

2017 HVAC

HVAC - Automatic - Encore, Trax

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Air Inlet Valve Actuator Bolt	1.5 N.m (13 lb in)
Air Inlet Valve Actuator Bolt(Recirculation)	1.2 N.m (11 lb in)
Heater and Air Conditioning Evaporator and Blower Module Bracket Bolt	1.5 N.m (13 lb in)
Mode Control Cam Actuator Bolt	1.5 N.m (13 lb in)

SCHEMATIC WIRING DIAGRAMS

HVAC WIRING SCHEMATICS (BUICK WITH CJ2)

Power, Ground, and Blower Motor (Buick)

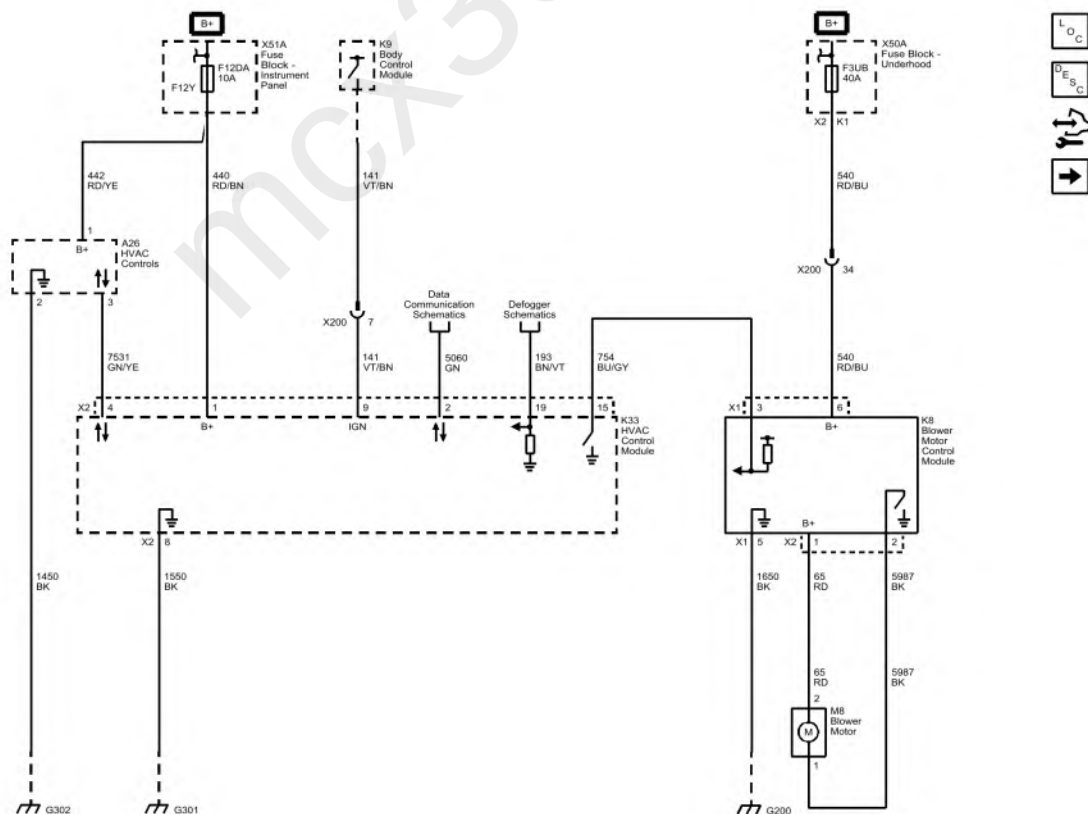


Fig. 1: Power, Ground, and Blower Motor (Buick)
Courtesy of GENERAL MOTORS COMPANY

Compressor Controls (Buick)

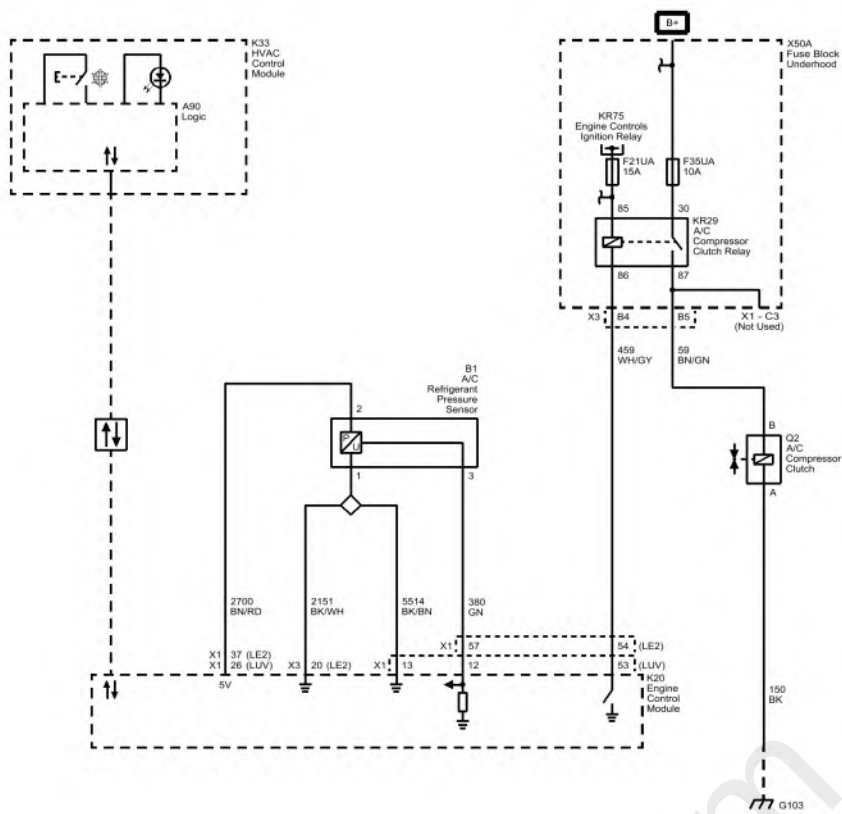


Fig. 2: Compressor Controls (Buick)
Courtesy of GENERAL MOTORS COMPANY

Duct and Evaporator Temperature Sensors (Buick)

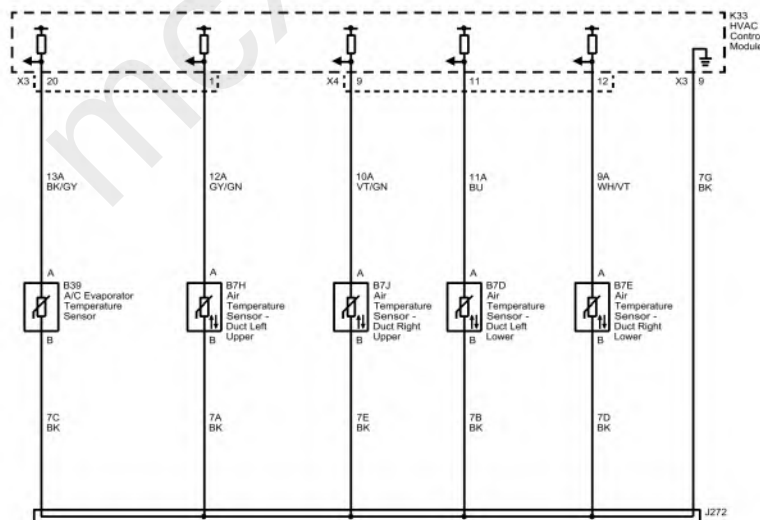


Fig. 3: Duct and Evaporator Temperature Sensors (Buick)
Courtesy of GENERAL MOTORS COMPANY

Mode and Temperature Control Actuators (Buick)

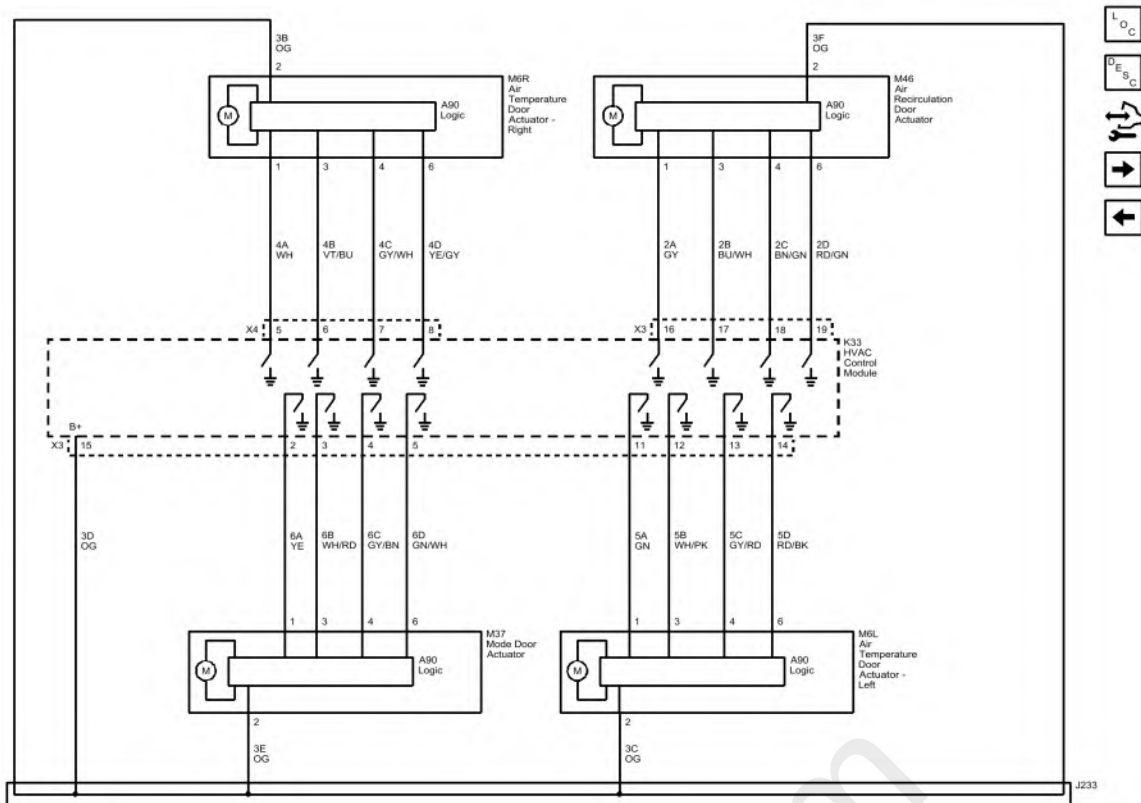


Fig. 4: Mode and Temperature Control Actuators (Buick)
 Courtesy of GENERAL MOTORS COMPANY

Sunload Sensor and Windshield Temperature Sensor (Buick)

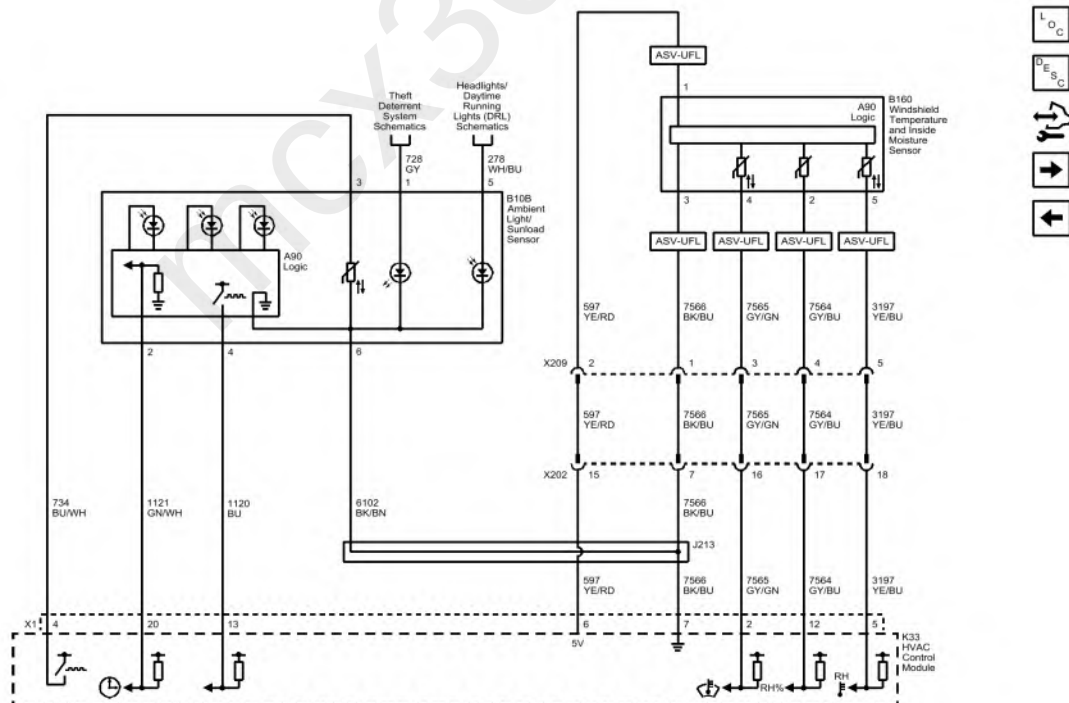


Fig. 5: Sunload Sensor and Windshield Temperature Sensor (Buick)
 Courtesy of GENERAL MOTORS COMPANY

Auxiliary Heater Coolant Pump (Buick with LE2)

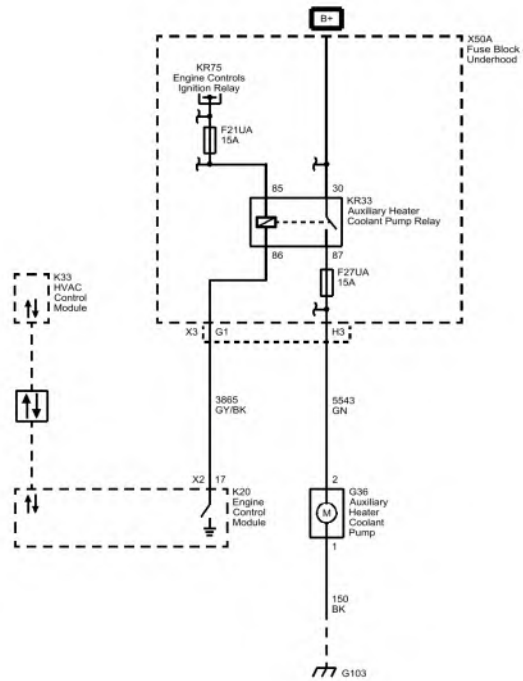


Fig. 6: Auxiliary Heater Coolant Pump (Buick with LE2).
Courtesy of GENERAL MOTORS COMPANY

Auxiliary Heater (Buick with C32)

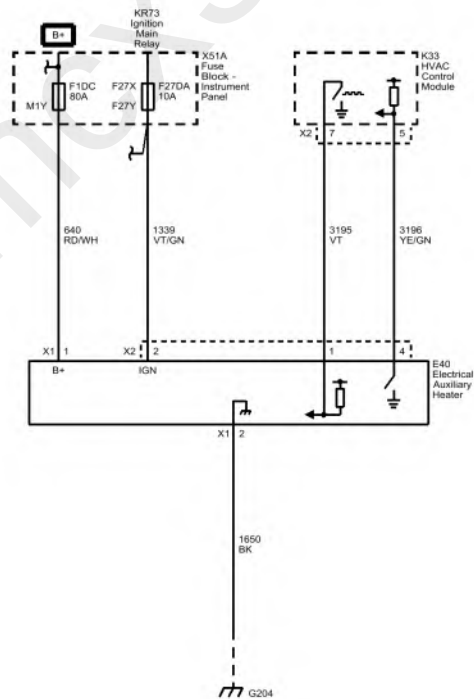


Fig. 7: Auxiliary Heater (Buick with C32).
Courtesy of GENERAL MOTORS COMPANY

HVAC COMPONENT REPLACEMENT REFERENCE

Component	Repair Instruction
A26 HVAC Controls	<u>Heater and Air Conditioning User Interface Control Replacement</u>
B1 A/C Refrigerant Pressure Sensor	<u>Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (2H0)</u> , <u>Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LUV)</u> , <u>Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LE2)</u>
B104 Sunload Sensor	<u>Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Replacement</u>
B160 Windshield Temperature and Inside Moisture Sensor	<u>Inside Air Moisture and Windshield Temperature Sensor Replacement</u>
B39 A/C Evaporator Temperature Sensor	<u>Air Conditioning Evaporator Temperature Sensor Replacement (CJ2 C60 C67 LHD Evaporator Core)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Left Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Right Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Left Lower Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Right Lower Duct)</u>
B7D Air Temperature Sensor - Duct Left Lower	<u>Air Conditioning Evaporator Temperature Sensor Replacement (CJ2 C60 C67 LHD Evaporator Core)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Left Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Right Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Left Lower Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Right Lower Duct)</u>
B7E Air Temperature Sensor - Duct Right Lower	<u>Air Conditioning Evaporator Temperature Sensor Replacement (CJ2 C60 C67 LHD Evaporator Core)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Left Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Right Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Left Lower Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Right Lower Duct)</u>
B7H Air Temperature Sensor - Duct Left Upper	<u>Air Conditioning Evaporator Temperature Sensor Replacement (CJ2 C60 C67 LHD Evaporator Core)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Left Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Right Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Left Lower Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Right Lower Duct)</u>
B7J Air Temperature Sensor - Duct Right Upper	<u>Air Conditioning Evaporator Temperature Sensor Replacement (CJ2 C60 C67 LHD Evaporator Core)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Left Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Upper Right Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Left Lower Duct)</u> , <u>Air Conditioning Evaporator Temperature Sensor Replacement (Right Lower Duct)</u>
K33 HVAC Control Module	<u>Heater and Air Conditioning Remote Control Replacement</u>
K8 Blower Motor Control Module	<u>Blower Motor Control Module Replacement (With RPO C67 CJ2)</u>
M37 Mode Door Actuator	<u>Mode Control Cam Actuator Replacement</u>
M46 Air Recirculation Door Actuator	<u>Air Inlet Valve Actuator Replacement (Recirculation)</u>
M6L Air Temperature Door Actuator - Left	<u>Air Inlet Valve Actuator Replacement - Left Side (With CJ2)</u>

Component	Repair Instruction
M6R Air Temperature Door Actuator - Right	Air Inlet Valve Actuator Replacement - Right Side (With CJ2)
M8 Blower Motor	Blower Motor Replacement
Q2 A/C Compressor Clutch	Air Conditioning Clutch Assembly Replacement (LUV) , Air Conditioning Clutch Assembly Replacement (2H0) , Air Conditioning Clutch Assembly Replacement (LE2)

DTC B0163, B0183, OR B1405: PASSENGER COMPARTMENT TEMPERATURE SENSOR/SOLAR LOAD SENSOR/CONTROL MODULE VOLTAGE REFERENCE OUTPUT 2

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B0163

Passenger Compartment Temperature Sensor Circuit

DTC B0183

Solar Load Sensor Circuit

DTC B1405

Control Module Voltage Reference Output 2 Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Temperature Signal	B0163 02	B0163 05	B0163 05	1
Sunload Signal	B0183 02	B0183 05	B0183 05	1
Clock Signal	B1405 02	B1405 05	B1405 05	1
Low Reference	-	B0163 05, B0183 05	-	-
1. HVAC Malfunction				

Circuit/System Description

The ambient light/sunload sensor integrates the sunload and passenger compartment temperature functions within a single assembly.

The solar sensor uses 4 unique circuits as detailed below:

- Low reference circuit - This is a common ground for the ambient light/sunload sensor assembly.
- Temperature signal circuit - This is the signal circuit for the temperature sensor.
- Clock signal circuit - This has 2 functions, via a high side PWM signal, the HVAC control module supplies power to the sensor as well as a clock input for the sensor microprocessor.
- Sunload signal circuit - This is used as an output from the solar sensor to the HVAC control module to transmit sun heat (IR) intensity, elevation, and azimuth data.

The passenger compartment temperature sensor is a negative temperature coefficient thermistor. As the air temperature increases, the sensor resistance decreases. The sensor signal varies between 0-5 V.

Bright or high intensity light causes the vehicles interior temperature to increase. The automatic HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle.

Conditions for Running the DTC

- Ignition ON
- The HVAC control module is ON.

Conditions for Setting the DTC

B0163 02

The input signal is out of range. The HVAC control module detects voltage less than 0.1 V on the temperature signal circuit.

B0163 05

The input signal is out of range. The HVAC control module detects voltage greater than 4.9 V on the temperature signal circuit.

B0183 02

The input signal is out of range. The HVAC control module detects voltage less than 0.1 V on the solar sensor signal circuit.

B0183 05

The input signal is out of range. The HVAC control module detects voltage greater than 4.9 V on the solar sensor signal circuit.

B1405 02

The input signal is out of range. The HVAC control module detects voltage less than 10 V on the clock/power supply circuit.

B1405 05

The input signal is out of range. The HVAC control module detects a short to voltage or an open the clock/power supply circuit.

Action Taken When the DTC Sets

B0163 02, B0163 05, B0183 02, B0183 05

The system will use the last valid values as a default.

B1405 02, B1405 05

If no value is read at the time of fault, the HVAC control module uses 0 W/m² as intensity.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE), **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Automatic HVAC Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTCs B0163, B0183, or B1405 are not set.
 - **If any of the DTCs are set**
Refer to Circuit System Testing.
 - **If none of the DTCs are set**
2. Verify the actual inside air temperature, using a thermometer, is less than a 3Â°C (5Â°F) difference from the scan tool Inside Passenger Compartment Air Temp. Sensor parameter
 - **If greater than a 3Â°C (5Â°F) difference**
Refer to Circuit System Testing.
 - **If less than a 3Â°C (5Â°F) difference**
3. Verify the scan tool Sunload parameter changes while covering the B10B Ambient Light/Sunload Sensor with a shop towel and changes when shining a bright light on it
 - **If the Sunload parameter does not change**
Refer to Circuit System Testing.
 - **If the Sunload parameter changes**
4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B10B Ambient Light/Sunload Sensor. It may take up to 10 min for all vehicle systems to power down.

NOTE: **The scan tool must be disconnected from the vehicle before performing the next test.**

2. Test for less than 10 Ω between the low reference circuit terminal 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 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 10 Ω**
3. Ignition ON, test for 4.8-5.2 V between the signal circuit terminal 3 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 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
3. Test for less than $2\ \Omega$ in the signal circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, replace the K33 HVAC Control Module.
 - **If greater than for 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.
 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**
 4. Test for 4.8-5.2 V between the signal circuit terminal 4 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 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
 3. Test for less than $2\ \Omega$ in the signal circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, replace the K33 HVAC Control Module.
 - **If greater than for 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.
 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. Verify a test lamp does not illuminate between the signal circuit terminal 2 and ground.
 - **If the test lamp illuminates**
 1. Ignition OFF, remove the test lamp and disconnect the harness connector at the K33 HVAC Control Module. Ignition ON.
 2. Test for less than 1 V between 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 the test lamp does not illuminate**
 6. Test for greater than 10 V between signal circuit terminal 2 and ground.
 - **If less than 10 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 2. Test for infinite resistance between signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than $2\ \Omega$ in the signal circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, replace the K33 HVAC Control Module.
 - **If 10 V or greater**
 7. Test or replace the B10B Ambient Light/Sunload Sensor.

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

DTC B0173, B0178, B0509, B0514 OR B3933: AIR TEMPERATURE SENSOR/AIR CONDITIONING EVAPORATOR TEMPERATURE SENSOR

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B0173 02

Upper Left Duct Air Temperature Sensor Circuit Short to Ground

DTC B0173 05

Upper Left Duct Air Temperature Sensor Circuit High Voltage/Open

DTC B0178 02

Lower Left Duct Air Temperature Sensor Circuit Short to Ground

DTC B0178 05

Lower Left Duct Air Temperature Sensor Circuit High Voltage/Open

DTC B0509 02

Upper Right Duct Air Temperature Sensor Circuit Short to Ground

DTC B0509 05

Upper Right Duct Air Temperature Sensor Circuit High Voltage/Open

DTC B0514 02

Lower Right Duct Air Temperature Sensor Circuit Short to Ground

DTC B0514 05

Lower Right Duct Air Temperature Sensor Circuit High Voltage/Open

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
Upper Left Duct Air Temperature Sensor Signal	B0173 02	B0173 05	B0173 05	-
Lower Left Duct Air Temperature Sensor Signal	B0178 02	B0178 05	B0178 05	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Upper Right Duct Air Temperature Sensor Signal	B0509 02	B0509 05	B0509 05	-
Lower Right Duct Air Temperature Sensor Signal	B0514 02	B0514 05	B0514 05	-
Air Conditioning Evaporator Temperature Sensor Signal	B3933 02	B3933 05	B3933 05	-
Low Reference	-	B0173 05, B0178 05, B0509 05, B0514 05, B3933 05	B0173 05, B0178 05, B0509 05, B0514 05, B3933 05	-

Circuit/System Description

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

- Air temperature sensor - left upper
- Air temperature sensor - left lower
- Air temperature sensor - right upper
- Air temperature sensor - right lower
- A/C evaporator temperature sensor

This sensor operates using signal and low reference circuits. As the air temperature surrounding the sensor increases, the sensor resistance decreases. The sensor sends a signal voltage between 0-5 V. If the HVAC control module detects a malfunctioning sensor the software uses a default air temperature value. The default action ensures that the HVAC system can adjust the inside air temperature near the desired temperature until the condition is corrected.

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 out of range. The 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 system operates using a default value.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE), COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B3933 is not set.
 - **If DTC B3933 is set**

Refer to Circuit/System Testing - Without Scan Tool Support.
 - **If DTC B3933 is not set**
3. Verify the appropriate temperature sensor has a parameter displayed in HVAC scan tool information.
 - **If there is no scan tool parameter**

Refer to Circuit/System Testing - Without Scan Tool Support.
 - **If there is a scan tool parameter**
4. Refer to Circuit/System Testing - With Scan Tool Support

Circuit/System Testing

With Scan Tool Support

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate temperature sensor. It may take up to 10 min for all vehicle systems to power down.

NOTE: **The scan tool must be disconnected from the vehicle before performing the next test.**

2. Test for less than 50 Ω between the low reference circuit terminal B and ground.
 - **If 50 Ω or greater**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 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 50 Ω**
3. Ignition ON.
4. Verify the appropriate scan tool temperature sensor parameter is less than -37 $^{\circ}$ C (-35 $^{\circ}$ F)
 - **If greater than -37 $^{\circ}$ C (-35 $^{\circ}$ F)**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 2. Test for infinite resistance between the signal circuit terminal A 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 -37 $^{\circ}$ C (-35 $^{\circ}$ F) or less**

5. Install a 3 A fused jumper wire between the signal circuit terminal A and the low reference circuit terminal B.
6. Verify the scan tool temperature sensor parameter is greater than 77°C (170°F).
 - **If less than 77°C (170°F)**
 1. Ignition OFF, remove the jumper wire and disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.
 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
 3. Ignition OFF
 4. 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 77°C (170°F) or greater**
7. Test or replace the temperature sensor.

Without Scan Tool Support

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate temperature sensor. It may take up to 10 min for all vehicle systems to power down.

NOTE: **The scan tool must be disconnected from the vehicle before performing the next test.**

2. Test for less than 50 Ω between the low reference circuit terminal B and ground.
 - **If 50 Ω or greater**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 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 50 Ω**
3. Test for 4.8-5.2 V between the signal circuit terminal A and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 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
 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**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.
 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**
4. Test or replace the temperature sensor.
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
 - **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](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for HVAC control module replacement, programming and setup

DTC B018A, B048C, B048F, OR B1395: WINDSHIELD TEMPERATURE SENSOR/HUMIDITY SENSOR TEMPERATURE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B018A

Windshield Temperature Sensor Circuit

DTC B048C

Humidity Sensor Humidity Circuit

DTC B048F

Humidity Sensor Temperature Circuit

DTC B1395

Control Module Voltage Reference Output Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	B1395 03	1	B1395 07	-
Signal Terminal 2	B048C 02	B048C 05	B048C 05	-
Signal Terminal 4	B018A 02	B018A 05	B018A 05	-
Signal Terminal 5	B048F 02	B048F 05	B048F 05	-
Low Reference	-	B018A 05, B048C 05, B048F 05, B1395 03	-	-
1. Sensor Malfunction				

Circuit/System Description

The windshield temperature and inside moisture sensor includes the relative humidity sensor, windshield temperature sensor and humidity sensing element temperature sensor all in one assembly.

This sensor assembly provides information about:

- Relative humidity level at the windshield inside the vehicle

- Temperature of the windshield inside the vehicle
- Temperature of the humidity sensor element

The relative humidity sensor measures the relative humidity of the compartment side of the windshield. It also detects the temperature of the windshield surface on the compartment side. Both values are used as control inputs for the HVAC control module application to calculate the fog risk on windshield compartment side and ability to reduce fuel consumption by decreasing A/C compressor usage to a minimum without causing any fog. The sensor will also enable partial recirculation mode in order to improve heat-up performance of the passenger compartment under cold ambient temperature conditions without the risk of mist build-up on the windshield. The humidity sensor element temperature sensor supplies the temperature of the humidity sensor element. It is only needed if the thermal contact between the humidity sensing element and the inside windshield surface is not sufficient.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B018A 02, B048C 02, or B048F 02

The HVAC control module detects the sensor signal out of range. The signal voltage is less than 0.1 V for more than 50 ms.

B018A 05, B048C 05, B048F 05 or B1395 07

The HVAC control module detects the sensor signal out of range. The signal voltage is greater than 4.9 V for more than 50 ms.

B1395 03

The HVAC control module detects the 5 V reference voltage out of range. The 5 V reference voltage is less than 4.5 V for more than 50 ms.

B1395 07

The HVAC control module detects the 5 V reference voltage out of range. The 5 V reference voltage is greater than 5.5 V for more than 50 ms.

Action Taken When the DTC Sets

- The system will use the last valid values as default.
- If no value is read at the time of fault, the HVAC control module uses 60% for humidity.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE), COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Automatic HVAC Description and Operation

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B160 Windshield Temperature and Inside Moisture Sensor. It may take up to 10 min for all vehicle systems to power down.

NOTE: The scan tool must be disconnected from the vehicle before performing the next test.

2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 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 10 Ω**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 1 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 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
 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 K33 HVAC Control Module.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.
 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 K33 HVAC Control Module.
 - **If between 4.8-5.2 V**
5. Verify the scan tool parameters listed below are less than -37 $^{\circ}$ C (-35 $^{\circ}$ F).
 - Windshield Temperature
 - Passenger Compartment Humidity Sensor Temperature
 - **If -37 $^{\circ}$ C (-35 $^{\circ}$ F) or greater**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module.
 2. Test for infinite resistance between the signal circuit terminals listed below and ground:
 - Windshield temperature sensor signal terminal 4
 - Passenger compartment humidity sensor temperature signal terminal 5
 - If less than infinite resistance, repair the short to ground on the circuit.

- If infinite resistance, replace the K33 HVAC Control Module.
 - **If less than -37Â°C (-35Â°F)**
6. Test for 4.8-5.2 V between the signal circuit terminals listed below and ground.
 - Windshield temperature sensor signal terminal 4
 - Passenger compartment humidity sensor temperature signal terminal 5
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.
 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
 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 for 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.
 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**
 7. Install a 3 A fused jumper wire between the low reference circuit terminal 3 and each signal circuit terminal listed below:
 - Windshield temperature sensor signal terminal 4
 - Passenger compartment humidity sensor temperature signal terminal 5
 8. Verify the appropriate scan tool parameter listed below is greater than 114Â°C (238Â°F).
 - Windshield Temperature
 - Passenger Compartment Humidity Sensor Temperature
 - **If 114Â°C (238Â°F) or less**
 1. Ignition OFF, remove the jumper wire and disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit terminals listed below and ground:
 - Windshield temperature sensor signal terminal 4
 - Passenger compartment humidity sensor temperature signal terminal 5
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 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 114Â°C (238Â°F)**
 9. Remove the jumper wire.
 10. Verify the scan tool Passenger Compartment Humidity parameter is greater than 95%.
 - **If 95% or less**
 1. Ignition OFF, disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.
 2. Test for infinite resistance between the signal circuit terminal 2 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 greater than 95%**
 11. Test for 4.8-5.2 V between the signal circuit terminal 2 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module.

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

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 for 5.2 V**

1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.

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**

12. Install a 3 A fused jumper wire between the passenger compartment humidity signal circuit terminal 2 and the low reference circuit terminal 3.

13. Verify the scan tool Passenger Compartment Humidity Sensor parameter is less than 5%.

- **If 5% or greater**

1. Ignition OFF, remove the jumper wire and disconnect the harness connectors at the K33 HVAC Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit terminal 2 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

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 less than 5%**

14. Test or replace the B160 Windshield Temperature and Inside Moisture Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for HVAC control module replacement, programming and setup

DTC B0193: FRONT BLOWER MOTOR SPEED

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B0193 01

Front Blower Motor Speed Circuit Short to Battery

DTC B0193 06

Front Blower Motor Speed Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Blower Motor Control Module B+	B0193 06	B0193 06	-	-
Blower Motor B+	B0193 06	1	-	-
Blower Motor Control Module Control	B0193 06	B0193 06	B0193 01	-
Blower Motor Control	2	1	1	-
Blower Motor Control Module Ground	-	1	-	-
1. Blower Motor Inoperative 2. Blower Motor Always ON				

Circuit/System Description

The blower motor control module is an interface between the HVAC control module and the blower motor. The blower motor control module has 5 circuits: a B+ input, ground, a control circuit from the HVAC control module, a B+ output to the blower motor, and a low side pulse width modulation (PWM) output. The HVAC control module provides a low side (PWM) signal to the blower motor control module in order to request the blower motor speed. The blower motor control module grounds the blower motor using a low side PWM signal in order to vary the blower motor speed.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B0193 01

The voltage at the HVAC control module output to the blower motor control module is always high.

B0193 06

The voltage at the HVAC control module output to the blower motor control module is always low or fluctuating.

Action Taken When the DTC Sets

The blower motor is inoperative.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

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

If the motor operates properly please reinstall it and check for Preliminary Information or Technical Service Bulletins.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Automatic HVAC Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the K8 Blower Motor Control Module. It may take up to 10 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 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**
3. Verify a test lamp illuminates between the B+ circuit terminal 6 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 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**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the B+ circuit terminal 6 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Disconnect the X2 harness connector at the K8 Blower Motor Control Module and disconnect the harness connector at the M8 Blower Motor.
 4. Test for infinite resistance between the M8 Blower Motor B+ circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, test or replace the M8 Blower Motor.
 - **If the test lamp illuminates**
4. Ignition ON. Test for less than 1 V between the control circuit terminal 3 and ground.
 - **If 1 V or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K33 HVAC Control Module. Ignition ON.
 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, replace the K33 HVAC Control Module
 - **If less than 1 V**
5. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the K33 HVAC Control Module. It may take up to 10 min for all vehicle systems to power down.

6. Test for infinite resistance between the control circuit terminal 15 and ground.

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

7. 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**

NOTE: **Verify the ignition is OFF before connecting the blower motor control module or incorrect test results may occur.**

8. Ignition OFF, connect all harness connectors. Ignition ON.

9. While backprobing terminal 3 X1 at the K8 Blower Motor Control Module, test for greater than 1 V between the control circuit and ground.

- **If less than 1 V**

Replace the K8 Blower Motor Control Module.

- **If 1 V or greater**

10. Verify the voltage decreases and increases while using the controls to change the blower speed selection.

- **If the voltage does not decrease and increase as the blower speed selection is changed**

Replace the K33 HVAC Control Module.

- **If the voltage decreases and increases as the blower speed selection is changed**

11. Ignition OFF, disconnect the harness connector at the M8 Blower Motor, ignition ON and blower ON.

12. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.

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

1. Ignition OFF, disconnect the X2 harness connector at the K8 Blower Motor Control Module.

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 K8 Blower Motor Control Module.

- **If the test lamp illuminates**

13. Connect a test lamp between control circuit terminal 1 and B+ circuit terminal 2.

14. Verify the test lamp becomes progressively brighter as the blower speed is increased and progressively dimmer as the blower speed is decreased.

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

1. Ignition OFF, disconnect the X2 harness connector at the K8 Blower Motor Control Module, ignition ON.

2. Test for less than 1 V between the control circuit terminal 1 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

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 replace the K8 Blower Motor Control Module.

- **If the test lamp illuminates, but does not change in brightness**

1. Ignition OFF, disconnect the X2 harness connector at the K8 Blower Motor Control Module.
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 K8 Blower Motor Control Module.
- **If the test lamp changes in brightness as the blower speed is changed**
15. Test or replace the M8 Blower Motor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

DTC B0223, B022A, B0233, B023A, B0408, OR B0418: RECIRCULATE POSITION COMMAND/AIR FLOW CONTROL/HVAC ACTUATORS/TEMPERATURE CONTROL

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B0223 01

Recirculate Position Command 1 Circuit Short to Battery

DTC B0223 06

Recirculate Position Command 1 Circuit Low Voltage/Open

DTC B022A 01

Recirculate Position Command 2 Circuit Short to Battery

DTC B022A 06

Recirculate Position Command 2 Circuit Low Voltage/Open

DTC B0233 01

Air Flow Control Circuit Short to Battery

DTC B0233 06

Air Flow Control Circuit Low Voltage/Open

DTC B023A 02

HVAC Actuators Supply Voltage Short to Ground

DTC B0408 01

Main Temperature Control Circuit Short to Battery

DTC B0408 06

Main Temperature Control Circuit Low Voltage/Open

DTC B0418 01

DTC B0418 06

Right Temperature Control Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Stepper Motors 12 V Reference	B023A 02, B0223 06, B0233 06, B0408 06, B0418 06	B0223 06, B0233 06, B0408 06, B0418 06	-	-
Recirculation Actuator Control 1	B0223 06	B0223 06	B0223 01	1
Recirculation Actuator Control 2	B0223 06	B0223 06	B0223 01	1
Recirculation Actuator Control 3	B0223 06	B0223 06	B0223 01	1
Recirculation Actuator Control 4	B0223 06	B0223 06	B0223 01	1
Air Temperature Actuator Control 1	B0408 06	B0408 06	B0408 01	1
Air Temperature Actuator Control 2	B0408 06	B0408 06	B0408 01	1
Air Temperature Actuator Control 3	B0408 06	B0408 06	B0408 01	1
Air Temperature Actuator Control 4	B0408 06	B0408 06	B0408 01	1
Passenger Air Temperature Actuator Control 1	B0418 06	B0418 06	B0418 01	1
Passenger Air Temperature Actuator Control 2	B0418 06	B0418 06	B0418 01	1
Passenger Air Temperature Actuator Control 3	B0418 06	B0418 06	B0418 01	1
Passenger Air Temperature Actuator Control 4	B0418 06	B0418 06	B0418 01	1
Mode Actuator Control 1	B0233 06	B0233 06	B0233 01	1
Mode Actuator Control 2	B0233 06	B0233 06	B0233 01	1
Mode Actuator Control 3	B0233 06	B0233 06	B0233 01	1
Mode Actuator Control 4	B0233 06	B0233 06	B0233 01	1
1. HVAC Malfunction				

Circuit/System Description

Stepper motors are used for temperature regulation, air distribution control and recirculation door control.

With the switches and dials on the HVAC controls, air temperature door position, mode door position and recirculation door position can be selected. The selected values are passed to the HVAC control module via serial data. The HVAC control module supplies a 12 V control voltage to the stepper motors and energizes the 4 stepper motor coils with a pulsed ground signal. The stepper motors move the appropriate doors into the calculated positions, in order to reach the desired positions.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B023A 02

The stepper motors supply output is shorted to ground.

B0223 01, B022A 01, B0233 01, B023A 01, B0408 01 or B0418 01

At least one control circuits of the appropriate stepper motor is shorted to voltage when motor starts moving. Faults are not detected when motor is already running or target position is already reached.

B0223 06, B022A 06, B0233 06, B0233 06, B0408 06 or B0418 06

At least one control circuits of the appropriate stepper motor is shorted to ground or open when motor starts moving. Faults are not detected when motor is already running or target position is already reached.

Action Taken When the DTC Sets

B023A

- The affected output will be switched off for hardware protection.
- All stepper motors are deactivated.

B0223, B022A, B0233, B0408 or B0418,

- The affected output will be switched off for hardware protection.
- The affected stepper motor is deactivated.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2).

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Automatic HVAC Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Perform the Actuator Recalibration procedure.
2. Verify the concern or DTC has been corrected.

- **If the concern or DTC has not been corrected**

1. Verify DTC B023A is not set.

- If DTC B023A is set

Refer to Circuit/System Testing - DTC B023A.

- If DTC B023A is not set

Refer to Circuit/System Testing - DTC B0223, B022A, B0233, B0408 or B0418.

- **If the concern or DTC has been corrected**

3. All OK.

Circuit/System Testing

DTC B023A

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the components listed below. It may take up to 2 min for all vehicle systems to power down.

- M37 Mode Door Actuator
- M46 Air Recirculation Door Actuator
- M6L Air Temperature Door Actuator - Left
- M6R Air Temperature Door Actuator - Right

2. Disconnect the X3 and X4 harness connectors at the K33 HVAC Control Module.

3. Test for infinite resistance between the K33 HVAC Control Module 12 V reference circuit terminal 15 X3 and ground.

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

4. Ignition ON.

5. Test for less than 1 V between the K33 HVAC Control Module 12 V reference circuit terminal 15 X3 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

6. Connect the X3 and X4 harness connectors at the K33 HVAC Control Module, ignition ON.

7. Clear all DTCs.

8. Verify DTC B023A is not set.

- **If the DTC is set.**

Replace the K33 HVAC Control Module.

- **If the DTC is not set.**

9. Verify DTC B023A does not set after connecting each of the components listed below one at a time and operating them through their full range.

- M37 Mode Door Actuator
- M46 Air Recirculation Door Actuator
- M6L Air Temperature Door Actuator - Left
- M6R Air Temperature Door Actuator - Right
- **If the DTC sets**

Replace the component that was connected immediately before the DTC set.

- **If the DTC does not set**

10. All OK.

DTC B0223, B022A, B0233, B0408 or B0418

1. Ignition OFF, disconnect the harness connector at the appropriate door actuator, ignition ON.
2. Verify a test lamp flashes when connected between the 12 V reference circuit terminal 2 and ground.
 - **If the test lamp does not flash**
 1. Ignition OFF, remove the test lamp and disconnect the harness connector at the K33 HVAC Control Module.
 2. Test for less than 2 Ω in the 12 V 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 the test lamp flashes**
3. Connect a test lamp between each control circuit listed below and B+.
 - Control Circuit - terminal 1
 - Control Circuit - terminal 3
 - Control Circuit - terminal 4
 - Control Circuit - terminal 6
4. Command the appropriate door actuator in both directions.
5. Verify the test lamp turns ON and then OFF during at least one of the directional commands.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp and disconnect the harness connector at the K33 HVAC Control Module.
 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 the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp and disconnect the harness connector at the K33 HVAC Control Module, ignition ON.
 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
 3. Ignition OFF
 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 K33 HVAC Control Module.
 - **If the test lamp turns ON and then OFF**
6. Replace the door actuator.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for HVAC control module replacement, programming and setup

DTC B048D OR B048E: AUXILIARY HEATER SYSTEM

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.

- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B048D

Auxiliary Heater Temperature Command Circuit

DTC B048E

Auxiliary Heater System Malfunction

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ground	B048E 00	B048E 00	B048E 00	-
B+	B048E 00	B048E 00	B048E 00	-
Ignition	B048E 00	B048E 00	B048E 00	-
Control	B048D 06	B048D 06	B048D 01	-
Signal	B048E 00	B048E 00	B048E 00	-

Circuit/System Description

The HVAC control module sends a low side pulse width modulation (PWM) signal to request electrical auxiliary heater operation if the interior temperature is too low and additional heat is required. The request signal from the HVAC control module, battery positive, ignition and ground circuits enable the electrical auxiliary heater to operate. The electrical auxiliary heater sends a ground signal to report the status of heater operation.

Conditions for Running the DTC

- Ignition ON.
- The HVAC control module is ON.
- The electrical auxiliary heater is commanded ON.

Conditions for Setting the DTC

B048D 01

The voltage at the HVAC control module output to the electrical auxiliary heater is always high.

B048D 06

The voltage at the HVAC control module output to the electrical auxiliary heater is always low or floating.

B048E 00

The feedback signal of the electrical auxiliary heater does not correspond with the requested PWM signal.

Action Taken When the DTC Sets

The electrical auxiliary heater is inoperative.

Conditions for Clearing the DTC

The feedback signal of the electrical auxiliary heater corresponds with the requested PWM signal.

Reference Information

HVAC Schematics (Buick with CJ2).

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Automatic HVAC Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC B048D 01 or B048D 06 is not set.
 - **If DTC B048D is present**
Refer to Electrical Auxiliary Heater Control Circuit Malfunction - Circuit System Testing.
 - **If DTC B048D is not present**
2. Verify that DTC B048E is not set.
 - **If DTC B048E is present**
Refer to Electrical Auxiliary Heater Signal Circuit Malfunction - Circuit System Testing.
 - **If DTC B048E is not present**
3. Verify the electrical auxiliary heater operates when commanded on by the HVAC module.
 - **If the electrical auxiliary heater does not operate**
Refer to Electrical Auxiliary Heater Control Circuit Malfunction.
 - **If the electrical auxiliary heater does operate**
4. All OK.

Circuit/System Testing

Electrical Auxiliary Heater Control Circuit Malfunction

1. Ignition OFF, disconnect the X3 harness connector at the E40 Electrical Auxiliary Heater. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal A and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 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**
3. Disconnect the X2 harness connector at the E40 Electrical Auxiliary Heater, ignition ON.

4. Verify a test lamp illuminates between the B+ circuit terminal A X2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 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**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the B+ circuit terminal and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the E40 Electrical Auxiliary Heater.
 - **If the test lamp illuminates**
5. Ignition OFF, remove the test lamp and disconnect the X1 harness connector at the E40 Electrical Auxiliary Heater, ignition ON.
6. Verify a test lamp illuminates between the ignition circuit terminal 2 X1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 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**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the ignition circuit terminal 2 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the E40 Electrical Auxiliary Heater.
 - **If the test lamp illuminates**
7. Ignition OFF, remove the test lamp and disconnect the X2 harness connector at the K33 HVAC Control Module, ignition ON.
8. Test for less than 0.3 V between the control circuit terminal 7 X2 at the K33 HVAC Control Module harness connector and ground.
 - **If greater than 0.3 V**

Repair the short to voltage on the circuit.
 - **If less than 0.3 V**
9. Ignition OFF.
10. Test for infinite resistance between the K33 HVAC Control Module control circuit terminal 7 X2 and ground.
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
11. Test for less than 5 Ω between the K33 HVAC Control Module control circuit terminal 7 X2 and the E40 Electrical Auxiliary Heater control circuit terminal 1 X1.
 - **If greater than 5 Ω**

Repair the open/high resistance in the circuit.
 - **If less than 5 Ω**
12. Replace the E40 Electrical Auxiliary Heater.
13. Ignition ON.
14. Verify heater related DTCs are not set.

- **If DTCs are set**

Replace the K33 HVAC Control Module.

- **If DTCs are not set**

15. All OK.

Electrical Auxiliary Heater Signal Circuit Malfunction

1. Ignition OFF, disconnect the X2 harness connector at the K33 HVAC Control Module and disconnect the X1 harness connector at the E40 Electrical Auxiliary Heater, ignition ON.
2. Test for less than 0.3 V between the K33 HVAC Control Module signal circuit terminal 5 X2 and ground.

- **If greater than 0.3 V**

Repair the short to voltage on the circuit.

- **If less than 0.3 V**

3. Ignition OFF.

4. Test for infinite resistance between the K33 HVAC Control Modules signal circuit terminal 5 X2 and ground.

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

5. Test for less than 5 Ω between the K33 HVAC Control Module control circuit terminal 5 X2 and the E40 Electrical Auxiliary Heater control circuit terminal 4 X1.

- **If greater than 5 Ω**

Repair the open/high resistance in the circuit.

- **If less than 5 Ω**

6. Replace the E40 Electrical Auxiliary Heater.

7. Ignition ON.

8. Verify heater related DTCs are not set.

- **If DTCs are set**

Replace the K33 HVAC Control Module.

- **If DTCs are not set**

9. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Control Module References](#) for HVAC control module replacement, programming and setup

DTC P0532 OR P0533: AIR CONDITIONING (A/C) REFRIGERANT PRESSURE SENSOR

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of the diagnostic category.

DTC Descriptors

DTC P0532

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	P0532, P0641	P0532	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. The ECM may use this information to turn the cooling fans on as well as to monitor clutch engagement. The HVAC module will receive the A/C refrigerant pressure information from the ECM via serial data.

Conditions for Running the DTC

- Engine is running.
- Any of the conditions for setting the DTC are met for 15 s.
- Battery voltage is between 11-18 V.

Conditions for Setting the DTC**P0532**

The ECM detects that the A/C pressure is less than 1 psi (0.25 V).

P0533

The ECM detects that the A/C pressure is more than 428 psi (4.92 V).

Action Taken When the DTC Sets

- DTCs P0532 and P0533 are Type B DTCs
- The A/C compressor is disabled.
- The ECM will illuminate the malfunction indicator lamp (MIL).

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

A malfunction within the refrigerant system causing high pressure can cause this DTC to set.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Automatic HVAC Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON
2. Verify the scan tool engine control module A/C High Side Pressure Sensor parameter is between 6.8 kPa (1 psi) and 2950 kPa (428 psi).
 - **If not between 6.8 kPa (1 psi) and 2950 kPa (428 psi)**
Refer to Circuit/System Testing
 - **If between 6.8 kPa (1 psi) and 2950 kPa (428 psi)**
3. All OK

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 min 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**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 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**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 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
 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**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 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 .25 V.
 - **If .25 V or greater**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 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 .25 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**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 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](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for engine control module replacement, programming and setup

DTC P0645, P0646, OR P0647: AIR CONDITIONING (A/C) COMPRESSOR CLUTCH RELAY CONTROL

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P0645

Air Conditioning (A/C) Compressor Clutch Relay Control Circuit

DTC P0646

Air Conditioning (A/C) Compressor Clutch Relay Control Circuit Low Voltage

DTC P0647

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
A/C Clutch Relay Coil Ignition	1	P0645	-	-
A/C Clutch Relay Switch B+	1	1	-	-
A/C Clutch Relay Coil Control	1	1	-	-
A/C Clutch Relay Switch Control	P0646	P0645	P0647	-
Component Ground	-	1	-	-
1. A/C Compressor Inoperative				

Circuit/System Description

When the A/C switch is pressed, the HVAC control module sends a serial data message to the engine control module (ECM) indicating the A/C request. In response to this message, the ECM grounds the A/C compressor clutch relay control circuit energizing the A/C compressor clutch relay. With the relay contacts closed, battery voltage is applied through the A/C compressor clutch control circuit activating the A/C compressor clutch.

Conditions for Running the DTC

- The ignition voltage is between 11-18 volts.
- The engine speed is greater than 600 RPM.
- An A/C request is made.

Conditions for Setting the DTC

P0645 or P0646

The ECM detects a short to ground or an open at the A/C compressor clutch relay control circuit.

P0647

The ECM detects a short to voltage at the A/C compressor clutch relay control circuit.

Action Taken When the DTC Sets

P0645 or P0646

The A/C compressor is inoperative or always active.

P0647

The A/C compressor is inoperative.

Conditions for Clearing the DTC

A history DTC clears after 40 consecutive warm-up cycles have occurred without a malfunction.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2).

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Ignition OFF, and all vehicle systems OFF. Disconnect the harness connector at the Q2 A/C Compressor Clutch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the Q2 A/C Compressor Clutch ground circuit terminal A and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 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**
3. Connect a test lamp between the control circuit terminal B and ground, ignition ON.
4. Verify the test lamp does not turn ON and OFF when commanding the Q2 A/C Compressor Clutch On and Off with a scan tool.
 - **If the test lamp turns ON and OFF**

Test or replace the Q2 A/C Compressor Clutch.
 - **If the test lamp does not turn ON and OFF**
5. Ignition OFF, connect the harness connector at the Q2 A/C Compressor Clutch. Disconnect the X3 harness connector at the X50A Fuse Block - Underhood, ignition ON.
6. Verify the Q2 A/C Compressor Clutch is not activated.
 - **If the Q2 A/C Compressor Clutch is activated**
 1. Ignition OFF, disconnect the harness connector at the Q2 A/C Compressor Clutch, ignition ON.
 2. Test for less than 1 V between the control circuit terminal B and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, test or replace the Q2 A/C Compressor Clutch.
 - **If the Q2 A/C Compressor Clutch is not activated**
7. Connect a 10 A fused jumper wire between the control circuit terminal B5 and B+.
8. Verify the Q2 A/C Compressor Clutch activates.
 - **If the Q2 A/C Compressor Clutch does not activate**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the Q2 A/C Compressor Clutch, ignition ON.
 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

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 , test or replace the Q2 A/C Compressor Clutch.
- **If the Q2 A/C Compressor Clutch activates**
9. Ignition OFF, connect the X3 harness connector at the X50A Fuse Block - Underhood and disconnect the harness connector at the K20 Engine Control Module, ignition ON.
10. Verify the Q2 A/C Compressor Clutch is not activated.
 - **If the Q2 A/C Compressor Clutch is activated**
 1. Ignition OFF, disconnect the X3 harness connector at the X50A Fuse Block - Underhood.
 2. Test for infinite resistance between the X3 X50A Fuse Block - Underhood control circuit terminal B4 and ground.
 - If less than Infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, test or replace the X50A Fuse Block - Underhood.
 - **If the Q2 A/C Compressor Clutch is not activated**
11. Connect a 3 A fused jumper wire between the K20 Engine Control Module control circuit terminal for the KR29 A/C Compressor Clutch Relay and ground.
12. Verify the Q2 A/C Compressor Clutch activates.
 - **If the Q2 A/C Compressor Clutch does not activate**
 1. Ignition OFF, remove the jumper wire, disconnect the X3 harness connector at the X50A Fuse Block - Underhood, ignition ON.
 2. Test for less than 1 V between the X3 X50A Fuse Block - Underhood control circuit terminal B4 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 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 , test or replace the X50A Fuse Block - Underhood.
 - **If the Q2 A/C Compressor Clutch activates**
13. Replace the K20 Engine Control Module.

Component Testing

Compressor Clutch Test

1. Ignition OFF, disconnect the Q2 A/C Compressor Clutch.
2. Test for 3.9 - 4.3 Ω between terminals A and B
 - **If not between 3.9 - 4.3 Ω**

Replace the Q2 A/C Compressor Clutch.
 - **If between 3.9 - 4.3 Ω**
3. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

SYMPTOMS - HVAC SYSTEMS - AUTOMATIC

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

1. Perform the [Diagnostic System Check - Vehicle](#) before using the HVAC System Malfunction procedure 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 [Automatic HVAC Description and Operation](#).

Visual/Physical Inspection

NOTE: Shutting one or more outlets may adversely affect the Automatic HVAC system by producing erroneous duct air temperature sensor readings in the duct connecting to the closed outlet. Where possible, always operate the Automatic HVAC system with all outlets open.

- Inspect for aftermarket devices which may affect the operation of the HVAC System. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- Verify the A/C compressor turns freely and is not seized.
- Verify that the customer is using the correct key to enable personalization and is not inadvertently activating auxiliary HVAC controls.
- The A/C compressor will not operate in cold outside air temperatures.
- 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
- 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 [HVAC System Malfunction](#) in order to diagnose the symptom.

HVAC SYSTEM MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Aids

Check the following mechanical fault sources:

- Air distribution box
- Air distribution hoses/air distribution ducts

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE), COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Automatic HVAC Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J43600 Air Conditioning Service Center

Circuit/System Verification

NOTE: Check for bulletins before proceeding.

1. Ignition ON.
2. Verify every applicable scan tool Switch parameter changes when pressing the appropriate switch on the A26 HVAC Controls.
 - **If any parameter does not change**
Replace the A26 HVAC Controls.
 - **If all parameters change**
3. Verify the blower motor operates properly with the blower motor switch in each speed position.
 - **If the blower motor does not operate in each speed position**
Refer to **DTC B0193**.
 - **If the blower motor operates properly in each speed position**
4. Verify the HVAC doors listed below move when pressing the appropriate switch.
 - Driver Temperature
 - Passenger Temperature
 - Mode
 - Recirculation
 - **If any HVAC door does not move**
Refer to **DTC B0223, B022A, B0233, B023A, B0408, or B0418**.
 - **If all HVAC doors move**
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 ECM A/C High Side Pressure Sensor parameter.

- **If the reading is not within 10%**

Refer to [DTC P0532 or P0533](#).

- **If the reading is within 10%**

7. Verify the A/C High Side Pressure Sensor parameter is between 269-2929 kPa (39-425 PSI).

- **If the reading is not between 269-2929 kPa (39-425 PSI)**

Refer to [Air Conditioning \(A/C\) System Performance Test](#) .

- **If the reading is between 269-2929 kPa (39-425 PSI)**

8. Verify the scan tool parameters listed below are within 10% of ambient temperature.

- Lower Left Duct Air Temperature Sensor
- Upper Left Duct Air Temperature Sensor
- Lower Right Duct Air Temperature Sensor
- Upper Right Duct Air Temperature Sensor
- A/C Evaporator Temperature Sensor
- **If not within 10% of ambient temperature**

Refer to [DTC B0173, B0178, B0509, B0514 or B3933](#).

- **If within 10% of ambient temperature**

9. Verify the scan tool parameters listed below are within 10% of actual conditions.

- Passenger Compartment Humidity
- Passenger Compartment Humidity Sensor Temperature
- Passenger Compartment Windshield Temperature
- **If not within 10% of actual conditions**

Refer to [DTC B018A, B048C, B048E, or B1395](#).

- **If within 10% of actual conditions**

10. Engine ON, A/C system ON.

11. Verify cool air flows from the ducts with the temperature control in the coldest position.

- **If the air is not cool**

1. Verify the Q2 A/C Compressor Clutch is engaged.

- If the Q2 A/C Compressor Clutch is not engaged, refer to [Air Conditioning Compressor Malfunction](#).
- If the Q2 A/C Compressor Clutch is engaged, refer to [Air Conditioning \(A/C\) System Performance Test](#) .

- **If the air is cool**

12. 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](#) .

- **If the air is warm**

13. Engine OFF, ignition ON.

14. Verify the Sunload parameter changes while covering the B10B Ambient Light/Sunload Sensor with a shop towel and changes when shining a bright light on it.

- **If the Sunload parameter does not change**

Refer to [DTC B0163, B0183, or B1405](#).

- **If the Sunload parameter changes**

15. Verify the actual inside air temperature, using a thermometer, is less than 3Â°C (5Â°F) difference from the scan tool Inside Passenger Compartment Air Temp. Sensor parameter.

- **If greater than a 3Â°C (5Â°F) difference**

Refer to [DTC B0163, B0183, or B1405](#).

- **If less than a 3Â°C (5Â°F) difference**

16. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for HVAC control module replacement, programming and setup

AIR CONDITIONING COMPRESSOR MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The A/C compressor uses a conventional belt driven magnetic clutch to engage and mechanically turn the compressor. When the A/C switch is pressed, the HVAC control module sends an A/C request message to the ECM via serial data. If specific criteria is met, the ECM then grounds the A/C compressor clutch relay control circuit, which will switch the A/C compressor clutch relay. With the relay contacts closed, battery voltage is supplied to the permanently grounded A/C compressor clutch. The A/C compressor clutch will then be activated.

Diagnostic Aids

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

- Battery voltage is between 9-18 V.
- Engine coolant temperature is less than 124Â°C (255Â°F).
- Engine speed is greater than 600 RPM.
- Engine speed is less than 5 500 RPM.
- A/C high side pressure is between 269-2 929 kPa (39-425 PSI).
- Throttle position is less than 100%.
- Evaporator temperature is greater than 3Â°C (38Â°F).
- ECM does not detect excessive torque load.
- ECM does not detect insufficient idle quality.
- The ambient temperature is above 1Â°C (34Â°F).
- Blower motor ON

Reference Information

Schematic Reference

[HVAC Schematics \(Buick with CJ2\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#), [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Automatic HVAC Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

NOTE: Refer to [HVAC System Malfunction](#) before performing this procedure.

1. Ignition ON, press and release the A/C Switch.
2. Verify the HVAC control module scan tool A/C Switch parameter changes between Active and Inactive.
 - **If the parameter does not change**
Replace the A26 HVAC Controls.
 - **If the parameter changes**
3. Set A/C system to coolest setting with blower ON.
4. Press and release the A/C switch several times.
5. Verify the engine control module (ECM) scan tool A/C Request Signal parameter changes between Active and Inactive.
 - **If the parameter does not change**
Replace the K33 HVAC Control Module.
 - **If the parameter changes**
6. Verify the A/C compressor clutch engages when commanding the engine control module (ECM) A/C Relay output function On and Off with a scan tool.
 - **If the A/C compressor clutch does not engage**
Refer to [DTC P0645, P0646, or P0647](#)
 - **If the A/C compressor clutch engages**
7. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for HVAC control module replacement, programming and setup

AUXILIARY HEATER COOLANT PUMP MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil B+	1	1	-	-
Relay Switch Ignition	1	1	-	-
Relay Coil Control	1	1	1	-
Relay Switch Control	1	1	2	-
Component Ground	-	1	-	-
1. Coolant Pump inoperative 2. Coolant Pump operates continuously				

Circuit/System Description

The primary purpose of the heater core coolant pump is to circulate engine coolant through the HVAC heater core when heat is required in the cabin for comfort. This normally happens when the vehicle is in an Auto Stop and the mechanical pump is not spinning. If the HVAC control module has determined heat is needed for the cabin, a request is sent via serial data to the engine control module to turn the pump ON. The engine control module controls the auxiliary coolant pump relay via the heater core coolant pump relay control circuit. The heater core coolant pump relay supplies voltage to the heater core coolant pump.

Reference Information

Schematic Reference

HVAC Schematics (Buick with CJ2)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Automatic HVAC Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the KR33 Auxiliary Heater Coolant Pump Relay. It may take up to 2 min for all vehicle systems to power down.
2. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**

Replace the X50A Fuse Block- Underhood.
 - **If the test lamp illuminates**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 85 and ground.
 - **If the test lamp does not illuminate**

- **If the test lamp illuminates**

5. Connect a test lamp between the ignition circuit terminal 85 and the control circuit terminal 86.
6. Verify the test lamp turns ON and OFF when commanding the G36 Auxiliary Heater Coolant Pump On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module. Ignition ON
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
3. Ignition OFF.
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**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module.
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**

7. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the G36 Auxiliary Heater Coolant Pump. It may take up to 2 min for all vehicle systems to power down.
8. Test for less than 10 Ω between the ground circuit terminal 1 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.
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 G36 Auxiliary Heater Coolant Pump.
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 G36 Auxiliary Heater Coolant Pump is activated.

- **If the G36 Auxiliary Heater Coolant Pump does not activate**

1. Ignition OFF, remove the jumper wire. Disconnect the harness connector at the G36 Auxiliary Heater Coolant Pump.
2. Test for infinite resistance between the control circuit 2 and ground.
 - If less than Infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
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 , test or replace the G36 Auxiliary Heater Coolant Pump.

- **If the G36 Auxiliary Heater Coolant Pump activates**

12. Test or replace the KR33 Auxiliary Heater Coolant Pump Relay.

Component Testing

Relay Test

1. Ignition OFF, disconnect the KR33 Auxiliary Heater Coolant Pump Relay.

2. Test for 60-180 Ω between terminals 85 and 86.

- **If less than 60 Ω or greater than 180 Ω**

Replace the KR33 Auxiliary Heater Coolant Pump Relay.

- **If between 60-180 Ω**

3. Test for infinite resistance between the terminals listed below:

- 30 and 86
- 30 and 87
- 30 and 85
- 85 and 87

- **If less than infinite resistance**

Replace the KR33 Auxiliary Heater Coolant Pump Relay.

- **If infinite resistance**

4. Install a 10 A fused jumper wire between relay terminal 86 and 12 V. Install a jumper wire between relay terminal 85 and ground.

5. Test for less than 2 Ω between terminals 30 and 87.

- **If 2 Ω or greater**

Replace the KR33 Auxiliary Heater Coolant Pump Relay.

- **If less than 2 Ω**

6. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [HVAC Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming, and setup

AFTERBLOW ENABLING

Afterblow is a feature that dries the evaporator core by operating the blower motor after the engine is turned off. This aids in reducing microbial growth that can create undesirable odors.

The vehicle does not come equipped with the afterblow feature turned on. If the afterblow feature is required due to an odor concern, it must be enabled by using the scan tool via the HVAC special functions menu.

Use the following procedure to enable the afterblow feature:

1. Connect the Scan Tool.
2. Turn ON the ignition, with the engine OFF.
3. Build the vehicle with the scan tool.
4. Select Module Diagnostics.
5. Select HVAC Control Module.
6. Select Configuration/Reset Functions.
7. Select HVAC Afterblow Configuration.

When afterblow has been enabled, the following conditions must be met for the HVAC control module to operate afterblow:

- The engine must be turned OFF.

- The outside air temperature must be at least 11Å°C (52Å°F) when the compressor was last operating before the engine was turned OFF.
- The A/C compressor must have operated for more than 2 minutes before the engine was turned OFF.
- The system voltage must be above 12 V.

Once the above conditions have been met, the blower motor will operate at a low blower speed, following the sequence below up to 5 times:

1. The blower motor will be OFF for 7-11 minutes.
2. The blower motor will operate for 20-60 seconds.

ACTUATOR RECALIBRATION

Preferred Method (with Scan Tool)

NOTE: Do not operate any HVAC controls while the HVAC control module is calibrating as this may interrupt the process. If interrupted, improper HVAC performance will result.

1. Using a scan tool, perform the HVAC Actuators Learn in the HVAC Control Module.
2. Follow the scan tool directions to complete the procedure.
3. Operate the system and verify that no DTCs have set as current DTCs.
4. If DTC B101E 4B is set after attempting the actuator recalibration procedure, perform the following:
 1. Verify which actuator does not have a scan tool learn status parameter status of complete.
 2. Verify the unlearned actuator is physically rotating - A common cause of DTC B101E 4B is an actuator that is electrically OK but fails to physically rotate (e.g. stripped gears).
 3. If the unlearned actuator is not physically rotating, replace the actuator, otherwise replace the HVAC control module.

Alternate Method (without Scan Tool)

NOTE: Do not operate any HVAC controls while the HVAC control module is calibrating as this may interrupt the process. If interrupted, improper HVAC performance will result.

1. Ignition OFF/ Vehicle OFF.
2. Remove the HVAC control module fuse for a minimum of 10 s.
3. Install the HVAC control module fuse.
4. Start the vehicle.
5. Wait 40 s for the HVAC control module to self-calibrate.

REPAIR INSTRUCTIONS

WIRE TO WIRE REPAIR - HVAC

Special Tools

- EL-38125-10 Splice Sleeve Crimping Tool
- J-38125-5A Ultra Torch Special Tool
- J-38125-8 Splice Sleeve Crimping Tool

For equivalent regional tools, refer to [Special Tools](#) .

WARNING: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High

voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

CAUTION: If the SIR/SRS wiring, connector, or terminal is damaged, the affected wiring harness must be replaced. Do not attempt to repair the wiring, connector, or terminals. Any attempt to repair the wires, connectors, or terminals could result in performance problems of the SIR/SRS System. Operations on restraint systems must only be performed by trained and qualified personnel.

NOTE: If the wiring harness internal to the transmission is damaged, the wiring harness must be replaced. The use of splice sleeves in an attempt to repair the internal transmission wires, connectors, or terminals could result in performance issues.

NOTE: Do not splice wires in Door Harness Grommets

NOTE: Use only DuraSeal splice sleeves. Other splice sleeves may not protect the splice from moisture or provide a good electrical connection.

Use DuraSeal splice sleeves to form a one-to-one splice on all types of insulation except Tefzel and coaxial. Use DuraSeal splice sleeves where there are special requirements such as moisture sealing. Follow the instructions below in order to splice copper wire using DuraSeal splice sleeves.

Splice Sleeve Color	Crimp Tool Nest Color		Wire Gauge mm ² / (American Wire Gauge (AWG))
	3 Crimp Nests	4 Crimp Nests	
Salmon (Yellow-Pink)	Red (1) or Red/Green (1)	Red (2)	0.5-0.8/(18-20)
Blue	Blue (2)	Blue (3)	1.0-2.0/(14-16)
Yellow	Yellow (3)	Yellow (4)	3.0-5.0/(10-12)

NOTE: Perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. Obtain a clean strip with all of the wire strands intact.

1. Open the harness by removing any tape:
 - Use a sewing seam ripper, available from sewing supply stores, in order to cut open the harness in order to avoid wire insulation damage.
 - Use the DuraSeal splice sleeves on all types of insulation except Tefzel and coaxial.
 - Do not use the crimp and DuraSeal splice sleeve to form a splice with more than 2 wires coming together.
2. Cut as little wire off the harness as possible. Extra wire length may be needed in order to change the location of a splice.

Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.

3. Strip the insulation:
 - When adding a length of wire to the existing harness, use the same size wire as the original wire.
 - Perform one of the following items in order to find the correct wire size:
 - Find the wire on the schematic and convert to regional wiring gauge size.
 - When the wire size is not known, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.

- Strip approximately 5.0 mm (0.20 in) of insulation from each wire to be spliced.
 - Do not nick or cut any of the strands. Inspect the stripped wire for nicks or cut strands.
 - If the wire is damaged, repeat this procedure after removing the damaged section.
4. For high temperature wiring, slide a section of high temperature SCT1 shrink tubing down the length of wire to be spliced. Ensure that the shrink tubing will not interfere with the splice procedure.
 5. Select the proper DuraSeal splice sleeve according to the wire size. Refer to the above table at the beginning of the repair procedure for the color coding of the DuraSeal splice sleeves and the crimp tool nests.

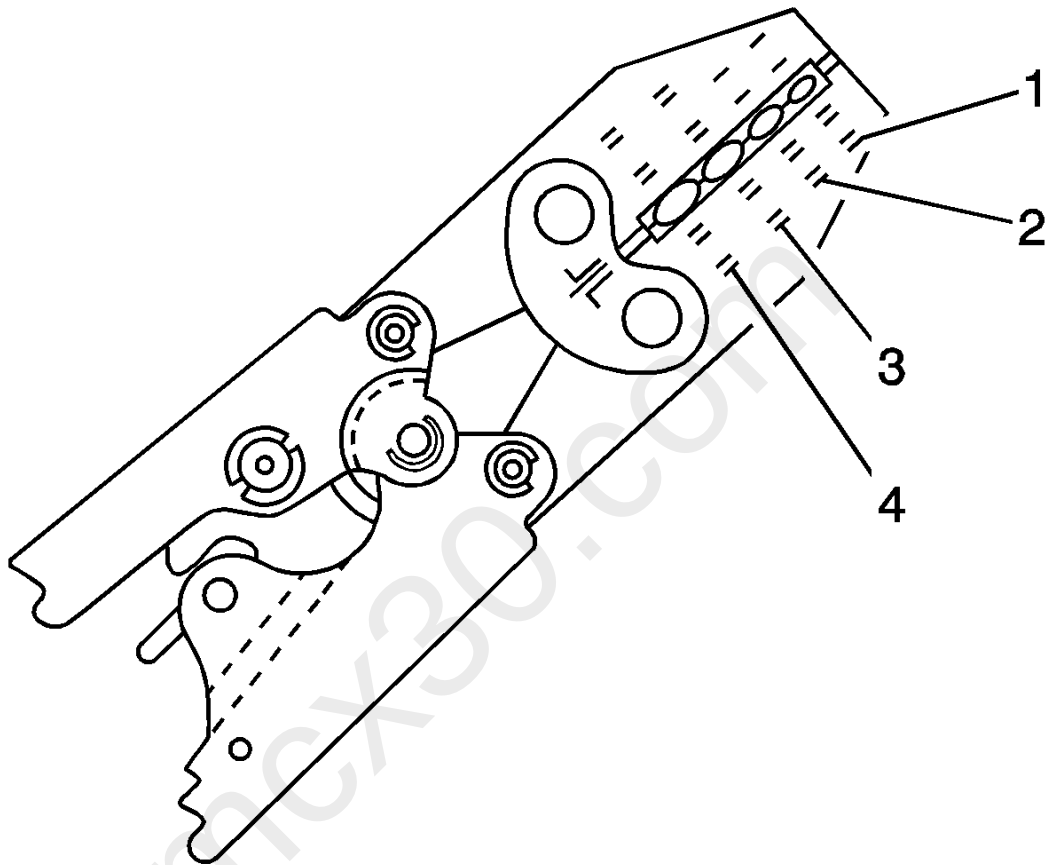


Fig. 8: Splice Sleeve Crimping Tool With 4 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

6. The **EL-38125-10** splice sleeve crimping tool has four crimp nests. The largest crimp nest (4) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (3) is used for crimping 14 and 16 gauge wires. The third largest crimp nest (2) is used for crimping 18 and 20 gauge wires. The smallest crimp nest (1) is used for crimping 22 to 26 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.

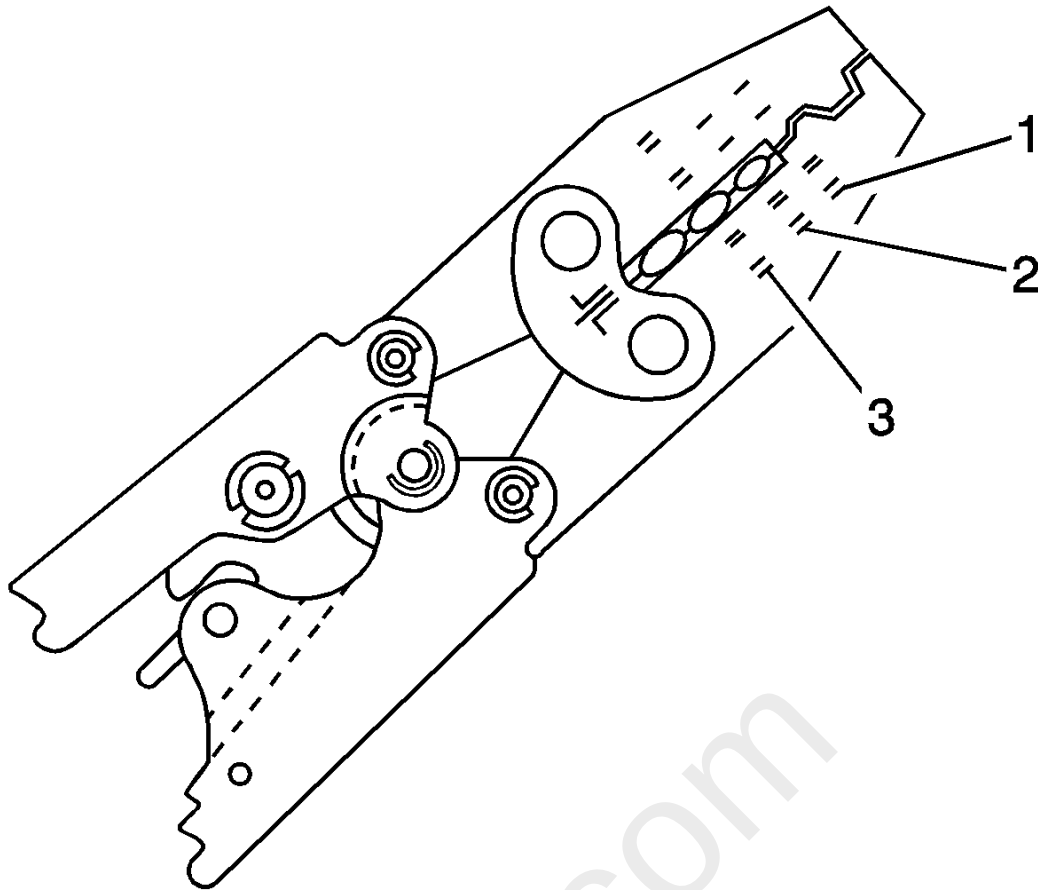


Fig. 9: Splice Sleeve Crimping Tool With 3 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

7. The **J-38125-8** splice sleeve crimping tool has three crimp nests. The largest crimp nest (3) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (2) is used for crimping 14 and 16 gauge wires. The smallest crimp nest (1) is used for crimping 18 to 20 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.
8. Use the splice sleeve crimp tool in order to position the DuraSeal splice sleeve in the proper color nest of the splice sleeve crimp tool. For the four crimp nest tool, use the three largest crimp nests to crimp the splice sleeves. For the three crimp nest tool, use all three crimp nests to crimp the splice sleeves. Use the four and three crimp tool diagrams (above) and the table (farther above) to match the splice sleeve with the correct crimp nest. The crimp tool diagram callout numbers match the numbers in the table (under crimp tool nest color).

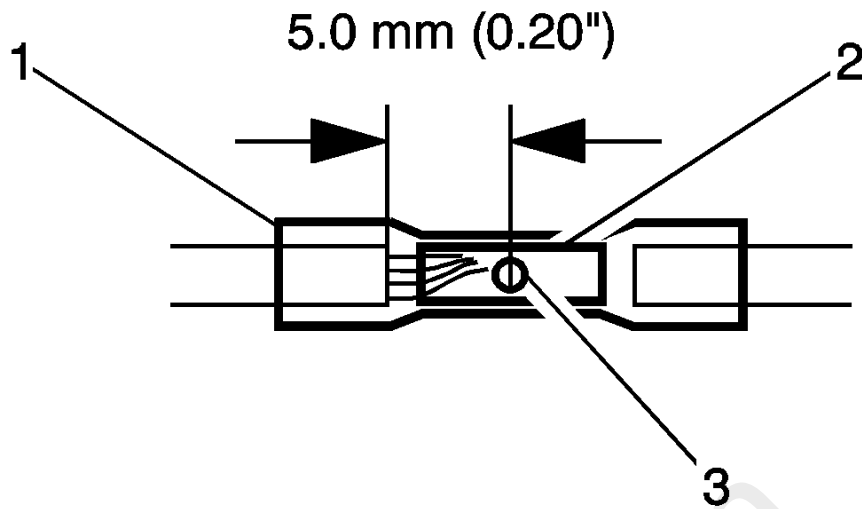


Fig. 10: Identifying Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

9. Place the DuraSeal splice sleeve in the nest. Ensure that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) in order to prevent the wire (1) from going further. Close the hand crimper handles slightly in order to firmly hold the DuraSeal splice sleeve in the proper nest.



Fig. 11: Crimped Duraseal Splice Sleeve

Courtesy of GENERAL MOTORS COMPANY

10. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop.
11. Tightly close the handles of the crimp tool until the crimper handles open when released.

The crimper handles will not open until the proper amount of pressure is applied to the DuraSeal splice sleeve. Repeat steps 4 and 6 for the opposite end of the splice.



Fig. 12: Crimped Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

12. Using the heat torch, apply heat to the crimped area of the barrel.
13. Start in the middle and gradually move the heat barrel to the open ends of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

High Temperature Wiring Repairs

Use the following procedures to perform high temperature wiring repairs:

1. Center the high temperature SCT1 shrink tube over the DuraSeal splice sleeve.
2. Using the heat torch, apply heat to the high temperature heat shrink tubing.
3. Gradually move the heat from the center to the open end of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.
4. Replace any reflective tape and clips that may have been removed during the repair.

CONNECTOR RECONNECTION - HVAC

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to [Special Tools](#).

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- Poor terminal to wire connection - Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required, in order to verify the customer concern.
- Refer to [Testing for Electrical Intermittents](#) for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to [Scan Tool Snapshot Procedure](#) for advanced intermittent diagnosis and Vehicle Data Recorder operation.

Testing for Terminal Fretting

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 micrometer can cause fretting. To put this in perspective, a sheet of paper is about 100 micrometer thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface.

To correct a fretting condition disconnect the suspect connector and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

Testing for Proper Terminal Contact

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the **EL-35616** kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves.

Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Testing for Proper Terminal Contact in Bussed Electrical Centers

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center. Use the **EL-35616** kit to test for proper terminal contact. Failure to use the **EL-35616** kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

1. Separate the connector halves.
2. Visually inspect the connector halves for contamination. Contamination may result in a white or green build-up within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
3. Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

1. Remove the component in question.
2. Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
3. Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
4. Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

Control Module/Component Voltage and Grounds

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#) , and [Power Distribution Schematics \(Buick\)](#) [Power Distribution Schematics \(Chevrolet\)](#) .
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#) , and [Ground Distribution Schematics \(Buick\)](#) [Ground Distribution Schematics \(Chevrolet\)](#) .

Temperature Sensitivity

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.

- If the intermittent is related to heat, review the data for a relationship with the following:
 - High ambient temperatures
 - Underhood/engine generated heat
 - Circuit generated heat due to a poor connection, or high electrical load
 - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
 - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
 - The condition only occurs on a cold start.
 - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to **Inducing Intermittent Fault Conditions** in order to duplicate the conditions required.

Electromagnetic Interference and Electrical Noise

Some electrical components/circuits are sensitive to electromagnetic interference or other types of electrical noise. Inspect for the following conditions:

- A harness that is too close routed to high voltage/high current devices such as secondary ignition components, motors, generator etc. These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch. These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to **Checking Aftermarket Accessories**.
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

HEATER AND AIR CONDITIONING USER INTERFACE CONTROL REPLACEMENT

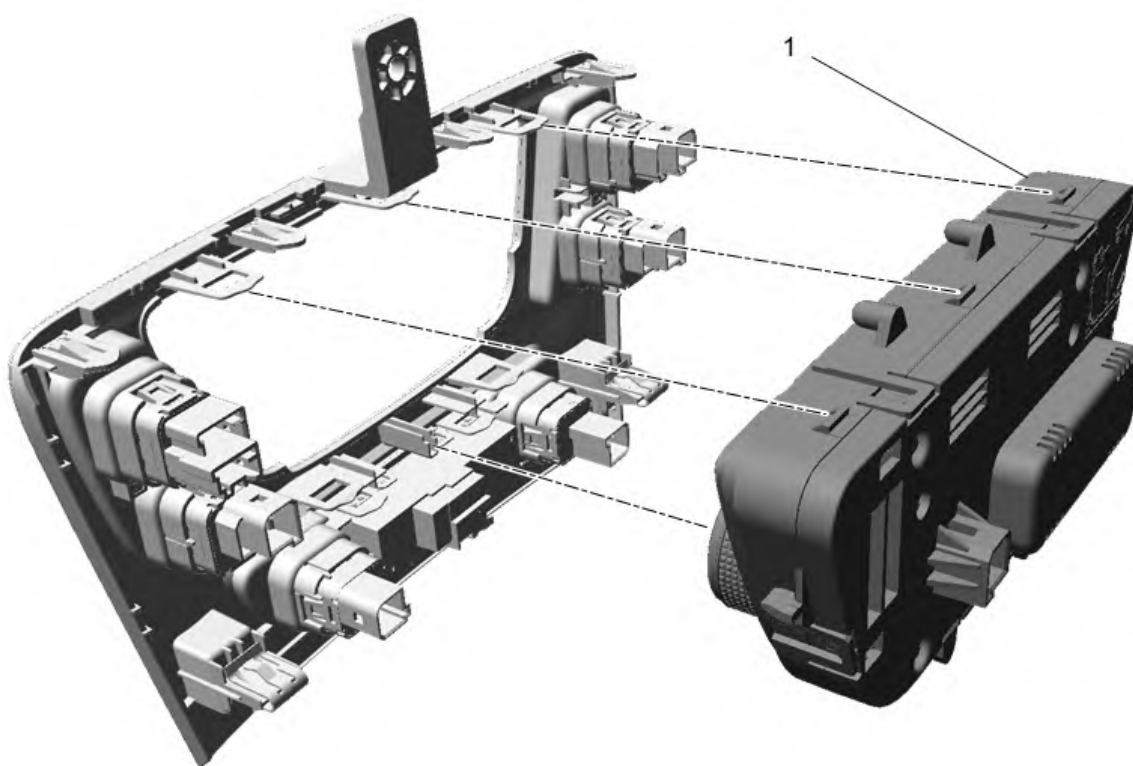


Fig. 13: Heater and Air Conditioning User Interface Control

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Accessory Bezel Replacement (Buick)</u>	
1	Heater and Air Conditioning User Interface Control Procedure Un-latch the heater and air conditioning user interface control from the instrument panel accessory bezel.

HEATER AND AIR CONDITIONING REMOTE CONTROL REPLACEMENT



Fig. 14: Heater and Air Conditioning Remote Control
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Battery Negative Cable Disconnection and Connection (without KL9), Battery Negative Cable Disconnection and Connection (with KL9). 2. Heater and Air Conditioning User Interface Control Replacement	
	Heater and Air Conditioning Remote Control NOTE: When reconnecting the heater and air conditioning remote module, the BROWN J2 connector must be connected last. Once all the parts are all in place, check and clear all DTCs in the heater and air conditioning remote control. Procedure 1 1. Un-latch the heater and air conditioning remote control from the Instrument panel and maneuver out from Instrument panel. 2. Connect the battery negative cable. Battery Negative Cable Disconnection and Connection (without KL9), Battery Negative Cable Disconnection and Connection (with KL9). 3. Perform the necessary programming and setup procedure: Control Module References 4. Clear the DTCs from the heater and air conditioning remote control module. 5. Perform the actuator calibration procedure. Actuator Recalibration

AIR CONDITIONING WIRING HARNESS REPLACEMENT

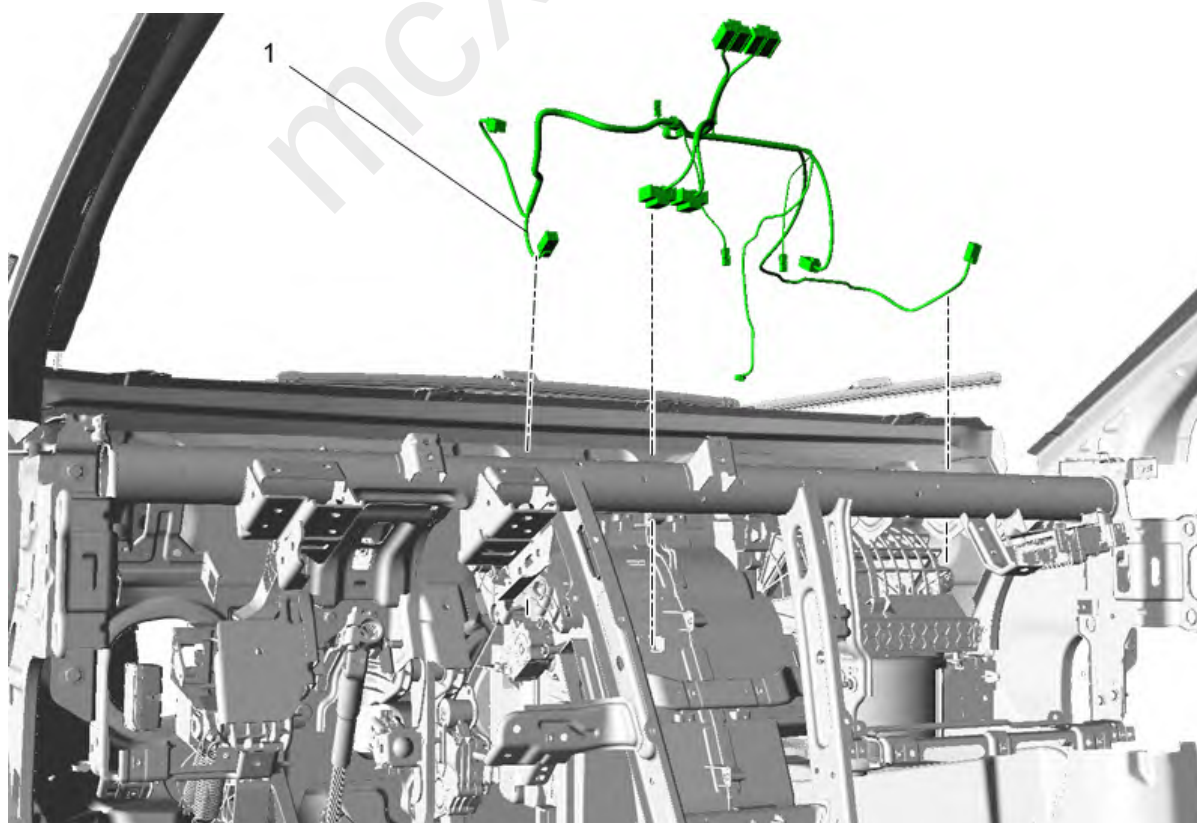


Fig. 15: Air Conditioning Wiring Harness
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Assembly Replacement (Buick)</u> <u>Instrument Panel Assembly Replacement (Chevrolet)</u>	
1	Air Conditioning Wiring Harness Procedure 1. Disconnect the electrical connectors. 2. Remove the wiring harness.

AIR INLET VALVE ACTUATOR REPLACEMENT (RECIRCULATION)

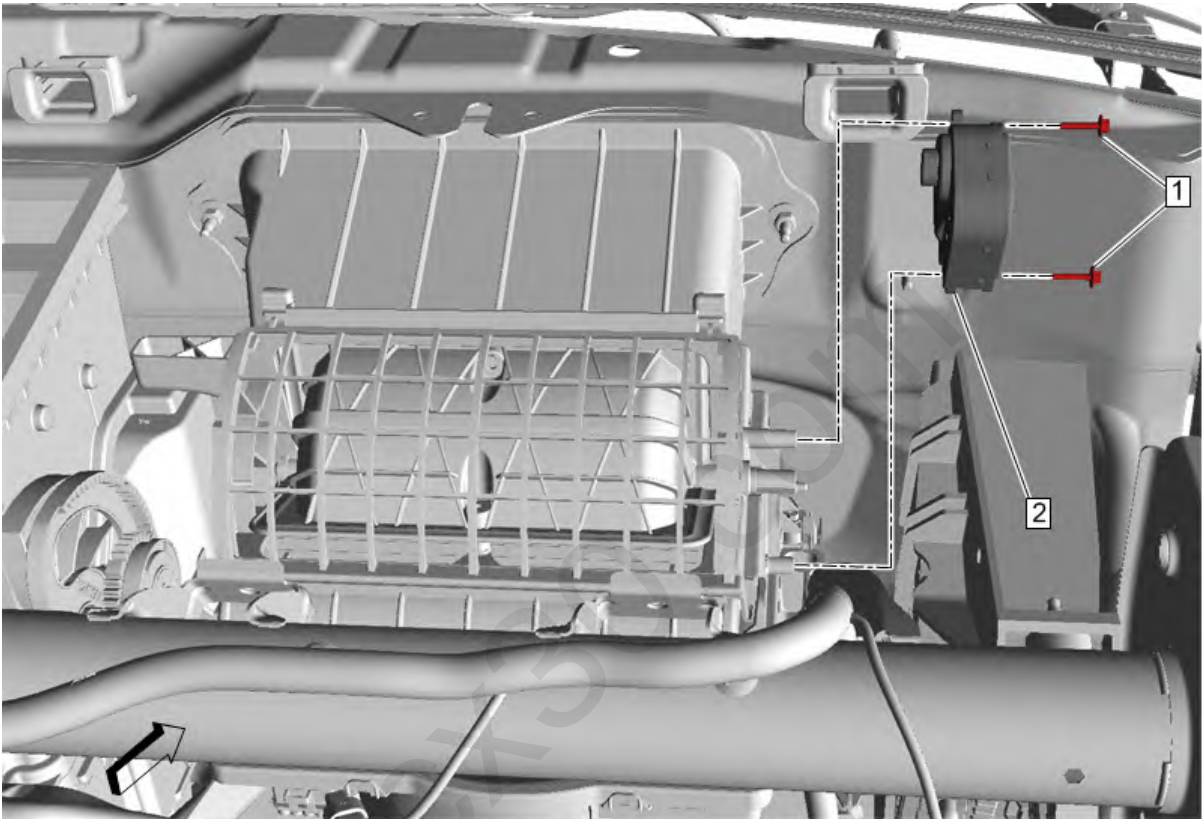


Fig. 16: Air Inlet Valve Actuator
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Assembly Replacement (Buick)</u> <u>Instrument Panel Assembly Replacement (Chevrolet)</u>	
1	Air Inlet Valve Actuator Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.2 N.m (11 lb in)
2	Air Inlet Valve Actuator Procedure Disconnect the electrical connector.

AIR INLET VALVE ACTUATOR REPLACEMENT - LEFT SIDE (WITH CJ2)

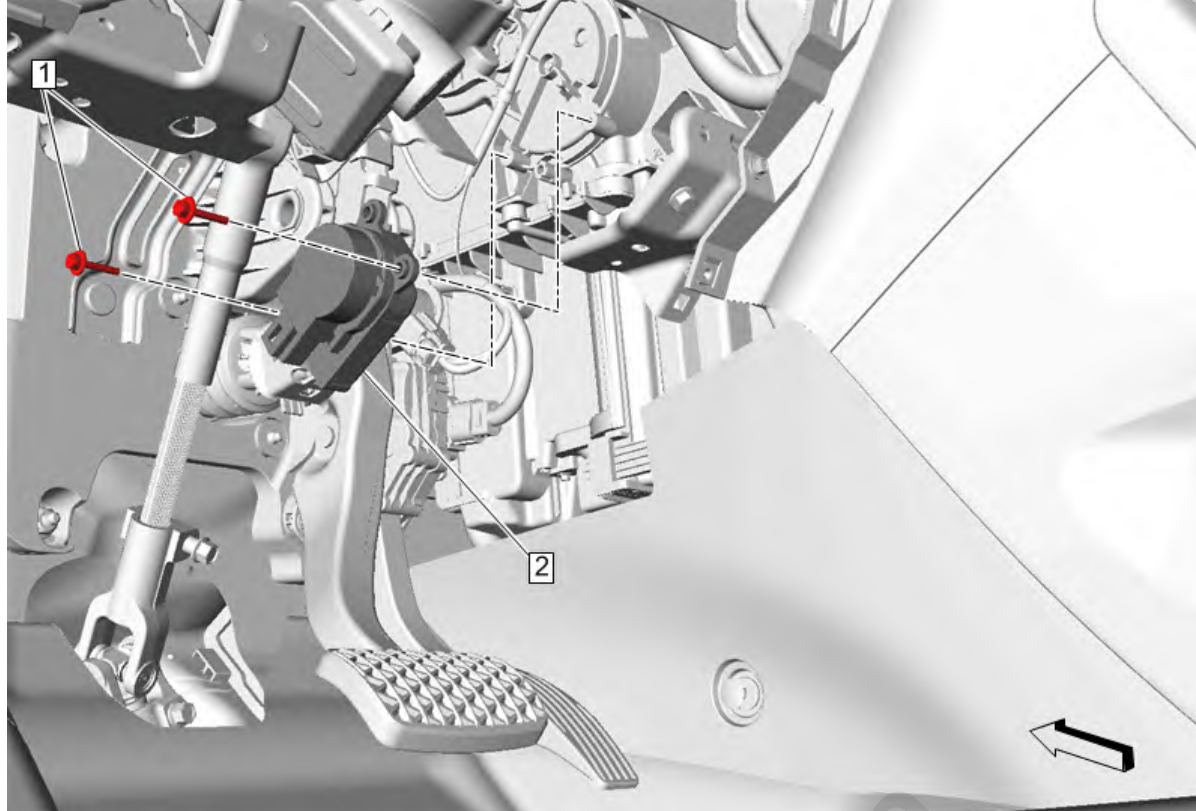


Fig. 17: Air Inlet Valve Actuator

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Floor Front Air Outlet Duct Replacement - Left Side (Chevrolet), Floor Front Air Outlet Duct Replacement - Left Side (Buick). Instrument Panel Knee Bolster Replacement (Buick), Instrument Panel Knee Bolster Replacement (Chevrolet).	
1	Air Inlet Valve Actuator Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 1.5 N.m (13 lb in)
2	Air Inlet Valve Actuator-Left Side Procedure - Disconnect the electrical connector. - Clear the DTCs from the heater and air conditioning remote control module. - Perform the actuator calibration procedure. Actuator Recalibration

AIR INLET VALVE ACTUATOR REPLACEMENT - RIGHT SIDE (WITH CJ2)

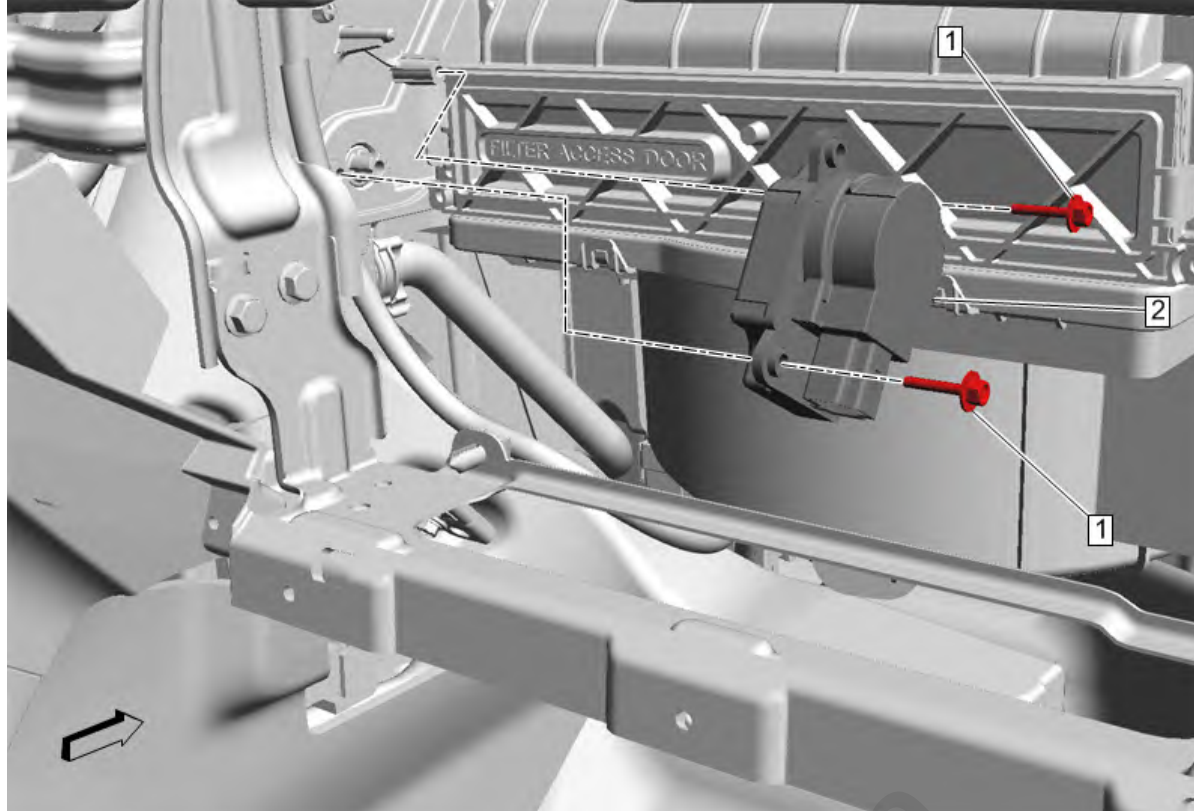


Fig. 18: Air Inlet Valve Actuator - Right Side (With CJ2)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Instrument Panel Compartment Replacement	
1	Air Inlet Valve Actuator Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 1.5 N.m (13 lb in)
2	Air Inlet Valve Actuator—Right Side Procedure 1. Disconnect the electrical connector. 2. Clear the DTCs from the heater and air conditioning remote control module. 3. Perform the actuator calibration procedure. Actuator Recalibration

MODE CONTROL CAM ACTUATOR REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. **Battery Negative Cable Disconnection and Connection (without KL9)** **Battery Negative Cable Disconnection and Connection (with KL9)**.
2. Remove Steering Column Assembly - **Steering Column Replacement (Buick, Mexico, NJ1, With BTM, With N06)** **Steering Column Replacement (Buick, Canada/United States, NJ1, With BTM, Without N06)** **Steering Column Replacement (Chevrolet, Mexico, NJ1, With BTM, With N06)** **Steering Column Replacement (Chevrolet, Canada/United States, NJ1, With BTM, Without N06)** **Steering Column Replacement (Chevrolet, Canada/United States, NJ1, Without BTM, Without N06)** **Steering Column Replacement (Chevrolet, Mexico, NJ1, Without BTM, Without N06)** **Steering Column Replacement (Mexico, N40)**.

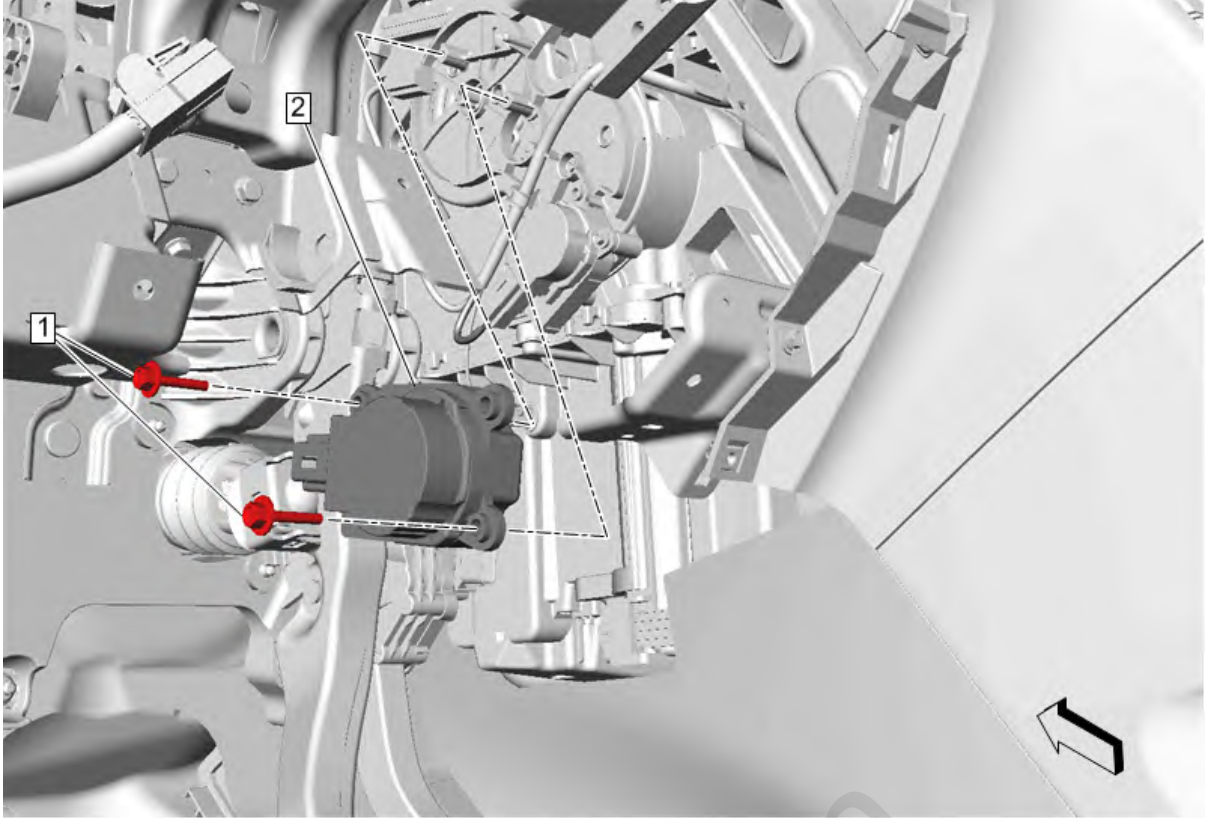


Fig. 19: Mode Control Cam Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Mode Control Cam Actuator Bolt (1)
4. Remove Mode Control Cam Actuator (2)
5. Disconnect the electrical connector.

Installation Procedure

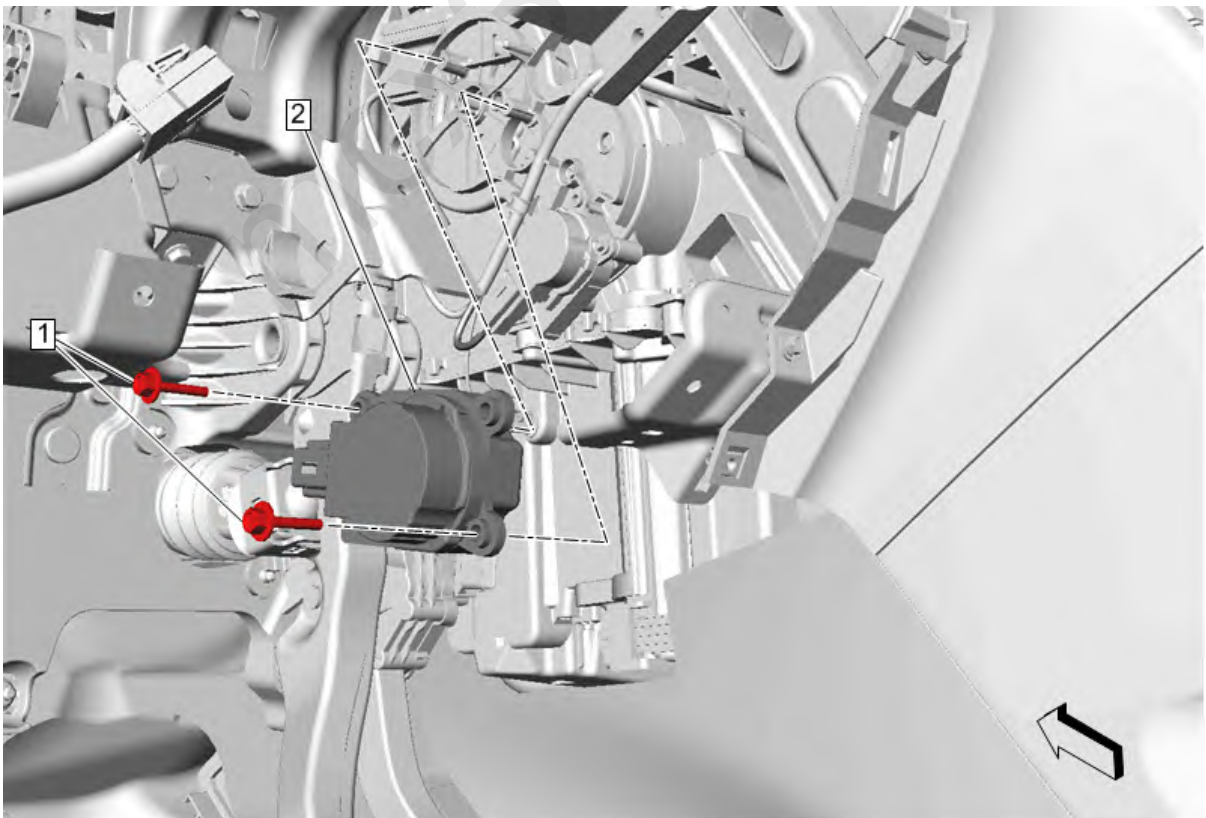


Fig. 20: Mode Control Cam Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Connect the electrical connector.
2. Install Mode Control Cam Actuator (2)
3. Install Mode Control Cam Actuator Bolt (1) and tighten 1.5 N.m (13 lb in)
4. Install Steering Column Assembly - [Steering Column Replacement \(Buick, Mexico, NJ1, With BTM, With N06\)](#) [Steering Column Replacement \(Buick, Canada/United States, NJ1, With BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Mexico, NJ1, With BTM, With N06\)](#) [Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, With BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, Without BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Mexico, NJ1, Without BTM, Without N06\)](#) [Steering Column Replacement \(Mexico, N40\)](#)
5. Connect the battery negative cable. [Battery Negative Cable Disconnection and Connection \(without KL9\)](#) [Battery Negative Cable Disconnection and Connection \(with KL9\)](#)
6. Clear the DTCs from the heater and air conditioning remote control module.
7. Perform the actuator calibration procedure. [Actuator Recalibration](#)

MODE CONTROL CAM REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection \(without KL9\)](#) [Battery Negative Cable Disconnection and Connection \(with KL9\)](#)
2. Remove Steering Column Assembly - [Steering Column Replacement \(Buick, Mexico, NJ1, With BTM, With N06\)](#) [Steering Column Replacement \(Buick, Canada/United States, NJ1, With BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Mexico, NJ1, With BTM, With N06\)](#) [Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, With BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, Without BTM, Without N06\)](#) [Steering Column Replacement \(Chevrolet, Mexico, NJ1, Without BTM, Without N06\)](#) [Steering Column Replacement \(Mexico, N40\)](#)

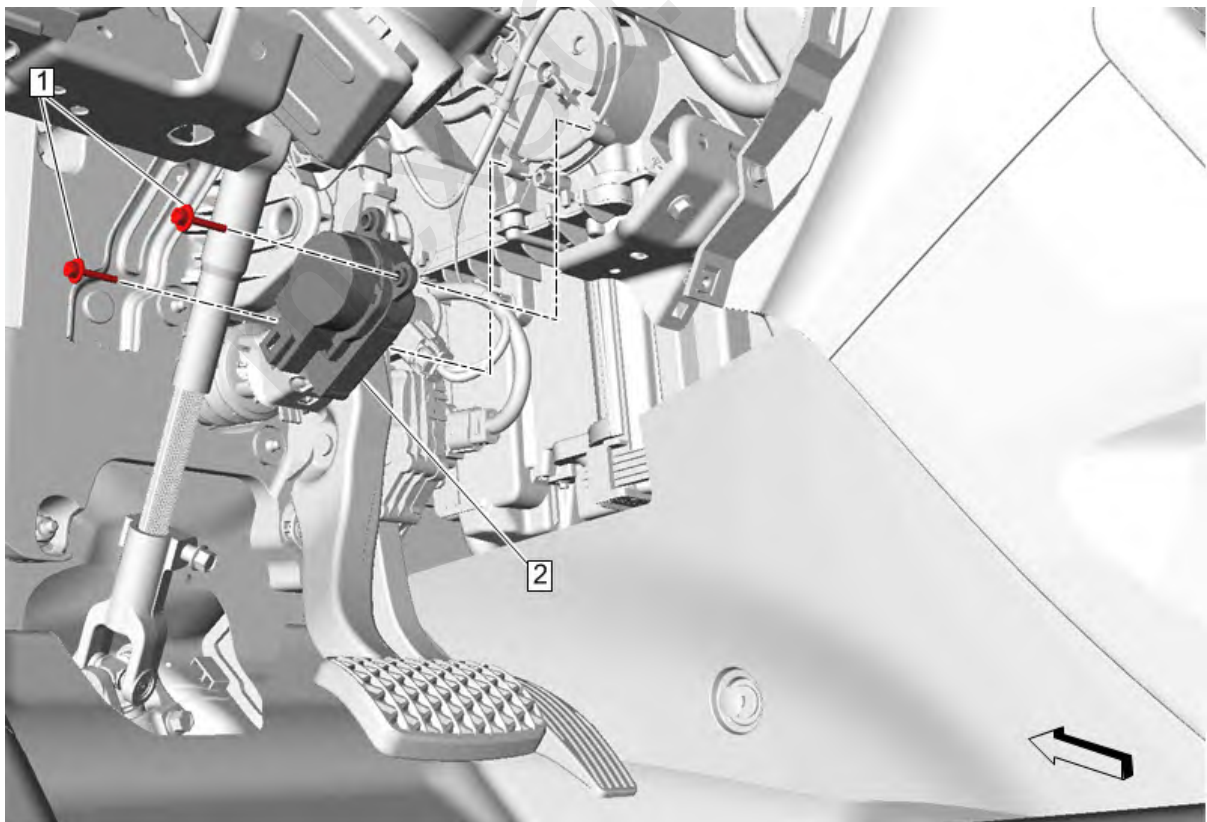


Fig. 21: Air Inlet Valve Actuator

Courtesy of GENERAL MOTORS COMPANY

3. Remove Air Inlet Valve Actuator (2) Left Side - [Air Inlet Valve Actuator Replacement - Left Side \(With CJ2\)](#)

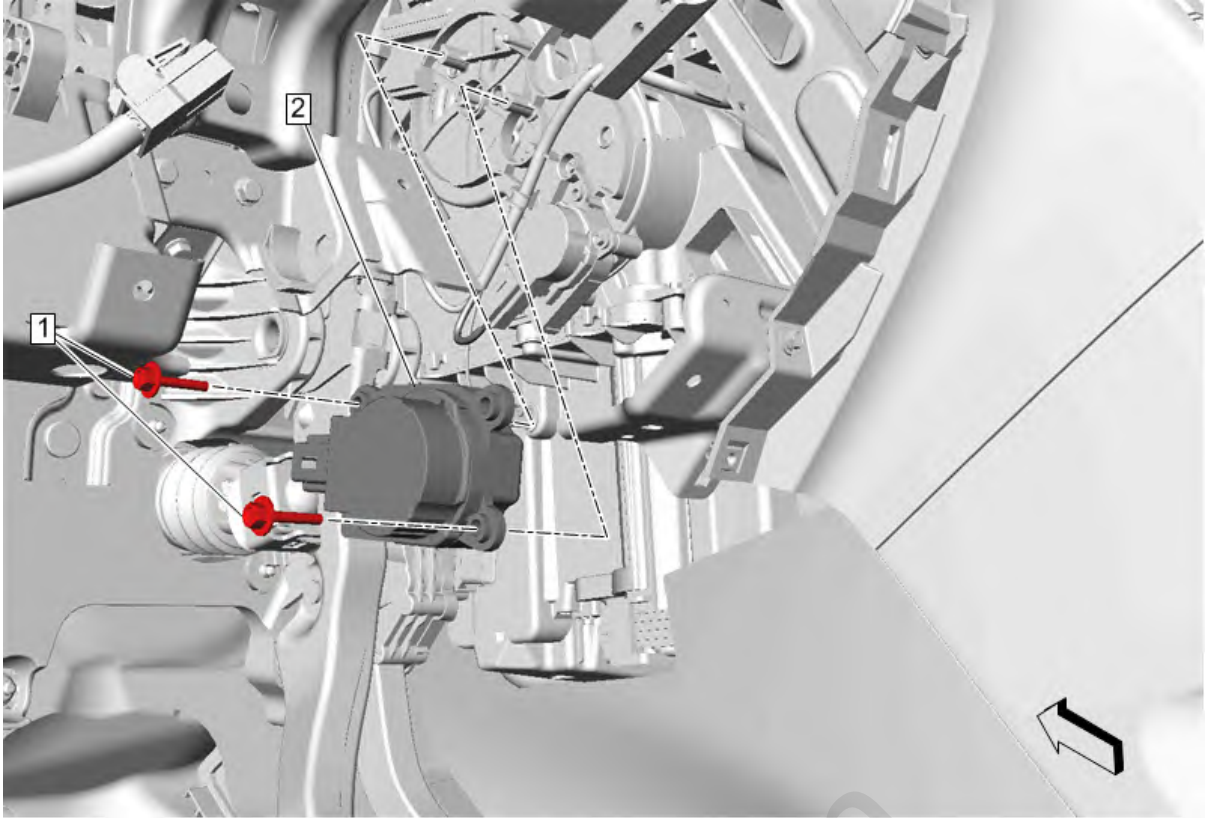


Fig. 22: Mode Control Cam Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Mode Control Cam Actuator Bolt (1)
5. Remove Mode Control Cam Actuator (2)
6. Disconnect the electrical connector.

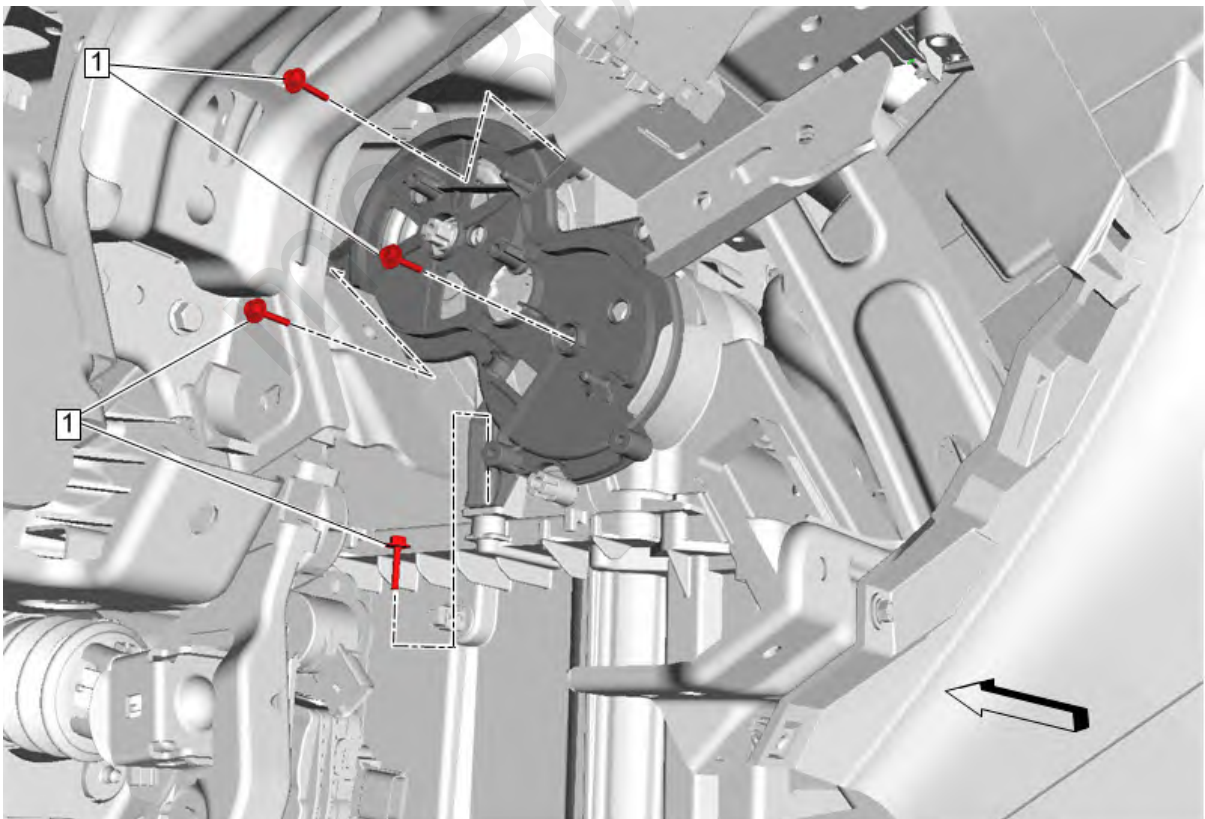


Fig. 23: Heater and Air Conditioning Evaporator and Blower Module Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

7. Remove Heater and Air Conditioning Evaporator and Blower Module Bracket Bolt (1)

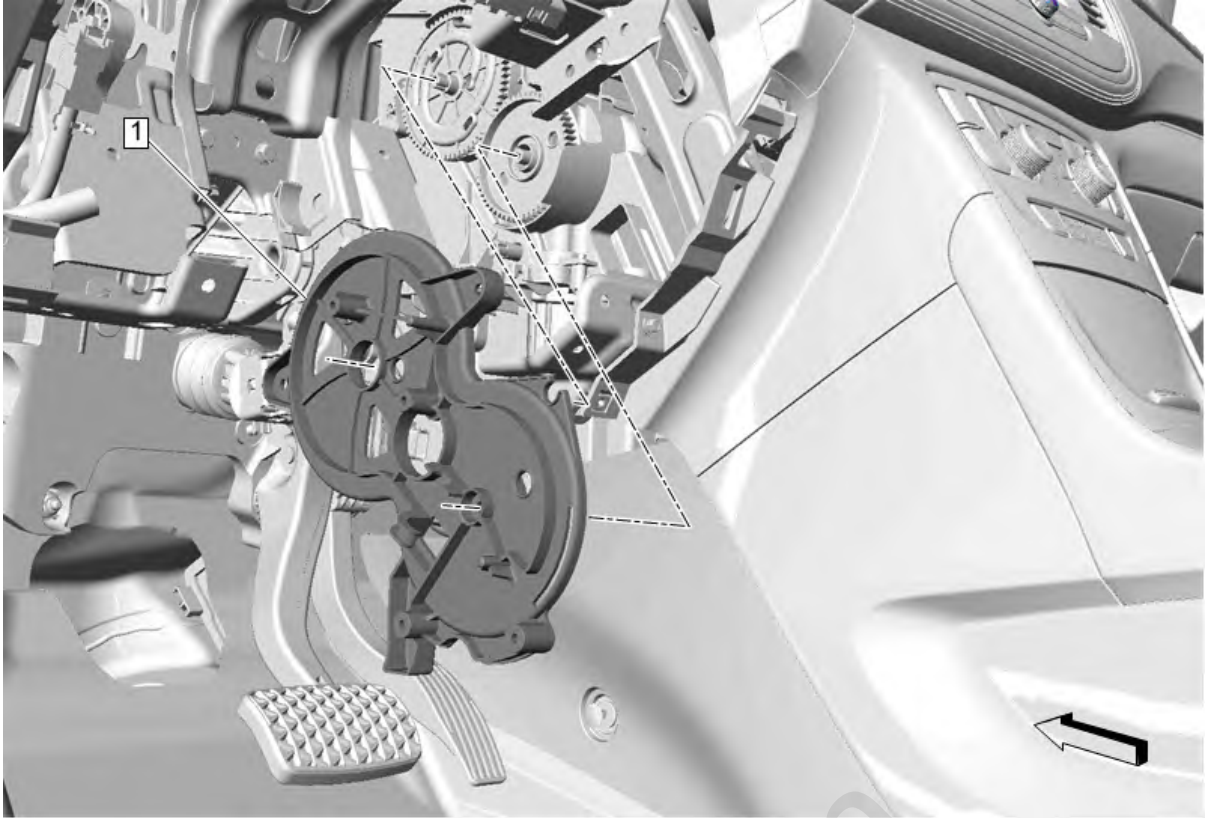


Fig. 24: Heater and Air Conditioning Evaporator and Blower Module Bracket
 Courtesy of GENERAL MOTORS COMPANY

8. Remove Heater and Air Conditioning Evaporator and Blower Module Bracket (1)

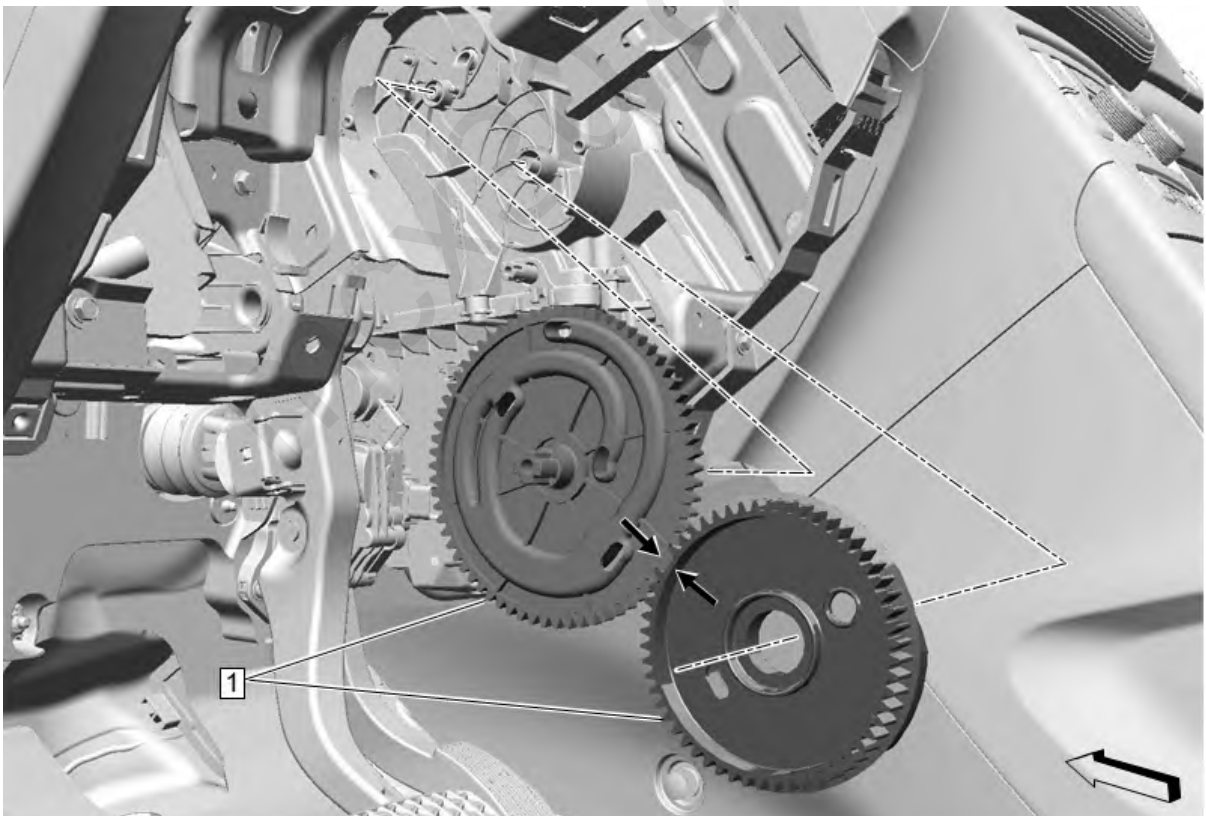


Fig. 25: Heater and Air Conditioning Mode Control Cam
 Courtesy of GENERAL MOTORS COMPANY

9. Remove Heater and Air Conditioning Mode Control Cam (1)

Installation Procedure

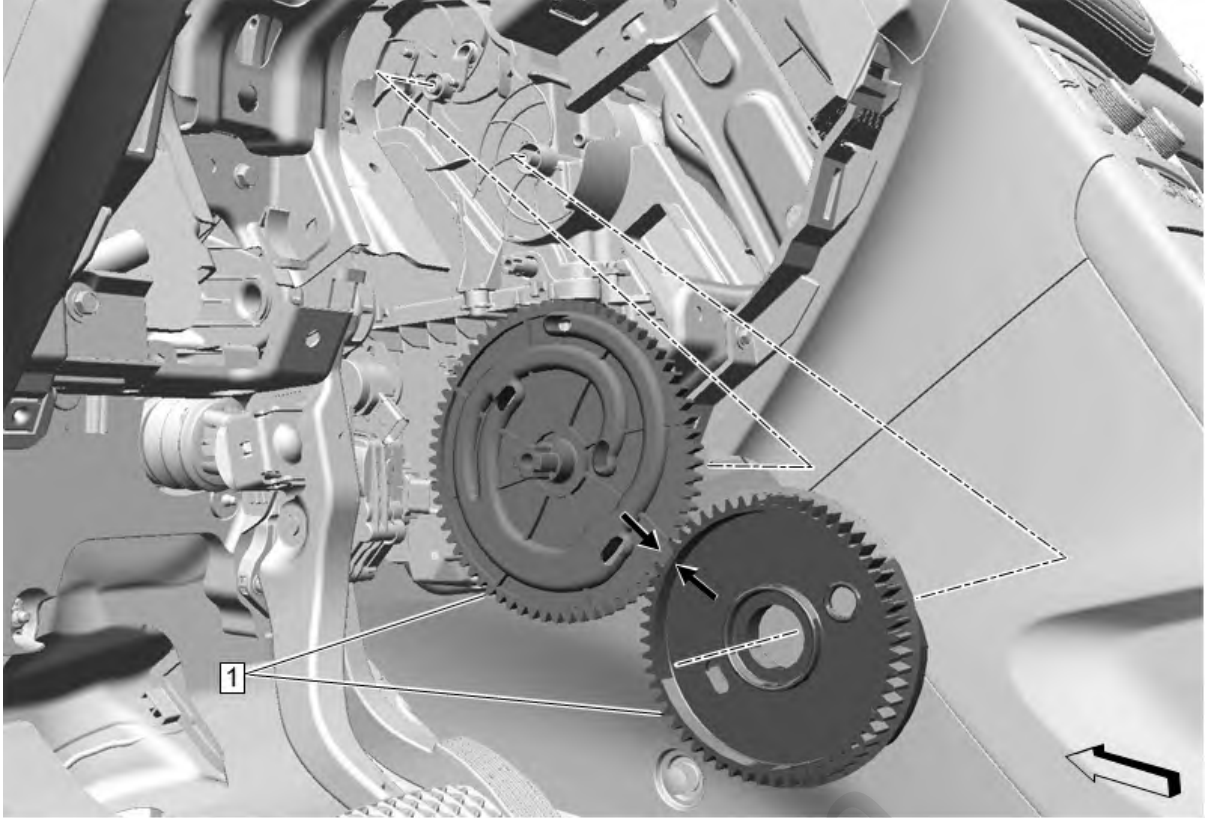


Fig. 26: Heater and Air Conditioning Mode Control Cam

Courtesy of GENERAL MOTORS COMPANY

NOTE: Index the wider male heater and air conditioning mode control cam gear tooth, to the wider female heater and air conditioning mode control cam gear tooth indicated by the arrows.

1. Install Heater and Air Conditioning Mode Control Cam

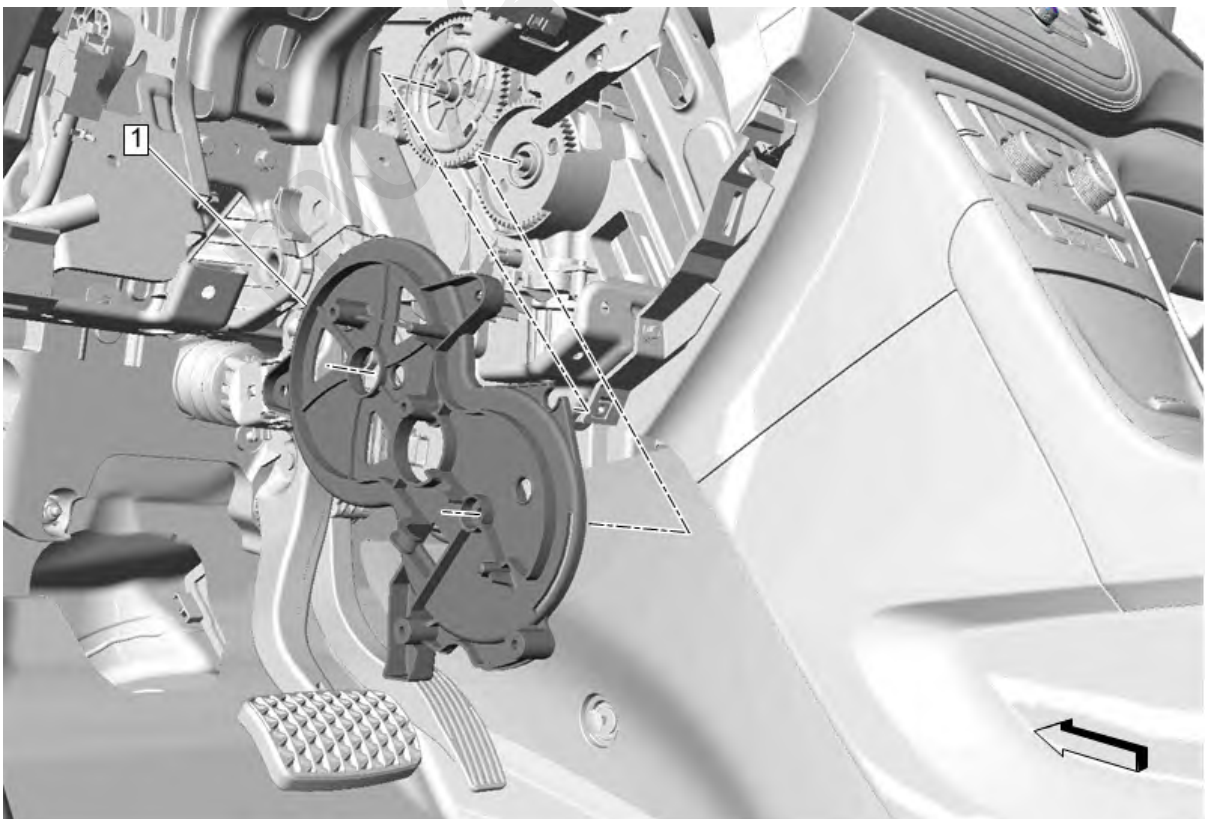


Fig. 27: Heater and Air Conditioning Evaporator and Blower Module Bracket

Courtesy of GENERAL MOTORS COMPANY

2. Install Heater and Air Conditioning Evaporator and Blower Module Bracket (1)

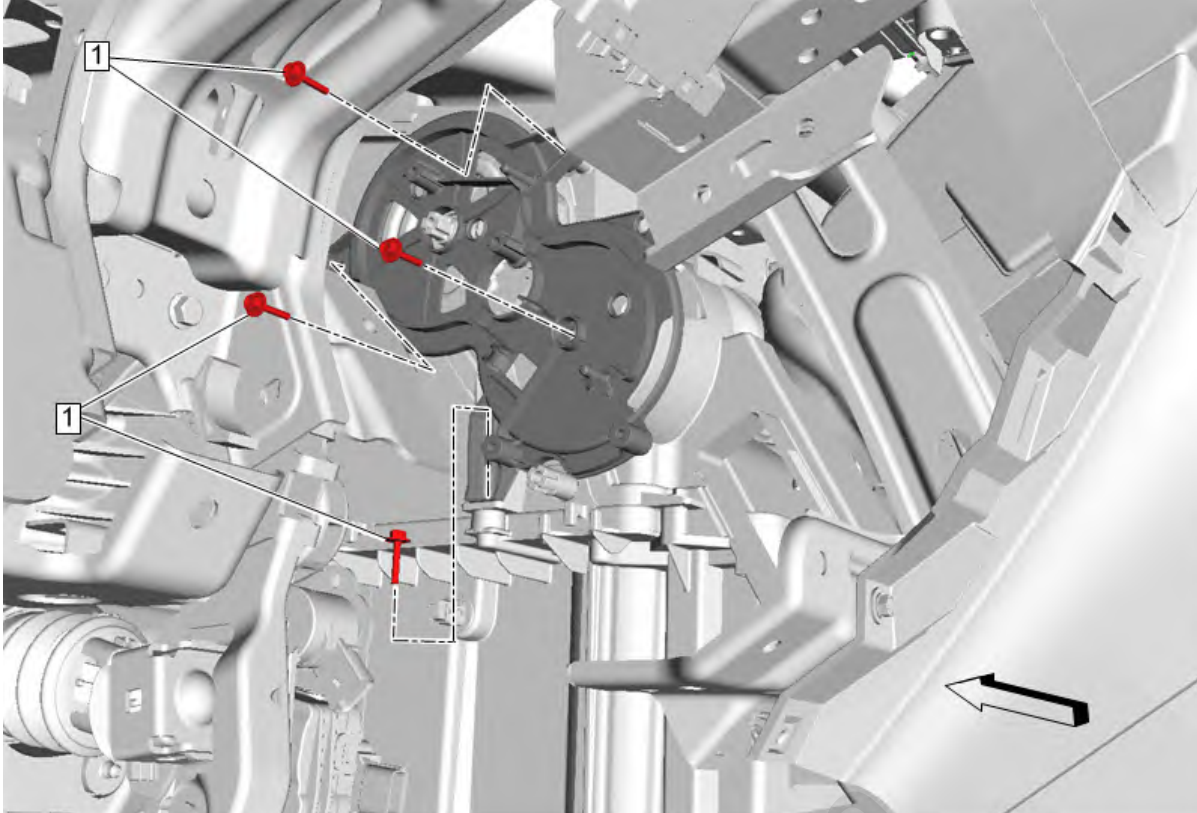


Fig. 28: Heater and Air Conditioning Evaporator and Blower Module Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

3. Install Heater and Air Conditioning Evaporator and Blower Module Bracket Bolt and tighten 1.5 N.m (13 lb in)
4. Connect the electrical connector.

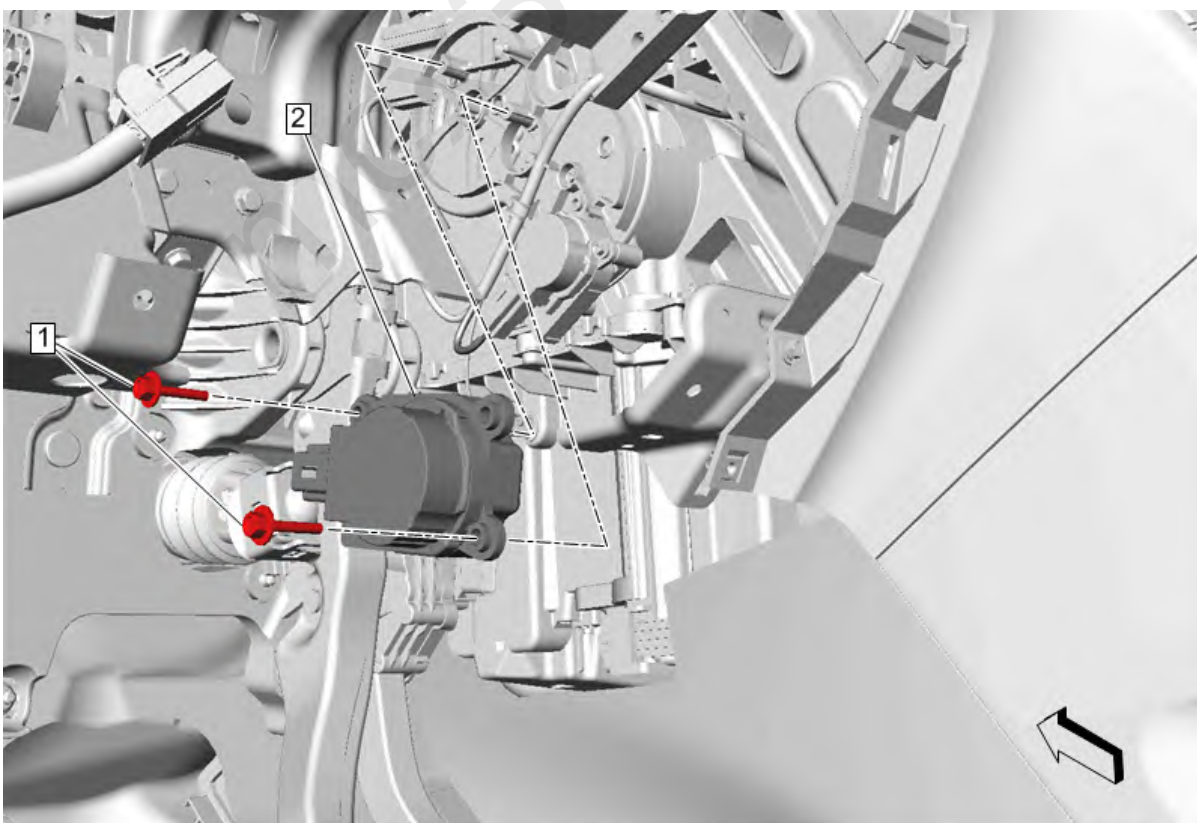


Fig. 29: Mode Control Cam Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

5. Install Mode Control Cam Actuator (2)
6. Install Mode Control Cam Actuator Bolt (1) and tighten 1.5 N.m (13 lb in)

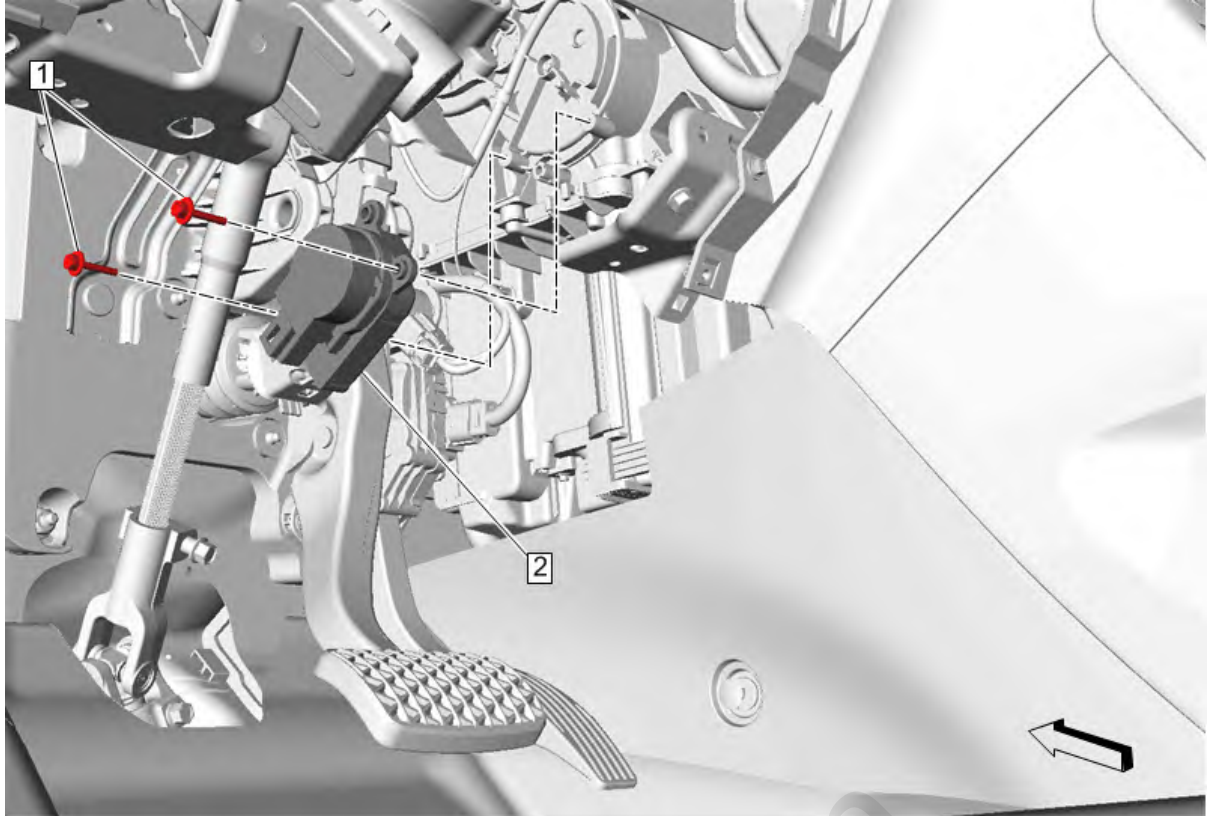


Fig. 30: Air Inlet Valve Actuator

Courtesy of GENERAL MOTORS COMPANY

7. Install Air Inlet Valve Actuator (2) - Left Side - [**Air Inlet Valve Actuator Replacement - Left Side \(With CJ2\)**](#).
8. Steering Column Assembly - [**Steering Column Replacement \(Buick, Mexico, NJ1, With BTM, With N06\)**](#), [**Steering Column Replacement \(Buick, Canada/United States, NJ1, With BTM, Without N06\)**](#), [**Steering Column Replacement \(Chevrolet, Mexico, NJ1, With BTM, With N06\)**](#), [**Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, With BTM, Without N06\)**](#), [**Steering Column Replacement \(Chevrolet, Canada/United States, NJ1, Without BTM, Without N06\)**](#), [**Steering Column Replacement \(Chevrolet, Mexico, NJ1, Without BTM, Without N06\)**](#), [**Steering Column Replacement \(Mexico, N40\)**](#).
9. Connect the battery negative cable. [**Battery Negative Cable Disconnection and Connection \(without KL9\)**](#), [**Battery Negative Cable Disconnection and Connection \(with KL9\)**](#).
10. Clear the DTCs from the heater and air conditioning remote control module.
11. Perform the actuator calibration procedure. [**Actuator Recalibration**](#)

MODE CONTROL CAM ALIGNMENT

Alignment Procedure

NOTE: The HVAC module must be removed to accurately set the mode cam gear timing. Failure to do so may result in poor HVAC performance, and damage to the HVAC module.

1. Remove the heater and air conditioning evaporator and blower module assembly (HVAC). Refer to [**Heater and Air Conditioning Evaporator and Blower Module Removal and Installation**](#).
2. Remove the mode control cam. Refer to [**Mode Control Cam Replacement \(C67\)**](#), [**Mode Control Cam Replacement \(C60 Heater Cam\)**](#), [**Mode Control Cam Replacement \(C60 Mode Cam\)**](#).
3. Inspect the mode valve levers and internal vent valve operation prior to installing the new mode control cam assembly.
4. Replace the components affecting the proper operation of the vent valves.

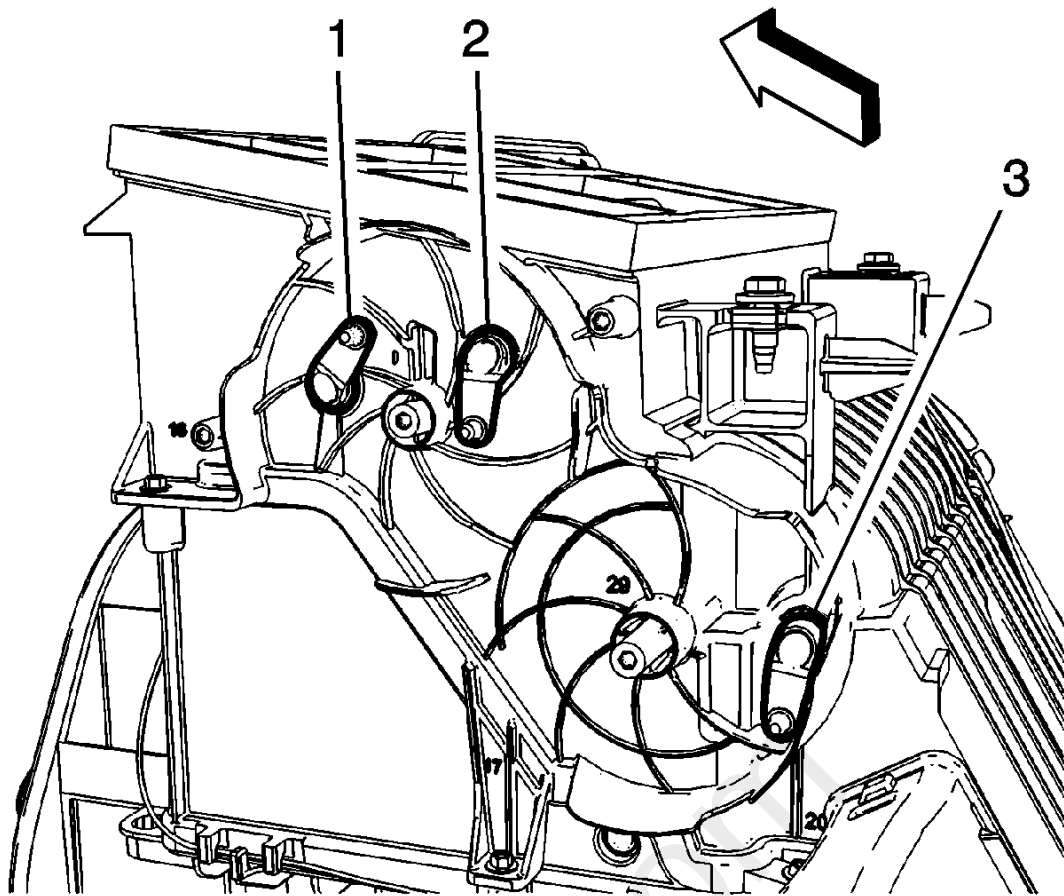


Fig.31: Identifying Defrost Valve Lever, Vent Valve Lever And Heater Valve Lever
Courtesy of GENERAL MOTORS COMPANY

5. Rotate the defrost valve lever (1), vent valve lever (2), and heater valve lever (3) to the position as shown.
6. Using a small brush, apply a lithium based lubricant to the channels of the heater cam, and the mode cam where the levers travel.

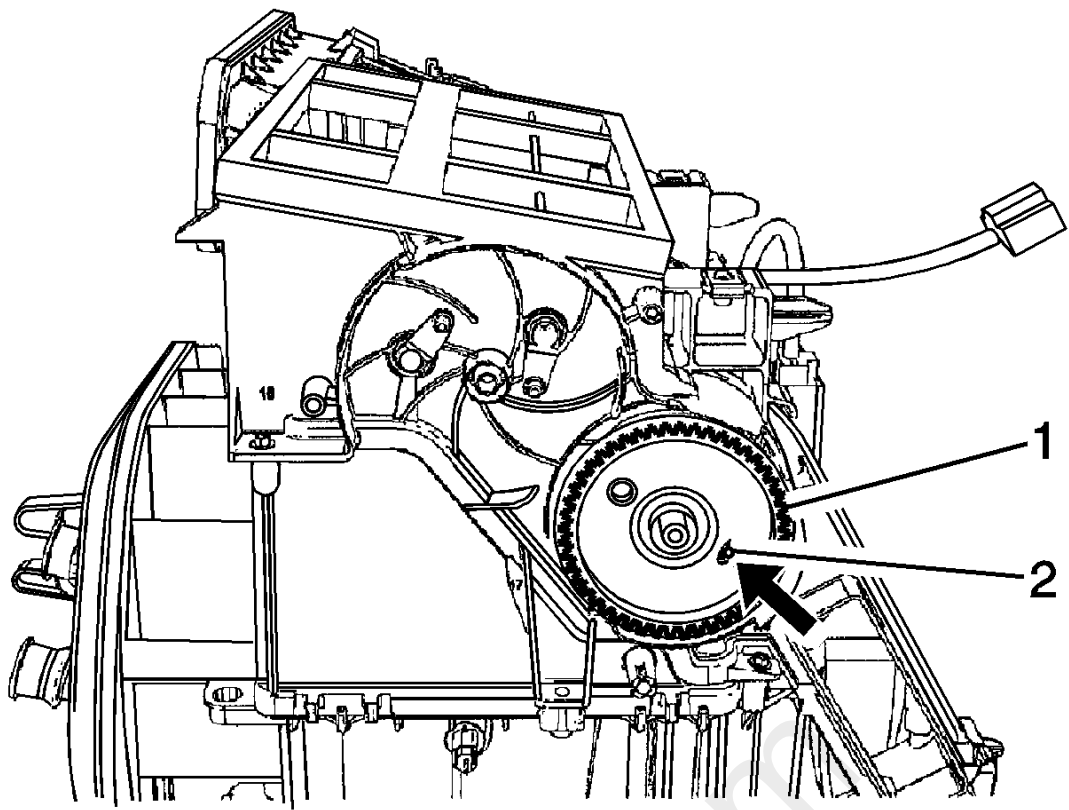


Fig.32: Heater Cam And Heater Valve Lever Pin

Courtesy of GENERAL MOTORS COMPANY

7. Install the heater cam (1) aligning the channel on the back side of the heater cam with the heater valve lever pin (2).
8. Inspect the heater valve lever pin (2) is visible in the heater cam (1) inspection window indicated by the arrow.

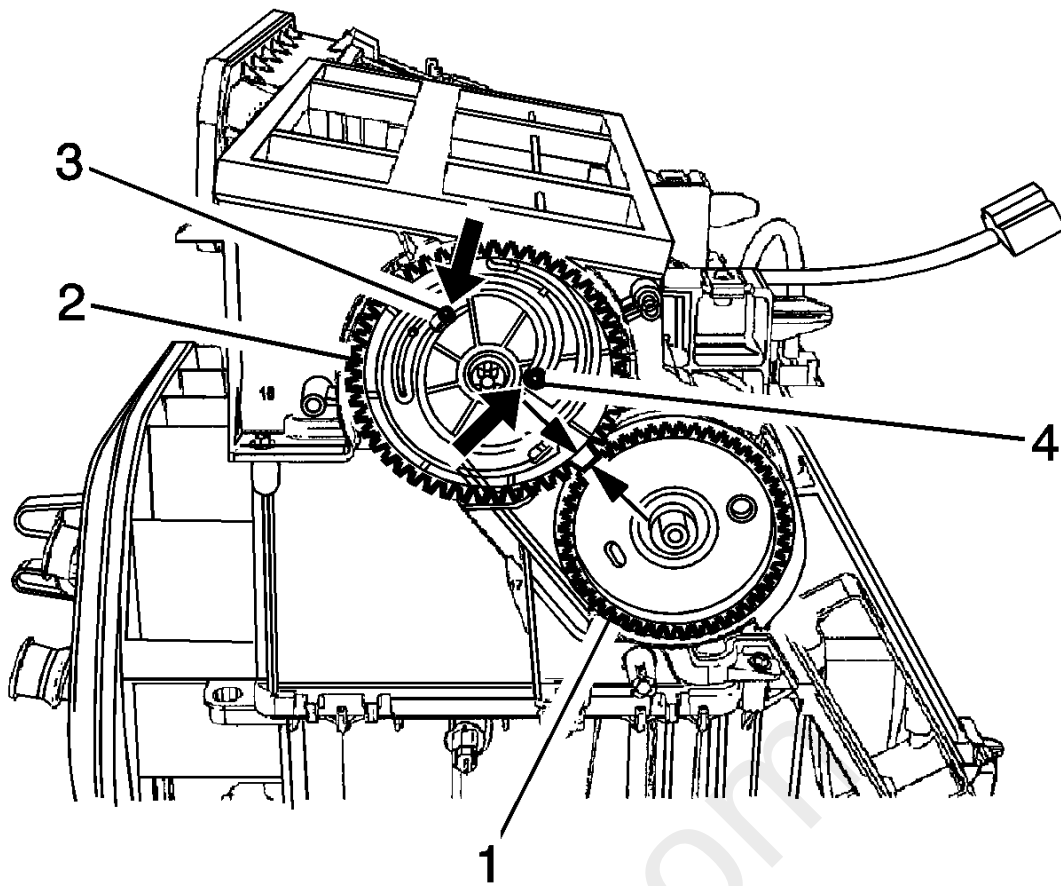


Fig. 33: Heater Cam, Mode Cam, Defroster Valve Lever Pin And Vent Valve Lever Pin
 Courtesy of GENERAL MOTORS COMPANY

NOTE: If the heater cam and mode cam are not aligned correctly, the mode operation will not function properly.

9. Rotate the heater cam (1) counter clockwise, position the larger heater cam female tooth gear as indicated by the arrow.
10. Install the mode cam (2) aligning the larger male tooth with the heater cam (1) larger female tooth indicated by the arrows, while aligning the channels on the back side of the mode cam (2) with the defroster valve lever pin (3), and the vent valve lever pin (4). The pins should be visible through the inspection windows.
11. Verify that the large male tooth on the mode control cam (2) is aligned with the large female tooth on the heater cam (1).
12. Re-install the heater and air conditioning evaporator and blower module assembly (HVAC). Refer to **Heater and Air Conditioning Evaporator and Blower Module Removal and Installation** .
13. Verify for proper operation of the HVAC system.

INSIDE AIR MOISTURE AND WINDSHIELD TEMPERATURE SENSOR REPLACEMENT

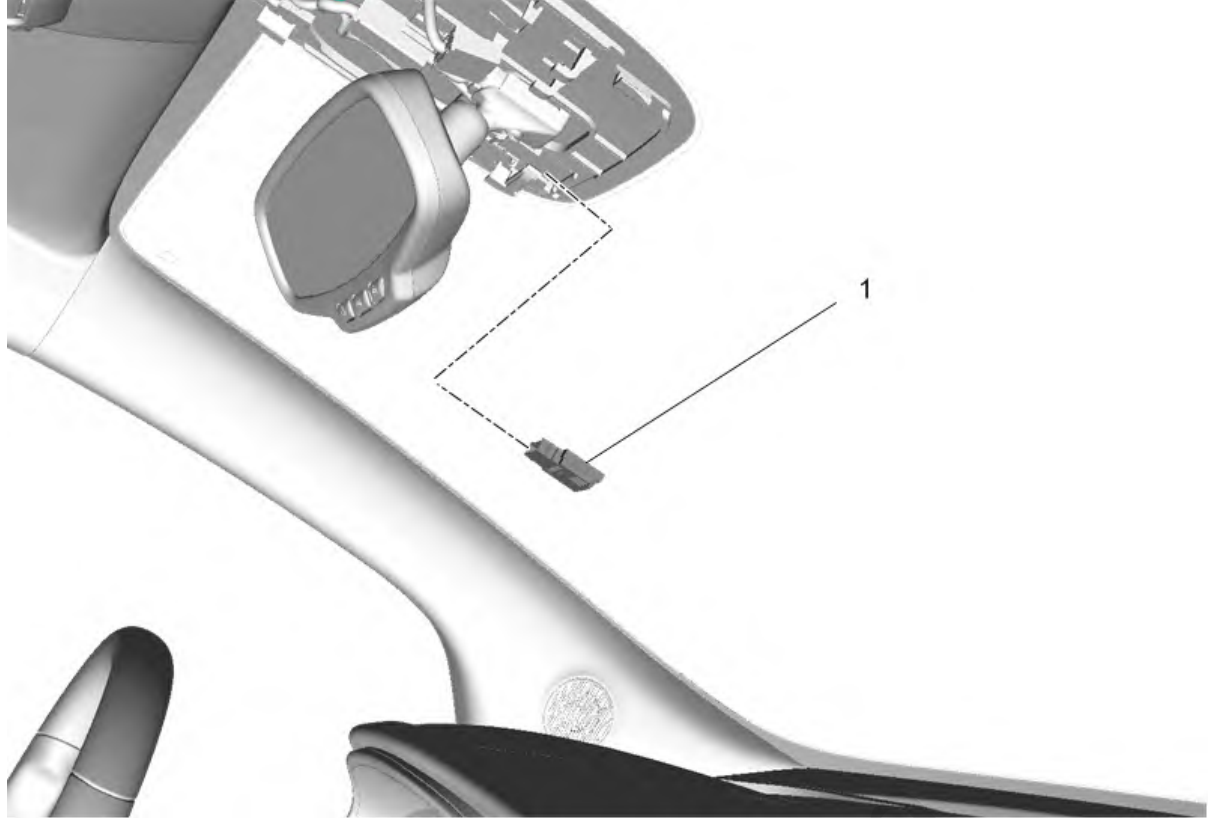


Fig. 34: Inside Air Moisture and Windshield Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Windshield Outside Moisture Sensor Cover Replacement (Buick)</u> , <u>Windshield Outside Moisture Sensor Cover Replacement (Chevrolet)</u>	
1	Inside Air Moisture and Windshield Temperature Sensor Procedures 1. Pull down and slide the inside air moisture and windshield temperature sensor, from the inside air moisture and windshield temperature sensor mounting bracket. 2. Disconnect the electrical connector.

SUN LOAD TEMPERATURE AND HEADLAMP AUTOMATIC CONTROL AMBIENT LIGHT SENSOR REPLACEMENT

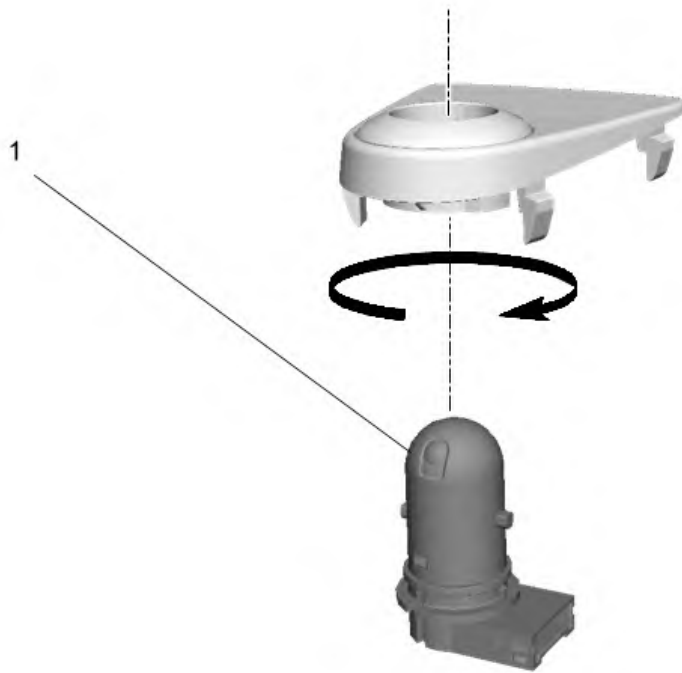


Fig. 35: Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Sun Load Temperature Sensor Bezel Replacement (Buick)</u>	
1	Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Procedure Turn the sun load temperature and head-lamp automatic control ambient light sensor quarter of turn counter clockwise to remove from the sun load temperature sensor bezel.

SUN LOAD TEMPERATURE SENSOR REPLACEMENT (CHEVROLET)

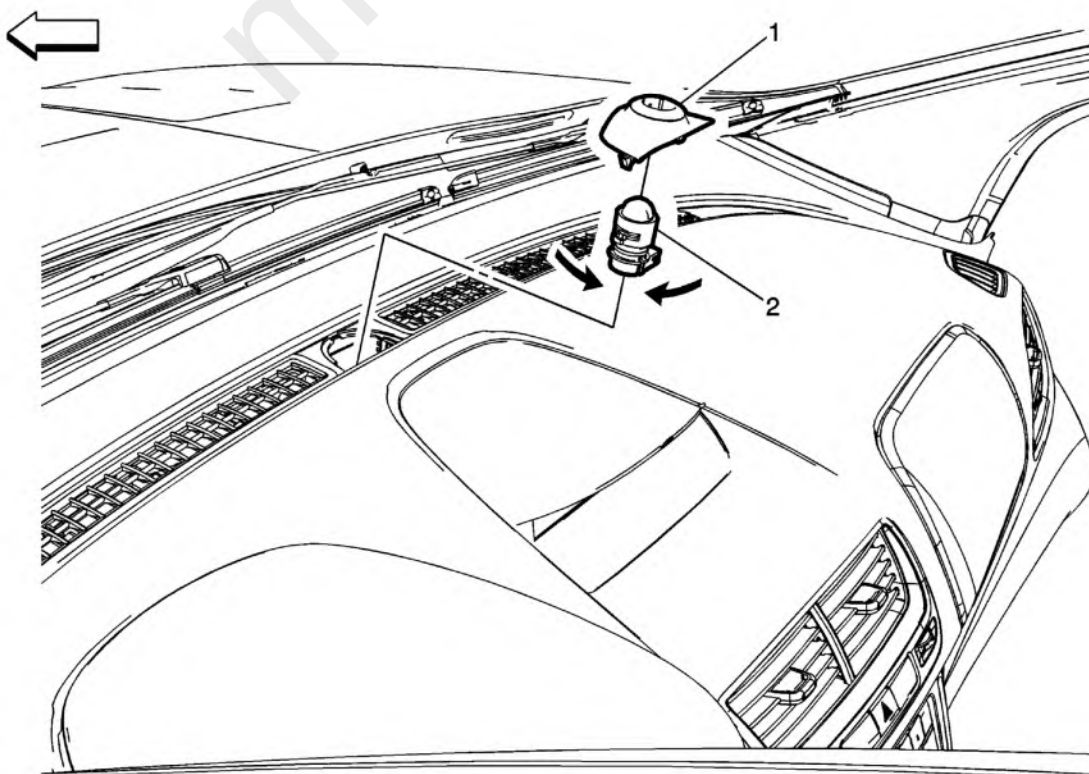


Fig. 36: Sun Load Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Sun Load Temperature Sensor Bezel Refer to Sun Load Temperature Sensor Bezel Replacement (Buick) .
2	Sun Load Temperature Sensor Procedures 1. Disconnect the electrical sun load temperature sensor connector. 2. Turn the sun load temperature sensor quarter of a turn clockwise to remove.

SUN LOAD TEMPERATURE SENSOR REPLACEMENT

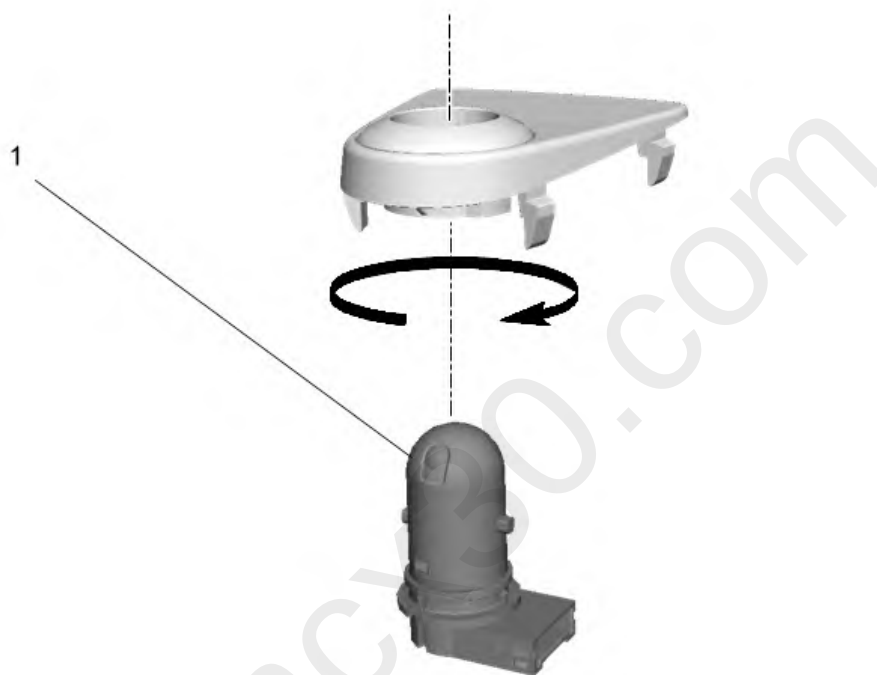


Fig. 37: Sun Load Temperature Sensor Replacement (Buick)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Sun Load Temperature Sensor Bezel Replacement (Buick)	
1	Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Procedure Turn the sun load temperature and head-lamp automatic control ambient light sensor quarter of turn counter clockwise to remove from the sun load temperature sensor bezel.

SUN LOAD TEMPERATURE SENSOR BEZEL REPLACEMENT (BUICK)



Fig. 38: Sun Load Temperature Sensor Bezel
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Sun Load Temperature Sensor Bezel Procedure 1. Use a flat bladed plastic trim tool to aid in the removal of the sensor bezel from the instrument panel assembly. 2. Disconnect the electrical connector. 3. Transfer components as necessary.

DESCRIPTION AND OPERATION

AUTOMATIC 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

The HVAC control contains all switches, buttons, and dials which are required to control the functions of the HVAC system and serve as interface between the operator and the HVAC control module. The selected values are passed to the HVAC control module via LIN-Bus.

HVAC Control Module

The HVAC control module is a GMLAN device that interfaces between the operator and the HVAC system to maintain and control desired air temperature and air distribution settings. The battery positive voltage circuit provides power that the HVAC control module uses for keep alive memory. If the battery positive voltage circuit loses power, all HVAC DTCs and settings will be erased from keep alive memory. The body control module (BCM), which is the vehicle mode master, provides a device ON-Signal. The HVAC control module provides blower, air delivery mode and air temperature settings.

The HVAC control module supports the following features:

Feature	Availability
Afterblow	YES
Purge	NO
Personalization	NO
Actuator Calibration	NO

Actuators

Doors in the HVAC case assembly are used to control air flow. The HVAC control module operates the doors through the use of actuators, with one actuator being used for each door. The system has the following air control doors and associated actuators: mode, temperature, right temperature (CJ2), and recirculation.

Each actuator used in the system is a 5-wire stepper motor. The HVAC control module supplies a 12 V reference voltage to the stepper motor and energizes the 4 stepper motor coils with a pulsed ground signal. The stepper motor moves the associated air control door into the calculated position in order to reach the selected position. The null point of the stepper motor will be calibrated, if the stepper motor is new. When the stepper motor is calibrated, the HVAC control module can drive the applicable coil to reach exactly the desired position of the air control door.

Blower Motor Control Module

The blower motor control module controls the speed of the blower motor by increasing or decreasing the voltage drop on the ground side of the blower motor. The HVAC control module provides a low side pulse width modulation (PWM) signal to the blower motor control module via the blower motor speed control circuit. As the requested blower speed increases, the HVAC control module increases the amount of time that the speed signal is modulated to ground. As the requested blower speed decreases, the HVAC control module decreases the amount of time that the signal is modulated to ground.

Duct Temperature Sensors

The air temperature sensors are 2-wire negative temperature co-efficient thermistors. The sensors operate within a temperature range of -40 to +85Â°C (-40 to +185Â°F). The sensors are installed in the air distribution ducts and measure the temperature of the air that streams from the ducts. The HVAC control module uses these values to calculate the mixed air door position.

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 +85Â°C (-40 to +185Â°F). The sensor is installed at the evaporator and measures its temperature. If the temperature drops under 1Â°C (34Â°F), the A/C compressor will be commanded off in order to prevent icing of the evaporator.

A/C Refrigerant Pressure Sensor

The engine control module (ECM) monitors the high side refrigerant pressure through the signal circuit of 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, a serial data message is sent from the HVAC control module to the ECM indicating the A/C request. If the ECM determines that conditions are acceptable for A/C operation, it will apply ground to the A/C compressor clutch relay control circuit, energizing the A/C compressor clutch relay. With the relay contacts closed, battery voltage is applied through the control circuit to the A/C compressor clutch. The A/C compressor clutch will engage and the compressor will operate.

Ambient Light/Sunload Sensor

The ambient light/sunload sensor includes the sunload sensor and passenger compartment temperature sensor.

This sensor assembly provides information about:

- Sun heat intensity
- Passenger compartment temperature

The solar sensor is connected to ground and to a 5 V stabilized voltage supply through the HVAC control module. As the sunload increases, the sensor signal voltage also increases and vice versa. The signal varies between 1.4-4.5 V and is provided to the HVAC control module.

The passenger compartment temperature sensor is a negative temperature co-efficient thermistor. A signal and low reference circuit enables the sensor to operate. As the air temperature increases, the sensor resistance decreases. The sensor signal varies between 0-5 V.

Bright or high intensity light causes the vehicles interior temperature to increase. The HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle.

Windshield Temperature and Inside Moisture Sensor

The windshield temperature and inside moisture sensor includes the relative humidity sensor, windshield temperature sensor and humidity sensing element temperature sensor.

This sensor assembly provides information about:

- Relative humidity level at windshield (compartment side)
- Temperature of the windshield inside (compartment side)
- Temperature of the humidity sensor element

The relative humidity sensor measures the relative humidity of the compartment side of the windshield. It also detects the temperature of the windshield surface on the passenger compartment side. Both values are used as control inputs for the HVAC control module application to calculate the fog risk on windshield compartment side and ability to reduce fuel consumption by decreasing A/C compressor power to a minimum without causing any fog. The sensor will also enable partial recirculation mode in order to improve heat-up performance of the passenger compartment under cold ambient temperature conditions without the risk of mist build-up on the windshield. The humidity sensor element temperature sensor supplies the temperature of the humidity sensor element.

When equipped with RPO CE1, the HVAC control module receives this information via serial data from the rain sensor module. When not equipped with CE1, the sensor values are received from signal circuits to the HVAC control module.

HVAC Coolant Pump

The coolant heater pump is controlled by a relay. When operating conditions exist that requires coolant flow, the engine control module turns ON the heater coolant pump by applying ground to the relay control circuit which energizes the heater coolant pump relay.

Air Speed

The blower control switch is part of the HVAC faceplate control. The selected value of the blower switch position is sent to the HVAC control module via serial data.

The blower motor control circuitry is integrated within the blower motor control module. The HVAC control module provides a ground pulse width modulation (PWM) signal to the blower motor control module to request a specific motor speed. The blower motor control module translates the PWM signal and drives the motor accordingly.

Air Delivery

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

- Defrost
- Defog
- Panel
- Floor
- BiLevel

In auto mode, the air delivery mode is controlled automatically based on cooling/warming needs of the compartment. The desired air distribution mode can be selected with the air distribution buttons at the HVAC faceplate control. The HVAC control delivers the values to the HVAC control module via serial data. The HVAC control module controls the mode actuator so that it drives the door to the calculated position. Depending on the position of the door, air is distributed through various ducts leading to the outlets in the dash. Turning the mode door to the defrost position, the HVAC control module will move the recirculation actuator to outside air, reducing window fogging. When defrost is selected, the blower motor will be activated. The HVAC control module enables a high volume of air delivered to the front defrost vents. A/C is available in all modes.

The rear window defogger does not affect the HVAC system.

Recirculation Operation

The recirculation switch is integrated into the HVAC control. The selected recirculation switch position is sent to the HVAC control module via LIN-Bus. The HVAC control module controls the air intake using the recirculation actuator. In recirculation mode the recirculation door opens in order to circulate the air within the vehicle. In fresh air mode the recirculation door is closed in order to route outside air into the vehicle.

Inside air recirculation is prevented if the defrost mode is active. When the defrost mode is active, the recirculation actuator opens the recirculation door and outside air is circulated to the windshield to reduce fogging.

In automatic mode the values of the windshield temperature and inside moisture sensor are used as control inputs for the HVAC control module application to calculate the fog risk on passenger compartment side of the windshield compartment side. The A/C compressor and the defrost mode are activated to prevent or remove fog on the passenger compartment side of the windshield.

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, the HVAC controls sends a signal to the HVAC control module via LIN-Bus. The HVAC control module evaluates this signal and sends an A/C request signal to the ECM via CAN-Bus. The ECM checks all preconditions before releasing and if all conditions are met sends a release signal back to the HVAC control module. The ECM will provide a ground for the A/C

compressor relay enabling it to close its internal contacts to send battery voltage to the A/C compressor clutch coil. The A/C compressor clutch will be activated.

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 124°C (255°F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 5 500 RPM
- A/C high side pressure is between 269-2 929 kPa (39-425 PSI)
- Throttle position is less than 100%
- Evaporator temperature is greater than 3°C (38°F)
- ECM does not detect immoderate torque load
- ECM does not detect insufficient idle quality
- The ambient temperature is above 1°C (34°F)

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

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

The air streams into the passenger compartment through the heater core and the evaporator core. The air temperature actuator drives the mixed air door to direct the airflow. If the interior temperature should be increased, the mixed air door is put into the position in which more air streams through the heater core. If the interior temperature should be decreased, the mixed air door is put into the position in which more air streams through the evaporator core.

Recirculation Operation

The recirculation switch is integrated into the HVAC control. The selected recirculation switch position is sent to the HVAC control module via LIN-Bus. The HVAC control module controls the air intake using the recirculation actuator. In recirculation mode the recirculation door opens in order to circulate the air within the vehicle. In fresh air mode the recirculation door is closed in order to route outside air into the vehicle.

Automatic Operation

In automatic operation, the HVAC control module maintains 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 actuator.

To put the HVAC system in automatic mode, the following is required:

1. The auto switch must be activated.
2. The air temperature switch must not be in either the full hot or full cold position.

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

- Monitors the following sensors:
 - Ambient air temperature sensor
 - Ambient light/sunload sensor
 - Windshield temperature and inside moisture sensor
- Regulate the blower motor speed
- Position the air temperature actuators

- Position the mode door actuator
- Position the recirculation actuator
- Request A/C operation
- Control of the A/C compressor

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

When the coldest position is selected in automatic operation the blower stays on high and the air temperature actuators stay in full cold position. The mode actuator remains in the panel position and the recirculation actuator will remain in the recirculation position.

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

Electric Auxiliary Heater (C32)

Some models are equipped with an auxiliary electric heater to assist in warming the passenger compartment when the engine coolant has not sufficiently warmed to operating temperature. The heater is a 12 V positive temperature coefficient heating element located in the HVAC case just downstream of the traditional heater core. The HVAC control module will activate it when the outside temperature is less than approximately 8°C (46°F), the engine coolant temperature is less than approximately 75°C (167°F), and the temperature blend door is commanded to the full hot position.

Engine Coolant and A/C System Refrigerant

For information on engine coolant, coolant flow, A/C refrigerant, and the A/C refrigerant cycle, refer to [Heating and Air Conditioning System Description and Operation](#) .
