

2010 HVAC

Heating, Ventilation, and Air Conditioning - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specifications	
	Metric	English
Air Inlet Assembly Screws	1.5 N.m	13 lb in
Air Outlet Duct Screws	1.5 N.m	13 lb in
Battery Box to Body Bolts	15 N.m	11 lb ft
Blower Case Assembly Screws	1.5 N.m	13 lb in
Blower Motor Control Module Screws	1.5 N.m	13 lb in
Blower Motor Screws	1.5 N.m	13 lb in
Center Air Outlet Duct Fastener	1.5 N.m	13 lb in
Compressor Clutch Bolt	12 N.m	106 lb in
Compressor Clutch Coil Connector Bracket Screw	4.3 N.m	38 lb in
Compressor Clutch Coil Screws	4.9 N.m	43 lb in
Compressor Hose Assembly to Battery Box Nut	9 N.m	80 lb in
Compressor Hose Assembly to Compressor Nut	22 N.m	16 lb ft
Compressor Hose Assembly to Condenser Nut	22 N.m	16 lb ft
Compressor Pressure Relief Valve	8 N.m	70 lb in
Compressor Mounting Bolts LAF	22 N.m	16 lb ft
Compressor Mounting Bolt LF1	58 N.m	43 lb ft
Condenser to Radiator Bolts	9 N.m	80 lb in
CRFM Bracket Bolts	20 N.m	15 lb ft
Evaporator Case Assembly Screws	1.5 N.m	13 lb in
Evaporator Outlet Hose and Liquid Line Clamp Bracket Nut to TXV	22 N.m	16 lb ft
Evaporator Outlet Hose to Compressor Hose Nut	22 N.m	16 lb ft
Front of Dash to HVAC Module Seal Nuts	9 N.m	80 lb in
Heater and Air Conditioning Evaporator and Blower Module Fastener	9 N.m	80 lb in
Heater Core Cover Screws	1.5 N.m	13 lb in
HVAC Module to Cross Car Beam Nuts and Bolts	8 N.m	71 lb in
Instrument Panel Air Outlet Fastener	2.5 N.m	22 lb in
Intermediate Duct Fasteners	2.5 N.m	22 lb in
Liquid Line to Condenser Nut	22 N.m	16 lb ft
Liquid Line to Strut Tower Nut	9 N.m	80 lb in
Mode Actuator to Evaporator Case Screws	1.5 N.m	13 lb in

Mode Cam Bracket to Evaporator Case Screws	1.5 N.m	13 lb in
Receiver Dehydrator to Condenser Bolt	4.2 N.m	37 lb in
Receiver Dehydrator Upper Clamp Bolt to Condenser	6.5 N.m	58 lb in
Refrigerant Pressure Sensor to Compressor Hose Assembly	4 N.m	35 lb in
Surge Tank to Body Bolts	9 N.m	80 lb in
TXV Backing Plate Bolts	4.7 N.m	41 lb in

REFRIGERANT SYSTEM SPECIFICATIONS

Application	Specification	
	Metric	English
PAG Oil GM P/N 12378526 for United States PAG Oil GM P/N 88900060 for Canada		
Abrupt Refrigerant Loss	65 ml	2.20 oz
Compressor Replacement		
The service compressor is precharged with the specified amount of PAG oil.	74 ml	2.50 oz
Condenser Replacement with the Receiver Dehydrator	60 ml	2 oz
Condenser Replacement without the Receiver Dehydrator	30 ml	1 oz
Evaporator Replacement	30 ml	1 oz
Receiver Dehydrator Replacement	30 ml	1 oz
Thermal Expansion Valve Replacement	20 ml	0.75 oz
Total System PAG Oil Capacity	120 ml	4 oz
R-134a		
Refrigerant Charge	0.65 kg	1.43 lb
Abrupt refrigerant loss due to a 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. If more than the specified amount of PAG oil was drained from a component, add the equal amount of oil drained.		

DIAGNOSTIC INFORMATION AND PROCEDURES

HANDLING OF REFRIGERANT LINES AND FITTINGS

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

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.
- Never bend a flexible hose line to a radius of less than four times the diameter of the hose.

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

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

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

LEAK TESTING

Special Tools

- **J 39400-A:** Halogen Leak Detector
- **J 41447:** R-134A A/C Tracer Dye-Box of 24
- **J 42220:** Universal 12V Leak Detection Lamp
- **J 43872:** Fluorescent Dye Cleaner
- **J 46297:** A/C Dye Injector Kit
- **J 46297-12:** Replacement Dye Cartridges

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 **J 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 **J 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 **J 43872: Fluorescent Dye Cleaner**.

Fluorescent Dye Injection

NOTE: Use only fluorescent dye approved by General Motors.

- **J 41447: R-134A A/C Tracer Dye-Box of 24** can be poured directly into a removed A/C component.
- **J 46297-12: Replacement Dye Cartridges** is injected into the low side port using **J 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 J 43872 . See Special Tools.

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 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 J 39400-A: Halogen Leak Detector.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST (LAF)

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

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

Test Description

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

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

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

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

Step	Action	Values	Yes	No
IMPORTANT: • 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. Update the ambient air temperature display. Refer to <u>Ambient Air Temperature Display Updating</u>. 3. Open the windows in order to ventilate the interior of the vehicle. 4. If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. 5. Turn OFF the ignition. 6. Install the J 43600. See <u>Special Tools</u>. 7. Record the ambient air temperature displayed on the J 43600. See <u>Special Tools</u>. 8. 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 <u>Leak Testing</u>
	IMPORTANT: 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			

2	• The panel outlet mode • All panel outlets are OPEN 4. Install the temperature probes of the J 43600 in the left and right center panel air outlets. See <u>Special Tools</u>. 5. Apply the parking brake. 6. Place the transaxle/transmission in PARK. 7. Start the engine. 8. Operate the A/C system for 5 minutes. 9. Inspect A/C components for the following conditions: • Abnormal frost areas • Unusual noises IMPORTANT: Press the RESET button, before using the print function of the J 43600 . See <u>Special Tools</u>. 10. Print 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?	-		
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. RESET the J 43600 and record the pressures and temperatures again. See <u>Special Tools</u>. 3. Compare the low and high side pressures and the panel output temperature to the A/C performance table. Does all the data recorded fall within the	-		

	specified ranges of the A/C performance table?		Go to Step 8	Go to Step 4
4	Do the high and low side pressures fall within the specified ranges, but the panel outlet temperatures do not?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone A</u>	Go to Step 5
5	Is the low side pressure greater than the specified range, but the high side pressure within or less than the specified range?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone B</u>	Go to Step 6
6	Are the low and high side pressures both greater than the specified ranges?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone C</u>	Go to Step 7
7	Is the high side pressure greater than the specified range, but the low side pressure is within or less than the specified range?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone D</u>	Go to Step 8
8	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

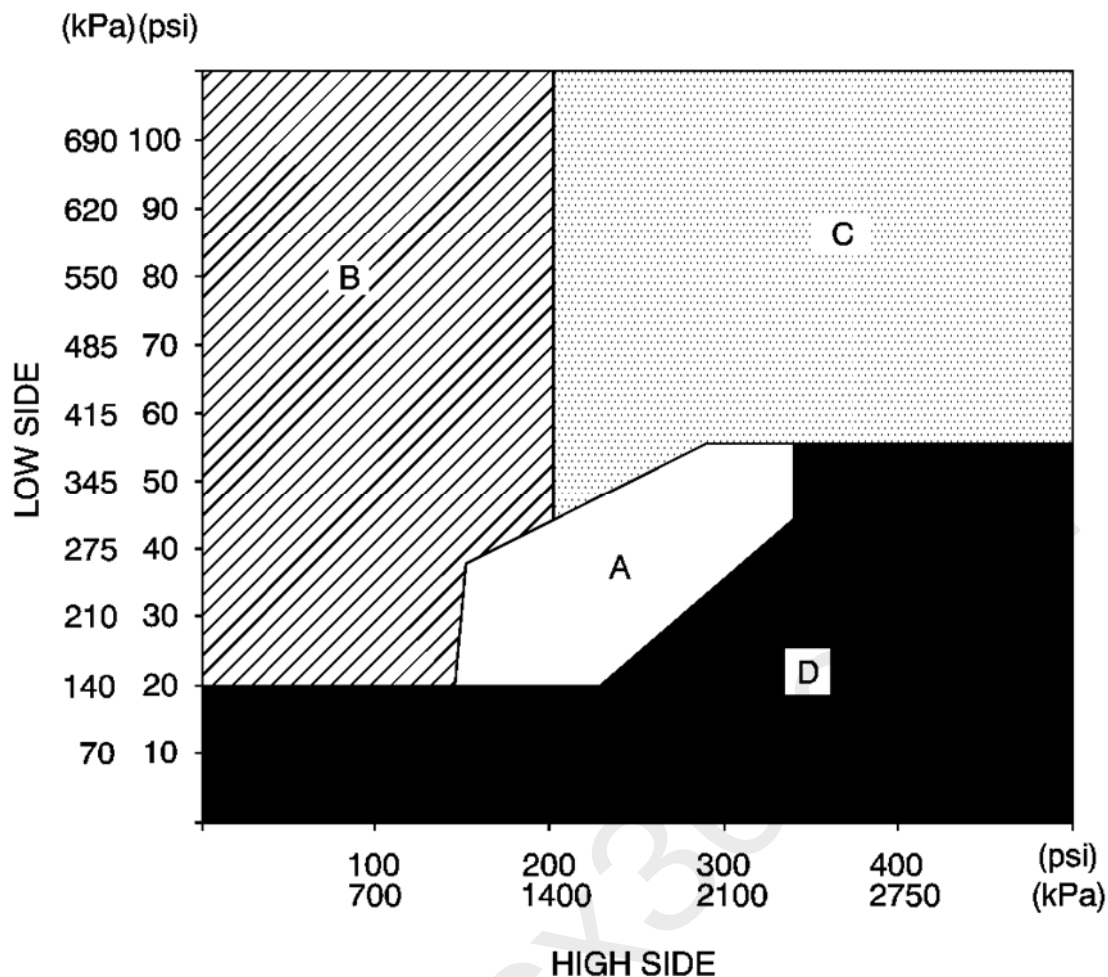


Fig. 1: Air Conditioning (A/C) Diagnostics - Pressure Zone Graph
 Courtesy of GENERAL MOTORS CORP.

A/C Performance Table

Ambient Temperature	Relative Humidity	Low Side Service Port Pressure	High Side Service Port Pressure	Maximum Left Center Discharge Air Temperature
13-18°C (55-65°F)	0-100%	151-199 kPa (22-29psi)	799-1129 kPa (116-164 psi)	12°C (52°F)
19-24°C (66-75°F)	Below 40%	151-220 kPa (22-32 psi)	950-1309 kPa (138-190psi)	12°C (52°F)
	Above 40%	151-248 kPa(22-36 psi)	999-1391 kPa(145-202psi)	13°C (55°F)
25-29°C (76-85°F)	Below 35%	165-241 kpa(24-35 psi)	1178-1502 kPa (171-218 psi)	13°C (54°F)
	35-50%	179-254 kPa (26-37 psi)	1219-1543 kPa (177-224 psi)	13°C (55°F)

	Above 50%	213-303 kPa (31-44 psi)	1460-1880 kPa (212-273 psi)	15°C (59°F)
30-35°C (86-95°F)	Below 30%	186-268 kPa (27-39 psi)	1357-1708 kPa (203-258 psi)	14°C (57°F)
	30-50%	199-282 kPa (29-41 psi)	1398-1777 kPa (218-263 psi)	14°C (57°F)
	Above 50%	227-303 kPa (33-44 psi)	1515-1839 kPa (220-267 psi)	15°C (59°F)
36-41°C (96-105°F)	Below 20%	213-296 kPa (31-43 psi)	1570-1901 kPa (228-276 psi)	15°C (59°F)
	20-40%	220-310 kPa (32-45 psi)	1598-1977 kPa (232-287psi)	15°C (59°F)
	Above 40%	234-323 kPa (34-47 psi)	1667-2060 kPa (242-299 psi)	17°C (61°F)
42-46°C (106-115°F)	Below 20%	248-316 kPa (36-46 psi)	1777-2087 kPa (258-303 psi)	17°C (61°F)
	Above 20%	254-330 kPa (37-48 psi)	1818-2177 kPa (264-316 psi)	18°C (63°F)
47-49°C (116-120°F)	Below 30%	275-351 kPa (40-51 psi)	2011-2328 kPa (292-338 psi)	18°C(64°F)

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST (LF1)

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

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

Test Description

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

- 1:** This step determines if the A/C system has at least the minimum refrigerant charge required to operate the system without damage.
- 2:** This step measures the performance of the A/C system.
- 3:** This step is to allow for vehicle variations as well as high ambient temperatures.

Step	Action	Values	Yes	No
IMPORTANT:				
• 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. Update the ambient air temperature display. Refer to <u>Ambient Air Temperature Display Updating</u>. 3. Open the windows in order to ventilate the interior of the vehicle. 4. If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. 5. Turn OFF the ignition. 6. Install the J 43600. See <u>Special Tools</u>. 7. Record the ambient air temperature displayed on the J 43600. See <u>Special Tools</u>. 8. 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 <u>Leak Testing</u>
	IMPORTANT: 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 panel outlet mode • All panel outlets are OPEN 4. Install the temperature probes of the J 43600 in the left and right center panel air outlets. See <u>Special Tools</u>. 5. Apply the parking brake.			

2	6. Place the transaxle/transmission in PARK. 7. Start the engine. 8. Operate the A/C system for 5 minutes. 9. Inspect A/C components for the following conditions: • Abnormal frost areas • Unusual noises IMPORTANT: Press the RESET button, before using the print function of the J 43600 . See <u>Special Tools</u>. 10. Print 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?	-		
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. RESET the J 43600 and record the pressures and temperatures again. See <u>Special Tools</u>. 3. Compare the low and high side pressures and the panel output temperature to the A/C performance table. Does all the data recorded fall within the specified ranges of the A/C performance table?	-		
4	Do the high and low side pressures fall within the specified ranges, but the panel outlet temperatures do not?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone A</u>	Go to Step 5

5	Is the low side pressure greater than the specified range, but the high side pressure within or less than the specified range?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone B</u>	Go to Step 6
6	Are the low and high side pressures both greater than the specified ranges?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone C</u>	Go to Step 7
7	Is the high side pressure greater than the specified range, but the low side pressure is within or less than the specified range?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone D</u>	Go to Step 8
8	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

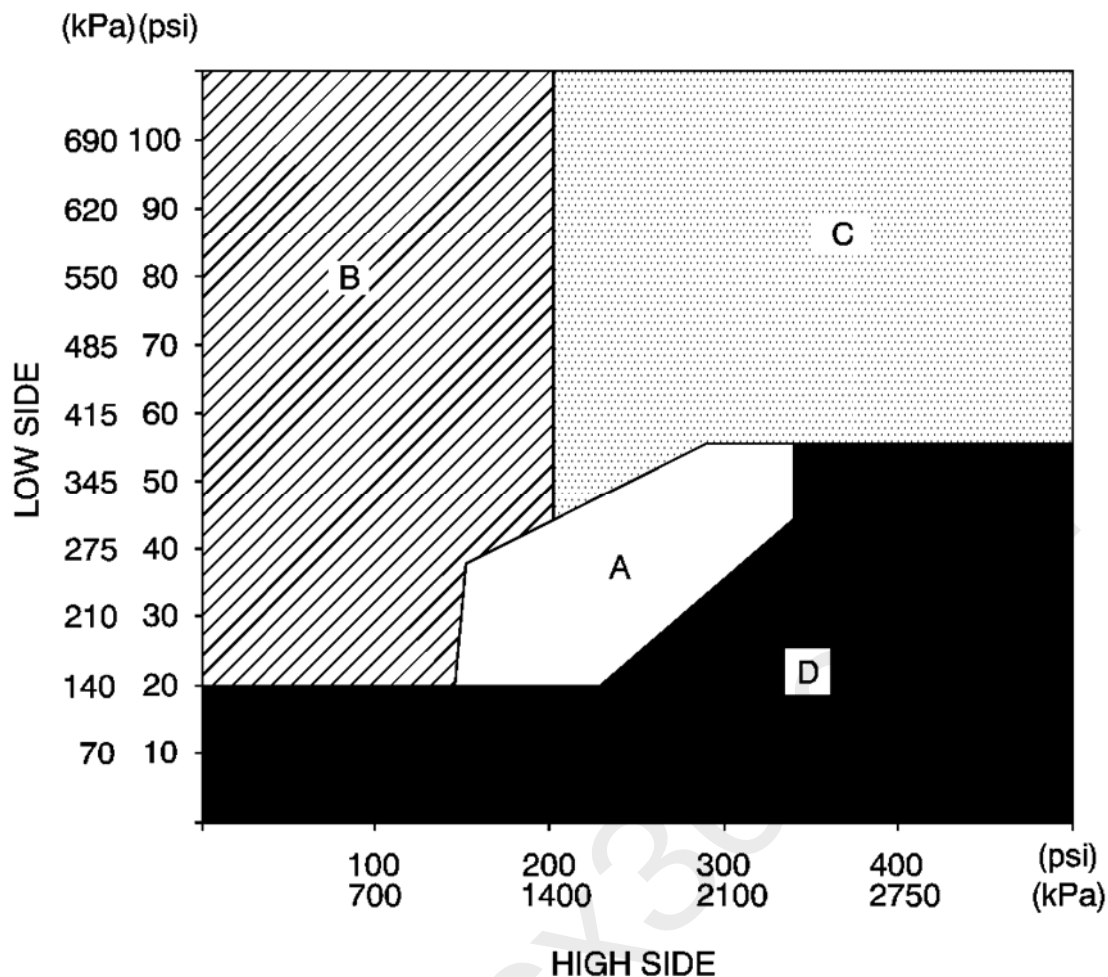


Fig. 2: Air Conditioning (A/C) Diagnostics - Pressure Zone Graph
 Courtesy of GENERAL MOTORS CORP.

A/C Performance Table

Ambient Temperature	Relative Humidity	Low Side Service Port Pressure	High Side Service Port Pressure	Maximum Left Center Discharge Air Temperature
13-18°C (55-65°F)	0-100%	151-220 kPa (22-32psi)	930-1350 kPa (135-196 psi)	9°C (48°F)
19-24°C (66-75°F)	Below 40%	151-220 kPa (22-32 psi)	950-1357 kPa (138-197psi)	10°C (50°F)
	Above 40%	158-248 kPa(23-36 psi)	1088-1502 kPa (158-218psi)	10°C (50°F)
25-29°C (76-85°F)	Below 35%	165-234 kpa(24-34 psi)	1191-1502 kPa (173-218 psi)	12°C (52°F)
	35-50%	179-248 kPa (26-36 psi)	1260-1543 kPa (183-224 psi)	12°C (52°F)

	Above 50%	186-261 kPa (27-38 psi)	1309-1619 kPa (190-235 psi)	12°C (52°F)
30-35°C (86-95°F)	Below 30%	179-254 kPa (26-37 psi)	1371-1688 kPa (199-245 psi)	13°C (54°F)
	30-50%	192-261 kPa (28-38 psi)	1412-1722 kPa (205-250 psi)	13°C (54°F)
	Above 50%	206-282 kPa (30-41 psi)	1460-1756 kPa (212-255 psi)	13°C (54°F)
36-41°C (96-105°F)	Below 20%	199-268 kPa (29-39 psi)	1577-1887 kPa (229-274 psi)	13°C (55°F)
	20-40%	206-275 kPa (30-40 psi)	1598-1901 kPa (232-276psi)	13°C (55°F)
	Above 40%	220-289 kPa (32-42 psi)	1632-1901 kPa (237-276 psi)	13°C (55°F)
42-46°C (106-115°F)	Below 20%	220-289 kPa (32-42 psi)	1798-2060 kPa (261-299 psi)	14°C (57°F)
	Above 20%	227-296 kPa (33-43 psi)	1812-2053 kPa (263-298 psi)	14°C (57°F)
47-49°C (116-120°F)	Below 30%	248-310 kPa (36-45 psi)	1977-2232 kPa (287-324 psi)	15°C (59°F)

AIR CONDITIONING (A/C) DIAGNOSTICS - PRESSURE ZONE A

Step	Action	Value	Yes	No
DEFINITION: The high and low side pressures may be normal or slightly less than normal. - Air Delivery Concern - Slight Refrigerant Under Charge - Refrigerant Contamination				
1	Were you sent here from the air conditioning (A/C) System Performance Test?	-	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>
2	Refer to the instrument panel outlet air temperatures recorded during the A/C system performance test. Does the discharge air temperature between the right and left center instrument panel outlets vary by more than 1-2°C (2-3°F)?	-	Go to Step 7	Go to Step 3

3	Did the customer mention that the A/C system output temperatures are good at first, but then turn warm during extended drives?	-	Go to Step 4	Go to Step 5
4	Increase engine speed to 2,000 RPM. During extended operation of the A/C system, does the low side pressure decrease, possibly accompanied by heavy frost on the liquid line between the expansion device and the evaporator?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone D</u>	Go to Step 5
5	1. Refer to the pressures recorded during the A/C system performance test. 2. Inspect for the following conditions: WARNING: <u>Refer to Moving Parts and Hot Surfaces Warning .</u> • The high side pressure is slightly greater than the specified pressure ranges but still within Zone A on the A/C Pressure-Zone Classification Chart in the A/C System Performance Test. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)Air Conditioning (A/C) System Performance Test (LF1) .</u> • The discharge line is hot. • The suction line is cool. Do the listed conditions exist?	-	Go to Step 7	Go to Step 6
6	1. Refer to the pressures recorded during the A/C system performance test. 2. Inspect for the following conditions: • The low side pressure is slightly lower than the specified pressure ranges but still within Zone A on the A/C Pressure-Zone Classification Chart in the A/C System Performance Test. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)Air Conditioning (A/C) System Performance Test (LF1) .</u> • The discharge line is warm to hot.	-		

	The suction line is cool to warm. Do the listed conditions exist?		Go to Step 8	Go to <u>Air Temperature Malfunction</u>
7	The A/C system may be undercharged. - Leak test A/C system. Refer to <u>Leak Testing</u>. - Recharge the A/C system to specifications. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the action complete?	-	Go to Step 14	-
8	The A/C system may be contaminated. View the information screen on J 43600 for detection of foreign gases in the A/C system. See <u>Special Tools</u>. Do foreign gases exist?	-	Go to Step 9	Go to Step 10
9	- Evacuate the A/C system to a scavenging tank. Refer to <u>Refrigerant Recovery and Recharging</u>. - Recharge the A/C system to specifications. Is the action complete?	-	Go to Step 14	-
10	The A/C system may contain too much moisture or air. - Evacuate and recharge the A/C system to specifications. Refer to <u>Refrigerant Recovery and Recharging</u>. - Operate the A/C system and inspect the instrument panel outlet air temperatures. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>. Are the instrument panel outlet air temperatures within the specified ranges of the A/C Performance Test Table?	-	Go to Step 15	Go to Step 11
	The A/C system may contain too much refrigerant oil. NOTE:			

11	Operate the A/C system on low, in order to enhance oil flow to the high side of the system. 1. Operate the A/C system with the engine at idle speed and the blower speed on low for approximately 15 minutes. 2. Recover the refrigerant from the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. 3. Remove the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>. 4. Drain and measure the refrigerant oil from the receiver dehydrator. Was more than the specified amount of refrigerant oil drained from the receiver?	148 ml (5 oz)		
12	1. Reinstall the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>. 2. Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Are the actions complete?	-	Go to Step 12	Go to Step 13
13	1. Add the specified amount of refrigerant oil to the receiver dehydrator. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Install the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>. 3. Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Are the actions complete?	-	Go to Step 14	-
14	1. Record the low and high side pressures and the instrument panel outlet air temperature. 2. Compare the instrument panel outlet air temperatures to those listed in the A/C System Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>.	-		Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning</u>

	Are the high and low side pressures and instrument panel outlet air temperatures within specifications?		Go to Step 15	<u>(A/C) System Performance Test (LF1)</u>
15	Operate the system in order to verify the repair. Did you find and correct the condition?	-	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

AIR CONDITIONING (A/C) DIAGNOSTICS - PRESSURE ZONE B

Step	Action	Yes	No
DEFINITION: The low side pressure is higher than normal and the high side pressure is lower than normal. - Malfunctioning Air Conditioning (A/C) Compressor - Refrigerant Under Charge			
1	Were you sent here from the air conditioning (A/C) System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>
2	After continued operation of the A/C system, do the low and the high side pressures equalize or become static?	Go to Step 5	Go to Step 3
3	1. Refer to the pressures recorded during the A/C System Performance Test. 2. Inspect for the following conditions: WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . - The low side pressure is equal to or greater than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u><u>Air Conditioning (A/C) System Performance Test (LF1)</u> . - The high side pressure is less than the specified pressure range of the A/C Performance Table. Refer to <u>Air</u>		

	<u>Conditioning (A/C) System Performance Test (LAF)Air Conditioning (A/C) System Performance Test (LF1) .</u> • The low side refrigerant line at the compressor feels cool to warm. • The high side refrigerant line at the compressor feels warm to hot.		
	Do the listed conditions exist?	Go to Step 5	Go to Step 4
4	1. Refer to the pressures recorded during the A/C System Performance Test. 2. Inspect for the following conditions: WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . • The low side pressure is greater than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)Air Conditioning (A/C) System Performance Test (LF1) .</u> • The high side pressure is less than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)Air Conditioning (A/C) System Performance Test (LF1) .</u> • The low side refrigerant line at the compressor feels warm. • The high side refrigerant line at the compressor feels warm to hot.		Go to <u>Air Conditioning (A/C) System Performance Test (LAF) or Air Conditioning (A/C) System Performance Test (LF1)</u>
	Do the listed conditions exist?	Go to Step 5	
5	The A/C system has a low refrigerant charge. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the action complete?	Go to Step 6	-
	1. After you perform the repairs, record the following: • The low and the high side pressures • The instrument panel outlet air temperature 2. Compare the pressures and the temperature to		

6	those listed in the A/C Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>. Are the readings within the specified ranges found on the A/C Performance Chart?	Go to Step 13	Go to Step 7
7	The A/C compressor is malfunctioning. Remove the thermal expansion valve (TXV) and inspect for contamination. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. Did you find metal flakes on the TXV?	Go to Step 9	Go to Step 8
8	Inspect the TXV for a brown, powdery residue indicating desiccant in the A/C system. Is a brown, powdery residue present?	Go to Step 11	Go to Step 12
9	1. Remove the compressor hose from the compressor. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>. 2. Inspect for metal flake contamination at the line connections and the compressor ports. Is metal flake contamination present?	Go to Step 10	Go to Step 12
10	1. Replace the A/C compressor. Refer to <u>Air Conditioning Compressor Replacement (LAF)</u> or <u>Air Conditioning Compressor Replacement (LF1)</u>. 2. Replace the TXV. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. 3. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the action complete?	Go to Step 13	-
11	1. Replace the TXV. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. 2. Replace the A/C compressor. Refer to <u>Air Conditioning Compressor Replacement (LAF)</u> or <u>Air Conditioning Compressor Replacement (LF1)</u>. 3. Replace the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>.		

	4. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u> .		
	Is the action complete?	Go to Step 13	-
12	1. Replace the A/C compressor. Refer to <u>Air Conditioning Compressor Replacement (LAF)</u> or <u>Air Conditioning Compressor Replacement (LF1)</u> . 2. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u> .		
	Is the action complete?	Go to Step 13	-
13	Operate the system in order to verify the repair Did you find and correct the condition?	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

AIR CONDITIONING (A/C) DIAGNOSTICS - PRESSURE ZONE C

Step	Action	Yes	No
DEFINITION: The low and the high side pressures are both higher than normal. • Restricted Condenser Air Flow • Cooling Fan Malfunction • Thermal Expansion Valve (TXV) Malfunction			
1	Were you sent here from the air conditioning (A/C) System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>
2	1. Start the engine. 2. Turn ON the A/C. 3. Inspect for proper cooling fan operation. Refer to <u>Cooling Fan Inoperative (LF1 or LFW)</u> or <u>Cooling Fan Inoperative (LAF)</u> .		
	Are the cooling fans ON and operating properly?	Go to Step 3	Go to Step 5
	Visually inspect for the following conditions: • Damaged condenser cooling fins • Missing or misaligned air baffles		

3	• Restricted air flow Do any of these conditions exist?	Go to Step 4	Go to Step 6
4	Repair the air flow restriction. Is the action complete?	Go to Step 9	-
5	Repair the fault to the cooling fan operation. Refer to <u>Cooling Fan Inoperative (LF1 or LFW)</u> or <u>Cooling Fan Inoperative (LAF)</u> . Is the repair complete?	Go to Step 9	-
6	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . Feel the liquid line on both sides of the thermal expansion valve (TXV). Are the temperatures on both sides of the TXV similar?	Go to Step 7	Go to Step 8
7	Replace the damaged or faulty TXV. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. Is the action complete?	Go to Step 9	-
8	1. Air is in the refrigerant system, or the system is overcharged. Refer to the view screen on J 43600 ACR 2000 Air Conditioning Service Center for foreign gas content in the refrigerant. See <u>Special Tools</u>. 2. Recover and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the action complete?	Go to Step 9	-
9	1. Record the low and high side pressures and the instrument panel outlet air temperature after you have performed the repairs. 2. Compare the pressures and the instrument panel outlet air temperature to those listed in the A/C Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>. Are the readings within the specified ranges listed in the A/C Performance Chart?	Go to Step 10	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>
10	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

AIR CONDITIONING (A/C) DIAGNOSTICS - PRESSURE ZONE D

Step	Action	Yes	No
DEFINITION: The low side pressure is lower than normal and the high side pressure is higher than normal. • A restriction in the Air Conditioning (A/C) system • Debris in the system			
1	Were you sent here from the air conditioning (A/C) System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u>
2	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . Feel the liquid line before the thermal expansion valve (TXV). Is the liquid line cold before the TXV?	Go to Step 3	Go to Step 8
3	Feel along the surfaces of the following high side components: • The compressor hose between the compressor and the condenser • The condenser • The liquid line between the condenser and the TXV Did you detect an abrupt drop in temperature along the surfaces of any of the listed components?	Go to Step 7	Go to Step 4
4	1. Feel the liquid line at the TXV location for extreme cold, possibly accompanied by heavy frost. 2. Feel along the liquid line beyond the TXV location for warm temperature. Is the liquid line extremely cold at the TXV location and warm beyond the TXV location?	Go to Step 11	Go to Step 5
	Feel along the surfaces of the following low side components:		

5	• The evaporator inlet tube between the TXV and the evaporator core • The evaporator outlet tube between the evaporator core and the compressor suction hose • The compressor suction hose Did you feel an abrupt temperature change along the surfaces of any of the listed components?	Go to Step 7	Go to Step 6
6	Feel along the surfaces of the low and the high side components. • The evaporator inlet tube between the TXV and the evaporator core • The evaporator outlet hose between the TXV and the compressor • The compressor hose assembly • The condenser • The liquid line between the condenser and the TXV Are the temperatures of these components only mildly warm?	Go to Step 14	Go to Step 8
7	1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Remove the restriction from the component, or replace the component which produced an abrupt temperature drop. Is the action complete?	Go to Step 9	-
8	1. Recover the refrigerant and evacuate the system. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Record the weight of the recovered refrigerant. 3. Compare the weight of the recovered refrigerant with the system capacity. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the weight of the recovered refrigerant charge greater than 75 percent of the total system capacity?	Go to Step 9	Go to Step 10
9	Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Is the cooling performance improved?	Go to Step 20	Go to Step 10

10	1. Leak test the system. Refer to <u>Leak Testing</u>. 2. Repair any leaks. Is the action complete?	Go to Step 20	-
11	The TXV is restricted. 1. Replace the TXV. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. 2. If the TXV was restricted, note the type of debris present. Are metal flakes present?	Go to Step 12	Go to Step 13
12	1. Remove the compressor hose assembly from the vehicle. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>. 2. Inspect the hose for debris by blowing shop air through one end of the hose while covering the other end with a shop towel. 3. Observe the amount of debris collected in the shop towel. Did a large amount of debris collect in the shop towel?	Go to Step 18	Go to Step 19
13	If the TXV was restricted with a brown or black residue, replace the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>. Are the actions complete?	Go to Step 20	-
14	1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Disconnect the compressor hose from the compressor. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>. 3. Inspect for the presence of debris in the compressor suction port. Is debris present in the compressor suction port?	Go to Step 15	Go to Step 19
15	1. Remove the debris from the suction port. 2. Inspect the TXV for damage or debris. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>.		

	Did you find evidence of damage or debris?	Go to Step 17	Go to Step 16
16	If the TXV does not show any signs of damage or debris, perform the following procedure: 1. Remove the compressor hose assembly from the vehicle. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>. 2. Inspect the hose for debris by blowing shop air through one end of the hose while covering the other end with a shop towel. 3. Observe the amount of debris collected in the shop towel. Did a large amount of debris collect in the shop towel?		
17	1. Replace the TXV. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>. 2. If the TXV was restricted, observe the type of debris present. Are metal flakes present?	Go to Step 18	Go to Step 19
18	If a large amount of debris was collected in the shop towel from the compressor hose assembly, replace the receiver dehydrator. Refer to <u>Receiver and Dehydrator Replacement</u>. Is the action complete?	Go to Step 12	Go to Step 13
19	1. Install the compressor hose assembly. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>. 2. Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. Are the actions complete?	Go to Step 19	-
20	1. Record the low and the high side pressures and the instrument panel outlet air temperature after you perform the repairs. 2. Compare the pressures and the instrument panel outlet air temperature to those listed in the A/C Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test</u>	Go to Step 20	Go to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air</u>

	<u>(LF1).</u> Are the readings within the specified ranges as shown on the A/C Performance Chart?	Go to Step 21	<u>Conditioning (A/C) System Performance Test (LF1)</u>
21	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u>

DEFROSTING INSUFFICIENT

Step	Action	Yes	No
DEFINITION: Time required to defrost the windshield is longer than usual.			
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 11
3	Measure the engine operating temperature. Does engine reach normal operating temperature?	Go to Step 4	Go to Step 9
4	1. Select the minimum blower speed. 2. Select the warmest temperature setting. WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . 3. Feel the temperature of the inlet and outlet hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 12	Go to Step 5
5	Is the vehicle equipped with A/C?	Go to Step 6	Go to Step 14
6	Test the operation of the A/C compressor clutch. Does the A/C compressor clutch engage?	Go to Step 8	Go to Step 7
7	Repair the A/C compressor clutch. Refer to <u>Air Conditioning Compressor Malfunction</u> . Is the repair complete?	Go to Step 15	-
8	Perform the A/C system performance test. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u> .		

	Is the A/C system operating within the specifications?	Go to Step 10	Go to Step 13
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 15	-
10	Inspect for correct operation of the recirculation door. Is the recirculation door operating correctly?	Go to Step 15	Go to Step 14
11	Repair the air delivery concern. Refer to <u>Vent Valve Replacement</u> . Is the repair complete?	Go to Step 15	-
12	Repair the heating concern. Refer to <u>Symptoms - HVAC Systems - Automatic</u> . Is the repair complete?	Go to Step 15	-
13	Repair the A/C performance concern. Refer to <u>Air Conditioning (A/C) System Performance Test (LAF)</u> or <u>Air Conditioning (A/C) System Performance Test (LF1)</u> . Is the repair complete?	Go to Step 15	-
14	Repair the recirculation door concern. Refer to <u>Vent Valve Replacement</u> . Is the repair 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

NOISE DIAGNOSIS - BLOWER MOTOR

Step	Action	Yes	No
DEFINITION: Noise originating from the blower motor.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Manual</u> or 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 in order to determine where and when the noise occurs.		

	Did you hear a noise 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 blower 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

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. • If the system has a front orifice tube and is not equipped with a filter in the rear auxiliary line, remove the filter in the auxiliary TXV and Install a universal inline A/C Filter P/N 89016656 (AC Delco P/N 15-10413) as close to the rear TXV as possible.
Dark brown/black and/or pungent/unusual odor with no debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Flush refrigerant system.
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. • If the system has a front orifice tube and is not equipped with a filter in the rear auxiliary line, remove the filter in the auxiliary TXV and install a universal inline A/C Filter P/N 89016656 (AC Delco P/N 15-10413) as close to the rear TXV as possible.
Oil Overcharge	Flush refrigerant system.
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 - HVAC MODULE

Step	Action	Yes	No
	Were you sent here from Symptoms or another diagnostic table?		Go to <u>Symptoms - HVAC Systems -</u>

1		Go to Step 2	<u>Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
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 instrument carrier. Refer to <u>Instrument Carrier Replacement (Equinox)</u> or <u>Instrument Carrier Replacement (Terrain)</u> . 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 instrument carrier. Refer to <u>Instrument Carrier Replacement (Equinox)</u> or <u>Instrument Carrier Replacement (Terrain)</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

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start the engine. 4. Allow the engine 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. Is debris present?	Go to Step 4	Go to Step 5
4	Remove any debris. Is the action complete?	Go to Step 15	-
5	Inspect for wet carpeting. Is the carpet wet?	Go to Step 6	Go to Step 14
6	Inspect for the following conditions: • Water leaks around the windshield • Blockage of the HVAC module drain • Leaks around the door seals Is a 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 a leak present?	Go to Step 10	Go to Step 12
10	Inspect for coolant leaking inside the vehicle or for a film build-up on the windshield. Is the condition present?	Go to Step 11	Go to Step 15
11	Replace the heater core. 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>Cooling System Leak Testing</u> • <u>Oil Leak Diagnosis</u> 2. Repair any oil leaks. Is the repair complete?	Go to Step 15	-
14	A musty odor can be caused by mold or mildew build-up on the evaporator or the heater core or inside of the HVAC module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</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

REFRIGERANT RECOVERY AND RECHARGING

Special Tools

J 34100: Smart Cart

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 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: 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.

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

CAUTION: Use only Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system and only 525 viscosity mineral oil on fitting threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure may result.

The **J 34100:** Smart Cart is a complete air conditioning service center for R-134a. The Smart Cart recovers, recycles, evacuates and recharges A/C refrigerant quickly, accurately and automatically. The unit has a display screen that contains the function controls and displays prompts that will lead the technician through the recover, recycle, evacuate and recharge operations. R-134a is recovered into and charged out of an internal storage vessel. The ACR 2000 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 Smart Cart 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 Smart Cart will not recover the refrigerant from the A/C system.

The Smart Cart also features automatic air purge, single pass recycling and an automatic oil drain.

Refer to the **J 34100:** Smart Cart 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 oil must be replenished.

FLUSHING

Tools Required

- **J 41447:** R-134A A/C Tracer Dye - Box of 24
- **J 42220:** Universal 12V Leak Detection Lamp
- **J 43600:** ACR 2000 Air Conditioning Service Center
- **J 45268:** A/C Flushing Adapter Kit

NOTE: **Flushing with the J 43600: ACR 2000 Air Conditioning Service Center is not intended to remove metal from the A/C system.**

Flushing is intended to remove the following:

- Contaminated PAG oil
- Desiccant, following a desiccant bag failure
- Overcharge of PAG oil
- Refrigerant contamination

Forward Flushing Setup

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

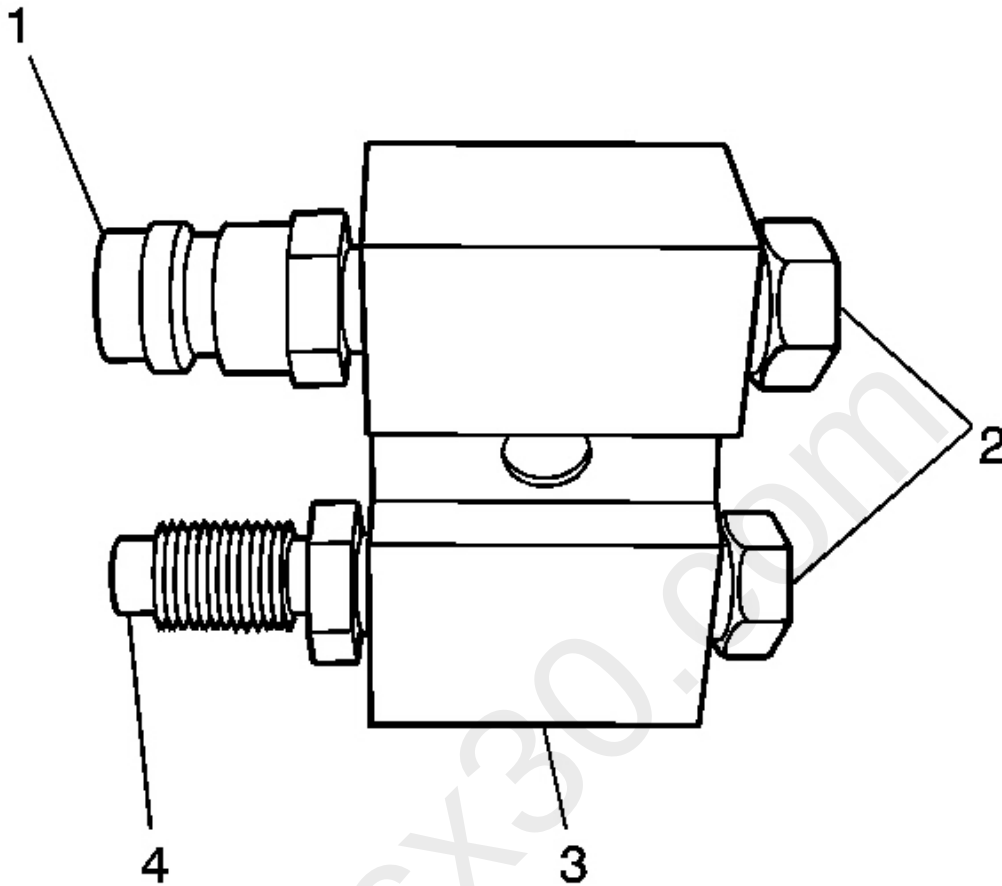


Fig. 3: Identifying J 45268-2, J 45268-7, J 45268-8, & J 45268-9
Courtesy of GENERAL MOTORS CORP.

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

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

Reverse Flushing Setup

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:

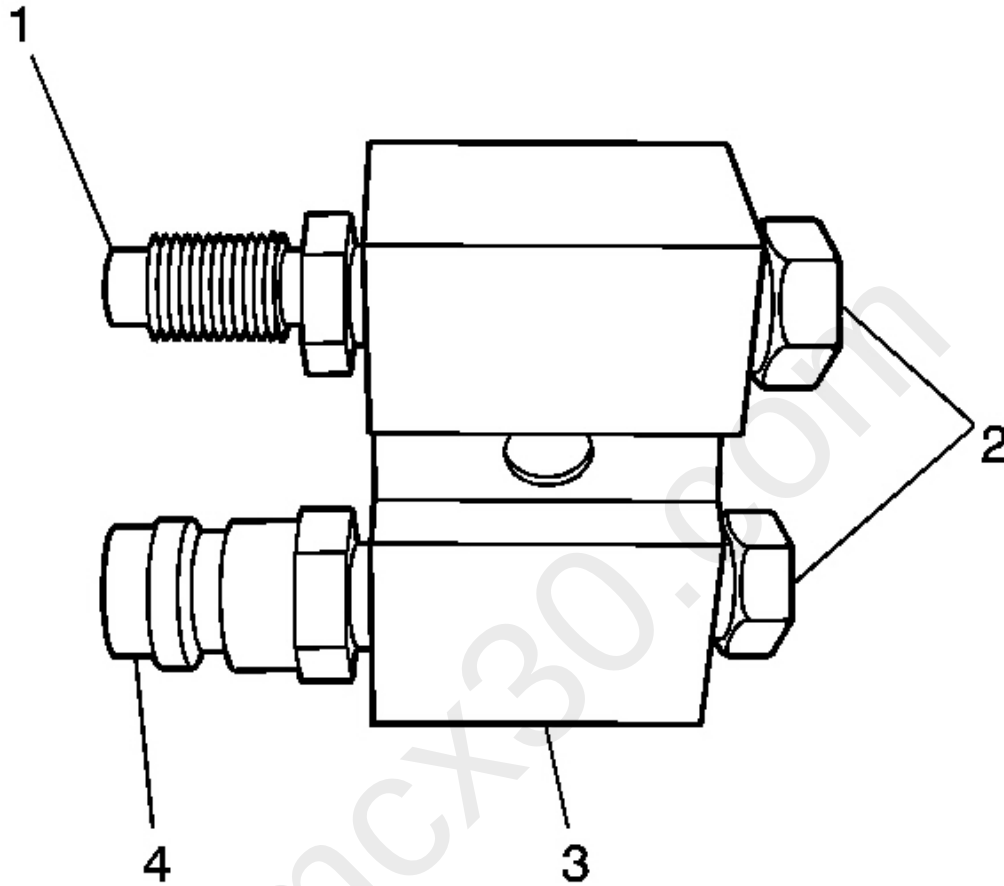


Fig. 4: Using J45268-9, J45268-8, J 45268-7, & J 45268-2
Courtesy of GENERAL MOTORS CORP.

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

1. Install both J 45268-9 (2) onto the J 45268-10 (3).
2. Install the J 45268-8 (1) onto the suction side of the J 45268-10 (3).
3. Install the J 45268-7 (4) onto the discharge side of the J 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.
2. Remove the TXV. Refer to Air Conditioning Evaporator Thermal Expansion Valve Replacement.

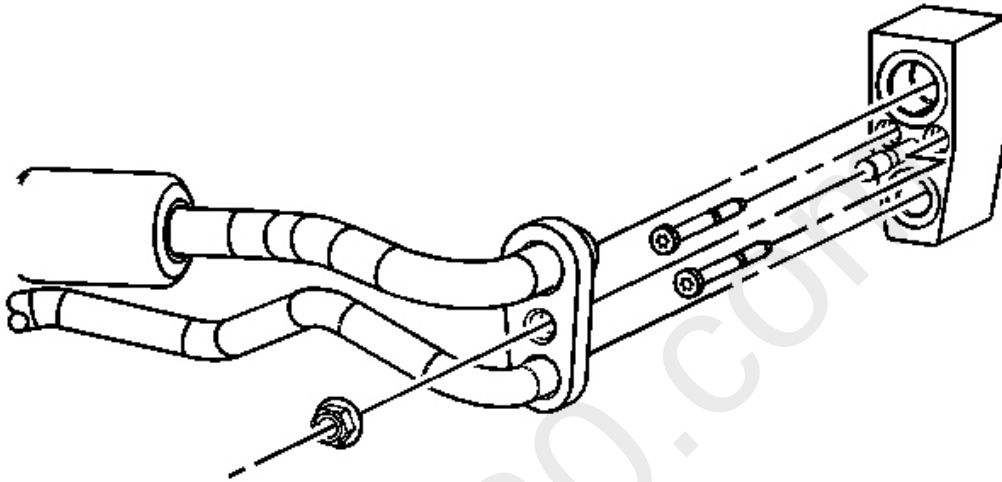


Fig. 5: J 45268-115 With TXV Components
Courtesy of GENERAL MOTORS CORP.

3. Install the stud onto the J 45268-115.
4. Install new sealing washers onto the evaporator core. Refer to Air Conditioning System Seal Replacement.
5. Install J 45268-115 in place of the TXV.

CAUTION: Refer to Fastener Caution .

6. Install TXV mounting bolts and tighten to 7 N.m (62 lb in).
7. Install new washers onto the rear evaporator line assembly. Refer to Air Conditioning System Seal Replacement.
8. Connect the rear evaporator line assembly to the J 45268-115.
9. Install the TXV block fitting nut and tighten to 20 N.m (15 lb ft).
10. Remove the A/C compressor. Refer to Air Conditioning Compressor Replacement (LAF) or Air Conditioning Compressor Replacement (LF1).

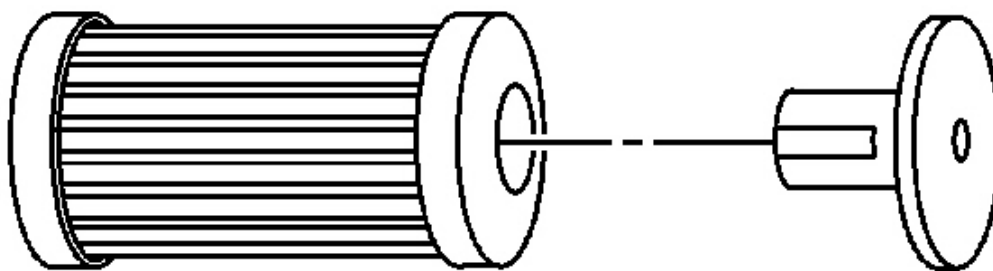


Fig. 6: A/C Filter & Check Valve
Courtesy of GENERAL MOTORS CORP.

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

11. Service the filter with ACDelco P/N GF 470, 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 J 45268-10 correspond to the suction and discharge ports on the compressor hose assembly.

12. Install the J 45268-10 to the compressor hose assembly.
13. Connect the J 45268-1 flush filter to the J 45268-7 flush adapter.

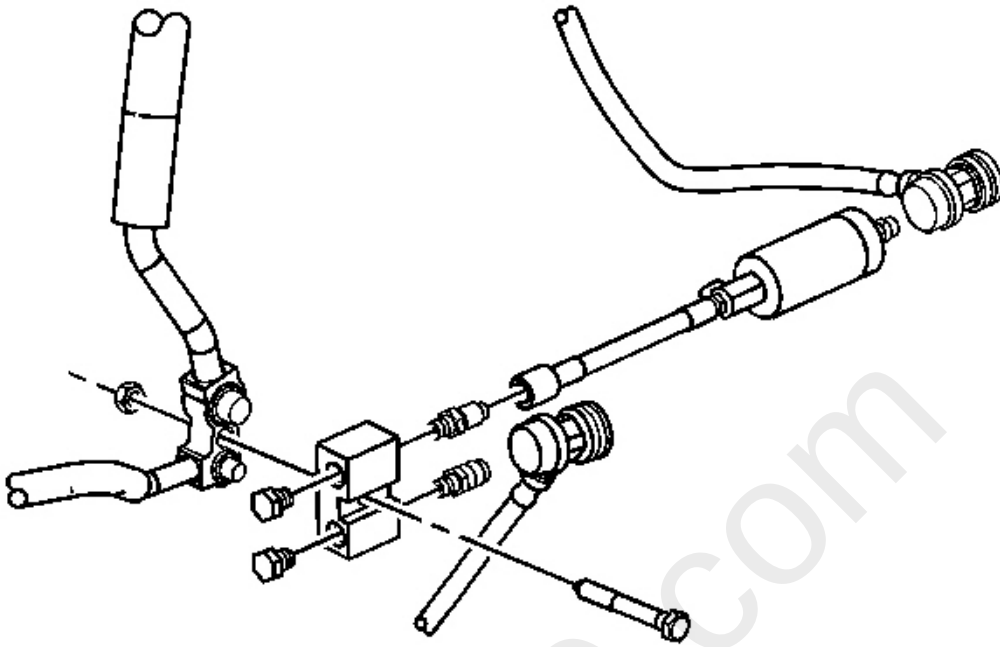


Fig. 7: J 43600, J 45268 Flush Adapters
Courtesy of GENERAL MOTORS CORP.

14. Connect the blue hose from the **J 43600**: ACR 2000 Air Conditioning Service Center to J 45268-1 flush filter adapter.
15. Connect the red hose from the **J 43600**: ACR 2000 Air Conditioning Service Center to J 45268-8 flush adapter.

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 **J 43600**: ACR 2000 Air Conditioning Service Center.
17. Disconnect the red hose from the **J 43600**: ACR 2000 Air Conditioning Service Center to J 45268-8 flush adapter.
18. Disconnect the blue hose from the **J 43600**: ACR 2000 Air Conditioning Service Center to J 45268-1 flush filter adapter.
19. Disconnect the J 45268-1 flush filter from the J 45268-10 flush adapter.
20. Remove the J 45268-10 from the 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. Drain the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
 2. Add the total system capacity of PAG oil to the crankcase of the A/C compressor. Refer to Refrigerant System Specifications.

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

3. Add one bottle of J 41447: R-134A A/C Tracer Dye - Box of 24 directly to the A/C compressor.

NOTE: A new service compressor is shipped with 2.5 oz of PAG oil. Refer to Refrigerant System Specifications.

22. Install the A/C compressor. Refer to Air Conditioning Compressor Replacement (LAF) or Air Conditioning Compressor Replacement (LF1).
23. Remove the TXV block fitting nut.
24. Disconnect the rear evaporator line assembly from the J 45268-115.

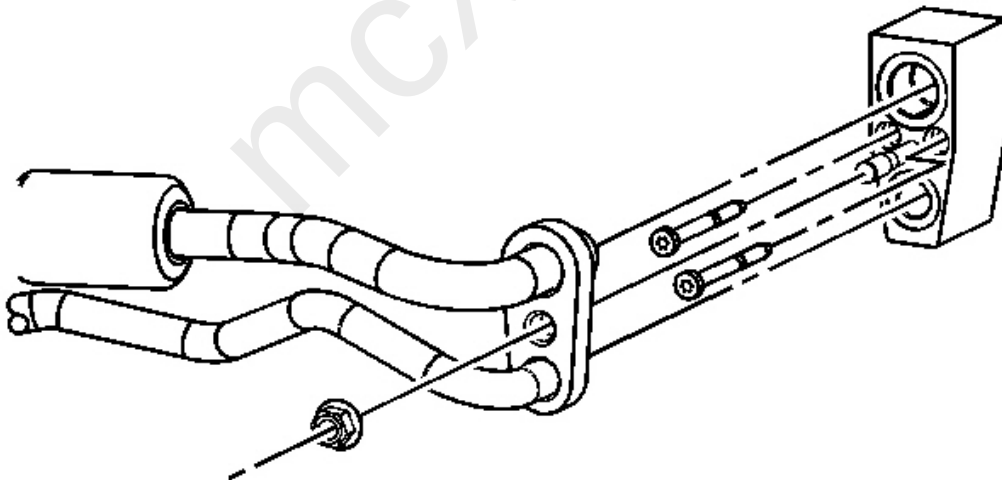


Fig. 8: J 45268-115 With TXV Components
Courtesy of GENERAL MOTORS CORP.

25. Remove the TXV bolts retaining the J 45268-115.
26. Remove the J 45268-115.
27. Inspect the TXV for debris. Clean or replace as needed.
28. Install the TXV. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement**.
29. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
30. Leak test the fittings using **J 42220**: Universal 12V Leak Detection Lamp.

AIR CONDITIONING COMPRESSOR OIL BALANCING

Draining Procedure

NOTE: **Drain and measure as much of the refrigerant oil as possible from the removed compressor.**

1. Remove the compressor crankcase oil drain plug and drain the crankcase into a clean, graduated container.

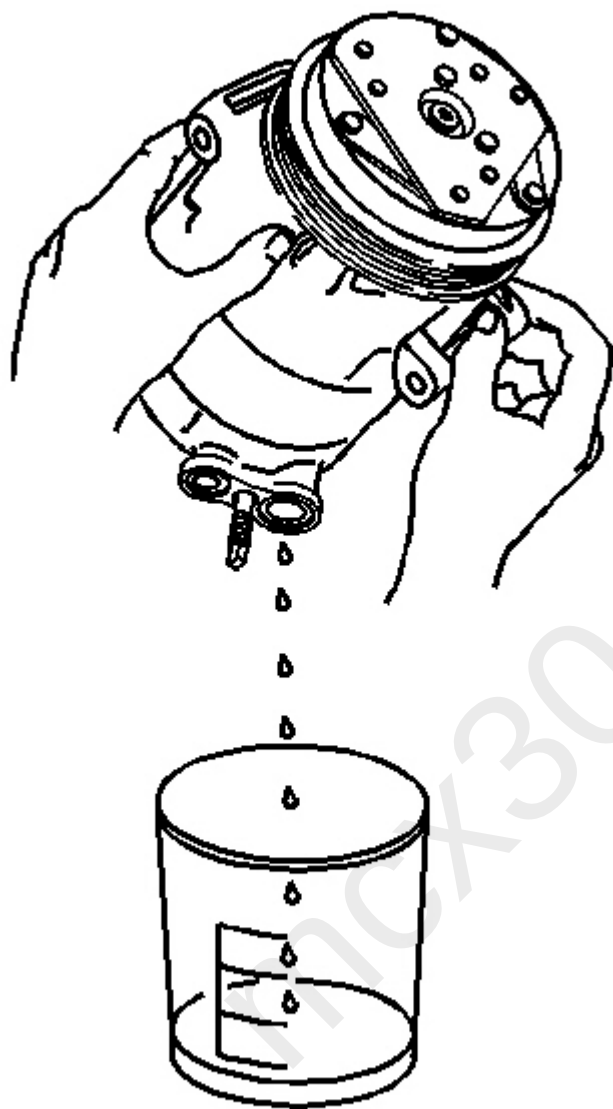


Fig. 9: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS CORP.

2. Drain the oil from both the suction and discharge ports of the removed compressor 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.

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.**

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

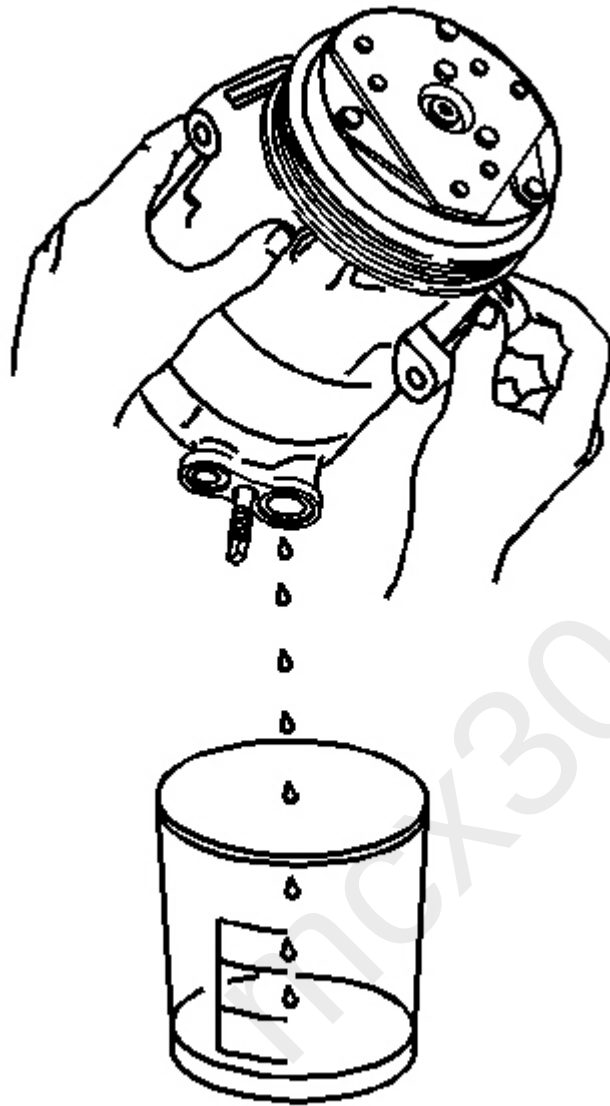


Fig. 10: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS CORP.

2. Before installing the compressor, the refrigerant oil will have to be partially drained:
 1. Refer to the amount of refrigerant oil recorded during the compressor removal.
 2. Subtract the amount recorded from the total system capacity. Refer to **Refrigerant System Specifications**.

The difference between the total system capacity and the recorded amount is the calculated amount to be drained from the replacement compressor.

3. Drain the calculated amount of refrigerant oil from the replacement compressor.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LAF)

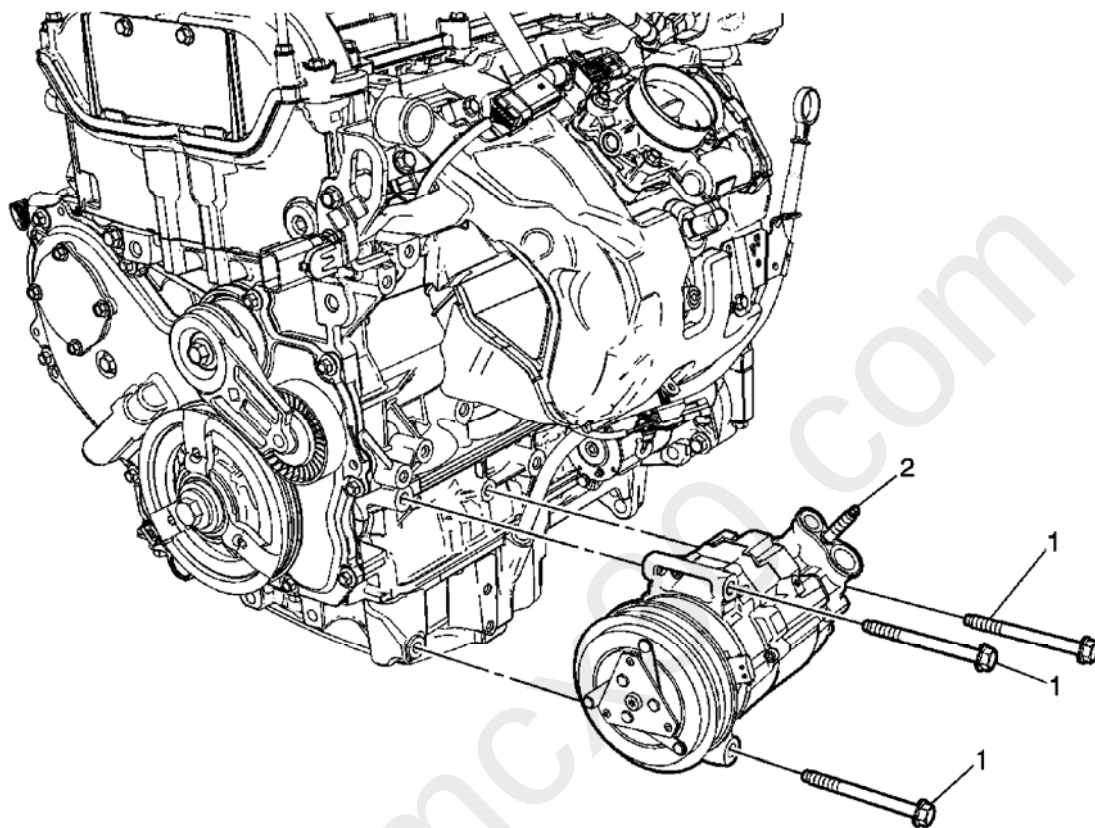


Fig. 11: Air Conditioning Compressor (LAF)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u> .
2.	Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u>
3.	Remove engine splash shield right side. Refer to <u>Engine Splash Shield Replacement - Right Side</u> .
4.	Remove the drive belt. Refer to <u>Drive Belt Replacement</u> .
5.	Disconnect the A/C compressor electrical connector.
6.	Remove the air conditioning compressor hose. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>

1	A/C Compressor Bolt (Qty 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 22 N.m (16 lb ft)
2	A/C Compressor

AIR CONDITIONING COMPRESSOR REPLACEMENT (LF1)

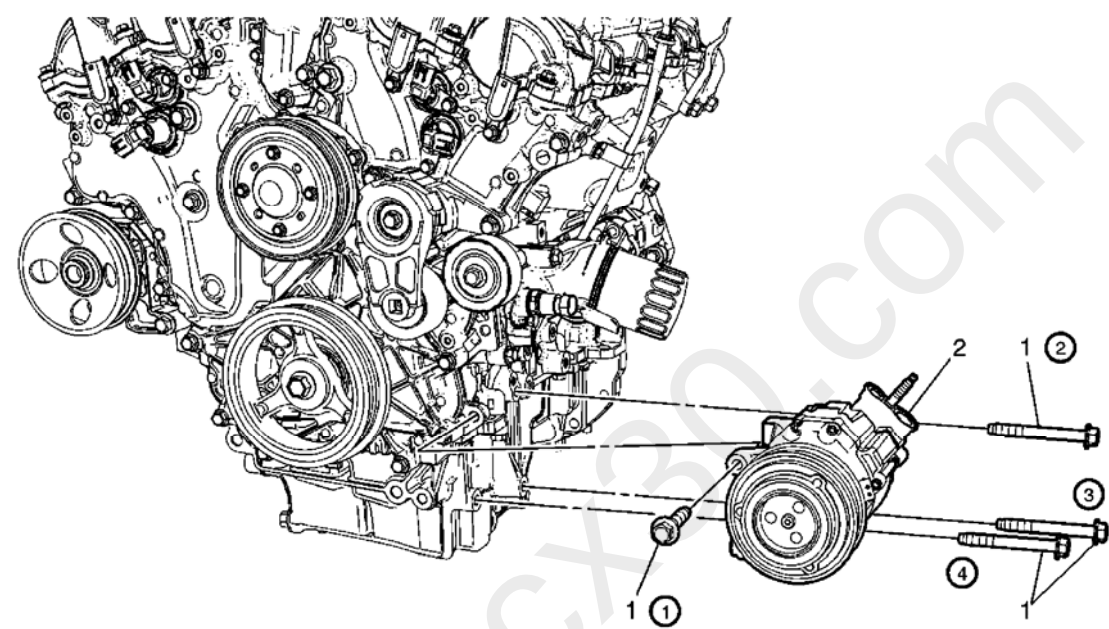


Fig. 12: Air Conditioning Compressor (LF1)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 3. Remove engine splash shield right side. Refer to <u>Engine Splash Shield Replacement - Right Side</u> . 4. Remove the drive belt. Refer to <u>Drive Belt Replacement</u> . 5. Disconnect the A/C compressor electrical connector. 6. Remove the air conditioning compressor hose. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>	
	A/C Compressor Bolt (Qty 4)

1	CAUTION: Refer to <u>Fastener Caution</u> . Tip: Tighten the A/C compressor mounting bolts in sequence. Tighten: 58 N.m (43 lb ft)
2	A/C Compressor 1. Replacement of the desiccant cartridge is required upon new compressor replacement. 2. Install suction screen after a major compressor failure. Tip: • Use a low viscosity, poly-alkylene glycol (PAG) oil. Use of the incorrect oil can result in compressor failure. • When replacing the A/C compressor, balance the compressor. Refer to <u>Air Conditioning Compressor Oil Balancing</u> • Using J 39400-A: Halogen Leak Detector leak test A/C compressor fittings. Special Tools: J 39400-A: Halogen Leak Detector

COMPRESSOR CLUTCH PLATE AND HUB ASSEMBLY REMOVAL

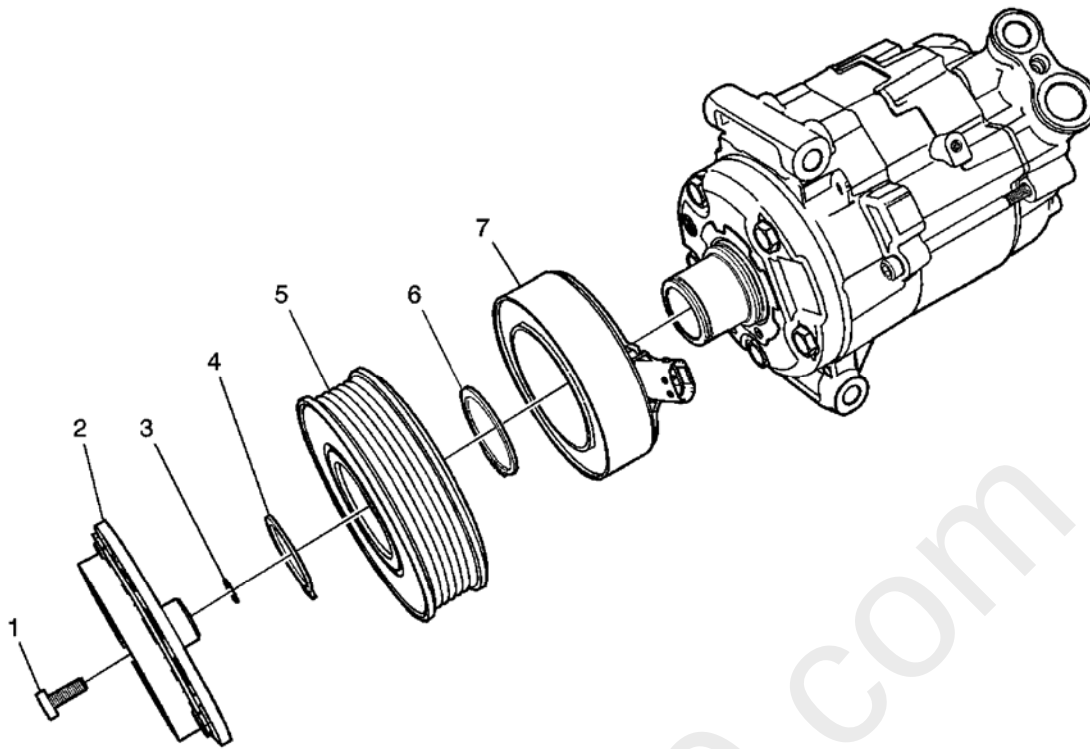


Fig. 13: Compressor Clutch Plate & Hub Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Remove the drive belt. Refer to <u>Drive Belt Replacement</u> . 2. Remove the air conditioning compressor if necessary. Refer to <u>Air Conditioning Compressor Replacement (LAF)</u> or <u>Air Conditioning Compressor Replacement (LF1)</u>. 3. Disconnect the electrical connector from the air conditioning compressor.	
1	Air Conditioning Compressor Pulley Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
2	Air Conditioning Clutch Drive Plate Procedure: Measure and adjust the air conditioning compressor clutch drive plate per specification. Refer to <u>Air Conditioning Clutch Drive Plate Adjustment</u> .
3	Air Conditioning Compressor Clutch Drive Plate Adjustment Shim
4	Air Conditioning Compressor Clutch Pulley Snap Ring Procedure:

	Ensure the clutch pulley snap ring is installed with the flat side toward the air compressor.
5	Air Conditioning Compressor Clutch Pulley
6	Air Conditioning Compressor Clutch Coil Snap Ring Procedure: Ensure the clutch coil snap ring is installed with the flat side toward the air compressor.
7	Air Conditioning Compressor Clutch Coil

AIR CONDITIONING CLUTCH DRIVE PLATE ADJUSTMENT

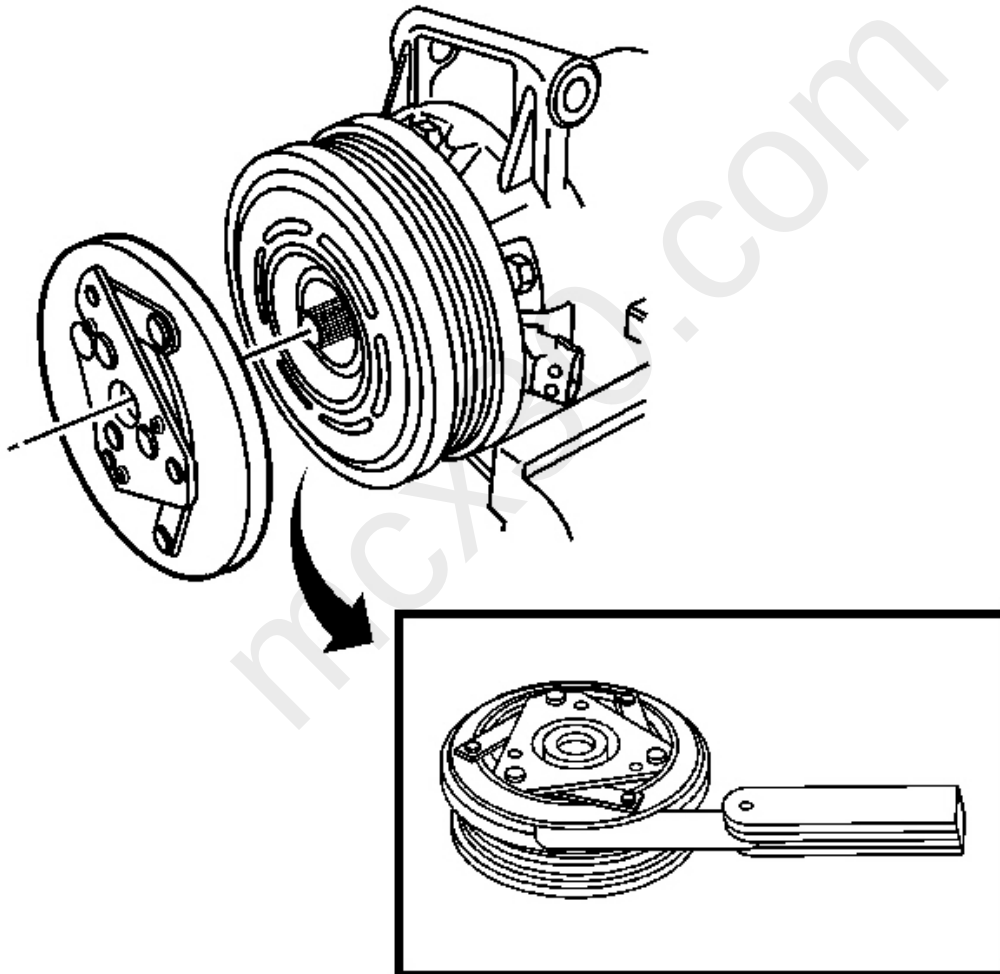


Fig. 14: Measuring Air Gap Between Pulley & Drive Plate
 Courtesy of GENERAL MOTORS CORP.

1. Install the clutch plate assembly.

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 to achieve a 0.30-0.60 mm (0.011-0.023 in) air gap.

CAUTION: Refer to Fastener Caution .

3. Install the clutch plate retaining bolt and tighten to 12 N.m (106 lb in).

AIR CONDITIONING SYSTEM SEAL REPLACEMENT

Removal Procedure

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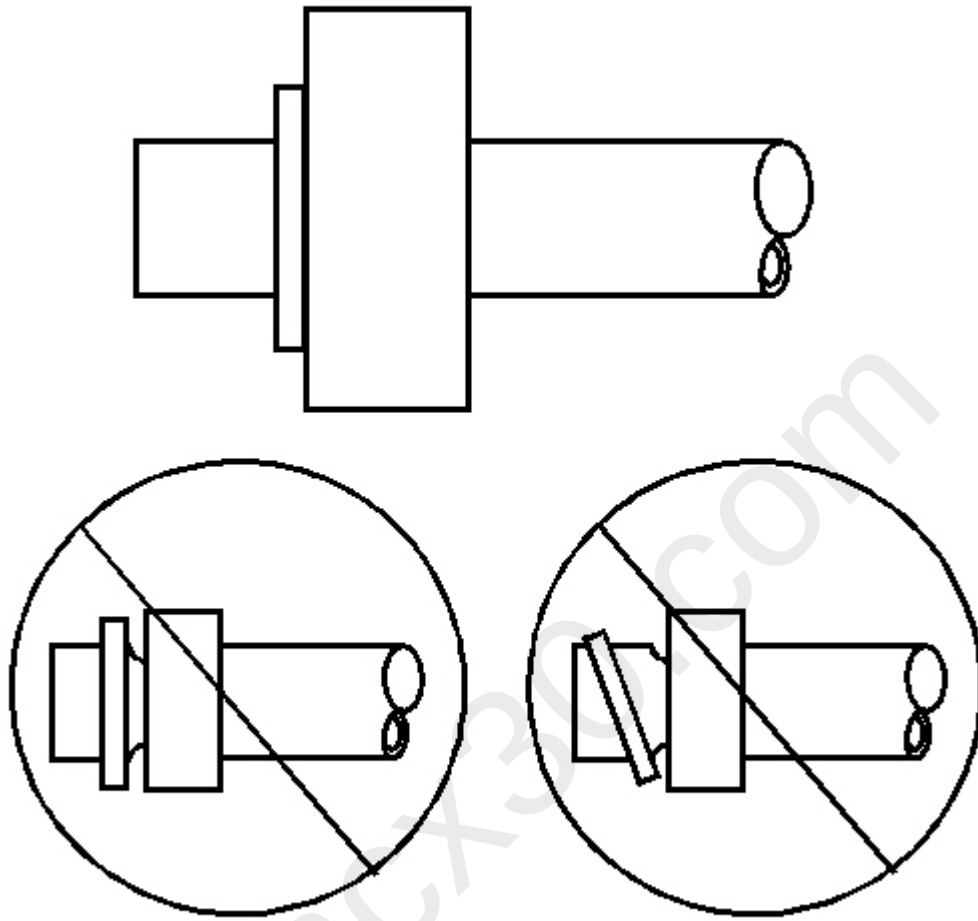


Fig. 15: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS CORP.

1. Remove the seal washer from the A/C refrigerant component.
2. Inspect the seal washer for any signs of damage.
3. Inspect the A/C refrigerant components for damage or burrs. Repair or replace as necessary.

NOTE: DO NOT reuse sealing washer.

4. Discard the sealing washer.

Installation Procedure

NOTE: Flat washer type seals do not require lubrication.

1. Inspect the new seal washer for any signs of cracks, cuts, or damage.

Do not use a damaged seal washer.

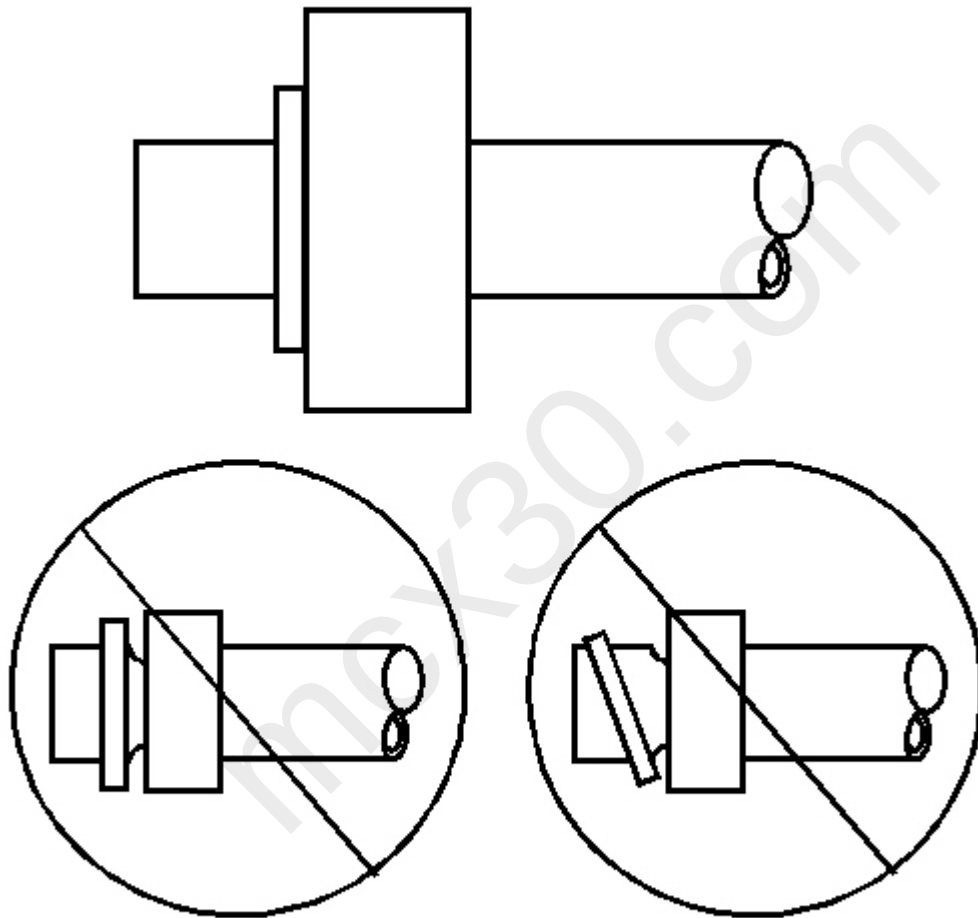


Fig. 16: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS CORP.

2. Using a lint-free clean, dry cloth, clean the sealing surfaces of the A/C refrigerant components.
3. Carefully install the new seal washer onto the A/C refrigerant component.
4. The washer must completely bottom against the surface of the fitting.

NOTE: After tightening the A/C components, there should be a slight sealing washer 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

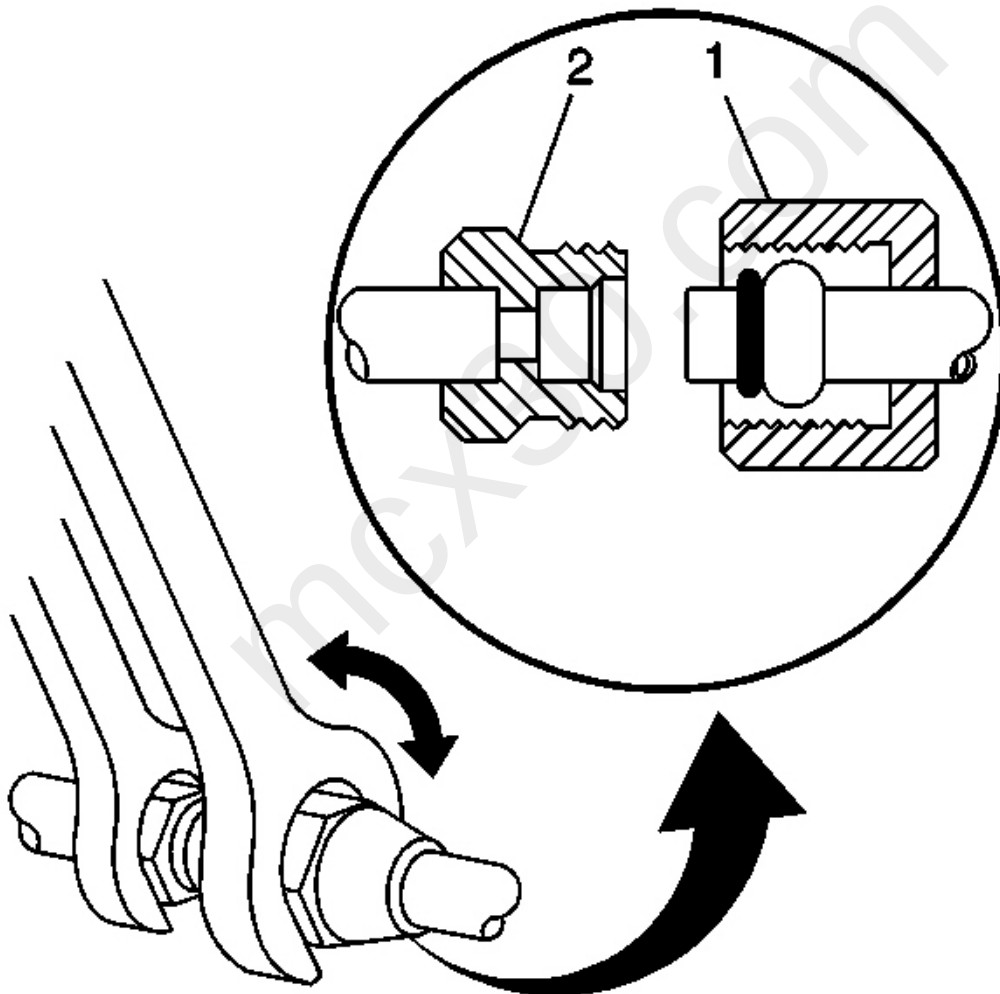


Fig. 17: Disassembling/Reassembling A/C Line Fittings
Courtesy of GENERAL MOTORS CORP.

1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure
 - For compression style fittings use a back up wrench on the fitting (2) and loosen the fitting nut (1).
 - For banjo style fittings remove the bolt retaining the banjo type fitting.
2. Remove the O-ring seal from the A/C refrigerant component.
3. Inspect the O-ring seal for signs of damage to help determine the root cause of the failure.
4. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.

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

5. Cap or tape the A/C refrigerant components.
6. Discard the O-ring seal.

Installation Procedure

1. Inspect the new O-ring seal for any sign or cracks, cuts, or damage. Replace if necessary.
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 onto the A/C refrigerant component.

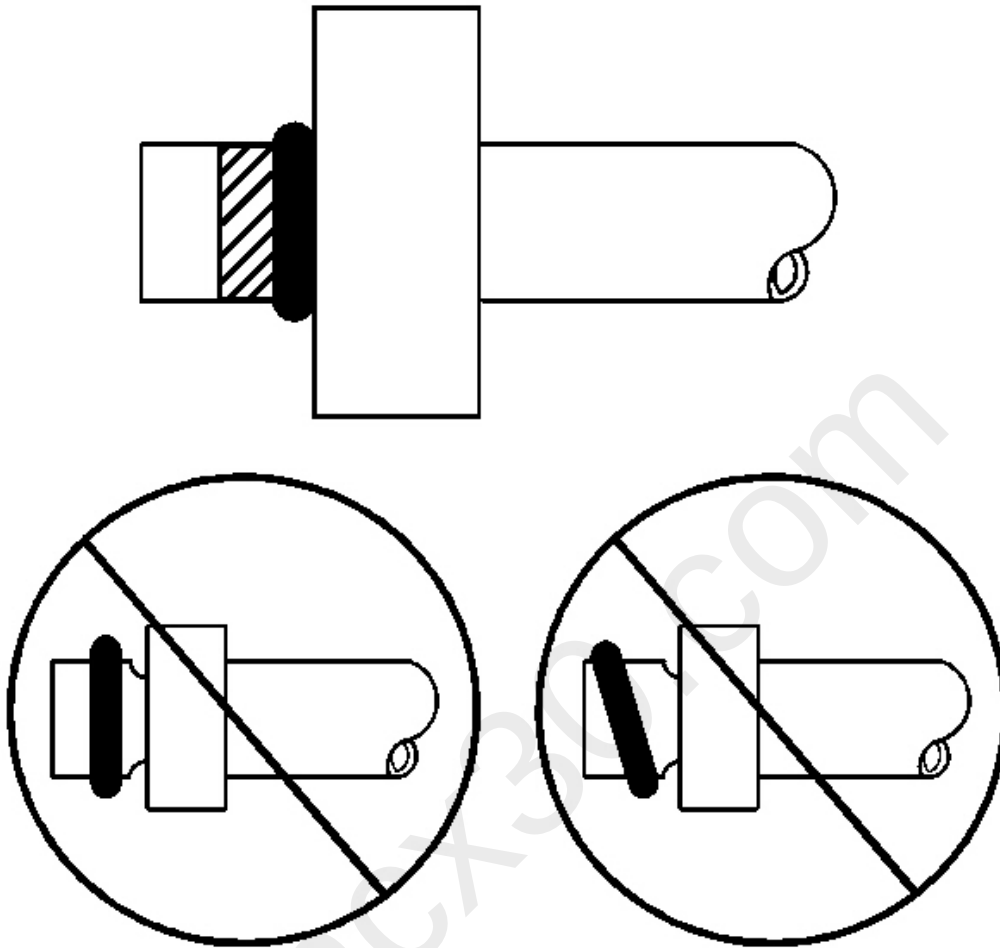


Fig. 18: Identifying Proper Seating Of A/C Refrigerant O-Ring
Courtesy of GENERAL MOTORS CORP.

6. The O-ring seal must be fully seated.

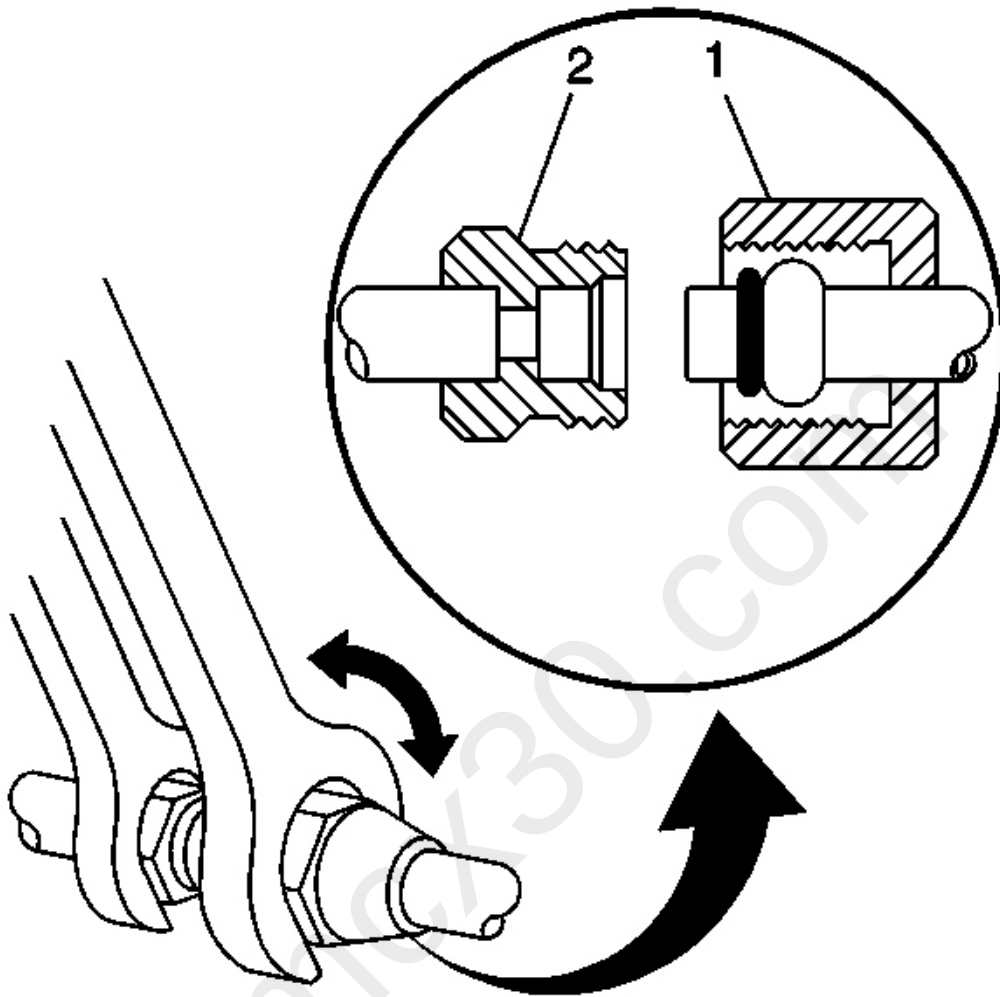


Fig. 19: Disassembling/Reassembling A/C Line Fittings
Courtesy of GENERAL MOTORS CORP.

7. Assemble the A/C components.

Refer to the appropriate repair procedure.

- For compression style fittings use a back up wrench on the fitting (2) and tighten the fitting nut (1) to specification.
- For banjo style fittings install the bolt retaining the banjo type fitting and tighten to specification.

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT (LAF)

Special Tools

J 39400-A: Halogen Leak Detector

Removal Procedures

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Remove the left headlamp. Refer to **Headlamp Replacement (Equinox)** or **Headlamp Replacement (Terrain)**.

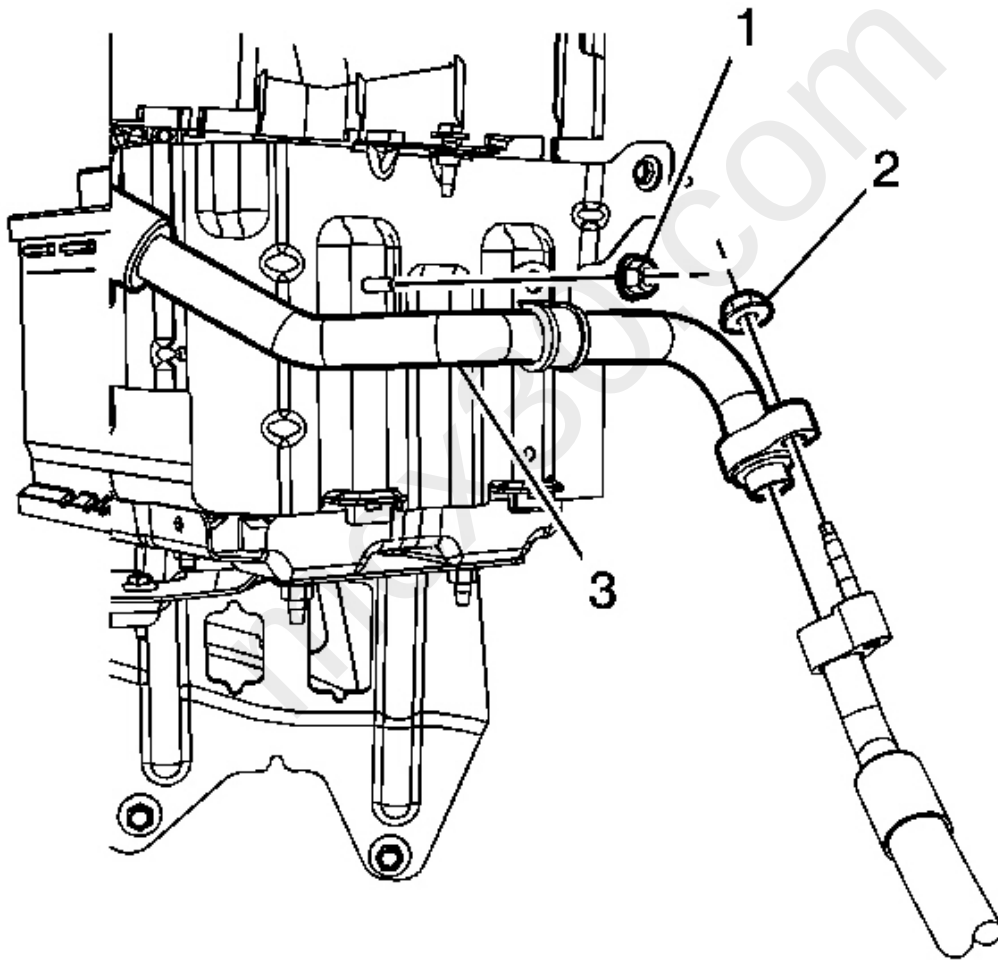


Fig. 20: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

3. Remove the air conditioning compressor hose nut (1) from the air conditioning evaporator thermal expansion valve tube hose.
4. Remove the air conditioning compressor hose from the air conditioning evaporator thermal expansion valve tube hose.

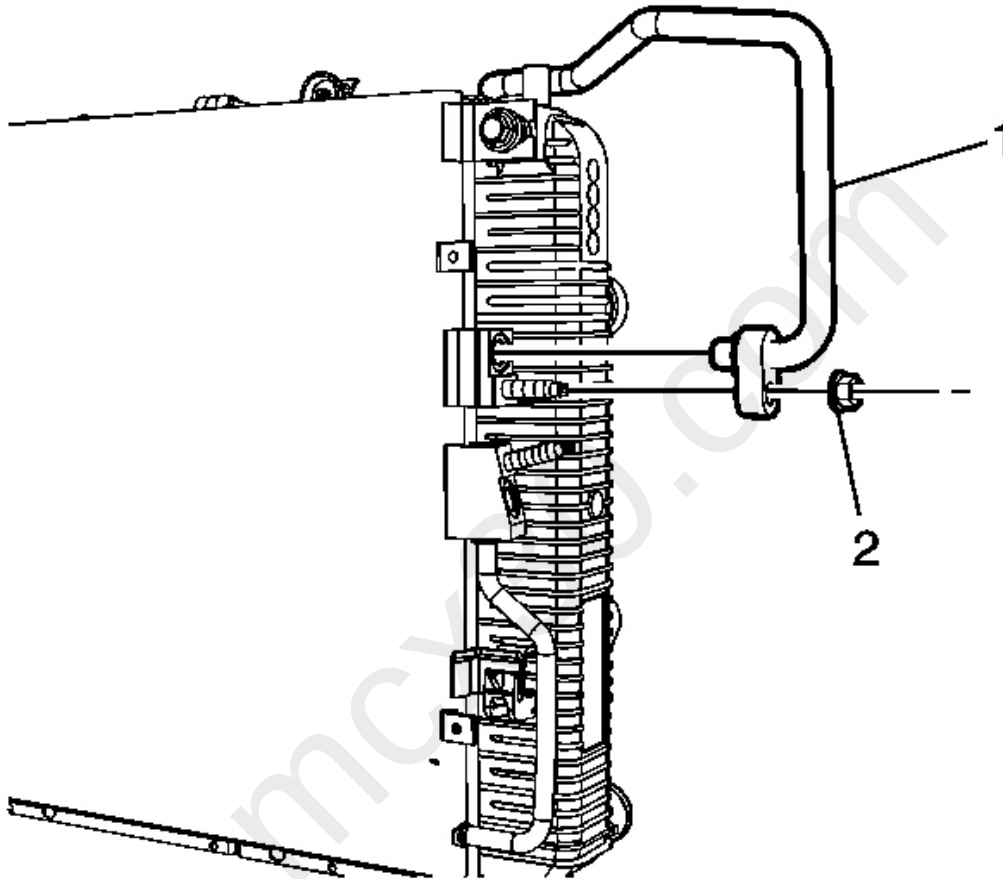


Fig. 21: Compressor Hose At Condenser
Courtesy of GENERAL MOTORS CORP.

5. Remove the compressor hose nut (1) from the condenser.
6. Remove the compressor hose (2) from the condenser.
7. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.

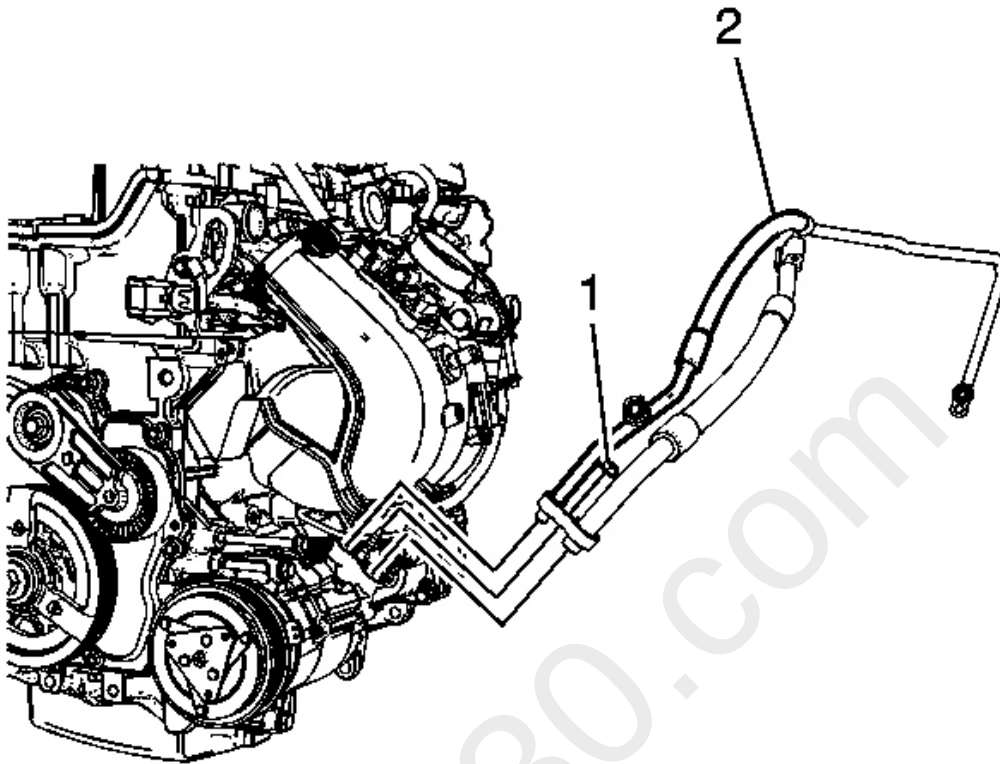


Fig. 22: Compressor Hose At Compressor
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the electrical connector from the air conditioning refrigerant pressure sensor valve.
9. Remove the compressor hose nut (1) at the compressor.
10. Remove the compressor hose (2) from the compressor.
11. Remove the compressor hose from the vehicle.
12. Remove and discard the sealing washers from the compressor hose. Refer to **Air Conditioning System Seal Replacement**.

Installation Procedure

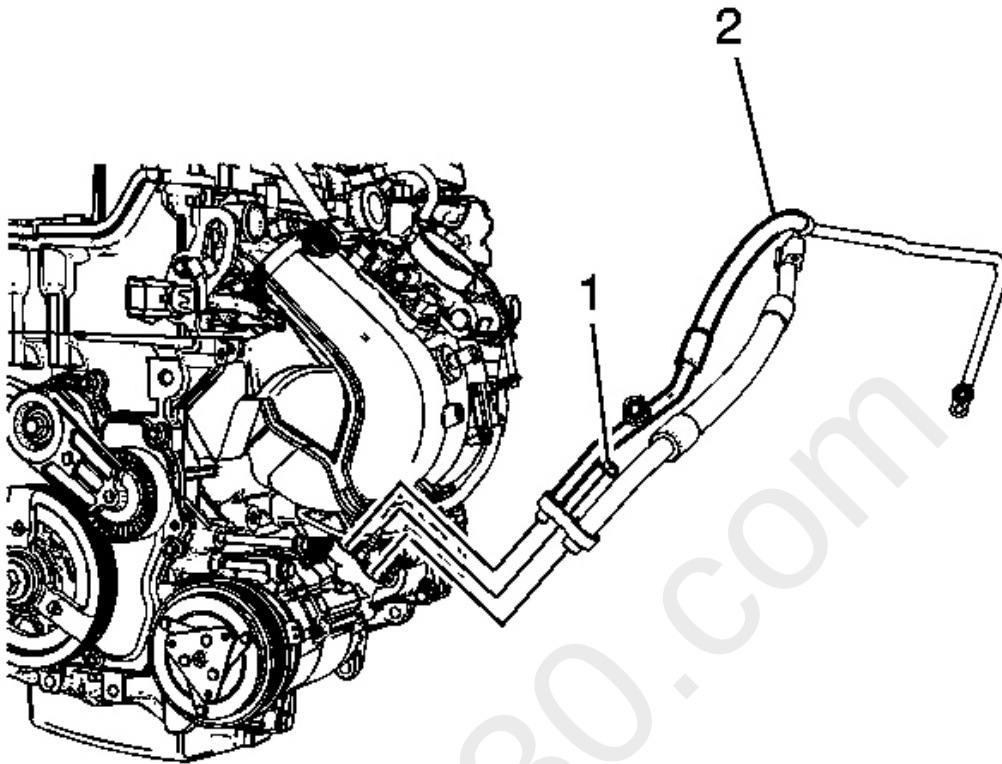


Fig. 23: Compressor Hose At Compressor
Courtesy of GENERAL MOTORS CORP.

1. Install new seal washers to the compressor hose. Refer to **Air Conditioning System Seal Replacement**.
2. Install the compressor hose (2) to the compressor.

CAUTION: Refer to Fastener Caution .

3. Install the compressor hose nut (1) to the compressor and tighten the nut to 22 N.m (16 lb ft).
4. Connect the electrical connector to the air conditioning refrigerant pressure sensor valve.

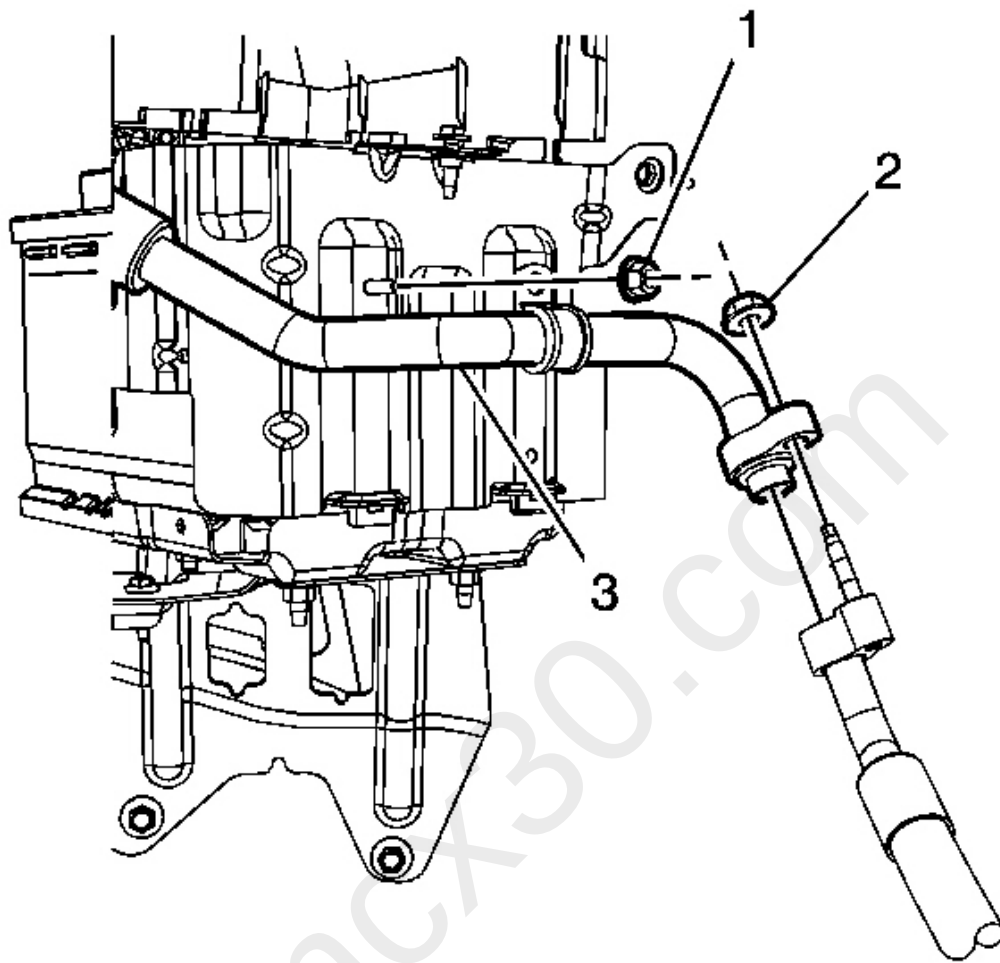


Fig. 24: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

5. Lower the vehicle.
6. Position the compressor hose in the vehicle.
7. Install a new sealing washer to the air conditioning evaporator thermal expansion valve tube hose. Refer to **Air Conditioning System Seal Replacement**.
8. Install the air conditioning evaporator thermal expansion valve tube hose to the compressor hose.
9. Install the compressor hose nut (1) to the air conditioning evaporator thermal expansion valve tube hose and tighten the nut to 22 N.m (16 lb ft).

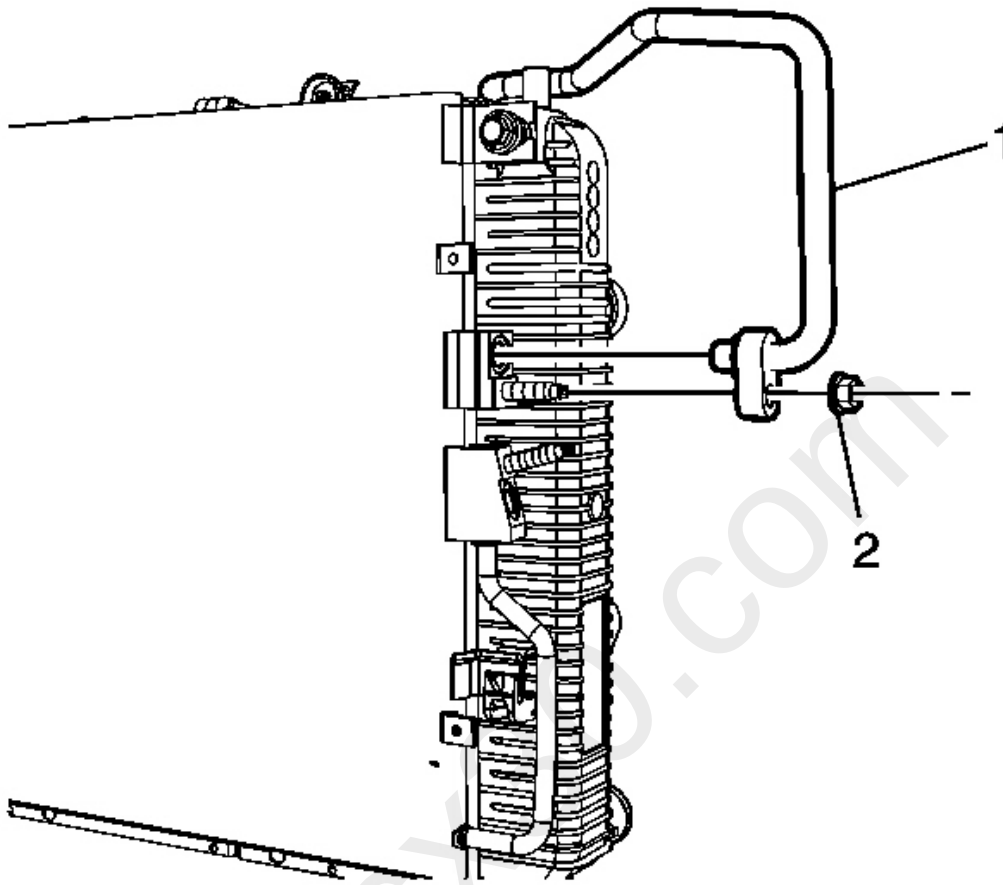


Fig. 25: Compressor Hose At Condenser
Courtesy of GENERAL MOTORS CORP.

10. Install a new sealing washer to the compressor hose at the condenser. Refer to **Air Conditioning System Seal Replacement**
11. Install the compressor hose (2) to the condenser.
12. Install the compressor hose nut (1) to the condenser and tighten to 22 N.m (16 lb ft).
13. Install the left headlamp. Refer to **Headlamp Replacement (Equinox)** or **Headlamp Replacement (Terrain)**.
14. Recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
15. Test the affected A/C joints for leaks using J 39400-A .

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT (LF1)

Special Tools

J 39400-A: Halogen Leak Detector

Removal Procedures

1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging.
2. Remove the left headlamp. Refer to Headlamp Replacement (Equinox) or Headlamp Replacement (Terrain).

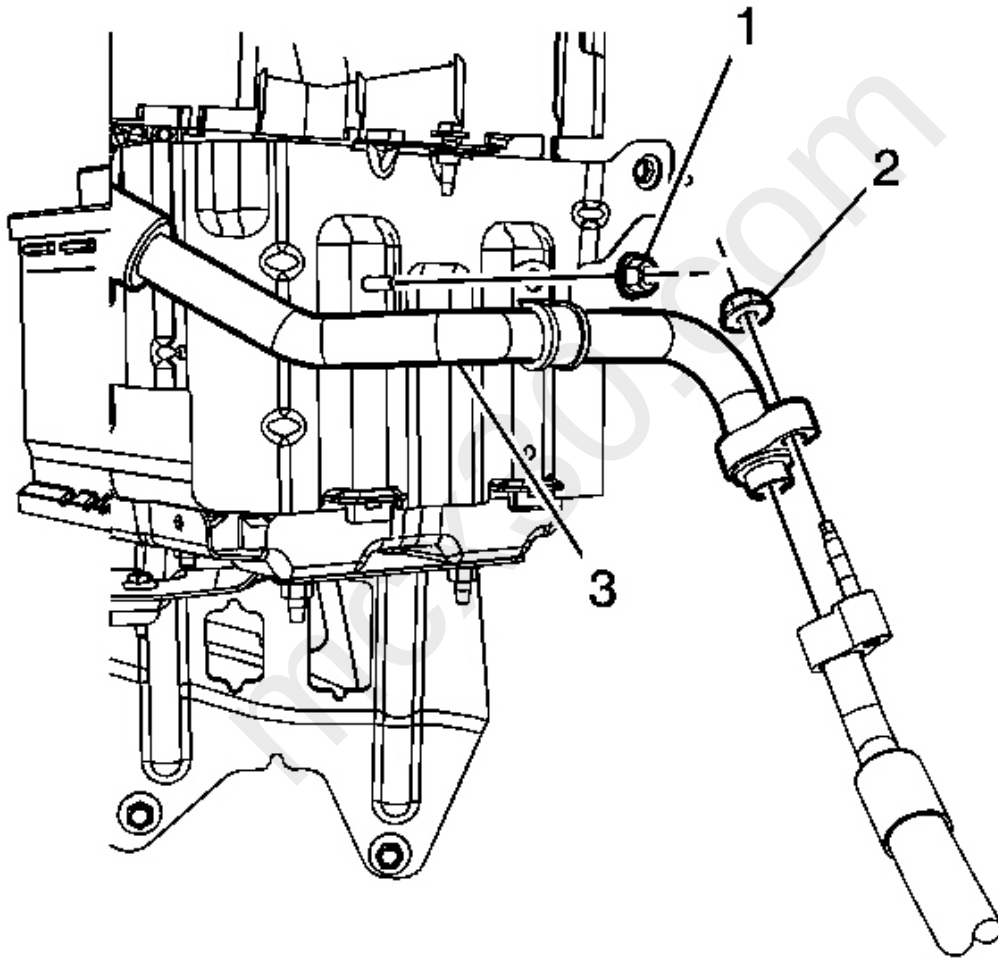


Fig. 26: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

3. Remove the air conditioning compressor hose nut (2) from the air conditioning evaporator thermal expansion valve tube hose.

4. Remove the air conditioning compressor hose from the air conditioning evaporator thermal expansion valve tube hose.

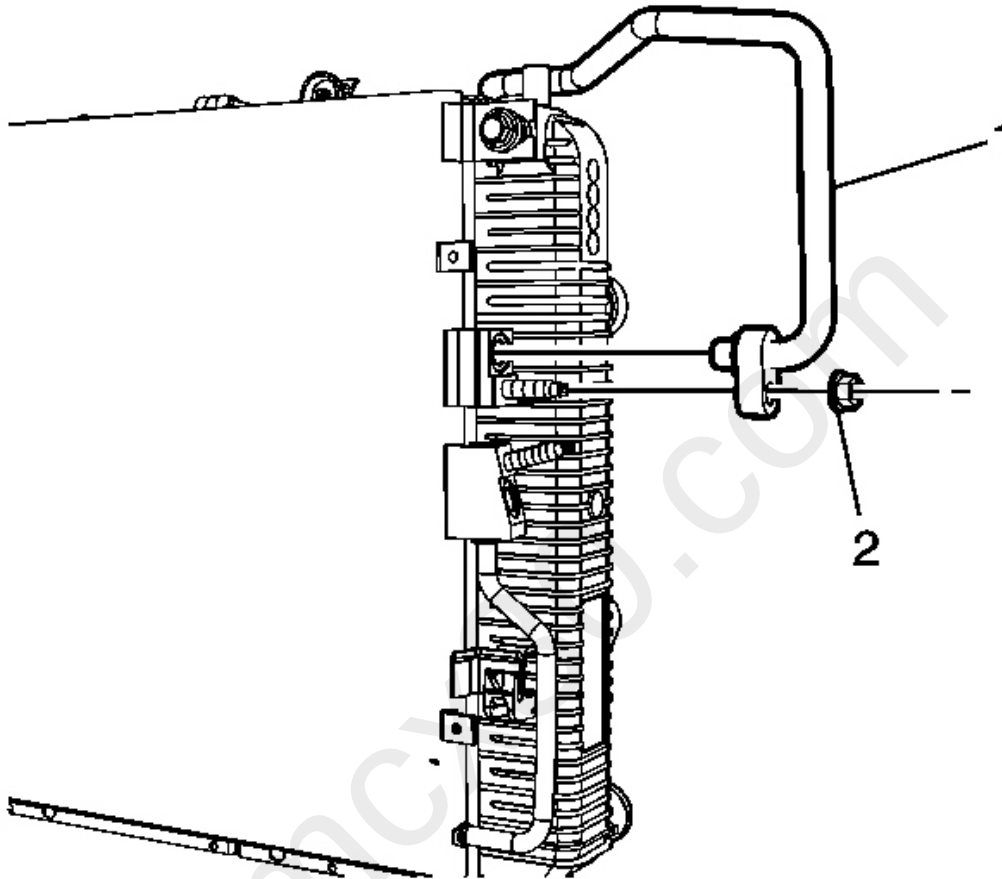


Fig. 27: Compressor Hose At Condenser
Courtesy of GENERAL MOTORS CORP.

5. Remove the compressor hose nut (2) from the condenser.
6. Remove the compressor hose (1) from the condenser.
7. Unclip hose from fan shroud.
8. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.

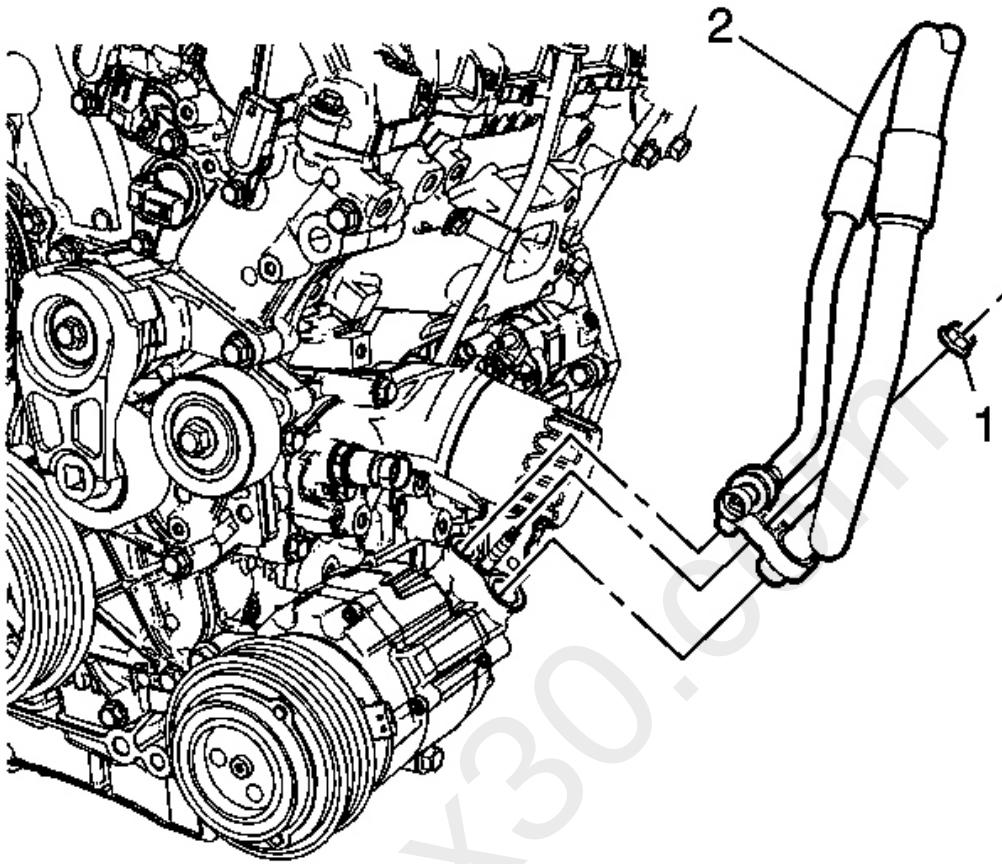


Fig. 28: Compressor Hose At Compressor
Courtesy of GENERAL MOTORS CORP.

9. Disconnect the electrical connector from the air conditioning refrigerant pressure sensor valve.
10. Remove the compressor hose nut (1) at the compressor.
11. Remove the compressor hose (2) from the compressor.
12. Remove the compressor hose from the vehicle.
13. Remove and discard the sealing washers from the compressor hose. Refer to **Air Conditioning System Seal Replacement**.

Installation Procedure

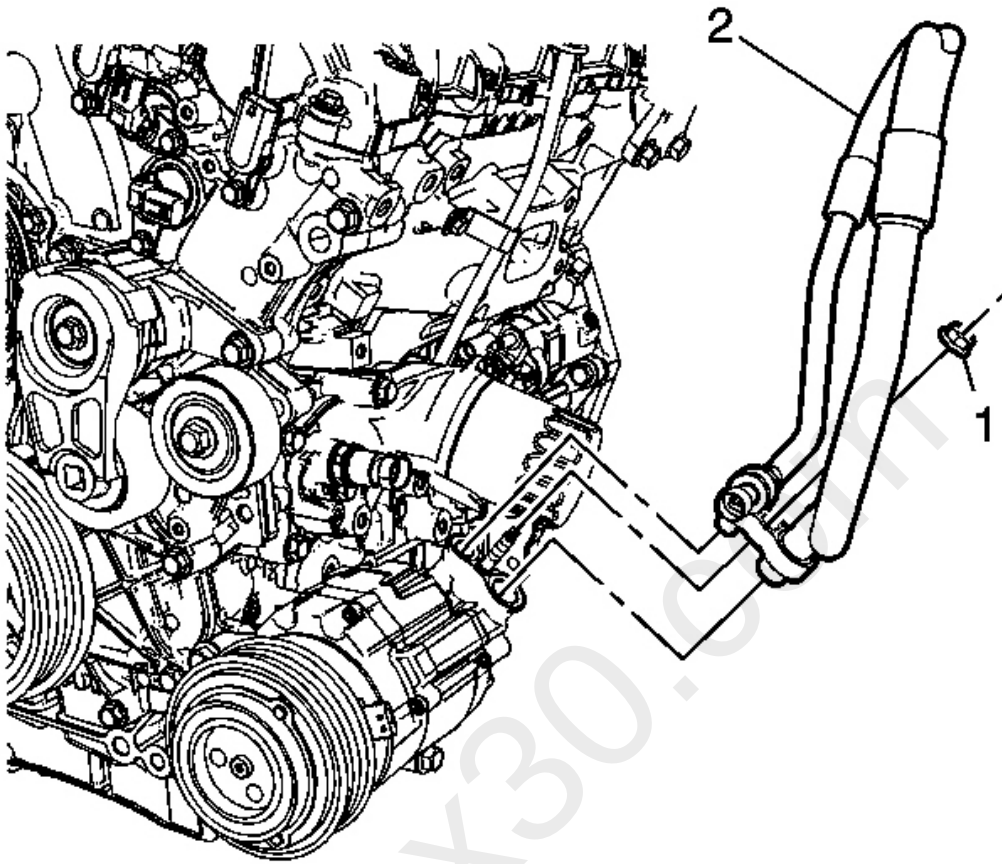


Fig. 29: Compressor Hose At Compressor
Courtesy of GENERAL MOTORS CORP.

1. Install new seal washers to the compressor hose. Refer to **Air Conditioning System Seal Replacement**.
2. Install the compressor hose (2) to the compressor.

CAUTION: Refer to Fastener Caution .

3. Install the compressor hose nut (1) to the compressor and tighten the nut to 22 N.m (16 lb ft).
4. Connect the electrical connector to the air conditioning refrigerant pressure sensor valve.

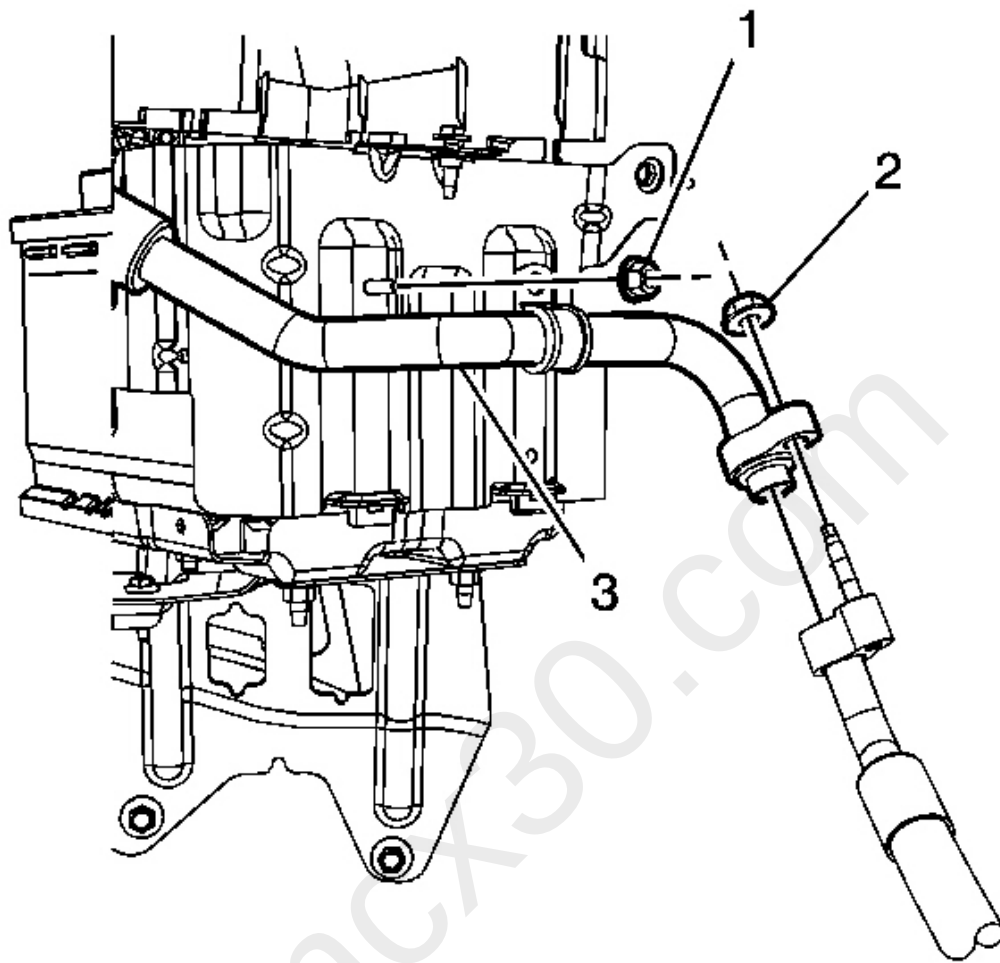


Fig. 30: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

5. Lower the vehicle.
6. Position the compressor hose in the vehicle.
7. Install a new sealing washer to the air conditioning evaporator thermal expansion valve tube hose. Refer to **Air Conditioning System Seal Replacement**.
8. Install the air conditioning evaporator thermal expansion valve tube hose to the compressor hose.
9. Install the compressor hose nut (2) to the air conditioning evaporator thermal expansion valve tube hose and tighten the nut to 22 N.m (16 lb ft).

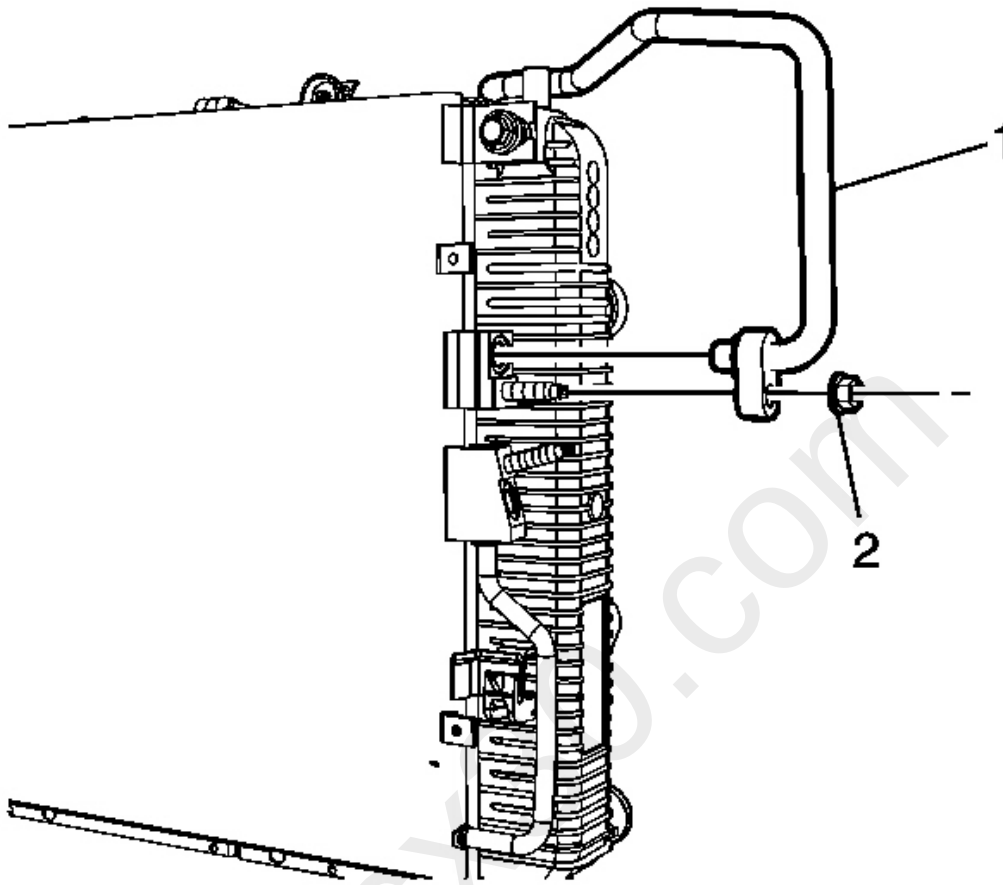


Fig. 31: Compressor Hose At Condenser
Courtesy of GENERAL MOTORS CORP.

10. Install a new sealing washer to the compressor hose at the condenser. Refer to **Air Conditioning System Seal Replacement**
11. Install the compressor hose (1) to the condenser.
12. Install the compressor hose nut (2) to the condenser and tighten to 20 N.m (15 lb ft).
13. Install the left headlamp. Refer to **Headlamp Replacement (Equinox)** or **Headlamp Replacement (Terrain)** .
14. Recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
15. Test the affected A/C joints for leaks using **J 39400-A** .

AIR CONDITIONING CONDENSER AND AIR CONDITIONING EVAPORATOR TUBE REPLACEMENT

Special Tools

J 39400-A: Halogen Leak Detector

Removal Procedure

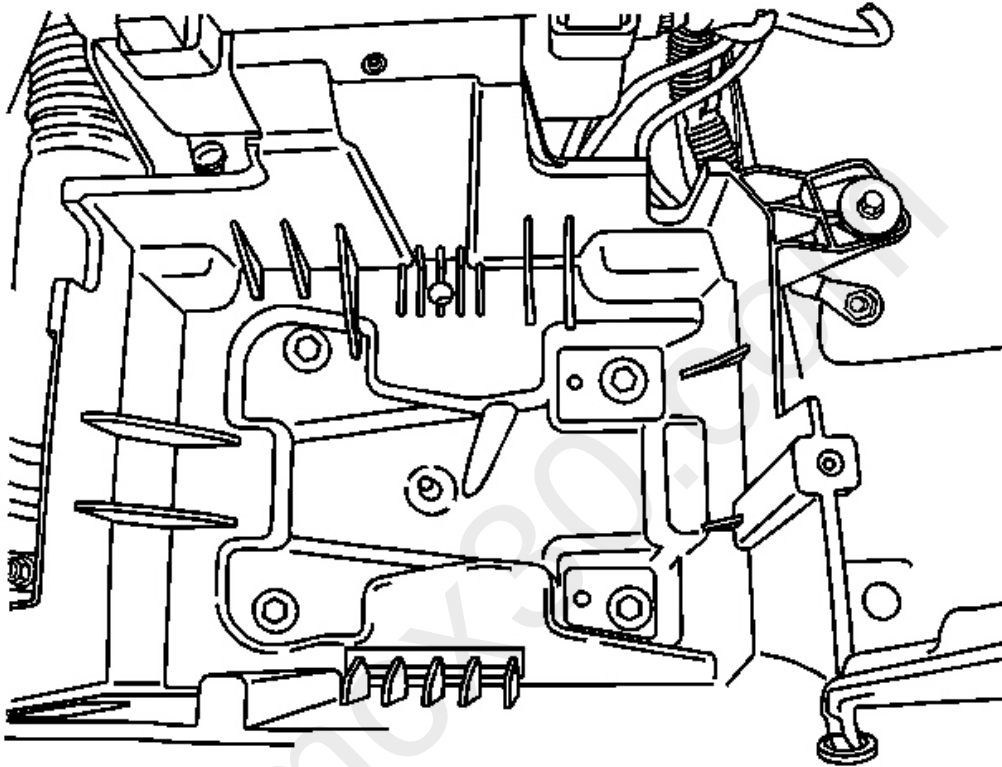


Fig. 32: Battery Box

Courtesy of GENERAL MOTORS CORP.

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Remove the left headlamp. Refer to **Headlamp Replacement (Equinox)** or **Headlamp Replacement (Terrain)**.
3. Remove the surge tank. Refer to **Radiator Surge Tank Replacement**.
4. Remove the washer bottle. Refer to **Windshield Washer Solvent Container Replacement (Equinox)** or **Windshield Washer Solvent Container Replacement (Terrain)**.
5. Remove the battery. Refer to **Battery Replacement**.
6. Remove the battery box bolts from the battery box.
7. Disconnect the negative battery cable nut from the wheelhouse.

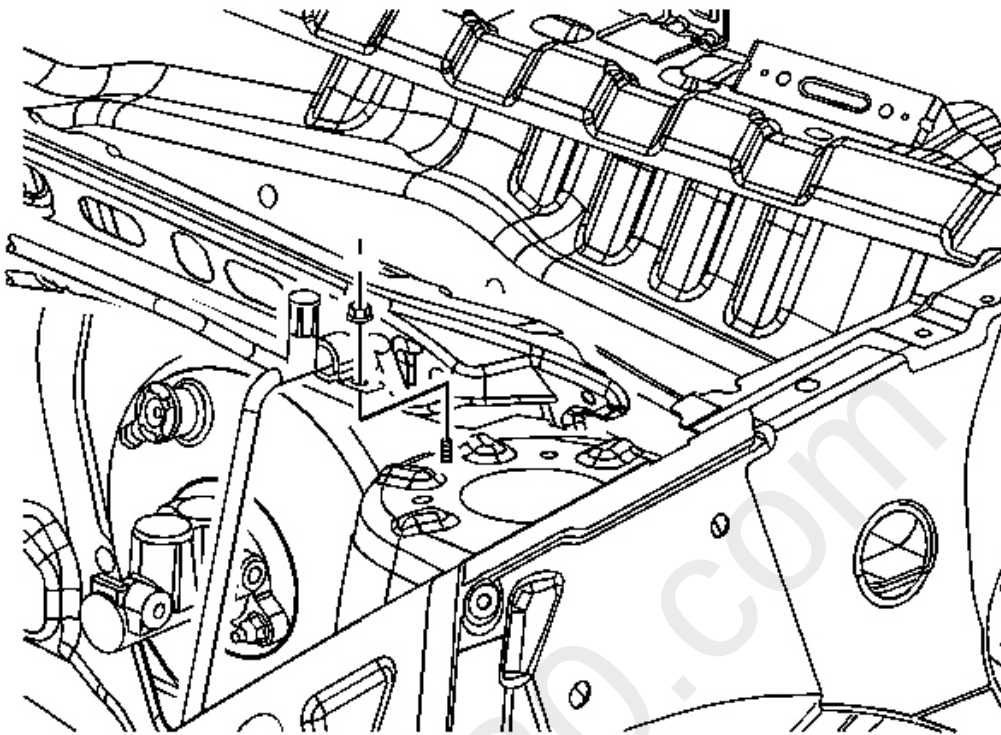


Fig. 33: Liquid Line Nut On Strut Tower
Courtesy of GENERAL MOTORS CORP.

8. Remove the nut retaining the liquid line to the strut tower.
9. Disconnect the harness and vent hose retainers from the liquid line.

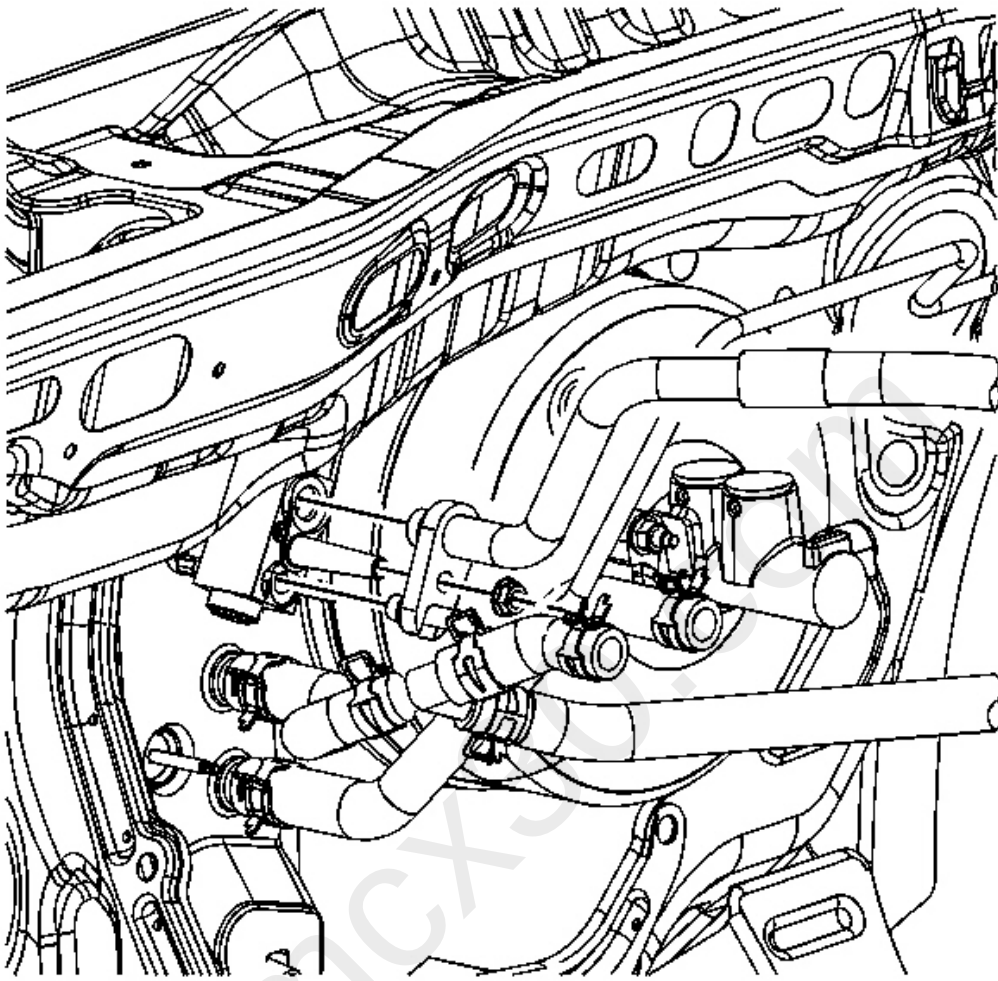


Fig. 34: Evaporator Outlet Hose & Liquid Line At TXV
Courtesy of GENERAL MOTORS CORP.

10. Remove the evaporator outlet hose and liquid line retainer plate nut from the thermal expansion valve (TXV).
11. Remove the evaporator outlet hose and liquid line from the TXV.

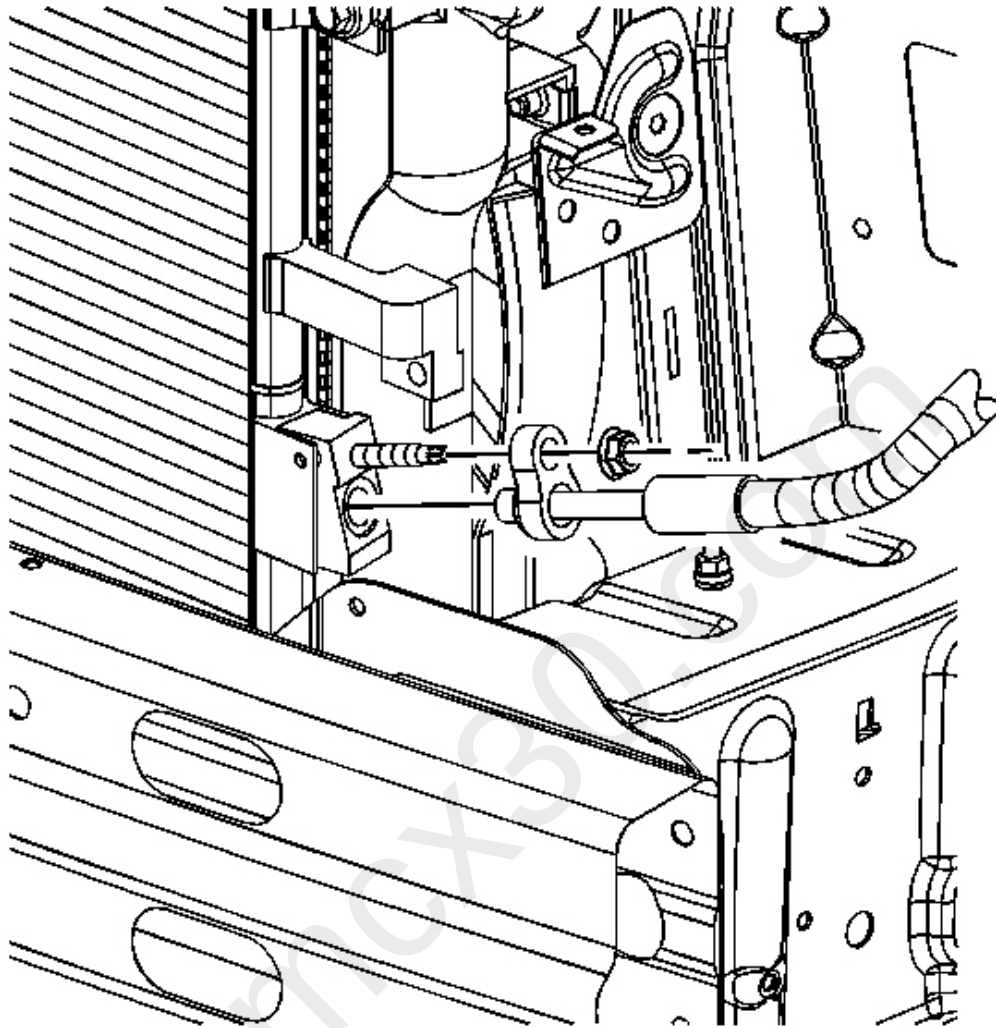


Fig. 35: Liquid Line Nut On Condenser
Courtesy of GENERAL MOTORS CORP.

12. Remove the liquid line nut from the condenser.
13. Remove the liquid line from the condenser.

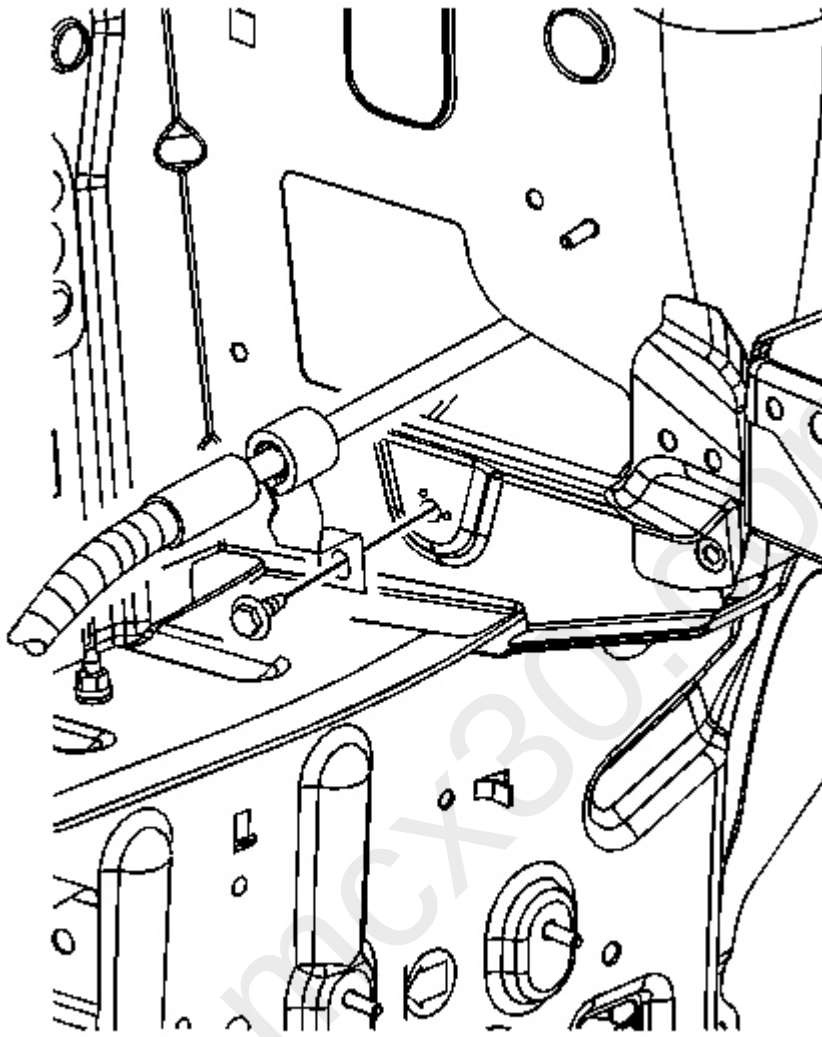


Fig. 36: Liquid Line Bolt On Body
Courtesy of GENERAL MOTORS CORP.

14. Remove the bolt retaining the liquid line to the body.

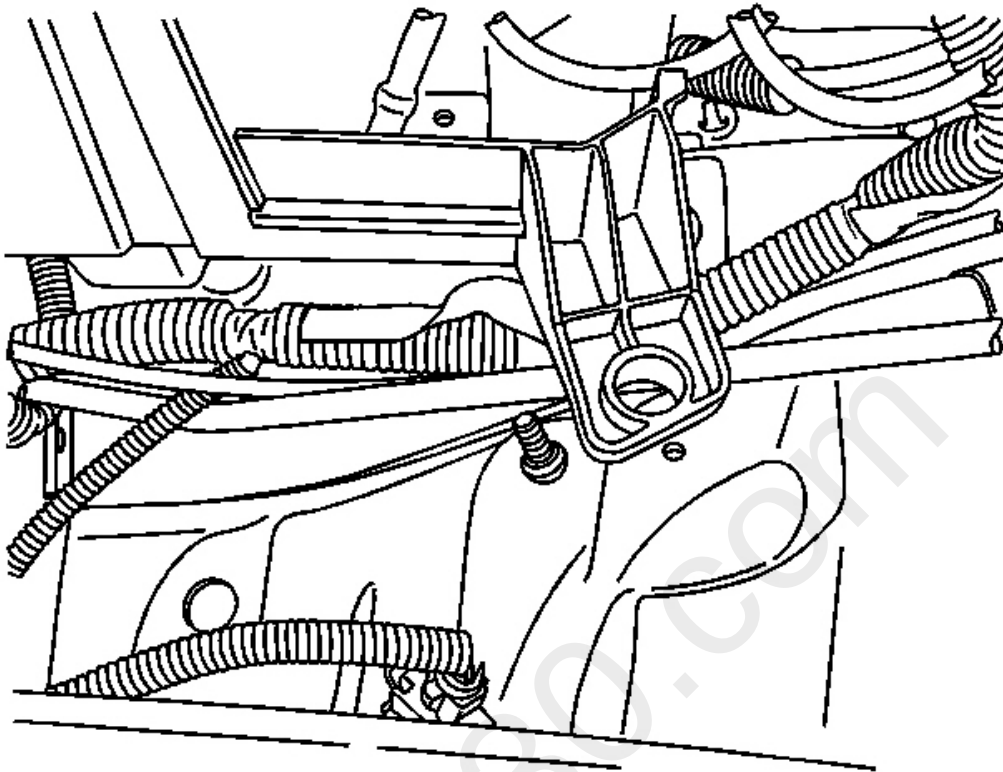


Fig. 37: Liquid Line, Battery Box & Ground Lug
Courtesy of GENERAL MOTORS CORP.

15. Position the battery box inboard to allow for routing of the liquid line.
16. Route the liquid line above the battery box and the ground lug.
17. Lift the rear portion of the liquid line upward and remove the liquid line from the vehicle.
18. Remove and discard the sealing washer from the liquid line. Refer to **Air Conditioning System Seal Replacement**.
19. Install protective caps to the condenser, the evaporator outlet hose, and the TXV to prevent contamination and desiccant saturation.

Installation Procedure

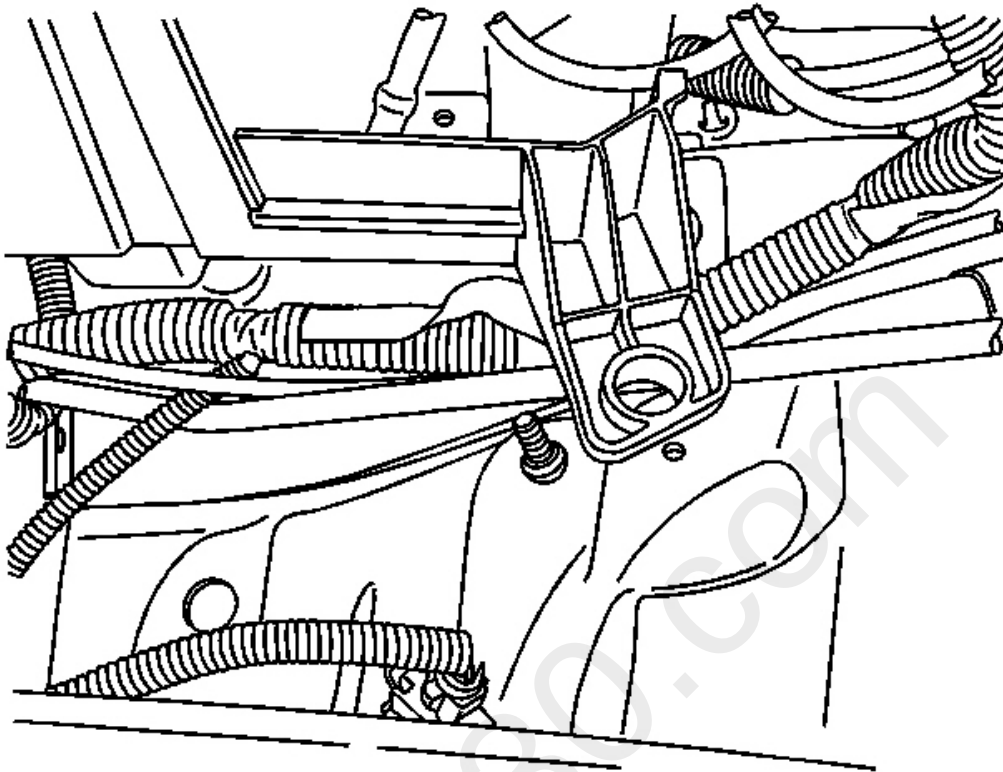


Fig. 38: Liquid Line, Battery Box & Ground Lug
Courtesy of GENERAL MOTORS CORP.

1. Route the liquid line below the battery box and the ground lug.

CAUTION: Refer to Fastener Caution .

2. Connect the negative battery cable nut to the wheelhouse and tighten to 12 N.m (106 lb in).

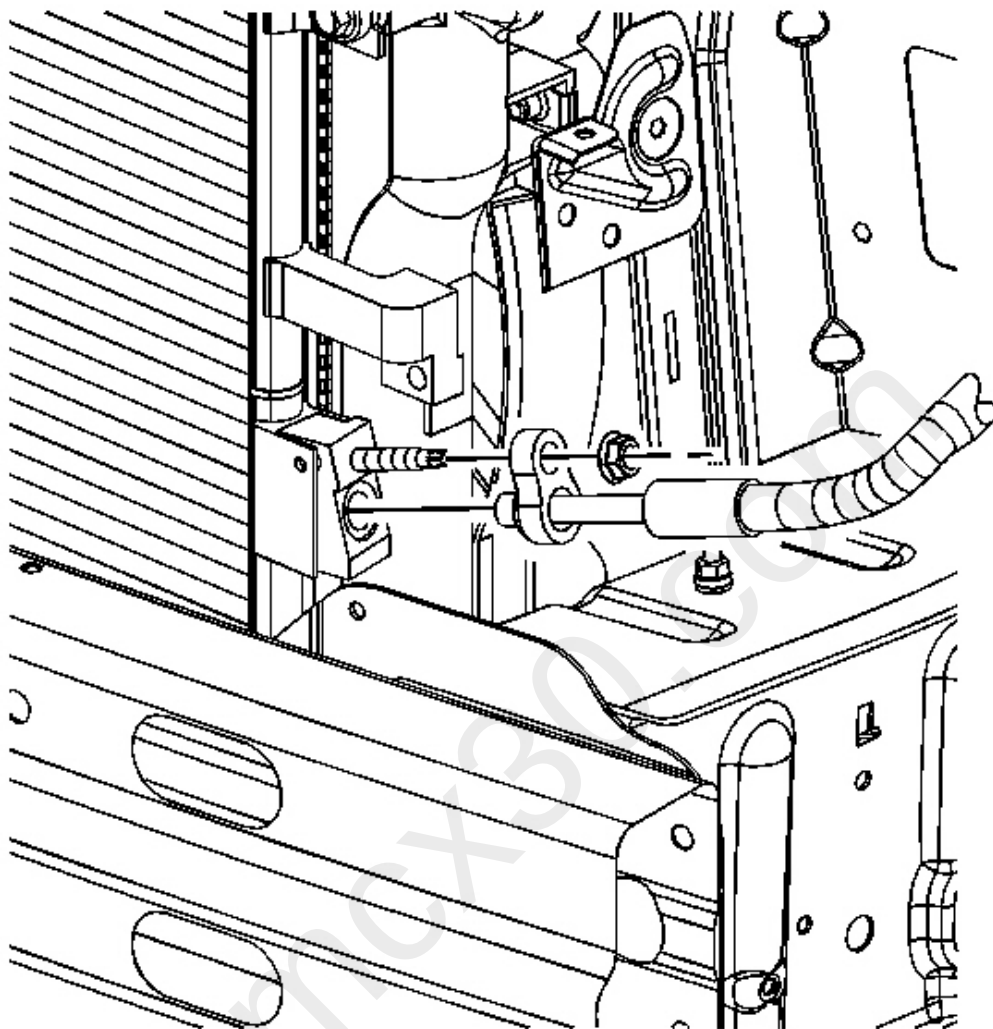


Fig. 39: Liquid Line Nut On Condenser
Courtesy of GENERAL MOTORS CORP.

3. Remove the protective caps from the condenser, the evaporator outlet hose, and the TXV.
4. Install the new sealing washer to the liquid line. Refer to **Air Conditioning System Seal Replacement**.
5. Route the condenser end of the liquid line into position.
6. Install the liquid line to the condenser.

NOTE: Use a large pair of pliers to hold the fitting while tightening the nut. Be careful not to twist the line.

7. Install the liquid line nut to the condenser and tighten to 22 N.m (16 lb ft).

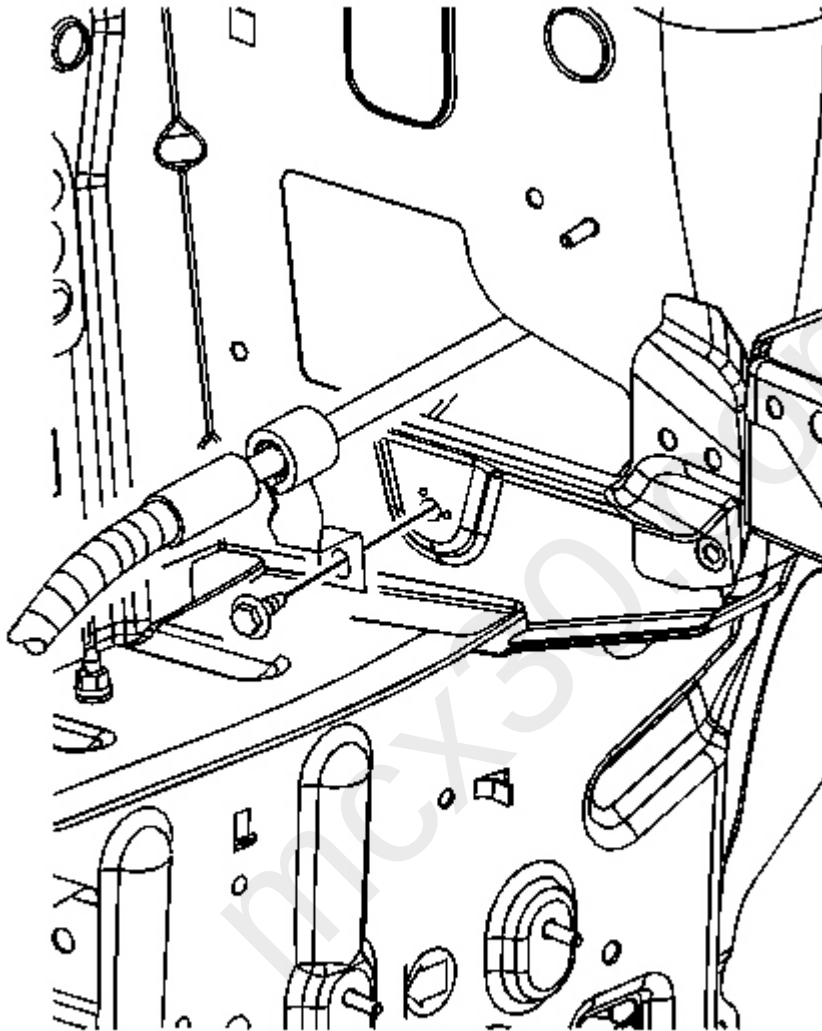


Fig. 40: Liquid Line Bolt On Body
Courtesy of GENERAL MOTORS CORP.

8. Install the bolt to retain the liquid line to the body and tighten to 9 N.m (80 lb in).

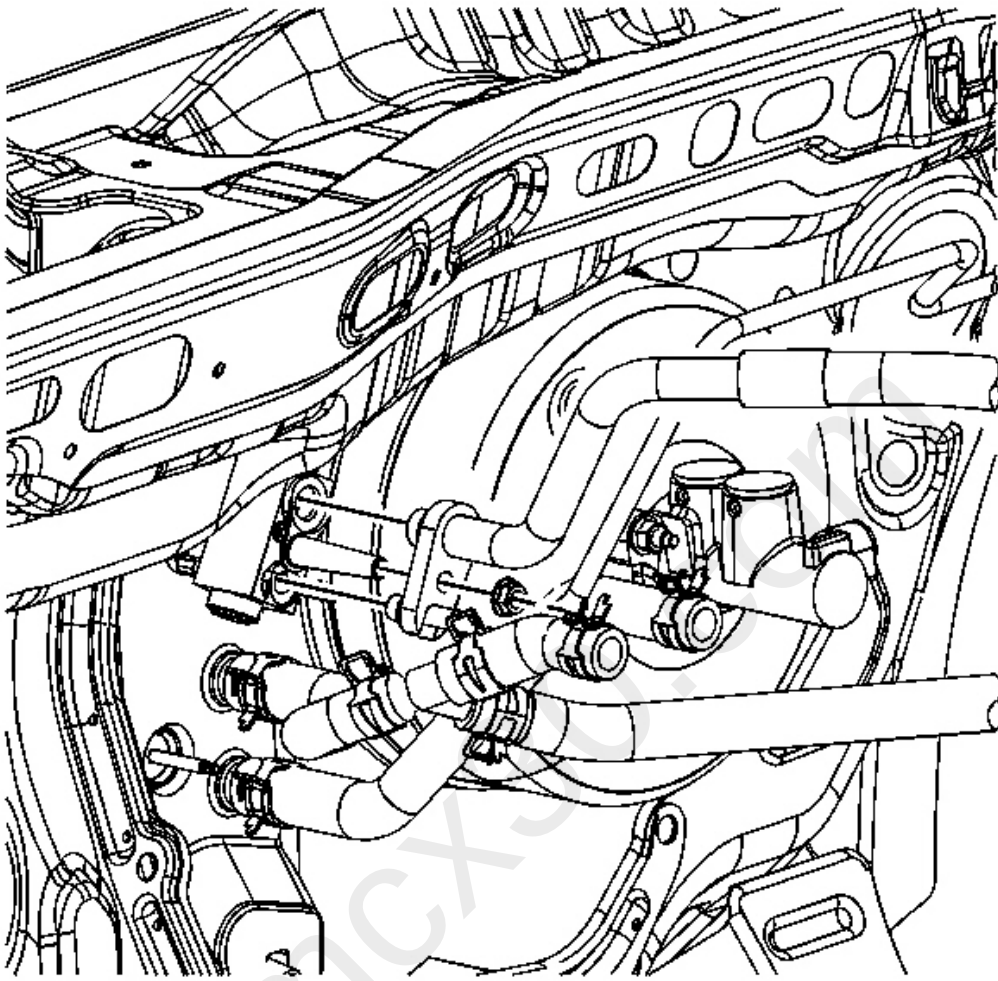


Fig. 41: Evaporator Outlet Hose & Liquid Line At TXV
Courtesy of GENERAL MOTORS CORP.

9. Remove the protective cap from the TXV, the liquid line, and the evaporator outlet hose.
10. Install new seal washers to the liquid line and the evaporator outlet hose. Refer to **Air Conditioning System Seal Replacement**.
11. Install the liquid line and the evaporator outlet hose to the TXV.
12. Install the liquid line and evaporator outlet hose retainer plate nut to the TXV and tighten to 22 N.m (16 lb ft).

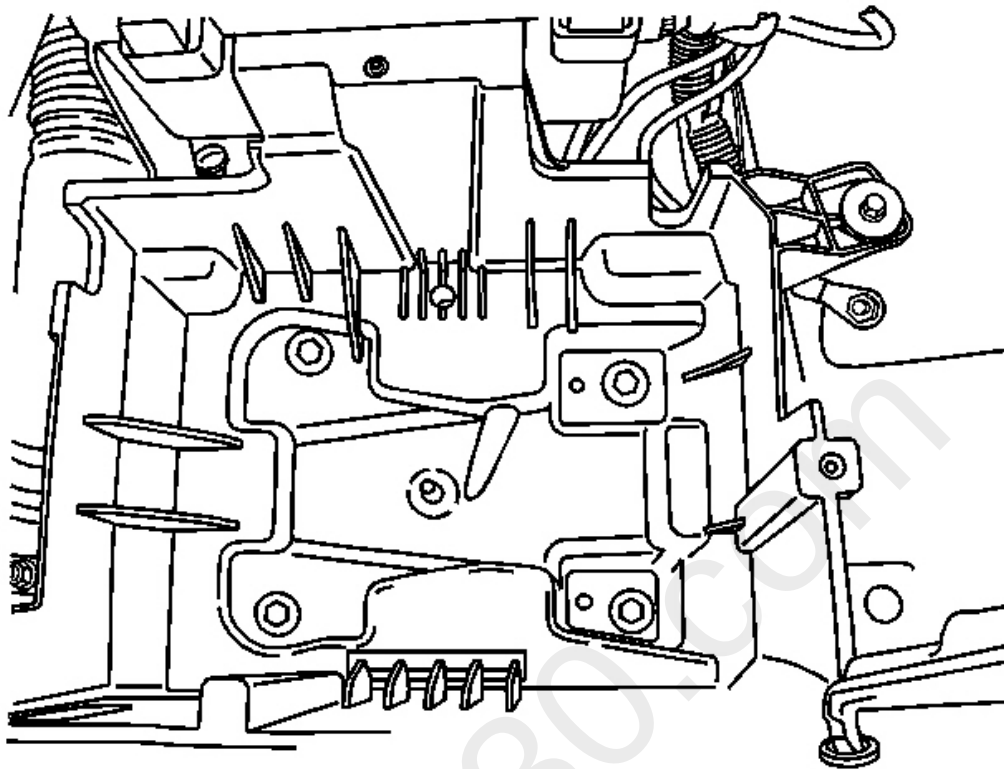


Fig. 42: Battery Box
Courtesy of GENERAL MOTORS CORP.

13. Install the four battery box bolts to the inside of the battery box and tighten to 15 N.m (11 lb ft).
14. Install the battery box bolt to the outside of the battery box and tighten to 10 N.m (86 lb in).
15. Install the battery. Refer to **Battery Replacement** .

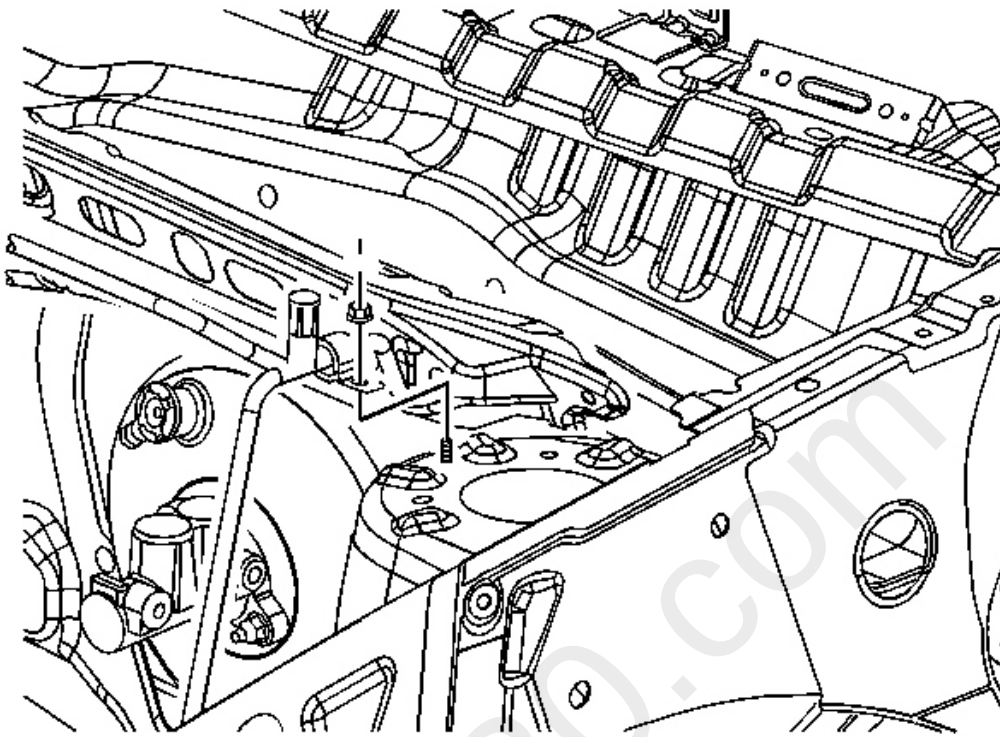


Fig. 43: Liquid Line Nut On Strut Tower
Courtesy of GENERAL MOTORS CORP.

16. Install the liquid line to the strut tower.
17. Install the liquid line nut to the strut tower and tighten to 9 N.m (80 lb in).
18. Connect the harness and vent hose retainers to the liquid line.
19. Install the surge tank. Refer to **Radiator Surge Tank Replacement** .
20. Install the washer bottle. Refer to **Windshield Washer Solvent Container Replacement (Equinox)** or **Windshield Washer Solvent Container Replacement (Terrain)** .
21. Install the left headlamp. Refer to **Headlamp Replacement (Equinox)** or **Headlamp Replacement (Terrain)** .
22. Recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
23. Test the affected A/C joints for leaks using **J 39400-A: Halogen Leak Detector**.

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE HOSE REPLACEMENT

Special Tools

J 39400-A: Halogen Leak Detector

Removal Procedures

1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging.

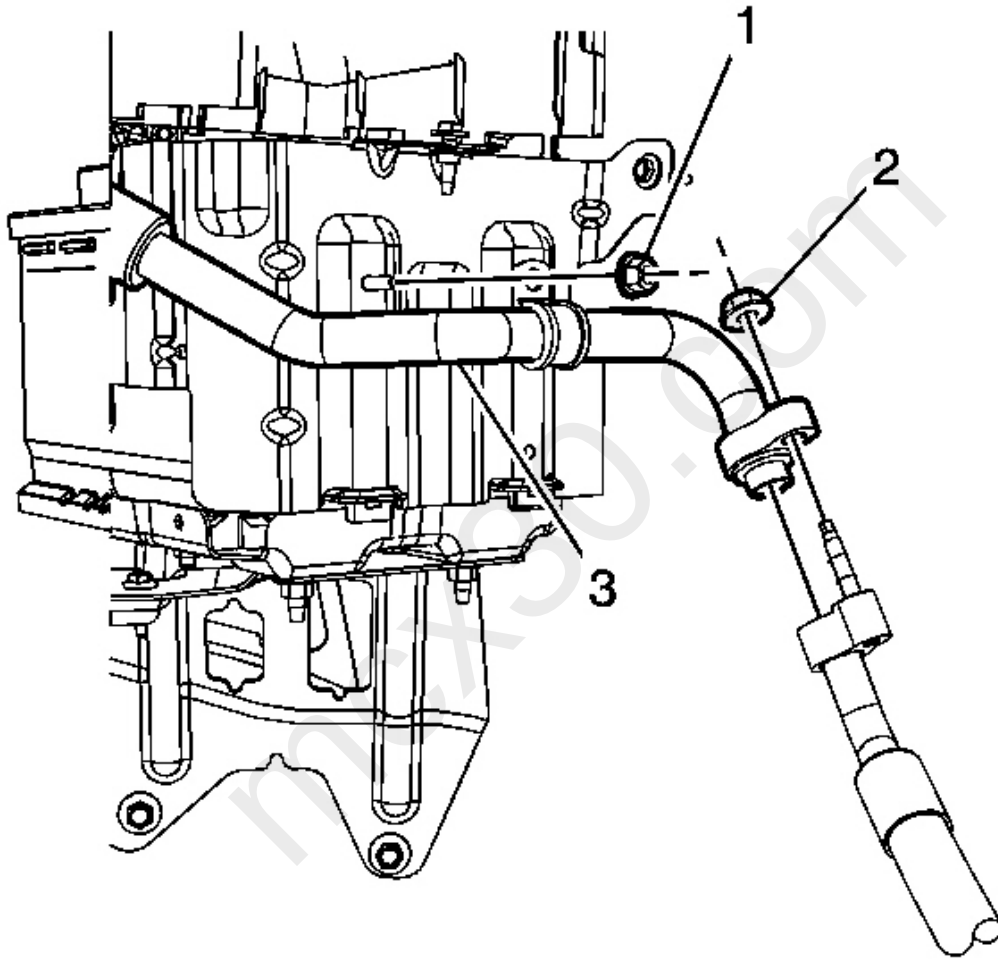


Fig. 44: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

2. Remove the air conditioning compressor hose nut (1) from the air conditioning evaporator thermal expansion valve tube hose.
3. Remove the air conditioning compressor hose from the air conditioning evaporator thermal expansion valve tube hose.

4. Remove the compressor hose retainer nut (2) from the battery box.

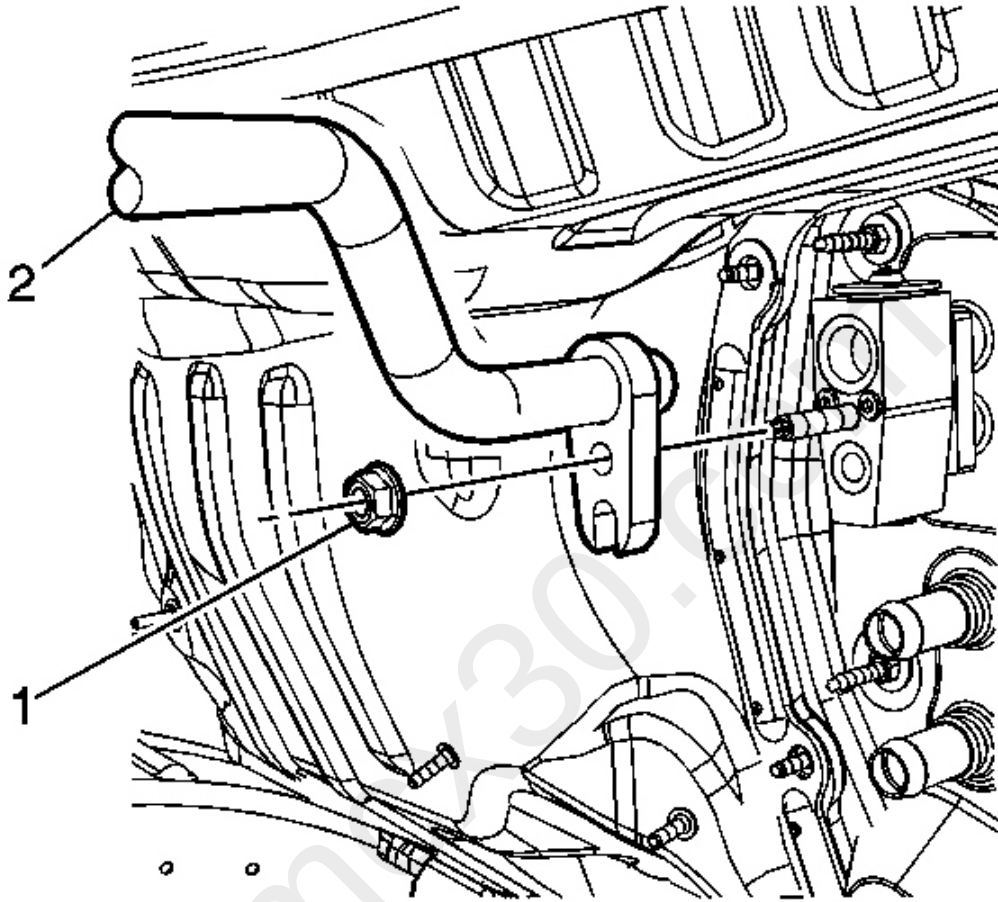


Fig. 45: Air Conditioning Evaporator Thermal Expansion Valve Tube Hose
Courtesy of GENERAL MOTORS CORP.

5. Remove the air conditioning evaporator thermal expansion valve tube hose nut (1) from the thermal expansion valve.
6. Remove the air conditioning evaporator thermal expansion valve tube hose (2) from the vehicle.
7. Remove and discard the sealing washers from the air conditioning evaporator thermal expansion valve tube hose. Refer to **Air Conditioning System Seal Replacement**.

Installation Procedure

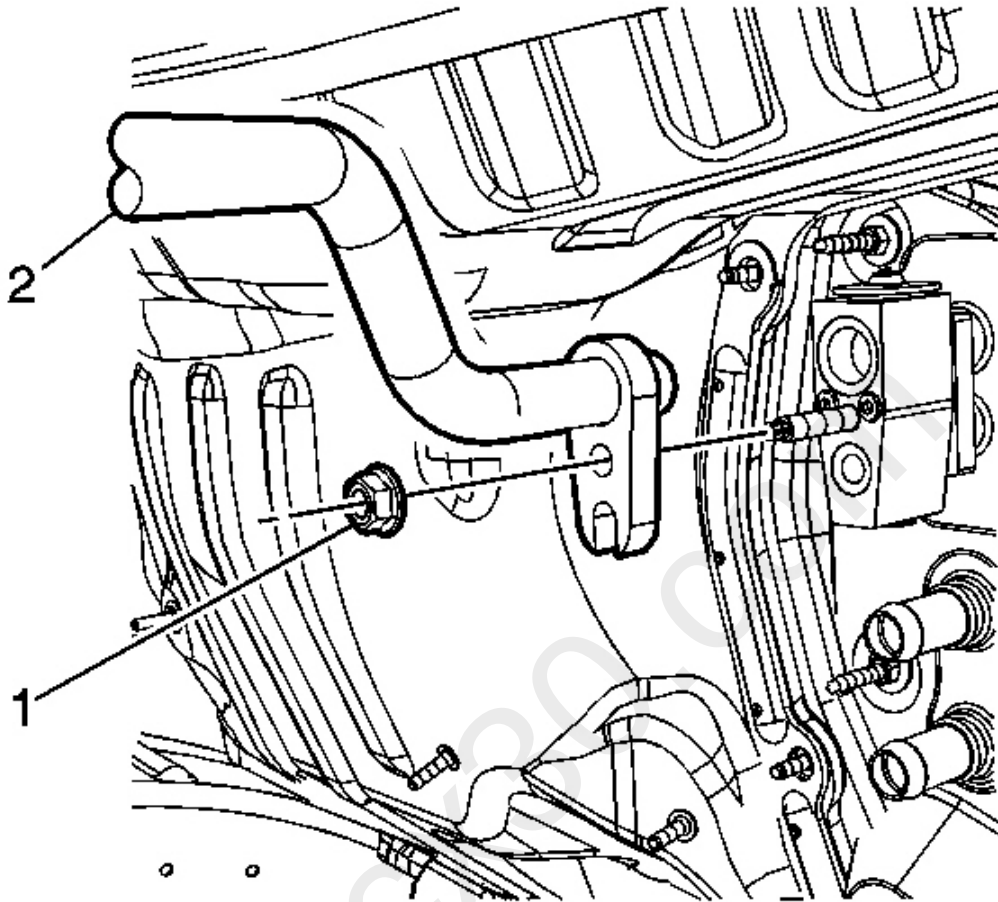


Fig. 46: Air Conditioning Evaporator Thermal Expansion Valve Tube Hose
Courtesy of GENERAL MOTORS CORP.

1. Install new seal washers to the air conditioning evaporator thermal expansion valve tube hose. Refer to **Air Conditioning System Seal Replacement**.
2. Position the air conditioning evaporator thermal expansion valve tube hose in the vehicle.
3. Install the air conditioning evaporator thermal expansion valve tube hose (2) to the thermal expansion valve.
4. Install the air conditioning evaporator thermal expansion valve tube hose nut (1) to the thermal expansion valve and tighten the nut to 22 N.m (16 lb ft).

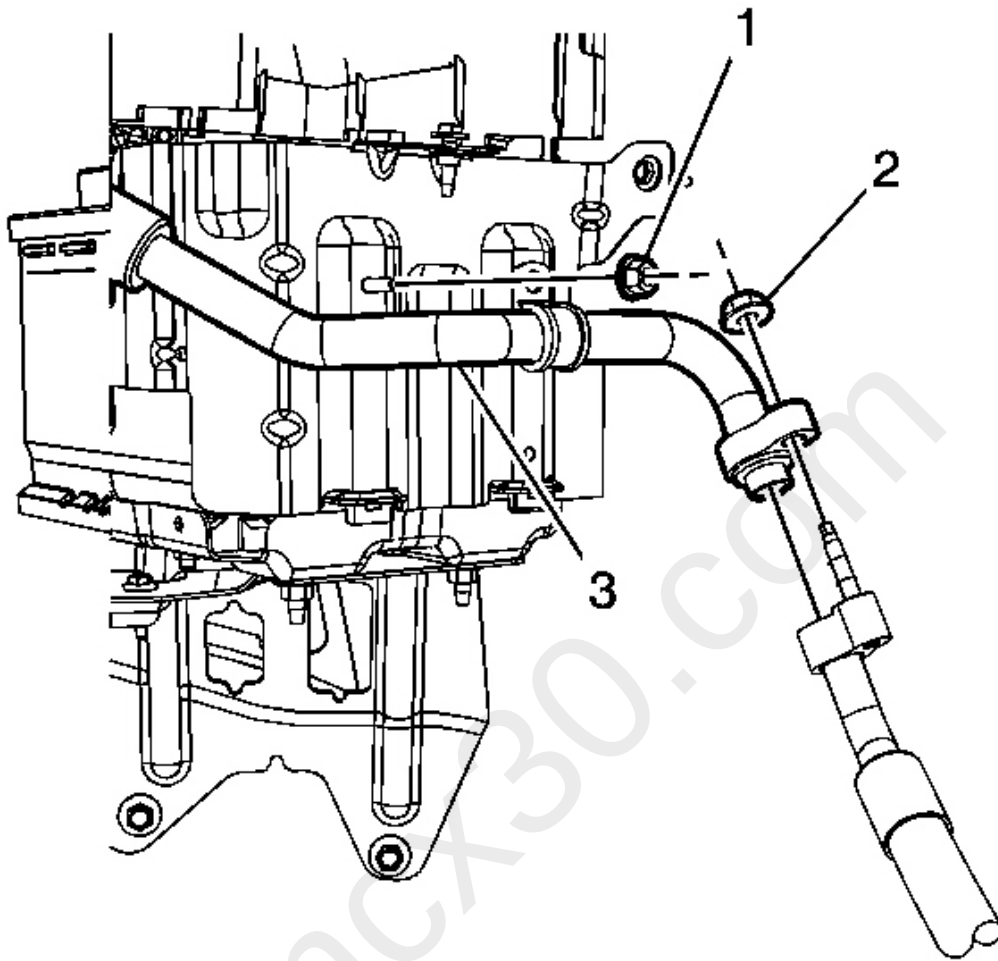


Fig. 47: Air Conditioning Compressor Hose Components
Courtesy of GENERAL MOTORS CORP.

5. Install a new sealing washer to the air conditioning evaporator thermal expansion valve tube hose at the compressor hose. Refer to **Air Conditioning System Seal Replacement**
6. Install the air conditioning evaporator thermal expansion valve tube hose (2) to the compressor hose.
7. Install the air conditioning evaporator thermal expansion valve tube hose nut (1) to the compressor hose and tighten to 22 N.m (16 lb ft).
8. install the compressor hose retainer nut (2) to the battery box and tighten to 22 N.m (16 lb ft).
9. Recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
10. Test the affected A/C joints for leaks using **J 39400-A**.

AIR CONDITIONING REFRIGERANT SERVICE VALVE CORE REPLACEMENT

Special Tools

- **J 39400-A:** Halogen Leak Detector
- **J 46246:** Valve Core Removal Tool

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging.**

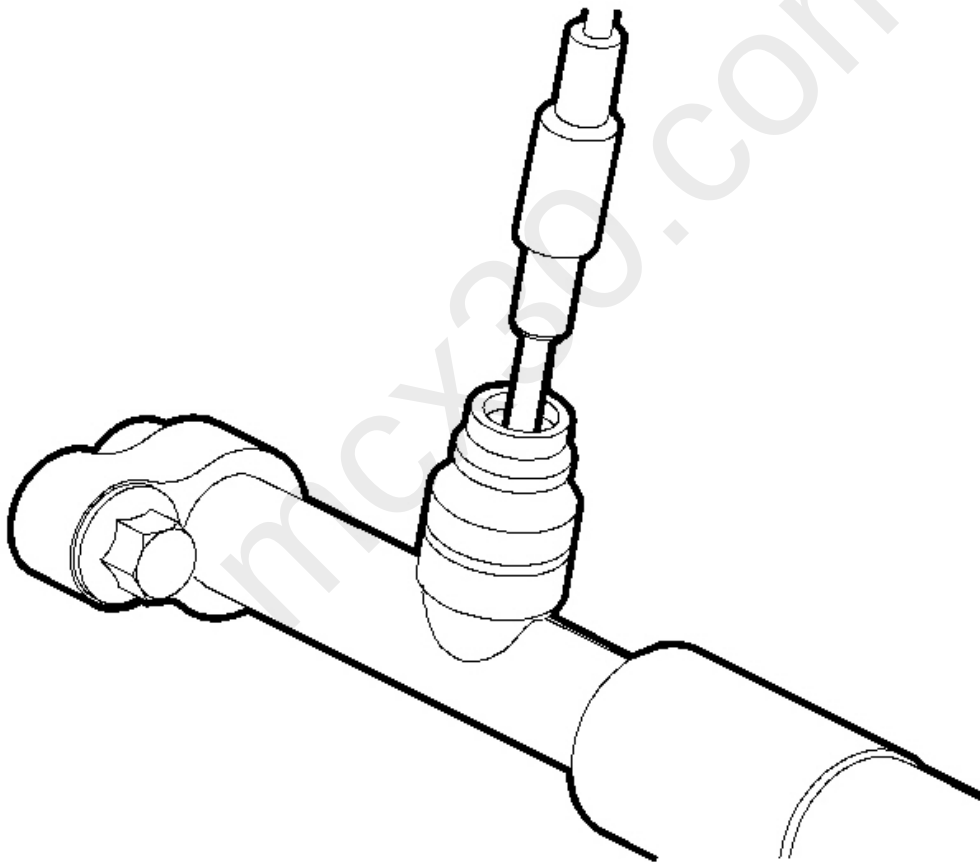


Fig. 48: Removing/Installing Valve Core
Courtesy of GENERAL MOTORS CORP.

2. Use **J 46246**: Valve Core Removal Tool or equivalent to remove the valve core.

Installation Procedure

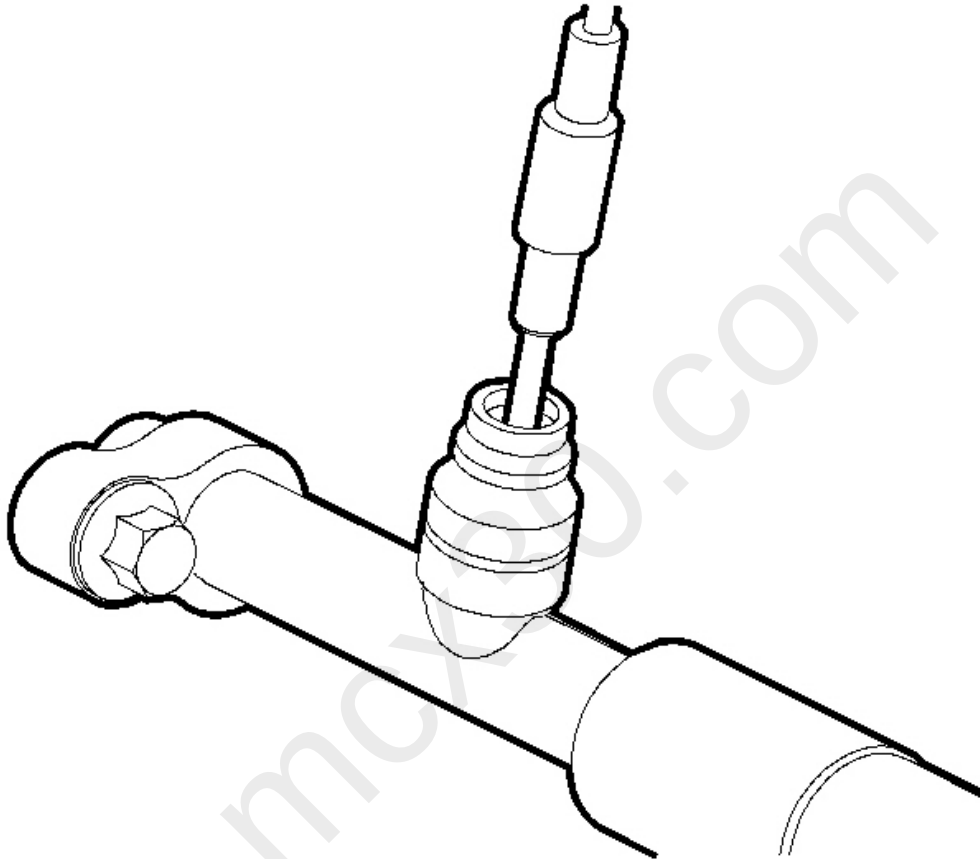


Fig. 49: Removing/Installing Valve Core
Courtesy of GENERAL MOTORS CORP.

1. Use **J 46246**: Valve Core Removal Tool or equivalent to install and tighten the valve core.
2. Evacuate and charge the A/C system. Refer to **Refrigerant Recovery and Recharging**.

NOTE: To prevent loss of refrigerant charge, tighten the cap. Replace the cap if the seal is missing or damaged.

3. Test the affected A/C fittings for leaks using **J 39400-A:** Halogen Leak Detector.

RECEIVER AND DEHYDRATOR REPLACEMENT

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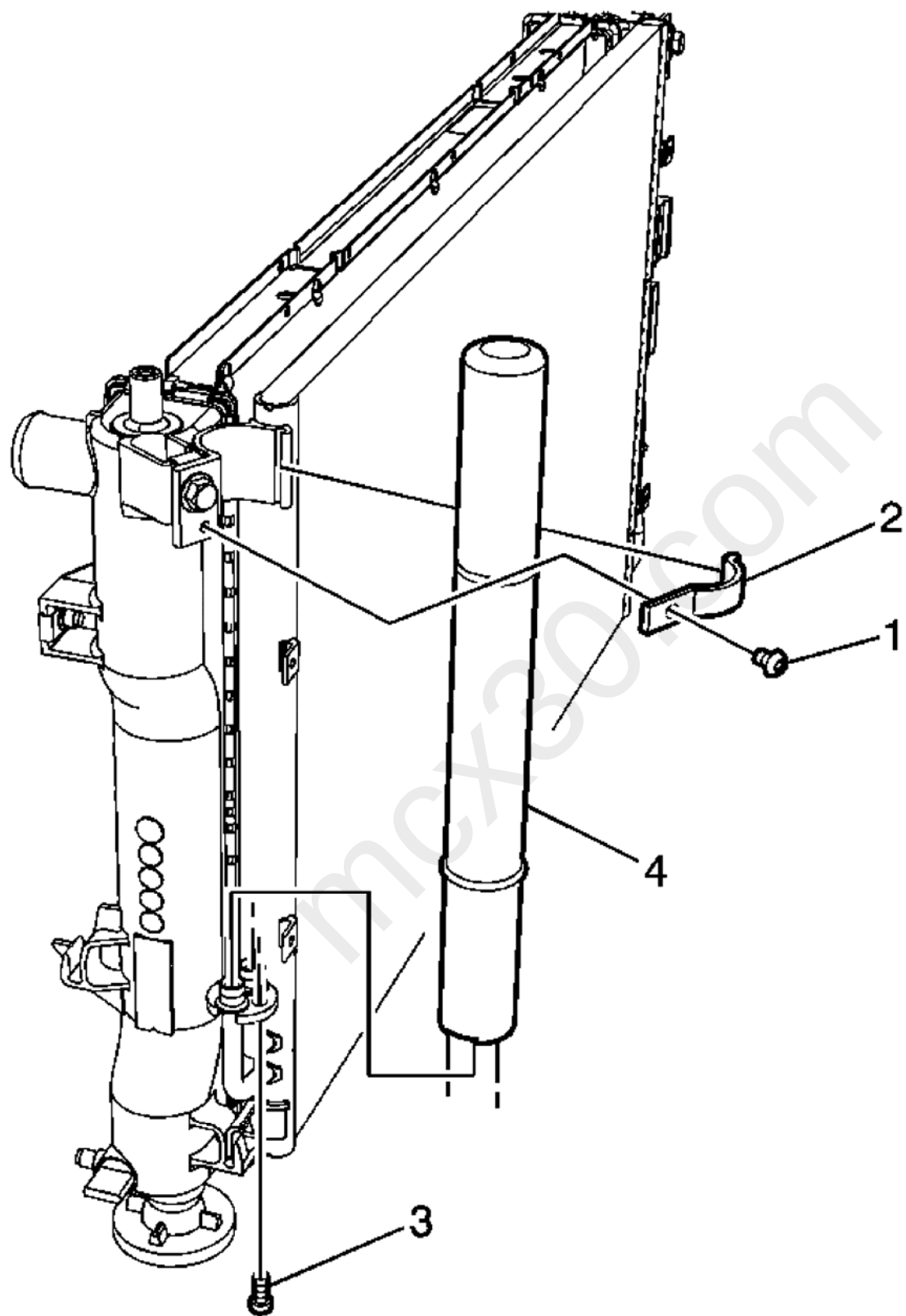


Fig. 50: Receiver & Dehydrator

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Remove the radiator air lower baffel and deflector. Refer to <u>Radiator Air Lower Baffle and Deflector Replacement</u>. 3. Remove the radiator air upper baffel and deflector. Refer to <u>Radiator Air Upper Baffle and Deflector Replacement</u>.	
1	Receiver and Dehydrator Bracket Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 4.2 N.m (37 lb in)
2	Receiver and Dehydrator Bracket
3	Receiver and Dehydrator Bolt Tighten: 6.5 N.m (58 lb in)
4	Receiver and Dehydrator Procedure 1. Add the specified amount of polyalkylene glycol (PAG) oil to the receiver dehydrator. Refer to <u>Refrigerant System Specifications</u> 2. Install new O-rings to the receiver dehydrator. Refer to <u>Air Conditioning O-Ring Seal Replacement</u>

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

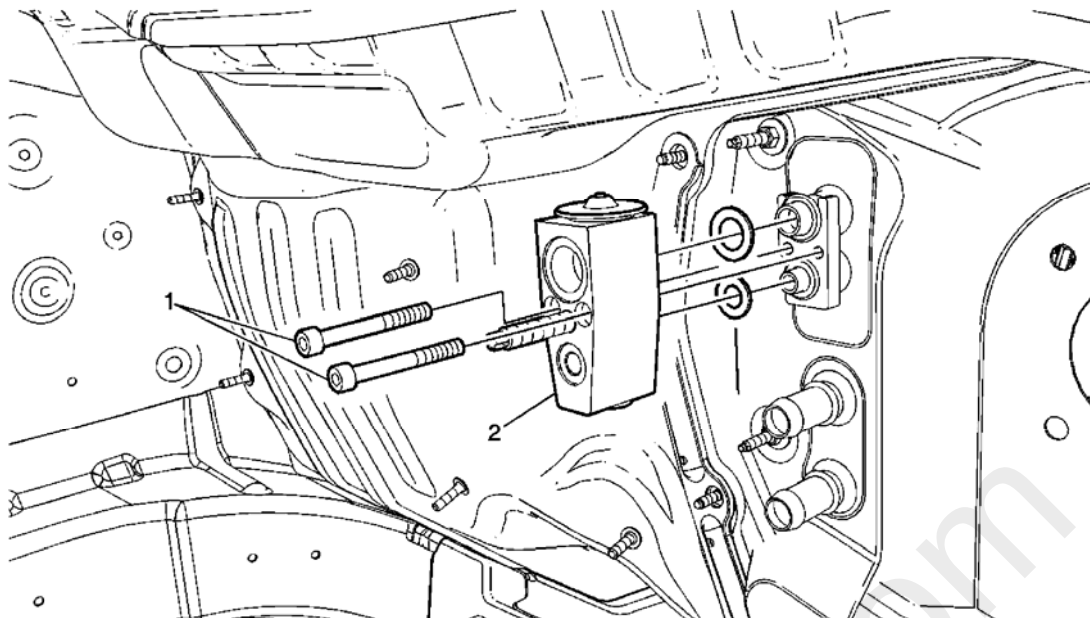


Fig. 51: Air Conditioning Evaporator Thermal Expansion Valve
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Remove the air conditioning condenser and air conditioning evaporator tube from the expansion valve. Refer to <u>Air Conditioning Condenser and Air Conditioning Evaporator Tube Replacement</u>.	
1	Thermal Expansion Valve Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 4.7 N.m (41 lb in)
2	Thermal Expansion Valve Tip: Remove and discard the sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .

AIR CONDITIONING REFRIGERANT PRESSURE SENSOR VALVE REPLACEMENT (LAF)

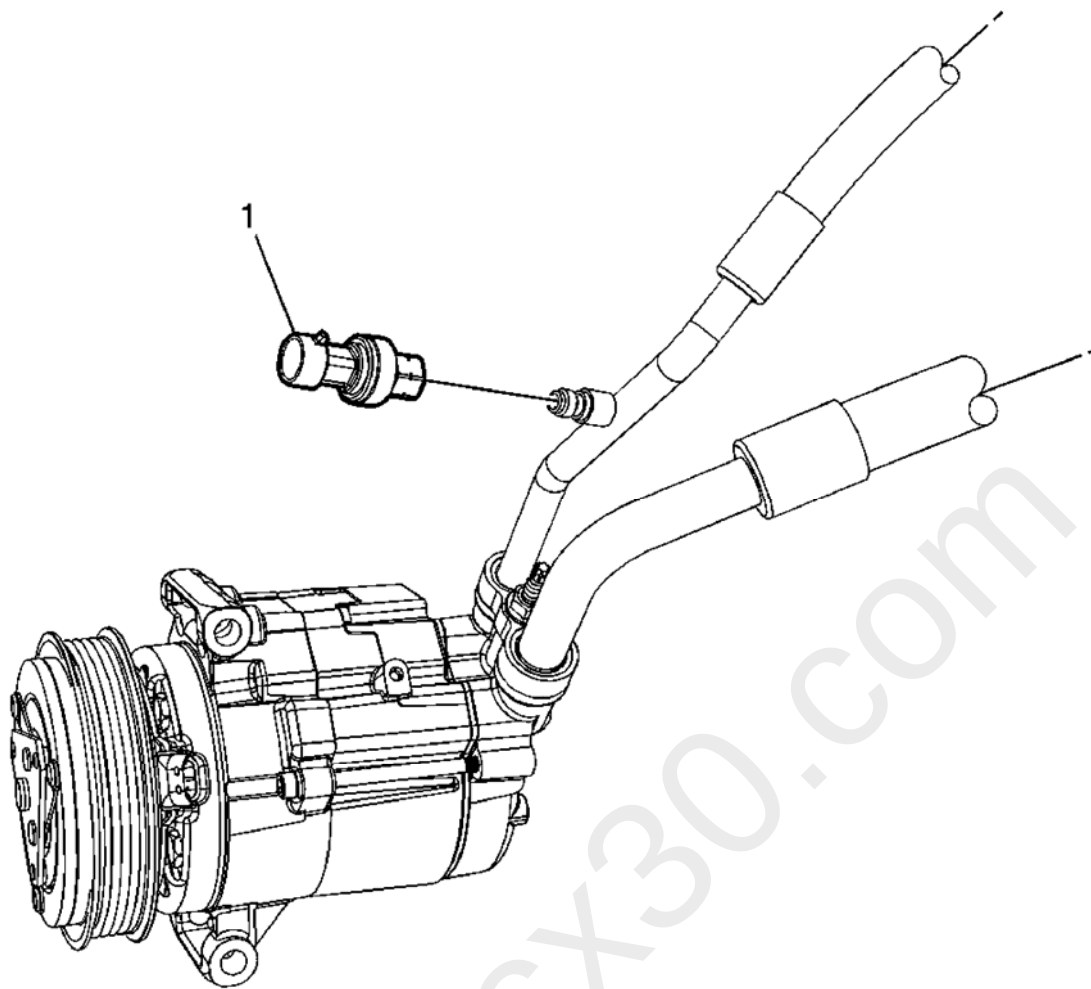


Fig. 52: Air Conditioning Refrigerant Pressure Sensor Valve (LAF)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Disconnect the electrical connector from the refrigerant pressure sensor.	
1	A/C Refrigerant Pressure Sensor CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Remove the refrigerant pressure sensor from the compressor hose.

2. Hand start the refrigerant pressure sensor to the compressor hose, taking care not to pinch the O-ring and tighten.

Tip: Lubricate the refrigerant pressure sensor O-ring with mineral oil. Refer to **Air Conditioning O-Ring Seal Replacement**.

Tighten: 4 N.m (35 lb in)

AIR CONDITIONING REFRIGERANT PRESSURE SENSOR VALVE REPLACEMENT (LF1)

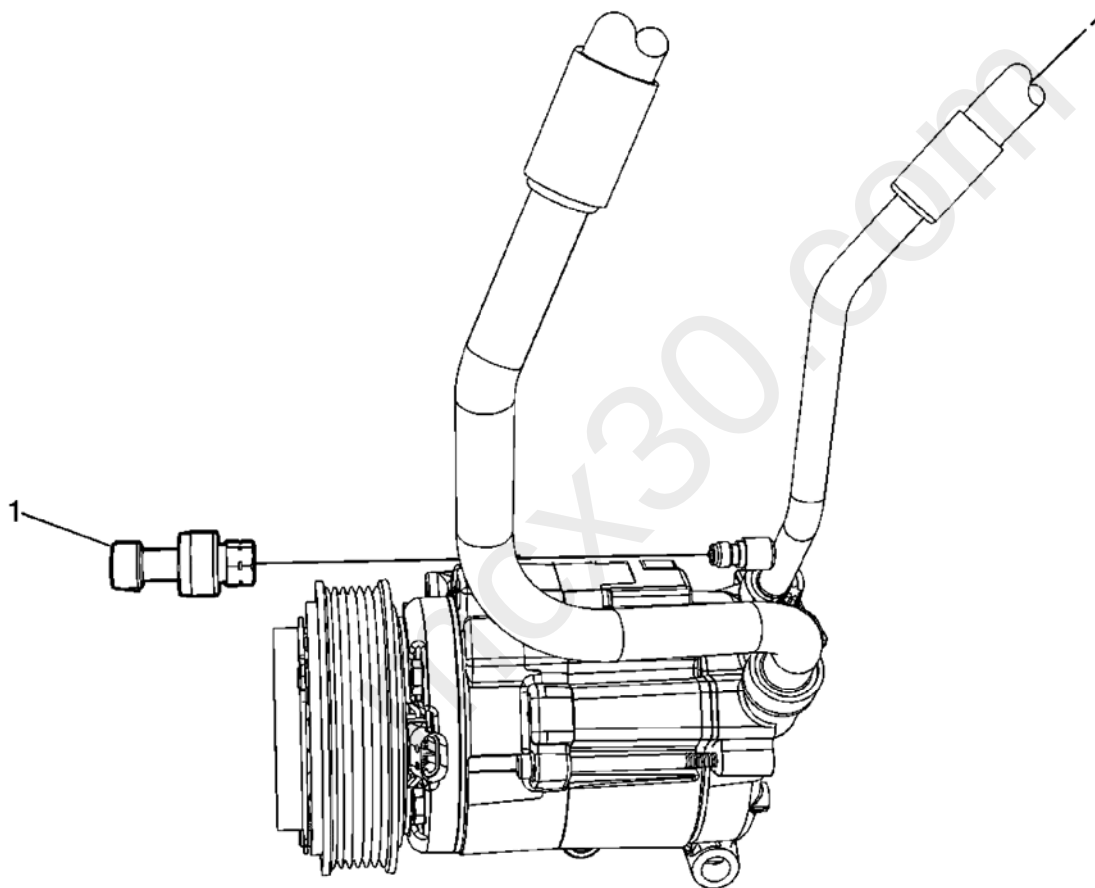


Fig. 53: Air Conditioning Refrigerant Pressure Sensor Valve (LF1)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Disconnect the electrical connector from the refrigerant pressure sensor.	

A/C Refrigerant Pressure Sensor

CAUTION:
Refer to Fastener Caution .

Procedure

1

1. Remove the refrigerant pressure sensor from the compressor hose.
2. Hand start the refrigerant pressure sensor to the compressor hose, taking care not to pinch the O-ring and tighten.

Tip: Lubricate the refrigerant pressure sensor O-ring with mineral oil. Refer to Air Conditioning O-Ring Seal Replacement.

Tighten: 4 N.m (35 lb in)

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

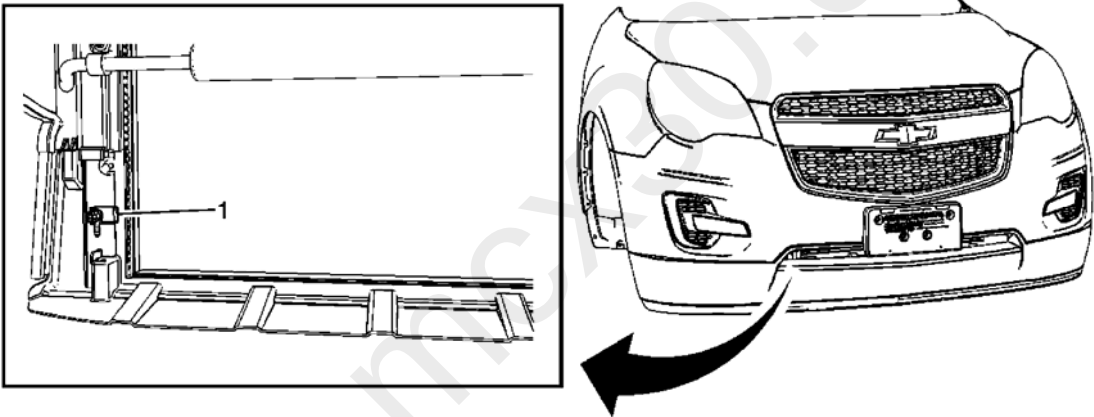


Fig. 54: Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove front bumper fascia. Refer to <u>Front Bumper Fascia Replacement (Equinox)</u> or <u>Front Bumper Fascia Replacement (Terrain)</u> .	
1	Ambient Air Temperature Sensor Procedure 1. Unsnap the ambient air temperature sensor. 2. Disconnect the electrical connector.

EVAPORATOR AIR TEMPERATURE SENSOR REPLACEMENT

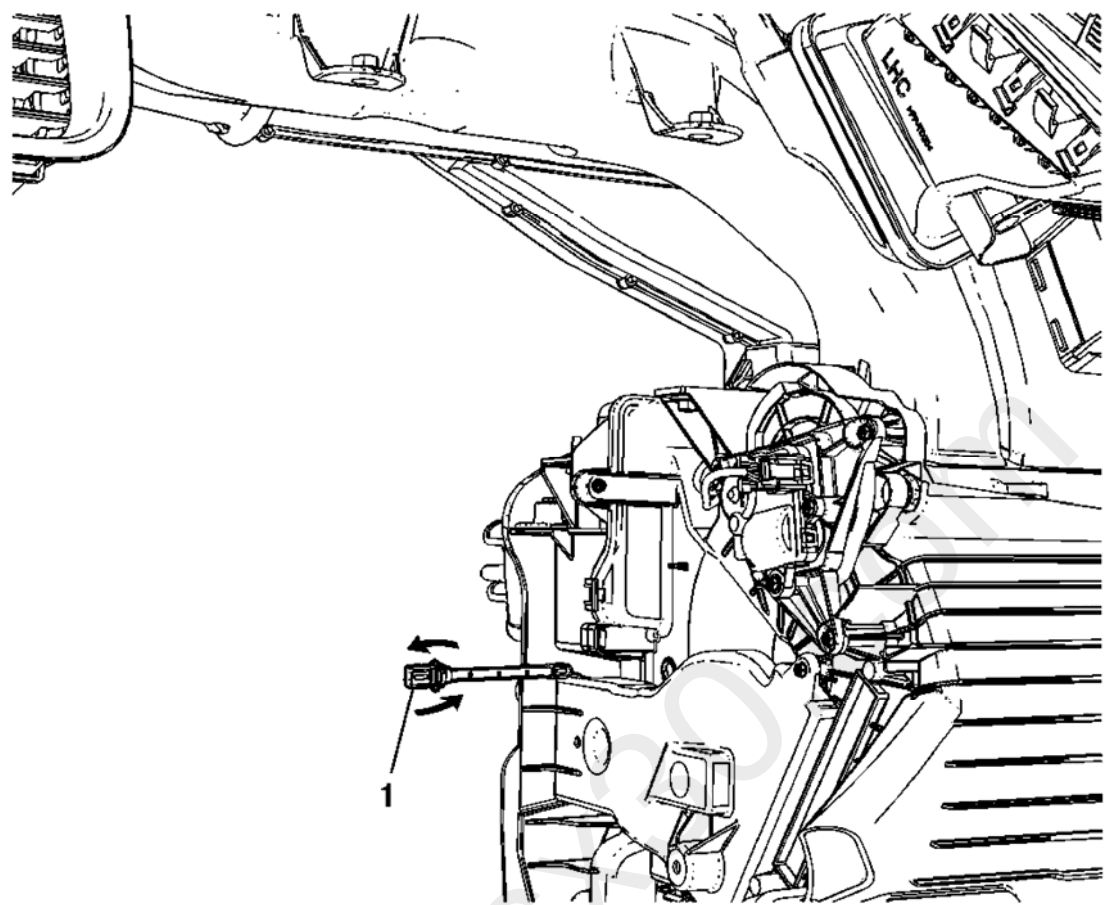


Fig. 55: Evaporator Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the Instrument panel insulator panel. Refer to <u>Instrument Panel Insulator Panel Replacement - Right Side (Equinox)</u> or <u>Instrument Panel Insulator Panel Replacement - Right Side (Terrain)</u> . 2. Reposition any wiring or hoses to gain access to evaporator temperature sensor.	
1	Evaporator Temperature Sensor Procedure 1. Disconnect the wiring connector 2. Rotate sensor 1/4 turn counter clock wise to remove

AIR CONDITIONING CONDENSER REPLACEMENT

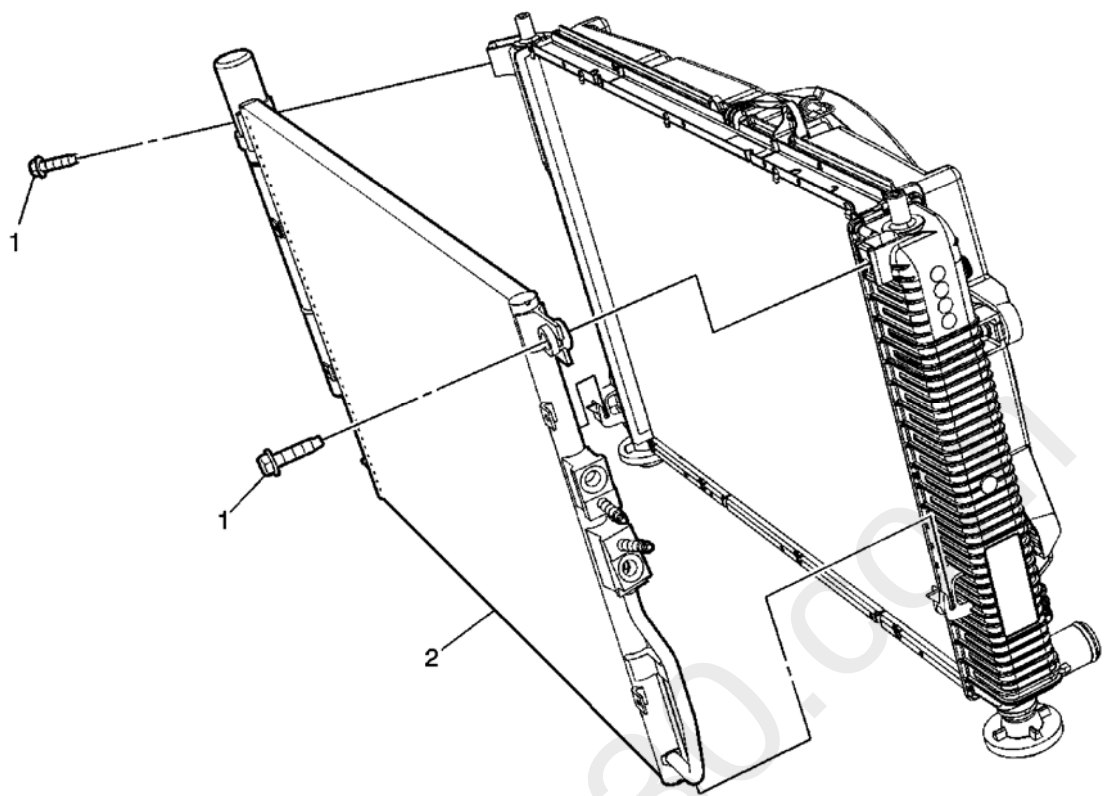


Fig. 56: Air Conditioning Condenser
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u> .	
2. Remove the radiator air lower baffel and deflector. Refer to <u>Radiator Air Lower Baffle and Deflector Replacement</u> .	
3. Remove the radiator air upper baffel and deflector. Refer to <u>Radiator Air Upper Baffle and Deflector Replacement</u> .	
4. Remove the air conditioning compressor hose. Refer to <u>Air Conditioning Compressor Hose Replacement (LAF)</u> or <u>Air Conditioning Compressor Hose Replacement (LF1)</u>	
5. Remove the air conditioning condenser and air conditioning evaporator tube. Refer to <u>Air Conditioning Condenser and Air Conditioning Evaporator Tube Replacement</u>	
1	Air Conditioning Condenser Bolt CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 9 N.m (80 lb in)
2	Air Conditioning Condenser Procedure: Add the specified amount of polyalkylene glycol (PAG) oil to the condenser. Refer to <u>Refrigerant System Specifications</u>

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REPLACEMENT

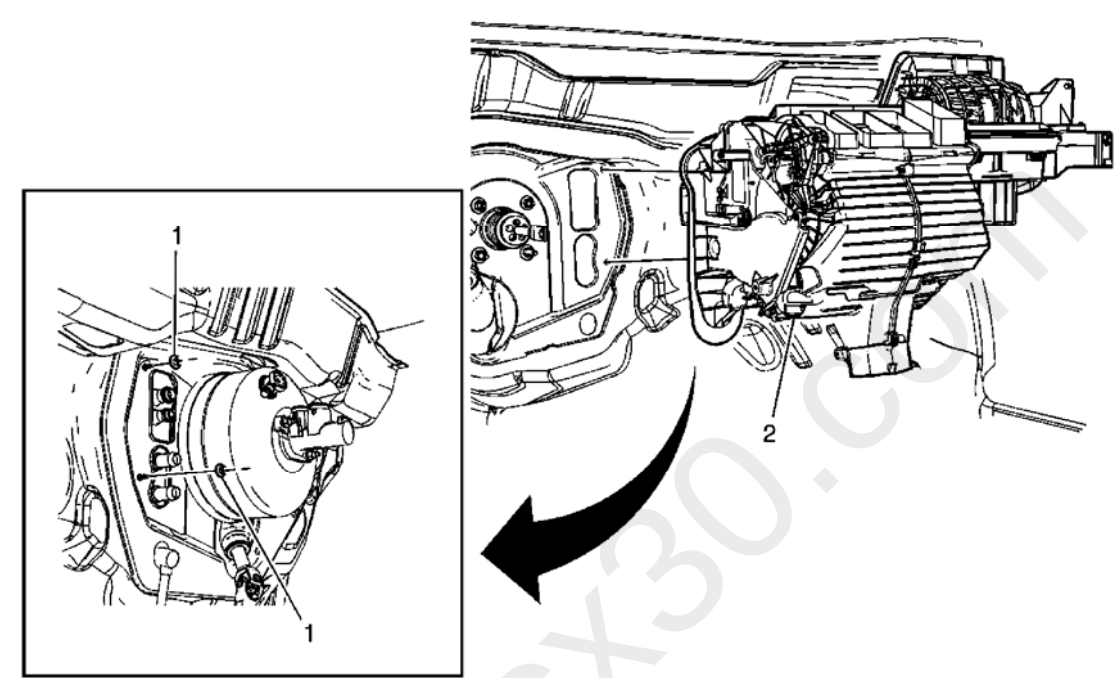


Fig. 57: Heater & Air Conditioning Evaporator & Blower Module
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Remove the intake manifold sight shield.
2.	Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u> .
3.	Remove the heater inlet hose from the heater core tube. Refer to <u>Heater Inlet Hose Replacement (LAF)</u> or <u>Heater Inlet Hose Replacement (LF1)</u> .
4.	Remove the heater outlet hose from the heater core tube. Refer to <u>Heater Outlet Hose Replacement (LAF)</u> or <u>Heater Outlet Hose Replacement (LF1)</u> .
5.	Remove the evaporator hose assembly from the thermal expansion valve. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u> .
6.	Remove the instrument panel carrier. Refer to <u>Instrument Carrier Replacement (Equinox)</u> or <u>Instrument Carrier Replacement (Terrain)</u> .

1	Heater and Air Conditioning Evaporator and Blower Module Fastener (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 9 N.m (80 lb in)
2	Heater and Air Conditioning Evaporator and Blower Module Procedure: With the aid of an assistant, remove the heater and air conditioning evaporator and blower module from the vehicle.

AIR CONDITIONING (A/C) EVAPORATOR CASE ASSEMBLY REPLACEMENT

Removal Procedure

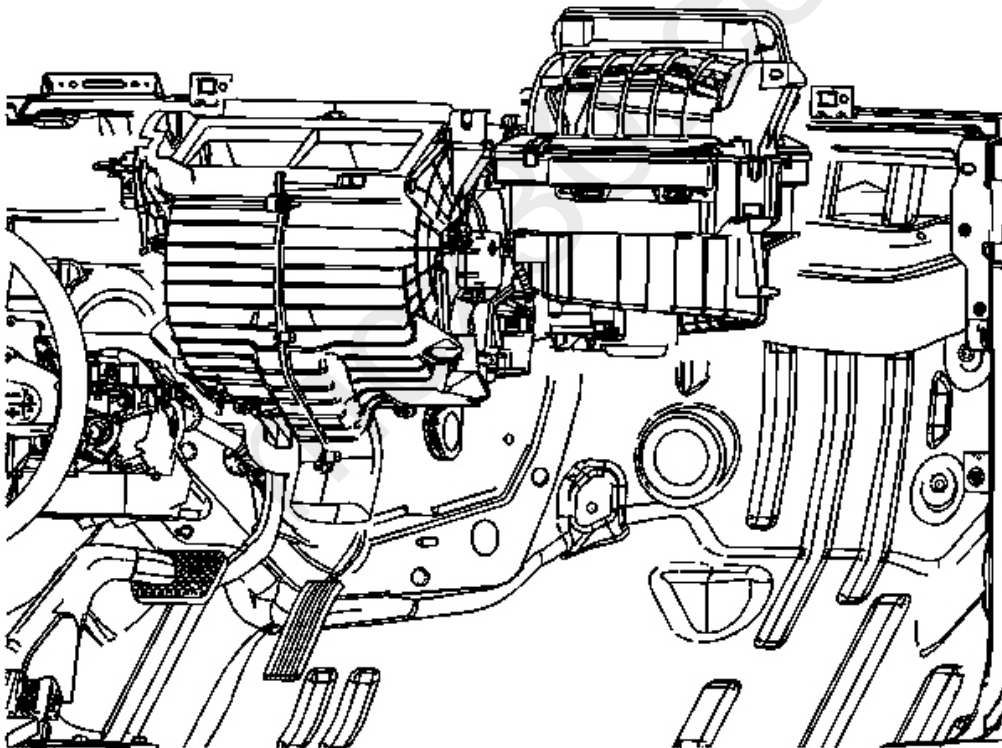


Fig. 58: View Of HVAC Module
Courtesy of GENERAL MOTORS CORP.

1. Remove the HVAC module. Refer to Heater and Air Conditioning Evaporator and Blower Module

Replacement.

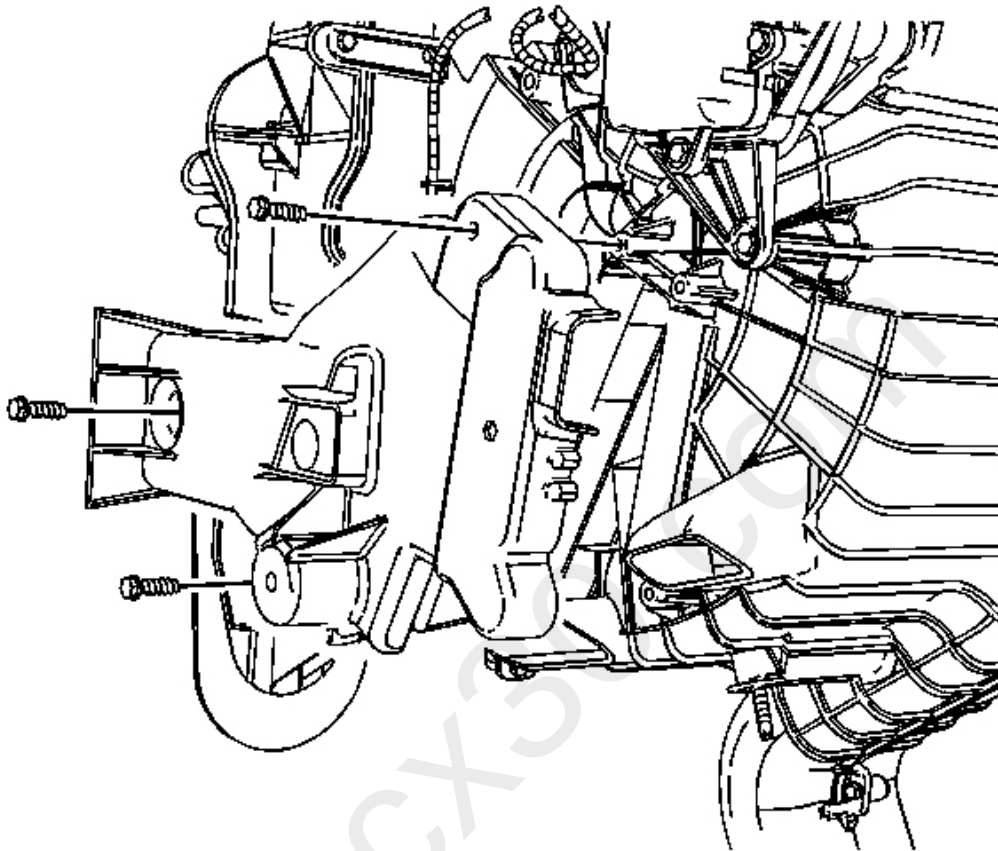


Fig. 59: View Of Heater Core Cover Screws
Courtesy of GENERAL MOTORS CORP.

2. Remove the heater core cover screws from the evaporator case assembly.
3. Remove the heater core cover from the evaporator case assembly.

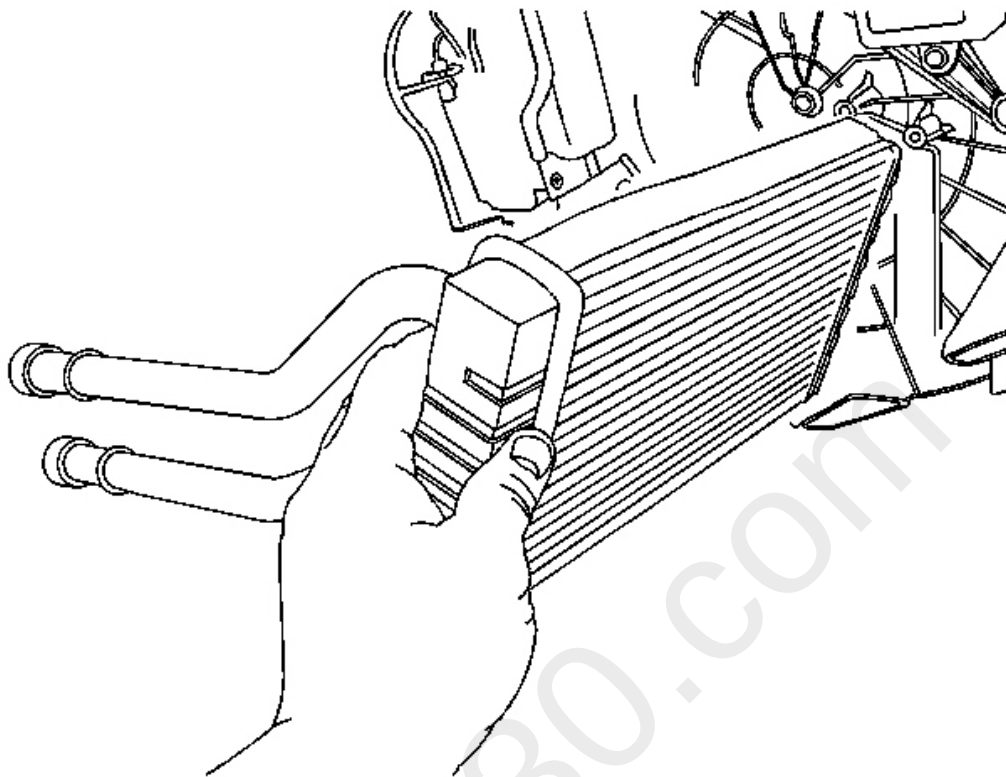


Fig. 60: View Of Heater Core
Courtesy of GENERAL MOTORS CORP.

4. Remove the heater core from the HVAC module.

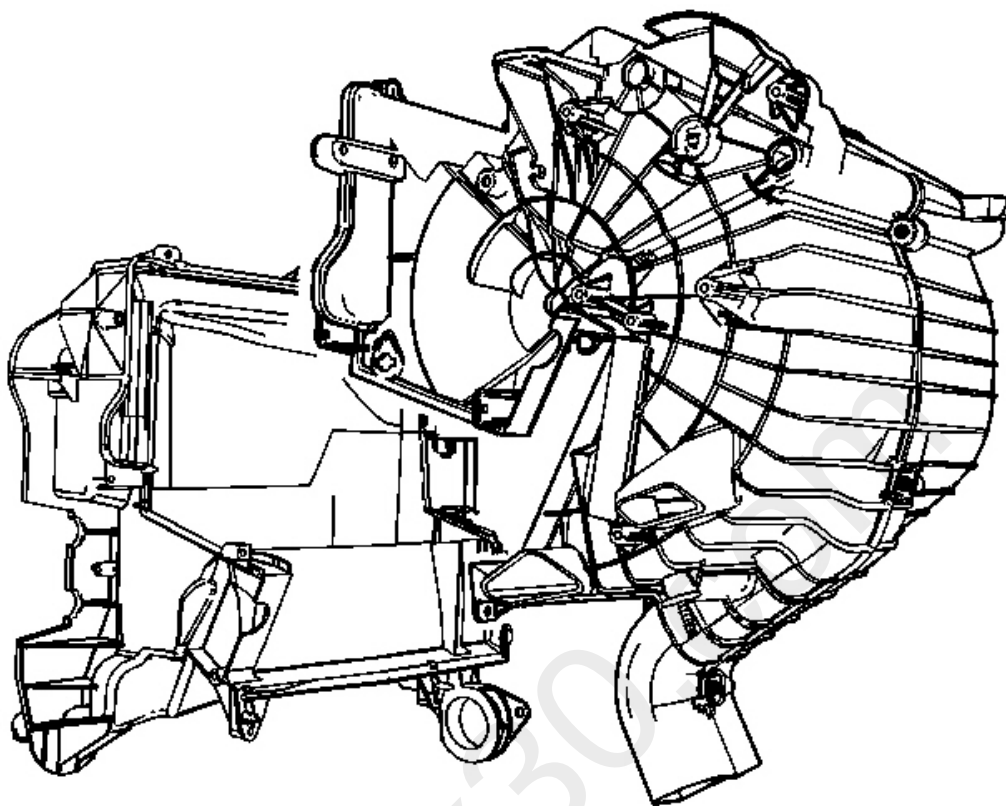


Fig. 61: View Of Evaporator Case Assembly
Courtesy of GENERAL MOTORS CORP.

5. Remove the evaporator case assembly screws from the blower case assembly.
6. Remove the evaporator case assembly from the blower case assembly.

Installation Procedure

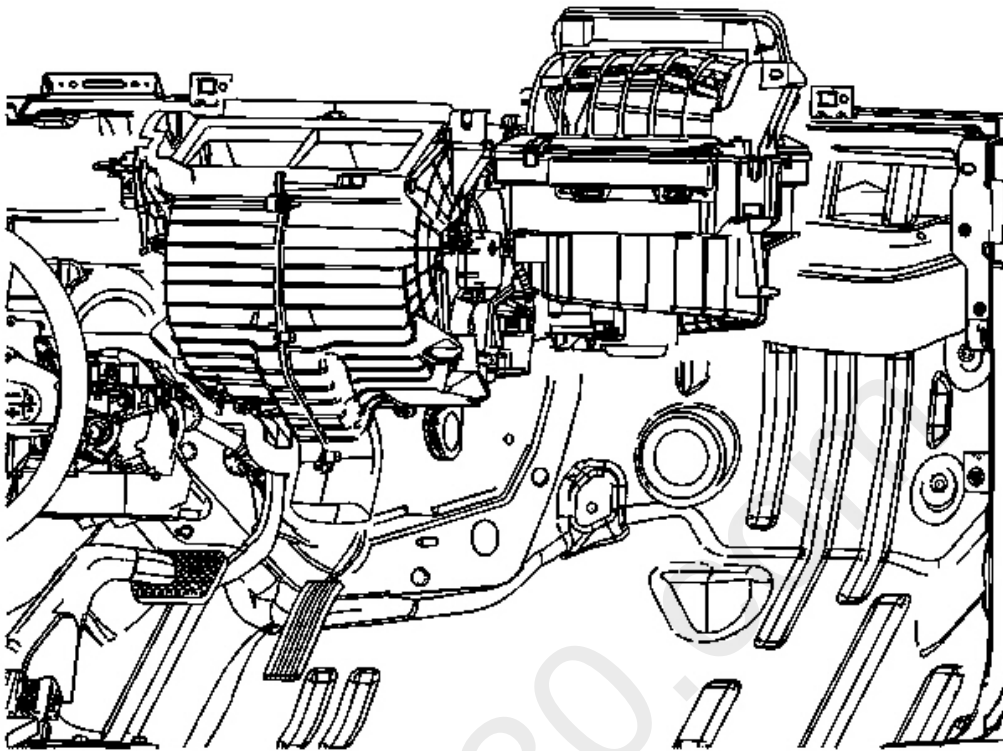


Fig. 62: View Of HVAC Module
Courtesy of GENERAL MOTORS CORP.

1. Install evaporator case assembly to the blower case assembly.

CAUTION: Refer to **Fastener Caution** .

2. Install evaporator case assembly screws to the blower case assembly.

Tighten: Tighten the screws to 1.5 N.m (13 lb in).

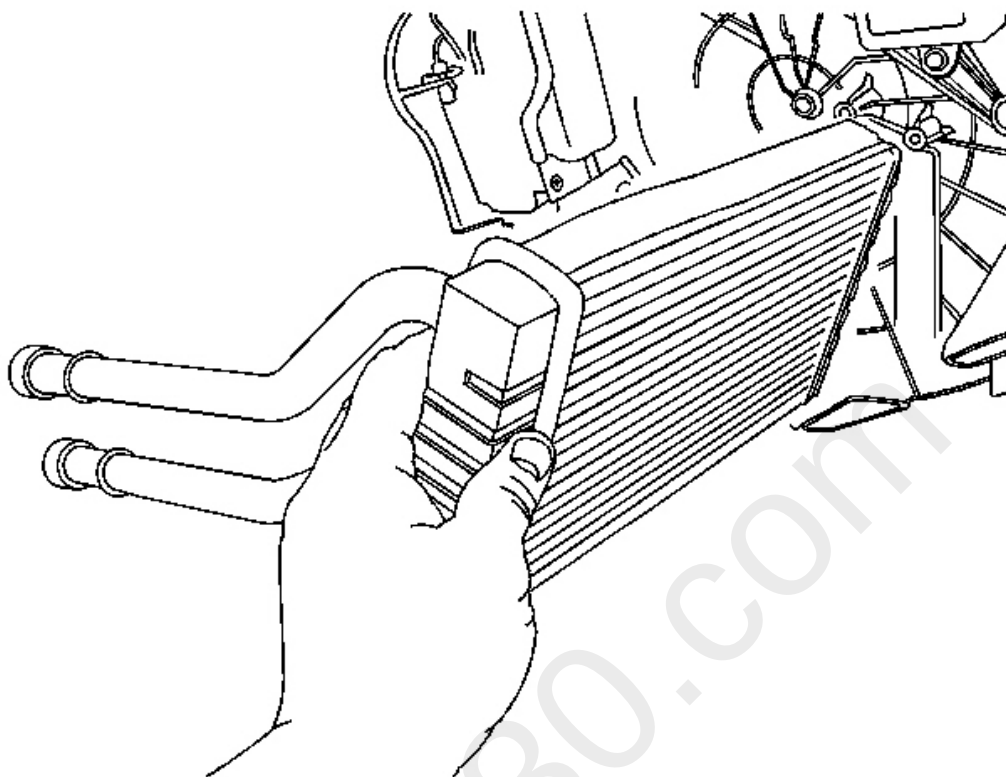


Fig. 63: View Of Heater Core
Courtesy of GENERAL MOTORS CORP.

3. Install heater core to the HVAC module.

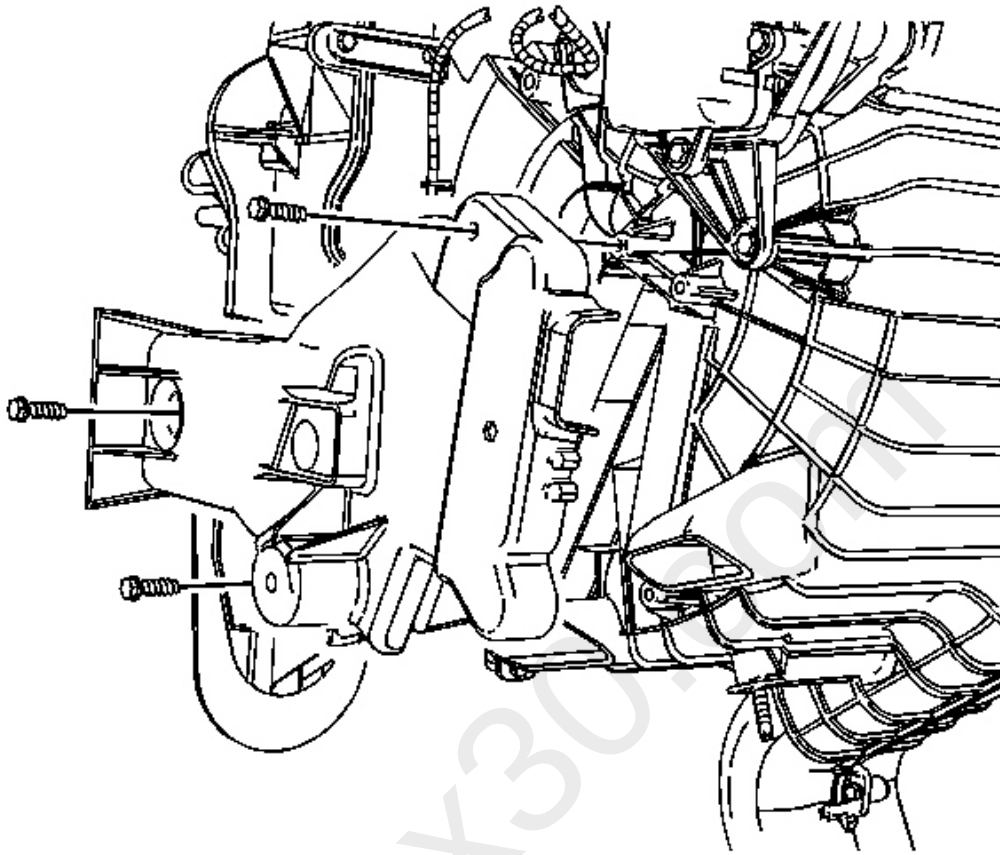


Fig. 64: View Of Heater Core Cover Screws
Courtesy of GENERAL MOTORS CORP.

4. Install heater core cover.
5. Install heater core cover screws.

Tighten: Tighten the screws to 1.5 N.m (13 lb in).

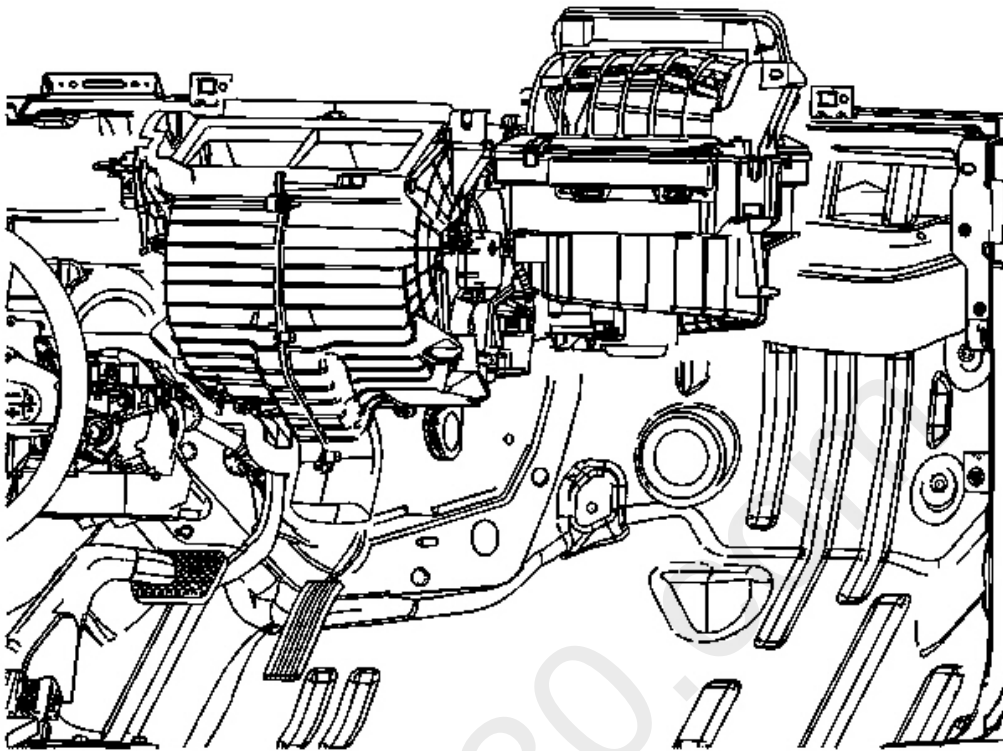


Fig. 65: View Of HVAC Module
Courtesy of GENERAL MOTORS CORP.

6. Install the HVAC module. Refer to **Heater and Air Conditioning Evaporator and Blower Module Replacement**.

AIR CONDITIONING EVAPORATOR CORE REPLACEMENT

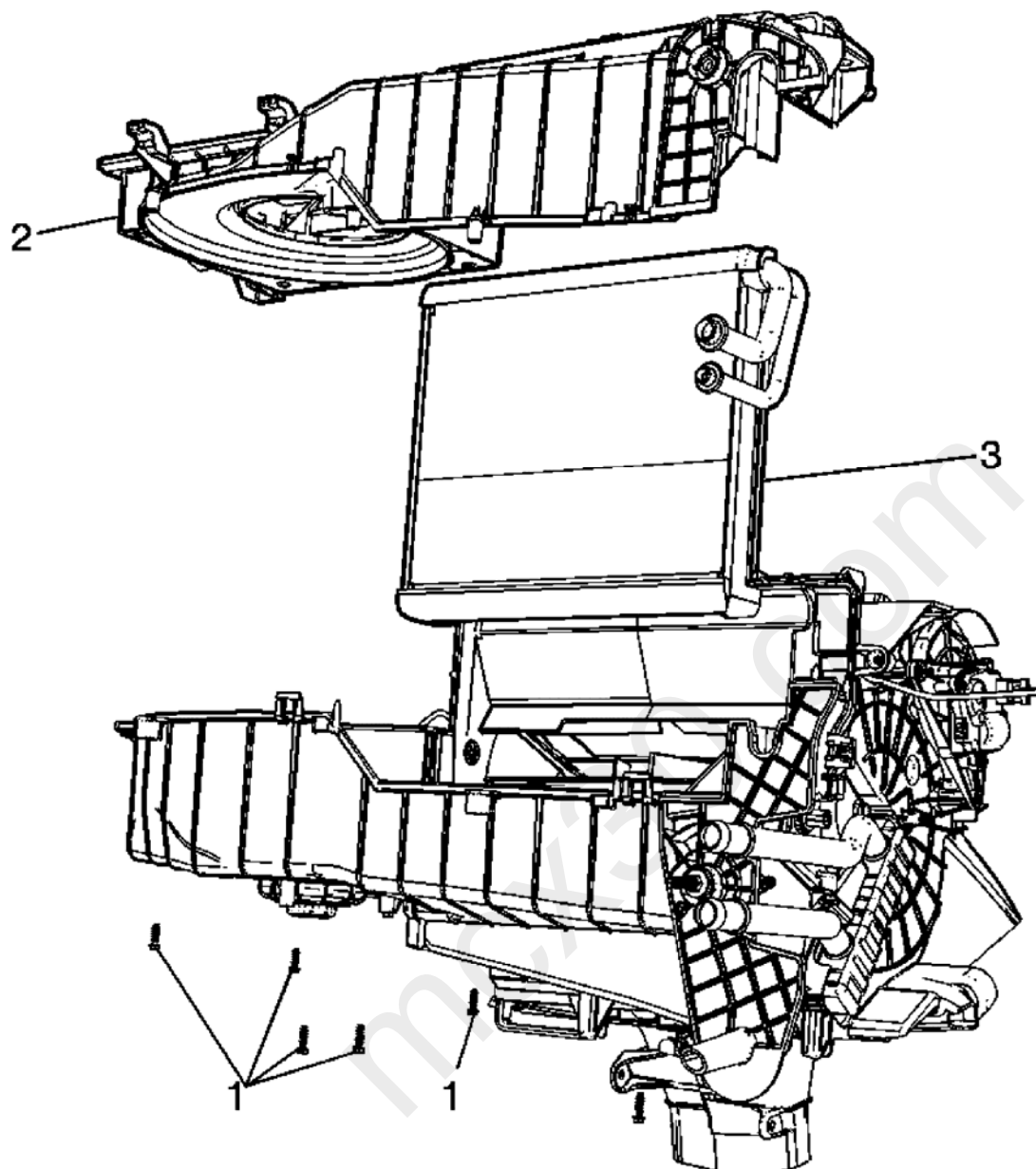


Fig. 66: Air Conditioning Evaporator Core
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Remove the thermal expansion valve. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Hose Replacement</u>
2.	Remove the heater and air conditioning evaporator and blower module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</u> .

3. Remove the heater core. Refer to **Heater Core Replacement**
4. Disconnect the Heater and air conditioning evaporator and Blower module assembly electrical connectors.

1	Heater and Air Conditioning Evaporator and Blower Module Case Screw (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5N.m (13 lb in)
2	Upper Heater Case.
3	Air Conditioning Evaporator Core

HEATER INLET HOSE REPLACEMENT (LAF)

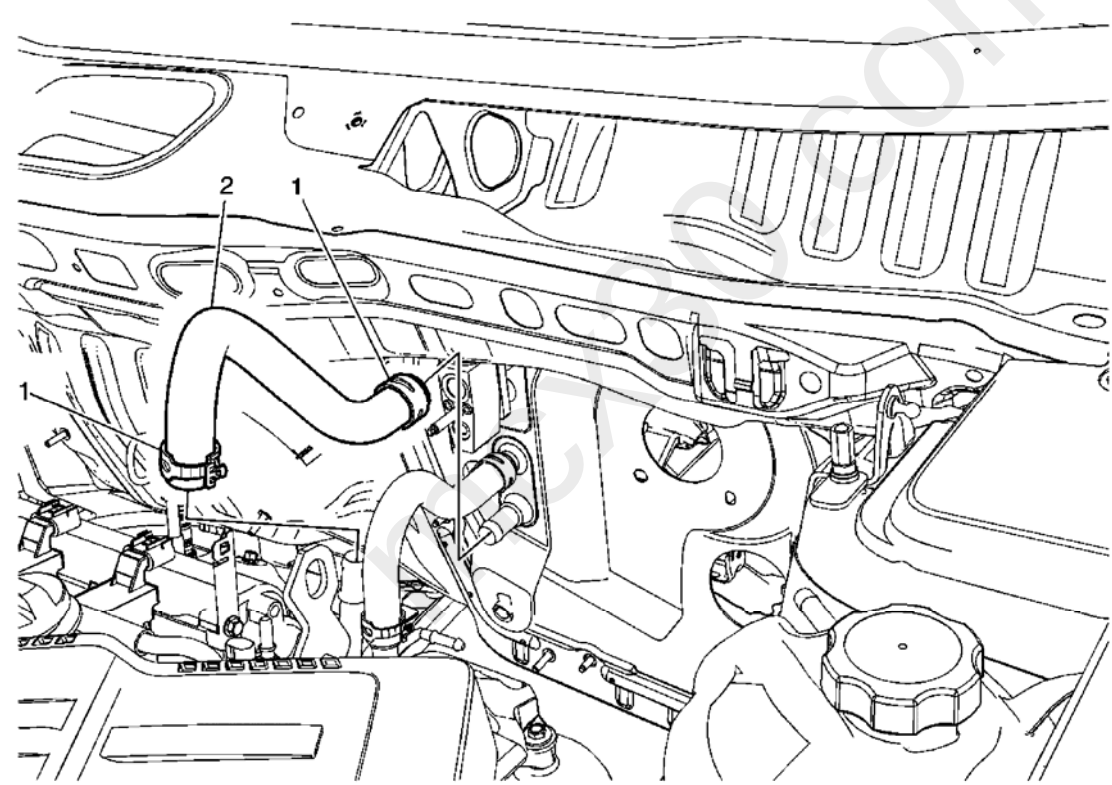


Fig. 67: Heater Inlet Hose (LAF)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static)</u> or <u>Cooling System Draining and Filling (GE 47716)</u>

2. Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement</u>	
1	Heater Inlet Hose Clamps (Qty 2) Procedure: Using J 38185: Hose Clamp Pliers reposition the heater inlet hose. Special Tools: J 38185: Hose Clamp Pliers
2	Heater Inlet Hose

HEATER INLET HOSE REPLACEMENT (LF1)

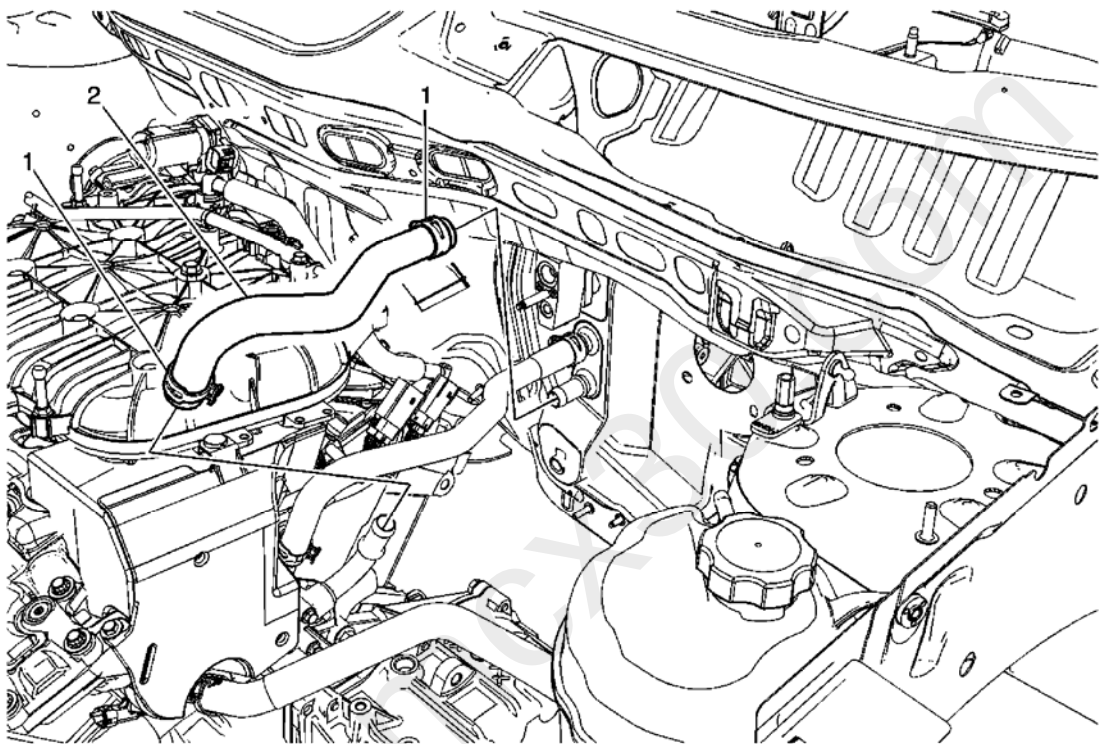


Fig. 68: Heater Inlet Hose (LF1)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static)</u> or <u>Cooling System Draining and Filling (GE 47716)</u>	
2. Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement</u>	
1	Heater Inlet Hose Clamps (Qty 2) Procedure: Using J 38185: Hose Clamp Pliers reposition the heater inlet hose. Special Tools:

	J 38185: Hose Clamp Pliers
2	Heater Inlet Hose

HEATER OUTLET HOSE REPLACEMENT (LAF)

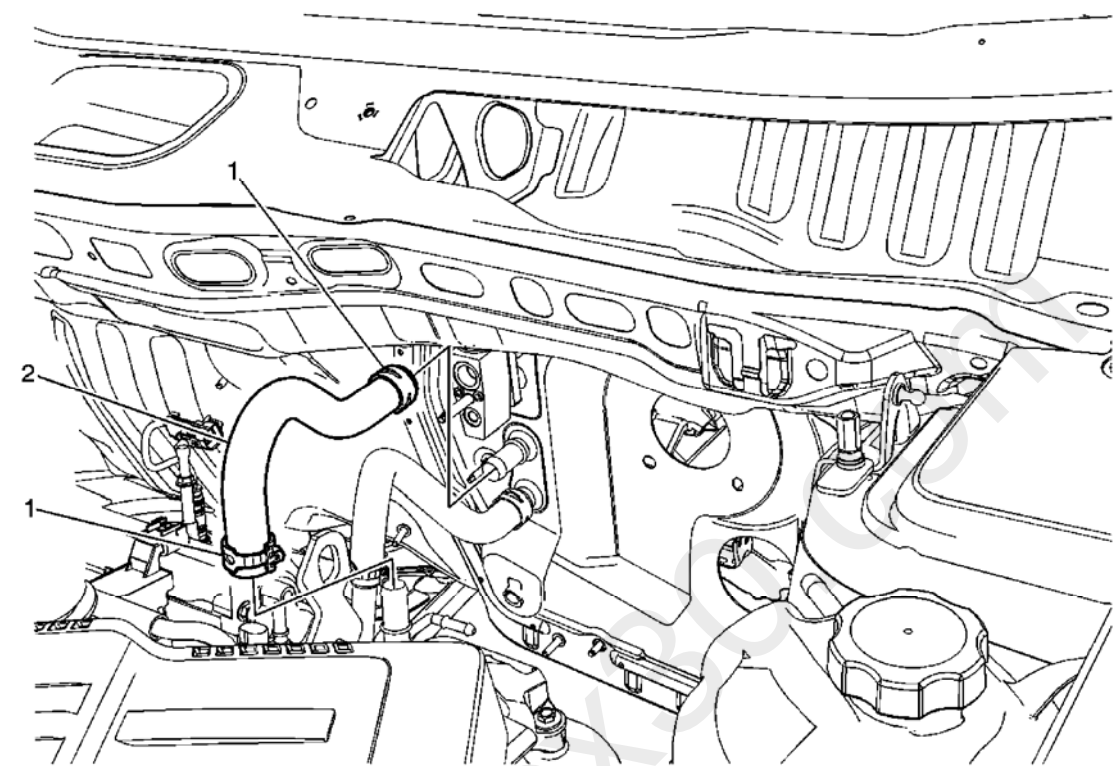


Fig. 69: Heater Outlet Hose (LAF)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Drain the cooling system. Refer to Cooling System Draining and Filling (Static) or Cooling System Draining and Filling (GE 47716) 2. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement	
1	Heater Outlet Hose Clamps (Qty 2) Procedure: Using J 38185: Hose Clamp Pliers reposition the heater outlet hose. Special Tools: J 38185: Hose Clamp Pliers
2	Heater Outlet Hose

HEATER OUTLET HOSE REPLACEMENT (LF1)

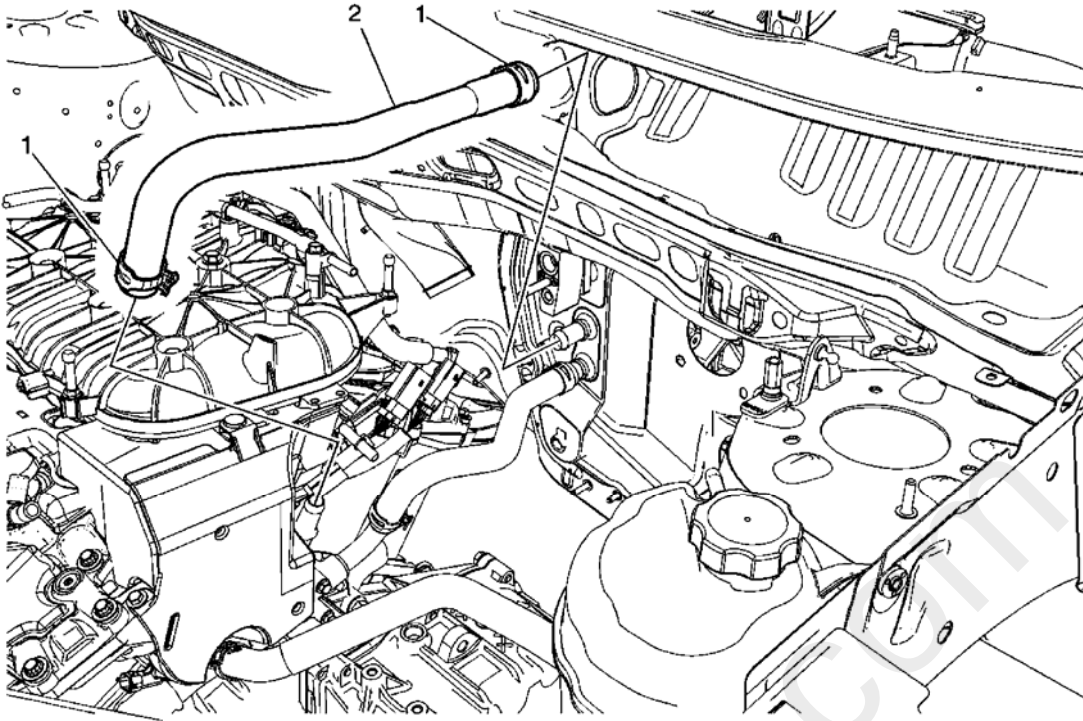


Fig. 70: Heater Outlet Hose (LF1)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static)</u> or <u>Cooling System Draining and Filling (GE 47716)</u> 2. Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement</u>	
1	Heater Outlet Hose Clamps (Qty 2) Procedure: Using J 38185: Hose Clamp Pliers reposition the heater outlet hose. Special Tools: J 38185: Hose Clamp Pliers
2	Heater Outlet Hose

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

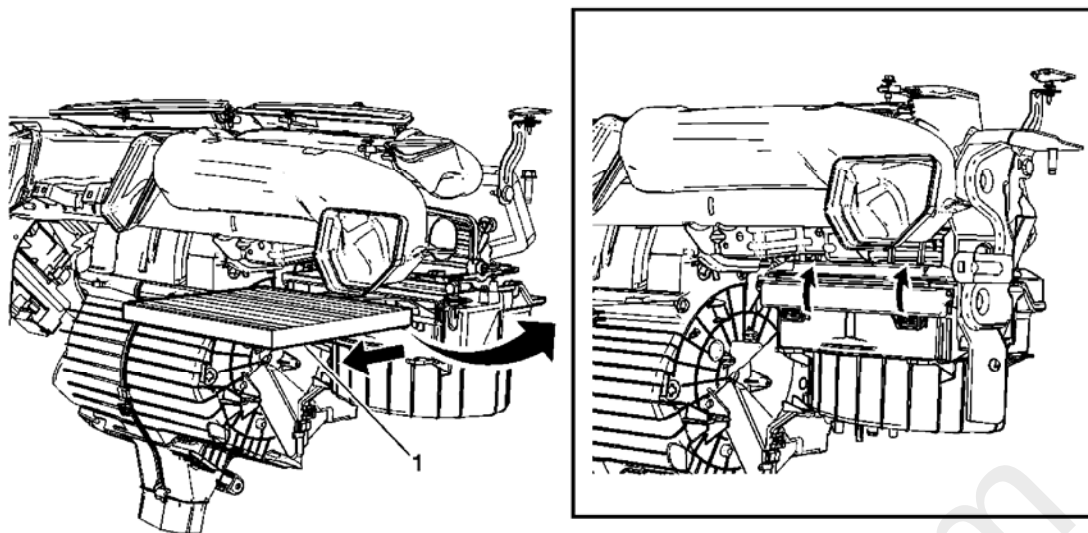


Fig. 71: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel compartment. Refer to <u>Instrument Panel Compartment Door Replacement (Equinox)</u> or <u>Instrument Panel Compartment Door Replacement (Terrain)</u> .	
1	Passenger Compartment Air Filter Procedure: Release the retainer and open the service lid.

AIR INLET HOUSING REPLACEMENT

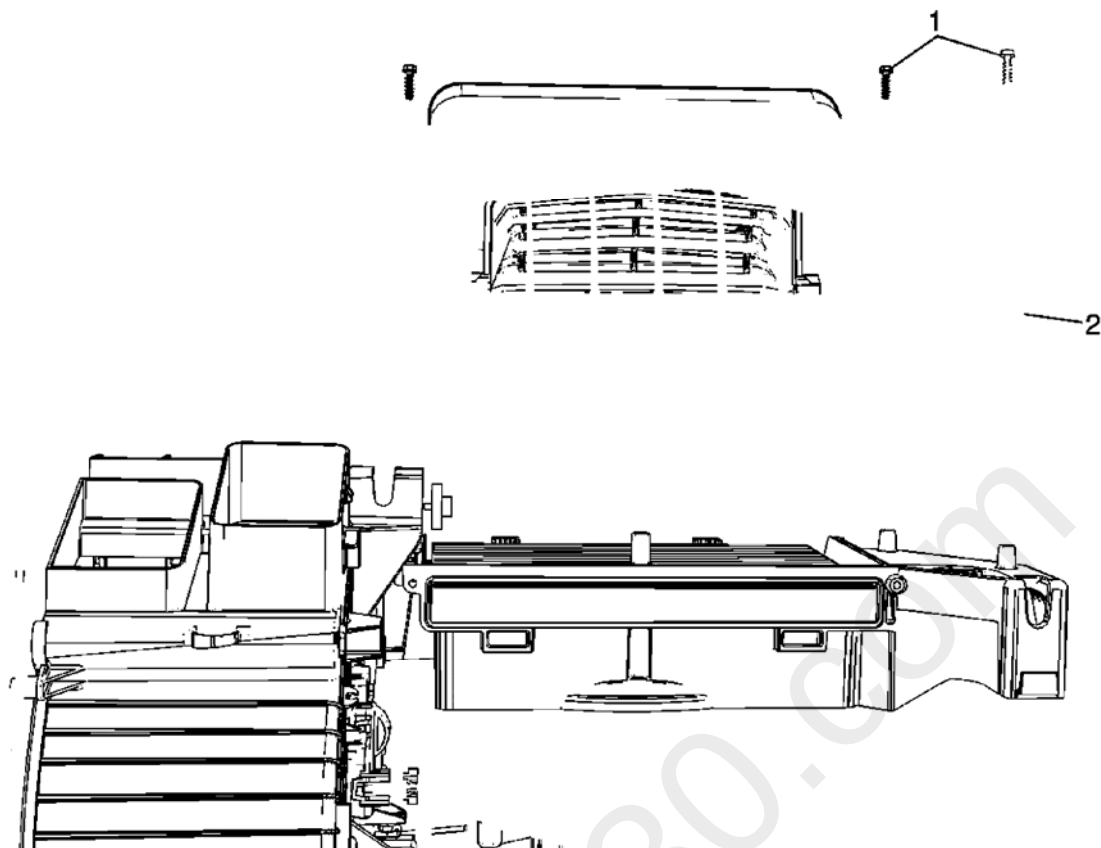


Fig. 72: Air Inlet Housing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Remove the Heater and Air Conditioning Evaporator and Blower Module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</u>. 2. Disconnect the electrical connectors as necessary.	
1	Air Inlet Housing Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Air Inlet Housing

BLOWER MOTOR REPLACEMENT

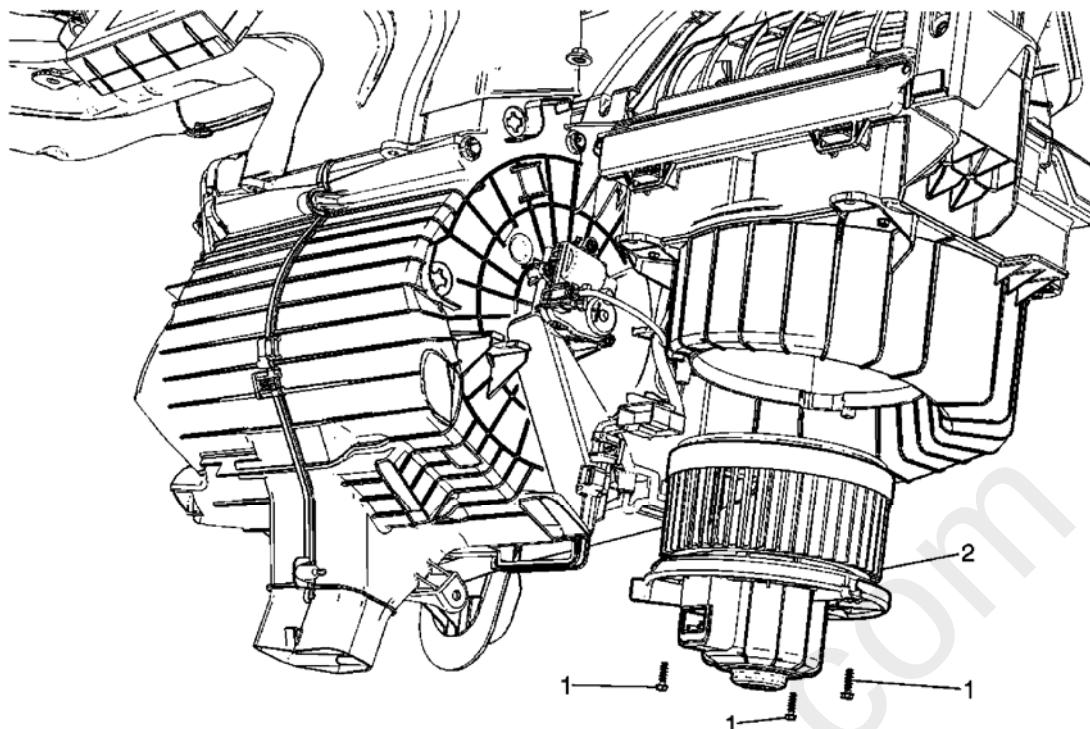


Fig. 73: Blower Motor

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure 1. Remove the instrument panel (I/P) insulator panel - right side. Refer to <u>Instrument Panel Insulator Panel Replacement - Right Side (Equinox)</u> or <u>Instrument Panel Insulator Panel Replacement - Right Side (Terrain)</u> . 2. Disconnect the blower motor electrical connector.	
1	Blower Motor Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Blower Motor

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT (EQUINOX)

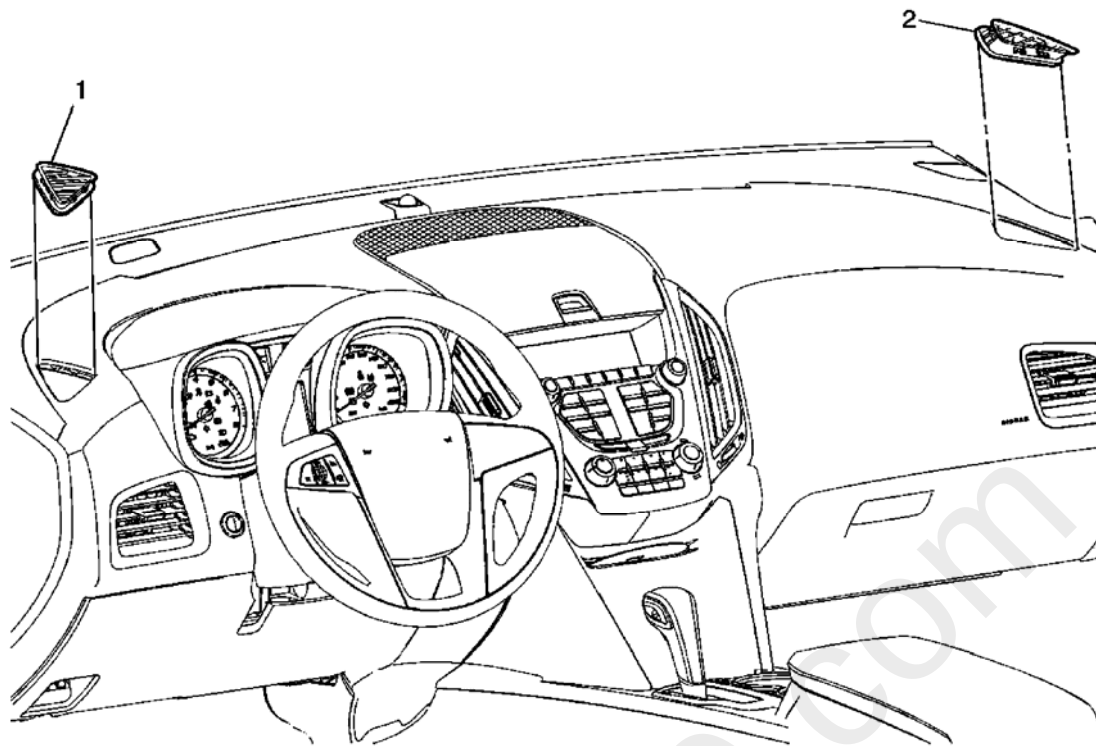


Fig. 74: Side Window Defogger Outlet Grille (Equinox)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Side Window Defroster Outlet Grilles (Left) Procedure: Use a flat bladed plastic trim tool in order to release the side window defroster outlet grille from the instrument panel assembly.
2	Side Window Defroster Outlet Grilles (Right) Procedure: Use a flat bladed plastic trim tool in order to release the side window defroster outlet grille from the instrument panel assembly.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT (TERRAIN)

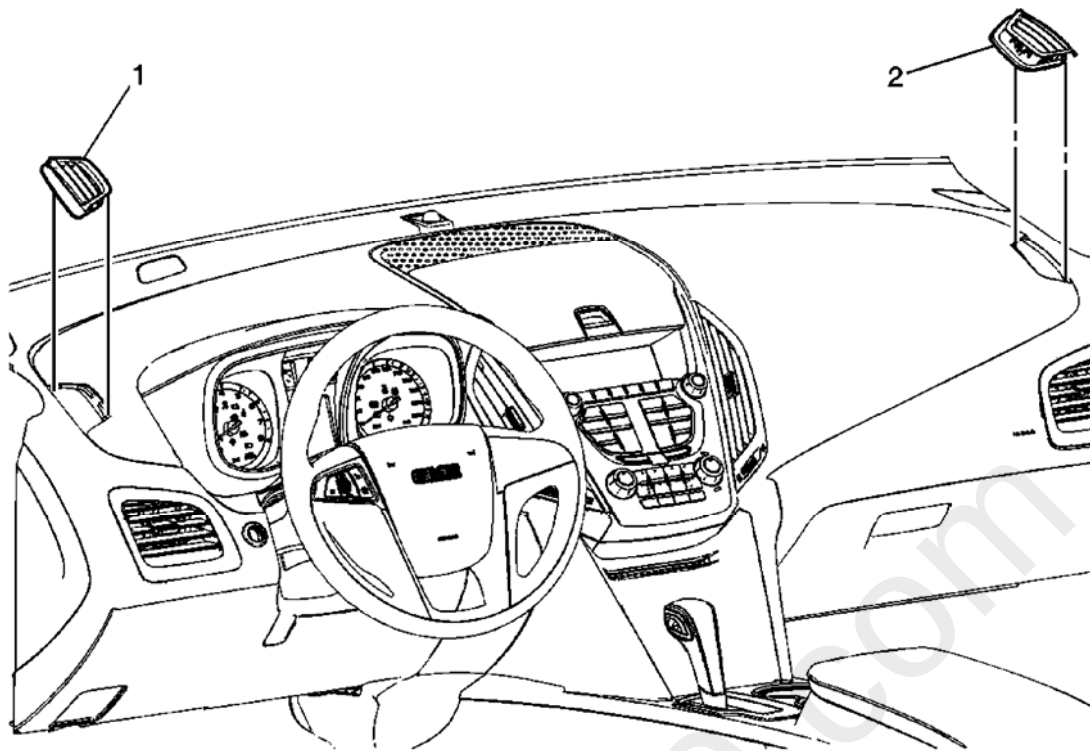


Fig. 75: Side Window Defogger Outlet Grille (Terrain)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Side Window Defroster Outlet Grilles (Left) Procedure: Use a flat bladed plastic trim tool in order to release the side window defroster outlet grille from the instrument panel assembly.
2	Side Window Defroster Outlet Grilles (Right) Procedure: Use a flat bladed plastic trim tool in order to release the side window defroster outlet grille from the instrument panel assembly.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT (EQUINOX)

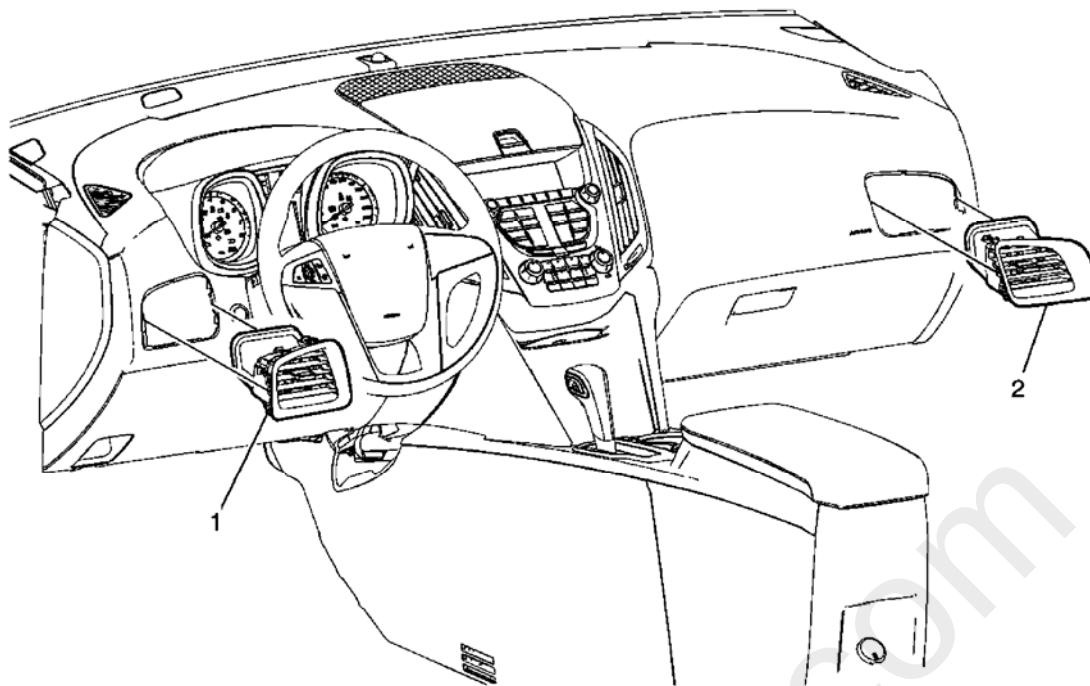


Fig. 76: Instrument Panel Outer Air Outlet (Equinox)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Outer Air Outlet (Left) Procedure: Use a flat bladed plastic trim tool in order to release the instrument panel outer air outlet from the instrument panel assembly.
2	Instrument Panel Outer Air Outlet (Right) Procedure: Use a flat bladed plastic trim tool in order to release the instrument panel outer air outlet from the instrument panel assembly.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT (TERRAIN)

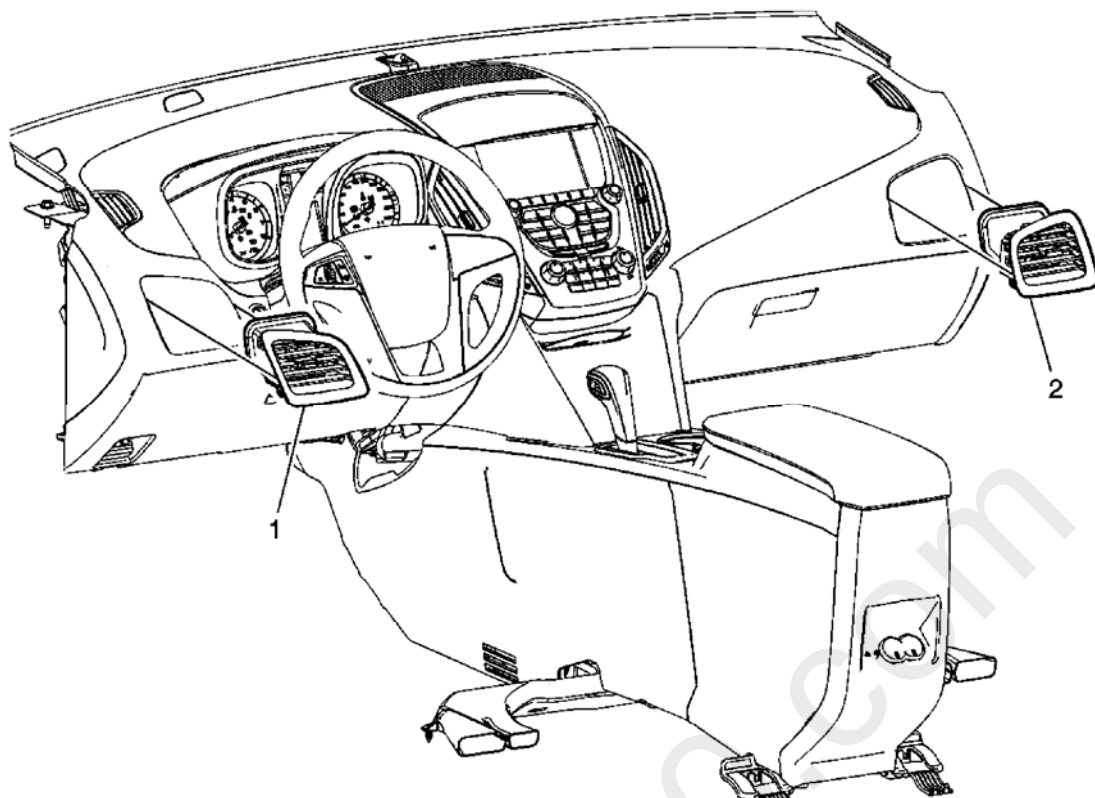


Fig. 77: Instrument Panel Outer Air Outlet (Terrain)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Outer Air Outlet (Left) Procedure: Use a flat bladed plastic trim tool in order to release the instrument panel outer air outlet from the instrument panel assembly.
2	Instrument Panel Outer Air Outlet (Right) Procedure: Use a flat bladed plastic trim tool in order to release the instrument panel outer air outlet from the instrument panel assembly.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT (EQUINOX)

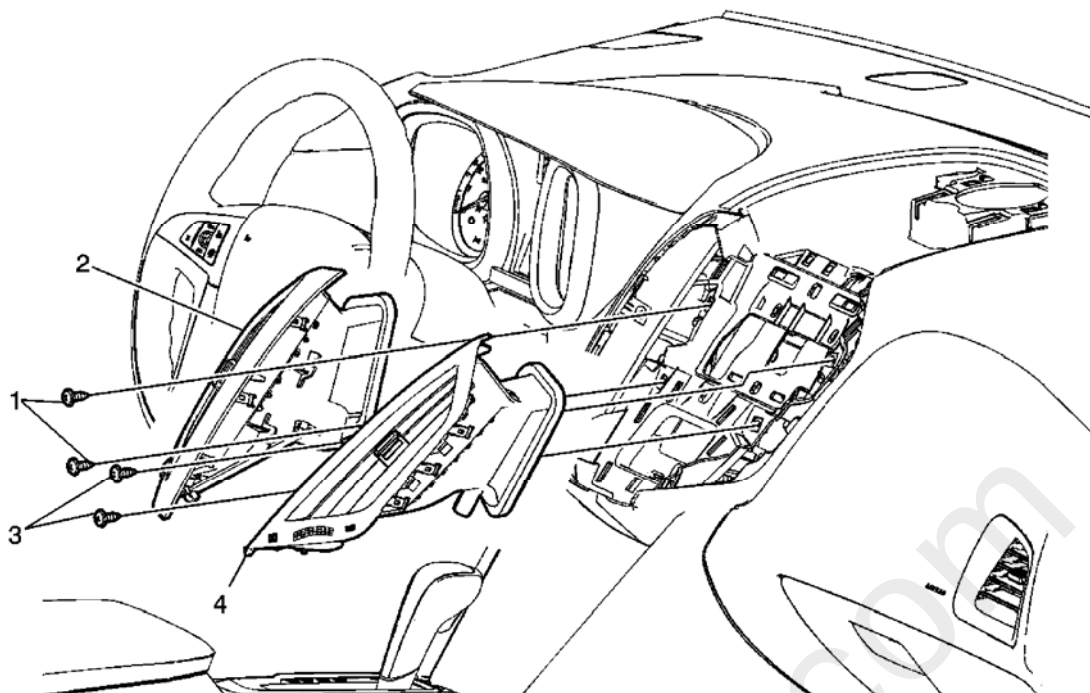


Fig. 78: Instrument Panel Center Air Outlet (Equinox)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the Radio Control Assembly. Refer to <u>Radio Control Assembly Replacement</u> .	
1	Left Instrument Panel Center Air Outlet Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Left Instrument Panel Center Air Outlet Procedure: Slide a flat bladed plastic trim tool along the outward edge of the outlet assembly releasing the retainer tabs securing the outlet to the instrument panel assembly.
3	Right Instrument Panel Center Air Outlet Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
4	Right Instrument Panel Center Air Outlet Procedure:

Slide a flat bladed plastic trim tool along the outward edge of the outlet assembly releasing the retainer tabs securing the outlet to the instrument panel assembly.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT (TERRAIN)

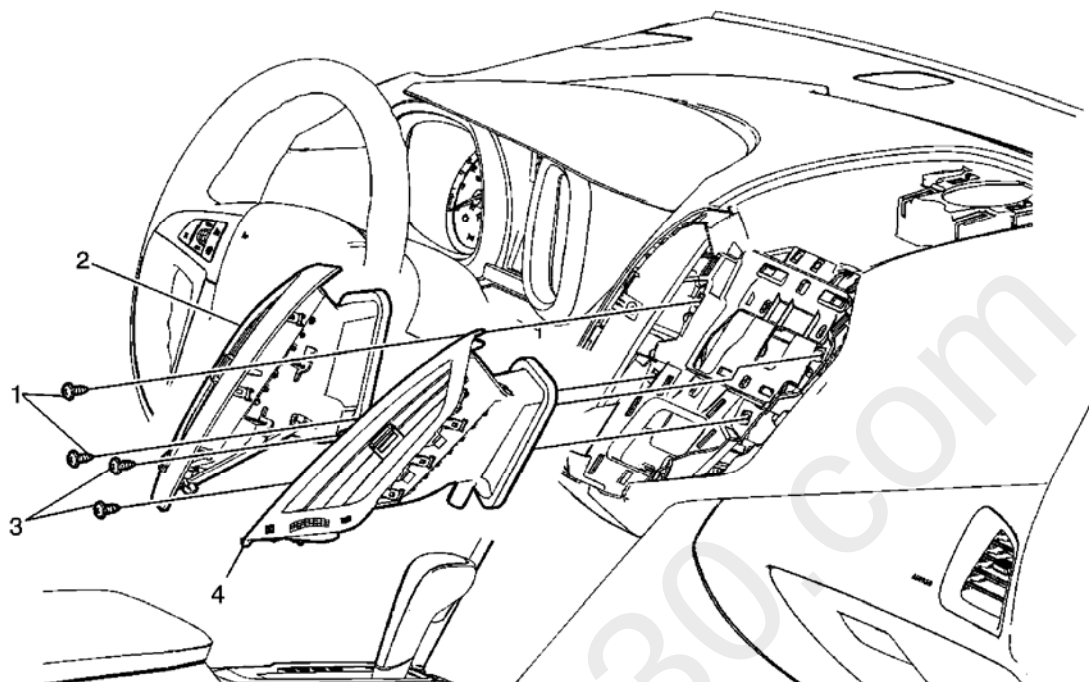


Fig. 79: Instrument Panel Center Air Outlet (Terrain)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the Radio Control Assembly. Refer to <u>Radio Control Assembly Replacement</u> .	
1	Left Instrument Panel Center Air Outlet Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Left Instrument Panel Center Air Outlet Procedure: Slide a flat bladed plastic trim tool along the outward edge of the outlet assembly releasing the retainer tabs securing the outlet to the instrument panel assembly.
3	Right Instrument Panel Center Air Outlet Fasteners (Qty: 2) CAUTION:

	Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
4	Right Instrument Panel Center Air Outlet Procedure: Slide a flat bladed plastic trim tool along the outward edge of the outlet assembly releasing the retainer tabs securing the outlet to the instrument panel assembly.

FLOOR AIR OUTLET REPLACEMENT - CENTER

Removal Procedure

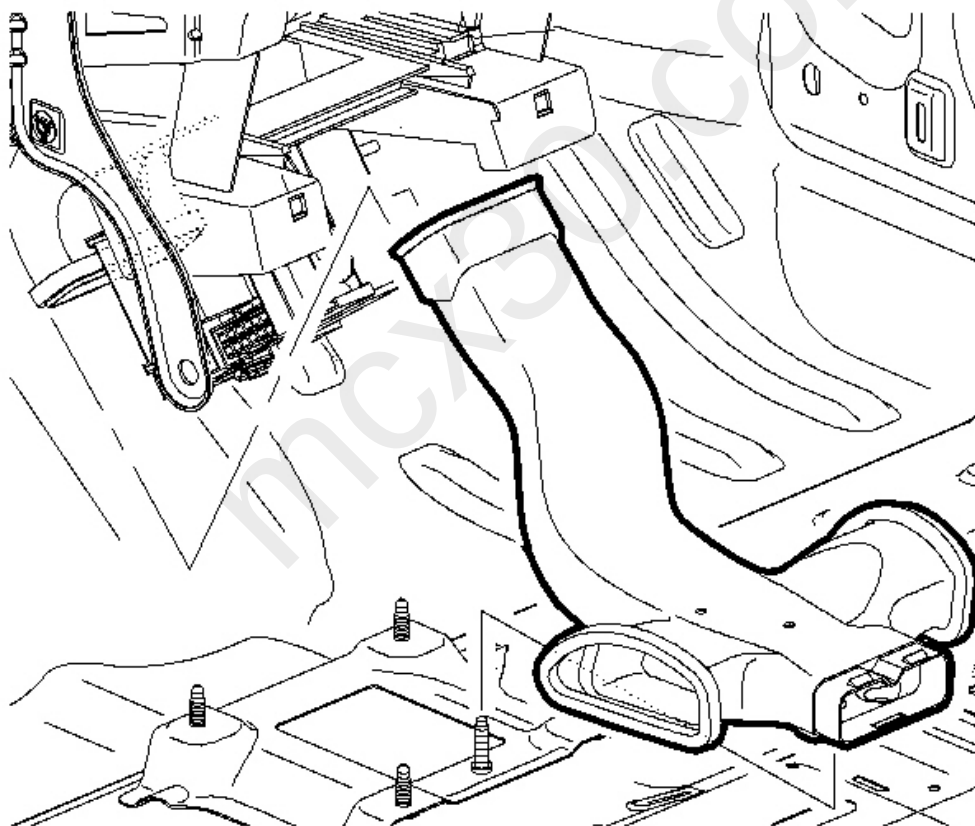


Fig. 80: View Of Center Floor Air Outlet Duct

Courtesy of GENERAL MOTORS CORP.

1. Remove the front floor console. Refer to **Front Floor Console Replacement** .
2. Slide the center floor air outlet duct forward enough to clear the rear floor air outlet duct, and then up, and rearward to remove.

Installation Procedure

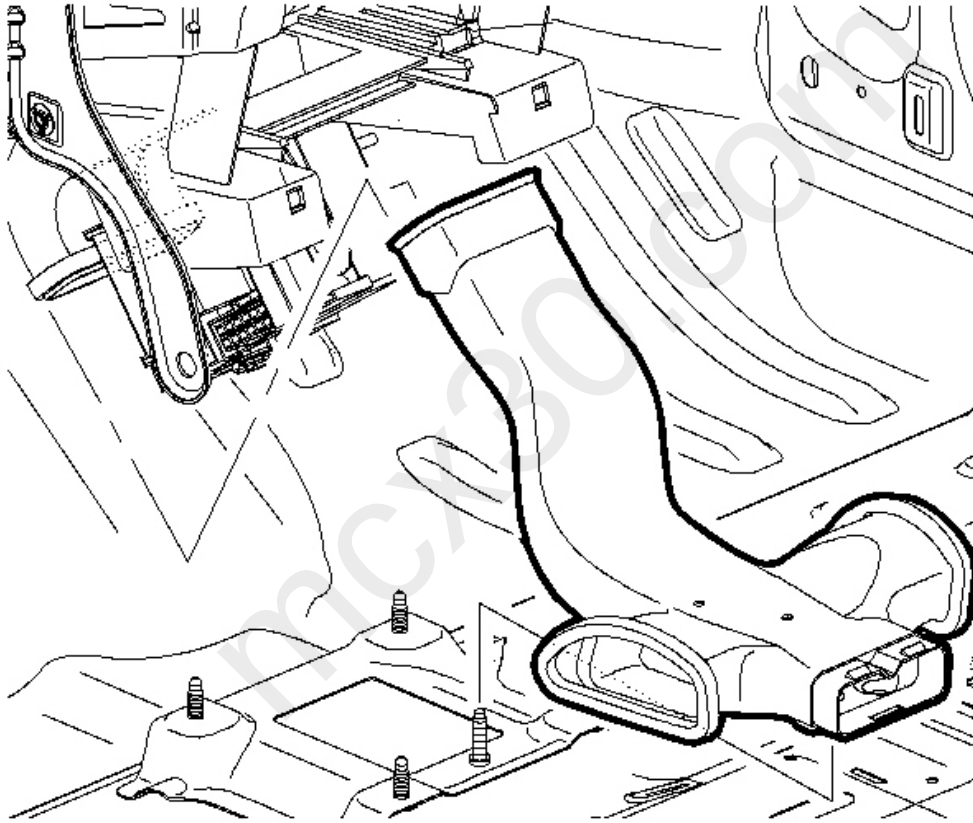


Fig. 81: View Of Center Floor Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

1. Slide the center floor air outlet duct forward enough to clear rear floor air duct, and then down, and rearward to install.

2. Install the front floor console. Refer to **Front Floor Console Replacement**.

REAR FLOOR AIR OUTLET REPLACEMENT

Removal Procedure

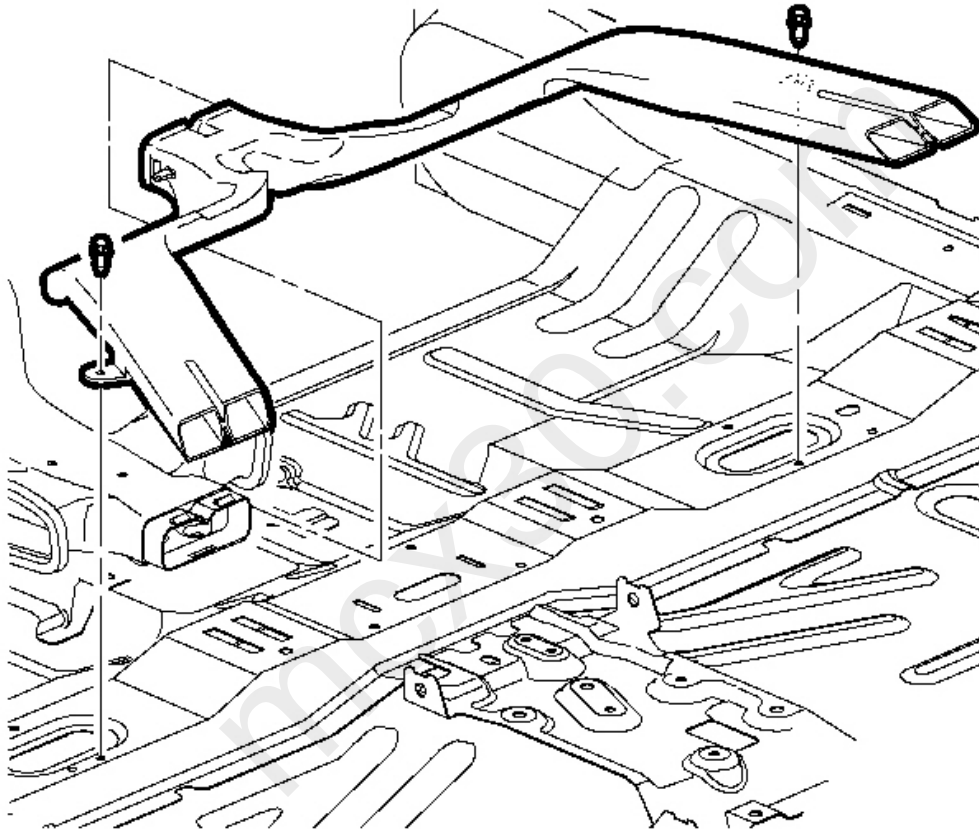


Fig. 82: Rear Floor Air Outlet & Push Pins
Courtesy of GENERAL MOTORS CORP.

1. Remove the front seats. Refer to **Driver or Passenger Seat Replacement**.
2. Remove the floor console. Refer to **Front Floor Console Replacement**.
3. Partially remove the floor carpet from the front footwells to the B-pillars. Refer to **Front Floor Panel Carpet Replacement**.

4. Remove the rear floor air outlet push pins from the floor pan.
5. Remove the rear floor air outlet from the floor pan.

Installation Procedure

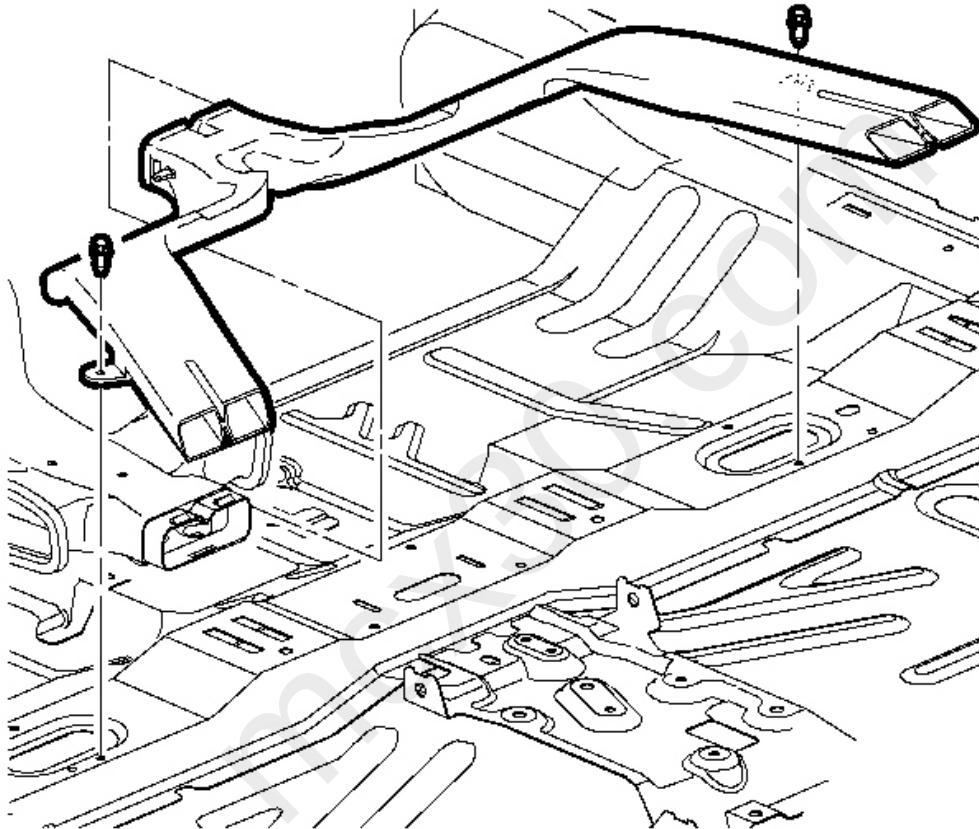


Fig. 83: Rear Floor Air Outlet & Push Pins
Courtesy of GENERAL MOTORS CORP.

1. Install the rear floor air outlet to the floor pan.
2. Install the rear floor air outlet push pins to the floor pan.
3. Install the floor carpet to the B-pillars and the front footwells. Refer to **Front Floor Panel Carpet Replacement**
4. Install the floor console. Refer to **Front Floor Console Replacement** .

5. Install the front seats. Refer to **Driver or Passenger Seat Replacement** .

DEFROSTER VALVE REPLACEMENT

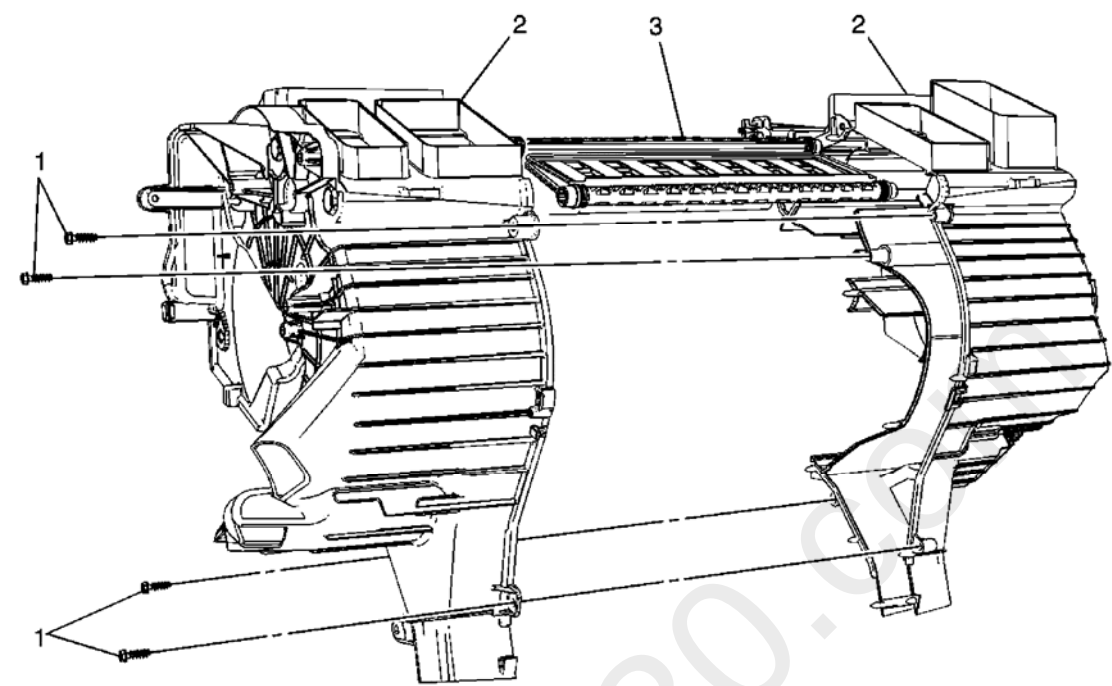


Fig. 84: Defroster Valve
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the HVAC module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</u>. 2. Disconnect all the electrical connectors from components associated with the HVAC module. 3. Remove any components associated with splitting the air distribution case.	
1	Distribution case fastener (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Split Distribution case
3	Defroster Valve

INSTRUMENT PANEL CENTER AIR OUTLET DUCT REPLACEMENT

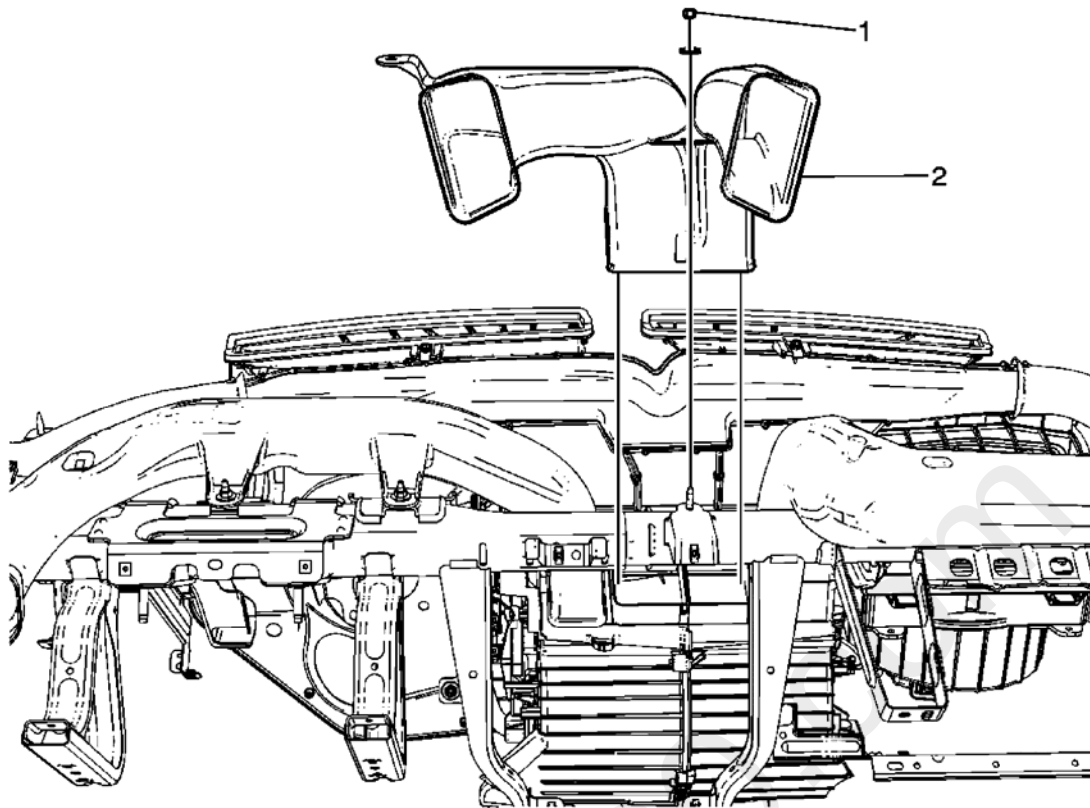


Fig. 85: Instrument Panel Center Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim pad retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Center Air Outlet Duct Fastener (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Center Air Outlet Duct

AIR DISTRIBUTOR OUTER DUCT REPLACEMENT - LEFT SIDE

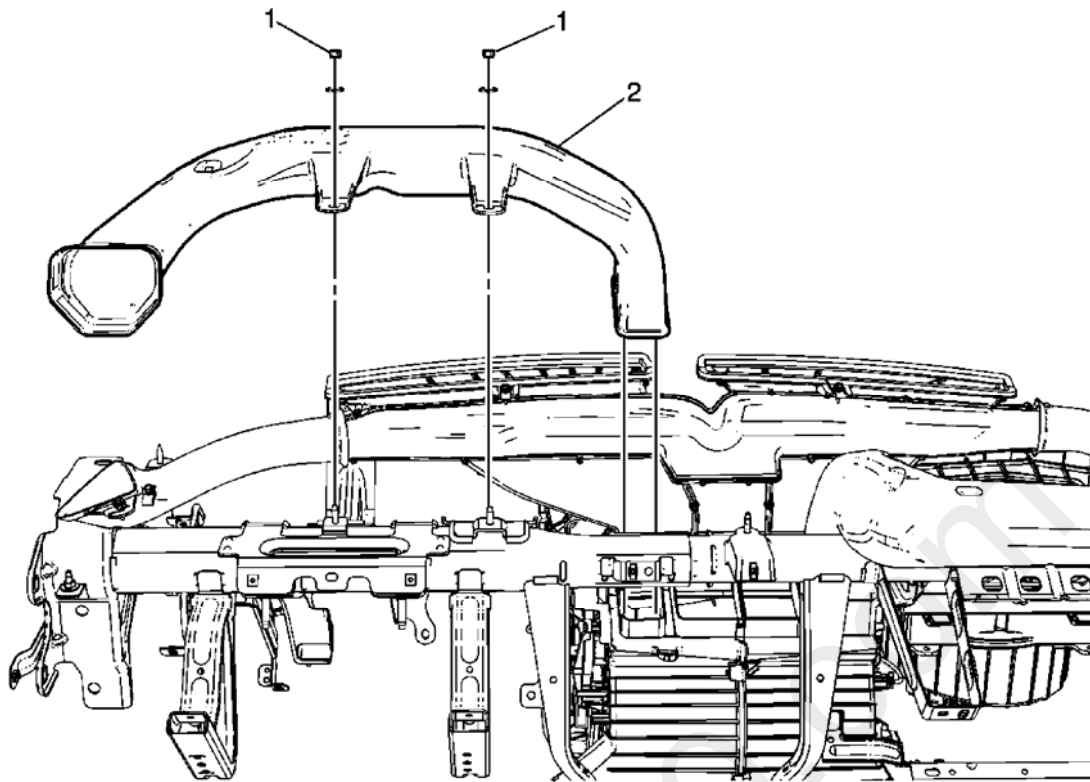


Fig. 86: Air Distributor Outer Duct - Left Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim panel retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Air Distributor Outlet Duct - Left Fastener (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Air Distributor Outlet Duct - Left

AIR DISTRIBUTOR OUTER DUCT REPLACEMENT - RIGHT SIDE

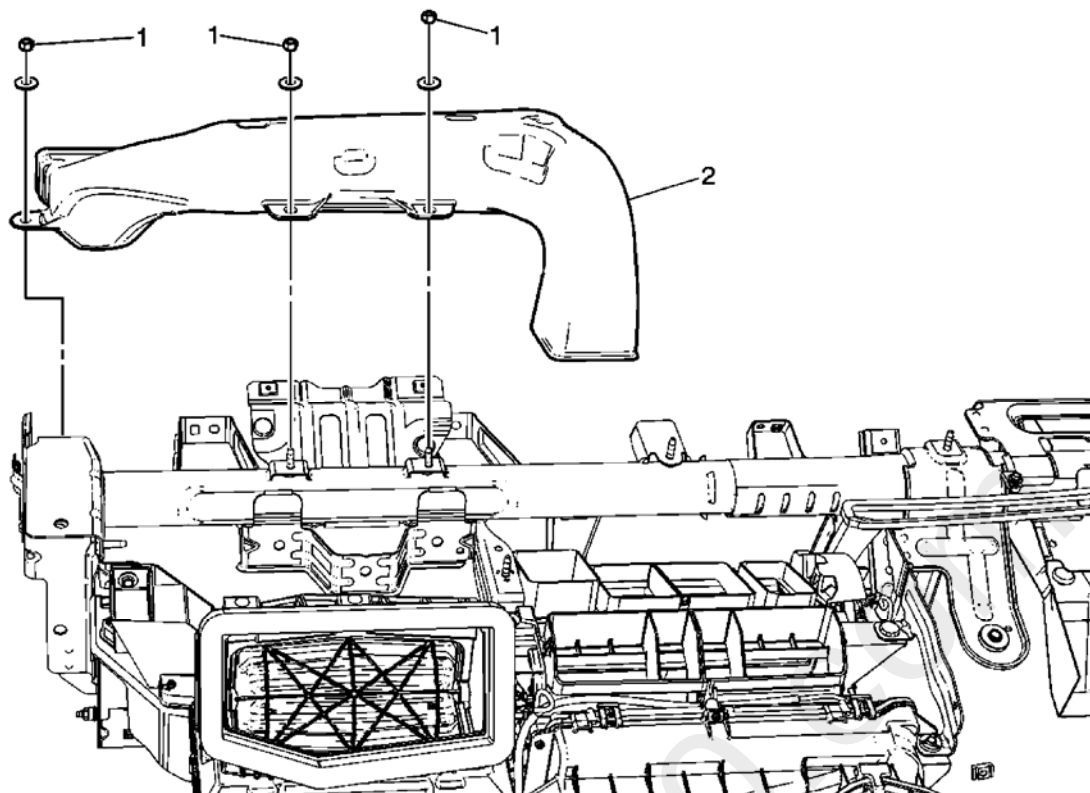


Fig. 87: Air Distributor Outer Duct - Right Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim panel retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Air Distributor Outlet Duct - Right Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Air Distributor Outlet Duct - Right

WINDSHIELD DEFROSTER DUCT REPLACEMENT

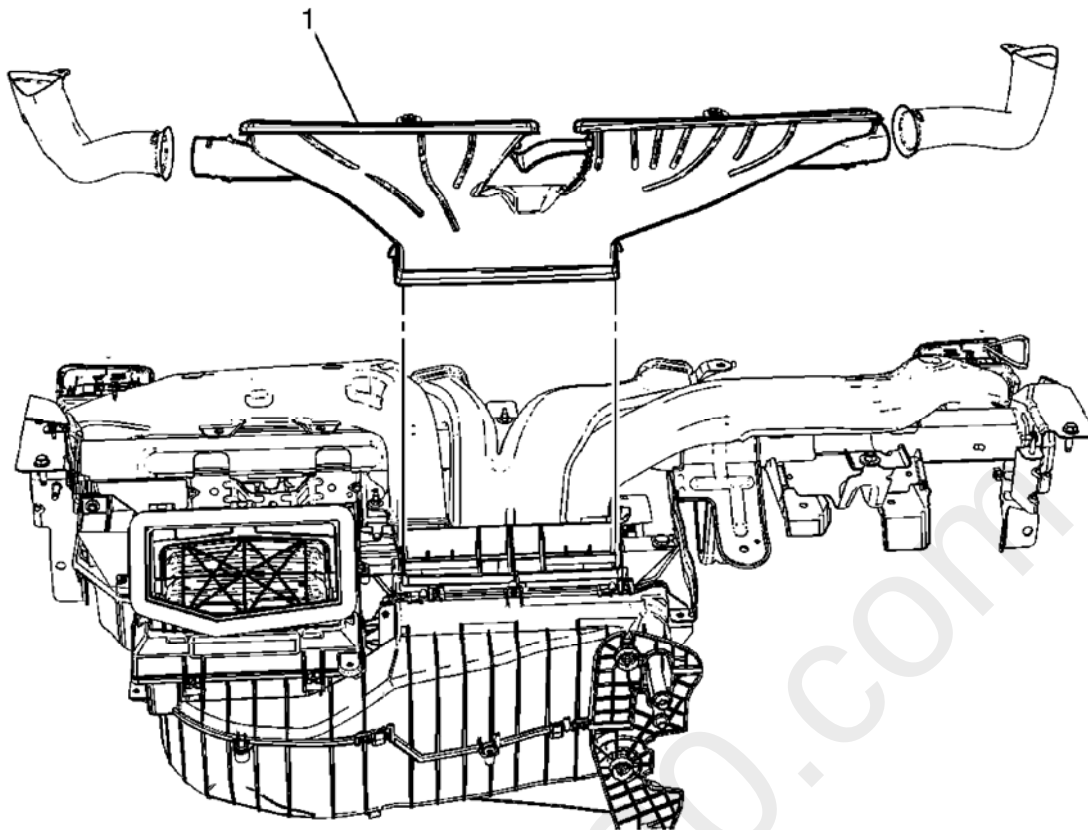


Fig. 88: Windshield Defroster Duct
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim panel retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Remove Windsheild Defroster Duct

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

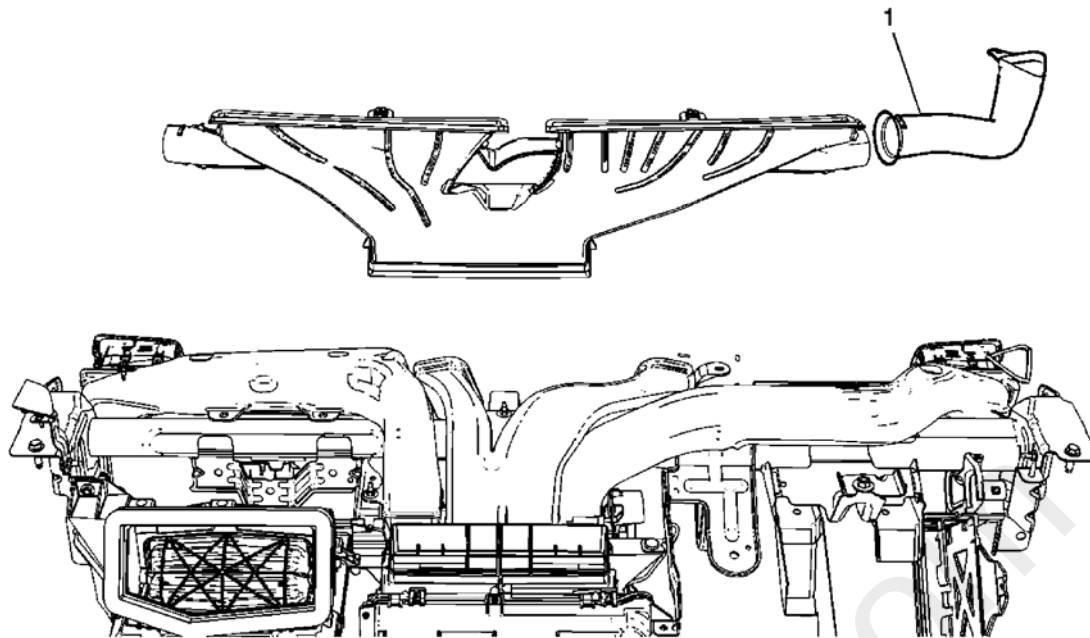


Fig. 89: Side Window Defogger Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim panel retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Side Window Defogger Duct Left Side

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

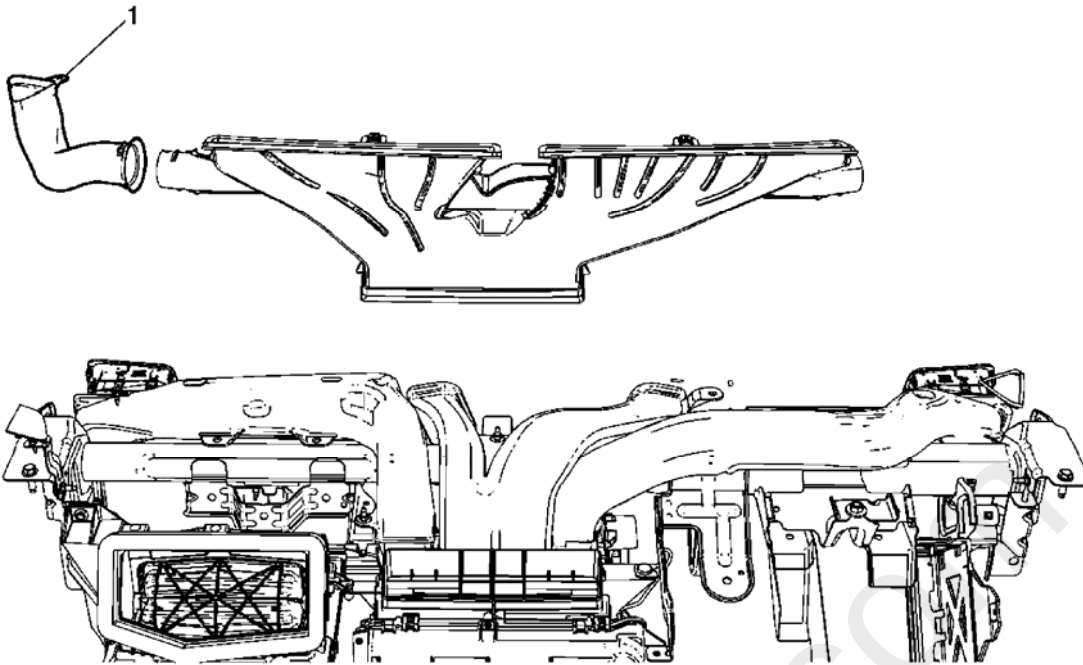


Fig. 90: Side Window Defogger Outlet Duct - Right Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel lower trim panel retainer. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or <u>Lower Trim Pad Retainer Replacement (Terrain)</u> .	
1	Side Window Defogger Duct Right Side

HEATER AND AIR CONDITIONING REMOTE CONTROL REPLACEMENT (EQUINOX)

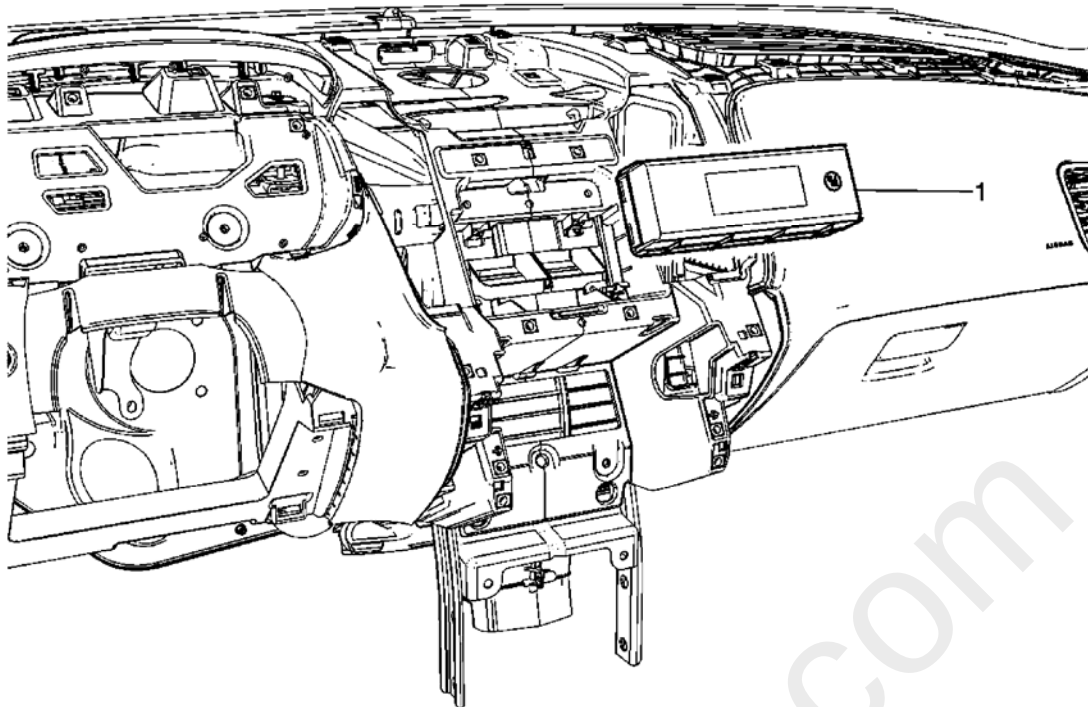


Fig. 91: Heater & Air Conditioning Remote Control (Equinox)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures: Remove instrument panel upper trim. Refer to Instrument Panel Assembly Replacement. <u>Instrument Panel Upper Trim Panel Replacement (Equinox)</u> or <u>Instrument Panel Upper Trim Panel Replacement (Terrain)</u>	
1	Heater and Air Condition Remote Control. Procedure 1. Disconnect the heater and air conditioning control harness connector. 2. Program the heater and air conditioning remote control. Refer to <u>Control Module References</u> .

HEATER AND AIR CONDITIONING REMOTE CONTROL REPLACEMENT (TERRAIN)

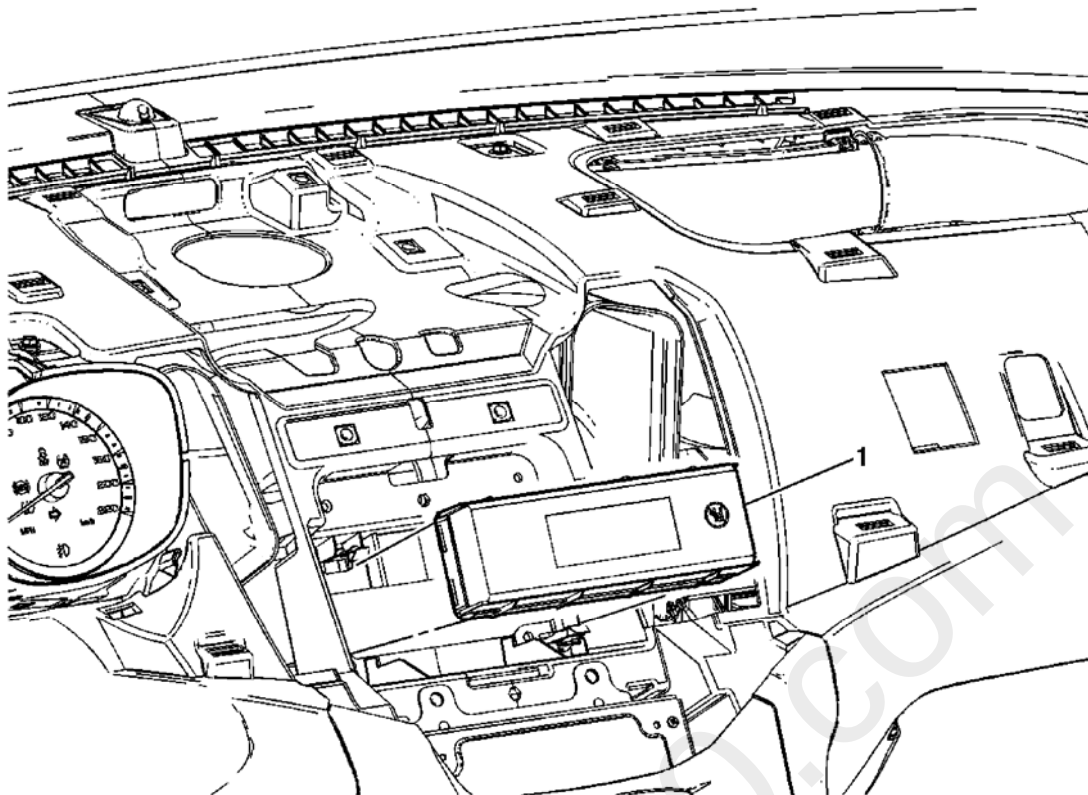


Fig. 92: Heater & Air Conditioning Remote Control (Terrain)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures: Remove instrument panel upper trim. Refer to Instrument Panel Assembly Replacement. <u>Instrument Panel Upper Trim Panel Replacement (Equinox)</u> or <u>Instrument Panel Upper Trim Panel Replacement (Terrain)</u>	
1	Heater and Air Condition Remote Control. Procedure 1. Disconnect the heater and air conditioning control harness connector. 2. Program the heater and air conditioning remote control. Refer to <u>Control Module References</u> .

VENT VALVE REPLACEMENT

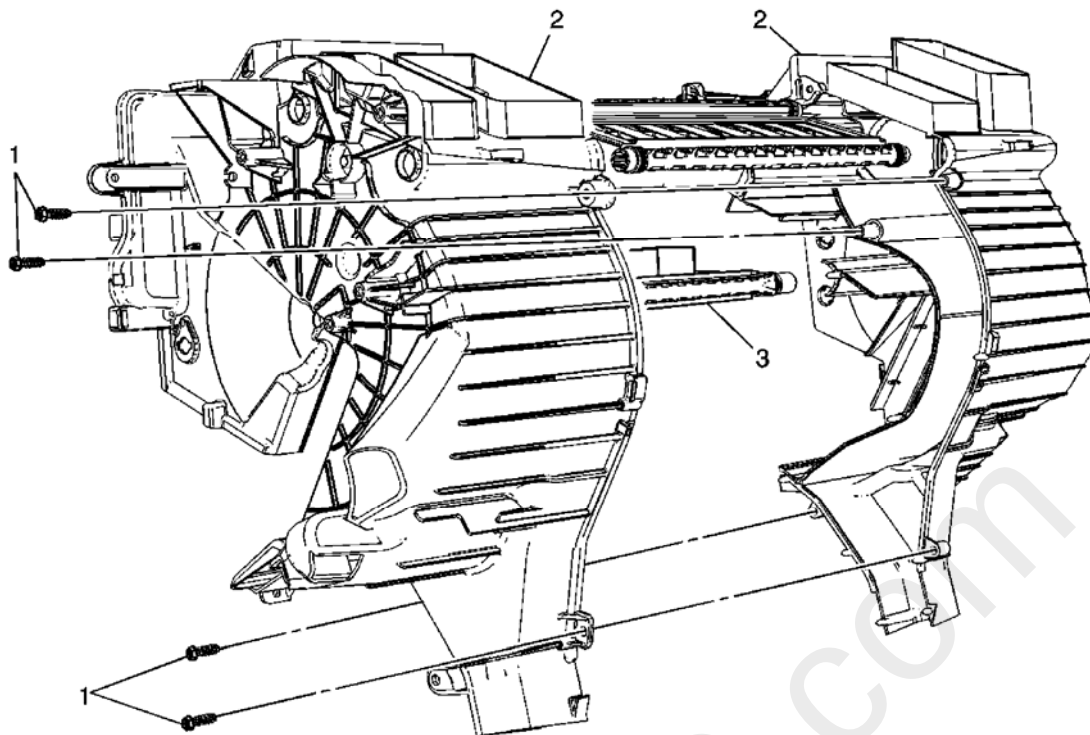


Fig. 93: Vent Valve

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Remove the HVAC module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</u>. 2. Disconnect all the electrical connectors from components associated with the HVAC module. 3. Remove any components associated with splitting the air distribution case.	
1	Distribution Case Fastener (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 1.5 N.m (13 lb in)
2	Distribution Case
3	Vent Valve

HEATER CORE REPLACEMENT

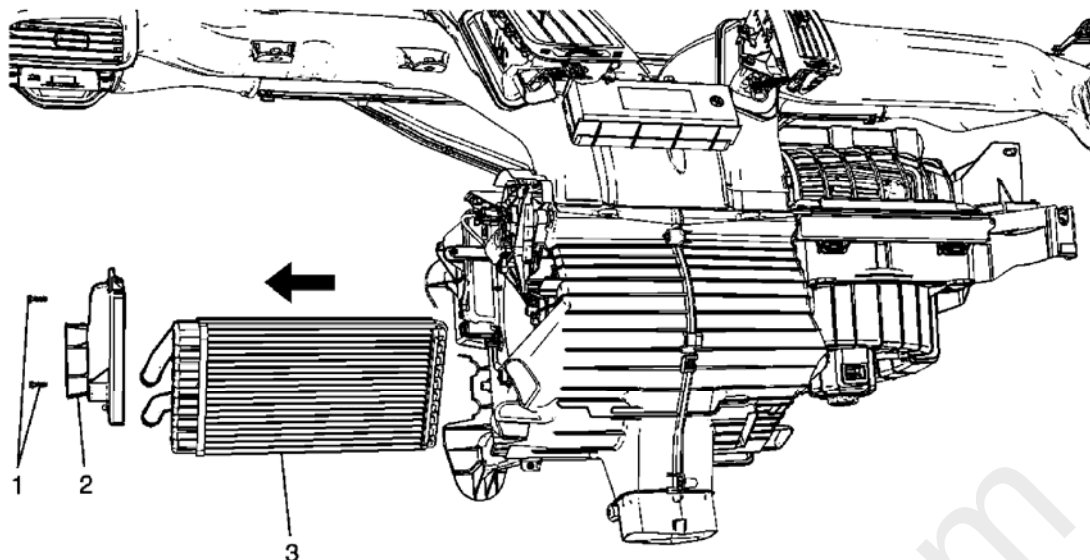


Fig. 94: Heater Core
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the heater and airconditioning evaporator and blower module. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Replacement</u> .	
1	Heater Core Cap Fasteners (Qty: 2)
2	Heater Core Cap
3	Heater Core Procedure: Pull out the heater core.

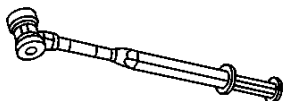
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

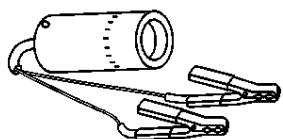
Illustration	Tool Number / Description
	J 38185 Hose Clamp Pliers



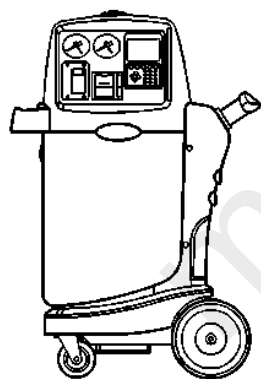
J 41447
R-134a A/C Tracer Dye - Box of 24



J 41459
A/C Oil Injector



J 42220
Universal 12V Leak Detection Lamp



J 43600
ACR 2000 Air Conditioning Service Center

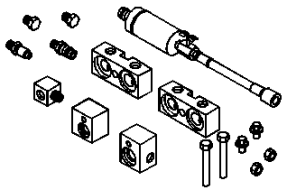
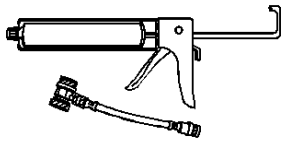
Fluorescent Dye Cleaner



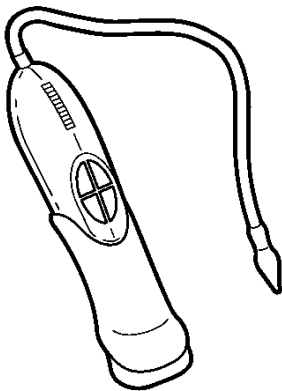
J 43872
Soapy Water Solution



J 45037
A/C Oil Injector



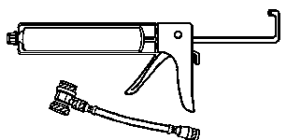
J 45268
A/C Flushing Adapter Kit



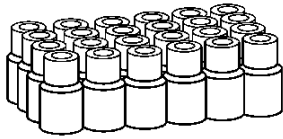
J 46053
Electronic Leak Detector



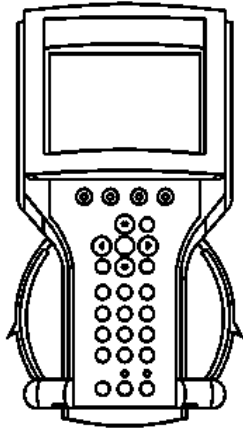
J 46246
Charge Port Valve Core Remover/Installer



J 46297
A/C Dye Injector Kit



J 46297-12
Replacement Dye Cartridges



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