SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Temperature Actuator Screws	2 N.m	18 lb in
Blower Motor Control Processor Screws	1.6 N.m	14 lb in
Evaporator Core Cover Screws	2 N.m	18 lb in
HVAC Control Module Screws	1.9 N.m	17 lb in
Mode Actuator Screws	2 N.m	18 lb in
Recirculation Actuator Screws	2 N.m	18 lb in

SENSOR RESISTANCE TABLE

Sensor Resistance Table

Temperature		Ambient Air Temperature Sensor Resistance		Inside Air Temperature Sensor Resistance	
° C	° F	Minimum Resistance K Ohms	Maximum Resistance K Ohms	Minimum Resistance K Ohms	Maximum Resistance K Ohms
-40	-40	332.4	334.7	95.80	105.6
-35	-31	240.3	241.8	69.09	75.81
-30	-22	175.6	176.6	50.34	55.00
-25	-13	129.6	130.3	37.04	40.29
-20	-4	96.55	97.07	27.51	29.80
-15	5	72.63	72.99	20.61	22.24
-10	14	55.12	55.38	15.57	16.74
-5	23	42.20	42.38	11.86	12.70
0	32	32.62	32.75	9.108	9.712
5	41	25.34	25.44	7.047	7.492
10	50	19.86	19.94	5.494	5.825
15	59	15.68	15.74	4.326	4.574
20	68	12.46	12.51	3.417	3.602
25	77	9.98	10.02	2.73	2.870
30	86	8.043	8.076	2.185	2.295
35	95	6.517	6.543	1.757	1.843

40	104	5.309	5.33	1.425	1.494

SCHEMATIC AND ROUTING DIAGRAMS

HVAC SCHEMATICS

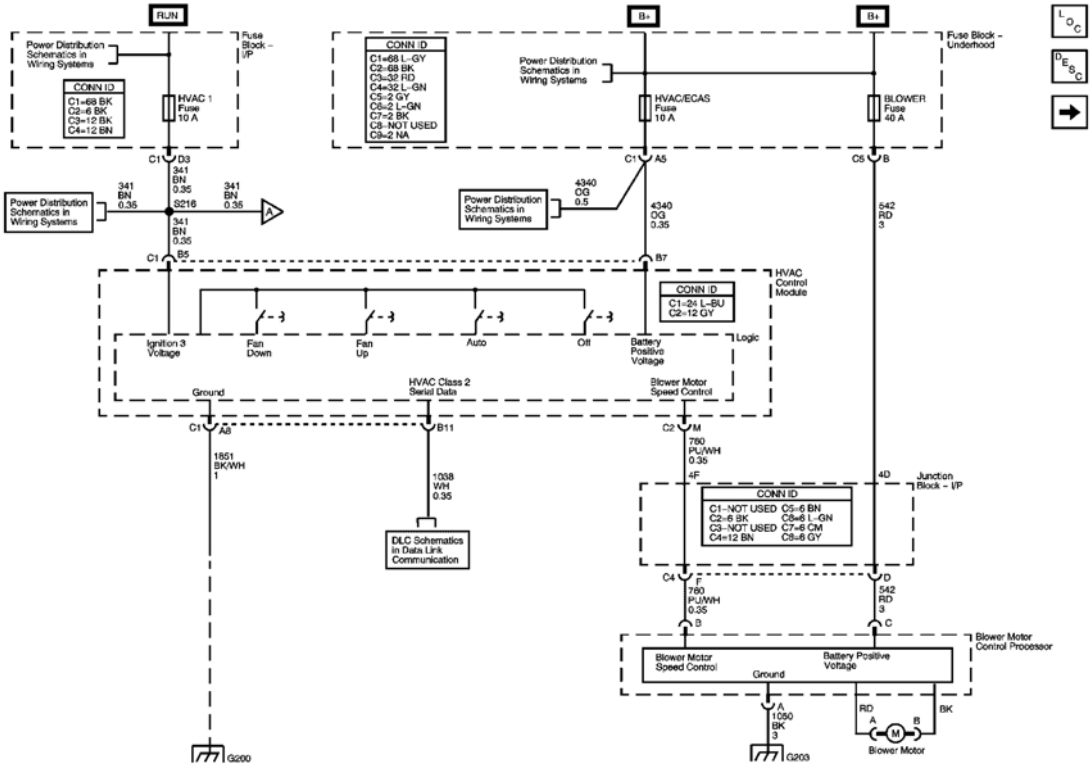


Fig. 1: Power, Grounding, DLC, and Blower Control Schematics
Courtesy of GENERAL MOTORS CORP.

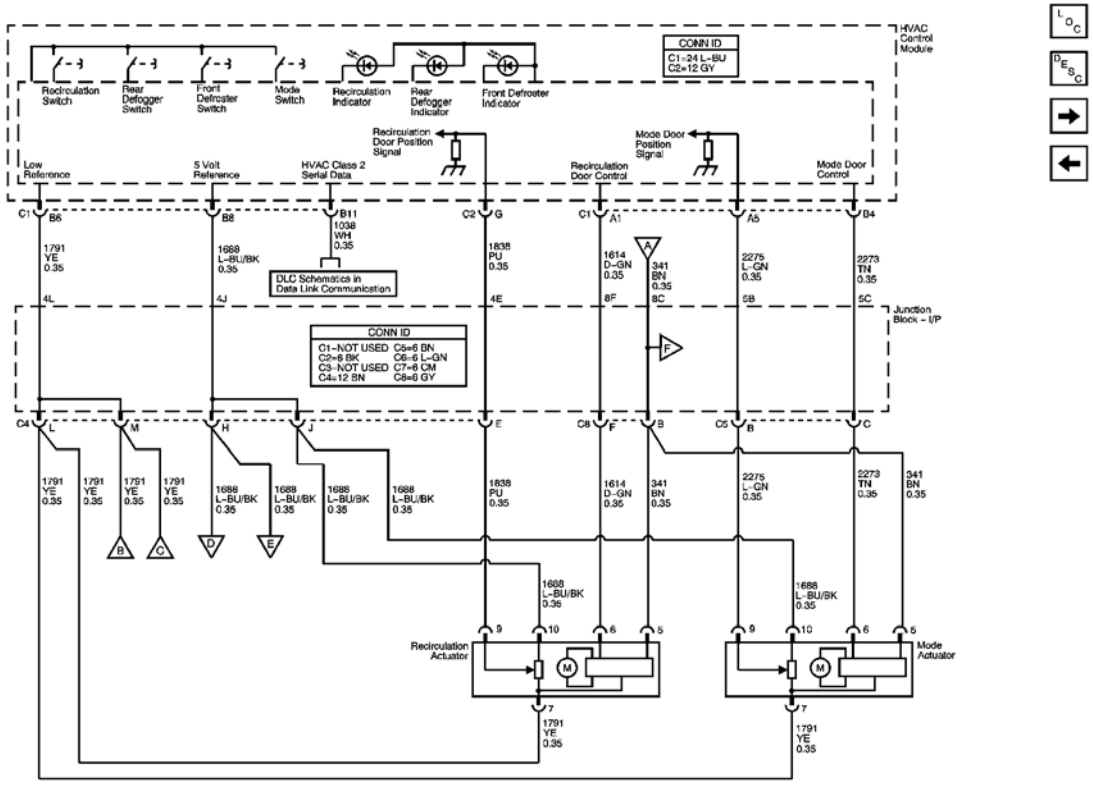


Fig. 2: Mode and Recirculation Controls, Front Defrost and Rear Defog Controls Schematics
Courtesy of GENERAL MOTORS CORP.

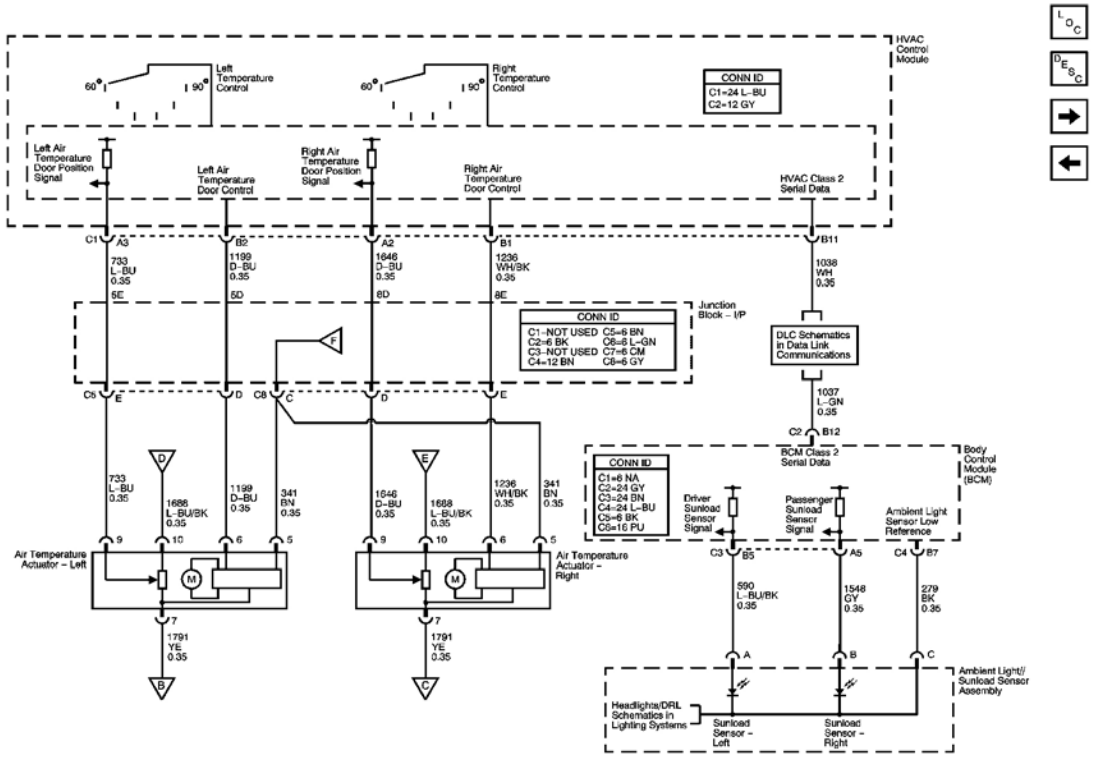


Fig. 3: Temperature Controls and Sunload Sensors Schematics
Courtesy of GENERAL MOTORS CORP.

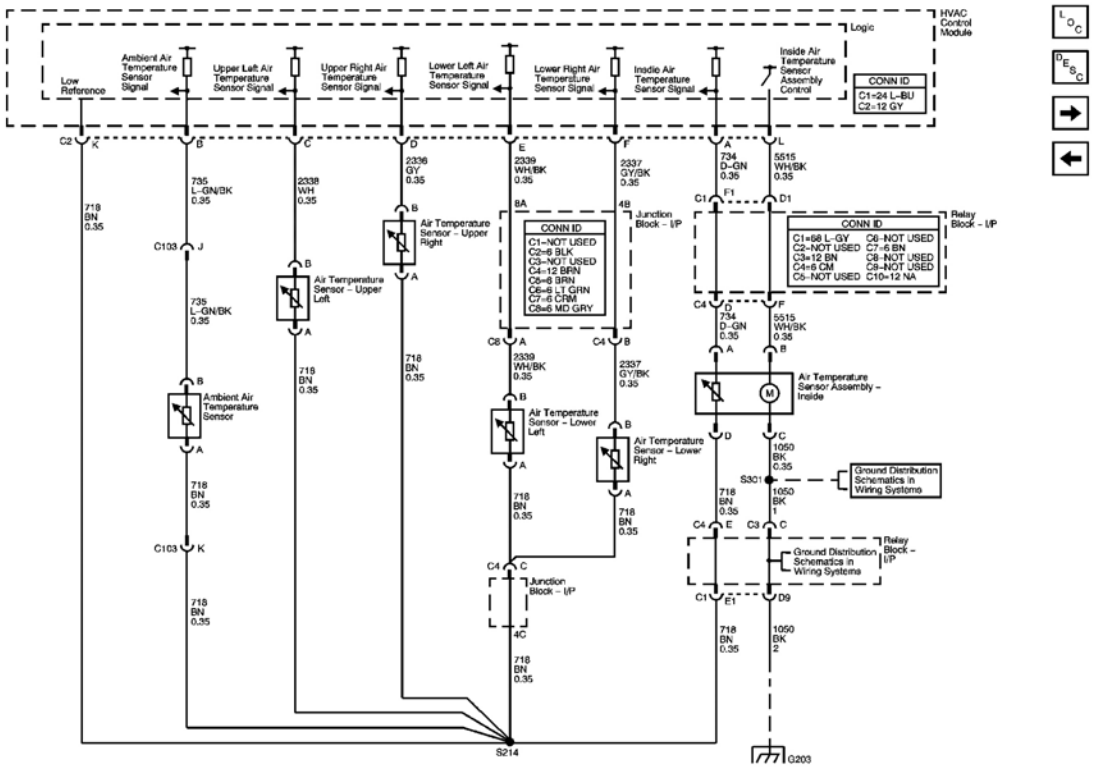


Fig. 4: Air Temperature Sensors Schematics
Courtesy of GENERAL MOTORS CORP.

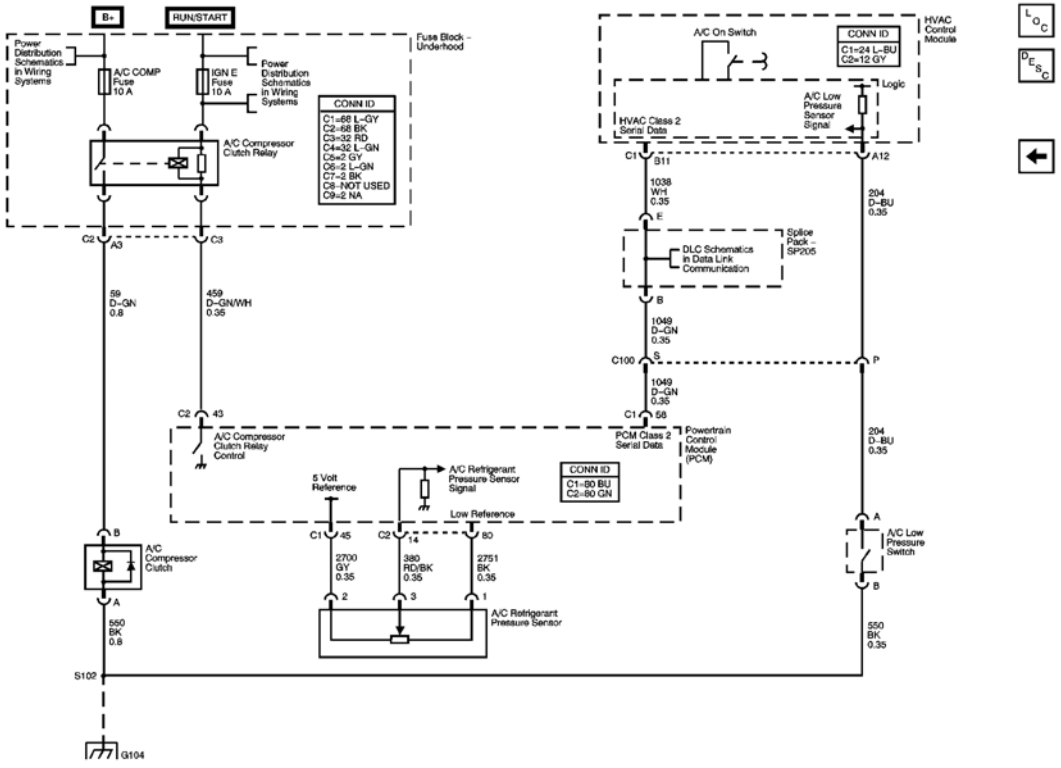


Fig. 5: Air Conditioning Compressor Control Schematics
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

HVAC COMPONENT VIEWS

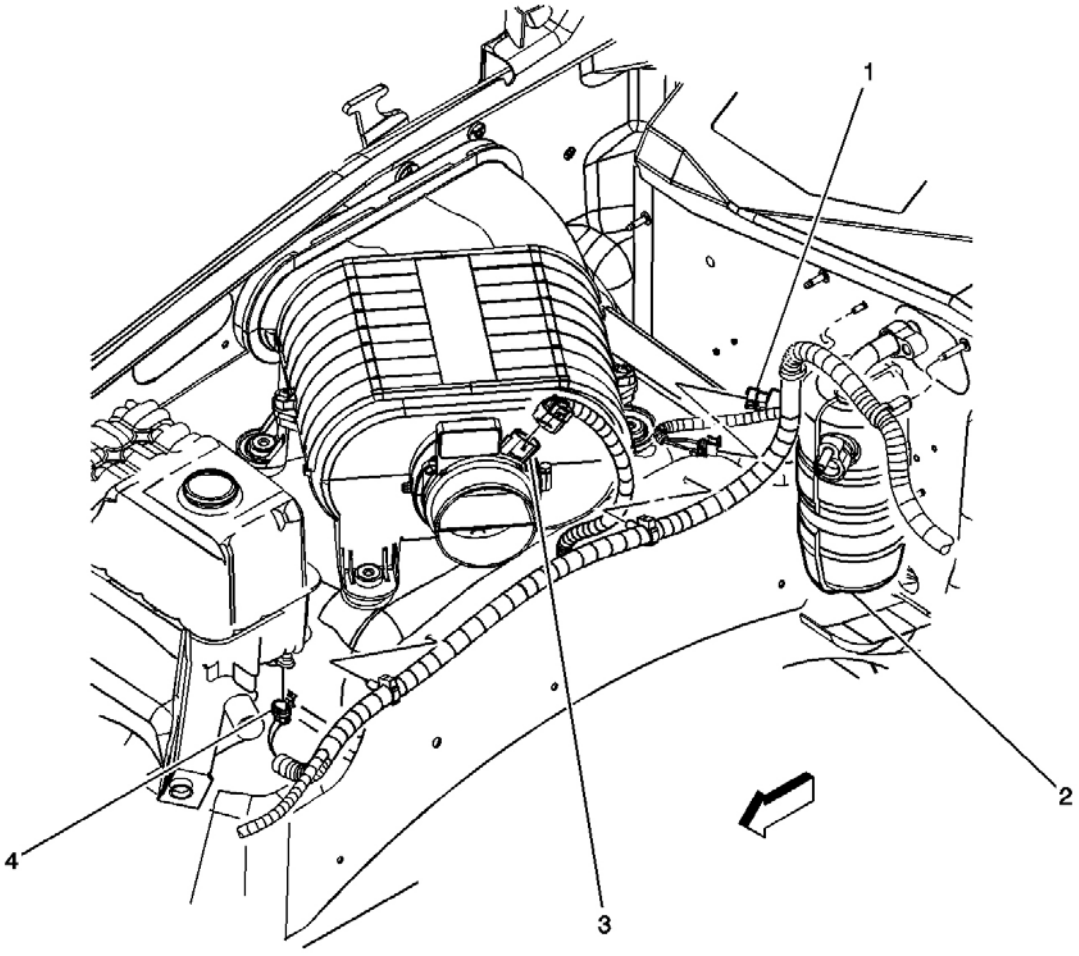


Fig. 6: RR Of Engine Compartment Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

Callout	Component Name
1	A/C Low Pressure Switch
2	A/C Accumulator
3	Intake Air Temperature (IAT)/Mass Air Flow (MAF) Sensor
4	Coolant Level Switch (If Equipped)

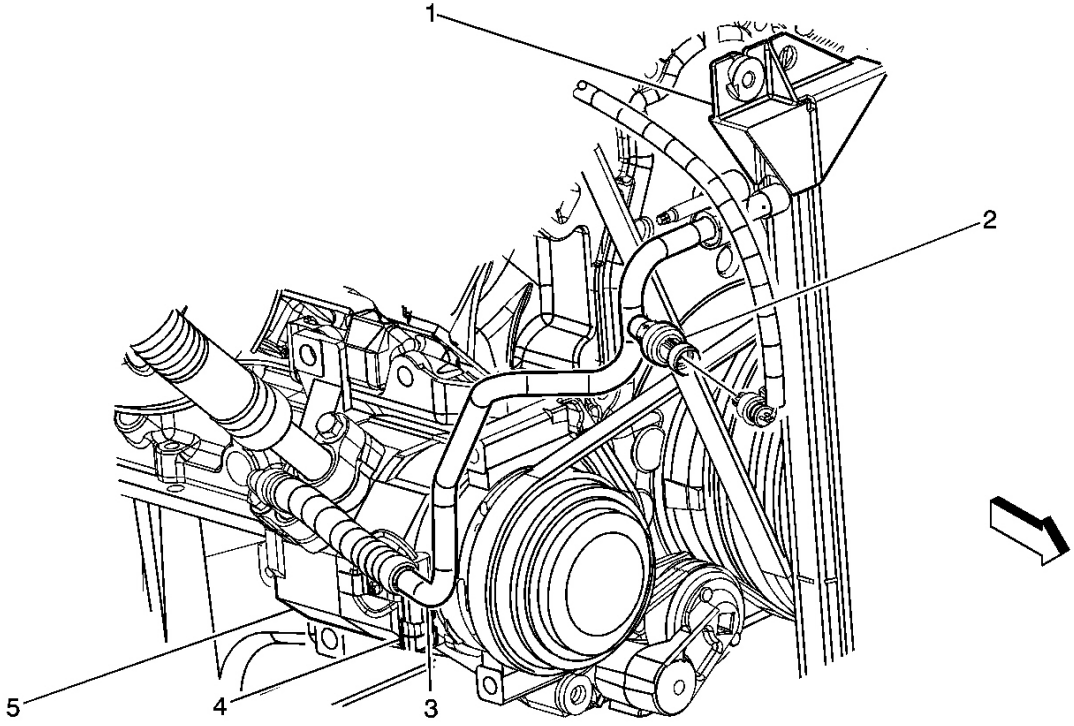


Fig. 7: Lower Right Side Of Engine Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	A/C Condenser
2	A/C Refrigerant Pressure Sensor
3	A/C Condenser Hose
4	A/C Compressor Clutch Connector
5	A/C Compressor

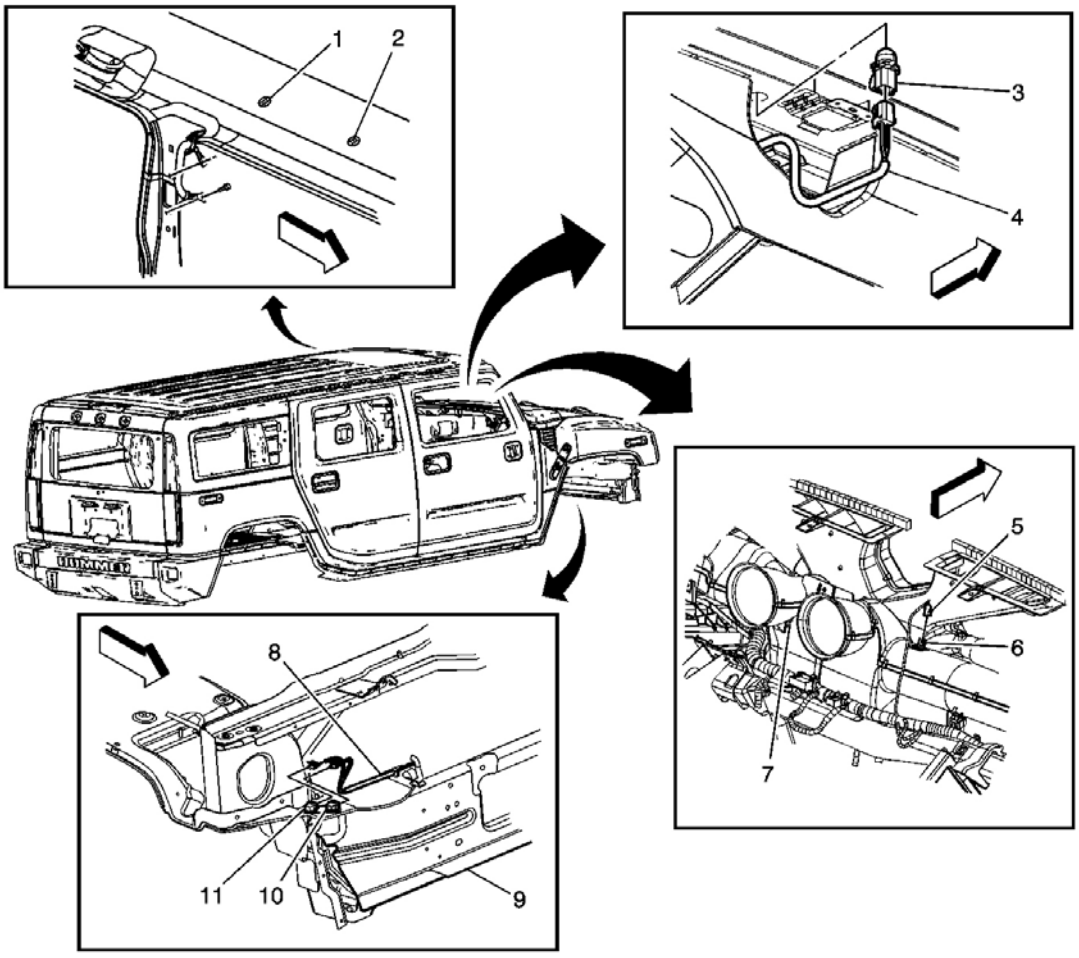


Fig. 8: HVAC Subsystem Component Views (1 of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Air Temperature Sensor - Inside
2	Cellular Telephone Microphone
3	Ambient Light/Sunload Sensor Assembly
4	I/P Harness
5	Air Temperature Sensor Connector - Upper Right
6	Air Temperature Sensor - Upper Right
7	Air Temperature Sensor - Upper Left
8	Forward Lamp Harness
9	Radiator Support
10	Ambient Air Temperature Sensor - HVAC

11	Ambient Air Temperature Sensor - Mirror

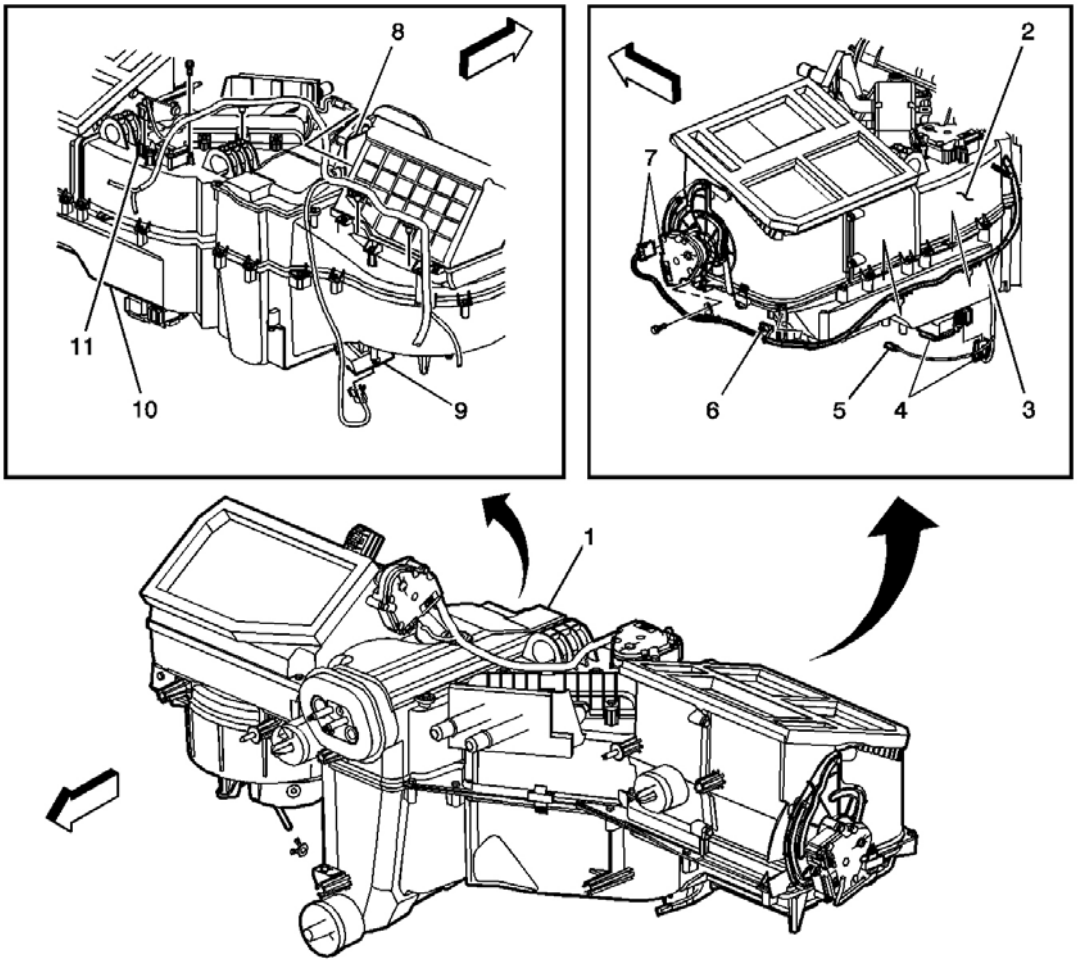


Fig. 9: HVAC Subsystem Component Views (2 of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	HVAC Control Module
2	HVAC Control Module
3	HVAC Harness
4	Air Temperature Actuator - Left
5	Air Temperature Sensor Connector - Lower Right
6	Air Temperature Sensor Connector - Lower Left
7	Mode Actuator
8	Recirculation Actuator

9	Blower Motor Control Processor
10	HVAC Module
11	Air Temperature Actuator - Right

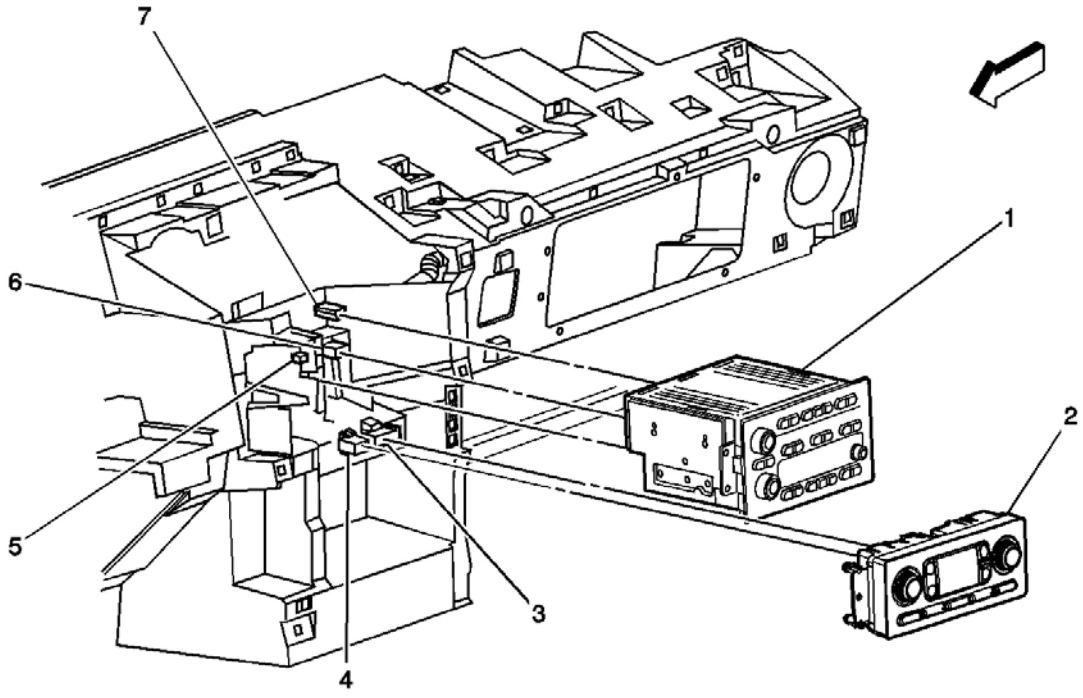


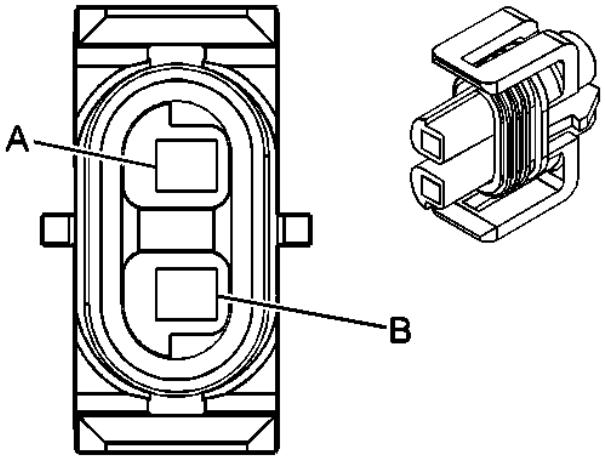
Fig. 10: HVAC Control Module Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 10

Callout	Component Name
1	Radio
2	HVAC Control Module
3	HVAC Control Module - C1
4	HVAC Control Module - C2
5	Radio - C3 - Not Used
6	Radio - C1
7	Radio - C2

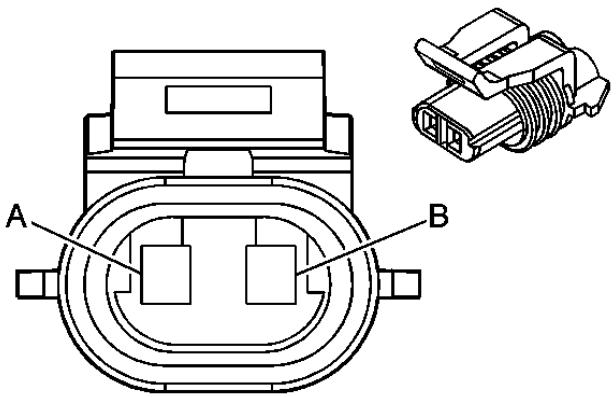
HVAC CONNECTOR END VIEWS

A/C Compressor Clutch Terminal Identification



Connector Part Information		• 12162017 • 2-Way F Metri-Pack 150 Series Sealed (MD GY)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BK	550	Ground
B	D-GN	59	A/C Compressor Clutch Supply Voltage

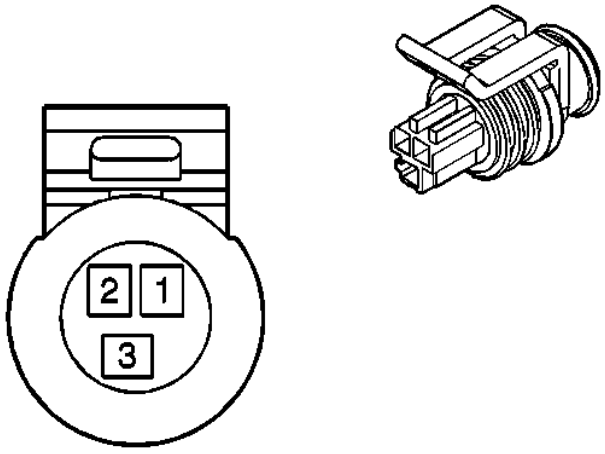
A/C Low Pressure Switch Terminal Identification



Connector Part Information		• 12052644 • 2-Way F Metri-Pack 150 Series Sealed (GY)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	D-BU	204	A/C Low Pressure Sensor Signal

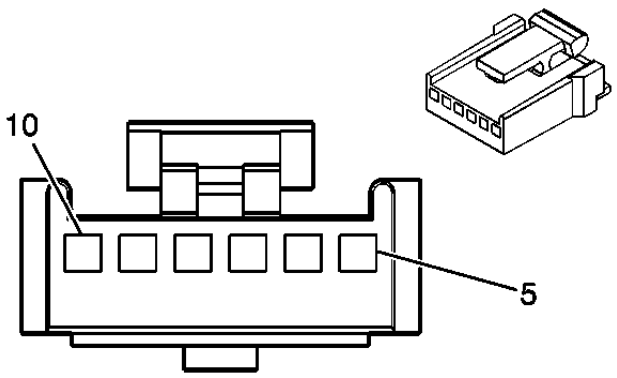
B	BK	550	Ground

A/C Refrigerant Pressure Sensor Terminal Identification



Connector Part Information		• **15344137** • **3-Way F GT 150 Sealed 5.2 (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

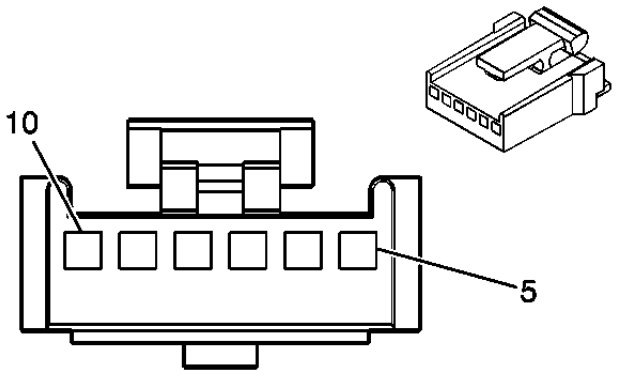
Air Temperature Actuator Terminal Identification - Left



Connector Part Information	• **12064993**

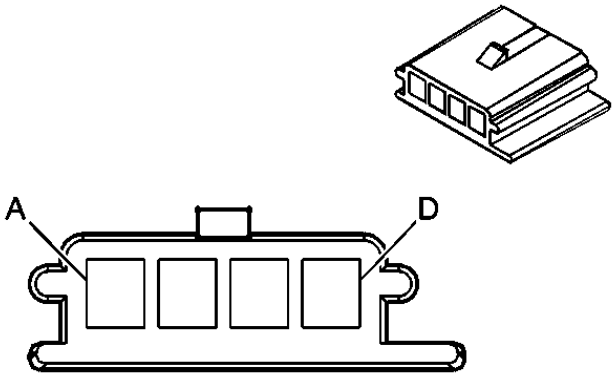
		• 6-Way F Micro-Pack 100 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
5	BN	341	Ignition 3 Voltage
6	D-BU	1199	Left Air Temperature Door Control
7	YE	1791	Low Reference
8	-	-	Not Used
9	L-BU	733	Left Air Temperature Door Position Signal
10	L-BU/BK	1688	5-Volt Reference

Air Temperature Actuator Terminal Identification - Right



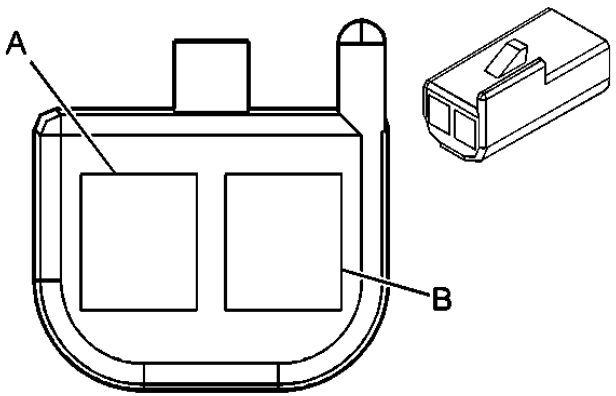
Connector Part Information		• **12064993** • **6-Way F Micro-Pack 100 Series (BK)**	
Pin	**Wire Color**	**Circuit No.**	**Function**
5	BN	341	Ignition 3 Voltage
6	WH/BK	1236	Right Air Temperature Door Control
7	YE	1791	Low Reference
8	-	-	Not Used
9	D-BU	1646	Right Air Temperature Door Position Signal
10	L-BU/BK	1688	5-Volt Reference

Air Temperature Sensor Assembly Terminal Identification - Inside



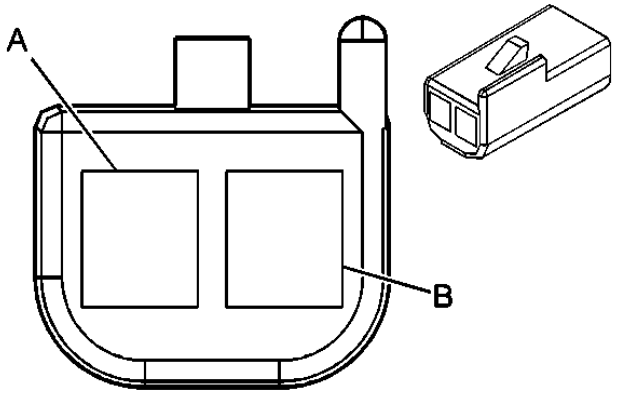
Connector Part Information		• 12045813 • 4-Way F Metri-Pack 150 Series (NT)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	D-GN	734	Inside Air Temperature Sensor Signal
B	WH/BK	5515	Inside Air Temperature Sensor Assembly Control
C	BK	1050	Ground
D	BN	718	Low Reference

Air Temperature Sensor Terminal Identification - Lower Left



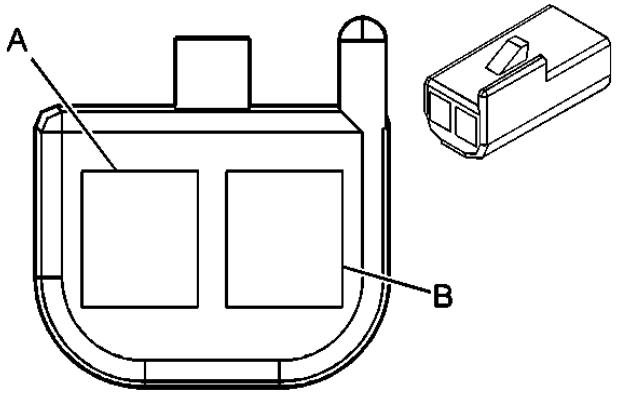
Connector Part Information		• 12047662 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	718	Low Reference
B	WH/BK	2339	Lower Left Air Temperature Sensor Signal

Air Temperature Sensor Terminal Identification - Lower Right



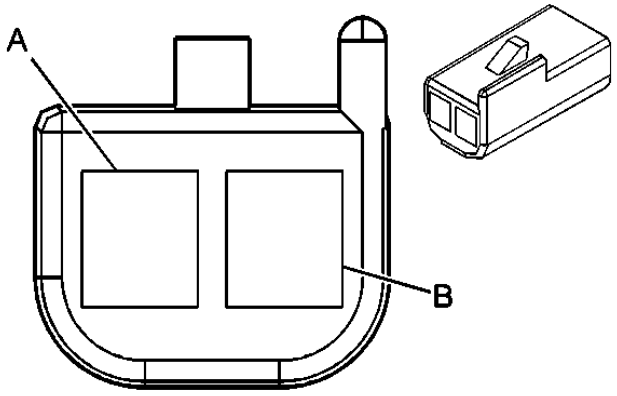
Connector Part Information		• 12047662 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	718	Low Reference
B	GY/BK	2337	Lower Right Air Temperature Sensor Signal

Air Temperature Sensor Terminal Identification - Upper Left



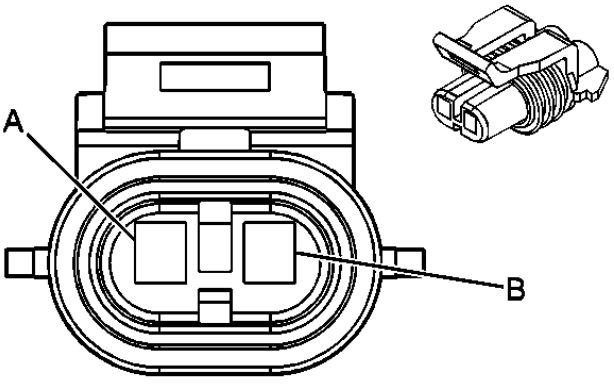
Connector Part Information		• 12047662 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	718	Low Reference
B	WH	2338	Upper Left Air Temperature Sensor Signal

Air Temperature Sensor Terminal Identification - Upper Right



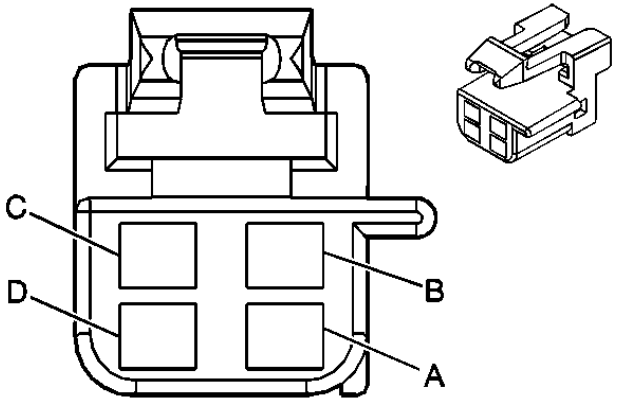
Connector Part Information		• 12047662 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	718	Low Reference
B	GY	2336	Upper Right Air Temperature Sensor Signal

Ambient Air Temperature Sensor Terminal Identification - HVAC



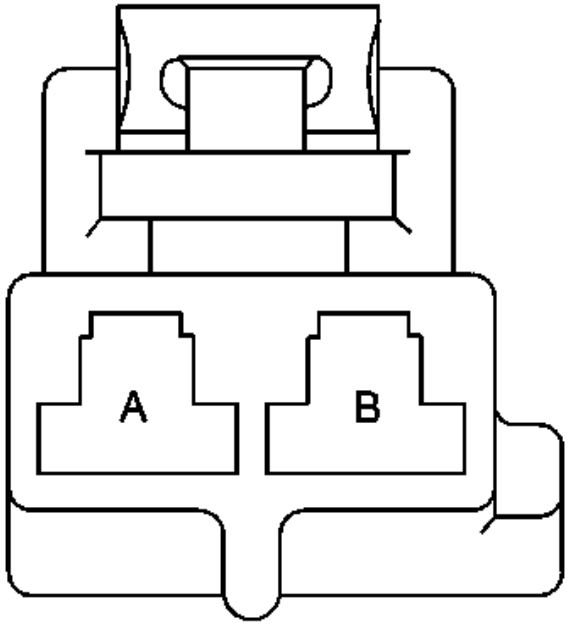
Connector Part Information		• 12052642 • 2-Way F Metri-Pack 150 Series Sealed (L- GN)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	718	Low Reference
B	L-GN/BK	735	Ambient Air Temperature Sensor Signal

Ambient Light/Sunload Sensor Assembly Terminal Identification



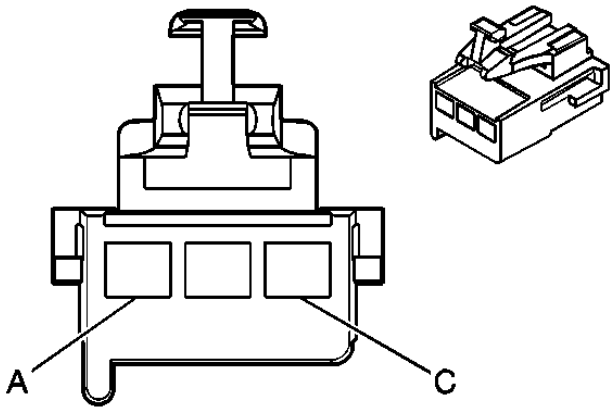
Connector Part Information		• 12064760 • 4-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	L-BU/BK	590	Driver Sunload Sensor Signal
B	GY	1548	Passenger Sunload Sensor Signal
C	BK	279	Ambient Light Sensor Low Reference
D	WH	278	Ambient Light Sensor Signal

Blower Motor Terminal Identification



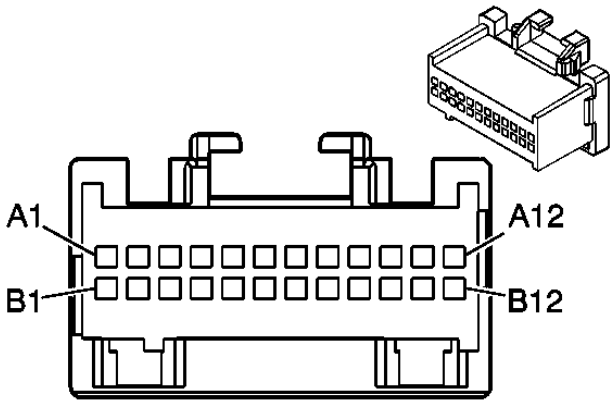
Connector Part Information		• 12064749 • 2-Way F Metri-Pack 150 Series Sealed (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	RD	-	Blower Motor Supply Voltage
B	BK	-	Ground

Blower Motor Control Processor Terminal Identification



Connector Part Information		• 12129489 • 3-Way F Metri-Pack 280 Series Flexlock (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BK	1050	Ground
B	PU/WH	760	Blower Motor Speed Control
C	RD	542	Battery Positive Voltage

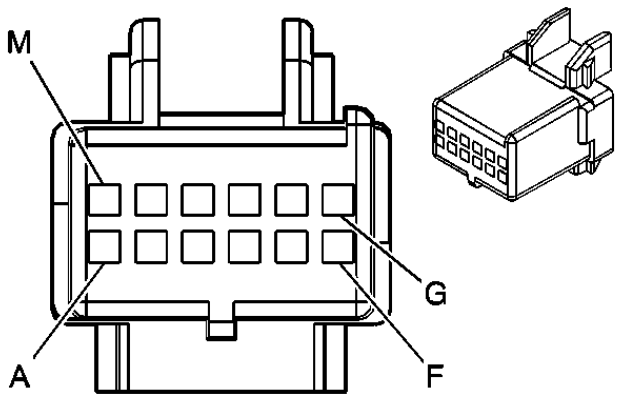
HVAC Control Module Terminal Identification - C1



Connector Part Information		• 12110206 • 24-Way F Micro-Pack 100 Series (L-BU)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A1	D-GN	1614	Recirculation Door Control
A2	D-BU	1646	Right Air Temperature Door Position Signal

A3	L-BU	733	Left Air Temperature Door Position Signal
A4	-	-	Not Used
A5	L-GN	2275	Mode Door Position Signal
A6	-	-	Not Used
A7	BN/WH	230	Instrument Panel Lamps Dimming Control
A8	BK/WH	1851	Ground
A9-A11	-	-	Not Used
A12	D-BU	204	A/C Low Pressure Sensor Signal
B1	WH/BK	1236	Right Air Temperature Door Control
B2	D-BU	1199	Left Air Temperature Door Control
B3	-	-	Not Used
B4	TN	2273	Mode Door Control
B5	BN	341	Ignition 3 Voltage
B6	YE	1791	Low Reference
B7	OG	4340	Battery Positive Voltage
B8	L-BU/BK	1688	5-Volt Reference
B9	BK	1050	Ground
B10	-	-	Not Used
B11	WH	1038	HVAC Class 2 Serial Data
B12	-	-	Not Used

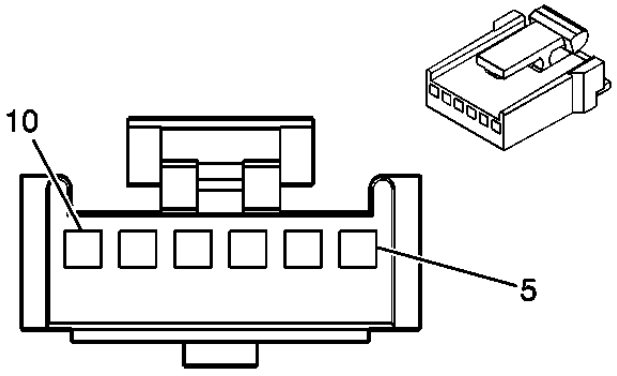
HVAC Control Module Terminal Identification - C2



Connector Part Information		• **15336594** • **12-Way F Micro Pack 100 (GY)**	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	D-GN	734	Inside Air Temperature Sensor Signal
B	L-GN/BK	735	Ambient Air Temperature Sensor Signal

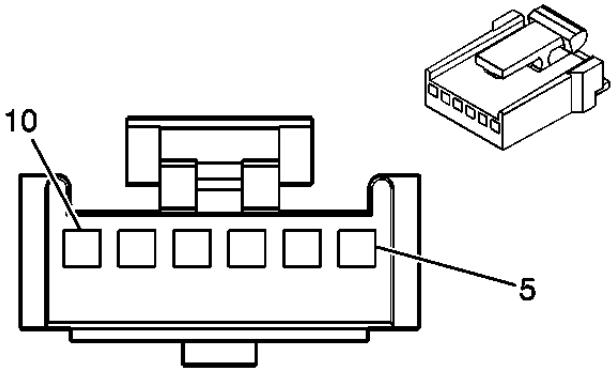
C	WH	2338	Upper Left Air Temperature Sensor Signal
D	GY	2336	Upper Right Air Temperature Sensor Signal
E	WH/BK	2339	Lower Left Air Temperature Sensor Signal
F	GY/BK	2337	Lower Right Air Temperature Sensor Signal
G	PU	1838	Recirculation Door Position Signal
H-J	-	-	Not Used
K	BN	718	Low Reference
L	WH/BK	5515	Inside Air Temperature Sensor Assembly Control
M	PU/WH	760	Blower Motor Speed Control

Mode Actuator Terminal Identification



Connector Part Information		• **12064993** • **6-Way F Micro-Pack 100 Series (BK)**	
Pin	**Wire Color**	**Circuit No.**	**Function**
5	BN	341	Ignition 3 Voltage
6	TN	2273	Mode Door Control
7	YE	1791	Low Reference
8	-	-	Not Used
9	L-GN	2275	Mode Door Position Signal
10	L-BU/BK	1688	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	BN	341	Ignition 3 Voltage
6	D-GN	1614	Recirculation Door Control
7	YE	1791	Low Reference
8	-	-	Not Used
9	PU	1838	Recirculation Door Position Signal
10	L-BU/BK	1688	5-Volt Reference

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC SYSTEM CHECK - HVAC SYSTEMS - AUTOMATIC

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 circuit. The specified procedure will determine the particular condition.

5: Determine if the HVAC control module, body control module, or powertrain control module have set DTCs which may affect HVAC operation are present.

6: The presence of DTCs which begin with "U" indicate some other module is not communicating.

7: Answer Yes if the first three characters of the DTC name begins with B10; regardless of the last two characters.

Diagnostic System Check - HVAC Systems - Automatic

Step	Action	Yes	No
	Did you review a Diagnostic Starting		Go to **Diagnostic Starting**

1	Point - Heating, Ventilation and Air Conditioning?	Go to **Step 2**	**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 following control modules: • HVAC Control Module • Body Control Module • Powertrain Control Module Does the scan tool communicate with the control modules?	Go to **Step 4**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
4	**IMPORTANT:** **The engine may start during the following step. Turn OFF the engine as soon as you have observed the Crank power mode.** 1. Access the Class 2 Power Mode in the Diagnostic Circuit Check on the scan tool. 2. Rotate the ignition switch through all positions while observing the Ignition Switch Power Mode parameter. Does the Ignition Switch parameter reading match the ignition switch position for all switch positions?	Go to **Step 5**	Go to **Power Mode Mismatch** in Body Control System
5	Select the display DTCs function on the scan tool for the following modules: • HVAC Control Module • Body Control Module • Powertrain Control Module		

	Does the scan tool display any DTCs?	Go to **Step 6**	Go to **Symptoms - HVAC Systems - Automatic**
6	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 7**
7	Does the scan tool display DTC B10XX?	Go to **Diagnostic Trouble Code (DTC) List** in Body Control Systems	Go to **Step 8**
8	Does the scan tool display any DTCs that are associated with the charging system?	Go to **Diagnostic Trouble Code (DTC) List** in Engine Electrical	Go to **Step 9**
9	Does the scan tool display any DTCs that are associated with the HVAC system?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Diagnostic Trouble Code (DTC) List** in Engine Controls - 4.8L, 5.3L, and 6.0L

SCAN TOOL OUTPUT CONTROLS

HVAC Control Module Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection (s)	Description
A/C Permission	Miscellaneous Tests	When you select ON, the HVAC control module changes the state of the A/C Permission parameter to Granted and transmits a clutch enable message to the PCM over the class 2 serial data circuit. The A/C compressor clutch engages and remains engaged until you select OFF. When you select OFF, the HVAC control module changes the state of the A/C Permission parameter to Withheld and transmits a clutch disable message to the PCM over the class 2 serial data circuit.
Air Inlet Door	Motor/Actuator Tests	When you select ON, the HVAC control module commands the recirculation actuator toward the maximum door position. The actuator moves the door to the recirculation position. When you select OFF, the HVAC control module commands the recirculation actuator toward the minimum door position. The actuator moves the door to the outside air position.
Blower Motor	Motor/Actuator Tests	When you select ON, the HVAC control module commands the blower motor to maximum speed. The blower motor operates at maximum speed until you select OFF. The HVAC control module must be in the ON state before selecting the output control.
HVAC Actuator Recalibration	-	When you select RESET, the HVAC control module recalibrates the maximum and minimum door positions of each HVAC door. The ambient air temperature display is set to the current value of the Outside Air Temp. Raw parameter.
Inside Air	Motor/Actuator	When you select OFF, the HVAC control module commands the

Temperature Fan	Tests	inside air temperature fan OFF. The fan remains OFF until you select ON. The normal state of the inside air temperature fan is ON.
Instant OAT Update	Miscellaneous Tests	The scan tool displays OFF or ON. This function updates the HVAC control module ambient air temperature input to the current raw value.
Left Mix Motor	Motor/Actuator Tests	When you select ON, the HVAC control module commands the left air temperature actuator toward the maximum door position. The actuator moves the door to the full hot position. When you select OFF, the HVAC control module commands the left air temperature actuator toward the minimum door position. The actuator moves the door to the full cold position.
Mode 1 Door Position	Motor/Actuator Tests	When you select ON, the HVAC control module commands the mode actuator toward the maximum door position. The actuator moves the door to the panel position. When you select OFF, the HVAC control module commands the mode actuator toward the minimum door position. The actuator moves the door to the floor position.
Right Mix Motor	Motor/Actuator Tests	When you select ON, the HVAC control module commands the right air temperature actuator toward the maximum door position. The actuator moves the door to the full cold position. When you select OFF, the HVAC control module commands the right air temperature actuator toward the minimum door position. The actuator moves the door to the full hot position.

PCM Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
A/C Relay	Engine Output Controls	The engine must be running and the PCM must receive an A/C request from the HVAC control module in order to enable the output control. The PCM de-energizes the A/C compressor clutch relay when you select OFF. The relay remains de-energized until you select ON.

SCAN TOOL DATA LIST

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)			
Left Solar Sensor	Data	Counts/Volts	Varies
Right Solar Sensor	Data	Counts/Volts	Varies

HVAC Control Module 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 Switch	Input/Output	On/Off	Off
AC Permission	Input/Output	Withheld/Granted	Varies
Air Inlet Door Actual	Door Positions	Counts	Varies
Air Inlet Commanded	Door Positions	Counts	Varies
Air Inlet Motor Drive	Door Positions	Stop, Increase, Decrease	Stop
Air Mix Door Left Commanded	Door Positions	Counts	Varies
Air Mix Door Right Commanded	Door Positions	Counts	Varies
Auto Switch	Input/Output	On/Off	Off
Battery Voltage	Input/Output	Volts	13.5-14.5 V
Blower Motor PWM Speed	Door Positions	Percent	12-114%
Dim Level Requested	Sensor Data	Percent	Varies
Engine Coolant Temp	Sensor Data	° C/° F	Varies
Fan Down Button	Input/Output	On/Off	Off
Fan Up Button	Input/Output	On/Off	Off
Front Defrost Switch	Input/Output	On/Off	Off
Ign. Since Current DTC	Input/Output	Cycles	0
Inside Air Temp. Sensor	Sensor Data	° C/° F	Varies
Inside Air Temp. Fan	Sensor Data	On/Off	On
Left Mix Door Actual	Door Positions	Counts	Varies
Left Mix Motor Drive	Door Positions	Stop, Increase, Decrease	Stop
Left Temp. Setting	Input/Output	° C/° F	Varies
LH AC Duct Actual	Sensor Data	Counts	Varies
LH AC Duct Desired	Sensor Data	Counts	Varies
LH Heater Duct Actual	Sensor Data	Counts	Varies
LH Heater Duct Desired	Sensor Data	Counts	Varies
Mode Door Actual	Door Positions	Counts	Varies
Mode Dr. Motor Command	Door Positions	Counts	Varies
Mode Motor Drive	Door Positions	Stop, Increase, Decrease	Stop
Mode Select Position	Door Positions	Off, Auto, Defrost, Heater, Htr/Def, Bi-Level, Panel	Varies

Mode Switch	Input/Output	On/Off	Off
Off Switch	Input/Output	On/Off	Off
Outside Air Temp. Filtered	Input/Output	° C/° F	22-27° C (70-80° F)
Outside Air Temp. Raw	Input/Output	° C/° F	Varies
Pressure Cycle Switch	Input/Output	Low Pressure, Normal	Varies
Rear Defrost Switch	Input/Output	On/Off	Off
Recirculate Switch	Input/Output	On/Off	Off
RH AC Duct Actual	Sensor Data	Counts	Varies
RH AC Duct Desired	Sensor Data	Counts	Varies
RH Heater Duct Actual	Sensor Data	Counts	Varies
RH Heater Duct Desired	Sensor Data	Counts	Varies
Right Mix Door Actual	Door Positions	Counts	Varies
Right Mix Motor Drive	Door Positions	Stop, Increase, Decrease	Stop
Right Temp. Setting	Input/Output	° C/° F	Varies

PCM 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 Pressure Sensor	Engine Data 2	kPa/Psi	629-845 kPa (85-120 psi)
A/C Pressure Sensor	Engine Data 2	Volts	Varies
A/C Relay Command	Engine Data 2	On/Off	Varies
A/C Request Signal	Engine Data 2	Yes/No	Varies
ECT Sensor	Engine Data 2	° C/° F	92° C (197° F)

SCAN TOOL DATA DEFINITIONS

A/C Switch

The scan tool displays On/Off. The scan tool displays On when the A/C request switch is active. The scan tool displays Off when the A/C request switch is inactive.

AC Permission

The scan tool displays Withheld/Granted. The scan tool displays Granted when the HVAC control module determines that conditions for compressor clutch engagement are present. The scan tool displays Withheld when the HVAC control module determines that conditions for compressor clutch engagement are not present.

AC Pressure Sensor

The scan tool displays 0-3450 kPa (0-500 psi). The voltage applied to the powertrain control module (PCM) input from the A/C refrigerant pressure sensor is converted to a pressure value.

AC Pressure Sensor

The scan tool displays 0-5 volts. The voltage applied to the PCM input for the A/C refrigerant pressure sensor.

A/C Relay Command

The scan tool displays On/Off. The scan tool displays the control decision for the compressor clutch relay output as determined by the PCM.

A/C Request Signal

The scan tool displays Yes/No. The scan tool displays Yes when the PCM receives a class 2 message from the HVAC control module to engage the A/C compressor clutch. The scan tool displays No when the PCM receives a class 2 message from the HVAC control module to disengage the A/C compressor clutch.

Air Inlet Door Commanded

The scan tool displays 0-255 counts. The scan tool displays the desired recirculation door position as determined by the HVAC control module.

Air Inlet Door Actual

The scan tool displays 0-255 counts. The voltage applied to the recirculation door position input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Air Inlet Motor Drive

The scan tool displays Stop, Increase, or Decrease. The scan tool displays the control decision for the actuator output as determined by the HVAC control module.

Air Mix Door Left Commanded

The scan tool displays 0-255 counts. The scan tool displays the desired left air temperature door position as determined by the HVAC control module.

Air Mix Door Right Commanded

The scan tool displays 0-255 counts. The scan tool displays the desired right air temperature door position as determined by the HVAC control module.

Auto Switch

The scan tool displays On/Off. The scan tool displays On when the automatic switch is active. The scan tool displays Off when the automatic switch is inactive.

Battery Voltage

The scan tool displays 0-25 volts. The voltage measured from the battery positive voltage circuit and the ground circuit of the HVAC control module.

Blower Motor PWM Speed

The scan tool displays 0-114%. The scan tool displays the control decision for the blower motor speed as determined by the HVAC control module. The scan tool displays 114% when the blower motor is commanded to maximum speed. The scan tool displays 0% when the blower motor is commanded OFF.

Dim Level Requested

The scan tool displays 0%-100%. This is the percentage of backlighting requested by the body control module.

Engine Coolant Temp.

The scan tool displays -39 to 140° C (-38 to 284° F). This is the engine coolant temperature sent to the HVAC control module by the PCM.

ECT Sensor

The scan tool displays -39 to 140° C (-38 to 284° F). The voltage applied to the PCM input from the engine coolant temperature sensor is converted to a temperature value.

Fan Down Button

The scan tool displays On/Off. The scan tool displays On when the fan down switch is active. The scan tool displays Off when the fan down switch is inactive.

Fan Up Button

The scan tool displays On/Off. The scan tool displays On when the fan up switch is active. The scan tool displays Off when the fan up switch is inactive.

Front Defrost Switch

The scan tool displays On/Off. The scan tool displays On when the defrost switch is active. The scan tool displays Off when the defrost switch is inactive.

Ign. Since Current DTC

The scan tool displays 0-100 Cycles. The number of the ignition cycles since the setting of the most recent current diagnostic trouble code (DTC).

Inside Air Temp Fan

The scan tool displays On/Off. The scan tool displays the control decision for the fan motor output as determined by the HVAC control module. The fan motor is internal to the inside air temperature sensor assembly.

Inside Air Temp.

The scan tool displays -40 to 215° C (-40 to 419° F). The voltage applied to the HVAC control module input for the inside air temperature sensor is converted to a temperature value.

Left Mix Door Actual

The scan tool displays 0-255 counts. The voltage applied to the left air temperature door position input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Left Mix Motor Drive

The scan tool displays Stop, Increase, or Decrease. The scan tool displays the control decision for the actuator output as determined by the HVAC control module.

Left Solar Sensor

The scan tool displays 0-255 counts. The voltage applied to the left sunload input of the BCM is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Left Temp. Setting

The scan tool displays 15 to 32° C (60 to 90° F). The scan tool displays the selected temperature from the left air temperature switch.

LH AC Duct Actual

The scan tool displays 0-255 counts. The voltage applied to the left upper duct air temperature input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

LH AC Duct Desired

The scan tool displays 0-255 counts. The desired value of the left upper duct air temperature input. The

HVAC control module monitors the actual value of the duct air temperature input and accordingly positions the left air temperature door to achieve the desired duct air temperature.

LH Heater Duct Actual

The scan tool displays 0-255 counts. The voltage applied to the left lower duct air temperature input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

LH Heater Duct Desired

The scan tool displays 0-255 counts. The desired value of the left lower duct air temperature input. The HVAC control module monitors the actual value of the duct air temperature input and accordingly positions the left air temperature door to achieve the desired duct air temperature.

Mode Door Actual

The scan tool displays 0-255 counts. The voltage applied to the mode door position input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Mode 1 Door Commanded

The scan tool displays 0-255 counts. The scan tool displays the desired mode door position as determined by the HVAC control module.

Mode Motor Drive

The scan tool displays Stop, Increase, or Decrease. The scan tool displays the control decision for the actuator output as determined by the HVAC control module.

Mode Select Position

The scan tool displays Off, Auto, Defrost, Heater, Htr/Def, Bi-Level, Panel. The scan tool displays the state of mode operation.

Mode Switch

The scan tool displays On/Off. The scan tool displays On when the mode switch is active. The scan tool displays Off when the mode switch is inactive.

Off Switch

The scan tool displays On/Off. The scan tool displays On when the Off switch is active. The scan tool displays Off when the Off switch is inactive.

Outside Air Temp. Filtered

The scan tool displays -40 to 215° C (-40 to 419° F). The current value of the ambient air temperature display on the HVAC control module.

Outside Air Temp. Raw

The scan tool displays -40 to 215° C (-40 to 419° F). The voltage applied to the HVAC control module input from the ambient air temperature sensor is converted to an unfiltered temperature value.

Pressure Cycle Switch

The scan tool displays Low Pressure/Normal. The current state of the input from the A/C low pressure switch. The scan tool displays Low Pressure when the switch is open and displays Normal when the switch is closed. The low pressure switch opens when low side pressure decreases to 138-172 kPa (20-25 psi) and closes when the low side pressure increases to approximately 275-317 kPa (40-46 psi) as measured at the switch/accumulator.

Rear Defrost Switch

The scan tool displays On/Off. The scan tool displays On when the rear defrost switch is active. The scan tool displays Off when the rear defrost switch is inactive.

Recirculate Switch

The scan tool displays On/Off. The scan tool displays On when the recirculation switch is active. The scan tool displays Off when the recirculation switch is inactive.

RH AC Duct Actual

The scan tool displays 0-255 counts. The voltage applied to the right upper duct air temperature input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

RH AC Duct Desired

The scan tool displays 0-255 counts. The desired value of the right upper duct air temperature input. The HVAC control module monitors the actual value of the duct air temperature input and accordingly positions the right air temperature door to achieve the desired duct air temperature.

RH Heater Duct Actual

The scan tool displays 0-255 counts. The voltage applied to the right lower duct air temperature input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

RH Heater Duct Desired

The scan tool displays 0-255 counts. The desired value of the right lower duct air temperature input. The HVAC control module monitors the actual value of the duct air temperature input and accordingly positions the right air temperature door to achieve the desired duct air temperature.

Right Mix Door Actual

The scan tool displays 0-255 counts. The voltage applied to the right air temperature door position input of the HVAC control module is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Right Motor Drive

The scan tool displays Stop, Increase, or Decrease. The scan tool displays the control decision for the actuator output as determined by the HVAC control module.

Right Solar Sensor

The scan tool displays 0-255 counts. The voltage applied to the BCM input from the right sunload sensor is converted to a number between 0 and 255 where 51 Counts is approximately equal to 1 V.

Right Temp. Setting

The scan tool displays 15 to 32° C (60 to 90° F). The scan tool displays the selected temperature from the right air temperature switch.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Diagnostic Procedure	Module
B0159	**DTC B0159**	HVAC Control Module
B0164	**DTC B0164**	HVAC Control Module
B0174	**DTC B0174, B0179, B0510, or B0515**	HVAC Control Module
B0179	**DTC B0174, B0179, B0510, or B0515**	HVAC Control Module
B0183	**DTC B0183 or B0188**	BCM
B0188	**DTC B0183 or B0188**	BCM
B0229	**DTC B0229, B0414, B0424, or B3770**	HVAC Control Module
B0263	**DTC B0263, B0268, B0408, or B0418**	HVAC Control Module
B0268	**DTC B0263, B0268, B0408, or B0418**	HVAC Control Module
B0408	**DTC B0263, B0268, B0408, or B0418**	HVAC Control Module
B0414	**DTC B0229, B0414, B0424, or B3770**	HVAC Control Module
B0418	**DTC B0263, B0268, B0408, or B0418**	HVAC Control Module
B0424	**DTC B0229, B0414, B0424, or B3770**	HVAC Control Module
B0510	**DTC B0174, B0179, B0510, or B0515**	HVAC Control Module
B0515	**DTC B0174, B0179, B0510, or B0515**	HVAC Control Module

B1375	**DTC B1375**	HVAC Control Module
B3770	**DTC B0229, B0414, B0424, or B3770**	HVAC Control Module
P0530	**DTC P0530**	Powertrain Control Module

DTC B0159

Circuit Description

The ambient air temperature sensor allows the HVAC control module to monitor the temperature of the air surrounding the front of the vehicle. The module applies 5 volts to internal input resistors that are connected to the signal circuit of the ambient air temperature sensor. The module provides ground to the ambient air temperature sensor through the low reference circuit. The HVAC control module monitors the voltage drop across the ambient air temperature sensor and uses the input for automatic control calculations. When the air temperature is cold, the resistance of the sensor is high and the voltage signal is high. When the air temperature is hot, the resistance of the sensor is low and the voltage signal is low.

Conditions for Running the DTC

- Battery voltage to the HVAC control module is greater than 8.7 V and less than 16.5 V.
- The ignition is turned ON.

Conditions for Setting the DTC

The HVAC control module determines that the voltage applied to the input for the ambient air temperature sensor is less than 0.09 V or greater than 4.9 V.

Action Taken When the DTC Sets

The scan tool displays 10° C (50° F) as the value for the Outside Air Temp. Raw parameter.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

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

Test Description

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

2: Verifies that the condition that set the DTC is present.

DTC B0159

Step	Action	Value (s)	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 - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the Heating and Air Conditioning display DTC function on the scan tool. Does the scan tool indicate that B0159 is a current DTC?	-	Go to **Step 3**	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the ambient air temperature sensor. 3. Turn ON the ignition, with the engine OFF. 4. Measure the voltage from the signal circuit of the ambient air temperature sensor to a good ground. Does the voltage measure near the specified value?	5 V	Go to **Step 4**	Go to **Step 5**
4	Measure the voltage from the signal circuit to the low reference circuit of the ambient air temperature sensor. Does the voltage measure near the specified value?	5 V	Go to **Step 7**	Go to **Step 6**
5	Test the signal circuit of the ambient air temperature sensor for an open, high resistance, short to ground, or short to voltage. 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	Test the low reference circuit of the ambient air temperature 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 11**	Go to **Step 8**
7	Inspect for poor connections at the harness connector of the ambient air 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 11**	Go to **Step 9**
	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent**			

8	**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 ambient air temperature sensor. Refer to **Ambient Air Temperature Sensor Replacement** . 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	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 B0164

Circuit Description

The inside air temperature sensor assembly allows the HVAC control module to monitor the temperature of the air inside the passenger compartment. The module applies 5 volts to internal input resistors that are connected to the signal circuit of the inside air temperature sensor assembly. The module provides ground to the inside air temperature sensor assembly through the low reference circuit. The HVAC control module monitors the voltage drop across the inside air temperature sensor assembly and uses the input for automatic control calculations. When the air temperature is cold, the resistance of the sensor is high and the voltage signal is high. When the air temperature is hot, the resistance of the sensor is low and the voltage signal is low.

Conditions for Running the DTC

- Battery voltage to the HVAC control module is greater than 8.7 V and less than 16.5 V.
- The ignition is turned ON.

Conditions for Setting the DTC

The HVAC control module determines that the voltage applied to the input for the inside air temperature sensor assembly is less than 0.09 V or greater than 4.9 V.

Action Taken When the DTC Sets

The HVAC control module uses a default value of 55° C (131° F) for the Inside Air Temp. parameter. This value will be displayed on the scan tool.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.

- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

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

Test Description

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

2: Verifies that the condition that set the DTC is present.

DTC B0164

Step	Action	Value (s)	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 - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the Heating and Air Conditioning display DTC function on the scan tool. Does the scan tool indicate that B0164 is a current DTC?	-	Go to **Step 3**	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the inside air temperature sensor assembly. 3. Turn ON the ignition, with the engine OFF. 4. Measure the voltage from the signal circuit of the inside air temperature sensor assembly to a good ground. Does the voltage measure near the specified value?	5 V	Go to **Step 4**	Go to **Step 5**
4	Measure the voltage from the signal circuit to the low reference circuit of the inside air temperature sensor assembly. Does the voltage measure near the specified value?	5 V	Go to **Step 7**	Go to **Step 6**
	Test the signal circuit of the inside air temperature sensor assembly for an open, high resistance, short to ground, or			

5	short to voltage. 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	Test the low reference circuit of the inside air temperature sensor assembly 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 11**	Go to **Step 8**
7	Inspect for poor connections at the harness connector of the inside air temperature sensor 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 11**	Go to **Step 9**
8	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 11**	Go to **Step 10**
9	Replace the inside air temperature sensor assembly. Refer to **Inside Air Temperature Sensor Assembly Replacement** . 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	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 B0174, B0179, B0510, OR B0515

Circuit Description

The following DTC's are for the air temperature sensors located in the discharge air ducts:

- B0174 is for the upper left air temperature sensor.
- B0179 is for the lower left air temperature sensor.
- B0510 is for the upper right air temperature sensor.
- B0515 is for the lower right air temperature sensor.

Air temperature sensors allow the HVAC control module to monitor the temperature of the discharge air in the HVAC ducts. The module applies 5 volts to internal input resistors that are connected to the signal circuits of the air temperature sensors. The module provides ground to the air temperature sensors through the low reference circuit. The HVAC control module monitors the voltage drop across the air temperature sensors and uses the inputs for automatic control calculations. When the duct air temperatures are cold, the resistances of the

sensors are high and the voltage signals are high. When the duct air temperatures are hot, the resistances of the sensors are low and the voltage signals are low. The HVAC control module converts the voltage values to count values where 1 V is approximately equal to 51 counts.

Conditions for Running the DTC

- Battery voltage is within 8.7-16.5 V.
- The ignition is ON.

Conditions for Setting the DTC

The HVAC control module determines that the value of the air temperature parameter is less than 5 counts or greater than 250 counts.

Action Taken When the DTC Sets

The HVAC control module uses a default air temperature value for further automatic control calculations. The default values are not displayed on the scan tool.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects a fault.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

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: Verifies that the temperature displayed is not within the calibrated range.

3: Tests for the proper operation of the circuit in the high voltage range.

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

DTC B0174, B0179, B0510, or B0515

Step	Action	Value (s)	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**				
	Did you perform the HVAC Diagnostic System			Go to **Diagnostic**

1	Check?	-	Go to **Step 2**	**System Check - HVAC Systems - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the appropriate Duct Actual parameter in the Heating and Air Conditioning data list. Refer to one of the following parameters: • LH AC Duct Actual • LH Heater Duct Actual • RH AC Duct Actual • RH Heater Duct Actual Does the scan tool indicate that the Duct Actual parameter is within the specified range?	5-250 Counts	Go to Diagnostic Aids	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the air temperature sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Duct Actual data parameter. Does the scan tool indicate that the Duct Actual data parameter is greater than the specified value?	250 Counts	Go to **Step 4**	Go to **Step 5**
4	1. Turn OFF the ignition. 2. Connect a 3 amp fused jumper wire between the signal circuit of the air temperature sensor and the low reference circuit of the air temperature sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Duct Actual data parameter. Does the scan tool indicate that the Duct Actual data parameter is less than the specified value?	5 Counts	Go to **Step 8**	Go to **Step 6**
5	Test the signal circuit of the air temperature sensor 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 12**	Go to **Step 9**
6	Test the signal circuit of the air temperature sensor for a short to voltage, 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 12**	Go to **Step 7**
7	Test the low reference circuit of the air temperature 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 12**	Go to **Step 9**
8	Inspect for poor connections at the harness connector of the air 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 12**	Go to **Step 10**
9	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 12**	Go to **Step 11**
10	Replace the air temperature sensor. Refer to the appropriate replacement procedure: • **Air Temperature Sensor Replacement - Upper Right** • **Air Temperature Sensor Replacement - Upper Left** • **Air Temperature Sensor Replacement - Lower Left** • **Air Temperature Sensor Replacement - Lower Right** Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 12**	-
12	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 B0183 OR B0188

Circuit Description

The following DTC's are for the left and right sunload sensors.

- B0183 is for the left sunload sensor.
- B0188 is for the right sunload sensor.

The left and right sunload sensors provide the HVAC control module with inputs as to the amount heat load the sun is placing on the interior of the vehicle. The sunload sensors are photodiodes that are sensitive to light intensity. The body control module (BCM) applies 5 volts to internal input resistors that are connected to the left and right signal circuits of the sunload sensor assembly. The BCM provides ground to the sensors through the low reference circuit. The BCM monitors the voltage drops across the sunload sensors and converts the voltage values to count values where 1 V is approximately equal to 51 counts. As the light intensity increases, the sunload sensors allow more current to travel through the circuits and the signal voltages decrease. As the light intensity decreases, the sunload sensors allow less current to travel through the circuits and the signal voltages increase. The BCM transmits the data to the HVAC control module over the class 2 serial data circuit.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The BCM determines that the value of the sunload sensor signal is less than 5 counts or greater than 250 counts.

Action Taken When the DTC Sets

The action taken will be for the BCM to revert to a calibrated default value.

Conditions for Clearing the DTC

- The DTC will become history if the BCM no longer detects a failure.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

If condition 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: Verifies that the value displayed is within the specified range.

3: Tests for the proper operation of the circuit in the high voltage range.

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

DTC B0183 or B0188

Step	Action	Value (s)	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 - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the appropriate Solar Sensor parameter in the Body Control Module data list. Refer to one of the following parameters: • Left Solar Sensor • Right Solar Sensor Does the scan tool indicate that the appropriate Solar Sensor parameter is within the specified range?	5-250 Counts	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 sunload sensor assembly. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Solar Sensor data parameter. Does the scan tool indicate that the appropriate Solar Sensor parameter is greater than the specified value?	250 Counts	Go to **Step 4**	Go to **Step 5**
4	1. Turn OFF the ignition. 2. Connect a 3 amp fused jumper wire between the signal circuit of the sunload sensor assembly and the low reference circuit of the sunload sensor assembly. 3. Turn ON the ignition, with the engine OFF.	5 Counts		

	4. With a scan tool, observe the appropriate Solar Sensor parameter. Does the scan tool indicate that the appropriate Solar Sensor parameter is less than the specified value?		Go to **Step 8**	Go to **Step 6**
5	Test the solar signal circuit of the sunload sensor assembly 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 12**	Go to **Step 9**
6	Test the signal circuit of the sunload sensor assembly for a short to voltage, 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 12**	Go to **Step 7**
7	Test the low reference circuit of the sunload sensor assembly 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 12**	Go to **Step 9**
8	Inspect for poor connections at the harness connector of the sunload sensor 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 12**	Go to **Step 10**
9	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 12**	Go to **Step 11**
10	Replace the sunload sensor assembly. Refer to **Sun Load Sensor Replacement** . Did you complete the replacement?	-	Go to **Step 12**	-
11	**IMPORTANT:** **Perform the set up procedure for the BCM.** Replace the BCM. Refer to **Body Control Module Replacement** in Body Control System.Did you complete the replacement?	-	Go to **Step 12**	-
	1. Use the scan tool in order to clear the DTCs.			

12	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 B0229, B0414, B0424, OR B3770

Circuit Description

The following DTC's are for the HVAC door actuators:

- B0229 is for the recirculation actuator.
- B0414 is for the left air temperature actuator.
- B0424 is for the right air temperature actuator.
- B3770 is for the mode actuator.

The HVAC control module controls the HVAC door actuators to regulate the airflow through the HVAC system. Each actuator consists of a stepper motor, a logic circuit, and a potentiometer. The potentiometer inside the door actuator allows the module to monitor the current position of the actuator drive shaft. The module supplies a 5 volt source voltage to the potentiometer on the 5 volt reference circuit. The module supplies ground to the potentiometer through the low reference circuit. The HVAC control module monitors the voltage drop across the potentiometer on the door position signal circuit. When the actuator shaft rotates, the voltage on the door position signal circuit changes. The module converts the voltage value to a count value where 1 volt is approximately equal to 51 counts.

The HVAC control module calibrates the travel range of the HVAC door actuators when it is initially powered by the battery positive voltage circuit. During calibration, the module commands the actuators in each direction until door travel is stopped. The module stores the minimum door positions and the maximum door positions of each actuator into memory. The total travel range is calculated by subtracting the minimum door position from the maximum door position. The door actuators can be calibrated again with a scan tool.

Conditions for Running the DTC

- Battery voltage is 8.7-16.5 volts.
- The ignition is ON.

Conditions for Setting the DTC

The DTC sets when one of the following conditions are present:

- The actual door position value for the actuator is less than 5 counts.
- The actual door position value for the actuator is greater than 250 counts.
- The actuator fails calibration because the calculated travel range value is too great or too small.

Action Taken When the DTC Sets

- If the DTC sets because the actual door position value is out of range, the HVAC control module will command the actuator to a default position.
- If the DTC sets because the actuator failed a calibration, the HVAC control module will attempt to calibrate the motor in the next transition from OFF to RUN mode.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

- If the condition is not present refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- If the DTC sets following a calibration of the door actuator, inspect the door and the actuator for the following conditions:
  - A misaligned actuator
  - Broken linkages or binding linkages
  - A broken door or a binding door
  - An obstruction that prevents the door from operating within the full range of motion
  - Missing seals to the door
  - Poor connections at the harness connector of the door actuator

Test Description

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

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

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

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

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

DTC B0229, B0414, B0424, or B3770

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 **Diagnostic System Check -**

			Go to **Step 2**	**HVAC Systems - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, observe the appropriate Door Actual parameter in the Heating and Air Conditioning data list. Does the scan tool indicate that the appropriate Door Actual parameter is within the specified range?	5-250 counts	Go to Diagnostic Aids	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the appropriate HVAC door actuator. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Door Actual parameter. Does the scan tool indicate that the appropriate Door Actual parameter is less than the specified value?	5 counts	Go to **Step 4**	Go to **Step 10**
4	1. Turn OFF the ignition. 2. Connect a 3-ampere fused jumper between the 5-volt reference circuit and the appropriate door position signal circuit of the HVAC door actuator. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Door Actual parameter. Does the scan tool indicate that the appropriate Door Actual parameter is greater than the specified value?	230 counts	Go to **Step 5**	Go to **Step 8**
5	1. Disconnect the fused jumper. 2. Measure the voltage between the 5-volt reference circuit and the low reference circuit of the HVAC door actuator. Does the voltage measure less than the specified value?	5.5 V	Go to **Step 6**	Go to **Step 7**
6	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. 3. Measure the resistance from the low reference circuit of the HVAC door actuator to a good ground.	5 ohm		

	Does the resistance measure less than the specified value?		Go to **Step 12**	Go to **Step 11**
7	Test the 5-volt reference circuit of the appropriate HVAC door actuator 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 16**	Go to **Step 13**
8	Test the 5-volt reference circuit of the appropriate HVAC door actuator for a short to ground, for a high resistance, or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 16**	Go to **Step 9**
9	Test the appropriate door position signal circuit of the HVAC door actuator for a short to ground, for a high resistance, or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 16**	Go to **Step 13**
10	Test the appropriate door position signal circuit of the HVAC door actuator 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 16**	Go to **Step 13**
11	1. Disconnect the HVAC control module. 2. Test the low reference circuit of the appropriate HVAC door actuator for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 16**	Go to **Step 13**
12	Inspect for poor connections at the harness connector of the appropriate HVAC door 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 16**	Go to **Step 14**
13	Inspect for poor 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 16**	Go to **Step 15**
	IMPORTANT: **Perform the calibration procedure for HVAC door actuators.** Replace the HVAC door actuator. Refer to the			

14	appropriate replacement procedure: • **Recirculation Actuator Replacement** • **Mode Actuator Replacement** • **Air Temperature Actuator Replacement - Right** • **Air Temperature Actuator Replacement - Left** Did you complete the replacement?	-	Go to **Step 16**	-
15	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 16**	-
16	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle according to the Conditions for Running in the DTC, as specified in the supporting text. Does the DTC set again?	-	Go to **Step 2**	System OK

DTC B0263, B0268, B0408, OR B0418

Circuit Description

The following DTC's are for the HVAC door actuators:

- B0263 is for the mode actuator.
- B0268 is for the recirculation actuator.
- B0408 is for the left air temperature actuator.
- B0418 is for the right air temperature actuator.

The HVAC control module controls the HVAC door actuators to regulate the airflow through the HVAC system. Each actuator consists of a stepper motor, a logic circuit, and a potentiometer. The potentiometer inside the door actuator allows the module to monitor the current position of the actuator drive shaft. The logic circuit inside the actuators receives control signals from the HVAC control module and controls the internal stepper motor. When a door positional change is required, the HVAC control module calculates a commanded door position. The module compares the commanded door position to the actual door position and determines the needed direction of motor rotation. The module applies a signal voltage to the door control circuit that is an input to the internal logic circuit of the door actuator. A 5 volt signal increases the door position. A 0 volt signal decreases the door position. When the commanded door position is equal to the actual door position, the HVAC control module sends a 2.5 volt signal to the door actuator and motor rotation stops. The ignition 3 voltage circuit provides source voltage to the logic circuit. The module provides ground to the actuator logic circuit through the low reference circuit.

Conditions for Running the DTC

- Source voltage is 8.7-16.5 volts.
- The ignition is ON.
- The HVAC control module commands the actuator to move.

Conditions for Setting the DTC

The actual door position is not near the commanded door position.

Action Taken When the DTC Sets

The HVAC control module does not command the actuator to move for the remainder of the ignition cycle.

Conditions for Clearing the DTC

- The DTC becomes history during the next ignition cycle in which the HVAC control module no longer detects a stall condition.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

- If the condition is not present refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- Inspect the appropriate door and door actuator for the following conditions:
  - A misaligned door actuator
  - Binding linkages
  - A binding door
  - An obstruction that prevents the door actuator from operating within the full range of motion

Test Description

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

2: Determines if the HVAC door actuator is stalled.

3: Applies control circuit voltages to the input of the HVAC door actuator.

DTC B0263, B0268, B0408, or B0418

Step	Action	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference: HVAC Connector End Views**			
	Did you perform the HVAC Diagnostic System Check?		Go to **Diagnostic System Check -**

1		Go to **Step 2**	**HVAC Systems - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the appropriate HVAC door actuator ON and OFF while observing the corresponding Door Actual parameter in the Heating and Air Conditioning Data List. Does the scan tool indicate that the value of the appropriate Door Actual parameter changes?	Go to Diagnostic Aids	Go to **Step 3**
3	1. Observe the appropriate HVAC door actuator drive shaft. 2. Connect a 3 amp fused jumper wire between appropriate door control circuit at the HVAC control module and a good ground. 3. Disconnect the fused jumper wire. 4. Connect a 3 amp fused jumper wire between the appropriate door control circuit and the 5 volt reference circuit at the HVAC control module. Does the drive shaft of the appropriate HVAC door actuator rotate?	Go to **Step 8**	Go to **Step 4**
4	Test the door control circuit of the appropriate HVAC door actuator for a short to voltage, for a short to ground, or for an open. 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 5**
5	1. Turn OFF the ignition. 2. Disconnect the fused jumper wire. 3. Disconnect the appropriate HVAC door actuator. 4. Turn ON the ignition, with the engine OFF. 5. Probe the ignition 3 voltage circuit of the appropriate HVAC door actuator with a test lamp that is connected to ground. Does the test lamp illuminate?	Go to **Step 6**	Go to **Step 9**
	Inspect the appropriate door and the door actuator for the following conditions: • A misaligned door actuator. • Binding linkages		

6	• A binding door • An obstruction that prevents the HVAC door actuator from operating within the full range of motion Did you find and correct the condition?	Go to **Step 12**	Go to **Step 7**
7	Inspect for poor connections at the harness connector of the appropriate HVAC door 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**
8	Inspect for poor 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 12**	Go to **Step 11**
9	Repair the ignition 3 voltage circuit of the appropriate HVAC door actuator. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 12**	-
10	**IMPORTANT:** **Perform the calibration procedure for HVAC door actuators.** Replace the appropriate HVAC door actuator. Refer to the appropriate replacement procedure: • **Recirculation Actuator Replacement** • **Mode Actuator Replacement** • **Air Temperature Actuator Replacement - Right** • **Air Temperature Actuator Replacement - Left** Did you complete the replacement?	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 12**	-
12	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle according to the Conditions for Running in the DTC as specified in the supporting text. Does the DTC set again?	Go to **Step 2**	System OK

DTC B1375

Circuit Description

The ignition 3 voltage circuit is a discrete input to the HVAC control module. The HVAC control modules uses the input to determine that the ignition switch is in the RUN position. When the ignition switch is in the RUN position, ignition voltage is applied to the input.

Conditions for Running the DTC

- Source voltage is 8.7-16.5 volts.
- The HVAC control module receives a RUN power mode message from the BCM over the class 2 serial data circuit.

Conditions for Setting the DTC

The HVAC control module does not detect ignition voltage on the ignition 3 voltage input.

Action Taken When the DTC Sets

The HVAC control module will continue to operate using the class 2 power mode messaging.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 100 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

DTC B1375

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 - Automatic**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the HVAC control module display DTC function on the scan tool. Does the scan tool indicate that B1375 is a current DTC?	Go to **Step 3**	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems
3	1. Turn OFF the ignition. 2. Disconnect the HVAC control module. 3. Turn ON the ignition, with the engine OFF. 4. Probe the ignition 3 voltage circuit with a test lamp that is connected to a good ground.	Go to	

	Does the test lamp illuminate?	**Step 4**	Go to **Step 5**
4	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**
5	Repair the ignition 3 voltage circuit. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 7**	-
6	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 7**	-
7	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 3**	System OK

DTC P0530

Circuit Description

The powertrain control module (PCM) monitors the high side refrigerant pressure via a A/C refrigerant pressure sensor. When the pressure is high the signal voltage is high. When the pressure is low the signal voltage is low. When pressure is too high the PCM will not allow the A/C compressor clutch to engage.

Conditions for Running the DTC

The PCM detects an A/C request.

Conditions for Setting the DTC

- The A/C refrigerant pressure sensor signal is less than 0.1 volts for 5 seconds.
- The A/C refrigerant pressure sensor signal is greater than 4.9 volts for 5 seconds.

Action Taken When the DTC Sets

The malfunction indicator lamp (MIL) will not illuminate.

Conditions for Clearing the DTC

- The DTC will become history if the PCM no longer detects a failure.
- The history DTC will clear after 40 fault-free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

For an intermittent, 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.

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

4: 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.

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

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

DTC P0530

Step	Action	Value (s)	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 - Automatic**
2	1. Turn ON the ignition with the engine OFF. 2. With a scan tool, observe the A/C Pressure Sensor parameter in the Powertrain Engine Data list. Does the scan tool indicate the A/C Pressure Sensor parameter is within the specified range?	0.1-4.9 V	Go to Diagnostic Aids	Go to **Step 3**
3	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 Pressure Sensor parameter. Does the scan tool indicate that the A/C Pressure Sensor parameter is less than the specified value?	0.09 V	Go to **Step 4**	Go to **Step 10**
	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.			

4	3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the A/C Pressure Sensor parameter. Does the scan tool indicate that the A/C Pressure Sensor parameter is greater than the specified value?	4.9 V	Go to **Step 8**	Go to **Step 5**
5	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 circuit of the A/C refrigerant pressure sensor. Does the voltage measure less than the specified value?	5.1 V	Go to **Step 6**	Go to **Step 7**
6	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 12**	Go to **Step 11**
7	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 16**	Go to **Step 13**
8	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 16**	Go to **Step 9**
9	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 16**	Go to **Step 13**
10	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 16**	Go to **Step 13**
11	1. Disconnect the powertrain 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 16**	Go to **Step 13**
12	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 16**	Go to **Step 14**
13	Inspect for poor connections at the harness connector of the powertrain 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 16**	Go to **Step 15**
14	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 16**	Go to **Step 15**
15	**IMPORTANT:** **Perform the programming procedure for the powertrain control module.** Replace the powertrain control module. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 4.8L, 5.3L, 6.0L.Did you complete the replacement?	-	Go to **Step 16**	-
16	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 - AUTOMATIC

IMPORTANT: The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic System Check - HVAC Systems - Automatic** before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control module can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to

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

Visual/Physical Inspection

1. Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
2. Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
3. Verify the A/C compressor clutch turns freely and is not seized.
4. Verify that the customer is using the correct key to enable personalization.
5. The A/C compressor will not operate in cold outside air temperatures. Refer to **Air Temperature Description and Operation** .
6. The following conditions may 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
7. 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**

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

HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE

Diagnostic Aids

A/C compressor clutch will not engage under the following conditions:

- The A/C high side line pressure is over 2957 kPa (429 psi).
- The A/C low side line pressure is under 138-172 kPa (20-25 psi).

To accurately determine what pressure the A/C low pressure switch opens and closes at, use Kent Moore GE-47742 which will allow the technician to measure the switch point pressure at the switch.

Using a scan tool, monitor the "low pressure switch" status while monitoring the "low side" pressure at the switch to determine the switch points of the low pressure switch.

The low pressure switch "connector seal" must be removed before plugging it into the switch for testing. The "plunger effect" of plugging the connector with seal into the switch induces a pressure on the back side of the switch, this pressure will skew the opening/closing characteristics of the switch 5-10 psi until the pressure bleeds off. The time required for the connection induced pressure to bleed off can take 20 minutes or longer.

Test Description

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

2: The A/C compressor output is disabled if the engine is idling at a low unstable RPM.

3: The A/C compressor relay output is disabled if engine coolant temperature is above 121° C (250° F). The engine coolant indicator will illuminate at this temperature.

4: This step ensures that the HVAC control module is receiving an input from the A/C switch.

5: These actions will enable the A/C compressor to operate.

6: This test ensures that there is sufficient refrigerant in the A/C system. The specific values come from the A/C System Performance Test in Heating, Ventilation and Air Conditioning.

8: The A/C Low Pressure Switch parameter is out of range when the HVAC control module interprets the signal being below 138-172 kPa (20-25 psi).

9: This action will simulate a closed switch condition. If the Pressure Cycle Switch parameter reads Low Pressure than there is a circuit condition or a condition with the HVAC control module.

12: The A/C compressor relay output from the powertrain control module (PCM) is disabled if the A/C

high side system pressure is interpreted to be higher than 2958 kPa (429 psi).

HVAC Compressor Clutch Does Not Engage

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 engage when 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 - Automatic**
2	1. Start the engine. 2. Set the parking brake. 3. Place the vehicle in drive and allow the engine to idle. 4. Observe the engine RPM. Does the engine idle at a steady RPM?	-	Go to **Step 3**	Go to **Rough, Unstable, or Incorrect Idle and Stalling** in Engine Controls - 4.8L, 5.3L, and 6.0L
3	1. Start the engine. 2. Observe the engine coolant temperature indicator. Is the engine coolant temperature indicator illuminated?	-	Go to **Diagnostic System Check - Engine Cooling** in Engine Cooling	Go to **Step 4**
4	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the A/C Switch parameter in the Heating and Air Conditioning data list. 4. Activate the A/C request switch. Does the scan tool indicate that the A/C Switch parameter changes states?	-	Go to **Step 5**	Go to **Step 26**
5	**IMPORTANT:** **For A/C compressor operation, the ambient air temperature must be above 5° C (40° 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 left air temperature switch in the coldest position. Does the A/C compressor clutch engage?		Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 6**
6	1. Park the vehicle inside or out of direct sunlight. 2. Open the window in order to ventilate the interior of the vehicle. 3. Turn OFF the ignition. 4. If the A/C system was operating, then wait for approximately 2 minutes. 5. Install **J 43600** . 6. Record the ambient 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. Are the low and the high side pressure values within the allowable limits for the recorded ambient air temperature. Are the pressure values within 103 kPa (15 psi) of each other?	Above 16° C (60° F) 345 kPa (50 psi) Above 24° C (75° F) 483 kPa (70 psi) Above 33° C (90° F) 690 kPa (100 psi)	Go to **Step 7**	Go to **Leak Testing** in Heating, Ventilation and Air Conditioning
7	1. Start the engine. 2. With a scan tool, observe the A/C Permission parameter in the Heating and Air Conditioning data list. Does the A/C Permission parameter display Granted?	-	Go to **Step 14**	Go to **Step 8**
	1. Turn the ignition OFF. 2. Turn ON the ignition, with the engine OFF.			

8	3. With a scan tool, observe the Pressure Cycle Switch parameter in the Heating and Air Conditioning data list. Does the Pressure Cycle Switch parameter display Normal?	-	Go to **Step 12**	Go to **Step 9**
9	1. Turn OFF the ignition. 2. Disconnect the A/C low pressure switch. 3. Turn ON the ignition, with the engine OFF. 4. Connect a 3-ampere fused jumper between the signal circuit and the ground circuit of the A/C low pressure switch. 5. Observe the Pressure Cycle Switch parameter in the Heating and Air Conditioning data list. Does the Pressure Cycle Switch parameter display Normal?	-	Go to **Step 23**	Go to **Step 10**
10	Test the signal circuit of the A/C low pressure switch for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 11**
11	Test the ground circuit of the A/C low pressure switch for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 26**
12	With a scan tool, observe the A/C Pressure Sensor parameter in the Powertrain Engine Data list. Is the parameter less than the specified value?	2958 kPa (429 psi)	Go to **Step 26**	Go to **Step 13**
	1. Turn OFF the ignition. 2. If the A/C system was operating, then wait for approximately 2 minutes. 3. Install **J 43600** .			

13	4. Turn ON the ignition, with the engine OFF. 5. With a scan tool, observe the A/C Pressure Sensor parameter in the Powertrain data list. 6. Compare the A/C high side pressure on the scan tool to the high side pressure on **J 43600** . Are the high side pressure values within 103 kPa (15 psi) of each other?	-	Go to **Air Conditioning (A/C) System Performance Test** in Heating, Ventilation and Air Conditioning	Go to **Step 24**
14	1. Start the engine. 2. With a scan tool, command the A/C Permission to Granted and Withheld. Does the relay turn ON and OFF with each command?	-	Go to **Step 15**	Go to **Step 19**
15	1. Turn OFF the ignition. 2. Test the battery positive voltage circuit of the A/C compressor clutch relay for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 16**
16	1. Turn OFF the ignition. 2. Connect a 10-ampere fused jumper between the battery positive circuit of the A/C compressor relay and the A/C compressor supply voltage circuit. 3. Disconnect the A/C compressor connector. 4. Turn ON the ignition, with engine OFF. 5. Connect a test lamp between the A/C compressor supply voltage circuit and the ground circuit of the A/C compressor. Does the test light illuminate?	-	Go to **Step 25**	Go to **Step 17**

17	Test the supply voltage circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 18**
18	Test the ground circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 22**
19	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 ignition 3 voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to ground. Does the test lamp illuminate?	-	Go to **Step 20**	Go to **Step 28**
20	1. Start the engine. 2. Connect a test lamp between the control circuit and the ignition 3 voltage circuit of the A/C compressor clutch relay. 3. With a scan tool, command the A/C Permission to Granted. Does the test lamp illuminate?	-	Go to **Step 22**	Go to **Step 21**
21	1. Turn OFF the ignition. 2. Test the A/C compressor clutch control circuit of the PCM for a high resistance or for an open. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 27**
	1. Turn OFF the ignition. 2. Inspect for poor connections at the			

22	A/C compressor clutch relay. 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 35**	Go to **Step 29**
23	Inspect for poor connections at the harness connector of the A/C low pressure switch. 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 35**	Go to **Step 30**
24	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 to **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 35**	Go to **Step 31**
25	Inspect for poor connections at the harness connector of the A/C compressor. 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 35**	Go to **Step 32**
26	Inspect for poor 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 35**	Go to **Step 33**
27	Inspect for poor connections at the harness connector of the powertrain control module (PCM). 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 35**	Go to **Step 34**
28	Repair the ignition 3 voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	-	Go to **Step 35**	-

29	Replace the A/C compressor clutch relay. Did you complete the replacement?	-	Go to **Step 35**	-
30	Replace the A/C low pressure switch. Refer to **Air Conditioning (A/C) Low Pressure Switch Replacement** in Heating, Ventilation, and Air Conditioning. Did you complete the replacement?	-	Go to **Step 35**	-
31	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 35**	-
32	Replace the A/C compressor clutch. Refer to **Compressor Clutch Plate/Hub Assembly Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	-	Go to **Step 35**	-
33	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 35**	-
34	**IMPORTANT:** **Program the PCM.** Replace the PCM. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.Did you complete the replacement?	-	Go to **Step 35**	-
35	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 5**

HVAC COMPRESSOR CLUTCH DOES NOT DISENGAGE

Test Description

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

2: These actions will disable the HVAC control module output to powertrain control module (PCM).

HVAC Compressor Clutch Does Not Disengage

Step	Action	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 - Automatic**
2	1. Start the engine. 2. Turn OFF the HVAC controls. 3. Place the A/C request switch in the OFF position. Does the A/C compressor clutch engage?	Go to **Step 3**	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems
3	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch. 3. Turn On the ignition, with the engine OFF. 4. Probe the supply voltage circuit of the A/C compressor clutch with a test lamp that is connected to ground. Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 8**
4	Test the supply voltage circuit of the A/C compressor clutch 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 13**	Go to **Step 5**
5	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn On the ignition, with the engine OFF. 4. Connect a test lamp between the control circuit and the ignition-3 voltage circuit of the A/C compressor clutch relay. Does the test lamp illuminate?	Go to **Step 6**	Go to **Step 7**
6	Test the control circuit of the A/C compressor clutch relay for a short to ground. Refer to **Circuit Testing** and to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 9**
7	Inspect for poor connections at the A/C compressor clutch relay. 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 13**	Go to **Step 10**
	Inspect for poor connections at the harness connector of the A/C compressor clutch. Refer to **Testing for Intermittent**		

8	**Conditions and Poor Connections** and to **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 powertrain control module (PCM). 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 13**	Go to **Step 12**
10	Replace the A/C compressor clutch relay. Did you complete the replacement?	Go to **Step 13**	-
11	Replace the A/C compressor clutch. Refer to **Compressor Clutch Plate/Hub Assembly Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	Go to **Step 13**	-
12	**IMPORTANT:** **Program the PCM.** Replace the PCM. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 4.8L, 5.3L, 6.0L.Did you complete the replacement?	Go to **Step 13**	-
13	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 number below refers to the step number on the diagnostic table.

4: The blower motor parameter must be commanded ON before an OFF command will function.

Blower Motor Always On

Step	Action	Values	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The blower motor operates with the HVAC controls in the OFF position.				
1	Did you perform the HVAC Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Automatic**
2	1. Turn the ignition ON, with the engine OFF. 2. Turn OFF the HVAC controls.	-	Go to **Testing for Intermittent Conditions and Poor Connections**	

	Is the blower motor OFF?		in Wiring Systems	Go to **Step 3**
3	With a scan tool observe the Blower Motor PWM Speed parameter in the Heating and Air Conditioning data list. Does the scan tool indicate that the Blower Motor PWM Speed parameter is near the specified value?	0%	Go to **Step 4**	Go to **Step 6**
4	1. With a scan tool, command the Blower Motor parameter ON in the Heating and Air Conditioning Scan Tool Output Controls. 2. Command the Blower Motor parameter OFF. Does the blower motor turn OFF?	-	Go to **Step 6**	Go to **Step 5**
5	Inspect for poor connections at the harness connector of the blower motor control processor. Refer to **Wiring Repairs** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 9**	Go to **Step 7**
6	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 9**	Go to **Step 8**
7	Replace the blower motor control processor. Refer to **Blower Motor Control Processor Replacement** . Did you complete the replacement?	-	Go to **Step 9**	-
8	**IMPORTANT:** **Perform the recalibration procedure for the HVAC control module.** Replace the HVAC control module. Refer to **HVAC Control Module Replacement** .Did you complete the replacement?	-	Go to **Step 9**	-
9	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**

BLOWER MOTOR INOPERATIVE

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 - Automatic**
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 of the speed positions?	Go to **Blower Motor Malfunction**	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the blower motor connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the blower motor supply voltage circuit and the blower motor ground circuit. 5. Place the blower motor switch in the maximum speed position. 6. Place the air temperature switch to the warmest position. Does the test lamp illuminate?	Go to **Step 10**	Go to **Step 4**
4	1. Disconnect the blower motor control processor. 2. Connect a test lamp between the battery positive voltage circuit and the ground circuit of the blower motor control processor. Does the test lamp illuminate?	Go to **Step 8**	Go to **Step 5**
5	Connect a test lamp between the battery positive voltage circuit of the blower motor control processor and a good ground. Does the test lamp illuminate?	Go to **Step 7**	Go to **Step 6**
6	Repair the battery positive voltage circuit of the blower motor control processor. Refer to **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 16**	-
7	Repair the ground circuit of the blower motor control processor. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	Go to **Step 16**	-
	1. Connect a test lamp between the blower motor		

8	speed control circuit and the battery positive voltage circuit of the blower motor control processor. 2. Observe the test lamp. 3. Place the blower motor switch from the minimum speed position to the maximum speed position. Does the test lamp increase intensity when the blower speed is increased?	Go to **Step 11**	Go to **Step 9**
9	Test the blower motor speed control circuit of the blower motor control processor for an open, short to ground, or short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 16**	Go to **Step 12**
10	Inspect for poor connections at the harness connector of 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 16**	Go to **Step 13**
11	Inspect for poor connections at the harness connector of the blower motor control processor. 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 16**	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 16**	Go to **Step 15**
13	Replace the blower motor. Refer to **Blower Motor Replacement** in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	Go to **Step 16**	-
14	Replace the blower motor control processor. Refer to **Blower Motor Control Processor Replacement** . Did you complete the replacement?	Go to **Step 16**	-
15	**IMPORTANT:** **Perform the recalibration procedure for the HVAC control module.** Replace the HVAC control module. Refer to **HVAC Control Module Replacement** .Did you complete the replacement?	Go to **Step 16**	-
16	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

2: This step verifies that the HVAC control module Fan Up Switch parameter matches the requested state of the blower motor switch.

3: This step verifies that the HVAC control module Fan Down Switch parameter matches the requested state of the blower motor switch.

Blower Motor Malfunction

Step	Action	Values	Yes	No
Schematic Reference:HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The blower motor operates in at least one speed position.				
1	Did you perform the HVAC Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Automatic**
2	1. Turn ON the ignition, with the engine OFF. 2. With a scan tool, observe the Fan Up Button parameter in the Heating and Air Conditioning data list. 3. Activate the fan up switch. Does the scan tool indicate that the Fan Up Button parameter changes state?	-	Go to **Step 3**	Go to **Step 10**
3	1. With a scan tool, observe the Fan Down Button parameter in the Heating and Air Conditioning data list. 2. Activate the fan down switch. Does the scan tool indicate that the Fan Down Button parameter changes state?	-	Go to **Step 4**	Go to **Step 10**
4	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 5**
5	1. Disconnect the harness connector of the blower motor control processor. 2. Measure the voltage between the battery positive voltage circuit and the ground circuit of the blower motor control	10-14 V		

	processor. Does the voltage measure within the specified range?		Go to **Step 6**	Go to **Step 8**
6	1. Connect the blower motor control processor. 2. Disconnect the harness connector of the HVAC control module. 3. Measure the voltage on the blower motor speed control circuit. Does the voltage measure within the specified range?	4.5-5.5 V	Go to **Step 9**	Go to **Step 7**
7	Test the control circuit of the blower motor control processor for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 9**
8	Test the battery positive voltage circuit of the blower motor control processor for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 11**
9	Inspect for poor connections at the harness connector of the blower motor control processor. 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 14**	Go to **Step 12**
10	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 14**	Go to **Step 13**
11	Repair a high resistance in the ground circuit of the blower motor control processor. Refer to **Circuit Testing** in Wiring Systems. Did you complete the repair?	-	Go to **Step 14**	-
12	Replace the blower motor control processor. Refer to **Blower Motor Control Processor Replacement** . Did you complete the replacement?	-	Go to **Step 14**	-
	IMPORTANT: **Perform the recalibration procedure for the**			

	HVAC control module.			
13	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** .Did you complete the replacement?	-	Go to **Step 14**	-
14	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**

TOO HOT IN VEHICLE

Diagnostic Aids

- The condition may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- The air temperature actuators can be calibrated. Refer to **Re-Calibrating Actuators** .
- If the door actuators are out of the calibrated range the auto recirculation function will not work. The vehicle operator must place the HVAC controls to the recirculation position manually. Ensure to perform an actuator recalibration to correct this condition.

Test Description

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

6: Ambient air temperature must be above 3° C (38° F) in order for this A/C compressor test to be run.

8: This step ensures that the lower air temperature sensors operate properly. The LH and RH Heater Duct Actual parameter count values should lower as the air temperature of the ducts get warmer. If there is a high resistance in either of the air temperature sensors circuits or the sensor itself then the count value of the effected sensor would remain high.

9: This step ensures that the upper air temperature sensors operate properly. The LH and RH AC Duct Actual parameter count values should lower as the air temperature of the ducts get warmer. If there is a high resistance in either of the air temperature sensors circuits or the sensor itself then the count value of the effected sensor would remain high.

14: Use the following table to determine that the recorded scan tool values are within range for the recorded probe temperatures of the **J 43600** .

Too Hot in Vehicle

Temperature ° C	Temperature ° F	Scan Tool Display
0-4	32-40	206-175 counts
5-9	41-49	194-161 counts
10-14	50-58	180-145 counts
15-19	59-67	166-133 counts
20-24	68-76	150-119 counts
25-29	77-85	136-106 counts

30-34	86-94	121-93 counts
35-39	95-103	107-81 counts
40-44	104-112	94-69 counts
45-49	113-121	83-59 counts
50-54	122-130	72-51 counts
55-59	131-139	63-44 counts
60-64	140-148	55-37 counts

Too Hot in Vehicle

Step	Action	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: Temperature can not be adjusted, or cooling insufficient during A/C operation.			
1	Did you perform the HVAC Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Automatic**
2	**IMPORTANT:** **If during this diagnostic procedure the HVAC control module is disconnected a recalibration of actuators must be performed to avoid misdiagnosis.** 1. Recalibrate actuators. Refer to **Re-Calibrating Actuators** . 2. Turn ON the ignition, with the engine OFF. 3. Observe the in Heating and Air Conditioning. Does the scan tool display any DTC B0229, B0414, B0424 or B3770?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Step 3**
3	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?	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate in each speed?	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the mode switch in the PANEL position. 2. Place the recirculation switch in the ON position. 3. Observe the recirculation door. 4. Place the recirculation switch in the OFF position. Does the recirculation door move from the recirculation		Go to **Air Recirculation**

	position to the outside air position?	Go to **Step 6**	**Malfunction**
6	1. Start the engine. 2. Observe the A/C compressor clutch. 3. Place the A/C request switch in the ON position. Does the A/C compressor engage?	Go to **Step 7**	Go to **HVAC Compressor Clutch Does Not Engage**
7	Perform the refrigerant system performance test. Refer to **Air Conditioning (A/C) System Performance Test** . Did you find and correct the condition?	Go to **Step 31**	Go to **Step 8**
8	1. Start the engine. 2. Wait until engine coolant temperature reaches its normal operating temperature. 3. Place the mode switch to the Floor position. 4. Place the drivers air temperature switch to the warmest position. 5. With a scan tool, observe the right and left Heater Duct Actual and Heater Duct Desired parameters. 6. Wait 3 minutes to allow the duct air temperature to stabilize. Do both of the Heater Duct Actual parameter values increase within 15 Counts of the Heater Duct Desired parameter?	Go to **Step 9**	Go to **Step 21**
9	1. Place the mode switch to the Panel position. 2. Place the drivers air temperature switch to the warmest position. 3. With a scan tool, observe the right and left AC Duct Actual and AC Duct Desired parameters. 4. Wait 3 minutes to allow the duct air temperature to stabilize. Do both of the AC Duct Actual parameter values increase within 15 Counts of the AC Duct Desired parameter?	Go to **Step 10**	Go to **Step 21**
10	Check the air temperature sensors for proper installation. Refer to the following procedures: • **Air Temperature Sensor Replacement - Upper Right** • **Air Temperature Sensor Replacement - Upper Left** • **Air Temperature Sensor Replacement - Lower Left**		

	• **Air Temperature Sensor Replacement - Lower Right** • **Inside Air Temperature Sensor Assembly Replacement** Did you find and correct the condition?	Go to **Step 31**	Go to **Step 11**
11	1. Turn ON the ignition, with the engine OFF. 2. Inspect for air flow through the inside air temperature sensor assembly by placing a 5 cm (2 in) square piece of paper over the sensor air inlet. Does the paper stay in place?	Go to **Step 12**	Go to **Step 17**
12	1. Install a scan tool. 2. With a scan tool, observe the Left Solar Sensor and Right Solar Sensor parameters in the Body Control Module data list. 3. Direct a light source at the left and right sides of the sunload sensor assembly. Does the scan tool indicate that the values of the Left Solar Sensor and the Right Solar Sensor parameters change?	Go to **Step 13**	Go to **Step 25**
13	1. Place the temperature probe of the **J 43600** near the inside air temperature sensor assembly. 2. With a scan tool, observe the Inside Air Temp parameter in the Heating and Air Conditioning Data list. Does the scan tool indicate that the sensor temperature is within 3° C (5° F) of the thermometer temperature?	Go to **Step 14**	Go to **Step 20**
	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the left and right air temperature switches in the FULL COLD positions. 4. Place the mode switch in the bi-level position. 5. Wait 3 minutes to allow the discharge air temperatures to stabilize. 6. With a scan tool, record the values of the following parameters in the Heating and Air Conditioning data list:		

14	• LH AC Duct Actual • LH Heater Duct Actual • RH AC Duct Actual • RH Heater Duct Actual 7. With the temperature probes of the **J 43600** , record the air temperatures near the following sensors: • The left upper air temperature sensor • The left lower air temperature sensor • The right upper air temperature sensor • The right lower air temperature sensor Are the parameter values within the specified range for the recorded air temperatures?	Go to Diagnostic Aids	Go to **Step 15**
15	1. Turn OFF the ignition. 2. Disconnect the suspect air temperature sensor. 3. Place the temperature probe of the **J 43600** near the air temperature sensor. 4. Record the probe temperature. 5. Measure the resistance of the air temperature sensor. Refer to the **Sensor Resistance Table** . Does the resistance measure within the specified range ?	Go to **Step 16**	Go to **Step 24**
16	Test the signal circuit and the low reference circuit of the suspect air temperature sensor for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 31**	Go to **Step 26**
17	1. Turn the ignition OFF. 2. Disconnect the inside air temperature sensor assembly. 3. Turn ON the ignition, with the engine OFF. 4. Probe the fan motor supply voltage circuit of the inside air temperature sensor assembly with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 19**	Go to **Step 18**
18	Test the fan motor supply voltage circuit of the inside air temperature sensor assembly for an open, a high resistance, 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 31**	Go to **Step 26**
19	Test the ground circuit of the inside air temperature sensor 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 31**	Go to **Step 23**
20	1. Turn OFF the ignition. 2. Disconnect the inside air temperature sensor assembly. 3. Place the temperature probe of the **J 43600** near the inside air temperature sensor assembly. 4. Record the probe temperature. 5. Measure the resistance of the inside air temperature sensor. Refer to **Sensor Resistance Table** . Does the resistance measure within the specified range ?	Go to **Step 22**	Go to **Step 23**
21	Test the signal circuit and the low reference circuit of the appropriate air temperature sensor for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 31**	Go to **Step 24**
22	Test the signal circuit and the low reference circuit of the inside air temperature sensor assembly for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 31**	Go to **Step 26**
23	Inspect for poor connections at the harness connector of the inside air temperature sensor 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 31**	Go to **Step 29**
24	Inspect for poor connections at the harness connector of the appropriate air 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 31**	Go to **Step 27**
25	Inspect for poor connections at the harness connector of the sunload sensor 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 31**	Go to **Step 28**
26	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 31**	Go to **Step 30**
27	Replace the appropriate air temperature sensor. Refer to one of the following procedures: • **Air Temperature Sensor Replacement - Upper Right** • **Air Temperature Sensor Replacement - Upper Left** • **Air Temperature Sensor Replacement - Lower Left** • **Air Temperature Sensor Replacement - Lower Right** Did you complete the replacement?	Go to **Step 31**	-
28	Replace the sunload sensor. Refer to **Sun Load Sensor Replacement** . Did you complete the replacement?	Go to **Step 31**	-
29	Replace the inside air temperature sensor assembly. Refer to **Inside Air Temperature Sensor Assembly Replacement** . Did you complete the replacement?	Go to **Step 31**	-
30	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 31**	-
31	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

TOO COLD IN VEHICLE

Diagnostic Aids

- The condition may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- The air temperature actuators can be calibrated. Refer to **Re-Calibrating Actuators** .

Test Description

The numbers below refers to the step numbers in the diagnostic table.

8: This step ensures that the lower air temperature sensors operate properly. The LH and RH Heater Duct Actual parameter count values should lower as the air temperature of the ducts get warmer. If there is a high resistance in either of the air temperature sensors circuits or the sensor itself then the count value of the effected sensor would remain high.

9: This step ensures that the upper air temperature sensors operate properly. The LH and RH AC Duct

Actual parameter count values should lower as the air temperature of the ducts get warmer. If there is a high resistance in either of the air temperature sensors circuits or the sensor itself then the count value of the effected sensor would remain high.

15: Use the following table to determine that the recorded scan tool values are within range for the recorded probe temperatures.

Too Cold in Vehicle

Temperature ° C	Temperature ° F	Scan Tool Display
0-4	32-40	206-175 counts
5-9	41-49	194-161 counts
10-14	50-58	180-145 counts
15-19	59-67	166-133 counts
20-24	68-76	150-119 counts
25-29	77-85	136-106 counts
30-34	86-94	121-93 counts
35-39	95-103	107-81 counts
40-44	104-112	94-69 counts
45-49	113-121	83-59 counts
50-54	122-130	72-51 counts
55-59	131-139	63-44 counts
60-64	140-148	55-37 counts

Too Cold in Vehicle

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature can not be adjusted, or heating is insufficient.				
1	Did you perform the HVAC Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - HVAC Systems - Automatic**
2	**IMPORTANT:** **If during this diagnostic procedure the HVAC control module is disconnected a recalibration of actuators must be performed to avoid misdiagnosis.** 1. Recalibrate actuators. Refer to **Re-Calibrating Actuators** . 2. Turn ON the ignition, with the engine OFF. 3. Observe the in Heating and Air Conditioning.	-	Go to **Diagnostic**	

	Does the scan tool display any DTC B0229, B0414, B0424 or B3770?		**Trouble Code (DTC) List**	Go to **Step 3**
3	1. Turn ON the ignition, with the engine OFF. 2. Turn ON the HVAC control module. 3. Place the mode switch in the PANEL position. 4. Place the blower motor switch in each speed position. Does the blower motor operate in any of the speed positions speed?	-	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate in all desired speed positions?	-	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the recirculation switch in the ON position. 2. Observe the recirculation door. 3. Place the recirculation switch in the OFF position. Does the recirculation door move from the recirculation position to the outside air position?	-	Go to **Step 6**	Go to **Air Recirculation Malfunction**
6	1. Start the engine. 2. Place the A/C request switch in the ON position. 3. Observe the A/C compressor clutch. 4. Place the A/C request switch in the OFF position. Does the A/C compressor clutch disengage?	-	Go to **Step 7**	Go to **HVAC Compressor Clutch Does Not Disengage**
7	Perform the Heating Performance Diagnostic. Refer to **Heating Performance Diagnostic** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 08**
8	1. Start the engine. 2. Wait until engine coolant temperature reaches its normal operating temperature. 3. Place the mode switch to the Floor position. 4. Place the drivers air temperature switch to the warmest position. 5. With a scan tool, observe the right and left Heater Duct Actual and Heater Duct Desired parameters.	-		

	6. Wait 3 minutes to allow the duct air temperature to stabilize. Do both of the Heater Duct Actual parameter values increase within 15 Counts of the Heater Duct Desired parameter?		Go to **Step 9**	Go to **Step 21**
9	1. Place the mode switch to the Panel position. 2. Place the drivers air temperature switch to the warmest position. 3. With a scan tool, observe the right and left AC Duct Actual and AC Duct Desired parameters. 4. Wait 3 minutes to allow the duct air temperature to stabilize. Do both of the AC Duct Actual parameter values increase within 15 Counts of the AC Duct Desired parameter?	-	Go to **Step 10**	Go to **Step 21**
10	Check the air temperature sensors for proper installation. Refer to the following procedures: • **Air Temperature Sensor Replacement - Upper Right** • **Air Temperature Sensor Replacement - Upper Left** • **Air Temperature Sensor Replacement - Lower Left** • **Air Temperature Sensor Replacement - Lower Right** • **Inside Air Temperature Sensor Assembly Replacement** Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 11**
11	1. Turn ON the ignition, with the engine OFF. 2. Inspect for air flow through the inside air temperature sensor assembly by placing a 5 cm (2 in) square piece of paper over inlet of the inside air temperature sensor assembly. Does the paper stay in place?	-	Go to **Step 13**	Go to **Step 12**
	1. Turn the ignition OFF.			

12	2. Disconnect the inside air temperature sensor assembly. 3. Turn ON the ignition, with the engine OFF. 4. Probe the fan motor supply voltage circuit of the inside air temperature sensor assembly with a test lamp that is connected to a good ground. Does the test lamp illuminate?	-	Go to **Step 18**	Go to **Step 17**
13	1. Turn ON the ignition with the engine OFF. 2. Install a scan tool. 3. Cover the sunload sensor. 4. With a scan tool, observe the Left Solar Sensor and Right Solar Sensor parameters in the Body Control Module data list. Does the scan tool indicate that the Left Solar Sensor and Right Solar Sensor parameters are greater than the specified value?	220 Counts	Go to **Step 14**	Go to **Step 23**
14	1. Place the temperature probe of the **J 43600** near the inside air temperature sensor assembly. 2. With a scan tool, observe the Inside Air Temp parameter in the Heating and Air Conditioning Data list. Does the scan tool indicate that the Inside Air Temp parameter is within 3° C (5° F) of the probe temperature?	-	Go to **Step 15**	Go to **Step 19**
	1. Start the engine. 2. Place the blower motor switch in the minimum speed position. 3. Allow the engine to reach normal operating temperature. 4. Place the blower motor switch in the maximum speed position. 5. Place the left and right air temperature switches in the FULL HOT positions. 6. Place the mode switch in the bi-level position. 7. Wait 3 minutes to allow the discharge air temperatures to stabilize.			

15	8. With a scan tool, record the values of the following parameters in the Heating and Air Conditioning data list: • LH AC Duct Actual • LH Heater Duct Actual • RH AC Duct Actual • RH Heater Duct Actual 9. With the temperature probes of the **J 43600** , record the air temperatures near the following sensors: • The left upper air temperature sensor • The left lower air temperature sensor • The right upper air temperature sensor • The right lower air temperature sensor Are the parameter values within the specified range for the recorded air temperatures?	-	Go to Diagnostic Aids	Go to **Step 16**
16	1. Turn OFF the ignition. 2. Disconnect the suspect air temperature sensor. 3. Place the temperature probe of the **J 43600** near the air temperature sensor. 4. Record the probe temperature. 5. Measure the resistance of the air temperature sensor. Refer to the **Sensor Resistance Table** . Does the resistance measure within the specified range ?	-	Go to **Step 24**	Go to **Step 22**
17	Test the fan motor supply voltage circuit of the inside air temperature sensor assembly for an open, a high resistance, 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 29**	Go to **Step 24**
18	Test the ground circuit of the inside air temperature sensor assembly 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 29**	Go to **Step 20**
	1. Turn OFF the ignition. 2. Disconnect the inside air temperature sensor			

19	assembly. 3. Place the temperature probe of the **J 43600** near the inside air temperature sensor assembly. 4. Record the probe temperature. 5. Measure the resistance of the inside air temperature sensor assembly. Refer to the **Sensor Resistance Table** . Does the resistance measure within the specified range ?	-	Go to **Step 24**	Go to **Step 20**
20	Inspect for poor connections at the harness connector of the inside air temperature sensor 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 29**	Go to **Step 27**
21	Test the signal circuit and the low reference circuit of the appropriate air temperature sensor for a high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 22**
22	Inspect for poor connections at the harness connector of the suspect air 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 29**	Go to **Step 25**
23	Inspect for poor connections at the harness connector of the sunload 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 29**	Go to **Step 26**
24	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 29**	Go to **Step 28**
	Replace the suspect air temperature sensor. Refer to one of the following procedures: • **Air Temperature Sensor Replacement - Upper Right**			

25	• **Air Temperature Sensor Replacement - Upper Left** • **Air Temperature Sensor Replacement - Lower Left** • **Air Temperature Sensor Replacement - Lower Right** Did you complete the replacement?	-	Go to **Step 29**	-
26	Replace the sunload sensor. Refer to **Sun Load Sensor Replacement** . Did you complete the replacement?	-	Go to **Step 29**	-
27	Replace the inside air temperature sensor assembly. Refer to **Inside Air Temperature Sensor Assembly Replacement** . Did you complete the replacement?	-	Go to **Step 29**	-
28	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 29**	-
29	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 3**

AIR DELIVERY IMPROPER

Diagnostic Aids

- The condition may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- Inspect the air delivery system for the following conditions:
  - An obstruction to the airflow
  - Air leaks
  - Misaligned air ducts
  - Broken or binding linkages or doors

Air Delivery Improper

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 - Automatic**
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 of the speed positions?	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	1. With a scan tool, observe the Mode Switch parameter in the Heating and Air Conditioning data list. 2. Activate the mode switch. Does the scan tool indicate that the Mode Switch parameter changes state?	Go to **Step 6**	Go to **Step 7**
6	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in the bi-level position. 3. Place the recirculation switch in the ON position. 4. Observe the drive shaft of the recirculation actuator. 5. Place the recirculation switch in the OFF position. Does the recirculation door move from the recirculation position to the outside air position?	Go to Diagnostic Aids	Go to **Air Recirculation Malfunction**
7	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 9**	Go to **Step 8**
8	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 9**	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

AIR RECIRCULATION MALFUNCTION

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 **Diagnostic System Check -**

		Go to **Step 2**	**HVAC Systems - Automatic**
2	1. Turn ON the ignition, with the engine OFF. 2. With a scan tool observe the Recirculate Switch Parameter. 3. Activate the recirculation switch. Does the scan tool indicate that the Recirculate Switch Parameter changes state?	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**
3	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 5**	Go to **Step 4**
4	Replace the HVAC control module. Refer to **HVAC Control Module Replacement** . Did you complete the replacement?	Go to **Step 5**	-
5	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

RE-CALIBRATING ACTUATORS

When replacing the HVAC control module it will be necessary to allow the HVAC control module to perform a calibration process. When installing the HVAC control module be sure to perform the following:

IMPORTANT: Do not adjust any controls on the HVAC control module while the HVAC control module is self-calibrating. If interrupted, improper HVAC performance will result.

1. Place the ignition switch to the OFF position.
2. Disconnect the scan tool.
3. Install the HVAC control module.
4. Connect all previously disconnected components.
5. Place the ignition switch in the RUN position.
6. Wait 40 seconds for the HVAC control module to self-calibrate.
7. Verify that no DTCs have set as current DTCs.

When replacing a HVAC actuator it will be necessary to allow the HVAC control module to perform a calibration process. When installing the HVAC actuator be sure to perform one of the following:

IMPORTANT: Do not adjust any controls on the HVAC control module while the HVAC control module is self-calibrating. If interrupted, improper HVAC performance will result.

Preferred Method (w/Scan Tool)

1. Clear all DTCs.
2. Place the ignition switch in the OFF position.
3. Install the HVAC actuator.
4. Connect all previously disconnected components.
5. Place the ignition switch in the RUN position.
6. With the scan tool, initiate the Motor Re-calibration feature of the Heating and Air Conditioning Special Functions menu.
7. Verify that no DTCs have set as current DTCs.

IMPORTANT: Do not adjust any controls on the HVAC control module while the HVAC control module is self-calibrating. If interrupted, improper HVAC performance will result.

Alternate Method (w/o Scan Tool)

1. Clear all DTCs.
2. Place the ignition switch to the OFF position.
3. Install the HVAC actuator.
4. Connect all previously disconnected components.
5. Remove the HVAC B fuse for a minimum of 10 seconds.
6. Install the HVAC B fuse.
7. Place the ignition switch in the RUN position.
8. Wait 40 seconds for the HVAC control module to self-calibrate.
9. Verify that no DTCs have set as current DTCs.

REPAIR INSTRUCTIONS

HVAC CONTROL MODULE REPLACEMENT

Removal Procedure

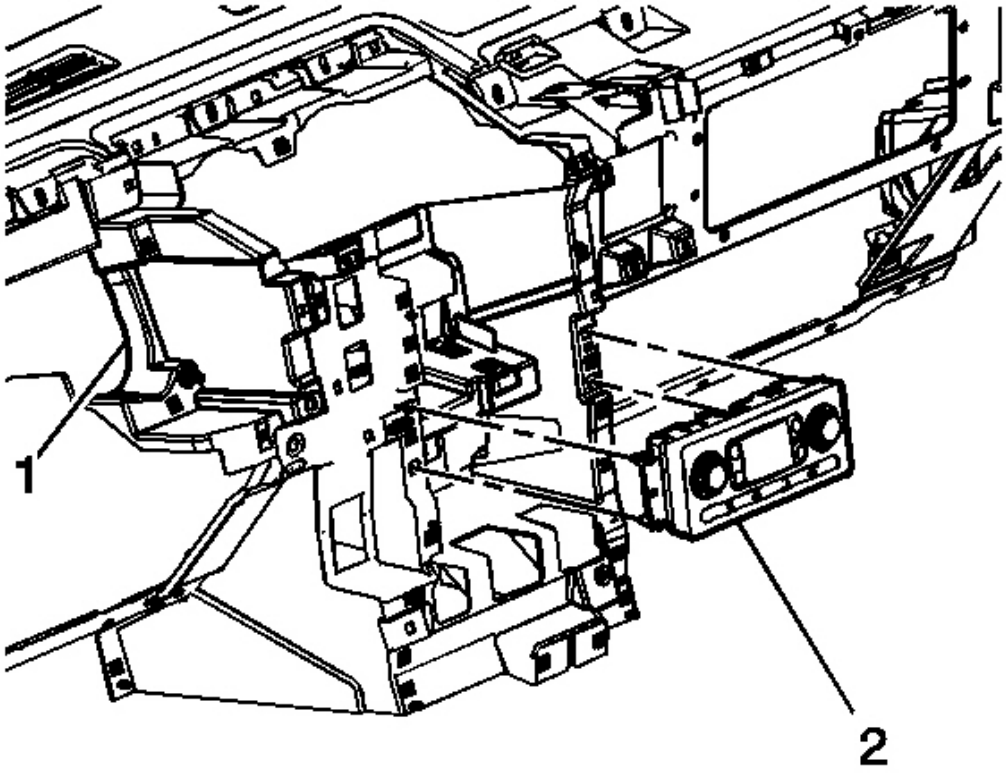


Fig. 11: HVAC Control Module & I/P Panel
Courtesy of GENERAL MOTORS CORP.

1. Remove the center I/P trim bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.
2. Remove the screws from the HVAC control module (2).
3. Depress the HVAC control module tabs (3) and remove the HVAC control module (2) from the I/P (4).
4. Reposition the HVAC control module (2) from the I/P panel (1).
5. Disconnect the electrical connectors from the HVAC control module (2).

Installation Procedure

IMPORTANT: The Key should be in the off position when connecting the electrical connectors to ensure proper calibration.

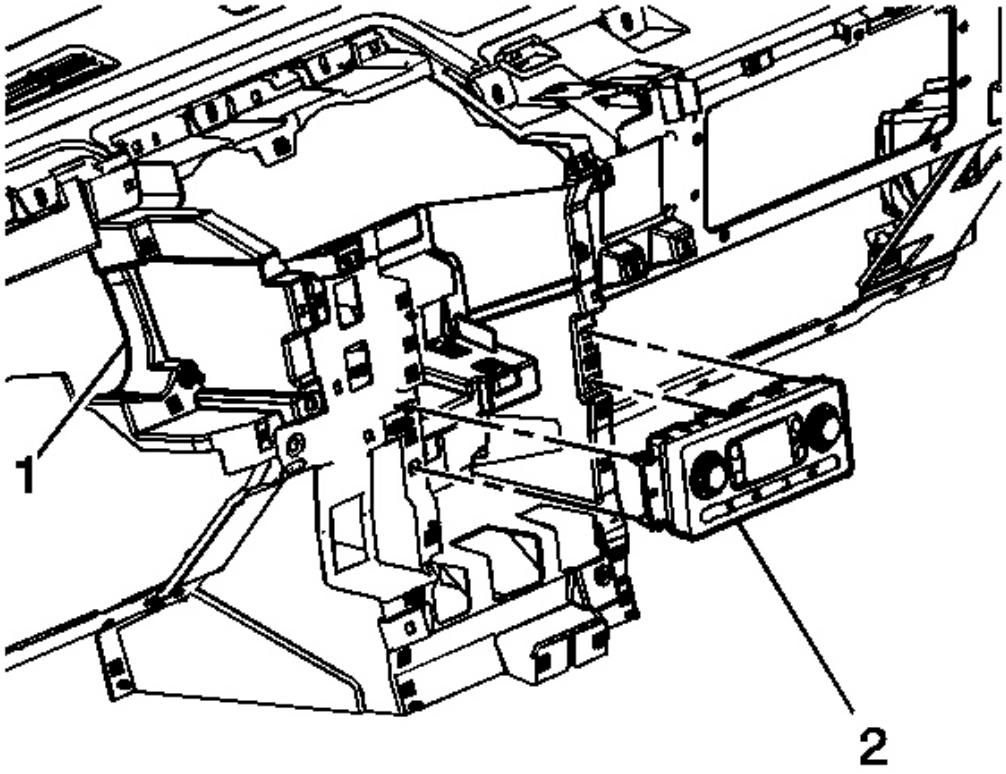


Fig. 12: HVAC Control Module & I/P Panel
Courtesy of GENERAL MOTORS CORP.

1. Connect the electrical connectors to the HVAC control module (2).

   IMPORTANT: Ensure that the HVAC control module tabs lock into place.

2. Install the HVAC control module (2) to the I/P (1).

   NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the screws to the HVAC control module (2).

   Tighten: Tighten the screws to 1.9 N.m (17 lb in).

4. Install the center I/P trim bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.

IMPORTANT: Do not adjust any controls on the HVAC control module while the HVAC control module is calibrating.
If interrupted improper HVAC performance will result.

5. Start the vehicle and let run for one minute.

BLOWER MOTOR CONTROL PROCESSOR REPLACEMENT

Removal Procedure

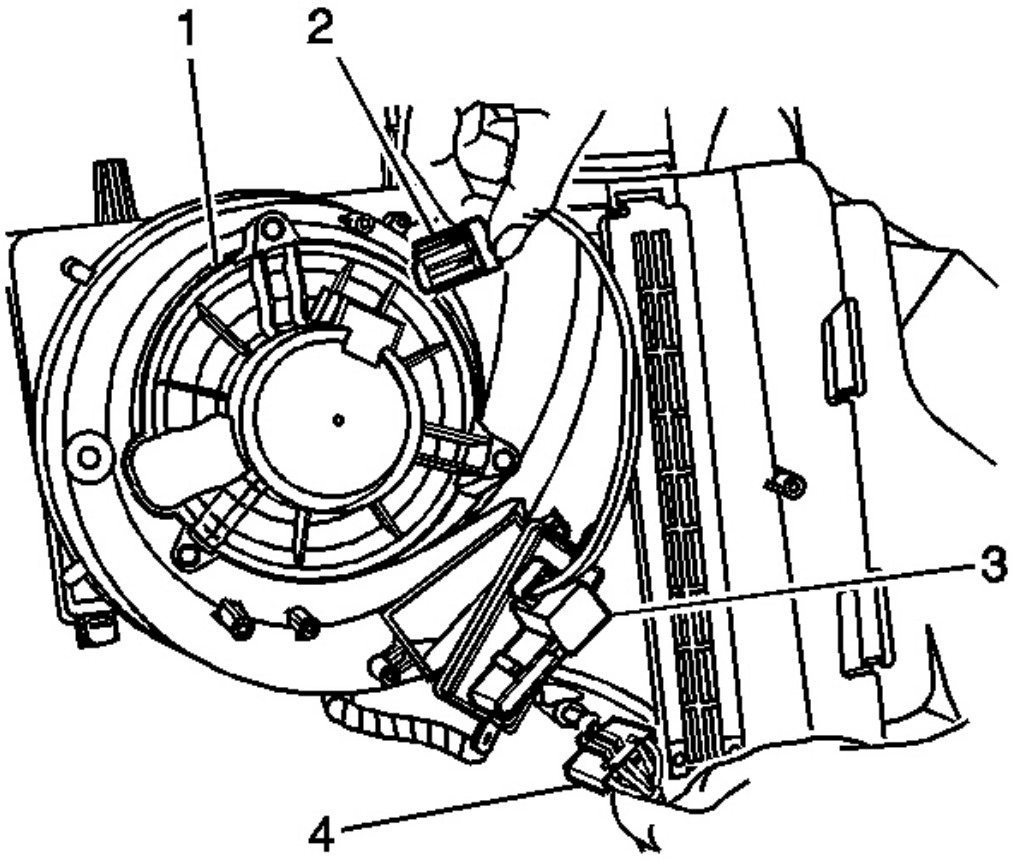


Fig. 13: Blower Motor Control Processor & HVAC Module Assembly
Courtesy of GENERAL MOTORS CORP.

1. Remove the I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** .
2. Disconnect the electrical connector (2) from the blower motor (1).

3. Disconnect the electrical connector (4) from the blower motor control processor (3).
4. Remove the screws from the blower motor control processor (3).
5. Remove the blower motor control processor (3) from the HVAC module assembly.

Installation Procedure

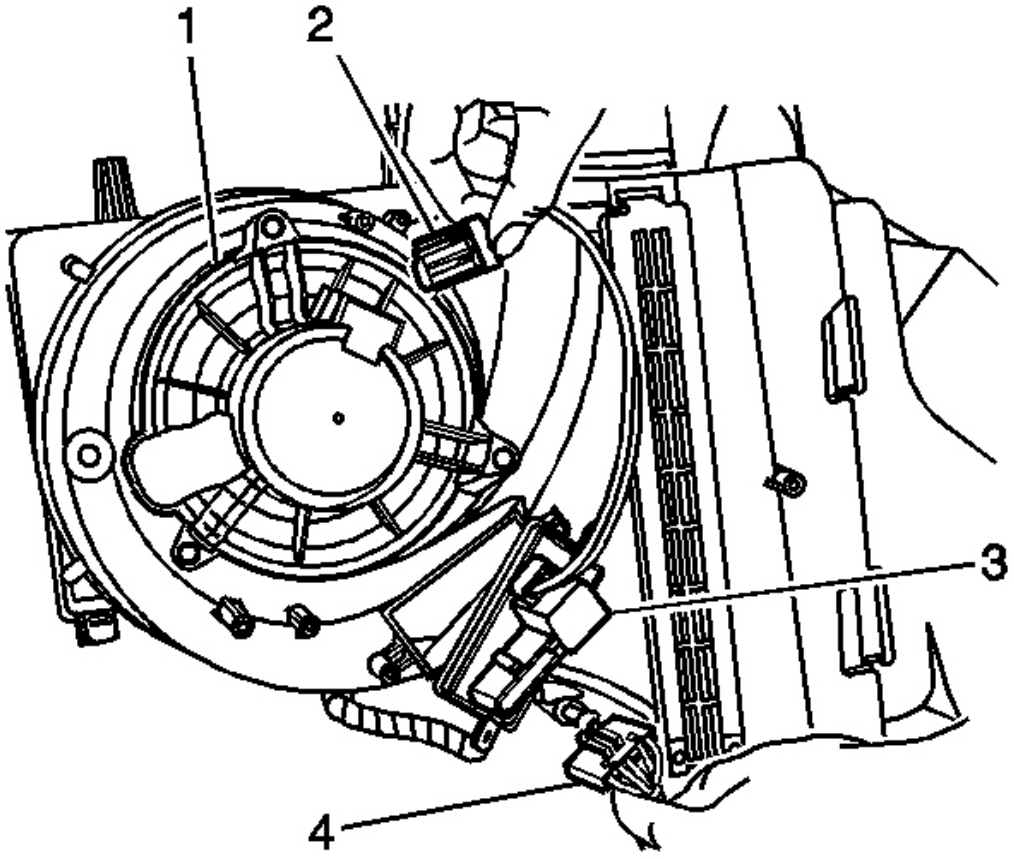


Fig. 14: Blower Motor Control Processor & HVAC Module Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the blower motor control processor (3) to the HVAC module assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the screws to the blower motor control processor (3).

Tighten: Tighten the screws to 1.6 N.m (14 lb in).

3. Connect the electrical connector (4) to the blower motor control processor (3).
4. Connect the electrical connector (2) to the blower motor (1).
5. Install the I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** .

RECIRCULATION ACTUATOR REPLACEMENT

Removal Procedure

1. Remove the HVAC module assembly. Refer to **HVAC Module Assembly Replacement** .
2. Disconnect the electrical connector from the recirculation actuator.

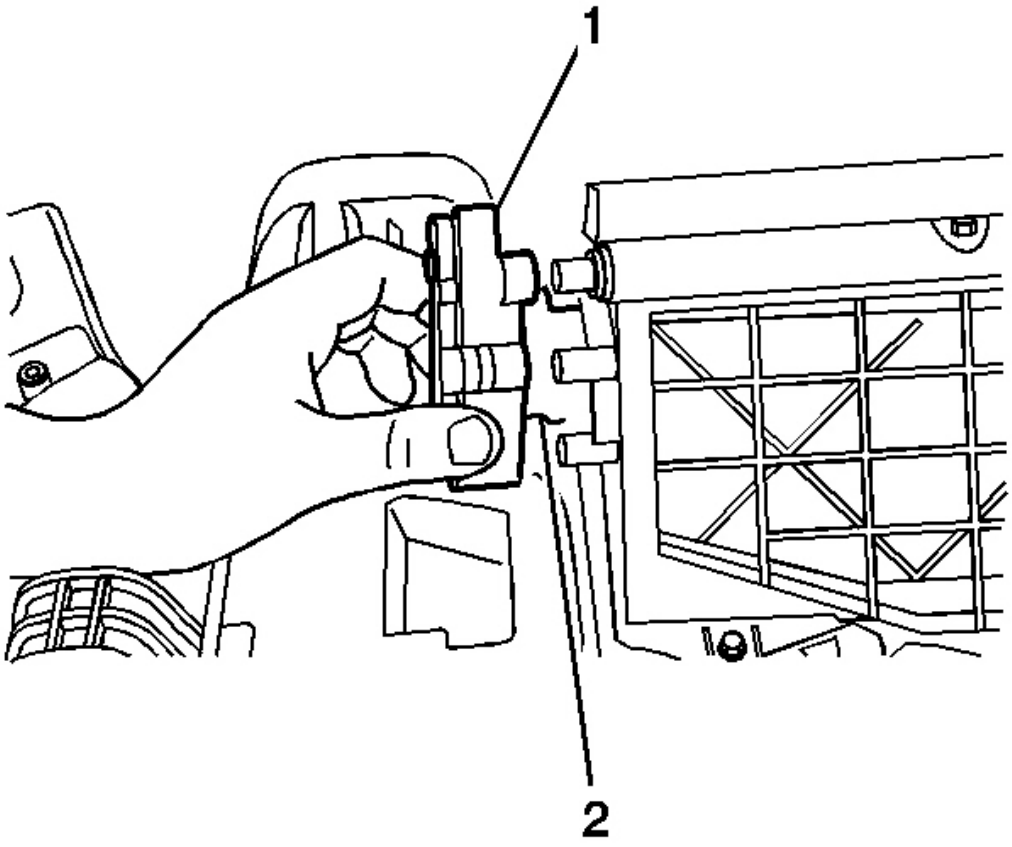


Fig. 15: Recirculation Actuator & Recirculation Housing (Visteon)
Courtesy of GENERAL MOTORS CORP.

3. Remove the screws from the recirculation actuator (1).
4. Remove the recirculation actuator (1) from the HVAC module assembly (2).

Installation Procedure

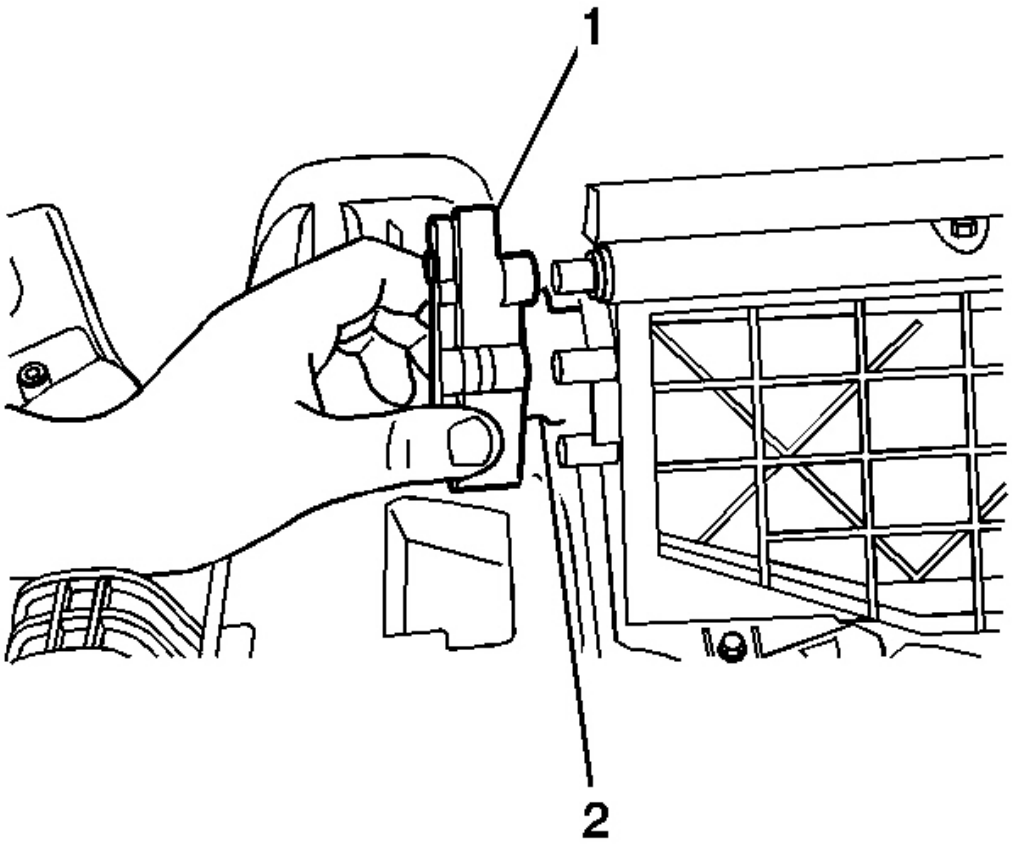


Fig. 16: Recirculation Actuator & Recirculation Housing (Visteon)
Courtesy of GENERAL MOTORS CORP.

1. Install the recirculation actuator (1) to the HVAC module assembly (2).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the screws to the recirculation actuator (1).

Tighten: Tighten the screws to 2 N.m (18 lb in).

3. Connect the electrical connector to the recirculation actuator.
4. Install the HVAC module assembly. Refer to **HVAC Module Assembly Replacement** .
5. Reprogram the recirculation actuator. Refer to **Re-Calibrating Actuators** .

MODE ACTUATOR REPLACEMENT

Removal Procedure

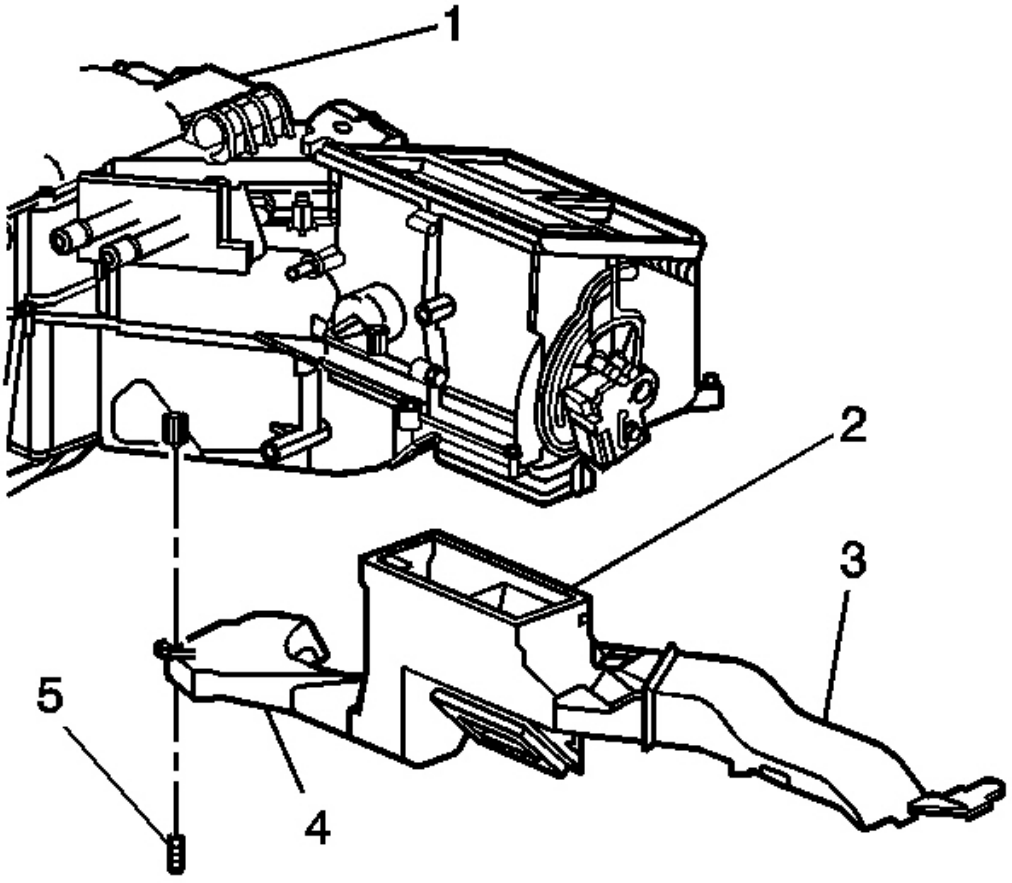


Fig. 17: Floor Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

1. Remove the push pin (5) from the HVAC module assembly (1).
2. Remove the left floor duct (3) from the HVAC module assembly (1).

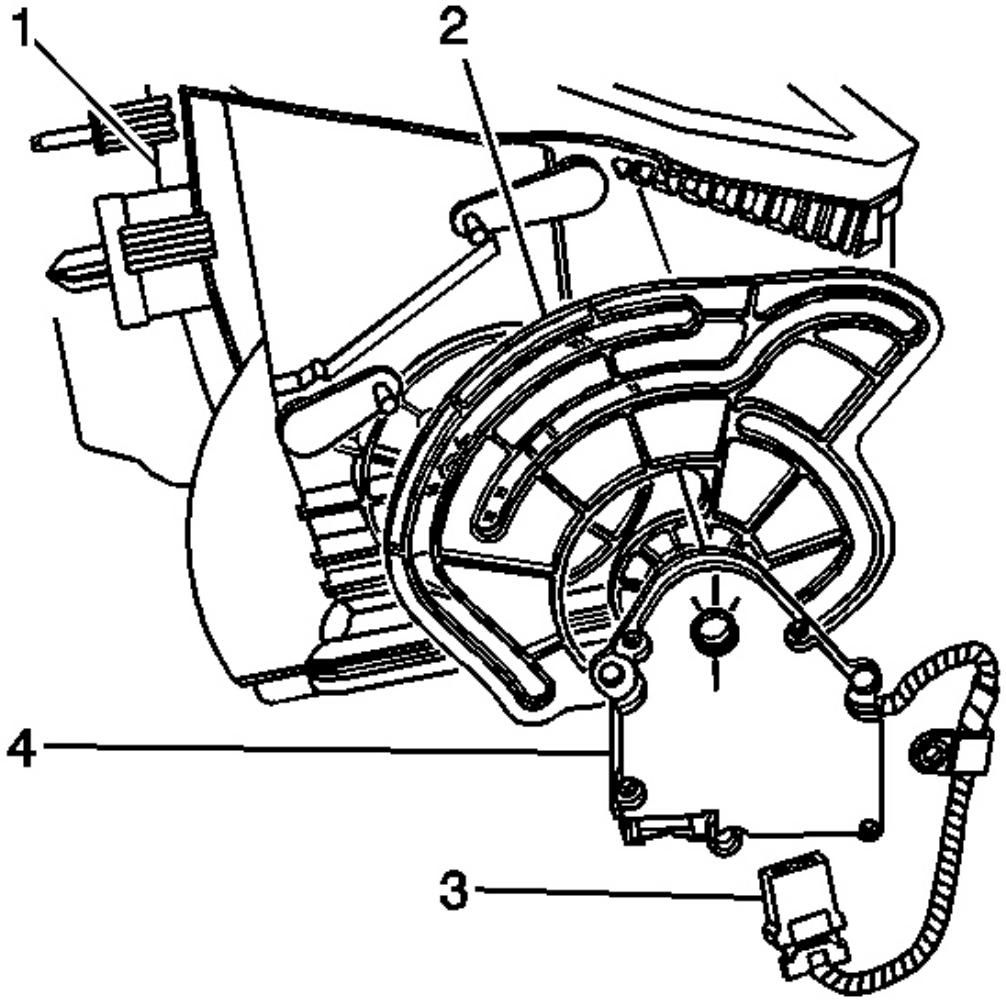


Fig. 18: Mode Actuator (Visteon)
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the electrical connector (3) from the mode actuator (4).
4. Remove the screws from the mode actuator (4).
5. Remove the mode actuator (4) from the HVAC module assembly (1).
6. Remove the cam (2) from the HVAC module assembly (1).

Installation Procedure

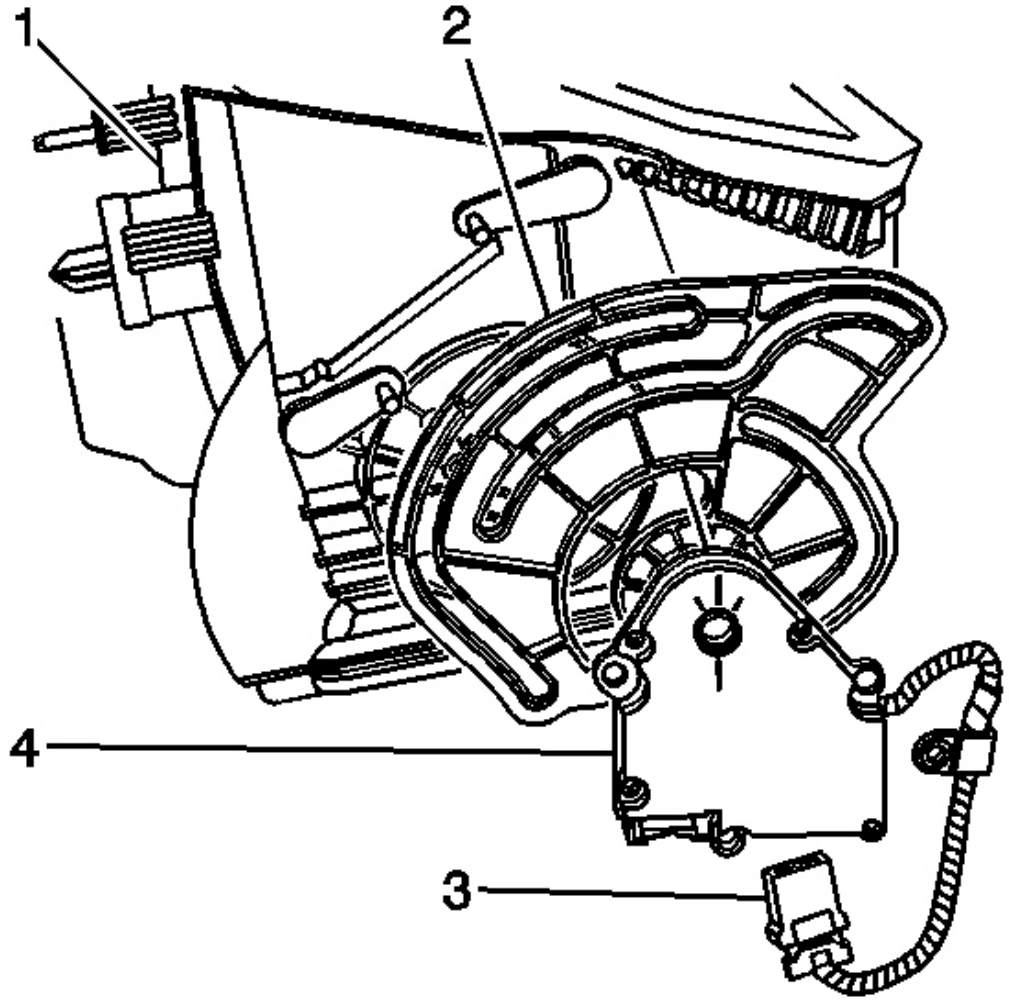


Fig. 19: Mode Actuator (Visteon)
Courtesy of GENERAL MOTORS CORP.

1. Install the cam (2) to the HVAC module assembly (1).
2. Install the mode actuator (4) to the HVAC module assembly (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the screws to the mode actuator (4).

Tighten: Tighten the screws to 2 N.m (18 lb in).

4. Connect the electrical connector (3) to the mode actuator (4).

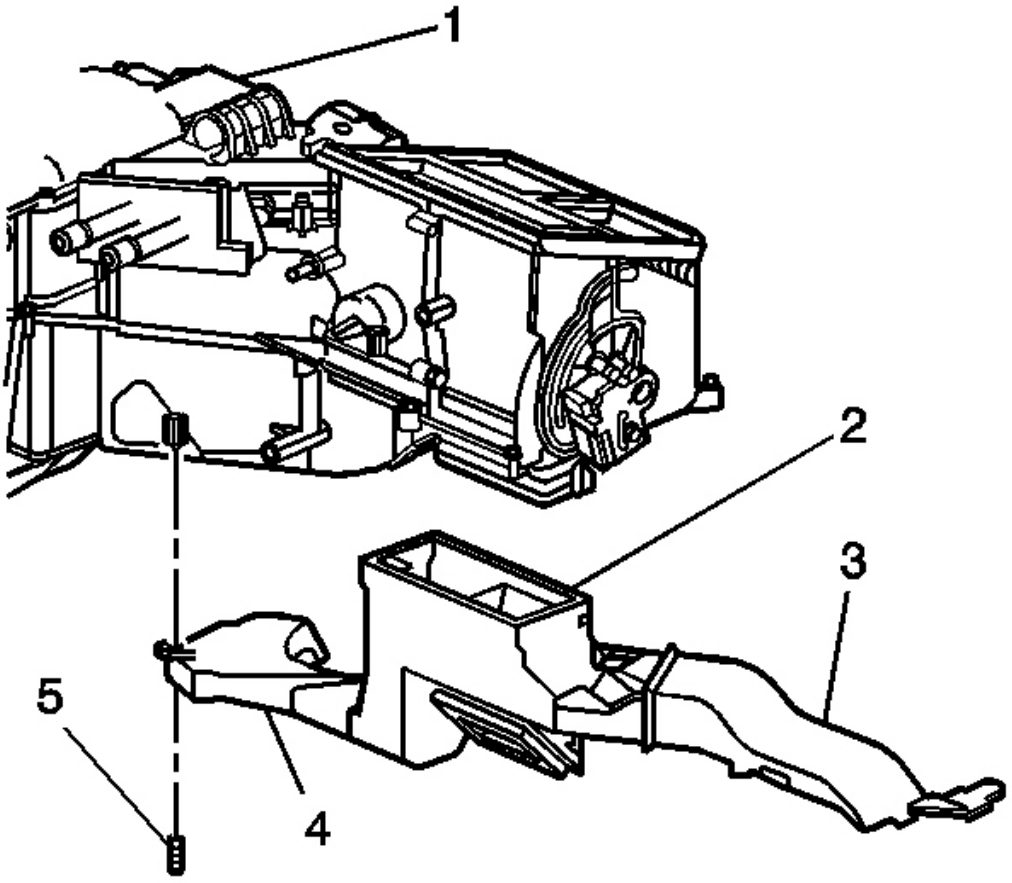


Fig. 20: Floor Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

5. Install the left floor air outlet duct (3) to the HVAC module assembly (1).
6. Install the push pin (5) to the HVAC module assembly (1).
7. Reprogram the Right air temperature actuator. Refer to **Re-Calibrating Actuators** .

AIR TEMPERATURE ACTUATOR REPLACEMENT - RIGHT

Removal Procedure

1. Remove the I/P carrier. Refer to **Instrument Panel (I/P) Carrier Replacement** in Instrument Panel, Gauges and Console.

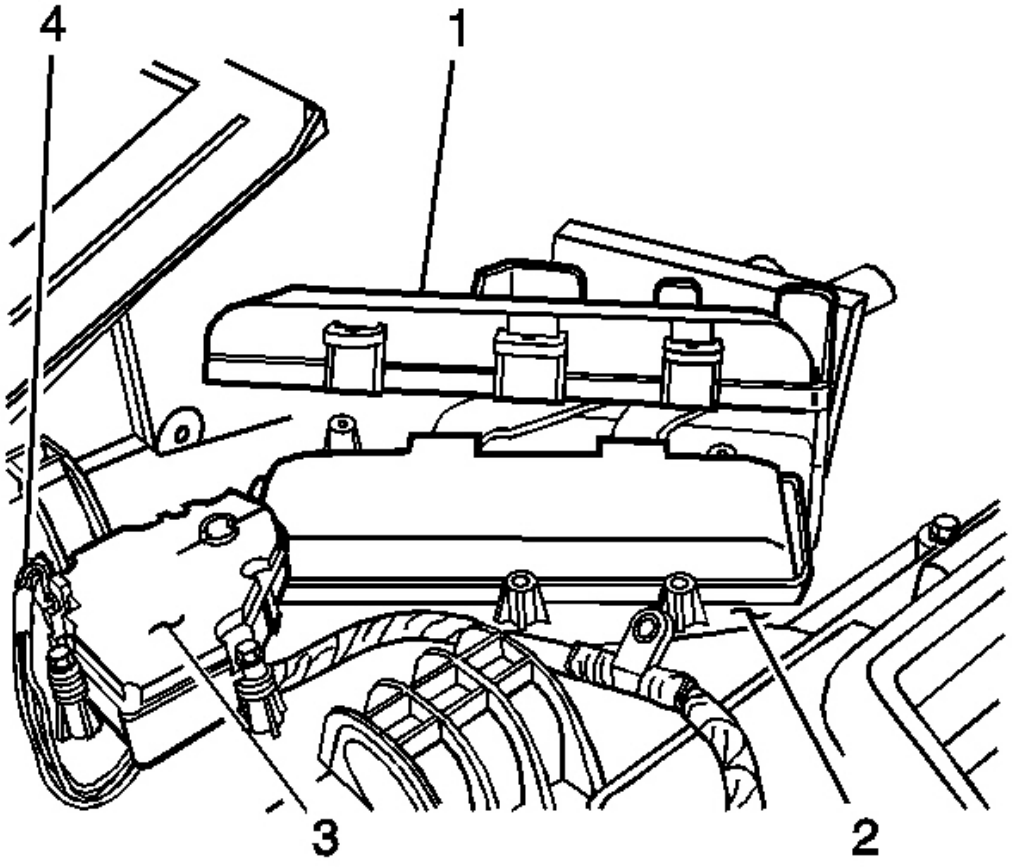


Fig. 21: Right Air Temperature Actuator & HVAC Module Assembly (Visteon)
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector (4) from the right air temperature actuator (3).
3. Remove the screws from the right air temperature actuator (3).
4. Remove the right air temperature actuator (3) from the HVAC module assembly (2).

Installation Procedure

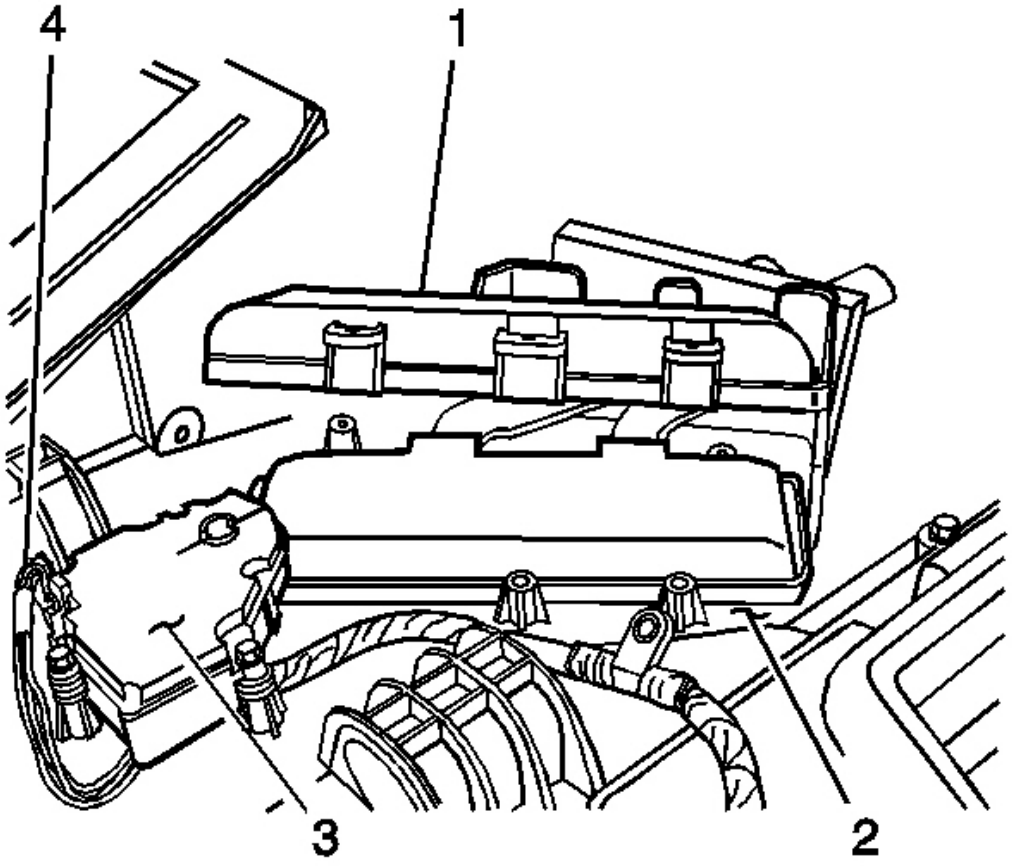


Fig. 22: Right Air Temperature Actuator & HVAC Module Assembly (Visteon)
Courtesy of GENERAL MOTORS CORP.

1. Install the right air temperature actuator (3) to the HVAC module assembly (2).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the screws to the right air temperature actuator (3).

   Tighten: Tighten the screws to 2 N.m (18 lb in).

3. Connect the electrical connector to the right air temperature actuator.
4. Install the I/P carrier. Refer to **Instrument Panel (I/P) Carrier Replacement** in Instrument Panel, Gauges, and Console.
5. Reprogram the air temperature actuator. Refer to **Re-Calibrating Actuators** .

AIR TEMPERATURE ACTUATOR REPLACEMENT - LEFT

Removal Procedure

1. Remove the I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** in Instrument Panel, Gauges and Console.

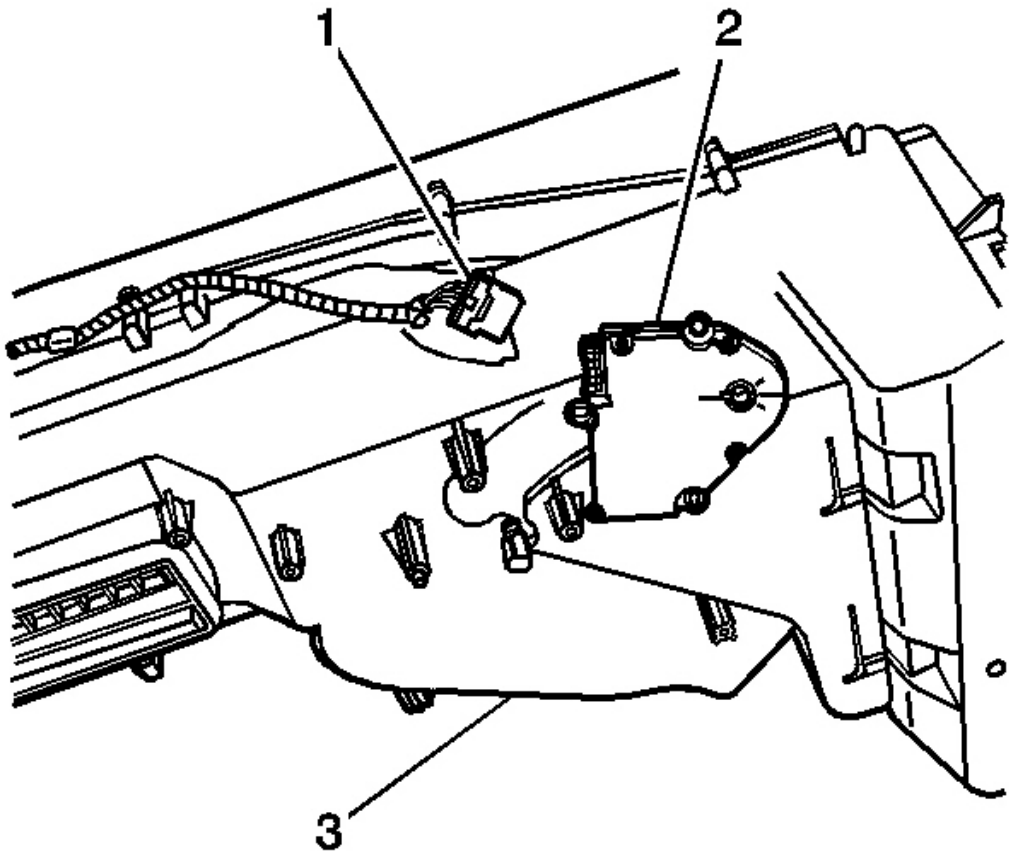


Fig. 23: Left Air Temperature Actuator & HVAC Module Assembly
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector (1) from the left air temperature actuator (2).
3. Remove the screws from the left air temperature actuator (2).
4. Remove the left air temperature actuator (2) from the HVAC module assembly (3).

Installation Procedure

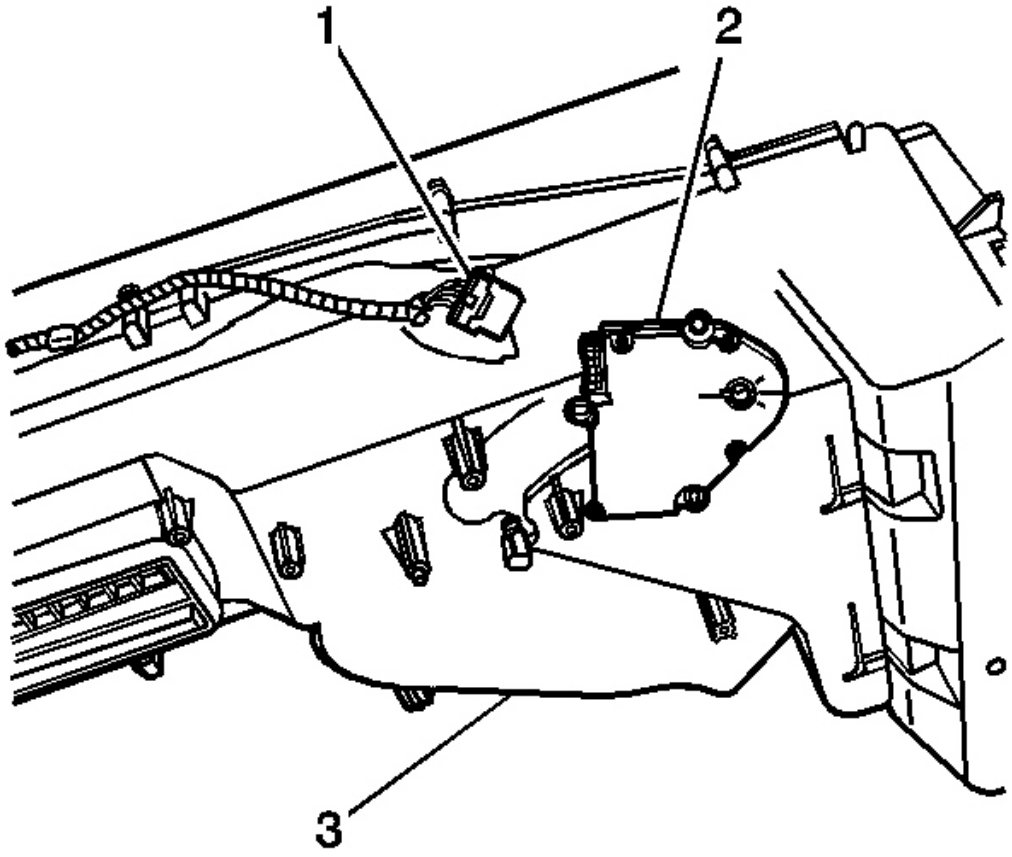


Fig. 24: Left Air Temperature Actuator & HVAC Module Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the left air temperature actuator (2) to the HVAC module assembly (3).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the screws to the left air temperature actuator (2).

   Tighten: Tighten the screws to 2 N.m (18 lb ft).

3. Install the electrical connector (1) to the left air temperature actuator (2).
4. Install the I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** in Instrument Panel, Gauges, and Console.
5. Reprogram the air temperature actuator. Refer to **Re-Calibrating Actuators** .

AIR TEMPERATURE SENSOR REPLACEMENT - UPPER RIGHT

Removal Procedure

1. Open the I/P compartment door.
2. Lower the I/P compartment door.

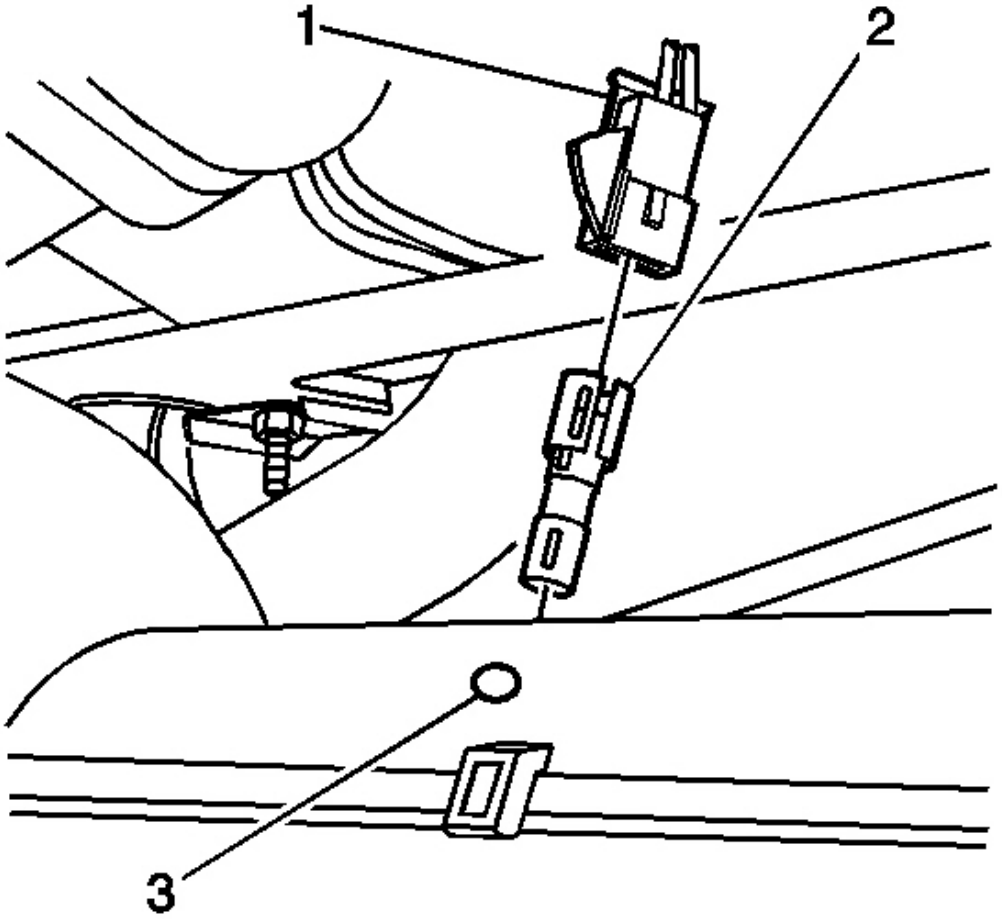


Fig. 25: Upper Right Air Temperature Sensor & Air Distributor Duct
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the electrical connector (1) from the upper right air temperature sensor (2).
4. Remove the upper right air temperature sensor (1) from the air distributor duct (3).

Installation Procedure

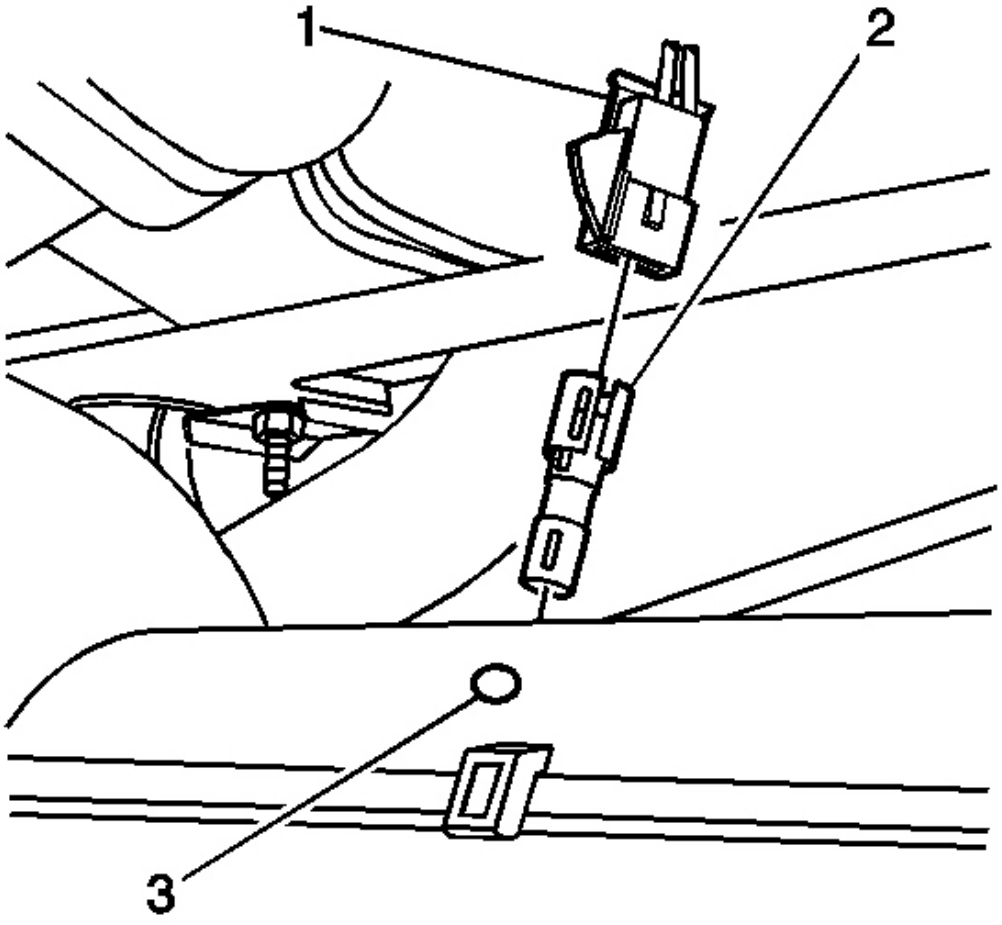


Fig. 26: Upper Right Air Temperature Sensor & Air Distributor Duct
Courtesy of GENERAL MOTORS CORP.

1. Install the upper right air temperature sensor (1) to the air distributor duct (3).
2. Connect the electrical connector (1) to the upper right air temperature sensor (2).
3. Close the I/P compartment door.

AIR TEMPERATURE SENSOR REPLACEMENT - UPPER LEFT

Removal Procedure

1. Remove the center trim bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges, and Console.

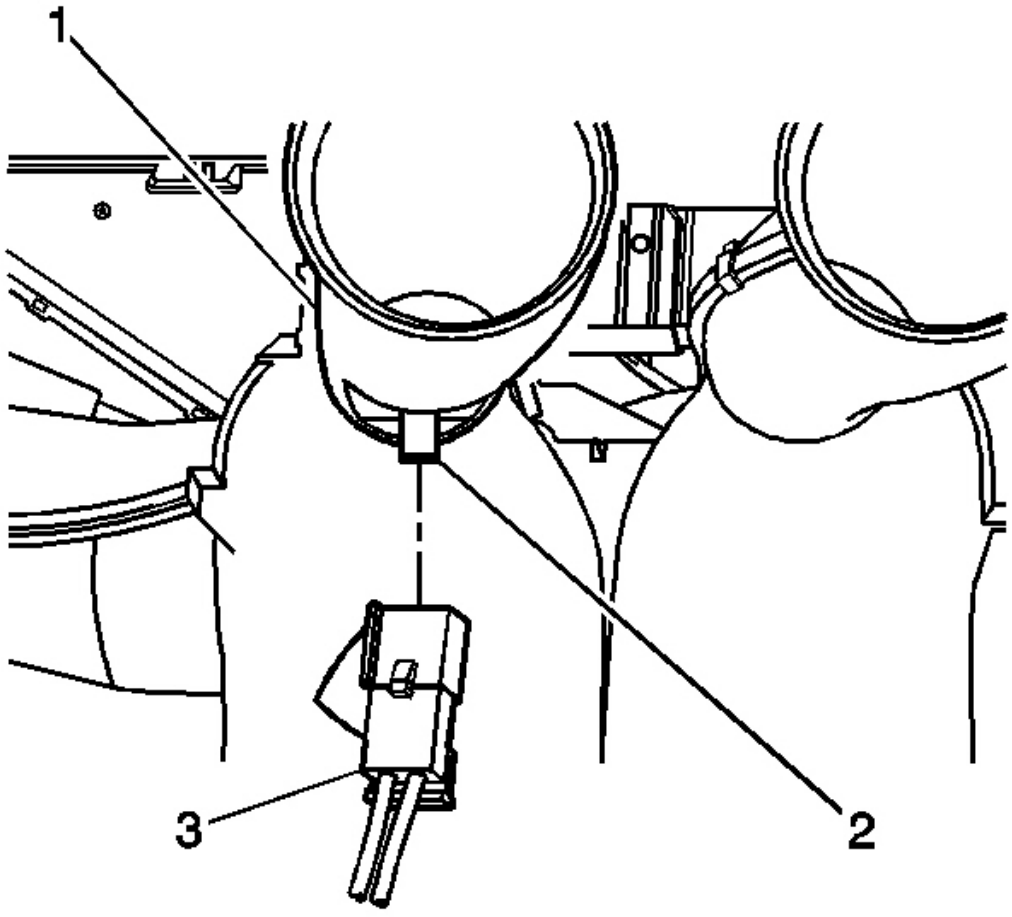


Fig. 27: Upper Left Air Temperature Sensor & Air Distributor Duct
Courtesy of GENERAL MOTORS CORP.

2. Remove the upper left air temperature sensor (2) from the air distributor duct (1).
3. Disconnect the electrical connector (3) from the upper left air temperature sensor (2).

Installation Procedure

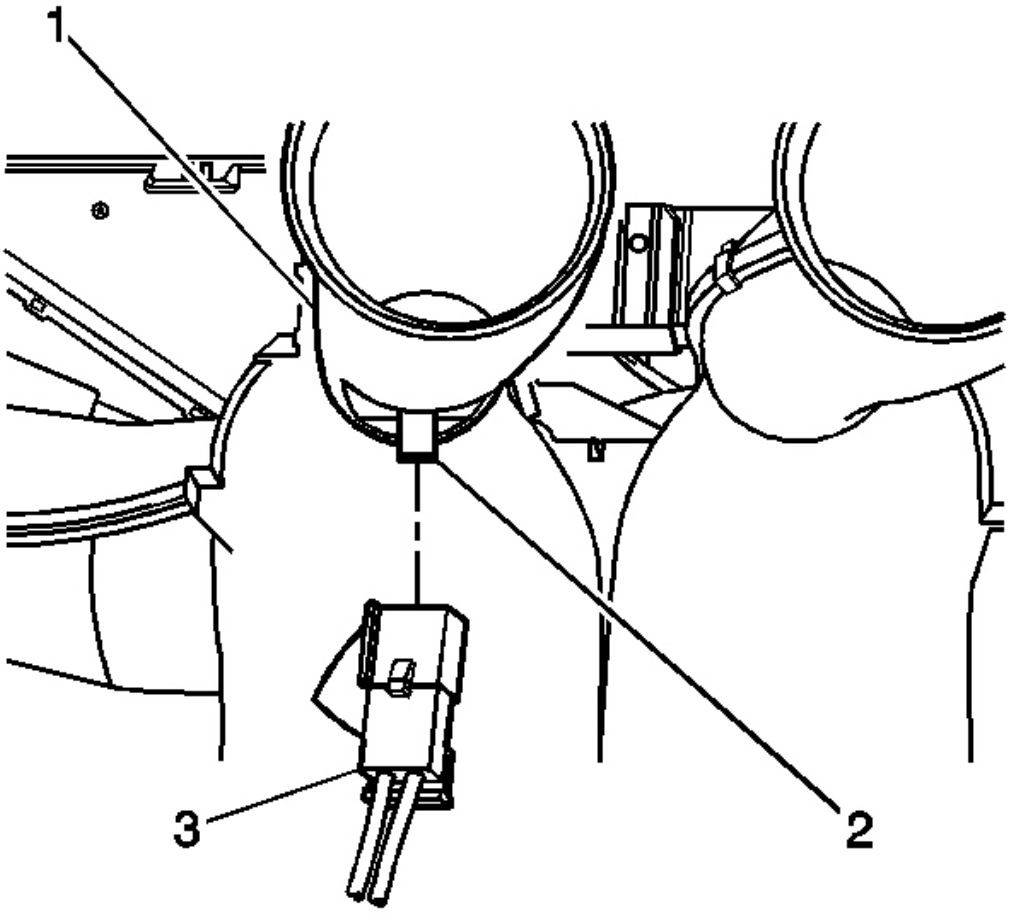


Fig. 28: Upper Left Air Temperature Sensor & Air Distributor Duct
Courtesy of GENERAL MOTORS CORP.

1. Install the upper left air temperature sensor (2) to the air distributor duct (1).
2. Connect the electrical connector (3) to the upper left air temperature sensor (2).
3. Install the center trim bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges, and Console.

AIR TEMPERATURE SENSOR REPLACEMENT - LOWER LEFT

Removal Procedure

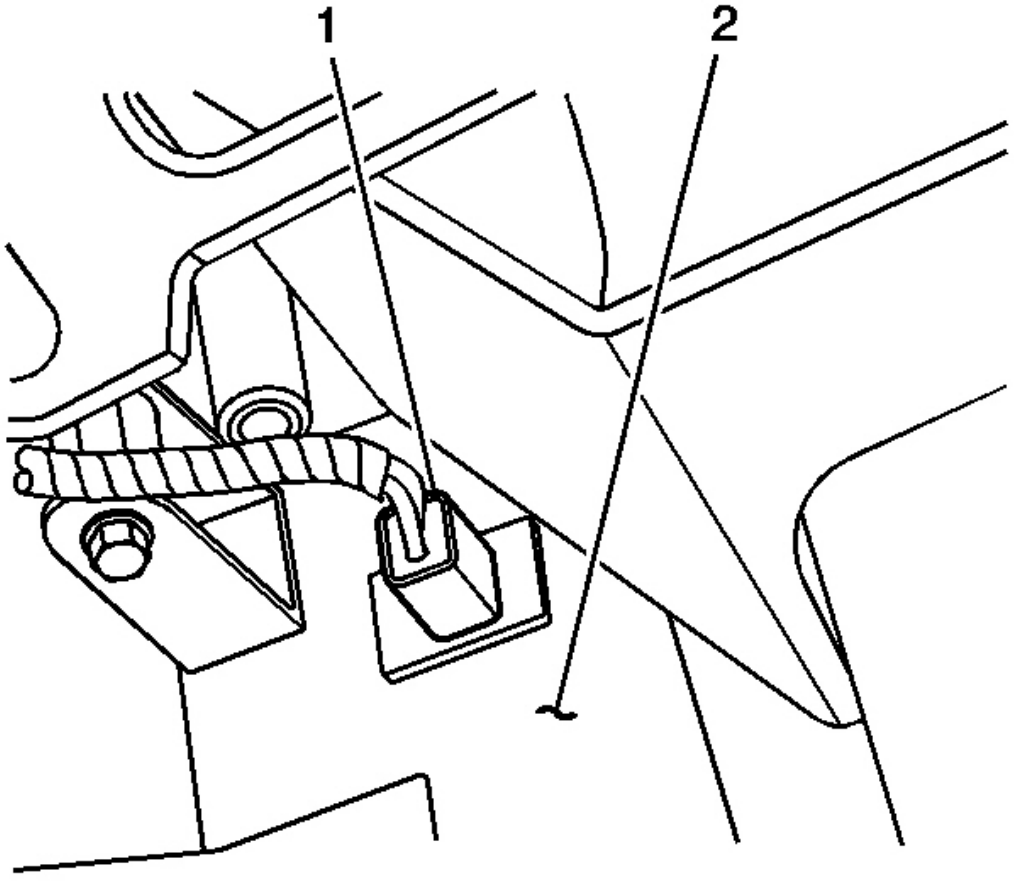


Fig. 29: Lower Right Air Temperature Sensor & HVAC Module
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the electrical connector from the lower left air temperature sensor (1).
2. Remove the lower left air temperature sensor (1) from the HVAC module (2).

Installation Procedure

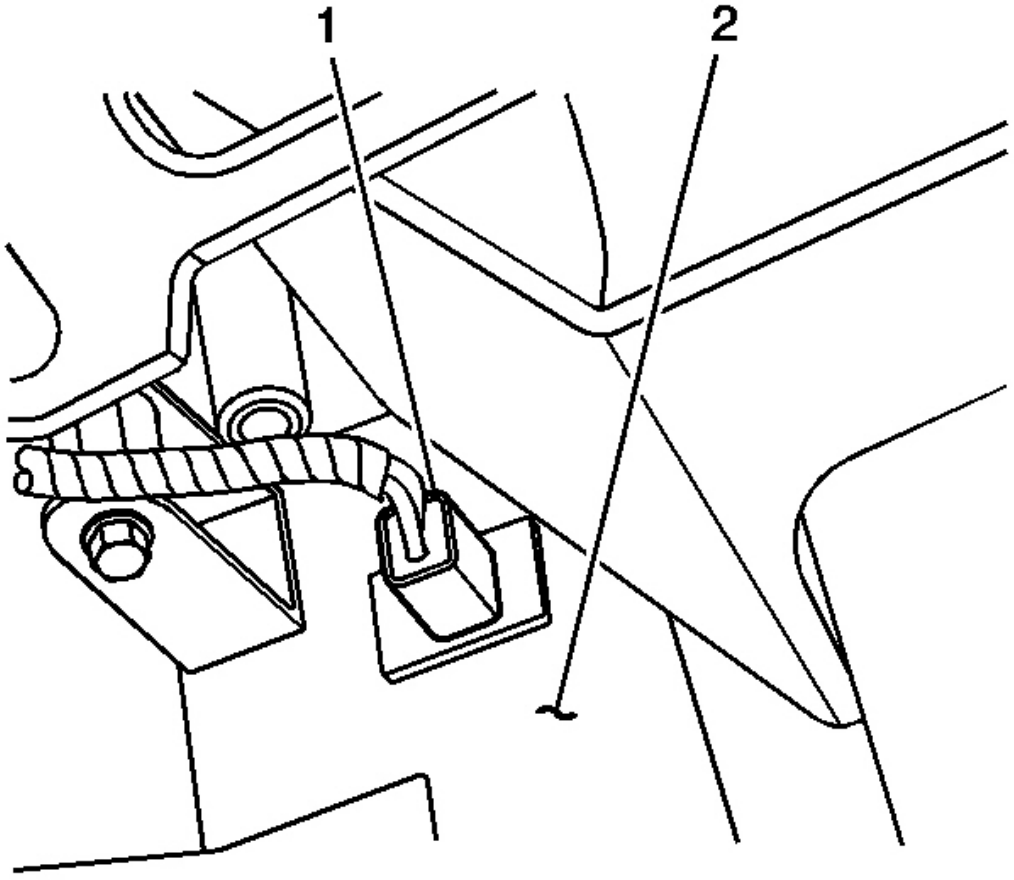


Fig. 30: Lower Right Air Temperature Sensor & HVAC Module
Courtesy of GENERAL MOTORS CORP.

1. Install the lower left air temperature sensor (1) to the HVAC module (2).
2. Connect the electrical connector to the lower left air temperature sensor (1).

AIR TEMPERATURE SENSOR REPLACEMENT - LOWER RIGHT

Removal Procedure

1. Remove the right I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** in Instrument Panel, Gauges and Console.

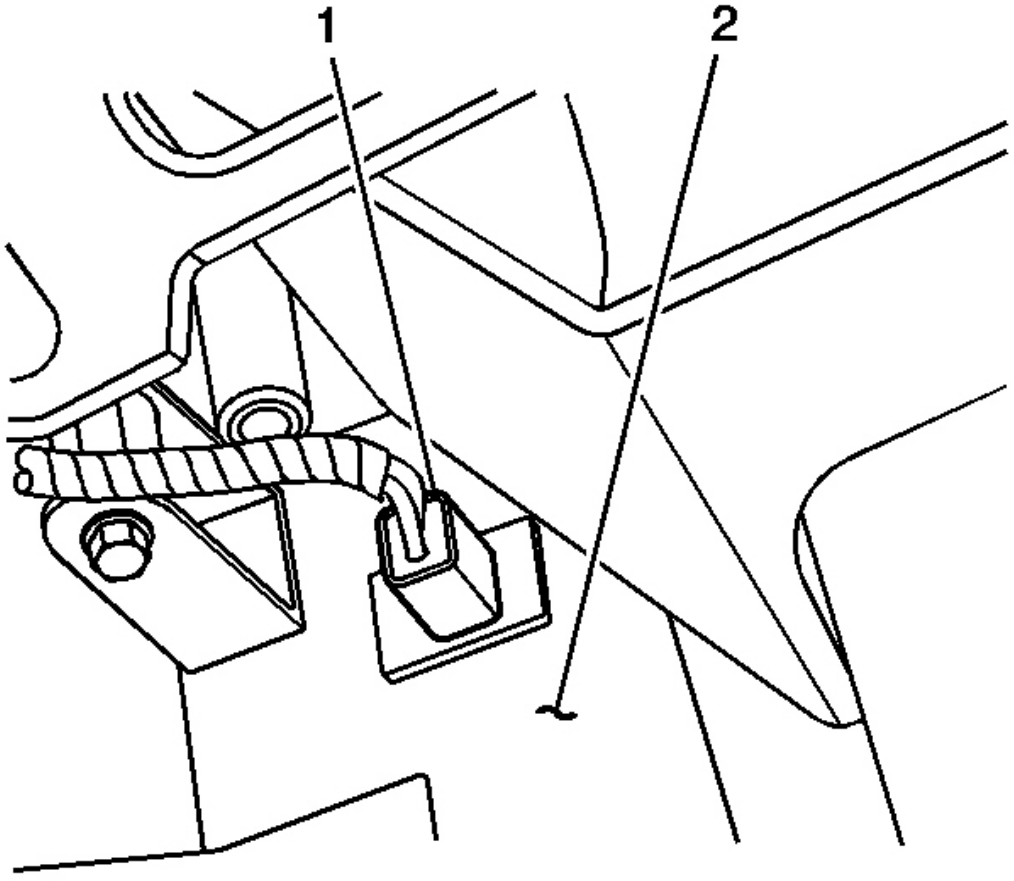


Fig. 31: Lower Right Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector from the lower right air temperature sensor (1).
3. Remove the lower right air temperature sensor (1).

Installation Procedure

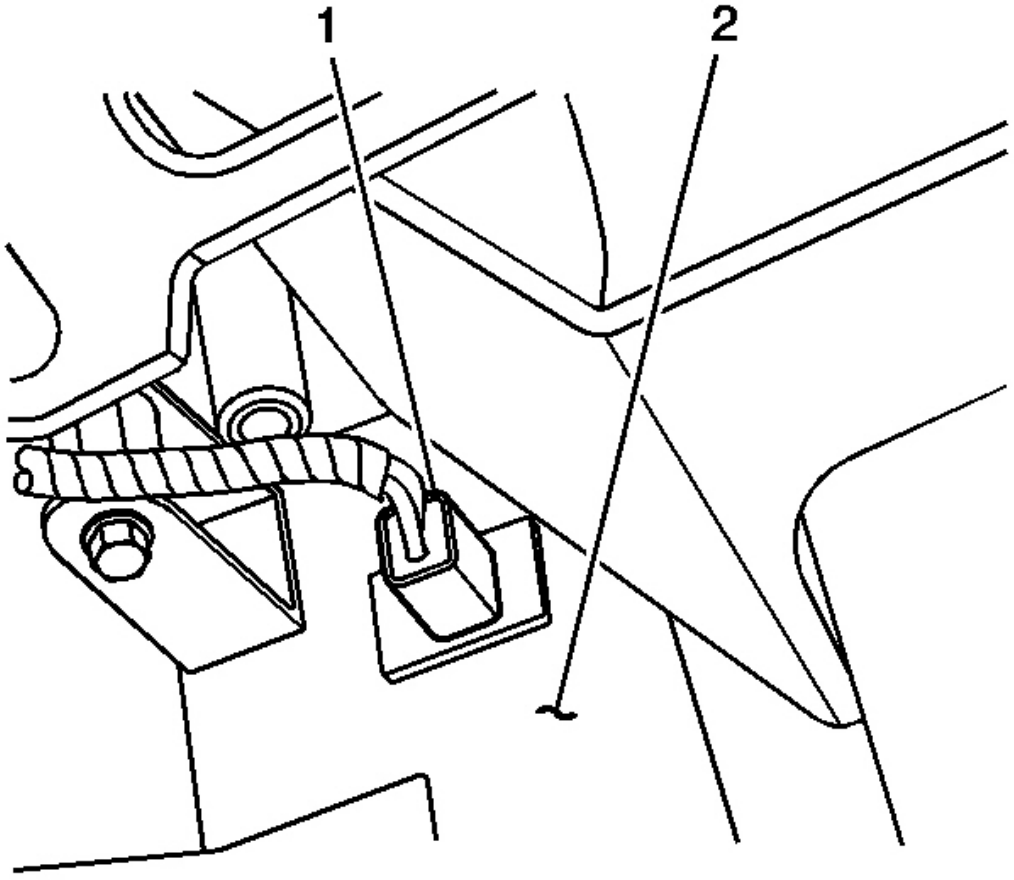


Fig. 32: Lower Right Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

1. Install the lower right air temperature sensor (1).
2. Connect the electrical connector to the lower right air temperature sensor (1).
3. Install the right I/P insulator panel. Refer to **Insulator Replacement - Instrument Panel (I/P)** in Instrument Panel, Gauges and Console.

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

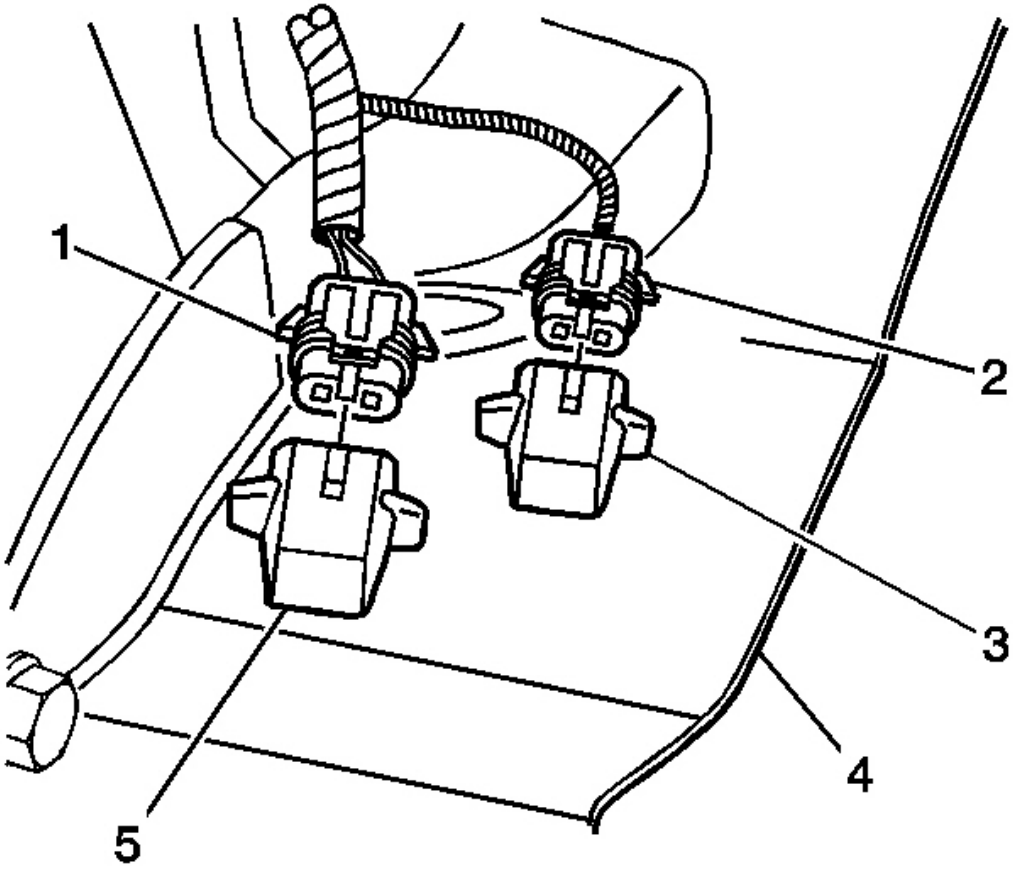


Fig. 33: Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the electrical connector (2) from the ambient air temperature sensor (3).
2. Remove the ambient air temperature sensor (3) from the vehicle (4).

Installation Procedure

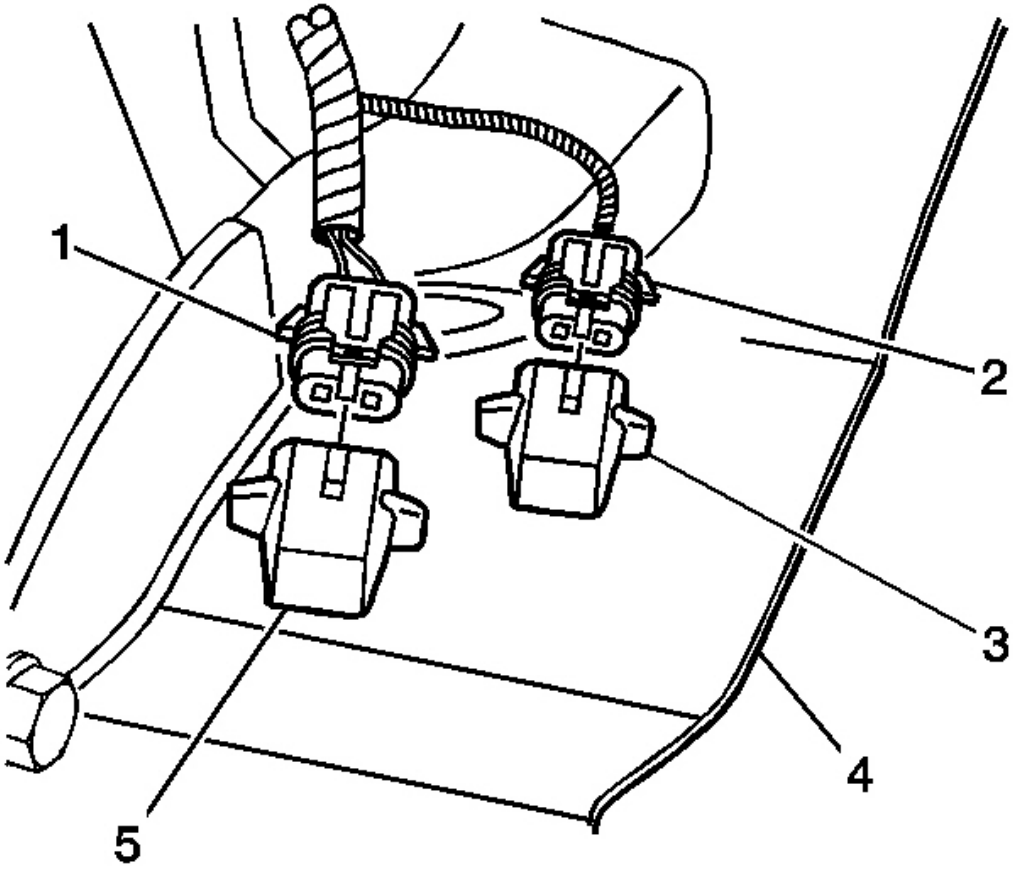


Fig. 34: Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

1. Install the ambient air temperature sensor (3) to the vehicle (4).
2. Connect the electrical connector (2) to the ambient air temperature sensor (3).

INSIDE AIR TEMPERATURE SENSOR ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the left windshield garnish molding. Refer to **Garnish Molding Replacement - Windshield Pillar** in Interior Trim.
2. Remove the left sunshade. Refer to **Sunshade Replacement** in Interior Trim.
3. Gently pull down the headliner.
4. Remove the inside air temperature sensor from the headliner.

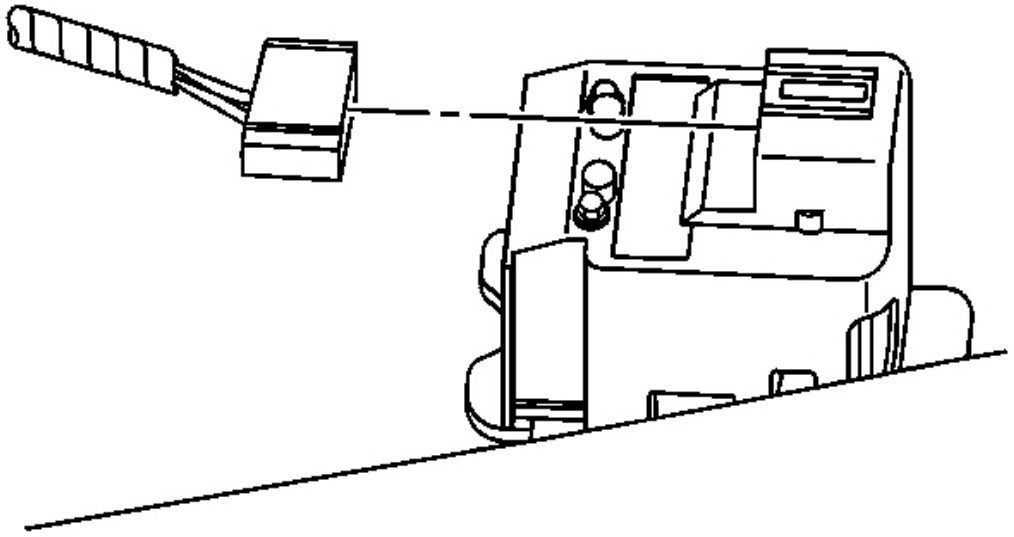


Fig. 35: Electrical Connector & Inside Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the electrical connector from the inside air temperature sensor.

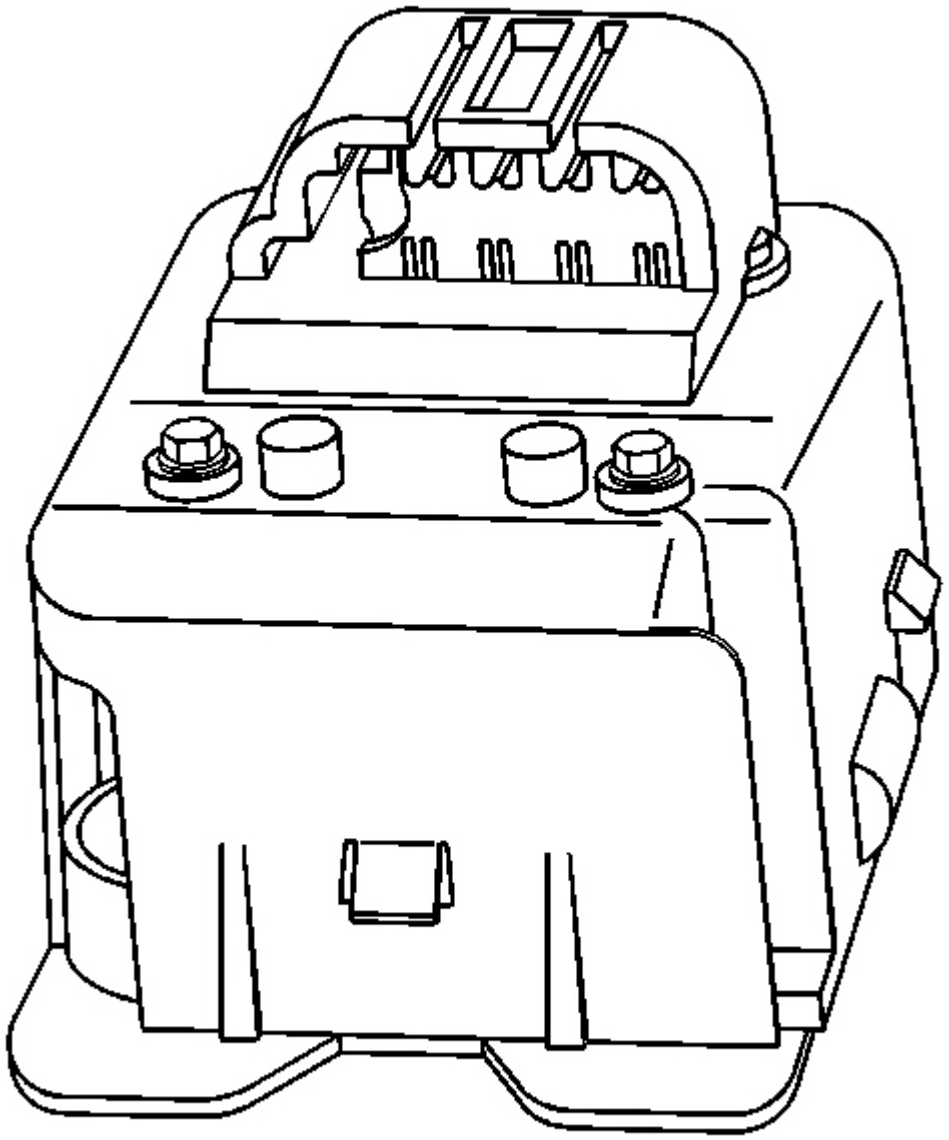


Fig. 36: Inside Air Temperature Sensor & Headliner
Courtesy of GENERAL MOTORS CORP.

6. Remove the inside air temperature sensor from the headliner.

Installation Procedure

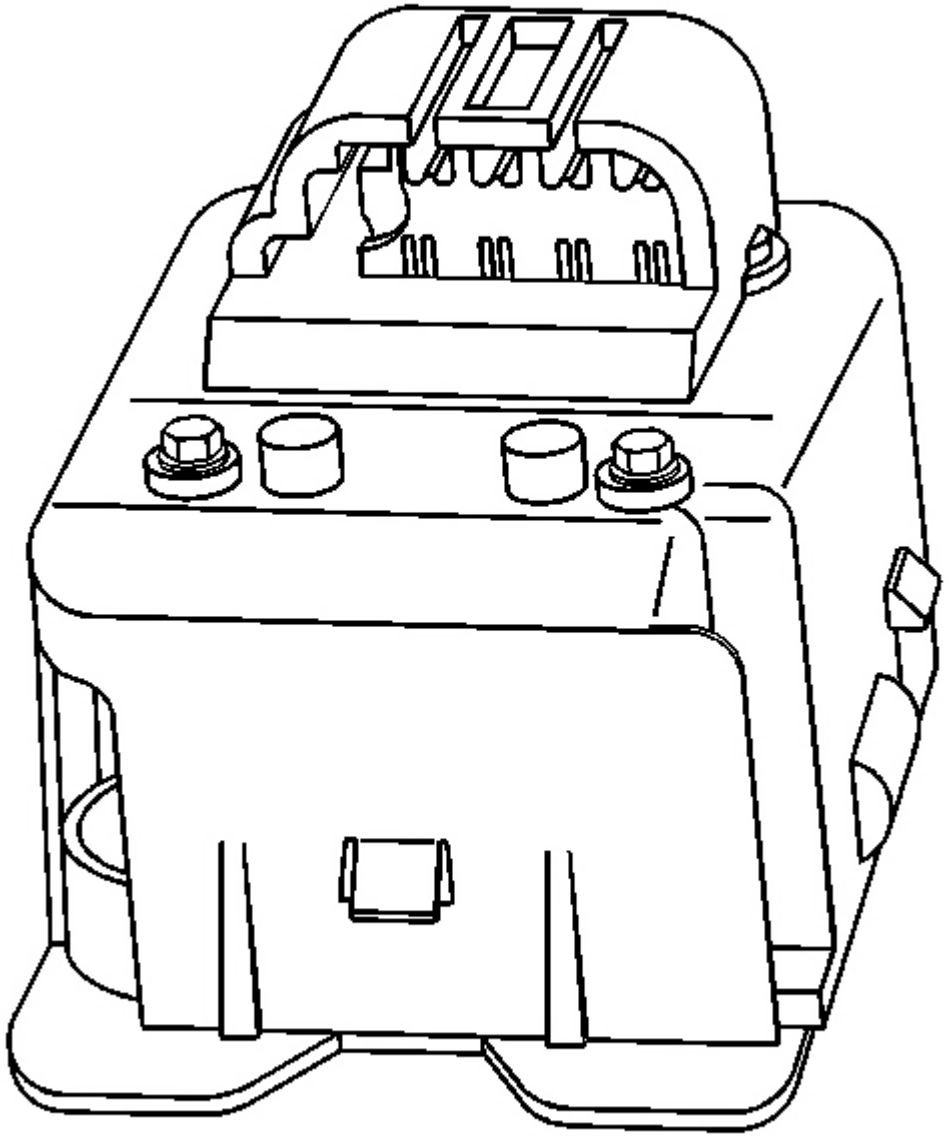


Fig. 37: Inside Air Temperature Sensor & Headliner
Courtesy of GENERAL MOTORS CORP.

1. Install the inside air temperature sensor to the headliner.

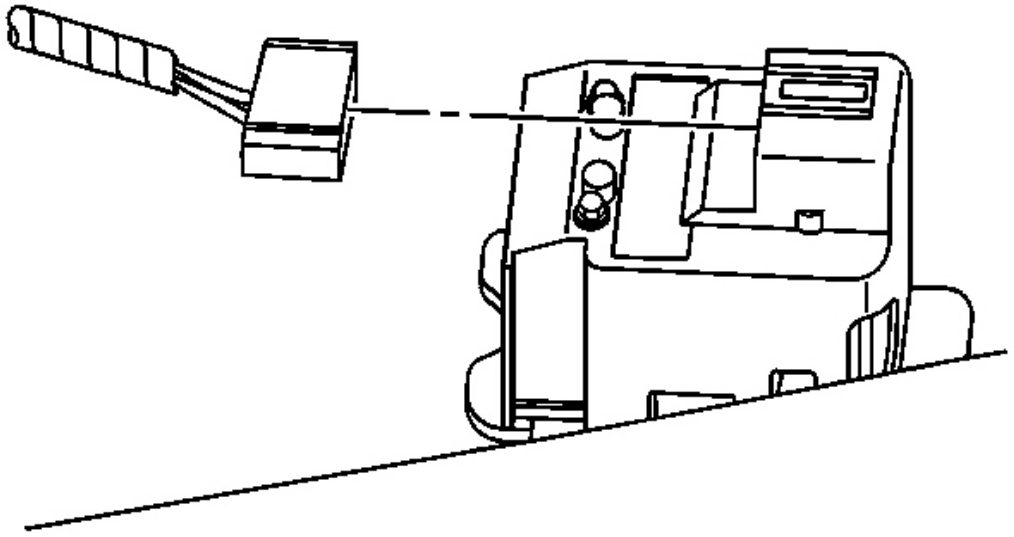


Fig. 38: Electrical Connector & Inside Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

2. Connect the electrical connector to the inside air temperature sensor.
3. Install the left sunshade. Refer to **Sunshade Replacement** in Interior Trim.
4. Install the left windshield garnish molding. Refer to **Garnish Molding Replacement - Windshield Pillar** in Interior Trim.

SUN LOAD SENSOR REPLACEMENT

Removal Procedure

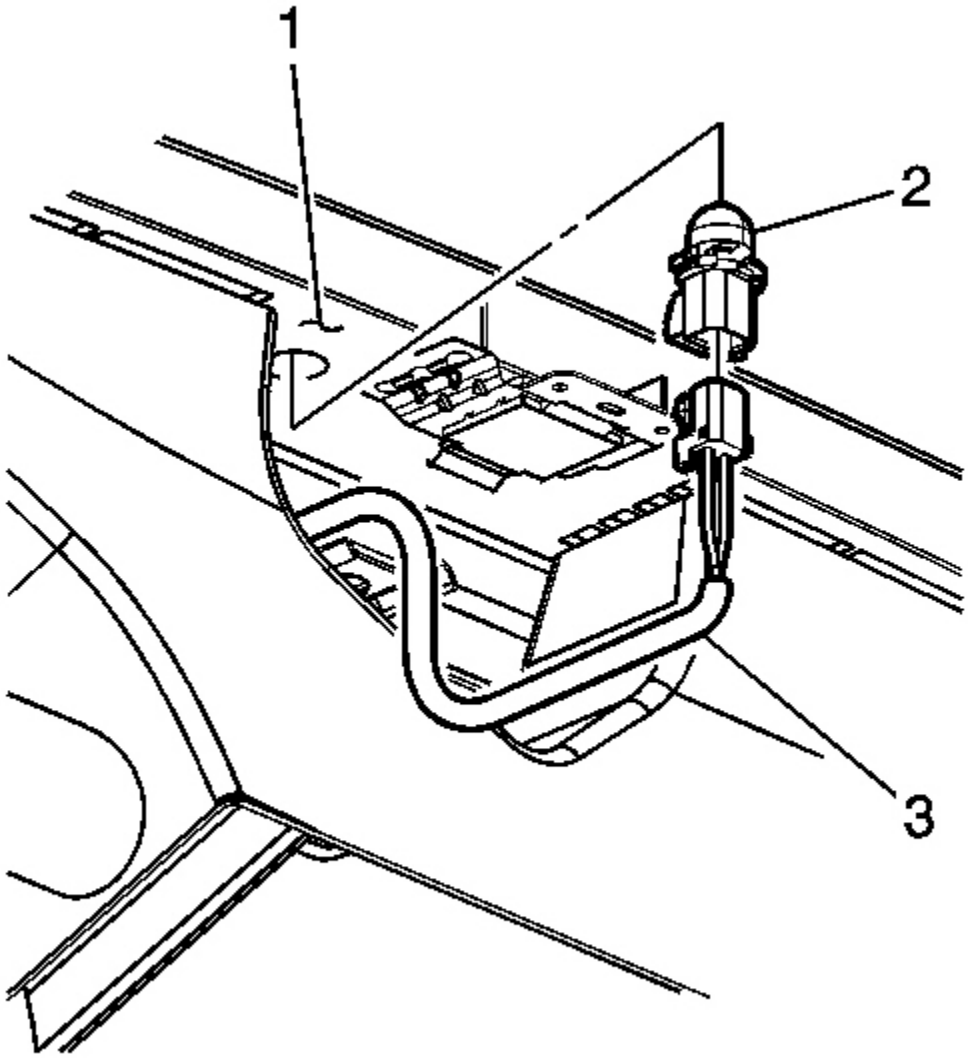


Fig. 39: Sun Load Sensor & I/P Upper Trim Pad
Courtesy of GENERAL MOTORS CORP.

1. Remove the I/P upper trim pad. Refer to **Trim Pad Replacement - Instrument Panel (I/P) Upper** in Trim Pad Replacement-I/P Upper.
2. Remove the sun load sensor from the I/P upper trim pad by turning counter clockwise.
3. Disconnect the electrical connector from the sun load sensor.

Installation Procedure

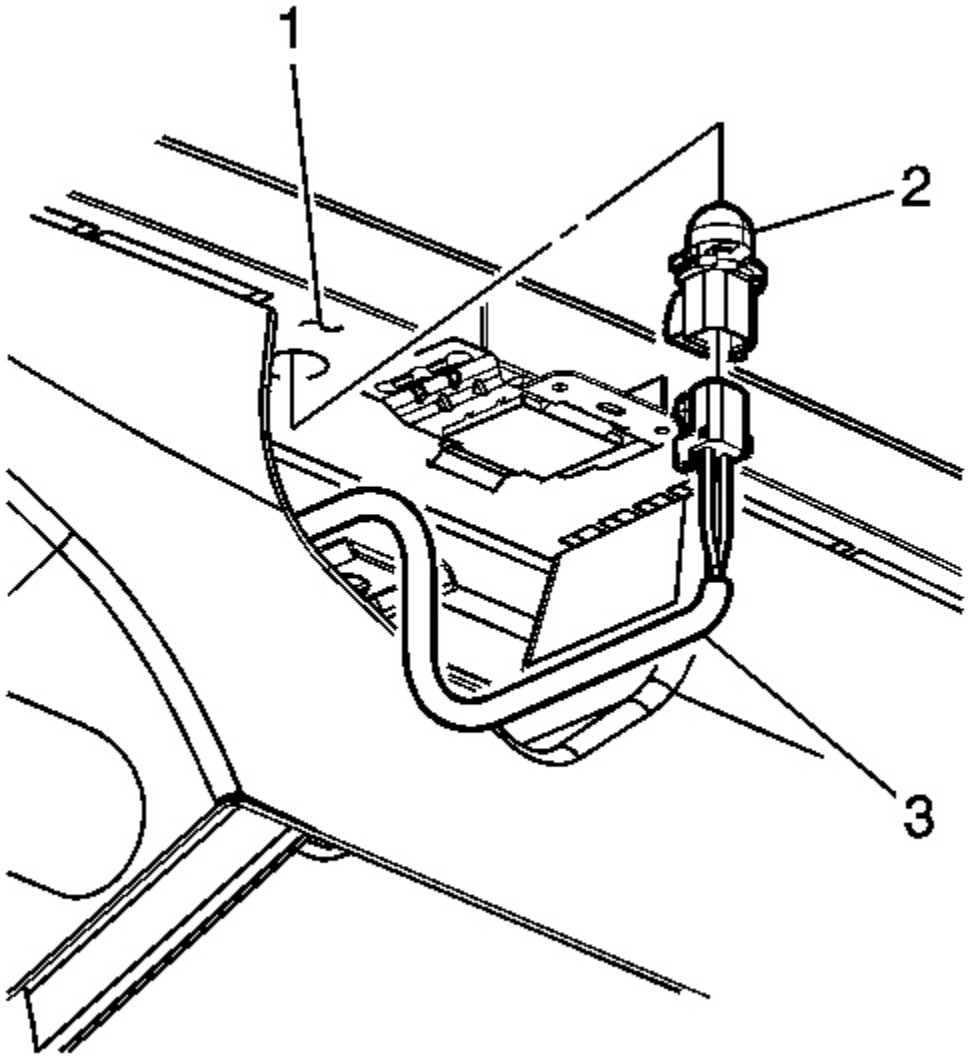


Fig. 40: Sun Load Sensor & I/P Upper Trim Pad
Courtesy of GENERAL MOTORS CORP.

1. Connect the electrical connector to the sun load sensor.
2. Install the sun load sensor to the I/P upper trim pad by turning clockwise.
3. Install the I/P upper trim pad. Refer to **Trim Pad Replacement - Instrument Panel (I/P) Upper** .

DESCRIPTION AND OPERATION

AIR DELIVERY DESCRIPTION AND OPERATION

The air delivery description and operation is divided into 5 areas:

- HVAC Control Components
- Air Speed
- Air Delivery
- Recirculation Operation
- Automatic Operation

HVAC Control Components

HVAC Control Module

The HVAC control module is a class 2 device that interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The battery positive voltage circuit provides power that the control module uses for keep alive memory (KAM). If the battery positive voltage circuit loses power, all HVAC DTCs and settings will be erased from KAM. The body control module (BCM), which is the vehicle mode master, provides a device on signal. The control module supports the following features:

Air Delivery Description and Operation

Feature	Availability
Afterblow	No
Purge	No
Personalization	Yes
Actuator Calibration	Yes

Mode Actuator

The mode actuator is a 5 wire bi-directional electric motor that incorporates a feedback potentiometer. Ignition 3 voltage, low reference, control, 5-volt reference and position signal circuits enable the actuator to operate. The control circuit uses either a 0, 2.5 or 5 volt signal to command the actuator movement. When the actuator is at rest, the control circuit value is 2.5 volts. A 0 or 5 volt control signal commands the actuator movement in opposite directions. 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, the control signal is changed to either 0 or 5 volts depending upon the direction that the actuator needs to rotate to reach the commanded value. 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 changes the control signal to 2.5 volts.

Blower Motor Control Processor

The blower motor control processor controls the speed of the blower motor by increasing or decreasing the

voltage drop on the ground side of the blower motor. The HVAC control module provides a linear pulse modulated signal to the blower motor control processor over the blower motor speed control circuit. As the requested blower speed increases, the HVAC control module increases the amount of time that the speed signal is modulated to ground. As the requested blower speed decreases, the HVAC control module decreases the amount of time that the signal is modulated to ground.

Air Speed - Front Control

The blower control switch is integrated into the HVAC control module. The two rocker type switches provide the vehicle operator the ability to select several blower speeds. The HVAC control module uses a bar graph type display to indicate the selected blower speed. The HVAC control module provides a linear pulse modulated (LPM) signal to the blower motor through the blower motor speed control circuit. The blower motor changes speed based on the received LPM signal from the HVAC control module. Power and ground are provided to the blower motor through the battery positive voltage and ground circuits. When the HVAC control module is operating in AUTO mode, the system automatically controls the blower speed. Power and ground are provided to the HVAC control module by the ignition 3 voltage and the ground circuits.

Air Distribution

The HVAC control module controls the distribution of air by the use of a mode actuator. The modes that may be selected are:

- Defrost
- Defog
- Panel
- BI-Level
- Floor

Mode Actuator

The mode actuator is connected to the mode door by a cam type linkage system. Depending on the position of the door, air is directed through the HVAC module and distributed through various ducts leading to the outlets in the dash. If the HVAC control module detects a fault with the mode door the HVAC control module will try to drive the actuator for a predetermined amount of time, to defrost, which is the defaulted position for the mode door actuator. When the mode switch is placed in the defrost or defog positions the A/C is commanded ON and the recirculation door is moved to the outside air position to help reduce window fogging. A/C is available in all modes and recirculation is only available in the panel and bi-level modes.

Front Defrost

When defrost is selected, the A/C compressor is activated. The A/C compressor clutch will engage when ambient temperatures are above 3° C (38° F). The blower motor will be activated, regardless of the coolant temperature. The HVAC control module will override the auxiliary HVAC control module so a high volume of air is delivered to the front defrost vents. The rear window defogger does not affect the HVAC system.

Recirculation Operation

The HVAC control module controls the air intake through the recirculation actuator. The recirculation switch closes the recirculation door in order to circulate the air within the vehicle. The outside air switch opens the recirculation door in order to route outside air into the vehicle. Regardless of the blower motor switch position, recirculation is available only in the panel and bi-level mode switch positions. The mode switch must be placed in either the panel or bi-level position and the recirculation switch pressed before the blower motor switch is placed in the OFF position to achieve recirculation with the blower in the OFF position. In order to reduce windshield fogging, outside air is circulated when the mode switch is in the defrost or defog positions. If the recirculation switch is pressed into the ON position when the mode switch is in an unavailable mode position, then the recirculation switch LED will flash 3 times. If the HVAC control module detects a fault with the recirculation door the HVAC control module will try to drive the actuator for a predetermined amount of time, to outside air, which is the defaulted position for the recirculation actuator.

Automatic Operation

In automatic operation, the HVAC control module will maintain the comfort level inside of the vehicle by controlling the A/C compressor clutch, the blower motor, the air temperature actuators, mode actuator and recirculation.

To place the HVAC system in Automatic mode, the following is required:

- The Auto switch must be activated
- The air temperature switch must be in any other position other than full hot or full cold position

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators will automatically be adjusted to maintain the temperature selected. The HVAC control module performs the following functions to maintain the desired air temperature:

- Monitor the following sensors:
  - Inside air temperature sensor
  - Ambient air temperature sensor
  - Lower left air temperature sensor
  - Lower right air temperature sensor
  - Upper left air temperature sensor
  - Upper right air temperature sensor
- Regulate blower motor speed
- Position the air temperature actuator
- Position the mode actuator
- Position the recirculation actuator
- Request A/C operation

AIR TEMPERATURE DESCRIPTION AND OPERATION

The air temperature controls are divided into 5 areas:

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

HVAC Control Components

HVAC Control Module

The HVAC control module is a class 2 device that interfaces between the vehicle operator and the HVAC System to maintain air temperature and distribution settings. The battery positive voltage circuit provides power that the control module uses for keep alive memory (KAM). If the battery positive voltage circuit loses power, all HVAC DTCs and settings will be erased from KAM. The body control module (BCM), which is the vehicle mode master, provides a device on signal. The control module supports the following features:

Air Temperature Description and Operation

Feature	Availability
Afterblow	No
Purge	No
Personalization	Yes
Actuator Calibration	Yes

Air Temperature Actuator

The air temperature actuators are a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Ignition 3 voltage, low reference, control, 5 volt reference and position signal circuits enable the actuator to operate. The control circuit uses either a 0, 2.5 or 5 volt signal to command the actuator movement. When the actuator is at rest, the control circuit value is 2.5 volts. A 0 or 5 volt control signal commands the actuator movement in opposite directions. When the actuator shaft rotates, the potentiometers 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, the control signal is changed to either 0 or 5 volts depending upon the direction that the actuator needs to rotate to reach the commanded value. 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 changes the control signal to 2.5 volts.

Air Temperature Sensors

The air temperature sensors are a 2-wire negative temperature co-efficient thermistor. The vehicle uses the following air temperature sensors:

- Ambient air temperature sensor
- Inside air temperature sensor assembly

- Upper left air temperature sensor
- Upper right air temperature sensor
- Lower left air temperature sensor
- Lower right air temperature sensor

A signal and low reference circuit enables the sensor to operate. As the air temperature surrounding the sensor increases, the sensor resistance decreases. The sensor signal voltage decreases as the resistance decreases. The sensor operates within a temperature range between -40° C (-40° F) to +101° C (+215° F). The sensor signal varies between 0-5 volts.

The input of the duct air temperature sensors are different from the ambient and inside sensors. The HVAC control module converts the signal to a range between 0-255 counts. As the air temperature increases the count value will decrease.

If the HVAC control module detects a malfunctioning sensor, then the control module software will use a defaulted air temperature value. The default value for the ambient and inside air temperature sensors will be displayed on the scan tool. The default value for the duct air temperature sensors will not be displayed on the scan tool. The scan tool parameter for the duct air temperature sensors are the actual state of the signal circuit. The default action ensures that the HVAC system can adjust the inside air temperature near the desired temperature until the condition is corrected.

Sunload Sensor Assembly

The sunload sensor is a 2-wire photo diode. The vehicle uses left and right sunload sensors. The two sensors are integrated into the sunload sensor assembly. Low reference and signal circuits enable the sensor to operate. As the light shining upon the sensor gets brighter, the sensor resistance increases. The sensor signal decreases as the resistance increases. The sensor operates within an intensity range between completely dark and bright. The sensor signal varies between 0-5 volts. The BCM converts the signal to a range between 0-255 counts. The BCM sends a class 2 serial data message to the HVAC control module for automatic temperature calculations.

The sunload sensor provides the BCM a measurement of the amount of light shining on the vehicle. Bright, or high intensity, light causes the vehicles inside temperature to increase. The HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle.

If the BCM detects a malfunctioning sensor, then the control module software will use a defaulted sunload value. This value will not be displayed on the scan tool. The default action ensures that the HVAC system can adjust the inside air temperature near the desired temperature until the condition is fixed. The scan tool parameter for the sunload sensor is the actual state of the signal circuit.

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 PCM converts the voltage signal to a pressure value.

The A/C refrigerant pressure sensor protects the A/C system from operating when an excessively high pressure condition exists. The PCM disables the compressor clutch if the A/C pressure is more than 2957 kPa (429 psi). The clutch will be enabled after the pressure decreases to less than 1578 kPa (229 psi).

A/C Low Pressure Switch

The A/C low pressure switch protects the A/C System from a low pressure condition that could damage the A/C compressor or cause evaporator icing. The HVAC control module applies 5 volts to the A/C low pressure switch signal circuit. The switch will open when the A/C low side pressure reaches 138-172 kPa (20-25 psi) as measured at the switch/accumulator. This prevents the A/C compressor from operating. The switch will then close when A/C low pressure side reaches 275-317 kPa (40-46 psi) as measured at the switch/accumulator. This enables the A/C compressor to turn back ON.

The low pressure switch uses refrigerant pressure to open and close a set of electrical contacts. When A/C request is authorized the switch is closed and shows normal status. During this state the switch will show 0 volts on the A/C low pressure sensor signal circuit. When A/C request is denied due to a low pressure condition the switch will be open. During this state the switch will show 5 volts on the A/C low pressure sensor signal circuit.

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 switch. The vehicle passenger can offset the passenger temperature as much as 16.7° C (30° F). Regardless of the temperature setting, the following can effect the rate that the HVAC System can achieve the desired temperature:

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

The control module makes the following actions when automatic operation is not selected, and an air temperature setting is selected:

- When the air temperature switch is placed in the warmest position, the control module commands the air temperature door to divert maximum air past the heater core.
- When the air temperature switch is placed in the coldest position, the control module commands the air temperature door to direct air to bypass the heater core.
- When the air temperature switch is placed between the warmest and coldest positions, the control module monitors the following sensor inputs to determine the air temperature door position that diverts the appropriate amount of air past the heater core in order to achieve the desired temperature:
    - Sunload
    - Duct temperatures
    - Ambient temperature

- Inside temperature

The A/C System can be engaged by either pressing the A/C switch or during automatic operation. The HVAC control module sends a class 2 message to the powertrain control module (PCM) for A/C compressor engagement. The PCM will provide a ground for the A/C compressor relay enabling it to close its internal contacts to send battery voltage to the A/C compressor clutch coil. The A/C compressor diode will prevent a voltage spike, resulting from the collapse of the magnetic field of the coil, from entering the vehicle electrical system when the compressor is disengaged.

The following conditions must be met in order for the A/C compressor clutch to turn on:

- The ambient air temperature above 4° C (40° F)
- The A/C low pressure switch signal circuit is grounded
- The A/C refrigerant pressure sensor parameter is less than 2957 kPa (429 psi)
- The PCM receives an A/C request from the HVAC control module
- The engine coolant temperature (ECT) is less than 121° C (250° F)
- The engine rpm is more than 550 rpm
- The throttle position is less than 100%

The HVAC control module monitors the A/C low pressure switch signal circuit. If the voltage signal on this circuit has no voltage drop the module will interpret this condition as a low pressure, disabling the A/C request. The A/C low pressure switch will open its internal contacts at 151 kPa (22 psi). Then close the contacts at 275 kPa (40 psi) to resume A/C operation. This switch assists in cycling the A/C compressor and prevents A/C compressor operation if system has a low refrigerant level.

The PCM monitors the A/C refrigerant pressure sensor signal circuit. The voltage signal on this circuit is proportional to the refrigerant pressure inside the A/C high side pressure line. As the pressure inside the line increases, so does the voltage signal. If the pressure is above 2957 kPa (429 psi), the A/C compressor output is disabled. When the pressure lowers to 1578 kPa (229 psi), the PCM enables the compressor to operate.

The sensor information is used by the PCM to determine the following:

- The A/C high side pressure
- An A/C system load on the engine
- An excessive A/C high side pressure
- The heat load at the A/C condenser

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

- The ambient air temperature is less than 4° C (40° F)
- The throttle position (TP) is 100 percent
- The A/C low pressure switch is open
- The A/C high side pressure is more than 2957 kPa (429 psi)

- The A/C low side pressure is less than 151 kPa (22 psi)
- The engine coolant temperature (ECT) is more than 121° C (250° F)
- The engine speed is more than 5,500 rpm
- The transmission shift
- The PCM detects excessive torque load
- The PCM detects insufficient idle quality
- The PCM detects a hard launch condition

Automatic Operation

In automatic operation, the HVAC control module will maintain the comfort level inside of the vehicle by controlling the A/C compressor clutch, the blower motor, the air temperature actuators, the mode actuator and the recirculation actuator.

To place the HVAC System in Automatic mode, the following is required:

- The Auto switch must be activated
- The air temperature switch must be in any other position other than full hot or full cold position

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators will automatically be adjusted to maintain the temperature selected. The HVAC control module performs the following functions to maintain the desired air temperature:

- Monitors the following sensors:
  - The inside air temperature sensor
  - The ambient air temperature sensor
  - The lower left air temperature sensor
  - The lower right air temperature sensor
  - The upper left air temperature sensor
  - The upper right air temperature sensor
- Regulates blower motor speed
- Positions the air temperature actuators
- Positions the mode actuator
- Positions the recirculation actuator
- Requests the A/C operation

A/C Cycle

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

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

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

The condenser is located in front of the radiator for maximum heat transfer. The condenser is made of aluminum 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 orifice tube.

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

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

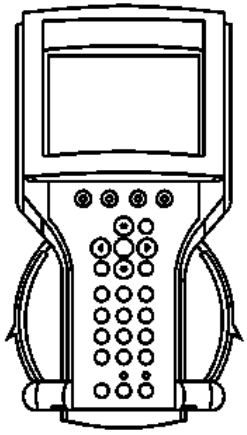
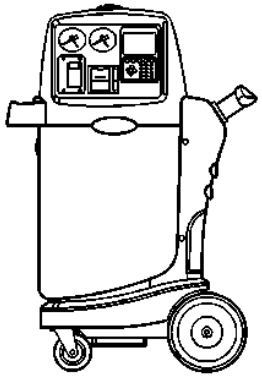
The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture removed from the passenger compartment will also change form, or condense, and is discharged from the HVAC module as water.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description

	Scan Tool
	J 43600 ACR 2000 Refrigerant Station