

HVAC

Heating, Ventilation, and Air Conditioning - CTS Coupe & Wagon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Compressor Bracket Mounting Bolt	50 N.m	36 lb ft
A/C Compressor Mounting Bolt (M8)	25 N.m	18 lb ft
A/C Compressor Mounting Bolt (M10)	50 N.m	36 lb ft
Air Conditioning Compressor and Condenser Hose Bolt	9 N.m	80 lb in
Air Conditioning Compressor Inlet Hose Bolt	9 N.m	80 lb in
Air Conditioning Compressor Outlet Hose Bolt	9 N.m	80 lb in
Air Conditioning Compressor Pulley Bolt	18 N.m	13 lb ft
Air Conditioning Condenser Tube Bolt	9 N.m	80 lb in
Air Conditioning Tube Bracket Nut	9 N.m	80 lb in
Air Distributor Duct Bolt	2 N.m	18 lb in
Air Inlet Case Bolt	1 N.m	9 lb in
Air Inlet Assembly Bolts	9 N.m	80 lb in
Air Distributor Center Duct	2 N.m	17 lb in
Air Distributor Duct- Left Side	2 N.m	17 lb in
Air Distributor Duct- Right Side	2 N.m	17 lb in
Air Outlet Duct Screws	2 N.m	17 lb in
Blower Motor Mounting Screws	1 N.m	9 lb in
Condenser Mounting Bolts	5.4 N.m	48 lb in
Desiccant Bag Plug	12.5 N.m	111 lb in
Heater and Air Conditioning Control Temperature Cam Grommet Bolt	1 N.m	9 lb in
Heater and Air Conditioning Evaporator and Blower Module Bolt	9 N.m	80 lb in
Heater and Air Conditioning Evaporator Module Bolt	1 N.m	9 lb in
Heater and Air Conditioning Evaporator and Blower Module Nut	9 N.m	80 lb in
Heater Hose Bracket Screws	9 N.m	80 lb in
Heater Pipe Assembly Bracket Nut	9 N.m	80 lb in
HVAC Module Mounting Bolts	9 N.m	80 lb in
HVAC Module Mounting Nuts	9 N.m	80 lb in
HVAC Module Screws	1 N.m	9 lb in

Liquid Line to Condenser Bolt	9 N.m	80 lb in
Power Steering Line Bracket Nuts	9 N.m	80 lb in
Rear Air Outlet Duct Nut	9 N.m	80 lb in
Refrigerant Pressure Sensor	9.8 N.m	87 lb in
Side Window Defogger Outlet Duct- Left Side	2 N.m	17 lb in
Side Window Defogger Outlet Duct- Right Side	2 N.m	17 lb in
TXV Bolts	3.5 N.m	31 lb in

REFRIGERANT SYSTEM SPECIFICATIONS

Refrigerant System Capacities

Application	Specification	
	Metric	English
PAG Oil GM P/N 12378526 for United States PAG Oil GM P/N 88900060 for Canada		
Compressor Replacement		
The Denso Service Compressor is precharged with the specified amount of PAG Oil	75 ml ¹	2.5 oz ¹
Condenser Replacement	40 ml ¹	1.35 oz ¹
Desiccant Bag Replacement	10 ml ¹	0.34 oz ¹
Evaporator Replacement	40 ml ¹	1.35 oz ¹
Refrigerant Line Replacement	10 ml ¹	0.34 oz ¹
Total System PAG Oil Capacity	110 ml	3.72 oz
R-134a		
Refrigerant Charge	0.55 kg	1.2 lb
¹ If more than the specified amount of PAG oil was drained from a component, add the equal amount of oil drained.		

DIAGNOSTIC INFORMATION AND PROCEDURES

HANDLING OF REFRIGERANT LINES AND FITTINGS

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

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.
- Never bend a flexible hose line to a radius of less than four times the diameter of the hose.
- Never allow a flexible hose line to come within 65 mm (2-1/2 in) of the exhaust manifold.
- Inspect flexible hose lines regularly for leaks or brittleness.

- Replace flexible hose lines with new lines if you find signs of deterioration or leaking.
- Discharge the refrigeration system of all refrigerant before disconnecting any fitting in the refrigeration system.
- Proceed very cautiously regardless of the gauge readings.

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

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

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

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

Refrigerant Leak Testing

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

The fluorescent dye mixes and flows with the polyalkylene glycol (PAG) oil throughout the refrigerant system.

Verifying some passive leaks may require using the **J 39400-A** halogen leak detector , even though the A/C system contains fluorescent dye.

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

Fluorescent Leak Detector

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

NOTE: PAG oil is water soluble.

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

Use the leak detection lamp in the following areas:

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

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

- Follow the instructions supplied with the **J 42220** universal 12V leak detection lamp.
- To prevent false diagnosis in the future, thoroughly clean the residual dye from any area where leaks were found. Use a rag and the approved **J 43872** fluorescent dye cleaner.

Fluorescent Dye Injection

NOTE: Use only fluorescent dye approved by General Motors.

- **J 41447 R-134A A/C tracer dye-box of 24** can be poured directly into a removed A/C component.
- **J 46297-12 replacement dye cartridges** is injected into the low side port using **J 46297 A/C dye injector kit**.
- Not all of the fluorescent dyes are compatible with PAG oil. Some types of dye decrease the oil viscosity or may chemically react with the oil.
- R-134A leak detection dye requires time to work. Depending upon the leak rate, a leak may not become

visible for between 15 minutes and 7 days.

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

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

Halogen Leak Detector

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

Ensure that the vehicle has at least 0.45 kg (1 lb) of refrigerant in the A/C refrigeration system in order to perform a leak test. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)** for recharging the A/C system.

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

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

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

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

Follow the instructions supplied with the **J 39400-A** halogen leak detector.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST

Special Tools

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

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

Test Description

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

- The current ambient air temperature

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

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

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

- If DTC B0157 is set, the compressor clutch will not engage until it is cleared.
- Record the relative humidity and the ambient air temperature at the time of the test.

1. Close the vehicle doors and windows.
2. Open the drivers door window 12.7-15.24 cm (5-6 in).
3. Start the engine.
4. With a scan tool clear any DTCs stored in the HVAC module.
5. Select the following HVAC control settings:
 - The A/C is ON
 - The maximum blower speed
 - The Face mode
 - The coldest temperature setting
 - Passenger setting is off
 - All A/C outlets are OPEN
6. Install the temperature probes in the left and right center A/C air outlets.
7. Apply the parking brake.
8. Place the transaxle/transmission in one of the following positions:
 - PARK, Automatic
 - NEUTRAL, Manual
9. Operate the A/C system for 5 minutes.
10. Inspect A/C components for the following conditions:
 - Abnormal frost areas
 - Unusual noises

NOTE:

Make sure that the compressor is engaged when taking the data.

11. Record the following information:
 - The outlet air temperatures
 - The low-side pressure
 - The high-side pressure

	12. Compare the low and high side pressures and the output temperatures to the A/C Performance Table. Does all the data recorded fall within the specified ranges of the A/C Performance Table?		Go to Step 5	Go to Step 3
3	If the pressures and temperatures recorded do not fall within the specified ranges of the A/C Performance Table: 1. Continue to operate the A/C system for an additional 5 minutes. 2. Record the pressures and temperatures again. 3. Compare the low and high side pressures and the output temperature to the A/C Performance Table. Does all the data recorded fall within the specified ranges?	-	Go to Step 5	Go to Step 4
4	Perform the necessary repairs. Refer to <u>A/C Diagnostics Chart</u>. Is the action complete?	-	Go to Step 5	-
5	Operate the system in order to verify the test results. Did you find the same results?	-	System OK	Go to <u>Symptoms - HVAC Systems - Automatic</u>

A/C Performance Table

Ambient Air Temperature	Relative Humidity	Service Port Pressure		Maximum Left Center Discharge Air Temperature	Maximum Left Rear Discharge Air Temperature
		Low Side Service Port Pressure	High Side Service Port Pressure		
13-18°C (55-65°F)	0-100%	151-234 kPa (22-34 psi)	999-1260 kPa (145-183 psi)	10°C (48°F)	12°C (52°F)
19-24°C (66-75°F)	Below 40%	151-241 kPa (22-35 psi)	1040-1309 kPa (151-190 psi)	12°C (52°F)	13°C (54°F)
	Above 40%	172-261 kPa (25-38 psi)	1102-1391 kPa (160-202 psi)	13°C (55°F)	14°C (57°F)
	Below 35%	186-261 kPa (27-38 psi)	1191-1412 kPa (173-205 psi)	13°C (55°F)	14°C (57°F)

25-29°C (76-85°F)	35-50%	199-268 kPa (29-39 psi)	1219-1440 kPa (177-209 psi)	13°C (55°F)	15°C (59°F)
	Above 50%	206-282 kPa (30-41 psi)	1247-1488 kPa (181-216 psi)	15°C (59°F)	18°C (63°F)
30-35°C (86-95°F)	Below 30%	206-289 kPa (30-42 psi)	1302-1543 kPa (189-224 psi)	15°C (59°F)	18°C (63°F)
	30-50%	220-296 kPa (32-43 psi)	1322-1570 kPa (192-228 psi)	17°C (61°F)	18°C (64°F)
	Above 50%	227-303 kPa (33-44 psi)	1357-1612 kPa (197-234 psi)	18°C (64°F)	20°C (68°F)
36-41°C (96-105°F)	Below 20%	241-316 kPa (35-46 psi)	1433-1660 kPa (208-241 psi)	18°C (63°F)	20°C (68°F)
	20-40%	241-316 kPa (35-46 psi)	1440-1681 kPa (209-244 psi)	18°C (64°F)	22°C (70°F)
	Above 40%	248-323 kPa (36-47 psi)	1467-1708 kPa (213-248 psi)	19°C (66°F)	23°C (72°F)
42-46°C (106-115°F)	Below 20%	268-337 kPa (39-49 psi)	1557-1770 kPa (226-257 psi)	20°C (68°F)	23°C (72°F)
	Above 20%	275-344 kPa (40-50 psi)	1577-1791 kPa (229-260 psi)	22°C (70°F)	23°C (73°F)
47-49°C (116-120°F)	Below 30%	303-365 kPa (44-53 psi)	1688-1887 kPa (245-274 psi)	23°C (72°F)	24°C (75°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
	Low	Compressor has Low Displacement or Internal Malfunction
High	High	Malfunctioning Cooling Fans
		Refrigerant Overcharge
		Restriction between the Low Side Port and Compressor Inlet
		Restricted Condenser Air Flow
		Expansion Device Stuck Open
		Air in A/C System
Normal/High	Normal/High	Refrigerant Contamination
		PAG or POE Oil Overcharge

HEATING PERFORMANCE DIAGNOSTIC

Heating Performance Diagnostic

Step	Action	Yes	No
DEFINITION: Heating system performance.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Allow the engine to idle. Does the engine reach a normal operating temperature?	Go to Step 3	Go to Step 9
3	WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . 1. Select the FLOOR mode. 2. Select the minimum blower speed. 3. Select the warmest temperature setting. 4. Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 7	Go to Step 4
	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. - Select the warmest temperature setting. - Record the temperature at the following locations: - The center I/P air outlet - The heater core outlet hose - Compare the recorded temperatures. Are the two temperature readings about equal?	Go to Step 5	Go to Step 6
5	- Inspect and repair the following areas of the vehicle for cold air leaks: - The cowl - The recirculation door - The HVAC module case - Perform the necessary repairs. Are the repairs complete?	Go to Step 10	-
6	- Inspect the temperature door operation. Refer to <u>Diagnostic System Check - Vehicle</u>. - Perform any necessary repairs. Are the repairs complete?	Go to Step 10	-
7	- Turn OFF the engine. - Backflush the heater core. - Start the engine. - Select the FLOOR mode. - Select the minimum blower speed. - Select the warmest temperature setting. - Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 8	Go to Step 10
8	Replace the heater core. Refer to <u>Heater Core Replacement</u>. Is the repair complete?	Go to Step 10	-
9	Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature</u>. Is the repair complete?	Go to Step 10	-
10	Operate the system in order to verify the repair.		

Did you find and correct the condition?	System OK	Go to Step 2
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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 Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Select the DEFROST mode. 3. Select the maximum blower speed. Does sufficient air flow from the defroster outlets?	Go to Step 3	Go to Step 10
3	Measure the engine operating temperature. Does engine reach a normal operating temperature?	Go to Step 4	Go to Step 8
4	1. Select the minimum blower speed. 2. Select the maximum temperature setting. WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . 3. Feel the temperature of the inlet and outlet hoses at the heater core. Does the inlet hose feel warmer than the outlet hose?	Go to Step 11	Go to Step 5
5	Test the operation of the A/C compressor clutch. Does the A/C compressor clutch engage?	Go to Step 7	Go to Step 6
6	Repair the A/C compressor clutch. Refer to <u>Air Conditioning Compressor Malfunction</u> . Is the repair complete?	Go to Step 14	-
7	Perform the A/C system performance test. Refer to <u>Air Conditioning (A/C) System Performance Test</u> . Is the A/C system operating within the specifications?	Go to Step 9	Go to Step 12
8	Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature</u> . Is the repair complete?	Go to Step 14	-
9	Inspect for correct operation of the recirculation door. Is the recirculation door operating correctly?	Go to Step 14	Go to Step 13
10	Repair the air delivery concern. Is the repair complete?	Go to Step 14	-

11	Repair the heating concern. Refer to <u>Heating Performance Diagnostic</u> . Is the repair complete?	Go to Step 14	-
12	Repair the A/C performance concern. Refer to <u>Symptoms - HVAC Systems - Automatic</u> . Is the repair complete?	Go to Step 14	-
13	Repair the recirculation door concern. Is the repair complete?	Go to Step 14	-
14	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 the HVAC Symptoms?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn ON the ignition, with the engine OFF. 4. Cycle the blower motor through all of the speeds in order to determine where and when the noise occurs.		
	Did you hear a noise during the blower operation?	Go to Step 3	Go to Step 10
3	Does the noise vary with the blower speed?	Go to Step 4	Go to Step 10
4	Inspect for excessive vibration at each blower motor speed by feeling the blower case. Is excess vibration present?	Go to Step 5	Go to Step 6
5	IMPORTANT: Inspect the blower motor impeller cavity through the access hole under the passenger compartment air filter.		
	Examine the blower motor cavity for deposits of foreign material. Did you find foreign material?	Go to Step 7	Go to Step 6
6	1. Remove the blower motor. Refer to <u>Blower Motor Replacement (Left Hand Drive)</u>, <u>Blower Motor Replacement (Right Hand Drive)</u>. 2. 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 8	Go to Step 10
7	Remove the foreign material. Is the action complete?	Go to Step 10	-
8	Replace the blower motor. Refer to <u>Blower Motor Replacement (Left Hand Drive)</u> , <u>Blower Motor Replacement (Right Hand Drive)</u> . Is the replacement complete?	Go to Step 10	-
9	Install the blower motor. Refer to <u>Blower Motor Replacement (Left Hand Drive)</u> , <u>Blower Motor Replacement (Right Hand Drive)</u> . Is the action complete?	Go to Step 10	-
10	Operate the system in order to verify the repair. Does the system operate correctly?	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	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable.

present	• Flush refrigerant system. • Inspect the suction port of the replacement compressor for presence of a suction screen. If the replacement compressor does NOT contain a suction screen, install suction screen. • Remove and inspect high pressure side filter (if applicable). • Remove, inspect, clean, or replace orifice tube. • If the system has a front orifice tube and is equipped with a filter in the rear auxiliary line, remove, inspect, clean, or replace the filter.
Oil Overcharge	Flush refrigerant system.
Refrigerant Contamination	Flush refrigerant system.
Hybrid Polyolester Refrigerant Oil (POE) Contamination	• Flush refrigerant system. • Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable.

NOISE DIAGNOSIS - AIR CONDITIONING (A/C) SYSTEM

Noise Diagnosis - Air Conditioning (A/C) System

Step	Action	Yes	No
DEFINITION: Noise Originating from the A/C compressor, drive belt, or the A/C lines.			
1	Were you sent here from HVAC Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. A/C system noises can be generally categorized into 3 areas: • Screeching, squealing, or chirping noises • Moaning noises • Vibration/rattle noises 2. Start the engine. 3. Ensure that the front and rear 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 drive belt for excessive wear. Refer to <u>Drive Belt Falls Off and Excessive Wear Diagnosis</u> . Is the drive belt excessively worn?	Go to Step 18	Go to Step 4
4	Inspect the drive belt tension. Refer to <u>Drive Belt Tensioner Diagnosis</u> . Is the drive belt tension correct?	Go to Step 19	Go to Step 5
5	Inspect the drive belt for excessive oil coverage. Is the drive belt covered with oil?	Go to Step 17	Go to Step 6

6	1. Start the engine. 2. Ensure that the front A/C is ON. 3. Inspect the compressor and the clutch. Is the 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	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 component ground-out. Are any of the A/C components grounding out and causing a noise?	Go to Step 22	Go to Step 13
12	Does a vibration or rattle noise exist when the A/C clutch is engaged?	Go to Step 13	Go to Step 14
13	Does the noise stop when the A/C clutch is disengaged?	Go to Step 15	Go to Step 14
14	1. Idle the engine in PARK with the A/C compressor clutch engaged. 2. Using a stethoscope, move around the entire A/C system 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 (Belt Driven Compressor). Is the abnormal compressor noise still present?	Go to Step 24	Go to Step 25
17	Repair the oil leak. Is the repair complete?	Go to Step 25	-

18	Replace the drive belt. Refer to <u>Drive Belt Replacement</u> . Is the replacement complete?	Go to Step 25	-
19	Replace the drive belt tensioner. Refer to <u>Drive Belt Tensioner Removal</u> . Is the replacement complete?	Go to Step 25	-
20	Repair or replace the A/C compressor mounting 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 (LSA), Air Conditioning Compressor Replacement (LFW LFX)</u> . Is the replacement complete?	Go to Step 25	-
24	The concern may be caused by an engine related component. Refer to <u>Drive Belt Falls Off and Excessive Wear Diagnosis</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	- Start the engine. - Cycle through all of the following: - Blower motor speeds - HVAC modes - Temperature control settings - Determine the type of noise: - Scrape, pop - Tick/click, chirp or groaning - Air rush/whistle		

	Is a scrape or pop noise evident when selecting modes or temperature settings?	Go to Step 6	Go to Step 3
3	Is a tick/click, chirping, groaning or scraping noise present, but decreases as blower motor speed is decreased?	Go to Step 6	Go to Step 4
4	Is an air rush/whistle noise evident in all modes but not all temperature settings?	Go to Step 6	Go to Step 5
5	Is an air rush/whistle noise evident only in defrost or floor mode?	Go to Step 6	Go to Step 6
6	Remove the instrument panel (I/P) carrier. Refer to <u>Instrument Panel Carrier Replacement (Left Hand Drive)</u> , <u>Instrument Panel Carrier Replacement (Right Hand Drive)</u> Is the action complete?	Go to Step 7	-
7	- Inspect the air flow doors for proper operation. - Inspect the ducts for obstructions or foreign materials. Were any of these conditions found?	Go to Step 10	Go to Step 8
8	Inspect the mode and temperature doors and seals for warping or cracking. Are the doors in normal condition?	Go to Step 11	Go to Step 9
9	Replace the appropriate door and/or seals. Is the repair complete?	Go to Step 11	-
10	Remove any obstructions or foreign material found. Is the action complete?	Go to Step 11	-
11	Install the I/P carrier. Refer to <u>Instrument Panel Carrier Replacement (Left Hand Drive)</u> , <u>Instrument Panel Carrier Replacement (Right Hand Drive)</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>
	- Sit inside the vehicle. - Close all of the doors and windows.		

2	3. Start the engine. 4. Allow the engine to idle at normal operating temperature. 5. Select the maximum blower speed. 6. Select the PANEL air outlet mode. 7. Select the coldest temperature setting. 8. Cycle through all of the blower speeds, modes, and temperatures to define what type of odor is present. • Musty smell • Coolant smell • Oil smell		
	Does the odor have a musty smell?	Go to Step 3	Go to Step 8
3	Inspect the HVAC filter and the air inlet grille for debris. Refer to <u>Passenger Compartment Air Filter Replacement</u>. Is the debris present?	Go to Step 4	Go to Step 5
4	Remove any debris. Is the action complete?	Go to Step 15	-
5	Inspect for wet carpeting. Is the carpet wet?	Go to Step 6	Go to Step 14
6	Inspect for the following conditions: • Water leaks around the windshield • Blockage of the HVAC module drain • Leaks around the door seals Is the leak present?	Go to Step 7	Go to Step 14
7	Repair the leak as necessary. Is the repair complete?	Go to Step 15	-
8	Does the odor have a coolant smell?	Go to Step 9	Go to Step 12
9	Inspect the cooling system for leaks. Refer to <u>Loss of Coolant</u>. Is the leak present?	Go to Step 10	Go to Step 12
10	Inspect for coolant leaking inside the vehicle or for a film build up on the windshield. Is the condition present?	Go to Step 11	Go to Step 15
11	Replace the heater core. Refer to <u>Heater Core Replacement</u>. Is the repair complete?	Go to Step 15	-
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15

13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: • <u>Oil Leak Diagnosis</u> for engine oil leaks • <u>Fluid Leak Diagnosis</u> for the transmission leaks • <u>Transmission Fluid Leak Diagnosis</u> for the Aisin AY6 transmission • <u>Power Steering Fluid Leaks</u> 2. Repair any oil leaks.		
	Is the repair complete?	Go to Step 15	
14	A musty odor can be caused by mold or mildew build-up on the evaporator or the heater core 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 Odor

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

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

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

Deodorize the evaporator core using Deodorizing Aerosol Kit.

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

1. Ensure that the plenum that draws outside air into the HVAC module is clear of debris.
2. Disable the A/C compressor clutch operation by disconnecting the clutch coil electrical connector.
3. Dry the evaporator core by performing the following steps:
 1. Start the engine.
 2. Select the maximum temperature setting.
 3. Select the recirculation mode.

4. Run the blower motor on high for 10 minutes.
4. Locate an area in the air conditioning duct between the blower motor and the evaporator core downstream of the blower motor.
5. Drill a 3.175 mm (0.125 in) hole where the hole will not interfere with or damage the following components:
 - The blower motor
 - The evaporator core
 - Any other operating part the of system
6. Wear safety goggles and latex gloves in order to perform the following actions:
 1. Select the maximum blower speed.
 2. Insert the deodorizer extension tube into the hole to the mark on the extension tube.
 3. Use short spray bursts and vary the direction of spray for a 2-3 minute period of time.
7. Shut the engine OFF. Allow the vehicle to sit for 3-5 minutes.
8. Seal the 3.175 mm (0.125 in) hole with body sealer or RTV gasket compound.
9. Start the engine.
10. Operate the blower motor on high for 15-20 minutes to dry.
11. Reconnect the A/C compressor clutch coil electrical connector.
12. Verify proper clutch operation.
13. Using the scan tool enable the afterblow. Refer to **Afterblow Enabling** .

REFRIGERANT RECOVERY AND RECHARGING (BELT DRIVEN COMPRESSOR)

Special Tools

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

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

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

WARNING: For personal protection, goggles with side protection and lint-free gloves (insulated against heat loss and impermeable to refrigerant) must be worn and a clean cloth wrapped around fittings, valves, and connections when

doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury may result. The exposed area should be flushed immediately with cold water and prompt medical attention should be obtained.

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

CAUTION: R-134a is the only approved refrigerant for use in this vehicle. The use of any other refrigerant may result in poor system performance or component failure and potentially void the vehicle warranty for the refrigerant system.

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

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

CAUTION: Use only GM approved Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system.

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

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

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

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

Refer to the **J-43600** ACR 2000 Air Conditioning Service Center or **GE-48800** CoolTech A/C Recharge

Machine manual for operation and setup instruction. Always recharge the A/C System with the proper amount of R-134a. Refer to **Refrigerant System Specifications** for the correct amount.

A/C Refrigerant System Oil Charge Replenishing

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

FLUSHING

Special Tools

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

NOTE: **Flushing 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

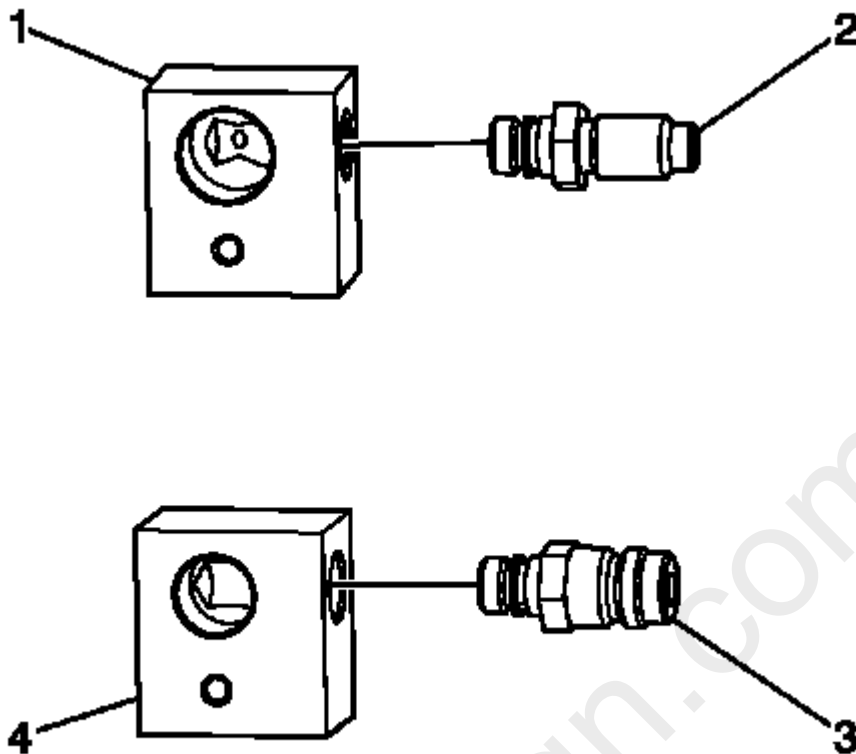


Fig. 1: Forward Flushing Setup
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Forward flow refrigerant flushing is recommended for contaminated refrigerant or PAG oil.
- Inspect and lubricate the J 45268 A/C flush adapter kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install the J 45268-7 (2) onto the suction line adapter block J 45268-13 (1).
2. Install the J 45268-8 (3) onto the discharge line adapter block J 45268-12 (4).

Reverse Flushing Setup

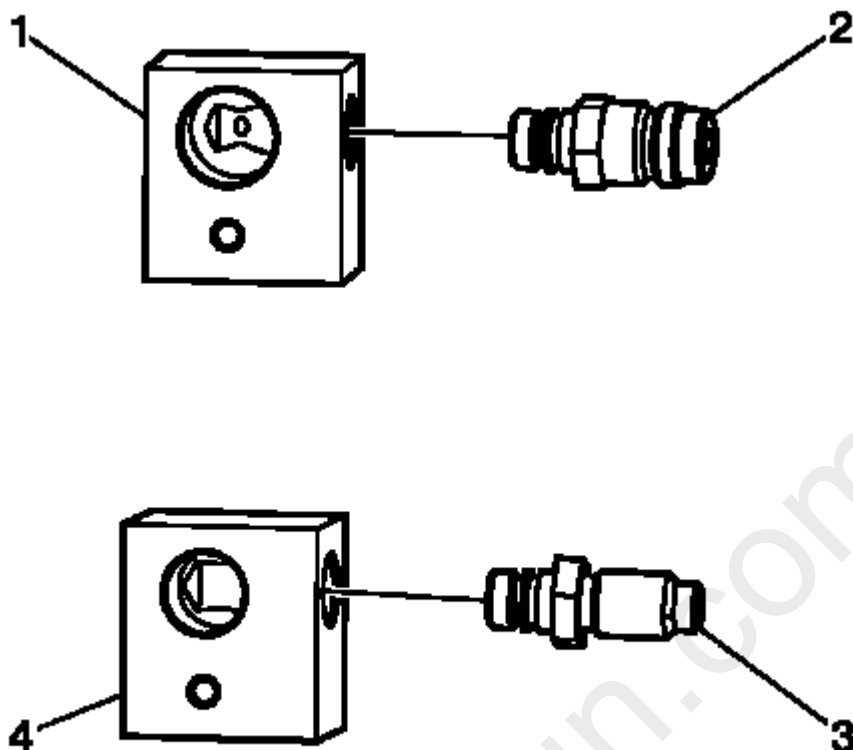


Fig. 2: Reverse Flushing Setup

Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Reverse flow refrigerant flush is recommended for desiccant bag failure. Replace the condenser/receiver dehydrator assembly when the A/C flush is complete and perform the following procedure:
- Inspect and lubricate the J 45268 A/C flush adapter kit fitting O-rings. Refer to Air Conditioning O-Ring Seal Replacement.

1. Install the J 45268-8 (2) onto the suction line adapter block J 45268-13 (1).
2. Install the J 45268-7 (3) onto the discharge line adapter block J 45268-12 (4).

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 (Belt Driven Compressor).

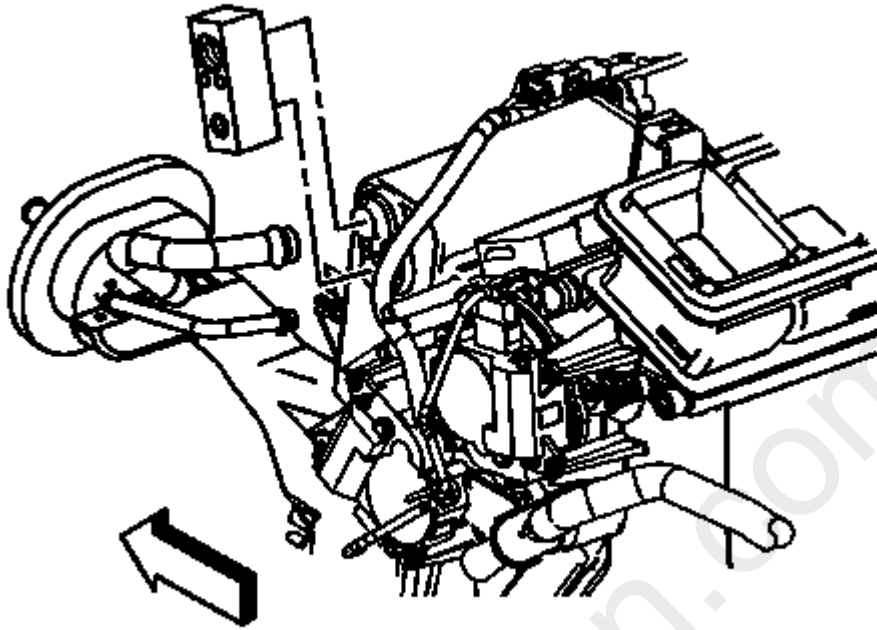


Fig. 3: View Of TXV

Courtesy of GENERAL MOTORS COMPANY

2. Remove the thermal expansion valve (TXV). Refer to **Air Conditioning Evaporator Thermal Expansion Valve Replacement**.
3. Install new O-rings onto the evaporator core and A/C lines. Refer to **Air Conditioning O-Ring Seal Replacement**.
4. Install the A/C lines into J 45268-110.
5. Install J 45268-110 onto the evaporator core.

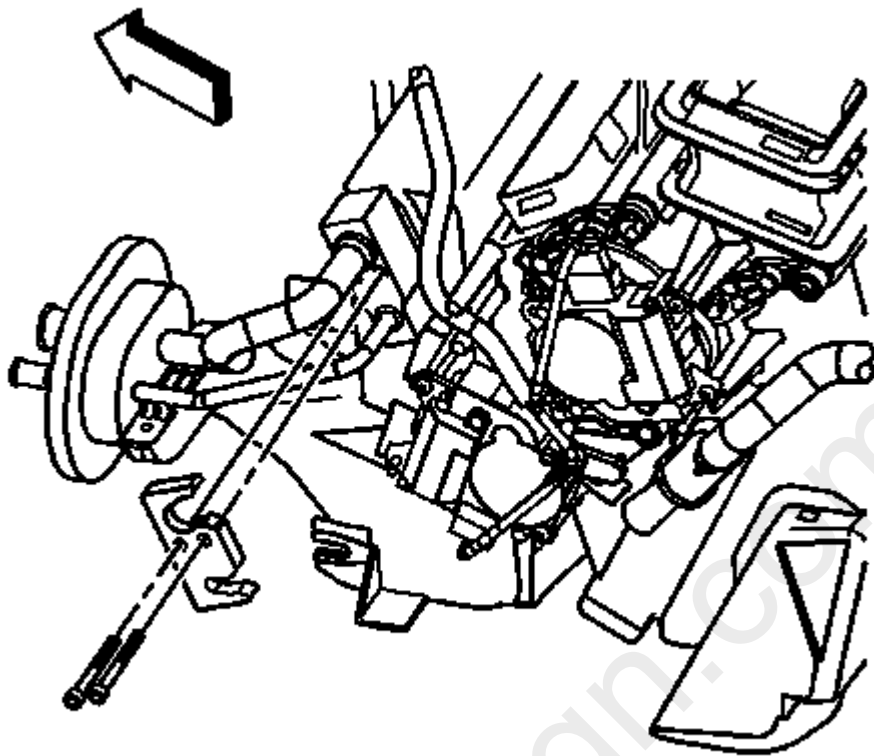


Fig. 4: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Install the TXV line bracket.

CAUTION: Refer to Fastener Caution .

7. Install TXV mounting bolts and tighten to 3.5 (31 lb in).
8. Remove the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LSA)**, **Air Conditioning Compressor Replacement (LFW LFX)**.

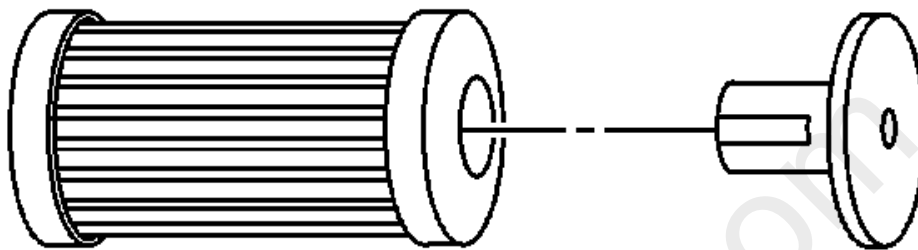


Fig. 5: View Of A/C Filter & Check Valve
Courtesy of GENERAL MOTORS COMPANY

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

9. Service the filter with AC Delco P/N GF 470, before each flush.

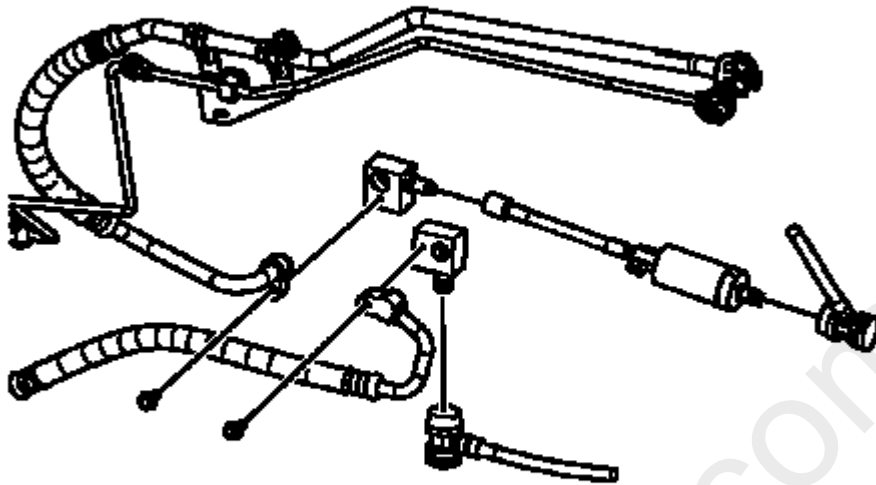


Fig. 6: View Of HVAC Hoses

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install new O-rings onto the A/C discharge and suction lines. Refer to Air Conditioning O-Ring Seal Replacement.

10. Install the J 45268-13 to the A/C suction line.
11. Install the J 45268-12 to the A/C discharge line.
12. Connect the J 45268-1 flush filter to the J 45268-7 flush fitting.
13. Connect the blue hose from the **J 43600** ACR 2000 air conditioning service center to J 45268-1 flush filter adapter.
14. Connect the red hose from the **J 43600** ACR 2000 air conditioning service center to J 45268-8 flush fitting.

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

15. Flush the A/C system. Follow the instructions supplied with the **J 43600** ACR 2000 air conditioning service center.
16. Disconnect the red hose from the **J 43600** ACR 2000 air conditioning service center to J 45268-8 flush

fitting.

17. Disconnect the blue hose from the **J 43600** ACR 2000 air conditioning service center to J 45268-1 flush filter adapter.
18. Disconnect the J 45268-1 flush filter from the J 45268-7 flush fitting.
19. Remove the J 45268-12 from the A/C discharge line.
20. Remove the J 45268-13 from the A/C suction line.

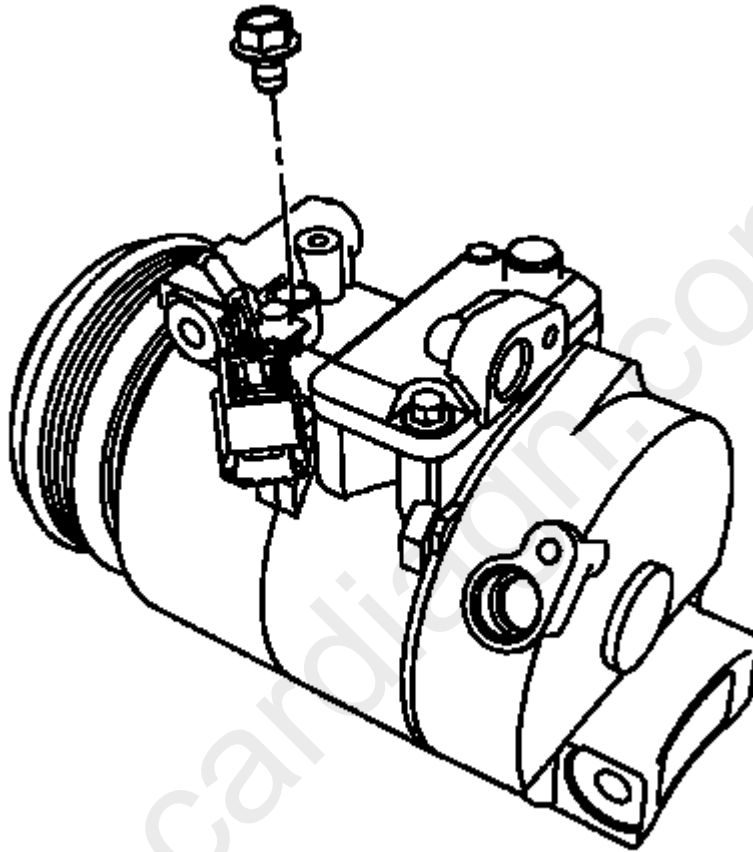


Fig. 7: View Of Drain Oil Bolt On Compressor
Courtesy of GENERAL MOTORS COMPANY

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

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

21. If you will reinstall the removed A/C compressor, perform the following procedure:
 1. Drain and properly discard the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.
 2. Add the total system capacity of PAG oil into the A/C compressor oil drain. Refer to **Refrigerant System Specifications**.

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

3. Add one bottle of J 41447 R-134A A/C tracer dye directly to the A/C compressor.

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 (LSA), Air Conditioning Compressor Replacement (LFW LFX).

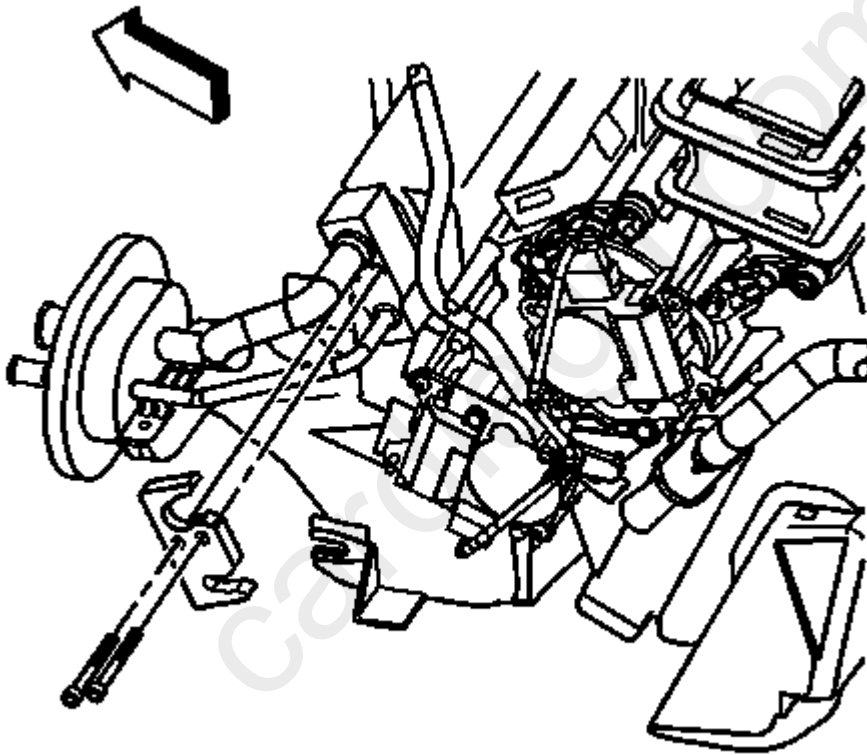


Fig. 8: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

23. Remove the TXV mounting bolts.
24. Remove the TXV line bracket.

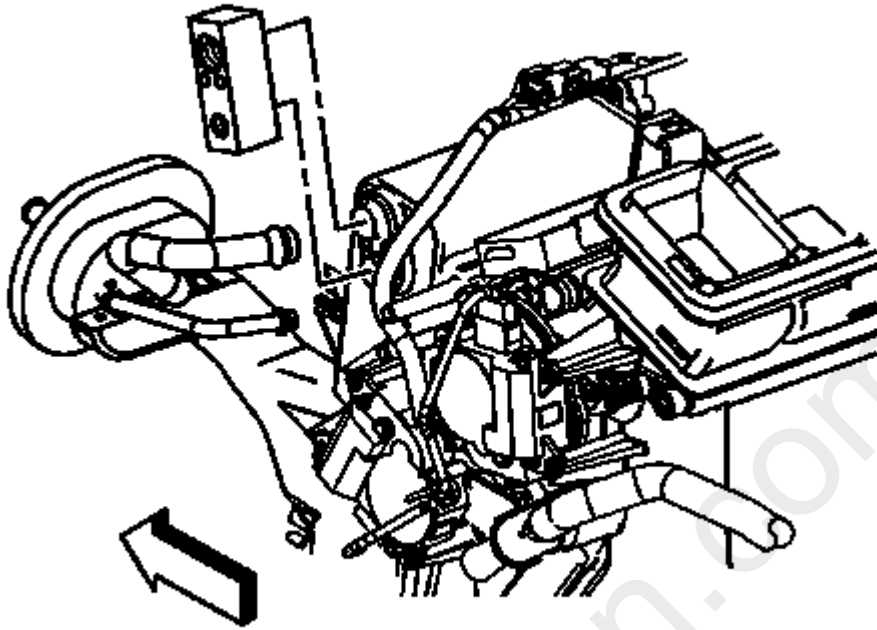


Fig. 9: View Of TXV

Courtesy of GENERAL MOTORS COMPANY

25. Remove J 45268-110 from the evaporator core.
26. Remove the A/C lines from J 45268-110.
27. Inspect the TXV for debris. Clean or replace as needed.
28. Replace the desiccant bag. Refer to **Air Conditioning Refrigerant Desiccant Replacement**.
29. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
30. Leak test the fittings using J 42220 universal 12V leak detection lamp.

AIR CONDITIONING COMPRESSOR OIL BALANCING

Draining Procedure

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

1. Before draining oil, position the compressor vertically (clutch facing upwards) and let it sit for 1 minute.
2. Position the compressor horizontally, with the ports facing downward, rotate the clutch and shake the

compressor in order to remove as much oil from the compressor as possible.

3. Drain the oil from both the suction and discharge ports of the removed compressor into a clean, graduated container. Rotate the compressor shaft to assist in draining the compressor.

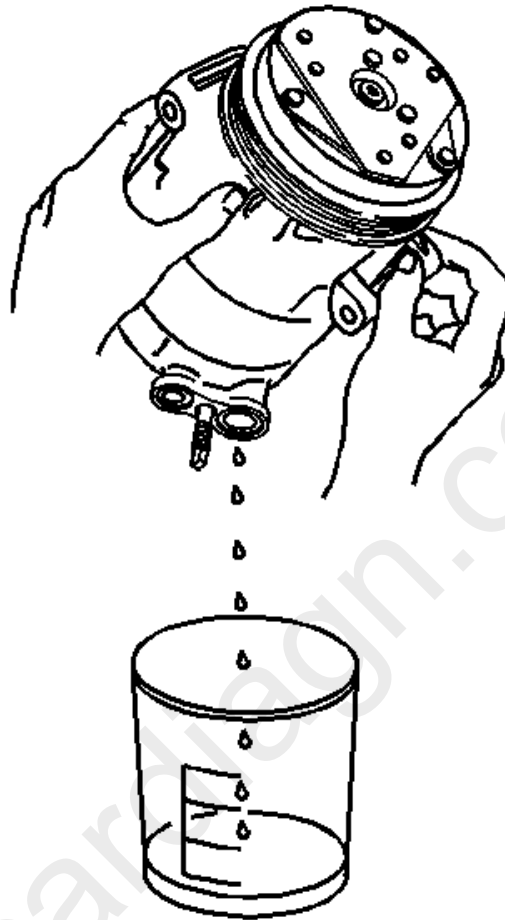


Fig. 10: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS COMPANY

4. Measure and record the amount of oil drained from the removed compressor. This measurement will be used during installation of the replacement compressor.
5. Inspect oil drained from removed comperssor. Refer to **Air Conditioning Compressor Oil Diagnosis**
6. Properly discard the used refrigerant oil.

Balancing Procedure

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

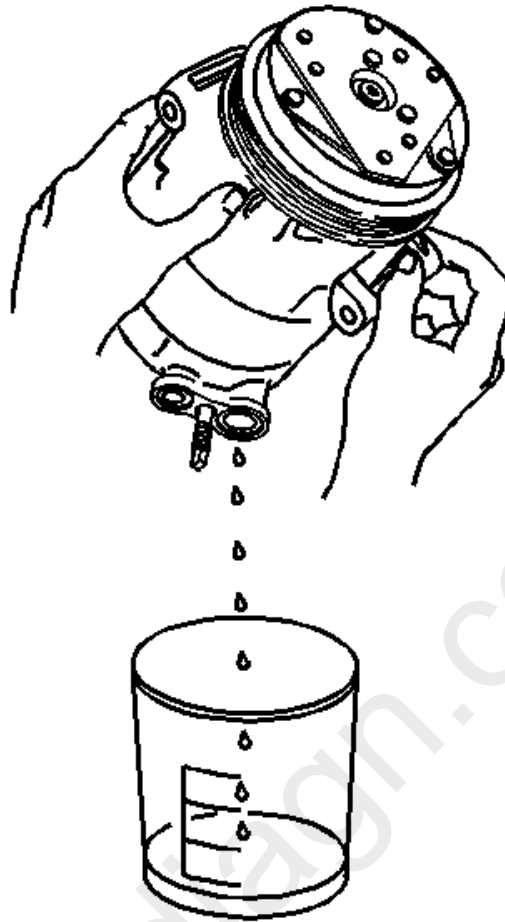


Fig. 11: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS COMPANY

1. Before installing the compressor, the refrigerant oil will have to be fully drained.
2. Add back the same quantity of polyalkylene glycol (PAG) oil as drained from the removed compressor.

Refer to the amount of refrigerant oil recorded during the compressor removal.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LSA)

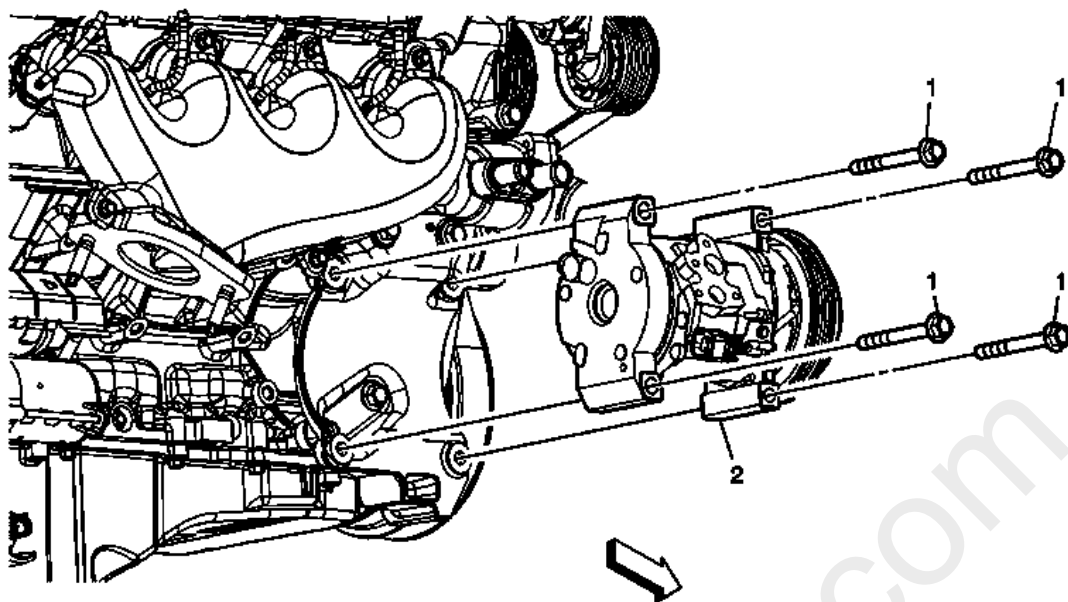


Fig. 12: Identifying Air Conditioning Compressor (LSA)

Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Replacement (LSA)

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u> 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 3. Remove the drive belt. Refer to <u>Air Conditioning Compressor Belt Replacement</u> 4. Remove the compressor hose. Refer to <u>Air Conditioning Compressor Hose Replacement (LSA)</u>. 5. Remove the compressor and condenser hose. Refer to <u>Air Conditioning Compressor and Condenser Hose Replacement (LSA)</u>. 6. Remove the right side engine splash shield. Refer to <u>Engine Splash Shield Replacement</u> 7. If you are replacing the compressor, balance the compressor oil. Refer to <u>Air Conditioning Compressor Oil Balancing</u>	
1	Compressor Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten

	50 N.m (36 lb ft)
2	Compressor TIP: Disconnect compressor electrical connector.

AIR CONDITIONING COMPRESSOR REPLACEMENT (LFW LFX)

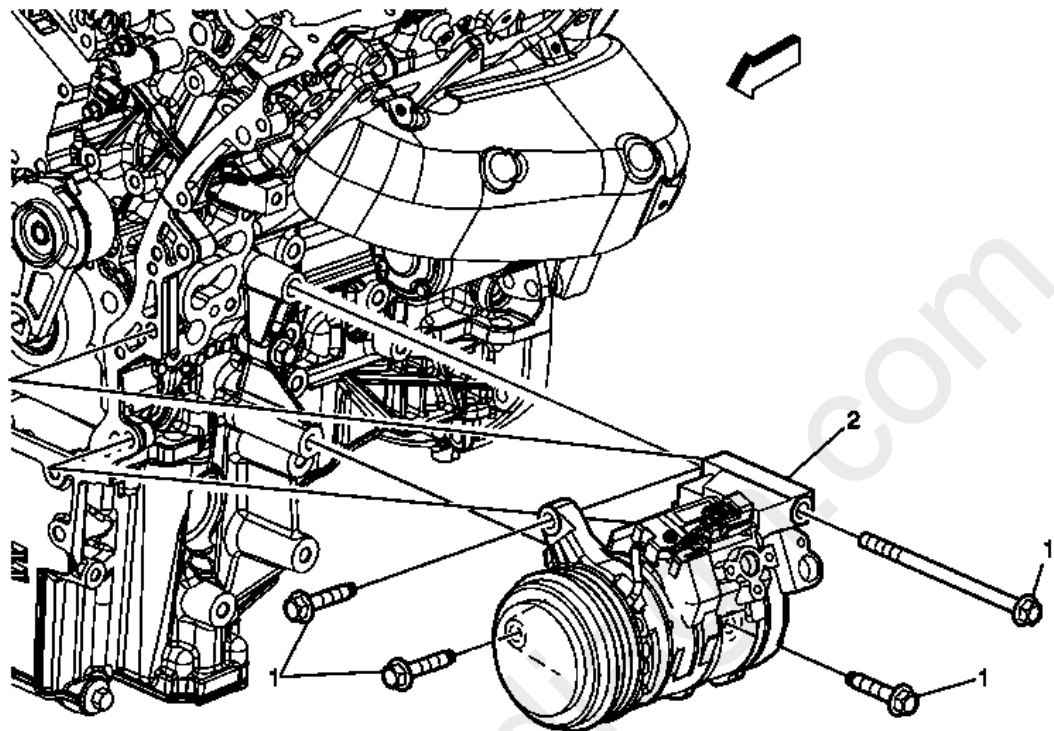


Fig. 13: Air Conditioning Compressor
Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Replacement (LFW LFX)

Callout	Component Name
Preliminary Procedures	
1.	Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u> .
2.	Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .
3.	Remove the drive belt. Refer to <u>Drive Belt Replacement</u> .
4.	Remove the A/C drive belt tensioner. Refer to <u>Drive Belt Tensioner Removal</u> .
5.	Remove the air cleaner duct. Refer to <u>Air Cleaner Outlet Duct Replacement</u> .
6.	Remove the front air deflector. Refer to <u>Front Air Deflector Replacement</u> .
7.	Remove the air conditioning compressor hose. Refer to <u>Air Conditioning Compressor Hose Replacement (LFX or LFW)</u> .
8.	Remove the air conditioning compressor and condenser hose. Refer to <u>Air Conditioning</u>

Compressor and Condenser Hose Replacement (LFW or LFX).

9. If you are replacing the compressor, balance the compressor oil. Refer to **Air Conditioning Compressor Oil Balancing.**

1	Compressor Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 45 N.m (35 lb ft)
2	Compressor TIP: Disconnect compressor electrical connector.

COMPRESSOR CLUTCH PLATE/HUB ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the engine drive belt. Refer to **Drive Belt Replacement** .

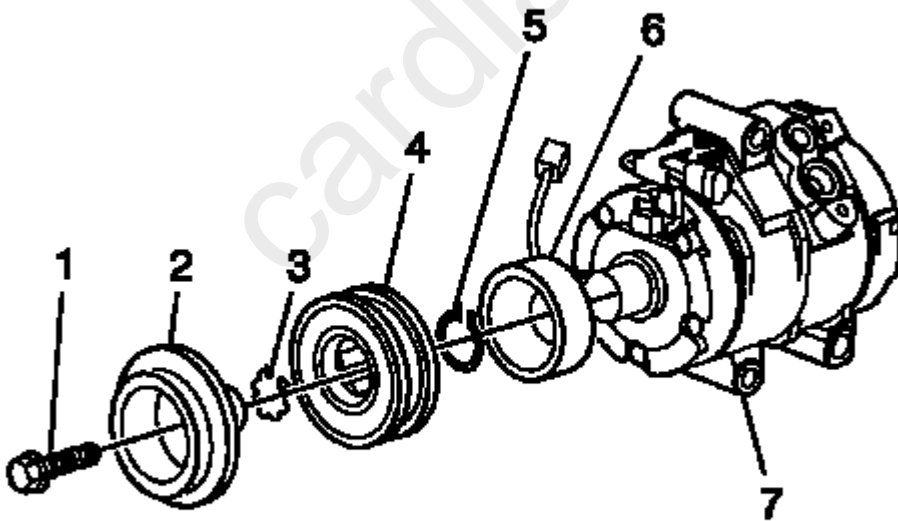


Fig. 14: Exploded View Of Clutch Hub/Bearing Assembly

Courtesy of GENERAL MOTORS COMPANY

2. Remove the clutch plate retaining bolt (1).
3. Remove the clutch plate assembly (2).
4. Remove the clutch hub/bearing snap ring (3).
5. Remove the clutch hub/bearing assembly (4).

Installation Procedure

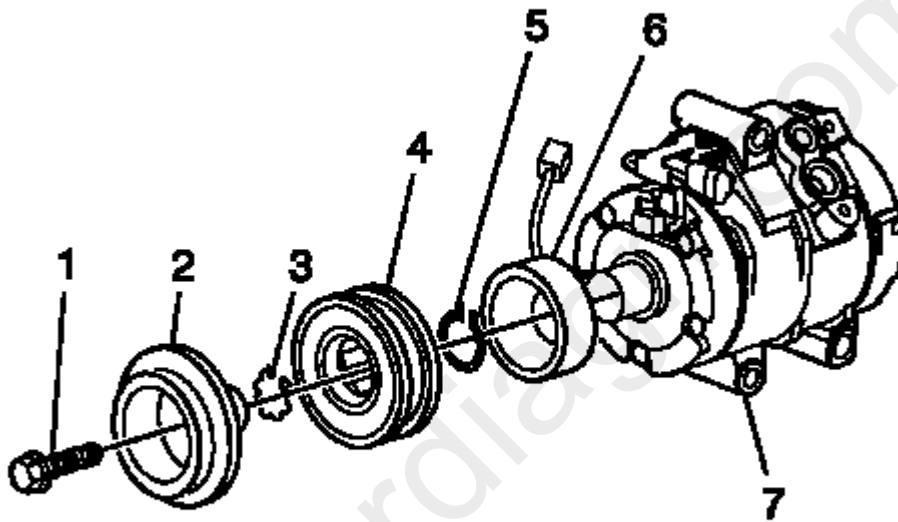


Fig. 15: Exploded View Of Clutch Hub/Bearing Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Install the clutch hub/bearing assembly (4).
2. Install the clutch hub/bearing snap ring (3).
3. Install the clutch plate assembly (2).

CAUTION: Refer to Fastener Caution .

4. Install the clutch plate retaining bolt (1) and tighten to 18 N.m (13 lb ft).

5. Install the engine drive belt. Refer to **Drive Belt Replacement** .

AIR CONDITIONING O-RING SEAL REPLACEMENT

Removal Procedure

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

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

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

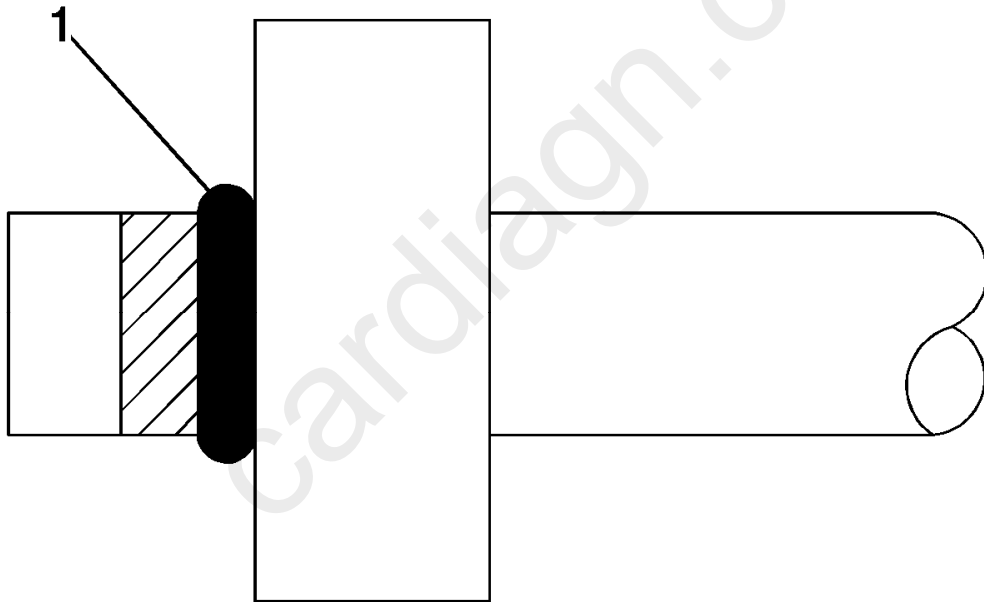


Fig. 16: O-ring seal

Courtesy of GENERAL MOTORS COMPANY

3. Remove the O-ring seal (1) from the A/C refrigerant component.
4. Inspect the O-ring seal for signs of damage to help determine the root cause of the failure.

5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.
6. DISCARD the O-ring seal.

Installation Procedure

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

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

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

NOTE: DO NOT reuse O-ring seals.

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

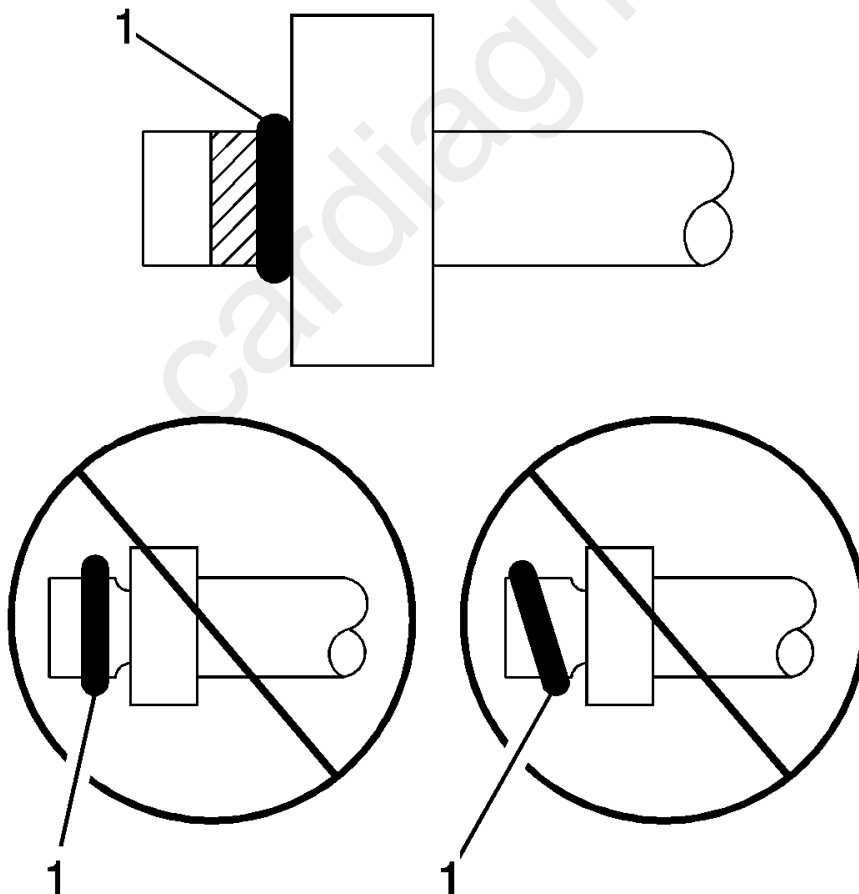


Fig. 17: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS COMPANY

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

Refer to the appropriate repair procedure.

AIR CONDITIONING LINE/TUBE CONNECTOR REMOVAL/REPLACEMENT

Tools Required

- J 39400-A Halogen Leak Detector
- J 45689 A/C Quick Joint Tool

Removal Procedure

1. Recover the refrigerant from the A/C system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.

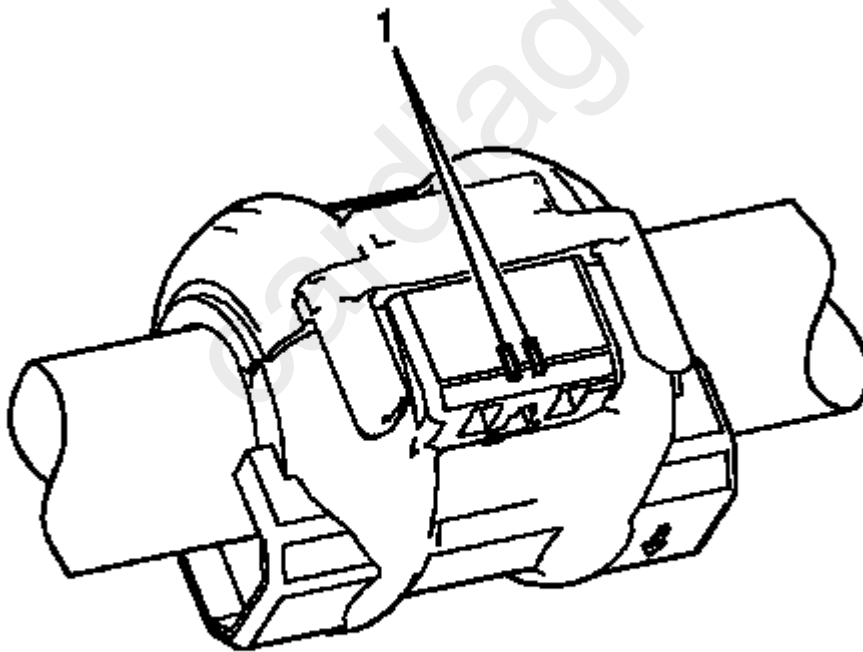


Fig. 18: Locating A/C Quick Connect Fitting Locking Tab Access Slots

Courtesy of GENERAL MOTORS COMPANY

2. Locate the A/C quick connect fitting locking tab access slots (1).

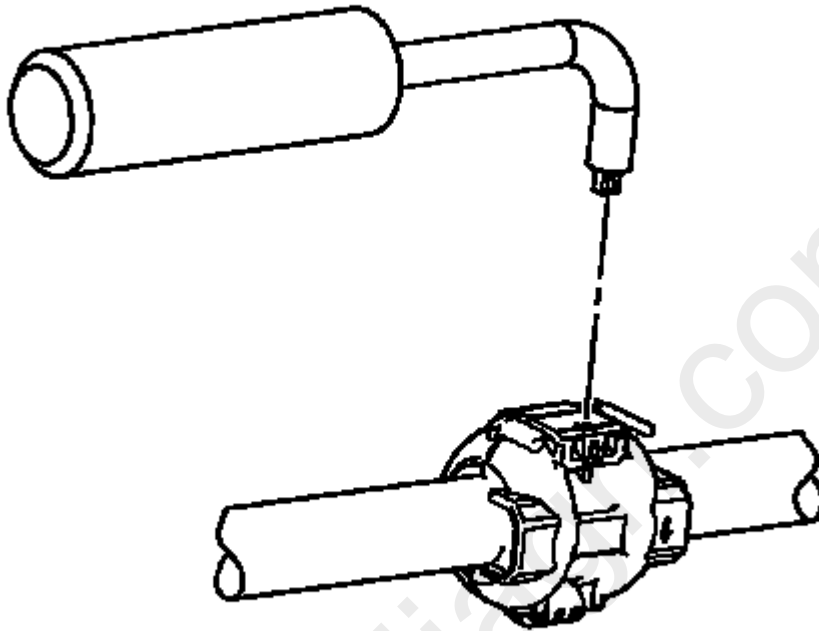


Fig. 19: A/C Quick Joint Tool & Locking Tab Access Slots
Courtesy of GENERAL MOTORS COMPANY

IMPORTANT: The J 45689 A/C quick joint tool should be parallel with the quick connect fitting.

3. Carefully insert **J 45689** A/C quick joint tool into the locking tab access slots.
4. Gently press down on the locking tab until the quick connect fitting locking tab releases.

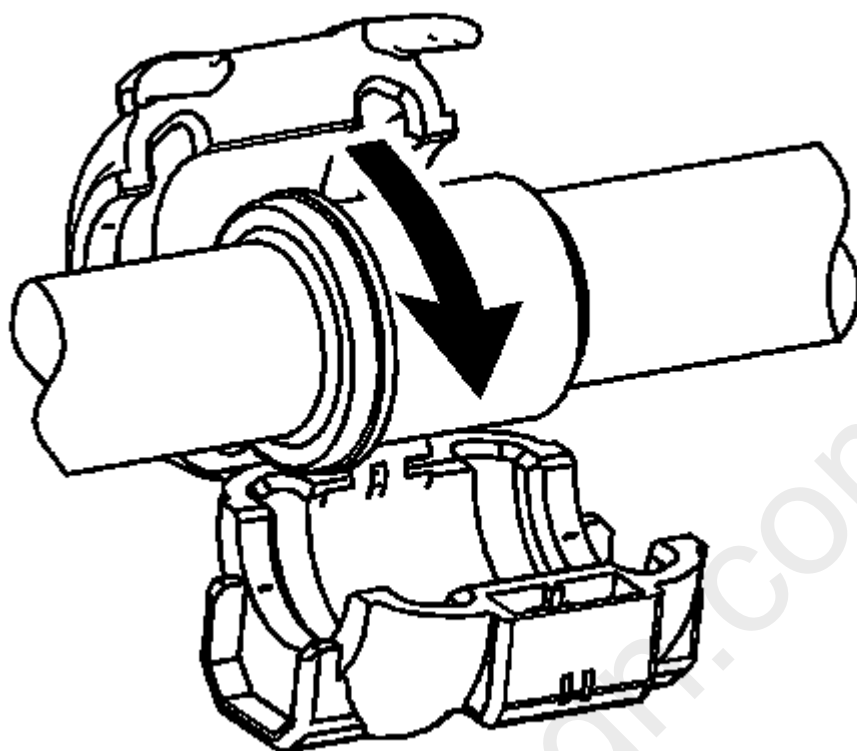


Fig. 20: Removing Quick Connect Fitting From A/C Refrigerant Component
Courtesy of GENERAL MOTORS COMPANY

5. Open and remove the quick connect fitting from the A/C refrigerant component.

Installation Procedure

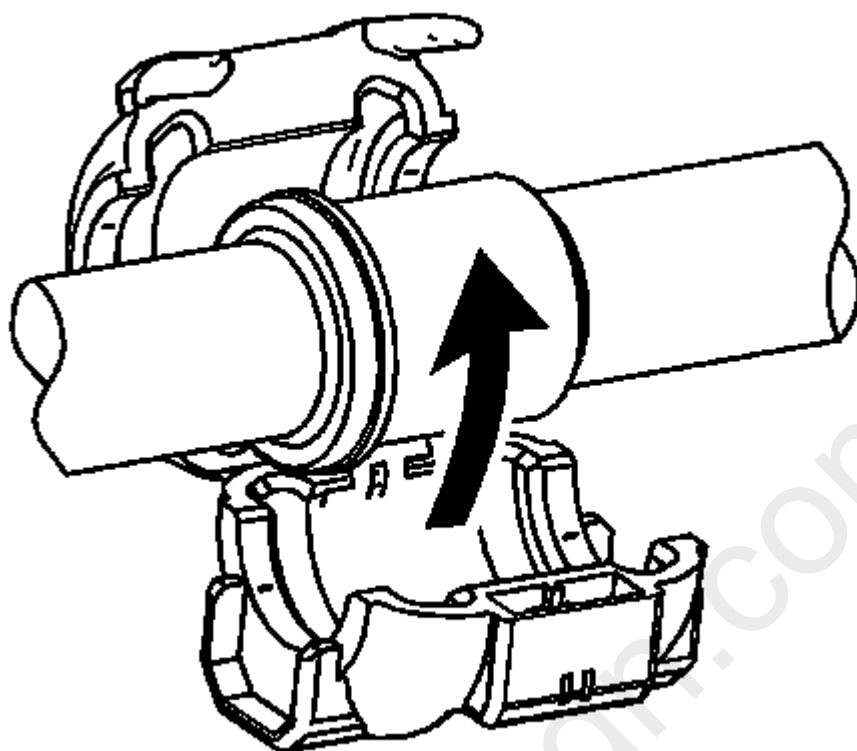


Fig. 21: Installing Quick Connect Fitting To A/C Refrigerant Component
Courtesy of GENERAL MOTORS COMPANY

IMPORTANT: Inspect the A/C quick connect fitting locking tab for damage or wear.
Replace the A/C quick connect fitting if any conditions exist.

1. Install the A/C quick connect fitting to the A/C refrigerant component.

IMPORTANT: Ensure that the A/C quick connect fitting is latched securely to the A/C refrigerant component.

2. Close the A/C quick connect fitting.
3. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
4. Leak test the fittings of the component using **J 39400-A** halogen leak detector.

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT (LFX OR LFW)

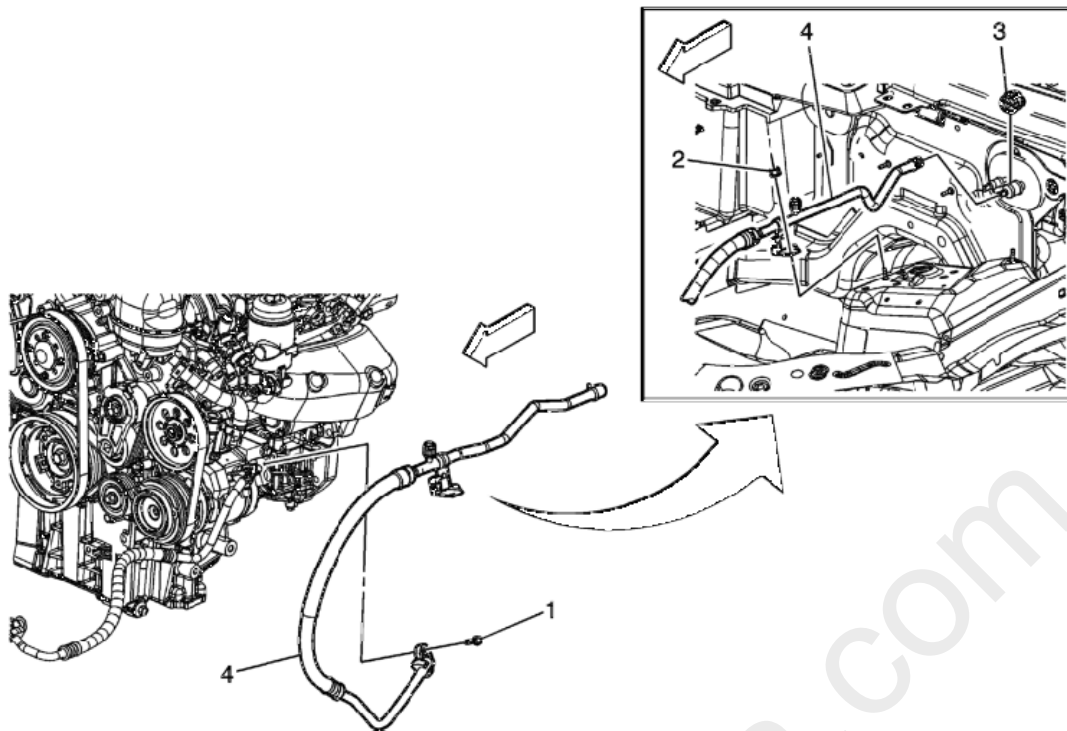


Fig. 22: Air Conditioning Compressor Hose
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor Hose Replacement (LFX or LFW)

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u>. 2. Remove the air deflector. Refer to <u>Front Air Deflector Replacement</u>. 3. Remove the air cleaner duct. Refer to <u>Air Cleaner Outlet Duct Replacement</u>.	
1	Air Conditioning Compressor Hose Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 (80 lb in)
2	Air Conditioning Compressor Hose Bracket Retaining Nut Tighten 9 (80 lb in)
	Air Conditioning Compressor Hose Clamp Procedure

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

AIR CONDITIONING COMPRESSOR HOSE REPLACEMENT (LSA)

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the front air deflector. Refer to **Front Air Deflector Replacement** .
4. Remove the front compartment lower noise shield (if equipped). Refer to **Front Compartment Lower Noise Shield Replacement (All Wheel Drive)** , **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)** .
5. Remove the engine coolant fan shroud**Engine Coolant Fan Shroud Replacement (LSA)** .
6. Remove the radiator outlet hose from the thermostat housing. Refer to **Radiator Outlet Hose Replacement (LSA)** .
7. Remove the heater inlet/outlet hoses from the water pump. **Heater Inlet Hose/Pipe and Heater Outlet Hose/Pipe Replacement (LSA)**.

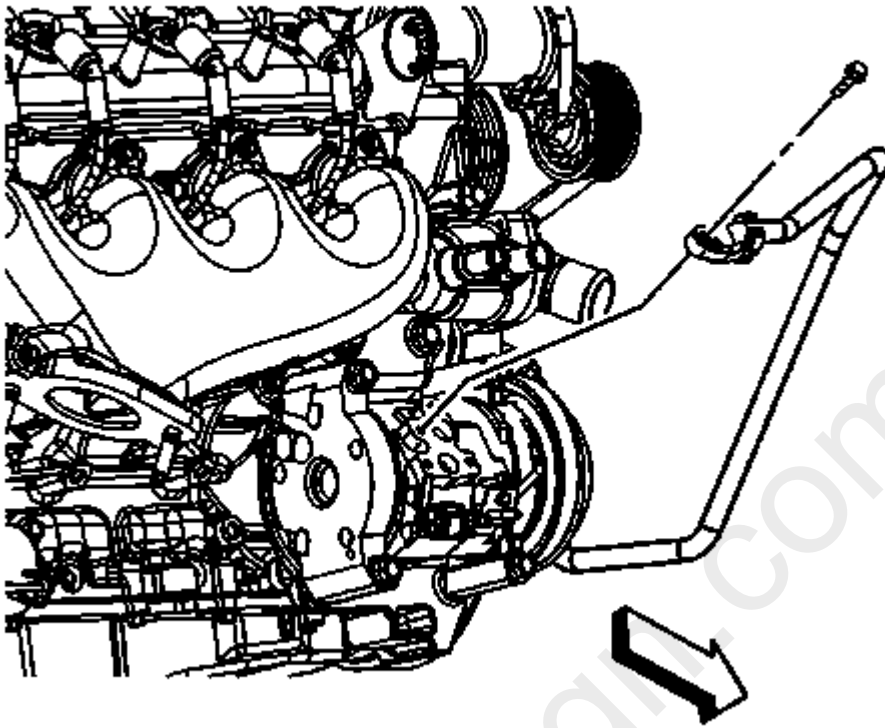


Fig. 23: View Of Suction Hose At Compressor
Courtesy of GENERAL MOTORS COMPANY

8. Remove the compressor hose bolt at the compressor.
9. Remove the compressor hose from the compressor.
10. Unclip the condenser and evaporator tube from the compressor hose bracket.

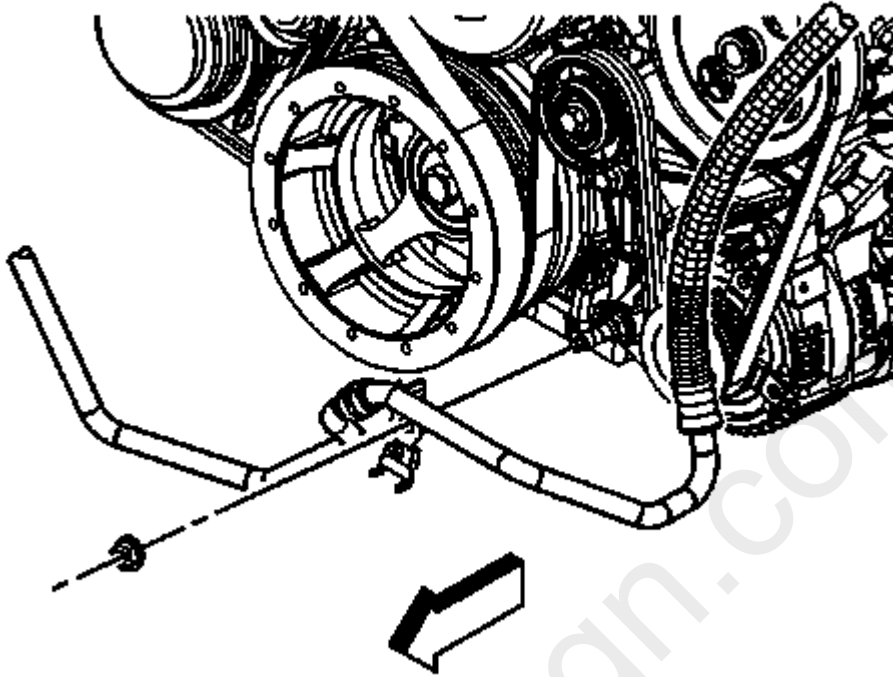


Fig. 24: View Of Suction Hose Bracket Bolt At Engine
Courtesy of GENERAL MOTORS COMPANY

11. Remove the compressor hose bracket bolt from the engine.

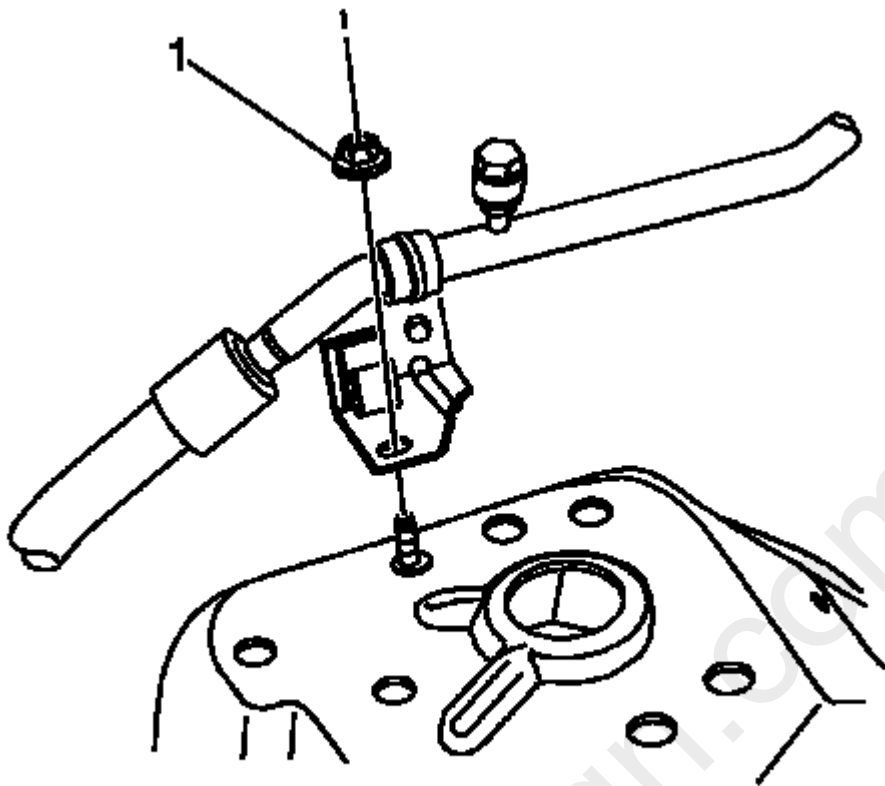


Fig. 25: Identifying Suction Hose Bracket Nut At Wheelhouse Panel Stud
Courtesy of GENERAL MOTORS COMPANY

12. Remove the compressor hose bracket nut (1) from the wheelhouse panel stud.

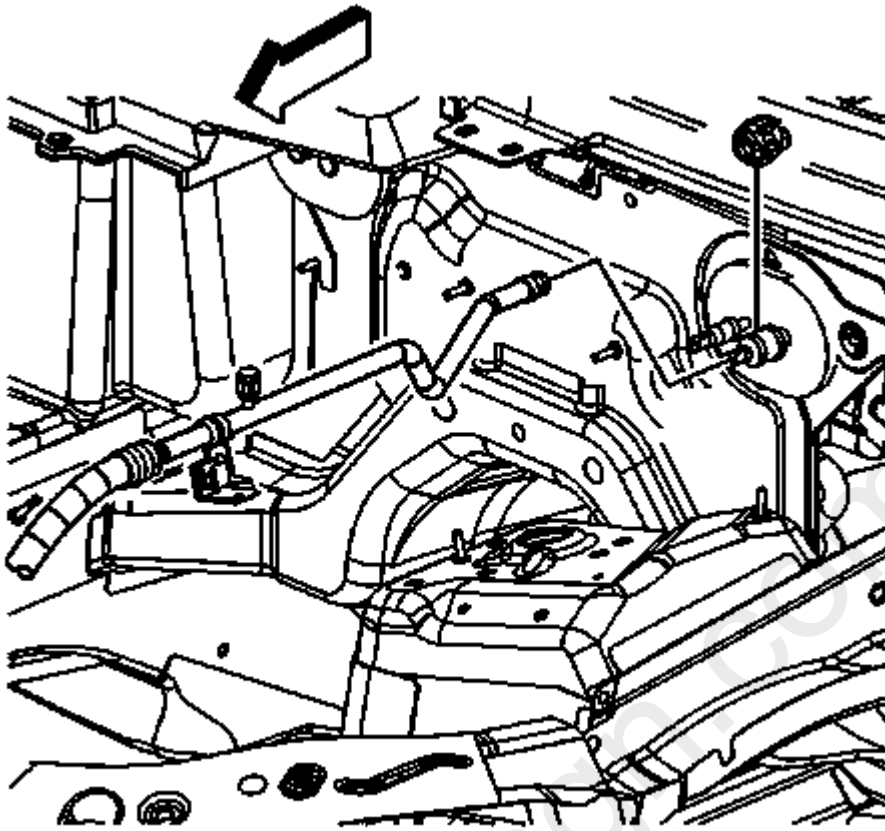


Fig. 26: View Of Suction Hose At Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

13. Remove the compressor hose from the evaporator core. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement**.
14. Remove the compressor hose from the vehicle.

Installation Procedure

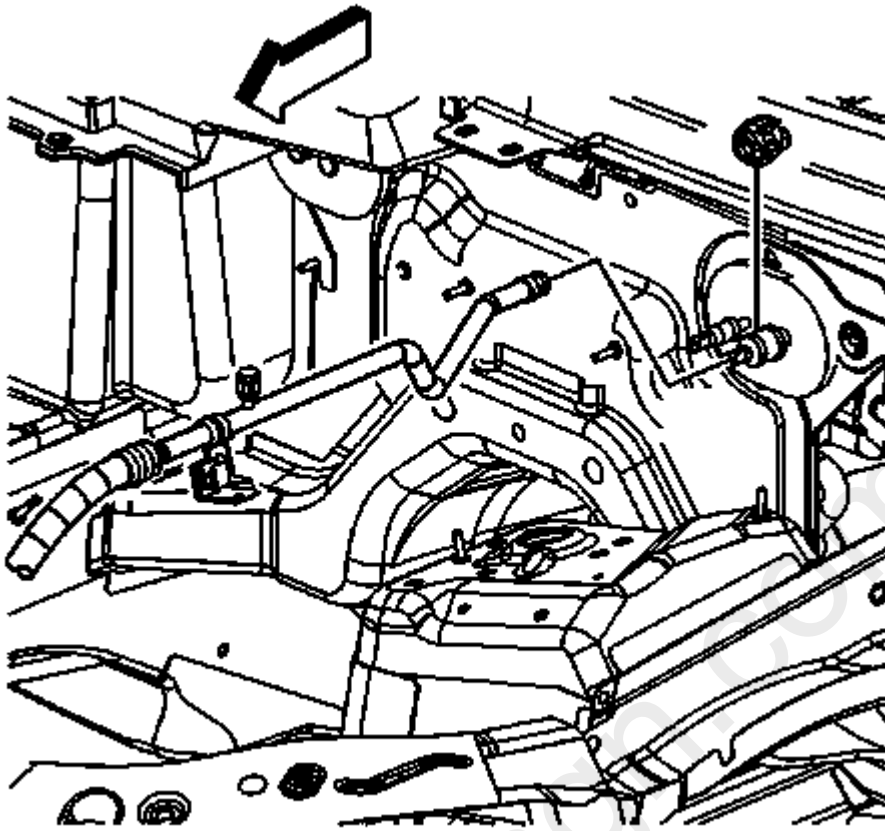


Fig. 27: View Of Suction Hose At Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

1. Install the compressor hose to the evaporator core. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement.**

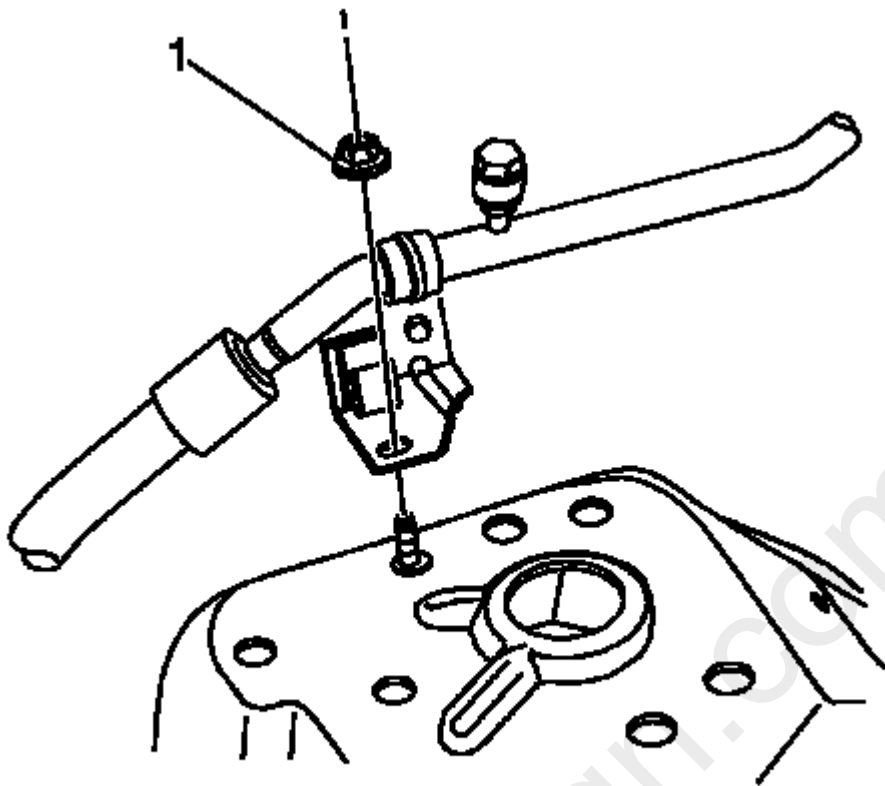


Fig. 28: Identifying Suction Hose Bracket Nut At Wheelhouse Panel Stud
Courtesy of GENERAL MOTORS COMPANY

2. Install the compressor hose bracket nut (1) from the wheelhouse panel stud and tighten to 9 N.m (80 lb in).

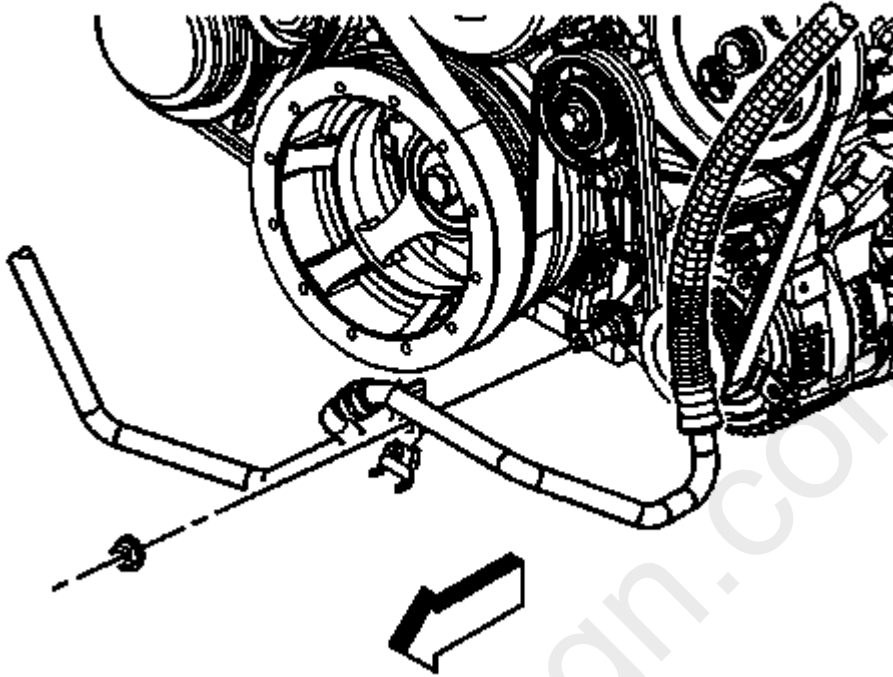


Fig. 29: View Of Suction Hose Bracket Bolt At Engine
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the compressor hose bracket bolt to the engine and tighten to 10 N.m (89 lb in).

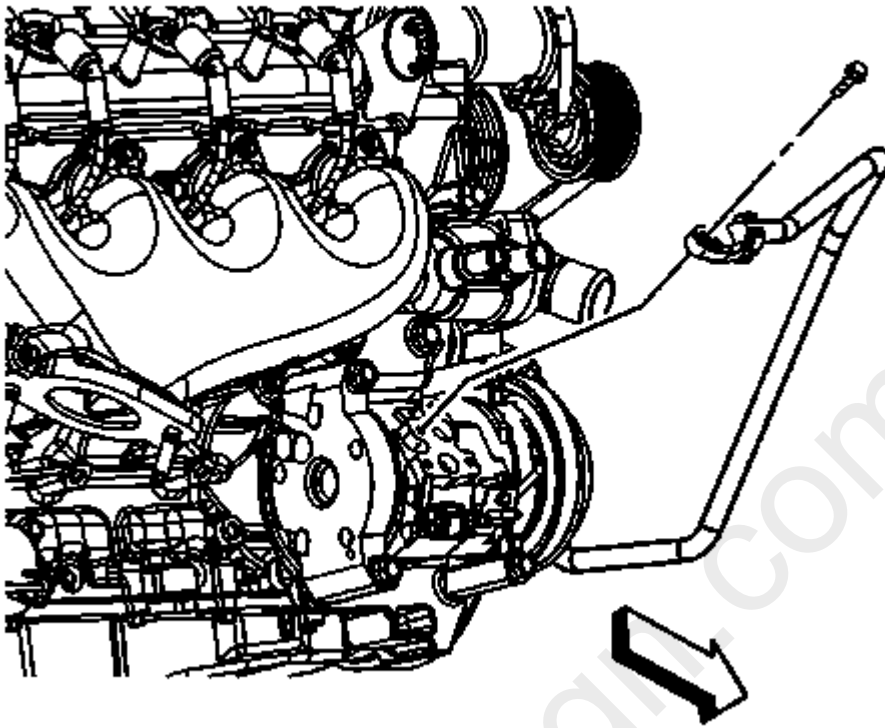


Fig. 30: View Of Suction Hose At Compressor
Courtesy of GENERAL MOTORS COMPANY

4. Install the compressor hose to the compressor.
5. Install the compressor hose bolt to the compressor and tighten to 9 N.m (80 lb in).
6. Clip the condenser and evaporator tube to the compressor hose bracket.
7. Install the heater inlet/outlet hoses to the water pump. **Heater Inlet Hose/Pipe and Heater Outlet Hose/Pipe Replacement (LSA)**.
8. Install the radiator outlet hose to the thermostat housing. Refer to **Radiator Outlet Hose Replacement (LSA)** .
9. Install the engine coolant fan shroud. Refer to **Engine Coolant Fan Shroud Replacement (LSA)** .
10. Install the front compartment lower noise shield (if equipped). Refer to **Front Compartment Lower Noise Shield Replacement (All Wheel Drive)** , **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)** .
11. Install the front air deflector. Refer to **Front Air Deflector Replacement** .
12. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .
13. Evacuate and recharge the system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.

AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE REPLACEMENT (LFW OR LFX)

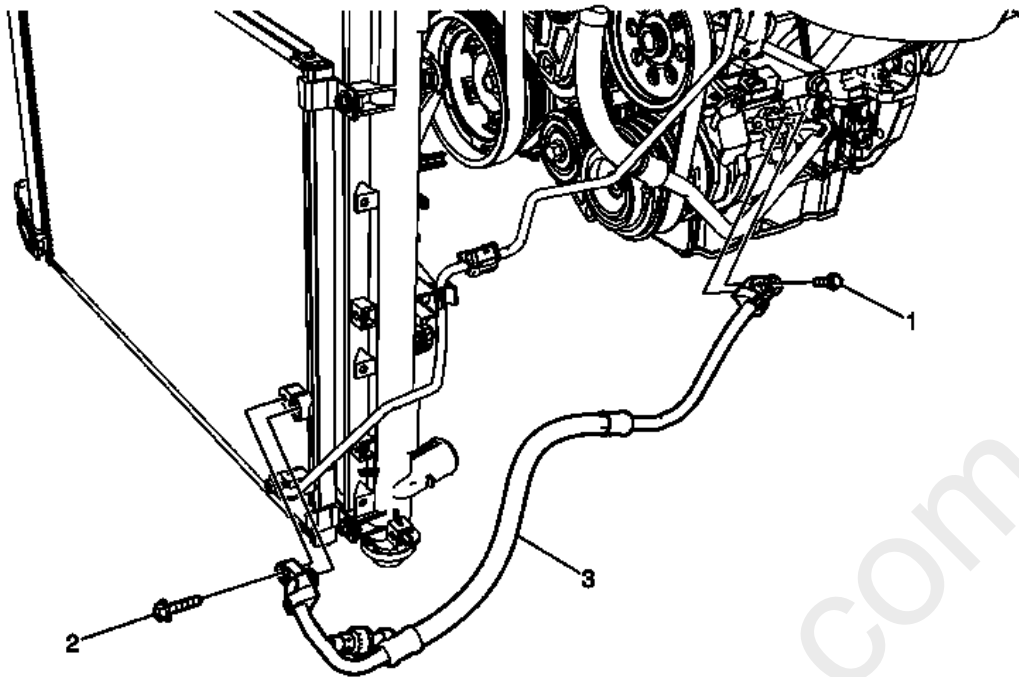


Fig. 31: Identifying Discharge Hose (LFW or LFX)
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Compressor and Condenser Hose Replacement (LFW or LFX)

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u>. 2. Remove the air deflector. Refer to <u>Front Air Deflector Replacement</u>. 3. Remove the air conditioning A/C pressure sensor. Refer to <u>Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement</u>.	
1	Air Conditioning Compressor and Condenser Hose Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9.8 N.m (87 lb in)
2	Air Conditioning Compressor and Condenser Hose Bolt Tighten 5.4 N.m (48 lb in)
	Air Conditioning Compressor and Condenser Hose

Procedure

Remove and discard sealing washer. Refer to **Air Conditioning O-Ring Seal Replacement.**

AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE REPLACEMENT (LSA)**Removal Procedure**

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor).**
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle .**
3. Remove the front air deflector. Refer to **Front Air Deflector Replacement .**
4. Remove the front compartment lower noise shield (if equipped). Refer to **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive) .**
5. Remove the engine coolant fan shroud. Refer to **Engine Coolant Fan Shroud Replacement (LSA) .**
6. Remove the radiator outlet hose from the thermostat housing. Refer to **Radiator Outlet Hose Replacement (LSA) .**
7. Remove the heater inlet/outlet hoses from the water pump. **Heater Inlet Hose/Pipe and Heater Outlet Hose/Pipe Replacement (LSA).**

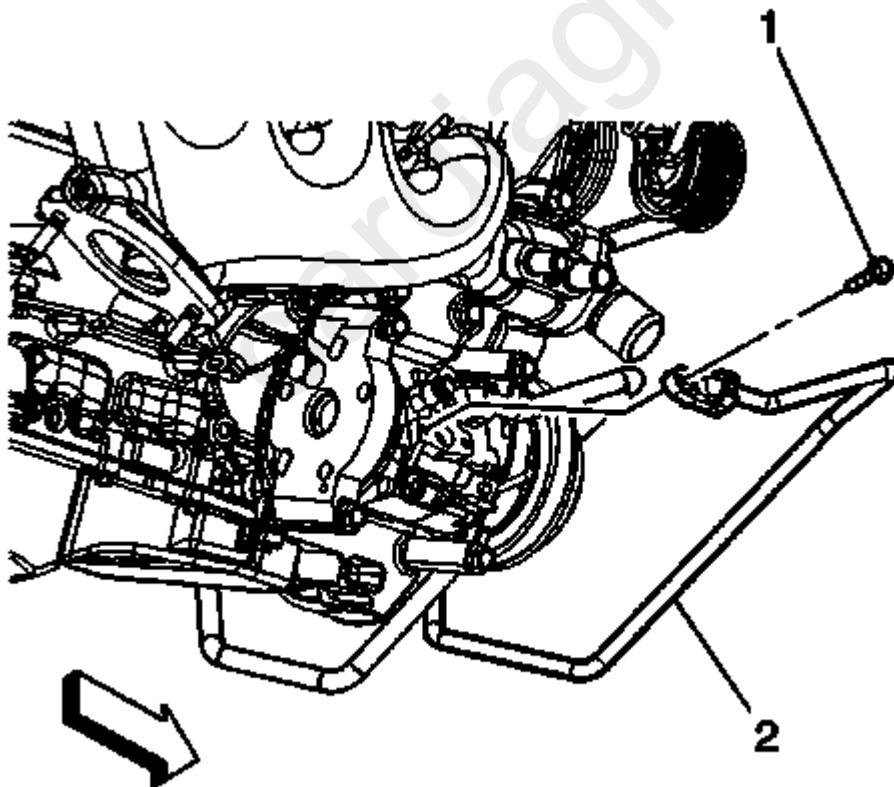


Fig. 32: Identifying Discharge Hose & Bolt At Compressor

Courtesy of GENERAL MOTORS COMPANY

8. Remove the compressor and condenser hose bolt (1) at the compressor.
9. Remove the compressor and condenser hose (2) from the compressor.

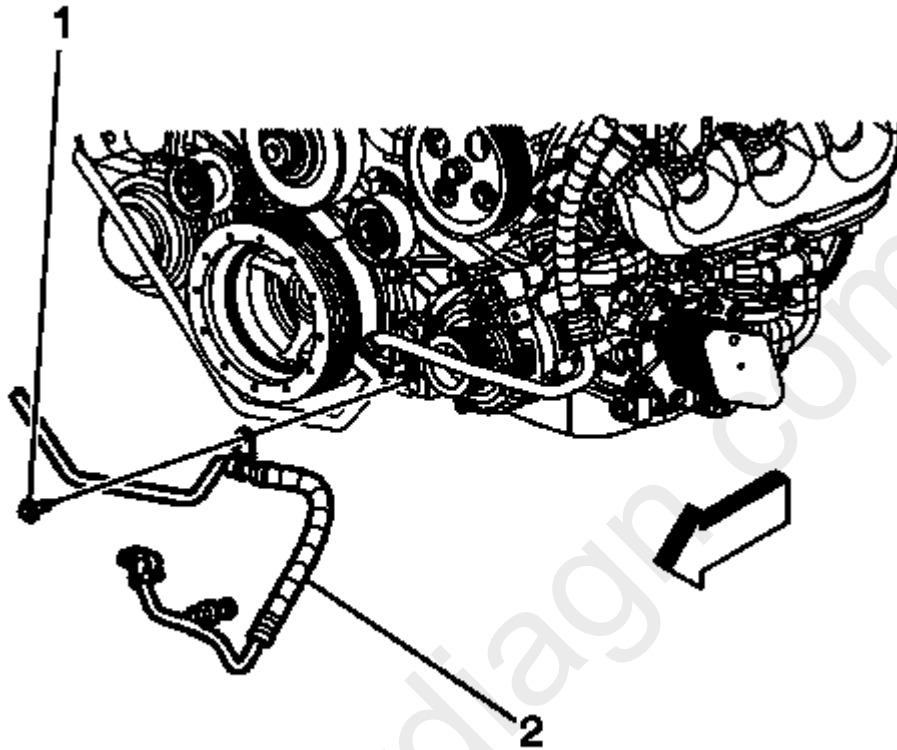


Fig. 33: Identifying Discharge Hose Bracket Bolt At Engine
Courtesy of GENERAL MOTORS COMPANY

10. Remove the compressor and condenser hose bracket bolt (1) from the engine.

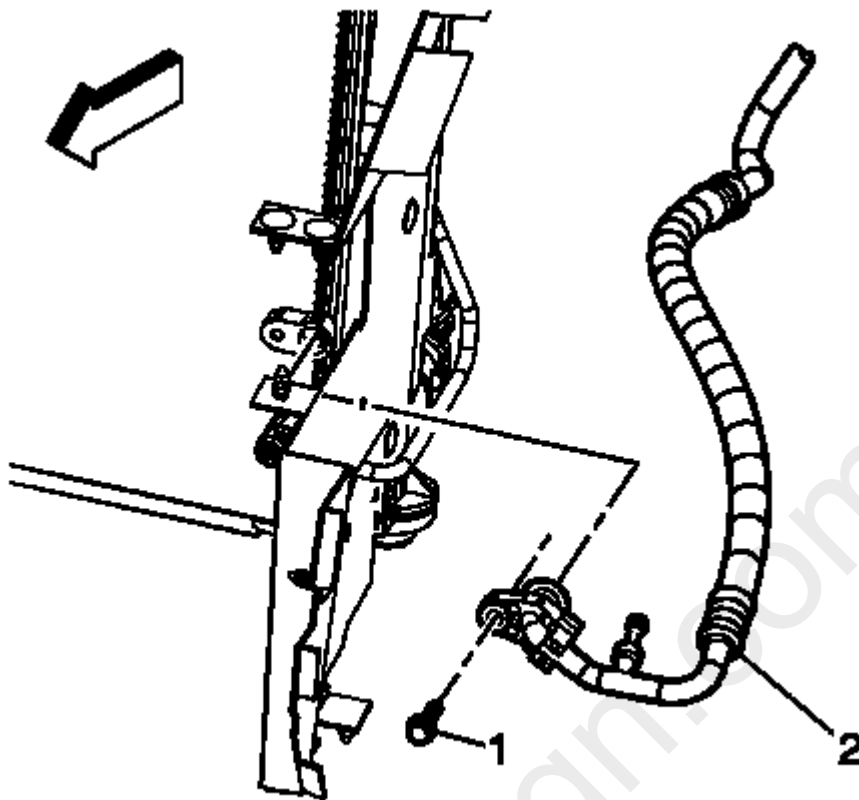


Fig. 34: Identifying Discharge Hose & Bolt At Condenser
Courtesy of GENERAL MOTORS COMPANY

11. Remove the compressor and condenser hose bolt (1) from the condenser.
12. Remove the compressor and condenser hose (2) from the vehicle.

Installation Procedure

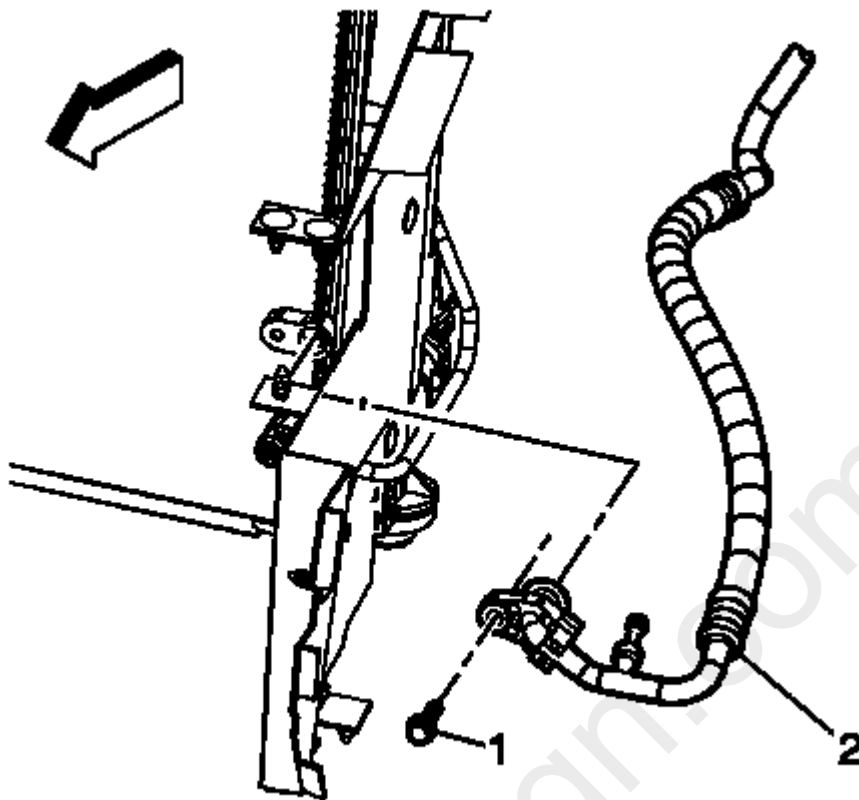


Fig. 35: Identifying Discharge Hose & Bolt At Condenser
Courtesy of GENERAL MOTORS COMPANY

1. Install the compressor and condenser hose (2) to the condenser.

CAUTION: Refer to Fastener Caution .

2. Install the compressor and condenser hose bolt (1) to the condenser and tighten to 10 N.m (89 lb in).

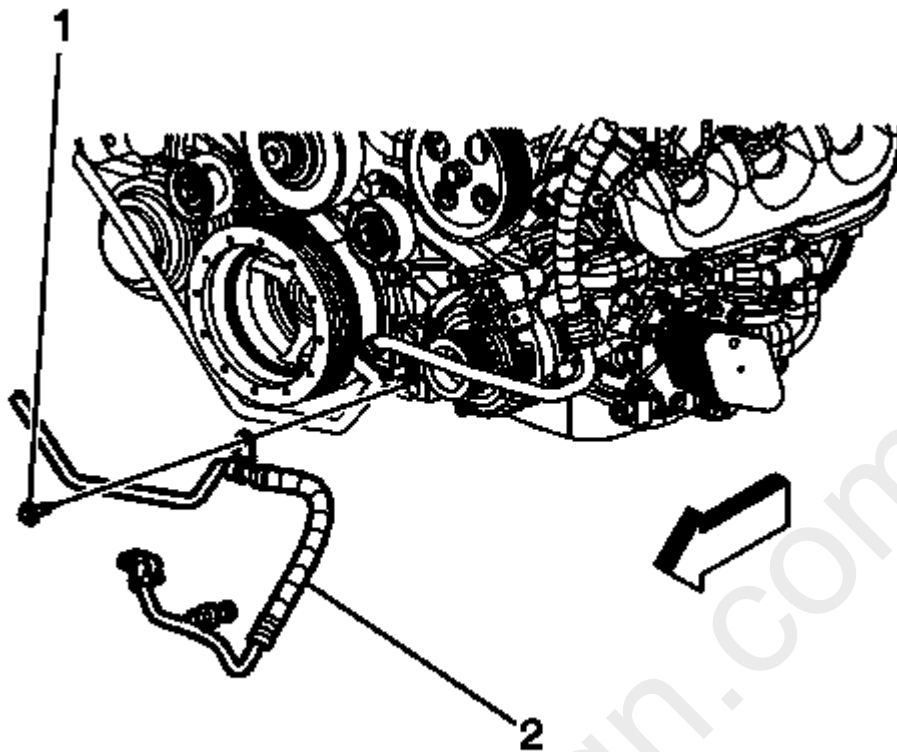


Fig. 36: Identifying Discharge Hose Bracket Bolt At Engine
Courtesy of GENERAL MOTORS COMPANY

3. Install the compressor and condenser hose bracket bolt (1) to the engine and tighten to 10 N.m (89 lb in).

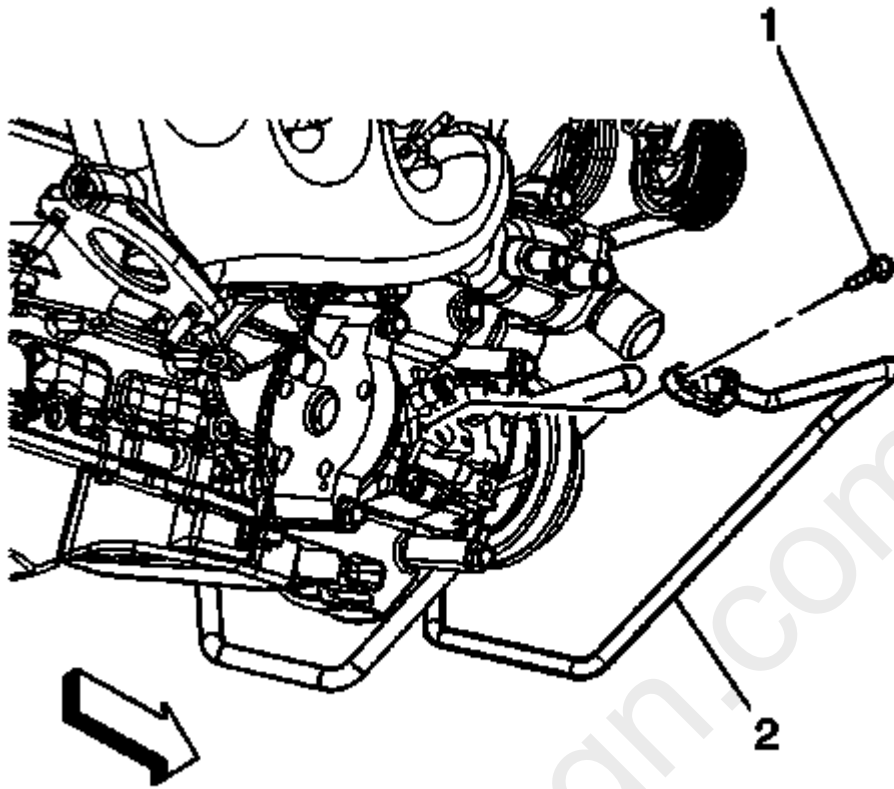


Fig. 37: Identifying Discharge Hose & Bolt At Compressor
Courtesy of GENERAL MOTORS COMPANY

4. Install the compressor and condenser hose (2) to the compressor.
5. Install the compressor and condenser hose bolt (1) to the compressor and tighten to 9 N.m (80 lb in).
6. Install the heater inlet/outlet hoses to the water pump. **Heater Inlet Hose/Pipe and Heater Outlet Hose/Pipe Replacement (LSA)**.
7. Install the radiator outlet hose to the thermostat housing. Refer to **Radiator Outlet Hose Replacement (LSA)** .
8. Install the engine coolant fan shroud. Refer to **Engine Coolant Fan Shroud Replacement (LSA)** .
9. Install the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)** .
10. Install the front air deflector. Refer to **Front Air Deflector Replacement** .
11. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .
12. Evacuate and recharge the system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.

CONDENSER TUBE REPLACEMENT (LFX OR LFW)

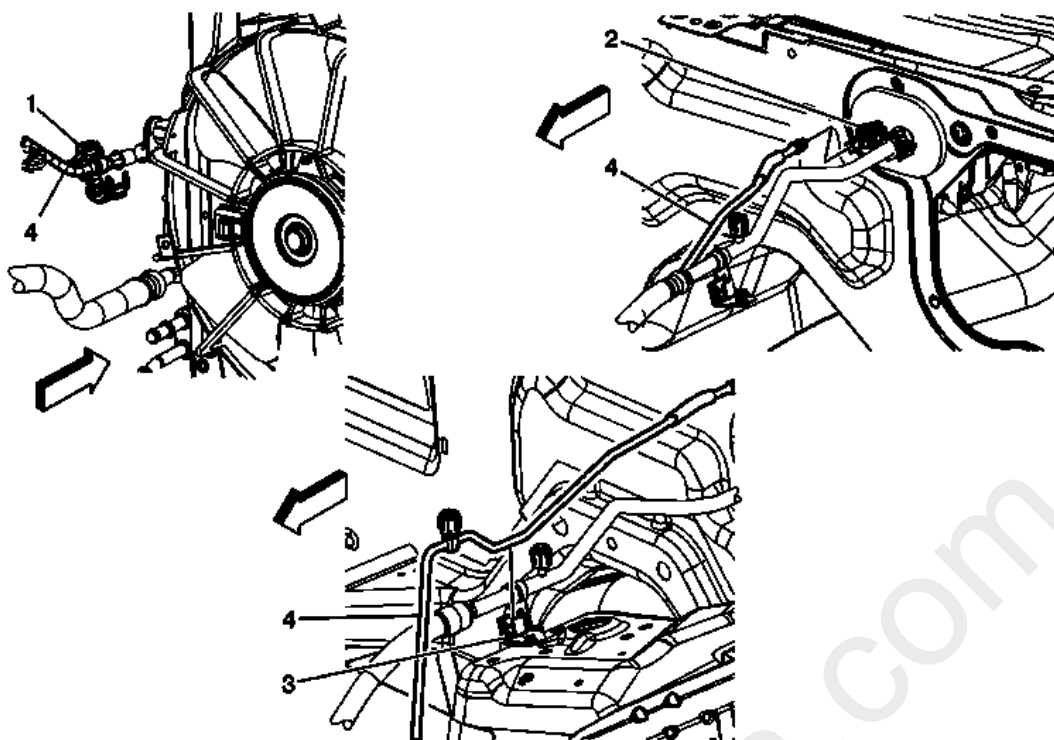


Fig. 38: Condenser Tube (LFX or LFW)
 Courtesy of GENERAL MOTORS COMPANY

Condenser Tube Replacement (LFX or LFW)

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u> . 2. Remove the air deflector. Refer to <u>Front Air Deflector Replacement</u> . 3. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement</u> .	
1	A/C Condenser and A/C Evaporator Clamp Procedure Remove clamp with J 45689 A/C Quick Joint Tool. Special Tools J 45689 A/C Quick Joint Tool
2	A/C Condenser and A/C Evaporator Clamp Procedure Remove clamp with J 45689 A/C Quick Joint Tool.
3	A/C Condenser Tube Retainer Procedure Align A/C condenser tube with plastic retainer on A/C compressor hose bracket.
4	A/C Condenser Tube Procedure Remove and discard sealing washer. Refer to <u>Air Conditioning O-Ring Seal</u>

Replacement.

EVAPORATOR INLET TUBE AND EVAPORATOR OUTLET TUBE REPLACEMENT

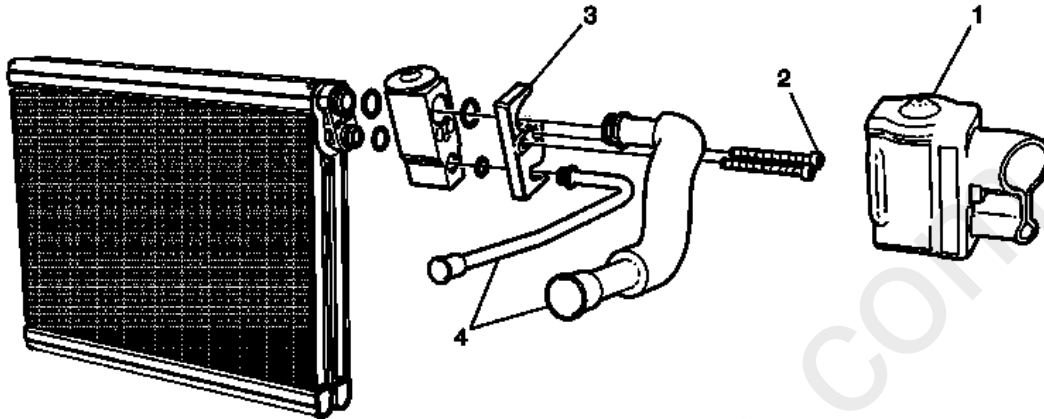


Fig. 39: Evaporator Inlet Tube and Evaporator Outlet Tube Replacement
Courtesy of GENERAL MOTORS COMPANY

Evaporator Inlet Tube and Evaporator Outlet Tube Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the HVAC module. Refer to <u>Air Conditioning and Heater Module Assembly Removal and Installation</u>	
2. Disconnect all the electrical connectors from components associated with the HVAC module.	
3. Remove any components associated with splitting the air distribution case.	
1	A/C Evaporator TXV Insulator.
2	A/C Evaporator TXV Bolt (Qty: 2).
3	A/C Evaporator TXV Attachment Connector.
4	A/C Evaporator TXV Tubes. Procedure Install new O-rings to the A/C Evaporator TXV Tubes. Refer to <u>Air Conditioning O-Ring Seal Replacement</u> .

AIR CONDITIONING REFRIGERANT DESICCANT REPLACEMENT

Special Tools

J 39400-A Halogen Leak Detector

Removal Procedure

1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging (Belt Driven Compressor).
2. Remove the front bumper fascia deflector. Refer to Front Bumper Fascia Air Deflector Replacement.

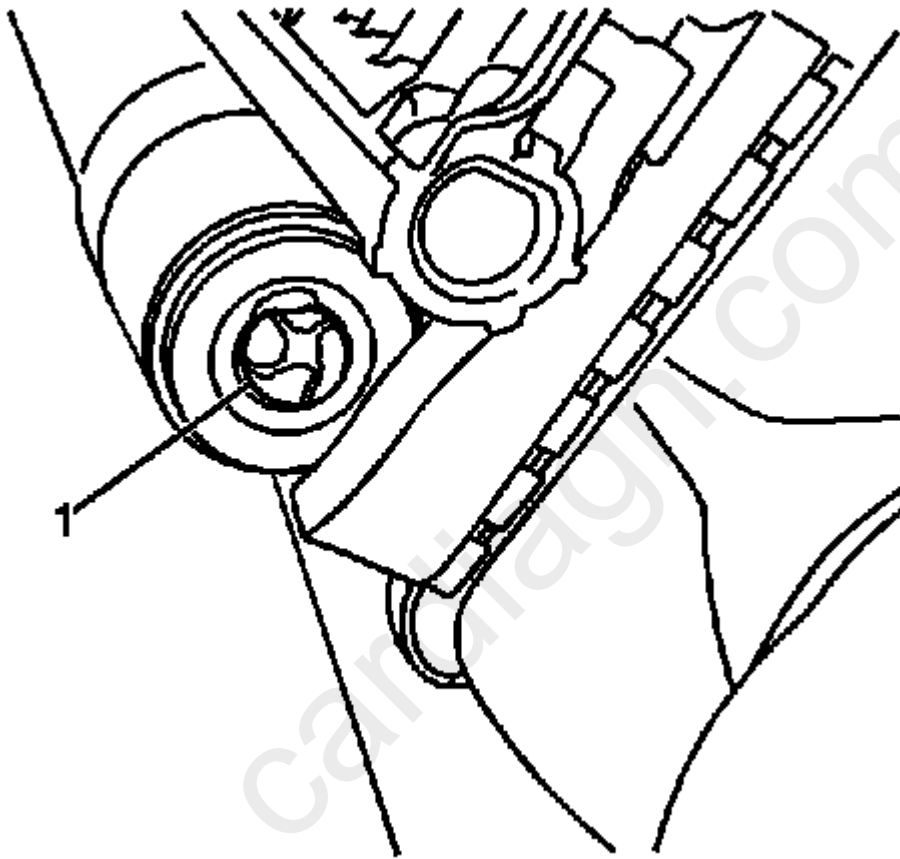


Fig. 40: Locating Desiccant Bag Plug
Courtesy of GENERAL MOTORS COMPANY

3. Remove the receiver dryer bottom plug (1).
4. Remove the filter (2).

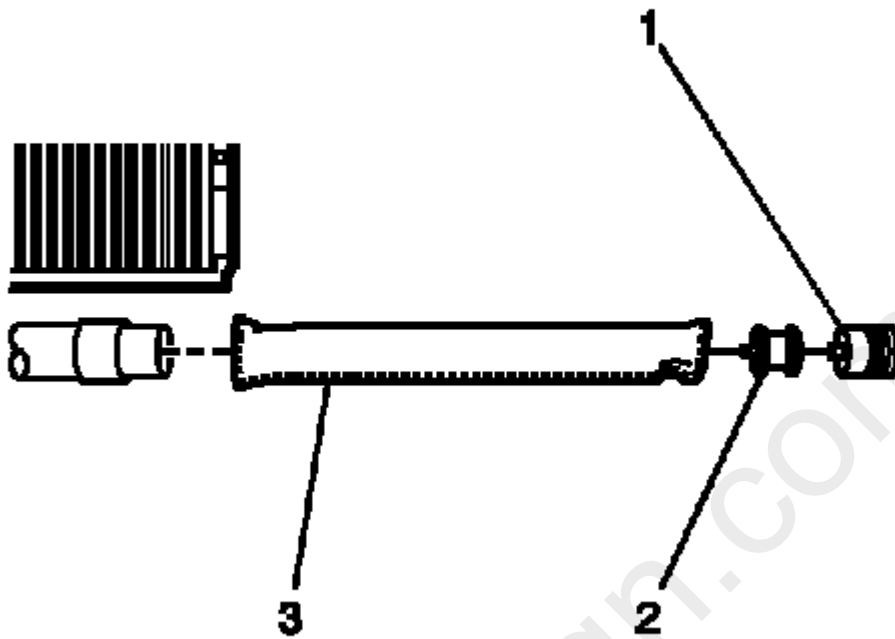


Fig. 41: View Of Receiver Dryer Bottom Plug, Filter & Desiccant Bag
Courtesy of GENERAL MOTORS COMPANY

5. Remove the desiccant bag (3).

Installation Procedure

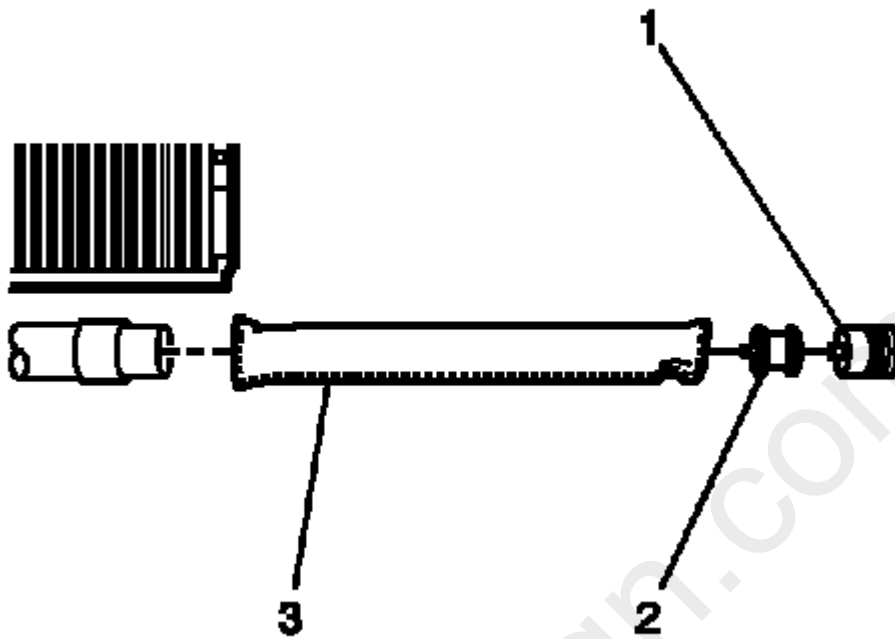


Fig. 42: View Of Receiver Dryer Bottom Plug, Filter & Desiccant Bag
Courtesy of GENERAL MOTORS COMPANY

1. Install the desiccant bag (3).
2. Install the filter (2).
3. Lubricate the O-rings on the plug with refrigerant oil before installing. Refer to **Air Conditioning O-Ring Seal Replacement**.

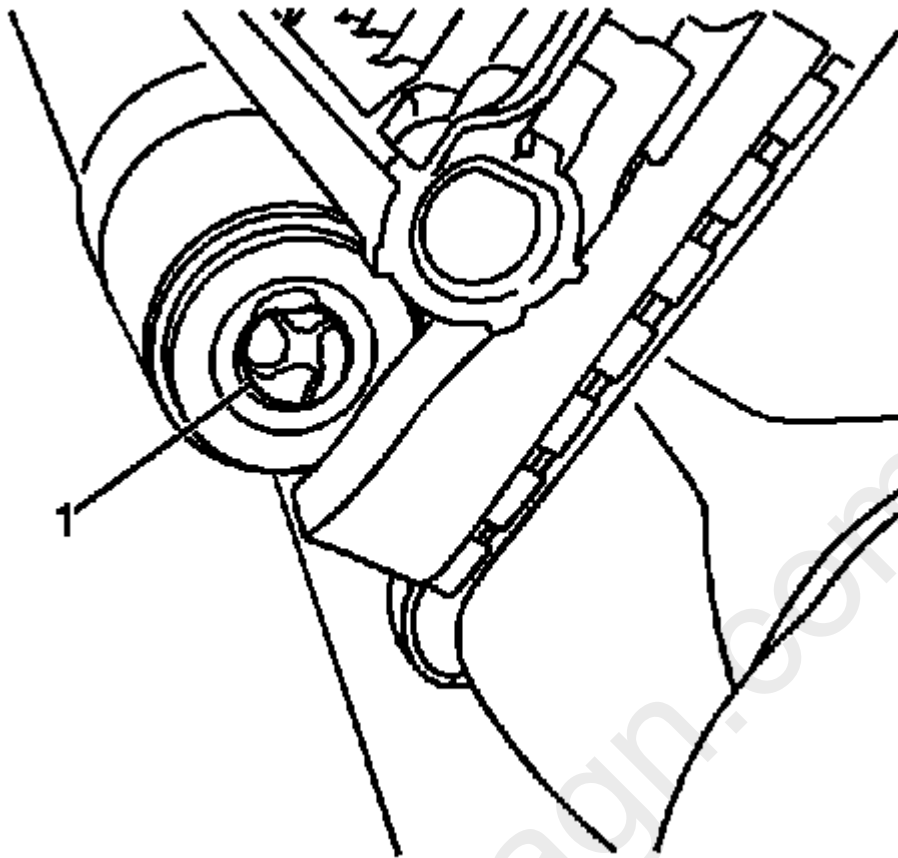


Fig. 43: Locating Desiccant Bag Plug
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Install the bottom plug (1) and tighten to 12.5 (111 lb in).
5. Install the front bumper fascia deflector. Refer to Front Bumper Fascia Air Deflector Replacement .
6. Lower the vehicle.
7. Add the proper amount of oil. Refer to Refrigerant System Specifications.
8. Evacuate and recharge the refrigerant. Refer to Refrigerant Recovery and Recharging (Belt Driven Compressor).
9. Leak test the fittings of the component with J 39400-A halogen leak detector.

AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

Special Tools

J 39400-A Halogen Leak Detector

Removal Procedure

1. Remove the HVAC module. Refer to **Air Conditioning and Heater Module Assembly Removal and Installation.**

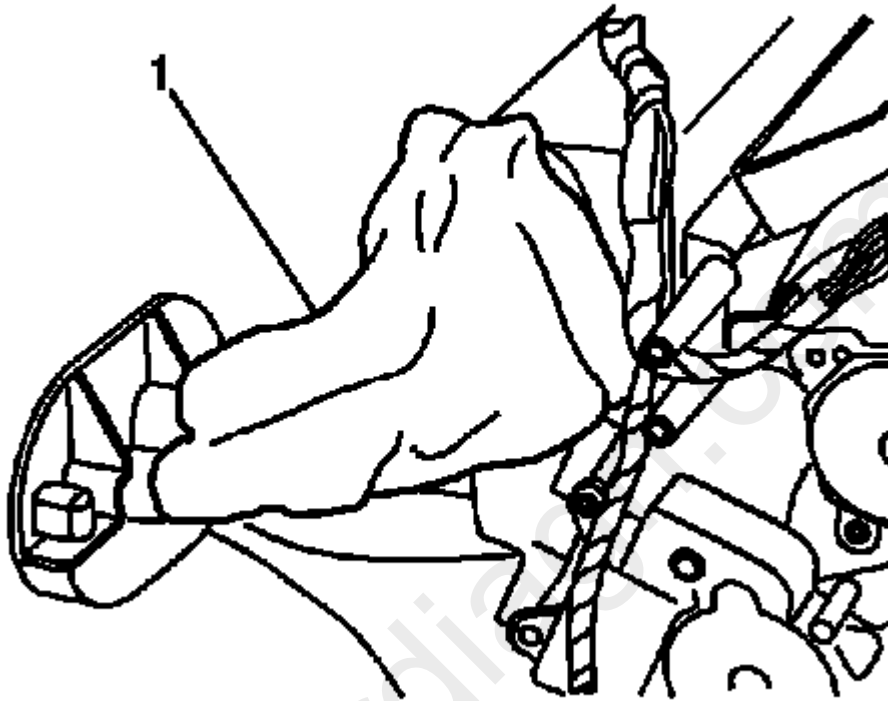


Fig. 44: View Of TXV Insulation

Courtesy of GENERAL MOTORS COMPANY

2. Remove the insulation (1) from the thermal expansion valve (TXV). Discard the used insulation.

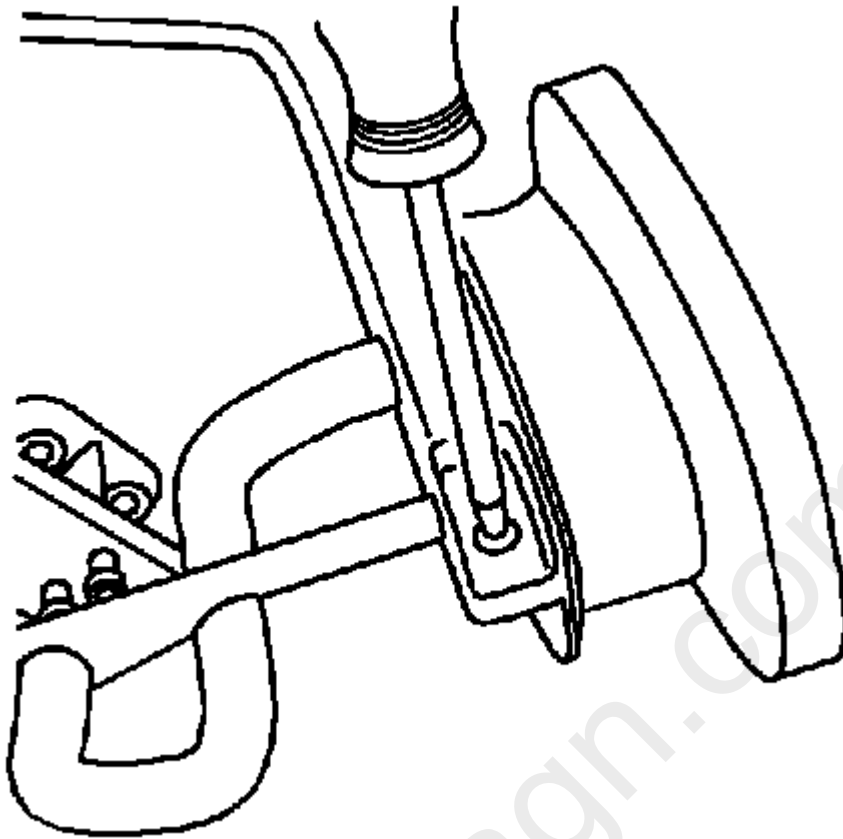


Fig. 45: View Of HVAC Line Clamp Screw
Courtesy of GENERAL MOTORS COMPANY

3. Remove the HVAC line clamp screw.

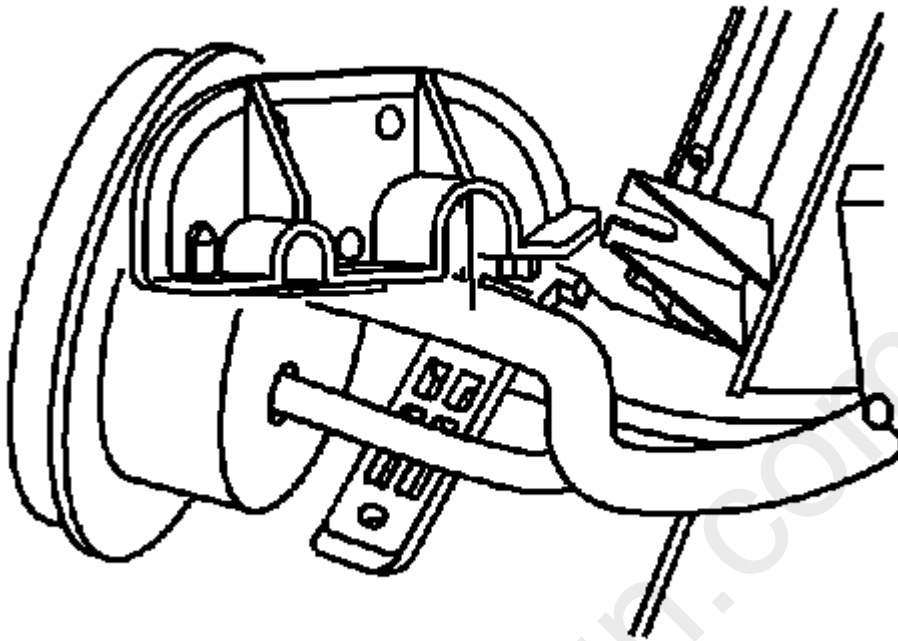


Fig. 46: View Of HVAC Line Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Remove the HVAC line clamp.

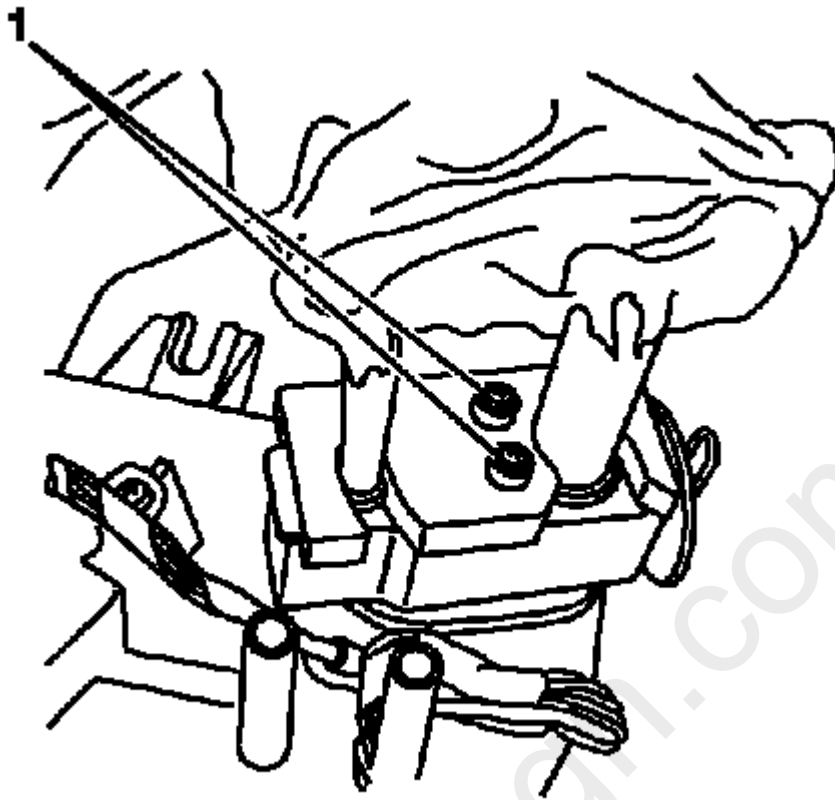


Fig. 47: View Of TXV To Evaporator Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the bolts (1) that secure the TXV to the evaporator.



Fig. 48: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Remove the TXV line bracket.

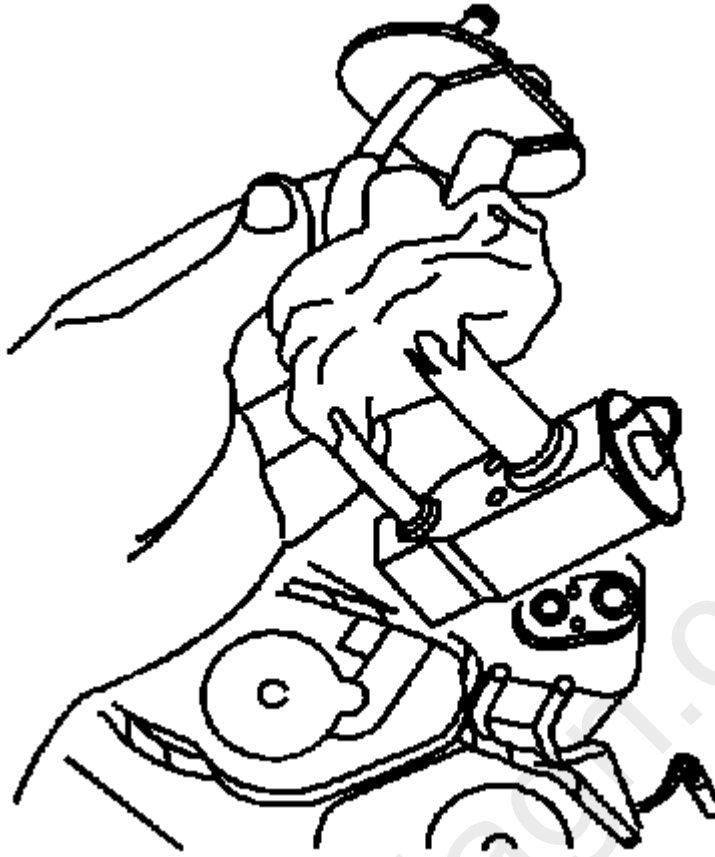


Fig. 49: View Of TXV Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

7. Remove the TXV from the evaporator core.
8. Separate the TXV from the A/C lines by pulling straight out.
9. Remove the TXV.

Installation Procedure

1. Lubricate the O-rings. Refer to **Air Conditioning O-Ring Seal Replacement**.
2. Install the A/C lines into the TXV.

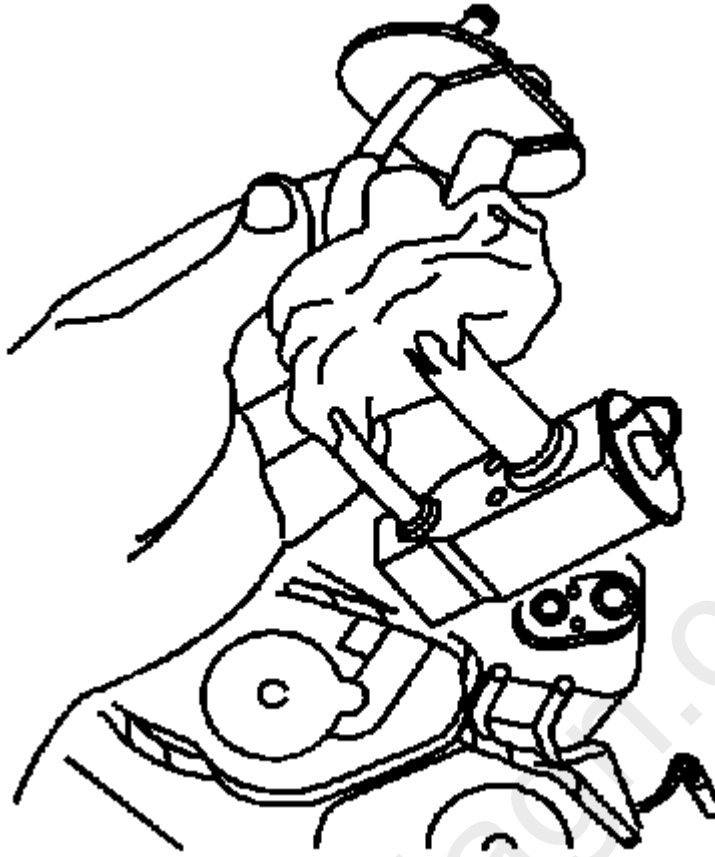


Fig. 50: View Of TXV Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

3. Carefully slide the TXV onto the evaporator core until seated.



Fig. 51: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

4. Install the TXV line bracket.

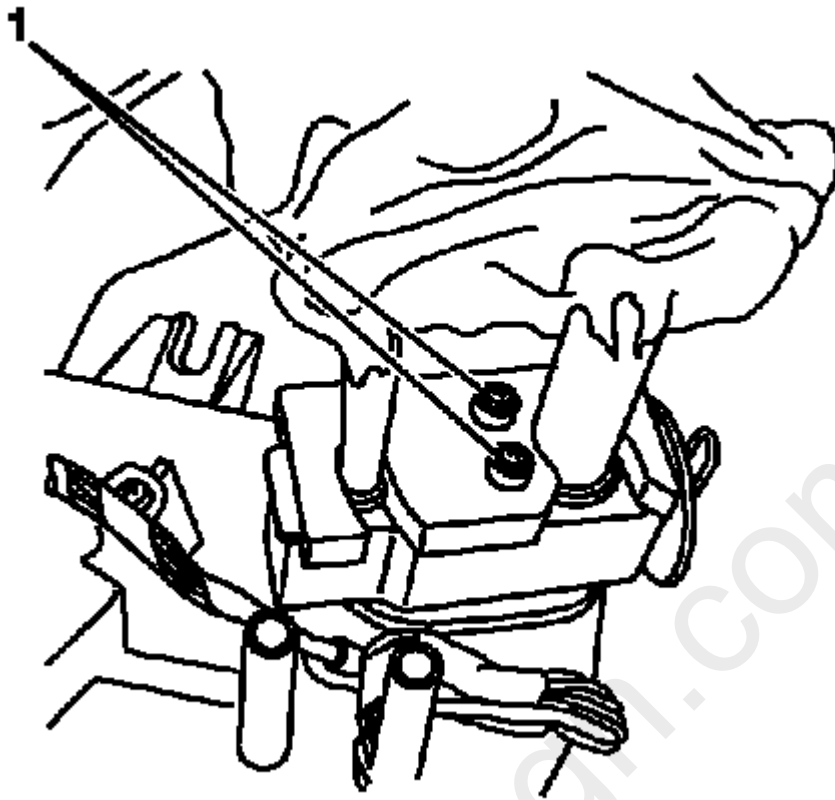


Fig. 52: View Of TXV To Evaporator Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the bolts (1) that secure the TXV to the evaporator and tighten to 3.5 (31 lb in).

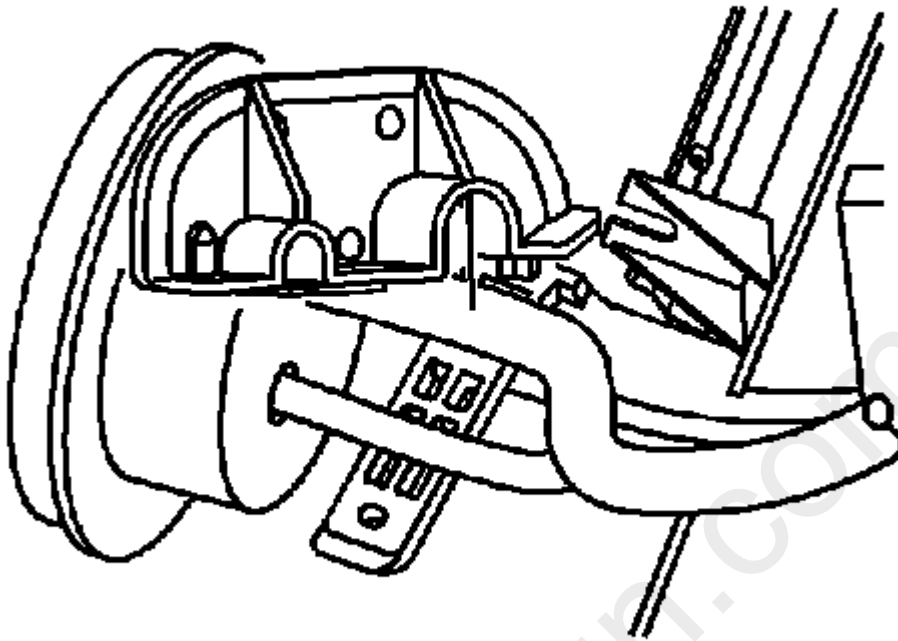


Fig. 53: View Of HVAC Line Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Install the HVAC line clamp.

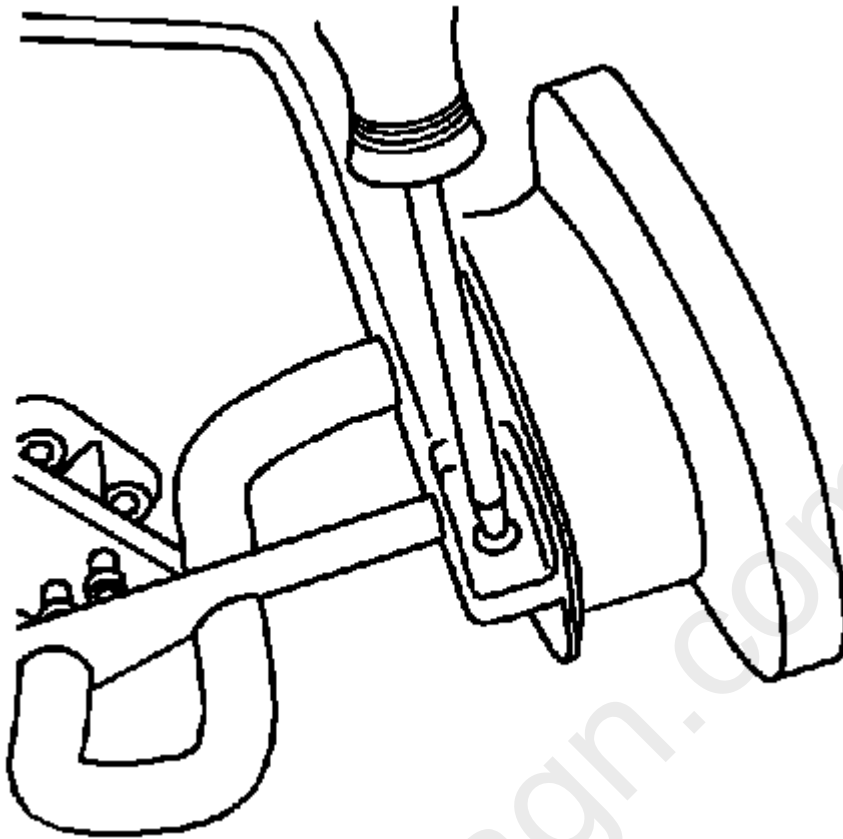


Fig. 54: View Of HVAC Line Clamp Screw
Courtesy of GENERAL MOTORS COMPANY

7. Install the HVAC line clamp screw and tighten to 1 (8 lb in).
8. Install the HVAC module. Refer to **Air Conditioning and Heater Module Assembly Removal and Installation**.

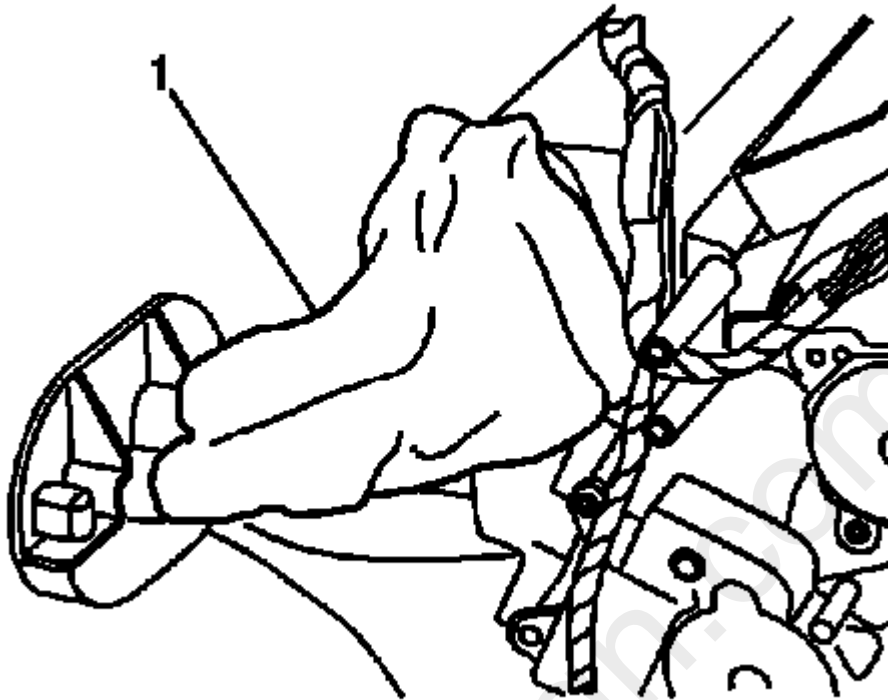


Fig. 55: View Of TXV Insulation

Courtesy of GENERAL MOTORS COMPANY

9. Install new insulation (1) onto the lines and TXV.

AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR REPLACEMENT

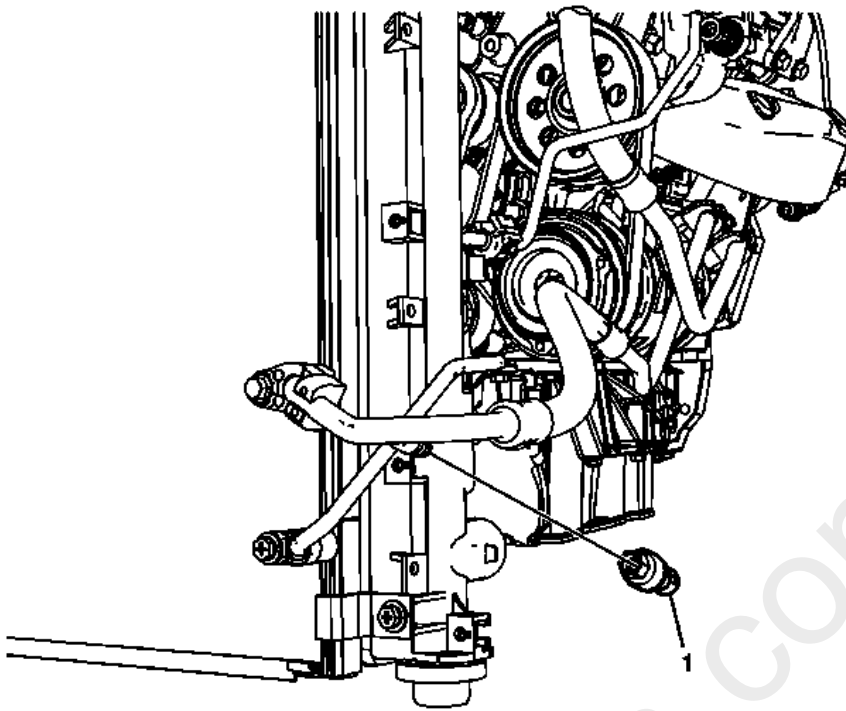


Fig. 56: Identifying Air Conditioning Refrigerant Pressure Sensor
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging (Belt Driven Compressor)</u>. 2. Remove the front wheelhouse liner. Refer to <u>Front Wheelhouse Liner Replacement</u>. 3. Disconnect the air conditioning A/C refrigerant pressure sensor.	
1	Air Conditioning A/C Refrigerant Pressure Sensor CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9.8 N.m (87 lb in)

EVAPORATOR AIR TEMPERATURE SENSOR REPLACEMENT

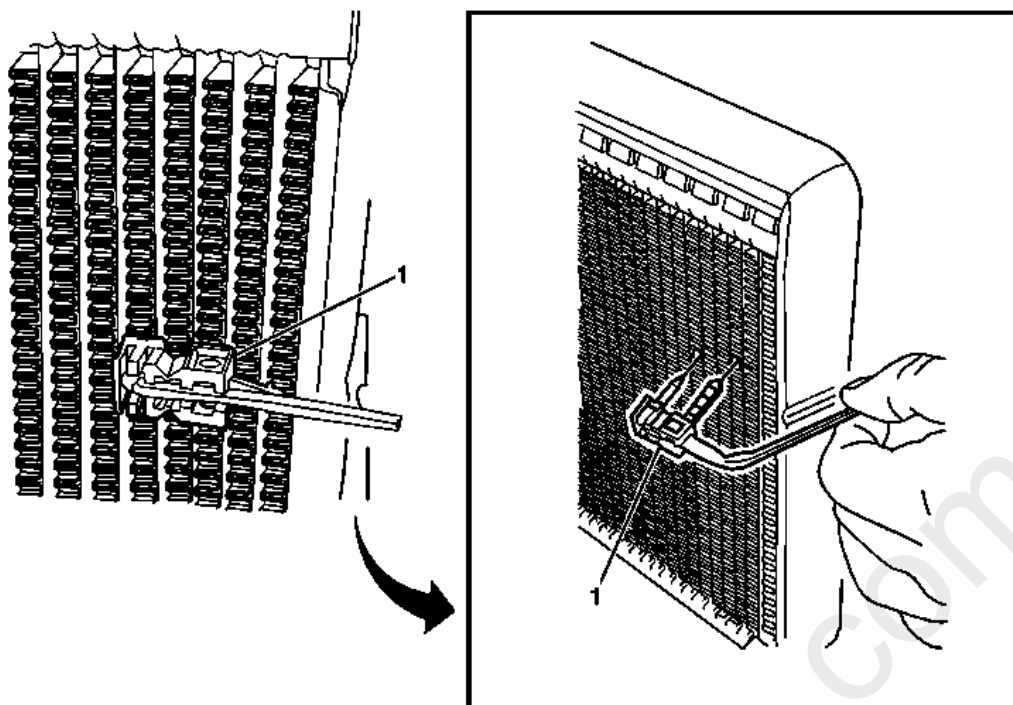


Fig. 57: Evaporator Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

Evaporator Air Temperature Sensor Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the HVAC module. Refer to <u>Air Conditioning and Heater Module Assembly Removal and Installation.</u> 2. Remove the floor front air outlet duct if attached. Refer to <u>Floor Front Air Outlet Duct Replacement.</u> 3. Remove the heater core. Refer to <u>Heater Core Replacement.</u> 4. Disconnect the electrical connector from the left air temperature actuator, the evaporator sensor and reposition. 5. Remove the 10 HVAC case screws and separate the case to expose the evaporator temperature sensor. Refer to <u>Air Distributor Case Replacement - Left Side.</u>	
1	Evaporator Temperature Sensor Procedure 1. Install the evaporator temperature sensor in the original location within the core. 2. Ensure all seals and gaskets are in position upon installation.

AIR CONDITIONING CONDENSER REPLACEMENT

Special Tools

J 39400-A Halogen Leak Detector

Removal Procedure

1. Remove the charge air cooler radiator, if equipped. Refer to **Charge Air Cooler Radiator Replacement** .

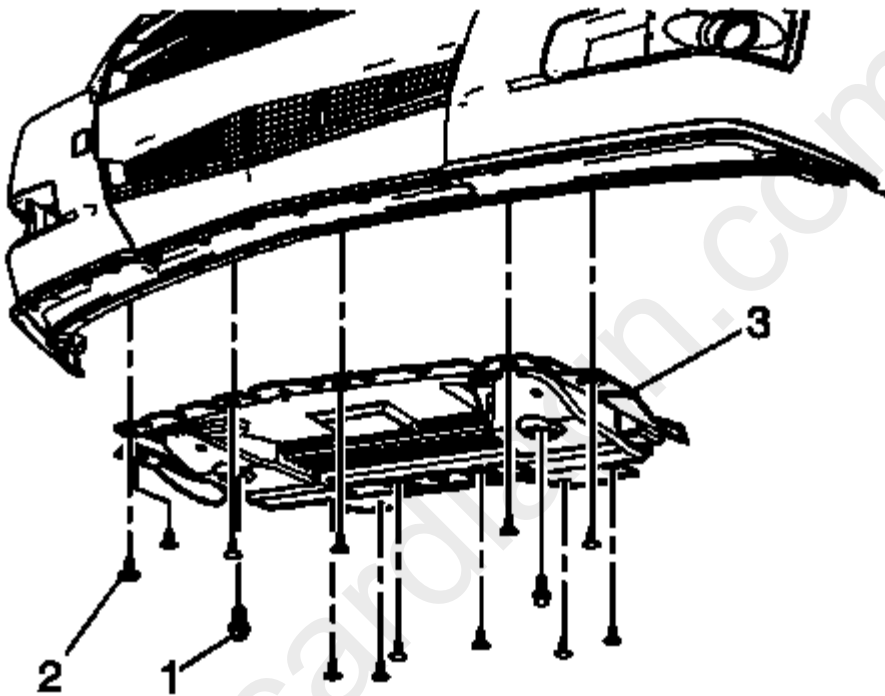


Fig. 58: View Of Front Air Deflector
Courtesy of GENERAL MOTORS COMPANY

2. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the front air deflector retainers (2).
5. Remove the front air deflector bolts (1).
6. Remove the front air deflector (3).

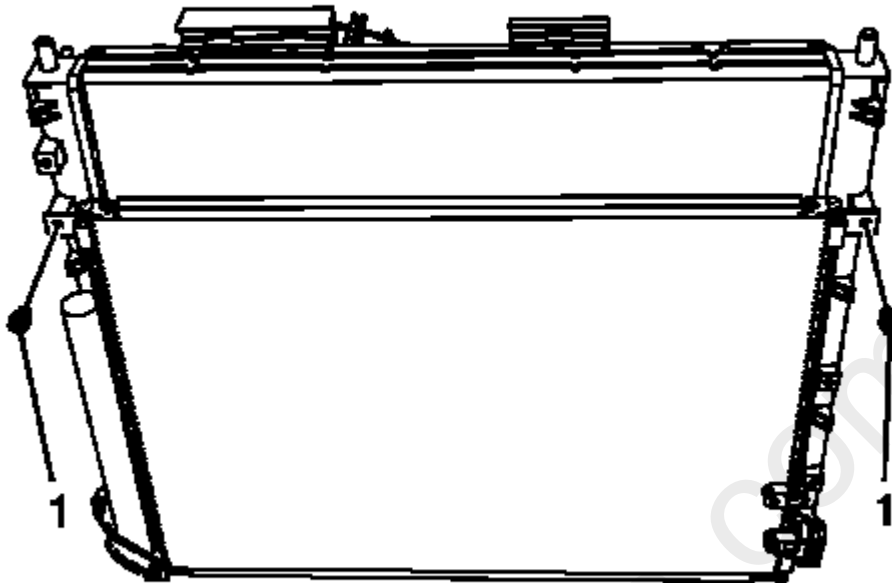


Fig. 59: View of Condenser Assembly and Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove the condenser upper bracket bolts (1).

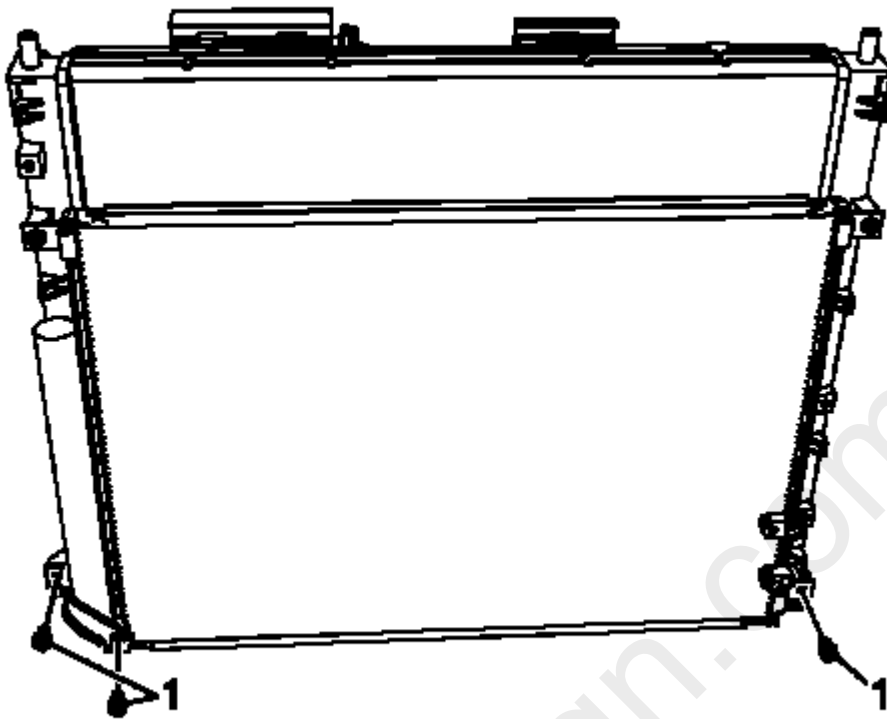


Fig. 60: View Of Condenser Lower Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the condenser lower mounting bolts (1).

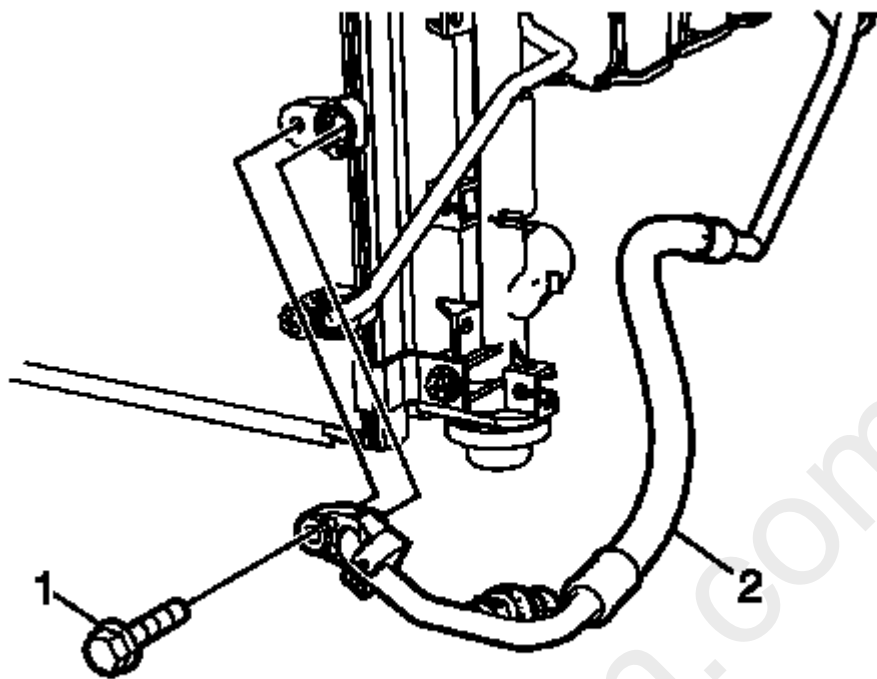


Fig. 61: Identifying Discharge Line & Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the a/c compressor and a/c condenser hose bolt (1).
10. Disconnect the a/c compressor and a/c condenser hose (2) from the condenser.
11. Remove and discard the O-ring.

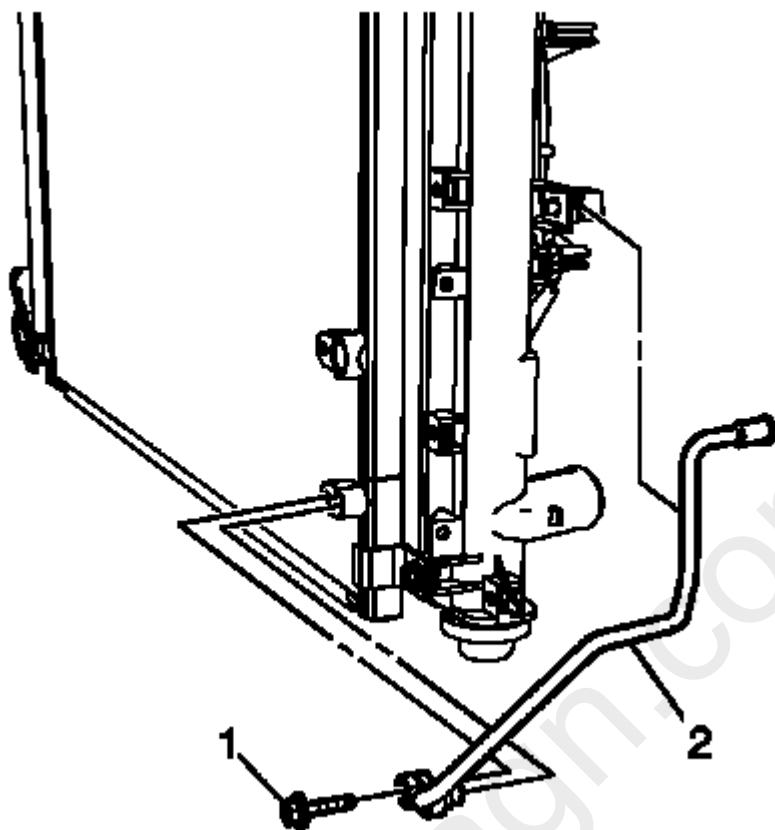


Fig. 62: Identifying Condenser Tube & Condenser Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

12. Remove the a/c condenser out tube bolt (1).
13. Disconnect the a/c condenser out tube (2) from the condenser.
14. Remove and discard the O-ring.

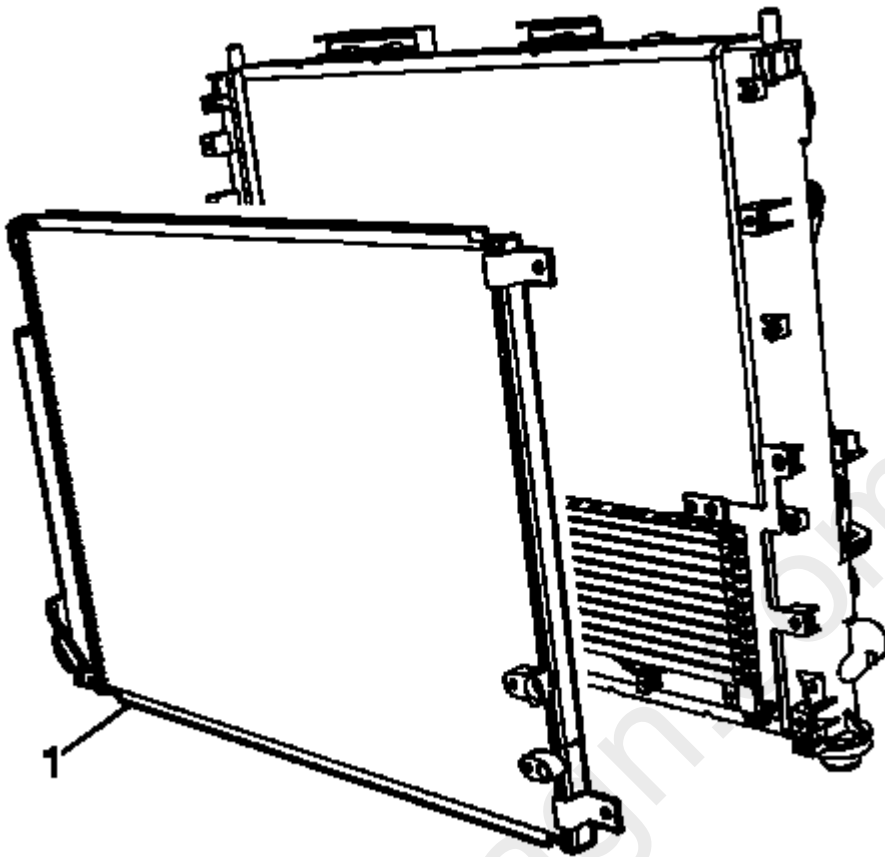


Fig. 63: View of Condenser
Courtesy of GENERAL MOTORS COMPANY

15. Remove the condenser (1).

Installation Procedure

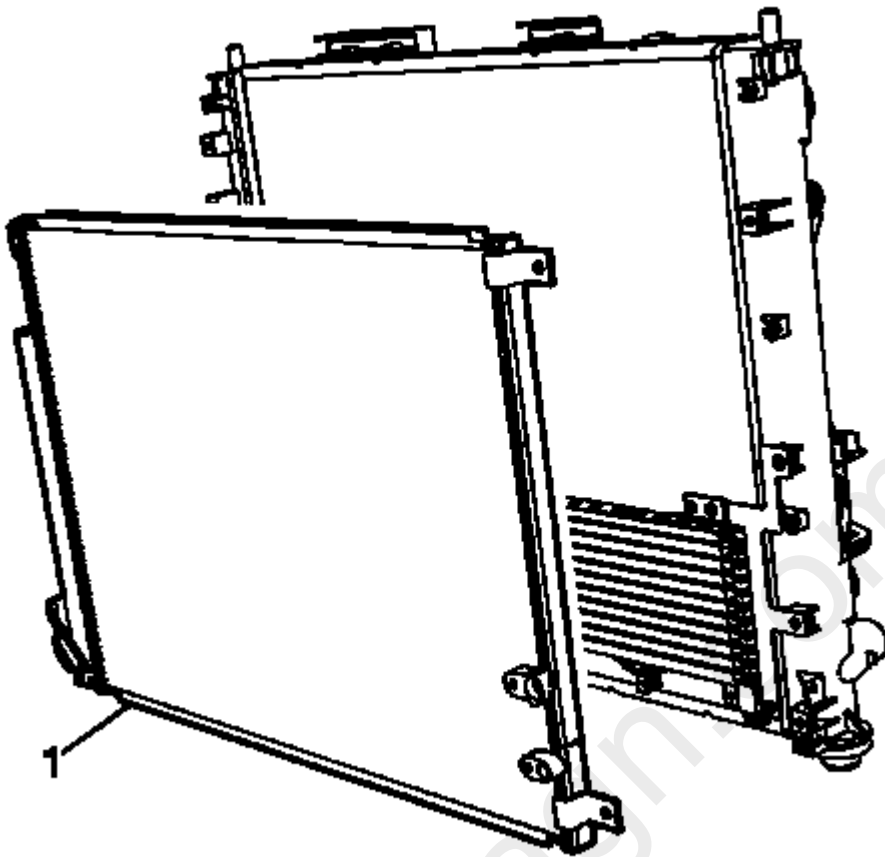


Fig. 64: View of Condenser

Courtesy of GENERAL MOTORS COMPANY

1. If replacing the condenser, add the specified amount of PAG oil directly to the condenser. Refer to **Refrigerant System Specifications**.
2. Install the condenser (1).
3. Install a new O-ring to the condenser tube. Refer to **Air Conditioning O-Ring Seal Replacement**.

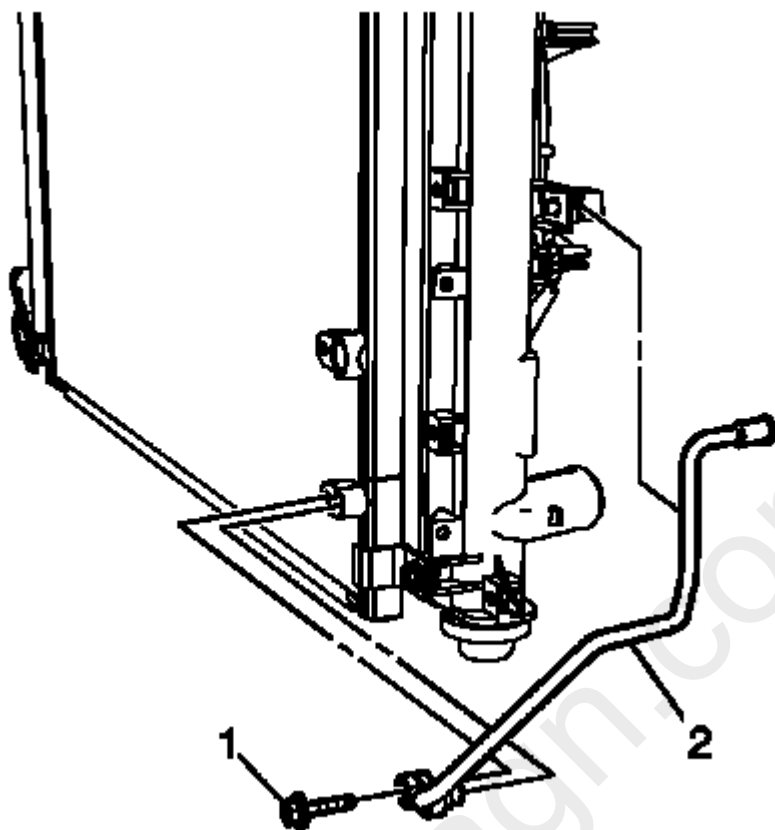


Fig. 65: Identifying Condenser Tube & Condenser Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Connect the a/c condenser out tube (2) to the condenser.
5. Install the a/c condenser out tube bolt (1) and tighten to 9 N.m (80 lb in).
6. Install a new O-ring to the discharge line. Refer to **Air Conditioning O-Ring Seal Replacement**.

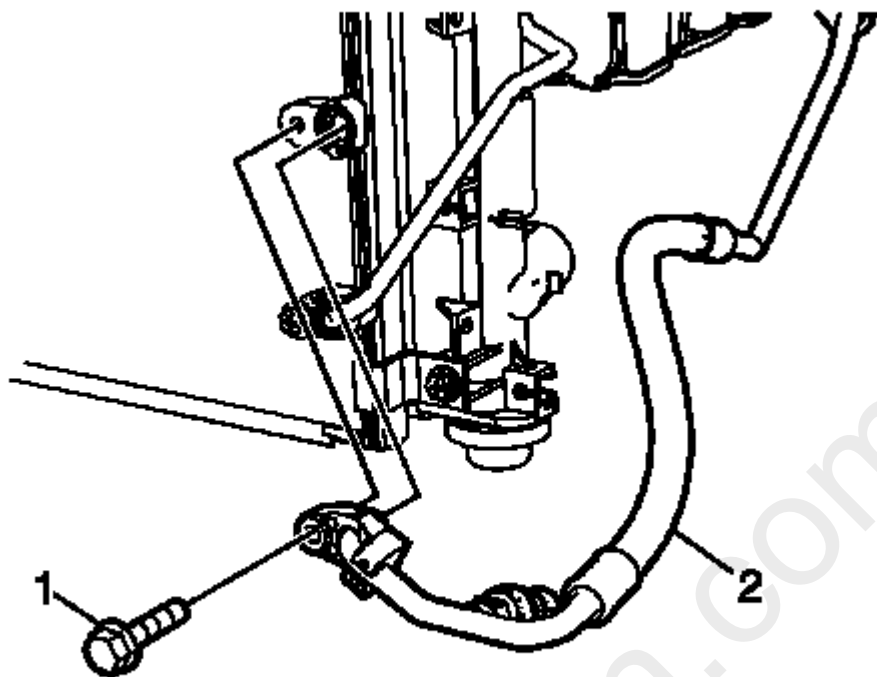


Fig. 66: Identifying Discharge Line & Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Connect the a/c compressor and a/c condenser hose (2) to the condenser.
8. Install the a/c compressor and a/c condenser hose bolt (1) and tighten to 9 N.m (80 lb in).

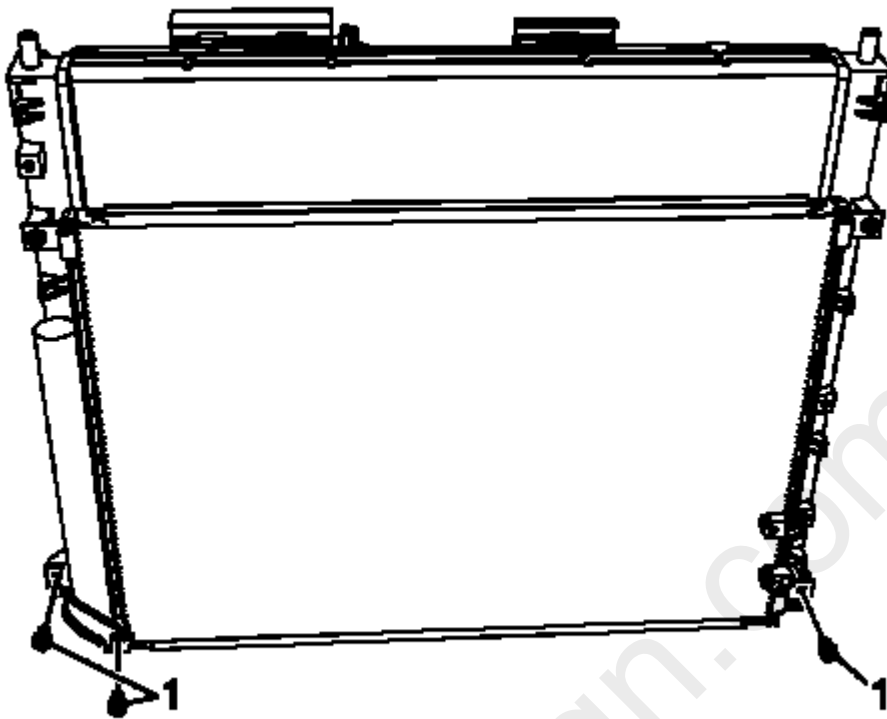


Fig. 67: View Of Condenser Lower Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Install the condenser lower mounting bolts (1) and tighten to 5.4 N.m (48 lb in).

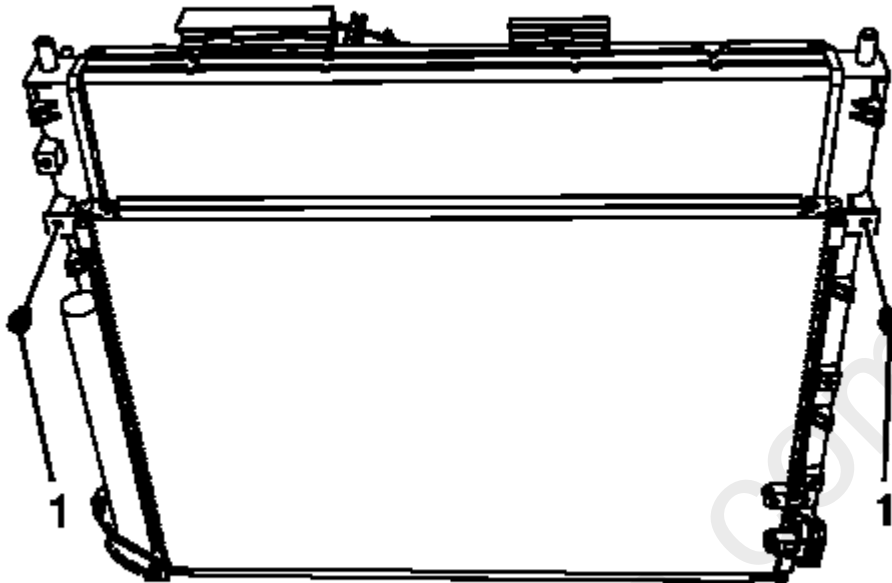


Fig. 68: View of Condenser Assembly and Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Install the condenser upper bracket bolts (1) and tighten to 5.4 N.m (48 lb in).

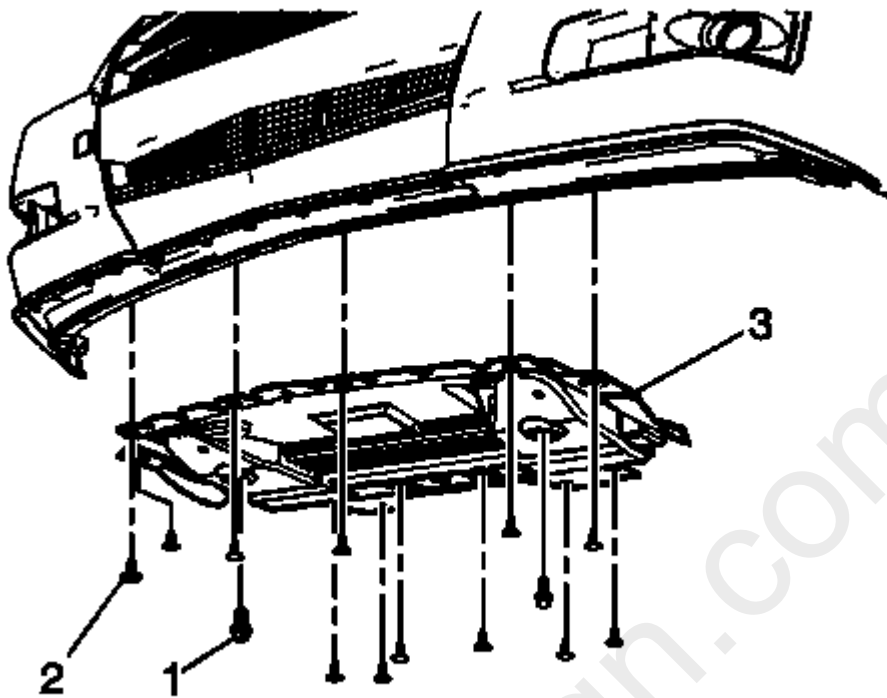


Fig. 69: View Of Front Air Deflector
Courtesy of GENERAL MOTORS COMPANY

11. Install the front air deflector (3).
12. Install the front air deflector bolts (1).
13. Install the front air deflector retainers (2).
14. Lower the vehicle.
15. Install the charge air cooler radiator, if equipped. Refer to **Charge Air Cooler Radiator Replacement**.
16. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
17. Leak test the fittings of the component using the **J 39400-A** leak detector

CONDENSER OUTLET TUBE REPLACEMENT

Special Tools

J 39400-A Halogen Leak Detector

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
3. Remove the A/C quick connect fitting at the liquid line. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement**.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Remove the front air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement** .

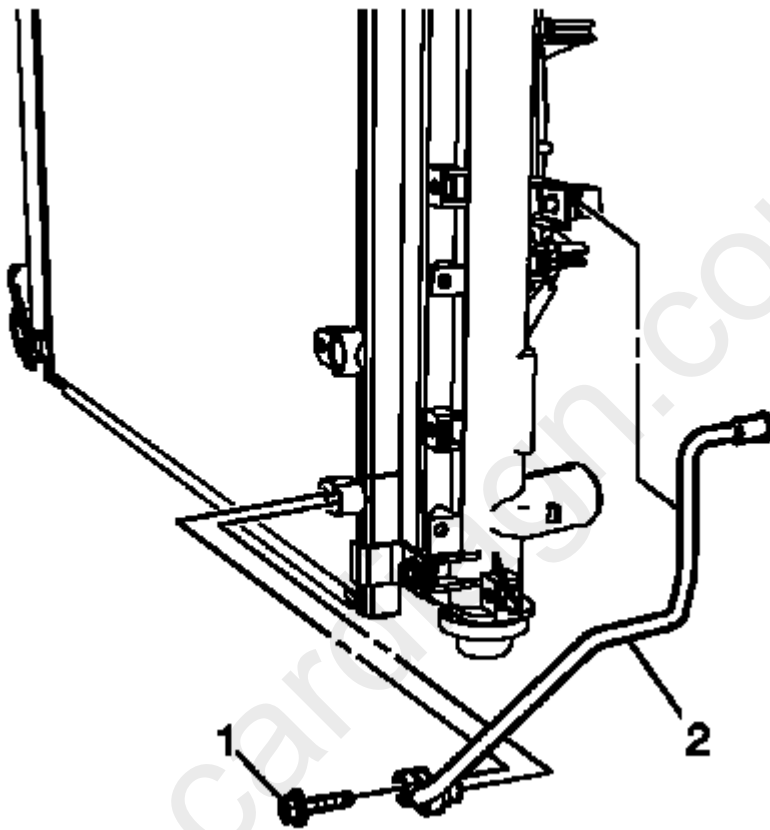


Fig. 70: Identifying Condenser Tube & Condenser Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the condenser tube to condenser retaining bolt (1).
7. Disconnect the condenser tube from the fan shroud retainer clip.
8. Disconnect the condenser tube (2) from the condenser.
9. Disconnect the condenser tube from the liquid line. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement**
10. Remove the condenser tube.
11. Remove and discard the O-rings.

Installation Procedure

1. Install the new O-rings to the condenser tube. Refer to **Air Conditioning O-Ring Seal Replacement**.
2. Install the condenser tube.
3. Connect the condenser tube to the liquid line. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement**

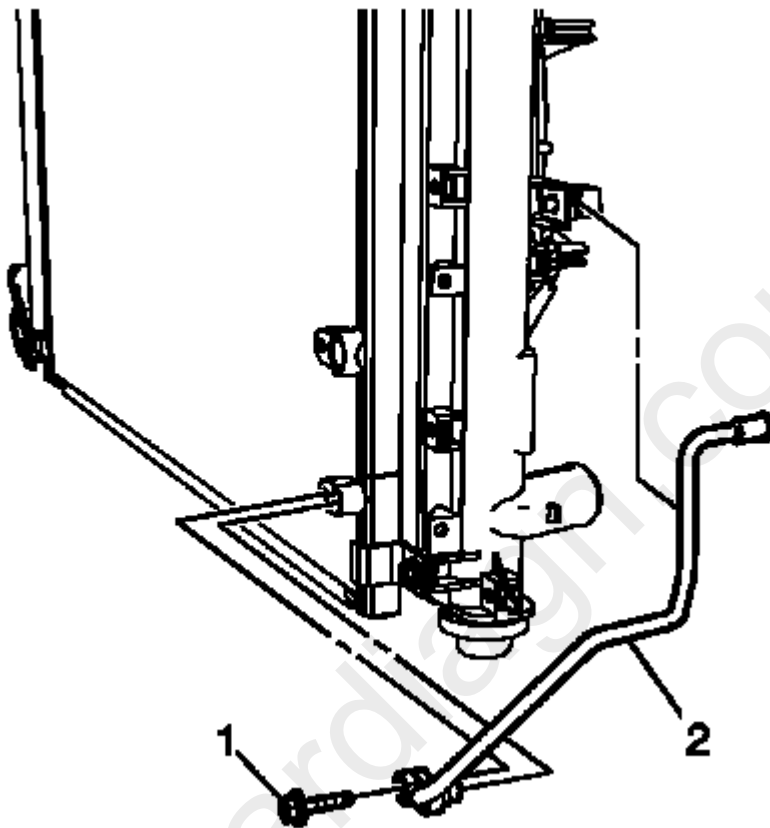


Fig. 71: Identifying Condenser Tube & Condenser Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Connect the condenser tube (2) to the condenser.
5. Connect the condenser tube to the fan shroud retainer clip.

CAUTION: Refer to Fastener Caution .

6. Install the condenser tube to condenser retaining bolt (1) and tighten to 9 N.m (80 lb in).
7. Install the front air deflector. Refer to **Front Bumper Fascia Air Deflector Replacement** .
8. Lower the vehicle.
9. Install the A/C quick connect fitting at the liquid line. Refer to **Air Conditioning Line/Tube Connector Removal/Replacement**.

10. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
11. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
12. Using **J 39400-A** Halogen Leak Detector , leak test the fittings of the component.

AIR CONDITIONING AND HEATER MODULE ASSEMBLY REMOVAL AND INSTALLATION

Special Tools

- **J 38185** Hose Clamp Pliers
- **J 39400-A** Halogen Leak Detector
- **J 45689** A/C Quick Joint Tool

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
2. Remove the battery. Refer to **Battery Replacement** .
3. Drain the coolant. Refer to **Cooling System Draining and Filling (Static Fill LFW or LFX)** , **Cooling System Draining and Filling (Static Fill LSA)** , **Cooling System Draining and Filling (GE 47716 LFW or LFX)** , **Cooling System Draining and Filling (GE 47716 LSA)** .

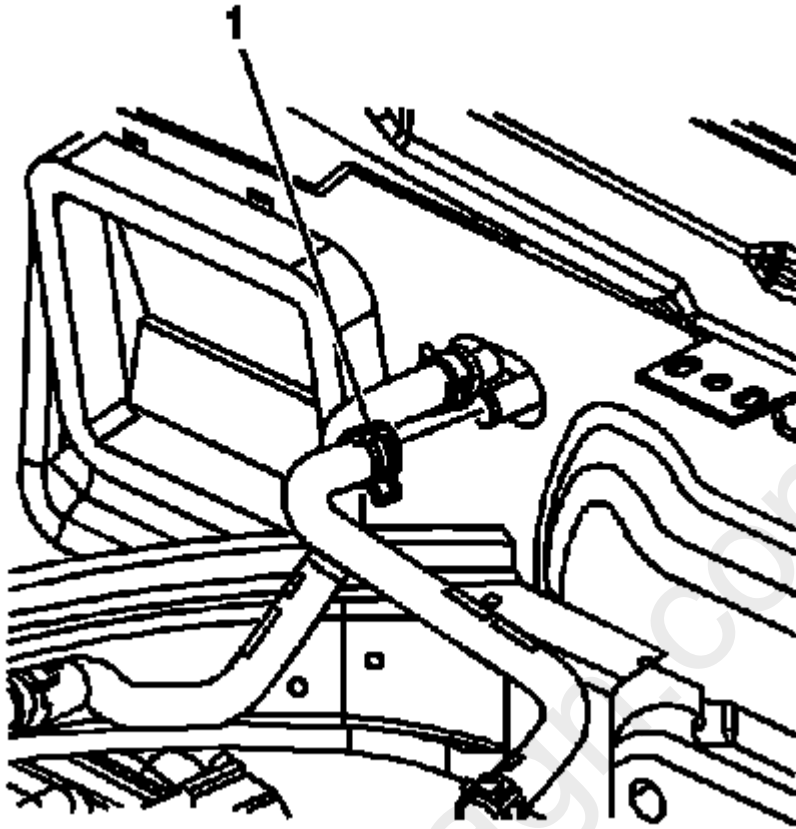


Fig. 72: Identifying Inlet Heater Hose
Courtesy of GENERAL MOTORS COMPANY

4. Using the J 38185 hose clamp pliers disconnect the heater inlet hose (1).

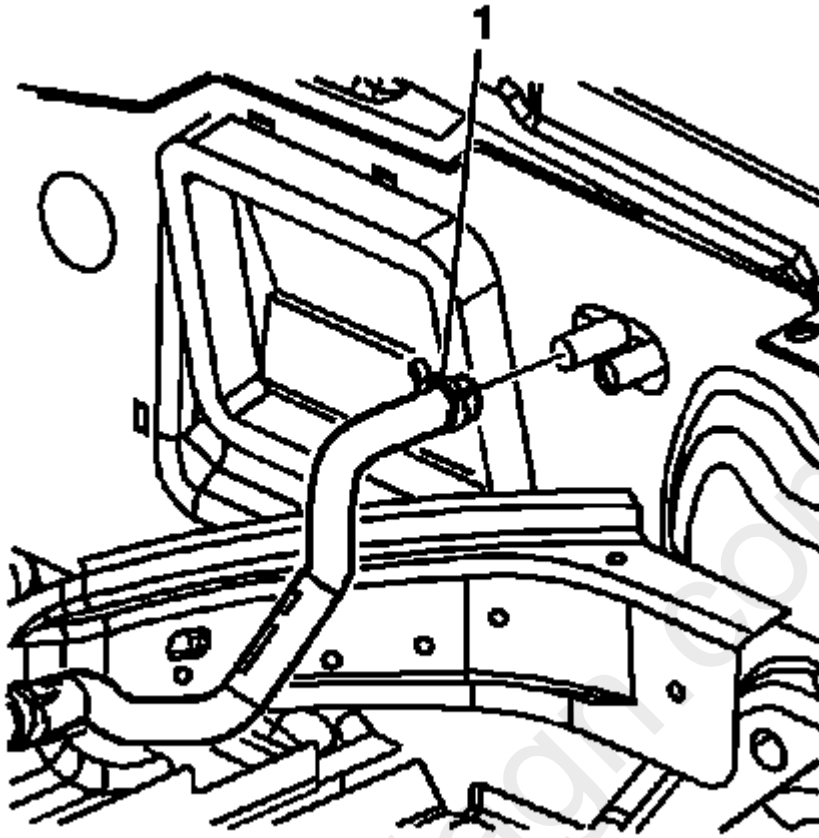


Fig. 73: Identifying Heater Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Using the J 38185 hose clamp pliers disconnect the heater outlet hose (1).
6. Disconnect both A/C lines at the cowl.

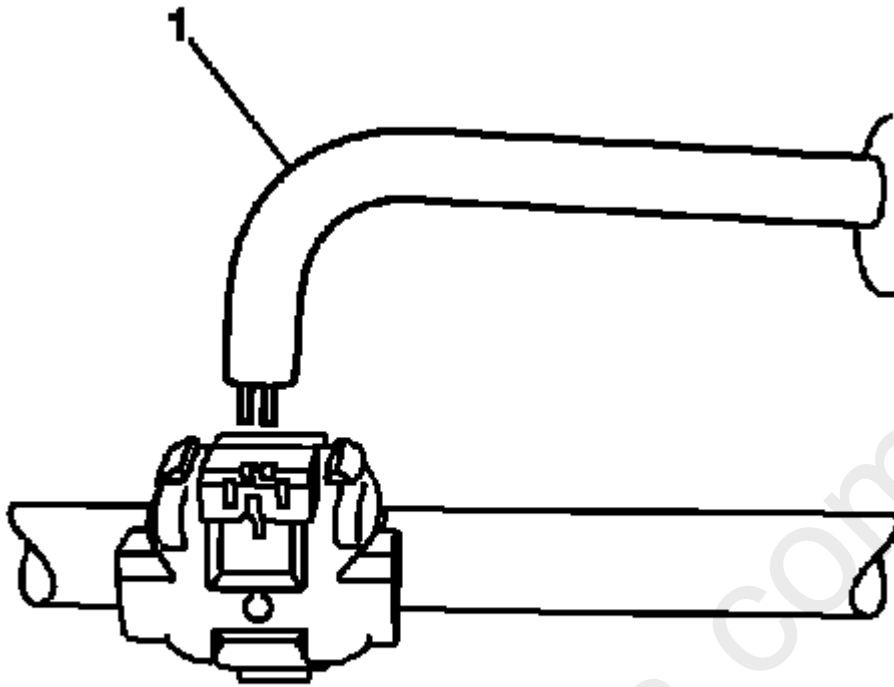


Fig. 74: Condenser Tube Quick Connect Fitting
Courtesy of GENERAL MOTORS COMPANY

NOTE: The body of the tool should be parallel to the A/C line.

7. Using the **J 45689** A/C quick joint tool (1) insert the probe end into the two small openings of the plastic quick joint.
8. Remove both quick joint clamps.
9. Disconnect both A/C lines.

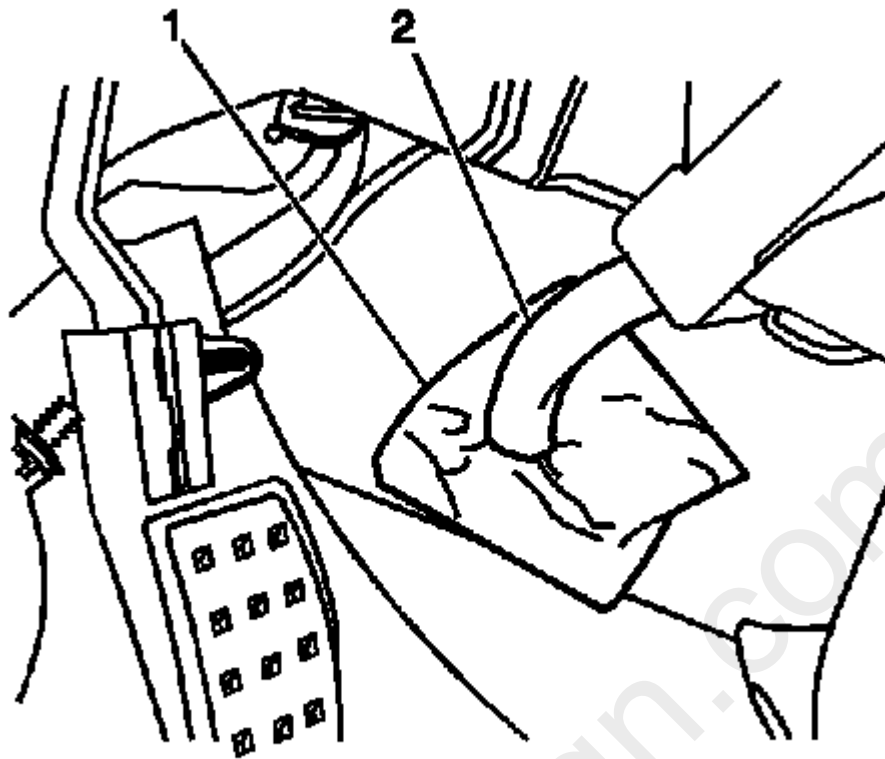


Fig. 75: View Of Rubber Adhesive Patch & Drain Tube
Courtesy of GENERAL MOTORS COMPANY

10. Remove the I/P Carrier. Refer to **Instrument Panel Carrier Replacement (Left Hand Drive)** , **Instrument Panel Carrier Replacement (Right Hand Drive)** .
11. Remove the air inlet assembly.
12. Disconnect the HVAC module electrical connector.
13. Disconnect the HVAC module drain tube (2) from the floor.

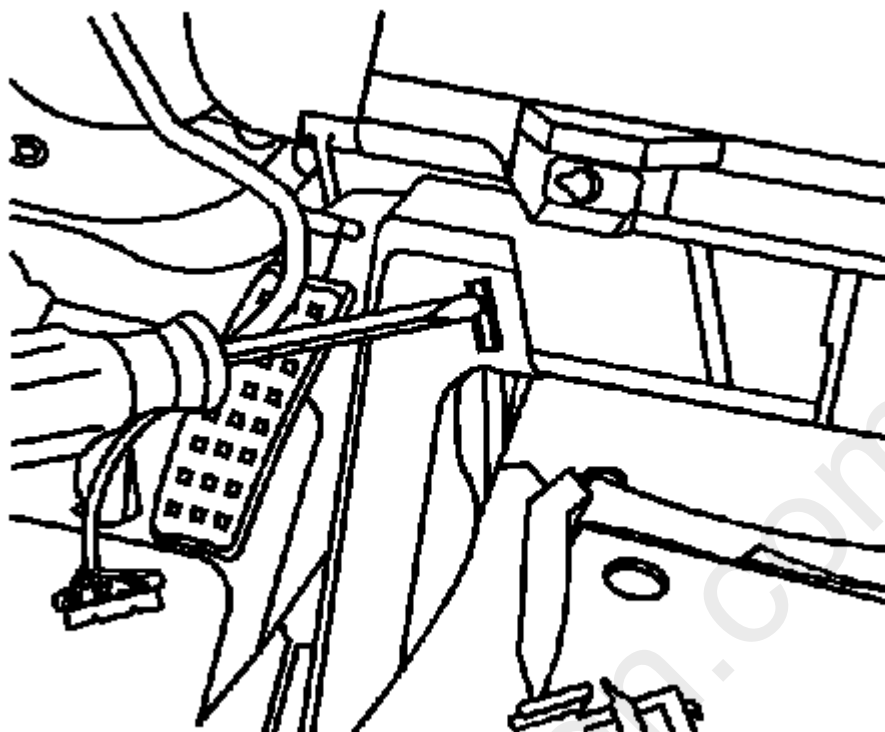


Fig. 76: Releasing Left Rear Duct
Courtesy of GENERAL MOTORS COMPANY

14. Press the tab and release the left rear duct from the HVAC module.

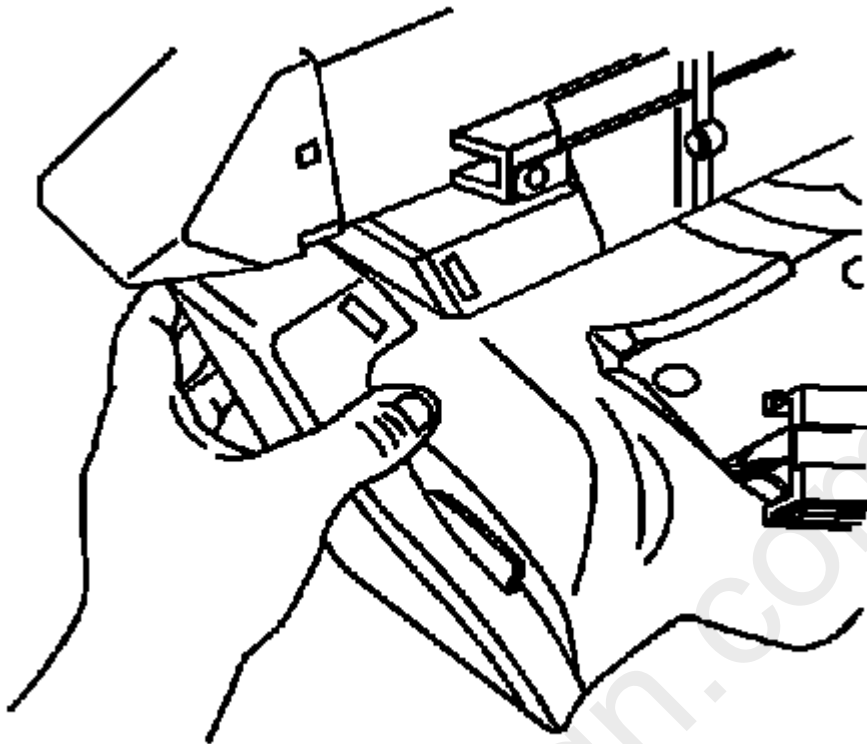


Fig. 77: View Of Module Duct

Courtesy of GENERAL MOTORS COMPANY

15. Disconnect the left rear heater duct from the HVAC module.

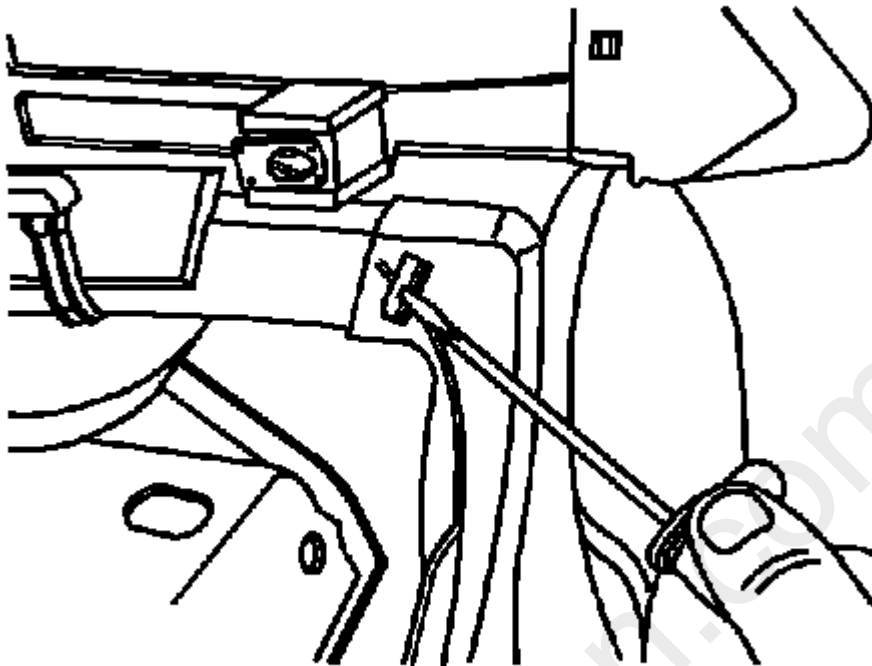


Fig. 78: Releasing Right Rear Duct
Courtesy of GENERAL MOTORS COMPANY

16. Press the tab and release the right rear duct from the HVAC module.

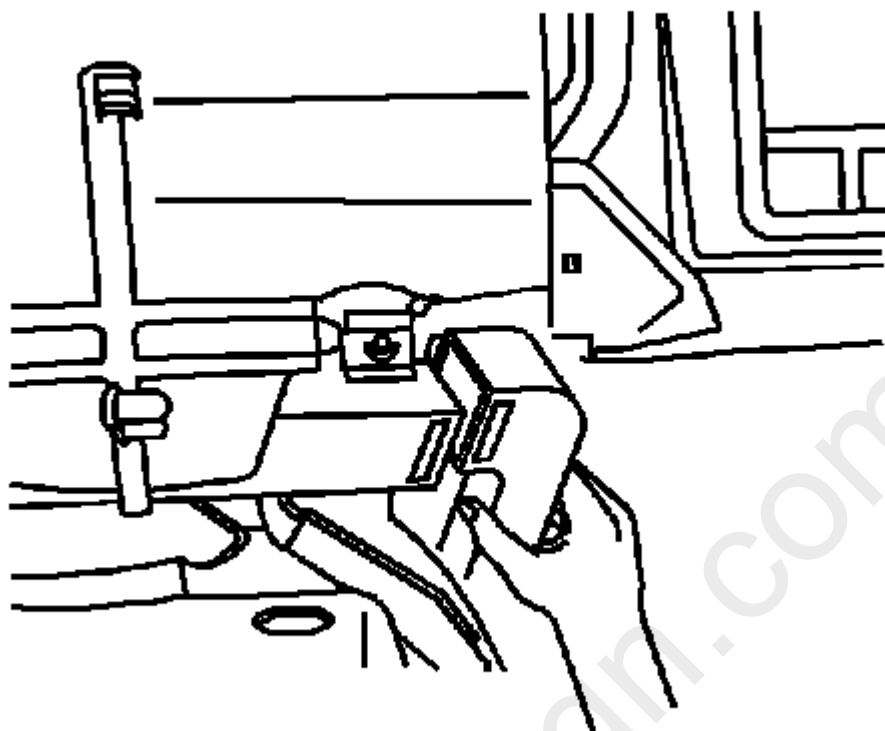


Fig. 79: View Of Air Outlet Duct - RH
Courtesy of GENERAL MOTORS COMPANY

17. Disconnect the right rear heater ducts from the HVAC module.

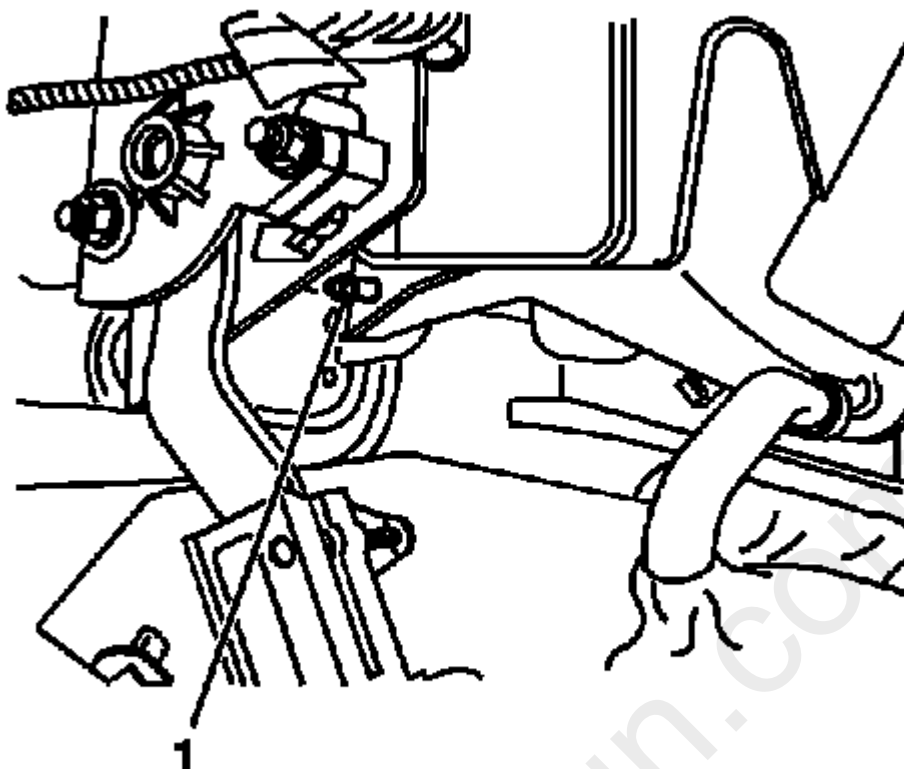


Fig. 80: Locating Lower Left HVAC Module Mounting Nut
Courtesy of GENERAL MOTORS COMPANY

18. Remove the lower left HVAC module mounting nut (1).

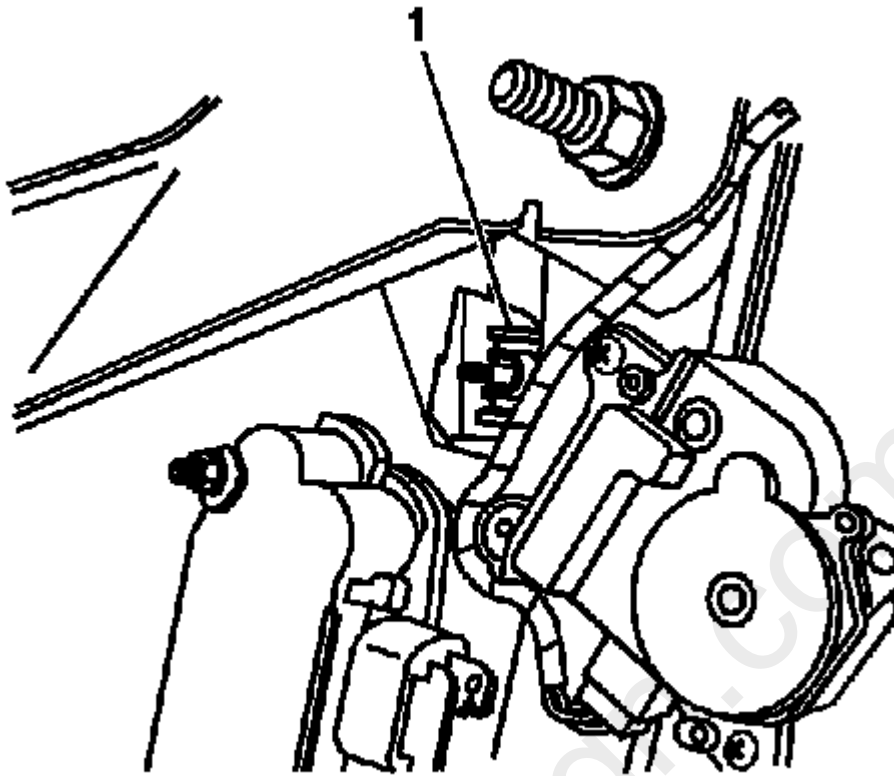


Fig. 81: Locating Upper Left HVAC Module Mounting Nut
Courtesy of GENERAL MOTORS COMPANY

19. Remove the upper left HVAC module mounting nut (1).
20. Remove the HVAC module from the vehicle.

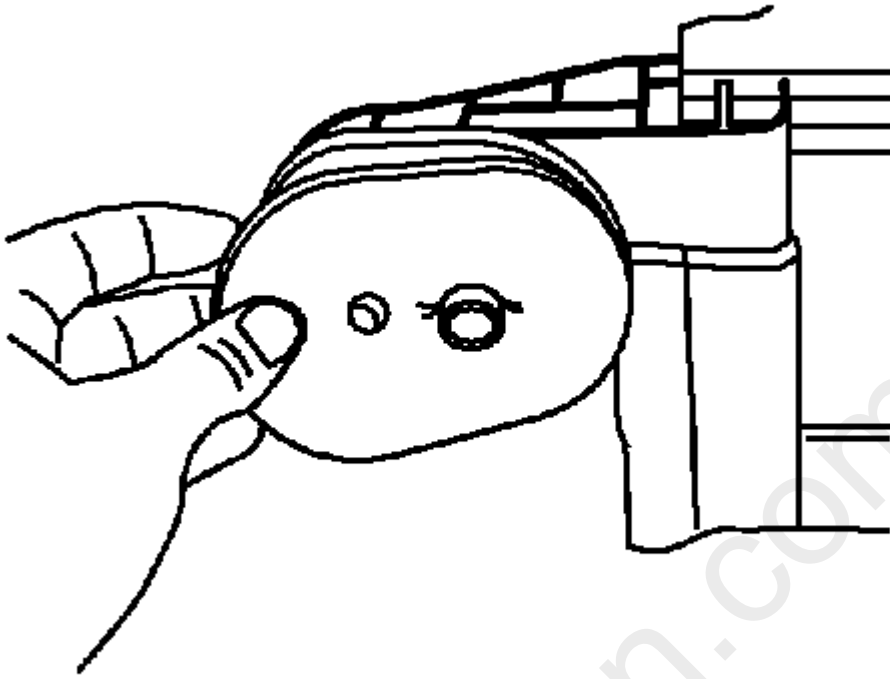


Fig. 82: Identifying Foam on A/C Line
Courtesy of GENERAL MOTORS COMPANY

21. Remove the foam from the A/C lines.
22. Remove the foam from around the heater pipes.

Installation Procedure

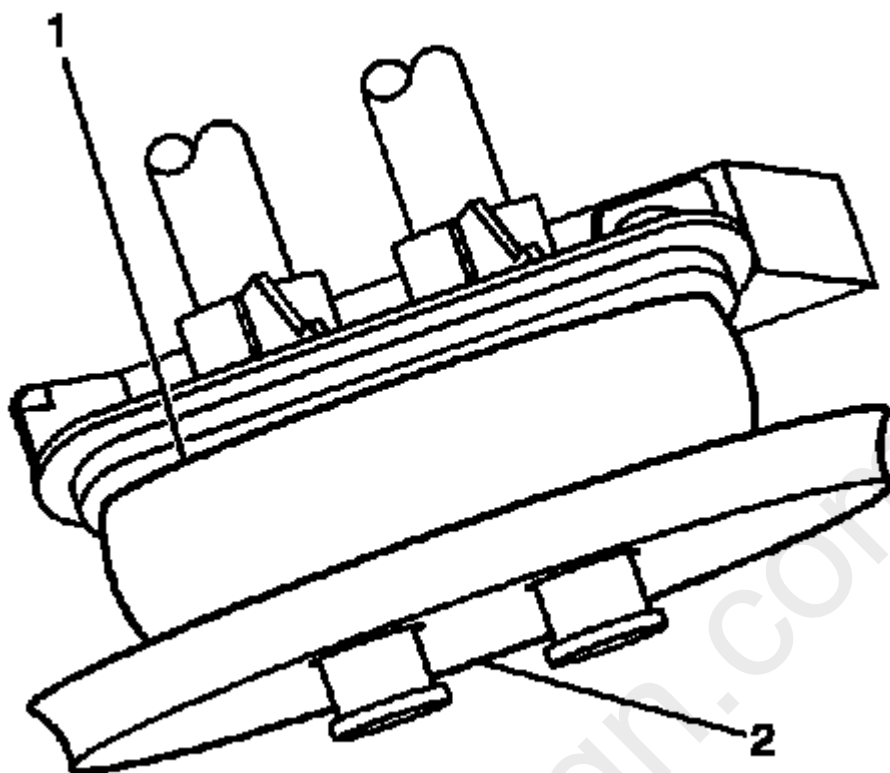


Fig. 83: View Of Thick Foam Packing On Heater Core Pipes
Courtesy of GENERAL MOTORS COMPANY

1. Install the thick foam packing (1) on the heater core pipes.
2. Install the thin foam packing (2) on the heater core pipes.

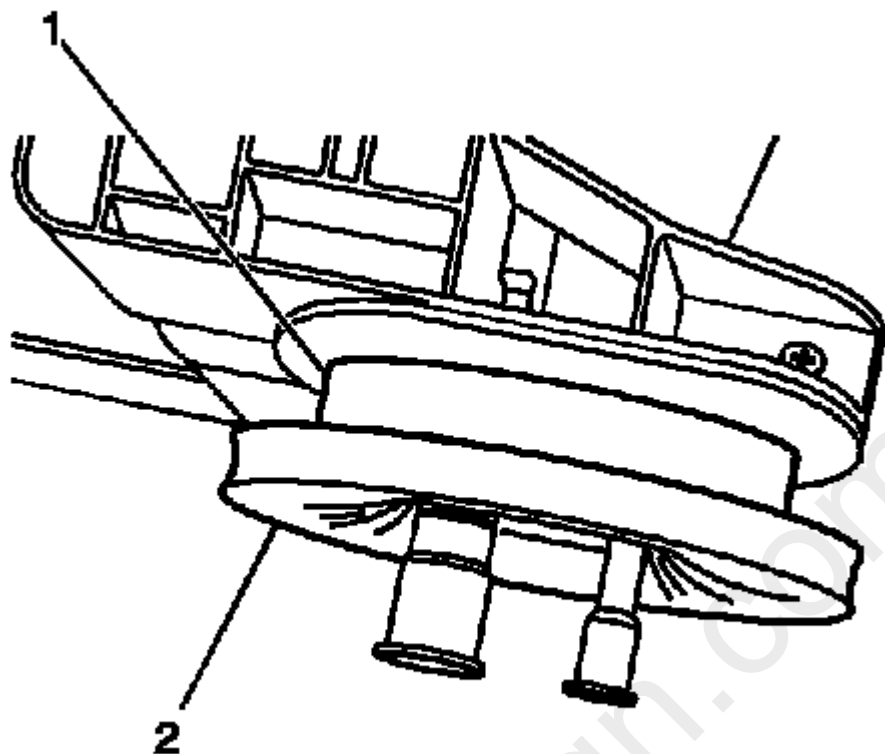


Fig. 84: View Of Thick Foam Packing On A/C Lines
Courtesy of GENERAL MOTORS COMPANY

3. Install the thick foam packing (1) on the A/C lines.
4. Install the thin foam packing (2) on the A/C lines.
5. Install the HVAC module into the vehicle.

CAUTION: Refer to Fastener Caution .

6. Install the upper left HVAC module mounting nut (1) and tighten to 9 (80 lb in).

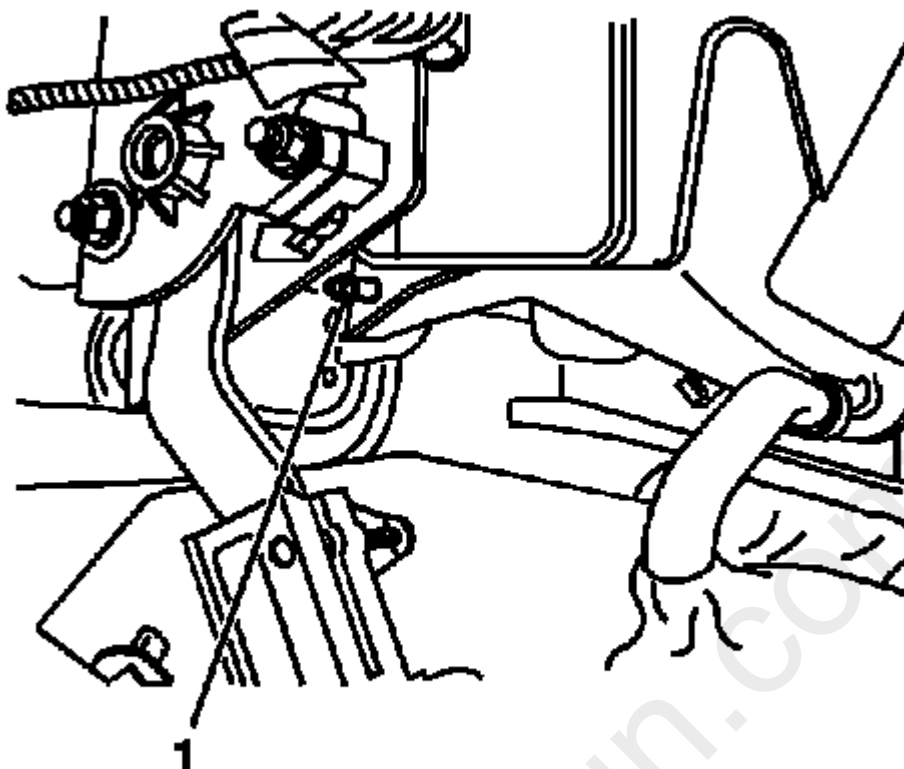


Fig. 85: Locating Lower Left HVAC Module Mounting Nut
Courtesy of GENERAL MOTORS COMPANY

7. Install the lower left HVAC module mounting nut (1) and tighten to 9 (80 lb in).
8. Connect the rear heater ducts to the HVAC module.
9. Connect the drain tube to the bottom of the HVAC module.

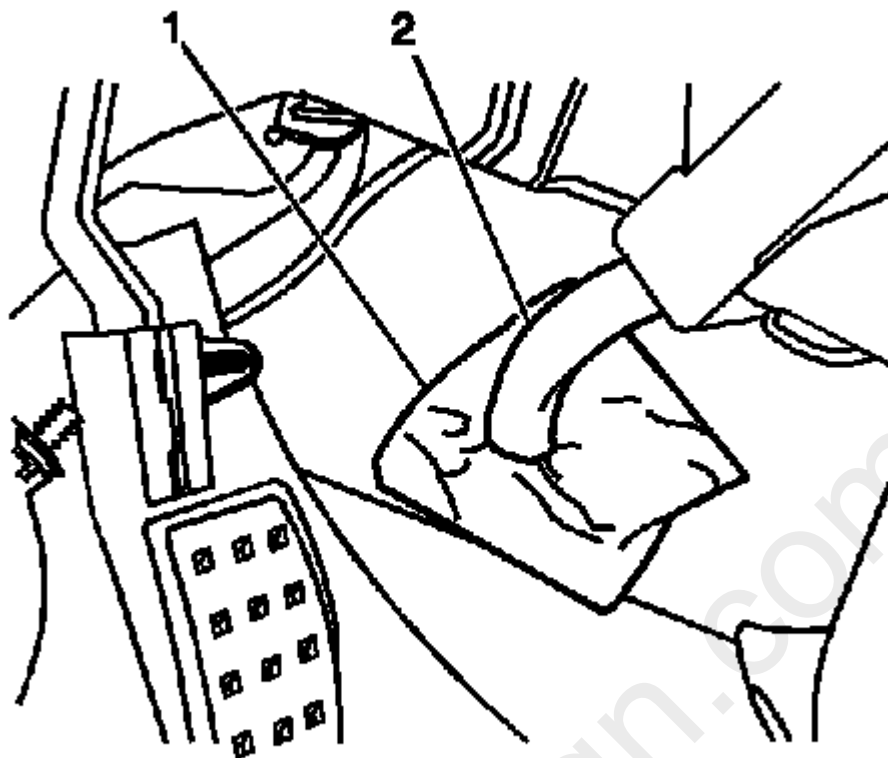


Fig. 86: View Of Rubber Adhesive Patch & Drain Tube
Courtesy of GENERAL MOTORS COMPANY

10. Connect the drain tube (2) to the floor.
11. Connect the HVAC electrical connector.
12. Install the air inlet assembly.

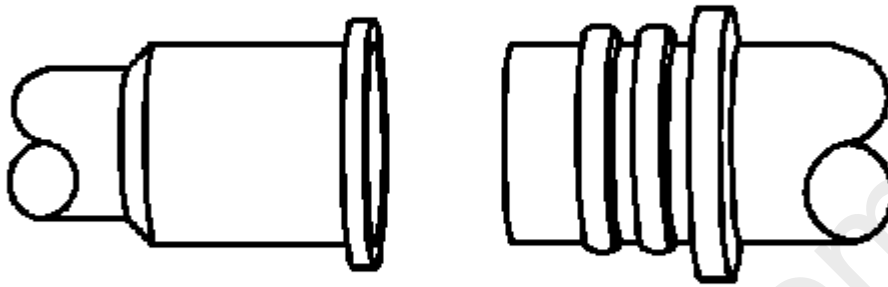


Fig. 87: View Of O-rings Of A/C Line
Courtesy of GENERAL MOTORS COMPANY

13. Lubricate the O-rings of the A/C line with refrigerant oil before connecting the A/C lines. Refer to **Air Conditioning O-Ring Seal Replacement**.

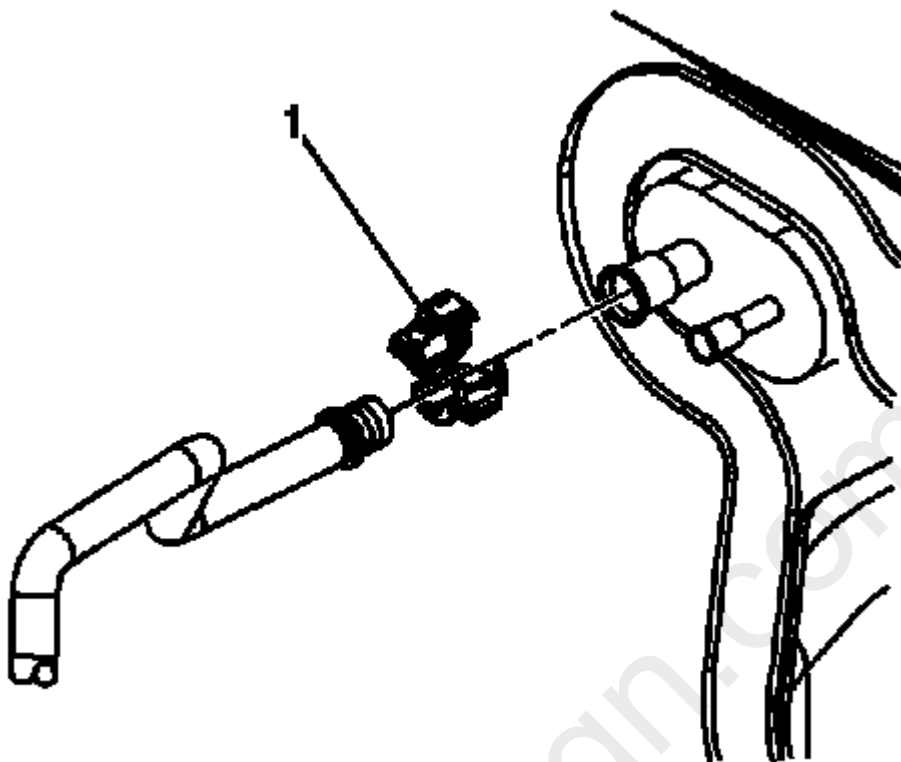


Fig. 88: Identifying Air Conditioning Suction Hose & Retainer
Courtesy of GENERAL MOTORS COMPANY

14. Install the A/C line and A/C line quick connect line clamp (1) to the evaporator.

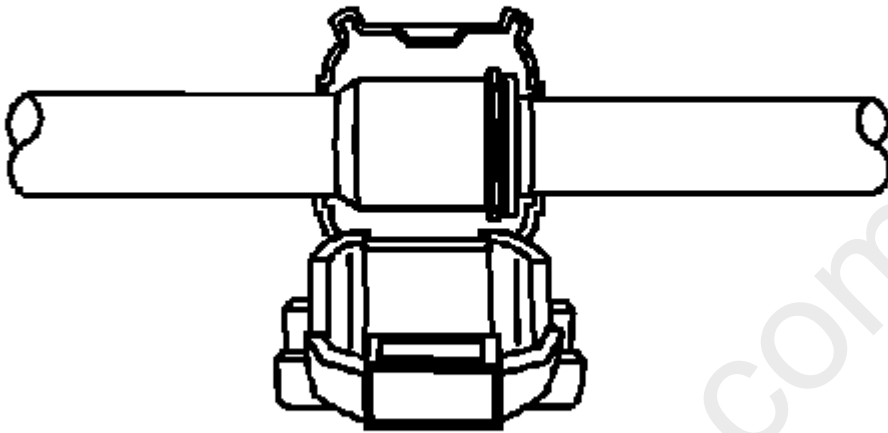


Fig. 89: Engaging Clamp

Courtesy of GENERAL MOTORS COMPANY

NOTE: Press the A/C line quick connect line clamp together until you hear it engage.

15. Engage the clamp.

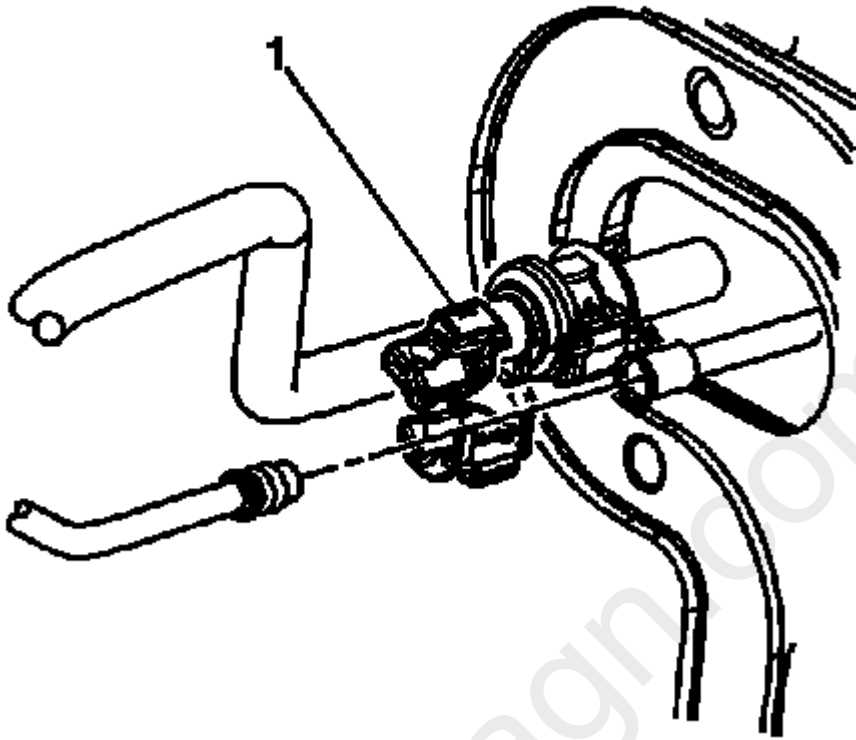


Fig. 90: Identifying A/C Fitting Retainer
Courtesy of GENERAL MOTORS COMPANY

16. Install the A/C line and A/C line quick connect line clamp (1) to the evaporator.

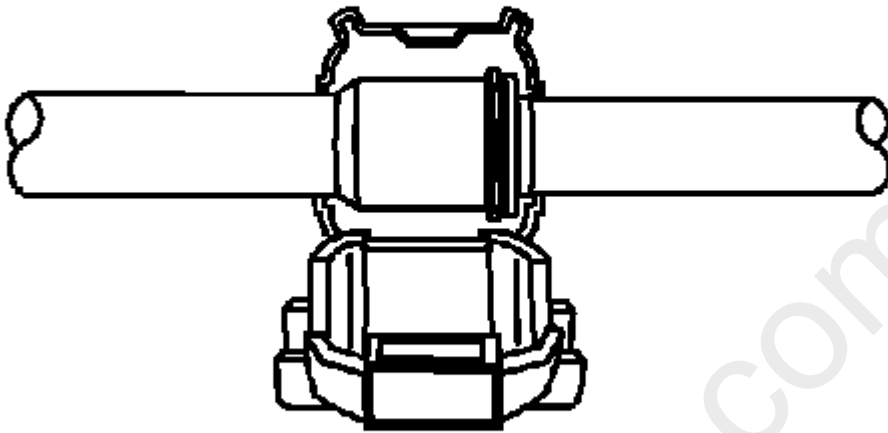


Fig. 91: Engaging Clamp

Courtesy of GENERAL MOTORS COMPANY

NOTE: Press the A/C line quick connect line clamp together until you hear it engage.

17. Engage the clamp.

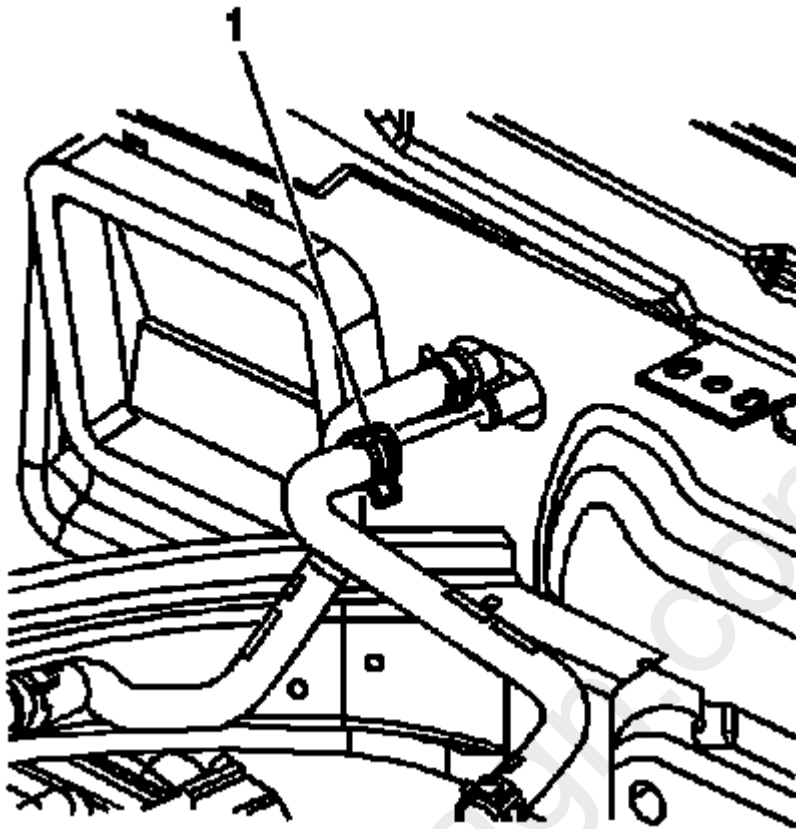


Fig. 92: Identifying Inlet Heater Hose
Courtesy of GENERAL MOTORS COMPANY

18. Connect the heater inlet hose (1) using J 38185 hose clamp pliers.

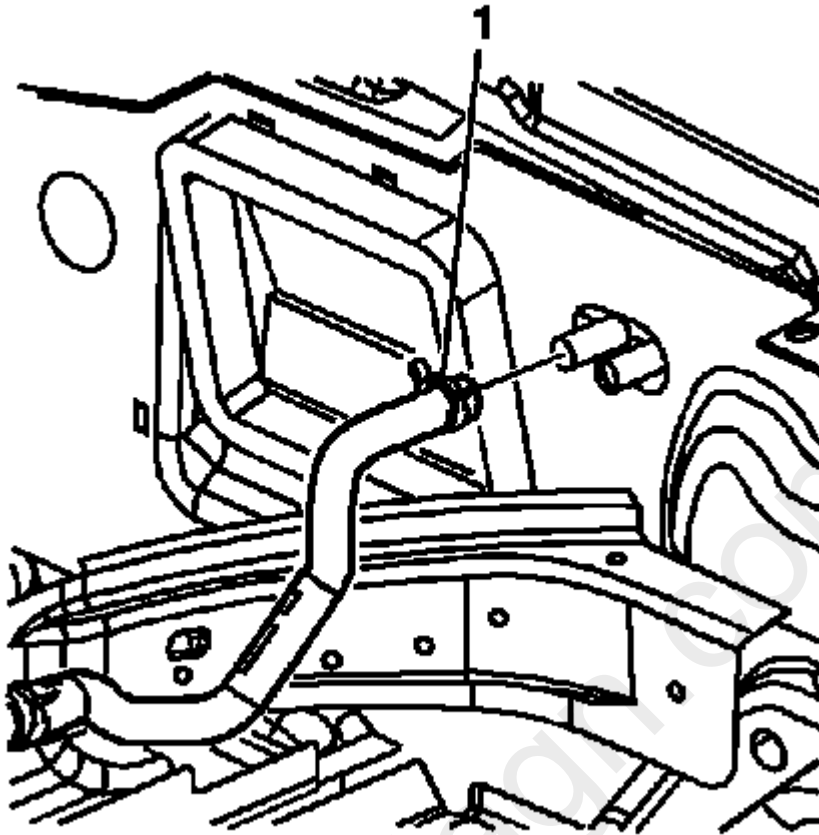


Fig. 93: Identifying Heater Outlet Hose
 Courtesy of GENERAL MOTORS COMPANY

19. Connect the heater outlet hose (1) using J 38185 hose clamp pliers.
20. Install the I/P carrier. Refer to **Instrument Panel Carrier Replacement (Left Hand Drive)** , **Instrument Panel Carrier Replacement (Right Hand Drive)** .
21. Install the battery. Refer to **Battery Replacement** .
22. Fill the coolant. Refer to **Cooling System Draining and Filling (Static Fill LFW or LFX)** , **Cooling System Draining and Filling (Static Fill LSA)** , **Cooling System Draining and Filling (GE 47716 LFW or LFX)** , **Cooling System Draining and Filling (GE 47716 LSA)** .
23. Evacuate and recharge the AC system. Refer to **Refrigerant Recovery and Recharging (Belt Driven Compressor)**.
24. Leak test the fittings of the component using J 39400-A halogen leak detector.

AIR CONDITIONING EVAPORATOR CORE REPLACEMENT

Removal Procedure

1. Remove the HVAC module assembly. Refer to **Air Conditioning and Heater Module Assembly Removal and Installation**.

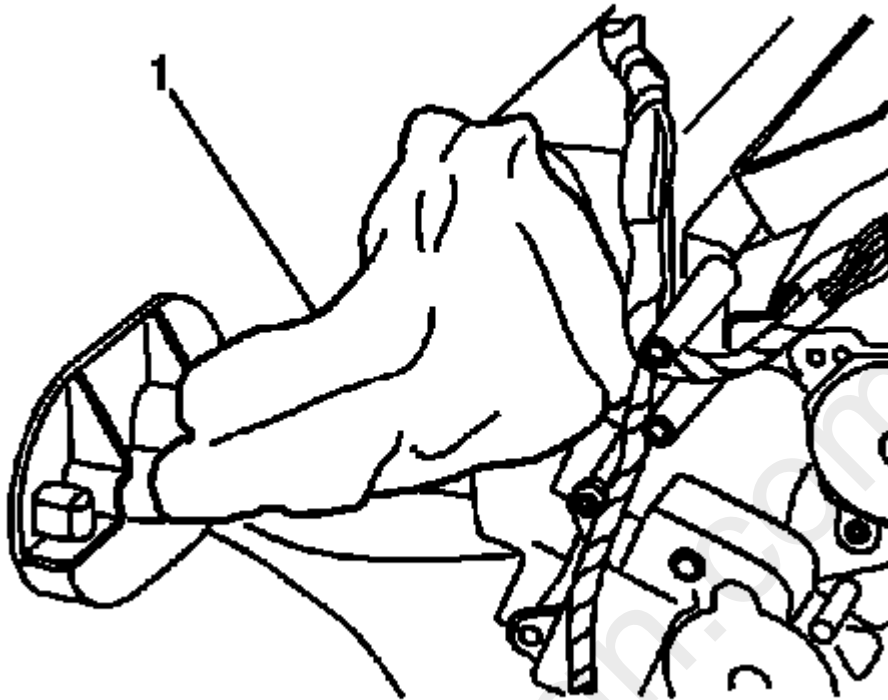


Fig. 94: View Of TXV Insulation

Courtesy of GENERAL MOTORS COMPANY

2. Remove the insulation (1) from the thermal expansion valve (TXV).

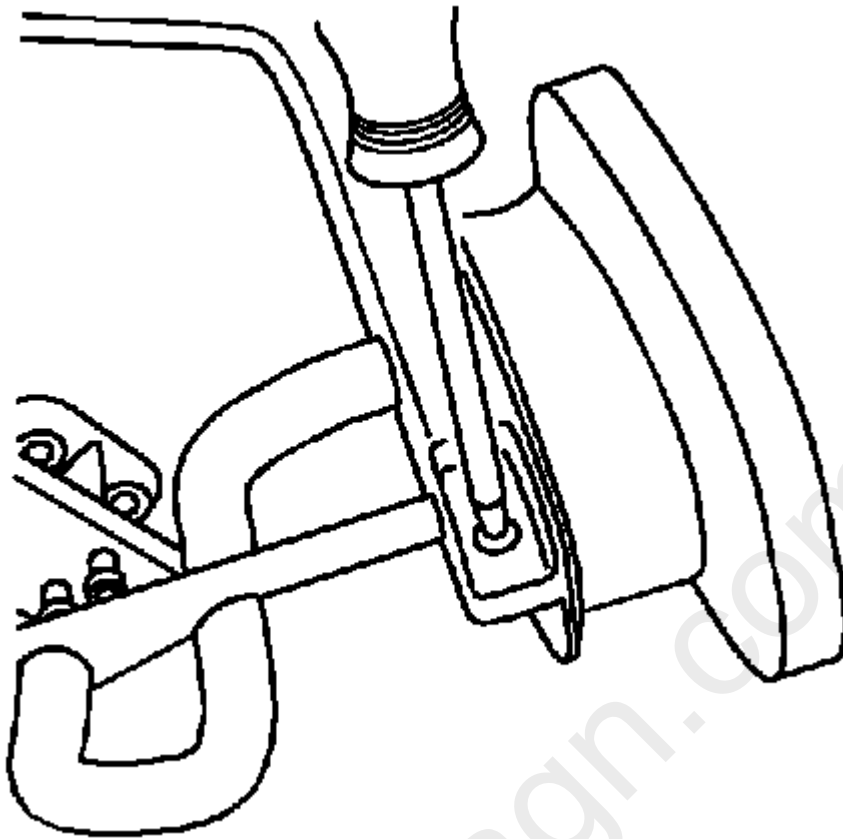


Fig. 95: View Of HVAC Line Clamp Screw
Courtesy of GENERAL MOTORS COMPANY

3. Remove the HVAC line clamp screw.

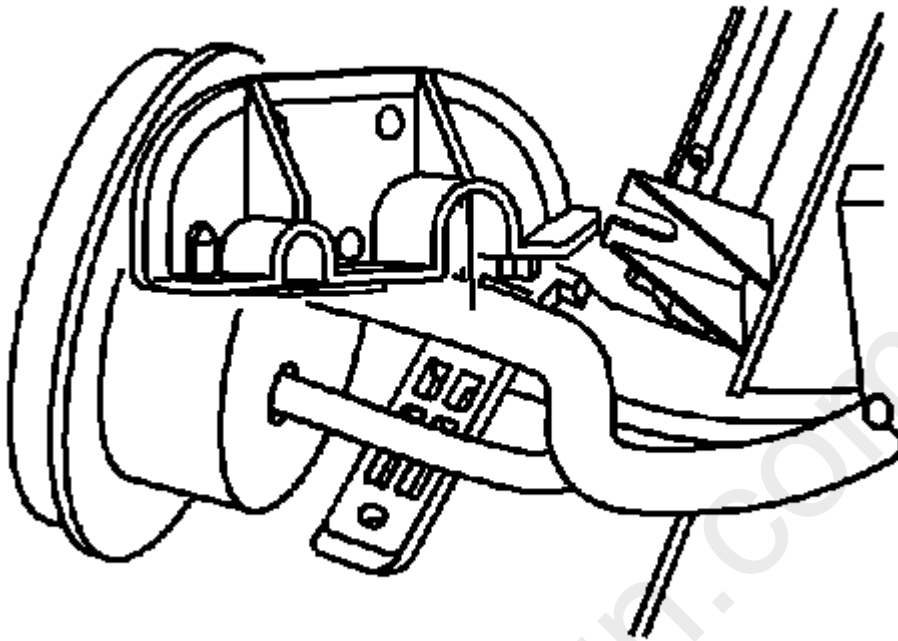


Fig. 96: View Of HVAC Line Clamp
Courtesy of GENERAL MOTORS COMPANY

4. Remove the HVAC line clamp.

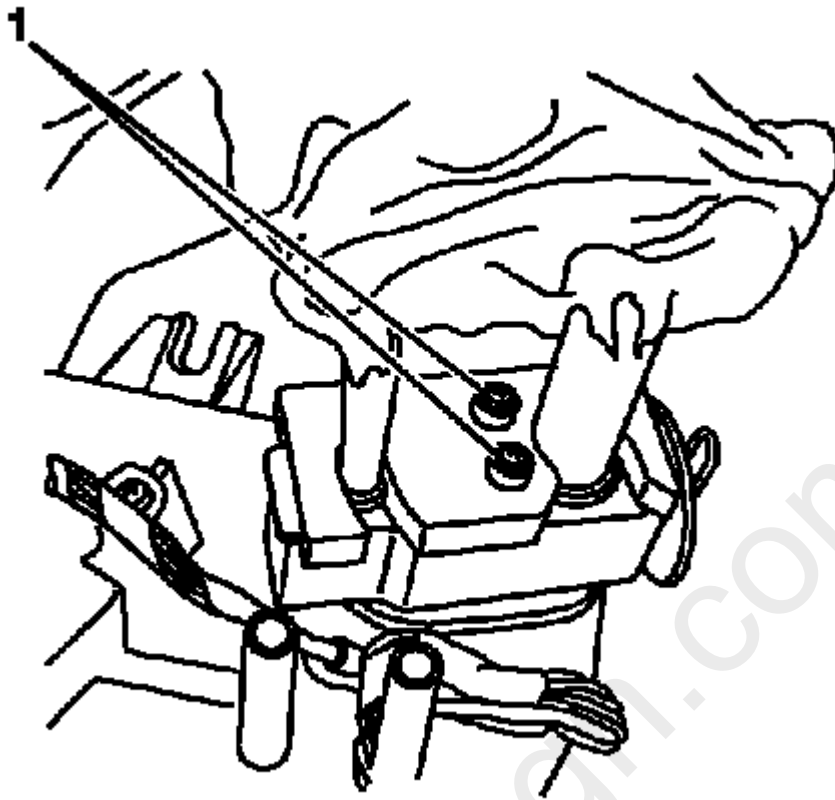


Fig. 97: View Of TXV To Evaporator Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the TXV to evaporator bolts (1).



Fig. 98: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Remove the TXV line bracket.

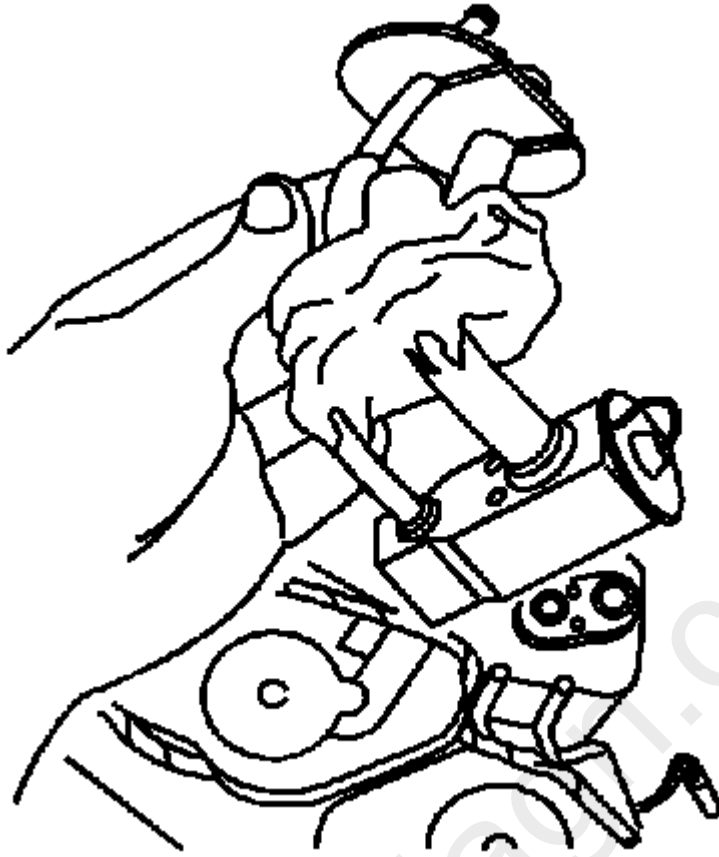


Fig. 99: View Of TXV Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

7. Remove the TXV from the evaporator core.
8. Separate the TXV from the A/C lines by pulling straight out.
9. Remove the TXV.
10. Remove the screws that hold the case together.

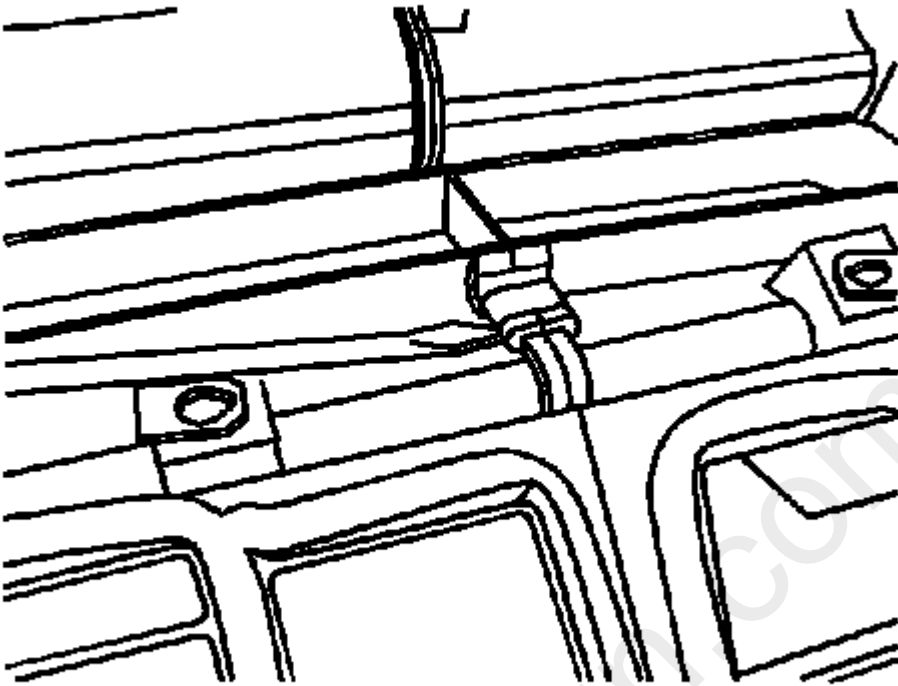


Fig. 100: Removing Clips That Hold Case Together
Courtesy of GENERAL MOTORS COMPANY

11. Remove the clips that hold the case together.

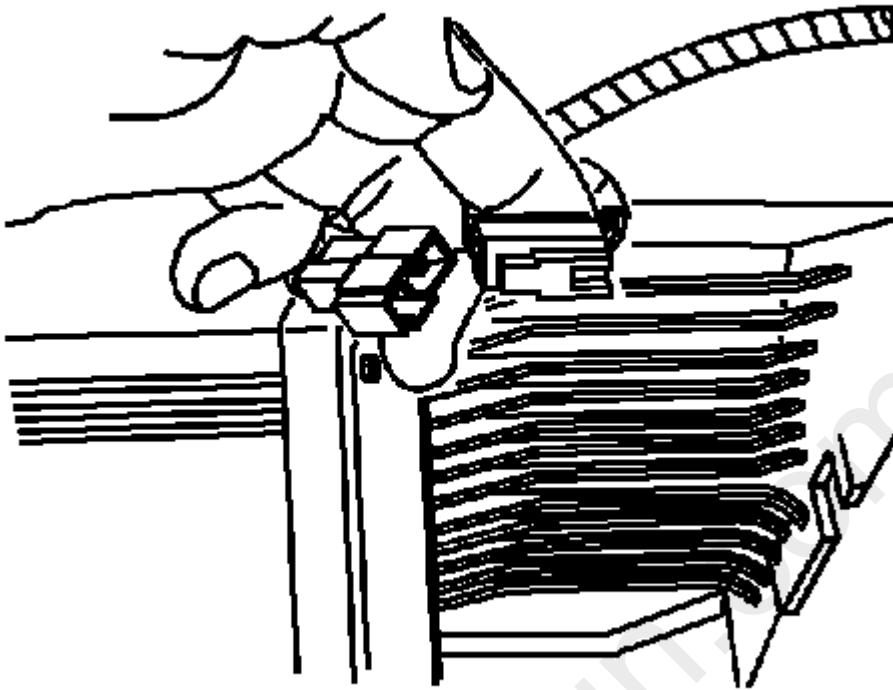


Fig. 101: Thermistor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

12. Disconnect the thermistor electrical connector.

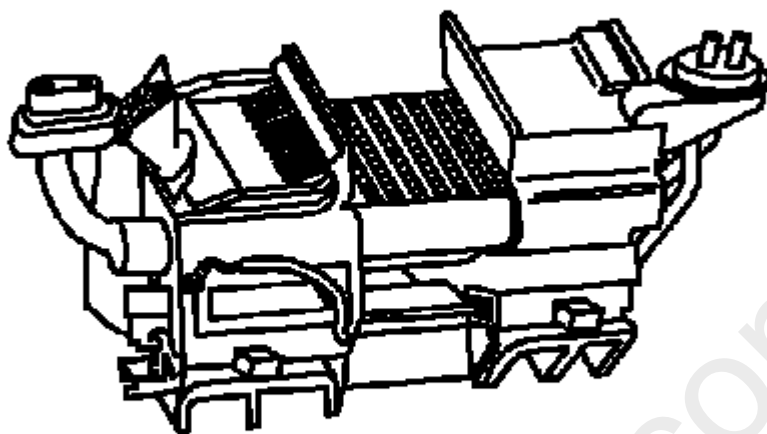


Fig. 102: Separating HVAC Module
Courtesy of GENERAL MOTORS COMPANY

13. Separate the HVAC module.

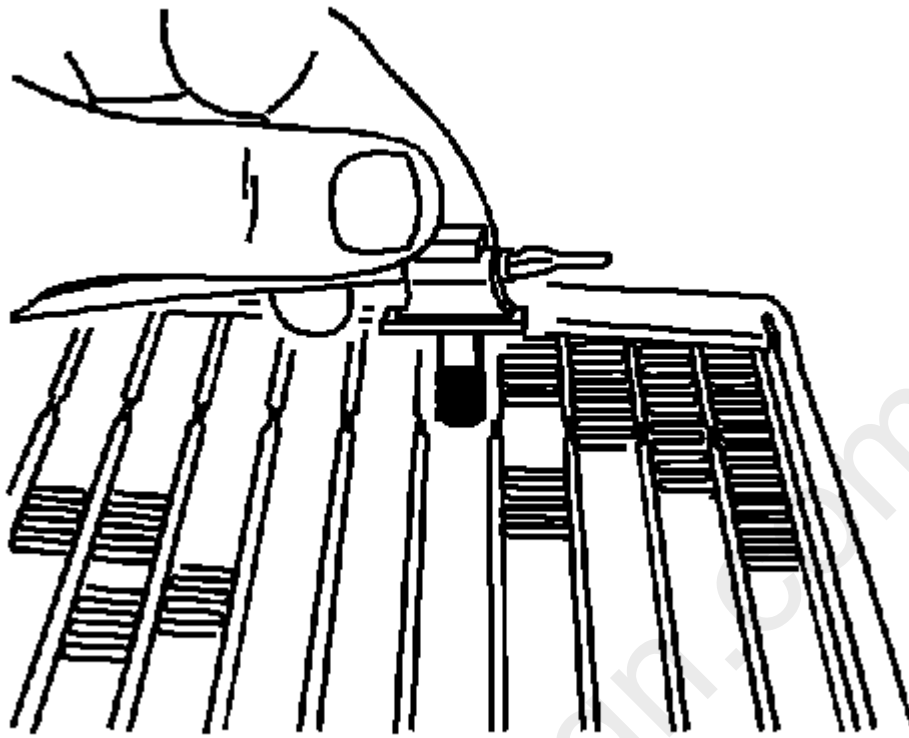


Fig. 103: View Of Evaporator Core Thermistor
Courtesy of GENERAL MOTORS COMPANY

14. Remove the thermistor from the evaporator core.

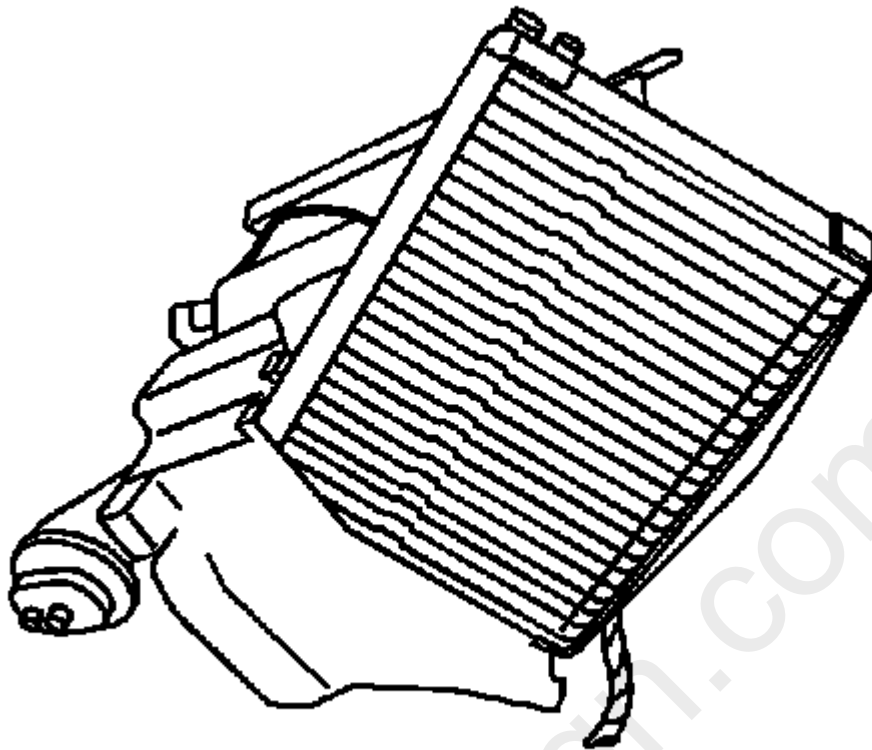


Fig. 104: View Of Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

15. Remove the evaporator core.

Installation Procedure

1. Add refrigerant oil. Refer to **Refrigerant System Specifications**.
2. Install new evaporator core seals to evaporator.

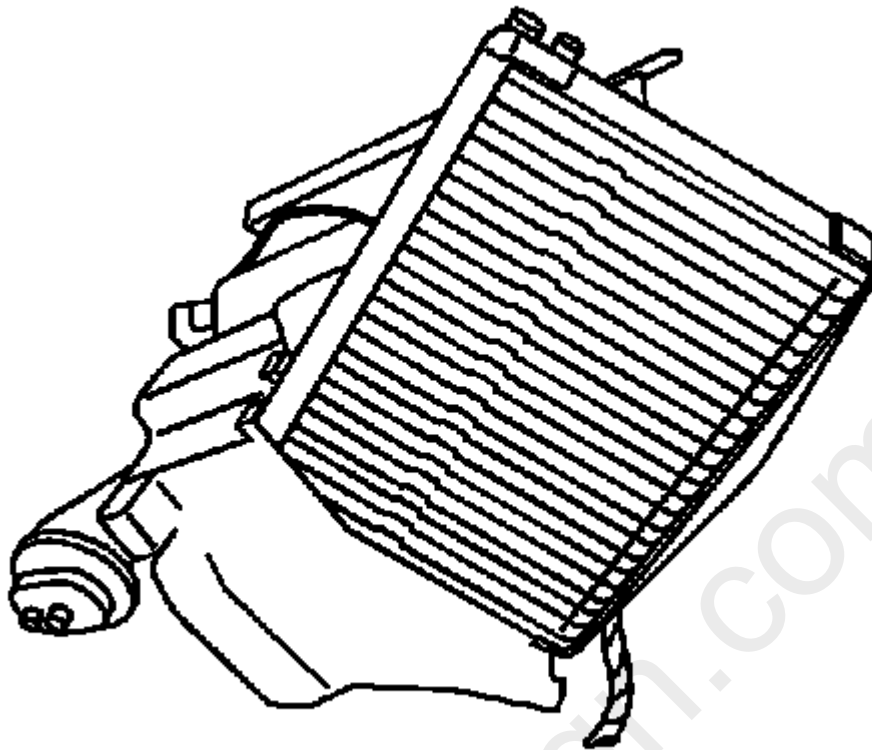


Fig. 105: View Of Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

3. Install the evaporator core.

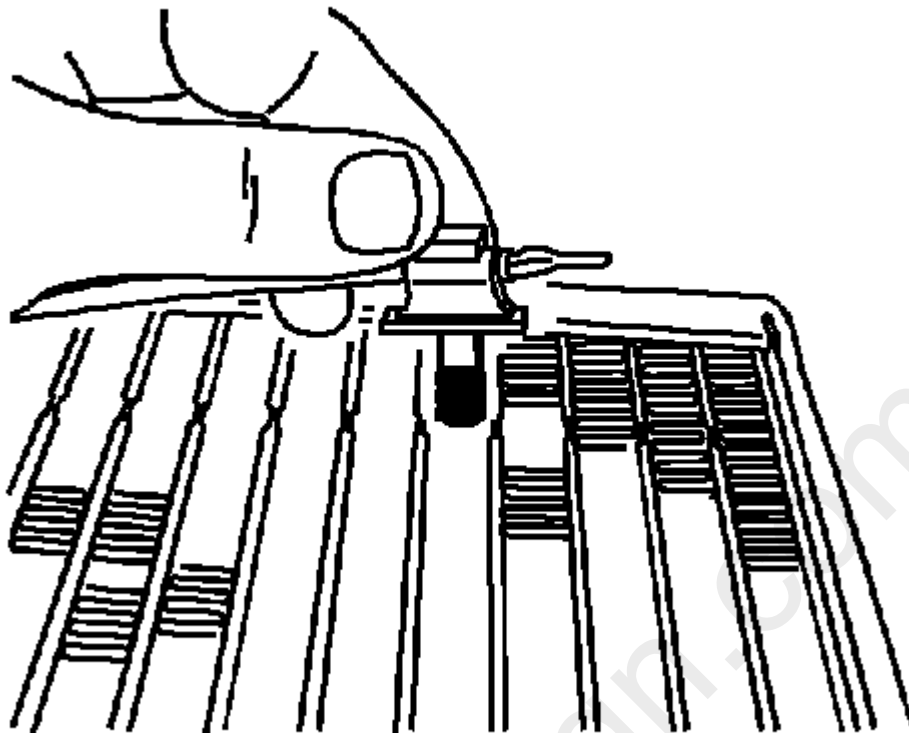


Fig. 106: View Of Evaporator Core Thermistor
Courtesy of GENERAL MOTORS COMPANY

4. Install the thermistor to the evaporator into the same position as removed.

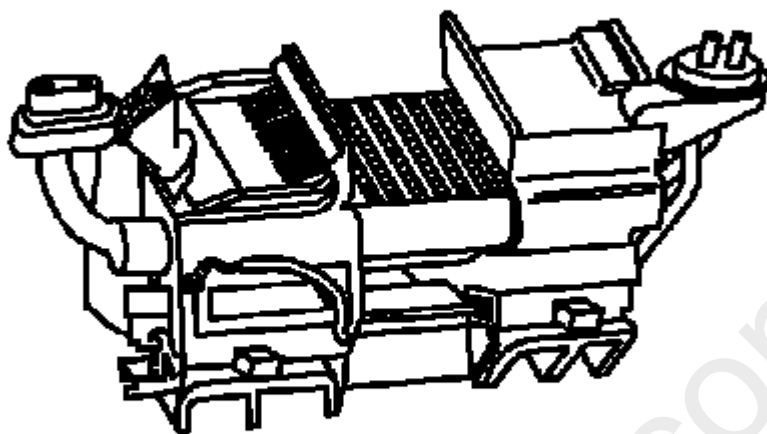


Fig. 107: Separating HVAC Module
Courtesy of GENERAL MOTORS COMPANY

5. Slide the HVAC module together.

CAUTION: Refer to Fastener Caution .

6. Install the screws that hold the case together and tighten to 1 N.m (8 lb in).
7. Install the clips that hold the case together.

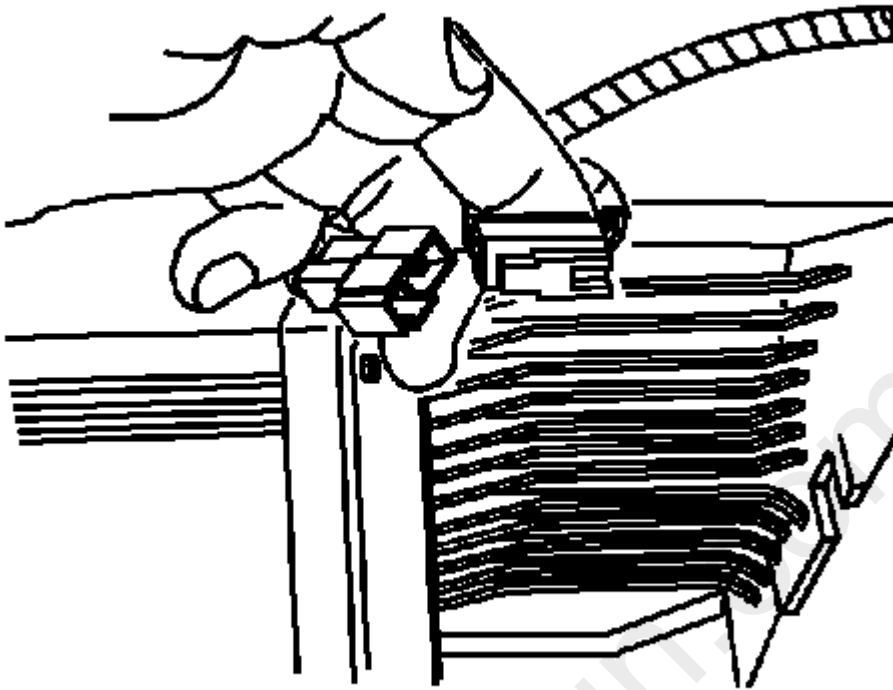


Fig. 108: Thermistor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Connect the thermistor electrical connector.
9. Lube A/C lines with refrigerant oil before installing. Refer to **Air Conditioning O-Ring Seal Replacement**.
10. Install the A/C lines into the TXV.

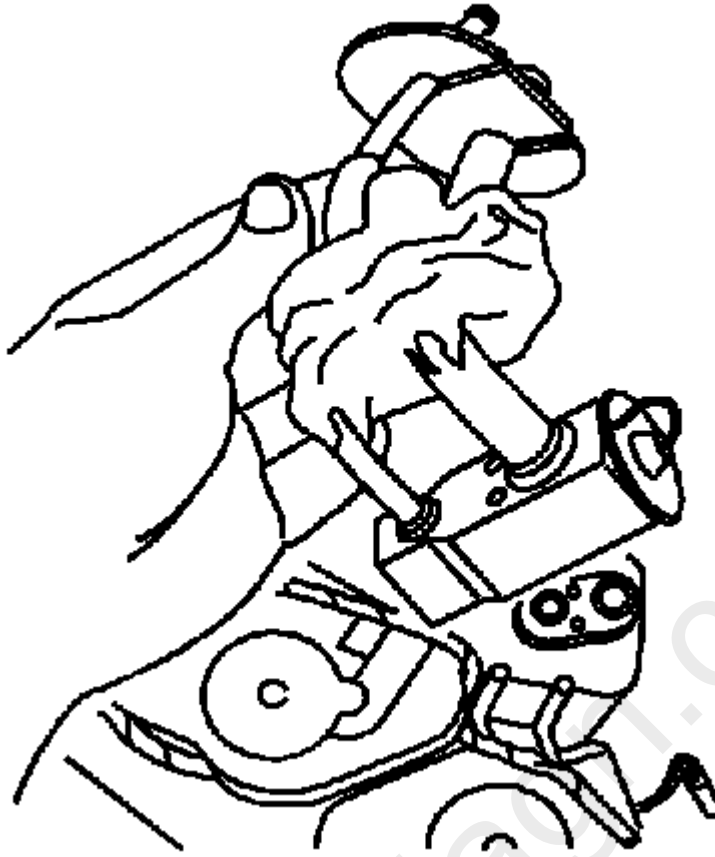


Fig. 109: View Of TXV Evaporator Core
Courtesy of GENERAL MOTORS COMPANY

11. Carefully slide the TXV onto the evaporator core until seated.



Fig. 110: View Of TXV Line Bracket
Courtesy of GENERAL MOTORS COMPANY

12. Install the TXV line bracket.

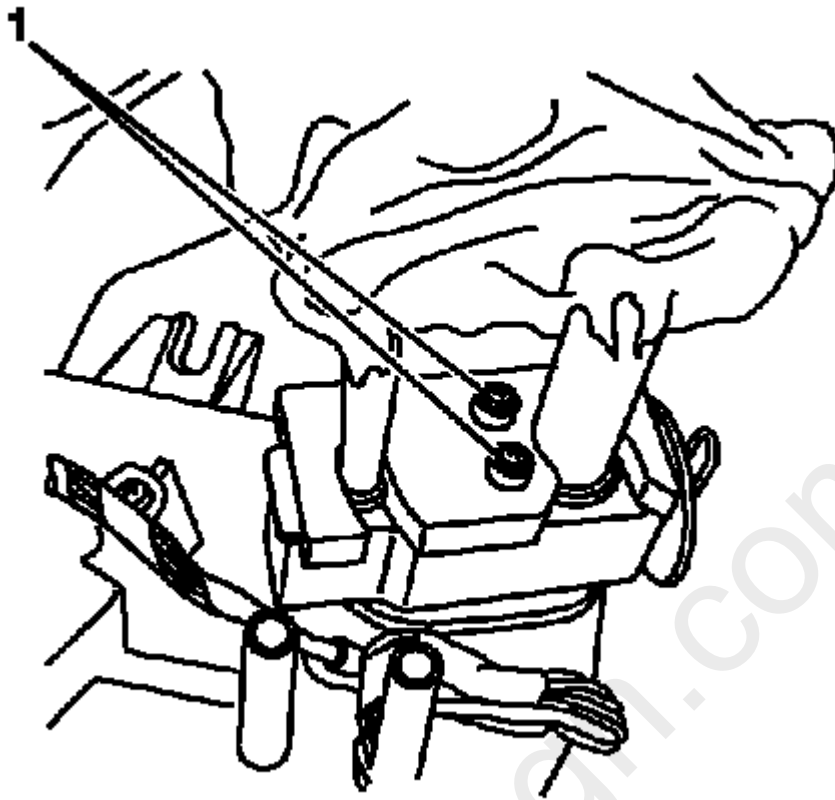


Fig. 111: View Of TXV To Evaporator Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

13. Install the TXV to evaporator bolts (1) and tighten to 3.5 N.m (31 lb in) .

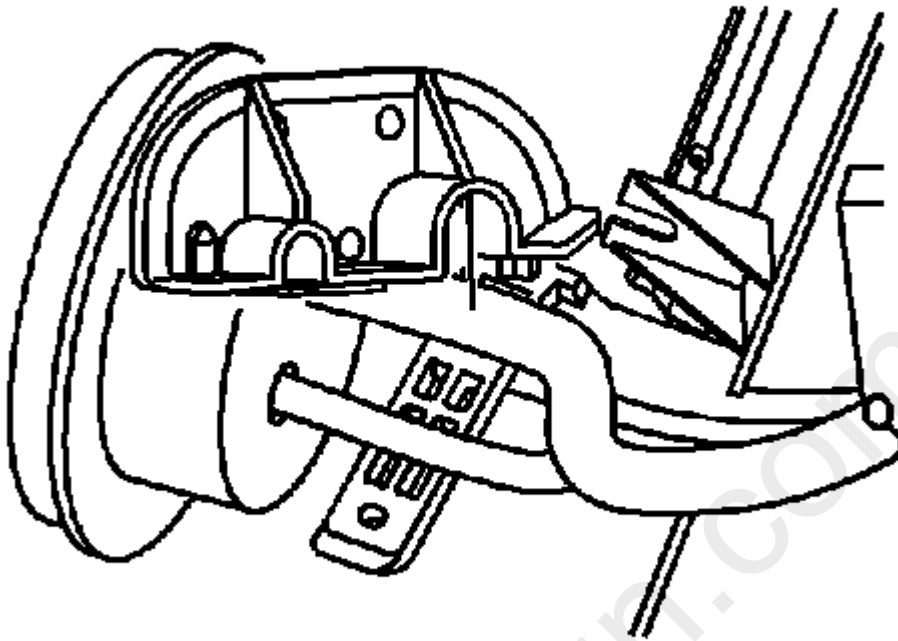


Fig. 112: View Of HVAC Line Clamp
Courtesy of GENERAL MOTORS COMPANY

14. Install the HVAC line clamp.

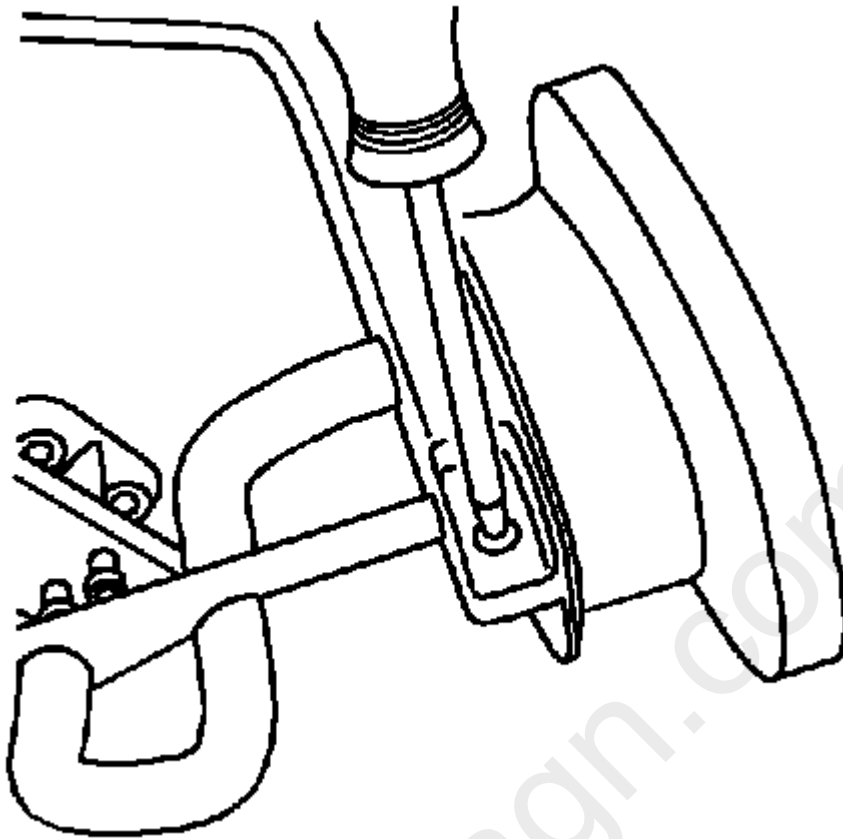


Fig. 113: View Of HVAC Line Clamp Screw
Courtesy of GENERAL MOTORS COMPANY

15. Install the HVAC line clamp screw and tighten to 1 N.m (8 lb in).

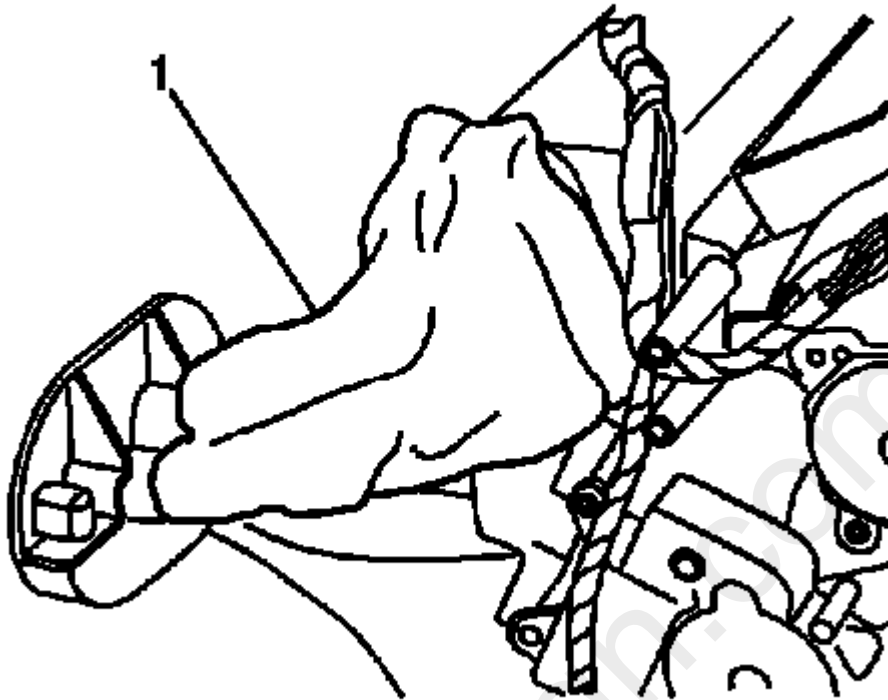


Fig. 114: View Of TXV Insulation
Courtesy of GENERAL MOTORS COMPANY

16. Install the insulation (1) onto the lines and TXV.
17. Install the HVAC module. Refer to **Air Conditioning and Heater Module Assembly Removal and Installation.**

AIR CONDITIONING EVAPORATOR AND BLOWER MODULE DRAIN HOSE REPLACEMENT (LEFT HAND DRIVE)

Removal Procedure

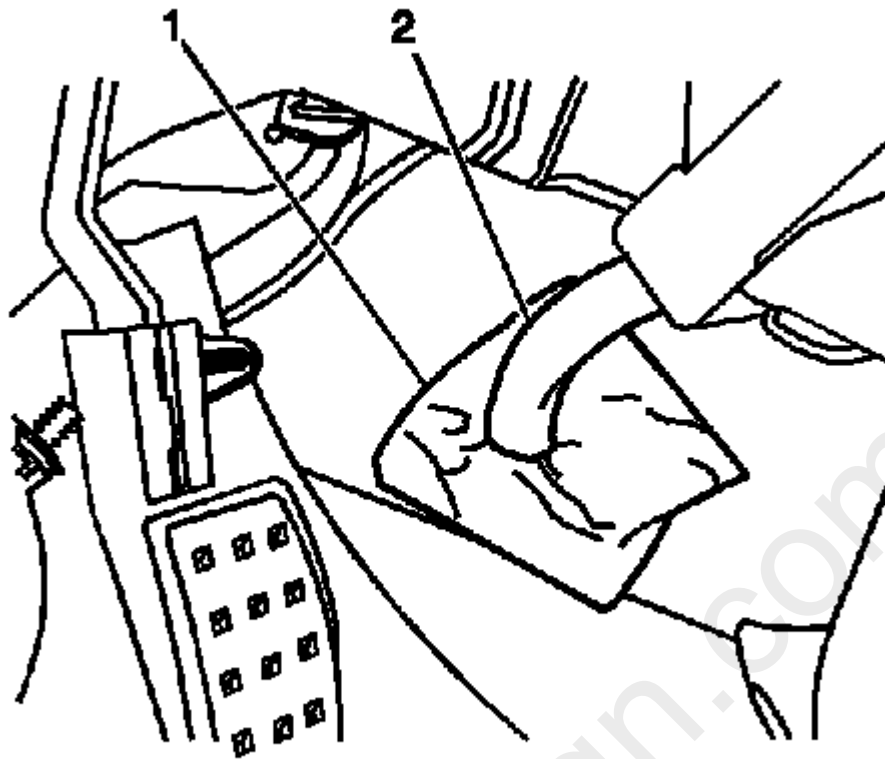


Fig. 115: View Of Rubber Adhesive Patch & Drain Tube
Courtesy of GENERAL MOTORS COMPANY

1. Peel back enough carpet and insulation to access drain tube.
2. Remove the rubber adhesive patch (1) from around the drain tube (2).
3. Open the flap in the tunnel insulator and unsnap drain fitting from the tunnel sheet metal.
4. Remove the HVAC module drain tube from the HVAC module.

Installation Procedure

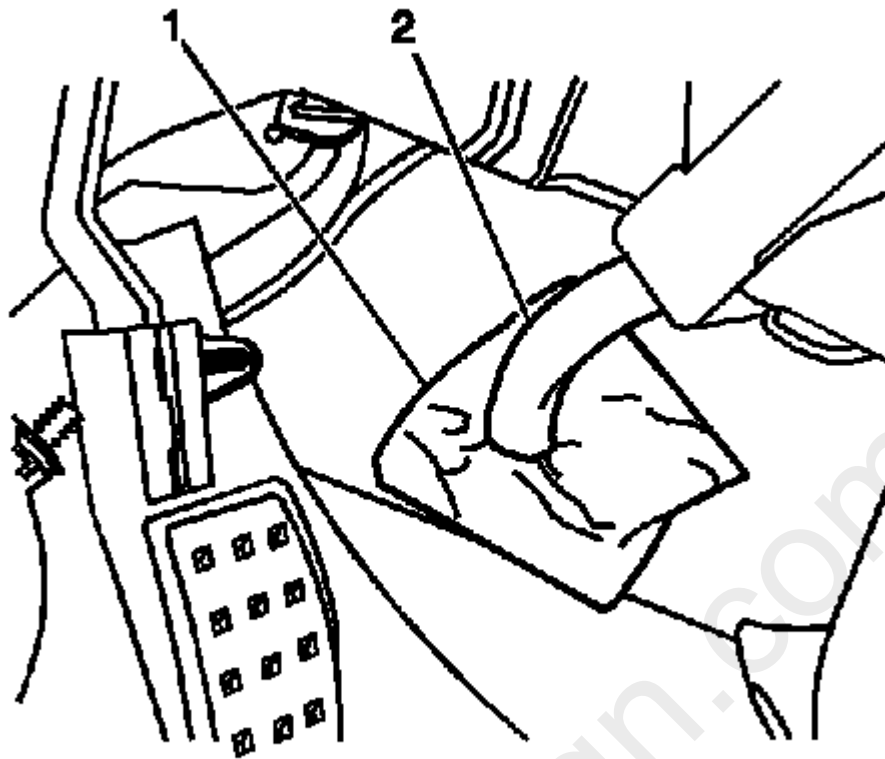


Fig. 116: View Of Rubber Adhesive Patch & Drain Tube
Courtesy of GENERAL MOTORS COMPANY

1. Install the HVAC module drain tube to the HVAC module.
2. Ensure that the drain tube is fully seated to the HVAC module.
3. Snap drain fitting into the tunnel sheet metal.
4. Close the flap on the tunnel insulator.
5. Install the rubber adhesive patch (1) around the drain tube (2).
6. Install insulation and carpet to original position.

**AIR CONDITIONING EVAPORATOR AND BLOWER MODULE DRAIN HOSE REPLACEMENT
(RIGHT HAND DRIVE)**

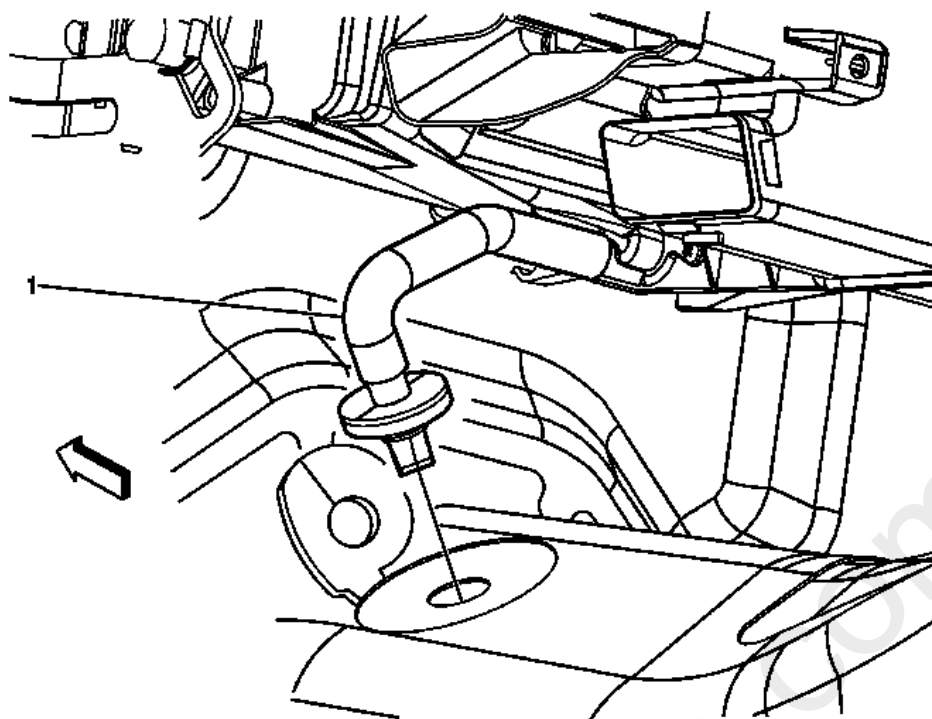


Fig. 117: Identifying HVAC Module Drain Hose
 Courtesy of GENERAL MOTORS COMPANY

Air Conditioning Evaporator and Blower Module Drain Hose Replacement (Right Hand Drive)

Callout	Component Name
Preliminary Procedure	
1. Remove the center console. Refer to <u>Front Floor Console Replacement (Right Hand Drive)</u> . 2. Remove the rubber adhesive patch from around the drain tube. 3. Open the flap in the tunnel insulator and unsnap drain fitting grommet from the tunnel sheet metal.	
1	HVAC Module Drain Hose

HEATER INLET HOSE REPLACEMENT

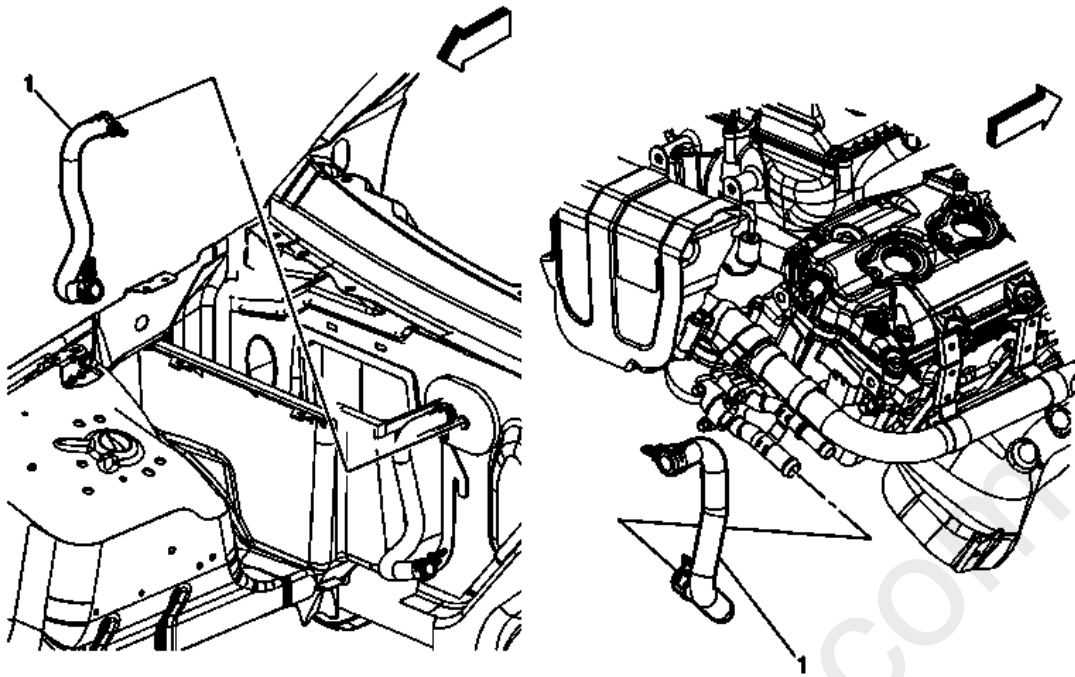


Fig. 118: Heater Inlet Hose Replacement
 Courtesy of GENERAL MOTORS COMPANY

Heater Inlet Hose Replacement

Callout	Component Name
Preliminary Procedures Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static Fill LFW or LFX)</u> , <u>Cooling System Draining and Filling (Static Fill LSA)</u> , <u>Cooling System Draining and Filling (GE 47716 LFW or LFX)</u> , <u>Cooling System Draining and Filling (GE 47716 LSA)</u> .	
1	Heater Inlet Hose TIP: Using J 38185 hose clamp pliers reposition the heater inlet hose clamps. Special Tools J 38185 Hose Clamp Pliers

HEATER OUTLET HOSE REPLACEMENT

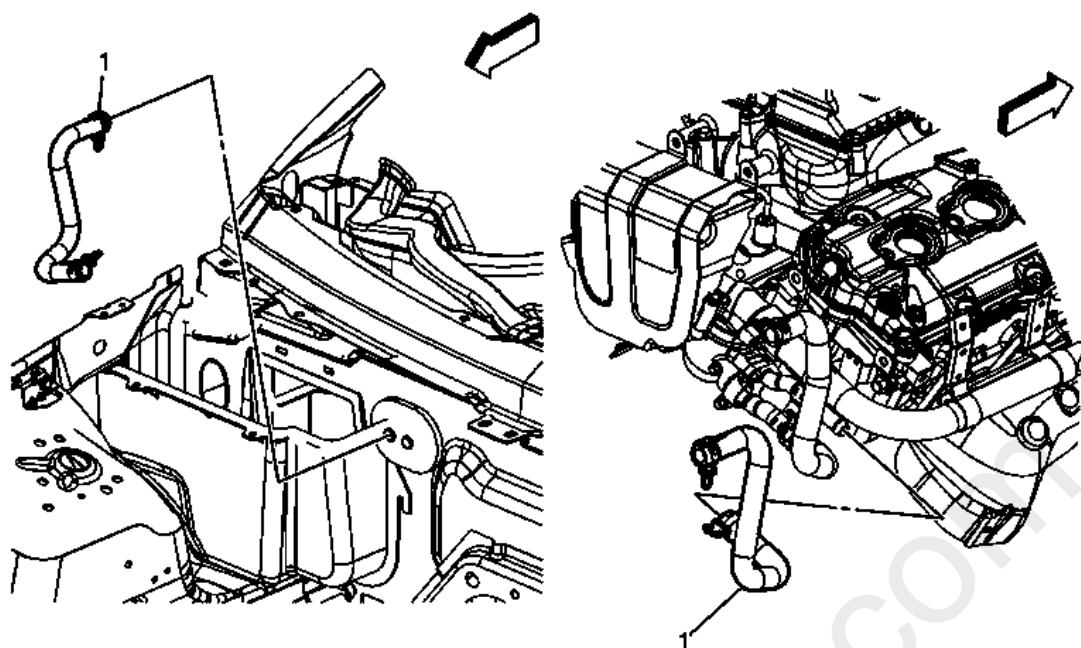


Fig. 119: Heater Outlet Hose Replacement
 Courtesy of GENERAL MOTORS COMPANY

Heater Outlet Hose Replacement

Callout	Component Name
Preliminary Procedures Drain the cooling system. Refer to <u>Cooling System Draining and Filling (Static Fill LFW or LFX)</u> , <u>Cooling System Draining and Filling (Static Fill LSA)</u> , <u>Cooling System Draining and Filling (GE 47716 LFW or LFX)</u> , <u>Cooling System Draining and Filling (GE 47716 LSA)</u> .	
1	Heater Outlet Hose TIP: Using J 38185 hose clamp pliers reposition the heater outlet hose clamps. Special Tools J 38185 Hose Clamp Pliers

HEATER INLET HOSE/PIPE AND HEATER OUTLET HOSE/PIPE REPLACEMENT (LSA)

Special Tools

J 47622 Hose Clamp Pliers

Removal Procedure

1. Drain the cooling system. Refer to Cooling System Draining and Filling (Static Fill LSA) , Cooling System Draining and Filling (GE 47716 LSA) .
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

3. Remove the front compartment lower noise shield (if equipped). Refer to **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)** .
4. Remove manifold cover.
5. Remove vehicle cross brace. Refer to **Cross Vehicle Brace Replacement** .
6. Remove charge air cooler pipe assembly. Refer to **Charge Air Cooler Coolant Pipe Replacement** .
7. Remove charge air coolant reservoir. Refer to **Charge Air Cooler Coolant Reservoir Replacement** .

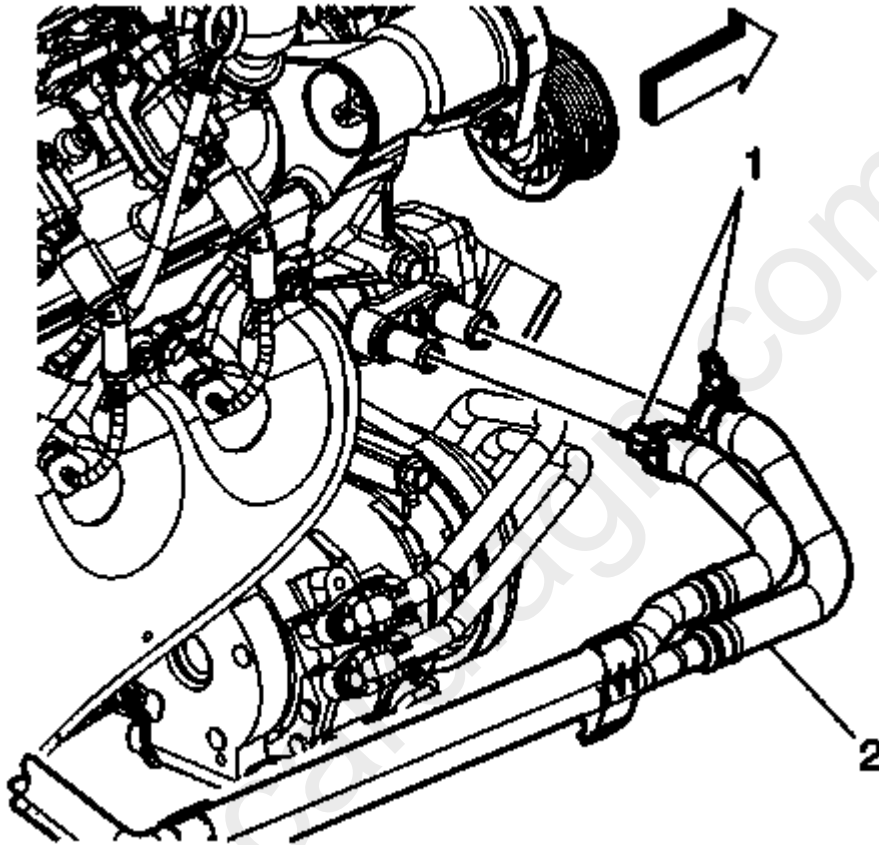


Fig. 120: Identifying Heater Hoses & Clamps
Courtesy of GENERAL MOTORS COMPANY

8. Reposition the heater hose clamps (1) at the engine using **J 47622** Hose Clamp Pliers.
9. Remove the heater hoses (2) from the engine.

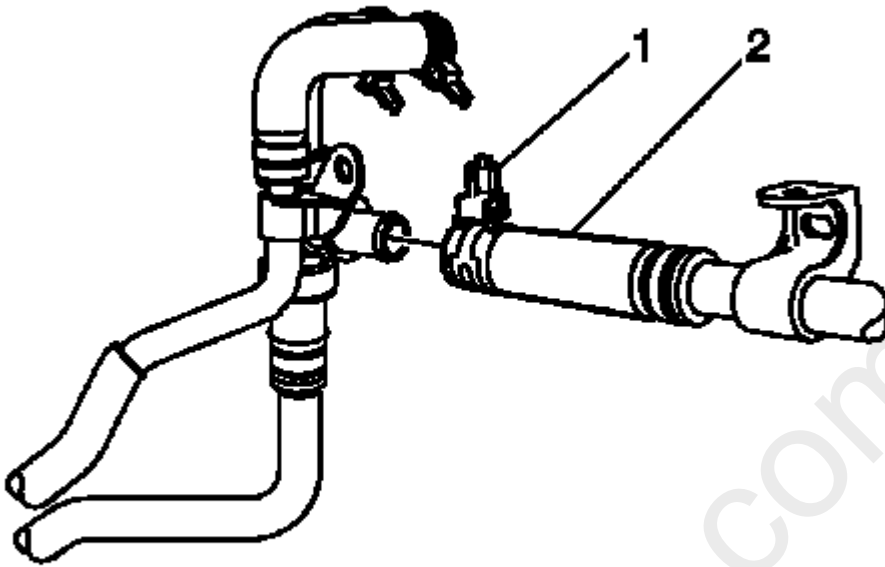


Fig. 121: Identifying Surge Tank Outlet Hose & Clamp
Courtesy of GENERAL MOTORS COMPANY

10. Reposition the surge tank outlet hose clamp (1) at the heater hose using **J 47622** Hose Clamp Pliers.
11. Remove the surge tank outlet hose (2) from the heater hose.

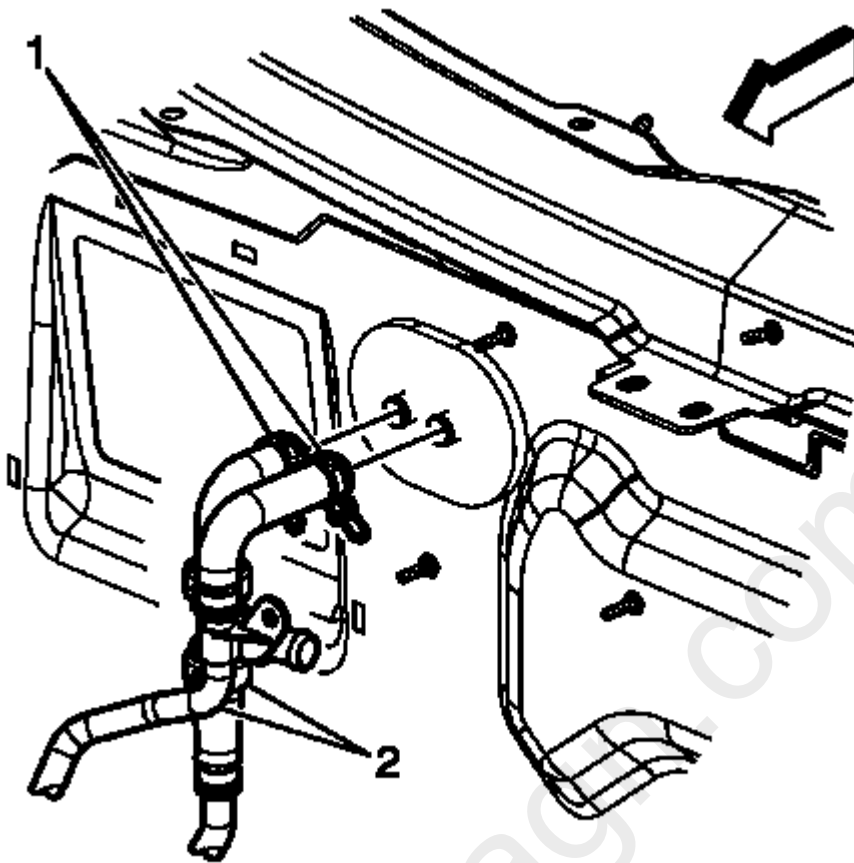


Fig. 122: Identifying Heater Hoses & Clamps
Courtesy of GENERAL MOTORS COMPANY

12. Reposition the heater hose clamps (1) at the heater core using J 47622 Hose Clamp Pliers.
13. Remove the heater hoses (2) from the heater core.

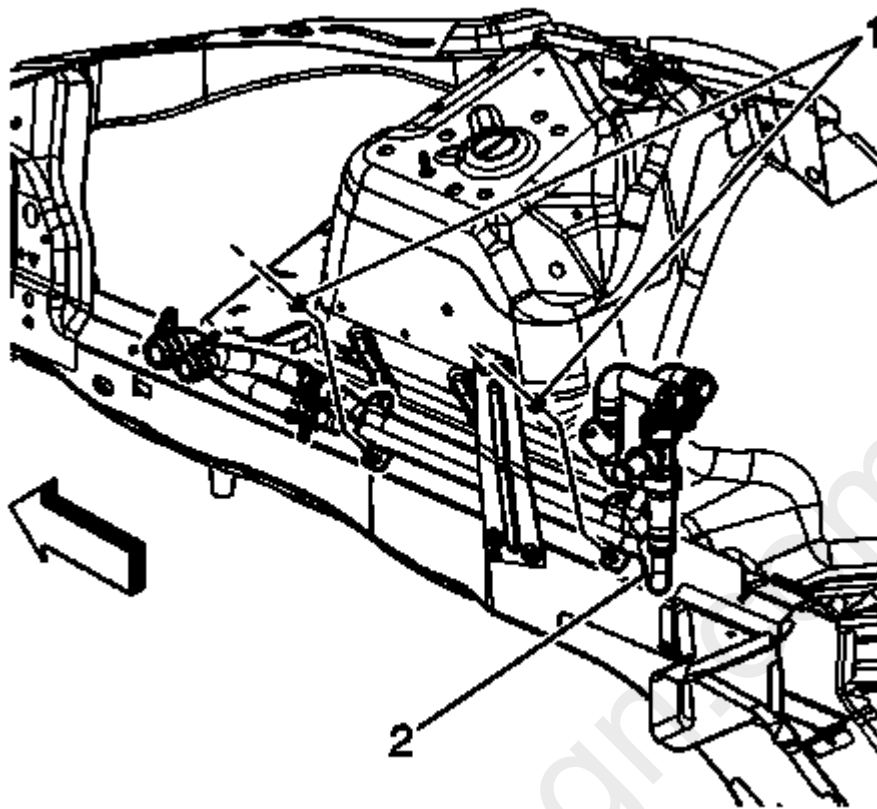


Fig. 123: Identifying Heater Hoses & Nuts
Courtesy of GENERAL MOTORS COMPANY

14. Remove heater pipe harness retainer brace and reposition harness.
15. Remove the heater hose nuts (1).
16. Remove the heater hoses (2) from the vehicle.

Installation Procedure

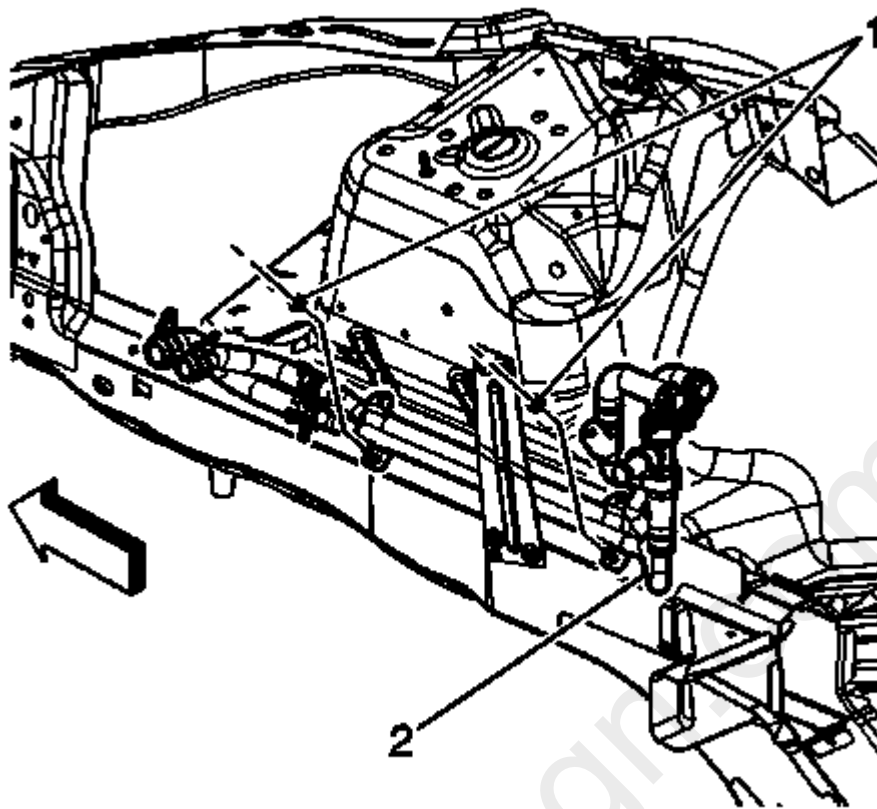


Fig. 124: Identifying Heater Hoses & Nuts
Courtesy of GENERAL MOTORS COMPANY

1. Install the heater hoses (2) to the vehicle.

CAUTION: Refer to Fastener Caution .

2. Install the heater hose nuts (1) and tighten to 10 N.m (89 lb in).
3. Install heater pipe harness retainer brace and reposition harness.

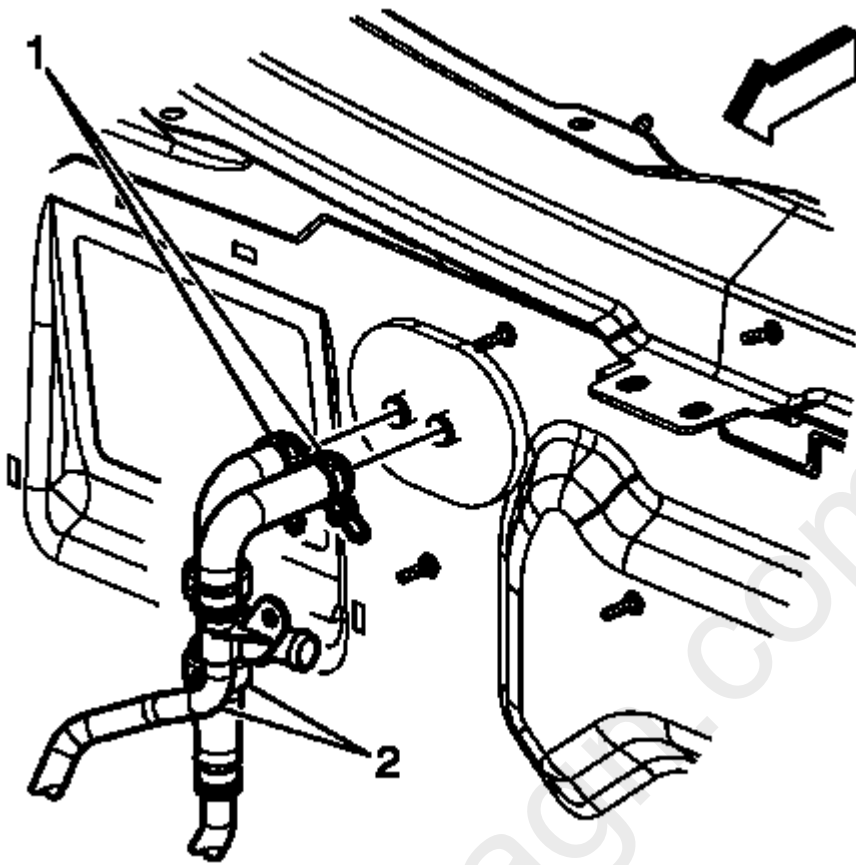


Fig. 125: Identifying Heater Hoses & Clamps
Courtesy of GENERAL MOTORS COMPANY

4. Install the heater hoses (2) from the heater core.
5. Reposition the heater hose clamps (1) at the heater core using J 47622 Hose Clamp Pliers.

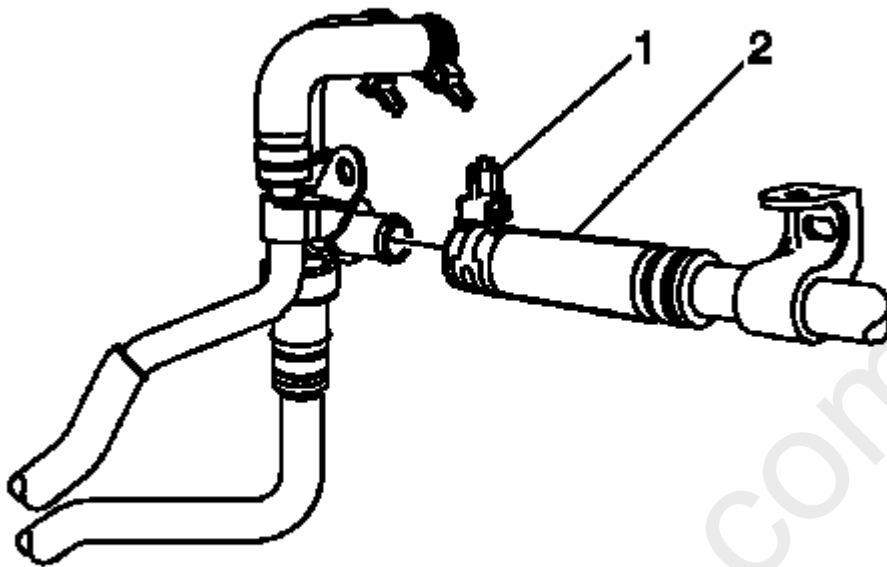


Fig. 126: Identifying Surge Tank Outlet Hose & Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Install the surge tank outlet hose (2) from the heater hose.
7. Reposition the surge tank outlet hose clamp (1) at the heater hose using **J 47622** Hose Clamp Pliers.

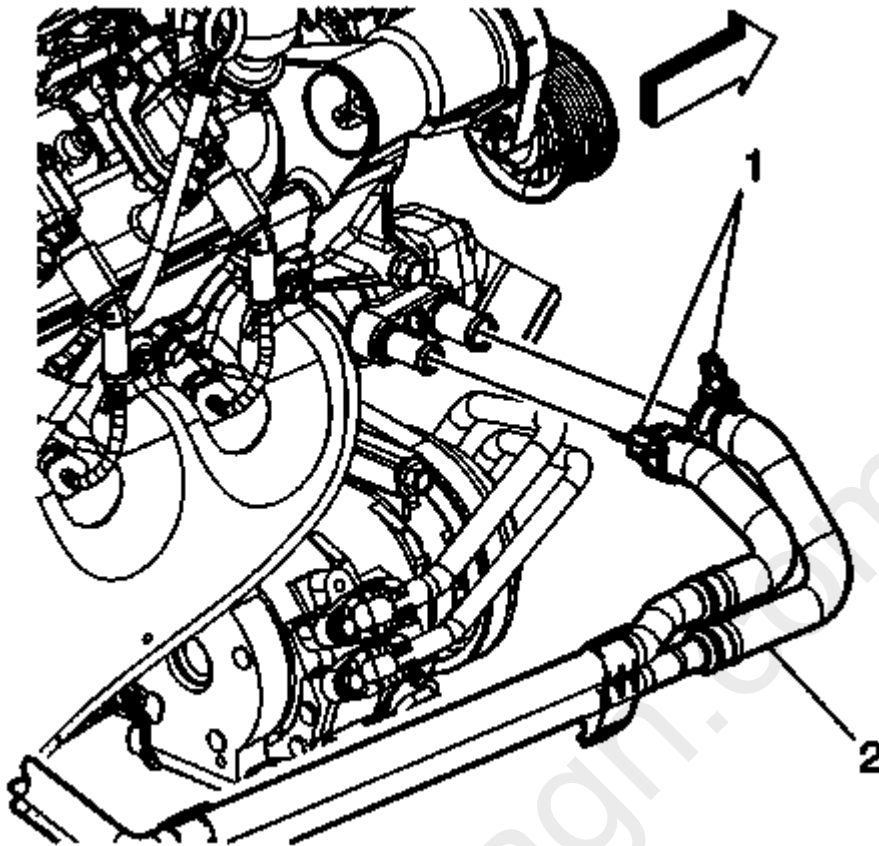


Fig. 127: Identifying Heater Hoses & Clamps
 Courtesy of GENERAL MOTORS COMPANY

8. Install the heater hoses (2) to the engine.
9. Reposition the heater hose clamps (1) at the engine using J 47622 Hose Clamp Pliers.
10. Install charge air coolant reservoir. Refer to **Charge Air Cooler Coolant Reservoir Replacement** .
11. Install charge air cooler pipe assembly. Refer to **Charge Air Cooler Coolant Pipe Replacement** .
12. Install vehicle cross brace. Refer to **Cross Vehicle Brace Replacement** .
13. Install manifold cover.
14. Install the front compartment lower noise shield (if equipped). Refer to **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)** .
15. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .
16. Fill the cooling system. Refer to **Cooling System Draining and Filling (Static Fill LSA)** , **Cooling System Draining and Filling (GE 47716 LSA)** .

PASSENGER COMPARTMENT AIR FILTER HOUSING REPLACEMENT

Removal Procedure

1. Remove the air inlet grille panel. Refer to **Air Inlet Grille Panel Replacement** .

2. With two hands release the tabs on each side of the access cover.

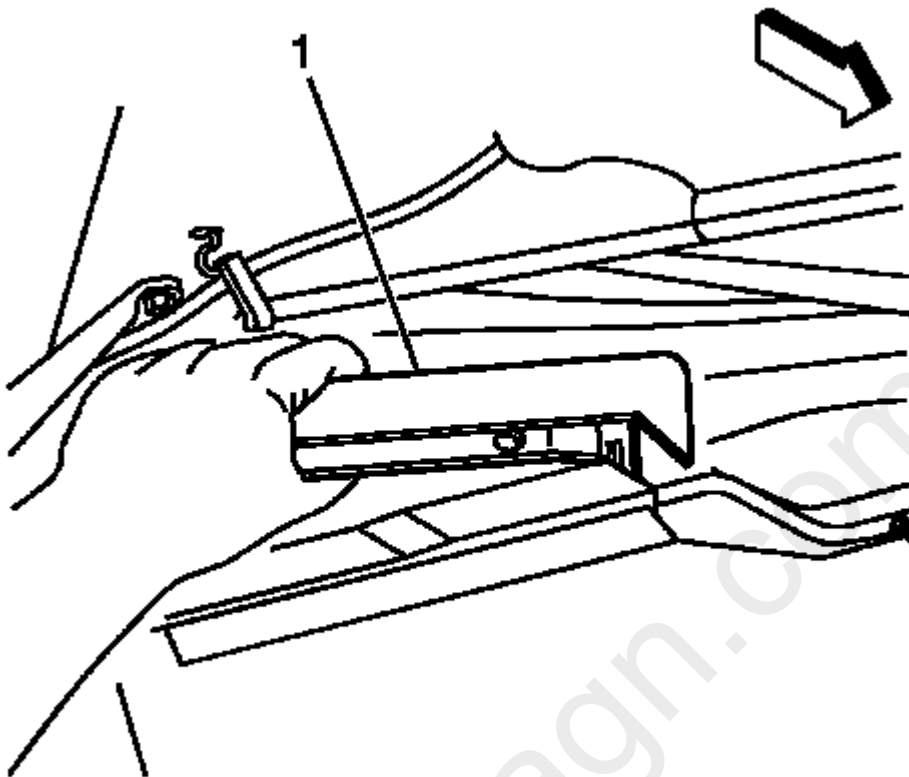


Fig. 128: View Filter Access Cover
Courtesy of GENERAL MOTORS COMPANY

3. Lift up the filter access cover (1).

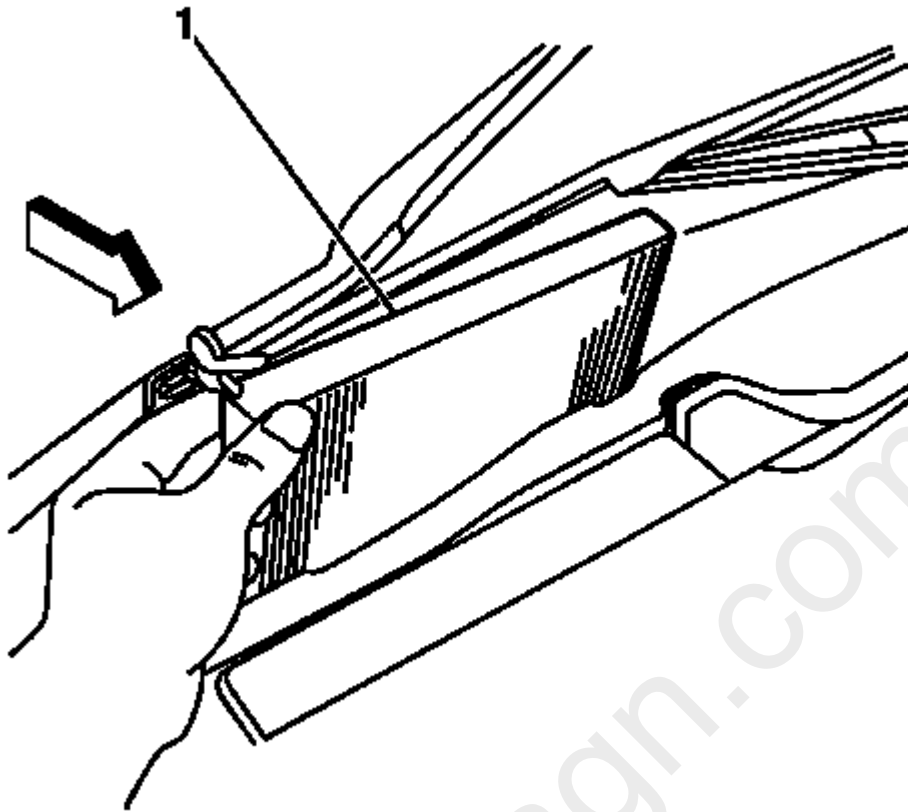


Fig. 129: View Of Filter

Courtesy of GENERAL MOTORS COMPANY

4. Remove the filter (1) from the filter housing.

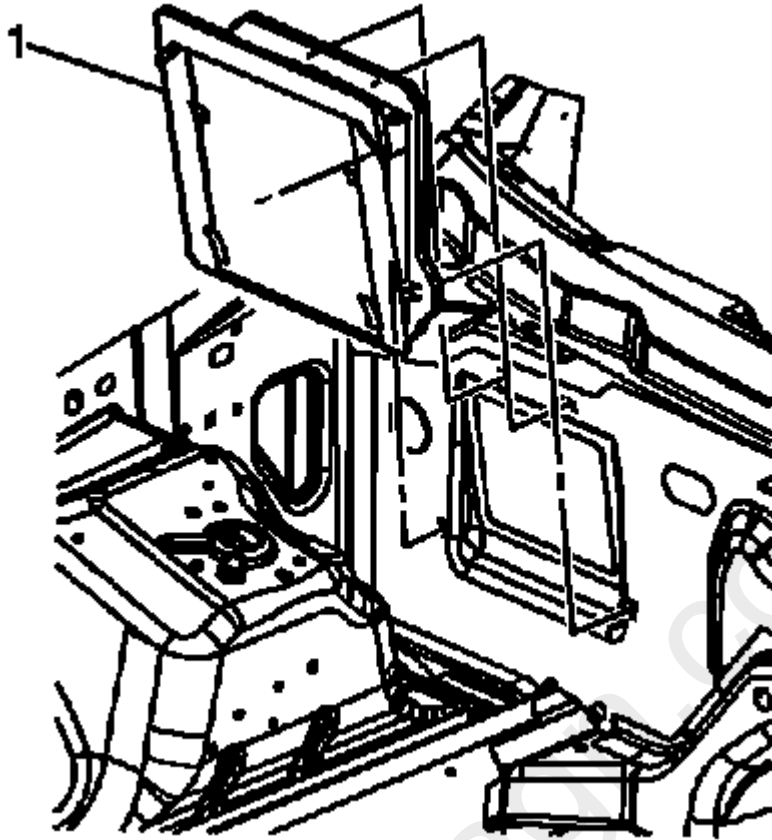


Fig. 130: View Of Passenger Air Filter Housing
Courtesy of GENERAL MOTORS COMPANY

5. Gently pry out on the filter housing to separate the housing from the sheet metal.
6. Remove the passenger air filter housing (1).

Installation Procedure

1. Install the passenger air filter housing (1).
2. Press the passenger air filter housing until all clips engage into the sheet metal.

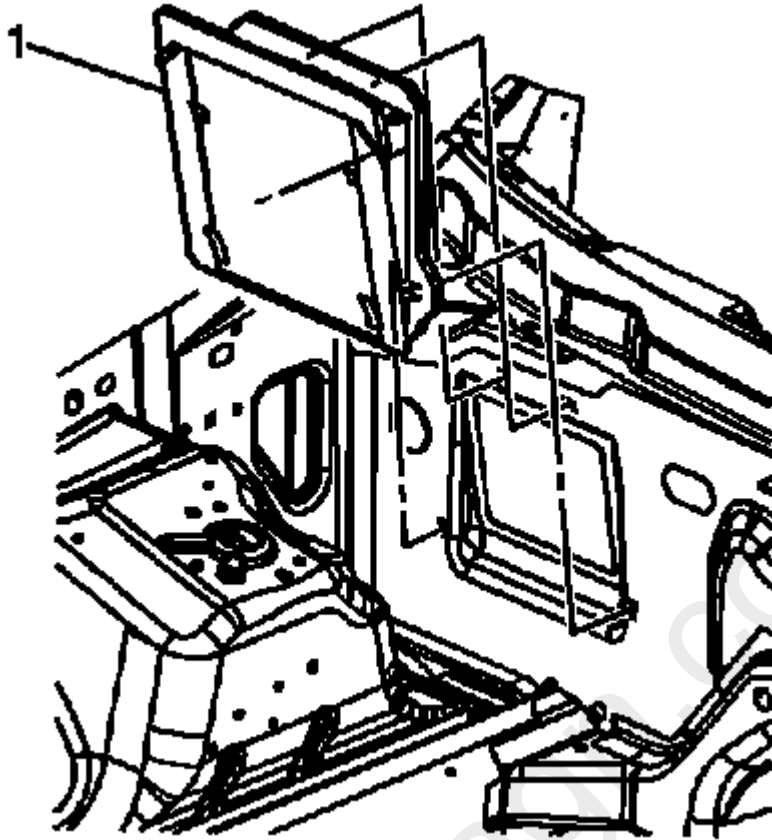


Fig. 131: View Of Passenger Air Filter Housing
Courtesy of GENERAL MOTORS COMPANY

3. Ensure that there is a good seal between the passenger air filter housing and the sheet metal.

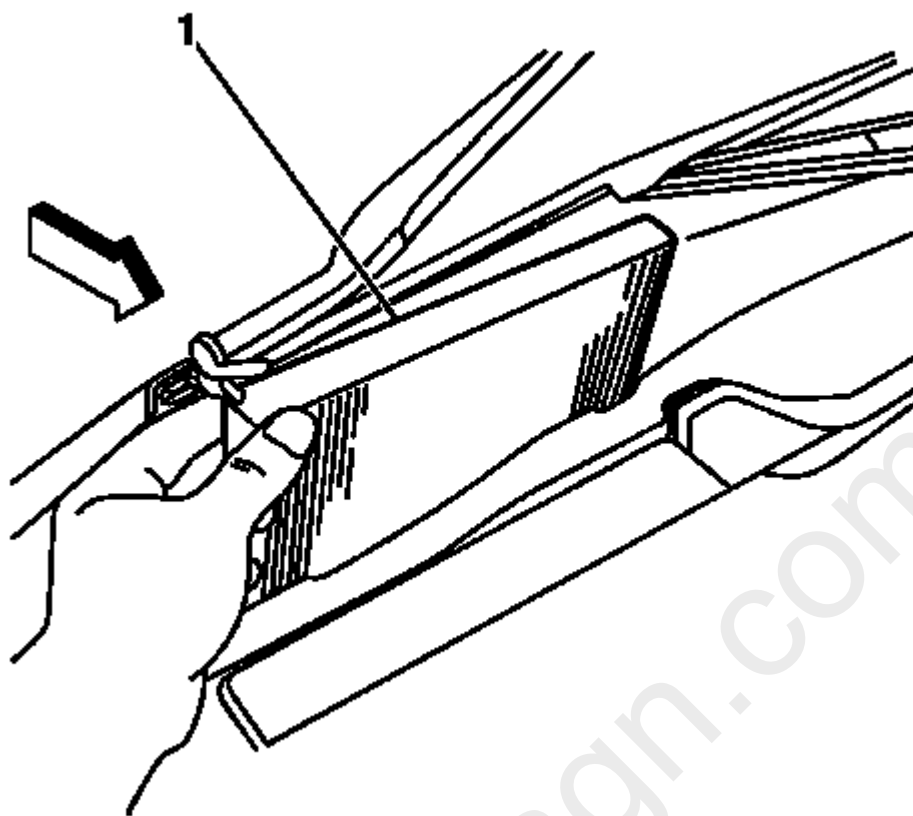


Fig. 132: View Of Filter

Courtesy of GENERAL MOTORS COMPANY

4. Install the filter (1) in to the filter housing.

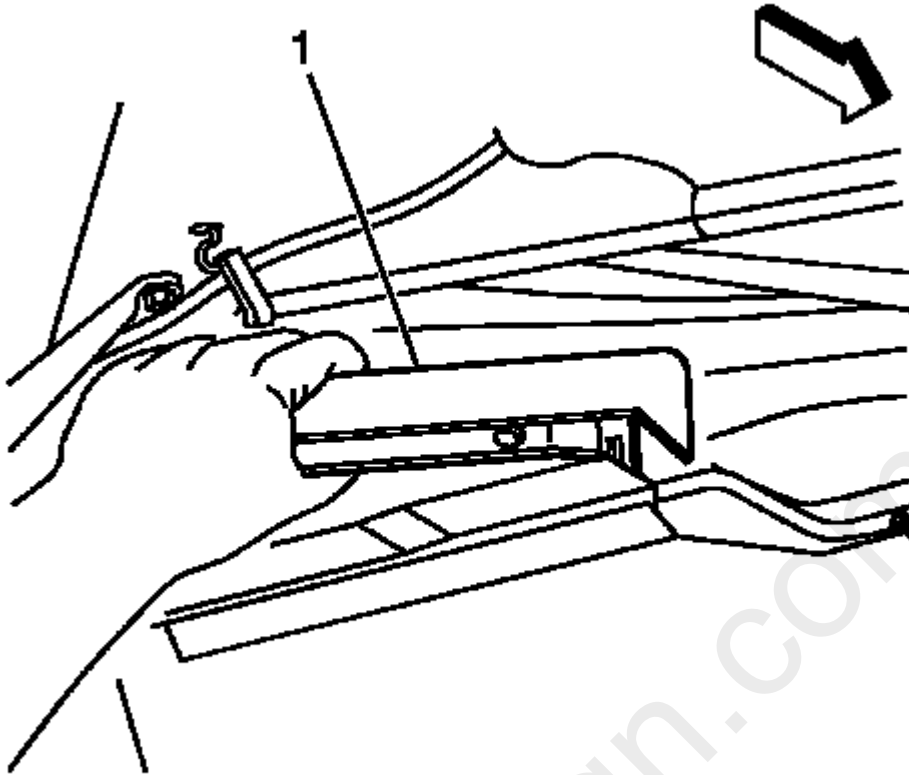


Fig. 133: View Filter Access Cover
Courtesy of GENERAL MOTORS COMPANY

5. Install the filter access cover (1).
6. Install the air inlet grille panel. Refer to **Air Inlet Grille Panel Replacement** .

PASSENGER COMPARTMENT AIR FILTER REPLACEMENT

Removal Procedure

1. Remove the air inlet grille panel. Refer to **Air Inlet Grille Panel Replacement** .
2. With two hands release the tabs on each side of the access cover.

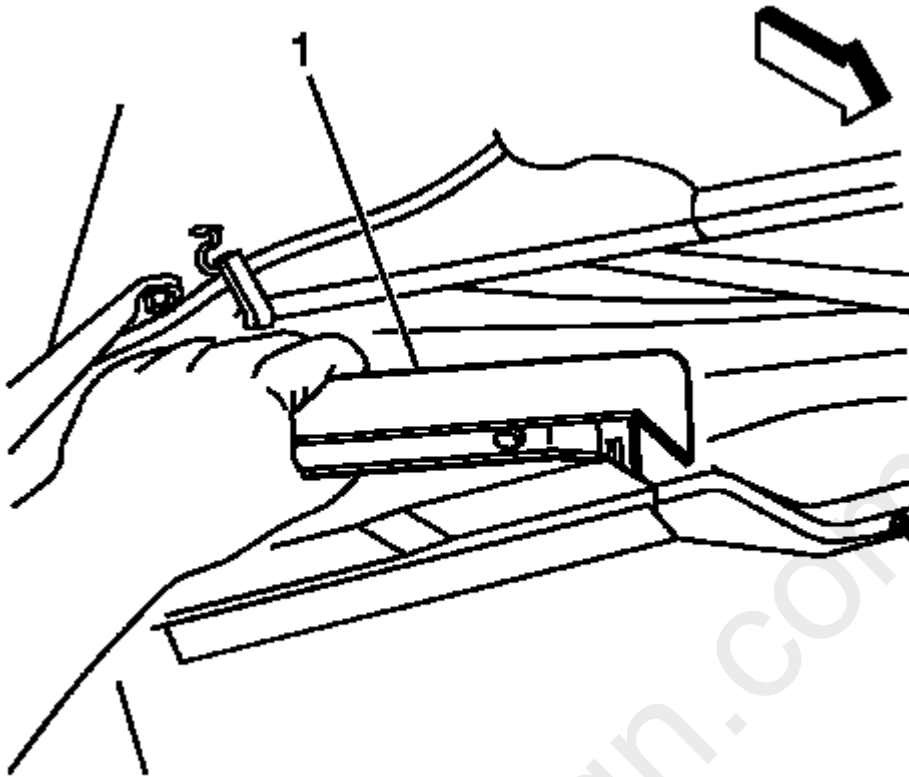


Fig. 134: View Filter Access Cover
Courtesy of GENERAL MOTORS COMPANY

3. Lift up the filter access cover (1).

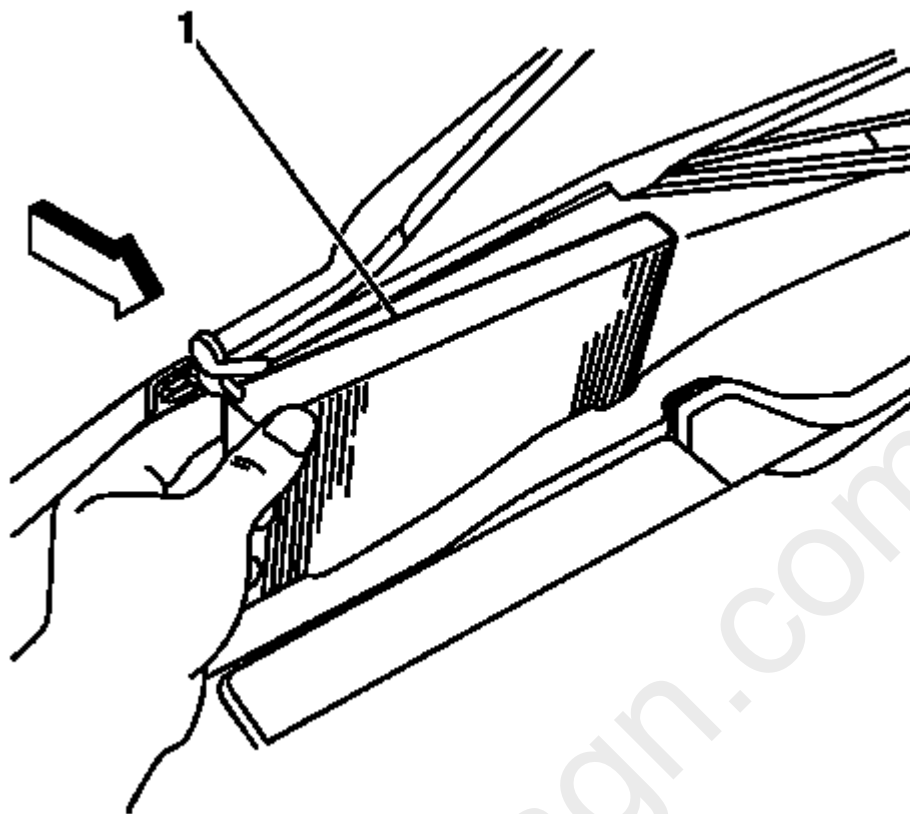


Fig. 135: View Of Filter

Courtesy of GENERAL MOTORS COMPANY

4. Remove the filter (1) from the filter housing.

Installation Procedure

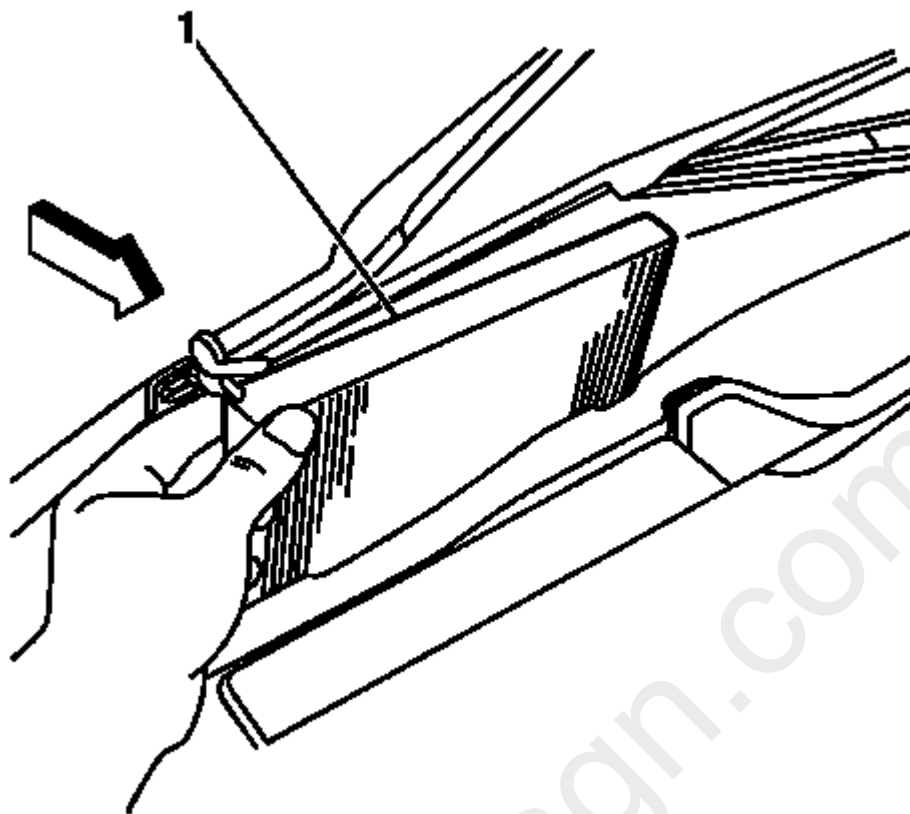


Fig. 136: View Of Filter

Courtesy of GENERAL MOTORS COMPANY

1. Install the filter (1) in to the filter housing.

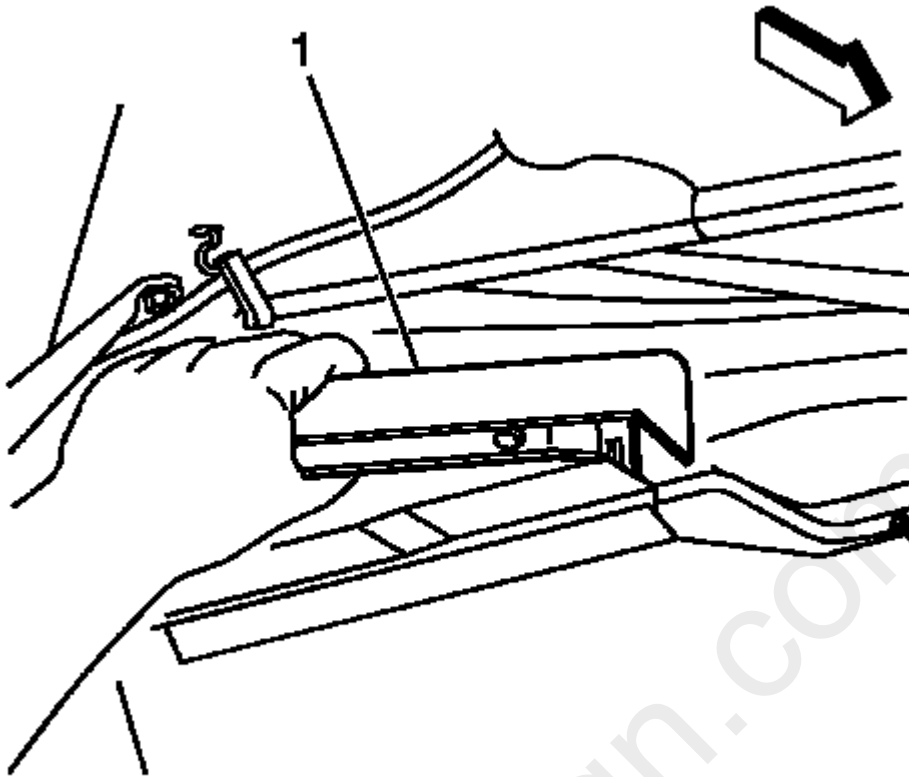


Fig. 137: View Filter Access Cover
Courtesy of GENERAL MOTORS COMPANY

2. Install the filter access cover (1).
3. Install the air inlet grille panel. Refer to **Air Inlet Grille Panel Replacement** .

AIR INLET ASSEMBLY REPLACEMENT (LEFT HAND DRIVE)

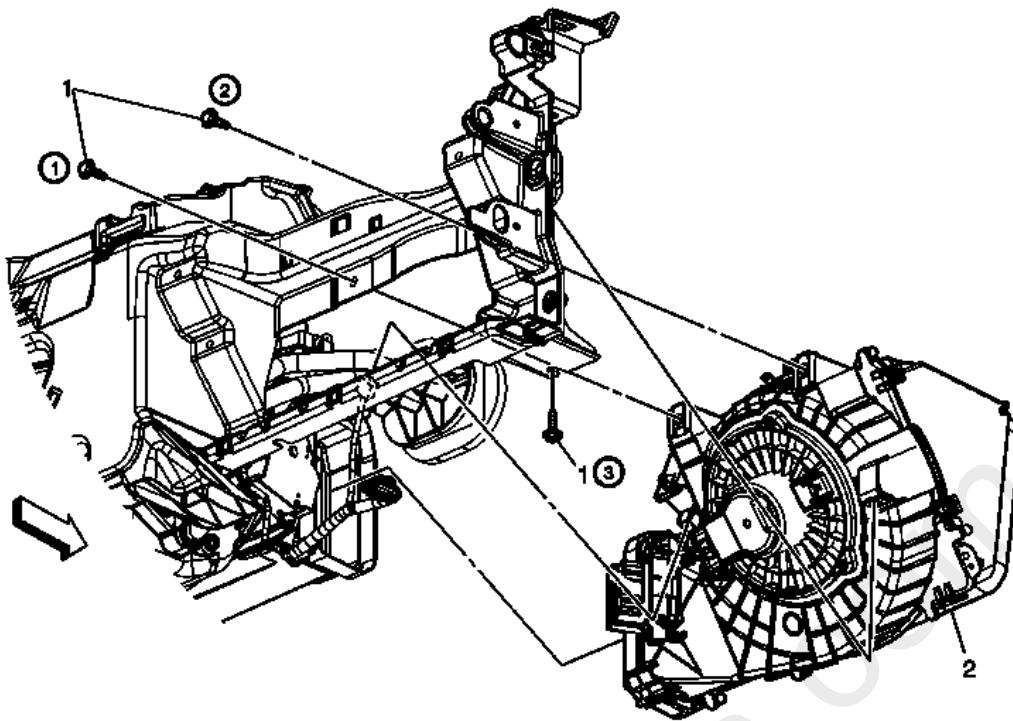


Fig. 138: Air Inlet Assembly Replacement
 Courtesy of GENERAL MOTORS COMPANY

Air Inlet Assembly Replacement (Left Hand Drive)

Callout	Component Name
Preliminary Procedure	
1. Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> . 2. Remove the blower motor. Refer to <u>Blower Motor Replacement (Left Hand Drive)</u> . 3. Remove the blower motor control module. Refer to <u>Blower Motor Control Module Replacement</u> . 4. Disconnect any electrical connectors from the I/P or air inlet assembly.	
1	Air Inlet Assembly Screw (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
	Air Inlet Assembly Procedure

2

1. Disconnect any wiring harness from the instrument panel carrier assembly and position out of the way.
2. Note the routing of wiring harness for proper installation.
3. Mandatory tightening sequence required of air inlet assembly screws per illustration.

AIR INLET ASSEMBLY REPLACEMENT (RIGHT HAND DRIVE)

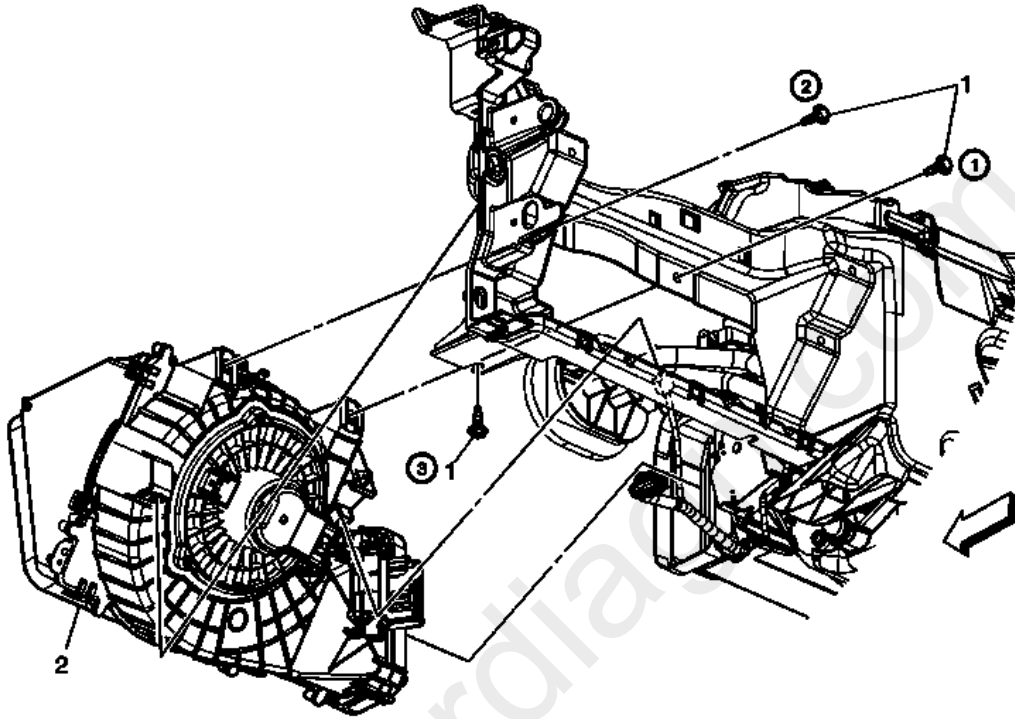


Fig. 139: Identifying Air Inlet Assembly (Right Hand Drive)
Courtesy of GENERAL MOTORS COMPANY

Air Inlet Assembly Replacement (Right Hand Drive)

Callout	Component Name
Preliminary Procedure	
1. Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> . 2. Remove the blower motor. Refer to <u>Blower Motor Replacement (Right Hand Drive)</u>. 3. Remove the blower motor control module. Refer to <u>Blower Motor Control Module Replacement</u>. 4. Disconnect any electrical connectors from the I/P or air inlet assembly.	
	Air Inlet Assembly Screw (Qty: 3)
	CAUTION:

1	Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Air Inlet Assembly. Procedure 1. Disconnect any wiring harness from the instrument panel carrier assembly and position out of the way. 2. Note the routing of wiring harness for proper installation. 3. Mandatory tightening sequence required of air inlet assembly screws per illustration.

BLOWER MOTOR CONTROL MODULE REPLACEMENT

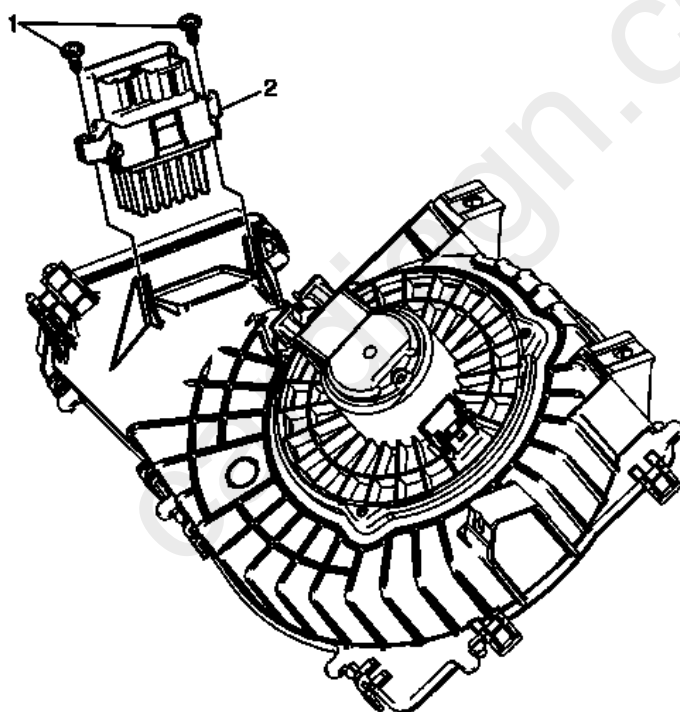


Fig. 140: View Of Blower Motor Control Processor (LHD)
Courtesy of GENERAL MOTORS COMPANY

Blower Motor Control Module Replacement

Callout	Component Name
Preliminary Procedures	
1.	Remove the right sound insulator. Refer to <u>Instrument Panel Insulator Replacement - Right</u>

Side (Left Hand Drive) .

2. Remove the I/P Compartment. Refer to **Instrument Panel Compartment Replacement (Left Hand Drive)** .
3. Remove the electrical connectors from the blower motor control processor.

1	Blower Motor Control Processor Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Blower Motor Control Processor

MODE CONTROL CABLE REPLACEMENT

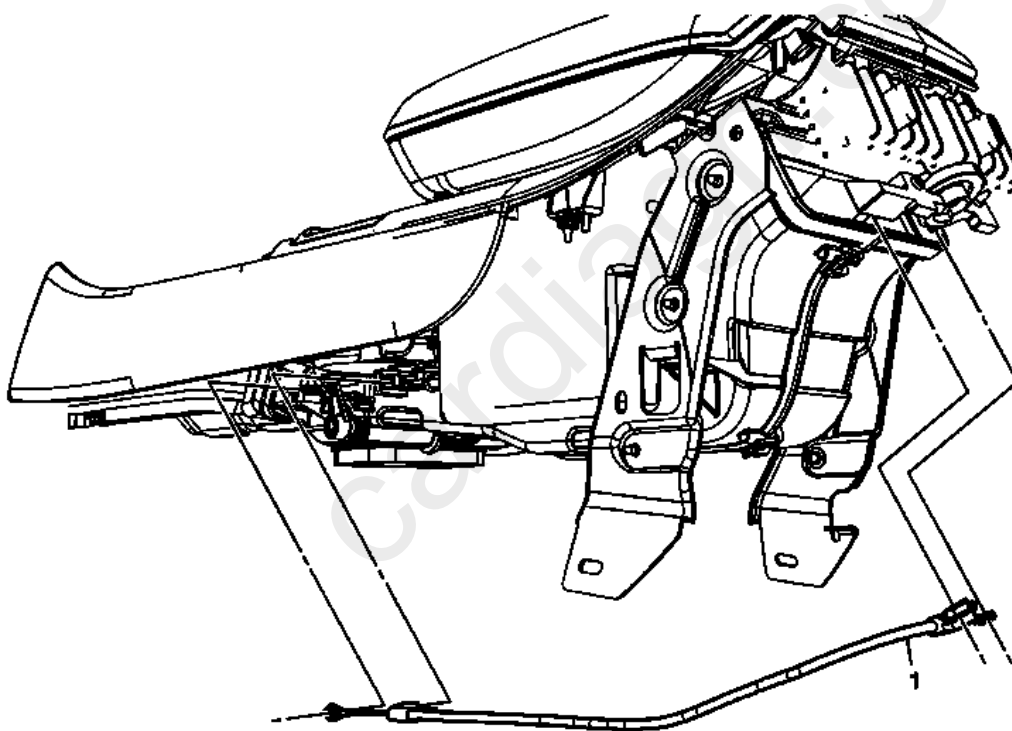


Fig. 141: Mode Control Cable

Courtesy of GENERAL MOTORS COMPANY

Mode Control Cable Replacement

Callout	Component Name
Preliminary Procedure	
1.	Remove the front floor console. Refer to <u>Front Floor Console Replacement (Right Hand</u>

Drive) , Front Floor Console Replacement (Left Hand Drive) .

2. Remove the front floor console rear compartment. Refer to **Front Floor Console Rear Compartment Replacement** .
3. Remove the left front floor console side panel.
4. Disconnect any electrical connectors from the front floor console.

1

Mode Control Cable Assembly.

Procedure

1. Squeeze the retaining tabs to release the mode cable from the mounting points.
2. Note the routing of the mode control cable for proper installation.

BLOWER MOTOR REPLACEMENT (LEFT HAND DRIVE)

Removal Procedure

1. Remove the (I/P) - right side insulator panel. Refer to **Instrument Panel Insulator Replacement - Right Side (Left Hand Drive)** .
2. Remove the I/P compartment. Refer to **Instrument Panel Compartment Replacement (Left Hand Drive)** .
3. Loosen the I/P carrier mounting bolts but do not remove, and reposition the carrier to gain clearance for blower motor removal. Refer to **Instrument Panel Carrier Replacement (Left Hand Drive)** .

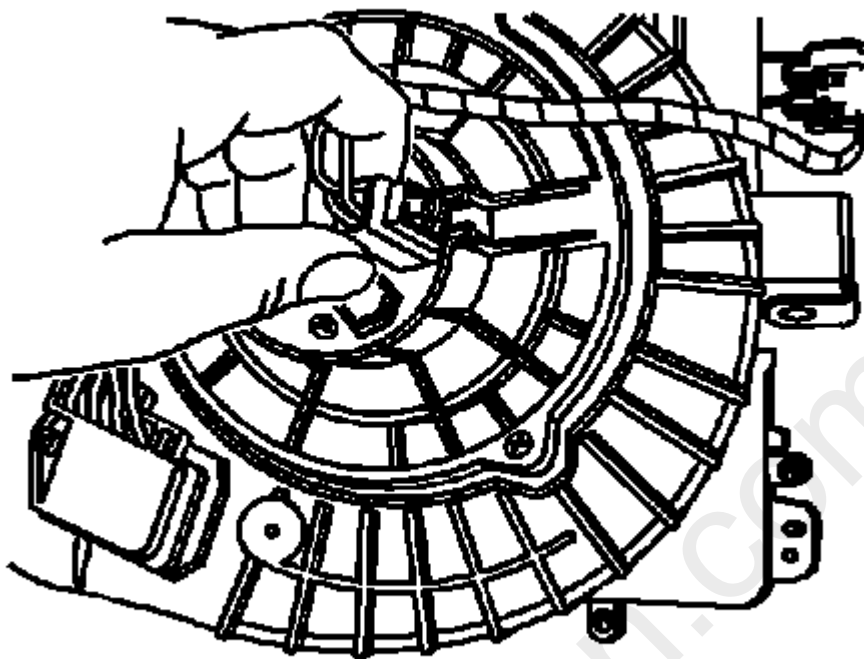


Fig. 142: View Of Blower Motor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the blower motor electrical connector.

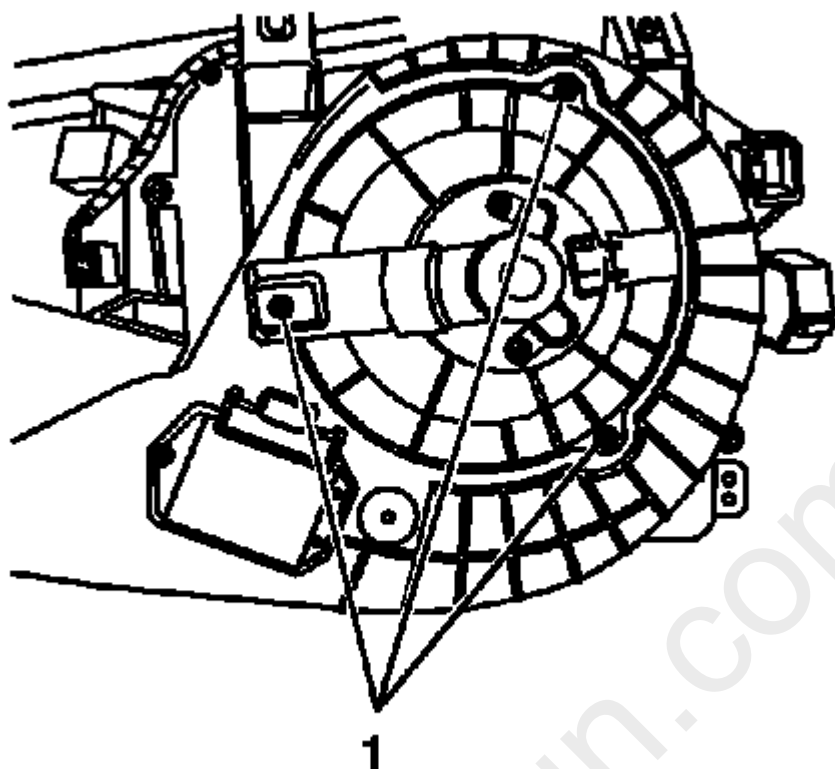


Fig. 143: Locating Blower Motor Retaining Screws
Courtesy of GENERAL MOTORS COMPANY

5. Remove the screws (1) that retain the blower motor.

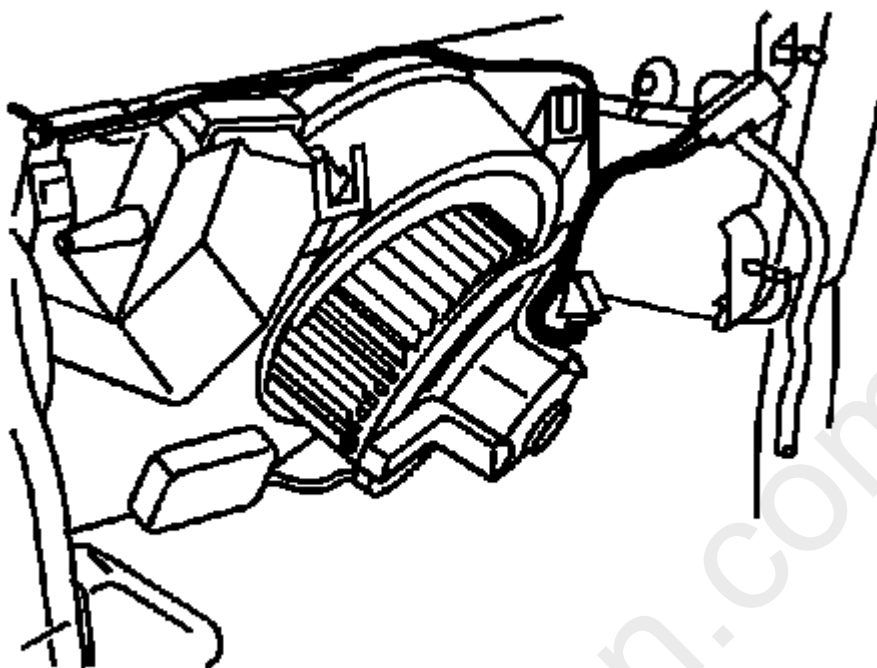


Fig. 144: View Of Blower Motor
Courtesy of GENERAL MOTORS COMPANY

6. Remove the blower motor.

Installation Procedure

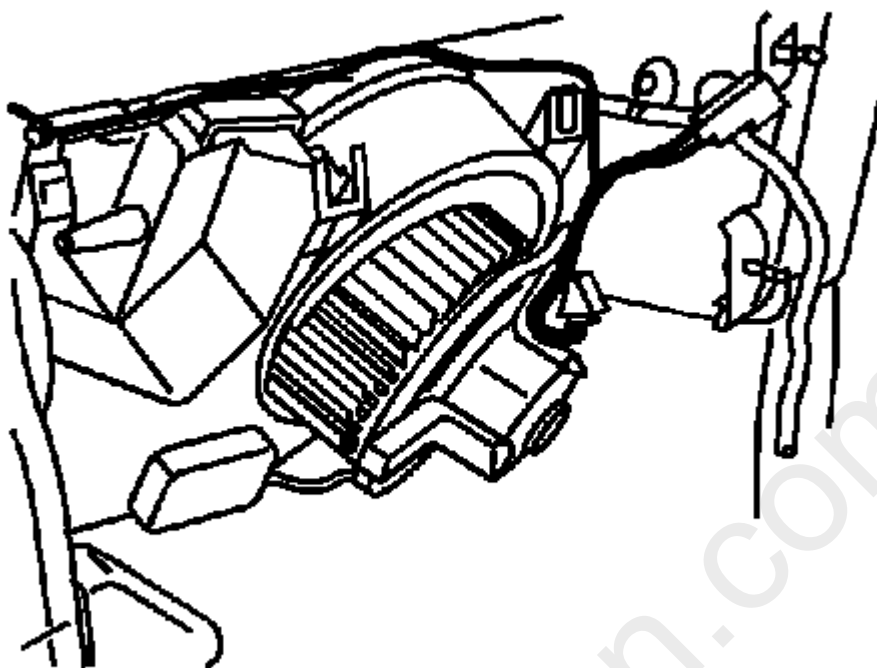


Fig. 145: View Of Blower Motor

Courtesy of GENERAL MOTORS COMPANY

1. Install the blower motor.

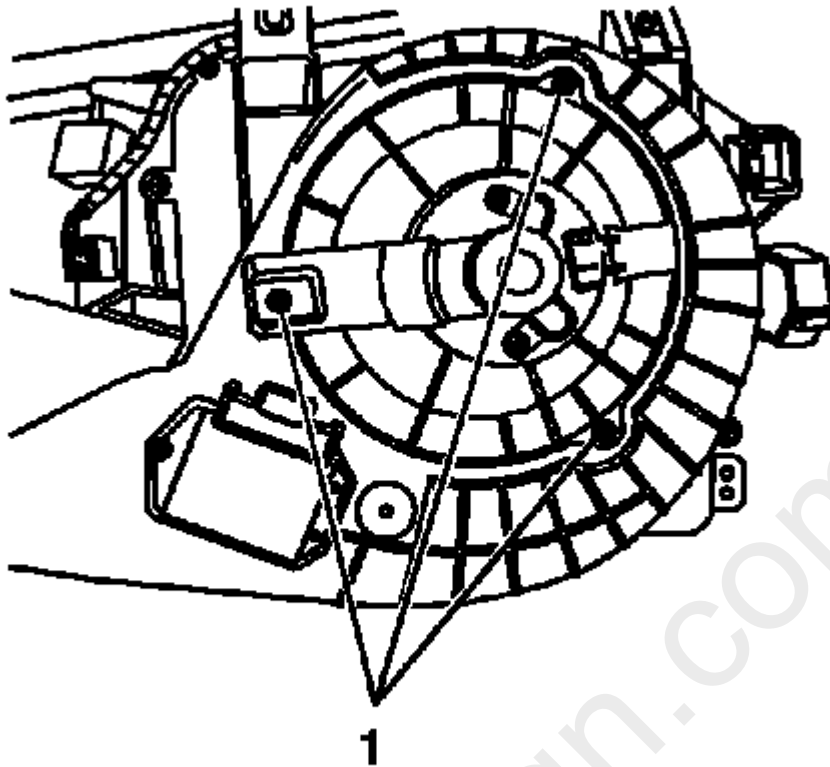


Fig. 146: Locating Blower Motor Retaining Screws
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the blower motor screws (1) and tighten to 1.5 N.m (13 lb in).

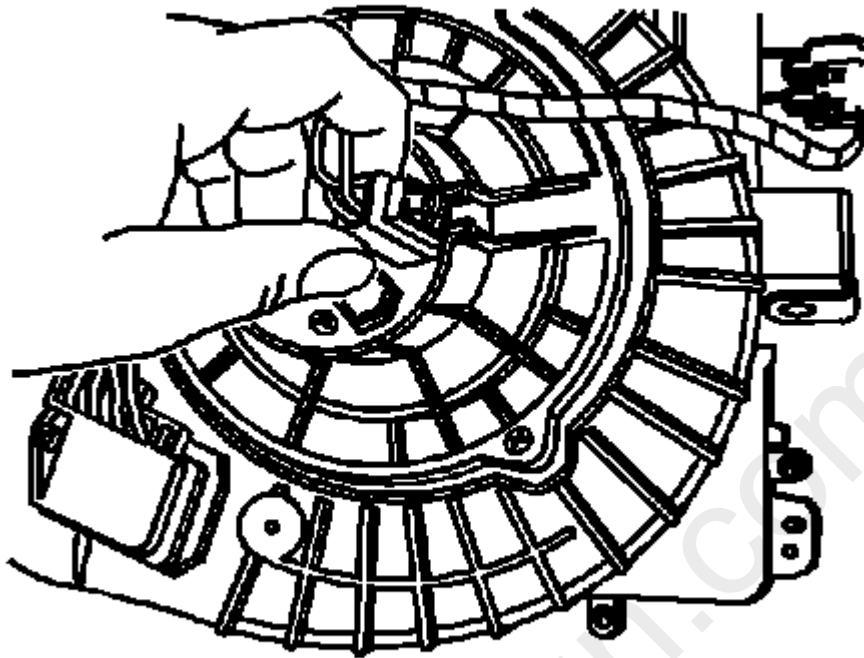


Fig. 147: View Of Blower Motor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

3. Connect the blower motor electrical connector.
4. Install the I/P compartment. Refer to **Instrument Panel Compartment Replacement (Left Hand Drive)** .
5. Install the I/P insulator - right side. Refer to **Instrument Panel Insulator Replacement - Right Side (Left Hand Drive)** .
6. Install the I/P carrier mounting bolts and tighten to 25 N.m (19 lb ft). Refer to **Instrument Panel Carrier Replacement (Left Hand Drive)** .

BLOWER MOTOR REPLACEMENT (RIGHT HAND DRIVE)

Removal Procedure

1. Remove the left insulator panel. Refer to **Instrument Panel Insulator Replacement - Left Side (Right Hand Drive)** .
2. Remove the instrument panel (I/P) compartment. Refer to **Instrument Panel Compartment Replacement (Right Hand Drive)** .
3. Loosen the I/P mounting bolts but do not remove, and reposition the I/P carrier to gain clearance for the blower motor removal. Refer to **Instrument Panel Carrier Replacement (Right Hand Drive)** .

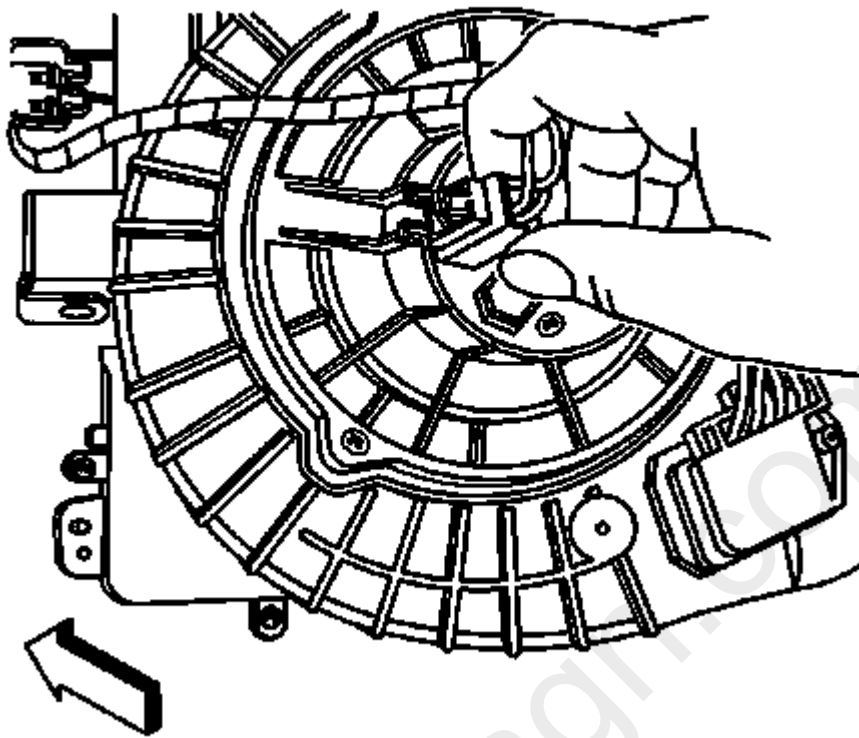


Fig. 148: Identifying Blower Motor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the blower motor electrical connector.

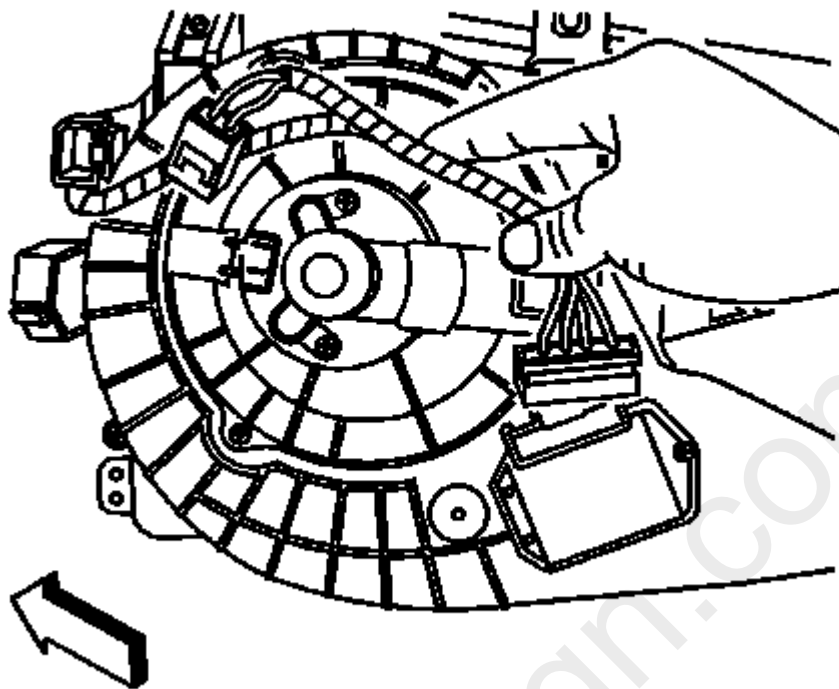


Fig. 149: Identifying Blower Motor Processor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the blower motor processor electrical connector.

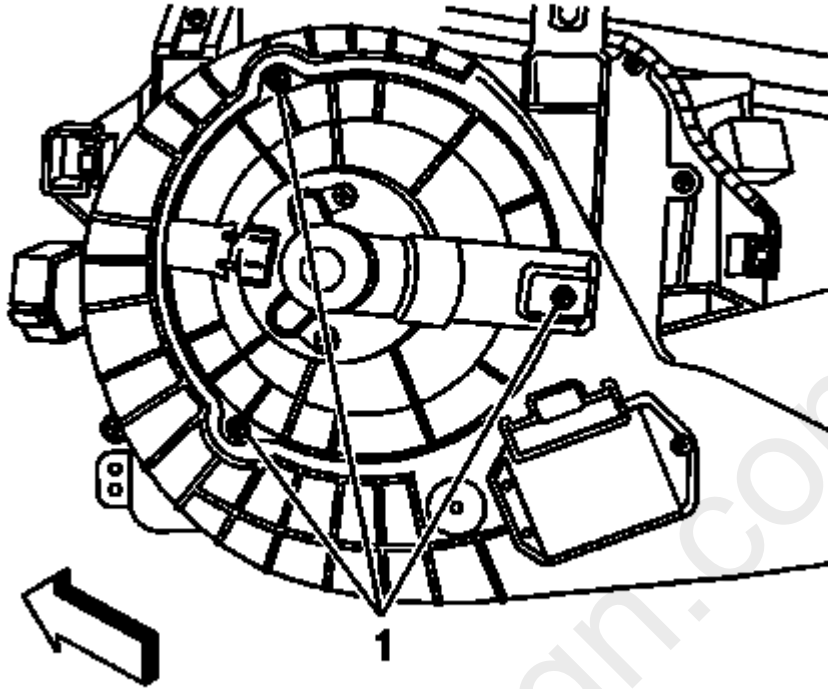


Fig. 150: Identifying Blower Motor Retaining Screws
Courtesy of GENERAL MOTORS COMPANY

6. Remove the screws (1) that retain the blower motor.

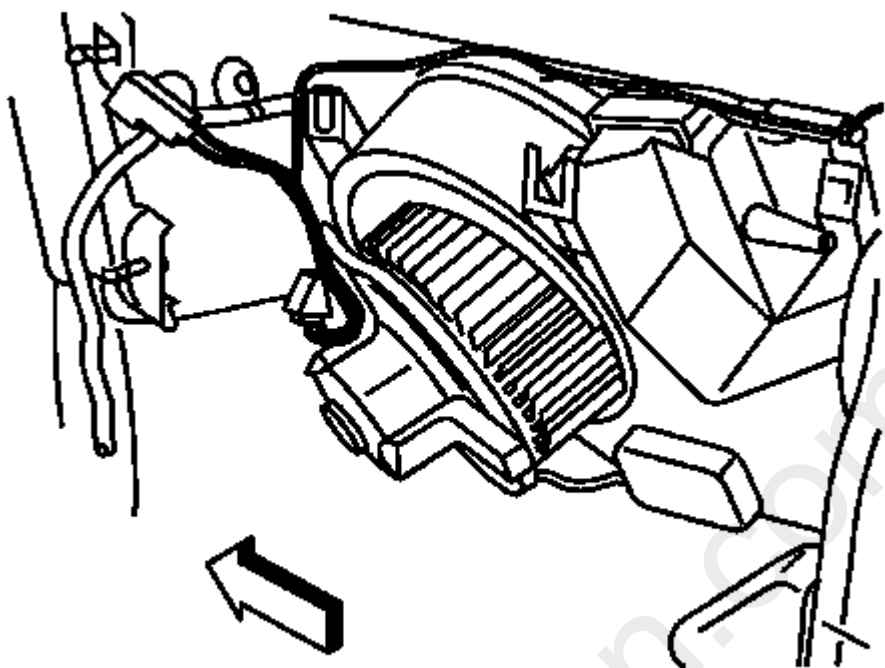


Fig. 151: View Of Blower Motor
Courtesy of GENERAL MOTORS COMPANY

7. Remove the blower motor.

Installation Procedure

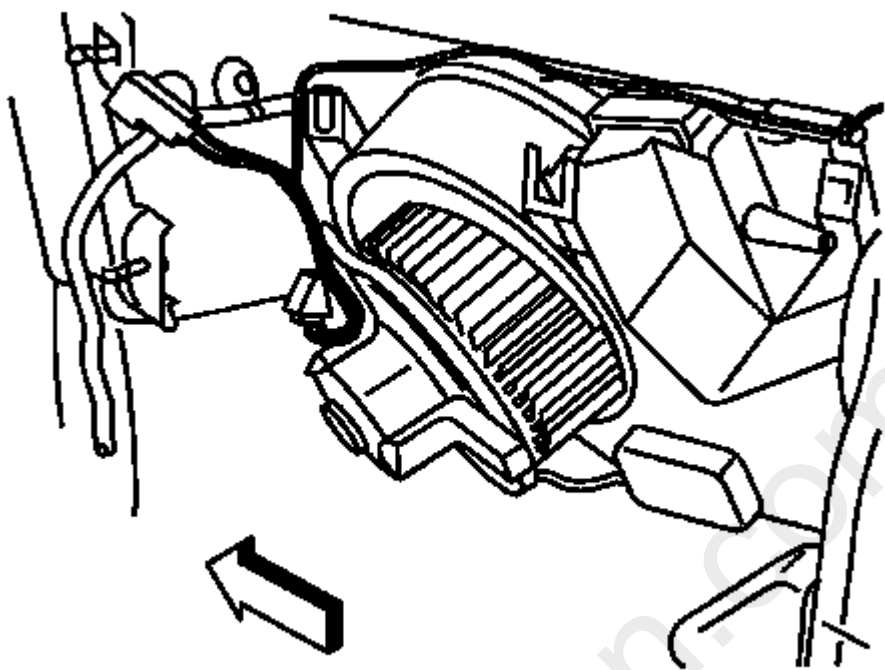


Fig. 152: View Of Blower Motor

Courtesy of GENERAL MOTORS COMPANY

1. Install the blower motor.

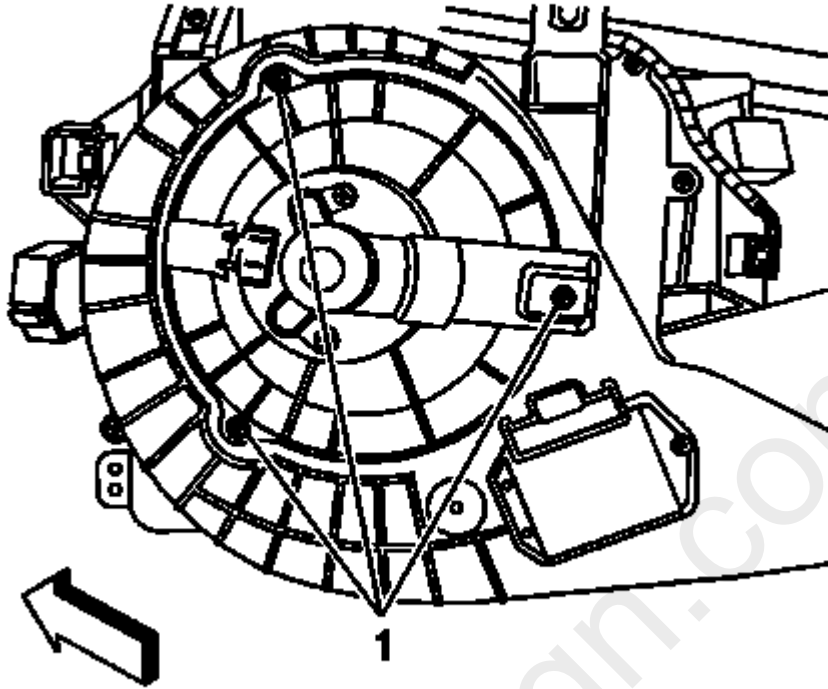


Fig. 153: Identifying Blower Motor Retaining Screws
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the blower motor screws (1) and tighten to 1.5 N.m (13 lb in).

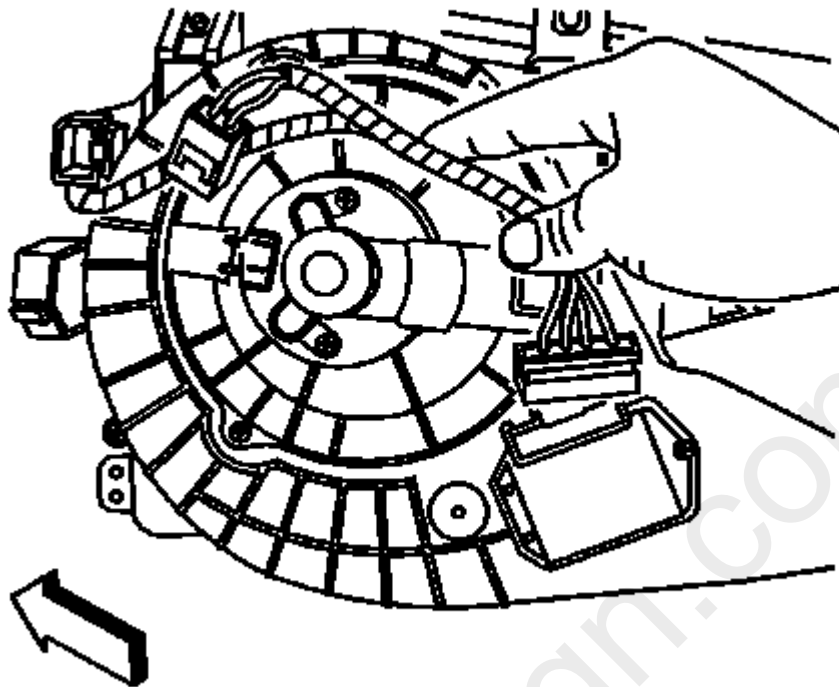


Fig. 154: Identifying Blower Motor Processor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

3. Connect the blower motor processor electrical connector.

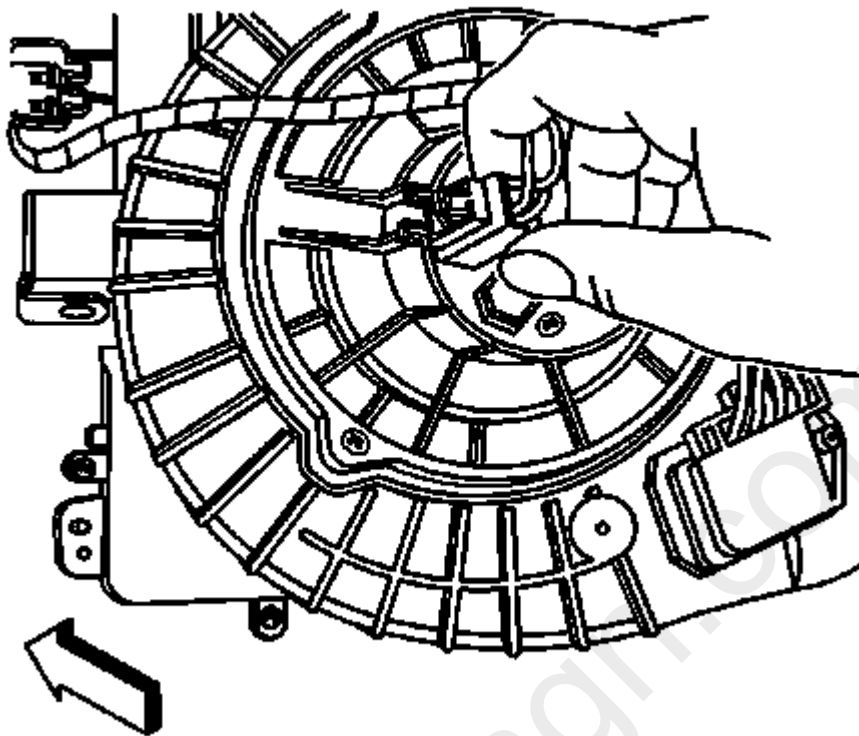


Fig. 155: Identifying Blower Motor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Connect the blower motor electrical connector.
5. Install the I/P compartment. Refer to **Instrument Panel Compartment Replacement (Right Hand Drive)** .
6. Install the left insulator panel. Refer to **Instrument Panel Insulator Replacement - Left Side (Right Hand Drive)** .
7. Install the I/P carrier mounting bolts and tighten to 25 N.m(19 lb ft). Refer to **Instrument Panel Carrier Replacement (Right Hand Drive)**

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - LEFT SIDE

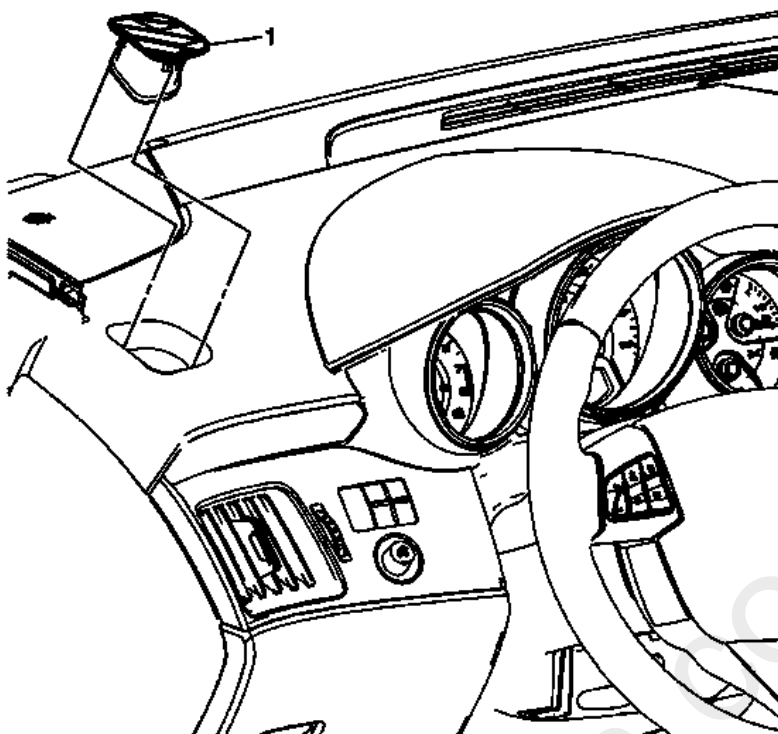


Fig. 156: Side Window Defogger Outlet Grille Replacement - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Grille Replacement - Left Side

Callout	Component Name
1	Side Window Defroster Outlet Grille Assembly Procedure Use a flat bladed plastic trim tool in order to release the grille assembly from the instrument panel.

SIDE WINDOW DEFOGGER OUTLET GRILLE REPLACEMENT - RIGHT SIDE

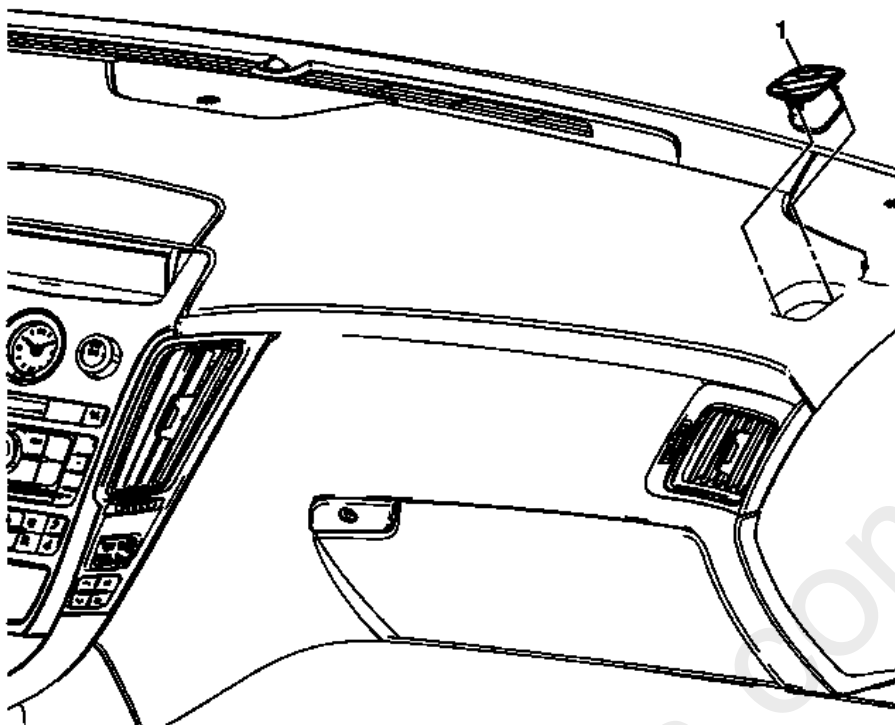


Fig. 157: Side Window Defogger Outlet Grille Replacement - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Grille Replacement - Right Side

Callout	Component Name
1	Side Window Defroster Outlet Grille Assembly Procedure Use a flat bladed plastic trim tool in order to release the grille assembly from the instrument panel.

AIR DISTRIBUTOR CASE REPLACEMENT - LEFT SIDE

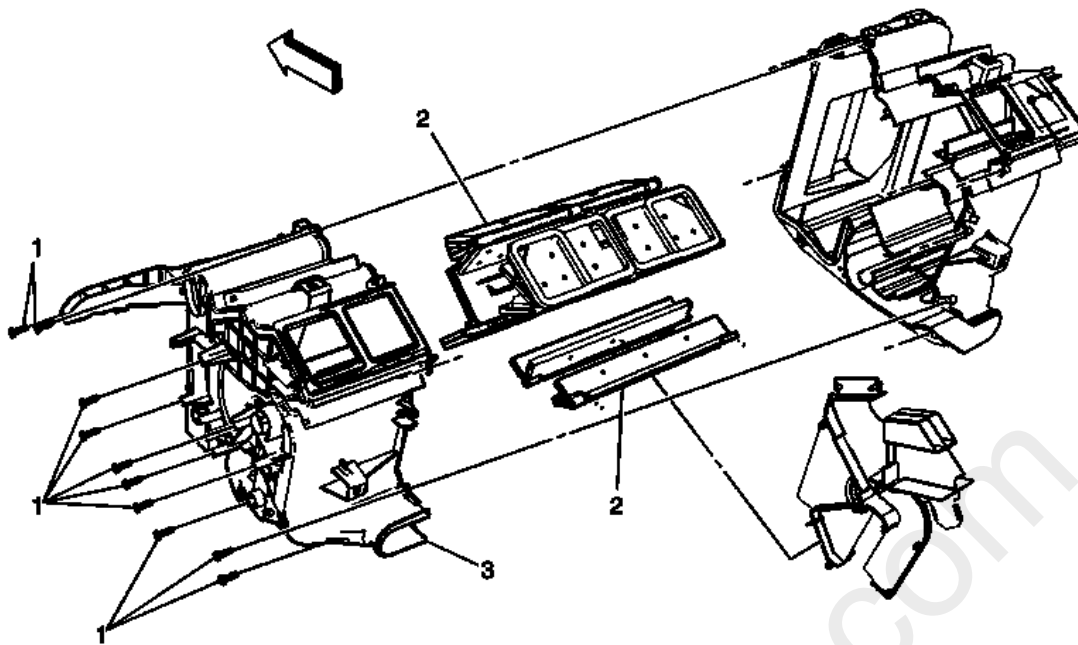


Fig. 158: Air Distributor Case Replacement (Left)
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Case Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Disconnect all the electrical connectors from components associated with the HVAC module. 2. Remove the HVAC module. Refer to <u>Air Conditioning and Heater Module Assembly Removal and Installation</u> 3. Remove any components associated with splitting the air distribution case.	
1	Air Distribution Screw (Qty: 10) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Air Vent Valves
3	Air Distribution Case (Left) Procedure

- Ensure all seals and gaskets are in position upon installation.
- When replacing the air distribution case, transfer all necessary components.

AIR DISTRIBUTOR CASE REPLACEMENT - RIGHT SIDE

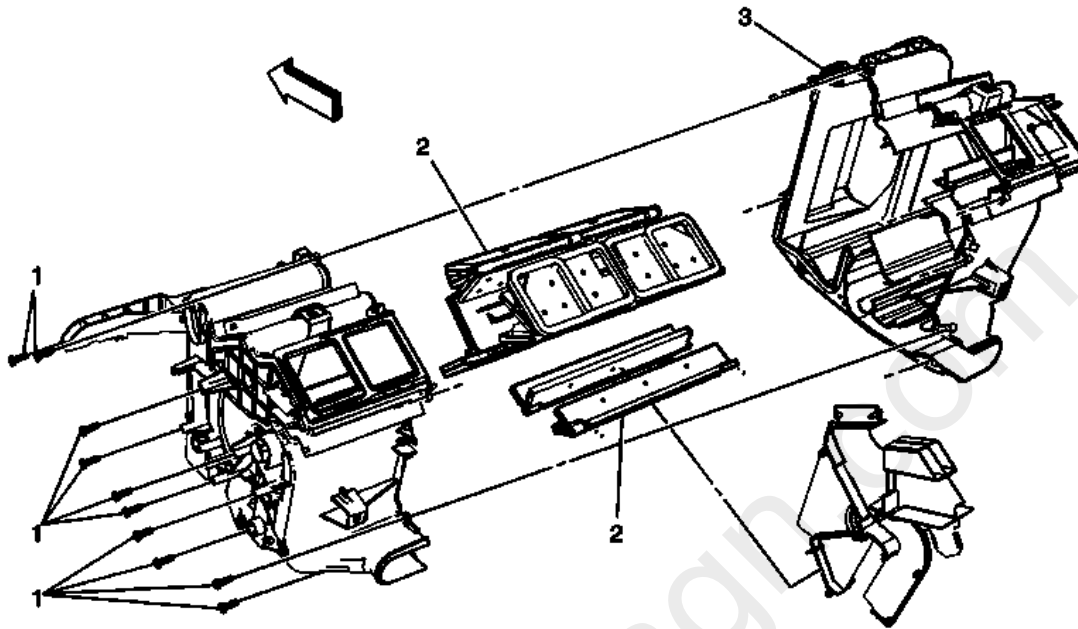


Fig. 159: Air Distributor Case Replacement (Right)
Courtesy of GENERAL MOTORS COMPANY

Air Distributor Case Replacement - Right Side

Callout	Component Name
Preliminary Procedures	
1. Disconnect all the electrical connectors from components associated with the HVAC module. 2. Remove the HVAC module. Refer to <u>Air Conditioning and Heater Module Assembly Removal and Installation</u>. 3. Remove any components associated with splitting the air distribution case.	
1	Air Distribution Screw (Qty: 10) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)

2	Air Vent Valve
3	Air Distribution Case (Right)
	Procedure 1. Ensure all seals and gaskets are in position upon installation. 2. When replacing the air distribution case, transfer all necessary components.

AIR DISTRIBUTOR CASE REPLACEMENT - CENTER

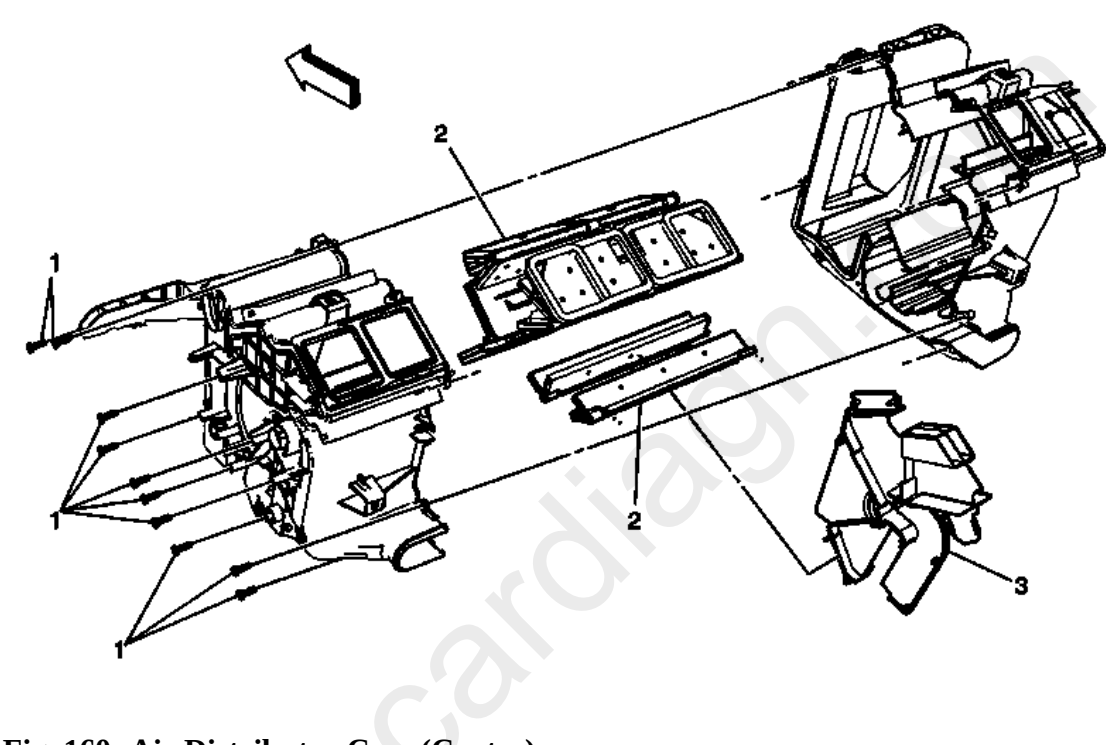


Fig. 160: Air Distributor Case (Center)
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Case Replacement - Center

Callout	Component Name
Preliminary Procedures 1. Disconnect all the electrical connectors from components associated with the HVAC module. 2. Remove the HVAC module. Refer to <u>Air Conditioning and Heater Module Assembly Removal and Installation</u>. 3. Remove the heater core. Refer to <u>Heater Core Replacement</u>.	
	Air Distribution Screw (Qty: 10) CAUTION:

1	Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Air Vent Valve
3	Air Distribution Case (Center) Procedure 1. Ensure all seals and gaskets are in position upon installation. 2. When replacing the air distribution case, transfer all necessary components.

INSTRUMENT PANEL OUTER AIR OUTLET DEFLECTOR REPLACEMENT - LEFT SIDE

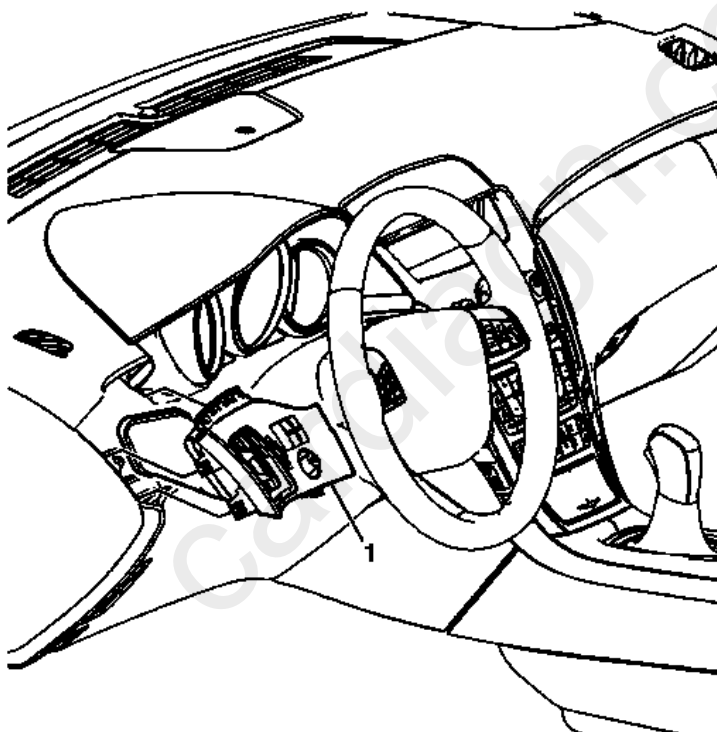


Fig. 161: Instrument Panel Outer Air Outlet Deflector - Left Side
Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Deflector Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Remove the left instrument panel side trim panel. Refer to <u>Instrument Panel Side Trim Panel Replacement</u>	

2. Remove the left instrument panel trim plate applique. Refer to **Instrument Panel Trim Plate Applique Replacement - Left Side (Right Hand Drive)** , **Instrument Panel Trim Plate Applique Replacement - Left Side (Left Hand Drive)** .

1	Instrument Panel Outer Air Outlet Deflector Assembly Procedure 1. Use a flat bladed plastic trim tool in order to release the retainer clips securing the deflector assembly to the instrument panel. 2. Pull the deflector assembly straight outward toward the rear of the vehicle. 3. Disconnect the electrical connections. 4. When replacing the instrument panel outer air outlet deflector, transfer all necessary components.
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INSTRUMENT PANEL CENTER AIR OUTLET DEFLECTOR REPLACEMENT

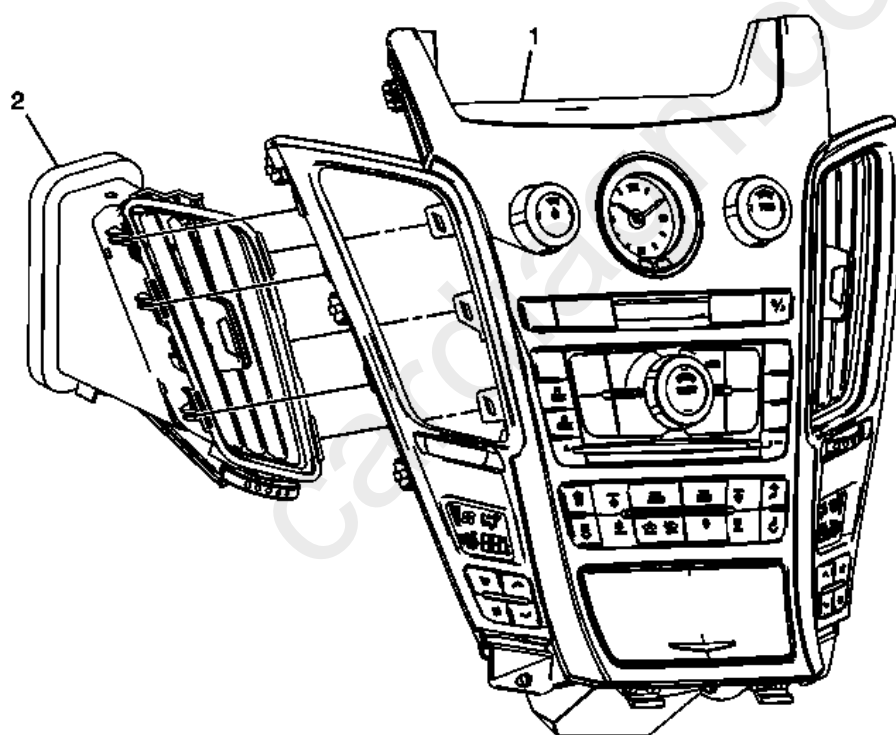


Fig. 162: Instrument Panel Center Air Outlet Deflector
 Courtesy of GENERAL MOTORS COMPANY

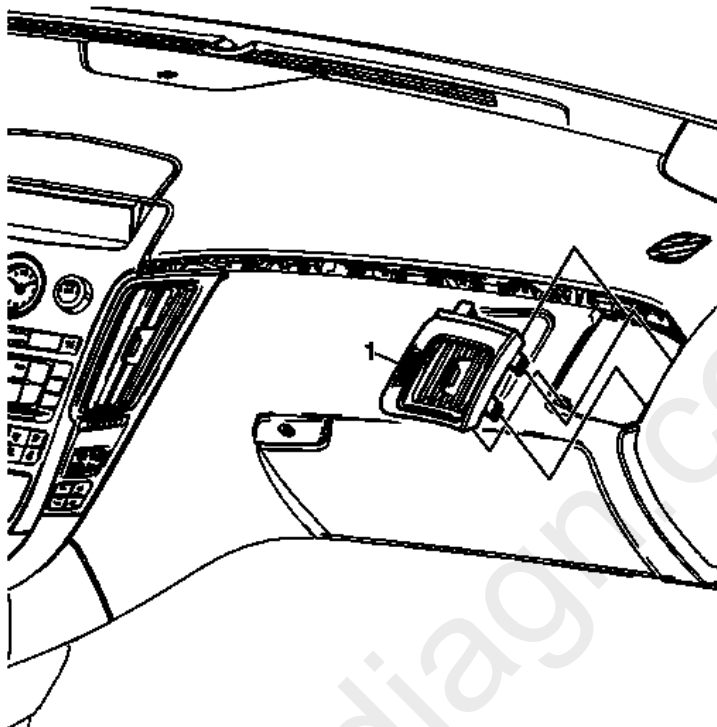
Instrument Panel Center Air Outlet Deflector Replacement

Callout	Component Name
1	AM/FM Stereo, Clock, and CD Player Radio Control Refer to <u>Radio Control Assembly Replacement (with Navigation Display)</u> , <u>Radio Control Assembly Replacement (without Navigation Display)</u> .

2

Instrument Panel Center Air Outlet Deflector Assembly**Procedure**

Unsnap the deflector assembly from the AM/FM stereo, clock, and CD player radio control.

INSTRUMENT PANEL OUTER AIR OUTLET DEFLECTOR REPLACEMENT - RIGHT SIDE**Fig. 163: Instrument Panel Outer Air Outlet Deflector - Right Side**

Courtesy of GENERAL MOTORS COMPANY

Instrument Panel Outer Air Outlet Deflector Replacement - Right Side

Callout	Component Name
Preliminary Procedures	
1. Remove the right instrument panel trim plate applique. Refer to <u>Instrument Panel Trim Plate Applique Replacement - Right Side (Left Hand Drive)</u> , <u>Instrument Panel Trim Plate Applique Replacement - Right Side (Right Hand Drive)</u> . 2. Unsnap the instrument panel flood lamp from the instrument panel assembly and position out of the way.	
1	Instrument Panel Outer Air Outlet Deflector Assembly Procedure Use a flat-bladed plastic trim tool in order to release the retainer clips securing the deflector assembly to the instrument panel.

FLOOR FRONT AIR OUTLET DUCT REPLACEMENT

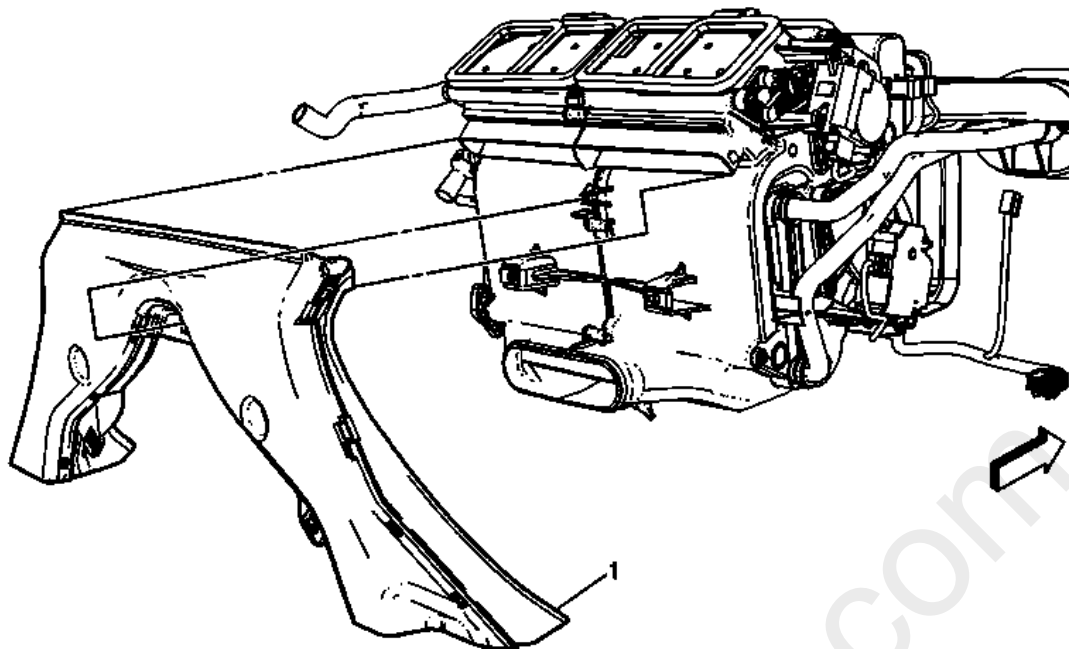


Fig. 164: Floor Front Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

Floor Front Air Outlet Duct Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the I/P carrier. Refer to <u>Instrument Panel Carrier Replacement (Left Hand Drive)</u> , <u>Instrument Panel Carrier Replacement (Right Hand Drive)</u> . 2. Disconnect any electrical connectors from the Instrument Panel.	
1	Front Floor Air Outlet. Procedure 1. Squeeze the retaining tabs to release the air outlet from the HVAC module. 2. Note the routing of any wiring harnesses for proper installation.

FRONT FLOOR CONSOLE FRONT AIR DUCT REPLACEMENT

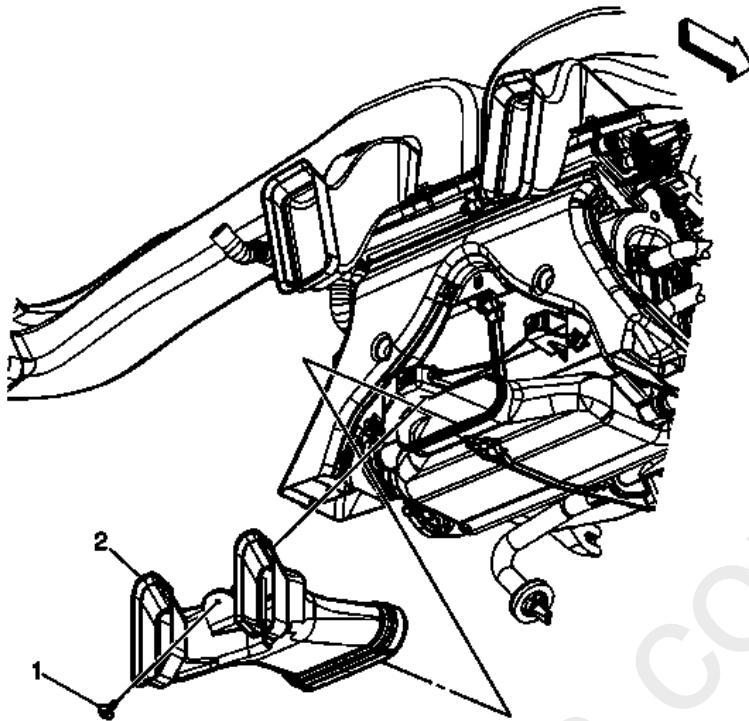


Fig. 165: Front Floor Console Front Air Duct
 Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Front Air Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the front floor console. Refer to Front Floor Console Replacement (Right Hand Drive) , Front Floor Console Replacement (Left Hand Drive) .	
1	Front Floor Console Front Air Duct Screw CAUTION: Refer to Fastener Caution . Tighten 2 N.m (18 lb in)
2	Front Floor Console Front Air Duct Procedure Push firmly and listen for audible click upon installation to the HVAC module.

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT (FRONT)

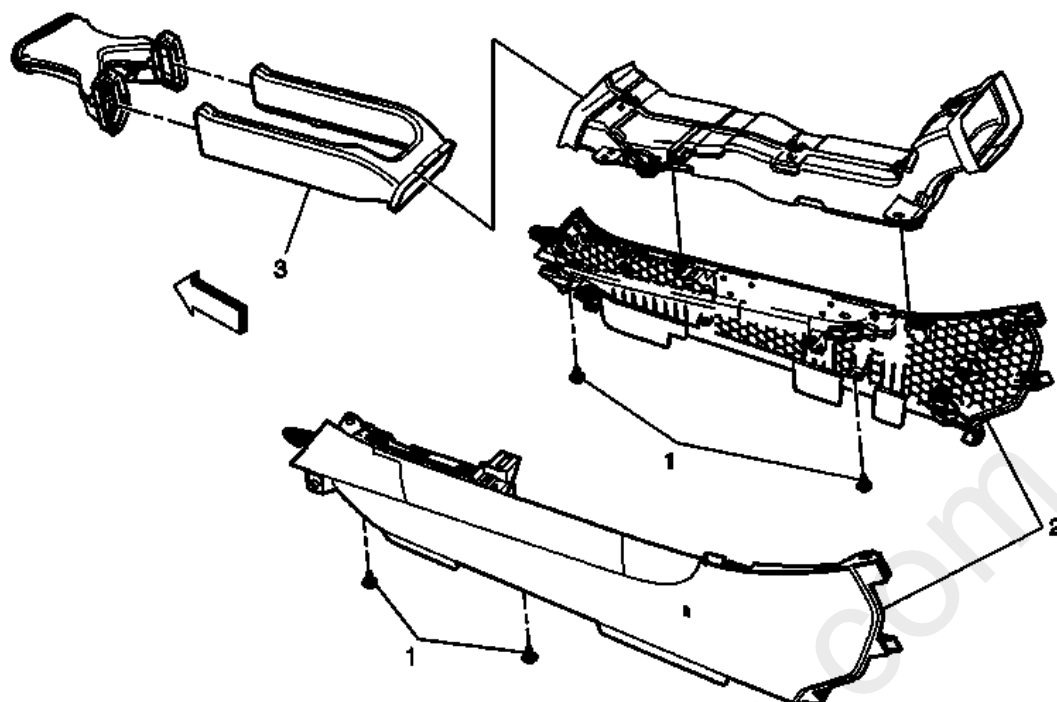


Fig. 166: Identifying Front Floor Console Rear Air Duct (Front)

Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Rear Air Duct Replacement (Front)

Callout	Component Name
Preliminary Procedure Remove the front floor console. Refer to Front Floor Console Replacement (Right Hand Drive) , Front Floor Console Replacement (Left Hand Drive) .	
1	Front Floor Console Rear Air Duct and Side Panel Screw (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 4 N.m (35 lb in)
2	Front Floor Console Side Panel Procedure Separate Side Panels from rear duct.
3	Front Floor Console Rear Air Duct (Front) Procedure 1. Disconnect any wiring harness from the console assembly or ducts and position out of the way.

2. When replacing the air duct, transfer all necessary components.

FRONT FLOOR CONSOLE REAR AIR DUCT REPLACEMENT (REAR)

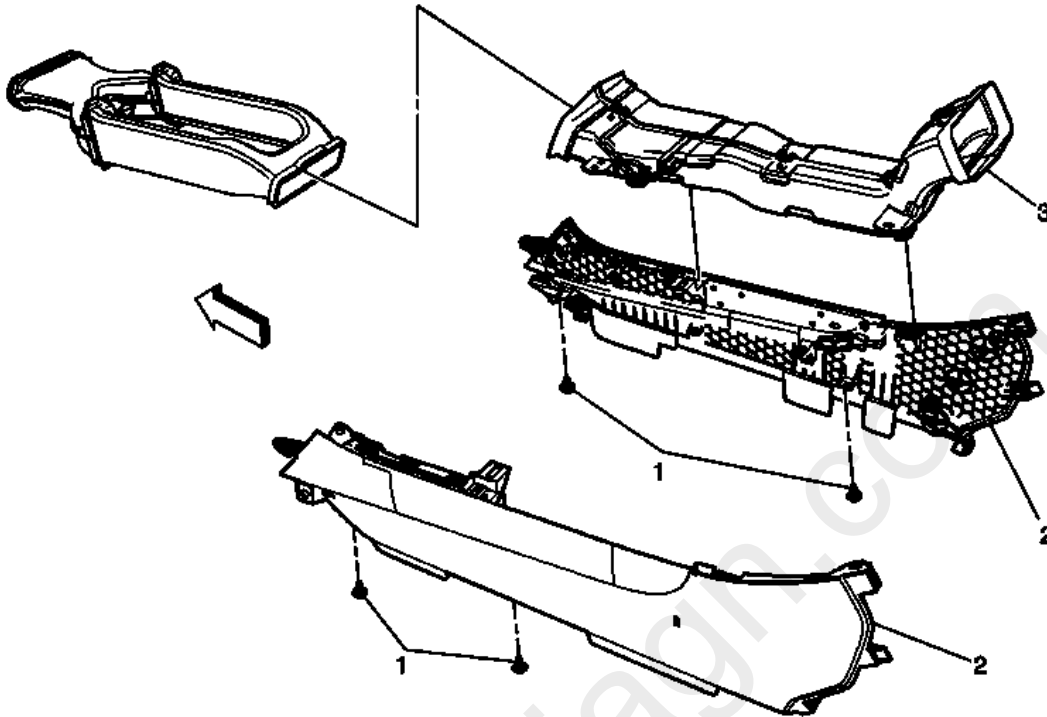


Fig. 167: Identifying Front Floor Console Rear Air Duct (Rear)

Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Rear Air Duct Replacement (Rear)

Callout	Component Name
Preliminary Procedure Remove the front floor console. Refer to <u>Front Floor Console Replacement (Right Hand Drive)</u> , <u>Front Floor Console Replacement (Left Hand Drive)</u> .	
1	Front Floor Console Rear Air Duct and Side Panel Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 4 N.m (35 lb in)
2	Front Floor Console Side Panel Procedure Separate Side Panels from rear duct.
	Front Floor Console Rear Air Duct (Rear)

3	Procedure 1. Disconnect any wiring harness from the console assembly or ducts and position out of the way. 2. When replacing the air duct, transfer all necessary components.
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FRONT FLOOR CONSOLE REAR AIR VALVE LEVER REPLACEMENT

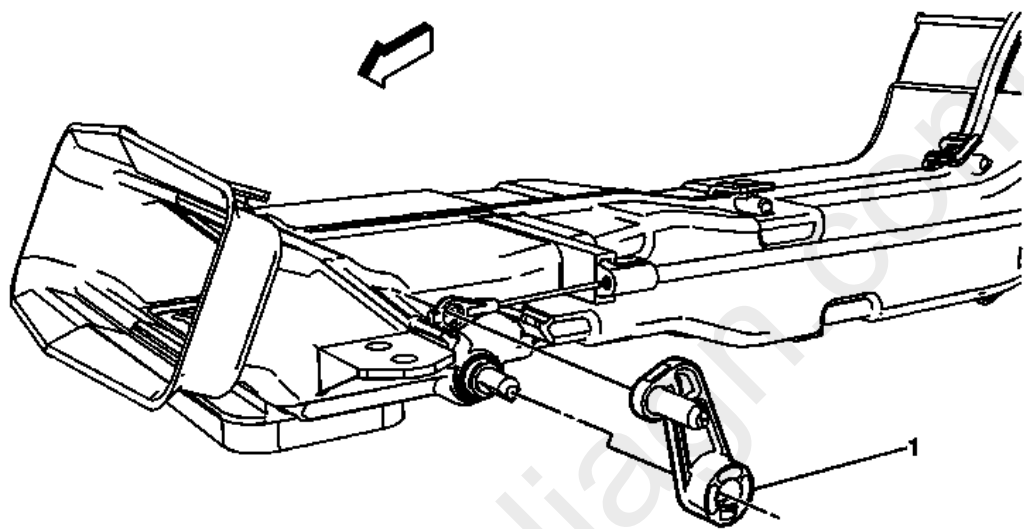


Fig. 168: Identifying Front Floor Console Rear Air Valve Lever
Courtesy of GENERAL MOTORS COMPANY

Front Floor Console Rear Air Valve Lever Replacement

Callout	Component Name
Preliminary Procedure Remove the front floor console rear air duct. Refer to Front Floor Console Rear Air Duct Replacement (Front) , Front Floor Console Rear Air Duct Replacement (Rear) .	
1	Front Floor Console Rear Air Valve Lever Procedure Pinch attachment tabs on both the cable and air valve to release air valve lever.

AUXILIARY FLOOR AIR OUTLET REPLACEMENT

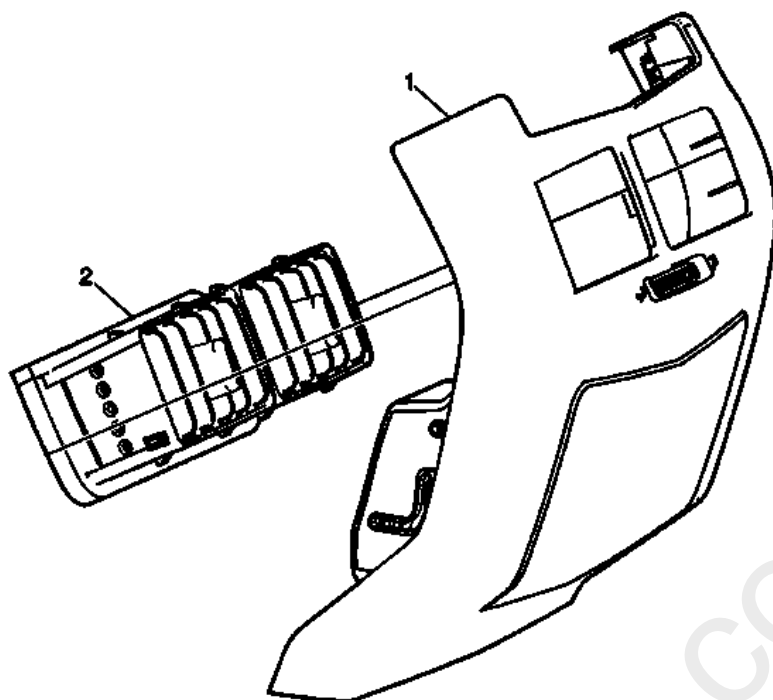


Fig. 169: Identifying Auxiliary Floor Air Outlet
 Courtesy of GENERAL MOTORS COMPANY

Auxiliary Floor Air Outlet Replacement

Callout	Component Name
1	Front Floor Console Rear Cover Refer to <u>Front Floor Console Rear Cover Replacement</u>
2	Auxiliary Floor Air Outlet Assembly Procedure Unsnap the auxiliary floor air outlet assembly from the front floor console rear cover assembly.

DEFROSTER VALVE REPLACEMENT

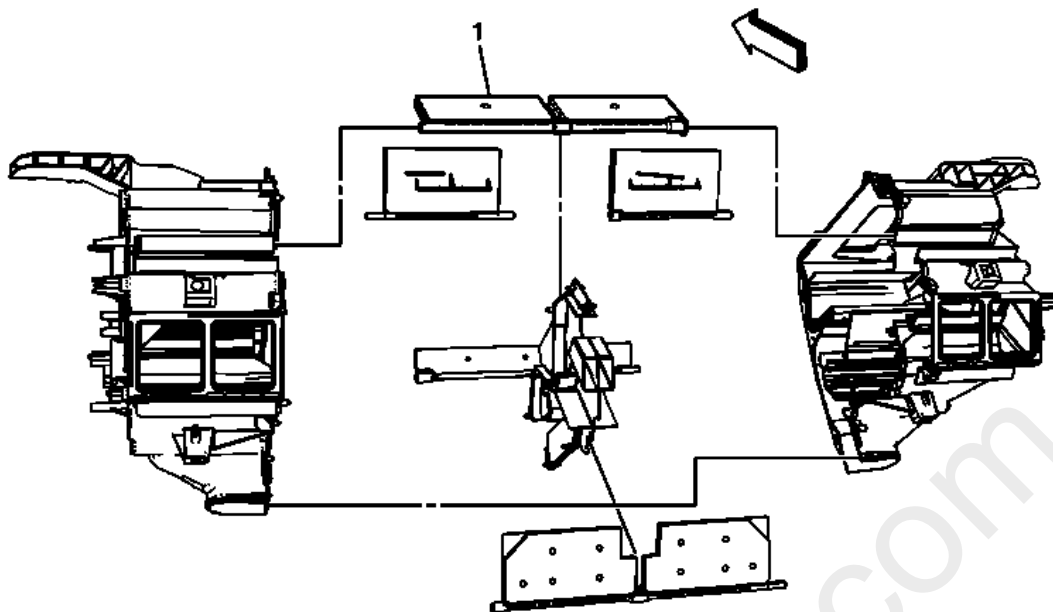


Fig. 170: Defroster Valve
 Courtesy of GENERAL MOTORS COMPANY

Defroster Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the air distribution case. Refer to <u>Air Distributor Case Replacement - Right Side.</u> 2. Disconnect all the electrical connectors from components associated with the HVAC module. 3. Remove any components associated with splitting the air distribution case.	
1	Defroster Valve

WINDSHIELD DEFROSTER NOZZLE DUCT REPLACEMENT

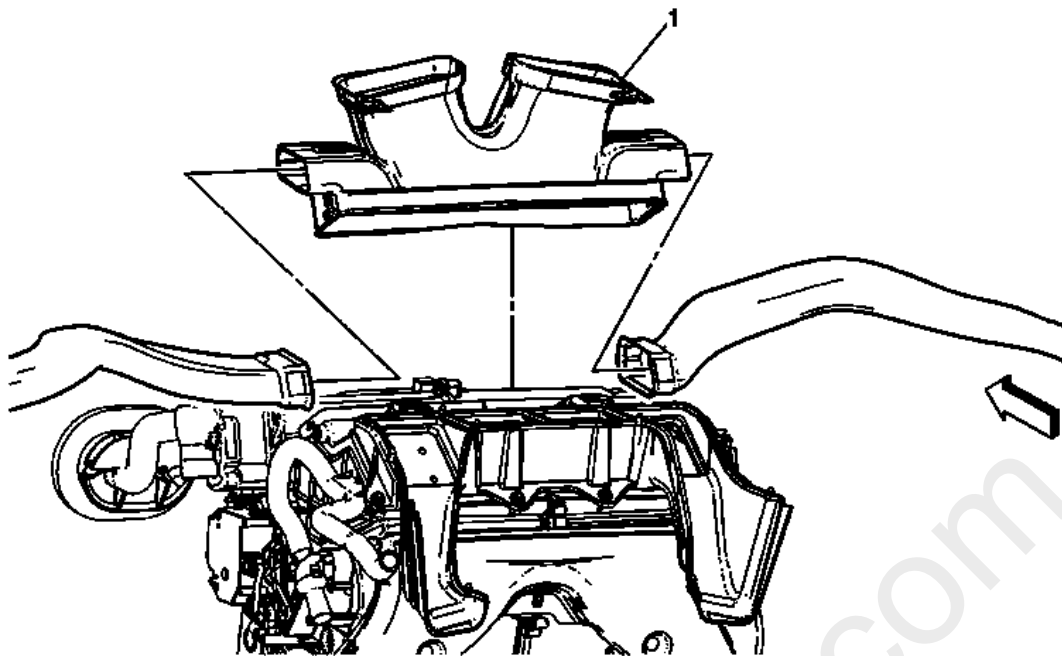


Fig. 171: Windshield Defroster Nozzle Duct
 Courtesy of GENERAL MOTORS COMPANY

Windshield Defroster Nozzle Duct Replacement

Callout	Component Name
Preliminary Procedure Remove I/P carrier assembly. Refer to <u>Instrument Panel Carrier Replacement (Left Hand Drive)</u> , <u>Instrument Panel Carrier Replacement (Right Hand Drive)</u> .	
1	Windshield Defroster Nozzle Duct. Procedure • Squeeze center mounting points of defroster nozzle to release from HVAC module. • Ensure the defroster nozzle is connected to side defroster ducts upon installation.

AIR DISTRIBUTOR CENTER DUCT REPLACEMENT

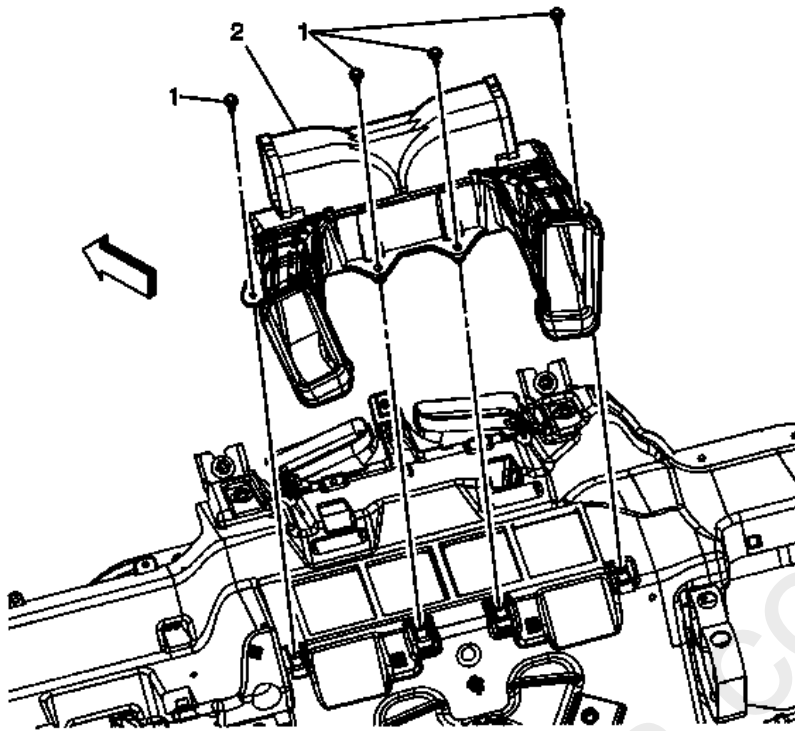


Fig. 172: Air Distributor Center Duct
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Center Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> , <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> .	
1	Center Air Distribution Duct Screw (Qty: 4)
2	Center Air Distribution Duct CAUTION: Refer to <u>Fastener Caution</u> . Procedure Repositioning of the left and right side window defogger outlet ducts may be necessary to ease removal of the center air distribution duct. Tighten 2 N.m (17 lb in)

AIR DISTRIBUTOR DUCT REPLACEMENT - LEFT SIDE

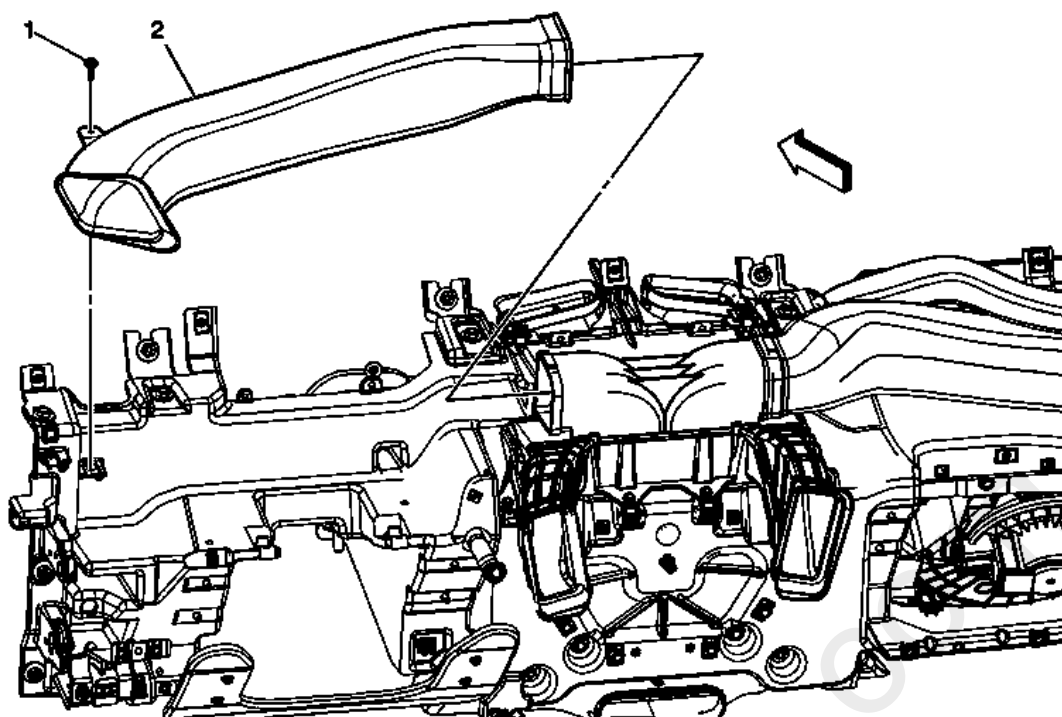


Fig. 173: Air Distributor Duct Replacement - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> , <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> .	
1	Left Air Distribution Duct Screw
2	Left Air Distribution Duct CAUTION: Refer to <u>Fastener Caution</u> . Procedure Repositioning of the left side window defogger outlet duct may be necessary to ease removal of the left air distribution duct. Tighten 2 N.m (17 lb in)

AIR DISTRIBUTOR DUCT REPLACEMENT - RIGHT SIDE

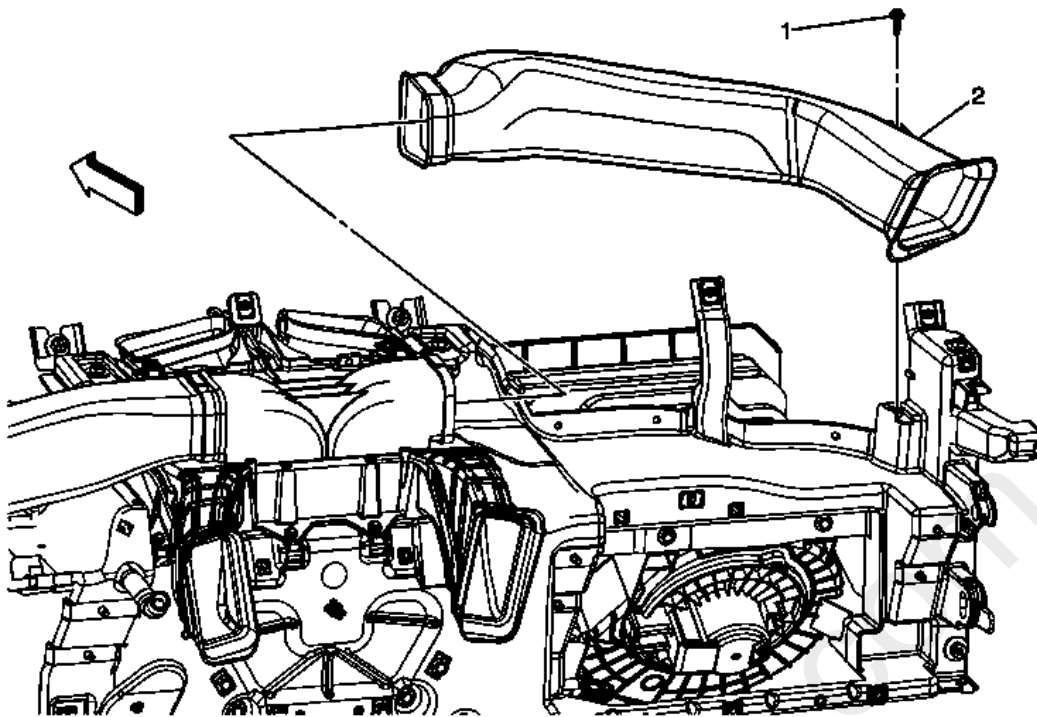


Fig. 174: Air Distributor Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Air Distributor Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> , <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> .	
1	Right Air Distribution Duct Screw
2	Right Air Distribution Duct CAUTION: Refer to <u>Fastener Caution</u> . Procedure Repositioning of the right side window defogger outlet duct may be necessary to ease removal of the right air distribution duct. Tighten 2 N.m (17 lb in)

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

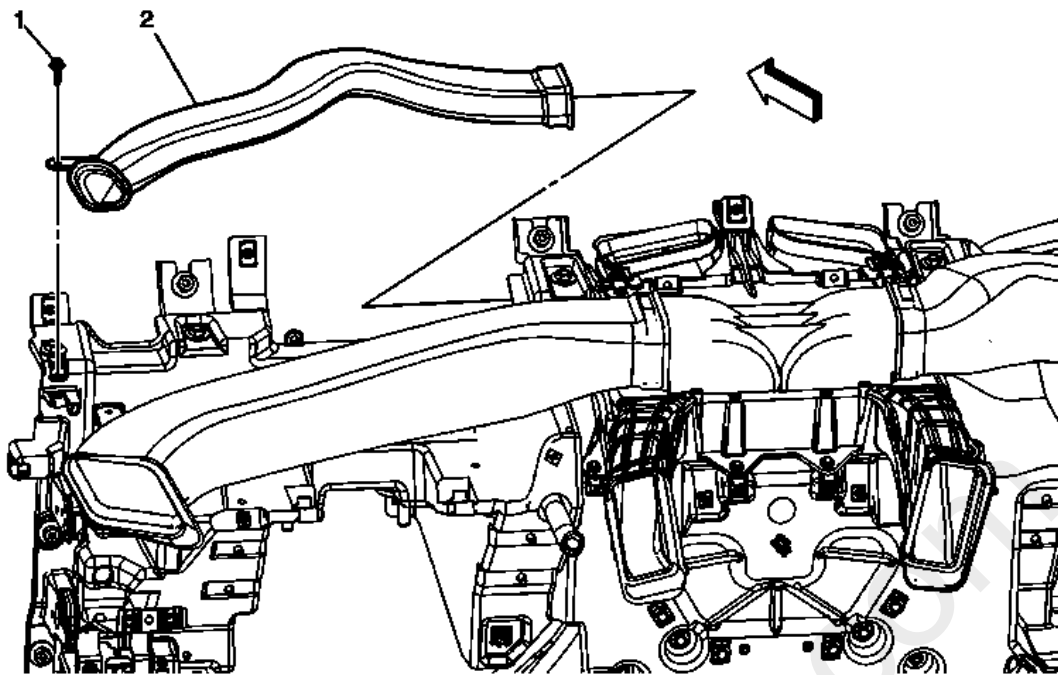


Fig. 175: Side Window Defogger Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> , <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> .	
1	Left Side Window Defogger Duct Screw CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (17 lb in)
2	Left Side Window Defogger Duct

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

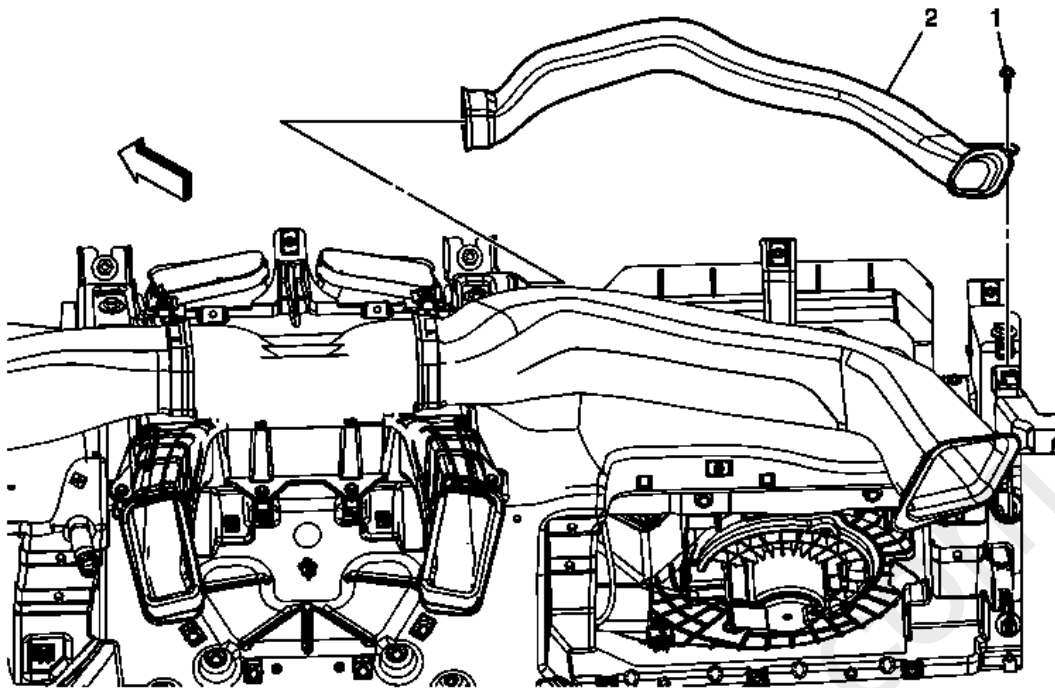


Fig. 176: Side Window Defogger Outlet Duct - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Side Window Defogger Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the I/P lower trim panel. Refer to <u>Instrument Panel Lower Trim Panel Replacement (Left Hand Drive)</u> , <u>Instrument Panel Lower Trim Panel Replacement (Right Hand Drive)</u> .	
1	Right Side Window Defogger Duct Screw CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (17 lb in)
2	Right Side Window Defogger Duct

REAR FLOOR AIR DUCT REPLACEMENT

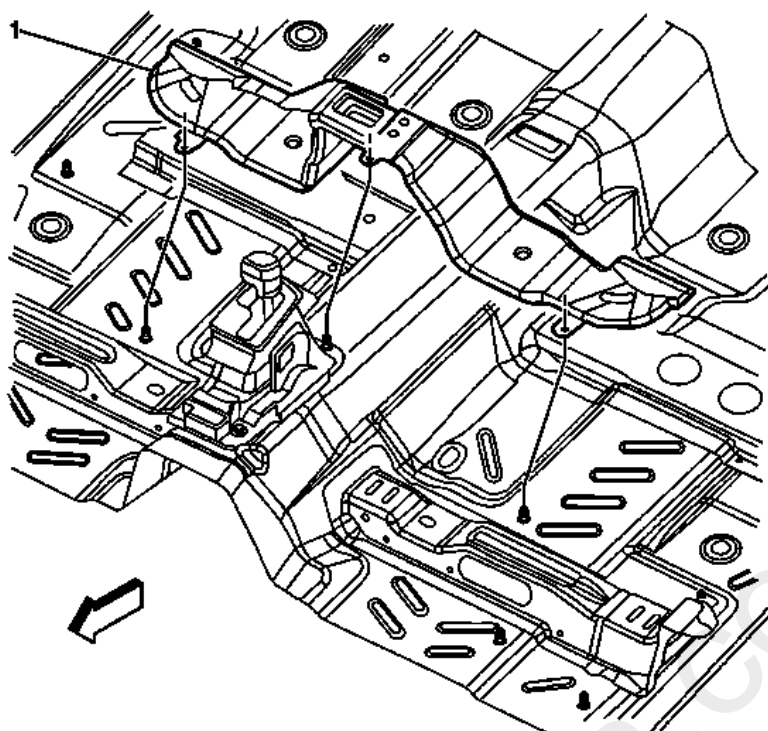


Fig. 177: Rear Floor Air Duct
 Courtesy of GENERAL MOTORS COMPANY

Rear Floor Air Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the rear floor panel carpet. Refer to Rear Floor Panel Carpet Replacement .	
1	Rear Floor Air Distribution Duct Procedure Push inboard and outboard tabs over floor pan studs and engage. TIP: Do not place center tab beneath shifter stud bolt before installing bolt.

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT - RIGHT SIDE

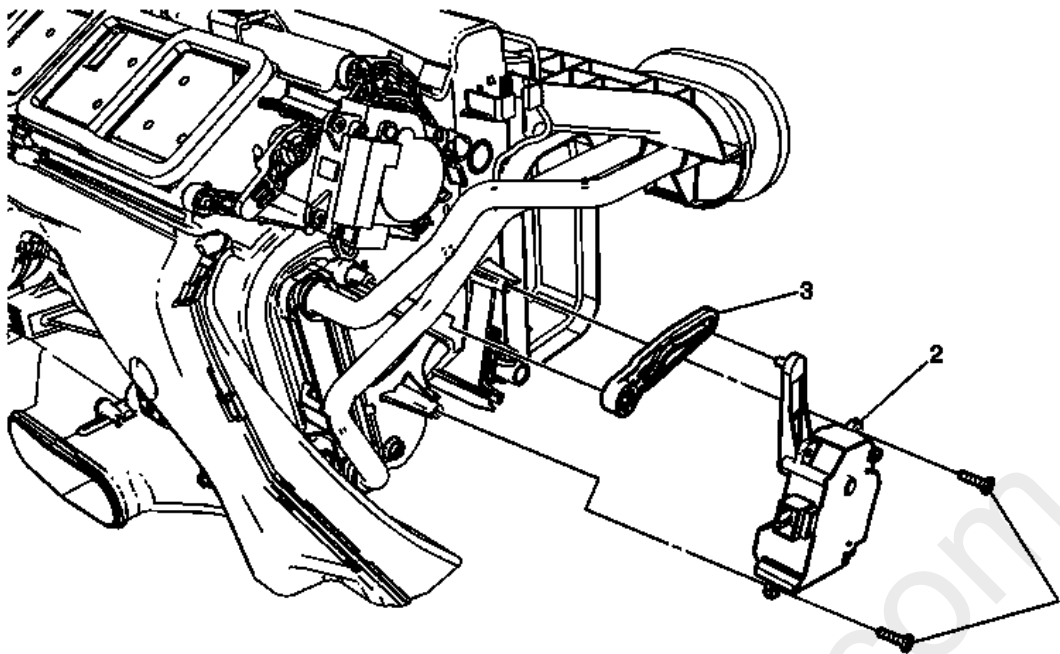


Fig. 178: Heater and Air Conditioning Control Temperature Lever (Right Side)
 Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement - Right Side

Callout	Component Name
Preliminary Procedure 1. Remove the right side instrument panel (I/P) insulator. Refer to <u>Instrument Panel Insulator Replacement - Right Side (Right Hand Drive)</u> , <u>Instrument Panel Insulator Replacement - Right Side (Left Hand Drive)</u> . 2. Remove the blower motor control module. Refer to <u>Blower Motor Control Module Replacement</u>. 3. Disconnect all the electrical connectors from components associated with the right air temperature actuator.	
1	Right Air Temperature Actuator Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Right Air Temperature Actuator
3	Right Air Temperature Actuator Lever

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT - LEFT SIDE

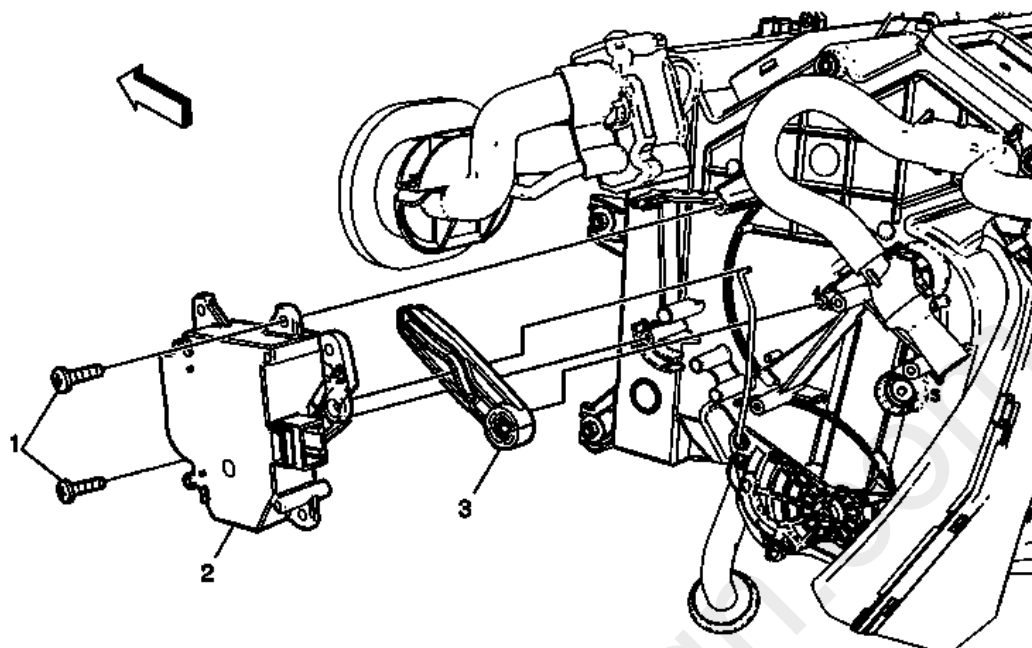


Fig. 179: Heater and Air Conditioning Control Temperature Lever (Left Side)
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Remove the left side instrument panel (I/P) insulator. Refer to <u>Instrument Panel Insulator Replacement - Left Side (Right Hand Drive)</u> , <u>Instrument Panel Insulator Replacement - Left Side (Left Hand Drive)</u> . 2. Disconnect all the electrical connectors from components associated with the left air temperature actuator.	
1	Left Air Temperature Actuator Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Left Air Temperature Actuator
3	Left Air Temperature Actuator Lever

HEATER AND AIR CONDITIONING CONTROL TEMPERATURE LEVER REPLACEMENT - LOWER LEFT SIDE

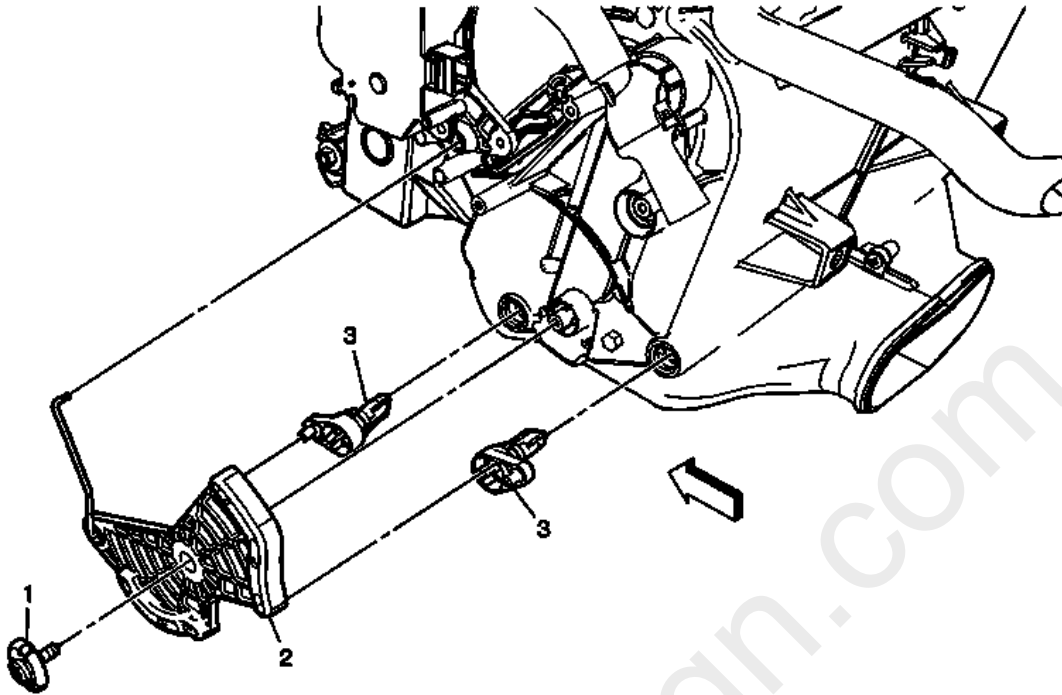


Fig. 180: Identifying Heater & Air Conditioning Control Temperature Lever - Lower Left Side
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Temperature Lever Replacement - Lower Left Side

Callout	Component Name
Preliminary Procedure Remove the left I/P insulator panel. Refer to <u>Instrument Panel Insulator Replacement - Left Side (Right Hand Drive)</u> , <u>Instrument Panel Insulator Replacement - Left Side (Left Hand Drive)</u> .	
1	Heater and A/C Control Temperature Cam Screw and Grommet CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Heater and A/C Control Temperature Cam Procedure Do not remove cam from heater and A/C control temperature cam rod.
3	Heater and A/C Control Temperature Cam Lever (Qty: 2) Procedure Rotate the cam levers upon removal.

TIP: The cam lever is part of a kit that provides all components for the left heater and A/C temperature control.

HEATER AND AIR CONDITIONING CONTROL CAM REPLACEMENT

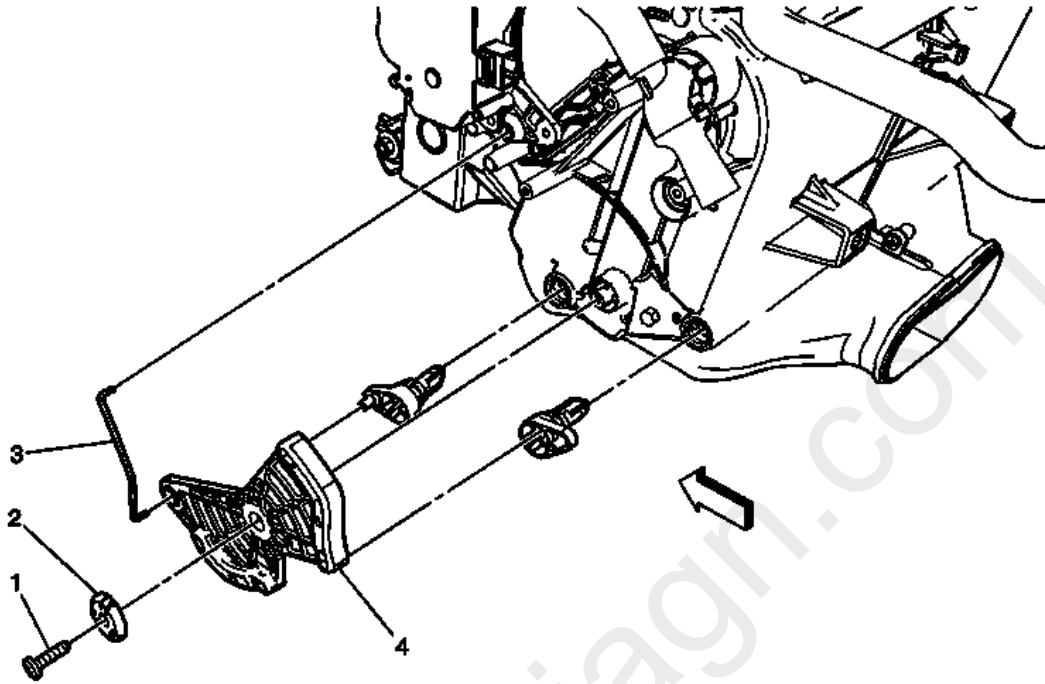


Fig. 181: Identifying Heater & Air Conditioning Control Cam
Courtesy of GENERAL MOTORS COMPANY

Heater and Air Conditioning Control Cam Replacement

Callout	Component Name
Preliminary Procedure Remove the left I/P insulator panel. Refer to <u>Instrument Panel Insulator Replacement - Left Side (Right Hand Drive)</u> , <u>Instrument Panel Insulator Replacement - Left Side (Left Hand Drive)</u> .	
1	Heater and A/C Control Temperature Cam Screw CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Heater and A/C Control Temperature Cam Grommet
3	Heater and A/C Control Temperature Cam Rod
	Heater and A/C Control Temperature Cam

TIP: The cam is part of a kit that provides all components for the left heater and A/C temperature control.

MIXER VALVE REPLACEMENT

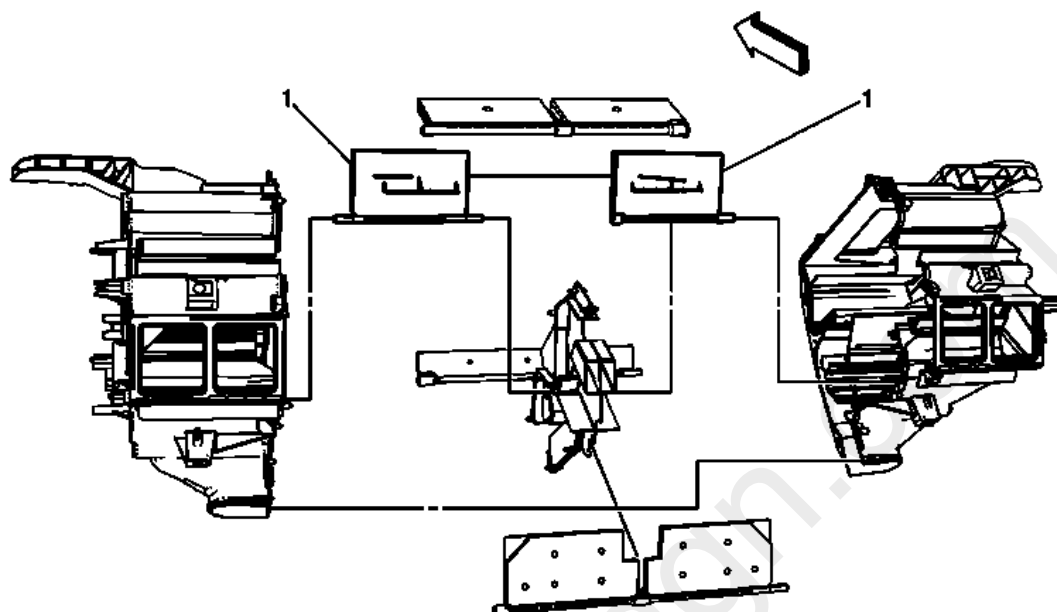


Fig. 182: Mixer Valve
Courtesy of GENERAL MOTORS COMPANY

Mixer Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the air distribution case. Refer to <u>Air Distributor Case Replacement - Right Side.</u>	
2. Disconnect all the electrical connectors from components associated with the HVAC module.	
3. Remove any components associated with splitting the air distribution case.	
1	Mixer Valve

VENT VALVE REPLACEMENT

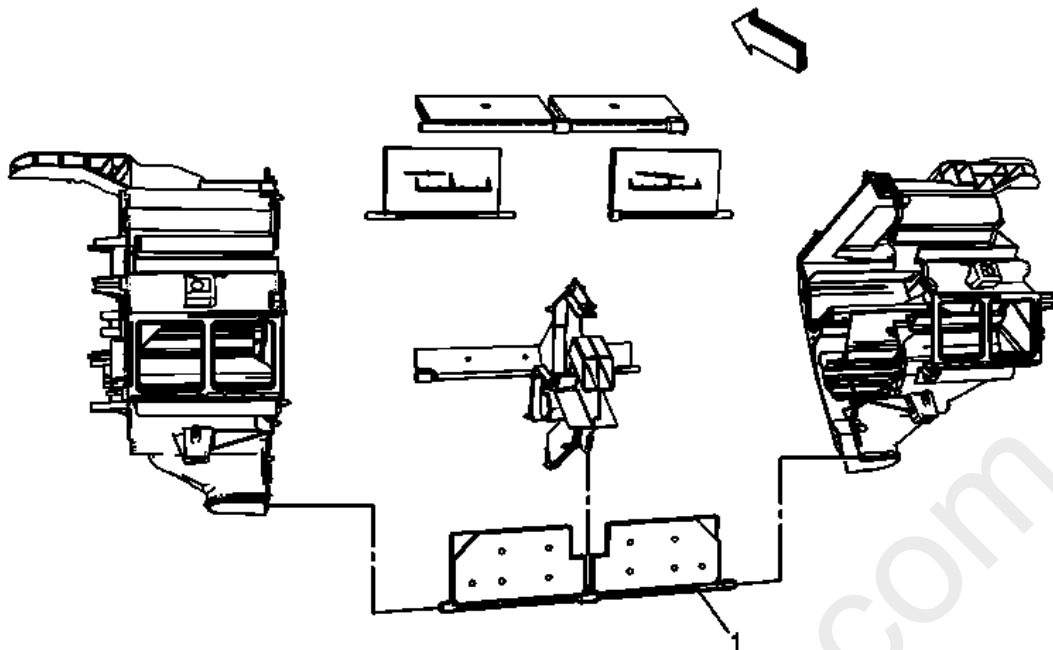


Fig. 183: Vent Valve
 Courtesy of GENERAL MOTORS COMPANY

Vent Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the air distribution case. Refer to <u>Air Distributor Case Replacement - Right Side.</u> 2. Disconnect all the electrical connectors from components associated with the HVAC module. 3. Remove any components associated with splitting the air distribution case.	
1	Vent Valve

HEATER CORE REPLACEMENT

Removal Procedure

1. Remove the HVAC module. Refer to **Air Conditioning and Heater Module Assembly Removal and Installation.**
2. Remove the heater hose bracket screw.

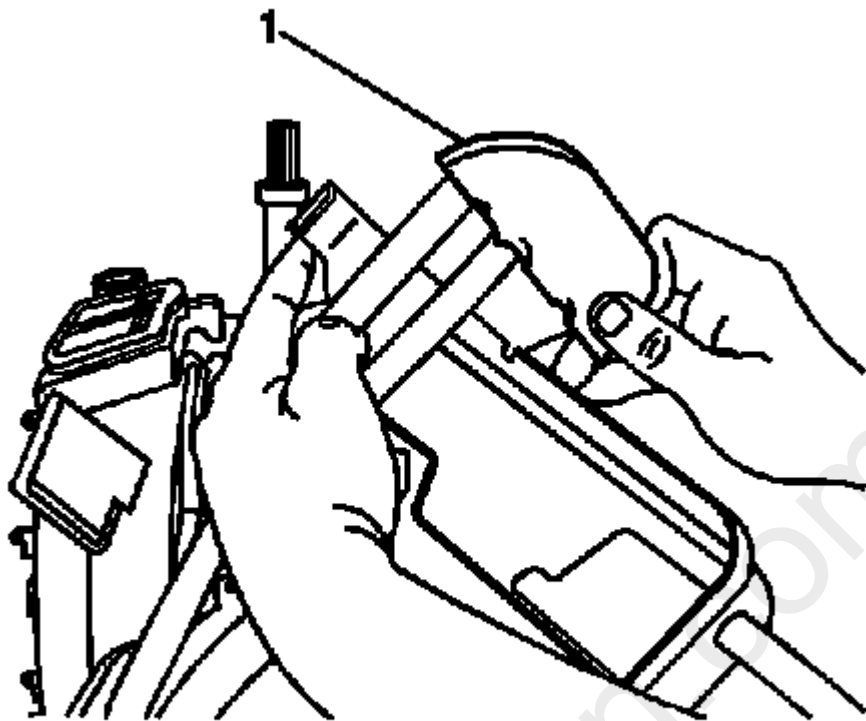


Fig. 184: Identifying Heater Hose Bracket
Courtesy of GENERAL MOTORS COMPANY

3. Remove the heater hose bracket (1).

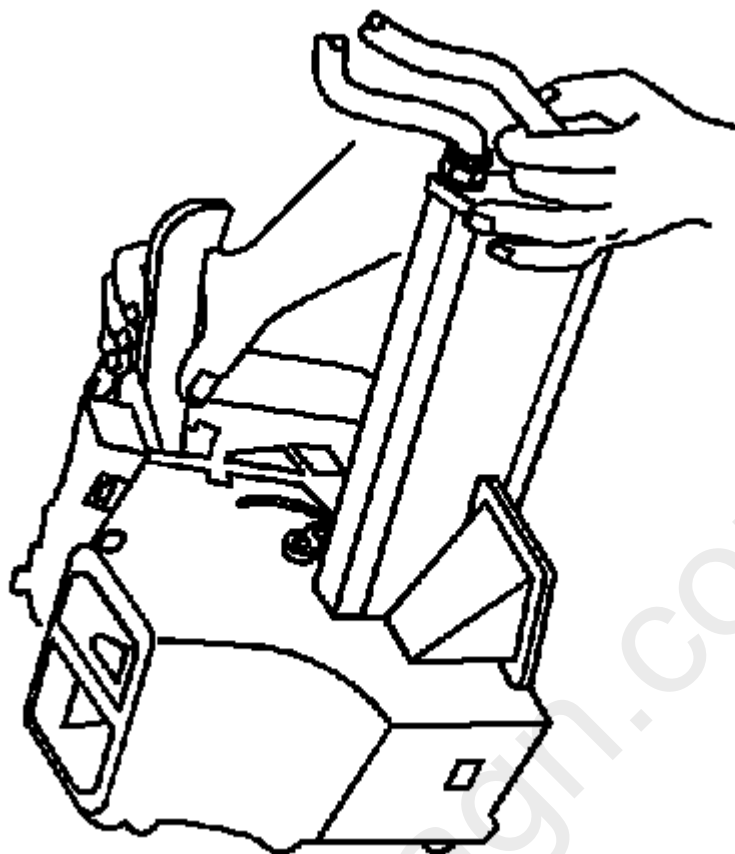


Fig. 185: Sliding Heater Core Out Of HVAC Module
Courtesy of GENERAL MOTORS COMPANY

4. Slide the heater core out of the HVAC module.

Installation Procedure

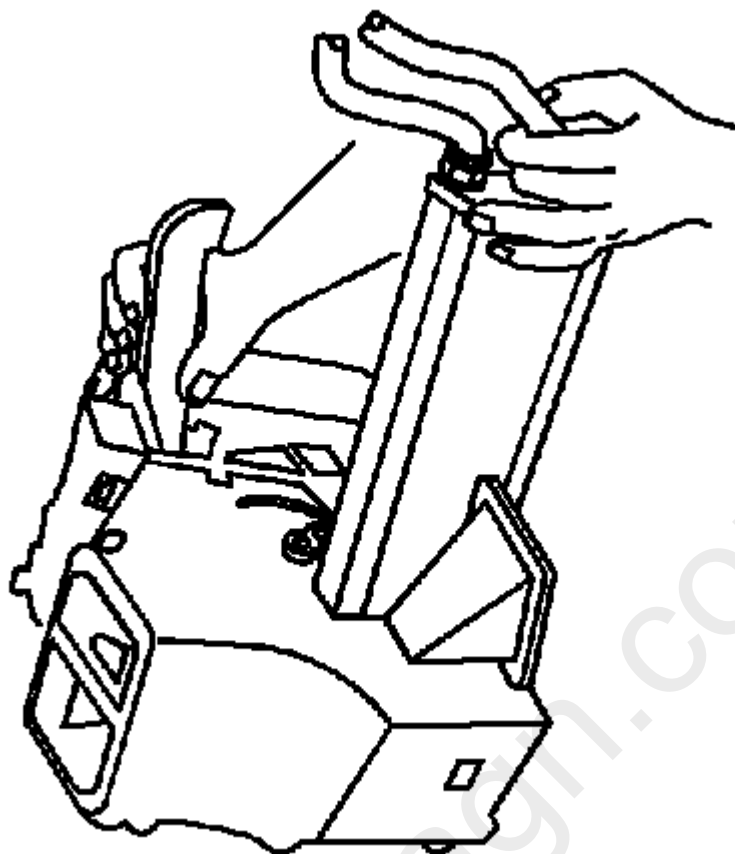


Fig. 186: Sliding Heater Core Out Of HVAC Module
Courtesy of GENERAL MOTORS COMPANY

1. Slide the heater core into the HVAC module.

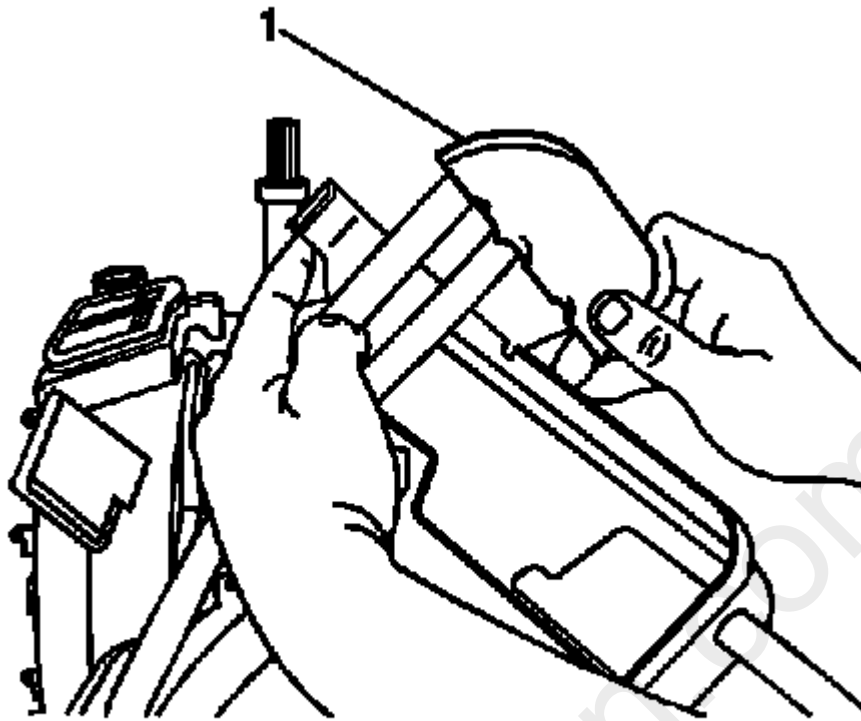


Fig. 187: Identifying Heater Hose Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Install the heater hose bracket (1).

CAUTION: Refer to Fastener Caution .

3. Install the heater hose bracket screw and tighten to 1 N.m (9 lb in).
4. Install the HVAC module. Refer to Air Conditioning and Heater Module Assembly Removal and Installation.

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 a 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.

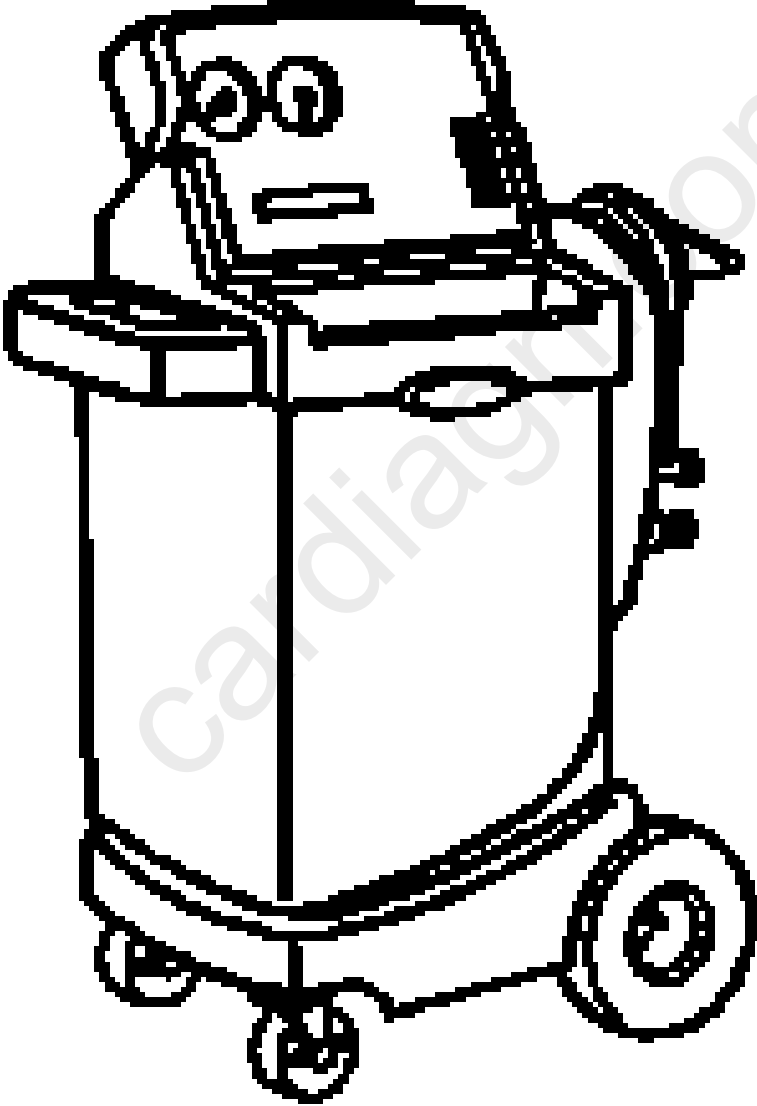
Refrigerant exiting the thermal expansion valve flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant to boil inside of the evaporator core. The boiling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

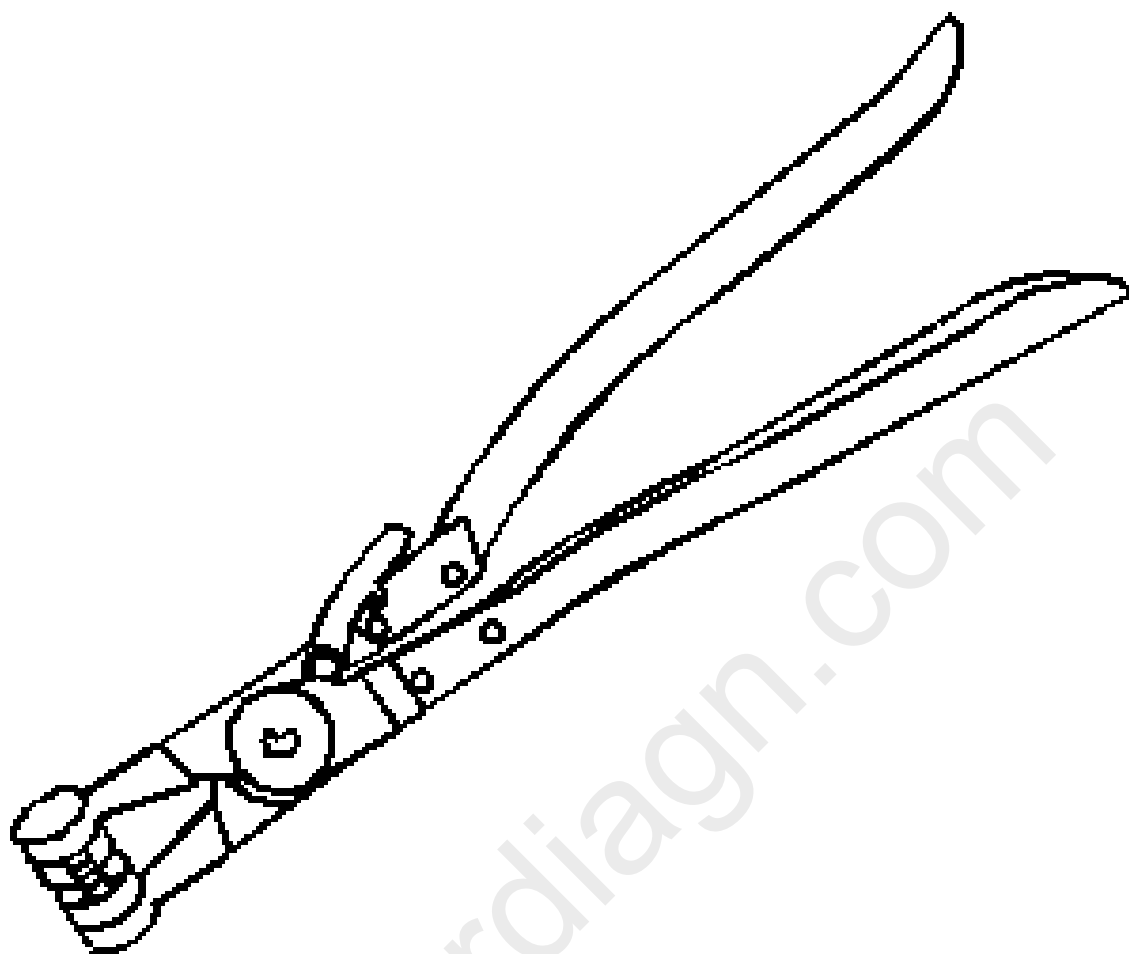
The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture

removed from the passenger compartment will also change form, or condense, and is discharged from the HVAC module as water under the vehicle.

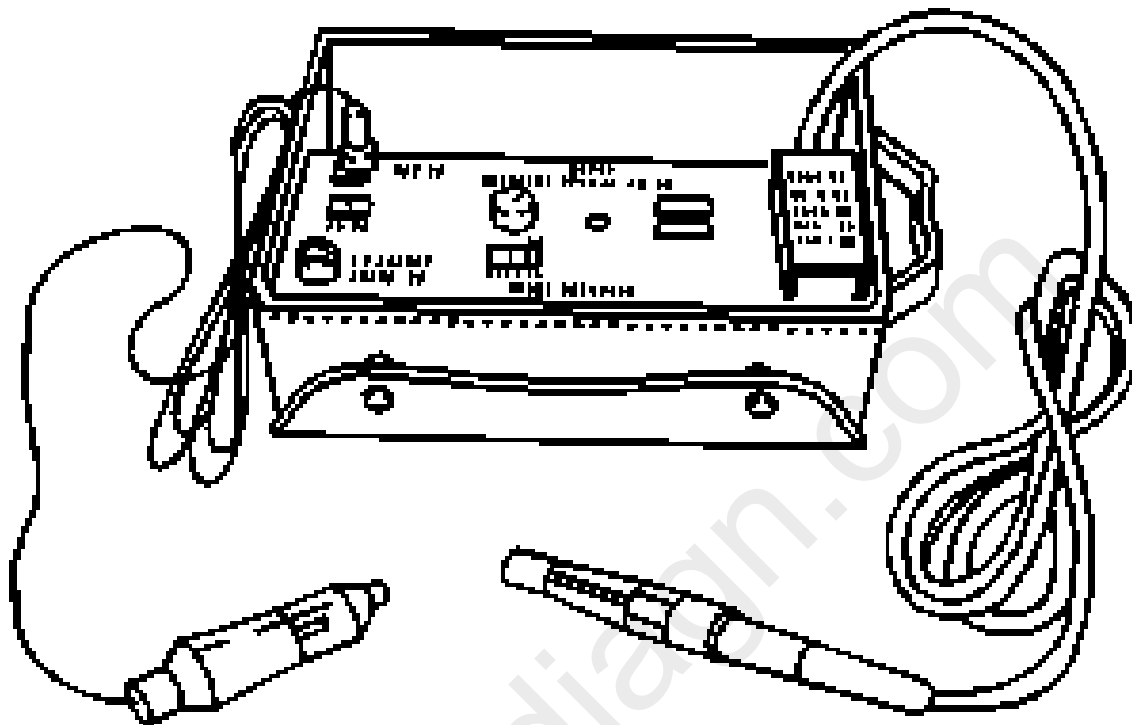
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

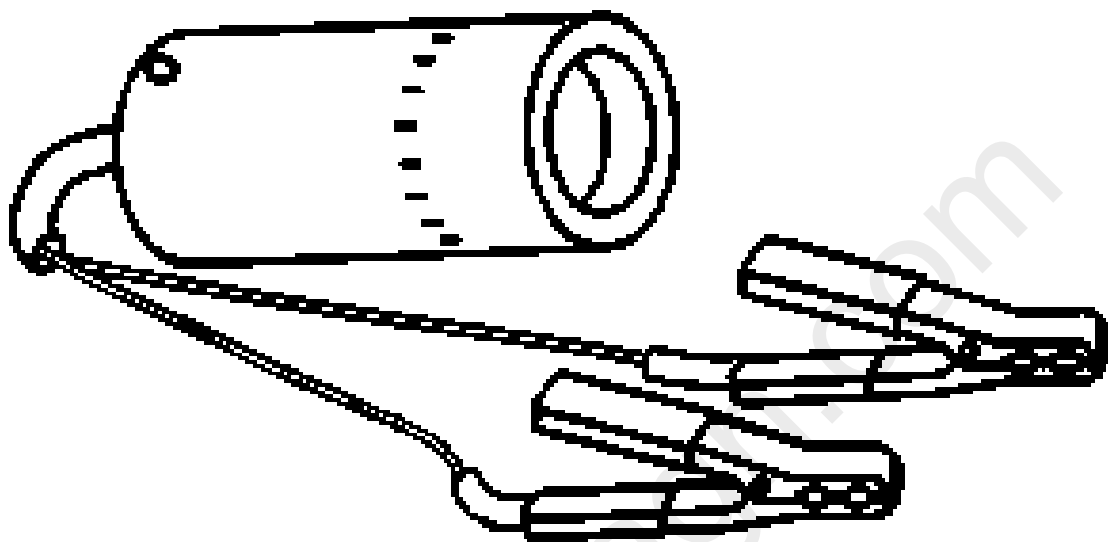
Illustration	Tool Number/ Description
	GE 48800 CoolTech A/C Recharge Machine



J 38185
Hose Clamp
Pliers



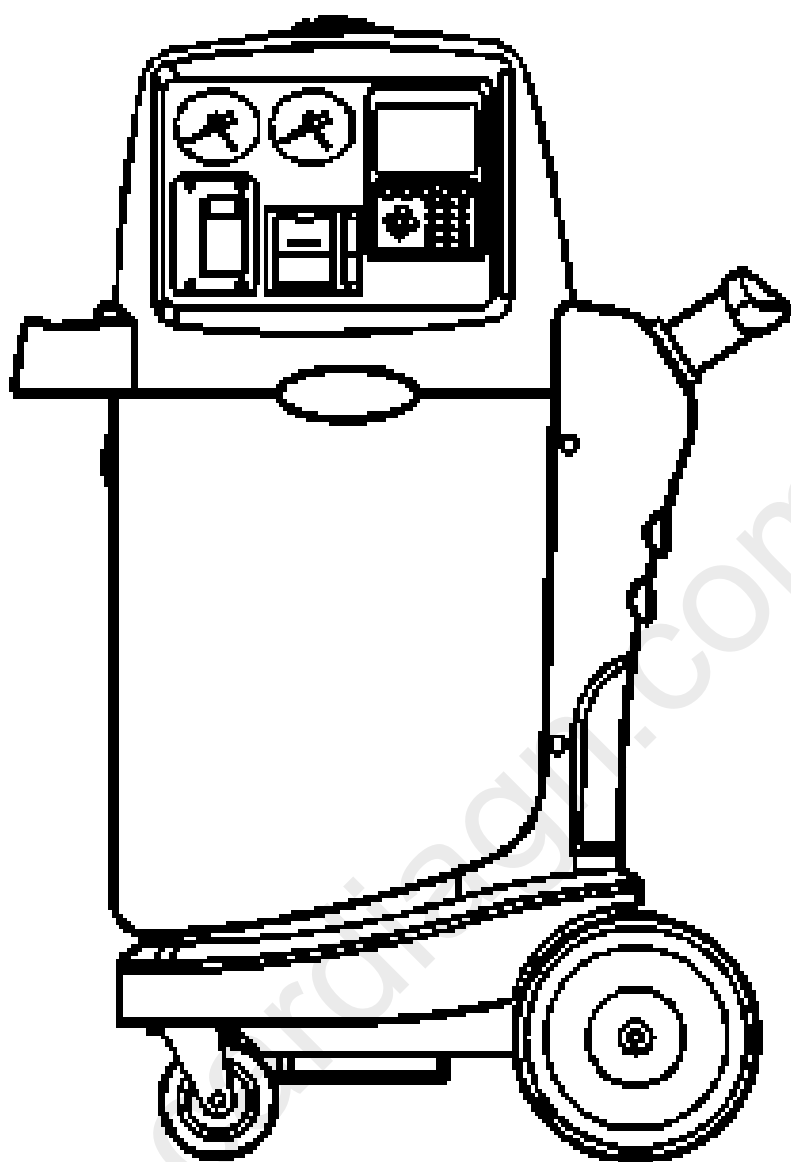
J 39400-A
Halogen
Leak
Detector



J 42220
Universal
12V Leak
Detection
Lamp



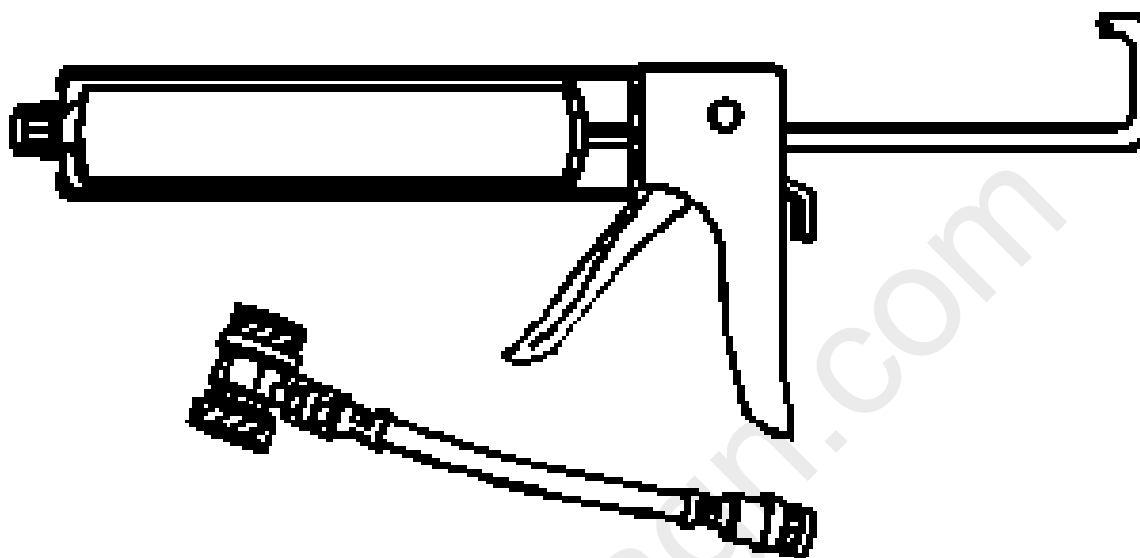
J 41447
R-134A A/C
Tracer Dye -
Box of 24



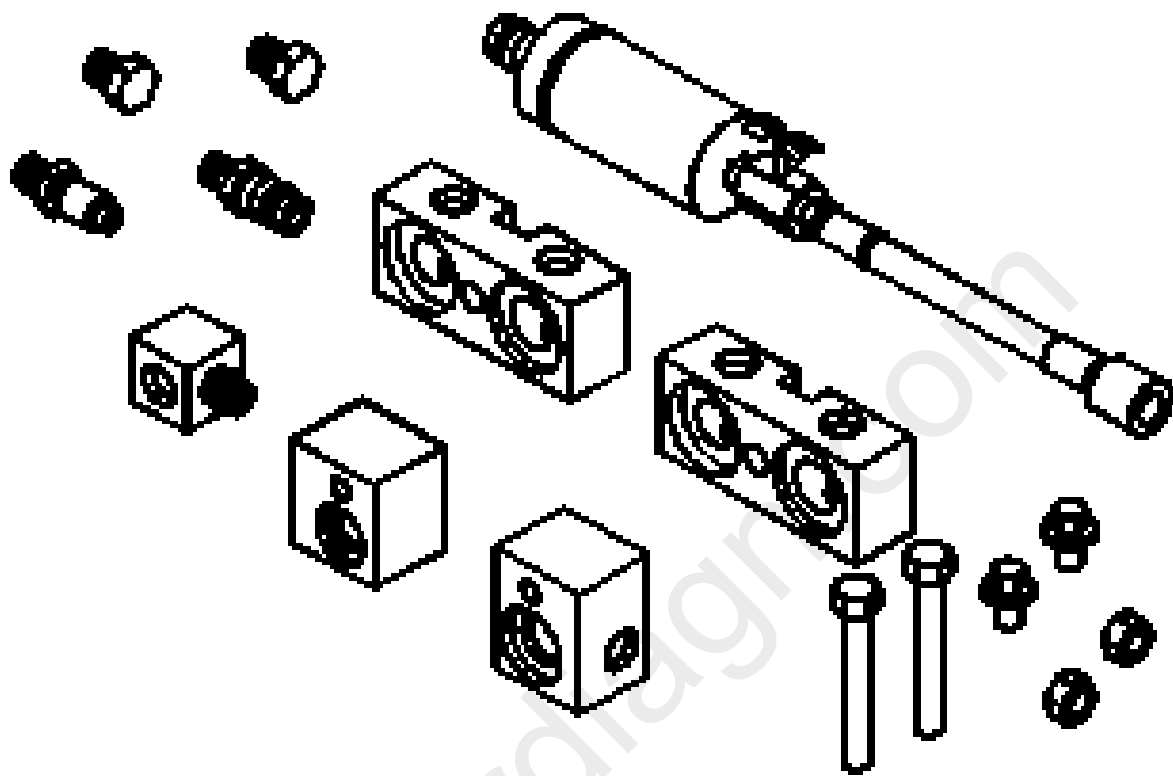
J 43600
ACR 2000
Air
Conditioning
Service
Center



J 43872
Fluorescent
Dye Cleaner

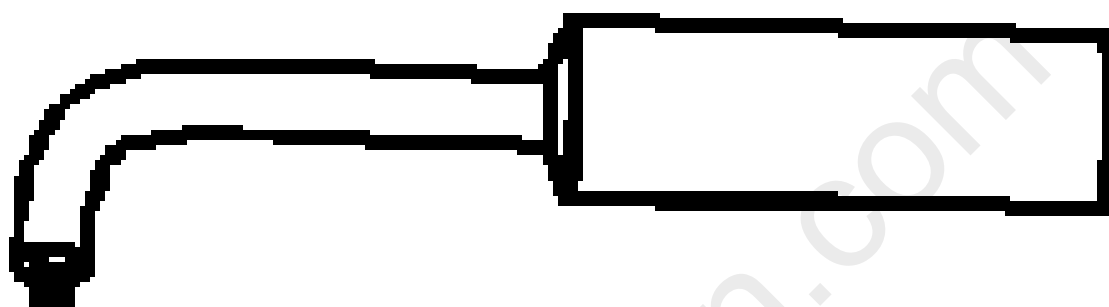


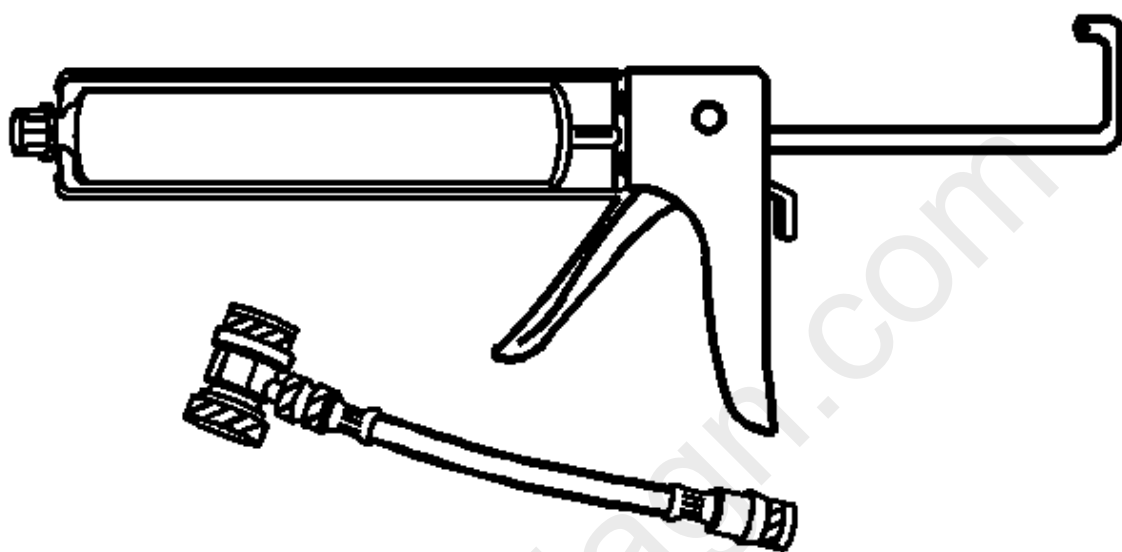
J 45037
A/C Oil
Injector



J 45268
A/C
Flushing
Adapter Kit

J 45689
A/C Quick
Joint Tool

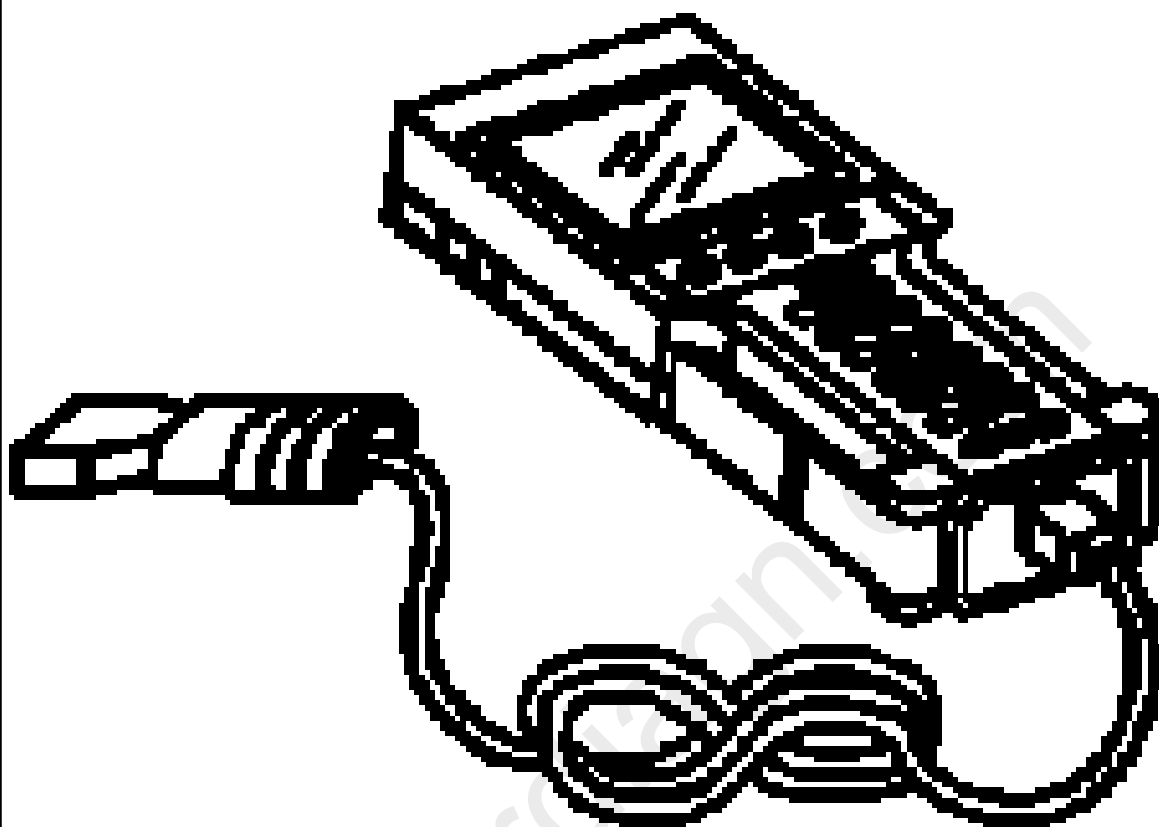




J 46297
A/C Dye
Injector Kit



J 46297-12
Replacement
Dye
Cartridges



J 39200
Tech 2