

HVAC

Heating, Ventilation and Air Conditioning - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Conditioning Compressor And Condenser Hose Bolt To The Air Conditioning Compressor	22	16 lb ft
Air Conditioning Compressor And Condenser Hose Nut To The Air Conditioning Compressor And Condenser Hose	22	16 lb ft
Air Conditioning Compressor And Condenser Hose Nut To The Air Conditioning Evaporator Thermal Expansion Valve Rear Tube	22	16 lb ft
Air Conditioning Compressor Bolt	22	16 lb ft
Air Conditioning Compressor Brace Bolt	22	16 lb ft
Air Conditioning Compressor Bracket Nut	22	16 lb ft
Air Conditioning Compressor Bracket Stud	8	71 lb in
Air Conditioning Evaporator Nut To The Air Conditioning Evaporator Thermal Expansion Valve Front Tube	22	16 lb ft
Air Conditioning Evaporator Nut To The Air Conditioning Evaporator Thermal Expansion Valve Rear Tube	22	16 lb ft
Air Conditioning Refrigerant High Pressure Service Valve	2	18 lb in
Floor Front Air Outlet Duct Fastener	1.5	13 lb in
Heater Inlet And Outlet Pipe Bolt	12	9 lb ft
Heater Inlet And Outlet Pipe Nut	12	9 lb ft
HVAC Module Assembly Nut	5	44 lb in
Instrument Panel Outer Air Outlet Duct Assembly Center Fastener	2.5	22 lb in
Instrument Panel Outer Air Outlet Duct Assembly Right Side Fastener	6	53 lb in
Windshield Defroster Nozzle Fastener	9	80 lb in

ADHESIVES, FLUIDS, LUBRICANTS AND SEALERS

Adhesives, Fluids, Lubricants and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Polyalkylene Glycol (PAG)	Lubricant	12378526	88900060

REFRIGERANT SYSTEM SPECIFICATIONS

Refrigerant System Specifications

Application	Specification	
	Metric	English
PAG Oil GM P/N 12378526 for United States PAG Oil GM P/N 88900060 for Canada		
Compressor Replacement		
The Delphi service compressor is precharged with the following specified amount of PAG oil. Refer to the instruction sheet included with the service compressor.	41 ml ¹	1.4 oz ¹
Condenser/Receiver Dehydrator Replacement	60 ml ¹	2.0 oz ¹
Evaporator Core Replacement	45 ml ¹	1.5 oz ¹
Evaporator Rear Line assembly	15 ml ¹	0.5 oz ¹
Total System PAG Oil Capacity	125 ml	4.3 oz
R-134a		
Refrigerant Charge	0.60 kg	1.2 lb
¹ If more than the specified amount of PAG oil was drained from a component, add the equal amount 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.

NOTE: Use two proper wrenches to connect the fittings.

- Back up the opposing fitting to prevent distortion of the connecting lines or the components.
- Keep the sealing surfaces in perfect condition. A burr or a piece of dirt may cause a refrigerant leak.
- When seal washers are used, always install the seal washer without lubrication.
- When O-rings are used, always lightly coat the new O-ring seal with mineral base 525 viscosity refrigerant oil prior to installation.

LEAK TESTING

Special Tools

- **GE-50078** Infrared Refrigerant Leak Detector
- **GE-41447** R-134A A/C Tracer Dye-Box of 24
- **GE-42220** Universal 12V Leak Detection Lamp
- **GE-43872** Fluorescent Dye Cleaner
- **GE-46297** A/C Dye Injector Kit
- **GE-46297-12** Replacement Dye Cartridges

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

Refrigerant Leak Testing

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

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

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

Verifying some passive leaks may require using the **GE-50078** Infrared Refrigerant 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. Excessive dye can result in compressor damage.

Visual Inspection

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

Fluorescent Leak Detector

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

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

NOTE: PAG oil is water soluble.

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

Use the leak detection lamp in the following areas:

- All fittings or connections that use seal washers or O-rings
- All of the A/C components
- The A/C compressor shaft seal
- The A/C hoses and pressure switches
- The HVAC module drain tube, if the evaporator core is suspected of leaking
- The service port sealing caps

The sealing cap is the primary seal for the service ports.

- Follow the instructions supplied with the **GE-42220** lamp.
- To prevent false diagnosis in the future, thoroughly clean the residual dye from any area where

Fluorescent Dye Injection

NOTE: Use only fluorescent dye approved by General Motors.

- **GE-41447 dye can be poured directly into a removed A/C component.**
- **GE-46297-12 dye cartridge is injected into the low side port using GE-46297 injector kit.**
- Not all of the fluorescent dyes are compatible with GM refrigerant systems. Using dyes not approved by GM may damage the vehicle's refrigerant system.

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

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

Electronic Leak Detection

Infrared detectors operate differently than heated sensor type detectors. They detect changes in concentration of refrigerant rather than absolute concentration. If the tip is held at a detected leak for more than 5 seconds the detector will saturate and zero to that concentration and will no longer detect leaks at that concentration or less. Move tip away from the leak saturation area for 30 seconds to reset the sensitivity of the detector.

Adequate system pressure is required for effective leak detection.

- If system is empty install 10% of system charge.
- Temperature must be above 60 F.

Do not use:

- Soap solutions (not effective for leak detection)
- Shop air (will introduce contamination to the refrigerant system)
- High pressure gasses i.e. nitrogen (may cause system damage)

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

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

continue to test the remainder of the system.

Follow the instructions supplied with the **GE-50078** detector.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST (LT1)

Test Description

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

- The current ambient air temperature (AAT)
- 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

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

1

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

2

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

3

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

Air Conditioning (A/C) System Performance Test (LT1)

Step	Action	Values	Yes	No
NOTE: • The ambient air temperature (AAT) 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. • Allow the vehicle to adjust to ambient temperature. • The outside air temperature (OAT) sensor must be updated prior to performing the A/C Performance Test to allow the engine control module (ECM) to update to the current ambient temperature.				
	1. To activate the outside air temperature (OAT) sensor instant update feature, refer to <u>Control Module References</u>			

1	for scan tool information or perform the following procedure: - Put the ignition in the ON position. - Press the following 3 buttons simultaneously: - Fan Up - Front Defrost - Rear Defog - Park the vehicle inside or in the shade. - Open the windows in order to ventilate the interior of the vehicle. - If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. - Turn OFF the ignition. - Install the J-43600 ACR 2000 Air Conditioning Service Center or GE-8800 CoolTech A/C Recharge Machine. - Record the ambient air temperature (AAT) displayed on the J-43600 ACR 2000 Air Conditioning Service Center or GE-8800 CoolTech A/C Recharge Machine. - Record the low and high side STATIC pressure readings. Are both the low side and high side pressures within the specified value?	Greater than 16°C (60°F) - 345 kPa (50 psi) Greater than 24°C (75°F) - 483 kPa (70 psi) Greater than 33°C (90°F) - 690 kPa (100 psi)	Go to Step 2	Go to Leak Testing
	NOTE: Record the relative humidity and the AAT at the time of the test. - Close the vehicle doors and windows. - Open the driver door window 12.7-15.2 cm (5-6 in). - Install the temperature probes of the J 43600 ACR 2000 Air Conditioning Service Center or GE-8800 CoolTech A/C Recharge Machine in the left and right center panel air outlets. - Apply the parking brake.			

2	5. Place the transaxle/transmission in one of the following position: • PARK (Automatic) • Neutral (Manual) 6. Start the engine. 7. Select the following HVAC control settings: • A/C ON • Recirculation mode • Maximum blower speed • Panel outlet mode • Coldest temperature setting • All panel outlets are open 8. Using the scan tool, command the engine cooling fan to 50 percent for ambient temperatures below 32.2°C (90°F) and 90 percent for ambient temperatures above 32.2°C (90°F). 9. Operate the A/C system for 5 minutes. 10. Inspect A/C components for the following conditions: • Abnormal frost areas • Unusual noises NOTE: Press the RESET button, before using the print function of the J-43600 ACR 2000 Air Conditioning Service Center or GE-8800 CoolTech A/C Recharge Machine. 11. Print the following information: • The panel outlet air temperature • The low-side pressure • The high-side pressure 12. Compare the low and high side pressures and the panel output temperature to the table below. Does all the data recorded fall within the specified ranges of the table below?	-	Go to Step 5	Go to Step 3
	If the pressures and temperatures recorded			

3	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 ACR 2000 Air Conditioning Service Center or GE-8800 CoolTech A/C Recharge Machine and record the pressures and temperature again. 3. Compare the low and high side pressures and the panel output temperature to the table below.	-		
	Does all the data recorded fall within the specified ranges of the table below?		Go to Step 5	Go to Step 4
4	Perform the necessary repairs. Refer to A/C Diagnostics Chart . Did you complete the repair?	-	Go to Step 5	-
5	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to Symptoms - HVAC Systems - Automatic

A/C Performance Table

Ambient Air Temperature	Relative Humidity	Service Port Pressure		Maximum Left Center Discharge Air Temperature
		Low Side	High Side	
13-18°C (55-65°F)	0-100%	151-227 kPa (22-33 psi)	902-1247 kPa (131-181 psi)	9°C (48°F)
19-24°C (66-75°F)	Below 40%	151-254 kPa (22-37 psi)	1012-1371 kPa (147-199 psi)	10°C (50°F)
	Above 40%	172-296 kPa (25-43 psi)	1081-1467 kPa (157-213 psi)	13°C (55°F)
24-29°C (75-85°F)	Below 35%	195-296 kPa (28-43 psi)	1233-1543 kPa (179-224 psi)	13°C (55°F)
	35-50%	213-310 kPa (31-45 psi)	11281-1577 kPa (186-229 psi)	15°C (59°F)
	Above 50%	227-344 kPa (33-50 psi)	1322-1667 kPa (192-242 psi)	18°C (63°F)
30-35°C (86-95°F)	Below 30%	234-337 kPa (34-49 psi)	1379-1743 kPa (203-253 psi)	18°C (63°F)
	30-50%	248-358 kPa (36-52 psi)	1440-1798 kPa (209-261 psi)	19°C (66°F)

	Above 50%	268-399 kPa (39-58 psi)	1502-1901 kPa (218-276 psi)	23°C (72°F)
36-41°C (96-105°F)	Below 20%	268-368 kPa (39-53 psi)	1591-1908 kPa (231-277 psi)	19°C (66°F)
	20-40%	282-399 kPa (41-58 psi)	1619-1977 kPa (235-287 psi)	23°C (72°F)
	Above 40%	310-427 kPa (45-62 psi)	1688-2053 kPa (245-298 psi)	24°C (75°F)
42-46°C (106-115°F)	Below 20%	310-406 kPa (45-59 psi)	1798-2087 kPa (261-303 psi)	23°C (72°F)
	Above 20%	323-440 kPa (47-64 psi)	1832-2156 kPa (266-313 psi)	25°C (77°F)
47-49°C (116-120°F)	Below 30%	365-461 kPa (53-67 psi)	2011-2301 kPa (292-334 psi)	27°C (81°F)

A/C DIAGNOSTICS CHART

A/C Diagnostics Chart

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

HEATING PERFORMANCE DIAGNOSTIC

Step	Action	Yes	No
DEFINITION: Heating system performance.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Allow the engine to idle. Does the engine reach a normal operating temperature?	Go to Step 3	Go to Step 9
3	WARNING: Refer to Moving Parts and Hot Surfaces Warning . 1. Allow the engine to idle. 2. Select the FLOOR mode. 3. Select the minimum blower speed. 4. Select the warmest temperature setting. 5. Feel the temperature of the inlet and outlet heater hoses near the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 7	Go to Step 4
4	1. Install a thermometer into the center instrument panel (I/P) air outlet. 2. Secure a thermometer to the heater core outlet hose. 3. Select the PANEL mode. 4. Select the maximum blower speed. 5. Select the warmest temperature setting. 6. Record the temperature at the following locations: • The center I/P air outlet • The heater core outlet hose 7. Compare the recorded temperatures. Are the two temperature readings about equal?	Go to Step 5	Go to Step 6
5	1. Inspect and repair the following areas of the vehicle for cold air leaks: • The cowl • The recirculation door		

	The HVAC module case 2. Perform the necessary repairs.		
	Are the repairs complete?	Go to Step 10	-
6	1. Inspect the temperature door operation. Refer to <u>Diagnostic System Check - Vehicle</u> . 2. Perform any necessary repairs.		
	Are the repairs complete?	Go to Step 10	-
7	1. Turn OFF the engine. 2. Backflush the heater core. 3. Start the engine. 4. Select the FLOOR mode. 5. Select the minimum blower speed. 6. Select the warmest temperature setting. 7. Feel the temperature of the inlet and outlet heater hoses near the heater core.		
	Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 8	Go to Step 10
8	Replace the heater core. Refer to <u>Heater Core Replacement</u> . Is the repair complete?	Go to Step 10	-
9	Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature</u> . Is the repair complete?	Go to Step 10	-
10	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

DEFROSTING INSUFFICIENT

Defrosting Insufficient

Step	Action	Yes	No
DEFINITION: Time required to defrost the windshield is longer than normal.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Automatic</u>
2	1. Turn ignition to ON.. 2. Select the DEFROST mode. 3. Select the maximum blower speed		

	Does sufficient air flow from the defroster outlets?	Go to Step 3	Go to Step 6
3	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . 1. Select the minimum blower speed. 2. Select the maximum temperature setting. 3. Feel the temperature of the inlet and outlet hoses at the heater core. Does the inlet hose feel warmer than the outlet hose?	Go to Step 7	Go to Step 4
4	Perform the A/C system performance test. Refer to <u>Air Conditioning (A/C) System Performance Test (LT1)</u> . Is the A/C system operating within the specifications?	Go to Step 5	Go to Step 8
5	Inspect for correct operation of the air inlet door. Is the air inlet door operating correctly?	Go to Step 10	Go to Step 9
6	Repair the air delivery concern. Refer to <u>Diagnostic Starting Point - Vehicle</u> . Is the repair complete?	Go to Step 10	-
7	Repair the heating concern. Refer to <u>Heating Performance Diagnostic</u> . Is the repair complete?	Go to Step 10	-
8	Repair the A/C performance concern. Refer to <u>Air Conditioning (A/C) System Performance Test (LT1)</u> . Is the repair complete?	Go to Step 10	-
9	Repair the air inlet door concern. Refer to <u>Air Inlet Housing Replacement</u> . Is the repair complete?	Go to Step 10	-
10	Operate the system in order to verify the repair. Did you find and correct the problem?	System OK	Go to Step 2

NOISE DIAGNOSIS - BLOWER MOTOR

Noise Diagnosis - Blower Motor

Step	Action	Yes	No
DEFINITION: Noise originating from the blower motor.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic

2	Is debris present?	Go to Step 8	Go to Step 3
3	1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn ON the ignition, with the engine OFF. 4. Cycle the blower motor through all of the speeds and modes in order to determine where and when the noise occurs. Is a noise evident during the blower operation?	Go to Step 4	Go to Step 11
4	Inspect for excessive vibration at each blower motor speed by feeling the blower case. Is excess vibration present?	Go to Step 6	Go to Step 5
5	Listen to the blower motor at each speed. Is the blower motor making a squeaking or chirping noise?	Go to Step 9	Go to Step 11
6	1. Remove the blower motor. Refer to <u>Blower Motor Replacement</u>. 2. Inspect the blower motor impeller for deposits of foreign material. 3. Inspect the blower motor for deposits of foreign material. Did you find any foreign material on the blower motor or blower motor impeller?	Go to Step 8	Go to Step 7
7	Inspect the blower motor for the following conditions: • Cracked blades • A loose impeller retainer • Improper impeller alignment Did you find any of these conditions?	Go to Step 9	Go to Step 10
8	Remove the foreign material. Is the action complete?	Go to Step 10	-
9	Replace the blower motor. Refer to <u>Blower Motor Replacement</u>. Is the repair complete?	Go to Step 11	-
10	Install the blower motor. Refer to <u>Blower Motor Replacement</u>. Is the action complete?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

AIR CONDITIONING COMPRESSOR OIL DIAGNOSIS

Air Conditioning Compressor Oil Diagnosis

Condition	Corrective Action
NOTE: To avoid repeat compressor failure, always inspect the condition of the refrigerant oil and take the appropriate corrective action before installing the replacement compressor.	
Clean Oil no debris present	No corrective action necessary.
Clean Oil with debris present	• Inspect the suction port of the replacement compressor for presence of a suction screen. If the replacement compressor does NOT contain a suction screen, install suction screen in the line. • Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Remove and inspect high pressure side filter (if applicable). • Remove, inspect, clean or replace orifice tube. • If the system has a front orifice tube and is equipped with a filter in the rear auxiliary line, remove, inspect, clean or replace the filter.
Dark brown/black and/or pungent/unusual odor with no debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Flush refrigerant system.
Dark brown/black and/or pungent/unusual odor with debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Flush refrigerant system. • Inspect the suction port of the replacement compressor for presence of a suction screen. If the replacement compressor does NOT contain a suction screen, install suction screen. • Remove and inspect high pressure side filter (if applicable). • Remove, inspect, clean or replace orifice tube. • If the system has a front orifice tube and is equipped with a filter in the rear auxiliary line, remove, inspect, clean or replace the filter.
Oil Overcharge	Flush refrigerant system.
Refrigerant Contamination	Flush refrigerant system.
Hybrid Polyolester Refrigerant Oil (POE) Contamination	• Flush refrigerant system. • Replace desiccant or component containing the desiccant.

NOISE DIAGNOSIS - AIR CONDITIONING (A/C) SYSTEM

Noise Diagnosis - Air Conditioning (A/C) System

Step	Action	Yes	No
DEFINITION: Noise originating from the A/C compressor, drive belt or the A/C lines.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. A/C system noises can be generally categorized into three areas: • Screeching, Squealing, Chirping noises • Moaning noises • Vibration/Rattle noises 2. Engage the Park brake. 3. Start the engine. 4. Ensure that the A/C is ON. Do you hear a screeching, squealing noise when you engage the A/C?	Go to Step 3	Go to Step 9
3	With the engine OFF, inspect the A/C drive belt for excessive wear. Refer to Drive Belt Falls Off and Excessive Wear Diagnosis. Is the drive belt excessively worn?	Go to Step 18	Go to Step 4
4	Inspect the A/C drive belt tensioner. Refer to Drive Belt Tensioner Diagnosis. Is the drive belt tension correct?	Go to Step 5	Go to Step 19
5	Inspect the drive belt for excessive oil coverage. Is the drive belt covered with oil?	Go to Step 17	Go to Step 6
6	1. Start the engine. 2. Ensure that the A/C is ON. 3. Inspect the compressor and the clutch. Is the A/C compressor locked up?	Go to Step 23	Go to Step 7
7	Is the A/C compressor clutch slipping?	Go to Step 23	Go to Step 8
8	WARNING: Avoid contact with moving parts and hot surfaces while working around a running engine in order to prevent physical injury. Using a stethoscope, listen to the A/C compressor for any abnormal noises. Is the compressor causing an abnormal noise?	Go to Step 15	Go to Step 10

9	Does a moaning noise exist when the A/C clutch is engaged?	Go to Step 10	Go to Step 12
10	Listen to the A/C compressor components and mounting for noise concerns using a stethoscope. Are any of these components loose, damaged or excessively worn?	Go to Step 20	Go to Step 11
11	1. Start the engine. 2. Engage the A/C compressor clutch. 3. Using a stethoscope, move around the entire refrigerant plumbing system. Listening for any abnormal noises caused by a component of the A/C system touching another component. Are any of the A/C components grounding out and causing a vibration noise?	Go to Step 22	Go to Step 13
12	Does a vibration or rattle noise exist when the A/C clutch is engaged?	Go to Step 13	Go to Step 14
13	Does the noise stop when the A/C clutch is disengaged?	Go to Step 15	Go to Step 24
14	1. Idle the engine with the A/C compressor clutch engaged. 2. Using a stethoscope, move around the entire A/C system listening for any abnormal noises caused by a component. Do any of the A/C components cause an abnormal noise?	Go to Step 21	Go to Step 24
15	Verify that the A/C system is properly charged. Refer to Refrigerant System Specifications . Is the A/C system properly charged?	Go to Step 24	Go to Step 16
16	Recharge the A/C system to specification. Refer to Refrigerant Recovery and Recharging (LT1) . Is the abnormal compressor noise still present?	Go to Step 23	Go to Step 25
17	Repair the oil leak. Refer to Oil Leak Diagnosis . Is the repair complete?	Go to Step 25	-
18	Replace the A/C drive belt. Refer to Drive Belt Replacement - Accessory . Is the replacement complete?	Go to Step 25	-
19	Replace the A/C drive belt tensioner. Refer to Drive Belt Tensioner Replacement - Accessory . Is the replacement complete?	Go to Step 25	-
	Repair or replace the A/C compressor mounting		

20	component. Is the repair complete?	Go to Step 25	-
21	Repair or replace the component which is causing the moaning concern as needed. Is the repair complete?	Go to Step 25	-
22	Correctly route or insulate the A/C component. Is the repair complete?	Go to Step 25	-
23	Replace the A/C compressor. Refer to <u>Air Conditioning Compressor Replacement</u> . Is the replacement complete?	Go to Step 25	-
24	The concern may be caused by an engine related component. Refer to <u>Vibration Analysis - Engine</u> . Did you find and correct the condition?	Go to Step 25	-
25	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

NOISE DIAGNOSIS - HVAC MODULE

Noise Diagnosis - HVAC Module

Step	Action	Yes	No
DEFINITION: Noise originating from the HVAC module.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <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	or floor mode?	Go to Step 6	Go to Step 6
6	Remove the instrument panel (I/P) assembly. Refer to <u>Instrument Panel Assembly Replacement</u> . Is the action complete?	Go to Step 7	-
7	1. Inspect the mode valve assembly 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 valve assembly and temperature doors and seals for warping or cracking. Are the mode valve assembly and temperature doors in normal condition?	Go to Step 11	Go to Step 9
9	Replace the appropriate component. 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 I/P assembly. Refer to <u>Instrument Panel Assembly Replacement</u> . Is the action complete?	Go to Step 12	-
12	Operate the system to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

ODOR DIAGNOSIS

Odor Diagnosis

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Automatic</u>
2	1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start the engine. 4. Allow the engine 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 8
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 15
7	Repair the leak as necessary. Is the repair complete?	Go to Step 15	-
8	Does the odor have a coolant smell?	Go to Step 9	Go to Step 12
9	Inspect the cooling system for leaks. 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	Inspect and if necessary replace the heater core. Refer to <u>Heater Core Replacement</u> . Is the repair complete?	Go to Step 15	-
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15
13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: • <u>Oil Leak Diagnosis</u> • <u>Fluid Leak Diagnosis</u> , for the 6L80-E transmission or <u>Transmission Fluid Leak Diagnosis</u> for the Tremec 7-Speed manual transmission		

	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>Odor Correction</u> . Is the action complete?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

REPAIR INSTRUCTIONS

ODOR CORRECTION

Eliminating Air Conditioning (A/C) Odor

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

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

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

Deodorize the evaporator core using Deodorizing Aerosol Kit.

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

1. Ensure that the plenum which draws outside air into the HVAC module is clear of debris.
2. Disable the air conditioning (A/C) compressor clutch operation by disconnecting the clutch coil electrical connector.
3. Dry the evaporator core by performing the following steps:
 1. Start the engine.
 2. Select the warmest temperature setting.
 3. Select the recirculation mode.
 4. Run the blower motor on high for 10 minutes.
4. Locate an area in the air conditioning duct between the blower motor and the evaporator core downstream of the blower motor.
5. Drill a 3.175 mm (0.125 in) hole where the hole will not interfere with or damage the following components:

- The evaporator core
 - Any other operating part the of system
6. Wear safety goggles and latex gloves in order to perform the following actions:
 1. Select the maximum blower speed.
 2. Insert the deodorizer extension tube into the hole to the mark on the extension tube.
 3. Use short spray bursts and vary the direction of spray for a 2-3 minute period of time.
 7. Shut the engine OFF. Allow the vehicle to sit for 3-5 minutes.
 8. Seal the 3.175 mm (0.125 in) hole with body sealer or RTV gasket compound.
 9. Start the engine.
 10. Operate the blower motor on high for 15-20 minutes to dry.
 11. Reconnect the A/C compressor clutch coil electrical connector.
 12. Verify proper A/C clutch operation.

REFRIGERANT RECOVERY AND RECHARGING (LT1)

Special Tools

- **J-43600** ACR 2000 Air Conditioning Service Center
- **J-45037** A/C Oil Injector

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

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

WARNING: For personal protection, goggles 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.

CAUTION: R-12 refrigerant and R-134a refrigerant must never be mixed, even in the smallest of amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur. Refer to the manufacturer instructions included with the service equipment before servicing.

The **J-43600** service center is a complete air conditioning service center for R-134a. The ACR 2000 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 ACR 2000 has a built in A/C refrigerant identifier that will test for contamination, prior to recovery and will notify the technician if there are foreign gases present in the A/C system. If foreign gases are present, the ACR 2000 will not recover the refrigerant from the A/C system.

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

Refer to the **J-43600** service center ACR 2000 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.

Refrigerant Service Valve

To gain access to the refrigerant service valve located on the air conditioning evaporator thermal expansion valve rear tube, the right side valve rocker arm cover insulator must be removed. Refer to **Valve Rocker Arm Cover Insulator Replacement - Right Side** .

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement the oil must be replenished. Oil can be injected into a charged system using

injector. For the proper quantities of oil to add to the A/C refrigerant system, refer to **Refrigerant System Specifications**.

FLUSHING

Special Tools

- **J 41447** R-134a-Leak Detection Dye
- **J 42220** Universal 12V Leak Detection Lamp
- **J 43600** ACR 2000 Air Conditioning Service Center
- **J 45268** A/C Flush Adapter Kit

NOTE: **Flushing with the ACR 2000 is not intended to remove metal from the A/C system.**

Flushing is intended to remove the following:

- Contaminated polyalkylene glycol (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.**

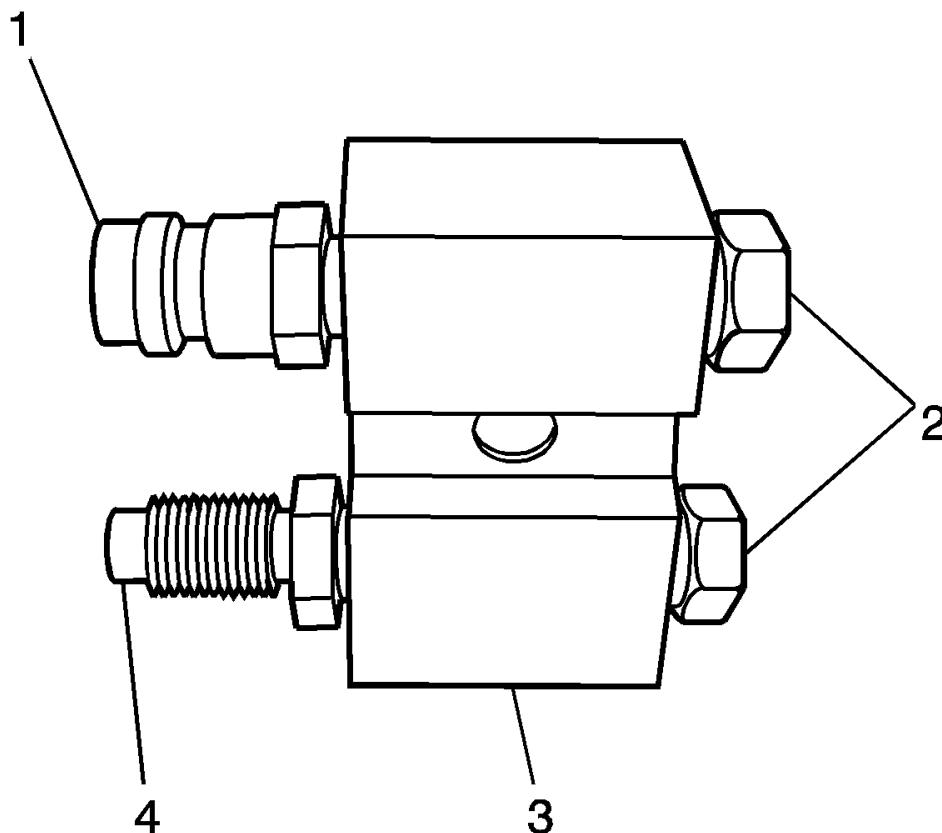


Fig. 1: Identifying J 45268-2 (3), J 45268-7 (1), J 45268-8 (4), & J 45268-9 (2)
Courtesy of GENERAL MOTORS COMPANY

NOTE: Inspect and lubricate the J 45268 A/C Flush Adapter Kit fitting O-rings.

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:

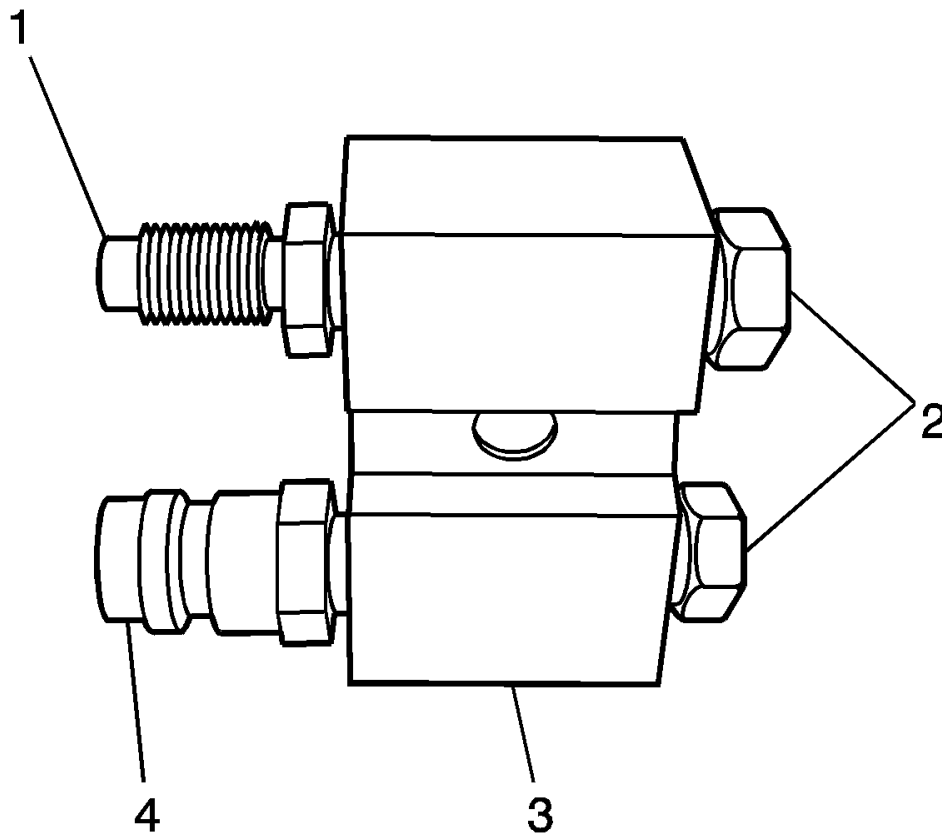


Fig. 2: Using J45268-9, J45268-8, J 45268-7, & J 45268-2
Courtesy of GENERAL MOTORS COMPANY

NOTE: Inspect and lubricate the J 45268 A/C Flush Adapter Kit fitting O-rings.

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 (LT1).
2. Remove the thermal expansion valve (TXV). Refer to Air Conditioning Evaporator Thermal Expansion Valve Replacement.

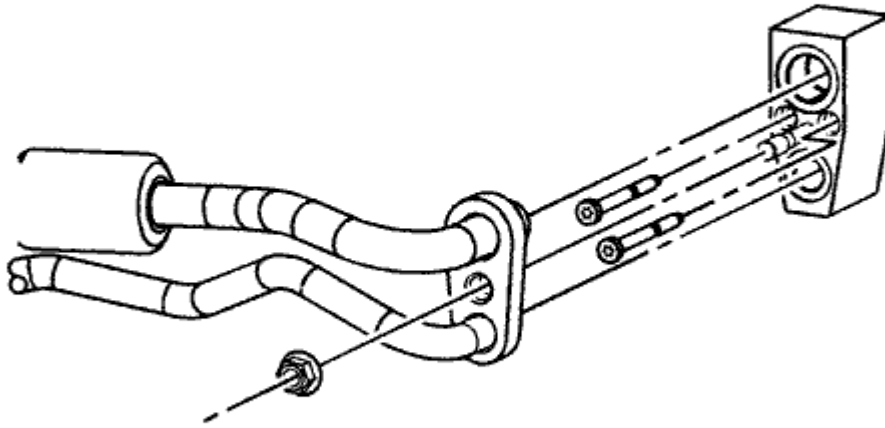


Fig. 3: J 45268-115 With TXV Components
Courtesy of GENERAL MOTORS COMPANY

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.
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**.

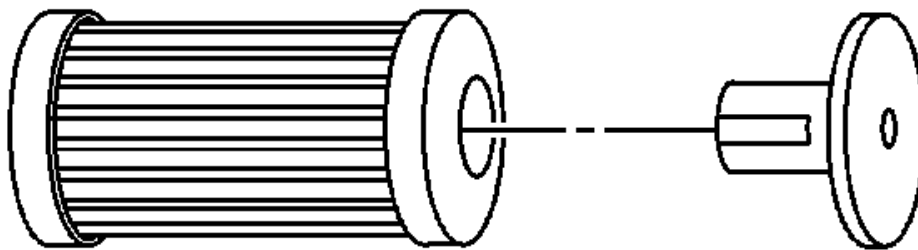


Fig. 4: View Of A/C Filter & Check Valve
Courtesy of GENERAL MOTORS COMPANY

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

11. Service the filter with AC Delco 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.

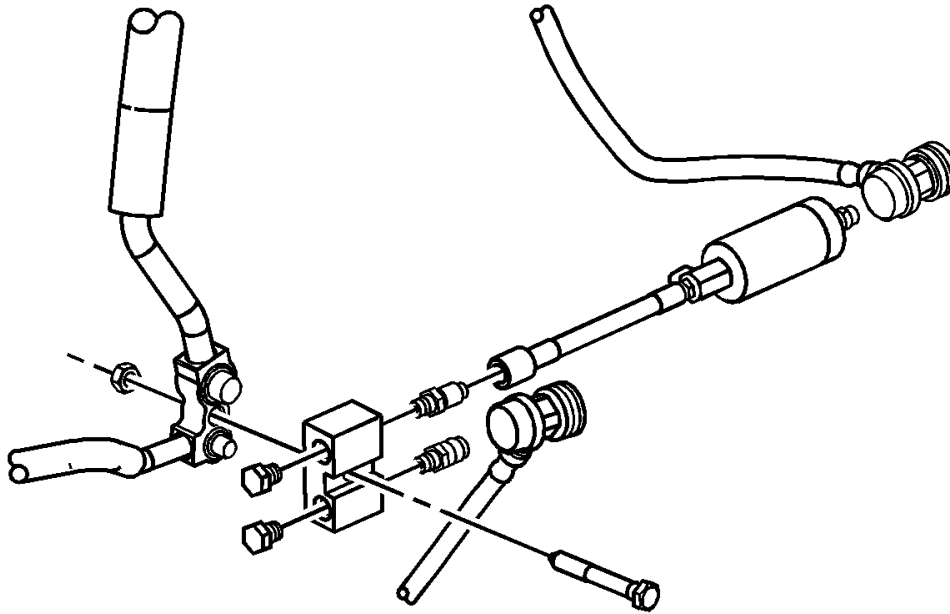


Fig. 5: Flush Adapters
Courtesy of GENERAL MOTORS COMPANY

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.

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:

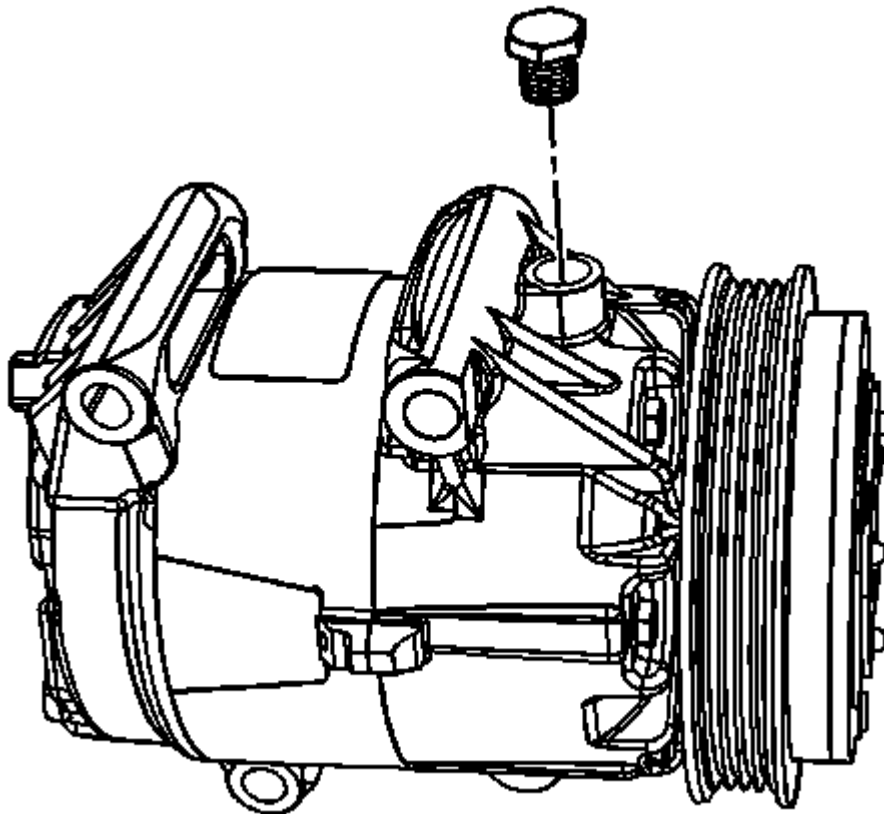


Fig. 6: A/C Compressor Drain Plug
Courtesy of GENERAL MOTORS COMPANY

1. Remove the A/C compressor drain plug.
2. Drain the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
3. 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.

4. Add one bottle of **J 41447** R-134a-Leak Detection Dye directly into the A/C compressor.
5. Install the A/C compressor drain plug and tighten to 15 N.m (11 lb ft).

NOTE: A new service compressor is shipped with a full charge of PAG oil. Refer to Refrigerant System Specifications.

22. Install the A/C compressor. Refer to Air Conditioning Compressor Replacement.
23. Remove the TXV block fitting nut.
24. Disconnect the rear evaporator line assembly from the J45268-115.

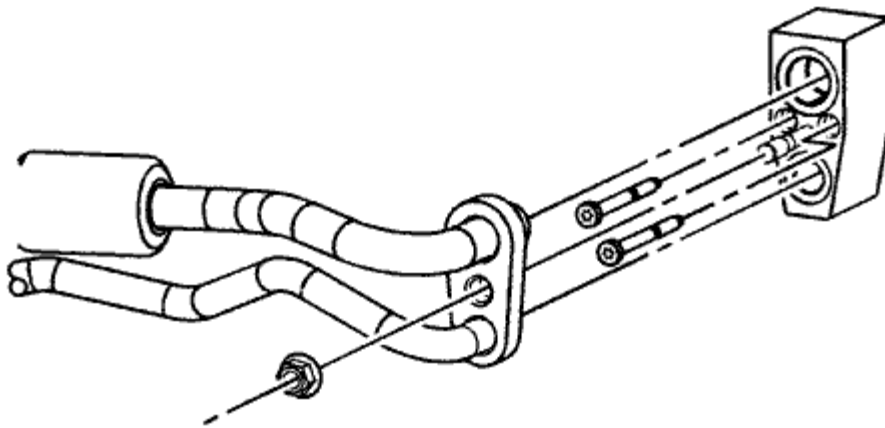


Fig. 7: J 45268-115 With TXV Components
Courtesy of GENERAL MOTORS COMPANY

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

(LT1).

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 rear head ports and the front head compressor drain bolt hole of the **REMOVED** compressor.

1. Remove the compressor crankcase oil drain bolt and drain the refrigerant oil from the crankcase and rear head ports into a clean, graduated container.

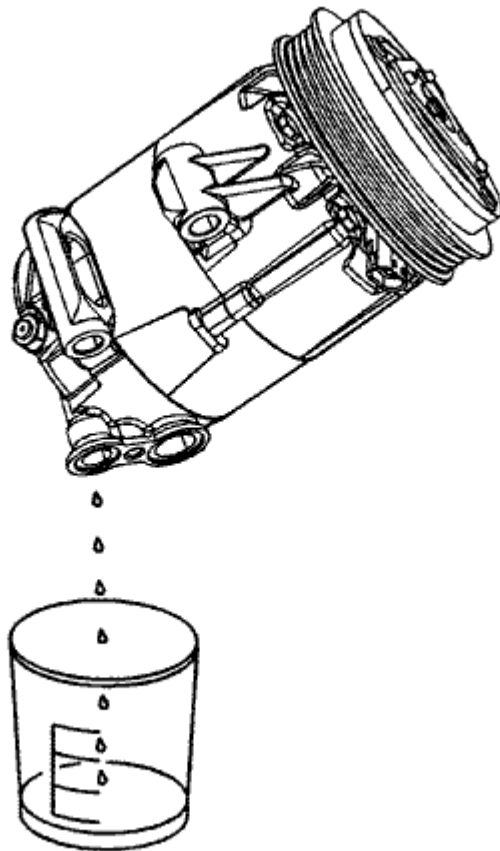


Fig. 8: Measuring Oil Drained From Removed Compressor
Courtesy of GENERAL MOTORS COMPANY

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

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

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

NOTE: **Drain and measure as much of the refrigerant oil as possible from the rear head ports and the front head compressor drain bolt hole of the NEW compressor.**

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

Balancing Procedure

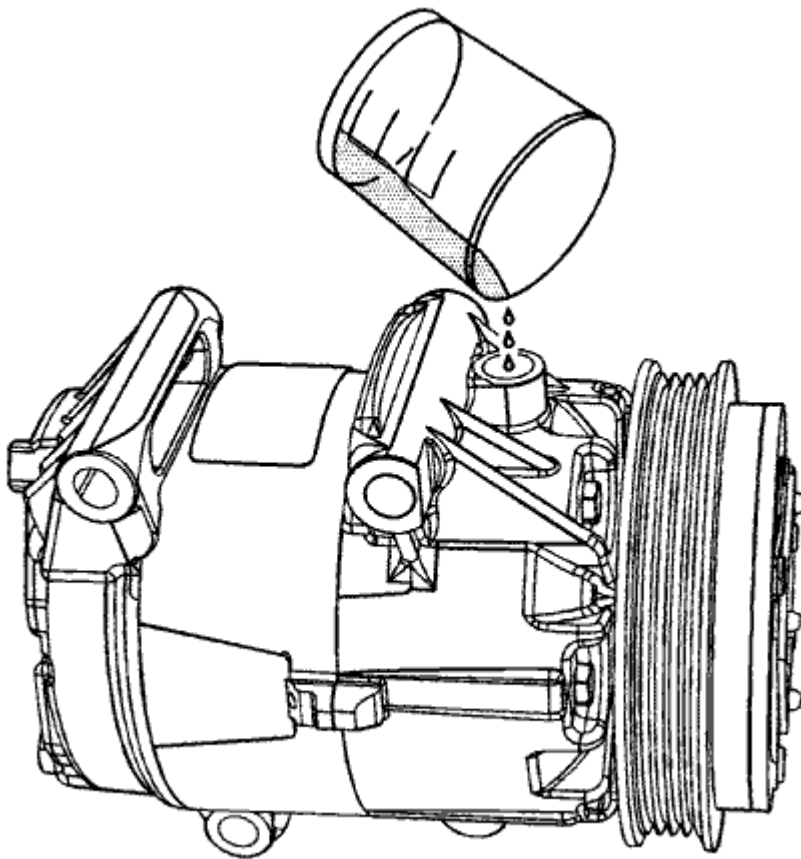


Fig. 9: Adding Measured Oil To Compressor
Courtesy of GENERAL MOTORS COMPANY

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

The replacement compressor is shipped with the total system capacity of refrigerant oil.

1. Refer to the amount of refrigerant oil recorded during the compressor removal.
2. If the sum of the amount of oil drained from the removed compressor and the amount of oil removed during refrigerant recovery is:
 - LESS THAN 41 ml (1.4 ounces), no balancing is required. Install the replacement compressor as is. It contains 40 ml (1.4 ounces) of oil.
 - MORE THAN 41 ml (1.4 ounces), additional oil is required. Subtract 41 ml (1.4 oz) from the sum of removed oil (oil drained + oil recovered). This calculated difference is the amount of service PAG-PSD1 oil that needs to be added to the replacement compressor. Add the additional oil needed and install the replacement compressor.

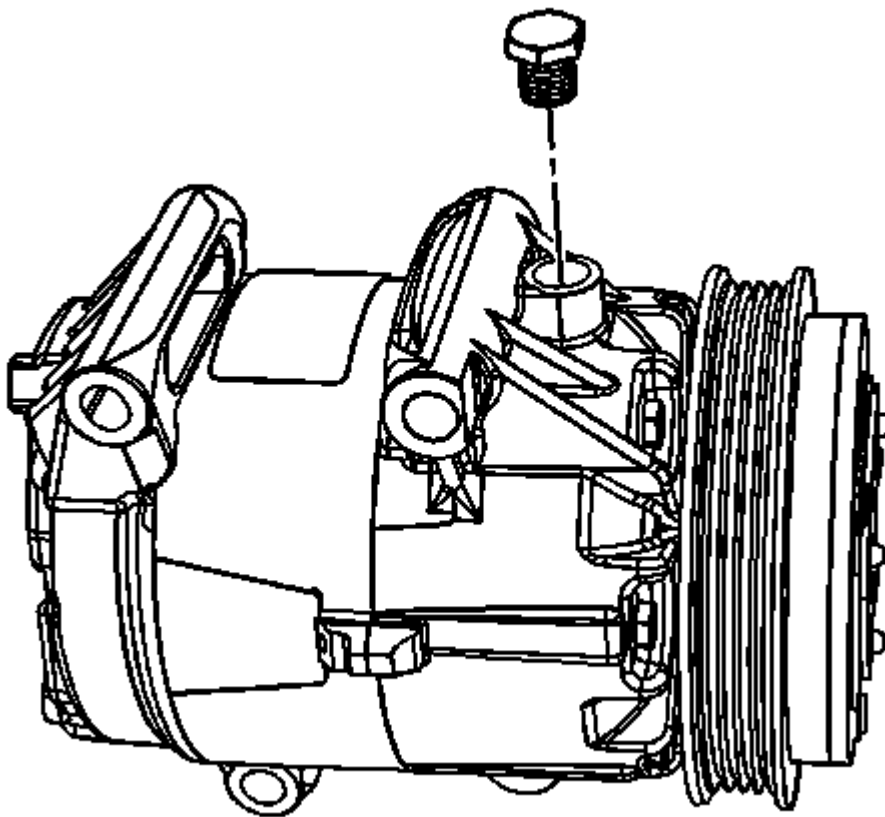


Fig. 10: A/C Compressor Drain Plug
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Rotate the clutch driver three times to lubricate the internal compressor components.

NOTE: If additional A/C components are replaced during compressor replacement, add the PAG-PSD1 oil directly to the A/C compressor to compensate the A/C system.

5. If necessary, refer to Refrigerant System Specifications.

AIR CONDITIONING COMPRESSOR OIL DRAIN PLUG REPLACEMENT

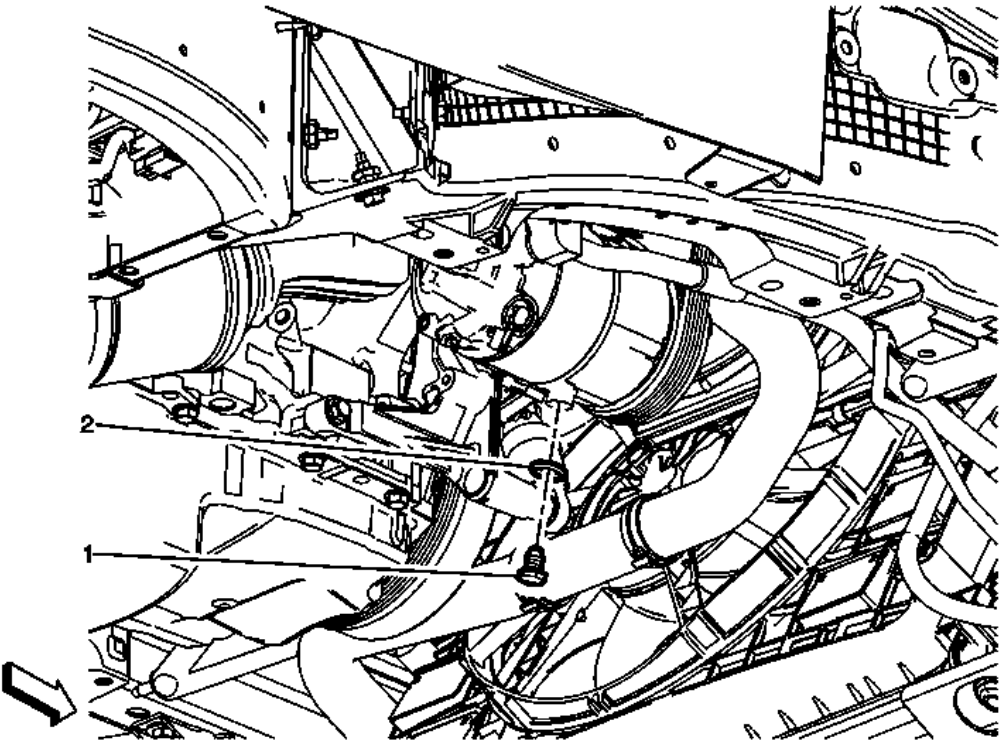


Fig. 11: Air Conditioning Compressor Oil Drain Plug
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Oil Drain Plug Replacement

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u> .	
2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Air Conditioning Compressor Oil Drain Plug
	CAUTION: Refer to <u>Fastener Caution</u> .

2

Procedure

Remove and discard old sealing washers and replace with NEW sealing washers.
Refer to **Air Conditioning System Seal Replacement**.

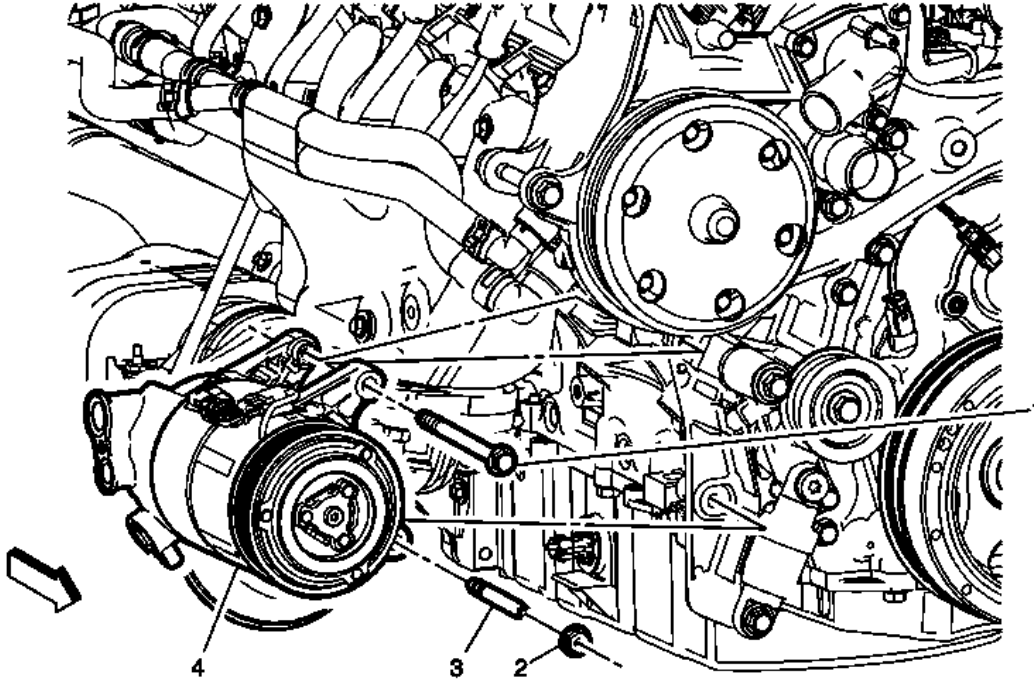
AIR CONDITIONING COMPRESSOR REPLACEMENT

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

Air Conditioning Compressor Replacement

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u> . 2. Remove the front cradle. Refer to <u>Front Cradle Replacement</u> . 3. Remove the air conditioning compressor and condenser hose from the air conditioning compressor. Refer to <u>Air Conditioning Compressor and Condenser Hose Replacement</u> .	
1	Air Conditioning Compressor Bolt CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten 22 (16 lb ft)
2	Air Conditioning Compressor Bracket Nut Tighten 22 (16 lb ft)
3	Air Conditioning Compressor Bracket Stud Tighten 8 (71 lb in)
4	Air Conditioning Compressor

COMPRESSOR PRESSURE RELIEF VALVE REPLACEMENT

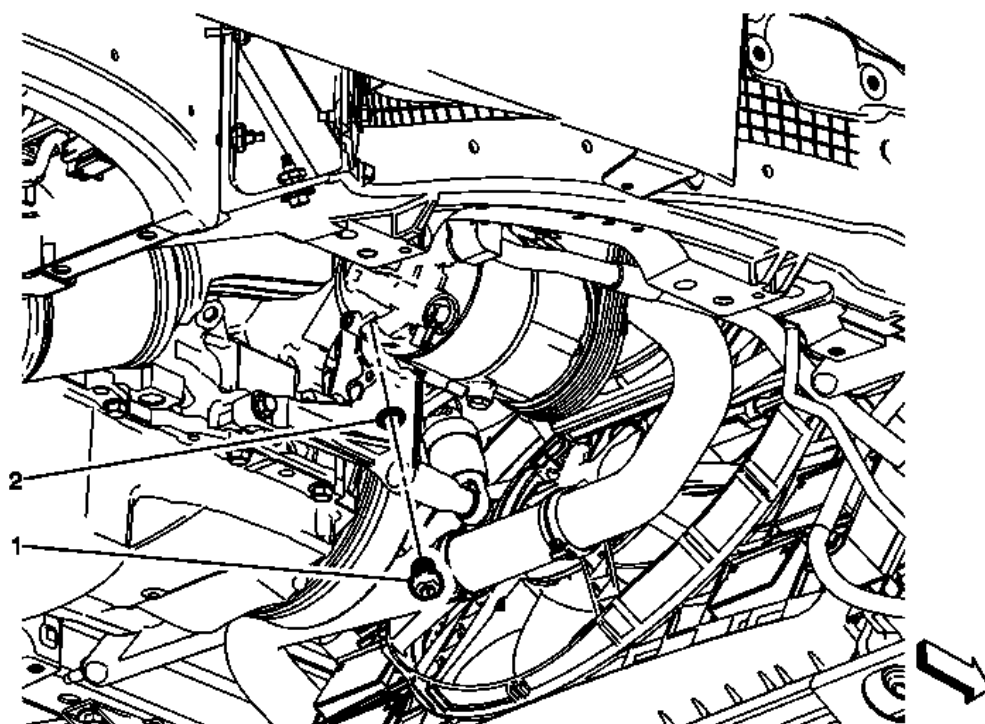


Fig. 13: Compressor Pressure Relief Valve
Courtesy of GENERAL MOTORS COMPANY

Compressor Pressure Relief Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u> . 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u>	
1	Air Conditioning Compressor Pressure Relief Valve CAUTION:

	Refer to Fastener Caution .
2	Air Conditioning Compressor Pressure Relief Valve Seal Procedure Remove and discard old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .

AIR CONDITIONING COMPRESSOR BRACKET REPLACEMENT

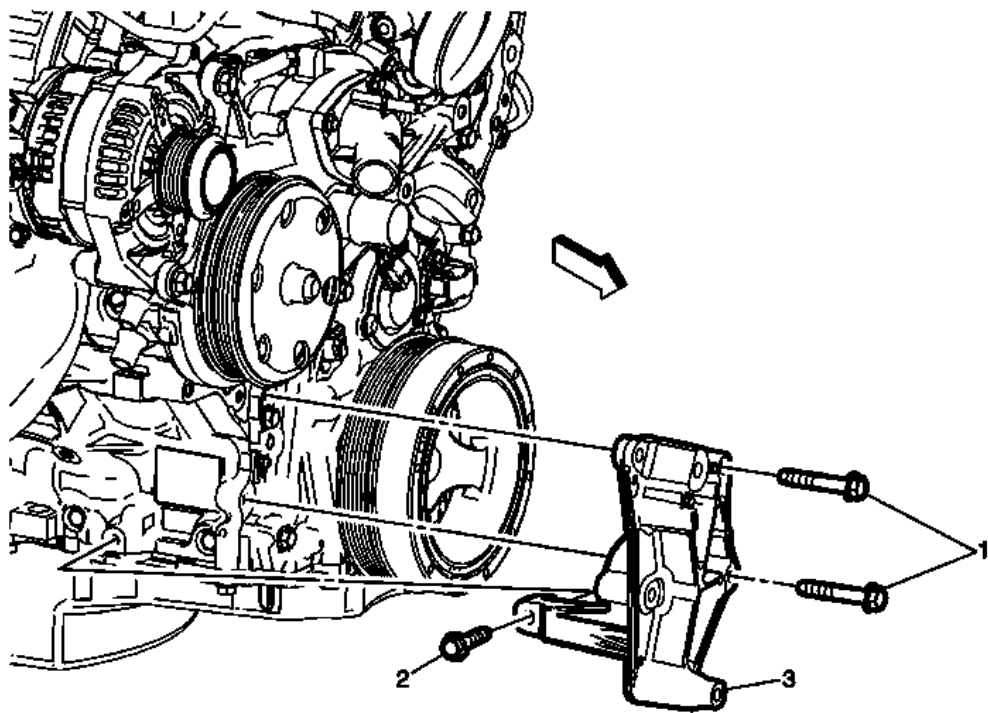


Fig. 14: Air Conditioning Compressor Bracket
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Bracket Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the air conditioning compressor. Refer to <u>Air Conditioning Compressor Replacement</u> 2. Remove the drive belt tensioner. Refer to <u>Drive Belt Tensioner Replacement - Accessory</u>	
1	Air Conditioning Compressor Brace Bolt (Qty: 2) CAUTION:

	Tighten 22 (16 lb ft)
2	Air Conditioning Compressor Brace Bolt Tighten 22 (16 lb ft)
2	Air Conditioning Compressor Bracket

AIR CONDITIONING SYSTEM SEAL REPLACEMENT

Removal Procedure

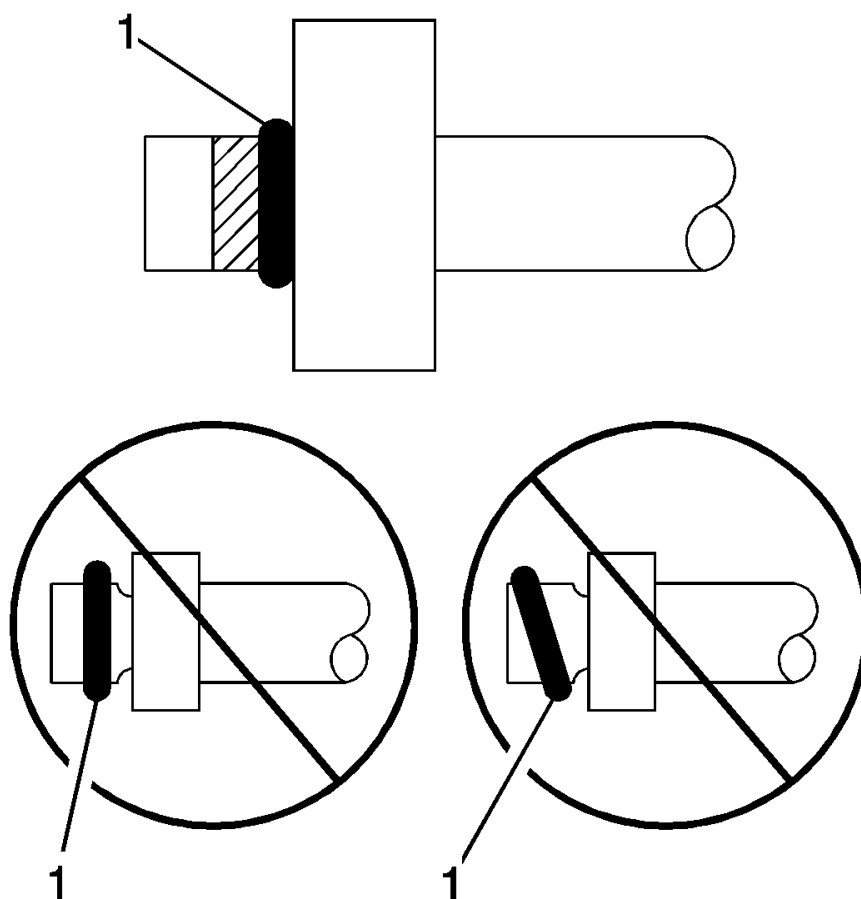


Fig. 15: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS COMPANY

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.

IMPORTANT: DO NOT reuse sealing washer.

4. Discard the sealing washer.

Installation Procedure

IMPORTANT: 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.

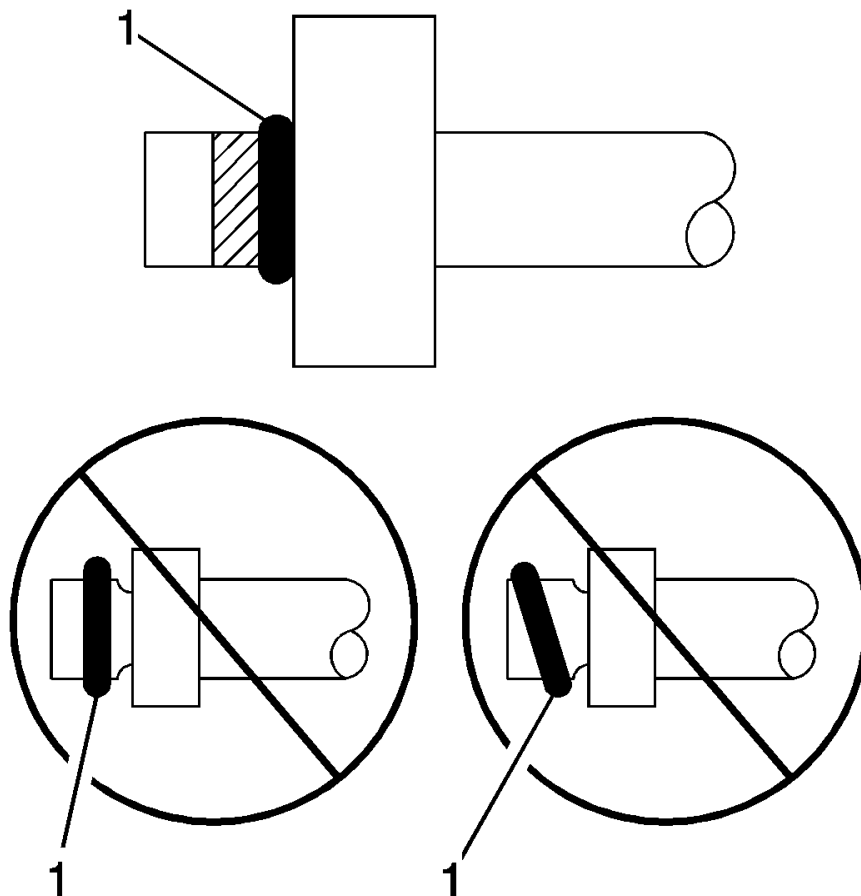


Fig. 16: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS COMPANY

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.

IMPORTANT: 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 COMPRESSOR AND CONDENSER HOSE REPLACEMENT

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (LT1)**.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement**.
3. Remove the intake manifold. Refer to **Intake Manifold Replacement**.
4. Install the engine support fixture and lower the engine and front cradle enough to gain access to the air conditioning compressor and condenser hose bolt. Refer to **Front Cradle Replacement**.
5. Disconnect the air conditioning refrigerant pressure sensor electrical connector.
6. Remove the front bumper fascia air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement**.

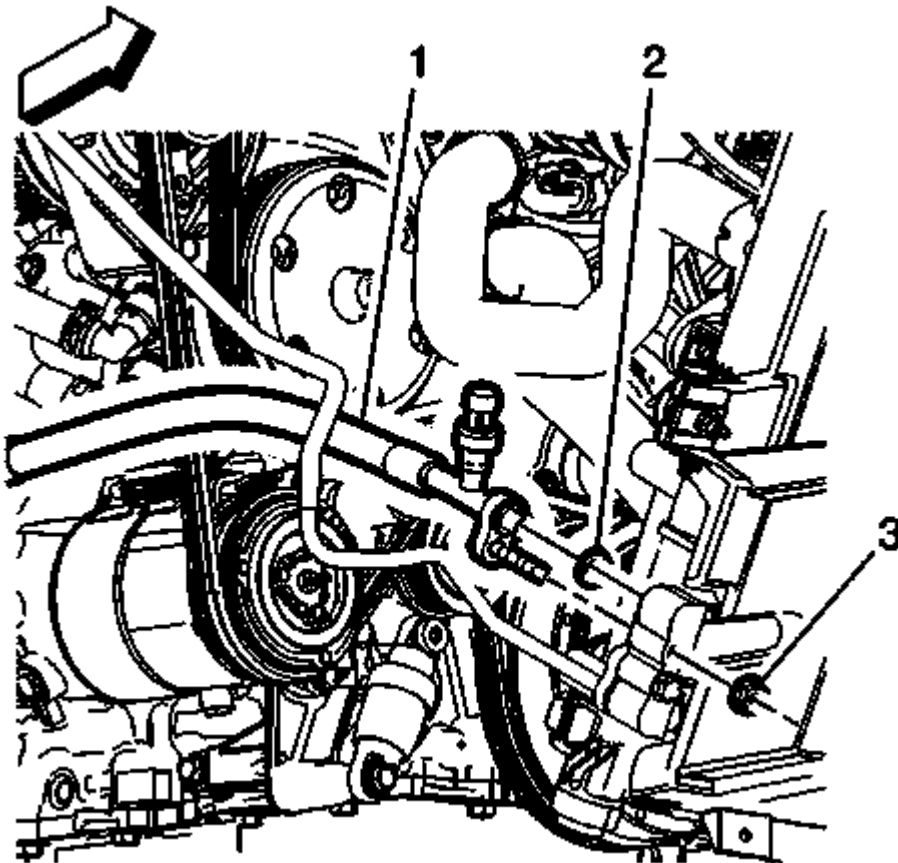


Fig. 17: Air Conditioning Compressor And Condenser

Courtesy of GENERAL MOTORS COMPANY

7. Remove the air conditioning compressor and condenser hose nut (3) from the air conditioning compressor and condenser hose (1).
8. Remove the air conditioning compressor and condenser hose (1) from the air conditioning evaporator.
9. Remove and discard sealing washer (2). Refer to **Air Conditioning System Seal Replacement**.

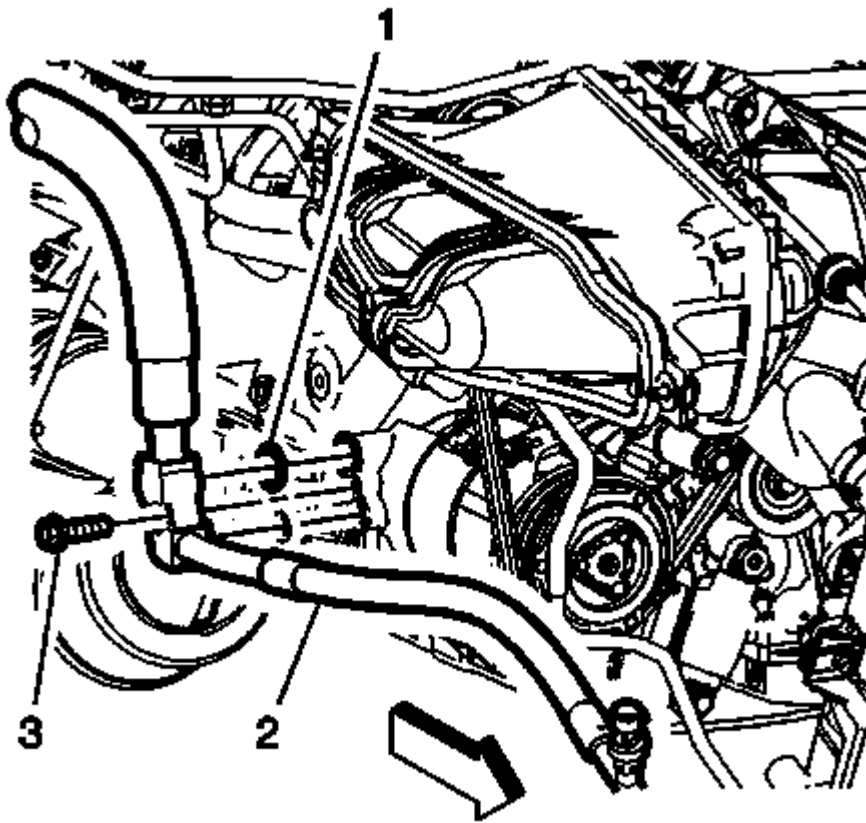


Fig. 18: Separating A/C Compressor And Condenser Hose From A/C Compressor
Courtesy of GENERAL MOTORS COMPANY

10. Remove the air conditioning compressor and condenser hose bolt (3) from the air conditioning compressor.
11. Remove the air conditioning compressor and condenser hose (2) from the air conditioning compressor.
12. Remove and discard sealing washers (1).

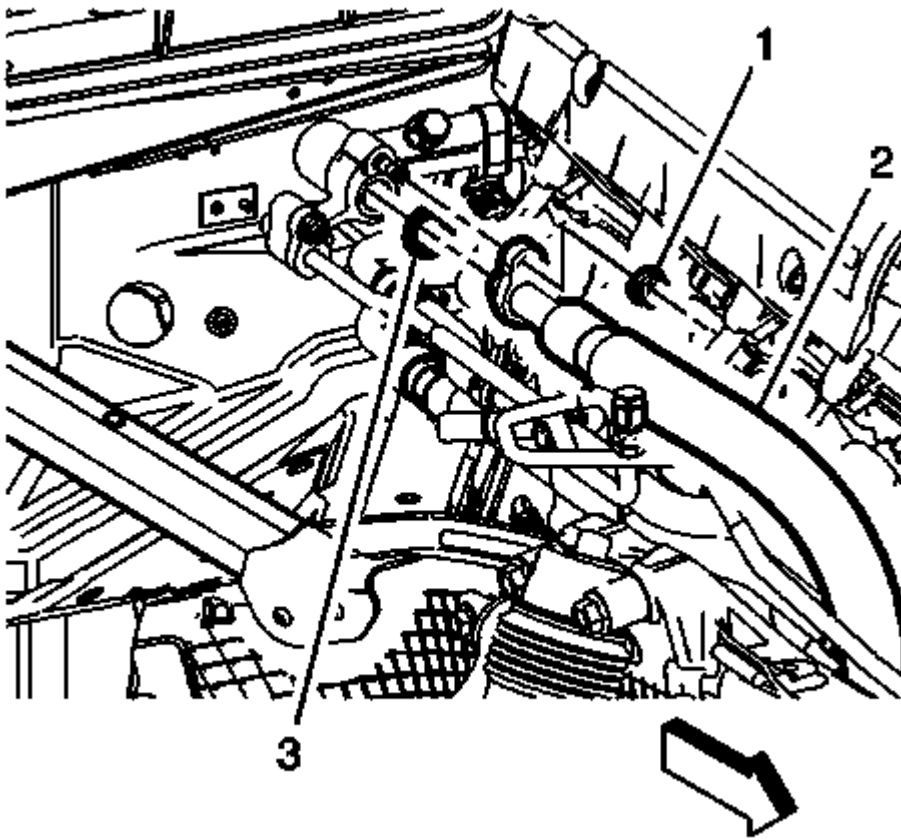


Fig. 19: Air Conditioning Compressor And Condenser Hose Nut And Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

13. Remove the air conditioning compressor and condenser hose nut (1) from the air conditioning evaporator thermal expansion valve rear tube.
14. Remove the air conditioning compressor and condenser hose (2) from the air conditioning evaporator thermal expansion valve rear tube.
15. Remove and discard sealing washer (3). Refer to **Air Conditioning System Seal Replacement**.
16. Remove the air conditioning compressor and condenser hose (2) from the vehicle.

Installation Procedure

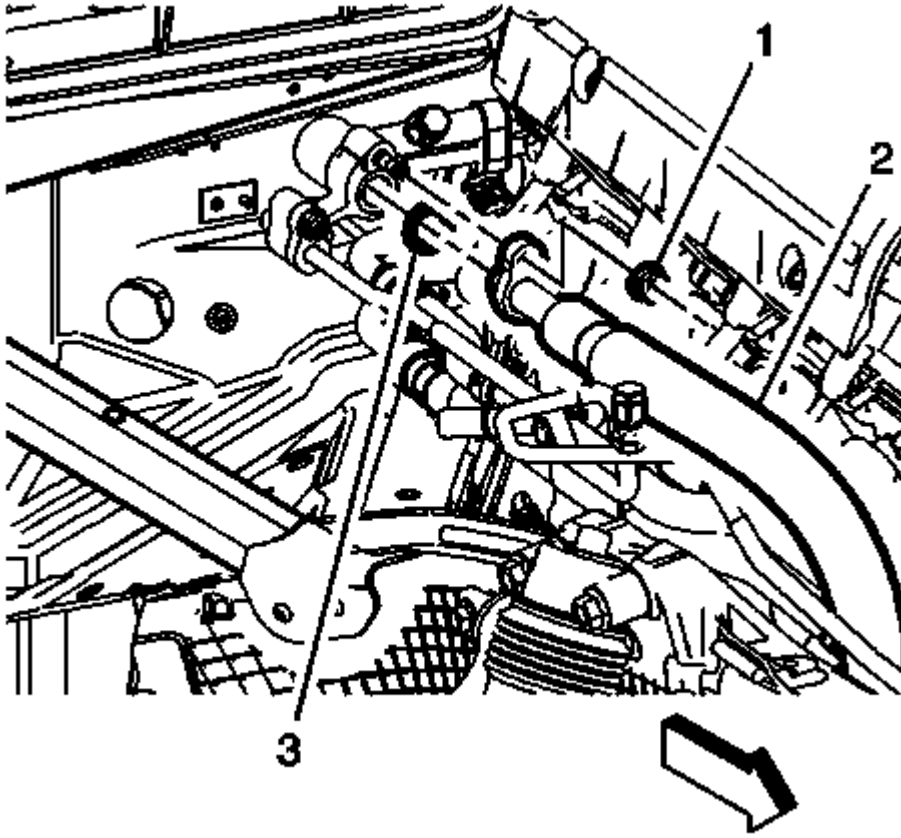


Fig. 20: Air Conditioning Compressor And Condenser Hose Nut And Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW sealing washer (3) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
2. Install the air conditioning compressor and condenser hose (2) to the vehicle.
3. Install the air conditioning compressor and condenser hose (2) to the air conditioning evaporator thermal expansion valve rear tube.

CAUTION: Refer to **Fastener Caution** .

4. Install the air conditioning compressor and condenser hose nut (1) to the air conditioning evaporator thermal expansion valve rear tube and tighten to 22 (16 lb ft).

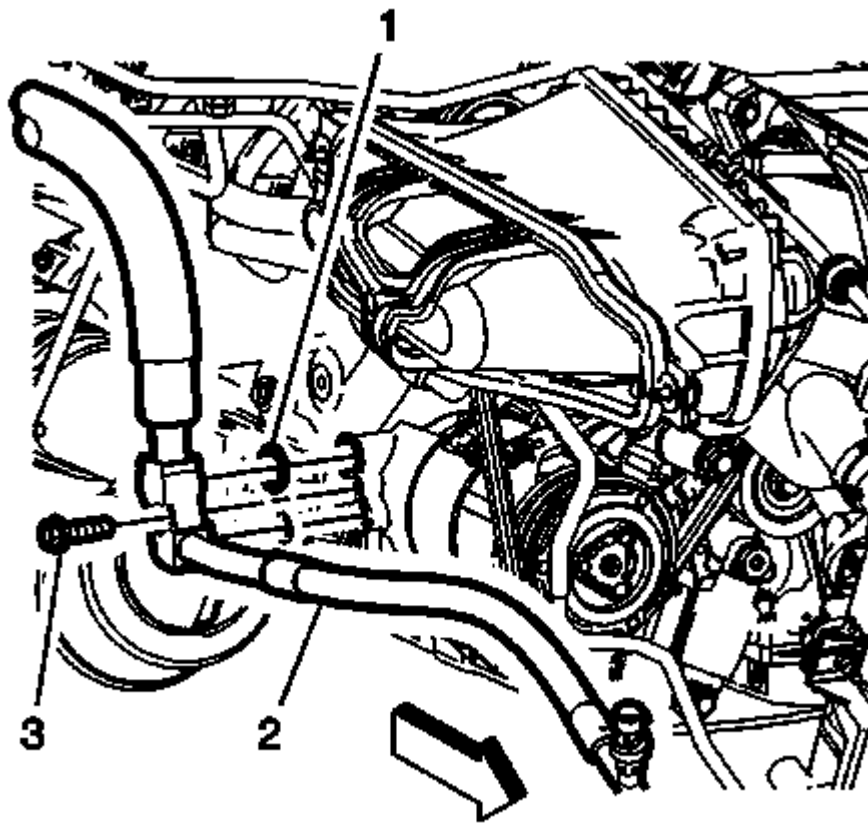


Fig. 21: Separating A/C Compressor And Condenser Hose From A/C Compressor
Courtesy of GENERAL MOTORS COMPANY

5. Install NEW sealing washer (1) to the air conditioning compressor and condenser hose (2). Refer to **Air Conditioning System Seal Replacement**.
6. Install the air conditioning compressor and condenser hose (2) to the air conditioning compressor.
7. Install the air conditioning compressor and condenser hose bolt (3) to the air conditioning compressor and tighten to 22 (16 lb ft).

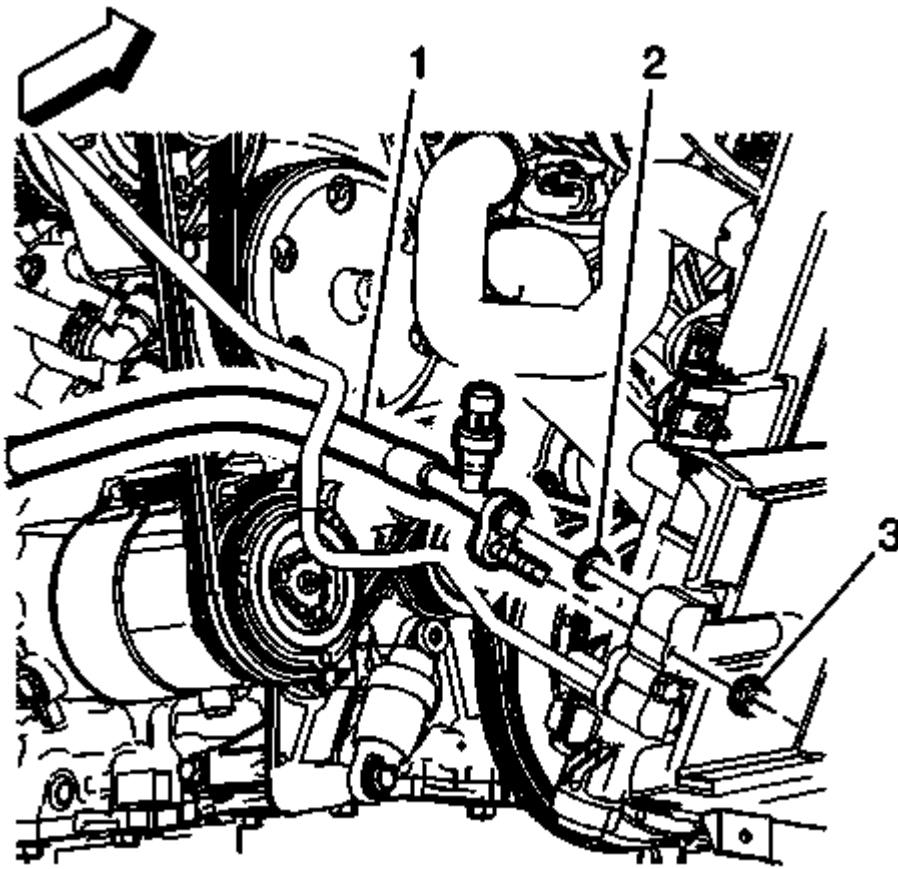


Fig. 22: Air Conditioning Compressor And Condenser
Courtesy of GENERAL MOTORS COMPANY

8. Install the engine and front cradle and remove the engine support fixture. Refer to **Front Cradle Replacement** .
9. Install the intake manifold. Refer to **Intake Manifold Replacement** .
10. Install NEW sealing washer (2) to the air conditioning compressor and condenser hose (1).
11. Install the air conditioning compressor and condenser hose (1) to the air conditioning condenser.
12. Install the air conditioning compressor and condenser hose nut (3) to the air conditioning compressor and condenser hose (1) and tighten to 22 (16 lb ft).
13. Install the air conditioning cycling and fan control air conditioning refrigerant pressure sensor electrical connector.
14. Install the front bumper fascia air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement** .
15. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
16. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .

REPLACEMENT

Removal Procedure

1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
2. Remove the radiator surge tank. Refer to **Radiator Surge Tank Replacement** .
3. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (LT1)**.
4. Remove the front bumper fascia air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement** .

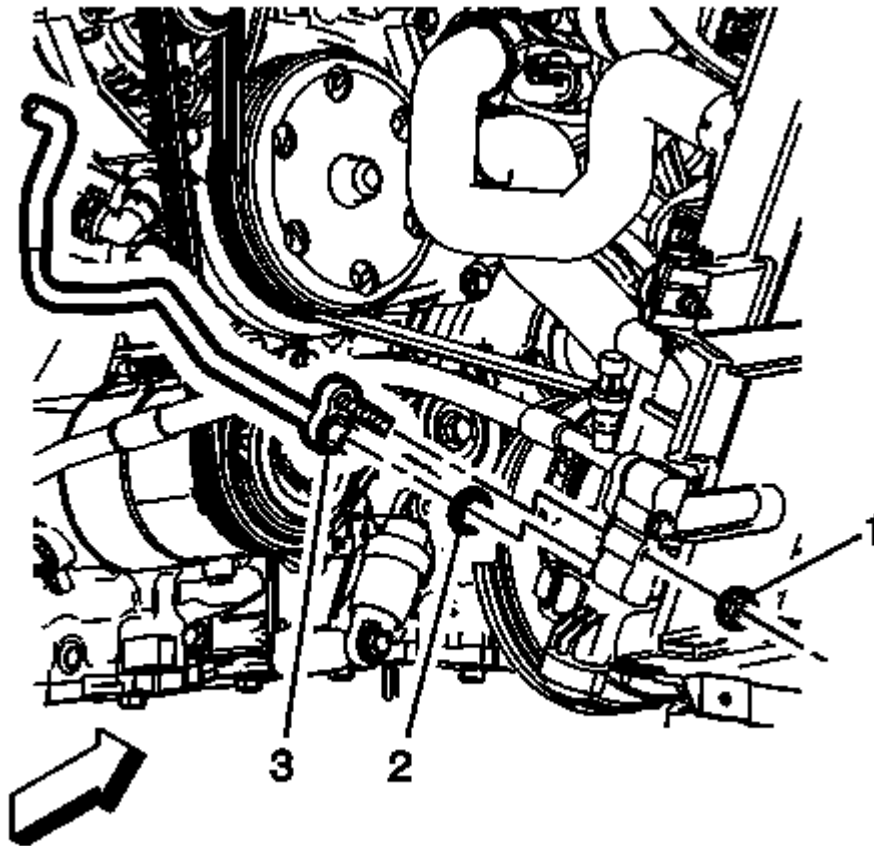


Fig. 23: Air Conditioning Evaporator Thermal Expansion Valve Front Tube
Courtesy of GENERAL MOTORS COMPANY

5. Remove the air conditioning evaporator nut (1) from the air conditioning evaporator thermal expansion valve front tube (3).
6. Remove the air conditioning evaporator thermal expansion valve front tube (3) from the air conditioning condenser.
7. Remove and discard sealing washer (2). Refer to **Air Conditioning System Seal Replacement**.

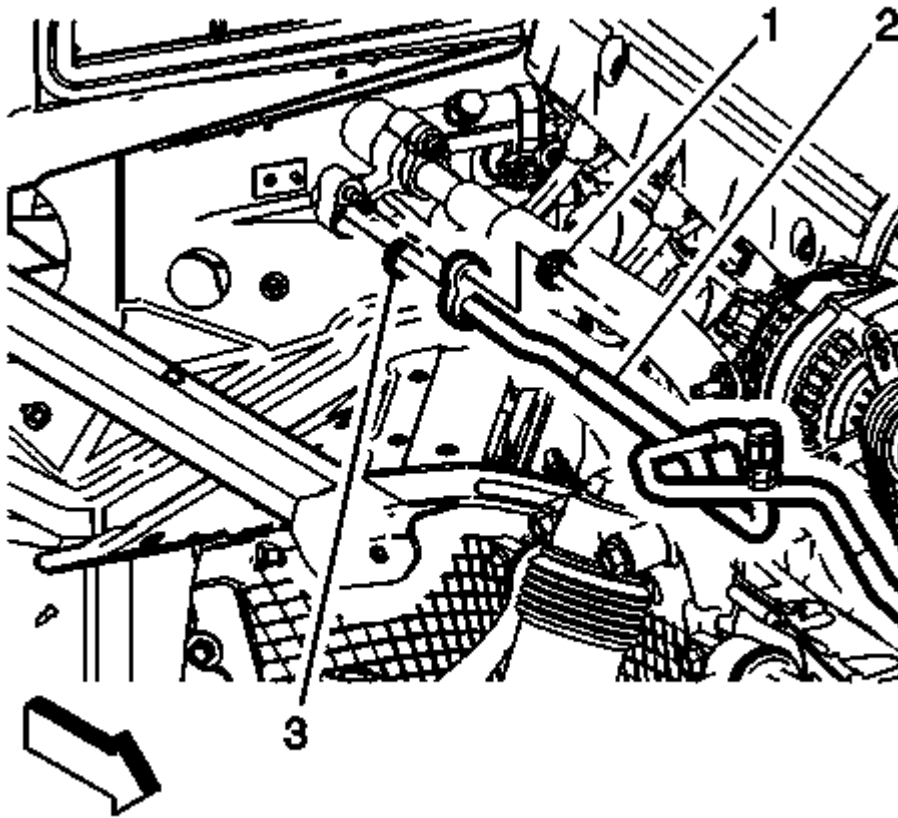


Fig. 24: Air Conditioning Evaporator Nut And Air Conditioning Evaporator Thermal Expansion Valve Front Tube

Courtesy of GENERAL MOTORS COMPANY

8. Remove the air conditioning evaporator nut (1) from the air conditioning evaporator thermal expansion valve rear tube.
9. Remove the air conditioning evaporator thermal expansion valve front tube (2) from the air conditioning evaporator thermal expansion valve rear tube.
10. Remove and discard sealing washer (3). Refer to **Air Conditioning System Seal Replacement**.
11. Remove the air conditioning evaporator thermal expansion valve front tube (2) from the vehicle.

Installation Procedure

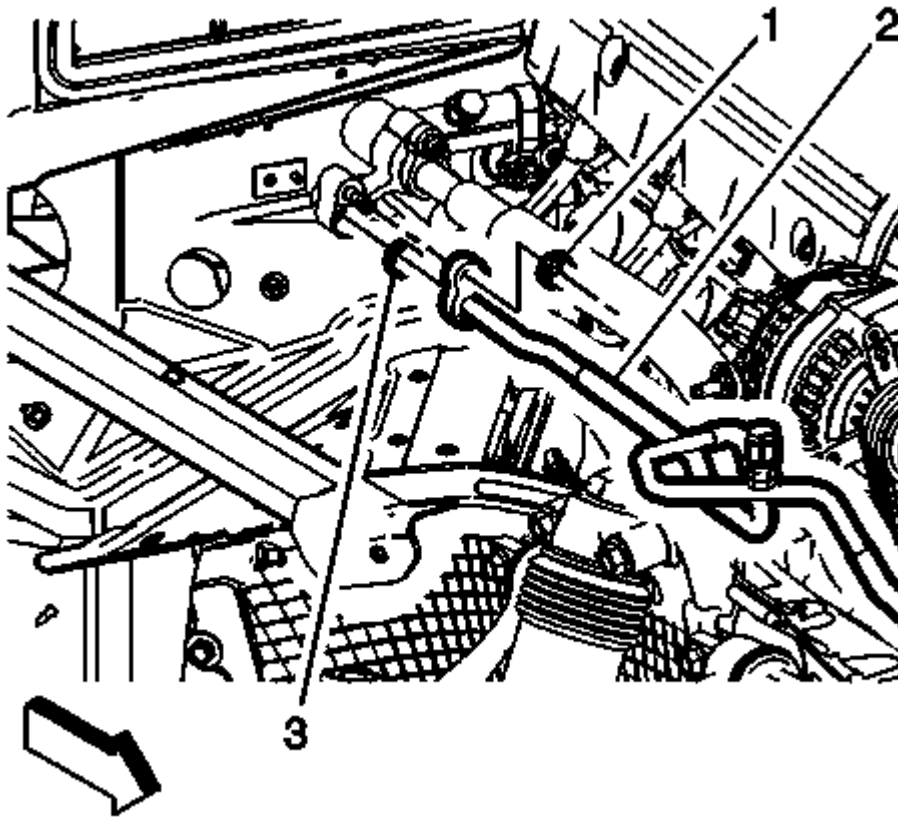


Fig. 25: Air Conditioning Evaporator Nut And Air Conditioning Evaporator Thermal Expansion Valve Front Tube

Courtesy of GENERAL MOTORS COMPANY

1. Install NEW sealing washer (3) to the air conditioning evaporator thermal expansion valve front tube (2). Refer to **Air Conditioning System Seal Replacement**.
2. Install the air conditioning evaporator thermal expansion valve front tube (2) to the vehicle.
3. Install the air conditioning evaporator thermal expansion valve front tube (2) to the air conditioning evaporator thermal expansion valve rear tube.

CAUTION: Refer to **Fastener Caution** .

4. Install the air conditioning evaporator nut (1) to the air conditioning evaporator thermal expansion valve rear tube and tighten to 22 (16 lb ft).

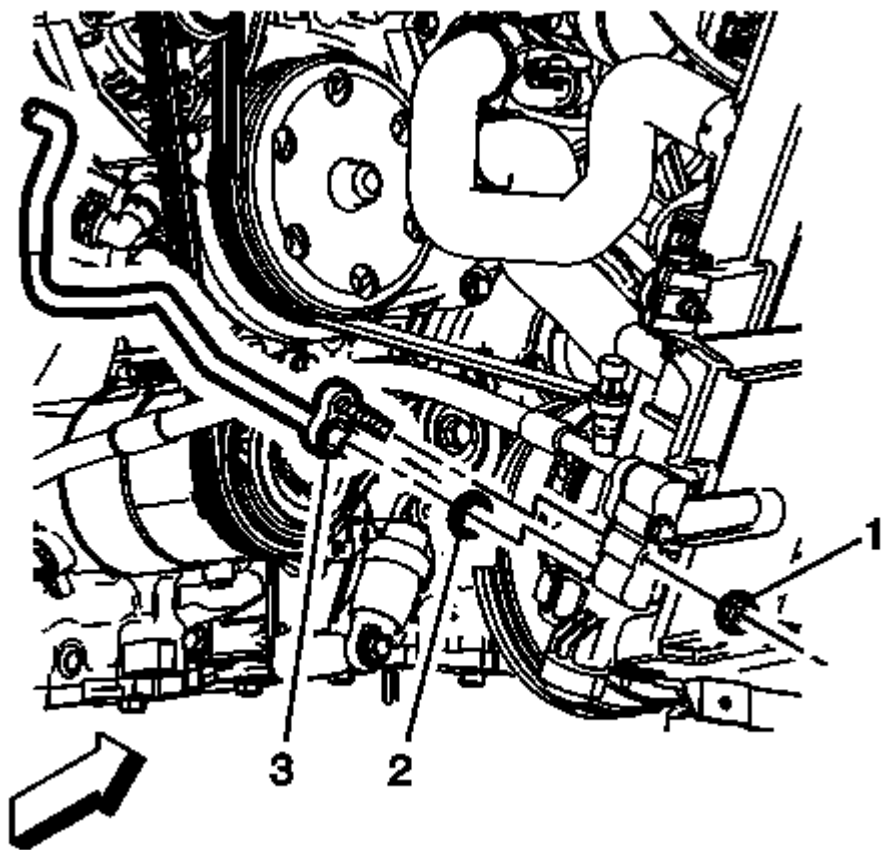


Fig. 26: Air Conditioning Evaporator Thermal Expansion Valve Front Tube
Courtesy of GENERAL MOTORS COMPANY

5. Install NEW sealing washer (2) to the air conditioning evaporator thermal expansion valve front tube (3).
6. Install the air conditioning evaporator thermal expansion valve front tube (3) to the air conditioning condenser.
7. Install the air conditioning evaporator nut (1) to the air conditioning evaporator thermal expansion valve front tube (3) and tighten to 22 (16 lb ft).
8. Install the front bumper fascia air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement** .
9. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
10. Install the radiator surge tank. Refer to **Radiator Surge Tank Replacement** .
11. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REAR TUBE REPLACEMENT

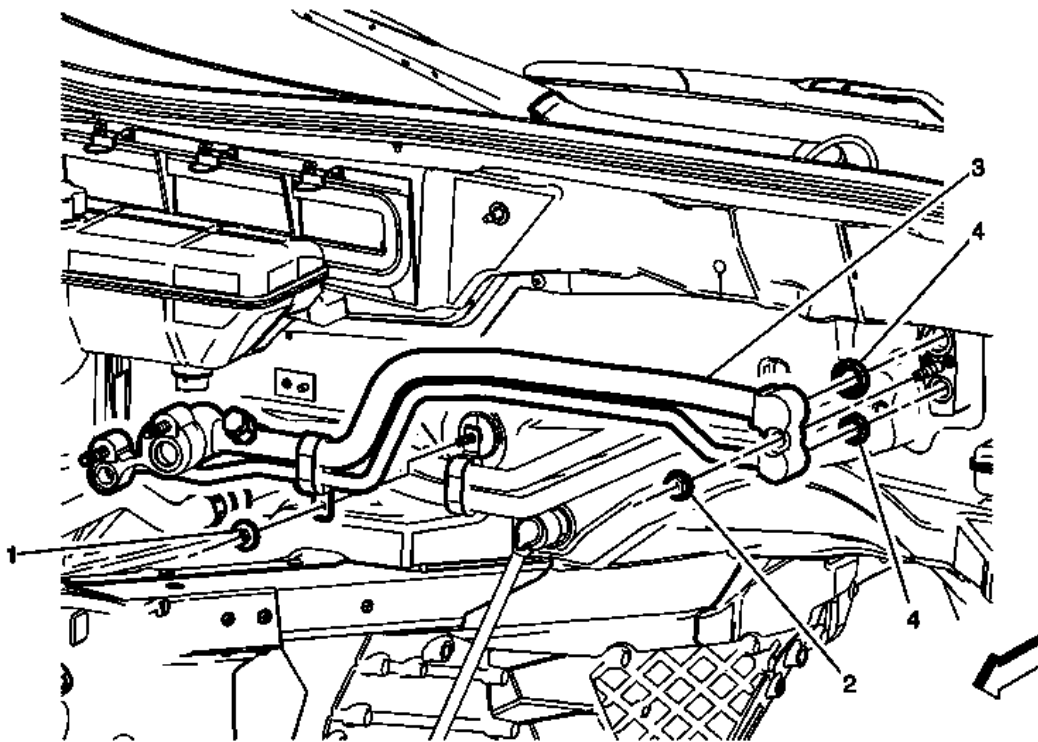


Fig. 27: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u>. 2. Remove the air conditioning evaporator thermal expansion valve front tube from the air conditioning evaporator thermal expansion valve rear tube. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Front Tube Replacement</u>. 3. Remove the air conditioning compressor and condenser hose from the air conditioning evaporator thermal expansion valve rear tube. Refer to <u>Air Conditioning Compressor and Condenser Hose Replacement</u>. 4. Remove the fuel pump insulator. Refer to <u>Fuel Pump Insulator Replacement</u>. 5. Remove the intake manifold. Refer to <u>Intake Manifold Replacement</u>. 6. Install the engine support fixture and lower the engine and front cradle enough to gain access to the air conditioning evaporator thermal expansion valve rear tube. Refer to <u>Front Cradle Replacement</u>.	
1	Heater Inlet and Outlet Pipe Nut CAUTION:

	Tighten 12 (9 lb ft)
2	Air Conditioning Evaporator Nut Tighten 22 (16 lb ft)
3	Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
4	Air Conditioning Compressor and Condenser Hose Seals (Qty: 2) Procedure Remove and discard old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .

AIR CONDITIONING REFRIGERANT SERVICE VALVE CORE REPLACEMENT

Special Tools

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

Removal Procedure

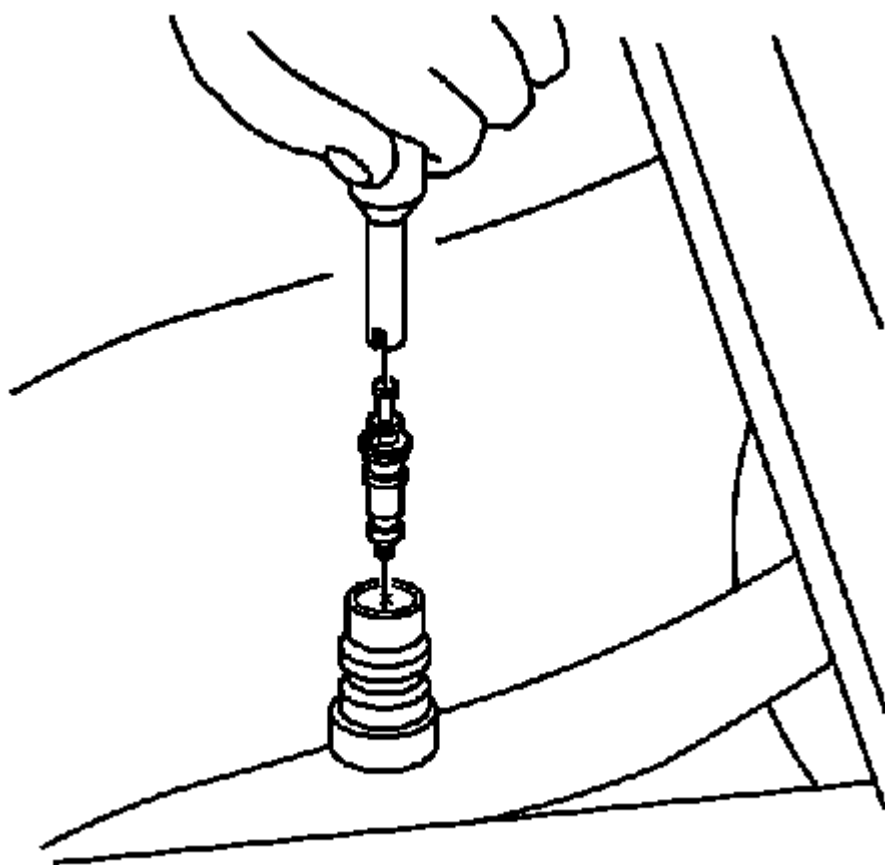


Fig. 28: A/C Service Port & Valve Core
Courtesy of GENERAL MOTORS COMPANY

1. Recover the refrigerant from the A/C system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
2. Using the **J 46246** Valve Core Tool, remove the valve core from the service port.

Installation Procedure

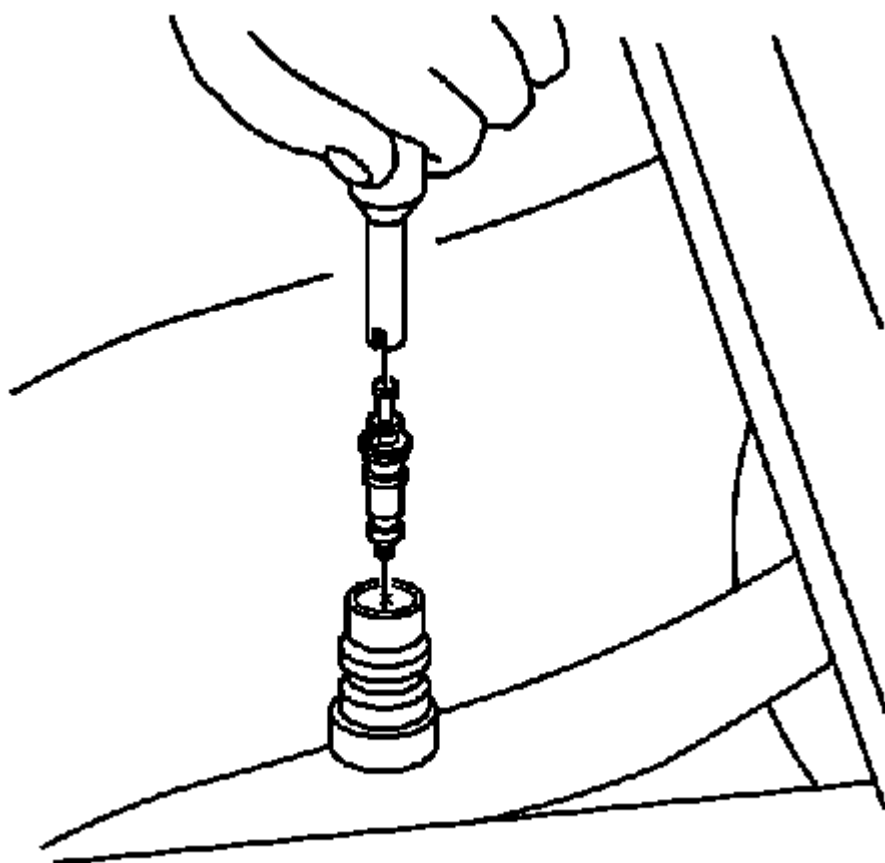


Fig. 29: A/C Service Port & Valve Core
Courtesy of GENERAL MOTORS COMPANY

1. Install the valve core to the service port.

CAUTION: Refer to Fastener Caution .

2. Using the **J 46246** Valve Core Tool, tighten the valve core.

Tighten

Tighten the valve core to 11 N.m (97 lb in).

3. Evacuate and recharge the A/C system. Refer to Refrigerant Recovery and Recharging (LT1).
4. Leak test the fittings of the component using **J 39400-A** Halogen Leak Detector.

RECEIVER AND DEHYDRATOR REPLACEMENT

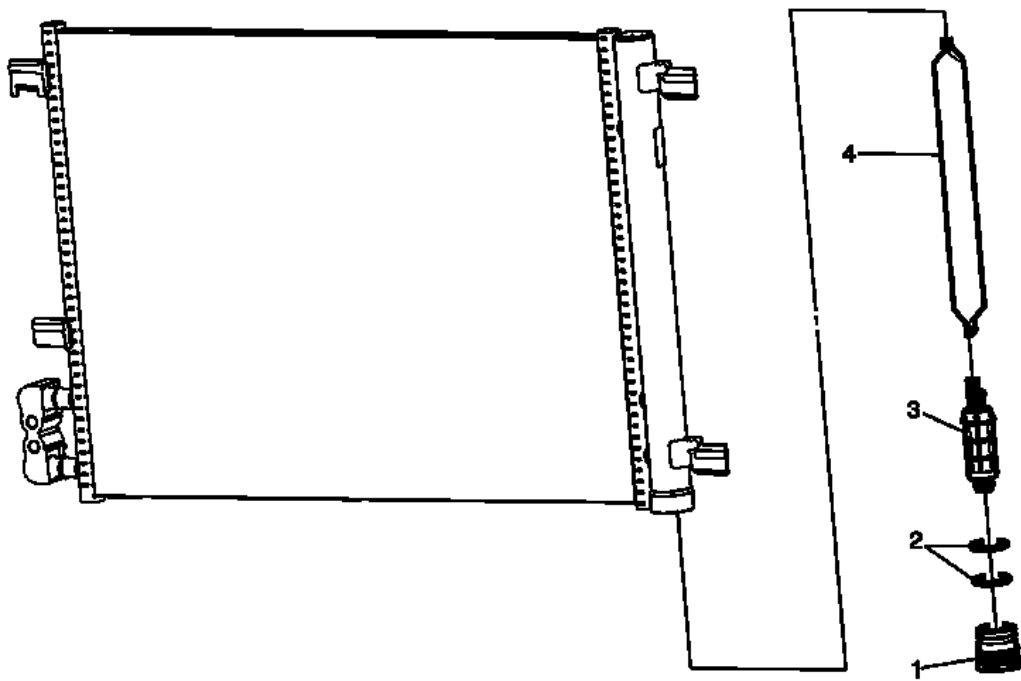


Fig. 30: Receiver and Dehydrator
 Courtesy of GENERAL MOTORS COMPANY

Receiver and Dehydrator Replacement

Callout	Component Name
Preliminary Procedure	
Remove the air conditioning condenser. Refer to Air Conditioning Condenser Replacement .	
1	Air Conditioning Receiver and Dehydrator Cover Seal CAUTION: Refer to Fastener Caution . NOTE: Cap all A/C components immediately to prevent system contamination.
2	Air Conditioning Receiver and Dehydrator Fitting Seal
3	Air Conditioning Receiver and Dehydrator Plug
4	Air Conditioning Refrigerant Desiccant

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

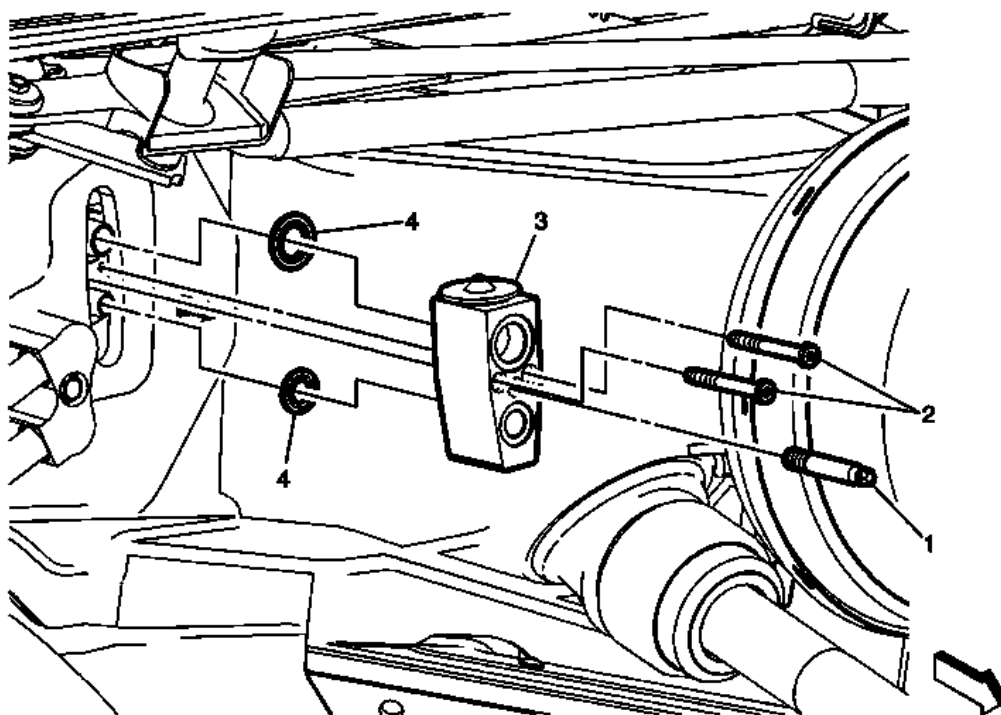


Fig. 31: Air Conditioning Evaporator Thermal Expansion Valve
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Thermal Expansion Valve Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning evaporator thermal expansion valve rear tube from the air conditioning evaporator thermal expansion valve and position out of the way. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement</u> .	
1	Air Conditioning Evaporator Thermal Expansion Valve Stud CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Evaporator Thermal Expansion Valve Bolt (Qty: 2)
3	Air Conditioning Thermal Expansion Valve
4	Air Conditioning Evaporator Thermal Expansion Valve Seal (Qty: 2) Procedure Remove and discard old sealing washers and replace with NEW sealing washers. Refer to <u>Air Conditioning System Seal Replacement</u> .

AIR CONDITIONING REFRIGERANT HIGH PRESSURE SERVICE VALVE REPLACEMENT

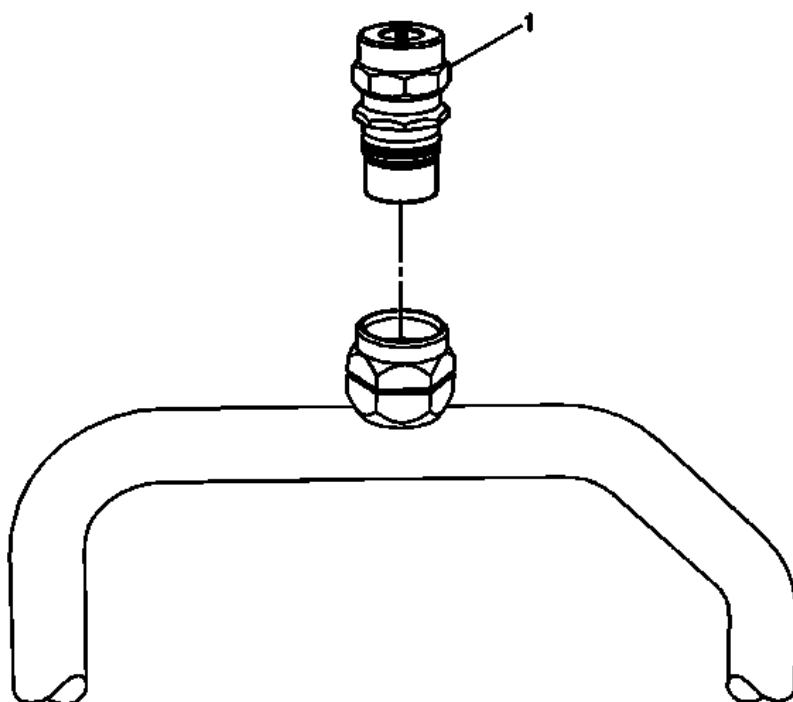


Fig. 32: Air Conditioning Refrigerant High Pressure Service Valve
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Refrigerant High Pressure Service Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the service port cap. 2. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u>	
1	Air Conditioning Refrigerant High Pressure Service Valve CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Use the J 39037 Charge Valve Octagon Socket to remove the air conditioning refrigerant high pressure service valve. 2. Replace the O-ring. Tighten 2 N.m (18 lb in)

AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR REPLACEMENT

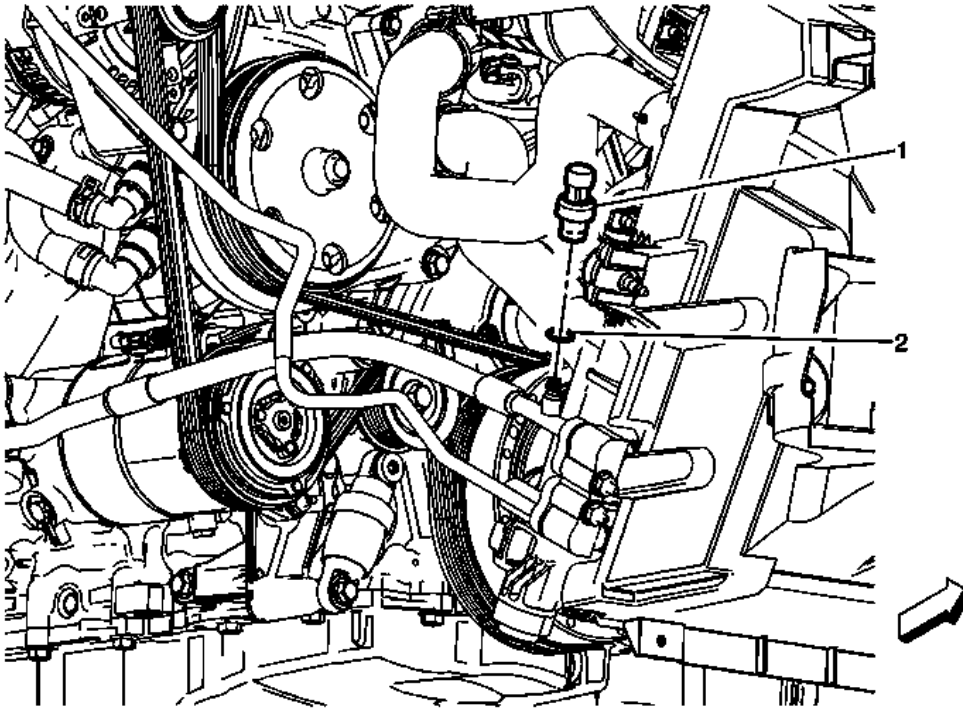


Fig. 33: Air Conditioning (A/C) Refrigerant Pressure Sensor
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 2. Disconnect the electrical connector from the air conditioning refrigerant pressure sensor.	
1	Air Conditioning Refrigerant Pressure Sensor CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Conditioning Compressor Refrigerant Pressure Switch Seal Remove and discard the O-ring and replace with NEW only.

AIR CONDITIONING CONDENSER REPLACEMENT

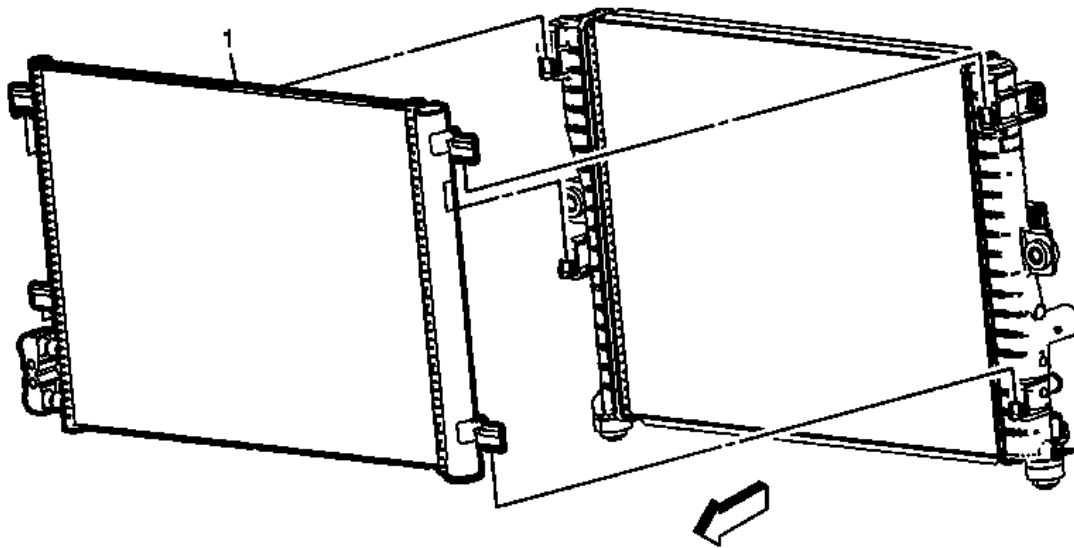


Fig. 34: Air Conditioning Condenser
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Condenser Replacement

Callout	Component Name
Preliminary Procedure	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (LT1)</u> . 2. Remove the radiator. Refer to <u>Radiator Replacement</u> .	
1	Air Conditioning Condenser

HEATER AND AIR CONDITIONING EVAPORATOR AND BLOWER MODULE REMOVAL AND INSTALLATION

Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Recover the air conditioning refrigerant system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
3. Drain the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .

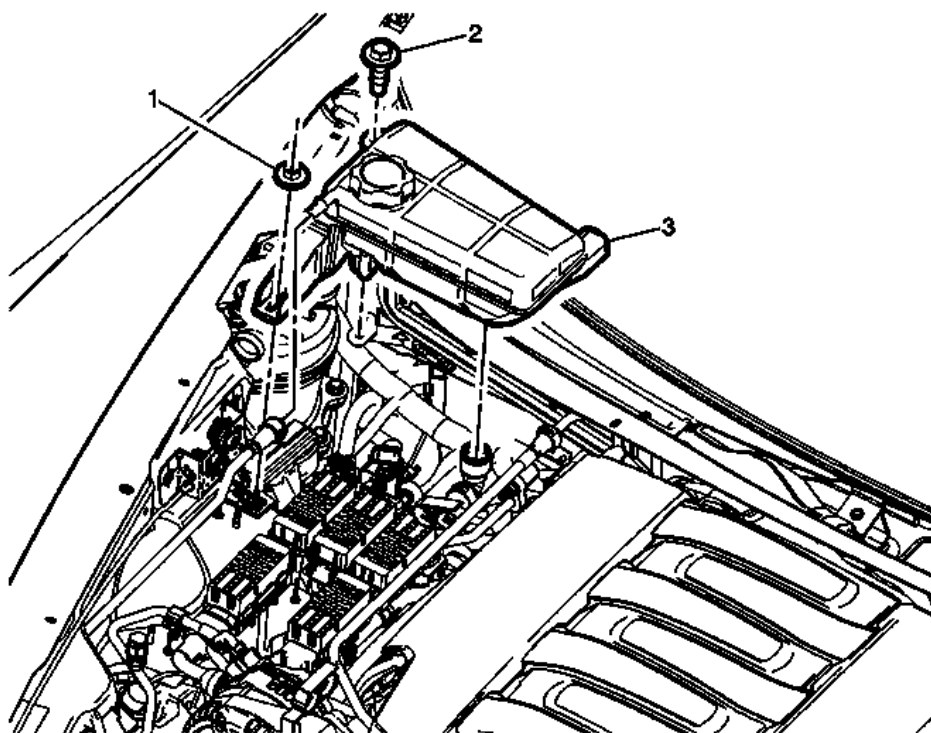


Fig. 35: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

4. Remove the radiator surge tank (3). Refer to **Radiator Surge Tank Replacement** .

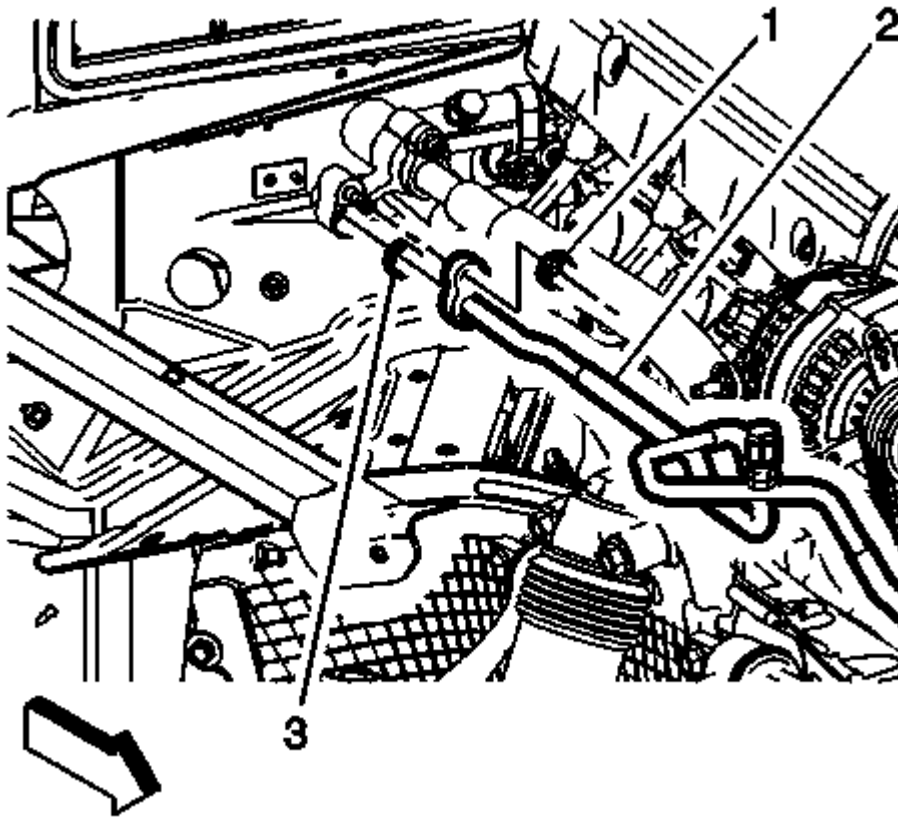


Fig. 36: Air Conditioning Evaporator Nut And Air Conditioning Evaporator Thermal Expansion Valve Front Tube

Courtesy of GENERAL MOTORS COMPANY

5. Remove the air conditioning evaporator thermal expansion valve front tube (2) from the air conditioning evaporator thermal expansion valve rear tube. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Front Tube Replacement.**

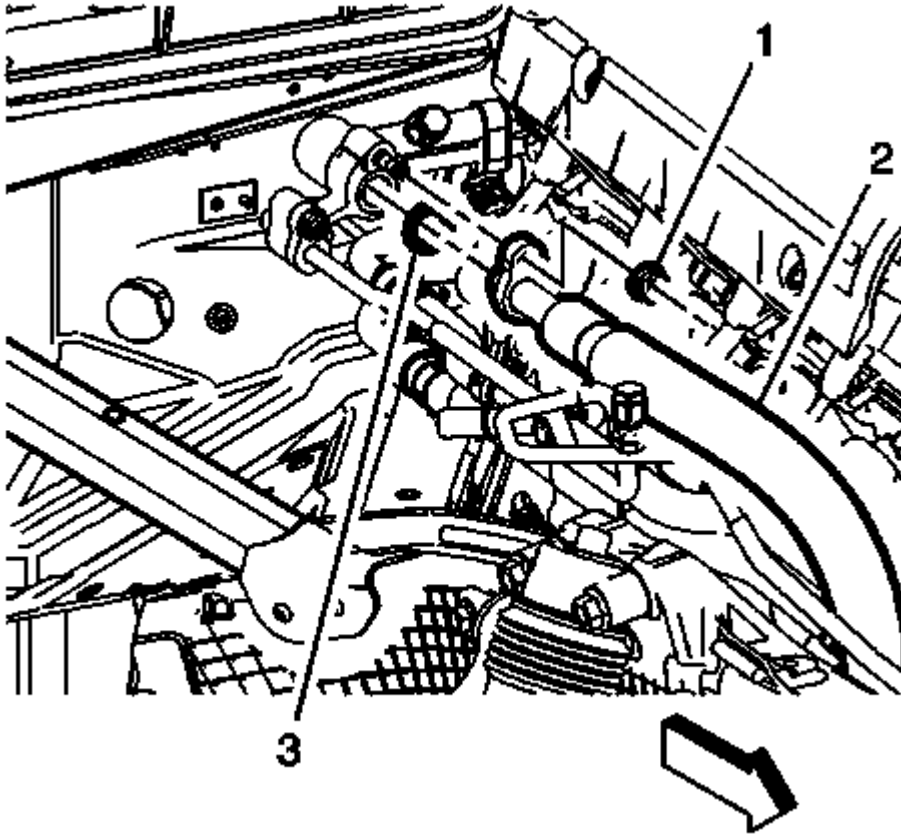


Fig. 37: Air Conditioning Compressor And Condenser Hose Nut And Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

6. Remove the air conditioning compressor and condenser hose (2) from the air conditioning evaporator thermal expansion valve rear tube. Refer to **Air Conditioning Compressor and Condenser Hose Replacement.**

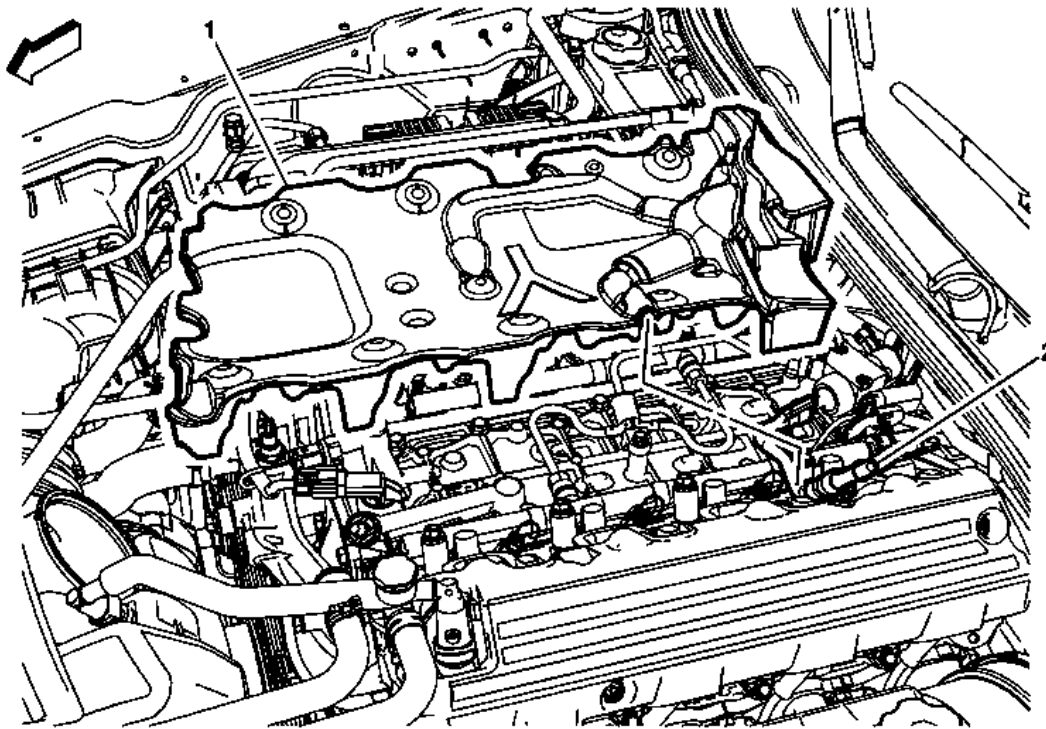


Fig. 38: Fuel Pump Insulator
 Courtesy of GENERAL MOTORS COMPANY

7. Remove the fuel pump Insulator (1). Refer to Fuel Pump Insulator Replacement .

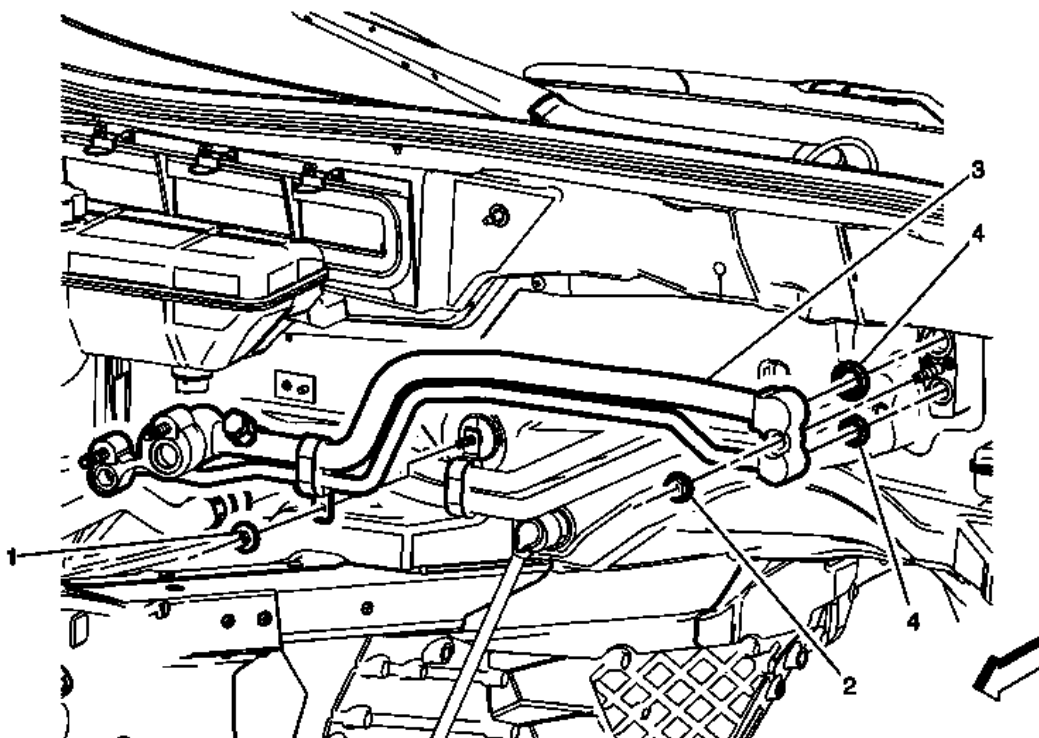


Fig. 39: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

8. Remove the air conditioning evaporator thermal expansion valve rear tube (3) from the air conditioning evaporator thermal expansion valve. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement**.

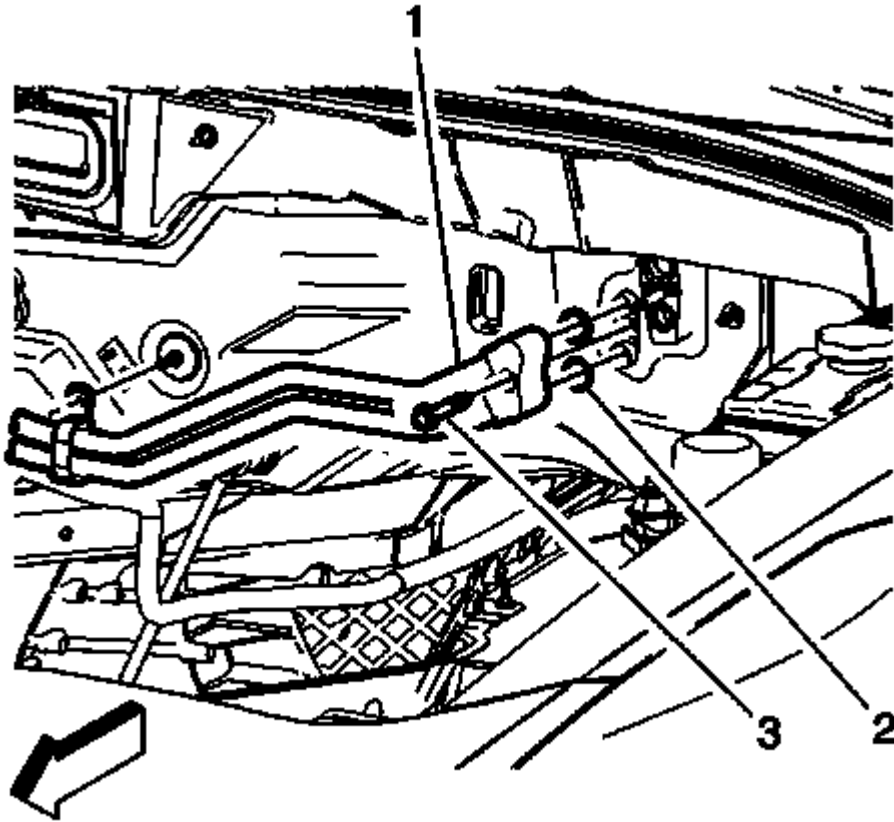


Fig. 40: Heater Inlet And Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Remove the heater inlet and outlet pipe from the heater core (1). Refer to **Heater Inlet And Outlet Pipe Replacement**.

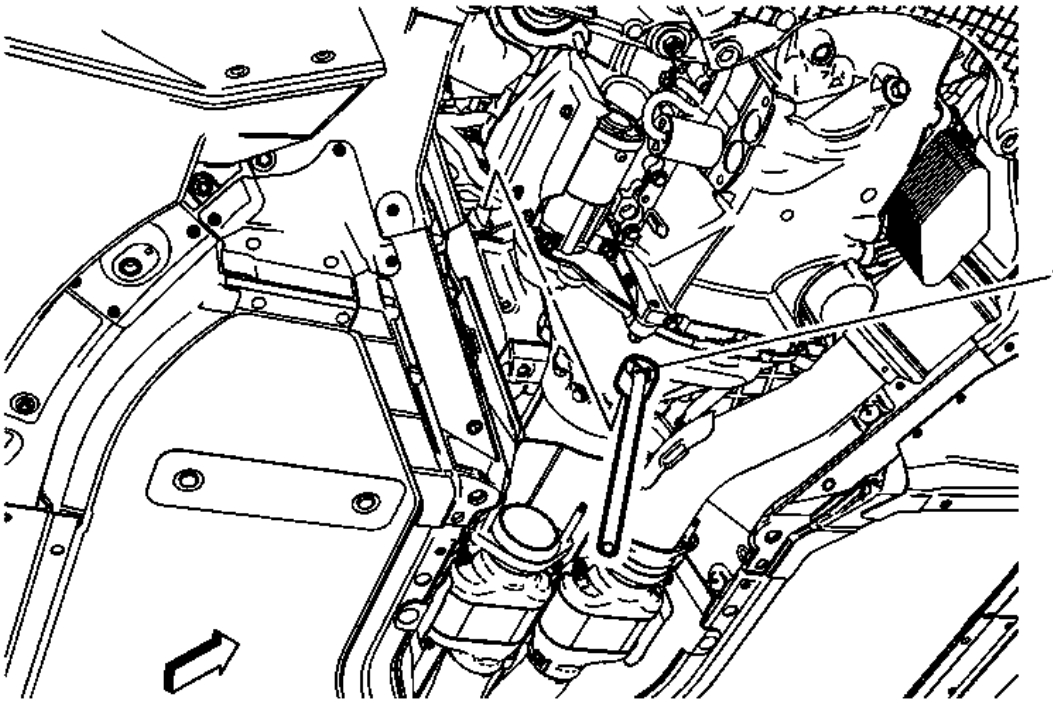


Fig. 41: Air Conditioning Evaporator And Blower Module Drain Tube
Courtesy of GENERAL MOTORS COMPANY

10. Remove the air conditioning evaporator and blower module drain tube (1). Refer to **Air Conditioning Evaporator and Blower Module Drain Tube Replacement.**

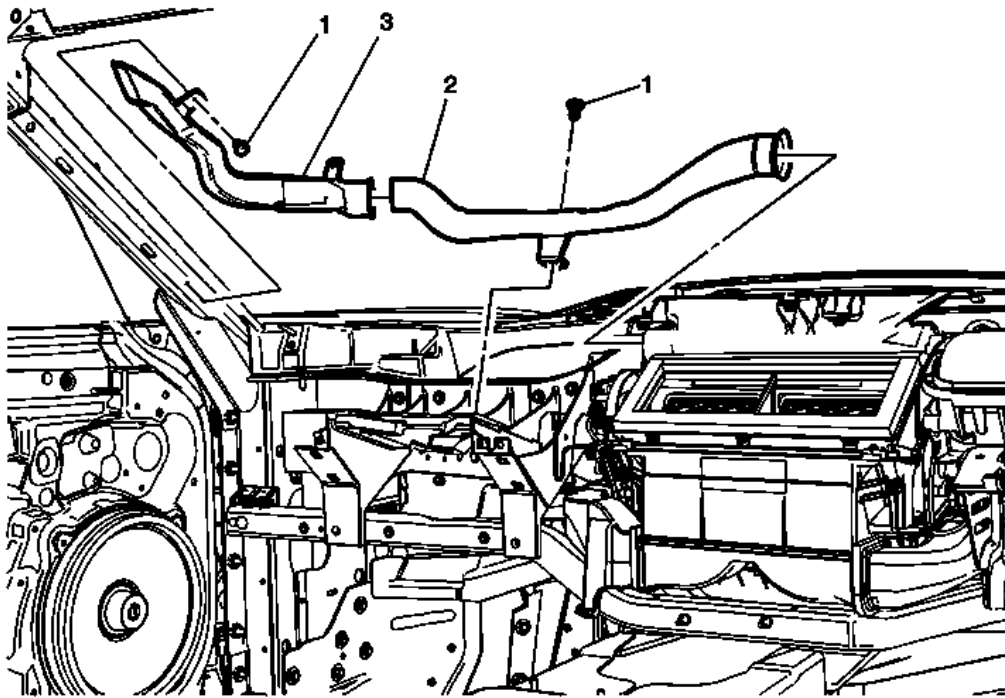


Fig. 42: Left Side Window Defogger Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

11. Remove the left side window defogger outlet duct (2). Refer to **Side Window Defogger Outlet Duct Replacement - Left Side**.

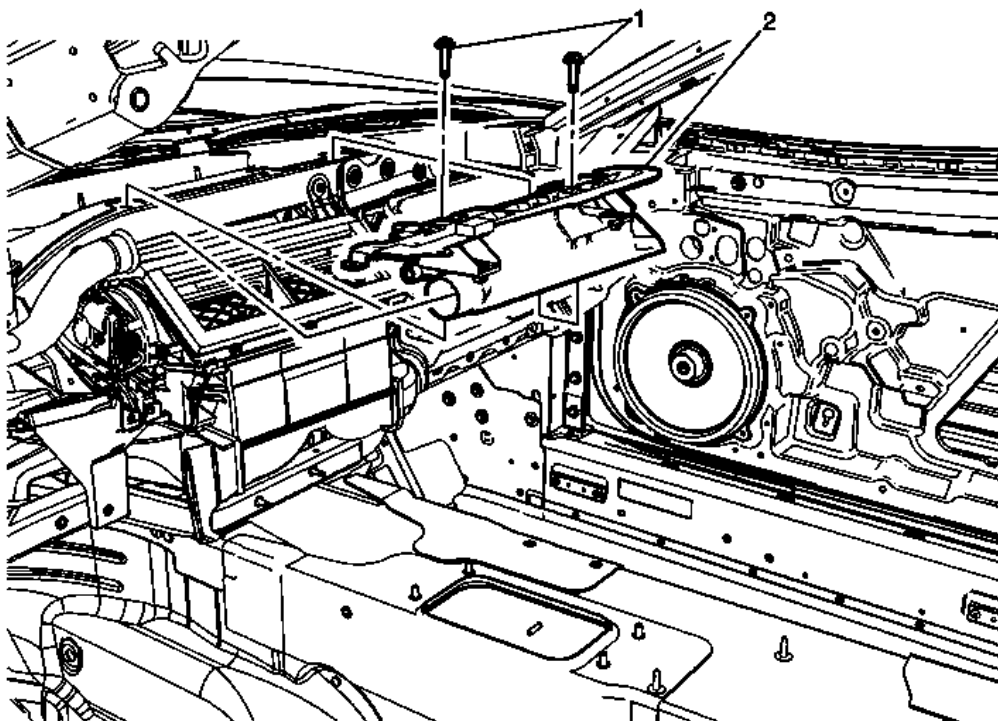


Fig. 43: Windshield Defroster Nozzle
Courtesy of GENERAL MOTORS COMPANY

12. Remove the windshield defroster nozzle (2). Refer to **Windshield Defroster Nozzle Replacement**.

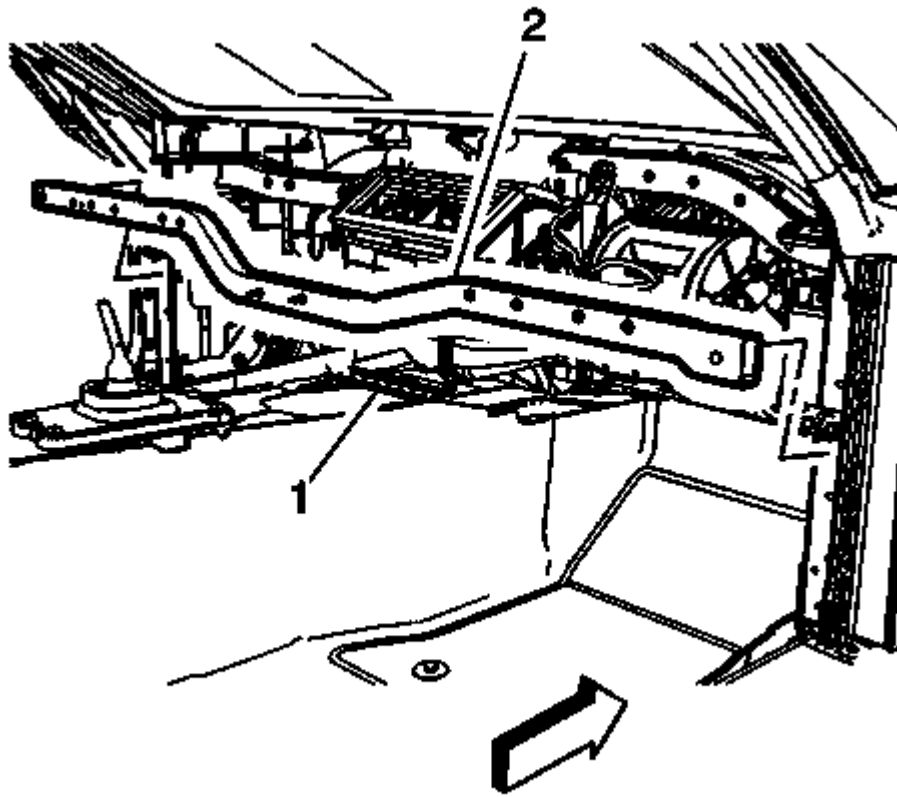


Fig. 44: Instrument Panel Tie Bar
Courtesy of GENERAL MOTORS COMPANY

13. Remove the instrument panel tie bar assembly (1). Refer to **Instrument Panel Tie Bar Replacement**.
14. Temporary support the heater and air conditioning evaporator and blower module (HVAC) assembly.
15. From within the engine compartment, reposition the vacuum lines and the under the hood wiring harness out of the way.
16. Remove the fuel line clips from the heater and air conditioning evaporator and blower (HVAC) module studs.

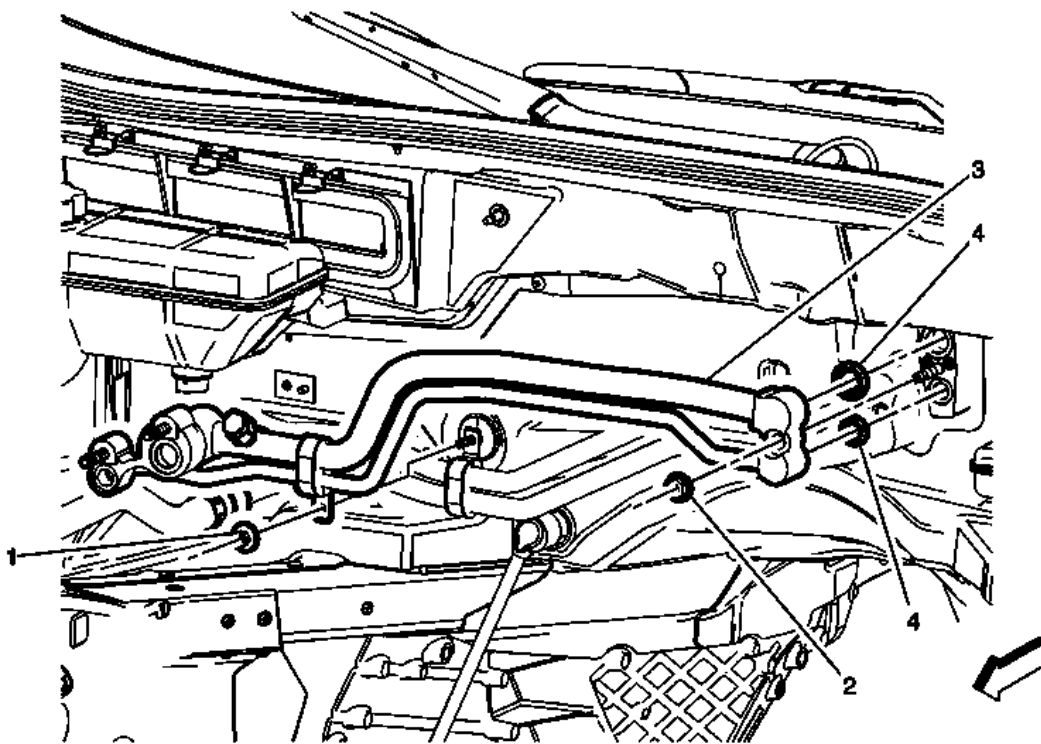


Fig. 45: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

17. Remove the retaining clip nut (1) and reposition the air conditioning evaporator thermal expansion valve rear tube and heater inlet and outlet pipe out of the way.

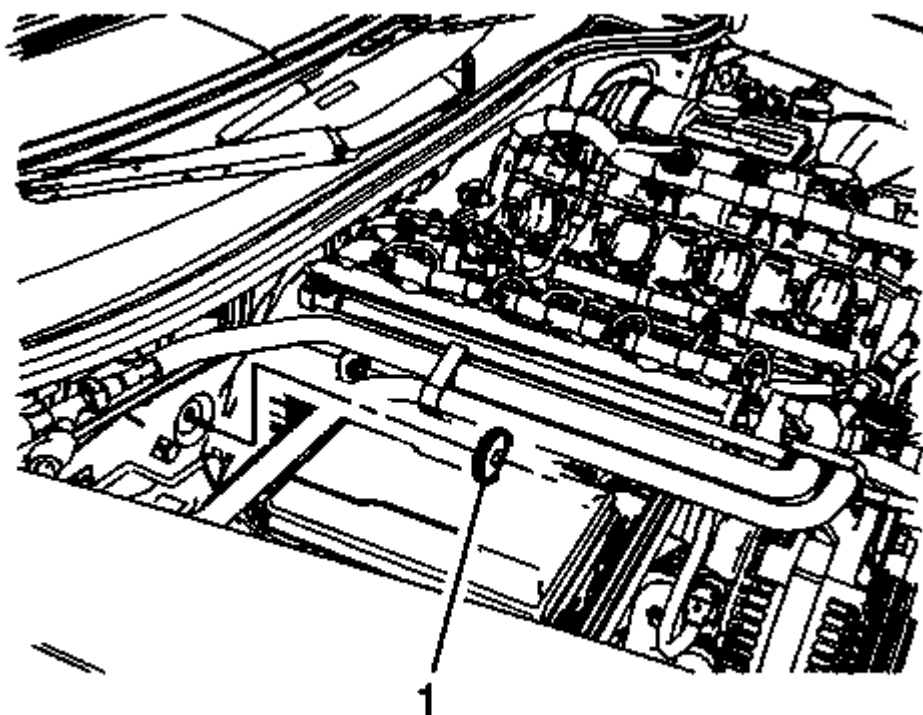


Fig. 46: HVAC Module Assembly Right Side Nut
Courtesy of GENERAL MOTORS COMPANY

18. Remove the HVAC module assembly right side nut, (1) securing the HVAC module assembly to the cowl panel.

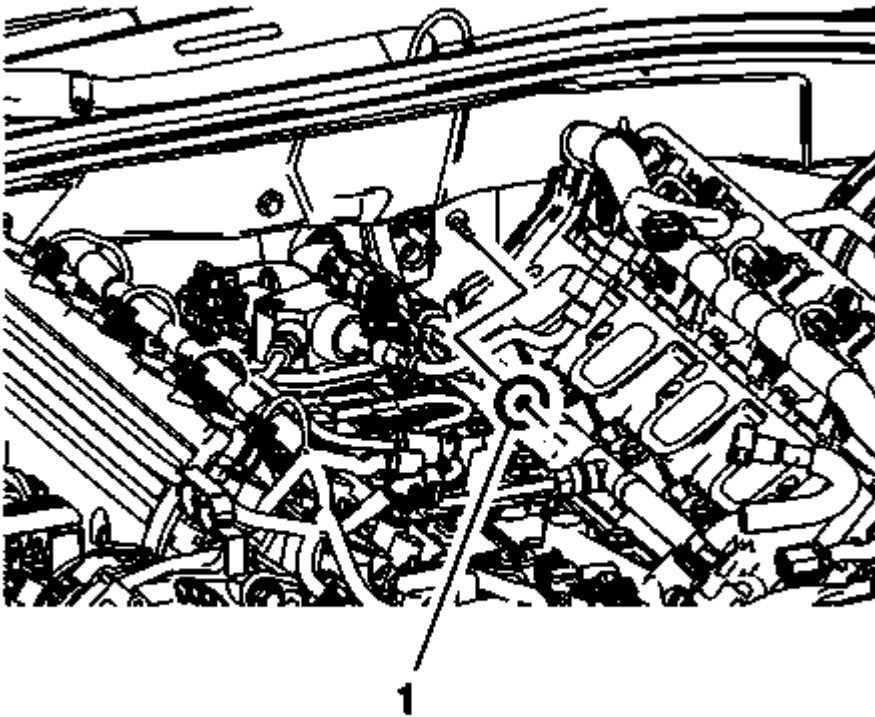


Fig. 47: HVAC Module Assembly Left Side Nut
Courtesy of GENERAL MOTORS COMPANY

19. Remove the HVAC module assembly left side nut, (1) securing the HVAC module assembly to the cowl panel.

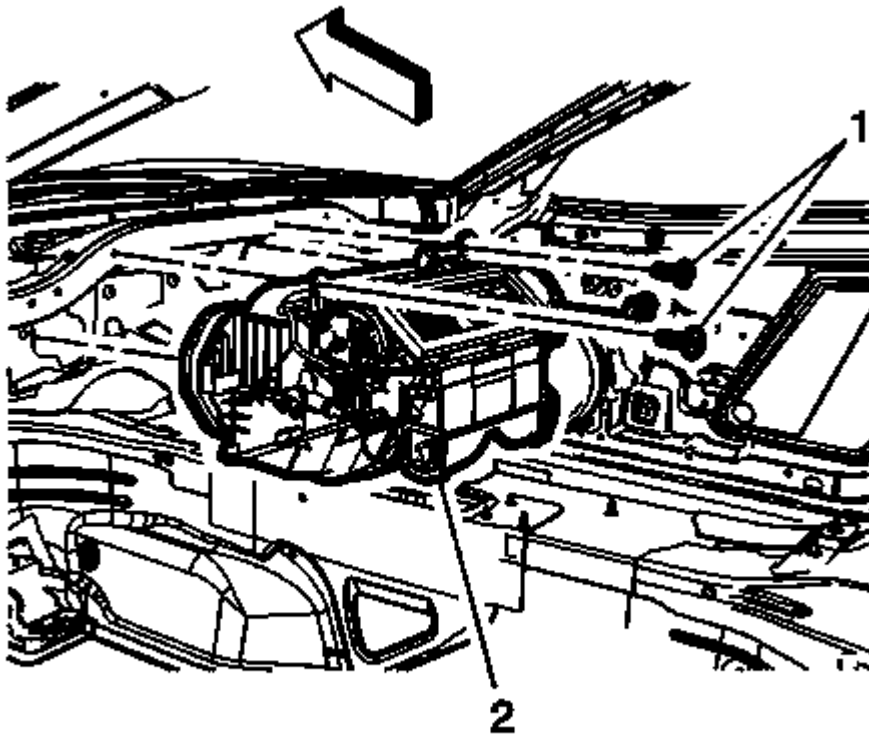


Fig. 48: HVAC Module Bolts

Courtesy of GENERAL MOTORS COMPANY

20. Remove the HVAC module bolts (1) securing the HVAC module assembly to the upper instrument panel tie bar.
21. Slide the HVAC module assembly (2) back to clear the air conditioning evaporator module drain and remove the HVAC module assembly (2) from the vehicle.
22. Transfer all the necessary components.

Installation Procedure

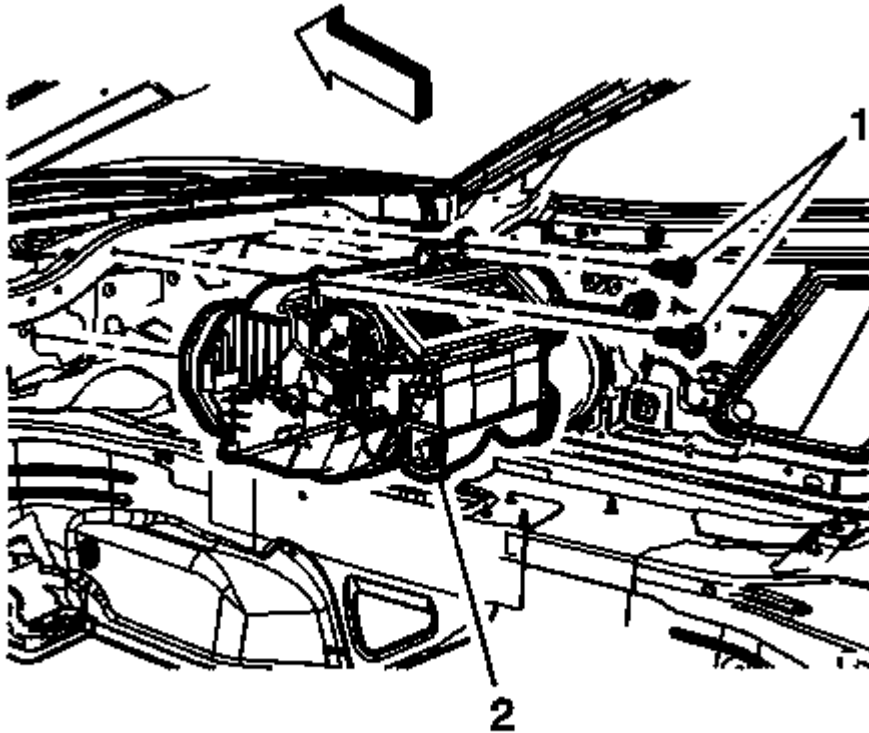


Fig. 49: HVAC Module Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Align the air conditioning evaporator module drain to the plenum lower panel extension pass through drain opening.
2. Slide the HVAC module assembly forward while positioning the HVAC module assembly (2) into the vehicle and temporarily support it.

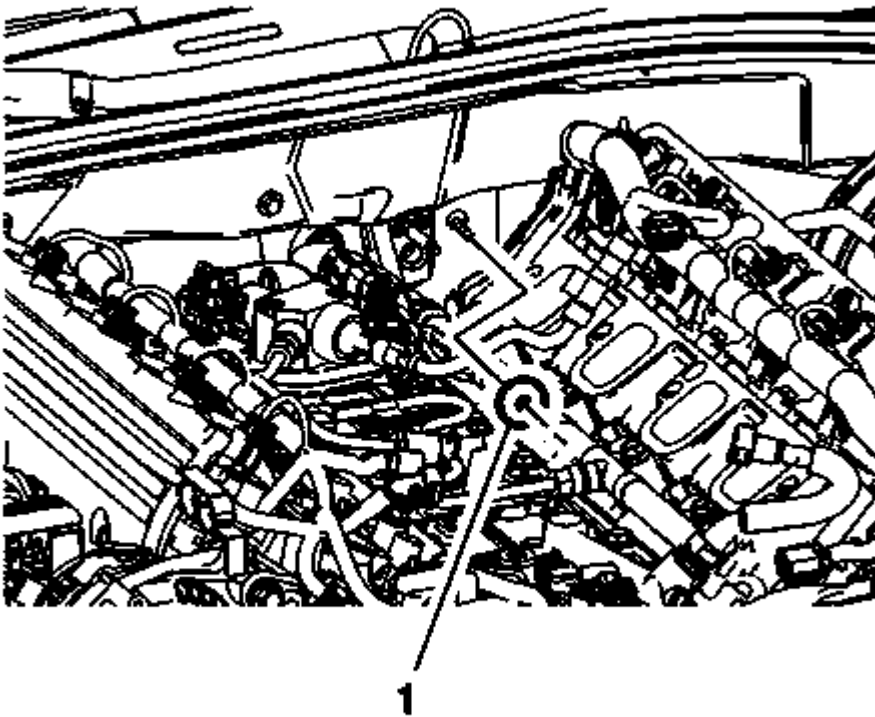


Fig. 50: HVAC Module Assembly Left Side Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. From within the engine compartment, install the HVAC module assembly left side nut (1) securing the HVAC module assembly to the cowl panel and tighten to 5 (44 lb in).

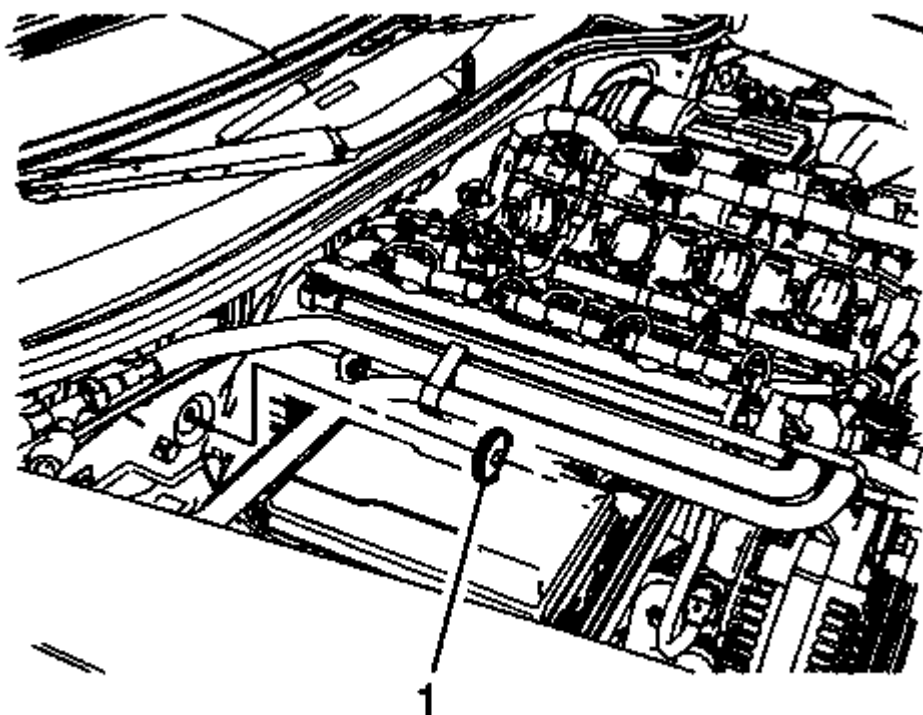


Fig. 51: HVAC Module Assembly Right Side Nut
Courtesy of GENERAL MOTORS COMPANY

4. Install the HVAC module assembly right side nut (1) securing the HVAC module assembly to the cowl panel and tighten to 5 (44 lb in).

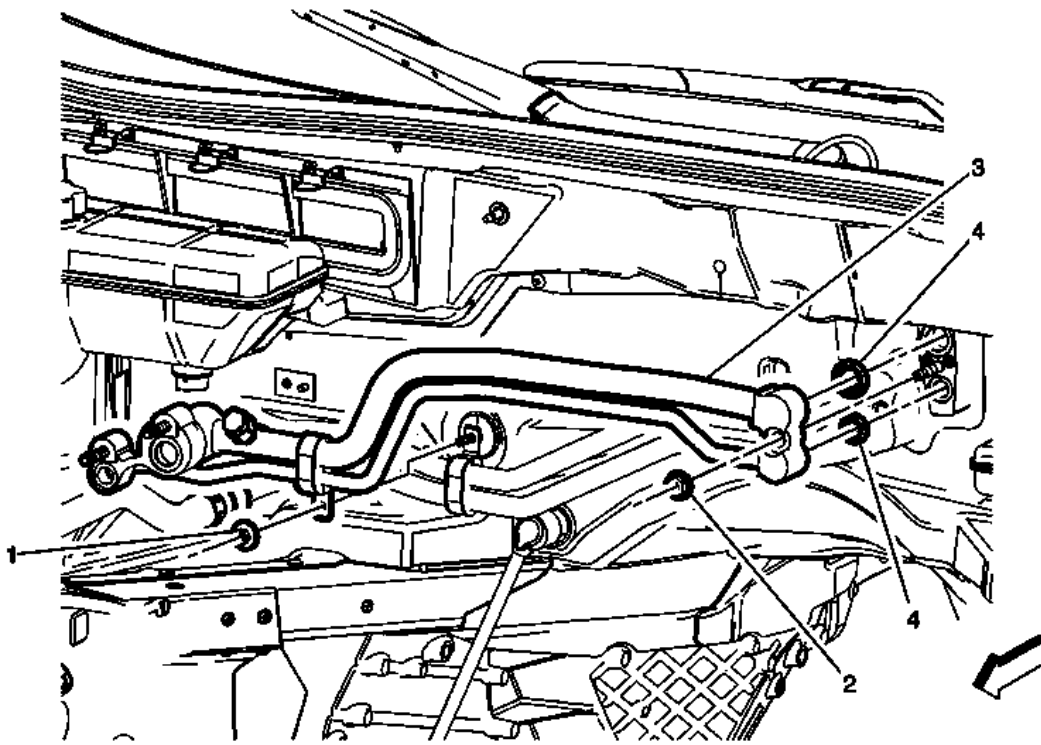


Fig. 52: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

5. Reposition the air conditioning evaporator thermal expansion valve rear tube and heater inlet and outlet pipe back to the original position and install the retaining clip nut (1).
6. Install the fuel line clips onto the heater and air conditioning evaporator and blower (HVAC) module studs.
7. Reposition the vacuum lines and under the hood wiring harness back to there proper routed position.

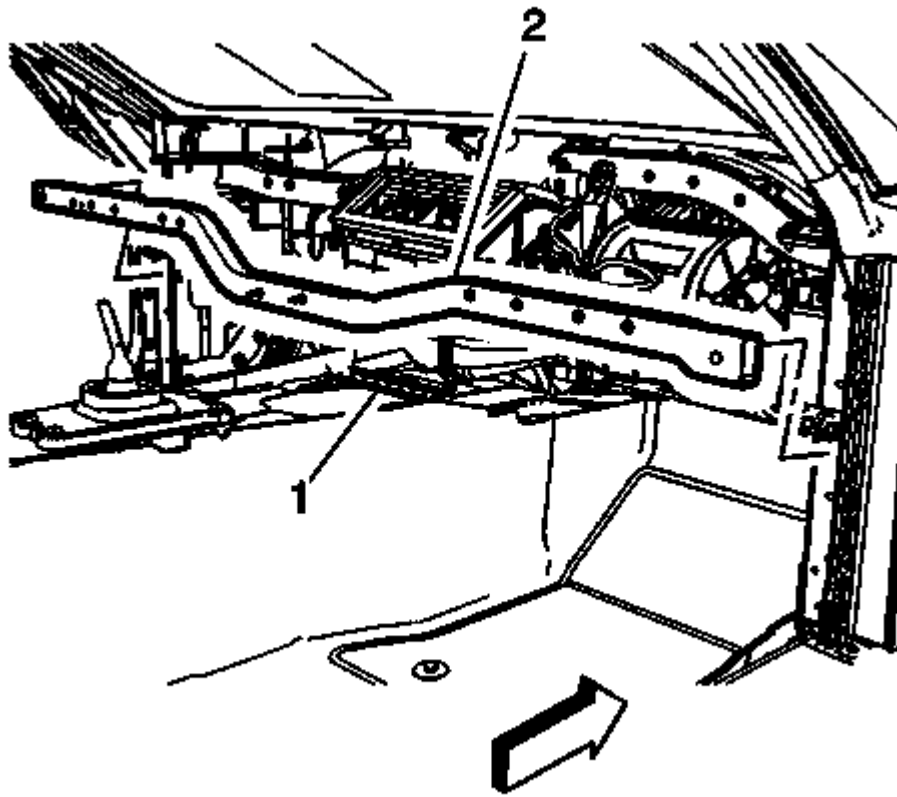


Fig. 53: Instrument Panel Tie Bar
Courtesy of GENERAL MOTORS COMPANY

8. Install the instrument panel tie bar assembly (1). Refer to **Instrument Panel Tie Bar Replacement** .

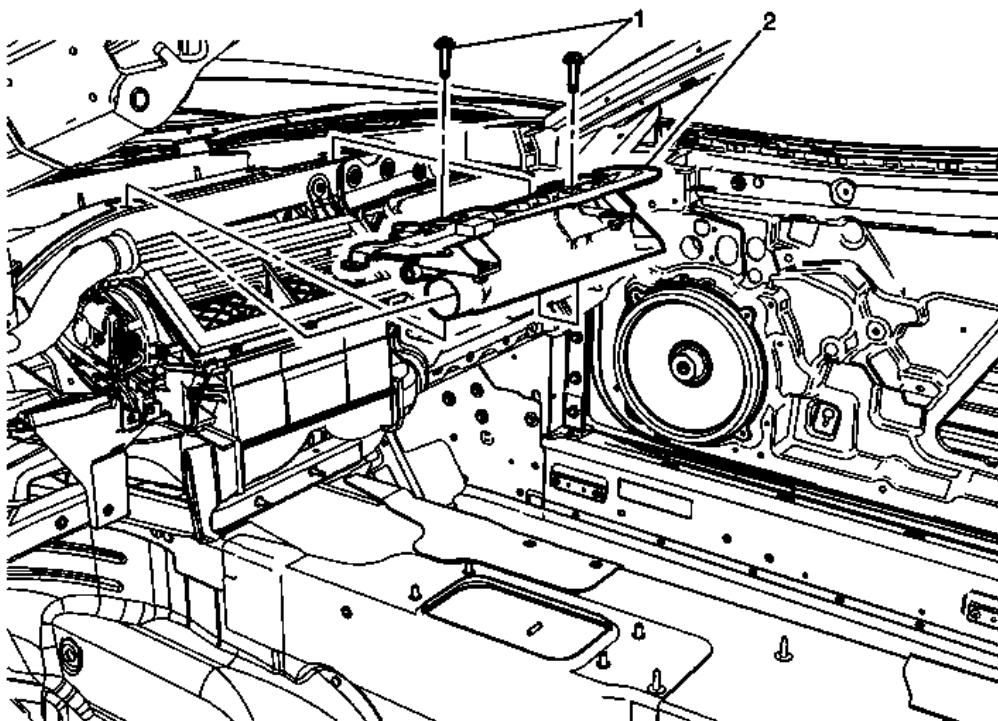


Fig. 54: Windshield Defroster Nozzle
Courtesy of GENERAL MOTORS COMPANY

9. Install the windshield defroster nozzle (2). Refer to **Windshield Defroster Nozzle Replacement**.

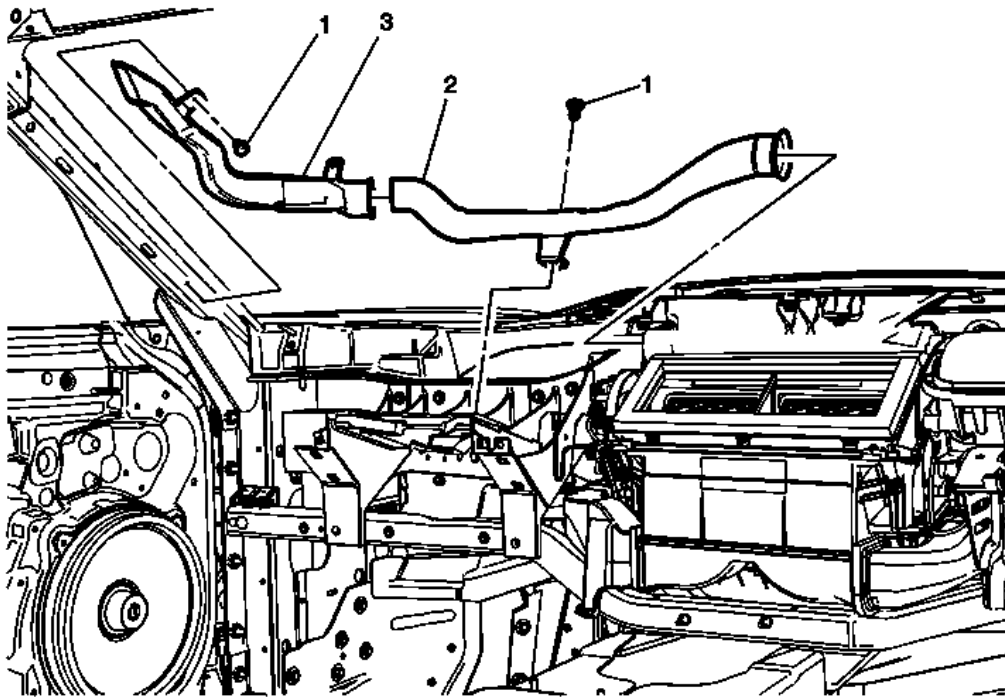


Fig. 55: Left Side Window Defogger Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

10. Install the left side window defogger outlet duct (2). Refer to **Side Window Defogger Outlet Duct Replacement - Left Side**.

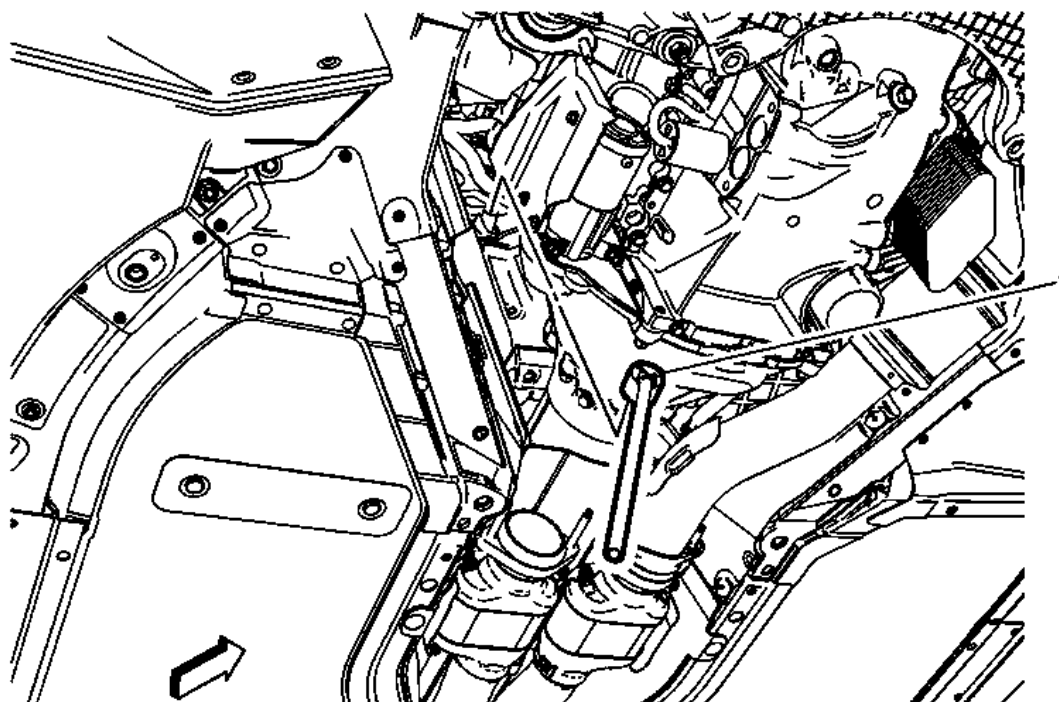


Fig. 56: Air Conditioning Evaporator And Blower Module Drain Tube
Courtesy of GENERAL MOTORS COMPANY

11. Install the air conditioning evaporator and blower module drain tube (1). Refer to **Air Conditioning Evaporator and Blower Module Drain Tube Replacement.**

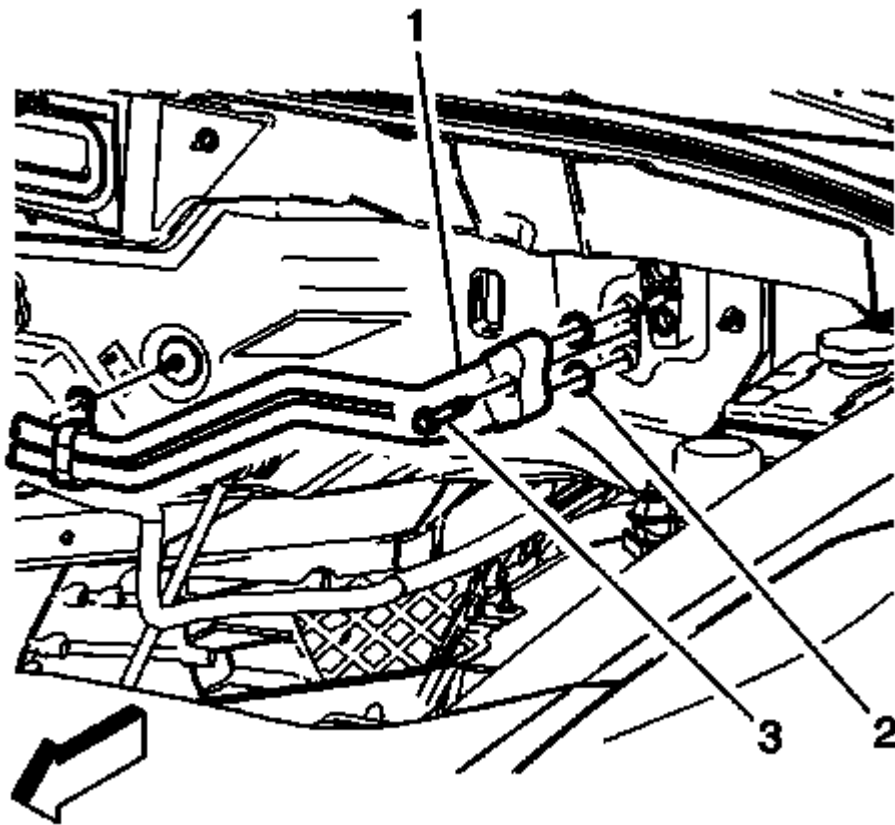


Fig. 57: Heater Inlet And Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

12. Install the heater inlet and outlet pipe (1) onto the heater core. Refer to **Heater Inlet And Outlet Pipe Replacement**.

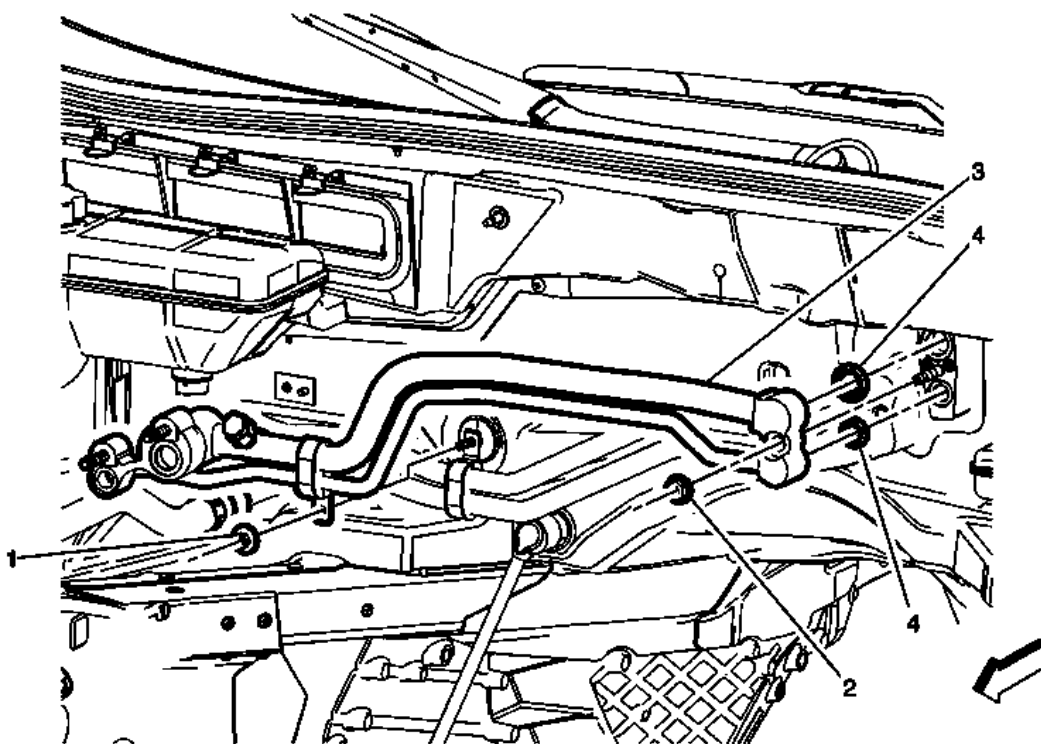


Fig. 58: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

13. Install the air conditioning evaporator thermal expansion valve rear tube (3) onto the air conditioning evaporator thermal expansion valve. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement**.

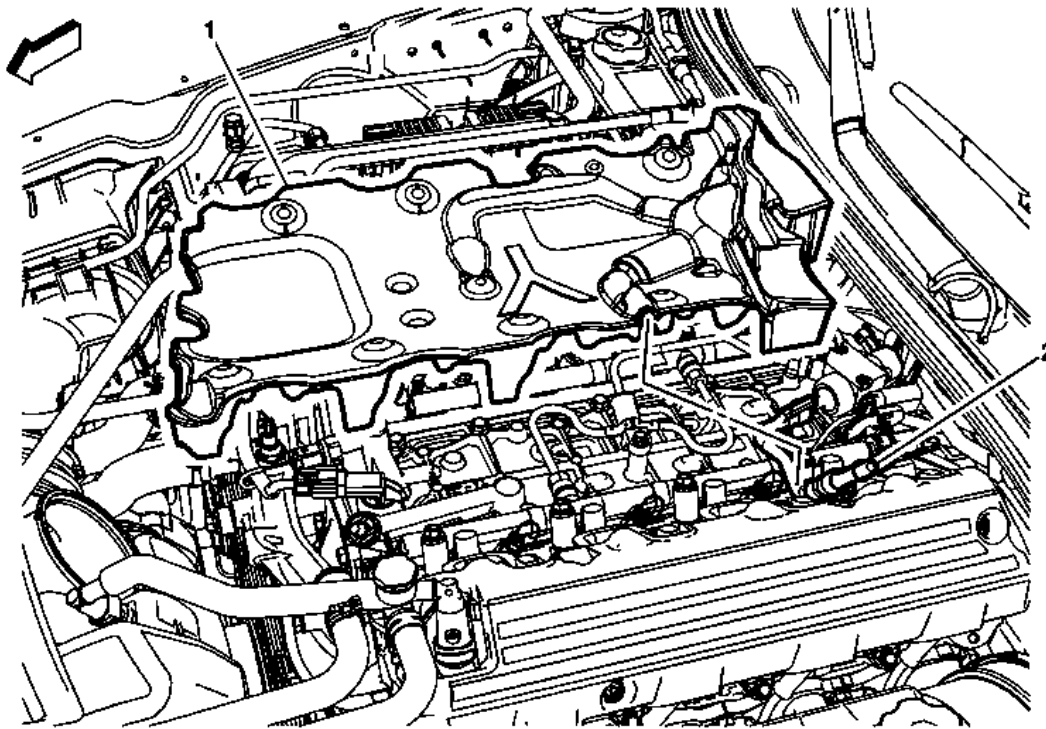


Fig. 59: Fuel Pump Insulator
Courtesy of GENERAL MOTORS COMPANY

14. Install the fuel pump Insulator (1). Refer to **Fuel Pump Insulator Replacement** .

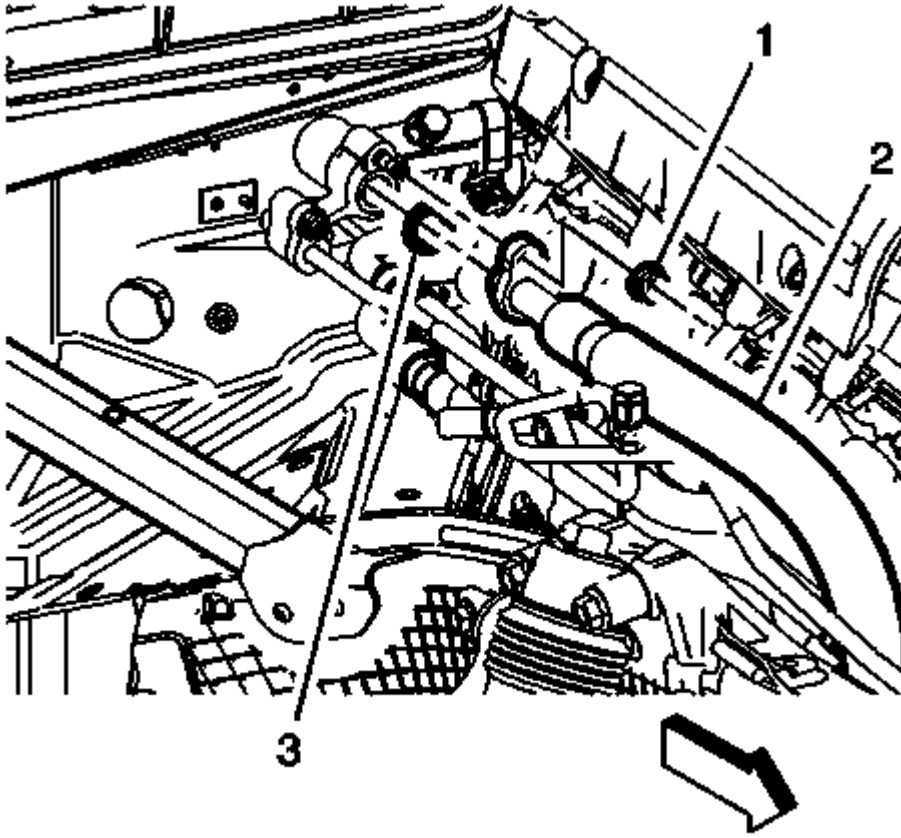


Fig. 60: Air Conditioning Compressor And Condenser Hose Nut And Air Conditioning Compressor And Condenser Hose
Courtesy of GENERAL MOTORS COMPANY

15. Install the air conditioning compressor and condenser hose (2) onto the air conditioning evaporator thermal expansion valve rear tube. Refer to **Air Conditioning Compressor and Condenser Hose Replacement**.

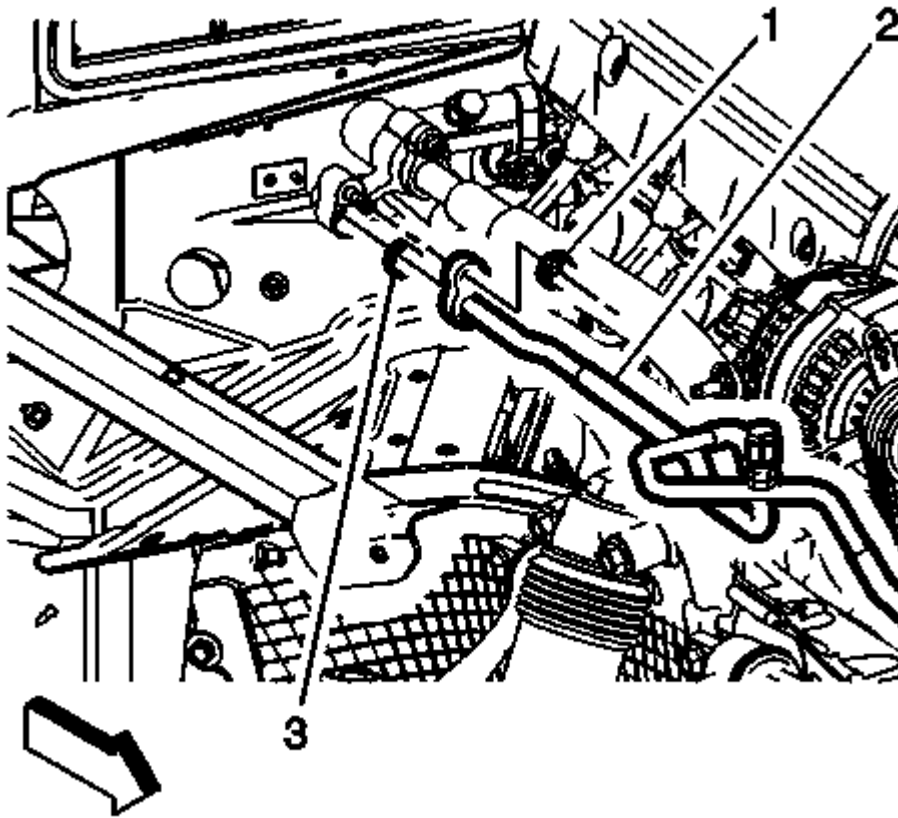


Fig. 61: Air Conditioning Evaporator Nut And Air Conditioning Evaporator Thermal Expansion Valve Front Tube

Courtesy of GENERAL MOTORS COMPANY

16. Install the air conditioning evaporator thermal expansion valve front tube (2) onto the air conditioning evaporator thermal expansion valve rear tube. Refer to **Air Conditioning Evaporator Thermal Expansion Valve Front Tube Replacement**.

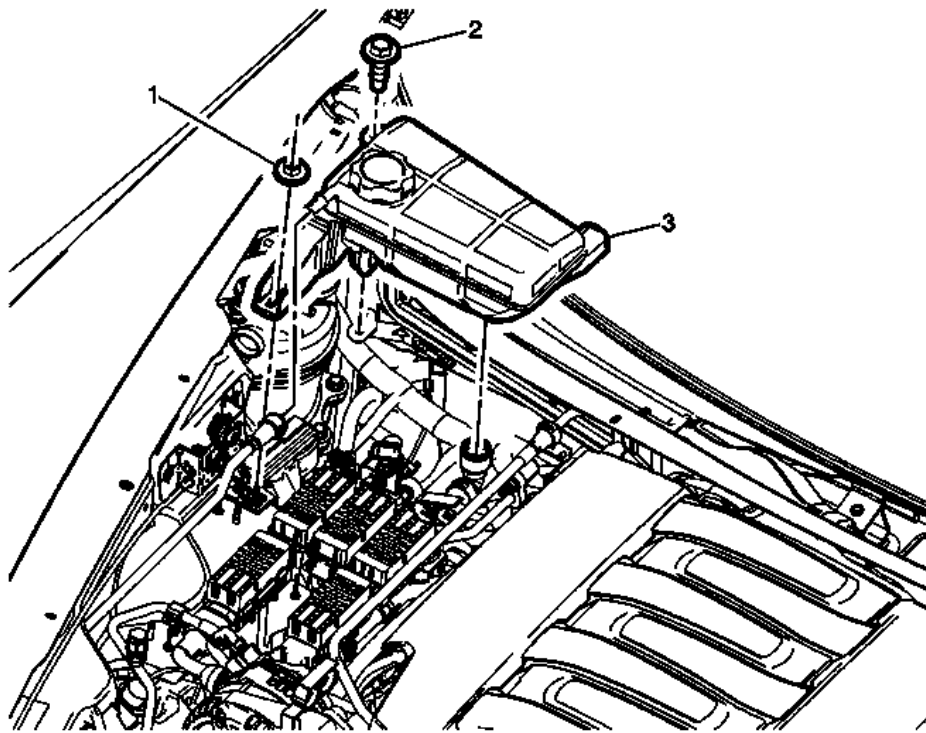


Fig. 62: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

17. Install the radiator surge tank (3). Refer to **Radiator Surge Tank Replacement** .
18. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .
19. Fill the engine coolant system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
20. Recharge the air conditioning refrigerant system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
21. Visually inspect for coolant leaks.
22. Visually inspect for refrigerant leaks.

HEATER LOWER CASE REPLACEMENT

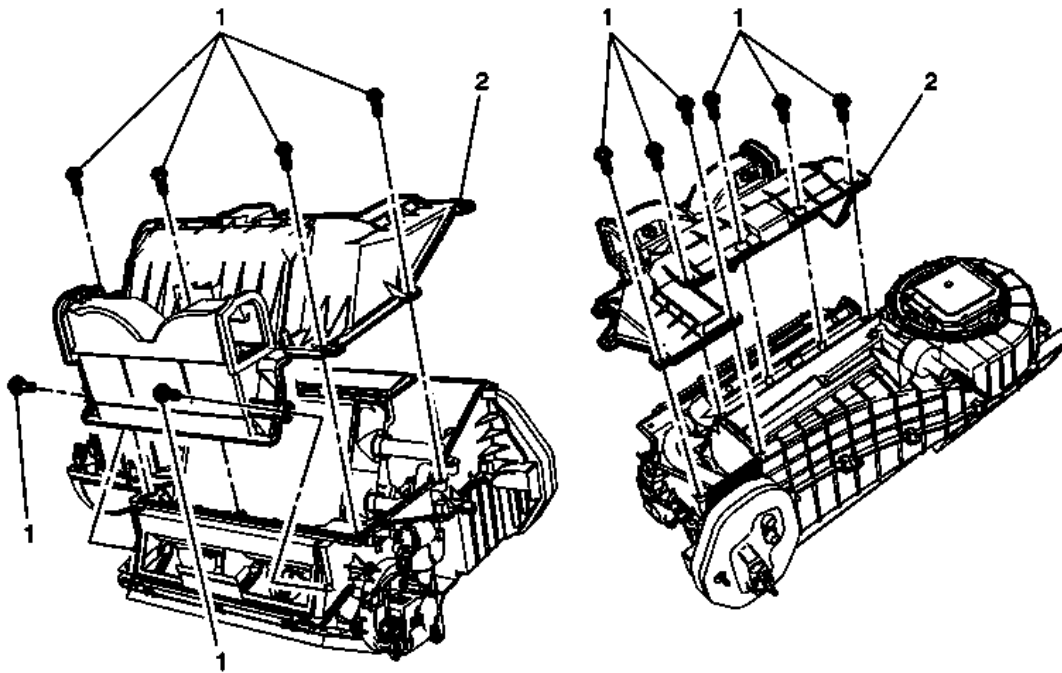


Fig. 63: Heater Lower Case
Courtesy of GENERAL MOTORS COMPANY

Heater Lower Case Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation</u>. 2. Remove the left side floor front air outlet duct. Refer to <u>Floor Front Air Outlet Duct Replacement - Left Side</u>. 3. Remove the right side floor front air outlet duct. Refer to <u>Floor Front Air Outlet Duct Replacement - Right Side</u>.	
1	Heater Lower Case Fastener (Qty: 12) CAUTION: Refer to <u>Fastener Caution</u> .
2	Heater Lower Case Procedure Transfer the components as necessary.

AIR CONDITIONING EVAPORATOR LOWER CASE REPLACEMENT

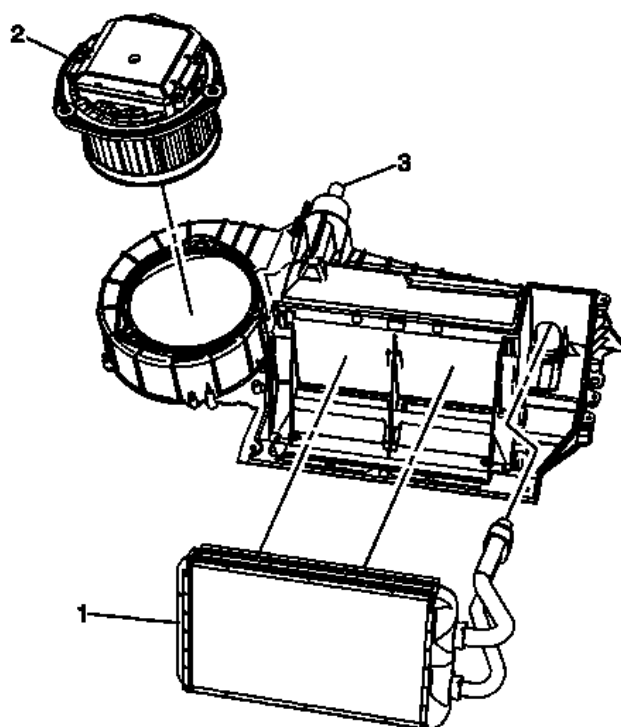


Fig. 64: Air Conditioning Evaporator Lower Case
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Lower Case Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning evaporator core assembly. Refer to <u>Air Conditioning Evaporator Core Replacement (R134a)</u> .	
1	Heater Core Refer to <u>Heater Core Replacement</u> .
2	Blower Motor Assembly Refer to <u>Blower Motor Replacement</u> .
3	Air Conditioning Evaporator Lower Case Procedure Transfer the components as necessary.

AIR CONDITIONING EVAPORATOR UPPER CASE REPLACEMENT

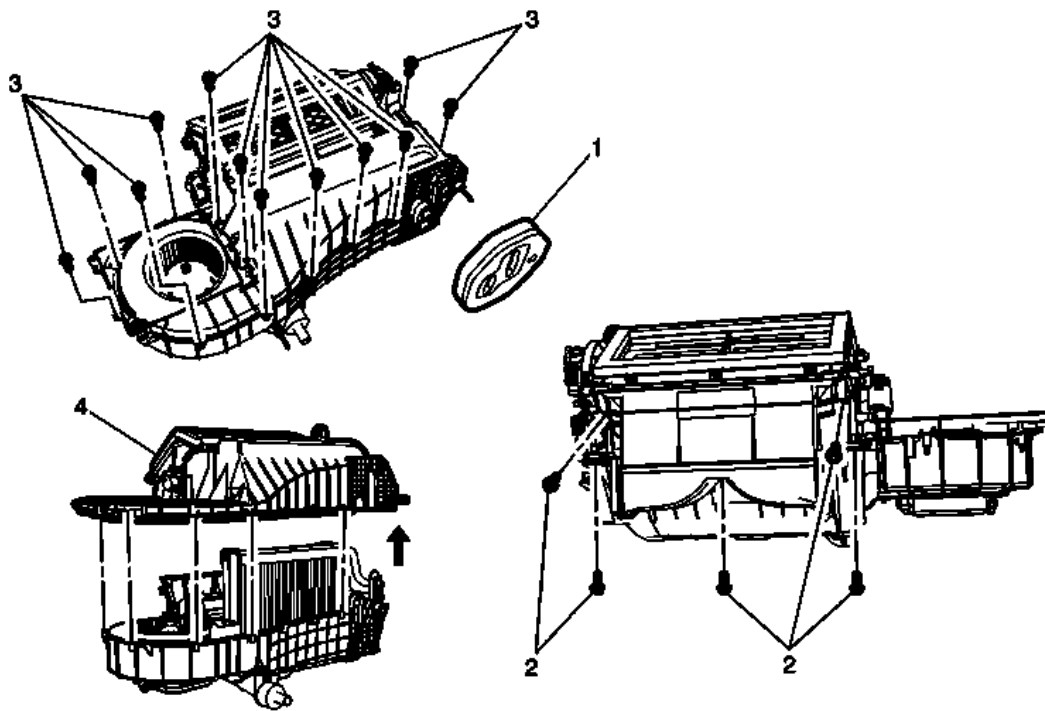


Fig. 65: Air Conditioning Evaporator Upper Case
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Upper Case Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the air inlet housing assembly. Refer to <u>Air Inlet Housing Replacement</u>. 2. Remove the left side floor front air outlet duct. Refer to <u>Floor Front Air Outlet Duct Replacement - Left Side</u>. 3. Remove the right side floor front air outlet duct. Refer to <u>Floor Front Air Outlet Duct Replacement - Right Side</u>.	
1	Heater and Air Conditioning Evaporator Tube Seal
2	Heater Lower Case Fastener (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> .
3	Heater and Air Conditioning Evaporator Upper Case Fastener (Qty: 12)
	Heater and Air Conditioning Evaporator Upper Case Procedures 1. Remove the left side temperature valve actuator. Refer to <u>Temperature</u>

4

2. Remove the right side temperature valve actuator. Refer to **Temperature Valve Actuator Replacement - Right Side** .
3. Remove the mode control cam. Refer to **Mode Control Cam Replacement** .
4. Remove the Air Distributor Case. Refer to **Air Distributor Case Replacement**.
5. Transfer the components as necessary.

AIR CONDITIONING EVAPORATOR CORE REPLACEMENT (R134A)

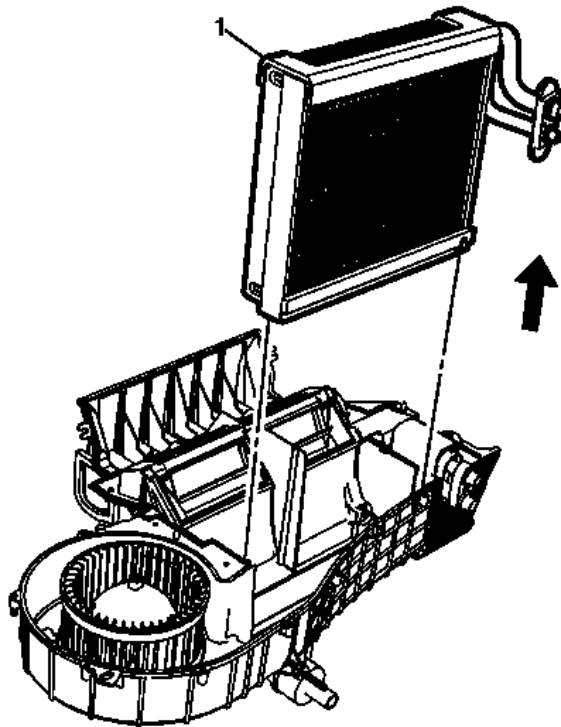


Fig. 66: Air Conditioning Evaporator Core (R134a)
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator Core Replacement (R134a)

Callout	Component Name
Preliminary Procedures	
1. Remove the heater and air conditioning evaporator upper case assembly. Refer to <u>Air Conditioning Evaporator Upper Case Replacement</u>. 2. Remove the air conditioning evaporator thermal expansion valve. Refer to <u>Air Conditioning Evaporator Thermal Expansion Valve Replacement</u>.	
1	Air Conditioning Evaporator Core Procedure Lift the air conditioning evaporator core up and out of the heater and air

AIR CONDITIONING EVAPORATOR AND BLOWER MODULE DRAIN TUBE REPLACEMENT

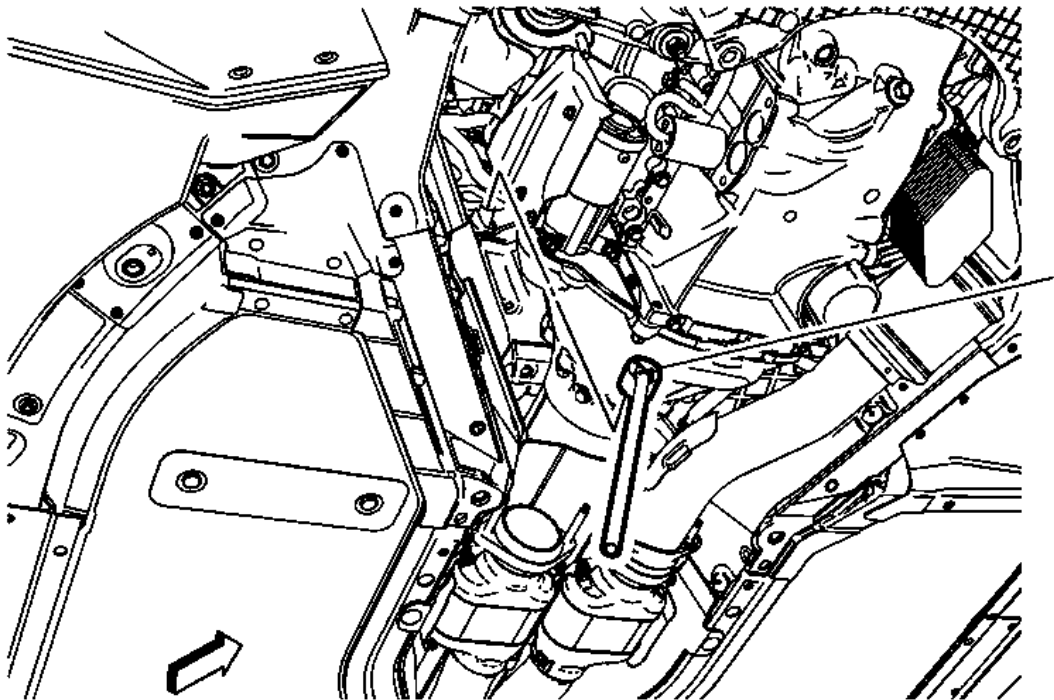


Fig. 67: Air Conditioning Evaporator And Blower Module Drain Tube
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator and Blower Module Drain Tube Replacement

Callout	Component Name
Preliminary Procedure Remove the right side catalytic converter. Refer to <u>Catalytic Converter Replacement - Right Side</u> .	
1	Air Conditioning Evaporator and Blower Module Drain Tube

HEATER INLET AND OUTLET HOSE REPLACEMENT

Removal Procedure

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

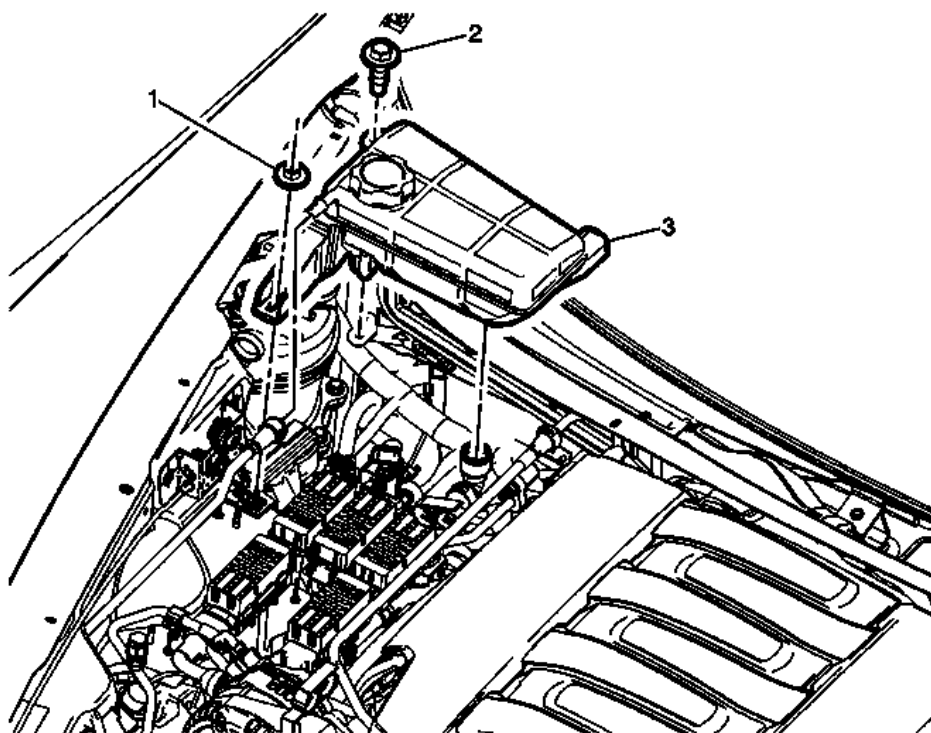


Fig. 68: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

3. Remove the radiator surge tank (3). Refer to **Radiator Surge Tank Replacement** .
4. Remove the generator. Refer to **Generator Replacement (LT1)** .

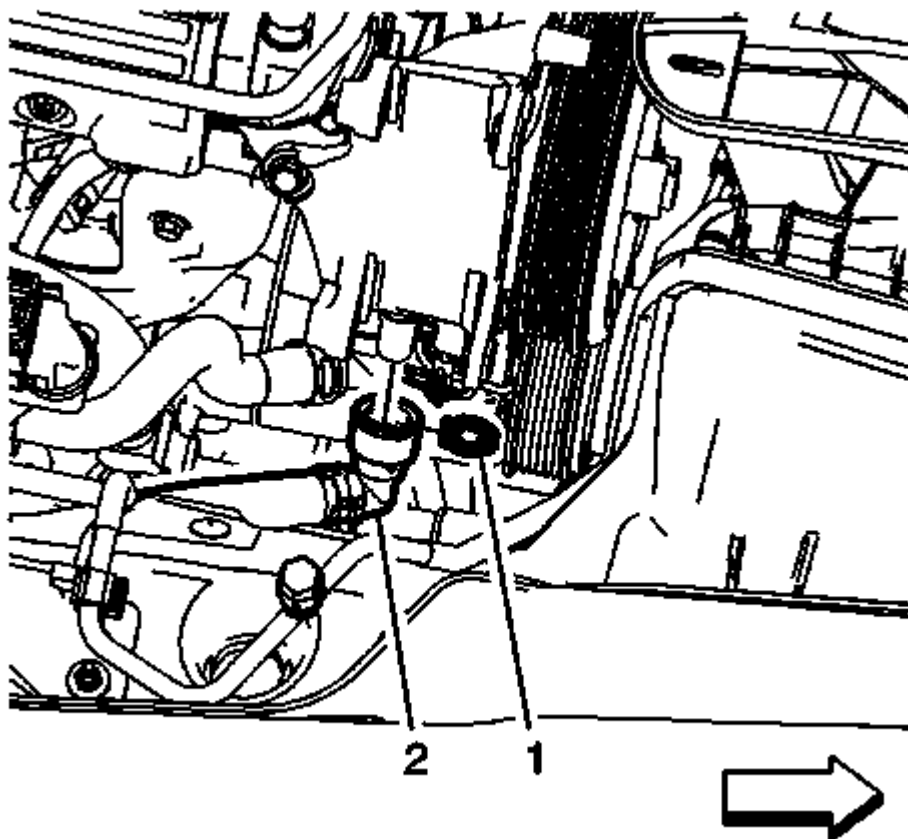


Fig. 69: Retaining Ring And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Remove the retaining ring (1) from the heater inlet hose (2).
6. Remove the heater inlet hose (2) from the water pump.

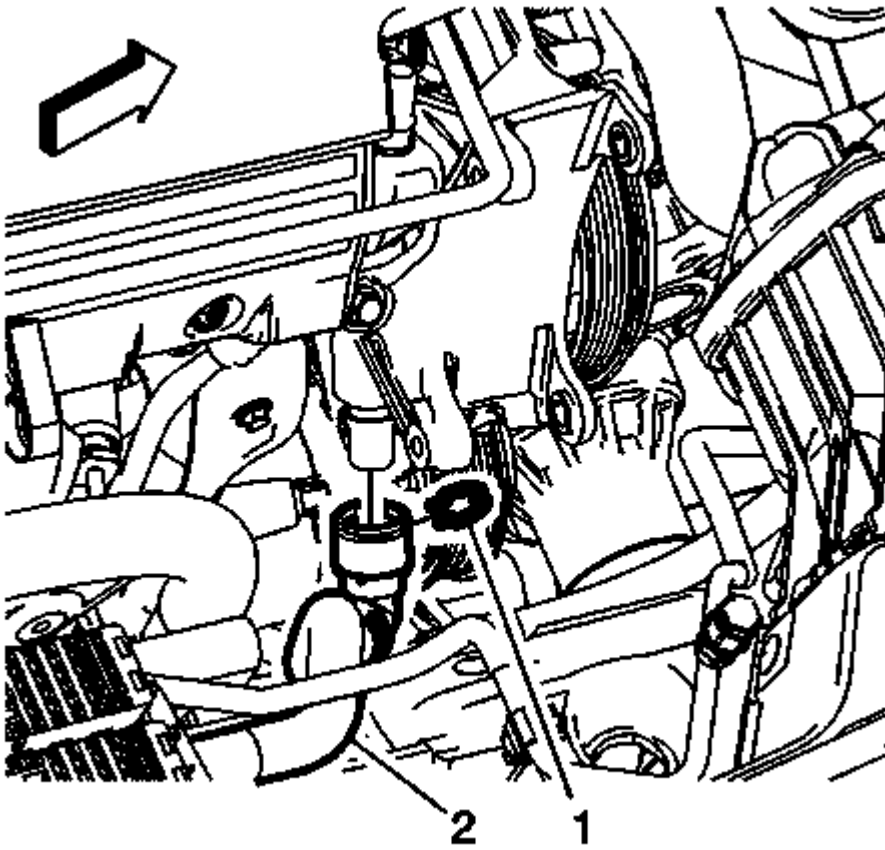


Fig. 70: Retaining Ring And Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Remove the retaining ring (1) from the heater outlet hose (2).
8. Remove the heater outlet hose (2) from the water pump.

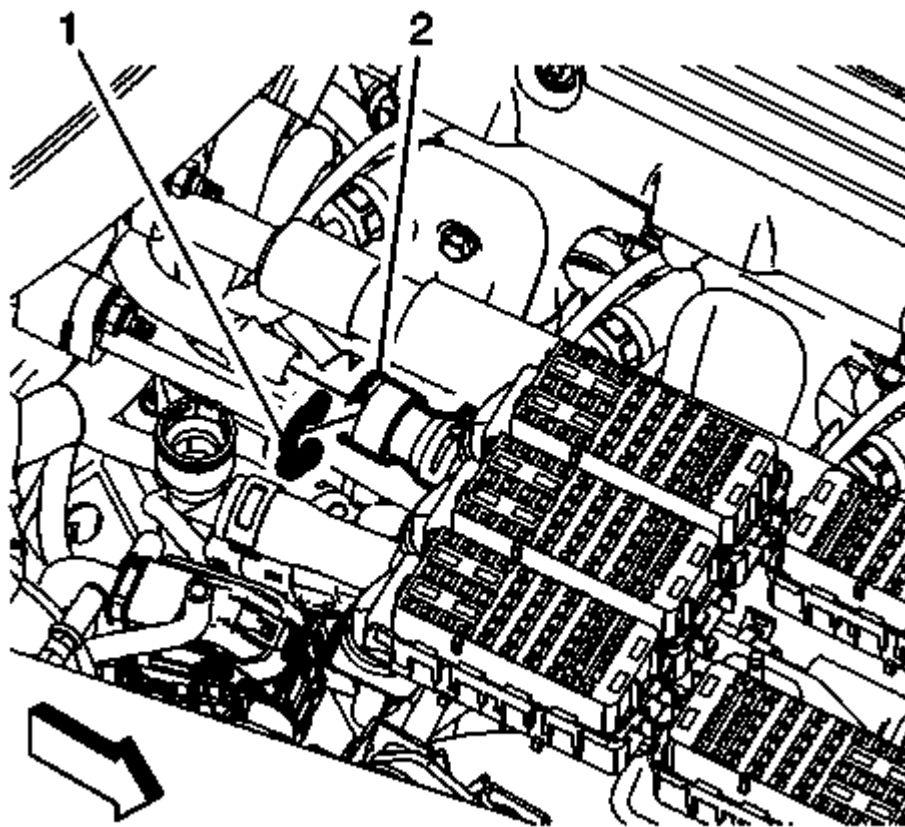


Fig. 71: Retaining Ring And Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

9. Remove the retaining ring (1) from the heater outlet hose (2).
10. Remove the heater outlet hose (2) from the heater inlet and outlet pipe.

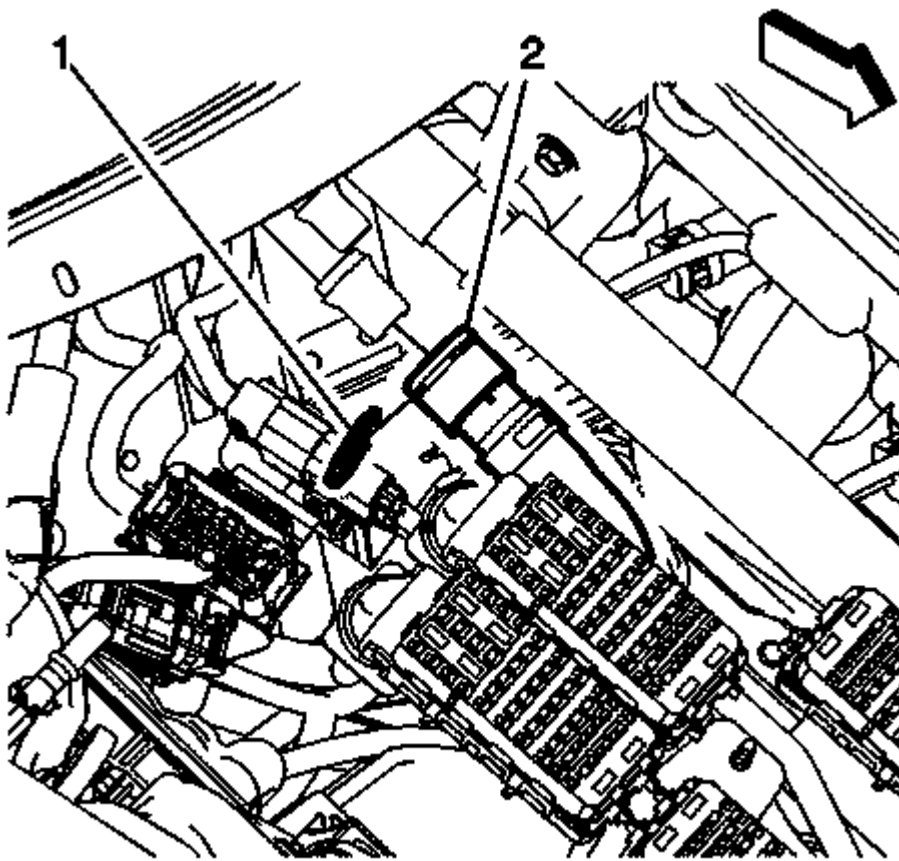


Fig. 72: Retaining Ring And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

11. Remove the retaining ring (1) from the heater inlet hose (2).
12. Remove the heater inlet hose (2) from the heater inlet and outlet pipe.

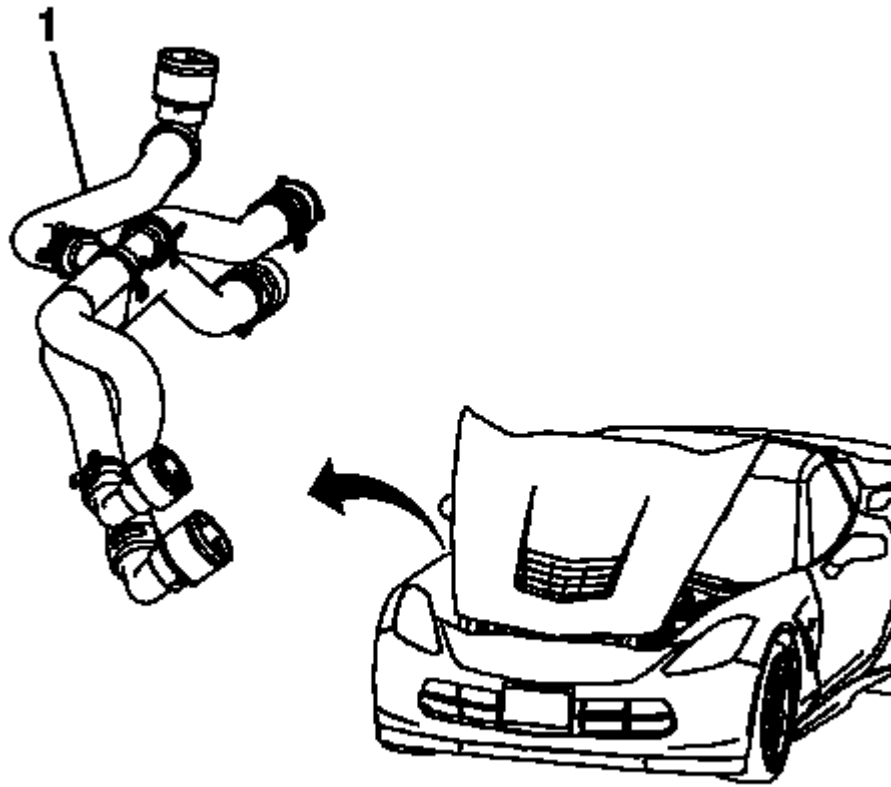


Fig. 73: Heater Inlet And Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

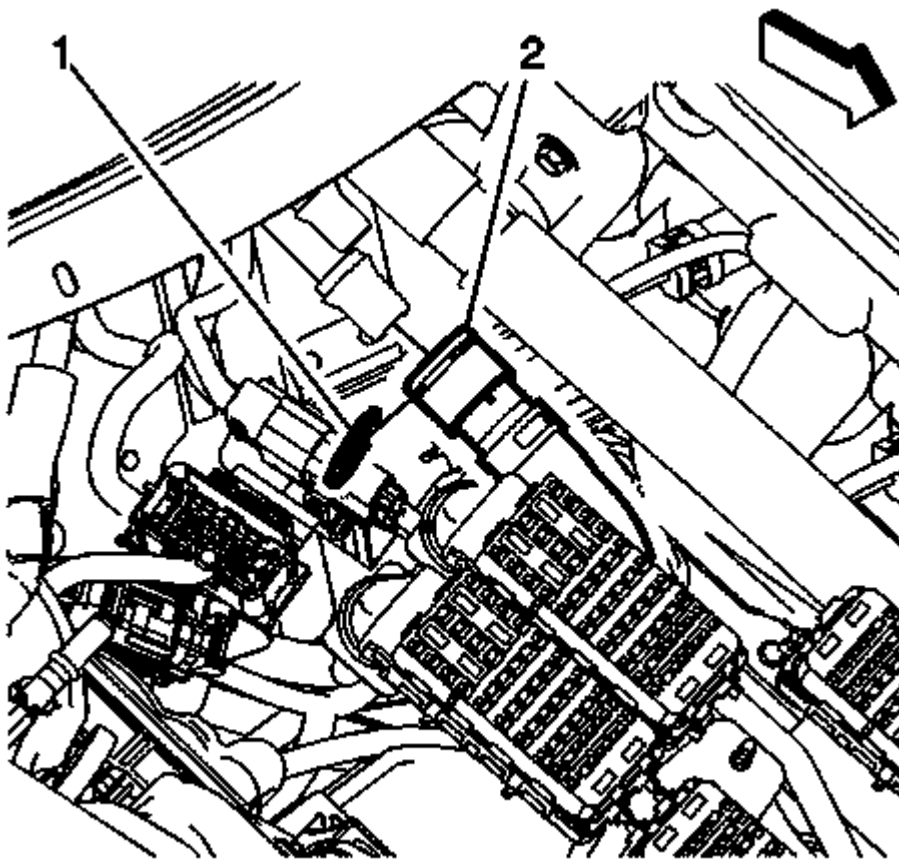


Fig. 74: Retaining Ring And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

1. Install the heater inlet and outlet hose (2) to the vehicle.
2. Install the heater inlet hose (2) to the heater inlet and outlet pipe.
3. Install the retaining ring (1) to the heater inlet hose (2).

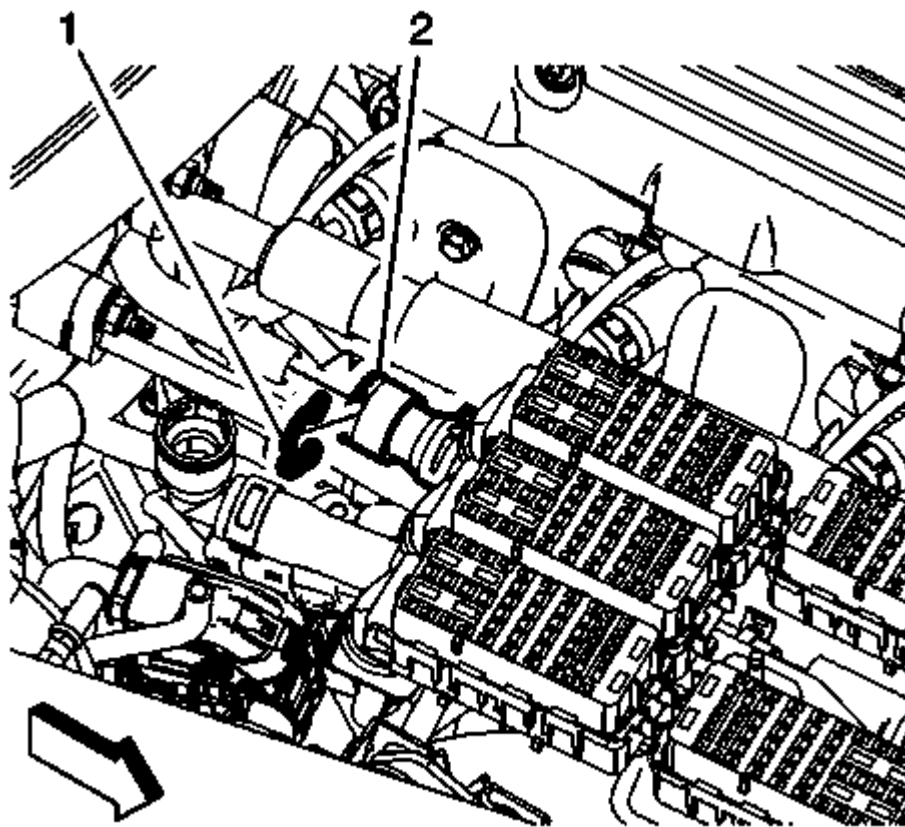


Fig. 75: Retaining Ring And Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Install the heater outlet hose (2) to the heater inlet and outlet pipe.
5. Install the retaining ring (1) to the heater outlet hose (2).

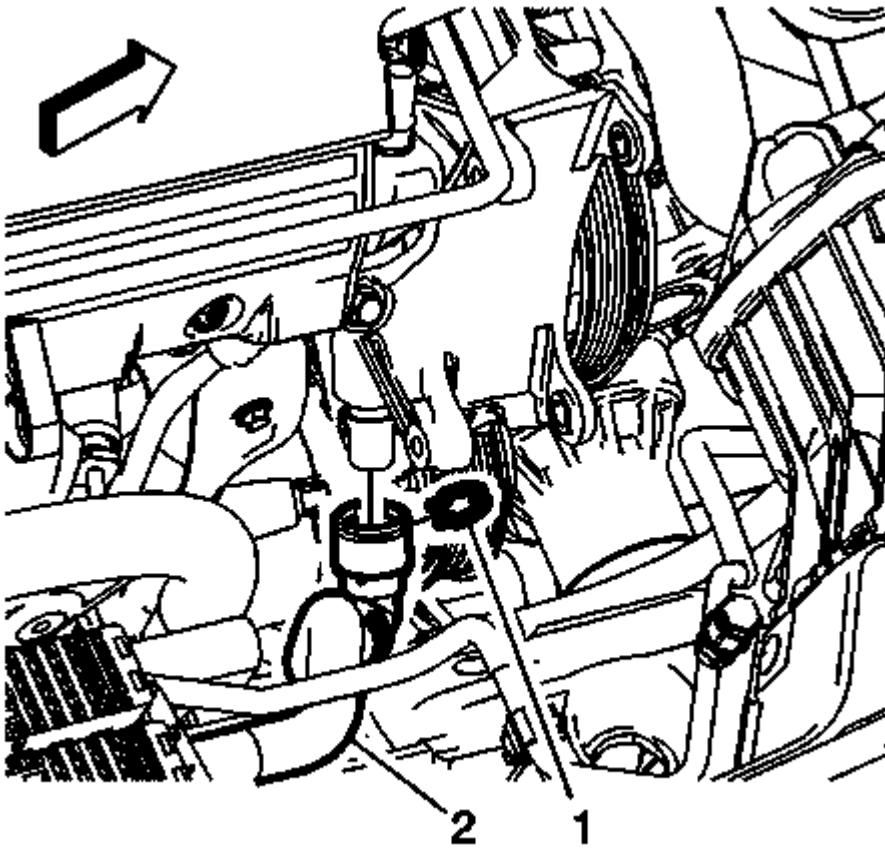


Fig. 76: Retaining Ring And Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

6. Install the heater outlet hose (2) to the water pump.
7. Install the retaining ring (1) to the heater outlet hose (2).

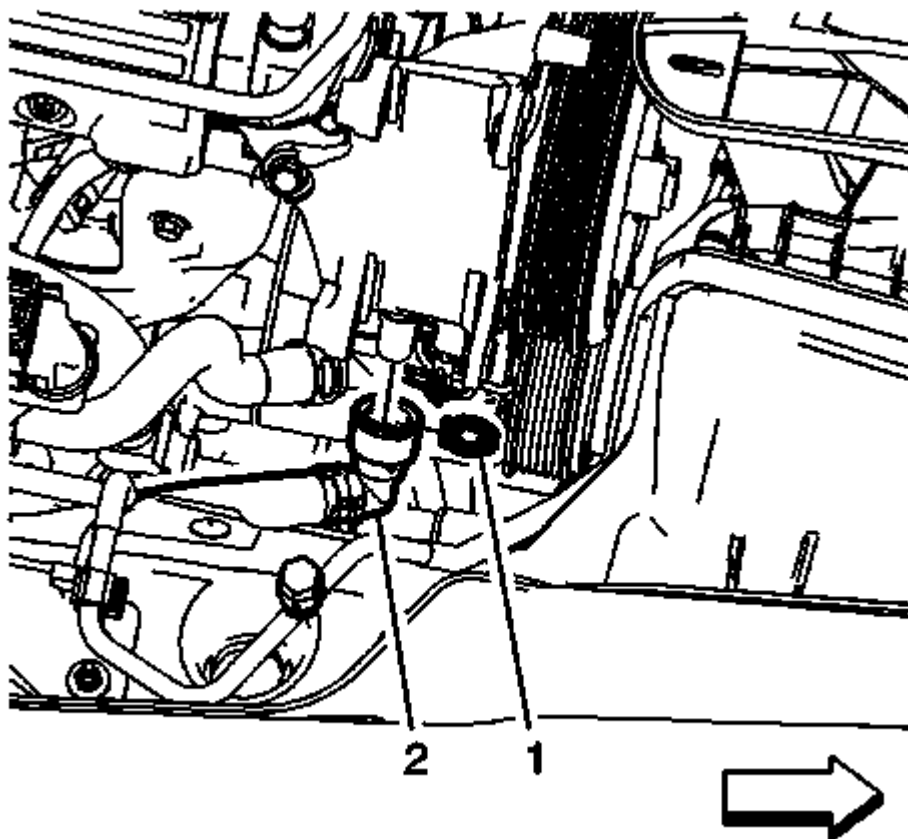


Fig. 77: Retaining Ring And Heater Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

8. Install the heater inlet hose (2) to the water pump.
9. Install the retaining ring (1) to the heater inlet hose (2).
10. Install the generator. Refer to **Generator Replacement (LT1)** .

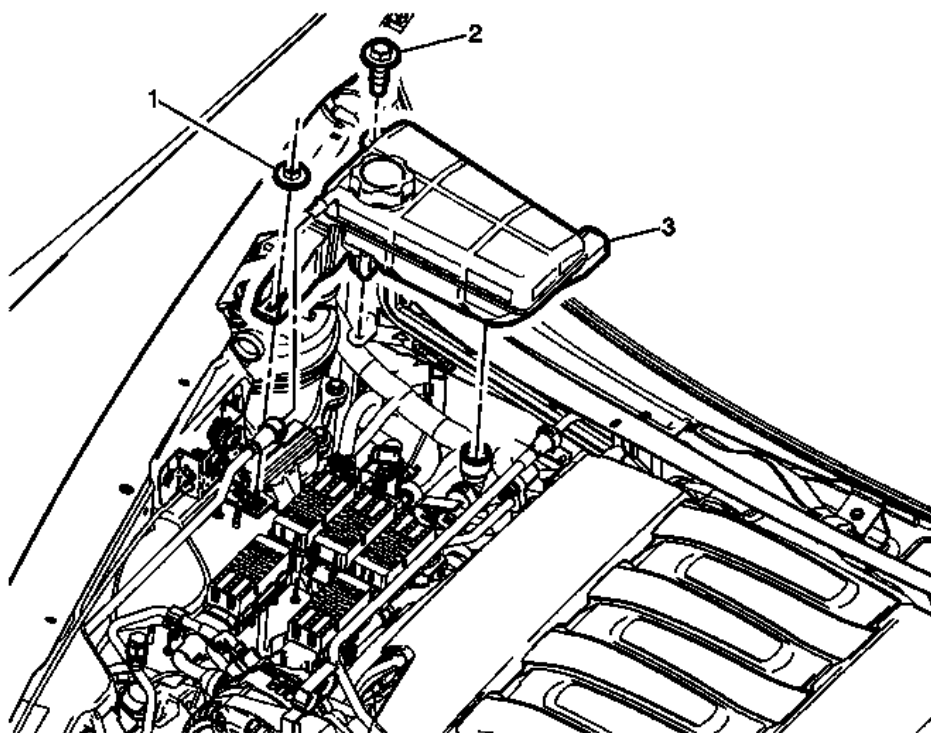


Fig. 78: Radiator Surge Tank
Courtesy of GENERAL MOTORS COMPANY

11. Install the radiator surge tank (3). Refer to **Radiator Surge Tank Replacement** .
12. Fill the cooling system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
13. Check the cooling system for leaks.

HEATER INLET AND OUTLET PIPE REPLACEMENT

Removal Procedure

1. Recover the refrigerant from the air conditioning system. Refer to **Refrigerant Recovery and Recharging (LT1)**.
2. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static Fill)** , **Cooling System Draining and Filling (GE 47716)** .
3. Remove the intake manifold. Refer to **Intake Manifold Replacement** .
4. Install the engine support fixture and lower the engine and front cradle enough to gain access to the heater inlet and outlet pipe. Refer to **Front Cradle Replacement** .

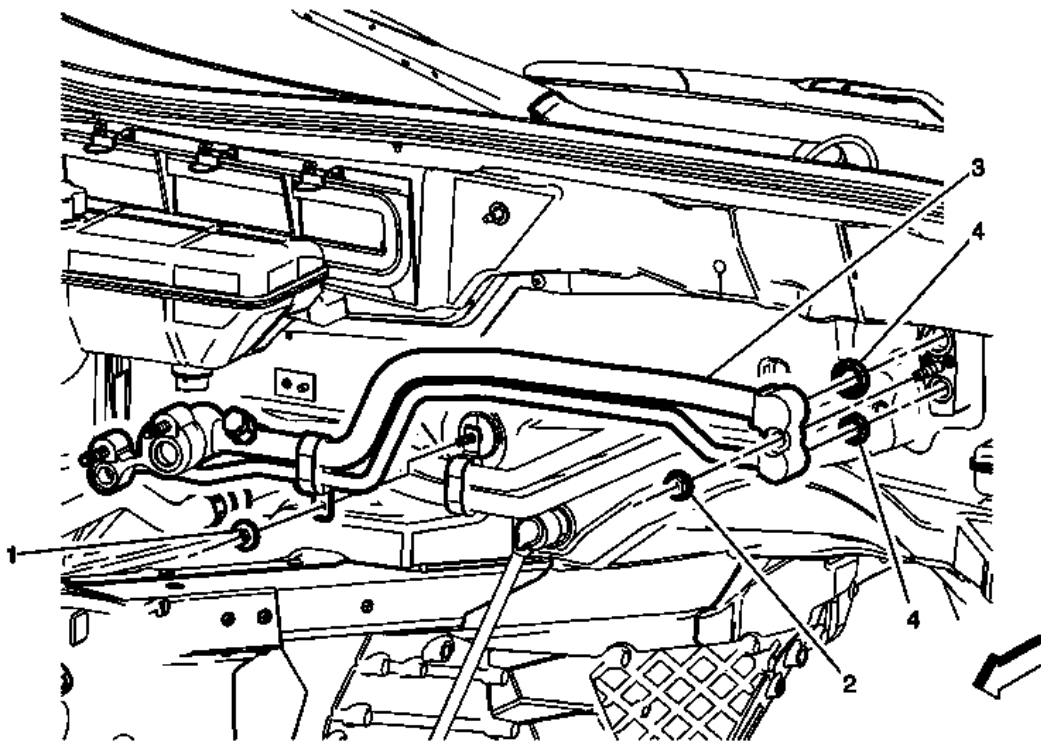


Fig. 79: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

5. Remove the air conditioning evaporator thermal expansion valve rear tube (3). Refer to **Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement.**

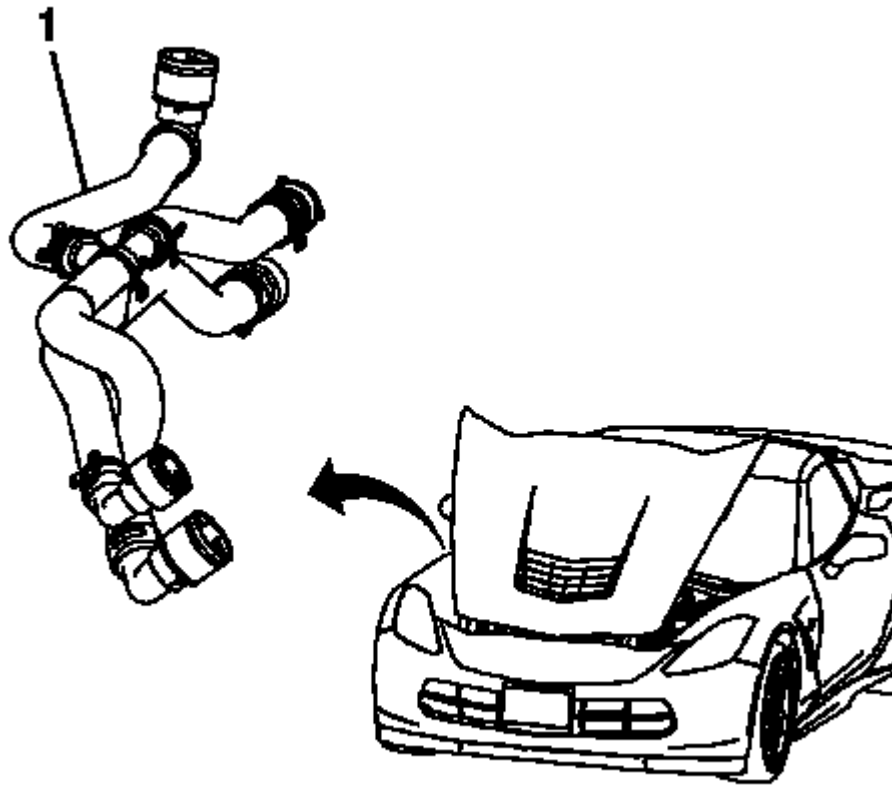


Fig. 80: Heater Inlet And Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

6. Remove the heater inlet and outlet hose (1) from the heater inlet and outlet pipe. Refer to **Heater Inlet and Outlet Hose Replacement**.

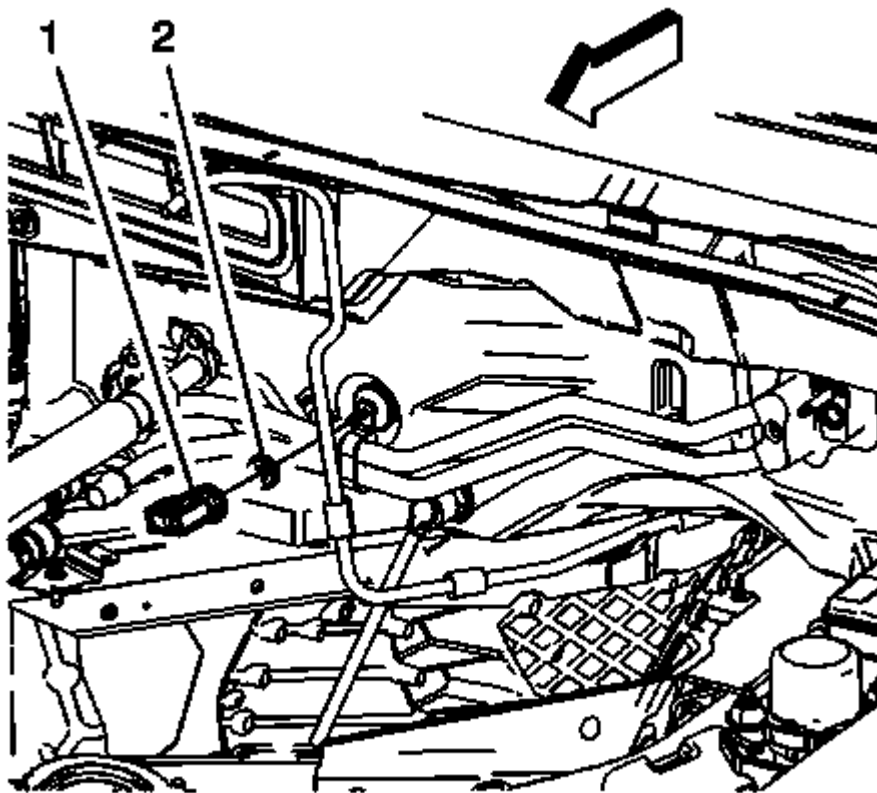


Fig. 81: Evaporative Emission Pipe Retainer
Courtesy of GENERAL MOTORS COMPANY

7. Remove the fuel feed and fuel return and evaporative emission pipe retainer (1) from the heater inlet and outlet pipe mounting nut.
8. Remove the heater inlet and outlet pipe mounting nut (2).

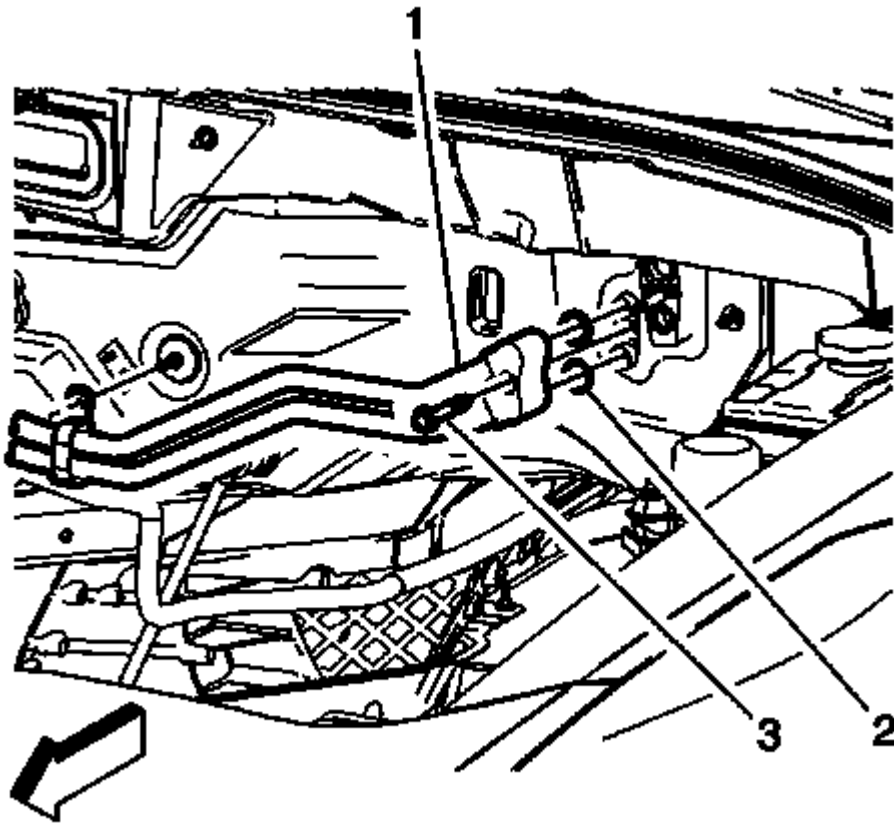


Fig. 82: Heater Inlet And Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Remove the heater inlet and outlet pipe bolt (3).
10. Remove the heater inlet and outlet pipe (1).
11. Remove the heater core pipe seals (2) and discard the old heater core pipe seals.
12. Remove the heater inlet and outlet pipe (1) from the vehicle.

Installation Procedure

1. Using a lint-free clean, dry cloth, carefully clean the sealing surfaces of the heater pipe assembly and the heater core.

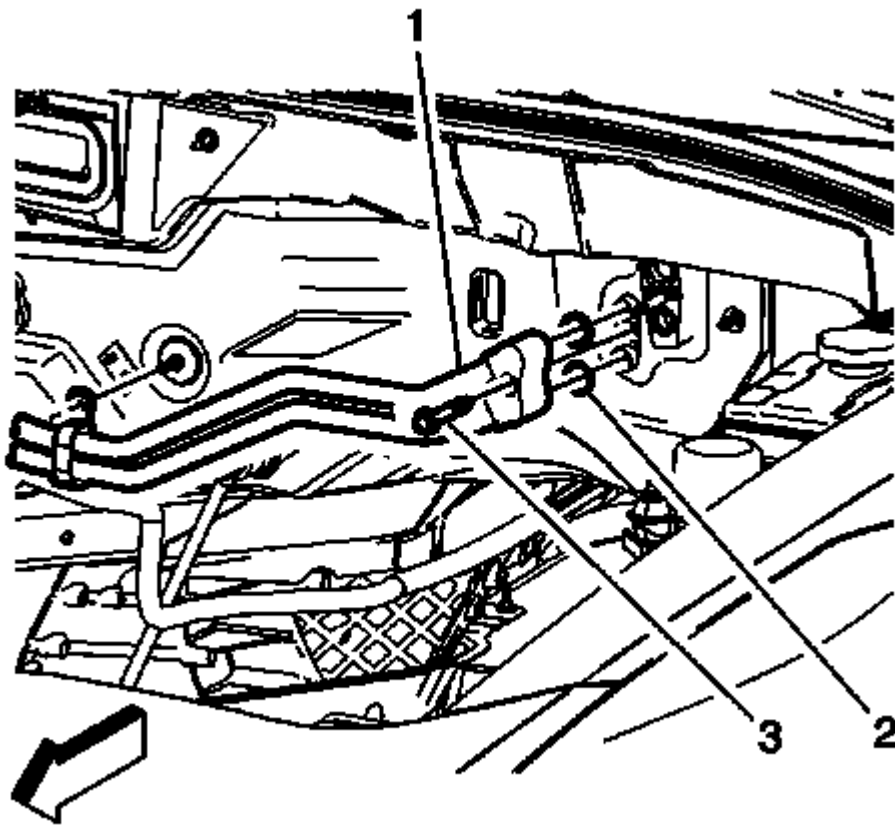


Fig. 83: Heater Inlet And Outlet Pipe
Courtesy of GENERAL MOTORS COMPANY

2. Install NEW heater core pipe seals (2) to the heater core.
3. Install the heater inlet and outlet pipe (1) to the vehicle.

CAUTION: Refer to Fastener Caution .

4. Install the heater inlet and outlet pipe bolt (3) and tighten to 12 (106 lb in).

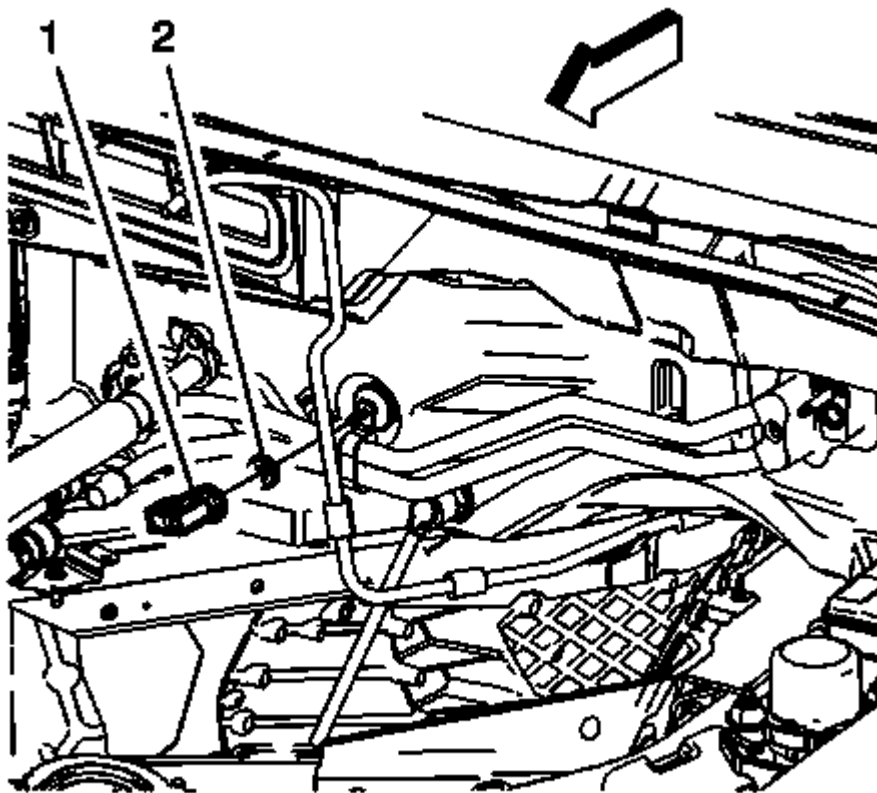


Fig. 84: Evaporative Emission Pipe Retainer
Courtesy of GENERAL MOTORS COMPANY

5. Install the heater inlet and outlet pipe mounting nut (2) and tighten to 12 (106 lb in).
6. Install the fuel feed and fuel return and evaporative emission pipe retainer (1) to the heater inlet and outlet pipe mounting nut.

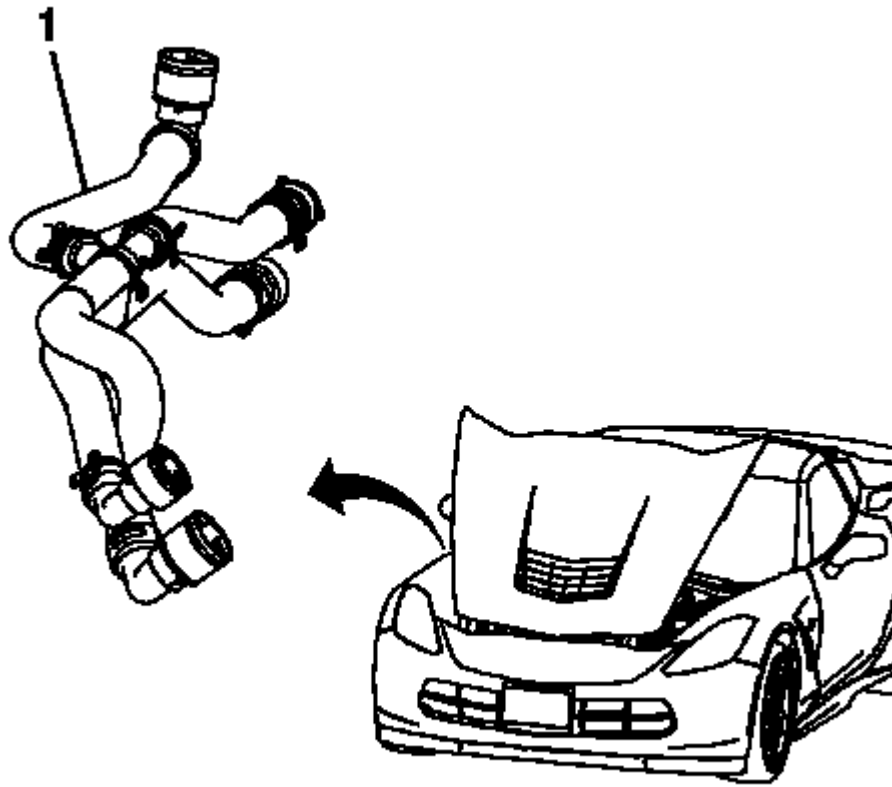


Fig. 85: Heater Inlet And Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

7. Install the heater inlet and outlet hose (1) to the heater inlet and outlet pipe. Refer to **Heater Inlet and Outlet Hose Replacement**.

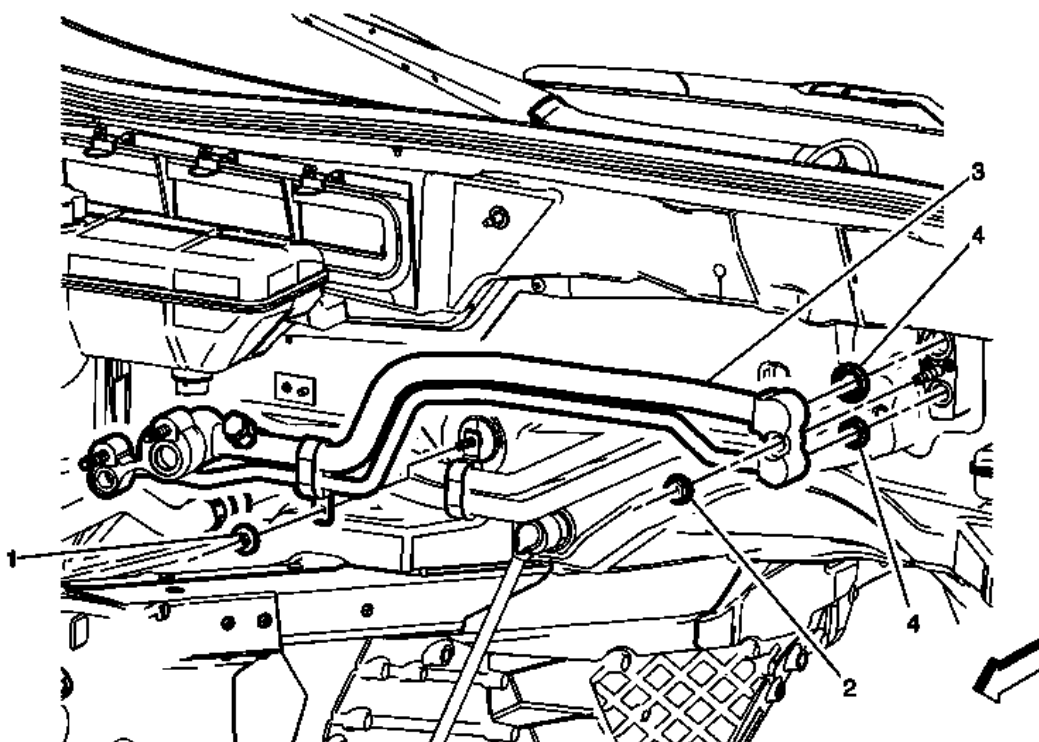


Fig. 86: Air Conditioning Evaporator Thermal Expansion Valve Rear Tube
Courtesy of GENERAL MOTORS COMPANY

8. Install the air conditioning evaporator thermal expansion valve rear tube (3). Refer to **Air Conditioning Evaporator Thermal Expansion Valve Rear Tube Replacement**.
9. Raise the engine and cradle into position and remove the engine support fixture. Refer to **Front Cradle Replacement**.
10. Install the intake manifold. Refer to **Intake Manifold Replacement**.
11. Fill the cooling system. Refer to **Cooling System Draining and Filling (Static Fill)**, **Cooling System Draining and Filling (GE 47716)**.
12. Check the cooling system for leaks.
13. Evacuate and charge the A/C system. Refer to **Refrigerant Recovery and Recharging (LT1)**.

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

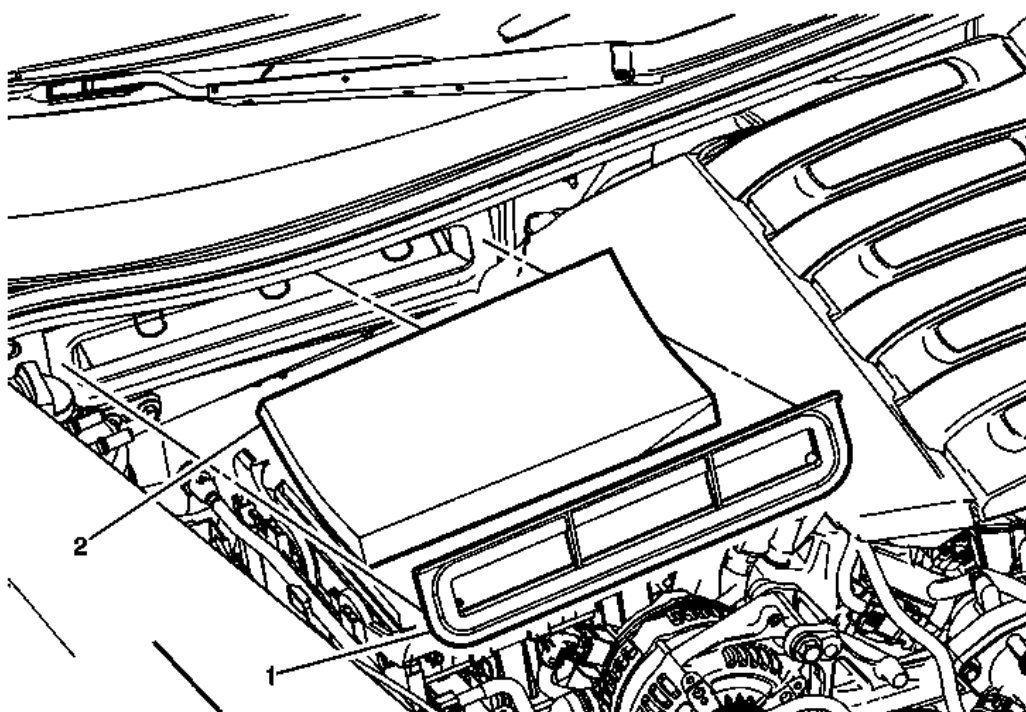


Fig. 87: Passenger Compartment Air Filter
 Courtesy of GENERAL MOTORS COMPANY

Passenger Compartment Air Filter Replacement

Callout	Component Name
1	Passenger Compartment Air Filter Cover Assembly Procedure Unlatch the air filter access hole cover clips from the passenger compartment air filter cover.
2	Passenger Compartment Air Filter

AIR INLET HOUSING REPLACEMENT

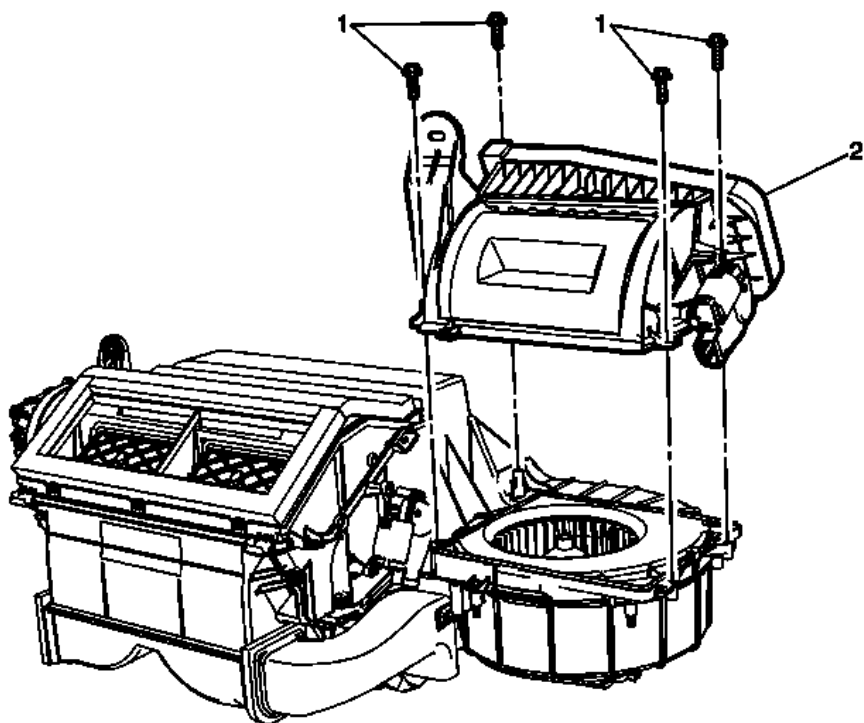


Fig. 88: Air Inlet Housing
 Courtesy of GENERAL MOTORS COMPANY

Air Inlet Housing Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Air Inlet Housing Fastener (Qty: 4) CAUTION: Refer to Fastener Caution .
2	Air Inlet Housing Procedures 1. Remove the air inlet valve actuator. Refer to Air Inlet Valve Actuator Replacement . 2. Transfer the components as necessary.

BLOWER MOTOR REPLACEMENT

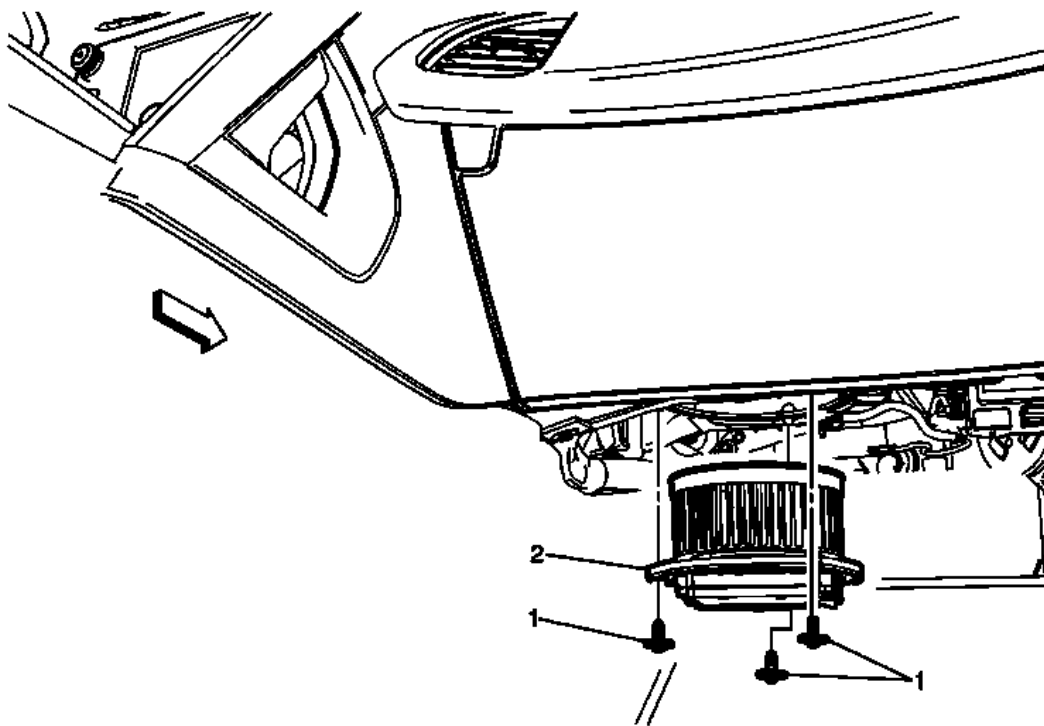


Fig. 89: Blower Motor
 Courtesy of GENERAL MOTORS COMPANY

Blower Motor Replacement

Callout	Component Name
Preliminary Procedure Remove the right side instrument panel insulator panel. Refer to <u>Instrument Panel Insulator Panel Replacement - Right Side</u> .	
1	Blower Motor Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> .
2	Blower Motor Assembly Procedure Disconnect the blower motor electrical connector.

AIR DISTRIBUTOR CASE REPLACEMENT

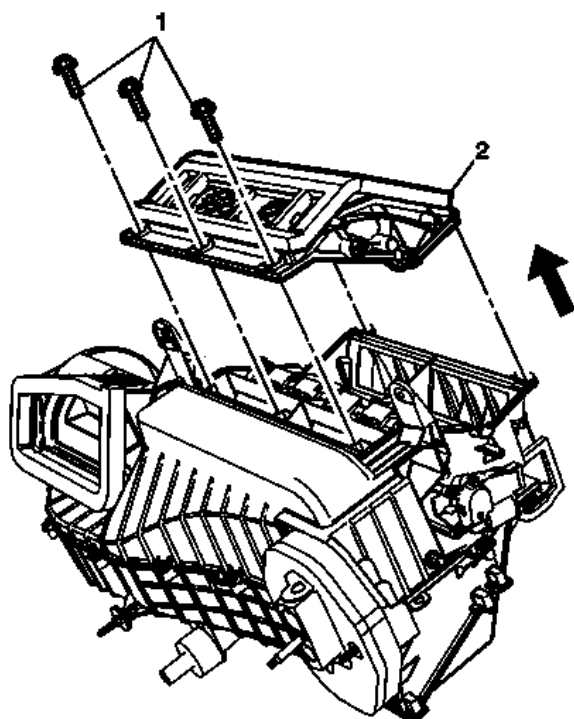


Fig. 90: Air Distributor Case
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Case Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the heater and air conditioning evaporator and blower module assembly. Refer to <u>Heater and Air Conditioning Evaporator and Blower Module Removal and Installation</u> . 2. Remove the mode control cam. Refer to <u>Mode Control Cam Replacement</u> .	
1	Air Distributor Case Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> .
2	Air Distributor Case Procedure Transfer the components as necessary.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - LEFT SIDE

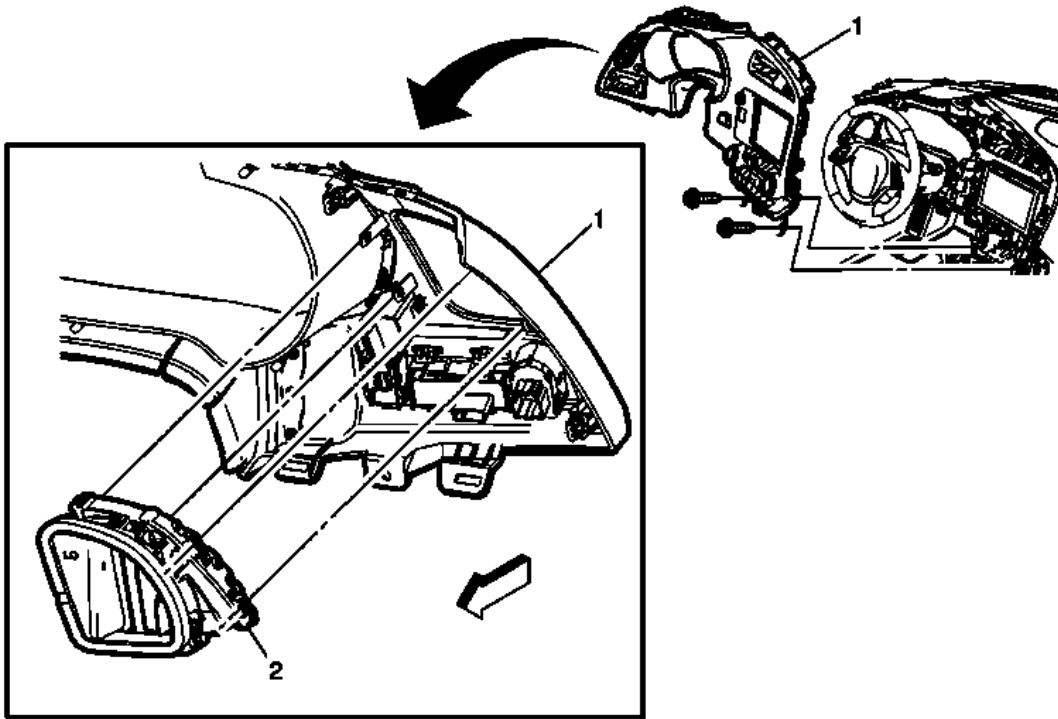


Fig. 91: Instrument Panel Outer Air Outlet - Left Side
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Replacement - Left Side

Callout	Component Name
1	Instrument Panel Trim Plate Refer to <u>Instrument Panel Trim Plate Replacement</u> .
2	Instrument Panel Outer Air Outlet - Left Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the outer air outlet from the instrument panel trim plate.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT - LEFT SIDE

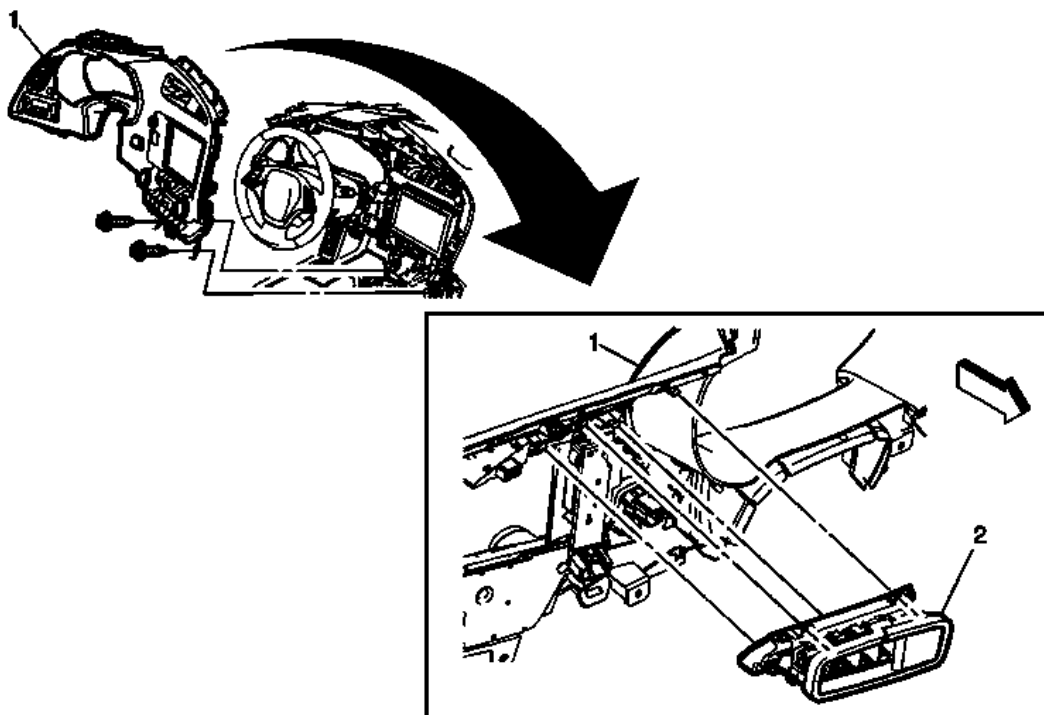


Fig. 92: Instrument Panel Center Air Outlet - Left Side
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Center Air Outlet Replacement - Left Side

Callout	Component Name
1	Instrument Panel Trim Plate Refer to Instrument Panel Trim Plate Replacement .
2	Instrument Panel Center Air Outlet - Left Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the center air outlet from the instrument panel trim plate.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT - RIGHT SIDE

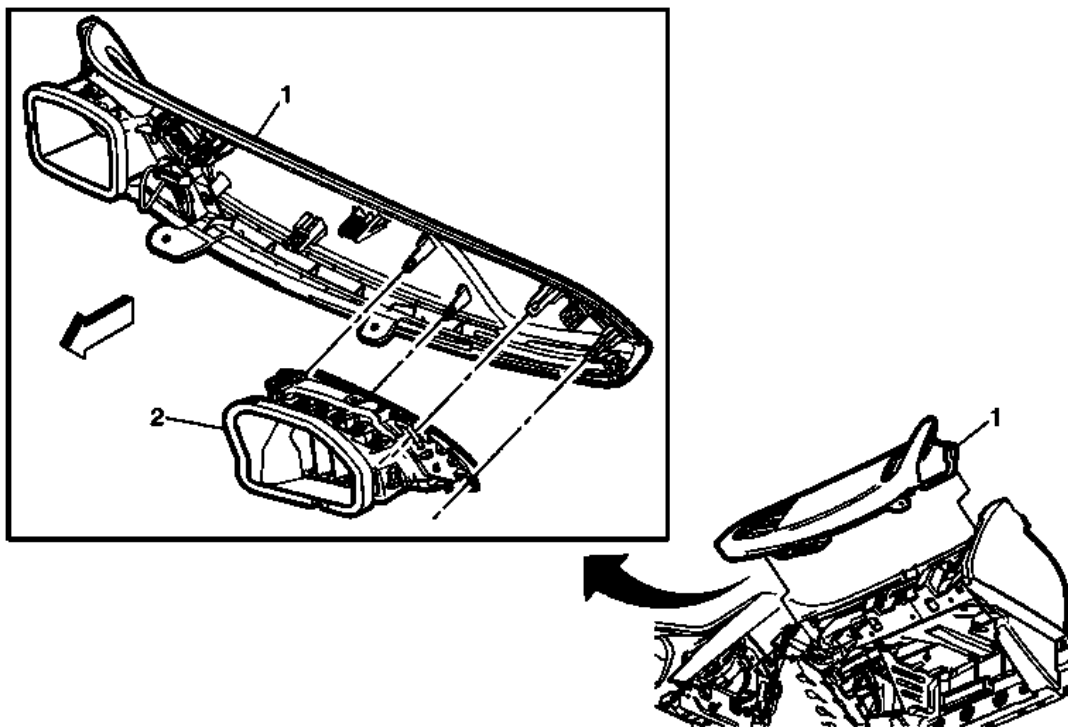


Fig. 93: Instrument Panel Center Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Center Air Outlet Replacement - Right Side

Callout	Component Name
1	Instrument Panel Trim Pad Refer to Instrument Panel Trim Pad Replacement .
2	Instrument Panel Center Air Outlet - Right Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the center air outlet from the instrument panel trim plate.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - RIGHT SIDE

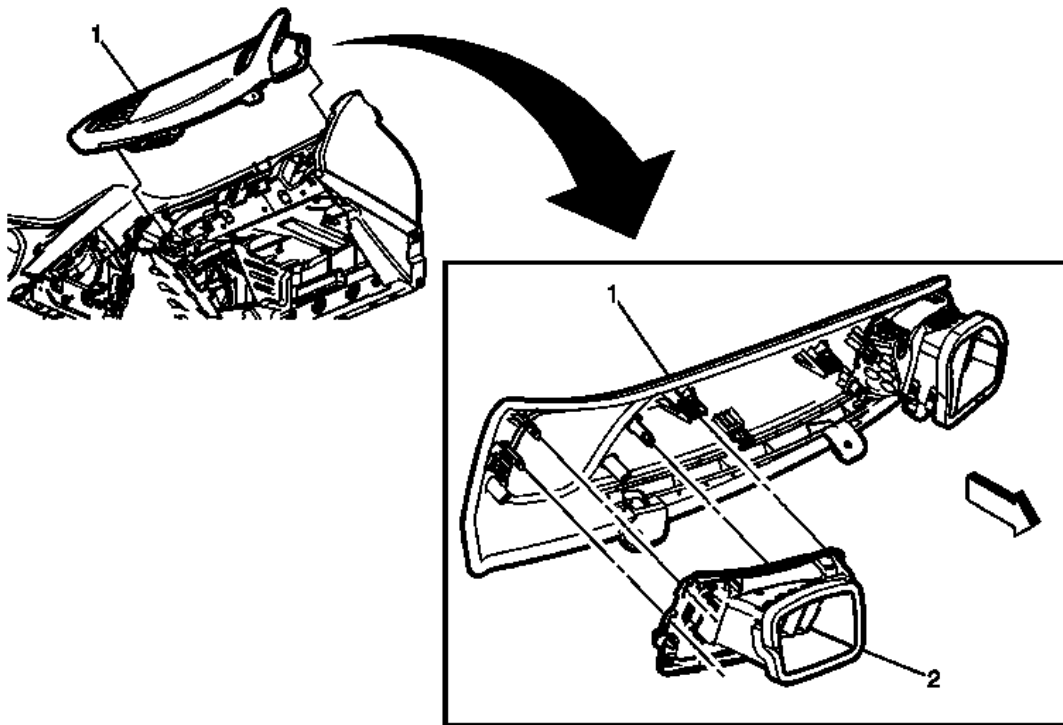


Fig. 94: Instrument Panel Outer Air Outlet - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Replacement - Right Side

Callout	Component Name
1	Instrument Panel Trim Pad Refer to Instrument Panel Trim Pad Replacement .
2	Instrument Panel Outer Air Outlet - Right Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the outer air outlet from the instrument panel trim plate.

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

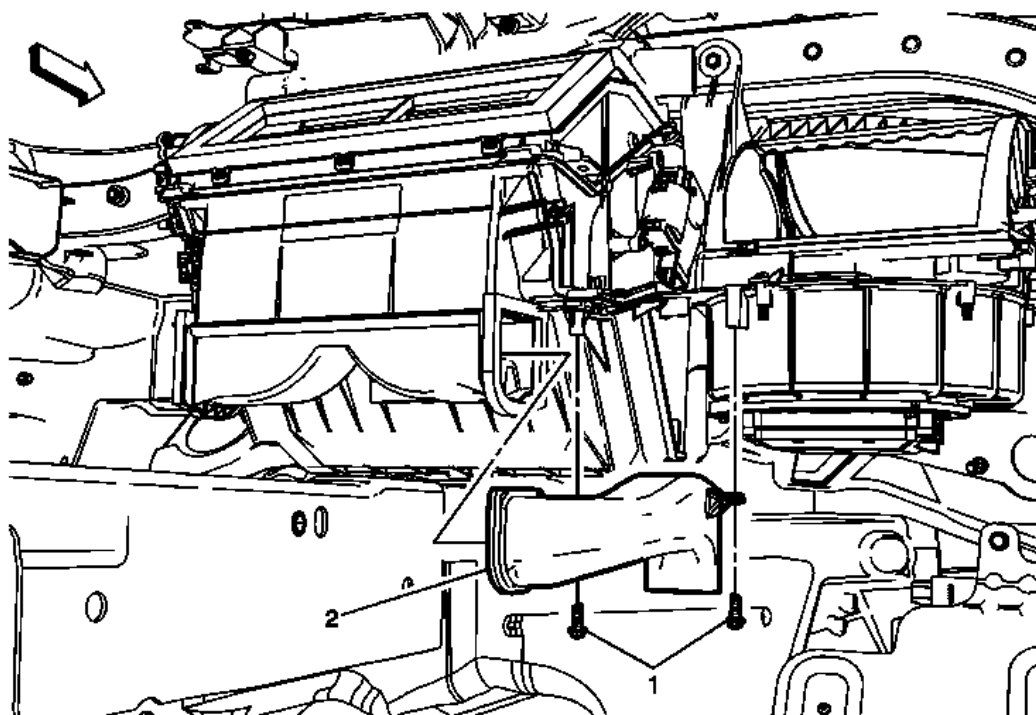


Fig. 95: Floor Front Air Outlet Duct - Right Side
Courtesy of GENERAL MOTORS COMPANY

Floor Front Air Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel tie bar. Refer to Instrument Panel Tie Bar Replacement .	
1	Floor Front Air Outlet Duct Fastener (Qty :2) CAUTION: Refer to Fastener Caution . Tighten 1.5 (13 lb in)
2	Floor Front Air Outlet Duct - Right Side

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT - LEFT SIDE

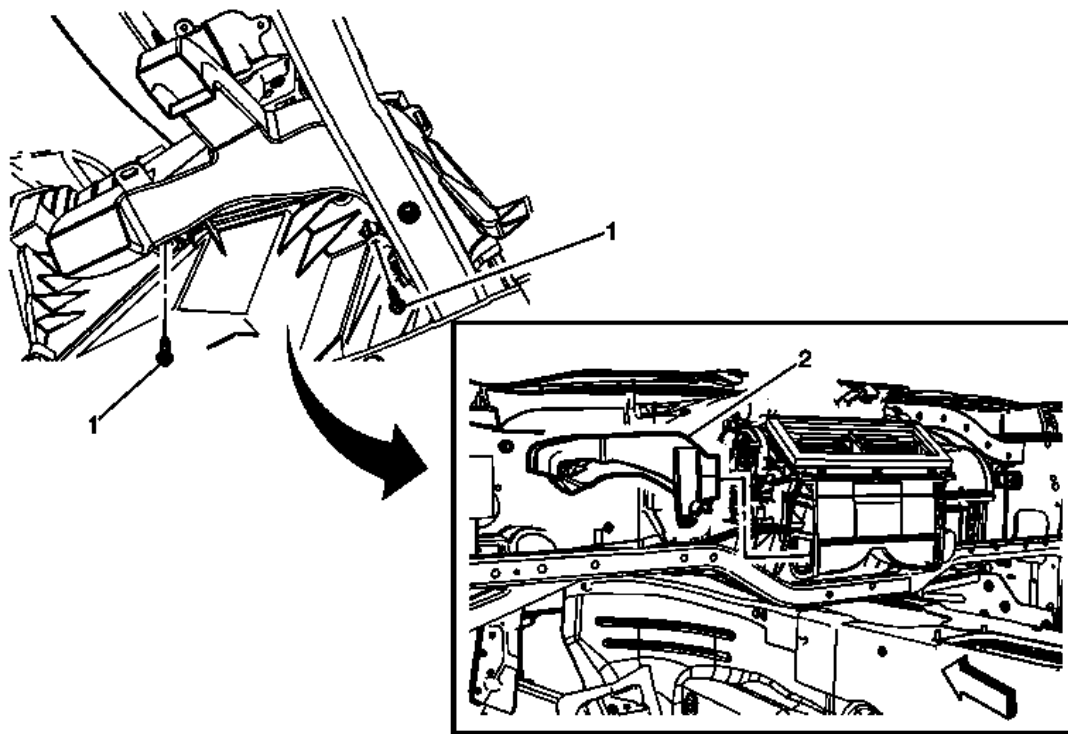


Fig. 96: Floor Front Air Outlet Duct - Left Side
Courtesy of GENERAL MOTORS COMPANY

Floor Front Air Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure	
Remove the steering column bracket. Refer to Steering Column Bracket Replacement .	
1	Floor Front Air Outlet Duct Fastener (Qty :2) CAUTION: Refer to Fastener Caution . Tighten 1.5 (13 lb in)
2	Floor Front Air Outlet Duct - Left Side

INSTRUMENT PANEL OUTER AIR OUTLET DUCT REPLACEMENT

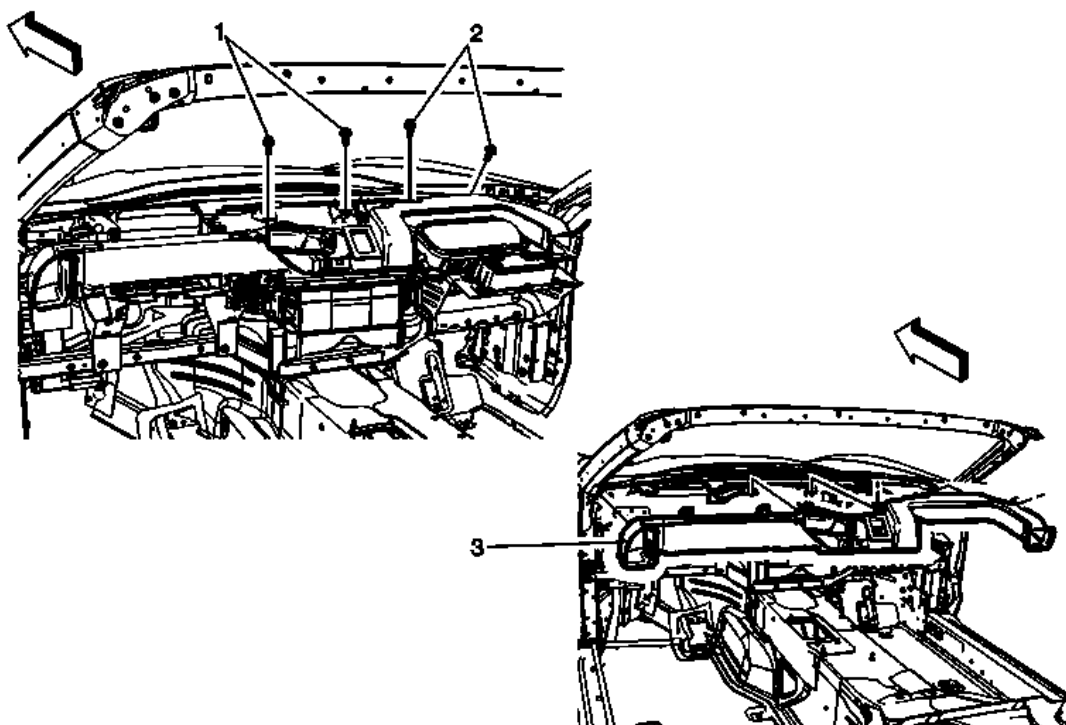


Fig. 97: Instrument Panel Outer Air Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Instrument Panel Outer Air Outlet Duct Assembly Center Fastener (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.5 (22 lb in)
2	Instrument Panel Outer Air Outlet Duct Assembly Right Side Fastener (Qty: 2) Tighten 6 (53 lb in)
3	Instrument Panel Outer Air Outlet Duct Assembly Procedures 1. Disconnect the left and right duct air temperature sensors electrical

2. Transfer the upper duct air temperature sensors.

INSTRUMENT PANEL OUTER AIR OUTLET DUCT REPLACEMENT - RIGHT SIDE

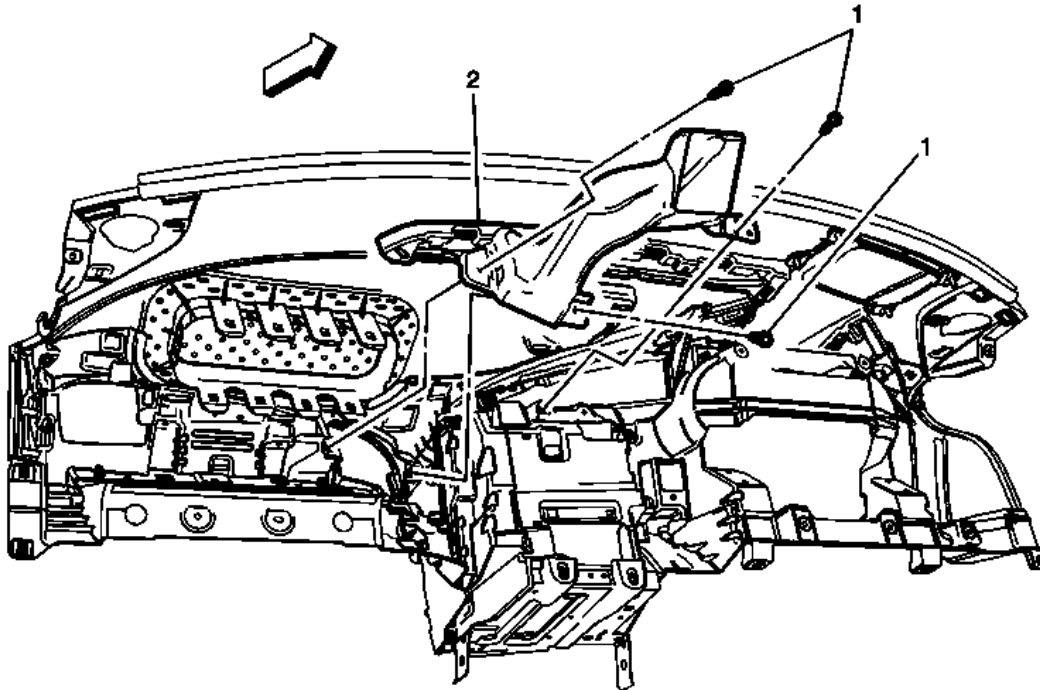


Fig. 98: Instrument Panel Outer Air Outlet Duct - Right Side
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Instrument Panel Outer Air Outlet Duct Fastener (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 2.5 (22 lb in)
2	Instrument Panel Outer Air Outlet Duct - Center Right Side

WINDSHIELD DEFROSTER NOZZLE REPLACEMENT

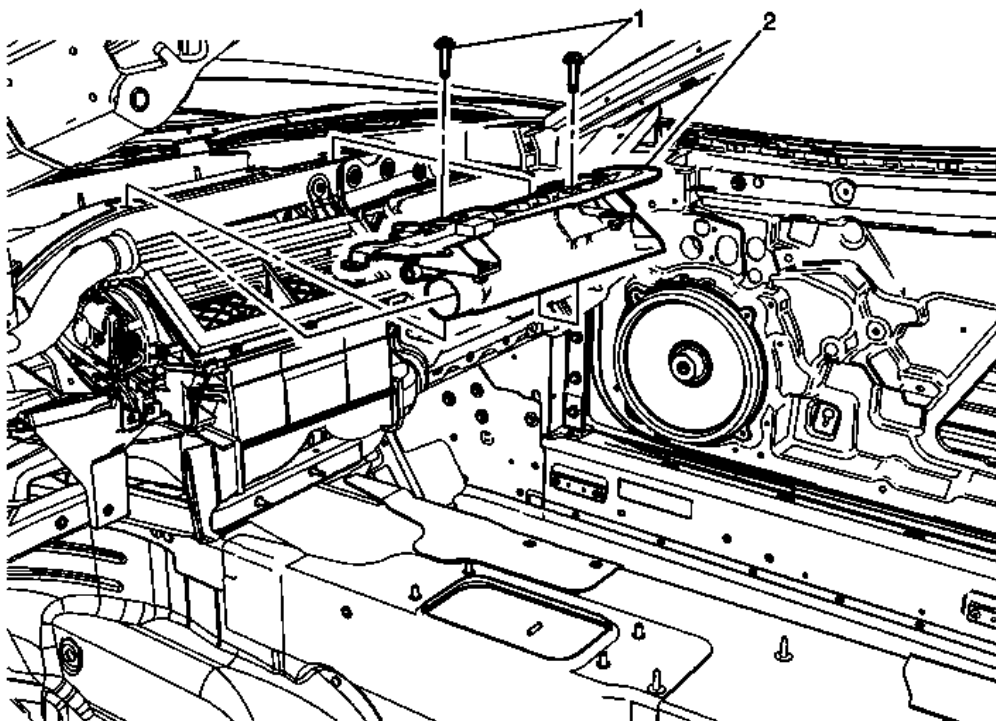


Fig. 99: Windshield Defroster Nozzle
Courtesy of GENERAL MOTORS COMPANY

Windshield Defroster Nozzle Replacement

Callout	Component Name
Preliminary Procedure Remove the right side window defogger outlet duct assembly. Refer to Side Window Defogger Outlet Duct Replacement - Right Side .	
1	Windshield Defroster Nozzle Fastener (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 9 (7 lb ft)
2	Windshield Defroster Nozzle Procedure Slide the windshield defroster nozzle out of the left side window defogger outlet duct assembly.

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

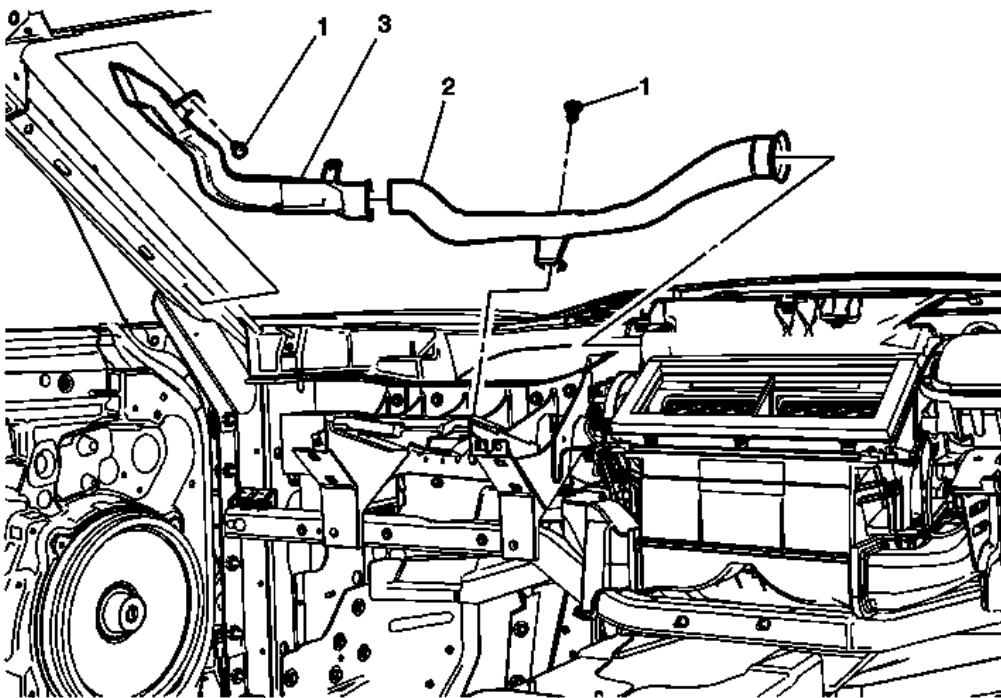


Fig. 100: Left Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedures	
1. Remove the instrument panel outer air outlet duct assembly. Refer to <u>Instrument Panel Outer Air Outlet Duct Replacement</u> .	
2. Remove the heads up display assembly. Refer to <u>Head-Up Display Replacement</u> .	
1	Side Window Defogger Outlet Duct Fastener (Qty: 2)
2	Side Window Defogger Outlet Duct - Left Side Inner Procedure Removing the left side window defogger outlet duct as an assembly, separate the inner duct from the outer duct.
3	Side Window Defogger Outlet Duct - Left Side Outer Procedure Removing the left side window defogger outlet duct as an assembly, separate the outer duct from the inner duct.

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

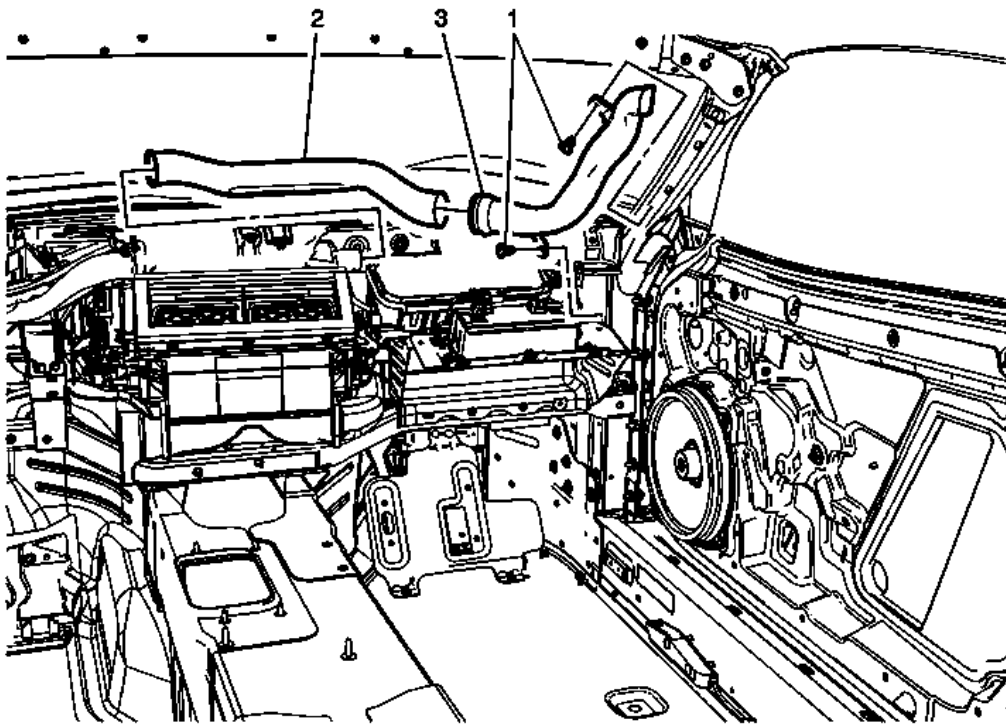


Fig. 101: Side Window Defogger Outlet Duct - Right Side
Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel outer air outlet duct assembly. Refer to <u>Instrument Panel Outer Air Outlet Duct Replacement</u> .	
1	Side Window Defogger Outlet Duct Fastener (Qty: 2)
2	Side Window Defogger Outlet Duct - Right Side Inner Procedure Removing the right side window defogger outlet duct as an assembly, separate the inner duct from the outer duct.
3	Side Window Defogger Outlet Duct - Right Side Outer Procedure Removing the right side window defogger outlet duct as an assembly, separate the outer duct from the inner duct.

HEATER CORE REPLACEMENT

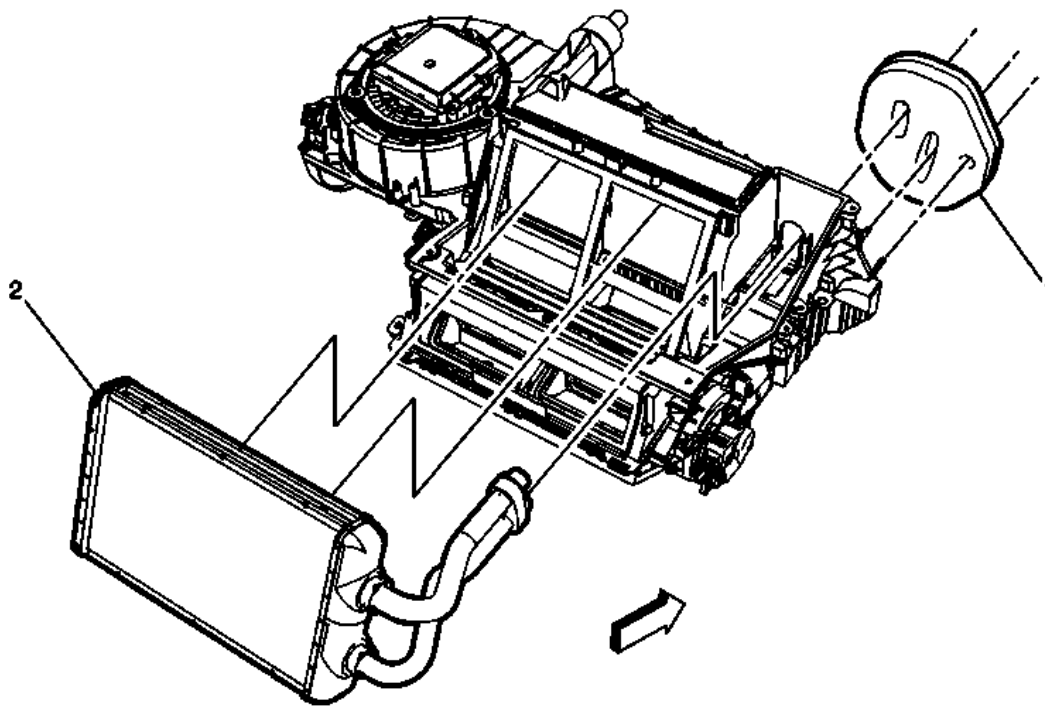


Fig. 102: Heater Core
 Courtesy of GENERAL MOTORS COMPANY

Heater Core Replacement

Callout	Component Name
Preliminary Procedure	
Remove the heater lower case. Refer to Heater Lower Case Replacement .	
1	Heater and Air Conditioning Evaporator Tube Seal
2	Heater Core

DESCRIPTION AND OPERATION

HEATING AND AIR CONDITIONING SYSTEM DESCRIPTION AND OPERATION

Engine Coolant

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

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

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

A/C Cycle

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

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

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

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

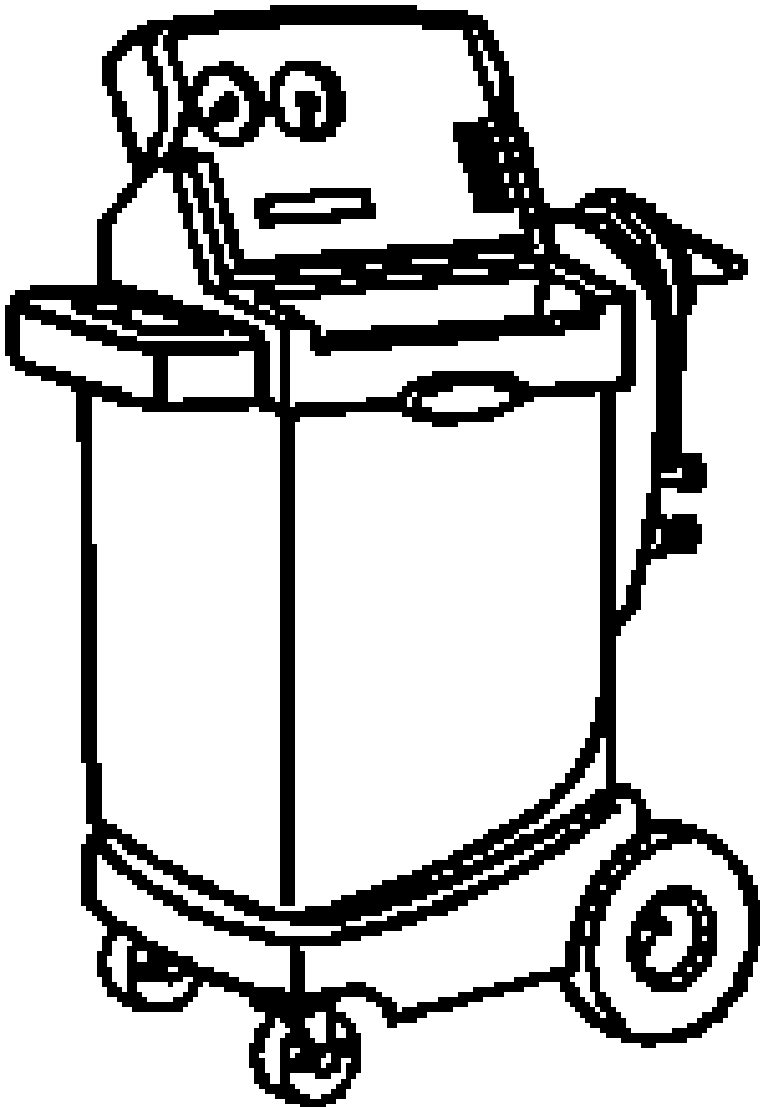
The thermal expansion valve is located in the condenser tube between the condenser and the evaporator. The thermal expansion valve is the dividing point for the high and the low pressure sides of the A/C system. As the refrigerant passes through the thermal expansion valve, the pressure of the refrigerant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

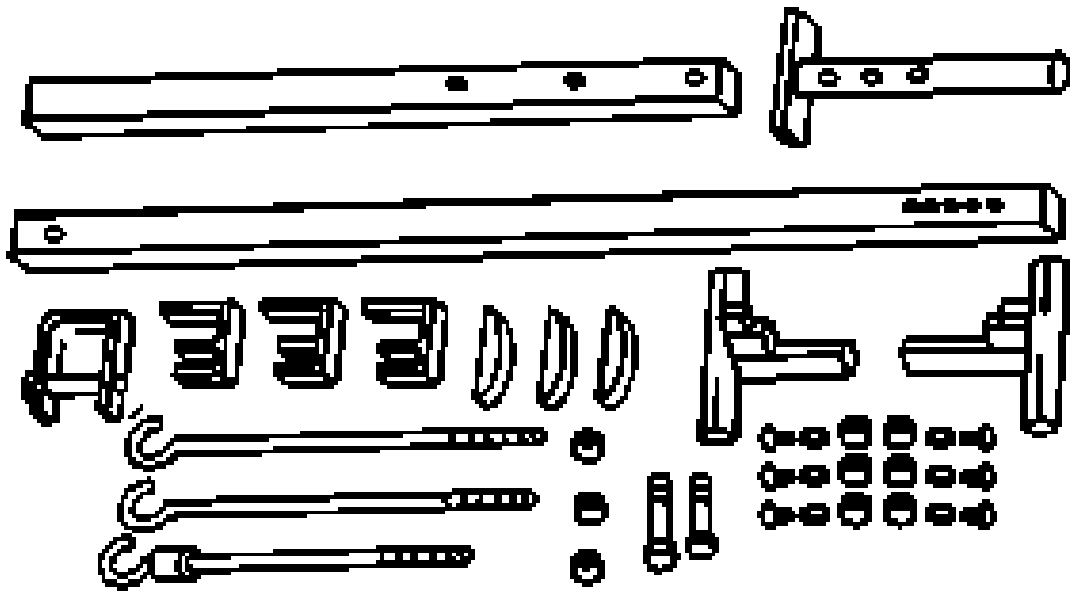
Refrigerant exiting the thermal expansion valve flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant boil inside of the evaporator core. The boiling refrigerant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

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

SPECIAL TOOLS AND EQUIPMENT

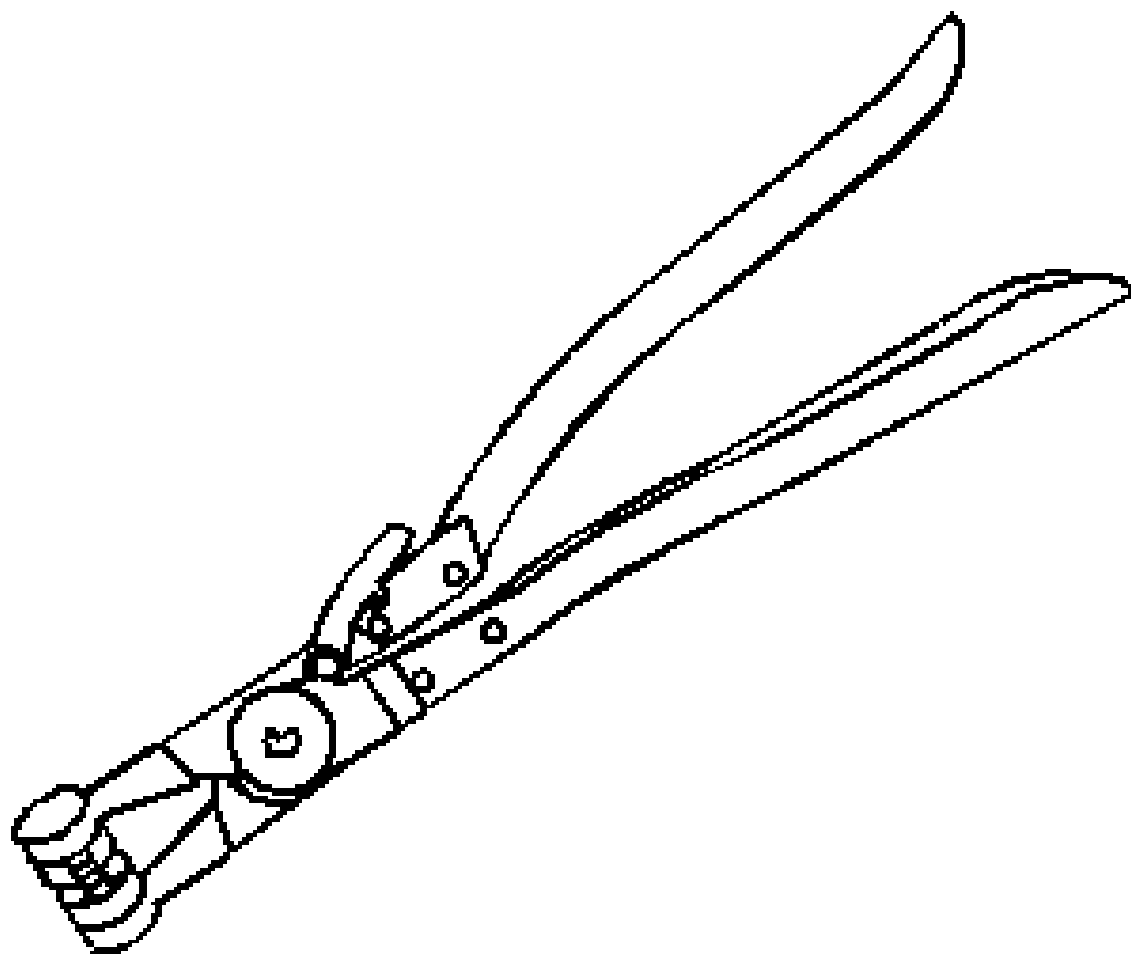
SPECIAL TOOLS

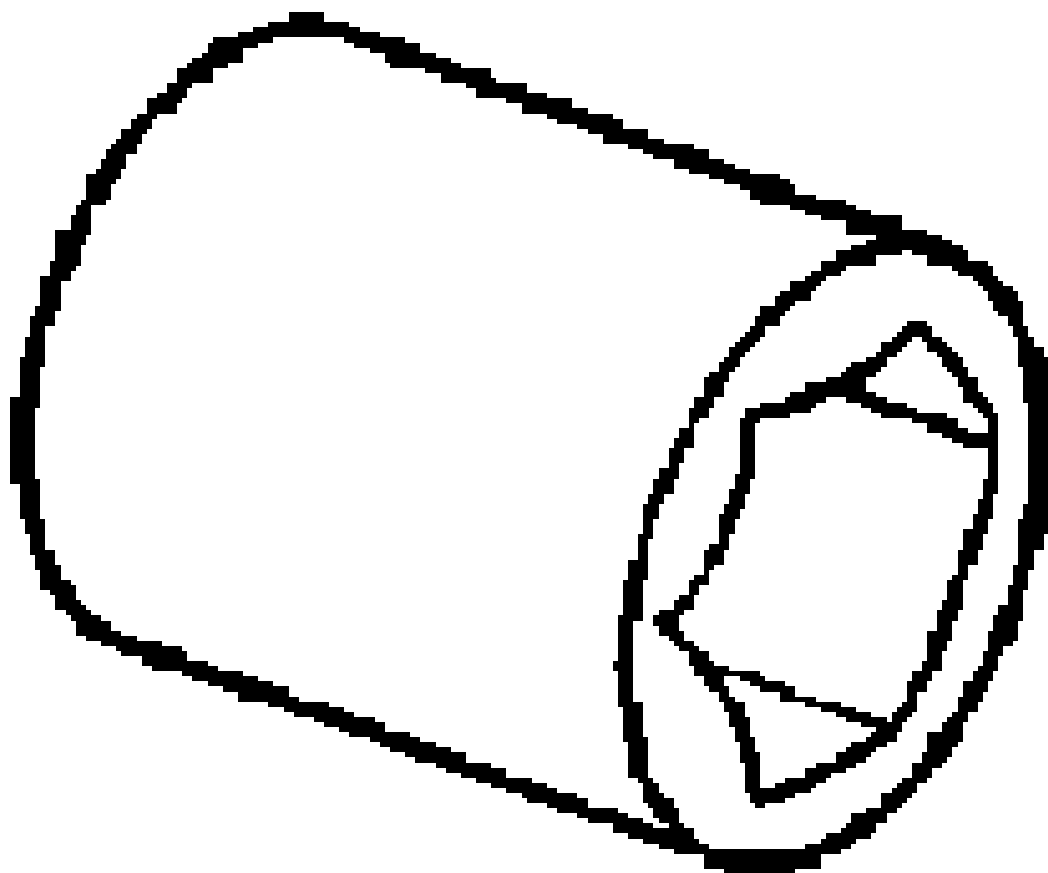
Illustration	Tool Number/Descri
	GE-48800 CoolTech A/ Recharge Mac



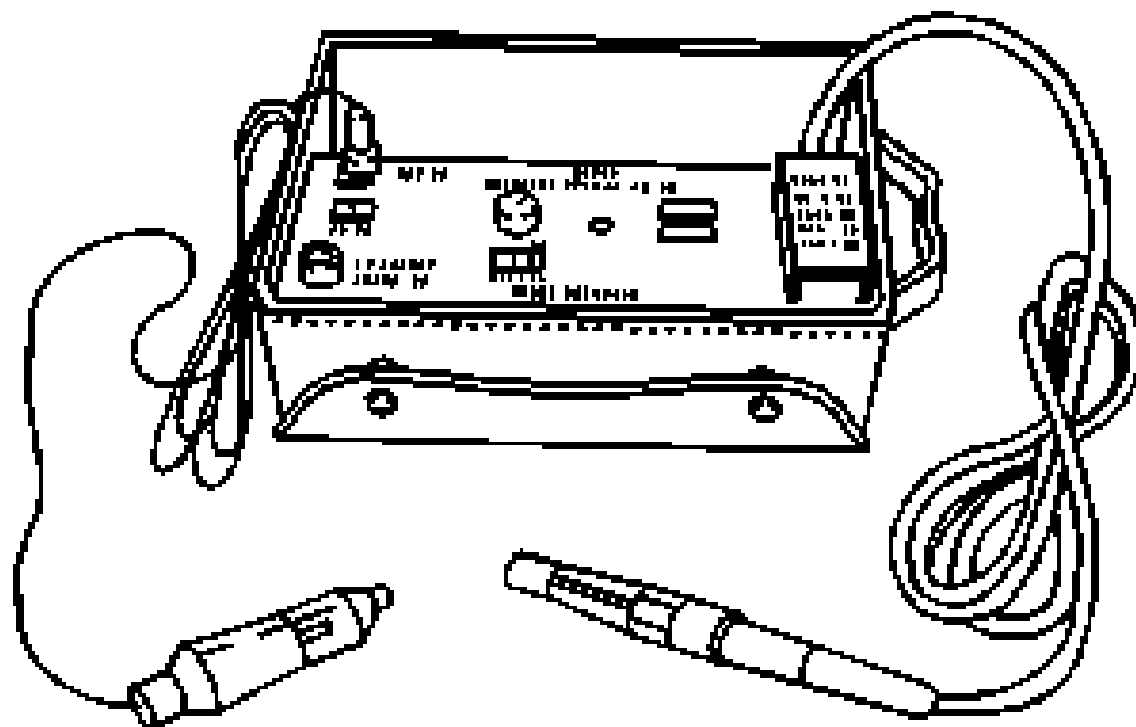
J 28467-B
Universal Eng
Support Fixtu

J 38185
Hose Clamp P

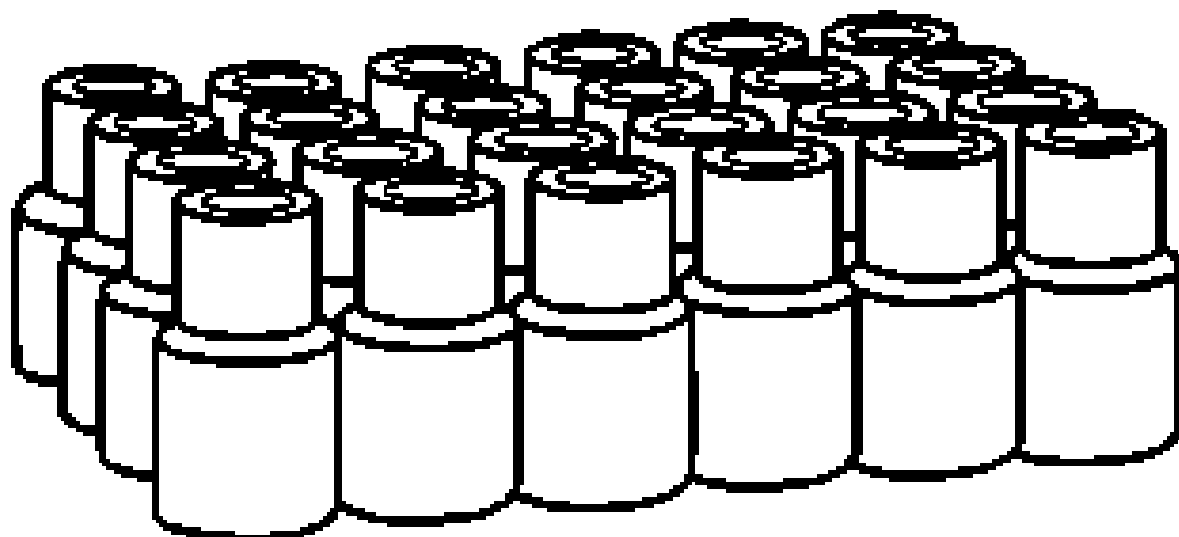




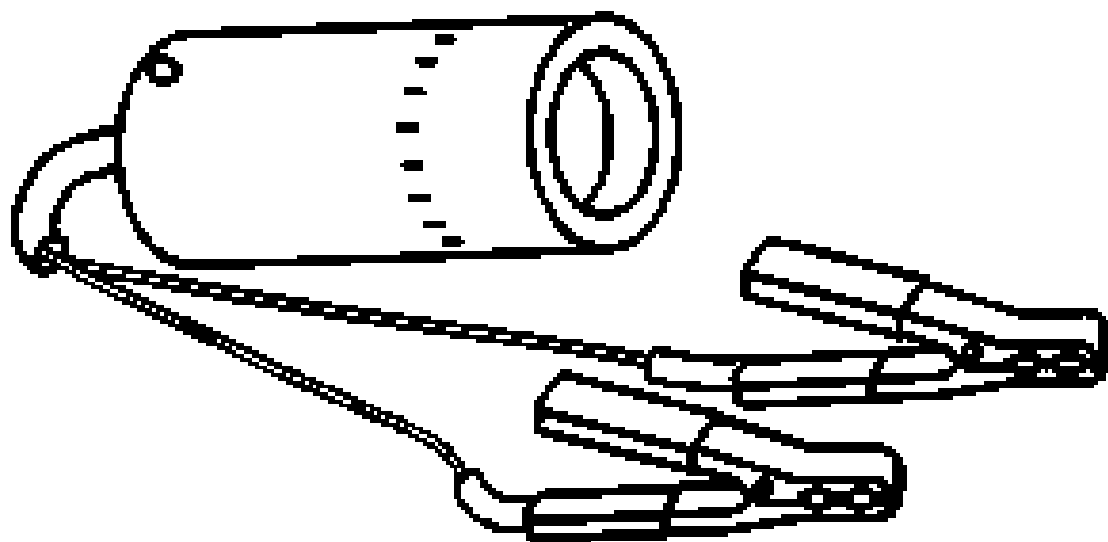
J 39037
Charge Valv
Octagon Socl



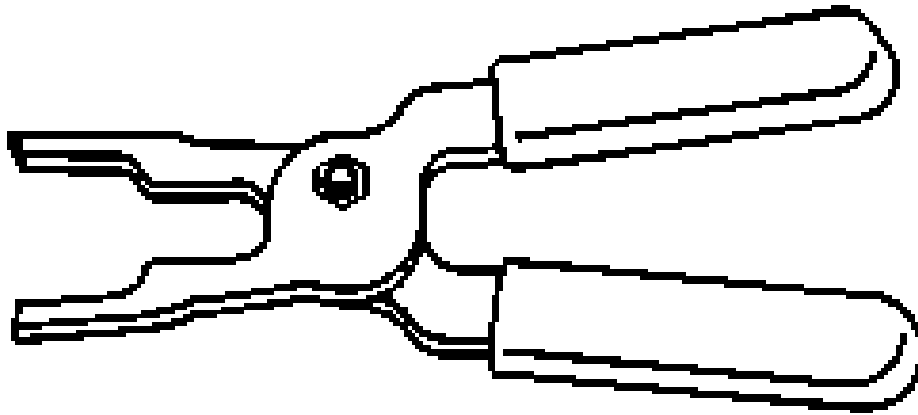
J 39400-A
Halogen Leak
Detector



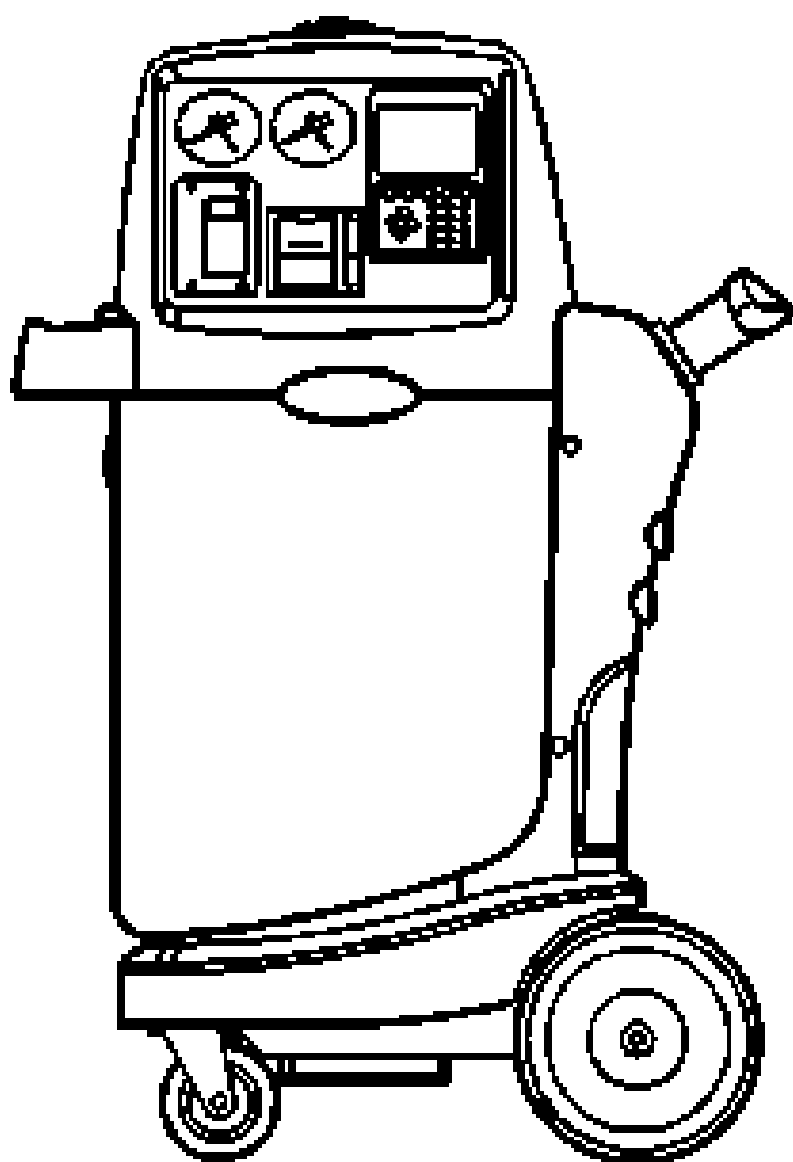
J 41447
R-134A A/C Tr.
Dye - Box of



J 42220
Universal 12V I
Detection Lar



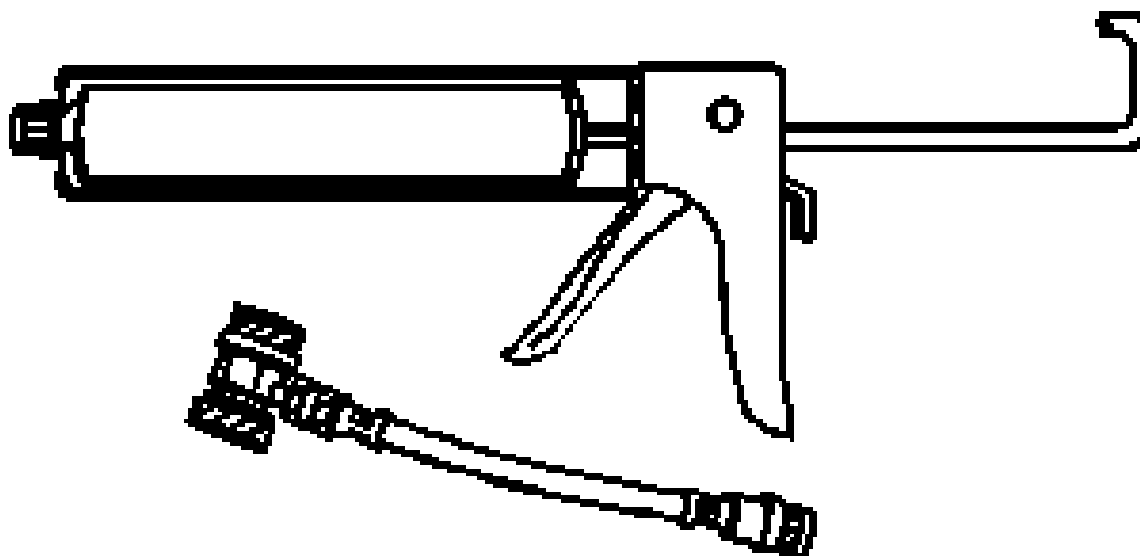
J 43244
Relay Puller Pl



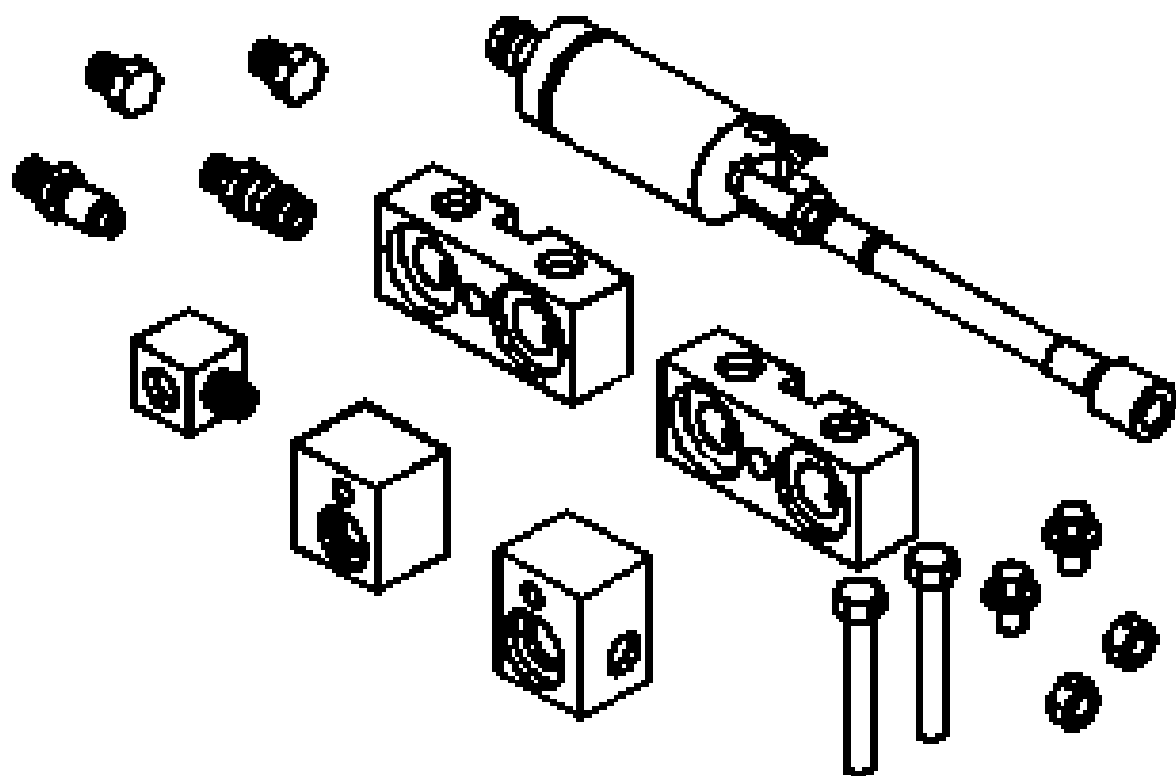
J 43600
ACR 2000 A
Conditioning Se
Center



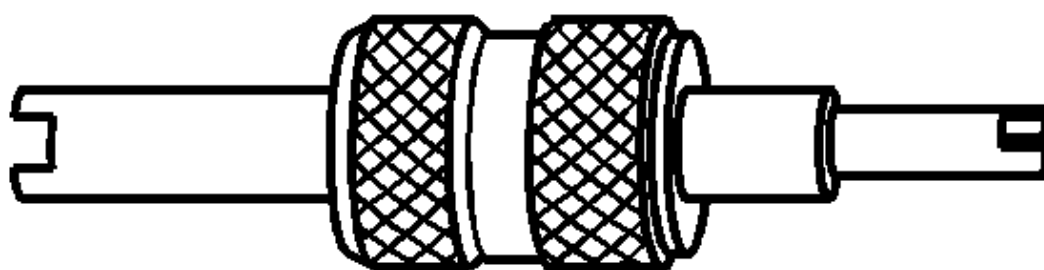
J 43872
Fluorescent L
Cleaner



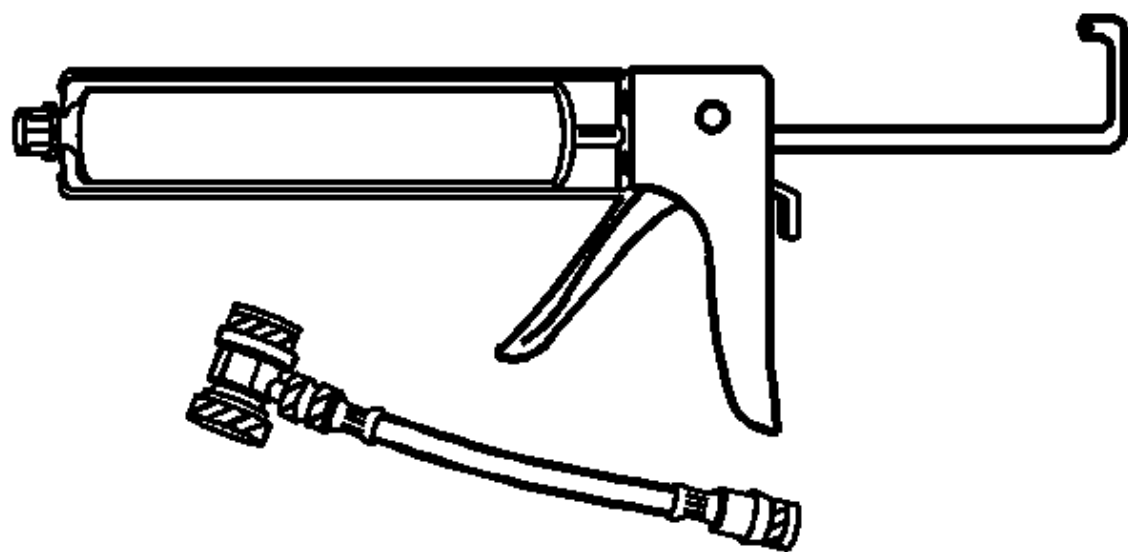
J 45037
A/C Oil Inject



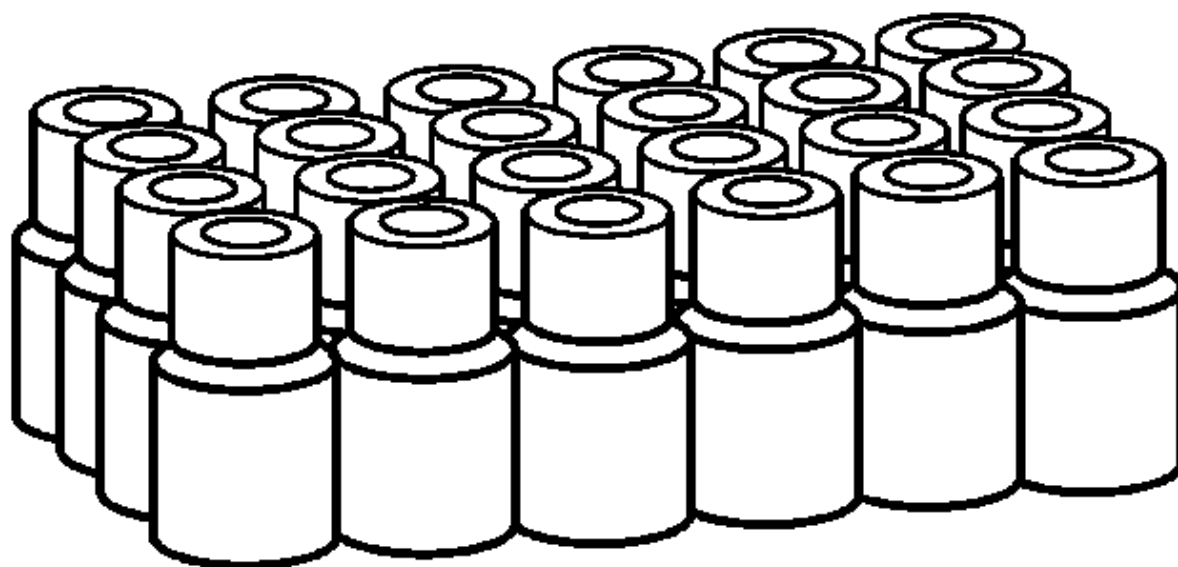
J 45268
A/C Flushing Ad
Kit



J 46246
Valve Core Ti



J 46297
A/C Dye Injectc



J 46297-12
Replacement I
Cartridges