SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Actuator to HVAC Case Screws	1 N.m	9 lb in
HVAC Controller to Radio Bezel Screws	2.5 N.m	22 lb in
Temperature Cable Screw	1 N.m	9 lb in

SCHEMATIC AND ROUTING DIAGRAMS

HVAC SCHEMATICS

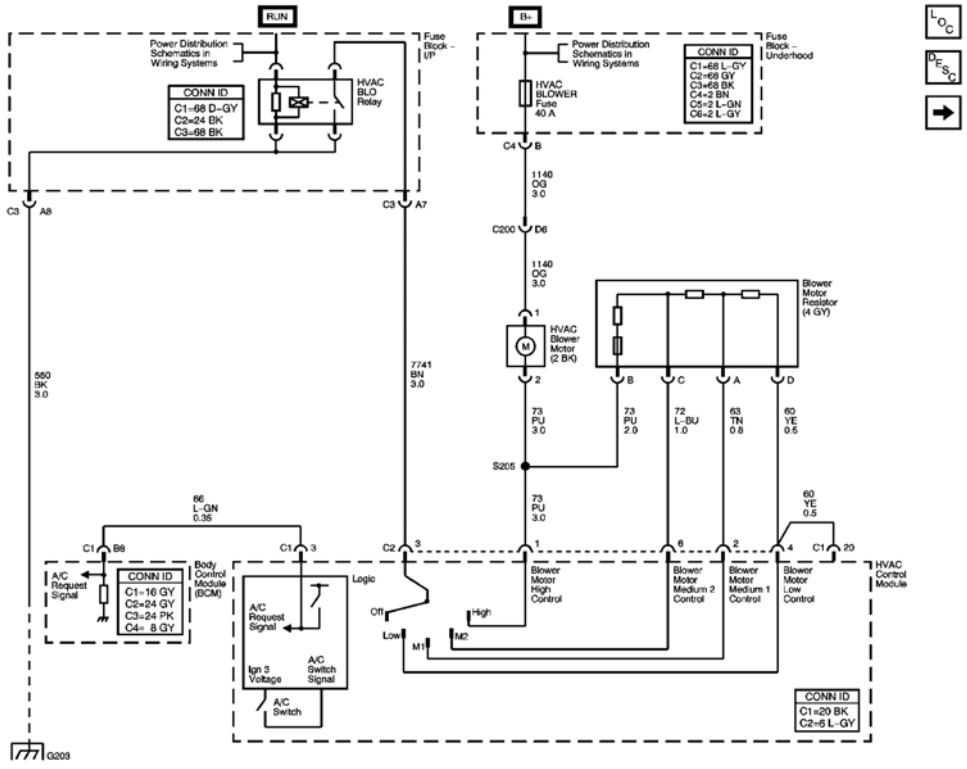


Fig. 1: Blower Controls Schematics
Courtesy of GENERAL MOTORS CORP.

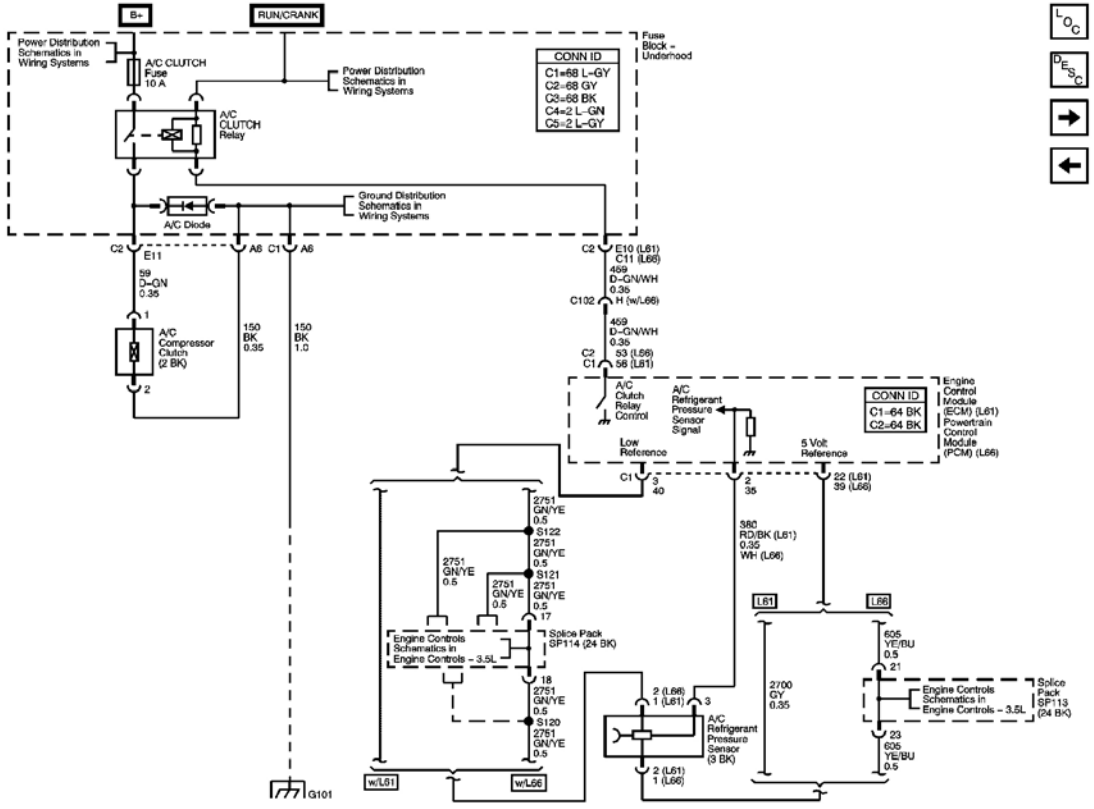


Fig. 2: Compressor And Pressure Sensor Signals Schematics
Courtesy of GENERAL MOTORS CORP.

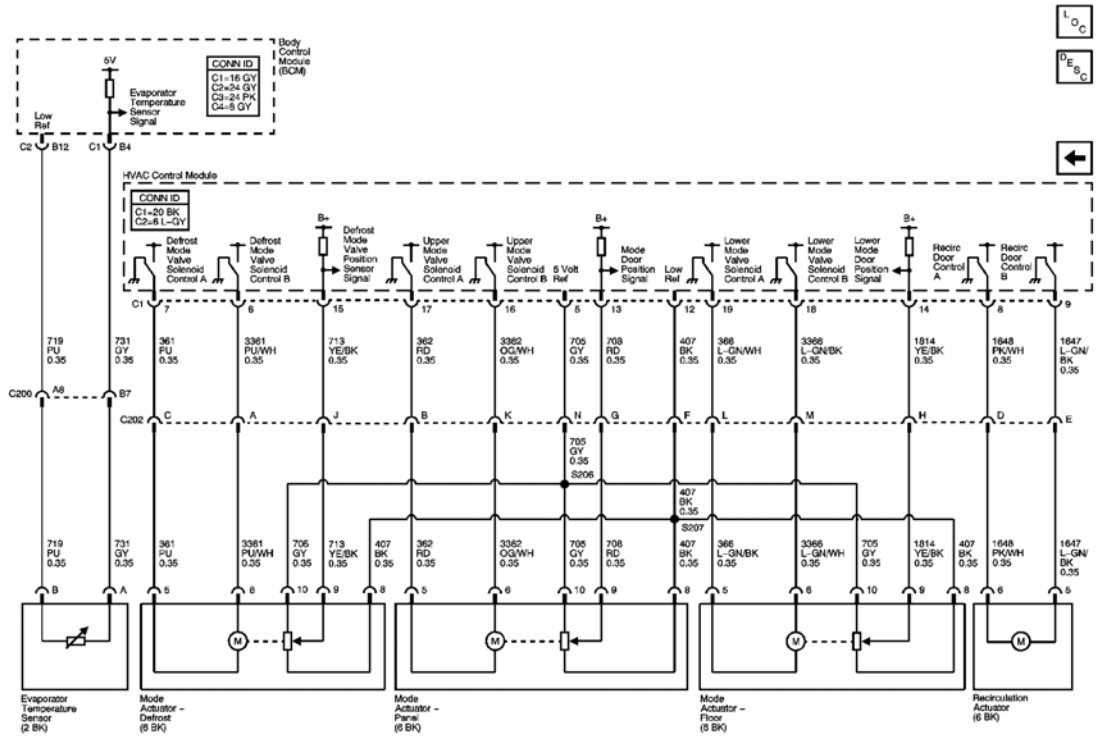


Fig. 3: Actuators And Evaporator Temperature Sensor Schematics
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

HVAC COMPONENT VIEWS

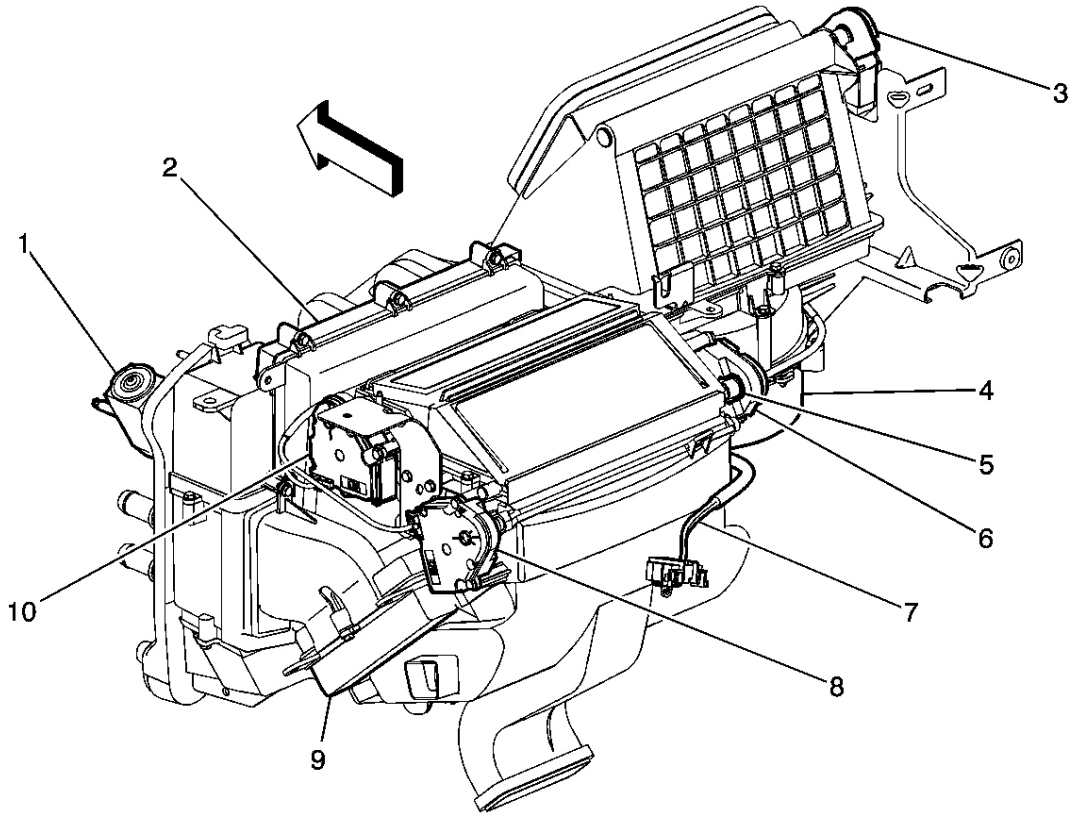


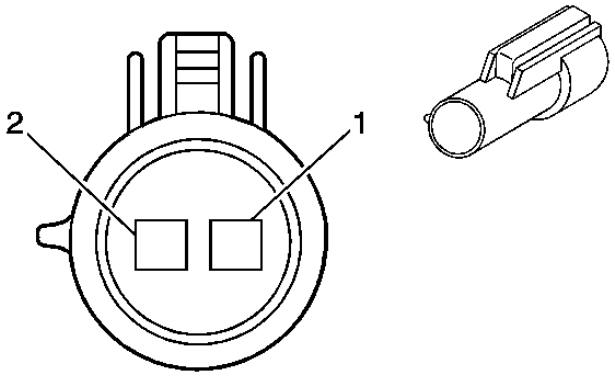
Fig. 4: HVAC Module Components View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	Thermal Expansion Valve
2	Evaporator
3	Recirculation Actuator
4	HVAC Blower Motor
5	Blower Motor Resistor - Hidden Behind Blower Motor
6	Mode Actuator - Panel
7	Temperature Cable
8	Mode Actuator - Floor
9	Heater Core
10	Mode Actuator - Defrost

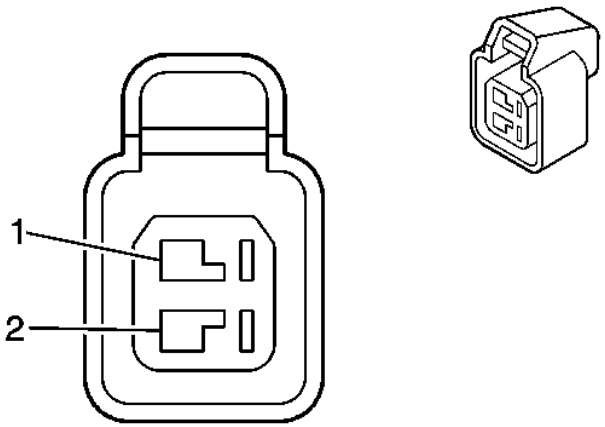
HVAC CONNECTOR END VIEWS

A/C Compressor Clutch (L61) Terminal Identification



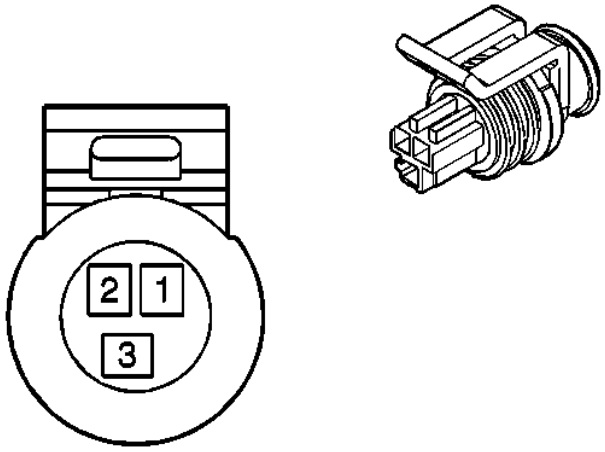
Connector Part Information		• XW4T-14A624-AA • 2-Way F (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	D-GN	59	A/C Compressor Clutch Supply Voltage
2	BK	150	Ground

A/C Compressor Clutch (L66) Terminal Identification



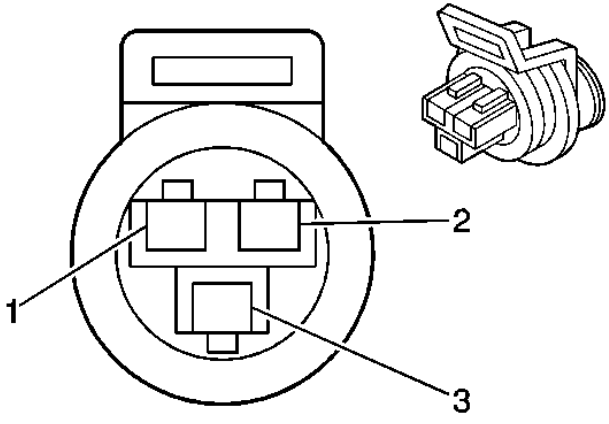
Connector Part Information		• 13008219 • 2-Way F (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	D-GN	59	A/C Compressor Clutch Supply Voltage
2	BK	150	Ground

A/C Refrigerant Pressure Sensor (L61) Terminal Identification



Connector Part Information		• 15344137 • 3-Way F (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	BK	2751	Low Reference
2	GY	2700	5-Volt Reference
3	RD/BK	380	A/C Refrigerant Pressure Sensor Signal

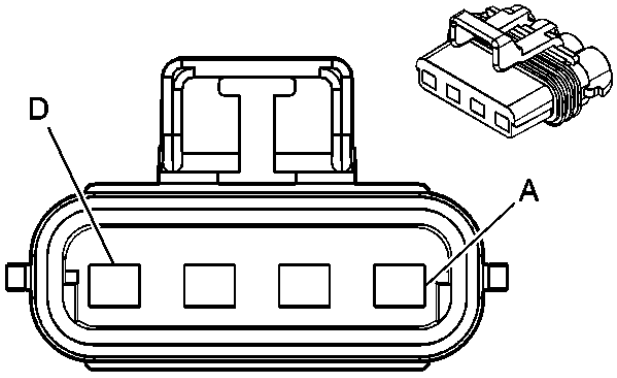
A/C Refrigerant Pressure Sensor (L66) Terminal Identification



Connector Part Information		• 13008378 • 3-Way F (BK)	

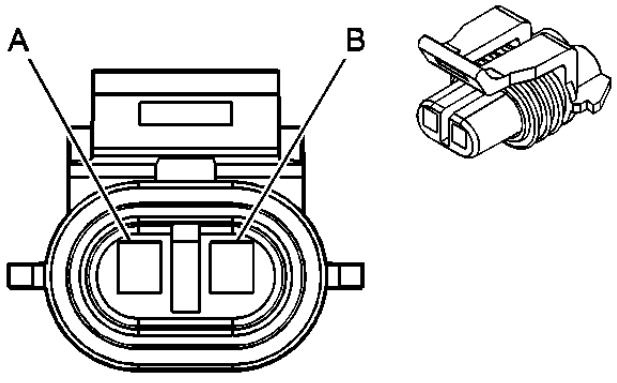
Pin	Wire Color	Circuit No.	Function
1	YE/BU	605	5-Volt Reference A
2	GN/YE	2751	Low Reference
3	WH	380	A/C Refrigerant Pressure Sensor Signal

Blower Motor Resistor Terminal Identification



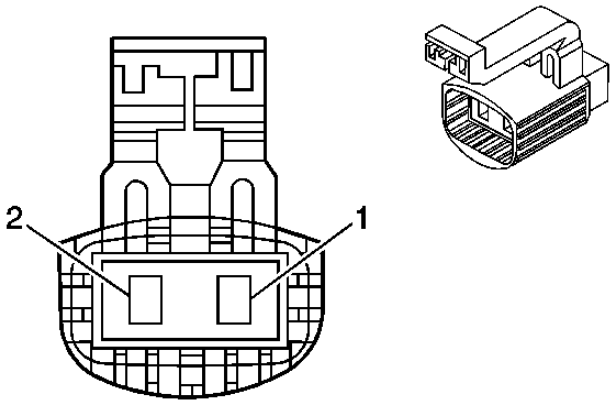
Connector Part Information		• 12129565 • 4-Way F Metri-Pack 280 Series Sealed (GY)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	TN	63	Blower Motor Medium 1 Control
B	PU	73	Blower Motor High Control
C	L-BU	72	Blower Motor Medium 2 Control
D	YE	60	Blower Motor Low Control

Evaporator Temperature Sensor Terminal Identification



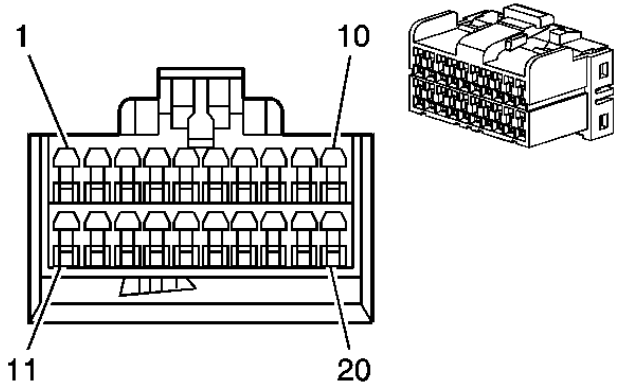
Connector Part Information		• 12052641 • 2-Way Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	GY	731	Evaporator Temperature Sensor Signal
B	PU	719	Low Reference

HVAC Blower Motor Terminal Identification



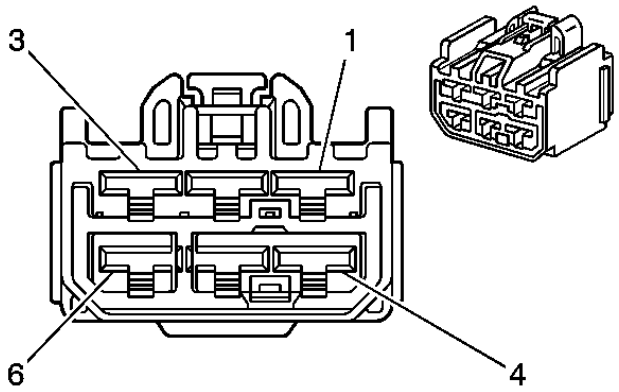
Connector Part Information		• E6DB-14489-ALA • 2-Way F (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	OG	1140	Battery Positive Voltage (Early Production)
	RD	1140	Battery Positive Voltage (Late Production)
2	PU	73	Blower Motor High Control

HVAC Control Module C1 Terminal Identification



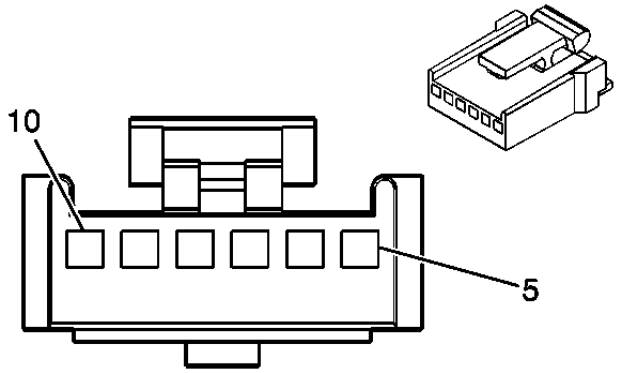
Connector Part Information		• 174047-2 • 20-Way F Hinged Lock (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	BK/WH	151	Ground
2	GY	8	Park Lamp Supply Voltage
3	L-GN	66	A/C Request Signal
4	WH	193	Rear Defogger Relay Control
5	GY	705	5-Volt Reference
6	PU/WH	3361	Defrost Mode Valve Solenoid Control B
7	PU	361	Defrost Mode Valve Solenoid Control A
8	PK/WH	1648	Recirculation Door Control A
9	L-GN/BK	1647	Recirculation Door Control B
10	L-BU	292	Rear Defog Switch Signal
11	BN	41	Ignition 3 Voltage
12	BK	407	Low Reference
13	RD	708	Mode Door Position Signal
14	YE/BK	1814	Lower Mode Door Position Signal
15	YE/BK	713	Defrost Mode Valve Position Sensor Signal
16	OG/WH	3362	Upper Mode Valve Solenoid Control B
17	RD	362	Upper Mode Valve Solenoid Control A
18	L-GN/BK	3366	Lower Mode Valve Solenoid Control B
19	L-GN/WH	366	Lower Mode Valve Solenoid Control A
20	YE	60	Blower Motor Low Control - Redundant

HVAC Control Module C2 Terminal Identification



Connector Part Information		• 7283-5591-40 • 6-Way F (L-GY)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	PU	73	Blower Motor High Control
2	TN	63	Blower Motor Medium 1 Control
3	BN	7741	HVAC Blower Relay Control
4	YE	60	Blower Motor Low Control
	YE	60	Blower Motor Low Control
5	-	-	Not Used
6	L-BU	72	Blower Motor Medium 2 Control

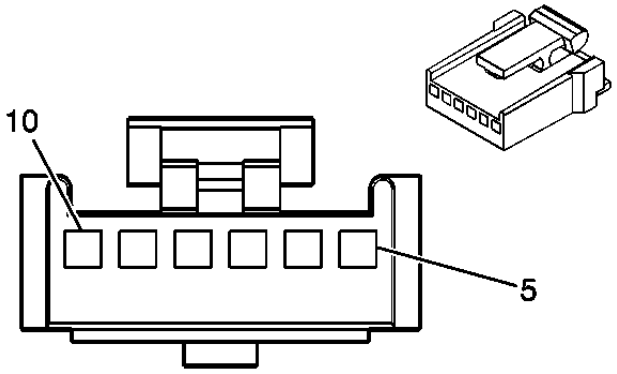
Mode Actuator - Defrost Terminal Identification



Connector Part Information		• 12064993 • 6-Way F Micro-Pack 100 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	PU	73	Blower Motor High Control
2	TN	63	Blower Motor Medium 1 Control
3	BN	7741	HVAC Blower Relay Control
4	YE	60	Blower Motor Low Control
	YE	60	Blower Motor Low Control
5	-	-	Not Used
6	L-BU	72	Blower Motor Medium 2 Control

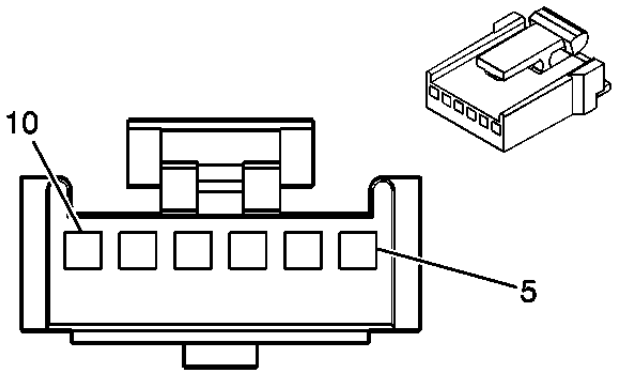
Pin	Wire Color	Circuit No.	Function
5	PU	361	Defrost Mode Valve Solenoid Control A
6	PU/WH	3361	Defrost Mode Valve Solenoid Control B
7	-	-	Not Used
8	BK	407	Low Reference
9	YE/BK	713	Defrost Mode Valve Position Sensor Signal
10	GY	705	5-Volt Reference

Mode Actuator - Floor Terminal Identification



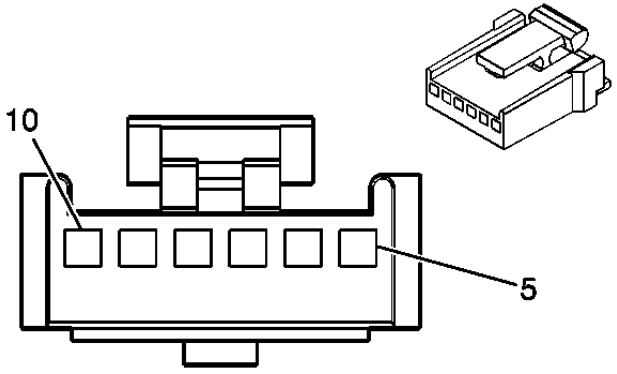
Connector Part Information		• **12064993** • **6-Way F Micro-Pack 100 Series (BK)**	
Pin	**Wire Color**	**Circuit No.**	**Function**
5	L-GN/BK	366	Lower Mode Valve Solenoid Control A
6	L-GN/WH	3366	Lower Mode Valve Solenoid Control B
7	-	-	Not Used
8	BK	407	Low Reference
9	YE/BK	1814	Lower Mode Door Position Signal
10	GY	705	5-Volt Reference

Mode Actuator - Panel Terminal Identification



Connector Part Information		• 12064993 • 6-Way F Micro-Pack 100 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
5	RD	362	Upper Mode Valve Solenoid Control A
6	OG/WH	3362	Upper Mode Valve Solenoid Control B
7	-	-	Not Used
8	BK	407	Low Reference
9	RD	708	Mode Door Position Signal
10	GY	705	5-Volt Reference

Recirculation Actuator Terminal Identification



Connector Part Information		• 12064993 • 6-Way F Micro-Pack 100 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**

5	L-GN/BK	1647	Recirculation Door Control B
6	PK/WH	1648	Recirculation Door Control A
7-10	-	-	Not Used

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC SYSTEM CHECK - HVAC SYSTEMS - MANUAL

Test Description

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

3: Lack of communication may be due to a malfunction of the class 2 serial data circuits. The specified procedure will determine the particular condition.

4: Determine if the Engine Control Module has set DTCs which may affect HVAC operation are present.

5: The presence of DTCs which begin with "U" indicate some other module is not communicating. The specified procedure will compile all the available information before tests are performed.

Diagnostic System Check - HVAC Systems - Manual

Step	Action	Yes	No
1	Did you review a Diagnostic Starting Point - Heating, Ventilation and Air Conditioning?	Go to **Step 2**	Go to **Diagnostic Starting Point - Heating, Ventilation and Air Conditioning** in Heating, Ventilation and Air Conditioning
2	Install a scan tool. Does the scan tool power up?	Go to **Step 3**	Go to **Scan Tool Does Not Power Up** in Data Link Communications
3	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communication with the Engine Control Module. Does the scan tool communicate with the Engine Control Module?	Go to **Step 4**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
4	Select the Engine Control Module display DTCs function on the scan tool. Does the scan tool display any DTCs?	Go to **Step 5**	Go to **Symptoms - HVAC Systems - Manual**
5	Does the scan tool display any DTCs which begin with a "U"?	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications	Go to **Step 6**

6	Does the scan tool display any DTCs which begin with a "P" that are associated with the HVAC system?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Diagnostic System Check - Engine Controls** in Engine Controls - 2.2L (L61) or **Diagnostic System Check - Engine Controls** in Engine Controls - 3.5L (L66)

SCAN TOOL OUTPUT CONTROLS

BCM Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
After Blow Relay	Output Controls-Miscellaneous test	The scan tool displays ON or OFF selections. This command allows you to turn the after blow relay On or Off. When the A/C relay is commanded On, the A/C compressor clutch should be engaged.

ECM/PCM Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection (s)	Description
A/C Relay	Engine Output Controls	The scan tool displays ON or OFF selections. This command allows you to turn the A/C relay On or Off. When the A/C relay is commanded On, the A/C compressor clutch should be engaged.

SCAN TOOL DATA LIST

Use the Scan Tool Data Display Values and Definitions Information in order to assist in diagnosing the HVAC Control Module problems. Compare the vehicles actual scan tool data with the typical data display value table information. Use the data information in order to aid in understanding the nature of the problem when the vehicle does not match with the typical data display values.

The scan tool data values were taken from a known good vehicle under the following conditions:

- The ignition switch is in the ON position.
- The engine is running at idle.
- The vehicle is in PARK.
- The doors are closed.
- The windows are closed.
- The A/C is ON.
- The ambient air temperatures are at 22-27° C (70-80° F).

Body Control Module (BCM) Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27° C (70-80°			

F)			
A/C Request	Switch Inputs	Yes/No	Yes
A/C Sensor	Accessory	Volts	Varies
After Blow Relay Command	Accessory	On/Off	Varies
After Blow Relay Feedback	Accessory	High/Low	Varies

Engine Control Module (ECM) Scan Tool Data List (L61)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27° C (70-80° F)			
A/C High Side Pressure	General Info-Inputs	kPa/psi	Varies
A/C High Side Pressure	General Info-Inputs/Outputs	0 to 5 Volts	Varies
A/C Relay Command	General Info-Inputs/Outputs	On/Off	On
A/C Request	General Info-Inputs	Yes/No	Yes
ECT	All	C/F	Varies

Powertrain Control Module (PCM) Scan Tool Data List (L66)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27° C (70-80° F)			
A/C High Side Pressure	General Info-Inputs	kPa/psi	Varies
A/C Pressure Sensor	General Info-Inputs	0 to 5 Volts	Varies
A/C Relay Command	General Info-Inputs/Outputs	On/Off	On
A/C Request	General Info-Inputs	Yes/No	Yes
ECT	All	C/F	Varies

SCAN TOOL DATA DEFINITIONS

Use the Scan Tool Data Display Values and Definitions Information in order to assist in diagnosing control module problems. Compare the vehicles actual scan tool data with the typical data display value table information. Use the data information in order to aid in understanding the nature of the problem when the vehicle does not match with the typical data display values.

The scan tool data values were taken from a known good vehicle under the following conditions:

- The ignition switch is in the ON position.
- The engine is running at idle.
- The vehicle is in PARK.
- The doors are closed.
- The windows are closed.
- The A/C is ON, in UPPER mode.
- The ambient air temperatures are at 22-27° C (70-80° F).

The HVAC Scan Tool Data Definitions contains a brief description of all HVAC related parameters available on the scan tool. The list is in alphabetical order. A given parameter may appear in any one of the data lists. In some cases, the parameter may appear more than once or in more than one data list in order to group certain related parameters together.

BCM-Switch Inputs-A/C Request

The scan tool displays On or Off. The BCM uses the A/C switch input in order to determine if A/C compressor operation is being requested by the HVAC control module.

BCM-After Blow Relay Command

The scan tool displays On or Off. On is displayed when the BCM has energized the after blow relay.

BCM-After Blow Relay Feedback

The scan tool displays High or Low. High is displayed when the after blow relay control circuit is not grounded by the BCM.

ECM/PCM-A/C Relay Command

The scan tool displays On or Off. On is displayed when the ECM/PCM has energized the A/C clutch relay.

ECM/PCM-A/C Refrigerant Pressure

The scan tool displays 0 to 4000 kPa (0 to 580 psi). This parameter represents the A/C refrigerant pressure sensor voltage signal converted to pressure.

ECM/PCM-A/C Refrigerant Pressure

The scan tool displays 0 to 5 volts. The output of the A/C refrigerant pressure sensor.

ECM/PCM-A/C Request

The scan tool displays Yes or No. Yes is displayed when the BCM is requesting A/C system operation.

ECM/PCM-ECT

The scan tool displays a range of 40 to 151° C (40 to 304° F). The ECM/PCM applies 5.0 volts to the ECT sensor circuit. The sensor is a thermistor which changes internal resistance as the engine temperature changes. When the sensor is cold, internal resistance is high, the ECM/PCM senses a high signal voltage and interprets the voltage as a cold engine. As the sensor warms, internal resistance decreases, the voltage signal decreases, and the ECM/PCM interprets the lower voltage as a warm engine.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Diagnostic Procedure	Module
B3787	**DTC B3787 or B3788**	BCM
B3788	**DTC B3787 or B3788**	BCM
P0530	**DTC P0530, P0532, or P0533**	ECM/PCM
P0532	**DTC P0530, P0532, or P0533**	ECM/PCM
P0533	**DTC P0530, P0532, or P0533**	ECM/PCM
P0645	**DTC P0645, P0646, or P0647**	ECM/PCM
P0646	**DTC P0645, P0646, or P0647**	ECM/PCM
P0647	**DTC P0645, P0646, or P0647**	ECM/PCM
P1640	**DTC P1640** in Engine Controls - 2.2L (L61)	ECM/PCM

DTC B3787 OR B3788

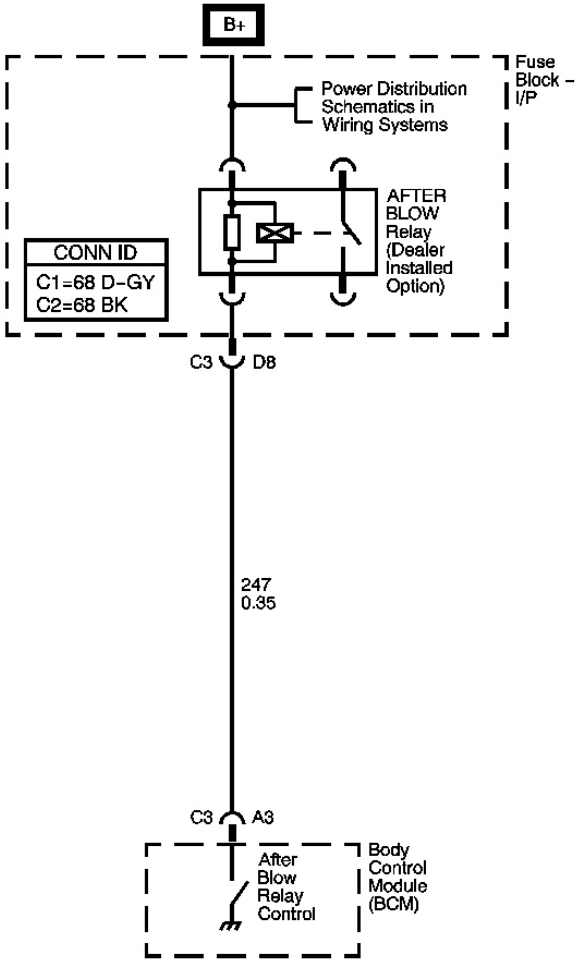


Fig. 5: DTC B3787 Or B3788 Schematics
Courtesy of GENERAL MOTORS CORP.

Circuit Description

Battery voltage is supplied directly to the after blow relay directly through the underhood fuse block. The body control module (BCM), provides the ground to enable the after blow operation through the blower motor relay control circuit. The after blow relay control circuit and relay are retailer installed. The BCM provides logic to enable the blower based on information from the engine control module (ECM) or powertrain control module (PCM). The duration of the after blow relay cycle is determined by A/C operation, ambient air temperature and vehicle speed.

Conditions for Running the DTC

- Engine is running.
- Any of the conditions for setting the DTC are met for 5 seconds.
- Battery voltage is between 11 to 18 volts.
- Output control is OFF.
- Output control is ON.

Conditions for Setting the DTC

B3787

The BCM detects a short to ground for 5 seconds on the blower motor relay control circuit when the output is OFF.

B3788

The BCM detects a short to battery for 5 seconds on the blower motor relay control circuit when the output is ON.

Action Taken When the DTC Sets

- The BCM will not illuminate the malfunction indicator lamp (MIL).
- The BCM stores the Failure Records.
- The HVAC blower is disabled.

Conditions for Clearing the DTC

- The history DTC will clear after forty consecutive ignition cycles have occurred without a malfunction.
- The DTC can be cleared by the scan tool.
- The DTC will become history if the BCM no longer detects a failure.

Diagnostic Aids

- Visually inspect the relay and connection for damage.
- Visually inspect the instrument panel fuse block for damage.
- Check for poor connection at the BCM.
- Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

2: Listen for an audible click when the after blower relay operates. Command both the ON and OFF states. Repeat the commands as necessary.

3: Tests for voltage at the coil side of the after blow relay. The BATT Feed fuse supplies power to the coil side of the after blow relay.

4: Verifies that the body control module is providing ground to the after blow relay.

5: Tests if ground is constantly being applied to the after blow relay.

6: Tests if intermittent voltage is being applied to the after blow relay.

12: It is important to follow the programming procedure for replacing the body control module.

DTC B3787 or B3788

Step	Action	Yes	No
Connector End View Reference:HVAC Connector End Views			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the after blow relay ON and OFF. Does the after blow relay turn ON and OFF with each command?	Go to Diagnostic Aids	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the after blow relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the after blow relay with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 10**
	1. Connect a test lamp between the control circuit of the		

4	after blow relay and the battery positive voltage circuit of the after blow relay. 2. With a scan tool, command the after blow relay ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to **Step 8**	Go to **Step 5**
5	Does the test lamp remain illuminated with each command?	Go to **Step 7**	Go to **Step 6**
6	Test the control circuit of the after blow relay for a short to voltage or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 9**
7	Test the control circuit of the after blow relay for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 9**
8	Inspect for poor connections at the after blow relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 11**
9	Inspect for poor connections at the harness connector of the body control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 12**
10	Repair the battery positive voltage circuit of the after blow relay. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 13**	-
11	Replace the after blow relay. Did you complete the replacement?	Go to **Step 13**	-
12	**IMPORTANT:** **Perform the setup procedure for the body control module.** Replace the body control module. Refer to **Body Control Module Replacement** in Body Control System.Did you complete the replacement?	Go to **Step 13**	-
13	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

DTC P0530, P0532, OR P0533

Circuit Description

The engine control module (ECM) or powertrain control module (PCM) monitors the high side refrigerant pressure through the A/C refrigerant pressure sensor. The ECM/PCM supplies a 5.0-volt reference and a low reference to the sensor. Changes in the A/C refrigerant pressure cause the A/C refrigerant pressure sensor signal to the ECM/PCM to vary. When the pressure is high, the signal voltage is high. When the pressure is low, the signal voltage is low. When pressure is high, the ECM/PCM commands the cooling fans on. When pressure is too high or too low, the ECM/PCM will not allow the A/C compressor clutch to engage.

Conditions for Running the DTC

- Engine is running.
- Battery voltage is between 11 to 18 volts.

Conditions for Setting the DTC

- The ECM/PCM detects that the A/C pressure is less than 0 psi (0.01 volts).
- The ECM/PCM detects that the A/C pressure is more than 446 psi (4.94 volts).

P0530

The ECM/PCM detects a too high or too low signal on the A/C refrigerant pressure sensor signal circuit.
The ECM/PCM has received an A/C request from the BCM over serial data with A/C sensor voltage greater than 4.94 volts (446 psi).
The ECM/PCM is not receiving an A/C request from the BCM over serial data with A/C refrigerant pressure sensor voltage greater than 4.0 volts (358 psi). Conditions for setting the DTC are met for 15 seconds.

P0532

The ECM/PCM detects a low signal on the A/C refrigerant pressure sensor signal circuit.
Conditions for setting the DTC are met for longer than 3 seconds.

P0533

The ECM/PCM detects a high signal on the A/C refrigerant pressure sensor signal circuit.
Conditions for setting the DTC are met for longer than 3 seconds.

Action Taken When the DTC Sets

- The ECM/PCM will not illuminate the malfunction indicator lamp (MIL).
- The ECM/PCM stores the Failure Records.
- The A/C compressor clutch is disabled.

Conditions for Clearing the DTC

- The history DTC will clear after 40 consecutive ignition cycles have occurred without a malfunction.
- The DTC can be cleared by using the scan tool.

- The DTC will become history if the ECM/PCM no longer detects a failure.

Diagnostic Aids

Test the following conditions:

- Visually inspect the sensor for contamination or damage.
- Inspect for the following that may affect the sensors accuracy:
  - A malfunction within the refrigerant system causing high pressure.
  - Visually inspect the A/C components and lines for damage.
- Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

4: Tests for the proper operation of the circuit in the low voltage range.

5: Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

6: Tests for a short to voltage in the 5-volt reference circuit.

7: Tests for a high resistance or an open in the low reference circuit.

DTC P0530, P0532, or P0533

Step	Action	Values	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views**				
1	Did you perform the HVAC Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	**IMPORTANT:** **The ambient air temperature must be above 5° C (40° F).** 1. Turn OFF the ignition. 2. Inspect the A/C compressor for free rotation operation. 3. Start the engine. 4. Place the HVAC control module in the OFF position. Does the A/C compressor operate?	-	Go to **HVAC Compressor Clutch Does Not Disengage**	Go to **Step 3**
	1. Install a scan tool.			

3	2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the A/C High Side Pressure parameter in the engine control module (ECM) or powertrain control module (PCM), General Info Outputs data list. Does the scan tool indicate that the A/C Refrigerant Pressure parameter is within the specified range?	0.1-4.9 V	Go to Diagnostic Aids	Go to **Step 4**
4	1. Turn OFF the ignition. 2. Disconnect the A/C refrigerant pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the A/C High Side Pressure parameter in the engine control module (ECM) or powertrain control module (PCM), General Info Outputs data list. Does the scan tool indicate that the A/C Refrigerant Pressure parameter is less than the specified value?	0.1 V	Go to **Step 5**	Go to **Step 11**
5	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the A/C refrigerant pressure sensor and the signal circuit of the A/C refrigerant pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the A/C High Side Pressure parameter in the engine control module (ECM) or powertrain control module (PCM), General Info Outputs data list. Does the scan tool indicate that the A/C Refrigerant Pressure parameter is greater than the specified value?	4.9 V	Go to **Step 6**	Go to **Step 9**
	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference circuit of the A/C refrigerant pressure sensor and the low reference			

6	circuit of the A/C refrigerant pressure sensor. Does the voltage measure less than the specified value?	4.9 V	Go to **Step 7**	Go to **Step 8**
7	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. 3. Measure the resistance from the low reference circuit of the A/C refrigerant pressure sensor to a good ground. Does the resistance measure less than the specified value?	5 ohm	Go to **Step 13**	Go to **Step 12**
8	Test the 5-volt reference circuit of the A/C refrigerant pressure sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
9	Test the 5-volt reference circuit of the A/C refrigerant pressure sensor for a short to ground, a high resistance, or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 10**
10	Test the signal circuit of the A/C refrigerant pressure sensor for a short to ground, a high resistance, or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
11	Test the signal circuit of the A/C refrigerant pressure sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
12	1. Disconnect the engine control module. 2. Test the low reference circuit of the A/C refrigerant pressure sensor for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
13	Inspect for poor connections at the harness connector of the A/C refrigerant pressure sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs**	-		

	in Wiring Systems. Did you find and correct the condition?		Go to **Step 17**	Go to **Step 15**
14	Inspect for poor connections at the harness connector of the engine control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 16**
15	Replace the A/C refrigerant pressure sensor. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	-	Go to **Step 17**	-
16	**IMPORTANT:** **Perform the programming procedure for the ECM/PCM.** Replace the ECM/PCM. Refer to **Engine Control Module (ECM) Replacement** in Engine Controls - 2.2L or **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5L.Did you complete the replacement?	-	Go to **Step 17**	-
17	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC P0645, P0646, OR P0647

Circuit Description

Ignition voltage is supplied directly to the A/C compressor clutch relay. The engine control module (ECM) or powertrain control module (PCM) controls the relay by grounding the A/C clutch relay control circuit via an internal solid state device called a driver. The primary function of the driver is to supply the ground for the component being controlled. The driver has a fault line which is monitored by the ECM/PCM. When the ECM/PCM is commanding a component ON, the voltage of the control circuit should be near 0 volts. When the ECM/PCM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be near battery voltage. If the fault detection circuit senses a voltage other than what is expected, a DTC will set.

The ECM/PCM will monitor the control circuit for the following:

- A short to ground

- A short to voltage
- An open circuit
- An open relay coil
- An internally shorted or excessively low resistance relay coil

When the ECM/PCM detects any of the above malfunctions, a DTC is set and the affected driver is disabled.

Conditions for Running the DTC

- The ignition voltage is between 11.0-18.0 volts.
- The engine speed is less than 600 RPM.
- The ECM/PCM driver transitions from ON to OFF or from OFF to ON.

Conditions for Setting the DTC

P0645

The ECM/PCM detects an open on the control circuit of the A/C compressor clutch relay when commanded off with the engine in crank or run status.

P0646

The ECM/PCM detects a short to ground on the control circuit of the A/C compressor clutch relay when commanded off with the engine in crank or run status.

P0647

The ECM/PCM detects a short to voltage on the control circuit of the A/C compressor clutch relay when commanded off with the engine in crank or run status.

Action Taken When the DTC Sets

- The ECM/PCM will not illuminate the malfunction indicator lamp (MIL).
- The ECM/PCM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.

Conditions for Clearing the DTC

- A History DTC clears after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using a scan tool.
- The DTC will become history if the ECM/PCM no longer detects a failure.

Diagnostic Aids

IMPORTANT: Be sure to verify that the ECM/PCM engine grounds are secure and clean.

If DTC P0645, P0646 and P0647 cannot be duplicated, reviewing the Failure Records vehicle millage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

If the condition is not present, refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

2: Listen for an audible click when the A/C compressor clutch relay operates. Command both the ON and OFF states. Repeat the commands as necessary.

3: Tests for voltage at the coil side of the A/C compressor clutch relay. The 10-amp fuse supplies power to the coil side of the A/C compressor clutch relay.

4: Verifies that the engine control module is providing ground to the A/C compressor clutch relay.

DTC P0645, P0646, or P0647

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views**			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the A/C Relay ON and OFF in the engine control module (ECM) or powertrain control module (PCM), Engine Output Controls data list. Does the A/C compressor clutch relay turn ON and OFF with each command?	Go to Diagnostic Aids	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to a good ground.		

	Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 6**
4	1. Connect a test lamp between the control circuit and the battery positive voltage circuit of the A/C compressor clutch relay. 2. With a scan tool, command the A/C relay ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to **Step 7**	Go to **Step 5**
5	Test the control circuit of the A/C compressor clutch relay for a short to voltage, an open, or a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 8**
6	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 11**	-
7	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 09**
8	Inspect for poor connections at the harness connector of the engine control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 10**
9	Replace the A/C compressor clutch relay. Did you complete the replacement?	Go to **Step 11**	-
10	**IMPORTANT:** **Perform the programming procedure for the ECM/PCM.** Replace the ECM/PCM. Refer to **Engine Control Module (ECM) Replacement** in Engine Controls - 2.2L or **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5L.Did you complete the replacement?	Go to **Step 11**	-
11	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

SYMPTOMS - HVAC SYSTEMS - MANUAL

IMPORTANT: Review the system operation in order to familiarize yourself with the system functions. Refer to the following procedures:

- **Air Delivery Description and Operation**
- **Air Temperature Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Verify the A/C compressor clutch turns freely and is not seized.
- The A/C compressor will not operate in cold outside air temperatures. Refer to **Air Temperature Description and Operation** .
- The following could cause window fogging:
  - Wet carpet or mats
  - High humidity
  - Interior water leak
  - Blocked A/C evaporator drain tube
  - Maximum passenger capacity
  - Blocked body pressure relief valves
- Inspect the air distribution system for causes of reduced air flow:
  - Obstructed or dirty passenger compartment air filter, if equipped
  - Blocked or damaged air inlet or outlet vents

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **HVAC Compressor Clutch Does Not Engage**
- **HVAC Compressor Clutch Does Not Disengage**
- **Blower Motor Always On**
- **Blower Motor Inoperative**
- **Blower Motor Malfunction**
- **Too Hot in Vehicle**
- **Too Cold in Vehicle**
- **Air Delivery Improper**

- **Leak Testing** in Heating, Ventilation and Air Conditioning
- **Noise Diagnosis - HVAC Module** in Heating, Ventilation and Air Conditioning
- **Noise Diagnosis - Air Conditioning (A/C) System** in Heating, Ventilation and Air Conditioning
- **Noise Diagnosis - Blower Motor** in Heating, Ventilation and Air Conditioning
- **Odor Diagnosis** in Heating, Ventilation and Air Conditioning

HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE

Diagnostic Aids

The refrigerant temperature at the temperature sensor in the thermal expansion valve (TXV) controls cycling of the compressor clutch to prevent freezing of the evaporator core. The compressor is disabled when the temperature goes below 3° C (37° F) and vehicle speed is greater than 5 mph (8 km/h). The compressor is enabled when the temperature exceeds 4° C (40° F). The minimum cycling time OFF is 4 seconds. Refer to **Air Temperature Description and Operation** for a voltage temperature value table of the evaporator temperature sensor.

Test Description

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

2: The air conditioning (A/C) compressor relay output is disabled if the engine coolant temperature is above 96° C (205° F).

3: Place the mode switch in any position except OFF, and place the air temperature control switch in a cold setting. Use the bi-level mode for consistent testing of the A/C system operation.

6: The HVAC control module is inoperative if the module does not respond to any operator control requests.

23: The compressor is disabled when the evaporator temperature goes below 3° C (38° F)

34: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

HVAC Compressor Clutch Does Not Engage

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The air conditioning (A/C) compressor clutch will not engage if an A/C request has been made, and a powertrain DTC has not been set.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
	1. Install a scan tool. 2. Start the engine.		

2	3. Observe the Engine Coolant Temperature (ECT) parameter in the Engine Control Data General Info-Inputs data list. Does the scan tool indicate that the ECT parameter is above 96° C (205° F)?	Go to **Engine Overheating** in Engine Cooling	Go to **Step 3**
3	**IMPORTANT:** **For A/C compressor operation, the evaporator air temperature must be above 3° C (38° F).** 1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the A/C request switch in the On position. 4. Place the air temperature switch in the coldest position. Does the A/C compressor clutch operate?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 4**
4	1. Park the vehicle inside or out of direct sunlight. 2. Open the window in order to ventilate the interior of the vehicle. 3. If the A/C system was operating, then wait for approximately 2 minutes. 4. Turn OFF the ignition. 5. Install the **J 43600** ACR 2000 Air Conditioning Service Center. 6. Record the ambient air temperature at the vehicle. 7. Record readings of the low and high side STATIC pressures. 8. Compare the low and the high side pressure values with the allowable limits for the recorded ambient air temperature. Refer to **Air Conditioning (A/C) System Performance Test (L61)** or **Air Conditioning (A/C) System Performance Test (L66)** in Heating, Ventilation and Air Conditioning. Are the low and high side pressure values within the allowable limits for the recorded ambient air temperature, and within 103 kPa (15 psi) of each other?	Go to **Step 5**	Go to **Leak Testing** in Heating, Ventilation and Air Conditioning
	1. Turn ON the ignition, with the engine OFF.		

5	2. With a scan tool, observe the A/C High Side Pressure Sensor parameter in the engine control module data list 3. Compare the scan tool A/C High Side Pressure parameter to the high side pressure values on the ACR 2000. Are the high side pressure values within 103 kPa (15 psi) of each other?	Go to **Step 6**	Go to **Step 24**
6	Is the HVAC control module inoperative?	Go to **Step 16**	Go to **Step 7**
7	1. Start the engine. 2. With a scan tool, observe the A/C Request Signal parameter in the engine control module (ECM) or powertrain control module (PCM) data list. 3. Place the air temperature switch in the coldest position. 4. Place the A/C request switch in the ON position. Does the scan tool indicate that the A/C Request Signal parameter is Yes?	Go to **Step 10**	Go to **Step 8**
8	1. Start the engine. 2. With a scan tool, observe the A/C Request parameter in the body control module (BCM) data list. 3. Place the air temperature switch in the coldest position. 4. Place the A/C request switch in the ON position. Does the scan tool indicate that the A/C Request parameter is ON?	Go to **Step 9**	Go to **Step 18**
9	1. Turn OFF the ignition. 2. Test the A/C request signal circuit for the following: • A short to voltage • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems.Did you find and correct the condition?	Go to **Step 43**	Go to **Step 10**

10	With a scan tool, command the A/C compressor clutch relay ON and OFF. Does the A/C compressor clutch relay turn ON and OFF with each command?	Go to **Step 14**	Go to **Step 11**
11	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the coil side of the voltage supply circuit with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 12**	Go to **Step 27**
12	1. Connect a test lamp between the control circuit and the coil side of the voltage supply circuit. 2. With a scan tool, command the A/C compressor clutch relay ON and OFF in scan tool special functions. Does the test lamp turn ON and OFF with each command?	Go to **Step 29**	Go to **Step 13**
13	Does the test lamp remain illuminated with each command?	Go to **Step 21**	Go to **Step 19**
14	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Probe the switch side of the voltage supply circuit with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 15**	Go to **Step 26**
15	1. Connect a 10-amp fused jumper between the switch side voltage circuit of the clutch relay and the supply voltage circuit of the clutch. 2. Turn ON the ignition, with the engine OFF. Does the A/C compressor clutch engage?	Go to **Step 29**	Go to **Step 22**
16	Test the ignition 3 voltage circuit of the HVAC control module for the following: • A short to voltage • A high resistance • An open		

	Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 17**
17	Test the ground circuit of the HVAC control module for an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 34**
18	1. Start the engine. 2. Place the A/C request in the ON position. 3. Measure the voltage on the request circuit at the BCM to a good ground. Does the value measure near battery voltage?	Go to **Step 31**	Go to **Step 20**
19	Test the control circuit of the A/C compressor clutch relay for an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 35**
20	Test the A/C request signal circuit for the following: • A short to voltage • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 23**
21	Test the control circuit of the A/C compressor clutch relay for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 35**
22	Test the supply voltage circuit at the A/C compressor clutch relay for the following: • A short to voltage • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 25**
	View the evaporator voltage in the BCM scan tool data		

23	list under A/C sensor. Refer to **Air Temperature Description and Operation** for the evaporator sensor temperature to voltage conversion chart. Is the Evaporator Voltage parameter greater than the voltage range of 2.45 V to 2.55 V which equals a temperature range of 36 - 38° F?	Go to **Step 24**	Go to **Step 32**
24	Test the ground circuit of the A/C refrigerant pressure sensor for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 28**
25	Test the ground circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 30**
26	Repair the switch side voltage supply circuit of the relay. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 43**	-
27	Repair the coil side of the voltage supply circuit of the relay. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 43**	-
28	Inspect for poor connections at the harness connector of the A/C refrigerant pressure sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 36**
29	Inspect for poor connections at the relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 38**
30	Inspect for poor connections at the harness connector of the A/C compressor clutch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 39**
31	Inspect for poor connections at the harness connector of the BCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 41**
	Test the evaporator temperature sensor circuits for the following: • A short to voltage		

32	• A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 33**
33	Inspect for poor connections at the harness connector of the evaporator low temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 34**
34	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 37**
35	Inspect for poor connections at the harness connector of the ECM/PCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 43**	Go to **Step 42**
36	Replace the A/C refrigerant pressure sensor. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement** in Heating, Ventilation, and Air Conditioning. Did you complete the replacement?	Go to **Step 43**	-
37	Replace the evaporator low temperature sensor. Refer to **Air Conditioning (A/C) Refrigerant Low Temperature Sensor Replacement (First Design)** or **Air Conditioning (A/C) Refrigerant Low Temperature Sensor Replacement (Second Design)** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	Go to **Step 43**	-
38	Replace the relay. Did you complete the replacement?	Go to **Step 43**	-
39	Replace the A/C compressor clutch. Refer to **Compressor Clutch Assembly Replacement** in Heating, Ventilation, and Air Conditioning. Did you complete the replacement?	Go to **Step 43**	-
40	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 43**	-
	IMPORTANT:		

41	**Perform the reprogramming procedure for the BCM.** Replace the BCM. Refer to **Body Control Module Replacement** in Body Control Systems.Did you complete the replacement?	Go to **Step 43**		-
42	**IMPORTANT:** **Perform the reprogramming procedure for the ECM/PCM.** Replace the ECM/PCM. Refer to **Engine Control Module (ECM) Replacement** in Engine Controls - 2.2L or **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5L.Did you complete the replacement?	Go to **Step 43**		-
43	Operate the system in order to verify the repair. Did you correct the condition?	System OK		Go to **Step 4**

HVAC COMPRESSOR CLUTCH DOES NOT DISENGAGE

Test Description

The number below refers to the step number on the diagnostic table.

12: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

HVAC Compressor Clutch Does Not Disengage

Step	Action	Values	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The A/C compressor clutch will not disengage when an A/C request has not been made and a Powertrain DTC has not been set.				
1	Did you perform the HVAC Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Start the engine. 2. Place the blower motor switch in the OFF position. 3. Place the A/C request switch in the OFF position. Does the A/C compressor operate?	-	Go to **Step 3**	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems
3	With a scan tool, observe the A/C Request Signal parameter in the engine control module (ECM) or powertrain control module (PCM), General Info Inputs	-		

	data list. Does the scan tool indicate that the A/C Request Signal parameter is YES?		Go to **Step 4**	Go to **Step 6**
4	Test the A/C request signal circuit for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 5**
5	1. Turn OFF the ignition. 2. Disconnect the A/C Refrigerant pressure sensor. 3. Start the engine. 4. With a scan tool, observe the A/C Request Signal parameter. Does the scan tool indicate that the A/C Request Signal parameter is YES?	-	Go to **Step 13**	Go to **Step 12**
6	With a scan tool, command the A/C compressor clutch relay ON and OFF. Does the A/C compressor clutch relay turn ON and OFF with each command?	-	Go to **Step 7**	Go to **Step 9**
7	Remove the A/C compressor clutch relay. Is the A/C compressor ON?	-	Go to **Step 10**	Go to **Step 8**
8	Measure the resistance between the switch side A/C compressor clutch relay terminals. Does the resistance measurement equal the specified value?	infinity	Go to **Step 9**	Go to **Step 11**
9	Test the A/C clutch relay control circuit for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 13**
10	Test the A/C compressor clutch supply voltage circuit for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 15**
11	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 14**
12	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 16**
	Inspect for poor connections at the harness connector of			

13	the engine control module (ECM) or powertrain control module (PCM). Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 18**	Go to **Step 17**
14	Replace the A/C compressor clutch relay. Did you complete the replacement?	-	Go to **Step 18**	-
15	Replace the A/C compressor clutch. Refer to **Compressor Clutch Assembly Replacement** in Heating, Ventilation, and Air Conditioning. Did you complete the replacement?	-	Go to **Step 18**	-
16	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 18**	-
17	**IMPORTANT:** **Perform the reprogramming procedure for the ECM/PCM.** Replace the ECM/PCM. Refer to **Engine Control Module (ECM) Replacement** in Engine Controls - 2.2 L or **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5 L.Did you complete the replacement?	-	Go to **Step 18**	-
18	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 3**

BLOWER MOTOR ALWAYS ON

Test Description

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

4: Test the Low, Med 1, Med 2 and High blower motor control circuits for an short to ground. The High speed blower motor control circuit is spliced to the Blower motor resistor circuit. This circuit should be checked for a short to ground also.

5: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

Blower Motor Always On

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The blower motor is ON while the blower motor switch is in the OFF position.			
1	Did you perform the HVAC Diagnostic System Check?		Go to **Diagnostic System Check -**

		Go to **Step 2**	**HVAC Systems - Manual**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch in the OFF position. Is the blower motor OFF?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the HVAC control assembly connector. 3. Turn ON the ignition, with the engine OFF. Is the blower motor OFF?	Go to **Step 5**	Go to **Step 4**
4	Repair the applicable blower motor control circuit for an short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 7**	-
5	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 7**	Go to **Step 6**
6	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 7**	-
7	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

BLOWER MOTOR INOPERATIVE

Test Description

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

4: The High speed blower motor control circuit is spliced to the Blower motor resistor circuit. A short to voltage on the control circuits will open the HVAC Blower fuse. Be sure to check all the blower motor control circuits for a short to ground.

6: The ground circuit to be tested comes from the HVAC blower relay.

8: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

Blower Motor Inoperative

Step	Action	Yes	No

Schematic Reference:HVAC Schematics
Connector End View Reference:HVAC Connector End Views
DEFINITION: The blower motor is inoperative in all speed positions.

1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	Go to **Blower Motor Malfunction**	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the blower motor. 3. Turn ON the ignition, with the engine OFF. 4. Turn ON the blower motor. 5. Connect a test lamp between the blower motor supply voltage circuit and the blower motor ground circuit. 6. Place the blower switch in the maximum speed position. Does the test lamp illuminate?	Go to **Step 7**	Go to **Step 4**
4	Test the blower motor supply voltage circuit for an open, short to ground or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 5**
5	Test the High blower motor control circuit for an open, or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 6**
6	Test the ground circuit of the HVAC control assembly for an open, short to voltage or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 8**
7	Inspect for poor connections at the blower motor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 9**
	Inspect for poor connections at the HVAC control Module. Refer to **Testing for Intermittent Conditions**		

8	**and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 11**	Go to **Step 10**
9	Replace the blower motor. Refer to **Blower Motor Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	Go to **Step 11**	-
10	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 11**	-
11	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

BLOWER MOTOR MALFUNCTION

Test Description

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

3: Test the Low, Med 1, Med 2 and High blower motor control circuits for an open, short to voltage, short to ground or high resistance. The High speed blower motor control circuit is spliced to the Blower motor resistor circuit. This circuit should be checked also.

7: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

Blower Motor Malfunction

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The blower motor operates in at least one, but not all, speed positions.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch in each speed position. Does the blower motor operate at the desired speeds?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
	1. Turn OFF the ignition. 2. Disconnect the blower motor resistor assembly. 3. Turn ON the ignition, with the engine OFF. 4. Probe the LOW, MED 1, MED 2 and HIGH blower motor control circuits at the blower motor		

3	resistor assembly and HVAC control assembly, with a test lamp that is connected to voltage. At the same time, place the blower motor switch in the appropriate speed position for the circuit being tested. Does the test lamp illuminate on all blower motor control circuits?	Go to **Step 5**	Go to **Step 4**
4	Test the applicable blower motor control circuit for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 7**
5	Test each blower motor control circuit for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 6**
6	Inspect for poor connections at the harness connector of the blower motor resistor assembly. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 8**
7	Inspect for poor connections at the harness connector of the HVAC control assembly. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 9**
8	Replace the blower motor resistor. Refer to **Blower Motor Resistor Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	Go to **Step 10**	-
9	Replace the HVAC control assembly. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 10**	-
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

TOO HOT IN VEHICLE

Test Description

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

2: This tests for A/C compressor engagement. Ambient air temperature must be above 5° C (40° F) for the compressor to engage.

3: This tests for the blower motor functionality.

6: This tests if the A/C compressor function is inoperative.

Too Hot in Vehicle

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted, or the cooling is insufficient during A/C operation.			
1	Did you perform the HVAC Diagnostics System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	**IMPORTANT:** **The ambient air temperature must be above 5° C (40° F).** 1. Turn OFF the ignition. 2. Inspect the A/C compressor for free rotation operation. Refer to **Symptoms - HVAC Systems - Manual** . 3. Start the engine. 4. Place the mode switch in Blend or Defrost. 5. Place the blower motor switch in the MAX position. 6. Place the air temperature switch in the coldest position. Does the A/C compressor operate?	Go to **Step 3**	Go to **HVAC Compressor Clutch Does Not Engage**
3	1. Turn ON the ignition, with the engine OFF. 2. Place the mode switch in any position. 3. Place the blower switch in each speed position. Does the blower motor operate in any of the speed positions?	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate at the desired speeds?	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the recirculation switch in the ON position. Does the recirculation door move to the recirculation position?	Go to **Step 6**	Go to **Air Recirculation Malfunction**
6	When the A/C is ON, does the customer concern occur?	Go to **Step 7**	Go to **Step 8**
	Perform the refrigerant system performance test. Refer to		

7	**Air Conditioning (A/C) System Performance Test (L61)** or **Air Conditioning (A/C) System Performance Test (L66)** in Heating, Ventilation and Air Conditioning. Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
8	Inspect the air temperature door and linkage for the following conditions: • High effort to operate air temperature door. • Broken or binding linkages or air temperature door • An obstruction that prevents the air temperature door from operating within its full range of motion • Missing seals to the air temperature door • Misaligned seals to the air temperature door Did you find and correct the condition?	Go to **Step 9**	Go to **High or Low Temperature Control Effort** in Heating, Ventilation and Air Conditioning
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

TOO COLD IN VEHICLE

Test Description

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

2: This tests for the blower motor functionality.

5: This tests for the A/C compressor clutch always on.

7: This test is to insure the cooling system is operating normally.

Too Cold in Vehicle

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted, or the heating is insufficient.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the mode switch in any position. 3. Place the blower switch in each speed position.		

	Does the blower motor operate in any of the speed positions?	Go to **Step 3**	Go to **Blower Motor Inoperative**
3	Does the blower motor operate at the desired speeds?	Go to **Step 4**	Go to **Blower Motor Malfunction**
4	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the recirculation switch in the recirculation position. Does the recirculation door move to the recirculation position?	Go to **Step 5**	Go to **Air Recirculation Malfunction**
5	Place the HVAC control module in the OFF position. Does the A/C compressor operate?	Go to **HVAC Compressor Clutch Does Not Disengage**	Go to **Step 6**
6	Inspect the cooling system for the following conditions: • A low coolant level • A loose radiator hose or heater hose • A kinked radiator hose or heater hose • A missing radiator cap pressure seal • A leaking radiator cap Did you find and correct the condition?	Go to **Step 9**	Go to **Step 7**
7	Perform the Heating Performance Diagnostic. Refer to **Heating Performance Diagnostic** in Heating, Ventilation and Air Conditioning. Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
8	Inspect the air temperature door and linkage for the following conditions: • High effort to operate air temperature door. • Broken or binding linkages or air temperature door • An obstruction that prevents the air temperature door from operating within it's full range of motion • Missing seals to the air temperature door		

	• Misaligned seals to the air temperature door Did you find and correct the condition?	Go to **Step 9**	Go to **High or Low Temperature Control Effort** in Heating, Ventilation and Air Conditioning
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

AIR DELIVERY IMPROPER

Test Description

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

13: The test lamp should illuminate while trying to command the appropriate mode door in both directions.

15: Two ignition 3 voltage circuits supply the HVAC control module. Test the ignition 3 voltage circuit that does not supply the blower motor switch.

18: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

Air Delivery Improper

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: Air does not flow correctly from the air distribution outlets.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch in the OFF position. Is the blower motor OFF?	Go to **Step 3**	Go to **Blower Motor Always On**
3	Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate in each speed position?	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	Are all of the HVAC control module controls except for the blower motor inoperative?	Go to **Step 15**	Go to **Step 6**

6	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in the vent position. 3. Place the recirculation switch in the ON position. 4. Observe the recirculation door. 5. Place the outside air switch in the ON position. Does the recirculation door move from the recirculation to the outside air position?	Go to **Step 7**	Go to **Air Recirculation Malfunction**
7	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in each mode position. Does air flow sufficiently from the proper air distribution outlets for each selected mode position?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 8**
8	Inspect the air delivery system for the following conditions: • A dirty HVAC air filter, if applicable • An obstruction to the airflow • Air leaks • Misaligned air ducts Did you find and correct the condition?	Go to **Step 21**	Go to **Step 9**
9	Inspect the appropriate mode door and the mode actuator for the following conditions: • A misaligned mode actuator Refer to **Panel Actuator Replacement** or **Defroster Actuator Replacement** or **Floor Actuator Replacement** . • Broken or binding linkages or mode door • An obstruction that prevents the mode actuator from operating within the full range of motion • Missing seals to the mode door • Misaligned seals to the mode door		

	Did you find and correct the condition?	Go to **Step 21**	Go to **Step 10**
10	Test the position signal circuit of the appropriate mode actuator for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 11**
11	Test the low reference circuit of the appropriate mode actuator for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 12**
12	Test the 5 volt reference circuit of the appropriate mode actuator for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 13**
13	1. Turn OFF the ignition. 2. Reconnect the appropriate mode actuator. 3. Turn ON the ignition with the engine OFF. 4. Connect a test lamp between mode door control A and mode door control B circuits of the appropriate mode actuator connector. 5. Place the mode switch in the Defrost position. 6. Place the mode switch in the Panel position. Does the test lamp illuminate in both positions?	Go to **Step 17**	Go to **Step 14**
14	Test the mode door control A and mode door control B circuits of the appropriate mode actuator for an open, a high resistance, a short to ground, or a short to voltage. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 18**
15	Test the ignition 3 voltage circuit of the HVAC control module for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 16**
16	Test the ground circuit of the HVAC control module for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 18**
17	Inspect for bad connections at the harness connector of the appropriate mode actuator. Refer to **Testing for Intermittent Conditions and Poor**		

	Connections and to **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 19**
18	Inspect for bad connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and to **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 21**	Go to **Step 20**
19	Replace the appropriate mode actuator. Refer to **Panel Actuator Replacement** or **Defroster Actuator Replacement** or **Floor Actuator Replacement** . Did you complete the replacement?	Go to **Step 21**	-
20	Replace the HVAC Control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 21**	-
21	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 8**

AIR RECIRCULATION MALFUNCTION

Test Description

The number below refers to the step number on the diagnostic table.

6: The HVAC control assembly is supplied by 2 ignition-3 voltage circuits. Test both ignition-3 voltage circuits.

9: Check the connection by removing and securely reinstalling before replacement of the HVAC control is considered.

Air Recirculation Malfunction

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference:HVAC Connector End Views** DEFINITION: Air recirculation is inoperative or is always ON.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Manual**
	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch at the maximum speed position. 3. Place the mode switch in the vent position. 4. Place the recirculation switch in the ON		

2	position. 5. Observe the recirculation door. 6. Place the recirculation switch in the OFF position. Does the recirculation door move from the recirculation to the outside air position?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the recirculation actuator. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between recirculation door control A and recirculation door control B of the recirculation actuator connector. 5. Place the blower motor switch in the maximum speed position. 6. Place the mode switch in the vent position. 7. Place the recirculation switch in the ON position. 8. Place the recirculation switch in the OFF position. Does the test lamp illuminate in both, recirculation and ambient air, positions?	Go to **Step 5**	Go to **Step 4**
4	Test the recirculation door control A and B circuits of the recirculation actuator for an open, for a high resistance, for a short to ground, or for a short to voltage. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 12**	Go to **Step 6**
5	Inspect the recirculation door and the recirculation actuator for the following conditions: • A misaligned recirculation actuator Refer to **Recirculation Actuator Replacement** . • Broken or binding linkages or recirculation door • An obstruction that prevents the recirculation actuator from operating within the full range of motion • Missing seals to the recirculation door		

	• Misaligned seals to the recirculation door Did you find and correct the condition?	Go to **Step 12**	Go to **Step 8**
6	Test the ignition 3 voltage circuits of the HVAC control assembly for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 12**	Go to **Step 7**
7	Test the ground circuit of the HVAC control assembly for an open or for a high resistance. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 12**	Go to **Step 9**
8	Inspect for bad connections at the harness connector of the recirculation actuator. Refer to **Testing for Intermittent Conditions and Poor Connections** and to **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 12**	Go to **Step 10**
9	Inspect for bad connections at the harness connector of the HVAC control assembly. Refer to **Testing for Intermittent Conditions and Poor Connections** and to **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 12**	Go to **Step 11**
10	Replace the recirculation actuator. Refer to **Recirculation Actuator Replacement** . Did you complete the replacement?	Go to **Step 12**	-
11	Replace the HVAC Control assembly. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 12**	-
12	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

RE-CALIBRATING ACTUATORS

Calibration Procedure at the HVAC Control Head

Use the following steps to perform the calibration update:

1. Ignition in ON position or engine running.
2. Simultaneously press the A/C and recirculation buttons on control head 3 times in less than 2 seconds.
3. The Mode setting lights will flash during calibration and will quit flashing once calibration is completed.
4. This calibration process can take up to 30 seconds.

REPAIR INSTRUCTIONS

HVAC CONTROL MODULE REPLACEMENT

Removal Procedure

1. Remove the console shift lever bezel. Refer to **Console Shift Lever Bezel Replacement** in Instrument Panel, Gages and Console.
2. Remove the I/P storage compartment. Refer to **Storage Compartment Replacement - Instrument Panel (I/P)** in Instrument Panel, Gages and Console.
3. Remove the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.

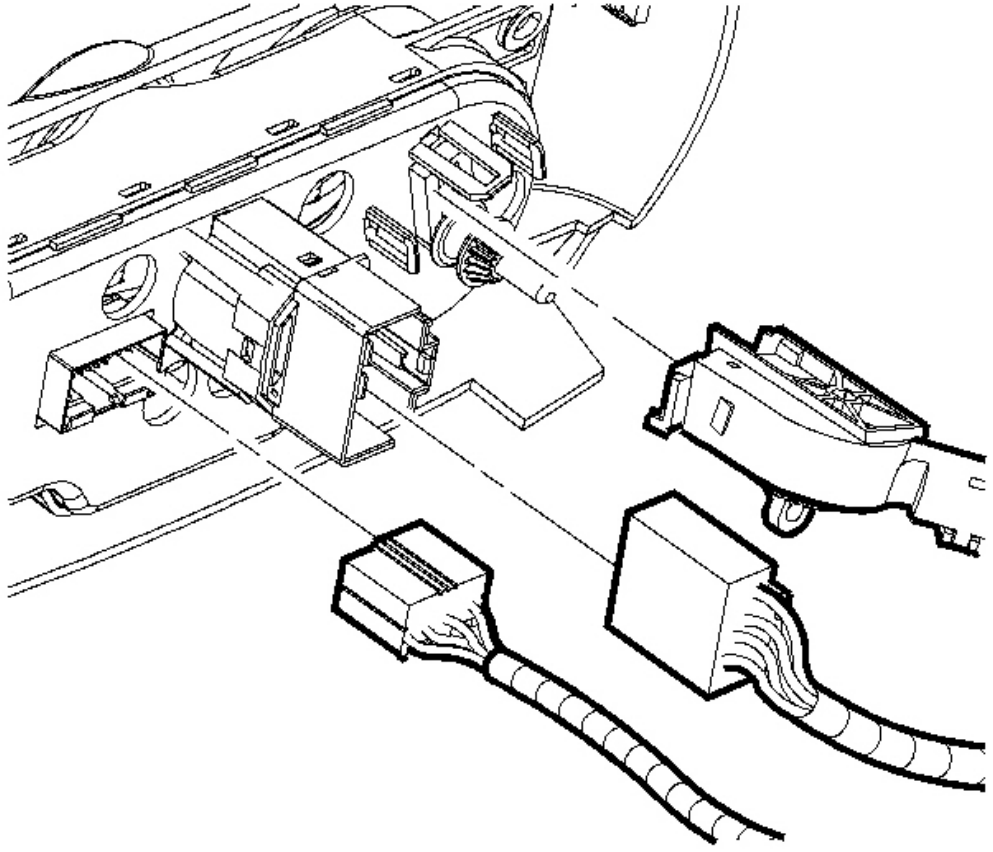


Fig. 6: HVAC Control Module Connectors
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the temperature cable from the HVAC control module.
5. Disconnect the blower switch from the HVAC control module.
6. Disconnect the electrical connector from the HVAC control module.
7. Disconnect the remaining electrical connectors from the center trim bezel.

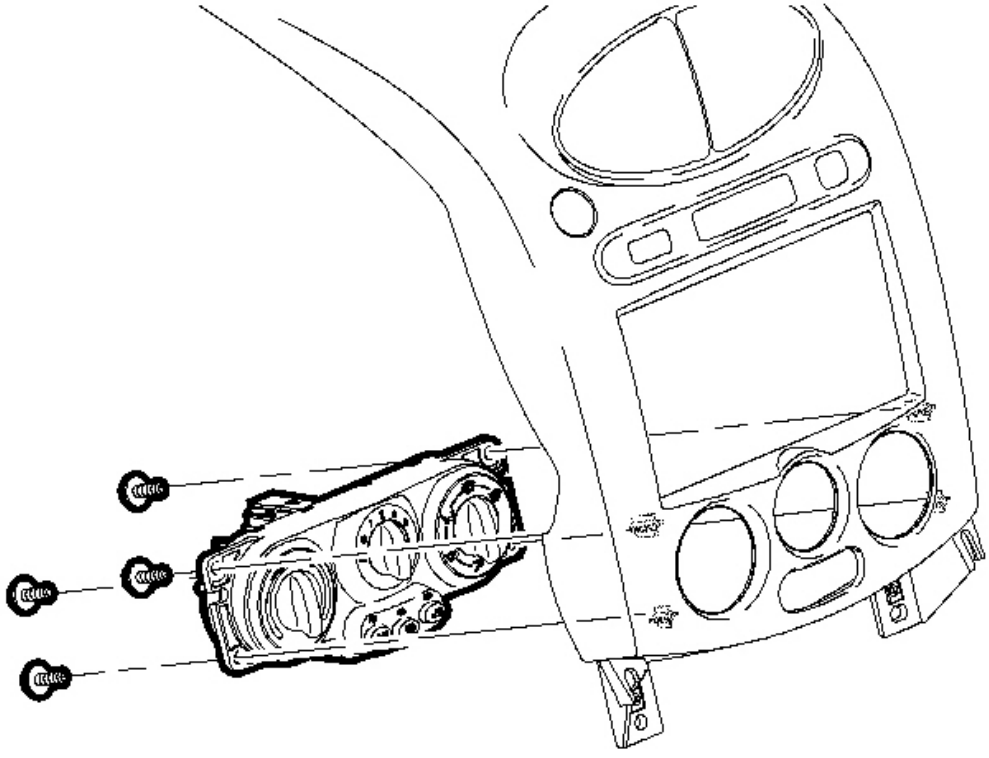


Fig. 7: HVAC Control Module & Screws
Courtesy of GENERAL MOTORS CORP.

8. Remove the HVAC control module screws from the center trim bezel.

9. Remove the HVAC control module from the center trim bezel.

Installation Procedure

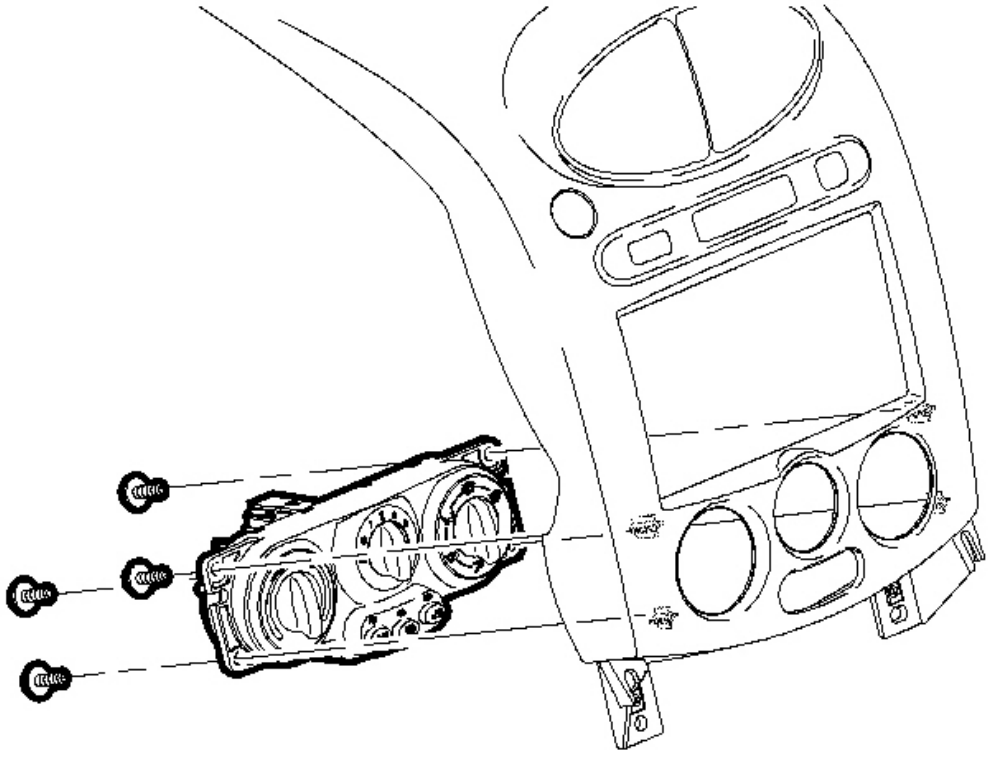


Fig. 8: HVAC Control Module & Screws
Courtesy of GENERAL MOTORS CORP.

1. Install the HVAC control module to the center trim bezel.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the HVAC control module screws to the center trim bezel.

Tighten: Tighten the screws to 2.5 N.m (22 lb in).

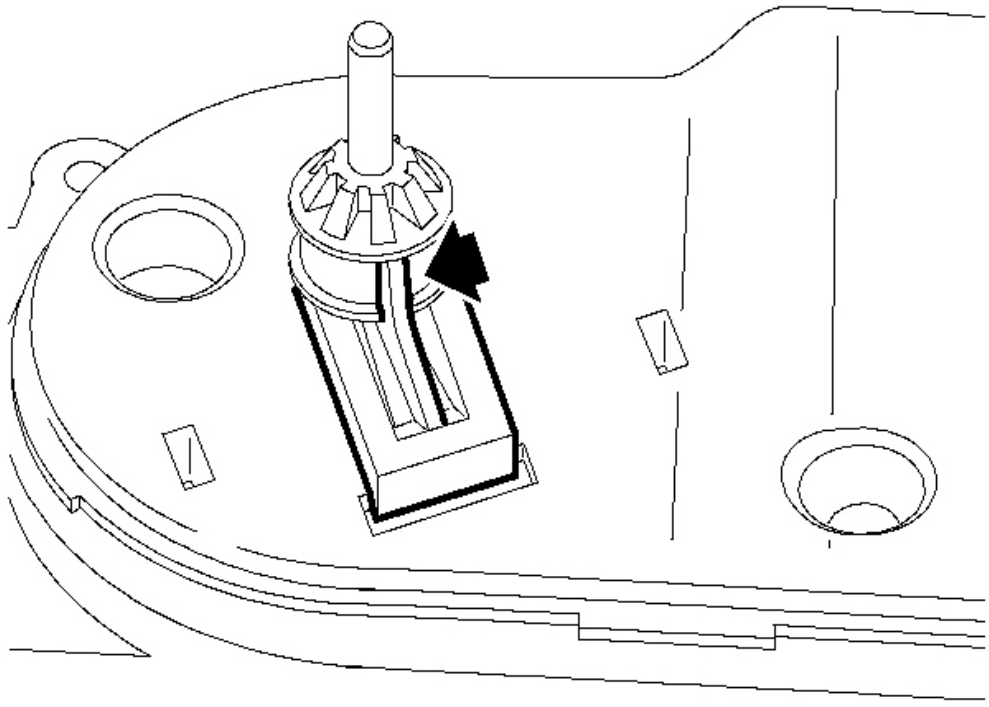


Fig. 9: Temperature Cable Knob & Shaft
Courtesy of GENERAL MOTORS CORP.

3. Center the temperature cable knob by inserting the assembly alignment tab into the centering slot of the temperature knob shaft.

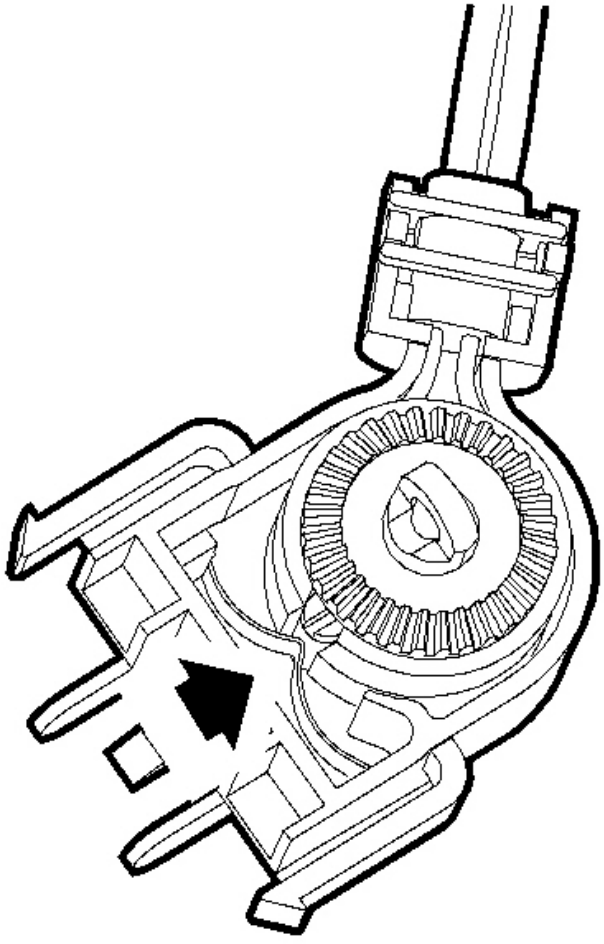


Fig. 10: HVAC Module Temperature Control Cable
Courtesy of GENERAL MOTORS CORP.

4. Center the HVAC module temperature door by aligning the cable lug of the temperature control cable with the center point of the detent spring. Detent spring force should hold the temperature door in the desired position.

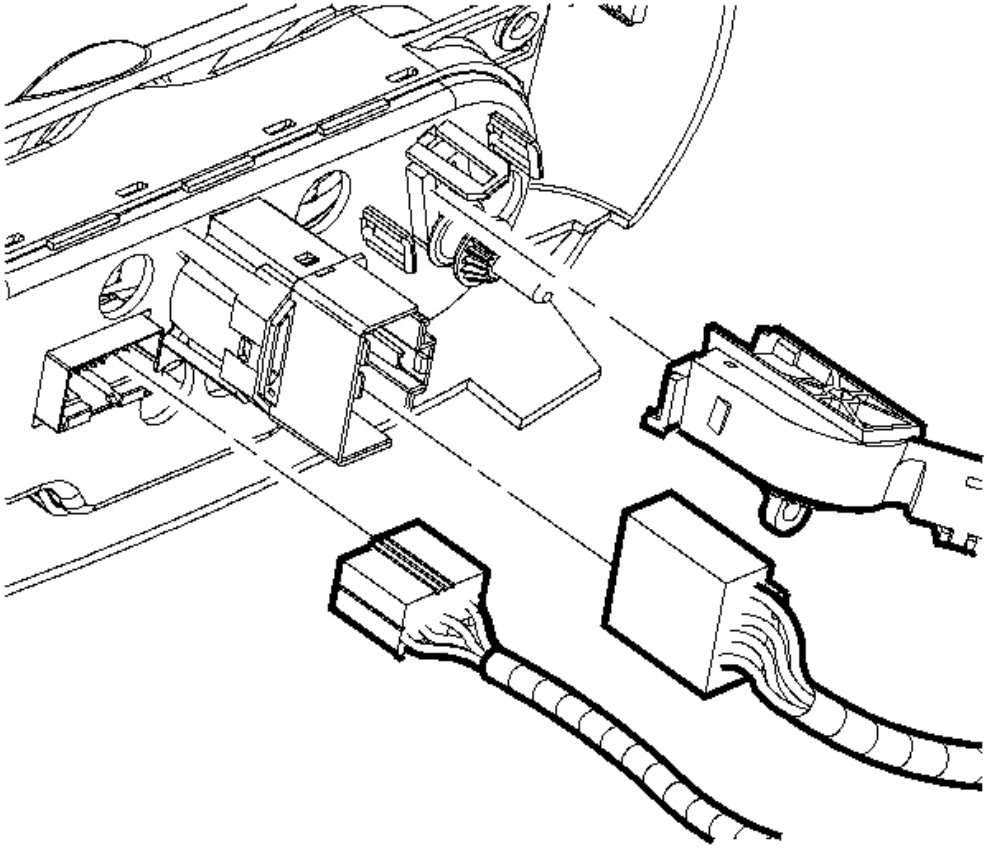


Fig. 11: HVAC Control Module Connectors
Courtesy of GENERAL MOTORS CORP.

5. Connect the temperature cable to the HVAC control module.
6. Connect the blower switch to the HVAC control module.
7. Connect the electrical connector to the HVAC control module.
8. Connect the remaining electrical connectors to the center trim bezel.
9. Install the center trim bezel to the I/P. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.
10. Install the I/P storage compartment. Refer to **Storage Compartment Replacement - Instrument Panel (I/P)** in Instrument Panel, Gages and Console.
11. Install the console shift lever bezel. Refer to **Console Shift Lever Bezel Replacement** in Instrument

Panel, Gages and Console.

IMPORTANT: Any time an HVAC module mode actuator or the HVAC control module is replaced, the HVAC control module must be calibrated to ensure proper air distribution.

12. Calibrate the mode door by simultaneously pushing the A/C and RECIRC buttons on the HVAC control module three times each, within 2 seconds of initial push.
    - The A/C and RECIRC button LED's will flash while this calibration is taking place.
    - The calibration will take anywhere between 10-30 seconds depending on battery voltage.
    - The LED's will quit flashing when the calibration is complete.
13. Cycle the ignition and verify proper operation.

BLOWER MOTOR SWITCH REPLACEMENT

Removal Procedure

1. Remove the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.
2. Remove the blower motor control knob by pulling rearward off shaft.

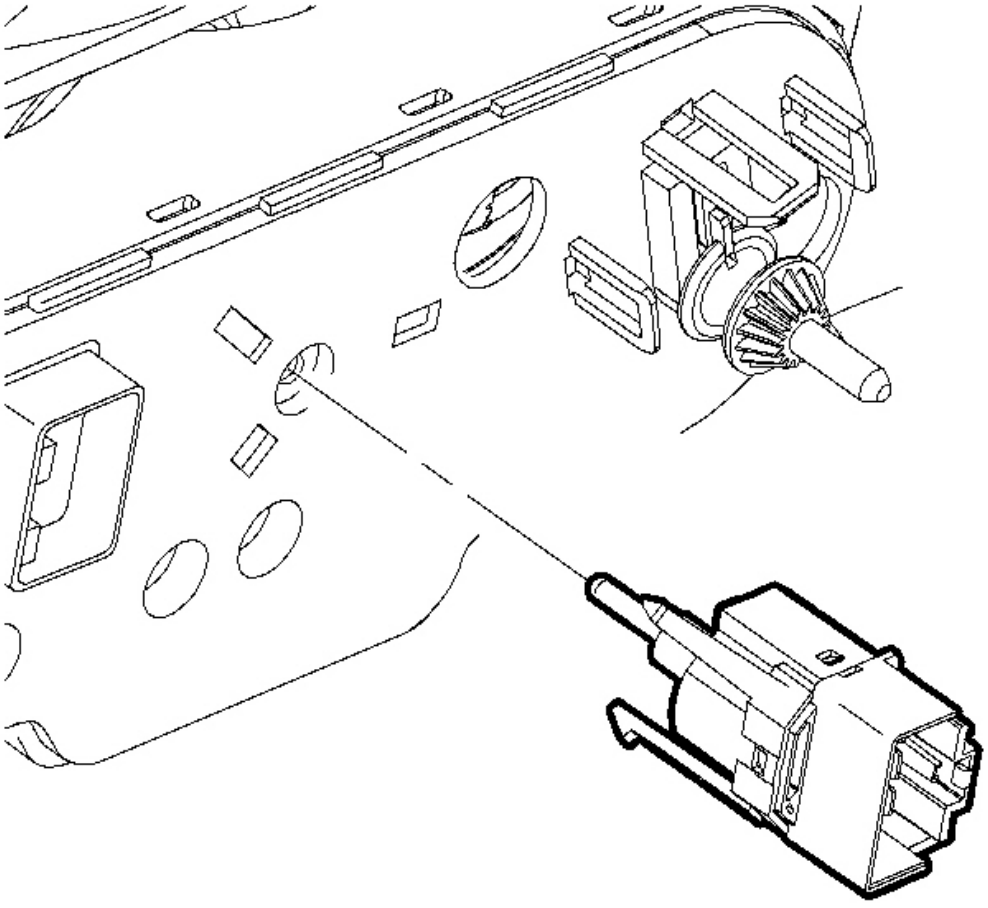


Fig. 12: Blower Motor Switch & Retention Prongs
Courtesy of GENERAL MOTORS CORP.

3. Press the blower motor switch retention prongs and remove the switch from the HVAC control module.

Installation Procedure

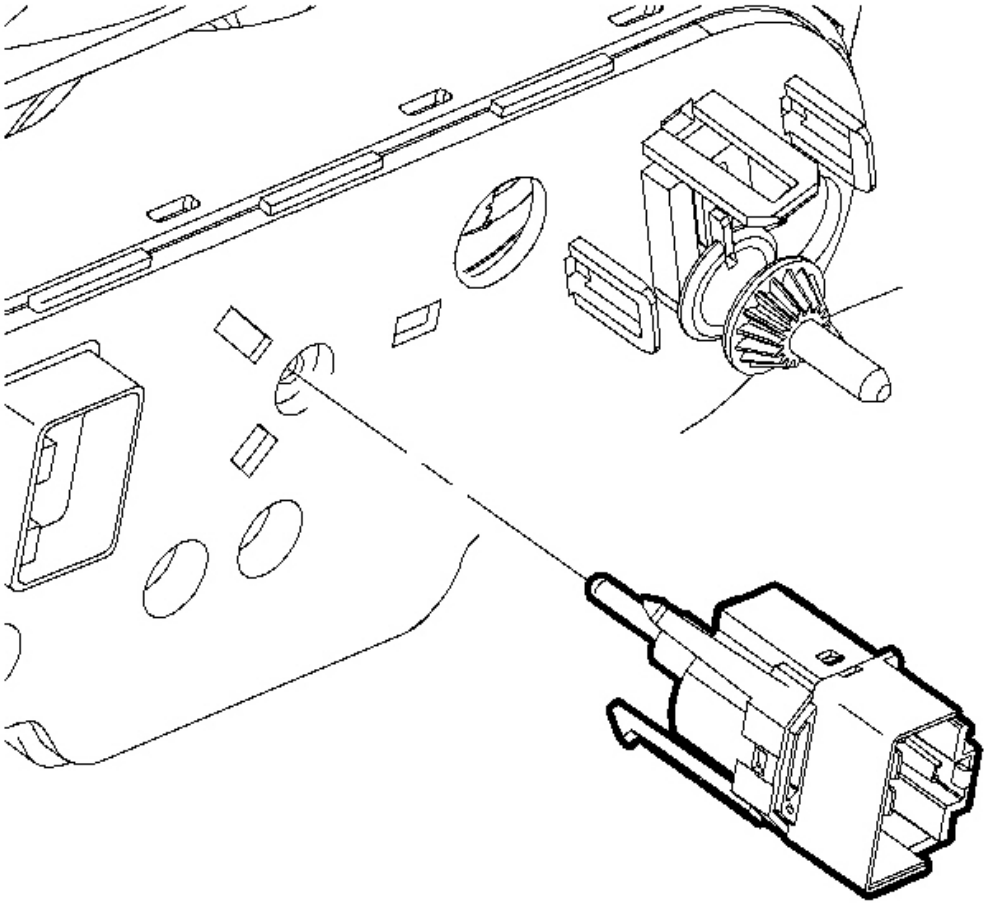


Fig. 13: Blower Motor Switch & Retention Prongs
Courtesy of GENERAL MOTORS CORP.

1. Install the blower motor switch to the HVAC control module. Press to engage the retention prongs.
2. Install the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.
3. Install the blower motor control knob.

TEMPERATURE CONTROL CABLE REPLACEMENT

Removal Procedure

1. Remove the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages

and Console.

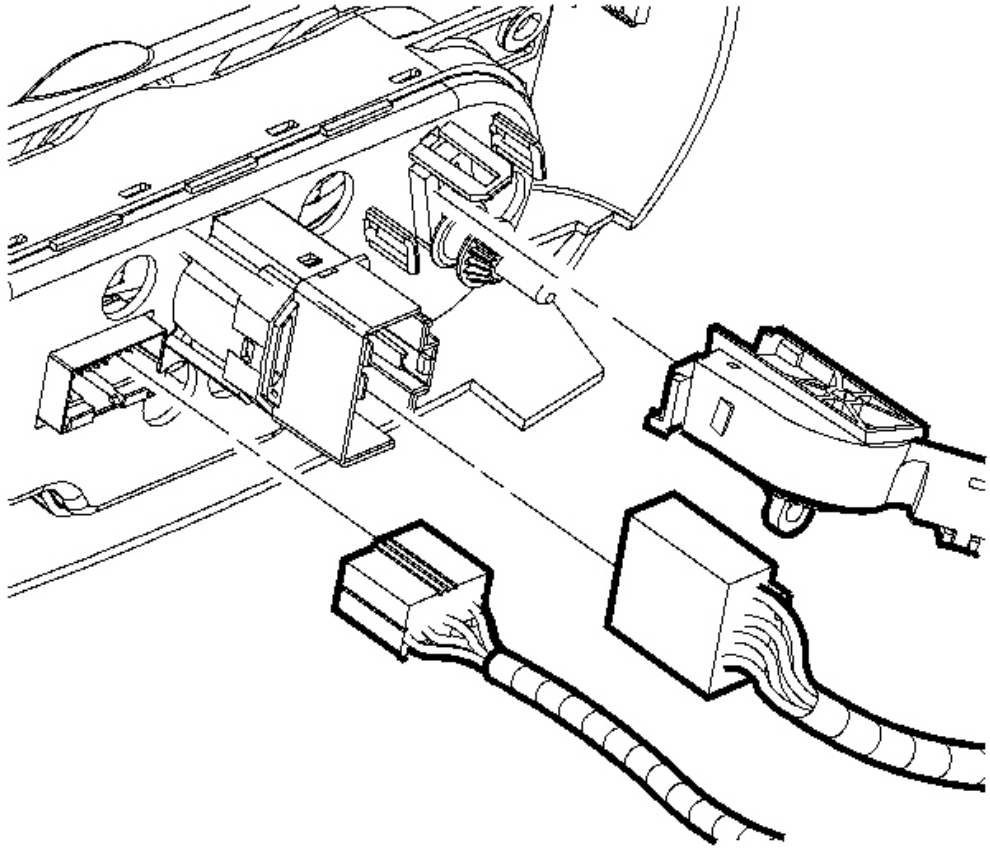


Fig. 14: HVAC Control Module Connectors
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the temperature cable from the HVAC control module.
3. Remove the temperature cable screw from the HVAC module.
4. Press the white tab at the center of the cable housing to release the cable from the temperature door shaft.

Installation Procedure

1. Position the cable housing to the temperature door shaft and press to engage.

NOTE: **Refer to Fastener Notice in Cautions and Notices.**

2. Install the temperature cable screw to the HVAC module.

   Tighten: Tighten the screw to 1 N.m (9 lb in).

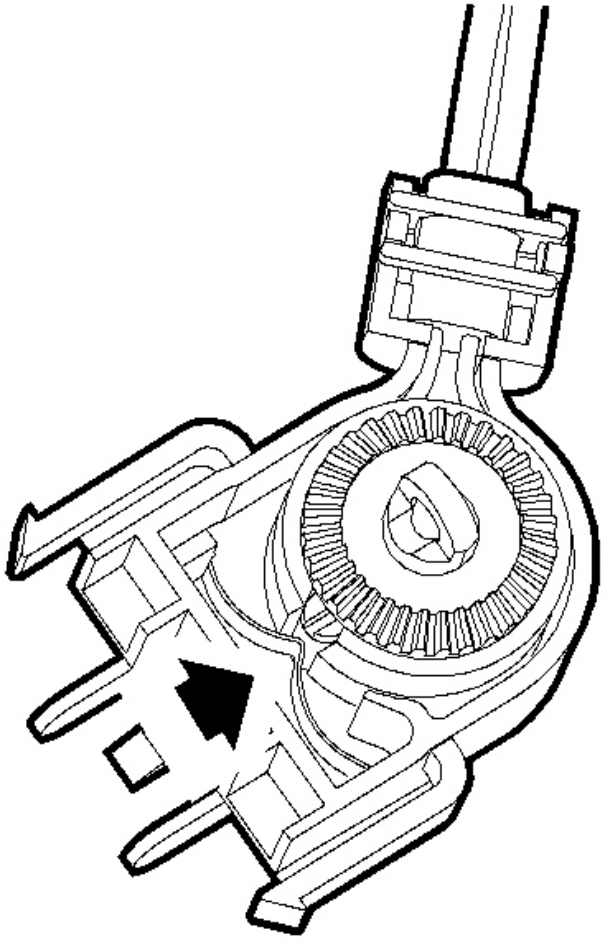


Fig. 15: HVAC Module Temperature Control Cable
Courtesy of GENERAL MOTORS CORP.

3. Center the HVAC module temperature door by aligning the cable lug of the temperature control cable with the center point of the detent spring. Detent spring force should hold the temperature door in the desired position.

4. Install the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.

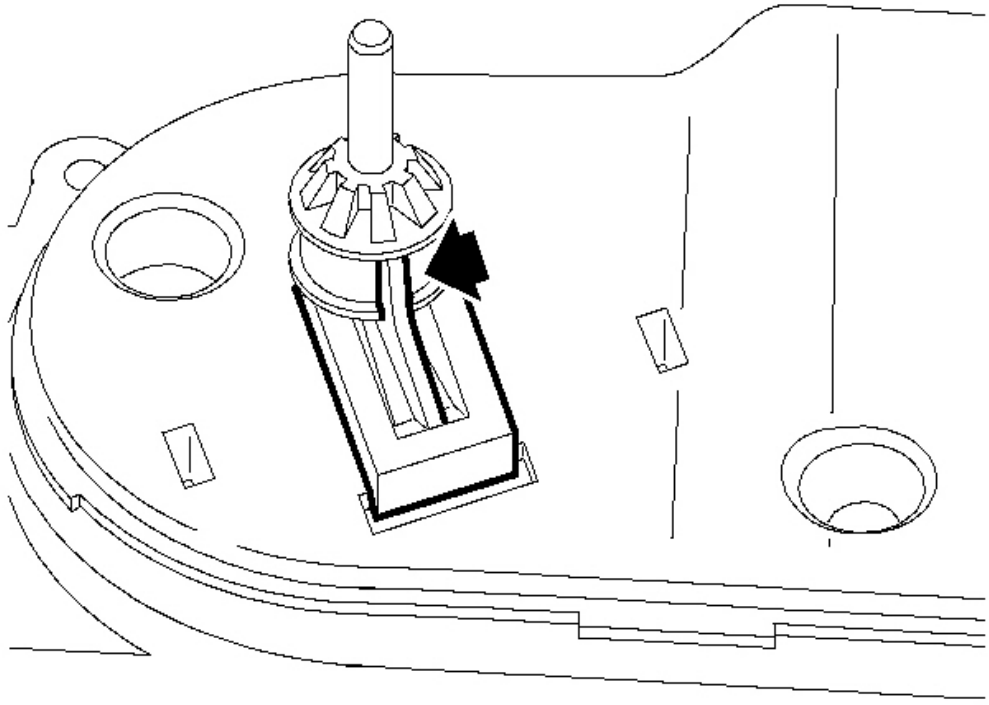


Fig. 16: Temperature Cable Knob & Shaft
Courtesy of GENERAL MOTORS CORP.

5. Center the temperature cable knob by inserting the assembly alignment tab into the centering slot of the temperature knob shaft.

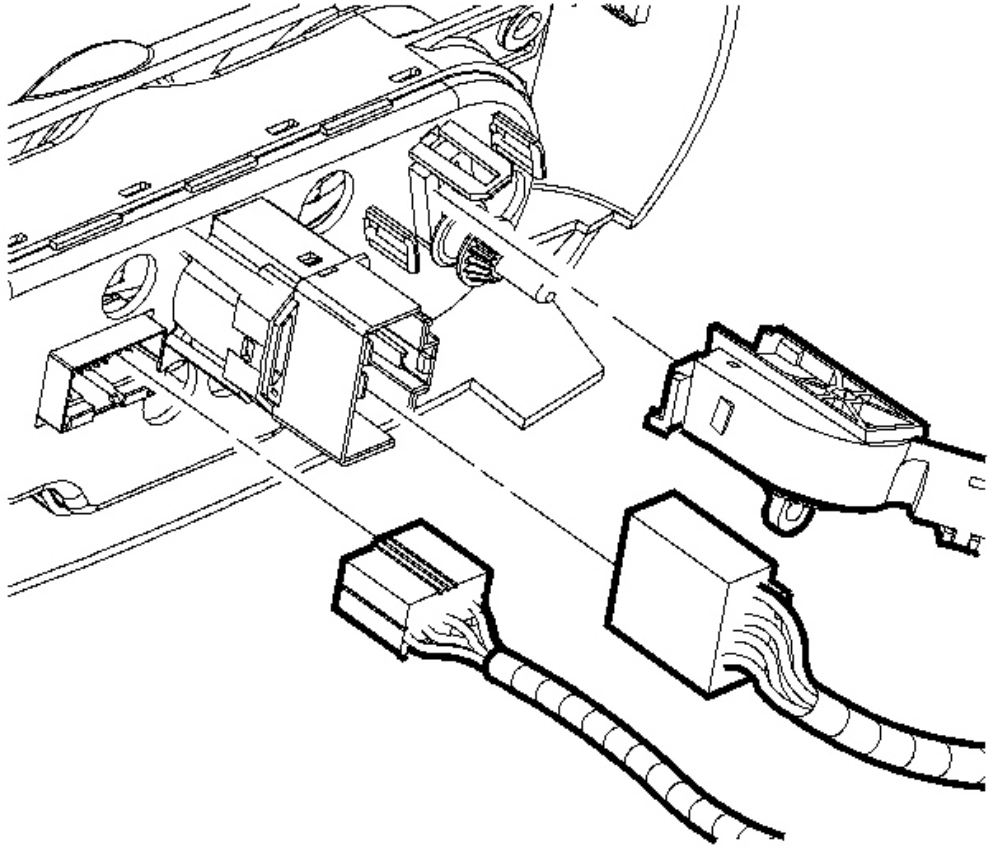


Fig. 17: HVAC Control Module Connectors
Courtesy of GENERAL MOTORS CORP.

6. Install the temperature cable to the HVAC control module by aligning the retention tabs and the temperature knob shaft and snapping into place.

TEMPERATURE CONTROL CABLE ADJUSTMENT

Adjustment Procedure

1. Remove the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.
2. Remove the temperature cable from the HVAC control module.

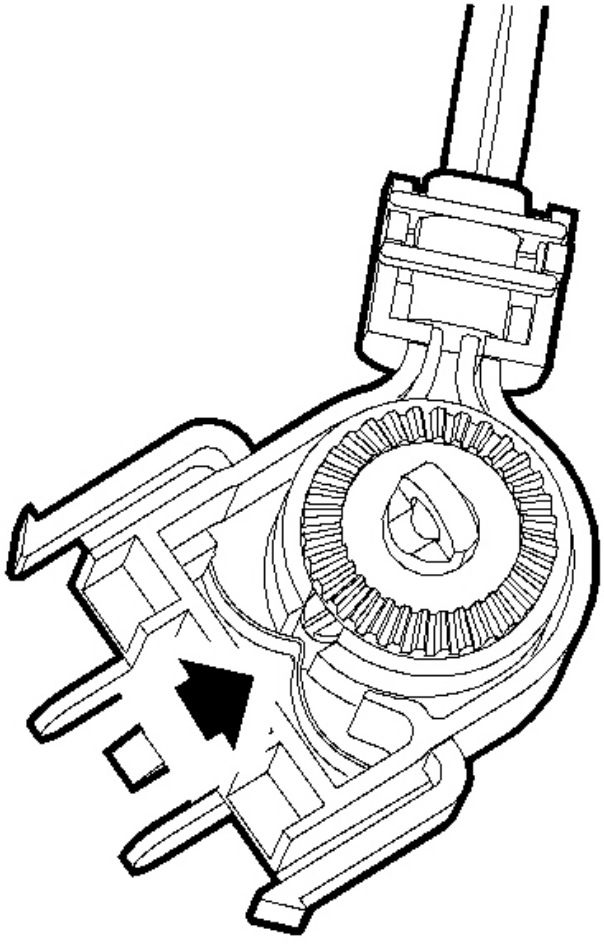


Fig. 18: HVAC Module Temperature Control Cable
Courtesy of GENERAL MOTORS CORP.

3. Center the HVAC module temperature door by aligning the cable lug of the temperature control cable with the center point of the detent spring. Detent spring force should hold the temperature door in the desired position.

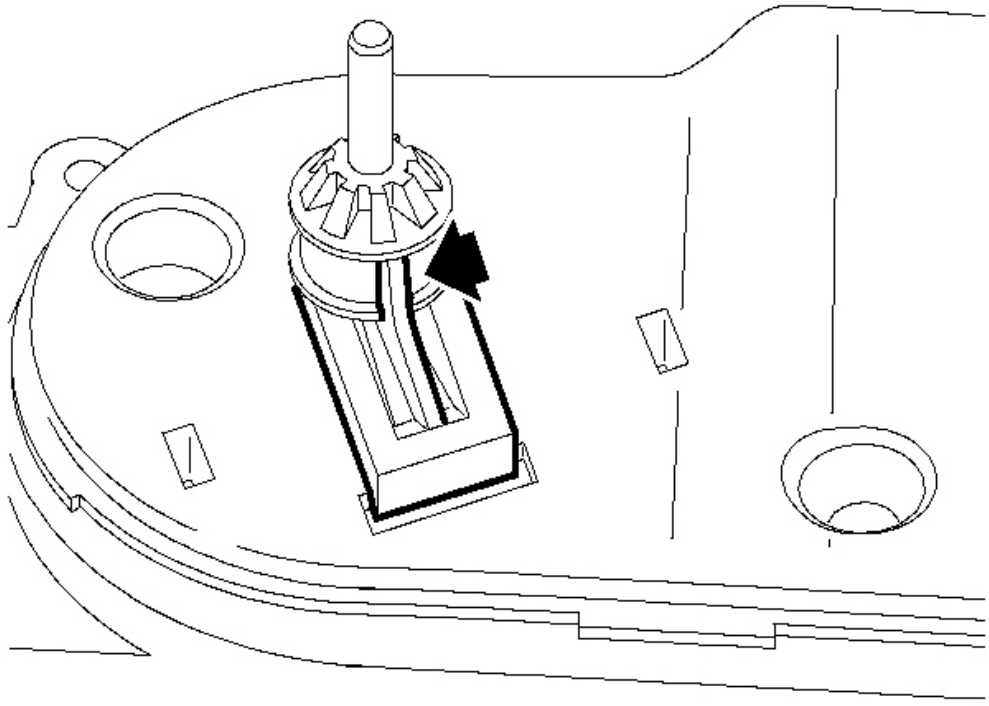


Fig. 19: Temperature Cable Knob & Shaft
Courtesy of GENERAL MOTORS CORP.

4. Center the temperature cable knob by inserting the assembly alignment tab into the centering slot of the temperature knob shaft.

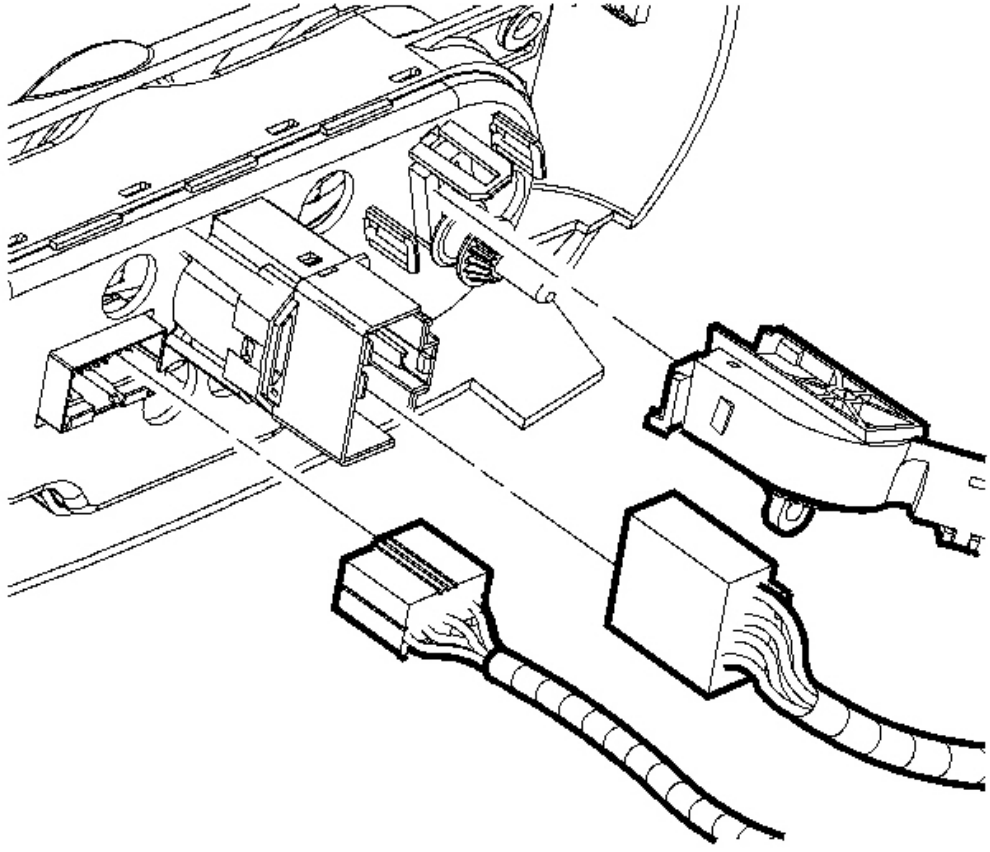


Fig. 20: HVAC Control Module Connectors
Courtesy of GENERAL MOTORS CORP.

5. Install the temperature cable to the HVAC control module by aligning the retention tabs and the temperature knob shaft and snapping into place.
6. Install the center trim bezel. Refer to **Trim Bezel Replacement - Center** in Instrument Panel, Gages and Console.

DEFROSTER ACTUATOR REPLACEMENT

Removal Procedure

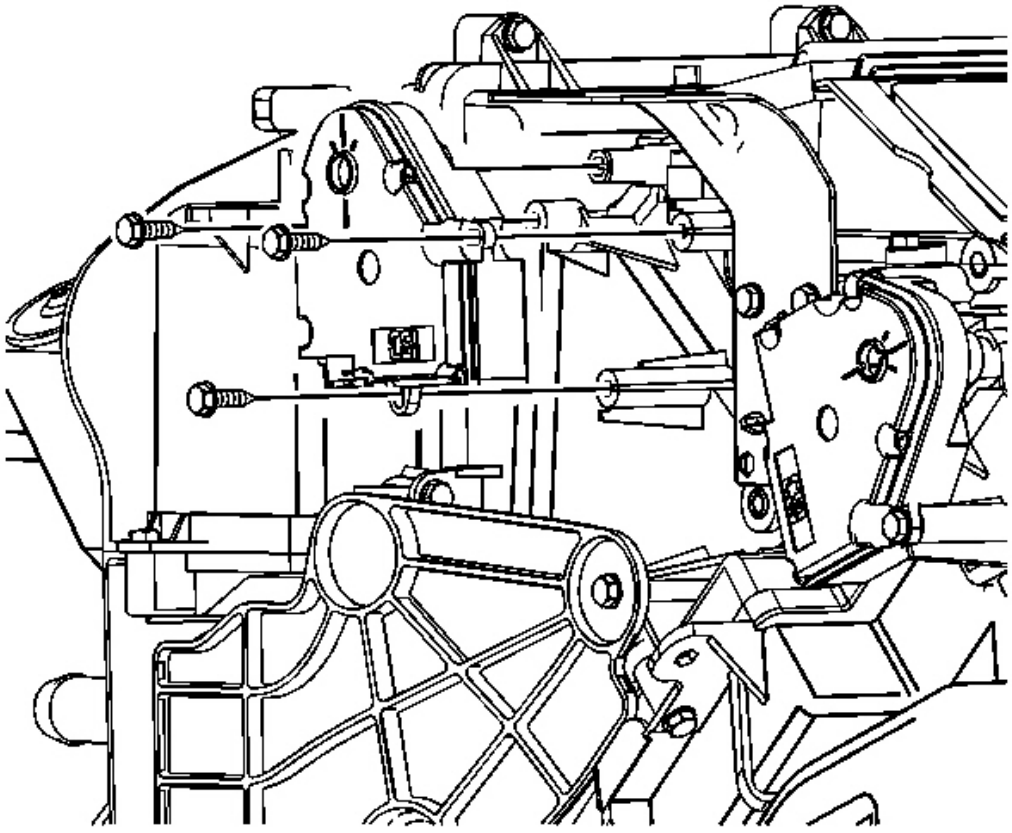


Fig. 21: Defroster Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Remove the left side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Left** in Instrument Panel, Gages, and Console.
2. Remove the communication interface module, if equipped. Refer to **Communication Interface Module Replacement** .
3. Disconnect the electrical connector from the defroster actuator.
4. Remove the defroster actuator screws from the HVAC module.
5. Remove the defroster actuator from the HVAC module.

Installation Procedure

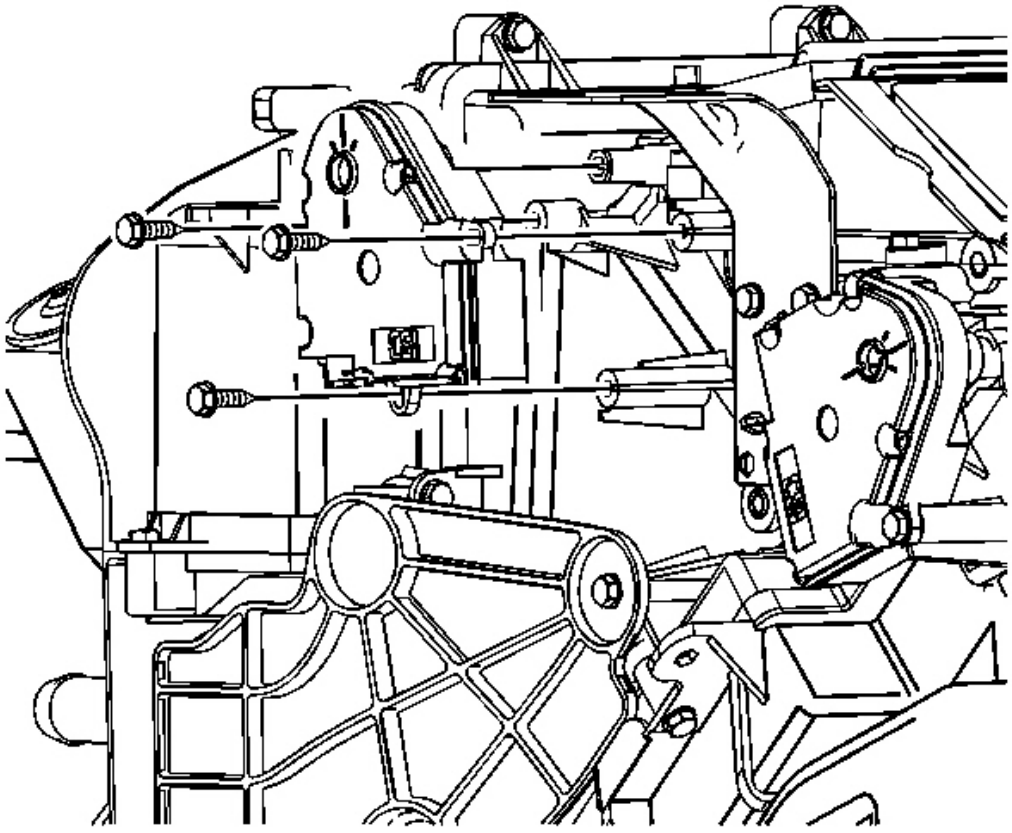


Fig. 22: Defroster Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Align the defroster actuator with the defroster door shaft and rotate into position.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the defroster actuator screws to the HVAC module.

   Tighten: Tighten the screws to 1 N.m (9 lb in).

3. Connect the electrical connector to the defroster actuator.
4. Install the communication interface module, if equipped. Refer to **Communication Interface Module Replacement** .
5. Install the left side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Left** in Instrument Panel, Gages, and Console.

IMPORTANT: Any time a mode actuator or the HVAC control module is replaced, the HVAC control module must be calibrated to ensure proper air distribution.

6. Calibrate the mode actuators by simultaneously pushing the A/C and RECIRC buttons on the HVAC control module 3 times each, within 2 seconds of initial push.
    - The A/C and RECIRC button LED's will flash while this calibration is taking place.
    - The calibration will take anywhere between 10-30 seconds depending on battery voltage.
    - The LED's will quit flashing when the calibration is complete.
7. Cycle the ignition and verify proper operation.

PANEL ACTUATOR REPLACEMENT

Removal Procedure

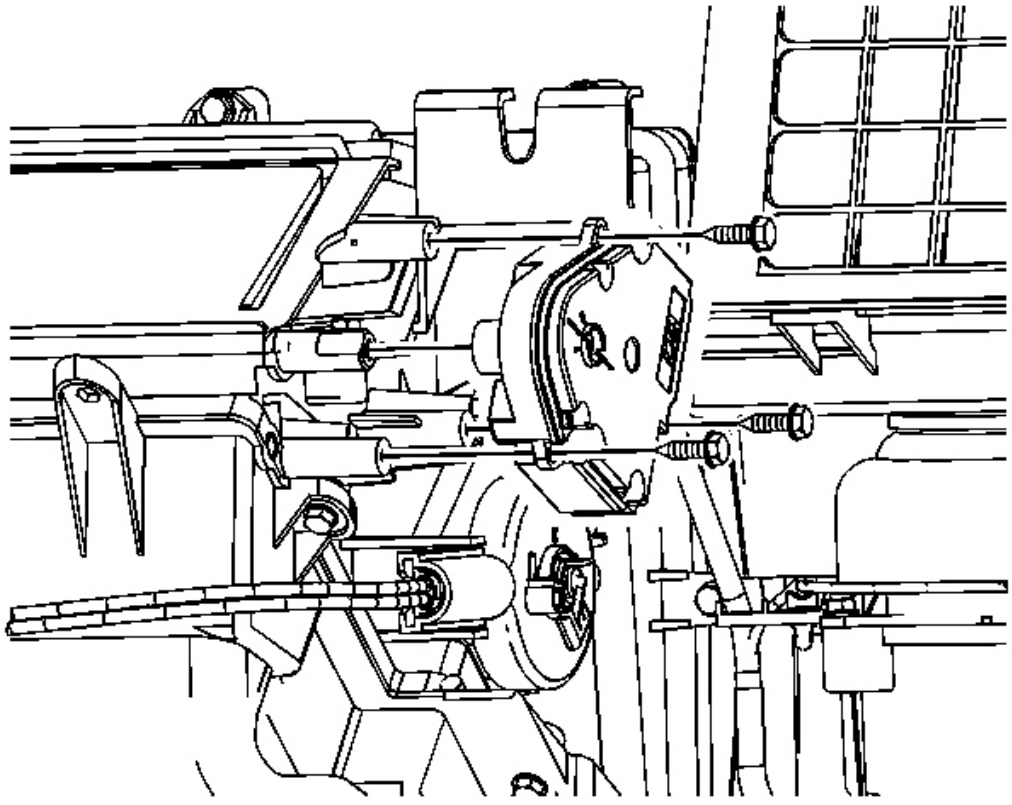


Fig. 23: Panel Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Remove the instrument panel compartment. Refer to **Compartment Replacement - Instrument Panel (I/P)** in Instrument Panel, Gages, and Console.
2. Disconnect the electrical connector from the panel actuator.
3. Remove the panel actuator screws from the HVAC module.
4. Remove the panel actuator from the HVAC module.

Installation Procedure

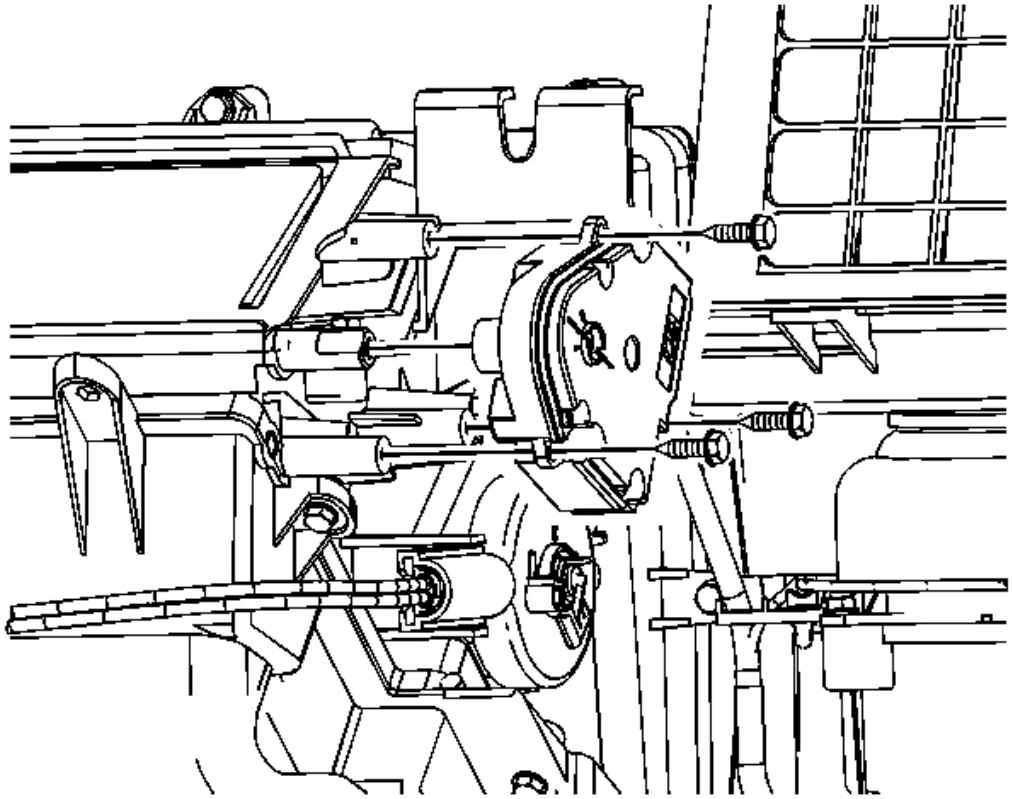


Fig. 24: Panel Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Align the panel actuator with the door shaft and rotate into position.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the panel actuator screws to the HVAC module.

Tighten: Tighten the screws to 1 N.m (9 lb in).

3. Connect the electrical connector to the panel actuator.

IMPORTANT: Any time a mode actuator or the HVAC control module is replaced, the HVAC control module must be calibrated to ensure proper air distribution.

4. Calibrate the mode actuators by simultaneously pushing the A/C and RECIRC buttons on the HVAC control module three times each, within two seconds of initial push.
    - The A/C and RECIRC button LED's will flash while this calibration is taking place.
    - The calibration will take anywhere between 10 to 30 seconds depending on battery voltage.
    - The LEDs will quit flashing when the calibration is complete.
5. Cycle the ignition and verify proper operation.
6. Install the instrument panel compartment. Refer to **Compartment Replacement - Instrument Panel (I/P)** in Instrument Panel, Gages, and Console.

FLOOR ACTUATOR REPLACEMENT

Removal Procedure

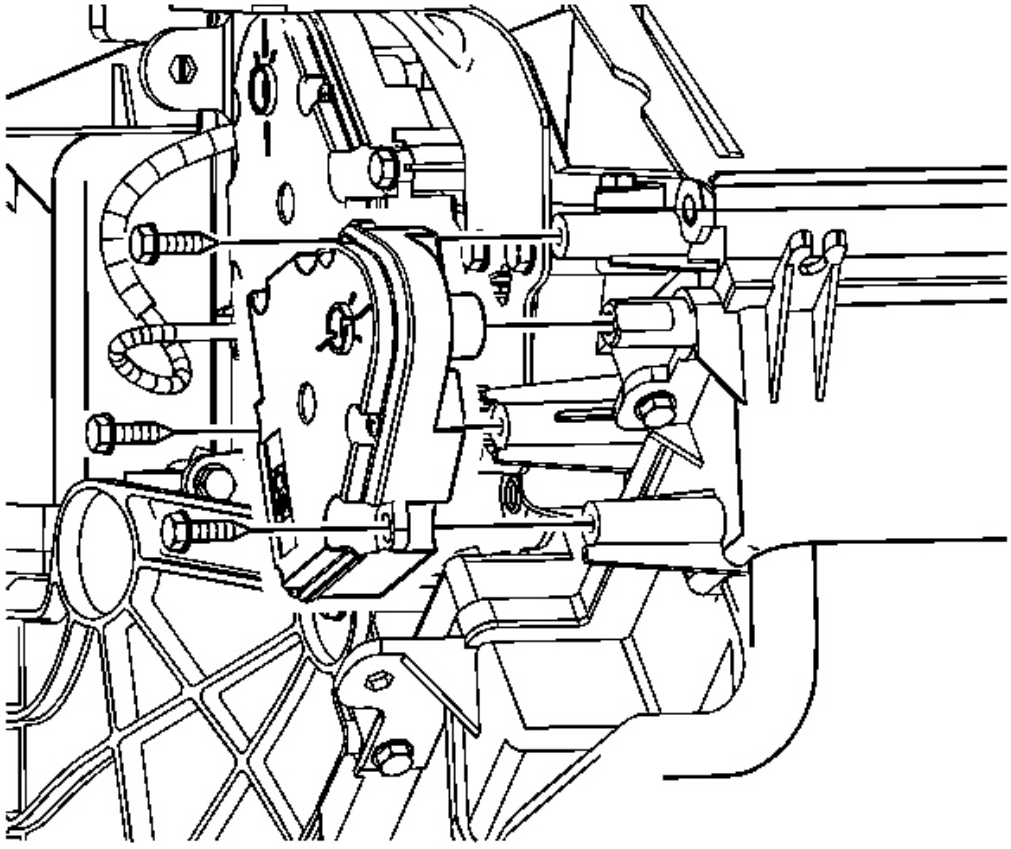


Fig. 25: Floor Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Remove the right side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Right** in Instrument Panel, Gages, and Console.
2. Disconnect the electrical connector from the floor actuator.
3. Remove the floor actuator screws from the HVAC module.
4. Remove the floor actuator from the HVAC module.

Installation Procedure

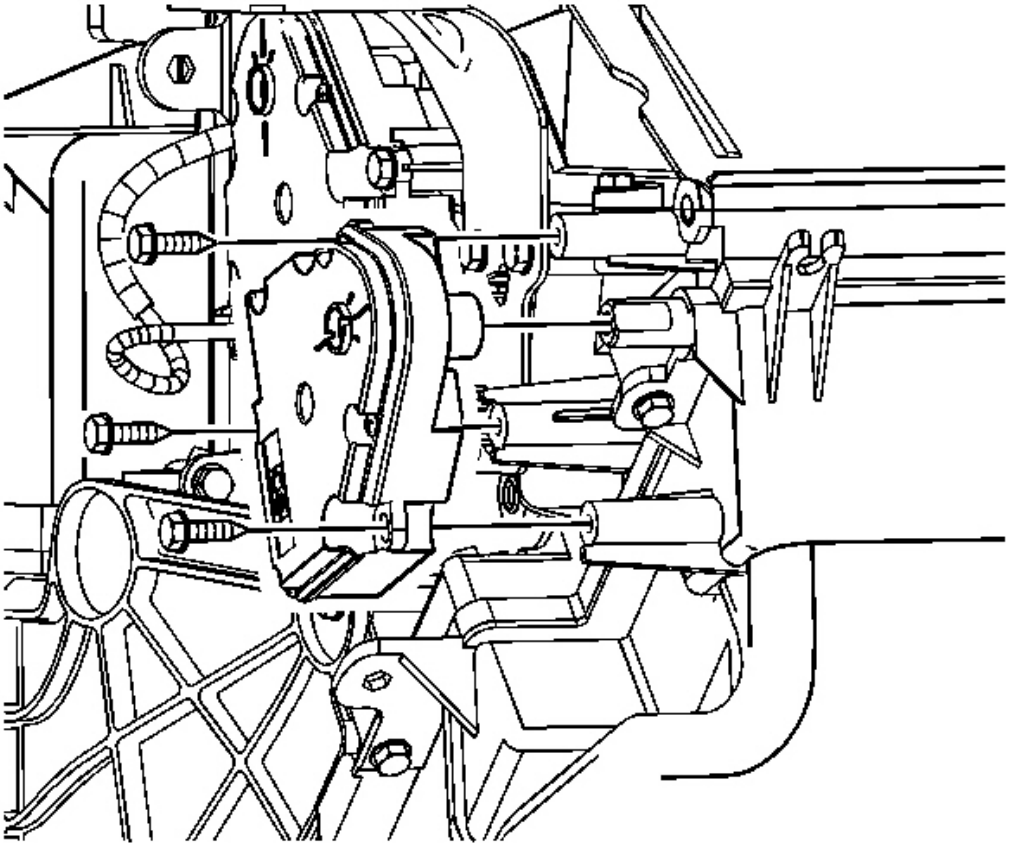


Fig. 26: Floor Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Align the floor actuator with the door shaft and rotate into position.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the floor actuator screws to the HVAC module.

Tighten: Tighten the screws to 1 N.m (9 lb in).

3. Connect the electrical connector to the floor actuator.

IMPORTANT: Any time a mode actuator or the HVAC control module is replaced, the HVAC control module must be calibrated to ensure proper air distribution.

4. Calibrate the mode actuators by simultaneously pushing the A/C and RECIRC buttons on the HVAC control module three times each, within two seconds of initial push.
    - The A/C and RECIRC button LEDs will flash while this calibration is taking place.
    - The calibration will take anywhere between 10 to 30 seconds depending on battery voltage.
    - The LEDs will quit flashing when the calibration is complete.
5. Cycle the ignition and verify proper operation.
6. Install the right side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Right** in Instrument Panel, Gages, and Console.

RECIRCULATION ACTUATOR REPLACEMENT

Removal Procedure

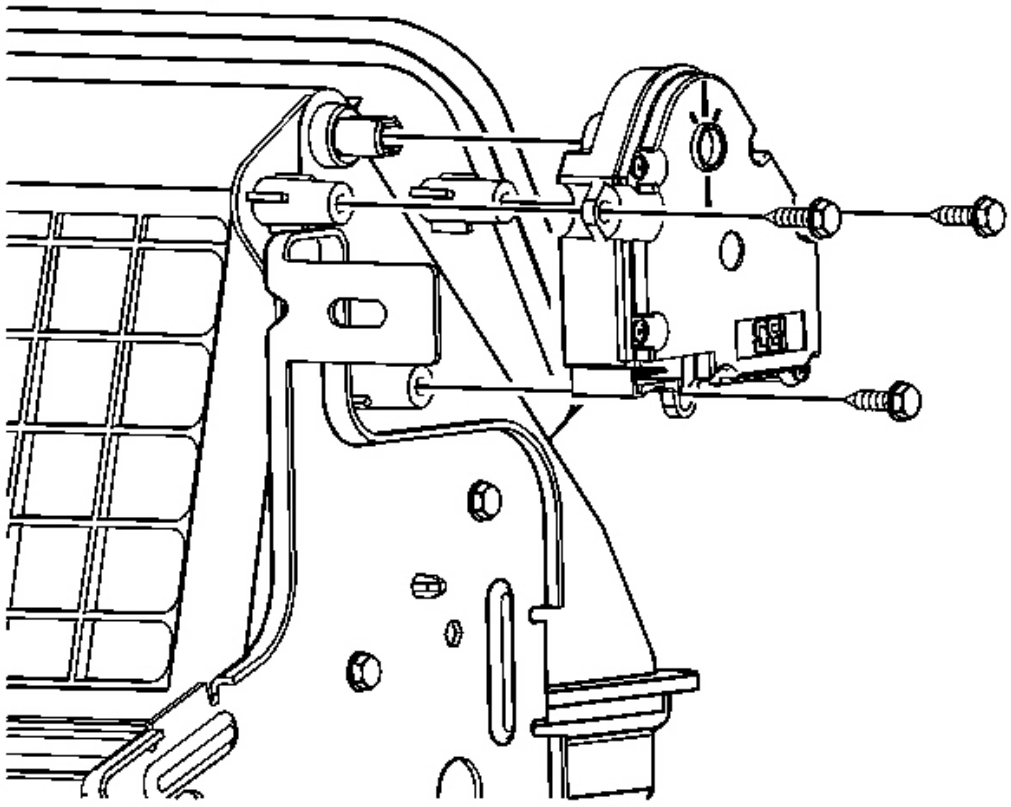


Fig. 27: Recirculation Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Remove the right side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Right** in Instrument Panel, Gages, and Console.
2. Disconnect the electrical connector from the recirculation actuator.
3. Remove the recirculation actuator screws from the HVAC module.
4. Remove the recirculation actuator from the HVAC module.

Installation Procedure

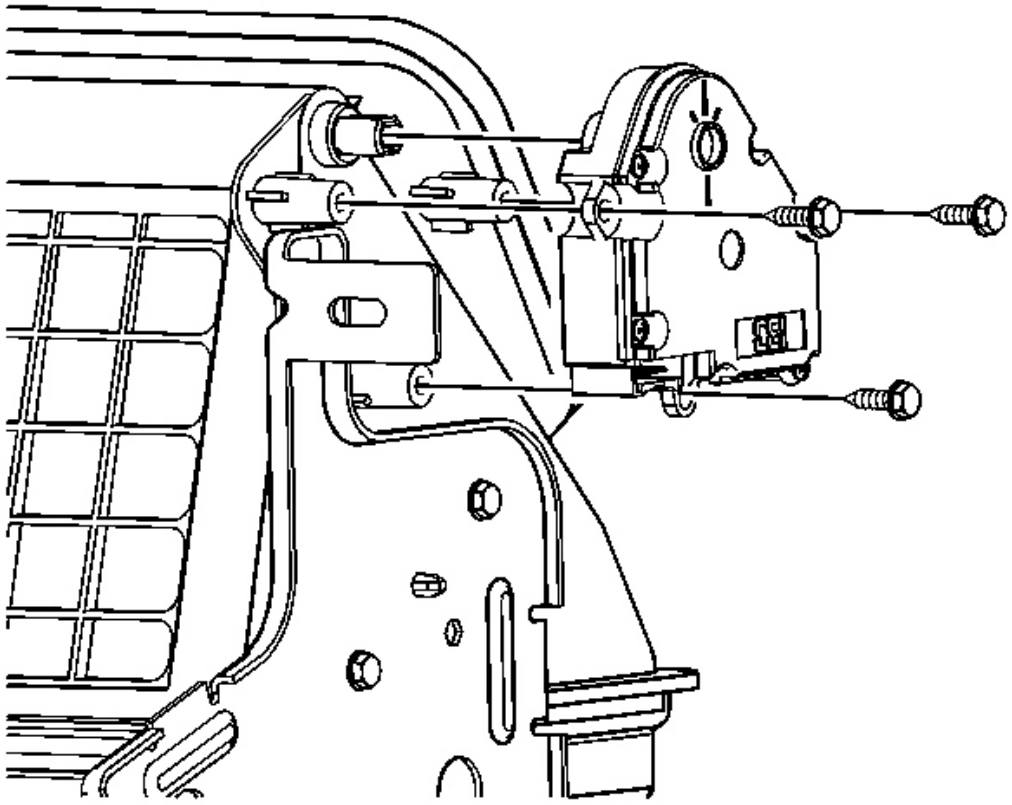


Fig. 28: Recirculation Actuator & Screws
Courtesy of GENERAL MOTORS CORP.

1. Align the recirculation actuator with the door shaft and rotate into position.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the recirculation actuator screws to the HVAC module.

Tighten: Tighten the screws to 1 N.m (9 lb in).

3. Connect the electrical connector to the recirculation actuator.
4. Cycle the ignition and verify proper operation.
5. Install the right side insulator/closeout panel. Refer to **Closeout/Insulator Panel Replacement - Right** in Instrument Panel, Gages, and Console.

DESCRIPTION AND OPERATION

AIR DELIVERY DESCRIPTION AND OPERATION

The air delivery description and operation is divided into 4 areas:

- HVAC control components
- Air speed
- Air delivery
- Recirculation operation

HVAC Control Components

HVAC Control Module

The HVAC control module is a non-Class 2 device that interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The battery positive and ignition 3 voltage circuits provide power to the control module. The temperature door is controlled by cable. The control module supports the following features:

Air Delivery Description and Operation

Feature	Availability
Afterblow	Yes
Purge	No
Personalization	No
Actuator Calibration	Yes

After blow

The after blow feature is a retailer installed accessory. The after blow relay control circuit of the BCM and the after blow relay of the Instrument Panel Fuse Block are the items included in this option. The duration of the after blow sequence is determined by A/C operation, ambient air temperature and vehicle speed.

Mode Actuators - Defrost, Panel and Floor

The mode actuators are 5 wire bi-directional electric motors that incorporate a feedback potentiometer. Low reference, 5 volt reference, position signal, and two control circuits enable the actuators to operate. The control circuits use either a 0 or 12 volt value to co-ordinate the actuator movement. When the actuator is at rest, both

control circuits have a value of 0 volts. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 volts. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometer's adjustable contact changes the door position signal between 0-5 volts.

The HVAC control module uses a range of 0-255 counts to index the actuator position. The door position signal voltage is converted to a 0-255 count range. When the module sets a commanded, or targeted, value, one of the control circuits is grounded. As the actuator shaft rotates the changing position signal is sent to the module. Once the position signal and the commanded value are the same, the module removes power from both control circuits.

Air Speed

The HVAC control module applies ground to the blower motor control circuit that corresponds to the selected blower speed. The resistors and the blower motor are in a series circuit. The following list represents the number of resistors in series with the blower motor per particular speed request:

- Low speed-3 resistors
- Medium 1 speed-2 resistors
- Medium 2 speed-1 resistors

When the operator requests High speed, the HVAC control module applies ground directly to the blower motor through the high blower motor control circuit. The resistor card has a fusible link which if blown, will require that the card be replaced.

Air Delivery

The defrost, panel and floor actuators control air delivery. The HVAC control module controls these actuators in order to distribute airflow to a desired outlet. When the vehicle operator selects the defrost, mix-blend or floor positions, the A/C compressor clutch engages and the recirculation actuator will be moved to the outside air position. The flow of air during the various modes of operation is as follows:

- Panel - Instrument panel outlets
- Bi-Level - Instrument panel and floor outlets
- Floor - Floor outlets only
- Mix-Blend - Floor and defroster outlets with a slight bleed to the instrument panel outlets
- Defrost - Defrost outlets with a small amount of air to the side window defoggers

Recirculation Operation

The recirculation actuator is a 2-wire bi-directional electric motor. Two control circuits enable the actuator to operate. The control circuits use either ground or a 12-volt value to co-ordinate the actuator movement. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. The recirculation operation can function with blower motor in either the ON or OFF position. The A/C compressor automatically comes on when recirculation is selected. Recirculation is not available in defrost, mix-blend or floor mode. The recirculation LED may still be on while the air inlet door is in the outside air

position.

AIR TEMPERATURE DESCRIPTION AND OPERATION

The air temperature controls are divided into four areas:

- HVAC Control Components
- Heating and A/C Operation
- Engine Coolant
- A/C Cycle

HVAC CONTROL COMPONENTS

HVAC Control Module

The HVAC control module is a non-class 2 device that interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The battery positive and ignition 3 voltage circuits provide power to the control module. The temperature door is controlled by cable. The control module supports the following features:

Air Temperature Description and Operation

Feature	Availability
After blow	Yes
Purge	No
Personalization	No
Actuator Calibration	Yes

A/C Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3 wire piezoelectric pressure transducer. A 5 volt reference, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0-5 volts. When the A/C refrigerant pressure is low, the signal value is near 0 volts. When the A/C refrigerant pressure is high, the signal value is near 5 volts.

The A/C refrigerant pressure sensor protects the A/C system from operating when an excessively high or low pressure condition exists. The engine control module (ECM) or powertrain control module (PCM) disables the compressor clutch under the following conditions:

L66/3.5 L - LY7/3.6L

The A/C high side pressure is more than 2929 kPa (495 psi). The clutch will be enabled after the high side pressure decreases to less than 1376 kPa (200 psi). A/C low side pressure is less than 2706 kPa (39 psi). The clutch will be enabled or will allow engagement again after the low side pressure increases to more than 2941 kPa (43 psi).

L61/2.2 L

A/C high side pressure is more than 2945 kPa (427 psi). The clutch will be enabled after the high side pressure decreases to less than 2069 kPa (300 psi). A/C low side pressure is less than 210 kPa (31 psi). The clutch will be enabled after the low side pressure increases to more than 258 kPa (37 psi).

Evaporator Low Ambient Protection

The refrigerant temperature at the temperature sensor in the TXV controls cycling of the compressor clutch to prevent freezing of the evaporator core. The compressor is disabled when the temperature goes below 3° C (37° F) and vehicle speed is greater than 8 km/h (5 mph). The compressor is enabled when the temperature exceeds 4° C (40° F). The minimum cycling time off is 4 seconds. For purposes of converting a voltage to a temperature value in the diagnosis of the temperature sensor located within the TXV at the inlet outlet of the Evaporator the following conversion chart has been inputted.

Air Temperature Description and Operation

TEMP (° C/ ° F)	MIN / MAX BCM Voltage
-2 / 28	2.80 / 2.90
-1 / 30	2.73 / 2.83
0 / 32	2.66 / 2.76
1 / 34	2.59 / 2.69
2 / 36	2.52 / 2.62
3 / 38	2.45 / 2.55
4 / 40	2.38 / 2.48
6 / 42	2.31 / 2.41
7 / 44	2.25 / 2.35
24 / 75	1.34 / 1.37
SET POINT	
-40 / -40	OPEN (4.85)
81 / 178	GROUND (0.122)

Heating and A/C Operation

The purpose of the heating and A/C system is to provide heated and cooled air to the interior of the vehicle. The A/C system will also remove humidity from the interior and reduce windshield fogging. The vehicle operator can determine the passenger compartment temperature by adjusting the air temperature control. Regardless of the temperature setting, the following can effect the rate that the HVAC system can achieve the desired temperature:

- Recirculation
- Difference between inside and desired temperature
- Difference between ambient and desired temperature
- Blower motor speed setting
- Mode setting

The vehicle operator can activate the A/C system by pressing the A/C switch. The A/C system can operate

regardless of the temperature setting.

The ECM/PCM will operate the A/C system automatically in FRONT DEFROST mode to help reduce moisture inside the vehicle. The A/C LED will not illuminate unless the driver presses the A/C request switch on the HVAC control module. The A/C system maybe running without the A/C LED indicator illuminated when in FRONT DEFROST mode. The HVAC system uses a compressor that incorporates a thermal switch that opens once the compressor temperature exceeds 211-217° C (380-454° F) creating an open circuit. The following conditions must be met in order for the ECM/PCM to turn on the compressor clutch:

- BCM
  - L61/2.2L - Battery voltage between 10.5-18 volts
  - L66/3.5L / LY7/3.6L - Battery voltage between 11-16 volts
  - A/C request from the HVAC control module
- ECM/PCM
  - L61/2.2L - Engine coolant temperature (ECT) is less than 114° C (237° F).
  - L66/3.5L / LY7/3.6L- Engine coolant temperature (ECT) is less than 117° C (243° F).
  - L61/2.2L - Engine speed is less than 4750 RPM.
  - L66/3.5L / LY7/3.6L- Engine speed is less than 4760 RPM.
  - L61/2.2L - A/C pressure is between 2945-210 kPa (427-31 psi).
  - L66/3.5L / LY7/3.6L- A/C pressure is between 2929-2706 kPa (495-39 psi).

Once engaged, the compressor clutch will be disengaged for the following conditions:

- L61/2.2L - Throttle position is 95 percent.
- L66/3.5L / LY7/3.6L - Throttle position is 100 percent
- L61/2.2L - A/C pressure is more than 2945 kPa (427 psi).
- L66/3.5L / LY7/3.6L - A/C pressure is more than 2929 kPa (495 psi).
- L61/2.2L - A/C pressure is less than 210 kPa (31 psi).
- L66/3.5L / LY7/3.6L - A/C pressure is less than 2706 kPa (39 psi).
- L61/2.2L - Engine coolant temperature (ECT) is more than 117° C (242° F).
- L66/3.5L / LY7/3.6L - Engine coolant temperature (ECT) is more than 120° C (248° F).
- L61/2.2L - Engine speed is more than 6250 RPM.
- L66/3.5L / LY7/3.6L - Engine speed is more than 6240 RPM.
- Transmission shift
- ECM/PCM detects excessive torque load.
- ECM/PCM detects insufficient idle quality.
- ECM/PCM detects a hard launch condition.

When the compressor clutch disengages, the compressor clutch diode protects the electrical system from a voltage spike.

Engine Coolant

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

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

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

A/C Cycle

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

The compressor is a variable displacement scroll type pump. The compressor uses a control valve to vary its displacement from 6.5 percent (9cc) to 100 percent (105cc). The A/C compressor is belt driven and operates when the magnetic clutch is engaged. A thermal protection switch is incorporated into the compressor. If the temperature exceeds 211-217° C (380-454° F), the switch will open creating an open circuit. 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 located in the compressor hose assembly block. This valve will open at 3965-3375 kPa (575-490 psi), and reset at 2930 kPa (425 psi). If this valve ever opens the a/c system must be serviced and the valve must be replaced.

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 tubing 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 (TXV).

The thermal expansion valve (TXV) is located at the evaporator inlet and outlet pipes. The TXV is the dividing point for the high and the low pressure sides of the A/C system. As the refrigerant passes through the TXV, the pressure on the refrigerant is lowered. Due to the pressure differential on the liquid refrigerant, the refrigerant will begin to boil at the TXV. The TXV also meters the amount of liquid refrigerant that can flow into the evaporator.

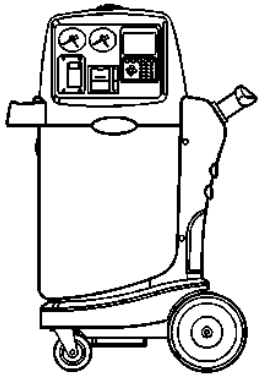
Refrigerant exiting the TXV flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant to boil inside of the evaporator core. The boiling refrigerant absorbs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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J 43600 ACR2000 Air Conditioning Service Center