

2007 Saturn Outlook XE

2007 HVAC Heating, Ventilation and Air Conditioning - Outlook

2007 HVAC

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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C High Pressure Recirculation Switch	6 N.m	53 lb in
A/C Line Bracket Nuts and Bolts	10 N.m	8 lb ft
A/C Line Mounting Nuts and Bolts	15 N.m	11 lb ft
A/C Underbody Line Bracket Nuts	4 N.m	35 lb in
Compressor Bracket Mounting Bolts	60 N.m	45 lb ft
Compressor Clutch Plate Retaining Bolt	18 N.m	13 lb ft
Compressor Mounting Bolts	25 N.m	18 lb ft
HVAC Module Case Screws	1.5 N.m	13 lb in
HVAC Module Mounting Bolt	3 N.m	27 lb in
HVAC Module Mounting Nuts	10 N.m	8 lb ft
Instrument Panel (I/P) Duct Mounting Bolts	3 N.m	27 lb in
Rear Duct Mounting Screws	10 N.m	8 lb ft

REFRIGERANT SYSTEM CAPACITIES

Refrigerant System Capacities

Application	Specification	
	Metric	English
PAG Oil GM P/N 12378526 for United States PAG Oil GM P/N 88900060 for Canada PAG Oil Saturn P/N 22695048		
Total System PAG Oil Capacity	195 ml	6.5 oz.
Compressor	75 ml ¹	2.5 oz. ¹
The Denso service compressor contains 75 ml (2.5 oz.) of PAG oil.		
Condenser	10 ml ¹	0.3 oz. ¹
Desiccant Cartridge	10 ml ¹	0.3 oz. ¹

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Evaporator, Front	10 ml ¹	0.3 oz. ¹
Evaporator, Rear	10 ml ¹	0.3 oz. ¹
Abrupt Refrigerant Loss	60 ml ²	2.0 oz. ²
Refrigerant Charge, R134a	1.05 kg	2.3 Lb

¹ If more than the specified amount of PAG oil was drained from a component, add the equal amount of oil drained.

² Abrupt refrigerant loss due to large leak, hose rupture, collision or pressure relief valve opening. Conditions that allow the refrigerant to seep or bleed off over time do not cause this oil loss. Upon replacement of a component that caused a large refrigerant loss, also add the required amount of oil for the particular component.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - HEATING, VENTILATION AND AIR CONDITIONING

Begin the system diagnosis with **Diagnostic System Check - Vehicle** . The Diagnostic System Check - Vehicle will provide the following information:

- The identification of the control modules which are not communicating
- The identification of any stored DTCs and their status

The use of the Diagnostic System Check - Vehicle will identify the correct procedures to begin vehicle diagnosis. These must be performed before system DTC or symptom diagnosis.

LEAK TESTING

Tools Required

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

Refrigerant Leak Testing

IMPORTANT: 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** , even though the A/C system contains fluorescent dye. See **Special Tools**.

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.

IMPORTANT: 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** . See **Special Tools**.
- 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** . See **Special Tools**.

Fluorescent Dye Injection

IMPORTANT: Use only fluorescent dye approved by General Motors.

- **J 41447 can be poured directly into a removed A/C component. See Special Tools.**
- **J 46297-12 is injected into the low side port using J 46297 . See Special Tools.**
- 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.

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

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

Halogen Leak Detector

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

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

IMPORTANT: 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.

IMPORTANT: 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** . See **Special Tools**.

AIR CONDITIONING (A/C) SYSTEM PERFORMANCE TEST

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

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

Test Description

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

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

Air Conditioning (A/C) System Performance Test

Step	Action	Values	Yes	No
IMPORTANT:				
<ul style="list-style-type: none"> • The ambient air temperature must be at least 16°C (60°F). • Do not induce additional air flow across the front of the vehicle during the test. • If you were sent here from a DTC diagnostic table, clear the DTC upon completion of this test. 				
1	1. Park the vehicle inside or in the shade. 2. Open the windows in order to ventilate the interior of the vehicle. 3. If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. 4. Turn OFF the ignition.	More than 16°C (60° F) - 345 kPa (50 psi) More than 24°C (75° F) - 483		

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<p>5. Install the J 43600 . See <u>Special Tools</u>.</p> <p>6. Record the ambient air temperature displayed on the J 43600 . See <u>Special Tools</u>.</p> <p>7. Record the low and high side STATIC pressure readings.</p> <p>Are both the low side and high side pressures within the specified value?</p>	<p>kPa (70 psi) More than 33°C (90° F) - 690 kPa (100 psi)</p>	<p>Go to Step 2</p>	<p>Go to <u>Leak Testing</u></p>
<p>IMPORTANT: Record the relative humidity and the ambient air temperature at the time of the test.</p> <p>1. Close the vehicle doors and windows.</p> <p>2. Open the drivers door window 12.7-15.2 cm (5-6 in).</p> <p>3. Select the following HVAC control settings:</p> <ul style="list-style-type: none"> • The A/C is ON • The coldest temperature setting • The maximum blower speed • Recirculation mode • The panel outlet mode • All panel outlets are OPEN <p>4. Install the temperature probes of the J 43600 in the left and right center panel air outlets. See <u>Special Tools</u>.</p> <p>5. Apply the parking brake.</p> <p>6. Place the</p>			

<p>2</p>	<p>transaxle/transmission in PARK.</p> <ol style="list-style-type: none"> 7. Start the engine. 8. Operate the A/C system for 5 minutes. 9. Inspect A/C components for the following conditions: <ul style="list-style-type: none"> • Abnormal frost areas • Unusual noises <p>IMPORTANT: Press the RESET button, before using the print function of the J 43600 . See <u>Special Tools</u>.</p> <ol style="list-style-type: none"> 10. Print the following information: <ul style="list-style-type: none"> • The panel outlet air temperatures • The low-side pressure • The high-side pressure 11. Compare the low and high side pressures and the panel output temperatures to the A/C performance table below. <p>Does all the data recorded fall within the specified ranges of the A/C performance table?</p>	<p>-</p>	<p>Go to Step 8</p>	<p>Go to Step 3</p>
	<p>If the pressures and temperatures recorded do not fall within the specified ranges:</p> <ol style="list-style-type: none"> 1. Continue to operate the A/C system for an additional 5 minutes. 2. RESET the J 43600 and record the pressures and 			

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<p align="center">3</p>	<p>temperatures again. See <u>Special Tools</u>.</p> <p>3. Compare the low and high side pressures and the panel output temperature to the A/C performance table.</p> <p>Does all the data recorded fall within the specified ranges of the A/C performance table?</p>	<p align="center">-</p>	<p align="center">Go to Step 8</p>	<p align="center">Go to Step 4</p>
<p align="center">4</p>	<p>Do the high and low side pressures fall within the specified ranges, but the panel outlet temperatures do not?</p>	<p align="center">-</p>	<p>Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone A</u></p>	<p align="center">Go to Step 5</p>
<p align="center">5</p>	<p>Is the low side pressure greater than the specified range, but the high side pressure within or less than the specified range?</p>	<p align="center">-</p>	<p>Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone B</u></p>	<p align="center">Go to Step 6</p>
<p align="center">6</p>	<p>Are the low and high side pressures both greater than the specified ranges?</p>	<p align="center">-</p>	<p>Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone C</u></p>	<p align="center">Go to Step 7</p>
<p align="center">7</p>	<p>Is the high side pressure greater than the specified range, but the low side pressure is within or less than the specified range?</p>	<p align="center">-</p>	<p>Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone D</u></p>	<p align="center">Go to Step 8</p>
<p align="center">8</p>	<p>Operate the system in order to verify the test results. Did you find the same results?</p>	<p align="center">-</p>		<p>Go to <u>Symptoms - HVAC Systems -</u></p>

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System OK Manual

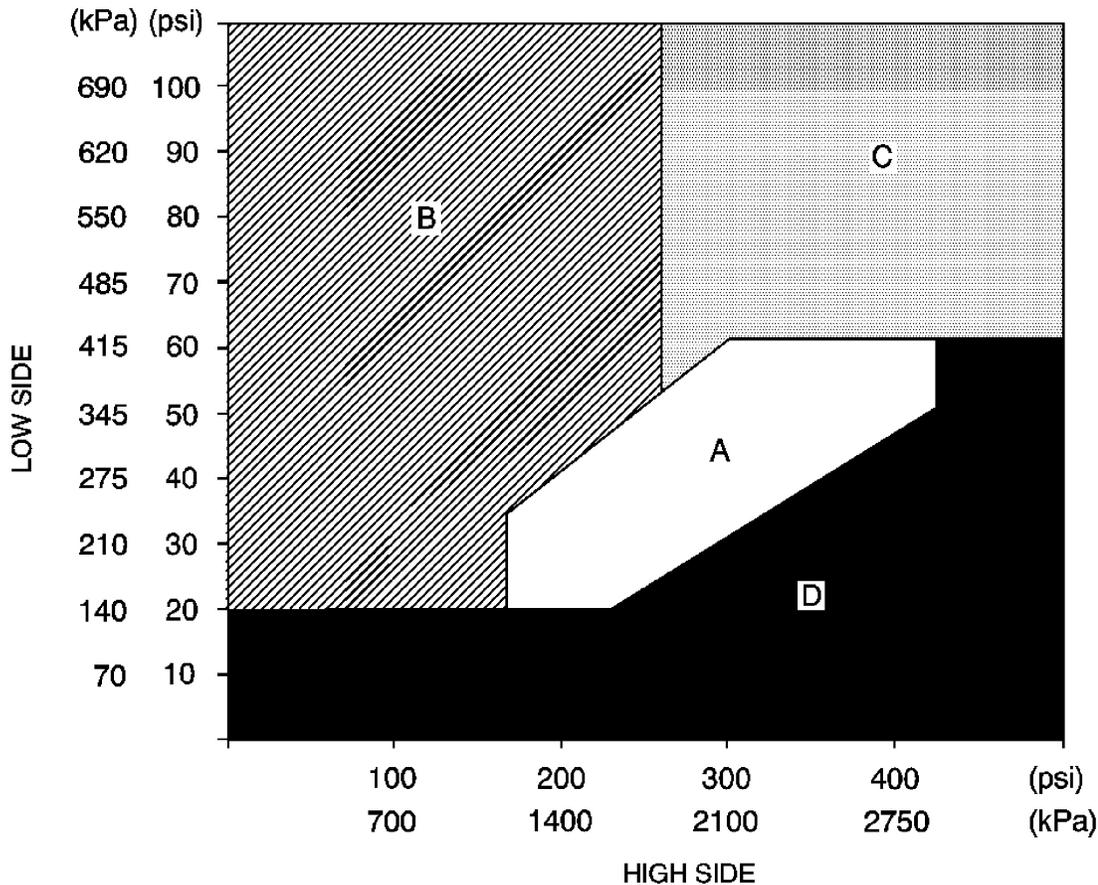


Fig. 1: View Of A/C System Pressure - Zone Classification
 Courtesy of GENERAL MOTORS CORP.

A/C Performance Table

Ambient Temperature	Relative Humidity	Low Side Service Port Pressure	High Side Service Port Pressure	Maximum Left Center Discharge Air Temperature	Maximum Left Rear Discharge Air Temperature
13-18°C (55-65°F)	0-100%	151-234 kPa (22-34 psi)	1288-1598 kPa (187-232 psi)	10°C (50°F)	14°C (57°F)
19-24°C (66-75°F)	Below 40%	158-254 kPa (23-37 psi)	1350-1660 kPa (196-241 psi)	12°C (52°F)	17°C (61°F)

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	Above 40%	179-275 kPa (26-40 psi)	1419-1701 kPa (206-247 psi)	13°C (54°F)	18°C (64°F)
25-29°C (76- 85°F)	Below 35%	199-282 kPa (29-41 psi)	1550-1791 kPa (225-260 psi)	13°C (55°F)	19°C (66°F)
	35-50%	213-289 kPa (31-42 psi)	1570-1791 kPa (228-260 psi)	13°C (55°F)	19°C (66°F)
	Above 50%	220-303 kPa (32-44 psi)	1591-1791 kPa (231-260 psi)	14°C (57°F)	20°C (68°F)
30-35°C (86- 95°F)	Below 30%	234-316 kPa (34-46 psi)	1708-1956 kPa (248-284 psi)	15°C (59°F)	23°C (72°F)
	30-50%	241-323 kPa (35-47 psi)	1708-1942 kPa (248-282 psi)	17°C (61°F)	23°C (73°F)
	Above 50%	248-330 kPa (36-48 psi)	1708-1901 kPa (248-276 psi)	18°C (63°F)	24°C (75°F)
36-41°C (96- 105°F)	Below 20%	268-351 kPa (39-51 psi)	1901-2149 kPa (276-312 psi)	18°C (64°F)	25°C (77°F)
	20-40%	275-358 kPa (40-52 psi)	1887-2101 kPa (274-305 psi)	18°C (64°F)	27°C (79°F)
	Above 40%	282-358 kPa (41-52 psi)	1867-2060 kPa (271-299 psi)	19°C (66°F)	28°C (81°F)
42-46°C (106- 115°F)	Below 20%	310-378 kPa (45-55 psi)	2101-2301 kPa (305-334 psi)	20°C (68°F)	29°C (84°F)
	Above 20%	310-385 kPa (45-56 psi)	2067-2232 kPa (300-324 psi)	22°C (70°F)	29°C (84°F)
47-49°C (116- 120°F)	Below 30%	344-413 kPa (50-60 psi)	2218-2411 kPa (322-350	23°C (73°F)	32°C (88°F)

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

Air Conditioning (A/C) Diagnostics - Pressure Zone A

Step	Action	Value	Yes	No
<p>DEFINITION: The high and low side pressures may be normal or slightly less than normal.</p> <ul style="list-style-type: none"> • Air Delivery Concern • Slight Refrigerant Under Charge • Refrigerant Contamination 				
1	Were you sent here from the A/C System Performance Test?	-	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test</u>
2	Refer to the instrument panel outlet air temperatures recorded during the A/C system performance test. Does the discharge air temperature between the right and left center instrument panel outlets vary by more than 1-2°C (2-3°F)?	-	Go to Step 7	Go to Step 3
3	Did the customer mention that the A/C system output temperatures are good at first, but then turn warm during extended drives?	-	Go to Step 4	Go to Step 5
4	Increase engine speed to 2000 RPM. During extended operation of the A/C system, does the low side pressure decrease, possibly accompanied by heavy frost on the liquid line between the expansion device and the evaporator?	-	Go to <u>Air Conditioning (A/C) Diagnostics - Pressure Zone D</u>	Go to Step 5

<p>5</p>	<p>1. Refer to the pressures recorded during the A/C system performance test.</p> <p>2. Inspect for the following conditions:</p> <p style="text-align: center;">CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <ul style="list-style-type: none"> • The high side pressure is slightly greater than the specified pressure ranges but still within Zone A on the A/C Pressure-Zone Classification Chart in the A/C System Performance Test. Refer to <u>Air Conditioning (A/C) System Performance Test</u>. • The discharge line is hot. • The suction line is cool. 	<p style="text-align: center;">-</p>	<p style="text-align: center;">Go to Step 7</p>	<p style="text-align: center;">Go to Step 6</p>
	<p>Do the listed conditions exist?</p> <p>1. Refer to the pressures recorded during the A/C system performance test.</p> <p>2. Inspect for the following conditions:</p> <ul style="list-style-type: none"> • The low side pressure is slightly lower than the specified pressure ranges but still within 			

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6	<p>Zone A on the A/C Pressure-Zone Classification Chart in the A/C System Performance Test. Refer to <u>Air Conditioning (A/C) System Performance Test.</u></p> <ul style="list-style-type: none"> • The discharge line is warm-to-hot. • The suction line is cool-to-warm. <p>Do the listed conditions exist?</p>	-	-	<p>Go to <u>Too Hot in Vehicle</u> for the manual system or <u>Too Hot in Vehicle</u> for the automatic system</p> <p>Go to Step 8</p>
7	<p>The A/C system may be undercharged.</p> <ol style="list-style-type: none"> 1. Leak test A/C system. Refer to <u>Leak Testing.</u> 2. Recharge the A/C system to specifications. Refer to <u>Refrigerant Recovery and Recharging.</u> <p>Is the action complete?</p>	-	-	-
8	<p>The A/C system may be contaminated. View the information screen on the J 43600 for detection of foreign gases in the A/C system. See <u>Special Tools.</u></p> <p>Do foreign gases exist?</p>	-	-	<p>Go to Step 9</p> <p>Go to Step 10</p>
9	<ol style="list-style-type: none"> 1. Evacuate the A/C system to a scavenging tank. Refer to <u>Refrigerant Recovery and Recharging.</u> 	-	-	-

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	<p>2. Recharge the A/C system to specifications.</p> <p>Is the action complete?</p>		Go to Step 13	
10	<p>The A/C system may contain too much moisture or air.</p> <p>1. Evacuate and recharge the A/C system to specifications. Refer to <u>Refrigerant Recovery and Recharging</u>.</p> <p>2. Operate the A/C system and inspect the instrument panel outlet air temperatures. Refer to <u>Air Conditioning (A/C) System Performance Test</u>.</p> <p>Are the instrument panel outlet air temperatures within the specified ranges of the A/C Performance Test Table?</p>	-	Go to Step 14	Go to Step 11
11	<p>The A/C system may contain too much refrigerant oil.</p> <p>IMPORTANT: Review the vehicles A/C repair history.</p> <p>If the vehicle history shows multiple A/C repairs and is suspected of improper PAG oil balancing in the previous repairs, perform the following procedure:</p> <p>1. Drain all of the PAG oil drain bottle on the ACR</p>	148 ml (5 oz.)		

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	<p>2000.</p> <p>2. Flush the A/C system. Refer to <u>Flushing</u>.</p> <p>Was more than the total system capacity of refrigerant oil recovered from the ACR 2000 oil drain bottle?</p>			<p>Go to Step 12</p> <p>Go to Step 13</p>
12	<p>1. Add the specified amount of refrigerant oil. Refer to <u>Refrigerant System Capacities</u>.</p> <p>2. Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>.</p> <p>Are the actions complete?</p>	-		<p>Go to Step 13</p>
13	<p>1. Record the low and high side pressures and the instrument panel outlet air temperature.</p> <p>2. Compare the instrument panel outlet air temperatures to those listed in the A/C System Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test</u>.</p> <p>Are the high and low side pressures and the instrument panel outlet air temperatures within specifications?</p>	-		<p>Go to Step 14</p>
	<p>Operate the system in order to verify the repair.</p>			<p>Go to Symptoms -</p>

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14	Did you find and correct the condition?	-	System OK	<u>HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
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AIR CONDITIONING (A/C) DIAGNOSTICS - PRESSURE ZONE B

Air Conditioning (A/C) Diagnostics - Pressure Zone B

Step	Action	Yes	No
DEFINITION: The low side pressure is higher than normal and the high side pressure is lower than normal.			
<ul style="list-style-type: none"> • Malfunctioning A/C compressor • Refrigerant under charge 			
1	Were you sent here from the A/C System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test</u>
2	After continued operation of the A/C system, do the low and the high side pressures equalize or become static?	Go to Step 5	Go to Step 3
	Refer to the pressures recorded during the A/C System Performance Test. Inspect for the following conditions: <p align="center">CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <ul style="list-style-type: none"> • The low side pressure is equal to or greater than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning</u> 		

<p>3</p>	<p><u>(A/C) System Performance Test.</u></p> <ul style="list-style-type: none"> • The high side pressure is less than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test.</u> • The low side refrigerant hose at the compressor feels cool-to-warm. • The high side refrigerant hose at the compressor feels warm-to-hot. 		
<p>4</p>	<p>Do the listed conditions exist?</p> <p>Refer to the pressures recorded during the A/C System Performance Test. Inspect for the following conditions:</p> <p>CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <ul style="list-style-type: none"> • The low side pressure is greater than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test.</u> • The high side pressure is less than the specified pressure range of the A/C Performance Table. Refer to <u>Air Conditioning (A/C) System Performance Test.</u> • The low side refrigerant hose at the compressor feels warm. • The high side refrigerant hose at the compressor feels warm-to-hot. 	<p>Go to Step 5</p>	<p>Go to Step 4</p> <p>Go to <u>Air Conditioning (A/C) System Performance Test</u></p>
	<p>Do the listed conditions exist?</p>	<p>Go to Step 5</p>	

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5	<p>The A/C system has a low refrigerant charge. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>.</p> <p>Is the procedure complete?</p>	Go to Step 6	-
6	<p>1. After you perform the repairs, record the following:</p> <ul style="list-style-type: none"> • The low and the high side pressures • Instrument panel (I/P) outlet air temperature <p>2. Compare the pressures and the temperature to those listed in the A/C Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test</u>.</p> <p>Are the readings within the specified ranges found on the A/C Performance Chart?</p>	Go to Step 13	Go to Step 7
7	<p>The A/C compressor is malfunctioning. Remove the expansion device and inspect for contamination. Refer to <u>Thermal Expansion Valve Replacement</u>.</p> <p>Did you find metal flakes on the expansion device?</p>	Go to Step 9	Go to Step 8
8	<p>Inspect the expansion device for a brown, powdery residue indicating desiccant in the A/C system.</p> <p>Is a brown, powdery residue present?</p>	Go to Step 11	Go to Step 12
9	<p>1. Remove the suction and the discharge hoses from the compressor. Refer to <u>Discharge Hose Replacement</u> and <u>Suction Hose Replacement</u>.</p> <p>2. Inspect for metal flake contamination at the line</p>		

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	connections and the compressor ports.		
	Is metal flake contamination present?	Go to Step 10	Go to Step 12
10	<ol style="list-style-type: none"> 1. Replace the A/C compressor. Refer to <u>Compressor Replacement</u>. 2. Replace the thermal expansion valve. Refer to <u>Thermal Expansion Valve Replacement</u>. 3. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. 		-
	Is the repair complete?	Go to Step 13	
11	<ol style="list-style-type: none"> 1. Flush the A/C system. Refer to <u>Flushing</u>. 2. Replace the thermal expansion valve. Refer to <u>Thermal Expansion Valve Replacement</u>. 3. Replace the A/C compressor. Refer to <u>Compressor Replacement</u>. 4. Replace the desiccant bag. Refer to <u>Air Conditioning Refrigerant Desiccant Replacement</u>. 5. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. 		-
	Is the repair complete?	Go to Step 13	
12	<ol style="list-style-type: none"> 1. Replace the A/C compressor. Refer to <u>Compressor Replacement</u>. 2. Evacuate and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>. 		-
	Is the repair complete?	Go to Step 13	
	Operate the system in order to verify the		Go to Symptoms

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13	repair. Did you find and correct the condition?		- <u>HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
		System OK	

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

Air Conditioning (A/C) Diagnostics - Pressure Zone C

Step	Action	Yes	No
<p>DEFINITION: The low and the high side pressures are both higher than normal.</p> <ul style="list-style-type: none"> • Restricted Condenser Air Flow • Cooling Fan Malfunction • Expansion Device Malfunction 			
1	Were you sent here from the A/C System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test</u>
2	<ol style="list-style-type: none"> 1. Start the engine. 2. Turn ON the A/C. 3. Inspect for proper cooling fan operation. Refer to <u>Cooling System Description and Operation</u> . <p>Are the cooling fans ON and operating properly?</p>	Go to Step 3	Go to Step 5
3	<p>Visually inspect for the following conditions:</p> <ul style="list-style-type: none"> • Damaged condenser cooling fins • Missing or misaligned air baffles • Restricted air flow 		

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	Do any of these conditions exist?	Go to Step 4	Go to Step 6
4	Repair the air flow restriction. Is the action complete?	Go to Step 9	-
5	Repair the fault to the cooling fan operation. Refer to <u>Cooling Fan Inoperative</u> . Is the repair complete?	Go to Step 9	-
6	CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> . Feel the liquid line on both sides of the expansion device.Are the temperatures on both sides of the expansion device similar?	Go to Step 7	Go to Step 8
7	Replace the damaged or faulty thermal expansion valve. Refer to <u>Thermal Expansion Valve Replacement</u> . Is the action complete?	Go to Step 9	-
8	1. Air is in the refrigerant system or the system is overcharged. Refer to the view screen on J 43600 for foreign gas content in the refrigerant. See <u>Special Tools</u> . 2. Recover and recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u> . Is the action complete?	Go to Step 9	-
9	1. Record the low and high side pressures and the instrument panel outlet air temperature after you have performed the repairs. 2. Compare the pressures and the instrument panel outlet air temperature to those listed in the A/C Performance Chart. Refer to		

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	<p align="center"><u>Air Conditioning (A/C) System Performance Test.</u></p> <p>Are the readings within the specified ranges listed in the A/C Performance Chart?</p>	Go to Step 10	Go to <u>Air Conditioning (A/C) System Performance Test</u>
10	<p>Operate the system in order to verify the repair. Did you find and correct the condition?</p>	System OK	Go to <u>Symptoms - HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>

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

Air Conditioning (A/C) Diagnostics - Pressure Zone D

Step	Action	Yes	No
<p>DEFINITION: The low side pressure is lower than normal and the high side pressure is higher than normal.</p> <ul style="list-style-type: none"> • A restriction in the A/C system • Debris in the system 			
1	Were you sent here from the A/C System Performance Test?	Go to Step 2	Go to <u>Air Conditioning (A/C) System Performance Test</u>
2	<p>CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <p>Feel the liquid line before the expansion device. Is the liquid line cold before the expansion device?</p>	Go to Step 3	Go to Step 8
	Feel along the surfaces of the following high side components:		

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<p align="center">3</p>	<ul style="list-style-type: none"> • The compressor discharge hose • The condenser • The liquid line between the condenser and the expansion device <p>Did you detect an abrupt drop in temperature along the surfaces of any of the listed components?</p>	<p align="center">Go to Step 7</p>	<p align="center">Go to Step 4</p>
<p align="center">4</p>	<ol style="list-style-type: none"> 1. Feel the liquid line at the expansion device location for extreme cold, possibly accompanied by heavy frost. 2. Feel along the liquid line beyond the expansion device location for warm temperature. <p>Is the liquid line extremely cold at the expansion device location and warm beyond the expansion device location?</p>	<p align="center">Go to Step 11</p>	<p align="center">Go to Step 5</p>
<p align="center">5</p>	<p>Feel along the surfaces of the following low side components:</p> <ul style="list-style-type: none"> • The evaporator inlet tube between the expansion device and the evaporator core • The evaporator outlet tube between the evaporator core and the compressor suction hose • The compressor suction hose <p>Did you feel an abrupt temperature change along the surfaces of any of the listed components?</p>	<p align="center">Go to Step 7</p>	<p align="center">Go to Step 6</p>
	<p>Feel along the surfaces of the low and the high side components:</p> <ul style="list-style-type: none"> • The evaporator inlet tube between the 		

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6	<p>expansion device and the evaporator core</p> <ul style="list-style-type: none"> • The evaporator outlet tube and the compressor • The compressor suction hose • The compressor discharge hose • The condenser • The evaporator inlet tube between the condenser and the expansion device <p>Are the temperatures of these components only mildly warm?</p>	Go to Step 14	Go to Step 8
7	<ol style="list-style-type: none"> 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Remove the restriction from the component or replace the component which produced an abrupt temperature drop. <p>Is the repair complete?</p>	Go to Step 9	-
8	<ol style="list-style-type: none"> 1. Recover the refrigerant and evacuate the system. Refer to <u>Refrigerant Recovery and Recharging</u>. 2. Record the weight of the recovered refrigerant. 3. Compare the weight of the recovered refrigerant with the system capacity. Refer to <u>Refrigerant System Capacities</u>. <p>Is the weight of the recovered refrigerant charge greater than 75 percent of the total system capacity?</p>	Go to Step 9	Go to Step 10
9	<p>Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>.</p>		

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	Is the cooling performance improved?	Go to Step 21	Go to Step 10
10	<ol style="list-style-type: none"> 1. Leak test the system. Refer to <u>Leak Testing</u>. 2. Repair any leaks. 		
	Is the repair complete?	Go to Step 21	-
11	<p>The expansion device is restricted. Replace the expansion device. Refer to <u>Thermal Expansion Valve Replacement</u>.</p>		
	Are metal flakes present?	Go to Step 12	Go to Step 13
12	<ol style="list-style-type: none"> 1. Remove the suction hose from the vehicle. Refer to <u>Suction Hose Replacement</u>. 2. Inspect the hose for debris by blowing shop air through one end of the hose while covering the other end with a shop towel. 3. Observe the amount of debris collected in the shop towel. 		
	Did a large amount of debris collect in the shop towel?	Go to Step 18	Go to Step 20
13	<p>If the expansion device was restricted with a brown or black residue, perform the following procedure:</p> <ol style="list-style-type: none"> 1. Flush the A/C system. Refer to <u>Flushing</u>. 2. Replace the desiccant bag. Refer to <u>Air Conditioning Refrigerant Desiccant Replacement</u>. 		
	Are the repairs complete?	Go to Step 21	-
	<ol style="list-style-type: none"> 1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u>. 		

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<p align="center">14</p>	<p>2. Disconnect the suction and the discharge hoses from the compressor. Refer to <u>Discharge Hose Replacement</u> and <u>Suction Hose Replacement</u>.</p> <p>3. Inspect for the presence of debris in the compressor suction port.</p> <p>Is debris present in the compressor suction port?</p>	<p align="center">Go to Step 15</p>	<p align="center">Go to Step 19</p>
<p align="center">15</p>	<p>1. Remove the debris from the suction port.</p> <p>2. Inspect the expansion device for damage or debris. Refer to <u>Thermal Expansion Valve Replacement</u>.</p> <p>Did you find evidence of damage or debris?</p>	<p align="center">Go to Step 17</p>	<p align="center">Go to Step 16</p>
<p align="center">16</p>	<p>If the expansion device does not show any signs of damage or debris, perform the following procedure:</p> <p>1. Remove the suction hose from the vehicle. Refer to <u>Suction Hose Replacement</u>.</p> <p>2. Inspect the hose for debris by blowing shop air through one end of the hose while covering the other end with a shop towel.</p> <p>3. Observe the amount of debris collected in the shop towel.</p> <p>Did a large amount of debris collect in the shop towel?</p>	<p align="center">Go to Step 18</p>	<p align="center">Go to Step 19</p>
	<p>1. Replace the expansion device. Refer to <u>Thermal Expansion Valve Replacement</u>.</p>		

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17	<p>2. If the expansion device was restricted, observe the type of debris present.</p> <p>Are metal flakes present?</p>	Go to Step 12	Go to Step 13
18	<p>If a large amount of debris was collected in the shop towel from the suction hose, replace the desiccant bag. Refer to <u>Air Conditioning Refrigerant Desiccant Replacement</u>.</p> <p>Is the repair complete?</p>	Go to Step 19	-
19	<p>Install the suction and the discharge hoses. Refer to <u>Discharge Hose Replacement</u> and <u>Suction Hose Replacement</u>.</p> <p>Are the repairs complete?</p>	Go to Step 21	-
20	<p>1. Install the suction and the discharge lines. Refer to <u>Discharge Hose Replacement</u> and <u>Suction Hose Replacement</u>.</p> <p>2. Recharge the A/C system. Refer to <u>Refrigerant Recovery and Recharging</u>.</p> <p>Are the repairs complete?</p>	Go to Step 21	-
21	<p>1. Record the low and the high side pressures and the panel outlet air temperature after you perform the repairs.</p> <p>2. Compare the pressures and the panel outlet temperature to those listed in the A/C Performance Chart. Refer to <u>Air Conditioning (A/C) System Performance Test</u>.</p> <p>Are the readings within the specified ranges as shown on the A/C Performance Chart?</p>	Go to Step 22	Go to <u>Air Conditioning (A/C) System Performance Test</u>
	Operate the system in order to verify the		Go to Symptoms

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22	repair. Did you find and correct the condition?	System OK	- <u>HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>

HEATING PERFORMANCE DIAGNOSTIC (FRONT SYSTEM ONLY)

Heating Performance Diagnostic (Front System Only)

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 <u>Symptoms - HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
2	1. Start the engine. 2. Allow the engine to idle. Does the engine reach a normal operating temperature?		Go to Step 3
3	CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> . 1. Allow the engine to idle. 2. Select the FLOOR mode. 3. Select the minimum blower speed. 4. Select the warmest temperature setting. 5. Feel the temperature of the inlet and		

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	<p>outlet heater hoses at the heater core.</p> <p>Does the inlet heater hose feel warmer than the outlet heater hose?</p>	Go to Step 7	Go to Step 4
4	<ol style="list-style-type: none"> 1. Install a thermometer into the center IP PANEL air outlet. 2. Secure a thermometer to the heater core outlet hose. 3. Select the PANEL mode. 4. Select the maximum blower speed. 5. Select the warmest temperature setting. 6. Record the temperature at the following locations: <ul style="list-style-type: none"> • The center IP PANEL air outlet • The heater core outlet hose 7. Compare the recorded temperatures. <p>Are the two temperature readings about equal?</p>	Go to Step 5	Go to Step 6
5	<ol style="list-style-type: none"> 1. Inspect and repair the following areas of the vehicle for cold air leaks: <ul style="list-style-type: none"> • The cowl • The recirculation door • The HVAC module case 2. Perform the necessary repairs. <p>Are the repairs complete?</p>	Go to Step 10	-
6	<ol style="list-style-type: none"> 1. Inspect the temperature door operation. Refer to <u>Diagnostic System Check - Vehicle</u> . 2. Perform any necessary repairs. <p>Are the repairs complete?</p>	Go to Step 10	-
	<ol style="list-style-type: none"> 1. Turn OFF the engine. 		

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7	<ol style="list-style-type: none"> 2. Backflush the heater core. 3. Start the engine. 4. Select the FLOOR mode. 5. Select the minimum blower speed. 6. Select the warmest temperature setting. 7. Feel the temperature of the inlet and outlet heater hoses at the heater core. <p>Does the inlet heater hose feel warmer than the outlet heater hose?</p>	Go to Step 8	Go to Step 10
8	<p>Replace the heater core. Refer to <u>Heater Core Replacement</u>.</p> <p>Is the repair complete?</p>	Go to Step 10	-
9	<p>Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature</u>.</p> <p>Is the repair complete?</p>	Go to Step 10	-
10	<p>Operate the system in order to verify the repair.</p> <p>Did you find and correct the condition?</p>	System OK	Go to Step 2

HEATING PERFORMANCE DIAGNOSTIC (AUXILIARY SYSTEM)

Heating Performance Diagnostic (Auxiliary System)

Step	Action	Yes	No
DEFINITION: Heating system performance of the auxiliary heater			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Too Cold in Vehicle</u>
2	<ol style="list-style-type: none"> 1. Start the engine. 2. Allow the engine to idle. <p>Does the engine reach a normal operating temperature?</p>	Go to Step 3	Go to Step 9
	<p>CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u>.</p>		

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3	<ol style="list-style-type: none"> 1. Allow the engine to idle. 2. Select the warmest auxiliary temperature setting. 3. Select the minimum auxiliary blower speed. 4. Feel the temperature of the inlet and outlet auxiliary heater hoses. <p>Does the inlet heater hose feel warmer than the outlet heater hose?</p>	Go to Step 7	Go to Step 4
4	<ol style="list-style-type: none"> 1. Install a thermometer into an auxiliary air outlet. 2. Secure a thermometer on the outlet heater hose of the auxiliary heater core. 3. Select the maximum auxiliary blower speed. 4. Select the warmest auxiliary temperature setting. 5. Record the temperature at the following locations: <ul style="list-style-type: none"> • The auxiliary air outlet • The auxiliary heater core outlet hose 6. Compare the recorded temperatures. <p>Are the 2 temperature readings about equal?</p>	Go to Step 5	Go to Step 6
5	<ol style="list-style-type: none"> 1. Inspect the following areas of the vehicle for cold air leaks: <ul style="list-style-type: none"> • The auxiliary HVAC module case • The auxiliary air ducts 2. Perform any necessary repairs. <p>Is the repair complete?</p>	Go to Step 11	-

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6	Inspect the auxiliary HVAC module for correct temperature door operation. Does the temperature door operate correctly?	Go to Step 11	Go to Step 10
7	<ol style="list-style-type: none"> 1. Turn OFF the engine. 2. Backflush the auxiliary heater core. 3. Start the engine and allow the engine to idle. 4. Select the minimum auxiliary blower speed. 5. Select the warmest auxiliary temperature setting. 6. Feel the temperature of the inlet and outlet heater hoses at the auxiliary heater core. <p>Does the inlet heater hose feel warmer than the outlet heater hose?</p>	Go to Step 8	Go to Step 11
8	Replace the auxiliary heater core. Refer to <u>Auxiliary Heater Core Replacement</u> . Is the repair complete?	Go to Step 11	-
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 11	-
10	Repair the temperature door operation. Is the repair complete?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

DEFROSTING INSUFFICIENT

Defrosting Insufficient

Step	Action	Yes	No
DEFINITION: Time required to defrost the windshield is longer than normal.			
	Were you sent here from Symptoms or		Go to

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1	another diagnostic table?	Go to Step 2	<u>Symptoms - HVAC Systems - Manual</u> or <u>Symptoms - HVAC Systems - Automatic</u>
2	<ol style="list-style-type: none"> 1. Start the engine. 2. Select the DEFROST mode. 3. Select the maximum blower speed. <p>Does sufficient air flow from the defroster outlets?</p>	Go to Step 3	Go to Step 10
3	<p>Measure the engine operating temperature.</p> <p>Does engine reach a normal operating temperature?</p>	Go to Step 4	Go to Step 8
4	<ol style="list-style-type: none"> 1. Select the minimum blower speed. 2. Select the maximum temperature setting. <p>CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <ol style="list-style-type: none"> 3. Feel the temperature of the inlet and outlet hoses at the heater core. <p>Does the inlet hose feel warmer than the outlet hose?</p>	Go to Step 11	Go to Step 5
5	<p>Test the operation of the A/C compressor clutch.</p> <p>Does the A/C compressor clutch engage?</p>	Go to Step 7	Go to Step 6
6	<p>Repair the A/C compressor clutch. Refer to <u>Air Conditioning Compressor Malfunction</u> .</p> <p>Is the repair complete?</p>	Go to Step 14	-
	<p>Perform the A/C system performance test. Refer to <u>Air Conditioning (A/C)</u></p>		

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7	<p><u>System Performance Test.</u> Is the A/C system operating within the specifications?</p>	Go to Step 9	Go to Step 12
8	<p>Repair the low engine temperature concern. Refer to <u>Engine Fails To Reach Normal Operating Temperature .</u> Is the repair complete?</p>	Go to Step 14	-
9	<p>Inspect for correct operation of the recirculation door. Is the recirculation door operating correctly?</p>	Go to Step 14	Go to Step 13
10	<p>Repair the air delivery concern. Refer to <u>Air Delivery Improper</u> for the manual system or <u>Air Delivery Improper</u> for the automatic system. Is the repair complete?</p>	Go to Step 14	-
11	<p>Repair the heating concern. Refer to <u>Heating Performance Diagnostic (Front System Only)</u> or <u>Heating Performance Diagnostic (Auxiliary System).</u> Is the repair complete?</p>	Go to Step 14	-
12	<p>Repair the A/C performance concern. Refer to <u>Symptoms - HVAC Systems - Manual</u> for the manual system or <u>Symptoms - HVAC Systems - Automatic</u> for the automatic system. Is the repair complete?</p>	Go to Step 14	-
13	<p>Repair the recirculation door concern. Refer to <u>Air Recirculation Malfunction</u> for the manual system or <u>Air Recirculation Malfunction</u> for the automatic system. Is the repair complete?</p>	Go to Step 14	-
14	<p>Operate the system in order to verify the repair. Did you find and correct the problem?</p>	System OK	Go to Step 2

NOISE DIAGNOSIS - AUXILIARY BLOWER MOTOR

Noise Diagnosis - Auxiliary Blower Motor

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
2	<ol style="list-style-type: none"> 1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn ON the ignition, with the engine OFF. 4. Cycle the auxiliary blower motor through all of the speeds and modes in order to determine where and when the noise occurs. <p>Is a noise evident during auxiliary blower operation?</p>	Go to Step 3	Go to Step 10
3	Does the noise vary with the auxiliary blower speed?	Go to Step 4	Go to Step 5
4	<p>Inspect for excessive vibration at each auxiliary blower motor speed by feeling the auxiliary blower case.</p> <p>Is excess vibration present?</p>	Go to Step 5	Go to Step 10
5	<ol style="list-style-type: none"> 1. Remove the auxiliary blower motor. Refer to <u>Auxiliary Blower Motor Replacement</u>. 2. Inspect the auxiliary blower motor for deposits of foreign material. <p>Did you find foreign material on the</p>		

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	auxiliary blower motor?	Go to Step 7	Go to Step 6
6	<p>Inspect the auxiliary blower motor for the following conditions:</p> <ul style="list-style-type: none"> • Cracked blades • A loose impeller retainer • Improper impeller alignment <p>Did you find any of these conditions?</p>	Go to Step 8	Go to Step 9
7	<p>Remove the foreign material. Is the action complete?</p>	Go to Step 10	-
8	<p>Replace the auxiliary blower motor. Refer to <u>Auxiliary Blower Motor Replacement</u>. Is the action complete?</p>	Go to Step 10	-
9	<p>Install the auxiliary blower motor. Refer to <u>Auxiliary Blower Motor Replacement</u>. Is the action complete?</p>	Go to Step 10	-
10	<p>Operate the system in order to verify the repair. Did you find and correct the condition?</p>	System OK	Go to Step 2

NOISE DIAGNOSIS - BLOWER MOTOR

Noise Diagnosis - Blower Motor

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Manual</u> or <u>Symptoms - HVAC Systems - Automatic</u>
2	Inspect the air inlet grille for debris. Is debris present?	Go to Step 8	Go to Step 3

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3	<ol style="list-style-type: none"> 1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn ON the ignition, with the engine OFF. 4. Cycle the blower motor through all of the speeds and modes in order to determine where and when the noise occurs. <p>Is a noise evident during the blower operation?</p>	Go to Step 4	Go to Step 11
4	<p>Inspect for excessive vibration at each blower motor speed by feeling the blower case.</p> <p>Is excess vibration present?</p>	Go to Step 6	Go to Step 5
5	<p>Listen to the blower motor at each speed.</p> <p>Is the blower motor making a squeaking or chirping noise?</p>	Go to Step 9	Go to Step 11
6	<ol style="list-style-type: none"> 1. Remove the blower motor. Refer to <u>Blower Motor Replacement</u>. 2. Inspect the blower motor impeller for deposits of foreign material. 3. Inspect the blower motor for deposits of foreign material. <p>Did you find any foreign material on the blower motor or blower motor impeller?</p>	Go to Step 8	Go to Step 7
7	<p>Inspect the blower motor for the following conditions:</p> <ol style="list-style-type: none"> 1. Cracked blades 2. A loose impeller retainer 3. Improper impeller alignment <p>Did you find any of these conditions?</p>	Go to Step 9	Go to Step 10
8	Remove the foreign material.		-

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	Is the action complete?	Go to Step 10	
9	Replace the blower motor. Refer to <u>Blower Motor Replacement</u> . Is the repair complete?	Go to Step 11	-
10	Install the blower motor. Refer to <u>Blower Motor Replacement</u> . Is the action complete?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

NOISE DIAGNOSIS - AIR CONDITIONING (A/C) SYSTEM

Noise Diagnosis - Air Conditioning (A/C) System

Step	Action	Yes	No
DEFINITION: Noise originating from the A/C compressor, drive belt or the A/C lines.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Manual</u> or Go to <u>Symptoms - HVAC Systems - Automatic</u>
2	<ol style="list-style-type: none"> 1. A/C system noises can be generally categorized into three areas: <ul style="list-style-type: none"> • Screeching, squealing, chirping noises • Moaning noises • Vibration/rattle noises 2. Start the engine. 3. Ensure that the A/C is ON. Is a screeching, squealing noise heard when the A/C is engaged?	Go to Step 3	Go to Step 9
	With the engine OFF, inspect the drive belt		

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3	<p>for excessive wear. Refer to <u>Drive Belt Falls Off and Excessive Wear Diagnosis</u> .</p> <p>Is the drive belt excessively worn?</p>	Go to Step 18	Go to Step 4
4	<p>Inspect the drive belt tension. Refer to <u>Drive Belt Tensioner Diagnosis</u> .</p> <p>Is the drive belt tension correct?</p>	Go to Step 5	Go to Step 19
5	<p>Inspect the drive belt for excessive oil coverage.</p> <p>Is the drive belt covered with oil?</p>	Go to Step 17	Go to Step 6
6	<ol style="list-style-type: none"> 1. Start the engine. 2. Ensure that the A/C is ON. 3. Inspect the compressor and the clutch. <p>Is the A/C compressor locked up?</p>	Go to Step 24	Go to Step 7
7	<p>Is the A/C compressor clutch slipping?</p>	Go to Step 23	Go to Step 8
8	<p>CAUTION: Refer to <u>Moving Parts and Hot Surfaces Caution</u> .</p> <p>Using a stethoscope, listen to the A/C compressor for any abnormal noises. Is the compressor causing an abnormal noise?</p>	Go to Step 15	Go to Step 10
9	<p>Does a moaning noise exist when the A/C clutch is engaged?</p>	Go to Step 10	Go to Step 12
10	<p>Listen to the A/C compressor components and mounting for noise concerns using a stethoscope.</p> <p>Are any of these components loose, damaged or excessively worn?</p>	Go to Step 20	Go to Step 11
11	<ol style="list-style-type: none"> 1. Idle the engine. 2. Engage the A/C compressor clutch. 3. Using a stethoscope, move around the entire refrigerant plumbing system. Listening for any abnormal noises caused by a component of the A/C 		

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	<p>system touching another component.</p> <p>Are any of the A/C components grounding out and causing a vibration noise?</p>	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 25
14	<ol style="list-style-type: none"> 1. Idle the engine in PARK with the A/C compressor clutch engaged. 2. Using a stethoscope, move around the entire A/C system testing for any abnormal noises caused by a component. <p>Do any of the A/C components cause an abnormal noise?</p>	Go to Step 21	Go to Step 25
15	<p>Verify that the A/C system is properly charged. Refer to <u>Refrigerant System Capacities</u>.</p> <p>Is the A/C system properly charged?</p>	Go to Step 26	Go to Step 16
16	<p>Recharge the A/C system to specification. Refer to <u>Refrigerant Recovery and Recharging</u>.</p> <p>Is the abnormal compressor noise still present?</p>	Go to Step 24	Go to Step 26
17	<p>Repair the oil leak. Refer to <u>Oil Leak Diagnosis</u>.</p> <p>Is the repair complete?</p>	Go to Step 18	-
18	<p>Replace the drive belt. Refer to <u>Drive Belt Replacement</u>.</p> <p>Is the replacement complete?</p>	Go to Step 26	-
19	<p>Replace the drive belt tensioner. Refer to <u>Drive Belt Tensioner Replacement</u>.</p> <p>Is the replacement complete?</p>	Go to Step 26	-
20	<p>Repair or replace the A/C compressor mounting component.</p> <p>Is the repair complete?</p>	Go to Step 26	-

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21	Repair or replace the component which is causing the moaning concern as needed. Is the repair complete?	Go to Step 26	-
22	Correctly route or insulate the A/C component. Is the repair complete?	Go to Step 26	-
23	Replace the A/C compressor clutch. Refer to <u>Compressor Clutch Assembly Replacement.</u> Is the repair complete?	Go to Step 26	-
24	Replace the A/C compressor. Refer to <u>Compressor Replacement.</u> Is the repair complete?	Go to Step 26	-
25	The concern may be caused by an engine related component. Refer to <u>Vibration Analysis - Engine .</u> Did you find and correct the condition?	Go to Step 26	-
26	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

NOISE DIAGNOSIS - HVAC MODULE

Noise Diagnosis - HVAC Module

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to <u>Symptoms - HVAC Systems - Manual</u> or <u>Symptoms - HVAC Systems - Automatic</u>
	<ol style="list-style-type: none"> 1. Start the engine. 2. Cycle through all of the following: <ul style="list-style-type: none"> • Blower motor speeds • HVAC modes 		

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2	<ul style="list-style-type: none"> • Temperature control settings <p>3. Determine the type of noise:</p> <ul style="list-style-type: none"> • Scrape, pop • Tick/click, chirp or groaning • Air rush/whistle <p>Is a scrape or pop noise evident when selecting modes or temperature settings?</p>	Go to Step 6	Go to Step 3
3	<p>Is a tick/click, chirping, groaning or scraping noise present, but decreases as blower motor speed is decreased?</p>	Go to Step 6	Go to Step 4
4	<p>Is an air rush/whistle noise evident in all modes but not all temperature settings?</p>	Go to Step 6	Go to Step 5
5	<p>Is an air rush/whistle noise evident only in defrost or floor mode?</p>	Go to Step 6	Go to Step 6
6	<p>Remove the instrument panel I/P carrier. Refer to <u>Instrument Panel Carrier Replacement</u> .</p> <p>Is the action complete?</p>	Go to Step 7	-
7	<ol style="list-style-type: none"> 1. Inspect the air flow doors for proper operation. 2. Inspect the ducts for obstructions or foreign materials. <p>Were any of these conditions found?</p>	Go to Step 10	Go to Step 8
8	<p>Inspect the mode and temperature doors and seals for warping or cracking. Are the doors in normal condition?</p>	Go to Step 11	Go to Step 9
9	<p>Replace the appropriate door and/or seals. Is the repair complete?</p>	Go to Step 11	-
10	<p>Remove any obstructions or foreign material found. Is the action complete?</p>	Go to Step 11	-
11	<p>Install the I/P carrier. Refer to <u>Instrument Panel Carrier Replacement</u> .</p> <p>Is the action complete?</p>	Go to Step 12	-

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12	Operate the system to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2
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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</u> - <u>HVAC Systems</u> - <u>Manual</u> or Go to <u>Symptoms</u> - <u>HVAC Systems</u> - <u>Automatic</u>
2	<ol style="list-style-type: none"> 1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start the engine. 4. Allow the engine idle at normal operating temperature. 5. Select the maximum blower speed. 6. Select the PANEL air outlet mode. 7. Select the coldest temperature setting. 8. Cycle through all of the blower speeds, modes and temperatures to define what type of odor is present. <ul style="list-style-type: none"> • Musty smell • Coolant smell • Oil smell 	Go to Step 3	Go to Step 8
3	Does the odor have a musty smell? Inspect the HVAC filter and the air inlet grille for debris. Is debris present?	Go to Step 4	Go to Step 5

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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: <ul style="list-style-type: none"> • Water leaks around the windshield • Blockage of the HVAC module drain • Leaks around the door seals Is a leak present?	Go to Step 7	Go to Step 14
7	Repair the leak as necessary. Is the repair complete?	Go to Step 15	-
8	Does the odor have a coolant smell?	Go to Step 9	Go to Step 12
9	Inspect the cooling system for leaks. Refer to <u>Loss of Coolant</u> . Is a leak present?	Go to Step 10	Go to Step 12
10	Inspect for coolant leaking inside the vehicle or for a film build-up on the windshield. Is the condition present?	Go to Step 11	Go to Step 15
11	Replace the heater core. Refer to <u>Heater Core Replacement</u> . Is the repair complete?	Go to Step 15	-
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15
13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: <ul style="list-style-type: none"> • <u>Oil Consumption Diagnosis</u> • <u>Fluid Leak Diagnosis</u> 2. Repair any oil leaks. Is the repair complete?	Go to Step 15	-
	A musty odor can be caused by mold or mildew build-up on the evaporator or		

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14	the heater core or inside of the HVAC module. Refer to <u>Odor Correction</u> . Is the action complete?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

REPAIR INSTRUCTIONS

ODOR CORRECTION

Eliminating Air Conditioning 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.

REFRIGERANT RECOVERY AND RECHARGING

Tools Required

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

CAUTION: Avoid breathing the A/C Refrigerant 134a (R-134a) and the lubricant vapor or the mist. Exposure may irritate the eyes, nose and throat. Work in a well ventilated area. In order to remove R-134a from the A/C system, use service equipment that is certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

CAUTION: For personal protection, goggles and gloves should be worn and a clean cloth wrapped around fittings, valves and connections when doing work that includes opening the refrigerant system. If R-134a 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.

- NOTE:** 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.
- NOTE:** To avoid system damage use only R-134a dedicated tools when servicing the A/C system.
- NOTE:** Use only Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system and only 525 viscosity mineral oil on fitting threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure may result.
- NOTE:** R-12 refrigerant and R-134a refrigerant must never be mixed, even in the smallest of amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur. Refer to the manufacturer instructions included with the service equipment before servicing.

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

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

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

Refer to the **J 43600** ACR 2000 manual for operation and setup instruction. See **Special Tools**. Always recharge the A/C System with the proper amount of R-134a. Refer to **Refrigerant System Capacities** for the correct amount.

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement, the oil must be replenished. Oil can be injected into a charged system using **J 45037**. See **Special Tools**. For the proper quantities of oil to add to the A/C refrigerant system, refer to **Refrigerant System Capacities**.

FLUSHING

Tools Required

- **J 43600** ACR 2000 Air Conditioning Service Center. See **Special Tools**.
- **J 45268** A/C Flushing Adapter Kit. See **Special Tools**.
- **J 41447** Leak Detection Dye. See **Special Tools**.
- **J 42220** R-134A A/C Tracer Dye - Box of 24. See **Special Tools**.

IMPORTANT: Flushing with the J 43600 is not intended to remove metal from the A/C system. See Special Tools.

Flushing is intended to remove the following contaminants:

- Contaminated polyalkylene glycol (PAG) oil
- Desiccant, following a desiccant bag failure
- Overcharge of PAG oil
- Refrigerant contamination

Flushing Procedure

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

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Remove the front thermal expansion valve (TXV). Refer to **Thermal Expansion Valve Replacement**.
3. Install the J 45268-121 in place of the TXV.
4. Remove the A/C compressor. Refer to **Compressor Replacement**.
5. Install J 45268-5 to the discharge hose.
6. Install J 45268-4 to the suction hose.

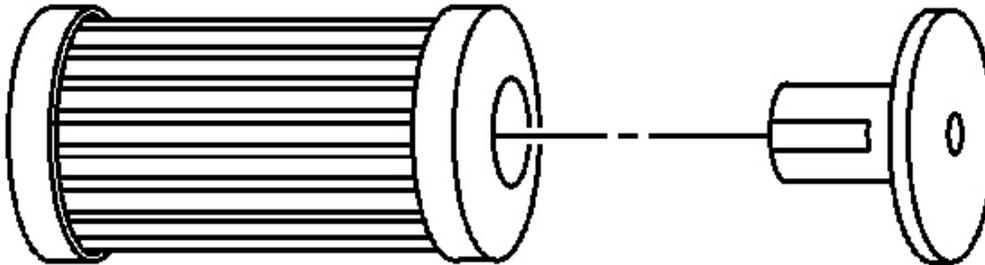


Fig. 2: View Of A/C Filter & Check Valve
Courtesy of GENERAL MOTORS CORP.

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

Perform the following procedure:

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

1. Service the filter with ACDelco P/N GF 470 before each flush.
 2. Connect J 45268-1 to the suction port of J 45268-4.
 3. Connect the blue hose from J 43600 to J 45268-1 flush filter adapter. See **Special Tools**.
 4. Connect the red hose from J 43600 to J 45268-5 flush adapter. See **Special Tools**.
8. Reverse flow refrigerant flushing is recommended for desiccant failure. Replace the desiccant when the A/C flush is complete and perform the following procedure:

IMPORTANT: The filter inside J 45268-1 is serviceable.

1. Service the filter with ACDelco P/N GF 470 before each flush.
2. Connect J 45268-1 to the discharge port of J 45268-5.
3. Connect the blue hose from J 43600 to J 45268-1 flush filter adapter. See **Special Tools**.
4. Connect the red hose from J 43600 to the suction port of J 45268-4 flush adapter. See

Special Tools.

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

9. Flush the front A/C system. Follow the instructions supplied with the **J 43600** . See **Special Tools.**

IMPORTANT: Flush the front A/C system before flushing the auxiliary A/C system.

10. If the vehicle is equipped with rear A/C, flush the auxiliary A/C system separately.
 1. Remove J 45268-121 from the front evaporator.
 2. Inspect the front TXV for debris. Clean or replace as needed.
 3. Install the front TXV. Refer to **Thermal Expansion Valve Replacement.**
 4. Install J 45268-121 in place of the auxiliary TXV.
11. Flush the auxiliary A/C system. Follow the instructions supplied with **J 43600** . See **Special Tools.**
12. Remove J 45268-5 from the discharge hose.
13. Remove J 45268-4 from the suction hose.

IMPORTANT: 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.

14. If the removed A/C compressor is being reinstalled, perform the following procedure:
 1. Drain the PAG oil from the A/C compressor.

Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.

2. Add the total system capacity of PAG oil to the A/C compressor. Refer to **Refrigerant System Capacities.**
15. If you will replace the A/C compressor after flushing the system, perform the following procedure:
 1. A new service compressor is shipped with PAG oil. Refer to the **Refrigerant System Capacities.**

2. If the service compressor is shipped with PAG oil, DO NOT drain the new PAG oil from the compressor.
3. Deduct the amount of PAG oil shipped with the service compressor from the amount of PAG oil listed in the capacities table. Refer to **Refrigerant System Capacities**.

Add the calculated amount to the compressor, as needed.

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

16. Add one bottle of **J 41447** directly to the A/C compressor. See **Special Tools**.
17. Install the A/C compressor. Refer to **Compressor Replacement**.
18. Remove J 45268-121.
19. Inspect the auxiliary TXV for debris. Clean or replace as needed.
20. Install the auxiliary TXV. Refer to **Auxiliary Air Conditioning Evaporator Thermal Expansion Valve Replacement**.
21. Evacuate and recharge the A/C system. Refer to **Refrigerant Recovery and Recharging**.
22. Leak test the fittings using **J 42220** . See **Special Tools**.

COMPRESSOR OIL BALANCING

Draining Procedure

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

1. 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.

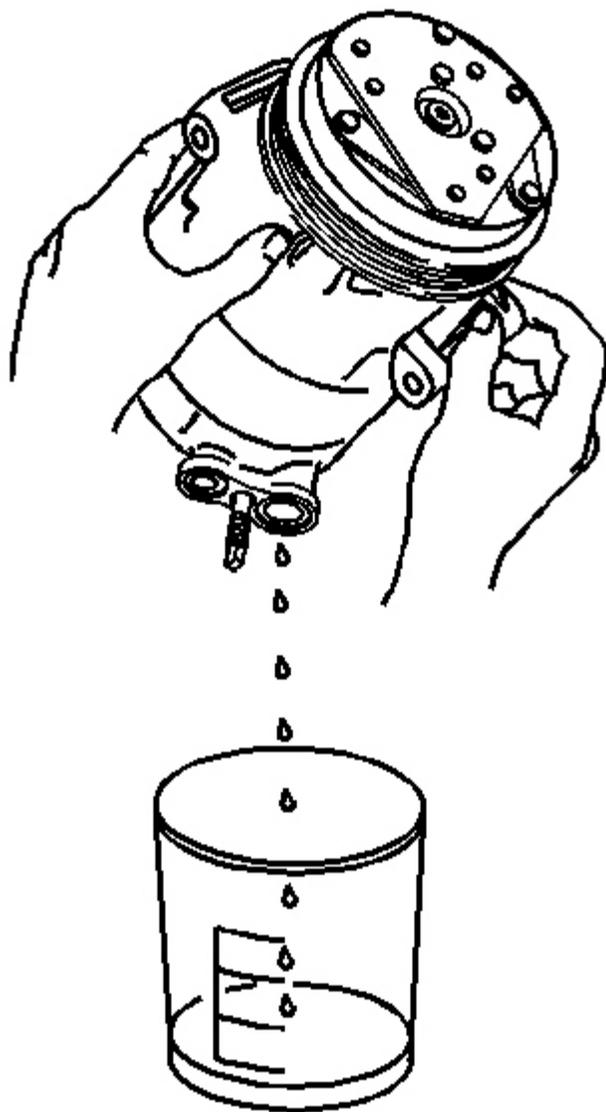


Fig. 3: Draining A/C Refrigerant Oil From Compressor
Courtesy of GENERAL MOTORS CORP.

2. Measure and record the amount of oil drained from the removed compressor.

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

3. Properly discard the used refrigerant oil.

Balancing Procedure

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

1. The replacement compressor is shipped with 74 ml (2.5 oz.) of refrigerant oil.

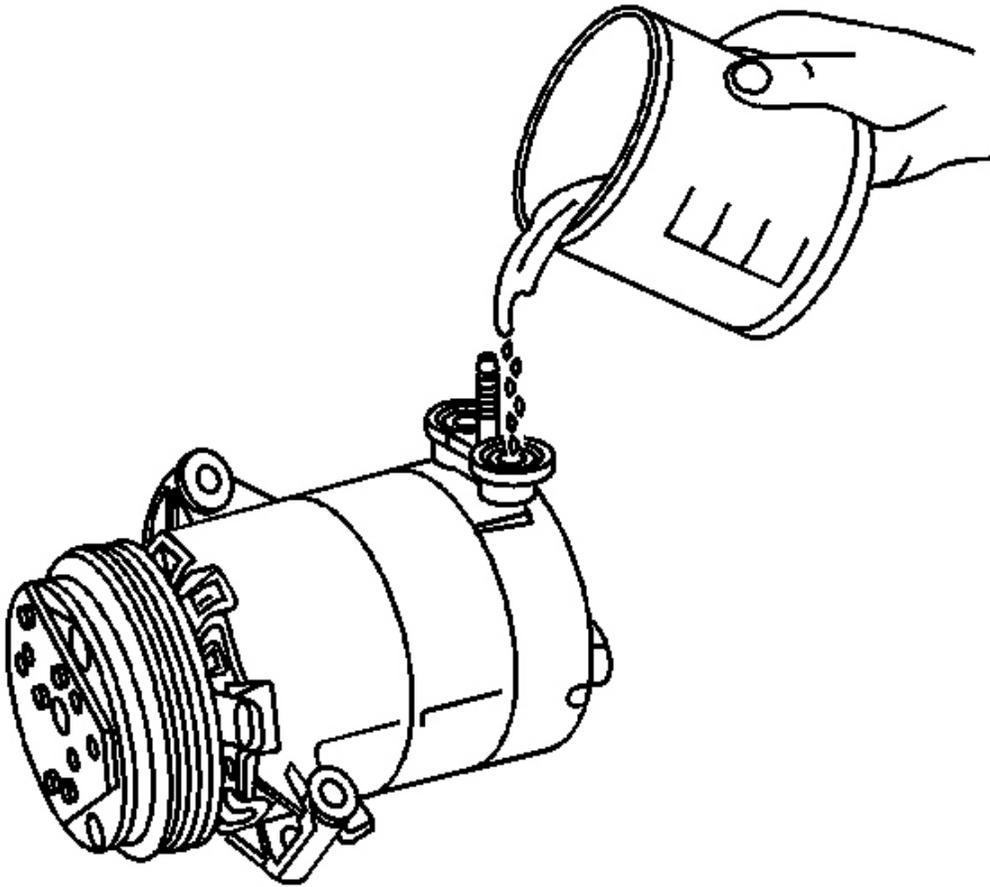


Fig. 4: Replacing Measured Compressor Oil
Courtesy of GENERAL MOTORS CORP.

2. Compare the amount of refrigerant oil recorded during compressor removal to the amount

of refrigerant oil shipped in the replacement compressor.

If the amount of refrigerant oil drained and recorded from the removed compressor is:

- Less than 74 ml (2.5 oz.)

Leave the 74 ml (2.5 oz.) in the replacement compressor.

- More than 74 ml (2.5 oz.)

Add to the compressor the difference between the 74 ml (2.5 oz.) and the amount drained.

COMPRESSOR REPLACEMENT

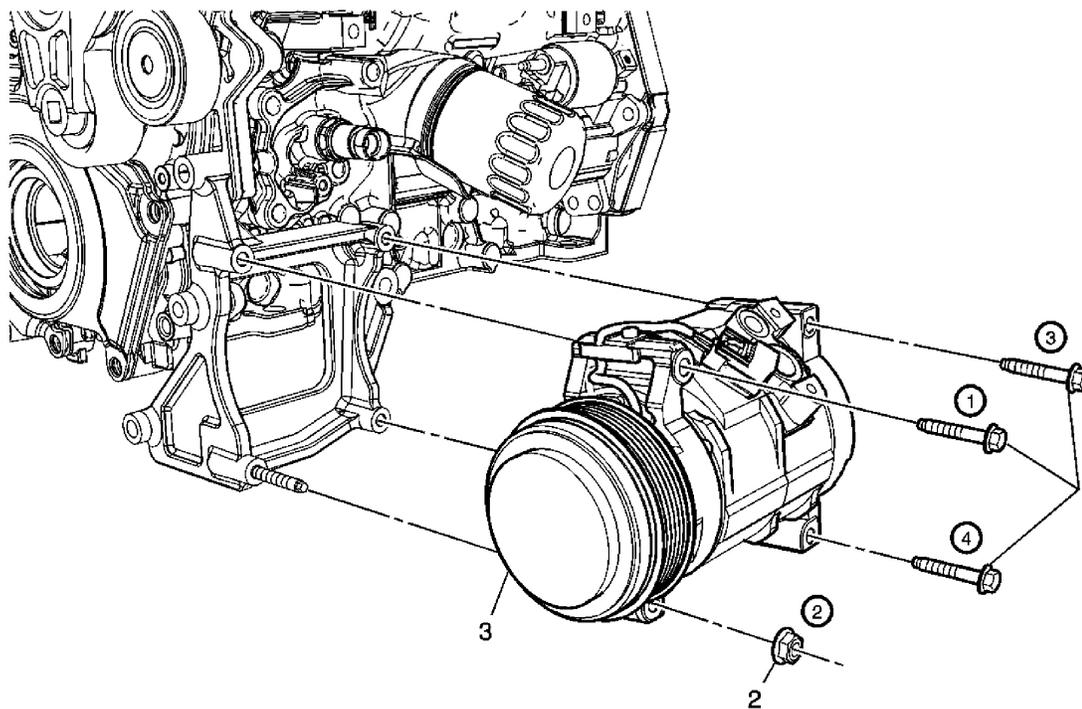


Fig. 5: View Of Air Conditioning Compressor
 Courtesy of GENERAL MOTORS CORP.

Compressor Replacement

Callout	Component Name
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Preliminary Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Remove the drive belt. Refer to **Drive Belt Replacement** .
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the right front fender liner. Refer to **Front Wheelhouse Liner Replacement (Front)** or **Front Wheelhouse Liner Replacement (Rear)** .
5. Disconnect the A/C compressor electrical connector.
6. Remove the A/C suction hose from the A/C compressor and cap hose. Refer to **Suction Hose Replacement**.
7. Remove the A/C discharge hose from the A/C compressor and cap hose. Refer to **Discharge Hose Replacement**.

1	<p>A/C Compressor Bolt (Qty: 3)</p> <p>NOTE: Refer to <u>Fastener Notice</u> .</p> <p>Tip: Tighten the A/C compressor mounting bolts and nut in sequence.</p> <p>Tighten: 50 N.m (37 lb ft)</p>
2	<p>A/C Compressor Nut</p> <p>Tighten: 50 N.m (37 lb ft)</p>
3	<p>A/C Compressor Assembly</p> <p>Procedure: Replacement of the desiccant cartridge is required upon new compressor replacement. Refer to <u>Air Conditioning Refrigerant Desiccant Replacement</u>.</p> <p>Tip:</p> <ol style="list-style-type: none"> 1. Use a low viscosity, poly-alkylene glycol (PAG) oil. Use of the incorrect oil can result in compressor failure. 2. When replacing the A/C compressor, balance the compressor. Refer to <u>Compressor Oil Balancing</u>. 3. Using J 39400 leak test A/C compressor fittings.

COMPRESSOR CLUTCH ASSEMBLY REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the engine splash shield. Refer to **Engine Splash Shield Replacement** .
3. Remove the drive belt. Refer to **Drive Belt Replacement** .

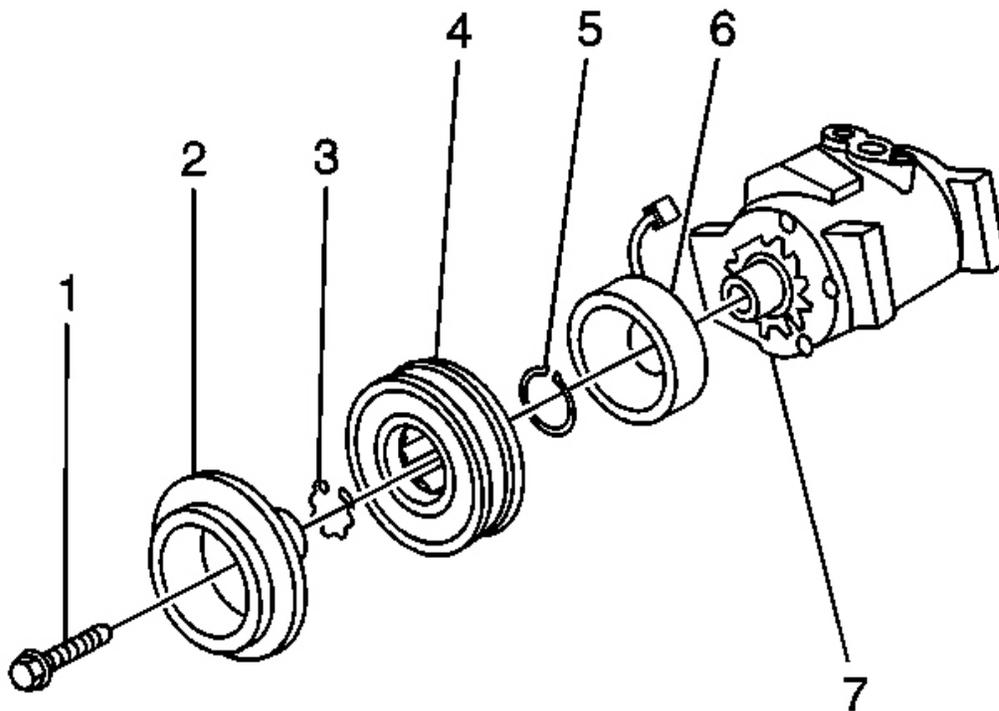


Fig. 6: Exploded View Of Compressor Clutch Plate Assembly
Courtesy of GENERAL MOTORS CORP.

4. Remove the clutch plate retaining bolt (1).
5. Remove the clutch plate assembly (2).
6. Remove the clutch hub/bearing snap ring (3).
7. Remove the clutch hub/bearing assembly (4).
8. Remove the snap ring (5) from the clutch coil (6).
9. Remove the clutch coil (6) from the A/C compressor (7).

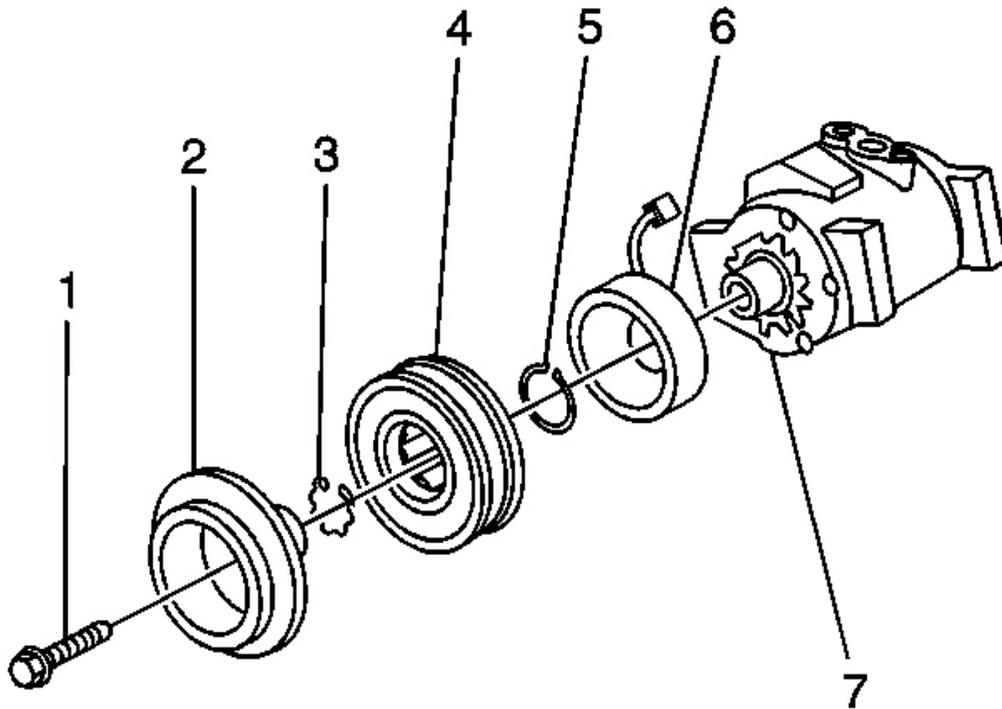


Fig. 7: Exploded View Of Compressor Clutch Plate Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the clutch coil (6) to the A/C compressor (7).
2. Install the snap ring (5) to the clutch coil (6).
3. Install the clutch hub/bearing assembly (4).
4. Install the clutch hub/bearing snap ring (3).
5. Place a small amount of oil on the thinnest air gap shim and place it inside the clutch plate.

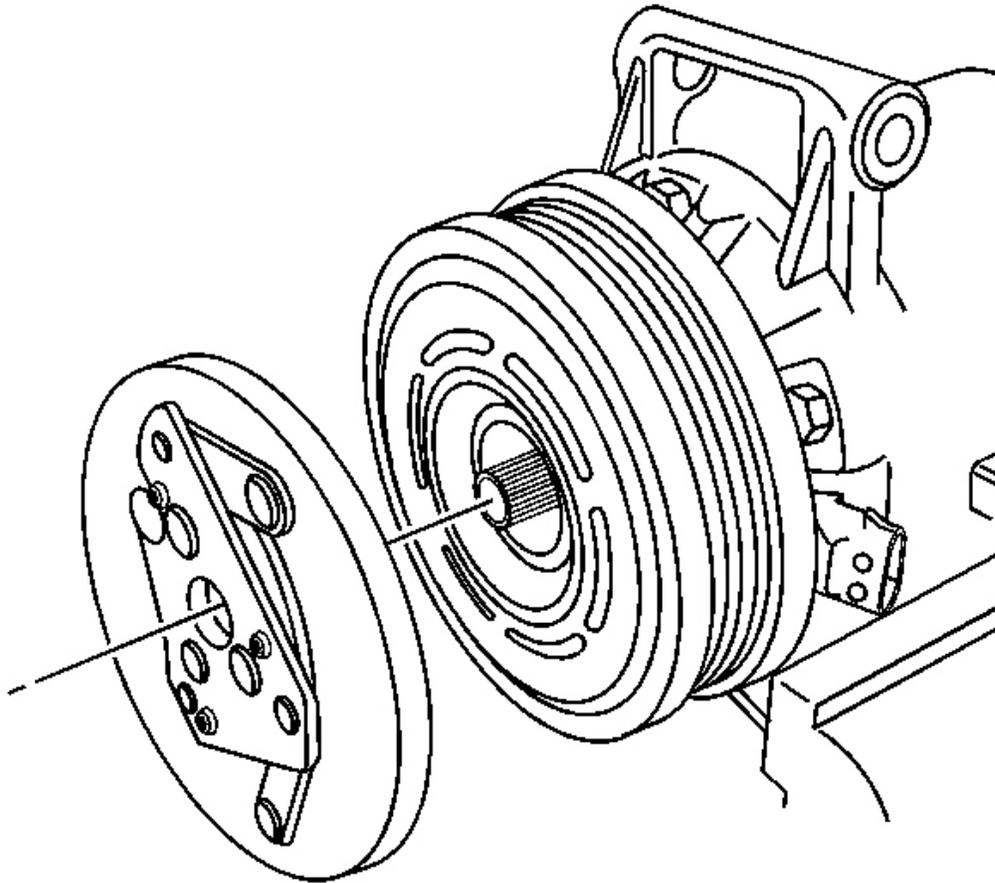


Fig. 8: Identifying Compressor Clutch Plate
Courtesy of GENERAL MOTORS CORP.

6. Install the clutch plate assembly.

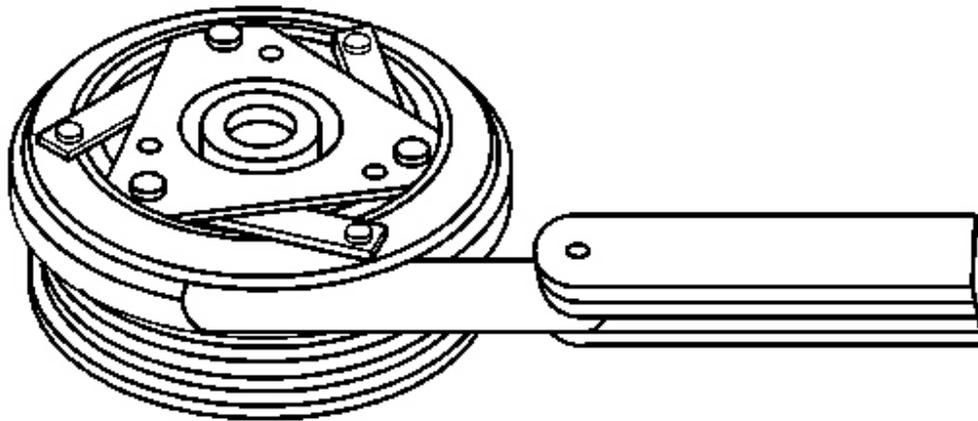


Fig. 9: Measuring Air Gap Between Pulley & Drive Plate
Courtesy of GENERAL MOTORS CORP.

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

7. Measure the air gap between the pulley and the drive plate. Adjust the shims to achieve a 0.35-0.65 mm (0.014-0.026 in) air gap.

NOTE: Refer to Fastener Notice .

8. Install the clutch plate retaining bolt.

Tighten: Tighten the bolt to 18 N.m (13 lb ft).

9. Install the drive belt. Refer to Drive Belt Replacement .
10. Install the engine protection shield. Refer to Engine Splash Shield Replacement .
11. Lower the vehicle.

SEALING WASHER REPLACEMENT

Removal Procedure

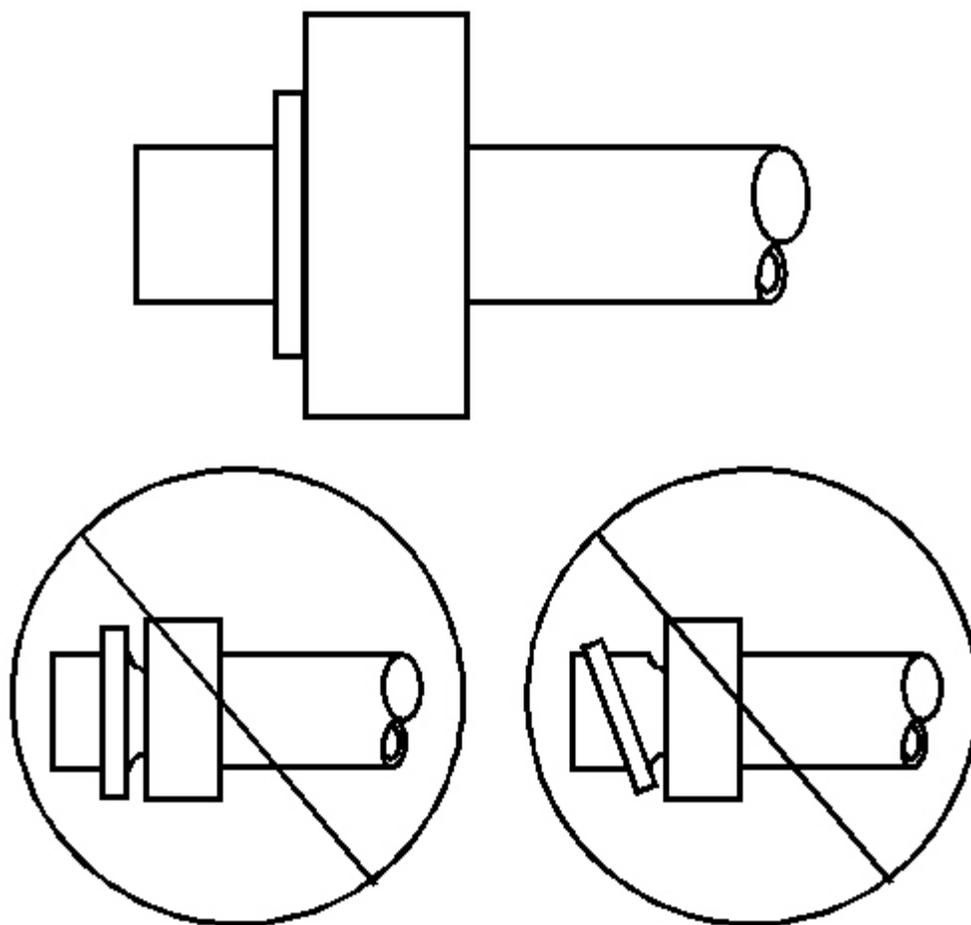


Fig. 10: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT: DO NOT reuse sealing washer.

4. Discard the sealing washer.

Installation Procedure

IMPORTANT: Flat washer type seals do not require lubrication.

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

Do not use a damaged seal washer.

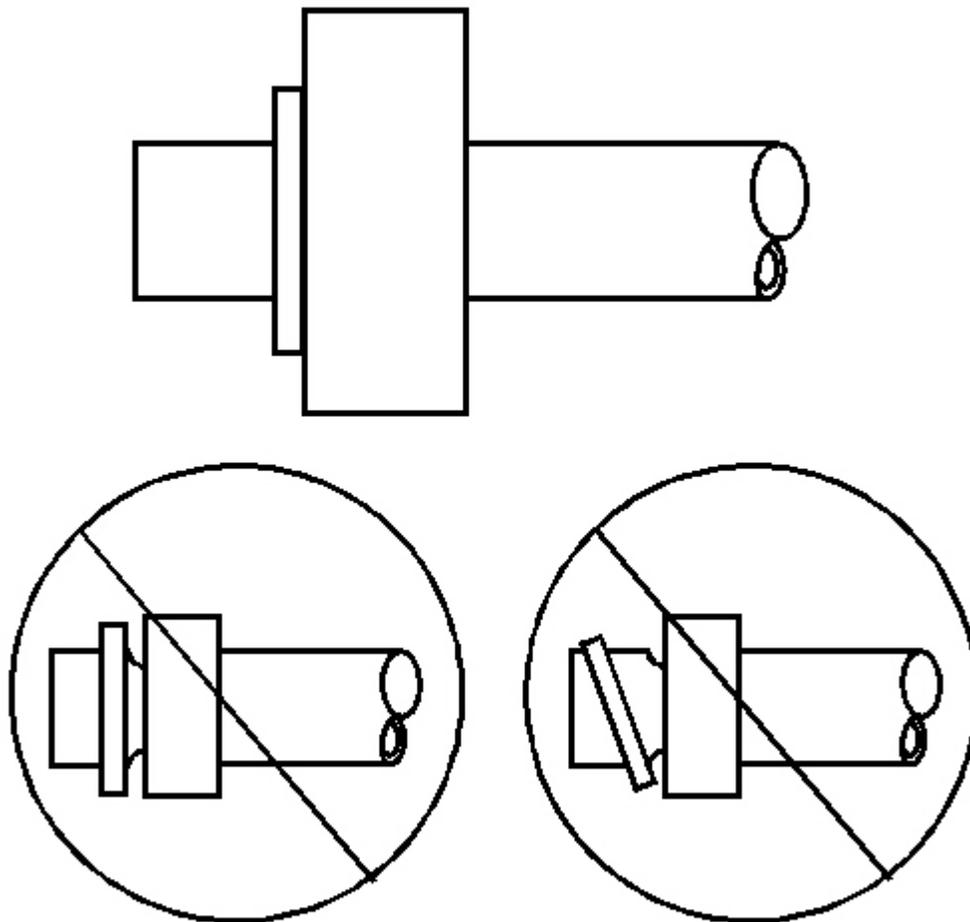


Fig. 11: Identifying Good & Bad Sealing Washer Positions
Courtesy of GENERAL MOTORS CORP.

2. Using a lint-free clean, dry cloth, clean the sealing surfaces of the A/C refrigerant

components.

3. Carefully install the new seal washer onto the A/C refrigerant component.
4. The washer must completely bottom against the surface of the fitting.

IMPORTANT: After tightening the A/C components, there should be a slight sealing washer gap of approximately 1.2 mm (3/64 in) between the A/C line and the A/C component.

5. Assemble the remaining A/C refrigerant components. Refer to the appropriate repair procedure.

O-RING REPLACEMENT

Removal Procedure

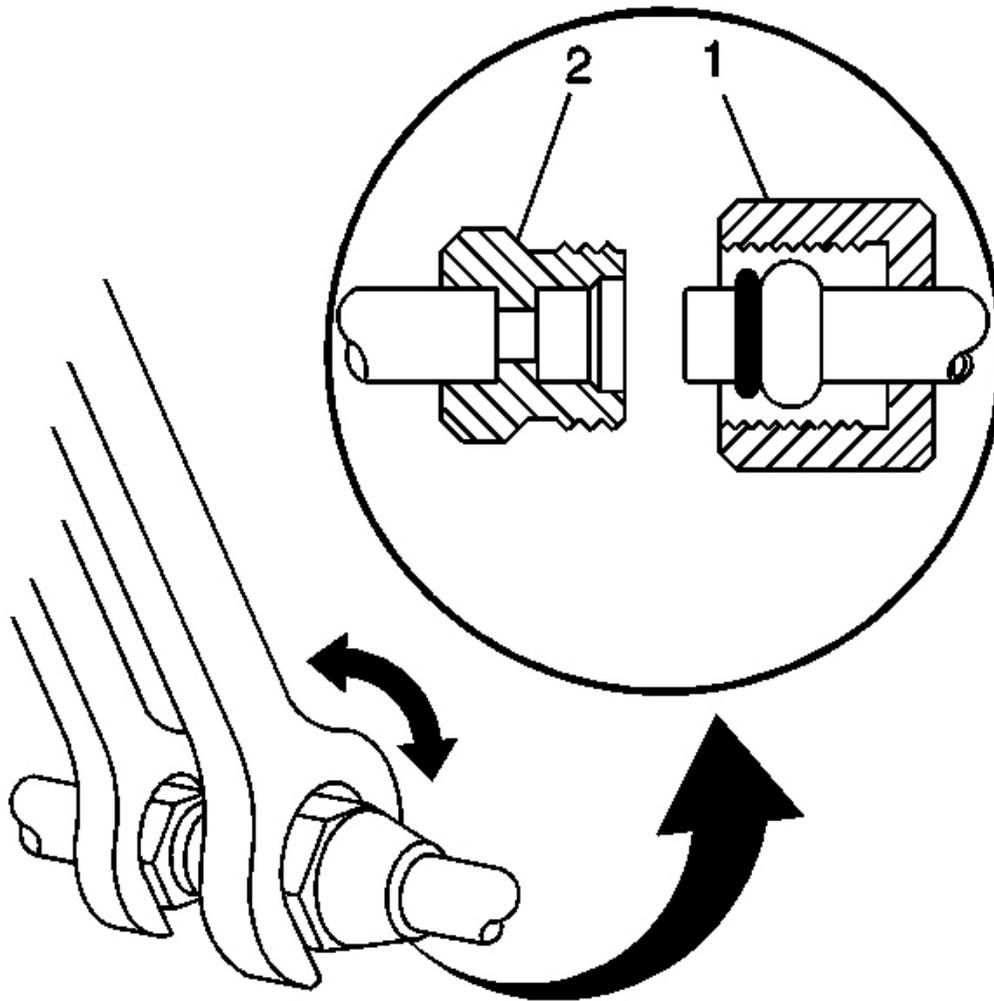


Fig. 12: Identifying A/C Compression Style Line Fittings
Courtesy of GENERAL MOTORS CORP.

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

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

Installation Procedure

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

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

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

IMPORTANT: DO NOT reuse O-ring seals.

4. Carefully slide the new O-ring seal onto the A/C refrigerant component.

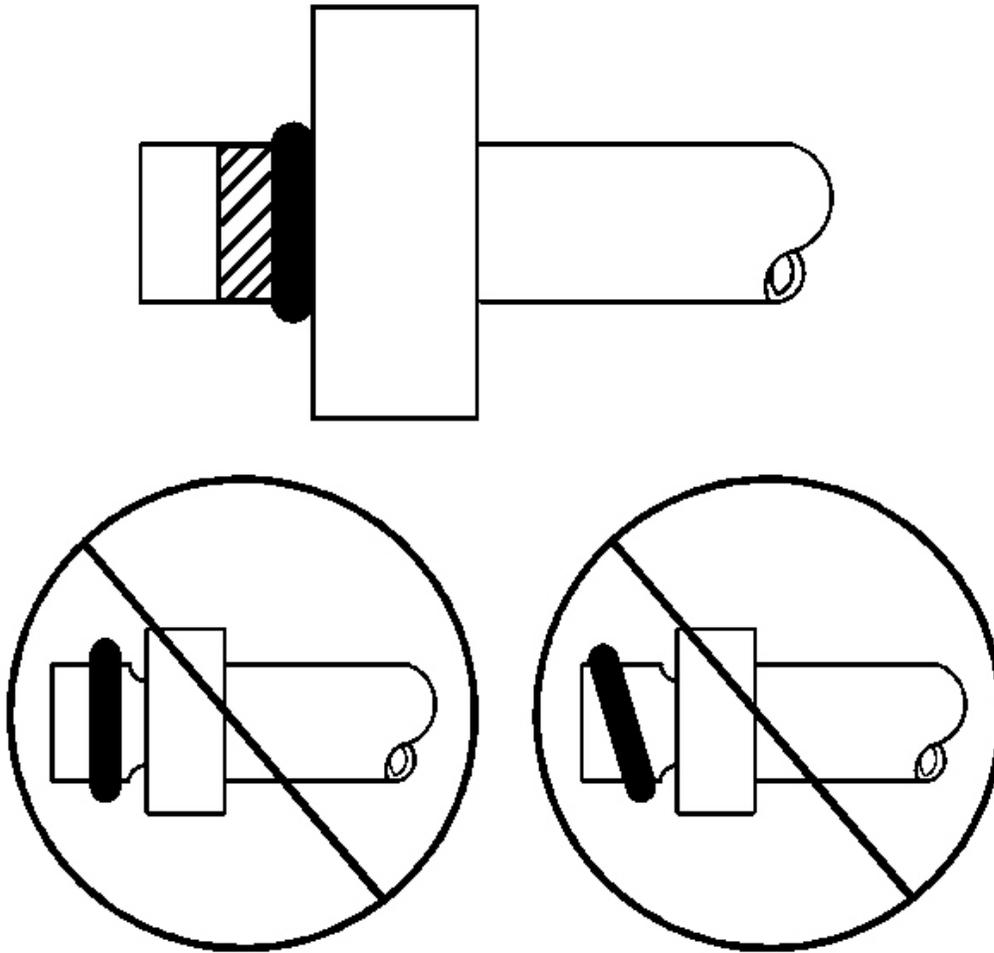


Fig. 13: Identifying Proper Seating Of A/C Refrigerant O-Ring
Courtesy of GENERAL MOTORS CORP.

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

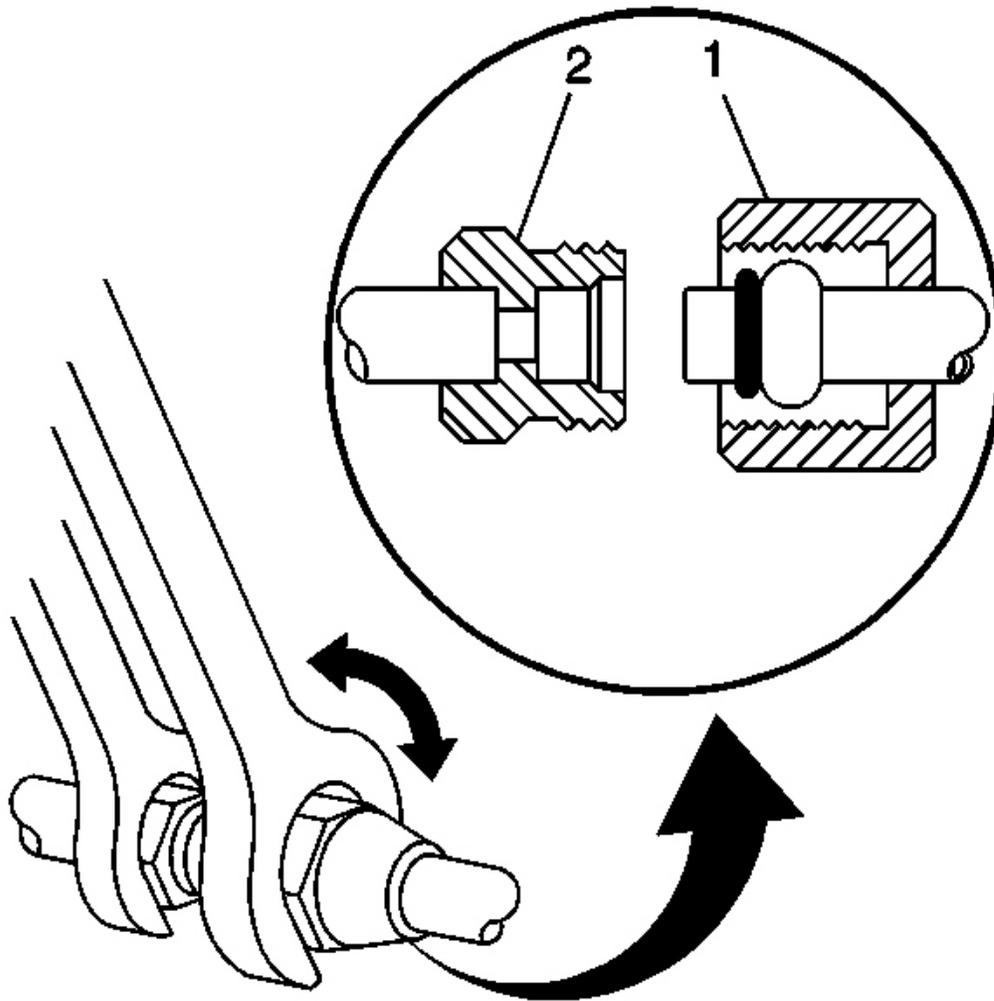


Fig. 14: Identifying A/C Compression Style Line Fittings
Courtesy of GENERAL MOTORS CORP.

6. Assemble the A/C components.

Refer to the appropriate repair procedure.

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

specification.

DISCHARGE HOSE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the right front wheel house liner. Refer to **Front Wheelhouse Liner Replacement (Front)** or **Front Wheelhouse Liner Replacement (Rear)** .
4. Remove the right front engine splash shield. Refer to **Engine Splash Shield Replacement** .
5. Remove right headlamp assembly. Refer to **Headlamp Capsule Replacement** .
6. Remove the front grill. Refer to **Radiator Grille Replacement (Outer)** or **Radiator Grille Replacement (Inner)** .

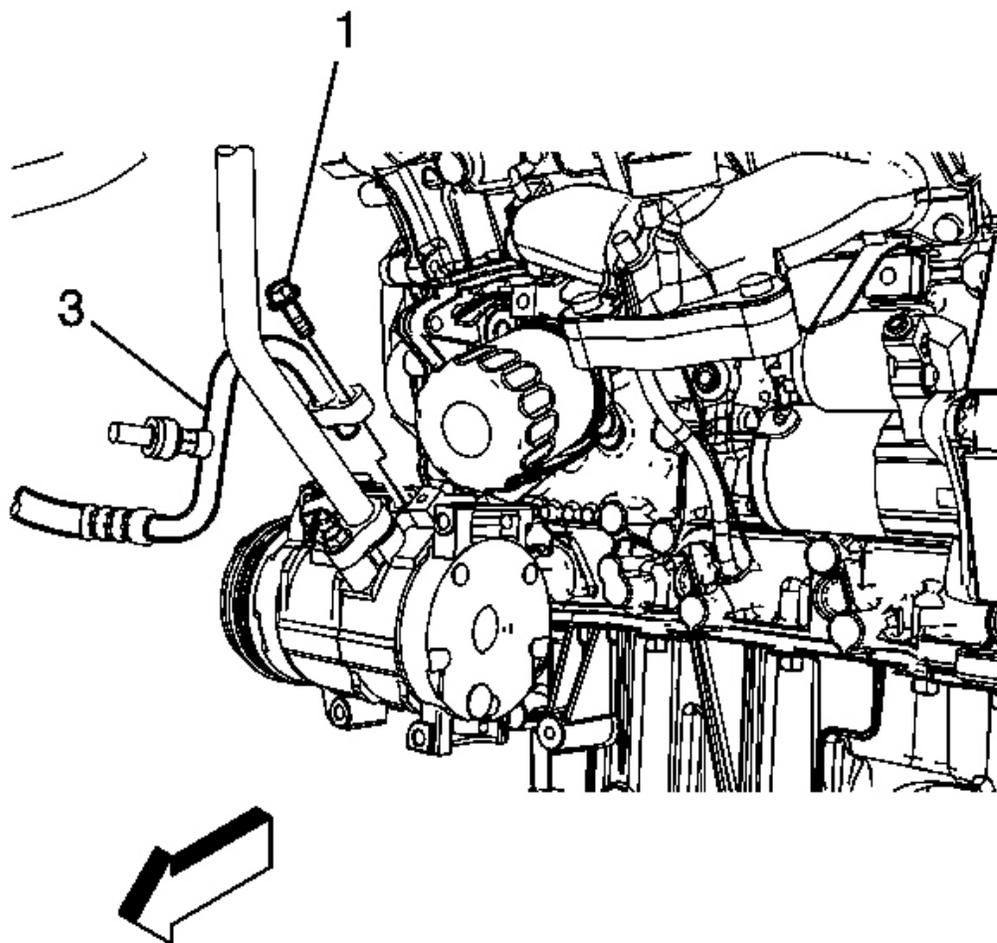


Fig. 15: Identifying A/C Compressor Discharge Line & Bolt
Courtesy of GENERAL MOTORS CORP.

7. Remove the electrical connector from the A/C pressure switch.
8. Remove the discharge line bolt from the A/C compressor (1).
9. Disconnect the discharge line from the A/C compressor (3).

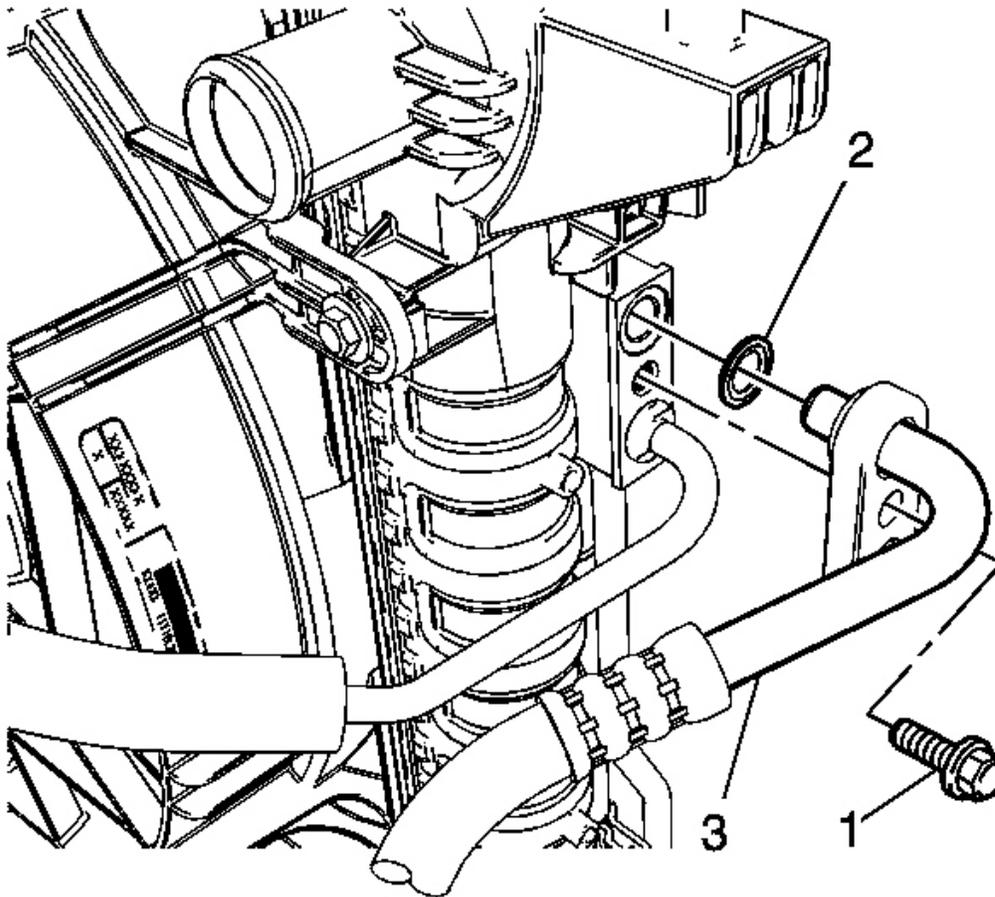


Fig. 16: Identifying Condenser & Bolt
Courtesy of GENERAL MOTORS CORP.

10. Remove the discharge line to condenser bolt (1).
11. Disconnect the discharge line from the condenser (3).
12. Remove the discharge line.
13. Remove the A/C pressure switch. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement**.
14. Remove and discard the discharge line O-rings (2).

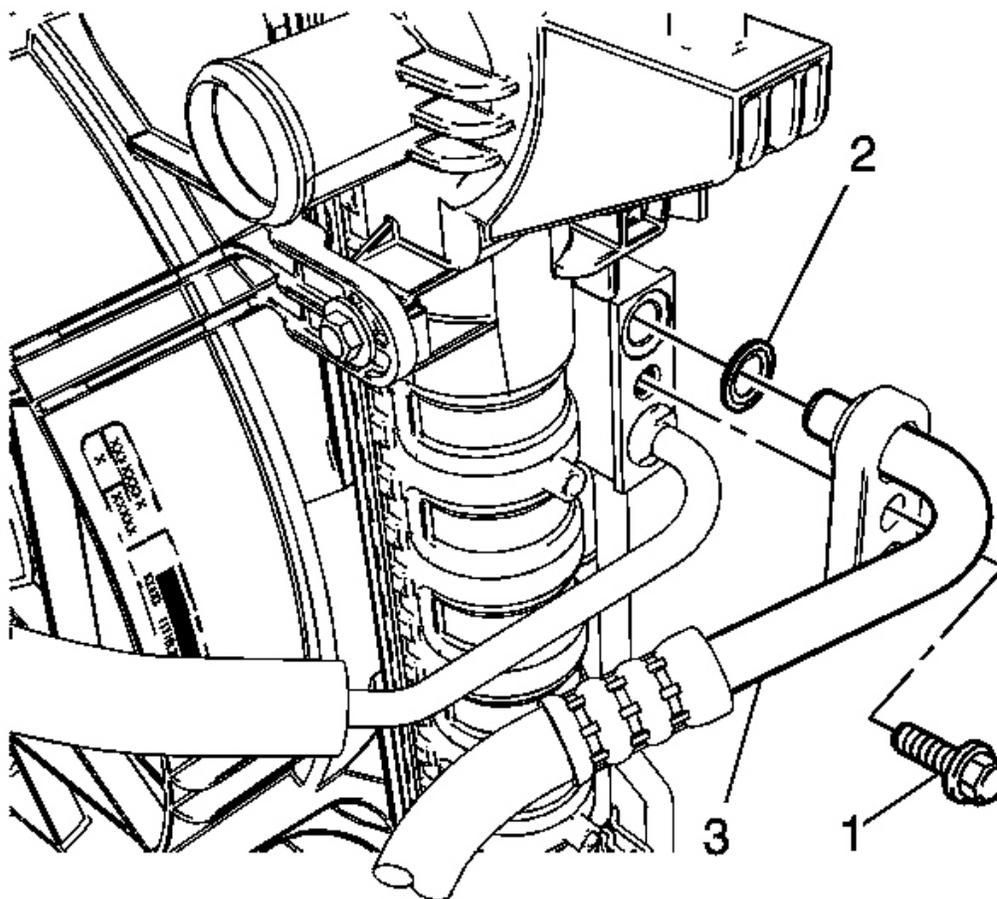


Fig. 17: Identifying Condenser & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install new O-rings to the discharge line (2). Refer to **O-Ring Replacement**.
2. Connect the discharge line to the condenser (3).

NOTE: Refer to **Fastener Notice** .

3. Install the discharge line to condenser bolt (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

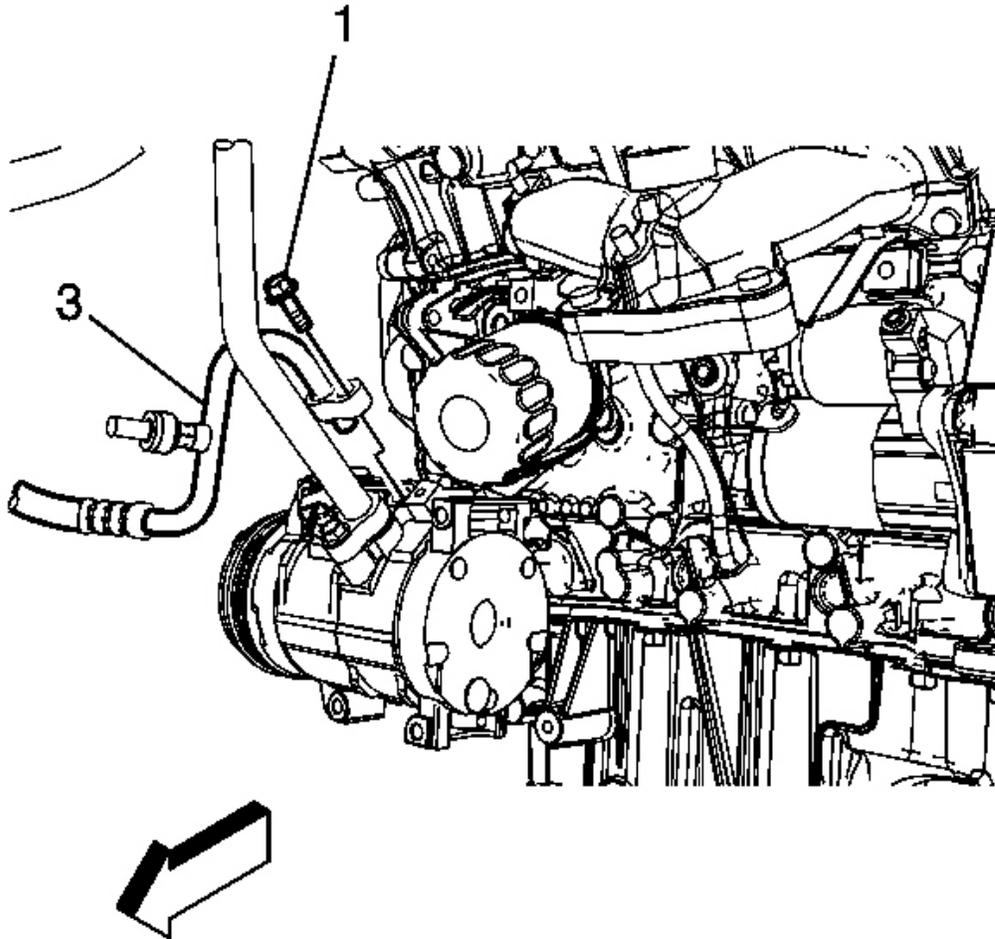


Fig. 18: Identifying A/C Compressor Discharge Line & Bolt
Courtesy of GENERAL MOTORS CORP.

4. Connect the discharge line to the A/C compressor (3).
5. Install the discharge line bolt to the A/C compressor (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

6. Install the A/C pressure switch and connect the electrical connector.
7. Install the right front engine splash shield. Refer to **Engine Splash Shield Replacement** .
8. Install the right front wheel house liner. Refer to **Front Wheelhouse Liner Replacement**

(Front) or Front Wheelhouse Liner Replacement (Rear) .

9. Install the right headlamp assembly. Refer to **Headlamp Capsule Replacement**
10. Install the front grill. Refer to **Radiator Grille Replacement (Outer)** or **Radiator Grille Replacement (Inner)** .
11. Lower the vehicle.
12. Evacuate and recharge the refrigerant system. Refer to **Refrigerant Recovery and Recharging**.
13. Leak test the fittings of the component using **J 39400-A** . See **Special Tools**.

SUCTION HOSE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the right front wheel house liner. Refer to **Front Wheelhouse Liner Replacement (Front)** or **Front Wheelhouse Liner Replacement (Rear)** .
4. Remove the right front engine splash shield. Refer to **Engine Splash Shield Replacement** .

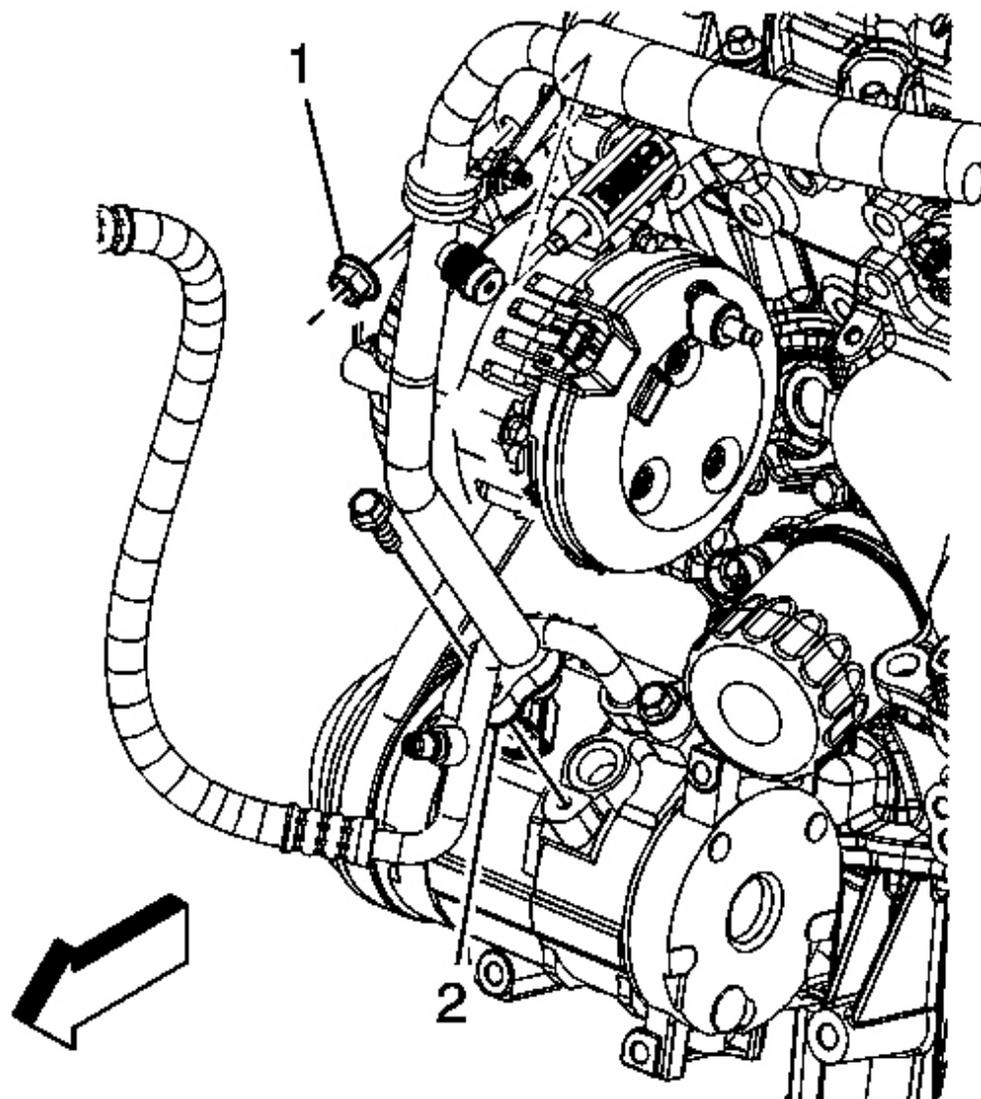


Fig. 19: Identifying Suction Hose Bracket Nut
Courtesy of GENERAL MOTORS CORP.

5. Remove the suction hose bracket nut (1) and remove bracket.
6. Remove the suction hose/pipe bolt from the A/C compressor.
7. Disconnect the suction hose/pipe from the A/C compressor.

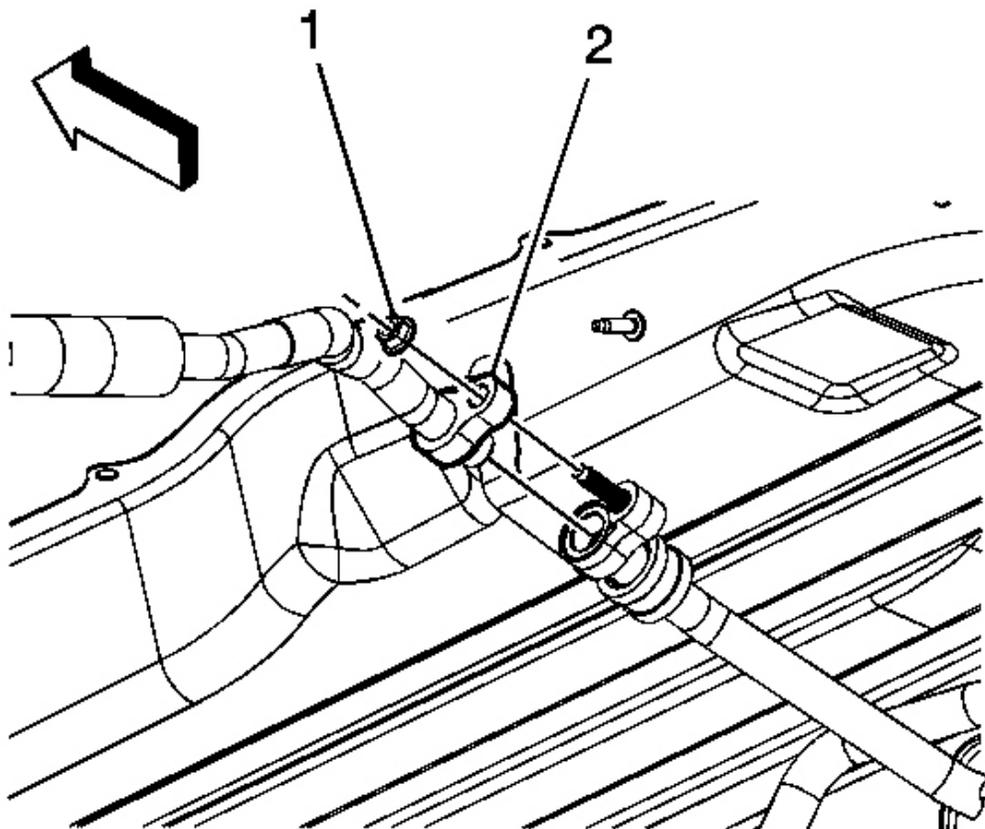


Fig. 20: View Of Suction Hose/Pipe Nut & TXV Tube
Courtesy of GENERAL MOTORS CORP.

8. Remove the suction hose/pipe nut (1) from TXV tube.
9. Disconnect the suction hose/pipe from the TXV tube (2).
10. Remove the suction hose/pipe.
11. Remove and discard the suction hose/pipe O-rings.

Installation Procedure

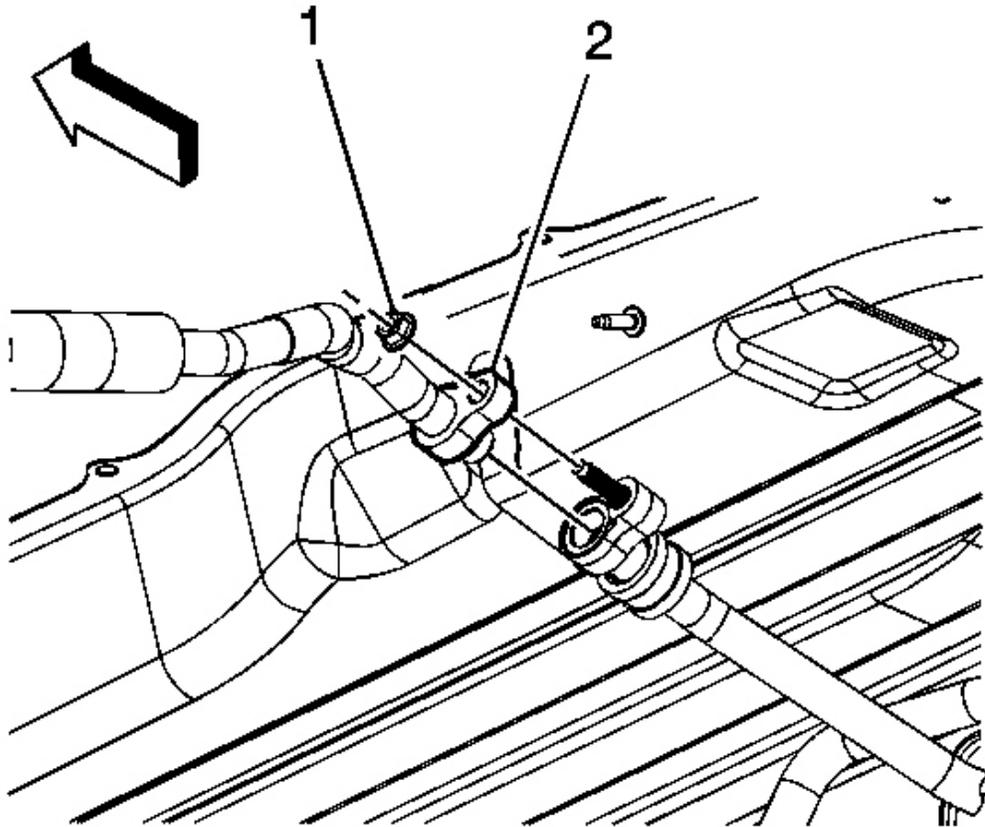


Fig. 21: View Of Suction Hose/Pipe Nut & TXV Tube
Courtesy of GENERAL MOTORS CORP.

1. Install new O-rings to the suction hose/pipe. Refer to **O-Ring Replacement**.
2. Connect the suction hose/pipe to the TXV tube.

NOTE: Refer to **Fastener Notice** .

3. Install the suction hose/pipe to TXV nut (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

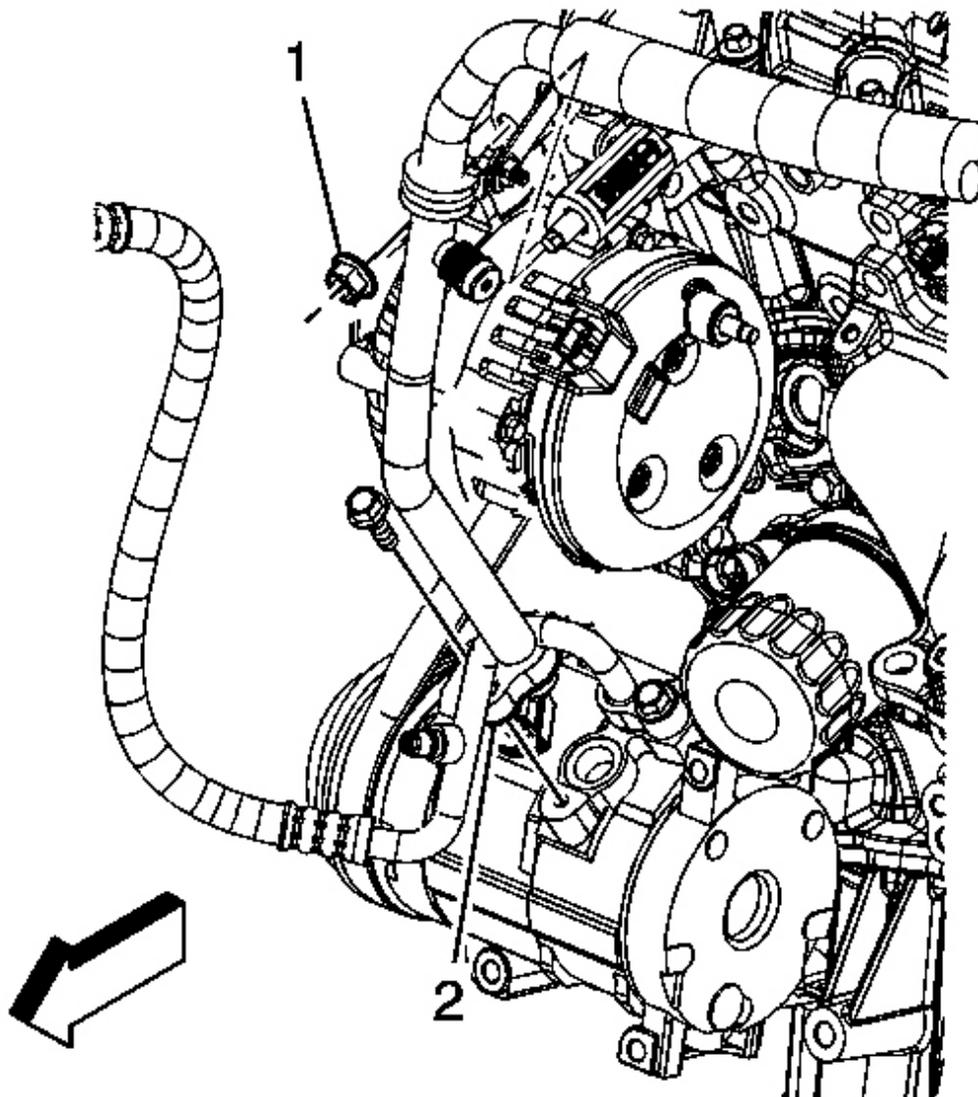


Fig. 22: Identifying Suction Hose Bracket Nut
Courtesy of GENERAL MOTORS CORP.

4. Connect the suction hose/pipe to the A/C compressor.
5. Install the suction hose/pipe bolt to the A/C compressor.

Tighten: Tighten the bolt to 9 N.m (80 lb in).

6. Install the suction hose/pipe bracket and secure with nut (1).
7. Install the right front engine splash shield. Refer to **Engine Splash Shield Replacement** .
8. Install the right front wheel house liner. Refer to **Front Wheelhouse Liner Replacement (Front)** or **Front Wheelhouse Liner Replacement (Rear)** .
9. Lower the vehicle.
10. Evacuate and recharge the refrigerant system. Refer to **Refrigerant Recovery and Recharging**.
11. Leak test the fittings of the component using **J 39400-A** . See **Special Tools**.

LIQUID LINE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

1. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging**.
2. Remove right headlamp assembly. Refer to **Headlamp Capsule Replacement** .
3. Remove the front grill. Refer to **Radiator Grille Replacement (Outer)** or **Radiator Grille Replacement (Inner)** .

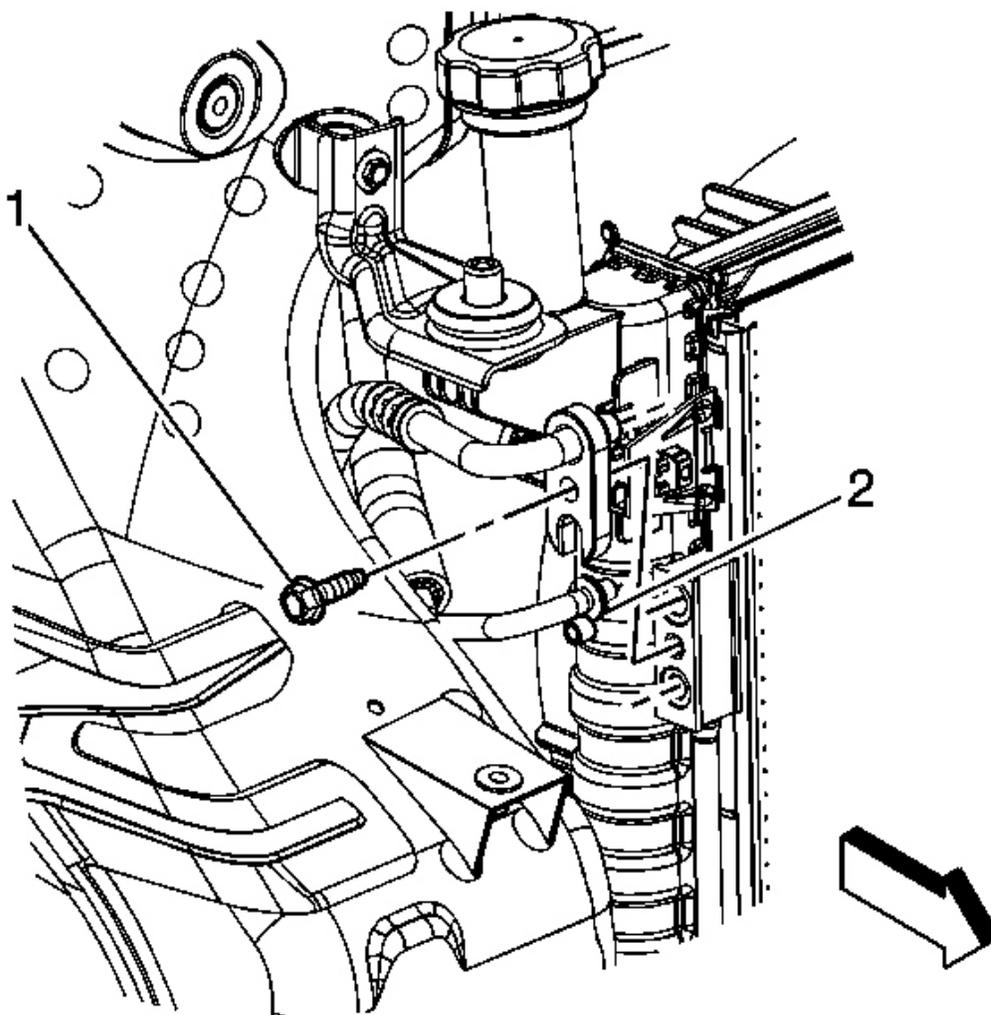


Fig. 23: Identifying A/C Condenser & Liquid Line Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the liquid line bolt from the A/C condenser (1).
5. Disconnect the liquid line from the A/C condenser (2).

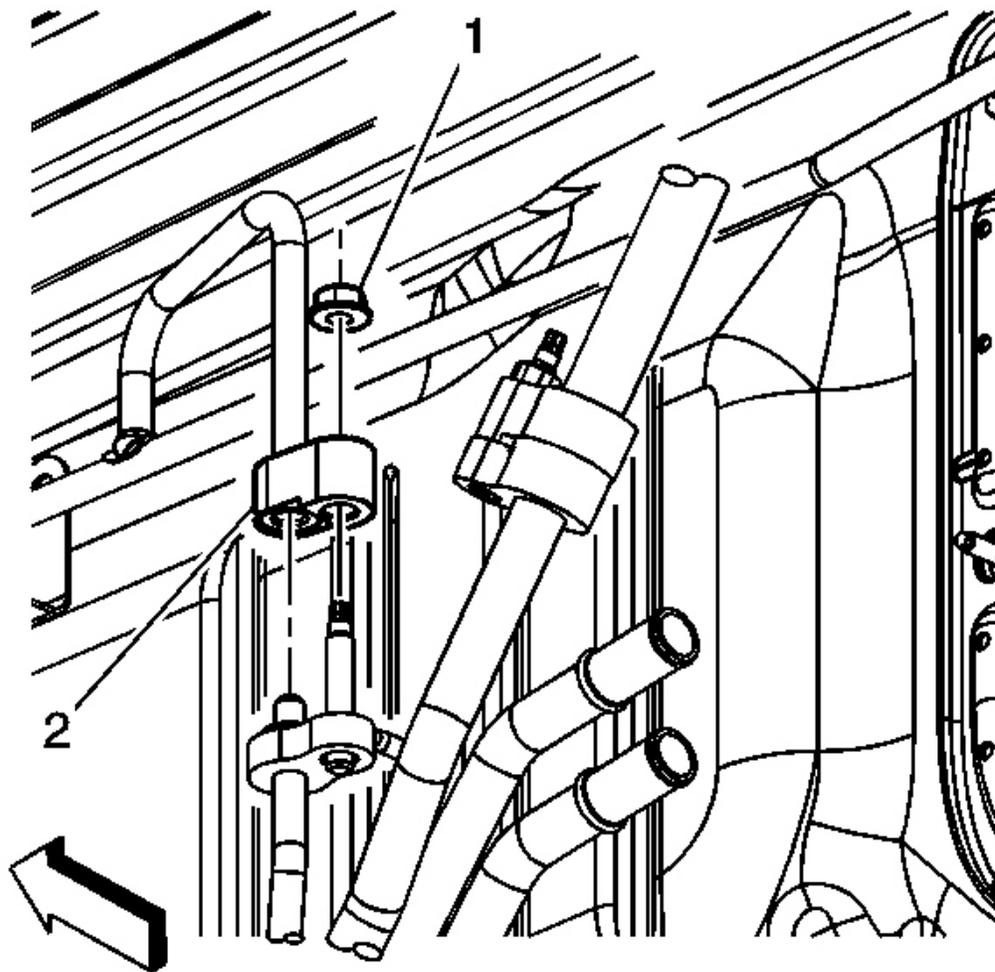


Fig. 24: View Of Auxiliary Tube Nut
Courtesy of GENERAL MOTORS CORP.

6. Remove the liquid line to auxiliary tube nut (1).

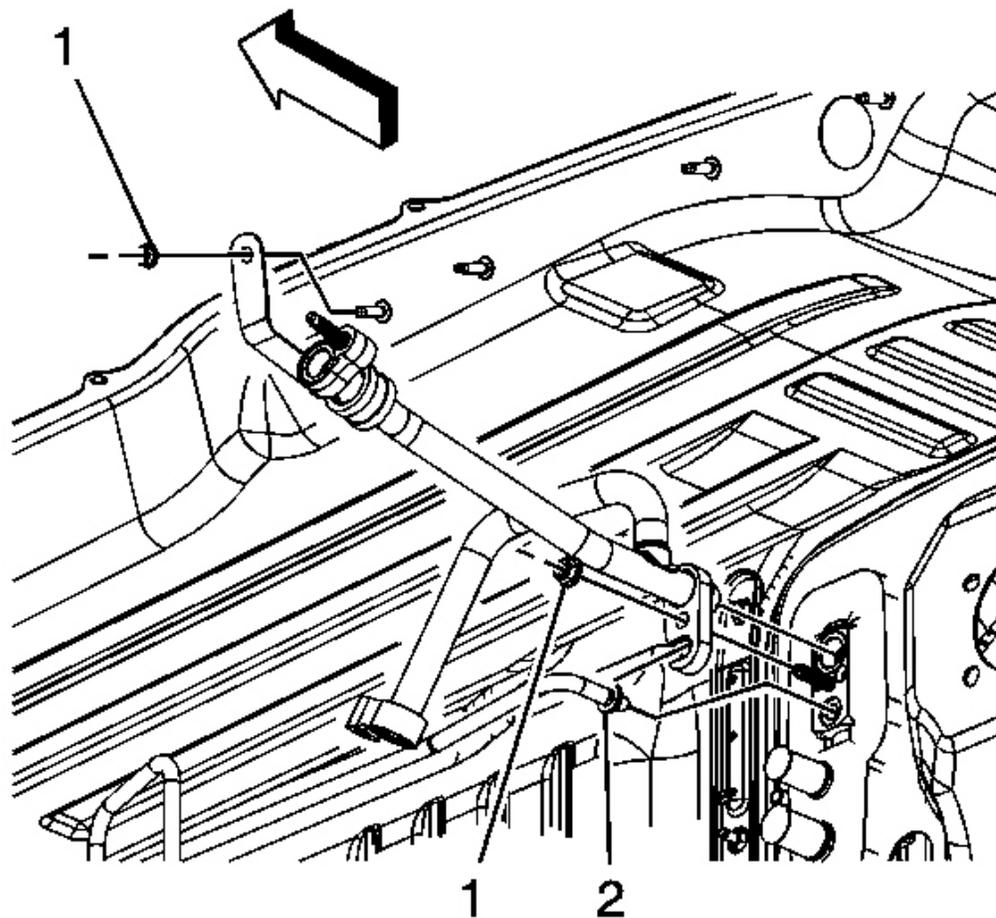


Fig. 25: Identifying Liquid Line Attaching Nut & Evaporator Hose/Tube
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the liquid line (2) and evaporator hose/tube from the TXV at plenum panel.

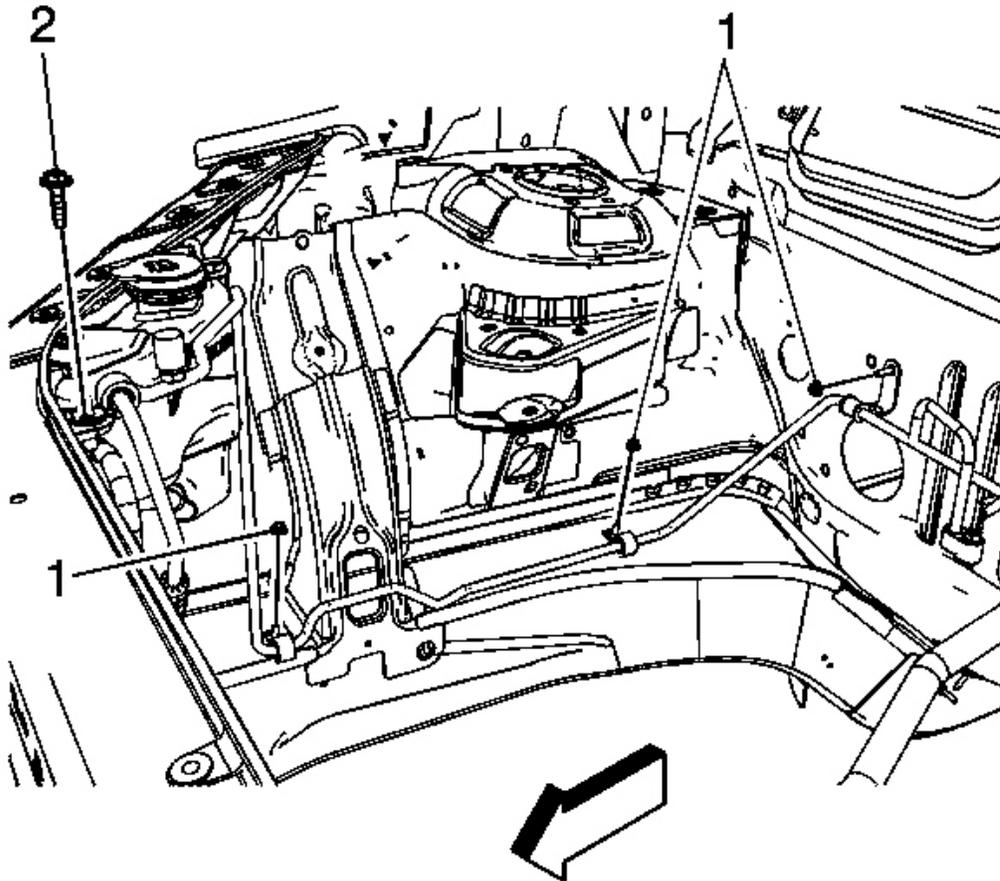


Fig. 26: Identifying Liquid Line Clamp Nuts & Liquid Line Bracket Bolt
Courtesy of GENERAL MOTORS CORP.

8. Remove the attaching liquid line clamp nuts along right inner frame rail and plenum panel (1).
9. Remove the liquid line bracket bolt at right side of upper tie bar support (2).
10. Remove the liquid line.
11. Remove and discard the discharge line sealing washer.

Installation Procedure

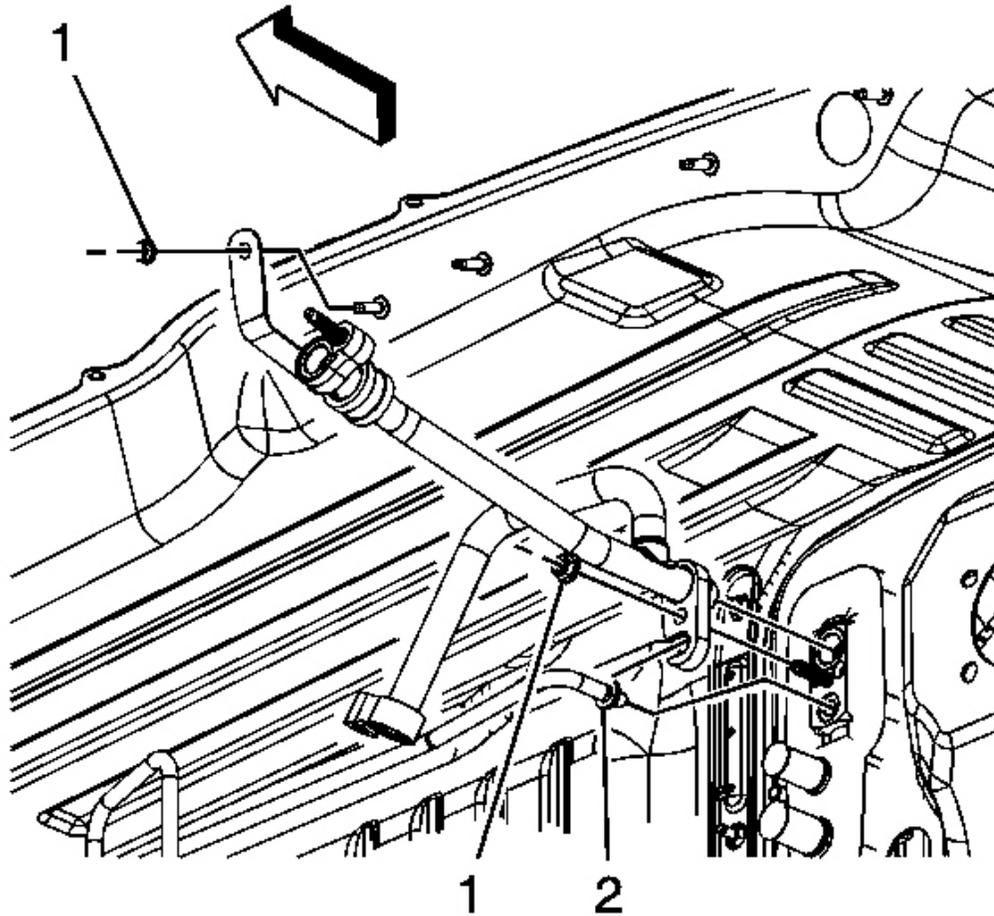


Fig. 27: Identifying Liquid Line Attaching Nut & Evaporator Hose/Tube
Courtesy of GENERAL MOTORS CORP.

1. Install new sealing washers to the liquid line. Refer to **Sealing Washer Replacement**.
2. Connect the liquid line (2) and evaporator hose/tube to the TXV at plenum panel.

NOTE: Refer to **Fastener Notice** .

3. Install the liquid line to TXV nut (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

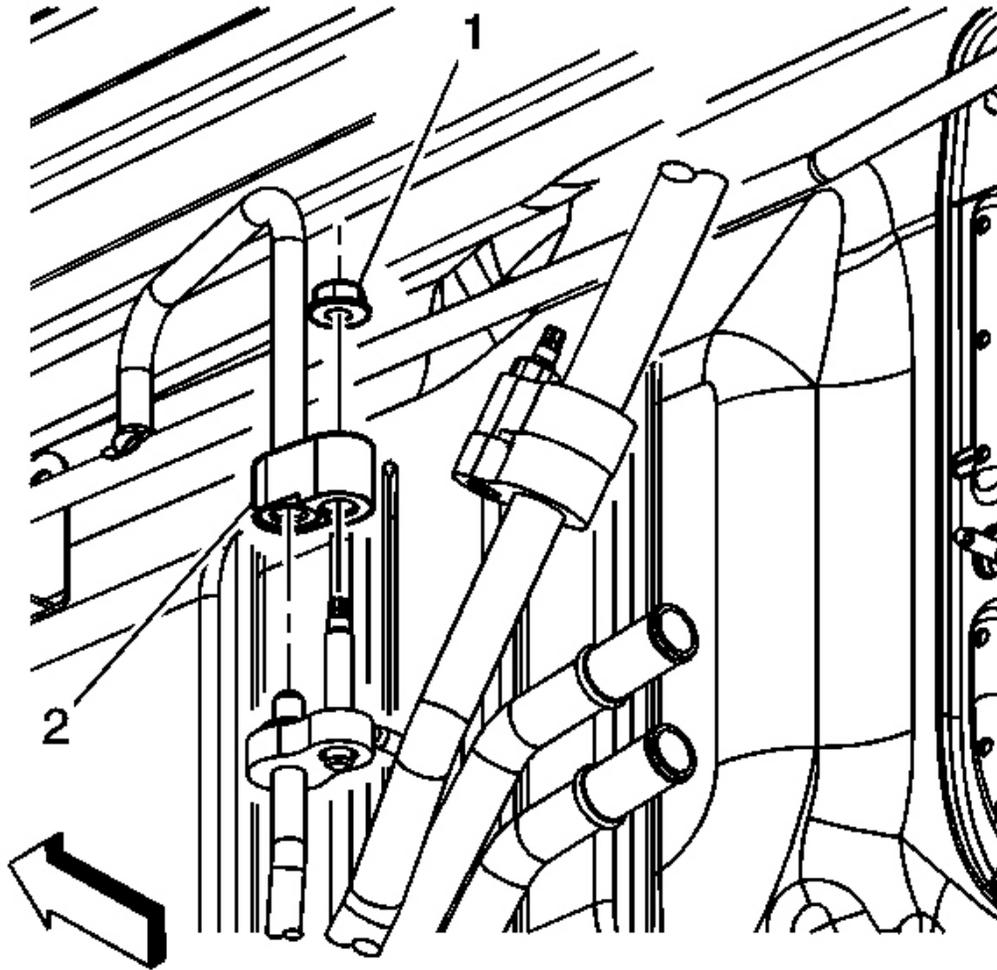


Fig. 28: View Of Auxiliary Tube Nut
Courtesy of GENERAL MOTORS CORP.

4. Connect the liquid line to the auxiliary evaporator tube.
5. Install the liquid line nut (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

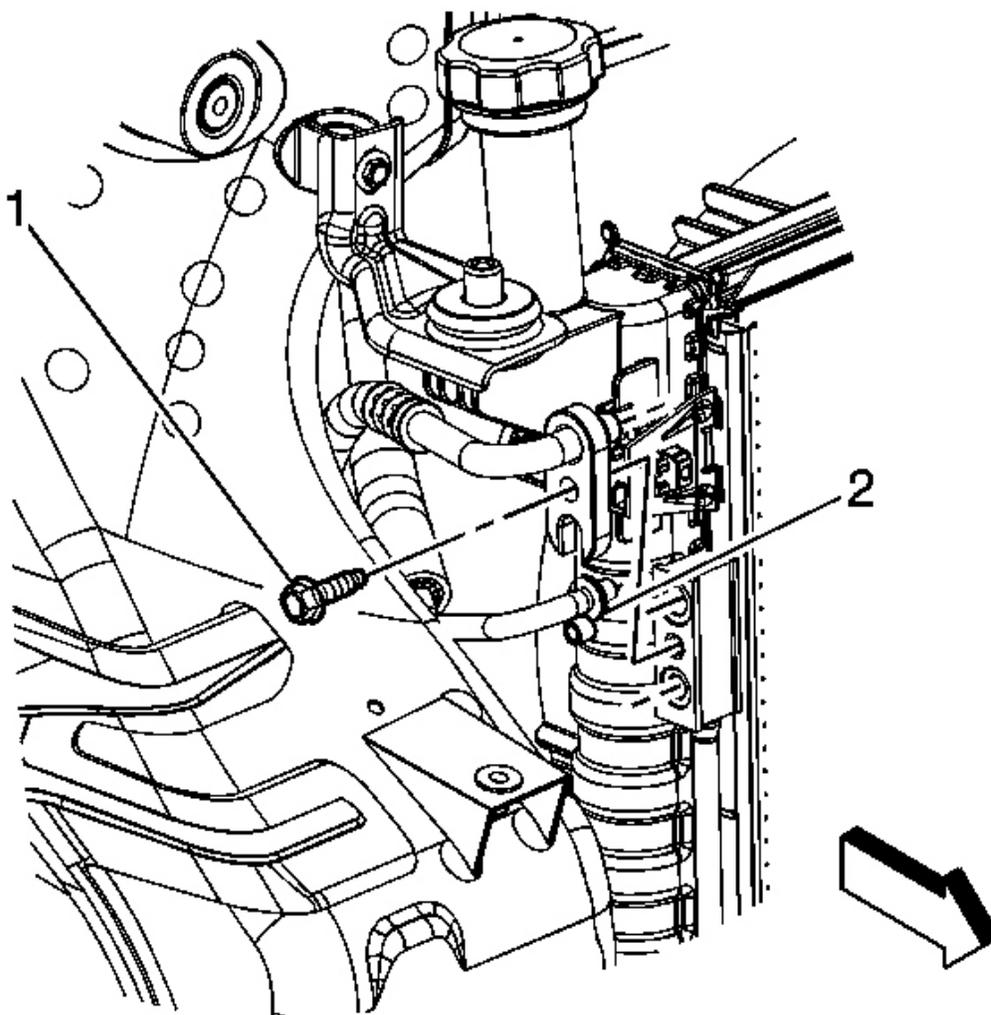


Fig. 29: Identifying A/C Condenser & Liquid Line Bolt
Courtesy of GENERAL MOTORS CORP.

6. Install the liquid line to the condenser (2).
7. Install the liquid line nut (1).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

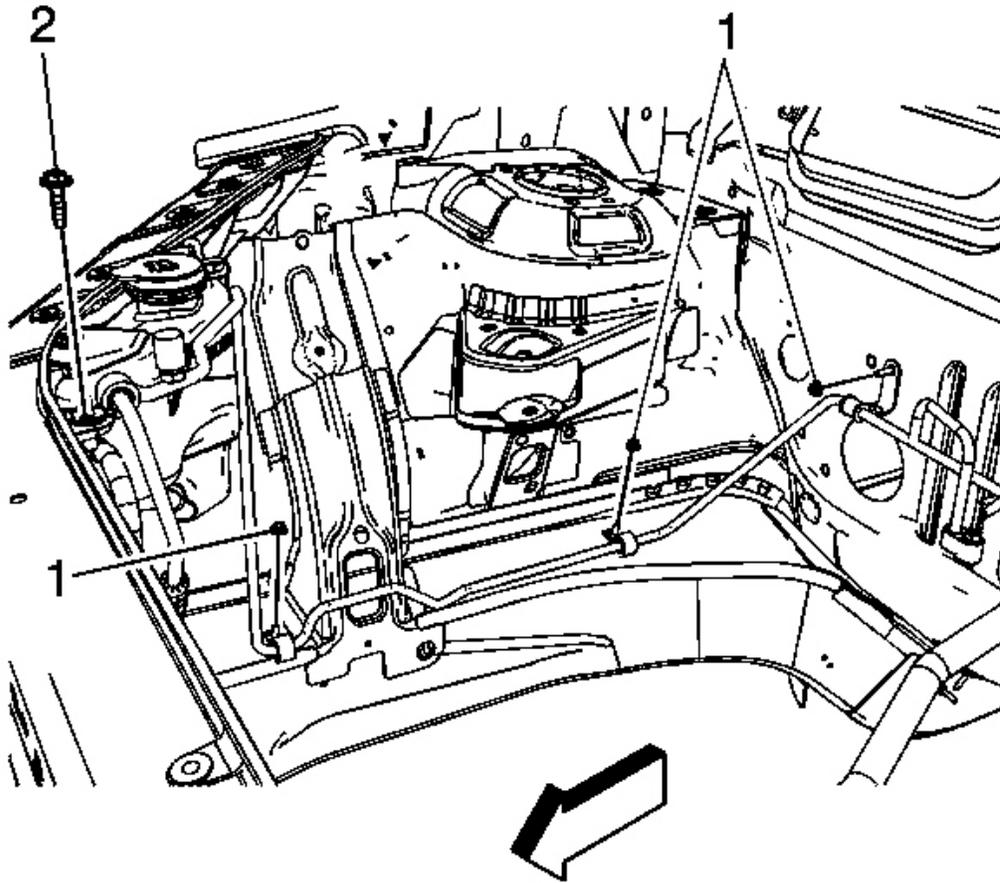


Fig. 30: Identifying Liquid Line Clamp Nuts & Liquid Line Bracket Bolt
 Courtesy of GENERAL MOTORS CORP.

8. Install liquid line bracket bolt to upper tie bar support (2).

Tighten: Tighten the bolt to 9 N.m (80 lb in).

9. Install the liquid line bracket nuts along frame rail and plenum panel (1).

Tighten: Tighten the bolt to 4 N.m (35 lb in).

10. Install the right headlamp assembly. Refer to **Headlamp Capsule Replacement**

11. Install the front grill. Refer to **Radiator Grille Replacement (Outer)** or **Radiator Grille**

Replacement (Inner) .

12. Evacuate and recharge the refrigerant system. Refer to **Refrigerant Recovery and Recharging**.
13. Leak test the fittings of the component using **J 39400-A** . See **Special Tools**.

SUCTION SCREEN INSTALLATION

Tools Required

J 44551 Suction Screen Kit. See **Special Tools**.

Suction Screen Installation

Part #	Screen Size	Fitting ID Application Range
J-44551-40	0.395" (10.03 mm)	0.384-0.392" (9.75-9.96 mm)
J-44551-60	0.471" (11.96 mm)	0.460-0.468" (11.68-11.89 mm)
J-44551-70	0.492" (12.50 mm)	0.481-0.489" (12.22-12.42 mm)
J-44551-80	0.500" (12.70 mm)	0.489-0.497" (12.42-12.62 mm)
J-44551-10	0.510" (12.95 mm)	0.499-0.507" (12.67-12.88 mm)
J-44551-20	0.552" (14.02 mm)	0.541-0.549" (13.74-13.94 mm)
J-44551-30	0.595" (15.11 mm)	0.584-0.592" (14.83-15.04 mm)
J-44551-90	0.600" (15.24 mm)	0.589-0.597" (14.96-15.16 mm)

Installation Procedure

IMPORTANT: Suction screens are intended to be installed in the suction hose after a major compressor failure.

1. Using a caliper that reads to 3 decimal places, measure the ID of the suction hose or manifold suction fitting. Refer to the suction screen coverage chart above to determine the correct size screen for the application.

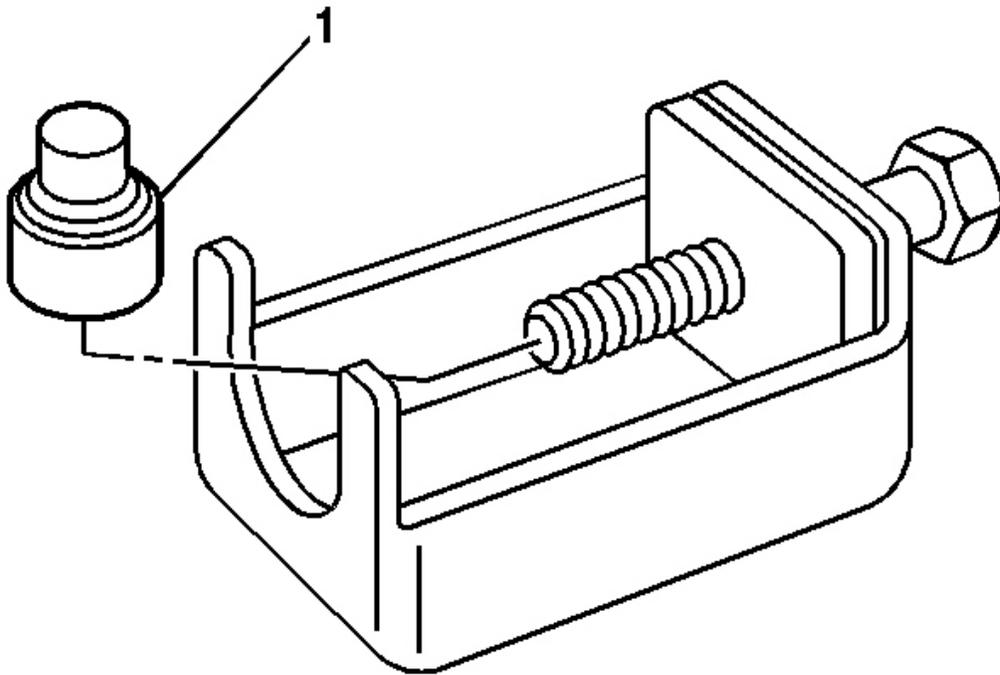


Fig. 31: View Of Mandrel & J 44551-5
Courtesy of GENERAL MOTORS CORP.

2. Select and install the correct mandrel (1) on the threaded portion of the installation tool bolt.
 - The brass Universal Mandrel is for use on hose fittings with a smooth bore where the screen installs flush with the end of the fitting.
 - **Specification:** The 0.471" (11.96 mm) Mandrel is only for the 0.471" (11.96 mm) screen in hose fittings with an internal hourglass shape where the screen installs at the recessed, reduced diameter point.

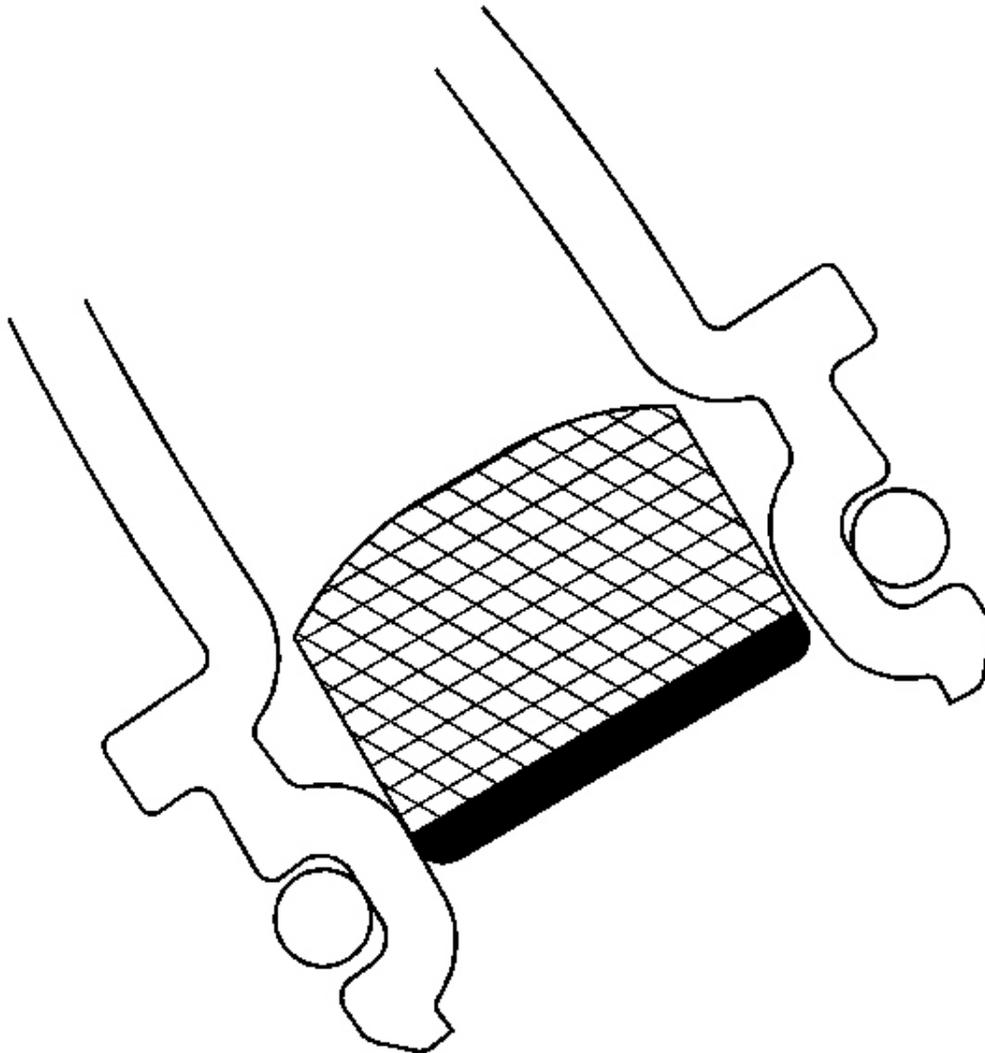


Fig. 32: View of Screen

Courtesy of GENERAL MOTORS CORP.

3. Install the 0.471" (11.96 mm) screen in the middle of the reduced diameter point of the fitting.

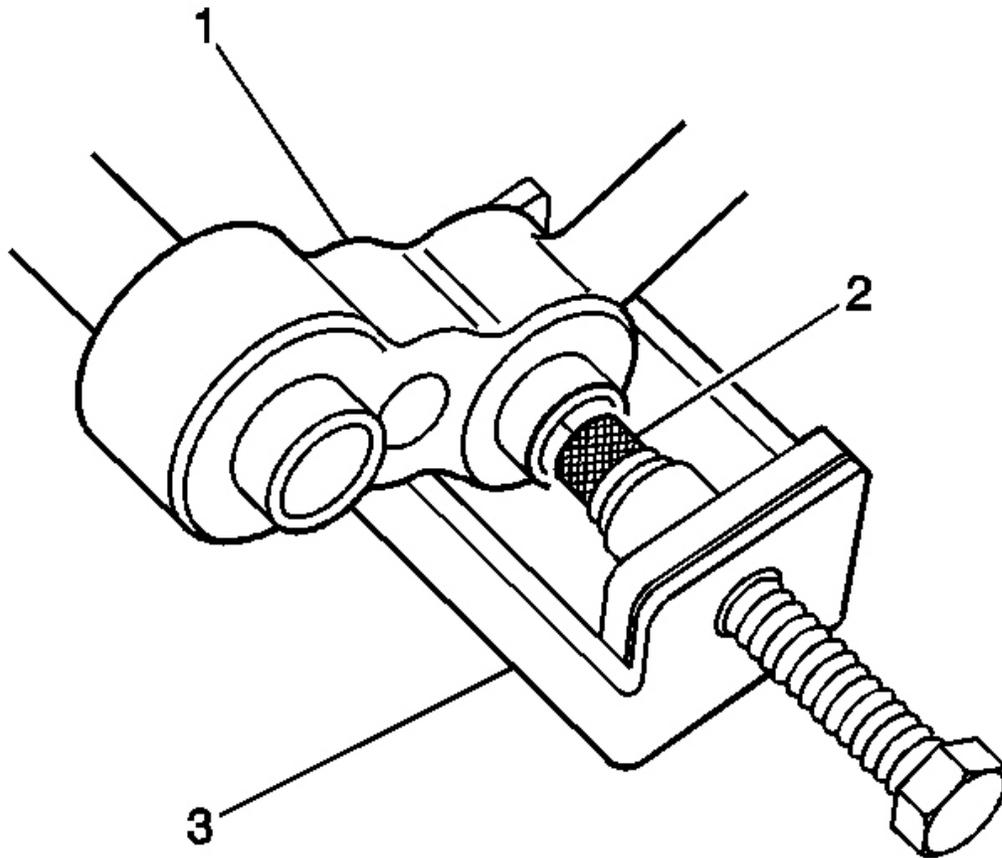


Fig. 33: Identifying Proper Placement Of J 44551-5
Courtesy of GENERAL MOTORS CORP.

4. Place the suction hose fitting or suction hose side of the manifold into the installation tool fixture J-44551-5 (3) so it is supported by the tools legs.

IMPORTANT: Correct placement of the J-44551-5 is critical.

5. Lubricate the A/C suction screen with the applicable refrigerant oil.
6. Align the screen (2), basket first; into the suction hose bore then hand tighten the bolt until contact is made between the hose, screen and tool.
7. Turn the bolt of the installation tool clockwise pressing the screen into the bore until the mandrel shoulder contacts the end of the hose fitting.

8. Unscrew the bolt and remove the installation tool from the hose or manifold.

IMPORTANT: Clean the surface to be used for attaching the label.

9. Install the J-44551-1 Suction Screen Notification Label.
10. Install the A/C compressor hose assembly to the A/C compressor, refer to **Suction Hose Replacement**.

SUCTION SCREEN REPLACEMENT

Tools Required

J 44551 Suction Screen Kit. See **Special Tools**.

Removal Procedure

1. Remove the A/C suction hose assembly from the A/C compressor. Refer to **Suction Hose Replacement**.

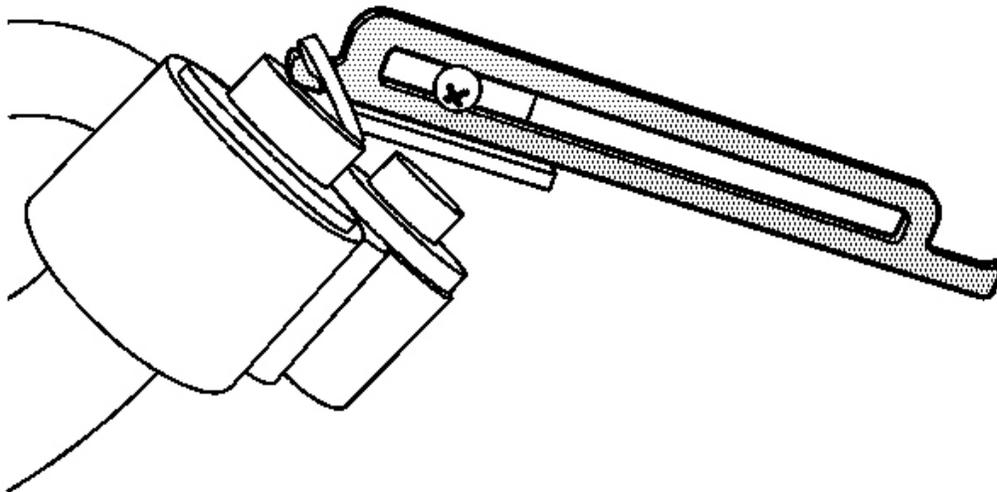


Fig. 34: View Of Universal Removal Tool
Courtesy of GENERAL MOTORS CORP.

2. Using the J-44551-9 place the tip of the tool under the inside edge of the compression band

of the suction screen and the cushioning fulcrum pad against the open end of the hose or manifold fitting.

IMPORTANT: Do not damage the end of the hose or manifold.

3. Pry upward on the band and move the tool around the diameter of the screen as necessary to remove the screen.

SERVICE PORTS REPLACEMENT

Tools Required

- **J 39400-A** Halogen Leak Detector. See **Special Tools**.
- **J 46246** Valve Core Removal Tool. See **Special Tools**.

Removal Procedure

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

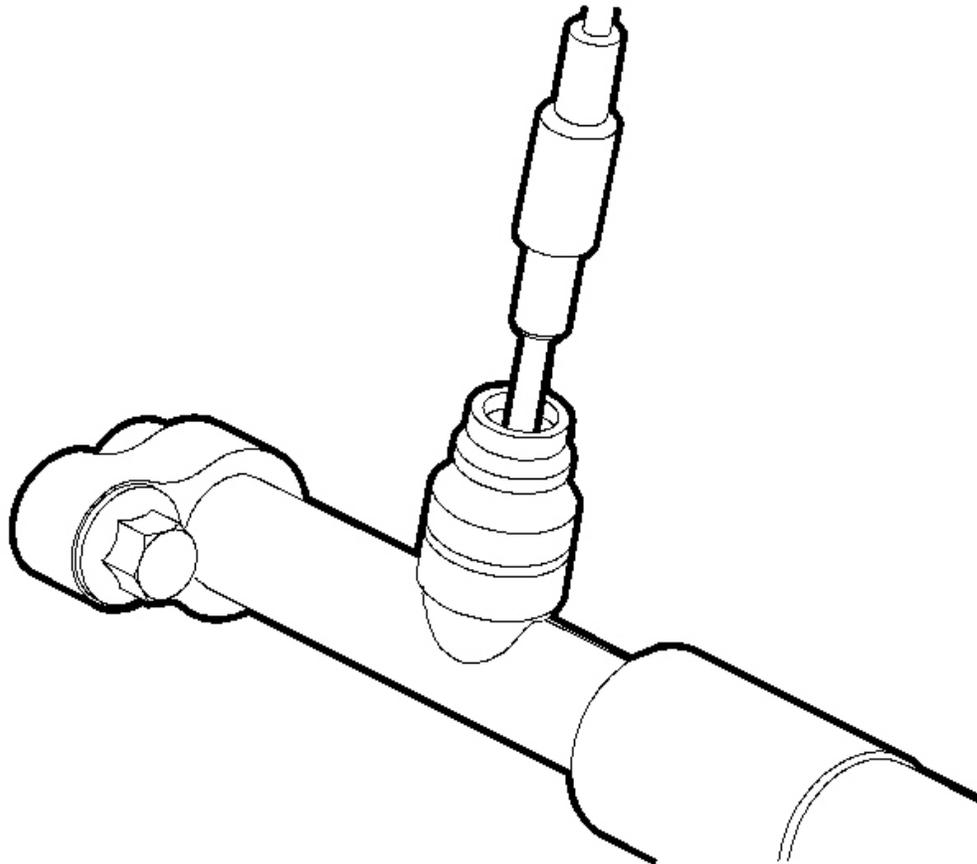


Fig. 35: Identifying Special Tools - J 46246 & Valve Core
Courtesy of GENERAL MOTORS CORP.

2. Use **J 46246** or equivalent to remove the valve core. See **Special Tools**.

Installation Procedure

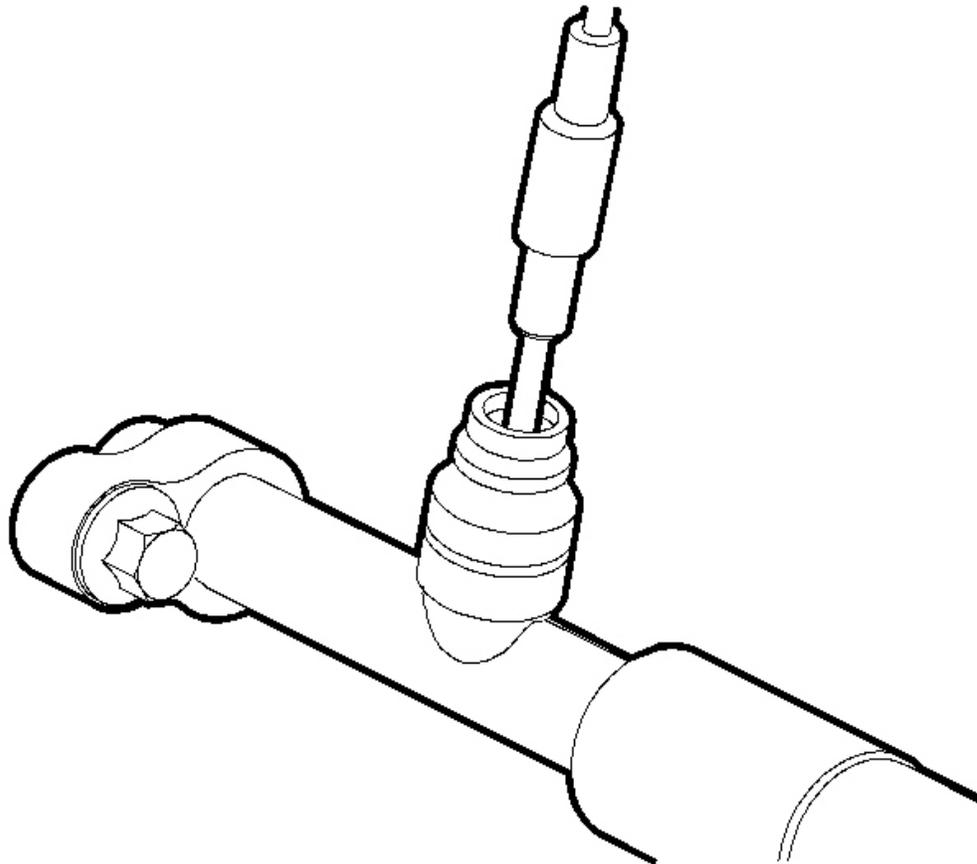


Fig. 36: Identifying Special Tools - J 46246 & Valve Core
Courtesy of GENERAL MOTORS CORP.

1. Use **J 46246** or equivalent to install and tighten the valve core. See **Special Tools**.
2. Evacuate and charge the A/C system. Refer to **Refrigerant Recovery and Recharging**.

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

3. Test the affected A/C fittings for leaks using **J 39400-A** . See **Special Tools**.

AIR CONDITIONING REFRIGERANT DESICCANT REPLACEMENT

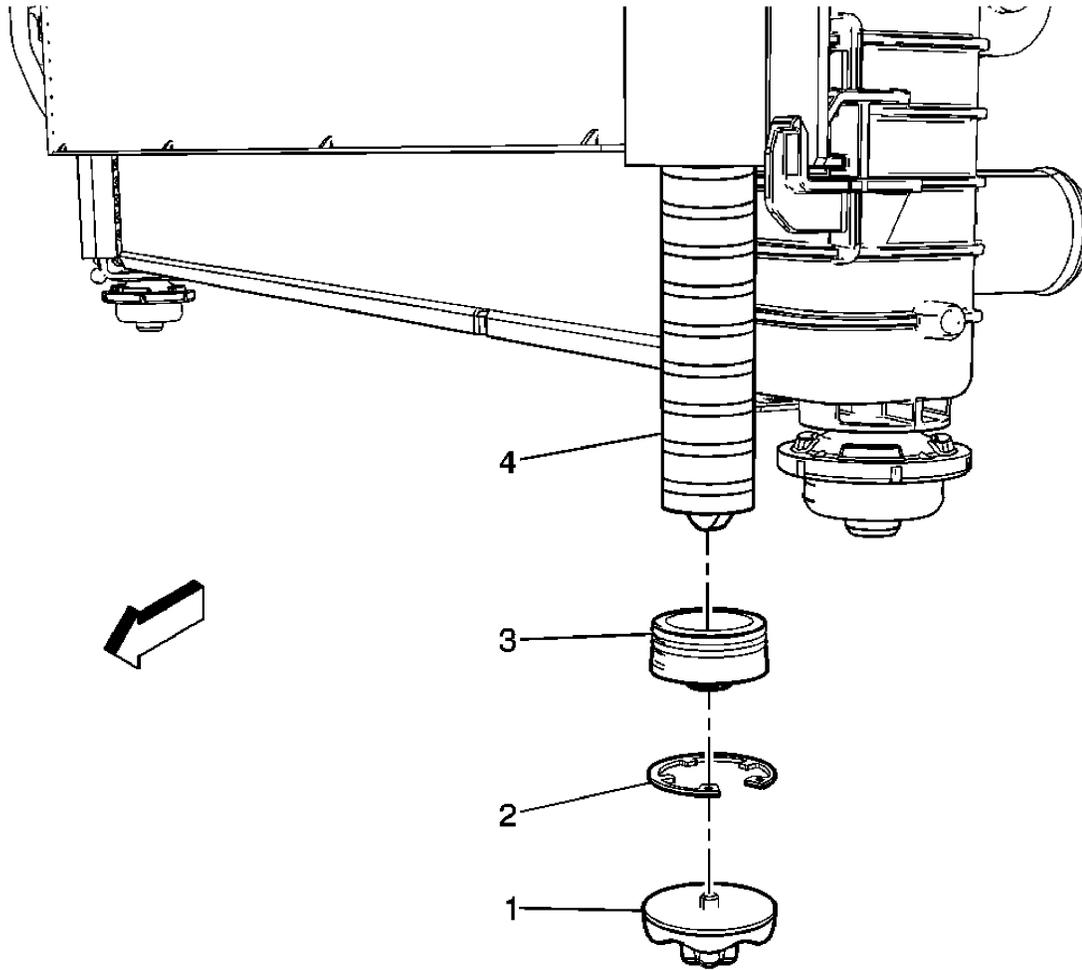


Fig. 37: Identifying Air Conditioning Refrigerant Desiccant
 Courtesy of GENERAL MOTORS CORP.

Air Conditioning Refrigerant Desiccant Replacement

Callout	Component Name
Preliminary Procedure	
1. Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging</u> .	
2. Remove the front bumper fascia air deflector. Refer to <u>Front Bumper Fascia Air Deflector Replacement</u> .	
3. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Desiccant Cartridge Cap

2007 Saturn Outlook XE

2007 HVAC Heating, Ventilation and Air Conditioning - Outlook

2	Desiccant Cartridge Snap Ring Procedure: Lightly tap inward on Desiccant Cartridge plug to gain clearance for snap ring removal.
3	Desiccant Cartridge Plug Procedure: Insert a 5 mm screw into plug and pull outward for removal.
4	Desiccant Cartridge Procedure: Use of pliers or vice grips may aid in cartridge removal.

THERMAL EXPANSION VALVE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

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

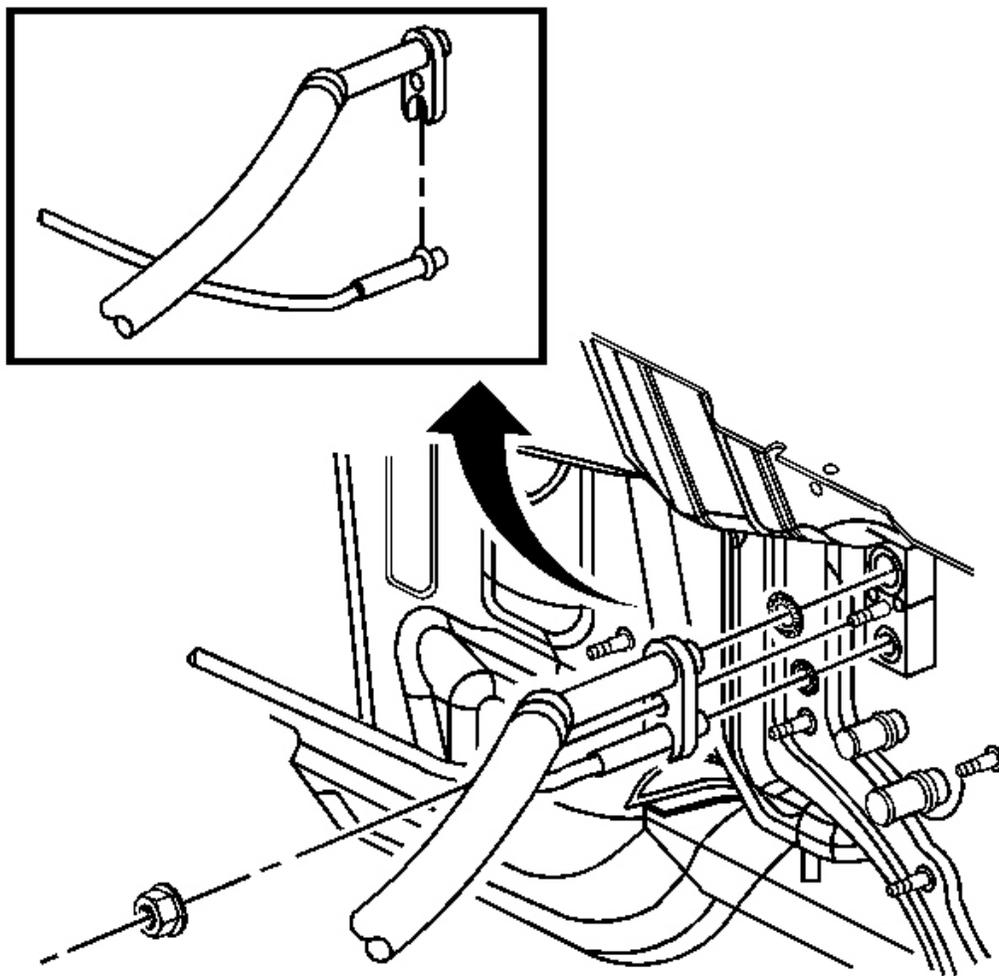


Fig. 38: View Of Evaporator Tube & Compressor Suction Hose At TXV
Courtesy of GENERAL MOTORS CORP.

2. Remove the condenser tube and evaporator hose from the thermal expansion valve (TXV).
3. Remove and discard the seal washers.

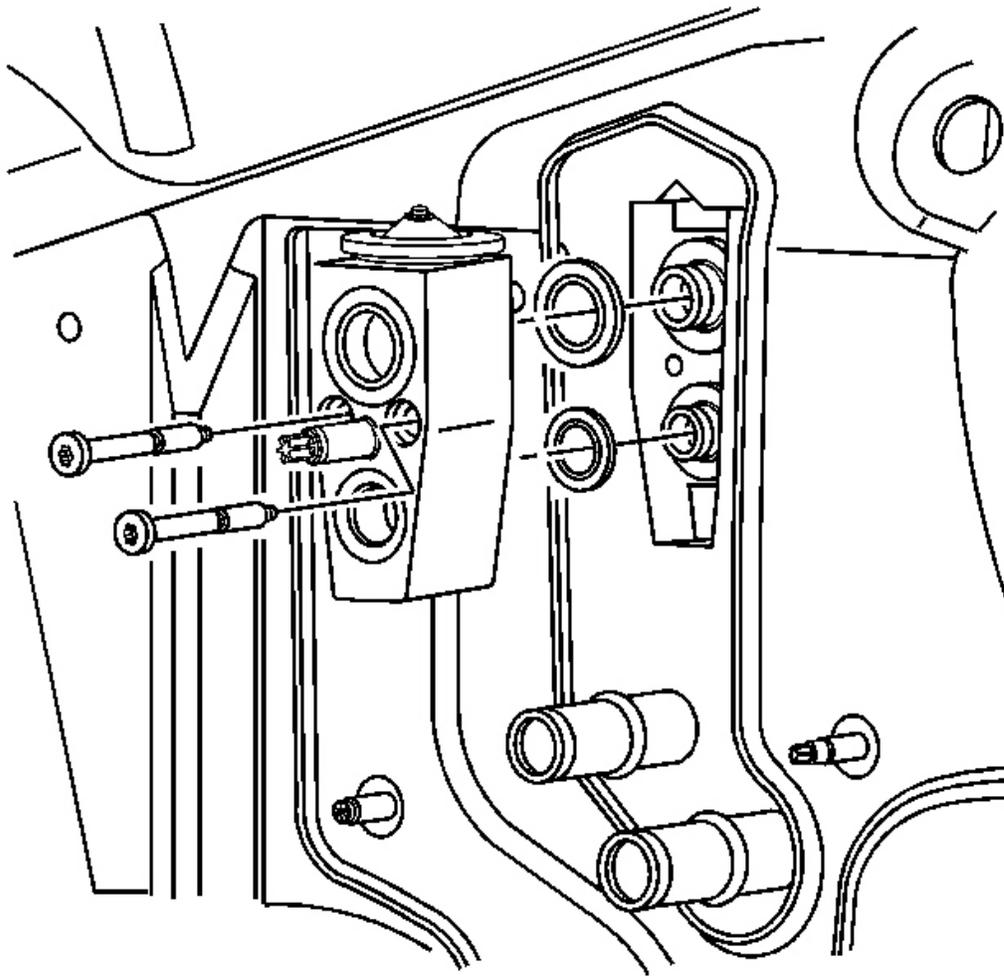


Fig. 39: View Of TXV & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the TXV bolts.
5. Remove the TXV.
6. Remove and discard the seal washers.

Installation Procedure

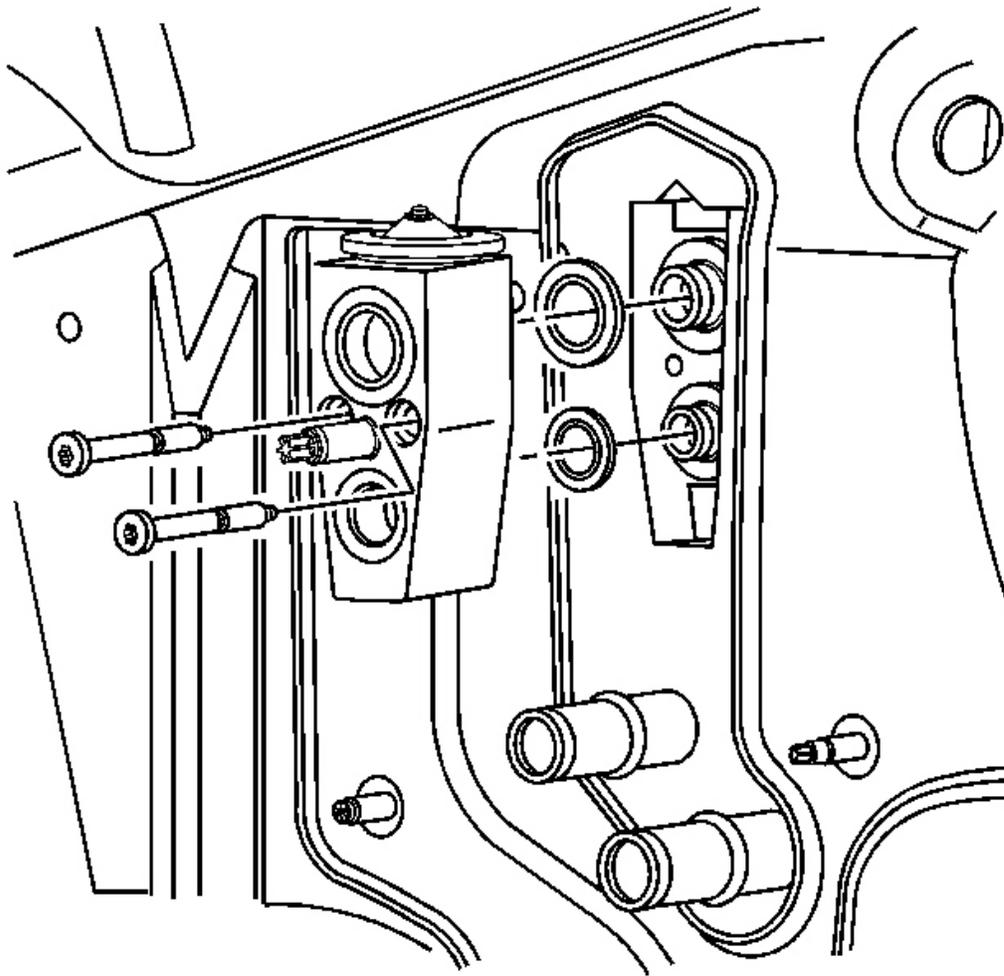


Fig. 40: View Of TXV & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install new seal washers to the evaporator core fittings. Refer to **Sealing Washer Replacement**.
2. Install the TXV.

NOTE: Refer to **Fastener Notice** .

3. Install the TXV bolts.

Tighten: Tighten the bolts to 7 N.m (62 lb in).

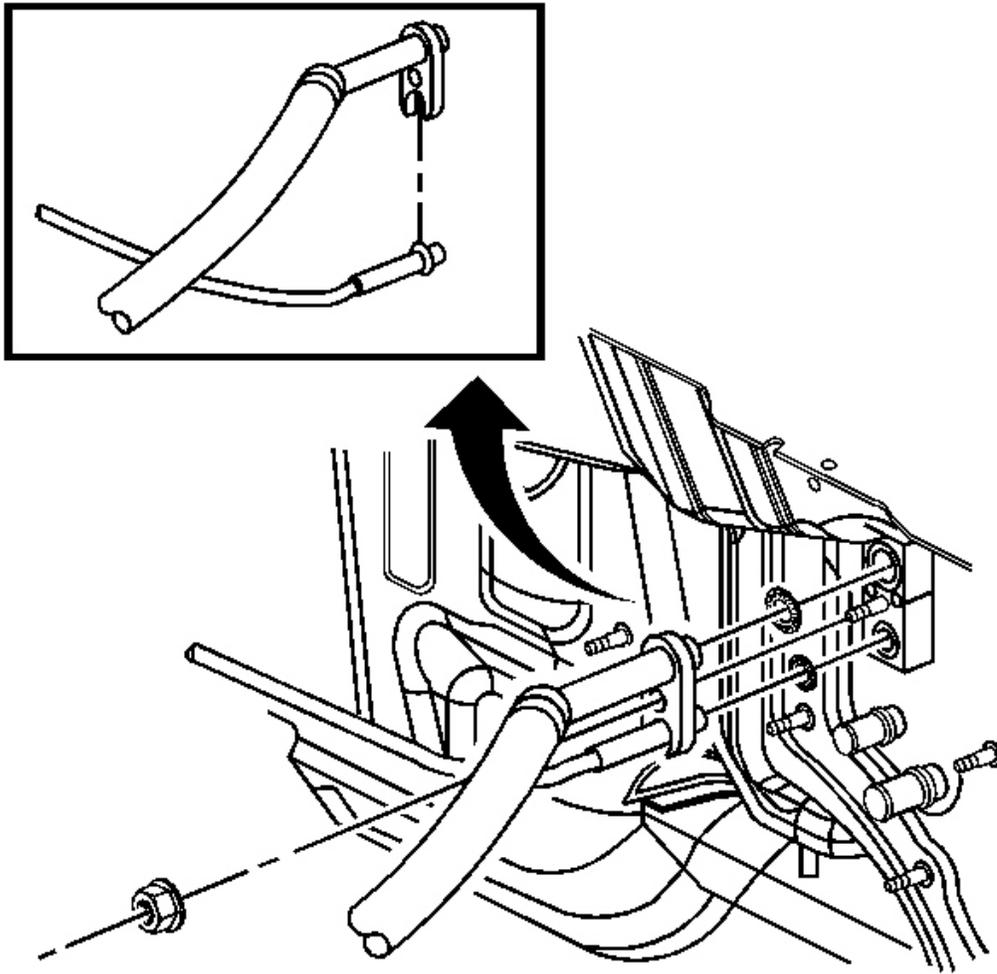


Fig. 41: View Of Evaporator Tube & Compressor Suction Hose At TXV
Courtesy of GENERAL MOTORS CORP.

4. Install new sealing washers on the condenser tube and evaporator hose fittings. Refer to **Sealing Washer Replacement**.
5. Install the condenser tube and evaporator hose to the TXV.
6. Install the TXV nut.

Tighten: Tighten the nut to 20 N.m (15 lb ft).

7. Evacuate and charge the refrigerant system. Refer to **Refrigerant Recovery and Recharging**.
8. Leak test the fittings using the **J 39400-A** . See **Special Tools**.

AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR REPLACEMENT

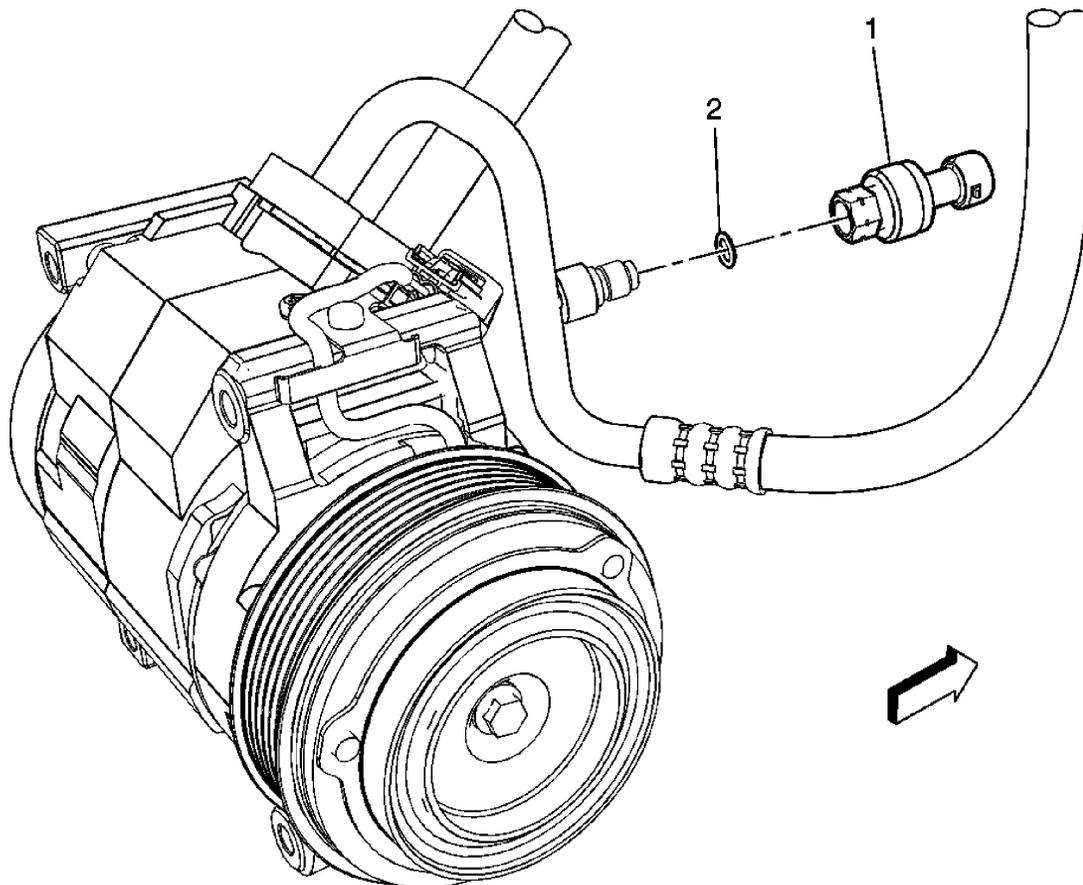


Fig. 42: Identifying Air Conditioning (A/C) Refrigerant Pressure Sensor
 Courtesy of GENERAL MOTORS CORP.

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Callout	Component Name
1	Remove the refrigerant pressure sensor from the compressor hose. NOTE: Refer to <u>Fastener Notice</u> .

	<p>Procedure: Hand start the refrigerant pressure sensor to the compressor hose, taking care not to pinch the O-ring and tighten.</p> <p>Tighten: 4 N.m (35 lb in)</p>
2	<p>O-ring Procedure: Lubricate the refrigerant pressure sensor O-ring with mineral oil.</p>

EVAPORATOR TEMPERATURE SENSOR REPLACEMENT

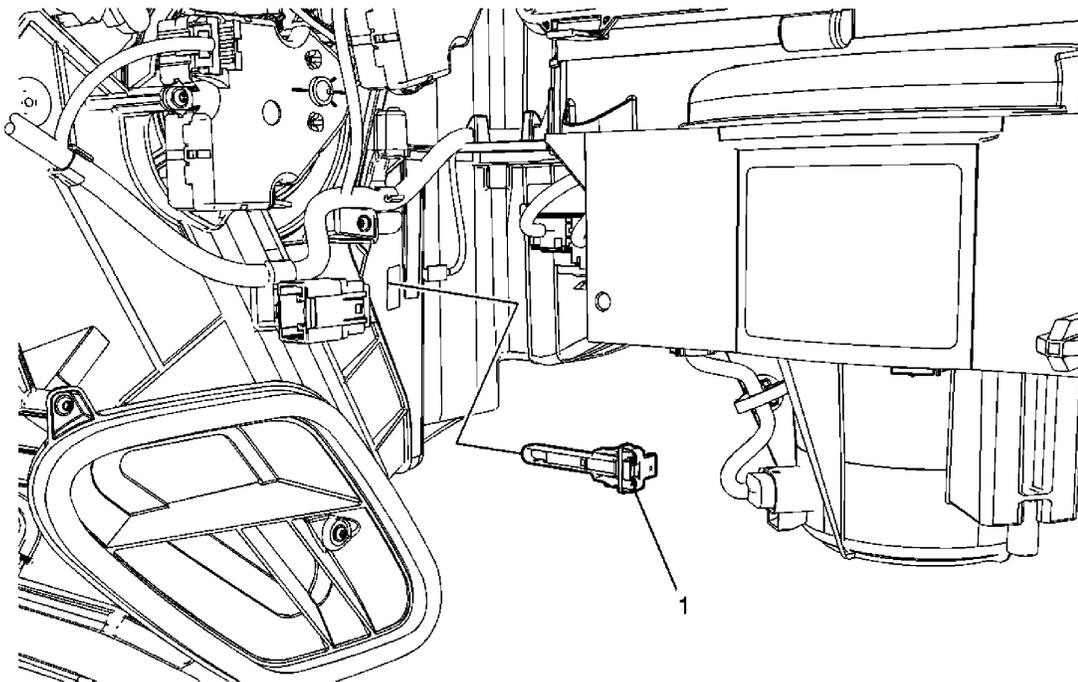


Fig. 43: View Of Evaporator Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

Evaporator Temperature Sensor Replacement

Callout	Component Name
<p>Preliminary Procedure: Remove the front floor console extension panel - right side. Refer to Front Floor Console Extension Panel Replacement - Right Side .</p>	
	<p>Evaporator Temperature Sensor</p> <p>Procedure</p>

1

1. Disconnect the sensor electrical connector.
2. Apply downward pressure on sensor to release tabs for removal.

CONDENSER REPLACEMENT

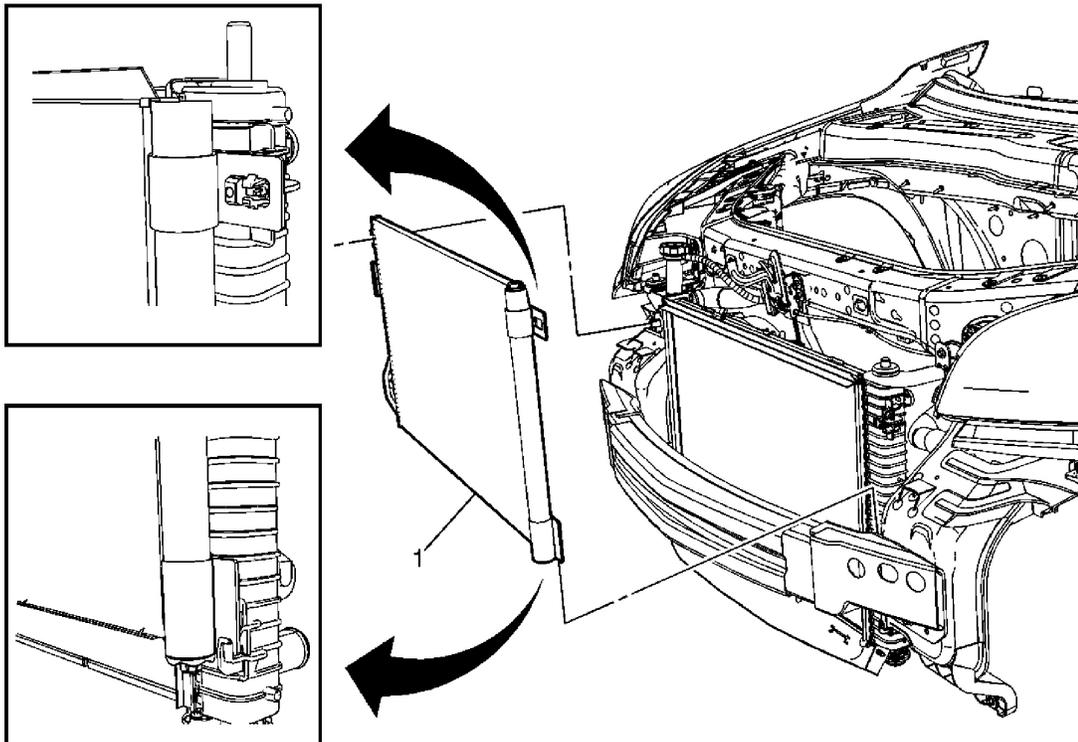


Fig. 44: View Of Condenser
 Courtesy of GENERAL MOTORS CORP.

Condenser Replacement

Callout	Component Name
Preliminary Procedure	
<ol style="list-style-type: none"> 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Remove the front bumper fascia upper support. Refer to Front Bumper Fascia Upper Support Replacement 3. Remove the A/C discharge line at condenser. Refer to Discharge Hose Replacement. 4. Remove the A/C liquid line at condenser. Refer to Liquid Line Replacement. 5. Pinch fastening tabs together at top of condenser and slide upward to remove. 	

1

Condenser Assembly

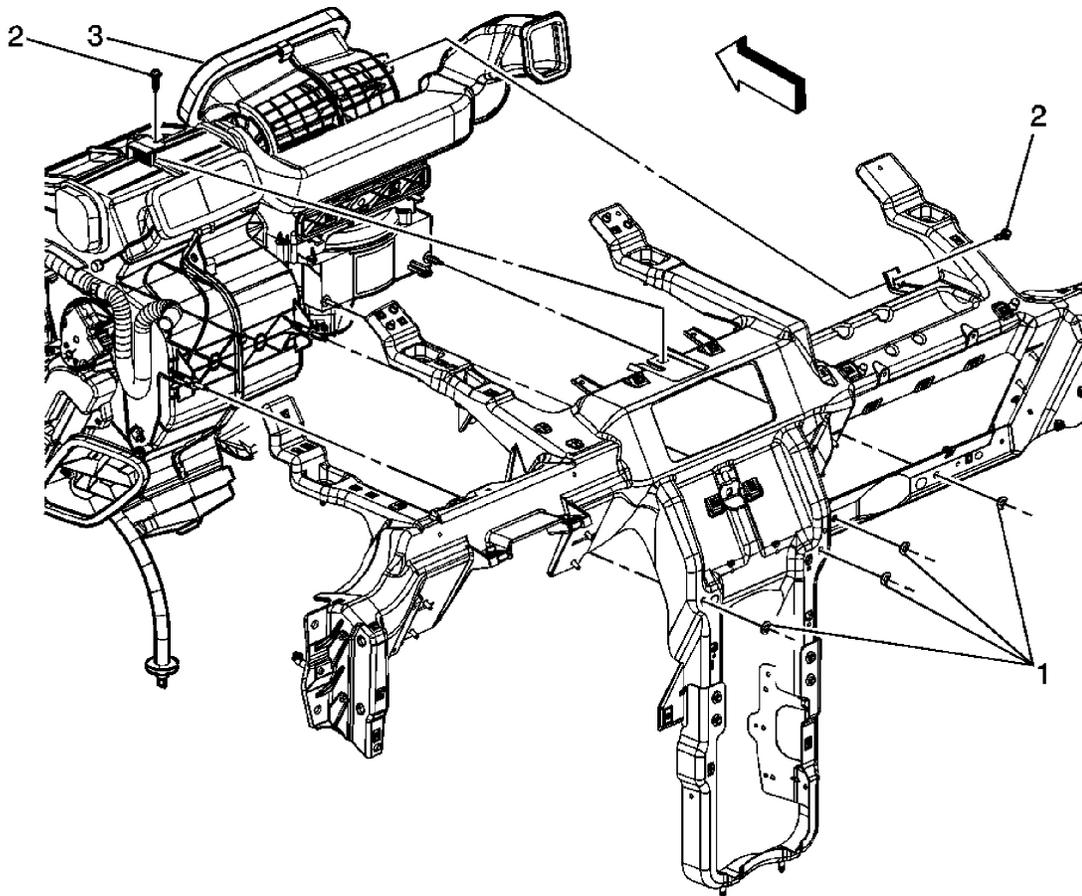
Tip: Bottom of condenser mounts into holding fixtures at bottom of radiator.**HVAC MODULE ASSEMBLY REPLACEMENT**

Fig. 45: Identifying HVAC Module Assembly
 Courtesy of GENERAL MOTORS CORP.

HVAC Module Assembly Replacement

Callout	Component Name
Preliminary Procedure	
1.	Drain the coolant. Refer to <u>Draining and Filling Cooling System (Static Fill)</u> or <u>Draining and Filling Cooling System (Vac N Fill)</u>
2.	Recover the refrigerant. Refer to <u>Refrigerant Recovery and Recharging.</u>
3.	Remove heater inlet hose from heater core. Refer to <u>Heater Inlet Hose</u>

Replacement.

4. Remove heater outlet hose from heater core. Refer to **Heater Outlet Hose Replacement.**
5. Remove A/C lines from TXV.
6. Remove I/P Carrier Assembly. Refer to **Instrument Panel Carrier Replacement .**

1	<p>HVAC Module Assembly Nut (Qty: 4)</p> <p>NOTE: Refer to <u>Fastener Notice .</u></p> <p>Tighten: 6 N.m (53 lb in)</p>
2	<p>HVAC Module to I/P Carrier Bolt (Qty: 2)</p> <p>Tighten: 6 N.m (53 lb in)</p>
3	<p>HVAC Module Assembly</p> <p>Procedure: Cap or plug A/C and heater pipe openings to prevent spillage of fluids upon removal.</p>

EVAPORATOR CORE REPLACEMENT

2007 Saturn Outlook XE

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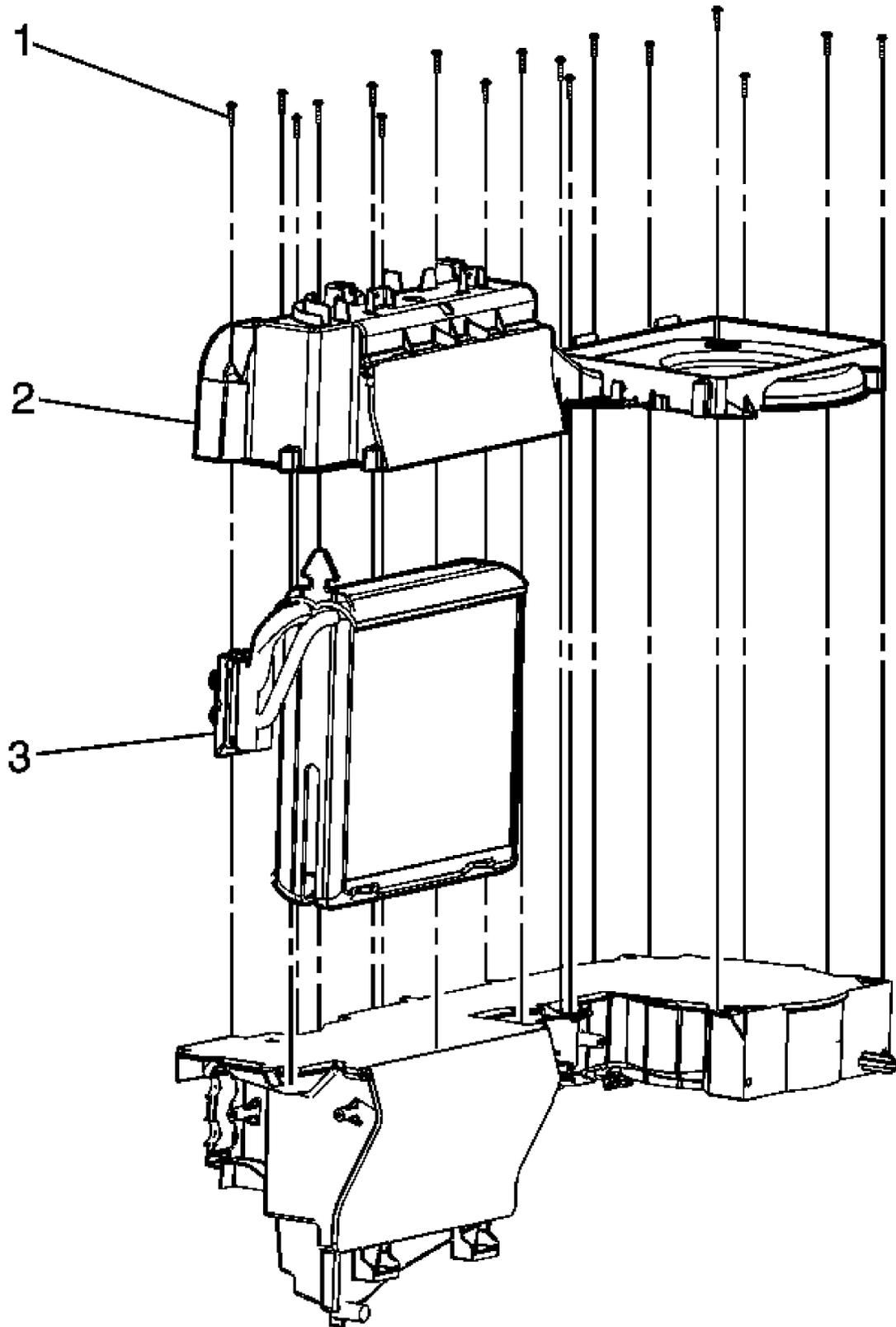


Fig. 46: Identifying Air Conditioning Evaporator Core
 Courtesy of GENERAL MOTORS CORP.

Evaporator Core Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the HVAC Module. Refer to <u>HVAC Module Assembly Replacement</u> . 2. Remove Thermal Expansion Valve (TXV). Refer to <u>Thermal Expansion Valve Replacement</u> .	
1	Evaporator Upper Case Screw (Qty: 17) NOTE: Refer to <u>Fastener Notice</u> . Tighten: 6 N.m (53 lb in)
2	Evaporator Upper Case
3	Evaporator Core Tip: Ensure all seals are in place upon installation.

EVAPORATOR DRAIN HOSE REPLACEMENT

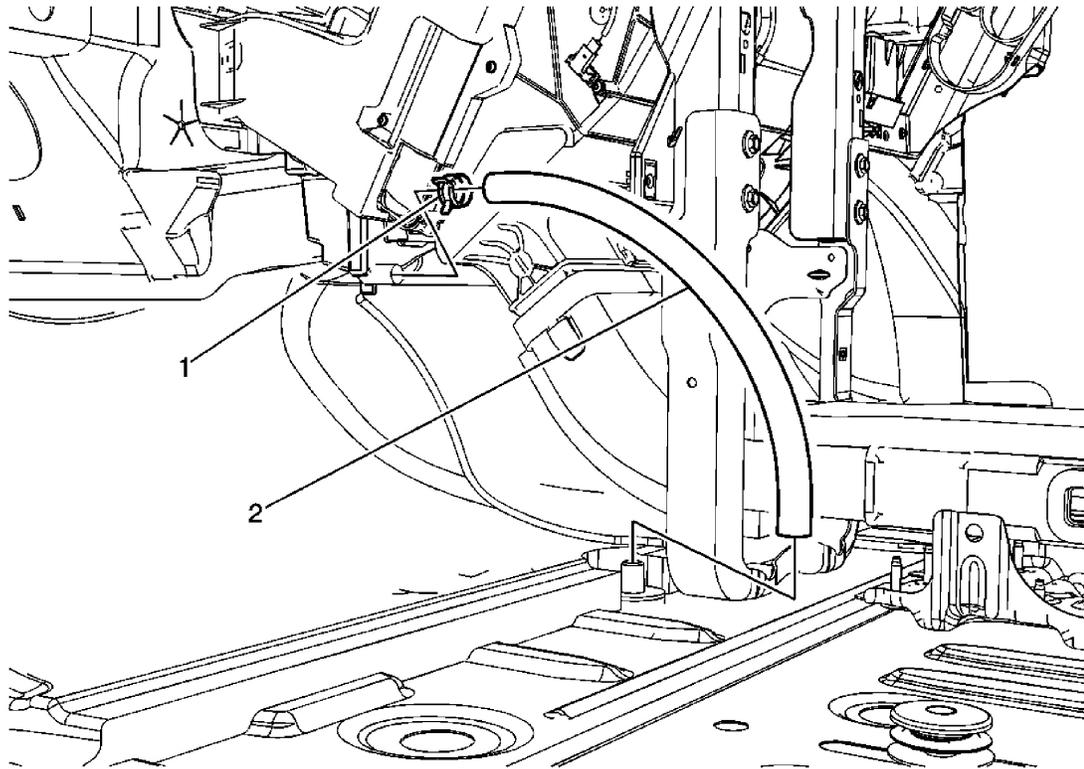


Fig. 47: View Of Air Conditioning Evaporator & Blower Module Drain Hose
 Courtesy of GENERAL MOTORS CORP.

Evaporator Drain Hose Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the left front floor console extension panel.	
2. Reposition carpet and pad from evaporator drain hose area.	
1	Evaporator Drain Hose Clamp
2	Evaporator Drain Hose

HEATER INLET HOSE REPLACEMENT

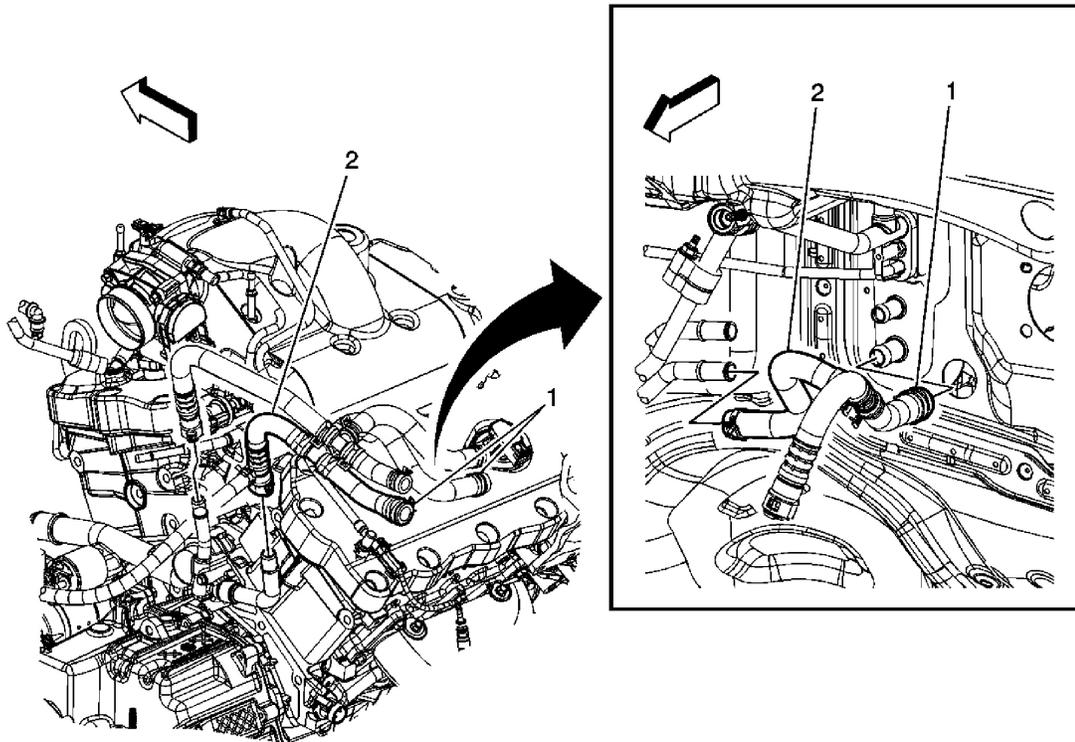


Fig. 48: View Of Heater Inlet Hose
 Courtesy of GENERAL MOTORS CORP.

Heater Inlet Hose Replacement

Callout	Component Name
Preliminary Procedure: Drain the coolant. Refer to <u>Draining and Filling Cooling System (Static Fill)</u> or <u>Draining and Filling Cooling System (Vac N Fill)</u>	
1	Heater Inlet Hose Clamp (Qty: 3)
2	Heater Inlet Hose Procedure: Disconnect the heater inlet hose from the auxiliary heater pipe, if equipped.

HEATER OUTLET HOSE REPLACEMENT

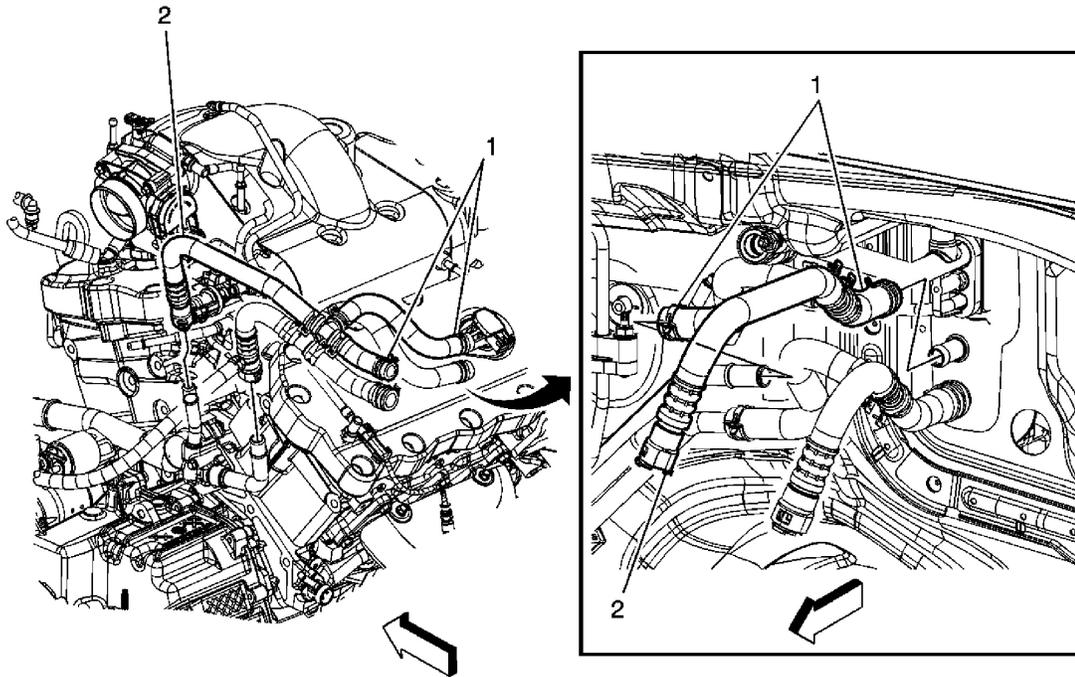


Fig. 49: Identifying Heater Outlet Hose
 Courtesy of GENERAL MOTORS CORP.

Heater Outlet Hose Replacement

Callout	Component Name
Preliminary Procedure: Drain the coolant. Refer to <u>Draining and Filling Cooling System (Static Fill)</u> or <u>Draining and Filling Cooling System (Vac N Fill)</u>	
1	Heater Outlet Hose Clamp (Qty: 3)
2	Heater Outlet Hose Procedure: Disconnect the heater outlet hose from the auxiliary heater pipe, if equipped.

HEATER CORE TUBE REPLACEMENT

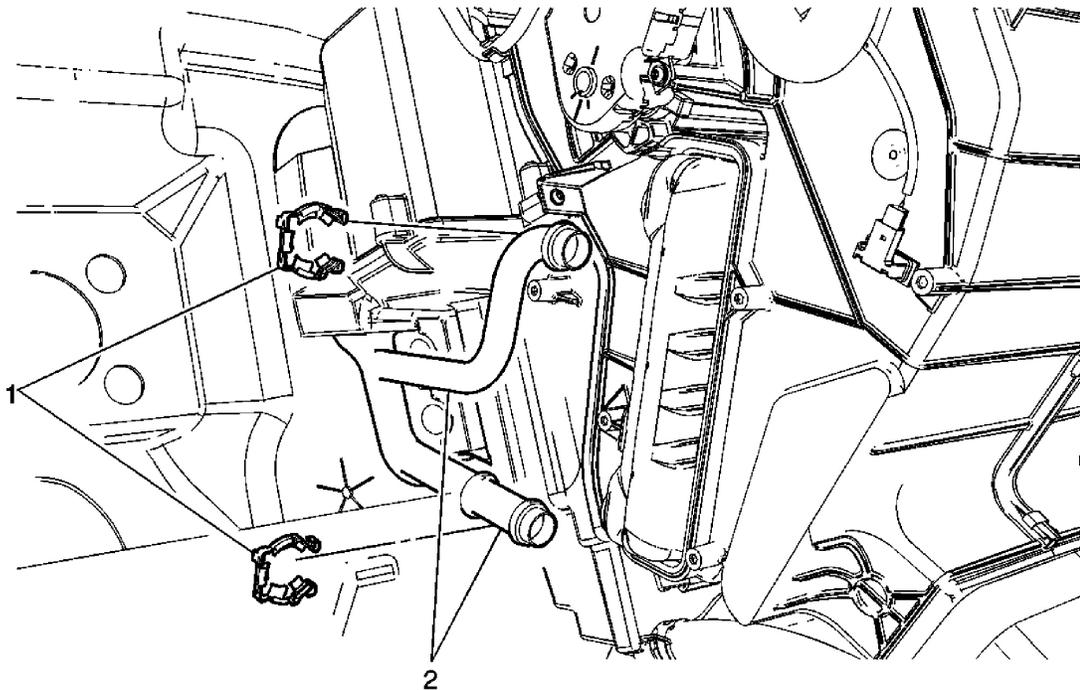


Fig. 50: View Of Heater Core Tube
 Courtesy of GENERAL MOTORS CORP.

Heater Core Tube Replacement

Callout	Component Name
Preliminary Procedure	
<ol style="list-style-type: none"> 1. Drain the coolant. Refer to <u>Draining and Filling Cooling System (Static Fill)</u> or <u>Draining and Filling Cooling System (Vac N Fill)</u> . 2. Remove heater inlet hose from heater core. Refer to <u>Heater Inlet Hose Replacement</u>. 3. Remove heater outlet hose from heater core. Refer to <u>Heater Outlet Hose Replacement</u>. 4. Remove heater core cover. Refer to <u>Heater Core Cover Replacement</u>. 	
1	Heater Core Tube Clip (Qty: 2)
2	Heater Core Tube Procedure <ol style="list-style-type: none"> 1. Cap or plug heater core, hoses and tubes to prevent any fluid leakage.

2. Position tube forward to release from heater core and slide rearward to remove.

Tip: Ensure heater core tube seals are in place upon installation.

PASSENGER COMPARTMENT AIR FILTER HOUSING REPLACEMENT

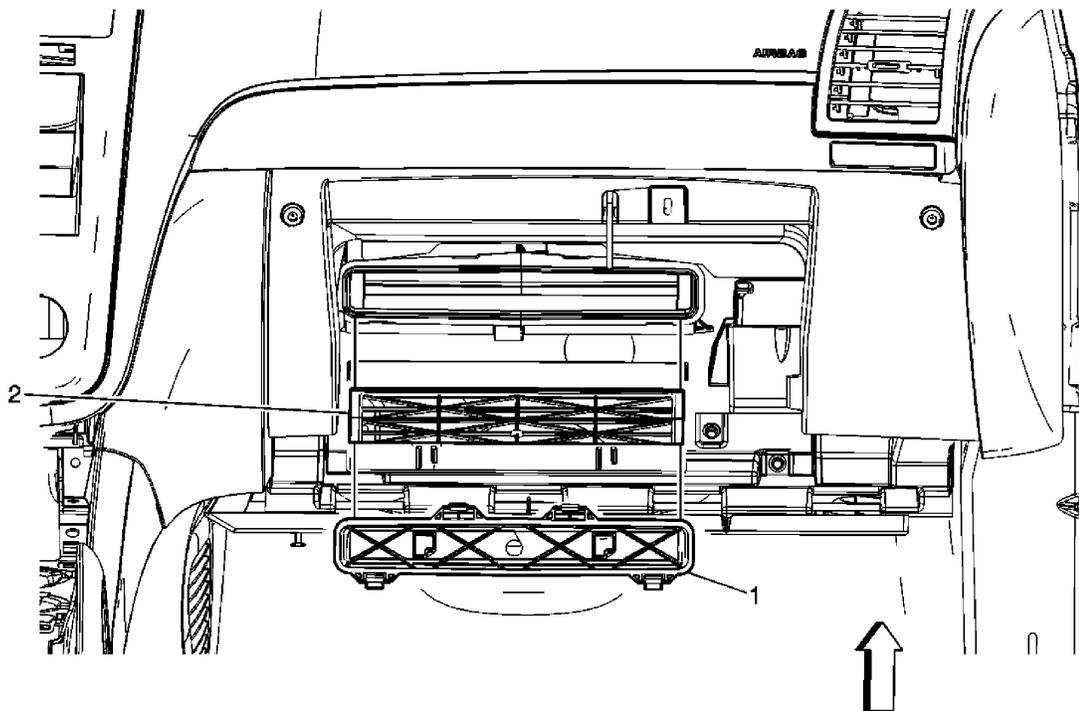


Fig. 51: Locating Passenger Compartment Air Filter Housing
 Courtesy of GENERAL MOTORS CORP.

Passenger Compartment Air Filter Housing Replacement

Callout	Component Name
<p>Preliminary Procedure: Remove the instrument panel compartment. Refer to <u>Instrument Panel Compartment Replacement</u></p>	
<p>1</p>	<p>Passenger Compartment Air Filter Housing Cover Procedure: Squeeze the housing cover tabs for removal. Tip: Ensure seals are in place upon installation.</p>

2 | Passenger Compartment Air Filter Housing

BLOWER MOTOR CONTROL MODULE REPLACEMENT

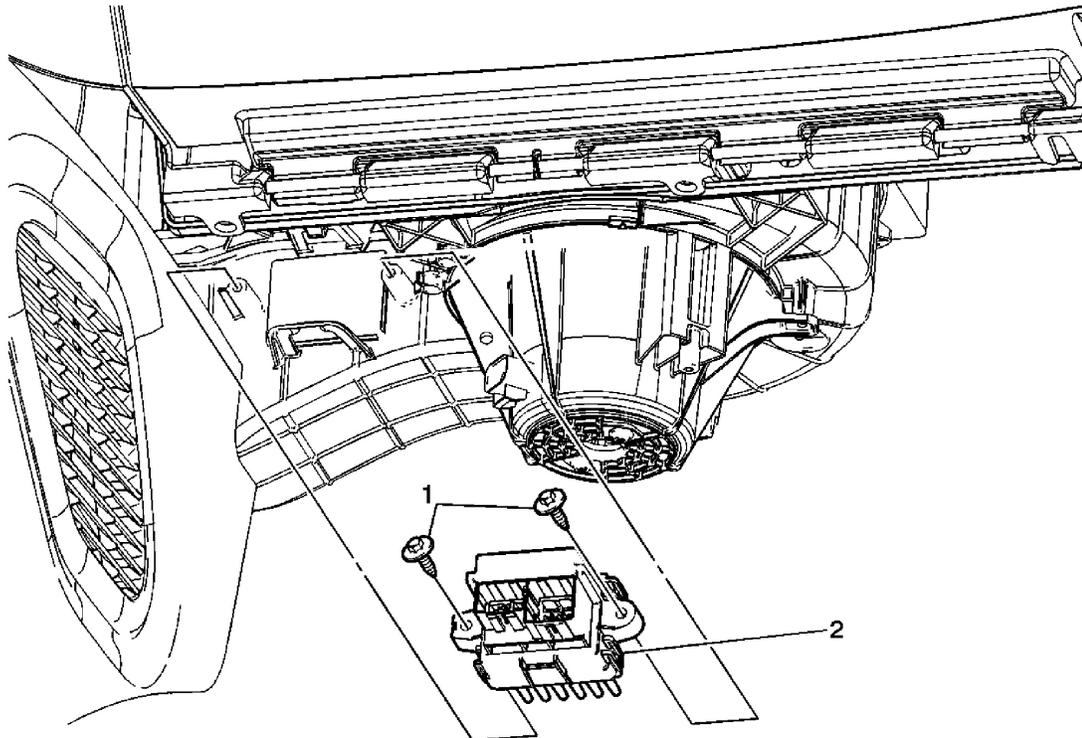


Fig. 52: Identifying Blower Motor Control Module
 Courtesy of GENERAL MOTORS CORP.

Blower Motor Control Module Replacement

Callout	Component Name
<p>Preliminary Procedure: Remove the instrument panel insulator - right side. Refer to <u>Instrument Panel Insulator Panel Replacement - Right Side</u> .</p>	
<p>1</p>	<p>Blower Motor Control Module Screw (Qty: 2)</p> <p>NOTE: Refer to <u>Fastener Notice</u> .</p> <p>Tighten: 2 N.m (18 lb in)</p>
<p>2</p>	<p>Blower Motor Control Module</p> <p>Procedure:</p>

Disconnect electrical connectors.

BLOWER MOTOR REPLACEMENT

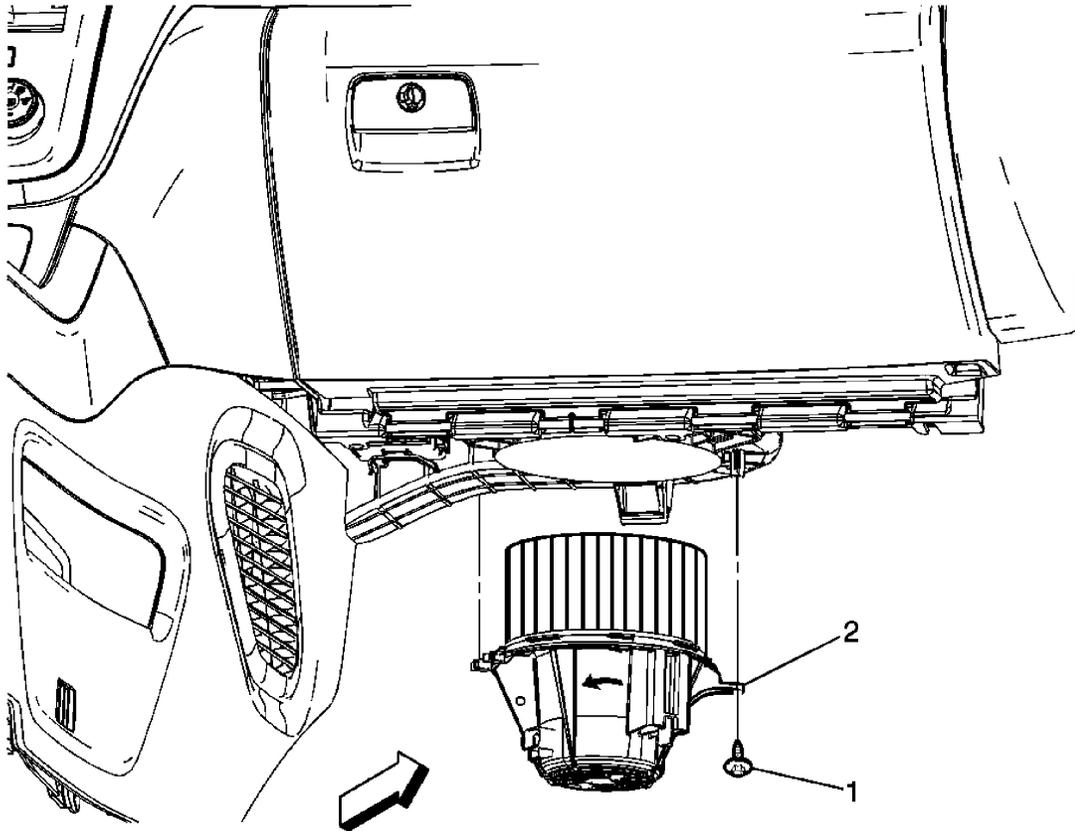


Fig. 53: Locating Blower Motor
 Courtesy of GENERAL MOTORS CORP.

Blower Motor Replacement

Callout	Component Name
Preliminary Procedure: Remove the instrument panel insulator - right side. Refer to <u>Instrument Panel Insulator Panel Replacement - Right Side</u> .	
1	Blower Motor Screw NOTE: Refer to <u>Fastener Notice</u> . Tighten: 2 N.m (18 lb in)

2	<p>Blower Motor</p> <p>Procedure</p> <ul style="list-style-type: none"> • Disconnect the electrical connectors. • Rotate the blower motor counterclockwise to remove.
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SIDE WINDOW AIR OUTLET REPLACEMENT

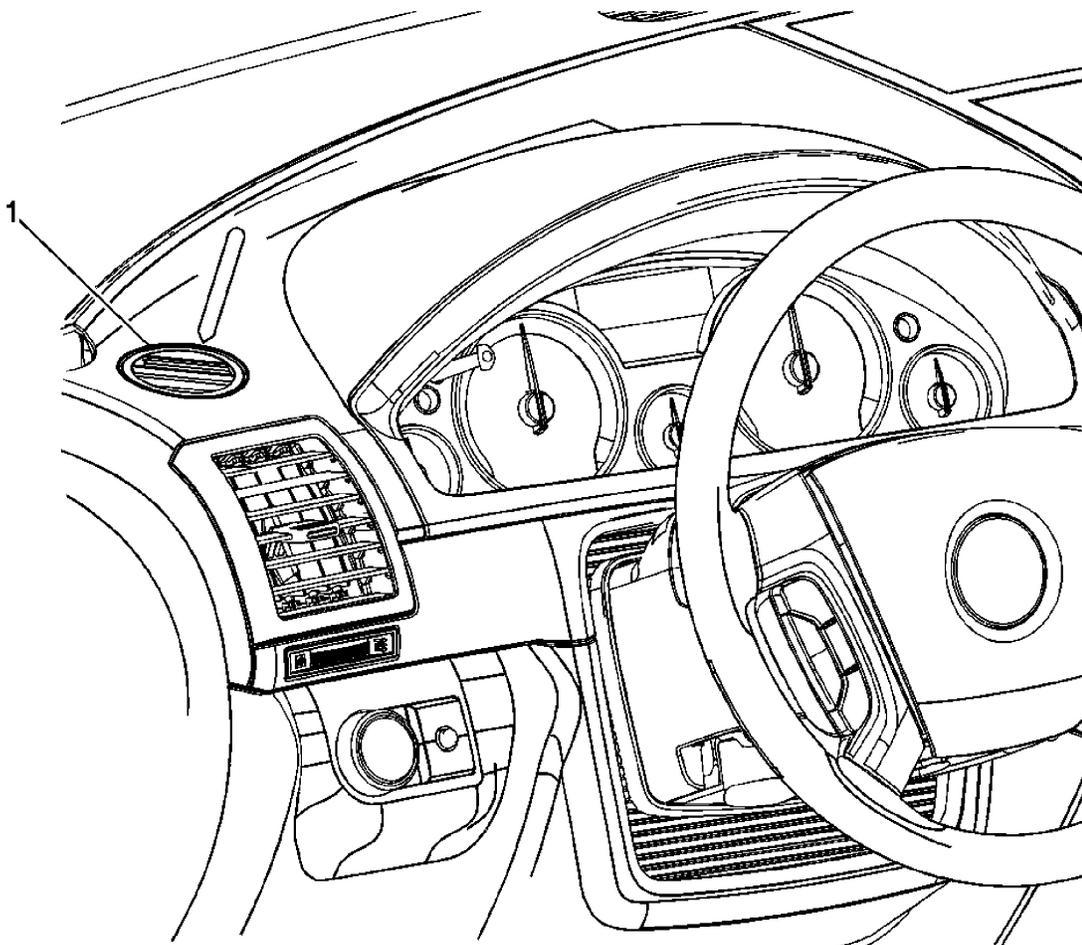


Fig. 54: View Of Side Window Air Outlet
 Courtesy of GENERAL MOTORS CORP.

Side Window Air Outlet Replacement

Callout	Component Name
1	Side Window Air Outlet Assembly

Procedures

- 1
1. Insert a flat bladed plastic trim tool in the approximate location indicated in order to release the retaining tab, releasing the air outlet from the instrument panel.
 2. Remove the air outlet from the vehicle.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - LEFT SIDE

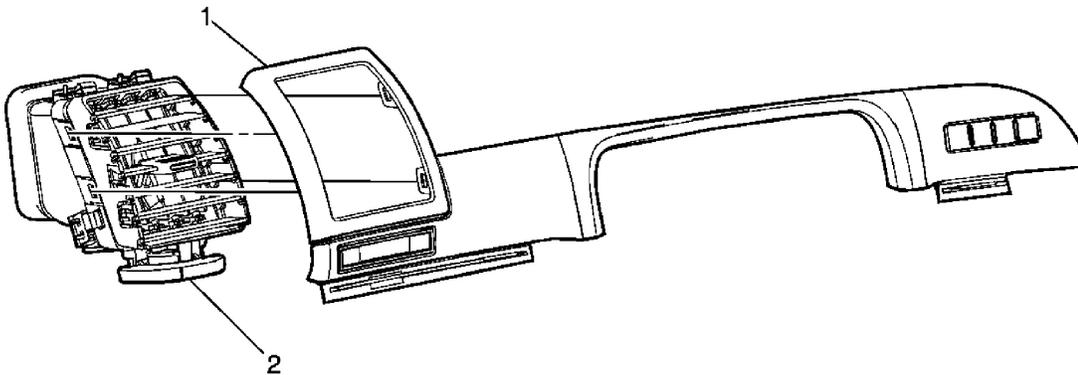


Fig. 55: View Of Left Side Instrument Panel Outer Air Outlet
 Courtesy of GENERAL MOTORS CORP.

Instrument Panel Outer Air Outlet Replacement - Left Side

Callout	Component Name
1	Instrument Panel Left Trim Panel Refer to <u>Instrument Panel Trim Panel Replacement - Left Side</u> .
2	Instrument Panel Left Air Outlet Procedure: Unsnap the air outlet from the trim panel.

INSTRUMENT PANEL CENTER AIR OUTLET REPLACEMENT

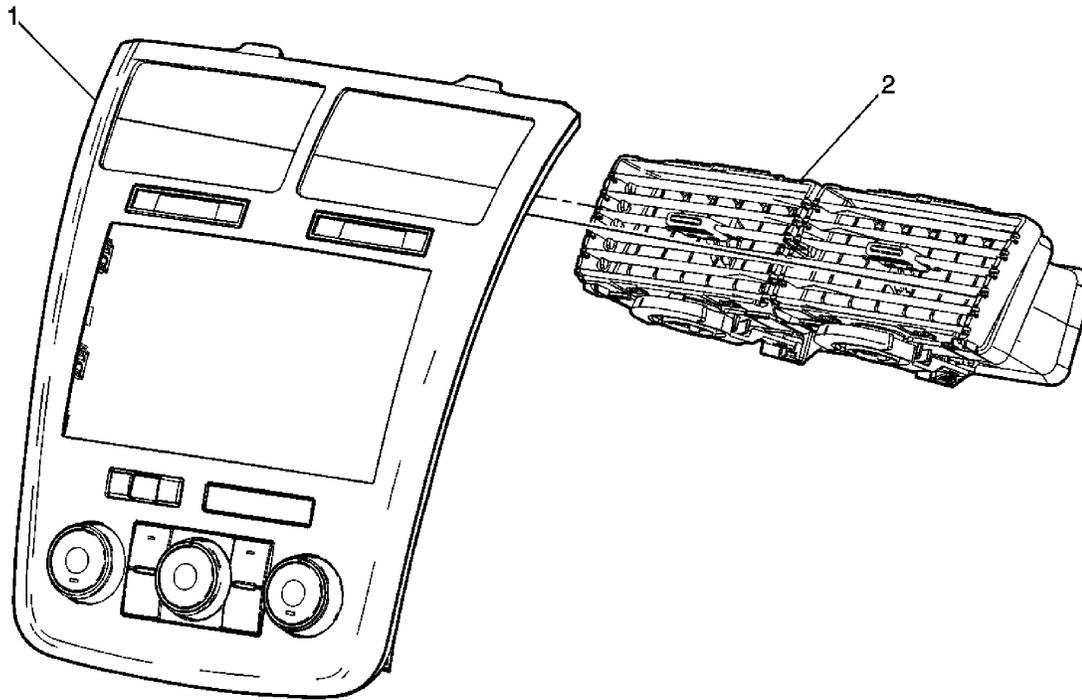


Fig. 56: View Of Instrument Panel Center Air Outlet
 Courtesy of GENERAL MOTORS CORP.

Instrument Panel Center Air Outlet Replacement

Callout	Component Name
1	Instrument Panel Accessory Trim Plate Refer to <u>Instrument Panel Accessory Trim Plate Replacement</u> .
2	Instrument Panel Center Air Outlets Procedure: Unsnap the air outlets from the accesory trim plate.

INSTRUMENT PANEL OUTER AIR OUTLET REPLACEMENT - RIGHT SIDE

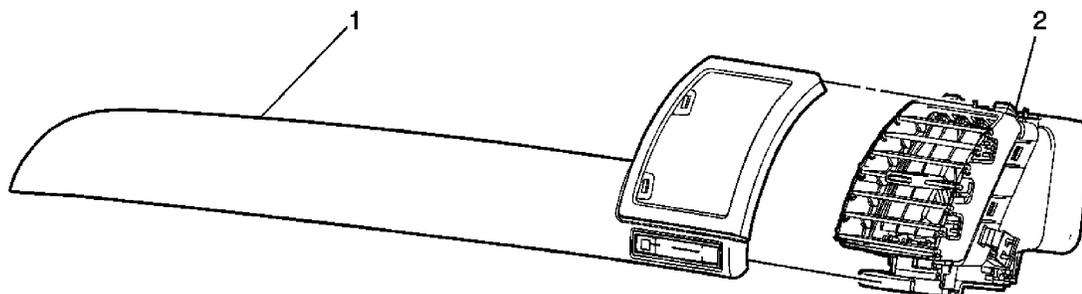


Fig. 57: View Of Right Side Instrument Panel Outer Air Outlet
 Courtesy of GENERAL MOTORS CORP.

Instrument Panel Outer Air Outlet Replacement - Right Side

Callout	Component Name
1	Instrument Panel Right Trim Panel Refer to <u>Instrument Panel Trim Panel Replacement - Right Side</u> .
2	Instrument Panel Right Air Outlet Procedure: Unsnap the air outlet from the trim panel.

WINDSHIELD DEFROSTER DUCT REPLACEMENT

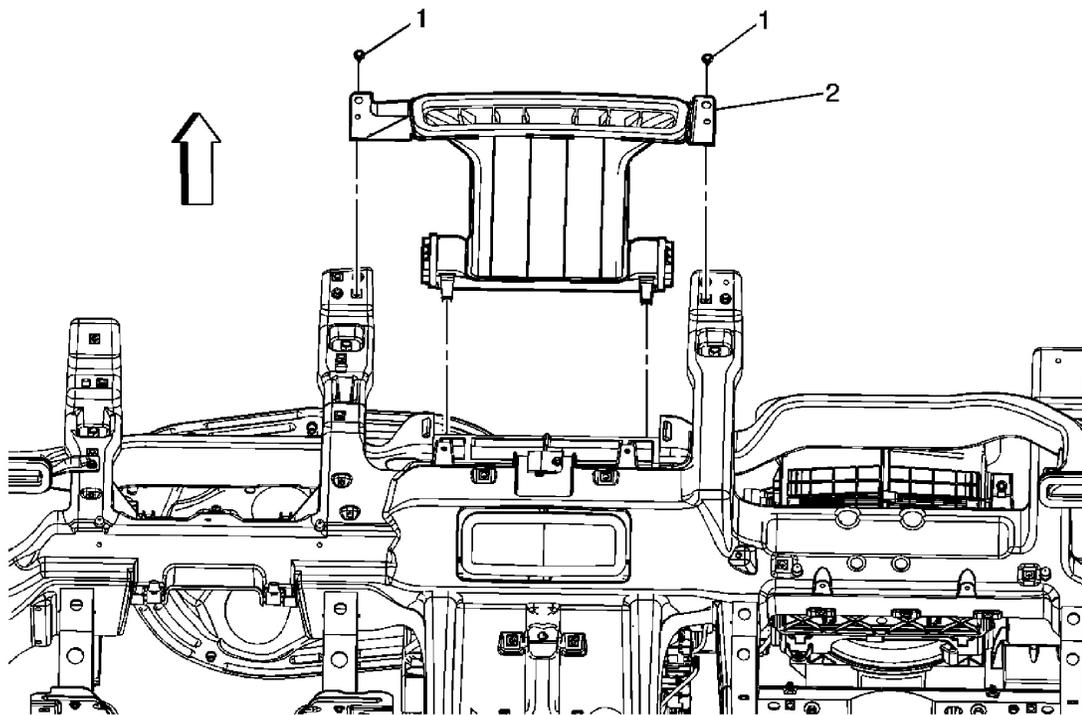


Fig. 58: Identifying Windshield Defroster Duct
 Courtesy of GENERAL MOTORS CORP.

Windshield Defroster Duct Replacement

Callout	Component Name
Preliminary Procedure: Remove the I/P trim pad. Refer to <u>Instrument Panel Trim Pad Replacement</u>	
	Windshield Defroster Duct Screw (Qty: 2)

1	<p>NOTE: Refer to <u>Fastener Notice</u> .</p> <p>Tighten: 2 N.m (18 lb in)</p>
2	Windshield Defroster Duct

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - LEFT SIDE

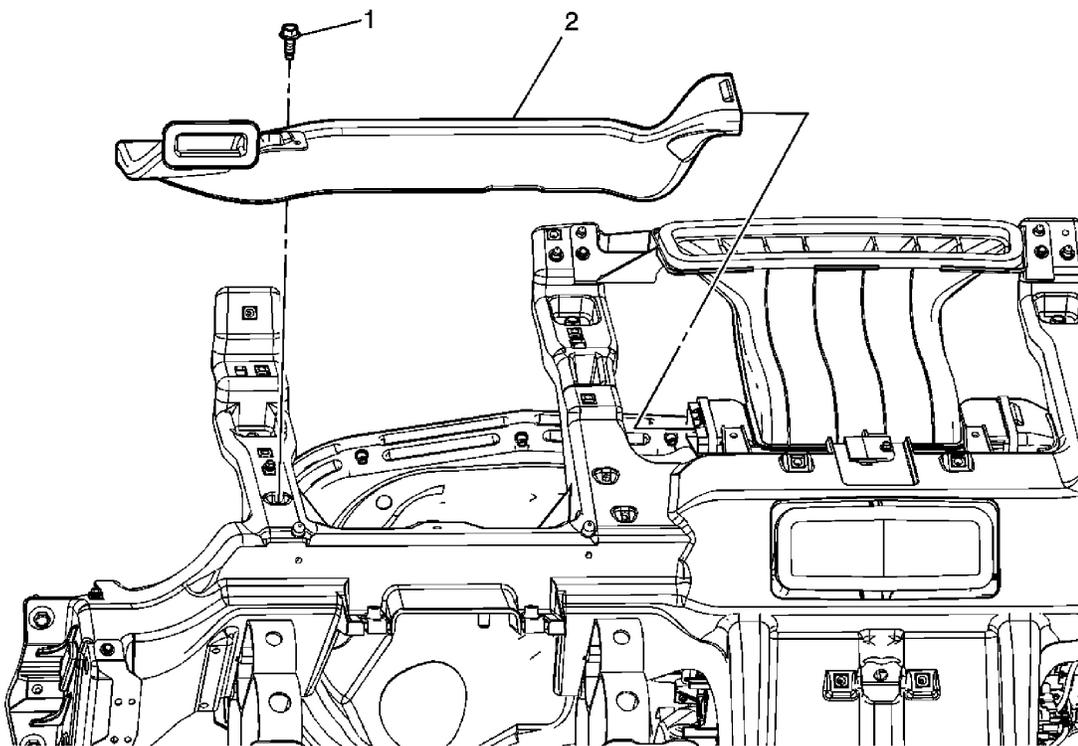


Fig. 59: View Of Side Window Defogger Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS CORP.

Side Window Defogger Outlet Duct Replacement - Left Side

Callout	Component Name
<p>Preliminary Procedure: Remove the I/P trim pad. Refer to <u>Instrument Panel Trim Pad Replacement</u></p>	
1	<p>Left Side Window Defogger Outlet Duct Screw</p> <p>NOTE: Refer to <u>Fastener Notice</u> .</p>

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	Tighten: 2 N.m (18 lb in)
2	Left Side Window Defogger Outlet Duct Procedure: Squeeze tab to release from windshield defroster duct.

SIDE WINDOW DEFOGGER OUTLET DUCT REPLACEMENT - RIGHT SIDE

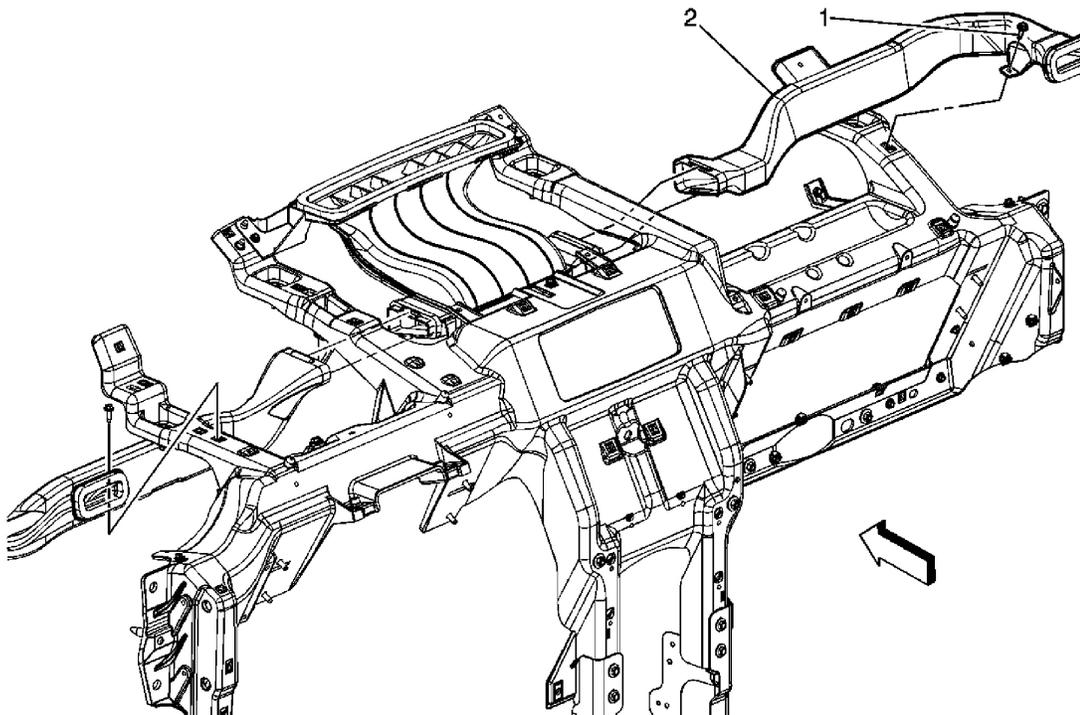


Fig. 60: Identifying Side Window Defogger Outlet Duct - Right Side
Courtesy of GENERAL MOTORS CORP.

Side Window Defogger Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure: Remove the I/P trim pad. Refer to <u>Instrument Panel Trim Pad Replacement</u> .	
1	Right Side Window Defogger Outlet Duct Screw NOTE: Refer to <u>Fastener Notice</u> . Tighten: 2 N.m (18 lb in)
	Right Side Window Defogger Outlet Duct

2

Procedure:

Squeeze tab to release from windshield defroster duct.

HEATER CORE COVER REPLACEMENT

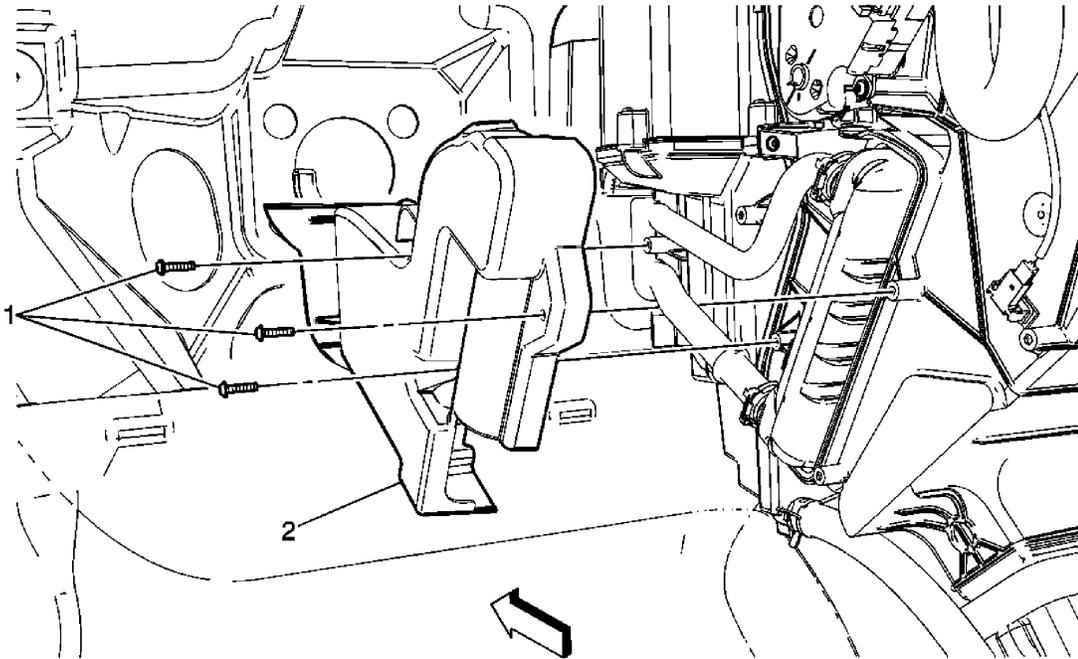


Fig. 61: Locating Heater Core Cover
 Courtesy of GENERAL MOTORS CORP.

Heater Core Cover Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove left front floor console extension panel. 2. Reposition any wiring harness to access heater core cover.	
1	Heater Core Cover Screw (Qty: 3) NOTE: Refer to <u>Fastener Notice</u> . Tighten: 3 N.m (27 lb in)
2	Heater Core Cover

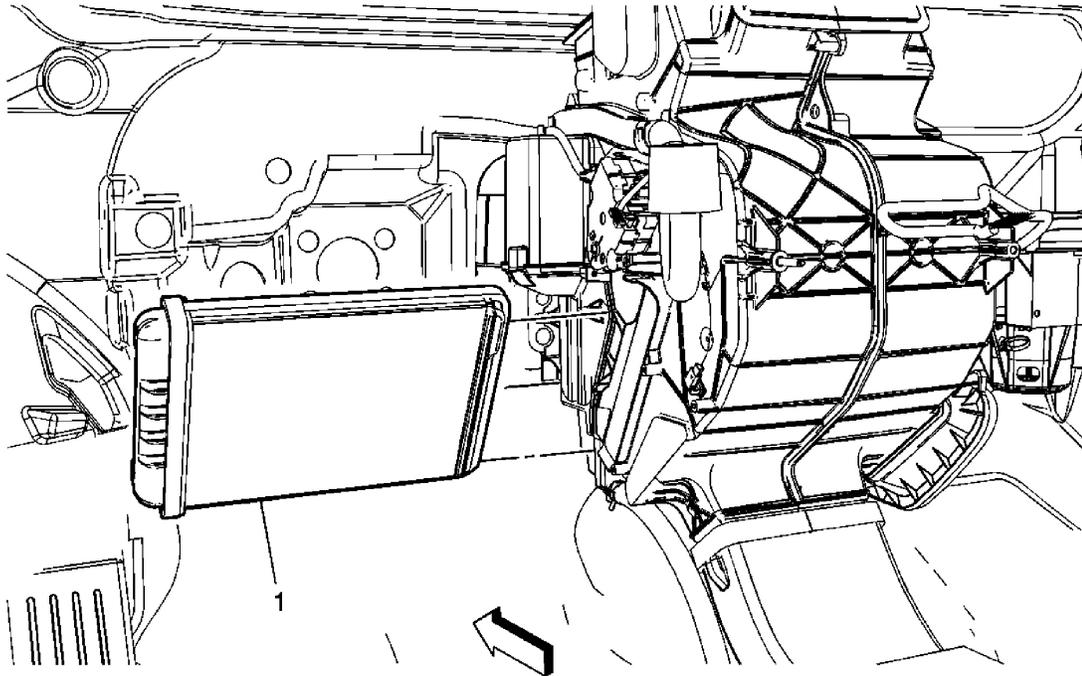
HEATER CORE REPLACEMENT

Fig. 62: Identifying Heater Core
 Courtesy of GENERAL MOTORS CORP.

Heater Core Replacement

Callout	Component Name
Preliminary Procedure: Remove the heater core tubes. Refer to Heater Core Tube Replacement .	
1	Heater Core Procedure: Reposition the heater core outward from the heater case to ease in removal. Tip: Ensure the heater core seals are in place upon installation.

AUXILIARY BLOWER CONTROL MODULE REPLACEMENT

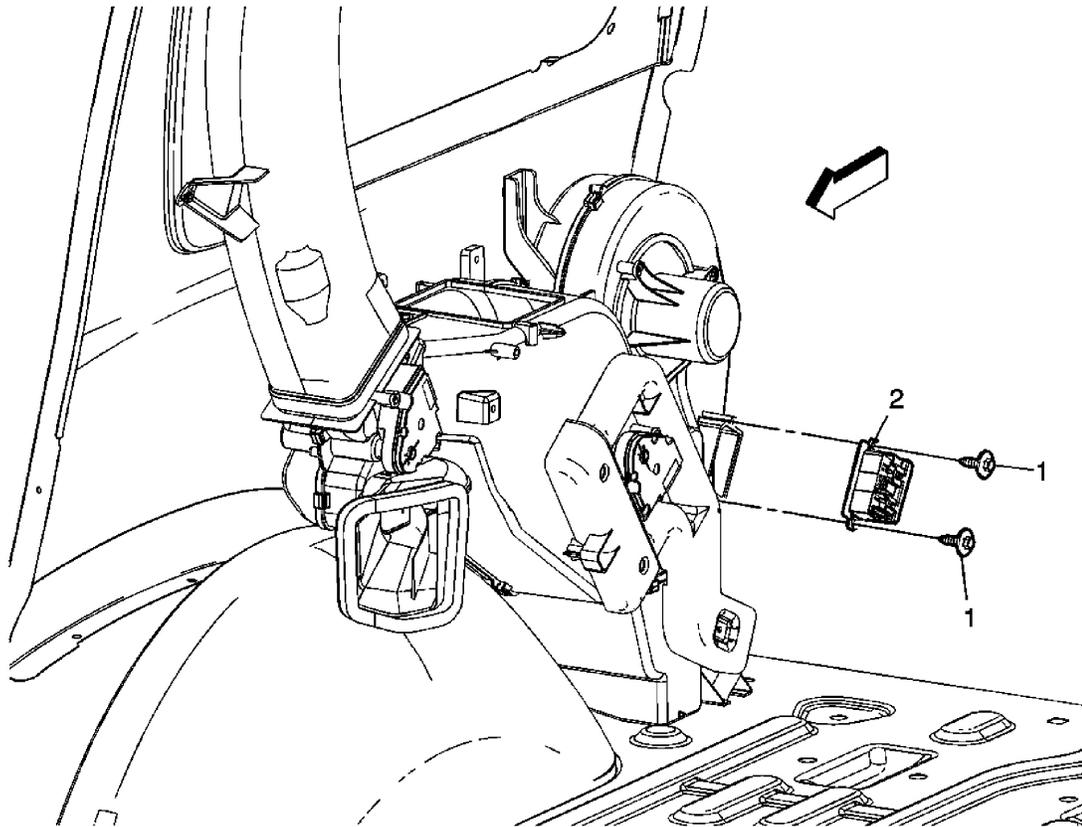


Fig. 63: Locating Auxiliary Blower Control Module
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Blower Control Module Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the right rear quarter trim panel. Refer to <u>Rear Quarter Lower Trim Panel Replacement (without RPO E61)</u> or <u>Rear Quarter Lower Trim Panel Replacement (with RPO E61)</u> . 2. Disconnect the blower motor control module electrical connector.	
1	Blower Motor Resistor Screw (Qty: 2) NOTE: Refer to <u>Fastener Notice</u> . Tighten: 1.5 N.m (13 lb in)
2	Blower Motor Control Module

AUXILIARY BLOWER MOTOR REPLACEMENT

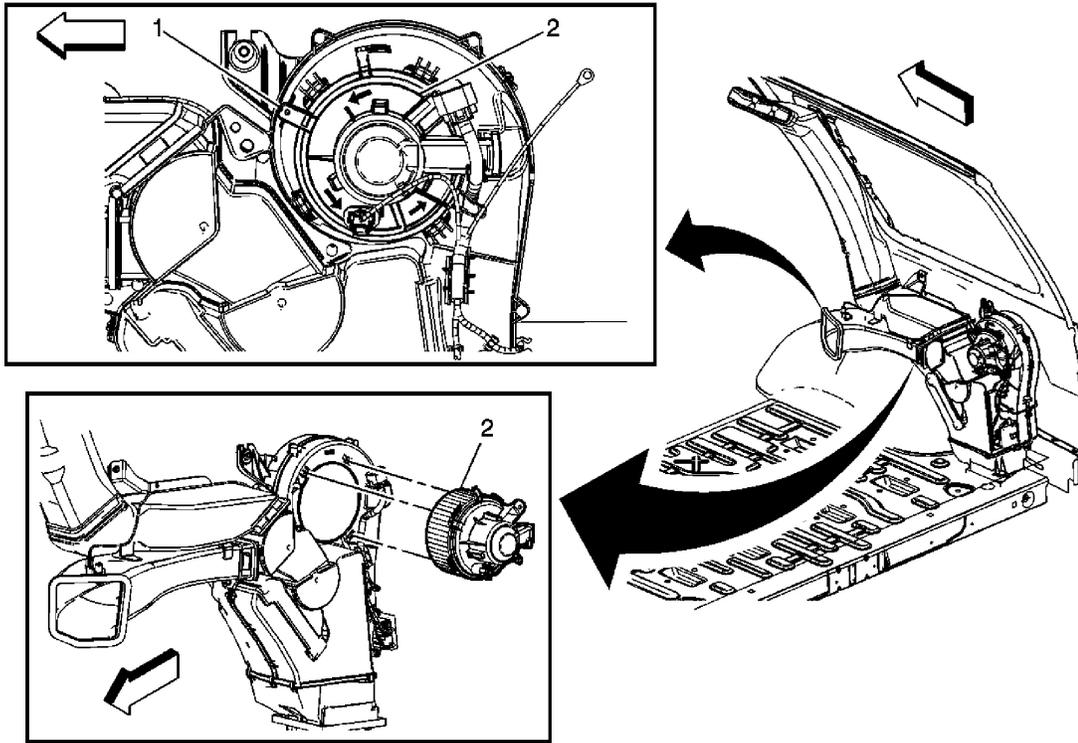


Fig. 64: View Of Blower Motor Assembly
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Blower Motor Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the right rear quarter trim panel. Refer to <u>Rear Quarter Lower Trim Panel Replacement (without RPO E61)</u> or <u>Rear Quarter Lower Trim Panel Replacement (with RPO E61)</u> . 2. Disconnect the blower motor electrical connector. 3. Tip: Remove one attaching screw securing blower motor if applicable.	
1	Carefully pull back locking tabs on blower motor assembly. (Qty: 2)
2	Rotate blower motor assembly counterclockwise.
3	Motor, Blower Assembly

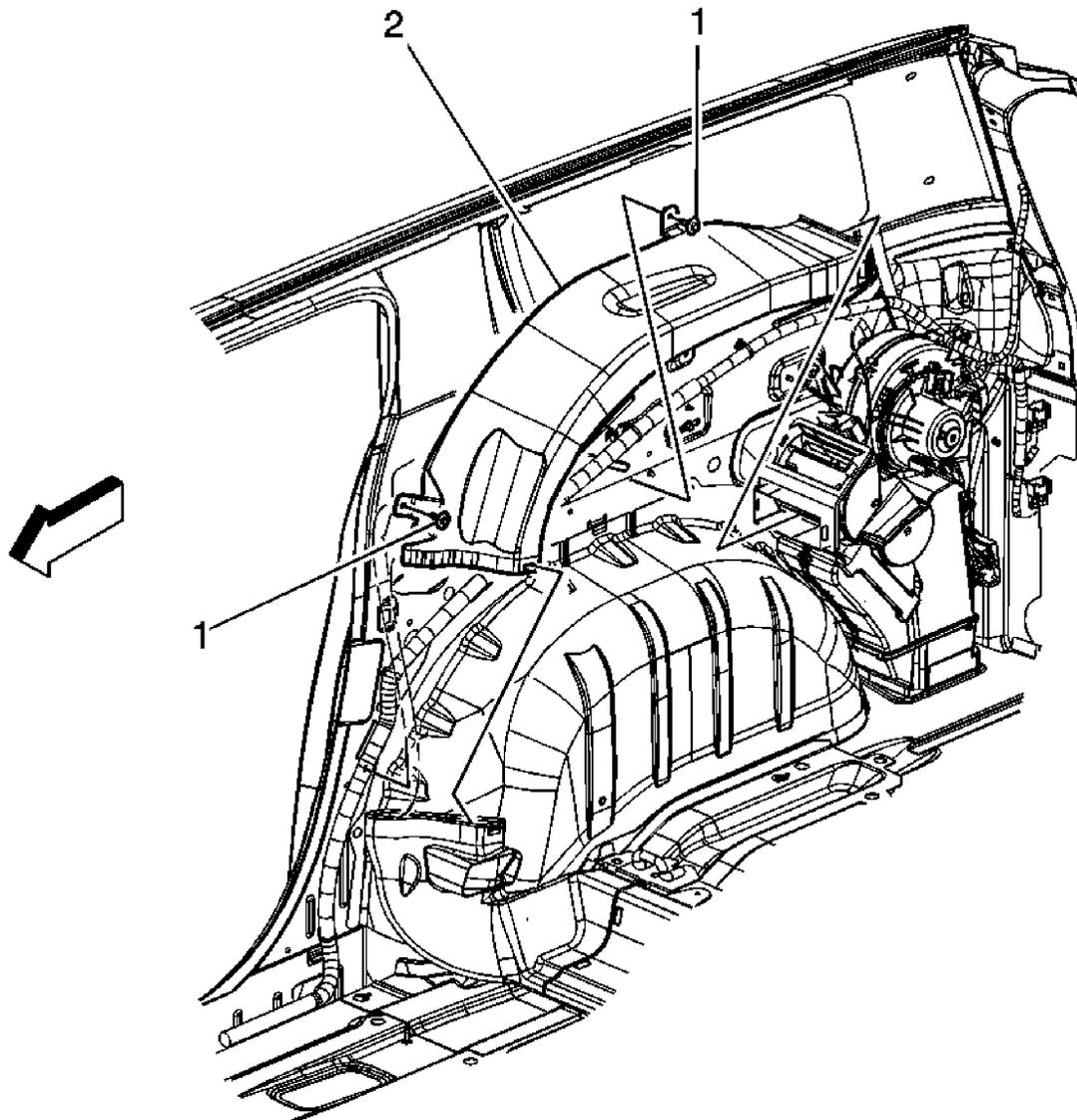
AUXILIARY AIR DISTRIBUTOR LOWER DUCT REPLACEMENT

Fig. 65: Identifying Auxiliary Air Distributor Lower Duct
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Air Distributor Lower Duct Replacement

Callout	Component Name
Preliminary Procedure	
1.	Remove the right rear quarter trim panel. Refer to Rear Quarter Lower Trim Panel Replacement (without RPO E61) or Rear Quarter Lower Trim Panel

Replacement (with RPO E61) .

2. Remove the upper air temperature sensor, if equipped.

1	<p>Air Distribution Duct Screw (Qty: 2)</p> <p>NOTE: Refer to Fastener Notice .</p> <p>Tighten: 2 N.m (18 lb in)</p>
2	<p>Lower Air Distribution Duct</p> <p>Procedure: Squeeze both ends of distribution duct to release for removal.</p>

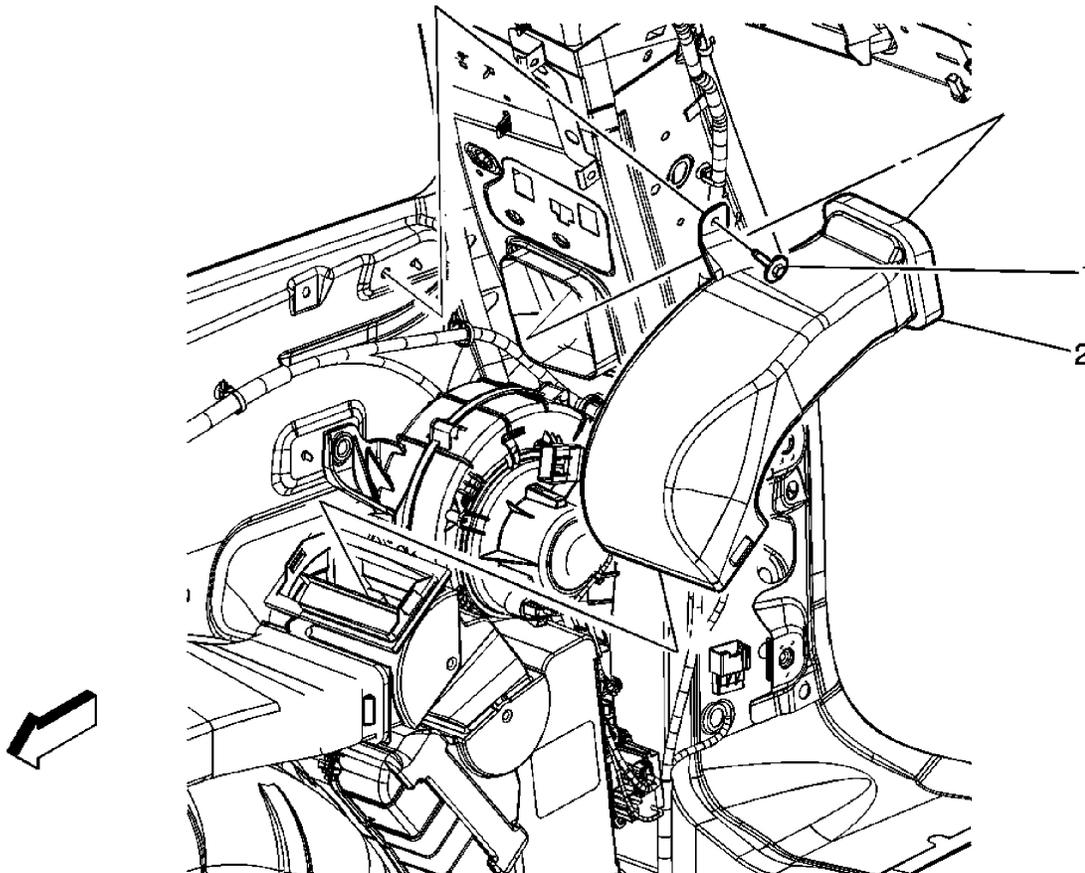
AUXILIARY AIR DISTRIBUTOR DUCT REPLACEMENT - UPPER

Fig. 66: View Of Auxiliary Air Distributor Duct - Upper
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Air Distributor Duct Replacement - Upper

Callout	Component Name
Preliminary Procedure 1. Remove the right rear quarter trim panel. Refer to <u>Rear Quarter Lower Trim Panel Replacement (without RPO E61)</u> or <u>Rear Quarter Lower Trim Panel Replacement (with RPO E61)</u> . 2. Remove the upper air temperature sensor, if equipped.	
1	Air Distribution Duct Screw NOTE: Refer to <u>Fastener Notice</u> . Tighten: 2 N.m (18 lb in)
2	Upper Air Distribution Duct Procedure: Squeeze both ends of distribution duct to release for removal.

AUXILIARY HEATER CORE REPLACEMENT

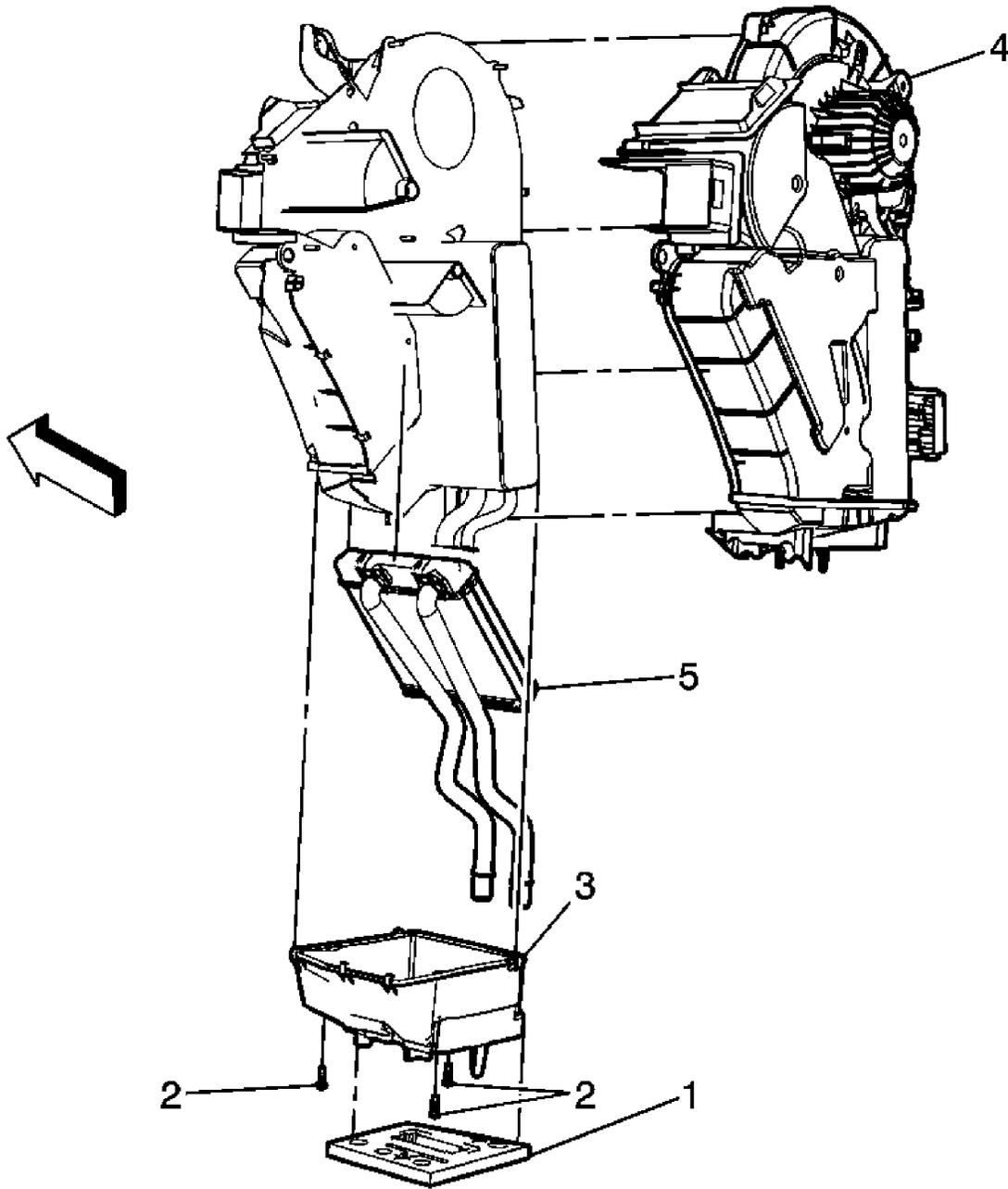


Fig. 67: Locating Auxiliary Heater Core
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Heater Core Replacement

Callout	Component Name
Preliminary Procedure: Remove the HVAC module - auxiliary. Refer to <u>Auxiliary HVAC Module Replacement.</u>	

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1	HVAC Module Gasket
2	Auxiliary HVAC Module Lower Cover Bolt (Qty: 3) NOTE: Refer to <u>Fastener Notice</u> . Procedure: Remove any fastener clips that secure cover to module. Tighten: 3 N.m (27 lb in)
3	Auxiliary HVAC Module Lower Cover
4	HVAC Module Case Procedure: Remove any fastener clips that secure cover to module. Tighten: 3 N.m (27 lb in)
5	Auxiliary HVAC Heater Core Tip: Ensure all seals and gaskets are in place upon installation.

AUXILIARY HEATER CORE TUBE REPLACEMENT

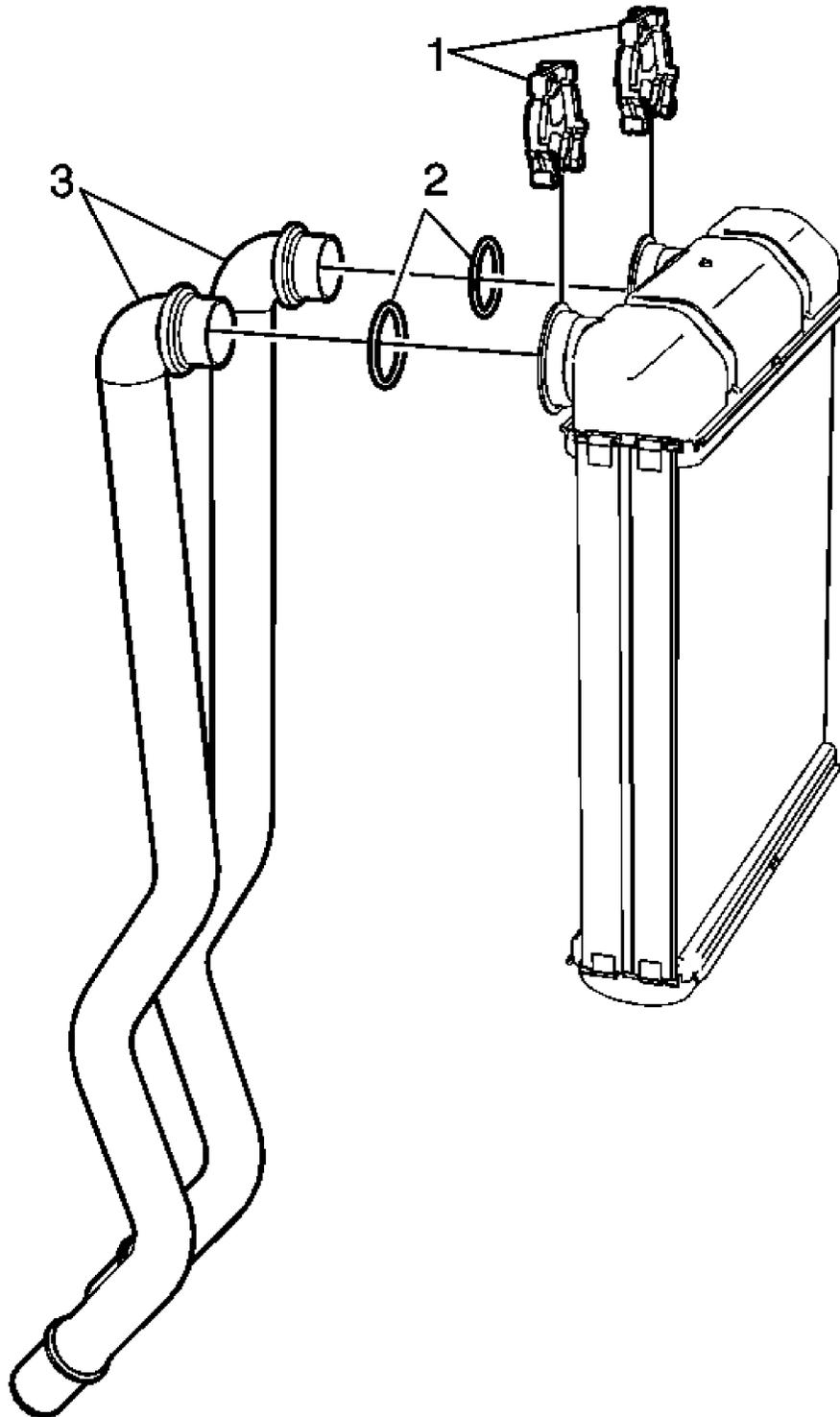


Fig. 68: Identifying Auxiliary Heater Core Tube
Courtesy of GENERAL MOTORS CORP.

Auxiliary Heater Core Tube Replacement

Callout	Component Name
Preliminary Procedure: Remove the auxiliary heater core. Refer to Auxiliary Heater Core Replacement .	
1	Heater Core Tube Clip (Qty: 2) Procedure: Expand the retaining clips outward to aid in removal.
2	Heater Core Tube O-rings (Qty: 2) Tip: Do not reuse O-rings
3	Heater Core Tube

AUXILIARY AIR CONDITIONING EVAPORATOR THERMAL EXPANSION VALVE REPLACEMENT

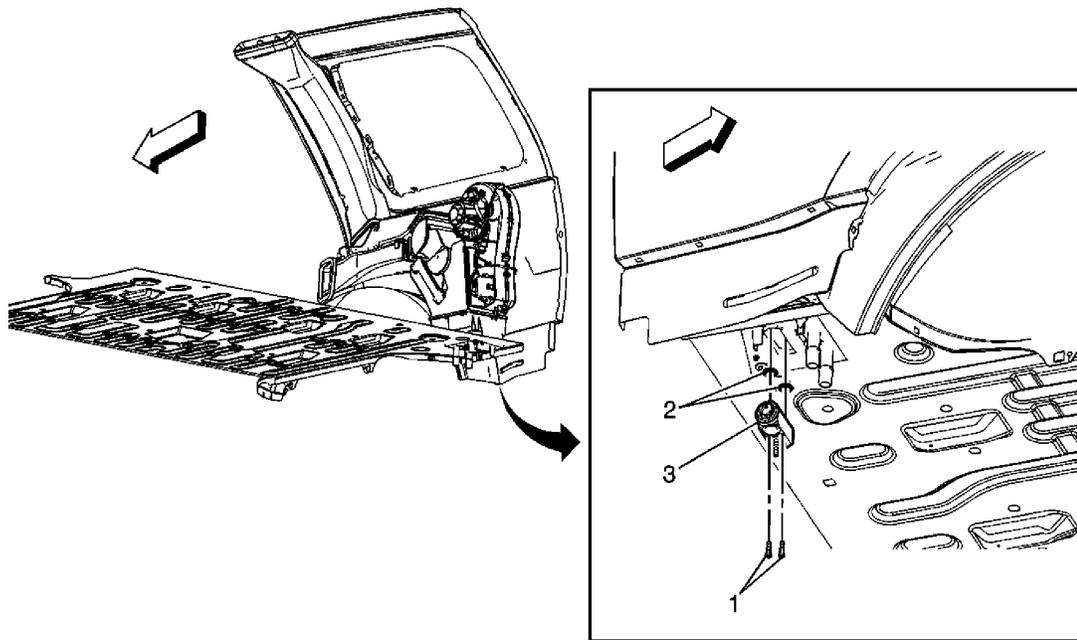


Fig. 69: Identifying Auxiliary Evaporator Thermal Expansion Valve & Components
Courtesy of GENERAL MOTORS CORP.

Auxiliary Air Conditioning Evaporator Thermal Expansion Valve Replacement

Callout	Component Name
Preliminary Procedures	
1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging .	
2. Remove the retaining nut and the auxiliary A/C evaporator tubes from the auxiliary	

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HVAC module. Refer to **Auxiliary Air Conditioning Evaporator Tube Replacement**.

1	Thermal Expansion Valve Bolt (Qty: 2) NOTE: Refer to <u>Fastener Notice</u> . Tighten: 16 N.m (12 lb ft)
2	Sealing Washer Tip: Remove and discard the sealing washer. Refer to <u>Sealing Washer Replacement</u> .
3	Thermal Expansion Valve

AUXILIARY HVAC MODULE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

1. Recover the refrigerant from the A/C system. Refer to **Refrigerant Recovery and Recharging**.
2. Drain the engine coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
3. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .

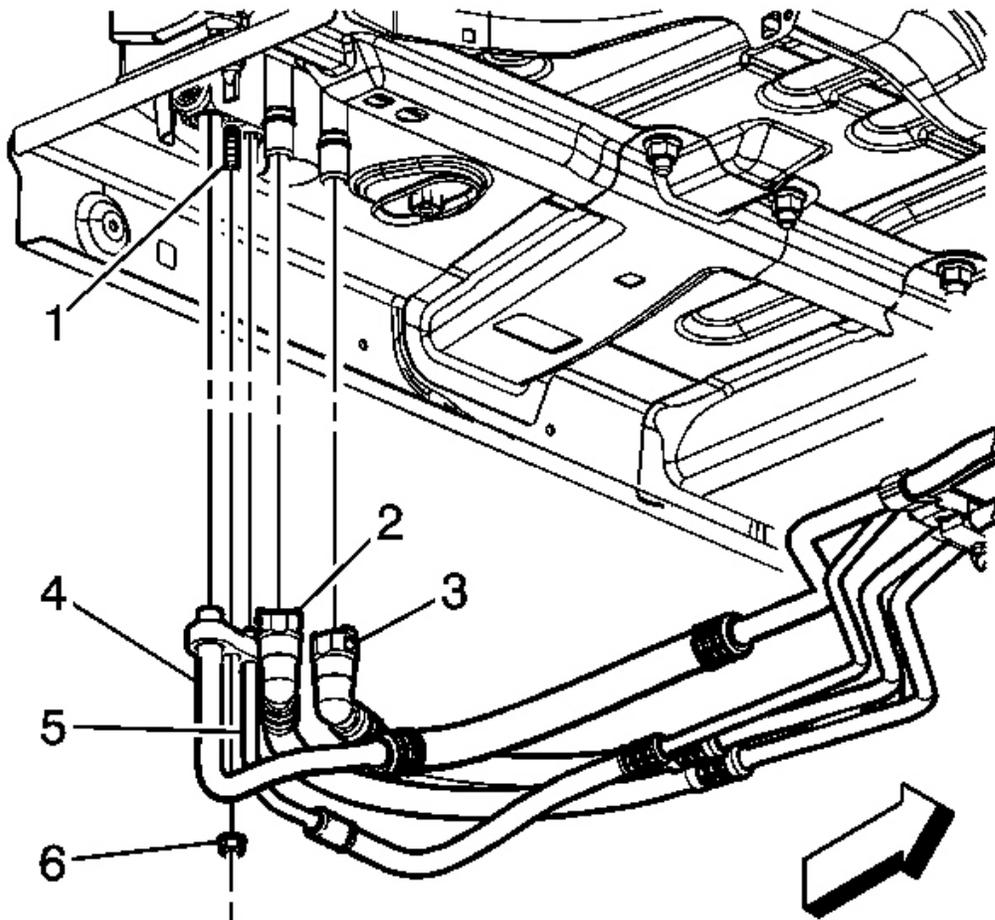


Fig. 70: Identifying Heater Lines, Air Conditioning Lines & Components
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the heater lines (2, 3) from the auxiliary HVAC module at the underside of the vehicle.
5. Disconnect the air conditioning lines (4, 5) from the auxiliary HVAC module at the underside of the vehicle.
6. Remove the nuts (6) from the studs (1) that secure the auxiliary HVAC module to the underside of the vehicle.
7. Lower the vehicle.
8. Remove the right rear quarter trim panel. Refer to **Rear Quarter Lower Trim Panel**

Replacement (without RPO E61) or Rear Quarter Lower Trim Panel Replacement (with RPO E61) .

9. Disconnect the electrical connectors from the Auxiliary HVAC module.

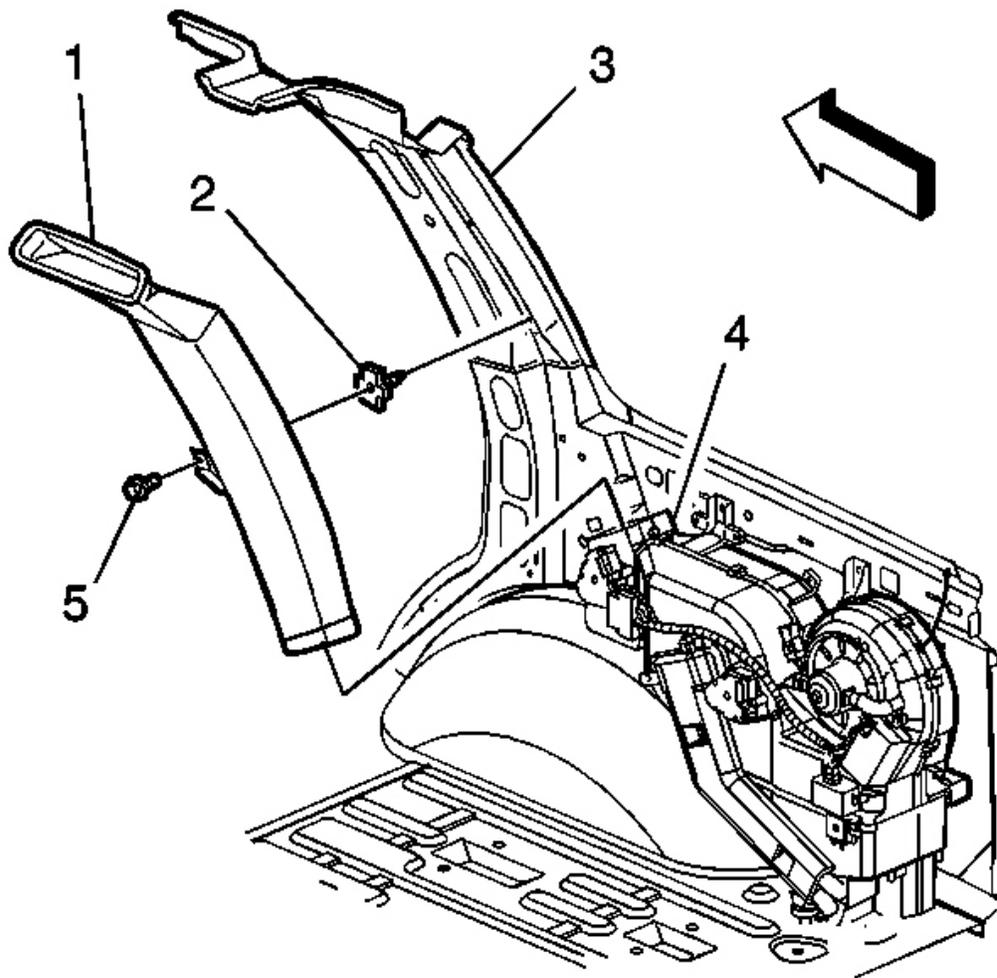


Fig. 71: View Of Upper Auxiliary Air Duct & Fastener (Tahoe/Yukon)
Courtesy of GENERAL MOTORS CORP.

10. Remove the fastener (5) for the upper auxiliary air duct (1). Carefully slide the duct up, into the headliner, until the bottom edge of the duct is above the air distributor duct.

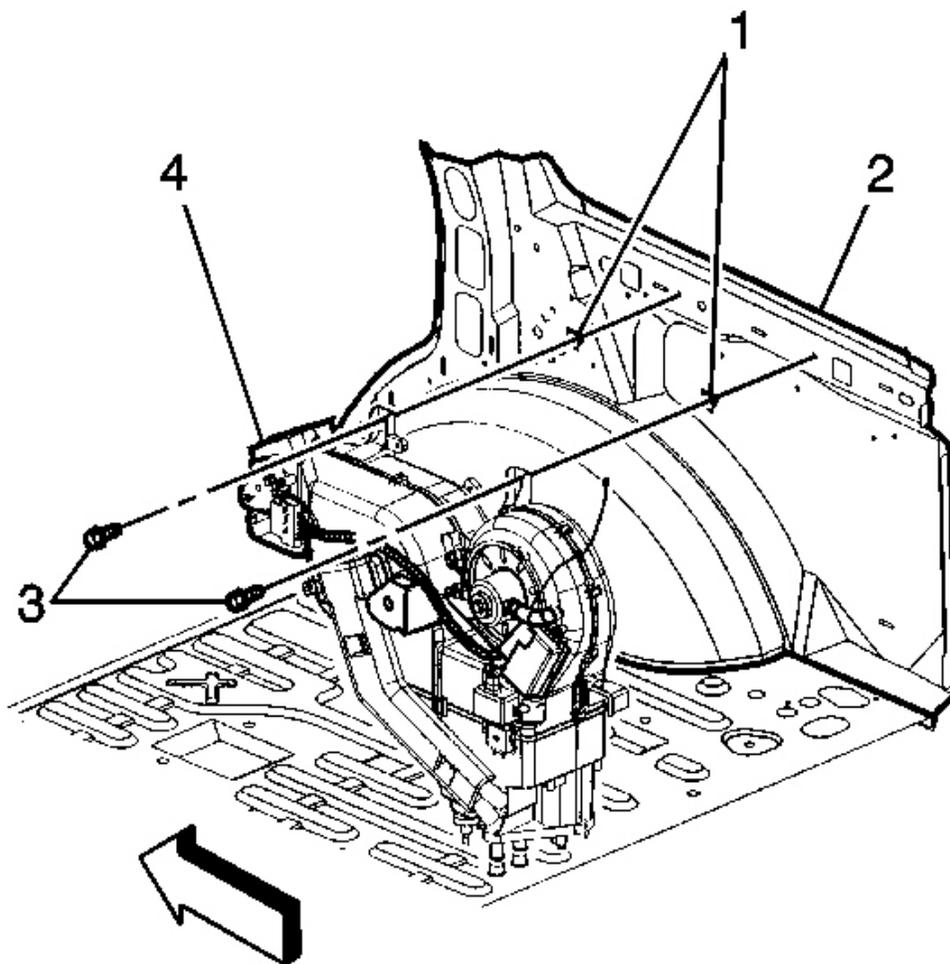


Fig. 72: View Of Auxiliary HVAC Module (Tahoe/Yukon)
Courtesy of GENERAL MOTORS CORP.

11. Remove the fasteners (3) retaining the auxiliary HVAC module to the vehicle.
12. Remove the auxiliary HVAC module (4) from the vehicle.

Installation Procedure

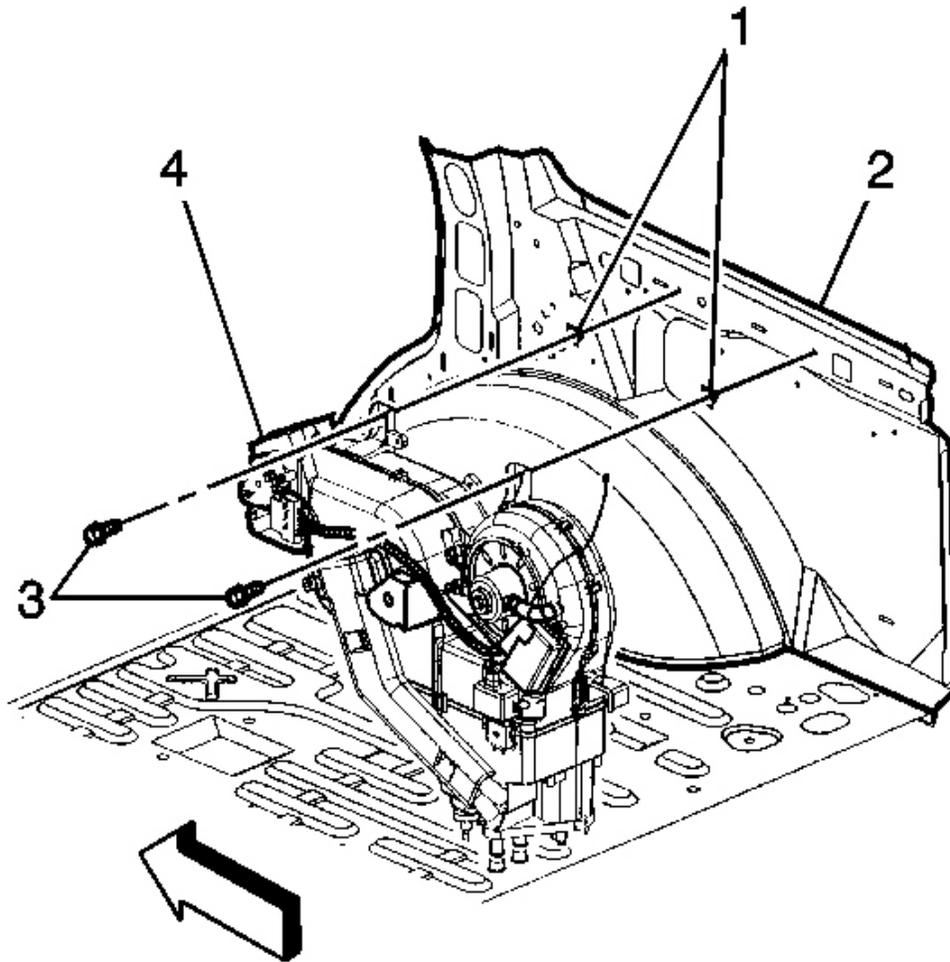


Fig. 73: View Of Auxiliary HVAC Module (Tahoe/Yukon)
Courtesy of GENERAL MOTORS CORP.

1. Install the auxiliary HVAC module assembly (4) to the vehicle.
2. Install the 2 bolts (3) inside the vehicle in order to retain the auxiliary HVAC module to the vehicle.

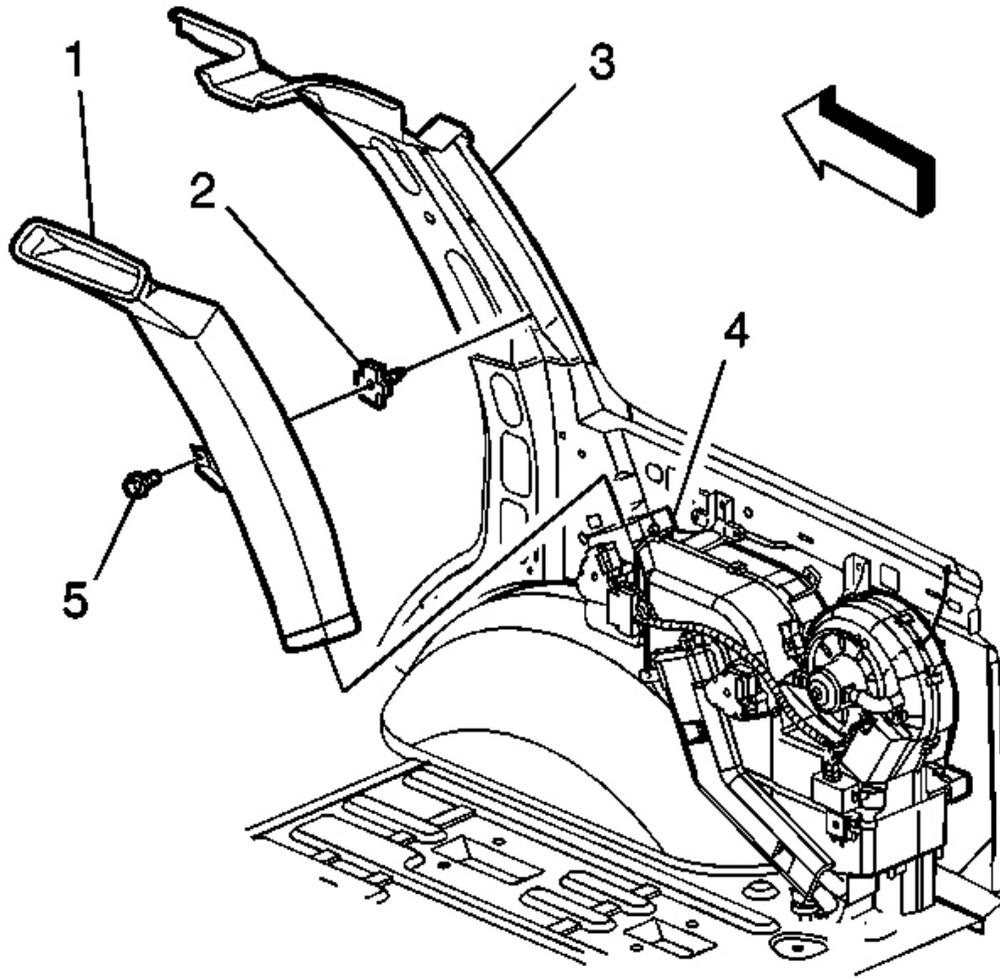


Fig. 74: View Of Upper Auxiliary Air Duct & Fastener (Tahoe/Yukon)
Courtesy of GENERAL MOTORS CORP.

3. Install the upper auxiliary air duct (1) to the air distributor duct. Install the fastener (5).
4. Connect the electrical connectors to the auxiliary HVAC module.
5. Install the right rear quarter trim panel. Refer to **Rear Quarter Lower Trim Panel Replacement (without RPO E61)** or **Rear Quarter Lower Trim Panel Replacement (with RPO E61)** .
6. Raise the vehicle.

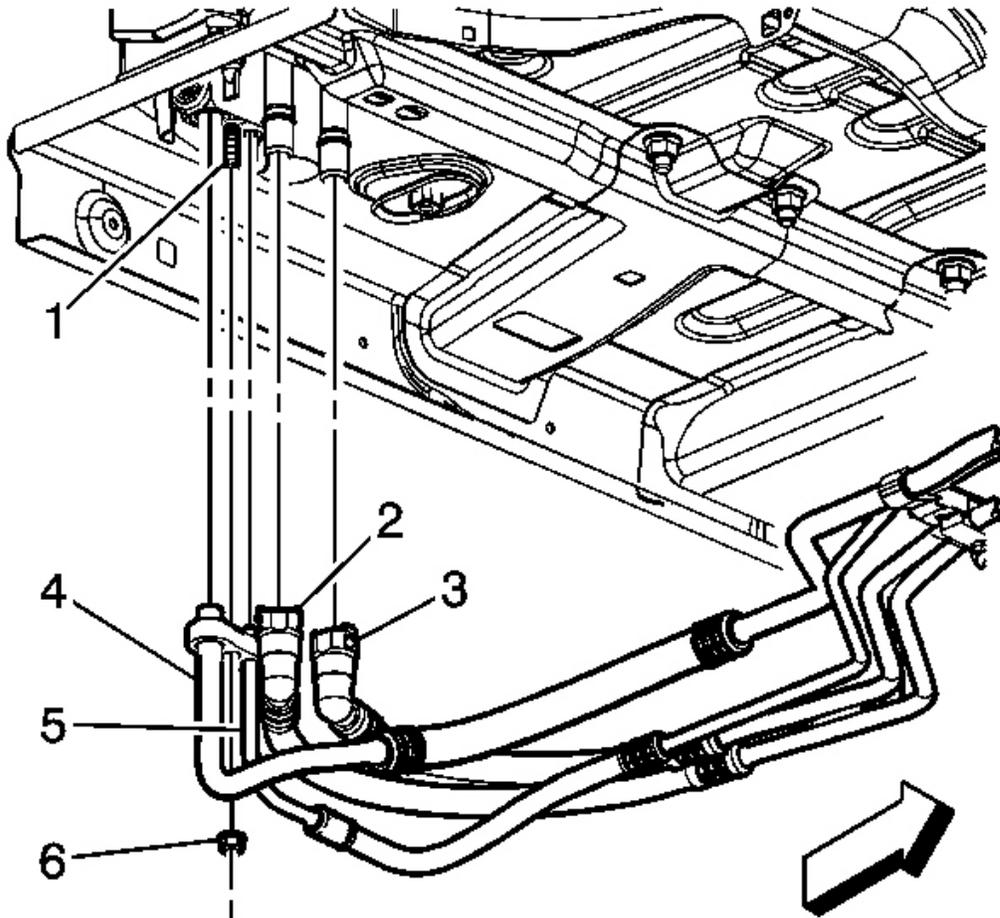


Fig. 75: Identifying Heater Lines, Air Conditioning Lines & Components
 Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

7. Install the nuts (6) that secure the auxiliary HVAC module to the vehicle.

Tighten: Tighten the nuts to 9 N.m (80 lb in).

8. Install the air conditioning lines (4, 5) and the nut (4) to the auxiliary HVAC module.

Tighten: Tighten the nut to 16 N.m (12 lb ft).

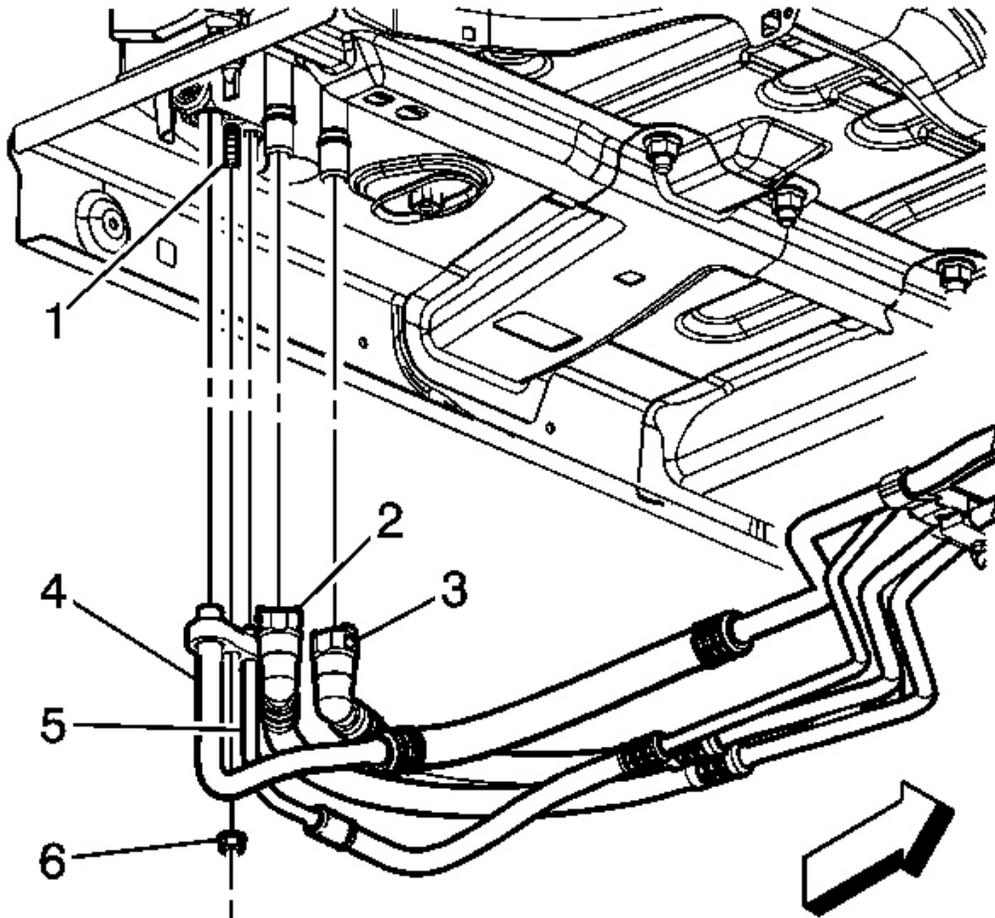


Fig. 76: Identifying Heater Lines, Air Conditioning Lines & Components
 Courtesy of GENERAL MOTORS CORP.

9. Install the heater lines (2, 3) to the auxiliary HVAC module at the underside of vehicle.
10. Lower the vehicle.
11. Fill the engine coolant. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
12. Recharge the refrigerant to the system. Refer to **Refrigerant Recovery and Recharging**.
13. Leak test the fittings of the component using the **J 39400-A** . See **Special Tools**.

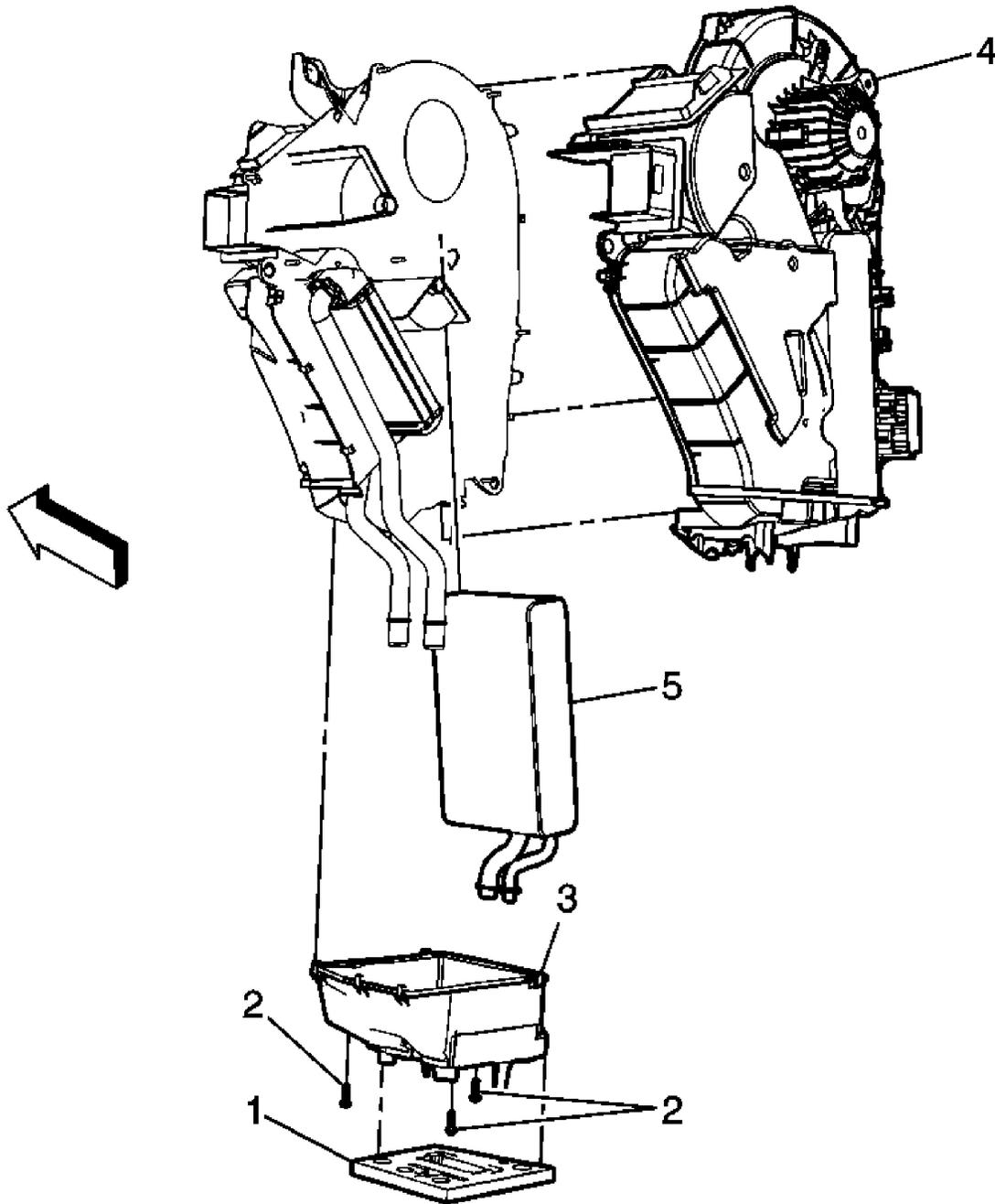


Fig. 77: View Of Auxiliary Air Conditioning Evaporator
 Courtesy of GENERAL MOTORS CORP.

Auxiliary Air Conditioning Evaporator Core Replacement

Callout	Component Name
Preliminary Procedure	

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1. Remove the HVAC module - auxiliary. Refer to **Auxiliary HVAC Module Replacement**.
2. Disconnect any wiring connectors or harnesses from HVAC module.

1	HVAC Module Gasket
2	Auxiliary HVAC Module Lower Cover Bolt (Qty: 3) NOTE: Refer to <u>Fastener Notice</u> . Tip: Remove any fastener clips that secure cover to module. Tighten: 3 N.m (27 lb in)
3	Auxiliary HVAC Module Lower Cover
4	HVAC Module Case Tip: Remove any fastener clips that secure cover to module. Tighten: 3 N.m (27 lb in)
5	Auxiliary HVAC Evaporator Core Tip: Ensure all seals and gaskets are in place upon installation.

AUXILIARY AIR CONDITIONING EVAPORATOR TUBE REPLACEMENT

Tools Required

J 39400-A Halogen Leak Detector. See **Special Tools**.

Removal Procedure

1. Recover the refrigerant from the system. Refer to **Refrigerant Recovery and Recharging**.
2. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the right rear inner wheelhouse liner if necessary. Refer to **Rear Wheelhouse Liner Panel Replacement** .

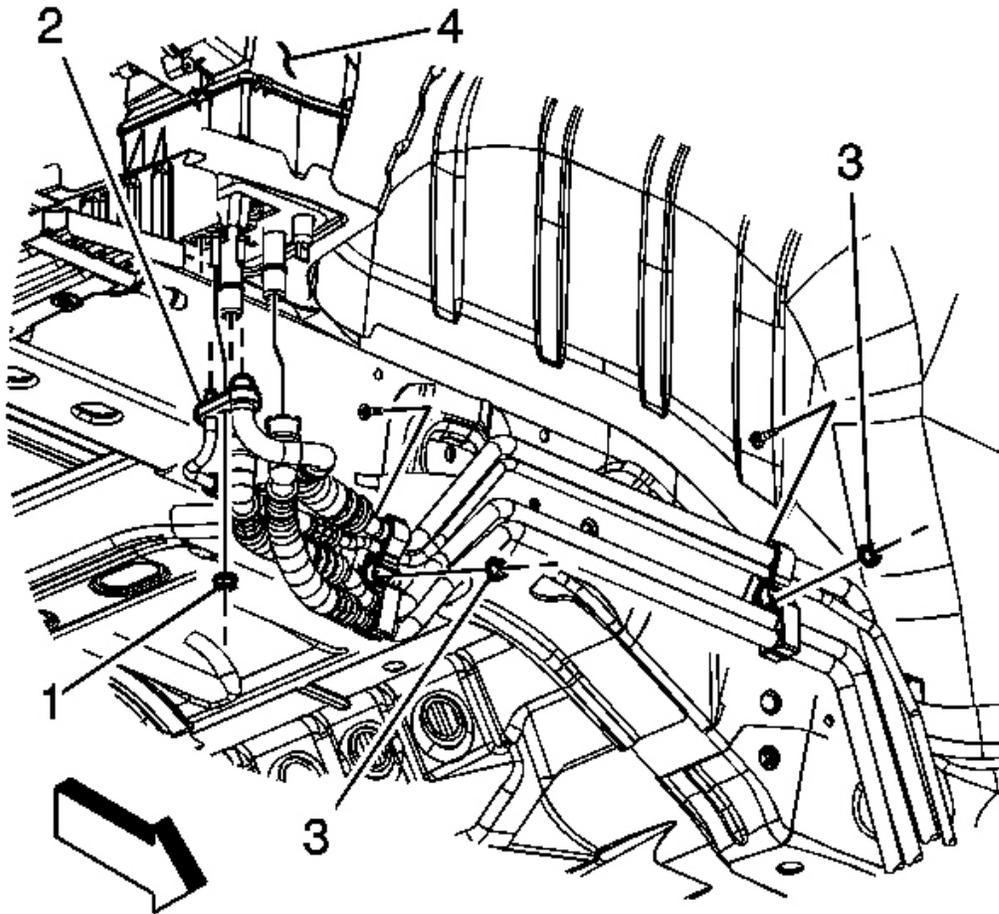


Fig. 78: Locating Auxiliary A/C Evaporator Tubes, HVAC Module & Retaining Nut
Courtesy of GENERAL MOTORS CORP.

4. Remove auxiliary evaporator tube nut (1) and pull downward to release the auxiliary A/C evaporator tubes (2) from the auxiliary HVAC module (4).
5. Remove auxiliary evaporator tube clip nuts (3) and release tubes from clips.

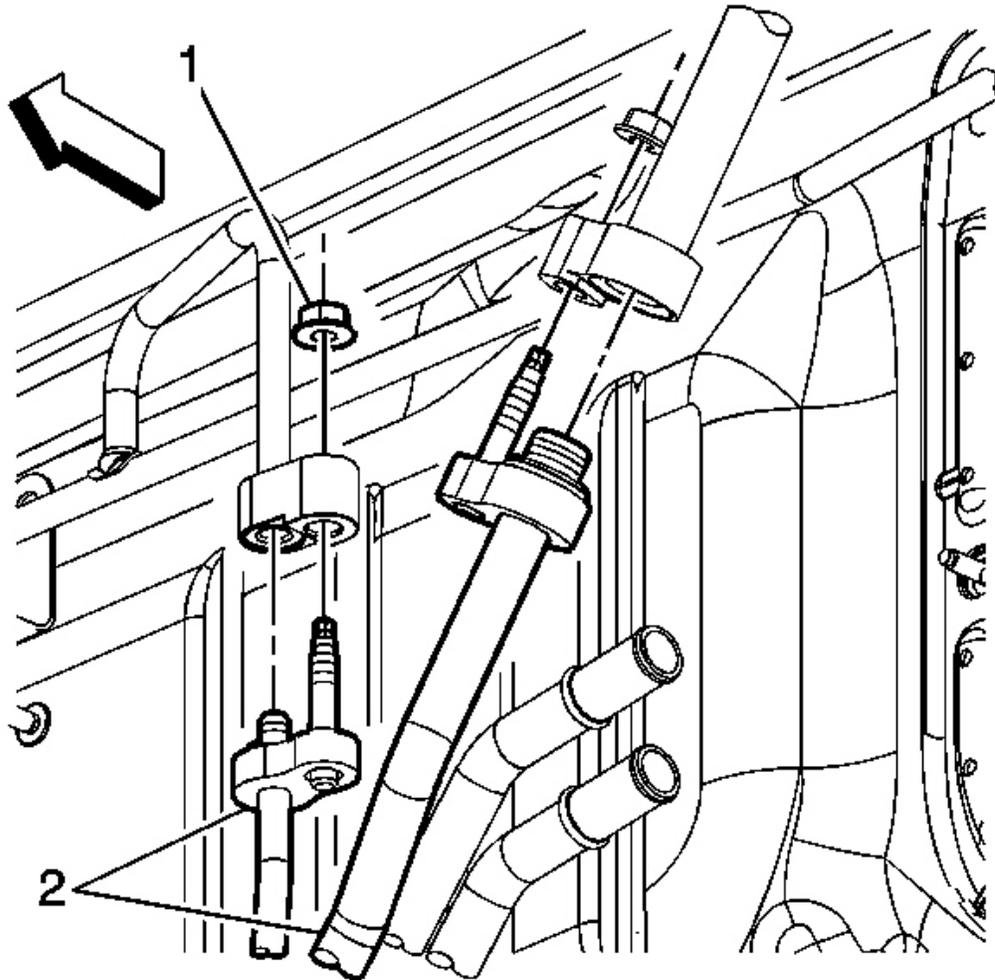


Fig. 79: View Of Auxiliary A/C Evaporator Tubes & Retaining Nuts
Courtesy of GENERAL MOTORS CORP.

6. Remove the retaining nuts (1) and the auxiliary A/C evaporator tubes (2) from the TXV tube and condenser tube.

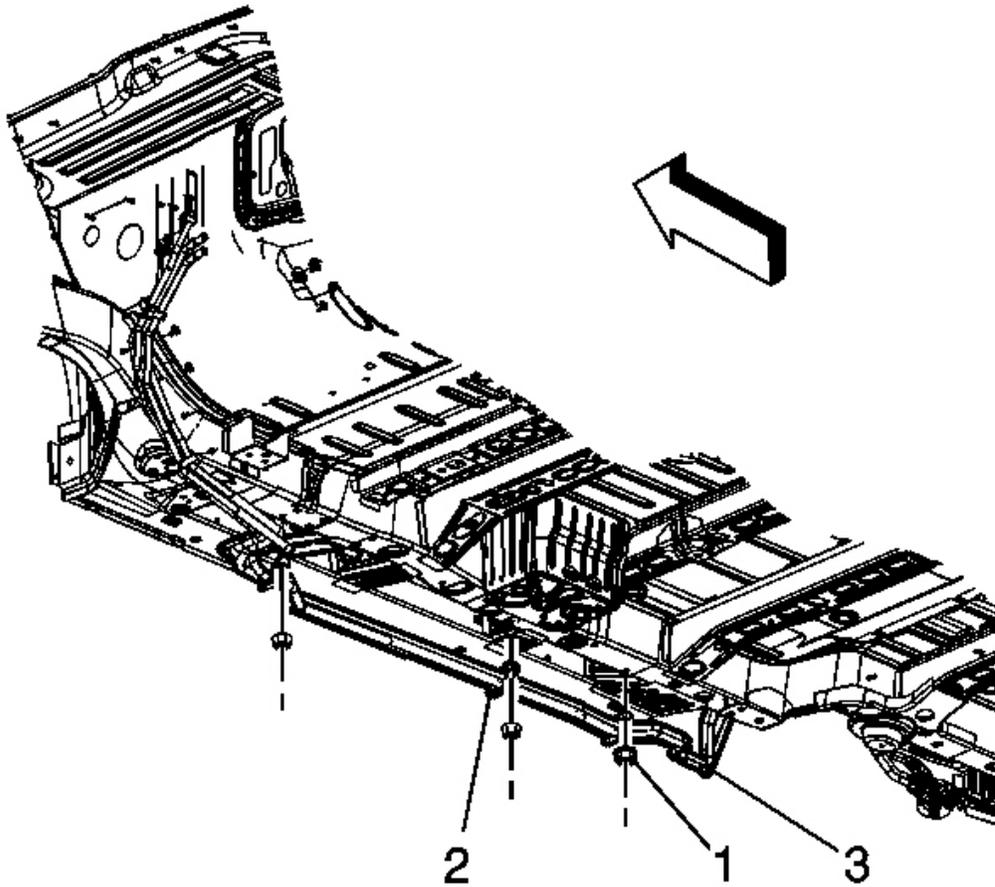


Fig. 80: Identifying Auxiliary A/C Evaporator Tubes & Clamps
Courtesy of GENERAL MOTORS CORP.

7. Remove the heater/A/C tubes retaining nuts (1) from the retaining studs and clips along the frame in four places.
8. Remove the auxiliary A/C evaporator tubes (3) from the clamps (2).
9. Remove the auxiliary A/C evaporator tubes from the vehicle.

Installation Procedure

IMPORTANT: The replacement A/C and heater pipes are shipped in two sections and spliced together upon installation. Refer to Auxiliary Heater and Air Conditioning Pipe Replacement/Repair.

1. Install the auxiliary A/C evaporator tubes to the vehicle.

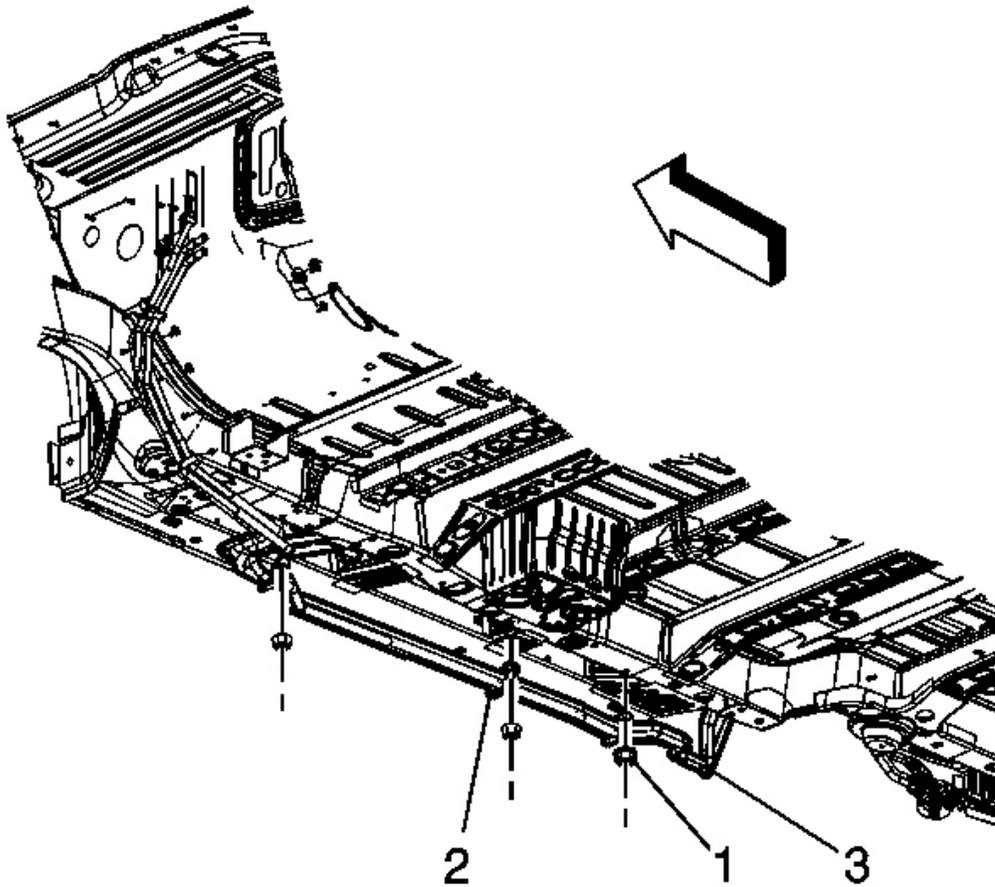


Fig. 81: Identifying Auxiliary A/C Evaporator Tubes & Clamps
Courtesy of GENERAL MOTORS CORP.

2. Install the auxiliary A/C evaporator tubes (3) to the clamps (2).

NOTE: Refer to Fastener Notice .

3. Install the heater/A/C tubes retaining nut (1) to the retaining studs and clips (2) along the frame in four places.

Tighten: Tighten the nut to 7 N.m (62 lb in).

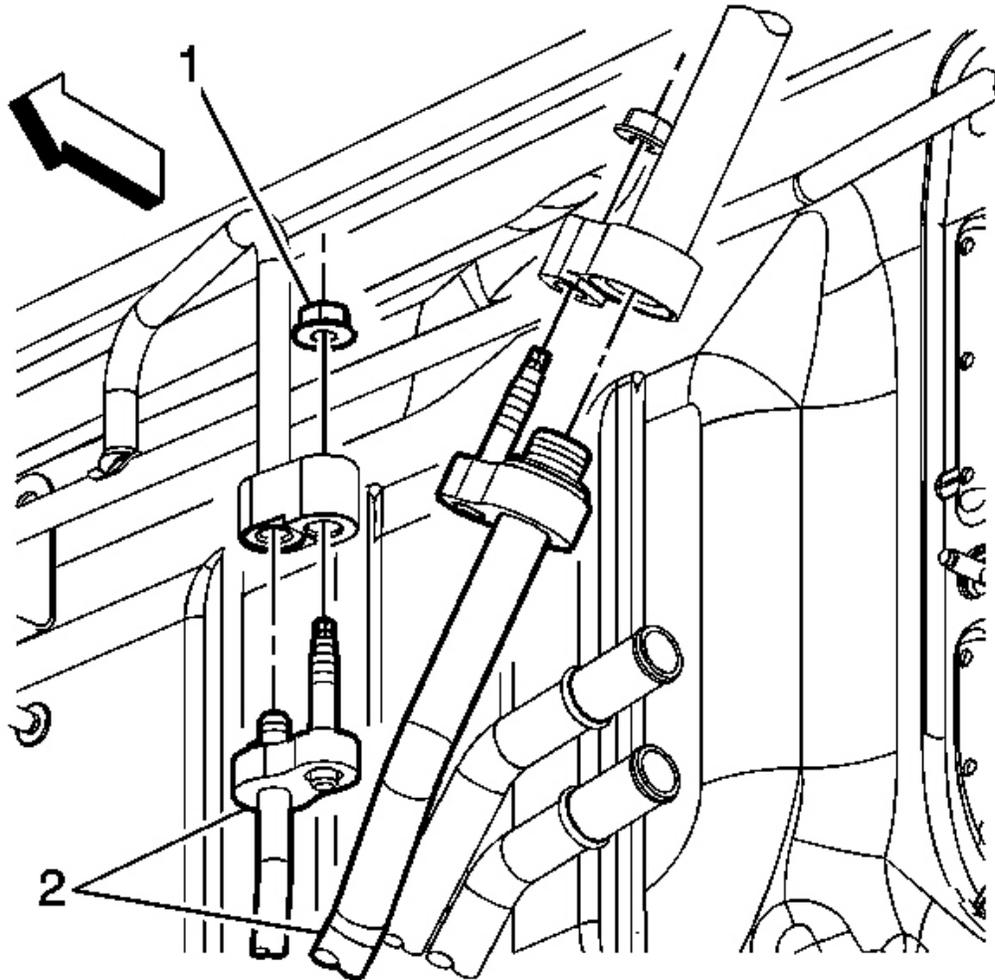


Fig. 82: View Of Auxiliary A/C Evaporator Tubes & Retaining Nuts
Courtesy of GENERAL MOTORS CORP.

4. Install the auxiliary A/C evaporator tubes (2) to the TXV tube and condenser tube and install the retaining nuts (1).

Tighten: Tighten the nut to 16 N.m (12 lb ft).

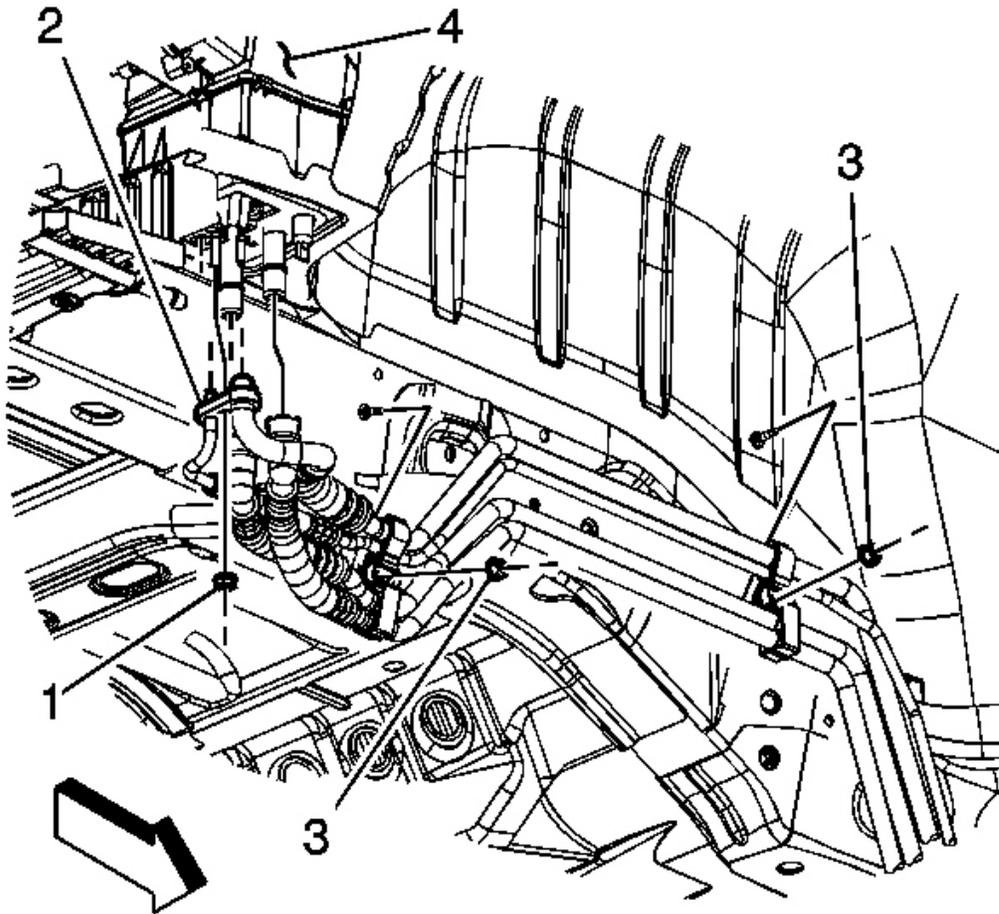


Fig. 83: Locating Auxiliary A/C Evaporator Tubes, HVAC Module & Retaining Nut
Courtesy of GENERAL MOTORS CORP.

5. Install the auxiliary A/C evaporator tubes (2) to the HVAC module (4) and install retaining nut (1).

Tighten: Tighten the nuts to 16 N.m (12 lb ft).

6. Install auxiliary evaporator tubes to retaining clips and install nuts (3) to secure.

Tighten: Tighten the nuts to 4 N.m (35 lb in).

7. Install the right rear inner wheelhouse liner if necessary. Refer to **Rear Wheelhouse Liner**

Panel Replacement .

8. Lower the vehicle.
9. Recharge the refrigerant to the system. Refer to **Refrigerant Recovery and Recharging**.
10. Leak test the fittings of the component using the **J 39400-A** . See **Special Tools**.

AUXILIARY HEATER AND AIR CONDITIONING PIPE REPLACEMENT/REPAIR

Tools Required

J 41425 A/C Line Repair Kit. See **Special Tools**.

Do not service the rear A/C or heater lines as a complete unit. Service the rear A/C or heater lines as a sectional repair.

You can obtain the various sections of line through GMSPO.

Use the **J 41425** when any of the following actions damage the rear A/C or heater lines:

- Rub-through
- Collision damage
- Leakage in the system

Minimum Tube Length Required Table

IMPORTANT: When you section the rear A/C or heater lines, ensure that the correct minimum length remains in the straight part of the line on both sides of the splice.

Follow the Straight Line Repair procedure in order to repair line damage in a straight section of line.

Follow the Line Sectioning Repair procedure in order to repair any damage in a bend area. Do not repair the rear A/C or heater lines in a bend area, replace the lines. Maintaining the original line shape will prevent vibrations and rub-through.

Auxiliary Heater and Air Conditioning Pipe Replacement/Repair

Tube Size	Dim A Standard Installation	Dim A Jaw Reversed Installation
8 mm (5/16 in)	29 mm (1 1/8 in) MIN	19-29 mm (3/4-1 1/8 in)
10 mm (3/8 in)	29 mm (1 1/8 in) MIN	19-29 mm (3/4-1 1/8 in)

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13 mm (1/2 in)	29 mm (1 1/8 in) MIN	19-29 mm (3/4-1 1/8 in)
16 mm (5/8 in)	32 mm (1 1/4 in) MIN	23-32 mm (7/8-1 1/4 in)
19 mm (3/4 in)	34 mm (1 5/16 in) MIN	23-34 mm (7/8-1 5/16 in)

Straight Line Repair

1. Recover the refrigerant, if repairing the A/C lines. Refer to **Refrigerant Recovery and Recharging**.
2. Drain the coolant, if repairing the heater lines. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Locate the area that requires repair.
5. Obtain a length of replacement line to make the repair.
6. Use a tubing cutter in order to cut and remove the section of damaged line.

IMPORTANT: The length of the replacement line must be the same as the section being replaced.

7. Use a tubing cutter in order to cut the replacement line to length.
8. Use the cleaning pad from the **J 41425** in order to clean any burrs or grease from the line ends. See **Special Tools**. Be sure to clean at least 19 mm (0.75 in) from the line ends.
9. Use the LOK prep sealant in order to prep the line ends.
10. Apply one drop of the J 41425-3 sealing compound to the outside of each end of the line.
11. Insert the line ends into the LOK fitting.
12. Rotate the LOK fitting one complete turn in order to evenly distribute the sealing compound around the lines.
13. Install the correct LOK fitting jaws into the J 41425-1 tool.
14. Install the J 41425-1 tool over the LOK connectors.

Verify that the LOK connector ends are positioned in the counter bores of the jaws.

IMPORTANT: Hold the J 41425-1 tool body with a 3/8-inch breaker bar.

15. Tighten the forcing screw of the J 41425-1 tool.

When fully seated, the LOK connector collars will bottom out on the center shoulder of the LOK fitting.

16. Loosen the forcing screw and remove the J 41425-1 tool from the repaired line.
17. Repeat Steps 8-16 to repair the other end of the line.
18. Verify that the LOK fittings are correctly installed.
19. Lower the vehicle.
20. Refill the coolant, if drained. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
21. Evacuate and recharge the refrigerant, if repairing the A/C lines. Refer to **Refrigerant Recovery and Recharging**.

Line Sectioning Repair

1. Recover the refrigerant, if repairing the A/C lines. Refer to **Refrigerant Recovery and Recharging**.
2. Drain the coolant, if repairing the heater lines. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Obtain a new A/C or heater line for sectioning.

IMPORTANT: Stagger the splices if repairing more than one line.

5. Scribe a mark on the line that will be sectioned.
6. Use a tubing cutter in order to cut the line or lines being replaced.
7. Remove the section of line being replaced from the vehicle.

IMPORTANT: The length of the replacement line must be the same as the line being replaced.

8. Install the replacement line to the vehicle.
9. Use a tubing cutter in order to cut the replacement line to length.
10. Use the cleaning pad from the **J 41425** in order to clean any burrs or grease. See **Special Tools**. Be sure to clean at least 19 mm (0.75 in) from the A/C line.
11. Use the LOK prep sealant in order to prep the A/C or heater line.
12. Apply one drop of the J 41425-3 sealing compound to the outside of each line end.
13. Insert the line ends into the LOK fitting.
14. Rotate the LOK fitting one complete turn in order to evenly distribute the sealing compound around the lines.

15. Install the correct LOK fitting jaws into the J 41425-1 tool.
16. Install the J 41425-1 tool over the LOK connectors.

Verify that the LOK connector ends are positioned in the counter bores of the jaws.
17. Hold the tool body with a 3/8-inch breaker bar. Turn the forcing screw until both of the connector collars bottom on the center shoulder of the LOK fitting.
18. Loosen the forcing screw. Remove the tool from the repaired line.
19. Verify that the LOK fitting is correctly installed.
20. Lower the vehicle.
21. Refill the coolant, if drained. Refer to **Draining and Filling Cooling System (Static Fill)** or **Draining and Filling Cooling System (Vac N Fill)** .
22. Evacuate and recharge the refrigerant, if repairing the A/C lines. Refer to **Refrigerant Recovery and Recharging**.

DESCRIPTION AND OPERATION

HEATING AND AIR CONDITIONING SYSTEM DESCRIPTION AND OPERATION

Engine Coolant

Engine coolant is the key element of the heating system. The engine thermostat controls the normal 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 ambient air drawn through the HVAC module absorbs the heat of the coolant flowing through the heater core. The HVAC module distributes heated air to the passenger compartment for consistent passenger comfort. Opening or closing the HVAC module temperature door controls the amount of heat delivered to the passenger compartment. The coolant exits the heater core through the return heater hose and is recirculated back through the engine cooling system.

A/C Cycle

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

The A/C compressor is belt driven and operates when the magnetic clutch is engaged. The compressor builds pressure on the vapor refrigerant. Compressing the refrigerant also adds heat to

the refrigerant. The refrigerant is discharged from the compressor, through the discharge hose and forced to flow to the condenser and then through the balance of the A/C system. The A/C system is mechanically protected with the use of a high pressure relief valve. If the high pressure switch were to fail or if the refrigerant system becomes restricted and refrigerant pressure continued to rise, the high pressure relief will pop open and release refrigerant from the system.

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

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

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

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

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

SPECIAL TOOLS AND EQUIPMENT

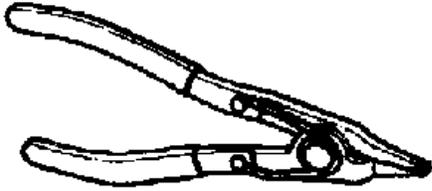
SPECIAL TOOLS

Special Tools

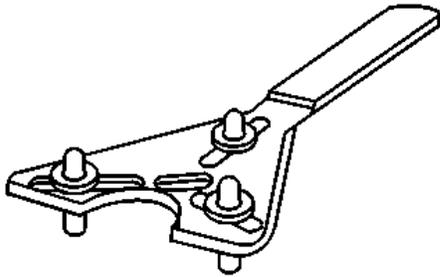
Illustration	Tool Number/Description
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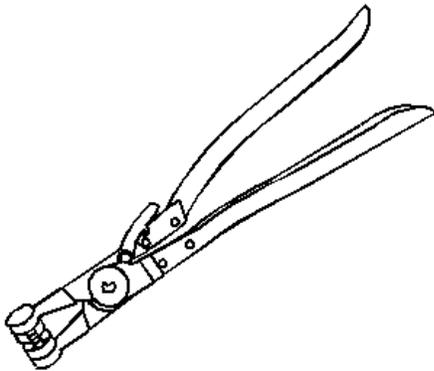
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J 6083
External Snap Ring Pliers



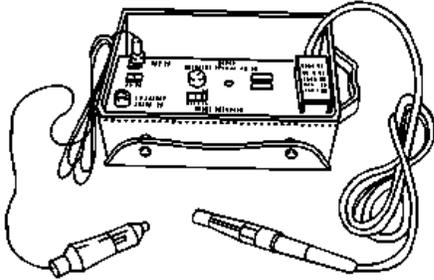
J 37872
Universal Spanner Wrench



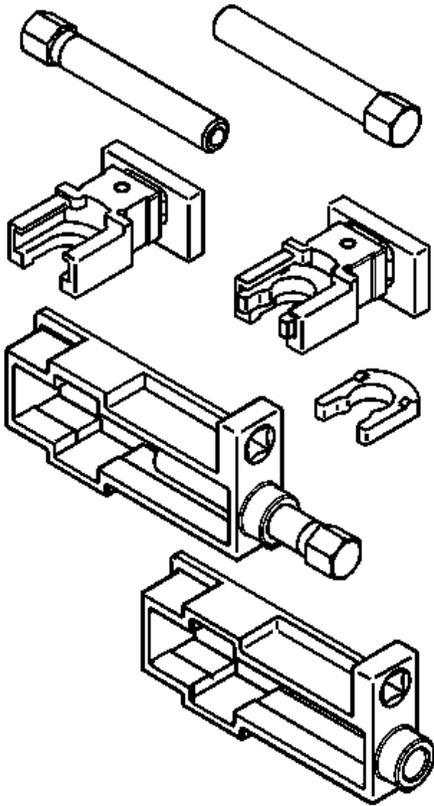
J 38185
Hose Clamp Pliers

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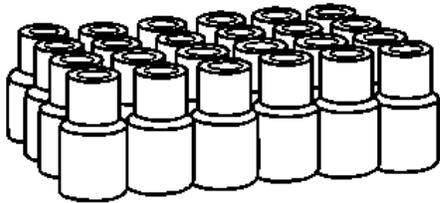
J 39400-A
Halogen Leak Detector



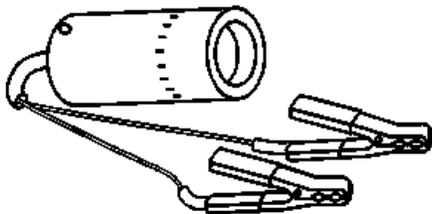
J 41425
A/C Line Repair Kit

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

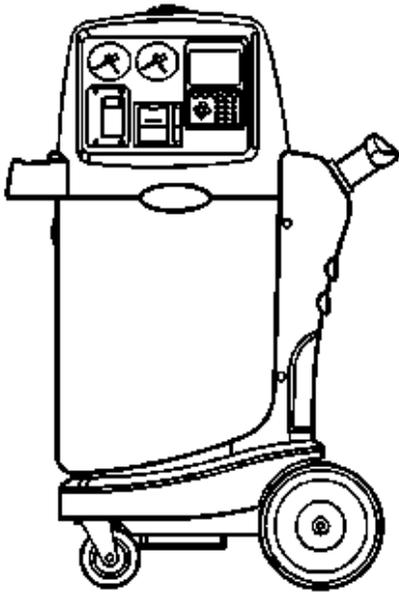


J 42220
Universal 12V Leak Detection Lamp

J 43600
ACR 2000 Air Conditioning Service Center

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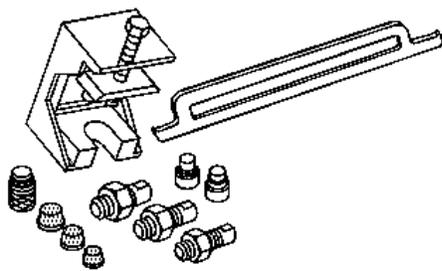


J 43872
Fluorescent Dye Cleaner

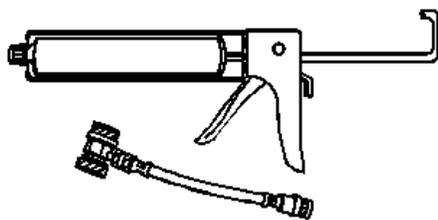


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J 44551
Suction Screen Installation/Removal Kit

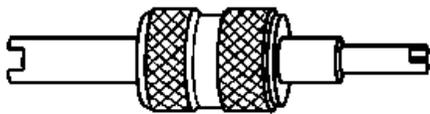
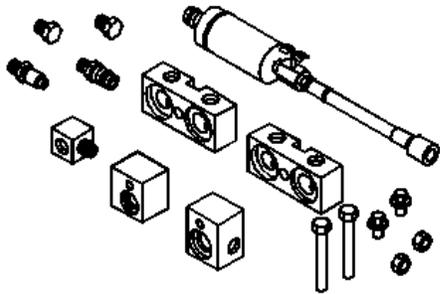


J 45037
A/C Oil Injector

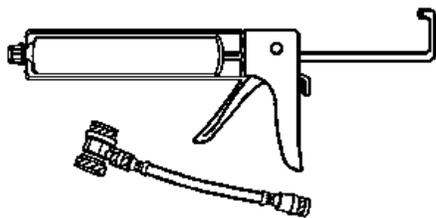
J 45268
A/C Flushing Adapter Kit

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J 46246
Valve Core Tool



J 46297
A/C Dye Injector Kit

J 46297-12
Replacement Dye Cartridges

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