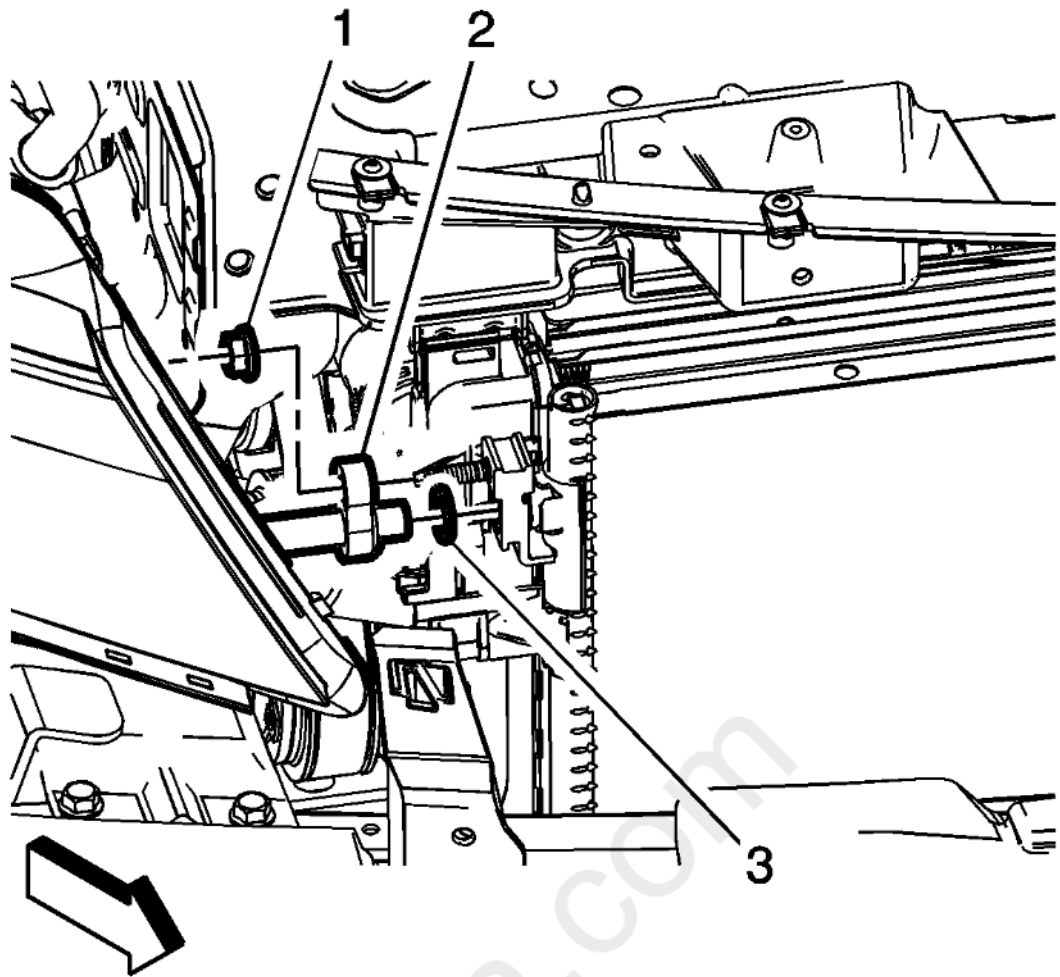


Fig. 14: A/C Compressor Hose, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

9. Remove the air conditioning compressor hose nut (1) from the condenser.
10. Remove the air conditioning compressor hose (2) from the condenser.
11. Remove and discard the sealing washer (3).
12. Remove the air conditioning compressor hose (2) from vehicle.

Installation Procedure

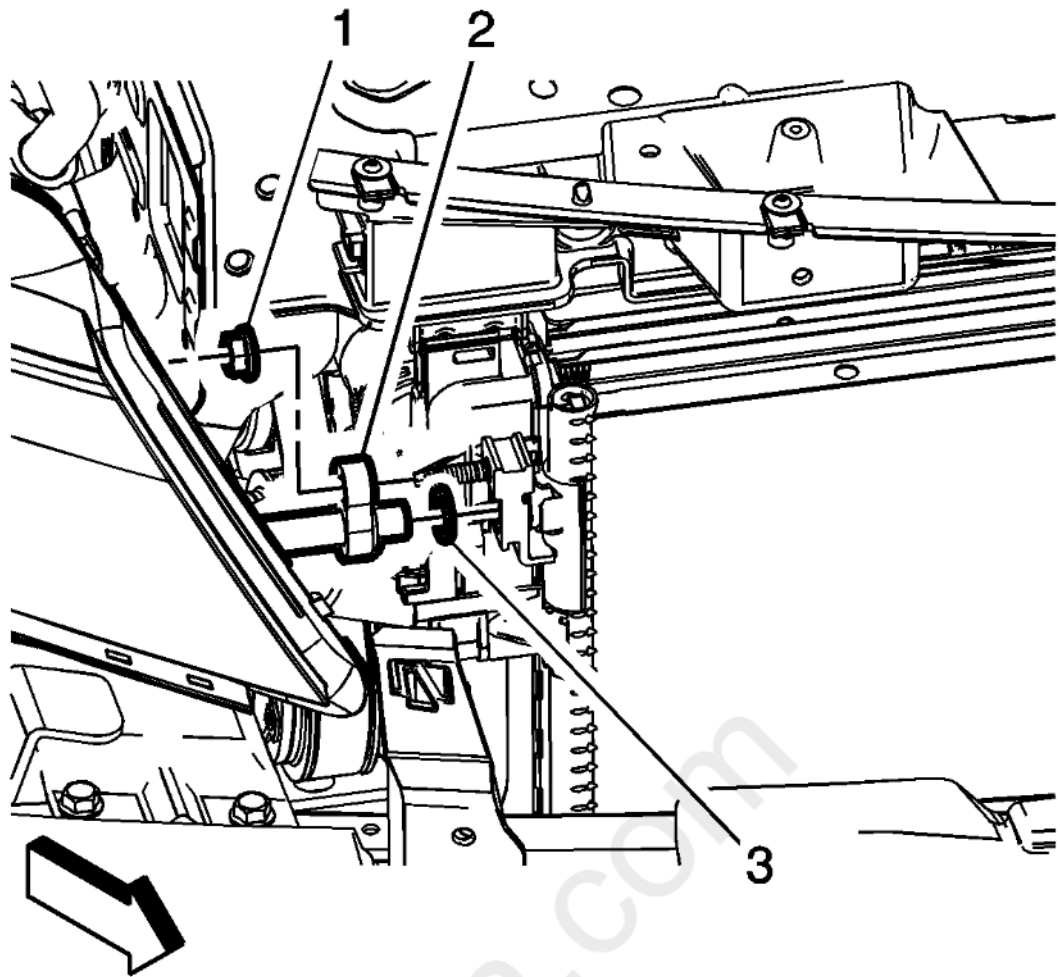


Fig. 15: A/C Compressor Hose, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW sealing washers (3) to the air conditioning compressor hose. Refer to [Air Conditioning System Seal Replacement](#).
2. Install the air conditioning compressor hose (2) to the condenser.

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

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

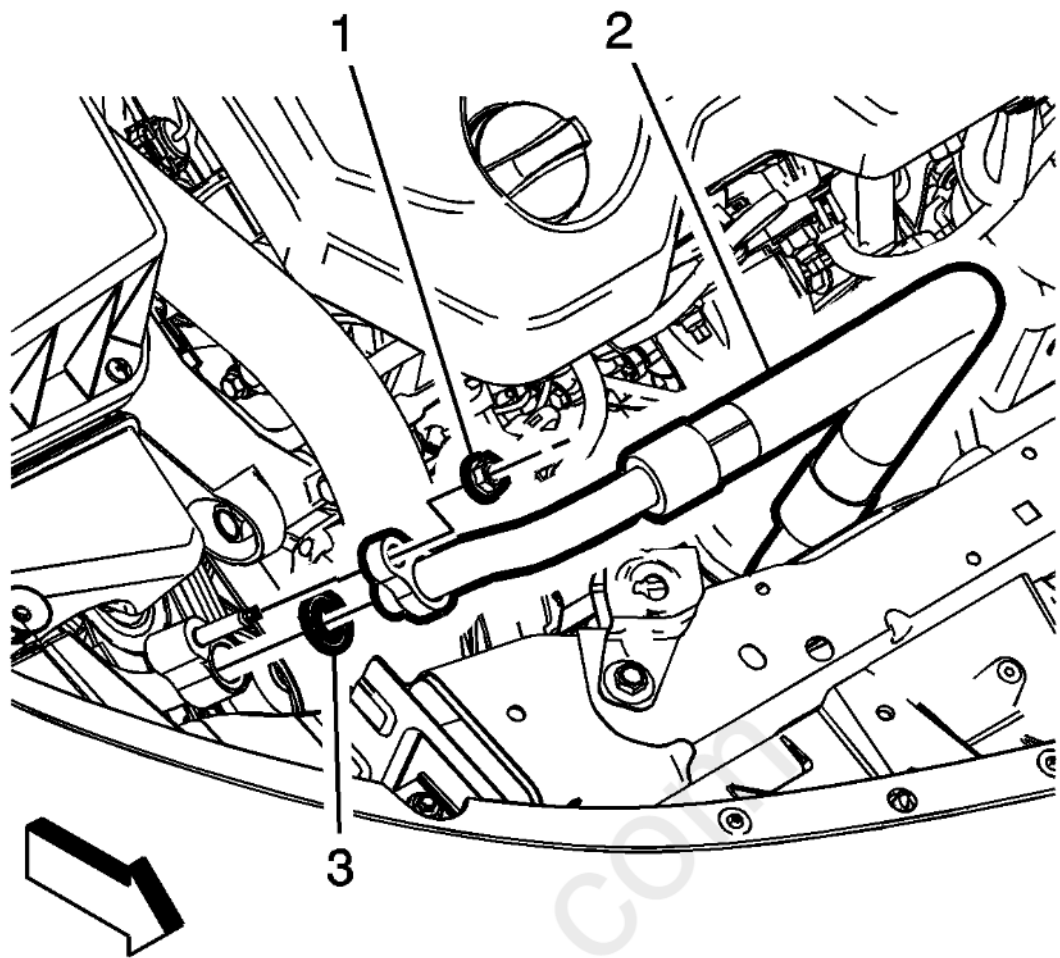


Fig. 16: A/C Compressor Hose, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

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

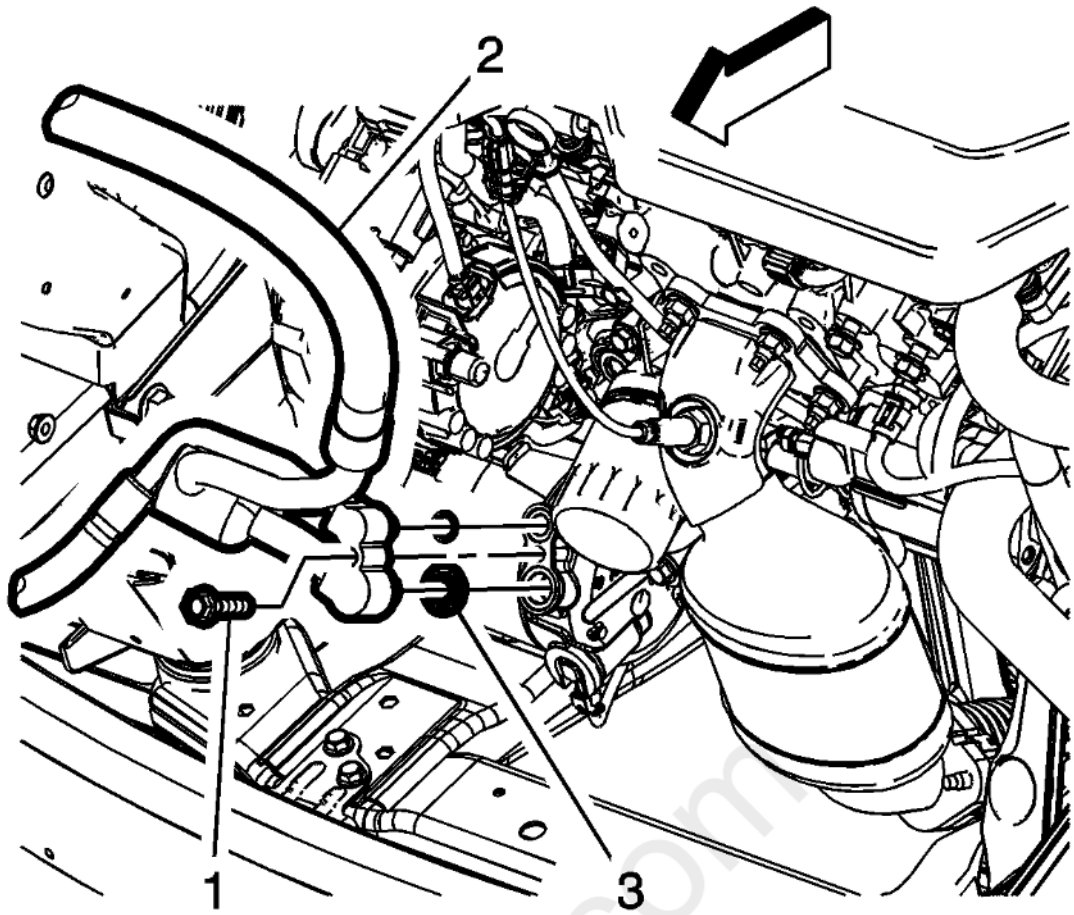


Fig. 17: A/C Compressor Hose, Bolt & Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

6. Install the air conditioning compressor hose (2) to the compressor.
7. Install the air conditioning compressor hose bolt (1) to the compressor and tighten to 22 N.m (16 lb ft).
8. Install the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#).
9. Evacuate and charge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT (LCV)

Removal Procedure

1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
2. Remove the front bumper fascia assembly. Refer to [Front Bumper Fascia Replacement](#).

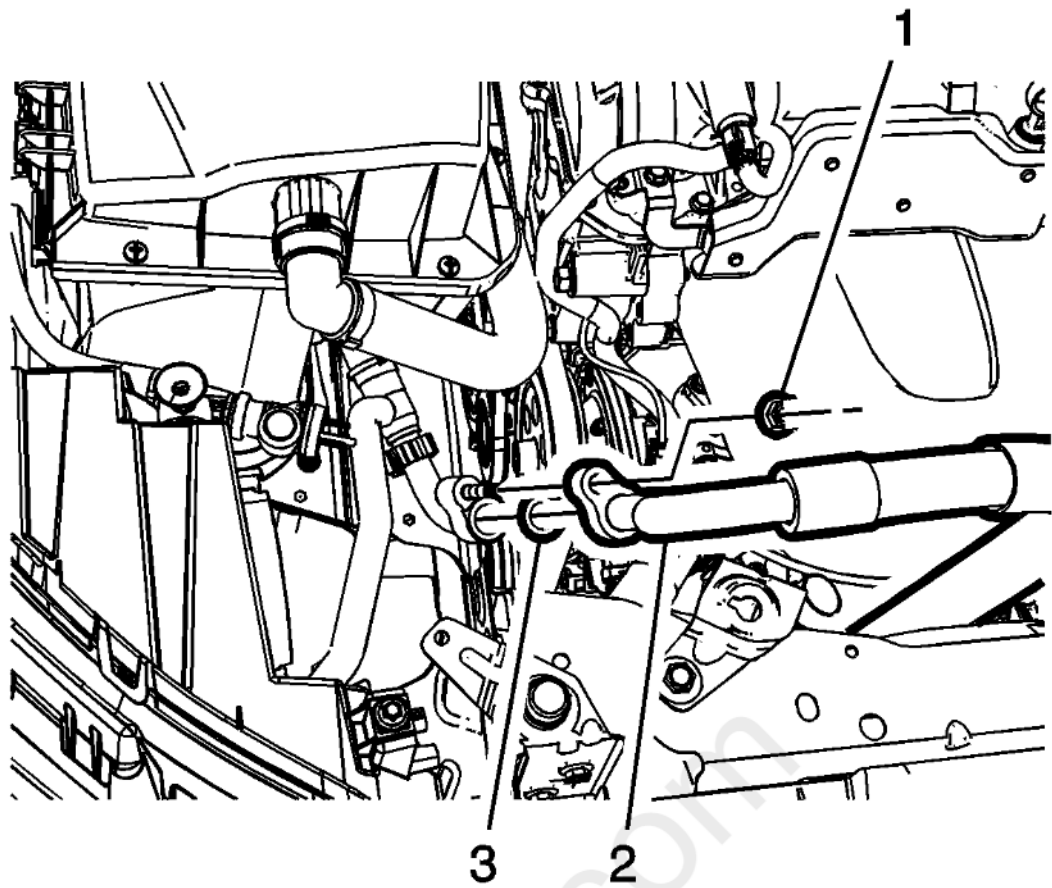


Fig. 18: Air Conditioning Compressor Hose Assembly, Nut & Washers
Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose assembly nut (1) from the evaporator hose assembly.
4. Remove the air conditioning compressor hose assembly (2) from the evaporator hose assembly.
5. Remove and discard the old sealing washers (3) and replace with NEW sealing washers.

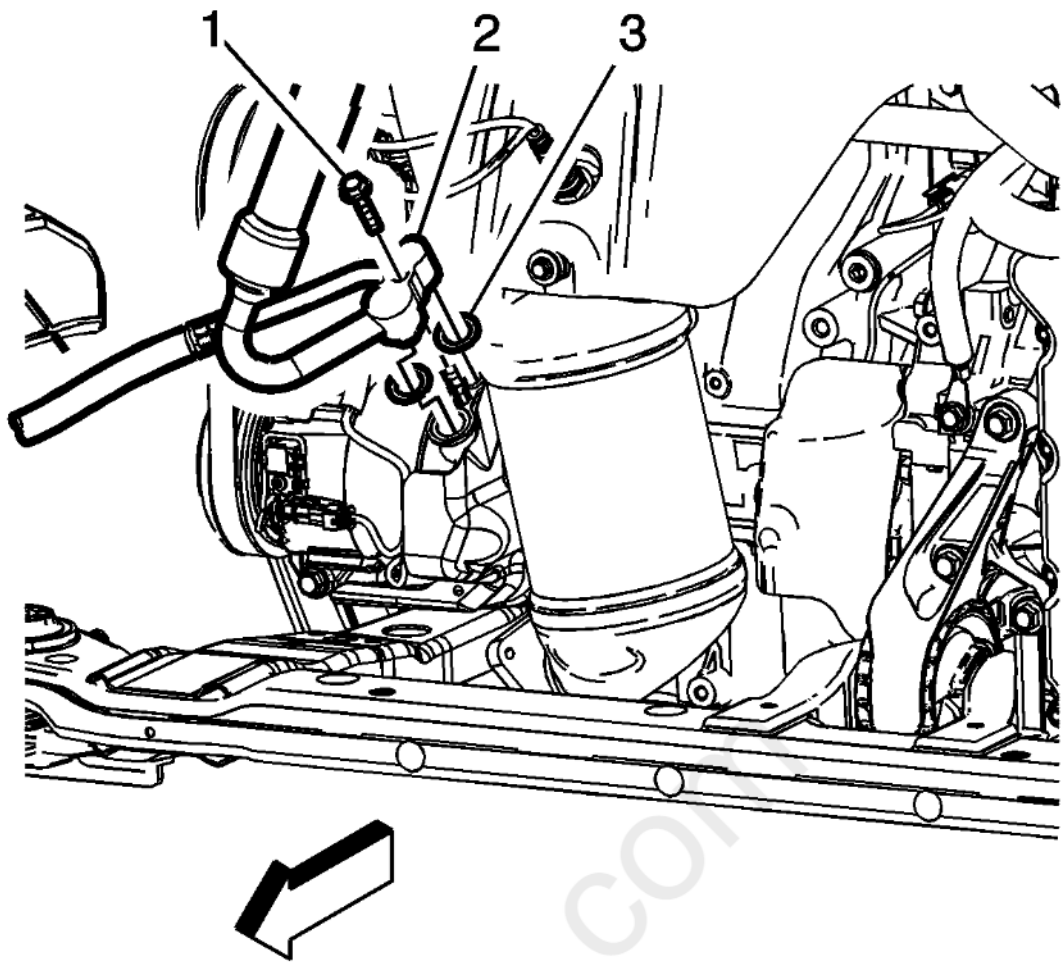


Fig. 19: Air Conditioning Compressor Hose Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove air conditioning compressor hose assembly bolt (1) from the air conditioning compressor.
7. Remove air conditioning compressor hose assembly (2) from the air conditioning compressor.
8. Remove and discard the old sealing washers (3) and replace with NEW sealing washers.

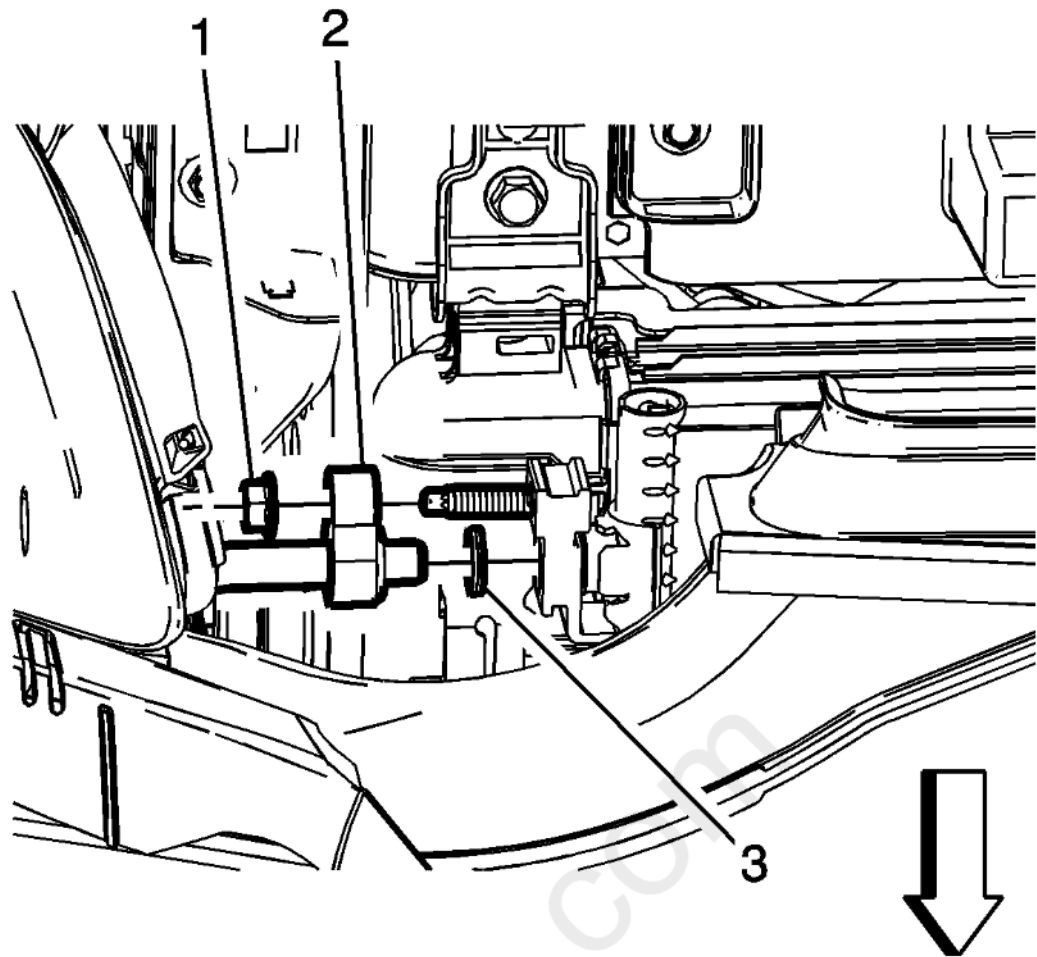


Fig. 20: Air Conditioning Compressor Hose Assembly Nut
Courtesy of GENERAL MOTORS COMPANY

9. Remove air conditioning compressor hose assembly nut (1) from the air conditioning condenser.
10. Remove air conditioning compressor hose assembly (2) from air conditioning condenser.
11. Remove and discard the old sealing washers (3) and replace with NEW sealing washers.
12. Remove air conditioning compressor hose assembly from the vehicle.
13. Transfer all required parts

Installation Procedure

NOTE: Install NEW air conditioning sealing washers to the air conditioning compressor hose assembly. Refer to **Air Conditioning System Seal Replacement**.

1. Install air conditioning compressor hose assembly into the vehicle.

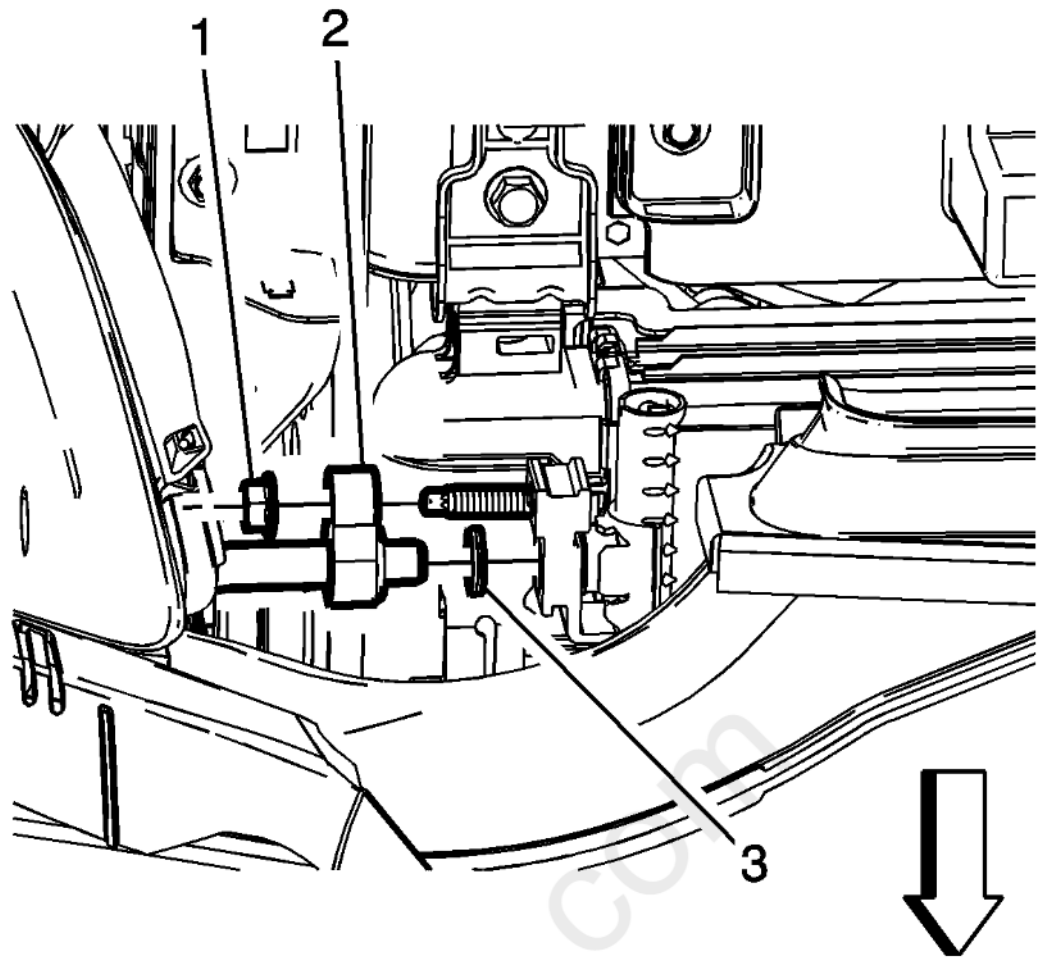


Fig. 21: Air Conditioning Compressor Hose Assembly Nut
Courtesy of GENERAL MOTORS COMPANY

2. Install NEW air conditioning sealing washer (3) to the air conditioning compressor hose assembly (2).
3. Install the air conditioning compressor hose assembly (2) to the air conditioning condenser assembly.

CAUTION: Refer to **Fastener Caution** .

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

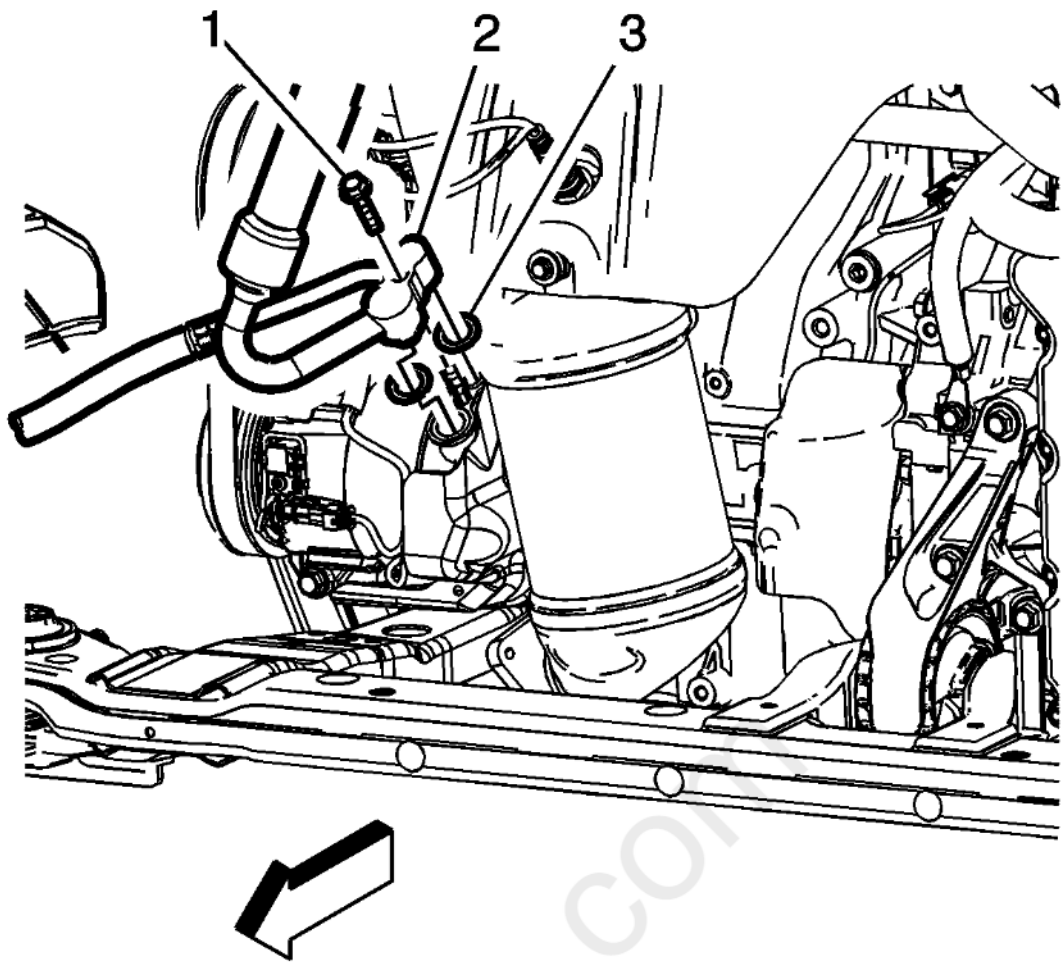


Fig. 22: Air Conditioning Compressor Hose Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Install NEW air conditioning sealing washers (3) to the air conditioning compressor hose assembly.
6. Install the air conditioning compressor hose assembly (2) to the air conditioning compressor assembly.
7. Install the air conditioning compressor hose assembly bolt (1) and tighten the bolt to 22 N.m (16 lb ft).

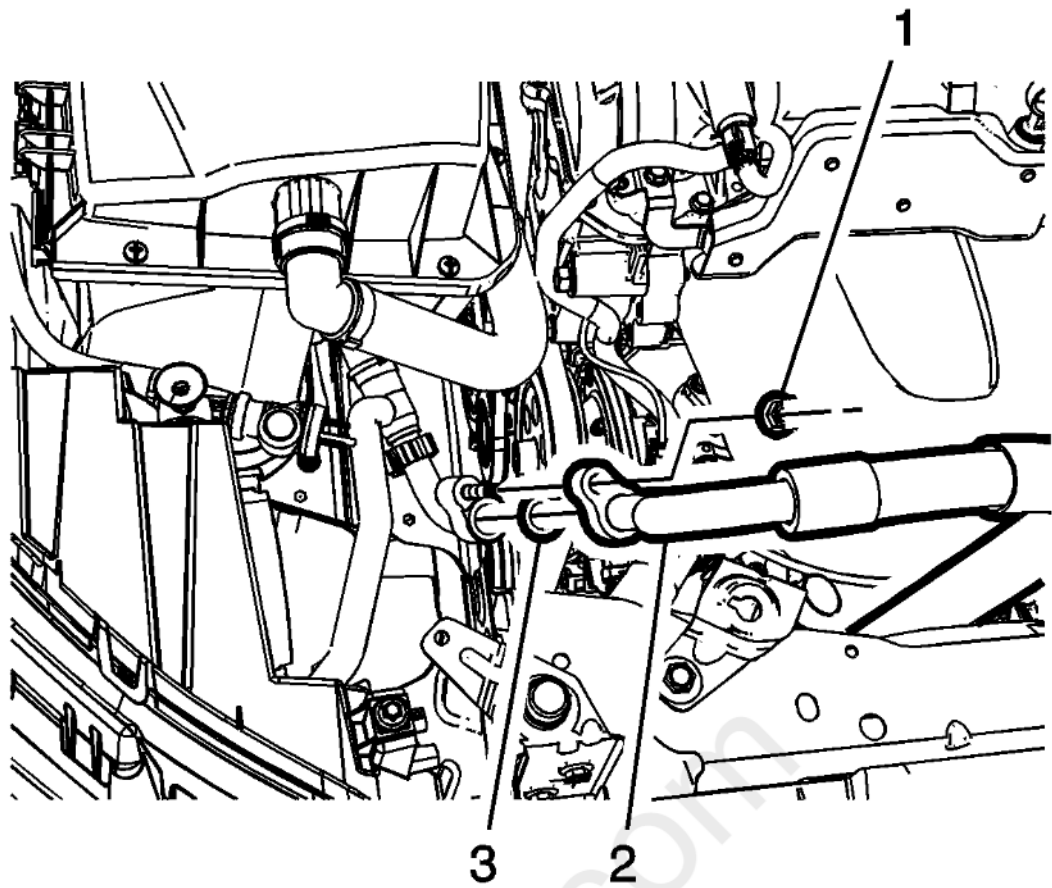


Fig. 23: Air Conditioning Compressor Hose Assembly, Nut & Washers
Courtesy of GENERAL MOTORS COMPANY

8. Install NEW air conditioning sealing washer (3) to the air conditioning compressor hose assembly (2).
9. Install the air conditioning compressor hose assembly (2) to the evaporator hose assembly.
10. Install the air compressor hose assembly nut (1) and tighten the nut to 22 N.m (16 lb ft).
11. Install the front bumper fascia assembly. Refer to [Front Bumper Fascia Replacement](#) .
12. Charge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).

AIR CONDITIONING EVAPORATOR HOSE ASSEMBLY REPLACEMENT (LFX)

Removal Procedure

1. Remove the front compartment front sight shield. Refer to [Front Compartment Front Sight Shield Replacement](#) .
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) .
3. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#) .
4. Recover the refrigerant from the air conditioning system. Refer to [Refrigerant Recovery and Recharging](#).
5. Remove the right front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#) .
6. Remove the right engine mount. Refer to [Engine Mount Replacement - Right Side](#) .

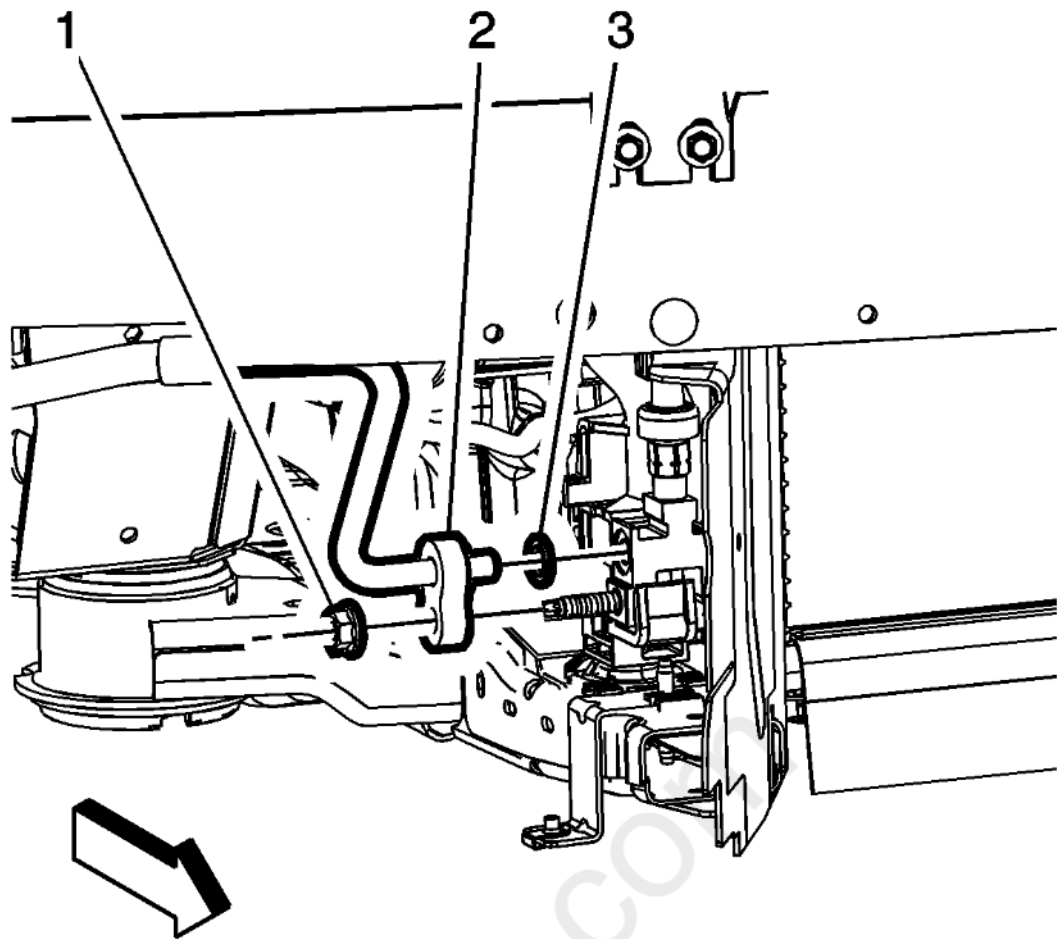


Fig. 24: A/C Evaporator Hose Assembly, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

7. Remove the air conditioning evaporator hose assembly nut (1) from the condenser.
8. Remove the air conditioning evaporator hose assembly (2) from the condenser.
9. Remove and discard the sealing washer (3).

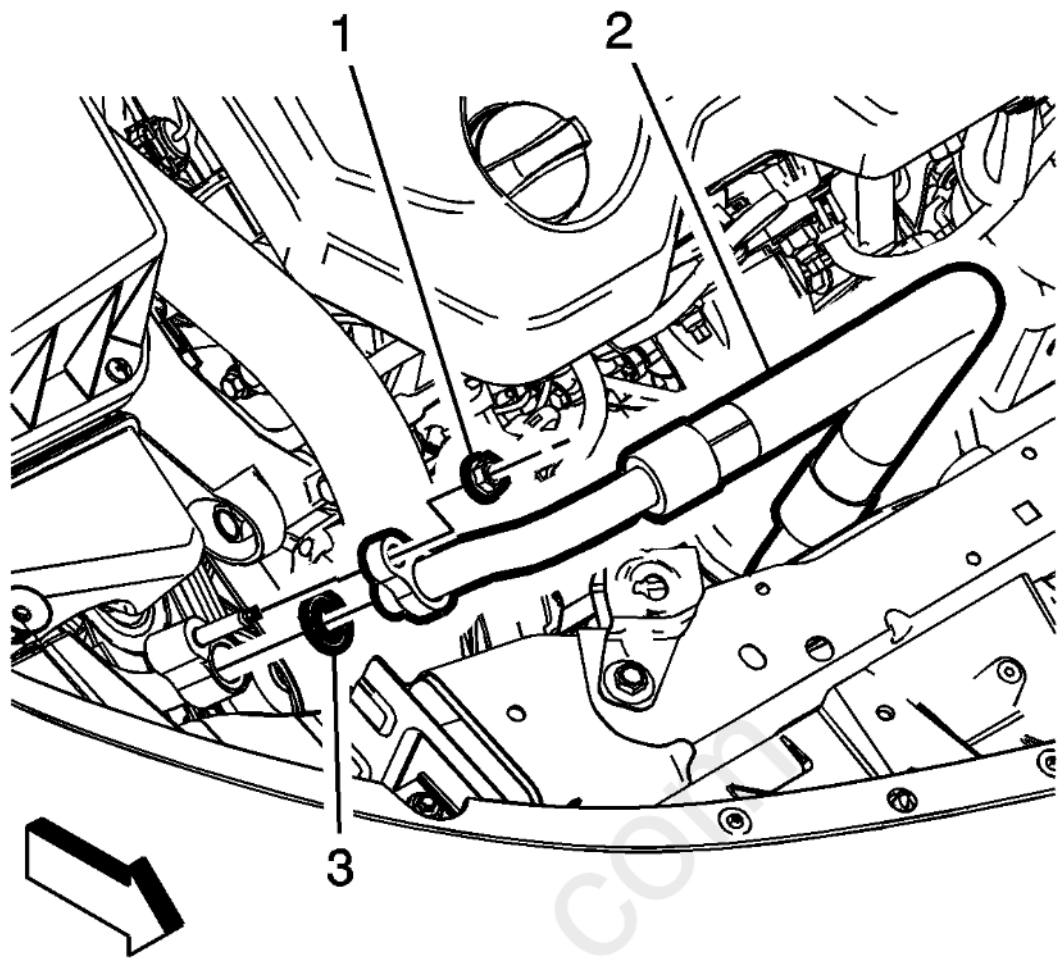


Fig. 25: A/C Compressor Hose, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

10. Remove the air conditioning compressor hose nut (1) from the air conditioning evaporator hose assembly. Refer to [**Air Conditioning Compressor Hose Replacement \(LFX\)**](#).
11. Remove the air conditioning compressor hose (2) from the air conditioning evaporator hose assembly.
12. Remove and discard the sealing washers (3).
13. Release the fuel feed front pipe from the retainer clips and reposition the pipe for access.
14. Release the power brake booster vacuum inlet pipe from the retainers on the dash panel and reposition access.

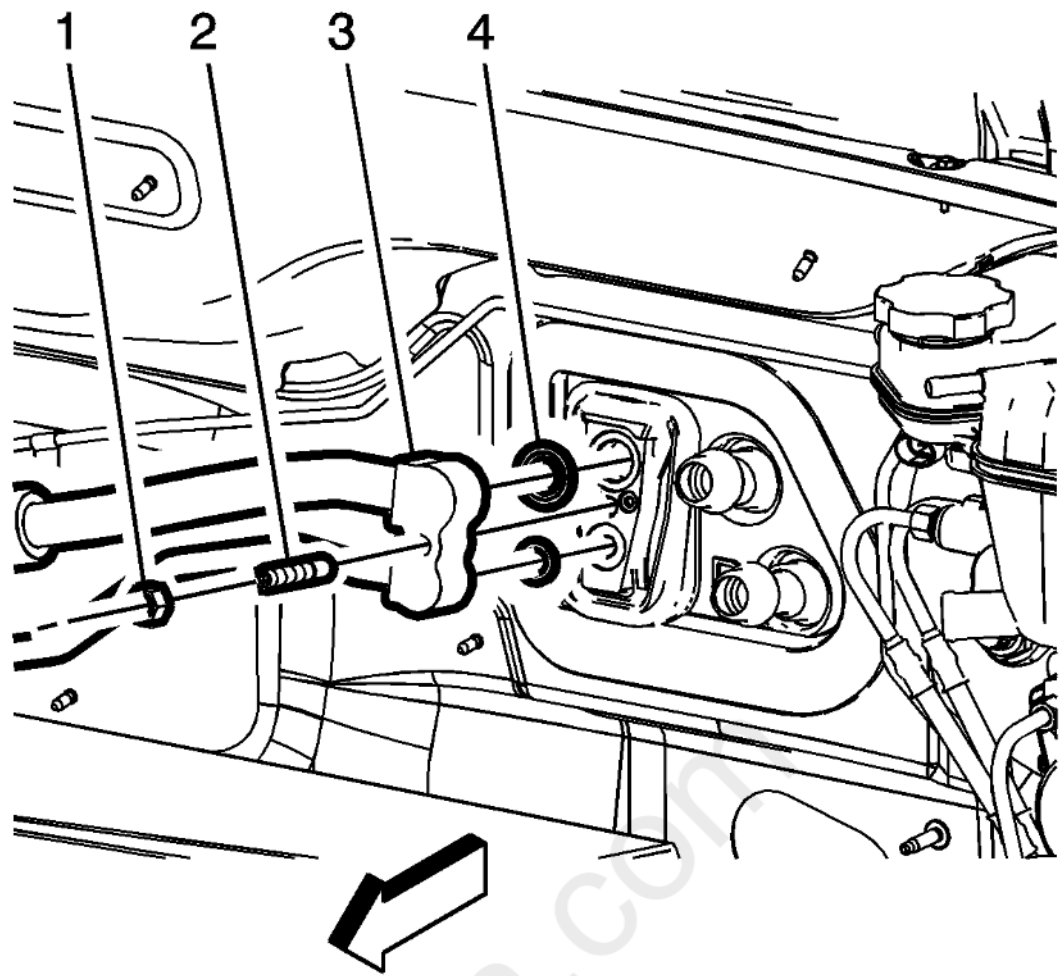


Fig. 26: A/C Evaporator Hose Assembly, Nut, Sealing Washers & Thermal Expansion Valve Stud
Courtesy of GENERAL MOTORS COMPANY

15. Remove the air conditioning evaporator hose assembly nut (1) from the air conditioning thermal expansion valve stud (2).
16. Remove the air conditioning thermal expansion valve stud (2) from the air conditioning thermal expansion valve.
17. Release the brake pipe retainer clips from the front of the dash panel and reposition the pipes for access.
18. Remove the air conditioning evaporator hose assembly (3) from the air conditioning thermal expansion valve.
19. Remove and discard the sealing washers (4).
20. Remove the air conditioning evaporator hose assembly (3) from the retainers.
21. Remove the air conditioning evaporator hose assembly (3) from the vehicle.

Installation Procedure

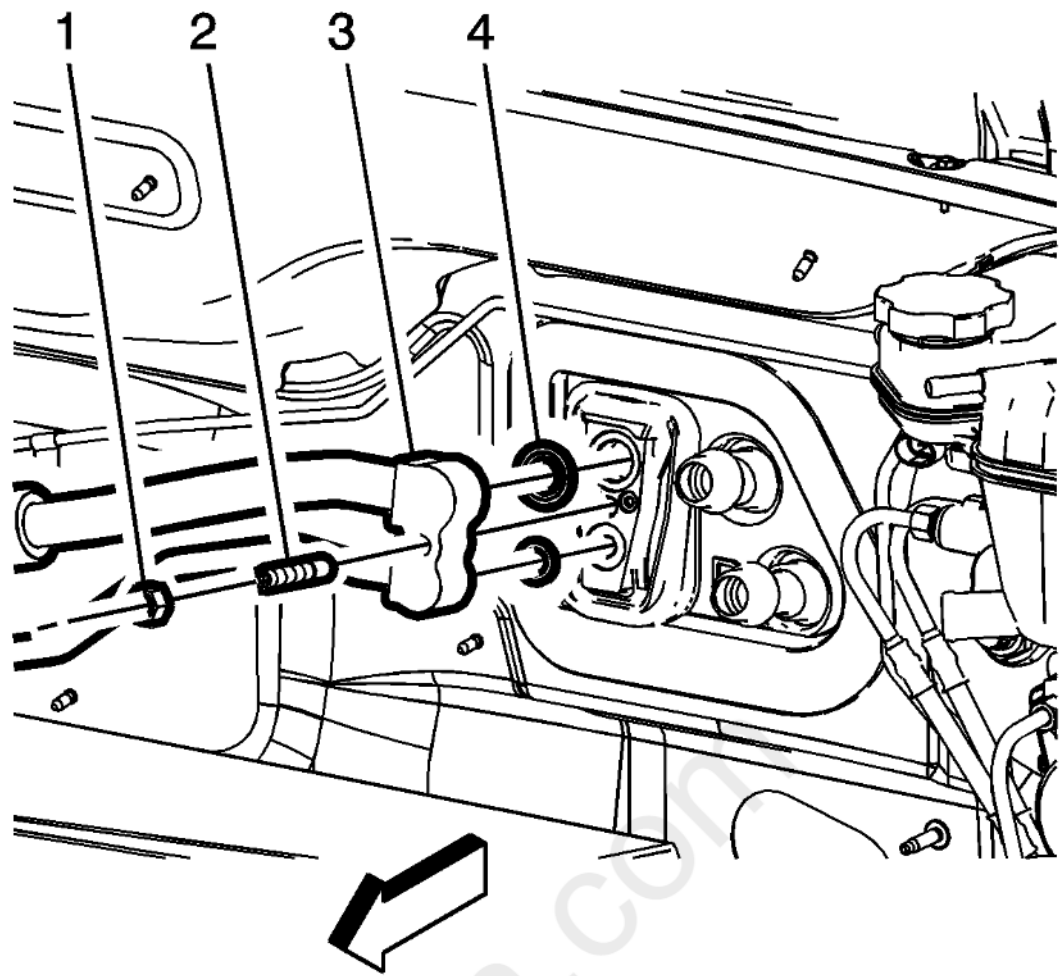


Fig. 27: A/C Evaporator Hose Assembly, Nut, Sealing Washers & Thermal Expansion Valve Stud
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW sealing washers (4) to the air conditioning evaporator hose assembly (3). Refer to [Air Conditioning System Seal Replacement](#).
2. Install the air conditioning evaporator hose assembly (3) to the vehicle.
3. Install the air conditioning evaporator hose assembly (3) to the retainers.
4. Install the air conditioning evaporator hose assembly (3) to the thermal expansion valve.

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

5. Install the air conditioning thermal expansion valve stud (2) to the air conditioning thermal expansion valve and tighten.
6. Install the air conditioning evaporator hose assembly nut (1) to the air conditioning thermal expansion valve stud (2) and tighten to 22 N.m (16 lb ft).
7. Install the brake pipe retainer clips to the front of the dash panel.

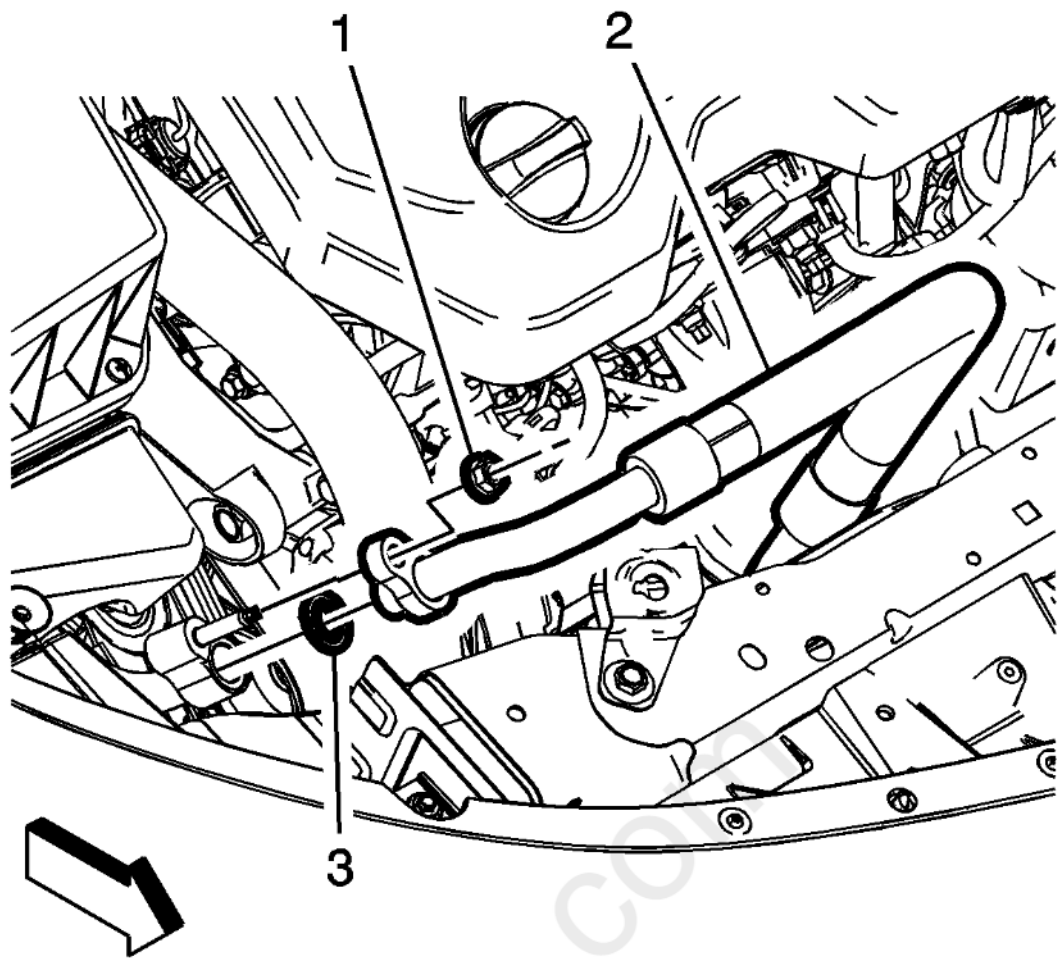


Fig. 28: A/C Compressor Hose, Nut & Sealing Washer

Courtesy of GENERAL MOTORS COMPANY

8. Install the air conditioning compressor hose nut (1) to the air conditioning evaporator hose assembly. Refer to [Air Conditioning Compressor Hose Replacement \(LFX\)](#).

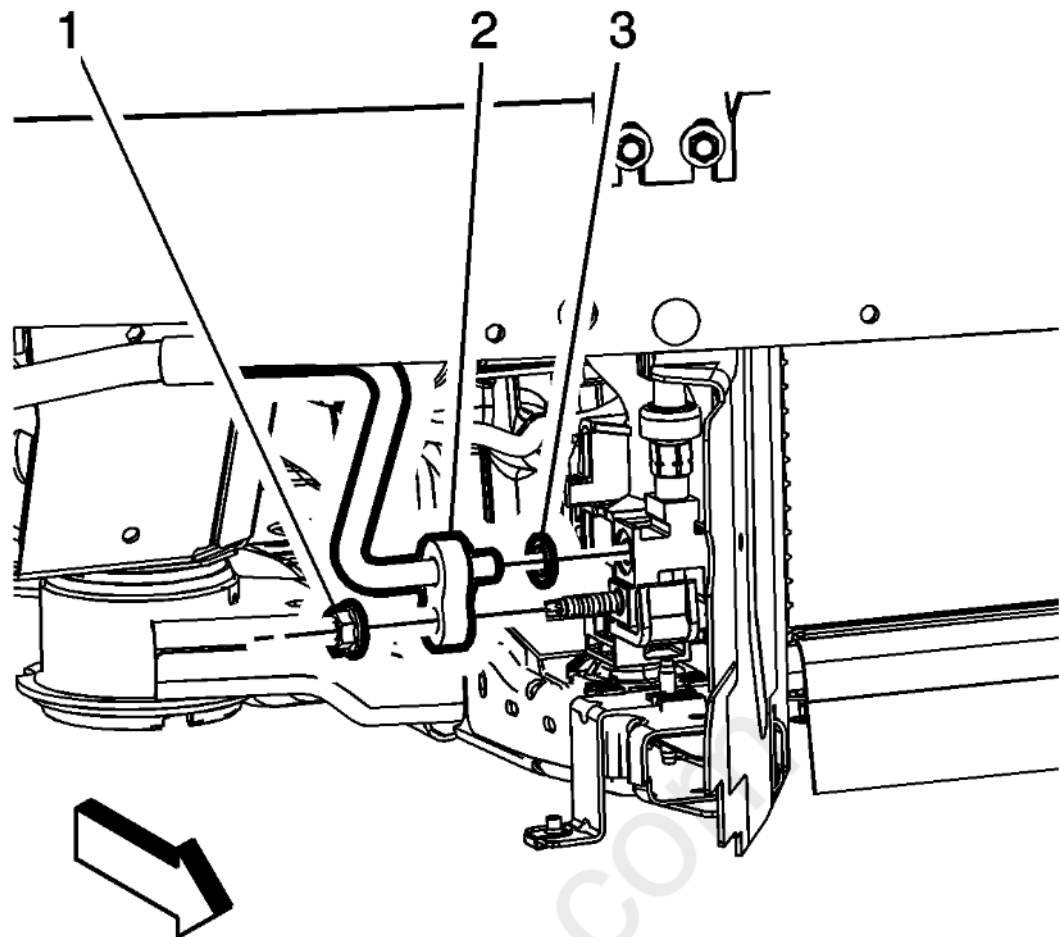


Fig. 29: A/C Evaporator Hose Assembly, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

9. Install the air conditioning evaporator hose assembly (2) to the condenser.
10. Install the air conditioning evaporator hose assembly nut (1) to the condenser and tighten to 22 N.m (16 lb ft).
11. Install the right engine mount. Refer to [Engine Mount Replacement - Right Side](#).
12. Install the right front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#).
13. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
14. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
15. Evacuate and charge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
16. Install the front compartment front sight shield. Refer to [Front Compartment Front Sight Shield Replacement](#).

AIR CONDITIONING EVAPORATOR HOSE ASSEMBLY REPLACEMENT (LCV)

Removal Procedure

1. Remove the front compartment front sight shield. Refer to [Front Compartment Front Sight Shield Replacement](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
3. Remove the air cleaner resonator and outlet duct. Refer to [Air Cleaner Resonator and Outlet Duct Replacement](#).
4. Recover the refrigerant from the air conditioning system. Refer to [Refrigerant Recovery and Recharging](#).
5. Remove the right front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#).
6. Remove the right engine mount. Refer to [Engine Mount Replacement](#).

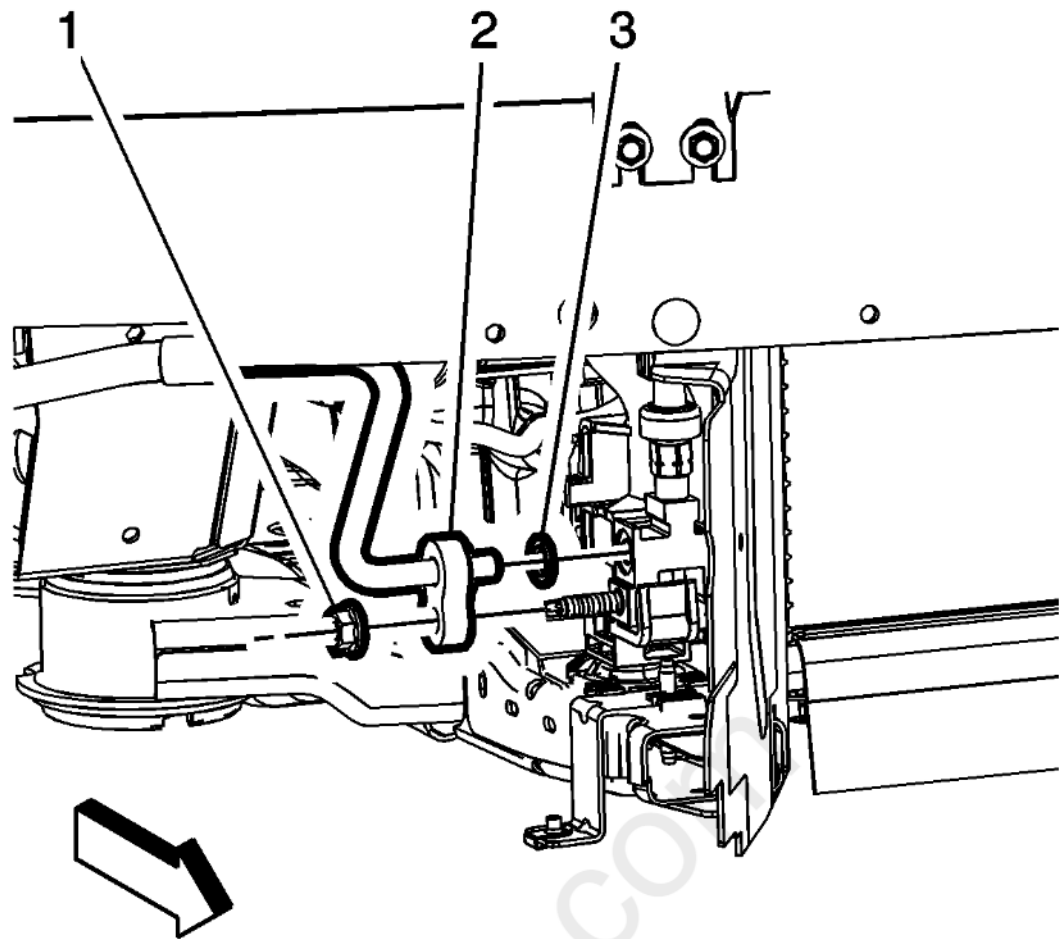


Fig. 30: A/C Evaporator Hose Assembly, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

7. Remove the air conditioning evaporator hose assembly nut (1) from the condenser.
8. Remove the air conditioning evaporator hose assembly (2) from the condenser.
9. Remove and discard the sealing washer (3).

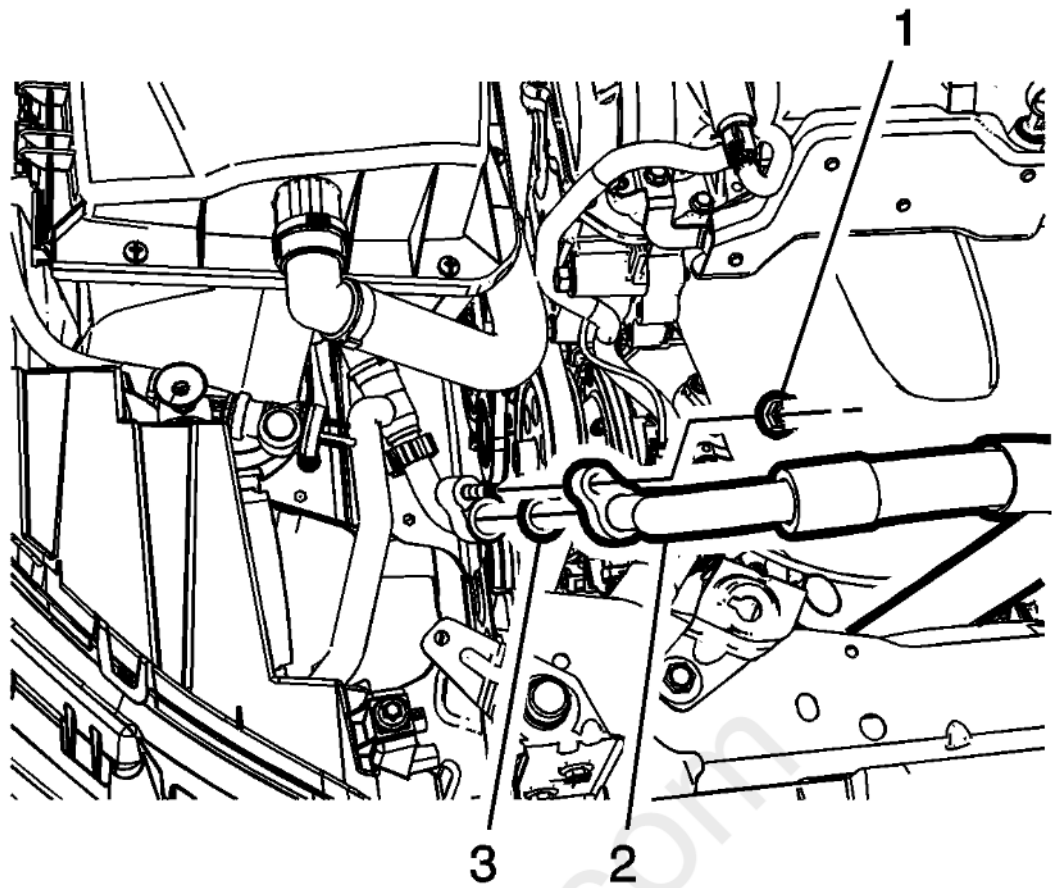


Fig. 31: Air Conditioning Compressor Hose Assembly, Nut & Washers
Courtesy of GENERAL MOTORS COMPANY

10. Remove the air conditioning compressor hose nut (1) from the air conditioning evaporator hose assembly. Refer to [Air Conditioning Compressor Hose Replacement \(LCV\)](#).
11. Remove the air conditioning compressor hose (2) from the air conditioning evaporator hose assembly.
12. Remove and discard the sealing washers (3).

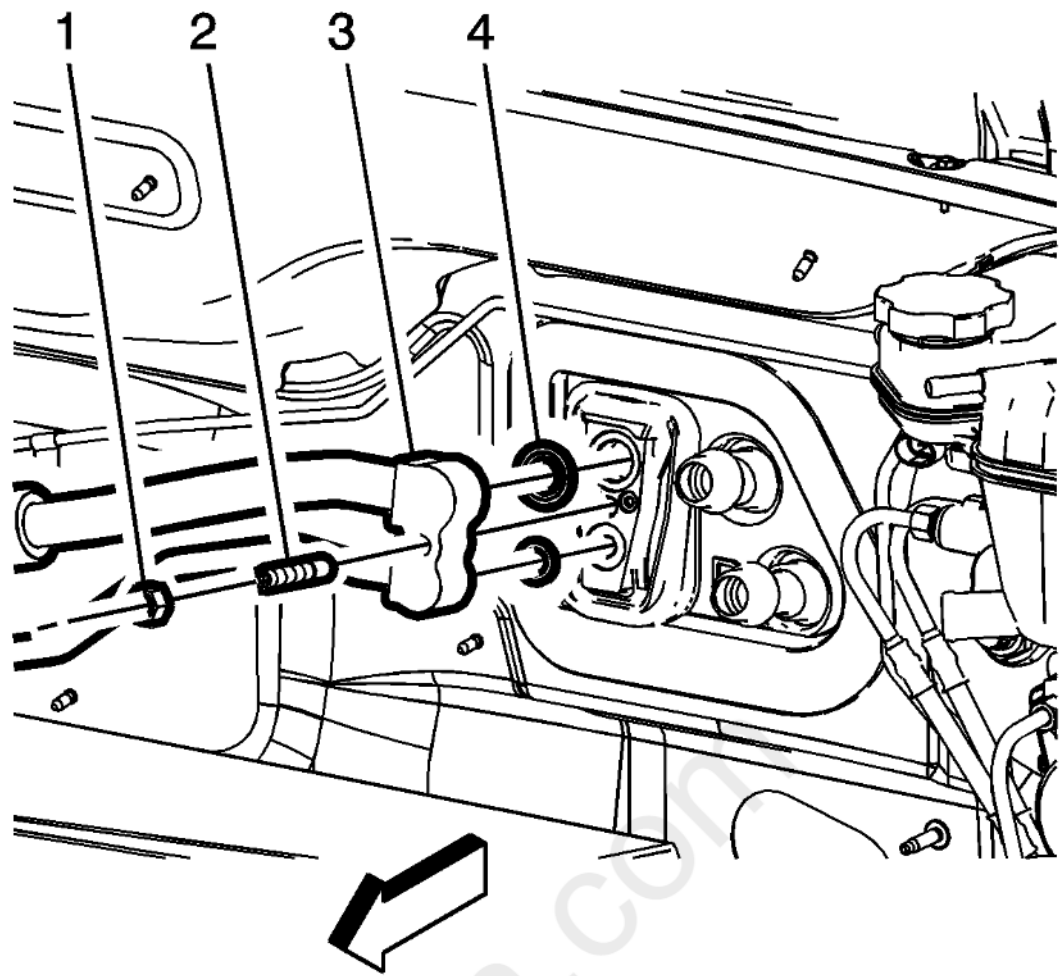


Fig. 32: A/C Evaporator Hose Assembly, Nut, Sealing Washers & Thermal Expansion Valve Stud
Courtesy of GENERAL MOTORS COMPANY

13. Remove the air conditioning evaporator hose assembly nut (1) from the air conditioning thermal expansion valve stud (2).
14. Remove the air conditioning thermal expansion valve stud (2) from the air conditioning thermal expansion valve.
15. Release the brake pipe retainer clips from the front of the dash panel and reposition the pipes for access.
16. Remove the air conditioning evaporator hose assembly (3) from the air conditioning thermal expansion valve.
17. Remove and discard the sealing washers (4).
18. Remove the air conditioning evaporator hose assembly (3) from the retainers.
19. Remove the air conditioning evaporator hose assembly (3) from the vehicle.

Installation Procedure

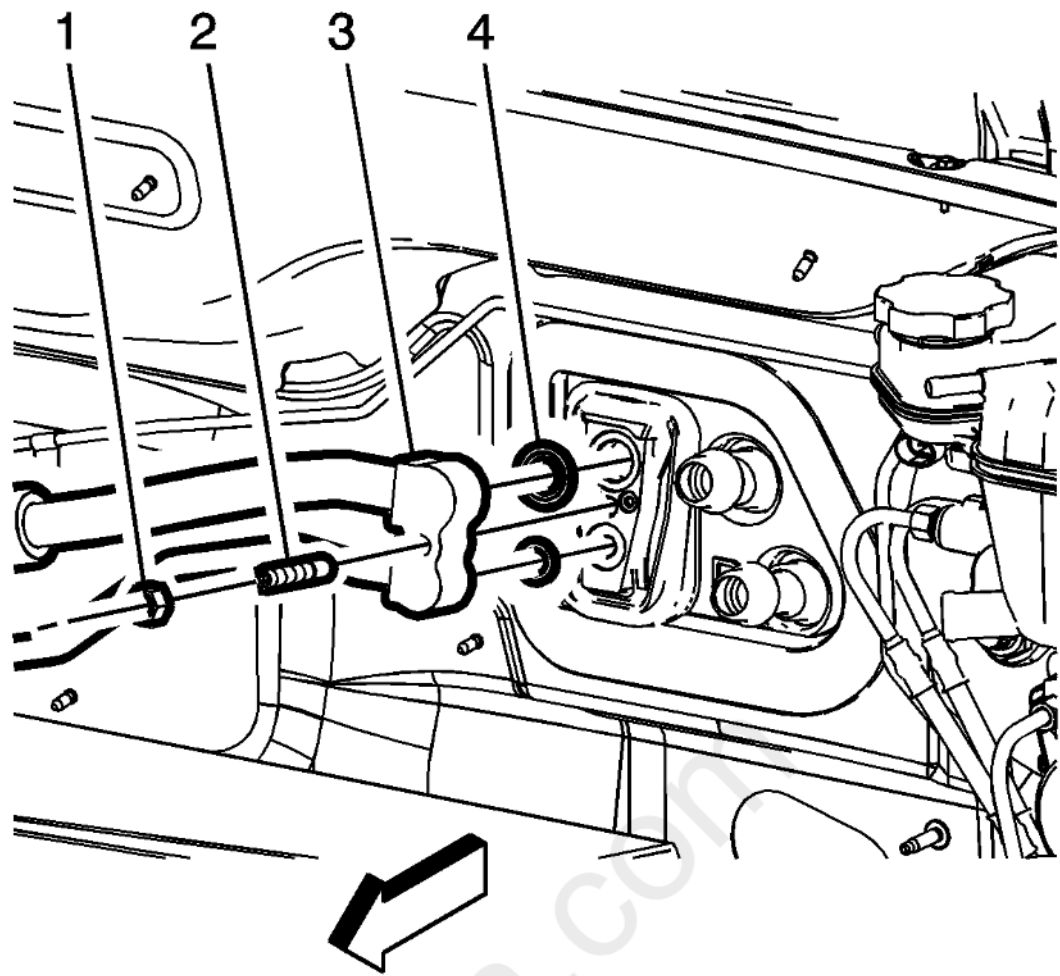


Fig. 33: A/C Evaporator Hose Assembly, Nut, Sealing Washers & Thermal Expansion Valve Stud
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW sealing washers (4) to the air conditioning evaporator hose assembly (3). Refer to [Air Conditioning System Seal Replacement](#).
2. Install the air conditioning evaporator hose assembly (3) to the vehicle.
3. Install the air conditioning evaporator hose assembly (3) to the retainers.
4. Install the air conditioning evaporator hose assembly (3) to the thermal expansion valve.

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

5. Install the air conditioning thermal expansion valve stud (2) to the air conditioning thermal expansion valve and tighten.
6. Install the air conditioning evaporator hose assembly nut (1) to the air conditioning thermal expansion valve stud (2) and tighten to 22 N.m (16 lb ft).
7. Install the brake pipe retainer clips to the front of the dash panel.

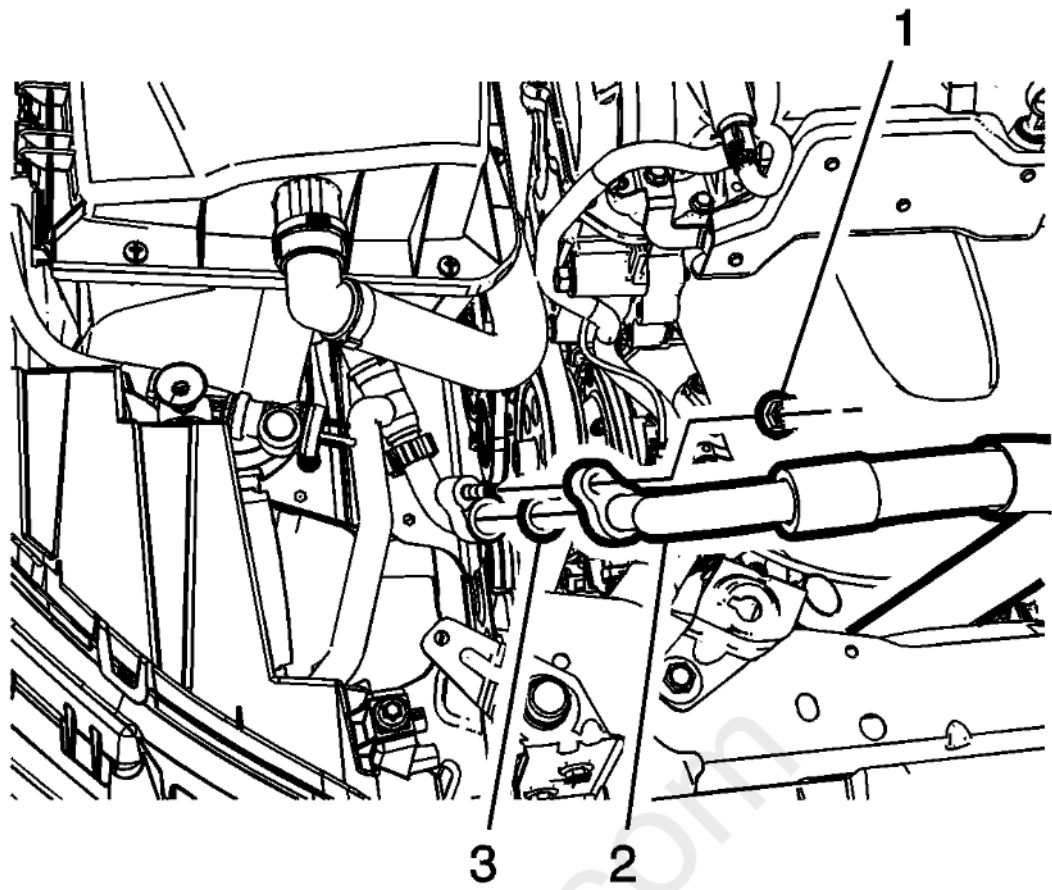


Fig. 34: Air Conditioning Compressor Hose Assembly, Nut & Washers
Courtesy of GENERAL MOTORS COMPANY

8. Install the air conditioning compressor hose nut (1) to the air conditioning evaporator hose assembly. Refer to **[Air Conditioning Compressor Hose Replacement \(LCV\)](#)**.

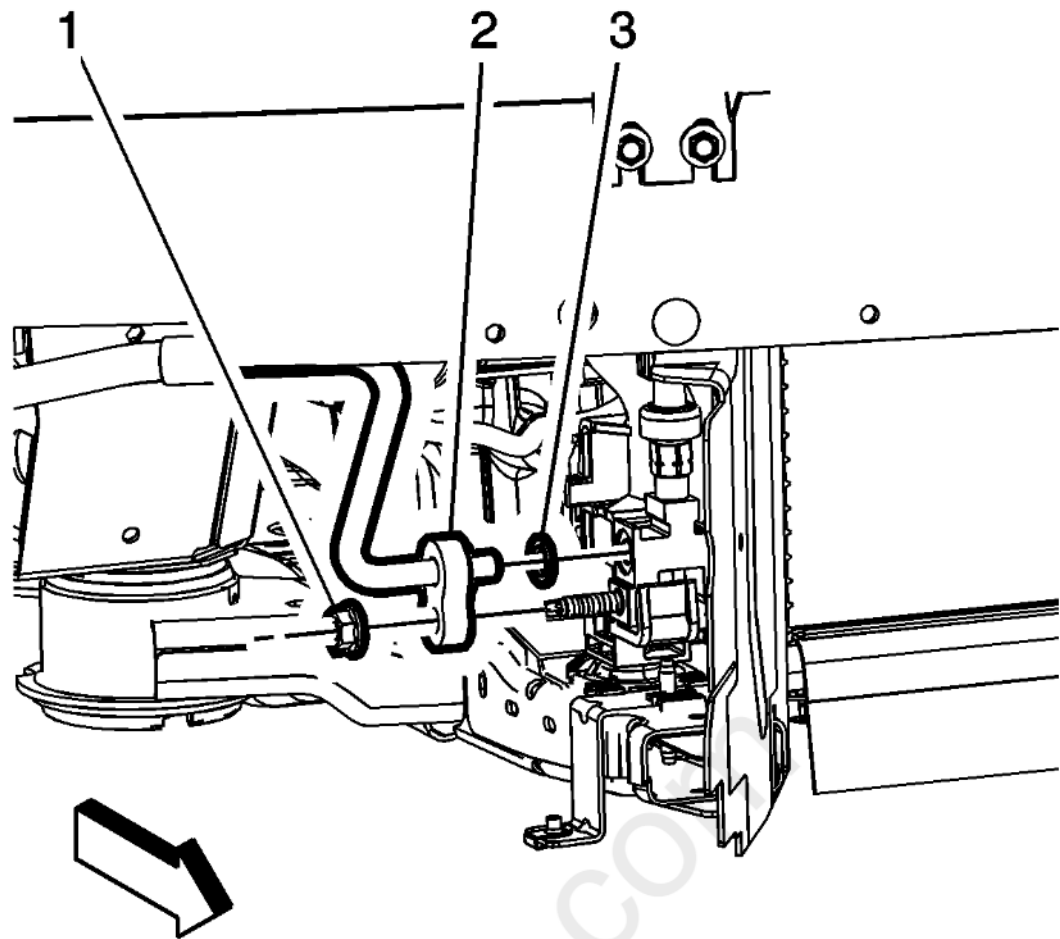


Fig. 35: A/C Evaporator Hose Assembly, Nut & Sealing Washer
Courtesy of GENERAL MOTORS COMPANY

9. Install the air conditioning evaporator hose assembly (2) to the condenser.
10. Install the air conditioning evaporator hose assembly nut (1) to the condenser and tighten to 22 N.m (16 lb ft).
11. Install the right engine mount. Refer to [Engine Mount Replacement](#) .
12. Install the right front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#) .
13. Install the air cleaner resonator and outlet duct. Refer to [Air Cleaner Resonator and Outlet Duct Replacement](#) .
14. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) .
15. Evacuate and charge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
16. Install the front compartment front sight shield. Refer to [Front Compartment Front Sight Shield Replacement](#) .

AIR CONDITIONING REFRIGERANT SERVICE VALVE CORE REPLACEMENT

Special Tools

- **GE 50078** Electronic Leak Detector
- **GE 46246** Valve Core Tool

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

Removal Procedure

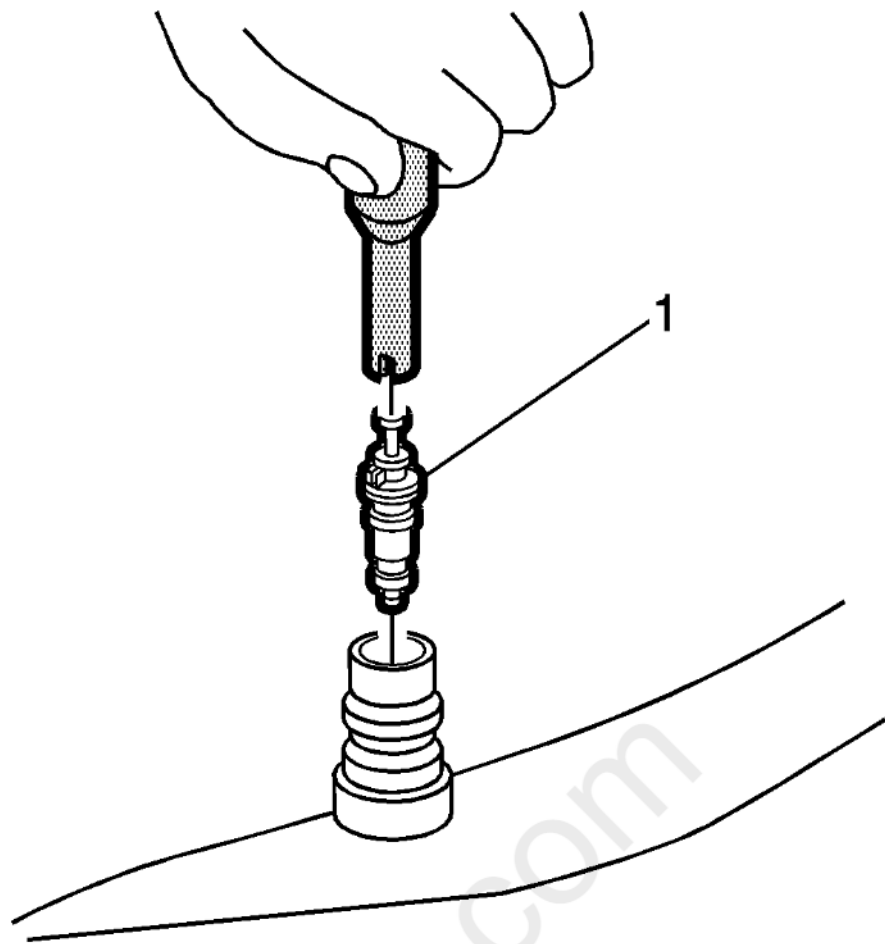


Fig. 36: Valve Core

Courtesy of GENERAL MOTORS COMPANY

1. Recover the refrigerant from the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
2. Using the **GE 46246** Valve Core Tool, remove the valve core (1) from the service port.

Installation Procedure

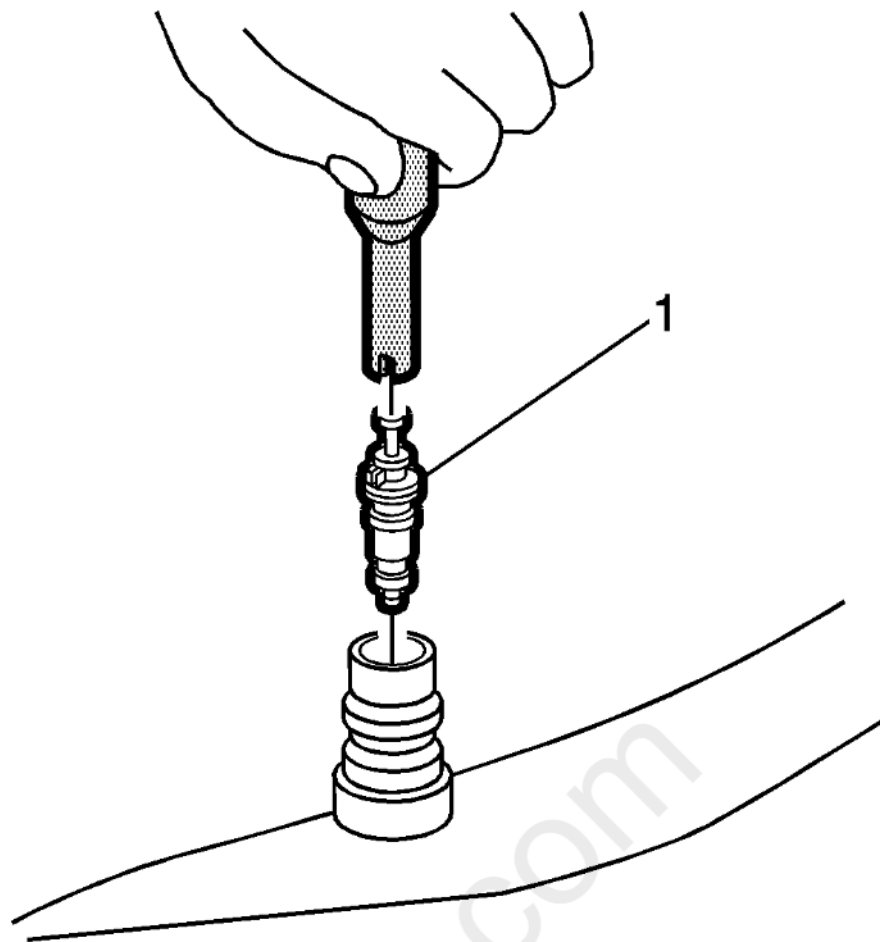


Fig. 37: Valve Core

Courtesy of GENERAL MOTORS COMPANY

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

1. Install the valve core (1) to the service port.
2. Using the **GE 46246** Valve Core Tool, tighten the valve core.
3. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
4. Leak test the fittings of the component using **GE 50078** Electronic Leak Detector.

RECEIVER AND DEHYDRATOR REPLACEMENT (LFX)

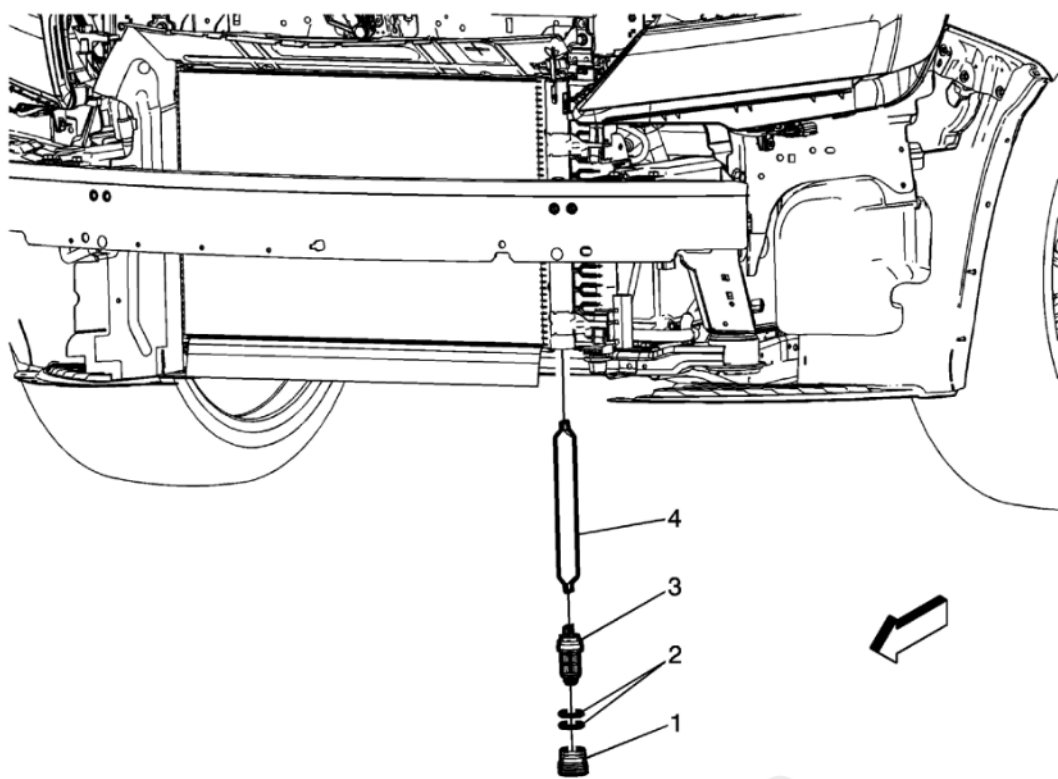


Fig. 38: A/C Refrigerant Desiccant, Filter, Receiver/Dehydrator O-Ring & Plug.(LFX)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant from the air conditioning system. Refer to Refrigerant Recovery and Recharging. 2. Support the left side of the condenser and radiator assembly with mechanics wire or equivalent. 3. Remove the left side member reinforcement. Refer to Side Member Reinforcement Replacement (NJ2).	
1	Receiver and Dehydrator Plug CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
2	Receiver and Dehydrator O-Ring (Qty: 2)
3	A/C Refrigerant Filter
4	A/C Refrigerant Desiccant

RECEIVER AND DEHYDRATOR REPLACEMENT (LCV)

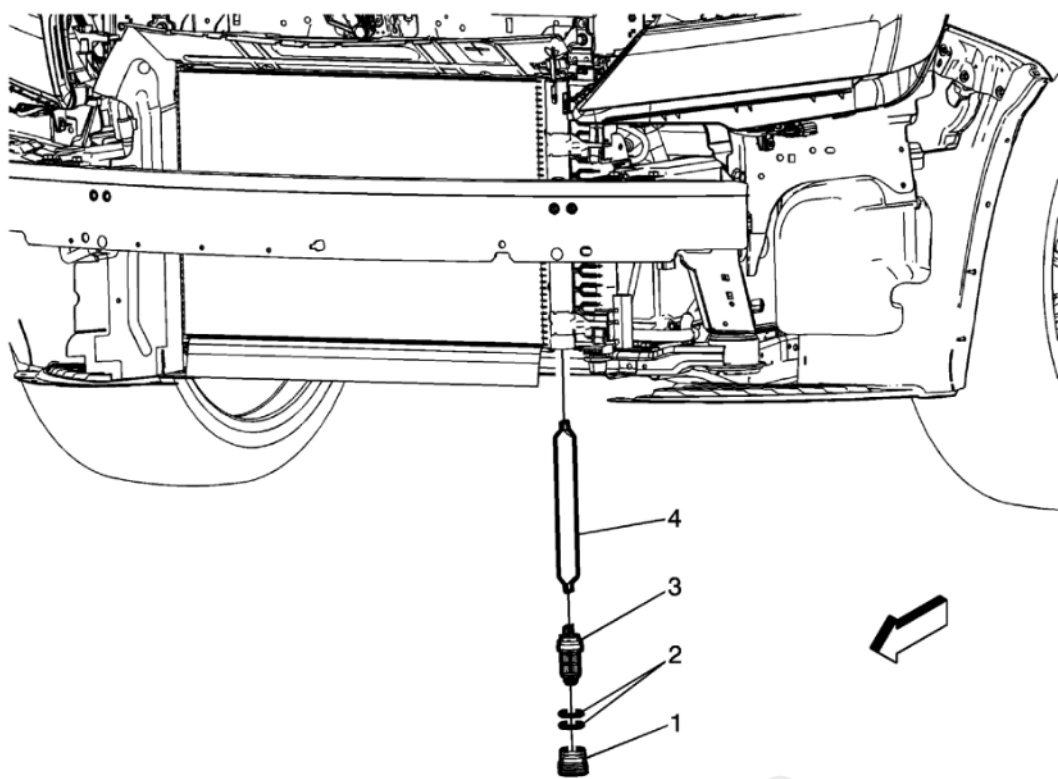


Fig. 39: A/C Refrigerant Desiccant, Filter, Receiver/Dehydrator O-Ring & Plug.(LCV)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant from the air conditioning system. Refer to Refrigerant Recovery and Recharging. 2. Support the left side of the condenser and radiator assembly with mechanics wire or equivalent. 3. Remove the left side lower radiator bracket. Refer to Radiator Lower Bracket Replacement (LCV).	
1	Receiver and Dehydrator Plug CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
2	Receiver and Dehydrator O-Ring (Qty: 2)
3	A/C Refrigerant Filter
4	A/C Refrigerant Desiccant

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

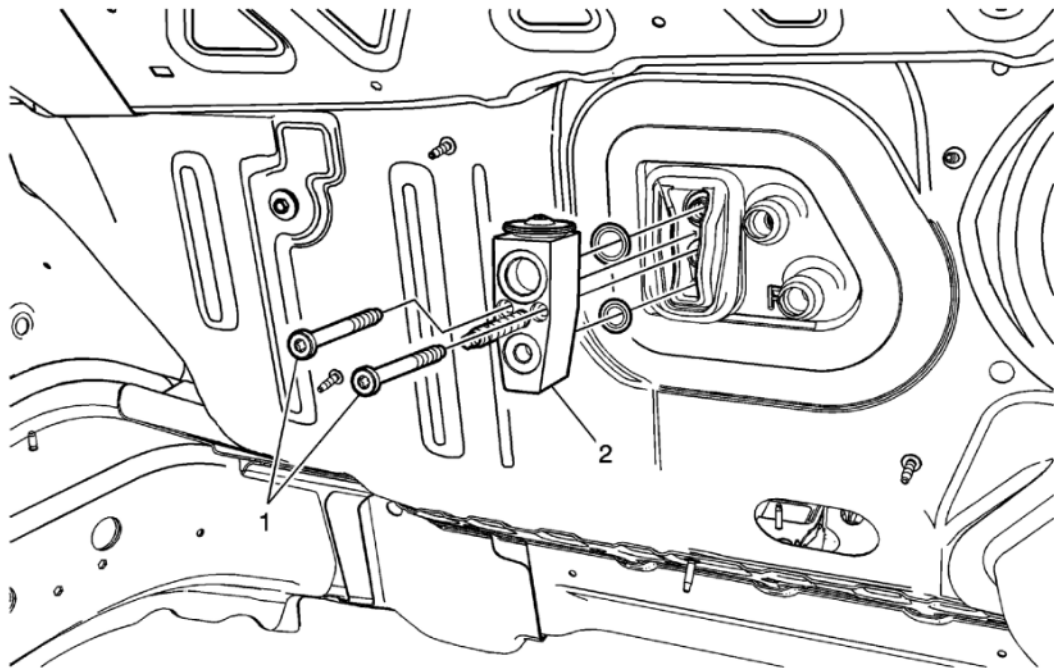


Fig. 40: Air Conditioning Evaporator Thermal Expansion Valve

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Remove the air conditioning evaporator hose assembly from the thermal expansion valve. Refer to Air Conditioning Evaporator Hose Assembly Replacement (LFX)Air Conditioning Evaporator Hose Assembly Replacement (LCV).	
1	Thermal Expansion Valve Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 6 N.m (53 lb in)
2	Thermal Expansion Valve NOTE: Remove and discard the sealing washers. Refer to Air Conditioning System Seal Replacement .

AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR REPLACEMENT

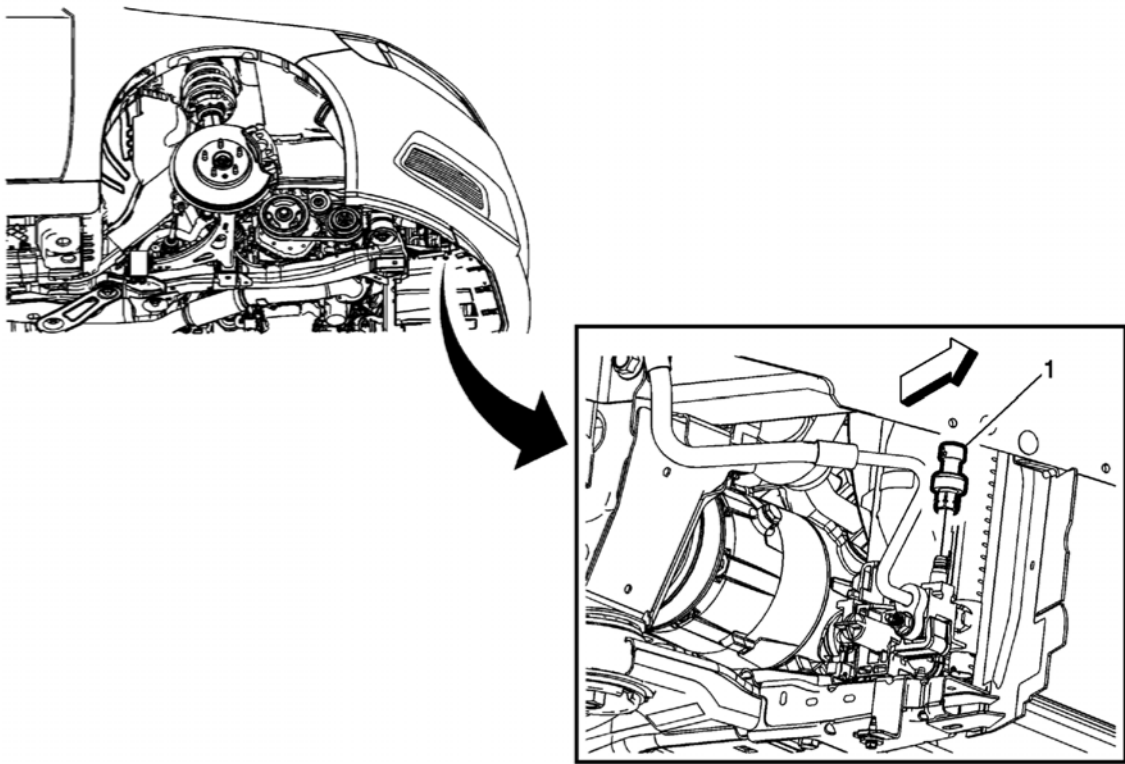


Fig. 41: A/C Refrigerant Pressure Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Reposition the right front wheelhouse liner enough to gain access to the air conditioning refrigerant pressure sensor. Refer to Front Wheelhouse Liner Replacement . 2. Disconnect the electrical connector from the pressure sensor.	
1	Air Conditioning Refrigerant Pressure Sensor CAUTION: Refer to Fastener Caution . Tighten 6 N.m (4 lb ft) NOTE: Remove and discard the O-ring and replace with NEW only. Refer to Air Conditioning O-Ring Seal Replacement .

AIR CONDITIONING CONDENSER REPLACEMENT

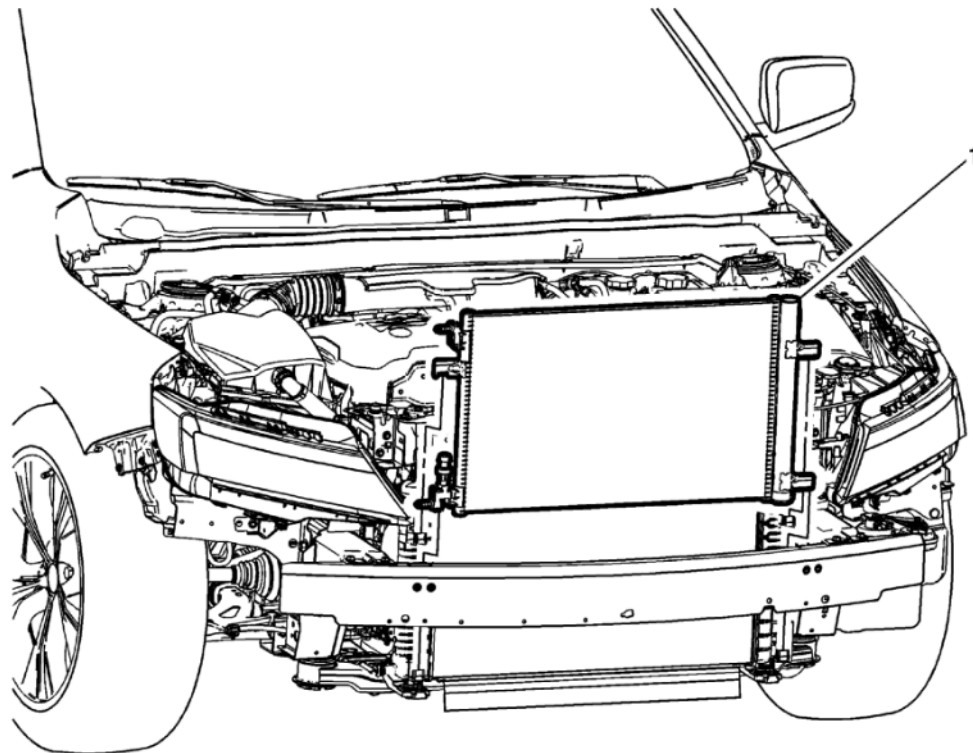


Fig. 42: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement. 3. Remove the radiator air upper baffle and deflector. Refer to Radiator Air Upper Baffle and Deflector Replacement (LFX) Radiator Air Upper Baffle and Deflector Replacement (LCV). 4. Remove the left and right radiator air side baffle and deflectors. Refer to Radiator Air Side Baffle and Deflector Replacement (Left) Radiator Air Side Baffle and Deflector Replacement (Right). 5. Remove the air conditioning compressor hose from the condenser. Refer to Air Conditioning Compressor Hose Replacement (LFX) Air Conditioning Compressor Hose Replacement (LCV). 6. Remove the air conditioning evaporator hose. Refer to Air Conditioning Evaporator Hose Assembly Replacement (LFX) Air Conditioning Evaporator Hose Assembly Replacement (LCV).	
1	Air Conditioning Condenser Procedure 1. Disconnect the refrigerant pressure sensor electrical connector. 2. Lift the condenser off the retainers on the radiator.

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REMOVAL AND INSTALLATION

Removal Procedure

1. Disconnect the negative battery cable. [Battery Negative Cable Disconnection and Connection](#)
2. Recover the refrigerant system. [Refrigerant Recovery and Recharging](#)
3. Drain the engine coolant system. [Cooling System Draining and Filling \(Vacuum and Fill\)](#) [Cooling System Draining and Filling \(Static\)](#)
4. Remove the heater inlet hose from the heater core tube. [Heater Inlet Hose Replacement \(LFX\)](#) [Heater Inlet Hose Replacement \(LCV\)](#)

5. Remove the heater outlet hose from the heater core tube. [Heater Outlet Hose Replacement \(LFX\)Heater Outlet Hose Replacement \(LCV\)Heater Outlet Hose Replacement \(LCV Heater Outlet Pipe to Auxiliary Water Pump\)](#)
6. Remove the thermal expansion valve stud, and the evaporator hose assembly from the thermal expansion valve. [Air Conditioning Evaporator Hose Assembly Replacement \(LFX\)Air Conditioning Evaporator Hose Assembly Replacement \(LCV\)](#)
7. Remove the instrument panel tie bar assembly. [Instrument Panel Tie Bar Replacement](#)

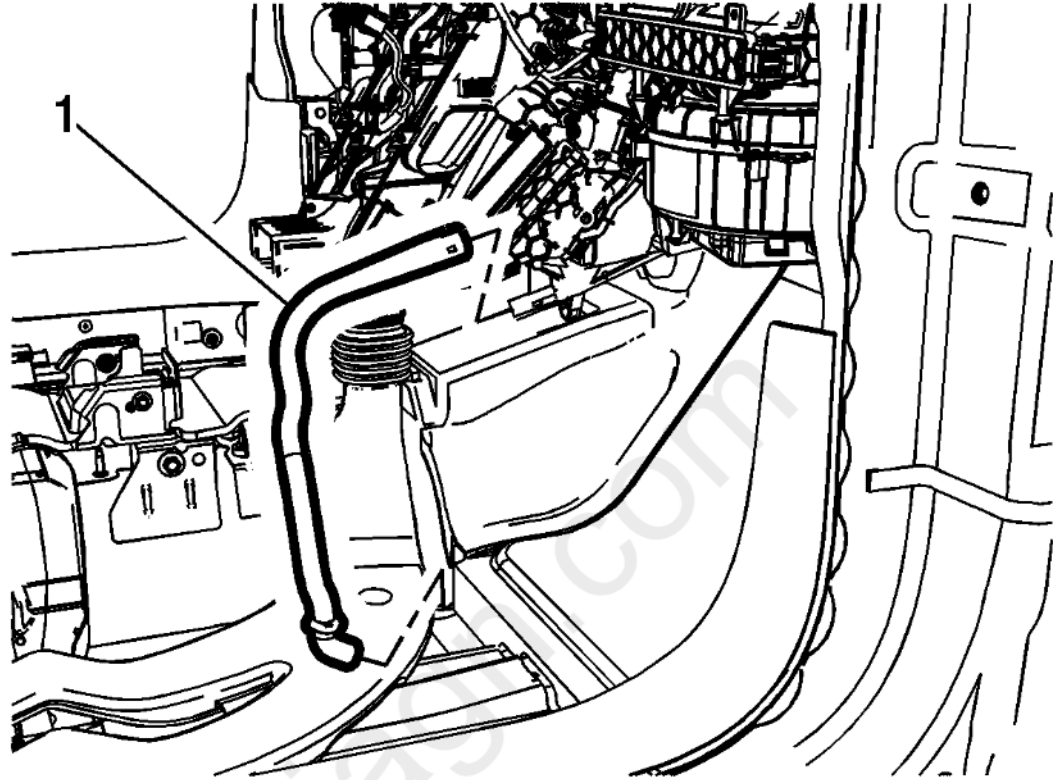


Fig. 43: HVAC Module Assembly Drain Tube
Courtesy of GENERAL MOTORS COMPANY

8. Remove the Heating Ventilation and Air Conditioning (HVAC) module assembly drain tube (1) from the HVAC module assembly.

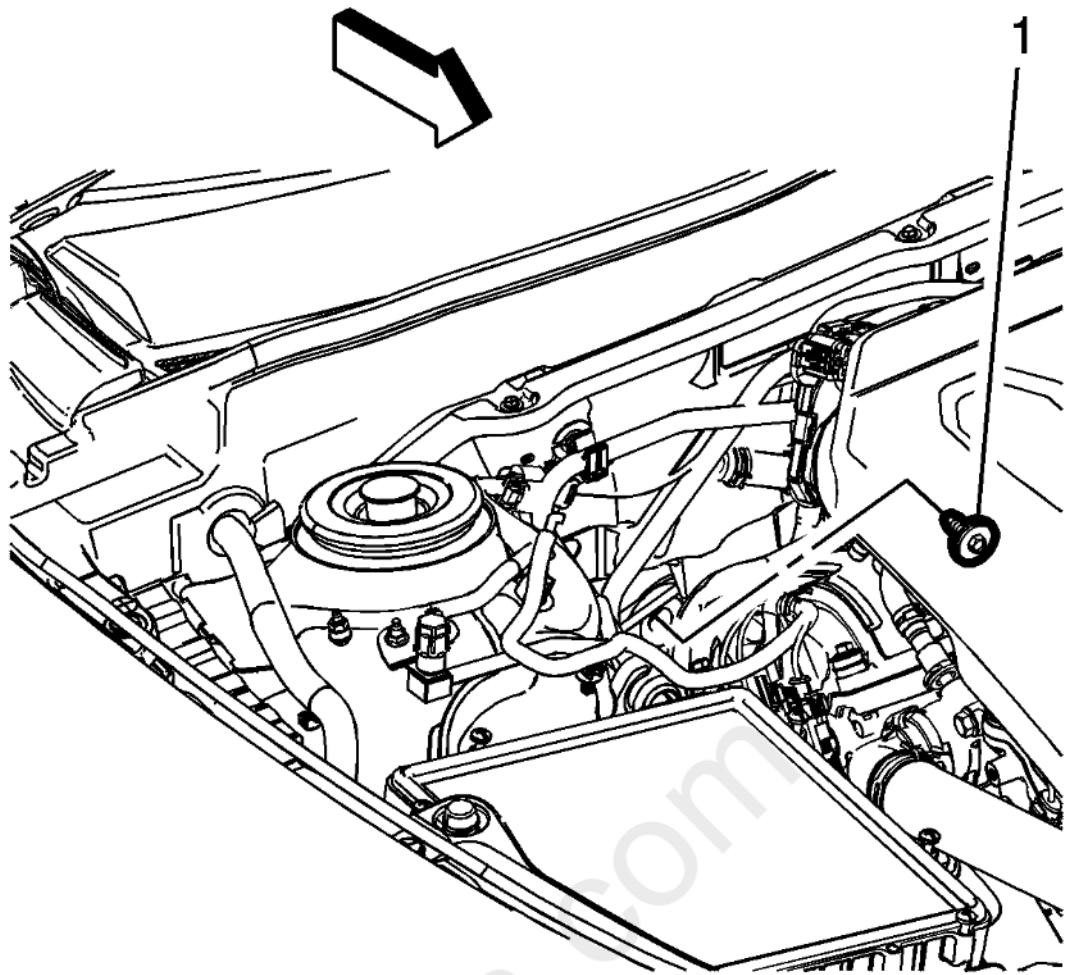


Fig. 44: HVAC Module Assembly Bolt

Courtesy of GENERAL MOTORS COMPANY

9. From within the engine compartment, remove the HVAC module assembly bolt, (1) securing the HVAC module assembly to the cowl panel.

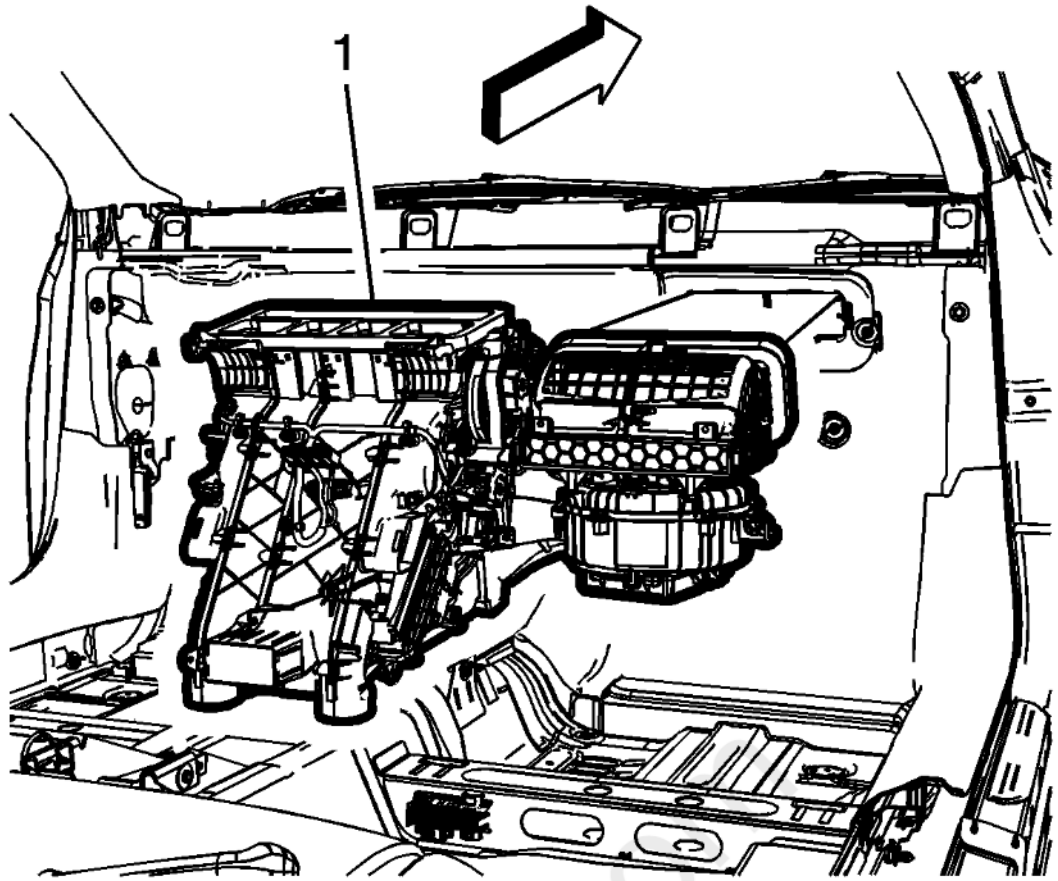


Fig. 45: HVAC Module Assembly

Courtesy of GENERAL MOTORS COMPANY

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

10. Remove the HVAC module assembly (1) from the vehicle.
11. Transfer all necessary components.

Installation Procedure

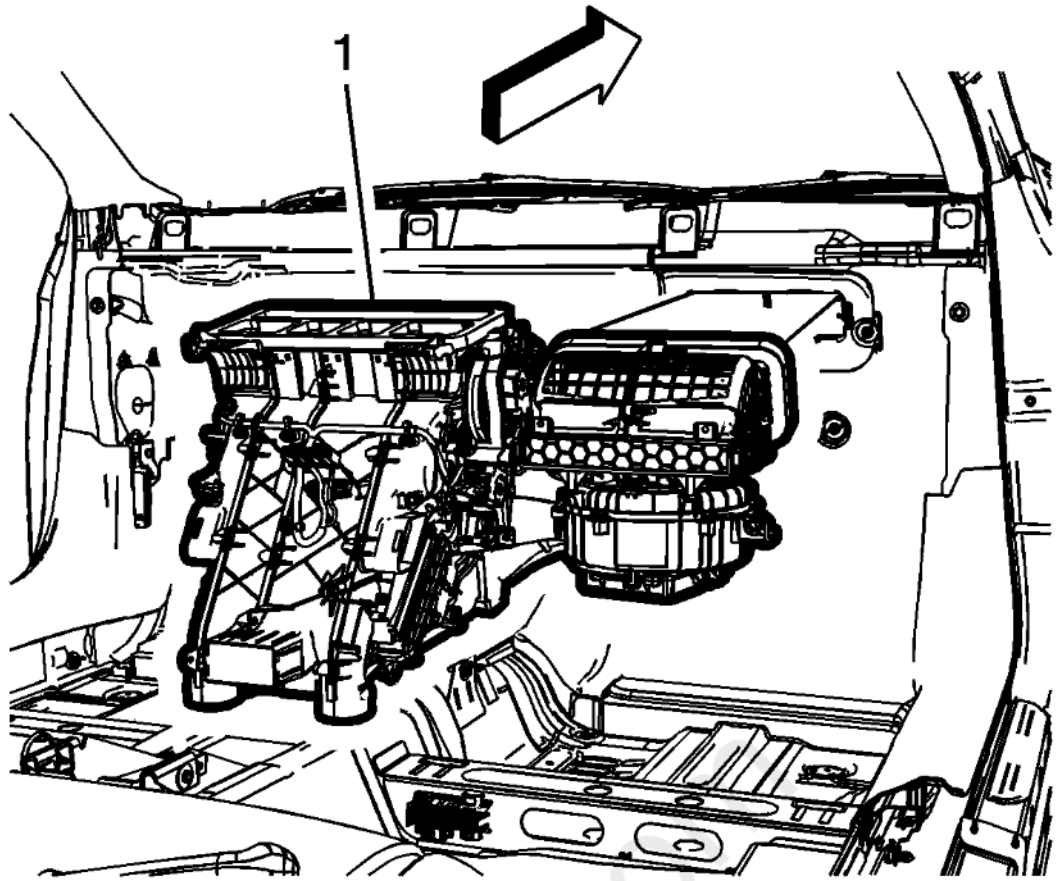


Fig. 46: HVAC Module Assembly

Courtesy of GENERAL MOTORS COMPANY

1. Position the HVAC module assembly (1) into the vehicle and temporarily support it.

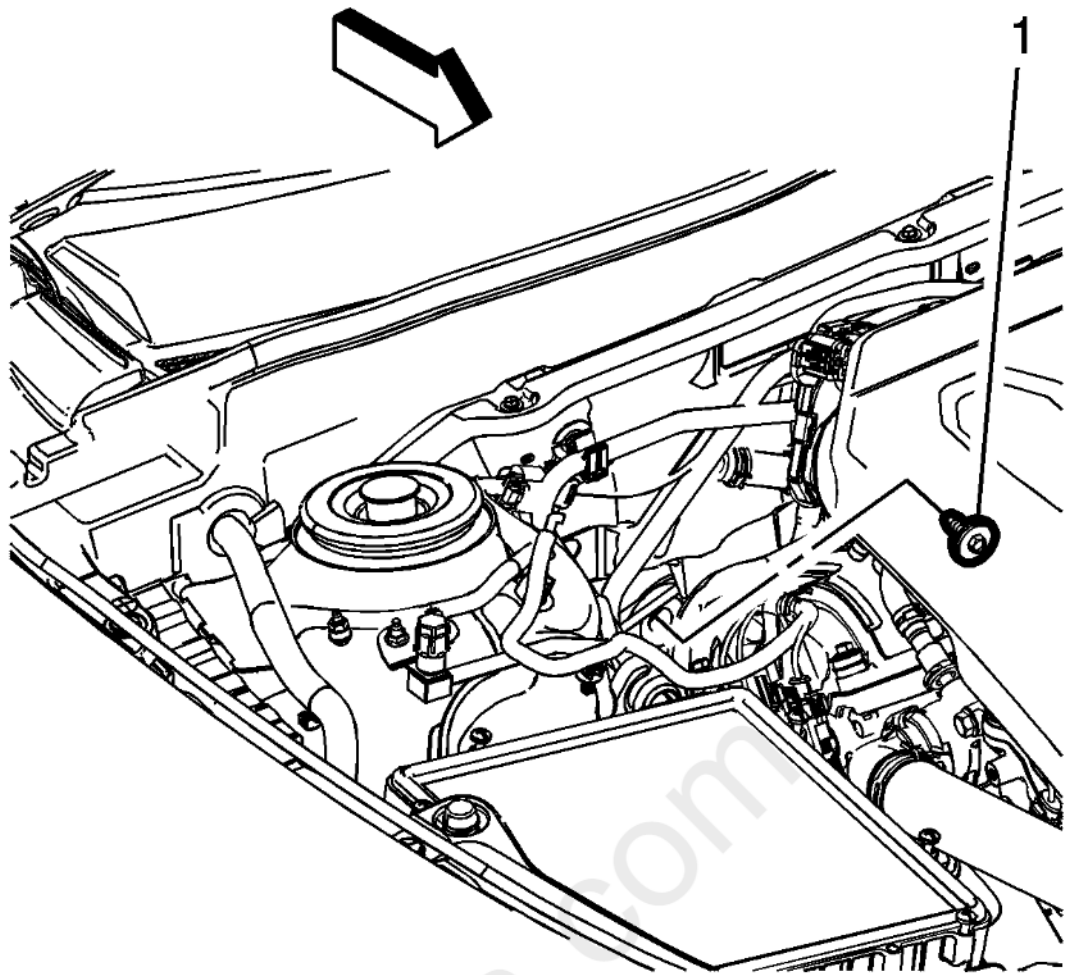


Fig. 47: HVAC Module Assembly Bolt

Courtesy of GENERAL MOTORS COMPANY

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

2. From within the engine compartment, install the HVAC module assembly bolt (1) securing the HVAC module assembly to the cowl panel, and tighten to 6 N.m (53 lb in).

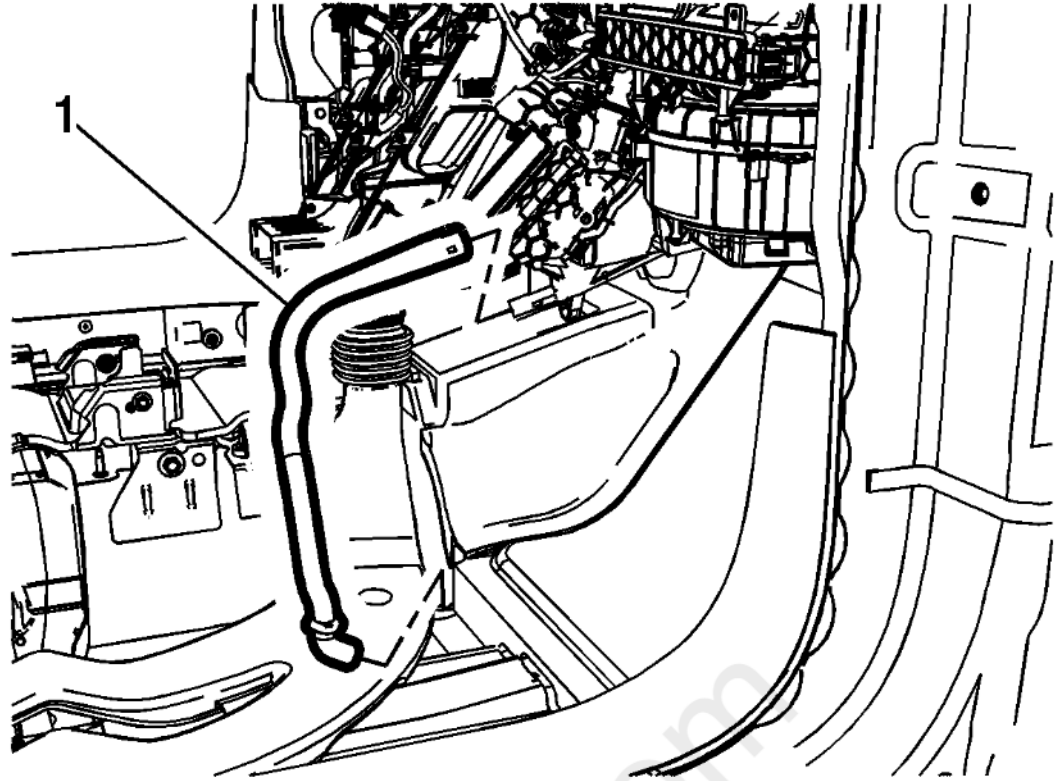


Fig. 48: HVAC Module Assembly Drain Tube
Courtesy of GENERAL MOTORS COMPANY

3. Install the HVAC module assembly drain tube (1) to the HVAC module assembly.
4. Install the instrument panel tie bar assembly. [Instrument Panel Tie Bar Replacement](#)
5. Install the evaporator hose assembly, and the thermal expansion valve stud to the thermal expansion valve. [Air Conditioning Evaporator Hose Assembly Replacement \(LFX\)](#)[Air Conditioning Evaporator Hose Assembly Replacement \(LCV\)](#)
6. Install the heater outlet hose to the heater core tube. [Heater Outlet Hose Replacement \(LFX\)](#)[Heater Outlet Hose Replacement \(LCV\)](#)[Heater Outlet Hose Replacement \(LCV Heater Outlet Pipe to Auxiliary Water Pump\)](#)
7. Install the heater inlet hose to the heater core tube. [Heater Inlet Hose Replacement \(LFX\)](#)[Heater Inlet Hose Replacement \(LCV\)](#)
8. Fill the engine coolant system. [Cooling System Draining and Filling \(Vacuum and Fill\)](#) [Cooling System Draining and Filling \(Static\)](#)
9. Recharge the refrigerant system. [Refrigerant Recovery and Recharging](#)
10. Connect the negative battery cable. [Battery Negative Cable Disconnection and Connection](#)
11. Visually inspect for coolant leaks.
12. Visually inspect for refrigerant leaks.

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER UPPER CASE REPLACEMENT

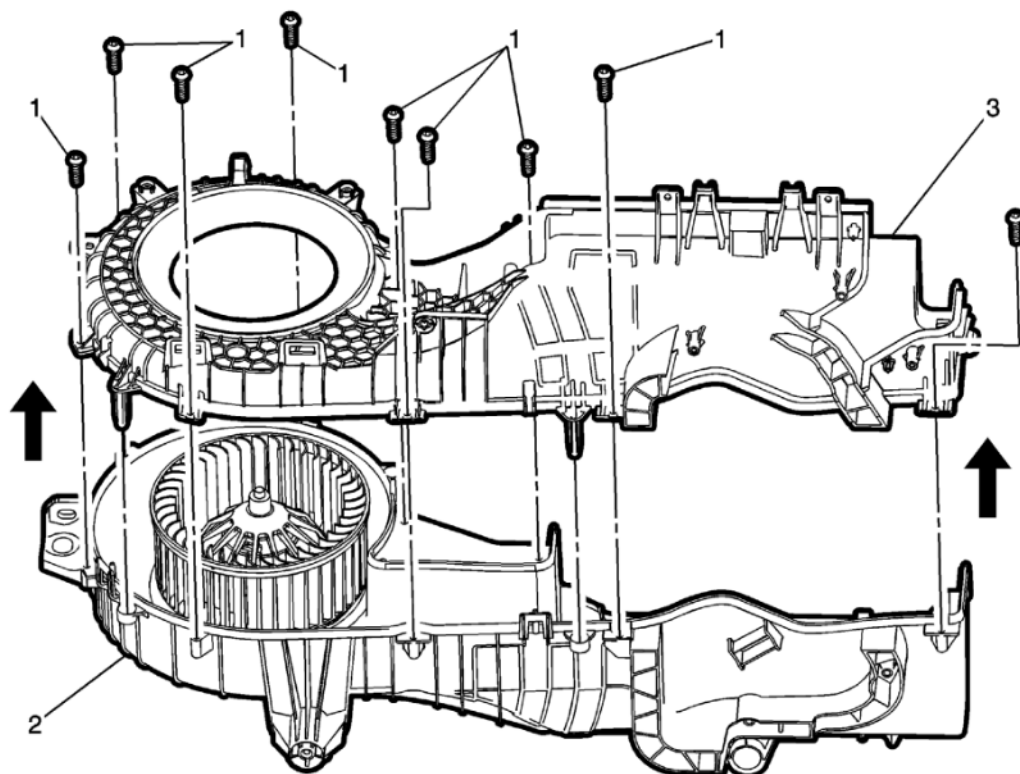


Fig. 49: HVAC Evaporator & Blower Upper Case Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Air Conditioning Evaporator Replacement</u>	
1	Heater and Air Conditioning Evaporator and Blower Case Bolt (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.2 N.m (11 lb in)
2	Heater and Air Conditioning Evaporator and Blower Lower Case
3	Heater and Air Conditioning Evaporator and Blower Upper Case Procedure Transfer components as necessary.

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER LOWER CASE REPLACEMENT

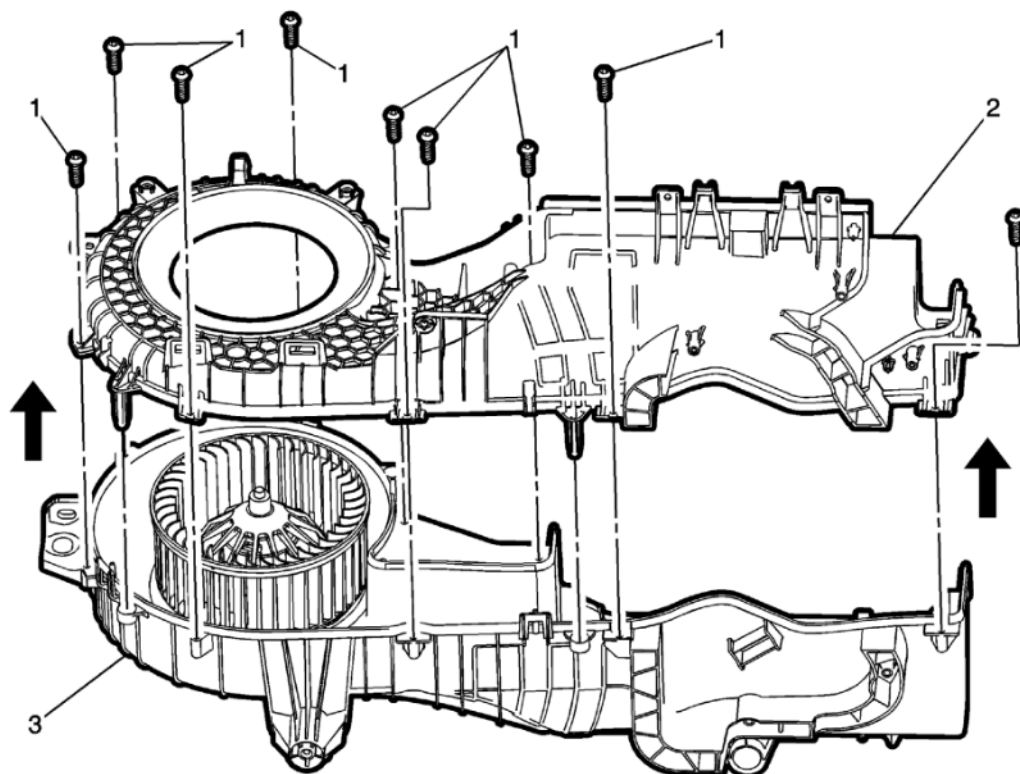


Fig. 50: HVAC Evaporator & Blower Lower Case Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Air Conditioning Evaporator Replacement</u>	
1	Heater and Air Conditioning Evaporator and Blower Case Bolt (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.2 N.m (11 lb in)
2	Heater and Air Conditioning Evaporator and Blower Upper Case
3	Heater and Air Conditioning Evaporator and Blower Lower Case Procedure Transfer components as necessary.

HEATER AND AIR CONDITIONING EVAPORATOR CASE REPLACEMENT

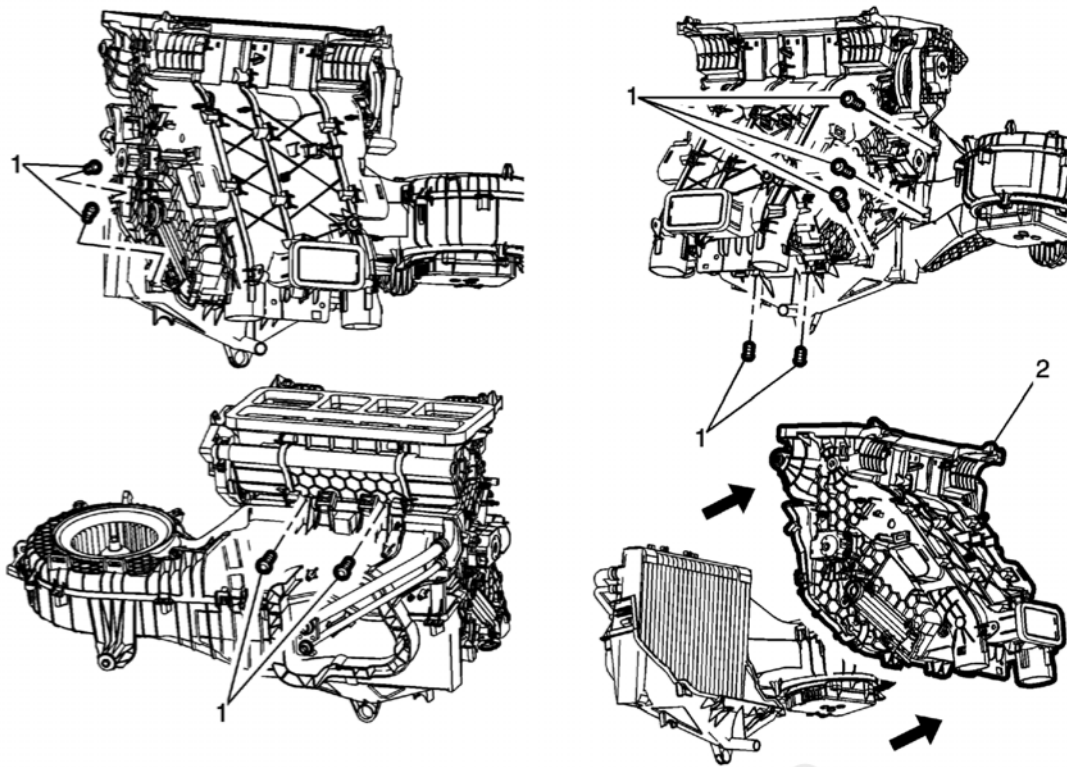


Fig. 51: HVAC Evaporator Case & Screws
Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedures 1. Remove the air inlet housing. Refer to Air Inlet Housing Replacement. 2. Disconnect the heater and air conditioning evaporator and blower module assembly electrical connectors, and note the proper location of each electrical connector. 3. Remove the heater core and heater tubes as an assembly. Refer to Heater Core Replacement.	
1	Heater and Air Conditioning Evaporator Case Screw (Qty: 9) CAUTION: Refer to Fastener Caution .
2	Heater and Air Conditioning Evaporator Case Assembly Procedure Transfer all the components to the heater and air conditioning evaporator case assembly.

AIR CONDITIONING EVAPORATOR REPLACEMENT

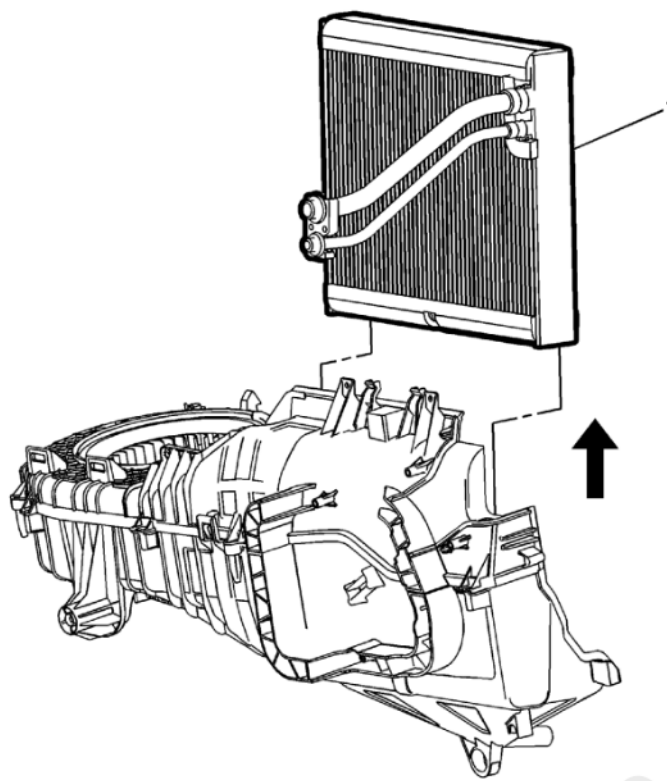


Fig. 52: Air Conditioning Evaporator Core
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator case assembly. Refer to Heater and Air Conditioning Evaporator Case Replacement .	
1	Air Conditioning Evaporator Core Procedure Lift the air conditioning evaporator core out of the heater and air conditioning evaporator and blower case assembly.

AIR CONDITIONING EVAPORATOR AND BLOWER MODULE DRAIN HOSE REPLACEMENT

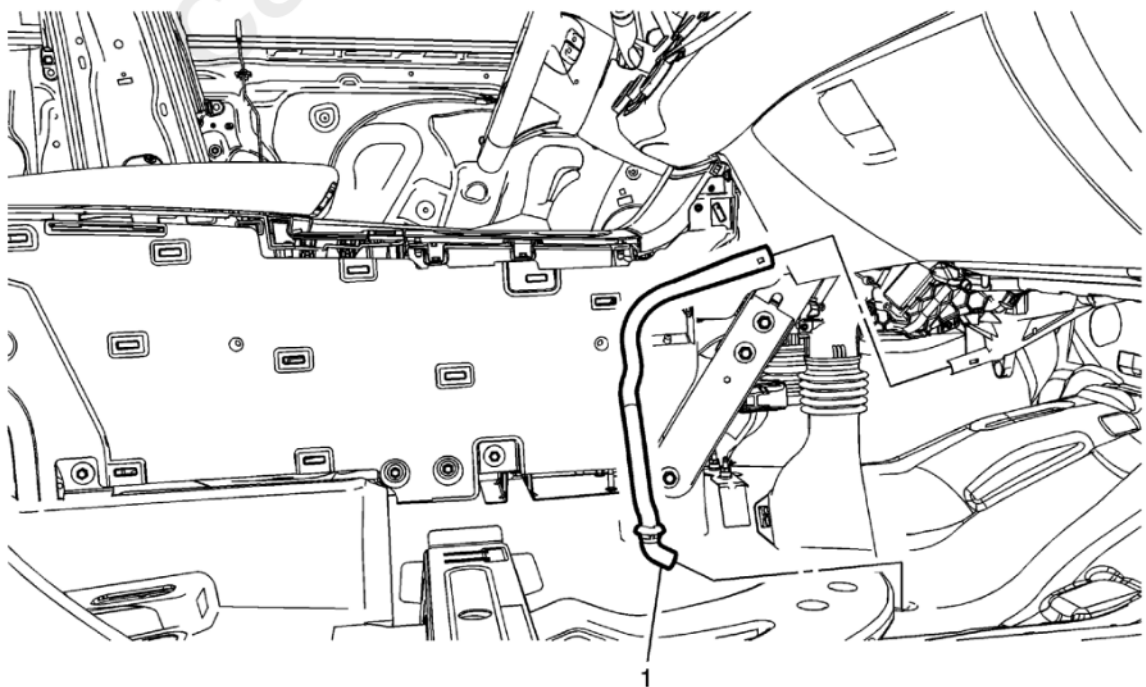


Fig. 53: Air Conditioning Evaporator & Blower Module Drain Hose
 Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedure Front Floor Console Extension Replacement - Right Side	
CAUTION: Refer to HVAC Module Drain Tube Caution .	
1	Air Conditioning Evaporator and Blower Module Drain Hose Procedure Pull back the carpet to gain access to the air conditioning evaporator and blower module drain hose.

HEATER INLET HOSE REPLACEMENT (LFX)

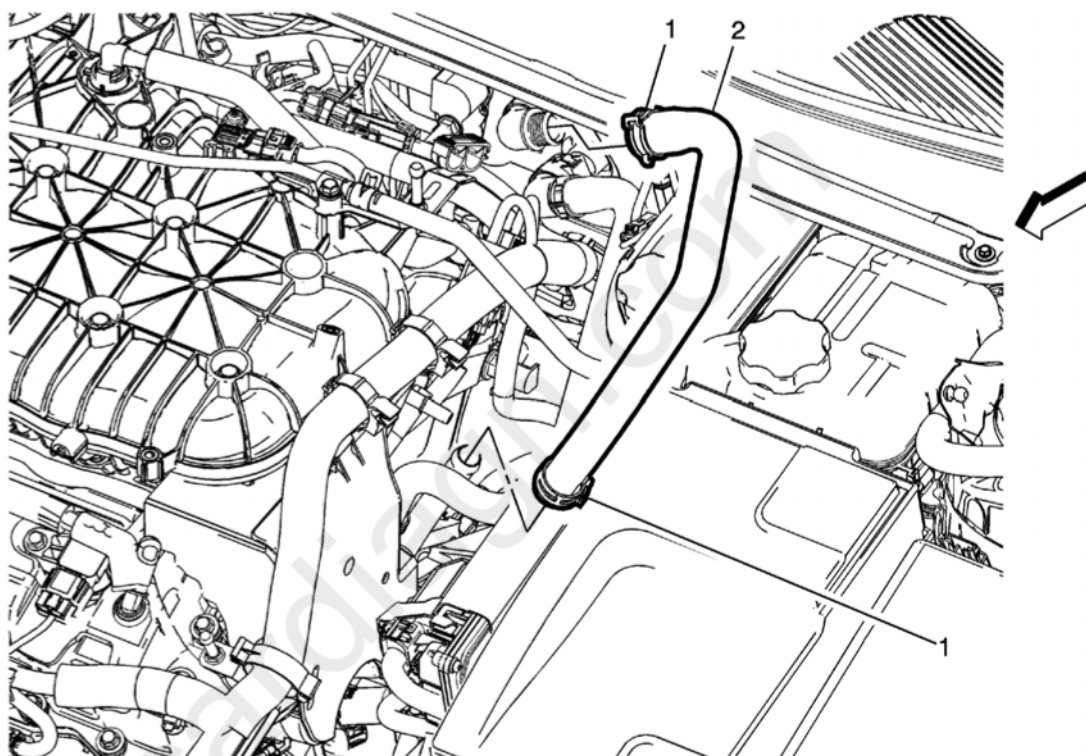


Fig. 54: Heater Inlet Hose & Clamp (LFX)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement (LFX) . 2. Reposition the fuel feed front pipe out of the way. Refer to Fuel Feed Front Pipe Replacement (LFX) . 3. Reposition the power brake booster vacuum pipe out of the way. Refer to Power Brake Booster Vacuum Pipe Replacement (LFX) . 4. Reposition the electrical harness out of the way. 5. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) .	

Callout	Component Name
1	Heater Inlet Hose Clamp (Qty: 2) Procedure Reposition the heater inlet hose clamps using the BO-38185 hose clamp pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Inlet Hose Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Inspect the cooling system for leaks.

HEATER INLET HOSE REPLACEMENT (LCV)

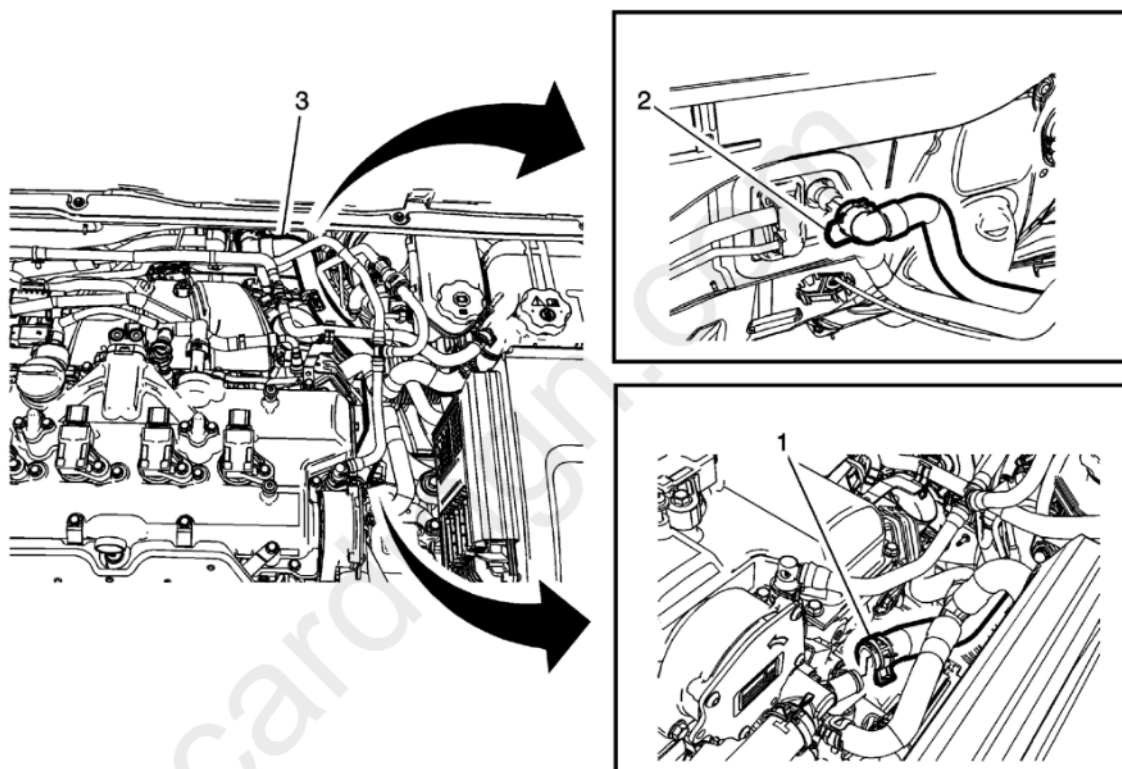


Fig. 55: Heater Inlet Hose (LCV)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement . 3. Remove the air cleaner resonator and outlet duct. Refer to Air Cleaner Resonator and Outlet Duct Replacement . 4. Reposition the engine control module. Refer to Engine Control Module Replacement .	
1	Heater Inlet Hose Clamp Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Inlet Hose Clip
3	Heater Inlet Hose

HEATER OUTLET HOSE REPLACEMENT (LFX)

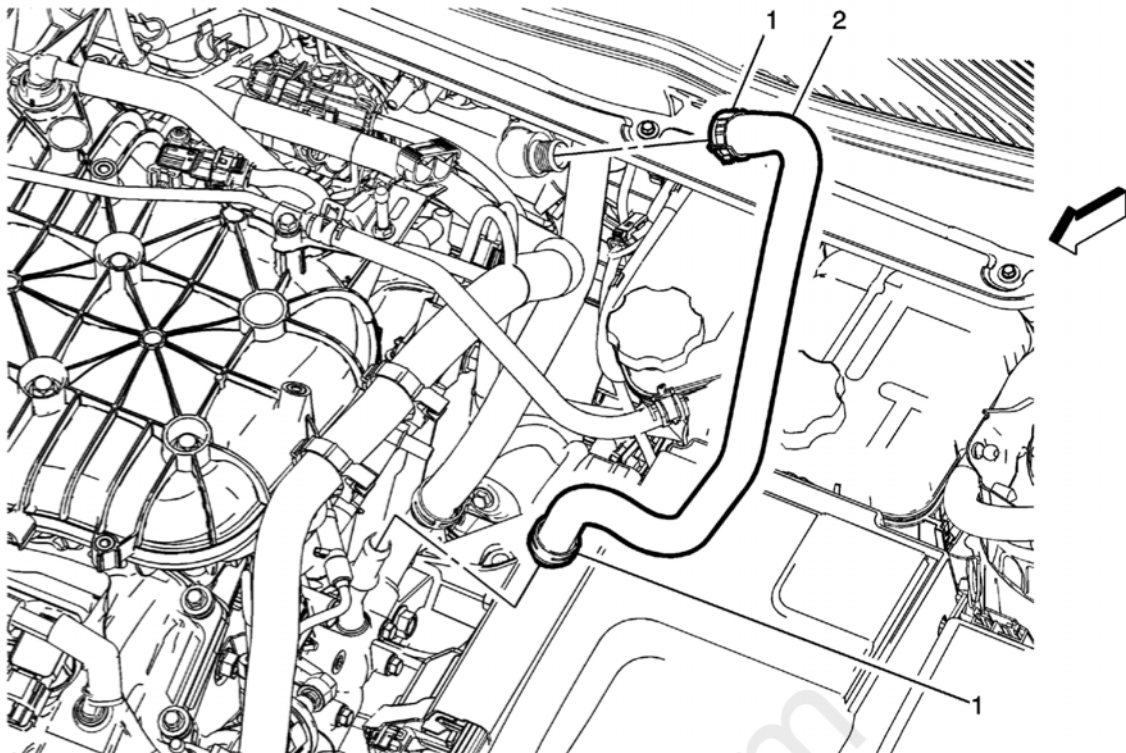


Fig. 56: Heater Outlet Hose & Clamp (LFX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement (LFX) . 2. Reposition the fuel feed front pipe out of the way. Refer to Fuel Feed Front Pipe Replacement (LFX) . 3. Reposition the power brake booster vacuum pipe out of the way. Refer to Power Brake Booster Vacuum Pipe Replacement (LFX) . 4. Reposition the electrical harness out of the way. 5. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) .	
1	Heater Outlet Hose Clamp (Qty: 2) Procedure Reposition the heater outlet hose clamps using the BO-38185 hose clamp pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Outlet Hose Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Inspect the cooling system for leaks.

HEATER OUTLET HOSE REPLACEMENT (LCV)

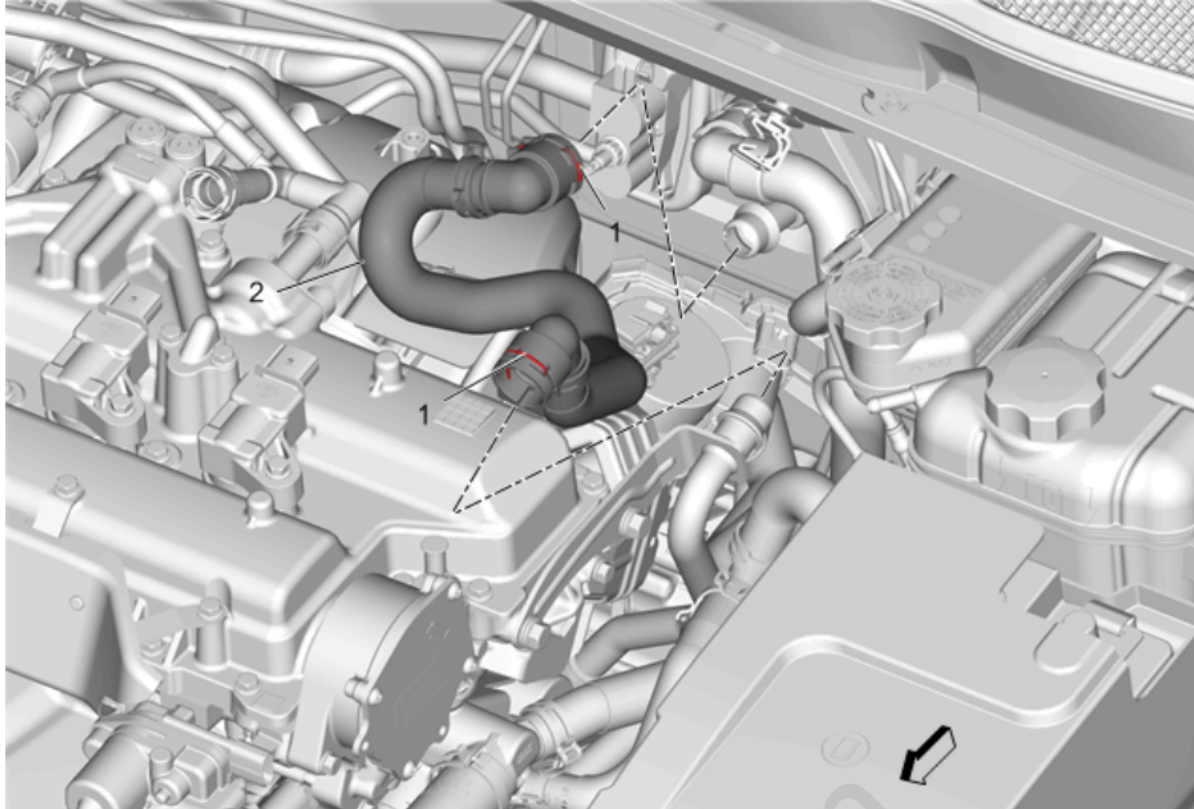


Fig. 57: Heater Outlet Hose (LCV)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement . 3. Remove the air cleaner resonator and outlet duct. Refer to Air Cleaner Resonator and Outlet Duct Replacement .	
1	Heater Outlet Hose Connector Retaining Clip (Qty: 2) Procedure Release the heater outlet hose connector retaining clips and remove the heater outlet hose.
2	Heater Outlet Hose 1. Fill the engine cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Check the cooling system for leaks. Refer to Cooling System Leak Testing .

HEATER OUTLET HOSE REPLACEMENT (LCV HEATER OUTLET PIPE TO AUXILIARY WATER PUMP)

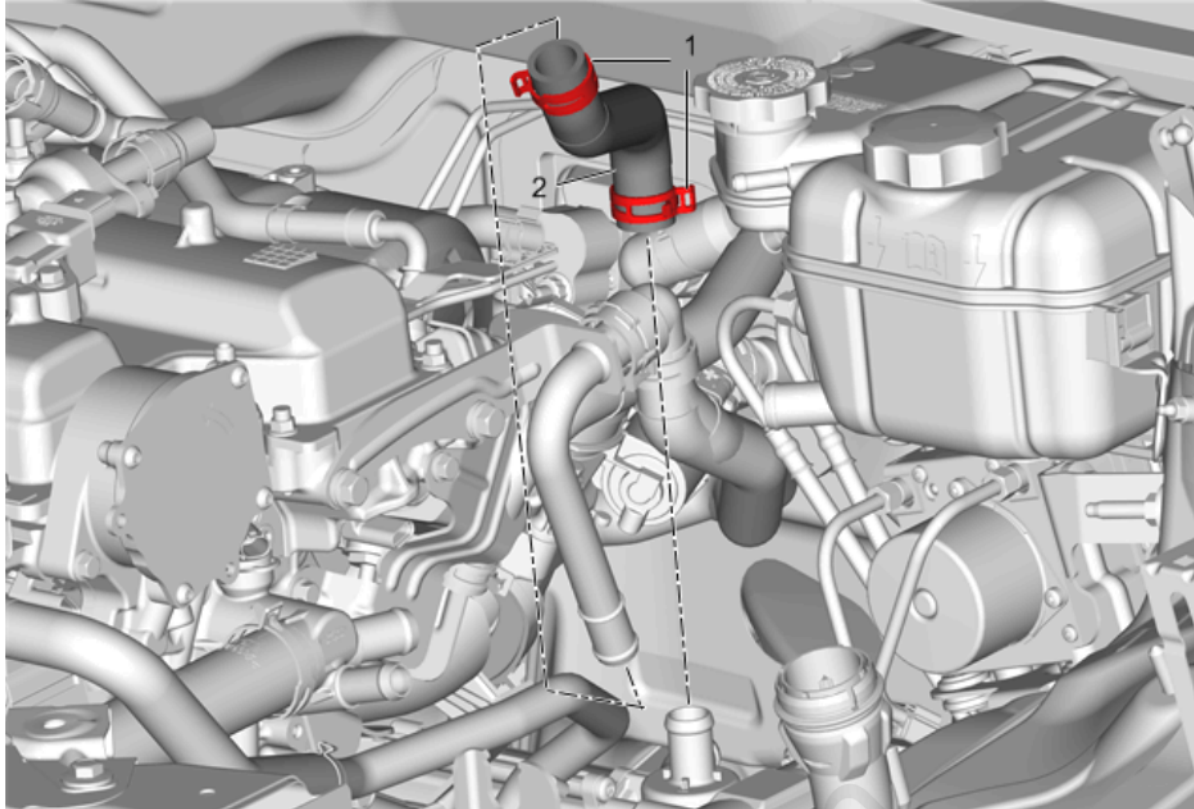


Fig. 58: Heater Outlet Hose (LCV Heater Outlet Pipe to Auxiliary Water Pump)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the air cleaner resonator and outlet duct. Refer to Air Cleaner Resonator and Outlet Duct Replacement . 3. Reposition the engine control module out of the way. Refer to Engine Control Module Replacement . 4. Reposition the heater coolant pump hose. Refer to Heater Coolant Pump Hose Replacement (LCV) . 5. Remove the battery tray. Refer to Battery Tray Replacement .	
1	Heater Outlet Hose Clamp (Qty: 2) Procedure Reposition the heater outlet hose clamp using the BO-38185 hose clamp pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Outlet Hose Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Inspect the cooling system for leaks.

HEATER OUTLET PIPE REPLACEMENT (LVC)

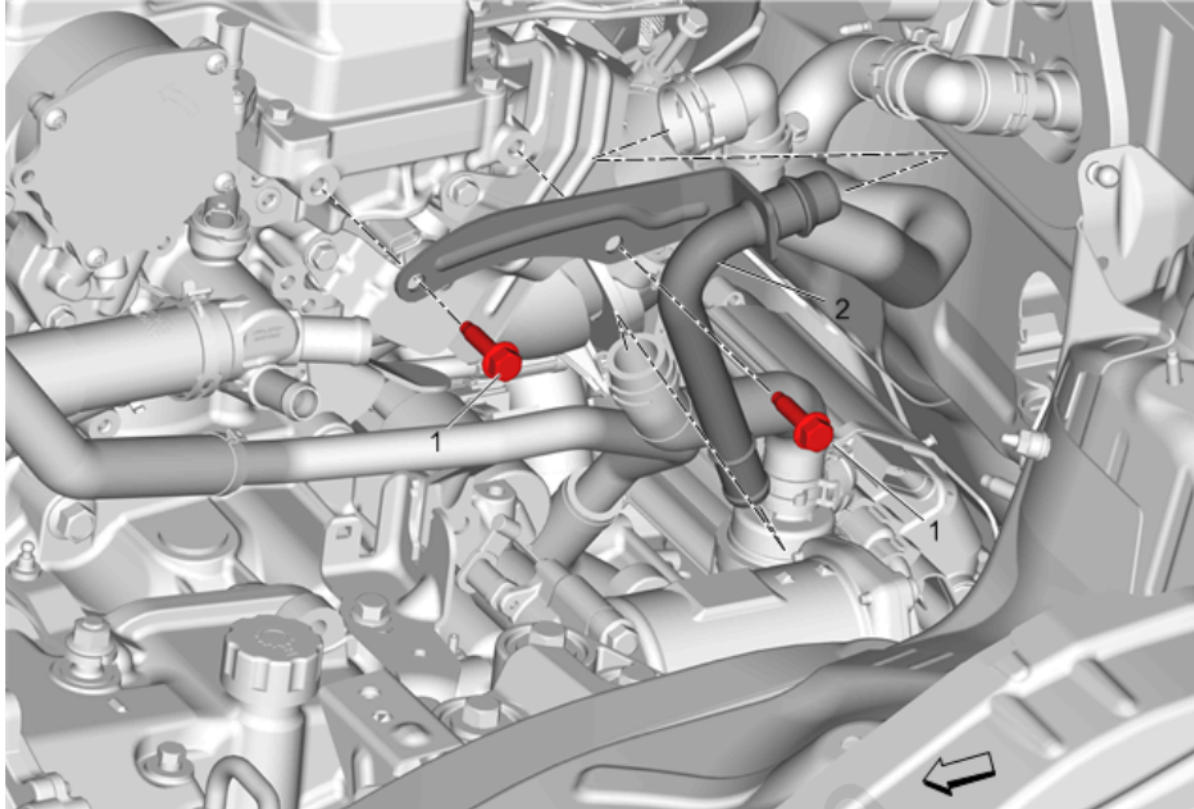


Fig. 59: Heater Outlet Pipe (LCV)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the air cleaner resonator and outlet duct. Refer to Air Cleaner Resonator and Outlet Duct Replacement . 3. Reposition the engine control module out of the way. Refer to Engine Control Module Replacement . 4. Reposition the radiator surge tank inlet hose out of the way. Refer to Radiator Surge Tank Inlet Hose Replacement (LFX) Radiator Surge Tank Inlet Hose Replacement (LCV) . 5. Remove both heater outlet hoses from the heater outlet pipe. Refer to Heater Outlet Hose Replacement (LCV) Heater Outlet Hose Replacement (LCV Heater Outlet Pipe to Auxiliary Water Pump).	
1	Heater Outlet Hose Bracket Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Heater Outlet Pipe Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Inspect the cooling system for leaks.

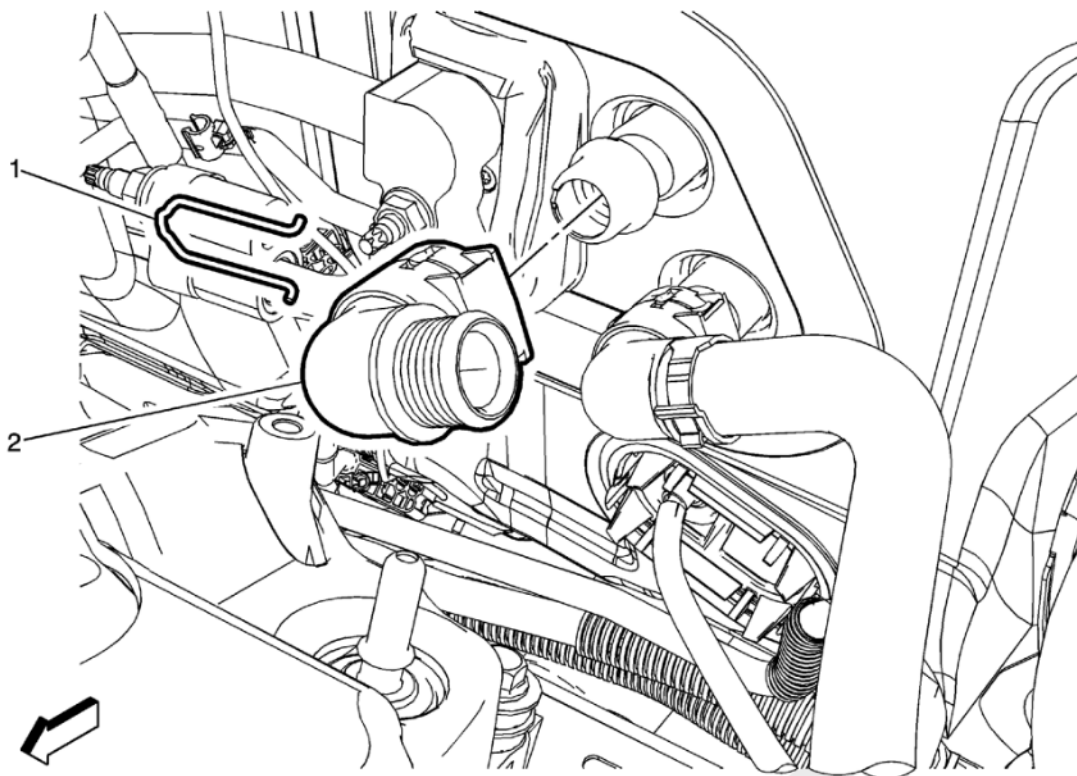


Fig. 60: Heater Inlet Hose Connector & Retaining Clips (LFR, LFX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures	
1. Drain the engine coolant. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the heater inlet hose. Refer to Heater Inlet Hose Replacement (LFX)	
1	Heater Inlet Hose Connector Retaining Clip
2	Heater Inlet Hose Connector

HEATER OUTLET HOSE CONNECTOR REPLACEMENT (LFX)

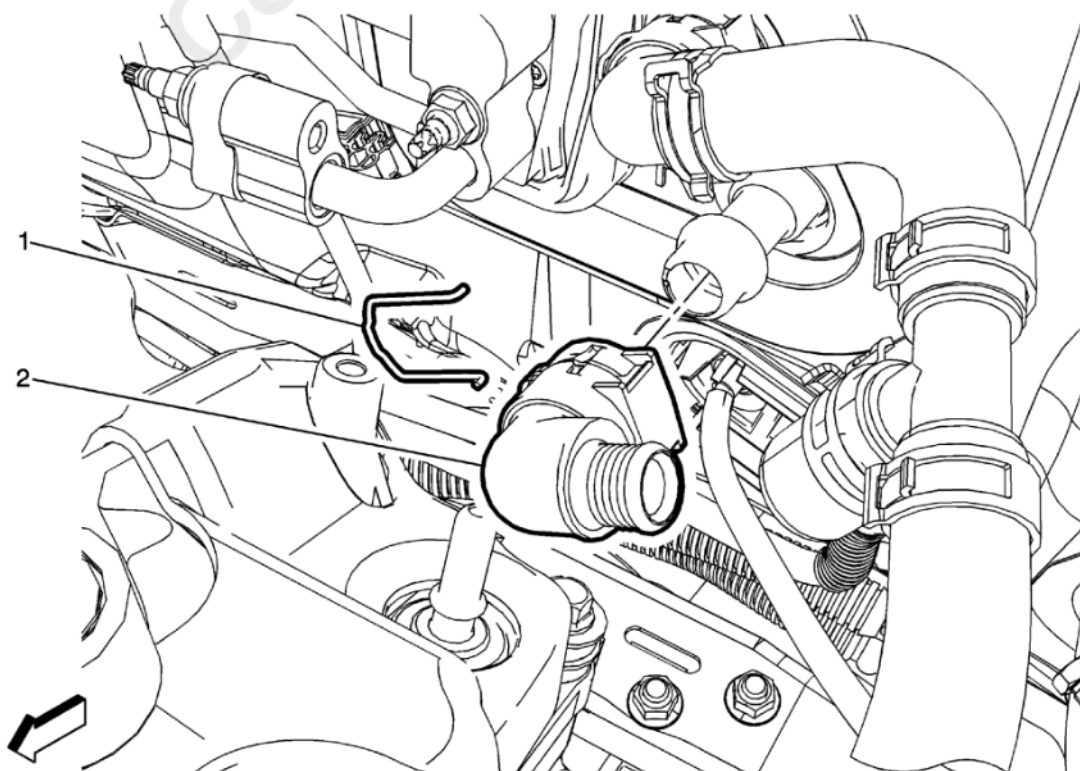


Fig. 61: Heater Outlet Hose Connector & Retaining Clips (LFR, LFX)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Drain the engine coolant. Refer to Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static) . 2. Remove the heater outlet hose. Refer to Heater Outlet Hose Replacement (LFX)	
1	Heater Outlet Hose Connector Retaining Clip
2	Heater Outlet Hose Connector

HEATER COOLANT PUMP HOSE REPLACEMENT (LCV)

Special Tools

BO-38185 Hose Clamp Pliers

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

Removal Procedure

1. Drain the engine cooling system. Refer to [Cooling System Draining and Filling \(Vacuum and Fill\)](#) [Cooling System Draining and Filling \(Static\)](#) .

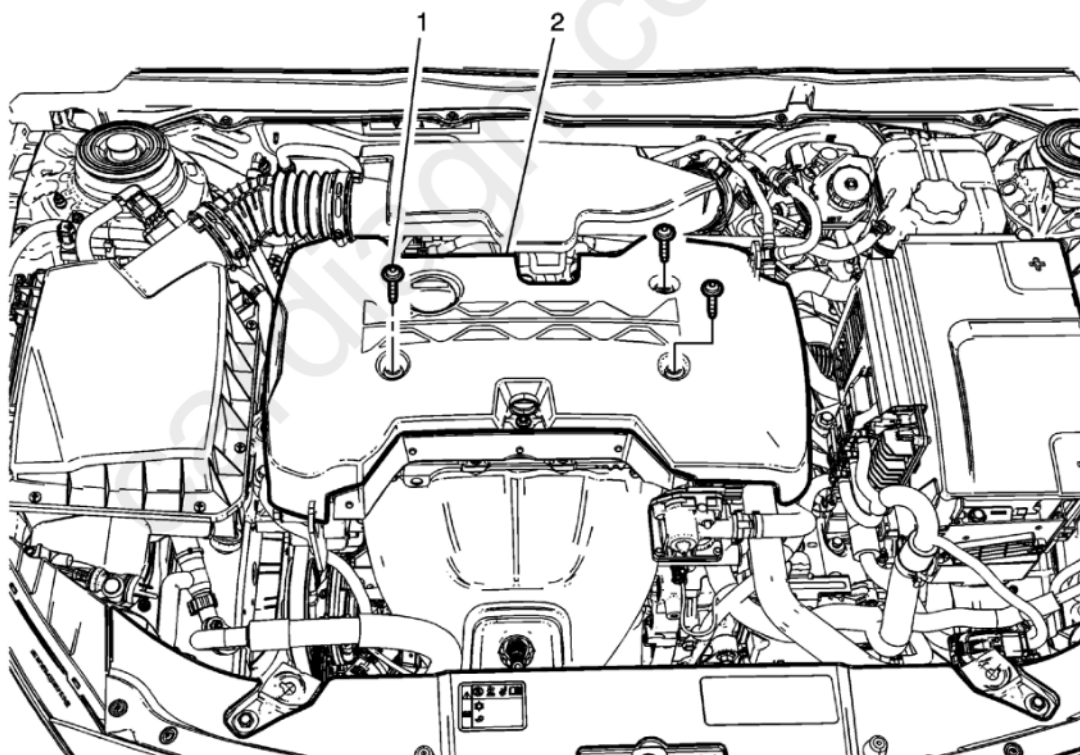


Fig. 62: Intake Manifold Cover (LCV)
 Courtesy of GENERAL MOTORS COMPANY

2. Remove the intake manifold cover. Refer to [Intake Manifold Cover Replacement](#) .

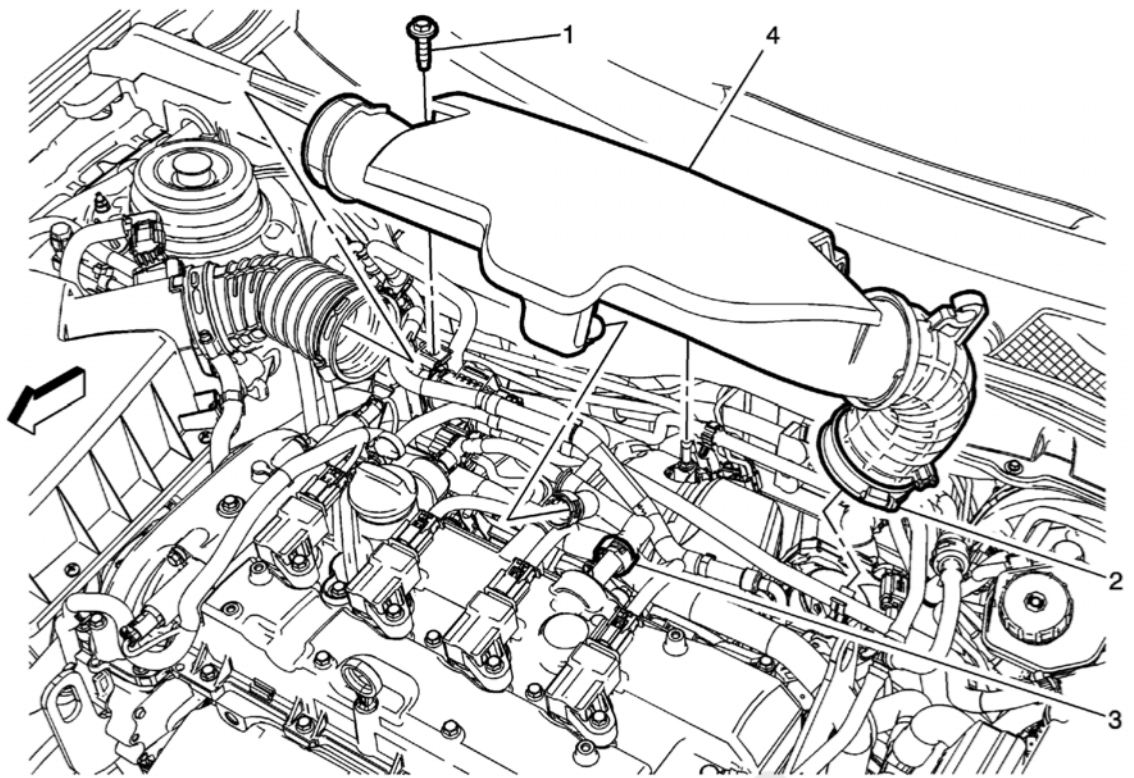


Fig. 63: Air Cleaner Resonator and Outlet Duct (LCV)
 Courtesy of GENERAL MOTORS COMPANY

3. Remove the air cleaner resonator and outlet duct. Refer to [Air Cleaner Resonator and Outlet Duct Replacement](#) .

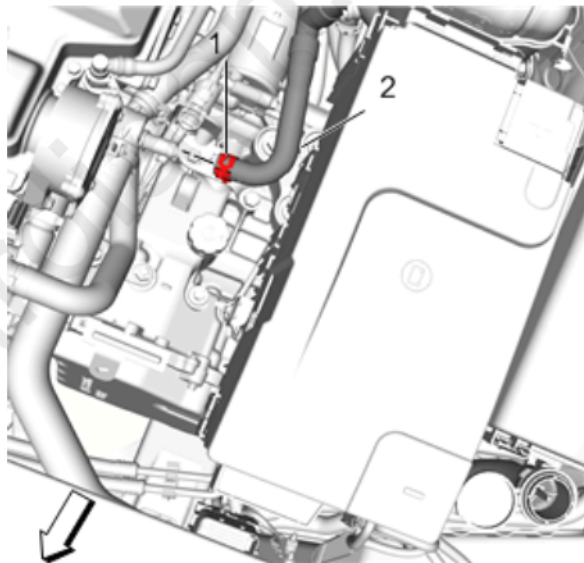


Fig. 64: Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

4. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.
5. Remove the heater coolant pump hose (2) from the water pump.

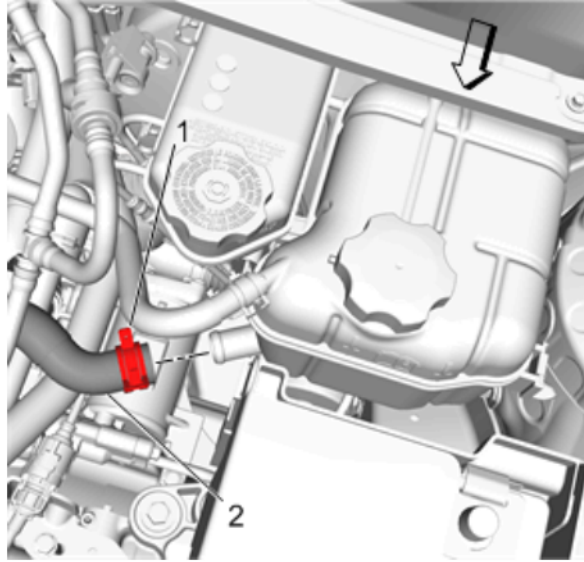


Fig. 65: Locating Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

6. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.
7. Remove the heater coolant pump hose (2) from the radiator surge tank.

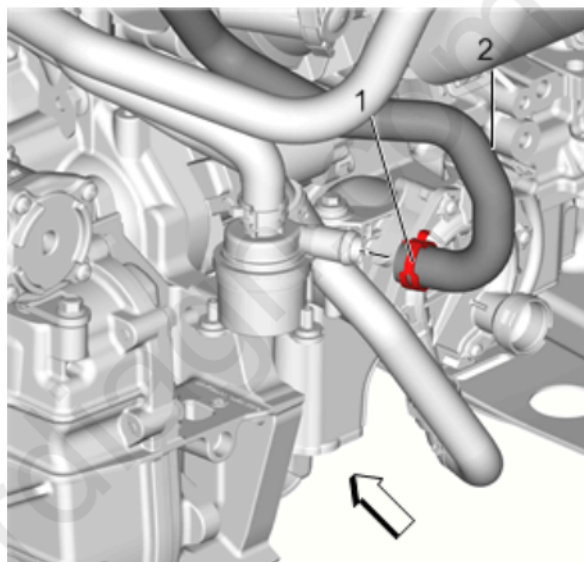


Fig. 66: Identifying Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

8. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.
9. Remove the heater coolant pump hose (2) from the auxiliary water pump.
10. Remove the heater coolant pump hose (2) from the vehicle.

Installation Procedure

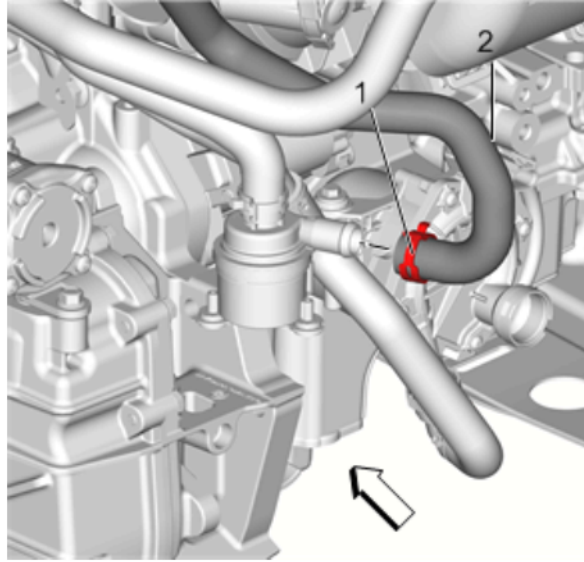


Fig. 67: Identifying Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

1. Install the heater coolant pump hose (2) to the auxiliary water pump.
2. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.

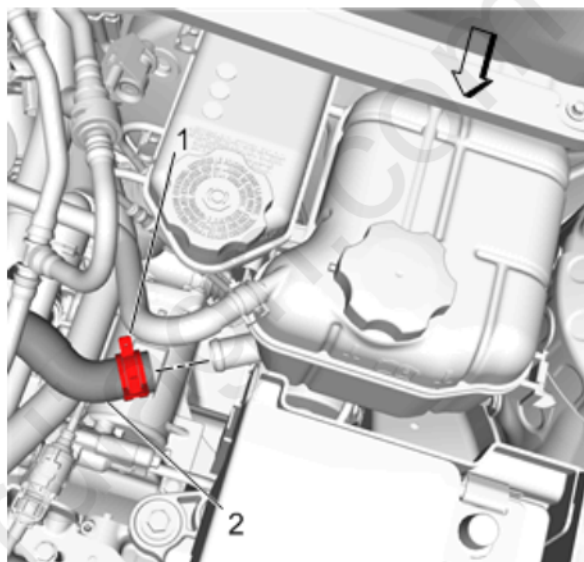


Fig. 68: Locating Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

3. Install the heater coolant pump hose (2) to the radiator surge tank.
4. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.
5. Install the heater coolant pump hose (2) to the radiator surge tank.
6. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.

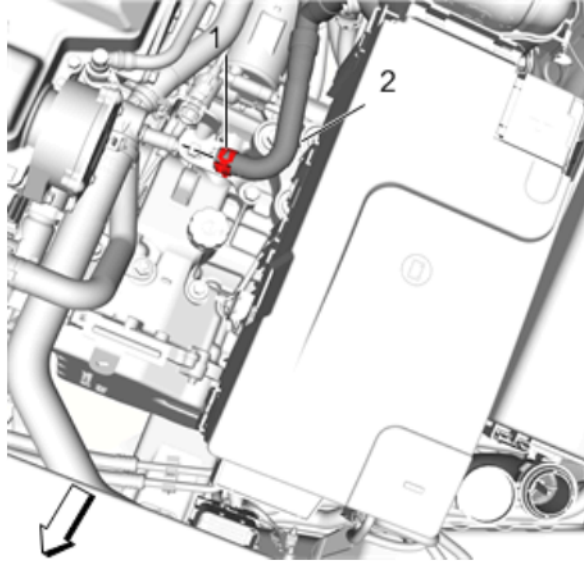


Fig. 69: Heater Coolant Pump Hose And Clamp
 Courtesy of GENERAL MOTORS COMPANY

7. Install the heater coolant pump hose (2) to the water pump.
8. Reposition the heater coolant pump hose clamp (1) using the **BO-38185** hose clamp pliers.

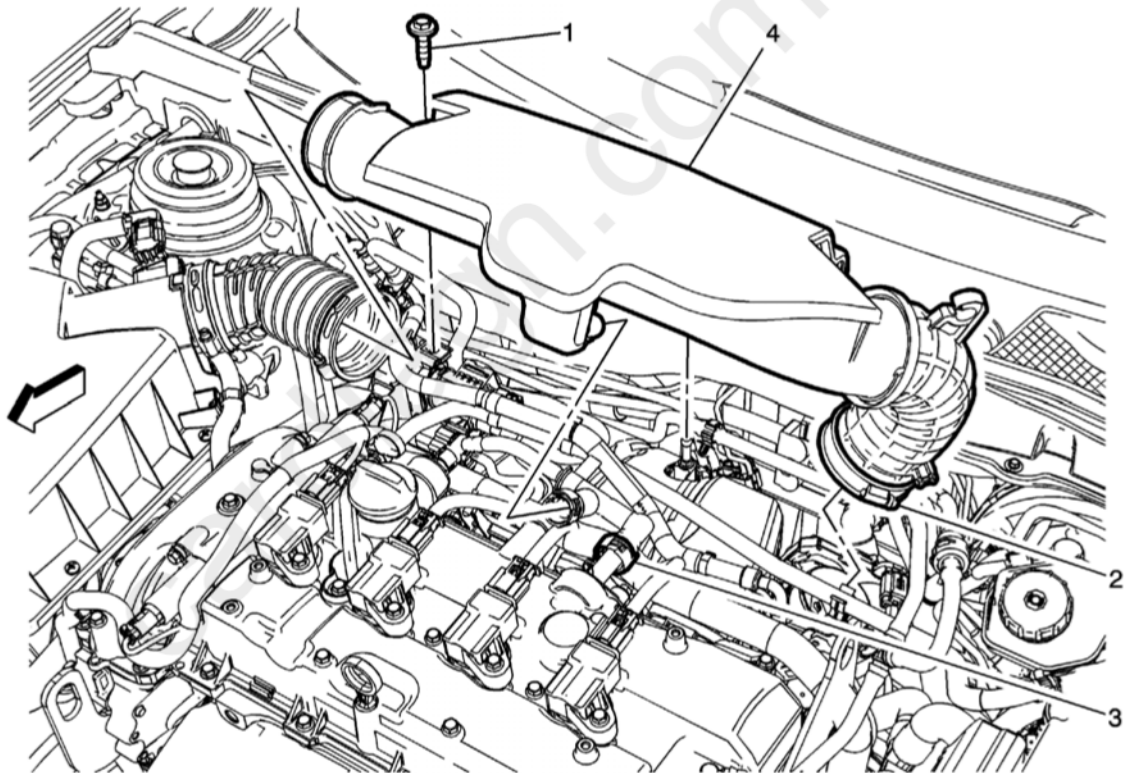


Fig. 70: Air Cleaner Resonator and Outlet Duct (LCV)
 Courtesy of GENERAL MOTORS COMPANY

9. Install the air cleaner resonator and outlet duct. Refer to [Air Cleaner Resonator and Outlet Duct Replacement](#).

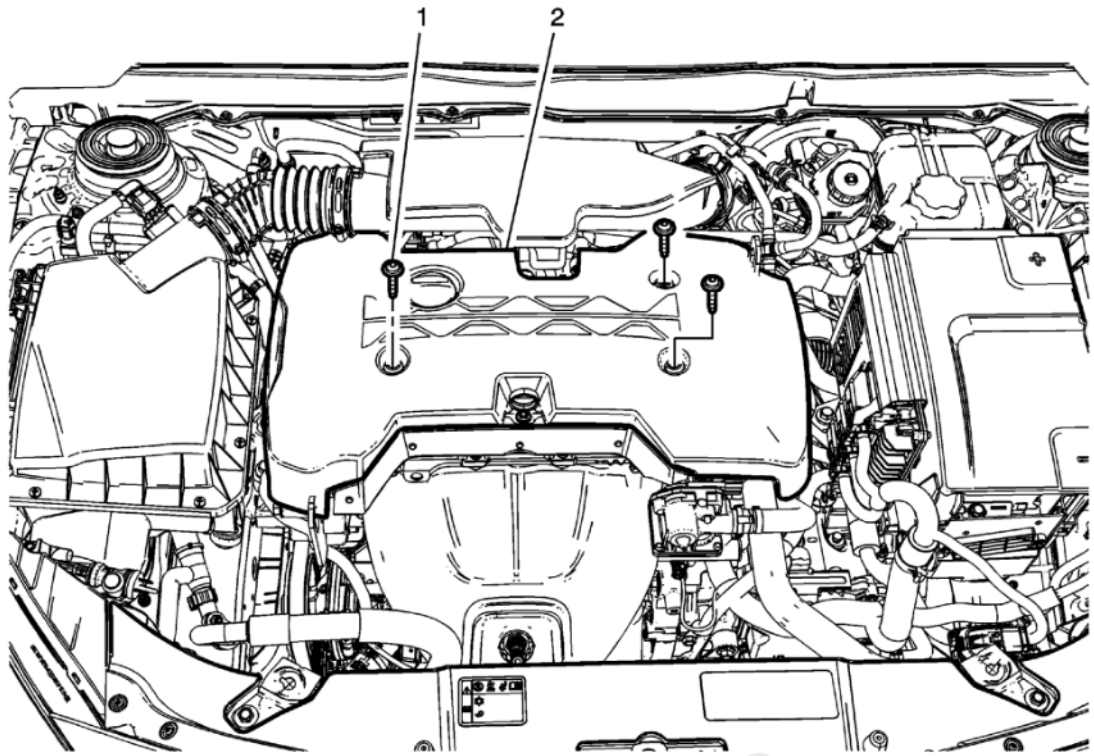


Fig. 71: Intake Manifold Cover (LCV)
 Courtesy of GENERAL MOTORS COMPANY

10. Install the intake manifold cover. Refer to [Intake Manifold Cover Replacement](#) .
11. Fill the engine cooling system. Refer to [Cooling System Draining and Filling \(Vacuum and Fill\)](#) [Cooling System Draining and Filling \(Static\)](#) .
12. Check the cooling system for leaks. Refer to [Cooling System Leak Testing](#) .

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

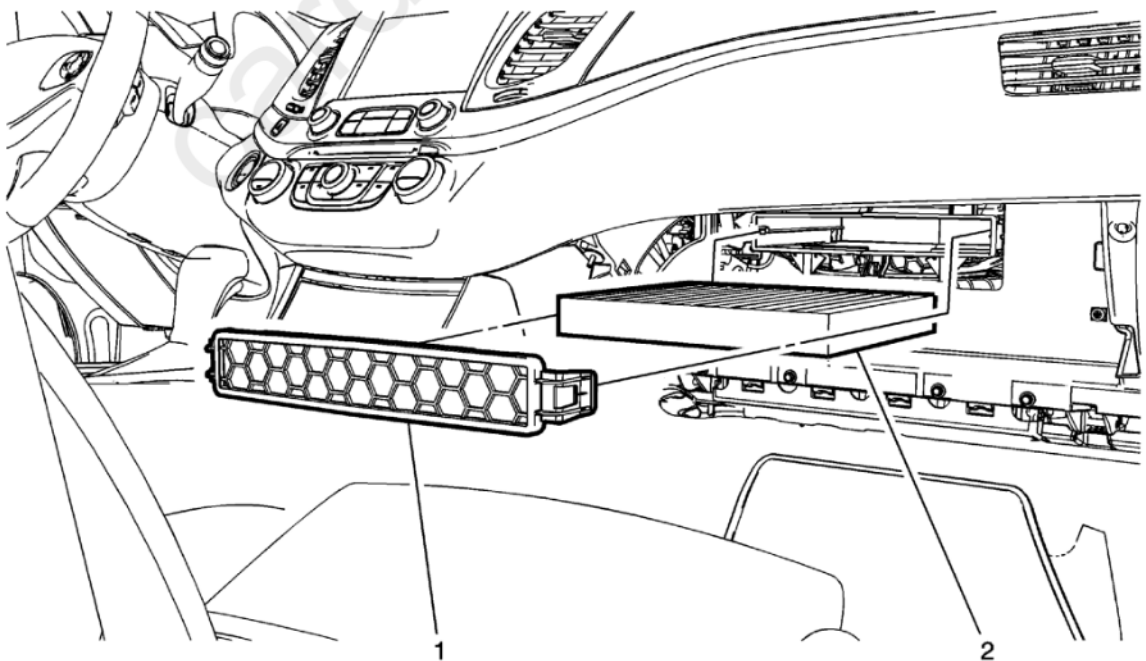


Fig. 72: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Old Air Filter
2	New Air Filter

Callout	Component Name
Preliminary Procedure Remove the instrument panel compartment door opening frame. Refer to Instrument Panel Compartment Door Opening Frame Replacement .	
1	Passenger Compartment Air Filter Cover
2	Passenger Compartment Air Filter

AIR INLET ASSEMBLY REPLACEMENT

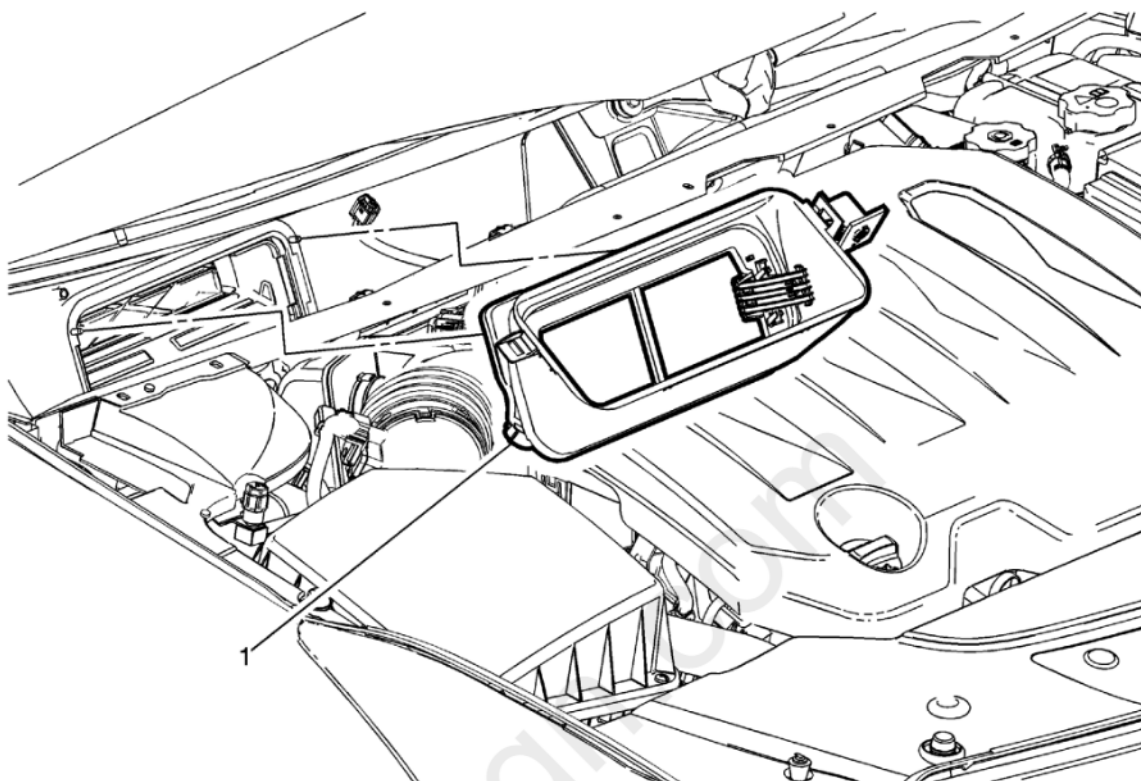


Fig. 73: Air Inlet Assembly

Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedure Remove the air inlet grille panel water deflector. Refer to Air Inlet Grille Panel Water Deflector Replacement .	
1	Air Inlet Assembly Procedure Un-latch the air Inlet assembly latches.

AIR INLET HOUSING REPLACEMENT

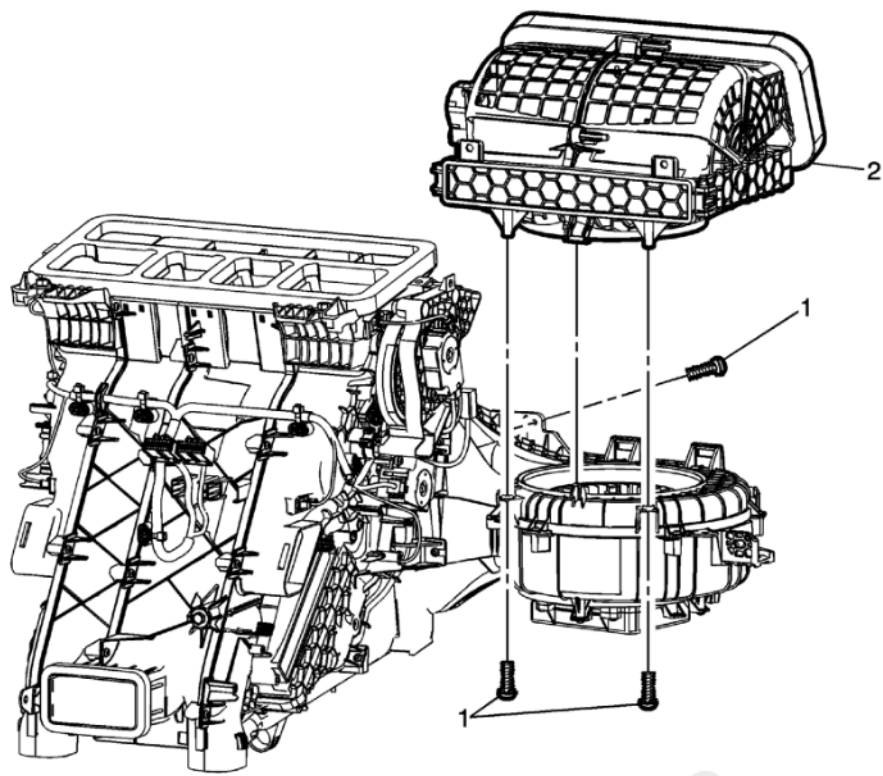


Fig. 74: Air Inlet Housing & Fasteners
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the heater and air conditioning evaporator and blower module assembly. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation. 2. Disconnect the electrical connectors as necessary.	
1	Air Inlet Housing Fastener (Qty: 3) CAUTION: Refer to Fastener Caution .
2	Air Inlet Housing Assembly Procedure Transfer all part as necessary.

BLOWER MOTOR REPLACEMENT

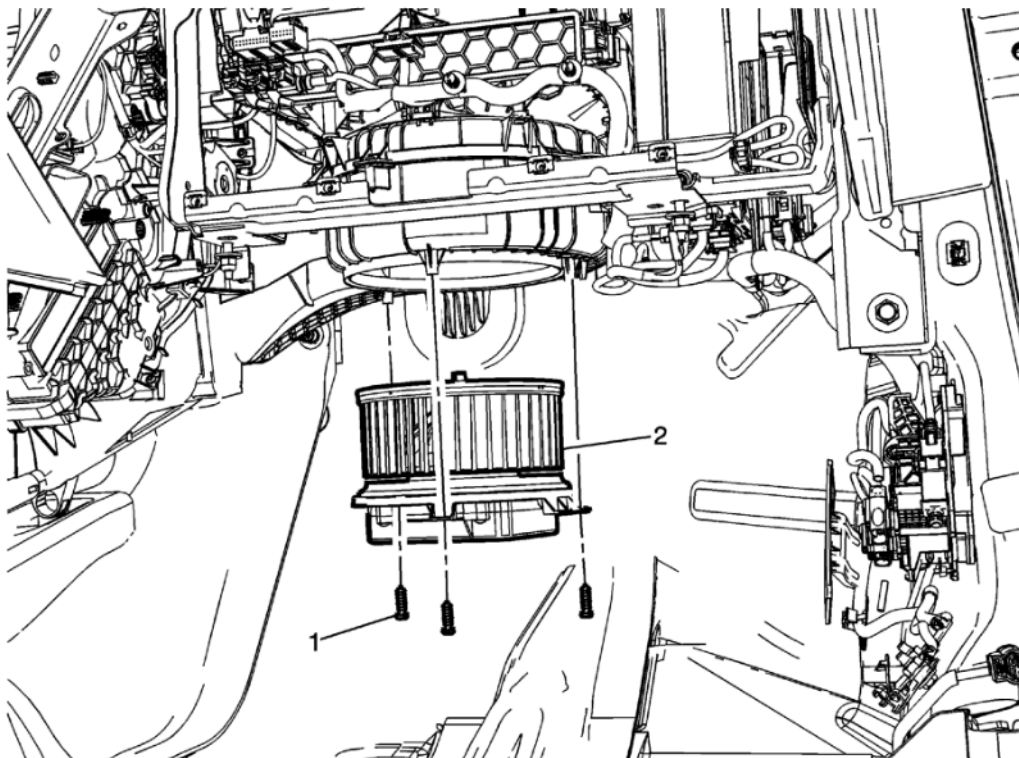


Fig. 75: Blower Motor & Fasteners

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the right side front floor air outlet duct. Refer to Floor Front Air Outlet Duct Replacement - Right Side. 2. Reposition the wiring harness.	
1	Blower Motor Fastener (Qty: 3) CAUTION: Refer to Fastener Caution .
2	Blower Motor Assembly Procedure Disconnect the blower motor connector.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT

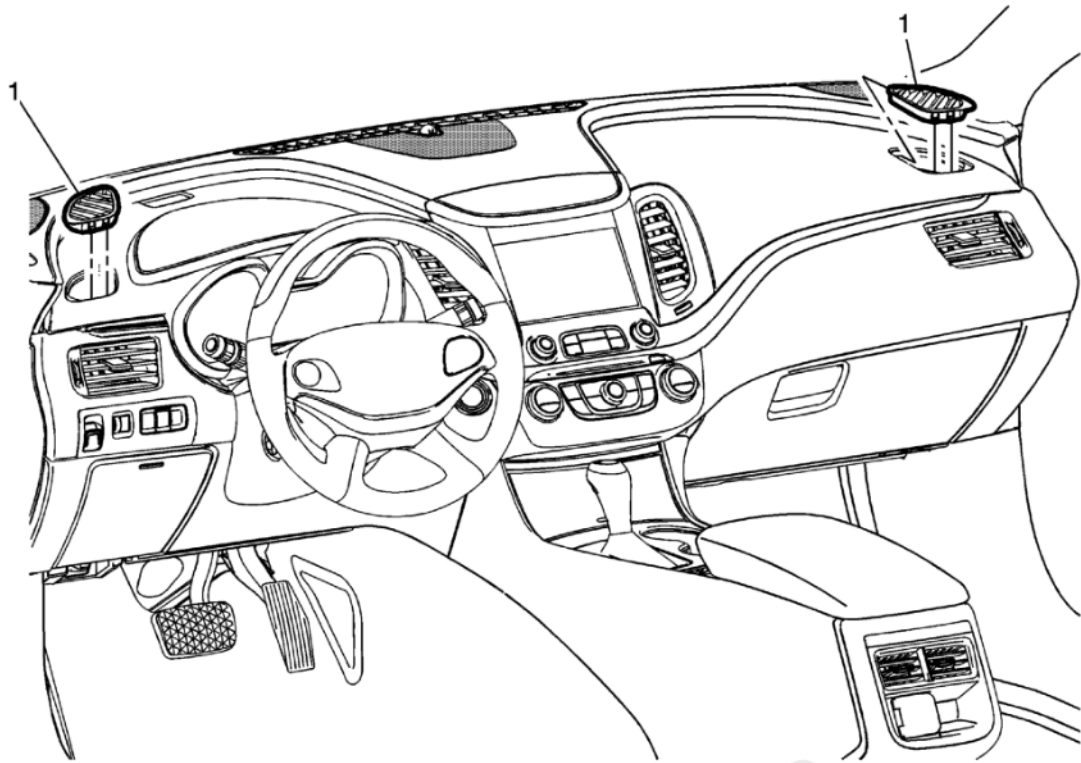


Fig. 76: Side Window Defogger Outlet Grille
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Side Window Defogger Outlet Grille (Left or Right) Procedure Use a flat bladed plastic trim tool in order to release the left or right side window defogger outlet grille from the instrument panel.

AIR DISTRIBUTOR DUCT REPLACEMENT

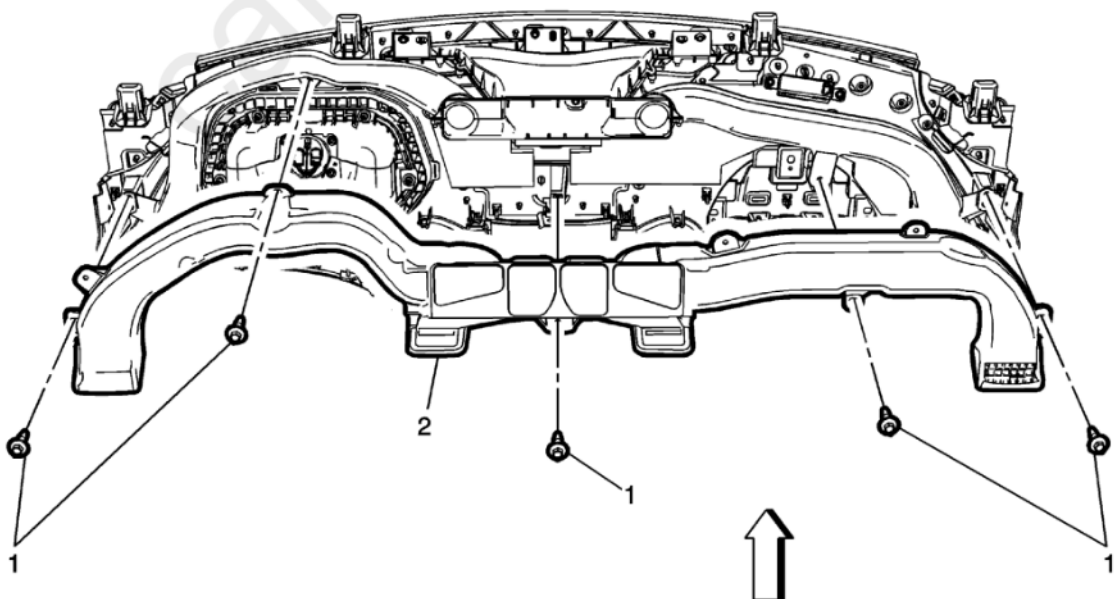


Fig. 77: Air Distributor Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
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Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Air Distributor Duct Fastener (QTY: 5) CAUTION: Refer to Fastener Caution .
2	Air Distributor Duct

INSTRUMENT PANEL OUTER AIR OUTLET BEZEL REPLACEMENT - LEFT SIDE

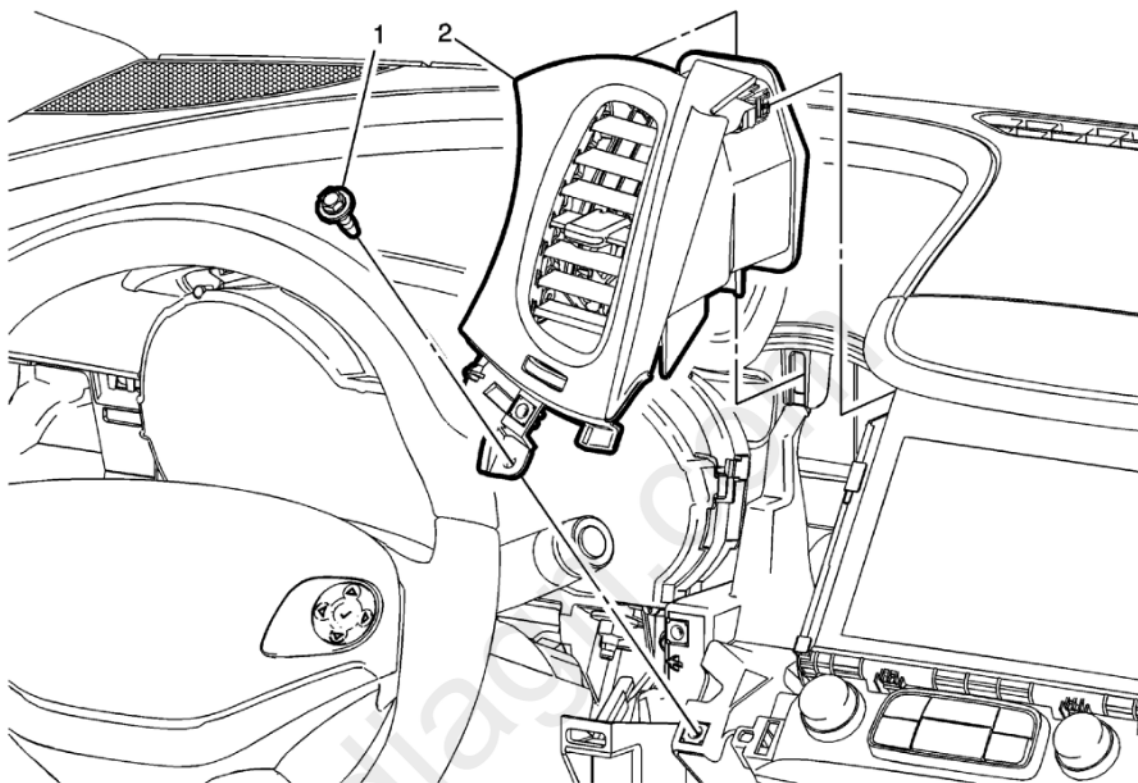


Fig. 78: Instrument Panel Outer Air Outlet Bezel - Left Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the instrument panel cluster trim plate. Refer to Instrument Panel Cluster Trim Plate Replacement .	
1	Instrument Panel Outer Air Outlet Bezel Bolt CAUTION: Refer to Fastener Caution .
2	Instrument Panel Outer Air Outlet Bezel - Left Side

INSTRUMENT PANEL OUTER AIR OUTLET BEZEL REPLACEMENT - RIGHT SIDE

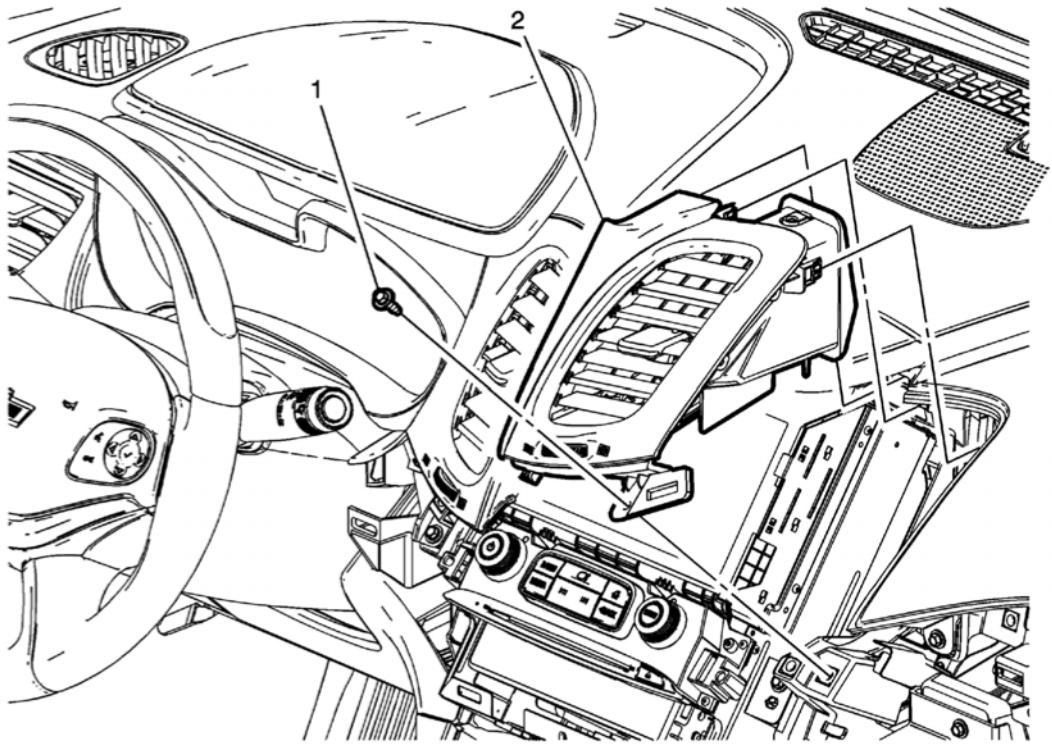


Fig. 79: Instrument Panel Outer Air Outlet Bezel - Right Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the instrument panel center trim pad. Refer to Instrument Panel Center Trim Pad Replacement .	
1	Instrument Panel Air Outlet Duct Bolt CAUTION: Refer to Fastener Caution .
2	Instrument Panel Outer Air Outlet Bezel - Right Side

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - LEFT SIDE

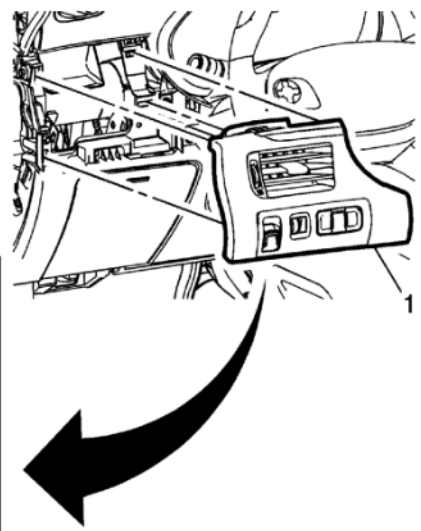
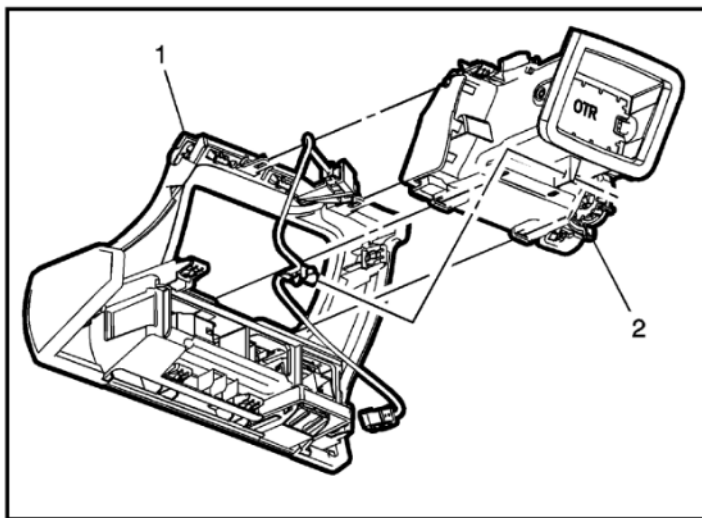


Fig. 80: Instrument Panel Outer Air Outlet - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Instrument Panel Trim Pad Refer to Instrument Panel Trim Pad Replacement .
2	Instrument Panel Outer Air Outlet - Left Side Procedures 1. Unsnap the instrument panel outer air outlet from the instrument panel trim pad. 2. Disconnect the electrical retainer.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT - LEFT SIDE

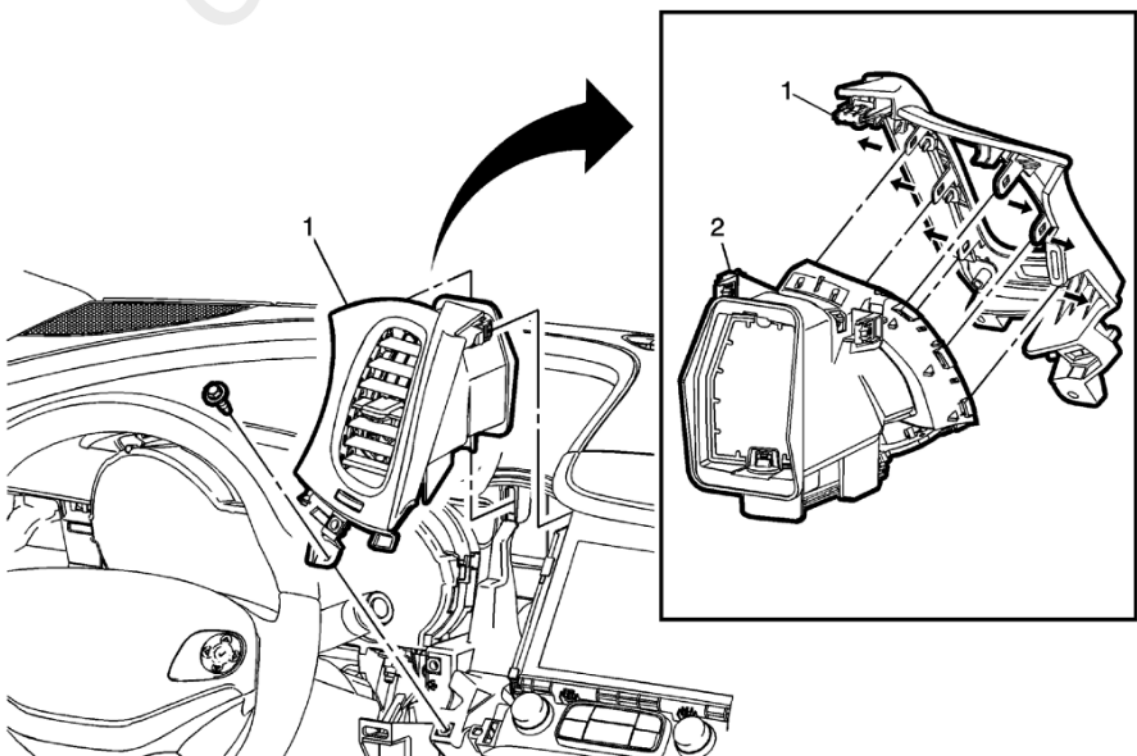


Fig. 81: Instrument Panel Center Air Outlet - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Instrument Panel Outer Air Outlet Bezel - Left Side Refer to Instrument Panel Outer Air Outlet Bezel Replacement - Left Side .
2	Instrument Panel Center Air Outlet - Left Side Procedure Unsnap the instrument panel center air outlet from the instrument panel outer air outlet bezel.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT - RIGHT SIDE

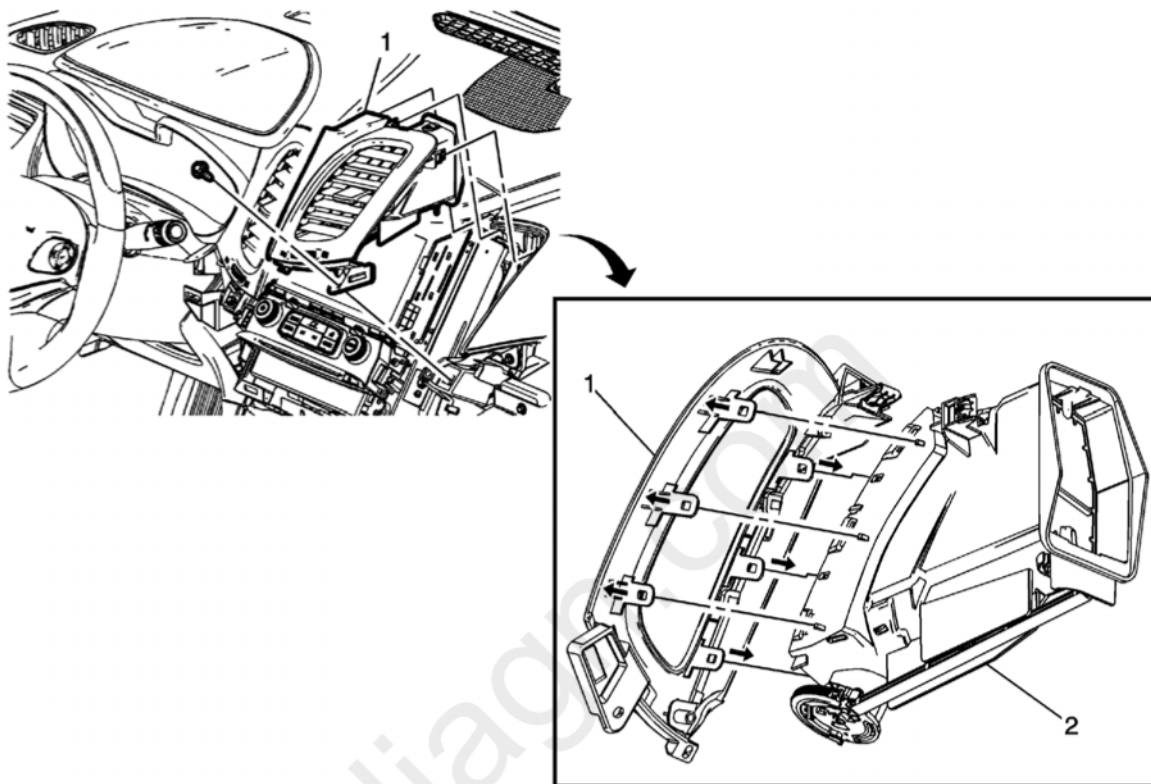


Fig. 82: Instrument Panel Center Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Instrument Panel Outer Air Outlet Bezel - Right Side Refer to Instrument Panel Outer Air Outlet Bezel Replacement - Left Side .
2	Instrument Panel Center Air Outlet - Right Side Procedure Unsnap the instrument panel center air outlet from the instrument panel outer air outlet bezel.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - RIGHT SIDE

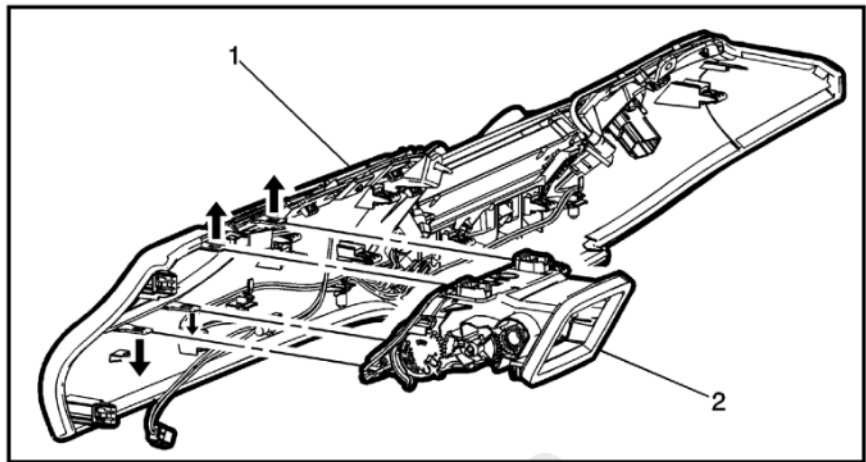
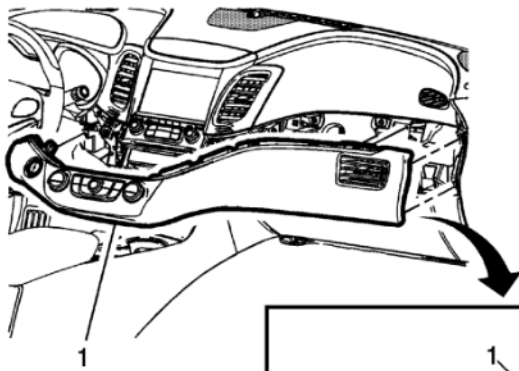


Fig. 83: Instrument Panel Outer Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Instrument Panel Center Trim Pad Refer to Instrument Panel Center Trim Pad Replacement .
2	Instrument Panel Outer Air Outlet - Right Side Procedures 1. Unsnap the instrument panel outer air outlet from the instrument panel center trim pad. 2. Disconnect the electrical retainer.

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

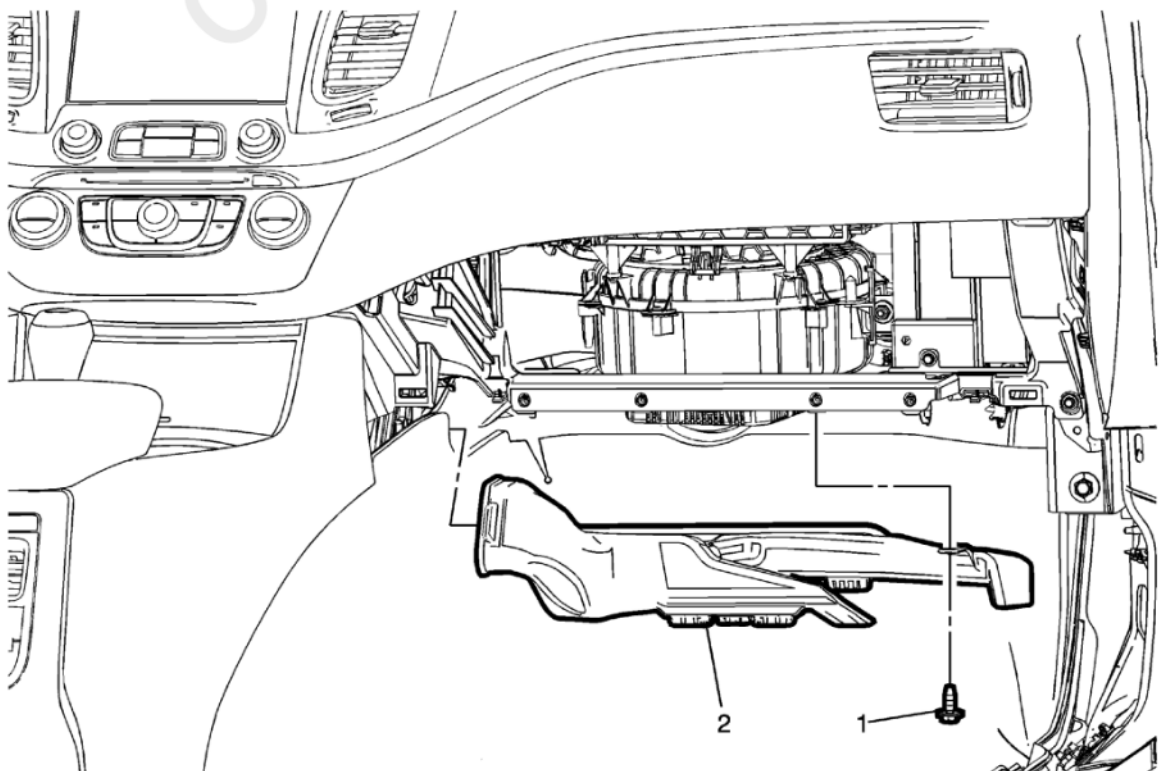


Fig. 84: Floor Front Air Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedure Remove the right side instrument panel insulator. Refer to Instrument Panel Insulator Replacement - Right Side .	
1	Right Side Front Floor Air Outlet Duct Fastener. CAUTION: Refer to Fastener Caution .
2	Front Floor Air Outlet Duct - Right Side

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

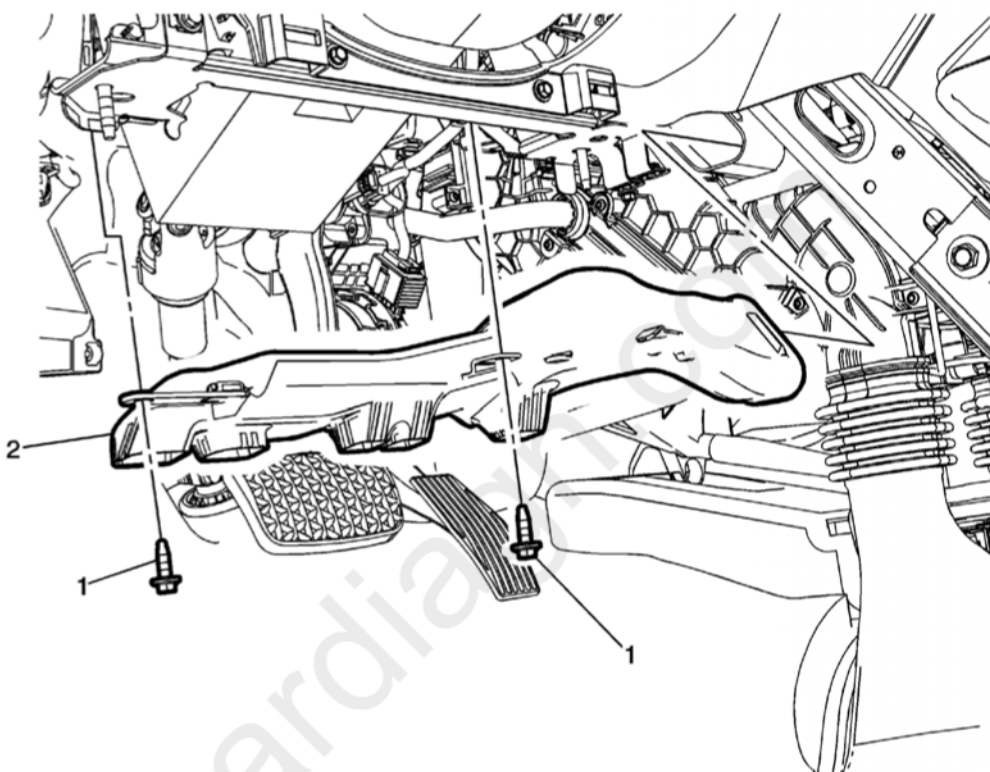


Fig. 85: Floor Front Air Outlet Duct & Fasteners - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedure Remove the left side instrument panel insulator. Refer to Instrument Panel Insulator Replacement - Left Side .	
1	Front Floor Air Outlet Duct Fastener (Qty: 2) CAUTION: Refer to Fastener Caution .
2	Front Floor Air Outlet Duct - Left Side

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT

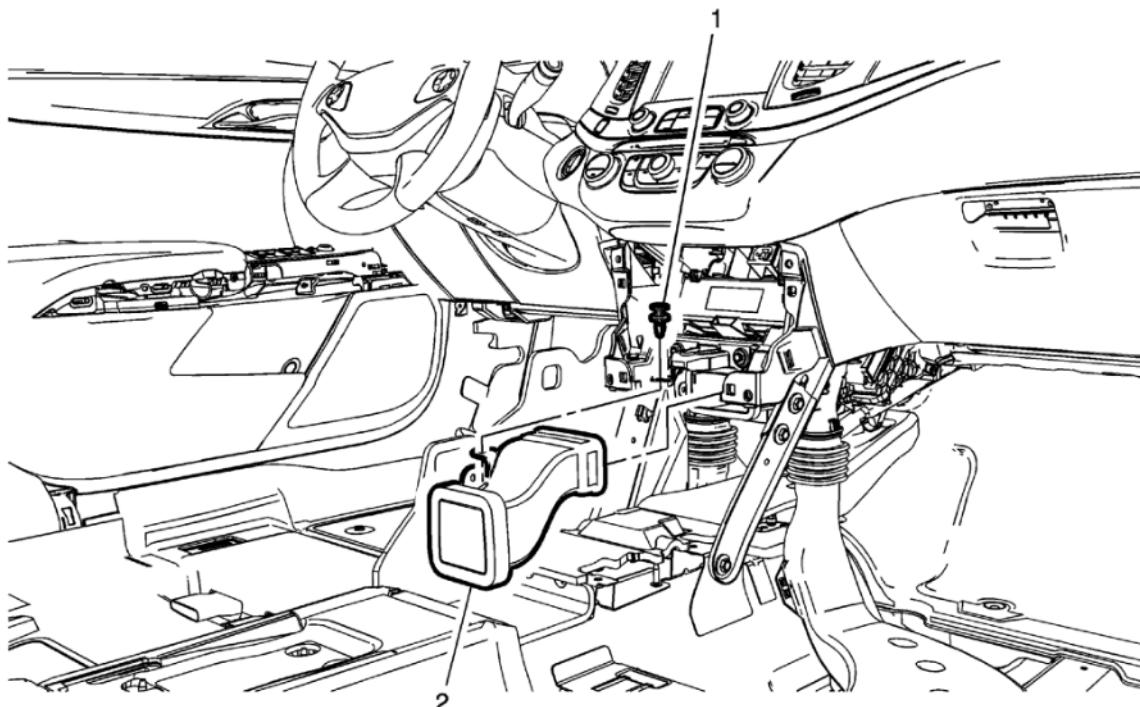


Fig. 86: Front Floor Console Rear Air Duct
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove the front floor console assembly. Refer to Front Floor Console Replacement .	
1	Front Floor Console Rear Air Duct Fastener
2	Front Floor Console Rear Air Duct

FRONT FLOOR CONSOLE REAR AIR OUTLET REPLACEMENT

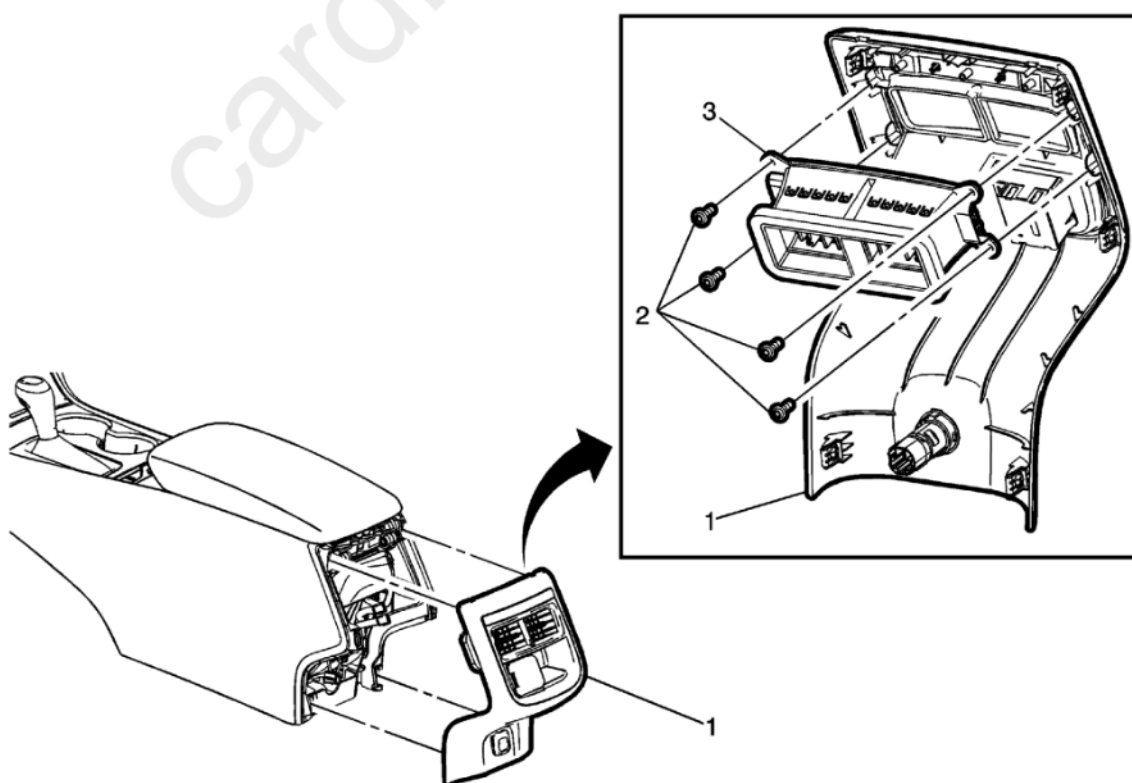


Fig. 87: Front Floor Console Rear Air Outlet
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Floor Console Rear Trim Panel Refer to Front Floor Console Rear Trim Panel Replacement .
2	Front Floor Console Rear Cover Screws (Qty: 4) CAUTION: Refer to Fastener Caution .
3	Front Floor Console Rear Air Outlet

WINDSHIELD DEFROSTER OUTLET DUCT REPLACEMENT

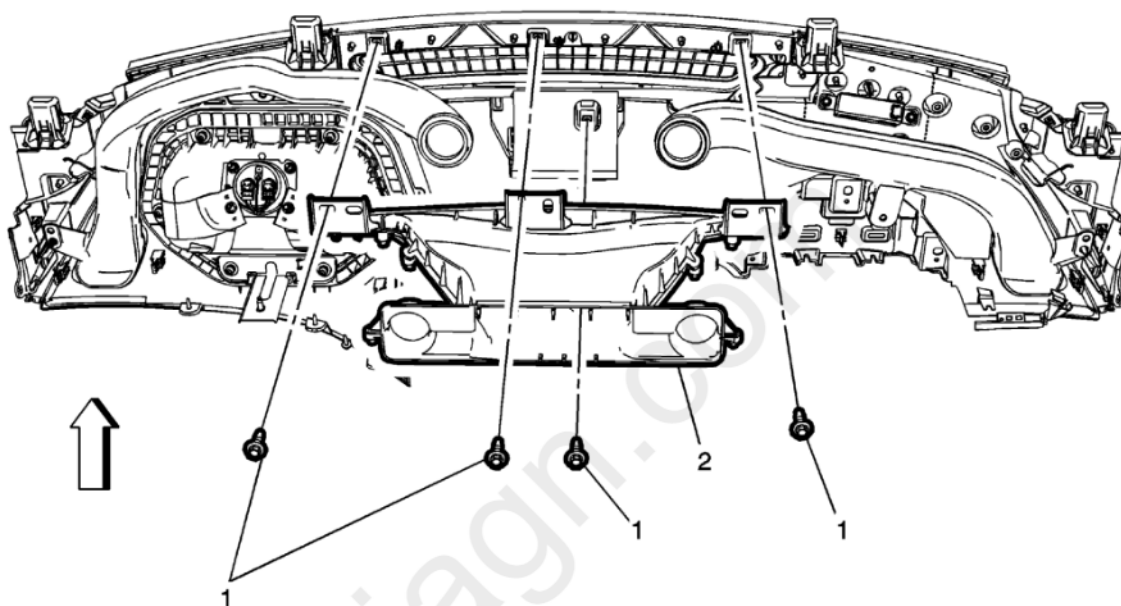


Fig. 88: Windshield Defroster Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Windshield Defroster Outlet Duct Fastener (QTY: 4) CAUTION: Refer to Fastener Caution .
2	Windshield Defroster Outlet Duct

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

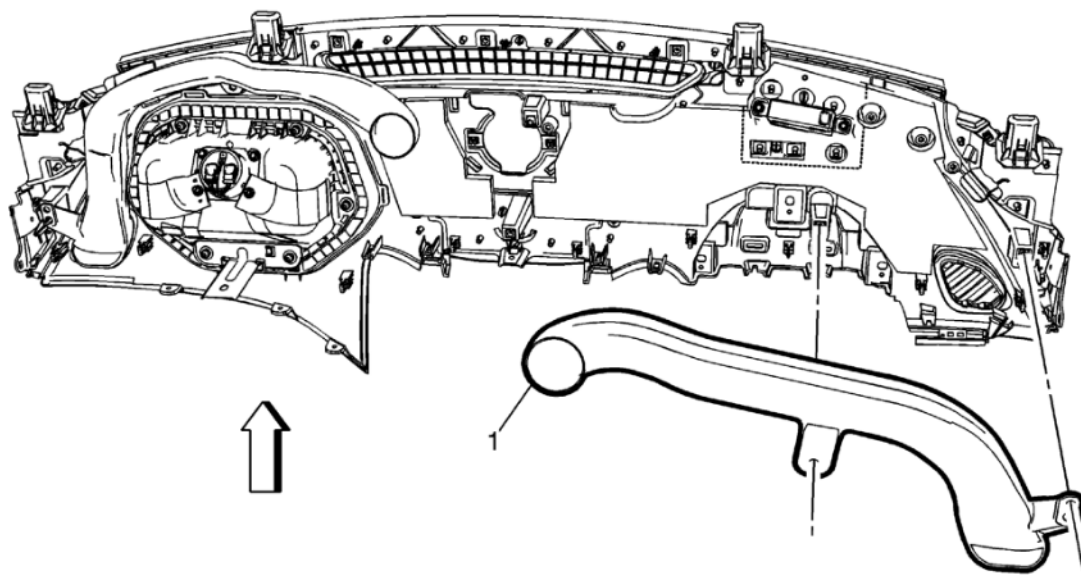


Fig. 89: Side Window Defogger Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures	
1. Remove the air distributor duct. Refer to Air Distributor Duct Replacement . 2. Remove the windshield defroster outlet duct. Refer to Windshield Defroster Outlet Duct Replacement .	
1	Side Window Defogger Outlet Duct - Left Side

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

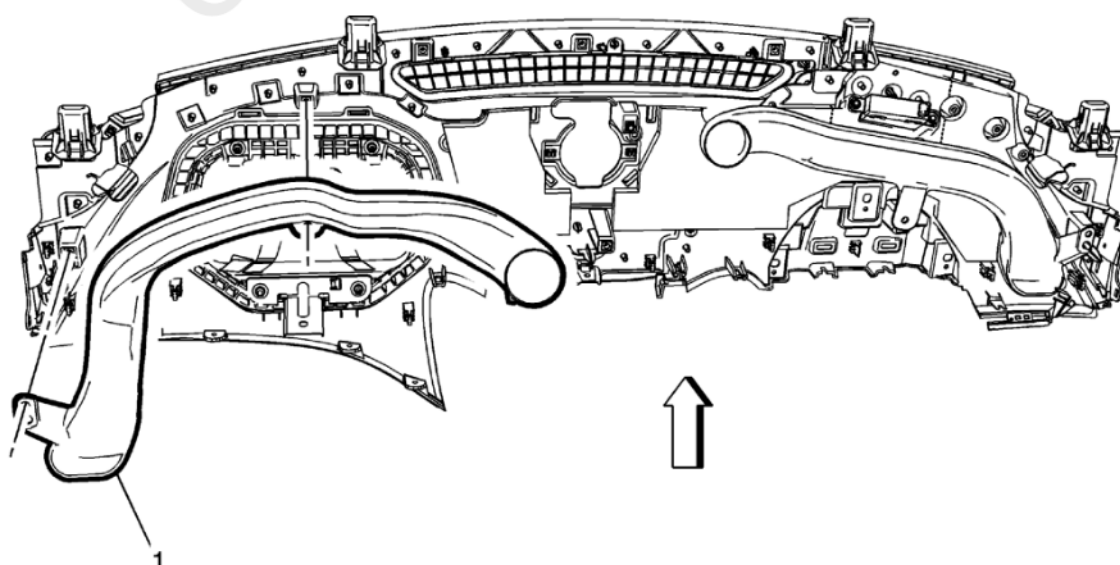


Fig. 90: Side Window Defogger Outlet Duct Replacement - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the air distributor duct. Refer to Air Distributor Duct Replacement. 2. Remove the windshield defroster outlet duct. Refer to Windshield Defroster Outlet Duct Replacement.	
1	Side Window Defogger Outlet Duct - Right Side

FLOOR REAR AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

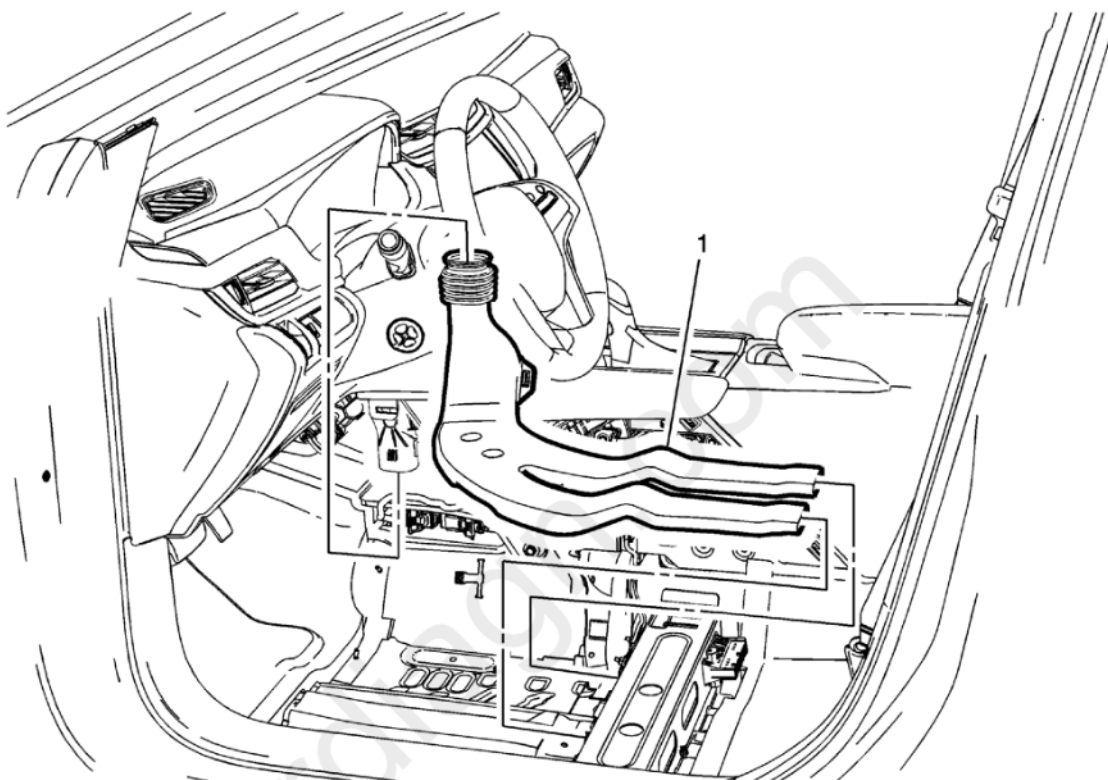


Fig. 91: Floor Rear Air Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the left side front carpet panel. Refer to Front Floor Panel Carpet Replacement - Left Side .	
1	Floor Rear Air Outlet Duct - Left Side

FLOOR REAR AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

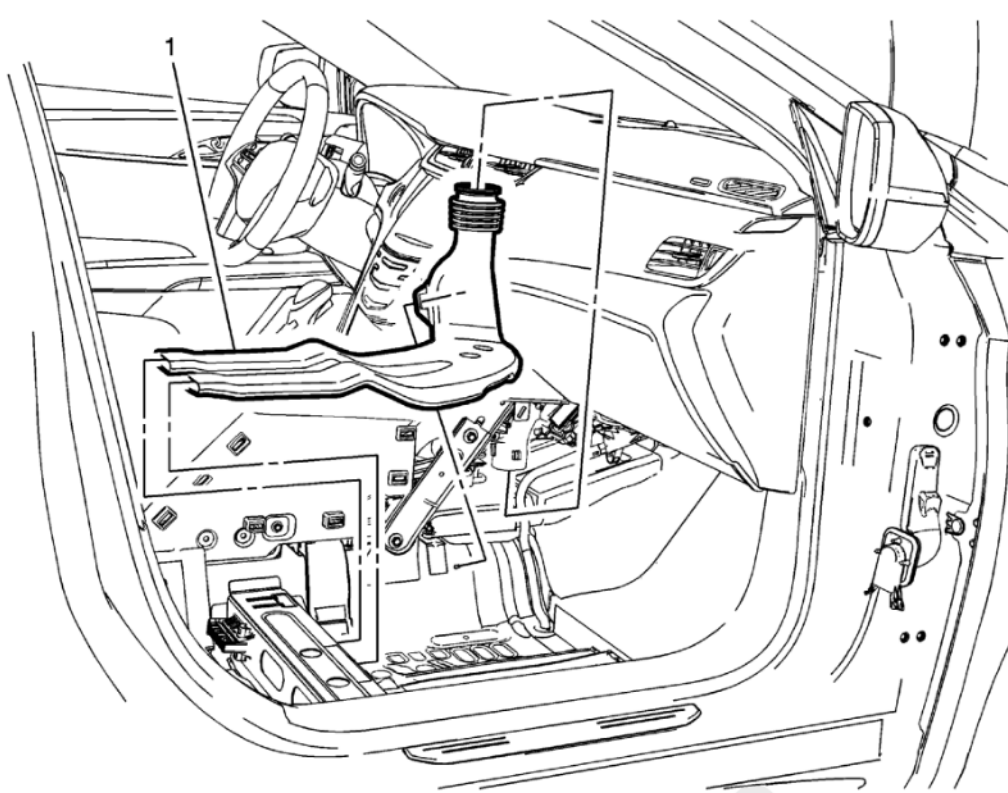


Fig. 92: Floor Rear Air Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the right front side carpet panel. Refer to Front Floor Panel Carpet Replacement - Right Side .	
1	Floor Rear Air Outlet Duct - Right Side

HEATER CORE REPLACEMENT

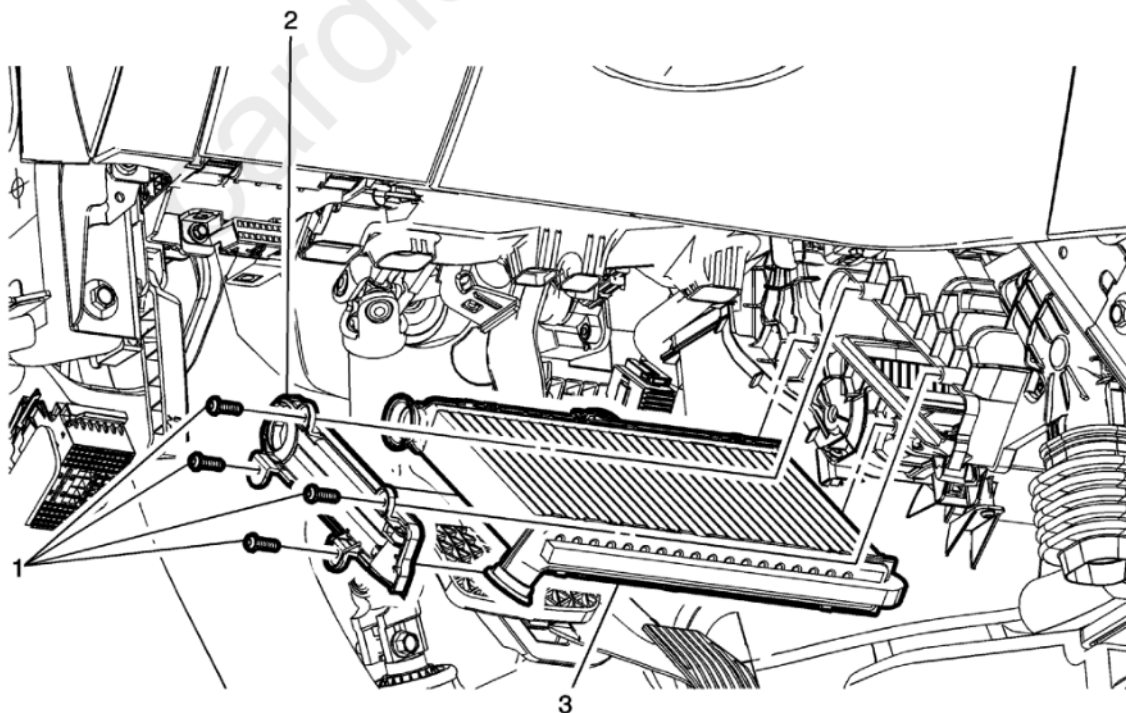


Fig. 93: Heater Core Assembly
 Courtesy of GENERAL MOTORS COMPANY

Call out	Component Name

Call out	Component Name
Preliminary Procedures 1. <u>Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static)</u> 2. <u>Floor Front Air Outlet Duct Replacement - Left Side</u> 3. <u>Front Floor Console Extension Replacement - Left Side</u> 4. Reposition the carpet to access the heater core tubes. 5. <u>Heater Tube Replacement</u> CAUTION: Refer to <u>HVAC Module Drain Tube Caution</u> .	
1	Heater and Air Conditioning Evaporator Module Cover Fastener (QTY: 4) CAUTION: Refer to <u>Fastener Caution</u> .
2	Heater And Air Conditioning Evaporator Module Cover
3	Heater Core Procedures 1. Level the engine coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Vacuum and Fill) Cooling System Draining and Filling (Static)</u> . 2. Inspect the engine cooling system for leaks.

HEATER TUBE REPLACEMENT

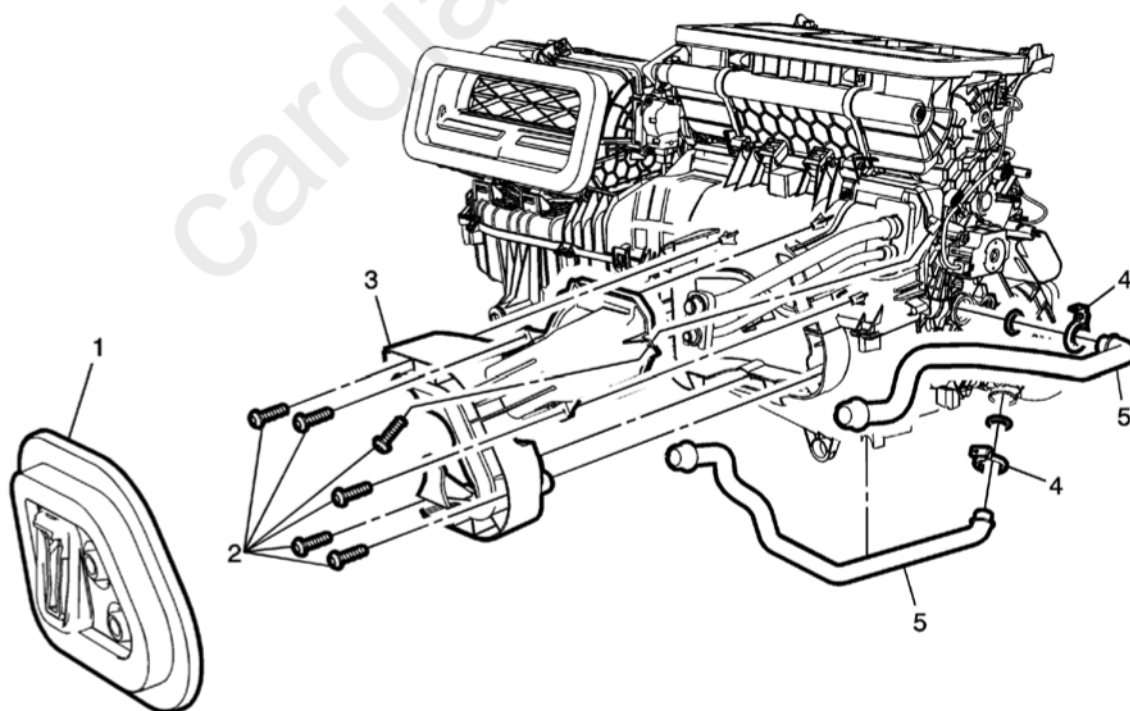


Fig. 94: Heater Tube & Evaporator Module Cover
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Heater and Air Conditioning Evaporator Tube Seal
2	Heater and Air Conditioning Evaporator Module Cover Fastener (Qty: 6) CAUTION: Refer to Fastener Caution .
3	Heater and Air Conditioning Evaporator Module Cover
4	Heater Core Outlet Tube Clamp (Qty: 2)
5	Heater Core Inlet and Outlet Tube (Qty: 2) Procedure Remove and discard the old sealing washers and replace with NEW.

DESCRIPTION AND OPERATION

HEATING AND AIR CONDITIONING SYSTEM DESCRIPTION AND OPERATION

Engine Coolant

Engine coolant is the key element of the heating system. The thermostat controls engine operating coolant temperature. The thermostat also creates a restriction for the cooling system that promotes a positive coolant flow and helps prevent cavitation. Coolant enters the heater core through the inlet heater hose, in a pressurized state.

The heater core is located inside the HVAC module. The heat of the coolant flowing through the heater core is absorbed by the ambient air drawn through the HVAC module. Heated air is distributed to the passenger compartment, through the HVAC module, for passenger comfort.

The amount of heat delivered to the passenger compartment is controlled by opening or closing the HVAC module air temperature door. The coolant exits the heater core through the return heater hose and recirculated back through the engine cooling system.

A/C Cycle

Refrigerant is the key element in an air conditioning system. R-134a is presently the only EPA approved refrigerant for automotive use. R-134a is an very low temperature gas that can transfer the undesirable heat and moisture from the passenger compartment to the outside air.

The A/C compressor is belt driven and operates when the magnetic clutch is engaged. The compressor builds pressure on the vapor refrigerant. Compressing the refrigerant also adds heat to the refrigerant. The refrigerant is discharged from the compressor, through the compressor and condenser hose, and forced to flow to the condenser and then through the balance of the A/C system. The A/C system is mechanically protected with the use of a high pressure relief valve. If the high pressure switch were to fail or if the refrigerant system becomes restricted and refrigerant pressure continued to rise, the high pressure relief will pop open and release refrigerant from the system.

Compressed refrigerant enters the condenser in a high temperature, high pressure vapor state. As the refrigerant flows through the condenser, the heat of the refrigerant is transferred to the ambient air passing through the condenser. Cooling the refrigerant causes the refrigerant to condense and change from a vapor to a liquid state.

The condenser is located in front of the radiator for maximum heat transfer. The condenser is made of aluminum and aluminum cooling fins, which allows rapid heat transfer for the refrigerant. The semi-cooled liquid refrigerant exits the condenser and flows through the condenser tube, to the thermal expansion valve.

The thermal expansion valve is located in the condenser tube between the condenser and the evaporator. The thermal expansion valve is the dividing point for the high and the low pressure sides of the A/C system. As the refrigerant passes through the thermal expansion valve, the pressure of the refrigerant is lowered. Due to the pressure differential of the liquid refrigerant, the refrigerant will begin to vaporize at the thermal expansion valve. The thermal expansion valve also meters the amount of liquid refrigerant that can flow into the evaporator.

Refrigerant exiting the thermal expansion valve flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant boil inside of the evaporator core. The boiling refrigerant absorbs heat from the ambient air and draws moisture onto the evaporator. The refrigerant exits the evaporator back through the thermal expansion valve and into the compressor hose and back to the compressor, in a vapor state completing the A/C cycle of heat removal. At the compressor, the refrigerant is compressed again and the cycle of heat removal is repeated.

The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture removed from the passenger compartment will also change form, or condense, and is discharged from the HVAC module as water under the vehicle.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	BO-38185 J-38185 Hose Clamp Pliers

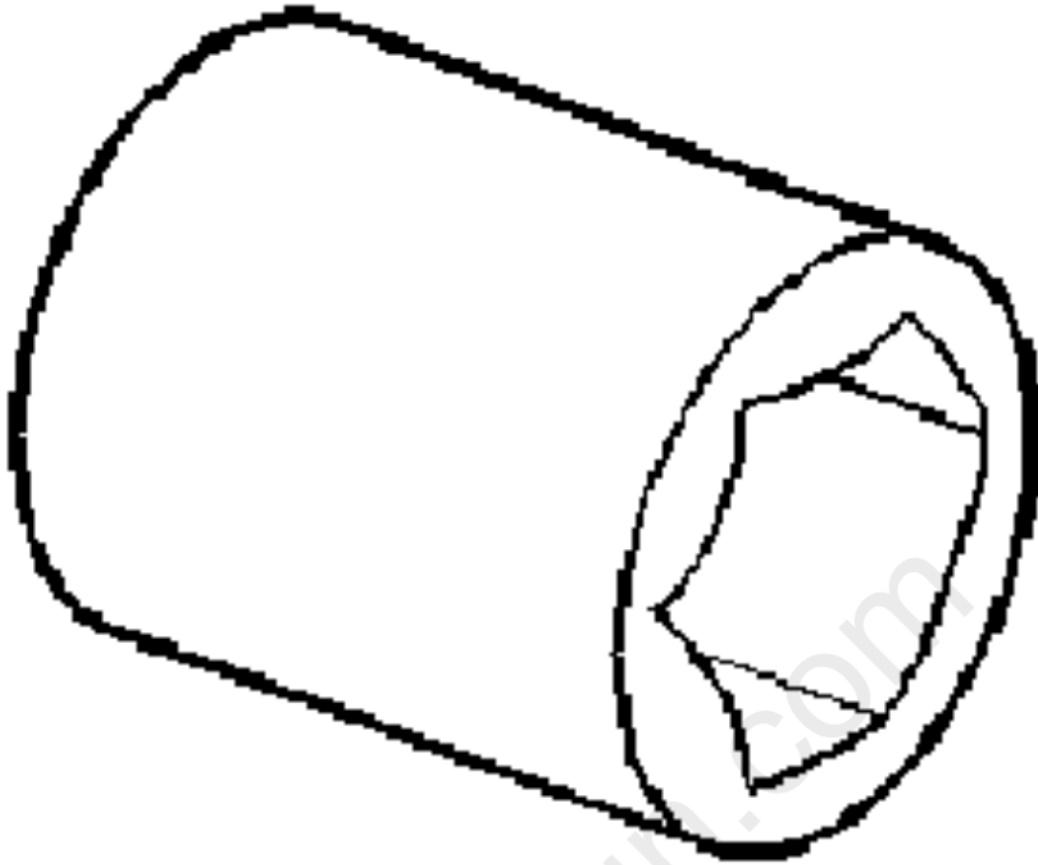
Illustration	Tool Number/ Description
	GE-39037 J-39037 Charge Valve Octagon Socket
	GE-41447 J-41447 R-134A A/C Tracer Dye - Box of 24

Illustration	Tool Number/ Description
	

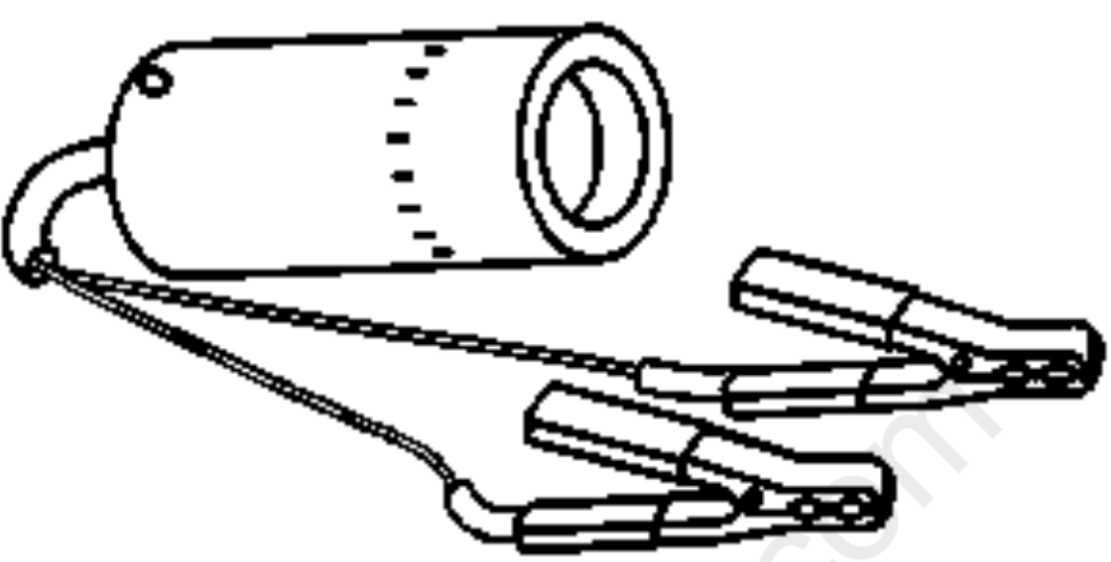
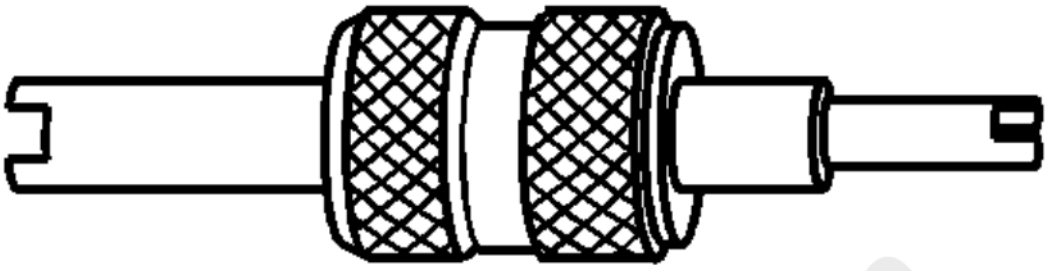
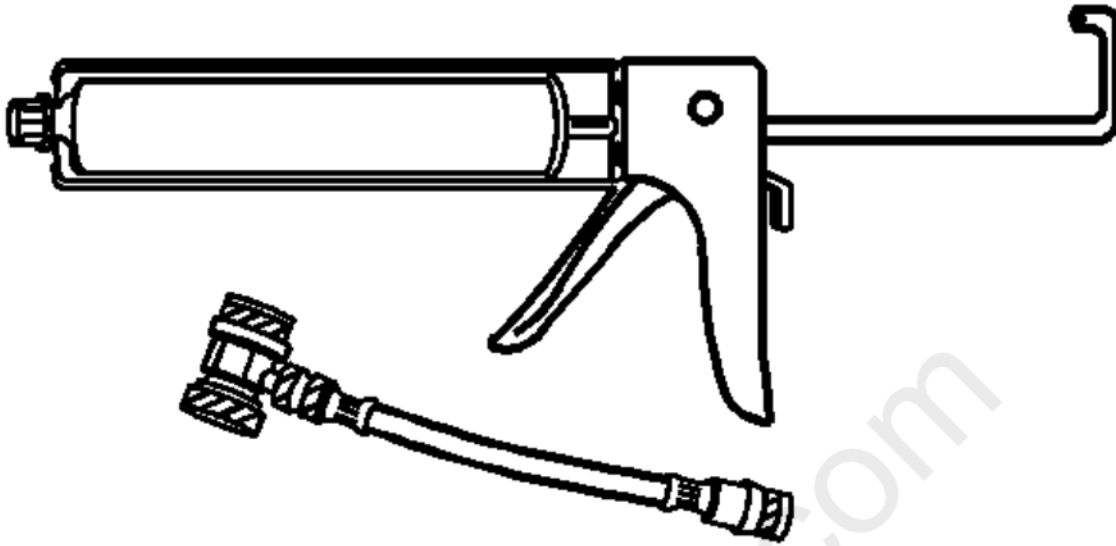
Illustration	Tool Number/ Description
 The illustration shows a cylindrical device, likely a leak detector, with a coiled cable extending from one end. The cable terminates in two alligator clips, one at each end, for connecting to a power source. The device has a simple, functional design with a cylindrical body and a circular opening at one end.	GE-42220 J-42220 Universal 12V Leak Detection Lamp

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

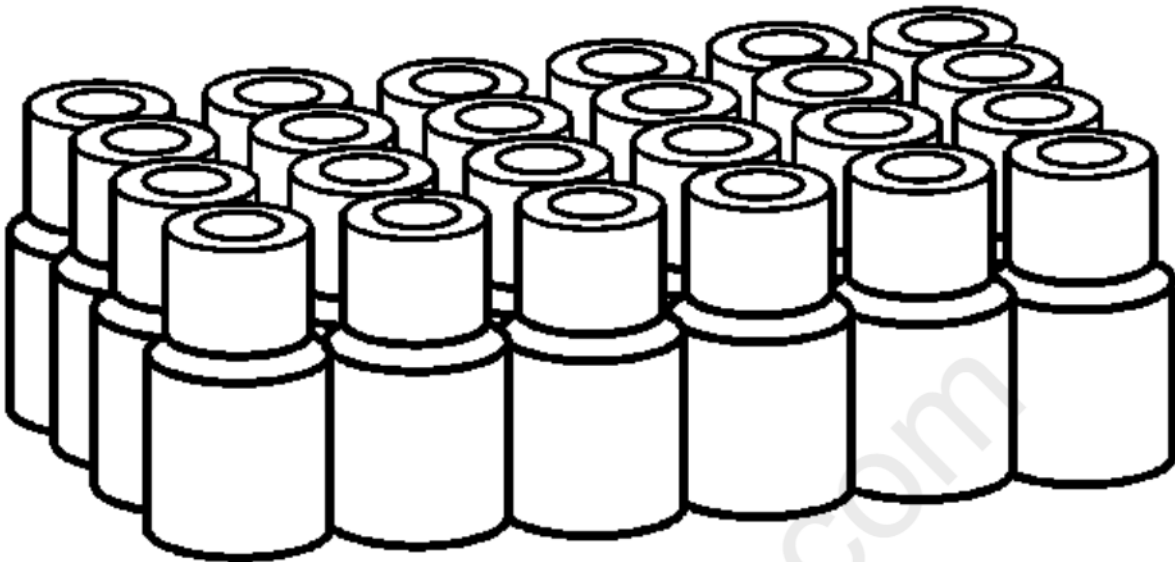
Illustration	Tool Number/ Description
	GE-46246 Valve Core Tool

Illustration

Tool Number/
Description

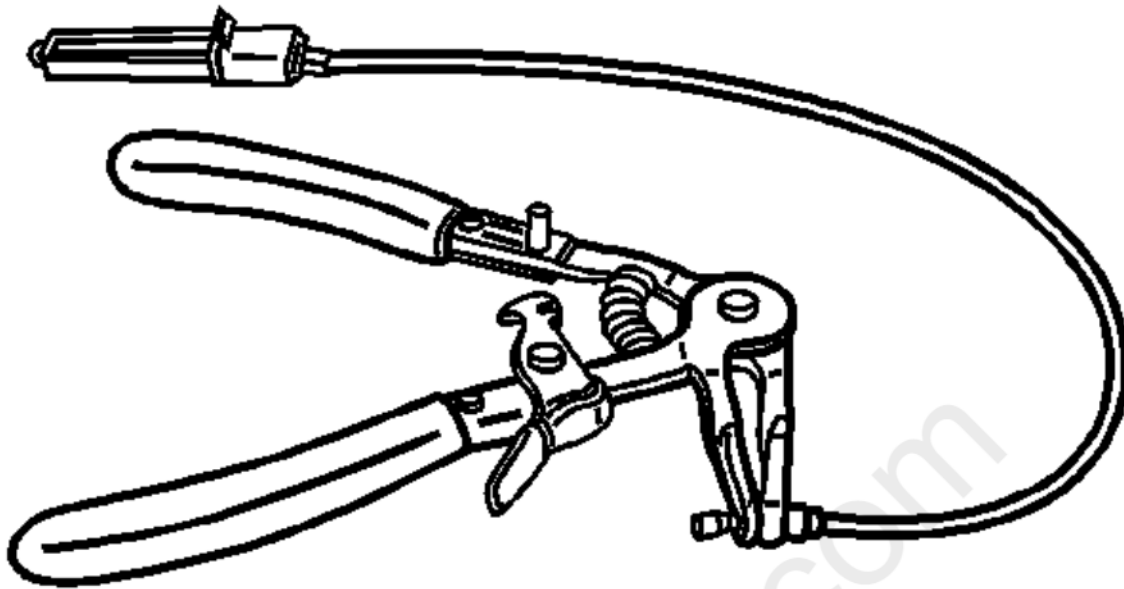


GE-46297
A/C Dye Injector
Kit

Illustration	Tool Number/ Description
 A cluster of 24 replacement dye cartridges arranged in a 4x3x2 grid. Each cartridge is a small cylinder with a wider base and a narrower top section. The top section has a circular opening. The cartridges are arranged in four rows, three columns, and two layers. A large, faint watermark 'cardiagn.com' is visible diagonally across the image.	GE-46297-12 Replacement Dye Cartridges

Illustration

Tool Number/
Description



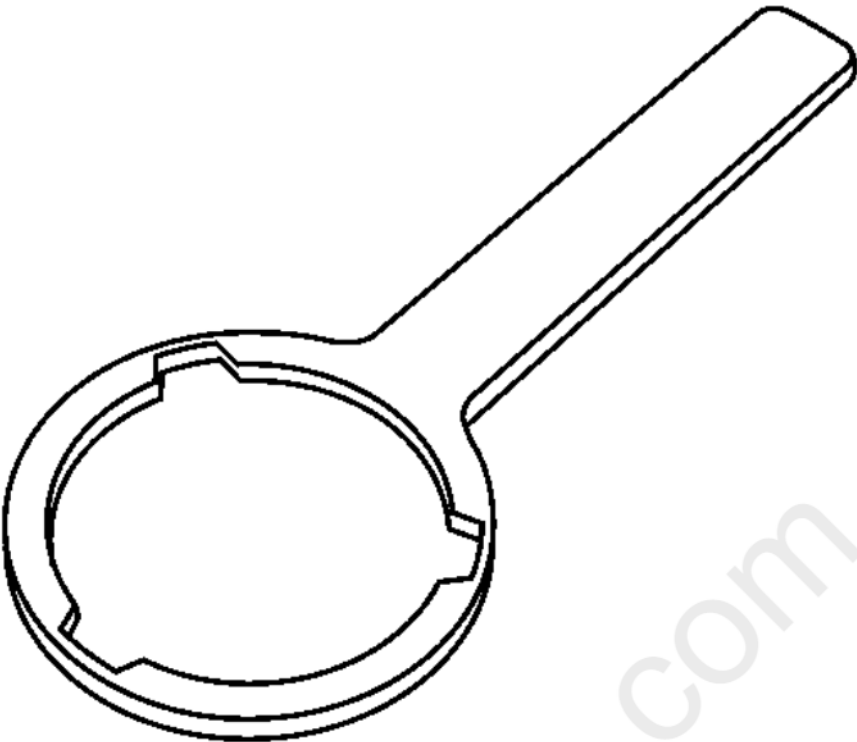
GE 47622
Hose Clamp Pliers

Illustration

Tool Number/
Description

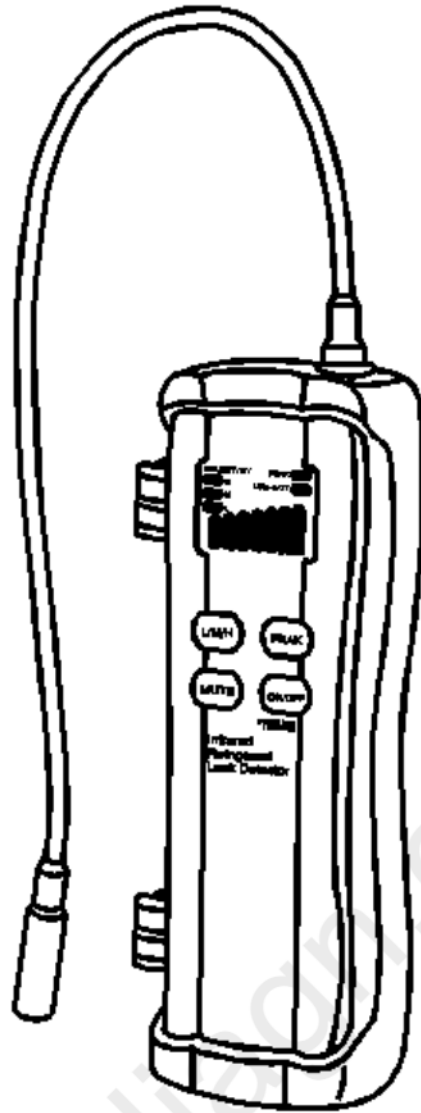


GE-48800
CoolTech A/C
Recharge Machine

Illustration	Tool Number/ Description
	GE 48965 Holding Wrench

Illustration

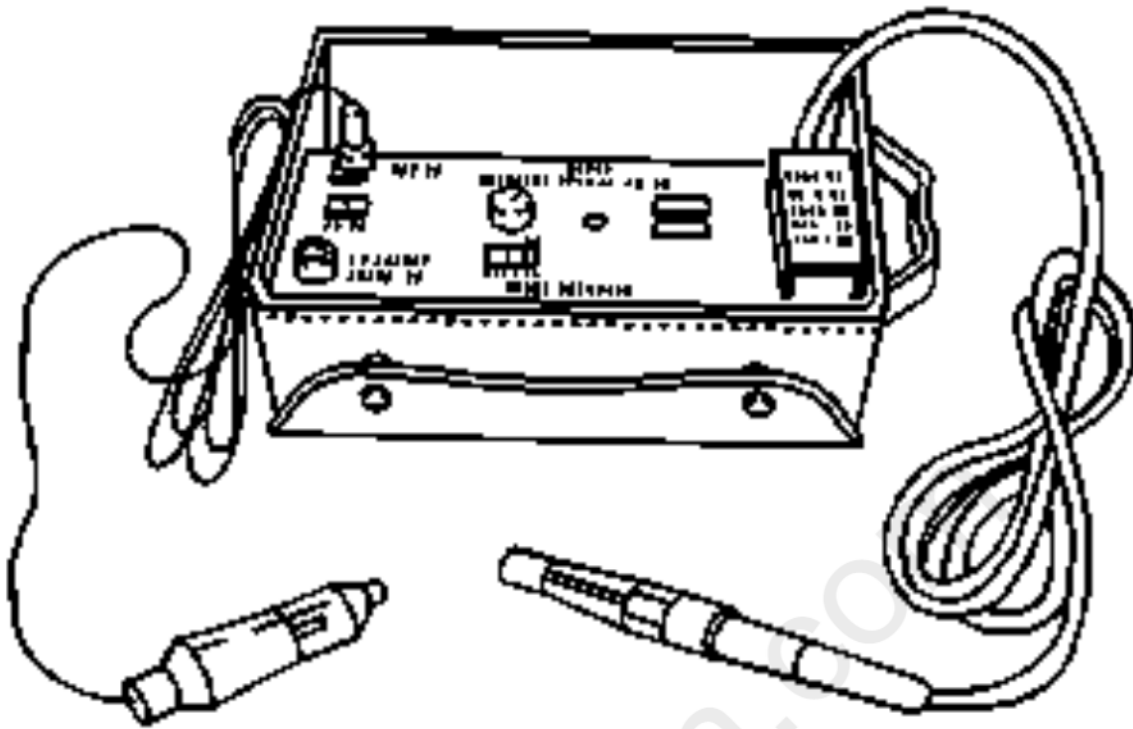
Tool Number/
Description



GE-50078
Infrared
Refrigerant Leak
Detector

Illustration

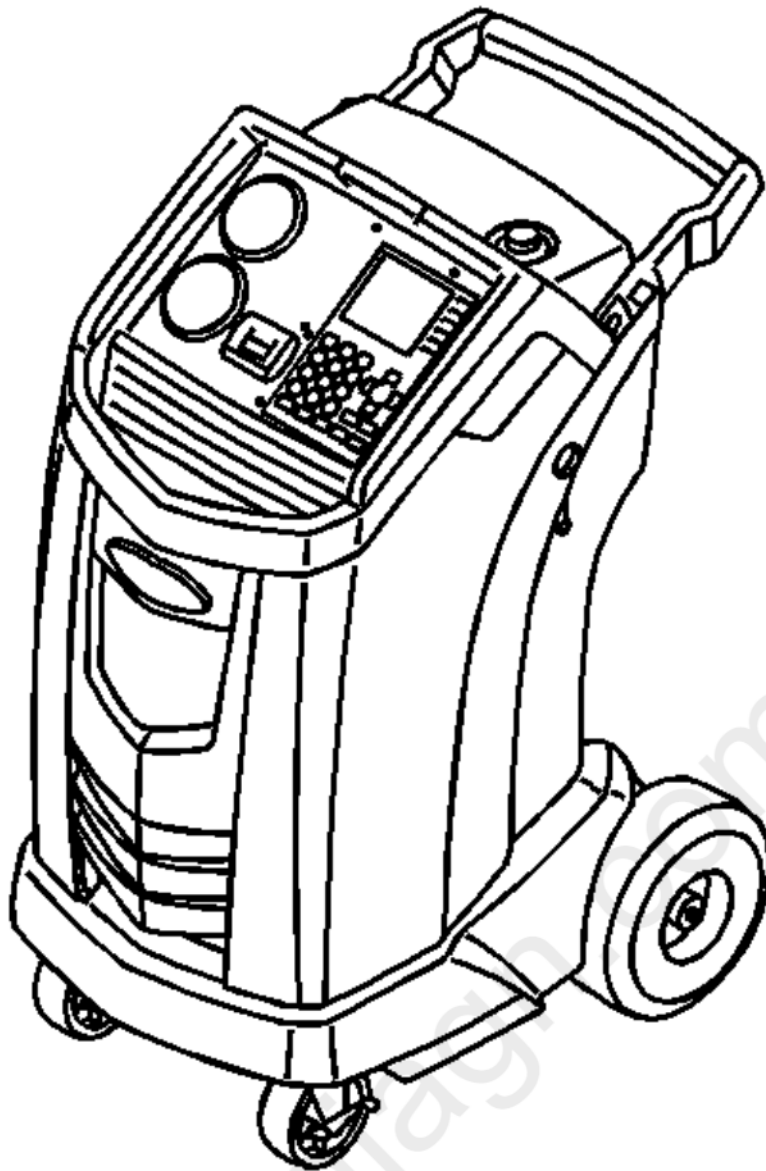
Tool Number/
Description



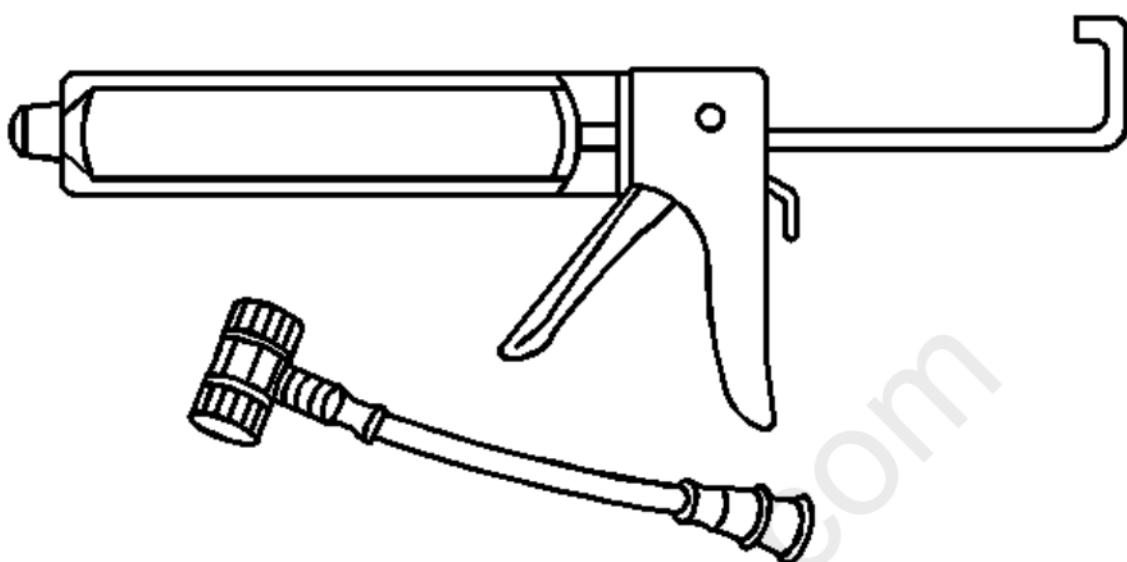
GE 39400-A
J 39400-A
Halogen Leak
Detector

Illustration

Tool Number/
Description

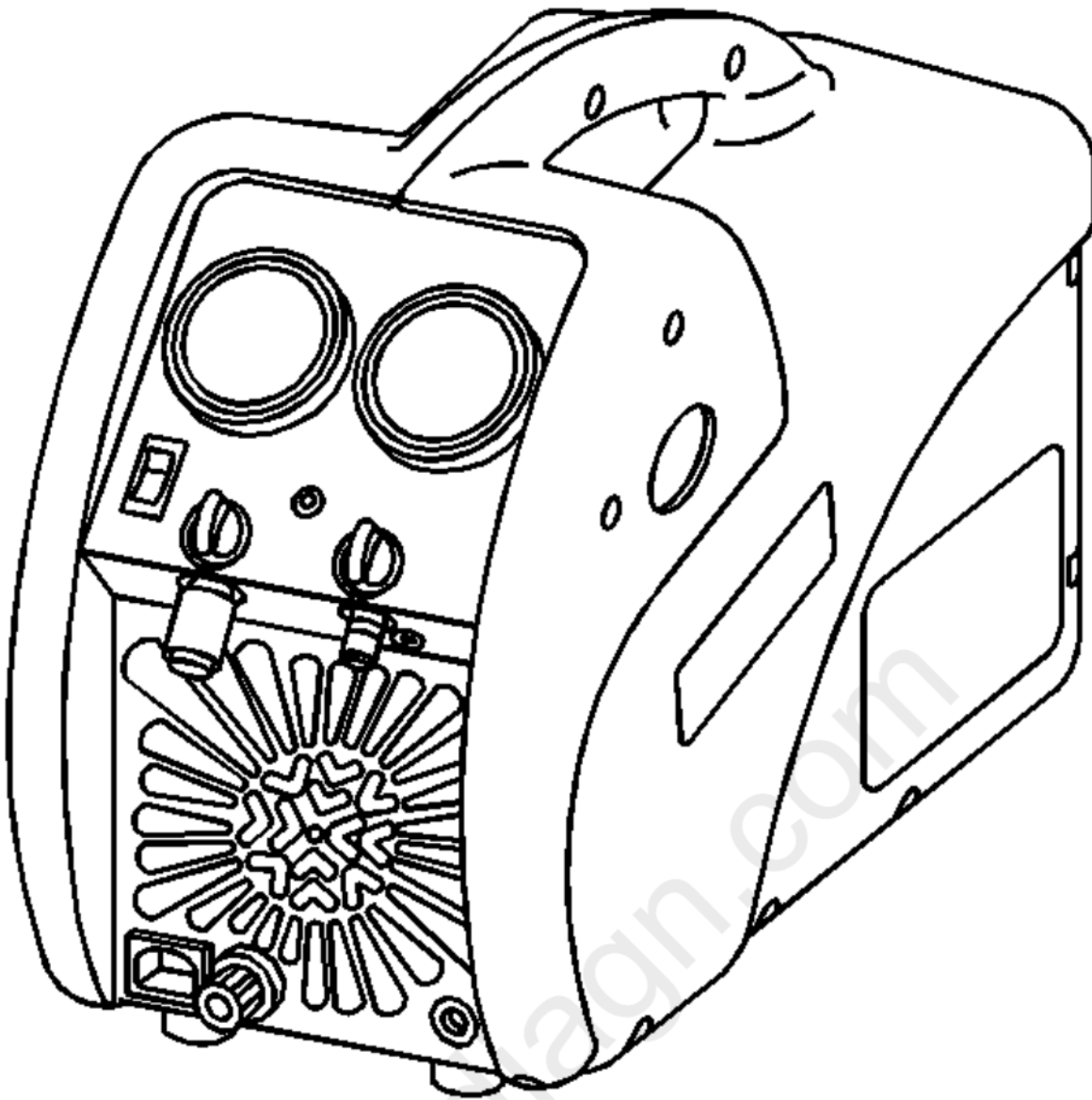


GE-50300
R-1234yf Air
Conditioning
Refrigerant
Recovery/Recharge
Cart

Illustration	Tool Number/ Description
 A line drawing of a manual oil injector tool. The tool consists of a cylindrical body with a trigger handle on the side and a long, thin nozzle extending from the front. Below the main tool is a separate flexible hose with a threaded connector at one end and a smaller nozzle at the other. A large, faint watermark 'cardiagn.com' is visible across the bottom half of the page.	GE-50744 R-1234yf PAG Oil Injector Hose

Illustration

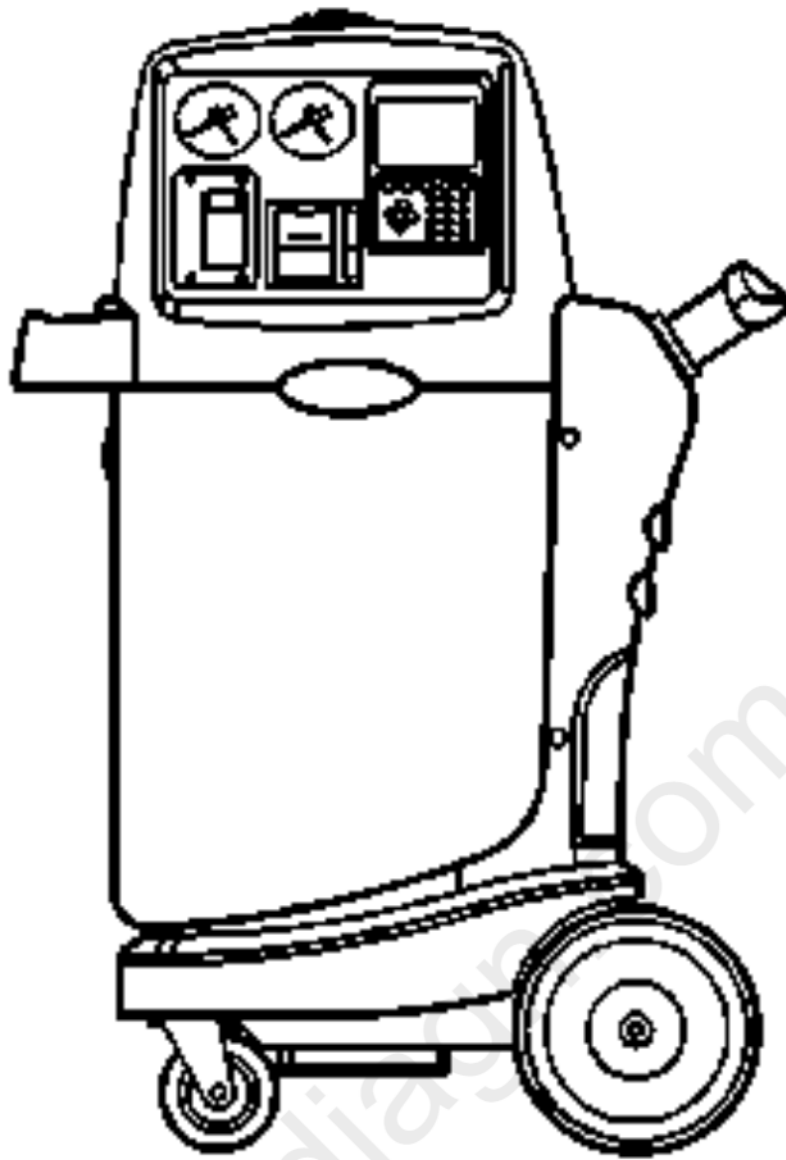
Tool Number/
Description



GE-50957
R-1234yf
Contaminated
Refrigerant
Recovery

Illustration

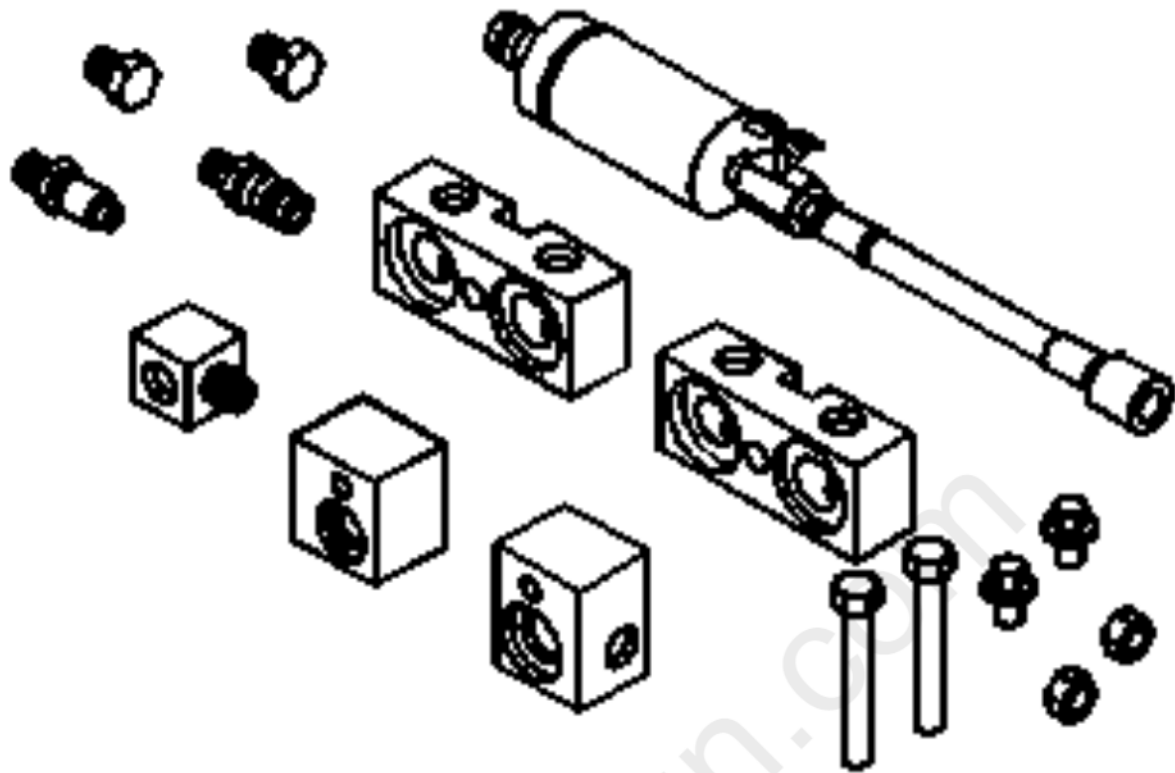
Tool Number/
Description



J-43600
ACR 2000 Air
Conditioning
Service Center

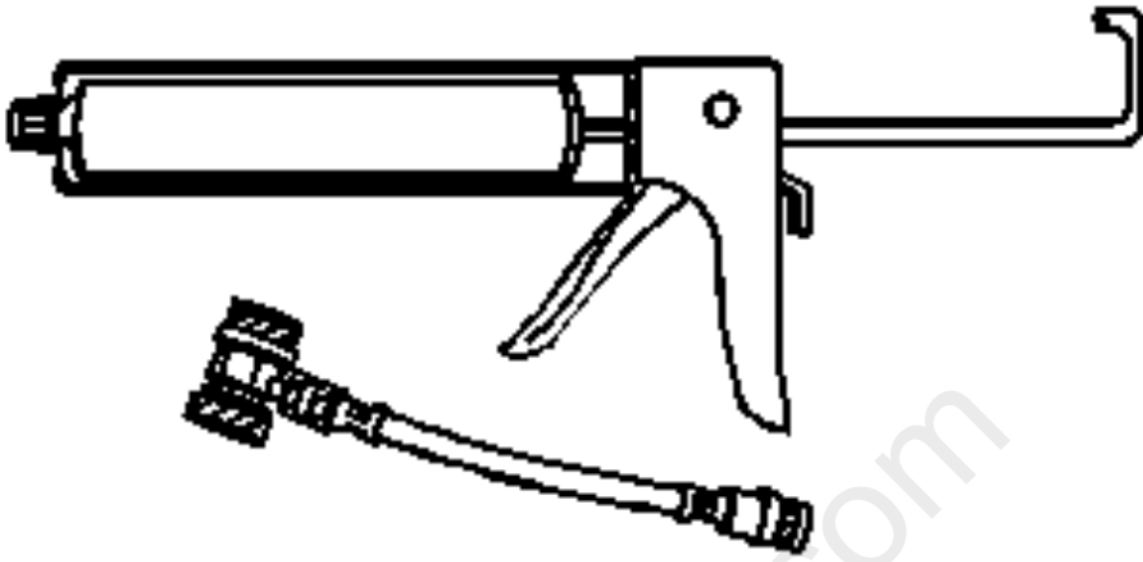
Illustration

Tool Number/
Description



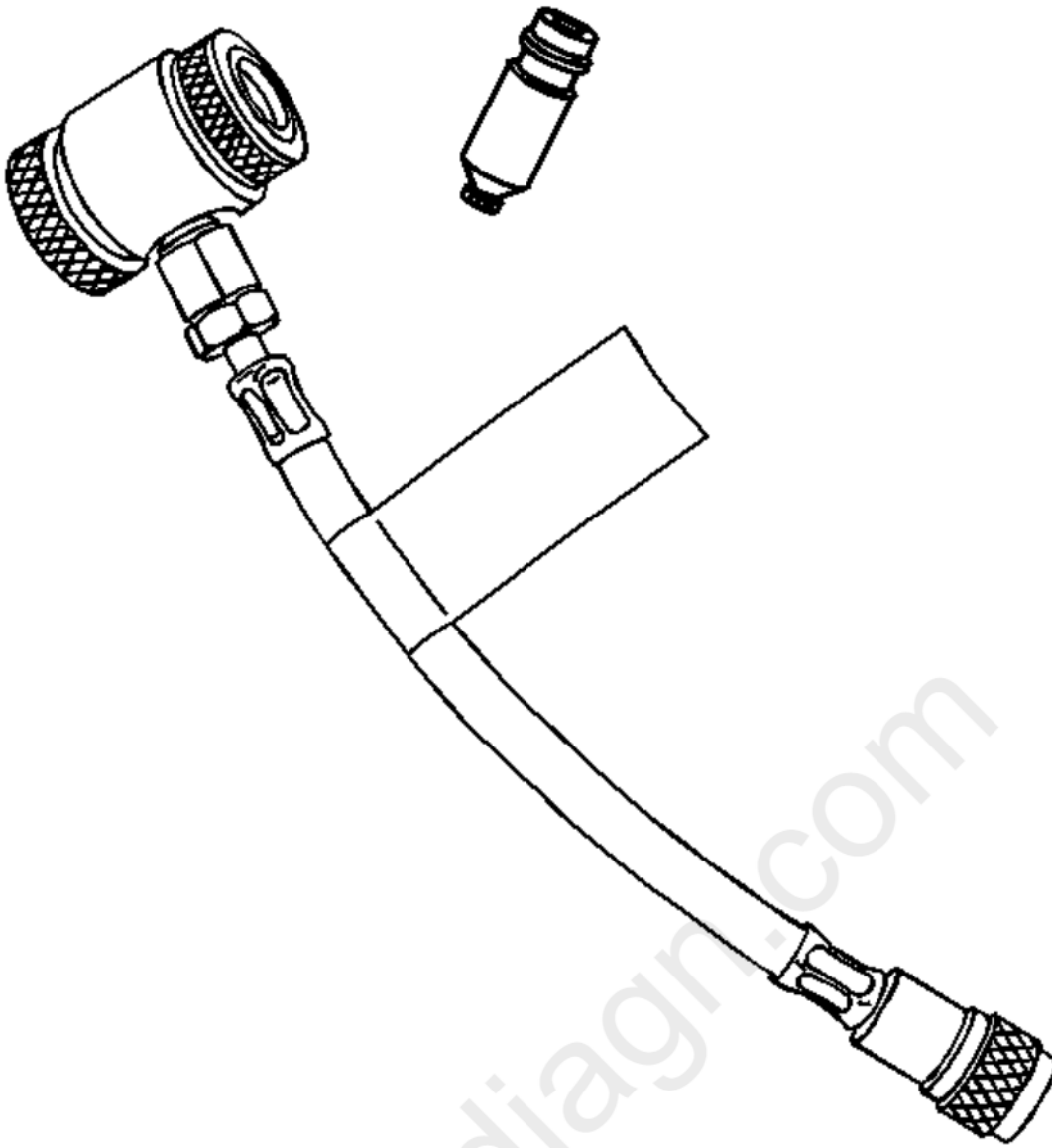
J-45268
A/C Flushing
Adapter Kit

Illustration	Tool Number/ Description
	J-43181 Heater Line Q.C. Release Tool

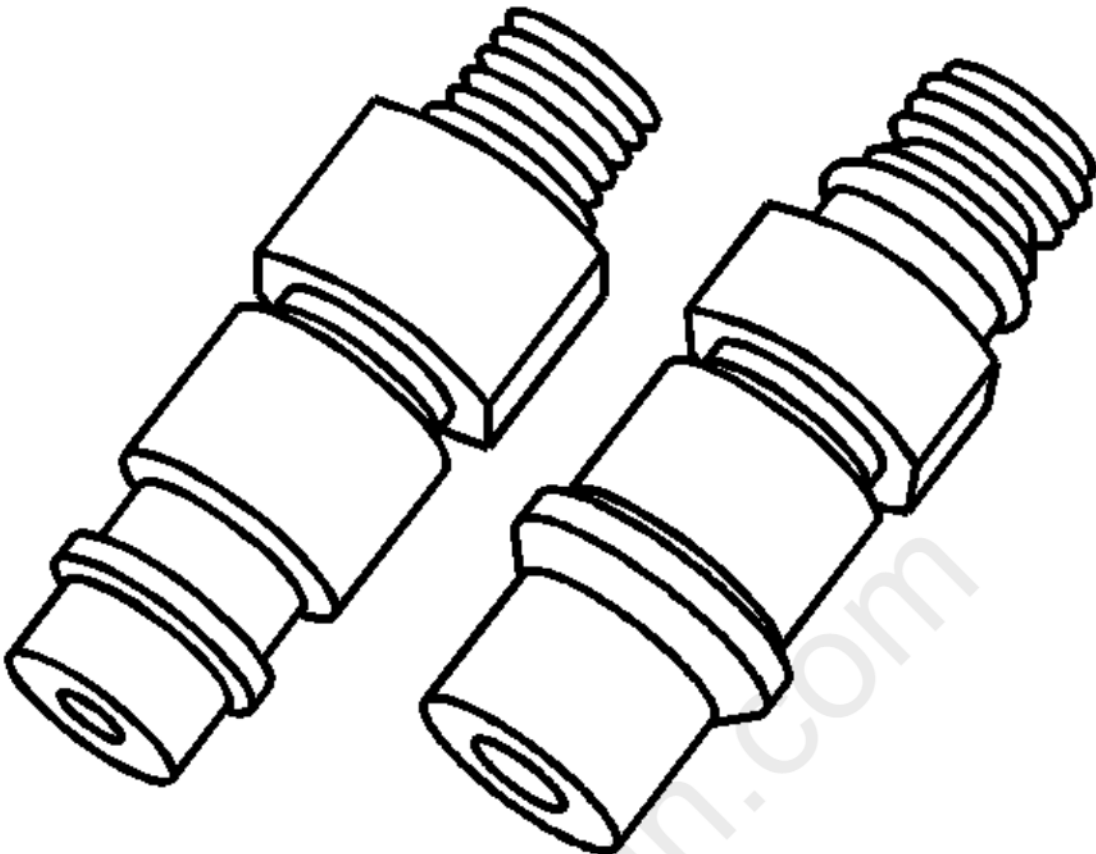
Illustration	Tool Number/ Description
	J - 45037 A/C Oil Injector

Illustration

Tool Number/ Description



GE-50745
R-1234yf POG Oil
Injector Hose

Illustration	Tool Number/ Description
	GE-45268-130 R-1234yf Flushing Adapter Kit