2007 HVAC

HVAC - Automatic - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Actuator Screws	1.6 N.m	14 lb in
HVAC Control Module Screws	1.9 N.m	17 lb in

SENSOR RESISTANCE TABLE (AIR TEMPERATURE DUCT SENSOR)

Sensor Resistance Table (Air Temperature Duct Sensor)

Duct Sensor Resistance	° C	° F
100,865	-40	-40
72,473	-35	-31
52,594	-30	-22
38,583	-25	-13
28,582	-20	-4
21,371	-15	5
16,120	-10	14
12,261	-5	23
9,399	0	32
7,263	5	41
5,658	10	50
4,441	15	59
3,511	20	68
2,795	25	77
1,806	30	86
1,465	35	95
1,195	40	104
980.3	45	113
808.8	50	122

670.9	55	131
559.4	60	140

SENSOR RESISTANCE TABLE (INSIDE AND AMBIENT AIR TEMP SENSOR)

Sensor Resistance Table (Inside and Ambient Air Temp Sensor)

Temperature		Ambient Air Temperature Sensor Resistance	Inside Air Temperature Sensor Resistance
°C	°F	Resistance K Ohms	Resistance K Ohms
-40	-40	336,000	333,562.4
-35	-31	242,700	241,071.9
-30	-22	177,000	176,081.5
-25	-13	130,400	129,925.3
-20	-4	97,060	96,807.3
-15	5	72,940	72,808.8
-10	14	55,320	55,252.8
-5	23	44,230	42,292.2
0	32	32,650	32,639.9
5	41	25,396	25,390.5
10	50	19,903	19,901.7
15	59	15,714	15,713.3
20	68	12,493	12,493
25	77	10,000	10,000
30	86	8,056	8,055.9
35	95	6,530	6,530
40	104	5,327	5,324.6
45	113	4,370	4,366.5
50	122	3,603	3,600.5

SCHEMATIC AND ROUTING DIAGRAMS

HVAC SCHEMATICS

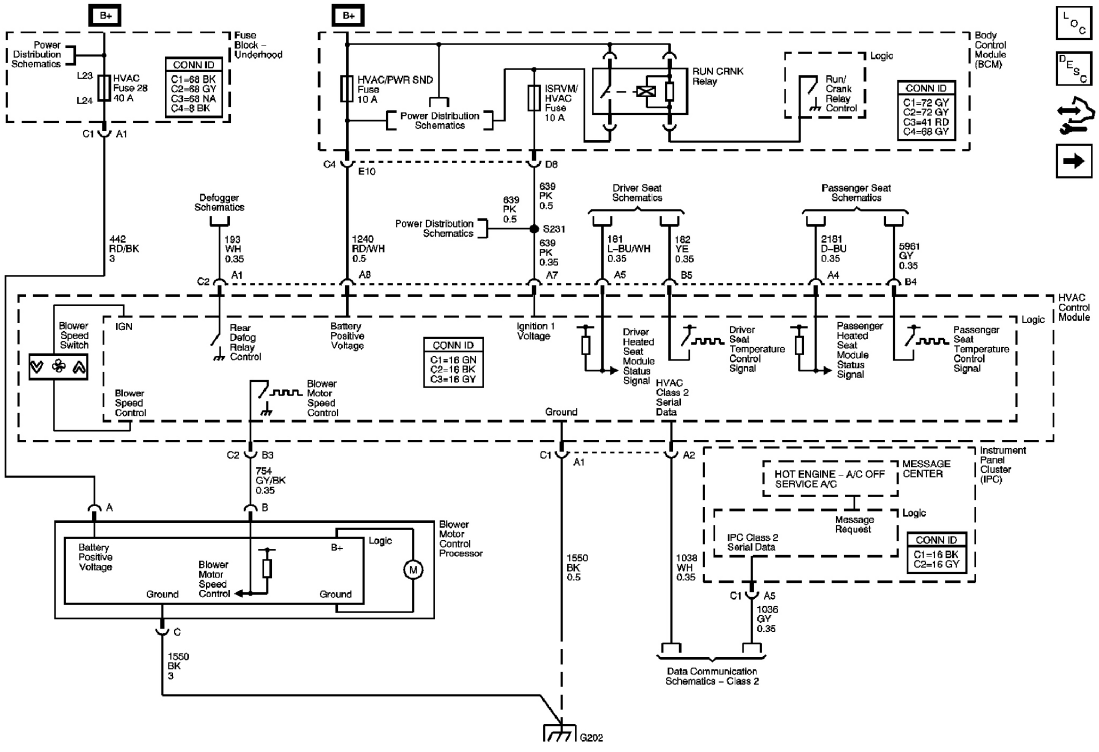


Fig. 1: Blower Controls, DLC, Ground, Power, and Subsystem Schematic
Courtesy of GENERAL MOTORS CORP.

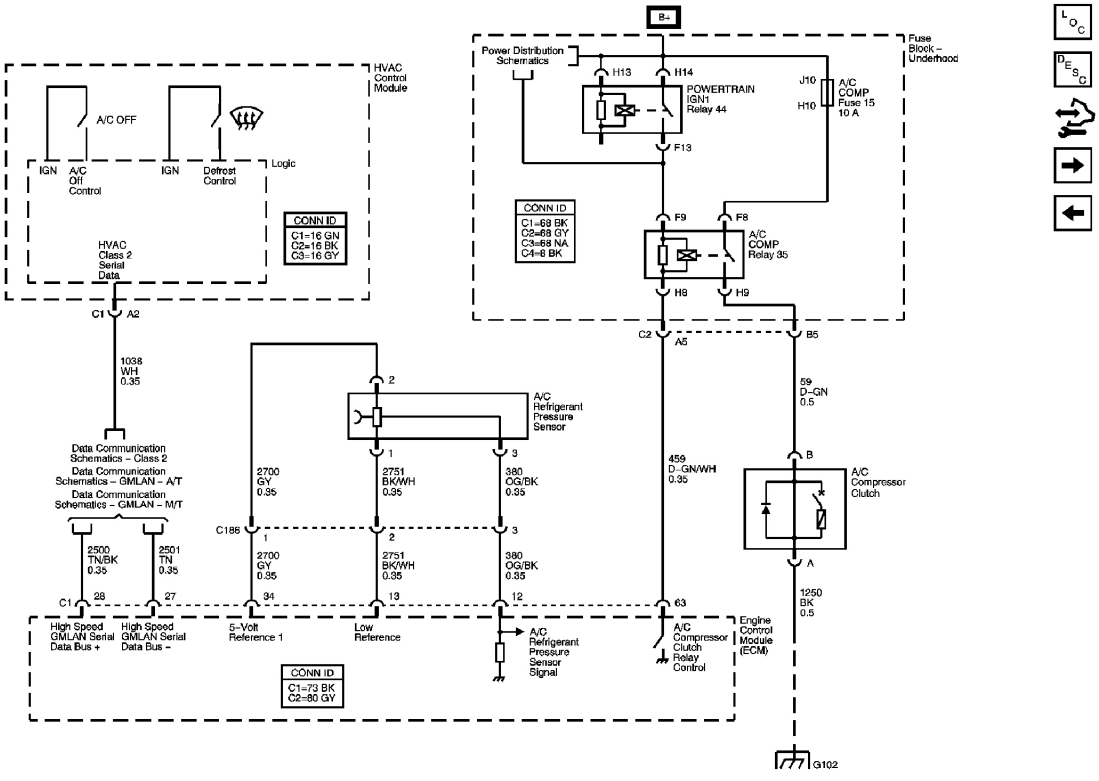


Fig. 2: Compressor Controls Schematic
Courtesy of GENERAL MOTORS CORP.

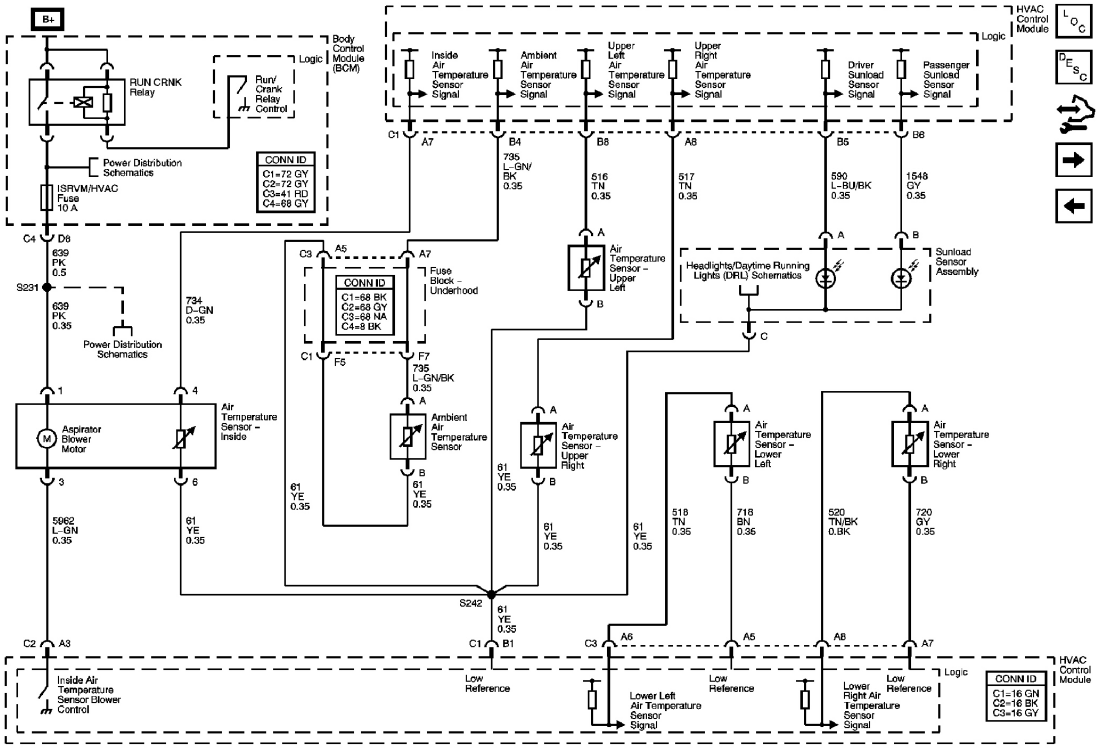


Fig. 3: Temperature Sensors Schematic
Courtesy of GENERAL MOTORS CORP.

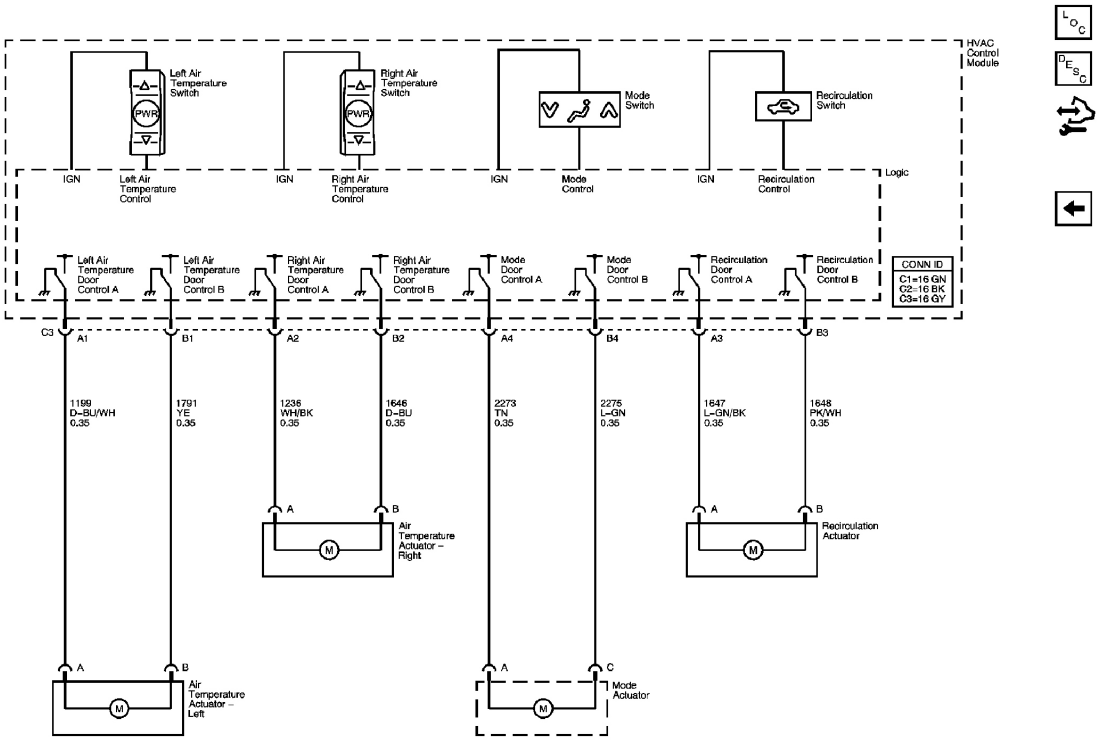


Fig. 4: Actuators Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

HVAC COMPONENT VIEWS

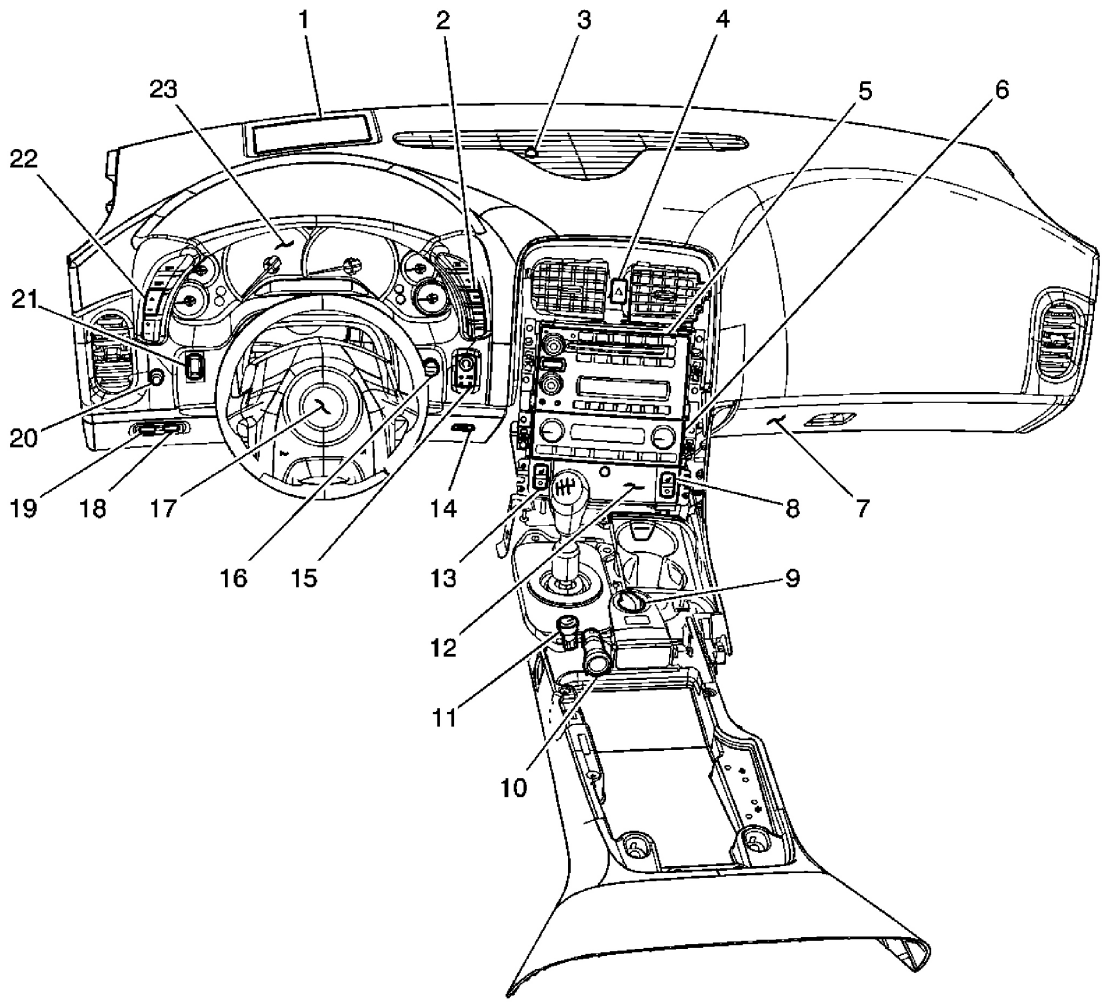


Fig. 5: I/P Console Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Head Up Display (HUD) (UV6)
2	Driver Information Center (DIC) Switch
3	Sunload Sensor Assembly
4	Hazard Switch
5	Radio
6	HVAC Control Module
7	I/P Compartment Lamp
8	Heated Seat Switch - Passenger

9	Suspension Control Switch
10	Auxiliary Power Outlet
11	Traction Control Switch
12	Cigar Lighter
13	Heated Seat Switch - Driver
14	Courtesy Lamp - Left
15	Ignition Mode Switch
16	Air Temperature Sensor - Inside
17	Inflatable Restraint Steering Wheel Module
18	Rear Compartment Lid Release Switch - Interior
19	Fuel Door Release Switch
20	I/P Dimmer Switch
21	Folding Top Control Switch (CM7)
22	Head Up Display (HUD) Switch (UV6)
23	Instrument Panel Cluster (IPC)

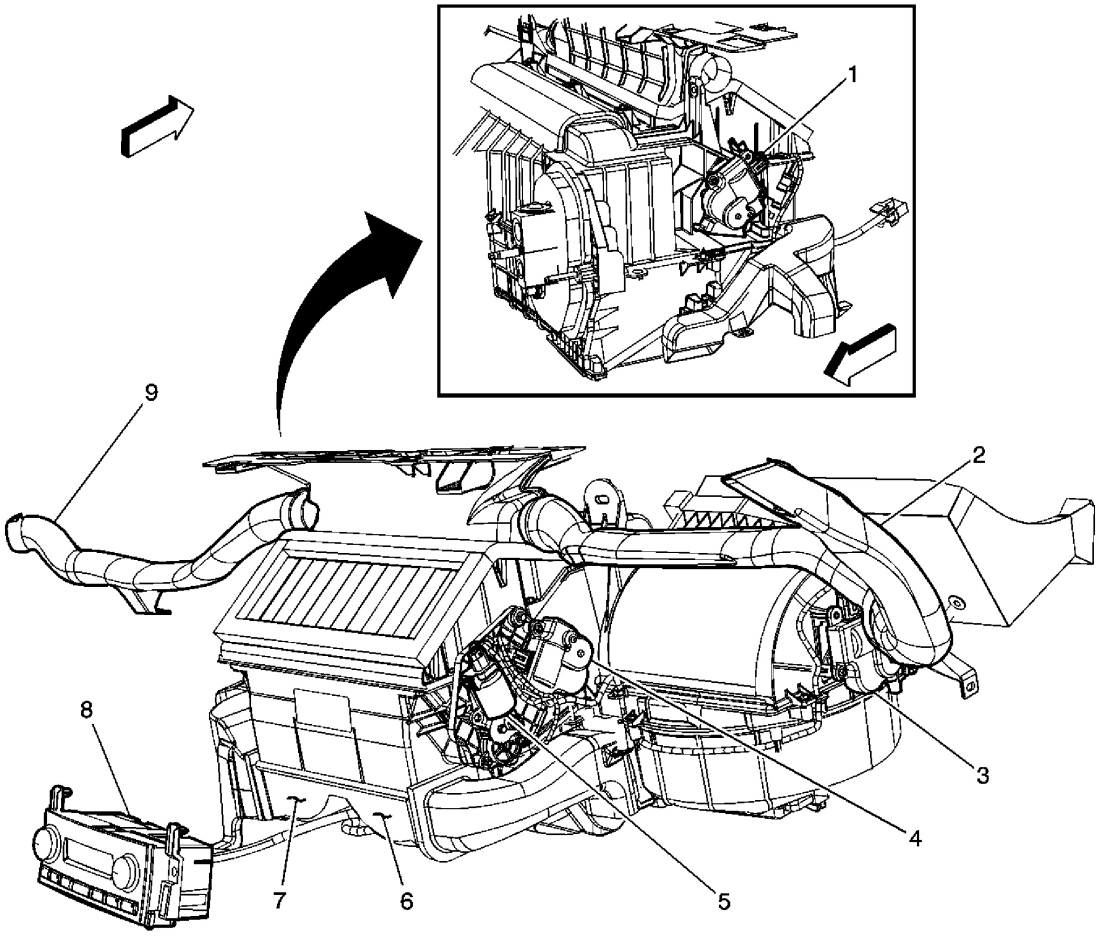


Fig. 6: HVAC Module Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

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

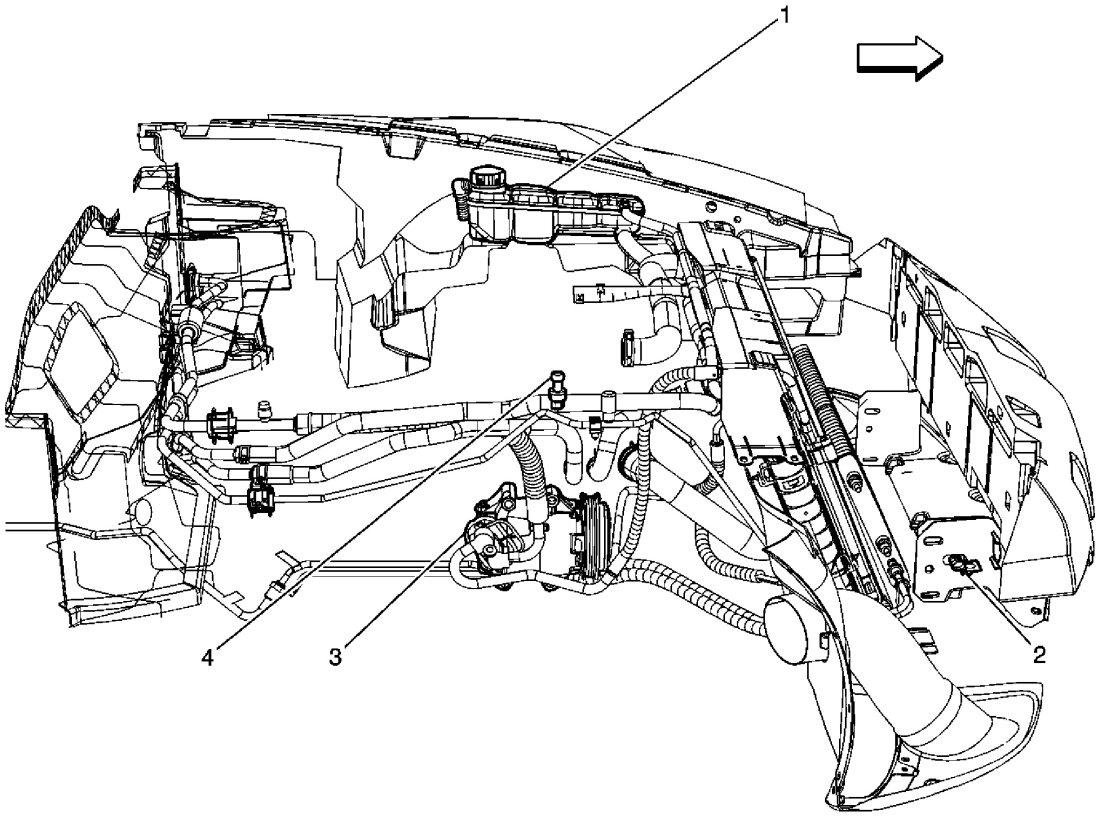


Fig. 7: HVAC Components - Engine Compartment
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	Surge Tank
2	Ambient Air Temperature Sensor
3	A/C Compressor
4	A/C Refrigerant Pressure Sensor

HVAC CONNECTOR END VIEWS

A/C Compressor Clutch

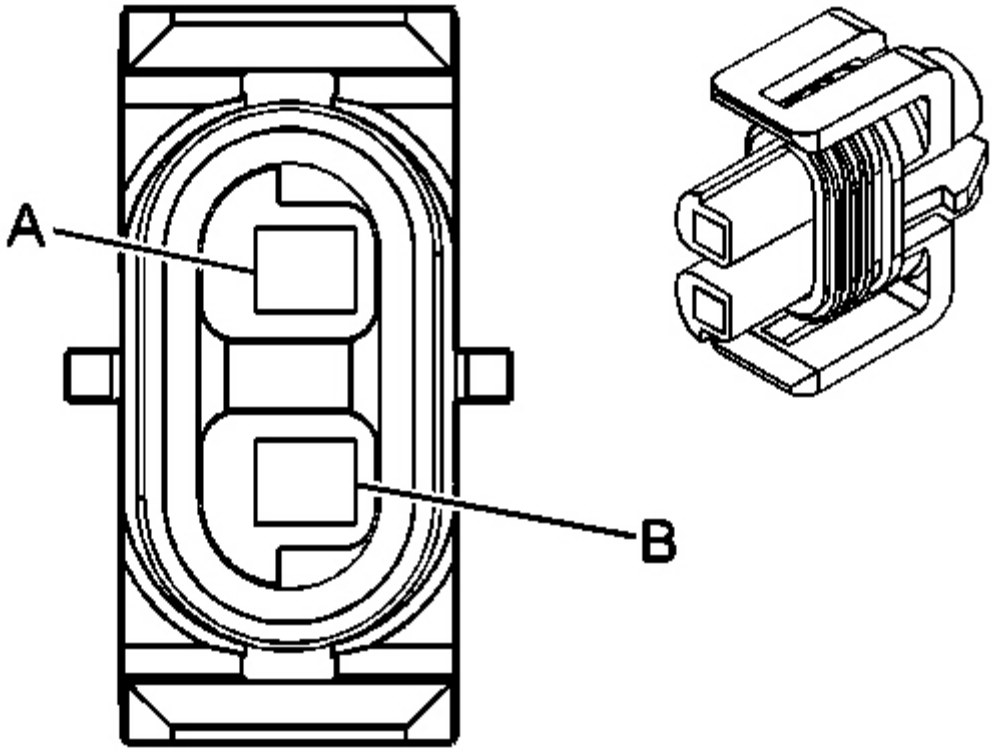


Fig. 8: A/C Compressor Clutch Connector End View
Courtesy of GENERAL MOTORS CORP.

A/C Compressor Clutch Connector Parts Information

Connector Part Information

- OEM: 12162017
- Service: 12101937
- Description: 2-Way F Metri-Pack 150 Series (GY)

Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

A/C Compressor Clutch Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	BK	1250	Ground
B	D-GN	59	A/C Compressor Clutch Supply Voltage

A/C Refrigerant Pressure Sensor

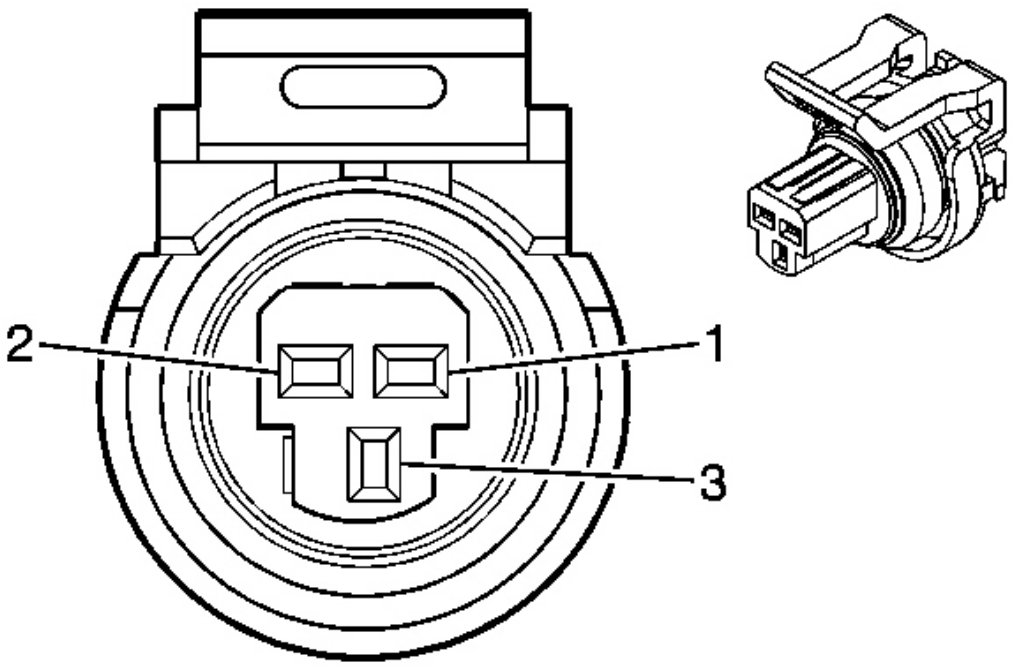


Fig. 9: A/C Refrigerant Pressure Sensor Connector End View
Courtesy of GENERAL MOTORS CORP.

A/C Refrigerant Pressure Sensor Connector Parts Information

Connector Part Information

- OEM: 15477863
- Service: 88988144
- Description: 3-Way F GT 150 Series Sealed (BK)

Terminal Part Information

- Terminal/Tray: 15326267/19
- Core/Insulation Crimp: E/4
- Release Tool/Test Probe: 15315247/J-35616-2A (GY)

A/C Refrigerant Pressure Sensor Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
1	BK/WH	2751	Low Reference
2	GY	2700	5-Volt Reference 1
3	OG/BK	380	A/C Refrigerant Pressure Sensor Signal

Air Temperature Actuator - Left

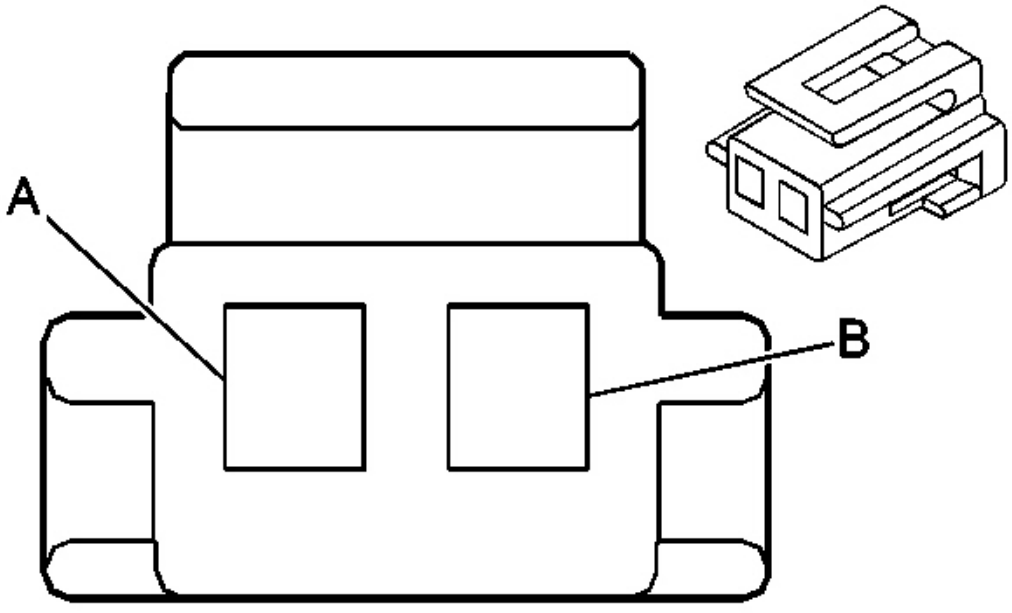


Fig. 10: Air Temperature Actuator - Left Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Actuator - Left Connector Parts Information

Connector Part Information

- OEM: 12059110
- Service: 88953271
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Actuator - Left Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	D-BU/WH	1199	Left Air Temperature Door Control A
B	YE	1791	Left Air Temperature Door Control B

Air Temperature Actuator - Right

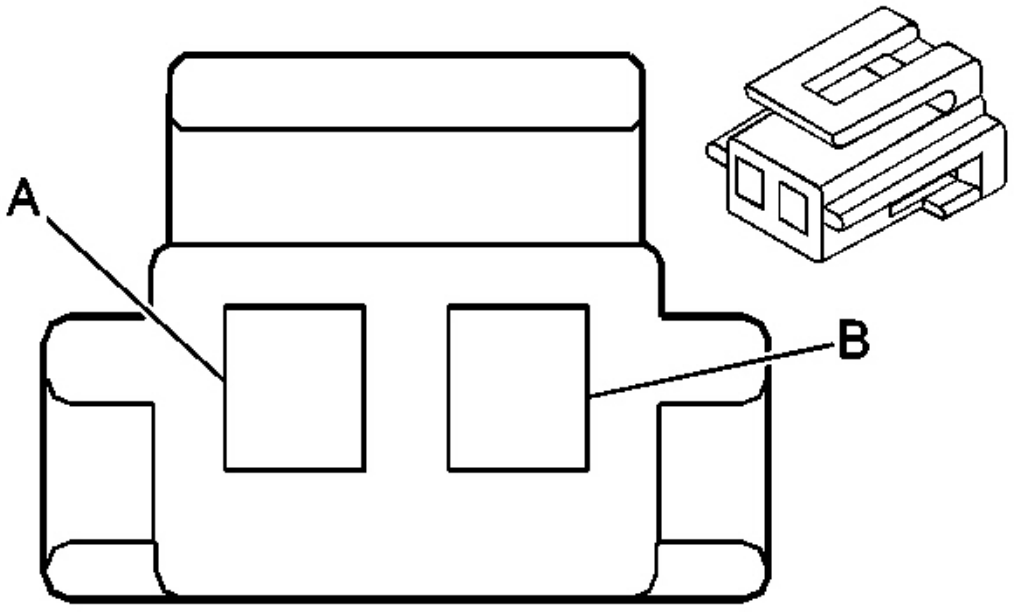


Fig. 11: Air Temperature Actuator - Right Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Actuator - Right Connector Parts Information

Connector Part Information

- OEM: 12059110
- Service: 88953271
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Actuator - Right Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	WH/BK	1236	Right Air Temperature Door Control A
B	D-BU	1646	Right Air Temperature Door Control B

Air Temperature Sensor - Inside

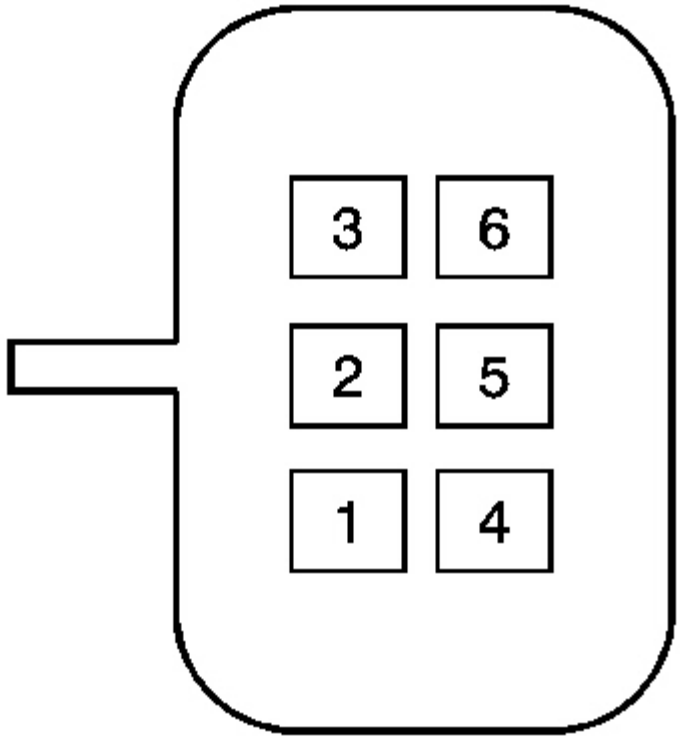


Fig. 12: Air Temperature Sensor - Inside Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Sensor - Inside Connector Parts Information

Connector Part Information

- OEM: 49901221
- Service: 88953365
- Description: 6-Way F 0.635 Series (BK)

Terminal Part Information

- Pins: 1, 3, 4, 6
- Terminal/Tray: 928999-5/15
- Core/Insulation Crimp: H/H

- Release Tool/Test Probe: 12094429/J-35616-64B (L-BU)

Air Temperature Sensor - Inside Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
1	PK	639	Ignition 1 Voltage
2	-	-	Not Used
3	L-GN	5962	Inside Air Temperature Sensor Blower Control
4	D-GN	734	Inside Air Temperature Sensor Signal
5	-	-	Not Used
6	YE	61	Low Reference

Air Temperature Sensor - Lower Left

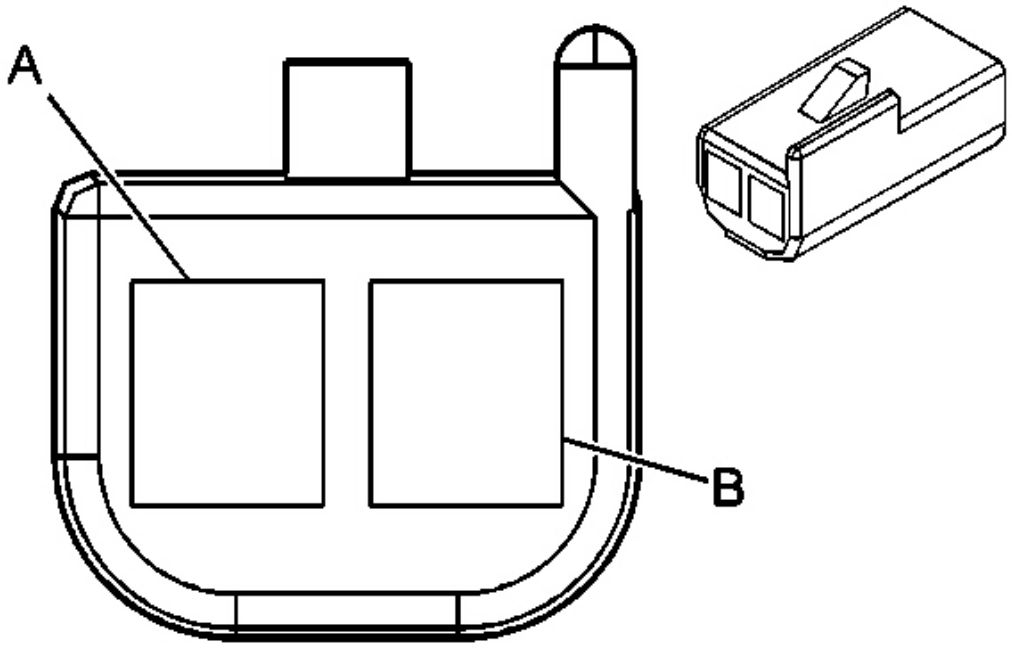


Fig. 13: Air Temperature Sensor - Lower Left Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Sensor - Lower Left Connector Parts Information

Connector Part Information

- OEM: 12047662
- Service: 12085535
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Sensor - Lower Left Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	TN	518	Lower Left Air Temperature Sensor Signal
B	BN	718	Low Reference

Air Temperature Sensor - Lower Right

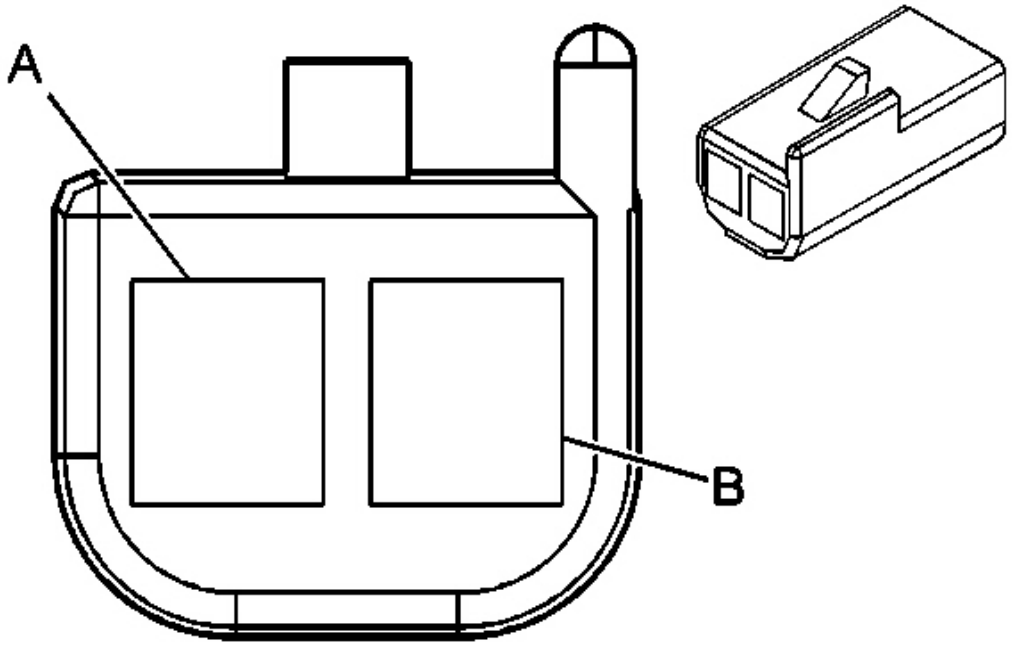


Fig. 14: Air Temperature Sensor - Lower Right Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Sensor - Lower Right Connector Parts Information

Connector Part Information

- OEM: 12047662
- Service: 12085535
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Sensor - Lower Right Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function

A	TN/BK	520	Lower Right Air Temperature Sensor Signal
B	GY	720	Low Reference

Air Temperature Sensor - Upper Left

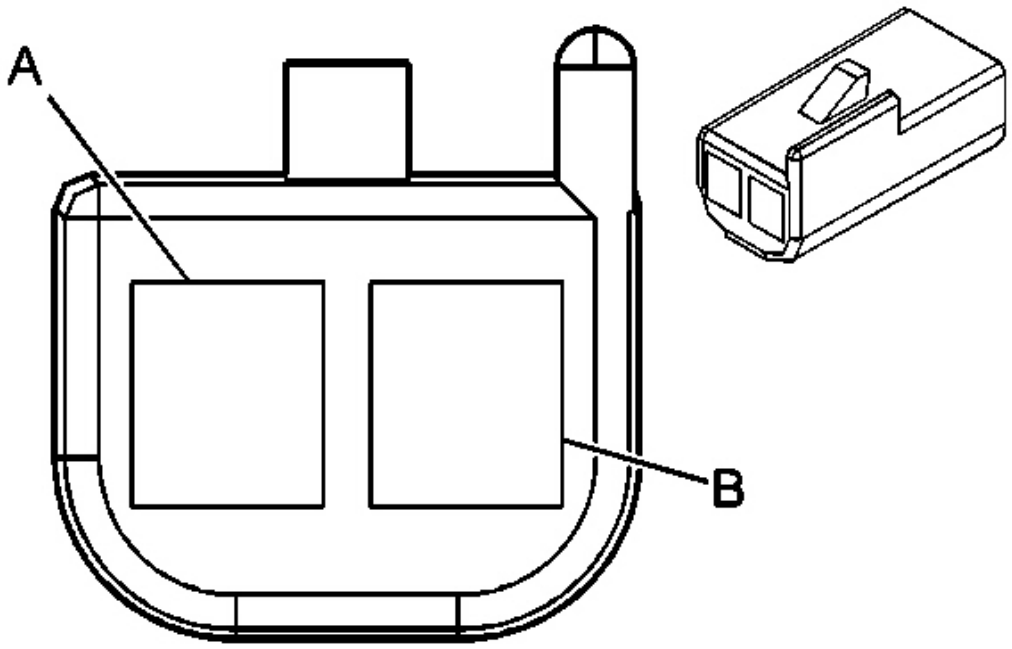


Fig. 15: Air Temperature Sensor - Upper Left Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Sensor - Upper Left Connector Parts Information

Connector Part Information

- OEM: 12047662
- Service: 12085535
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit

- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Sensor - Upper Left Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	TN	517	Upper Left Air Temperature Sensor Signal
B	YE	61	Low Reference

Air Temperature Sensor - Upper Right

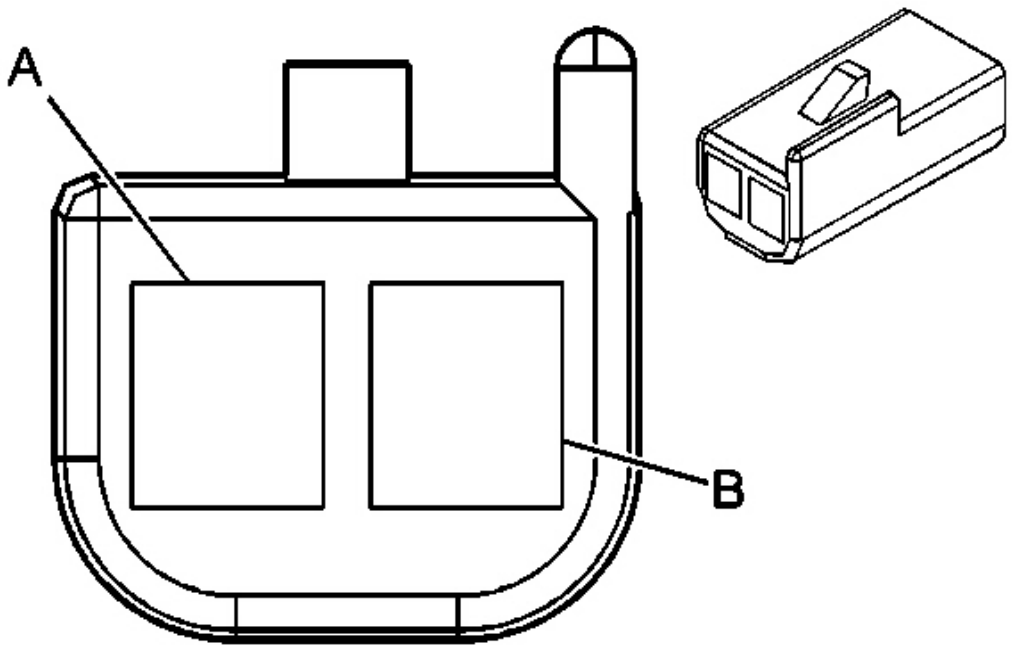


Fig. 16: Air Temperature Sensor - Upper Right Connector End View
Courtesy of GENERAL MOTORS CORP.

Air Temperature Sensor - Upper Right Connector Parts Information

Connector Part Information

- OEM: 12047662

- Service: 12085535
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Sensor - Upper Right Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	TN	516	Upper Right Air Temperature Sensor Signal
B	YE	61	Low Reference

Ambient Air Temperature Sensor

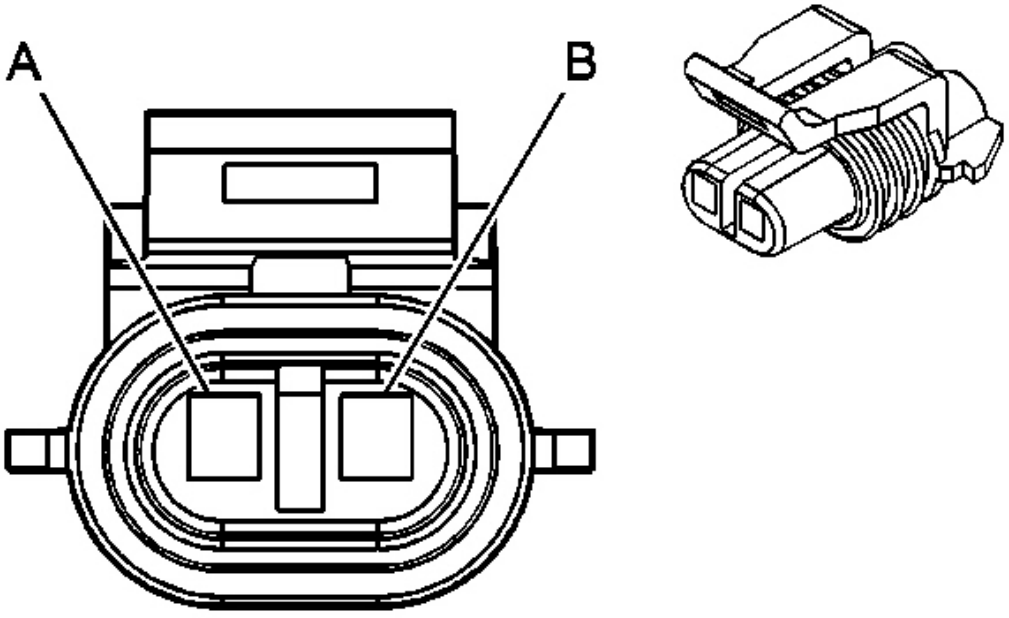


Fig. 17: Ambient Air Temperature Sensor Connector End View
Courtesy of GENERAL MOTORS CORP.

Ambient Air Temperature Sensor Connector Parts Information

Connector Part Information

- OEM: 12186685
- Service: 12102747
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

Ambient Air Temperature Sensor Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	L-GN/BK	735	Ambient Air Temperature Sensor Signal
B	YE	61	Low Reference

Blower Motor Control Processor

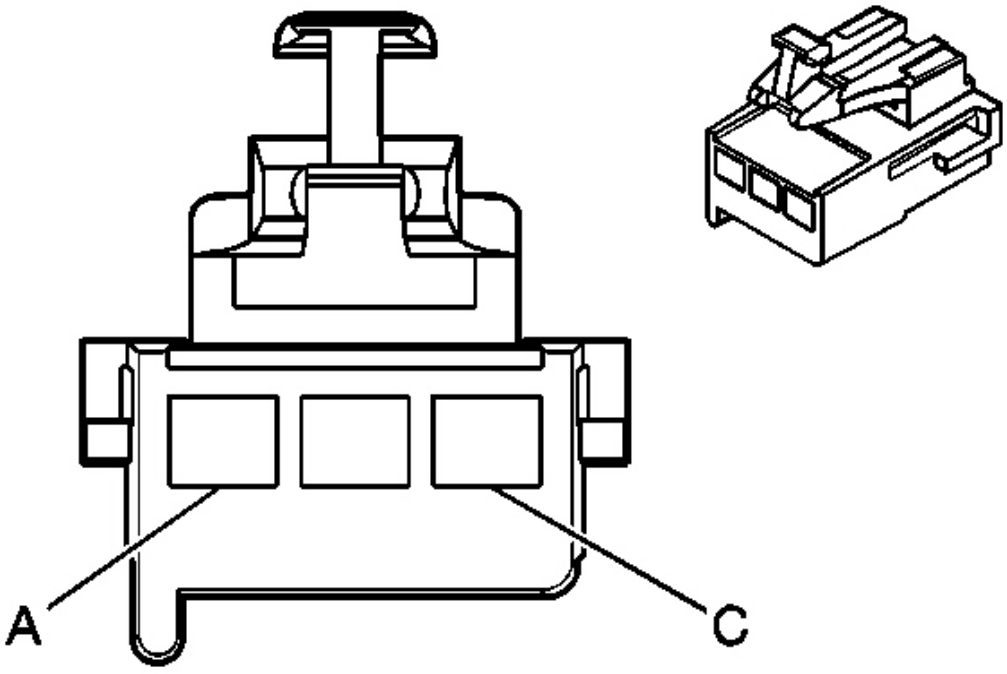


Fig. 18: Blower Motor Control Processor Connector End View
Courtesy of GENERAL MOTORS CORP.

Blower Motor Control Processor Connector Parts Information

Connector Part Information

- OEM: 12129489
- Service: 12126486
- Description: 3-Way F Metri-Pack 280 Series Flexlock (BK)

Terminal Part Information

- Pins: A, C
- Terminal/Tray: 12110842/4
- Core/Insulation Crimp: F/G
- Release Tool/Test Probe: 15315247/J-35616-4A (PU)

- Pins: B

- Terminal/Tray: 12110844/4
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 15315247/J-35616-4A (PU)

Blower Motor Control Processor Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	RD/BK	442	Battery Positive Voltage
B	GY/BK	754	Blower Motor Speed Control
C	BK	1550	Ground

HVAC Control Module C1

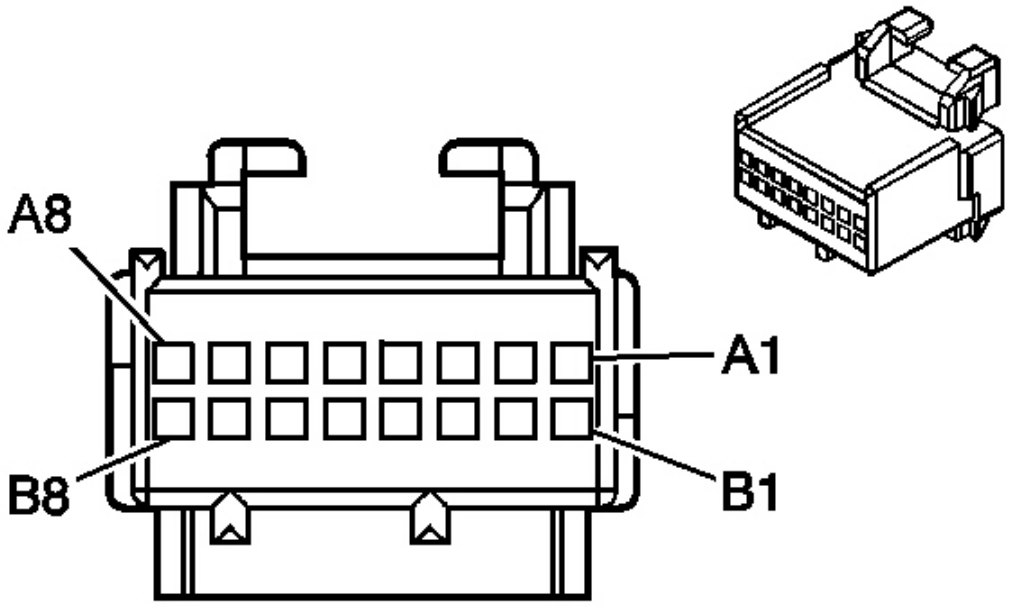


Fig. 19: HVAC Control Module C1 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Control Module C1 Connector Parts Information

Connector Part Information

- OEM: 12110259
- Service: 12110259
- Description: 16-Way F Micro-Pack 100 Series (GN)

Terminal Part Information

- Pins: A1, A2, A7, A8, B1, B4-B8
- Terminal/Tray: 12146447/3
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12031876-1/J-35616-6 (BN)

HVAC Control Module C1 Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A1	BK	1550	Ground
A2	WH	1038	HVAC Class 2 Serial Data
A3-A6	-	-	Not Used
A7	D-GN	734	Inside Air Temperature Sensor Signal
A8	TN	516	Upper Right Air Temperature Sensor Signal
B1	YE	61	Low Reference
B2-B3	-	-	Not Used
B4	L-GN/BK	735	Ambient Air Temperature Sensor Signal
B5	L-BU/BK	590	Driver Sunload Sensor Signal
B6	GY	1548	Passenger Sunload Sensor Signal
B7	WH	278	Ambient Light Sensor Signal
B8	TN	517	Upper Left Air Temperature Sensor Signal

HVAC Control Module C2

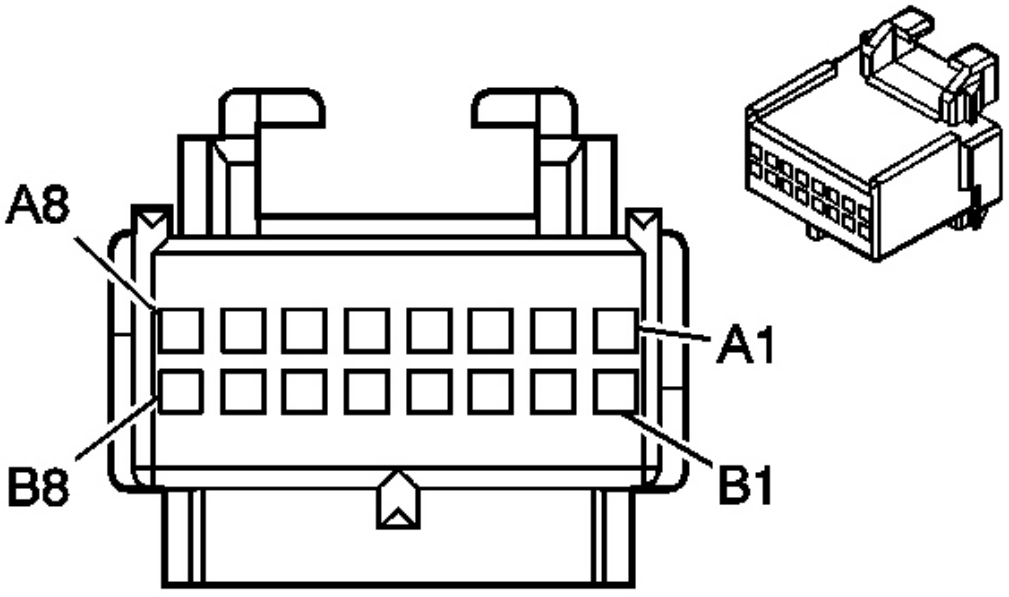


Fig. 20: HVAC Control Module C2 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Control Module C2 Connector Parts Information

Connector Part Information

- OEM: 12084944
- Service: 12084944
- Description: 16-Way F Micro-Pack 100 Series (BK)

Terminal Part Information

- Pins: A1, A3-A5, A7, A8, B1-B5
- Terminal/Tray: 12146447/3
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12031876-1/J-35616-6 (BN)

HVAC Control Module C2 Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function

A1	WH	193	Rear Defog Relay Control
A2	-	-	Not Used
A3	L-GN	5962	Inside Air Temperature Sensor Blower Control
A4	D-BU	2181	Passenger Heated Seat Control Module Status Signal
A5	L-BU/WH	181	Driver Heated Seat Control Module Status Signal
A6	-	-	Not Used
A7	PK	639	Ignition 1 Voltage
A8	RD/WH	1240	Battery Positive Voltage
B1	GY/BK	1458	Instrument Panel Lamp Supply Voltage 4
B2	GY/BK	1357	Instrument Panel Lamp Control
B3	GY/BK	754	Blower Motor Speed Control
B4	GY	5961	Passenger Seat Temperature Control Signal
B5	YE	182	Driver Seat Temperature Control Signal
B6-B8	-	-	Not Used

HVAC Control Module C3

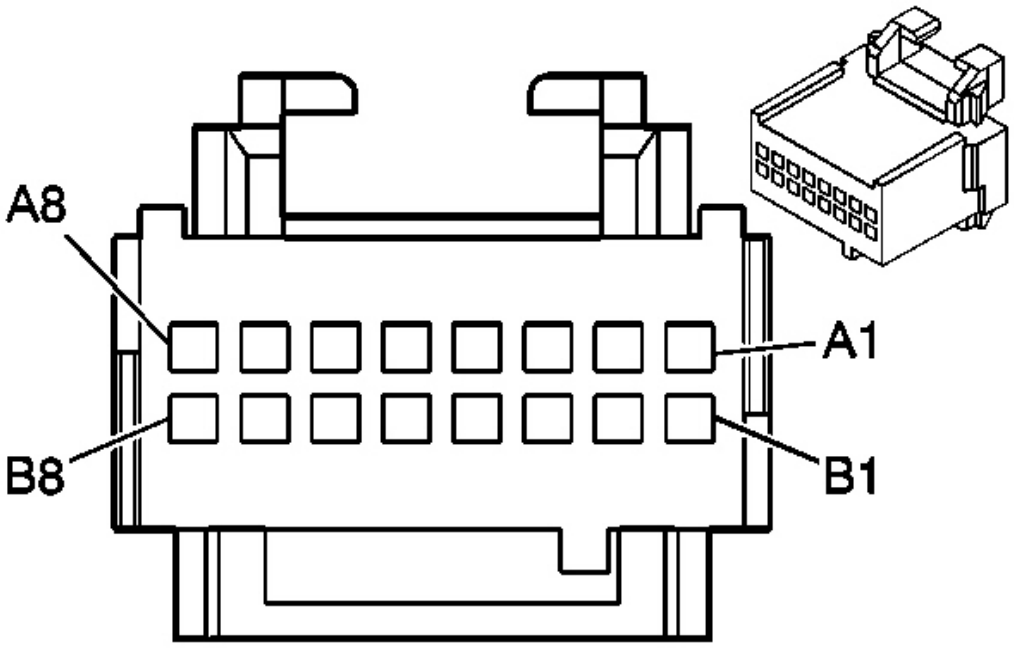


Fig. 21: HVAC Control Module C3 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Control Module C3 Connector Parts Information

Connector Part Information

- OEM: 12084945
- Service: 12084945
- Description: 16-Way F Micro-Pack 100 Series (GY)

Terminal Part Information

- Pins: A1-A8, B1-B4
- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

HVAC Control Module C3 Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A1	D-BU/WH	1199	Left Air Temperature Door Control A
A2	WH/BK	1236	Right Air Temperature Door Control A
A3	L-GN/BK	1647	Recirculation Door Control A
A4	TN	2273	Mode Door Control A
A5	BN	718	Low Reference
A6	TN	518	Lower Left Air Temperature Sensor Signal
A7	GY	720	Low Reference
A8	TN/BK	520	Lower Right Air Temperature Sensor Signal
B1	YE	1791	Left Air Temperature Door Control B
B2	D-BU	1646	Right Air Temperature Door Control B
B3	PK/WH	1648	Recirculation Door Control B
B4	L-GN	2275	Mode Door Control B
B5-B8	-	-	Not Used

Mode Actuator

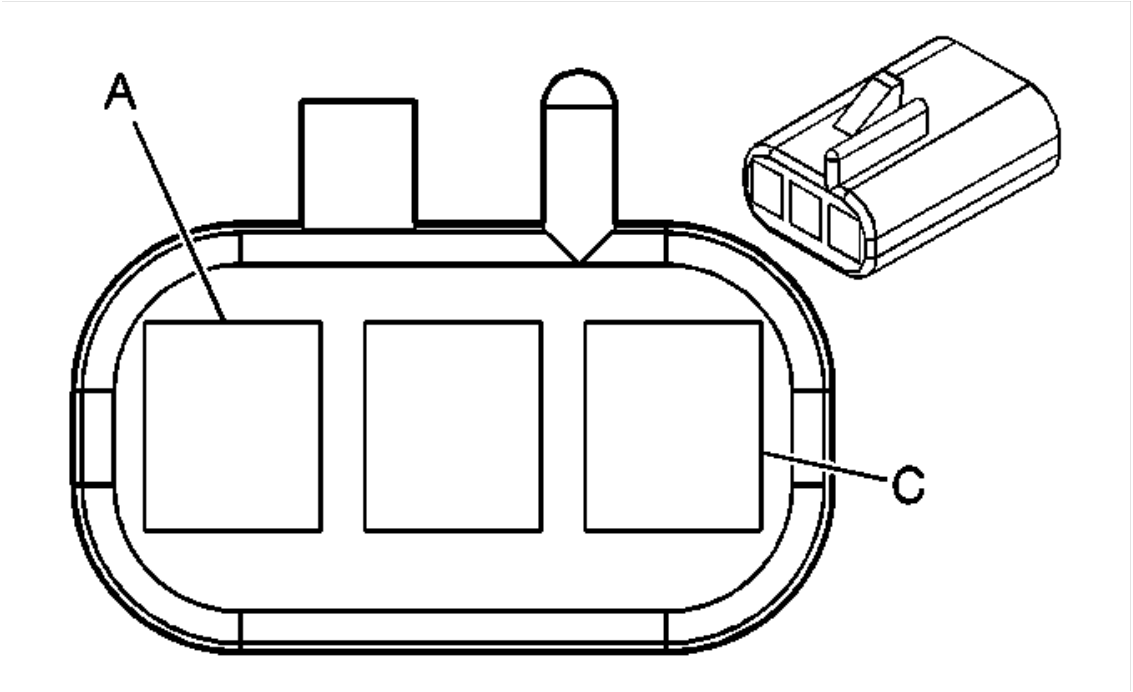


Fig. 22: Mode Actuator Connector End View
Courtesy of GENERAL MOTORS CORP.

Mode Actuator Connector Parts Information

Connector Part Information

- OEM: 12047781
- Service: 12101864
- Description: 3-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Pins: A, C
- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Mode Actuator Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	TN	2273	Mode Door Control A
B	-	-	Not Used
C	L-GN	2275	Mode Door Control B

Recirculation Actuator

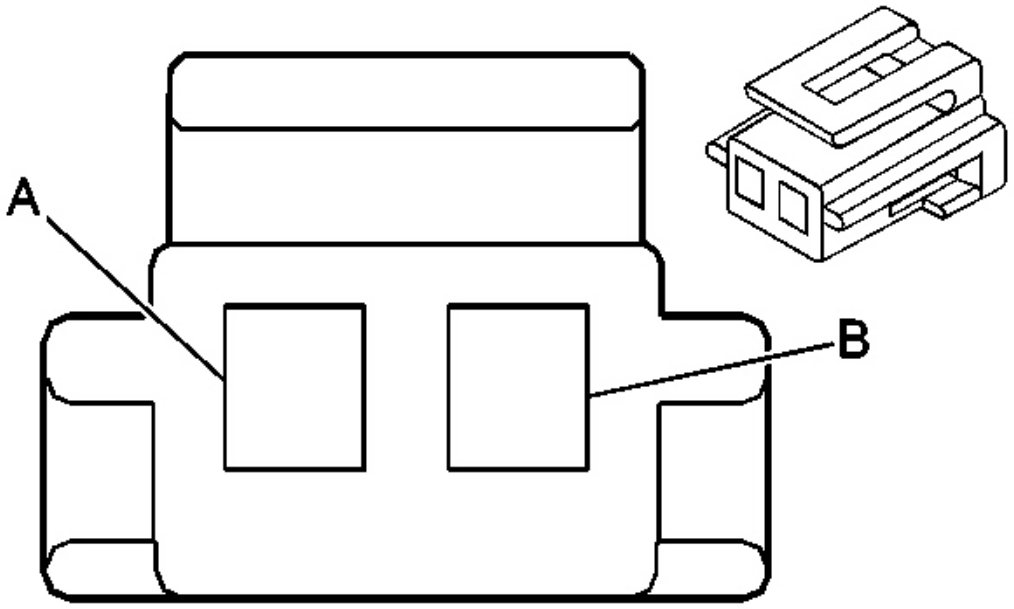


Fig. 23: Recirculation Actuator Connector End View
Courtesy of GENERAL MOTORS CORP.

Recirculation Actuator Connector Parts Information

Connector Part Information

- OEM: 12059110
- Service: 88953271
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Recirculation Actuator Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	L-GN/BK	1647	Recirculation Door Control A

B	PK/WH	1648	Recirculation Door Control B

Sunload Sensor Assembly

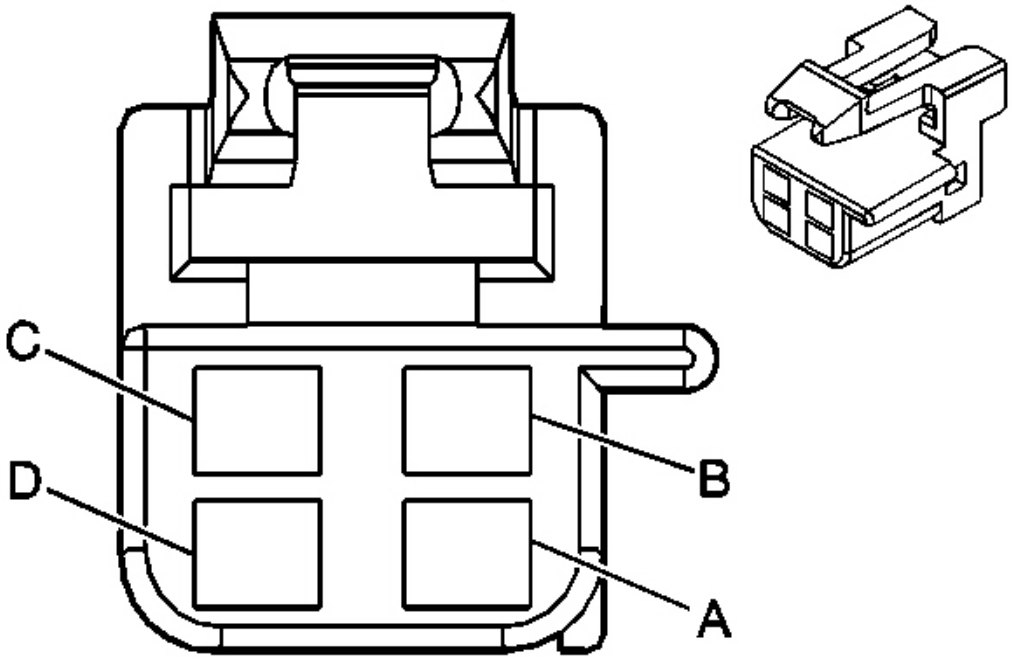


Fig. 24: Sunload Sensor Assembly Connector End View
Courtesy of GENERAL MOTORS CORP.

Sunload Sensor Assembly Connector Parts Information

Connector Part Information

- OEM: 12064760
- Service: 12085208
- Description: 4-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: 12064971/5
- Core/Insulation Crimp: E/C

- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

Sunload Sensor Assembly Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	L-BU/BK	590	Driver Solar Sensor Signal
B	GY	1548	Passenger Sunload Sensor Signal
C	YE	61	Low Reference
D	WH	278	Ambient Light Sensor Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B0159 or B0164	DTC B0159 Outside Air Temperature Sensor Circuit DTC B0164 Passenger Compartment Temperature Sensor Circuit
DTC B0174, B0179, B0510, or B0515	DTC B0174 Output Air Temperature Sensor 1 DTC B0179 Output Air Temperature Sensor 2 DTC B0510 Output Air Temperature Sensor 3 DTC B0515 Output Air Temperature Sensor 4
DTC B0184 or B0189	DTC B0184 Solar Load Sensor Left DTC B0189 Solar Load Sensor Right
DTC B0248, B0268, B0408, or B0423	DTC B0248 Air Flow Control 3 Circuit DTC B0268 Air Flow Control 7 Circuit DTC B0408 Temperature Control 1 Circuit DTC B0423 Temperature Control 2 Circuit
DTC B0249, B0269, B0409, or B0419	DTC B0249 Air Flow Control 3 Circuit Range DTC B0269 Air Flow Control 7 Circuit Range DTC B0409 Temperature Control 1 Circuit Range DTC B0419 Temperature Control 2 Circuit Range
DTC P0532 or P0533	DTC P0532 A/C Refrigerant Pressure Sensor Circuit Low Voltage DTC P0533 A/C Refrigerant Pressure Sensor Circuit High Voltage
DTC P0645	A/C Clutch Relay Control Circuit

SCAN TOOL OUTPUT CONTROLS

HVAC Control Module Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selections	Description
Afterblow Option	Output Control	When after blow is activated the scan tool displays an *.
Blower Motor Speed	Output Control	The scan tool displays Off or On selections. This function allows you to command the blower motor to its maximum (100%) or minimum (0%) speeds for 5 seconds.
Compressor Clutch	Output Control	The scan tool displays the A/C compressor clutch status: Engage or Disengage. This function allows you to command the A/C compressor clutch On and Off.
Driver Temp. Door	Output Control	The scan tool displays On or Off selections. The selection drives the actuator to its minimum (cold) or maximum (hot) positions for 20 seconds.
Mode Door	Output Control	The scan tool displays On or Off selections. This function drives the actuator to its minimum (defrost) or maximum (upper) positions for 20 seconds.
Passenger Temp. Door	Output Control	The scan tool displays On or Off selections. The selection drives the actuator to its minimum (hot) or maximum (cold) positions for 20 seconds.
Recalibrate All Motors	Output Control	When commanded the scan tool displays the actuators counts moving from hot to cold until the re-cal is complete.
Recirculation Door	Output Control	The scan tool displays On or Off selections. This function drives the actuator to its minimum (outside air) or maximum (recirculate) stops for 20 seconds.
Update Ambient Air Temperature Display	Output Control	The scan tool displays Commanded State: On or Off. This function updates the HVAC control module ambient air temperature input to the current raw value.

IPC Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selections	Description

Displays Test	Output Control	The scan tool displays Off or On selections. When you select On, all segments of the HVAC control module and IPC should illuminate for 5 seconds, and all gages should sweep through their full range of motion. When you select Off, all segments of the HVAC control module and IPC should be blank, and all gages should be at zero for 5 seconds.

ECM Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selections	Description
Compressor Clutch	Engine Output Controls	The scan tool displays On or Off selections. This command allows you to turn the A/C compressor clutch relay ON for 5 seconds or OFF. When the relay is commanded ON, the A/C compressor clutch should be engaged.

SCAN TOOL DATA LIST

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

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

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

Heating and Air Conditioning Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value

Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27°C (70-80°F)			
A/C Request	HVAC System Data, Module and Display Data	Yes/No	Yes
Ambient Air Temp. Sensor	HVAC System Data, Sensor Data, Module and Display Data	°C/°F	Varies
Blower Motor Speed	HVAC System Data	%	Varies
Blower Motor Speed Command	HVAC System Data	%	Varies
Compressor Clutch Status	HVAC System Data	OFF/Auto	Auto
Driver Program Number	Module and Display Data	Counts	Varies
Driver Temp. Dr. Cal. Range	Actuator Data	Pulses	Varies
Driver Temp. Dr. Motor Command	Actuator Data	Counts	Varies
Driver Temp. Dr. Position	Actuator Data	Counts	Varies
Driver Temp. Dr. Position	Actuator Data	Pulses	Varies
Inside Air Temp. Sensor	HVAC System Data, Sensor Data, Module and Display Data	°C/°F	Varies
LED Intensity	Module and Display Data	Counts	Varies
Left Sunload Sensor	Sensor Data	Counts	Varies
Load Management Status	Module and Display Data	ON/OFF	OFF
Lower Left Duct Temp. Sensor	Sensor Data	Counts	Varies
Lower Right Duct Temp. Sensor	Sensor Data	Counts	Varies
Mode Dr. Cal. Range	Actuator Data	Pulses	Varies
Mode Dr. Motor Command	Actuator Data	Counts	Varies
Mode Dr. Position	Actuator Data	Counts	Varies
Mode Dr. Position	Actuator Data	Pulses	Varies
		Auto, Panel,	

Mode Status	HVAC System Data, Module and Display Data	Lower, Bi-level, Defog, Defrost, Off	Varies
Psgr. Program Number	Module and Display Data	Counts	Varies
Psgr. Temp. Dr. Cal. Range	Actuator Data	Pulses	Varies
Psgr. Temp. Dr. Motor Command	Actuator Data	Counts	Varies
Psgr. Temp. Dr. Position	Actuator Data	Counts	Varies
Psgr. Temp. Dr. Position	Actuator Data	Pulses	Varies
Recirculation Dr. Cal. Range	Actuator Data	Pulses	Varies
Recirculation Dr. Motor Command	Actuator Data	Counts	Varies
Recirculation Dr. Position	Actuator Data	Counts	Varies
Recirculation Dr. Position	Actuator Data	Pulses	Varies
Right Sunload Sensor	Sensor Data	Counts	Varies
Upper Left Duct Temp. Sensor	Sensor Data	Counts	Varies
Upper Right Duct Temp. Sensor	Sensor Data	Counts	Varies
Valet Switch	Module and Display Data	Active/Inactive	OFF
Vehicle Speed	HVAC System Data	Km/h/mph	Varies

ECM 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 Off for WOT	ECM	Yes/No	No
A/C Pressure Disabled	ECM	Yes/No	No
A/C Refrigerant Pressure Sensor	ECM	kPa/psi	Varies
A/C Refrigerant Pressure Sensor	ECM	Volts	Varies
A/C Relay Command	ECM	Yes/No	Yes
A/C Request Signal	ECM	Yes/No	Yes
ECT Sensor	ECM, EVAP Data, Fuel Trim Data, Misfire Data, CMP	°C/°F	Varies

	Actuator Data		

Vehicle Control Systems ECU Identification Information - HVAC

Scan Tool Parameter	Data List	ID Number
Operating Conditions: Ignition ON		
8-Digit GM Part Number	Module Information 1	8 Digit ID Number
Calibration ID	Module Information 2	8 Digit ID Number
Prom ID	Module Information 1	8 Digit ID Number
Software Part Number	Module Information 2	8 Digit ID Number

SCAN TOOL DATA DEFINITIONS

A/C Refrigerant Pressure Sensor

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

A/C Refrigerant Pressure Sensor

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

A/C Relay Command

The scan tool displays Yes/No. The scan tool displays the control decision for the compressor clutch relay output as determined by the ECM.

A/C Request

The scan tool displays Yes/No. The scan tool displays Yes when the HVAC control module requires the A/C compressor clutch to engage. The scan tool displays No when the HVAC control module does not need the A/C compressor clutch to engage.

A/C Request Signal

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

Afterblow Option

The scan tool can activate the afterblow feature and will display an * if the feature is activated.

Ambient Air Temp. Sensor

The scan tool displays -40 to 60°C (-40 to 140°F). The voltage applied to the HVAC control module input from the ambient air temperature sensor is converted to an unfiltered temperature value.

Blower Motor Speed

The scan tool displays 0-100 %. The actual blower speed interpreted by the HVAC control module.

Blower Motor Speed Command

The scan tool displays 0-100 %. The blower speed being requested by the HVAC control module.

Calibration ID

The scan tool displays the current level of calibration in the HVAC module.

Compressor Clutch Status

The scan tool displays Off/Auto. The scan tool displays Off when the HVAC control module is not using A/C system for cooling requirements. The scan tool displays Auto when the HVAC control module is using A/C system for cooling requirements.

Driver Program Number

The scan tool displays 0-255 Counts. This value will vary, depending on the air delivery mode and the air discharge temperature selected by the driver. The higher the program number will relate to a higher heating requirement.

Driver Temp. Dr. Cal. Range

The scan tool displays 0-65535 Pulses. The total calibrated range of the actuator that is stored in the memory of the HVAC control module.

Driver Temp. Dr. Motor Command

The scan tool displays 0-255 Counts. The desired position of the left air temperature actuator.

Driver Temp. Dr. Position

The scan tool displays 0-255 Counts. The signal output from the feedback potentiometer on the left air temperature actuator.

Driver Temp. Dr. Position

The scan tool displays 0-65535 Pulses. The signal output from the feedback potentiometer on the left air temperature actuator.

ECT Sensor

The scan tool range is -40 to +150°C (-40 to +302°F). This parameter indicates the engine coolant temperature based on input from the engine coolant temperature sensor.

Inside Air Temp. Sensor

The scan tool displays -40 to 60°C (-40 to 140°F). The voltage applied to the HVAC control module input for the inside air temperature sensor is converted to a temperature value.

LED Intensity

The scan tool displays 0-255 Counts. This parameter gives an indication of the intensity of the LED of the HVAC control module. The higher the count value the brighter the LED is.

A/C Off for WOT

The scan tool displays Yes/No. The scan tool displays Yes when the ECM recognizes wide open throttle. The scan tool displays No in all other throttle positions.

A/C Pressure Disable

The scan tool displays Yes/No. The scan tool displays Yes when the ECM recognizes an A/C pressure of 4.5 volts (400 psi). The scan tool displays no when less than 4.5 volts (400 psi) is recognized.

Left Sunload Sensor

The scan tool displays 0-255 Counts. The voltage applied to the left sunload input of the HVAC control module is converted to a number between 0-255. A high light intensity will produce a low count value.

Load Management Status

The scan tool displays On/Off. On will be displayed when a low battery condition is detected and one or more accessories have been disabled in order to reduce the electrical load.

Lower Left Duct Temp. Sensor

The scan tool displays 0-255 Counts. The voltage applied to the lower left duct air temperature input of the HVAC control module is converted to a number between 0-255. The higher the duct air temperature the lower the count value.

Lower Right Duct Temp. Sensor

The scan tool displays 0-255 Counts. The voltage applied to the lower right duct air temperature input of the HVAC control module is converted to a number between 0-255. The higher the duct air temperature the lower the count value.

Mode Dr. Cal. Range

The scan tool displays 0-65535 Pulses. The total calibrated range of the actuator that is stored in the memory of the HVAC control module.

Mode Dr. Motor Command

The scan tool displays 0-255 Counts. The desired position of the mode actuator.

Mode Dr. Position

The scan tool displays 0-255 Counts. The signal output from the feedback potentiometer on the mode actuator.

Mode Dr. Position

The scan tool displays 0-65535 Pulses. The signal output from the feedback potentiometer on the mode actuator.

Mode Status

The scan tool displays Off, Auto, Defrost, Heater, Defog, Bi-level and Mid. The scan tool displays the state of mode operation.

Psgr. Program Number

The scan tool displays 0-255 Counts. This value will vary, depending on the air delivery mode and the air discharge temperature selected by the passenger. The higher the program number will relate to a higher heating requirement.

Psgr. Temp. Dr. Cal. Range

The scan tool displays 0-65535 Pulses. The total calibrated range of the actuator that is stored in the memory of the HVAC control module.

Psgr. Temp. Dr. Motor Command

The scan tool displays 0-255 Counts. The desired position of the right air temperature actuator.

Psgr. Temp. Dr. Position

The scan tool displays 0-255 Counts. The signal output from the feedback potentiometer on the right air temperature actuator.

Psgr. Temp. Dr. Position

The scan tool displays 0-65535 Pulses. The signal output from the feedback potentiometer on the right air temperature actuator.

Recirculation Dr. Cal. Range

The scan tool displays 0-65535 Pulses. The total calibrated range of the actuator that is stored in the memory of the HVAC control module.

Recirculation Dr. Motor Command

The scan tool displays 0-255 Counts. The desired position of the recirculation actuator.

Recirculation Dr. Position

The scan tool displays 0-255 Counts. The signal output from the feedback potentiometer on the recirculation actuator.

Recirculation Dr. Position

The scan tool displays 0-65535 Pulses. The signal output from the feedback potentiometer on the recirculation actuator.

Right Sunload Sensor

The scan tool displays 0-255 Counts. The voltage applied to the right sunload input of the HVAC control module is converted to a number between 0-255. A high light intensity will produce a low count value.

Software Part Number

The scan tool displays the current level of software in the HVAC module.

Upper Left Duct Temp. Sensor

The scan tool displays 0-255 Counts. The voltage applied to the upper left duct air temperature input of the HVAC control module is converted to a number between 0-255. The higher the duct air temperature the lower the count value.

Upper Right Duct Temp. Sensor

The scan tool displays 0-255 Counts. The voltage applied to the upper right duct air temperature input of the HVAC control module is converted to a number between 0-255. The higher the duct air temperature the lower the count value.

Valet Switch

The scan tool displays Active/Inactive. This is the actual state of the Valet switch.

Vehicle Speed

The scan tool range is 0-255 km/h (0-158 mph). This parameter indicates the vehicle speed calculated by the ECM from the vehicle speed sensor (VSS).

DTC B0159 OR B0164

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 inside air temperature sensor assembly allows the HVAC control module to monitor the temperature of the air inside the passenger compartment. The inside air temperature assembly contains an electric fan which pulls the air from the passenger compartment to the sensor. 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 circuits. The HVAC control module monitors the voltage drops across the air temperature sensors and uses the inputs for automatic control calculations. The HVAC control module also uses the ambient air temperature input to calculate the value of the ambient air temperature display. When the air temperatures are cold, the resistances of the sensors are high and the voltage signals are high. When the air temperatures are hot, the resistances of the sensors are low and the voltage signals are low.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0159 Outside Air Temperature Sensor Circuit
- DTC B0164 Passenger Compartment Temperature Sensor Circuit

Conditions for Running the DTC

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

Conditions for Setting the DTC

The HVAC control module determines that the voltage applied to the input for the air temperature sensor is less than -40 to +215°C (-40 to +419°F).

Action Taken When the DTC Sets

- The driver information center (DIC) will display a default value of 75 in place of the ambient air temp sensor.
- 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 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.

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 B0159 or B0164

Step	Action	Value(s)	Yes	No
Schematic Reference: HVAC Schematics				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	**IMPORTANT:** **For instant outside air temperature update simultaneously press Recirc, Rear Defog and mode up.** 1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the appropriate Air Temp. Sensor parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the appropriate Air Temp. Sensor parameter is within the specified range?	-40 to +215°C (-40 to +19° F)	Go to Diagnostic Aids	Go to **Step 3**
	IMPORTANT: **For instant outside air temperature update**			

3	**simultaneously press Recirc, Rear Defog and mode up.** 1. Turn OFF the ignition. 2. Disconnect the appropriate air temperature sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Air Temp. Sensor parameter. Does the scan tool indicate that the appropriate Air Temp. Sensor parameter is greater than the specified value?	200°C (392°F)	Go to **Step 4**	Go to **Step 5**
4	**IMPORTANT:** **For instant outside air temperature update simultaneously press Recirc, Rear Defog and mode up.** 1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the signal circuit of the appropriate air temperature sensor and the low reference circuit of the appropriate air temperature sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Air Temp. Sensor parameter. Does the scan tool indicate that the appropriate Air Temp. Sensor parameter is less than the specified value?	-25°C (-13° F)	Go to **Step 8**	Go to **Step 6**
5	Test the signal circuit of the appropriate air temperature sensor for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** .	-	Go to **Step**	

	Did you find and correct the condition?		**12**	Go to **Step 9**
6	Test the signal circuit of the appropriate air temperature sensor for a short to voltage, a high resistance, or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 7**
7	Test the low reference circuit of the appropriate air temperature sensor for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . 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 appropriate air temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 11**
10	Replace the appropriate air temperature sensor. Refer to **Ambient Air Temperature Sensor Replacement** or **Inside Air Temperature Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. 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 B0174, B0179, B0510, OR B0515

Circuit Description

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 drops 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 volt is approximately equal to 51 counts.

- Output Air Temperature Sensor 1 refers to the upper left air temperature sensor
- Output Air Temperature Sensor 2 refers to the lower left air temperature sensor
- Output Air Temperature Sensor 3 refers to the upper right air temperature sensor
- Output Air Temperature Sensor 4 refers to the lower right air temperature sensor

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0174 Output Air Temperature Sensor 1
- DTC B0179 Output Air Temperature Sensor 2
- DTC B0510 Output Air Temperature Sensor 3
- DTC B0515 Output Air Temperature Sensor 4

Conditions for Running the DTC

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

Conditions for Setting the DTC

The HVAC control module detects the signal circuit is less than 5 counts (0.09 volt) or greater than 250 counts (4.90 volts).

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.

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				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the appropriate Duct Temp. Sensor parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the appropriate Duct Temp. Sensor is within the specified range?	5-250 counts (0.09-4.90 V)	Go to **Testing for Intermittent Conditions and Poor Connections**	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 Temp. Sensor Data parameter. Does the scan tool indicate that the appropriate Duct Temp. Sensor is greater than the specified value?	250 counts (4.90 V)	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 Temp. Sensor Data parameter. Does the scan tool indicate that the appropriate Duct Temp. Sensor data parameter is less than the specified value?	5 counts (0.09 V)	Go to **Step 8**	Go to **Step 6**
5	Test the appropriate signal circuit of the air temperature sensor for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 9**
6	Test the appropriate 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** . 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** . 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 appropriate air temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . 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 Side** • **Air Temperature Sensor Replacement - Upper Left Side** • **Air Temperature Sensor Replacement - Lower Left Side** • **Air Temperature Sensor Replacement - Lower Right Side** Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 12**	-
	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the			

12	Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC B0184 OR B0189

Circuit Description

The HVAC control module monitors the ambient light on the left and right side of the vehicle through a light sensitive photodiode called a sunload sensor assembly. The HVAC control module uses this information to compensate for the effect of the sun on the inside air temperature of the vehicle. When the sensor is in direct sunlight, the signal voltage is low. When the sensor is shaded, the signal voltage is high. The HVAC control module requests A/C compressor clutch engagement and controls the air temperature actuator door positions in order to maintain the selected air temperature on the HVAC control module.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0184 Solar Load Sensor Left
- DTC B0189 Solar Load Sensor Right

Conditions for Running the DTC

The ignition is turned ON.

Conditions for Setting the DTC

The HVAC control module detects the signal circuit is less than 5 counts (0.09 volts) or greater than 250 counts (4.90 volts).

Action Taken When the DTC Sets

The HVAC control module uses a default sunload sensor 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 failure.
- The history DTC will clear after 50 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** .

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 B0184 or B0189

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the appropriate Sunload Sensor parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the appropriate Sunload Sensor parameter is with in the specified range?	5-250 Counts	Go to Diagnostic Aids	Go to **Step 3**
	1. Turn OFF the ignition. 2. Disconnect the sunload sensor assembly. 3. Turn ON the ignition, with the			

3	engine OFF. 4. With a scan tool, observe the appropriate Sunload Sensor parameter. Does the scan tool indicate that the appropriate Sunload 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 appropriate signal circuit of the sunload sensor assembly and the low reference circuit of the sunload sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the appropriate Sunload Sensor parameter. Does the scan tool indicate that the appropriate Sunload Sensor parameter is less than the specified value?	5 Counts	Go to **Step 8**	Go to **Step 6**
5	Test the appropriate signal circuit of the sunload sensor assembly for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 9**
6	Test the appropriate 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** . 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** .	-	Go to **Step**	

	Did you find and correct the condition?		**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** . 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** . 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	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. 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 B0248, B0268, B0408, OR B0423

Circuit Description

The actuator is an electronic stepper motor. The HVAC control module supplies power and ground to the actuator. The HVAC control module controls the direction of the actuator by changing the polarity of the control circuits. When the actuator reaches its desired position, both circuits are fixed to the same value 0 volts. The HVAC control module determines the door or mode film position by counting pulses, voltage fluctuations, caused by the brush to commutator action generated during normal motor operation. The HVAC control module monitors a voltage

drop across an internal resistance to detect the pulses. The HVAC control module converts the pulses to counts with a range of 0-255 counts.

When a calibration or recalibration procedure is performed, the HVAC control module calculates the door or mode film travel range. The HVAC control module commands the actuator in one extreme position then counts pulses starting from 0 counts. The HVAC control module compares the total number of pulses to calibrated limits. If the total pulse count is less than or equal to the maximum calibrated limit and greater than or equal to the minimum calibrated limit, then the calibration is considered successful.

- Air Flow Control 3 Circuit refers to the mode actuator
- Air Flow Control 7 Circuit refers to the recirculation actuator
- Temperature Control 1 Circuit refers to the left air temperature
- Temperature Control 2 Circuit refers to the right air temperature

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0248 Air Flow Control 3 Circuit
- DTC B0268 Air Flow Control 7 Circuit
- DTC B0408 Temperature Control 1 Circuit
- DTC B0423 Temperature Control 2 Circuit

Conditions for Running the DTC

The ignition is turned ON. The inoperative actuator DTC runs during and after the next range check following the setting of the actuator range error DTC. The appropriate actuator inoperative code will set with the appropriate actuator range error code.

- DTC B0249 Air Flow Control 3 Circuit Range
- DTC B0269 Air Flow Control 7 Circuit Range
- DTC B0409 Temperature Control 1 Circuit Range
- DTC B0419 Temperature Control 2 Circuit Range

Conditions for Setting the DTC

The HVAC control module does not detect any movement of the actuator.

Action Taken When the DTC Sets

- The HVAC control module will recalibrate the appropriate actuator each time the ignition switch is turned ON.
- If DTC B0268 is set, the HVAC control module will command the recirculation door to the outside air position.

Conditions for Clearing the MIL/DTC

- The DTC will become history if the HVAC control module 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

- Inspect the actuator door and actuator for the following conditions:
  - A misaligned actuator-Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**.
  - Broken or binding mode actuator film or actuator door
  - Obstruction that prevents the mode film or actuator door from operating within its full range of motion
  - Missing seals to the actuator door
  - Misaligned seals to the actuator door
- Refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

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

2: This step verifies that the HVAC control module is able to command the appropriate actuator through its full range of motion.

4: If the actuator does not move at all, the problem is likely to be the drive circuitry within the HVAC control module, the actuator, or the wiring harness. If the actuator does move, but not within its full range of motion, the problem is likely to be a mechanical binding of the actuator door or actuator door linkage.

6: This step drives the actuator in one position. The actuator shaft will not move if the actuator door is already in the position you are attempting to drive it to.

7: This step drives the actuator in the opposite direction.

DTC B0248, B0268, B0408, or B0423

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn the ignition ON, with the engine OFF. 3. With the scan tool, command the appropriate actuator in both directions. 4. Observe the appropriate Actual parameter. Does the scan tool indicate that the value of the appropriate Actual parameter is within 5 counts or the minimum and maximum specified values?	3 Counts 250 Counts	Go to Diagnostic Aids	Go to **Step 3**
3	When commanding the actuator in both directions, does the scan tool indicate that the value of the appropriate Actual parameter changes by more than the specified value?	3 Counts	Go to **Step 7**	Go to **Step 4**
4	Test the appropriate door control A circuit and the appropriate door control B circuit for an open, high resistance, short to ground or a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 5**
	1. Turn the ignition OFF. 2. Disconnect the HVAC control module. 3. Connect a 10-amp fused jumper wire			

5	between the actuator door control A circuit of the appropriate actuator and battery positive voltage. 4. Connect a 10-amp fused jumper wire between the actuator door control B circuit of the appropriate actuator and a good ground. Does the actuator shaft rotate?	-	Go to **Step 9**	Go to **Step 6**
6	1. Connect a 10-amp fused jumper wire between the actuator door control B circuit of the appropriate actuator and battery positive voltage. 2. Connect a 10-amp fused jumper wire between the actuator door control A circuit of the appropriate actuator and a good ground. Does the actuator shaft rotate?	-	Go to **Step 9**	Go to **Step 7**
7	Inspect the appropriate door and actuator for the following conditions: • A misaligned actuator-Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**. • Broken or binding linkages or actuator door • An obstruction that prevents the actuator door from operating within its full range of motion • Missing seals to the actuator door • Misaligned seals to the actuator door	-		

	Did you find and correct the condition?		Go to **Step 12**	Go to **Step 8**
8	Inspect for poor connections at the harness connector of the appropriate actuator. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 11**
10	**IMPORTANT:** **Perform the recalibration procedure for the appropriate actuator.** Replace the appropriate actuator. Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**.Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. 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 3**	System OK

DTC B0249, B0269, B0409, OR B0419

Circuit Description

The actuator is an electronic stepper motor. The HVAC control module supplies power and ground to the actuator. The HVAC control module controls the direction of the actuator by changing the polarity of the control circuits. When the actuator reaches its desired position, both circuits are fixed to the same value 0 volts. The HVAC control module determines the door or mode film position by counting pulses (voltage fluctuations) caused by the brush to commutator action generated during normal motor operation. The HVAC control module monitors a voltage drop across an internal resistance to detect the pulses. The HVAC control module converts the pulses to counts with a range of 0-255 counts.

When a calibration or recalibration procedure is performed, the HVAC control module calculates the door or mode film travel range. The HVAC control module commands the actuator in one extreme position then counts pulses starting from 0 counts. The HVAC control module compares the total number of pulses to calibrated limits. If the total pulse count is less than or equal to the maximum calibrated limit and greater than or equal to the minimum calibrated limit, then the calibration is considered successful.

- Air Flow Control 3 Circuit refers to the mode actuator
- Air Flow Control 7 Circuit refers to the recirculation actuator
- Temperature Control 1 Circuit refers to the left air temperature actuator
- Temperature Control 2 Circuit refers to the right air temperature actuator

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0249 Air Flow Control 3 Circuit Range
- DTC B0269 Air Flow Control 7 Circuit Range
- DTC B0409 Temperature Control 1 Circuit Range
- DTC B0419 Temperature Control 2 Circuit Range

Conditions for Running the DTC

The HVAC control module will run the DTC when either of the following conditions are met.

- The HVAC control module has completed a calibration/recalibration of the actuator.
- The HVAC control module commands the actuator to move.

Conditions for Setting the DTC

The HVAC control module will set this DTC if either of the following conditions are true.

- The actuator fails calibration/recalibration due to an over travel or under travel condition. The HVAC control module does not detect the calibrated number of total pulse counts during a travel range check.
- The HVAC control module determines that the actual door position does not equal the commanded door position. The HVAC control module commands the door to move but does not see the expected number of pulses between positions.

Action Taken When the DTC Sets

- The HVAC control module will attempt to make use of whatever range is still available.
- The HVAC control module will recalibrate the actuator each time the ignition switch is turned ON.

Conditions for Clearing the MIL/DTC

- The DTC will become history if the HVAC control module 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

- Inspect the appropriate actuator door and actuator for the following conditions:
  - A misaligned actuator-Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**.
  - Broken or binding mode actuator film or actuator door
  - Obstruction that prevents the mode film or actuator door from operating within its full range of motion
  - Missing seals to the actuator door
  - Misaligned seals to the actuator door
- Refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

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

2: This step verifies that the HVAC control module is able to command the actuator through its full range of motion.

4: If the actuator does not move at all, the problem is likely to be the drive circuitry within the HVAC control module, the actuator, or the wiring harness. If the actuator does move, but not within its full range of motion, the problem is likely to be a mechanical binding of the actuator door or actuator door linkage.

6: This step drives the actuator in one direction. The actuator shaft will not move if the actuator door is already in the position you are attempting to drive it to.

7: This step drives the actuator in the opposite direction.

DTC B0249, B0269, B0409, or B0419

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn the ignition ON, with the engine OFF. 3. With the scan tool, command the appropriate actuator in both directions. 4. Observe the appropriate Actual parameter. Does the scan tool indicate that the value of the appropriate Actual parameter is within 5 counts of the minimum and maximum specified values?	3 Counts 250 Counts	Go to Diagnostic Aids	Go to **Step 3**
3	When commanding the actuator in both directions, does the scan tool indicate that the value of the appropriate Actual parameter changes by more than the specified value?	0-3 Counts	Go to **Step 7**	Go to **Step 4**
	Test the appropriate door control A circuit and the appropriate door control B			

4	circuit for an open, high resistance, short to ground or a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 5**
5	1. Turn the ignition OFF. 2. Disconnect the HVAC control module. 3. Connect a 10-amp fused jumper wire between the actuator door control A circuit of the appropriate actuator and battery positive voltage. 4. Connect a 10-amp fused jumper wire between the actuator door control B circuit of the appropriate actuator and a good ground. Does the actuator shaft rotate?	-	Go to **Step 9**	Go to **Step 6**
6	1. Connect a 10-amp fused jumper wire between the actuator door control B circuit of the appropriate actuator and battery positive voltage. 2. Connect a 10-amp fused jumper wire between the actuator door control A circuit of the appropriate actuator and a good ground. Does the actuator shaft rotate?	-	Go to **Step 9**	Go to **Step 7**
7	Inspect the appropriate door and actuator for the following conditions: • A misaligned actuator-Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**.	-		

	• Broken or binding linkages or actuator door • An obstruction that prevents the actuator door from operating within its full range of motion • Missing seals to the actuator door • Misaligned seals to the actuator door Did you find and correct the condition?		Go to **Step 12**	Go to **Step 8**
8	Inspect for poor connections at the harness connector of the appropriate actuator. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 11**
10	**IMPORTANT:** **Perform the recalibration procedure for the appropriate actuator.** Replace the appropriate actuator. Refer to **Mode Actuator Replacement**, **Air Temperature Actuator Replacement - Right**, **Air Temperature Actuator Replacement - Left** or **Recirculation Actuator Replacement**.Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 12**	-
	1. Use the scan tool in order to clear			

12	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 P0532 OR P0533

Circuit Description

The engine control module (ECM) monitors the high side refrigerant pressure through an air conditioning (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 the pressure is high, the ECM commands the cooling fans ON. When the pressure is too high or too low, the ECM will not allow the A/C compressor clutch to engage.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC P0532 A/C Refrigerant Pressure Sensor Circuit Low Voltage
- DTC P0533 A/C Refrigerant Pressure Sensor Circuit High Voltage

Conditions for Running the DTC

- The engine is running.
- A/C OFF when P0532 is set.

Conditions for Setting the DTC

P0532

The ECM detects an A/C pressure of less than 0.1 volt for 1.6 seconds.

P0533

The ECM detects an A/C pressure of more than 4.9 volts for 1.6 seconds.

Action Taken When the DTC Sets

- The ECM will not illuminate the malfunction indicator lamp (MIL).
- The ECM stores the failure records.

- The A/C compressor clutch is disabled.
- SERVICE A/C SYSTEM displays on the driver information center (DIC).
- A/C OFF displays on the HVAC control module.

Conditions for Clearing the DTC

- The DTC will become history if the ECM no longer detects a failure.
- The history DTC will clear after 40 fault-free ignition cycles.
- Clear the DTC with a scan tool then cycle the ignition.

Diagnostic Aids

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

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.

DTC P0532 or P0533

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the air conditioning (A/C) High Side	0.2-4.88 V		

	Pressure parameter in the Powertrain Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is within the specified range?		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 High Side Pressure parameter in the Powertrain Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is less than the specified value?	0.2 V	Go to **Step 4**	Go to **Step 10**
4	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit and the A/C refrigerant pressure sensor signal circuit of the A/C refrigerant pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the A/C High Side Pressure parameter in the Powertrain Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is greater than the specified value?	4.88 V	Go to **Step 5**	Go to **Step 8**
5	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference circuit and the low reference circuit of the A/C	5.5 V		

	refrigerant pressure sensor. Does the voltage measure less than the specified value?		Go to **Step 6**	Go to **Step 7**
6	Does the voltage measure near the specified value?	5 V	Go to **Step 12**	Go to **Step 11**
7	Test the 5-volt reference circuit of the A/C refrigerant pressure sensor for short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . 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 the following: • An open • A high resistance • A short to ground Refer to **Circuit Testing** and **Wiring Repairs** . 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 the following: • An open • A high resistance • A short to ground Refer to **Circuit Testing** and **Wiring Repairs** . 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 . Did you find and correct the condition?		Go to **Step 16**	Go to **Step 13**
11	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** . 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** . 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 engine control module (ECM). Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . Did you complete the replacement?	-	Go to **Step 16**	-
15	Replace the ECM. Refer to **Control Module References** for replacement, setup and programming. 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

DTC P0645

Circuit Description

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

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0645 A/C Clutch Relay Control Circuit

Conditions for Running the DTC

- The ignition must be ON and the voltage must be between 9-18 volts.
- The ECM driver is activated or deactivated.

Conditions for Setting the DTC

- The ECM detects an improper voltage level on the output circuit that controls the A/C relay.
- The condition is present for at least 5 seconds.

Action Taken When the DTC Sets

- The ECM will not illuminate the malfunction indicator lamp (MIL).
- The ECM will not store Freeze Frame or Failure Records.
- The A/C compressor clutch is disabled for the ignition cycle.

Conditions for Clearing the DTC

- The DTC will become history if the ECM 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.

Test Description

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

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

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

4: Verifies that the engine control module is providing ground to the A/C compressor clutch relay. If light always on circuit shorted to ground.

8: Tests for a short to voltage or an open.

10: If the A/C fuse is open ensure to test the A/C compressor clutch supply voltage circuit for short to ground.

DTC P0645

Step	Action	Yes	No
Schematic Reference: HVAC Schematics Connector End View Reference: HVAC Connector End Views			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the A/C Relay ON and OFF in the HVAC Systems Automatic Special Functions, HVAC list. Does the A/C Relay turn ON and OFF with each command?	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to a good ground.		

	Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 8**
4	1. Connect a test lamp between the control circuit of the A/C compressor clutch relay and the battery positive voltage circuit of the A/C compressor clutch relay. 2. With a scan tool, command the A/C Relay ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to **Step 6**	Go to **Step 5**
5	Test the control circuit of the A/C compressor clutch relay for a short to ground, short to voltage or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 11**	Go to **Step 7**
6	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 11**	Go to **Step 9**
7	Inspect for poor connections at the harness connector of the engine control module (ECM). Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 11**	Go to **Step 10**
8	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** . Did you complete the repair?	Go to **Step 11**	-
9	Replace the A/C compressor clutch relay. Did you complete the replacement?	Go to **Step 11**	-
10	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	Go to **Step 11**	-
	1. Use the scan tool in order to clear the DTCs.		

11	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 - Vehicle** before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control module(s) can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to the following information:
   - **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** .
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 and is not inadvertently activating auxiliary HVAC controls.
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** .

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**
- **Noise Diagnosis - Blower Motor**
- **Noise Diagnosis - Air Conditioning (A/C) System**
- **Odor Diagnosis**

HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE

HVAC Compressor Clutch Does Not Engage

Step	Action	Value(s)	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 Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**	
2	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Ensure the A/C OFF switch is not selected. 4. Place the left air temperature switch in the coldest position. Does the A/C compressor operate?	-	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**	
3	1. Start the engine. 2. Observe the coolant temperature indicator. Is the engine coolant temperature indicator illuminated?	Go to **Diagnostic System Check - Vehicle**			Go to **Step 4**
4	1. Turn OFF the ignition. 2. Install the **J 43600** ACR 2000. 3. Record the ambient temperature at the vehicle. 4. Record readings of the low and high side STATIC pressures. 5. Compare the low and the high side pressure values with the allowable limits for the recorded ambient air temperature.	Above 16° C (60°F) 345 kPa (50 psi) Above 24° C (75°F) 483 kPa (70 psi) Above 33° C (90°F)			

	Are the low and the high side pressure values within the allowable limits for the recorded ambient air temperature and are the pressure values within 103 kPa (15 psi) of each other?	690 kPa (100 psi)	Go to **Step 5**	Go to **Leak Testing**	
5	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool observe the A/C refrigerant pressure sensor in the engine, engine cooling data list. 4. Compare the A/C refrigerant pressure sensor parameter on the scan tool with the ACR 2000 high side pressure value. Is the scan tool A/C refrigerant pressure sensor parameter and the ACR 2000 pressure value within 15 psi of each other?	Go to **Step 6**			Go to **Step 13**
6	With a scan tool, view the ambient air temperature in the HVAC system data. Is the ambient air temperature below 3°C (38F°)?	Go to **Step 16**			Go to **Step 7**
7	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.	-			

	5. With a scan tool, command the A/C compressor clutch relay ON. Does the test lamp illuminate?		Go to **Step 8**	Go to **Step 9**
8	Test the ground circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 12**
9	Test the voltage supply circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 10**
10	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit on the switch side of the A/C compressor clutch relay with a test lamp that is connected to ground. Does the test lamp illuminate?	-	Go to **Step 11**	Go to **Step 21**
11	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the	-	Go to **Step**	Go to **Step**

	condition?		**25**	**22**
12	Inspect for poor connections at the harness connector of the A/C compressor clutch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 23**
13	1. Disconnect the A/C pressure sensor. 2. With a test lamp connected to battery voltage, probe the ground circuit at the A/C pressure sensor connector. Does the test lamp illuminate?	-	Go to **Step 17**	Go to **Step 14**
14	Test the ground circuit of the A/C refrigerant pressure sensor for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 15**
15	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** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 24**
16	Inspect the ambient air temperature sensor circuits for high resistance. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the	-	Go to **Step**	Go to **Step**

	condition?		**25**	**19**	
17	Inspect for poor connections at the harness connector of the A/C pressure sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 25**			Go to **Step 18**
18	Replace the A/C refrigerant pressure sensor. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement** . Did you complete the replacement?	Go to **Step 25**			-
19	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** . Did you find and correct the condition?	-	Go to **Step 25**	Go to **Step 20**	
20	Replace the ambient air temperature sensor. Refer to **Ambient Air Temperature Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 25**	-	
21	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** . Did you complete the repair?	-	Go to **Step 25**	-	
22	Replace the A/C compressor clutch relay. Did you complete the replacement?	-	Go to **Step 25**	-	
23	Replace the A/C compressor clutch. Refer to **Compressor**	-			

	Replacement . Did you complete the replacement?		Go to **Step 25**	-
24	Replace the HVAC control module. Refer to **HVAC Control Module Replacement**. Did you complete the replacement?	-	Go to **Step 25**	-
25	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**

HVAC COMPRESSOR CLUTCH DOES NOT DISENGAGE

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 Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Start the engine. 2. Place the A/C request switch in the OFF position. Is the A/C compressor clutch still engaged?	Go to **Step 3**	Go to **Testing for Intermittent Conditions and Poor Connections**
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 6**
4	Test the supply voltage circuit of the A/C compressor clutch for a short to voltage. Refer		

	to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 5**
5	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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 A/C compressor clutch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
7	Replace the A/C compressor clutch relay. Refer to **Compressor Relay Replacement** . Did you complete the replacement?	Go to **Step 9**	-
8	Replace the A/C compressor. Refer to **Compressor 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 3**

BLOWER MOTOR ALWAYS ON

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 Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Turn ON the ignition, with the engine OFF. 2. Turn OFF the HVAC control module.	-	Go to **Testing for Intermittent Conditions**	

	Is the blower motor OFF?		**and Poor Connections**	Go to **Step 3**	
3	With the scan tool, observe the Commanded Blower parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the Commanded Blower parameter is near the specified value?	0%	Go to **Step 4**	Go to **Step 8**	
4	1. Turn OFF the ignition. 2. Disconnect the blower motor control processor. 3. Turn ON the ignition, with the engine OFF. Is the blower motor OFF?	-	Go to **Step 5**	Go to **Step 7**	
5	1. Place the blower motor control in the OFF position. 2. With a test lamp that is connected to battery positive voltage probe the blower motor speed control circuit. Does the test lamp illuminate?	Go to **Step 6**			Go to **Step 7**
6	Test the blower motor speed control circuit of the blower motor for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** . 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 blower motor. Refer to **Wiring Repairs** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 11**	Go to **Step 9**	
	Inspect for poor connections at the				

8	harness connector of the HVAC control module. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 11**	Go to **Step 10**	
9	Replace the blower motor. Refer to **Blower Motor Replacement** . Did you complete the replacement?	-	Go to **Step 11**	-	
10	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 11**	-	
11	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**	

BLOWER MOTOR INOPERATIVE

Blower Motor Inoperative

Step	Action	Values	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 Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
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. Place the blower motor switch in the maximum speed position. 2. With the scan tool observe the Commanded Blower parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the Commanded Blower parameter is near the specified value?	100%	Go to **Step 4**	Go to **Step 10**
4	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. Does the test lamp illuminate?	-	Go to **Step 9**	Go to **Step 5**
5	Test the battery positive voltage circuit of the blower motor for an open, high resistance or short to ground. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 13**	Go to **Step 6**
6	Test the ground circuit of the blower motor for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 13**	Go to **Step 7**
	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			

7	blower motor supply voltage circuit and the blower motor control circuit. 5. Adjust the blower controls from high speed to low speed. Does the test lamp change intensity with the movement of the controls?	-	Go to **Step 9**	Go to **Step 8**
8	Test the blower motor speed control circuit of the HVAC control module for an open, short to ground or short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 13**	Go to **Step 10**
9	Inspect for poor connections at the harness connector of the blower motor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 13**	Go to **Step 11**
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** . Did you find and correct the condition?	-	Go to **Step 13**	Go to **Step 12**
11	Replace the blower motor. Refer to **Blower Motor Replacement** . Did you complete the replacement?	-	Go to **Step 13**	-
12	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. 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 2**

BLOWER MOTOR MALFUNCTION

Blower Motor Malfunction

Step	Action	Values	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 Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
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 **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**
3	1. With the scan tool observe the Commanded Blower parameter in the HVAC Systems Automatic data list. 2. Place the blower motor switch from the minimum speed position to the maximum. Does the scan tool indicate that the Commanded Blower parameter is within the specified value?	0-100%	Go to **Step 4**	Go to **Step 9**
4	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.	-		

	Does the test lamp illuminate?		Go to **Step 6**	Go to **Step 5**
5	Test the battery positive voltage circuit and the ground circuit of the blower motor for high resistance. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 12**	-
6	1. Connect a test lamp between the blower motor supply voltage circuit and the blower motor control circuit. 2. Place the blower motor switch from the minimum speed position to the maximum. Does the test lamp illuminate and change intensity?	-	Go to **Step 8**	Go to **Step 7**
7	Test the blower motor speed control circuit of the HVAC control module for high resistance. Refer to **Circuit Testing** and **Wiring Repairs** . 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 blower motor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . 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** . Did you find and correct the condition?	-	Go to **Step 12**	Go to **Step 11**
10	Replace the blower motor. Refer to **Blower Motor Replacement** . Did you complete the replacement?	-	Go to **Step 12**	-
11	Replace the HVAC control module. Refer to **Control Module References** for	-		

	replacement, setup, and programming. Did you complete the replacement?		Go to **Step 12**	-
12	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**

TOO HOT IN VEHICLE

Test Description

2: This test resets HVAC control module and checks for current air temperature actuator DTC.

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

Too Hot in Vehicle

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted, or cooling is insufficient during the A/C operation.				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Recalibrate the HVAC actuators. Refer to **Re-Calibrating Actuators**. 4. With a scan tool, observe the current DTC list for the HVAC System Automatic. Does the scan tool display DTC B0408, B0409, B0419 or B0423?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 3**

3	Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	-	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate in each speed position?	-	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode controls in the vent position. 3. Alternately, place the recirculation switch in the outside air and recirculation positions. Does the recirculation door move from the recirculation position to the ambient air position?	-	Go to **Step 6**	Go to **Air Delivery Improper**
6	Place the passenger temperature in the OFF position. Does the Too Hot in Vehicle concern occur when A/C cooling desired?	-	Go to **Step 7**	Go to **Step 9**
7	**IMPORTANT:** **Ambient air temperature must be above 3℃ (38℉).** 1. Cover the sunload sensor. 2. Start the engine. 3. Open all panel outlets in order to allow maximum air flow. 4. Place the air temperature switch to the coldest position. 5. Place the mode switch in the vent position. 6. Place the blower motor switch in the maximum speed position. 7. Ensure that the vent indicator is not	-		Go to **HVAC**

	illuminated. Does the A/C compressor operate?		Go to **Step 8**	**Compressor Clutch Does Not Engage**
8	Perform the A/C system performance test. Refer to **Air Conditioning (A/C) System Performance Test (6.0L)** or **Air Conditioning (A/C) System Performance Test (7.0L)** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 9**
9	Inspect the upper left, upper right, lower left, and lower right air temperature sensors for the following conditions: • An obstruction to the airflow • A damaged or a missing seal to the sensor • Misaligned air ducts • A misaligned temperature sensor Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 10**
10	1. Turn ON the ignition, with the engine OFF. 2. Inspect for airflow through the inside air temperature 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 11**	Go to **Step 14**
11	1. Install a thermometer near the upper left, upper right, lower left and lower right air sensors and the inside air temperature assembly. 2. With a scan tool, observe the following data parameters in the HVAC System Automatic data list: • Left AC Duct Temp.	-3 to +3°C		

	• Left Htr. Duct Temp. • Right AC Duct Temp. • Right Htr. Duct Temp. • Inside Air Temp. Does the scan tool indicate that the sensor temperatures are within the specifications at the thermometer temperatures?	(-5 to +5°F)	Go to **Step 12**	Go to **Step 17**
12	1. Turn the engine OFF. 2. Cover the sunload sensor. 3. Start the engine. 4. Place the driver side temperature at 22°C (72°F). 5. With a scan tool, observe the Solar Sensor Data parameter in the HVAC System Automatic data list. Does the scan tool indicate that the Solar Sensor parameter is greater than the specified value?	224 Counts	Go to **Step 13**	Go to **Step 19**
13	1. Uncover the sunload sensor. 2. Direct a light source at the sunload sensor. Do the counts change?	-	System OK	Go to **Step 19**
14	1. Disconnect inside air temperature assembly. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the ignition 3 circuit of the inside air temperature assembly and the inside air temperature assembly control circuit of the inside air temperature assembly.	-	Go to **Step**	

	Does the test lamp illuminate?		**18**	Go to **Step 15**
15	Test the ignition 3 voltage circuit of the inside air temperature assembly for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 16**
16	Test the inside air temperature assembly control circuit of the inside air temperature assembly for a short to voltage, a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 20**
17	Test the suspect temperature sensor resistance. Refer to **Sensor Resistance Table (Air Temperature Duct Sensor)** or **Sensor Resistance Table (Inside and Ambient Air Temp Sensor)**. Does the resistance measure near the Sensor Resistance Table?	-	Go to **Step 20**	Go to **Step 18**
18	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** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 21**
19	Inspect for poor connections at the harness connector of the sunload sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 22**
20	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** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 23**

21	Replace the appropriate temperature sensor. Refer to the following procedures: • **Air Temperature Sensor Replacement - Upper Left Side** • **Air Temperature Sensor Replacement - Upper Right Side** • **Air Temperature Sensor Replacement - Lower Left Side** • **Air Temperature Sensor Replacement - Lower Right Side** • **Inside Air Temperature Sensor Replacement** Did you complete the replacement?	-	Go to **Step 24**	-
22	Replace the sunload sensor. Refer to **Sun Load Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 24**	-
23	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 24**	-
24	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 3**

TOO COLD IN VEHICLE

Test Description

2: This test resets HVAC control module and checks for current air temperature actuator DTC.

8: This checks for proper operation of coolant system to insure heater output.

Too Cold in Vehicle

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics				

Connector End View Reference: HVAC Connector End Views

DEFINITION: The temperature cannot be adjusted, or the heating is insufficient.

1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Recalibrate the HVAC actuators. Refer to **Re-Calibrating Actuators**. 4. With a scan tool, observe the current DTC list in HVAC Systems Automatic. Does the scan tool display DTC B0408, B0409, B0419 or B0423?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 3**
3	Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	-	Go to **Step 4**	Go to **Blower Motor Inoperative**
4	Does the blower motor operate at the desired speeds?	-	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode controls in the vent position. 3. Alternately, place the recirculation switch in the outside air and recirculation positions. Does the recirculation door move from the recirculation position to the ambient air position?	-	Go to **Step 6**	Go to **Air Delivery Improper**

6	Place the passenger temperature switch in the OFF position. Does the Too Cold in Vehicle concern occur when heating or defrosting is desired?	-	Go to **Step 7**	Go to **Step 9**
7	1. Start the engine. 2. Place the HVAC control module in the OFF position. Does the A/C compressor operate?	-	Go to **HVAC Compressor Clutch Does Not Disengage**	Go to **Step 8**
8	Inspect the cooling system for the following conditions: • A low coolant level • A loose or worn accessory drive belt • A leaking radiator hose or heater hose • A kinked radiator hose or heater hose • A missing radiator cap pressure seal • A leaking radiator cap Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 9**
9	Inspect the upper left, upper right, lower left, and lower right air temperature sensors for the following conditions: • An obstruction to the airflow • A damaged or a missing seal in the sensor • Misaligned air ducts • A misaligned sensor Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 10**

10	1. Turn ON the ignition, with the engine OFF. 2. Inspect for airflow through the inside air temperature 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 11**	Go to **Step 14**
11	1. Install a thermometer near the upper left, upper right, lower left and lower right air sensors and the inside air temperature assembly. 2. With a scan tool, observe the following data parameters in the HVAC Systems Automatic data list: • Left AC Duct Temp. • Left Htr. Duct Temp. • Right AC Duct Temp. • Right Htr. Duct Temp. • Inside Air Temp. Does the scan tool indicate that the sensor temperatures are within the specification at the thermometer temperatures?	-3 to +3°C (-5 to +5°F)	Go to **Step 12**	Go to **Step 17**
12	1. Turn the engine OFF. 2. Cover the sunload sensor. 3. Start the engine. 4. Place the driver side temperature to 22°C (72°F). 5. With a scan tool, observe the Solar Sensor Data parameter in the HVAC Systems Automatic data list. Does the scan tool indicate that the Solar Sensor parameter is greater than the specified value?	224 Counts	Go to **Step 13**	Go to **Step 19**

13	1. Uncover the sunload sensor. 2. Direct a light source at the sunload sensor. Do the counts change?	-	System OK	Go to **Step 19**
14	1. Disconnect the inside air temperature assembly. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the ignition 3 circuit of the inside air temperature assembly and the inside air temperature assembly control circuit of the inside air temperature assembly. Does the test lamp illuminate?	-	Go to **Step 18**	Go to **Step 15**
15	Test the ignition 3 voltage circuit of the inside air temperature assembly for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 16**
16	Test the inside air temperature assembly control circuit of the inside air temperature assembly for a short to voltage, a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 20**
17	Test the suspect temperature sensor resistance. Refer to **Sensor Resistance Table (Air Temperature Duct Sensor)** or **Sensor Resistance Table (Inside and Ambient Air Temp Sensor)**. Does the resistance measure near the Sensor Resistance Table?	-	Go to **Step 20**	Go to **Step 18**
	Inspect for poor connections at the harness connector of the suspect air			

18	temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 21**
19	Inspect for poor connections at the harness connector of the sunload sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 22**
20	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** . Did you find and correct the condition?	-	Go to **Step 24**	Go to **Step 23**
21	Replace the appropriate temperature sensor. Refer to the following procedures: • **Air Temperature Sensor Replacement - Upper Left Side** • **Air Temperature Sensor Replacement - Upper Right Side** • **Air Temperature Sensor Replacement - Lower Left Side** • **Air Temperature Sensor Replacement - Lower Right Side** • **Inside Air Temperature Sensor Replacement** Did you complete the replacement?	-	Go to **Step 24**	-
22	Replace the sunload sensor. Refer to **Sun Load Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 24**	-
23	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming.	-		

	Did you complete the replacement?		Go to **Step 24**	-
24	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 3**

AIR DELIVERY IMPROPER

Test Description

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

9: Refer to the following table of specified values.

Air Delivery Improper

Mode Position	Value
Defrost	44 Counts
Mix-Blend	66 Counts
Floor	103 Counts
Bi-Level	143 Counts
Vent	255 Counts

Air Delivery Improper

Step	Action	Yes	No
Schematic Reference: HVAC Schematics DEFINITION: Air does not flow correctly from the air distribution outlets.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Turn ON the ignition, with the engine OFF. 2. Turn OFF the HVAC controls. 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 each speed position?	Go to **Step 4**	Go to **Blower Motor Inoperative**
	Does the blower motor operate at the desired		Go to **Blower**

4	speeds?	Go to **Step 5**	**Motor Malfunction**
5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in the vent position. 3. Alternately, place recirculation switch in the outside air and recirculation positions. Does the recirculation door move from the recirculation position to the ambient air position?	Go to **Step 6**	Go to **Air Recirculation Malfunction**
6	1. Install a scan tool. 2. Recalibrate the HVAC door actuators. Refer to **Re-Calibrating Actuators**. 3. With a scan tool, observe the current DTC list in HVAC Systems Automatic. Does the scan tool display any DTCs?	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 7**
7	Place the mode switch in each mode position. Does the air flow from the correct air distribution outlets in each selected mode position?	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 8**
8	1. With the scan tool, observe the Mode Door Position parameter in the HVAC Systems Automatic data list. 2. Place the mode switch in each mode position. Does the scan tool display the correct state for each selected mode?	Go to **Step 9**	Go to **Step 10**
9	1. With the scan tool, observe the Mode Dr. Commanded parameter in the HVAC Systems Automatic data list. 2. Place the mode switch in each mode position.		

	Does the scan tool indicate that the Mode Dr. Commanded parameter is near the specified value in each mode position? Refer to the test description for this step.	Go to **Step 11**	Go to **Step 10**
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** . Did you find and correct the condition?	Go to **Step 13**	Go to **Step 12**
11	Inspect the air distribution system for the following conditions: • A restricted passenger compartment air filter • An obstruction restricting air flow • Air leaks • Misaligned ducts Did you find and correct the condition?	Go to **Step 13**	-
12	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. 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**

AIR RECIRCULATION MALFUNCTION

Test Description

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

2: This action will calibrate the HVAC actuators and check to ensure the DTCs that set when calibration is performed will be set.

4: This step is to ensure that the recirculation actuator is with its calibrated range.

Air Recirculation Malfunction

Step	Action	Values	Yes	No	

Schematic Reference: HVAC Schematics
DEFINITION: Air recirculation is inoperative or always on.

1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Recalibrate the motors. Refer to **Re-Calibrating Actuators**. 4. With a scan tool, observe the current DTC list in Heating and Air Conditioning. Does the scan tool display any DTCs?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 3**
3	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in the vent position. 3. Alternately, place the recirculation switch in the recirculation and outside air positions. Does the recirculation door move from the recirculation position to the ambient air position?	-	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 4**
	1. With a scan tool, observe the Recirculation Dr. Command parameter in the HVAC Systems Automatic data list. 2. Alternately place the			

	recirculation switch in the recirculation and outside air positions.				
4	Does the scan tool indicate that the value of the Recirculation Dr. Command parameter changes from the minimum specified value to the maximum specified value?	0-230 counts	Go to **Step 6**	Go to **Step 5**	
5	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 8**	Go to **Step 7**	
6	Inspect the air distribution system for the following conditions: • A restricted passenger compartment air filter. • An obstruction restricting air flow. • Air leaks. • Misaligned ducts. Did you find and correct the condition?	-	Go to **Step 8**	-	
7	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 8**	-	
8	Operate the system in order to verify the repair. Did you correct the condition?				Go to **Step**

		System OK	**3**

AFTERBLOW ENABLING

The afterblow mode can be enabled using the scan tool. The afterblow mode allows the blower motor to operate after the engine has been turned off. This operation of the blower motor dries the evaporator core, which reduces the amount of microbial growth which can create undesirable odors.

Use the following procedure in order to enable the afterblow mode:

1. Connect the scan tool.
2. Turn ON the ignition, with the engine OFF.
3. Select HVAC Module.
4. Select HVAC Systems Automatic.
5. Select Special Functions.
6. Select HVAC.
7. Select Afterblow Option.
8. Select ENTER to enable the afterblow.
9. When done, use the soft key to save changes.

When afterblow has been enabled by the scan tool the blower motor will operate between medium and high speed for 4 minutes after the engine has been turned off.

The following conditions must be met for the HVAC module to operate the afterblow:

- The outside air temperature must be at least 21°C (70°F).
- The A/C compressor must operate for more than 2 minutes.
- The engine must be turned off for at least 45 minutes.
- The system voltage must be at least 12 volts.

RE-CALIBRATING ACTUATORS

Calibration Procedure with a Scan Tool

Use the following steps to perform the calibration update:

1. Install a scan tool.
2. Turn ON the ignition, with the engine OFF.

3. With a scan tool, select HVAC Systems Automatic.
4. Select Special Functions.
5. Select HVAC.
6. Select Calibrate HVAC Module.
7. Select ON, wait 30 seconds.

Calibration Procedure without a Scan Tool

1. Turn OFF the ignition.
2. Remove the battery positive voltage circuit fuse of the HVAC control module.

IMPORTANT: The module memory will not clear if the battery positive voltage circuit fuse is installed in less than 60 seconds.

3. Wait 60 seconds.
4. Install the fuse.

REPAIR INSTRUCTIONS

HVAC CONTROL MODULE REPLACEMENT

Removal Procedure

1. Remove the instrument panel (I/P) accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .

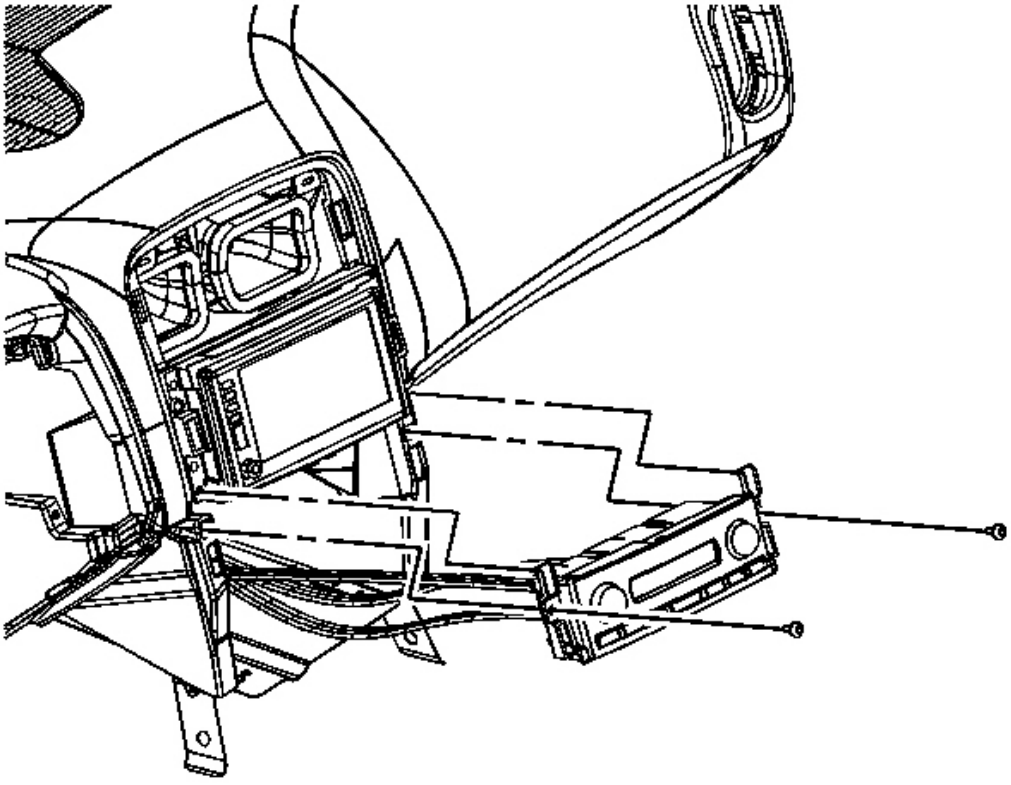


Fig. 25: HVAC Control Module & Retaining Screws
Courtesy of GENERAL MOTORS CORP.

2. Remove the HVAC control module retaining screws.
3. Remove the HVAC control module.

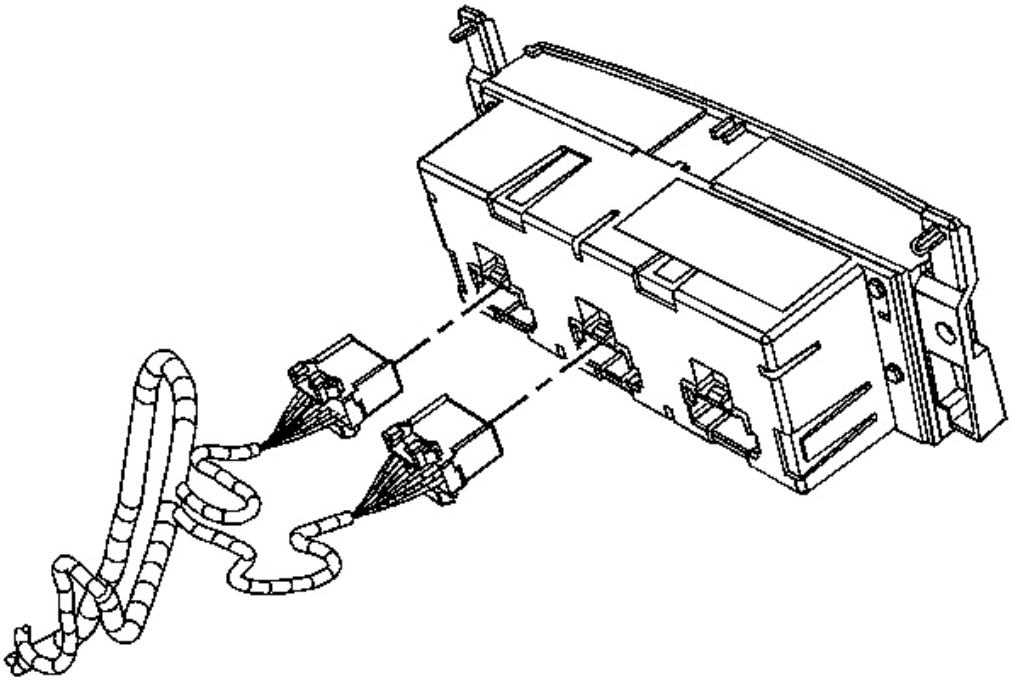


Fig. 26: HVAC Control Module Electrical Connections
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the HVAC control module electrical connections.

Installation Procedure

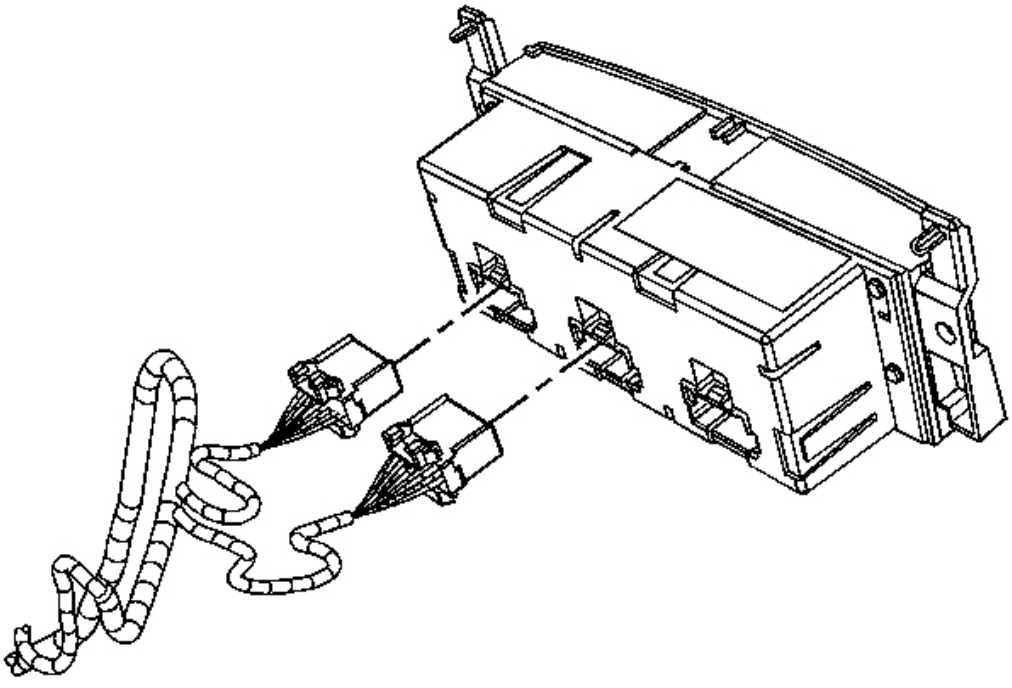


Fig. 27: HVAC Control Module Electrical Connections
Courtesy of GENERAL MOTORS CORP.

1. Connect the HVAC control module electrical connections.

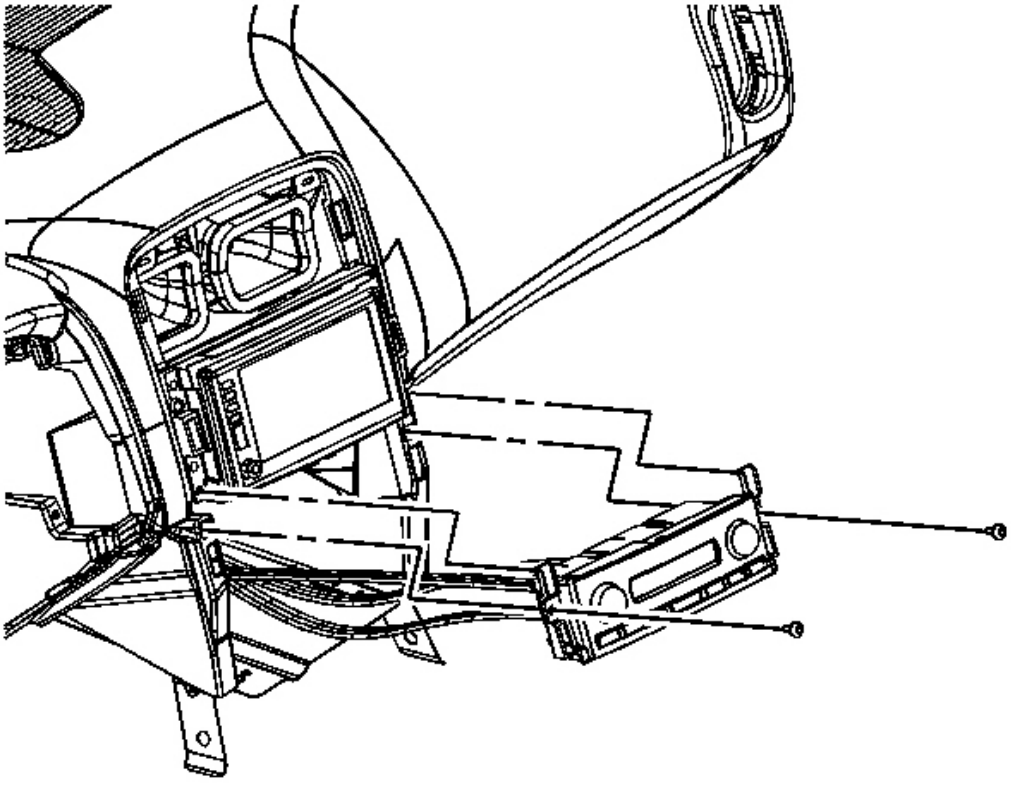


Fig. 28: HVAC Control Module & Retaining Screws
Courtesy of GENERAL MOTORS CORP.

2. Install the HVAC control module to the I/P trim plate.

NOTE: **Refer to Fastener Notice .**

3. Install the HVAC control module retaining screws.

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

4. Connect the electrical connectors to the HVAC control module.
5. Install the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .

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.
The engine must be running for proper calibration to occur.

6. Start and allow the engine to run for at least one minute.
7. Refer to **Control Module References** for programming and setup information.

RECIRCULATION ACTUATOR REPLACEMENT

Removal Procedure

1. Remove the RH lower insulator panel. Refer to **Instrument Panel Insulator Panel Replacement** .

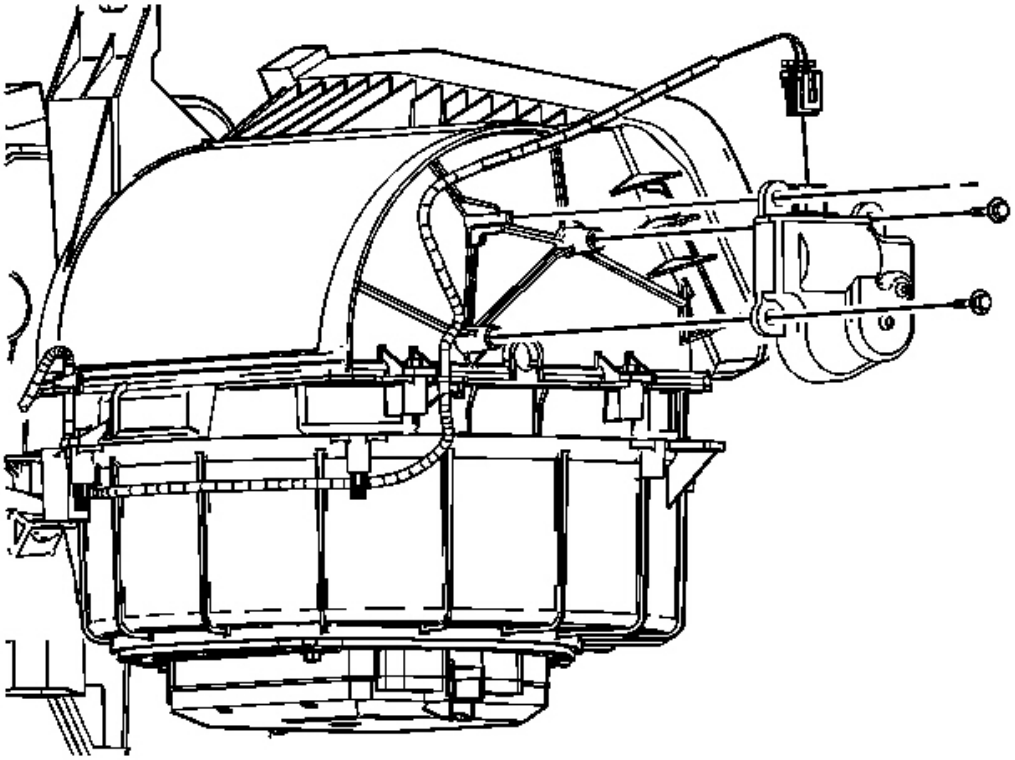


Fig. 29: HVAC Module & Components

Courtesy of GENERAL MOTORS CORP.

2. Disconnect the HVAC module wiring harness from the recirculation housing wire harness retainer.
3. Remove the recirculation actuator mounting screws.
4. Remove the recirculation actuator.
5. Disconnect the electrical connector from the recirculation actuator.

Installation Procedure

1. Connect the recirculation actuator electrical connector.

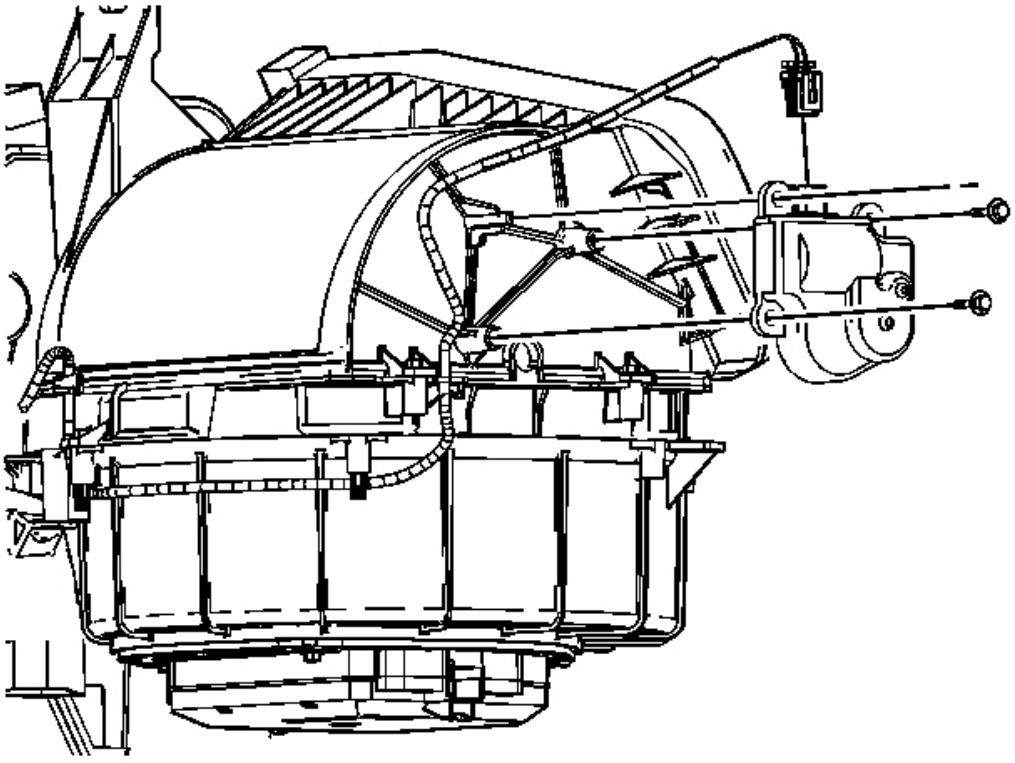


Fig. 30: HVAC Module & Components
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

2. Install the recirculation actuator.

   Install the recirculation actuator mounting screws.

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

3. Connect the HVAC module wiring harness to the recirculation housing wire harness retainer.
4. Install the RH lower insulator panel. Refer to **Instrument Panel Insulator Panel Replacement** .

MODE ACTUATOR REPLACEMENT

Removal Procedure

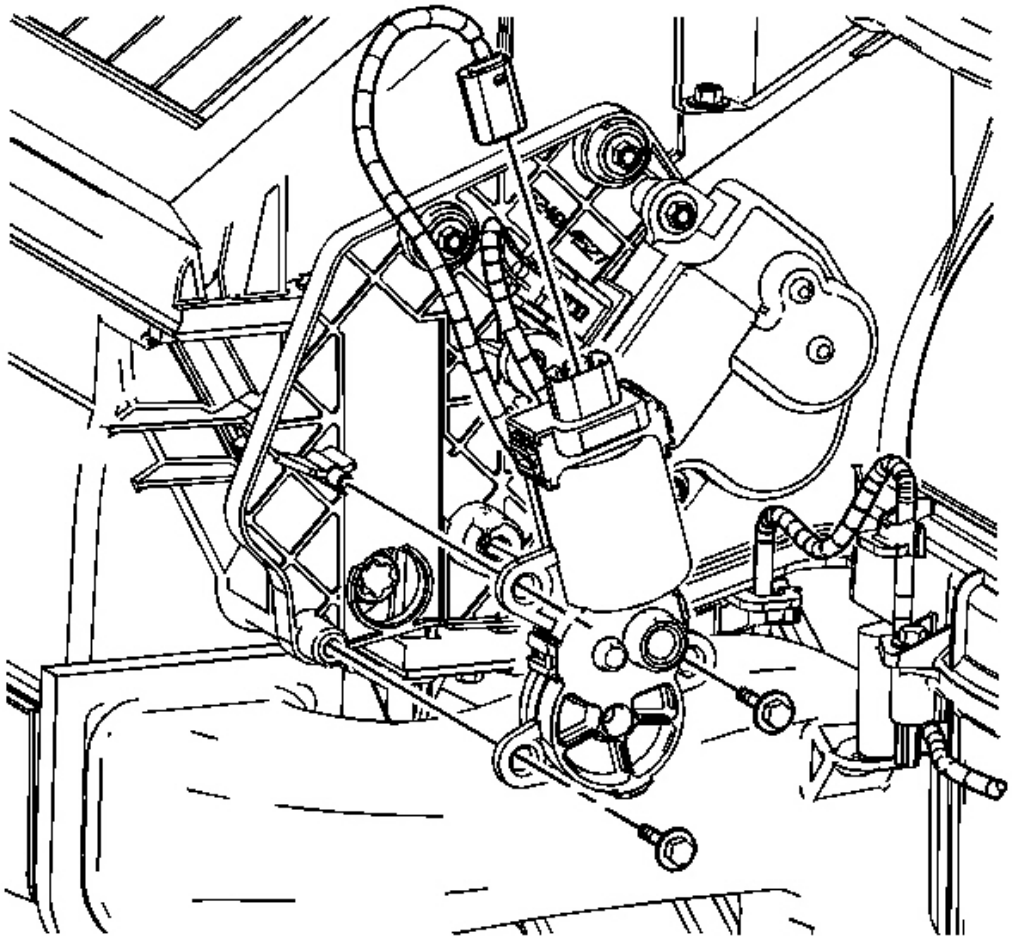


Fig. 31: Identifying Mode Actuator & Components
Courtesy of GENERAL MOTORS CORP.

1. Remove the SIR bracket. Refer to **Instrument Panel Inflatable Restraint Module Bracket Replacement** .
2. Disconnect the mode actuator electrical connector.
3. Remove the mode actuator mounting screws.
4. Remove the mode actuator.

Installation Procedure

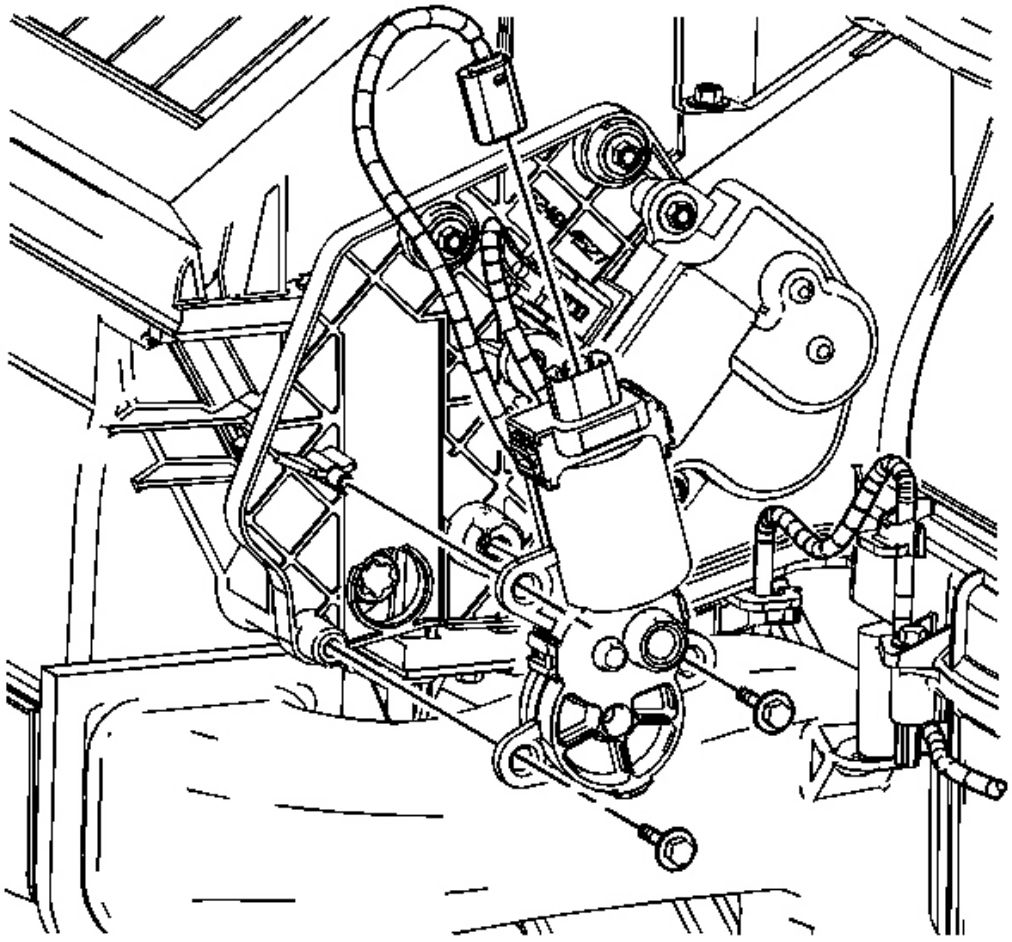


Fig. 32: Identifying Mode Actuator & Components
Courtesy of GENERAL MOTORS CORP.

1. Install the mode actuator.

NOTE: Refer to Fastener Notice .

2. Install the mode actuator mounting screws.

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

3. Connect the mode actuator electrical connector.

4. Install the SIR bracket. Refer to **Instrument Panel Inflatable Restraint Module Bracket Replacement** .
5. Recalibrate the actuators. Refer to **Re-Calibrating Actuators**.

AIR TEMPERATURE ACTUATOR REPLACEMENT - RIGHT

Removal Procedure

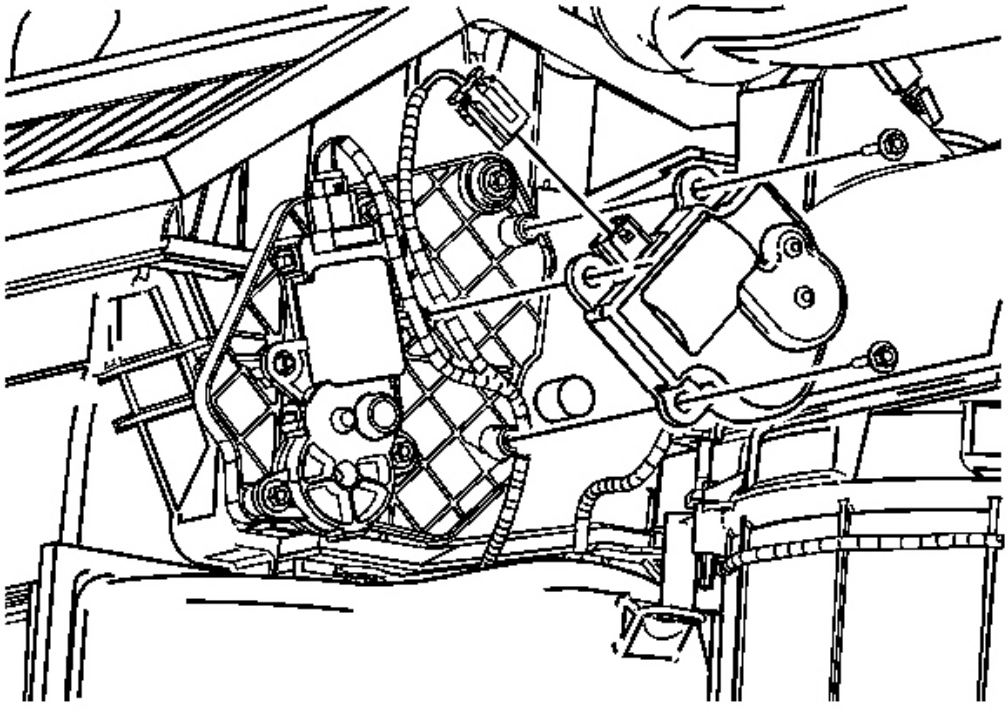


Fig. 33: View Of RH Air Temperature Actuator
Courtesy of GENERAL MOTORS CORP.

1. Remove the SIR bracket. Refer to **Instrument Panel Inflatable Restraint Module Bracket Replacement** .
2. Disconnect the RH air temperature actuator electrical connector.
3. Remove the RH air temperature actuator mounting screws.
4. Remove the RH air temperature actuator.

Installation Procedure

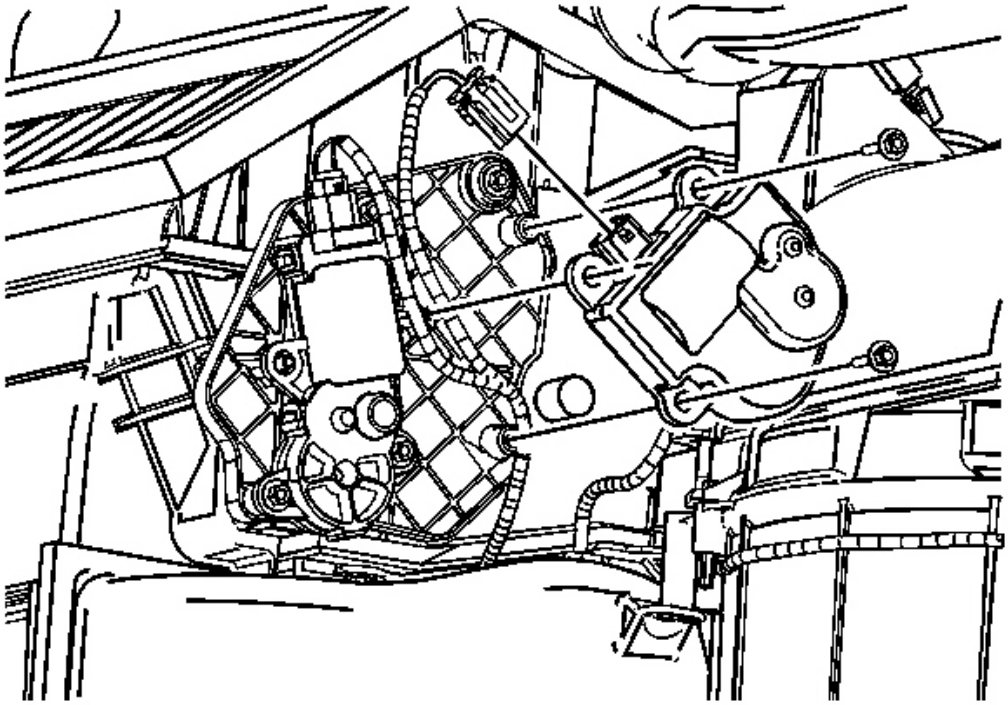


Fig. 34: View Of RH Air Temperature Actuator
Courtesy of GENERAL MOTORS CORP.

1. Install the RH air temperature actuator.

   NOTE: Refer to Fastener Notice .

2. Install the RH air temperature actuator mounting screws.

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

3. Connect the RH air temperature actuator electrical connector.
4. Install the SIR bracket. Refer to **Instrument Panel Inflatable Restraint Module Bracket Replacement** .
5. Recalibrate the actuators. Refer to **Re-Calibrating Actuators**.

AIR TEMPERATURE ACTUATOR REPLACEMENT - LEFT

Removal Procedure

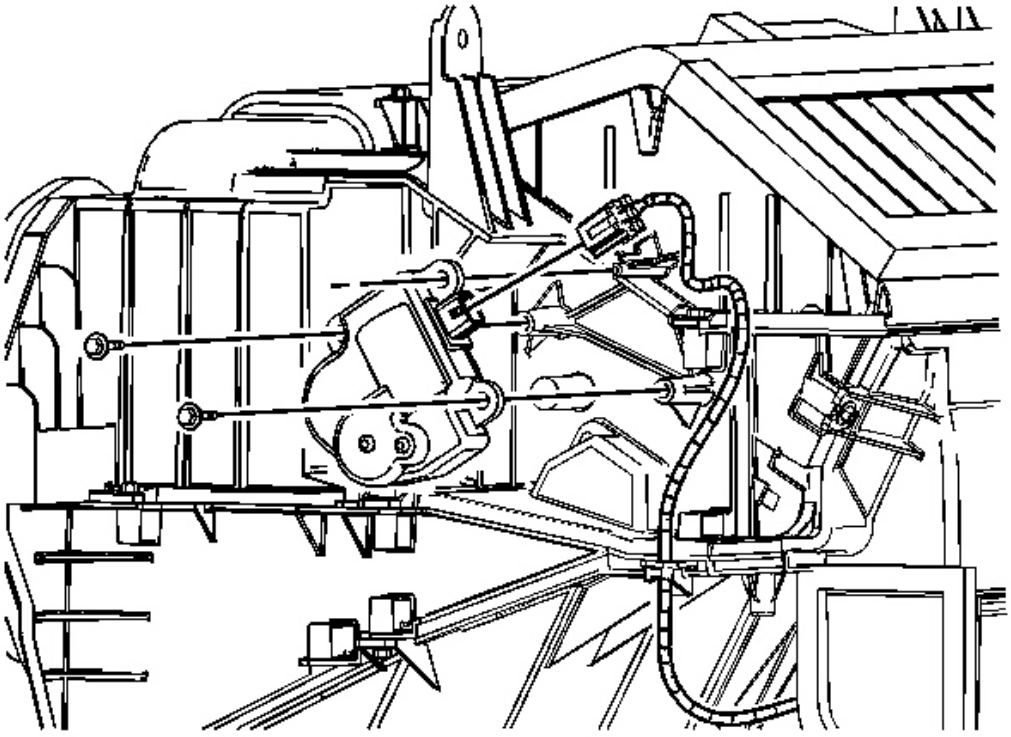


Fig. 35: Identifying LH Air Temperature Actuator & Components
Courtesy of GENERAL MOTORS CORP.

1. Remove the instrument panel (I/P) cluster assembly. Refer to **Instrument Cluster Replacement** .
2. Disconnect the electrical connector from the left air temperature actuator.
3. Remove the actuator mounting screws.
4. Remove the actuator.

Installation Procedure

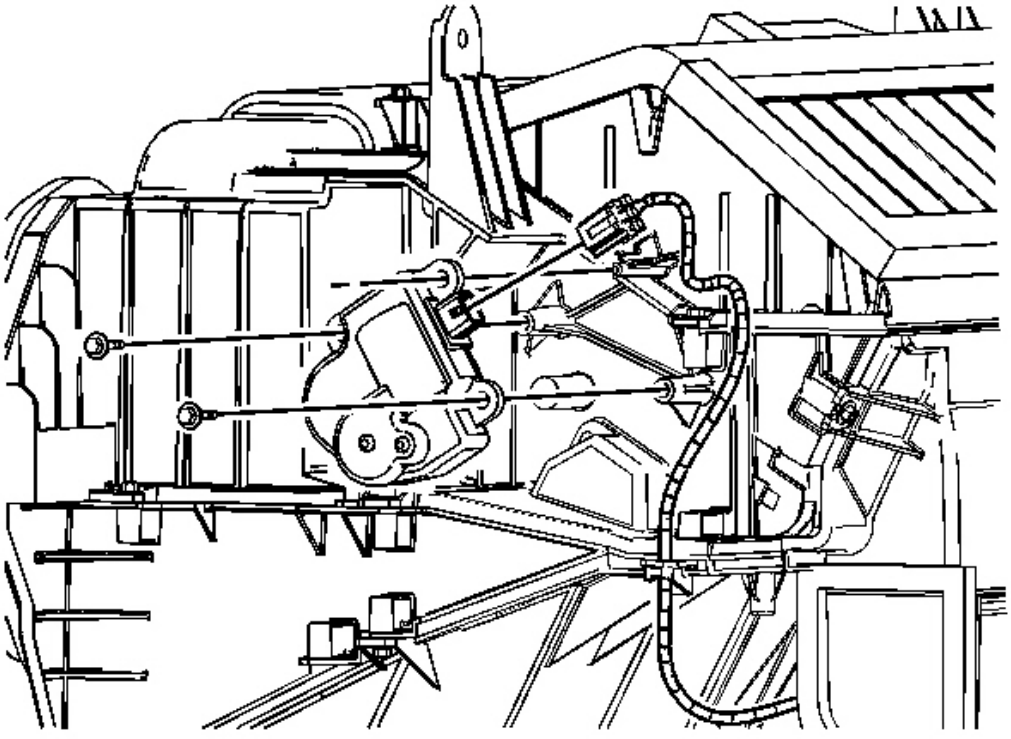


Fig. 36: Identifying LH Air Temperature Actuator & Components
Courtesy of GENERAL MOTORS CORP.

1. Install the left air temperature actuator.

   NOTE: Refer to Fastener Notice .

2. Install the actuator mounting screws.

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

3. Connect the actuator electrical connector.
4. Install the I/P cluster assembly. Refer to **Instrument Cluster Replacement** .
5. Recalibrate the actuators. Refer to **Re-Calibrating Actuators**.

AIR TEMPERATURE SENSOR REPLACEMENT - UPPER RIGHT SIDE

Removal Procedure

1. Remove the instrument panel (I/P) assembly. Refer to **Instrument Panel Assembly Replacement** .

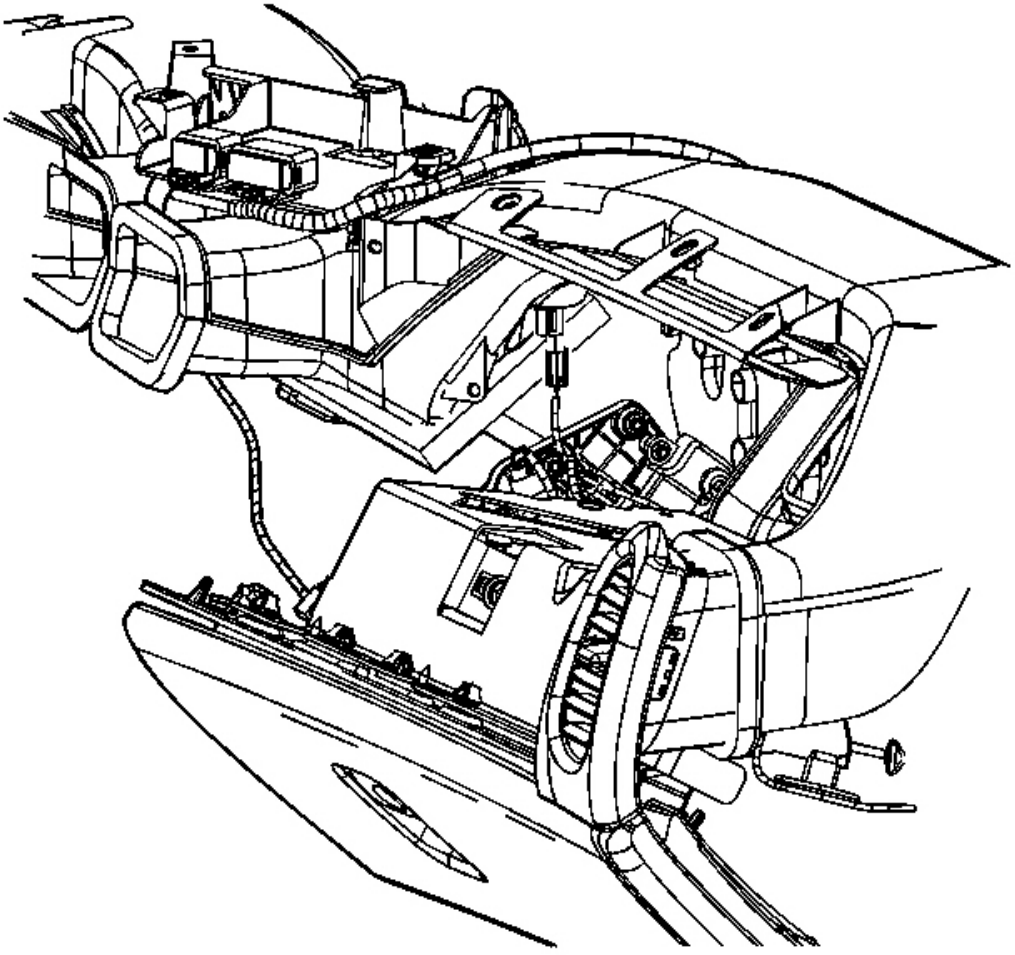


Fig. 37: Right Upper Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the right upper air temperature sensor electrical connector.

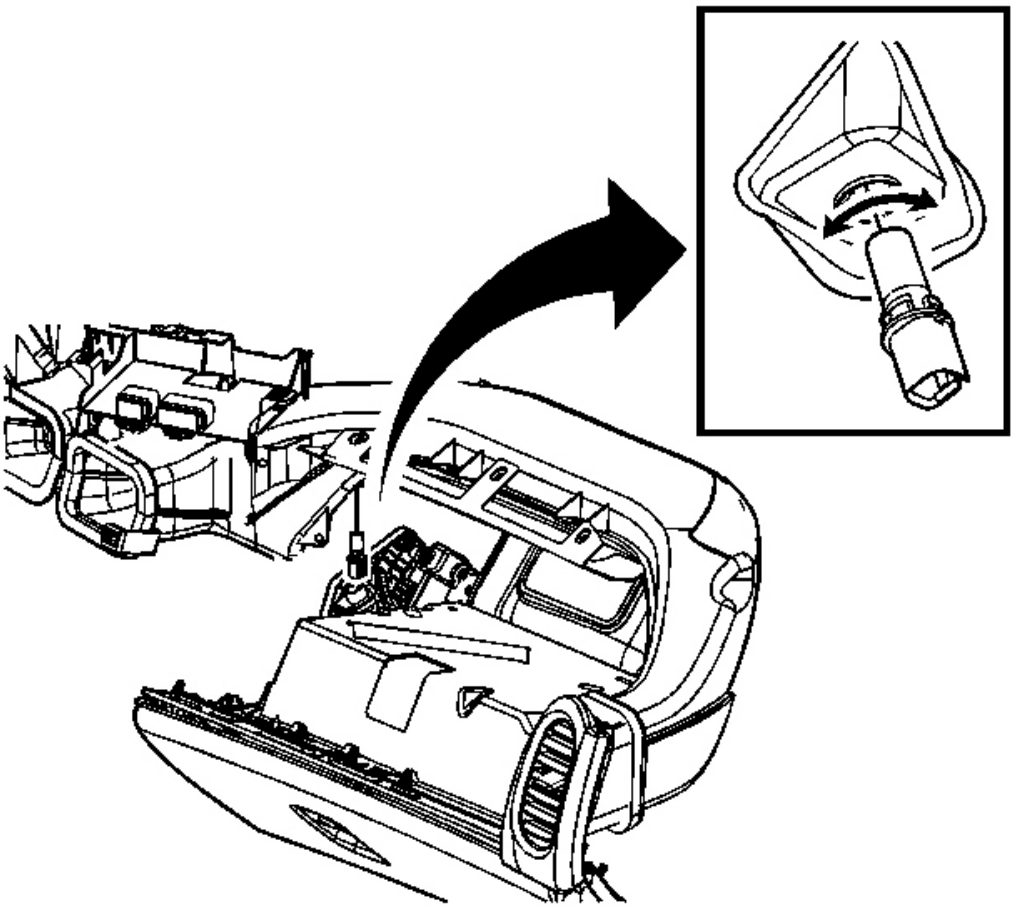


Fig. 38: Right Upper Air Temperature Sensor At Air Distribution Duct
Courtesy of GENERAL MOTORS CORP.

3. Remove the right upper air temperature sensor from the air distribution duct.

Installation Procedure

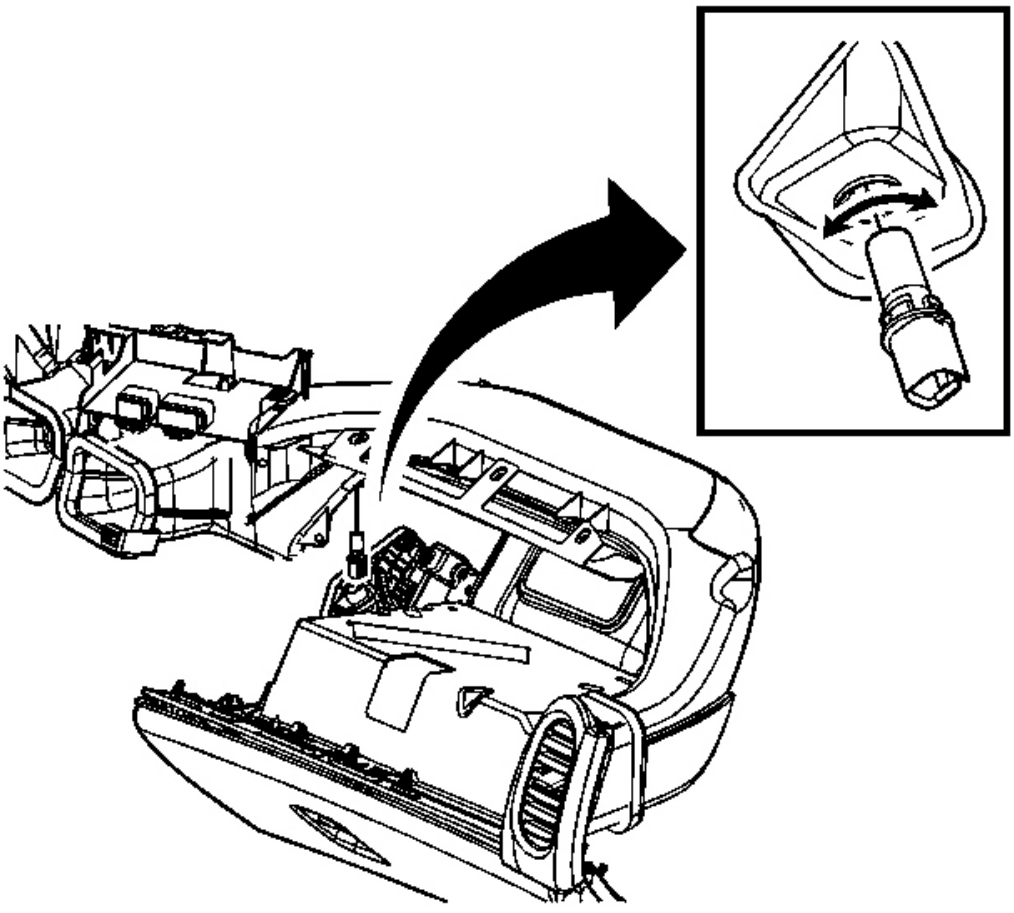


Fig. 39: Right Upper Air Temperature Sensor At Air Distribution Duct
Courtesy of GENERAL MOTORS CORP.

1. Install the right upper air temperature sensor to the air distribution duct.

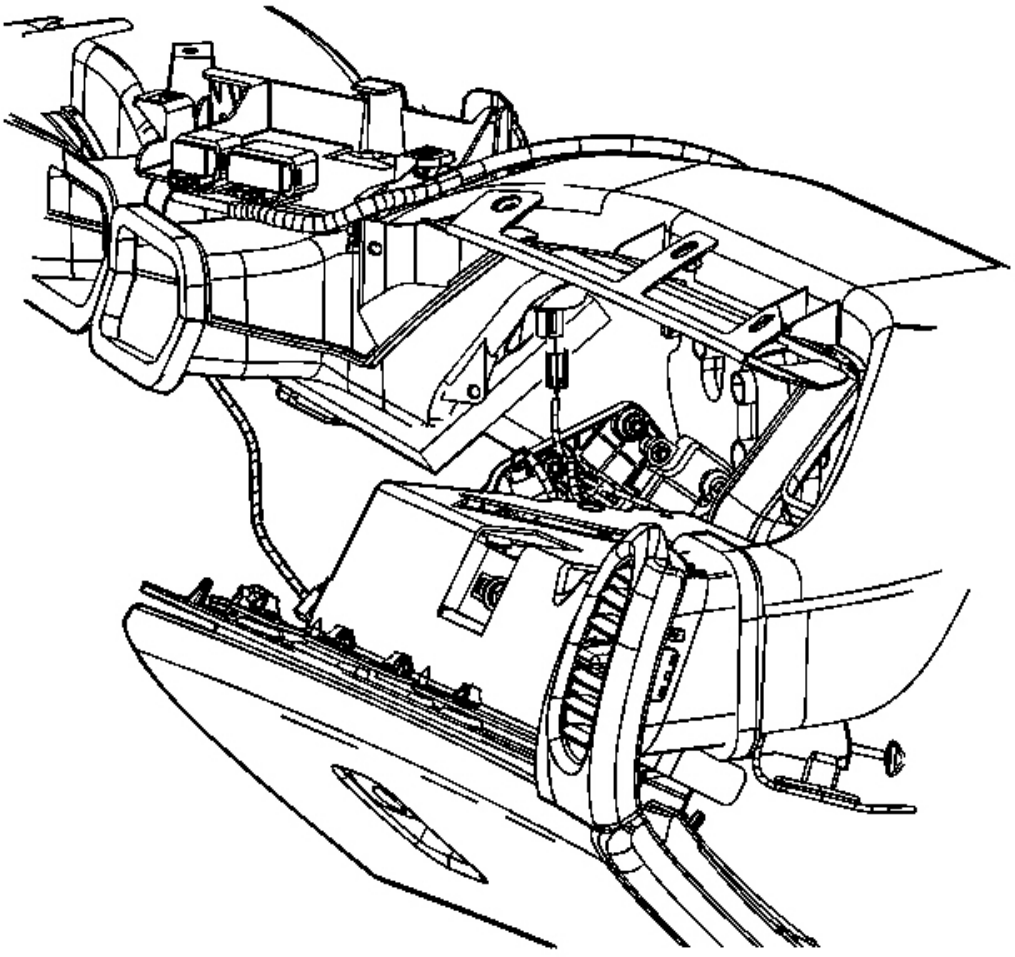


Fig. 40: Right Upper Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the right upper air temperature sensor electrical connector.
3. Install the I/P assembly. Refer to **Instrument Panel Assembly Replacement** .

AIR TEMPERATURE SENSOR REPLACEMENT - UPPER LEFT SIDE

Removal Procedure

1. Remove the instrument panel cluster (IPC). Refer to **Instrument Cluster Replacement** in Instrument Panel, Gages and Console.

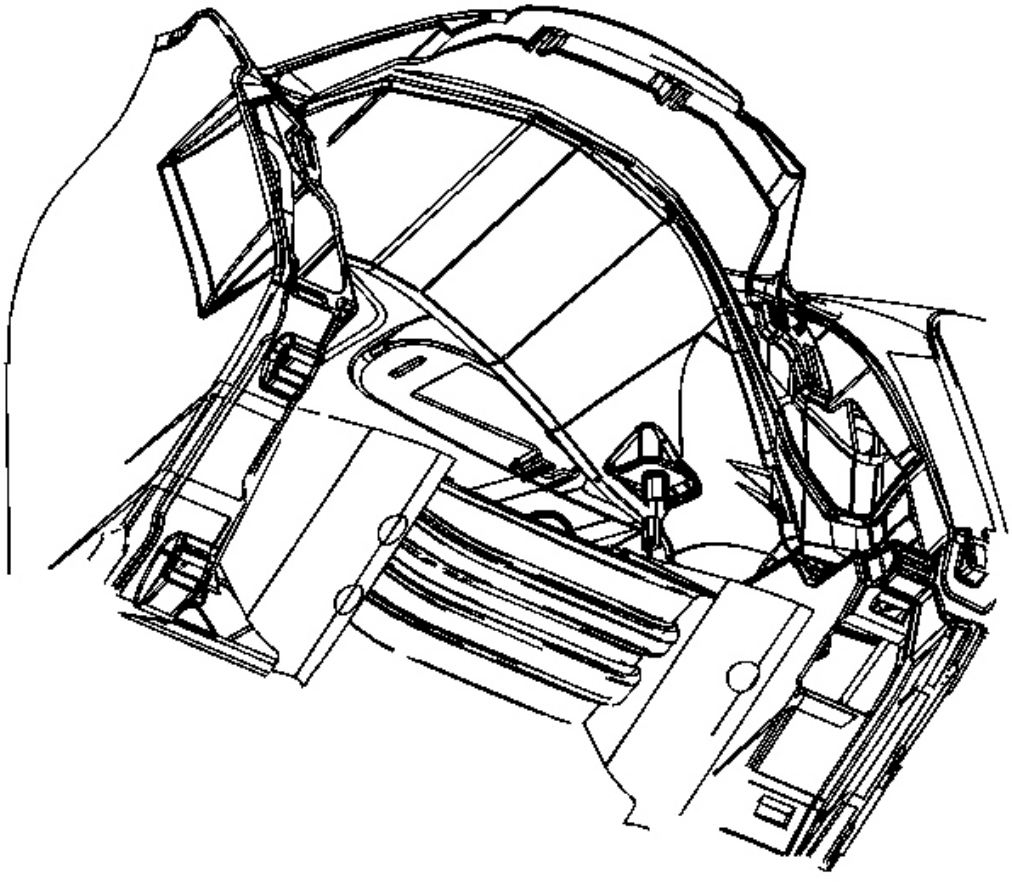


Fig. 41: Left Upper Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the left upper air temperature sensor electrical connector.

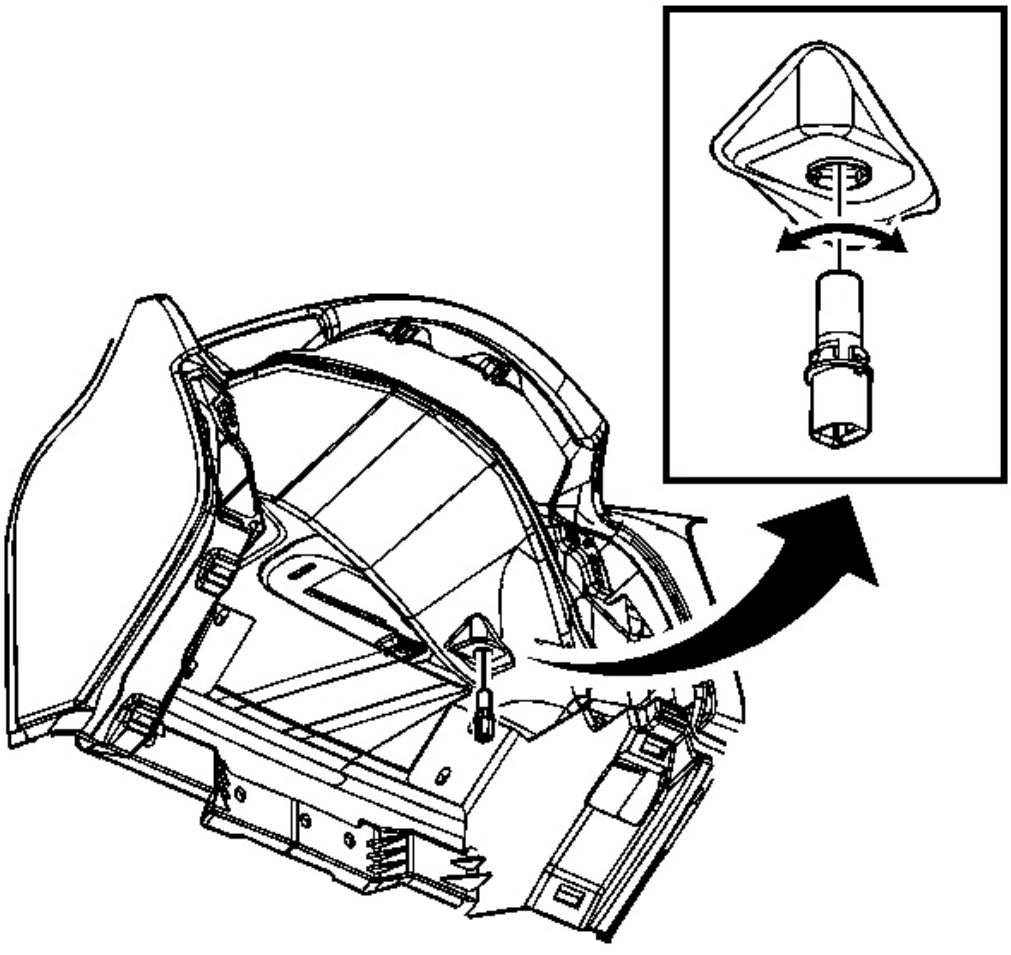


Fig. 42: Left Upper Air Temperature Sensor At Air Distribution Duct
Courtesy of GENERAL MOTORS CORP.

3. Remove the left upper air temperature sensor from the air distribution duct.

Installation Procedure

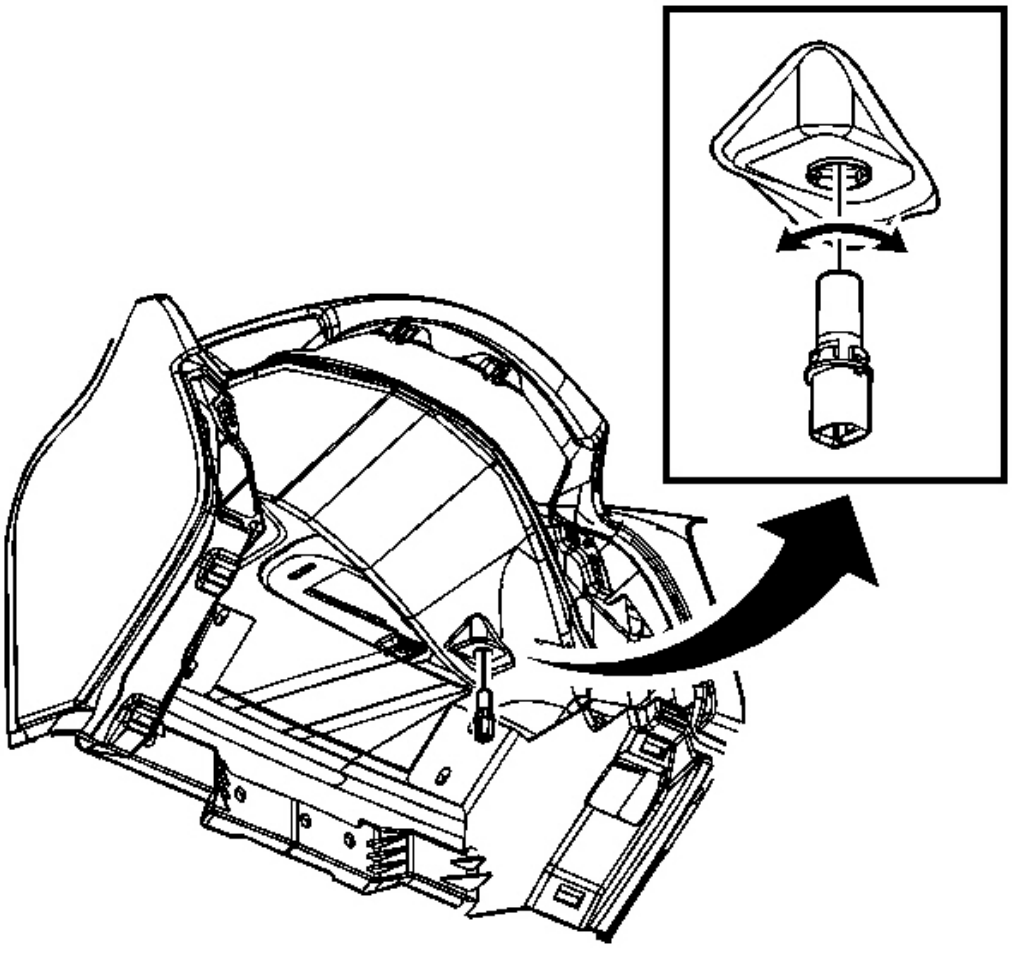


Fig. 43: Left Upper Air Temperature Sensor At Air Distribution Duct
Courtesy of GENERAL MOTORS CORP.

1. Install the left upper air temperature sensor to the air distribution duct.

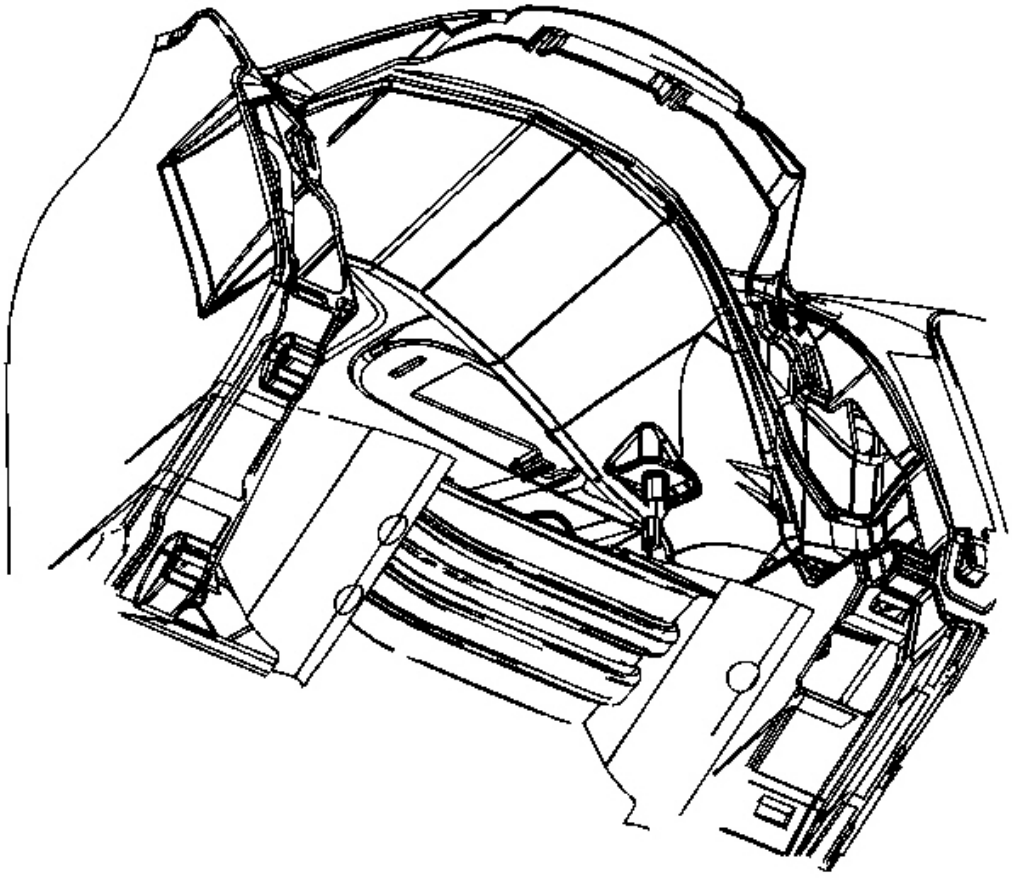


Fig. 44: Left Upper Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the left upper air temperature sensor electrical connector.
3. Install the IPC. Refer to **Instrument Cluster Replacement** in Instrument Panel, Gages and Console.

AIR TEMPERATURE SENSOR REPLACEMENT - LOWER LEFT SIDE

Removal Procedure

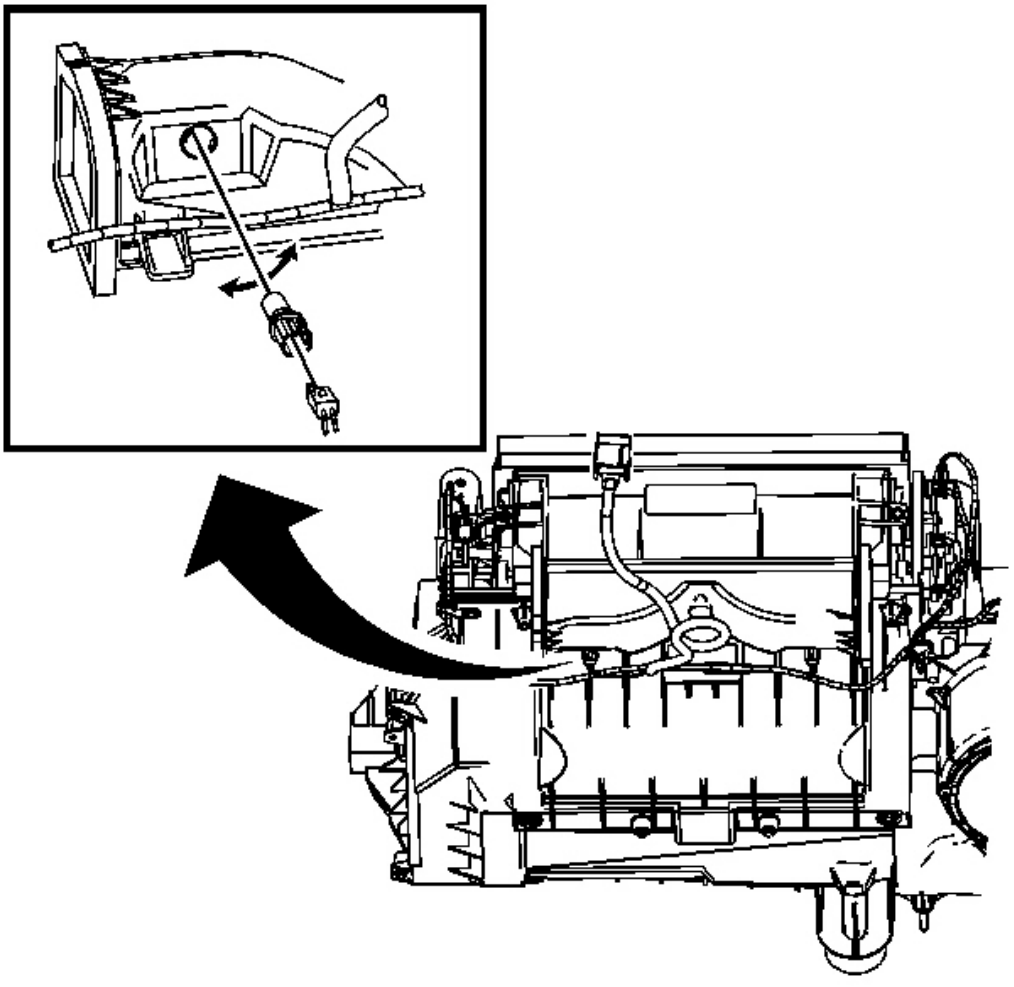


Fig. 45: Identifying DTM Sensor & Electrical Connector (Lower Left)
Courtesy of GENERAL MOTORS CORP.

1. Remove the HVAC module. Refer to **HVAC Module Assembly Replacement** in Heating, Ventilation and Air Conditioning.
2. Disconnect the lower LH diagnostic test mode (DTM) sensor electrical connector.

IMPORTANT: Rotate the DTM sensor counterclockwise to disengage the sensor from the lower duct.

3. Remove the lower LH DTM sensor from the HVAC module.

Installation Procedure

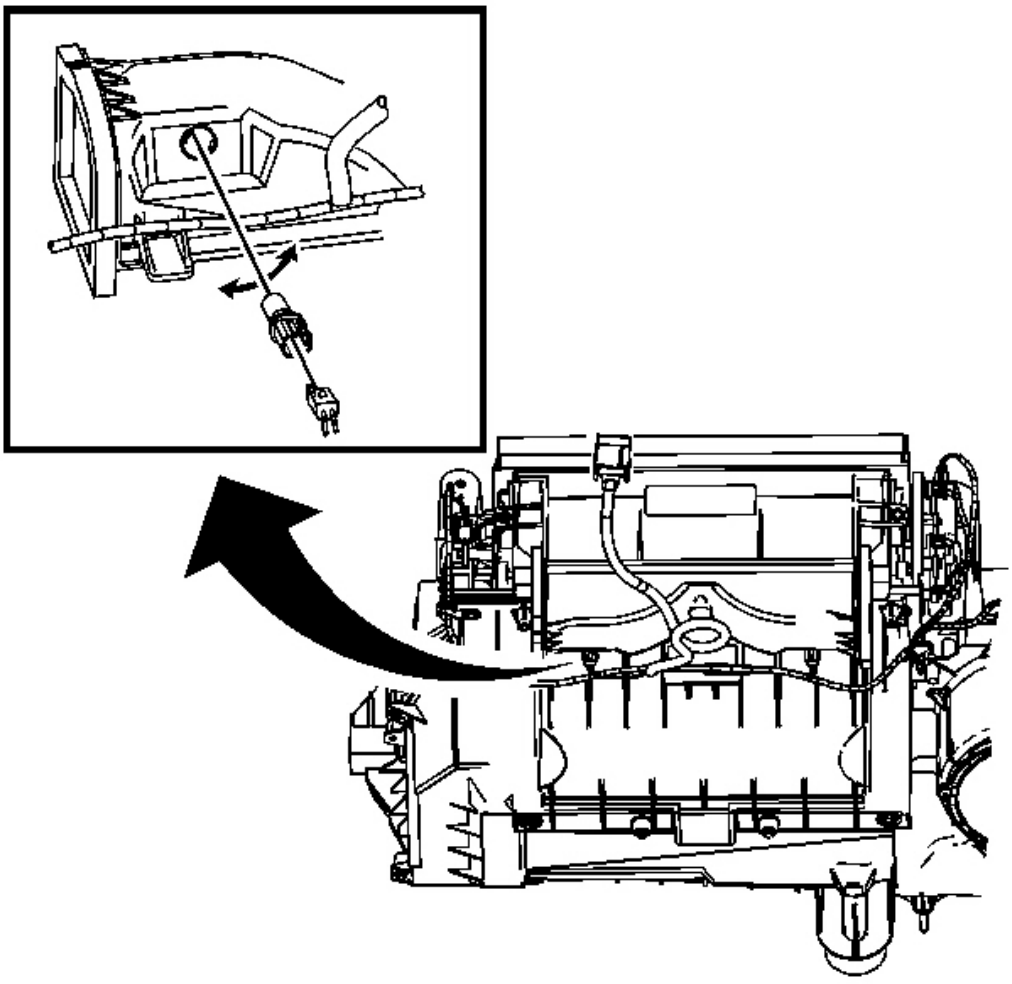


Fig. 46: Identifying DTM Sensor & Electrical Connector (Lower Left)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Rotate the DTM sensor clockwise to engage the sensor to the lower duct.

1. Install the lower LH DTM sensor to the HVAC module.
2. Connect the lower LH DTM sensor electrical connector.
3. Install the HVAC module. Refer to **HVAC Module Assembly Replacement** in Heating,

Ventilation and Air Conditioning.

AIR TEMPERATURE SENSOR REPLACEMENT - LOWER RIGHT SIDE

Removal Procedure

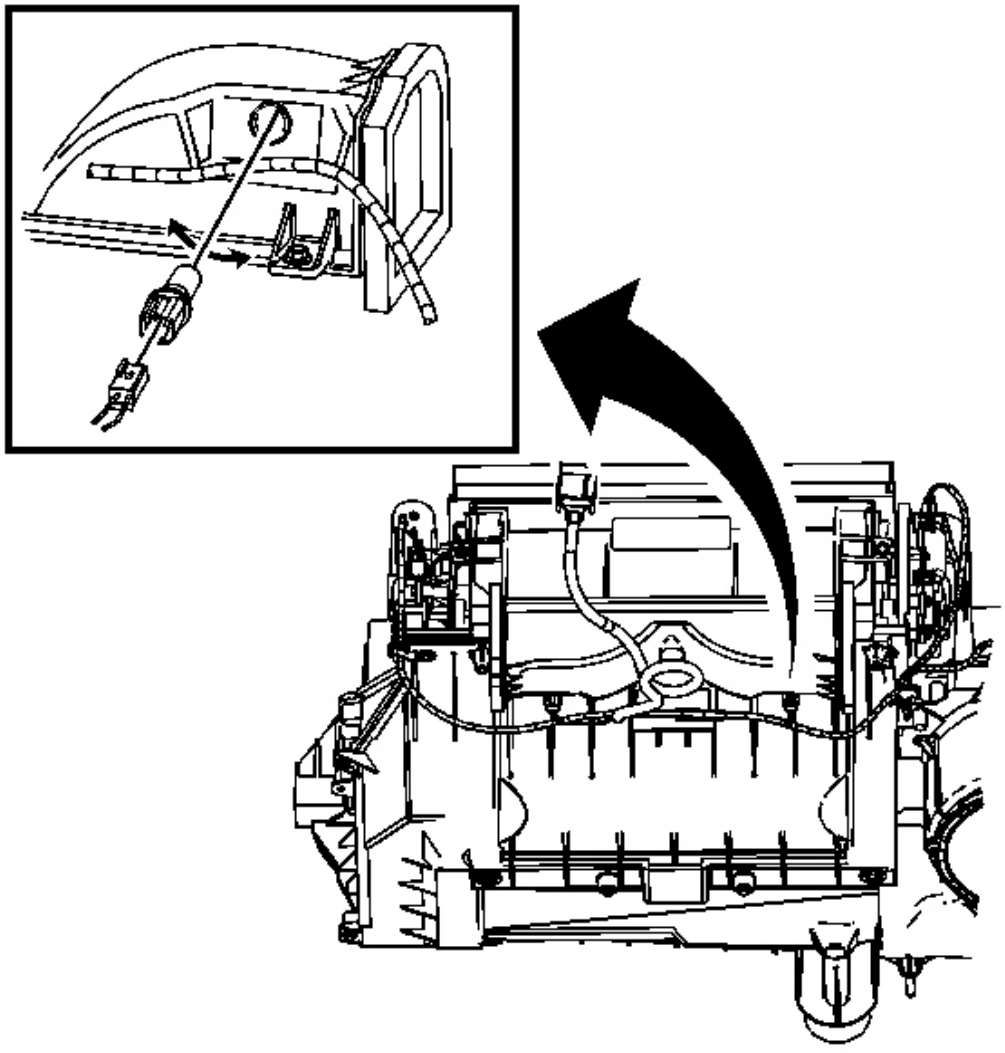


Fig. 47: Identifying DTM Sensor & Electrical Connector (Lower Right)
Courtesy of GENERAL MOTORS CORP.

1. Remove the HVAC module. Refer to **HVAC Module Assembly Replacement** in Heating,

Ventilation and Air Conditioning.

IMPORTANT: Rotate the diagnostic test mode (DTM) sensor counterclockwise to disengage the sensor from the lower duct.

2. Disconnect the lower RH DTM sensor electrical connector.
3. Remove the lower RH DTM sensor from the HVAC module.

Installation Procedure

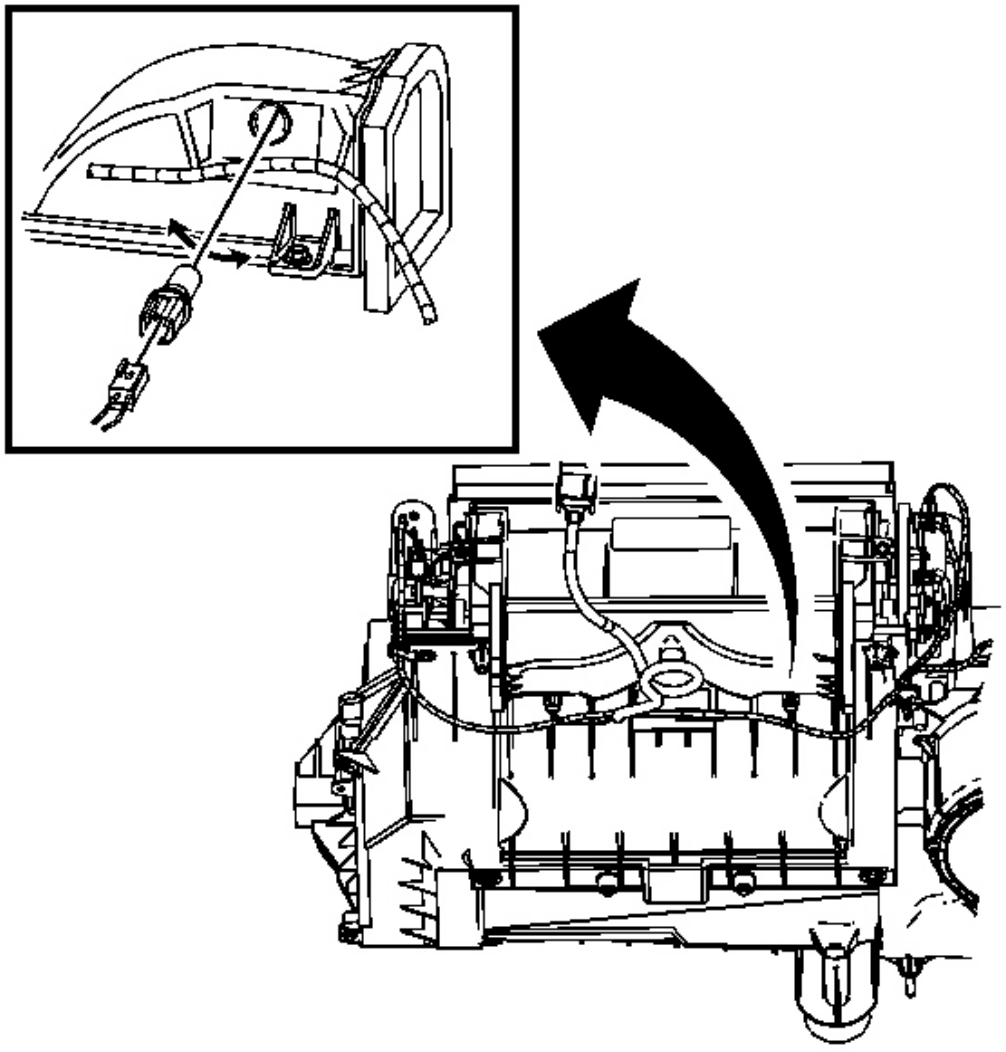


Fig. 48: Identifying DTM Sensor & Electrical Connector (Lower Right)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Rotate the DTM sensor clockwise to engage the sensor to the lower duct.

1. Install the lower RH DTM sensor to the HVAC module.
2. Connect the lower RH DTM sensor electrical connector.

3. Install the HVAC module. Refer to **HVAC Module Assembly Replacement** in Heating, Ventilation and Air Conditioning.

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

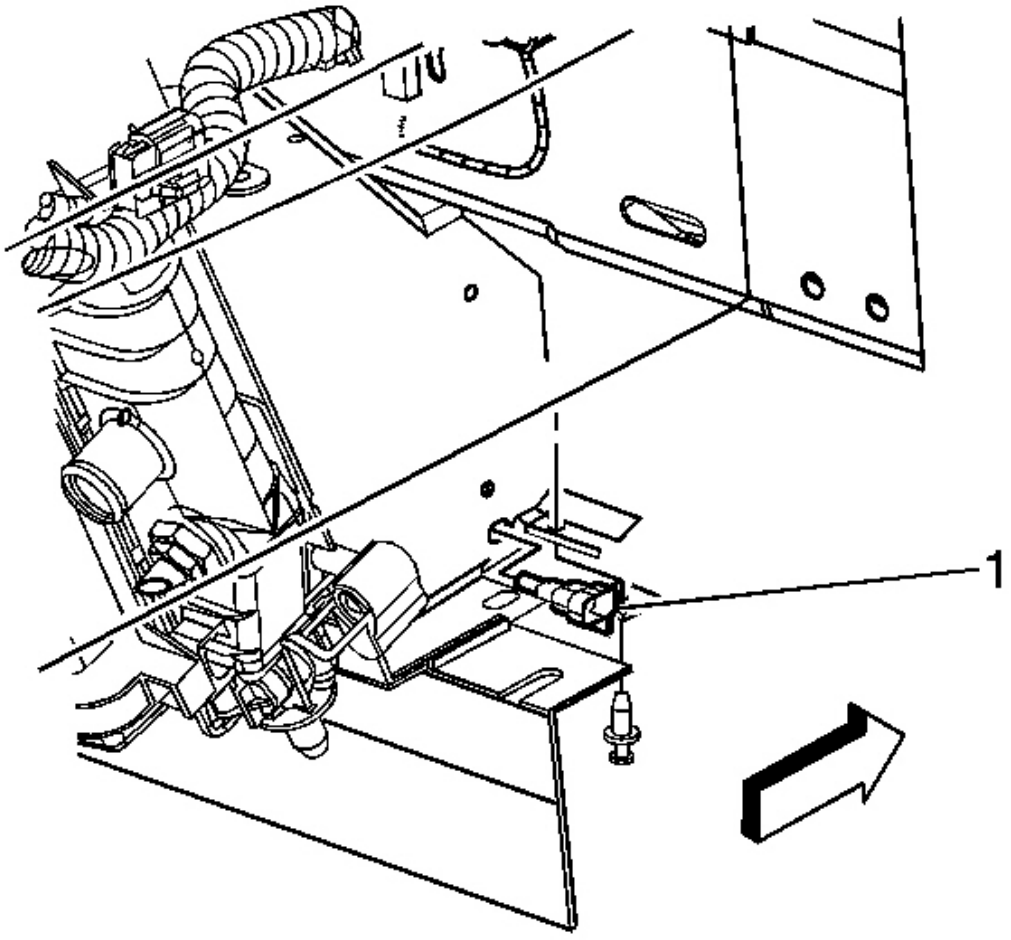


Fig. 49: Identifying Ambient Air Temperature Sensor & Electrical Connector At Radiator Support
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General

Information.

2. Disconnect the ambient air temperature sensor electrical connector.
3. Remove the push-in retainer securing the ambient air temperature sensor to the lower RH side of the radiator support.
4. Remove the ambient air temperature sensor from the radiator support.

Installation Procedure

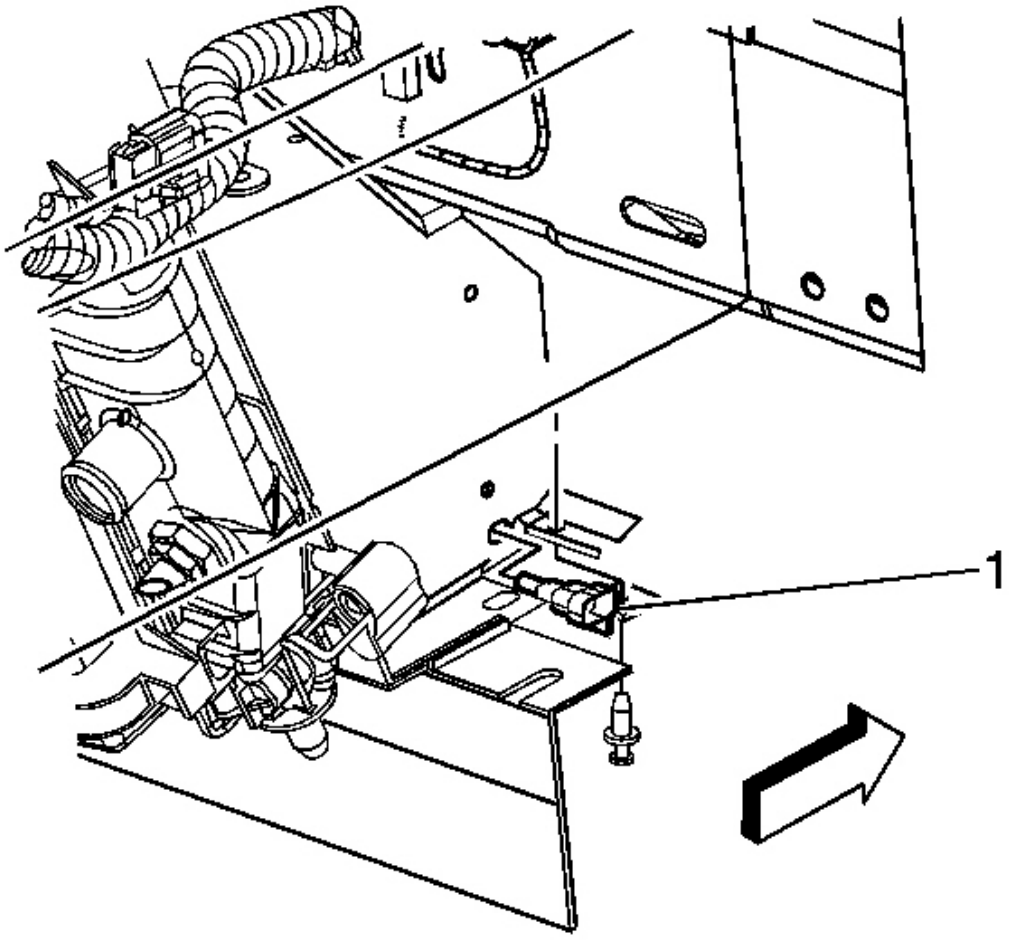


Fig. 50: Identifying Ambient Air Temperature Sensor & Electrical Connector At Radiator Support
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The ambient air temperature sensor must be orientated so that the sensor probe end is inboard and the electrical connector is outboard.

1. Install the ambient air temperature sensor to the lower radiator support.
2. Install the push-in retainer to secure the ambient air temperature sensor to the radiator support.
3. Connect the ambient air temperature sensor electrical connector.

INSIDE AIR TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

1. Remove the knee bolster. Refer to **Driver Knee Bolster Panel Replacement** .
2. Remove the driver information center (DIC) retaining screw.
3. Disconnect DIC from the instrument panel (I/P).
4. Disconnect the inside air temperature sensor from the DIC bezel.

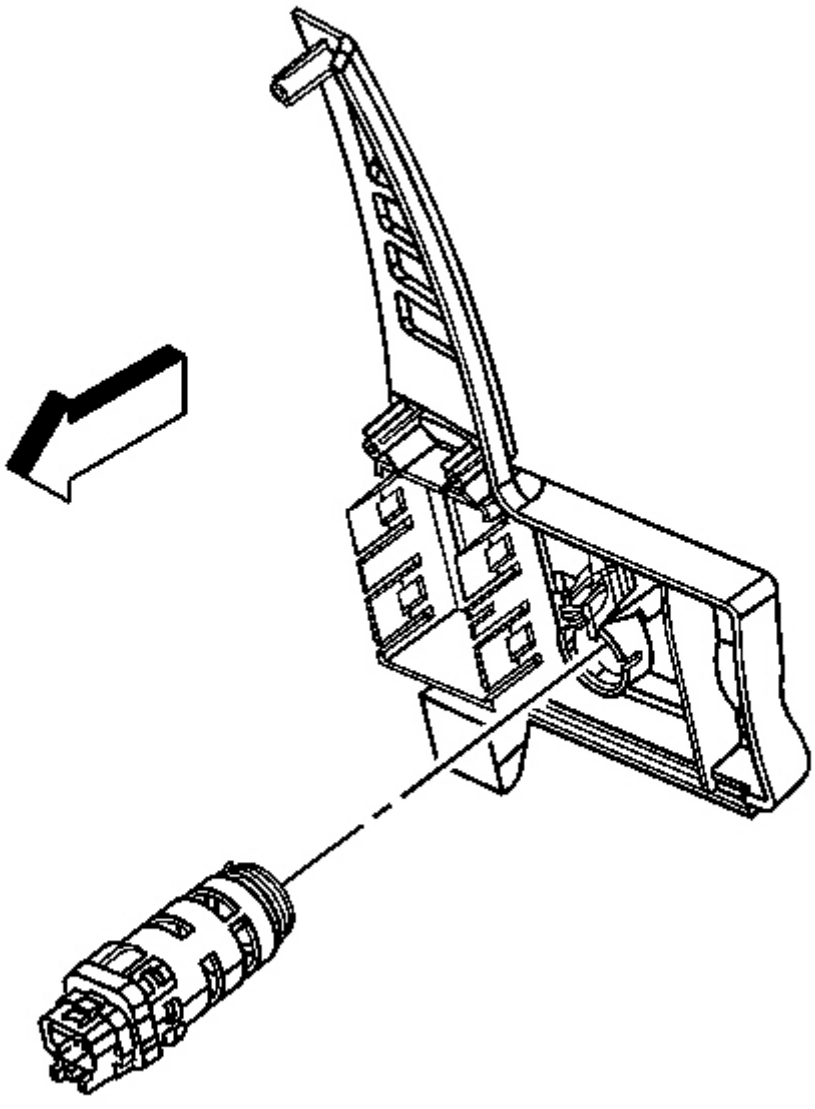


Fig. 51: View Of Inside Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the inside air temperature sensor electrical connector.

Installation Procedure

1. Connect the inside air temperature sensor electrical connector.

IMPORTANT: Ensure that the inside temperature sensor is fully seated into the DIC bezel.

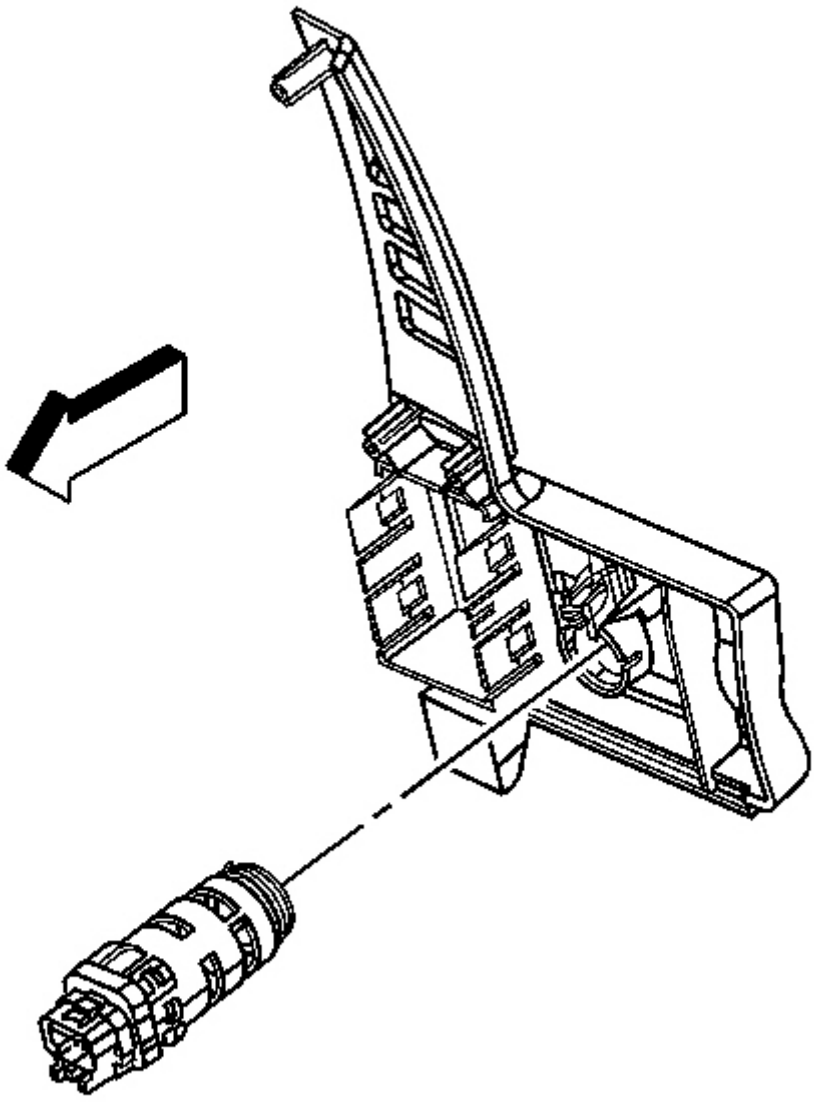


Fig. 52: View Of Inside Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Install the inside air temperature sensor.

3. Connect DIC to the I/P.

NOTE: Refer to Fastener Notice .

4. Install the DIC retaining screw.

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

5. Install the knee bolster. Refer to **Driver Knee Bolster Panel Replacement** .

SUN LOAD SENSOR REPLACEMENT

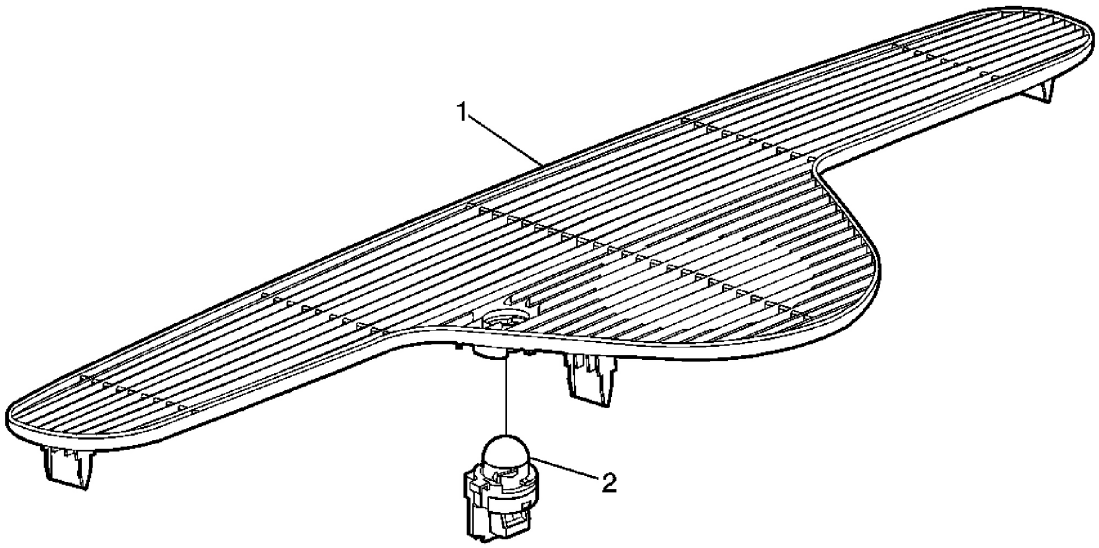


Fig. 53: Defroster Grille Assembly & Sunload Sensor Assembly
Courtesy of GENERAL MOTORS CORP.

Sun Load Sensor Replacement

Callout	Component Name
Fastener Tightening Specifications: Refer to **Fastener Tightening Specifications**.	
1	Grille Assembly, Defroster Refer to **Defroster Grille Replacement** .
2	Sensor Assembly, Sunload

DESCRIPTION AND OPERATION

AIR DELIVERY DESCRIPTION AND OPERATION

The air delivery controls are divided into two primary areas. The first, air speed, is dependent upon blower motor speed. The second, air distribution, is related to various single or multiple air outlets.

Air Speed

The blower motor forces air throughout the vehicles interior. The vehicle operator determines the blower motor's speed by toggling the blower motor switch manually or by using the automatic mode. The blower motor will always operate at some speed as long as the HVAC control module is in any position other than OFF, as long as the ignition switch is in the RUN position. The blower motor and mode switches are located within the HVAC control module.

Power is provided to the blower motor from the blower motor control processor through the blower motor supply voltage circuit. The blower motor control processor receives power from the under hood electrical center through the battery positive voltage circuit. Ground is provided by the blower motor control processor and ground circuit.

When any blower speed is selected, whether manual or automatic, the blower motor control processor will control blower motor speeds based on a 5 volt signal circuit that is pulse width modulated (PWM) signal by the HVAC control module. When a low blower speed is requested, the PWM signal is reduced. When a higher blower speed is requested, the PWM signal is increased. The blower motor control processor interprets the PWM signal and varies the ground on the blower motor control circuit internally. An open circuit, short to ground or short to battery on the blower motor speed control circuit will disrupt the PWM signal and cause the blower motor to not operate. In automatic operation, the HVAC control module will determine what blower speed is necessary in order to achieve or maintain a desired temperature. Toggling the blower button manually also activates the LCD display for the blower speed selected.

Off Mode

When the vehicle is moving, air flowing over the vehicle increases the air pressure just ahead of the windshield. This forces air into the outside air inlet, into the HVAC module and out through the floor outlets. The HVAC control module attempts to match the inside air temperature and driver selected temperatures. Since the A/C compressor is not running, the incoming air may be warmed but not cooled. Press the driver side air temperature switch to turn off the HVAC system. The ambient air temperature will show on the display.

Recirculation Mode

When the recirculation switch is pressed, the HVAC control module will apply a ground to one of the recirculation door control circuits in order to obtain the desired position. The recirculation actuator is a reverse polarity motor, each circuit provides both power and ground to the

recirculation actuator. When the actuator is being held in a stationary position, both of the recirculation door control circuits have 12 volts applied to both sides of the actuator motor. This holds the actuator stationary. When a recirculate position is requested, one of the recirculation door control circuits will ground driving the recirculation actuator into the desired position. When an outside air position is requested, the other recirculation door control circuit will ground. This moves the recirculation actuator into an outside air position. This brings air from outside the vehicle instead of air from the inside.

The HVAC control module provides power and ground to the recirculation actuator. The HVAC control module receives power from the under hood electrical center through the ignition 3 voltage circuit. Ground is provided by the ground circuit.

The recirculation mode can be used in both automatic and manual operation. The only time recirculation is not available is when FRONT DEFROST and mix blend mode is selected. The RECIRC LED will flash to alert the driver that recirculation mode is not available. Pressing the recirculation switch, from the OFF position, will set the blower, mode and A/C compressor clutch into automatic mode.

When in automatic mode, recirculation will stay on until either the vehicle operator selects outside air, by pressing the RECIRCULATION switch, or the HVAC control module automatically moves the recirculation actuator. Automatic recirculation is only available when air temperatures are 21°C (70°F) or warmer. The recirculation actuator position will vary to obtain a cooler duct air temperature when cool air is selected. This will assist in cooling the vehicle quicker.

The HVAC control module will move the recirculation actuator to the outside air position at ignition off to bring fresh air to replace stale air that has accumulated in the HVAC module during shut down.

When requested the recirculation actuator will be able to move to the 100% recirculation position for a limited time, after that limited time the actuator will move to the 90% position. In the auto mode only, the recirculation actuator will move faster to the recirculation position when vehicle is at an idle compared to the normal speed of the actuator during normal operation.

If the recirculation actuator or related circuits has a failure the HVAC control module will attempt to drive the actuator to the outside air position regardless of mode selection. If there is a failure with one of the air temperature actuators the HVAC control module will allow the recirculation actuator to move to the outside air position.

Automatic Modes

The automatic HVAC system will warm up/cool down and maintain the interior temperature of the vehicle by controlling the A/C compressor clutch, blower motor, air temperature, mode and recirculation actuators to achieve the desired temperature. For fully automatic operation, both the blower and mode buttons must be in the AUTO position. Blower speeds will change automatically based on inputs to the HVAC control module. The HVAC control module will always come back to the last settings after an ignition cycle or, if equipped, to the last settings of the driver by pressing the UNLOCK button on the remote keyless entry fob and placing the ignition in RUN. Only RECIRCULATION will have to be reset after each ignition cycle.

Moisture tends to accumulate in the HVAC module assembly after the engine has been shut off. The HVAC control module will purge the HVAC module of stale air and moisture to prevent window fogging. The mode actuator will move to the floor mode and run the low speed blower for 10 seconds to purge out the air and moisture. The recirculation actuator will be in the outside air position. Purge mode can be bypassed if any manual modes are selected.

In cold temperatures, the automatic HVAC system will provide heat in the most efficient manner. On cold engine start-up, when temperatures are -1°C (30°F) or colder, low blower speeds will be selected and airflow will be directed on the windshield for 3 minutes. This is done to prevent windshield fogging. To warm the interior quickly, maximum heat mode is used where the blower is at maximum speed, floor mode, both air temperature actuators are in full hot position and outside air is being drawn in. The vehicle operator can select the extreme warm setting of 32°C (90°F), but the system will be out of automatic operation and not warm the vehicle any faster or regulate the blower speed. Once the desired temperature is reached, the blower motor, mode, recirculation and temperature will be adjusted automatically by the HVAC control module.

In warm temperatures, the automatic HVAC system will provide A/C in the most efficient manner. On vehicle start up, the HVAC control module will monitor for conditions that indicate the possible presence of moisture in the HVAC module. To avoid blowing hot air and moisture out at the driver, the HVAC control module moves the mode door toward the floor and runs the low speed blower for a 3 seconds. This purge mode can be bypassed if the vehicle is started with the blower switch in maximum speed position. To cool the interior quickly, maximum cool mode is used where the blower is at maximum speed, both air temperature actuators are in full cold position and the recirculation actuator is drawing air from inside the vehicle. The vehicle operator can select the extreme cool setting of 16°C (60°F), but the system will be out of automatic operation and not cool the vehicle any faster or regulate the blower speed. Once the desired temperature is reached, the blower motor, mode, recirculation and temperature will be adjusted automatically by the HVAC control module.

Air Distribution

When the mode switch is pressed, a ground is provided from the HVAC control module to the

mode actuator through the mode door control circuits. When the mode actuator receives the signal, the mode actuator moves into the desired position.

The HVAC control module provides power and ground to the mode actuator. The HVAC control module receives power from the rear fuse block through the ignition 3 voltage circuit. Ground is provided by the ground circuit.

The mode actuator is a reverse polarity motor. Each circuit provides both power and ground to the mode actuator. When the mode actuator is being held in position, both of the mode door control circuits have 12 volts applied to both sides of the actuator motor. This holds the actuator stationary. When a mode is requested, one of the mode door control circuits will ground, driving the mode actuator into the desired mode.

Front Defrost Mode

The front defrost mode is the only setting that is not controlled by the automatic HVAC system. When defrost is selected, by the vehicle operator, the A/C compressor is activated and outside air is brought into the vehicle. The blower motor will be activated, regardless of coolant temperature and air will be directed toward the windshield, the side windows and some air flow to the floor. Recirculation mode is not available in front defrost. The recirculation LED will flash on their respective displays if any of those switches are pressed when in front defrost mode. This indicates that these modes are not available. The rear window defogger does not affect the HVAC system in any setting.

Mode Switch

Use the MODE switch in order to change the air delivery mode in the vehicle. Selection of the MODE switch when in AUTO mode will lock in the air flow mode that AUTO was controlling. The system will stay in that mode until the MODE or AUTO switch is pressed. Toggling the MODE button also activates the LCD display for the mode selected. If an airflow mode is currently displayed, pressing the MODE button selects the next air flow mode. The air flow direction will sequence through the following modes:

- MIX-BLEND. Air is directed through the floor, windshield, and side window outlets.
- BI-LEVEL. Cool air is delivered through the vent outlets while warm air is delivered through the floor outlets.
- FLOOR. Air is delivered though the floor, windshield and side window outlets.
- VENT. Air is delivered through the instrument panel outlets.

These are the only air flow modes available through the MODE button. When in AUTO mode, the HVAC control module will only operate in the following modes:

- BI-LEVEL
- VENT
- FLOOR

Dual Zone Control Switch

The passenger air temperature switch is provided to allow the passenger to set air discharge temperatures on the passenger side of the vehicle. Passenger temperatures can be set from 15°C (60°F) to 32°C (90°F). To activate the dual zone, the passenger air temperature switch to the desired offset. If the passenger air temperature switch has been turned on, it can be turned off by pressing the passenger switch. Greater sunload on one side of the vehicle may cause the discharge air temperatures to be different, even when the HVAC system is not operating in a dual zone mode.

The HVAC control module provides power and ground to the passenger air temperature actuator. The HVAC control module receives power from the under hood electrical center through the ignition 3 voltage circuit. Ground is provided by the ground circuit.

The passenger air temperature actuator is a reverse polarity motor. Each circuit provides both power and ground to the passenger air temperature actuator. When the passenger air temperature actuator is being held in position, both of the passenger air temperature door control circuits have 12 volts applied to both sides of the actuator motor. This holds the actuator stationary. When a temperature offset is requested, one of the passenger air temperature door control circuits will ground, driving the passenger air temperature actuator into the desired temperature offset.

AIR TEMPERATURE DESCRIPTION AND OPERATION

The air temperature controls are divided into three primary areas:

- Automatic operation
- The heating and air conditioning system
- The A/C cycle

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 power mode master, provides a device on signal. The control module supports the following features:

Air Temperature Description and Operation

Feature	Availability
Afterblow	Yes
Purge	Yes
Personalization	Yes
Actuator Calibration	Yes

Personalization

The HVAC control module will receive information that defines the current driver of the vehicle from the driver door module (DDM) through class 2 communication. The HVAC system will memorize the following system configurations for up to three unique drivers:

- Driver set temperature
- Passenger set temperature
- Mode
- Blower motor speed (auto, speed 1, 2, 3, 4, 5, 6)
- A/C compressor request, auto ON or A/C OFF

This information shall be stored inside the HVAC control module memory. When a different driver identification button is selected the HVAC control module will recall the appropriate driver settings. When the HVAC control module is first turned on, the last stored settings for the current driver will be activated except for the rear defrost and heated seat settings.

Air Temperature Actuators

The air temperature actuator is a 2-wire bi-directional electric motor. Two control circuits enable the actuator to operate. The control circuits use either a 0 or 12 volt value to co-ordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 12 volts. In order to move the actuator, the HVAC control module grounds the appropriate control circuit for the commanded direction. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction.

The HVAC control module determines the door position by counting motor pulses on one of the control circuits. These pulses are small voltage fluctuations that occur when the brush is shorted across two commutator contacts as the motor rotates. As the actuator shaft rotates, the HVAC control module monitors the voltage drop across an internal resistance to detect the pulses. The

HVAC control module converts the pulses to counts with a range of 0-255 counts. The HVAC control module uses a range of 0-255 counts to index the actuator position.

Air Temperature Sensors

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

- Outside
- Inside
- Upper right
- Upper left
- Lower right
- Lower left

The upper and lower duct sensors are divided into left and right zone operation. The left side upper and lower duct sensors will only effect the operation of the left air temperature actuator and the right side upper and lower duct sensors will only effect the operation of the right air temperature actuator. The duct sensors are used to measure the temperature of the air exiting the ducts. The sensors operate within a temperature range between -6.5°C (20.3°F) to 57.5°C (135.5° F). When temperature increases the sensor signal decreases. The HVAC control module converts the 0-5 volt sensor signal to a range between 0-255 counts. If the HVAC control module detects that one of the duct temperatures must change, the HVAC control module will adjust the appropriate air temperature actuator. The following list shows the duct sensors that are monitored by the HVAC control module in each mode position:

Air Temperature Description and Operation

Mode Position	Duct Sensor Monitored
Vent	Upper left duct sensor and upper right duct sensor
Bi-Level	Upper left duct sensor and upper right duct sensor
Defog	Lower left duct sensor and lower right duct sensor
Floor	Lower left duct sensor and lower right duct sensor
Front Defrost	Lower left duct sensor and lower right duct sensor

If the HVAC control module detects a malfunctioning sensor, the HVAC system will only malfunction when the sensor is monitored.

The inside temperature sensor operates within a temperature range between -6.5°C (20.3°F) to 57.5°C (135.5°F). If the sensor is shorted to ground, an open, or shorted to voltage, the HVAC

system will use a default value.

The outside temperature sensor operates within a temperature range between -30°C (-22°F) to 51°C (123.8°F). The radio displays the OAT value that it receives from the HVAC control module through a class 2 message. If the HVAC control module has determined that the outside temperature sensor has failed, the radio shall display, 75, in place of the outside air temperature. If the sensor is shorted to ground, an open, or shorted voltage, the HVAC control module will use a default value.

The radio displays the outside air temperature value that it receives from the HVAC control module through a class 2 message. The scan tool has the ability to update the displayed ambient air temperature. The outside air temperature value is displayed or updated under the following conditions:

Air Temperature Description and Operation

Condition	Display
At start up with the engine OFF more than 3 hours	Displays actual outside temperature
At start up with the engine OFF less than 3 hours	Displays last stored temperature
Vehicle moving above 16 km/h (10 mph) for 5 minutes	Updates temperature display at a slow filtered rate.
Vehicle moving at 51 km/h (32 mph) or greater for 2.5 minutes	Updates temperature display as rapidly as possible.
When the sensor reading is less than the displayed value.	Updates temperature display as rapidly as possible.
When the Front Defrost, Rear Defog and fan up buttons are pressed simultaneously.	Updates temperature display instantly.

Sunload Sensor

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 along with the ambient light sensor. Low reference and signal circuits enable the sensor to operate. As the sunload increases, the sensor signal decreases. The sensor operates within an intensity range between completely dark and bright. The sensor signal varies between 0-5 volts. The HVAC control module converts the signal to a range between 0-255 counts.

The sunload sensor provides the HVAC control module 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 sensor is open or shorted, no sunload condition occurs.

A/C Refrigerant Pressure Sensor

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

The A/C refrigerant pressure sensor prevents the A/C system from operating when an excessively high or low pressure condition exists. The ECM disables the compressor clutch under the following conditions:

- A/C pressure is more than 2850 kPa (413 psi). The clutch will be enabled after the pressure decreases to less than 2100 kPa (254 psi).
- A/C pressure is less than 204 kPa (30 psi). The clutch will be enabled after the pressure increases to more than 220 kPa (32 psi).

If the ECM detects a failure in the A/C refrigerant pressure sensor or circuit, the class 2 message sent to the HVAC control module will be invalid. The HVAC control module will display A/C OFF on the module as long as the condition is present.

Heating and A/C Operation

The purpose of the heating and A/C system is to provide the following:

- Heated air
- Cooled air
- Remove humidity from the interior of the vehicle
- Reduce windshield fogging

Regardless of the temperature setting, the following can effect the rate that the HVAC system can achieve a desired temperature:

- Recirculation actuator setting
- Difference between inside and desired temperature
- Difference between ambient and desired temperature

- Blower motor speed setting
- Mode setting

The HVAC control module commands or monitors the following actions when an air temperature setting is selected.

WARMEST POSITION - The air temperature actuator door position directs maximum air flow through the heater core.

COLDEST POSITION - The air temperature actuator door position directs maximum air flow around the heater core.

BETWEEN THE WARMEST AND COLDEST POSITION - The following sensors are monitored to direct the appropriate amount of air through the heater core to achieve the desired temperature:

- Sunload
- Outside temperature
- Inside temperature
- Duct temperatures

The A/C system is engaged by selecting any switch on the HVAC control module except the, A/C OFF switch. The A/C switch will illuminate, A/C OFF, when the A/C switch is selected. The HVAC control module sends a class 2 A/C request message to the body control module (BCM) for A/C compressor clutch operation. The BCM must communicate with the ECM in order for the A/C clutch to be engaged. The HVAC system uses a compact variable swash plate compressor. The following conditions must be met in order for the ECM to turn on the compressor clutch from the HVAC control module request:

- BCM will allow A/C operation if the following limits are within normal operating range
  - A/C line pressure
  - A/C refrigerant low temperature
  - Ambient temperature
  - Engine coolant temperature
  - Battery voltage
- HVAC control module
  - OAT temperature more than 1.5°C (35°F)
  - Control module operating range 9 and 16 volts

- ECM
  - Engine coolant temperature (ECT) is less than 128°C (262°F)
  - Engine RPM is more than 0 RPM
  - A/C pressure is between 2850 kPa (413 psi) and 204 kPa (30 psi).

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

- Throttle position is 100%
- A/C pressure is more than 2850 kPa (413 psi)
- A/C pressure is less than 204 kPa (30 psi)
- Engine coolant temperature (ECT) is more than 128°C (262°F)

If there is a malfunction in the A/C system, the driver information center will read, SERVICE A/C SYSTEM, to alert the driver.

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

Dual Zone Operation

The HVAC control module has temperature settings for the driver and the passenger. If the passengers setting is turned off then the drivers setting controls both driver and passenger temperature actuators. The passengers setting can not be used without the drivers setting also being ON. The passengers setting can be turned ON or OFF by pressing the temperature switch on the passengers side of the HVAC control module. When the passengers setting is ON, the passenger temperature can be adjusted independently from the drivers setting and the passenger temperature is displayed on the passengers side of the control module. A different sunload or duct temperature on one side of the vehicle may cause different discharge air temperatures even when the passengers setting is not turned ON.

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 blower motor switch must be in the AUTO position.
- The air temperature switch must be in any other position other than 60 or 90 degrees.

- The mode switch must be in the AUTO position.

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

- Regulate blower motor speed
- Position the air temperature actuator
- Position the mode actuator
- Position the recirculation actuator

When the warmest position is selected in automatic operation the blower speed, based on coolant temperature, will increase gradually until the vehicle reaches normal operating temperature. When normal operating temperature is reached the blower will stay on high speed and the air temperature actuators will stay in the full heat position. When the coldest position is selected in automatic operation the blower will stay on high and the air temperature actuators will stay in the full cold position.

In cold temperatures, the automatic HVAC system will provide heat in the most efficient manner. The vehicle operator can select an extreme temperature setting but the system will not warm the vehicle any faster. In warm temperatures, the automatic HVAC system will also provide air conditioning in the most efficient manner. Selecting an extreme cool temperature will not cool the vehicle any faster.

Engine Coolant

Engine coolant is the key element of the heating system. The engine thermostat controls the normal engine operating coolant temperature. Coolant pumped out of the engine enters the heater core through the inlet heater hose. The air flowing through the HVAC module absorbs the heat of the coolant flowing through the heater core. The coolant then exits the heater core through the heater outlet hose and returns back to the engine block.

A/C Cycle

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

A Delphi model CVC-7 compressor is used on this model year vehicle. The A/C compressor is belt driven and operates when the magnetic clutch is engaged. The compressor builds pressure in

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

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

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

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

Refrigerant exiting the TXV flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant to boil inside 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. This completes the A/C cycle of heat removal. At the compressor, the refrigerant is compressed again and the cycle of heat removal is repeated.

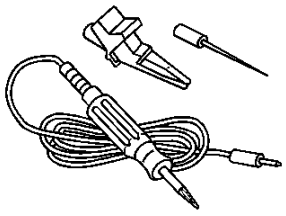
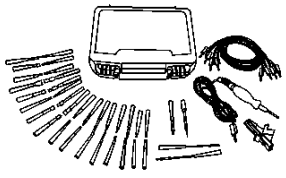
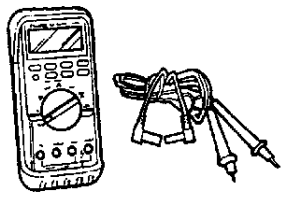
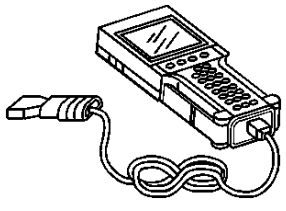
The conditioned air is distributed through the HVAC module for passenger comfort. The moisture removed from the passenger compartment will also change form, or condense, and is discharged from the HVAC module as water.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description

	J 34142-B 12-V Unpowered Test Lamp
	J 35616-A Connector Test Adapter Kit
	J 39200 Digital Multimeter
	7000081 Tech 2 Kit