

HVAC

Heating, Ventilation, and Air Conditioning - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Conditioning Compressor Bolt (LTG)	22 N.m	16 lb ft
Air Conditioning Compressor Clutch Pulley Bolt	18 N.m	13 lb ft
Air Conditioning Compressor Drain Plug	30 N.m	22 lb ft
Air Conditioning Compressor and Condenser Hose Bolt To Compressor	22 N.m	16 lb ft
Air Conditioning Compressor and Condenser Hose Nut	22 N.m	16 lb ft
Air Conditioning Compressor and Condenser Hose Nut To Air Conditioning Evaporator Hose	22 N.m	16 lb ft
Air Conditioning Compressor and Condenser Hose Nut To Condenser	22 N.m	16 lb ft
Air Conditioning Compressor Nut (LTG)	22 N.m	16 lb ft
Air Conditioning Compressor Stud (LTG)	9 N.m	80 lb in
Air Conditioning Condenser Outlet Tube Bolt	10 N.m	89 lb in
Air Conditioning Condenser Outlet Tube Nut	22 N.m	16 lb ft
Air Conditioning Evaporator Hose Nut	22 N.m	16 lb ft
Air Conditioning Evaporator Hose Support Bracket Nut	10 N.m	89 lb in
Air Conditioning Evaporator Hose Support Rail Bracket Nut	10 N.m	89 lb in
Air Conditioning Evaporator Thermal Expansion Valve Tube Nut	22 N.m	16 lb ft
Air Conditioning (A/C) Refrigerant Pressure Sensor	7 N.m	62 lb in
Front Air Conditioning Compressor Bolt (LFX)	58 N.m	43 lb ft
Heater Water Auxiliary Pump Fastener	50 N.m	37 lb ft
HVAC Module Assembly Bolt to Cowl Panel	9 N.m	80 lb in
Rear Air Conditioning Compressor Bolt (LFX)	58 N.m	43 lb ft
Receiver and Dehydrator Plug	12.5 N.m	111 lb in

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada

PAG Oil (R-134a)	Lubricant	88901445	88900060
PAG Oil (R-1234yf)	Lubricant	19299051	19299052

REFRIGERANT SYSTEM SPECIFICATIONS

Refrigerant System Capacities

Application	Specification	
	Metric	English
Abrupt Refrigerant Loss	60 ml ¹	2.0 oz ¹
PAG Oil-Refer to Adhesives, Fluids, Lubricants, and Sealers .		
Compressor Replacement		
NOTE: Compressor failure can occur if the oil removed during refrigerant recovery is not replaced. The service compressor is precharged with one of the following specified amounts of PAG oil. Refer to the instruction sheet included with the service compressor.	41 ml ²	1.4 oz ²
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	120.0 ml	4.1 oz
R-134a		
• Refrigerant Charge	0.55 kg	1.2 lb
R-1234yf		
• Refrigerant Charge	0.55 kg	1.2 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.		

DIAGNOSTIC INFORMATION AND PROCEDURES

HANDLING OF REFRIGERANT LINES AND FITTINGS

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

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.

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

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 (R-134a), Leak Testing (R-1234yf)**
- **Noise Diagnosis - HVAC Module**
- **Noise Diagnosis - Air Conditioning (A/C) System**
- **Noise Diagnosis - Blower Motor**
- **Odor Diagnosis**

LEAK TESTING (R-134A)

Special Tools

- **GE-39400-A** Halogen Leak Detector
- **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

For equivalent regional tools. Refer to **Special Tools** .

Refrigerant Leak Testing

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 polyalkylene glycol (PAG) oil throughout the refrigerant system.

Verifying some passive leaks may require using the **GE-39400-A** Halogen 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.

Fluorescent Leak Detector

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

NOTE: **PAG oil is water soluble.**

- Condensation on the evaporator core or the refrigerant lines may wash the PAG 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 PAG oil. 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**.

Halogen 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 0.45 kg (1 lb) of refrigerant in the A/C refrigeration system in order to perform a leak test. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)** for recharging the A/C system.

NOTE: Halogen 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.

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

Follow the instructions supplied with the **GE-39400-A** Halogen Leak Detector.

LEAK TESTING (R-1234YF)

Special Tools

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

- **GE-43872** Fluorescent Dye Cleaner
- **GE-50078** Electronic Leak Detector

For equivalent regional tools, refer to **Special Tools**.

Refrigerant Leak Testing

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

WARNING: *Technicians shall only use a SAE J2913 certified electronic leak detector when checking for leaks with an R-1234yf vehicles A/C refrigerant system. Certain leak detection devices (heated diode or corona discharge) could serve as ignition sources in the presence of hydrocarbons or other flammable refrigerants. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.*

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

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

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

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

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

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

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

Fluorescent Leak Detection

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

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

Use the leak detection lamp in the following areas:

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

Fluorescent Dye Injection

NOTE: Use only fluorescent dye approved by General Motors.

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

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

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

Electronic Leak Detector - SAE J2913 Certified

Ensure that the vehicle has at least 15 percent of the specified refrigerant charge in the A/C refrigeration system in order to perform a leak test. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

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

Follow the manufacturer instructions supplied with **GE-50078** Electronic Leak Detector or a SAE J2913

certified electronic leak detector.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST (R-134A)

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

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.

Air Conditioning (A/C) System Performance Test (R-134a)

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. 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.	More than 16°C (60°F) - 345 kPa (50		

1	4. Turn OFF the ignition. 5. Install the J-43600 Acr2000 Air Conditioning Service Center ACR 2000 Air Conditioning Service Center. 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?	psi) More than 24°C (75°F) - 483 kPa (70 psi) More than 33°C (90°F) - 690 kPa (100 psi)	Go to Leak Testing (R-134a), Leak Testing (R-1234yf)	
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
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 <u>A/C Diagnostics Chart</u>. 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 <u>Symptoms - HVAC Systems - Automatic</u>

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 (55-64°F)	0-100%	186-289 kPa (27-42 psi)	930-1260 kPa (135-183 psi)	10°C (50°F)
19-24°C (66-75°F)	Less than 40%	186-289 kPa (27-42 psi)	909-1212 kPa (132-176 psi)	9°C (48°F)
	Greater than 40%	213-323 kPa (31-	1019-1329 kPa	13°C (55°F)

		47 psi)	(148-193 psi)	
25-29°C (77-84°F)	Less than 35%	220-310 kPa (32-45 psi)	1061-1288 kPa (154-187 psi)	12°C (54°F)
	35-50%	241-323 kPa (35-47 psi)	1123-1322 kPa (163-192 psi)	13°C (55°F)
	Greater than 50%	254-351 kPa (37-51 psi)	1157-1391 kPa (168-202 psi)	15°C (59°F)
30-35°C (86-95°F)	Less than 30%	248-337 kPa (36-49 psi)	1157-1391 kPa (168-202 psi)	14°C (57°F)
	30-50%	261-358 kPa (38-52 psi)	1198-1419 kPa (174-206 psi)	15°C (59°F)
	Greater than 50%	282-378 kPa (41-55 psi)	1240-1460 kPa (180-212 psi)	18°C (64°F)
36-41°C (97-106°F)	Less than 20%	282-365 kPa (41-53 psi)	1288-1508 kPa (187-219 psi)	17°C (63°F)
	20-40%	289-378 kPa (42-55 psi)	1302-1522 kPa (189-221 psi)	18°C (64°F)
	Greater than 40%	303-392 kPa (44-57 psi)	1329-1529 kPa (193-222 psi)	19°C (66°F)
42-46°C (108-115°F)	Less than 20%	316-392 kPa (46-57 psi)	1419-1612 kPa (206-234 psi)	18°C (64°F)
	Greater than 20%	323-406 kPa (47-59 psi)	1433-1612 kPa (208-234 psi)	20°C (68°F)
47-49°C (117-120°F)	Below 30%	351-427 kPa (51-62 psi)	1529-1701 kPa (222-247 psi)	22°C (72°F)

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST (R-1234YF)

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

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

- 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.

Air Conditioning (A/C) System Performance Test (R-1234yf)

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 Acr2000 Air Conditioning Service Center ACR 2000 Air Conditioning Service Center. 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 (R-134a), Leak Testing (R-1234yf)
	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			

2	cm (5-6 in). - 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. - Install thermometers in the left and right center panel air outlets. - Apply the parking brake. - Place the transaxle/transmission in one of the following positions: - PARK (Automatic) - NEUTRAL (Manual) - Start the engine and warm to operating temperature. - Operate the A/C system for 5 minutes. - Inspect A/C components for the following conditions: - Abnormal frost areas - Unusual noises - Record the following information: - The panel outlet air temperatures - The low-side pressure - The high-side pressure - 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?			
	If the pressures and temperatures recorded do not fall within the specified ranges: - Continue to operate the A/C system for an additional 5 minutes. - Record the pressures and temperatures		Go to Step 5	Go to Step 3

3	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?			
4	Perform the necessary repairs. Refer to <u>A/C Diagnostics Chart.</u> Is the action complete?	-	Go to Step 5	Go to Step 4
5	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to <u>Symptoms - HVAC Systems - Automatic</u>

A/C Performance Table

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47-49°C (117-120°F)	Below 30%	351-427 kPa (51-62 psi)	1529-1701 kPa (222-247 psi)	22°C (72°F)

A/C DIAGNOSTICS CHART

A/C Diagnostics Chart

Low Side Gauge Reading	High Side Gauge Reading	Potential Causes
Low	Low	Low Refrigerant Charge
		Restriction between Compressor and High Side port
	Low/Normal	Evaporator Freezing
	High	Restriction between the Low Side and High Side ports or Restricted TXV/Orifice Tube
		Compressor Stuck at Maximum Displacement
High	Low	Compressor has Low Displacement or Internal Malfunction
		Malfunctioning Cooling Fans
	High	Refrigerant Overcharge
		Restriction between the Low Side Port and Compressor Inlet
		Restricted Condenser Air Flow
		Expansion Device Stuck Open
		Air in A/C System
Normal/High	Normal/High	Refrigerant Contamination
		PAG or POE Oil Overcharge

HEATING PERFORMANCE DIAGNOSTIC

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
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 instrument panel (I/P) 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 air outlet • The heater core outlet hose 7. Compare the recorded temperatures. Are the two temperature readings about equal?	Go to Step 5	Go to Step 6
5	1. Inspect and repair the following areas of the vehicle for cold air leaks: • The cowl • The recirculation door • The HVAC module case 2. Perform the necessary repairs. Are the repairs complete?	Go to Step 10	-
6	1. Inspect the temperature door operation. Refer to <u>Automatic HVAC Description and Operation</u> . 2. Inspect the temperature valve actuator for proper operation. Refer to <u>Temperature Valve Actuator Replacement - Right Side</u> , and <u>Temperature Valve Actuator Replacement - Left Side (CJ4)</u> , <u>Temperature Valve Actuator</u>		-

	<u>Replacement - Left Side (CJ2)</u> . 3. Perform any necessary repairs. Are the repairs complete?	Go to Step 10	
7	1. Turn OFF the engine. 2. Back flush 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 <u>Heater Core Replacement</u> . Is the repair complete?	Go to Step 10	-
9	Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature</u> . 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

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 <u>Symptoms - HVAC Systems - Automatic</u>
2	1. Start the engine. 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
	1. Select the minimum blower speed. 2. Select the maximum temperature setting. WARNING:		

	Refer to <u>Moving Parts and Hot Surfaces Warning</u> .		
3	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 <u>Air Conditioning (A/C) System Performance Test (R-134a)</u> , <u>Air Conditioning (A/C) System Performance Test (R-1234yf)</u> . 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 <u>Diagnostic Starting Point - Vehicle</u> . Is the repair complete?	Go to Step 10	-
7	Repair the heating concern. Refer to <u>Heating Performance Diagnostic</u> . Is the repair complete?	Go to Step 10	-
8	Repair the A/C performance concern. Refer to <u>Air Conditioning (A/C) System Performance Test (R-134a)</u> , <u>Air Conditioning (A/C) System Performance Test (R-1234yf)</u> . Is the repair complete?	Go to Step 10	-
9	Repair the air inlet door concern. Refer to <u>Air Inlet Housing Replacement</u> . 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

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 <u>Symptoms - HVAC Systems - Automatic</u>
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 <u>Blower Motor Replacement</u>. 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
8	Remove the foreign material. Is the action complete?	Go to Step 10	-
9	Replace the blower motor. Refer to <u>Blower Motor Replacement</u> . Is the repair complete?	Go to Step 11	-
10	Install the blower motor. Refer to <u>Blower Motor Replacement</u> . 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

Air Conditioning Compressor Oil Diagnosis

Condition	Corrective Action
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.
Hybrid Polyolester 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

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
	1. A/C system noises can be generally categorized		

2	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 <u>Drive Belt Falls Off and Excessive Wear Diagnosis</u> , or <u>Drive Belt Falls Off and Excessive Wear Diagnosis</u> . Is the drive belt excessively worn?	Go to Step 18	Go to Step 4
4	Inspect the drive belt tension. Refer to <u>Drive Belt Tensioner Diagnosis</u> , or <u>Drive Belt Tensioner Diagnosis</u> . 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
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 <u>Refrigerant System Specifications</u> . 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 <u>Refrigerant Recovery and Recharging (R-134a)</u> , <u>Refrigerant Recovery and Recharging (R-1234yf)</u> . 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 <u>Drive Belt Replacement (LFX)</u> , <u>Drive Belt Replacement (LF3)</u> , or <u>Drive Belt Replacement</u> . Is the replacement complete?	Go to Step 26	-
19	Replace the A/C drive belt tensioner. Refer to <u>Drive Belt Tensioner Replacement (LFX)</u> , <u>Drive Belt Tensioner Replacement (LF3)</u> , or <u>Drive Belt Tensioner Replacement</u> . 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 clutch. Refer to <u>Air Conditioning Clutch Assembly Replacement</u> . Is the replacement complete?	Go to Step 26	-
24	Replace the A/C compressor. Refer to <u>Air Conditioning Compressor Replacement (LTG)</u> , <u>Air Conditioning Compressor Replacement (LFX)</u> , <u>Air</u>		-

	Conditioning Compressor Replacement (LF3). 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

NOISE DIAGNOSIS - HVAC MODULE

Noise Diagnosis - HVAC Module

Step	Action	Yes	No
DEFINITION: Noise originating from the HVAC module.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Cycle through all of the following: • Blower motor speeds • HVAC modes • Temperature control settings 3. Determine the type of noise: • Scrape, pop • Tick/click, chirp or groaning • Air rush/whistle Is a scrape or pop noise evident when selecting modes or temperature settings?	Go to Step 6	Go to Step 3
3	Is a tick/click, chirping, groaning or scraping noise present, but decreases as blower motor speed is decreased?	Go to Step 6	Go to Step 4
4	Is an air rush/whistle noise evident in all modes but not all temperature settings?	Go to Step 6	Go to Step 5
5	Is an air rush/whistle noise evident only in defrost or floor mode?	Go to Step 6	Go to Step 6
6	Remove the IP carrier. Refer to Instrument 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 <u>Instrument Carrier Replacement</u> . 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

Odor Diagnosis

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Automatic</u>
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 <u>Passenger Compartment Air Filter Replacement</u> . 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 <u>Loss of Coolant</u> . 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 <u>Heater Core Replacement</u> . Is the repair complete?	Go to Step 15	-
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15
13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: • <u>Oil Leak Diagnosis</u> for engine oil leaks • <u>Fluid Leak Diagnosis</u> for the automatic 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 <u>Odor Correction</u> . 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

HVAC ASSEMBLY PLANT REPAIR EXCEPTIONS (DO NOT RELEASE)

Introduction:

NOTE: *This document must never be released to the Service Community. This document must remain in WIP status for Assembly Plant usage only.*

NOTE: Heating, Ventilation, and Air Conditioning (HVAC) systems are pressurized refrigeration, high voltage (Hybrid) and impact environmental issues with recycling. Prior to repairing these systems, operators should receive appropriate service and safety training in mobile HVAC.

For various reasons, vehicles assembled in Assembly Plants may require Heating, Ventilation, and Air Conditioning System (HVAC) repairs. These repairs require diagnostics, special tools, non-production parts, and a specific repair procedure. The Repair procedures for given model vehicles is published for GM dealerships under SI (Service Information) The information is updated daily and has been reviewed by appropriate service engineering support. To provide Assembly Plant HVAC repair person with specific written procedures for diagnostics and repair procedures, the repair personnel shall follow these procedures except under the following circumstances:

Diagnostics:

1. Follow diagnostic methods described in the SI but include information from ALD test write-ups as well as the inspection reports. Confirm this information with the MDI (when possible) prior to repair. Clear all DTC's after work
2. Employ and record refrigerant information from recovery equipment when confirming charge. Do not employ Vacuum only recovery equipment. This equipment does not have the ability to measure vehicle refrigerant charge, nor the amount of lubricant removed.
3. Refrigerant Leak Detection may be hampered since dye circulation may not have sufficiently occurred. Therefore, use of the electronic leak detector is mandatory. If leak dye is required, injection of additional service dye (as per SI) is authorized (up to 1/4oz service dye)

Remove and Replace Components/Sub-Assemblies - Exception to SI for Assembly Plant

HVAC Module Components - Exceptions for Part R&R

1. Evaporator Core is replaced in the SI documentation. However, for assembly plant repair, the entire module with the evaporator core should be replaced as a unit. Install new seal washers on the evaporator.
2. Heater Core is generally replaced as a separate unit. Unless SI details how to remove the heater core w/o disassembly of the HVAC module, the entire module is required to be replaced.
3. Broken/Cracked HVAC Module Case - these defects are not to be repaired per SI directions. The plastic assembly or module requires replacement

Condensors - Exceptions for Part R&R

1. Condensers are serviced in SI documentation as individual units. However, majority of units employed arrive as CRA's (Condenser Radiator Assembly) If the condenser or radiator require replacement, the replacement should be a replacement CRA.
2. RD desiccant bag replacement. Internal desiccant bag replacement although authorized in SI, is not to be done at assembly plant. If material contamination - from failed compressor or desiccant bag is noted,

entire assembly to be replaced and not flushed.

A/C Hoses/Lines- Exceptions for Part R&R

1. Line Splice - line rub through or damage are to be replaced with new assemblies and not line spliced.
2. In-Line filters - Assembly plant is not authorized to employ install these filters
3. Compressor Suction line screens - Assembly plant is not authorized to install suction screens or screen blocks unless specifically authorized by platform engineering.

Control Heads and Sensors - Exceptions for Part R&R

1. Replace and reprogram control head.
2. R&R sensors - do not splice into wire harness.
3. Replace electrical terminals per spec. Do not splice connectors.

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 (R-134A)

Special Tools

- **GE-48800** CoolTech A/C Recharge Machine
- **J-43600** ACR 2000 Air Conditioning Service Center
- **J-45037** A/C Oil Injector

For equivalent regional tools, refer to **Special Tools**

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: R-134a is the only approved refrigerant for use in this vehicle. The use of any other refrigerant may result in poor system performance or component failure and potentially void the vehicle warranty for the 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 GM approved Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system.

Both the **J-43600** ACR 2000 Air Conditioning Service Center and **GE-48800** CoolTech A/C Recharge Machine are complete air conditioning service center for R-134a. Both units recovers, recycles, evacuates and recharges A/C refrigerant quickly, accurately and automatically. Both units have a display screen that contains the function controls and displays prompts that will lead the technician through the recover, recycle, evacuate and recharge operations. R-134a is recovered into and charged out of an internal storage vessel. Both units automatically replenishes this vessel from an external source tank in order to maintain a constant 5.45-6.82 kg (12-15 lbs) of A/C refrigerant.

The ACR 2000 has a built in A/C refrigerant identifier that will test for contamination, prior to recovery and will notify the technician if there are foreign gases present in the A/C system. If foreign gases are present, the ACR 2000 will not recover the refrigerant from the A/C system.

The ACR 2000 also features automatic air purge, single pass recycling and an automatic oil drain.

GE-48800 CoolTech A/C Recharge Machine is released as a required replacement for the previously essential **J-43600** ACR 2000 Air Conditioning Service Center. The **GE-48800** CoolTech A/C Recharge Machine is SAE J2788 compliant and meets GM requirements for A/C Refrigerant System Repairs on all General Motors vehicles, including Hybrid systems with Polyolester (POE) refrigerant oil.

Refer to the **J-43600** ACR 2000 Air Conditioning Service Center or **GE-48800** CoolTech A/C Recharge Machine manual for operation and setup instruction. Always recharge the A/C System with the proper amount of R-134a. Refer to **Refrigerant System Specifications** for the correct amount.

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement, the same quantity of PAG oil must be replenished. If no oil was removed from the A/C system during recovery, do not charge any PAG oil into the A/C system. Oil can be injected into a charged system using **J-45037** A/C Oil Injector. For the proper quantities of oil to add to the A/C refrigerant system, refer to **Refrigerant System Specifications**.

REFRIGERANT RECOVERY AND RECHARGING (R-1234YF)

Special Tools

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

For equivalent regional tools, refer to **Special Tools**.

General Information

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

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

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

MVAC service shops must certify to the EPA that they have acquired and are properly using approved refrigerant recovery equipment. Service shops must also verify (with on site documentation) that each person using the equipment has been properly trained and certified. MVAC service shops must maintain records of the names and addresses of facilities to which the refrigerant they recover is sent.
(<http://www.epa.gov/ozone/title6/609/technicians/appequip.html>)

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

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

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

Refrigerant Recovery and Recharging

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

(<http://www.epa.gov/ozone/title6/609/technicians/appequip.html>)

To remove contaminated refrigerant from a vehicles refrigerant system use **GE-50957** Machine R-1234yf Contaminated Refrigerant or only service equipment designed for contaminated refrigerant removal and certified to meet the requirements of SAE J2851. Refrigerant recovered by this equipment cannot be reused or recycled on site and must be sent to an EPA approved reclamation facility for reprocessing or disposal. (<http://www.epa.gov/ozone/title6/608/reclamation/reclist.html>)

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

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

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

Refrigerant service equipment is required to ensure adequate refrigerant recovery to reduce emissions and provide for accurate recharging of mobile air conditioning systems. Venting refrigerant to the atmosphere is illegal per US Environmental Protection Agency (EPA) Clean Air Act Section 608.

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

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

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

desiccant will result in damage to the A/C refrigerant system.

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

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

To protect the refrigerant supply **GE-50300** R-1234yf Air Conditioning Refrigerant Recovery/Recharge Cart or SAE J2843 equipment requires the refrigerant to be analyzed for purity prior to its recovery or transfer. The equipment is required to receive an acceptable reading from the integrated refrigerant identifier prior to recovery or transfer. An acceptable reading is $\geq 98\%$ -1/+2 R-1234yf.

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

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

The equipments display will then ask the following:

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

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement, the oil must be replenished. Oil can be injected into a charged system using **GE-45037** injector with **GE-50744** A/C R1234yf PAG Oil Injector Hose. For the proper quantities of oil to add to the A/C refrigerant system, refer to **Refrigerant System Specifications**, and **Air Conditioning Compressor Oil Balancing**.

FLUSHING (R-134A)

Special Tools

- **GE-41447** A/C Tracer Dye - Box of 24
- **GE-45268** A/C Flushing Adapter Kit
- **GE-48800** CoolTech A/C Recharge Machine
- **GE-50078** Enhanced Leak Detector

For equivalent regional tools, refer to **Special Tools**.

General Information

NOTE: **Flushing is not intended to remove metal from the A/C system.**

Flushing is intended to remove the following:

- Contaminated A/C Compressor oil
- Desiccant, following a desiccant bag failure
- Overcharge of A/C Compressor oil
- Refrigerant contamination

NOTE: **Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.**

Forward Flushing Setup

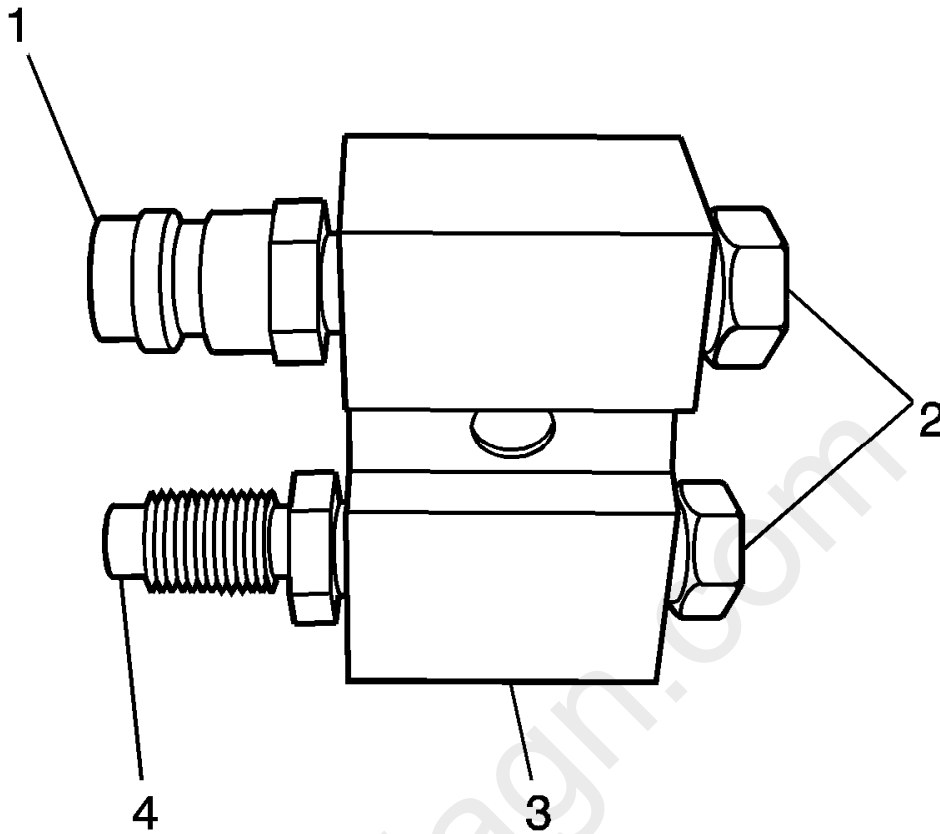


Fig. 1: Identifying J 45268-2 (3), J 45268-7 (1), J 45268-8 (4), & J 45268-9 (2)
Courtesy of GENERAL MOTORS COMPANY

NOTE: Forward flow refrigerant flushing is recommended for contaminated refrigerant or PAG oil.

NOTE: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-7 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-8 (1) onto the discharge side of the GE-45268-10 (3).

Reverse Flushing Setup

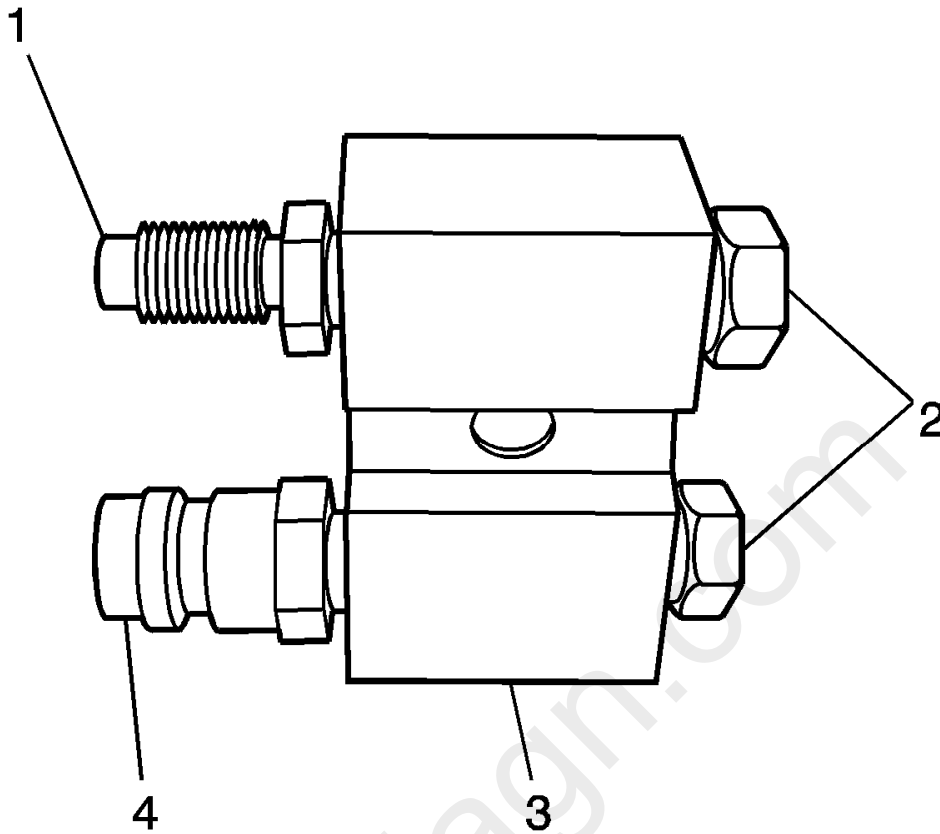


Fig. 2: Using J45268-9, J45268-8, J 45268-7, & J 45268-2
Courtesy of GENERAL MOTORS COMPANY

NOTE: Reverse flow refrigerant flush is recommended for desiccant bag failure. Replace the condenser/receiver dehydrator assembly when the A/C flush is complete and perform the following procedure:

NOTE: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-8 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-7 (1) onto the discharge side of the GE-45268-10 (3).

Flush Procedure

NOTE: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the thermal expansion valve (TXV). Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LFX, LF3)**, **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LTG)**.
3. Install the TXV stud onto the GE-45268-115 adapter.
4. Install new sealing washers onto the evaporator core. Refer to **Air Conditioning System Seal Replacement**.
5. Install GE-45268-115 in place of the TXV.

CAUTION: Refer to Fastener Caution .

6. Install TXV mounting bolts and tighten to 5 (44 lb in).
7. Install new washers onto the liquid line and suction hose. Refer to **Air Conditioning System Seal Replacement**.
8. Connect the liquid line and suction hose to the GE-45268-115.
9. Install the TXV block fitting nut and tighten to 22 (16 lb ft).
10. Remove the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LTG)**, **Air Conditioning Compressor Replacement (LFX)**, **Air Conditioning Compressor Replacement (LF3)**.

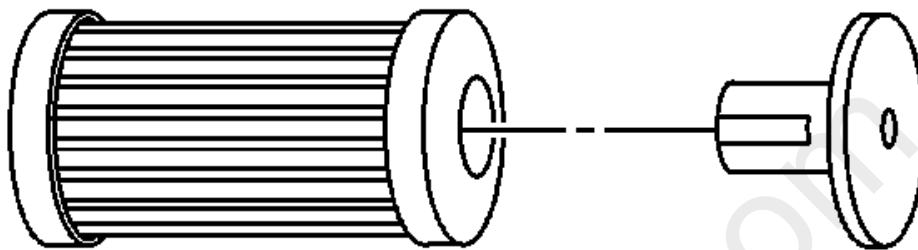


Fig. 3: View Of A/C Filter & Check Valve
Courtesy of GENERAL MOTORS COMPANY

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

11. Service the filter before each flush.

NOTE: Install new sealing washers onto the compressor hose assembly. Refer to Air Conditioning System Seal Replacement.

Assure that the suction and discharge ports on the GE-45268-10 correspond to the suction and discharge ports on the compressor hose assembly.

12. Install the GE-45268-10 to the A/C compressor to condenser hose assembly.
13. Connect the GE-45268-1 filter to GE-45268-7 adapter.

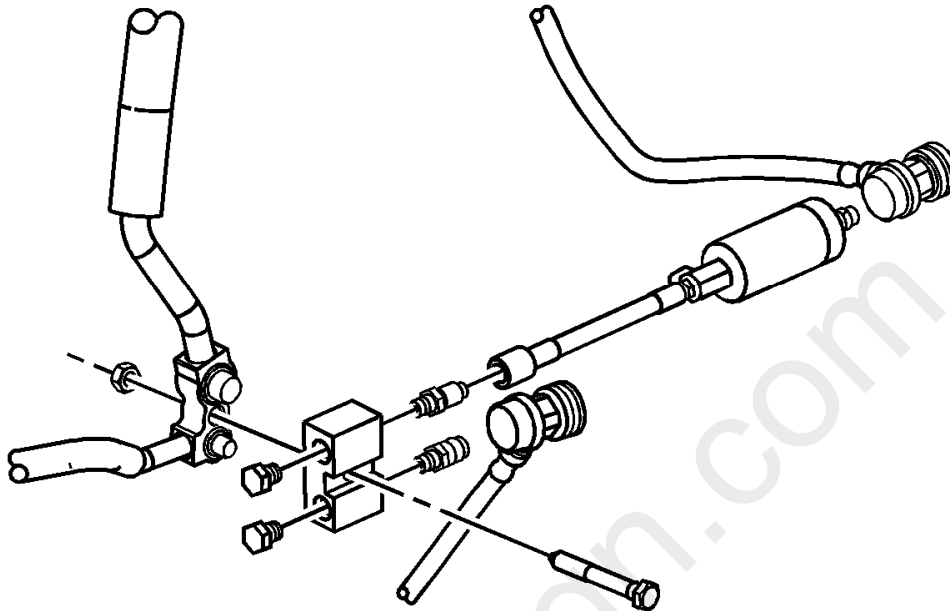


Fig. 4: Flush Adapters
Courtesy of GENERAL MOTORS COMPANY

14. Connect the blue hose from the **GE-48800** CoolTech A/C Recharge Machine to GE-45268-1 flush filter adapter.
15. Connect the red hose from the **GE-48800** CoolTech A/C Recharge Machine to fitting GE-45268-8.

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

16. Flush the A/C system. Follow the instructions supplied with the **GE-48800** Air Conditioning Service Center.
17. Disconnect the red hose from the **GE-48800** CoolTech A/C Recharge Machine from GE-45268-8.
18. Disconnect the blue hose from the **GE-48800** CoolTech A/C Recharge Machine to GE-45268-1 flush filter adapter.
19. Disconnect the GE-45268-1 flush filter from the GE-45268-10 flush adapter.
20. Remove the GE-45268-10 from the A/C compressor hose assembly.

NOTE: Flushing will remove all the PAG oil from the A/C system.

The A/C system must be replenished with the correct amount of PAG oil.

21. If you will reinstall the removed A/C compressor, perform the following procedure:
 1. Remove the A/C compressor drain plug.
 2. Drain the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
 3. Install the A/C compressor drain plug and tighten to 30 (22 lb ft).
 4. Add the total system capacity of PAG oil to the A/C compressor. Refer to **Refrigerant System Specifications**.
22. If you will replace the A/C compressor after flushing the system, perform the following procedure:
 1. Deduct 41 ml (1.4 oz), which is the amount of PAG oil shipped with the service compressor, from the amount of PAG oil listed in the capacities table. Refer to **Refrigerant System Specifications**.
 2. Add the calculated amount to the compressor, as needed.

NOTE: Flushing will remove fluorescent leak detection dye from A/C system.

23. Add one bottle of **GE-41447** R-134A A/C Tracer Dye directly to the A/C Compressor.
24. Install the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LTG)**, **Air Conditioning Compressor Replacement (LFX)**, **Air Conditioning Compressor Replacement (LF3)**.
25. Remove the TXV block fitting nut.
26. Disconnect the liquid line and suction hose from the GE-45268-115.
27. Remove the TXV bolts retaining the GE-45268-115.
28. Remove the GE-45268-115.
29. Inspect the TXV for debris. Clean or replace as needed.
30. Install the TXV. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LFX, LF3)**, **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LTG)**.
31. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
32. Leak test the fittings using **GE-50078** Enhanced Leak Detector.

FLUSHING (R1234YF)

Special Tools

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

For equivalent regional tools, refer to **Special Tools**.

General Information

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

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

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

NOTE: Flushing is not intended to remove metal from the A/C system.

Flushing is intended to remove the following:

- Contaminated A/C Compressor oil
- Desiccant, following a desiccant bag failure
- Overcharge of A/C Compressor oil
- Refrigerant contamination

NOTE: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.

Forward Flushing Setup

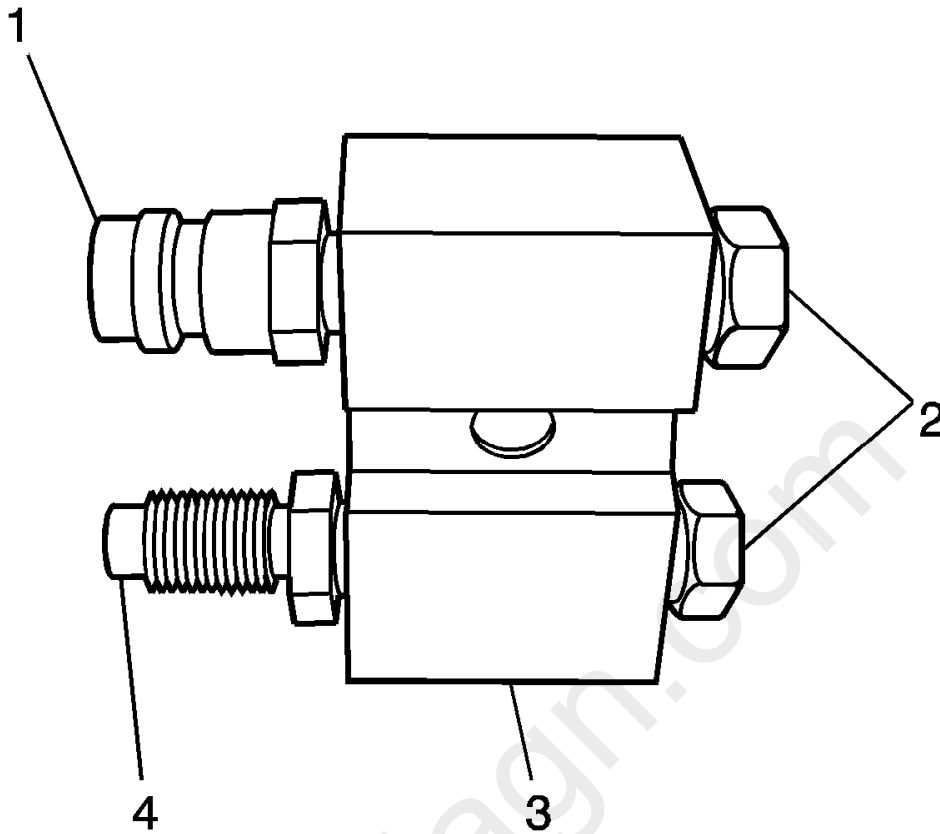


Fig. 5: Identifying J 45268-2 (3), J 45268-7 (1), J 45268-8 (4), & J 45268-9 (2)
Courtesy of GENERAL MOTORS COMPANY

NOTE: Forward flow refrigerant flushing is recommended for contaminated refrigerant or PAG oil.

NOTE: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-7 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-129 (1) onto the discharge side of the GE-45268-10 (3).

Reverse Flushing Setup

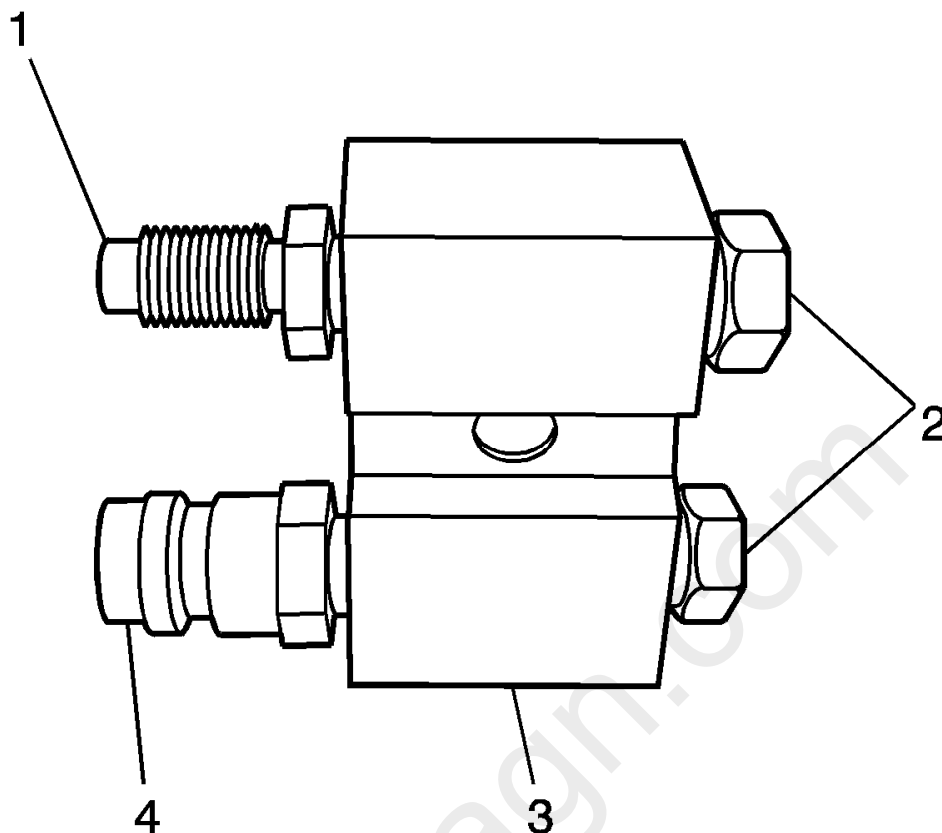


Fig. 6: Using J45268-9, J45268-8, J 45268-7, & J 45268-2
Courtesy of GENERAL MOTORS COMPANY

NOTE: Reverse flow refrigerant flush is recommended for desiccant bag failure. Replace the condenser/receiver dehydrator assembly when the A/C flush is complete and perform the following procedure:

NOTE: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-129 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-7 (1) onto the discharge side of the GE-45268-10 (3).

Flush Procedure

NOTE: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the thermal expansion valve (TXV). Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LFX, LF3)**, **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LTG)**.
3. Install the TXV stud onto the GE-45268-115 adapter.
4. Install new sealing washers onto the evaporator core. Refer to **Air Conditioning System Seal Replacement**.
5. Install GE-45268-115 in place of the TXV.

CAUTION: Refer to Fastener Caution .

6. Install TXV mounting bolts and tighten to 5 (44 lb in).
7. Install new washers onto the liquid line and suction hose. Refer to **Air Conditioning System Seal Replacement**.
8. Connect the liquid line and suction hose to the GE-45268-115.
9. Install the TXV block fitting nut and tighten to 22 (16 lb ft).
10. Remove the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LTG)**, **Air Conditioning Compressor Replacement (LFX)**, **Air Conditioning Compressor Replacement (LF3)**.

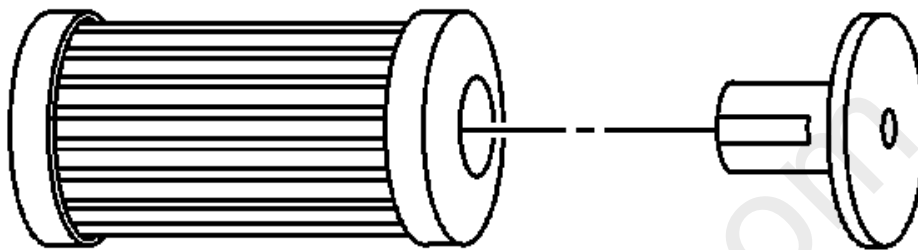


Fig. 7: View Of A/C Filter & Check Valve
Courtesy of GENERAL MOTORS COMPANY

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

11. Service the filter before each flush.

NOTE: Install new sealing washers onto the compressor hose assembly. Refer to Air Conditioning System Seal Replacement.

Assure that the suction and discharge ports on the GE-45268-10 correspond to the suction and discharge ports on the compressor hose assembly.

12. Install the GE-45268-10 to the A/C compressor to condenser hose assembly.
13. Install fitting GE-45268-128 to the filter cylinder end of GE-45268-1.
14. Connect GE-45268-1 filter to GE-45268-7 adapter.

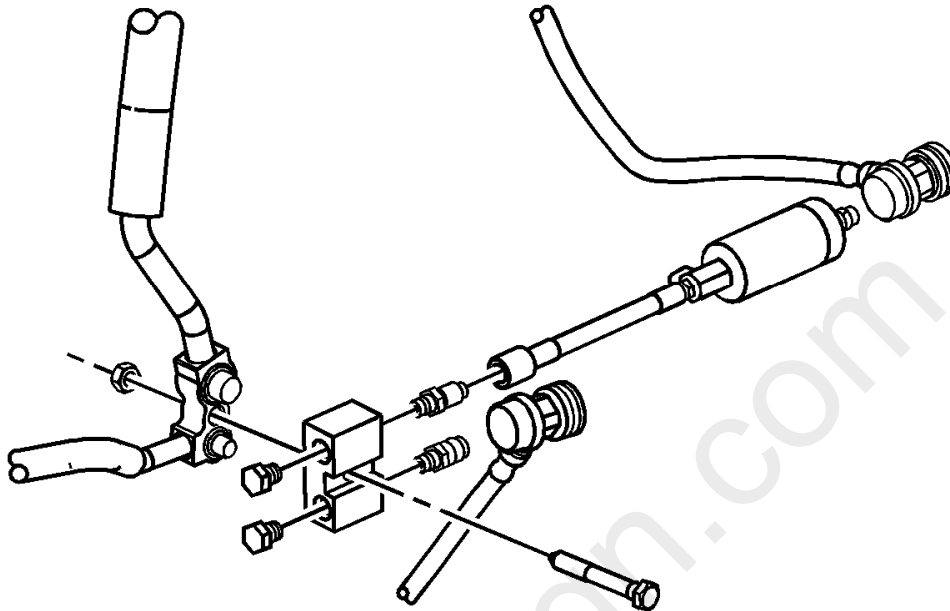


Fig. 8: Flush Adapters
Courtesy of GENERAL MOTORS COMPANY

15. Connect the blue hose from the **GE-50300** Air Conditioning Service Center to GE-45268-1 flush filter adapter.
16. Connect the red hose from the **GE-50300** Air Conditioning Service Center to fitting GE-45268-129.

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

17. Flush the A/C system. Follow the instructions supplied with the **GE-50300** Air Conditioning Service Center.
18. Disconnect the red hose from the **GE-50300** Air Conditioning Service Center from fitting GE-45268-129.
19. Disconnect the blue hose from the **GE-50300** Air Conditioning Service Center to GE-45268-1 flush filter adapter.
20. Disconnect the GE-45268-1 flush filter from the GE-45268-10 flush adapter.
21. Remove the GE-45268-10 from the A/C compressor hose assembly.

NOTE: Flushing will remove all the PAG oil from the A/C system.

The A/C system must be replenished with the correct amount of PAG oil.

22. If you will reinstall the removed A/C compressor, perform the following procedure:
 1. Remove the A/C compressor drain plug.
 2. Drain the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
 3. Install the A/C compressor drain plug and tighten to 30 (22 lb ft).
 4. Add the total system capacity of PAG oil to the A/C compressor. Refer to **Refrigerant System Specifications**.
23. If you will replace the A/C compressor after flushing the system, perform the following procedure:
 1. Deduct 41 ml (1.4 oz), which is the amount of PAG oil shipped with the service compressor, from the amount of PAG oil listed in the capacities table. Refer to **Refrigerant System Specifications**.
 2. Add the calculated amount to the compressor, as needed.

NOTE: Flushing will remove fluorescent leak detection dye from A/C system.

24. Add one bottle of A/C Tracer Dye directly to the A/C Compressor.
25. Install the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LTG)**, **Air Conditioning Compressor Replacement (LFX)**, **Air Conditioning Compressor Replacement (LF3)**.
26. Remove the TXV block fitting nut.
27. Disconnect the liquid line and suction hose from the GE-45268-115.
28. Remove the TXV bolts retaining the GE-45268-115.
29. Remove the GE-45268-115.
30. Inspect the TXV for debris. Clean or replace as needed.
31. Install the TXV. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LFX, LF3)**, **Air Conditioning Evaporator Thermal Expansion Valve Replacement (LTG)**.
32. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
33. Leak test the fittings using **GE-50078** Enhanced Leak Detector.

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. Remove the compressor crankcase oil drain plug from the removed compressor and drain the refrigerant oil from the crankcase into a clean, graduated container.

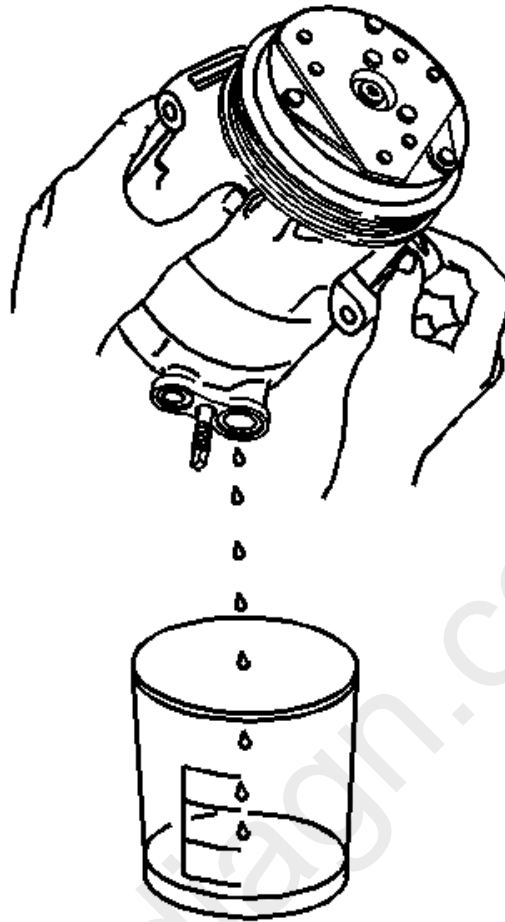


Fig. 9: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS COMPANY

2. Drain the oil from both the suction and discharge ports into the same container. Rotate the compressor shaft to assist in draining the compressor.
3. Measure and record the amount of oil drained from the removed compressor. In addition, measure and record the amount of oil recovered during refrigerant recovery.

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

4. Inspect oil drained from removed compressor. Refer to **Air Conditioning Compressor Oil Diagnosis**.
5. Properly discard the used refrigerant oil.

Balancing Procedure

NOTE: **The refrigerant oil in the A/C system must be balanced during compressor replacement.**

NOTE: **Check the oil volume in the replacement compressor.**

The replacement compressor is shipped partially filled with refrigerant oil. The amount of oil has to be balanced according to below:

- 1. Refer to the amounts of refrigerant oil recorded during the compressor removal and refrigerant recovery.
- 2. If the sum of the amount of oil drained from the removed compressor and the amount of oil removed during refrigerant recovery is:
 - Less than 41 ml (1.4 oz), no balancing is required. Install the replacement compressor as is. It contains 41 ml (1.4 oz) of oil.
 - More than 41 ml (1.4 oz), additional oil is required. Subtract 41 ml (1.4 oz) from the sum of removed oil (oil drained + oil recovered). This calculated difference is the amount of service PAG oil that needs to be added to the replacement compressor. Add the additional oil needed and install the replacement compressor.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LTG)

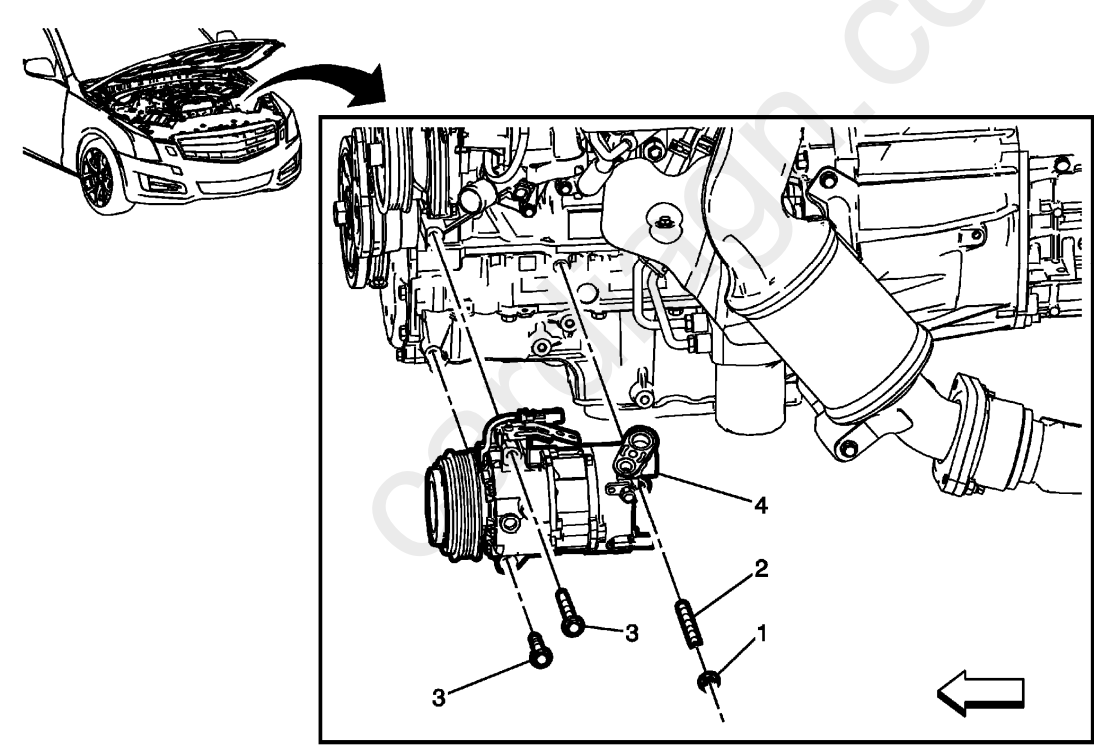


Fig. 10: Air Conditioning Compressor (LTG)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Replacement (LTG)

Callout	Component Name
Preliminary Procedures	

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
3. Remove the charge air cooler inlet air tube. Refer to **Charge Air Cooler Inlet Air Tube Replacement** .
4. Remove the air conditioning compressor and condenser hose from the air conditioning compressor. Refer to **Air Conditioning Compressor and Condenser Hose Replacement (LTG)**, **Air Conditioning Compressor and Condenser Hose Replacement (LFX)**, **Air Conditioning Compressor and Condenser Hose Replacement (LF3)**.
5. Remove the drive belt from the air conditioning compressor. Refer to **Drive Belt Replacement** .
6. Disconnect the air conditioning compressor electrical connector.

1	Air Conditioning Compressor Nut CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Air Conditioning Compressor Stud Tighten 9 (80 lb in)
3	Air Conditioning Compressor Bolt (Qty: 2) Tighten 22 (16 lb ft)
4	Air Conditioning Compressor Procedure 1. Remove and discard sealing washers and replace with NEW. Refer to <u>Air Conditioning System Seal Replacement</u>. 2. When replacing the air conditioning compressor, balance the compressor oil. Refer to <u>Air Conditioning Compressor Oil Balancing</u>.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LFX)

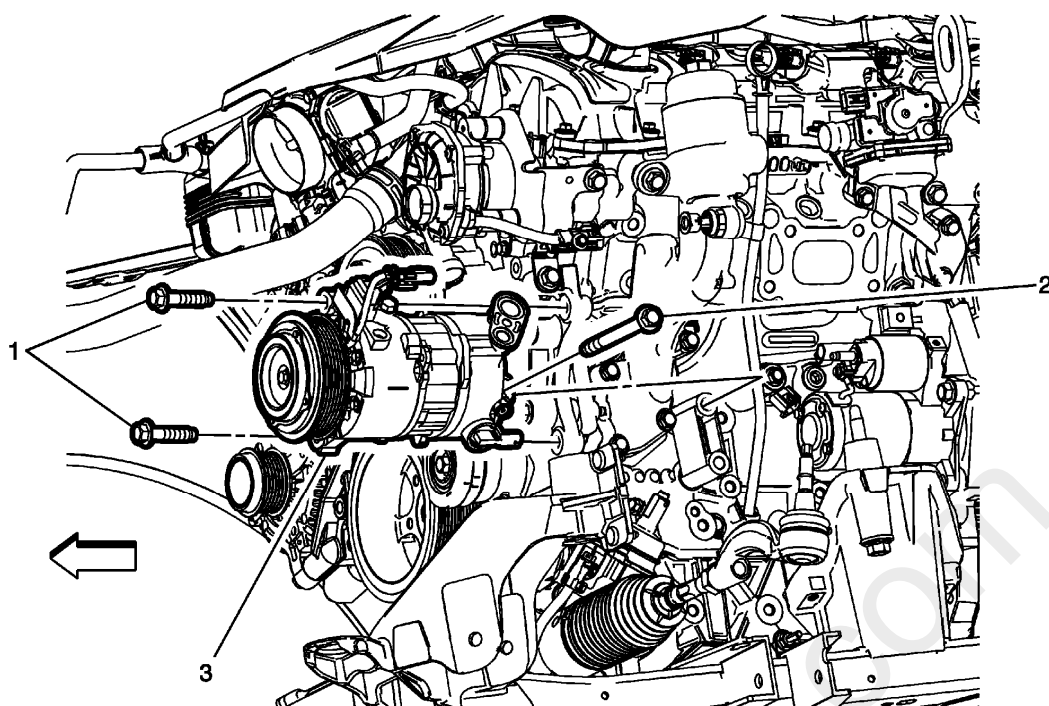


Fig. 11: Air Conditioning Compressor (LFX)
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Replacement (LFX)

Callout	Component Name
Preliminary Procedures	
1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement (LFX)</u> , <u>Air Cleaner Assembly Replacement (LF3)</u> . 3. Remove the secondary air injection pump assembly, if equipped. Refer to <u>Secondary Air Injection Pump Replacement</u> . 4. Remove the air conditioning compressor and condenser hose assembly. Refer to <u>Air Conditioning Compressor and Condenser Hose Replacement (LTG)</u>, <u>Air Conditioning Compressor and Condenser Hose Replacement (LFX)</u>, <u>Air Conditioning Compressor and Condenser Hose Replacement (LF3)</u>. 5. Remove the drive belt from the air conditioning compressor. Refer to <u>Drive Belt Replacement (LFX)</u> , <u>Drive Belt Replacement (LF3)</u> . 6. Disconnect the air conditioning compressor electrical connector.	
1	Front Air Conditioning Compressor Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten 58 (43 lb ft)
2	Rear Air Conditioning Compressor Bolt Tighten 58 (43 lb ft)
3	Air Conditioning Compressor Procedure 1. Remove and discard sealing washers. Refer to <u>Air Conditioning System Seal Replacement.</u> 2. When replacing the air conditioning compressor, balance the compressor oil. Refer to <u>Air Conditioning Compressor Oil Balancing.</u>

AIR CONDITIONING COMPRESSOR REPLACEMENT (LF3)

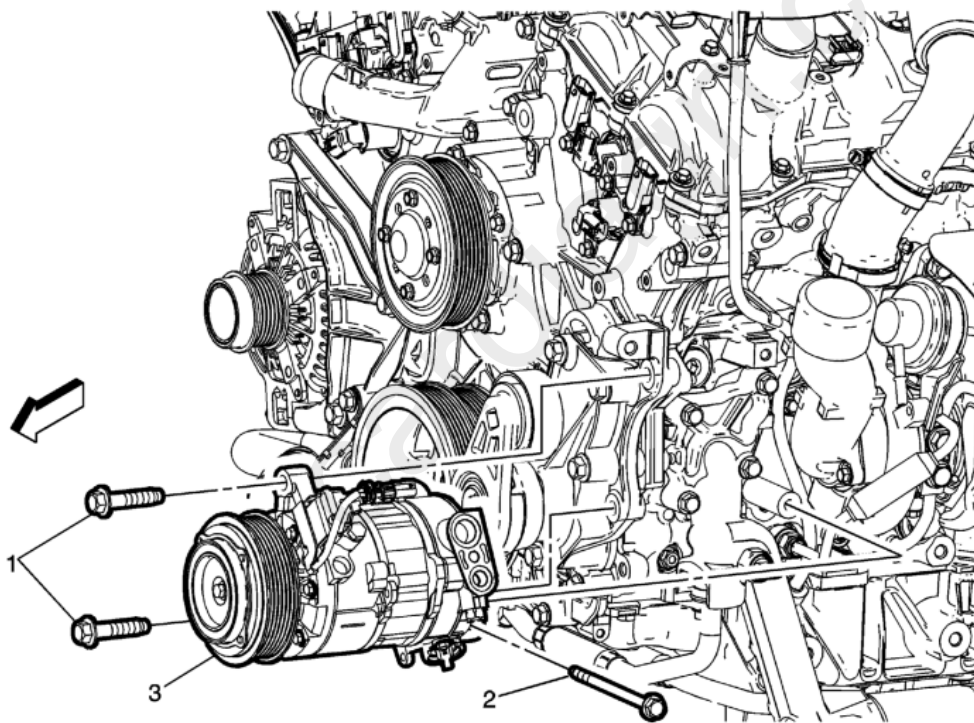


Fig. 12: Air Conditioning Compressor (LF3)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Replacement (LF3)

Callout	Component Name
Preliminary Procedures	

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement (LFX)** , **Air Cleaner Assembly Replacement (LF3)** .
3. Remove the air conditioning compressor and condenser hose assembly. Refer to **Air Conditioning Compressor and Condenser Hose Replacement (LTG)**, **Air Conditioning Compressor and Condenser Hose Replacement (LFX)**, **Air Conditioning Compressor and Condenser Hose Replacement (LF3)**.
4. Remove the drive belt from the air conditioning compressor. Refer to **Drive Belt Replacement (LFX)** , **Drive Belt Replacement (LF3)** .
5. Remove the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (AWD)** , **Front Compartment Lower Noise Shield Replacement (RWD)** .
6. Remove the engine lower front splash shield. Refer to **Engine Lower Front Splash Shield Replacement** .
7. Disconnect the air conditioning compressor electrical connector.

1	Front Air Conditioning Compressor Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 58 (43 lb ft)
2	Air Conditioning Compressor Bolt Tighten 22 (16 lb ft)
3	Air Conditioning Compressor Procedure 1. Remove and discard sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u>. 2. When replacing the air conditioning compressor, balance the compressor oil. Refer to <u>Air Conditioning Compressor Oil Balancing</u>.

AIR CONDITIONING CLUTCH ASSEMBLY REPLACEMENT

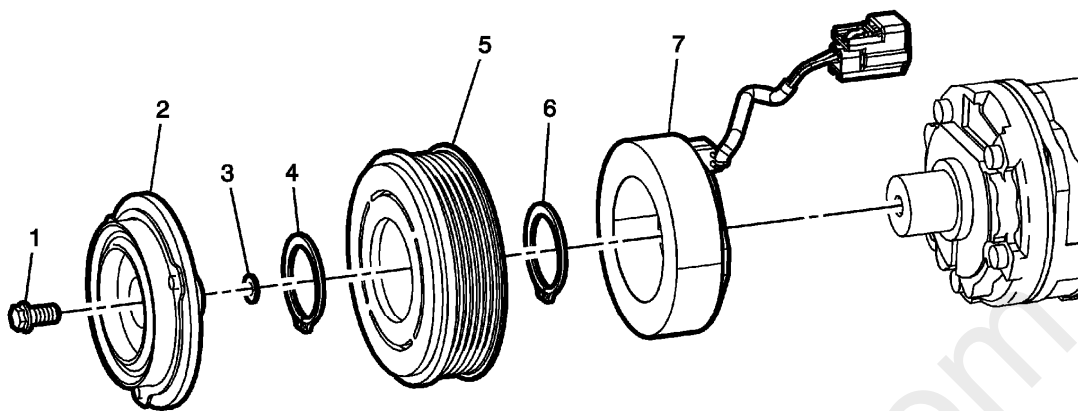


Fig. 13: Air Conditioning Clutch Assembly Components (with V4U)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Clutch Assembly Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning compressor. Refer to <u>Air Conditioning Compressor Replacement (LTG)</u> , <u>Air Conditioning Compressor Replacement (LFX)</u> , <u>Air Conditioning Compressor Replacement (LF3)</u> .	
1	Air Conditioning Compressor Clutch Pulley Bolt CAUTION: Refer to <u>Fastener Caution</u> . Procedure Use the CH-37872 universal spanner wrench to hold the compressor clutch plate from turning when removing the nut. Tighten 18 (13 lb ft) Special Tools CH-37872 Universal Spanner Wrench For equivalent regional tools, refer to <u>Special Tools</u> .
2	Air Conditioning Compressor Clutch Drive Plate Procedure

	Measure and adjust the air conditioning compressor clutch drive plate. Refer to <u>Air Conditioning Clutch Drive Plate Adjustment.</u>
3	Air Conditioning Compressor Clutch Shim (Qty: 5)
4	Retaining Ring
5	Air Conditioning Compressor Pulley
6	Retaining Ring
7	Air Conditioning Compressor Coil

AIR CONDITIONING CLUTCH DRIVE PLATE ADJUSTMENT

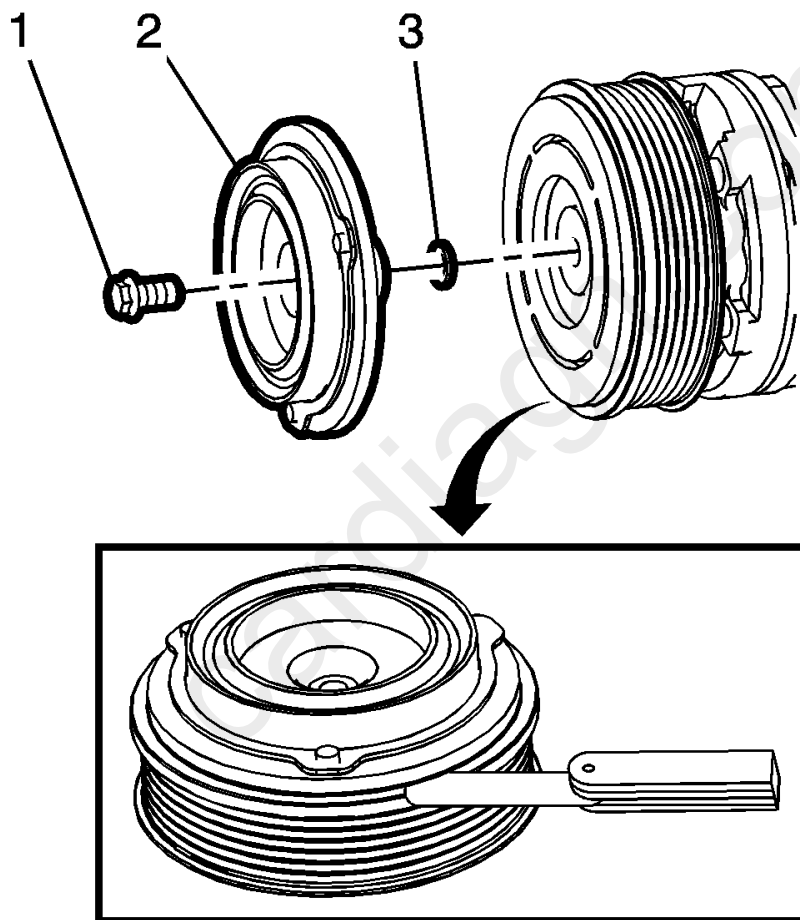


Fig. 14: AC Clutch Plate Assembly, Clutch Pulley Bolt And Shims
 Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning clutch plate assembly (2).

NOTE: Ensure the drive plate does not drag against the pulley when the pulley is rotated.

2. Measure the air gap between the pulley and the drive plate. Adjust the shims (3) to achieve a 0.30-0.60 mm (0.011-0.023 in) air gap.

CAUTION: Refer to Fastener Caution .

3. Install the air conditioning compressor clutch pulley bolt (1) and tighten to 18 N.m (13 lb ft).

AIR CONDITIONING COMPRESSOR BRACKET REPLACEMENT (LFX)

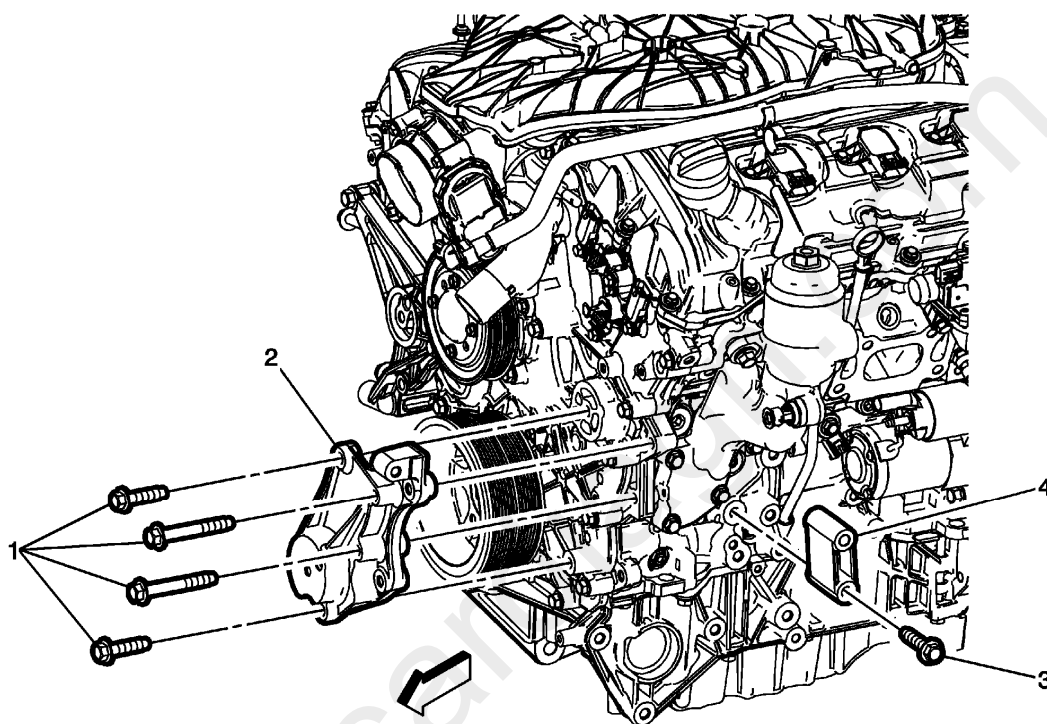


Fig. 15: Air Conditioning Compressor Bracket (LFX)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Bracket Replacement (LFX)

Callout	Component Name
Preliminary Procedures	
1. Remove the air conditioning compressor. Refer to <u>Air Conditioning Compressor Replacement (LTG)</u> , <u>Air Conditioning Compressor Replacement (LFX)</u> , <u>Air Conditioning Compressor Replacement (LF3)</u>	
2. Remove the drive belt tensioner. Refer to <u>Drive Belt Tensioner Replacement (LFX)</u> , <u>Drive Belt Tensioner Replacement (LF3)</u>	
	Air Conditioning Compressor Bracket Bolt (Qty: 4)

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 50 (37 lb ft)
2	Front Air Conditioning Compressor Bracket
3	Air Conditioning Compressor Bracket Bolt (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 50 (37 lb ft)
4	Rear Air Conditioning Compressor Bracket

AIR CONDITIONING COMPRESSOR BRACKET REPLACEMENT (LF3)

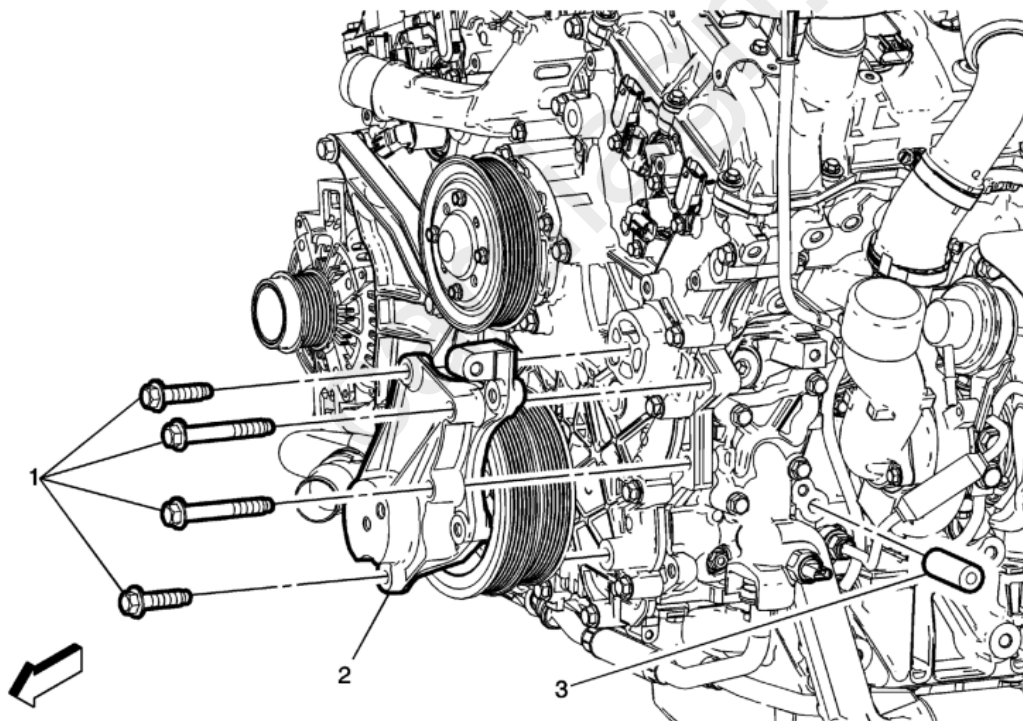


Fig. 16: Air Conditioning Compressor Bracket (LF3)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Bracket Replacement (LF3)

Callout	Component Name

Preliminary Procedures

1. Remove the air conditioning compressor. Refer to **Air Conditioning Compressor Replacement (LTG)**, **Air Conditioning Compressor Replacement (LFX)**, **Air Conditioning Compressor Replacement (LF3)**
2. Remove the drive belt tensioner. Refer to **Drive Belt Tensioner Replacement (LFX)** , **Drive Belt Tensioner Replacement (LF3)**

1	Air Conditioning Compressor Bracket Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 58 (43 lb ft)
2	Front Air Conditioning Compressor Bracket
3	Rear Air Conditioning Compressor Bracket

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.

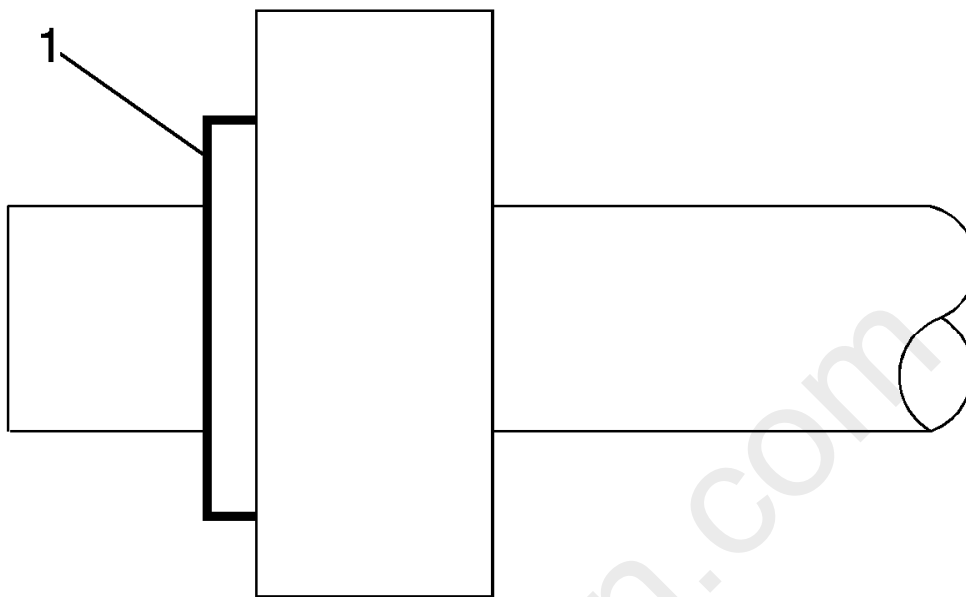


Fig. 17: Sealing Washer

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.

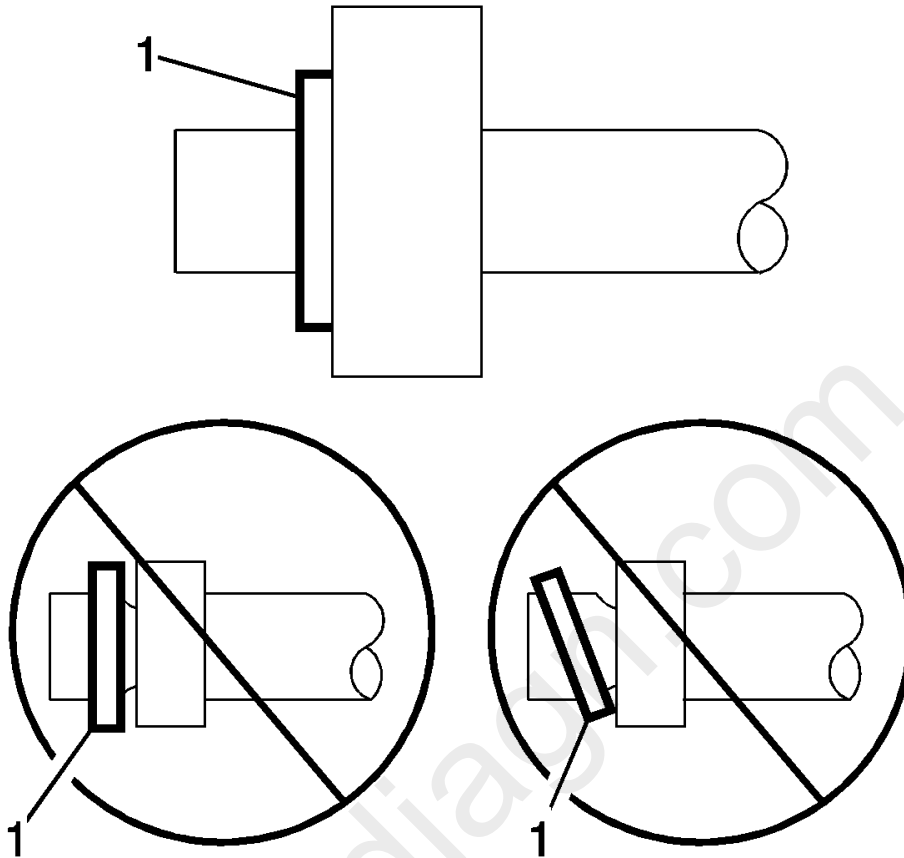


Fig. 18: Identifying Proper Seating Of A/C Refrigerant O-Ring
Courtesy of GENERAL MOTORS COMPANY

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.

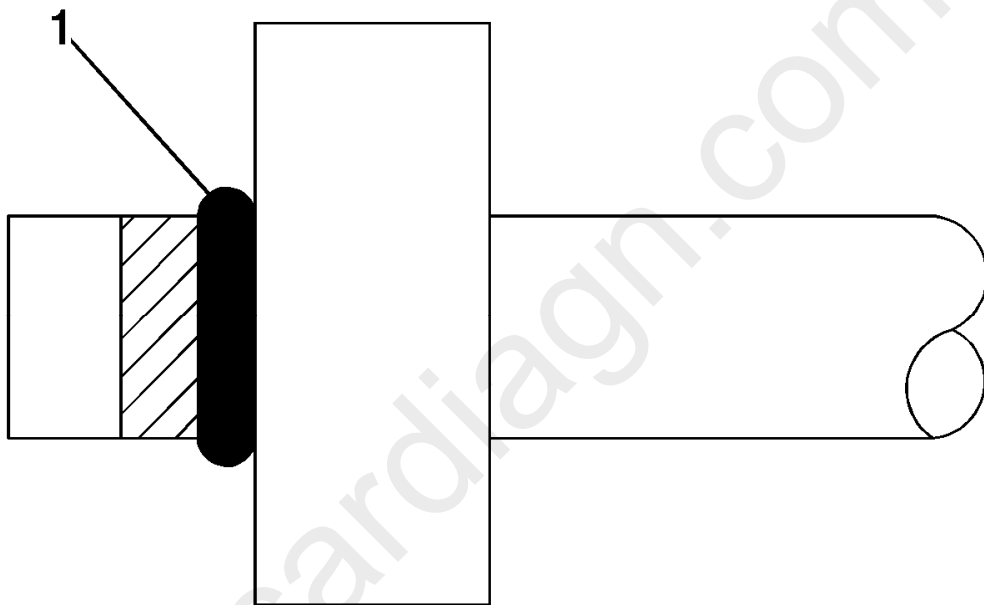


Fig. 19: O-ring seal

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: **DO NOT allow any of the mineral base 525 viscosity refrigerant oil on the new O-ring seal to enter the refrigerant system.**

4. Lightly coat the new O-ring seal with mineral base 525 viscosity refrigerant oil.

NOTE: **DO NOT reuse O-ring seals.**

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

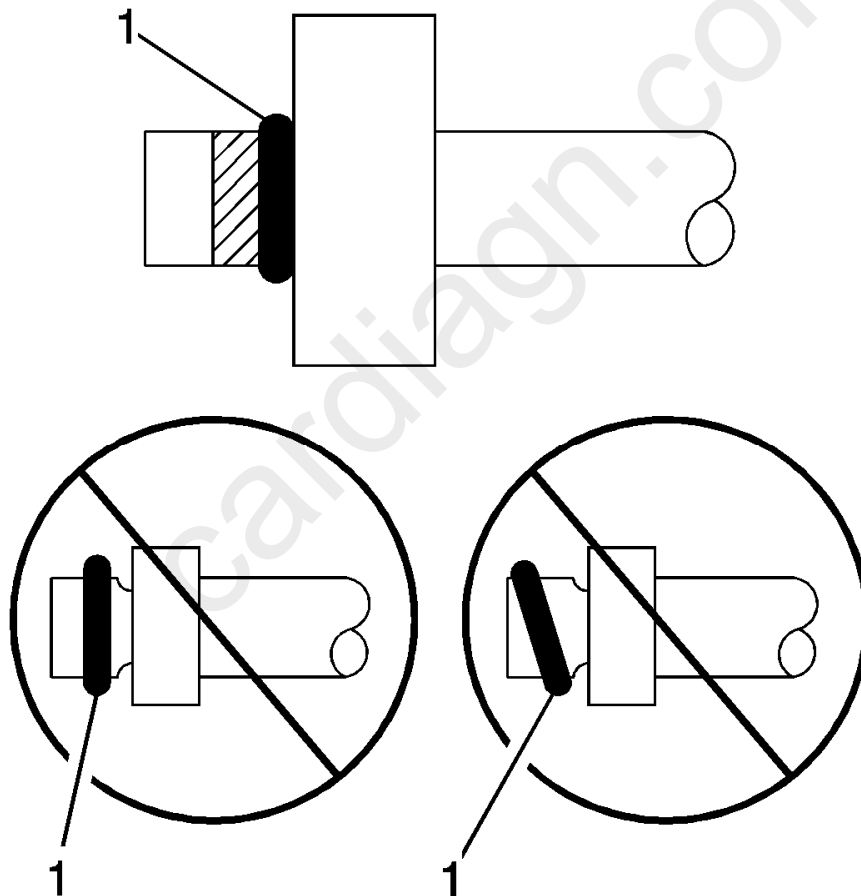


Fig. 20: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS COMPANY

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)

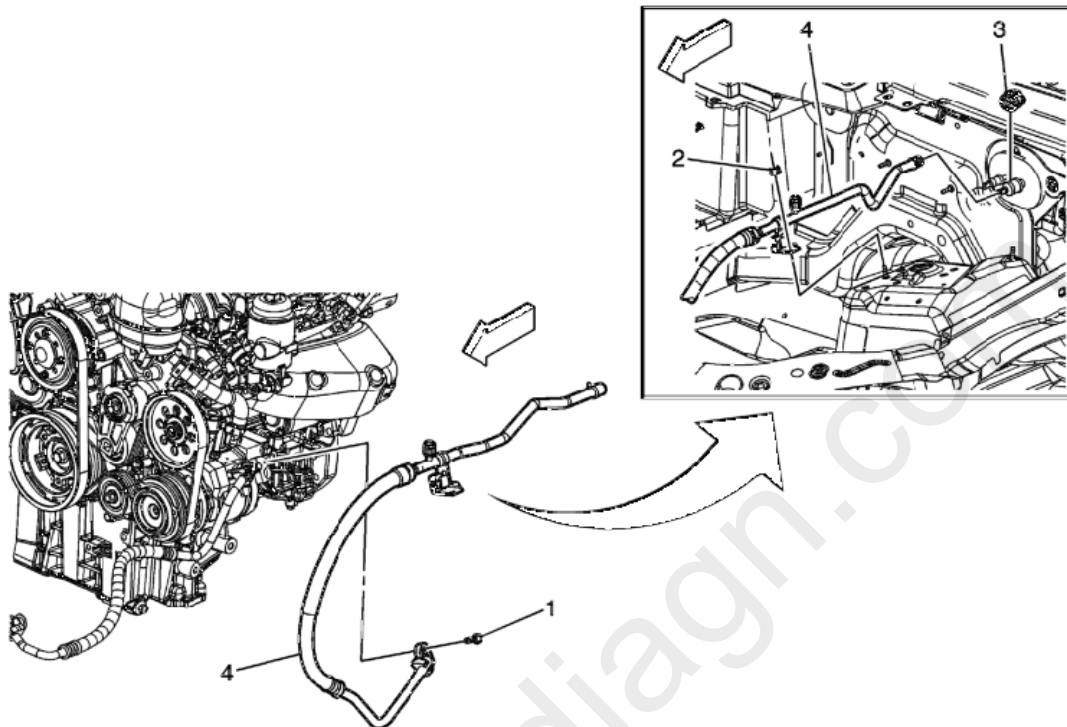


Fig. 21: Suction Hose Replacement
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Hose Replacement (LFX)

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u> , <u>Refrigerant Recovery and Recharging (R-1234yf)</u> .	
2. Remove the front bumper fascia air deflector replacement - center. Refer to <u>Front Bumper Fascia Air Deflector Replacement - Center</u> .	
3. Remove the air cleaner duct. Refer to <u>Front Bumper Fascia Air Deflector Replacement - Center</u> .	
1	Air Conditioning Compressor Hose Bolt CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten 9 (80 lb in)
2	Air Conditioning Compressor Hose Bracket Retaining Nut Tighten 9 (80 lb in)
3	Air Conditioning Compressor Hose Clamp Procedure Using J-45689 A/C quick joint tool , disconnect the air conditioning compressor hose from the evaporator by pressing the probe end into the 2 small openings in the plastic quick joint. Special Tools J 45689 A/C Quick Joint Tool
4	Air Conditioning Compressor Hose Procedure Remove and discard sealing washer. Refer to <u>Air Conditioning O-Ring Seal Replacement.</u>

AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE REPLACEMENT (LTG)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).**
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
4. Remove the charge air cooler inlet air tube. Refer to **Charge Air Cooler Inlet Air Tube Replacement** .
5. Remove the turbocharger heat shield. Refer to **Turbocharger Heat Shield Replacement** .

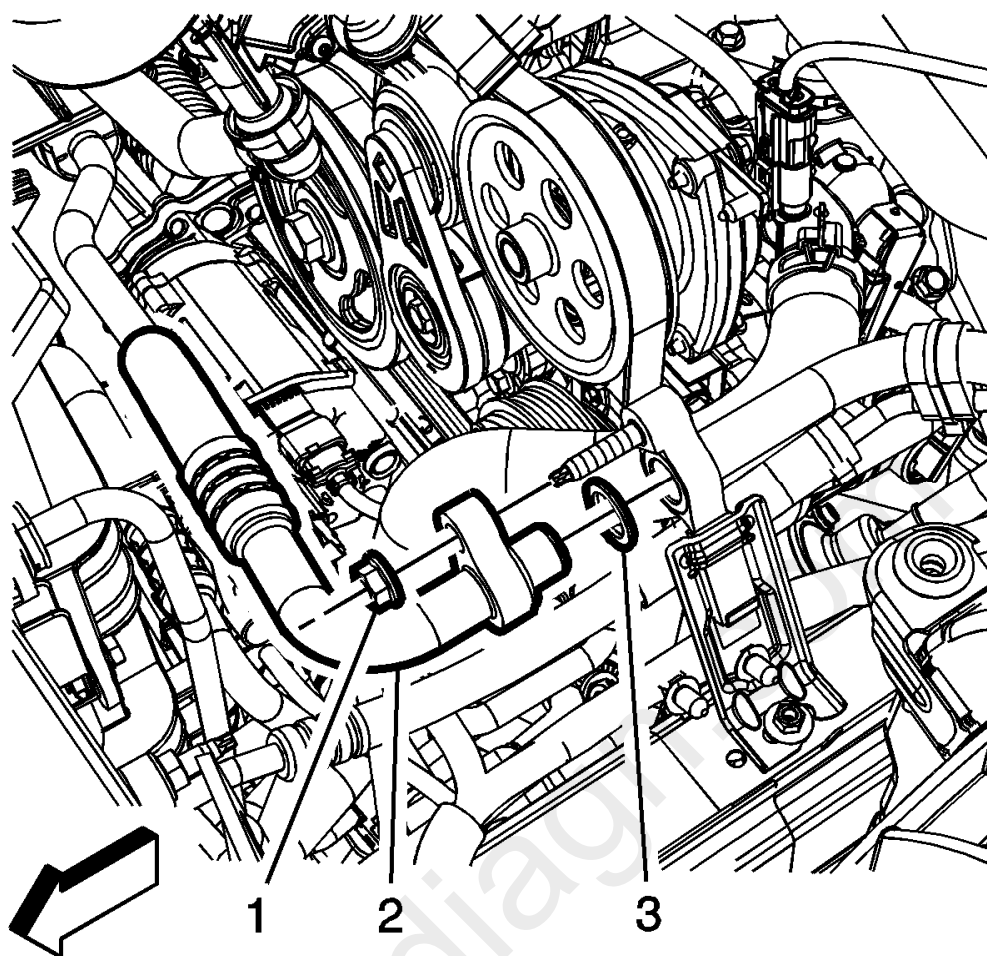


Fig. 22: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

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

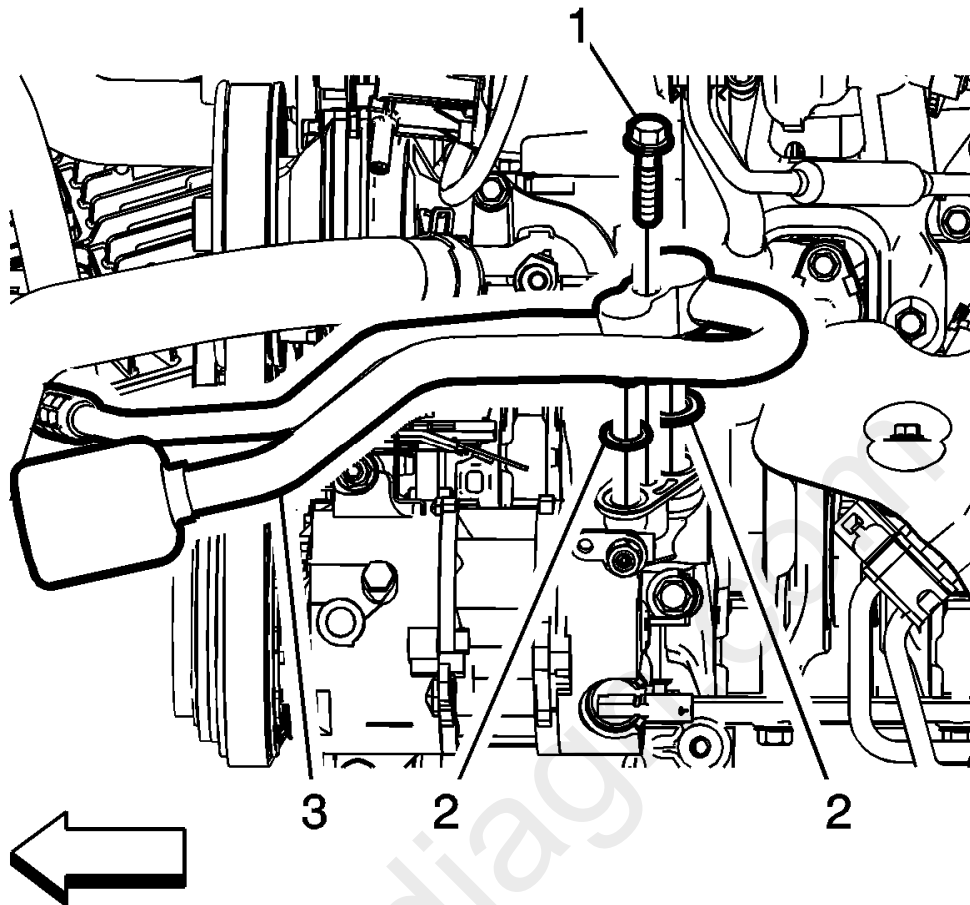


Fig. 23: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

9. Remove the air conditioning compressor and condenser hose bolt (1) from the compressor.
10. Remove the air conditioning compressor and condenser hose (2) from the compressor.
11. Remove and discard the sealing washers (3).
12. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
13. Remove the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .

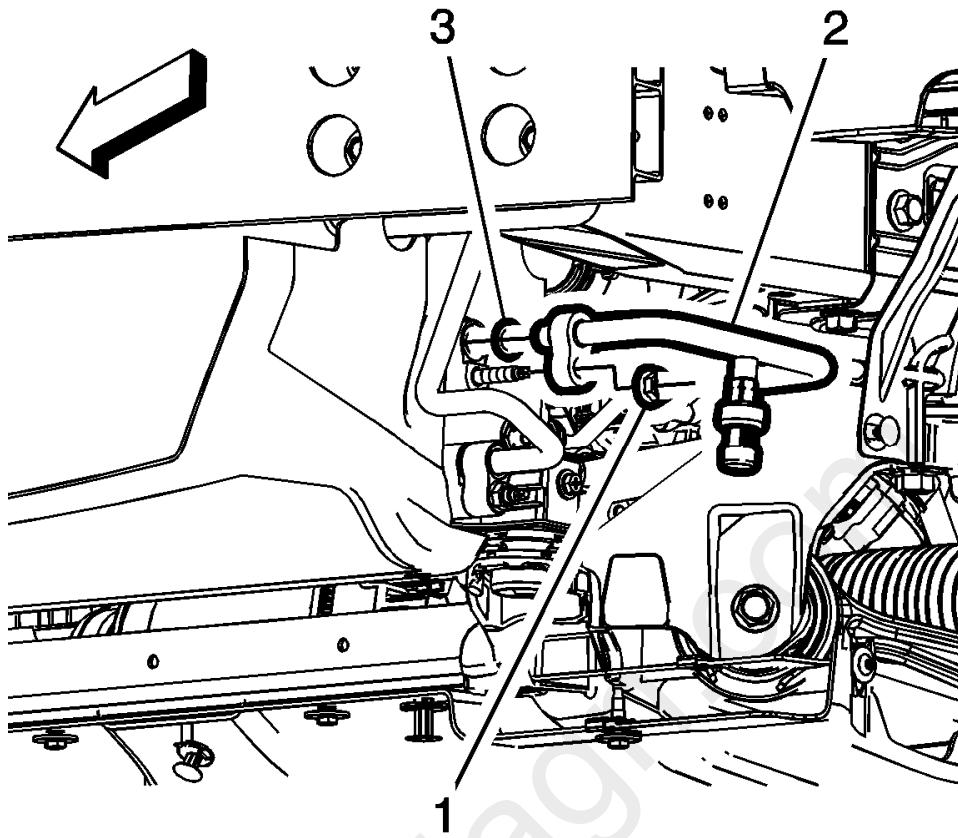


Fig. 24: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose nut (1) from the condenser.
15. Disconnect the refrigerant pressure sensor electrical connector.
16. Remove the air conditioning compressor and condenser hose (2) from the condenser.
17. Remove and discard the sealing washer (3).

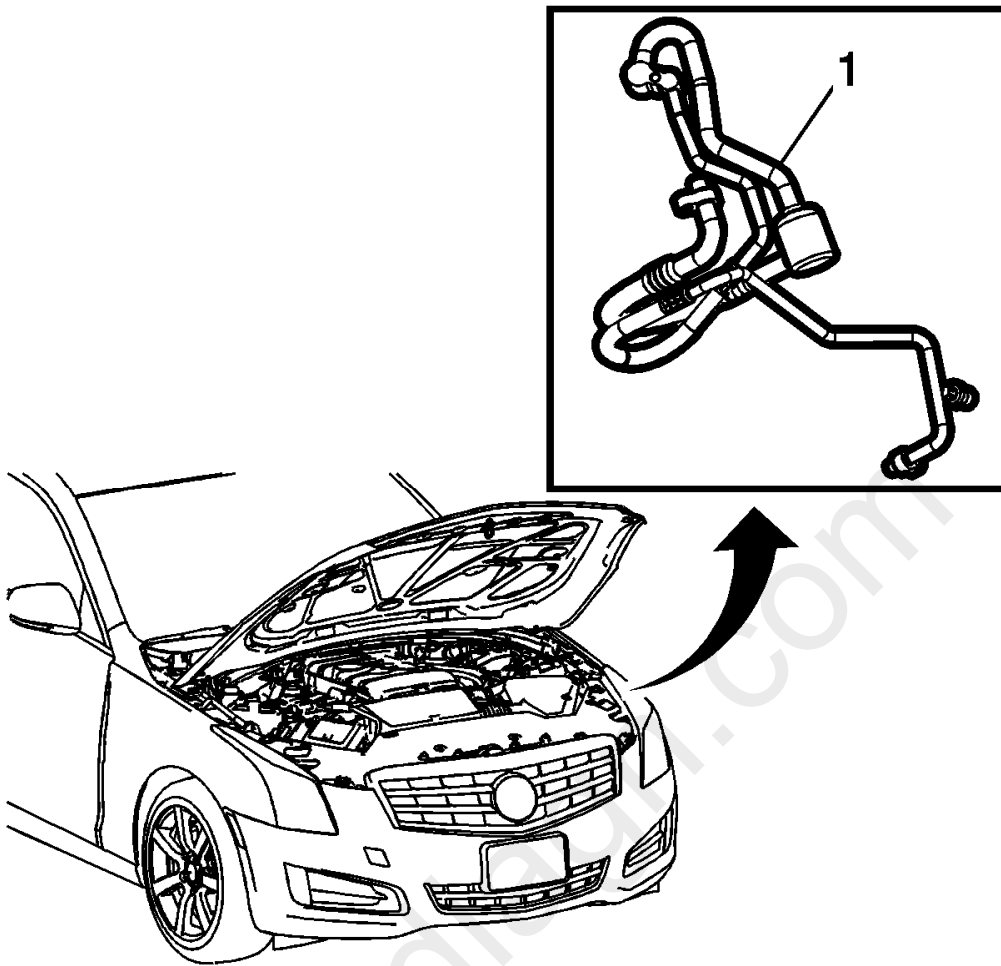


Fig. 25: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

18. Lower the vehicle.
19. Remove the air conditioning compressor and condenser hose (1) from vehicle.

Installation Procedure

1. Install the air conditioning compressor and condenser hose to the vehicle.

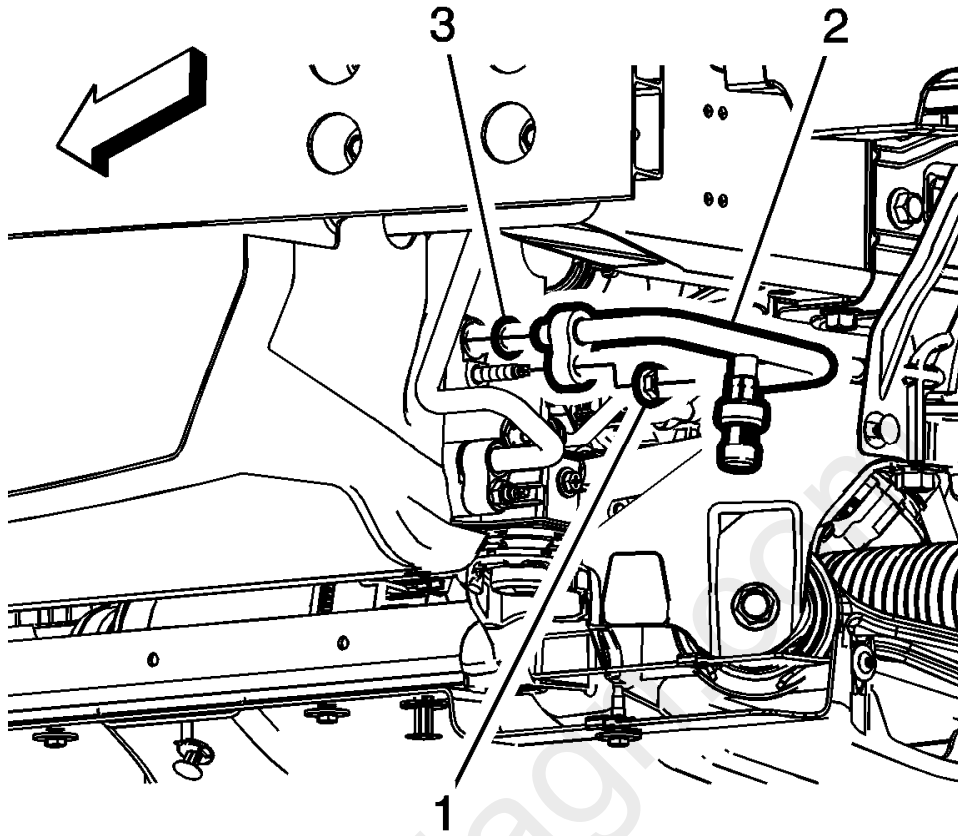


Fig. 26: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

2. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
4. Install the air conditioning compressor and condenser hose (2) to the condenser.

CAUTION: Refer to Fastener Caution.

5. Install the air conditioning compressor and condenser hose nut (1) to the condenser and tighten to 22 N.m (16 lb ft).
6. Connect the refrigerant pressure sensor electrical connector.
7. Install the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement**.
8. Lower the vehicle.

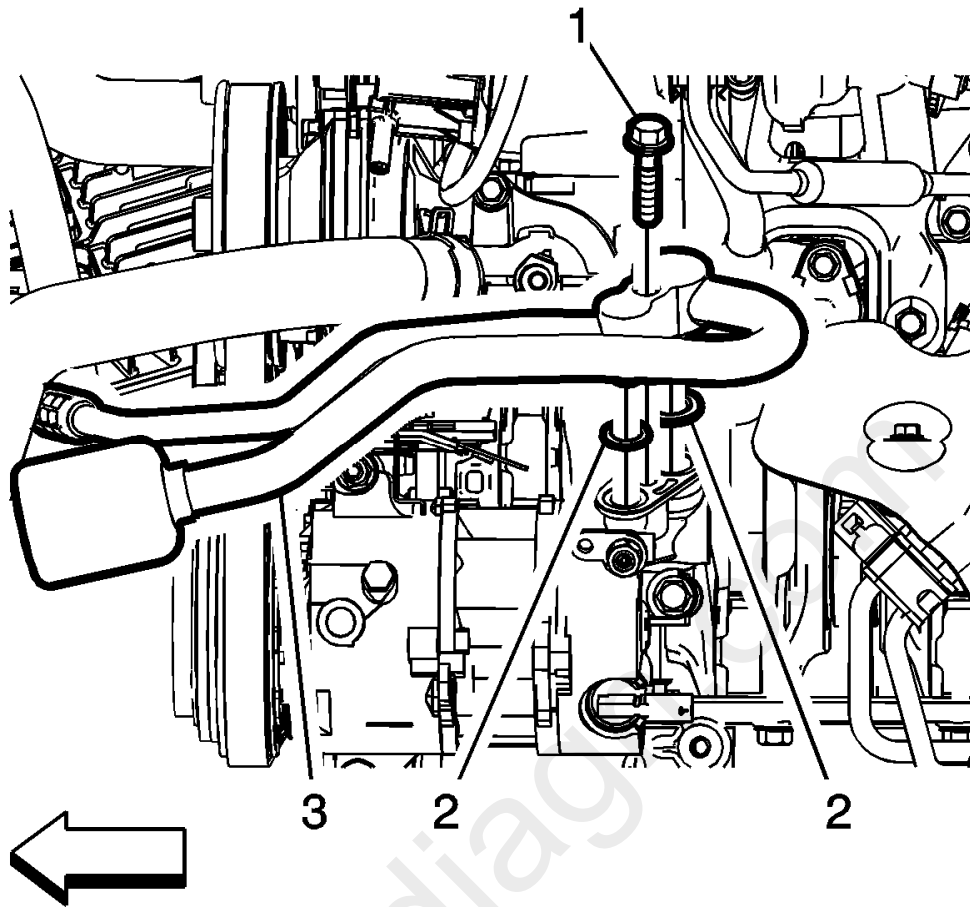


Fig. 27: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

9. Install NEW sealing washers (3) to the air conditioning compressor hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the compressor.

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

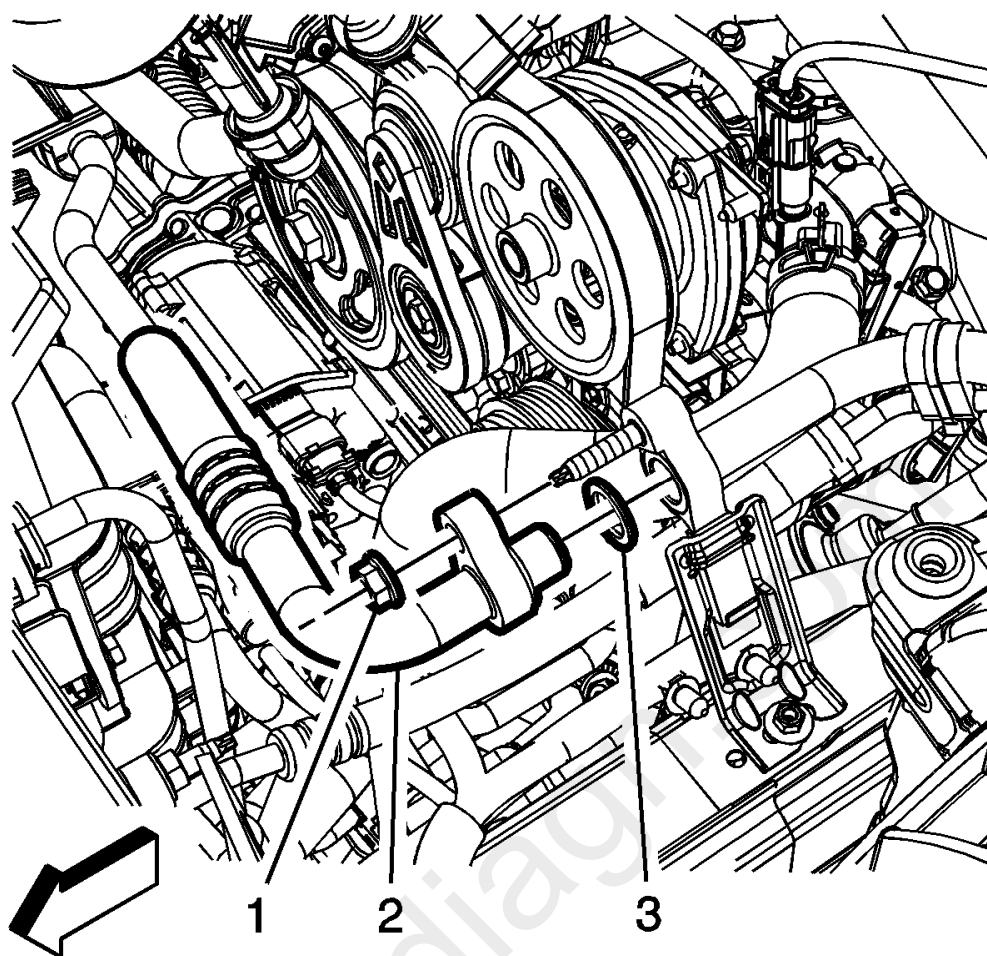


Fig. 28: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

11. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the air conditioning evaporator hose.

12. Install the air conditioning compressor and condenser hose nut (1) to air conditioning evaporator hose (2) and tighten to 22 N.m (16 lb ft).
13. Install the turbocharger heat shield. Refer to **Turbocharger Heat Shield Replacement** .
14. Install the charge air cooler inlet air tube. Refer to **Charge Air Cooler Inlet Air Tube Replacement** .
15. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
16. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
17. Evacuate and charge the air conditioning system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE REPLACEMENT (LFX)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).
2. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement (LFX).

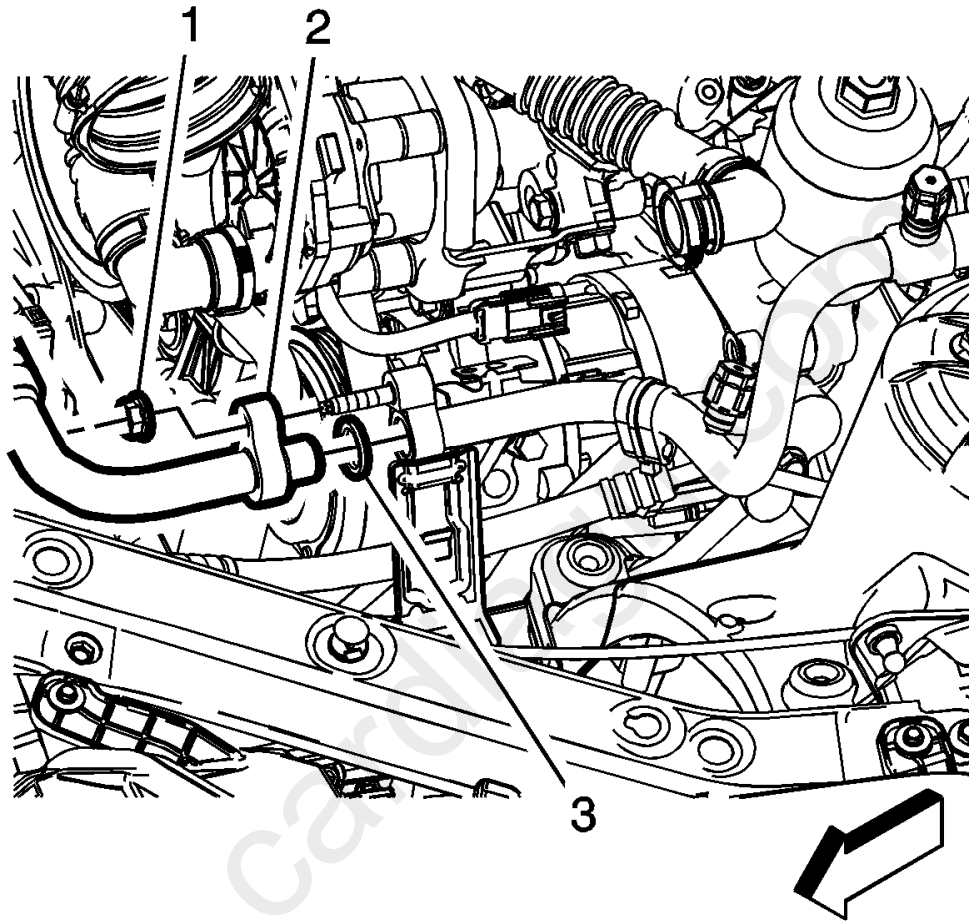


Fig. 29: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose nut (1)
4. Remove the air conditioning compressor and condenser hose (2) from air conditioning evaporator hose joint.
5. Remove and discard the sealing washer (3).

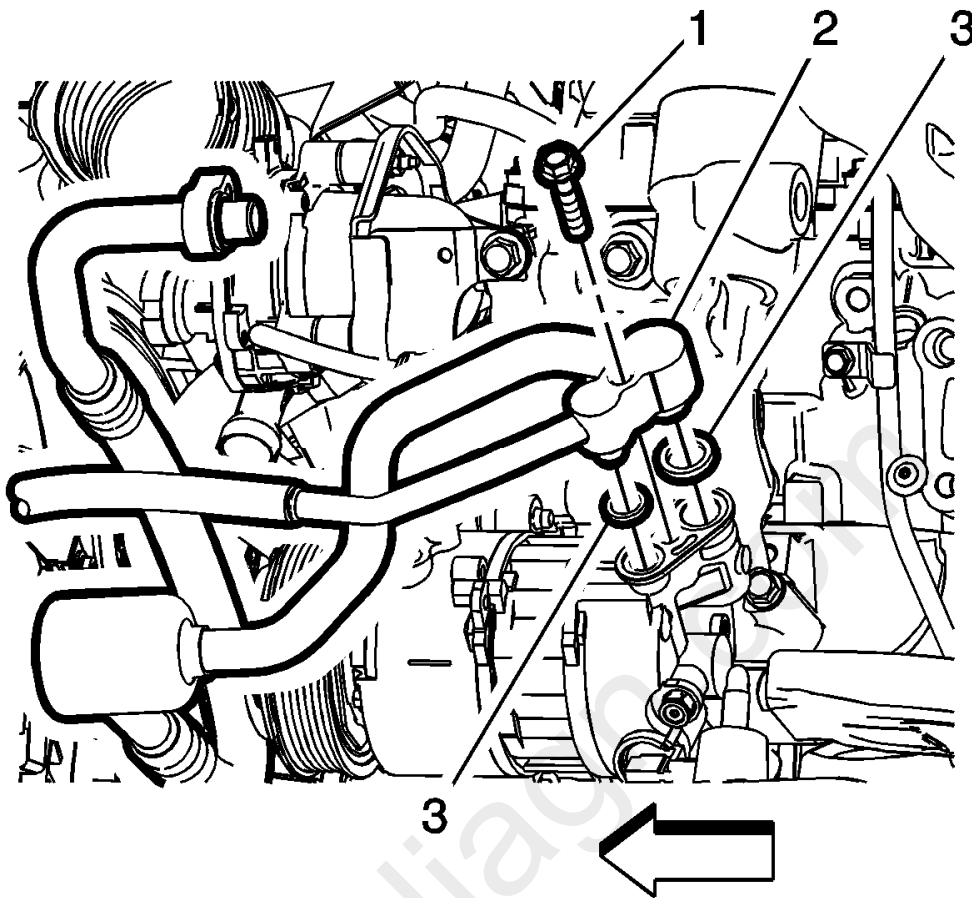


Fig. 30: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

6. Remove the air conditioning compressor and condenser hose bolt (1) at the compressor.
7. Remove the air conditioning compressor and condenser hose (2) from the compressor.
8. Remove and discard the sealing washers (3).
9. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
10. Remove the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .

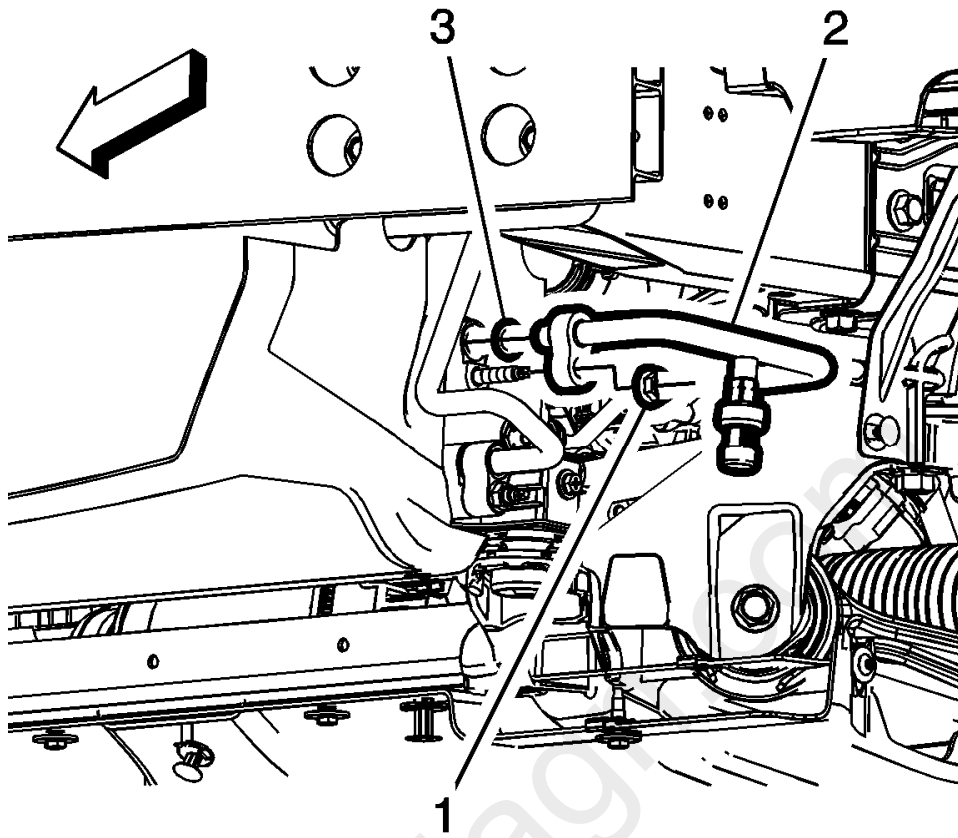


Fig. 31: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

11. Remove the air conditioning compressor and condenser hose nut (1) at the condenser.
12. Remove the air conditioning compressor and condenser hose (2) from the condenser.
13. Remove and discard the sealing washer (3) and replace with NEW sealing washers.

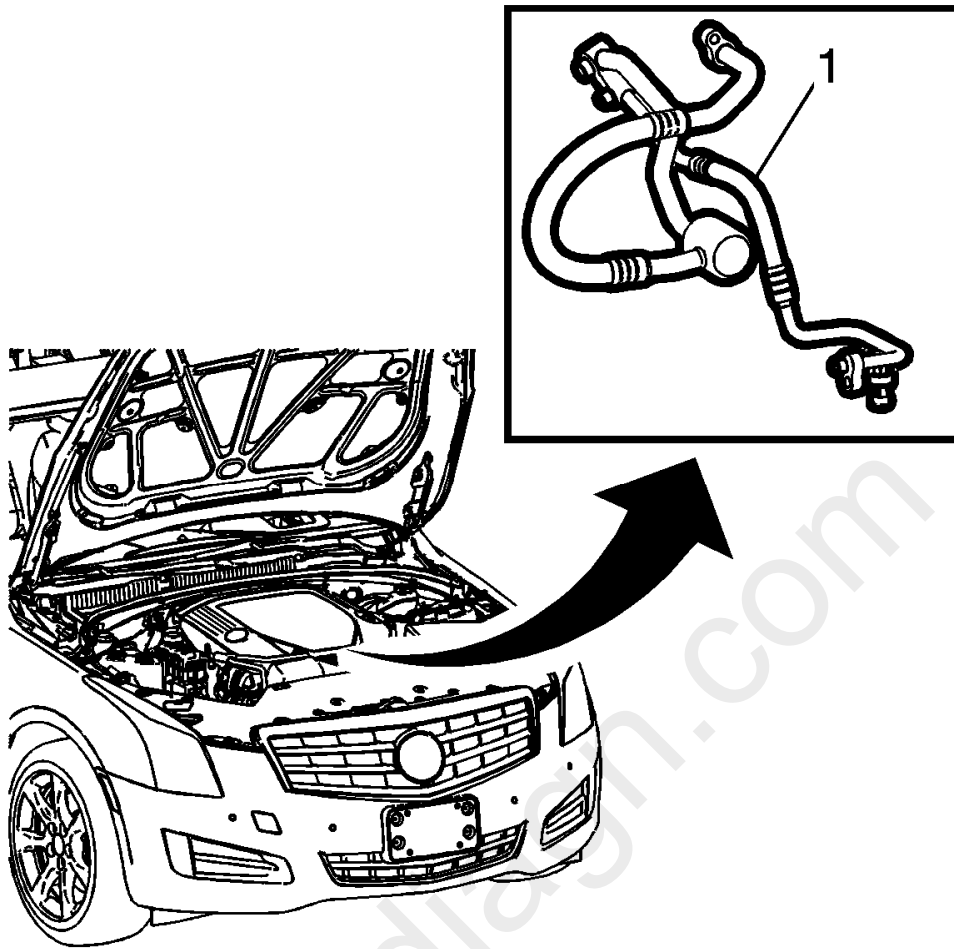


Fig. 32: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose (1) from vehicle.

Installation Procedure

1. Install the air conditioning compressor and condenser hose to the vehicle.

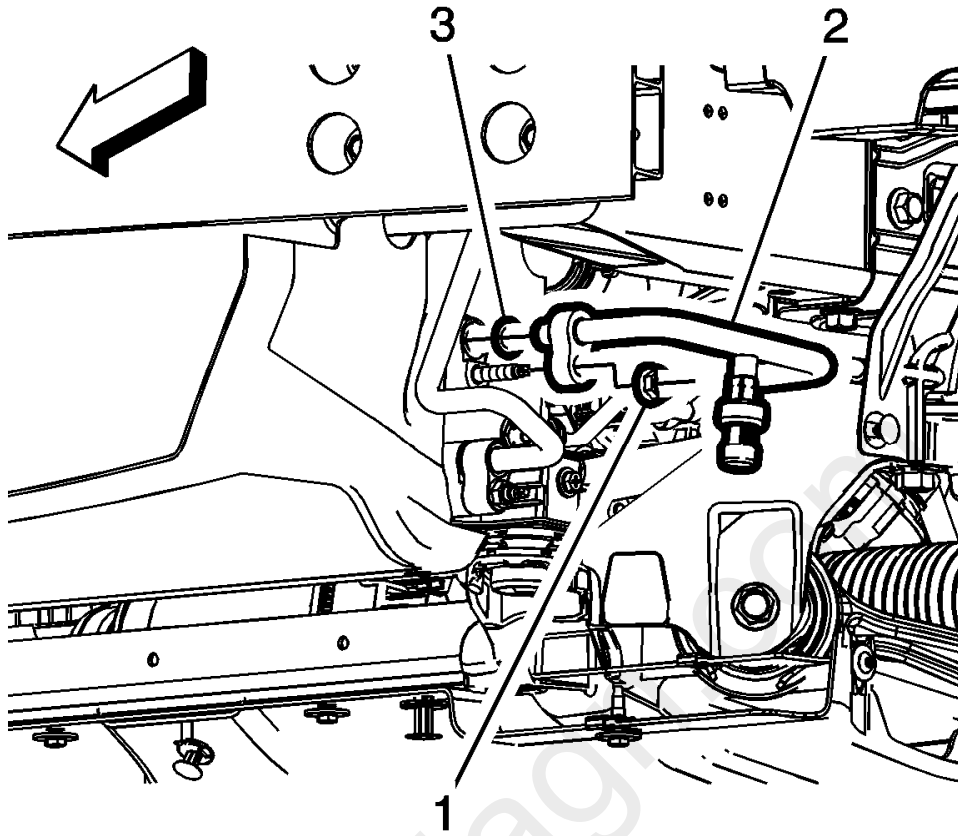


Fig. 33: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

2. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
3. Install the air conditioning compressor and condenser hose (2) to the condenser.

CAUTION: Refer to Fastener Caution .

4. Install the air conditioning compressor and condenser hose nut (1) at the condenser and tighten to 22 N.m (16 lb ft).
5. Install the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .
6. Lower the vehicle.

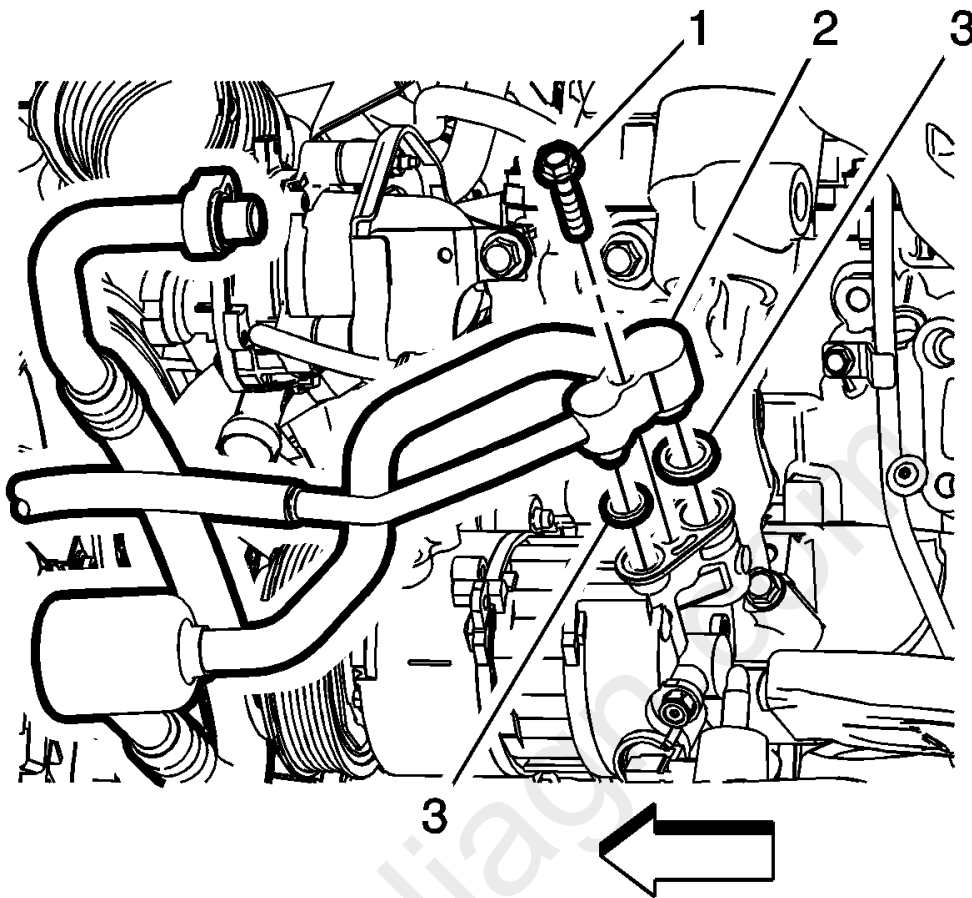


Fig. 34: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

7. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the compressor.

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

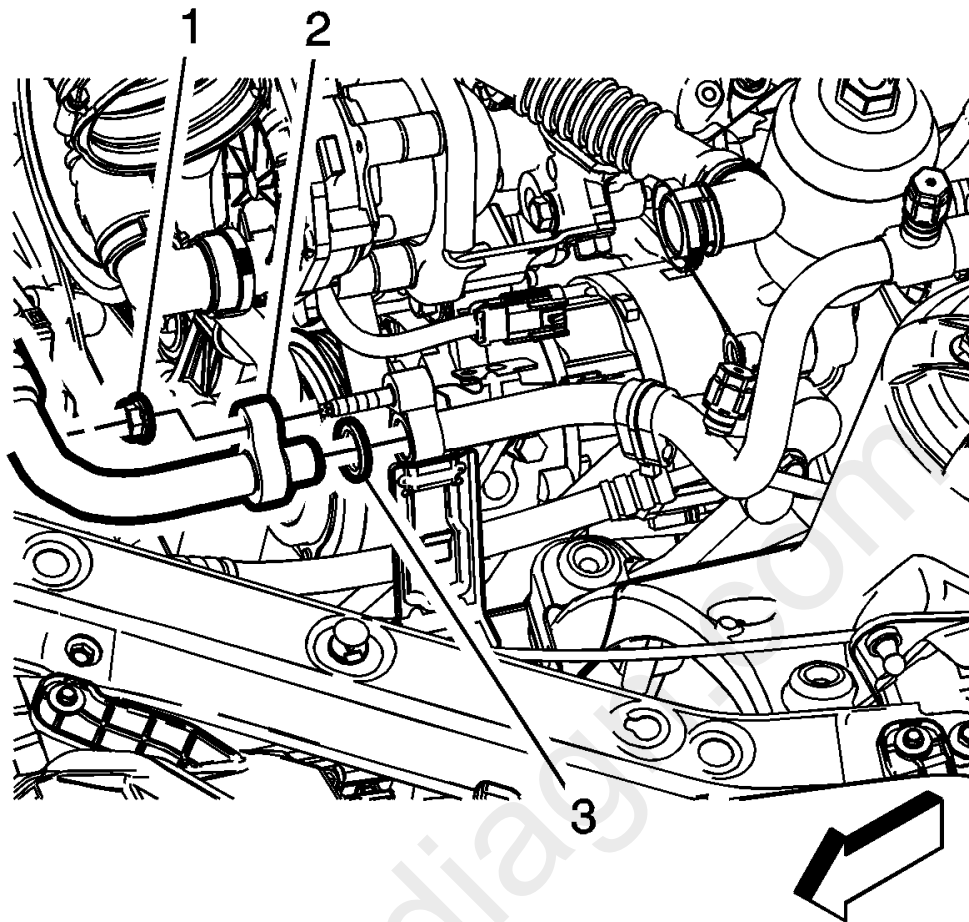


Fig. 35: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

9. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the air conditioning evaporator hose joint.

10. Install the air conditioning compressor and condenser nut (1) to air conditioning evaporator hose (2) and tighten to 22 N.m (16 lb ft).
11. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement (LFX)**.
12. Evacuate and charge the A/C system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE REPLACEMENT (LF3)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).
2. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement (LF3) .

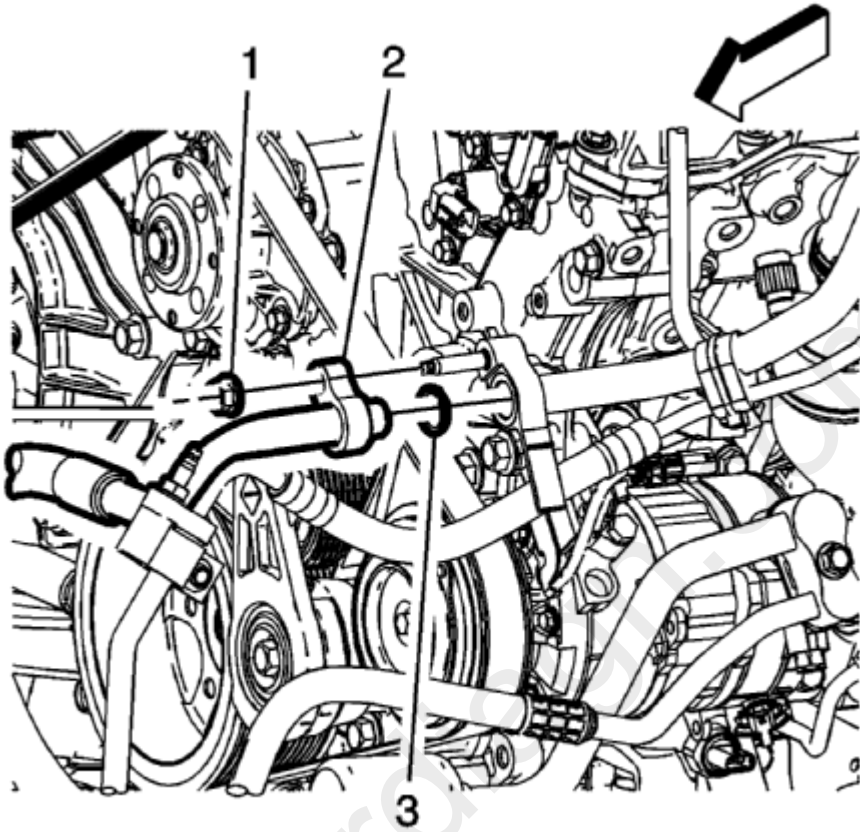


Fig. 36: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

3. Remove the air conditioning compressor hose nut (1)
4. Remove the air conditioning compressor and condenser hose (2) from air conditioning evaporator hose joint.
5. Remove and discard the sealing washer (3).

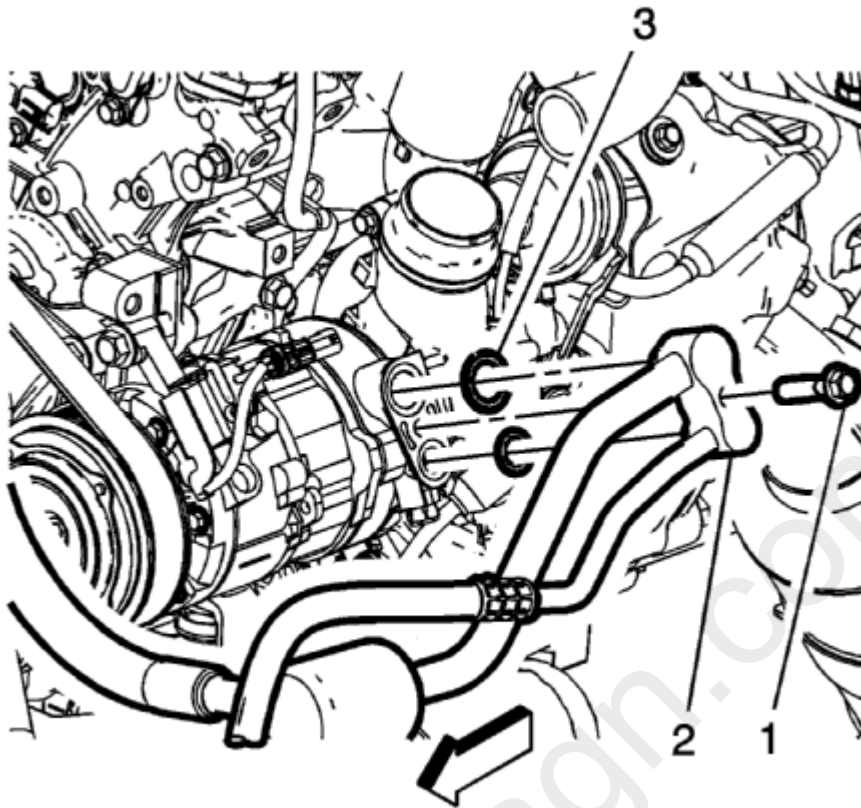


Fig. 37: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

6. Remove the air conditioning compressor and condenser hose bolt (1) at the compressor.
7. Remove the air conditioning compressor and condenser hose (2) from the compressor.
8. Remove and discard the sealing washers (3).
9. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
10. Remove the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .

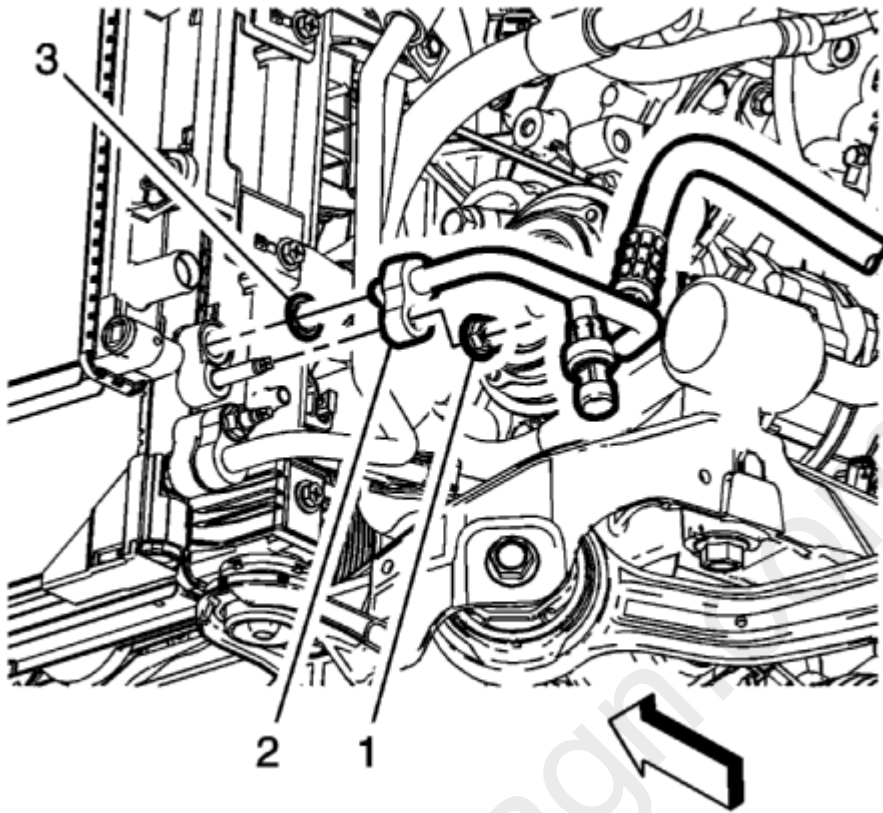


Fig. 38: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

11. Remove the air conditioning compressor and condenser hose nut (1) at the condenser.
12. Remove the air conditioning compressor and condenser hose (2) from the condenser.
13. Remove and discard the sealing washer (3) and replace with NEW sealing washers.

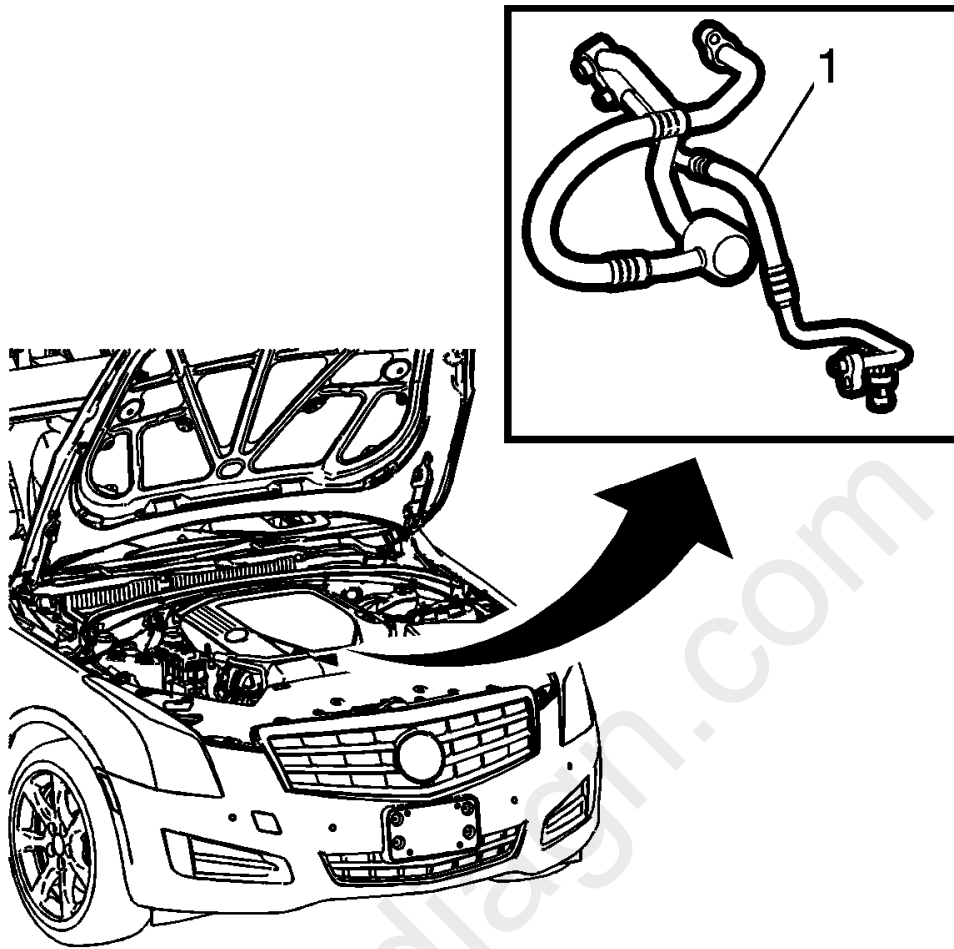


Fig. 39: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose (1) from vehicle.

Installation Procedure

1. Install the air conditioning compressor and condenser hose to the vehicle.

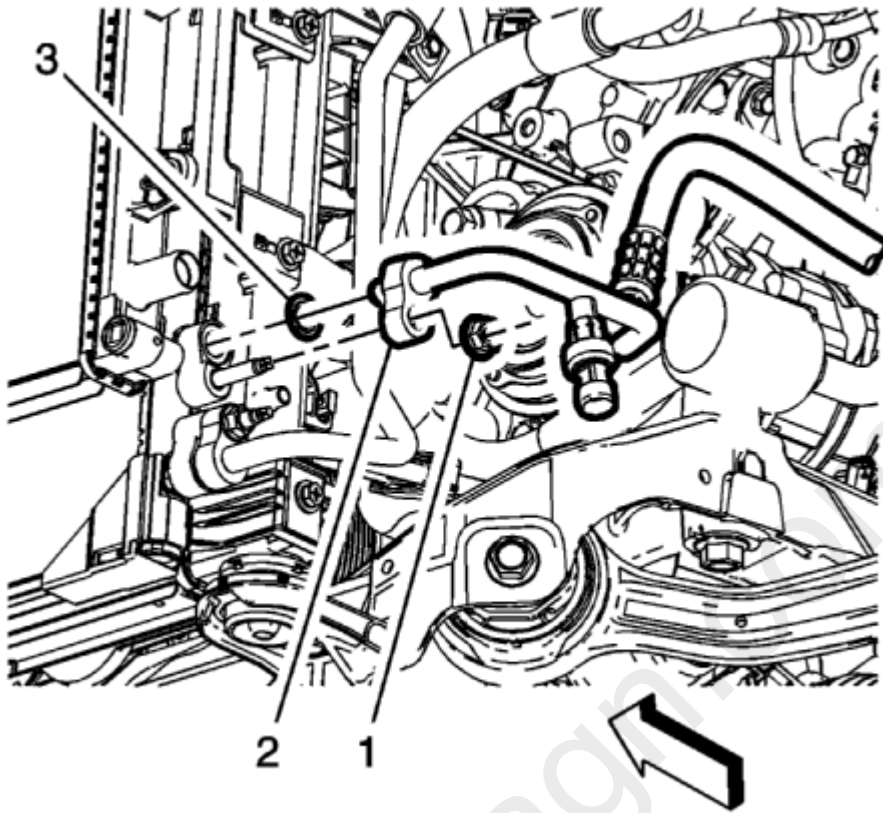


Fig. 40: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

2. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
3. Install the air conditioning compressor and condenser hose (2) to the condenser.

CAUTION: Refer to Fastener Caution .

4. Install the air conditioning compressor and condenser hose nut (1) at the condenser and tighten to 22 (16 lb ft).
5. Install the left front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .
6. Lower the vehicle.

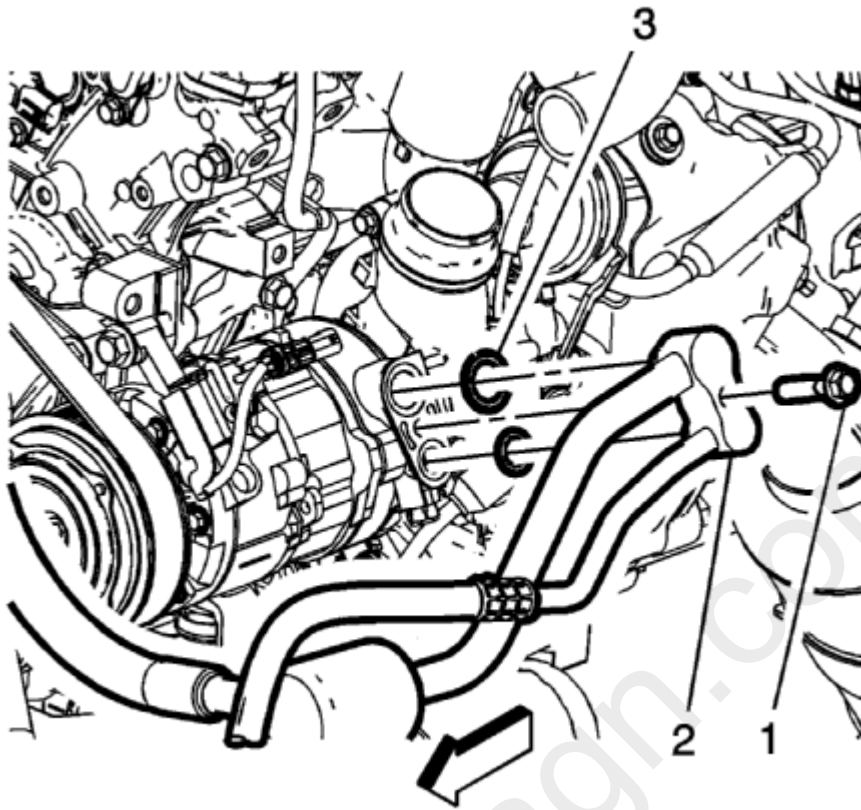


Fig. 41: Air Conditioning Compressor And Condenser Hose And Sealing Washers
Courtesy of GENERAL MOTORS COMPANY

7. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the compressor.

8. Install the air conditioning compressor and condenser hose bolt (1) at compressor and tighten to 22 (16 lb ft).

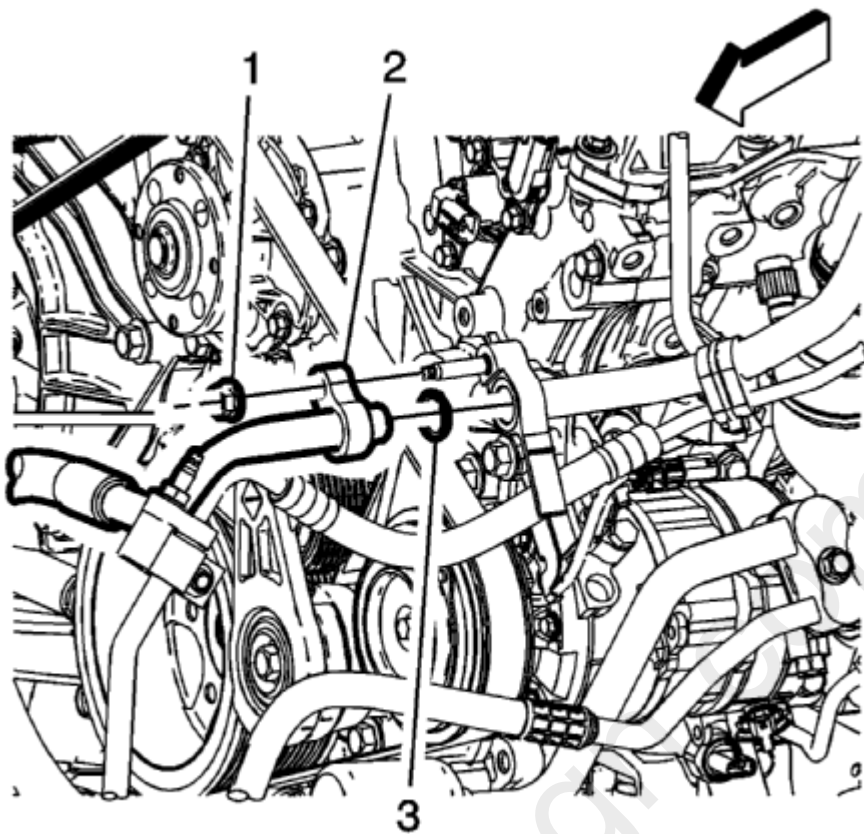


Fig. 42: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

9. Install NEW sealing washers (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.

Install the air conditioning compressor and condenser hose (2) to the air conditioning evaporator hose joint.

10. Install the air conditioning compressor and condenser nut (1) to air conditioning evaporator hose (2) and tighten to 22 (16 lb ft).
11. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement (LF3)** .
12. Evacuate and charge the A/C system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

AIR CONDITIONING EVAPORATOR HOSE ASSEMBLY REPLACEMENT (LF3, LFX)

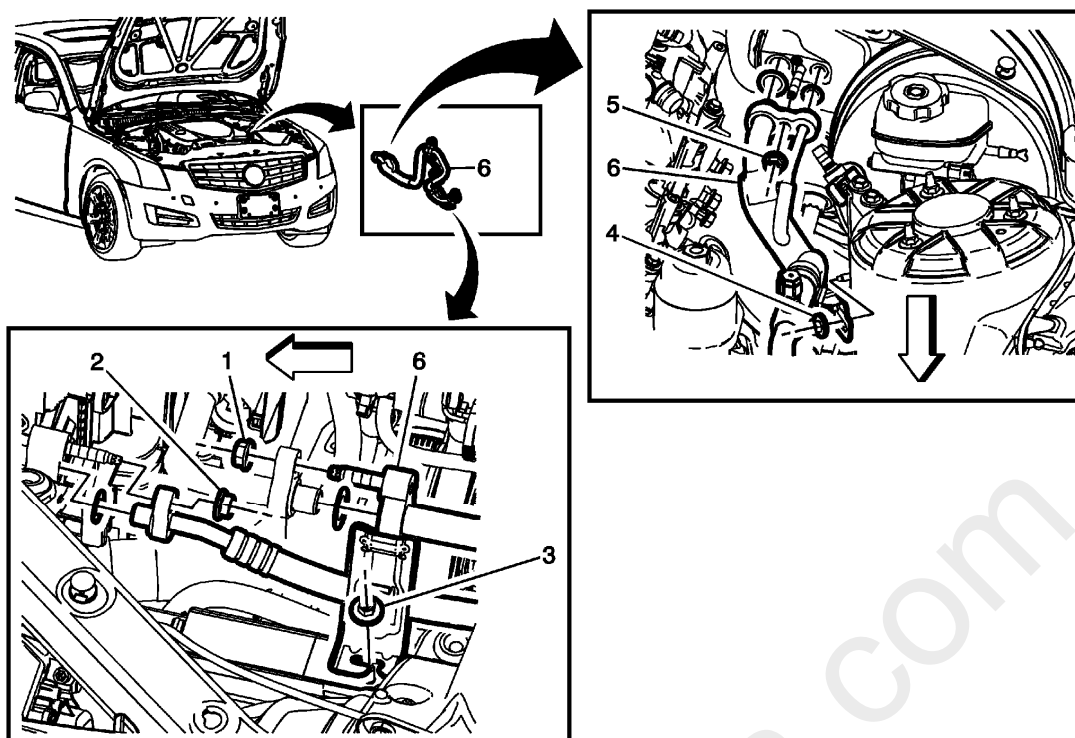


Fig. 43: Air Conditioning Evaporator Hose Assembly (LF3, LFX)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Hose Assembly Replacement (LF3, LFX)

Callout	Component Name
Preliminary Procedures 1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement (LFX)</u> , <u>Air Cleaner Assembly Replacement (LF3)</u> .	
1	Air Conditioning Compressor and Condenser Hose Nut CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Air Conditioning Evaporator Hose Nut Tighten 22 (16 lb ft)
3	Air Conditioning Evaporator Hose Support Rail Bracket Nut Tighten 10 (89 lb in)

4	Air Conditioning Evaporator Hose Support Bracket Nut Tighten 10 (89 lb in)
5	Air Conditioning Evaporator Thermal Expansion Valve Tube Nut Tighten 22 (16 lb ft)
6	Air Conditioning Evaporator Hose Assembly Procedure Remove and discard the old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement.</u>

AIR CONDITIONING EVAPORATOR HOSE ASSEMBLY REPLACEMENT (LTG)

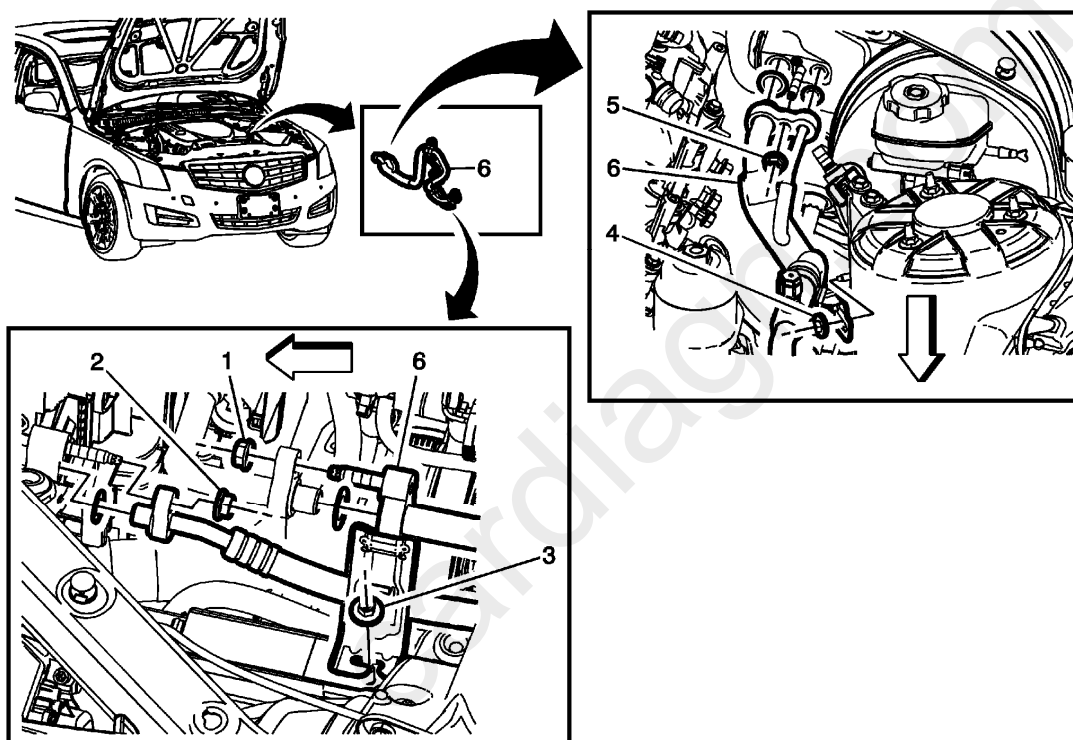


Fig. 44: Air Conditioning Evaporator Hose Assembly (LTG)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Hose Assembly Replacement (LTG)

Callout	Component Name
Preliminary Procedures	
1.	Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).</u>
2.	Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement .</u>
	Air Conditioning Compressor and Condenser Hose Nut

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Air Conditioning Evaporator Hose Nut Tighten 22 (16 lb ft)
3	Air Conditioning Evaporator Hose Support Rail Bracket Nut Tighten 10 (89 lb in)
4	Air Conditioning Evaporator Hose Support Bracket Nut Tighten 10 (89 lb in)
5	Air Conditioning Evaporator Thermal Expansion Valve Tube Nut Tighten 22 (16 lb ft)
6	Air Conditioning Evaporator Hose Assembly Procedure Remove and discard the old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .

AIR CONDITIONING EVAPORATOR TUBE COVER REPLACEMENT

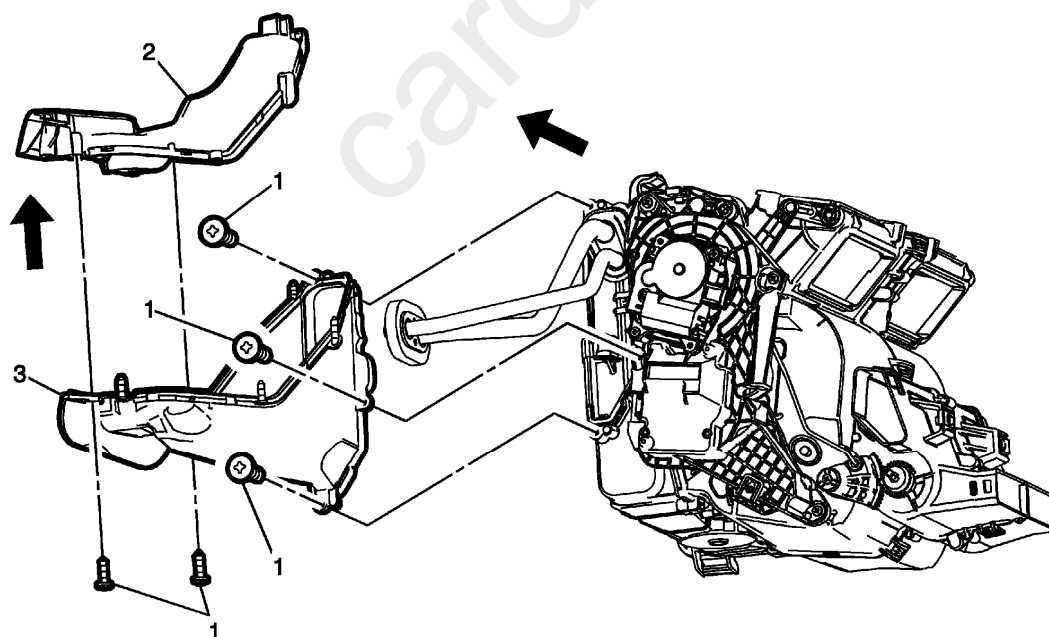


Fig. 45: Air Conditioning Evaporator Tube Cover
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Tube Cover Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LTG)</u>, <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX LF3)</u>. 2. Disconnect the electrical connectors as necessary.	
1	Air Conditioning Evaporator Tube Cover Fastener (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Evaporator Upper Tube Cover Procedures 1. Replace the appropriate part during disassembly. 2. Replace the air conditioning evaporator tube seal.
3	Air Conditioning Evaporator Lower Tube Cover Procedures 1. Replace the appropriate part during disassembly. 2. Replace the air conditioning evaporator tube seal.

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

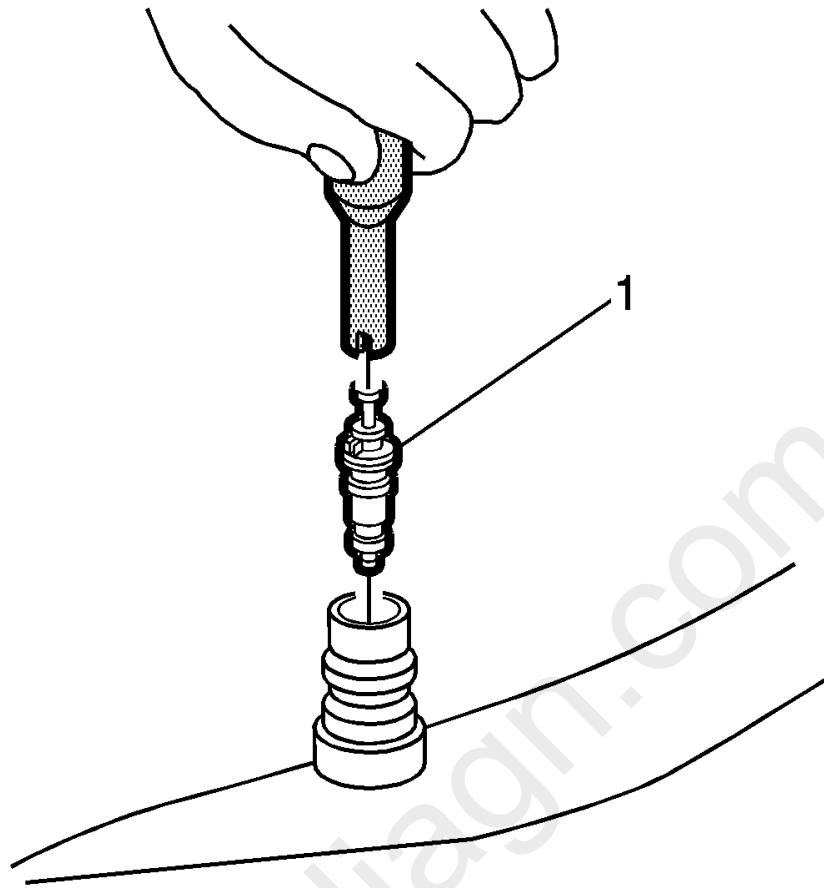


Fig. 46: Valve Core

Courtesy of GENERAL MOTORS COMPANY

1. Recover the refrigerant from the A/C system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Using the **GE 46246** Valve Core Tool , remove the valve core (1) from the service port.

Installation Procedure

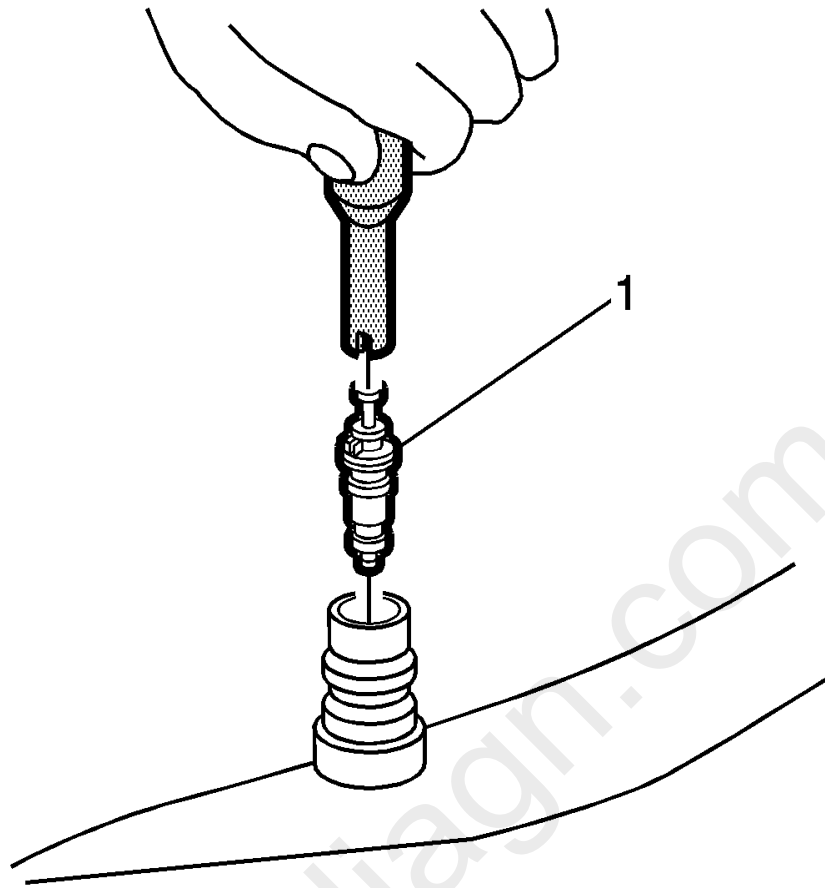


Fig. 47: Valve Core
Courtesy of GENERAL MOTORS COMPANY

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 (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
4. Leak test the fittings of the component using **GE 50078** Electronic Leak Detector.

AIR CONDITIONING REFRIGERANT DESICCANT REPLACEMENT (LFX)

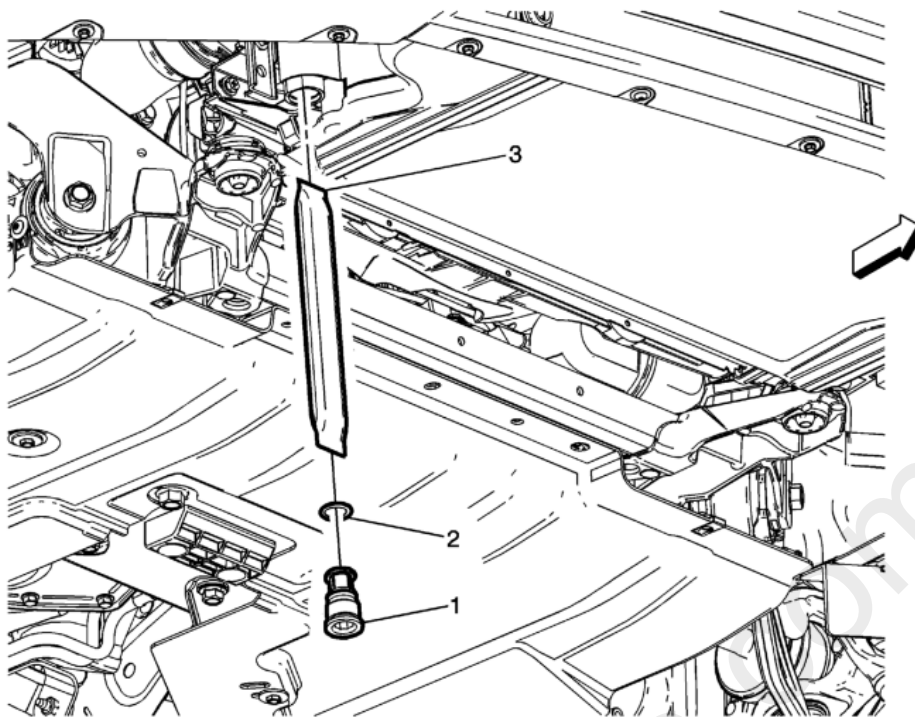


Fig. 48: Air Conditioning Refrigerant Desiccant (LFX)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Refrigerant Desiccant Replacement (LFX)

Callout	Component Name
Preliminary Procedure 1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the front bumper fascia air deflector replacement - center. Refer to <u>Front Bumper Fascia Air Deflector Replacement - Center</u>.	
1	Air Conditioning Receiver and Dehydrator Plug CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Receiver and Dehydrator Cover Seal NOTE: Remove and discard the old O-ring and replace with a NEW O-ring. Refer to <u>Air Conditioning O-Ring Seal Replacement</u> .
3	Air Conditioning Refrigerant Desiccant

AIR CONDITIONING REFRIGERANT DESICCANT REPLACEMENT (LF3)

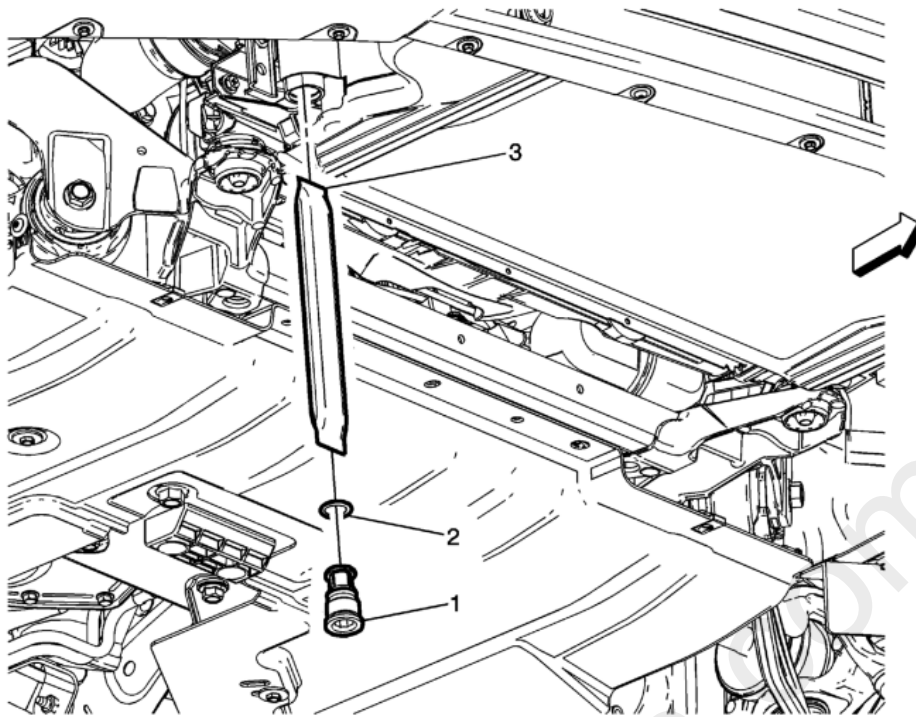


Fig. 49: Air Conditioning Refrigerant Desiccant (LF3)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Refrigerant Desiccant Replacement (LF3)

Callout	Component Name
Preliminary Procedure 1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the front bumper fascia air deflector replacement - center. Refer to <u>Front Bumper Fascia Air Deflector Replacement - Center</u> . 3. Remove the auxiliary radiator outlet hose from the auxiliary radiator pipe and position aside. Recover the air conditioning system refrigerant. Refer to <u>Auxiliary Radiator Outlet Hose Replacement (LF3)</u> .	
1	Air Conditioning Receiver and Dehydrator Plug CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Receiver and Dehydrator Cover Seal NOTE: Remove and discard the old O-ring and replace with a NEW O-ring. Refer to <u>Air Conditioning O-Ring Seal Replacement</u>.
3	Air Conditioning Refrigerant Desiccant

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT (LFX, LF3)

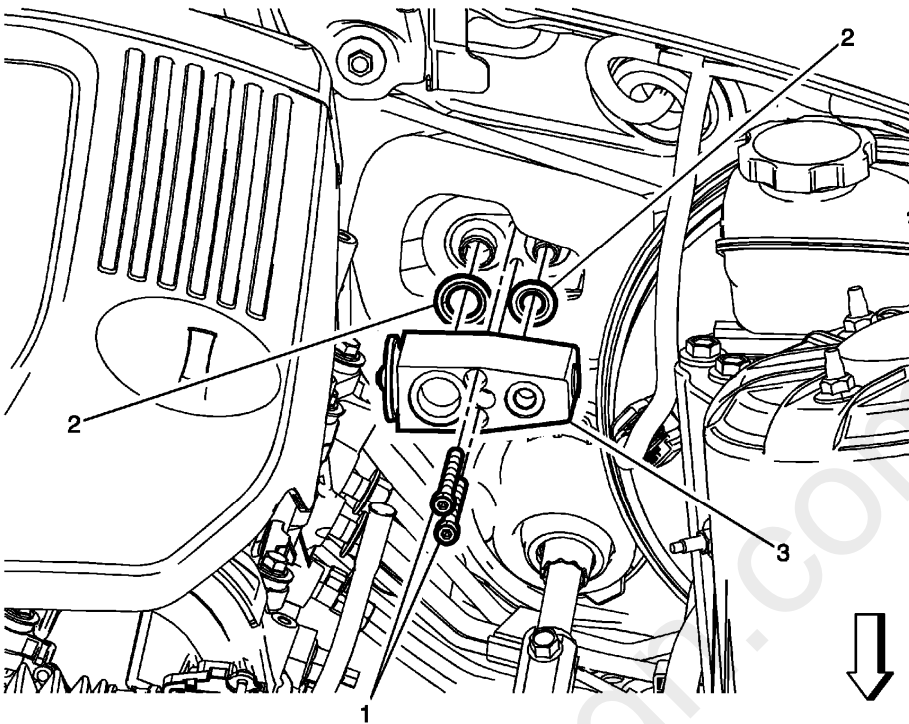


Fig. 50: Air Conditioning Evaporator Thermal Expansion Valve (LFX, LF3)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Thermal Expansion Valve Replacement (LFX, LF3)

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the air conditioning evaporator hose assembly from the thermal expansion valve. Refer to <u>Air Conditioning Evaporator Hose Assembly Replacement (LF3, LFX)</u>.	
1	Air Conditioning Evaporator Thermal Expansion Valve Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Sealing Washer (Qty: 2) NOTE: Remove and discard the sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .
3	Air Conditioning Evaporator Thermal Expansion Valve

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT (LTG)

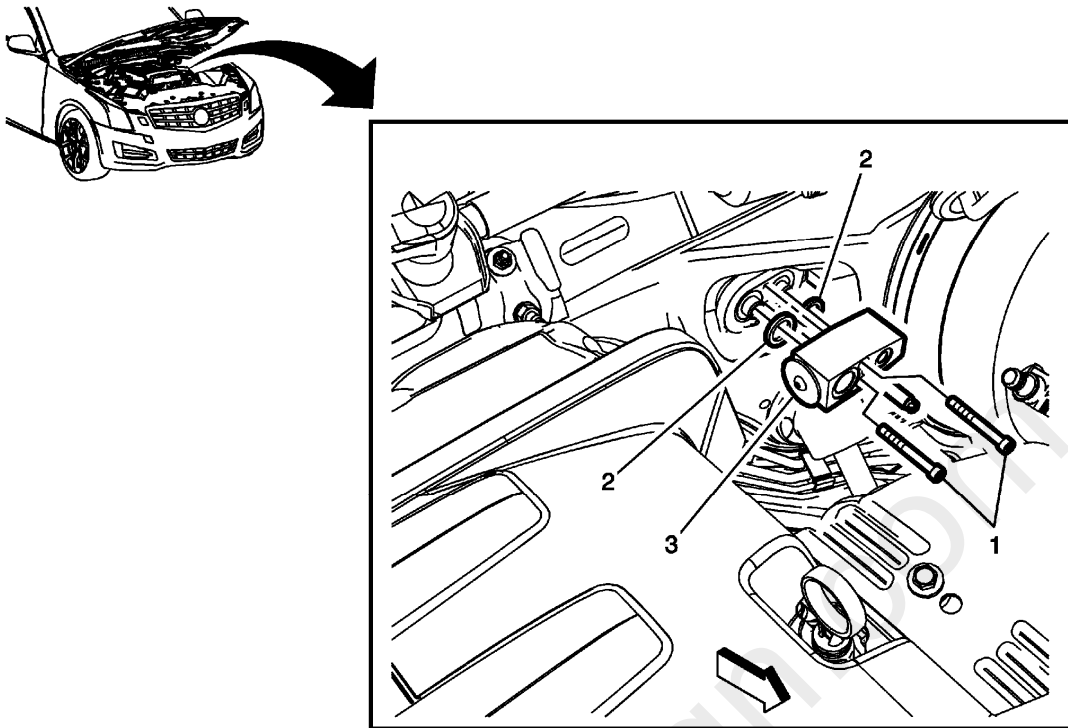


Fig. 51: Air Conditioning Evaporator Thermal Expansion Valve (LTG)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Thermal Expansion Valve Replacement (LTG)

Callout	Component Name
Preliminary Procedures	
1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the air conditioning evaporator hose assembly from the thermal expansion valve. Refer to <u>Air Conditioning Evaporator Hose Assembly Replacement (LTG)</u>.	
1	Air Conditioning Evaporator Thermal Expansion Valve Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Sealing Washer (Qty: 2) NOTE: Remove and discard the old sealing washers. Replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u>.
3	Air Conditioning Evaporator Thermal Expansion Valve

AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR REPLACEMENT

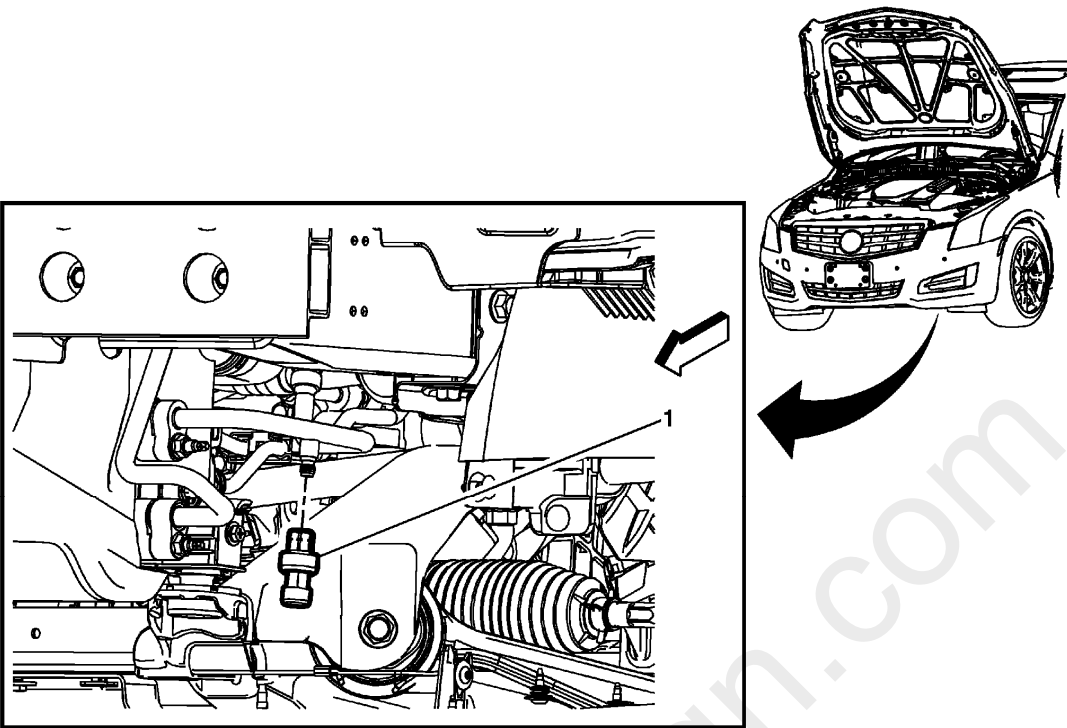


Fig. 52: Air Conditioning (A/C) Refrigerant Pressure Sensor
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the left front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement .	
2. Disconnect the electrical connector from the air conditioning refrigerant pressure sensor.	
1	Air Conditioning Refrigerant Pressure Sensor CAUTION: Refer to Fastener Caution . NOTE: Remove and discard the O-ring and replace with NEW only. Refer to Air Conditioning O-Ring Seal Replacement. Tighten 7 (62 lb in)

AIR CONDITIONING CONDENSER REPLACEMENT (LTG WITH V03)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).
2. Remove the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement .
3. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement .

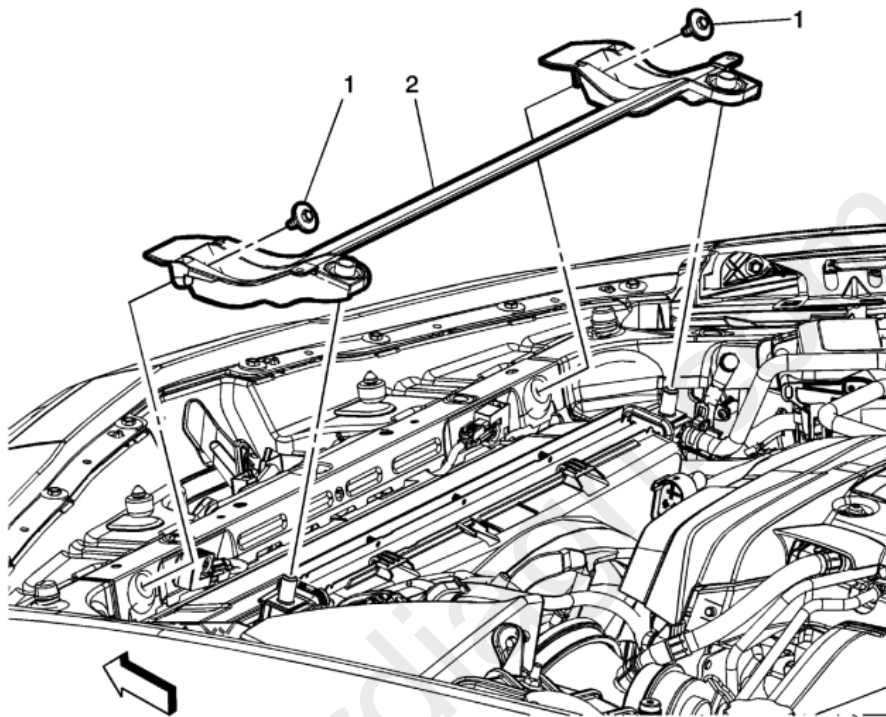


Fig. 53: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator upper bracket (2). Refer to Radiator Upper Bracket Replacement (LFX, LTG) .
5. Remove the front bumper impact bar. Refer to Front Bumper Impact Bar Replacement .
6. Remove the front bumper fascia center support and the forward range radar module if equipped. Refer to Forward Range Radar Module Replacement , or Front Bumper Fascia Center Support Replacement (Upper) , Front Bumper Fascia Center Support Replacement (Lower) .
7. Reposition the electrical harness out of the way.

NOTE: Cap the fittings and plug the holes when removing the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

8. Place a drain pan under the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

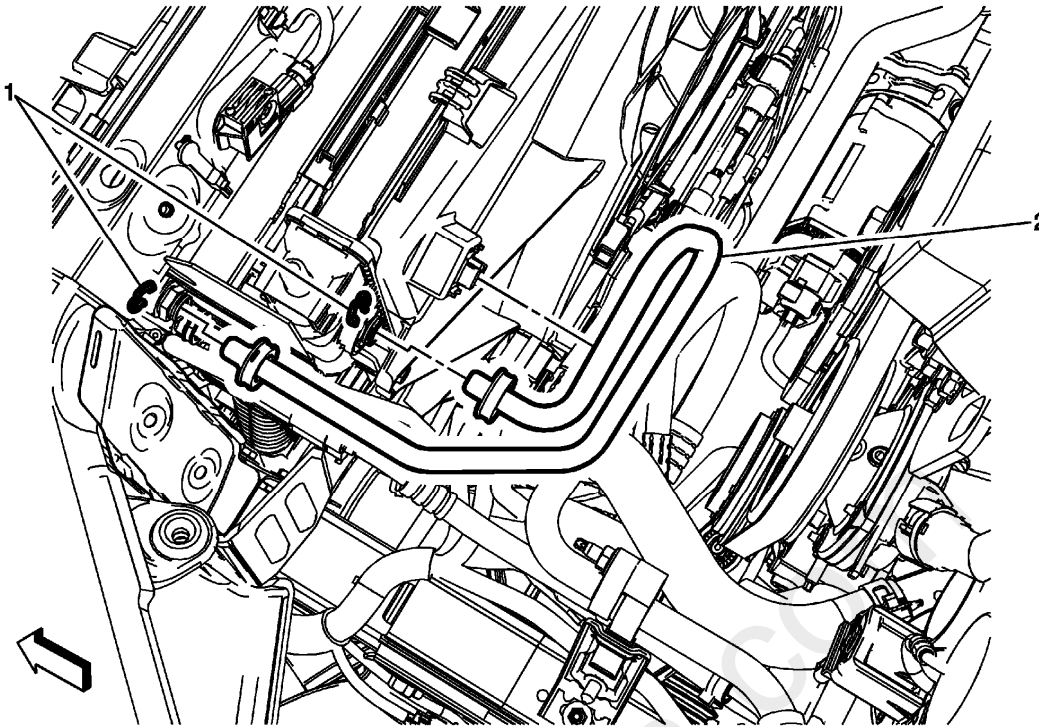


Fig. 54: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Disconnect the transmission fluid cooler pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
10. Disconnect the transmission fluid cooler pipe (2) from the air conditioning condenser.

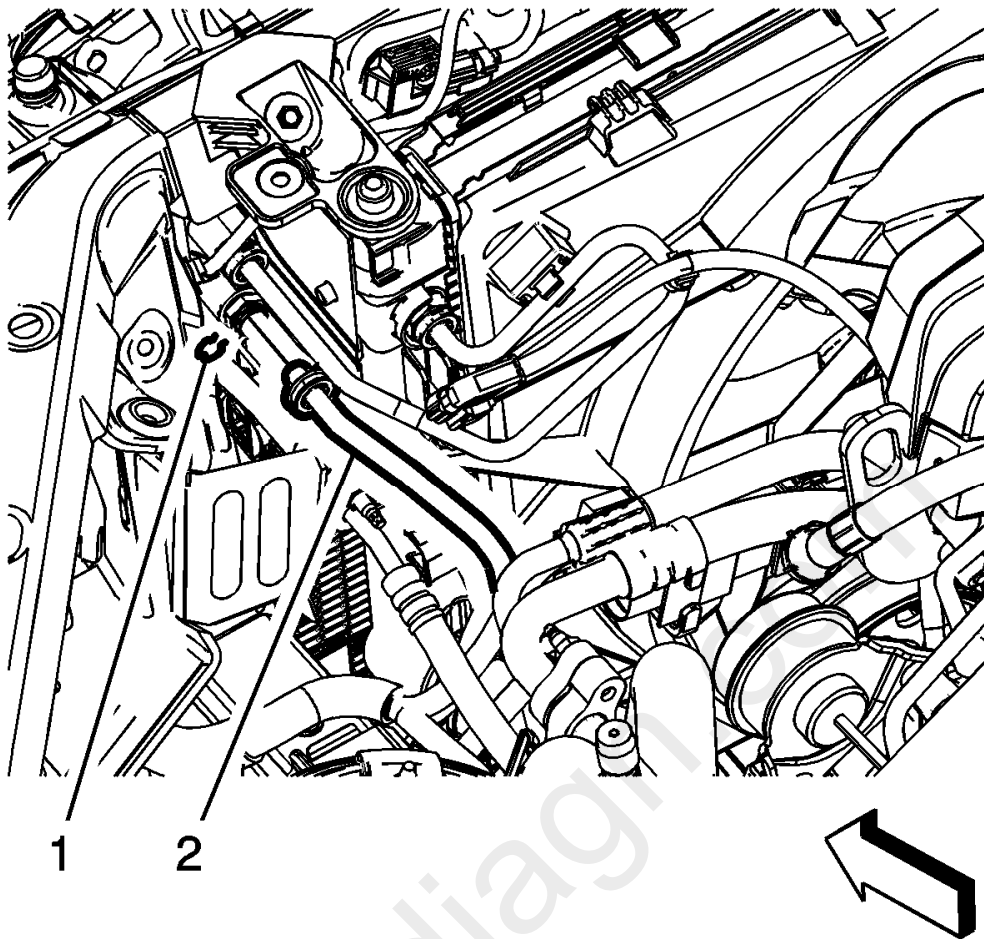


Fig. 55: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

11. Disconnect the transmission fluid cooler inlet and outlet pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
12. Disconnect the transmission fluid cooler inlet and outlet pipe (2) from the air conditioning condenser.
13. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

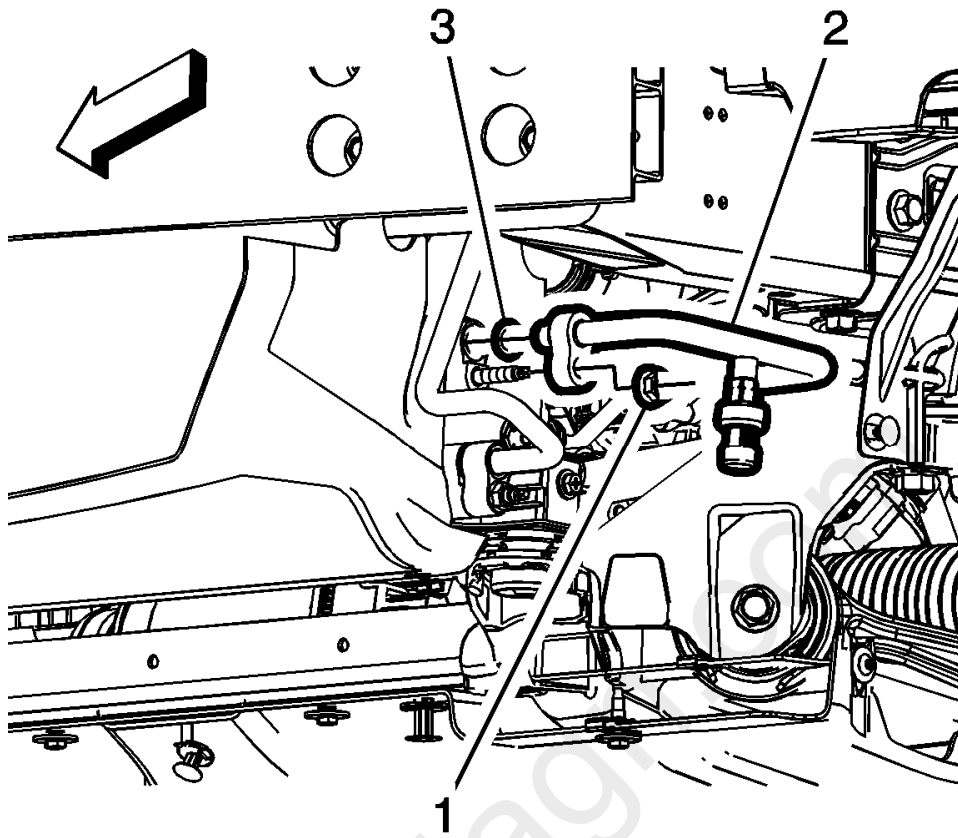


Fig. 56: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose nut (1) from the air conditioning condenser.
15. Remove the air conditioning compressor and condenser hose (2) from air conditioning condenser.
16. Remove and discard the sealing washer (3).

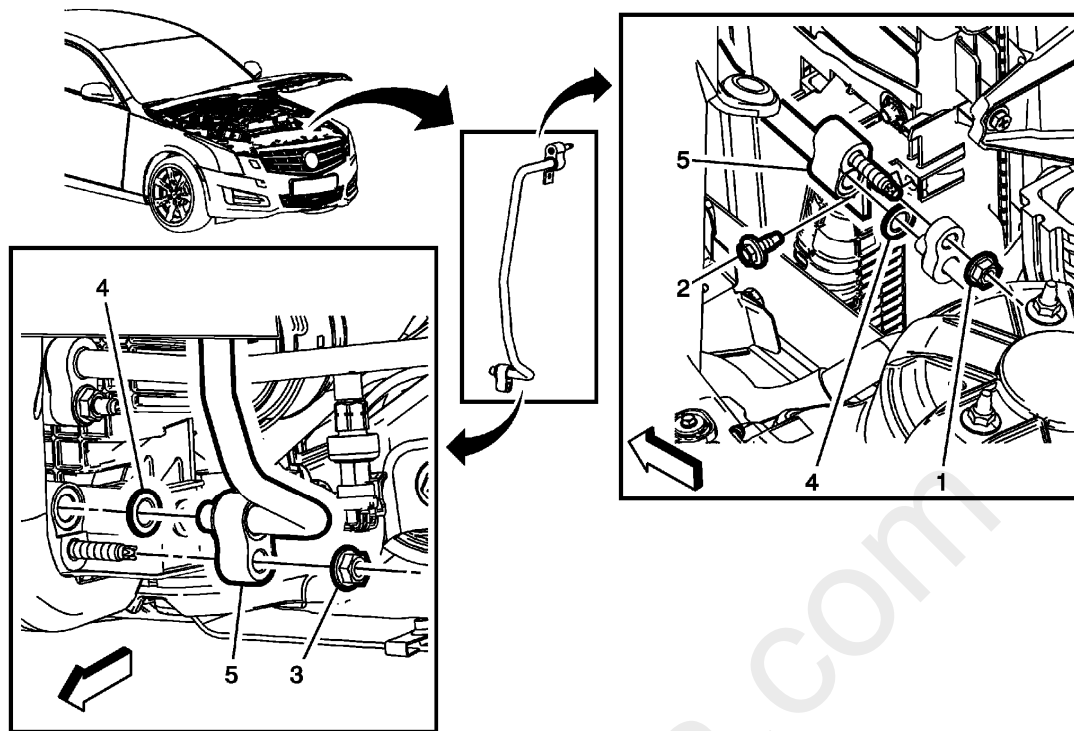


Fig. 57: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

17. Remove air conditioning condenser outlet tube nut (3) from the condenser.
18. Remove air conditioning condenser outlet tube (5) from the condenser.
19. Lower the drivetrain and front suspension cradle enough to access the air conditioning condenser outlet tube to radiator mounting bolt. Refer to **Drivetrain and Front Suspension Cradle Replacement** .
20. Remove the air conditioning condenser outlet tube to radiator mounting bolt (2).
21. Remove the hood latch mounting bolts and reposition the hood latch out of the way. Refer to **Hood Primary and Secondary Latch Replacement** .
22. Remove the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
23. Remove the radiator air lower baffle and deflector side retainers from the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LTG)** .
24. Reposition the radiator air lower baffle away from the condenser and radiator.
25. Remove and discard the sealing washer (4).

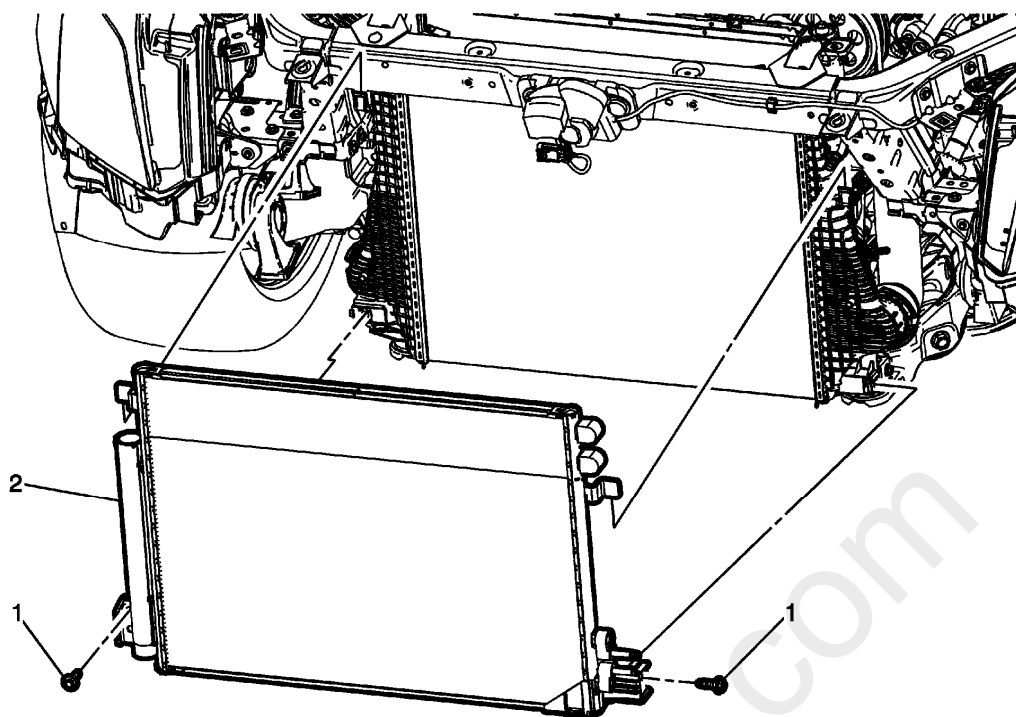


Fig. 58: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

26. Remove the air conditioning condenser bolts (1) from the charge air cooler radiator.
27. Remove the air conditioning condenser (2) from the charge air cooler radiator.

Installation Procedure

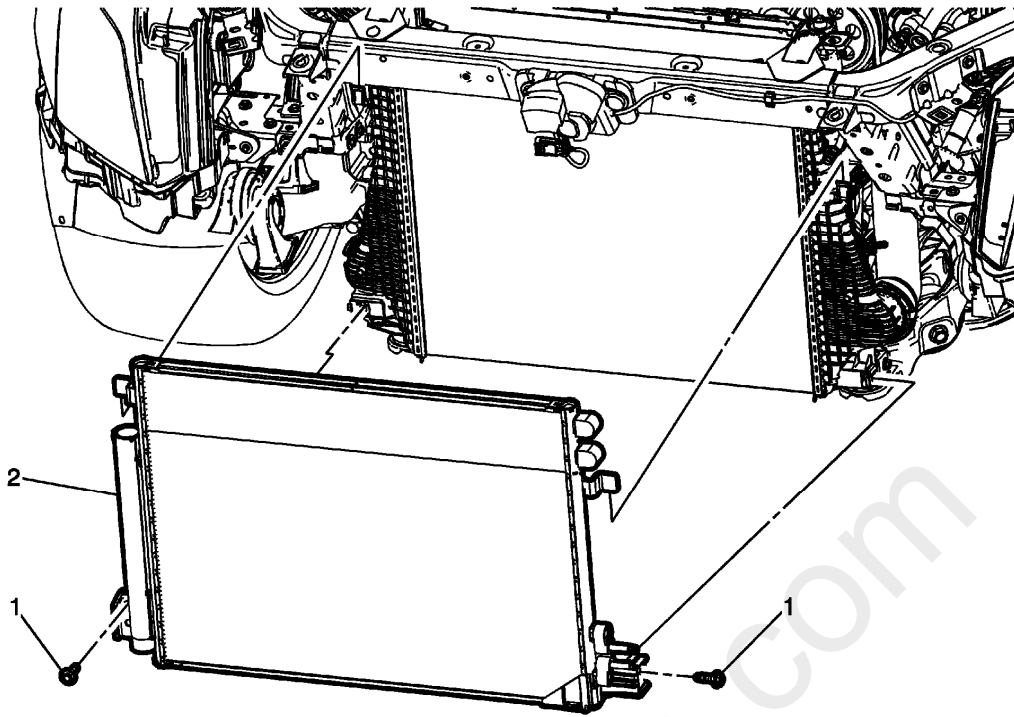


Fig. 59: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning condenser (2) to the charge air cooler radiator.

CAUTION: Refer to Fastener Caution .

2. Install the air conditioning condenser bolts (1) to the charge air cooler radiator and tighten.

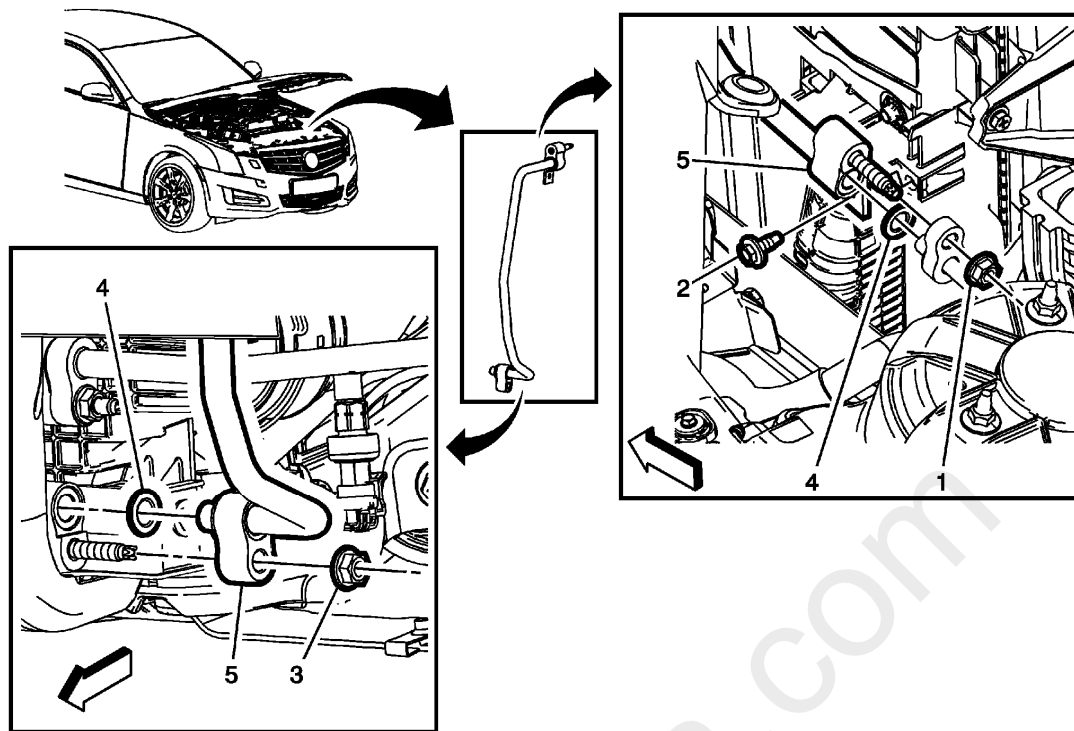


Fig. 60: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

3. Install NEW sealing washer (4) to the air conditioning condenser outlet tube (5). Refer to **Air Conditioning System Seal Replacement**.
4. Install the radiator air lower baffle and deflector side retainers to the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LTG)** .
5. Install the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
6. Install the hood latch. Refer to **Hood Primary and Secondary Latch Replacement** .
7. Install the air conditioning condenser outlet tube to radiator mounting bolt (2).
8. Install the drivetrain and front suspension cradle. Refer to **Drivetrain and Front Suspension Cradle Replacement** .
9. Install the air conditioning condenser outlet tube (5) to the condenser.
10. Install the air conditioning condenser outlet tube nut (3) to the condenser and tighten to 22 N.m (16 lb ft).

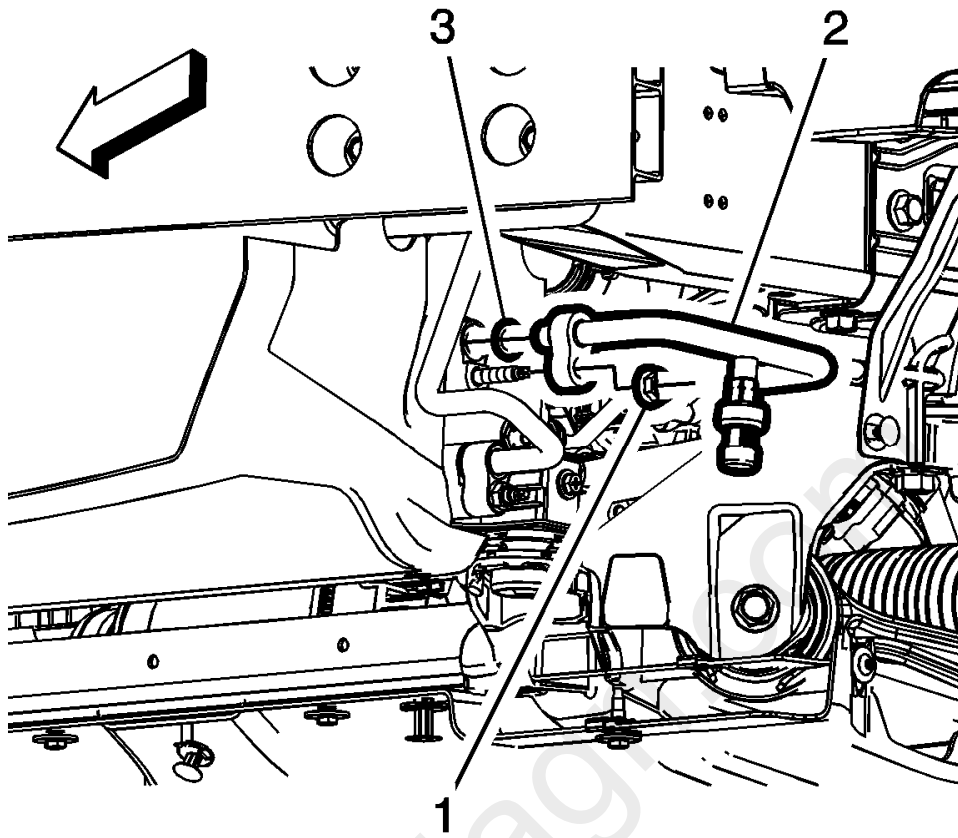


Fig. 61: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

11. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
12. Install the air conditioning compressor and condenser hose (2) to the air conditioning condenser.
13. Install the air conditioning compressor and condenser hose nut (1) to the air conditioning condenser and tighten to 22 N.m (16 lb ft).
14. Lower the vehicle.

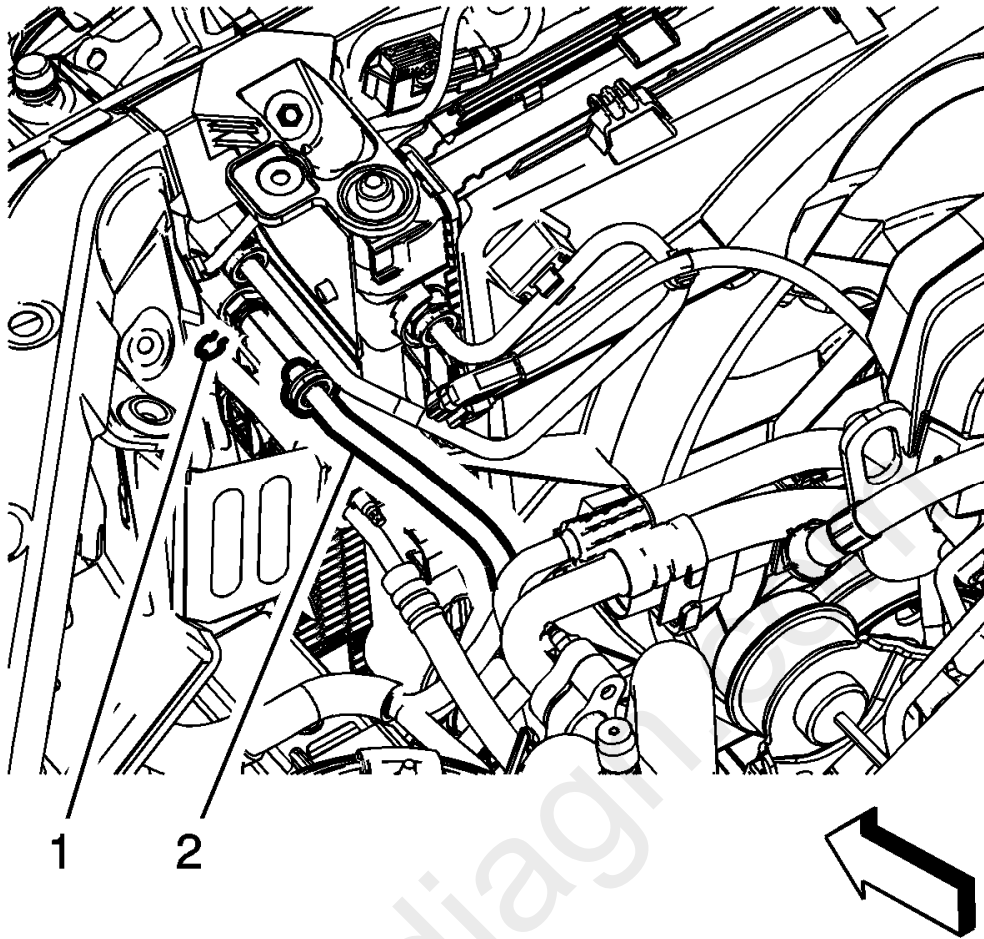


Fig. 62: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

15. Connect the transmission fluid cooler inlet and outlet pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .

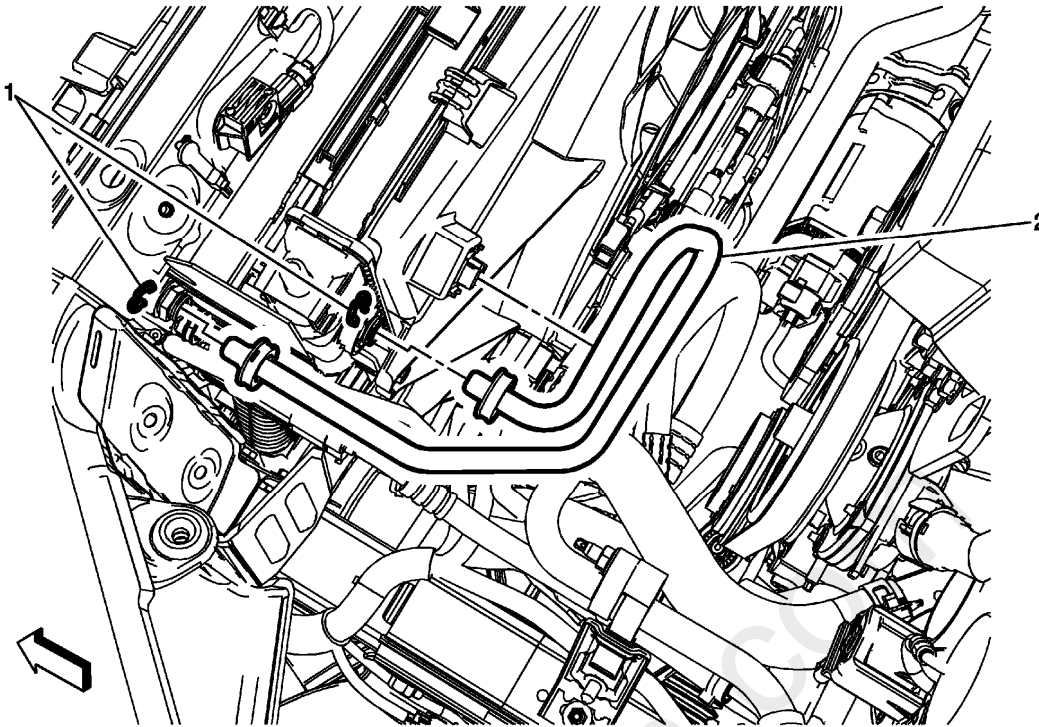


Fig. 63: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

16. Connect the transmission fluid cooler pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
17. Install the front bumper fascia center support and the forward range radar module if equipped. Refer to **Forward Range Radar Module Replacement** , or **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
18. Install the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement** .

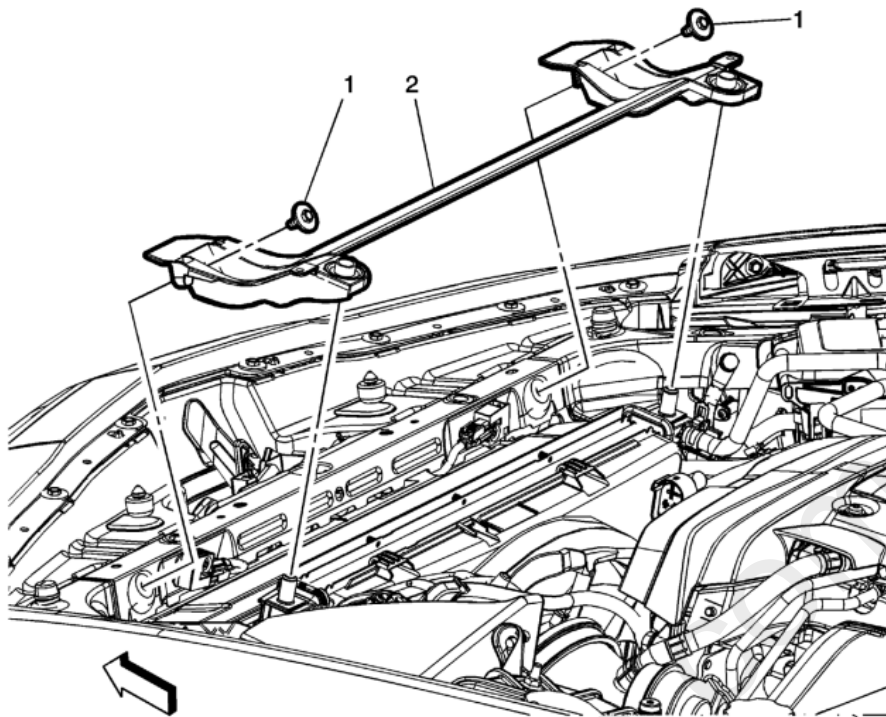


Fig. 64: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

19. Install the radiator upper brackets (2). Refer to **Radiator Upper Bracket Replacement (LFX, LTG)** .
20. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
21. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
22. Evacuate and charge the air conditioning system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
23. Inspect the transmission fluid level. Refer to **Transmission Fluid Fill Procedure** .
24. Inspect for transmission fluid leaks. Refer to **Automatic Transmission Fluid Leaks** .

AIR CONDITIONING CONDENSER REPLACEMENT (LFX WITH V03)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .

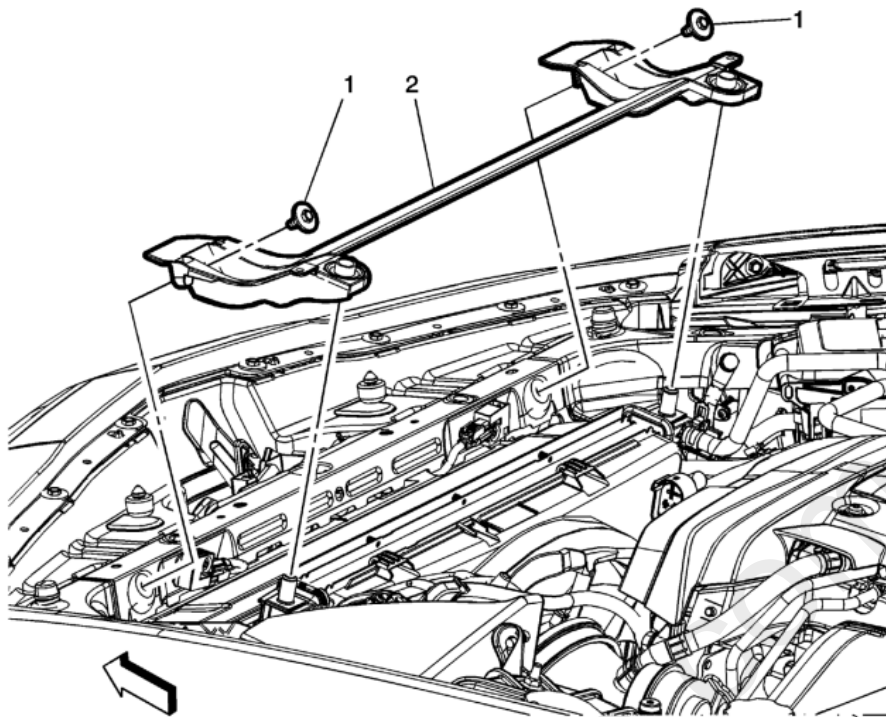


Fig. 65: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator upper bracket (2). Refer to **Radiator Upper Bracket Replacement (LFX, LTG)** .
5. Remove the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement** .
6. Remove the front bumper fascia center support and the forward range radar module if equipped. Refer to **Forward Range Radar Module Replacement** , or **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
7. Reposition the electrical harness out of the way.

NOTE: Cap the fittings and plug the holes when removing the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

8. Place a drain pan under the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

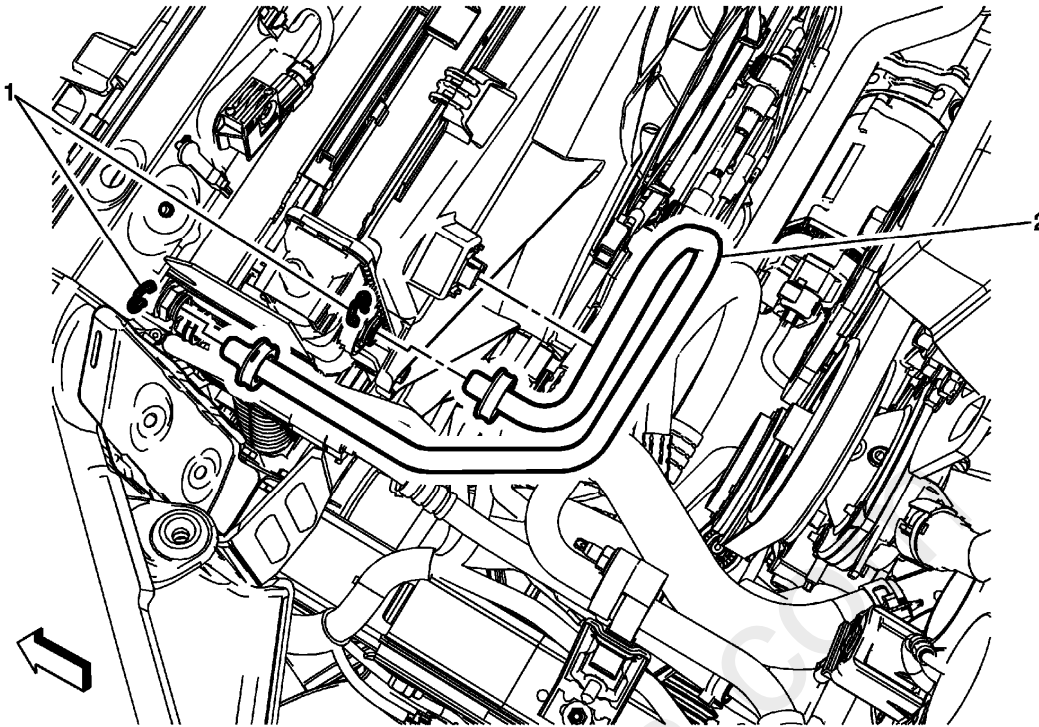


Fig. 66: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Disconnect the transmission fluid cooler pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
10. Disconnect the transmission fluid cooler pipe (2) from the air conditioning condenser.

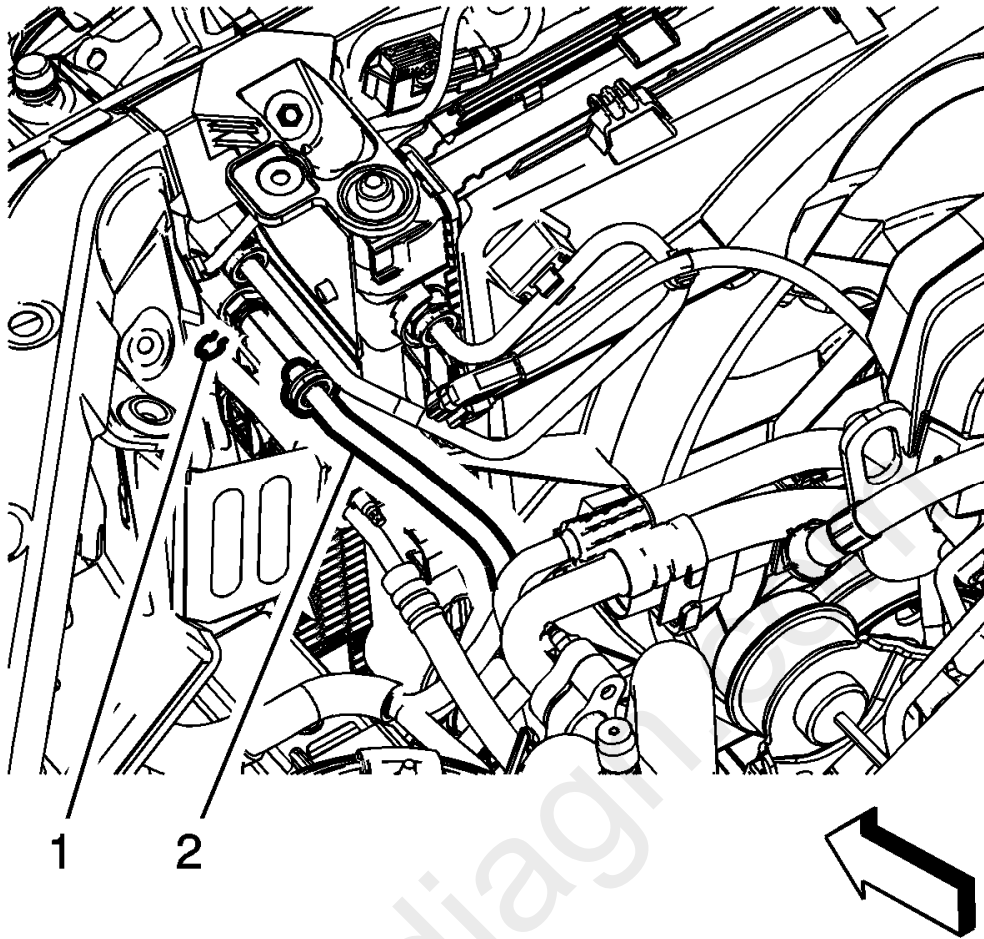


Fig. 67: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

11. Disconnect the transmission fluid cooler inlet and outlet pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
12. Disconnect the transmission fluid cooler inlet and outlet pipe (2) from the air conditioning condenser.
13. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

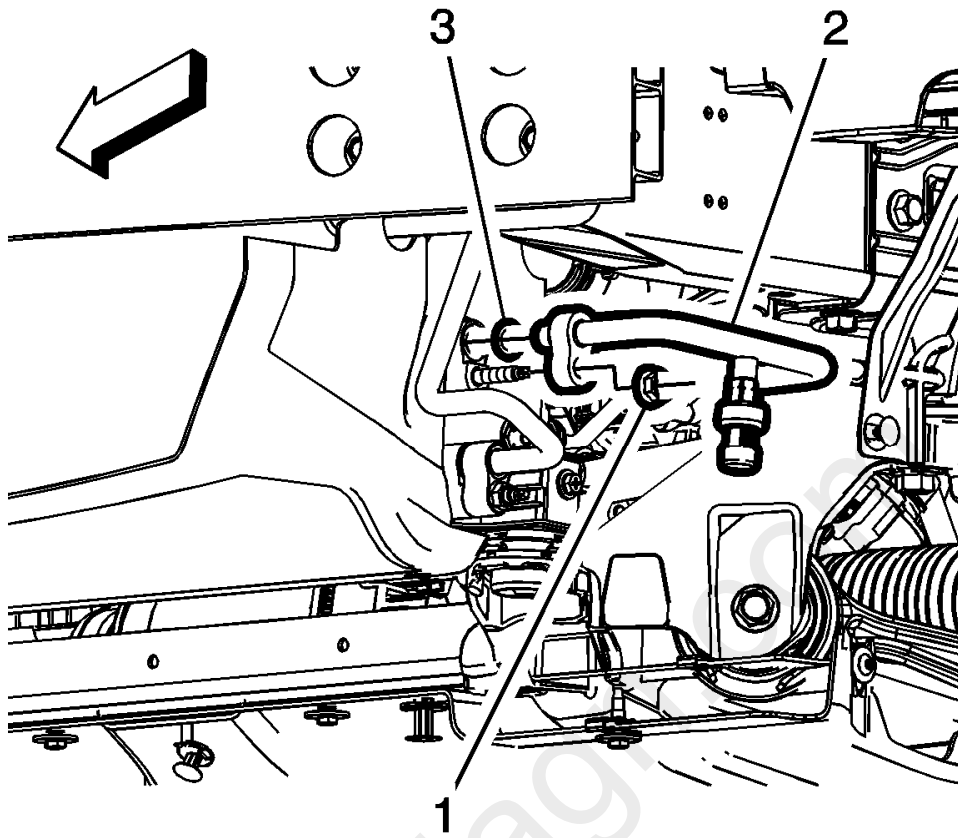


Fig. 68: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose nut (1) from the air conditioning condenser.
15. Remove the air conditioning compressor and condenser hose (2) from air conditioning condenser.
16. Remove and discard the sealing washer (3).

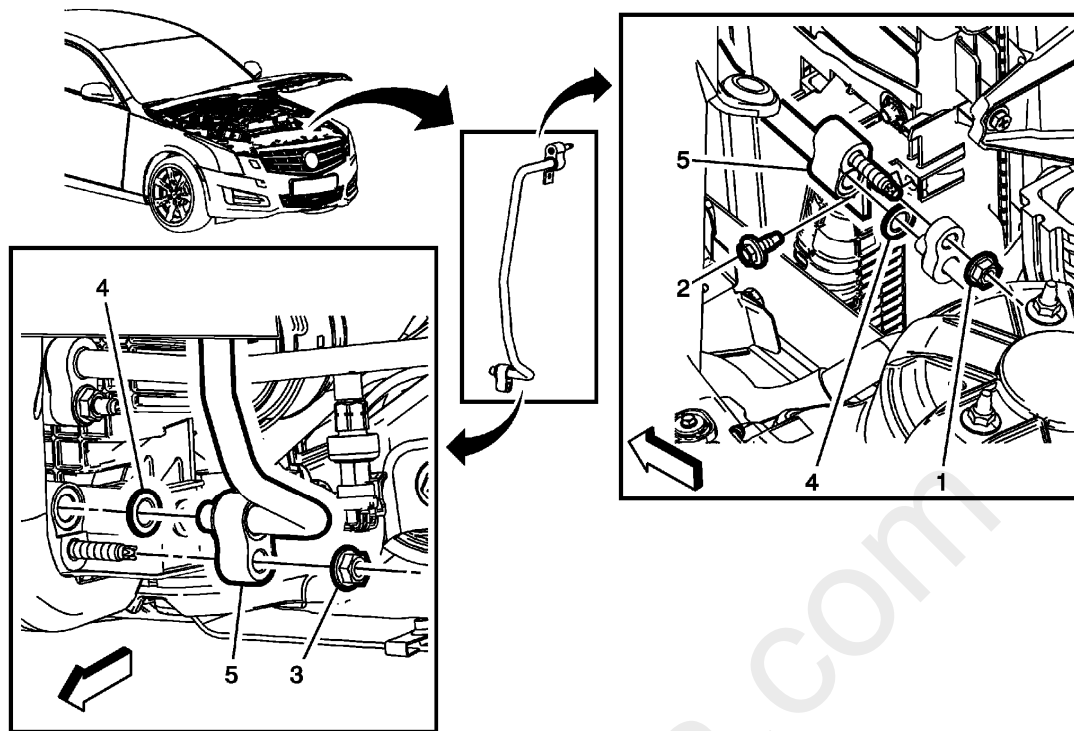


Fig. 69: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

17. Remove air conditioning condenser outlet tube nut (3) from the condenser.
18. Remove air conditioning condenser outlet tube (5) from the condenser.
19. Lower the drivetrain and front suspension cradle enough to access the air conditioning condenser outlet tube to radiator mounting bolt. Refer to **Drivetrain and Front Suspension Cradle Replacement** .
20. Remove the air conditioning condenser outlet tube to radiator mounting bolt (2).
21. Remove the hood latch mounting bolts and reposition the hood latch out of the way. Refer to **Hood Primary and Secondary Latch Replacement** .
22. Remove the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
23. Remove the radiator air lower baffle and deflector side retainers from the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LFX)** .
24. Reposition the radiator air lower baffle away from the condenser and radiator.
25. Remove and discard the sealing washer (4).

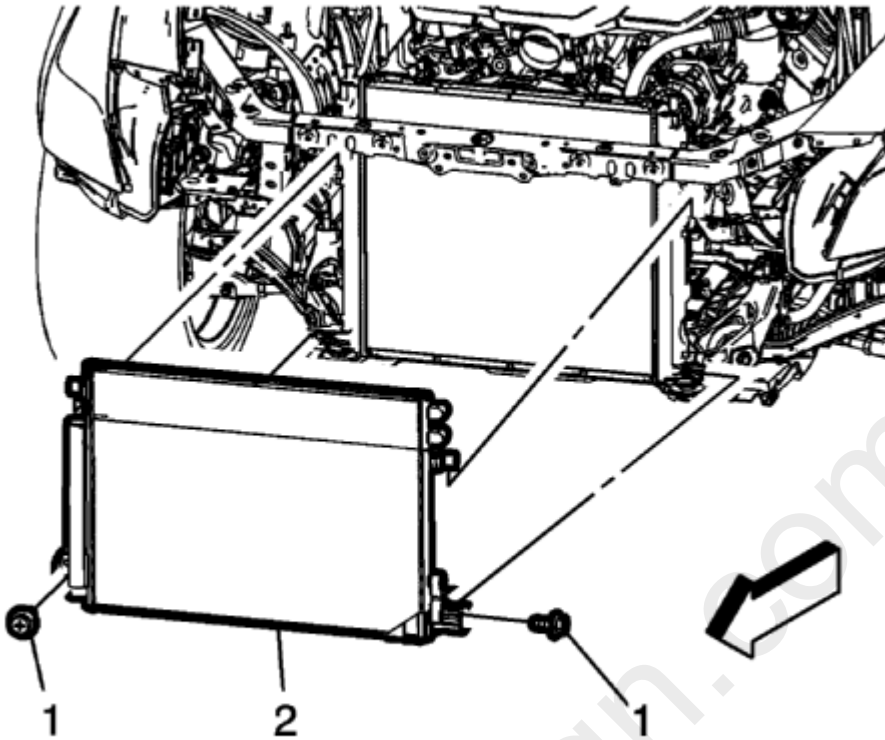


Fig. 70: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

26. Remove the air conditioning condenser bolts (1) from the radiator.
27. Remove the air conditioning condenser (2) from the radiator.

Installation Procedure

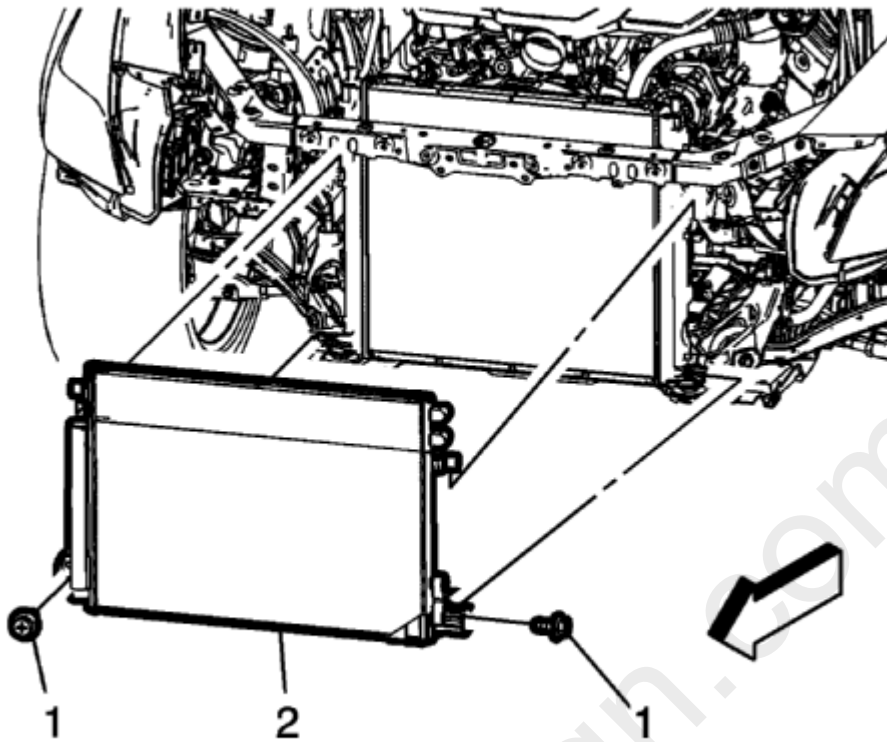


Fig. 71: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning condenser (2) to the radiator.

CAUTION: Refer to Fastener Caution .

2. Install the air conditioning condenser bolts (1) to the radiator and tighten.

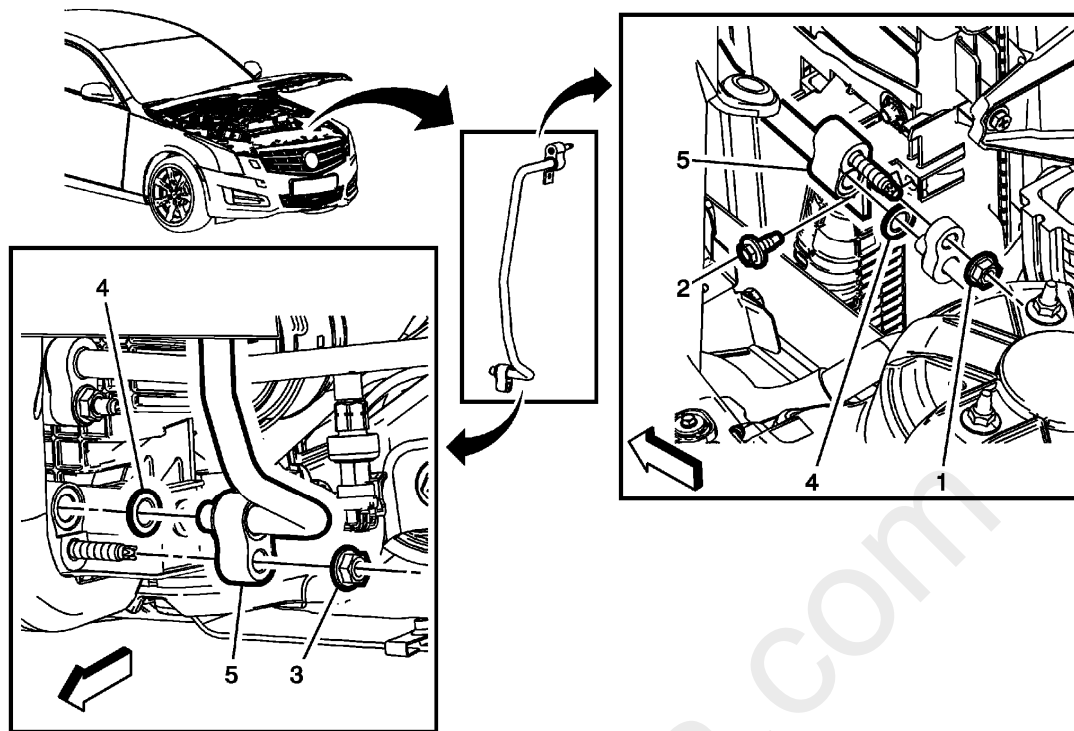


Fig. 72: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

3. Install NEW sealing washer (4) to the air conditioning condenser outlet tube (5). Refer to **Air Conditioning System Seal Replacement**.
4. Install the radiator air lower baffle and deflector side retainers to the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LFX)** .
5. Install the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
6. Install the hood latch. Refer to **Hood Primary and Secondary Latch Replacement** .
7. Install the air conditioning condenser outlet tube to radiator mounting bolt (2).
8. Install the drivetrain and front suspension cradle. Refer to **Drivetrain and Front Suspension Cradle Replacement** .
9. Install the air conditioning condenser outlet tube (5) to the condenser.
10. Install the air conditioning condenser outlet tube nut (3) to the condenser and tighten to 22 N.m (16 lb ft).

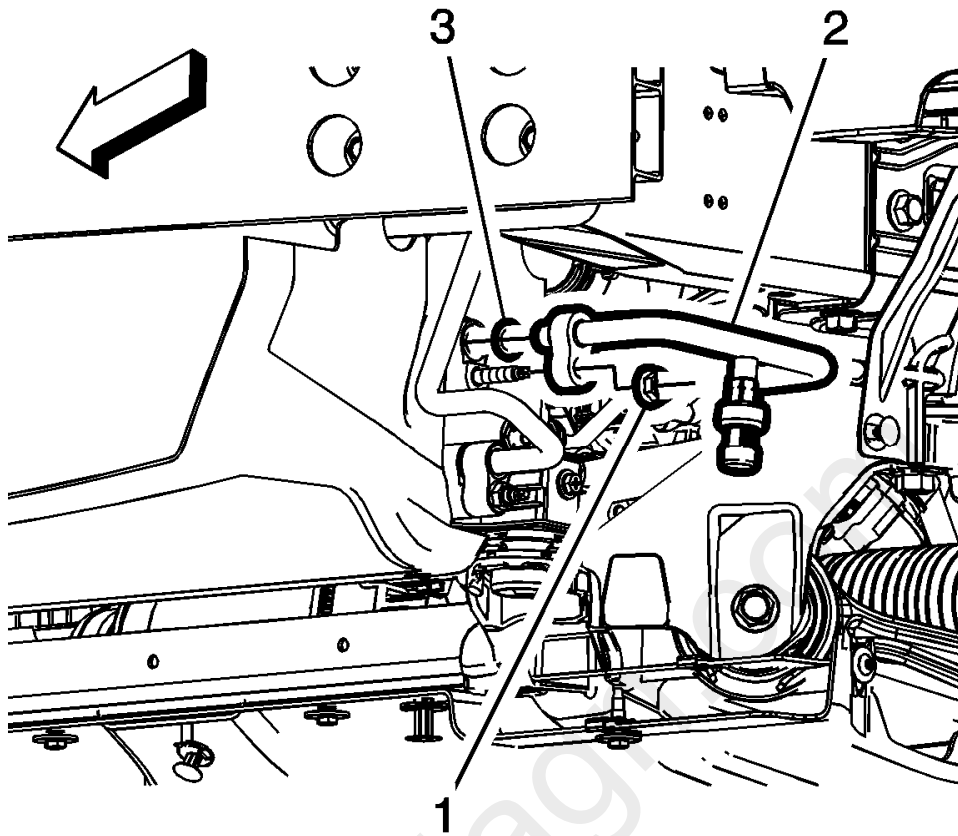


Fig. 73: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

11. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
12. Install the air conditioning compressor and condenser hose (2) to the air conditioning condenser.
13. Install the air conditioning compressor and condenser hose nut (1) to the air conditioning condenser and tighten to 22 N.m (16 lb ft).
14. Lower the vehicle.

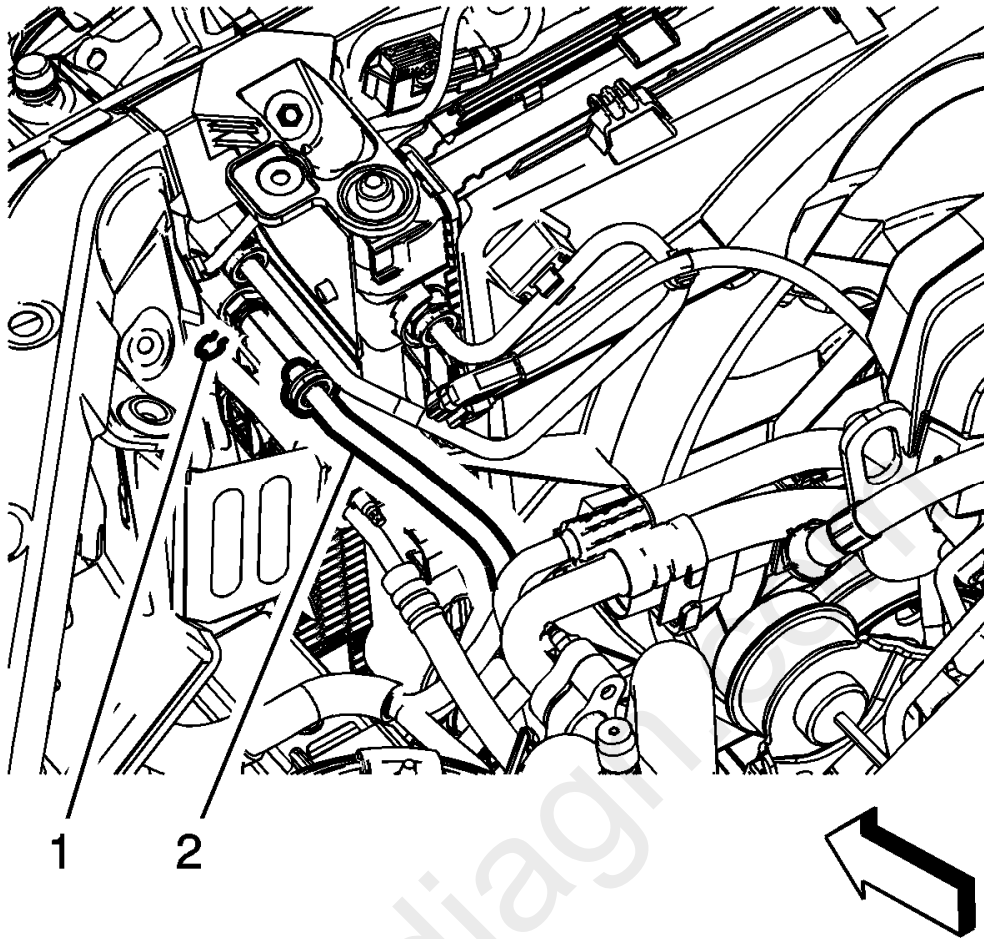


Fig. 74: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

15. Connect the transmission fluid cooler inlet and outlet pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .

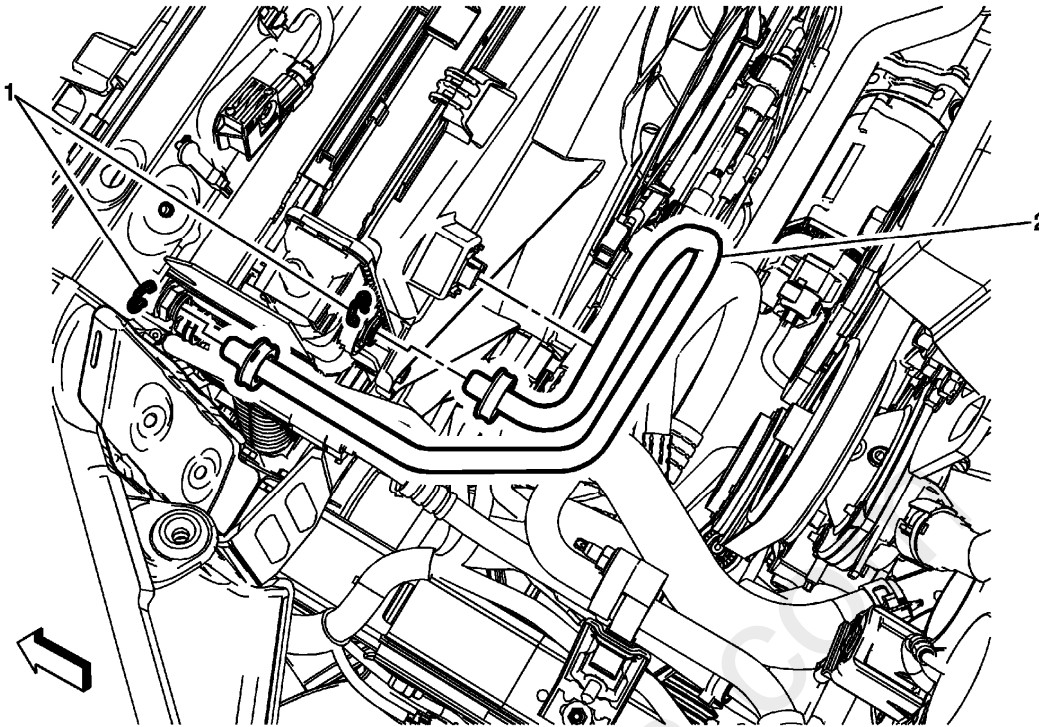


Fig. 75: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

16. Connect the transmission fluid cooler pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
17. Install the front bumper fascia center support and the forward range radar module if equipped. Refer to **Forward Range Radar Module Replacement** , or **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
18. Install the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement** .

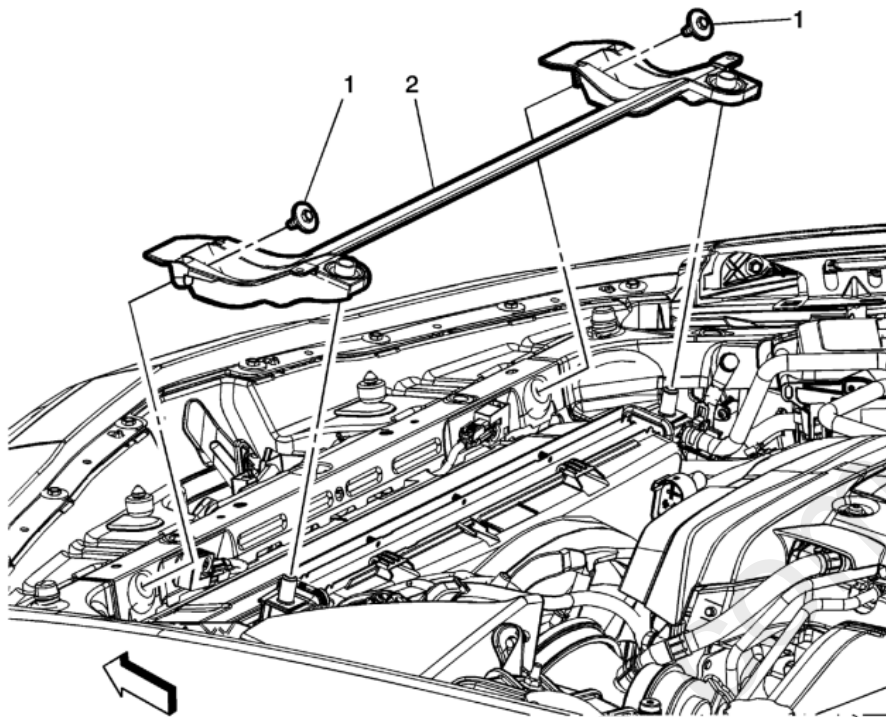


Fig. 76: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

19. Install the radiator upper brackets (2). Refer to **Radiator Upper Bracket Replacement (LFX, LTG)** .
20. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
21. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
22. Evacuate and charge the air conditioning system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
23. Inspect the transmission fluid level. Refer to **Transmission Fluid Fill Procedure** .
24. Inspect for transmission fluid leaks. Refer to **Automatic Transmission Fluid Leaks** .

AIR CONDITIONING CONDENSER REPLACEMENT (LFX WITHOUT V03)

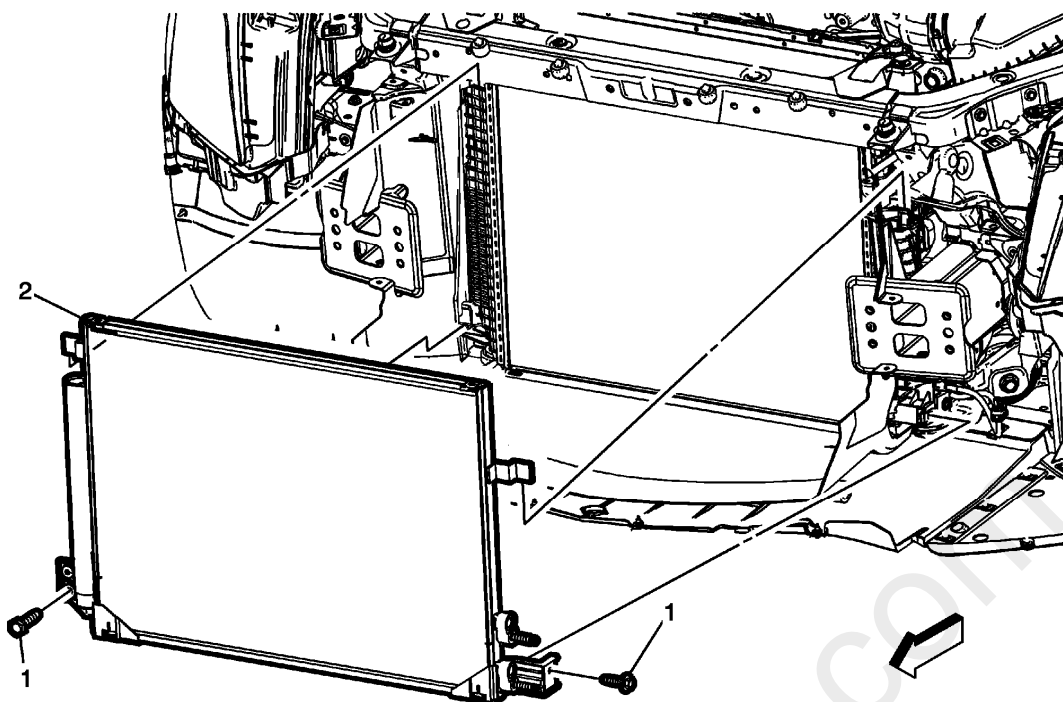


Fig. 77: Air Conditioning Condenser (LFX without V03)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Condenser Replacement (LFX without V03)

Callout	Component Name
Preliminary Procedure	
1. Recover the refrigerant from the air conditioning system. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the front bumper impact bar. Refer to <u>Front Bumper Impact Bar Replacement</u>. 3. Remove the front bumper fascia center support and the forward range radar module if equipped. Refer to <u>Forward Range Radar Module Replacement</u>, or <u>Front Bumper Fascia Center Support Replacement (Upper)</u>, <u>Front Bumper Fascia Center Support Replacement (Lower)</u>. 4. Remove the radiator air upper baffle and deflector. Refer to <u>Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)</u>. 5. Remove air conditioning compressor and condenser hose from the condenser and position out of the way. Refer to <u>Air Conditioning Compressor and Condenser Hose Replacement (LFX)</u>. 6. Remove air conditioning condenser outlet tube from the condenser and position out of the way. Refer to <u>Condenser Outlet Tube Replacement (LF3, LFX)</u>.	
1	Air Conditioning Condenser Assembly Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
	Air Conditioning Condenser Assembly

AIR CONDITIONING CONDENSER REPLACEMENT (LF3 WITH V03)**Removal Procedure**

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf)**.
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
4. Remove the turbocharger wastegate actuator vacuum tank. Refer to **Turbocharger Wastegate Actuator Vacuum Tank Replacement (LF3)** .
5. Remove the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement** .
6. Remove the front bumper fascia center support and the forward range radar module if equipped. Refer to or **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
7. Reposition the electrical harness out of the way.

NOTE: Cap the fittings and plug the holes when removing the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

8. Place a drain pan under the transmission fluid cooler pipe and the transmission fluid cooler inlet and outlet pipe.

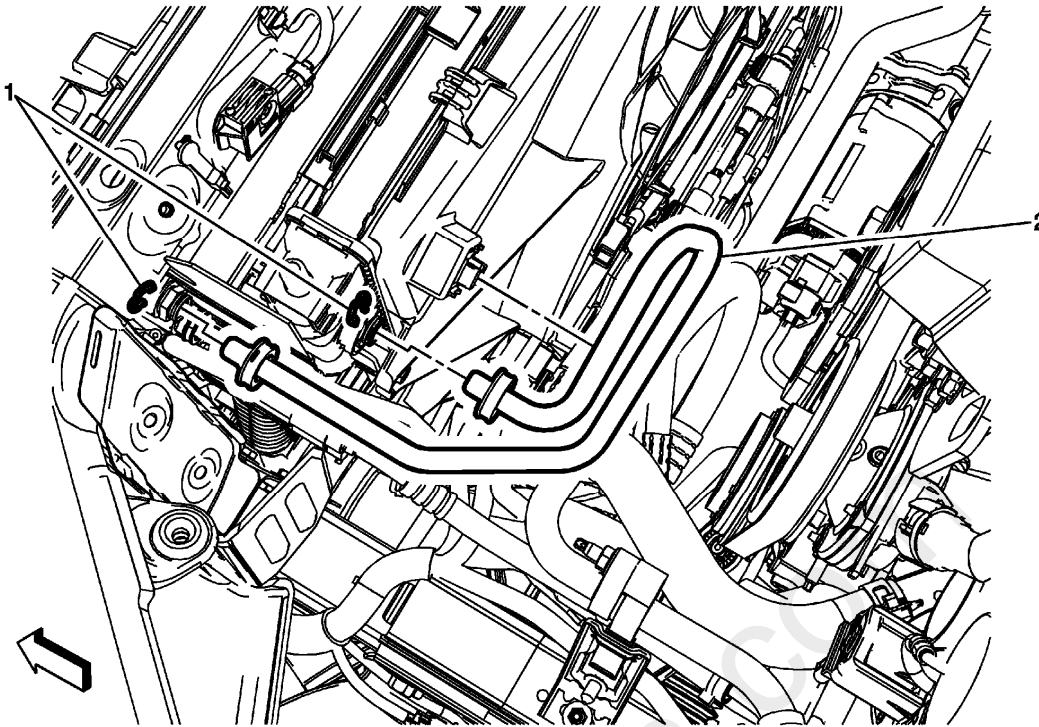


Fig. 78: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Disconnect the transmission fluid cooler pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
10. Disconnect the transmission fluid cooler pipe (2) from the air conditioning condenser.

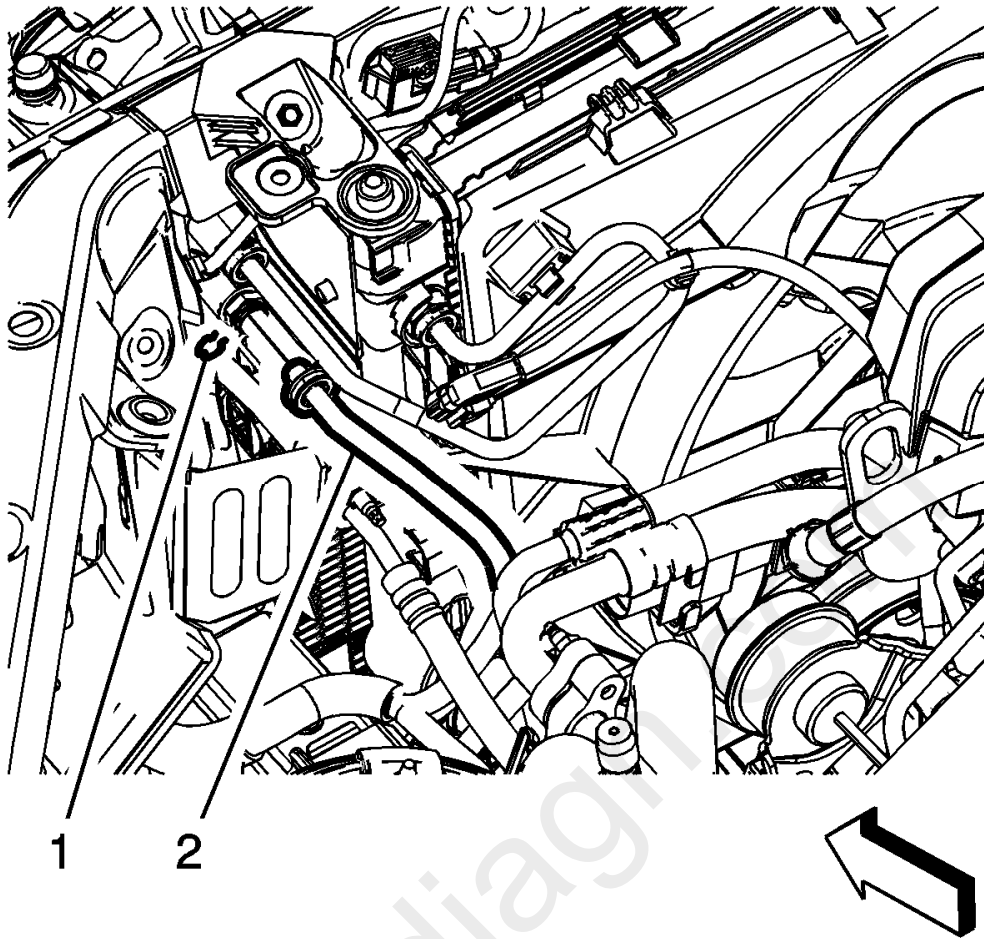


Fig. 79: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

11. Disconnect the transmission fluid cooler inlet and outlet pipe retaining ring (1) from the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
12. Disconnect the transmission fluid cooler inlet and outlet pipe (2) from the air conditioning condenser.
13. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

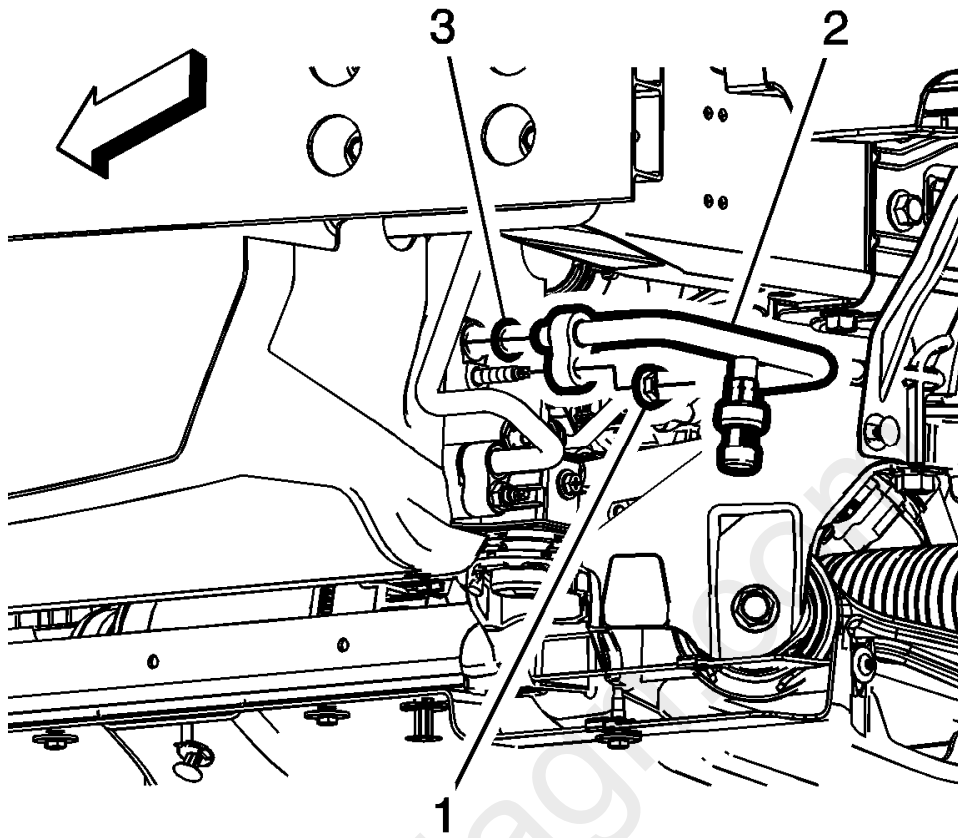


Fig. 80: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

14. Remove the air conditioning compressor and condenser hose nut (1) from the air conditioning condenser.
15. Remove the air conditioning compressor and condenser hose (2) from air conditioning condenser.
16. Remove and discard the sealing washer (3).

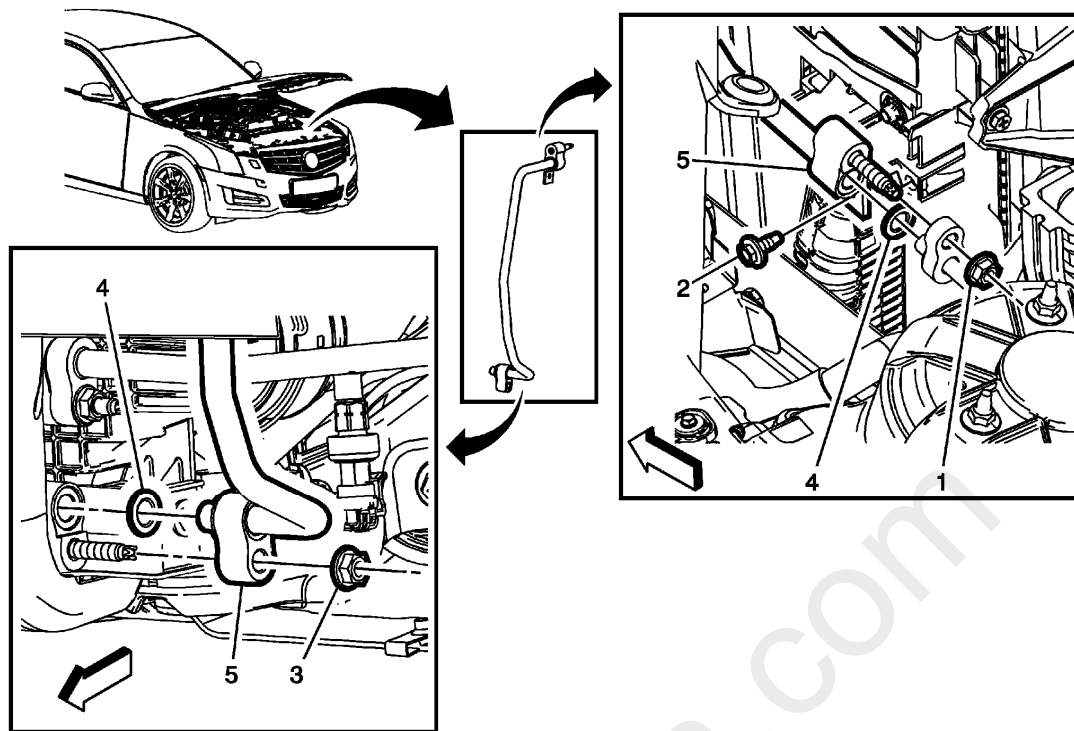


Fig. 81: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

17. Remove air conditioning condenser outlet tube nut (3) from the condenser.
18. Remove air conditioning condenser outlet tube (5) from the condenser.
19. Remove the air conditioning condenser outlet tube to radiator mounting bolt (2).
20. Remove and discard the sealing washer (4).

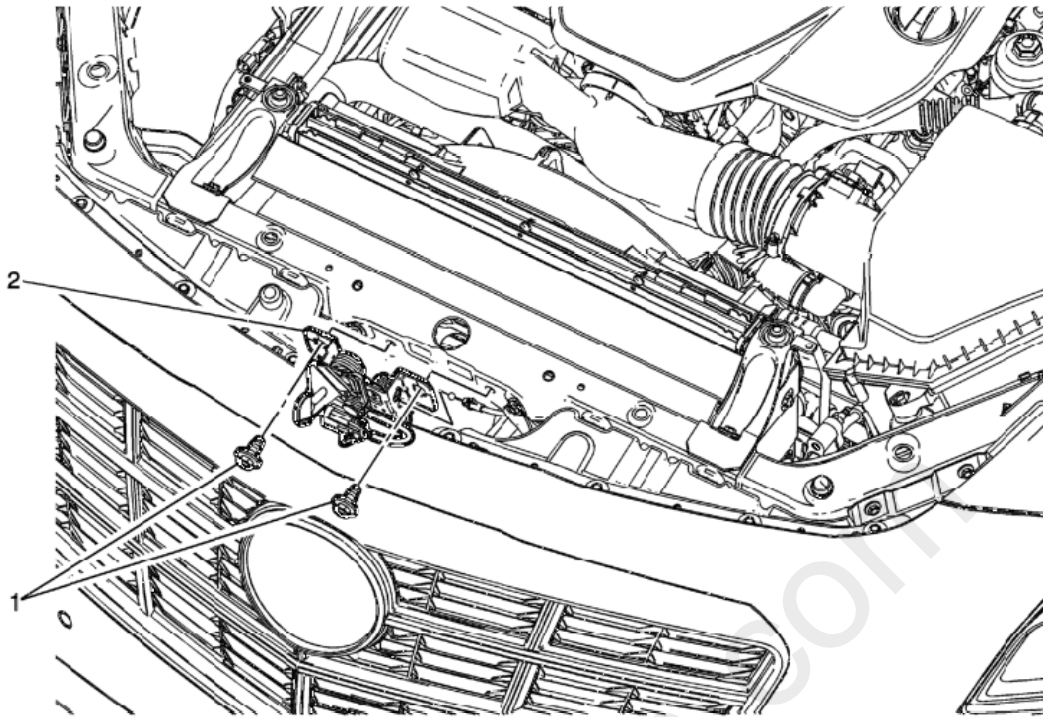


Fig. 82: Hood Primary and Secondary Latch
Courtesy of GENERAL MOTORS COMPANY

21. Remove the hood latch mounting bolts (1) and reposition the hood latch (2) out of the way. Refer to **Hood Primary and Secondary Latch Replacement** .

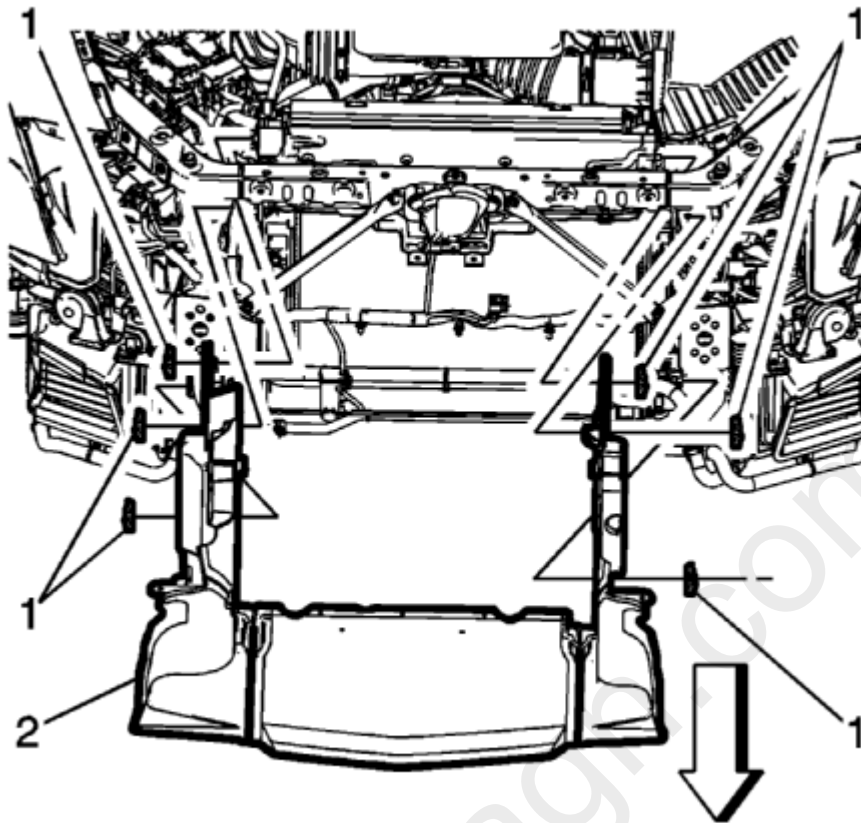


Fig. 83: Radiator Air Lower Baffle And Deflector Side Retainers
Courtesy of GENERAL MOTORS COMPANY

22. Remove the lower air baffle and deflector (2). Refer to **Radiator Air Lower Baffle and Deflector Replacement (LF3)** .
23. Remove the left side lower charge air cooler bracket. Refer to **Charge Air Cooler Radiator Lower Bracket Replacement - Left Side (LF3)** .

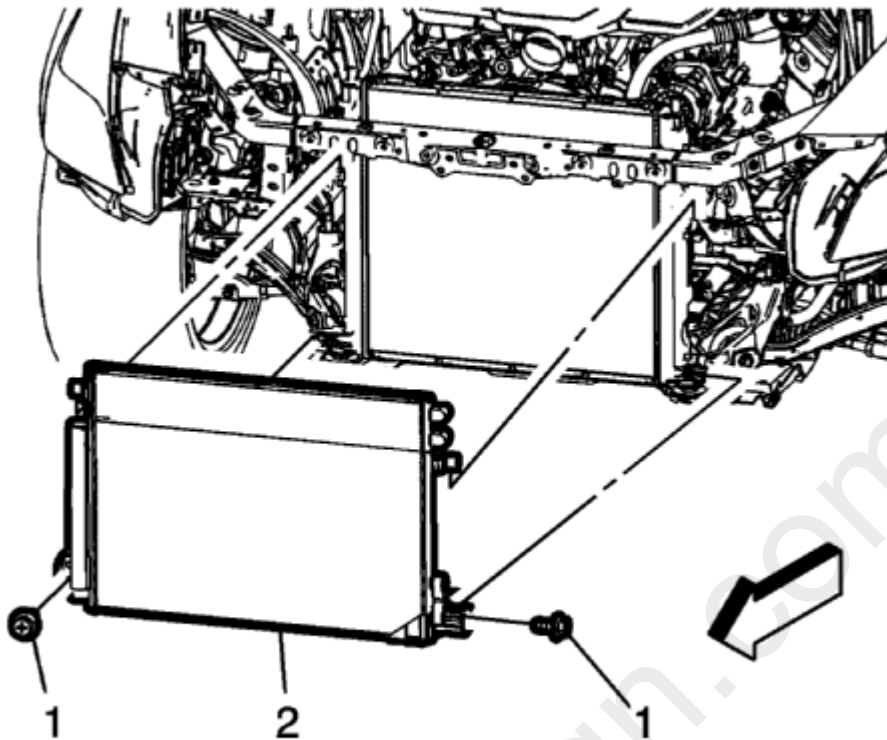


Fig. 84: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

24. Remove the air conditioning condenser bolts (1) from the radiator.
25. Remove the air conditioning condenser (2) from the radiator.

Installation Procedure

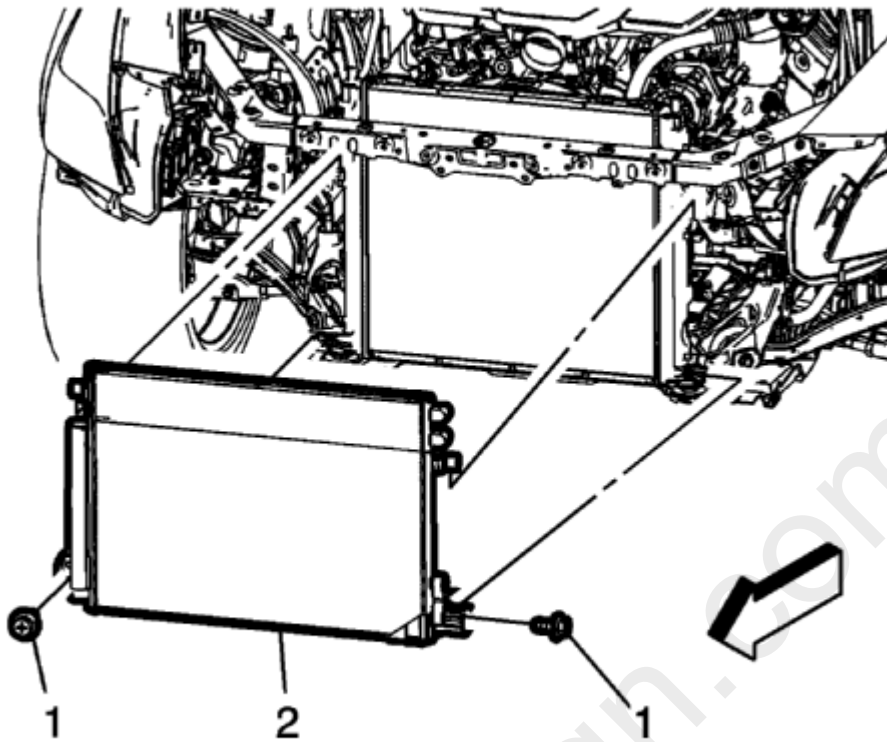


Fig. 85: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning condenser (2) to the radiator.

CAUTION: Refer to Fastener Caution .

2. Install the air conditioning condenser bolts (1) to the radiator and tighten.

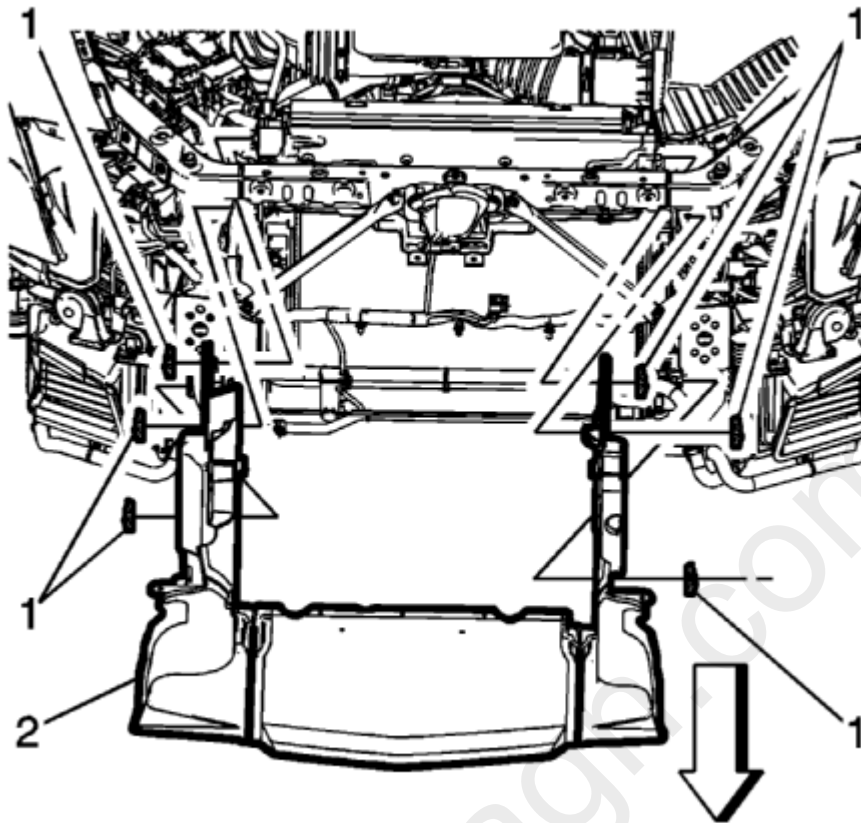


Fig. 86: Radiator Air Lower Baffle And Deflector Side Retainers
Courtesy of GENERAL MOTORS COMPANY

3. Install the lower air baffle and deflector (2). Refer to **Radiator Air Lower Baffle and Deflector Replacement (LF3)** .
4. Install the left side lower charge are cooler lower bracket. Refer to **Charge Air Cooler Radiator Lower Bracket Replacement - Left Side (LF3)** .

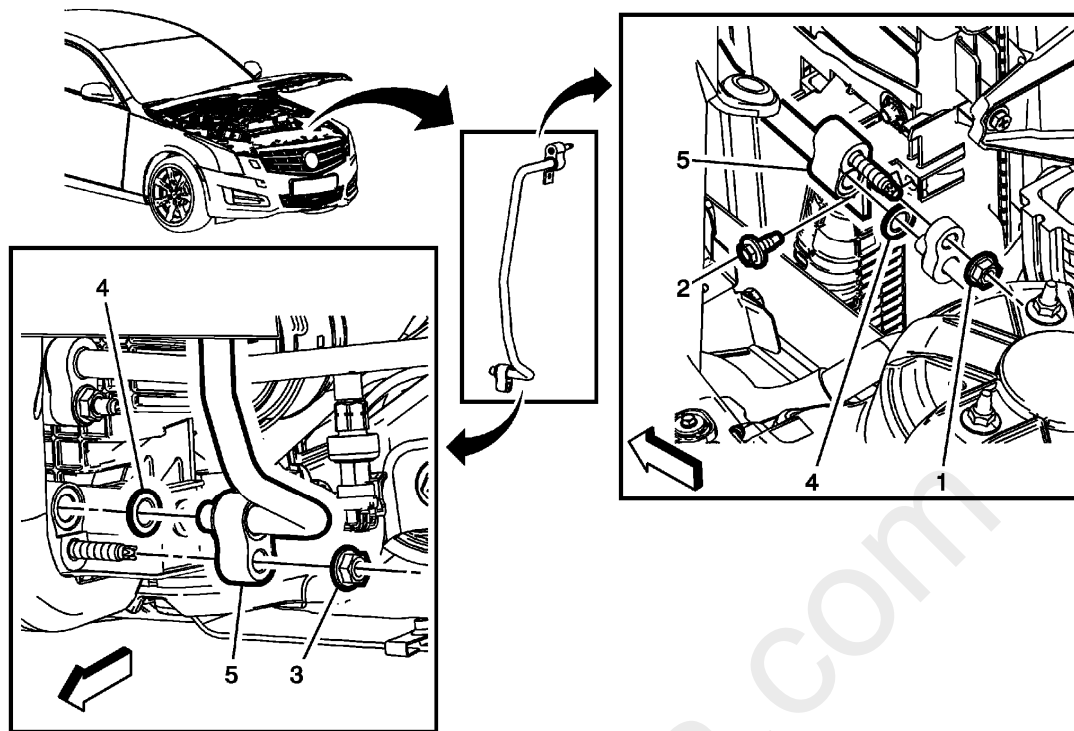


Fig. 87: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Install NEW sealing washer (4) to the air conditioning condenser outlet tube (5). Refer to **Air Conditioning System Seal Replacement**.
6. Install the air conditioning condenser outlet tube to radiator mounting bolt (2).
7. Install the air conditioning condenser outlet tube (5) to the condenser.
8. Install the air conditioning condenser outlet tube nut (3) to the condenser and tighten to 22 (16 lb ft).

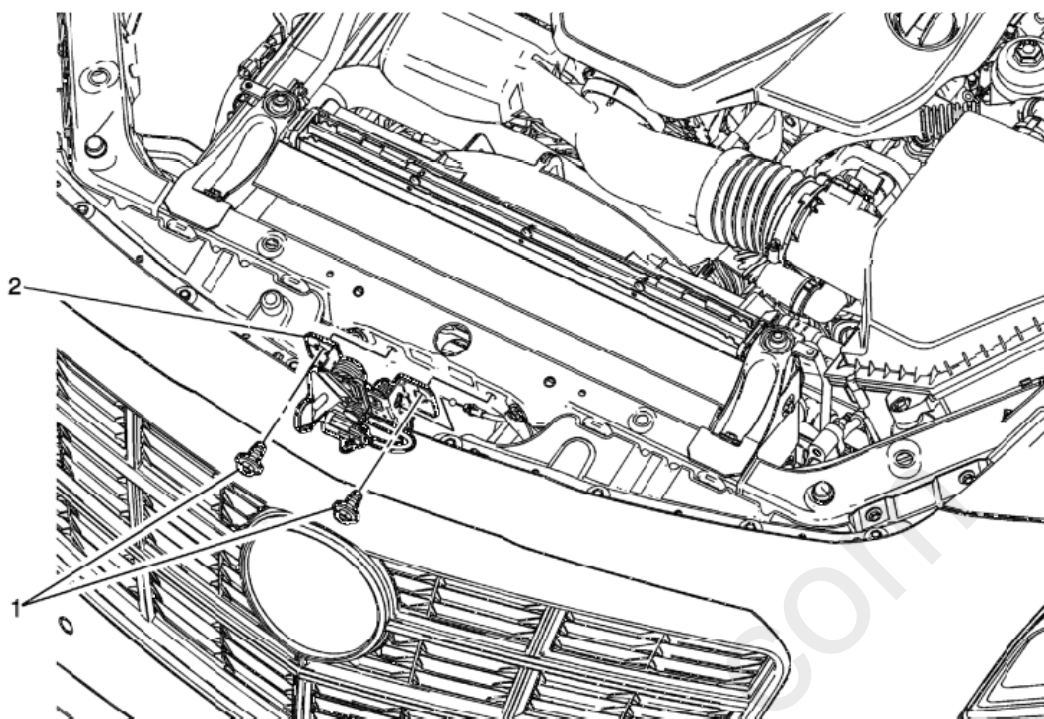


Fig. 88: Hood Primary and Secondary Latch
Courtesy of GENERAL MOTORS COMPANY

9. Install the hood latch (2) and mounting bolts (1) and tighten to 22 (16 lb ft). Refer to **Hood Primary and Secondary Latch Replacement** .

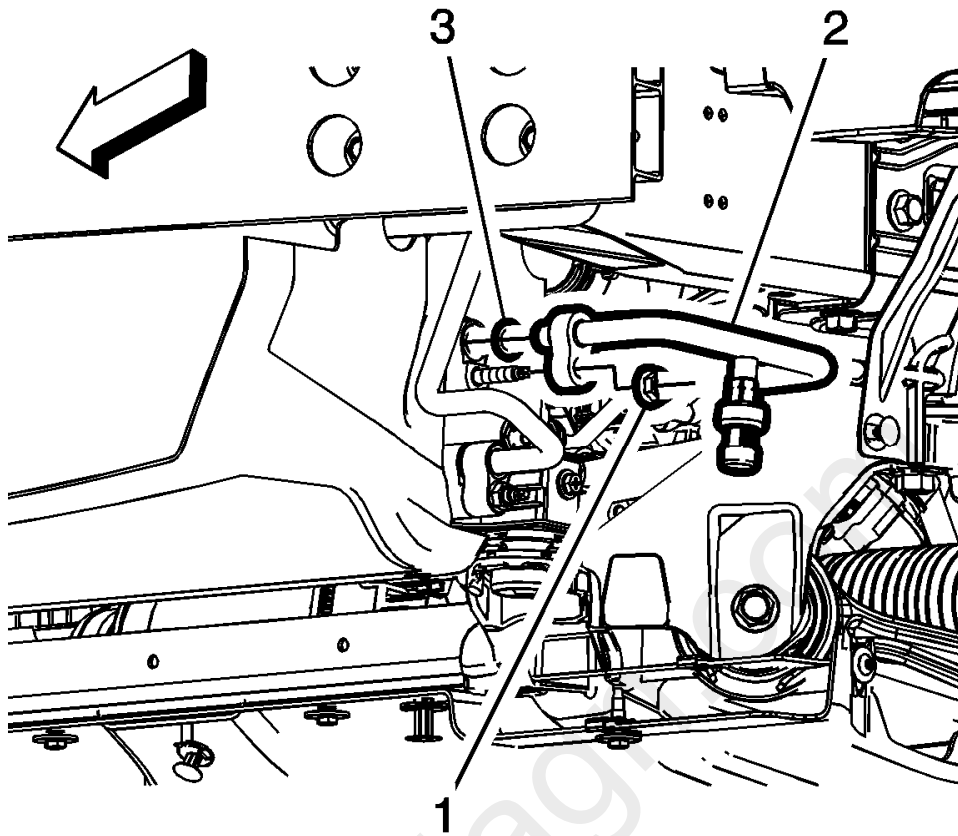


Fig. 89: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

10. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
11. Install the air conditioning compressor and condenser hose (2) to the air conditioning condenser.
12. Install the air conditioning compressor and condenser hose nut (1) to the air conditioning condenser and tighten to 22 (16 lb ft).
13. Lower the vehicle.

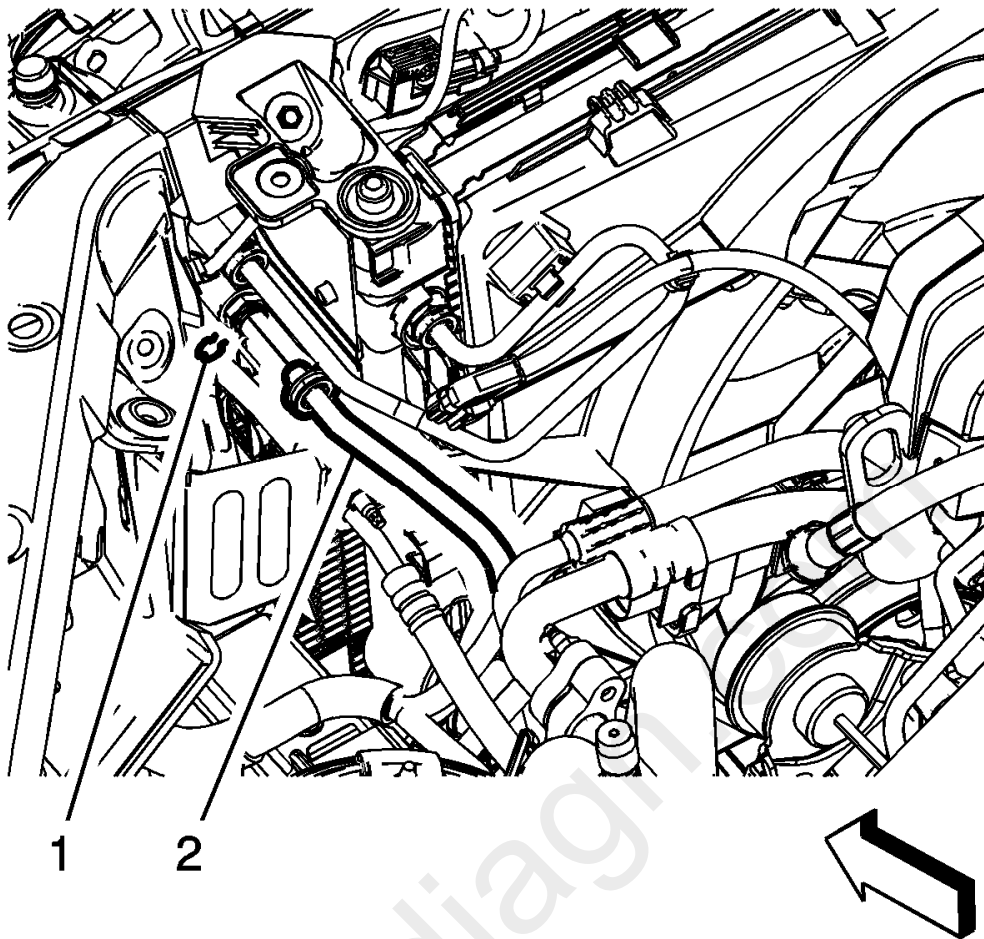


Fig. 90: Transmission Fluid Cooler Inlet & Outlet Pipe With Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

14. Connect the transmission fluid cooler inlet and outlet pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .

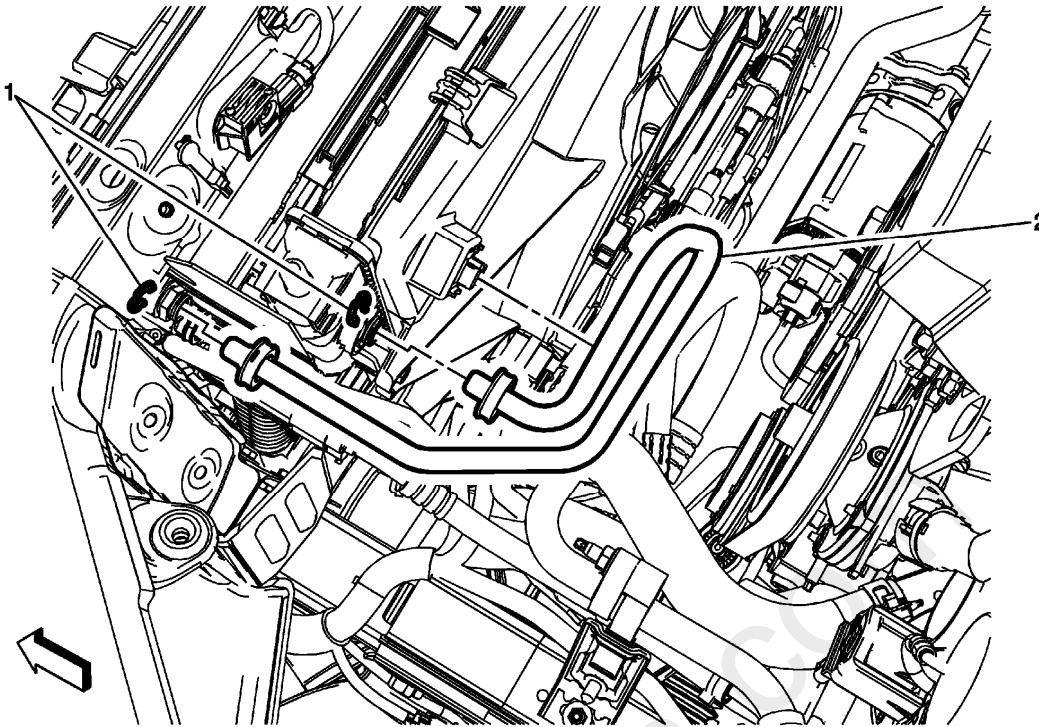


Fig. 91: Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS COMPANY

15. Connect the transmission fluid cooler pipe (2) to the air conditioning condenser. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .
16. Install the front bumper fascia center support and the forward range radar module if equipped. Refer to or **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
17. Install the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement** .
18. Install the turbocharger wastegate actuator vacuum tank (2). Refer to **Turbocharger Wastegate Actuator Vacuum Tank Replacement (LF3)** .
19. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
20. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
21. Evacuate and charge the air conditioning system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
22. Inspect the transmission fluid level. Refer to **Transmission Fluid Fill Procedure** .
23. Inspect for transmission fluid leaks. Refer to **Automatic Transmission Fluid Leaks** .

AIR CONDITIONING CONDENSER REPLACEMENT (LTG WITHOUT V03)

Removal Procedure

1. Recover the air conditioning system refrigerant. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .

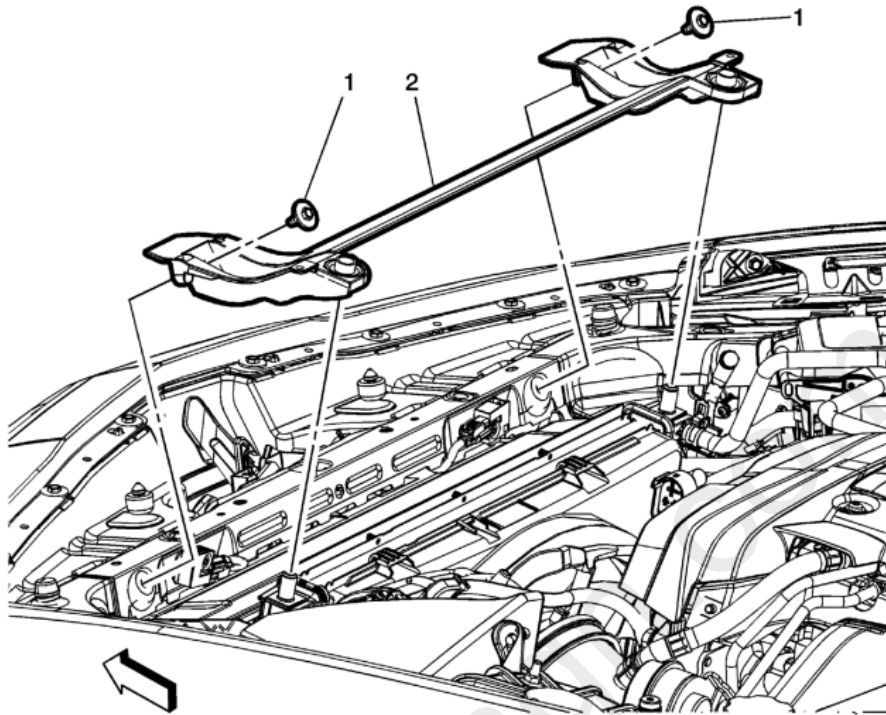


Fig. 92: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator upper bracket (2). Refer to **Radiator Upper Bracket Replacement (LFX, LTG)** .
5. Remove the front bumper fascia center support and the forward range radar module if equipped. Refer to **Forward Range Radar Module Replacement** , and **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .
6. Reposition the electrical harness out of the way.
7. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

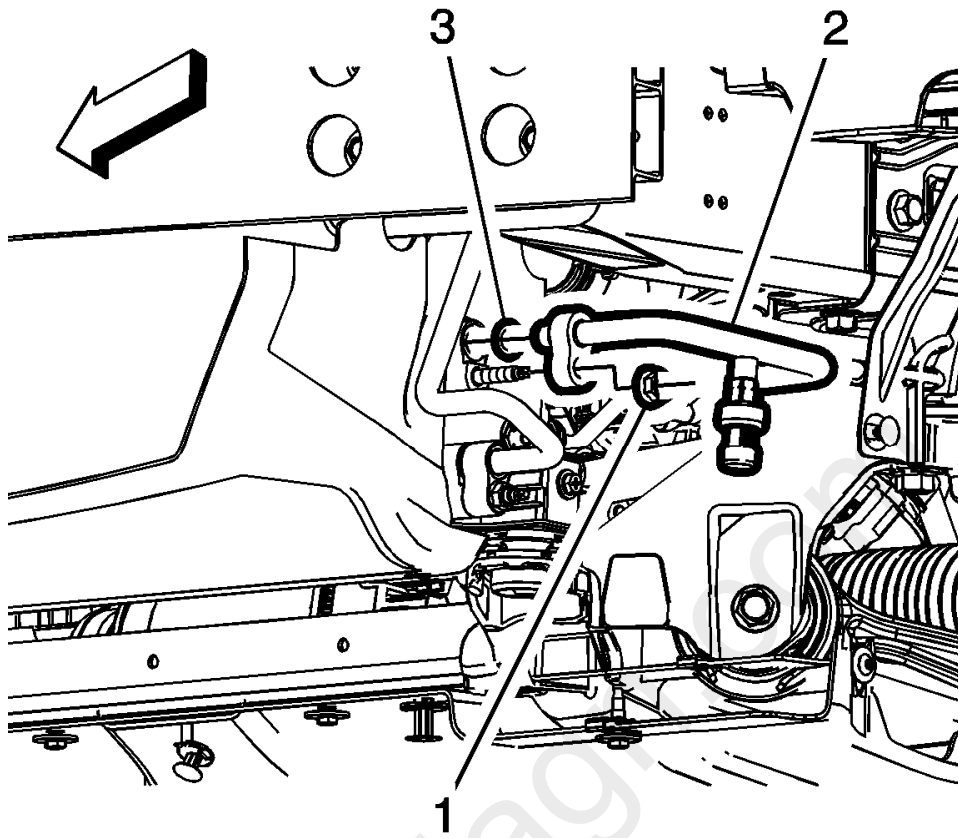


Fig. 93: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

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

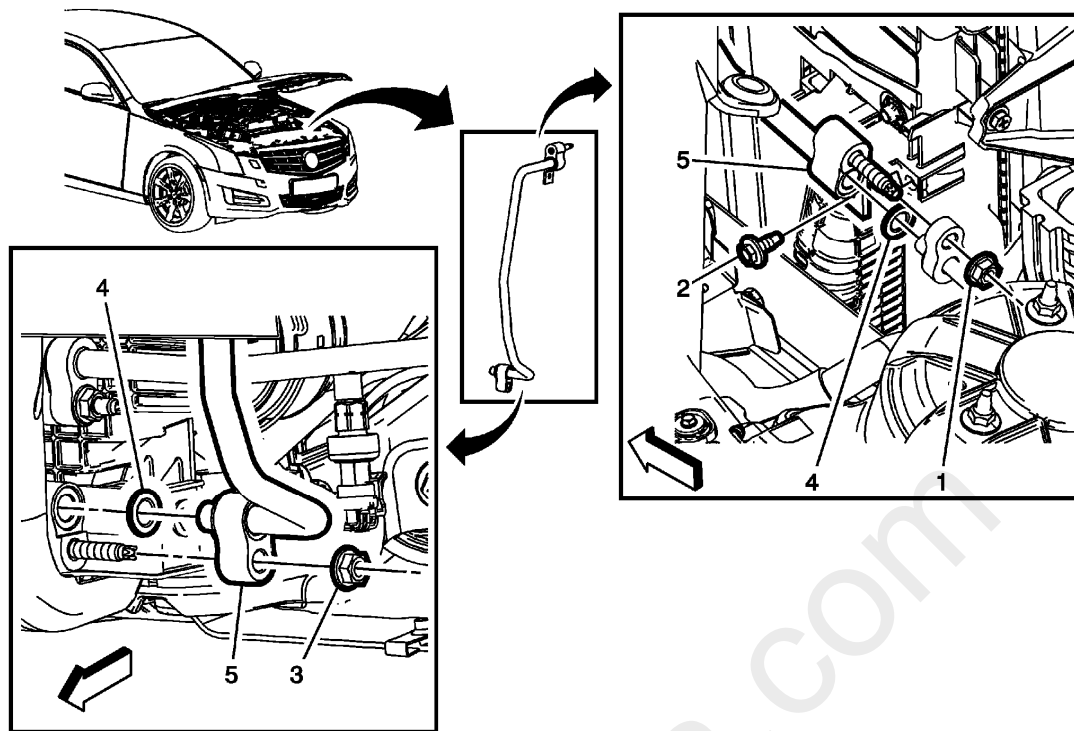


Fig. 94: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

11. Remove air conditioning condenser outlet tube nut (3) from the condenser.
12. Remove air conditioning condenser outlet tube (5) from the condenser.
13. Remove the air conditioning condenser outlet tube to radiator mounting bolt (2).
14. Remove the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
15. Remove the radiator air lower baffle and deflector side retainers from the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LTG)** .
16. Reposition the radiator air lower baffle away from the condenser and radiator.
17. Remove and discard the sealing washer (4).

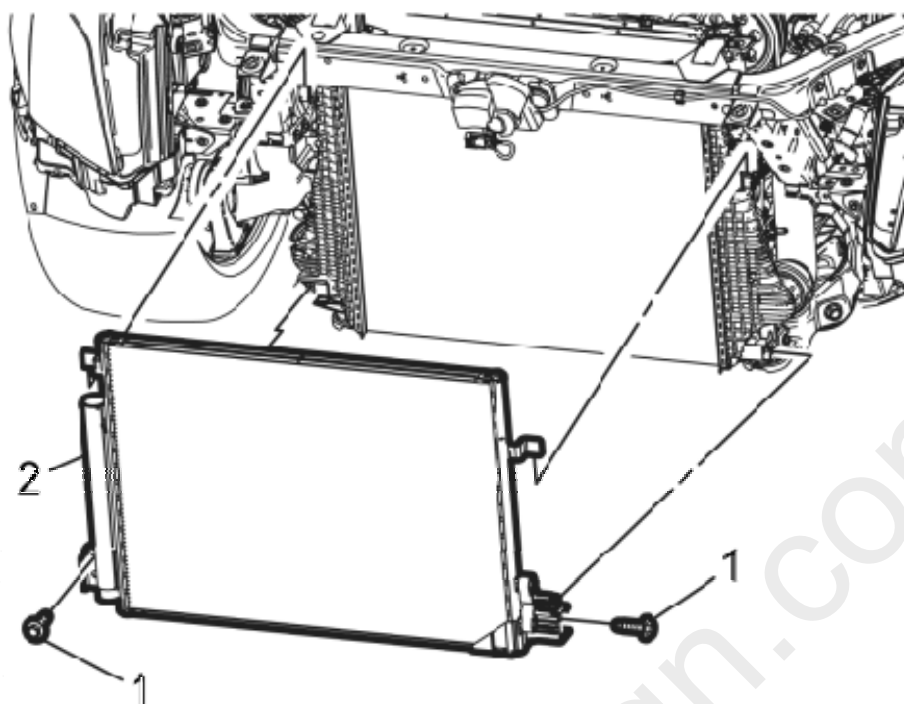


Fig. 95: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

18. Remove the air conditioning condenser bolts (1) from the charge air cooler radiator.
19. Remove the air conditioning condenser (2) from the charge air cooler radiator.

Installation Procedure

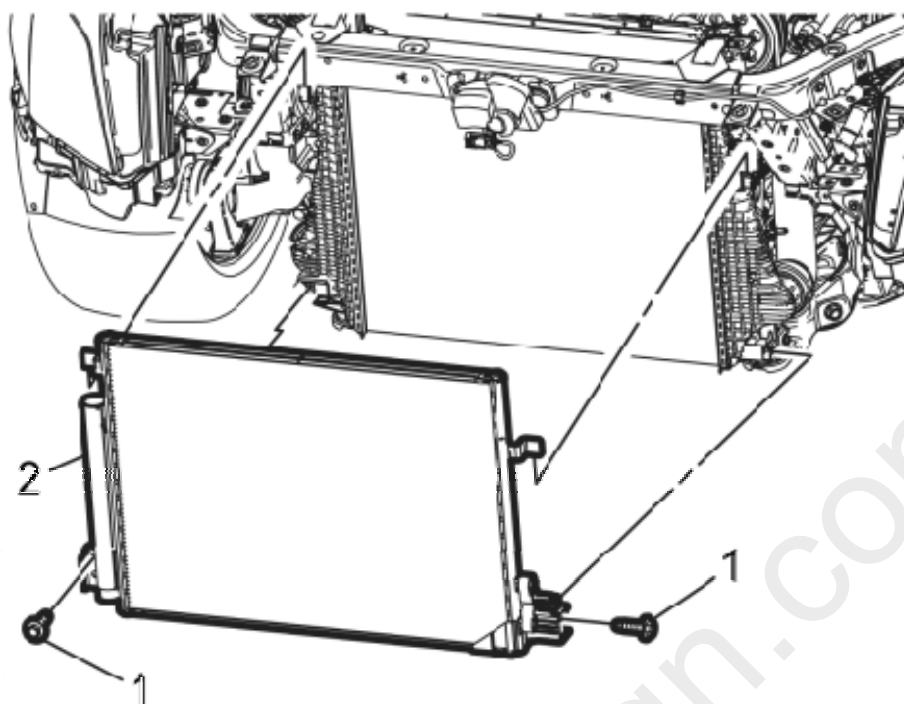


Fig. 96: Air Conditioning Condenser
Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning condenser (2) to the charge air cooler radiator.

CAUTION: Refer to Fastener Caution .

2. Install the air conditioning condenser bolts (1) to the charge air cooler radiator and tighten.

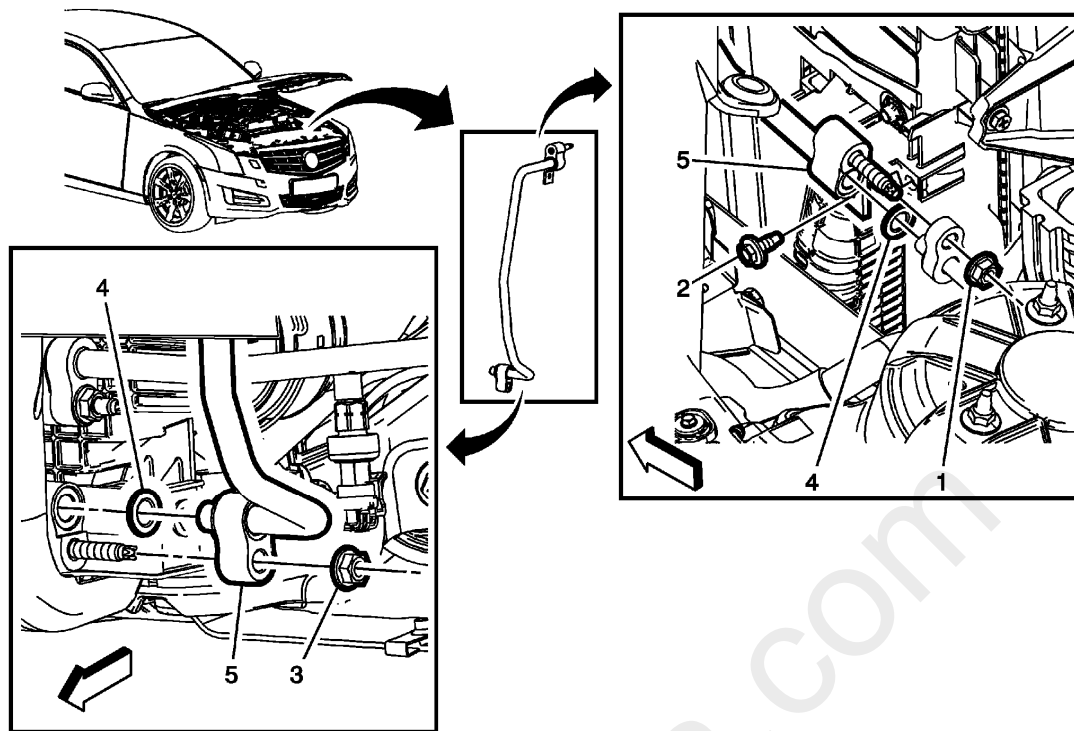


Fig. 97: Air Conditioning Condenser Outlet Tube Fasteners
Courtesy of GENERAL MOTORS COMPANY

3. Install NEW sealing washer (4) to the air conditioning condenser outlet tube (5). Refer to **Air Conditioning System Seal Replacement**.
4. Install the radiator air lower baffle and deflector side retainers to the radiator and charge air cooler. Refer to **Radiator Air Lower Baffle and Deflector Replacement (LTG)** .
5. Install the upper air baffle and deflector retainers. Refer to **Radiator Air Upper Baffle and Deflector Replacement (LFX, LTG)** .
6. Install the air conditioning condenser outlet tube to radiator mounting bolt (2).
7. Install the air conditioning condenser outlet tube (5) to the condenser.
8. Install the air conditioning condenser outlet tube nut (3) to the condenser and tighten to 22 N.m (16 lb ft).

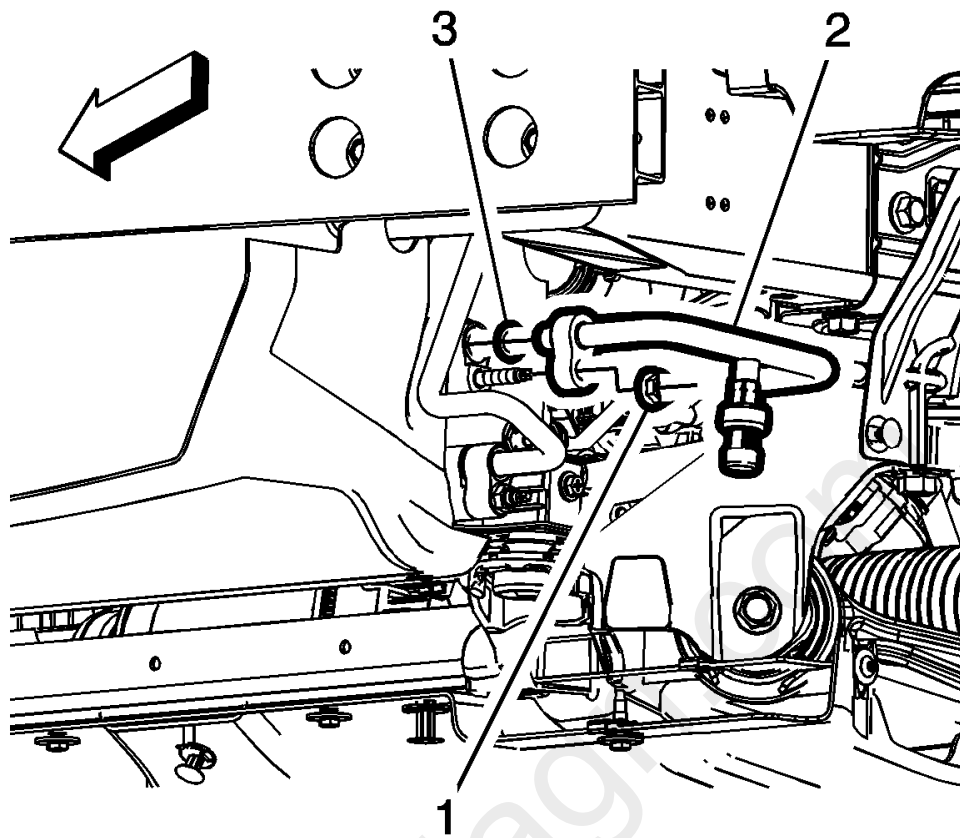


Fig. 98: Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

9. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
10. Install the air conditioning compressor and condenser hose (2) to the air conditioning condenser.
11. Install the air conditioning compressor and condenser hose nut (1) to the air conditioning condenser and tighten to 22 N.m (16 lb ft).
12. Lower the vehicle.
13. Install the front bumper fascia center support and the forward range radar module if equipped. Refer to **Forward Range Radar Module Replacement** , and **Front Bumper Fascia Center Support Replacement (Upper)** , **Front Bumper Fascia Center Support Replacement (Lower)** .

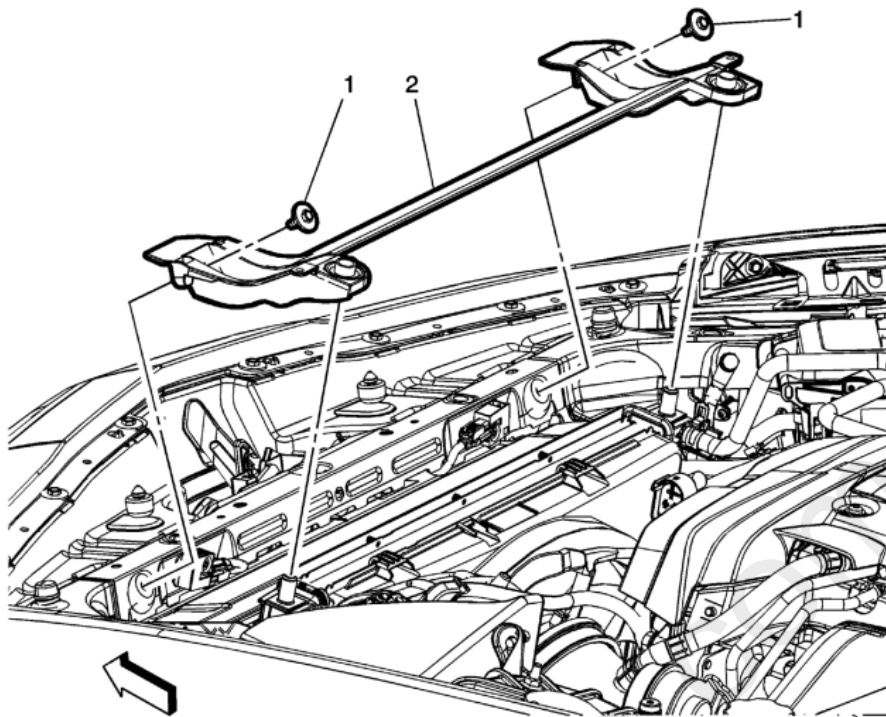


Fig. 99: Radiator Upper Bracket (LFX, LTG)
Courtesy of GENERAL MOTORS COMPANY

14. Install the radiator upper brackets (2). Refer to **Radiator Upper Bracket Replacement (LFX, LTG)** .
15. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
16. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
17. Evacuate and charge the air conditioning system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.

AIR CONDITIONING CONDENSER BRACKET REPLACEMENT (LF3)

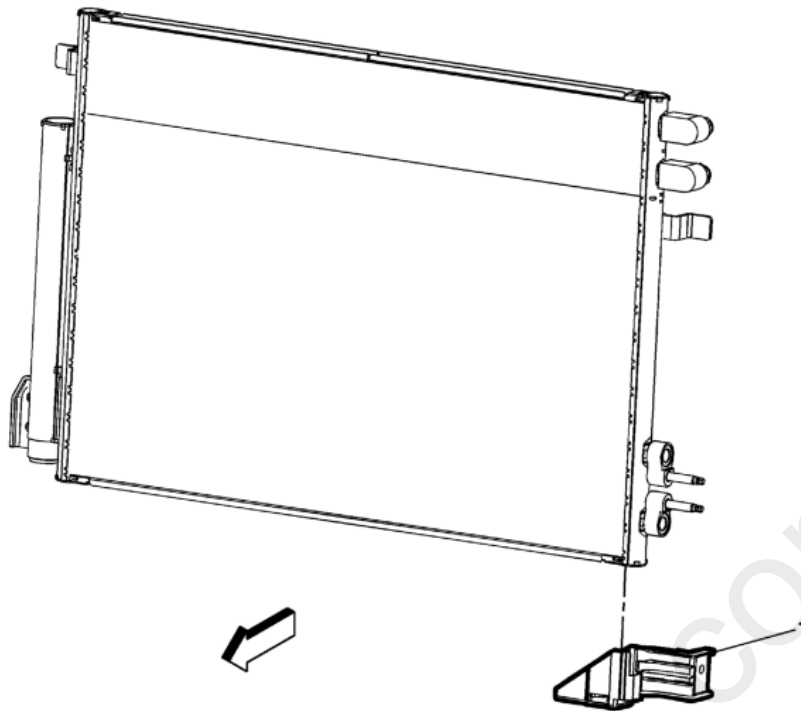


Fig. 100: Air Conditioning Condenser Bracket (LF3)
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Condenser Bracket Replacement (LF3)

Callout	Component Name
Preliminary Procedures	
1. Remove the air conditioning condenser. Refer to <u>Air Conditioning Condenser Replacement (LF3 with V03)</u>	
1	Air Conditioning Condenser Bracket

CONDENSER OUTLET TUBE REPLACEMENT (LF3, LFX)

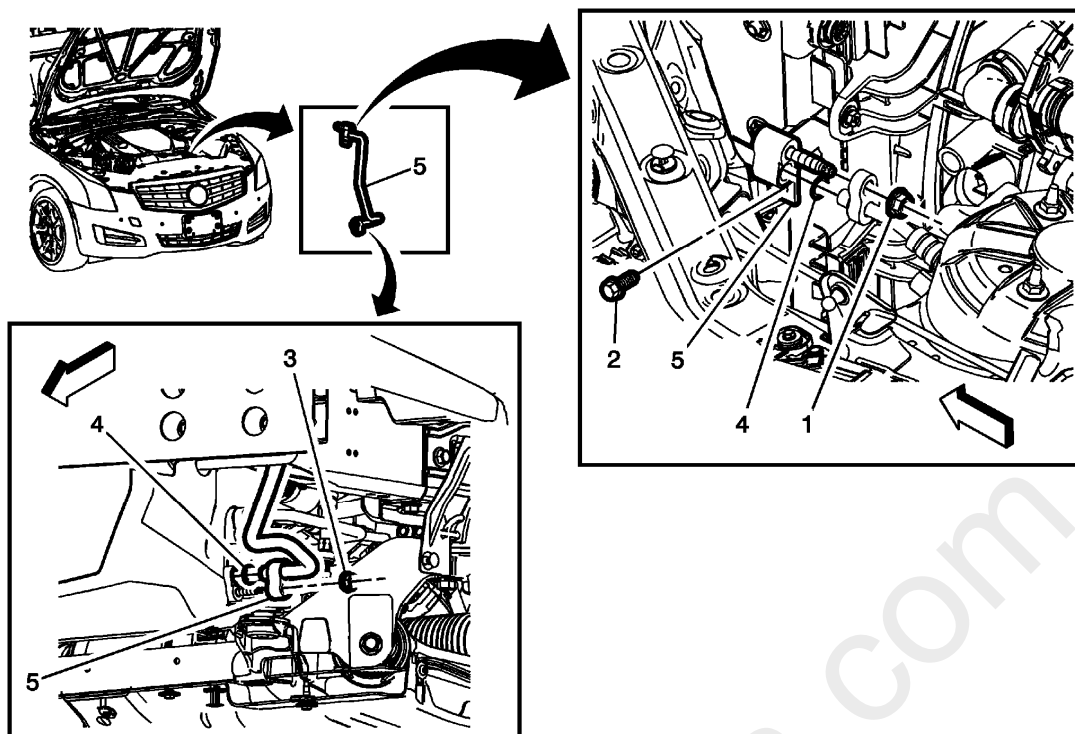


Fig. 101: Air Conditioning Condenser Outlet Tube
Courtesy of GENERAL MOTORS COMPANY

Condenser Outlet Tube Replacement (LF3, LFX)

Callout	Component Name
Preliminary Procedures 1. Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>. 2. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement (LFX)</u> , <u>Air Cleaner Assembly Replacement (LF3)</u> . 3. Remove the left front wheelhouse liner. Refer to <u>Front Wheelhouse Liner Replacement</u> . 4. Remove the front bumper fascia center air deflector. Refer to <u>Front Bumper Fascia Air Deflector Replacement - Center</u> .	
1	Air Conditioning Condenser and Condenser Hose Nut CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Air Conditioning Condenser Outlet Tube Bolt Tighten

	10 (89 lb in)
3	Air Conditioning Condenser Outlet Tube Nut Tighten 22 (16 lb ft)
4	Air Conditioning Condenser Outlet Tube Washer (Qty: 2) Procedure Remove and discard the old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement.</u>
5	Air Conditioning Condenser Outlet Tube

CONDENSER OUTLET TUBE REPLACEMENT (LTG)

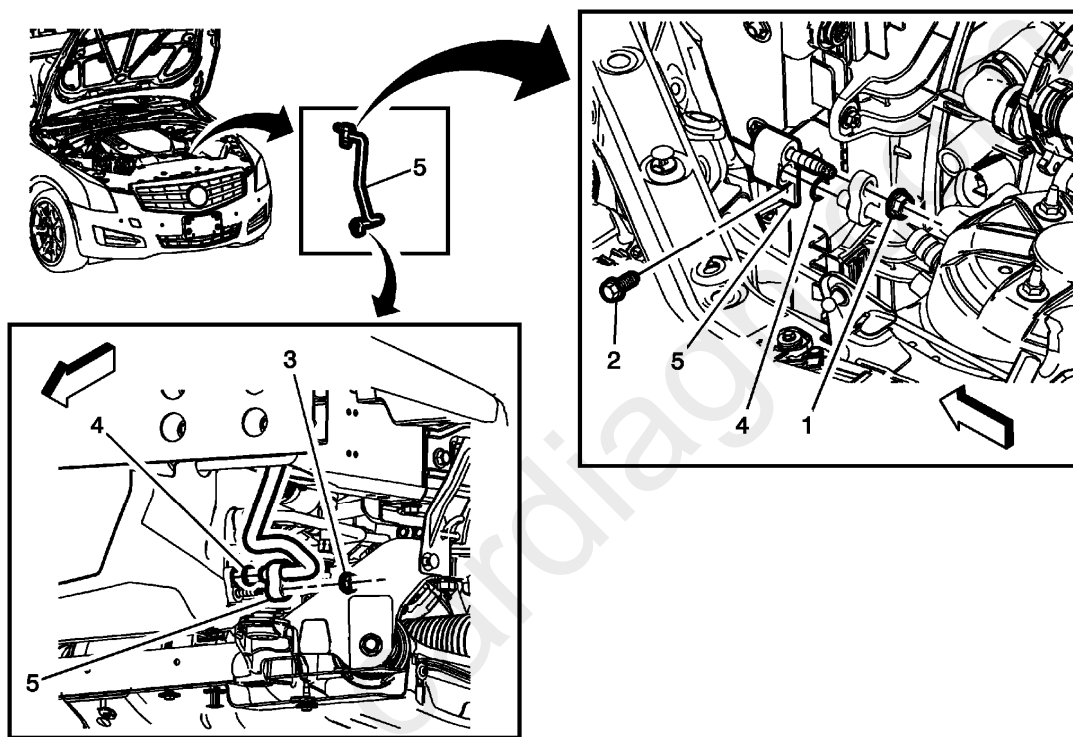


Fig. 102: Air Conditioning Condenser Outlet Tube
Courtesy of GENERAL MOTORS COMPANY

Condenser Outlet Tube Replacement (LTG)

Callout	Component Name
Preliminary Procedures	
1.	Recover the air conditioning system refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).</u>
2.	Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement .</u>
3.	Remove the left front wheelhouse liner. Refer to <u>Front Wheelhouse Liner Replacement .</u>
4.	Remove the front bumper fascia center air deflector. Refer to <u>Front Bumper Fascia Air Deflector</u>

Replacement - Center .

1	Air Conditioning Condenser and Condenser Hose Nut CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Air Conditioning Condenser Outlet Tube Bolt Tighten 10 (89 lb in)
3	Air Conditioning Condenser Outlet Tube Nut Tighten 22 (16 lb ft)
4	Air Conditioning Condenser Outlet Tube Washer (Qty: 2) Procedure Remove and discard the old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .
5	Air Conditioning Condenser Outlet Tube

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REMOVAL AND INSTALLATION (LTG)

Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Recover the refrigerant system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
3. Drain the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
4. Remove the heater inlet hose from the heater core tube. Refer to **Heater Inlet Hose Replacement (LTG)**.
5. Remove the heater outlet hose from the heater core tube. Refer to **Heater Outlet Hose Replacement (LTG)**.
6. Remove the evaporator hose assembly from the thermal expansion valve. Refer to **Air Conditioning Evaporator Hose Assembly Replacement (LTG)**.
7. Disconnect the right side floor rear air outlet duct from the heater and air conditioning evaporator and blower module assembly. Refer to **Floor Rear Air Outlet Duct Replacement - Right Side**.
8. Disconnect the left side floor rear air outlet duct from the heater and air conditioning evaporator and blower module assembly. Refer to **Floor Rear Air Outlet Duct Replacement - Left Side**.
9. Remove the instrument panel tie bar assembly. Refer to **Instrument Panel Tie Bar Replacement** .

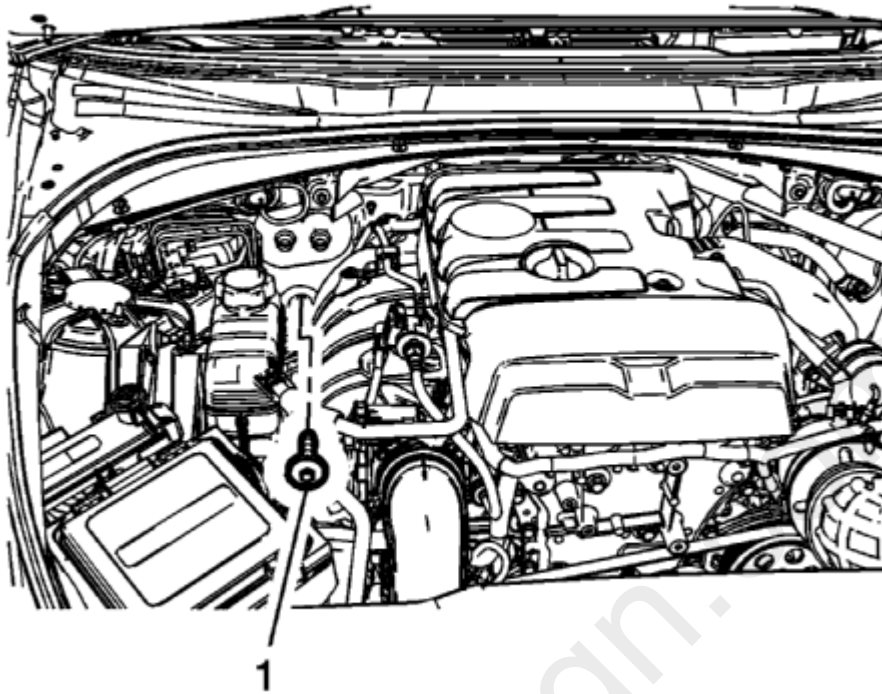


Fig. 103: Air Conditioning Evaporator And Blower Module Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

10. From within the engine compartment, remove the heater and air conditioning evaporator and blower module assembly bolt (HVAC), (1) securing the HVAC module assembly to the cowl panel.

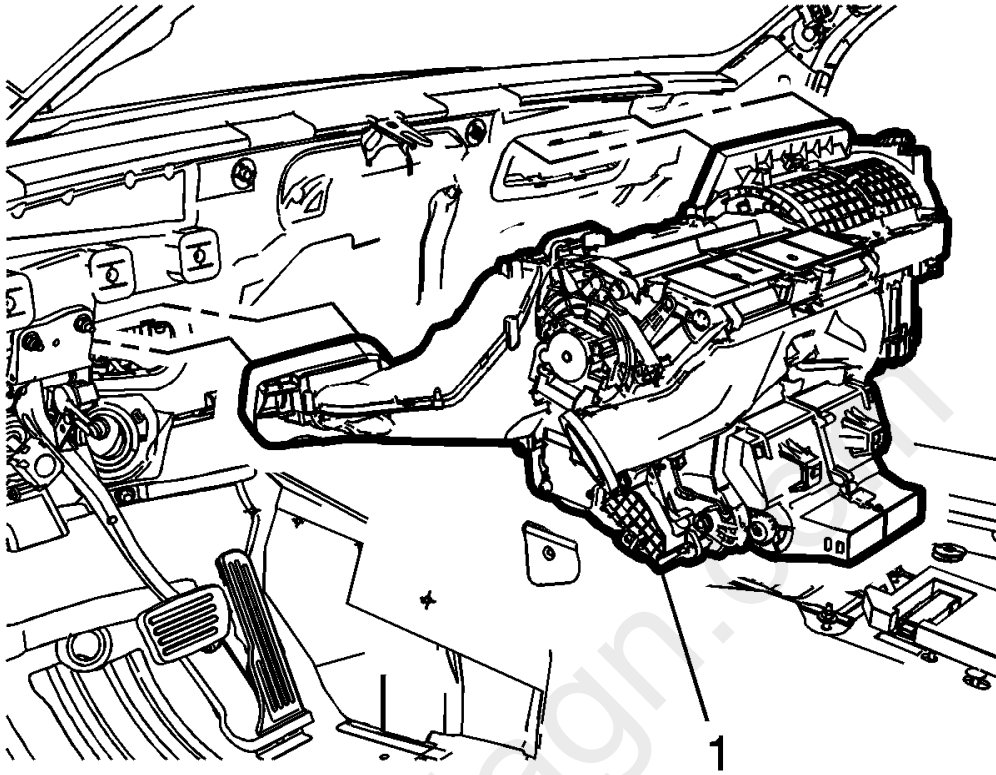


Fig. 104: HVAC Module Assembly
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

1. Inspect the air conditioning evaporator and blower case drain bellow for cuts, tears or deformation damage to the bellow. If the bellow is damaged, replace the bellow. Refer to **Air Conditioning Evaporator and Blower Case Drain Replacement (MYA)**, **Air Conditioning Evaporator and Blower Case Drain Replacement (MGG)**.
2. Using a long thin flat blade tool carefully compress the air conditioning evaporator and blower case drain bellow.

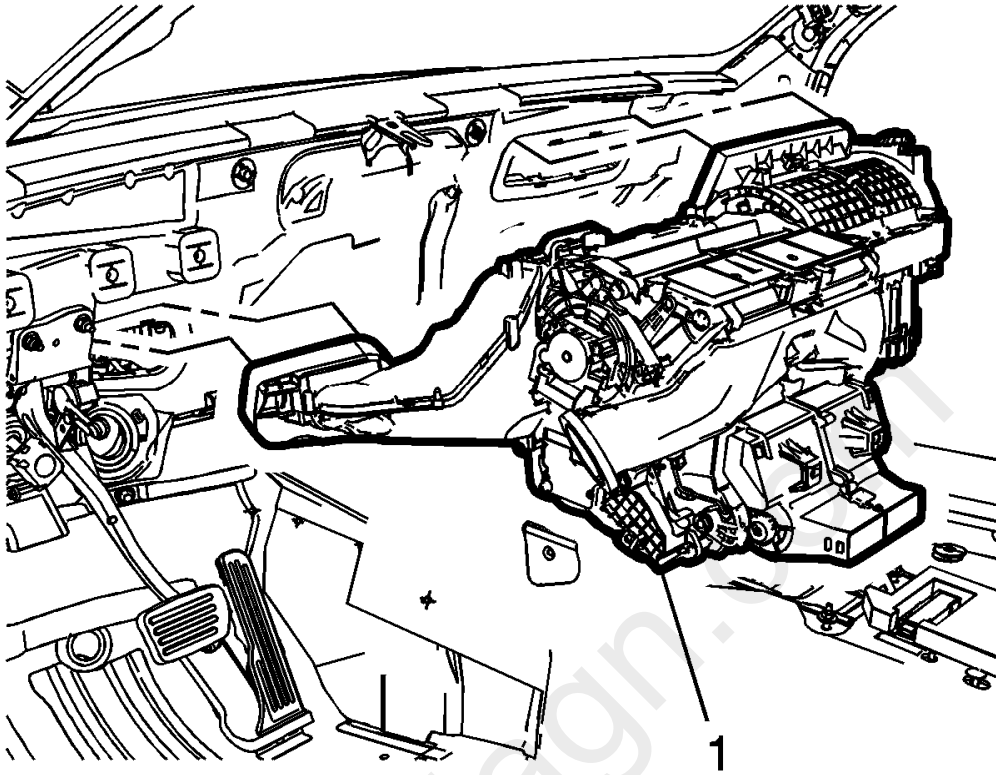


Fig. 105: HVAC Module Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Position the HVAC module assembly (1) into the vehicle and temporarily support it.
4. Remove the long thin flat blade tool from in between the HVAC drain bellow and the HVAC module assembly.

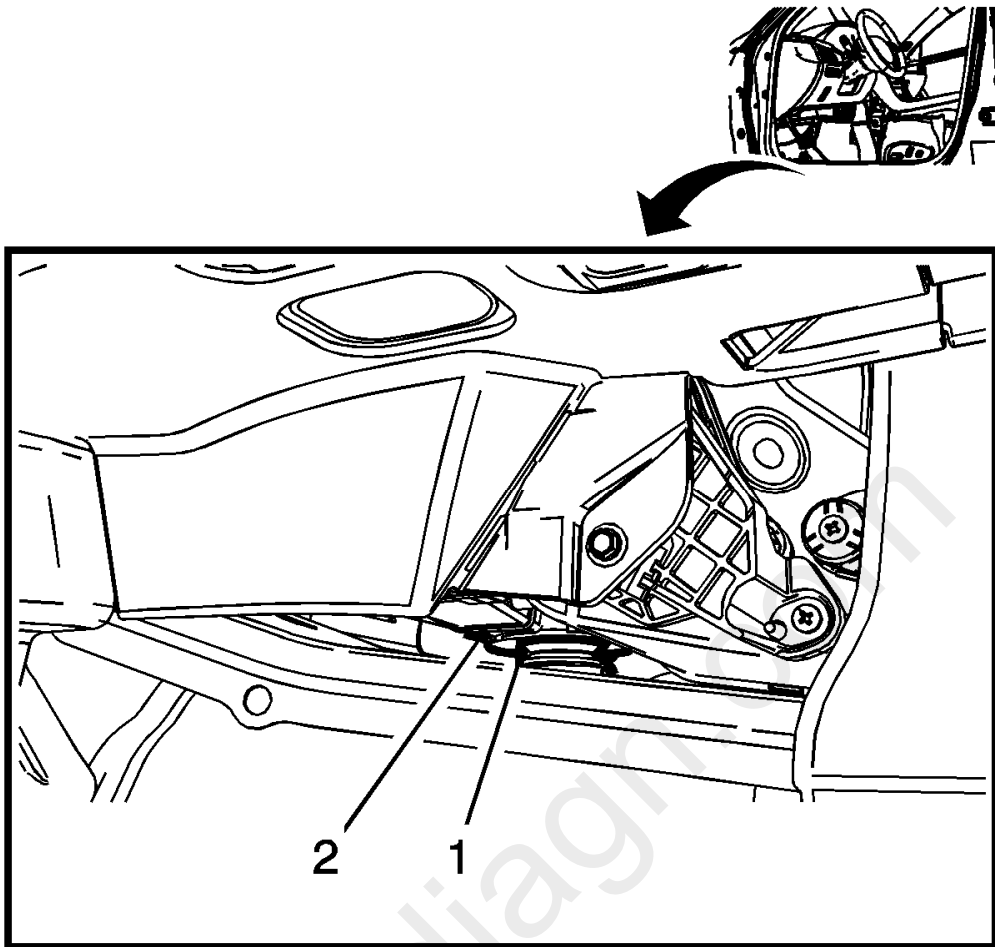


Fig. 106: Blower Case Drain Bellow And Drain Hole
Courtesy of GENERAL MOTORS COMPANY

5. Verify the air conditioning evaporator and blower case drain bellow (1) is aligned with the air conditioning evaporator and blower case drain hole (2).

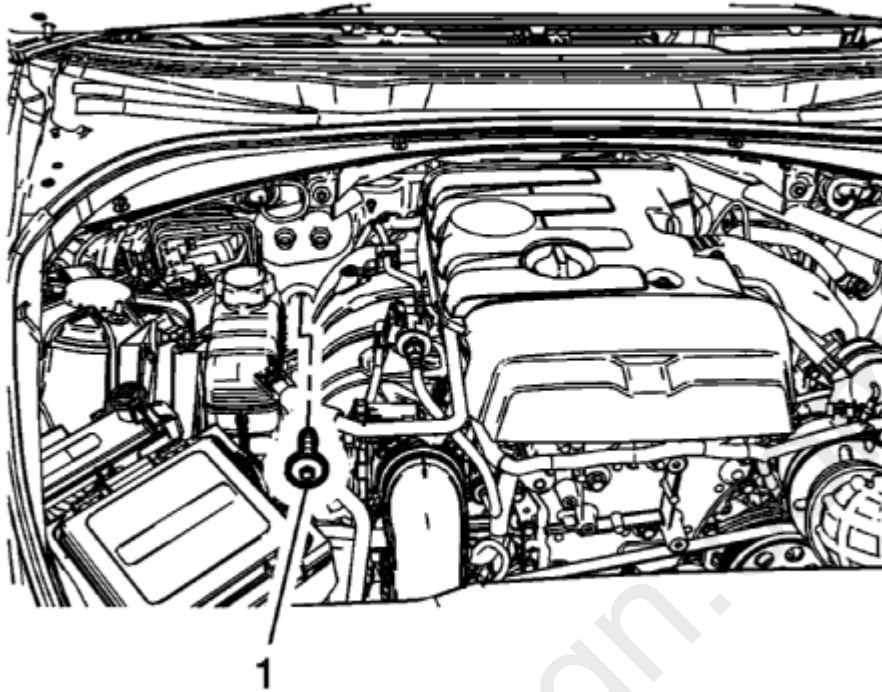


Fig. 107: Air Conditioning Evaporator And Blower Module Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

6. From within the engine compartment, install the HVAC module assembly bolt (1) securing the HVAC module assembly to the cowl panel, and tighten to 9 (80 lb in).
7. Install the instrument panel tie bar assembly. Refer to Instrument Panel Tie Bar Replacement .
8. Connect the left side floor rear air outlet duct to the heater and air conditioning evaporator and blower module assembly. Refer to Floor Rear Air Outlet Duct Replacement - Left Side.

NOTE: Do not install the left side front floor console side trim panel at this time.

9. Connect the right side floor rear air outlet duct to the heater and air conditioning evaporator and blower module assembly. Refer to Floor Rear Air Outlet Duct Replacement - Right Side.

NOTE: Do not install the right side front floor console side trim panel at this time.

10. Install the evaporator hose assembly to the thermal expansion valve. Refer to Air Conditioning

Evaporator Hose Assembly Replacement (LTG).

11. Install the heater outlet hose to the heater core tube. Refer to **Heater Outlet Hose Replacement (LTG).**
12. Install the heater inlet hose to the heater core tube. Refer to **Heater Inlet Hose Replacement (LTG)**
13. Fill the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) .**
14. Recharge the refrigerant system. Refer to **Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf).**
15. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection .**
16. Turn the air conditioning on and set to the full cold position. Set the blower speed to Hi. Let the air conditioning system run for 10 minutes with the left and right side carpet pulled back to visually inspect for water leaks, at the air conditioning evaporator and blower case drain bellow connection.

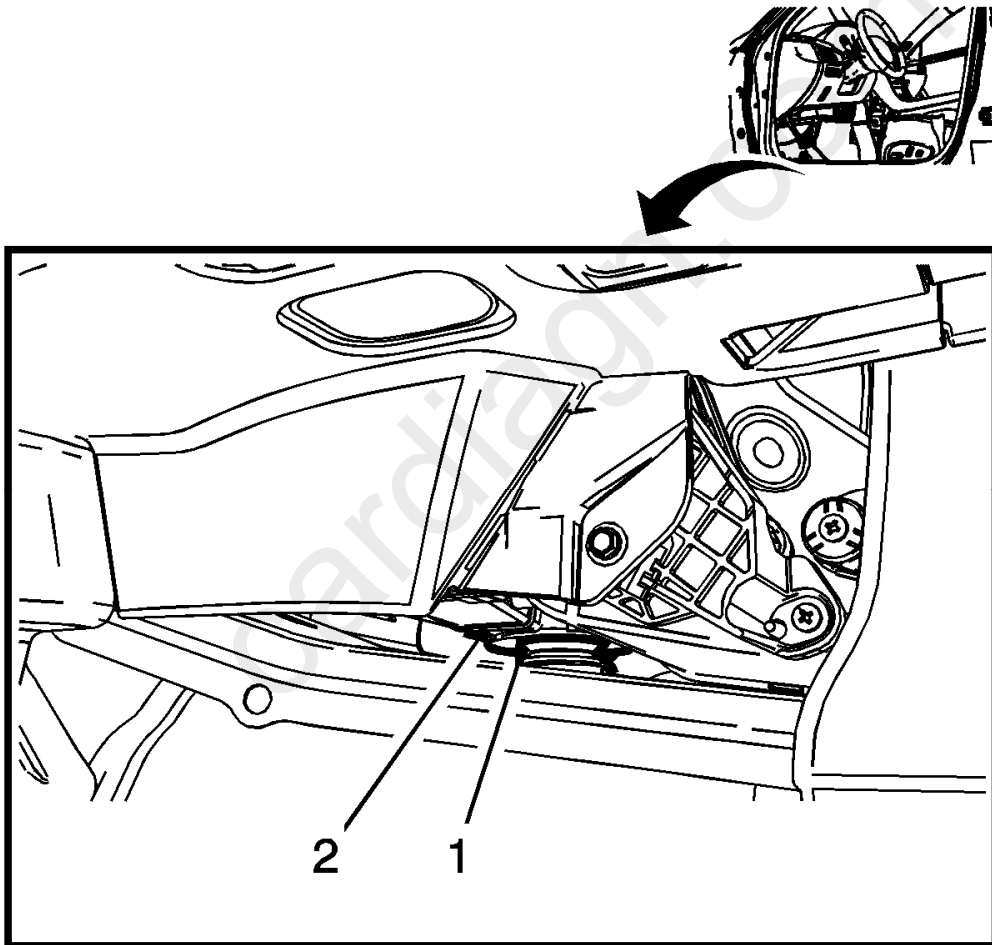


Fig. 108: Blower Case Drain Bellow And Drain Hole
Courtesy of GENERAL MOTORS COMPANY

17. The air conditioning evaporator and blower case drain bellow (1) should seal against the air conditioning evaporator and blower case assembly (2).

18. If a water leak is found, reposition and re-seat the bellow, and re-inspect for a water leak.
19. Install the left and right side front floor console side trim panels. Refer to **Front Floor Console Side Trim Panel Replacement - Left Side** , and **Front Floor Console Side Trim Panel Replacement - Right Side** .

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REMOVAL AND INSTALLATION (LFX LF3)

Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Recover the refrigerant system. Refer to **Refrigerant Recovery and Recharging (R-134a)**, **Refrigerant Recovery and Recharging (R-1234yf)**.
3. Drain the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
4. Remove the heater inlet hose from the heater core tube. Refer to **Heater Inlet Hose Replacement (LFX)**, **Heater Inlet Hose Replacement (LF3)**.
5. Remove the heater outlet hose from the heater core tube. Refer to **Heater Outlet Hose Replacement (LFX)**, **Heater Outlet Hose Replacement (LF3)**.
6. Remove the evaporator hose assembly from the thermal expansion valve. Refer to **Air Conditioning Evaporator Hose Assembly Replacement (LF3, LFX)**.
7. Disconnect the right side floor rear air outlet duct from the heater and air conditioning evaporator and blower module assembly. Refer to **Floor Rear Air Outlet Duct Replacement - Right Side**.
8. Disconnect the left side floor rear air outlet duct from the heater and air conditioning evaporator and blower module assembly. Refer to **Floor Rear Air Outlet Duct Replacement - Left Side**.
9. Remove the instrument panel tie bar assembly. Refer to **Instrument Panel Tie Bar Replacement** .

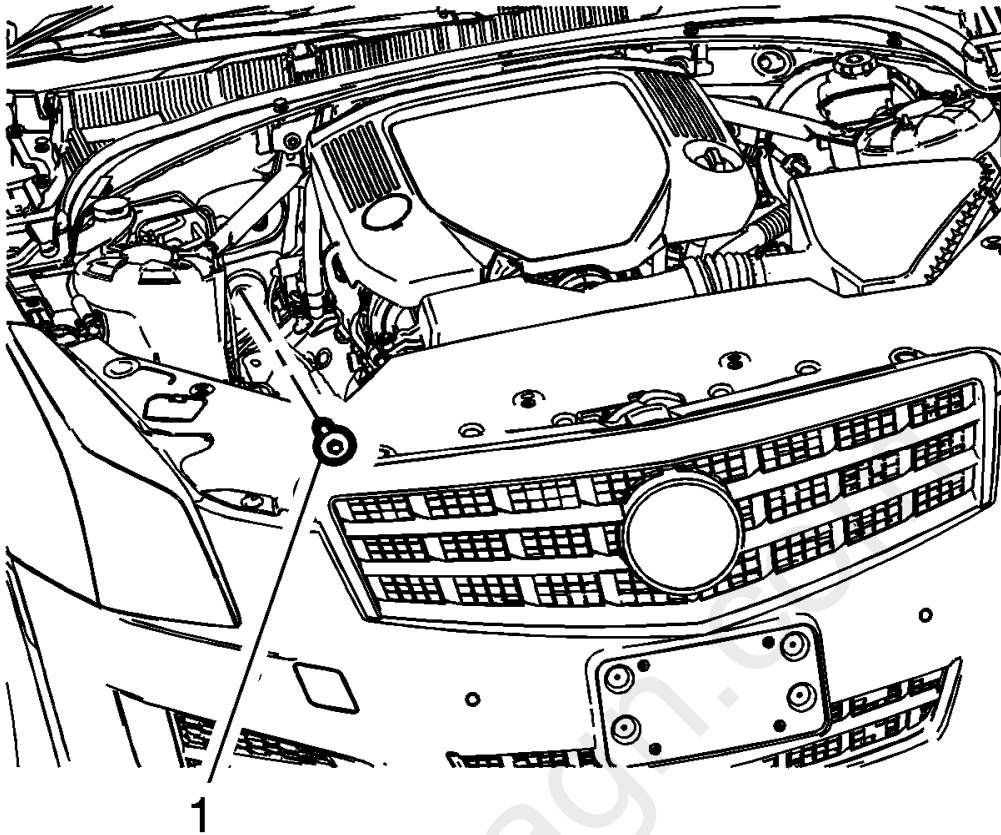


Fig. 109: Air Conditioning Evaporator And Blower Module Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

10. From within the engine compartment, remove the heater and air conditioning evaporator and blower module assembly bolt (HVAC), (1) securing the HVAC module assembly to the cowl panel.

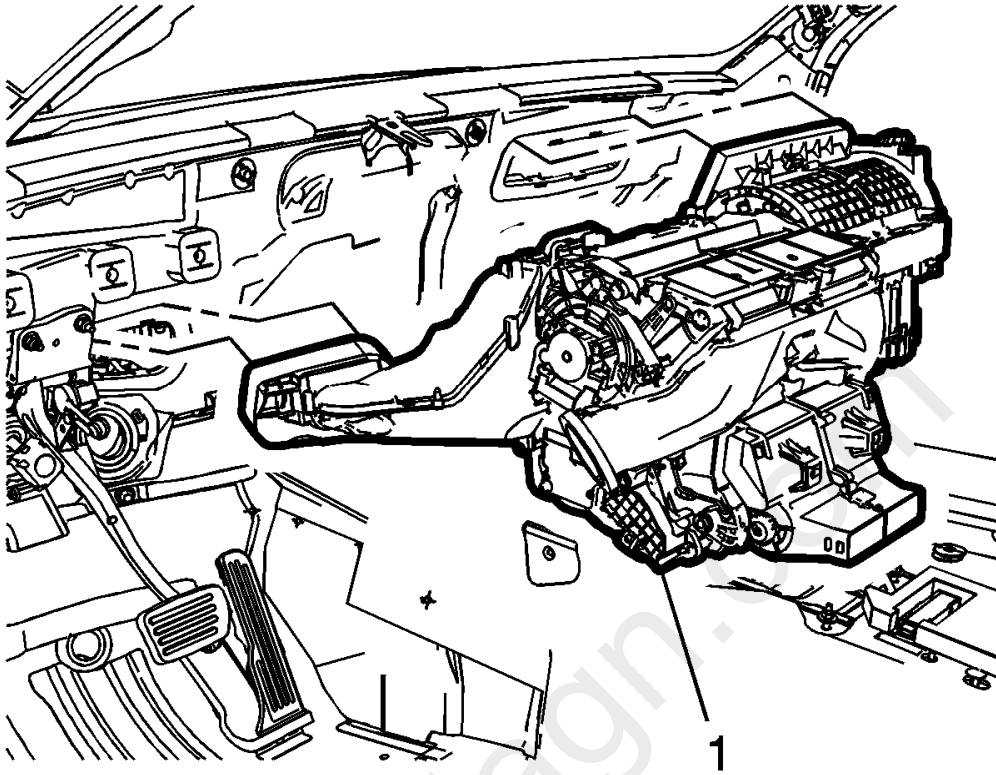


Fig. 110: HVAC Module Assembly
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

1. Inspect the air conditioning evaporator and blower case drain bellow for cuts, tears or deformation damage to the bellow. If the bellow is damaged, replace the bellow. Refer to **Air Conditioning Evaporator and Blower Case Drain Replacement (MYA)**, **Air Conditioning Evaporator and Blower Case Drain Replacement (MGG)**.
2. Using a long thin flat blade tool carefully compress the air conditioning evaporator and blower case drain bellow.

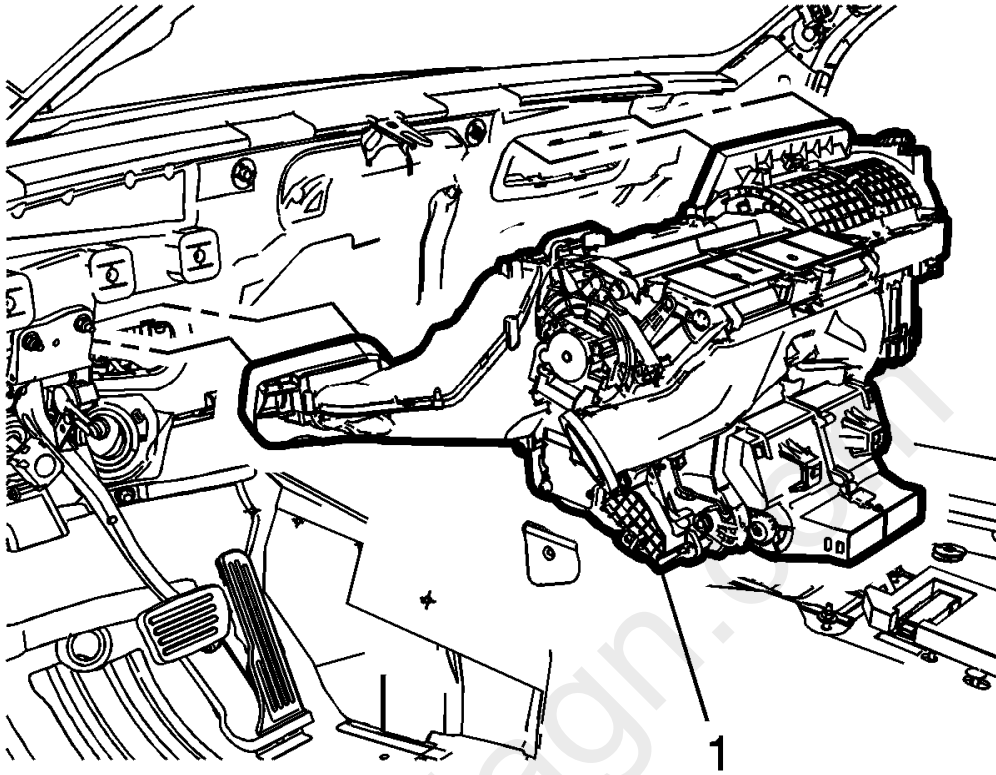


Fig. 111: HVAC Module Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Position the HVAC module assembly (1) into the vehicle and temporarily support it.
4. Remove the long thin flat blade tool from in between the HVAC drain bellow and the HVAC module assembly.

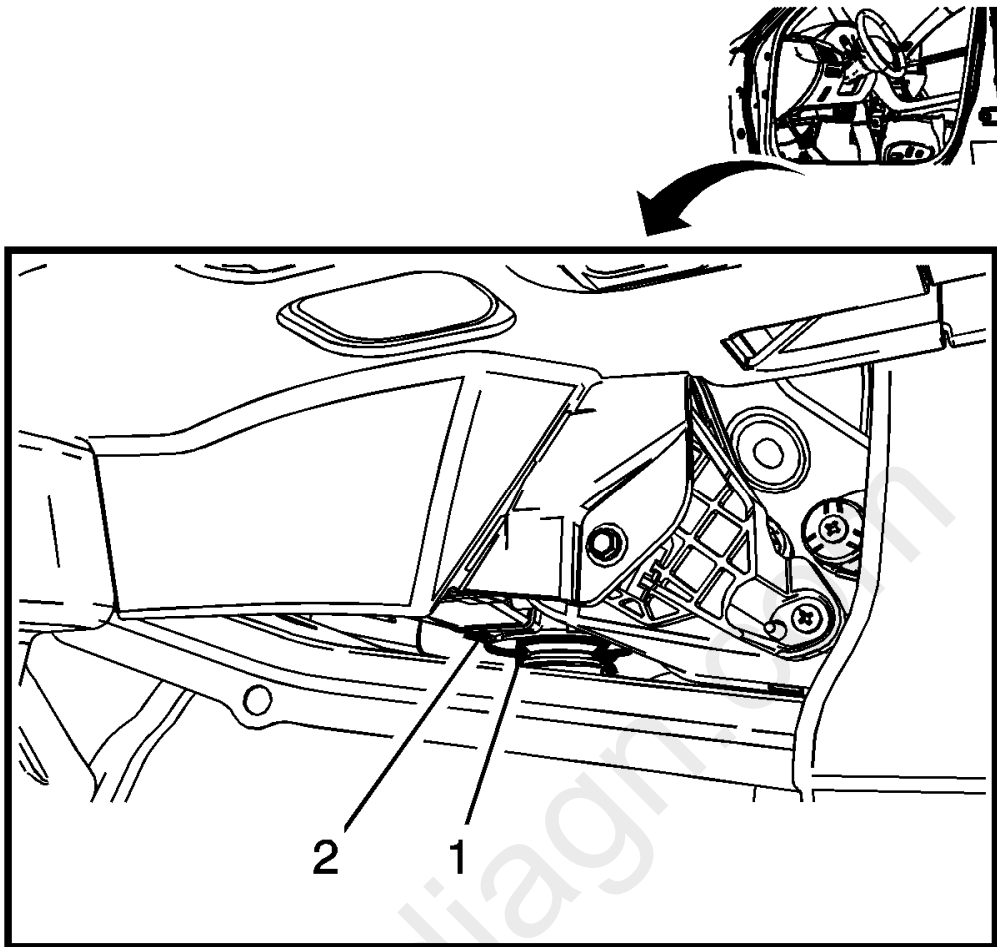


Fig. 112: Blower Case Drain Bellow And Drain Hole
Courtesy of GENERAL MOTORS COMPANY

5. Verify the air conditioning evaporator and blower case drain bellow (1) is aligned with the air conditioning evaporator and blower case drain hole (2).

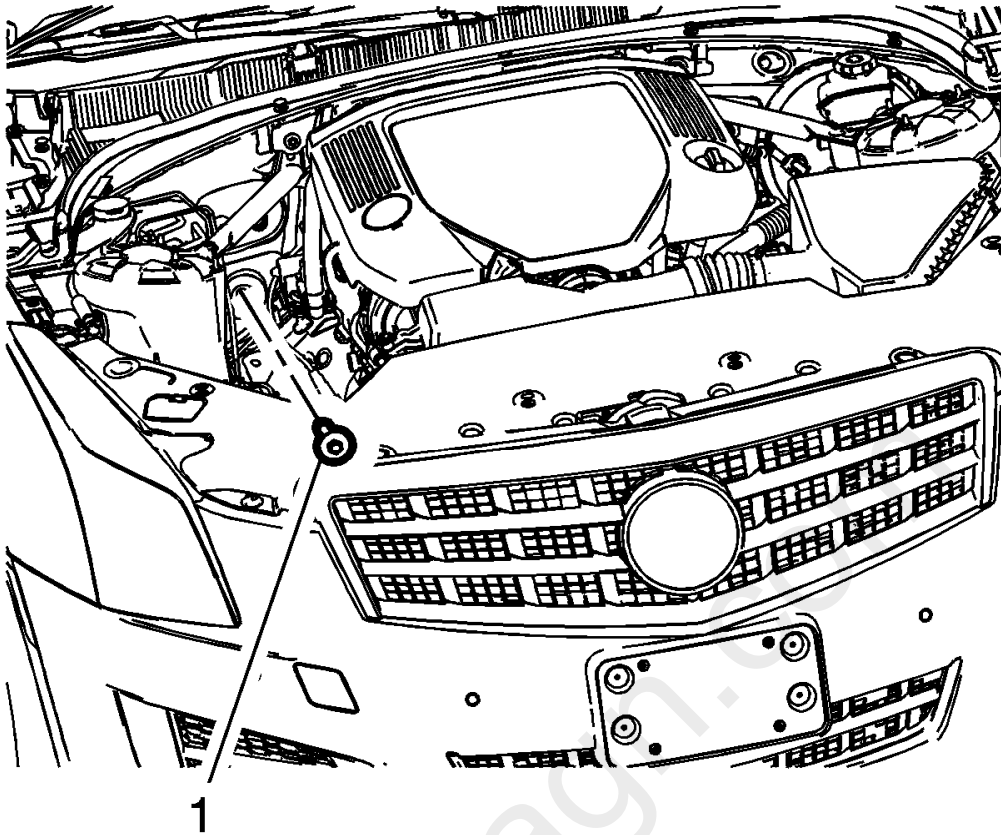


Fig. 113: Air Conditioning Evaporator And Blower Module Assembly Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

6. From within the engine compartment, install the HVAC module assembly bolt (1) securing the HVAC module assembly to the cowl panel, and tighten to 9 (80 lb in).
7. Install the instrument panel tie bar assembly. Refer to Instrument Panel Tie Bar Replacement .
8. Connect the left side floor rear air outlet duct to the heater and air conditioning evaporator and blower module assembly. Refer to Floor Rear Air Outlet Duct Replacement - Left Side.

NOTE: Do not install the left side front floor console side trim panel at this time.

9. Connect the right side floor rear air outlet duct to the heater and air conditioning evaporator and blower module assembly. Refer to Floor Rear Air Outlet Duct Replacement - Right Side.

NOTE: Do not install the right side front floor console side trim panel at this time.

10. Install the evaporator hose assembly to the thermal expansion valve. Refer to **Air Conditioning Evaporator Hose Assembly Replacement (LF3, LFX)**.
11. Install the heater outlet hose to the heater core tube. Refer to **Heater Outlet Hose Replacement (LFX), Heater Outlet Hose Replacement (LF3)**.
12. Install the heater inlet hose to the heater core tube. Refer to **Heater Inlet Hose Replacement (LFX), Heater Inlet Hose Replacement (LF3)**.
13. Fill the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) .**
14. Recharge the refrigerant system. Refer to **Refrigerant Recovery and Recharging (R-134a), Refrigerant Recovery and Recharging (R-1234yf)**.
15. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection .**
16. Turn the air conditioning on and set to the full cold position. Set the blower speed to Hi. Let the air conditioning system run for 10 minutes with the left and right side carpet pulled back to visually inspect for water leaks, at the air conditioning evaporator and blower case drain bellow connection.

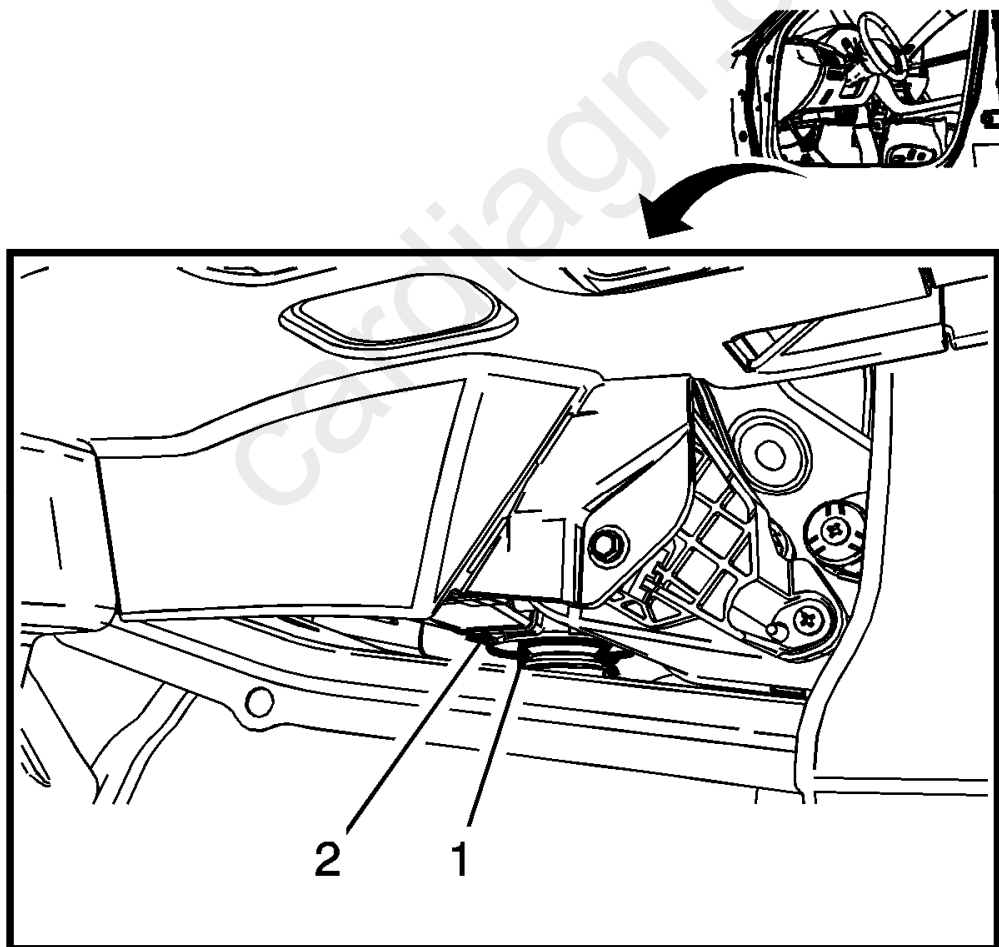


Fig. 114: Blower Case Drain Bellow And Drain Hole
 Courtesy of GENERAL MOTORS COMPANY

17. The air conditioning evaporator and blower case drain bellow (1) should seal against the air conditioning evaporator and blower case assembly (2).
18. If a water leak is found, reposition and re-seat the bellow, and re-inspect for a water leak.
19. Install the left and right side front floor console side trim panels. Refer to **Front Floor Console Side Trim Panel Replacement - Left Side** , and **Front Floor Console Side Trim Panel Replacement - Right Side** .

AIR CONDITIONING EVAPORATOR LOWER CASE REPLACEMENT

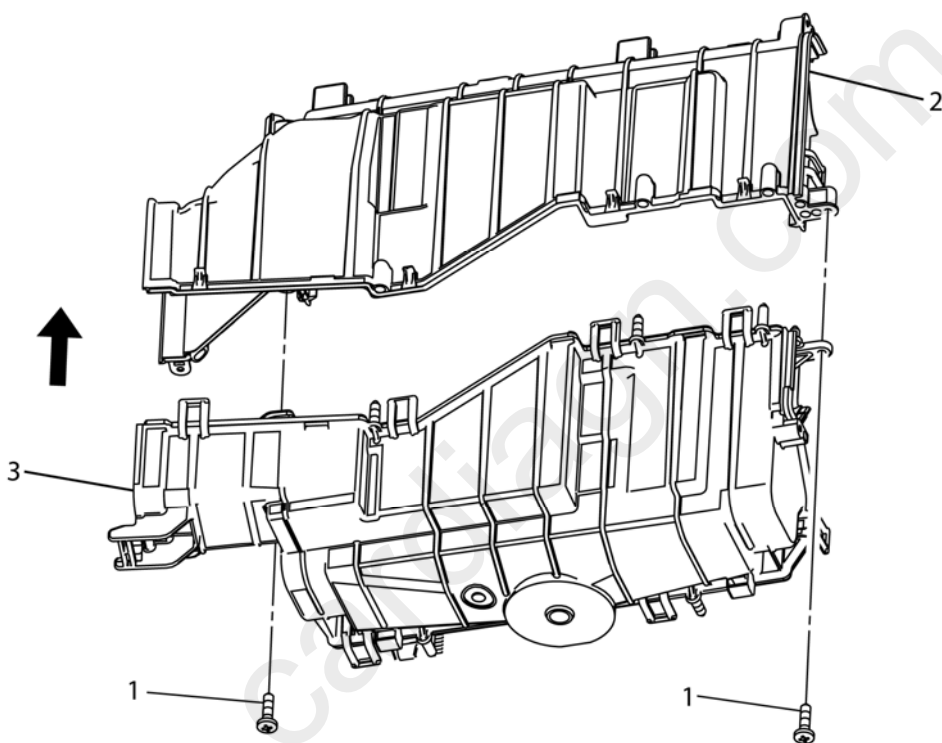


Fig. 115: Air Conditioning Evaporator Lower Case
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Lower Case Replacement

Call out	Component Name
Preliminary Procedure Remove the air conditioning evaporator case assembly. Refer to <u>Air Conditioning (A/C) Evaporator Case Assembly Replacement</u> .	
1	Air Conditioning Evaporator Case Assembly Fastener (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .

2	Air Conditioning Evaporator Upper Case Assembly Procedure Unlatch the air conditioning evaporator lower case assembly from the air conditioning evaporator upper case assembly.
3	Air Conditioning Evaporator Lower Case Assembly

AIR CONDITIONING EVAPORATOR UPPER CASE REPLACEMENT

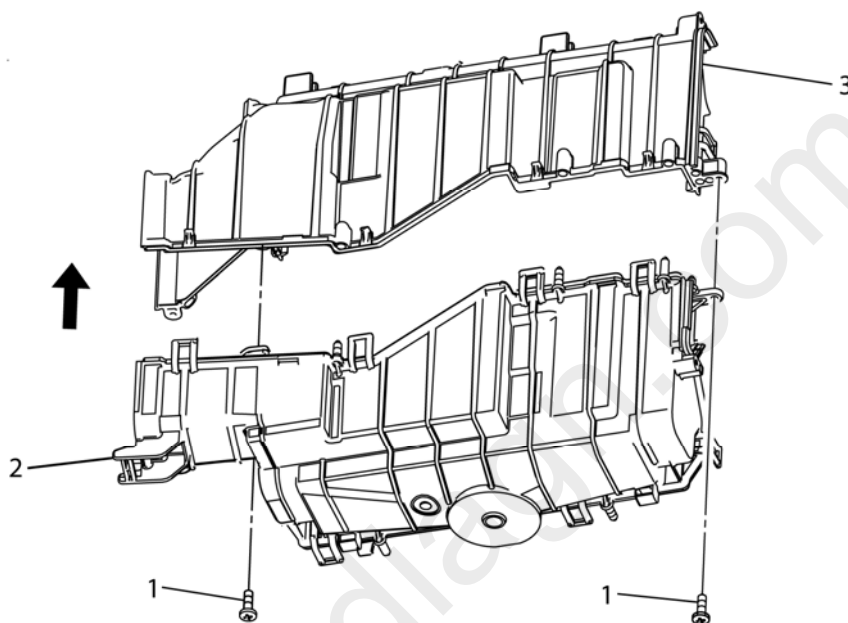


Fig. 116: Air Conditioning Evaporator Upper Case
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Upper Case Replacement

Call out	Component Name
Preliminary Procedure Remove the air conditioning evaporator case assembly. Refer to <u>Air Conditioning (A/C) Evaporator Case Assembly Replacement</u> .	
1	Air Conditioning Evaporator Case Assembly Fastener. (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Evaporator Lower Case Assembly Procedure Unlatch the air conditioning evaporator lower case assembly from the air conditioning evaporator upper case assembly.

AIR CONDITIONING (A/C) EVAPORATOR CASE ASSEMBLY REPLACEMENT

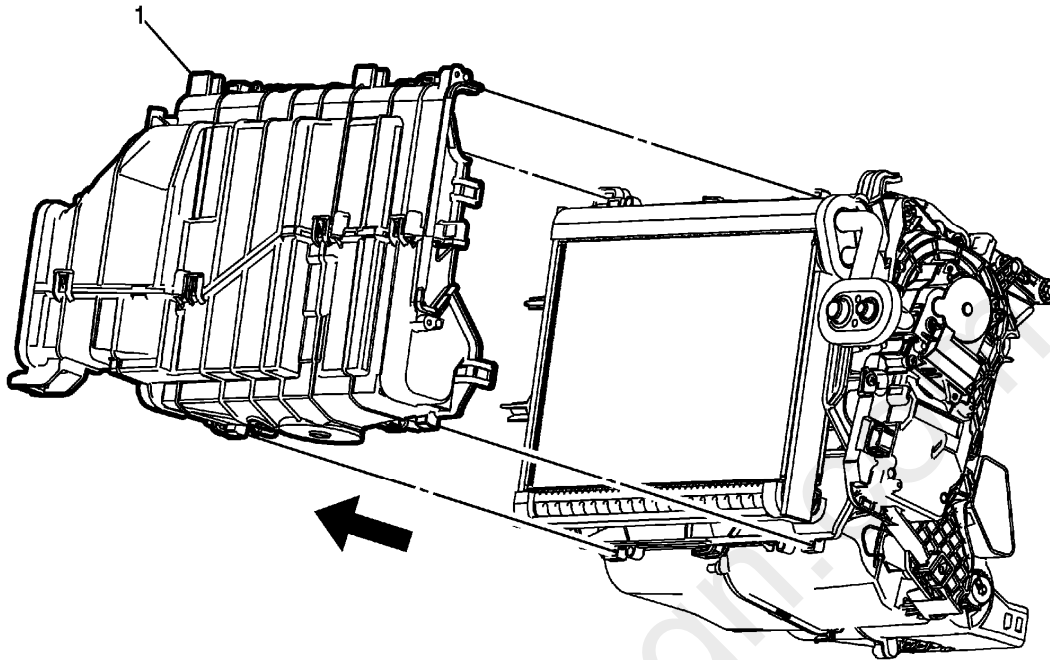


Fig. 117: Air Conditioning (A/C) Evaporator Case Assembly
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning (A/C) Evaporator Case Assembly Replacement

Call out	Component Name
Preliminary Procedures	
1. Remove the air conditioning evaporator tube cover assembly. Refer to <u>Air Conditioning Evaporator Tube Cover Replacement</u>. 2. Remove the blower case assembly. Refer to <u>Blower Case Replacement</u>. 3. Remove the air conditioning evaporator air temperature sensor. Refer to <u>Evaporator Air Temperature Sensor Replacement</u>. 4. Remove the auxiliary temperature valve actuator, if equipped with CJ4. Refer to <u>Auxiliary Temperature Valve Actuator Replacement (CJ4)</u>.	
1	Air Conditioning Evaporator Case Assembly Procedures 1. Unlatch the air conditioning evaporator case assembly from the air distributor case. 2. Transfer the air conditioning evaporator core from the evaporator case.

BLOWER CASE REPLACEMENT

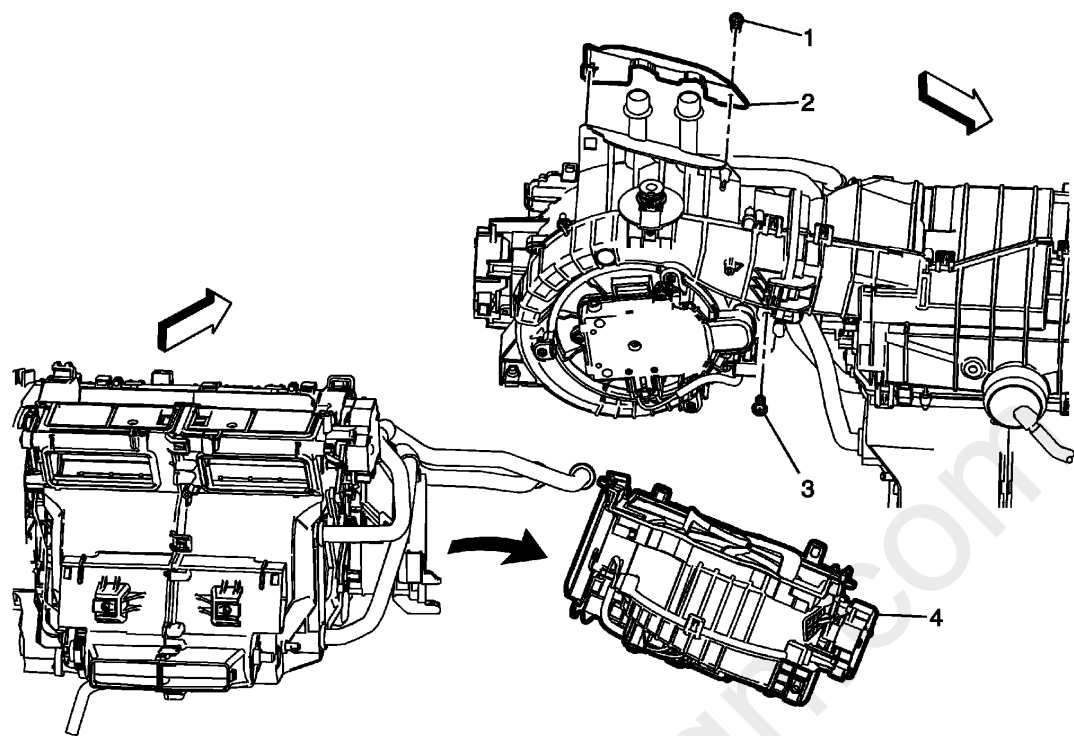


Fig. 118: Blower Case
Courtesy of GENERAL MOTORS COMPANY

Blower Case Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the air inlet housing assembly. Refer to <u>Air Inlet Housing Replacement</u> .	
2. Disconnect the electrical connectors as necessary.	
1	Heater Core Tube Bracket Fastener CAUTION: Refer to <u>Fastener Caution</u> .
2	Heater Core Tube Bracket
3	Blower Case Assembly Fastener
4	Blower Case Assembly Procedure Unlatch and tilt down the blower case assembly form the air conditioning evaporator case assembly to remove.

BLOWER LOWER CASE REPLACEMENT

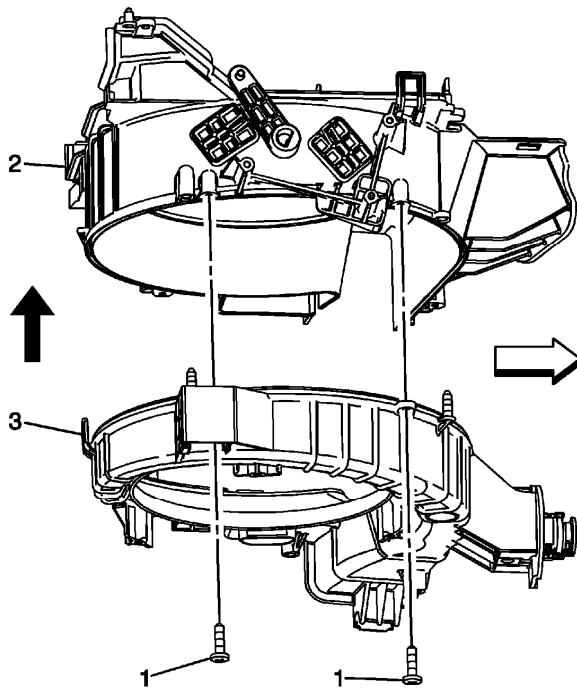


Fig. 119: Blower Lower Case
 Courtesy of GENERAL MOTORS COMPANY

Blower Lower Case Replacement

Call out	Component Name
Preliminary Procedures	
1. Remove the blower case assembly. Refer to <u>Blower Case Replacement</u> . 2. Remove the blower motor assembly. Refer to <u>Blower Motor Replacement</u> .	
1	Blower Case Assembly Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Blower Upper Case
3	Blower Lower Case Procedures 1. Cut the blower case seal at the seam to separate the blower case halves. 2. Replace the blower case seal as needed. 3. Transfer all the components.

BLOWER UPPER CASE REPLACEMENT

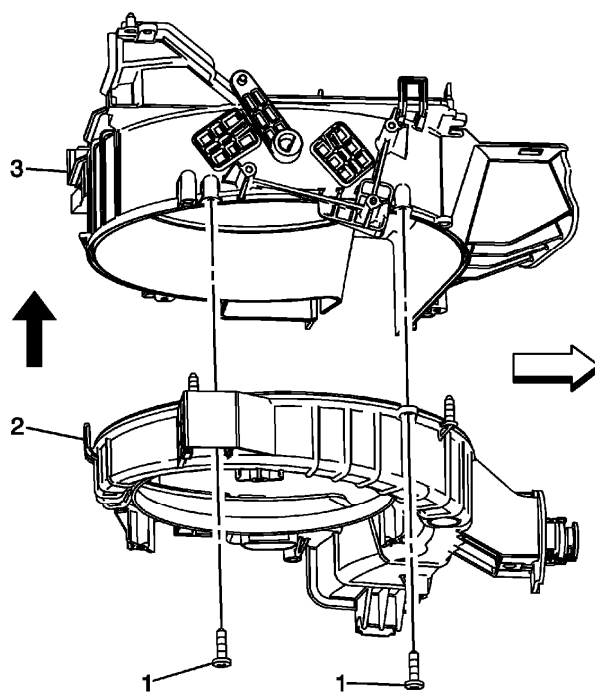


Fig. 120: Blower Upper Case
Courtesy of GENERAL MOTORS COMPANY

Blower Upper Case Replacement

Call out	Component Name
Preliminary Procedures	
1. Remove the blower case assembly. Refer to <u>Blower Case Replacement</u>. 2. Remove the fresh air inlet valve actuator. Refer to <u>Air Inlet Valve Actuator Replacement (Fresh Air)</u>.	
1	Blower Case Assembly Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Blower Lower Case
3	Blower Upper Case Procedures 1. Cut the blower case seal at the seam to separate the blower case halves. 2. Replace the seal as needed.

AIR CONDITIONING EVAPORATOR REPLACEMENT (R-134A)

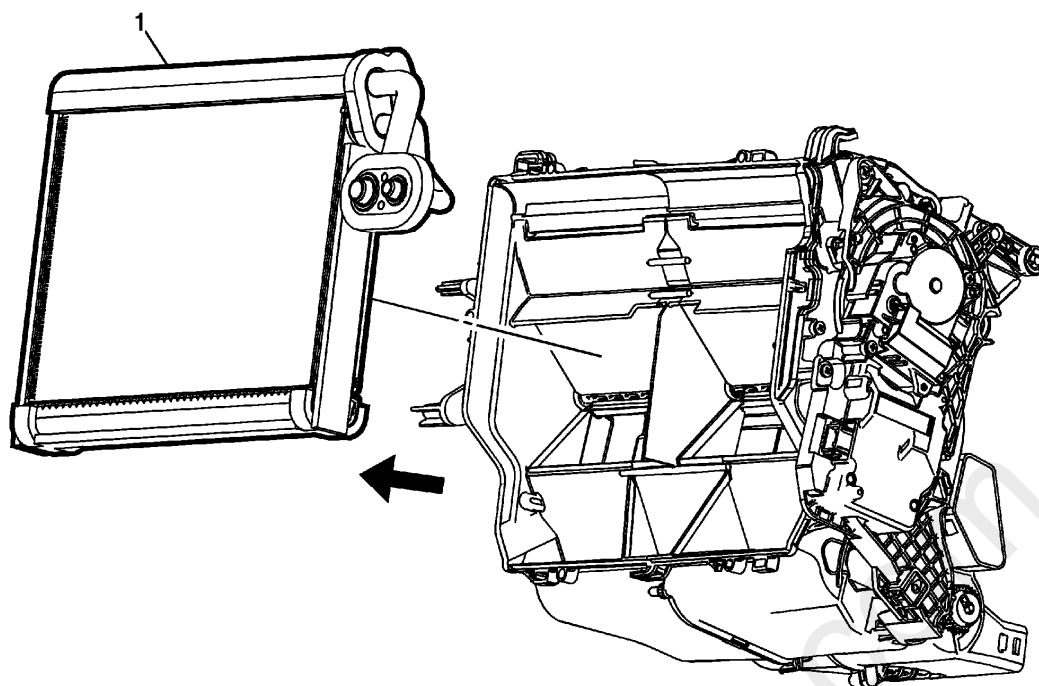


Fig. 121: Air Conditioning Evaporator (R-134a)
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Replacement (R-134a)

Callout	Component Name
Preliminary Procedure	
Remove the air conditioning evaporator case assembly. Refer to <u>Air Conditioning (A/C) Evaporator Case Assembly Replacement</u> .	
1	Air Conditioning Evaporator Core

AIR CONDITIONING EVAPORATOR REPLACEMENT (R-1234YF)

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

CAUTION: Evaporators in vehicles equipped with R-1234yf refrigerant systems, shall never be repaired or replaced with one removed from another or salvage. Only new, SAE J2842 certified and labeled evaporator(s) shall be used as replacement parts. Failure to follow the above guidelines could result in EPA Penalties and/or fines.

NOTE: Technicians repairing or servicing motor vehicle air conditioning (MVAC) systems must be trained and certified by an EPA approved organization. Certification is obtained by passing an EPA approved examination.

(<http://www.epa.gov/ozone/title6/609/technicians/609certs.html>)

Removal Procedure

1. Remove the air conditioning (a/c) evaporator case assembly. Refer to **Air Conditioning (A/C) Evaporator Case Assembly Replacement**.

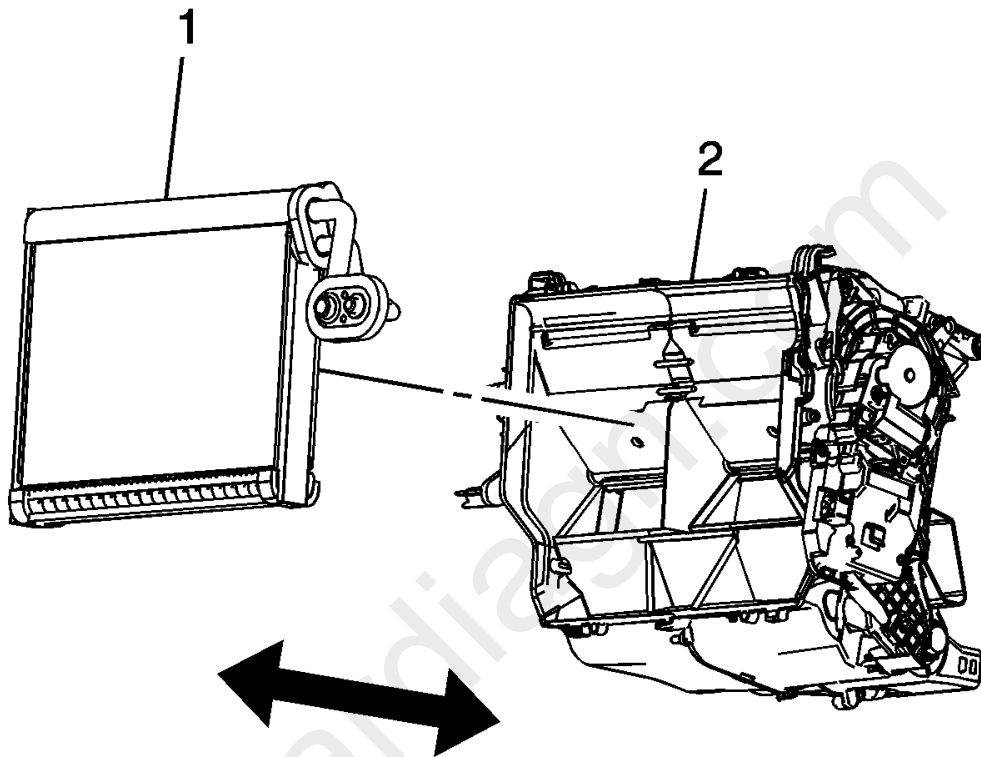


Fig. 122: Air Conditioning Evaporator Core And Distributor Case Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Remove the air conditioning evaporator core (1) from the air distributor case assembly (2).

Installation Procedure

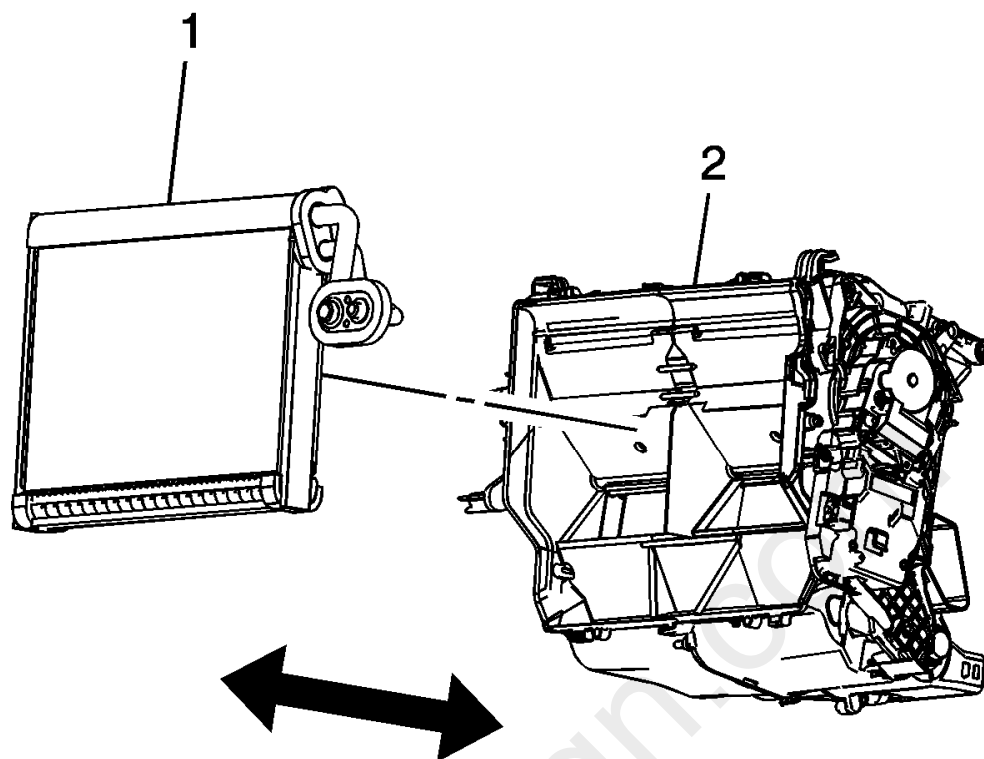


Fig. 123: Air Conditioning Evaporator Core And Distributor Case Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Position the air conditioning evaporator core (1) into the air distributor case assembly (2).
2. Install the air conditioning (a/c) evaporator case assembly. Refer to **Air Conditioning (A/C) Evaporator Case Assembly Replacement**.

Replacement Evaporator Label Requirements

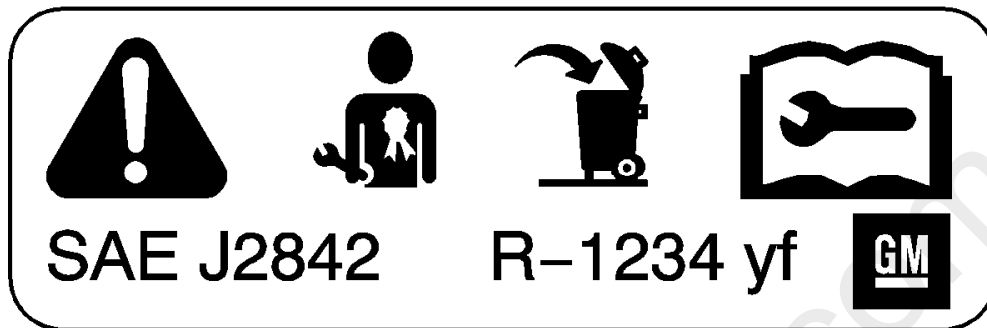


Fig. 124: Replacement Evaporator Label
Courtesy of GENERAL MOTORS COMPANY

Replacement evaporators shall have a permanent marking (label, stamp, or etching) that indicates that this evaporator design meets SAE J2842 and shall include the wording below or optionally the symbols as shown:

Text Only- Label Wording- "Conforms to SAE J2842 (Evaporator Manufacturer's Name or Trademark) Replace only with new evaporator certified to meet SAE J2842.

Leak Free Joints Inside the Passenger Compartment

If a refrigerant joint/connection is made or disturbed inside the passenger cabin the following steps shall be followed by the technician to ensure the joint/connection is leak free.

1. Shall clean all dirt, grease and debris from and around connection joints before disassembly/assembly of refrigerant connections.
2. Shall be advised to carefully inspect the joint/connection seal surfaces for signs of deformation, contamination or damage after disassembly.
3. Shall be advised that Seals/O-rings shall never be reused, but replaced with all new parts.

4. Shall be advised to ensure proper alignment of male/female portions and seal so there is no misalignment and stress on the fitting connection.
5. Shall tighten the joint using the proper torque.
6. With full refrigerant charge installed and the vehicles HVAC blower motor set on its lowest speed, A/C switch off and air distribution set to floor. The technician shall insert a SAE J2913 compliant electronic leak detector set to high sensitivity (4 grams/year leak rate) into the center of a floor duct outlet, as far as possible. The technician shall monitor the electronic leak detector for 5 minutes or until the detector alarms.
 - If electronic leak detector alarms, recover the refrigerant and repair the leak.
 - If after 5 minutes there is no alarm, there is no indication of a leak in the passenger compartment and the repair can be completed.
7. If vehicle is equipped with an auxiliary evaporator, monitor the air downstream from the evaporator at the outlet duct closest to the auxiliary unit under the same conditions and set up as step 6.

Proper Disposal of the Replaced Evaporator

The replaced evaporator shall be disabled to ensure that it never be repaired or reused.

Disable the replaced evaporator by completing one of the following steps:

- Using tin snips sever a minimum of 3 of the evaporators tubes.
- Drill or Punch a minimum of two 25 mm (.25 inch) holes in each end tank.

AIR CONDITIONING EVAPORATOR AND BLOWER CASE DRAIN REPLACEMENT (MYA)

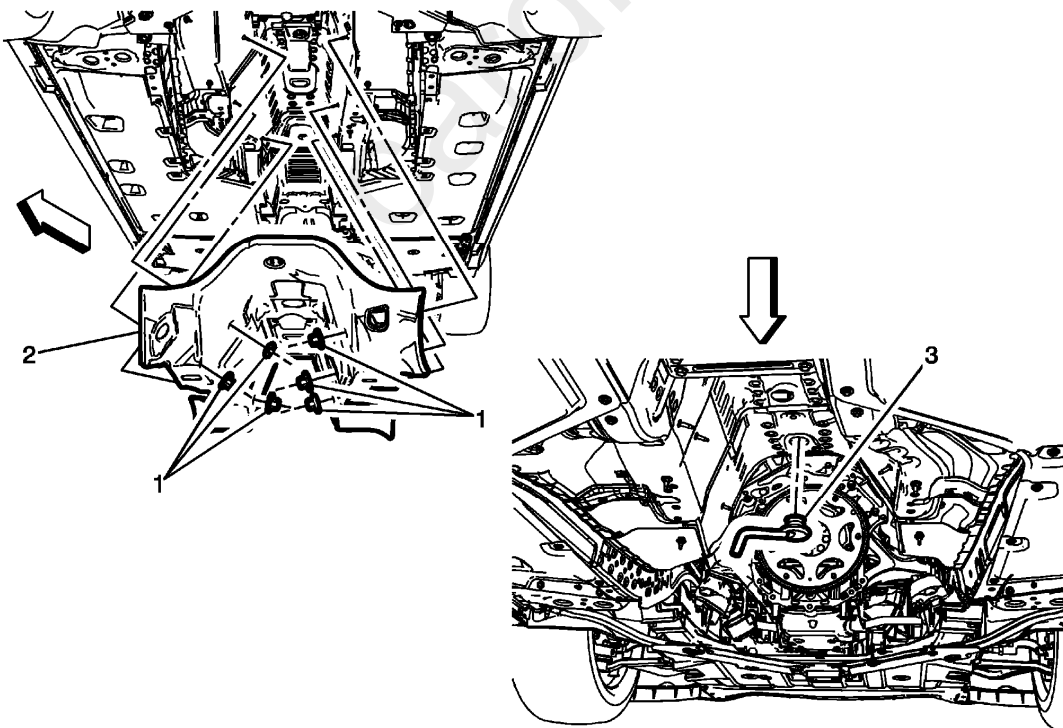


Fig. 125: Air Conditioning Evaporator and Blower Case Drain (MYA)
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator and Blower Case Drain Replacement (MYA)

Call out	Component Name
Preliminary Procedures 1. Remove the right and left front body exhaust heat shield. Refer to <u>Front Body Exhaust Heat Shield Replacement (Right)</u> , <u>Front Body Exhaust Heat Shield Replacement (Left)</u> . 2. Remove the transmission assembly. Refer to <u>Transmission Replacement (LTG)</u> , <u>Transmission Replacement (LFX)</u> .	
1	Floor Panel Tunnel Panel Outer Insulator Nut (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 (7 lb ft)
2	Floor Panel Tunnel Panel Front Insulator
3	Air Conditioning Evaporator and Blower Case Drain

AIR CONDITIONING EVAPORATOR AND BLOWER CASE DRAIN REPLACEMENT (MGG)

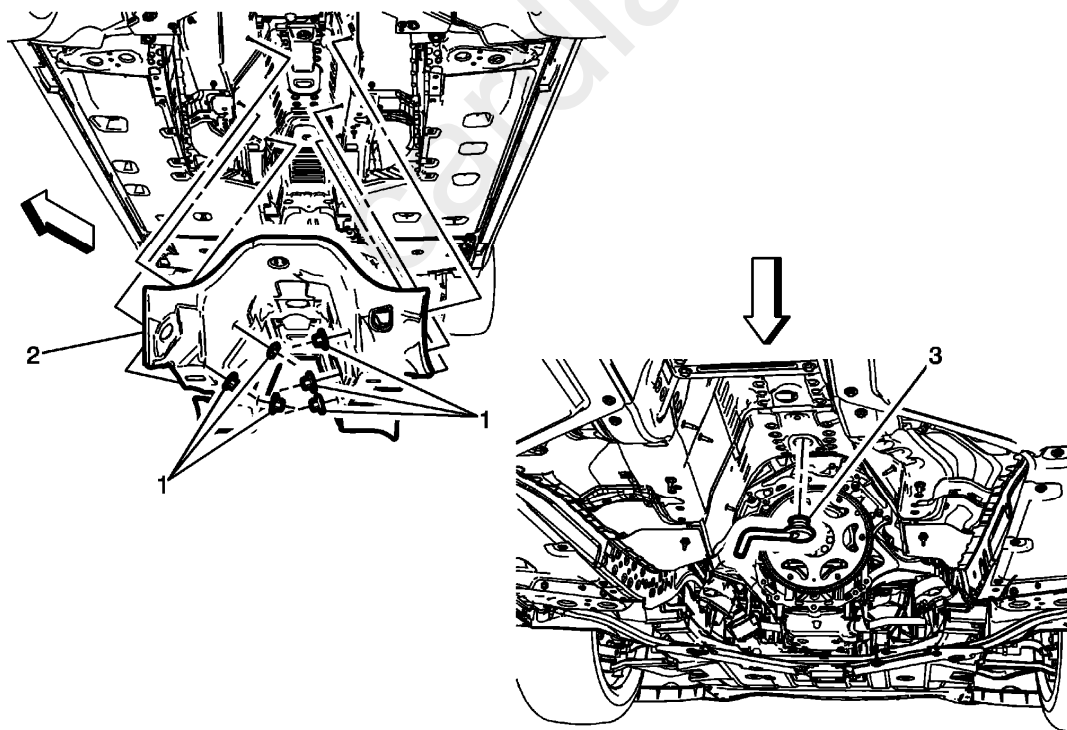


Fig. 126: Air Conditioning Evaporator and Blower Case Drain (MGG)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator and Blower Case Drain Replacement (MGG)

Call out	Component Name
Preliminary Procedures 1. Remove the right and left front body exhaust heat shield. Refer to <u>Front Body Exhaust Heat Shield Replacement (Right)</u> , <u>Front Body Exhaust Heat Shield Replacement (Left)</u> . 2. Remove the transmission assembly. Refer to <u>Transmission Replacement</u> .	
1	Floor Panel Tunnel Panel Outer Insulator Nut (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 (7 lb ft)
2	Floor Panel Tunnel Panel Front Insulator
3	Air Conditioning Evaporator and Blower Case Drain

HEATER INLET HOSE REPLACEMENT (LTG)

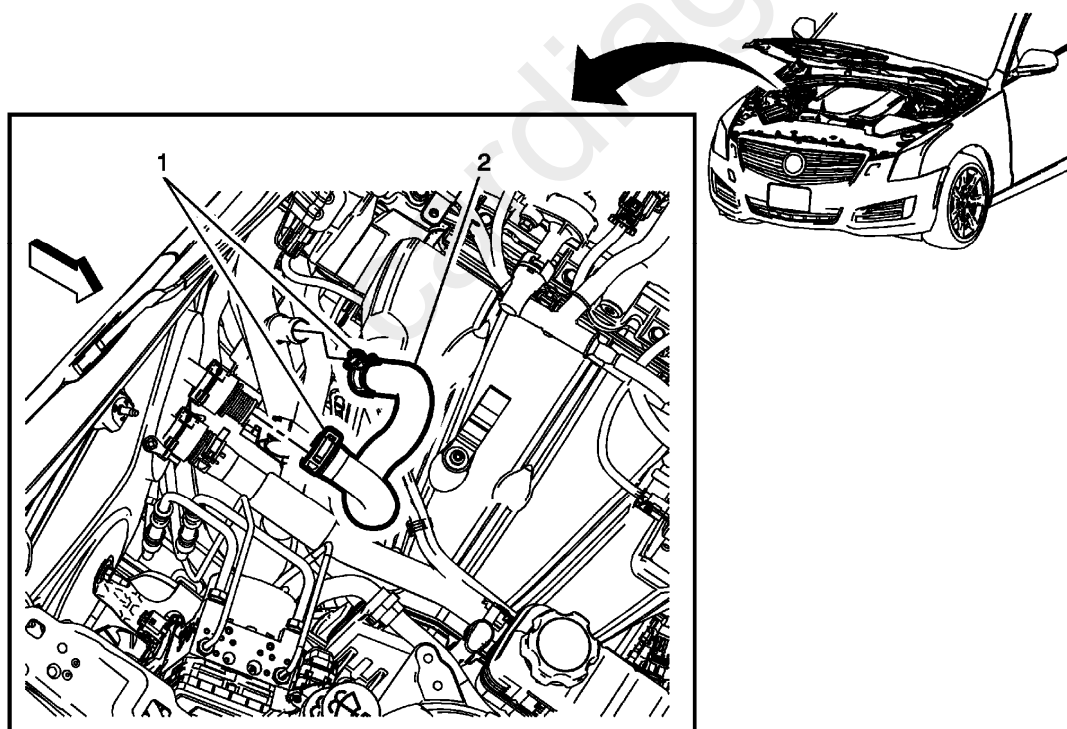


Fig. 127: Heater Inlet Hose (LTG)

Courtesy of GENERAL MOTORS COMPANY

Heater Inlet Hose Replacement (LTG)

Callout	Component Name
Preliminary Procedures 1. Remove the outer fuel pump insulator. Refer to <u>Fuel Pump Insulator Replacement (Inner)</u> , <u>Fuel Pump Insulator Replacement (Outer)</u> . 2. Remove the right side front end sheet metal diagonal brace. Refer to <u>Front End Sheet Metal Diagonal Brace Replacement - Right Side</u> . 3. Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> .	
1	Heater Outlet Hose Clamp (Qty: 2) Procedure Reposition the heater outlet hose clamps using BO-38185 Hose Clamp Pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to <u>Special Tools</u> .
2	Heater Outlet Hose Procedure 1. Unclip the heater outlet hose from the retainer. 2. Fill coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

HEATER INLET HOSE REPLACEMENT (LFX)

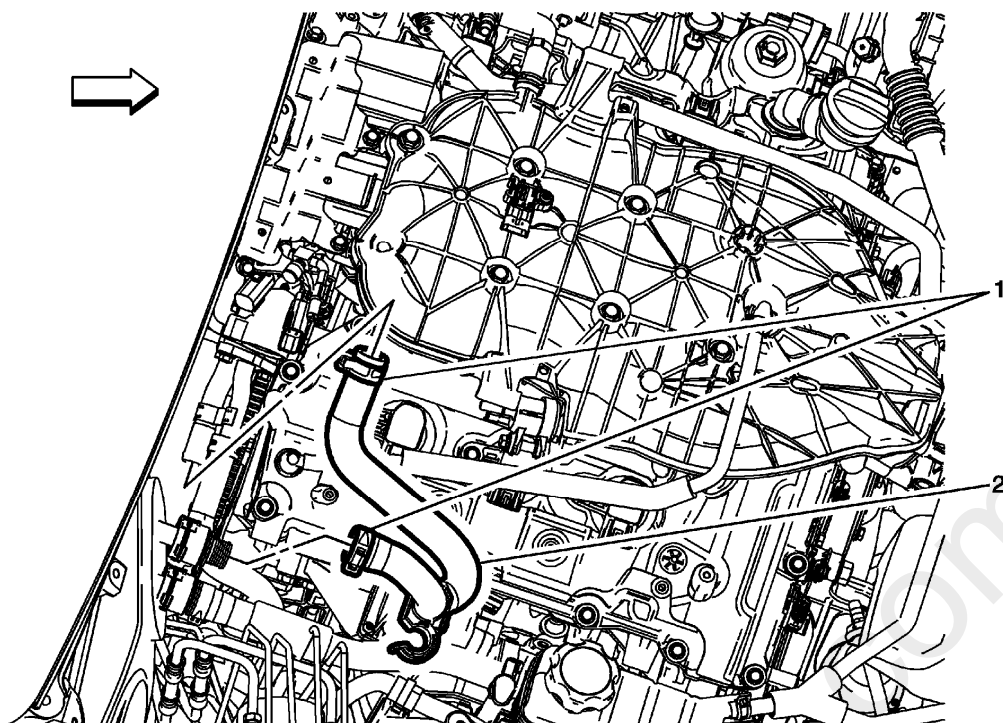


Fig. 128: Heater Inlet Hose (LFX)

Courtesy of GENERAL MOTORS COMPANY

Heater Inlet Hose Replacement (LFX)

Callout	Component Name
Preliminary Procedures 1. Remove the intake manifold insulator. Refer to <u>Intake Manifold Insulator Replacement</u> . 2. Remove the plenum front panel. Refer to <u>Plenum Front Panel Replacement</u> . 3. Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> .	
1	Heater Outlet Hose Clamp (Qty: 2) Procedure Reposition the heater outlet hose clamps using BO-38185 Hose Clamp Pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to <u>Special Tools</u> .
2	Heater Outlet Hose Procedure 1. Fill coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 2. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

HEATER INLET HOSE REPLACEMENT (LF3)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
2. Remove the right side catalytic converter. Refer to **Catalytic Converter Replacement - Right Side (LF3)** .

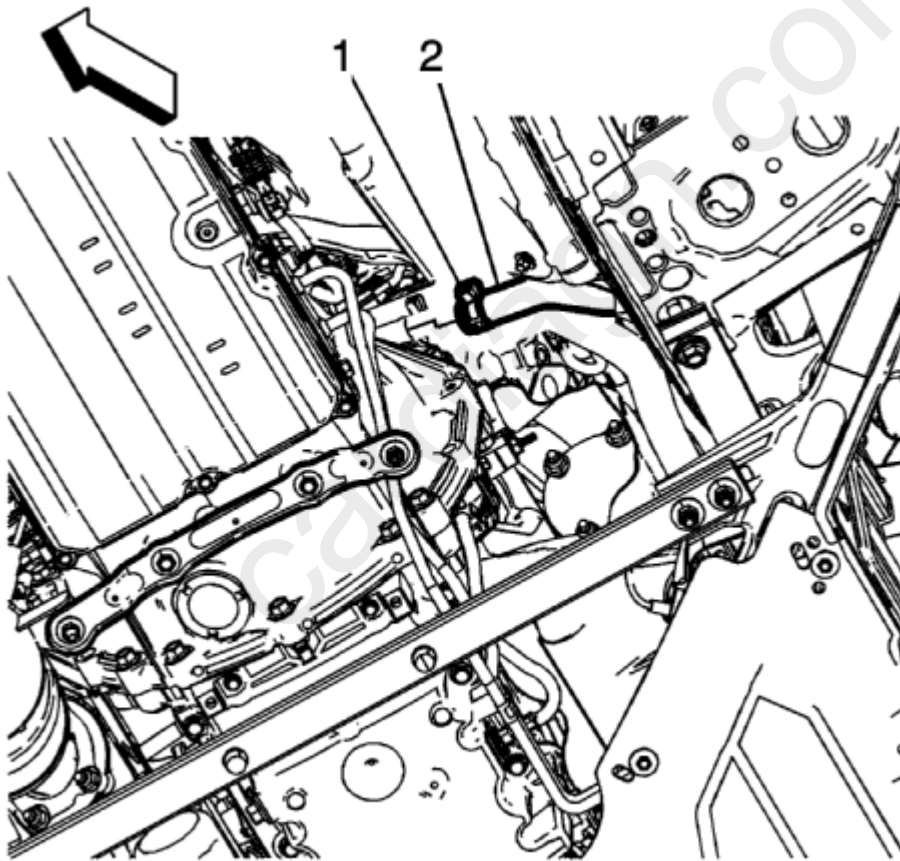


Fig. 129: Heater Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

3. Disengage tension on the heater inlet hose clamp (1) at the heater inlet pipe using **BO-38185** Hose Clamp Pliers.
4. Remove the heater inlet hose (2) and clamp (1) from the heater inlet pipe.

5. Lower the vehicle.
6. Remove the intake manifold cover. Refer to **Intake Manifold Cover Replacement (LF3)** .
7. Remove the right front end sheet metal diagonal brace. Refer to **Front End Sheet Metal Diagonal Brace Replacement - Right Side** .

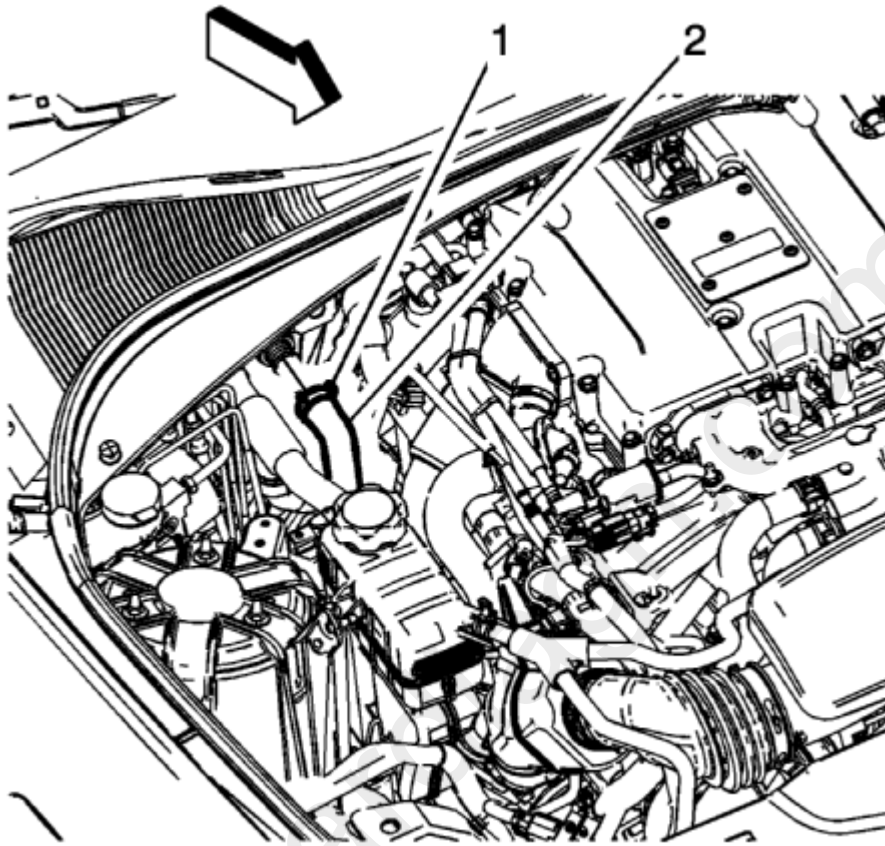


Fig. 130: Heater Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

8. Disengage tension on the heater inlet hose clamp (1) at the heater inlet hose connector using **BO-38185** Hose Clamp Pliers.
9. Remove the heater inlet hose (2) and clamp (1) from the heater inlet hose connector.
10. Remove the heater inlet hose (1) from the retainer.



Fig. 131: Heater Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

11. Remove the heater inlet hose (1) from the vehicle.

Installation Procedure

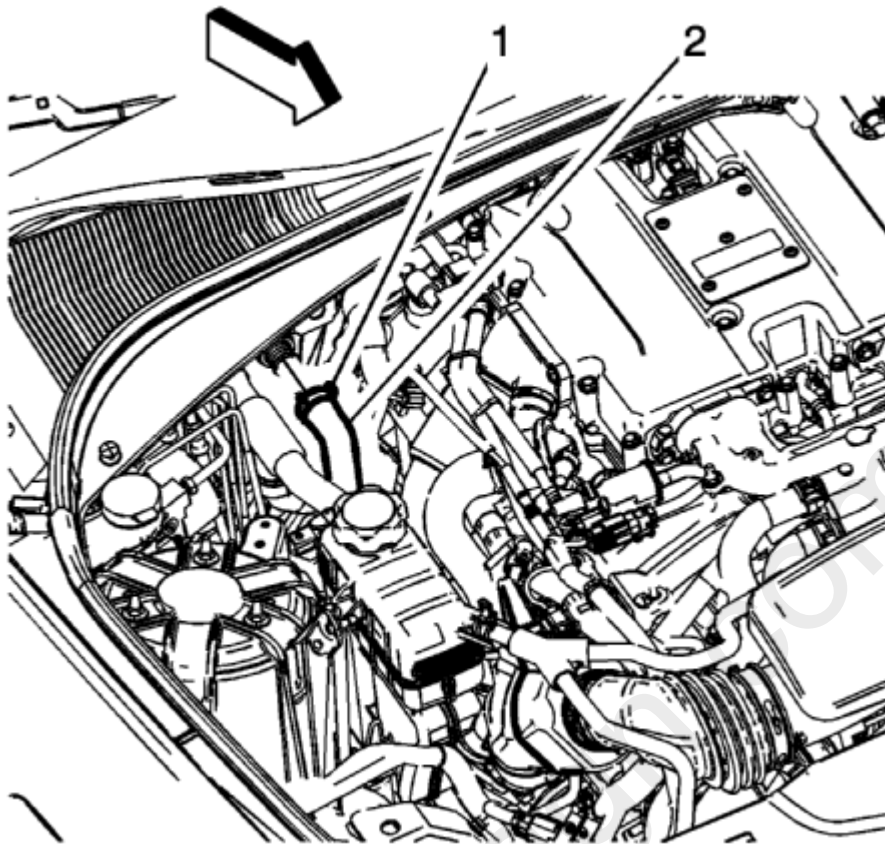


Fig. 132: Heater Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

NOTE: Lubricate the inside diameters of the heater inlet hose with clean coolant prior to installation.

1. Install the heater inlet hose (2) and clamp (1) to the heater inlet hose connector.
2. Engage tension on the heater inlet hose clamp (1) at the heater inlet hose connector using **BO-38185** Hose Clamp Pliers.
3. Install the heater inlet hose (1) to the retainer.
4. Install the right front end sheet metal diagonal brace. Refer to **Front End Sheet Metal Diagonal Brace Replacement - Right Side** .
5. Install the intake manifold cover. Refer to **Intake Manifold Cover Replacement (LF3)** .
6. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .



Fig. 133: Heater Inlet Hose

Courtesy of GENERAL MOTORS COMPANY

7. Install the heater inlet hose (2) clamp (1) to the heater inlet pipe.
8. Engage tension on the heater inlet hose clamp (1) at the heater inlet pipe using **BO-38185** Hose Clamp Pliers.
9. Install the right side catalytic converter. Refer to **Catalytic Converter Replacement - Right Side (LFX)** , **Catalytic Converter Replacement - Right Side (LF3)** .
10. Lower the vehicle.
11. Fill the engine cooling system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
12. Check the cooling system for leaks. Refer to **Cooling System Leak Testing** .

HEATER OUTLET HOSE REPLACEMENT (LTG)

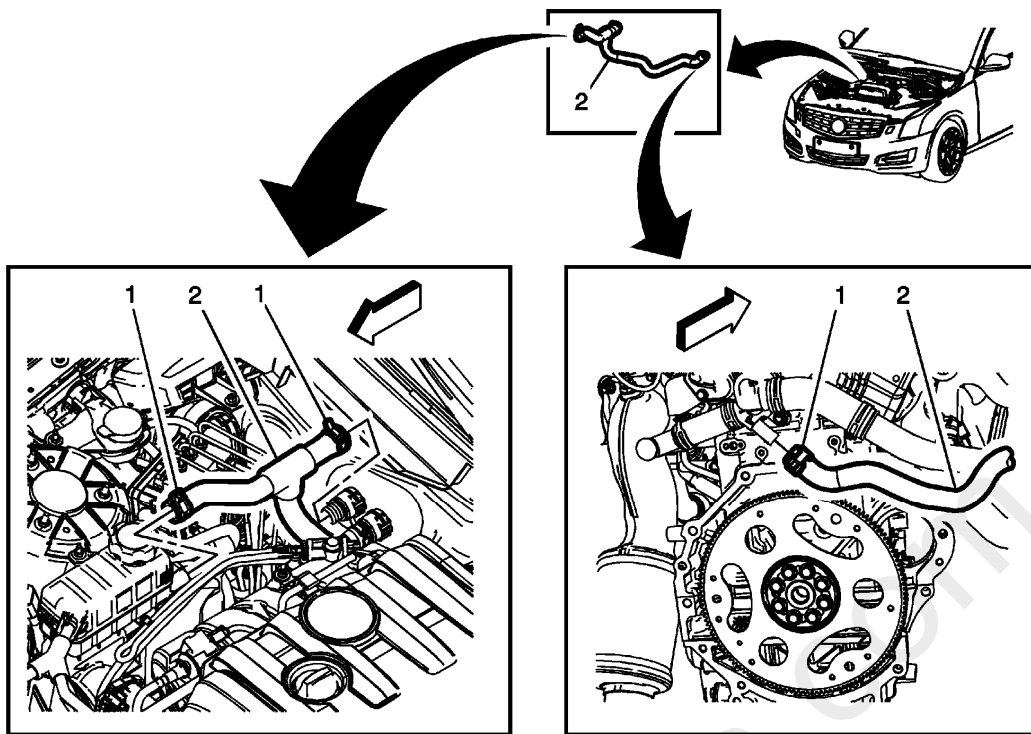


Fig. 134: Heater Outlet Hose (LTG)
 Courtesy of GENERAL MOTORS COMPANY

Heater Outlet Hose Replacement (LTG)

Callout	Component Name
Preliminary Procedures 1. Remove the fuel pump. Refer to <u>Fuel Pump Replacement</u> . 2. Partially drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Remove the radiator inlet pipe at the water outlet. Refer to <u>Radiator Inlet Pipe Replacement (LTG)</u> .	
1	Heater Outlet Hose Clamp (Qty: 3) Procedure Reposition the heater outlet hose clamps using BO-38185 Hose Clamp Pliers. Special Tools BO-38185 Hose Clamp Pliers For equivalent regional tools, refer to <u>Special Tools</u> .
2	Heater Outlet Hose Procedure 1. Fill coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 2. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

HEATER OUTLET HOSE REPLACEMENT (LFX)

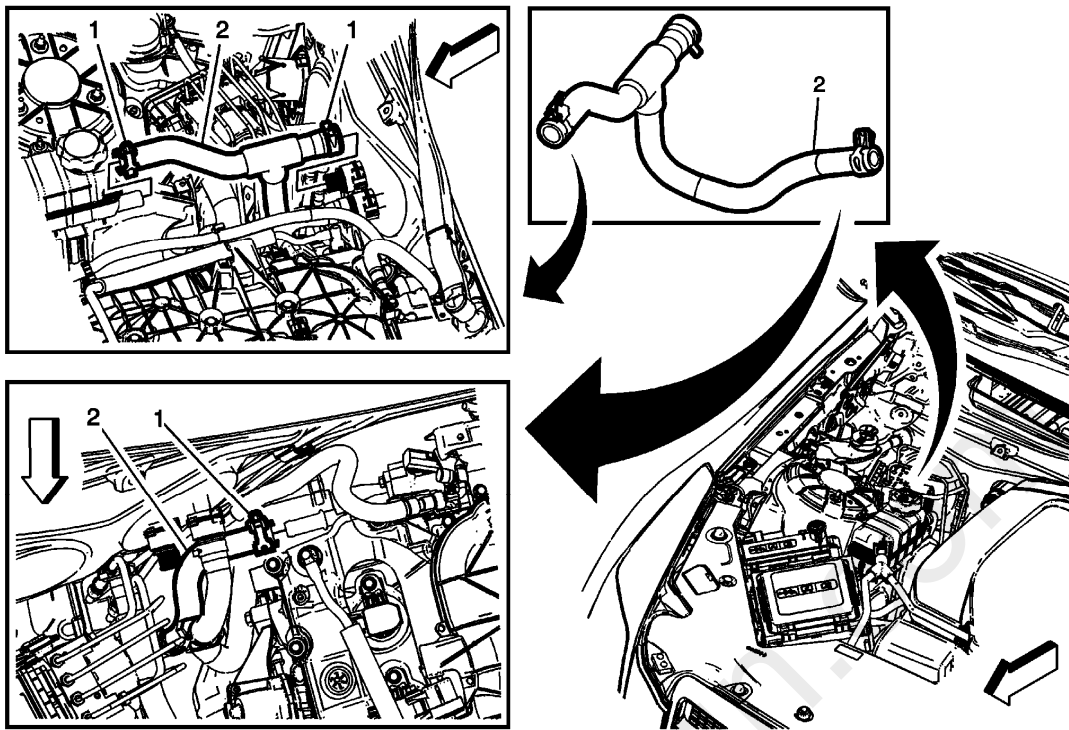


Fig. 135: Heater Outlet Hose (LFX)

Courtesy of GENERAL MOTORS COMPANY

Heater Outlet Hose Replacement (LFX)

Callout	Component Name
Preliminary Procedures	
1. Remove the plenum front panel. Refer to Plenum Front Panel Replacement .	
2. Partially drain the cooling system. Refer to Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) .	
3. Remove the intake manifold insulator. Refer to Intake Manifold Insulator Replacement .	
1	Heater Outlet Hose Clamp (Qty: 3) Procedure Reposition the heater outlet hose clamps using 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 coolant to the proper level. Refer to Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) .

2. Inspect cooling system for leaks. Refer to Cooling System Leak Testing .

HEATER OUTLET HOSE REPLACEMENT (LF3)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to Special Tools.

Removal Procedure

1. Drain the cooling system. Refer to Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) .
2. Remove the heater inlet hose from the heater inlet pipe. Refer to Heater Inlet Hose Replacement (LF3).

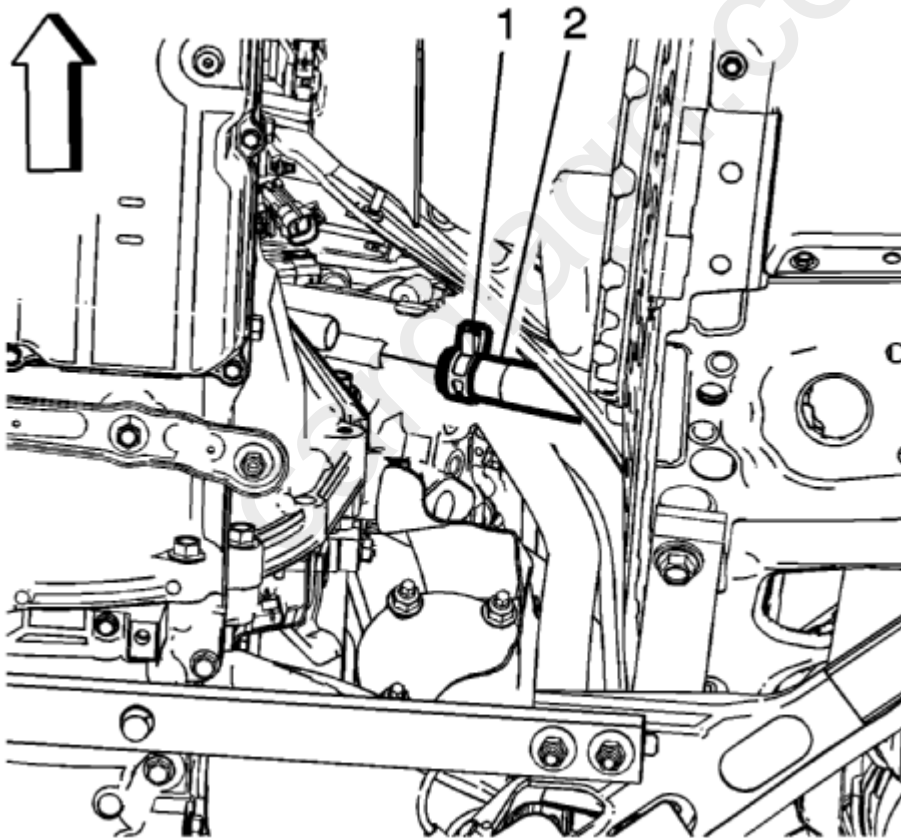


Fig. 136: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

3. Disengage tension on the heater outlet hose clamp (1) at the heater outlet pipe using **BO-38185** Hose Clamp Pliers.

4. Remove the heater outlet hose (2) and clamp (1) from the heater outlet pipe.
5. Lower the vehicle.
6. Remove the intake manifold cover. Refer to **Intake Manifold Cover Replacement (LF3)** .
7. Remove the right front end sheet metal diagonal brace. Refer to **Front End Sheet Metal Diagonal Brace Replacement - Right Side** .

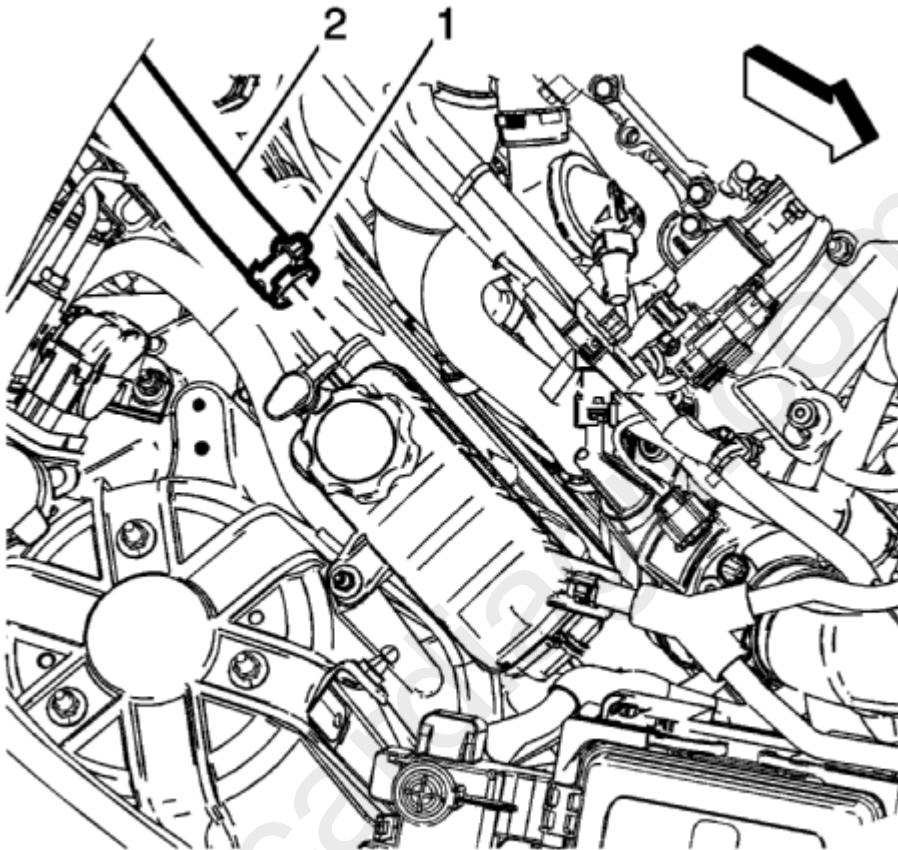


Fig. 137: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

8. Disengage tension on the heater outlet hose clamp (1) at the radiator surge tank using **BO-38185** Hose Clamp Pliers.
9. Remove the heater outlet hose (2) and clamp (1) from the radiator surge tank.

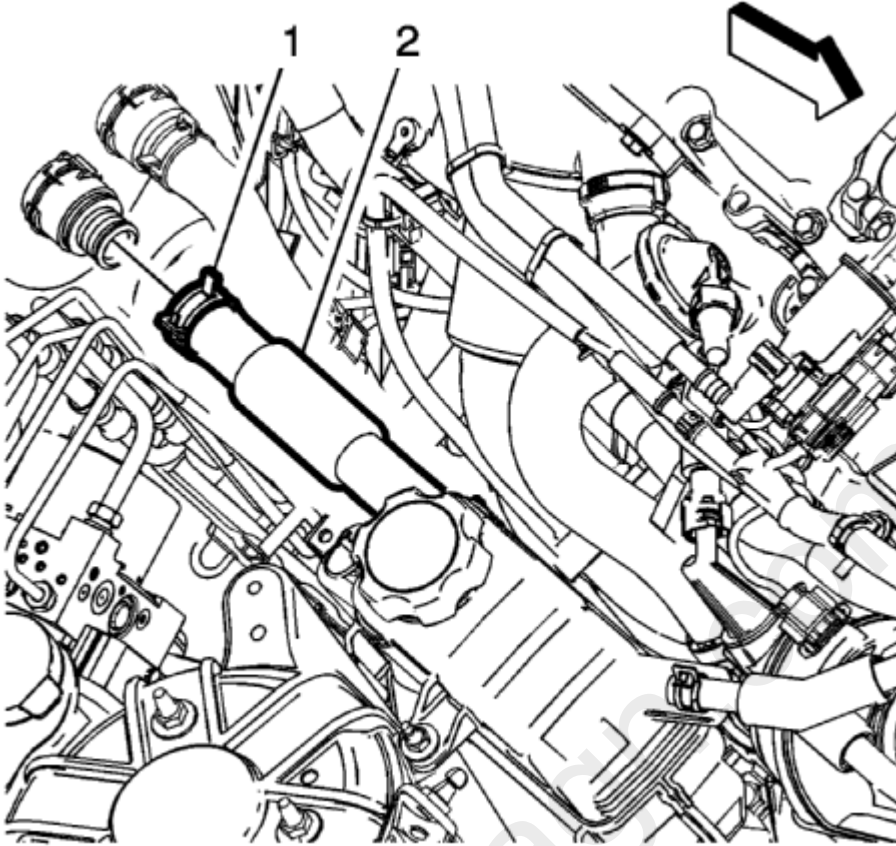


Fig. 138: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

10. Disengage tension on the heater outlet hose clamp (1) at the heater outlet hose connector using **BO-38185** Hose Clamp Pliers.
11. Remove the heater outlet hose (2) and clamp (1) from the heater outlet hose connector.
12. Remove the heater outlet hose (1) from the retainer.

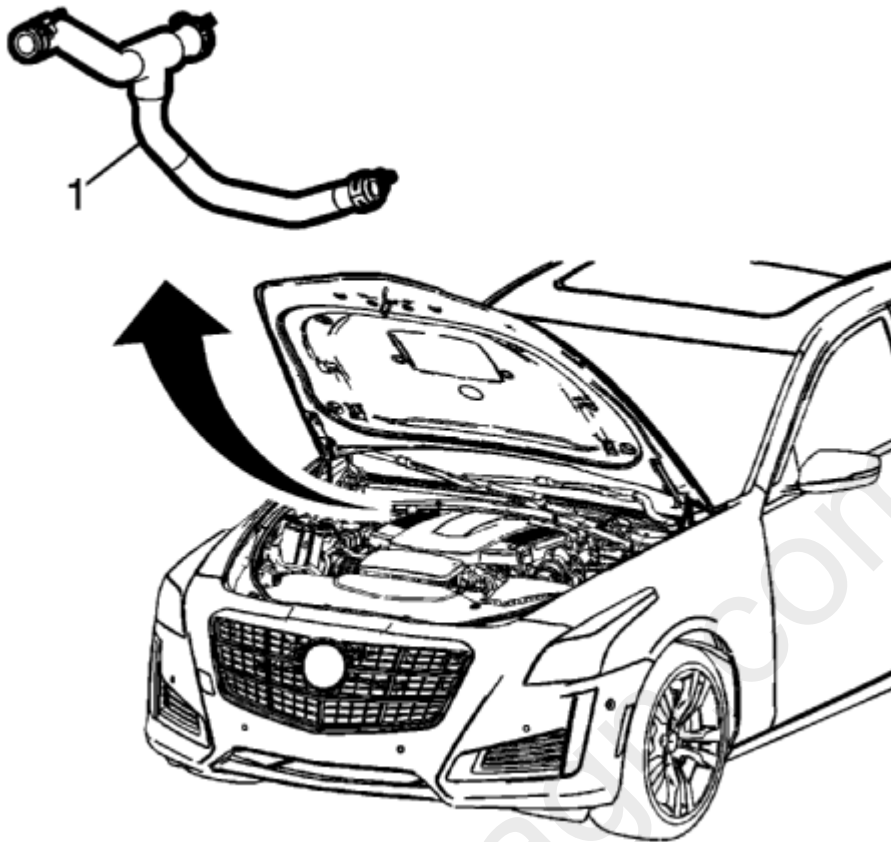


Fig. 139: Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

13. Remove the heater outlet hose (1) from the vehicle.

Installation Procedure

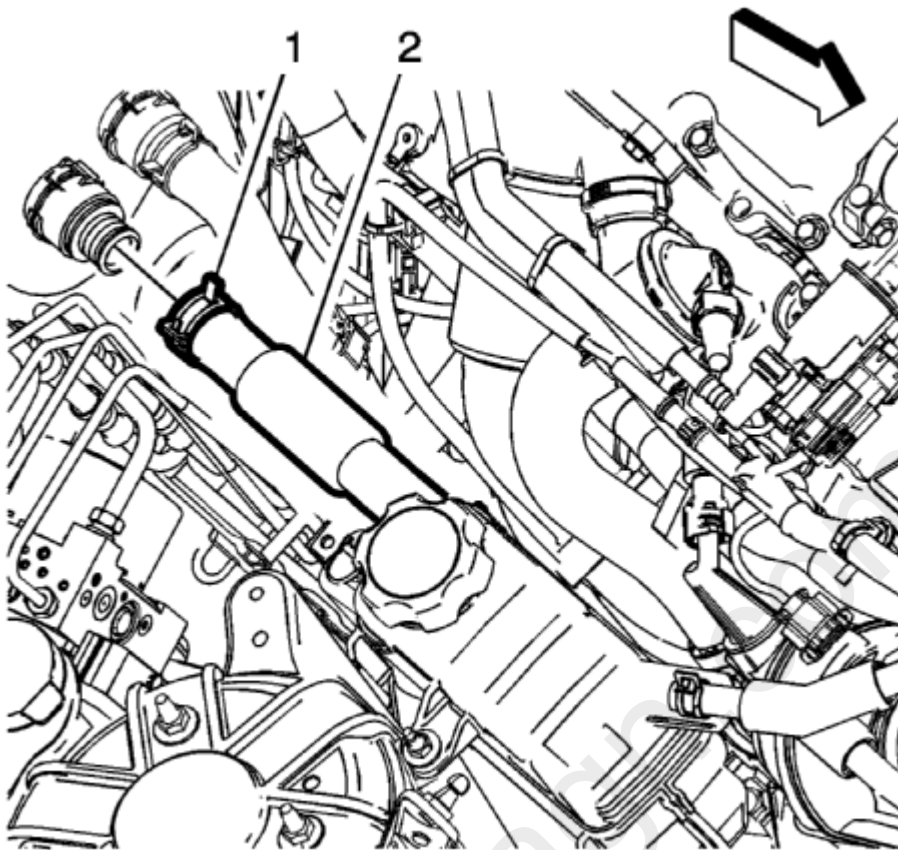


Fig. 140: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

NOTE: Lubricate the inside diameters of the heater outlet hose with clean coolant prior to installation.

1. Install the heater outlet hose (2) and clamp (1) to the heater outlet hose connector.
2. Engage tension on the heater outlet hose clamp (1) at the heater outlet hose connector using **BO-38185** Hose Clamp Pliers.

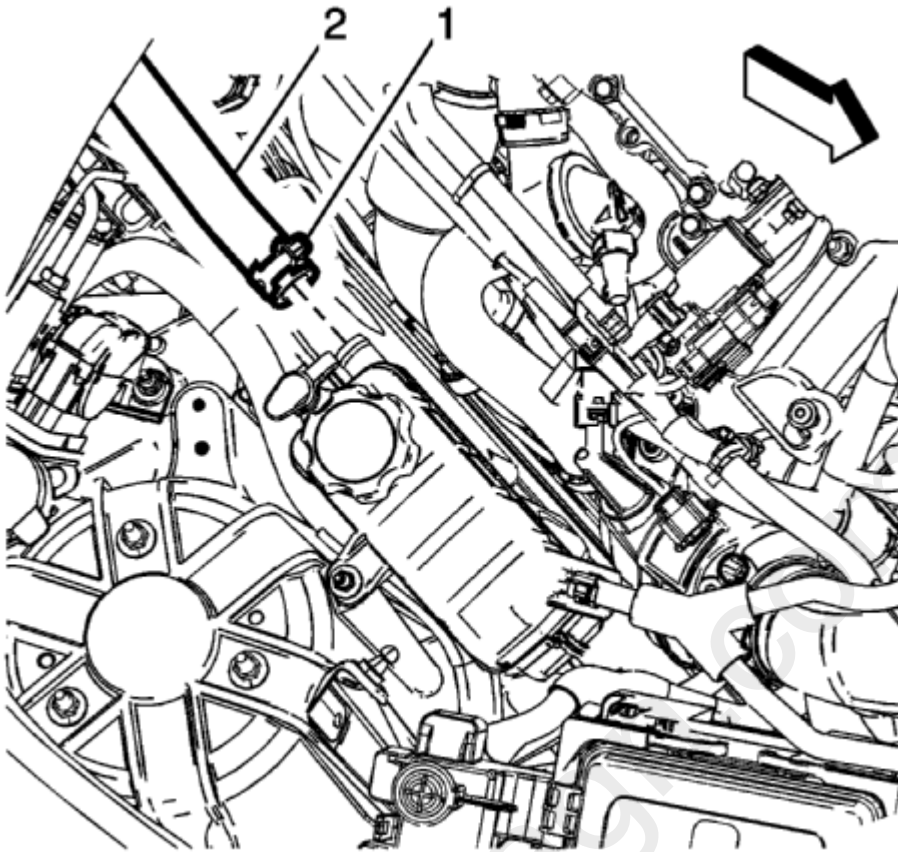


Fig. 141: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

3. Install the heater outlet hose (2) and clamp (1) to the radiator surge tank.
4. Engage tension on the heater outlet hose clamp (1) at the radiator surge tank using **BO-38185** Hose Clamp Pliers.
5. Install the heater outlet hose (1) to the retainer.
6. Install the right front end sheet metal diagonal brace. Refer to **Front End Sheet Metal Diagonal Brace Replacement - Right Side** .
7. Install the intake manifold cover. Refer to **Intake Manifold Cover Replacement (LF3)** .
8. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

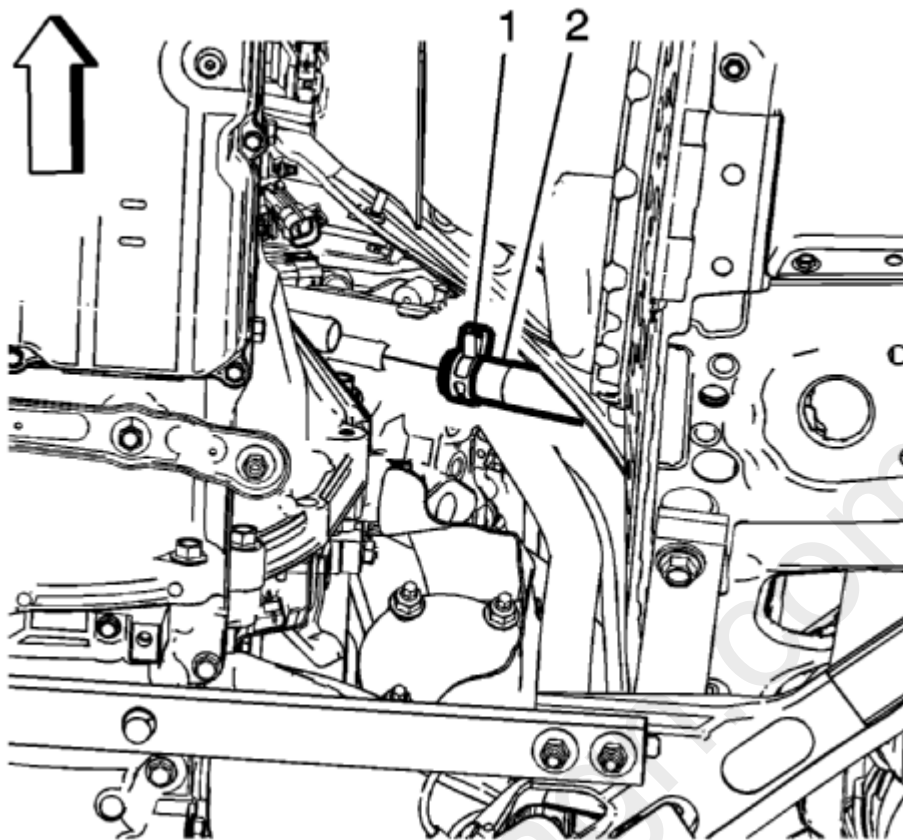


Fig. 142: Heater Outlet Hose

Courtesy of GENERAL MOTORS COMPANY

9. Install the heater outlet hose (2) clamp (1) to the heater outlet pipe.
10. Engage tension on the heater outlet hose clamp (1) at the heater outlet pipe using **BO-38185** Hose Clamp Pliers.
11. Install the heater inlet hose from the heater inlet pipe. Refer to **Heater Inlet Hose Replacement (LF3)**.
12. Lower the vehicle.
13. Fill the engine cooling system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
14. Check the cooling system for leaks. Refer to **Cooling System Leak Testing** .

HEATER CORE TUBE BRACKET REPLACEMENT

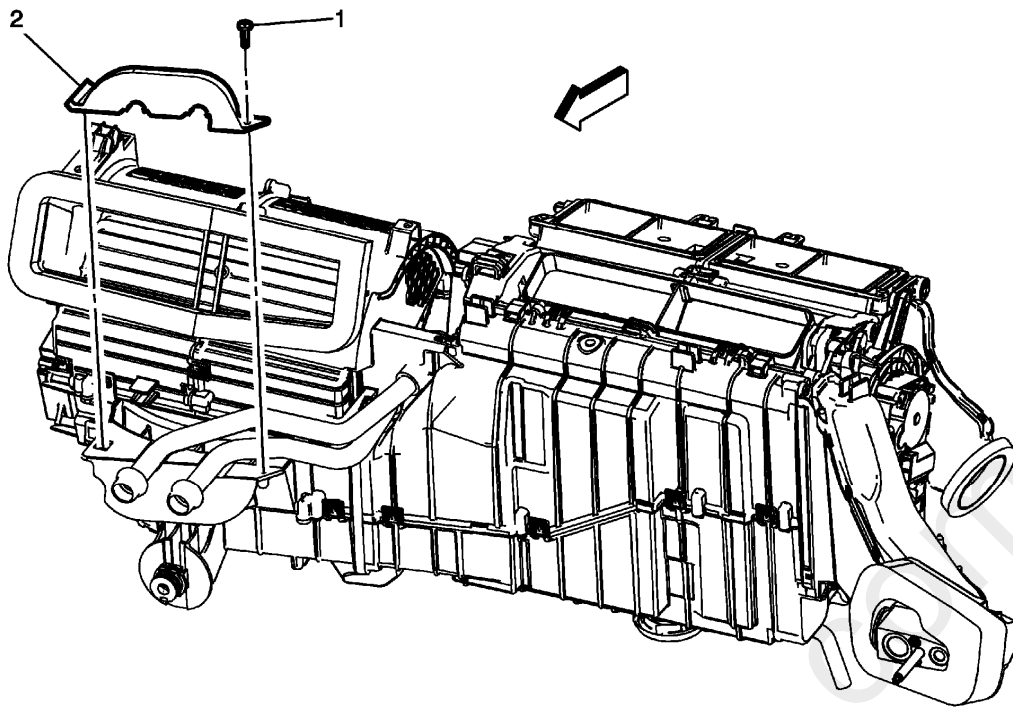


Fig. 143: Heater Core Tube Bracket
 Courtesy of GENERAL MOTORS COMPANY

Heater Core Tube Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LTG)</u> , <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX LF3)</u> .	
1	Heater Core Tube Bracket Fastener CAUTION: Refer to <u>Fastener Caution</u> .
2	Heater Core Tube Bracket

HEATER INLET HOSE CONNECTOR REPLACEMENT (LF3, LTG)

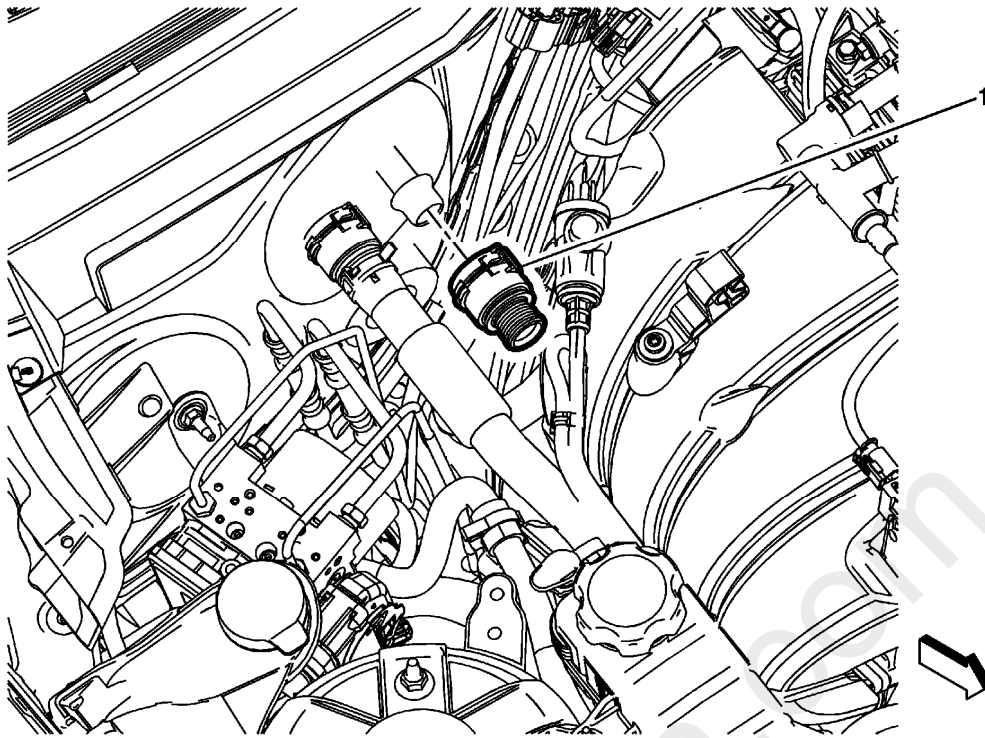


Fig. 144: Heater Inlet Hose Connector (LF3, LTG)

Courtesy of GENERAL MOTORS COMPANY

Heater Inlet Hose Connector Replacement (LF3, LTG)

Callout	Component Name
Preliminary Procedures 1. Drain the engine coolant. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 2. Disconnect the heater inlet hose from the heater inlet hose connector. Refer to <u>Heater Inlet Hose Replacement (LTG)</u>, <u>Heater Inlet Hose Replacement (LF3)</u>.	
1	Heater Inlet Hose Connector Procedure 1. Release the heater inlet hose connector retaining clip. 2. Fill the coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

HEATER INLET HOSE CONNECTOR REPLACEMENT (LFX)

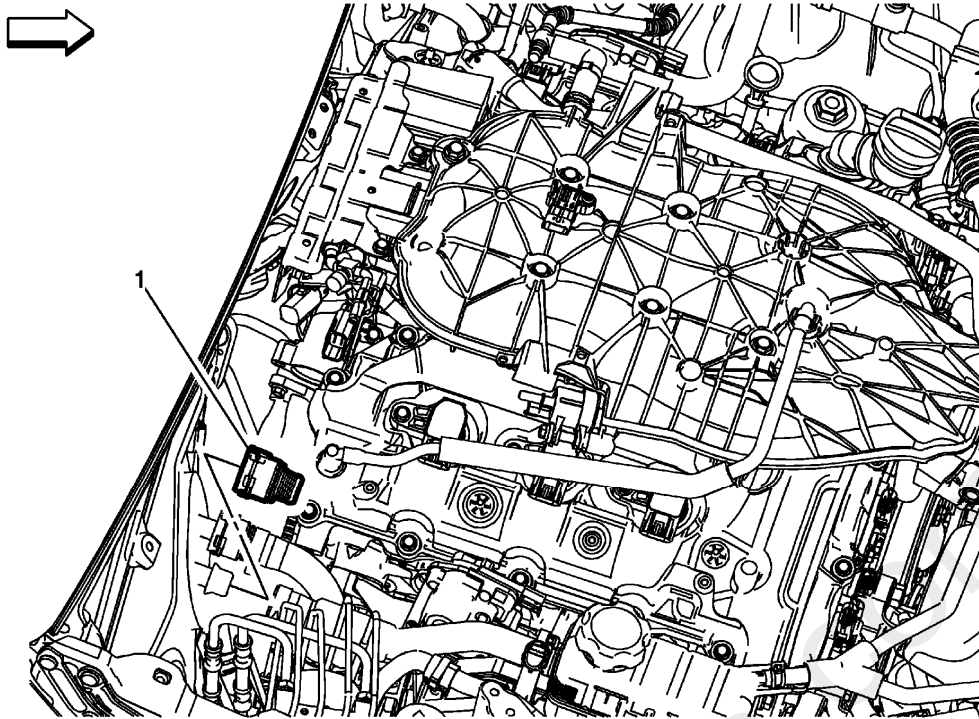


Fig. 145: Heater Inlet Hose Connector (LFX)
 Courtesy of GENERAL MOTORS COMPANY

Heater Inlet Hose Connector Replacement (LFX)

Callout	Component Name
Preliminary Procedures 1. Remove the plenum front panel. Refer to <u>Plenum Front Panel Replacement</u> . 2. Drain the engine coolant. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Disconnect the heater inlet hose from the heater inlet hose connector. Refer to <u>Heater Inlet Hose Replacement (LFX)</u>	
1	Heater Inlet Hose Connector Procedure 1. Release the heater inlet hose connector retaining clip. 2. Fill the coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

HEATER OUTLET HOSE CONNECTOR REPLACEMENT (LTG)

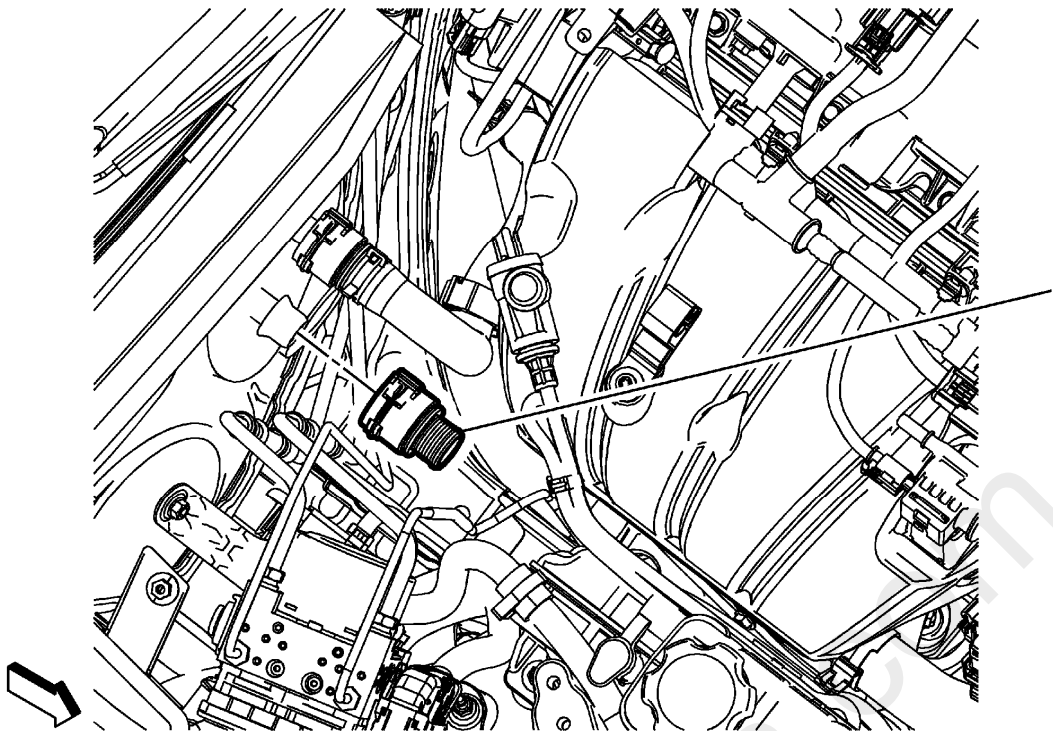


Fig. 146: Heater Outlet Hose Connector (LTG)

Courtesy of GENERAL MOTORS COMPANY

Heater Outlet Hose Connector Replacement (LTG)

Callout	Component Name
Preliminary Procedures 1. Drain the engine coolant. Refer to Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) . 2. Disconnect the heater outlet hose from the heater outlet hose connector. Refer to Heater Outlet Hose Replacement (LTG).	
1	Heater Outlet Hose Connector Procedure 1. Release the heater outlet hose connector retaining clip. 2. Fill the coolant to the proper level. Refer to Cooling System Draining and Filling (Static Fill) , Cooling System Draining and Filling (GE 47716) . 3. Inspect cooling system for leaks. Refer to Cooling System Leak Testing .

HEATER OUTLET HOSE CONNECTOR REPLACEMENT (LF3, LFX)

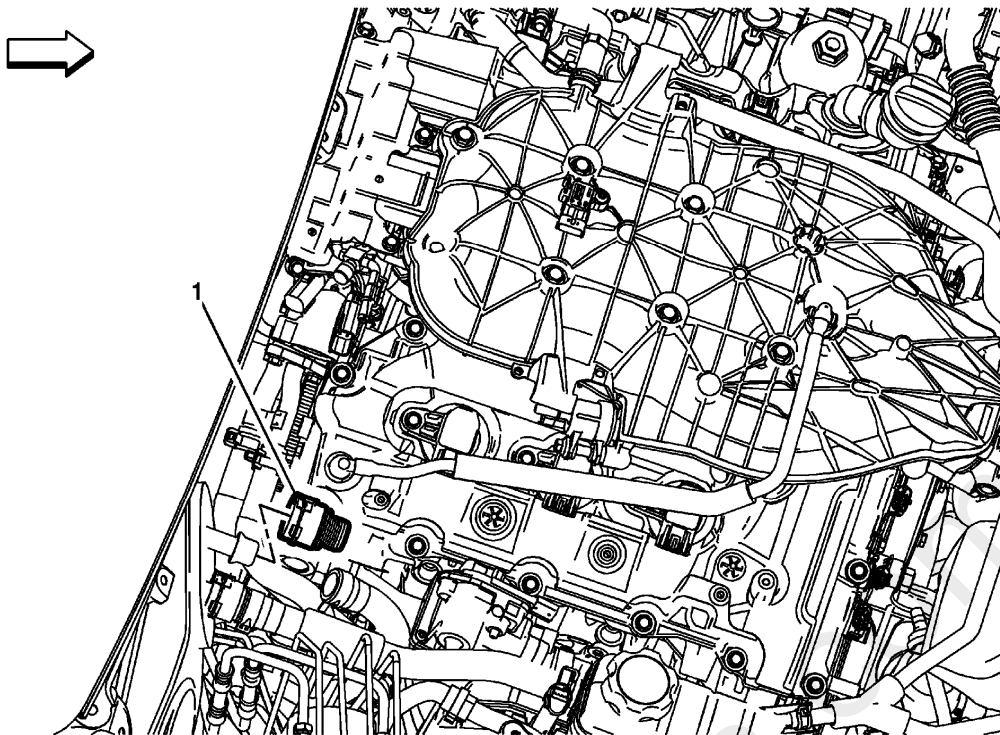


Fig. 147: Heater Outlet Hose Connector (LF3, LFX)

Courtesy of GENERAL MOTORS COMPANY

Heater Outlet Hose Connector Replacement (LF3, LFX)

Callout	Component Name
Preliminary Procedures 1. Remove the plenum front panel. Refer to <u>Plenum Front Panel Replacement</u> . 2. Drain the engine coolant. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Disconnect the heater outlet hose from the heater outlet hose connector. Refer to <u>Heater Outlet Hose Replacement (LFX)</u>, <u>Heater Outlet Hose Replacement (LF3)</u>	
1	Heater Outlet Hose Connector Procedure 1. Release the heater outlet hose connector retaining clip. 2. Fill the coolant to the proper level. Refer to <u>Cooling System Draining and Filling (Static Fill)</u> , <u>Cooling System Draining and Filling (GE 47716)</u> . 3. Inspect cooling system for leaks. Refer to <u>Cooling System Leak Testing</u> .

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

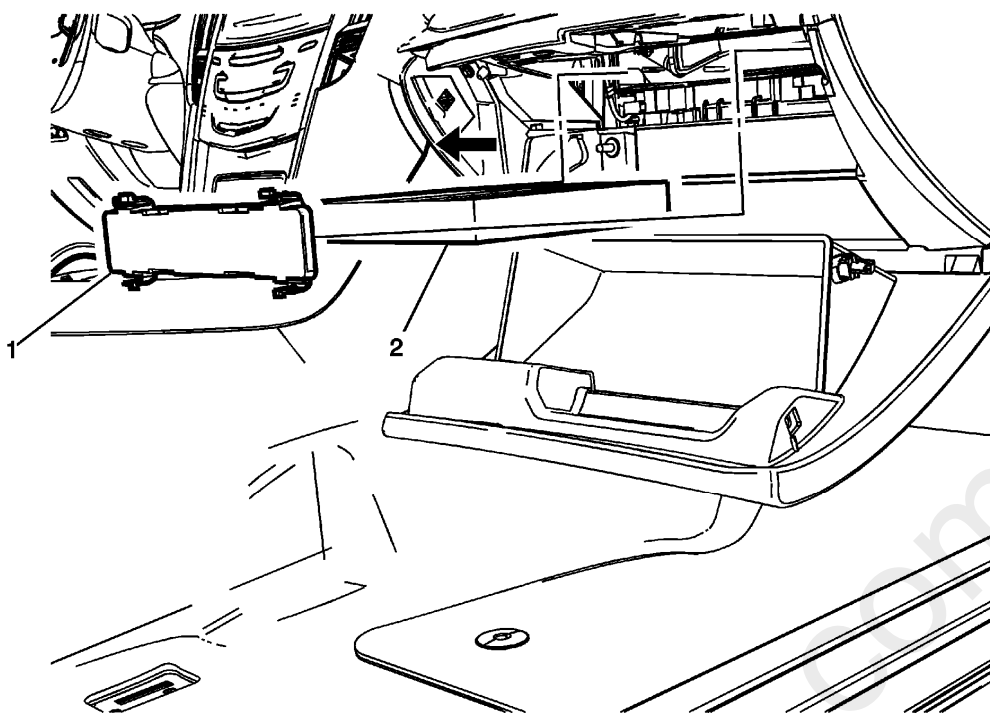


Fig. 148: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS COMPANY

Passenger Compartment Air Filter Replacement

Callout	Component Name
Preliminary Procedure Remove instrument panel compartment shelf. Refer to <u>Instrument Panel Compartment Shelf Replacement</u> .	
1	Passenger Compartment Air Filter Cover
2	Passenger Compartment Air Filter

AIR INLET HOUSING REPLACEMENT

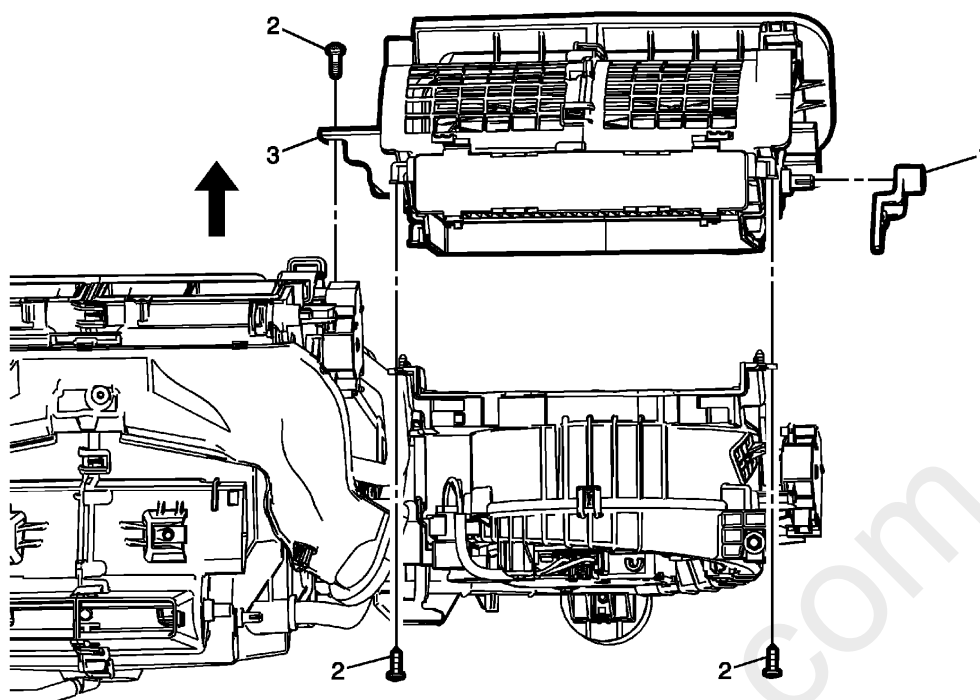


Fig. 149: Air Inlet Housing

Courtesy of GENERAL MOTORS COMPANY

Air Inlet Housing Replacement

Call out	Component Name
Preliminary Procedures	
1. Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LTG)</u>, <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX LF3)</u>. 2. Disconnect the electrical connectors as necessary. 3. Remove the heater core tube bracket only. Refer to <u>Blower Case Replacement</u>.	
1	Air Inlet Valve Lever
2	Air Inlet Housing Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> .
	Air Inlet Housing Assembly Procedures 1. Remove the passenger compartment air filter cover and air filter. 2. Unlatch the four latches to remove the air inlet housing assembly from the blower

3

case.

3. Transfer all part as necessary.

NOTE:

There is a hidden latch located between the air inlet housing and the air conditioning evaporator case assembly.

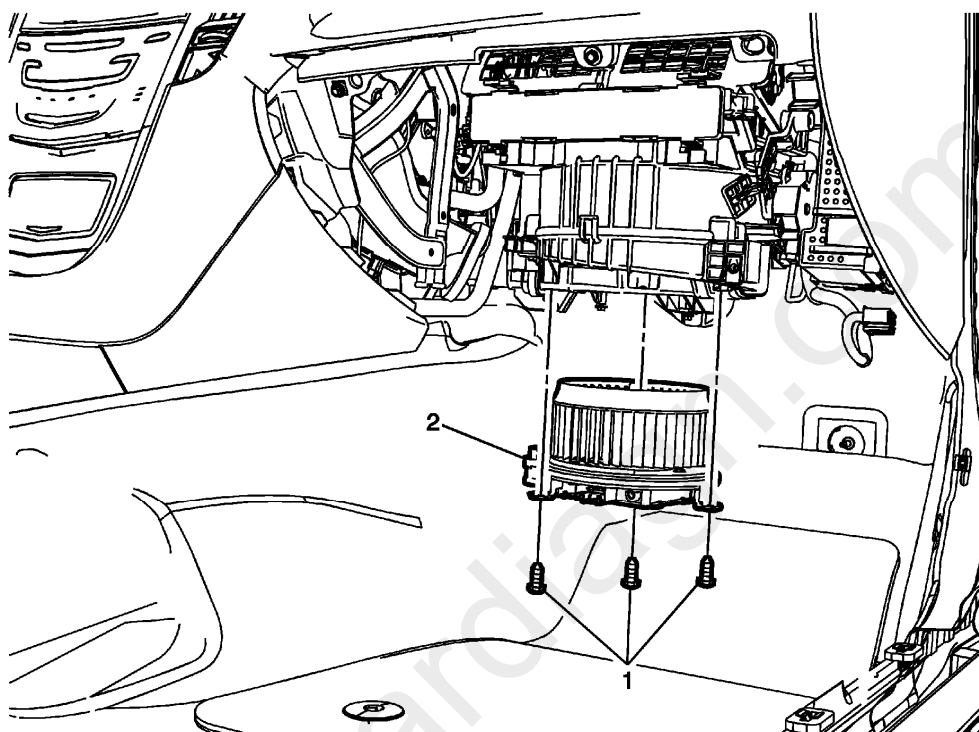
BLOWER MOTOR REPLACEMENT

Fig. 150: Blower Motor

Courtesy of GENERAL MOTORS COMPANY

Blower Motor Replacement

Call out	Component Name
Preliminary Procedures	
1. Remove the right side front floor air outlet duct. Refer to <u>Floor Front Air Outlet Duct Replacement - Right Side.</u> 2. Remove the passenger side inflatable restraint instrument panel lower module assembly. Refer to <u>Instrument Panel Lower Airbag Replacement - Passenger Side .</u> 3. Remove the harness retaining screw form the blower motor and reposition the wiring harness out of the way.	
	Blower Motor Fastener (Qty: 3)

1	CAUTION: Refer to <u>Fastener Caution</u> .
2	Blower Motor Assembly Procedure Disconnect the blower motor connector.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - LEFT SIDE

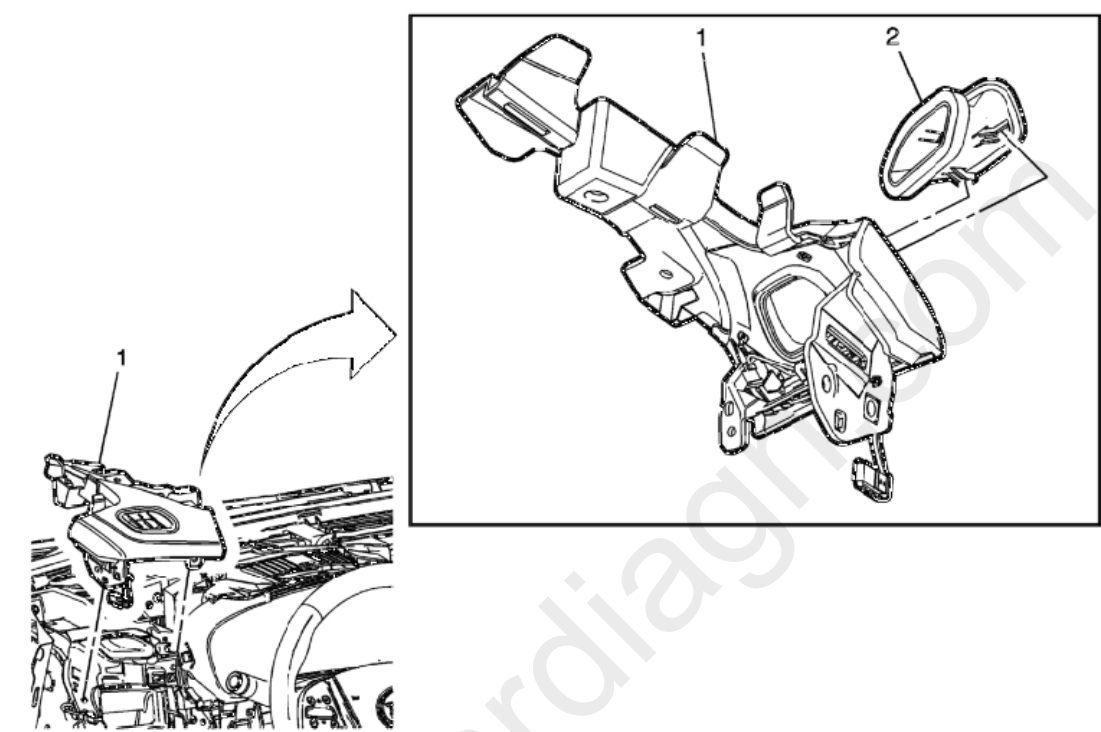


Fig. 151: Side Window Defogger Outlet Grille - Left Side
Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Grille Replacement - Left Side

Callout	Component Name
1	Instrument Panel Trim Pad - Driver Side Procedure Refer to <u>Instrument Panel Trim Pad Replacement (Driver Side)</u> .
2	Side Window Defogger Outlet Grille - Left Side Procedure Use a suitable tool to release the tabs securing the outlet grille from the instrument panel trim pad.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - RIGHT SIDE

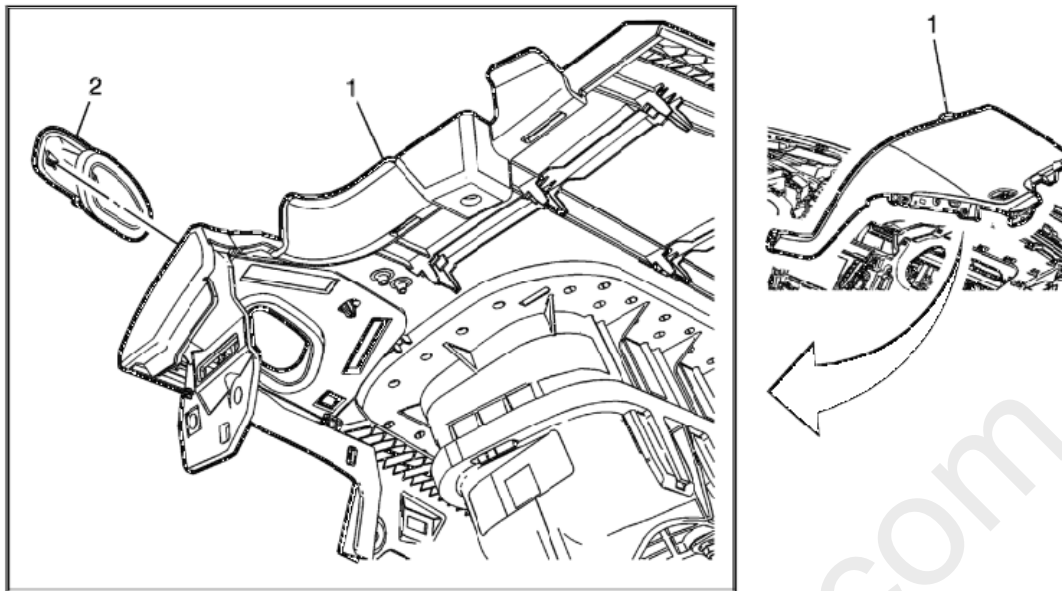


Fig. 152: Side Window Defogger Outlet Grille - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Grille Replacement - Right Side

Callout	Component Name
1	Instrument Panel Trim Pad - Passenger Side Procedure Refer to <u>Instrument Panel Trim Pad Replacement (Passenger Side)</u> .
2	Side Window Defogger Outlet Grille - Right Side Procedure Use a suitable tool to release the tabs securing the outlet grille from the instrument panel trim pad.

AIR DISTRIBUTOR CASE REPLACEMENT

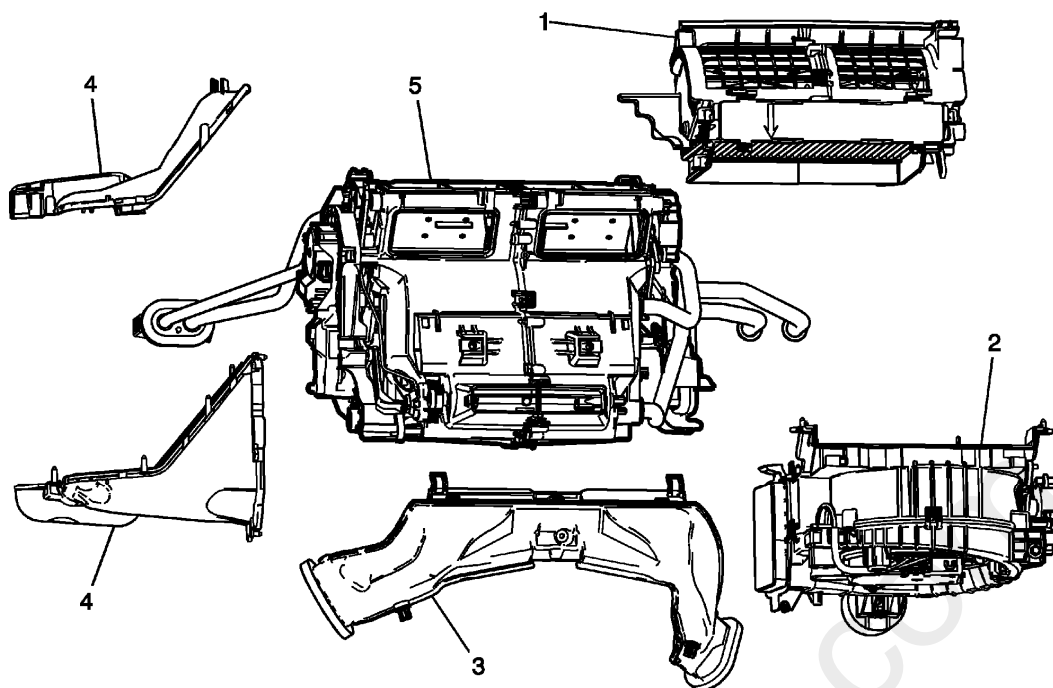


Fig. 153: Air Distributor Case
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Case Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LTG)</u> , <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX LF3)</u> .	
1	Air Inlet Housing Assembly Procedure Refer to <u>Air Inlet Housing Replacement</u> .
2	Blower Case Assembly Procedure Refer to <u>Blower Case Replacement</u> .
3	Air Distributor Lower Duct Assembly Procedure Refer to <u>Air Distributor Lower Duct Replacement</u> .
4	Air Conditioning Evaporator Tube Upper and Lower Cover Procedure Refer to <u>Air Conditioning Evaporator Tube Cover Replacement</u> .
5	Air Distributor Case Assembly Procedure Transfer all necessary components.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - LEFT SIDE

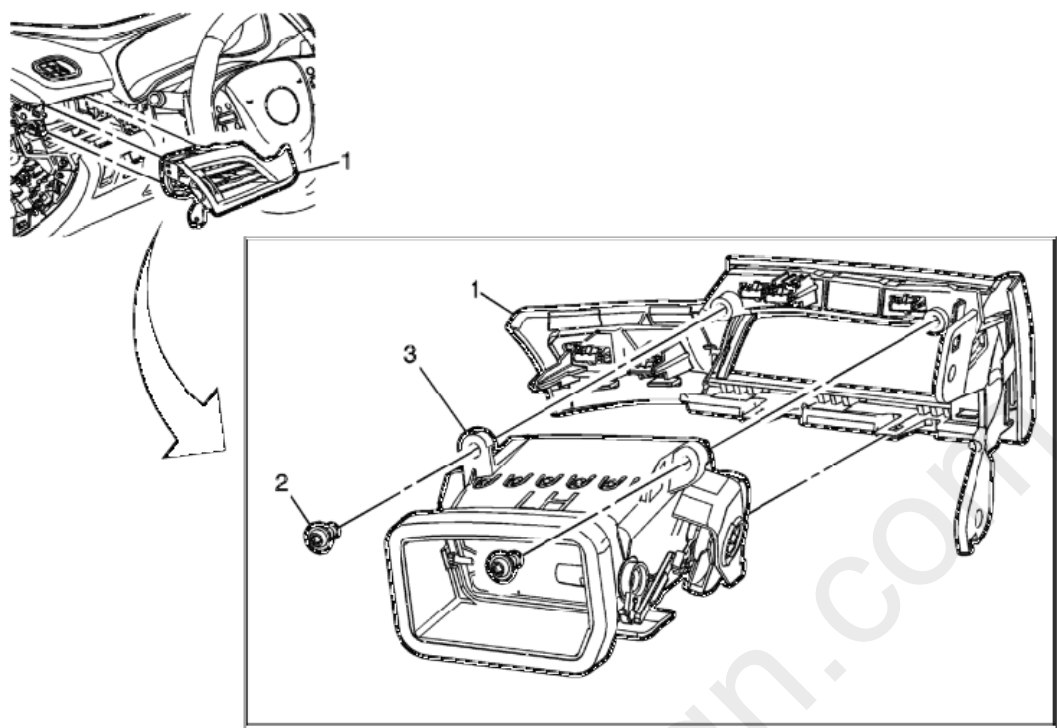


Fig. 154: Instrument Panel Outer Air Outlet - Left Side
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Replacement - Left Side

Callout	Component Name
1	Instrument Panel Trim Plate Applique Procedure Refer to <u>Instrument Panel Trim Plate Applique Replacement - Left Side</u> .
2	Instrument Panel Outer Air Outlet Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 (13 lb in)
3	Instrument Panel Outer Air Outlet

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT

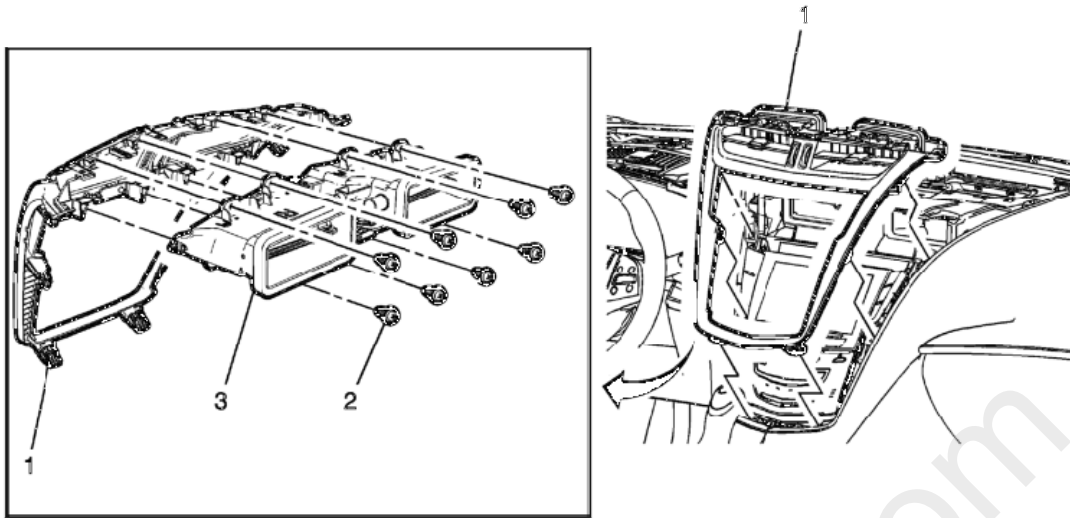


Fig. 155: Instrument Panel Center Air Outlet
 Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Center Air Outlet Replacement

Callout	Component Name
1	Instrument Panel Trim Plate Procedure Refer to <u>Instrument Panel Trim Plate Replacement</u> .
2	Instrument Panel Center Air Outlet Bracket Bolt (Qty: 8) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 (13 lb in)
3	Instrument Panel Center Air Outlet

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - RIGHT SIDE

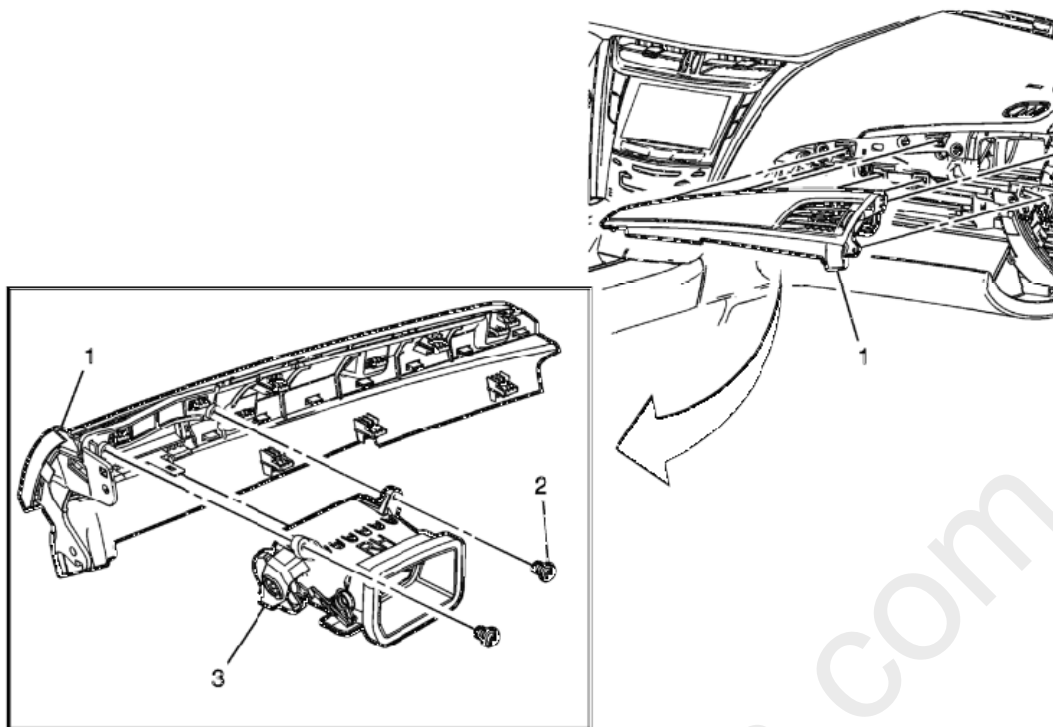


Fig. 156: Instrument Panel Outer Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Replacement - Right Side

Callout	Component Name
1	Instrument Panel Trim Plate Applique Procedure Refer to <u>Instrument Panel Trim Plate Applique Replacement - Right Side</u> .
2	Instrument Panel Outer Air Outlet Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 (13 lb in)
3	Instrument Panel Outer Air Outlet

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

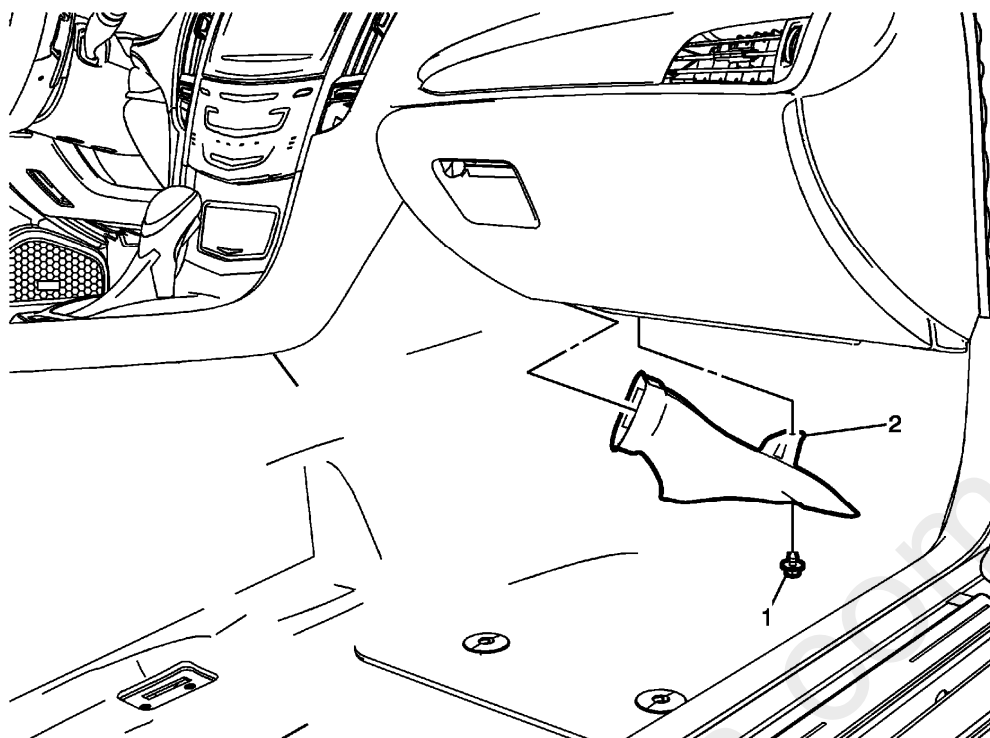


Fig. 157: Floor Front Air Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Floor Front Air Outlet Duct Replacement - Right Side

Call out	Component Name
Preliminary Procedure Remove the right side instrument panel insulator panel. Refer to <u>Instrument Panel Lower Trim Panel Insulator Replacement - Right Side</u> .	
1	Right Side Front Floor Air Outlet Duct Fastener CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (22 lb in)
2	Front Floor Air Outlet Duct - Right Side

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

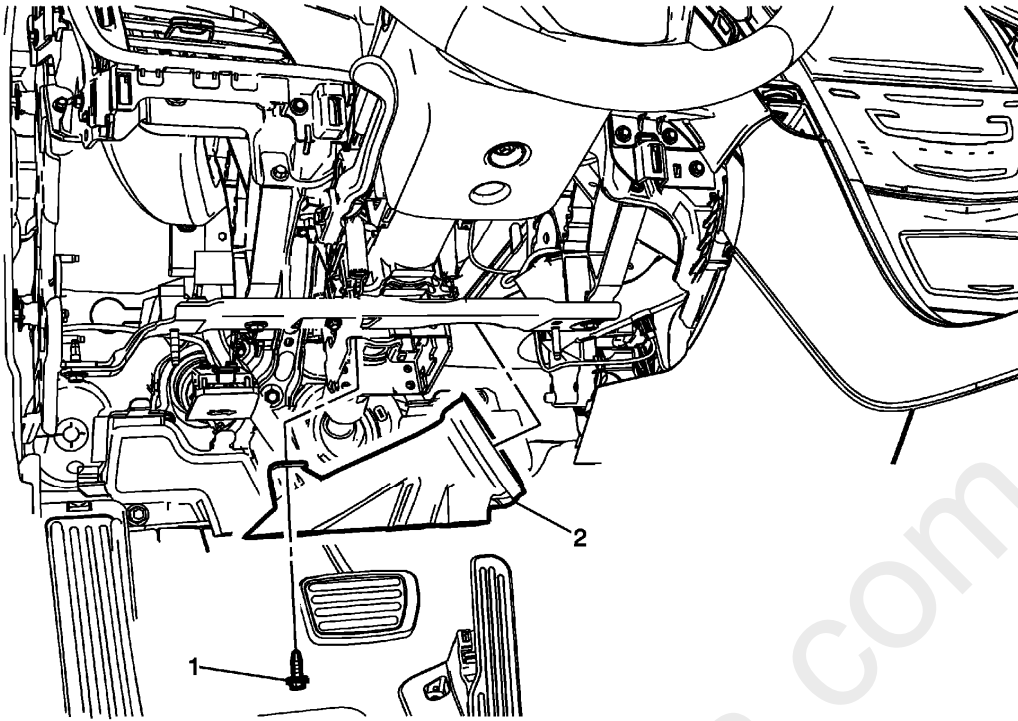


Fig. 158: Floor Front Air Outlet Duct Replacement - Left Side
Courtesy of GENERAL MOTORS COMPANY

Floor Front Air Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel knee bolster. Refer to <u>Instrument Panel Knee Bolster Replacement</u> .	
1	Left Side Front Floor Air Outlet Duct Fastener CAUTION: Refer to <u>Fastener Caution</u> .
2	Front Floor Air Outlet Duct - Left Side

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT

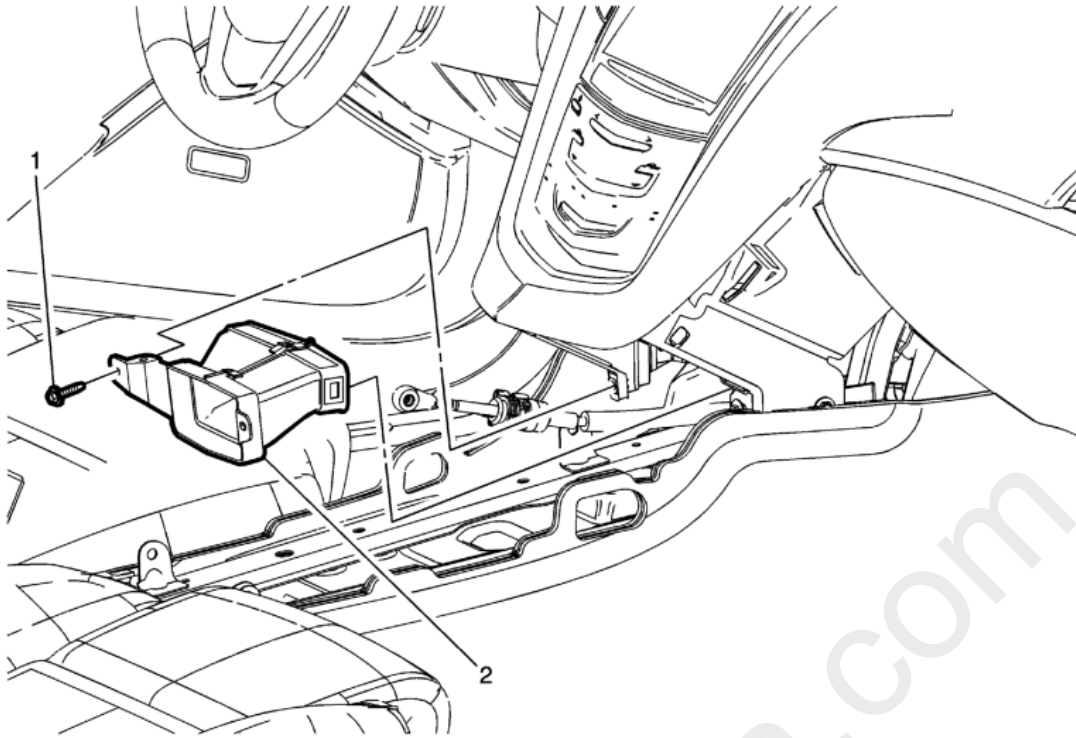


Fig. 159: Front Floor Console Rear Air Duct
 Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Rear Air Duct Replacement

Call out	Component Name
Preliminary Procedure	
Remove the front floor console assembly. Refer to Front Floor Console Replacement .	
1	Front Floor Console Rear Air Duct Fastener CAUTION: Refer to Fastener Caution . Tighten 2.5 (22 lb in)
2	Front Floor Console Rear Air Duct Procedures 1. Disconnect the harness retainer from the front floor console rear air duct. 2. Unsnap the front floor console rear air duct from the heater and air conditioning evaporator and blower module assembly. 3. Maneuver the front floor console rear air duct out from behind the instrument panel.

FRONT FLOOR CONSOLE REAR AIR OUTLET REPLACEMENT

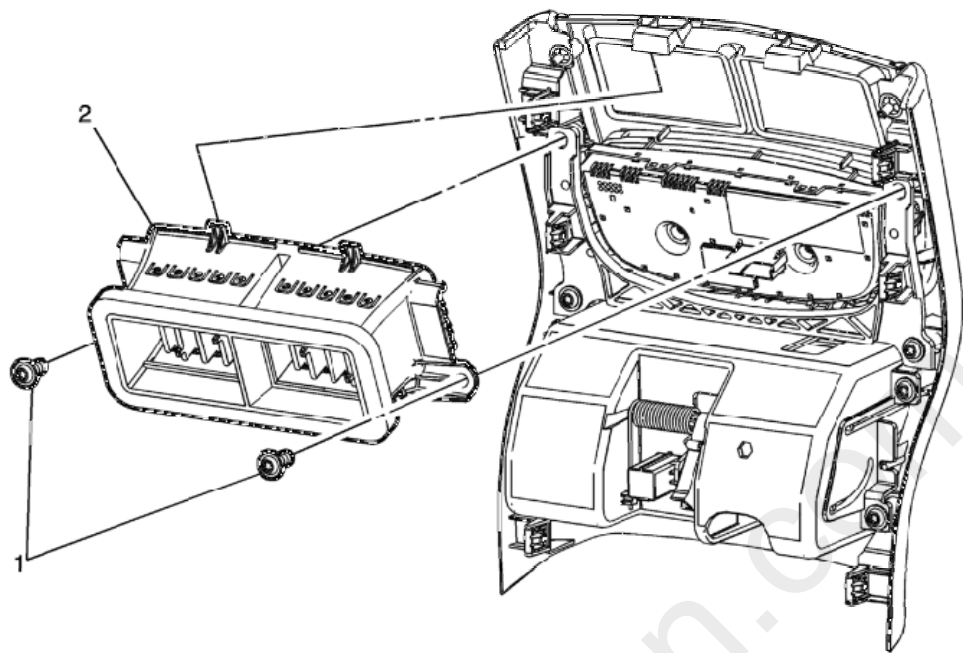


Fig. 160: Front Floor Console Rear Air Outlet
Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Rear Air Outlet Replacement

Callout	Component Name
Preliminary Procedure Remove the front floor console rear trim panel. Refer to Front Floor Console Rear Trim Panel Replacement .	
1	Front Floor Console Rear Compartment Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.5 (22 lb in)
2	Front Floor Console Rear Air Outlet

WINDSHIELD DEFROSTER NOZZLE DUCT REPLACEMENT

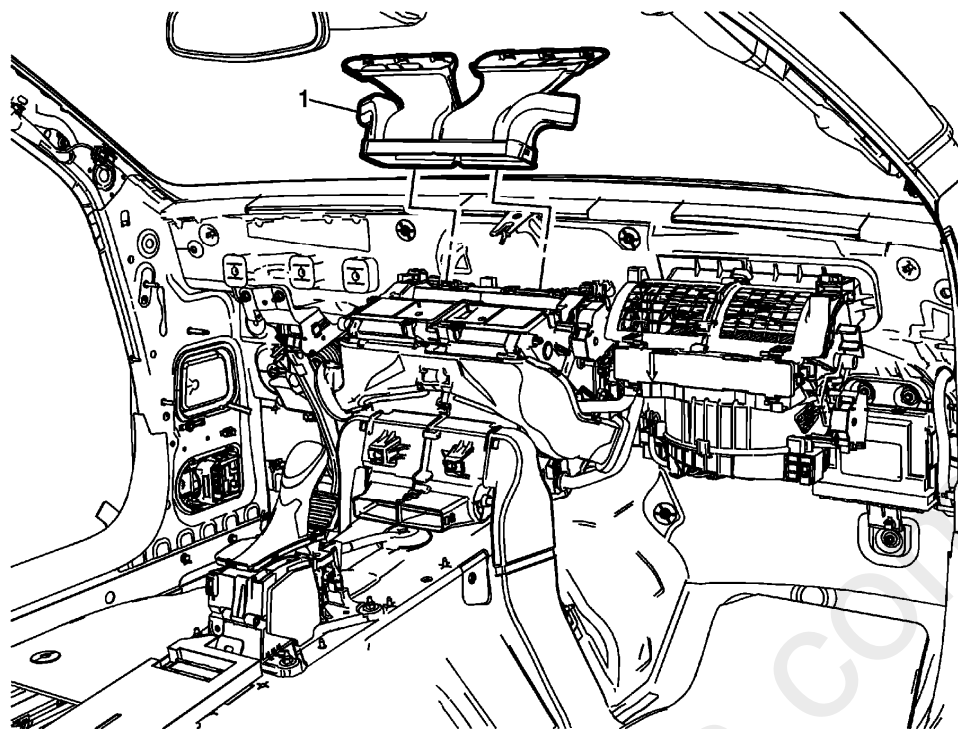


Fig. 161: Windshield Defroster Nozzle Duct
 Courtesy of GENERAL MOTORS COMPANY

Windshield Defroster Nozzle Duct Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the air distributor center duct. Refer to <u>Air Distributor Center Duct Replacement.</u>	
2. Remove the instrument panel tie bar assembly. Refer to <u>Instrument Panel Tie Bar Replacement .</u>	
1	Windshield Defroster Nozzle Duct

AIR DISTRIBUTOR CENTER DUCT REPLACEMENT

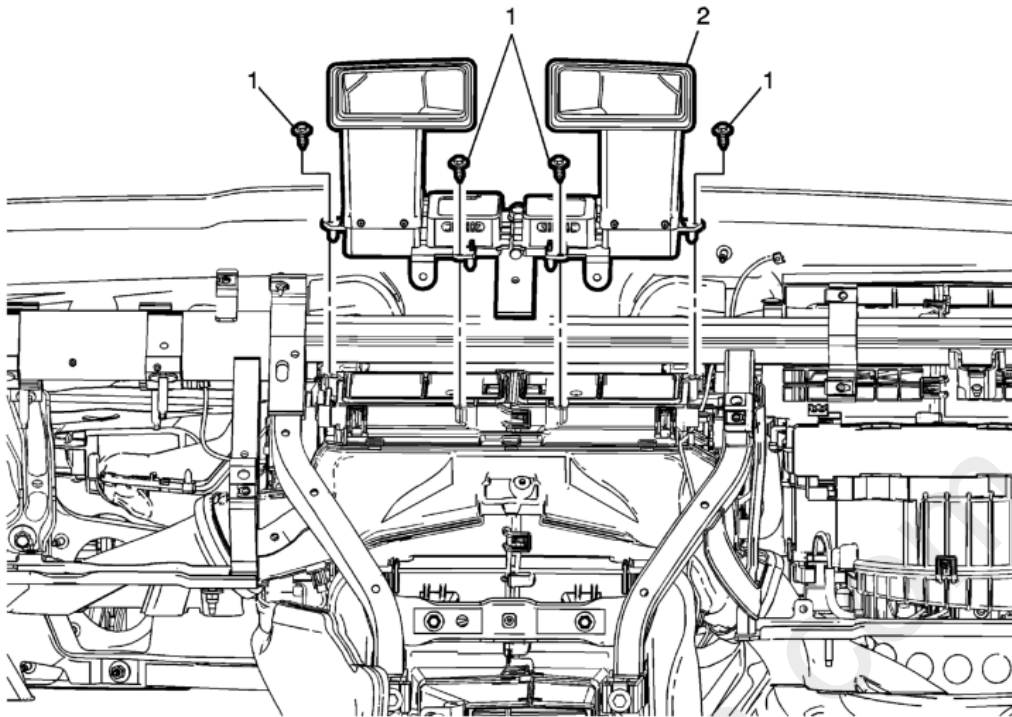


Fig. 162: Air Distributor Center Duct
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Center Duct Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the instrument panel carrier assembly. Refer to <u>Instrument Carrier Replacement</u> . 2. Remove the left side air distributor duct. Refer to <u>Air Distributor Duct Replacement - Left Side</u>. 3. Remove the right side air distributor duct. Refer to <u>Air Distributor Duct Replacement - Right Side</u>.	
1	Air Distributor Center Duct Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Distributor Center Duct

AIR DISTRIBUTOR LOWER DUCT REPLACEMENT

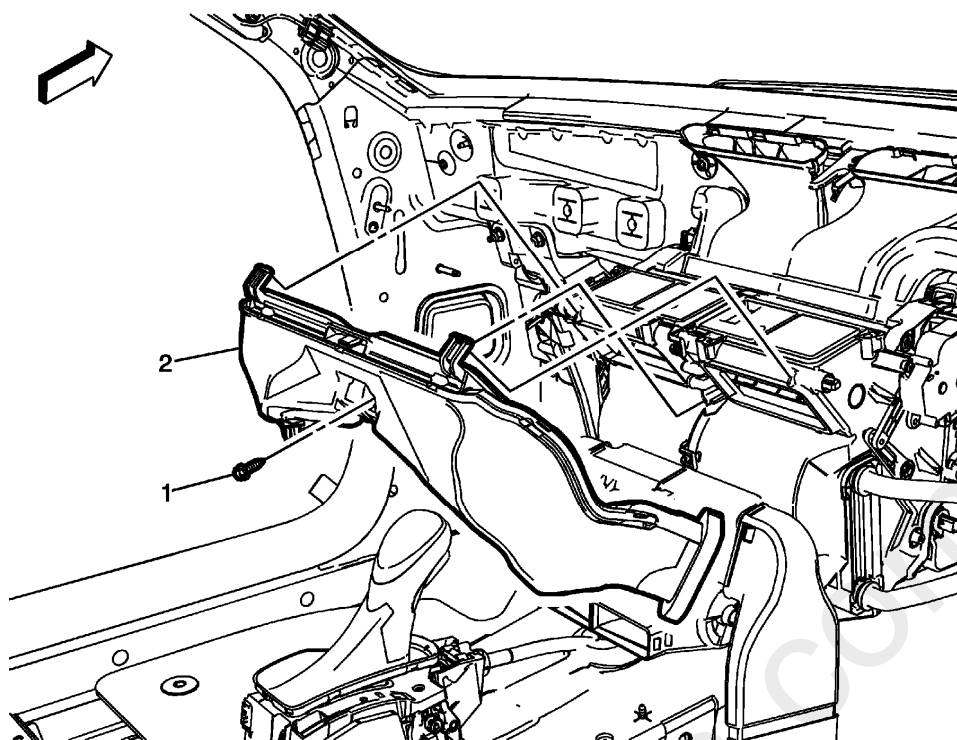


Fig. 163: Air Distributor Lower Duct
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Lower Duct Replacement

Call out	Component Name
Preliminary Procedures 1. Remove the air distributor center duct. Refer to <u>Air Distributor Center Duct Replacement</u>. 2. Remove the instrument panel tie bar assembly. Refer to <u>Instrument Panel Tie Bar Replacement</u>. 3. Disconnect the lower air duct temperature sensor electrical connectors.	
1	Air Distributor Lower Duct Bolt CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Distributor Lower Duct Procedures 1. Using the appropriate tool release the air distributor lower duct retaining clips. 2. Transfer the lower duct air temperature sensors.

AIR DISTRIBUTOR DUCT REPLACEMENT - LEFT SIDE

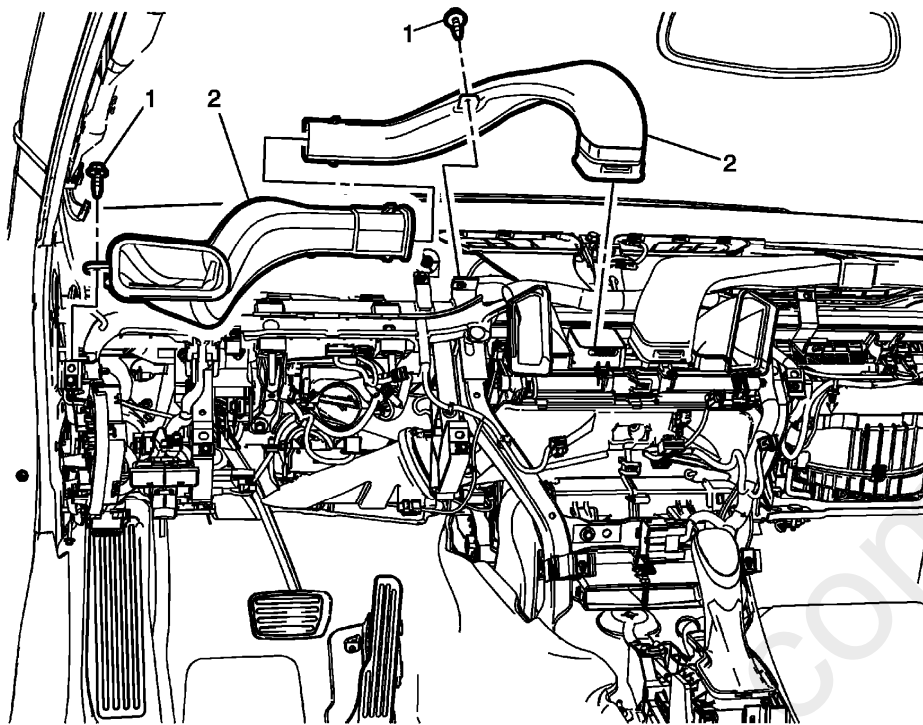


Fig. 164: Air Distributor Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Duct Replacement - Left Side

Call out	Component Name
Preliminary Procedures 1. Remove the left side window defogger outlet duct. Refer to <u>Side Window Defogger Outlet Duct Replacement - Left Side</u>. 2. Reposition the instrument panel wiring harness left side fuse block out of the way. 3. Remove the air distributor center duct bolt only. Refer to <u>Air Distributor Center Duct Replacement</u>.	
1	Left Side Air Distributor Duct Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (2 lb ft)
	Air Distributor Duct - Left Side Procedures

- | | |
|---|--|
| 2 | <ol style="list-style-type: none"> 1. Reposition the air distributor center air duct to provide clearance to remove the left side air distributor duct. 2. Separate the inner and outer air distributor ducts. 3. Remove the inner air distributor duct. 4. Disconnect the left upper air duct temperature sensor electrical connector. 5. Maneuver the outer air distributor duct out from the vehicle. 6. Transfer the left upper air duct temperature sensor. |
|---|--|

AIR DISTRIBUTOR DUCT REPLACEMENT - RIGHT SIDE

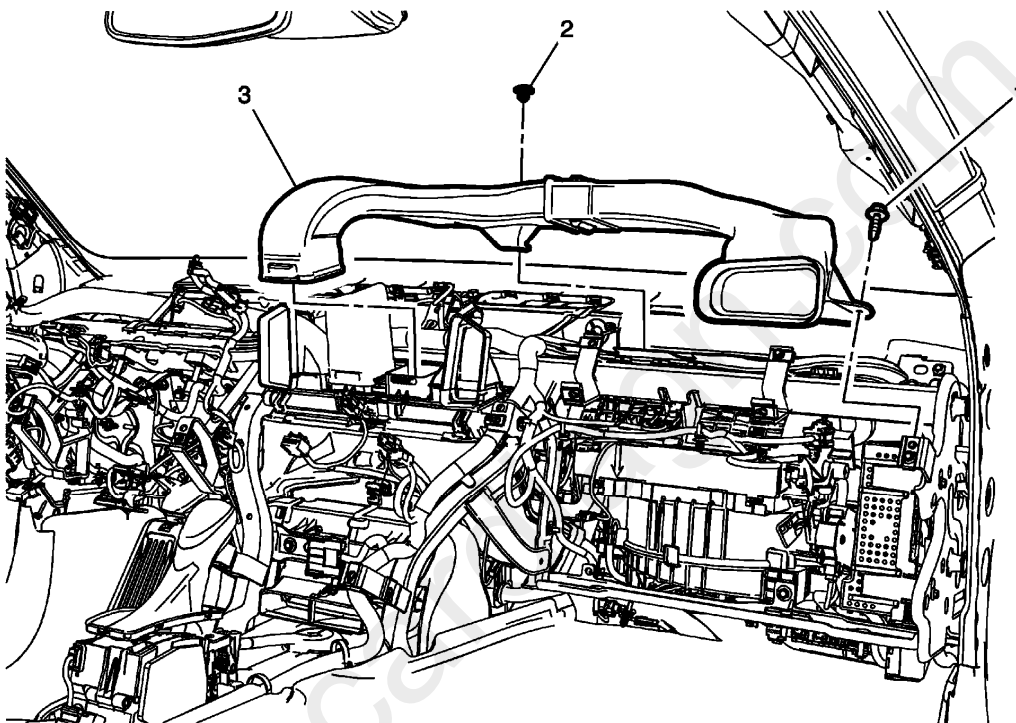


Fig. 165: Air Distributor Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Duct Replacement - Right Side

Call out	Component Name
Preliminary Procedures 1. Remove the right side window defogger outlet duct. Refer to <u>Side Window Defogger Outlet Duct Replacement - Right Side.</u> 2. Remove the air distributor center duct bolt only. Refer to <u>Air Distributor Center Duct Replacement.</u>	
	Right Side Air Distributor Duct Bolt

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (2 lb ft)
2	Right Side Air Distributor Duct Fastener
3	Air Distributor Duct - Right Side Procedures 1. Reposition the air distributor center air duct to provide clearance to remove the right side air distributor duct. 2. Disconnect the right upper air duct temperature sensor electrical connector. 3. Transfer the right upper air duct temperature sensor.

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

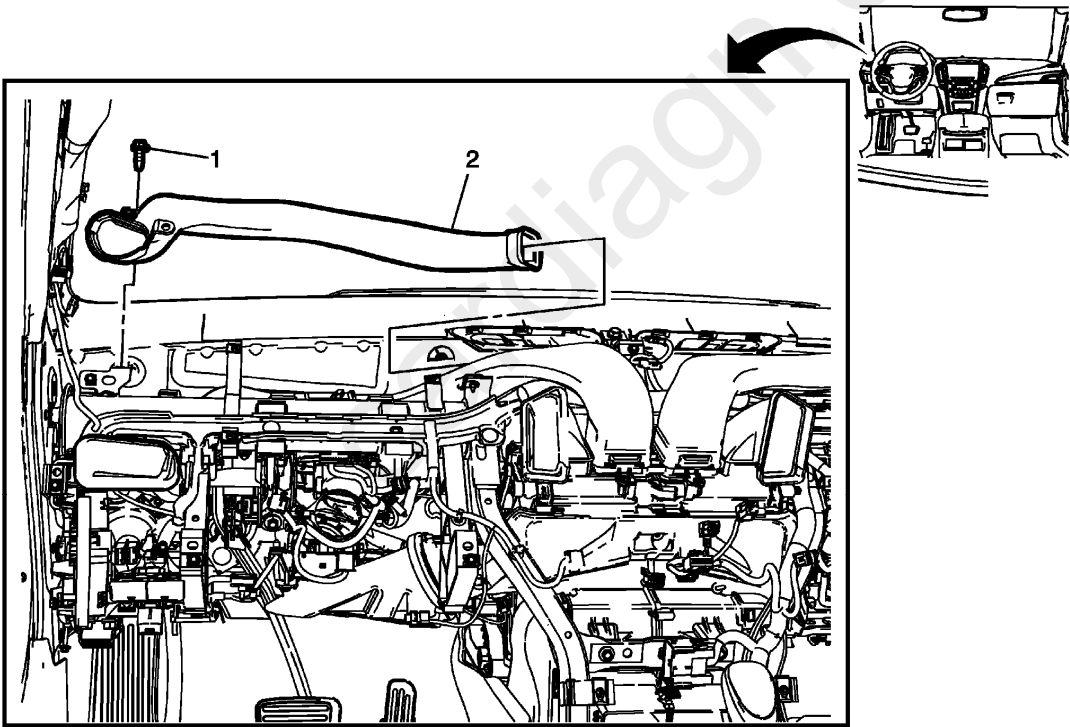


Fig. 166: Side Window Defogger Outlet Duct - Left Side
Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Left Side

Call out	Component Name
Preliminary Procedure	

Remove the instrument panel carrier assembly. Refer to Instrument Carrier Replacement .

1	Left Side Window Defogger Outlet Duct Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (22 lb in)
2	Side Window Defogger Outlet Duct - Left Side

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

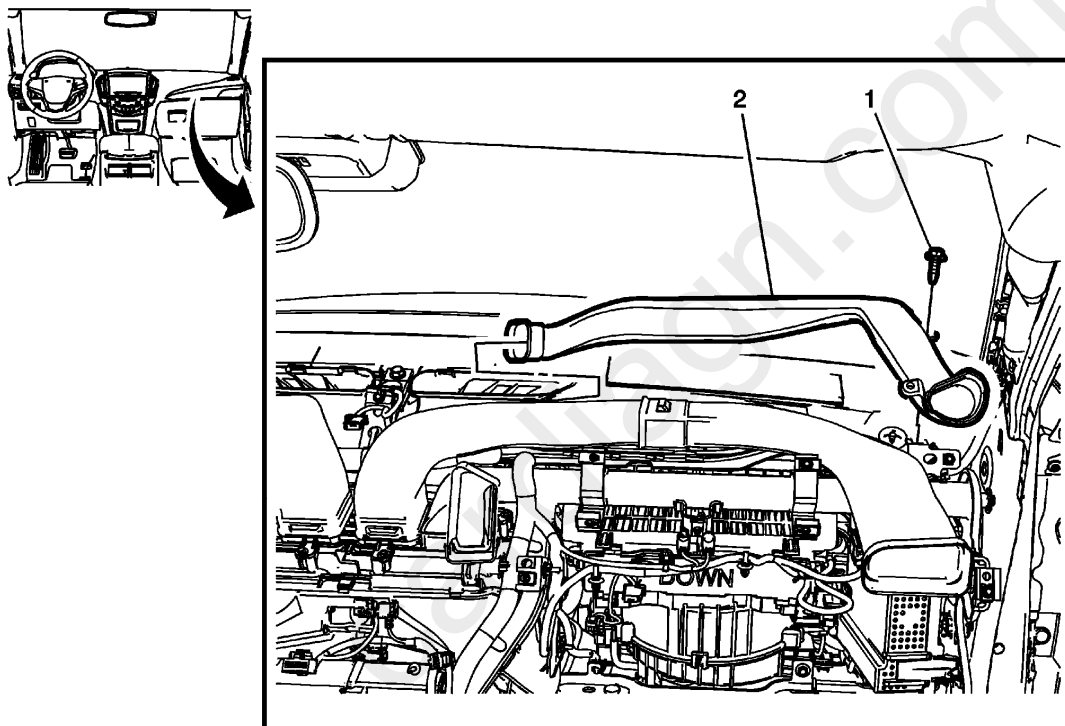


Fig. 167: Side Window Defogger Outlet Duct - Right Side

Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Right Side

Call out	Component Name
Preliminary Procedures	
1. Remove the instrument panel carrier assembly. Refer to <u>Instrument Carrier Replacement</u> .	
2. Remove the right side air distributor center duct bolt only. Refer to <u>Air Distributor Center Duct Replacement</u> .	
	Right Side Window Defogger Outlet Duct Bolt

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (22 lb in)
2	Side Window Defogger Outlet Duct - Right Side Procedures 1. Reposition the right air distributor center air duct to provide clearance to remove the right side window defogger outlet duct. 2. Maneuver the right side window defogger outlet duct out from the vehicle.

FLOOR REAR AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

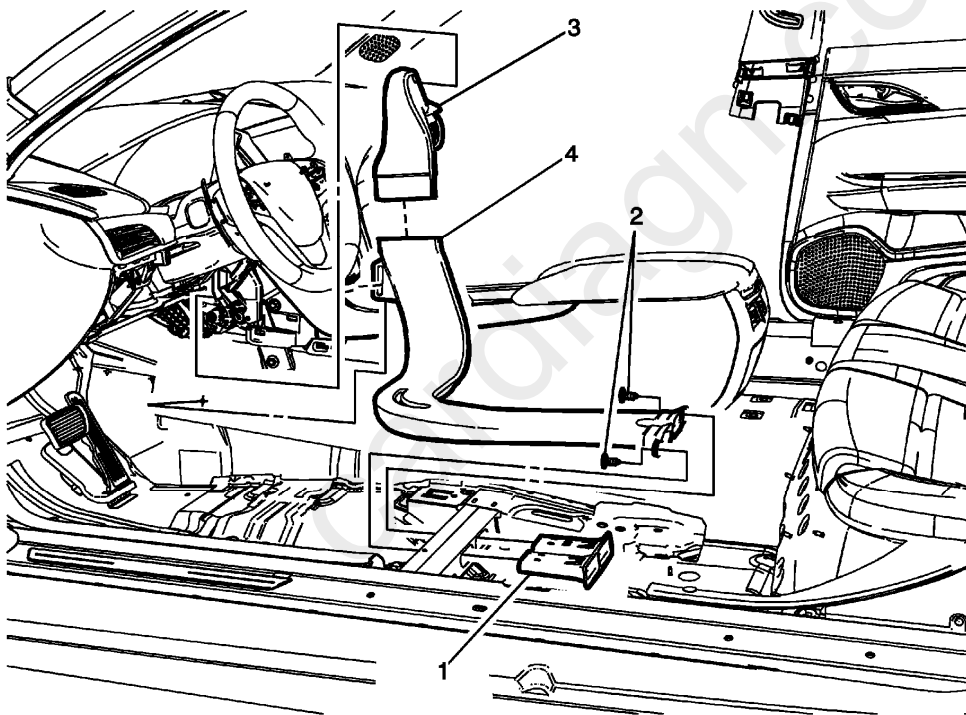


Fig. 168: Floor Rear Air Outlet Duct - Left Side
Courtesy of GENERAL MOTORS COMPANY

Floor Rear Air Outlet Duct Replacement - Left Side

Call out	Component Name
Preliminary Procedures	
1.	Remove the left side instrument panel lower trim panel insulator. Refer to <u>Instrument Panel</u>

Lower Trim Panel Insulator Replacement - Left Side .

2. Remove the driver side instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement** .
3. Remove the left side front floor panel carpet . Refer to **Front Floor Panel Carpet Replacement - Left Side** .

1	Floor Rear Air Outlet Duct - Left Side Insert Central Procedure Replace the left side central floor rear air outlet duct as necessary.
2	Floor Rear Air Outlet Duct Fastener - Left Side (Qty: 2)
3	Floor Rear Air Outlet Duct Adaptor - Left Side Upper Procedures 1. After removing the floor rear air outlet duct as an assembly, separate the adaptor from the duct. 2. Replace the need left side floor rear air outlet duct as necessary.
4	Floor Rear Air Outlet Duct - Left Side Lower Procedures 1. Remove the floor rear air outlet duct and the floor rear air outlet adaptor as an assembly. 2. Replace the need left side floor rear air outlet duct as necessary.

FLOOR REAR AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

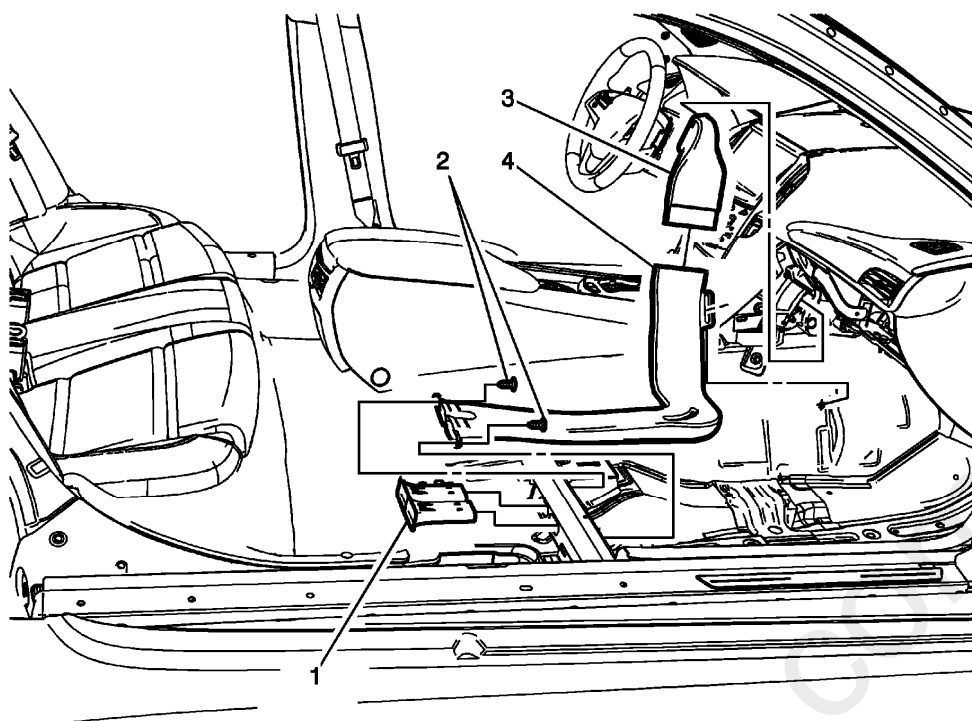


Fig. 169: Floor Rear Air Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Floor Rear Air Outlet Duct Replacement - Right Side

Call out	Component Name
Preliminary Procedures	
1. Remove the right side instrument panel lower trim panel insulator. Refer to <u>Instrument Panel Lower Trim Panel Insulator Replacement - Right Side</u> . 2. Remove the instrument panel compartment. Refer to <u>Instrument Panel Compartment Replacement</u> . 3. Remove the right side front floor panel carpet . Refer to <u>Front Floor Panel Carpet Replacement - Right Side</u> .	
1	Floor Rear Air Outlet Duct - Right Side Central Procedure Replace the right side central floor rear air outlet duct as necessary.
2	Floor Rear Air Outlet Duct Fastener - Right Side (Qty: 2)
3	Floor Rear Air Outlet Duct Adaptor - Right Side Upper Procedures 1. After removing the floor rear air outlet duct as an assembly, separate the adaptor from the duct.

	2. Replace the need right side floor rear air outlet duct as necessary.
4	Floor Rear Air Outlet Duct - Right Side Lower Procedures 1. Remove the floor rear air outlet duct and the floor rear air outlet adaptor as an assembly. 2. Replace the need right side floor rear air outlet duct as necessary.

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT (CJ4 REAR DOOR)

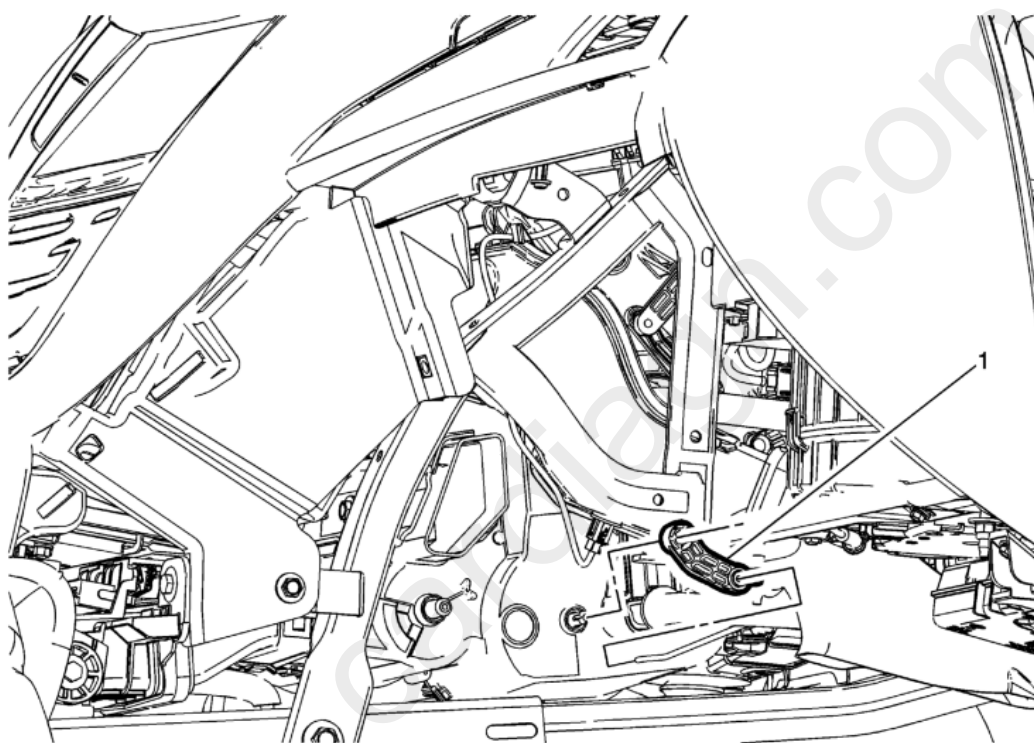


Fig. 170: Heater and Air Conditioning Control Temperature Lever (CJ4 Rear Door)
 Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement (CJ4 Rear Door)

Call out	Component Name
Preliminary Procedures	
1.	Remove the instrument panel compartment. Refer to <u>Instrument Panel Compartment Replacement</u> .
2.	Remove the passenger side instrument panel lower airbag. Refer to <u>Instrument Panel Lower Airbag Replacement - Passenger Side</u> .
3.	Pull the passenger side carpet back to gain access to the rear door heater and air conditioning

control temperature lever .

4. Remove the right side floor rear air outlet duct adaptor. Refer to **Floor Rear Air Outlet Duct Replacement - Right Side.**

Heater and Air Conditioning Control Temperature Lever - Rear Door

Procedure

1

1. Unlatch the rear door heater and air conditioning control temperature lever detent, and slide the lever off.
2. Un-clip and rotate the locking detent from the heater and air conditioning control temperature rod .

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT (CJ4 REAR MID)

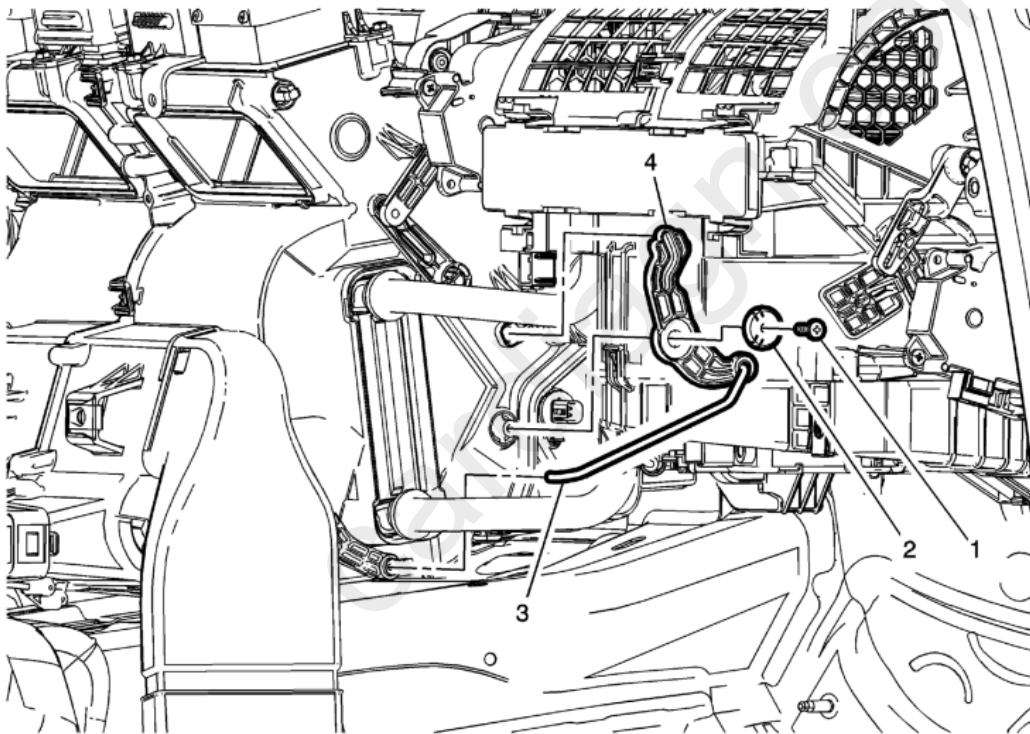


Fig. 171: Heater and Air Conditioning Control Temperature Lever (CJ4 Rear MID)
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement (CJ4 Rear MID)

Call out	Component Name
Preliminary Procedure	
Remove the air distributor lower duct. Refer to <u>Air Distributor Lower Duct Replacement.</u>	
1	Heater and Air Conditioning Control Temperature Lever Fastener

	CAUTION: Refer to <u>Fastener Caution</u> .
2	Heater and Air Conditioning Control Temperature Washer
3	Heater and Air Conditioning Control Temperature Rod - Rear Procedure Un-clip and rotate the locking detent from the heater and air conditioning control temperature rod to remove.
4	Heater and Air Conditioning Control Temperature Lever - Rear Mid Procedure Maneuver the heater and air conditioning control temperature rear mid lever from the auxiliary temperature valve actuator lever.

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT - RIGHT SIDE

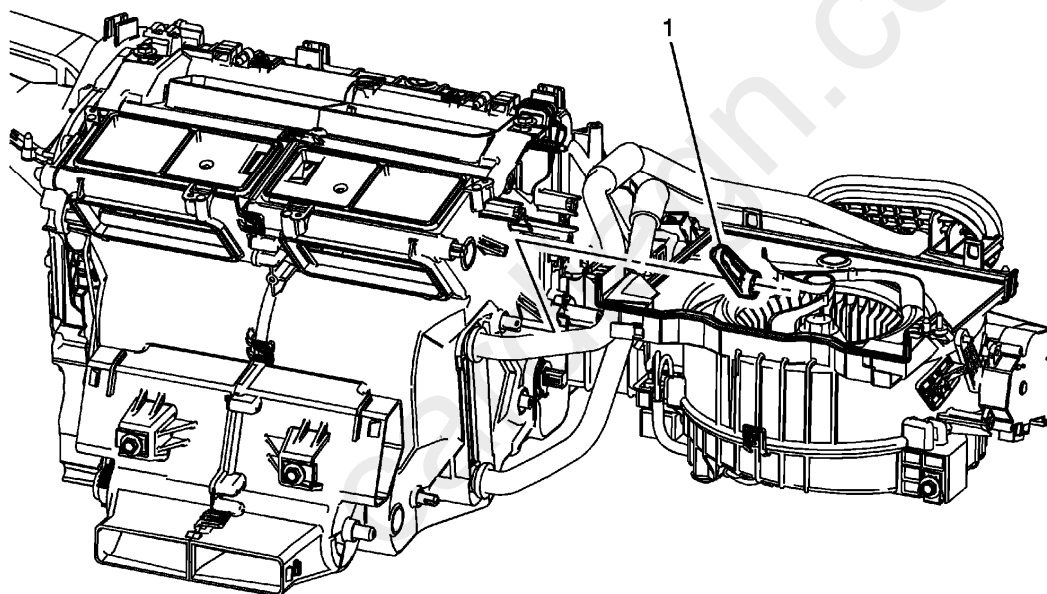


Fig. 172: Heater and Air Conditioning Control Temperature Lever - Right Side
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the right side temperature valve actuator. Refer to <u>Temperature Valve Actuator Replacement - Right Side</u> .	
1	Heater and Air Conditioning Control Temperature Valve Actuator Lever - Right Side

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT - LEFT SIDE

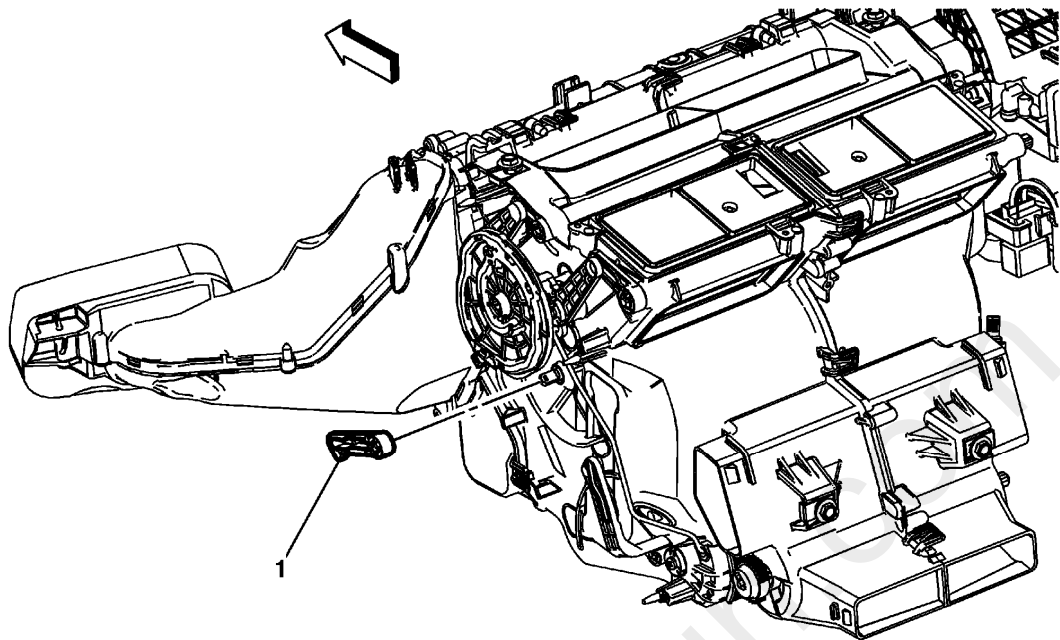


Fig. 173: Heater and Air Conditioning Control Temperature Lever - Left Side
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement - Left Side

Callout	Component Name
Preliminary Procedure	
Remove the heater and air conditioning mode control cam cover assembly. Refer to <u>Mode Control Cam Cover Replacement (CJ4)</u> , <u>Mode Control Cam Cover Replacement (CJ2)</u> .	
1	Heater and Air Conditioning Control Temperature Valve Actuator Lever - Left Side

AIR CONDITIONING REFRIGERANT SERVICE VALVE REPLACEMENT

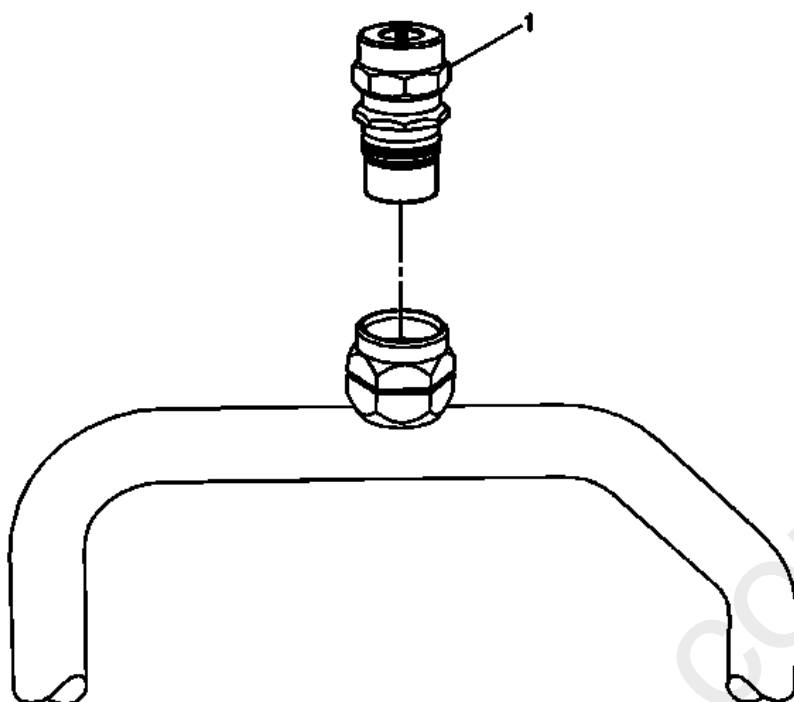


Fig. 174: Air Conditioning Refrigerant High Pressure Service Valve
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Refrigerant Service Valve Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the service port cap. 2. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (R-134a)</u>, <u>Refrigerant Recovery and Recharging (R-1234yf)</u>	
1	Air Conditioning Refrigerant Service Valve CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Use the J 39037 Charge Valve Octagon Socket to remove the air conditioning refrigerant service valve. 2. Replace the O-ring. Tighten 2 N.m (18 lb in) Special Tools

HEATER CORE REPLACEMENT

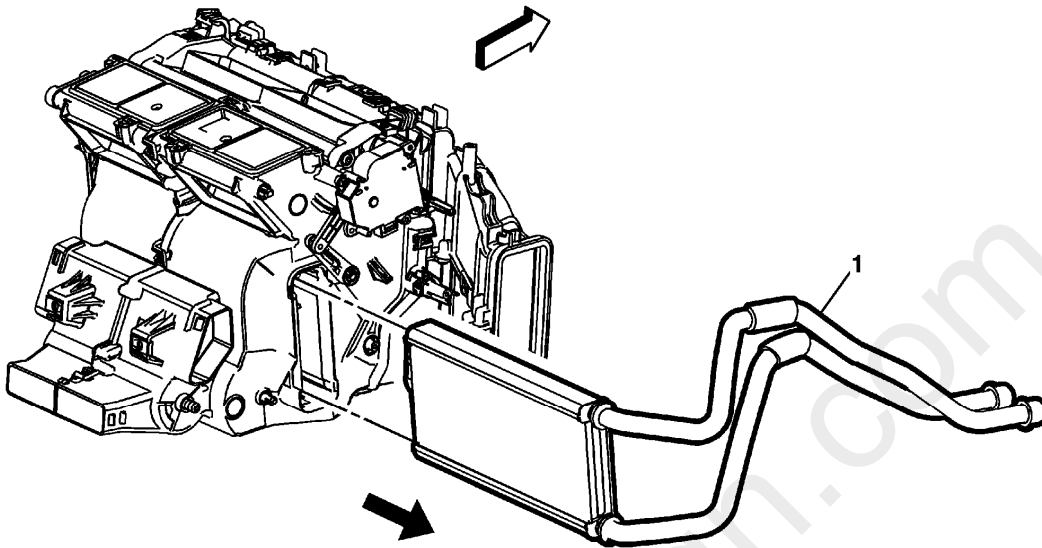


Fig. 175: Heater Core
Courtesy of GENERAL MOTORS COMPANY

Heater Core Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the blower case assembly. Refer to <u>Blower Case Replacement</u> .	
2. Remove the front floor foot air distributor lower duct. Refer to <u>Air Distributor Lower Duct Replacement</u> .	
1	Heater Core Assembly

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 and R-1234yf are very low temperature gases 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 discharge 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 evaporator hose, to the thermal expansion valve.

The thermal expansion valve is attached between the evaporator tubes and evaporator hose. 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.

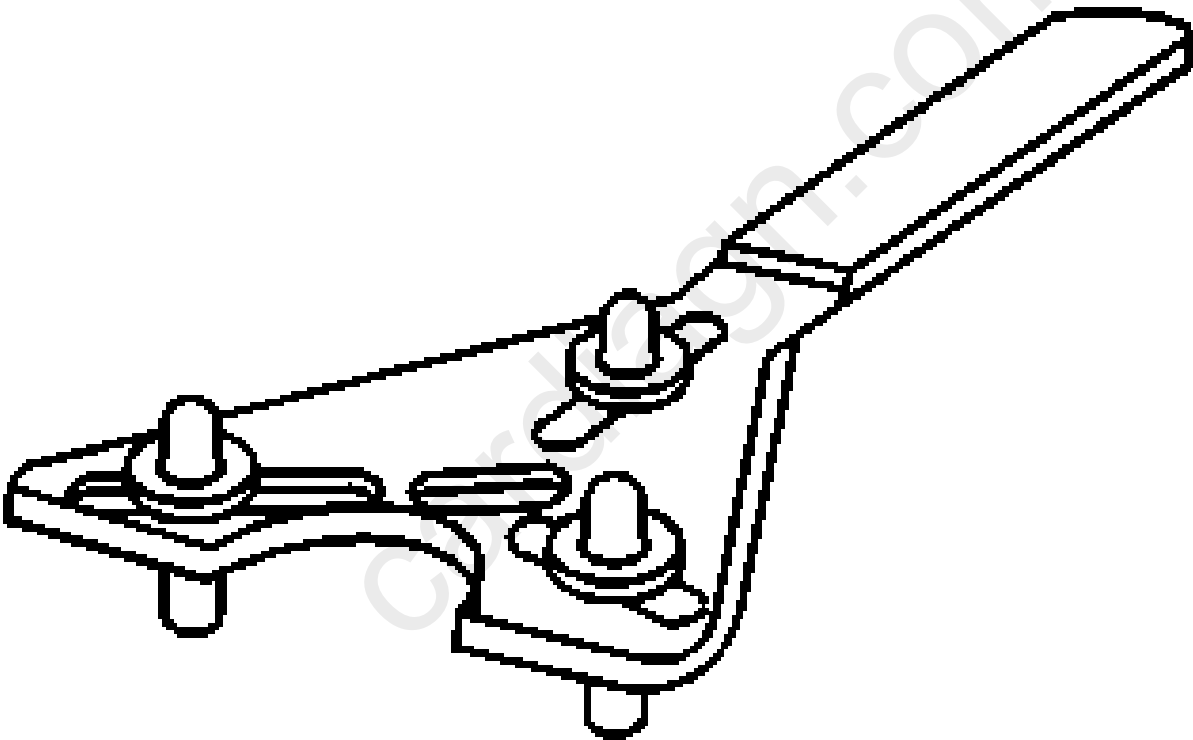
Refrigerant exiting the thermal expansion valve flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant to boil inside of the evaporator core. The boiling refrigerant absorbs heat from the ambient air and draws moisture onto the evaporator. The refrigerant exits the evaporator back through the thermal expansion valve, through the outlet line of the evaporator hose, into the suction line 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.

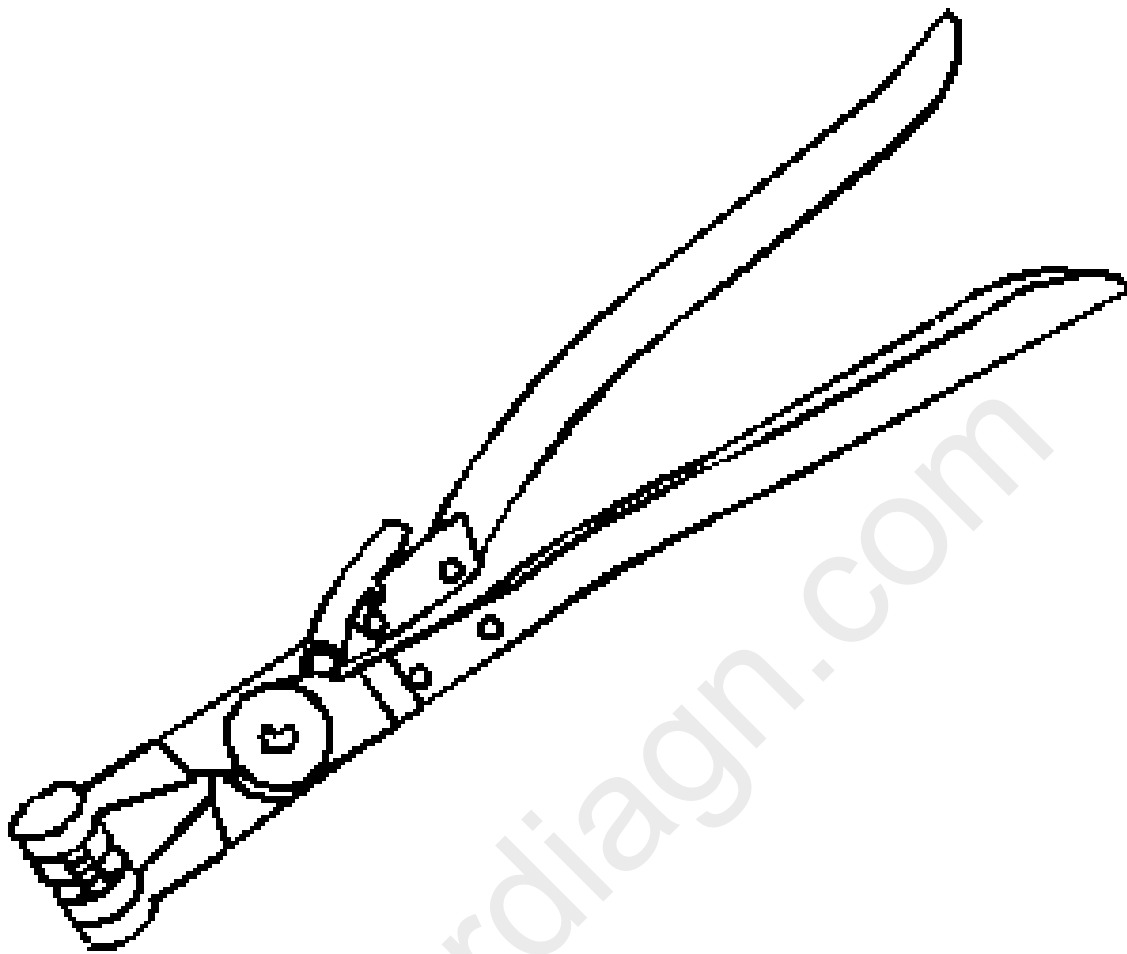
The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture removed from the passenger compartment will also change form, or condense, and is discharged from the

HVAC module as water under the vehicle.

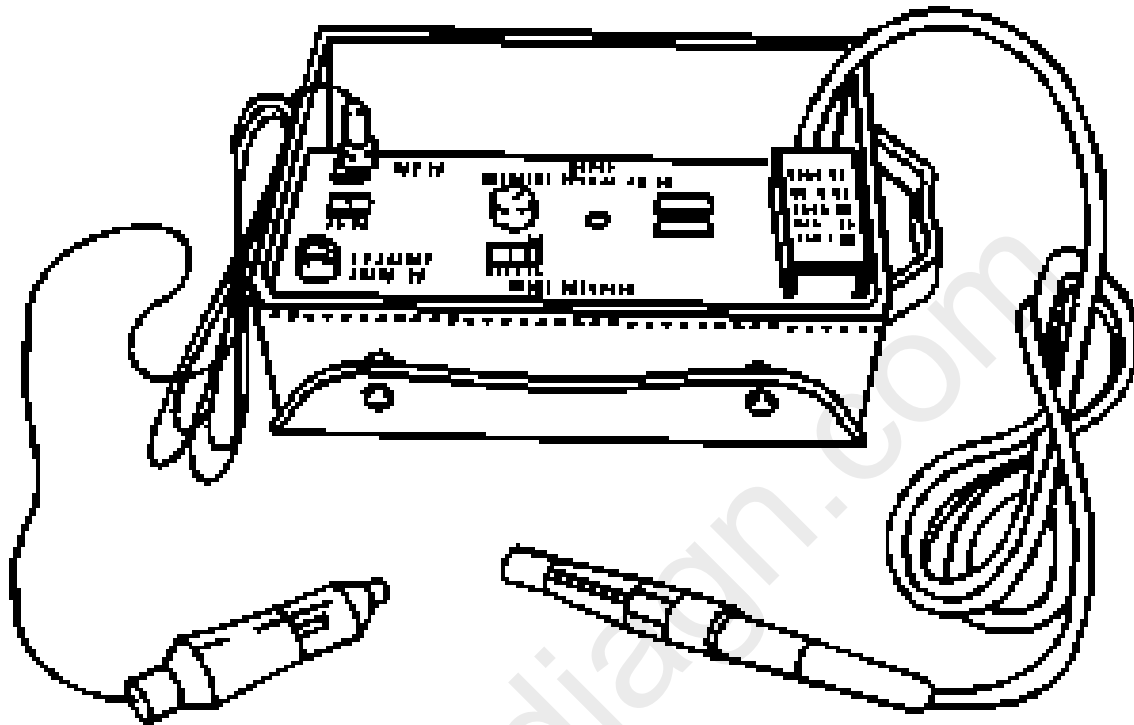
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number / Description
	CH 37872 J 37872 Universal Spanne Wrench



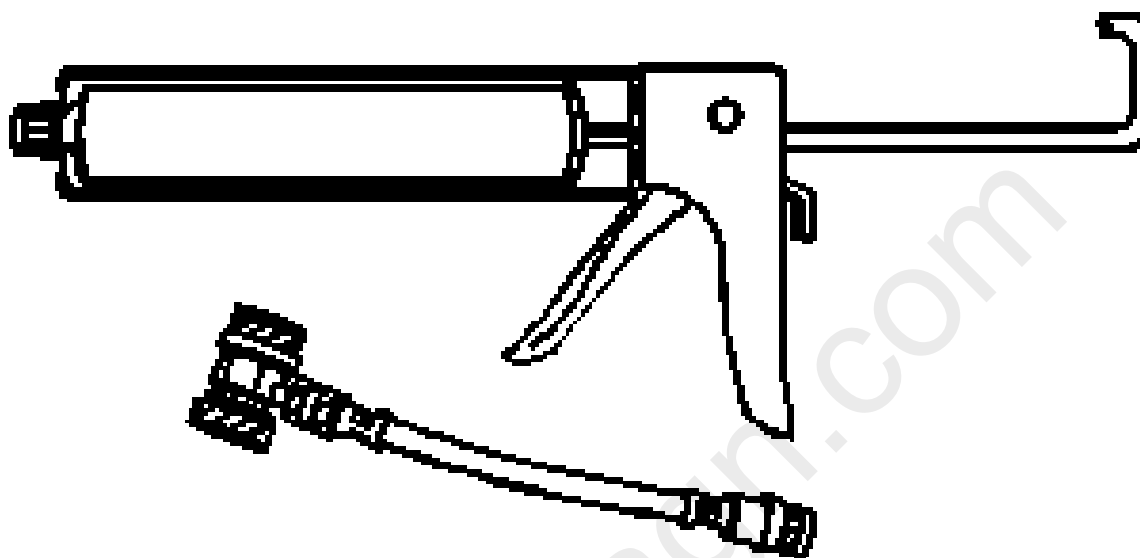
BO 38185
J 38185
Hose Clamp Plier



GE 39400-A
J 39400-A
Halogen Leak
Detector



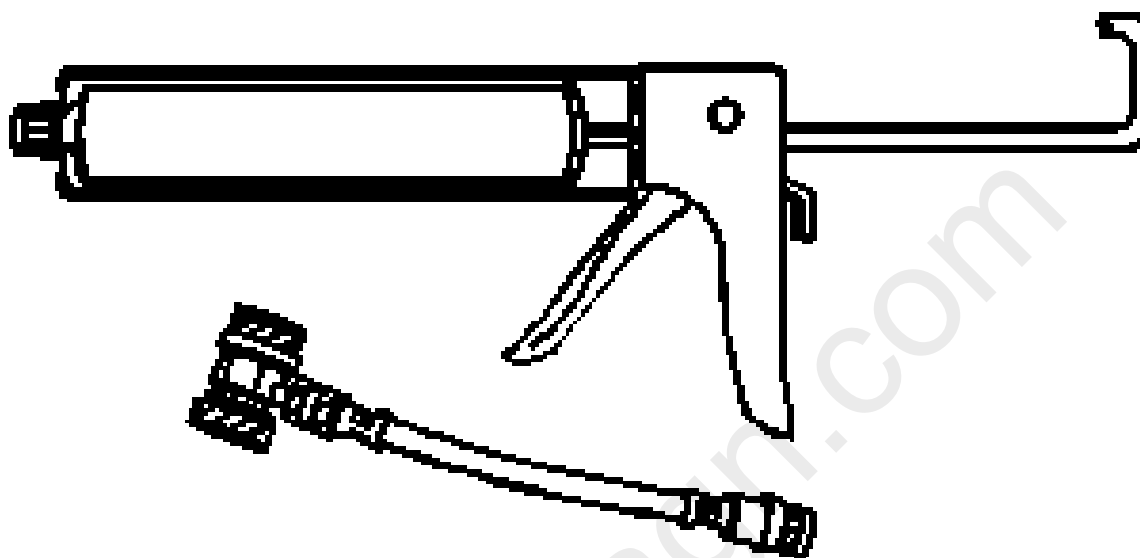
GE 41447
J 41447
R-134a A/C Tracer
Dye - Box of 24



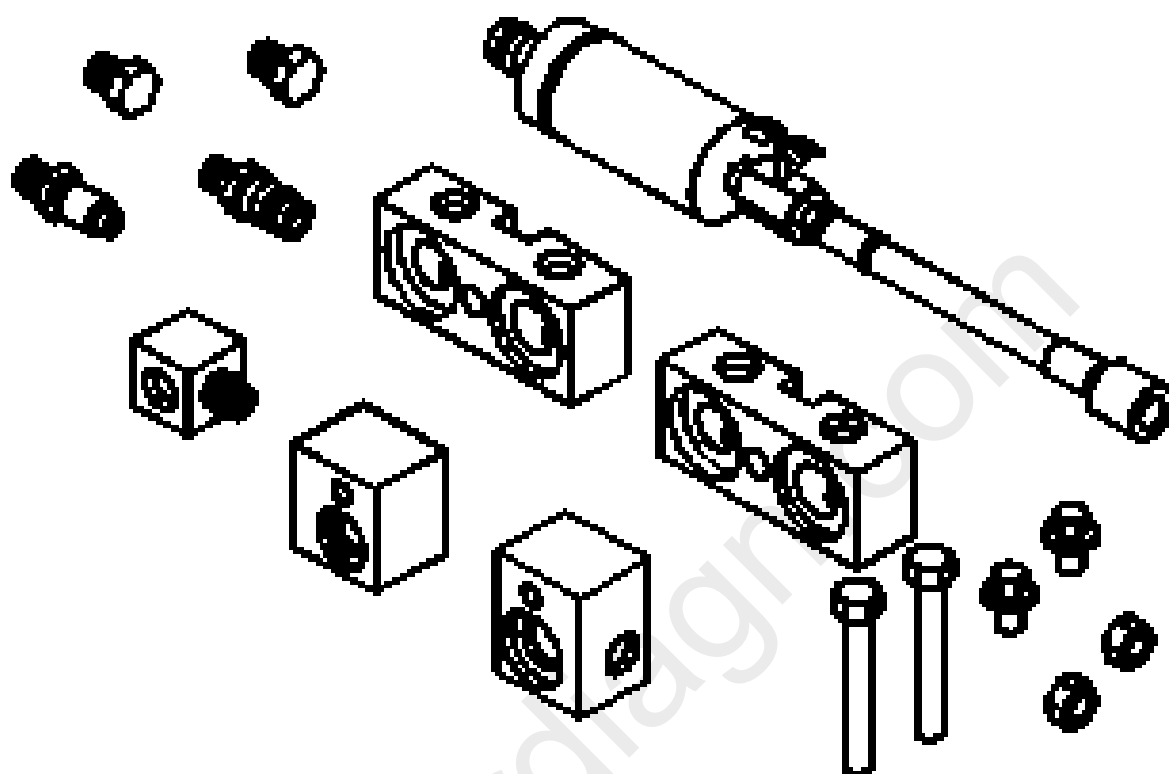
GE 42220
J 42220
Universal 12V
Leak Detection
Lamp



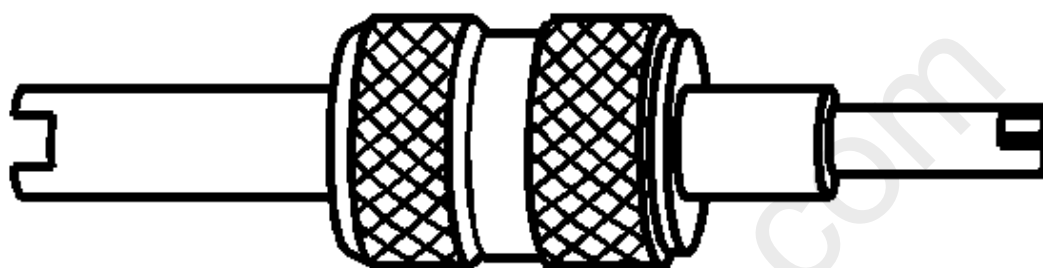
GE 43872
J 43872
Fluorescent Dye
Cleaner



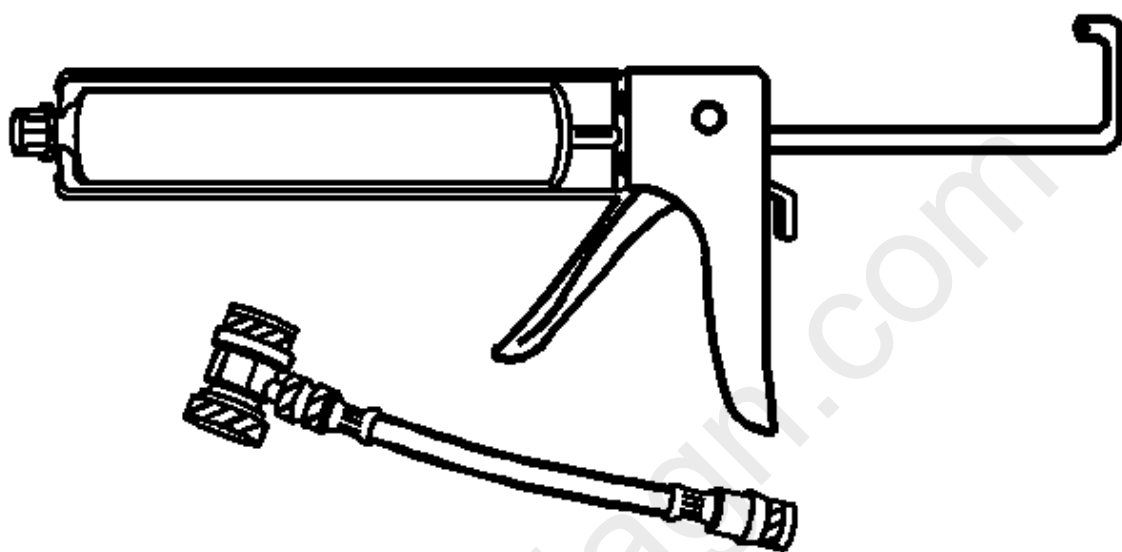
GE 45037
J 45037
A/C Oil Injector



GE 45268
J 45268
A/C Flushing
Adapter Kit



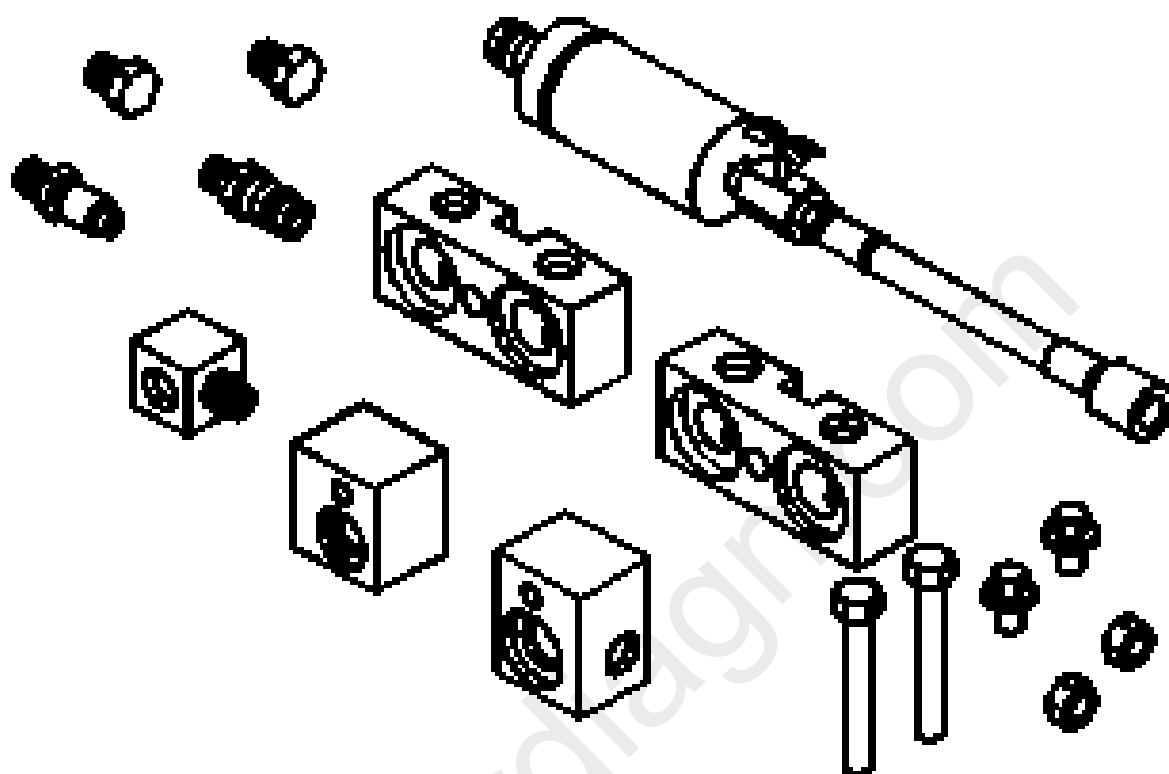
GE 46246
J 46246
Valve Core Tool



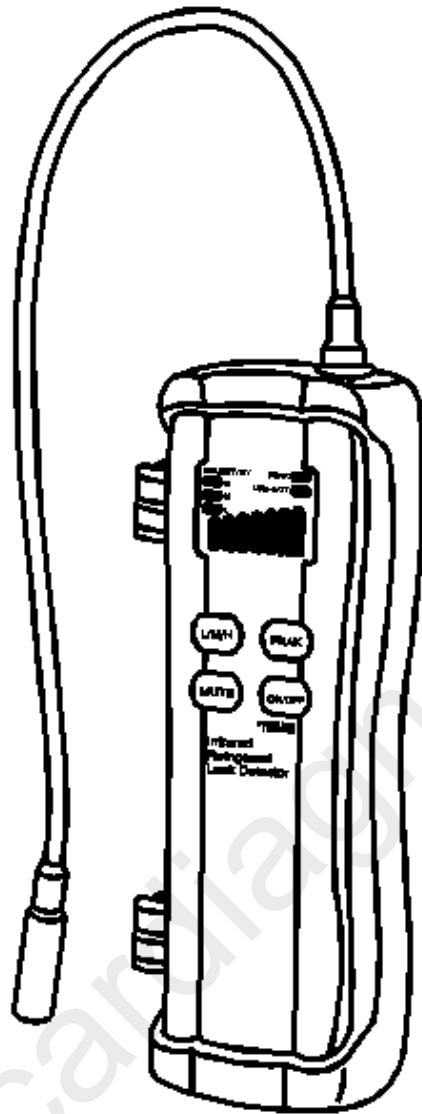
GE 46297
J 46297
A/C Dye Injector
Kit



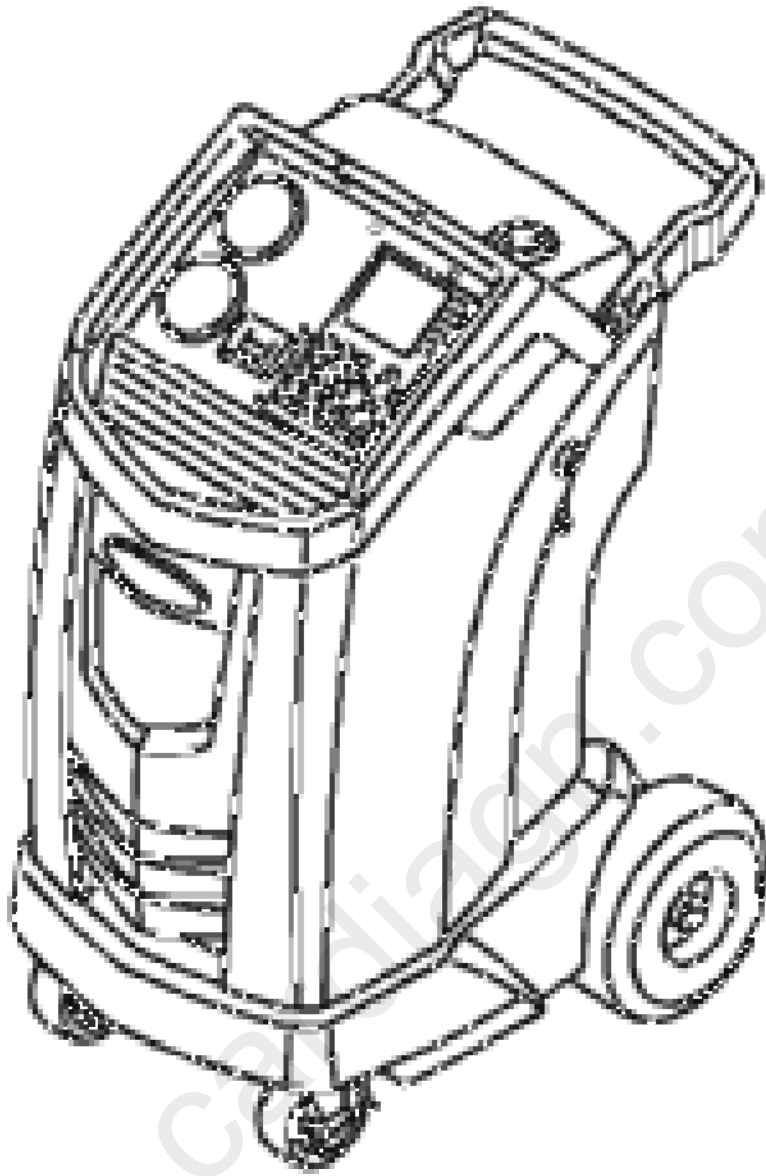
GE 46297-12
J 46297-12
Replacement Dye
Cartridges



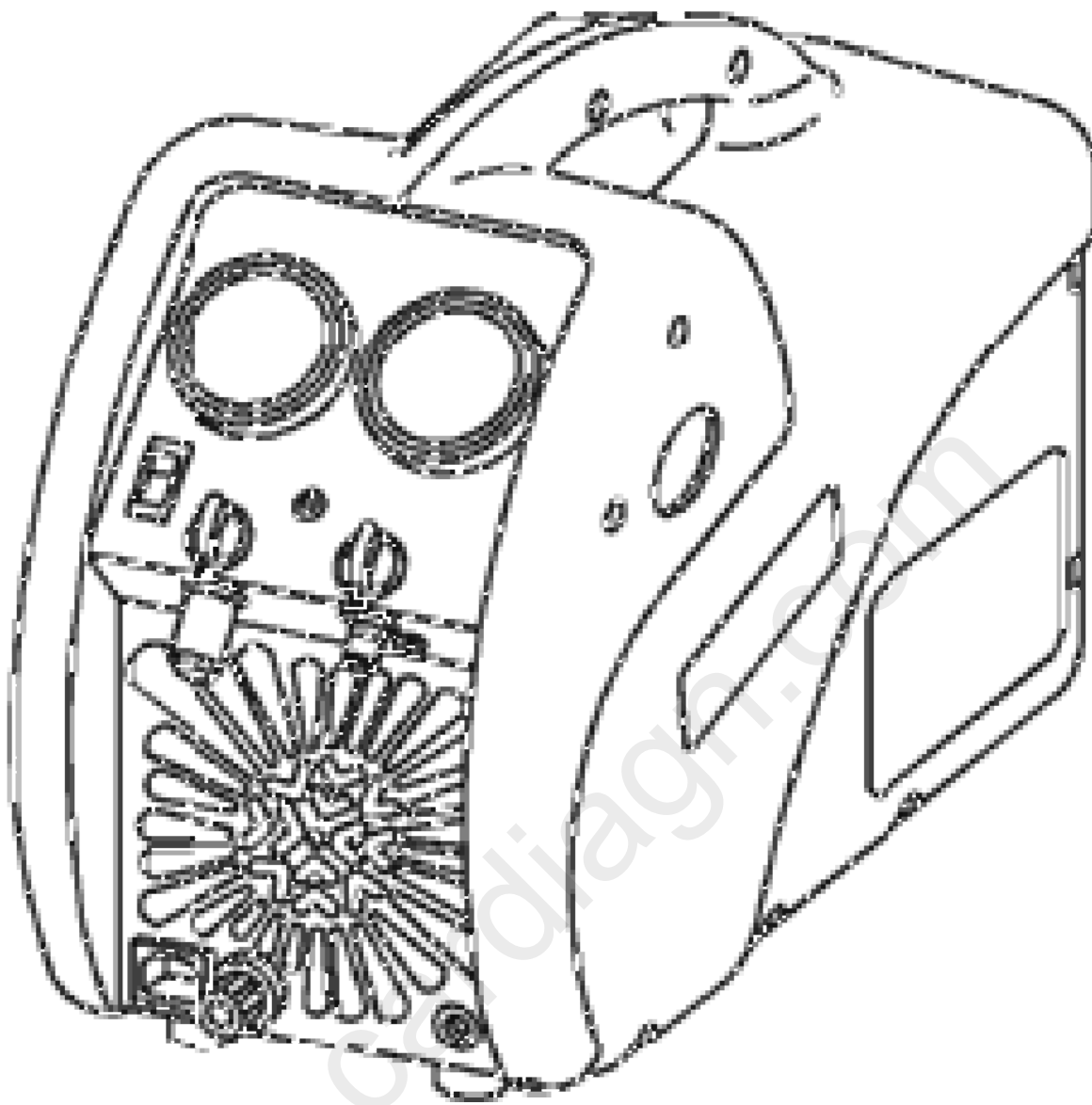
GE 48800
J 43600
CoolTech A/C
Recharge Machin



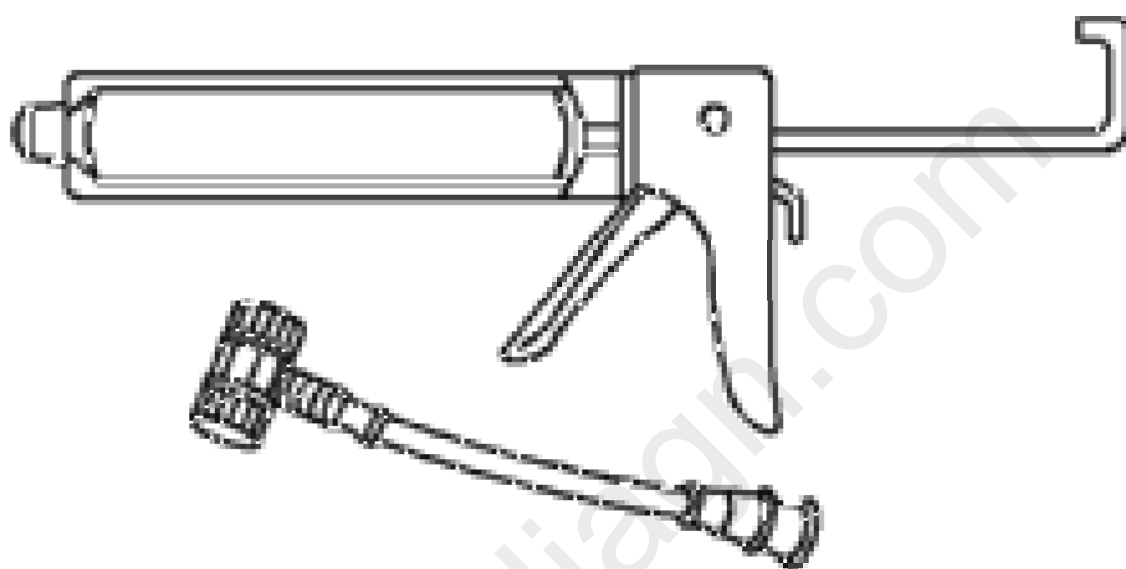
GE 50078
Electronic Leak
Detector



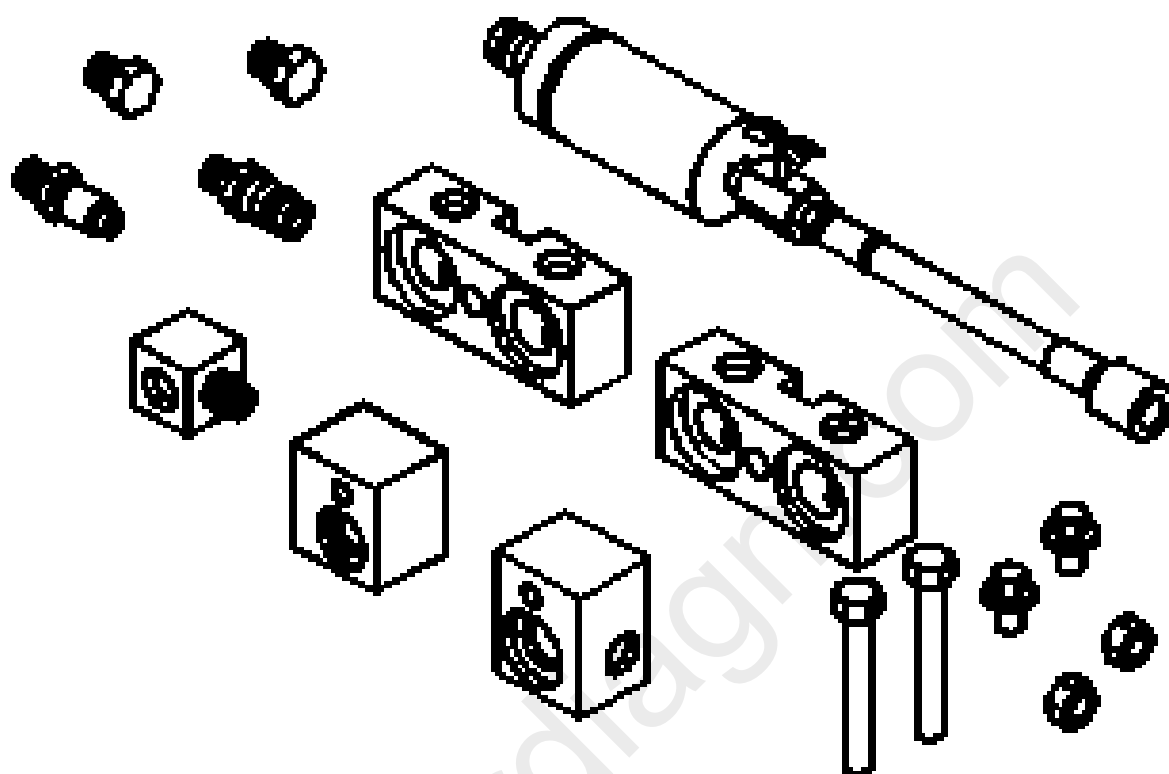
GE 50300
R-1234yf A/C
Refrigerant
Recovery/Recharge
Cart



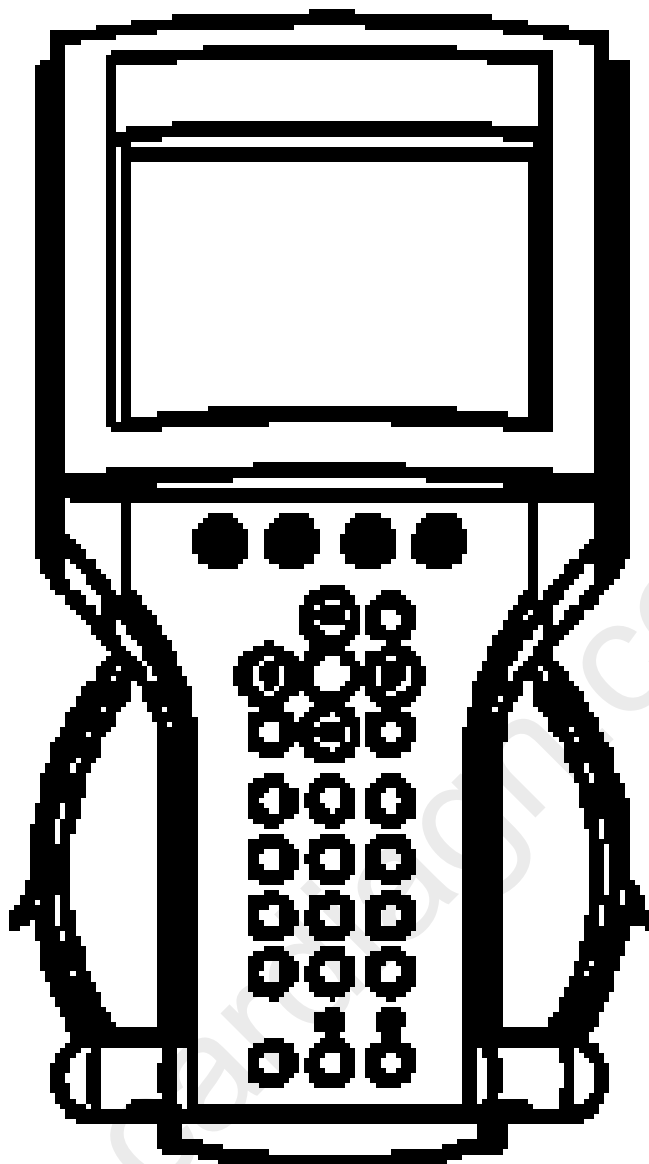
GE 50957
Machine R-1234y
Contaminated
Refrigerant



GE 50744
R-1234yf PAG O
Injector Hose



GE 8800
J 43600
ACR 2000 Air
Conditioning
Service Center



7000086I
Scan Tool
Used for diagnosis
of vehicle electric
system.