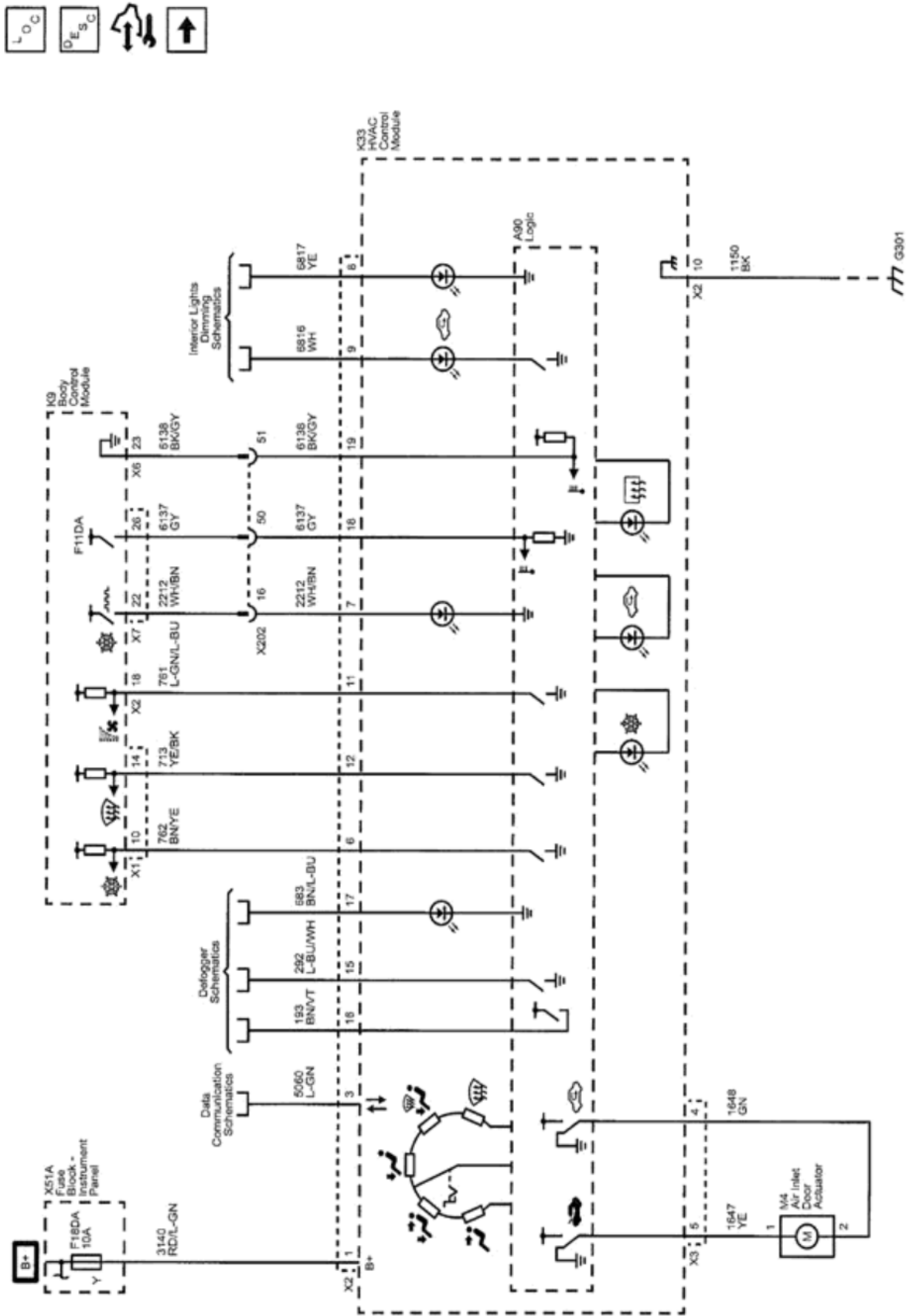


HVAC - Manual

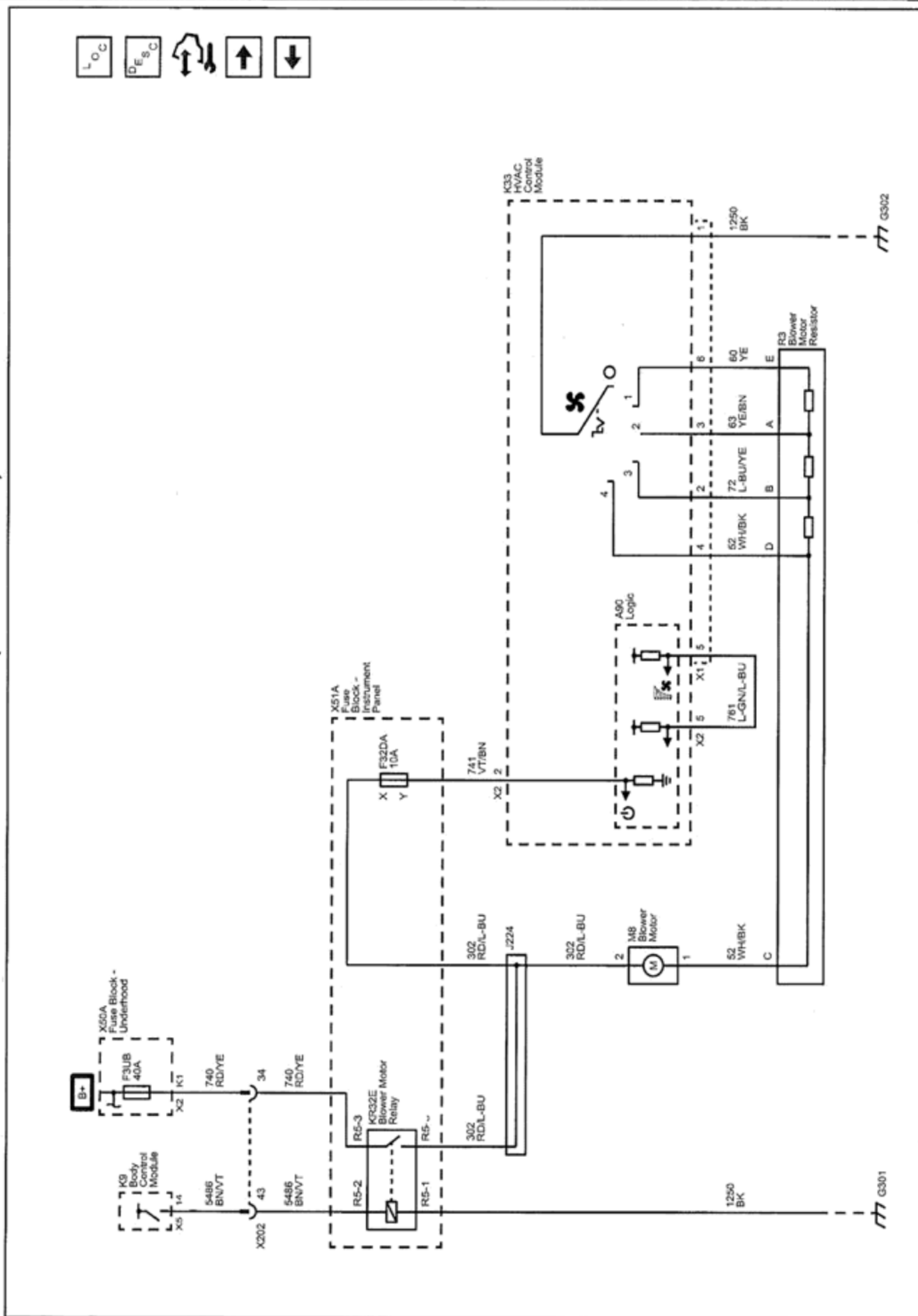
Schematic and Routing Diagrams

HVAC Schematics (Power, Ground, and Air Inlet Actuator)

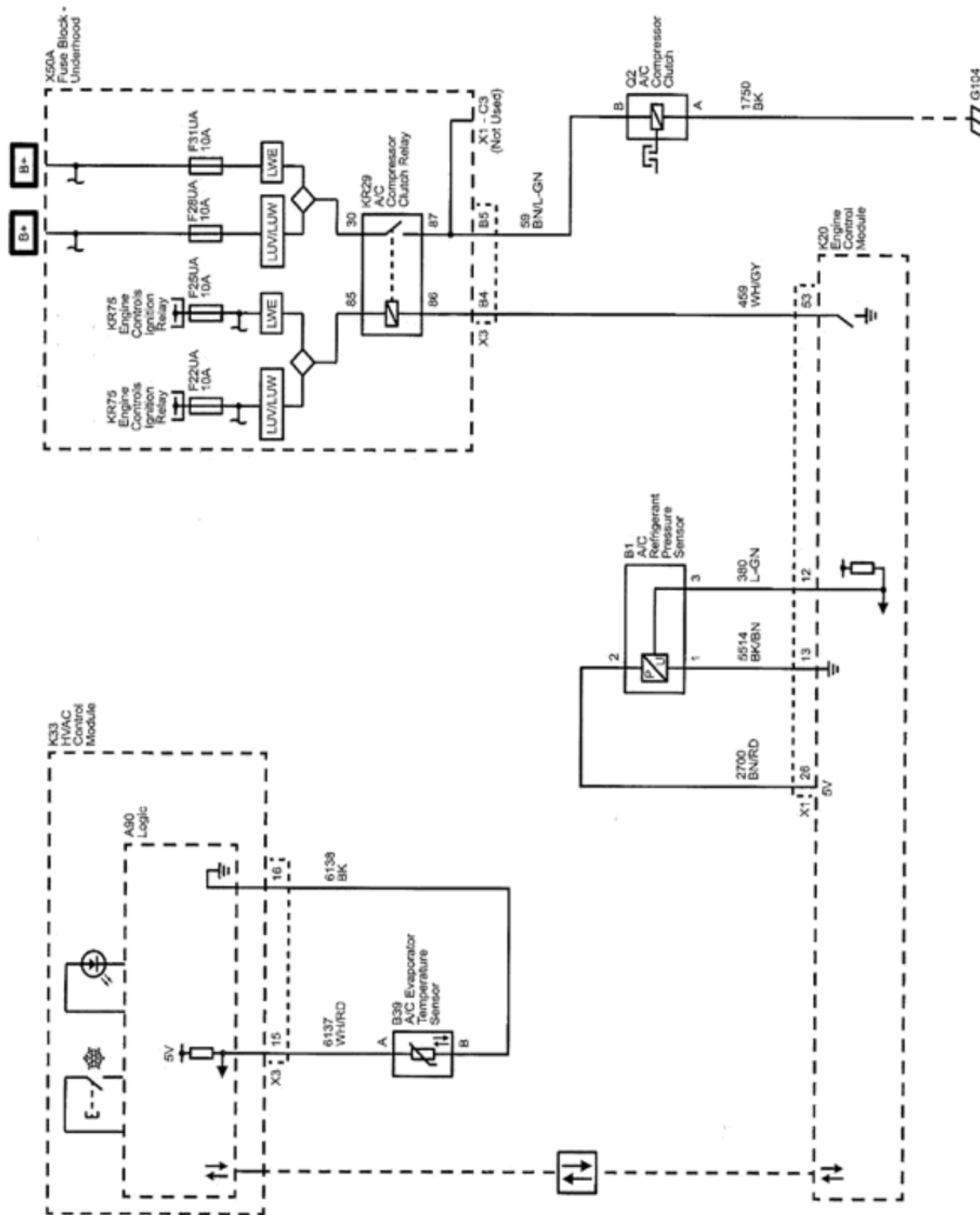


2762225

HVAC Schematics (Blower Controls)



HVAC Schematics (Compressor Controls)



2782232

Diagnostic Information and Procedures

DTC B0223

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B0223 01: Recirculate Position Command 1 Circuit Short to Battery

DTC B0223 02: Recirculate Position Command 1 Circuit Short to Ground

DTC B0223 04: Recirculate Position Command 1 Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control – Terminal A	B0223 01	B0223 04	B0223 02	—
Control – Terminal B	B0223 01	B0223 04	B0223 02	—

Circuit/System Description

The air inlet actuator is a 2-wire bi-directional electric motor. There are two control circuits that enable the actuator to operate. The control circuits use either a 0 or 12 V value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 V. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 V. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

B0223 01

The HVAC control module detects a short to battery in either air inlet control circuit.

B0223 02

The HVAC control module detects a short to ground in either air inlet control circuit.

B0223 04

The HVAC control module detects an open in an either inlet control circuit.

Action Taken When the DTC Sets

The air inlet door will be inoperative.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the M4 Air Inlet Door Actuator. It may take up to 2 minutes for all vehicle systems to power down.

2. Test for less than 100 Ω between each control circuit terminal listed below and ground.

- Terminal A
- Terminal B

⇒ **If 100 Ω or greater**

- 2.1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 - 2.2. Test for less than 2 Ω in the control circuit end to end.
- ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
- ⇒ If less than 2 Ω , replace the K33 HVAC Control Module.

⇓ **If less than 100 Ω**

3. Connect a test lamp between control circuit terminal A and control circuit terminal B, ignition ON.

4. Verify the test lamp turns ON for approximately 10 seconds when commanding the RECIRCULATE and FRESH AIR positions using the recirculate switch.

⇒ **If the test lamp remains OFF during either of the commands**

- 4.1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.

- 4.2. Test for less than 1 V between each control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

- 4.3. Test for less than infinite resistance between each control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K33 HVAC Control Module.

⇓ **If the test lamp illuminates during each of the commands**

5. Test or replace the M4 Air Inlet Door Actuator.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

- *Air Inlet Valve Actuator Replacement (LHD)* on page 10-49
- *Control Module References* on page 6-3 for K33 HVAC Control Module replacement, programming and setup

DTC B3933

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B3933 02: Air Conditioning Evaporator Temperature Sensor Circuit Short to Ground

DTC B3933 05: Air Conditioning Evaporator Temperature Sensor Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B3933 02	B3933 05	B3933 05	—
Low Reference	—	B3933 05	—	—

Circuit/System Description

The temperature sensors are a 2-wire negative temperature co-efficient thermistor. A signal circuit and low reference circuit is provided to the sensor. As the air temperature surrounding the sensor increases, the sensor resistance decreases. The sensor signal voltage decreases as the resistance decreases. The sensor operates within a temperature range between -40 to 85°C (-40 to 185°F).

Conditions for Running the DTC

- Ignition ON.
- The HVAC control module is ON.

Conditions for Setting the DTC

The HVAC control module detects the sensor signal voltage is less than 0.1 V or greater than 4.9 V for more than 50 ms.

Action Taken When the DTC Sets

The A/C compressor is disabled if the last test is not passed.

Conditions for Clearing the DTC

The sensor signal is within specified range between 0.1-4.9 V.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B39 A/C Evaporator Temperature Sensor. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 20 Ω between the low reference circuit terminal B and ground.
 - ⇒ **If 20 Ω or greater**
 - 2.1. Ignition OFF, disconnect X3 the harness connector at the K33 HVAC Control Module.
 - 2.2. Test for less than 2 Ω in the low reference circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , replace the K33 HVAC Control Module.
 - ⇓ **If less than 20 Ω**
3. Ignition ON.

4. Test for 4.8–5.2 V between the signal circuit terminal A and ground.

⇒ **If less than 4.8 V**

- 4.1. Ignition OFF, disconnect the X3 harness connector at the K33 HVAC Control Module.
4.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

- 4.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K33 HVAC Control Module.

⇒ **If greater than 5.2 V**

- 4.1. Ignition OFF, disconnect the X3 harness connector at the K33 HVAC Control Module, ignition ON.

- 4.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K33 HVAC Control Module.

⇓ **If between 4.8–5.2 V**

5. Test or replace the B39 A/C Evaporator Temperature Sensor.
6. Verify the DTC does not set while operating the vehicle under the Conditions for Running the DTC.

⇒ **If the DTC sets**

Replace the K33 HVAC Control Module.

⇓ **If the DTC does not set**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

- *Evaporator Air Temperature Sensor Replacement (LHD) on page 10-85*
- *Control Module References on page 6-3 for K33 HVAC Control Module replacement, programming and setup*

DTC P0532 or P0533

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC P0532: Air Conditioning (A/C) Refrigerant Pressure Sensor Circuit Low Voltage

DTC P0533: Air Conditioning (A/C) Refrigerant Pressure Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0452, P0532, P0641	P0452, P0532, P0641	P0533	—
Signal	P0532	P0532	P0533	—
Low Reference	—	P0533	—	—

Circuit/System Description

The engine control module (ECM) monitors the high side refrigerant pressure through the A/C refrigerant pressure sensor. The ECM supplies a 5 V reference and a low reference to the sensor. Changes in the A/C refrigerant pressure cause the sensor signal to the ECM to vary. When the pressure is high, the signal voltage is high. When the pressure is low, the signal voltage is low. When pressure is high, the ECM commands the cooling fans on. When pressure is too high or too low, the ECM will inhibit activation of the A/C compressor.

Conditions for Running the DTC

Engine is running.

Conditions for Setting the DTC

P0532

The ECM detects a short to ground or open at the A/C pressure sensor signal circuit.

P0533

The ECM detects a short to voltage at the A/C pressure sensor signal circuit.

Action Taken When the DTC Sets

The A/C compressor is disabled.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B1 A/C Refrigerant Pressure Sensor. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 1 and ground.
 - ⇒ **If 10 Ω or greater**
 - 2.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 - 2.2. Test for less than 2 Ω in the low reference circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , replace the K20 Engine Control Module.
 - ⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 4.8–5.2 V between the 5 V reference circuit terminal 2 and ground.

⇒ **If less than 4.8 V**

- 4.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

- 4.2. Test for infinite resistance between the 5 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

- 4.3. Test for less than 2 Ω in the 5 V reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K20 Engine Control Module.

⇒ **If greater than 5.2 V**

- 4.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

- 4.2. Test for less than 1 V between the 5 V reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K20 Engine Control Module.

⇓ **If between 4.8–5.2 V**

5. Verify the scan tool A/C High Side Pressure Sensor parameter is less than 0.3 V.

⇒ **If 0.3 V or greater**

- 5.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

- 5.2. Test for less than 1 V between the signal circuit terminal 3 and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K20 Engine Control Module.

⇓ **If less than 0.3 V**

6. Install a 3 A fused jumper wire between the signal circuit terminal 3 and the 5 V reference circuit terminal 2.

7. Verify the scan tool A/C High Side Pressure Sensor parameter is greater than 4.8 V.

⇒ **If 4.8 V or less**

- 7.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

- 7.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

- 7.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K20 Engine Control Module.

⇓ **If greater than 4.8 V**

8. Test or replace the B1 A/C Refrigerant Pressure Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

- *Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (1.4L)* on page 10-30 or *Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LUV)* on page 10-31 or *Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LDE/LUW/LWE)* on page 10-32
- *Control Module References* on page 6-3 for K20 Engine Control Module replacement, programming, and setup

DTC P0645, P0646, or P0647

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC P0645 00: Air Conditioning (A/C) Compressor Clutch Relay Control Circuit

DTC P0646 00: Air Conditioning (A/C) Clutch Relay Control Circuit Low Voltage

DTC P0647 00: Air Conditioning (A/C) Compressor Clutch Relay Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Switch B+	1	1	—	—
Relay Coil Ignition	P0645, P0646, 1	P0645, P0646, 1	—	—
Relay Coil Control	P0645, P0646, 2	P0645, P0646, 1	P0645, P0647, 1	—
Compressor Clutch Control	1	1	2	—
Compressor Clutch Ground	—	1	—	—
1. A/C compressor clutch will not engage 2. A/C compressor clutch engaged at all times				

Circuit/System Description

When the A/C switch is pressed and system conditions are such that A/C operation is allowed, the ECM will ground the A/C compressor clutch relay control circuit energizing the KR29 A/C Compressor Clutch Relay. With the relay contacts closed, battery voltage is supplied to the A/C compressor clutch assembly, engaging the A/C compressor.

Conditions for Running the DTC

- The ignition voltage is between 11-18 volts.
- An A/C request is made.

Conditions for Setting the DTC

The ECM detects an open, short to ground or short to voltage on the control circuit of the A/C compressor clutch relay

Action Taken When the DTC Sets

The ECM will store conditions which were present when the DTC set

Conditions for Clearing the DTC

A history DTC clears after 40 consecutive ignition cycles have occurred without a malfunction.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Circuit/System Verification

1. Ignition ON.
2. Verify the A/C Compressor Clutch Relay clicks when commanding the A/C clutch ON and OFF with a scan tool.
 - ⇒ **If the relay does not click**
Refer to Circuit/System Testing
 - ⇓ **If the relay clicks**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the KR29 A/C Compressor Clutch Relay, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is good**
 - 2.1. Ignition OFF, remove the test lamp.
 - 2.2. Test for less than 2 Ω in the B+ circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is open**
 - 2.1. Ignition OFF, remove the test lamp.
 - 2.2. Test for infinite resistance between the B+ circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ↓ If infinite resistance,
 - 2.3. Disconnect the harness connector at the Q2 A/C Compressor Clutch.
 - 2.4. Test for infinite resistance between the control circuit terminal 87 and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇒ If infinite resistance, test or replace the Q2 A/C Compressor Clutch.
 - ↓ **If the test lamp illuminates**
3. Verify a test lamp illuminates between the ignition circuit terminal 85 and ground.
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is good**
 - 3.1. Ignition OFF, remove the test lamp.
 - 3.2. Test for less than 2 Ω in the ignition circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is open**
 - 3.1. Ignition OFF, remove the test lamp.
 - 3.2. Test for infinite resistance between the B+ circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇒ If infinite resistance, test or replace the KR29 A/C Compressor Clutch Relay.
 - ↓ **If the test lamp illuminates**
4. Connect a test lamp between the control circuit terminal 86 and B+.
5. Verify the test lamp turns ON and OFF when commanding the Engine Control Module Q2 A/C Compressor Clutch Relay ON and OFF with a scan tool.
 - ⇒ **If the test lamp is always OFF**
 - 5.1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 - 5.2. Test for less than 1 V between the control circuit and ground.
 - ⇒ If 1 V or greater, repair the short to voltage on the circuit.
 - ↓ If less than 1 V
 - 5.3. Ignition OFF.
 - 5.4. Test for less than 2 Ω in the control circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , replace the K20 Engine Control Module.
 - ⇒ **If the test lamp is always ON**
 - 5.1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module.
 - 5.2. Test for infinite resistance between the control circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇒ If infinite resistance, replace the K20 Engine Control Module.
 - ↓ **If the test lamp turns ON and OFF**
6. Verify a test lamp does not illuminate between the control circuit terminal 87 and ground.
 - ⇒ **If the test lamp illuminates**

Repair the short to voltage on the circuit.
 - ↓ **If the test lamp does not illuminate**
7. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the Q2 A/C Compressor Clutch. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 10 Ω between the Q2 A/C Compressor Clutch ground circuit terminal A and ground.
 - ⇒ **If 10 Ω or greater**
 - 8.1. Ignition OFF.
 - 8.2. Test for less than 2 Ω in the ground circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.
 - ↓ **If less than 10 Ω**
9. Connect the harness connector at the Q2 A/C Compressor Clutch.
10. Ignition ON, connect a 10 A fused jumper wire between the B+ circuit terminal 30 and the control circuit terminal 87.

11. Verify the Q2 A/C Compressor Clutch is activated.

⇒ **If the Q2 A/C Compressor Clutch does not activate**

11.1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the Q2 A/C Compressor Clutch.

11.2. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , test or replace the Q2 A/C Compressor Clutch.

↓ **If the Q2 A/C Compressor Clutch activates**

12. Test or replace the KR29 A/C Compressor Clutch Relay.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

- *Air Conditioning Clutch Assembly Replacement (LUV) on page 10-18 or Air Conditioning Clutch Assembly Replacement (LDE/LUW/LWE) on page 10-19*
- *Relay Replacement (Within an Electrical Center) on page 11-607 or Relay Replacement (Attached to Wire Harness) on page 11-607*
- *Control Module References on page 6-3 for K20 Engine Control Module replacement, programming and setup*

Symptoms - HVAC Systems - Manual

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

1. Perform the *Diagnostic System Check - Vehicle* on page 6-66 before using the Symptom Tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules 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 system descriptions:
 - *Manual HVAC Description and Operation on page 10-85*
 - *Heating and Air Conditioning System Description and Operation on page 10-61*

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to *Checking Aftermarket Accessories on page 11-525*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Verify the A/C compressor clutch turns freely and is not seized.

- The following could cause window fogging:
 - Wet carpet or mats
 - High humidity
 - Interior water leak
 - Blocked A/C evaporator drain tube
 - Maximum passenger capacity
 - Blocked body pressure relief valves
- Inspect the air distribution system for causes of reduced air flow:
 - Obstructed or dirty passenger compartment air filter, if equipped
 - Blocked or damaged air inlet or outlet vents

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Symptom List

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

- *HVAC System Malfunction on page 10-75*
- *Blower Motor Malfunction on page 10-76*

HVAC System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool HVAC Control Module parameters listed below change between Active and Inactive when pressing the appropriate switch.
 - A/C Switch
 - Air Recirculation Mode Switch
- ⇒ **If either parameter does not change**
Replace the K33 HVAC Control Module.
- ⇓ **If both parameters change**
3. Verify the blower motor operates in all speed positions.
- ⇒ **If the blower motor does not operate in all speed positions**
Refer to *Blower Motor Malfunction* on page 10-76.
- ⇓ **If the blower motor operates in all speed positions**
4. Verify the recirculation door moves when pressing the air recirculation switch.
- ⇒ **If the recirculation door does not move**
Refer to *DTC B0223* on page 10-67.
- ⇓ **If the recirculation door moves**
5. Install the J43600 Air Conditioning Service Center.
6. Verify the high side pressure reading on the Air Conditioning Service Center is within 10% of the scan tool A/C High Side Pressure Sensor parameter.
- ⇒ **If the reading is not within 10%**
Refer to *DTC P0532* or *P0533* on page 10-71.
- ⇓ **If the reading is within 10%**

7. Verify the A/C High Side Pressure Sensor is between 269–2929 kPa (39–425 PSI).
 - ⇒ **If not between 269–2929 kPa (39–425 PSI)**
Refer to *Air Conditioning (A/C) System Performance Test* on page 10-4.
 - ⇓ **If between 269–2929 kPa (39–425 PSI)**
8. Engine ON, A/C system On.
9. Verify cool air flows from the air ducts with the temperature control in the coldest position.
 - ⇒ **If the air is not cool**
 - 9.1. A/C System ON.
 - 9.2. Verify the Q2 A/C Compressor Clutch is engaged.
 - ⇒ If not engaged, refer to *DTC P0645, P0646, or P0647* on page 10-73.
 - ⇒ If engaged, refer to *Air Conditioning (A/C) System Performance Test* on page 10-4.
 - ⇓ **If the air is cool**
10. Verify warm air flows from the ducts with the temperature control in the warmest position.
 - ⇒ **If the air is not warm**
Refer to *Heating Performance Diagnostic* on page 10-7.
 - ⇓ **If the air is warm**
11. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for K33 HVAC Control Module replacement, programming and setup

Blower Motor Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Blower Motor Ignition Voltage	2	2	—	—
Blower Motor Control	1	2	—	—
Speed 4 Control	1	3	—	—
Speed 3 Control	1	3	—	—

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Speed 2 Control	1	3	—	—
Speed 1 Control	1	3	—	—
Switch Ground	—	2	—	—
1. Unwanted Blower Operation 2. Blower Inoperative 3. Blower Speed Inoperative				

Circuit/System Description

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

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

When blower switch is in the Hi speed position, ground is applied directly to the blower motor through the blower switch.

Diagnostic Aids

Prior to motor replacement connect a direct independent B+ and ground to verify operation.

Inspect the motor shaft for rust or other foreign material which may prohibit proper motor operation.

If the motor operates properly please reinstall it, check for PIs or TSBs, and refer to Testing for Intermittent Conditions and Poor Connections in the Electrical Information Reference section of this document.

Reference Information

Schematic Reference

HVAC Schematics on page 10-64

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Manual HVAC Description and Operation on page 10-85

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Circuit/System Verification

1. Ignition ON
2. Verify the blower motor operates in all speed positions.
 - ⇒ **If the blower motor does not operate in any speed positions**
Refer to the Blower Motor Circuit Test
 - ⇒ **If the blower motor operates in one or more, but not all speed positions**
Refer to the Blower Motor Switch Circuit Test
 - ⇒ **If the blower motor is always ON**
Refer to the Blower Motor Always ON Circuit Test
 - ↓ **If the blower motor operates correctly in all speed positions**
3. All OK

Circuit/System Testing

Blower Motor Circuit Test

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the K33 HVAC Control Module. It may take up to 2 minutes for all vehicle system to power down.
2. Test for less than 5 Ω between the control circuit terminal 1 and ground.
 - ⇒ **If 5 Ω or greater**
 - 2.1. Ignition OFF.
 - 2.2. Test for less than 2 Ω in the ground circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.
 - ⇒ **If less than 5 Ω**
3. Ignition OFF, connect the X1 harness connector at the K33 HVAC Control Module and disconnect the harness connector at the R3 Blower Motor Resistor.
4. Place the blower motor switch in the high speed position.

5. Test for less than 5 Ω between the control circuit terminal D and ground.

⇒ **If 5 Ω or greater**

- 5.1. Ignition OFF, disconnect the X1 harness connector at the K33 HVAC Control Module.
- 5.2. Test for less than 2 Ω in the control circuit end to end.
- ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
- ⇒ If less than 2 Ω , replace the K33 HVAC Control Module.

↓ **If less than 5 Ω**

6. Ignition OFF, connect the harness connector at the R3 Blower Motor Resistor and disconnect the harness connector at the M8 Blower Motor. Place the blower motor switch in the high speed position.
7. Test for less than 5 Ω between the control circuit terminal 1 and ground.

⇒ **If 5 Ω or greater**

- 7.1. Ignition OFF, disconnect the harness connector at the R3 Blower Motor Resistor.
- 7.2. Test for less than 2 Ω in the control circuit terminal end to end.
- ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
- ⇒ If less than 2 Ω , replace the R3 Blower Motor Resistor.

↓ **If less than 5 Ω**

8. Ignition ON.
9. Verify a test lamp illuminates between the control circuit terminal 2 and ground.

⇒ **If the test lamp does not illuminate**

- 9.1. Ignition OFF.
- 9.2. Test for infinite resistance between the control circuit and ground.
- ⇒ If less than infinite resistance, repair the short to ground on the circuit.
- ↓ **If infinite resistance**
- 9.3. Test for less than 2 Ω in the control circuit end to end.
- ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
- ⇒ If less than 2 Ω , refer to *Power Mode Mismatch* on page 11-515.

↓ **If the test lamp illuminates**

10. Test or replace the M8 Blower Motor.

Blower Motor Switch Circuit Test

1. Ignition OFF, disconnect the harness connector at the R3 Blower Motor Resistor.
2. Test for less than 5 Ω between each control circuit terminal listed below and ground with the blower switch in the appropriate speed position.
 - Blower speed 1 terminal E
 - Blower speed 2 terminal A

- Blower speed 3 terminal B
- Blower speed 4 terminal D

⇒ **If 5 Ω or greater**

- 2.1. Disconnect the X1 harness connector at the K33 HVAC Control Module.
- 2.2. Test for less than 2 Ω in the control circuit end to end.
- ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
- ⇒ If less than 2 Ω , replace the K33 HVAC Control Module.

↓ **If less than 5 Ω**

3. Test or replace the R3 Blower Motor Resistor.

Blower Motor Always ON

1. Ignition OFF, disconnect the harness connector at the R3 Blower Motor Resistor.
2. Place the blower motor switch in the OFF position.
3. Test for infinite resistance between each control circuit terminal listed below and ground.
 - Blower speed 1 terminal E
 - Blower speed 2 terminal A
 - Blower speed 3 terminal B
 - Blower speed 4 terminal D

⇒ **If less than infinite resistance**

- 3.1. Ignition OFF, disconnect the X1 harness connector at the K33 HVAC Control Module.
- 3.2. Test for infinite resistance between the control circuit and ground.
- ⇒ If less than infinite resistance, repair the short to ground on the circuit.
- ⇒ If infinite resistance, replace the K33 HVAC Control Module.

↓ **If infinite resistance**

4. Ignition OFF, disconnect the harness connector at the M8 Blower Motor.
5. Test for infinite resistance between the control circuit terminal 1 and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

↓ **If infinite resistance**

6. All OK.

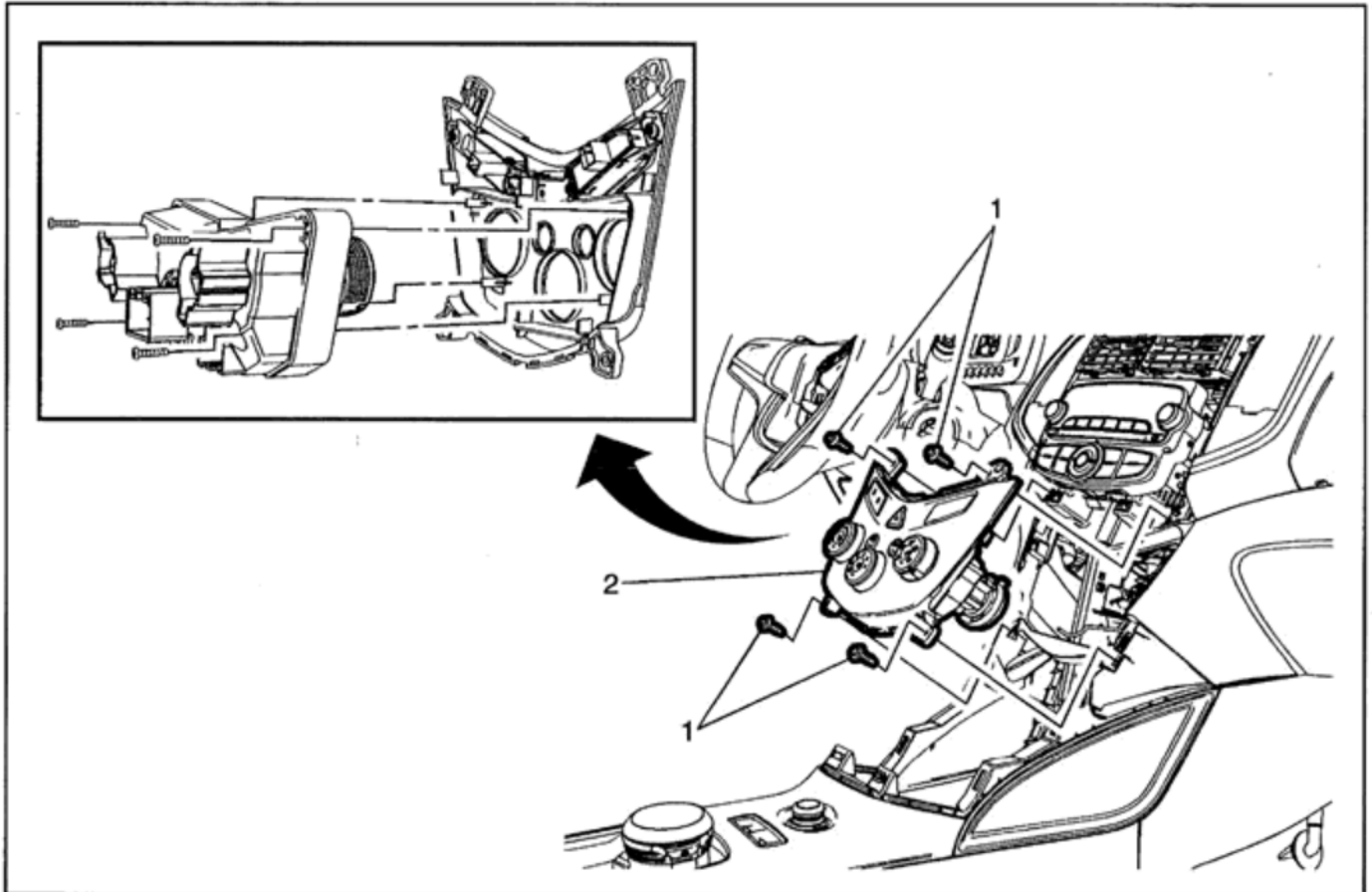
Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the diagnostic repair.

- *Heater and Air Conditioning Control Replacement* on page 10-79
- *Blower Motor Resistor Replacement* on page 10-48
- *Blower Motor Replacement* on page 10-49

Repair Instructions

Heater and Air Conditioning Control Replacement

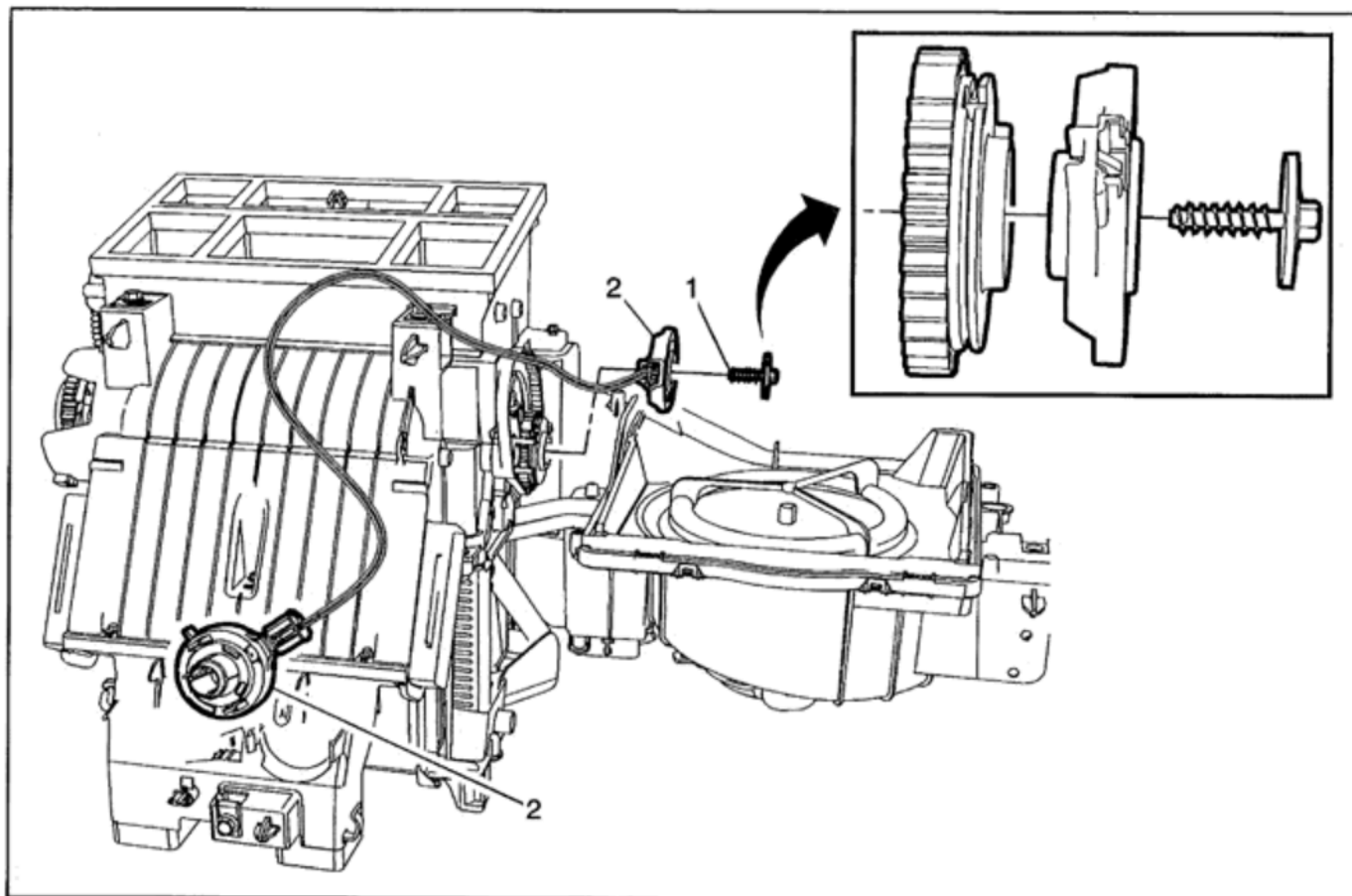


2493462

Heater and Air Conditioning Control Replacement

Callout	Component Name
Preliminary Procedures 1. Remove I/P center bezel. Refer to <i>Instrument Panel Center Molding Replacement (With U58)</i> on page 2-47 or <i>Instrument Panel Center Molding Replacement (Without U58)</i> on page 2-48. 2. Remove front floor shifter bezel. Refer to <i>Front Floor Console Cover Replacement (Manual Transmission)</i> on page 2-56 or <i>Front Floor Console Cover Replacement (Automatic Transmission)</i> on page 2-55.	
1	Heater and Air Conditioning Control Retainer (Qty: 4) Caution: Refer to <i>Fastener Caution</i> on page 0-8. Tighten 2.5N•m (22 lb in)
2	Heater and Air Conditioning Control Procedure 1. Disconnect the electrical connectors 2. Disconnect the heater and air conditioning temperature control cable. Refer to <i>Temperature Control Cable Replacement (LHD)</i> on page 10-80. 3. Disconnect the mode control cable. Refer to <i>Mode Control Cable Replacement (LHD)</i> on page 10-81.

Temperature Control Cable Replacement (LHD)

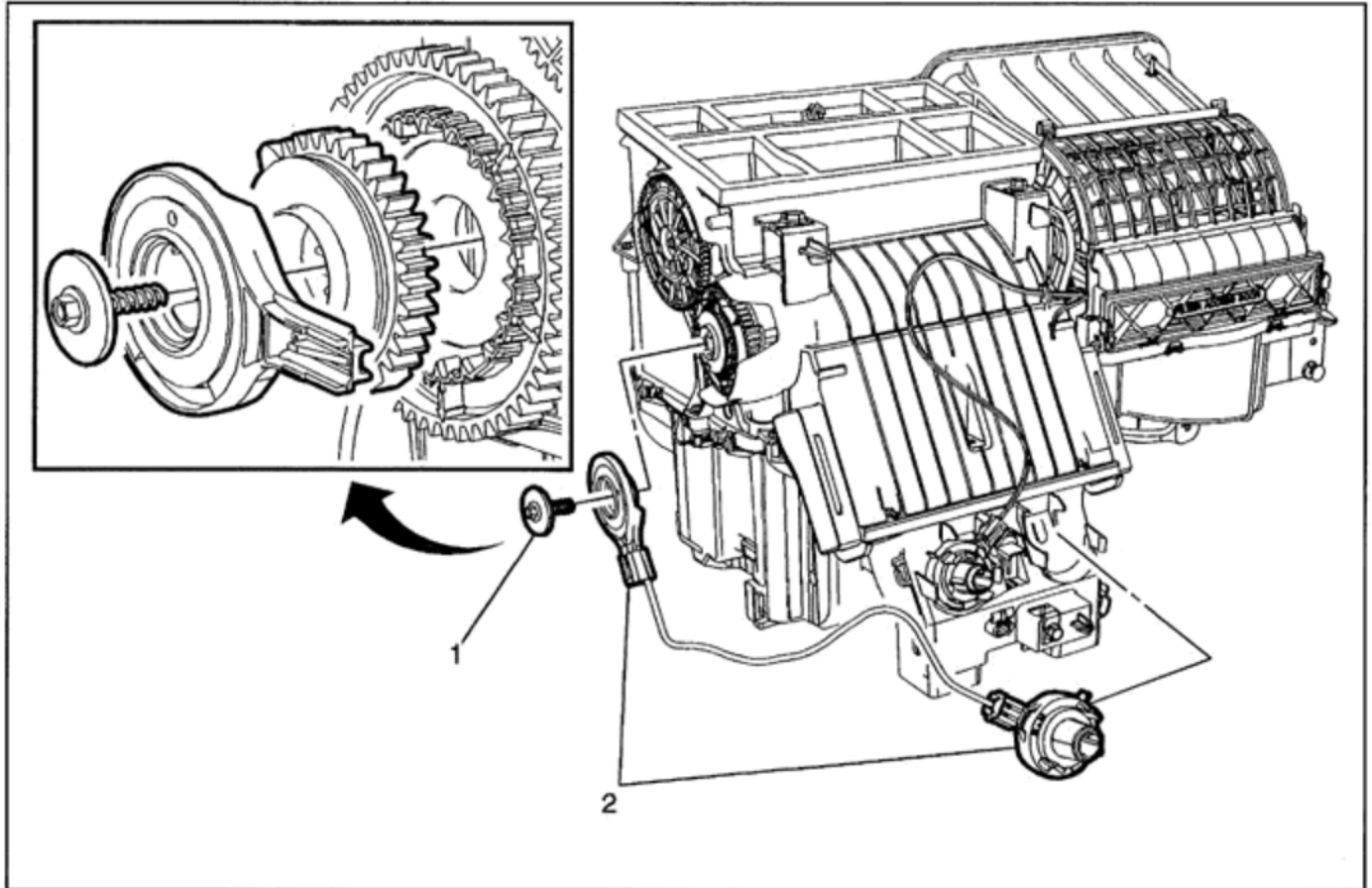


2498353

Temperature Control Cable Replacement (LHD)

Callout	Component Name
Preliminary Procedures	
1. Remove the instrument panel compartment. Refer to <i>Instrument Panel Lower Compartment Replacement</i> on page 2-44.	
2. Remove the heater and air conditioning control. Refer to <i>Heater and Air Conditioning Control Replacement</i> on page 10-79	
1	Temperature Control Cable Retaining Screw Caution: Refer to <i>Fastener Caution</i> on page 0-8. Tighten 1.2 N·m (11 lb in)
2	Temperature Control Cable

Mode Control Cable Replacement (LHD)

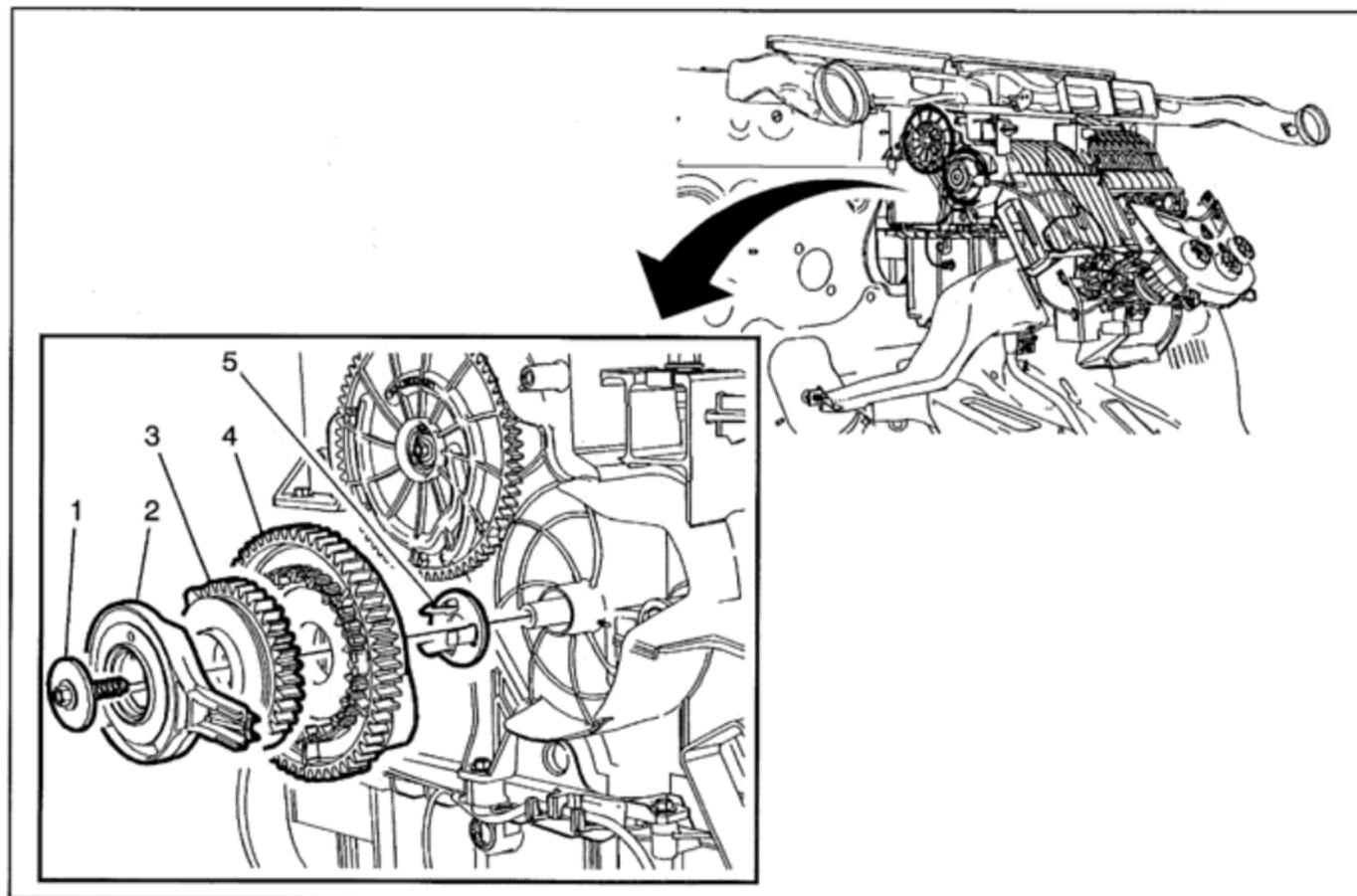


2488290

Mode Control Cable Replacement (LHD)

Callout	Component Name
Preliminary Procedures 1. Remove the heater and air conditioning control. Refer to <i>Heater and Air Conditioning Control Replacement</i> on page 10-79 2. Remove the instrument panel lower trim pad cover. Refer to <i>Instrument Panel Lower Trim Pad Cover Replacement (Without AAL)</i> on page 2-40 or <i>Instrument Panel Lower Trim Pad Cover Replacement (With AAL)</i> on page 2-41 3. Remove the left floor duct. Refer to <i>Floor Air Outlet Duct Replacement - Left Side (LHD)</i> on page 10-56	
1	Mode Control Cable Retaining Screw Caution: Refer to <i>Fastener Caution</i> on page 0-8. Tighten 1.2 N•m (11 lb in)
2	Mode Control Cable

Mode Control Cam Replacement

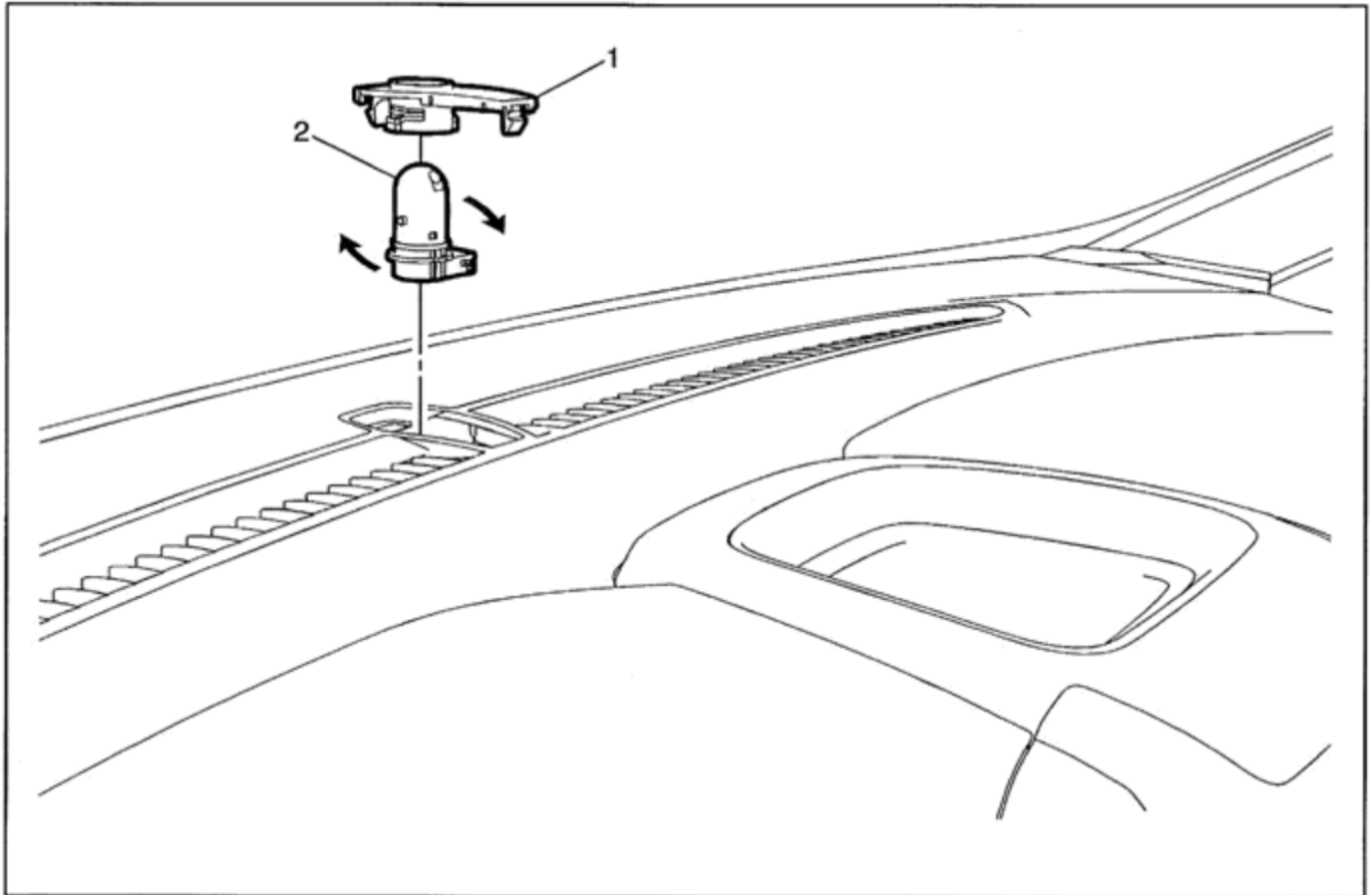


2494558

Mode Control Cam Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the heater and air conditioning control. . Refer to <i>Heater and Air Conditioning Control Replacement</i> on page 10-79	
2. Remove the instrument panel lower trim pad cover. Refer to <i>Instrument Panel Lower Trim Pad Cover Replacement (Without AAL)</i> on page 2-40 or <i>Instrument Panel Lower Trim Pad Cover Replacement (With AAL)</i> on page 2-41	
3. Remove the left floor duct. Refer to <i>Floor Air Outlet Duct Replacement - Left Side (LHD)</i> on page 10-56	
1	Heater and A/C Control Mode Cam Screw Caution: Refer to <i>Fastener Caution</i> on page 0-8. Tighten 1.2N•m (11 lb in)
2	Heater and A/C Control Mode Cable
3	Heater and A/C Control Mode Cam Inner Gear
4	Heater and A/C Control Mode Cam Outer Gear
5	Heater and A/C Control Mode Cam Inner Gear Retainer

Sun Load Temperature Sensor Replacement

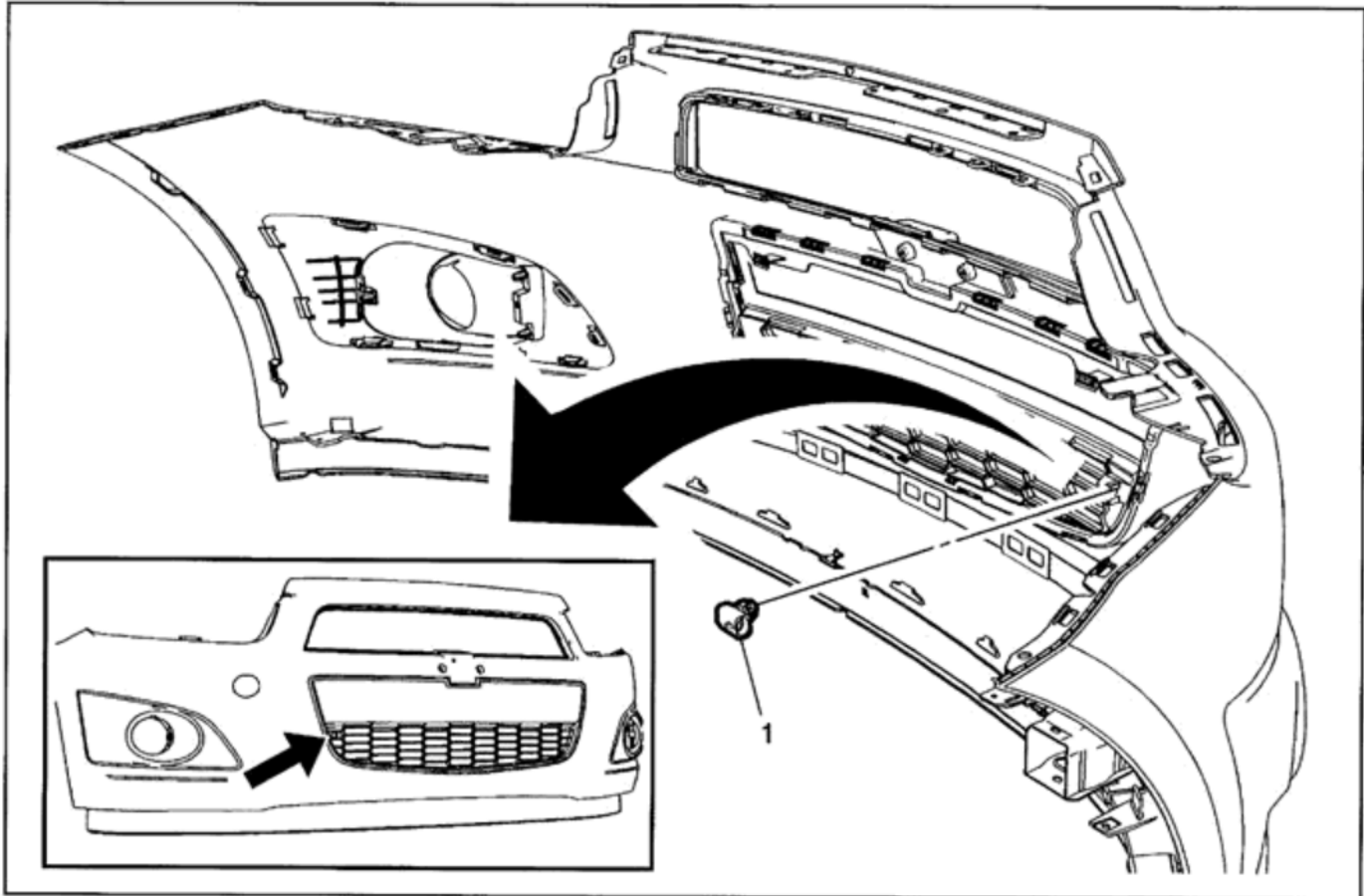


2495247

Sun Load Temperature Sensor Replacement

Callout	Component Name
1	Sun Load Temperature Sensor Bezel
2	Sun Load Temperature Sensor
	Procedure 1. Disconnect the electrical connector. 2. Twist the sensor clockwise to remove.

Ambient Air Temperature Sensor Replacement

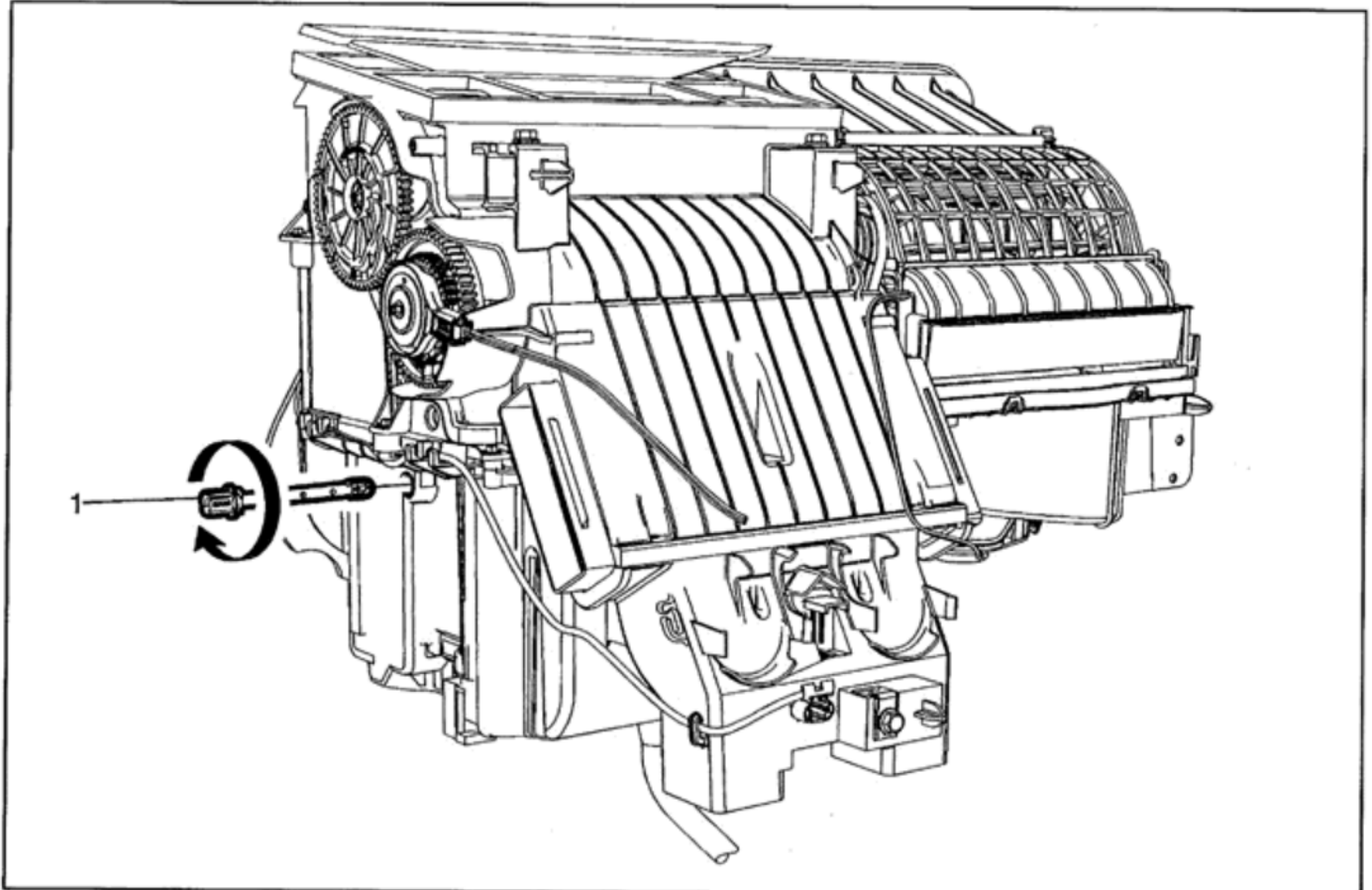


2492605

Ambient Air Temperature Sensor Replacement

Callout	Component Name
Preliminary Procedure Remove the front bumper fascia lower panel. Refer to <i>Front Bumper Fascia Opening Lower Cover Replacement</i> on page 3-58.	
1	Ambient Air Temperature Sensor Procedures 1. Unsnap the ambient air temperature sensor and move it forward. 2. Disconnect the electrical connector.

Evaporator Air Temperature Sensor Replacement (LHD)



2493423

Evaporator Air Temperature Sensor Replacement (LHD)

Callout	Component Name
1	Evaporator Air Refrigerant Temperature Sensor Procedures 1. Disconnect the refrigerant temperature sensor electrical connector. 2. Twist and pull the refrigerant temperature sensor from the HVAC module assembly.

Description and Operation

Manual HVAC Description and Operation

The air temperature and the air delivery description and operation are divided into five areas:

- HVAC Control Components
- Air Speed
- Air Delivery
- Heating and A/C Operation
- Recirculation Operation

HVAC Control Components

HVAC Control Assembly

The HVAC control assembly interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The air temperature and mode doors are controlled by cables. The recirculation actuator is electrically controlled.

There are two different HVAC control assemblies. The first type uses serial data to communicate system messages and requests to other module. The other uses discrete hard-wired signals to communicate commands. The hard-wired HVAC control assembly cannot communicate via serial data.

HVAC control module programming can not be performed on the hard-wired HVAC control assembly. The HVAC control module supports the following features:

Feature	Availability
Afterblow	NO
Purge	NO
Personalization	NO
Actuator Calibration	NO

Evaporator Temperature Sensor

The evaporator temperature sensor is a two-wire negative temperature co-efficient thermistor. The sensor operates within a temperature range of -40 to +85°C (-40 to +185°F). The sensor is installed at the evaporator and measures its temperature. If the temperature drops under 1°C (34°F), the compressor will be switched off in order to prevent a frozen evaporator.

A/C Refrigerant Pressure Sensor

The engine control module (ECM) monitors the high side refrigerant pressure through the A/C refrigerant pressure sensor. The ECM supplies a 5V reference and a low reference to the sensor. Changes in the A/C refrigerant pressure cause the sensor signal to the ECM to vary. When the pressure is high, the signal voltage is high. When the pressure is low, the signal voltage is low. When pressure is high, the ECM commands the cooling fans on. When pressure is too high or too low, the ECM will inhibit activation of the A/C compressor.

A/C Compressor

The A/C compressor is belt driven and operates when the magnetic clutch is engaged. When the A/C switch is pressed, an A/C request message to the ECM. If the ECM determines that conditions are acceptable for A/C operation, it will ground the A/C compressor clutch relay control circuit, which activate the A/C compressor clutch relay. With the relay contacts closed, battery voltage is supplied to the A/C compressor clutch. The A/C compressor clutch will engage and the compressor will operate.

Air Speed

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

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

When blower switch is in the Hi speed position, ground is applied directly to the blower motor through the blower switch.

Air Delivery

The HVAC control assembly controls the distribution of air by the use of recirculation actuator and the mechanically controlled mode door. The modes that may be selected are:

- Defrost – Air flow is directed at the windshield
- Defog – Air flow is split between the windshield and floor
- Vent – Air flow is directed to the vents located in the instrument panel
- Bi-Level – Air flow is split between the instrument panel vents and the floor vents
- Floor – Air flow is directed to the floor

The desired air distribution mode can be selected with the air distribution knob at the HVAC control assembly. Depending on the position of the flap, air is distributed through various ducts leading to the outlets in the instrument panel. When the defrost position is selected, the HVAC control assembly will command the recirculation actuator to outside air, reducing window fogging.

Heating and A/C Operation

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

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

When the A/C switch is pressed, an A/C request message to the ECM. If the ECM determines that conditions are acceptable for A/C operation, it will ground the A/C compressor clutch relay control circuit, which activate the A/C compressor clutch relay. With the relay contacts closed, battery voltage is supplied to the A/C compressor clutch. The A/C compressor clutch will engage and the compressor will operate.

The following conditions must be met in order to activate the A/C compressor:

- Battery voltage is between 9–18 V
- Engine coolant temperature is less than 120°C (248 °F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 6200 RPM
- A/C high side pressure is between 220-3100 kPa (32-450 PSI)
- Throttle position is less than 95%
- Evaporator temperature is greater than 3°C (38°F)
- ECM does not detect an unacceptable torque load
- ECM does not detect insufficient idle quality

The temperature door controls the temperature of the air entering the passenger compartment. Air entering the passenger compartment passes through the heater core and/or the evaporator core. The position of the temperature door determines how much air passes through the heater or evaporator core. As the temperature control is moved to a hotter setting, the temperature door will direct more air through the heater core. As the temperature control is moved to a cooler setting, more air will be passed through the evaporator core.

Recirculation Operation

Recirculation Actuator

The recirculation actuator is a two-wire bi-directional electric motor. There are two control circuits that allow actuator operation. The control circuits use either a 0 or 12-volt value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 volts. To move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 volts. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction.