

HVAC - Automatic - Equinox & Terrain

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	2.5 N.m (22 lb in)
Heater and Air Conditioning Mode Control Cam Cover Bolt	2.5 N.m (22 lb in)
Heater and Air Conditioning User Interface Control Bolt	2.5 N.m (22 lb in)
Mode Control Cam Actuator Mounting Plate Bolt	2.5 N.m (22 lb in)
Mode Valve Actuator Bolt	2.5 N.m (22 lb in)
Temperature Valve Actuator Bolt	2.5 N.m (22 lb in)

SCHEMATIC WIRING DIAGRAMS

HVAC WIRING SCHEMATICS

Power, Ground, Serial Data and HVAC Controls

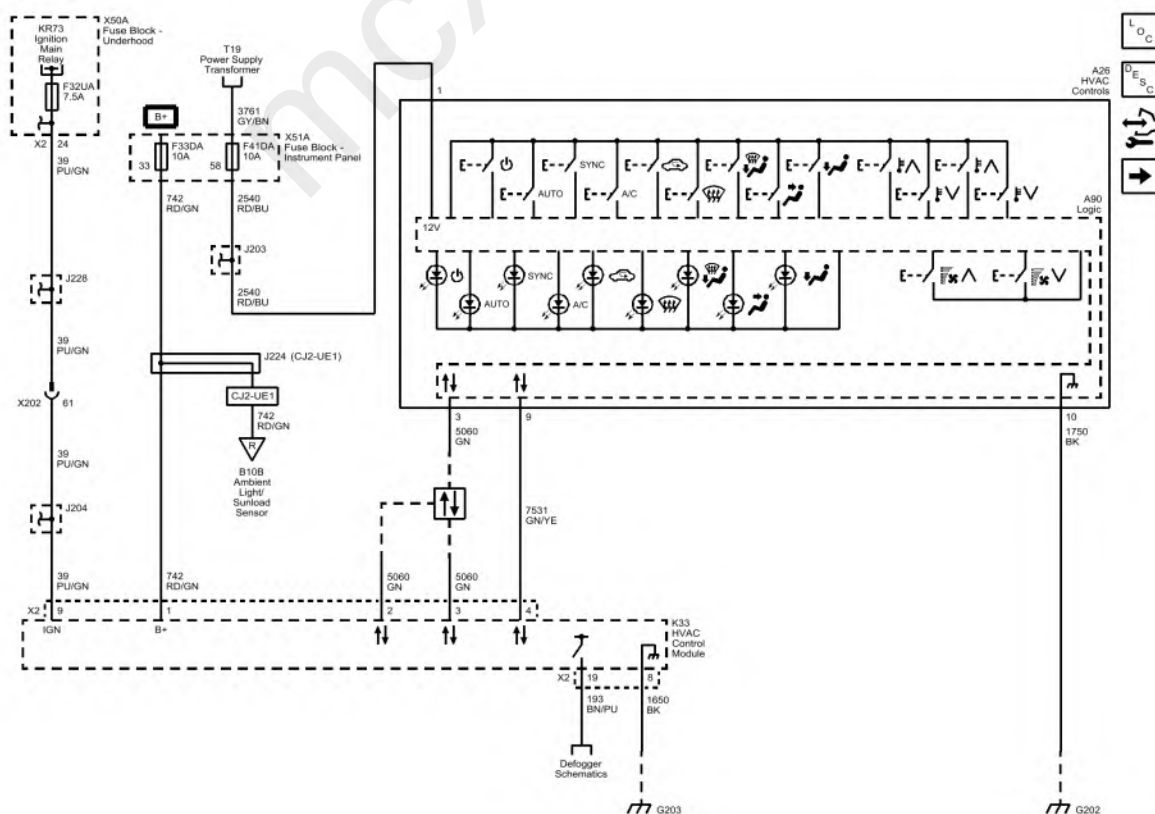


Fig. 1: Power, Ground, Serial Data and HVAC Controls

Courtesy of GENERAL MOTORS COMPANY

A/C Compressor Controls

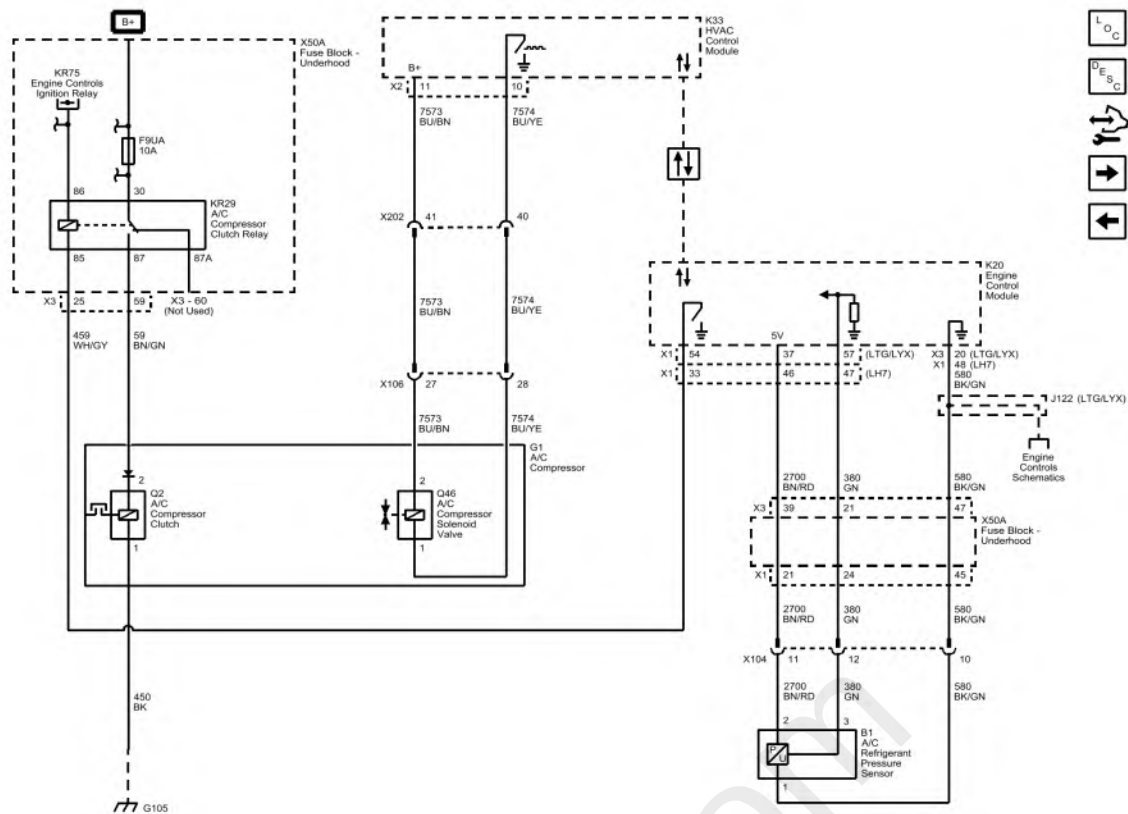


Fig. 2: A/C Compressor Controls
Courtesy of GENERAL MOTORS COMPANY

Blower Motor, and Evaporator Temperature Sensor

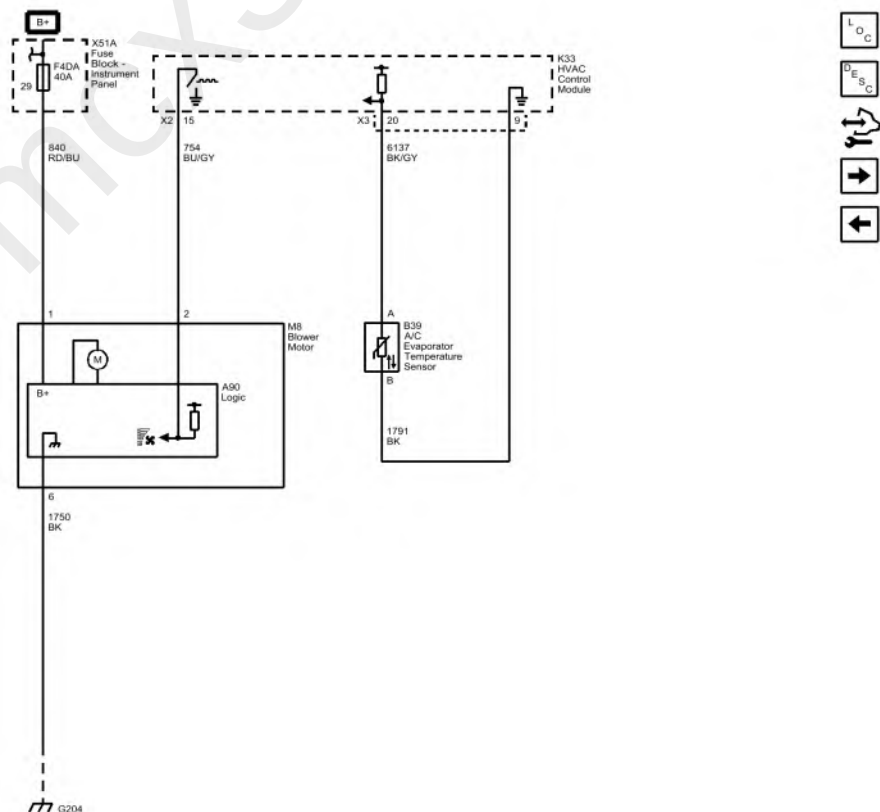


Fig. 3: Blower Motor, and Evaporator Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

Mode and Temperature Control Actuators

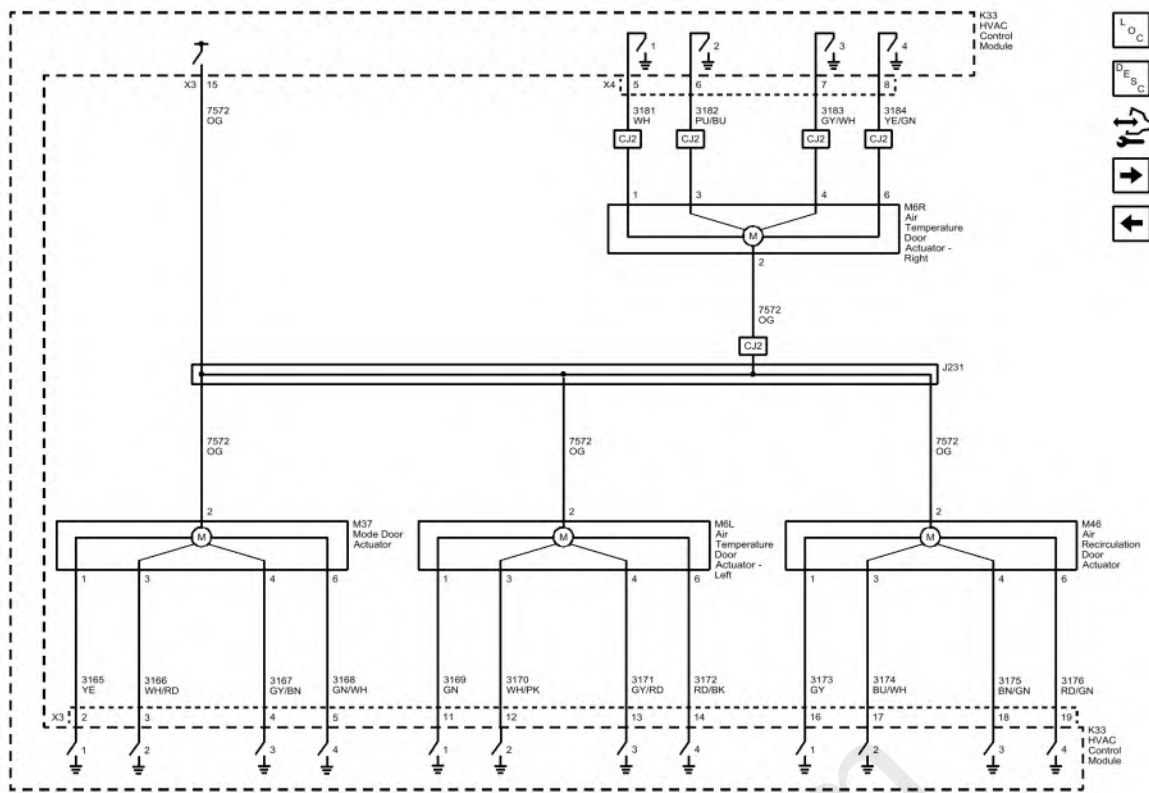


Fig. 4: Mode and Temperature Control Actuators
Courtesy of GENERAL MOTORS COMPANY

Sunload Sensor, and Windshield Temperature Sensor

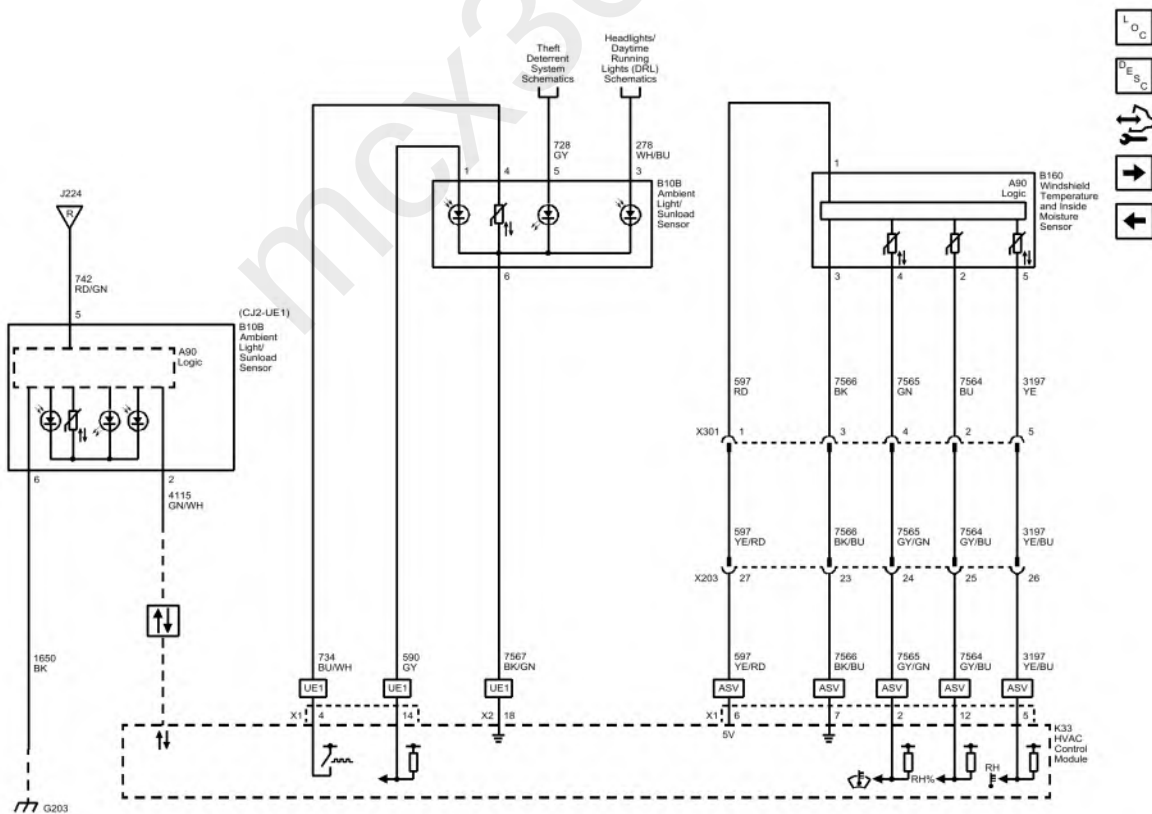


Fig. 5: Sunload Sensor, and Windshield Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

Auxiliary Heater Coolant Pump

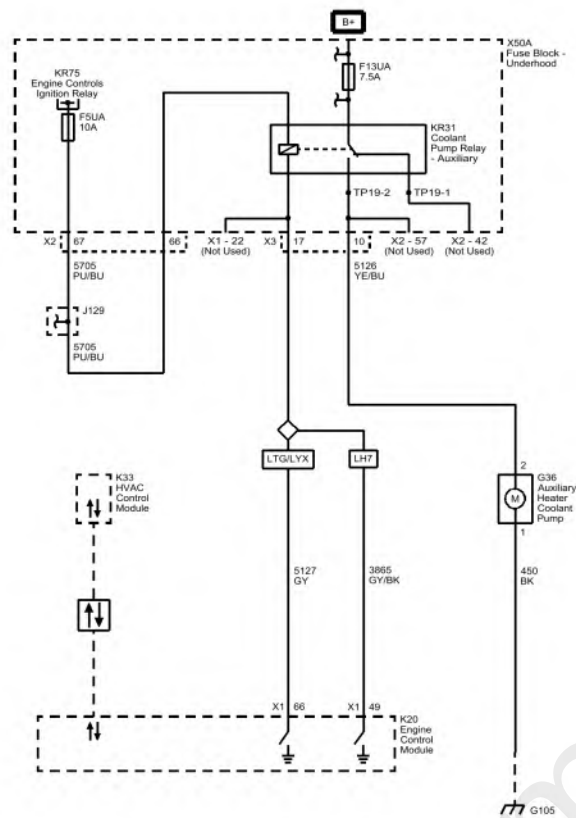


Fig. 6: Auxiliary Heater Coolant Pump
Courtesy of GENERAL MOTORS COMPANY

Electric Auxiliary Heater (C32)

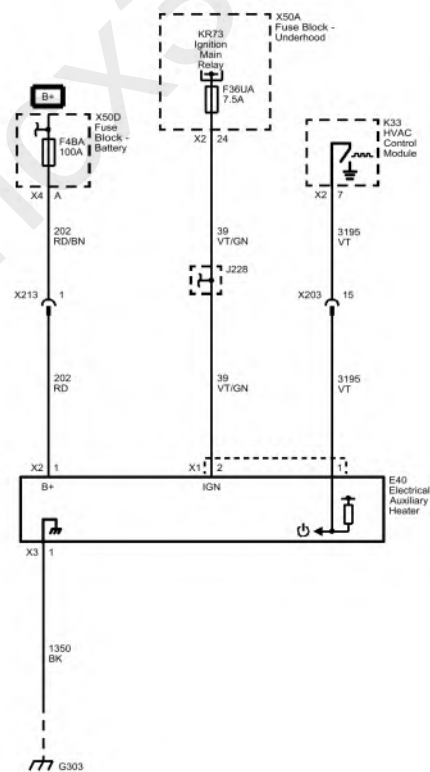


Fig. 7: Electric Auxiliary Heater (C32)
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

HVAC COMPONENT REPLACEMENT REFERENCE

Component	Repair Instruction
A26 HVAC Controls	Heater and Air Conditioning User Interface Control Replacement (Equinox) Heater and Air Conditioning User Interface Control Replacement (Terrain)
B1 A/C Refrigerant Pressure Sensor	Air Conditioning Cycling and Fan Control Refrigerant Pressure Sensor Replacement
B10B Ambient Light/Sunload Sensor	Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Replacement (Equinox) Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Replacement (Terrain)
B160 Windshield Temperature and Inside Moisture Sensor	Inside Air Moisture and Windshield Temperature Sensor Replacement
B39 A/C Evaporator Temperature Sensor	Evaporator Air Temperature Sensor Replacement
E40 Electrical Auxiliary Heater	Auxiliary Heater Core Replacement (C32)
G36 Auxiliary Heater Coolant Pump	Auxiliary Water Pump Replacement (LYX with KL9) Auxiliary Water Pump Replacement (LH7 Equinox) Auxiliary Water Pump Replacement (LTG with KL9) Auxiliary Water Pump Replacement (LH7 Terrain)
K33 HVAC Control Module	Heater and Air Conditioning Remote Control Replacement (Equinox) Heater and Air Conditioning Remote Control Replacement (Terrain)
M37 Mode Door Actuator	Mode Valve Actuator Replacement
M46 Air Recirculation Door Actuator	Air Inlet Valve Actuator Replacement
M6L Air Temperature Door Actuator - Left	Temperature Valve Actuator Replacement - Left Side
M6R Air Temperature Door Actuator - Right	Temperature Valve Actuator Replacement - Right Side
M8 Blower Motor	Blower Motor Replacement
Q2 A/C Compressor Clutch	Air Conditioning Compressor Replacement (LYX) Air Conditioning Compressor Replacement (LTG) Air Conditioning Compressor Replacement (LH7)
Q46 A/C Compressor Solenoid Valve	Air Conditioning Compressor Replacement (LYX) Air Conditioning Compressor Replacement (LTG) Air Conditioning Compressor Replacement (LH7)

DTC B0163 OR B0183: PASSENGER COMPARTMENT TEMPERATURE SENSOR CIRCUIT/SOLAR LOAD SENSOR CIRCUIT

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

DTC Descriptors

DTC B0163

Passenger Compartment Temperature Sensor Circuit

DTC B0183

Solar Load Sensor 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
Sensor Signal Terminal 1	B0183 02	B0183 05	B0183 05	1
Sensor Signal Terminal 4	B0163 02	B0163 05	B0163 05	1
Low Reference	-	B0163 05, B0183 05	-	-
1. HVAC Malfunction				

Circuit/System Description

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

The solar sensor is connected to a low reference and a 5 V biased (pull up) signal circuit voltage from the HVAC control module. As the sunload increases, the sensor signal voltage decreases. The signal varies between 0.1 - 4.9 V and is provided to the HVAC control module.

The passenger compartment temperature sensor is a negative temperature coefficient thermistor. A signal and low reference circuit enable 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 vehicle interior temperature to increase. The 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 or B0183 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.

B0163 05 or B0183 05

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.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

[HVAC Wiring Schematics](#)

COMPONENT CONNECTOR END VIEWS - INDEX

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 harness connector at the B10B Ambient Light/Sunload Sensor. It may take up to 10 min for all vehicle systems to power down.
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.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8 - 5.2 V between the signal circuits listed below and ground.
 - Sunload signal circuit terminal 1.
 - Temperature signal circuit terminal 4.
 - **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 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.
 - **Go to next step: If between 4.8 - 5.2 V**
5. Test or replace the B10B Ambient Light/Sunload Sensor.
6. Verify the DTC does not set or the symptom does not occur while operating the vehicle within the Conditions for Running the DTC.
 - **If the DTC or symptom is not corrected.**

Replace the K33 HVAC Control Module.

- Go to next step: If the DTC or symptom is corrected.

7. All OK.

Repair Instructions

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

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

DTC B018A, B048C, B048F OR B1395: WINDSHIELD TEMPERATURE SENSOR CIRCUIT/HUMIDITY SENSOR HUMIDITY CIRCUIT/HUMIDITY SENSOR TEMPERATURE CIRCUIT/CONTROL MODULE VOLTAGE REFERENCE OUTPUT CIRCUIT

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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 Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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.
 - **Go to next step: 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.
 - **Go to next step: 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.
 - **Go to next step: 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.
 - **Go to next step: 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.
 - **Go to next step: 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.
 - **Go to next step: 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.

- **Go to next step: 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.

- **Go to next step: 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.

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

DTC B0193: FRONT BLOWER MOTOR SPEED CIRCUIT

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

DTC Descriptors

DTC B0193

Front Blower Motor Speed 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
B+	B0193 06	B0193 06	-	-
Control	B0193 06	B0193 06	B0193 01	1
Ground	-	B0193 01	-	-
1. HVAC Malfunction				

Circuit/System Description

The blower motor speed control signal from the HVAC control module, battery positive and ground circuits enable the blower motor to operate. The blower motor control circuitry is integrated within the blower motor assembly. The HVAC control module provides a ground pulse width modulation (PWM) signal to the blower motor to request a specific motor speed. The blower motor translates the PWM signal and drives the motor accordingly.

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

The design of this motor does not allow for bench testing. The motor will not operate by simply applying power and ground.

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

Check for Preliminary Information or Technical Service Bulletins.

Reference Information

Schematic Reference

HVAC Wiring Schematics

Connector End View Reference

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- [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 M8 Blower Motor. 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 6 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.
 - **Go to next step: If less than 10 Ω**
3. Verify a test lamp illuminates between the B+ circuit terminal 1 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 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the M8 Blower Motor.
 - **Go to next step: If the test lamp illuminates**
4. Remove the test lamp.
5. Ignition ON. Test for less than 1 V between the control circuit terminal 2 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
 - **Go to next step: If less than 1 V**
6. Ignition OFF. It may take up to 10 min for all vehicle systems to power down.
7. Test for infinite resistance between the control circuit terminal 2 and ground.
 - **If less than infinite resistance**
 1. Disconnect the X2 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
 - **Go to next step: If infinite resistance**

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

8. Ignition OFF, connect the harness connector at the M8 Blower Motor. Ignition ON.
9. While backprobing terminal 2 at the M8 Blower Motor, test for greater than 1 V between control circuit and ground.
 - **If less than 1 V**

Replace the M8 Blower Motor.
 - **Go to next step: 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**
 1. Ignition OFF, disconnect the X2 harness connector at the K33 HVAC 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 K33 HVAC Control Module.
 - **Go to next step: If the voltage decreases and increases as the blower speed selection is changed**
11. Replace the M8 Blower Motor.

Repair Instructions

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

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

DTC B0223, B0233, B023A, B0408 OR B0418: RECIRCULATE POSITION COMMAND 1 CIRCUIT/AIR FLOW CONTROL CIRCUIT/HVAC ACTUATORS SUPPLY VOLTAGE/MAIN TEMPERATURE CONTROL CIRCUIT/RIGHT TEMPERATURE CONTROL CIRCUIT

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

DTC Descriptor

DTC B0223

Recirculate Position Command 1 Circuit

DTC B0233

Air Flow Control Circuit

DTC B023A

HVAC Actuators Supply Voltage

DTC B0408

Main Temperature Control Circuit

DTC B0418

Right Temperature Control 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
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, B0233 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, 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.

Diagnostic Aids

During diagnosis, it is important to verify that the air control door and any associated components (linkage, cams, gears, etc.) operate properly. Inspect for any conditions that may limit or prevent the air control door from moving smoothly or moving through its full range of travel. Any mechanical issues should be corrected first, before proceeding with electrical diagnosis.

Reference Information

Schematic Reference

HVAC Wiring Schematics

Connector End View Reference

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

Scan Tool Reference

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, B0233, B0408 or B0418.
 - **Go to next step: 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.
 - **Go to next step: 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.
 - **Go to next step: If less than 1 V**
6. Connect the 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.
 - **Go to next step: 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.

- **Go to next step: If the DTC does not set**

10. All OK.

DTC B0223, 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.
 - **Go to next step: 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.
 - **Go to next step: If the test lamp turns ON and then OFF**
6. Test or replace the actuator.

Repair Instructions

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

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

DTC B048D: AUXILIARY HEATER TEMPERATURE COMMAND CIRCUIT

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

DTC Descriptors

DTC B048D 01

Auxiliary Heater Temperature Command Circuit Short to Battery

DTC B048D 06

Auxiliary Heater Temperature Command Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	1	1	-	-
Ignition	B048D 06	B048D 06	-	-
Electrical Auxiliary Heater Control	B048D 06	B048D 06	B048D 01	-
Ground	-	B048D 06	-	-
1. Auxiliary Heater Inoperative				

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.

Conditions for Running the DTC

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

Action Taken When the DTC Sets

The electrical auxiliary heater is inoperative.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

HVAC Wiring Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF, disconnect the X2 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 2 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.
 - **Go to next step: If less than 10 Ω**
3. Verify a test lamp illuminates between the B+ circuit terminal 1 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 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the E40 Electrical Auxiliary Heater.
 - **Go to next step: If the test lamp illuminates**
4. Ignition OFF, remove the test lamp and disconnect the X1 harness connector at the E40 Electrical Auxiliary Heater, ignition ON.
5. 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.
- **Go to next step: If the test lamp illuminates**
6. Ignition OFF, remove the test lamp and disconnect the X2 harness connector at the K33 HVAC Control Module, ignition ON.
7. Test for less than 1 V between the control circuit terminal 7 X2 at the K33 HVAC Control Module harness connector and ground.
 - **If greater than 1 V**

Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
8. Ignition OFF.
9. Test for infinite resistance between the control circuit terminal 7 X2 at the K33 HVAC Control Module harness connector and ground.
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **Go to next step: If infinite resistance**
10. Test for less than 2 Ω between the K33 HVAC Control Module control circuit terminal 7 X2 and control circuit terminal 1 X1 at the E40 Electrical Auxiliary Heater harness connector.
 - **If greater than 2 Ω**

Repair the open/high resistance in the circuit.
 - **Go to next step: If less than 2 Ω**
11. Replace the E40 Electrical Auxiliary Heater and verify the DTC does not reset.
 - **If DTC resets**

Replace the K33 HVAC Control Module.
 - **Go to next step: If DTC does not reset**
12. All OK.

Repair Instructions

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

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

DTC B269A, B269C OR B269D: HEATER COOLANT PUMP CONTROL CIRCUIT

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

DTC Descriptor

DTC B269A

Heater Coolant Pump Control Circuit

DTC B269C

DTC B269D

Heater Coolant Pump Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Switch B+	1	1	-	-
Relay Coil Ignition	B269C	B269A	-	-
Relay Coil Control	B269C	B269A	B269D	-
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.

Conditions for Running the DTC

- The 12 V battery voltage is greater than or equal to 9 V.
- The auxiliary heater coolant pump enable is commanded.

Conditions for Setting the DTC

The engine control module detects the auxiliary heater coolant pump relay control circuit is open, shorted to voltage or shorted to ground.

Action Taken When the DTC Sets

DTCs B269A, B269C and B269D are type B DTCs.

Conditions for Clearing the DTC

DTCs B269A, B269C and B269D are type B DTCs.

Reference Information

Schematic Reference

HVAC Wiring Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF, disconnect the X3 harness connector at the X50A Fuse Block - Underhood.
2. Connect a test lamp between the control circuit terminal 17 and B+, ignition ON.
3. 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.
 - **Go to next step: If the test lamp turns ON and OFF**
4. Ignition OFF and all vehicle systems OFF, connect the X3 harness connector at the X50A Fuse Block - Underhood. 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.
5. 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.
 - **Go to next step: If less than 10 Ω**
6. Connect a test lamp between the control circuit terminal 2 and ground.
7. 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 and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp, disconnect the X3 harness connector at the X50A Fuse Block - Underhood.
 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 X50A Fuse Block - Underhood.
 - **If the test lamp is always OFF and the circuit fuse is open**
 1. Ignition OFF, remove the test lamp.

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, test or replace the G36 Auxiliary Heater Coolant Pump.

• **If the test lamp is always ON**

1. Ignition OFF, disconnect the X3 harness connector at the X50A Fuse Block - Underhood, 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 X50A Fuse Block - Underhood.

• **Go to next step: If the test lamp turns ON and OFF**

8. Test or replace the G36 Auxiliary Heater Coolant Pump.

Repair Instructions

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

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

DTC B3933: A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT

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

DTC Descriptors

DTC B3933 02

A/C Evaporator Temperature Sensor Circuit Short to Ground

DTC B3933 05

A/C Evaporator Temperature Sensor Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Evaporator Temperature Sensor Signal	B3933 02	B3933 05	B3933 05	-
Low Reference	-	B3933 05	-	-

Circuit Description

The evaporator air temperature sensor is a 2-wire negative temperature coefficient thermistor. The HVAC control module provides a low reference circuit and signal circuit. The HVAC control module determines the voltage drop across the sensor, which is proportional to temperature. As the air temperature increases, the sensor resistance decreases and the voltage signal decreases. As the air temperature decreases, the sensor resistance increases and the voltage signal increases.

Conditions for Running the DTC

The ignition 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 DTC will become history if the HVAC control module no longer detects a failure.
- The history DTC will clear after 100 fault-free ignition cycles.

Reference Information

Schematic Reference

HVAC Wiring Schematics

Connector End View Reference

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B39 A/C Evaporator Temperature Sensor.
2. Test for less than 5 Ω between the low reference circuit terminal 2 and ground.
 - **If greater than 5 Ω**
 1. 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.
 - **Go to next step: If less than 5 Ω**
3. Ignition ON, turn the HVAC system ON.
4. Test for 4.8 - 5.2 V between the signal circuit terminal 1 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 5.2 V**

1. Ignition OFF, disconnect the harness connector at the K33 HVAC Control Module, ignition ON.
2. Test for less than 0.3 V between the signal circuit and ground.
 - If greater than 0.3 V, repair the short to voltage on the circuit.
 - If less than 0.3 V, replace the K33 HVAC Control Module.
- **Go to next step: If within 4.8 - 5.2 V**
5. Replace the B39 A/C Evaporator Temperature Sensor and verify the DTC does not reset.
 - **If DTC resets**

Replace the K33 HVAC Control Module.
 - **Go to next step: If DTC does not reset**
6. All OK.

Repair Instructions

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

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

DTC B393B: AIR CONDITIONING COMPRESSOR VALVE CONTROL CIRCUIT

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

DTC Descriptor

DTC B393B

Air Conditioning Compressor Valve Control 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
B+	B393B 0B	B393B 04	-	-
Control	B393B 04	B393B 04	B393B 0B	-

Circuit/System Description

This A/C system uses a conventional clutch to engage and mechanically turn the compressor and a variable displacement solenoid valve to alter the amount of displacement created by the turning of the compressor. The HVAC control module provides both switched battery voltage and a pulse width modulated ground to the variable displacement solenoid valve. When the A/C switch is pressed, the HVAC control module grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is based on adjusted interior temperature and engine load.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B393B 04

A PWM greater than 10% is sent but no current is read back.

B393B 0B

Measured current is above threshold of 815 mA.

Action Taken When the DTC Sets

B393B 04

The A/C compressor is disabled.

B393B 0B

- The A/C compressor is disabled.
- Output will be switched off for hardware protection.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

HVAC Wiring Schematics

Connector End View Reference

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- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the Q46 A/C Compressor Solenoid Valve. Connect a test light between terminals 1 and 2 of the harness connector. Ignition ON.
2. Verify the test light turns on and off when commanding the Q46 A/C Compressor Solenoid Valve ON and OFF with the scan tool.
 - **If the test light does not turn ON and OFF**
 1. Ignition OFF, disconnect the X2 harness connector at the K33 HVAC Control Module, ignition ON.
 2. Test for less than 1 V between ground and each control circuit terminal listed below:
 - terminal 10
 - terminal 11
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V

3. Ignition OFF.

4. Test for infinite resistance between ground and each control circuit terminal listed below:

- terminal 10
- terminal 11
- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

5. Test for less than 2 Ω in each of the control circuits end to end listed below:

- Q46 A/C Compressor Solenoid Valve terminal 1 and K33 HVAC Control Module terminal 10
- Q46 A/C Compressor Solenoid Valve terminal 2 and K33 HVAC Control Module terminal 11
- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K33 HVAC Control Module.

• **Go to next step: If the test light turns ON and OFF**

3. Test the Q46 A/C Compressor Solenoid Valve or replace the G1 A/C Compressor.

Component Testing

A/C Compressor Solenoid Valve Test

1. Ignition OFF, disconnect the harness connector at the Q46 A/C Compressor Solenoid Valve.

2. Test for 7 - 15 Ω between B+ terminal 2 and control terminal 1.

- **If less than 7 Ω or greater than 15 Ω**

Replace the G1 A/C Compressor.

- **Go to next step: If between 7 - 15 Ω**

3. Test for infinite resistance between each terminal and the Q46 A/C Compressor Solenoid Valve housing/case.

- **If less than infinite resistance**

Replace the G1 A/C Compressor.

- **Go to next step: If infinite resistance**

4. All OK.

Repair Instructions

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

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

DTC P0531, 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of the diagnostic category.

DTC Descriptors

DTC P0531

Air Conditioning (A/C) Refrigerant Pressure Sensor Performance

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*	P0532*	P0533*	-
Signal	P0532	P0532	P0533	P0531
Low Reference	-	P0533	-	-
* Additional DTCs may be set based on other components that share the 5 V reference circuit.				

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**P0531**

The A/C high side pressure sensor change over a predetermined period of time is outside of an acceptable expected amount. The expected amount of change is determined using ambient temperature, coolant temperature, vehicle speed, and fan speed.

P0532

The engine control module detects that the A/C pressure is less than 2.5 V.

P0533

The engine control module detects that the A/C pressure is greater than 4.75 V.

Action Taken When the DTC Sets

- DTCs P0531, 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 Wiring Schematics

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- [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. Install the appropriate Air Conditioning Service Center.
3. 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 Circuit/System Testing below.
 - **Go to next step: If the reading is within 10%**
4. 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.
 - **Go to next step: 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.
- **Go to next step: 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 B1 A/C Refrigerant Pressure Sensor 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.
 - **Go to next step: 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 B1 A/C Refrigerant Pressure Sensor 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.
 - **Go to next step: 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.

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

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

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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
Relay Coil Ignition	P0645	P0645	-	-
Relay Switch B+	1	1	-	-
Relay Coil Control	P0646	P0645	P0647	-
Relay Switch Control	1	1	1	-
Ground	-	1	-	-
1. A/C Compressor Malfunction				

Circuit/System Description

When the A/C switch is pressed, an A/C request message is sent to the engine control module (ECM) via serial data. If specific criteria is met, the ECM then grounds the A/C compressor clutch relay coil control circuit, closing the relay contacts. The closed relay contacts provide voltage to the compressor clutch causing it to engage.

Conditions for Running the DTC

- Engine is running.
- The HVAC control module is ON.
- The A/C switch is active.

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

The condition for setting the DTC is no longer present.

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- [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, disconnect the KR29 A/C Compressor Clutch Relay, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 3 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 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Disconnect the harness connector at the Q2 A/C Compressor Clutch.
 4. Test for infinite resistance between the control 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 Q2 A/C Compressor Clutch.
 - **Go to next step: If the test lamp illuminates**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.
 - **If the test lamp does not illuminate**

Refer to [Power Mode Mismatch](#) .

 - **Go to next step: If the test lamp illuminates**
5. Connect a test lamp between the ignition circuit terminal 1 and the control circuit terminal 2.
6. Verify the test lamp turns ON and OFF when commanding the ECM A/C Compressor Clutch Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp and 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 and 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.
 - **Go to next step: If the test lamp turns ON and OFF**
 7. Verify a test lamp does not illuminate between the control circuit terminal 5 and ground.
 - **If the test lamp illuminates**

Repair the short to voltage on the circuit.
 - **Go to next step: If the test lamp does not illuminate**
 8. 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.
 9. 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.
 - **Go to next step: If less than 10 Ω**
 10. Connect the harness connector at the Q2 A/C Compressor Clutch.
 11. Ignition ON, connect a 10 A fused jumper wire between the B+ circuit terminal 3 and the control circuit terminal 5.
 12. Verify the Q2 A/C Compressor Clutch is engaged.
 - **If the Q2 A/C Compressor Clutch does not engage**
 1. Ignition OFF, disconnect the harness connector at the Q2 A/C Compressor Clutch.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the Q2 A/C Compressor Clutch.
 - **Go to next step: If the Q2 A/C Compressor Clutch is engaged**
 13. Test or replace the KR29 A/C Compressor Clutch Relay.

Component Testing

1. Ignition OFF, disconnect the KR29 A/C Compressor Clutch Relay.
2. Test for 60 - 180 Ω between terminals 1 and 2.
 - **If not between 60 - 180 Ω**

Replace the KR29 A/C Compressor Clutch Relay.
 - **Go to next step: If between 60 - 180 Ω**
3. Test for infinite resistance between the terminals listed below:
 - 3 and 1
 - 3 and 2
 - 3 and 5

- 1 and 5
- **If less than infinite resistance**

Replace the KR29 A/C Compressor Clutch Relay.

- **Go to next step: If infinite resistance**

4. Install a 15 A fused jumper wire between terminal 1 and 12 V. Install a jumper wire between terminal 2 and ground.
5. Test for less than 2 Ω between terminals 3 and 5.

- **If 2 Ω or greater**

Replace the KR29 A/C Compressor Clutch Relay.

- **Go to next step: If less than 2 Ω**

6. All OK.

Repair Instructions

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

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

DTC P156A, P156B, P156C: AIR CONDITIONING (A/C) PRESSURE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of the diagnostic category.

DTC Descriptors

DTC P156A

Air Conditioning (A/C) Pressure Too High when A/C Off

DTC P156B

Air Conditioning (A/C) Pressure Too Low when A/C On

DTC P156C

Air Conditioning (A/C) Pressure Too High After Soak Time

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0452, P0532, P0641	P0532	P0453, P0533, P0641	-
Signal	P0532	P0532	P0533	P156A, P156B, P156C
Low Reference	-	P0533	-	-

Circuit/System Description

The engine control module monitors the high side refrigerant pressure through the high side A/C refrigerant pressure sensor. The engine control module 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 engine control module 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 engine control module commands the cooling fans on.

If the engine control module detects the refrigerant pressure sensor signal is not logical based on the current operating conditions, the engine control module sets the DTC.

Conditions for Running the DTC

P156A

- Vehicle ON
- None of these DTCs are set: P0532, P0533, or U016B
- The compressor has been OFF for more than 20 s.
- The ECM monitors the A/C high side pressure every 100 ms when the above conditions are met.

P156B

- Vehicle ON
- None of these DTCs are set: P0532, P0533, or U016B
- The compressor has been ON for more than 10 s.
- The ECM monitors the A/C high side pressure every 100 ms when the above conditions are met.

Conditions for Running the DTC

P156A

- P156A is a type B DTC
- The ECM detects the A/C high side pressure is too high based on the current operating conditions.

P156B

- P156B is a type B DTC
- The ECM detects the A/C high side pressure is too low based on the current operating conditions.

Action Taken When the DTC Sets

P156A and P156B are type B DTCs

Conditions for Clearing the DTC

P156A and P156B are type B DTCs

Diagnostic Aids

A malfunction within the refrigerant system causing can cause these DTCs to set.

Reference Information

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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 no other DTCs are set.
 - **If any other DTCs are set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If no other DTCs are set**
3. Install the appropriate Air Conditioning Service Center.
4. 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 P0531, P0532 or P0533](#).
 - **Go to next step: If the reading is within 10%**
5. Refer to [Air Conditioning \(A/C\) System Performance Test \(R-134a\)](#), [Air Conditioning \(A/C\) System Performance Test \(R-1234yf\)](#) .

[Repair Instructions](#)

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

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

Diagnostic Aids

Check the following mechanical fault sources:

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

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Scan Tool Reference

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

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.
 - **Go to next step: 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](#).
 - **Go to next step: If the blower motor operates properly in each speed position**
4. Verify all HVAC doors move when pressing the appropriate switch.
 - **If any HVAC door does not move**
Refer to [DTC B0223, B0233, B023A, B0408 or B0418](#).
 - **Go to next step: If all HVAC doors move**
5. Install the appropriate ACR Air Conditioning Recharge Service Center.
6. Verify the high side pressure reading on the Air Conditioning Service Center is within 10% of the scan tool A/C High Side Pressure Sensor parameter.
 - **If the reading is not within 10%**
Refer to [DTC P0531, P0532 or P0533](#).
 - **Go to next step: 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 \(R-134a\)](#), [Air Conditioning \(A/C\) System Performance Test \(R-1234yf\)](#).
 - **Go to next step: If the reading is between 269-2929 kPa (39-425 PSI)**
8. Verify the A/C Evaporator Temperature Sensor scan tool parameter is within 10% of ambient temperature.
 - **If not within 10% of ambient temperature**
Refer to [DTC B3933](#).
 - **Go to next step: 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, B048F or B1395](#).
 - **Go to next step: 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 \(R-134a\)](#), [Air Conditioning \(A/C\) System Performance Test \(R-1234yf\)](#) and [DTC B393B](#).
- **Go to next step: 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](#) .
 - **Go to next step: 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 or other suitable item.
 - **If the Sunload parameter does not change**

Refer to [DTC B0163 or B0183](#).
 - **Go to next step: 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 or B0183](#).
 - **Go to next step: If less than a 3Â°C (5Â°F) difference**
16. Verify the vehicle is equipped with RPO code C32.
 - **If the vehicle is not equipped with RPO code C32**

Refer to step 18.
 - **Go to next step: If the vehicle is equipped with RPO code C32**
17. Verify the E40 Electrical Auxiliary Heater is operating properly.
 - **If the E40 Electrical Auxiliary Heater is not operating properly**

Refer to [DTC B048D](#)
 - If the E40 Electrical Auxiliary Heater is operating properly.
18. All OK.

Repair Instructions

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

- Refer to [HVAC Component Replacement Reference](#)
- Refer to [Control Module References](#) for 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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.

This A/C system utilizes a variable displacement solenoid valve to alter the amount of displacement created by the turning of the compressor. The HVAC control module provides both battery voltage and a pulse width modulated ground to the variable displacement solenoid valve. When the A/C switch is pressed, the HVAC control module grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is regulated based on the adjusted interior temperature.

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 - 2929 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 sensor senses above 1Â°C (34Â°F).
- Blower motor is ON.

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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.

- **Go to next step: 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 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.

- **Go to next step: If the parameter changes**

6. Verify the A/C compressor clutch engages and disengages when commanding the ECM A/C Relay output function On and Off with a scan tool.

- **If the A/C compressor clutch does not engage or disengage as commanded**

Refer to [DTC P0645, P0646 or P0647](#)

- **Go to next step: If the A/C compressor clutch engages and disengages as commanded**

7. Engine ON.

8. Verify the HVAC control module scan tool A/C Compressor Refrigerant Solenoid Valve Command parameter changes with varying cooling loads.

- **If the parameter does not change**

Refer to [DTC B393B](#)

- **Go to next step: If the parameter does change**

9. All OK.

Repair Instructions

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

- Refer to [HVAC Component Replacement Reference](#)
- Refer to [Control Module References](#) for HVAC 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.

Use the following procedure to enable the afterblow feature:

1. Connect the Scan Tool.
2. Ignition ON/Vehicle in Service Mode
3. Select Module Diagnostics.
4. Select HVAC Control Module.
5. Select Configuration/Reset Functions.
6. Select HVAC Afterblow Configuration.

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

- The vehicle must be turned OFF.
- The outside air temperature must be at least 11Â°C (52Â°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 (non GMNA)
- J-38125-5A Ultra Torch Special Tool
- J-38125-8 Splice Sleeve Crimping Tool (GMNA)

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.

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: The DuraSeal splice sleeves have the following 2 critical features:

- A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside.
- A cross hatched (knurled) core crimp provides the necessary low resistance contact integrity for these sensitive, low energy circuits.

Use only DuraSeal splice sleeves to form a one-to-one splice on all types of insulation except high voltage and specialty cables. 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 Selection

Splice Sleeve Color	Crimp Tool Nest Color		Wire Gauge mm ² / (AWG)
	3 Crimp Nests	4 Crimp Nests	
Salmon (Yellow-Pink) 19300089	Red (1) or Red/Green (1)	Red (2)	0.22 - 0.8/(18 - 26)
Blue 19168447	Blue (2)	Blue (3)	1.0 - 2.0/(14 - 16)
Yellow 19168448	Yellow (3)	Yellow (4)	3.0 - 5.0/(10 - 12)

NOTE: You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must 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. You may need the extra length of wire 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.
 - If you are unsure of the wire size, 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.

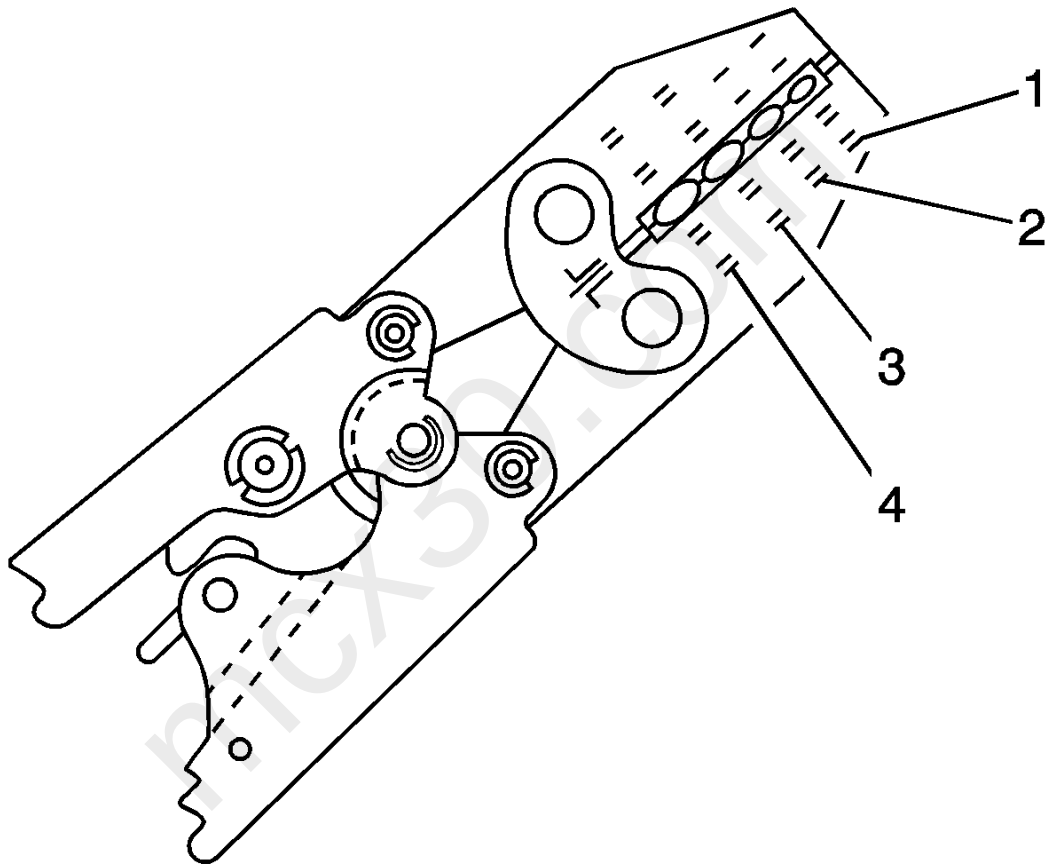


Fig. 8: Splice Sleeve Crimping Tool With 4 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

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.

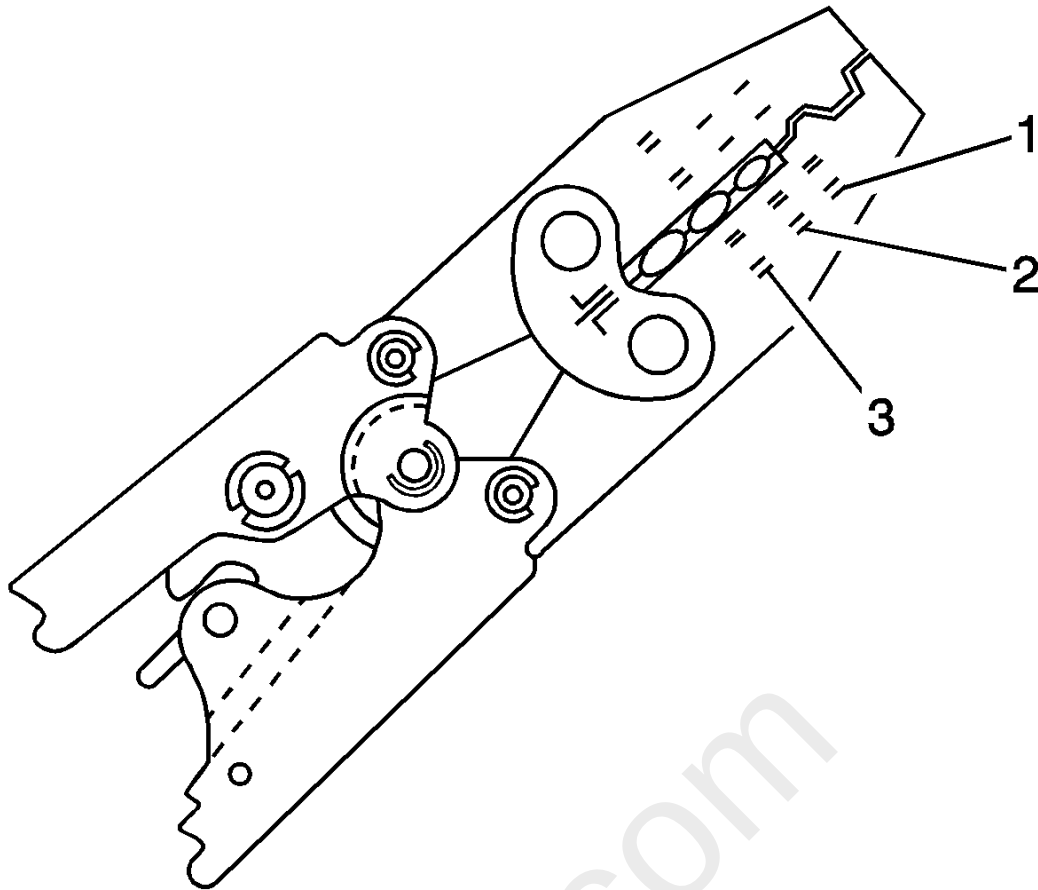


Fig. 9: Splice Sleeve Crimping Tool With 3 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

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).

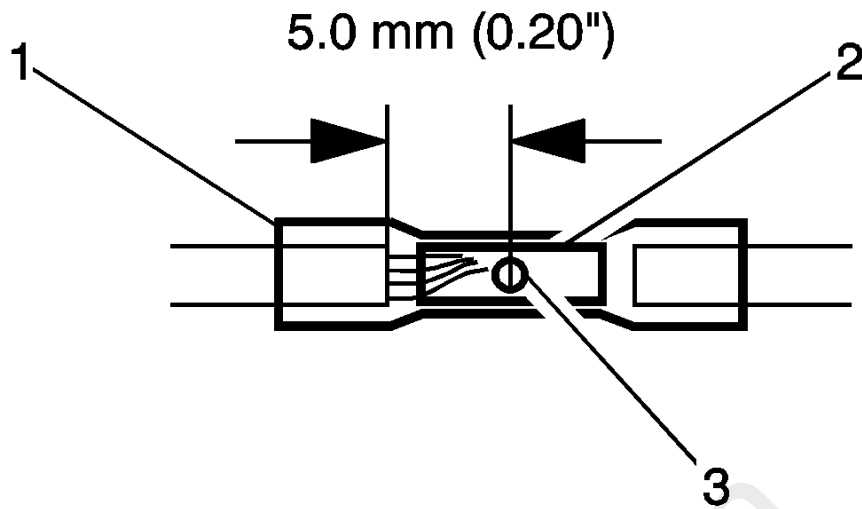


Fig. 10: Identifying DuraSeal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

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. Refer to **Folded-Over Wire Repair** for splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes) and for splicing wires of different gauges.
11. Tightly close the handles of the crimp tool until the crimper handles open when released.

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



Fig. 12: Heated 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.

Weatherpack™ Wiring Repair

NOTE: Some replacement pigtail connectors may be delivered without the terminated leads installed into the connector. For Weatherpack™ connectors, all terminated leads included in the package should to be installed into the connector. If the connector end view shows that a terminal is not occupied, the extra terminated lead(s) need to be installed and the end(s) sealed using a DuraSeal splice sleeve and taped back into the harness.

1. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop. Refer to **Folded-Over Wire Repair** for splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes) and for splicing wires of different gauges.

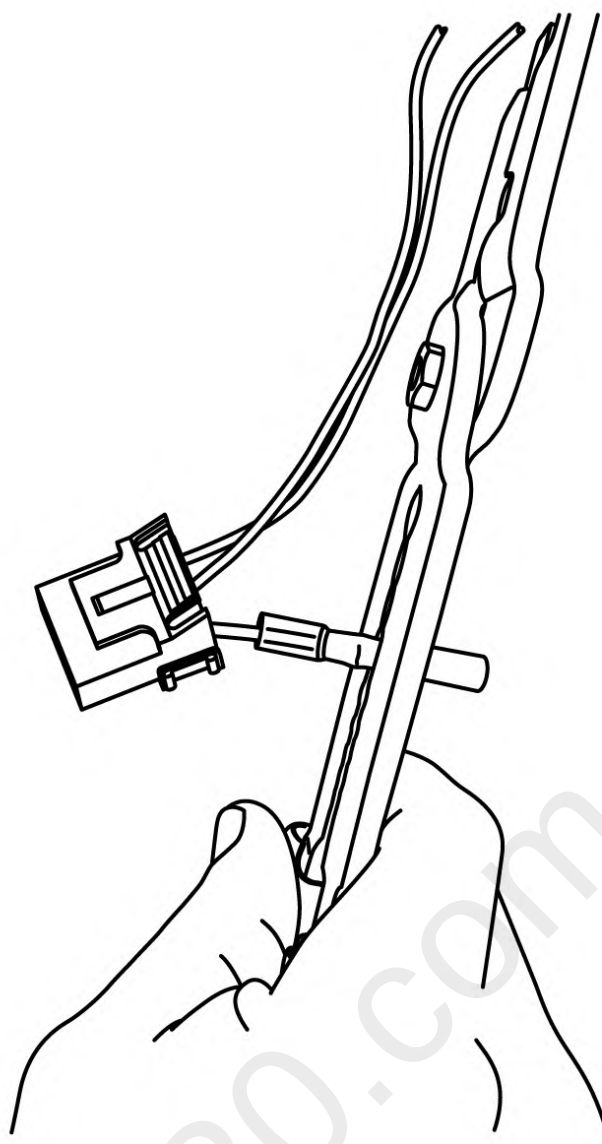


Fig. 13: Tightly Close Handles Of Crimp Tool
Courtesy of GENERAL MOTORS COMPANY

2. Tightly close the handles of the crimp tool until the crimper handles open when released.

The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Holding the DuraSeal with one hand gently tug on the wire to ensure it is crimped in the DuraSeal.

3. Using the heat torch, apply heat to the crimped area of the barrel.

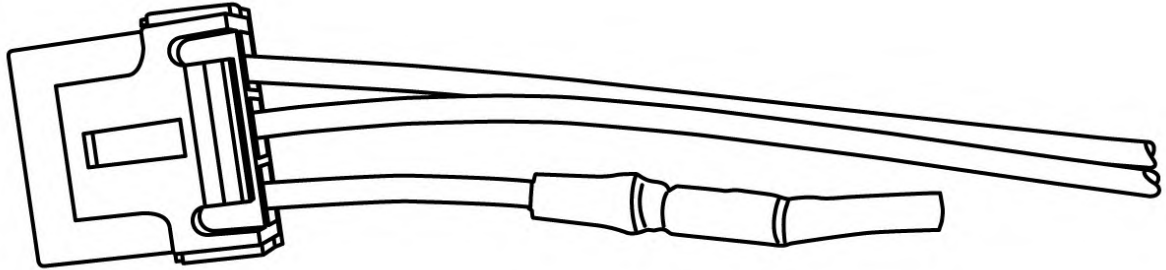


Fig. 14: Heat To Crimped Area Of Barrel

Courtesy of GENERAL MOTORS COMPANY

4. 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.

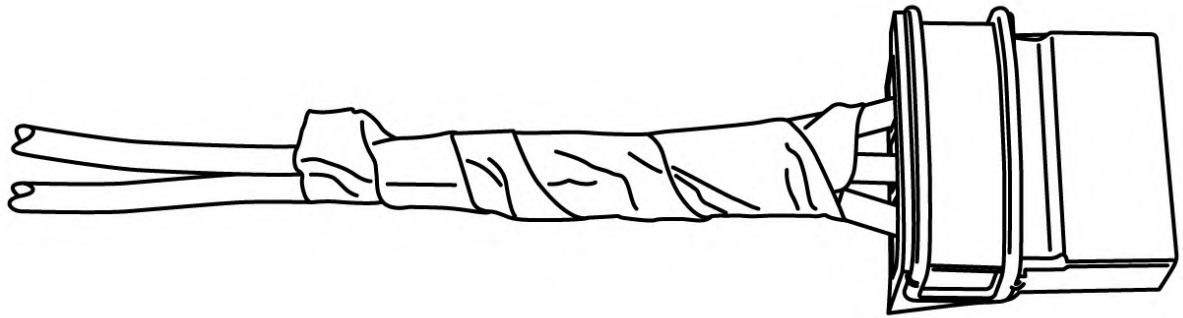


Fig. 15: Taping Extra Terminated Leads Back Into Harness
Courtesy of GENERAL MOTORS COMPANY

5. Tape the extra terminated lead(s) back into the harness.

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:

- Loose, corroded, or painted terminal stud/fastener
- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- A terminal not seated all the way into the connector body
- 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 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns 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 Wiring Schematics .
- 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 (screw or stud). 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 Wiring Schematics .

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 mis-routed harness that is too close 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.

Incorrect Control Module

- There are only a few situations where reprogramming a control module is appropriate:
 - A new service control module is installed.
 - A control module from another vehicle is installed.
 - Revised software/calibration files have been released for this vehicle.

NOTE: **DO NOT re-program the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.**

- Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to [Control Module References](#) for replacement, setup, and programming.

HEATER AND AIR CONDITIONING USER INTERFACE CONTROL REPLACEMENT (EQUINOX)

Removal Procedure

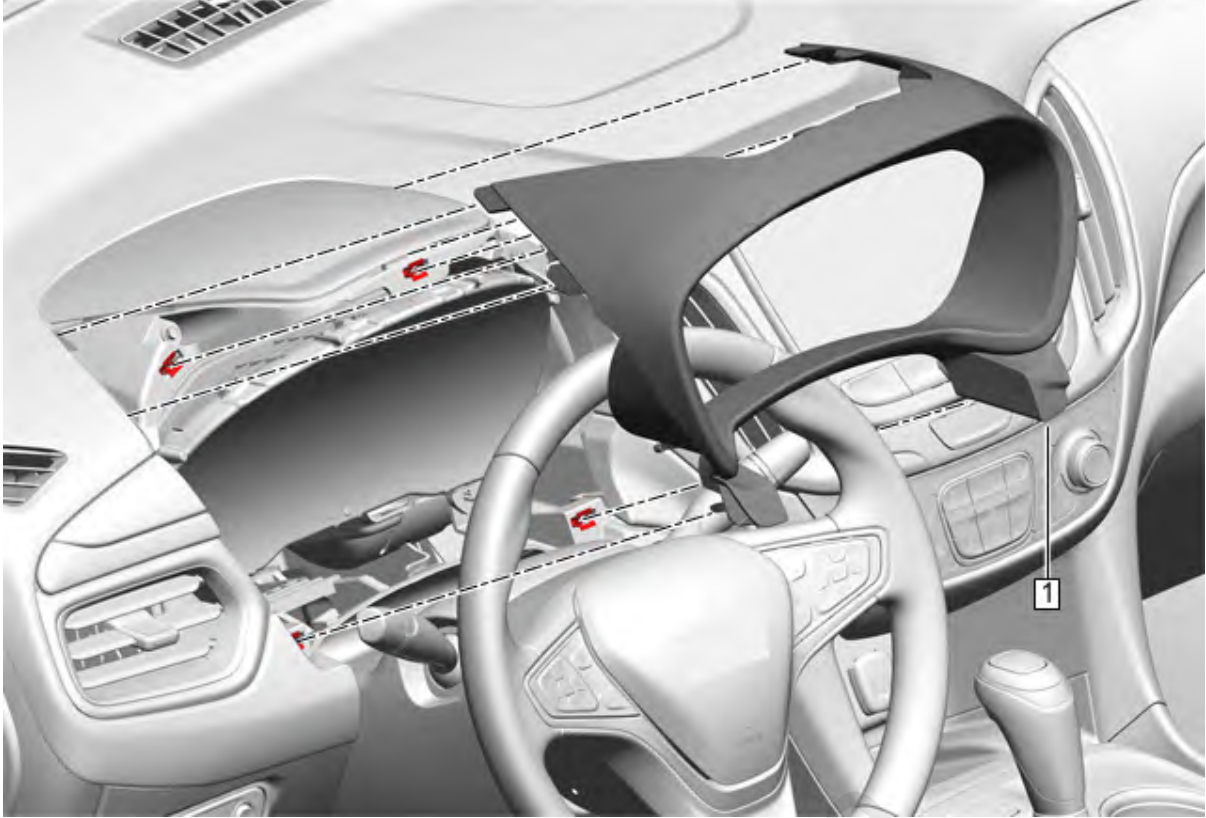


Fig. 16: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#)

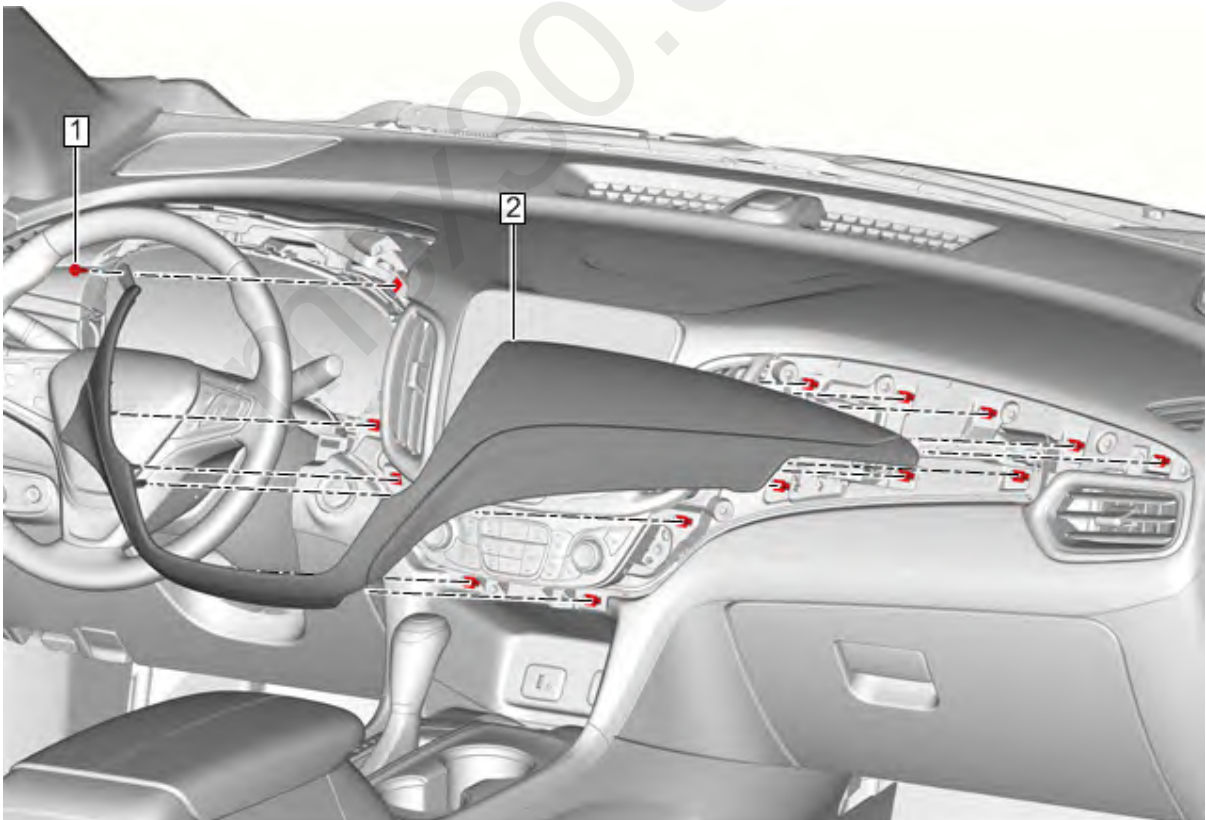


Fig. 17: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#)

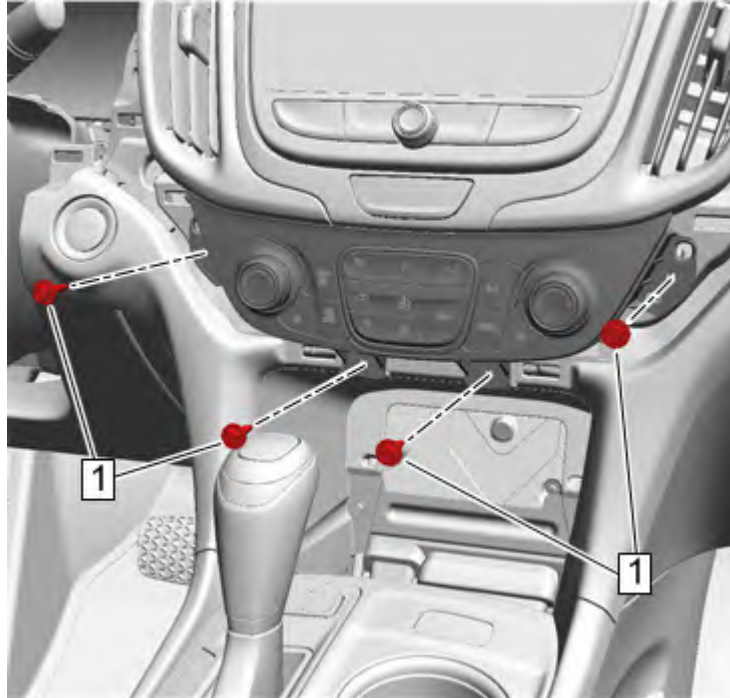


Fig. 18: Heater And Air Conditioning User Interface Control Bolts
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Heater and Air Conditioning User Interface Control Bolt (1) (Qty: 4)



Fig. 19: Heater And Air Conditioning User Interface Control
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Heater and Air Conditioning User Interface Control (1)
5. Disconnect the electrical connector.

Installation Procedure



Fig. 20: Heater And Air Conditioning User Interface Control
 Courtesy of GENERAL MOTORS COMPANY

1. Connect the electrical connector.
2. Install Heater and Air Conditioning User Interface Control (1)

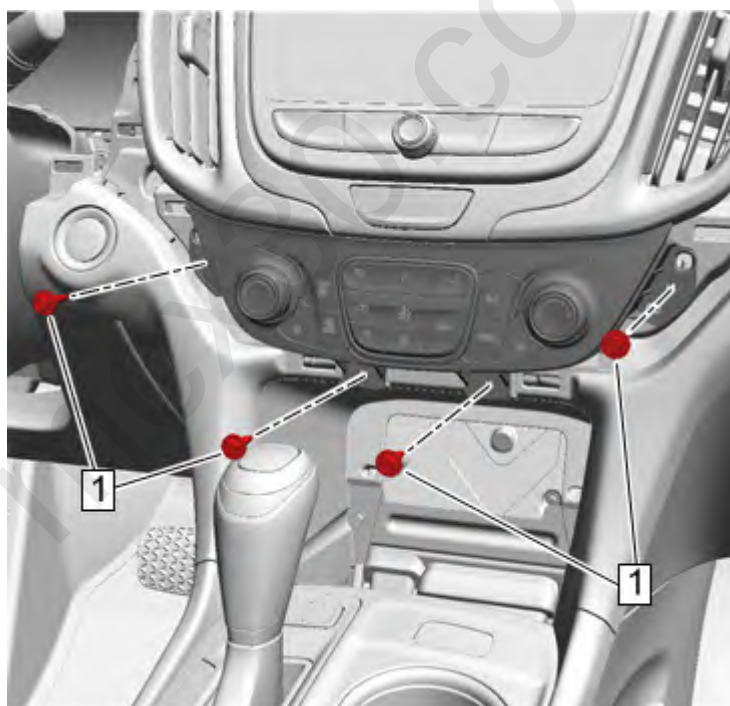


Fig. 21: Heater And Air Conditioning User Interface Control Bolts
 Courtesy of GENERAL MOTORS COMPANY

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

3. Install and tighten Heater and Air Conditioning User Interface Control Bolt (1) (Qty: 4) to 2.5 N.m (22 lb in)

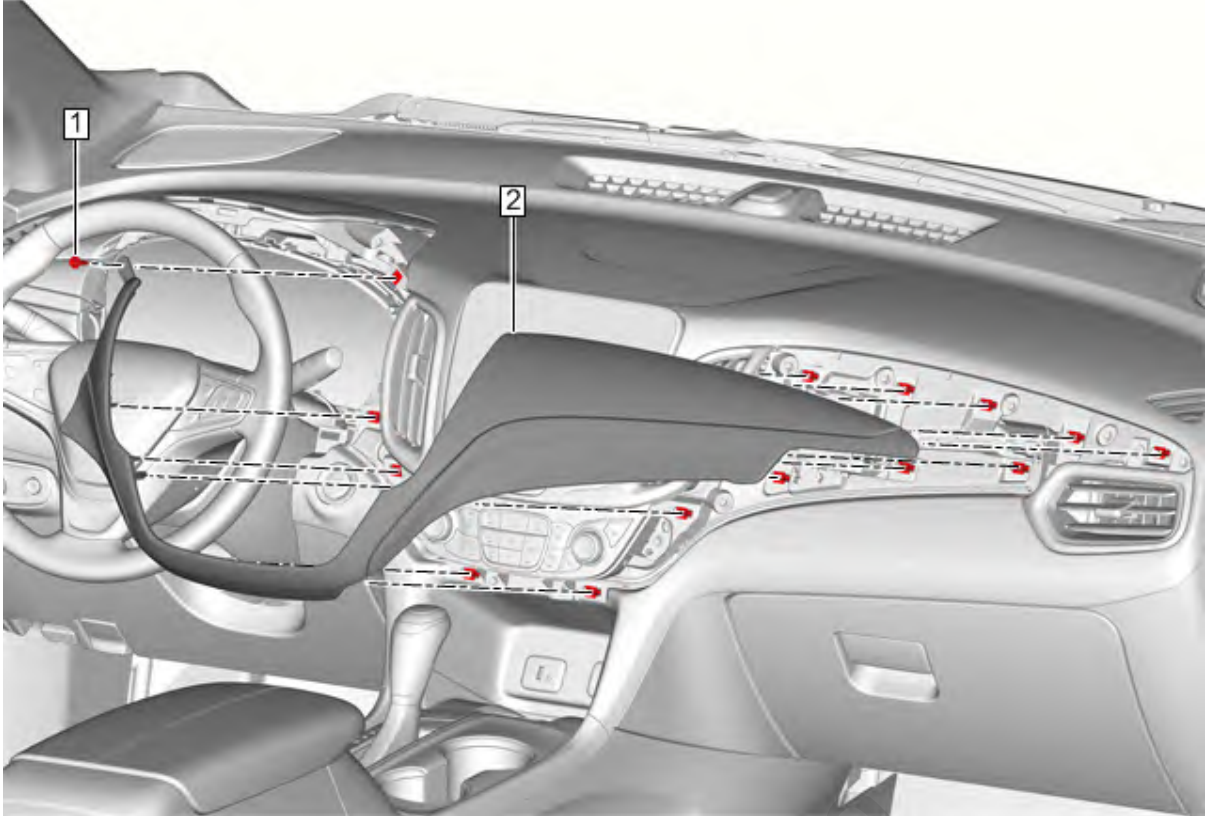


Fig. 22: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

4. Install Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#).



Fig. 23: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

5. Install Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#).

HEATER AND AIR CONDITIONING USER INTERFACE CONTROL REPLACEMENT (TERRAIN)

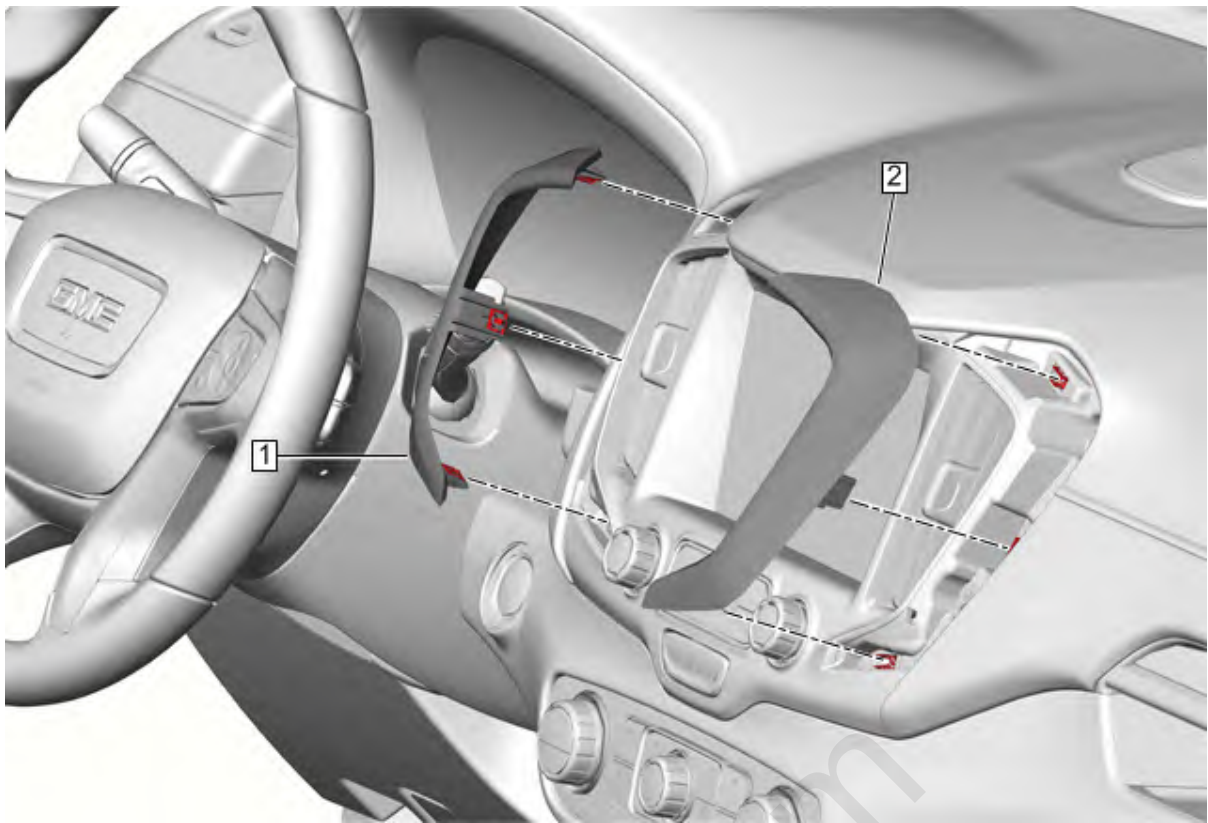


Fig. 24: Instrument Panel Center Trim Plate Appliques

Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Center Trim Plate Applique (1) & (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).

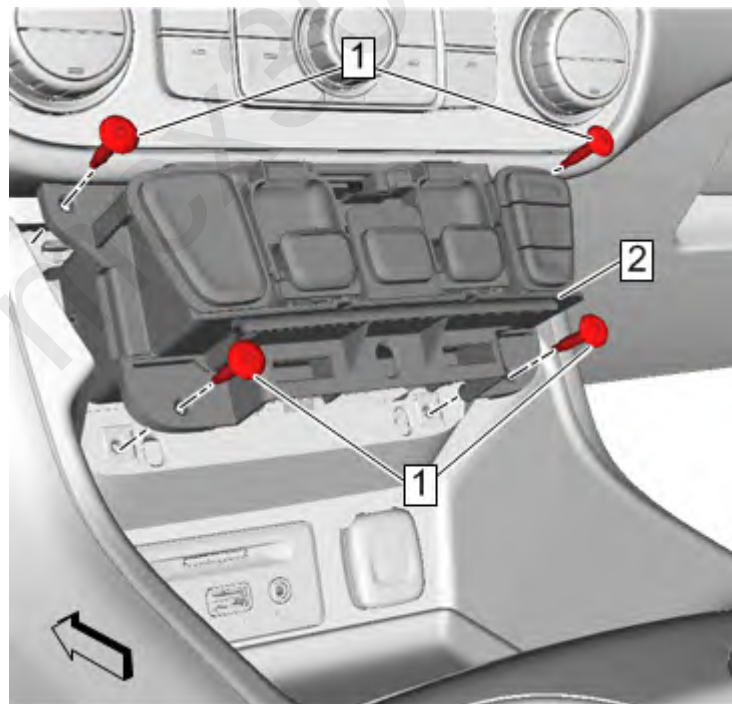


Fig. 25: Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

2. Remove Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

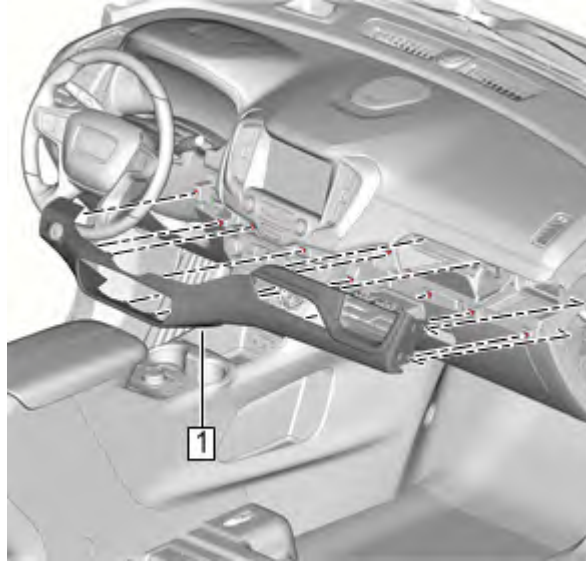


Fig. 26: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#)

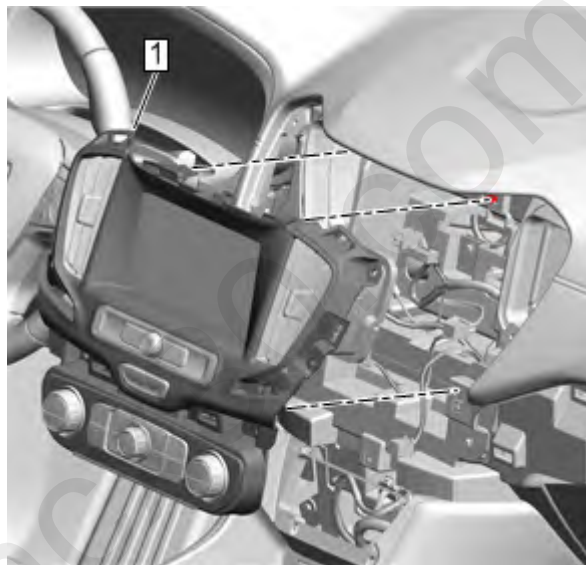


Fig. 27: Radio Control Assembly
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Rear Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Terrain\)](#)
5. Disconnect all electrical connectors.

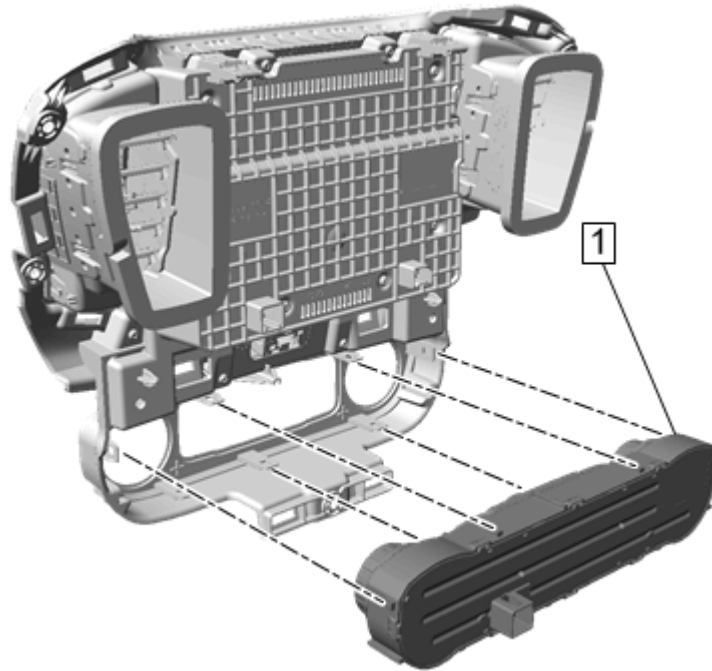


Fig. 28: Heater And Air Conditioning User Interface Control
Courtesy of GENERAL MOTORS COMPANY

6. Release the detentes using the appropriate tool.
7. Remove Heater and Air Conditioning User Interface Control (1)

Installation Procedure

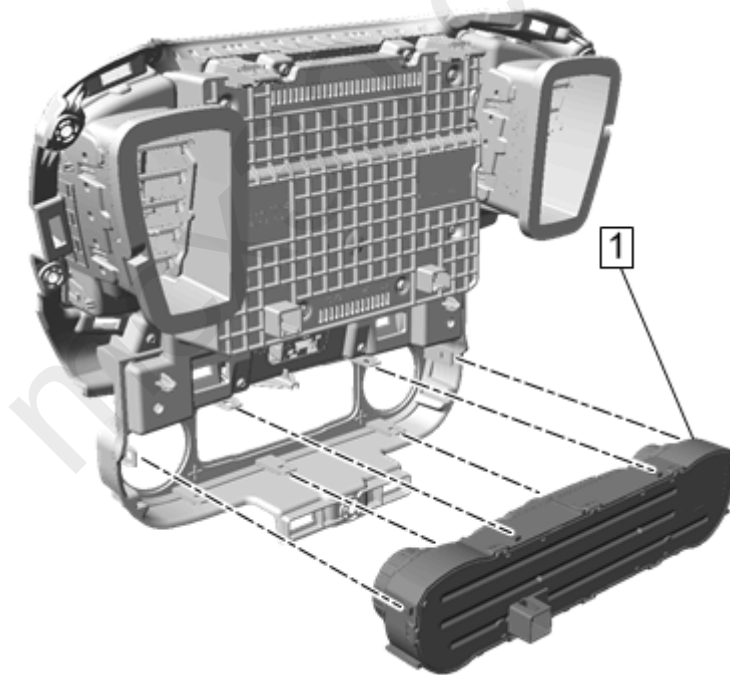


Fig. 29: Heater And Air Conditioning User Interface Control
Courtesy of GENERAL MOTORS COMPANY

1. Install Heater and Air Conditioning User Interface Control (1)

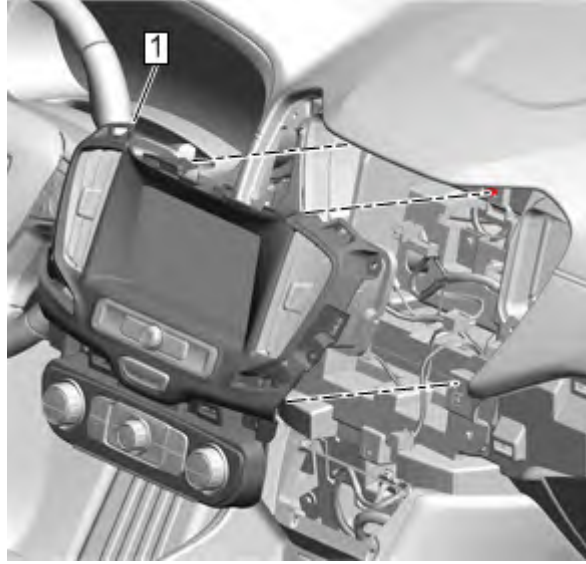


Fig. 30: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

2. Connect the electrical connectors.
3. Install Rear Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Terrain\)](#)

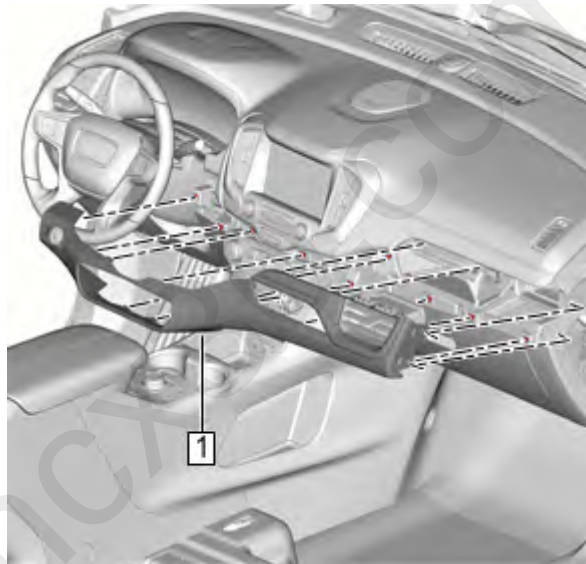


Fig. 31: Right Side Instrument Panel Trim Pad

Courtesy of GENERAL MOTORS COMPANY

4. Install Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#)

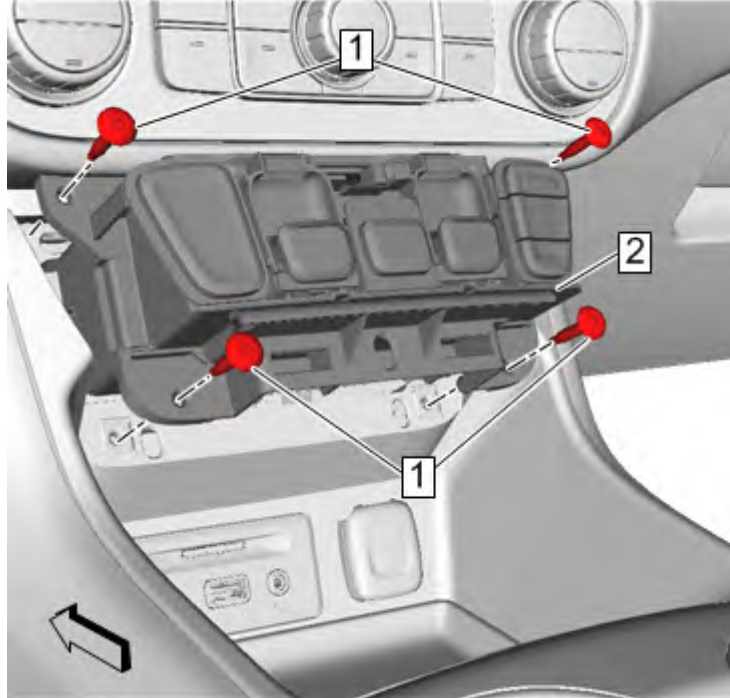


Fig. 32: Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

5. Install Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

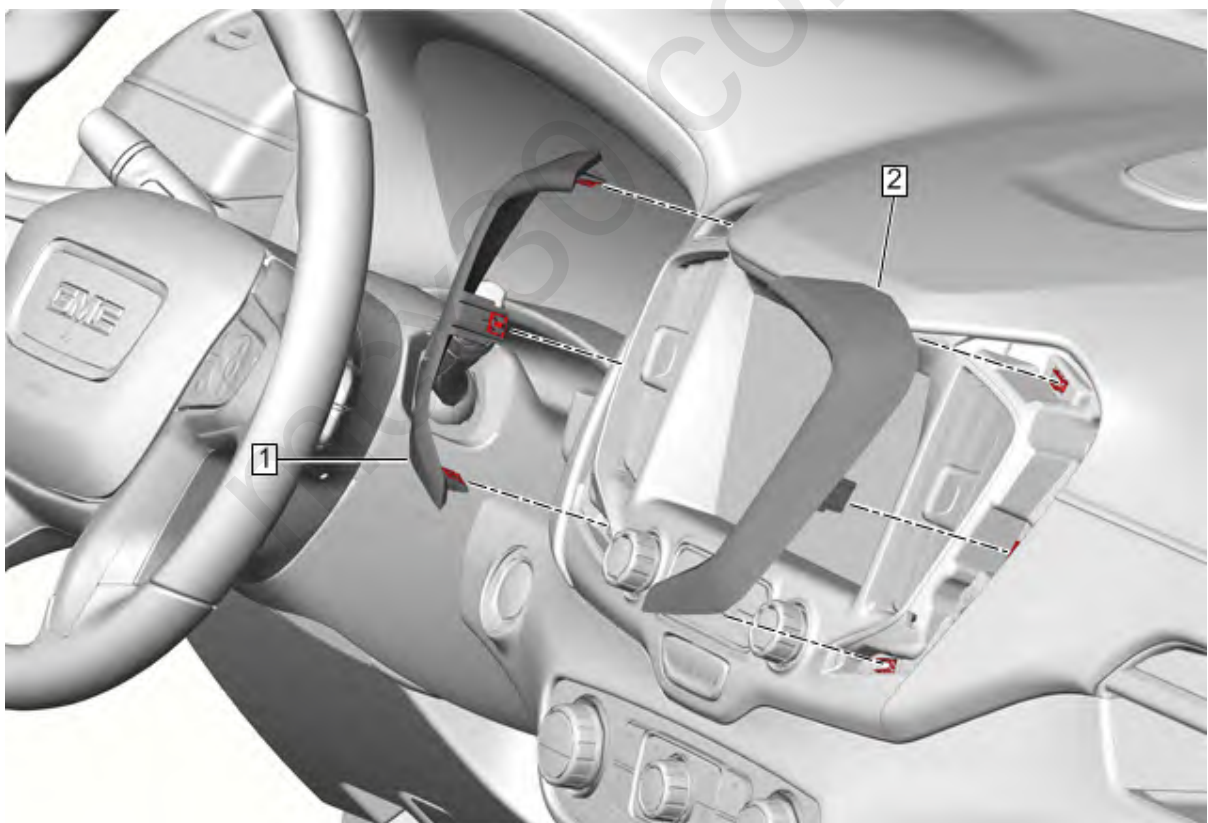


Fig. 33: Instrument Panel Center Trim Plate Appliques

Courtesy of GENERAL MOTORS COMPANY

6. Install Instrument Panel Center Trim Plate Applique (1) & (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).

HEATER AND AIR CONDITIONING REMOTE CONTROL REPLACEMENT (EQUINOX)

Removal Procedure

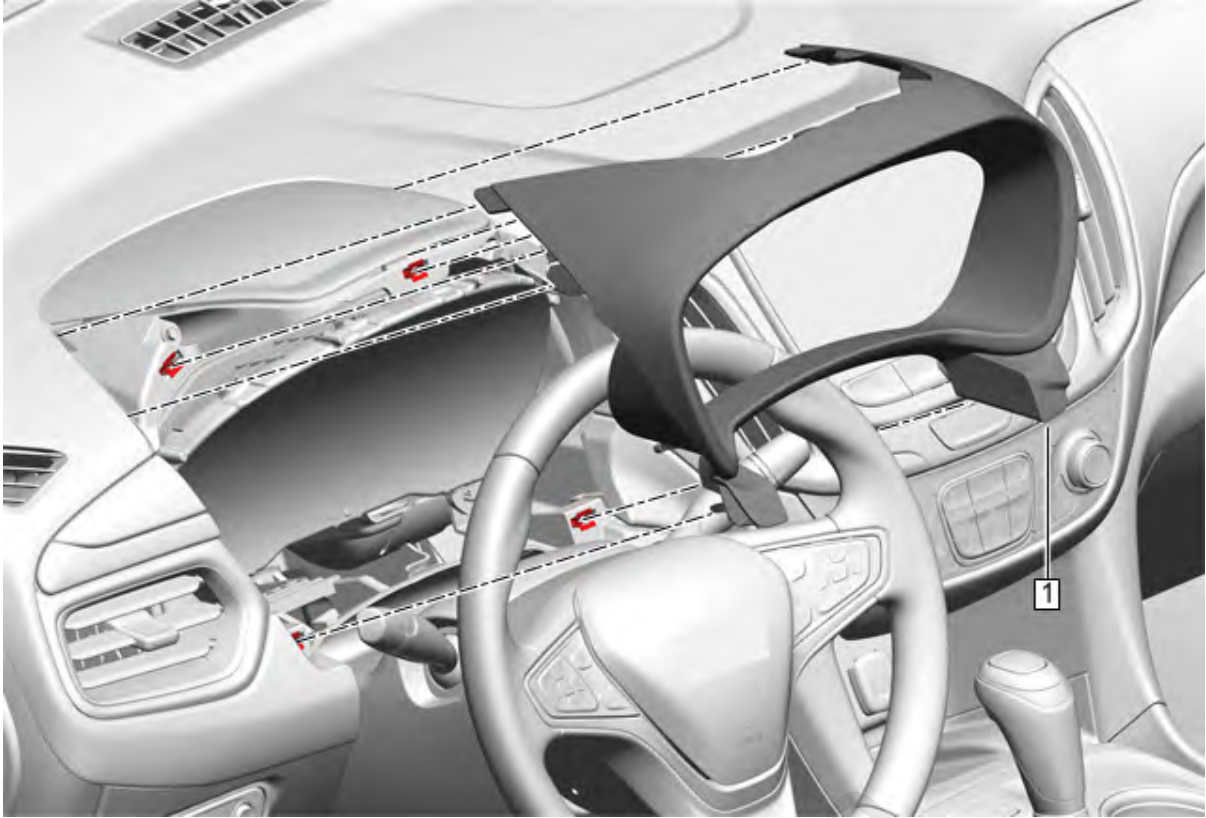


Fig. 34: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#)

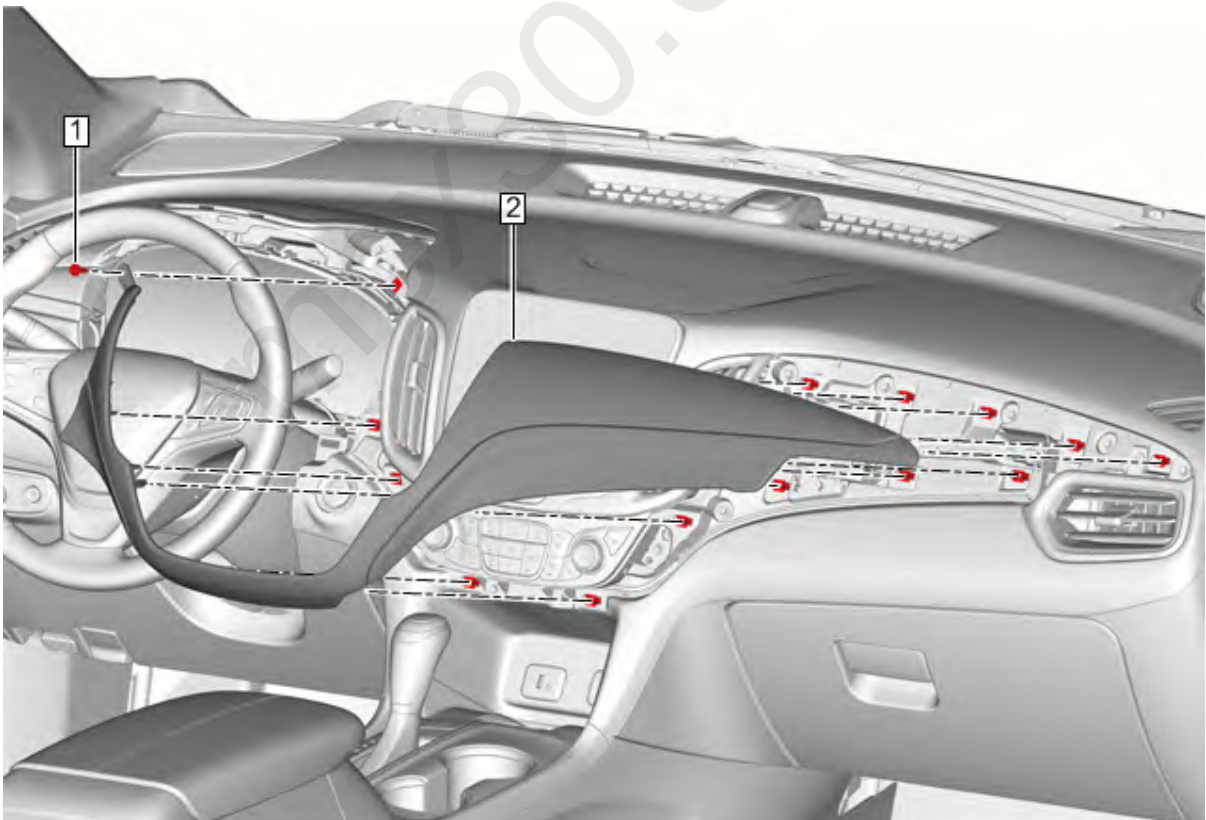


Fig. 35: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#)



Fig. 36: Heater And Air Conditioning User Interface Control

Courtesy of GENERAL MOTORS COMPANY

3. Remove Heater and Air Conditioning User Interface Control (1). Refer to [Heater and Air Conditioning User Interface Control Replacement \(Equinox\)](#).



Fig. 37: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

4. Remove Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Equinox\)](#).



Fig. 38: Heater And Air Conditioning Remote Control
Courtesy of GENERAL MOTORS COMPANY

5. Remove Heater and Air Conditioning Remote Control (1)
6. Disconnect the electrical connectors.

Installation Procedure

NOTE: When reconnecting the 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.

1. Connect the electrical connectors.



Fig. 39: Heater And Air Conditioning Remote Control
Courtesy of GENERAL MOTORS COMPANY

2. Install Heater and Air Conditioning Remote Control (1)

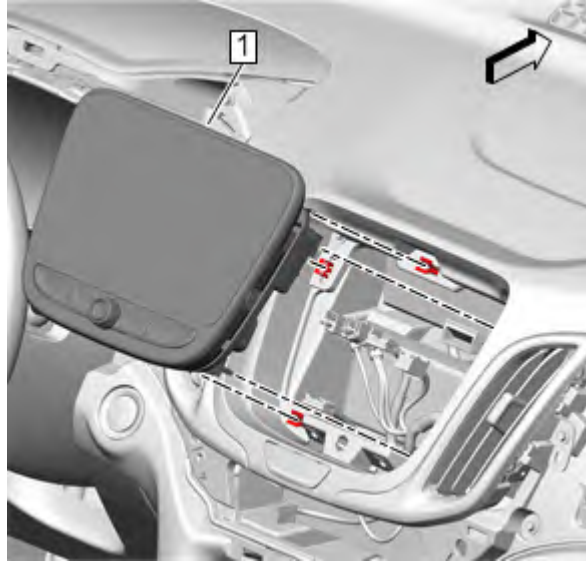


Fig. 40: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Install Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Equinox\)](#).

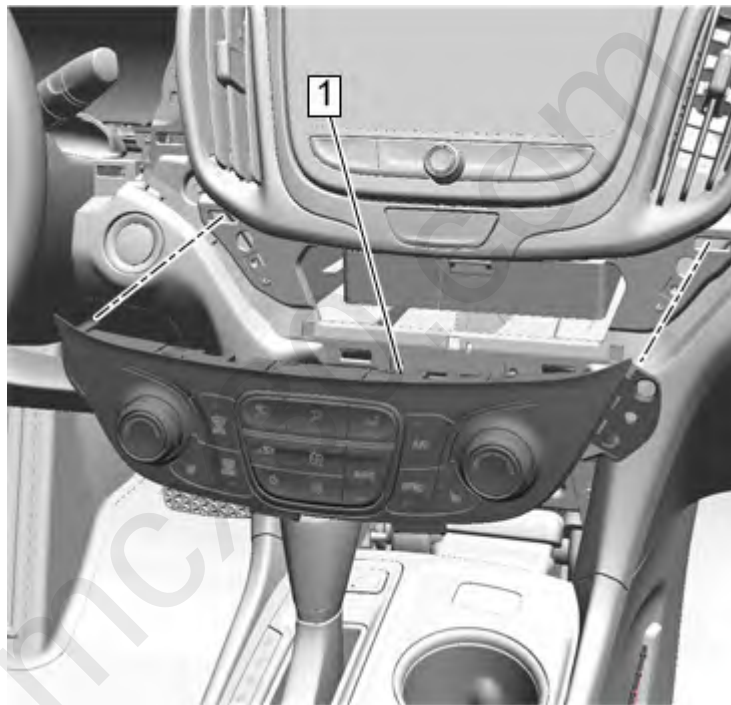


Fig. 41: Heater And Air Conditioning User Interface Control

Courtesy of GENERAL MOTORS COMPANY

4. Install Heater and Air Conditioning User Interface Control (1). Refer to [Heater and Air Conditioning User Interface Control Replacement \(Equinox\)](#).

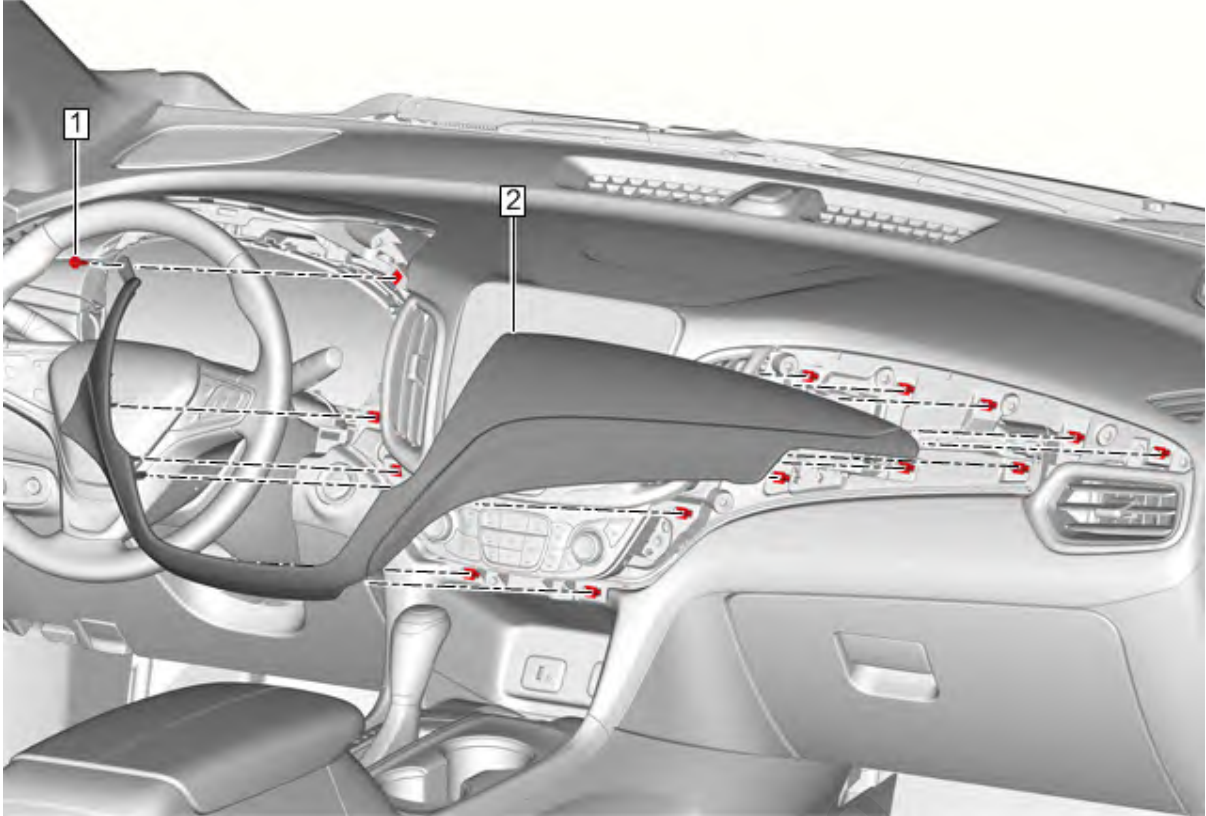


Fig. 42: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

5. Install Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#).



Fig. 43: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

6. Install Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#).
7. Perform the necessary programming and setup procedure. Refer to [Control Module References](#)
8. Clear the DTCs from the heater and air conditioning remote control module.
9. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

Removal Procedure

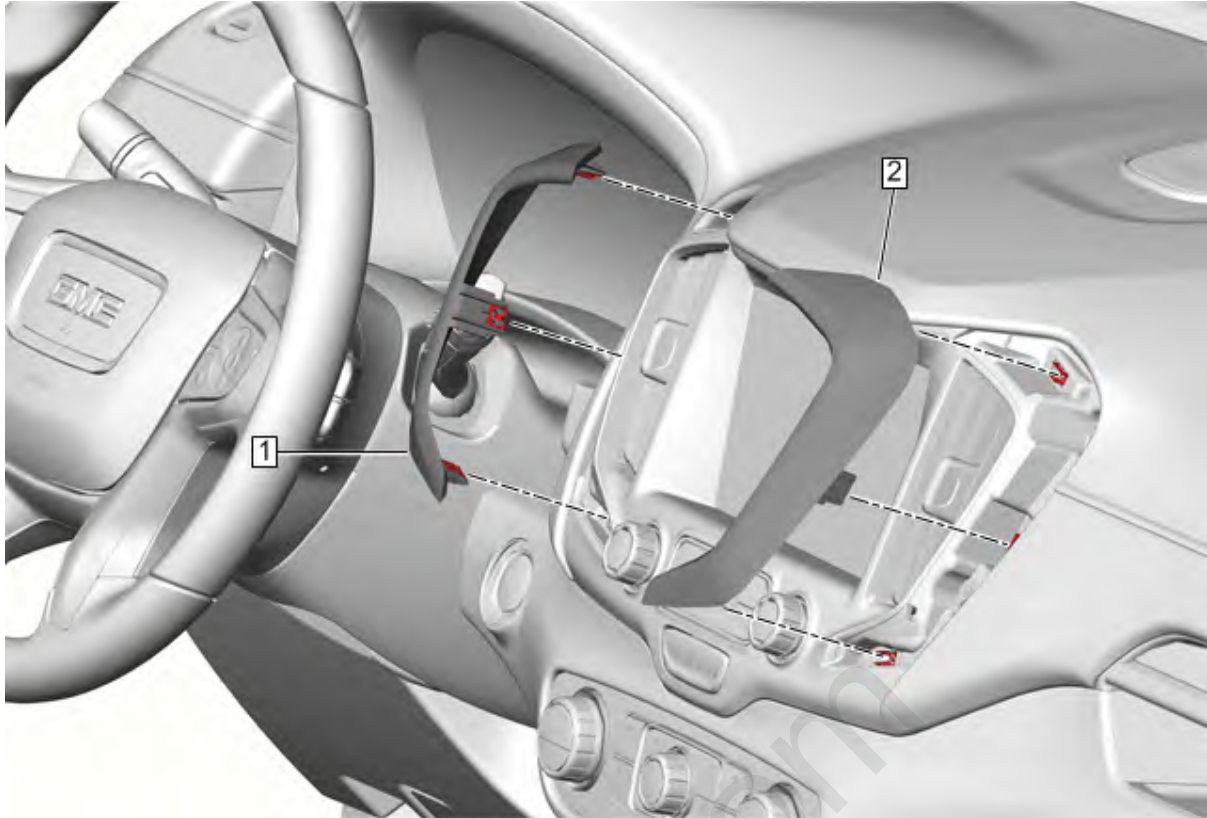


Fig. 44: Instrument Panel Center Trim Plate Appliques

Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Center Trim Plate Applique (1) & (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).

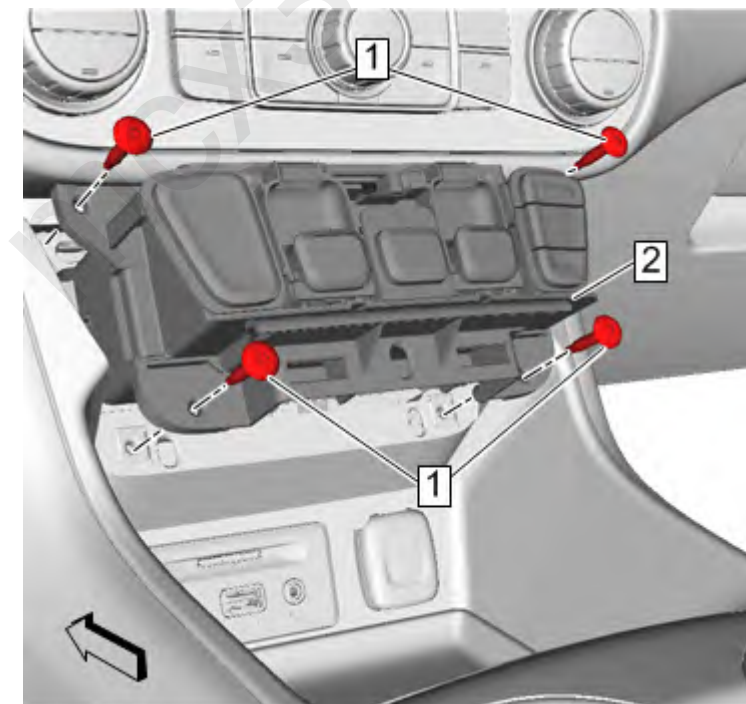


Fig. 45: Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

2. Remove Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

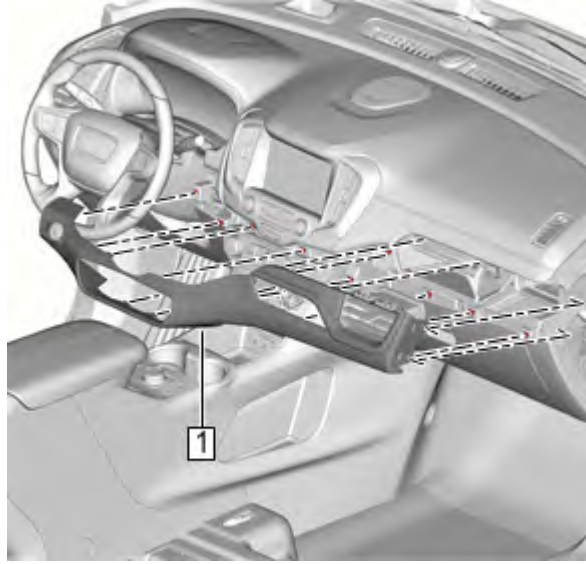


Fig. 46: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#)

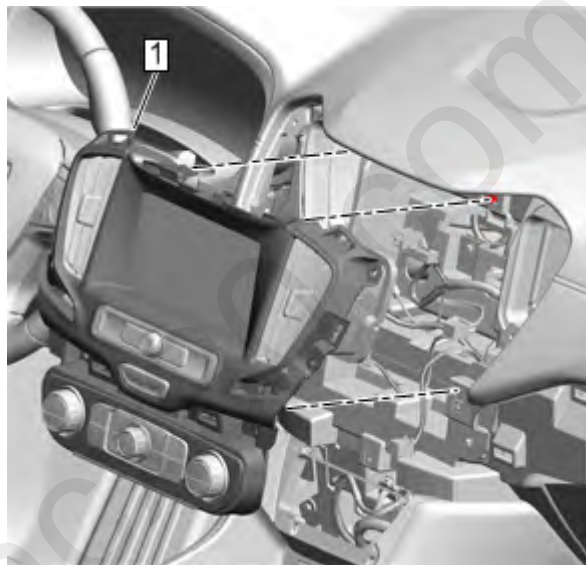


Fig. 47: Radio Control Assembly
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Rear Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Terrain\)](#)
5. Disconnect the electrical connectors.

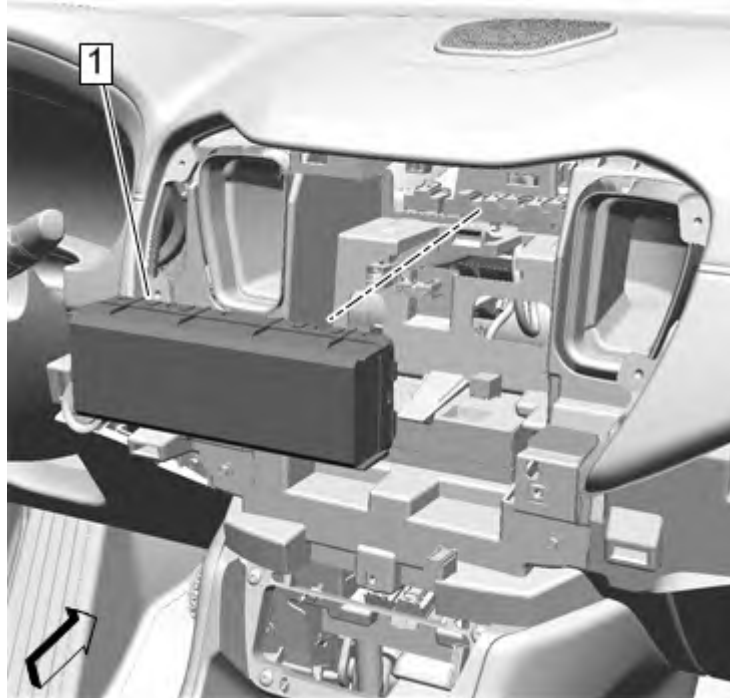


Fig. 48: Heater And Air Conditioning Remote Control
Courtesy of GENERAL MOTORS COMPANY

6. Remove Heater and Air Conditioning Remote Control (1)
7. Disconnect the electrical connectors.

Installation Procedure

NOTE: When reconnecting the 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.

1. Connect the electrical connectors.

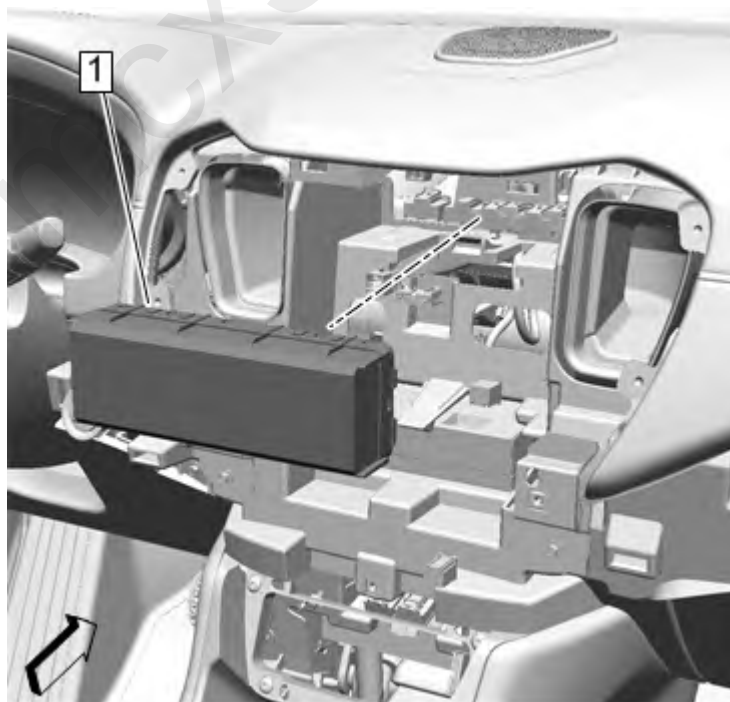


Fig. 49: Heater And Air Conditioning Remote Control
Courtesy of GENERAL MOTORS COMPANY

2. Install Heater and Air Conditioning Remote Control (1)

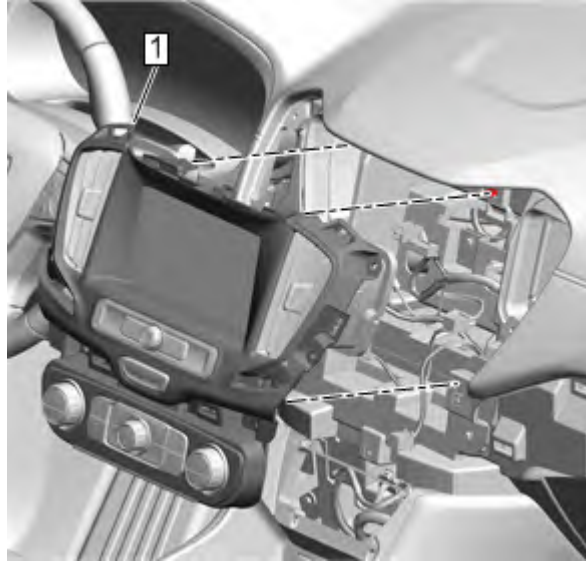


Fig. 50: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Connect the electrical connectors.
4. Install Rear Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Terrain\)](#)

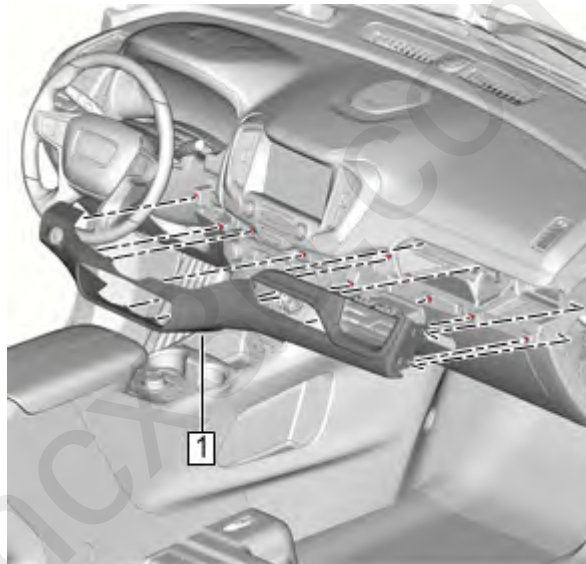


Fig. 51: Right Side Instrument Panel Trim Pad

Courtesy of GENERAL MOTORS COMPANY

5. Install Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#)

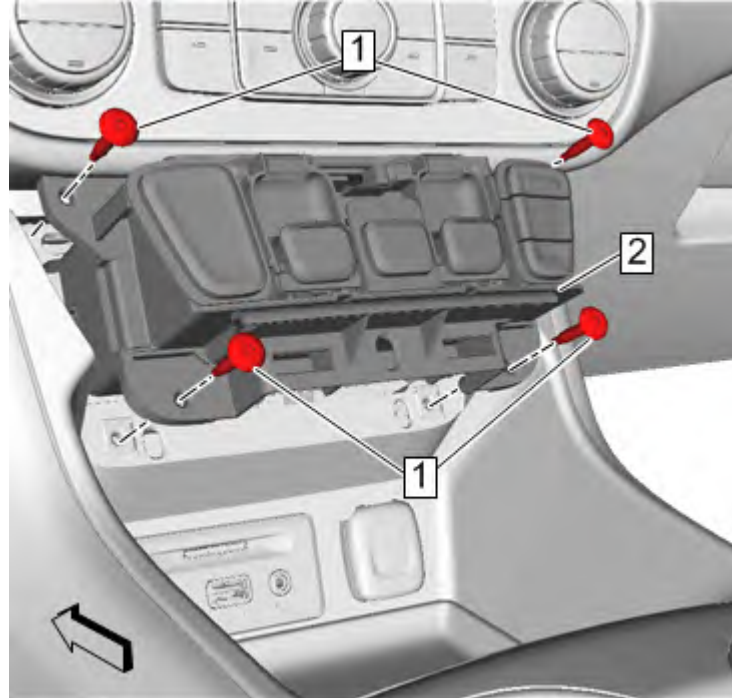


Fig. 52: Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

6. Install Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

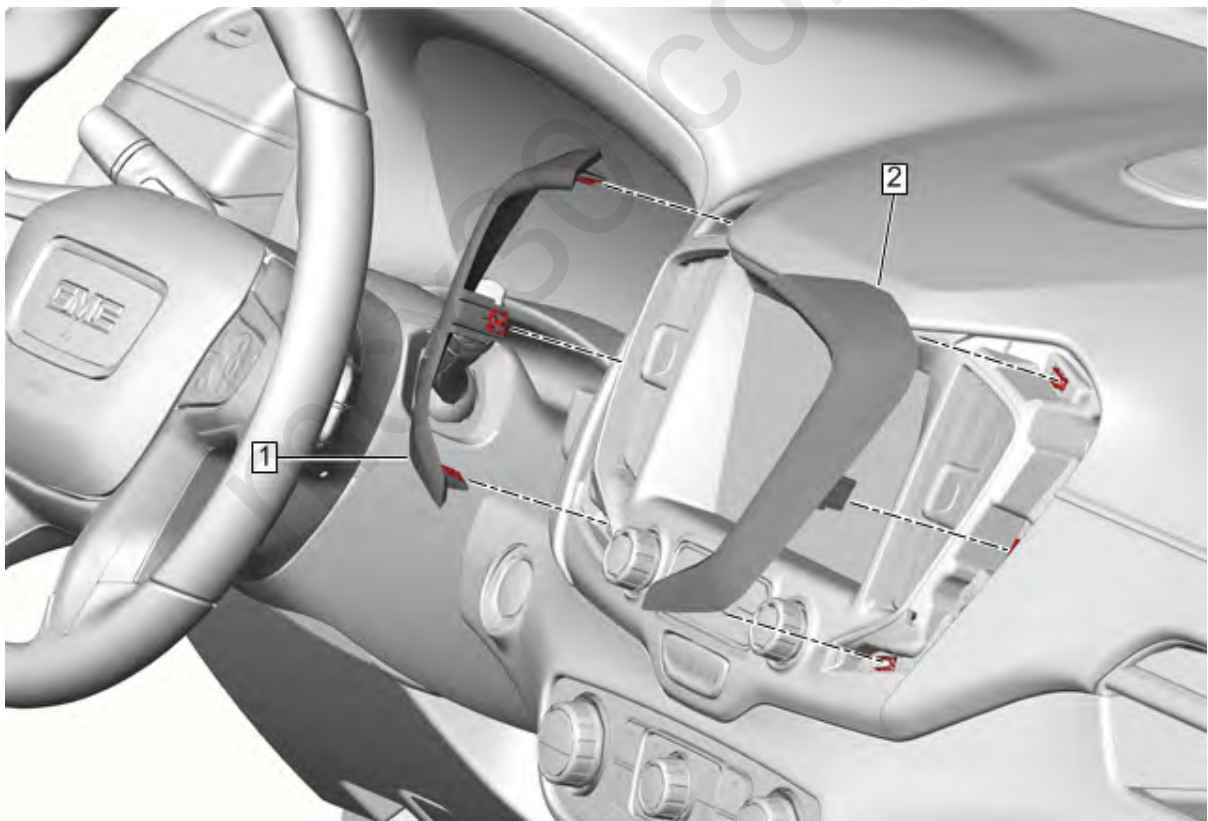


Fig. 53: Instrument Panel Center Trim Plate Appliques

Courtesy of GENERAL MOTORS COMPANY

7. Install Instrument Panel Center Trim Plate Applique (1) & (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).
8. Perform the necessary programming and setup procedure. Refer to [Control Module References](#)
9. Clear the DTCs from the heater and air conditioning remote control module.
10. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

AIR CONDITIONING WIRING HARNESS REPLACEMENT (EQUINOX)

Removal Procedure

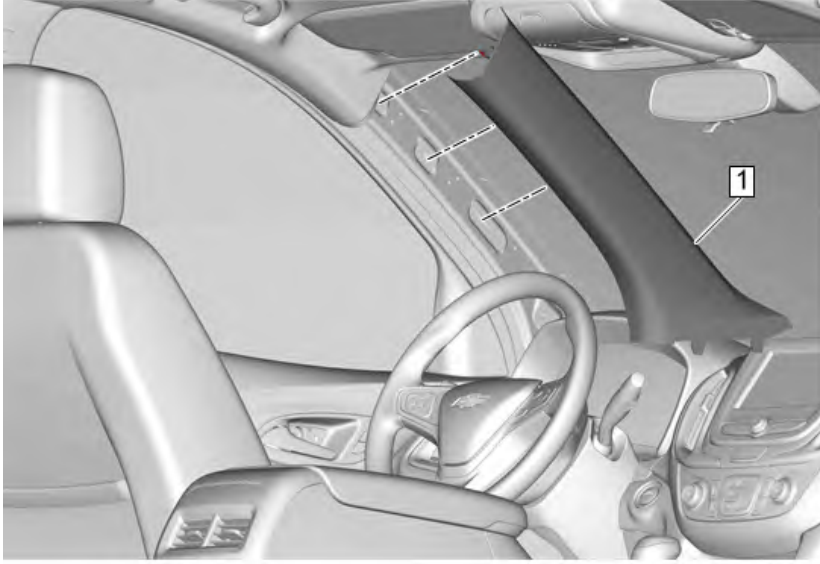


Fig. 54: Left And Right Windshield Garnish Molding
 Courtesy of GENERAL MOTORS COMPANY

1. Remove the left and right side windshield garnish molding (1). Refer to [Windshield Garnish Molding Replacement \(Equinox\)](#).

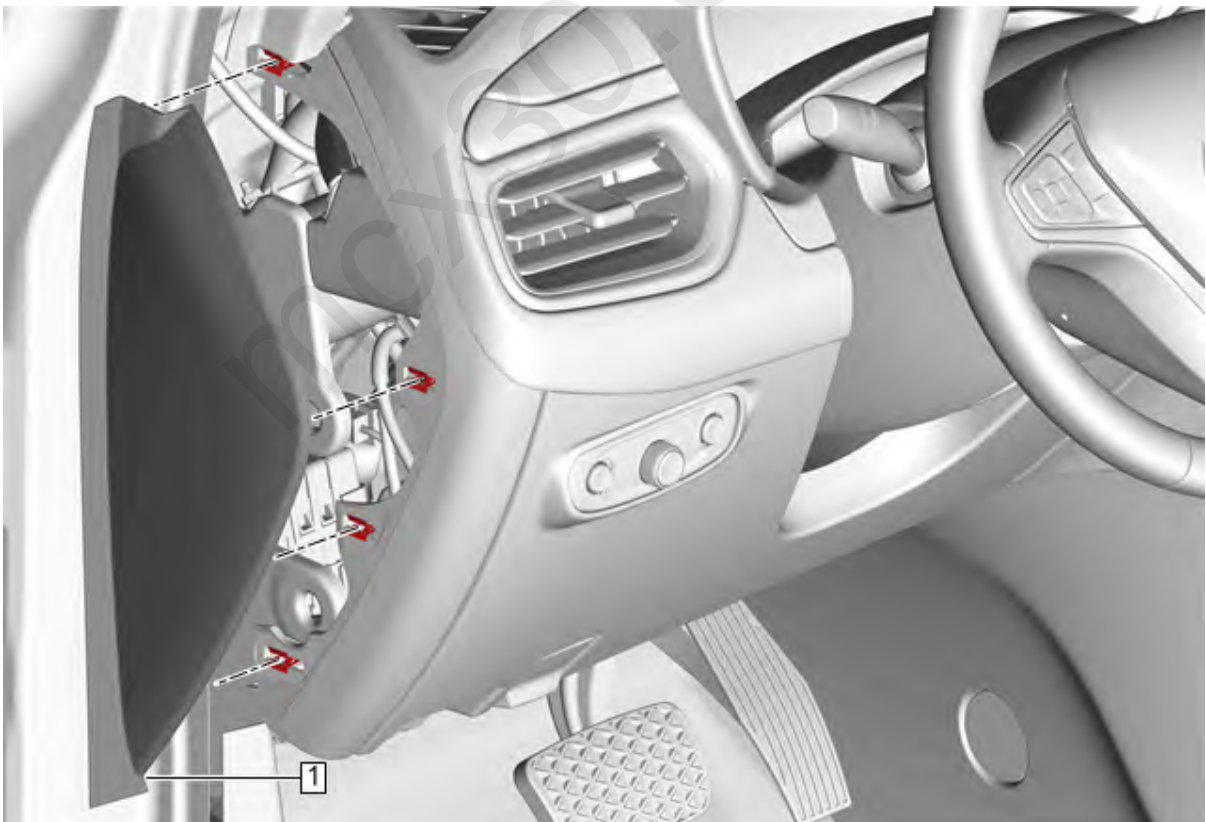


Fig. 55: Left And Right Instrument Panel Outer Trim Cover
 Courtesy of GENERAL MOTORS COMPANY

2. Remove the left and right instrument panel outer trim cover (1). Refer to [Instrument Panel Outer Trim Cover Replacement \(Equinox\)](#).

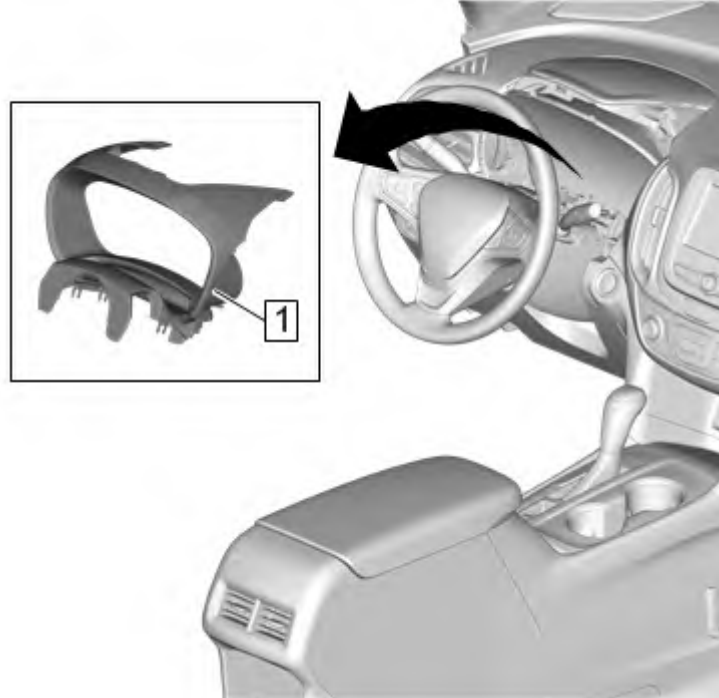


Fig. 56: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#)

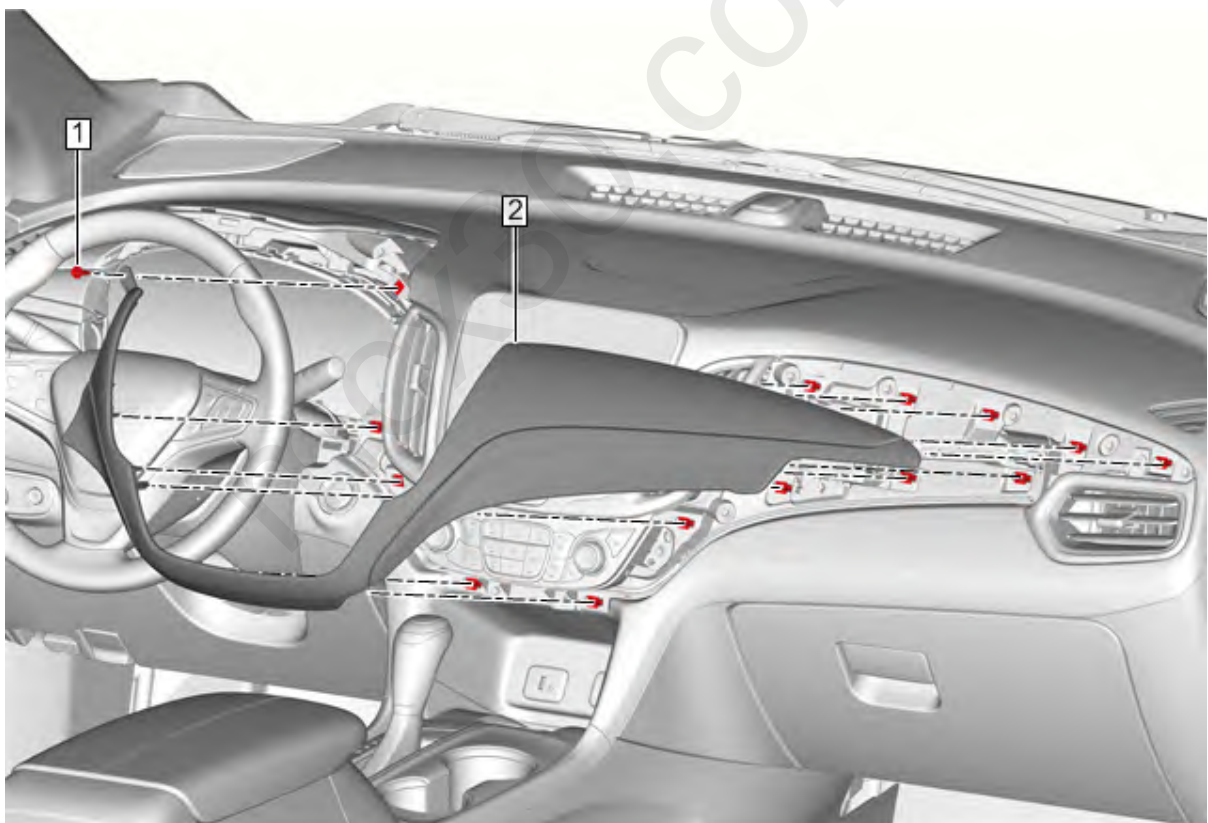


Fig. 57: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#)

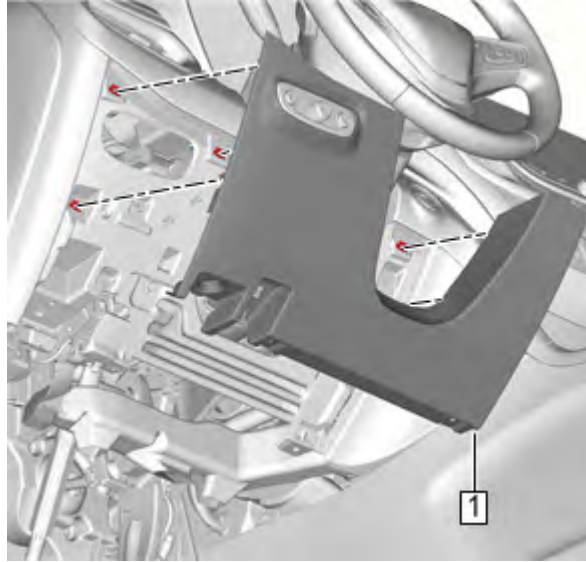


Fig. 58: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

5. Remove Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#)

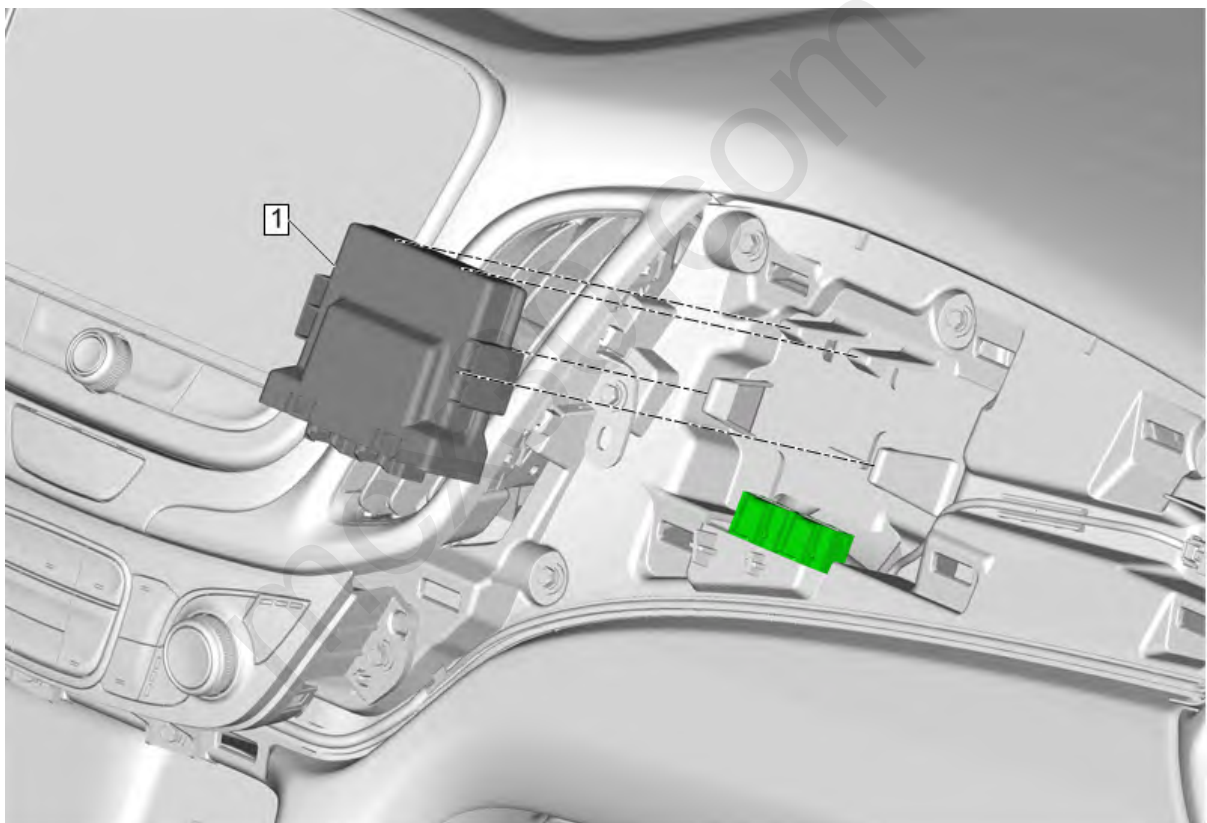


Fig. 59: Serial Data Gateway Module

Courtesy of GENERAL MOTORS COMPANY

6. Remove Serial Data Gateway Module (1). Refer to [Serial Data Gateway Module Replacement \(Equinox\)](#)



Fig. 60: Heater And Air Conditioning User Interface Control

Courtesy of GENERAL MOTORS COMPANY

7. Remove Heater and Air Conditioning User Interface Control (1). Refer to [Heater and Air Conditioning User Interface Control Replacement \(Equinox\)](#).

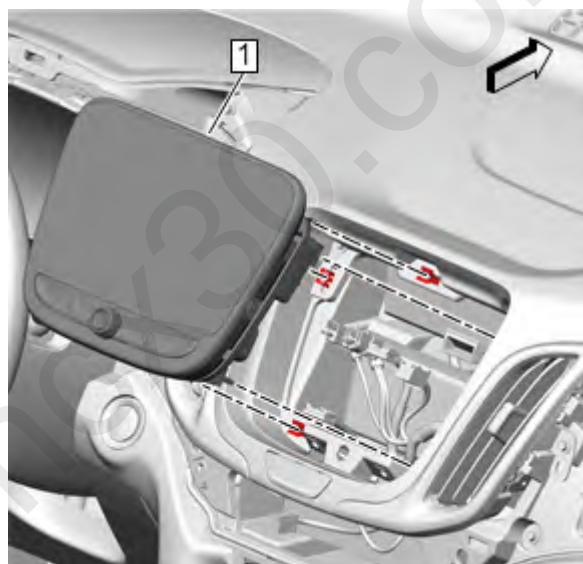


Fig. 61: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

8. Remove Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Equinox\)](#).



Fig. 62: Heater And Air Conditioning Remote Control

Courtesy of GENERAL MOTORS COMPANY

9. Remove Heater and Air Conditioning Remote Control (1). Refer to [Heater and Air Conditioning Remote Control Replacement \(Equinox\)](#)

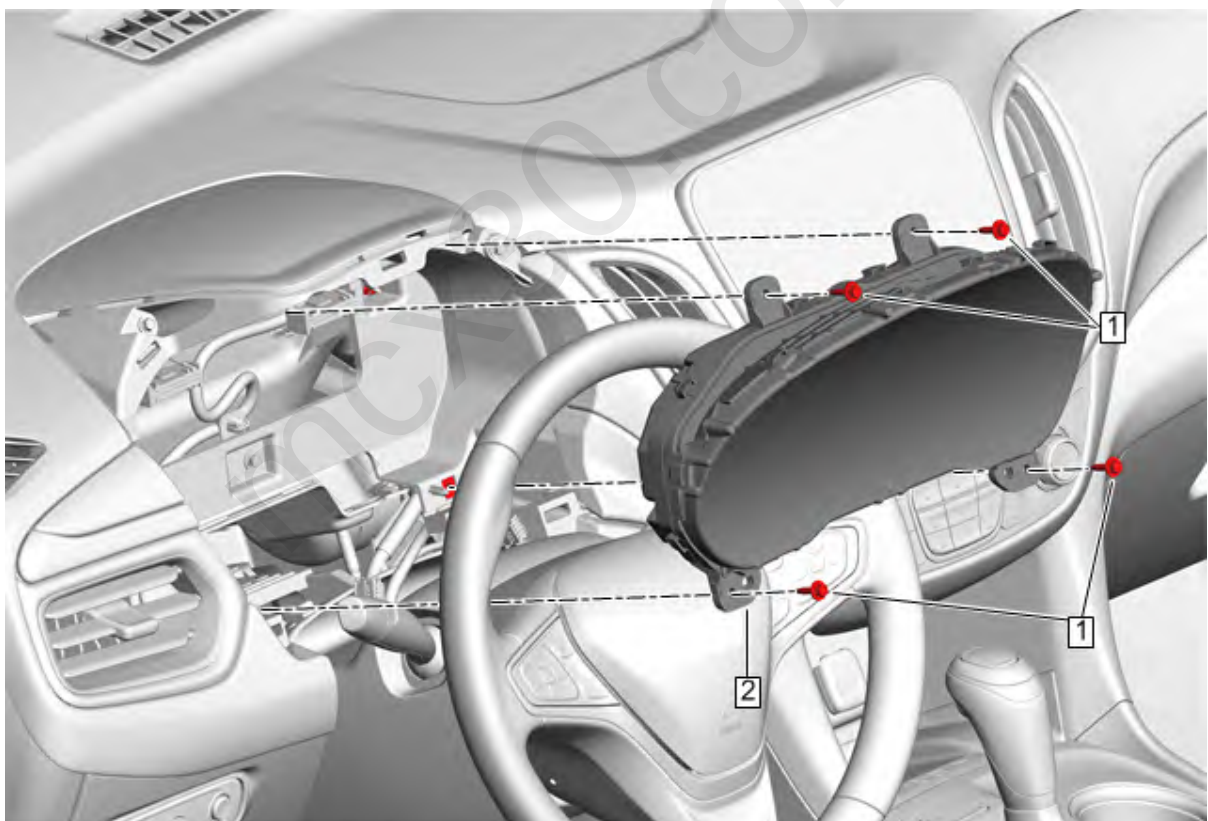


Fig. 63: Instrument Cluster And Screws

Courtesy of GENERAL MOTORS COMPANY

10. Remove Instrument Cluster (2). Refer to [Instrument Cluster Replacement \(Equinox\)](#)

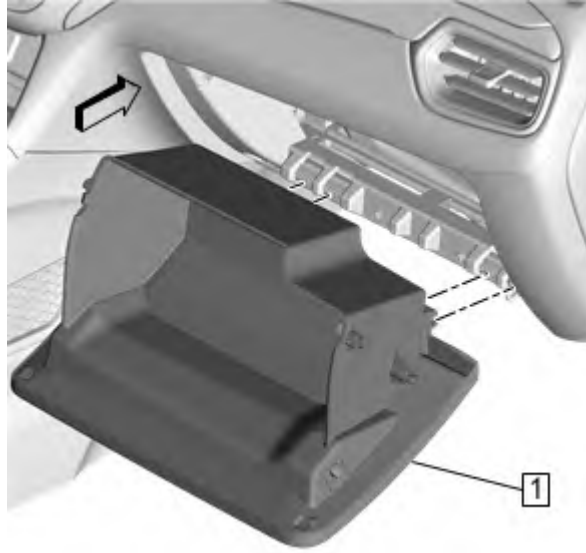


Fig. 64: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

11. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#).

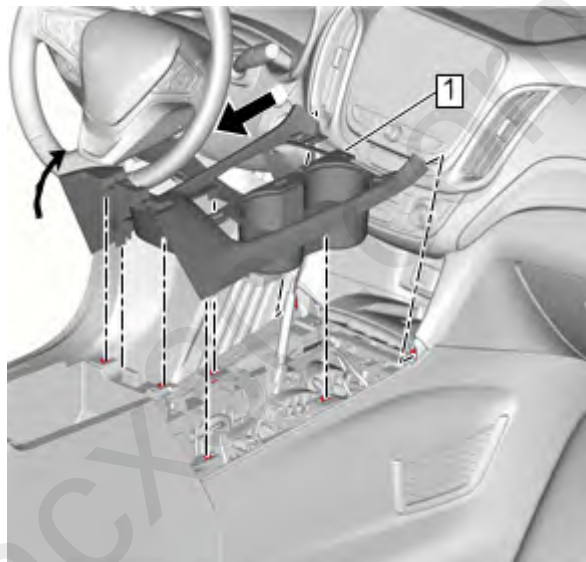
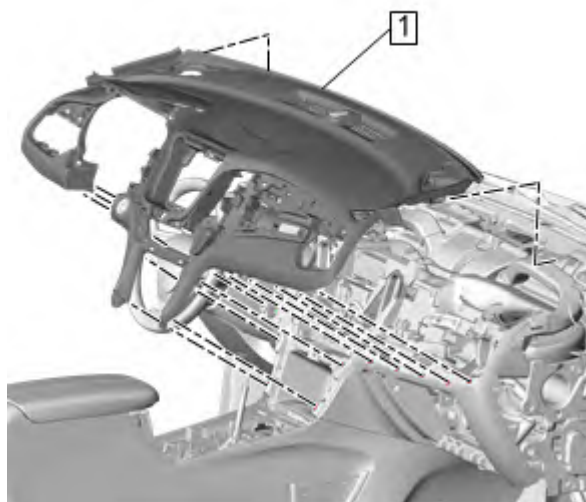


Fig. 65: Front Floor Console Applique
 Courtesy of GENERAL MOTORS COMPANY

12. Remove Front Floor Console Applique (1). Refer to [Front Floor Console Applique Replacement \(Equinox\)](#).



13. Remove Instrument Panel Upper Trim Panel (1). Refer to [Instrument Panel Upper Trim Panel Replacement \(Equinox\)](#)

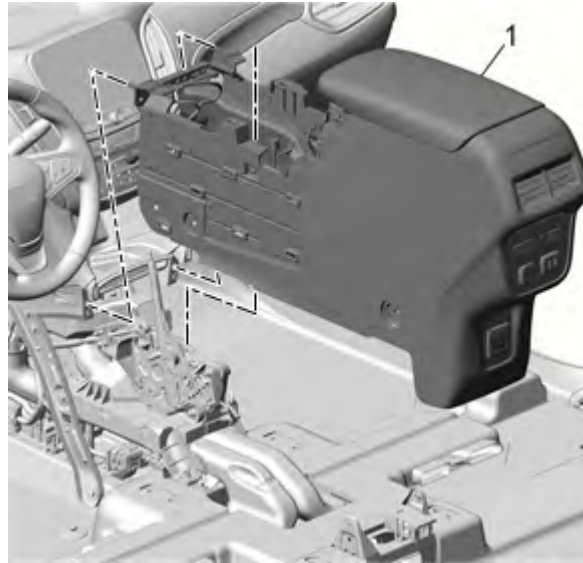


Fig. 67: Front Floor Console
Courtesy of GENERAL MOTORS COMPANY

14. Remove Front Floor Console (1). Refer to [Front Floor Console Replacement \(Equinox\)](#)

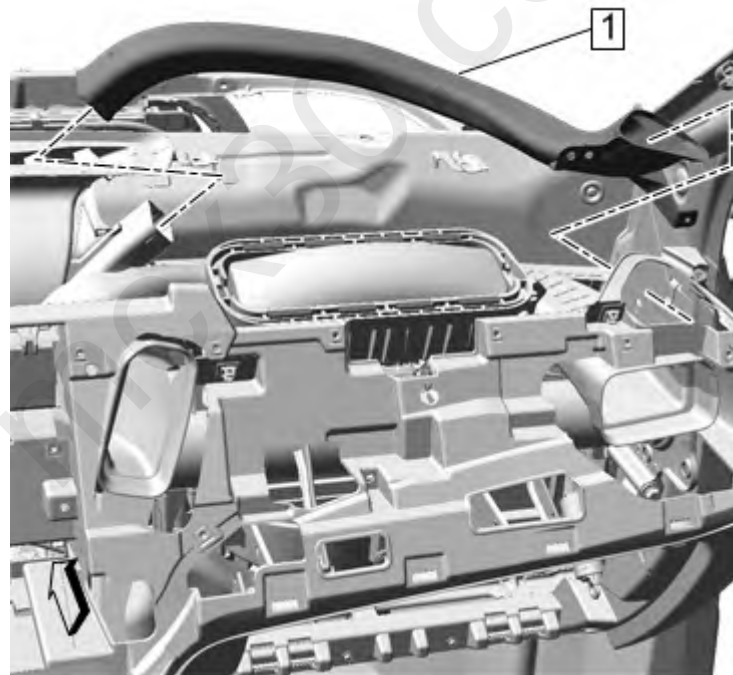


Fig. 68: Right Side Window Defogger Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

15. Remove Side Window Defogger Outlet Duct - Right Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Right Side \(Equinox\)](#)



Fig. 69: Left Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

16. Remove Side Window Defogger Outlet Duct - Left Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Left Side \(Equinox\)](#).

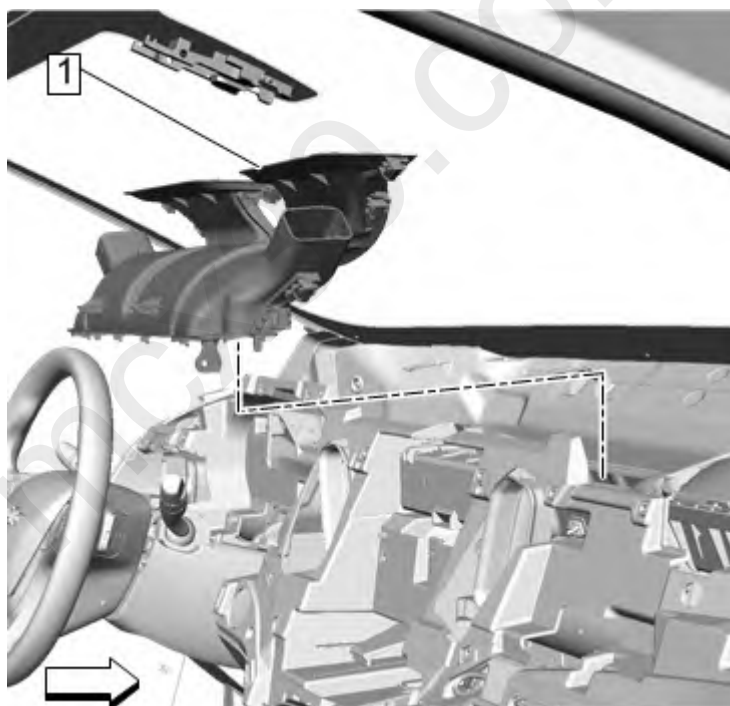


Fig. 70: Windshield Defroster Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

17. Remove Windshield Defroster Outlet Duct (1). Refer to [Windshield Defroster Outlet Duct Replacement \(Equinox\)](#).

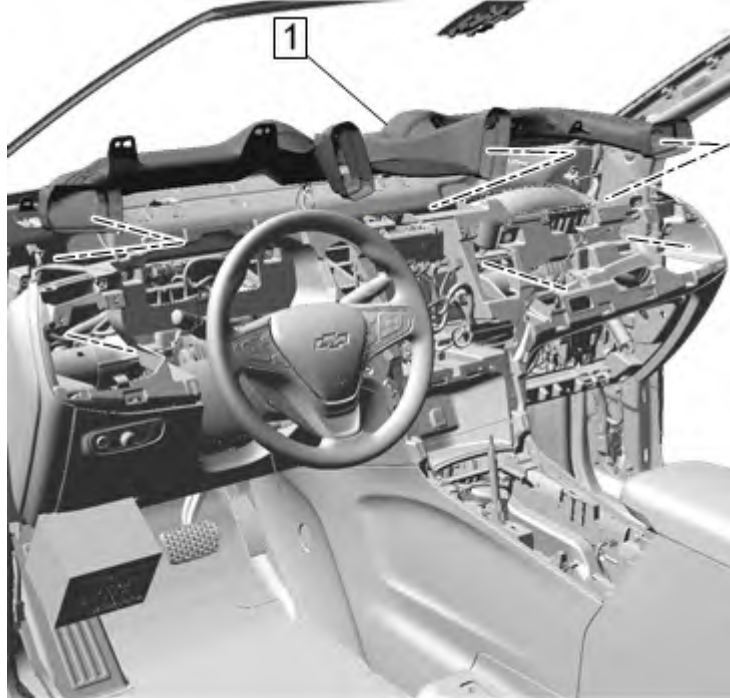


Fig. 71: Instrument Panel Center Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

18. Remove Instrument Panel Center Air Outlet Duct (1). Refer to [Instrument Panel Center Air Outlet Duct Replacement \(Equinox\)](#).

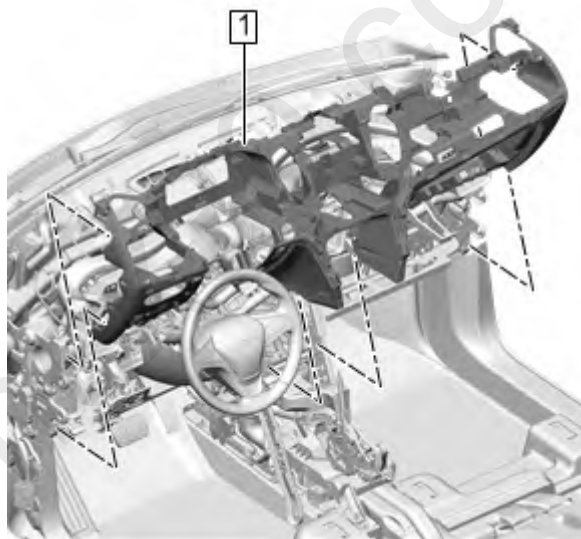


Fig. 72: Instrument Panel
 Courtesy of GENERAL MOTORS COMPANY

19. Remove Instrument Panel (1). Refer to [Instrument Panel Assembly Replacement \(Equinox\)](#).

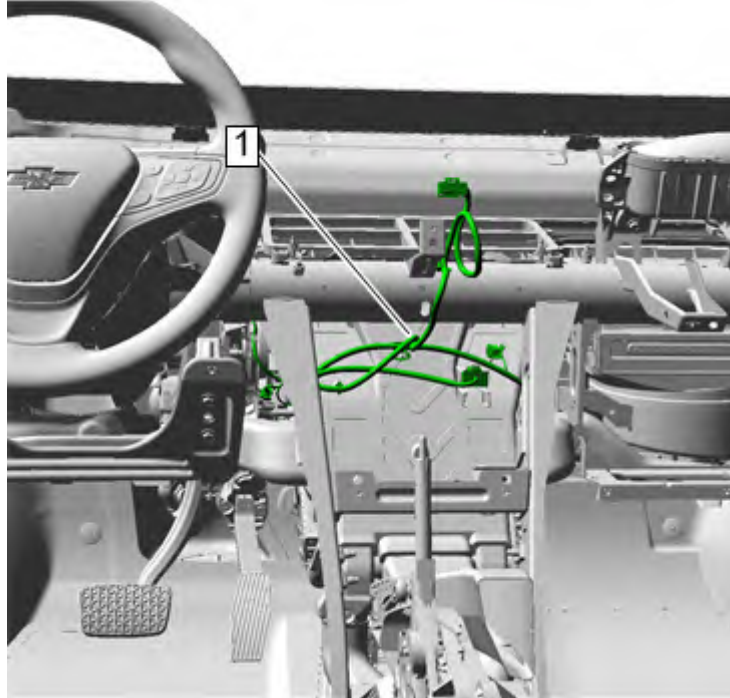


Fig. 73: Air Conditioning Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

20. Disconnect all electrical connectors.
21. Remove Air Conditioning Wiring Harness (1)

Installation Procedure

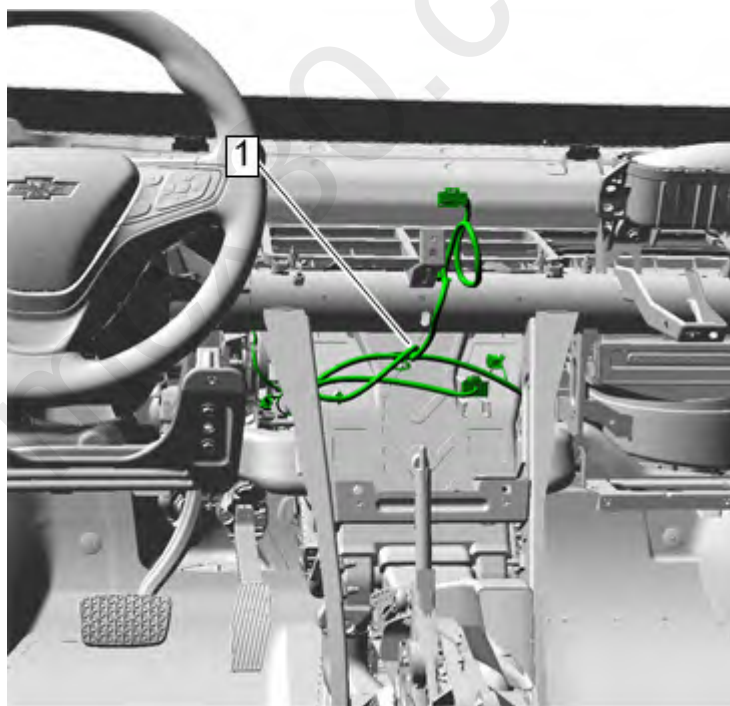


Fig. 74: Air Conditioning Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

1. Install Air Conditioning Wiring Harness (1)
2. Connect all electrical connectors.

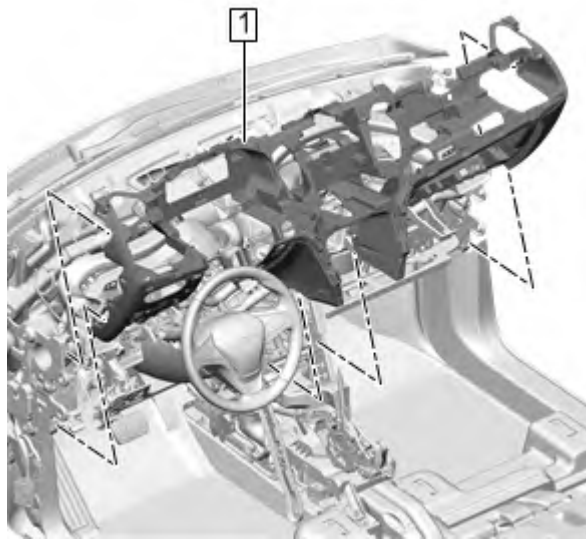


Fig. 75: Instrument Panel

Courtesy of GENERAL MOTORS COMPANY

3. Install Instrument Panel (1). Refer to [Instrument Panel Assembly Replacement \(Equinox\)](#)

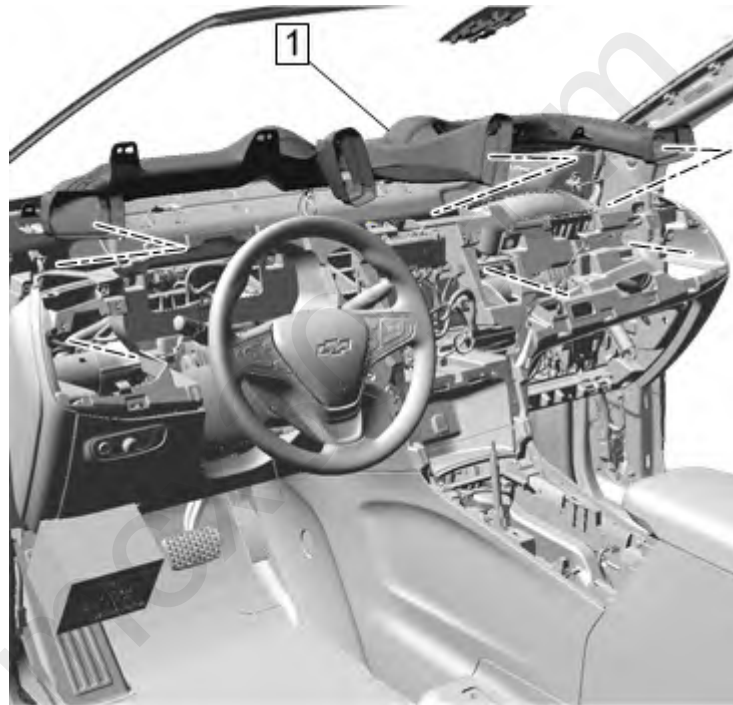


Fig. 76: Instrument Panel Center Air Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

4. Install Instrument Panel Center Air Outlet Duct (1). Refer to [Instrument Panel Center Air Outlet Duct Replacement \(Equinox\)](#)

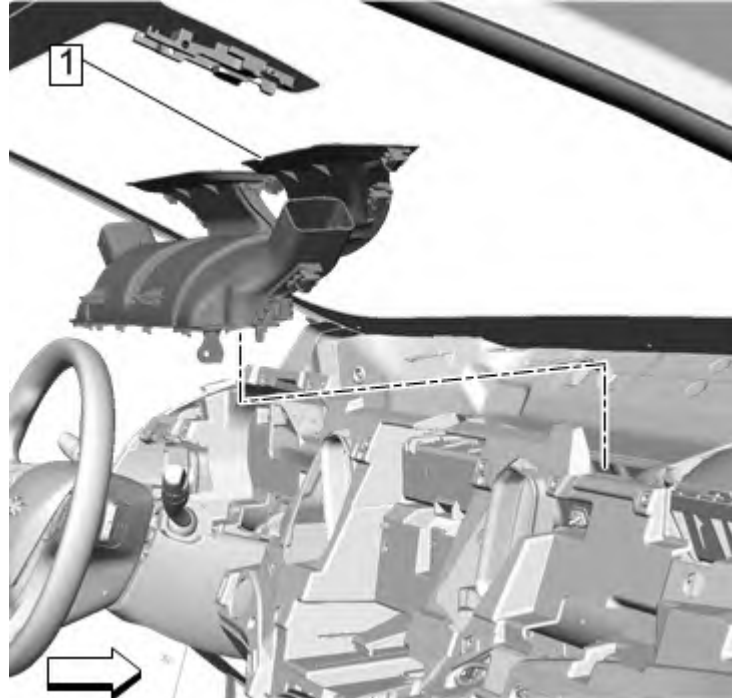


Fig. 77: Windshield Defroster Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

5. Install Windshield Defroster Outlet Duct (1). Refer to [Windshield Defroster Outlet Duct Replacement \(Equinox\)](#)



Fig. 78: Left Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

6. Install Side Window Defogger Outlet Duct - Left Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Left Side \(Equinox\)](#)

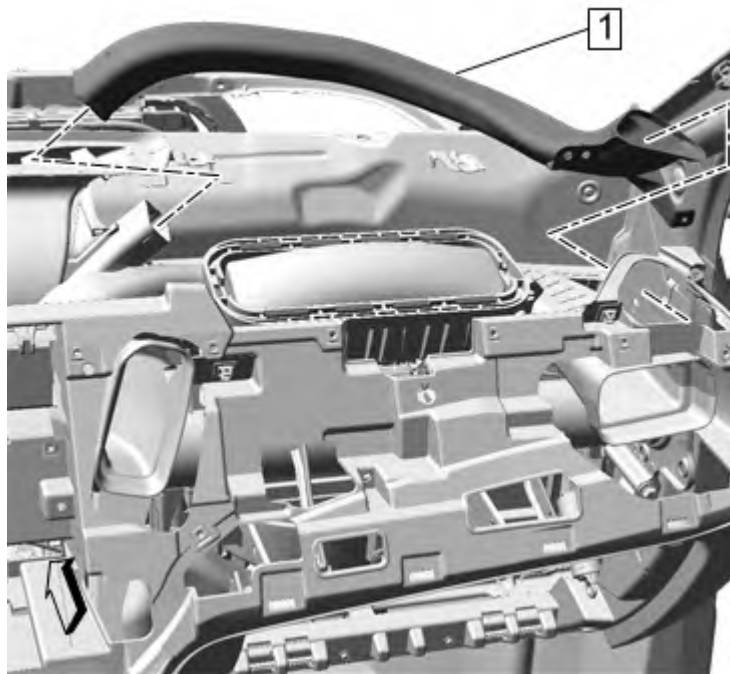


Fig. 79: Right Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

7. Install Side Window Defogger Outlet Duct - Right Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Right Side \(Equinox\)](#)

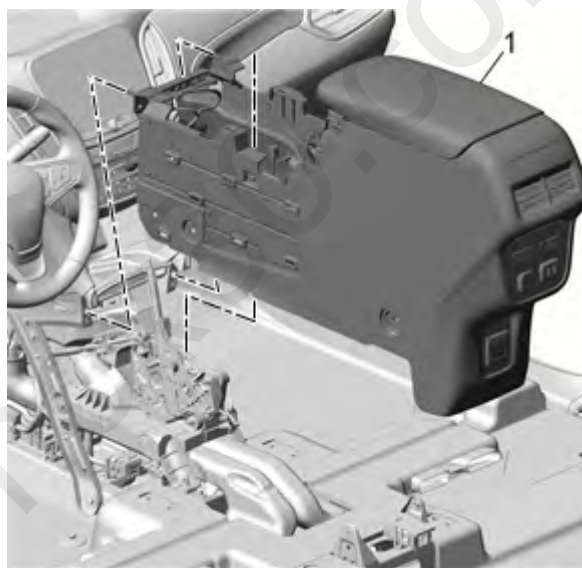


Fig. 80: Front Floor Console
 Courtesy of GENERAL MOTORS COMPANY

8. Install Front Floor Console (1). Refer to [Front Floor Console Replacement \(Equinox\)](#)

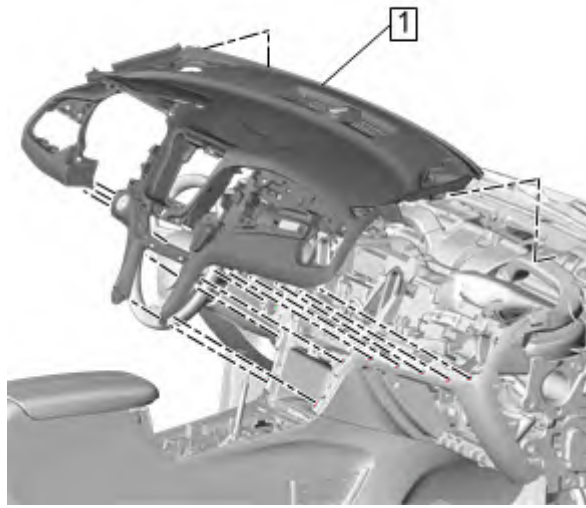


Fig. 81: Instrument Panel Upper Trim Panel
 Courtesy of GENERAL MOTORS COMPANY

9. Install Instrument Panel Upper Trim Panel (1). Refer to [Instrument Panel Upper Trim Panel Replacement \(Equinox\)](#)

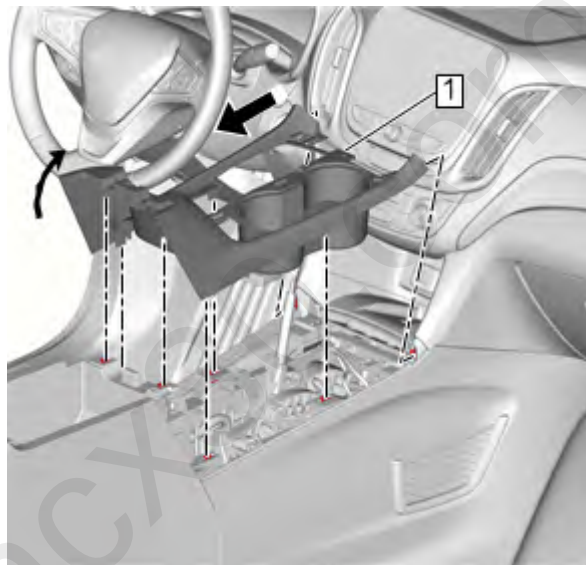


Fig. 82: Front Floor Console Applique
 Courtesy of GENERAL MOTORS COMPANY

10. Install Front Floor Console Applique (1). Refer to [Front Floor Console Applique Replacement \(Equinox\)](#)

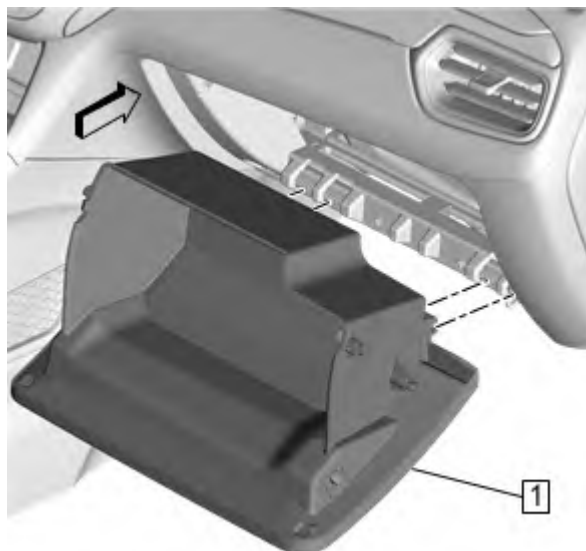


Fig. 83: Instrument Panel Compartment Door
Courtesy of GENERAL MOTORS COMPANY

11. Install Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#)

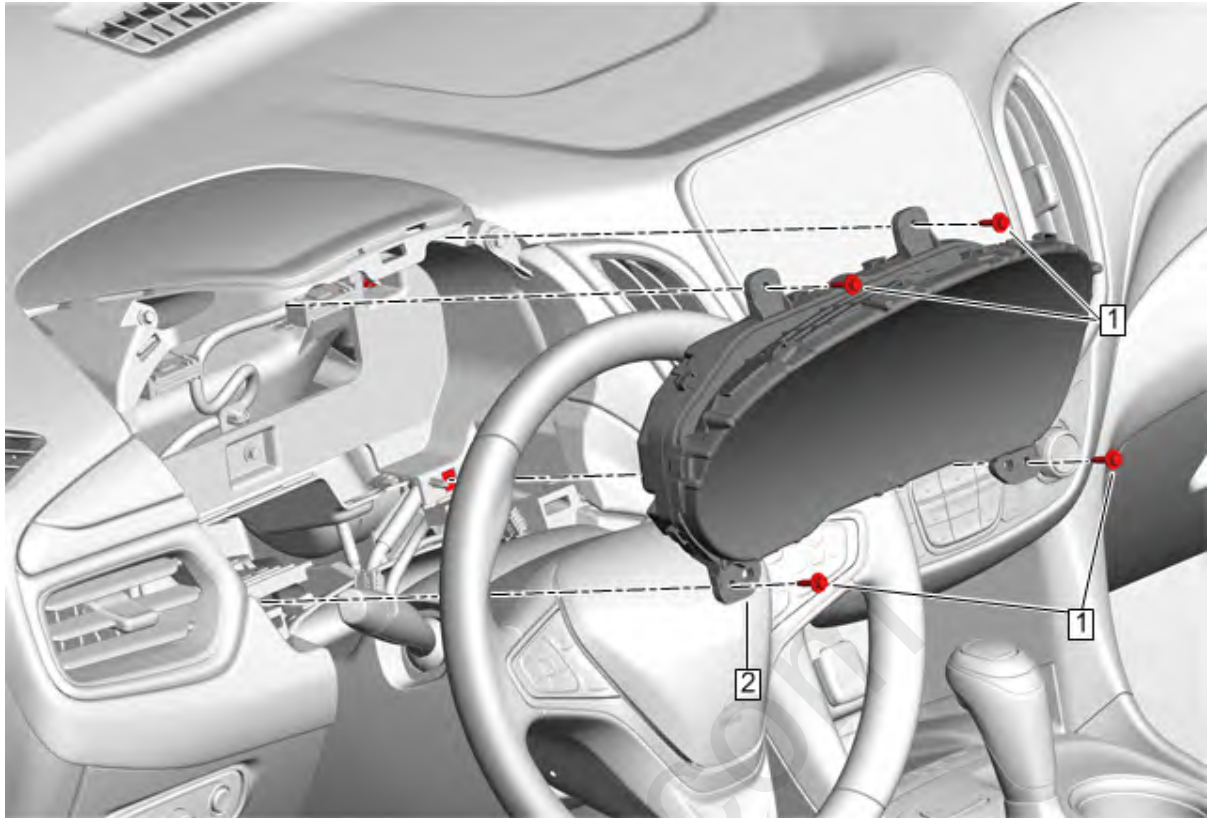


Fig. 84: Instrument Cluster And Screws
Courtesy of GENERAL MOTORS COMPANY

12. Install Instrument Cluster (2). Refer to [Instrument Cluster Replacement \(Equinox\)](#)



Fig. 85: Heater And Air Conditioning Remote Control
Courtesy of GENERAL MOTORS COMPANY

13. Install Heater and Air Conditioning Remote Control (1). Refer to [Heater and Air Conditioning Remote Control Replacement \(Equinox\)](#)

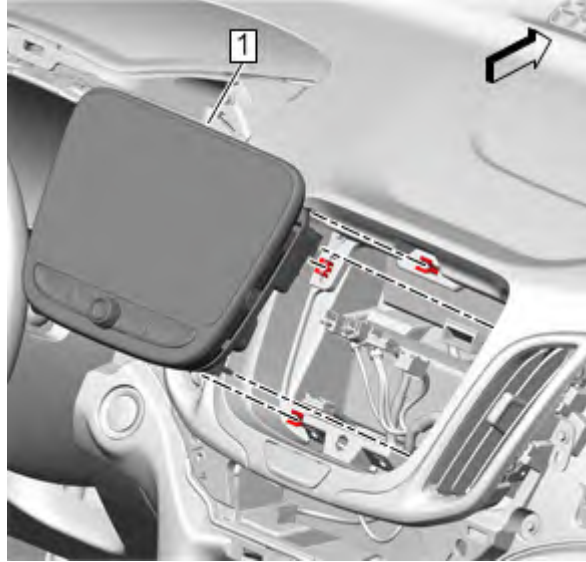


Fig. 86: Radio Control Assembly

Courtesy of GENERAL MOTORS COMPANY

14. Install Radio Control Assembly (1). Refer to [Radio Control Assembly Replacement \(Equinox\)](#).

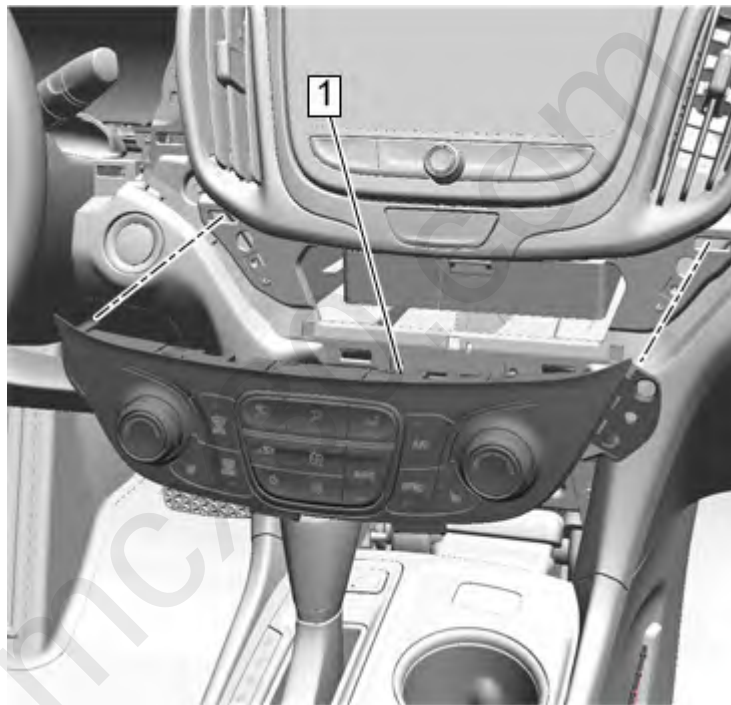


Fig. 87: Heater And Air Conditioning User Interface Control

Courtesy of GENERAL MOTORS COMPANY

15. Install Heater and Air Conditioning User Interface Control (1). Refer to [Heater and Air Conditioning User Interface Control Replacement \(Equinox\)](#).

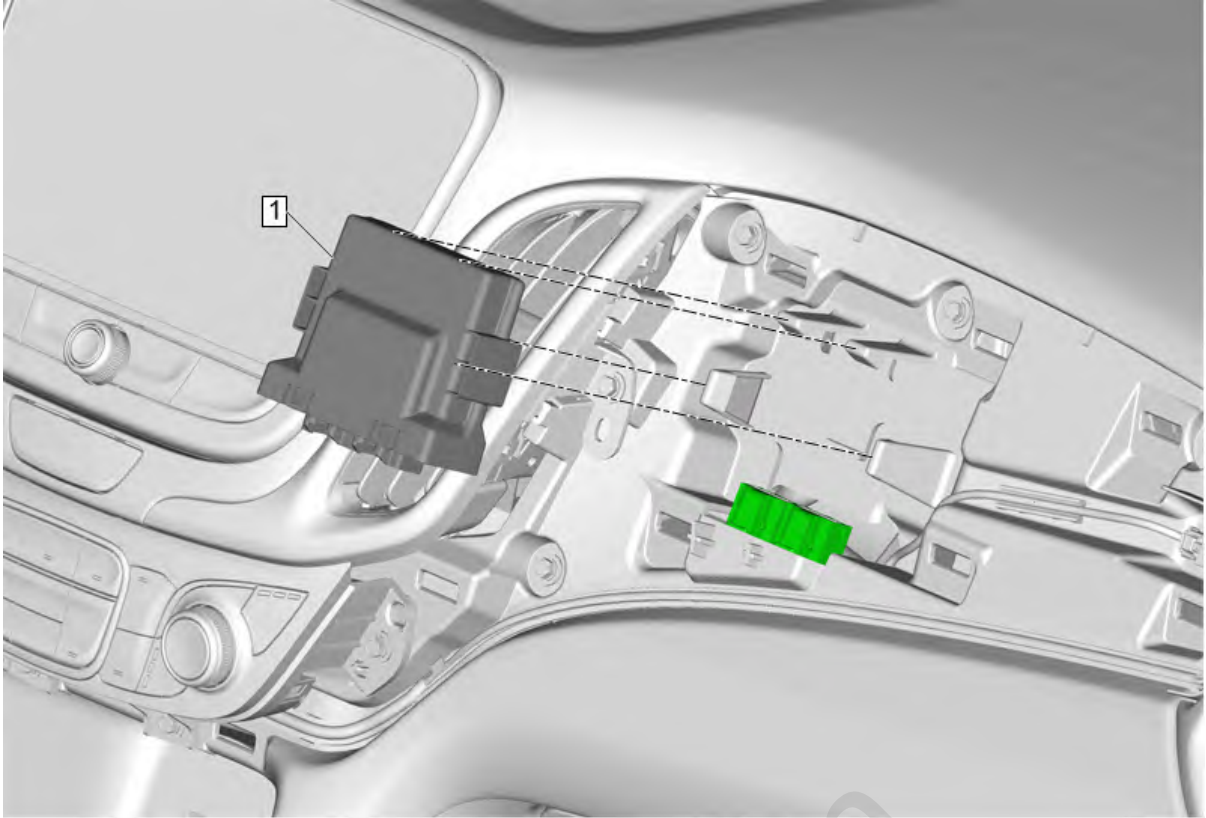


Fig. 88: Serial Data Gateway Module

Courtesy of GENERAL MOTORS COMPANY

16. Install Serial Data Gateway Module (1). Refer to [Serial Data Gateway Module Replacement \(Equinox\)](#)

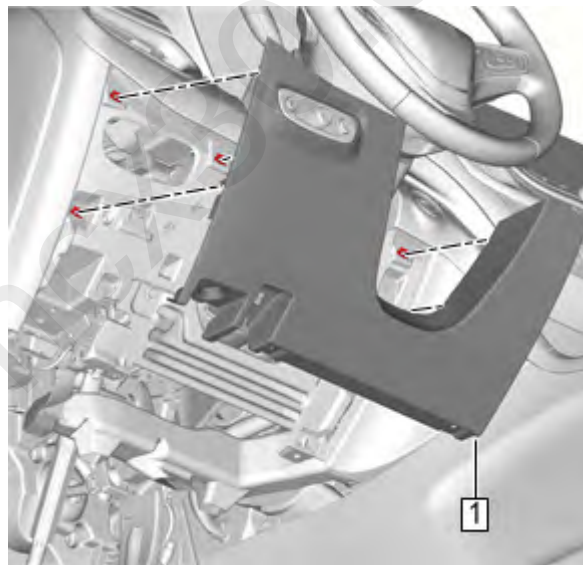


Fig. 89: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

17. Install Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#)

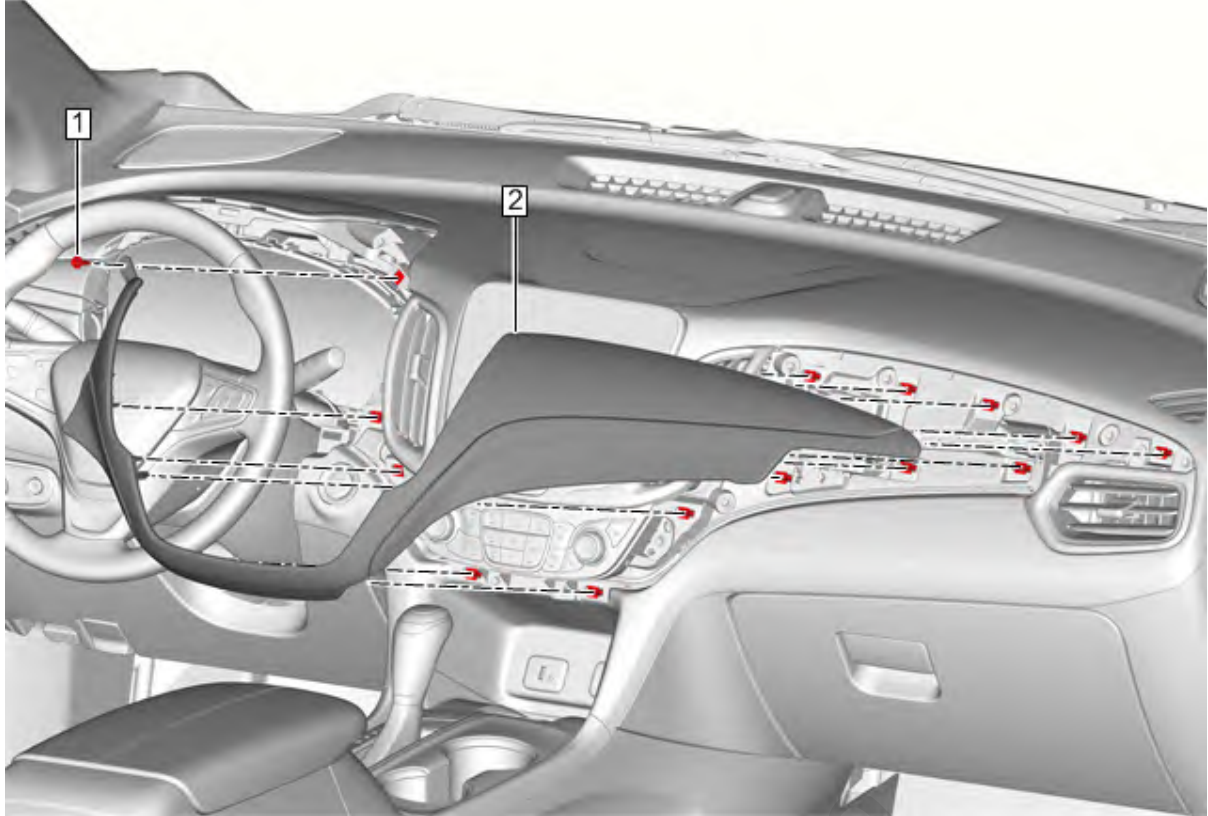


Fig. 90: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

18. Install Instrument Panel Trim Pad - Right Side (2). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Equinox\)](#).

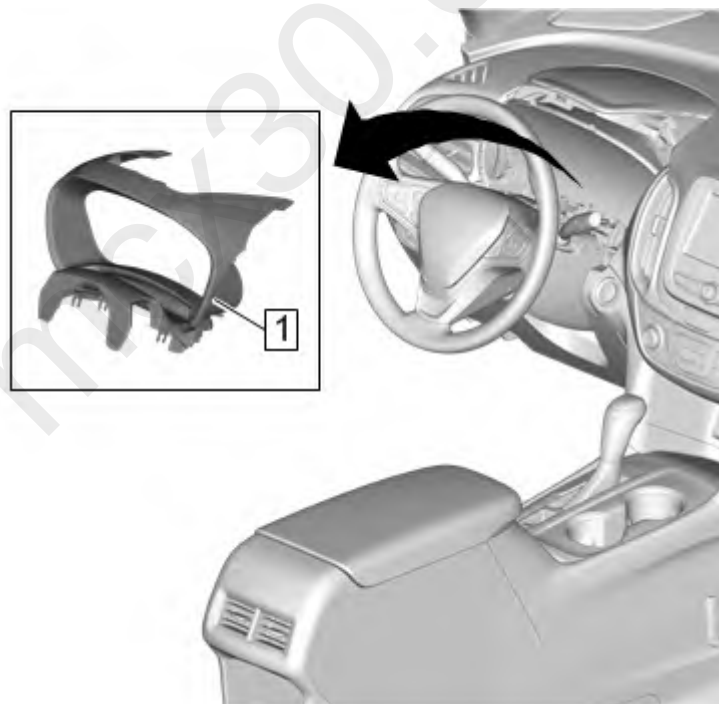


Fig. 91: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

19. Install Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Equinox\)](#).



Fig. 92: Left And Right Instrument Panel Outer Trim Cover

Courtesy of GENERAL MOTORS COMPANY

20. Install the left and right instrument panel outer trim cover (1). Refer to [Instrument Panel Outer Trim Cover Replacement \(Equinox\)](#).

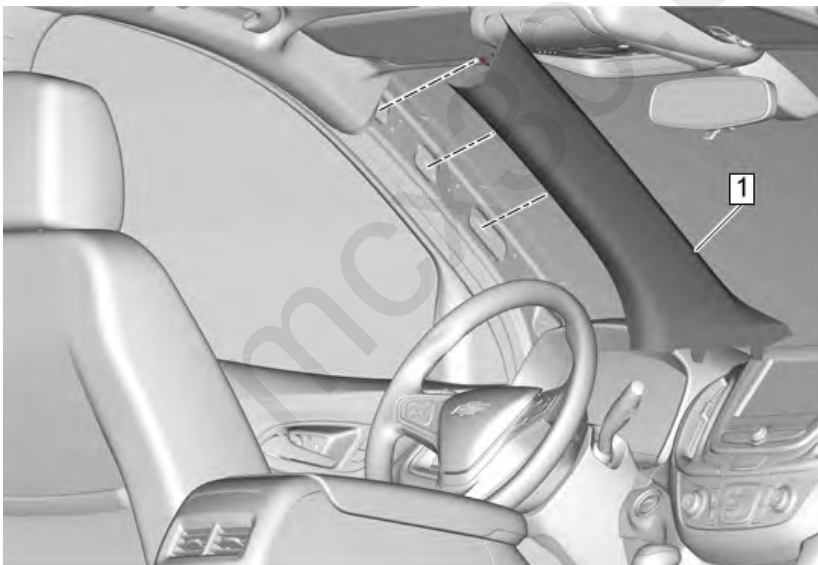


Fig. 93: Left And Right Windshield Garnish Molding

Courtesy of GENERAL MOTORS COMPANY

21. Install the left and right side windshield garnish molding (1). Refer to [Windshield Garnish Molding Replacement \(Equinox\)](#).

AIR CONDITIONING WIRING HARNESS REPLACEMENT (TERRAIN)

Removal Procedure

1. Remove Drivers Seat and Passengers Seat. Refer to [Driver or Passenger Seat Removal and Installation](#)
2. Remove the left and right side windshield garnish molding. Refer to [Windshield Garnish Molding Replacement \(Terrain\)](#).

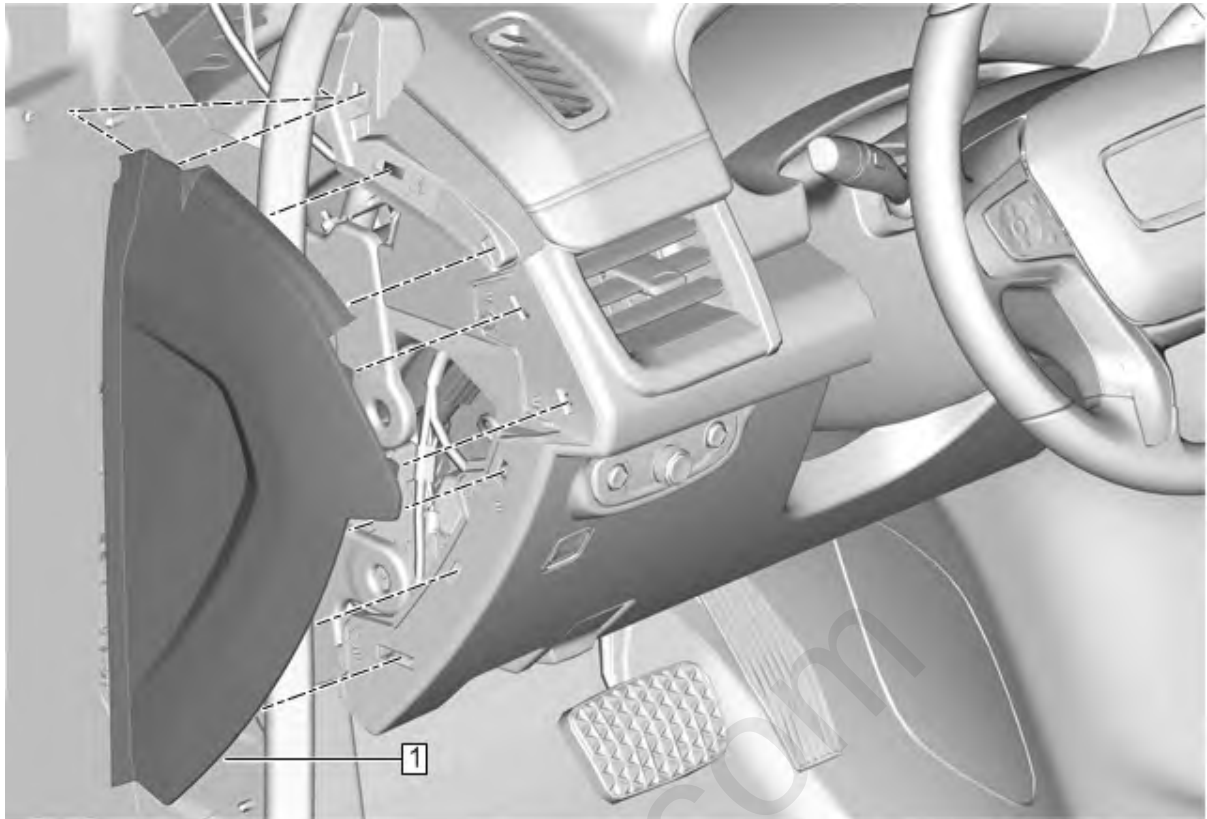


Fig. 94: Instrument Panel Outer Trim Cover (Terrain)

Courtesy of GENERAL MOTORS COMPANY

3. Remove the left and right instrument panel outer trim cover (1). Refer to [Instrument Panel Outer Trim Cover Replacement \(Terrain\)](#).

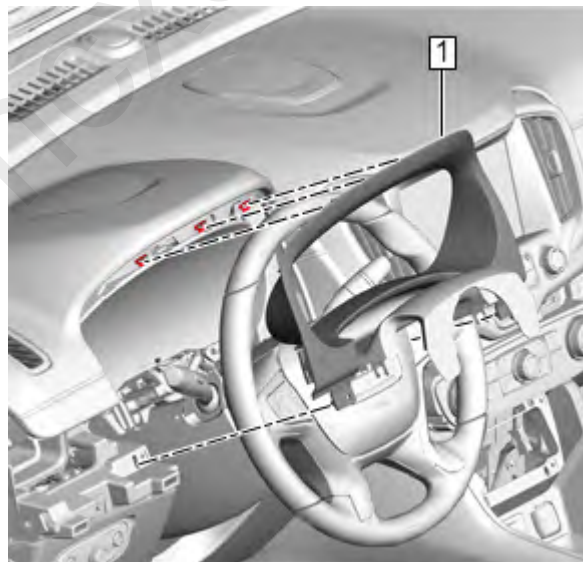


Fig. 95: Instrument Panel Cluster Trim Plate

Courtesy of GENERAL MOTORS COMPANY

4. Remove Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Terrain\)](#).

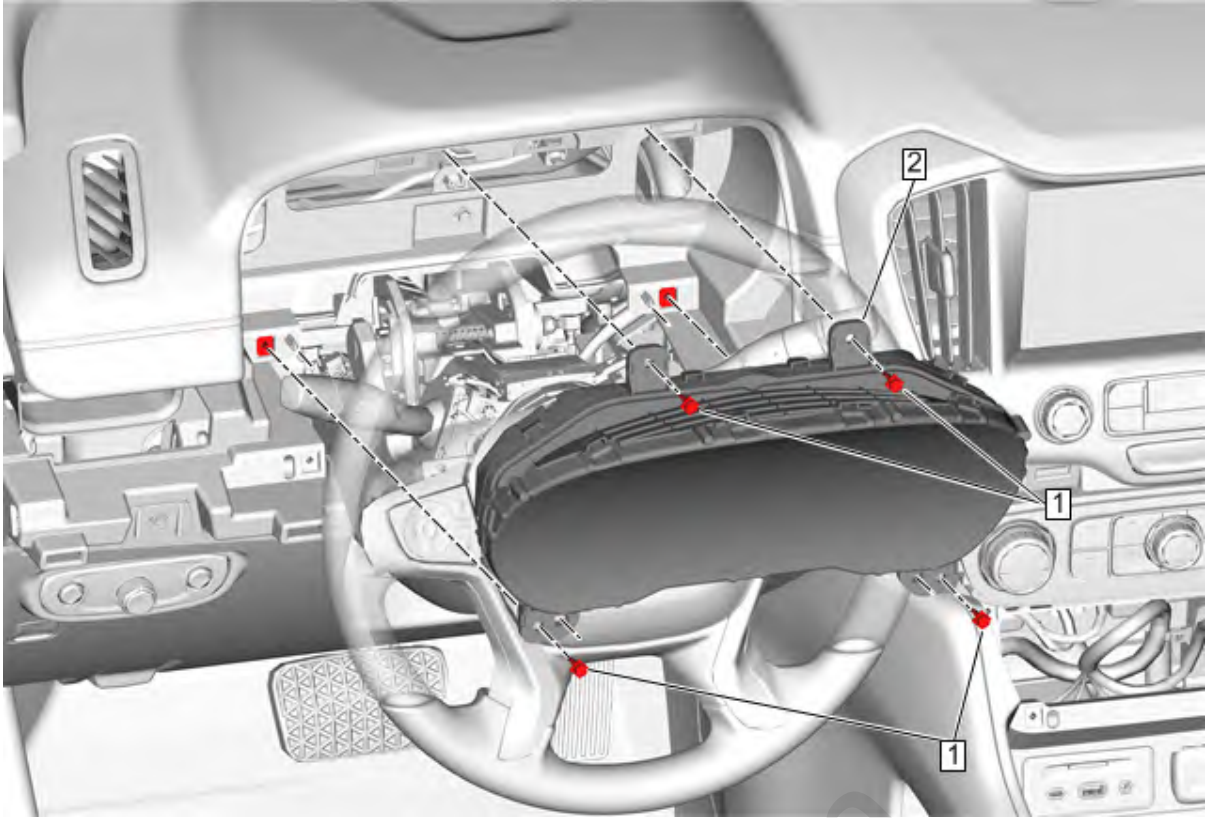


Fig. 96: Instrument Cluster And Screws

Courtesy of GENERAL MOTORS COMPANY

5. Remove Instrument Cluster (2). Refer to [Instrument Cluster Replacement \(Terrain\)](#).

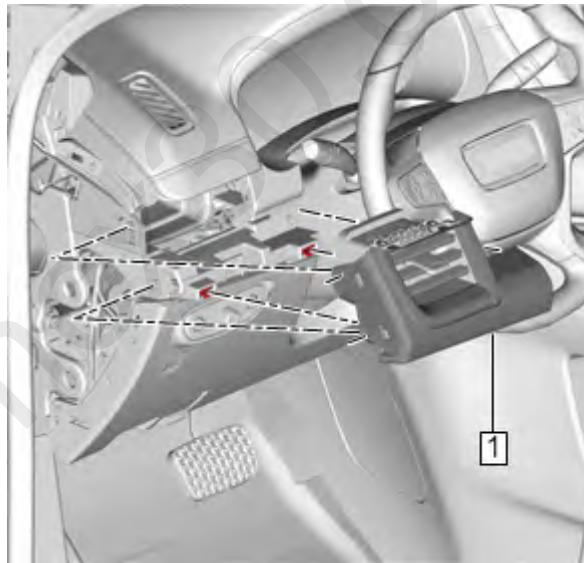


Fig. 97: Left Side Instrument Panel Trim Pad

Courtesy of GENERAL MOTORS COMPANY

6. Remove Instrument Panel Trim Pad - Left Side (1). Refer to [Instrument Panel Trim Pad Replacement - Left Side \(Terrain\)](#).

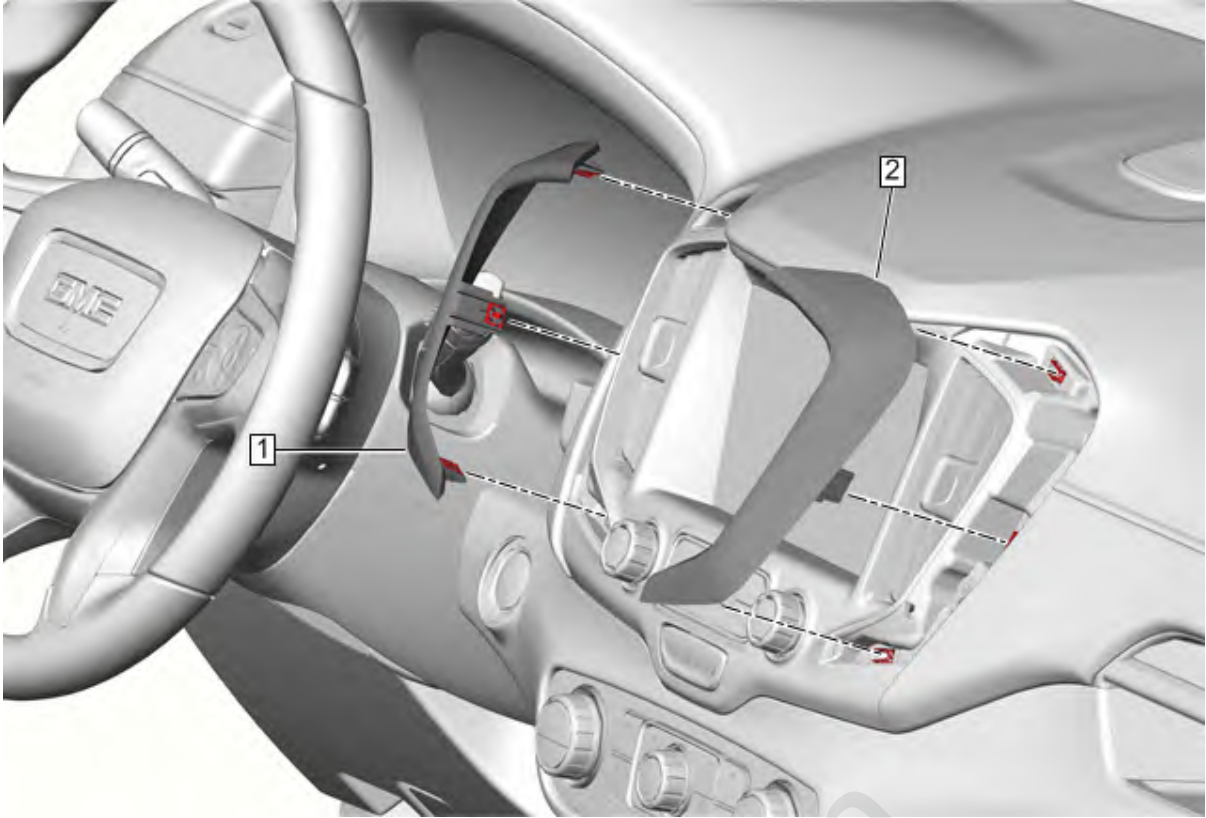


Fig. 98: Instrument Panel Center Trim Plate Appliques

Courtesy of GENERAL MOTORS COMPANY

7. Remove Instrument Panel Center Trim Plate Applique - Left Side (1). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).
8. Remove Instrument Panel Center Trim Plate Applique - Right Side (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).

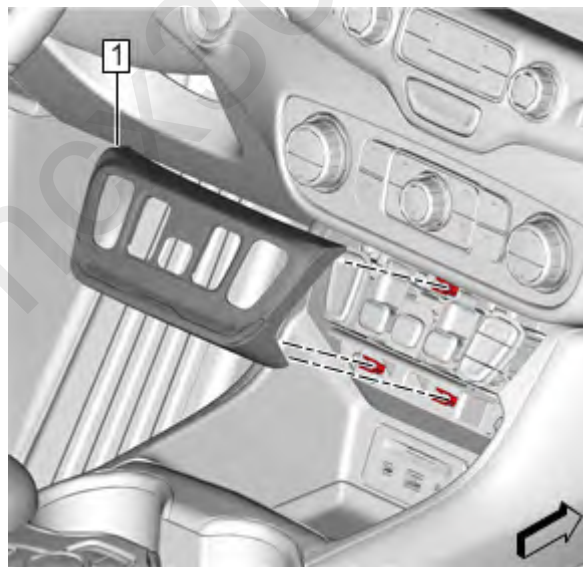


Fig. 99: Front Floor Console Transmission Shift Opening Bezel

Courtesy of GENERAL MOTORS COMPANY

9. Remove Front Floor Console Transmission Shift Opening Bezel (1). Refer to [Front Floor Console Transmission Shift Opening Bezel Replacement \(Terrain\)](#).

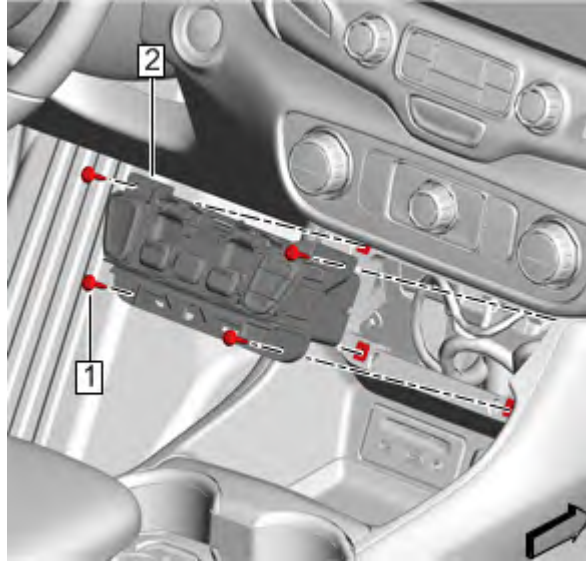


Fig. 100: Automatic Transmission Control Bolts And Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

10. Remove Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

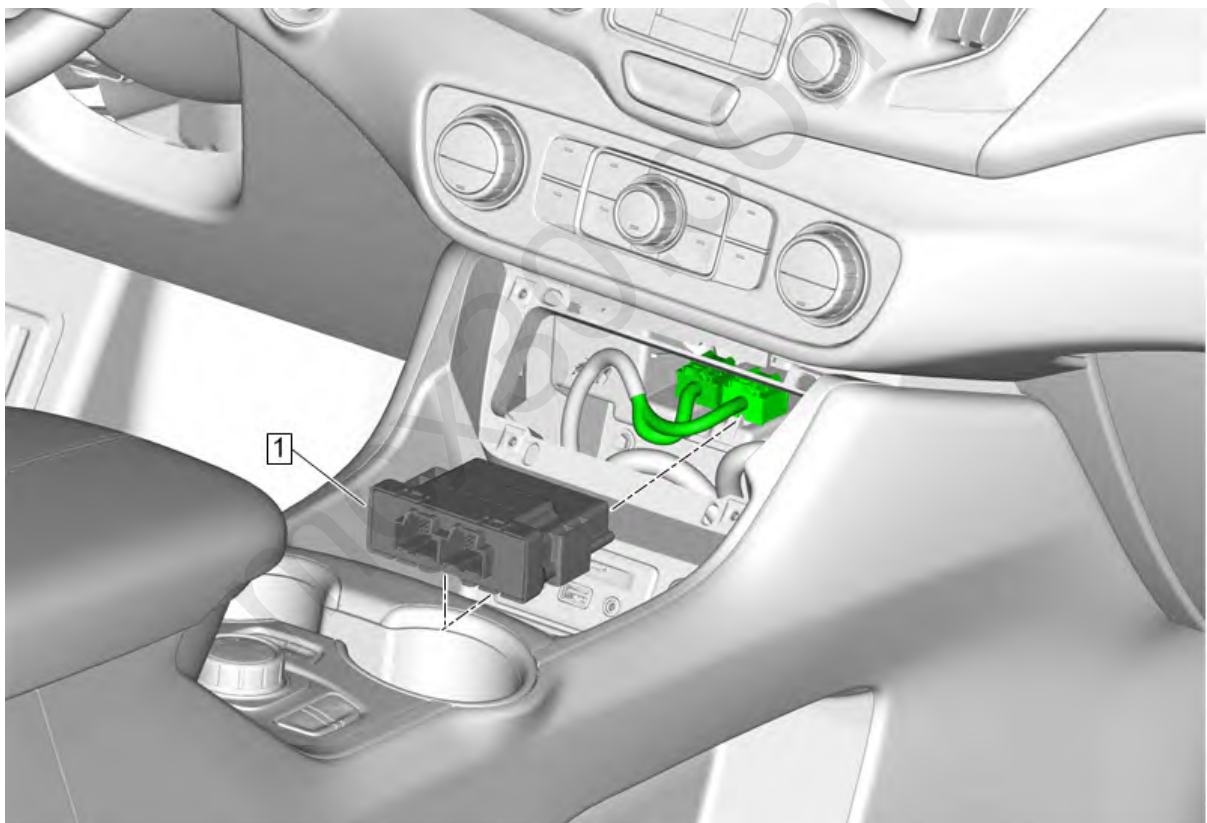


Fig. 101: Serial Data Gateway Module

Courtesy of GENERAL MOTORS COMPANY

11. Remove Serial Data Gateway Module (1). Refer to [Serial Data Gateway Module Replacement \(Terrain with MNH, NMK, or MHG\)](#), [Serial Data Gateway Module Replacement \(Terrain with M3U, M3D, or M3H\)](#)

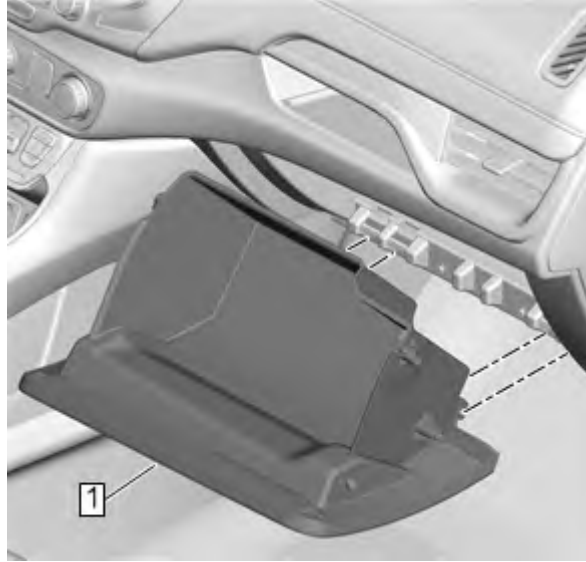


Fig. 102: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

12. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Terrain\)](#).

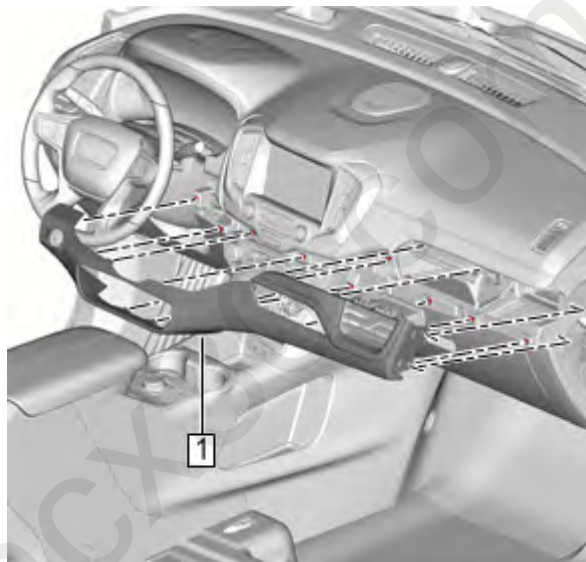


Fig. 103: Right Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

13. Remove Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#).

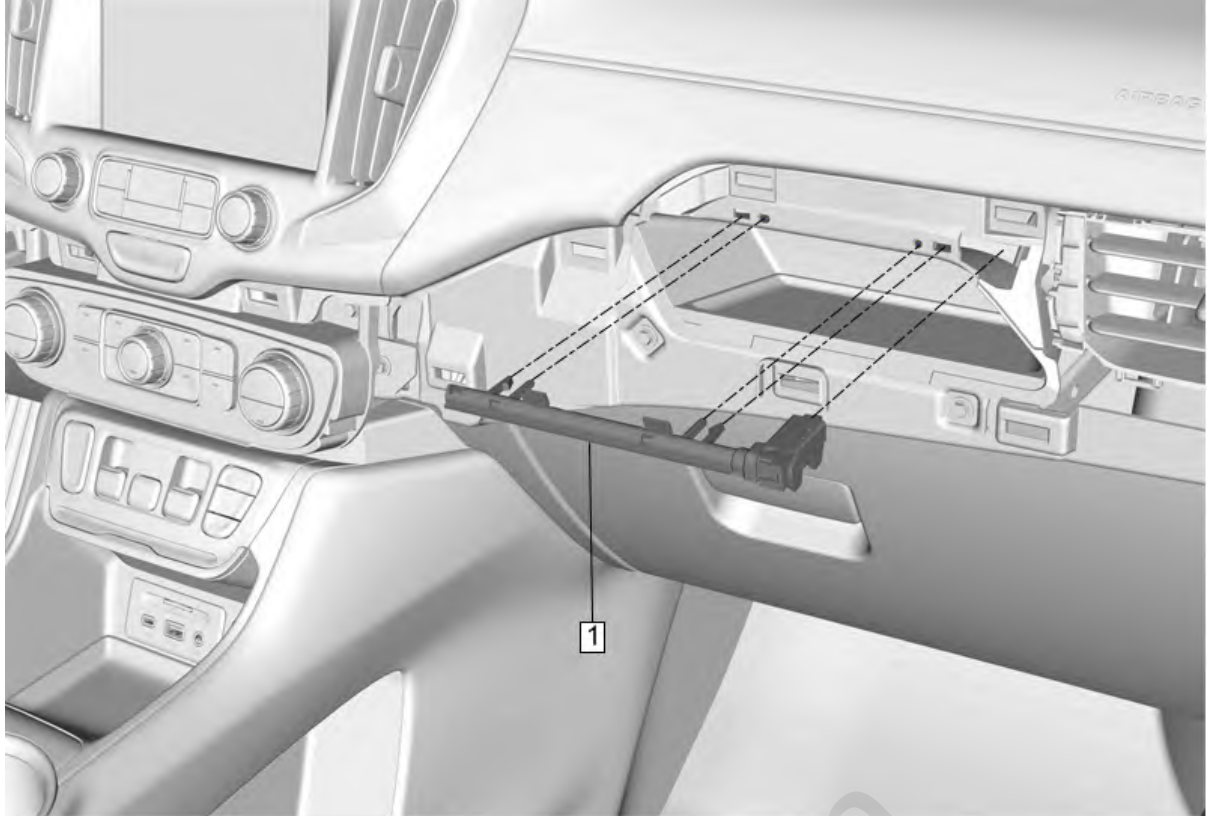


Fig. 104: Instrument Panel Light Conductor Lamp
 Courtesy of GENERAL MOTORS COMPANY

14. Remove Instrument Panel Light Conductor Lamp (1). Refer to [Instrument Panel Light Conductor Lamp Replacement \(GMC\)](#)

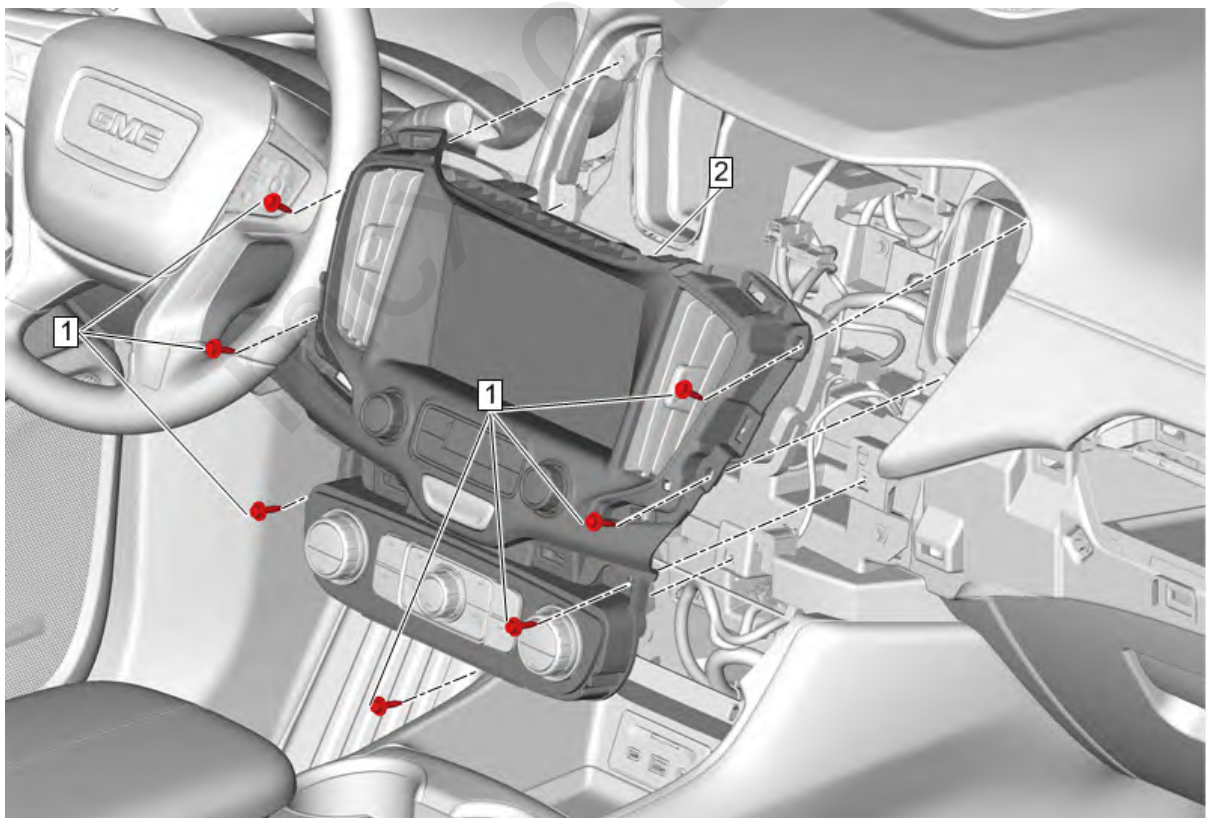


Fig. 105: Radio Control Assembly And Screws
 Courtesy of GENERAL MOTORS COMPANY

15. Remove Radio Control Assembly (2). Refer to [Radio Control Assembly Replacement \(Terrain\)](#)
16. Disconnect all electrical connectors.



Fig. 106: Radio Front Center Speaker
 Courtesy of GENERAL MOTORS COMPANY

17. Remove Radio Front Center Speaker (2). Refer to [Radio Front Center Speaker Replacement \(Terrain\)](#).

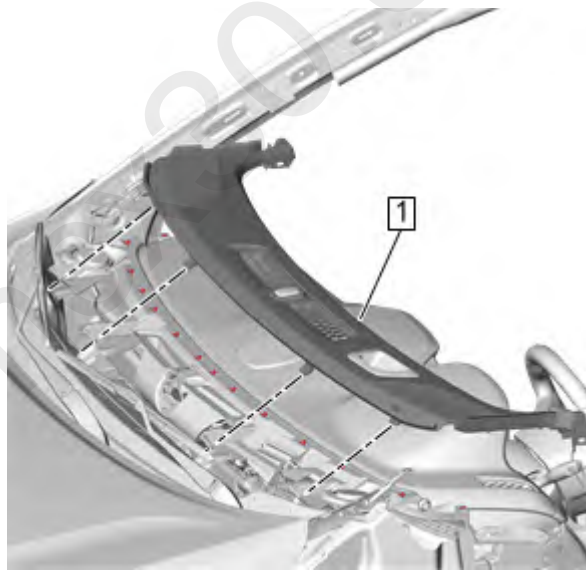


Fig. 107: Instrument Panel Extension
 Courtesy of GENERAL MOTORS COMPANY

18. Remove Instrument Panel Extension (1). Refer to [Instrument Panel Extension Replacement \(Terrain\)](#).

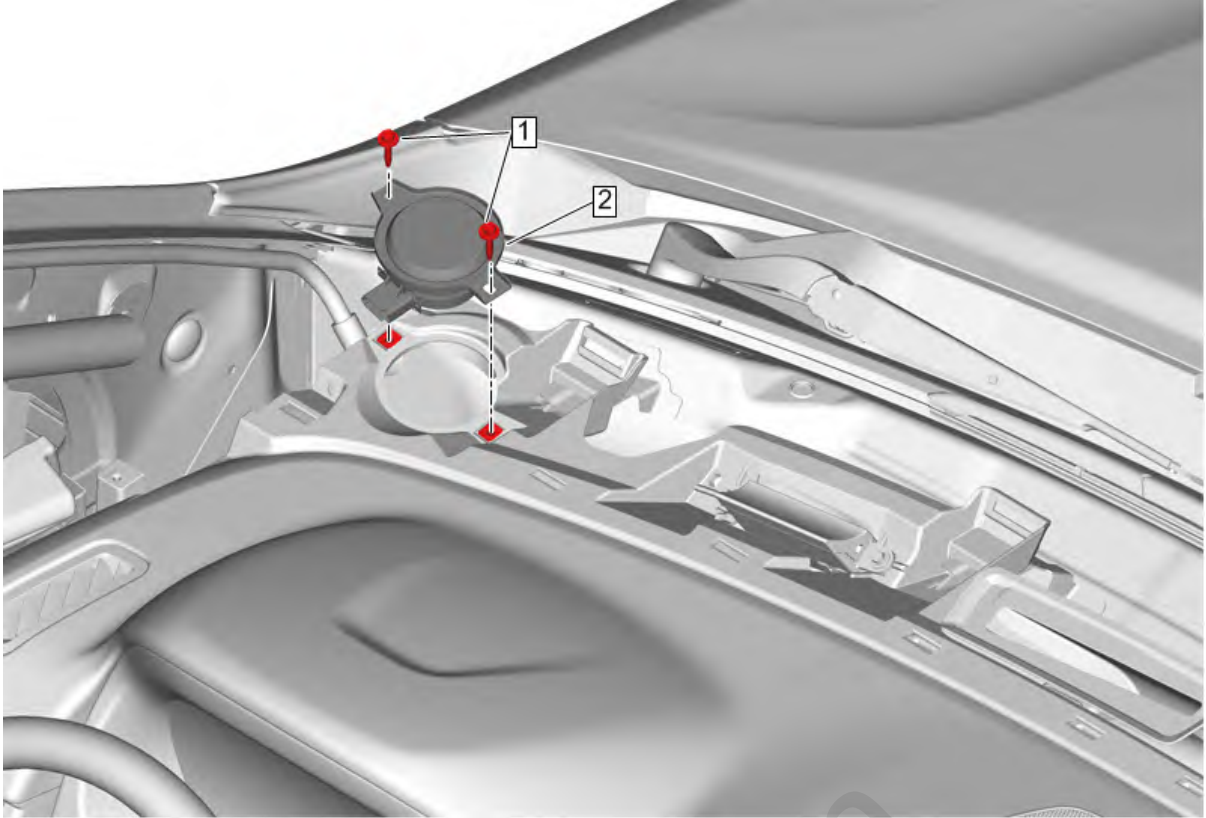


Fig. 108: Radio Front Speaker

Courtesy of GENERAL MOTORS COMPANY

19. Remove the left and right side radio front speakers (2). Refer to [Radio Front Speaker Replacement \(Terrain\)](#)

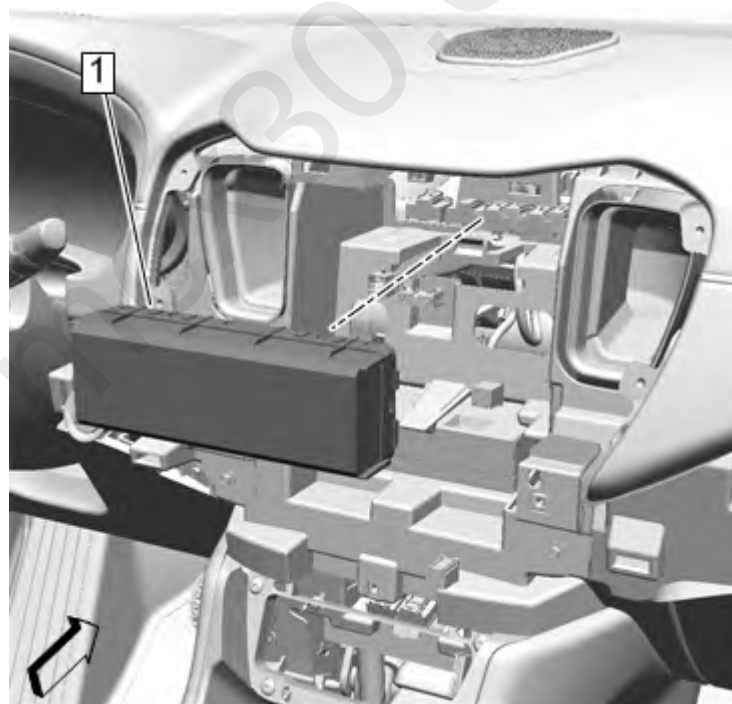


Fig. 109: Heater And Air Conditioning Remote Control

Courtesy of GENERAL MOTORS COMPANY

20. Remove Heater and Air Conditioning Remote Control (1). Refer to [Heater and Air Conditioning Remote Control Replacement \(Terrain\)](#)

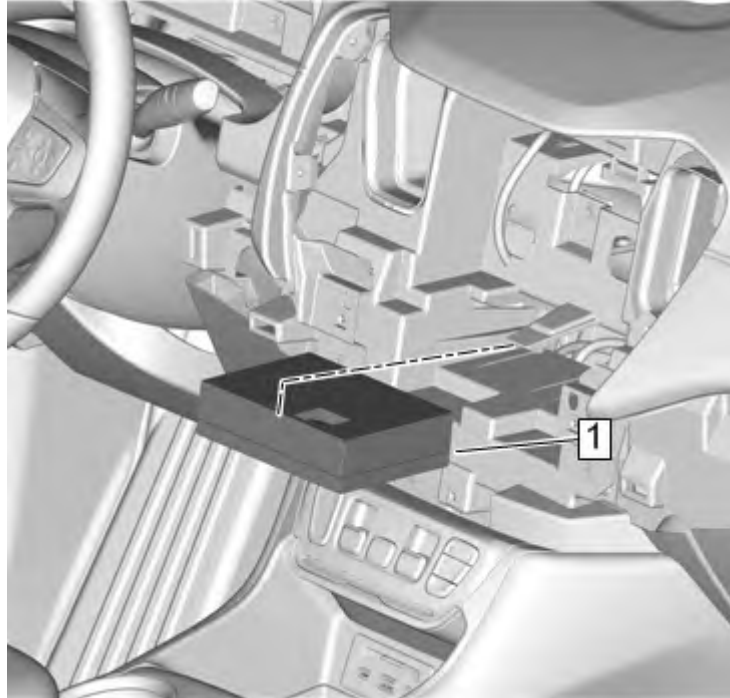


Fig. 110: Communication Interface Module

Courtesy of GENERAL MOTORS COMPANY

21. Remove Communication Interface Module (1). Refer to [Communication Interface Module Replacement \(Terrain with IOS, IOT, IOU\)](#). [Communication Interface Module Replacement \(Terrain with IOR\)](#).

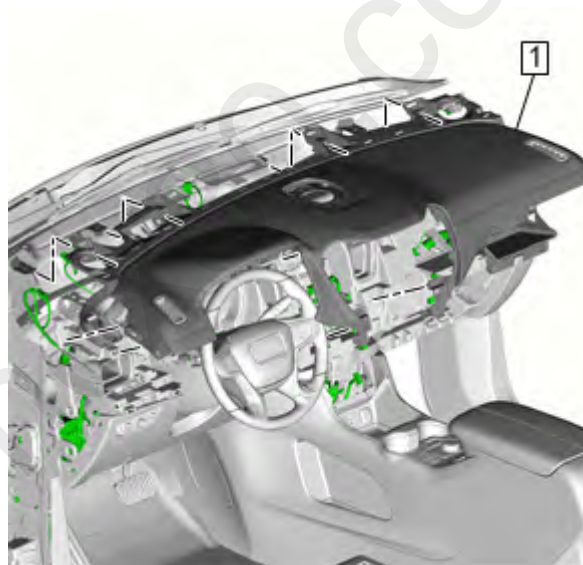


Fig. 111: Instrument Panel Upper Trim Panel

Courtesy of GENERAL MOTORS COMPANY

22. Remove Instrument Panel Upper Trim Panel (1). Refer to [Instrument Panel Upper Trim Panel Replacement \(Terrain\)](#).

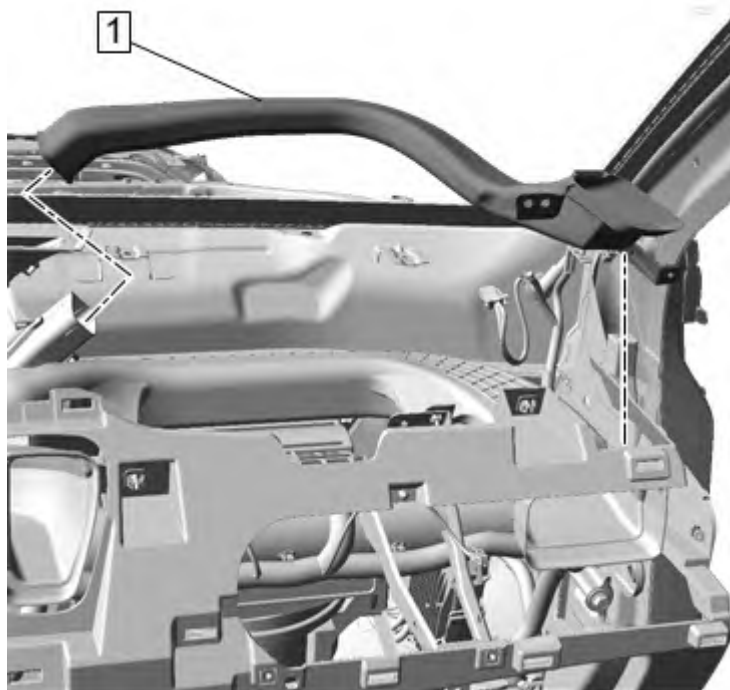


Fig. 112: Right Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

23. Remove Side Window Defogger Outlet Duct - Right Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Right Side \(Terrain\)](#)

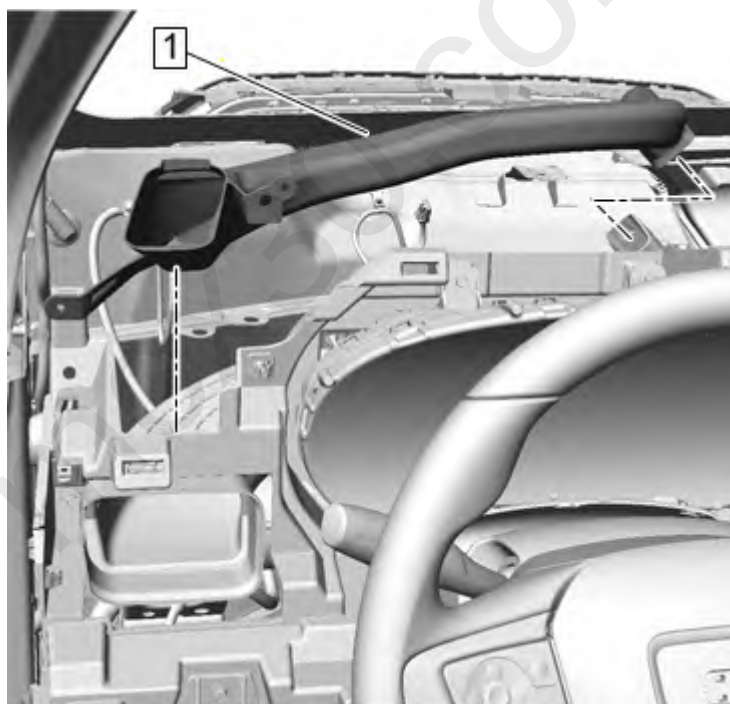


Fig. 113: Left Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

24. Remove Side Window Defogger Outlet Duct - Left Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Left Side \(Terrain\)](#)

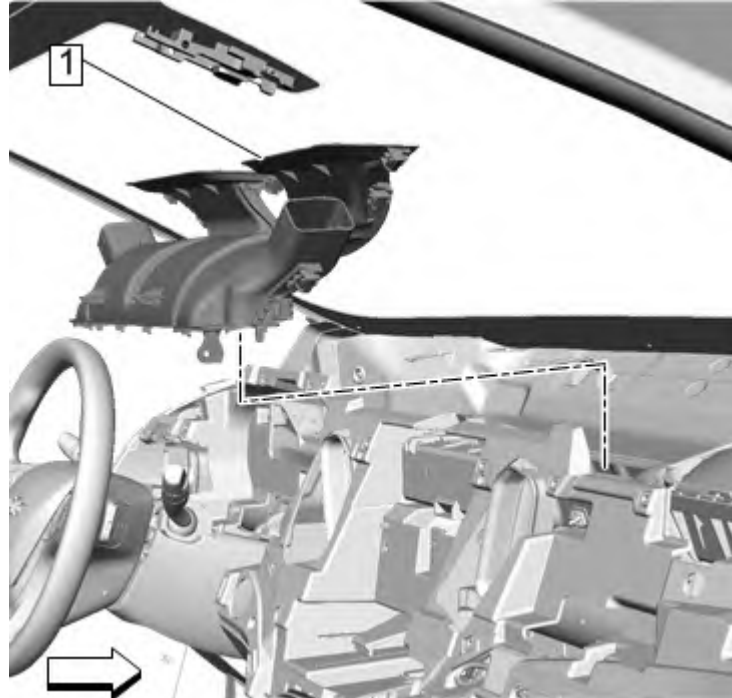


Fig. 114: Windshield Defroster Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

25. Remove Windshield Defroster Outlet Duct (1). Refer to [Windshield Defroster Outlet Duct Replacement \(Terrain\)](#)
26. Disconnect and reposition harness as necessary.

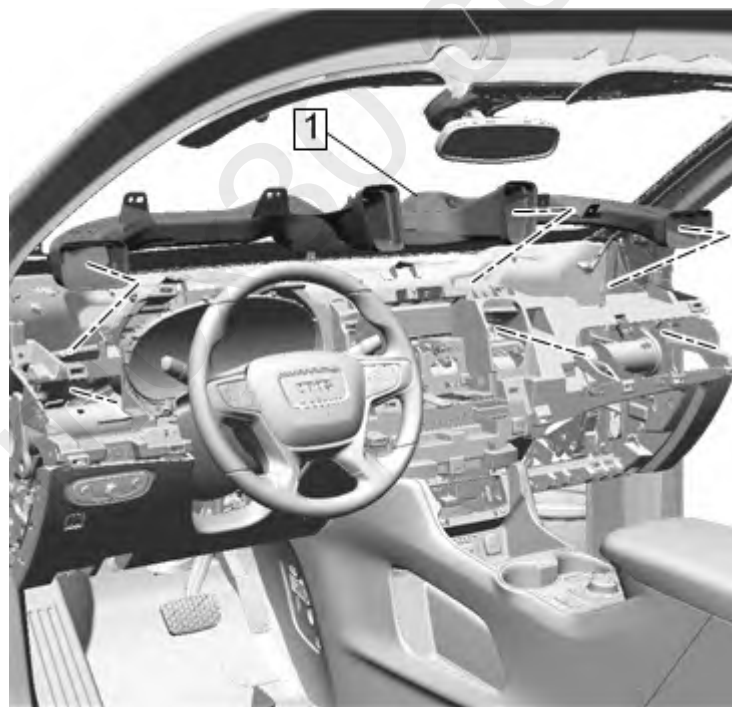


Fig. 115: Instrument Panel Center Air Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

27. Remove Instrument Panel Center Air Outlet Duct (1). Refer to [Instrument Panel Center Air Outlet Duct Replacement \(Terrain\)](#)

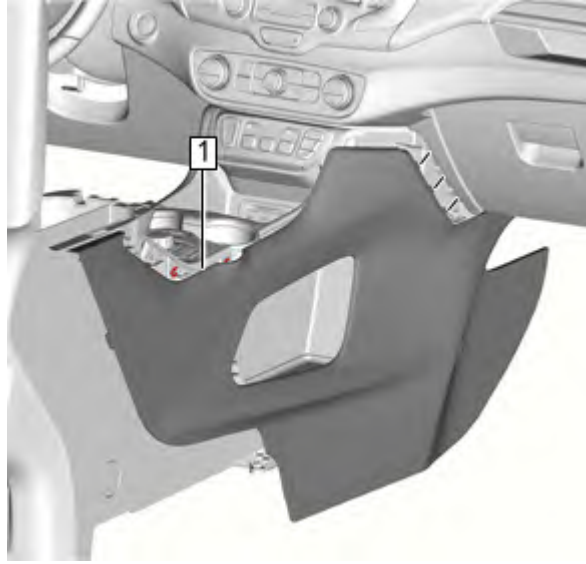


Fig. 116: Right Front Floor Console Extension Panel
 Courtesy of GENERAL MOTORS COMPANY

28. Remove Front Floor Console Extension Panel - Right (1). Refer to [Front Floor Console Extension Panel Replacement - Right Side \(Terrain\)](#).

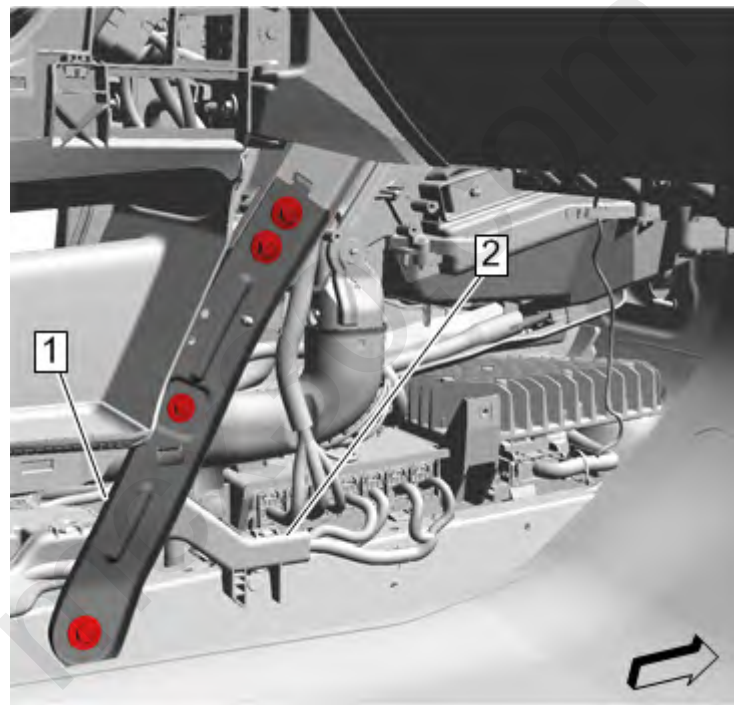


Fig. 117: Right Side Instrument Panel Center Lower Bracket
 Courtesy of GENERAL MOTORS COMPANY

29. Remove Instrument Panel Center Lower Bracket-Right Side (1). Refer to [Instrument Panel Center Lower Bracket Replacement \(Terrain - Right Side\)](#).



Fig. 118: Left Front Floor Console Extension Panel
 Courtesy of GENERAL MOTORS COMPANY

30. Remove Front Floor Console Extension Panel - Left (1). Refer to [Front Floor Console Extension Panel Replacement - Left Side \(Terrain\)](#)

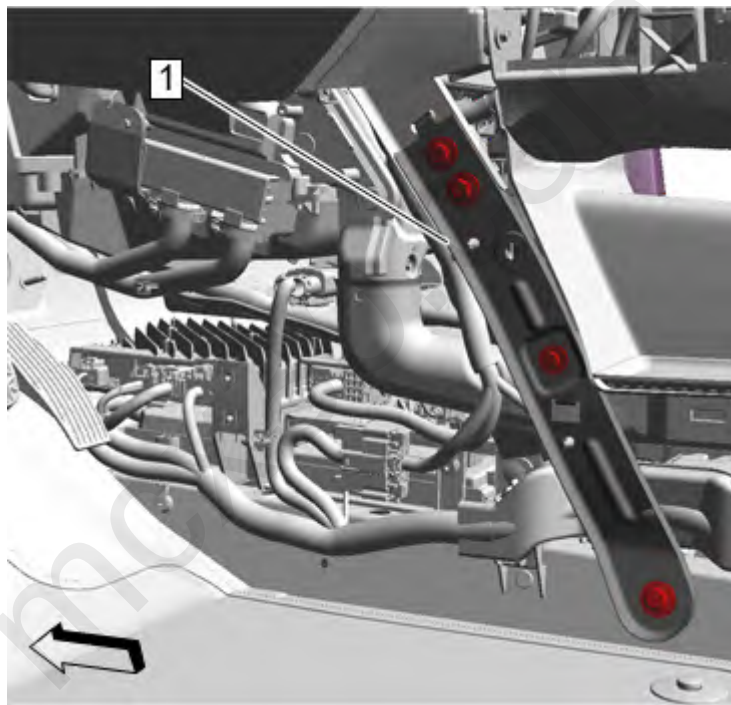


Fig. 119: Left Side Instrument Panel Center Lower Bracket
 Courtesy of GENERAL MOTORS COMPANY

31. Remove Instrument Panel Center Lower Bracket-Left Side (1). Refer to [Instrument Panel Center Lower Bracket Replacement \(Terrain - Left Side\)](#)

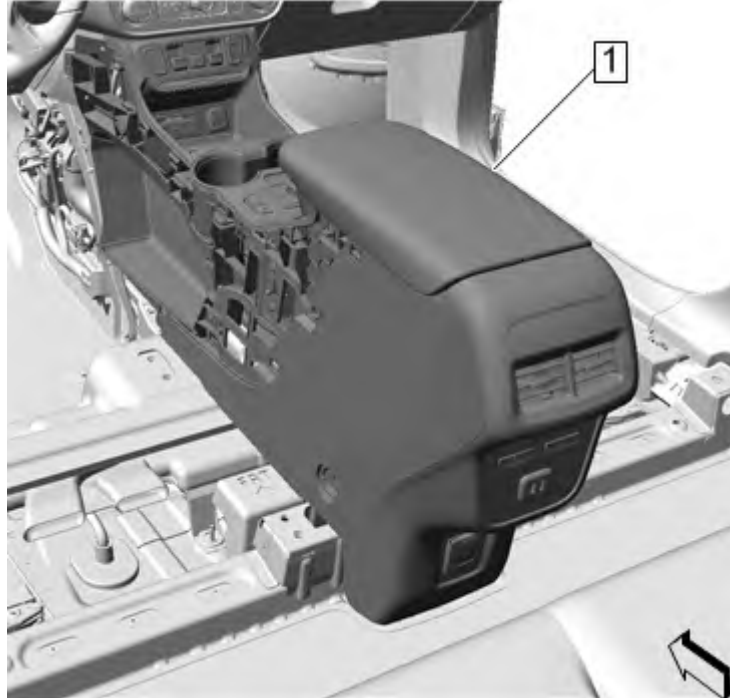


Fig. 120: Front Floor Console

Courtesy of GENERAL MOTORS COMPANY

32. Remove Front Floor Console (1). Refer to [Front Floor Console Replacement \(Terrain\)](#).
33. Disconnect the electrical connectors.

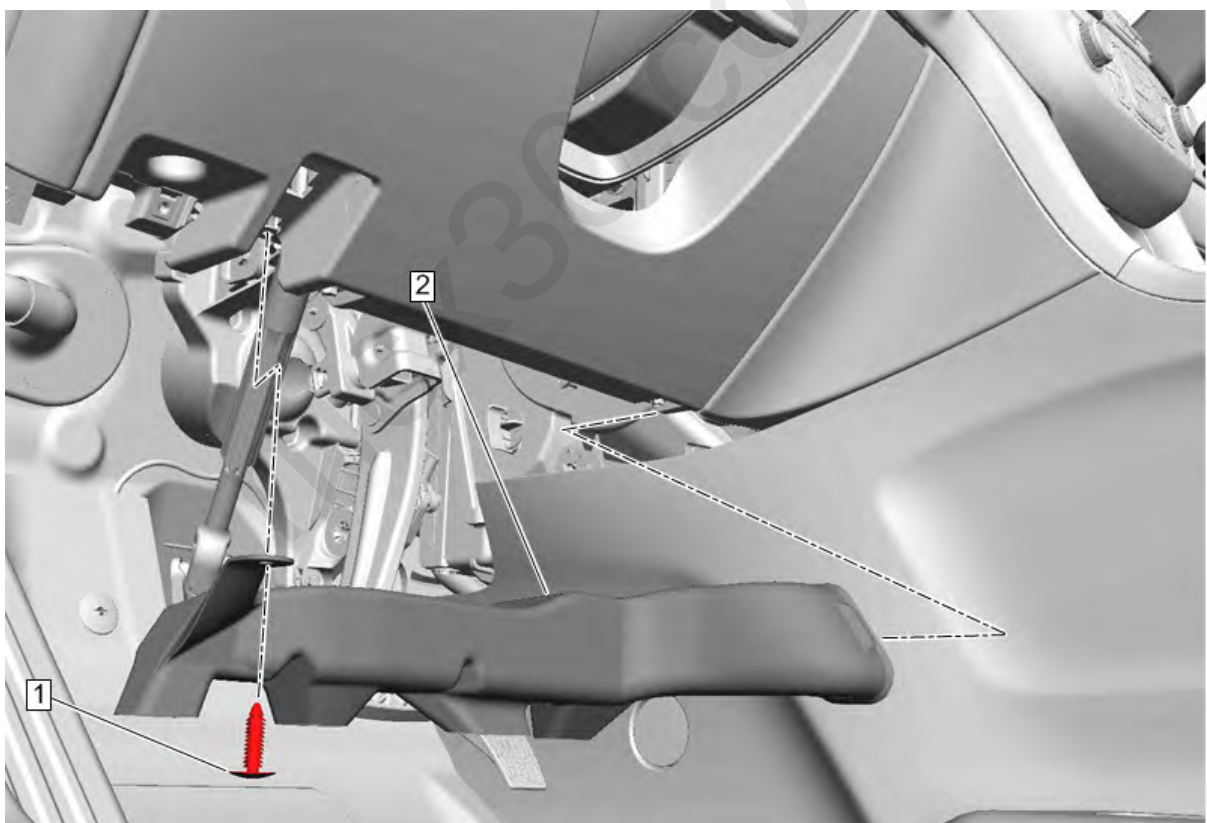


Fig. 121: Left Side Floor Front Air Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

34. Remove Floor Front Air Outlet Duct - Left Side (2). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#)

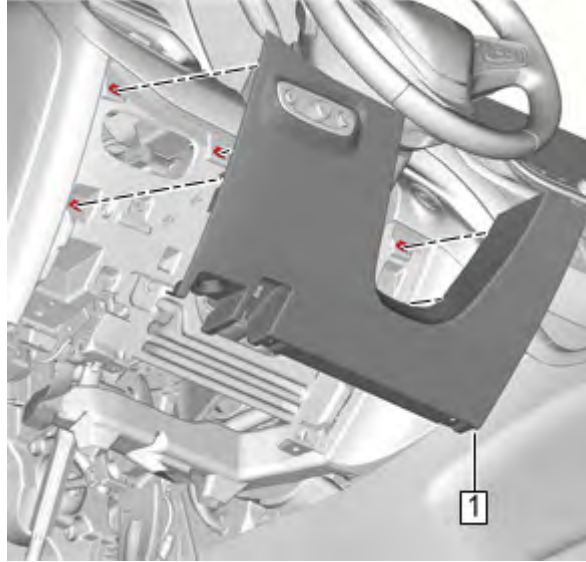


Fig. 122: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

35. Remove Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).

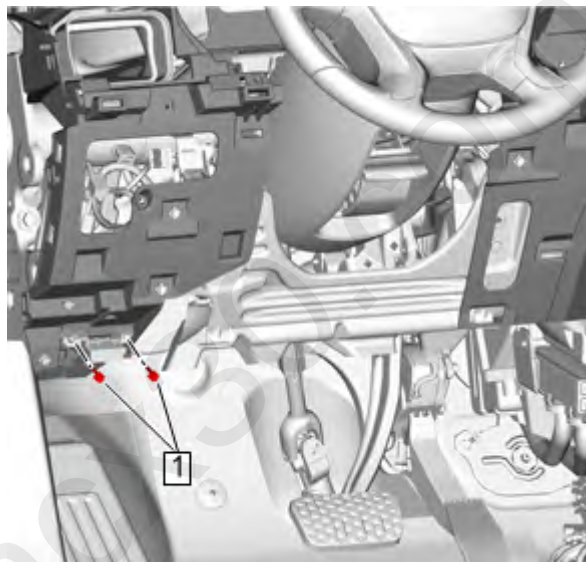


Fig. 123: Data Link Connector Bolts

Courtesy of GENERAL MOTORS COMPANY

36. Remove Data Link Connector Bolts (1) (Qty: 2)

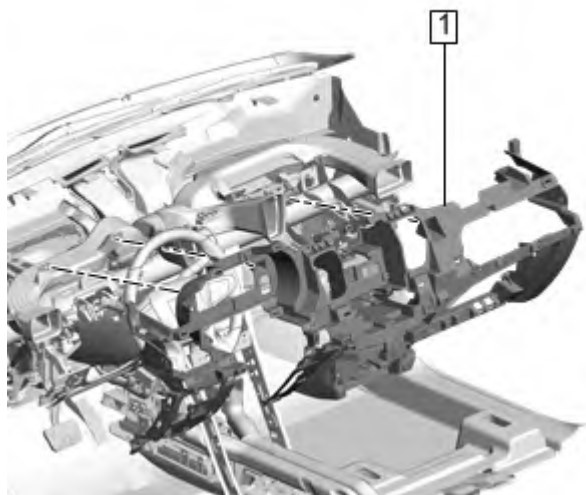


Fig. 124: Instrument Panel

Courtesy of GENERAL MOTORS COMPANY

37. Remove Instrument Panel Assembly (1). Refer to [Instrument Panel Assembly Replacement \(Terrain\)](#).

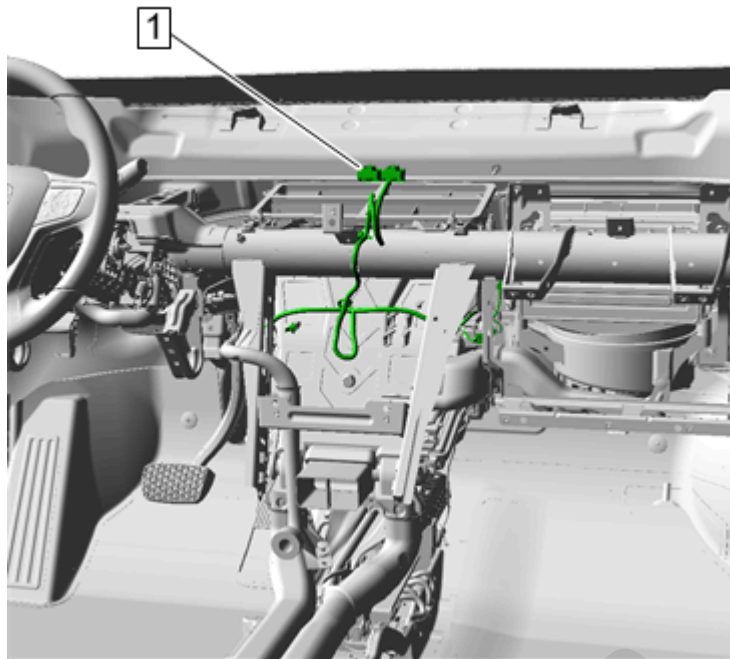


Fig. 125: Air Conditioning Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

38. Disconnect all electrical connectors.
39. Remove Air Conditioning Wiring Harness (1)

Installation Procedure

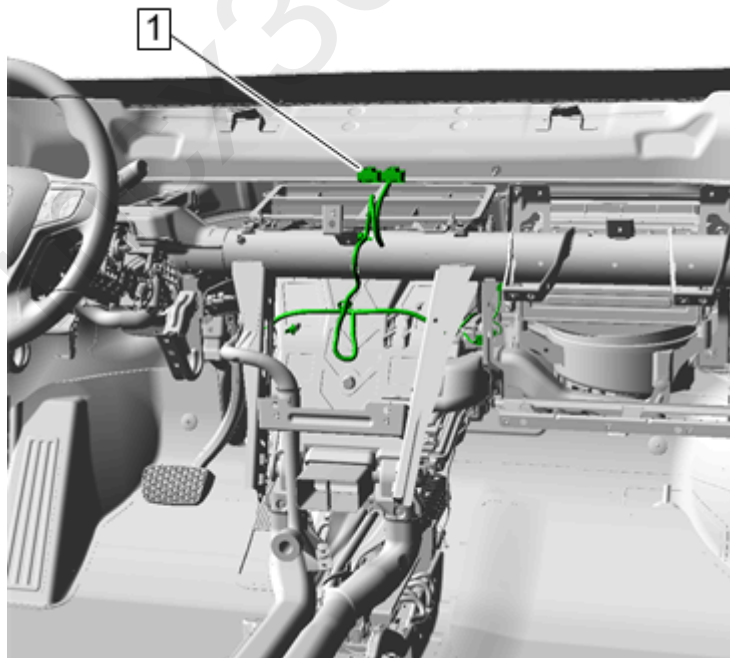


Fig. 126: Air Conditioning Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

1. Install Air Conditioning Wiring Harness (1)
2. Connect all electrical connectors.

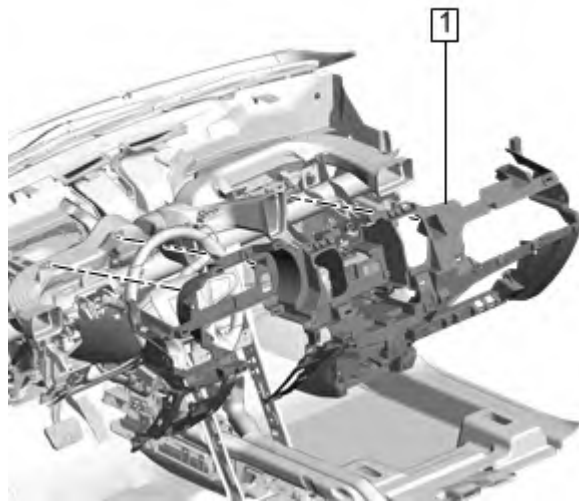


Fig. 127: Instrument Panel

Courtesy of GENERAL MOTORS COMPANY

3. Install Instrument Panel Assembly (1). Refer to [Instrument Panel Assembly Replacement \(Terrain\)](#).

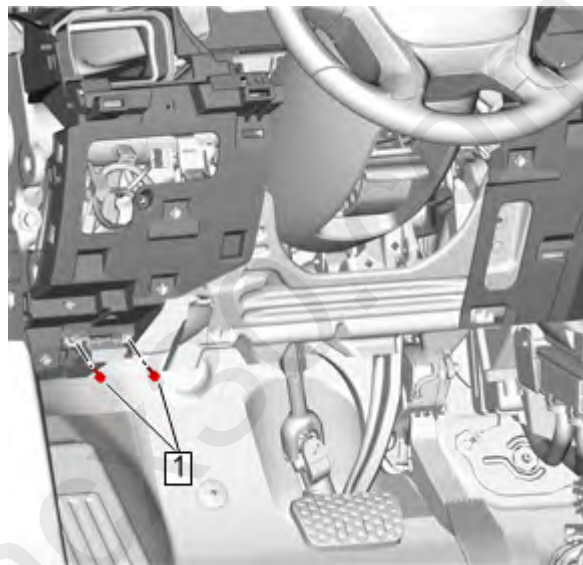


Fig. 128: Data Link Connector Bolts

Courtesy of GENERAL MOTORS COMPANY

4. Install and tighten Data Link Connector Bolts (1) (Qty: 2) to 2.5 N.m (22 lb in)

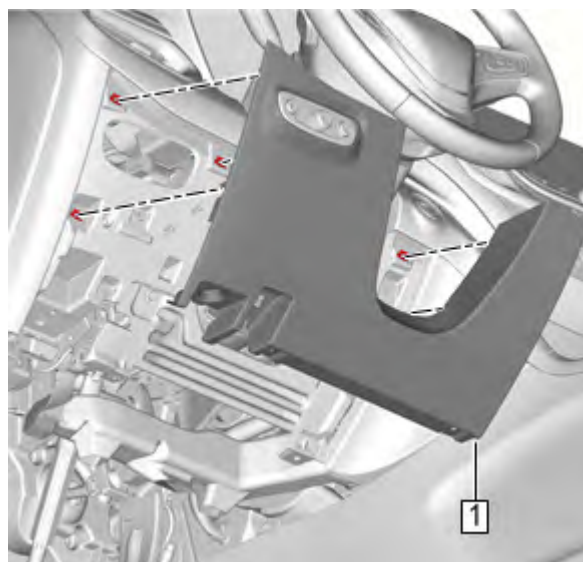


Fig. 129: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

5. Install Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).

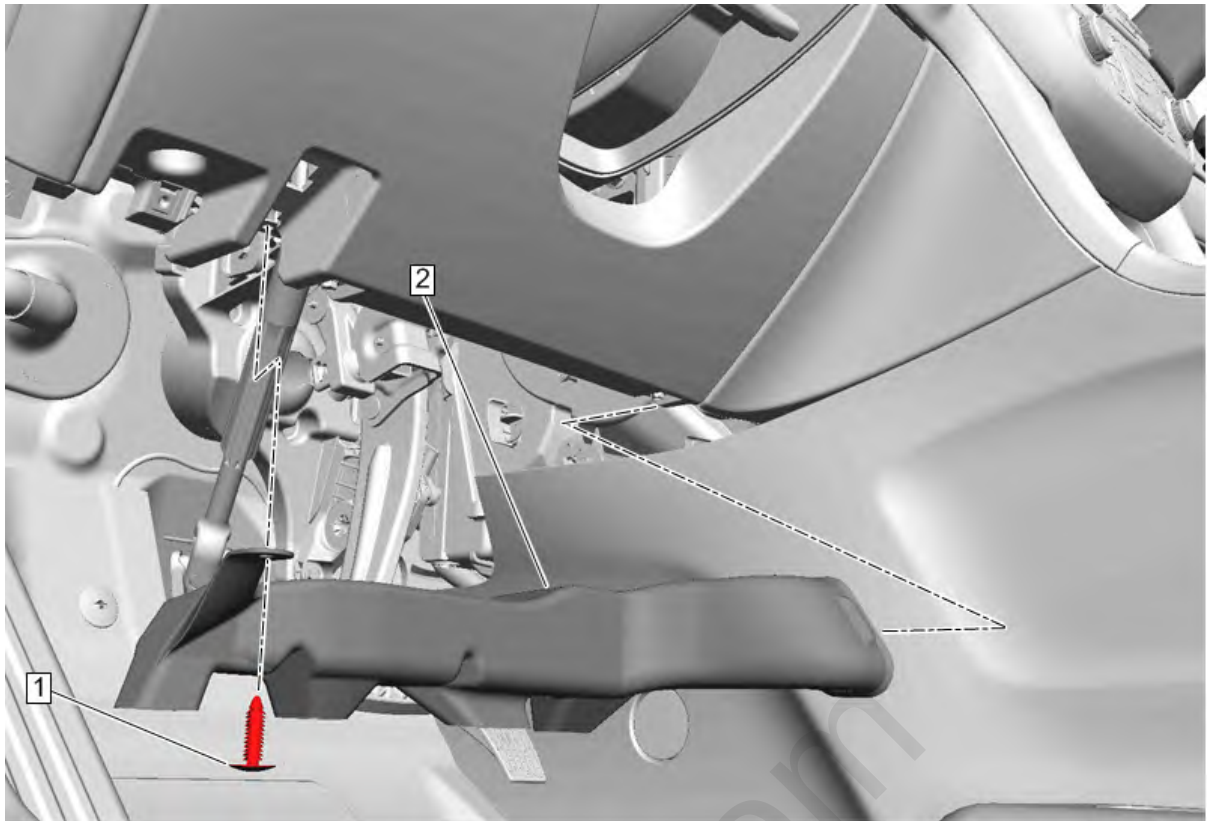


Fig. 130: Left Side Floor Front Air Outlet Duct
Courtesy of GENERAL MOTORS COMPANY

6. Install Floor Front Air Outlet Duct - Left Side (2). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#).

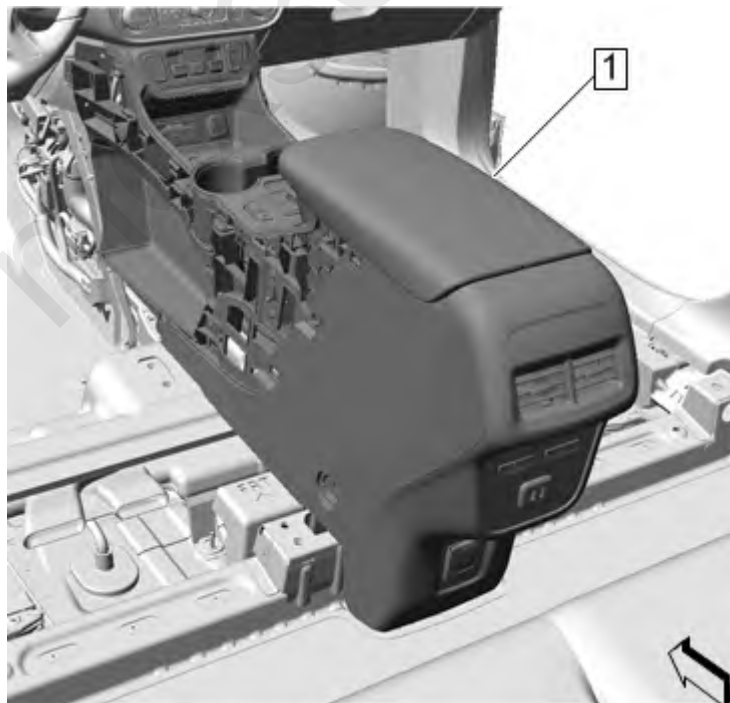


Fig. 131: Front Floor Console
Courtesy of GENERAL MOTORS COMPANY

7. Connect the electrical connectors.
8. Install Front Floor Console (1). Refer to [Front Floor Console Replacement \(Terrain\)](#).

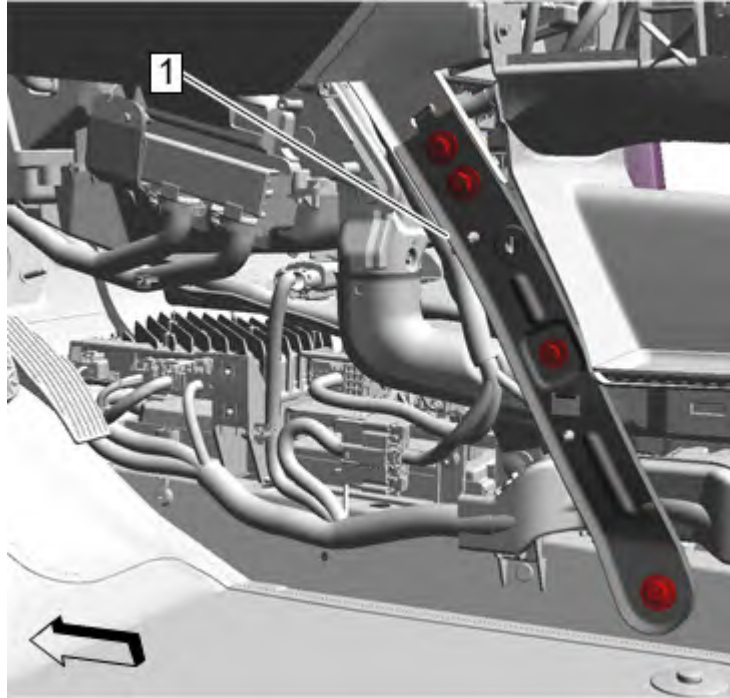


Fig. 132: Left Side Instrument Panel Center Lower Bracket
 Courtesy of GENERAL MOTORS COMPANY

9. Install Instrument Panel Center Lower Bracket-Left Side (1). Refer to [Instrument Panel Center Lower Bracket Replacement \(Terrain - Left Side\)](#)



Fig. 133: Left Front Floor Console Extension Panel
 Courtesy of GENERAL MOTORS COMPANY

10. Install Front Floor Console Extension Panel - Left (1). Refer to [Front Floor Console Extension Panel Replacement - Left Side \(Terrain\)](#)

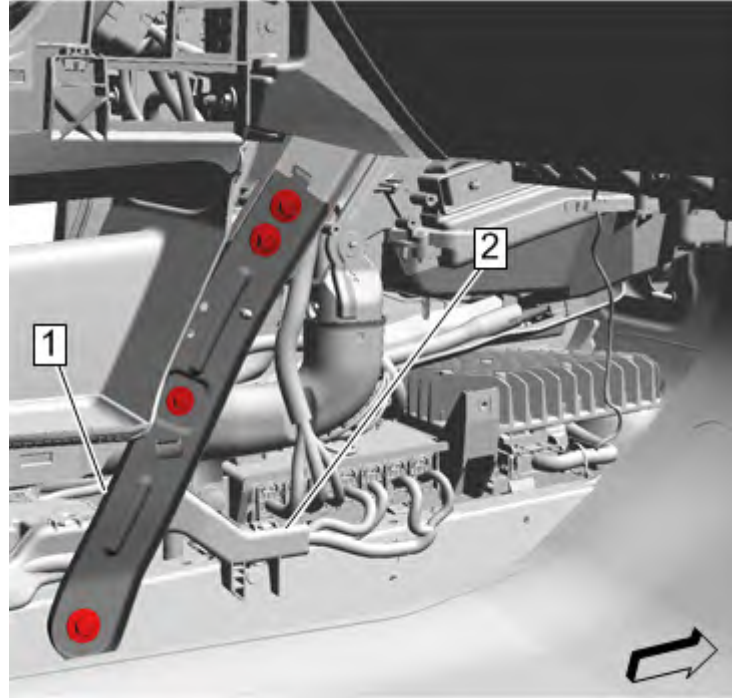


Fig. 134: Right Side Instrument Panel Center Lower Bracket
 Courtesy of GENERAL MOTORS COMPANY

11. Install Instrument Panel Center Lower Bracket - Right Side (1). Refer to [Instrument Panel Center Lower Bracket Replacement \(Terrain - Right Side\)](#).

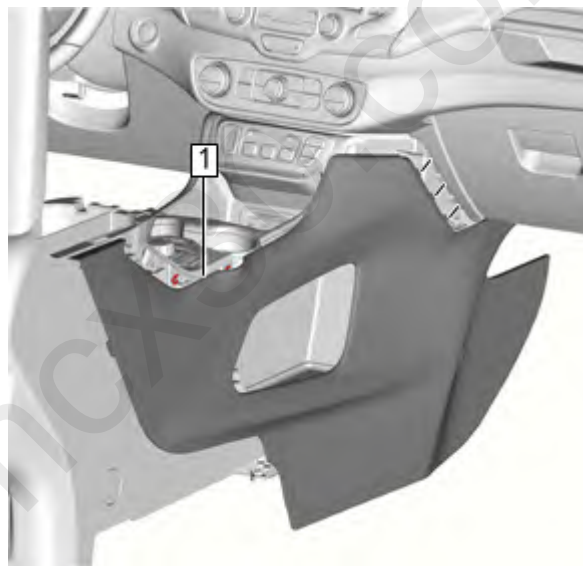


Fig. 135: Right Front Floor Console Extension Panel
 Courtesy of GENERAL MOTORS COMPANY

12. Install Front Floor Console Extension Panel - Right Side (1). Refer to [Front Floor Console Extension Panel Replacement - Right Side \(Terrain\)](#).

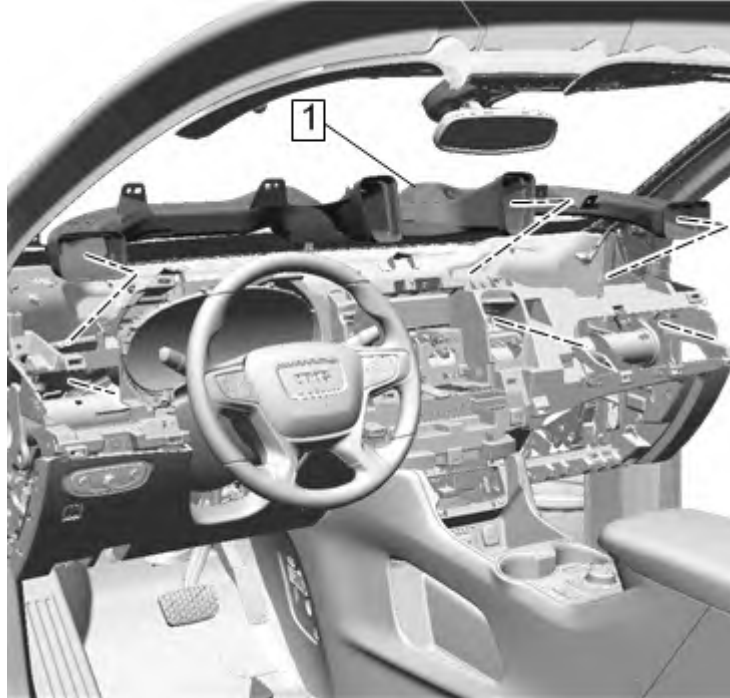


Fig. 136: Instrument Panel Center Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

13. Install Instrument Panel Center Air Outlet Duct (1). Refer to [Instrument Panel Center Air Outlet Duct Replacement \(Terrain\)](#)

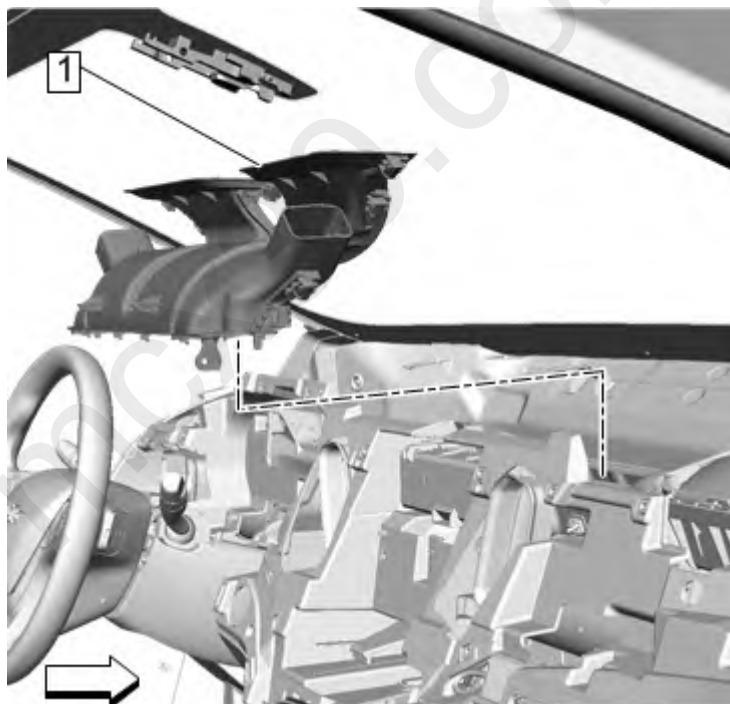


Fig. 137: Windshield Defroster Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

14. Attach the wiring harness and connect the electrical connectors as necessary.
15. Install Windshield Defroster Outlet Duct (1). Refer to [Windshield Defroster Outlet Duct Replacement \(Terrain\)](#)

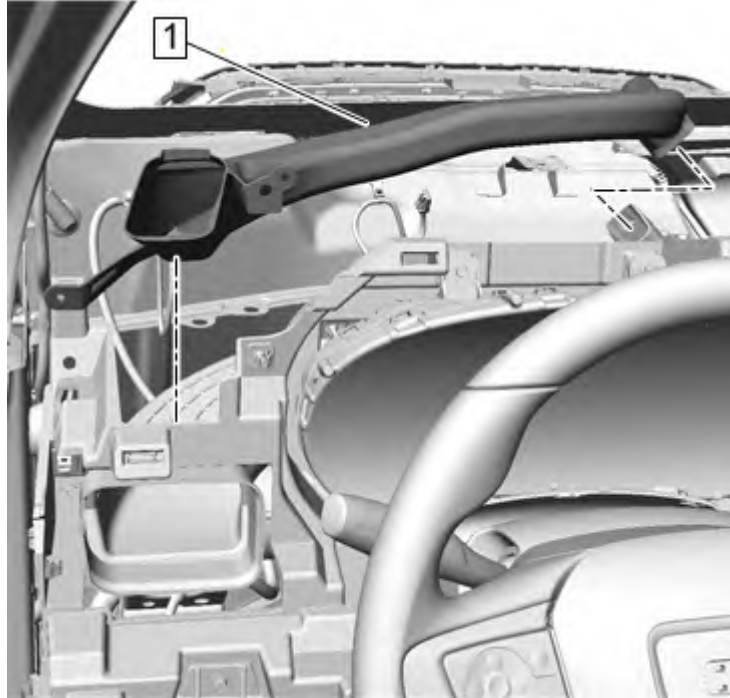


Fig. 138: Left Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

16. Install Side Window Defogger Outlet Duct - Left Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Left Side \(Terrain\)](#).

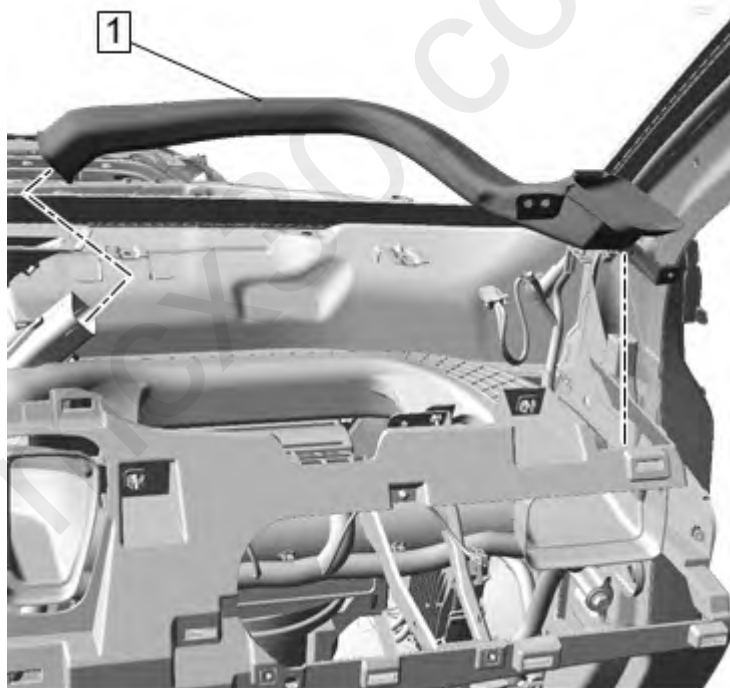


Fig. 139: Right Side Window Defogger Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

17. Install Side Window Defogger Outlet Duct - Right Side (1). Refer to [Side Window Defogger Outlet Duct Replacement - Right Side \(Terrain\)](#).

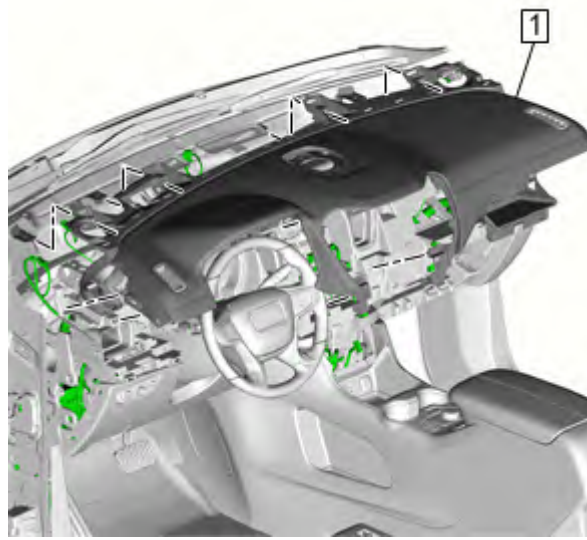


Fig. 140: Instrument Panel Upper Trim Panel
 Courtesy of GENERAL MOTORS COMPANY

18. Install Instrument Panel Upper Trim Panel (1). Refer to [Instrument Panel Upper Trim Panel Replacement \(Terrain\)](#).

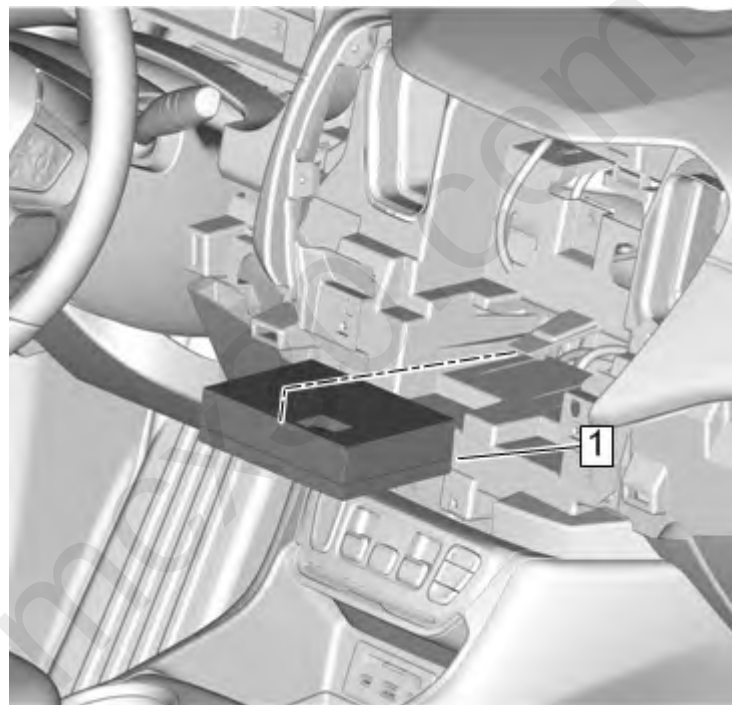


Fig. 141: Communication Interface Module
 Courtesy of GENERAL MOTORS COMPANY

19. Install Communication Interface Module (1). Refer to [Communication Interface Module Replacement \(Terrain with IOS, IOT, IOU\)](#). [Communication Interface Module Replacement \(Terrain with IOR\)](#).

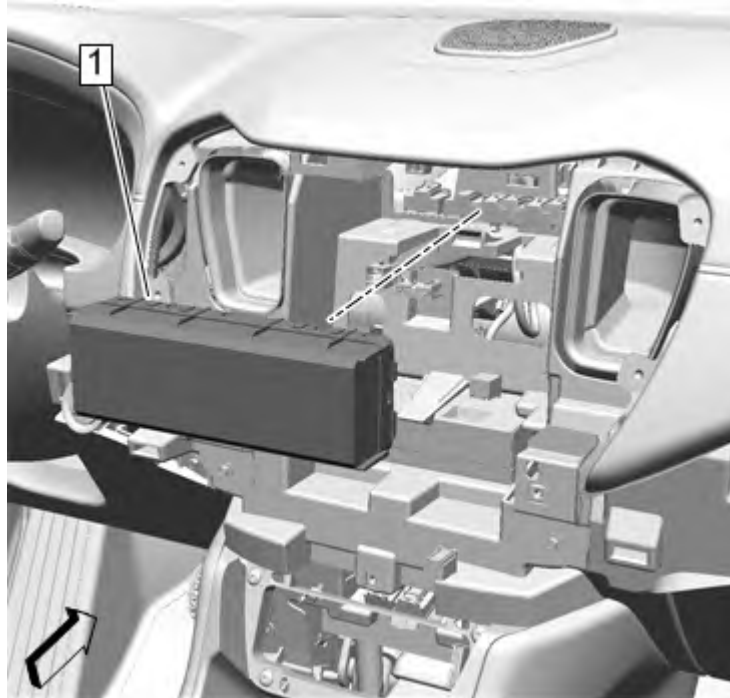


Fig. 142: Heater And Air Conditioning Remote Control
 Courtesy of GENERAL MOTORS COMPANY

20. Install Heater and Air Conditioning Remote Control (1). Refer to [Heater and Air Conditioning Remote Control Replacement \(Terrain\)](#)

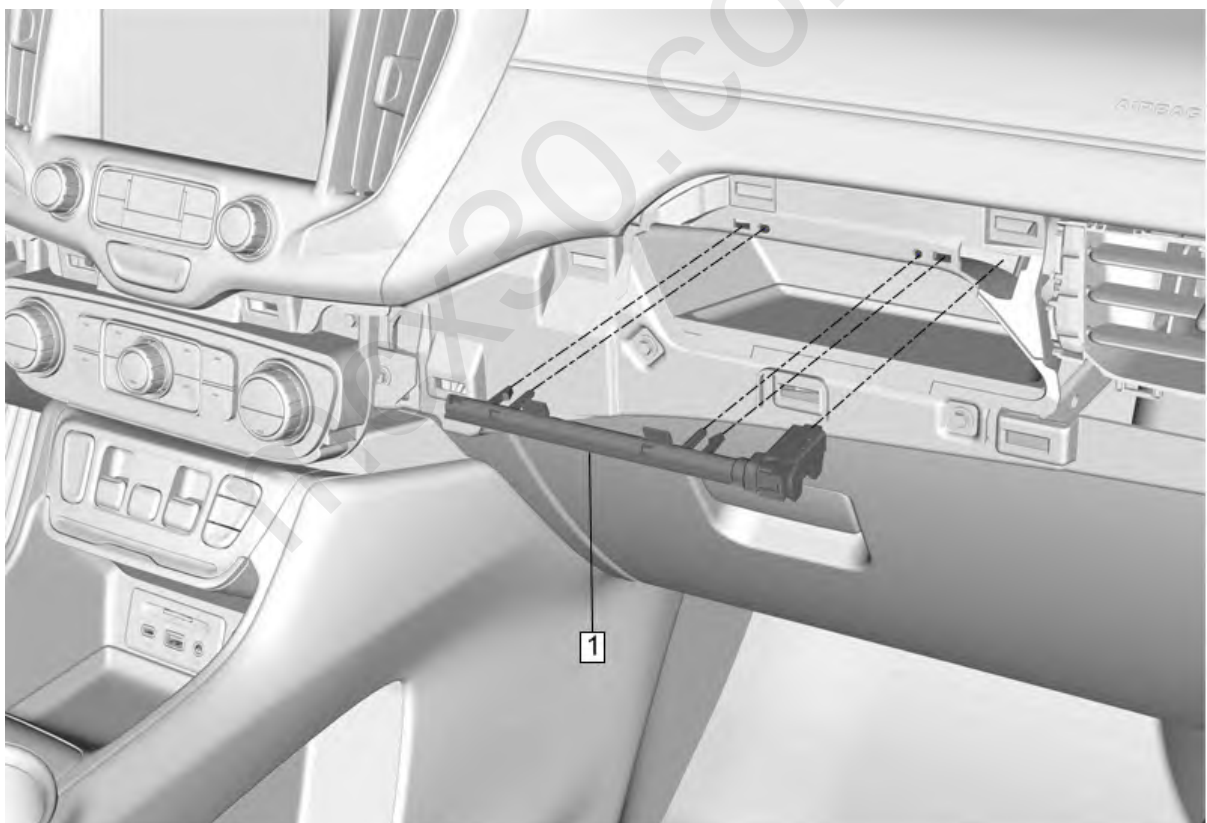


Fig. 143: Instrument Panel Light Conductor Lamp
 Courtesy of GENERAL MOTORS COMPANY

21. Install Instrument Panel Light Conductor Lamp (1). Refer to [Instrument Panel Light Conductor Lamp Replacement \(GMC\)](#)

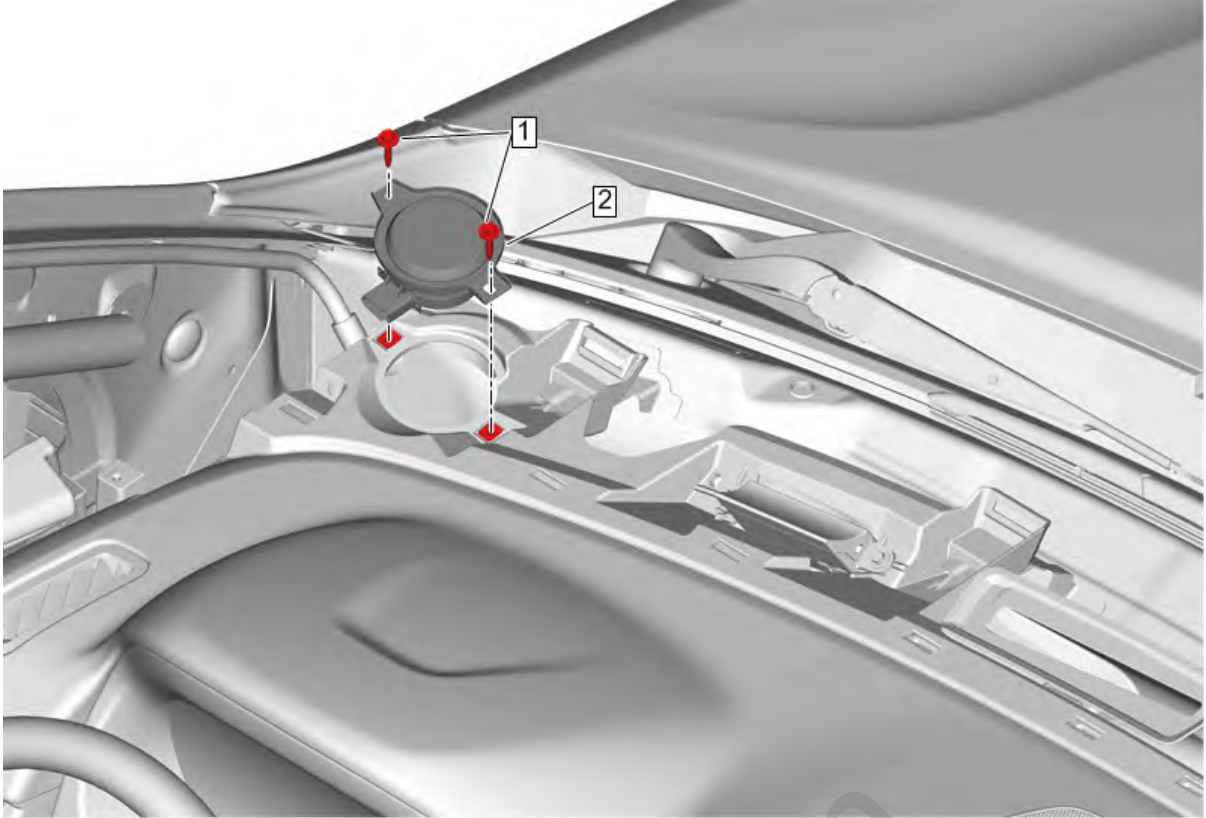


Fig. 144: Radio Front Speaker

Courtesy of GENERAL MOTORS COMPANY

22. Install the left and right side radio front speakers (2). Refer to [Radio Front Speaker Replacement \(Terrain\)](#)

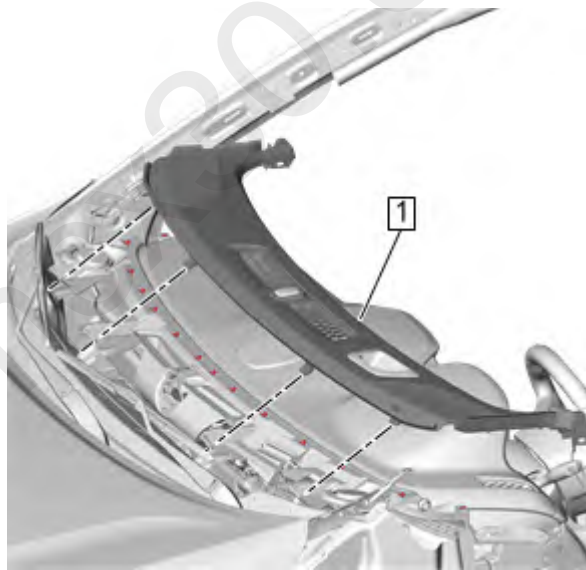


Fig. 145: Instrument Panel Extension

Courtesy of GENERAL MOTORS COMPANY

23. Install Instrument Panel Extension (1). Refer to [Instrument Panel Extension Replacement \(Terrain\)](#)



Fig.146: Radio Front Center Speaker
 Courtesy of GENERAL MOTORS COMPANY

24. Install Radio Front Center Speaker (2). Refer to [Radio Front Center Speaker Replacement \(Terrain\)](#).

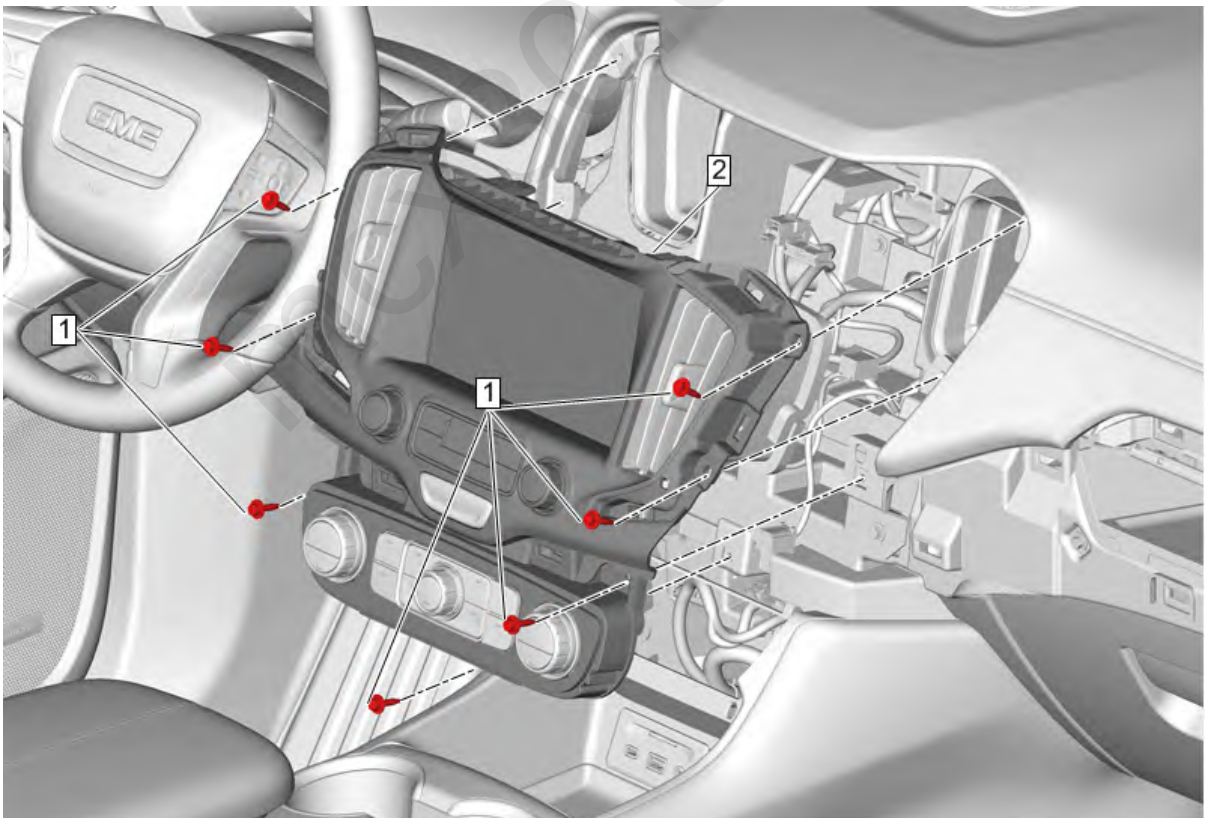


Fig.147: Radio Control Assembly And Screws
 Courtesy of GENERAL MOTORS COMPANY

25. Connect the electrical connectors.
 26. Install Radio Control Assembly (2). Refer to [Radio Control Assembly Replacement \(Terrain\)](#).

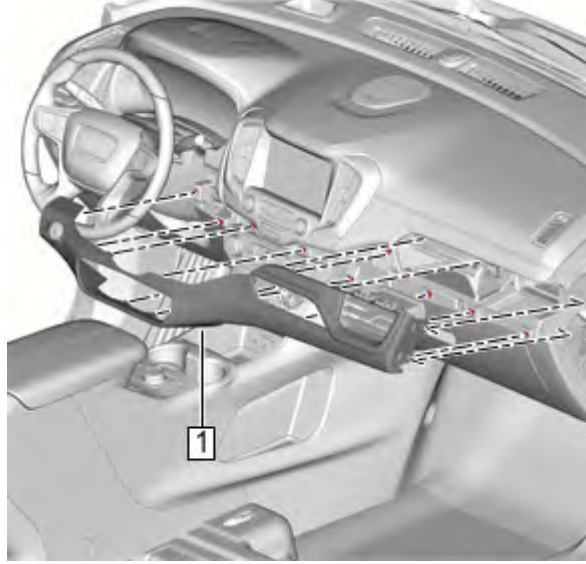


Fig. 148: Right Side Instrument Panel Trim Pad
Courtesy of GENERAL MOTORS COMPANY

27. Install Instrument Panel Trim Pad - Right Side (1). Refer to [Instrument Panel Trim Pad Replacement - Right Side \(Terrain\)](#)

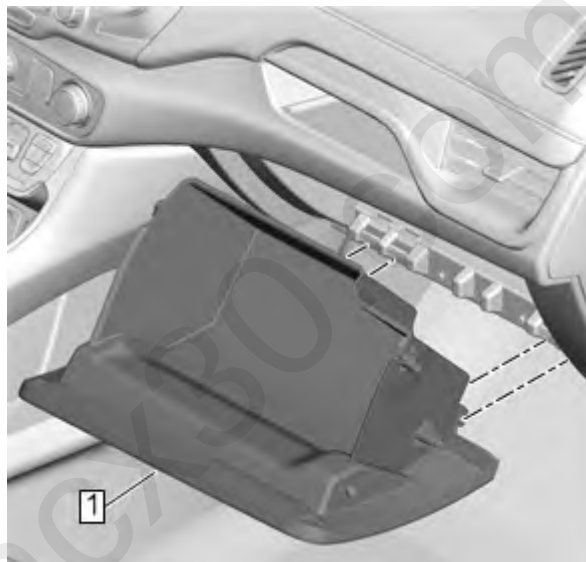


Fig. 149: Instrument Panel Compartment Door
Courtesy of GENERAL MOTORS COMPANY

28. Install Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Terrain\)](#)

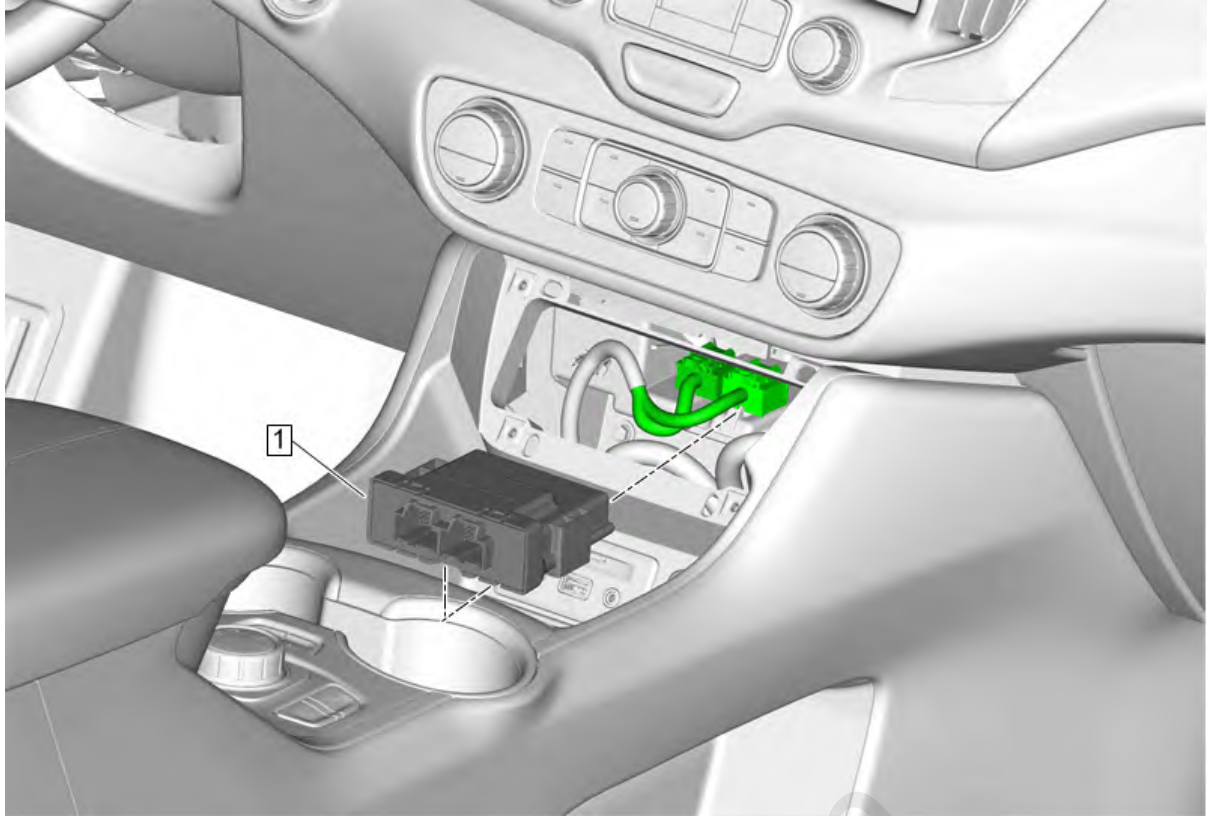


Fig. 150: Serial Data Gateway Module

Courtesy of GENERAL MOTORS COMPANY

29. Install Serial Data Gateway Module (1). Refer to [Serial Data Gateway Module Replacement \(Terrain with MNH, NMK, or MHG\)](#), [Serial Data Gateway Module Replacement \(Terrain with M3U, M3D, or M3H\)](#)

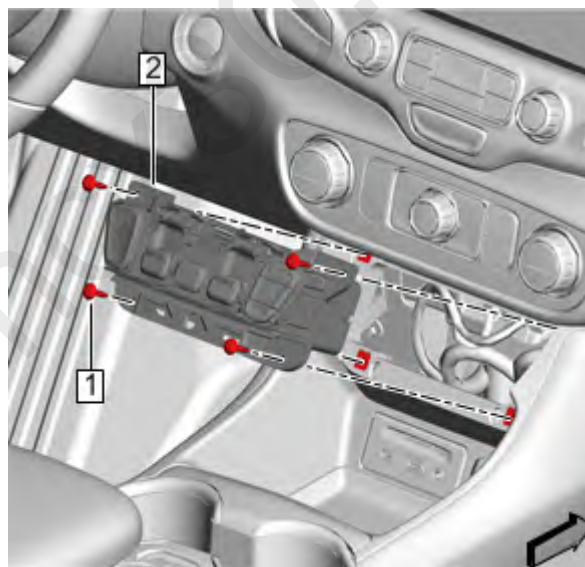


Fig. 151: Automatic Transmission Control Bolts And Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

30. Install Electronic Transmission Shift Control Pushbutton (2). Refer to [Electronic Transmission Shift Control Pushbutton Replacement](#)

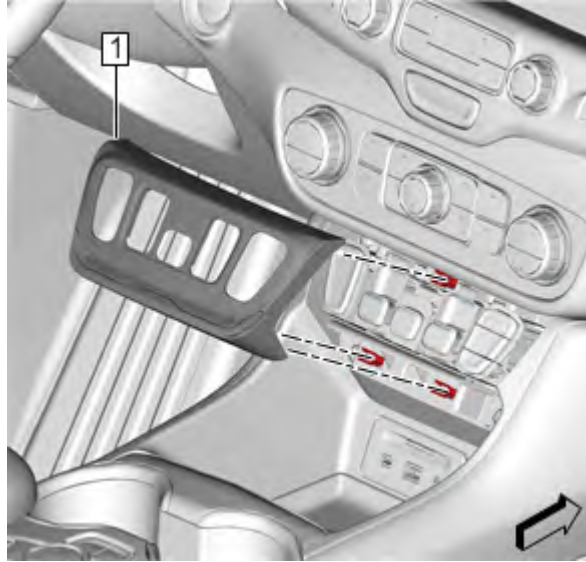


Fig. 152: Front Floor Console Transmission Shift Opening Bezel
 Courtesy of GENERAL MOTORS COMPANY

31. Install Front Floor Console Transmission Shift Opening Bezel (1). Refer to [Front Floor Console Transmission Shift Opening Bezel Replacement \(Terrain\)](#).

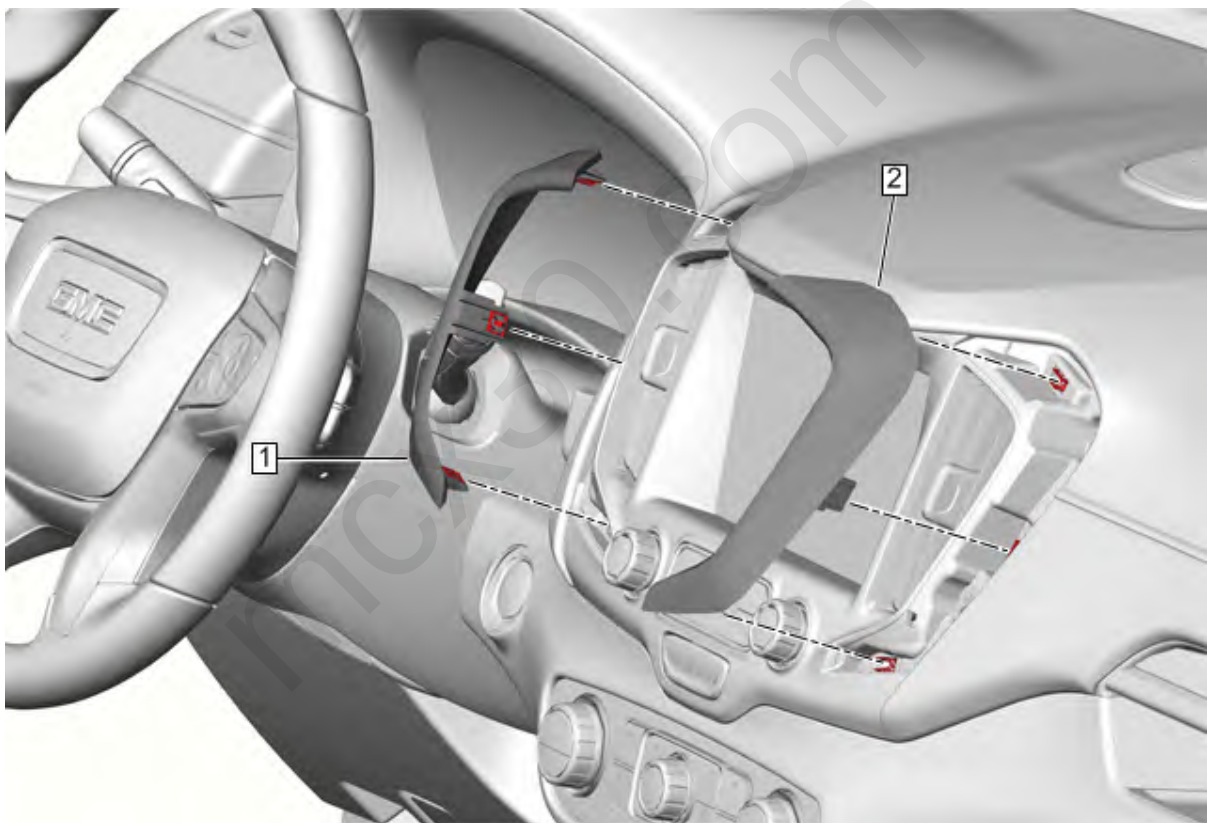


Fig. 153: Instrument Panel Center Trim Plate Appliques
 Courtesy of GENERAL MOTORS COMPANY

32. Install Instrument Panel Center Trim Plate Applique - Left Side (1). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).
33. Install Instrument Panel Center Trim Plate Applique - Right Side (2). Refer to [Instrument Panel Center Trim Plate Applique Replacement \(Terrain\)](#).

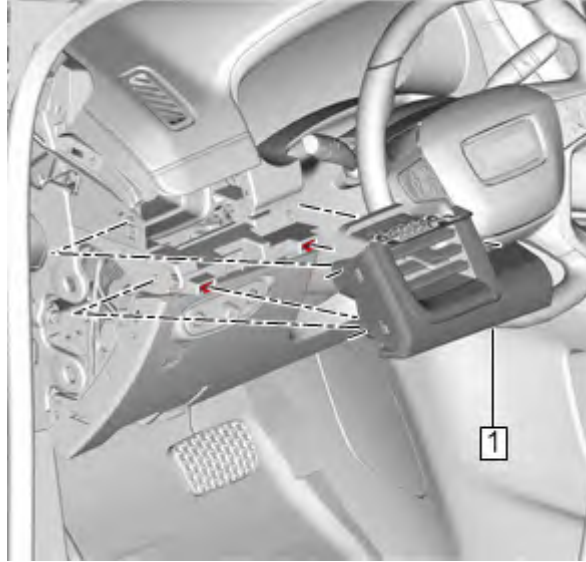


Fig. 154: Left Side Instrument Panel Trim Pad
 Courtesy of GENERAL MOTORS COMPANY

34. Install Instrument Panel Trim Pad - Left Side (1). Refer to [Instrument Panel Trim Pad Replacement - Left Side \(Terrain\)](#).

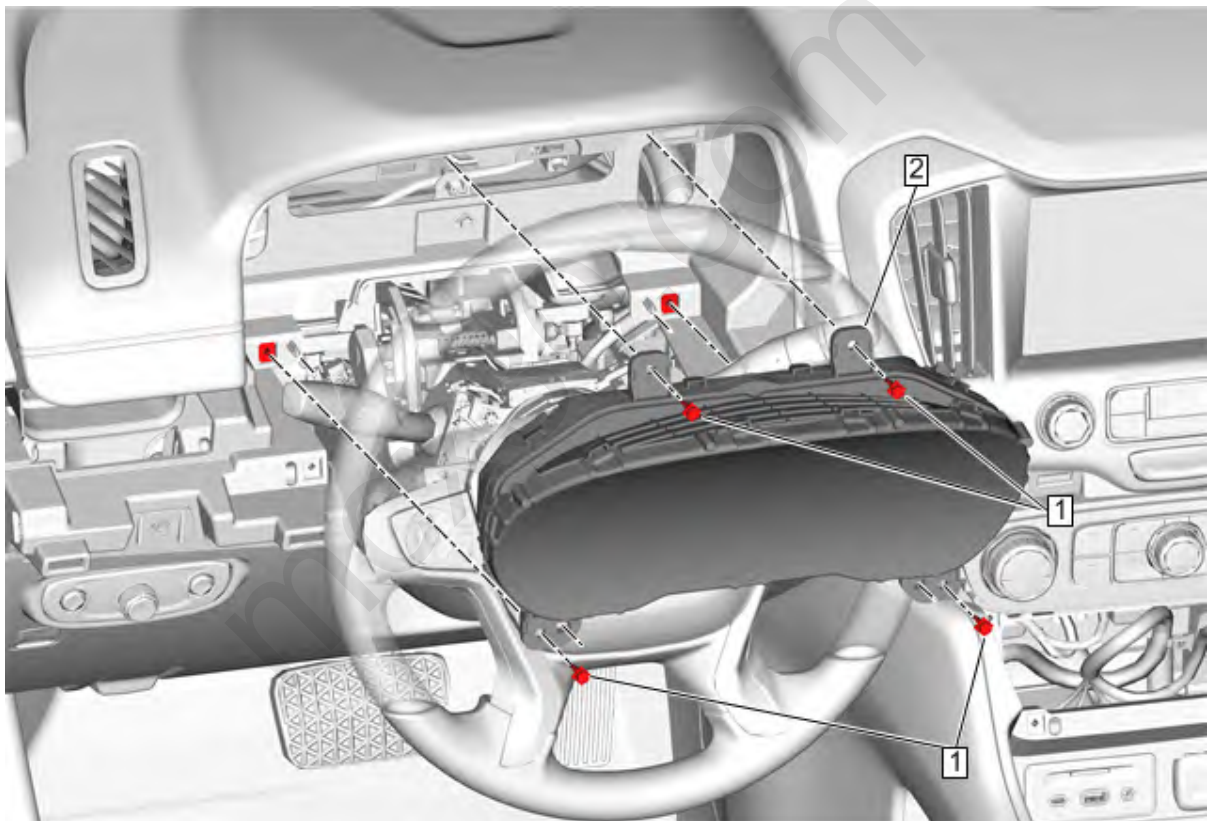


Fig. 155: Instrument Cluster And Screws
 Courtesy of GENERAL MOTORS COMPANY

35. Install Instrument Cluster (2). Refer to [Instrument Cluster Replacement \(Terrain\)](#).

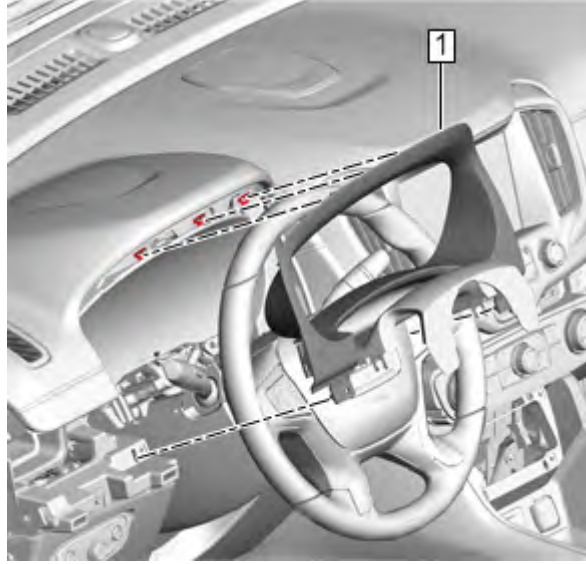


Fig. 156: Instrument Panel Cluster Trim Plate
 Courtesy of GENERAL MOTORS COMPANY

36. Install Instrument Panel Cluster Trim Plate (1). Refer to [Instrument Panel Cluster Trim Plate Replacement \(Terrain\)](#).

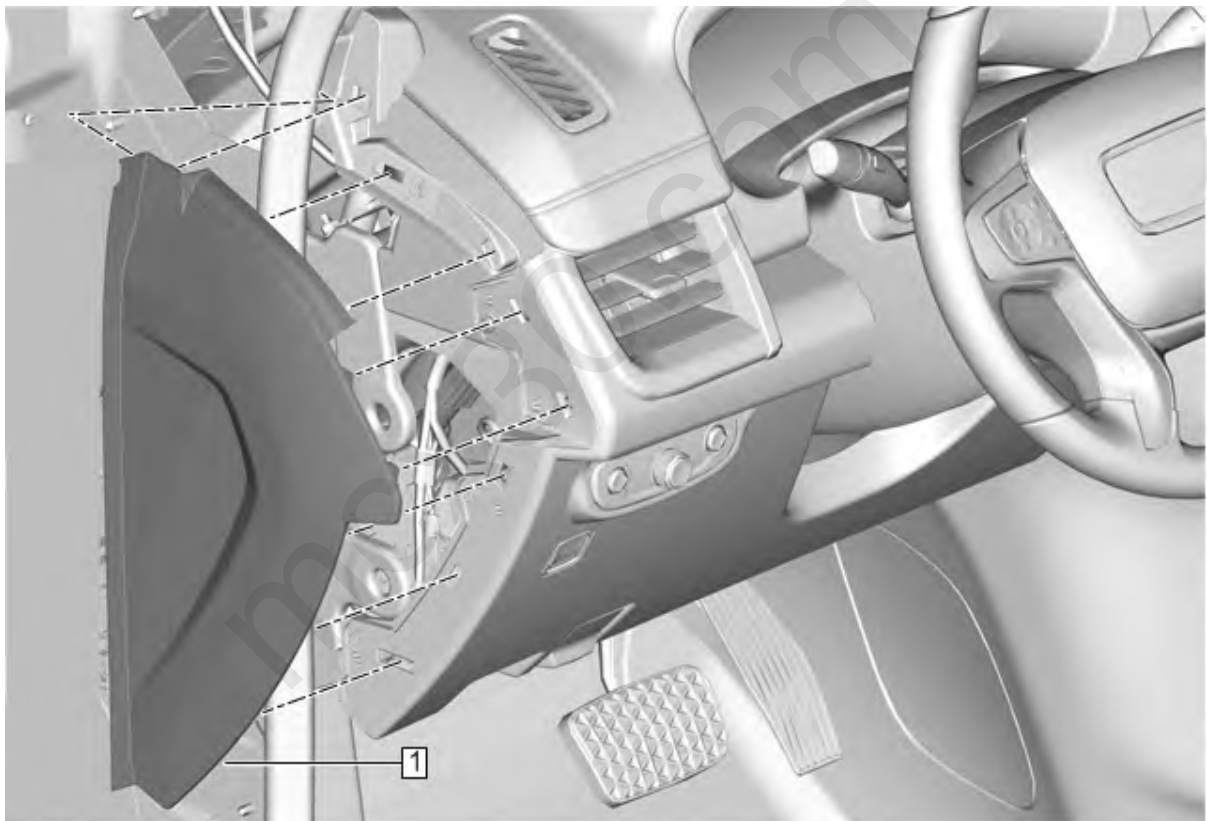


Fig. 157: Instrument Panel Outer Trim Cover (Terrain)
 Courtesy of GENERAL MOTORS COMPANY

37. Install the left and right instrument panel outer trim cover (1). Refer to [Instrument Panel Outer Trim Cover Replacement \(Terrain\)](#).
38. Install the left and right side windshield garnish molding. Refer to [Windshield Garnish Molding Replacement \(Terrain\)](#).
39. Install Drivers Seat and Passengers Seat. Refer to [Driver or Passenger Seat Removal and Installation](#).

AIR INLET VALVE ACTUATOR REPLACEMENT

Removal Procedure

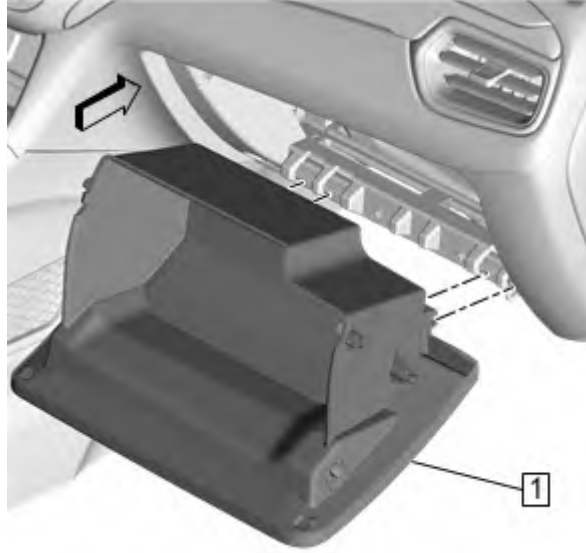


Fig. 158: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#), [Instrument Panel Compartment Door Replacement \(Terrain\)](#).

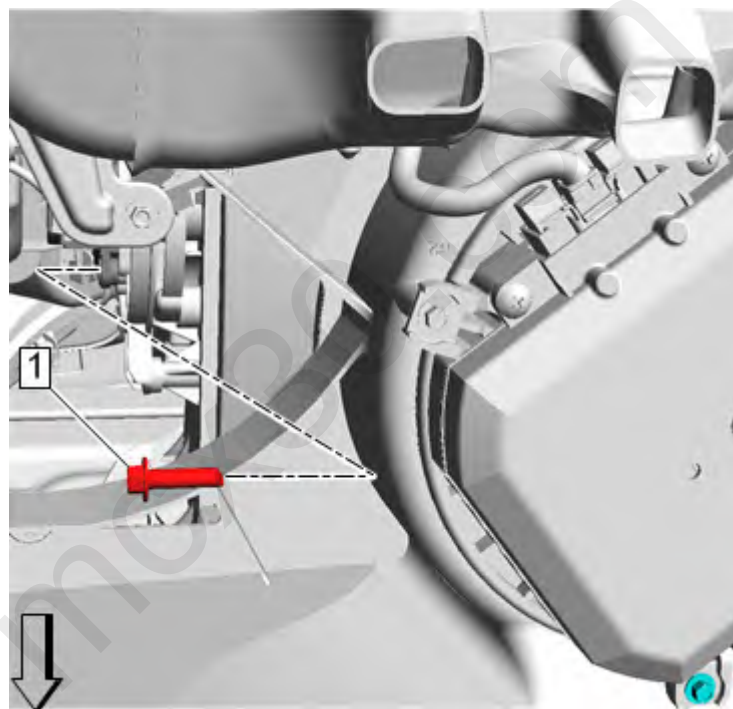


Fig. 159: Air Inlet Valve Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Air Inlet Valve Actuator Bolt (1)

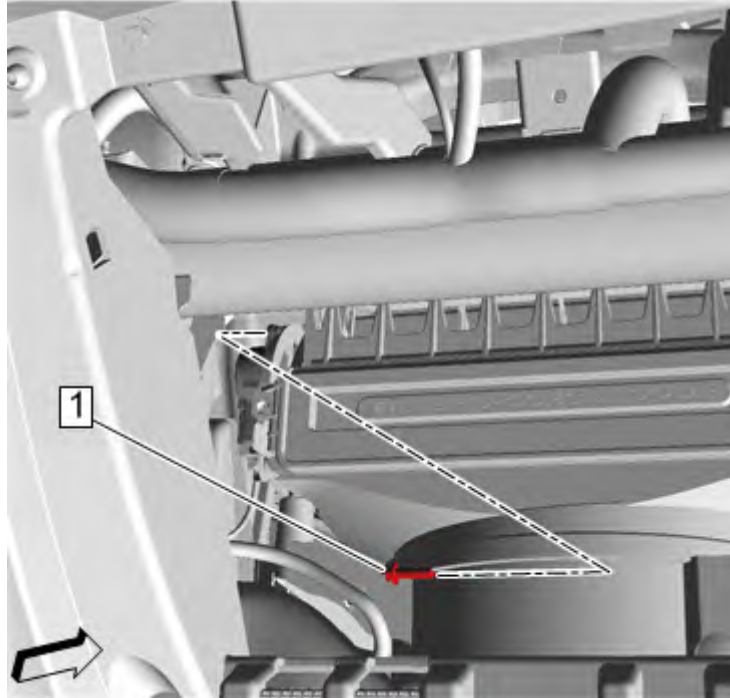


Fig. 160: Air Inlet Valve Actuator Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Remove Air Inlet Valve Actuator Bolt (1)

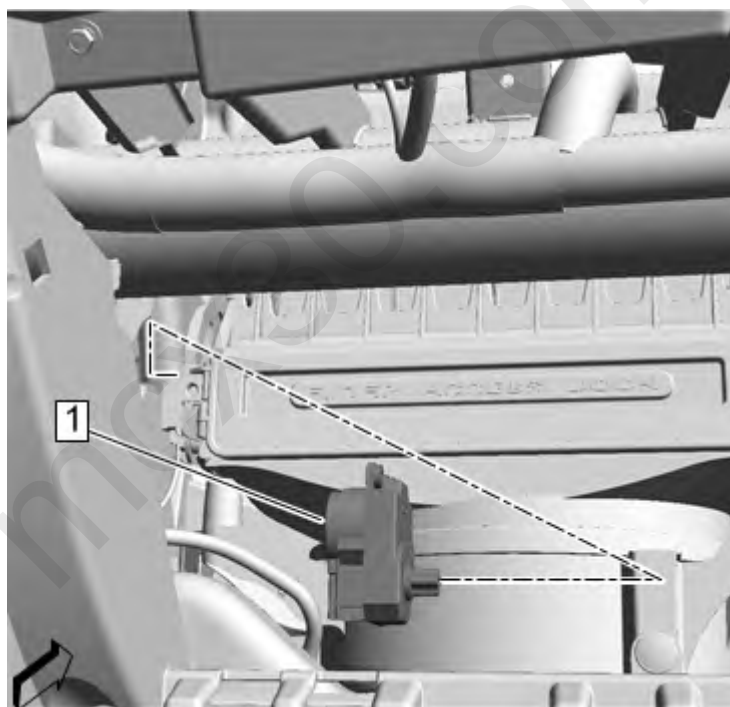


Fig. 161: Air Inlet Valve Actuator
Courtesy of GENERAL MOTORS COMPANY

4. Remove Air Inlet Valve Actuator (1)
5. Disconnect the electrical connector.

Installation Procedure

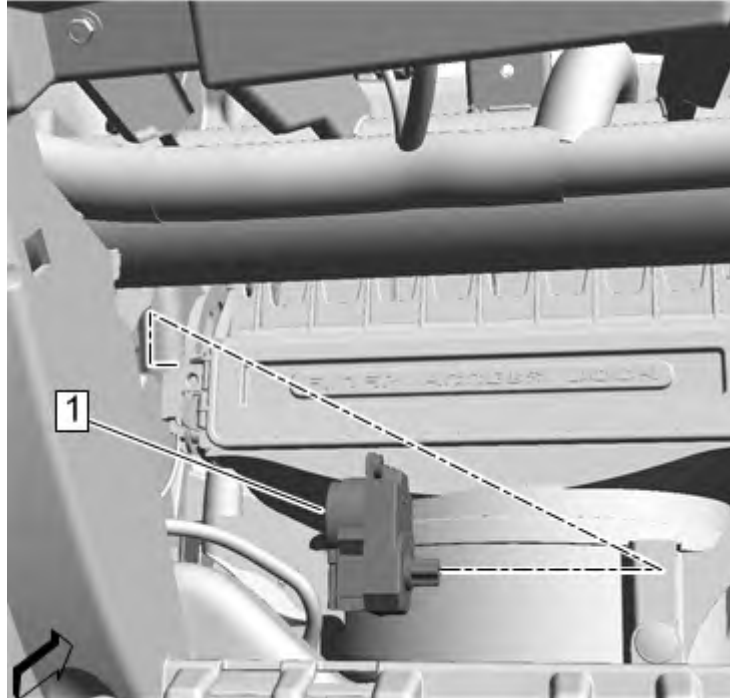


Fig. 162: Air Inlet Valve Actuator

Courtesy of GENERAL MOTORS COMPANY

1. Connect the electrical connector.
2. Install Air Inlet Valve Actuator (1)

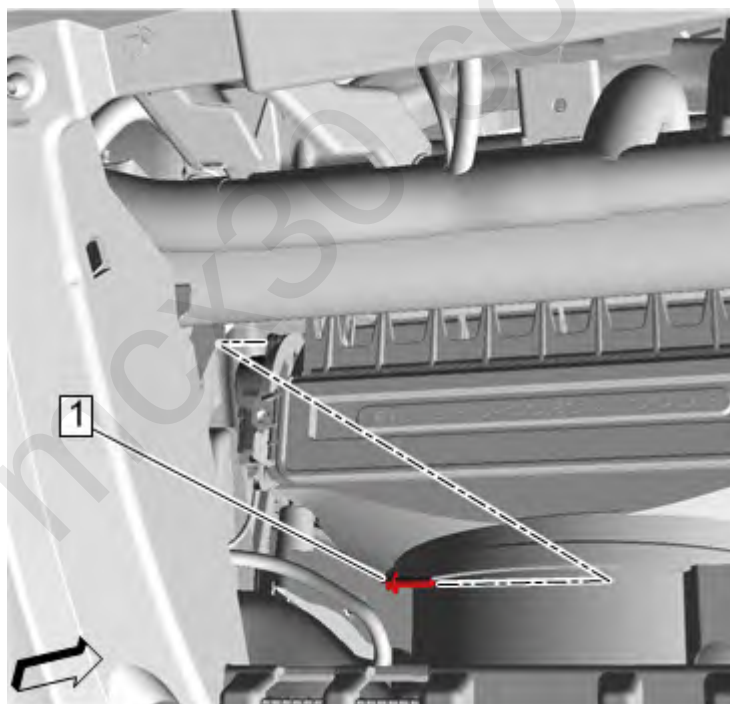


Fig. 163: Air Inlet Valve Actuator Bolt

Courtesy of GENERAL MOTORS COMPANY

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

3. Install and tighten Air Inlet Valve Actuator Bolt (1) to 2.5 N.m (22 lb in)

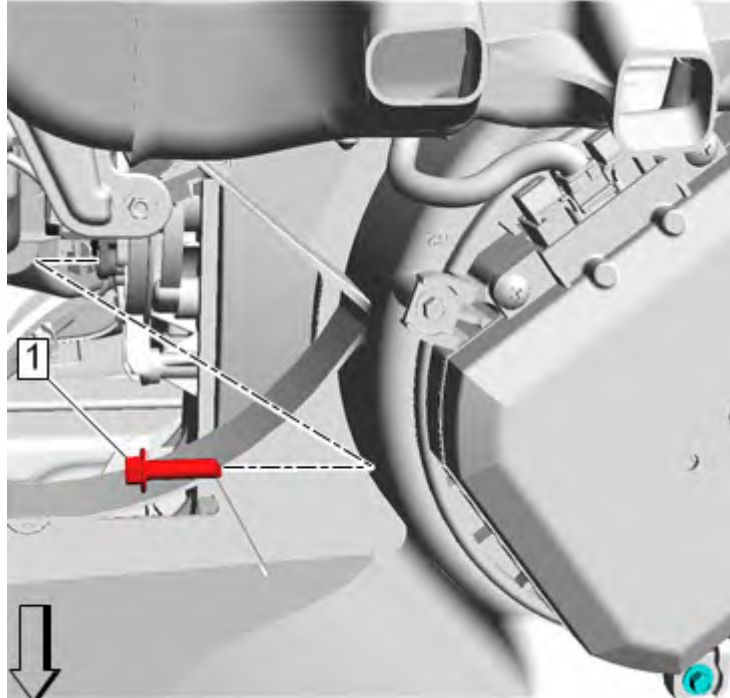


Fig. 164: Air Inlet Valve Actuator Bolt
 Courtesy of GENERAL MOTORS COMPANY

4. Install and tighten Air Inlet Valve Actuator Bolt (1) to 2.5 N.m (22 lb in)

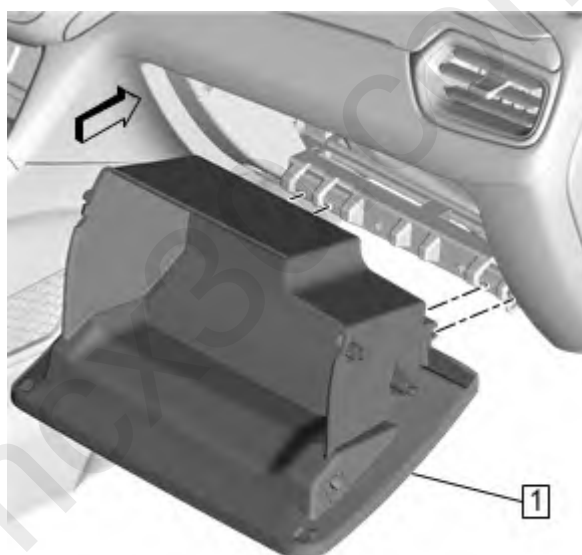


Fig. 165: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

5. Install Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#) [Instrument Panel Compartment Door Replacement \(Terrain\)](#).
6. Clear the DTCs from the heater and air conditioning remote control module.
7. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

MODE VALVE ACTUATOR REPLACEMENT

Removal Procedure

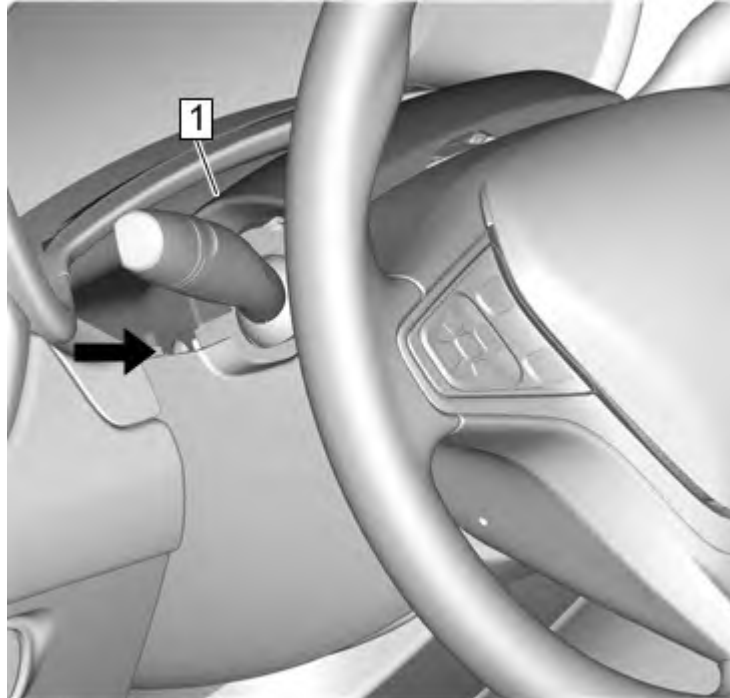


Fig. 166: Steering Column Upper Trim Cover

Courtesy of GENERAL MOTORS COMPANY

1. Use a flat bladed plastic trim tool to separate the steering column upper trim cover (1) from the steering column lower trim cover.
2. Position the steering column upper trim (1) cover out of the way.

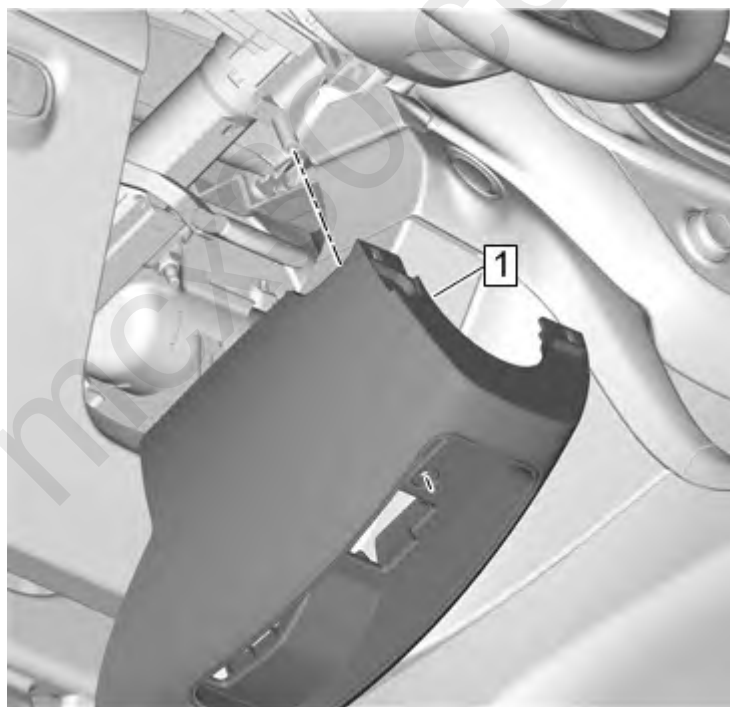


Fig. 167: Steering Column Lower Trim Cover

Courtesy of GENERAL MOTORS COMPANY

3. Remove Steering Column Lower Trim Cover (1). Refer to [Steering Column Lower Trim Cover Replacement \(Equinox\)](#) [Steering Column Lower Trim Cover Replacement \(Terrain\)](#).
4. With the wheels of the vehicle in the straight ahead position, LOCK the steering column.

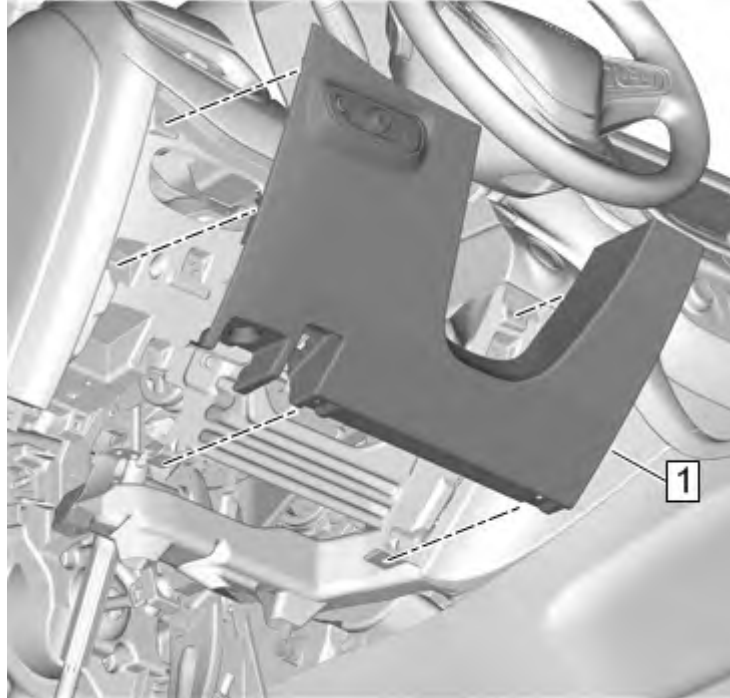


Fig. 168: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

5. Remove Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#), [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).



Fig. 169: Left Side Floor Front Air Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

6. Remove Floor Front Air Outlet Duct - Left Side (1). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#)

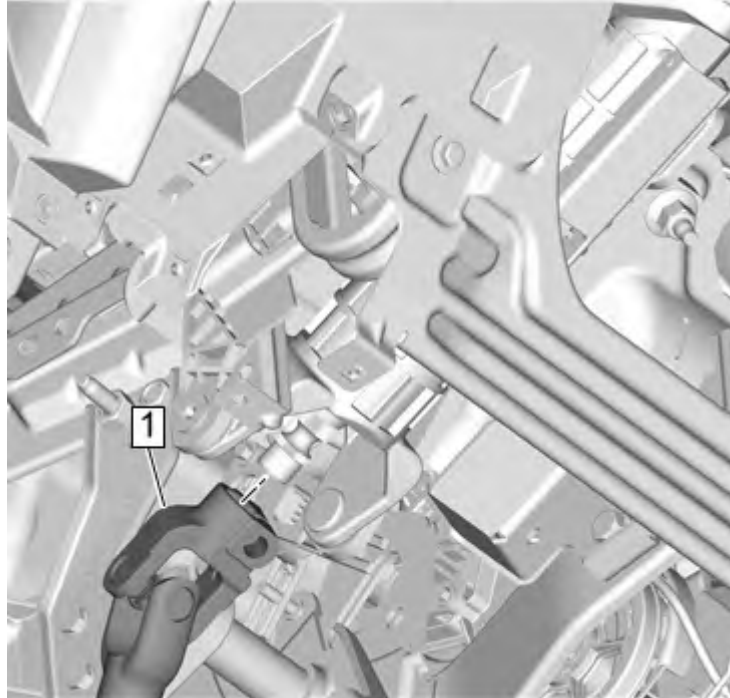


Fig. 170: Intermediate Steering Shaft

Courtesy of GENERAL MOTORS COMPANY

7. Remove Intermediate Steering Shaft (1) @ Steering Column. Refer to [Intermediate Steering Shaft Replacement \(Equinox\)](#), [Intermediate Steering Shaft Replacement \(Terrain\)](#).
8. Disconnect the steering column electrical connectors as necessary.

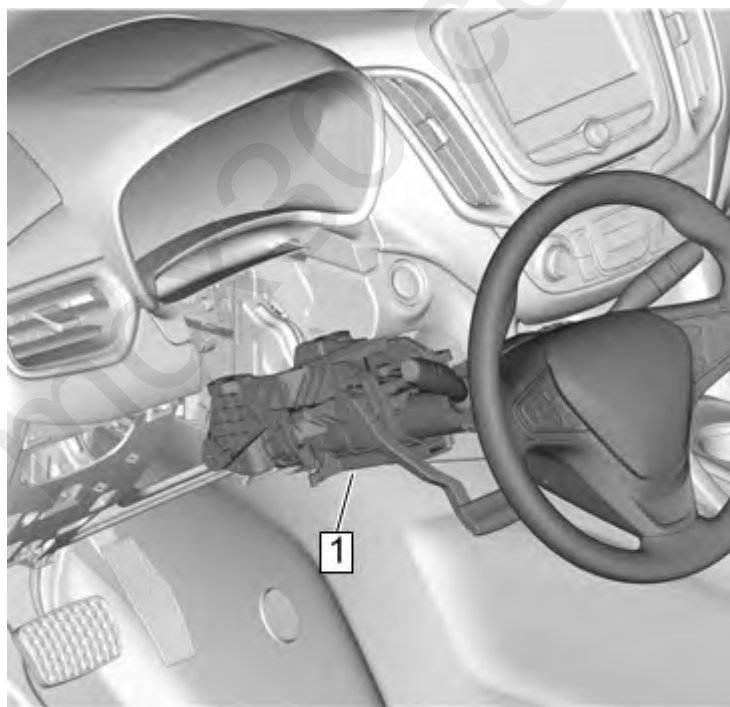


Fig. 171: Steering Column

Courtesy of GENERAL MOTORS COMPANY

9. Remove Steering Column (1). Refer to [Steering Column Replacement \(Equinox\)](#), [Steering Column Replacement \(Terrain\)](#).

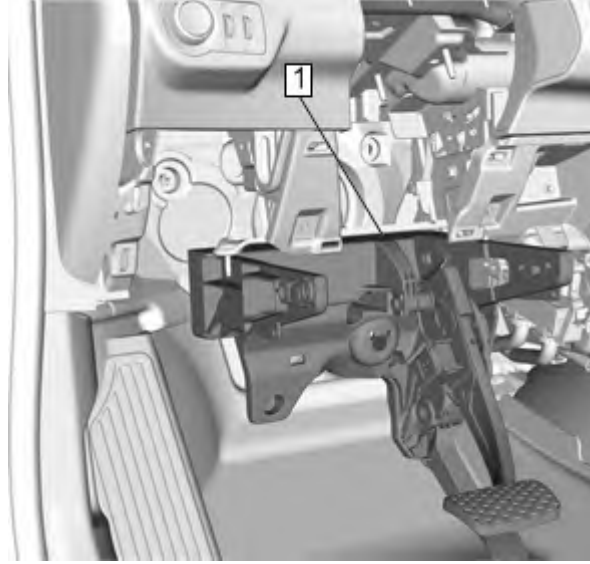


Fig. 172: Brake And Accelerator Pedal Assembly.

Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake pedal assembly (1). Refer to [Brake Pedal Assembly Replacement](#)

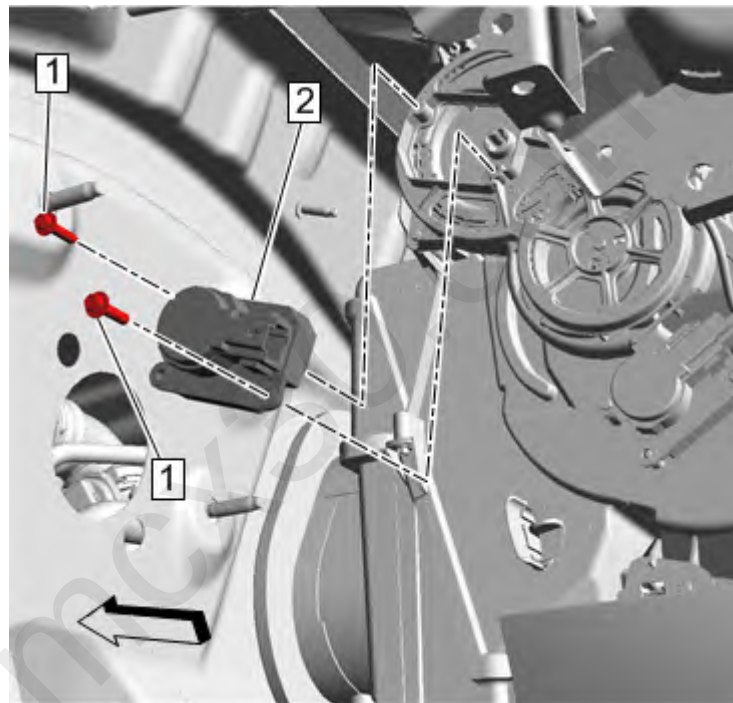


Fig. 173: Mode Valve Actuator And Bolts

Courtesy of GENERAL MOTORS COMPANY

11. Remove Mode Valve Actuator Bolts (1) (Qty: 2)
12. Remove Mode Valve Actuator (2)
13. Disconnect the electrical connector.

Installation Procedure

1. Connect the electrical connector.

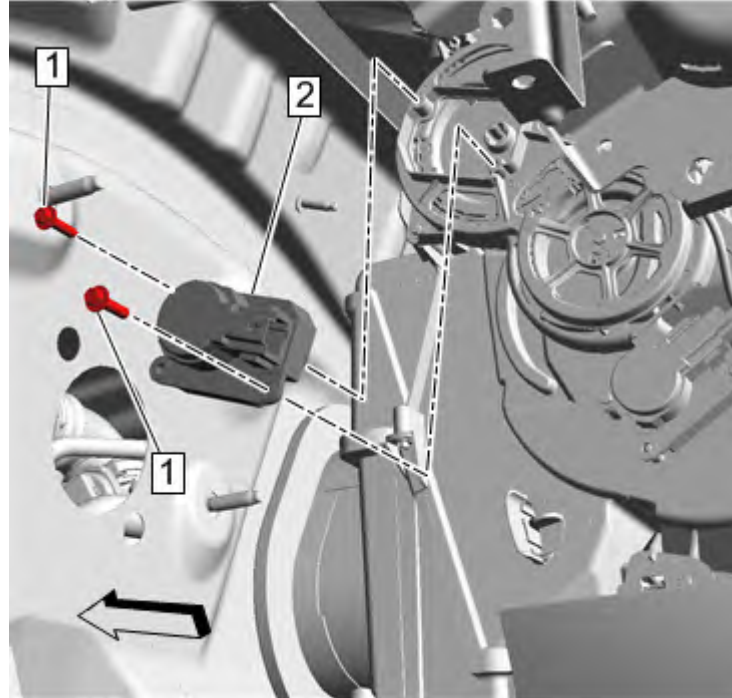


Fig. 174: Mode Valve Actuator And Bolts
 Courtesy of GENERAL MOTORS COMPANY

2. Install Mode Valve Actuator (2)

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

3. Install and tighten Mode Valve Actuator Bolts (1) (Qty: 2) to 2.5 N.m (22 lb in)

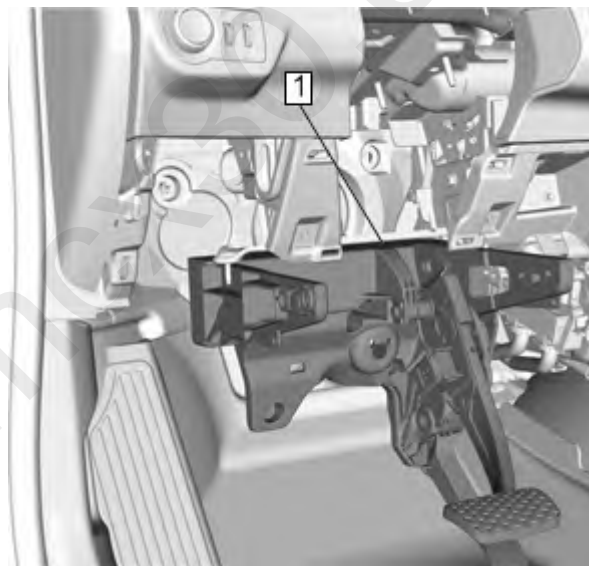


Fig. 175: Brake And Accelerator Pedal Assembly
 Courtesy of GENERAL MOTORS COMPANY

4. Install the brake pedal assembly (1). Refer to [Brake Pedal Assembly Replacement](#)

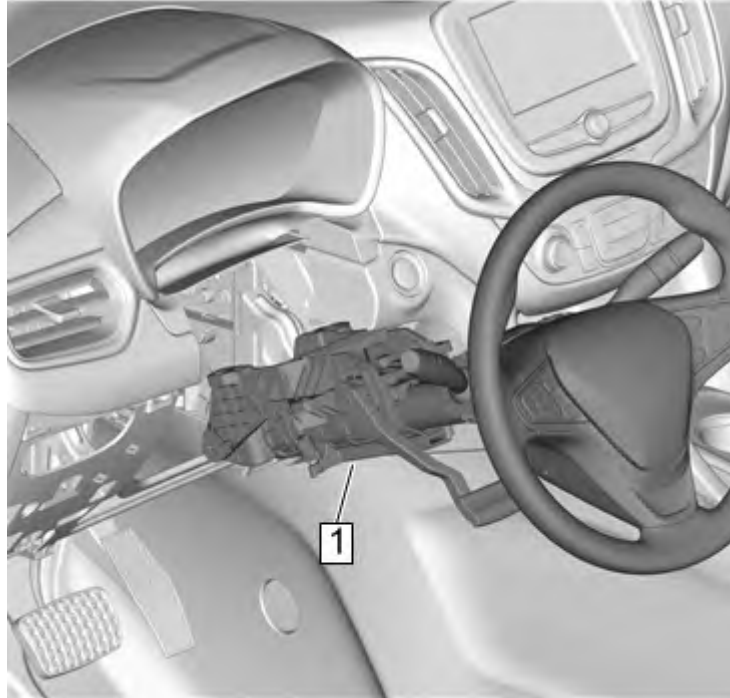


Fig. 176: Steering Column

Courtesy of GENERAL MOTORS COMPANY

5. Install Steering Column (1). Refer to [Steering Column Replacement \(Equinox\)](#), [Steering Column Replacement \(Terrain\)](#).
6. Connect the steering column electrical connectors.

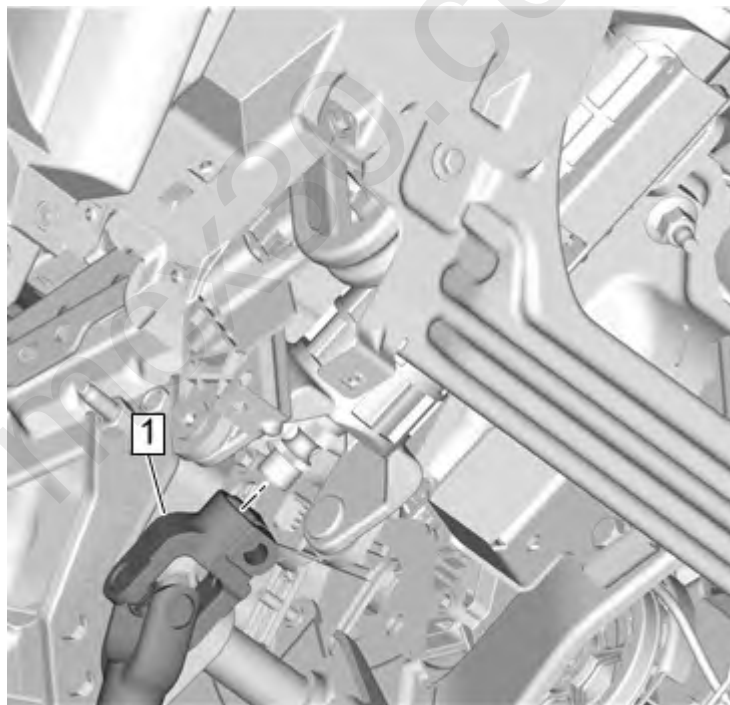


Fig. 177: Intermediate Steering Shaft

Courtesy of GENERAL MOTORS COMPANY

7. Install Intermediate Steering Shaft (1) @ Steering Column - Install - Refer to [Intermediate Steering Shaft Replacement \(Equinox\)](#), [Intermediate Steering Shaft Replacement \(Terrain\)](#).

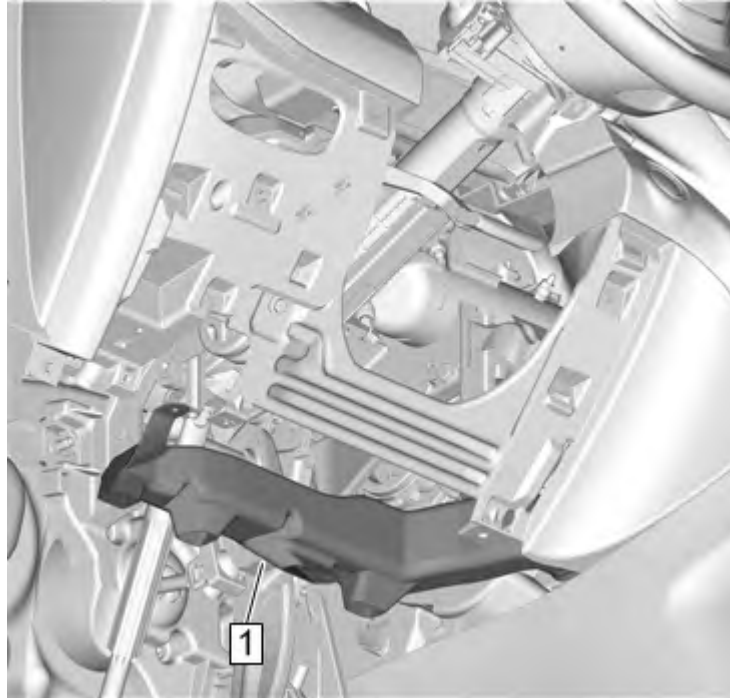


Fig. 178: Left Side Floor Front Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

8. Install Floor Front Air Outlet Duct - Left Side (1). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#)

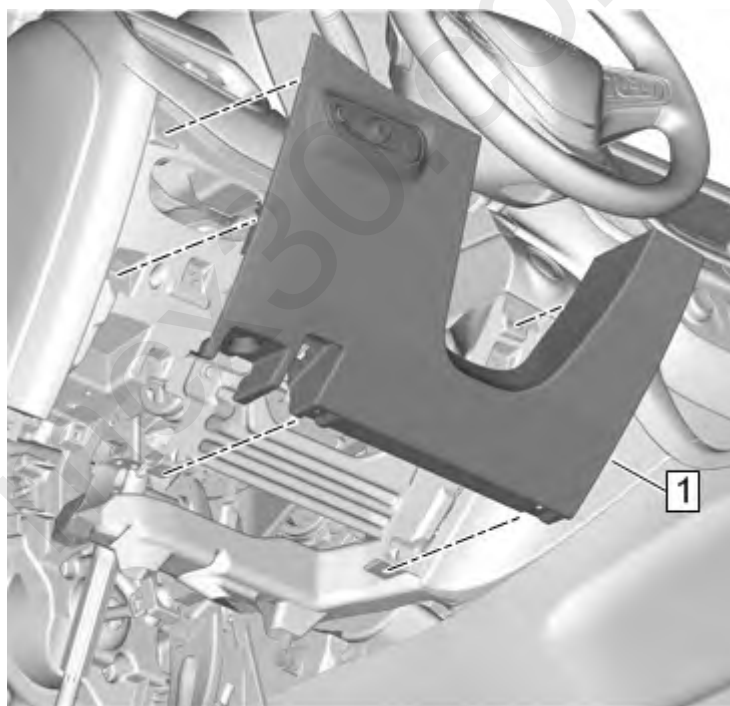


Fig. 179: Instrument Panel Knee Bolster
 Courtesy of GENERAL MOTORS COMPANY

9. Install Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#) [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).
10. Unlock the steering column.

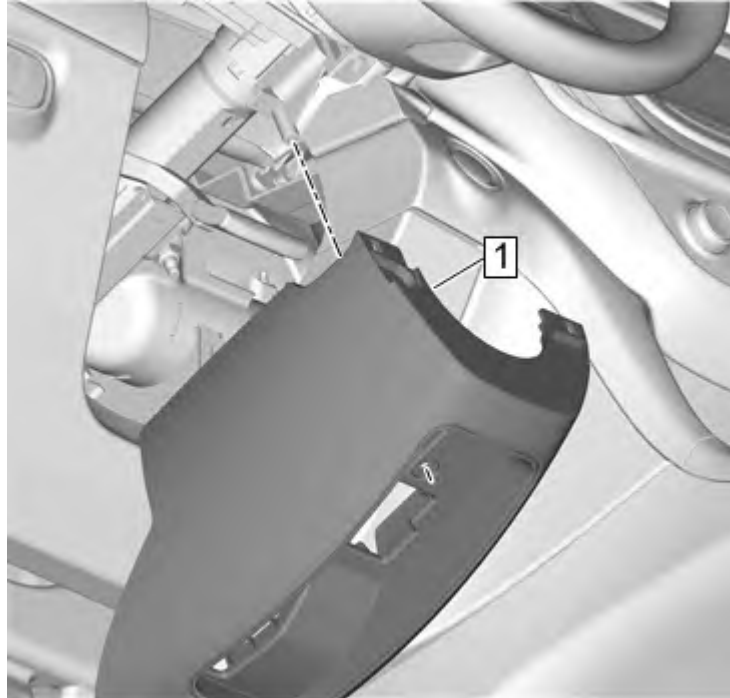


Fig. 180: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

11. Install Steering Column Lower Trim Cover (1). Refer to [Steering Column Lower Trim Cover Replacement \(Equinox\)](#), [Steering Column Lower Trim Cover Replacement \(Terrain\)](#).

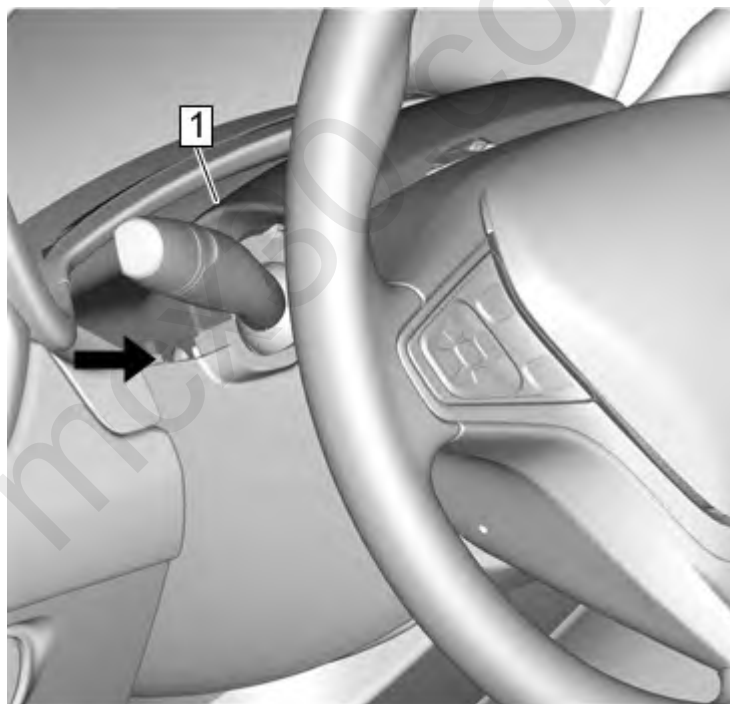


Fig. 181: Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

12. Secure the steering column upper trim (1) to the steering column lower trim cover.
13. Center the steering angle sensor. Refer to [Steering Wheel Angle Sensor Centering](#)
14. Clear the DTCs from the heater and air conditioning remote control module.
15. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

AIR INLET VALVE AND INSIDE AIR VALVE CONTROL CAM REPLACEMENT

Removal Procedure

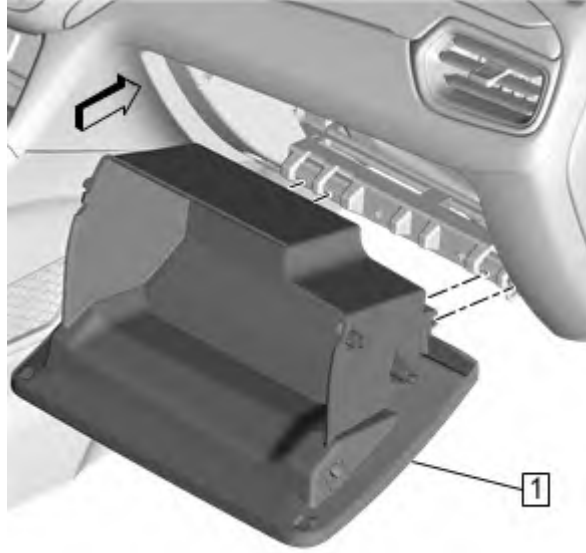


Fig. 182: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#), [Instrument Panel Compartment Door Replacement \(Terrain\)](#).

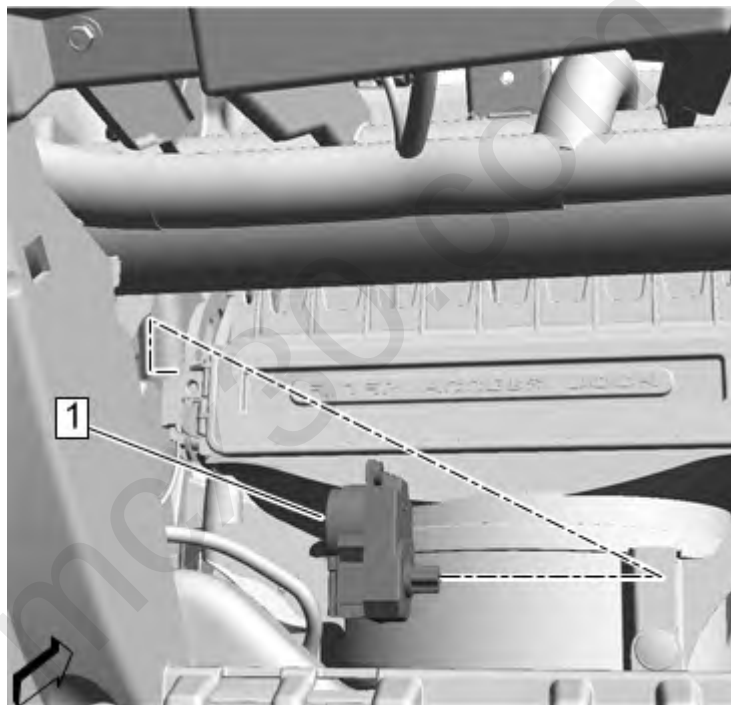


Fig. 183: Air Inlet Valve Actuator
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Air Inlet Valve Actuator (1). Refer to [Air Inlet Valve Actuator Replacement](#)

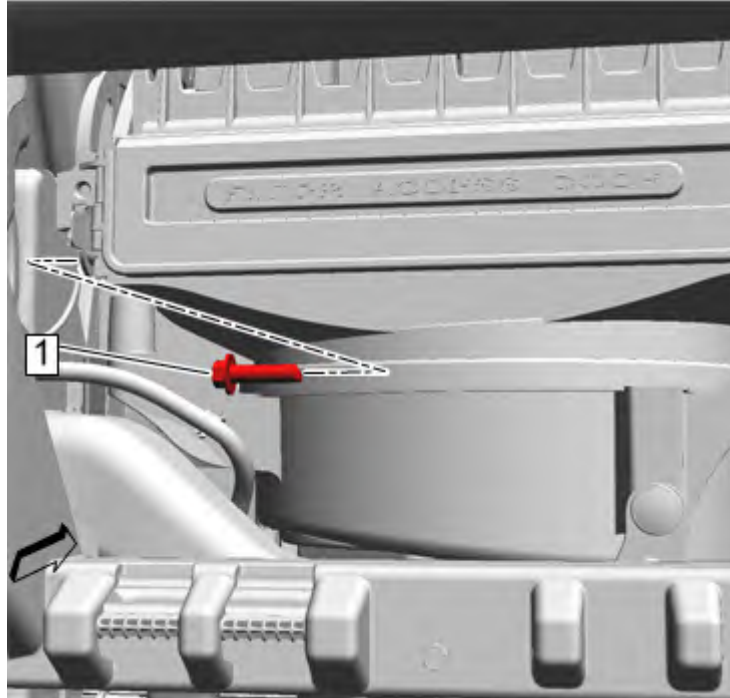


Fig. 184: Control Cam Actuator Mounting Plate Bolt
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Mode Control Cam Actuator Mounting Plate Bolt (1)

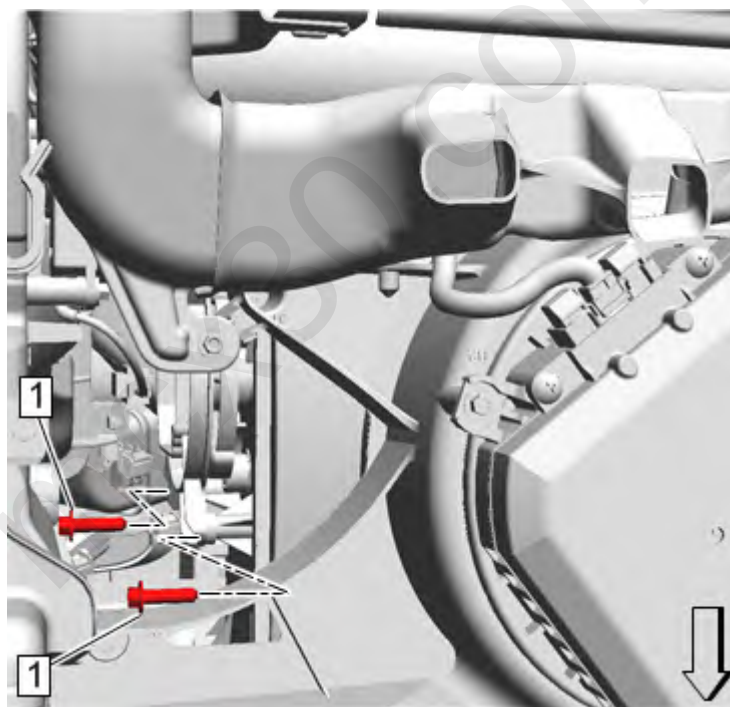


Fig. 185: Mode Control Cam Actuator Mounting Plate Bolts
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Mode Control Cam Actuator Mounting Plate Bolt (1) (Qty: 2)

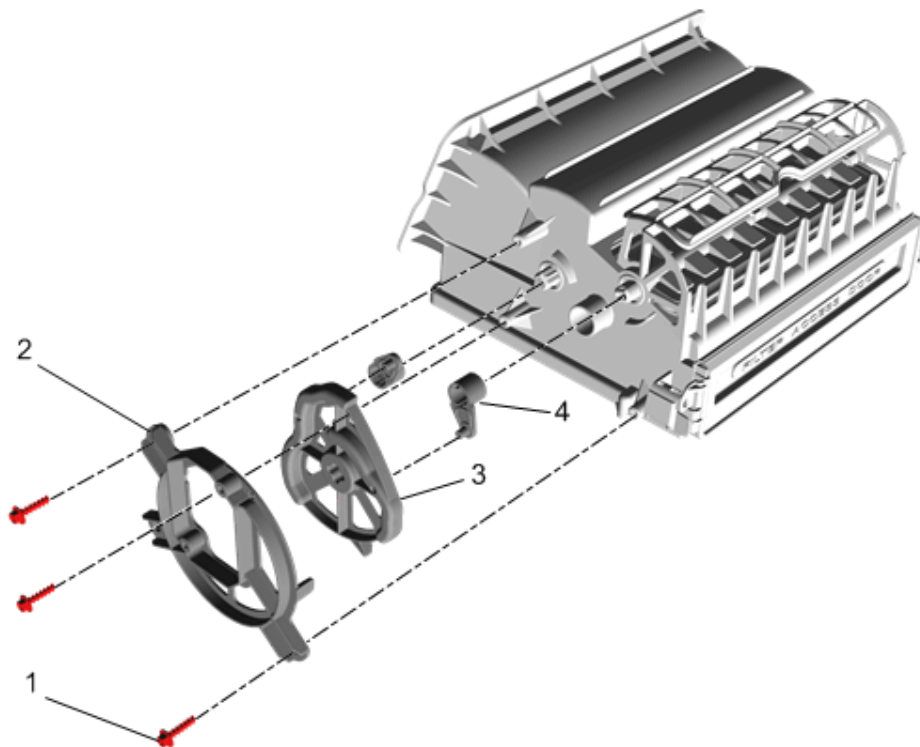


Fig. 186: Mode Control Cam Actuator Mounting Plate, Air Inlet Valve/Inside Air Valve Control Cam, Air Inlet Valve Levers And Screws
 Courtesy of GENERAL MOTORS COMPANY

NOTE: The air inlet housing assembly is shown off the vehicle for clarity of the service removal procedure.

5. Remove Mode Control Cam Actuator Mounting Plate (2)
6. Remove Air Inlet Valve and Inside Air Valve Control Cam (3)
7. Remove Air Inlet Valve Lever (4) (Qty: 2)

Installation Procedure

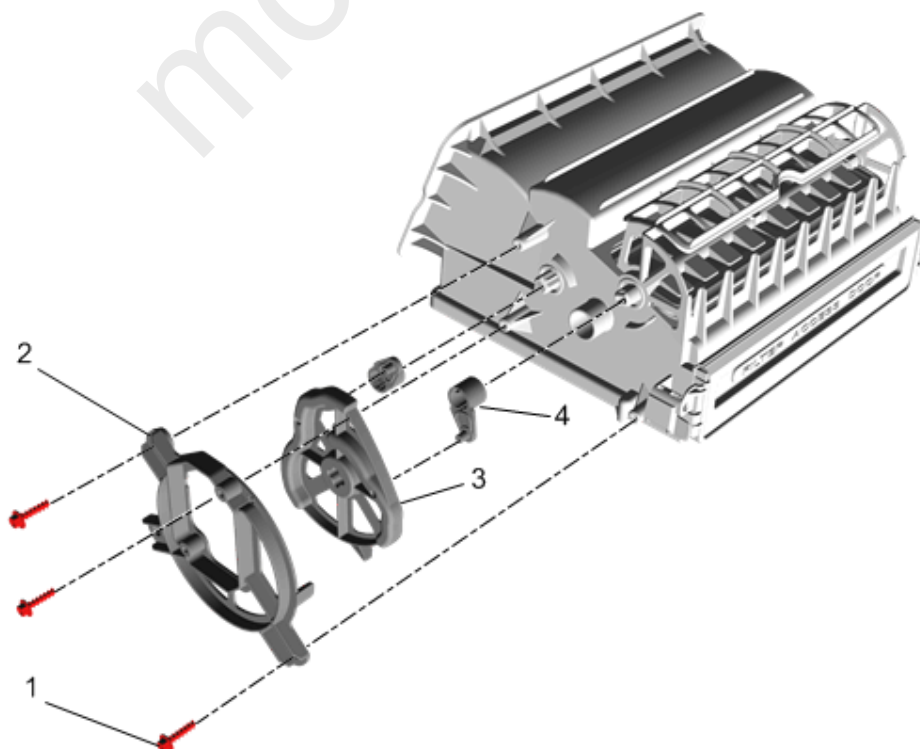


Fig. 187: Mode Control Cam Actuator Mounting Plate, Air Inlet Valve/Inside Air Valve Control Cam, Air Inlet Valve Levers And Screws
Courtesy of GENERAL MOTORS COMPANY

1. Install Air Inlet Valve Lever (4) (Qty: 2)
2. Install Air Inlet Valve and Inside Air Valve Control Cam (3)
3. Install Mode Control Cam Actuator Mounting Plate (2)

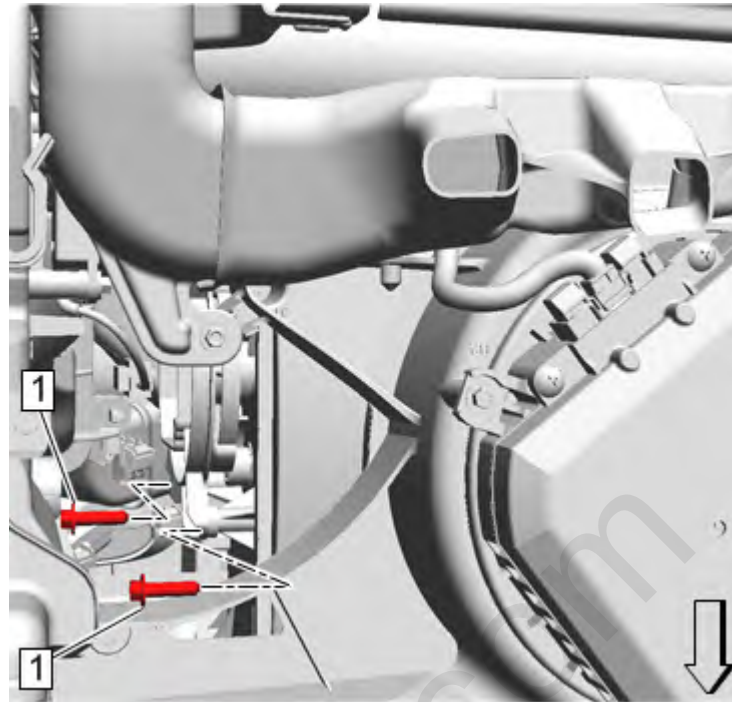


Fig. 188: Mode Control Cam Actuator Mounting Plate Bolts
Courtesy of GENERAL MOTORS COMPANY

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

4. Install and tighten Mode Control Cam Actuator Mounting Plate Bolts (1) (Qty: 2) to 2.5 N.m (22 lb in)

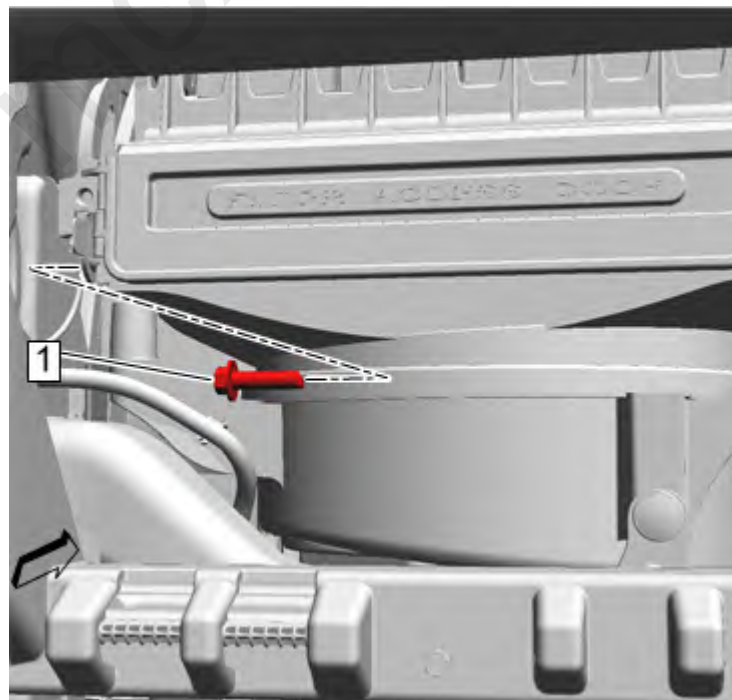


Fig. 189: Control Cam Actuator Mounting Plate Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Install and tighten Mode Control Cam Actuator Mounting Plate Bolt (1) to 2.5 N.m (22 lb in)

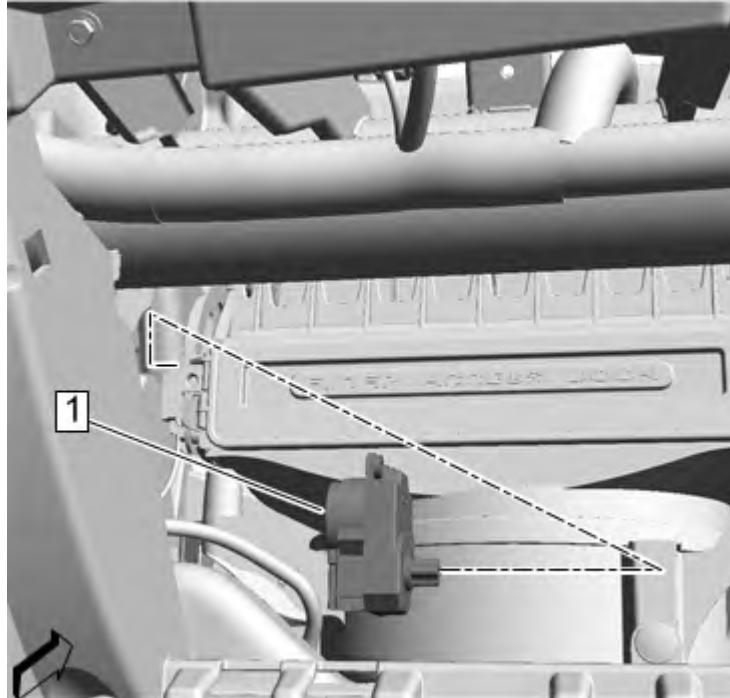


Fig. 190: Air Inlet Valve Actuator

Courtesy of GENERAL MOTORS COMPANY

6. Install Air Inlet Valve Actuator (1). Refer to [Air Inlet Valve Actuator Replacement](#)

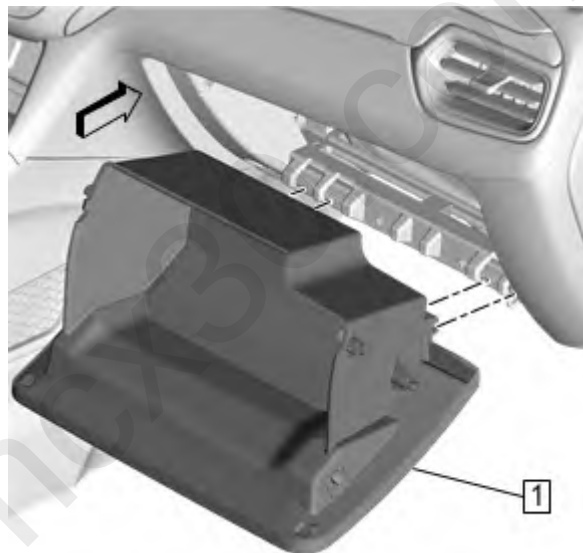


Fig. 191: Instrument Panel Compartment Door

Courtesy of GENERAL MOTORS COMPANY

7. Install Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#) [Instrument Panel Compartment Door Replacement \(Terrain\)](#).
8. Clear the DTCs from the heater and air conditioning remote control module.
9. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

MODE CONTROL CAM REPLACEMENT

Removal Procedure

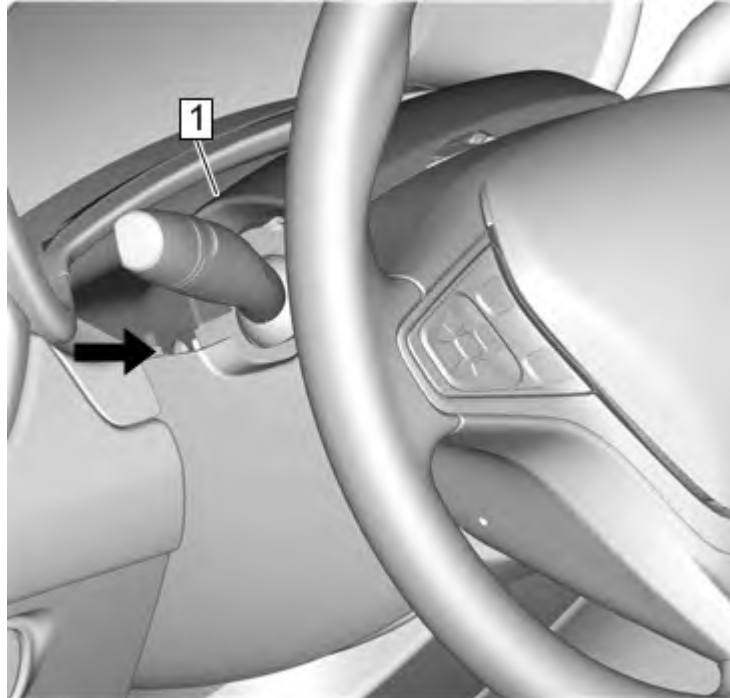


Fig. 192: Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

1. Use a flat bladed plastic trim tool to separate the steering column upper trim cover (1) from the steering column lower trim cover.
2. Position the steering column upper trim (1) cover out of the way.

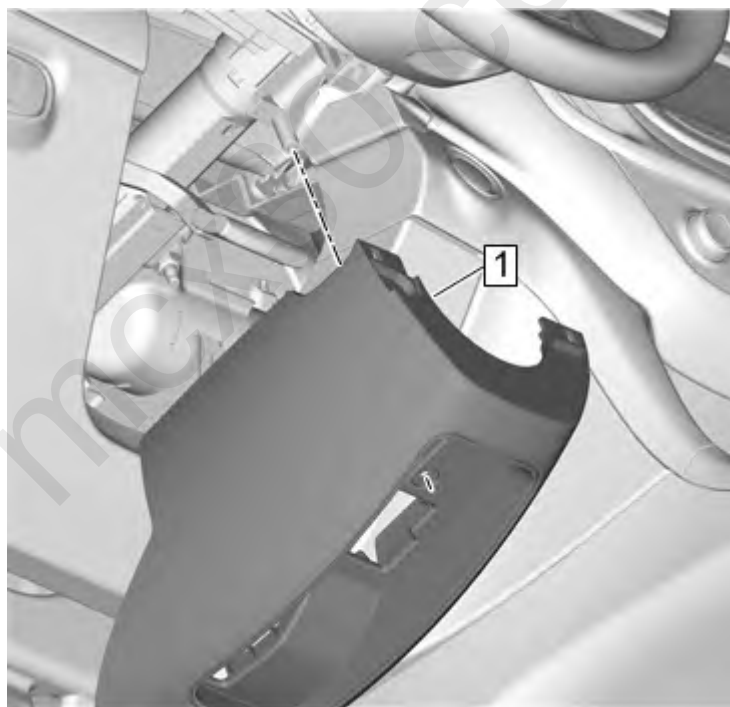


Fig. 193: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

3. Remove Steering Column Lower Trim Cover (1). Refer to [Steering Column Lower Trim Cover Replacement \(Equinox\)](#) [Steering Column Lower Trim Cover Replacement \(Terrain\)](#).
4. With the wheels of the vehicle in the straight ahead position, LOCK the steering column.

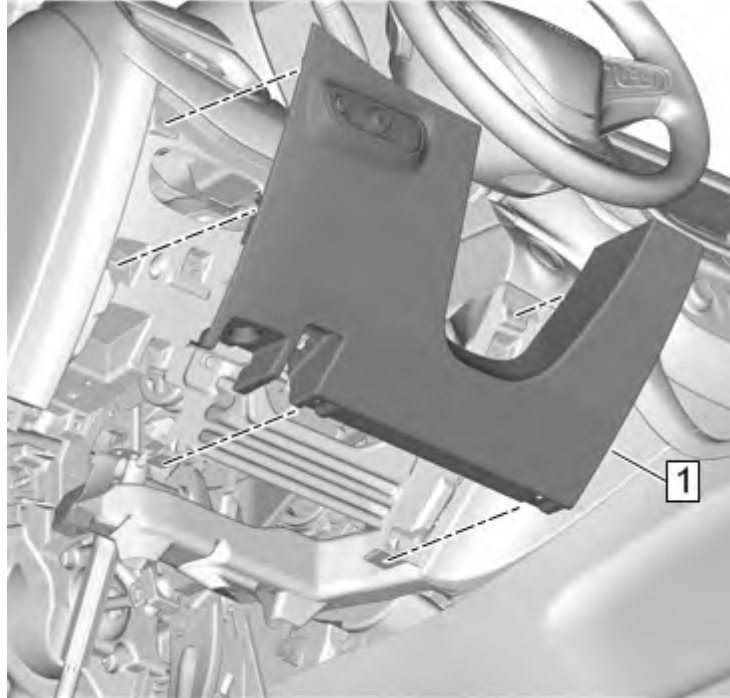


Fig. 194: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

5. Remove Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#) [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).

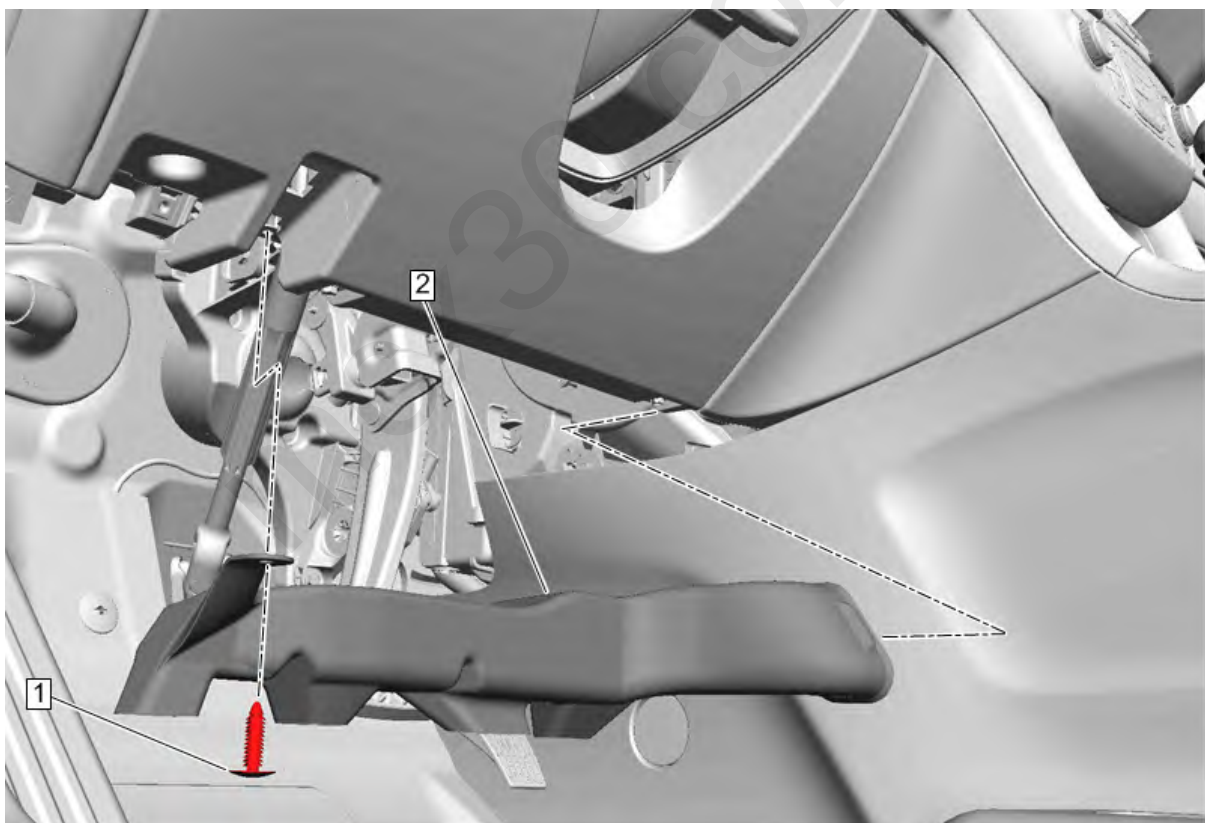


Fig. 195: Left Side Floor Front Air Outlet Duct

Courtesy of GENERAL MOTORS COMPANY

6. Remove Floor Front Air Outlet Duct - Left Side (2). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#)

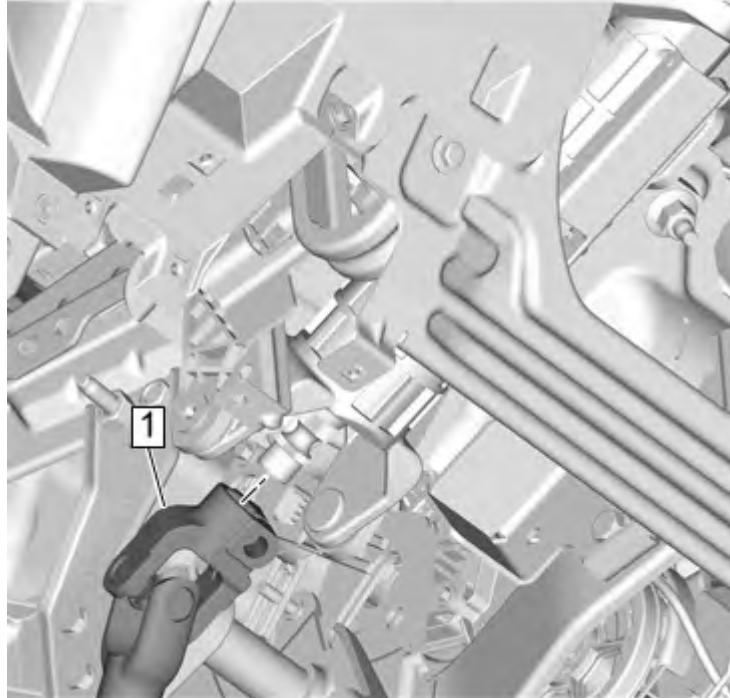


Fig. 196: Intermediate Steering Shaft

Courtesy of GENERAL MOTORS COMPANY

7. Remove Intermediate Steering Shaft (1) @ Steering Column. Refer to [Intermediate Steering Shaft Replacement \(Equinox\)](#) [Intermediate Steering Shaft Replacement \(Terrain\)](#).
8. Disconnect the steering column electrical connectors as necessary.

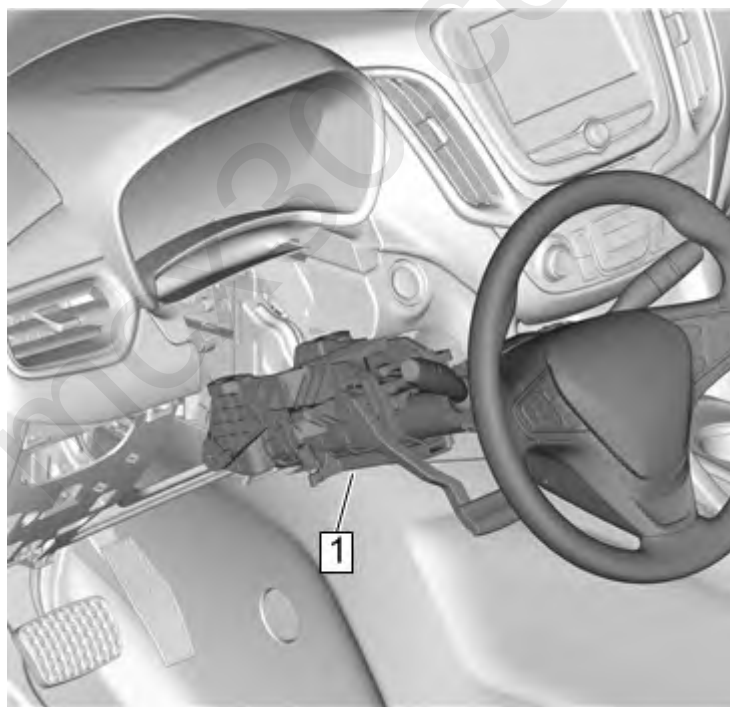


Fig. 197: Steering Column

Courtesy of GENERAL MOTORS COMPANY

9. Remove Steering Column (1). Refer to [Steering Column Replacement \(Equinox\)](#) [Steering Column Replacement \(Terrain\)](#).



Fig. 198: Brake And Accelerator Pedal Assembly.
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake pedal assembly (1). Refer to [Brake Pedal Assembly Replacement](#)

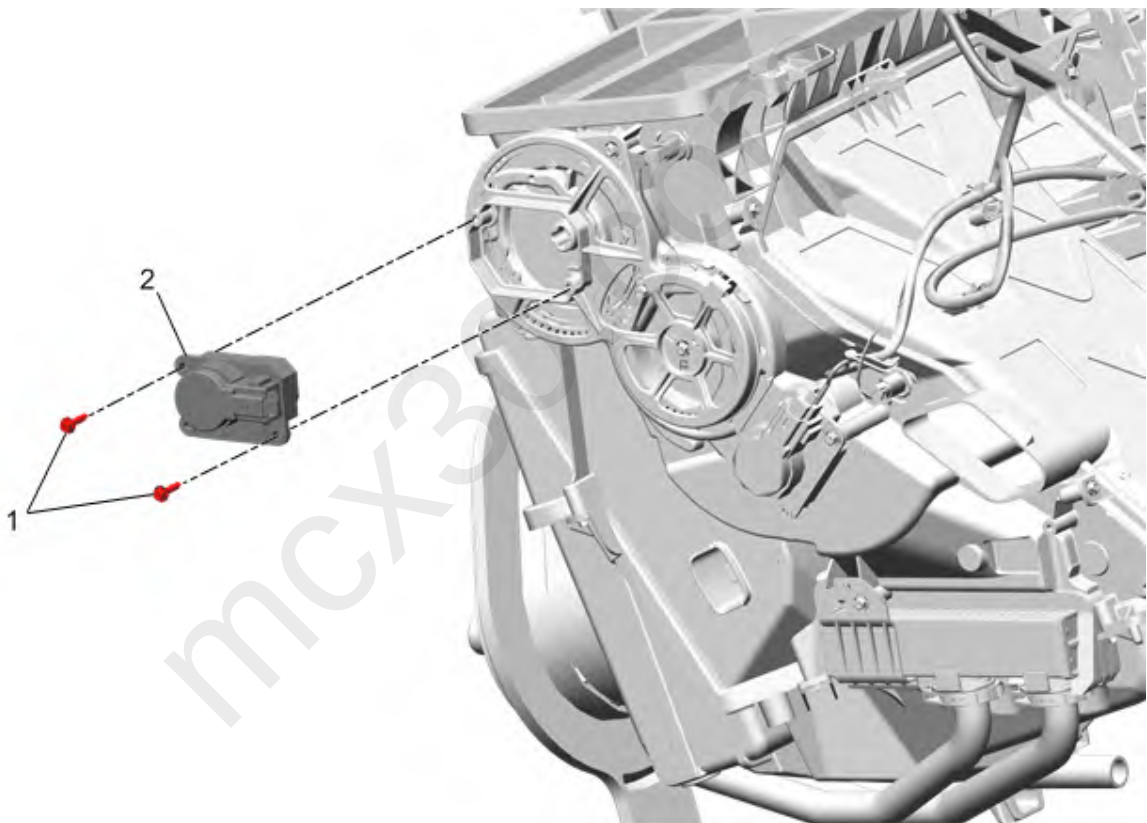


Fig. 199: Mode Control Cam Actuator
Courtesy of GENERAL MOTORS COMPANY

11. Remove Mode Valve Actuator (2). Refer to [Mode Valve Actuator Replacement](#)
12. Disconnect the electrical connector.

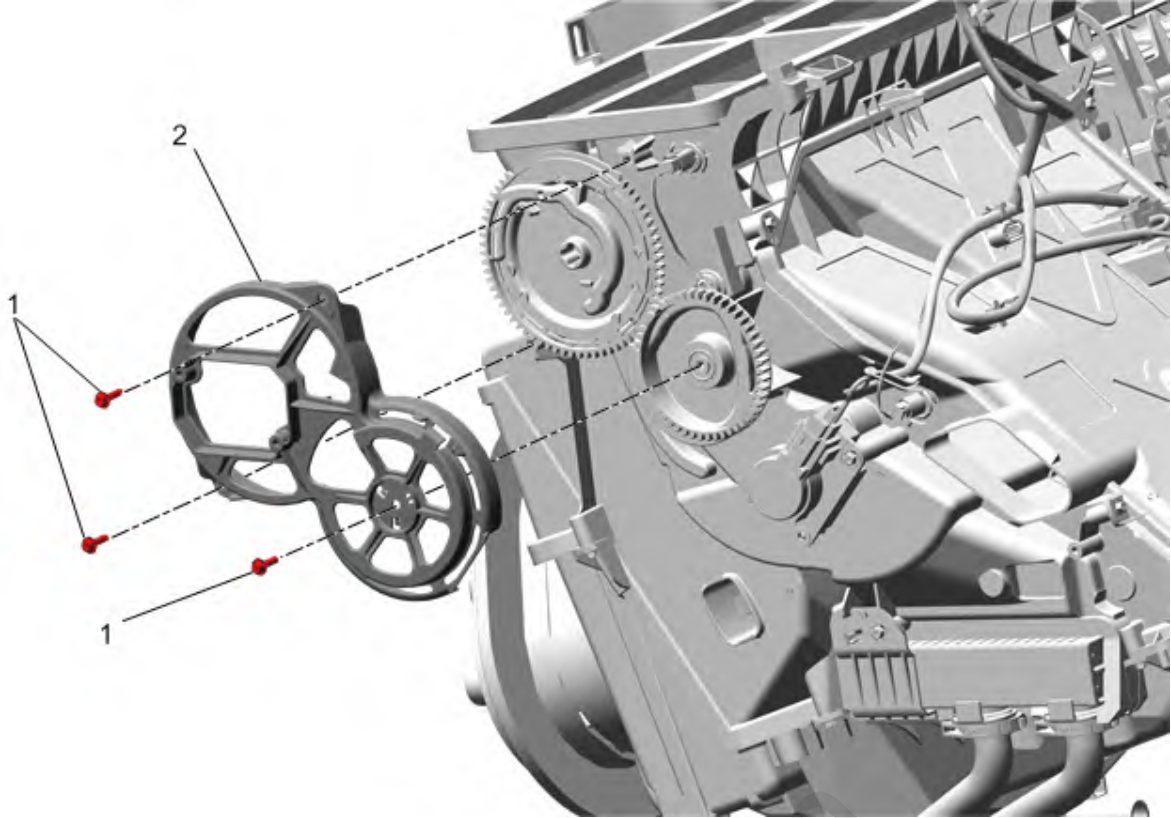


Fig. 200: Heater And Air Conditioning Mode Control Cam Cover And Bolts
 Courtesy of GENERAL MOTORS COMPANY

NOTE: The heater and air conditioning evaporator and blower module is shown out of the vehicle for clarity.

13. Remove Heater and Air Conditioning Mode Control Cam Cover Bolt (1) (Qty: 3)
14. Remove Heater and Air Conditioning Mode Control Cam Cover (2)

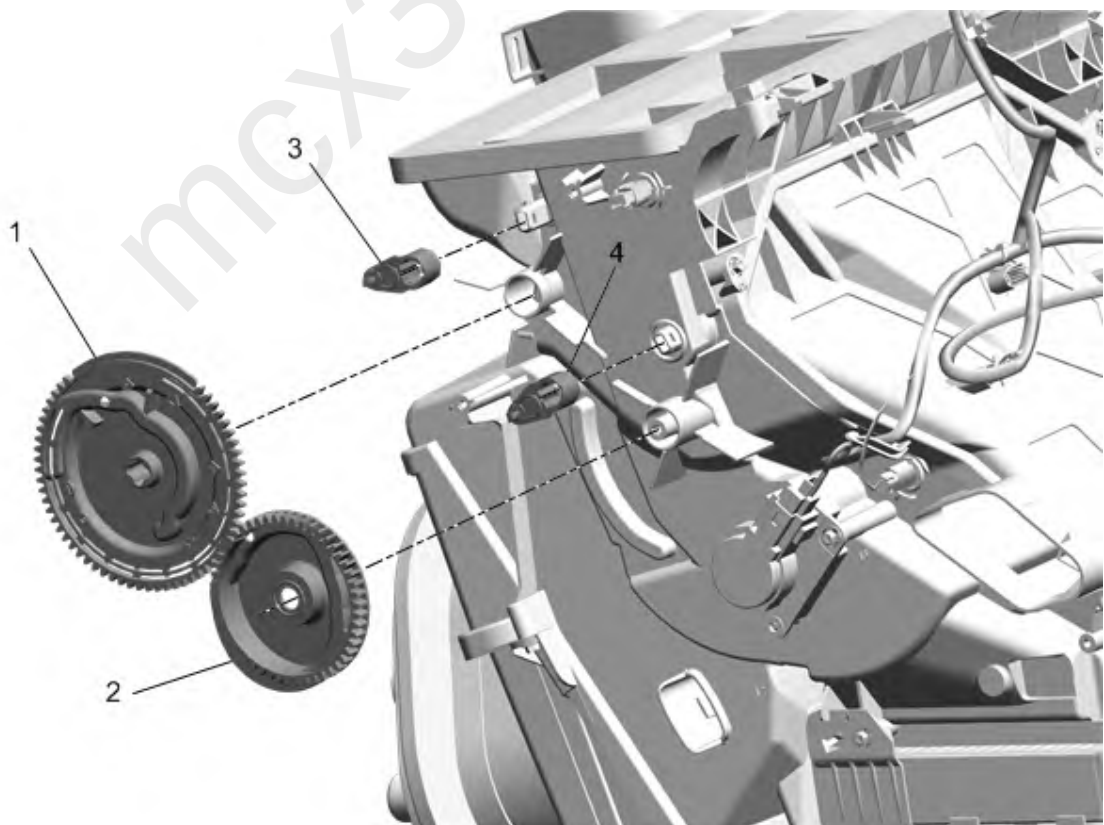


Fig. 201: Mode Control Cam
 Courtesy of GENERAL MOTORS COMPANY

15. Remove Mode Control Cam (1)
16. Remove Mode Control Cam (2)

17. Remove Defroster Valve Lever (3)
18. Remove Mode Valve Lever (4)

Installation Procedure

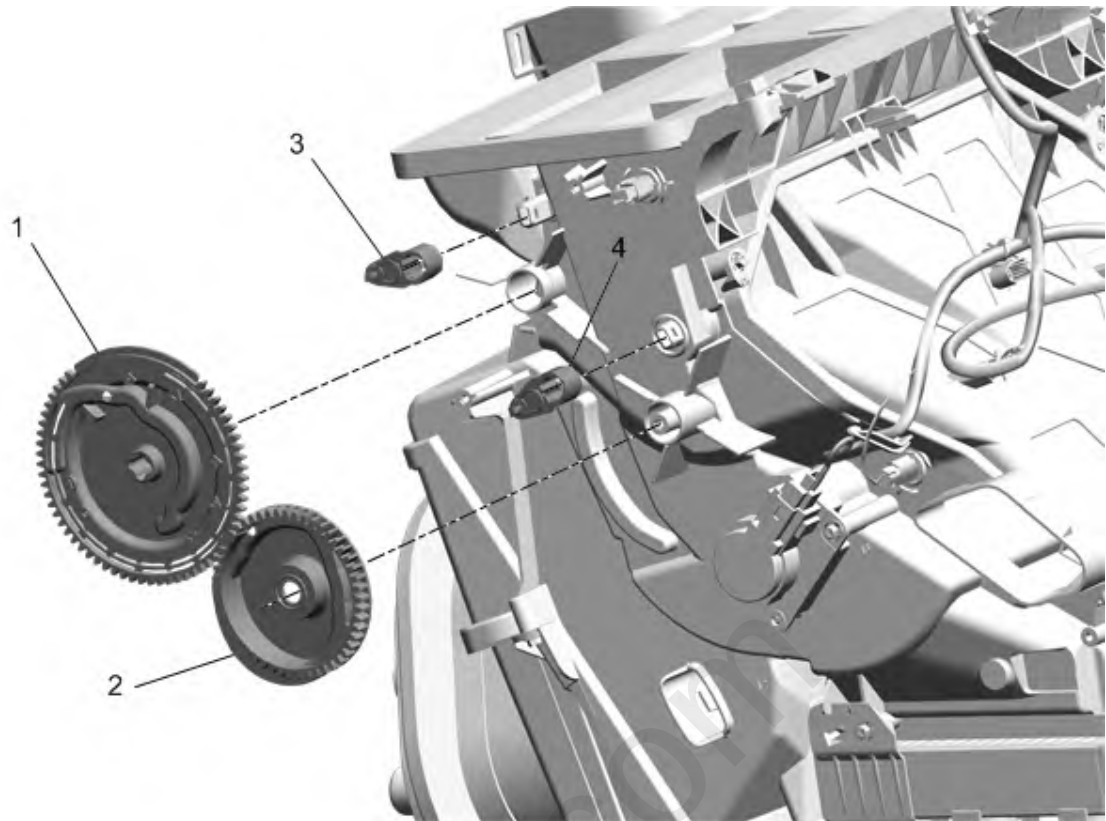


Fig. 202: Mode Control Cam

Courtesy of GENERAL MOTORS COMPANY

1. Install Mode Valve Lever (4)
2. Install Defroster Valve Lever (3)
3. Install Mode Control Cam (2)
4. Install Mode Control Cam (1)

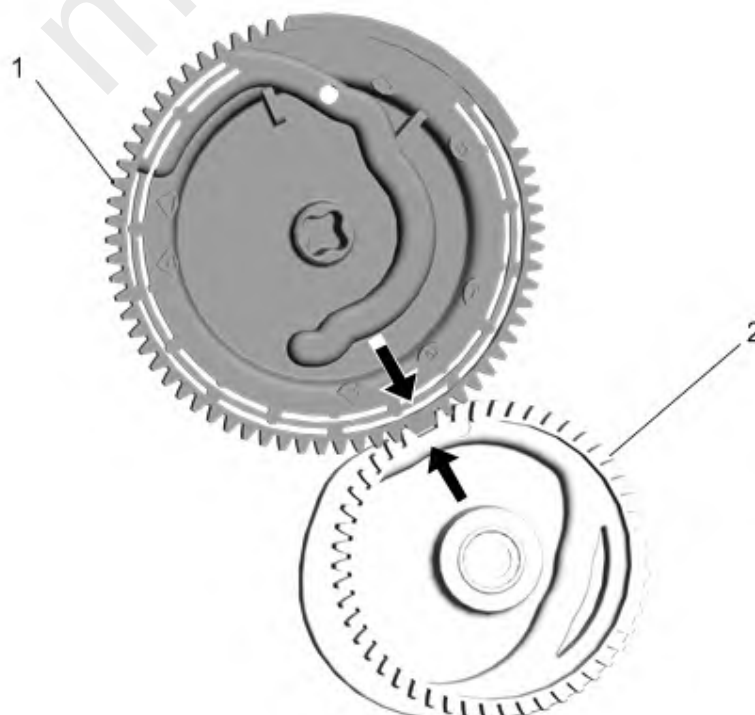


Fig. 203: Mode Control Valve Cam And Mode Control Heater Valve Cam Large Female Tooth

Courtesy of GENERAL MOTORS COMPANY

5. Index the mode control valve cam (1) large male tooth to the mode control heater valve cam large female tooth (2) as indicated by the arrows.

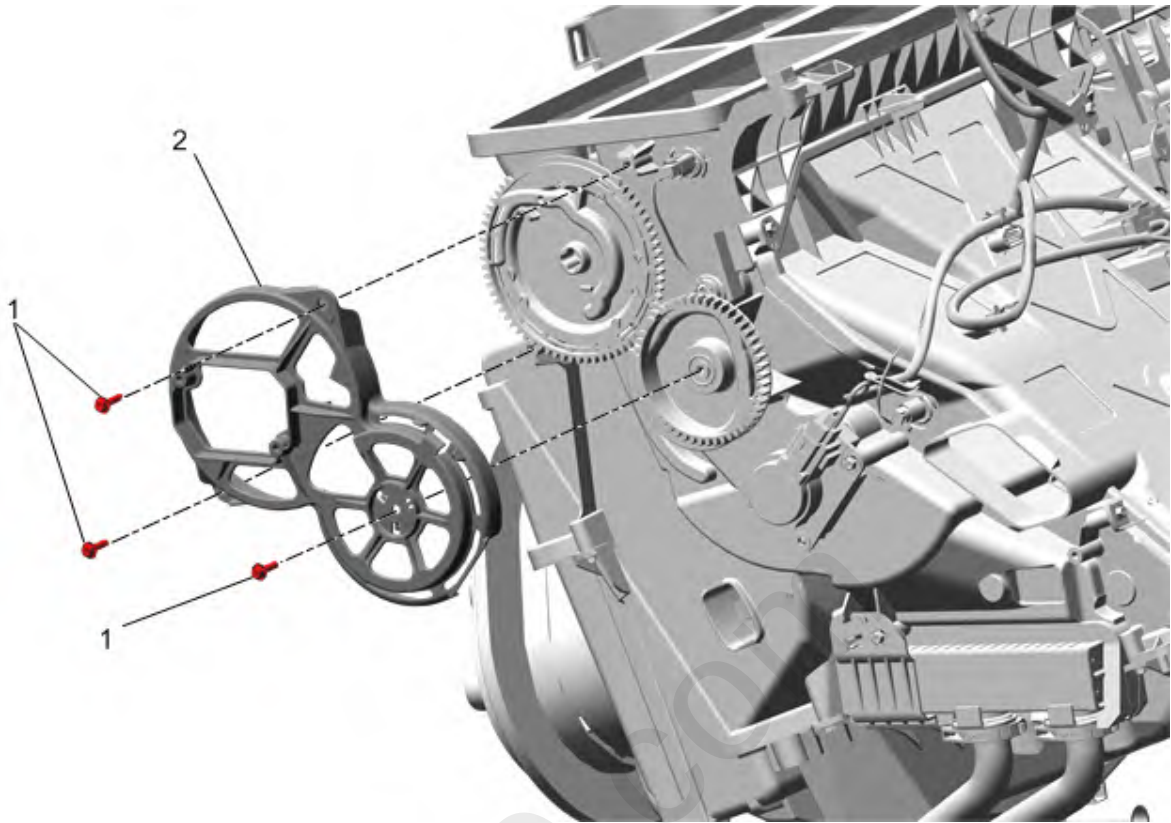


Fig. 204: Heater And Air Conditioning Mode Control Cam Cover And Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Install Heater and Air Conditioning Mode Control Cam Cover (2)

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

7. Install and tighten Heater and Air Conditioning Mode Control Cam Cover Bolts (1) (Qty: 3) to 2.5 N.m (22 lb in)

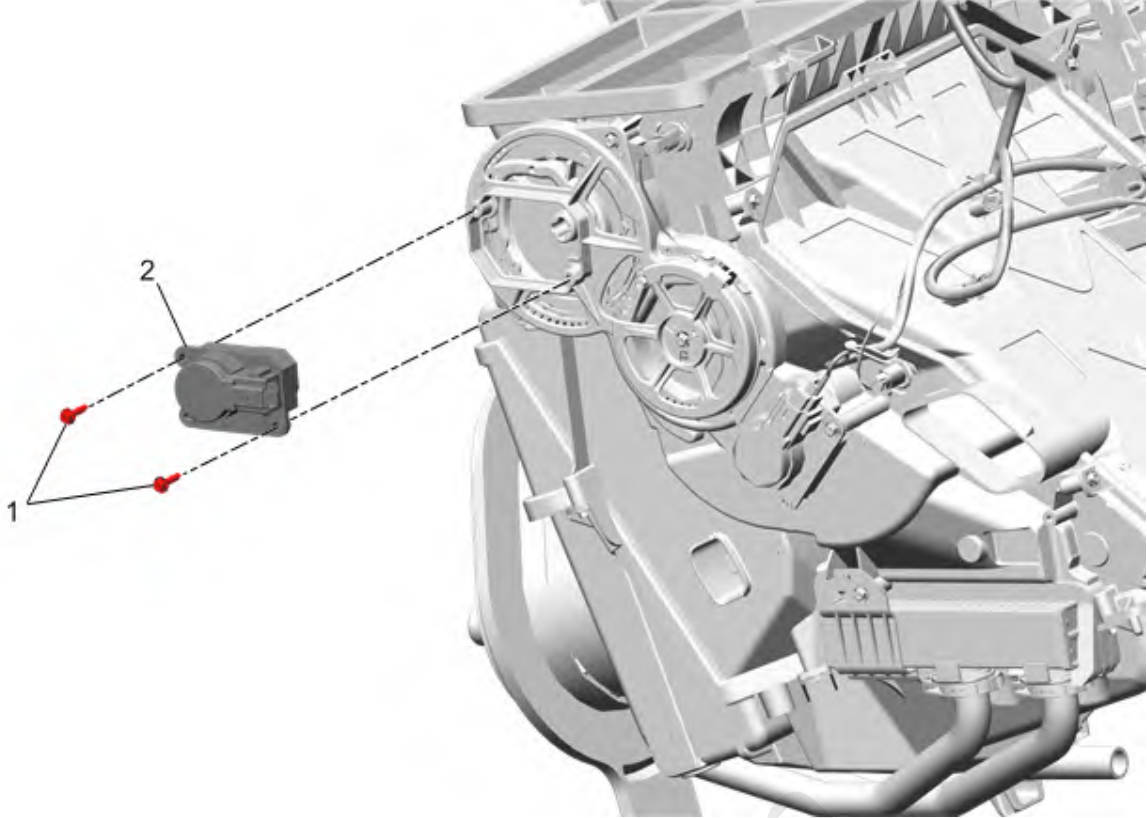


Fig. 205: Mode Control Cam Actuator

Courtesy of GENERAL MOTORS COMPANY

8. Install Mode Valve Actuator (2). Refer to [Mode Valve Actuator Replacement](#)
9. Connect the electrical connector.

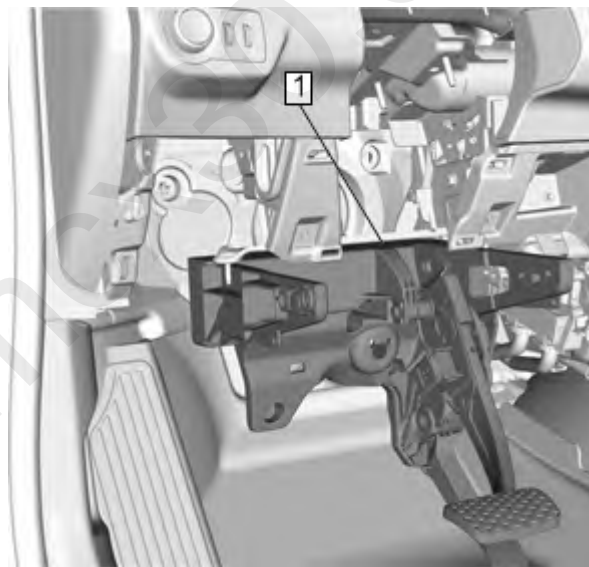


Fig. 206: Brake And Accelerator Pedal Assembly

Courtesy of GENERAL MOTORS COMPANY

10. Install the brake pedal assembly (1). Refer to [Brake Pedal Assembly Replacement](#)

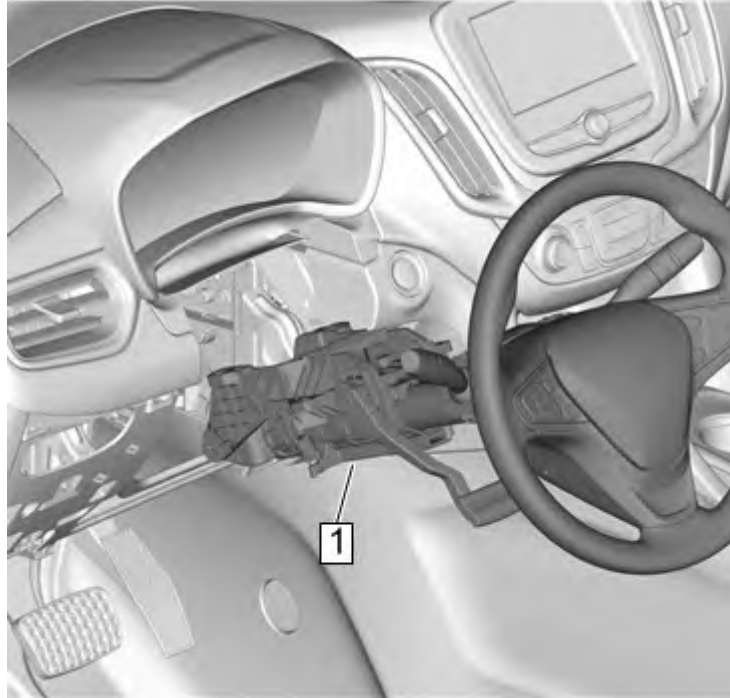


Fig. 207: Steering Column

Courtesy of GENERAL MOTORS COMPANY

11. Install Steering Column (1). Refer to [Steering Column Replacement \(Equinox\)](#), [Steering Column Replacement \(Terrain\)](#).
12. Connect the steering column electrical connectors.

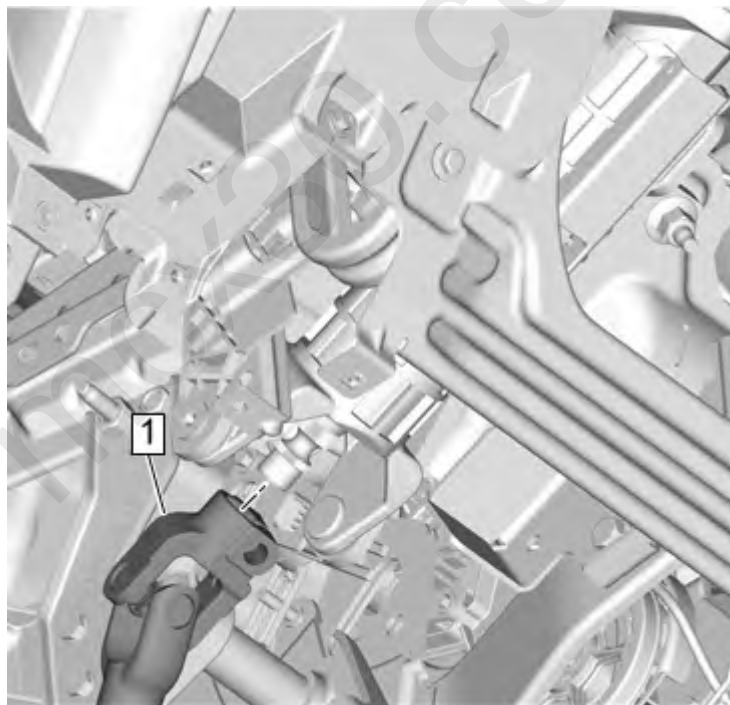


Fig. 208: Intermediate Steering Shaft

Courtesy of GENERAL MOTORS COMPANY

13. Install Intermediate Steering Shaft (1) @ Steering Column. Refer to [Intermediate Steering Shaft Replacement \(Equinox\)](#), [Intermediate Steering Shaft Replacement \(Terrain\)](#).

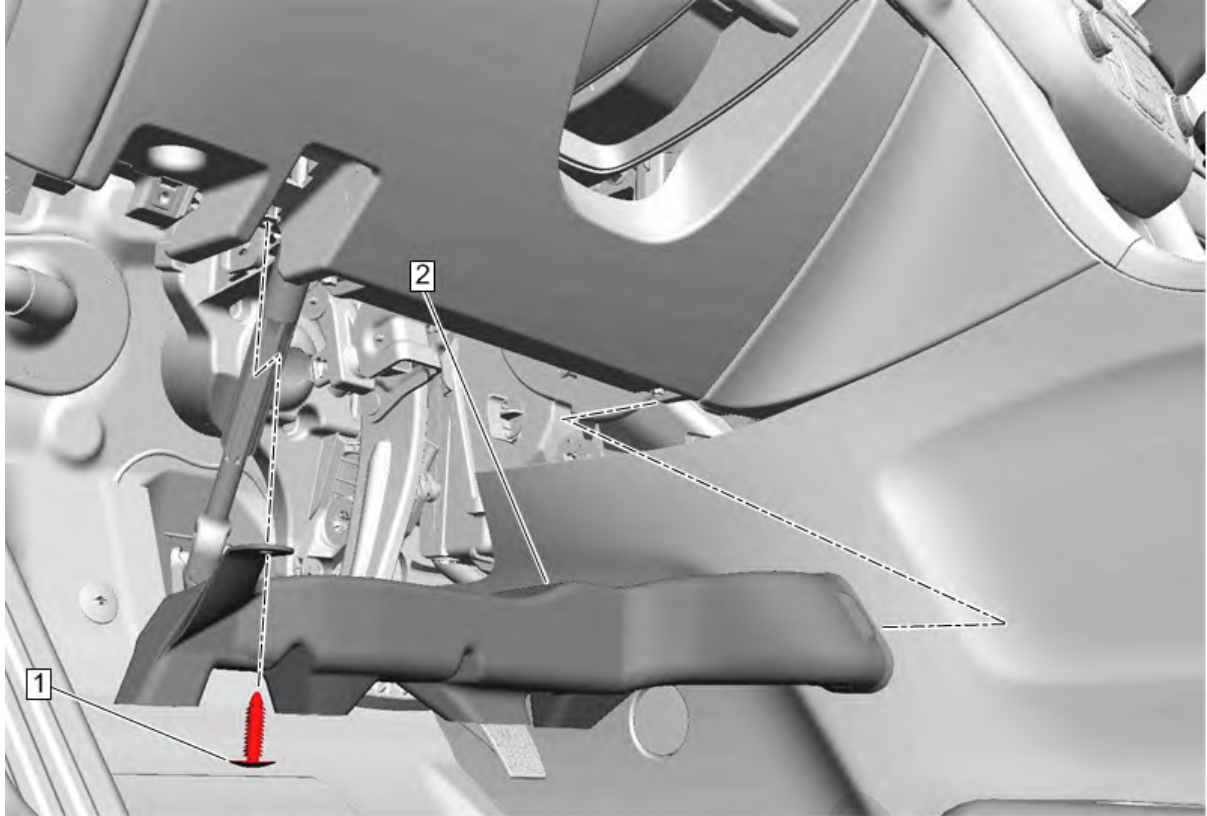


Fig. 209: Left Side Floor Front Air Outlet Duct
 Courtesy of GENERAL MOTORS COMPANY

14. Install Floor Front Air Outlet Duct - Left Side (2). Refer to [Floor Front Air Outlet Duct Replacement - Left Side](#)

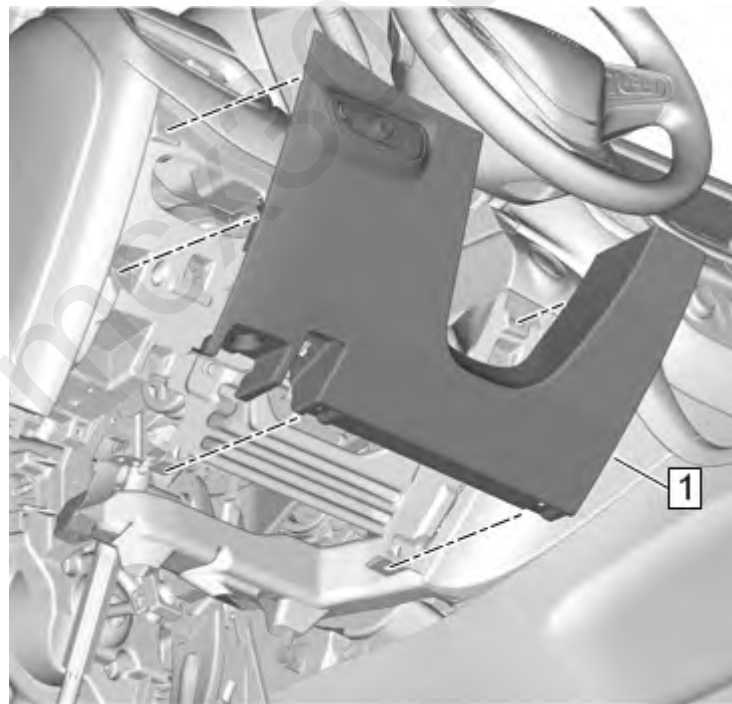


Fig. 210: Instrument Panel Knee Bolster
 Courtesy of GENERAL MOTORS COMPANY

15. Install Instrument Panel Knee Bolster (1). Refer to [Instrument Panel Knee Bolster Replacement \(Equinox\)](#), [Instrument Panel Knee Bolster Replacement \(Terrain\)](#).
16. Unlock the steering column.

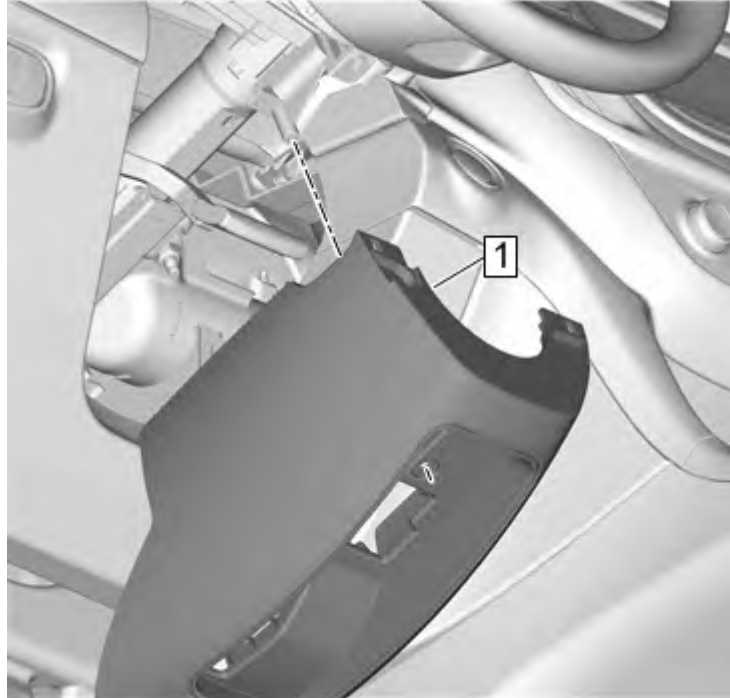


Fig. 211: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

17. Install Steering Column Lower Trim Cover (1). Refer to [Steering Column Lower Trim Cover Replacement \(Equinox\)](#), [Steering Column Lower Trim Cover Replacement \(Terrain\)](#).

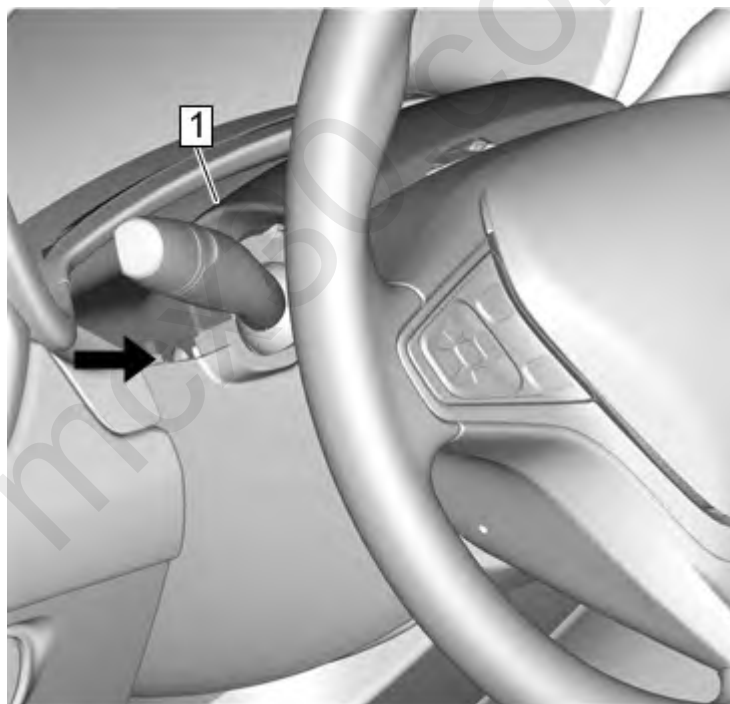


Fig. 212: Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

18. Secure the steering column upper trim (1) to the steering column lower trim cover.
19. Center the steering angle sensor. Refer to [Steering Wheel Angle Sensor Centering](#)
20. Clear the DTCs from the heater and air conditioning remote control module.
21. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

TEMPERATURE VALVE ACTUATOR REPLACEMENT - RIGHT SIDE

Removal Procedure

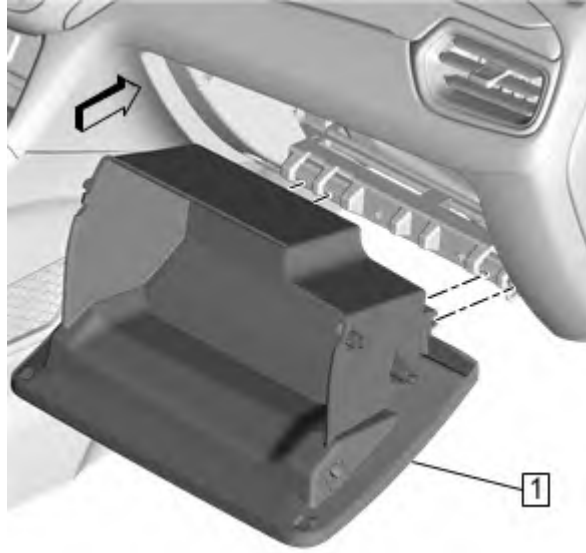


Fig. 213: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#), [Instrument Panel Compartment Door Replacement \(Terrain\)](#).
2. Disconnect the electrical connector.

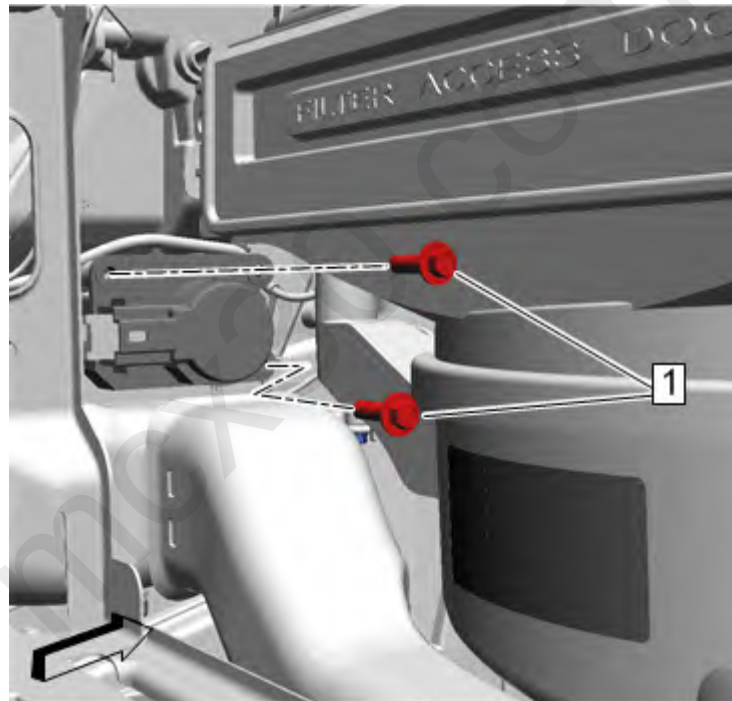


Fig. 214: Temperature Valve Actuator Bolts
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Temperature Valve Actuator Bolt (1) (Qty: 2)

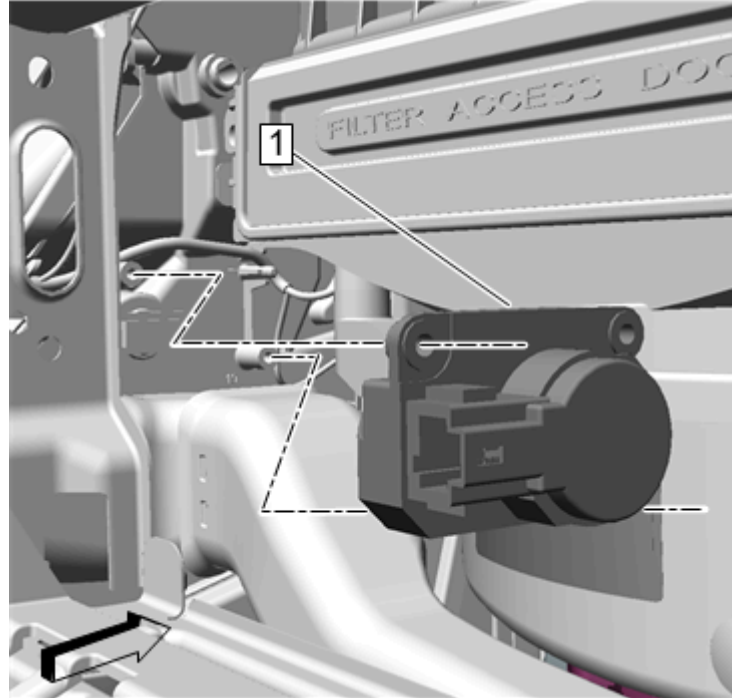


Fig. 215: Right Side Temperature Valve Actuator
 Courtesy of GENERAL MOTORS COMPANY

4. Remove Temperature Valve Actuator - Right Side (1)

Installation Procedure

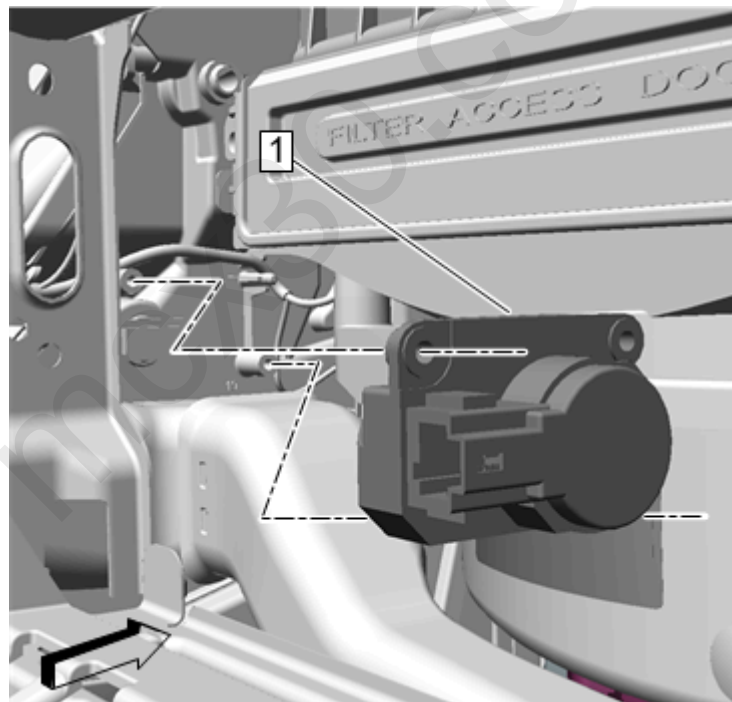


Fig. 216: Right Side Temperature Valve Actuator
 Courtesy of GENERAL MOTORS COMPANY

1. Install Temperature Valve Actuator - Right Side (1)

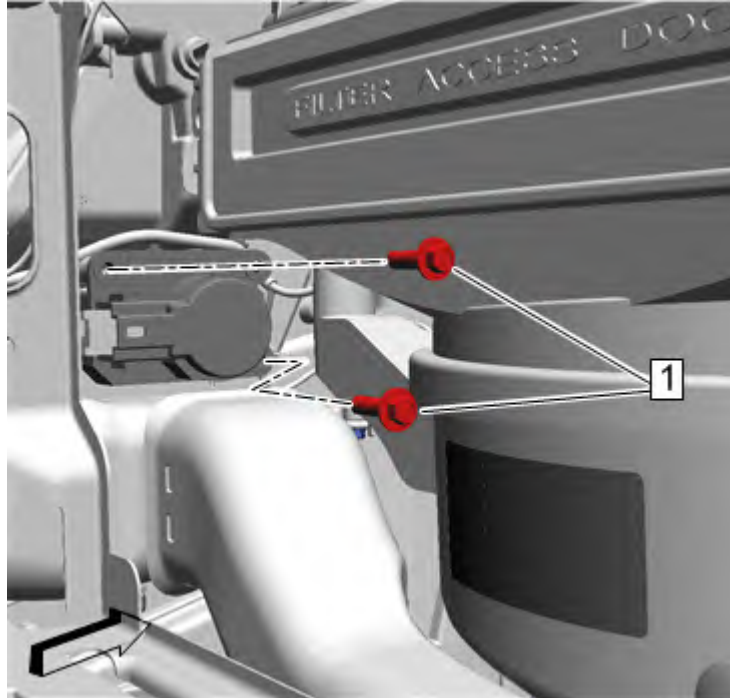


Fig. 217: Temperature Valve Actuator Bolts

Courtesy of GENERAL MOTORS COMPANY

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

2. Install and tighten Temperature Valve Actuator Bolts (1) (Qty: 2) to 2.5 N.m (22 lb in)
3. Connect the electrical connector.

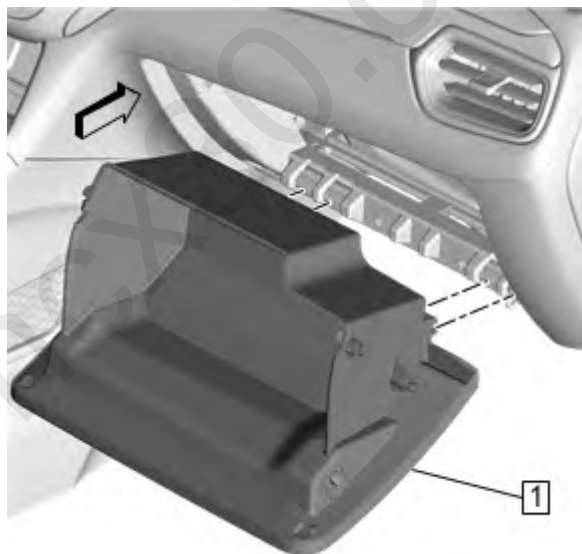


Fig. 218: Instrument Panel Compartment Door

Courtesy of GENERAL MOTORS COMPANY

4. Install Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#) [Instrument Panel Compartment Door Replacement \(Terrain\)](#).
5. Clear the DTCs from the heater and air conditioning remote control module.
6. Perform the actuator calibration procedure. Refer to [Actuator Recalibration](#)

TEMPERATURE VALVE ACTUATOR REPLACEMENT - LEFT SIDE

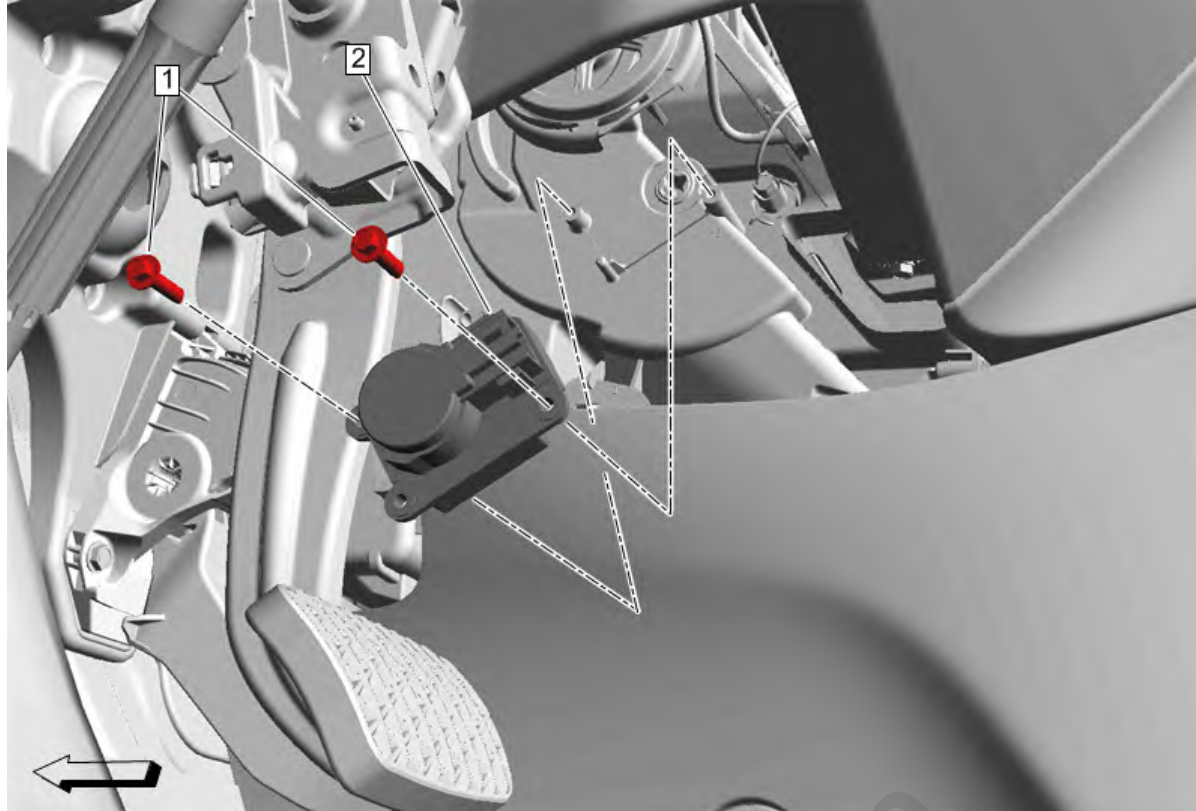


Fig. 219: Temperature Valve Actuator - Left Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Floor Front Air Outlet Duct - Left Side. Refer to Floor Front Air Outlet Duct Replacement - Left Side 2. Remove Instrument Panel Compartment Air Duct @ Heater and Air Conditioning Evaporator and Blower Module	
1	Temperature Valve Actuator Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Temperature Valve Actuator - Left 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. Refer to Actuator Recalibration

FLOOR AIR TEMPERATURE SENSOR REPLACEMENT - LEFT SIDE

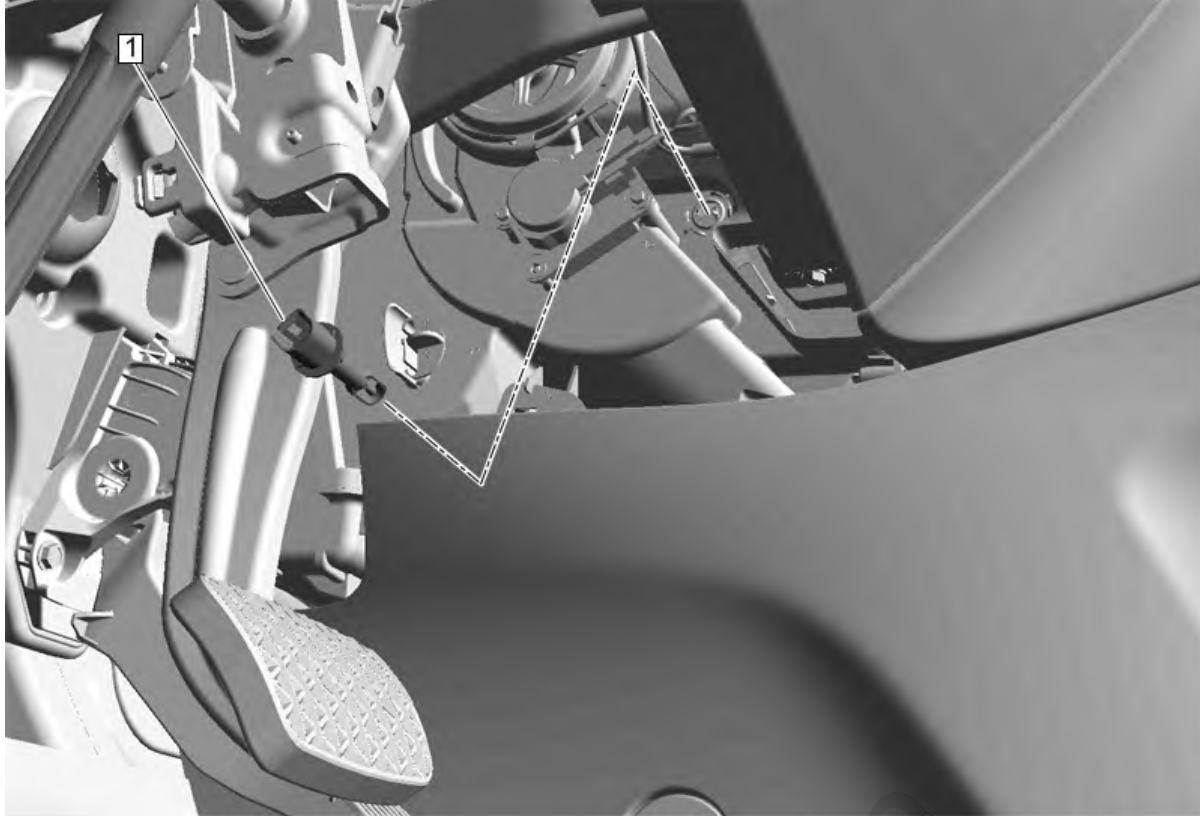


Fig. 220: Floor Air Temperature Sensor - Left Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Floor Front Air Outlet Duct - Left Side. Refer to Floor Front Air Outlet Duct Replacement - Left Side	
1	Floor Air Temperature Sensor - Left Side Procedure 1. Disconnect the electrical connector. 2. Turn the air temperature sensor a quarter turn counterclockwise to remove. 3. Clear the DTCs from the heater and air conditioning remote control module.

FLOOR AIR TEMPERATURE SENSOR REPLACEMENT - RIGHT SIDE

Removal Procedure

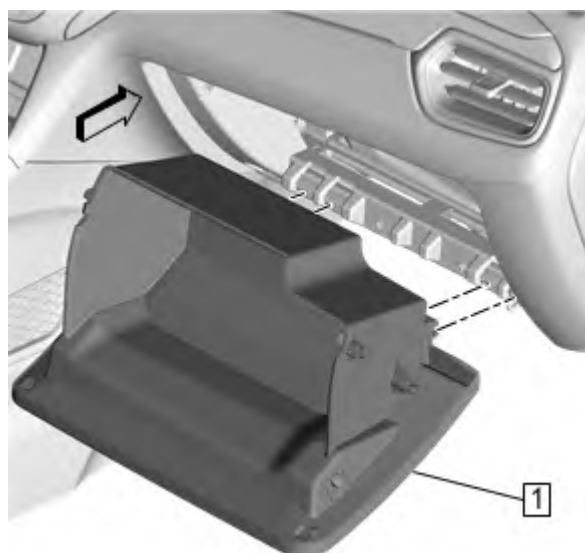


Fig. 221: Instrument Panel Compartment Door

Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Compartment Door (1). Refer to [Instrument Panel Compartment Door Replacement \(Equinox\)](#). [Instrument Panel Compartment Door Replacement \(Terrain\)](#).
2. Disconnect the electrical connector.

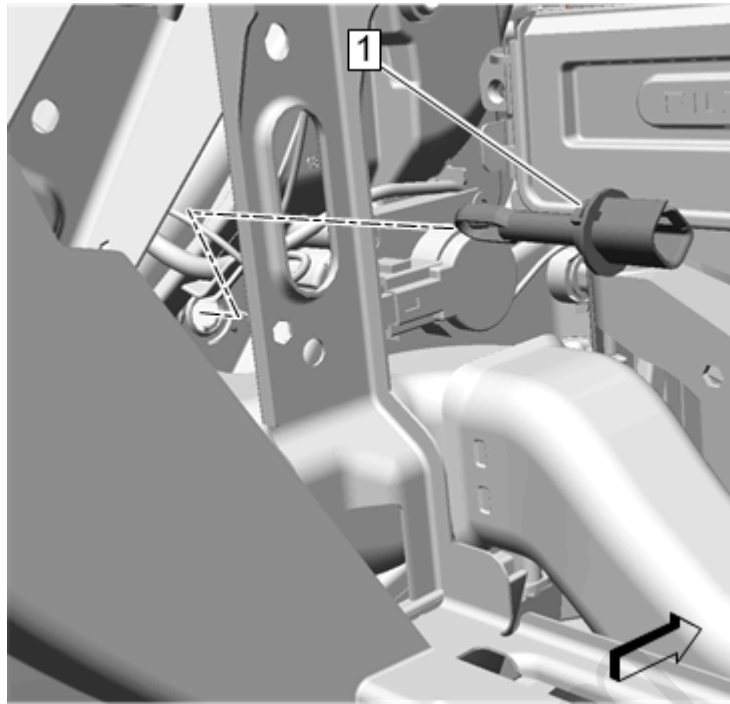


Fig. 222: Right Side Floor Air Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

3. Remove Floor Air Temperature Sensor - Right Side (1)

Installation Procedure

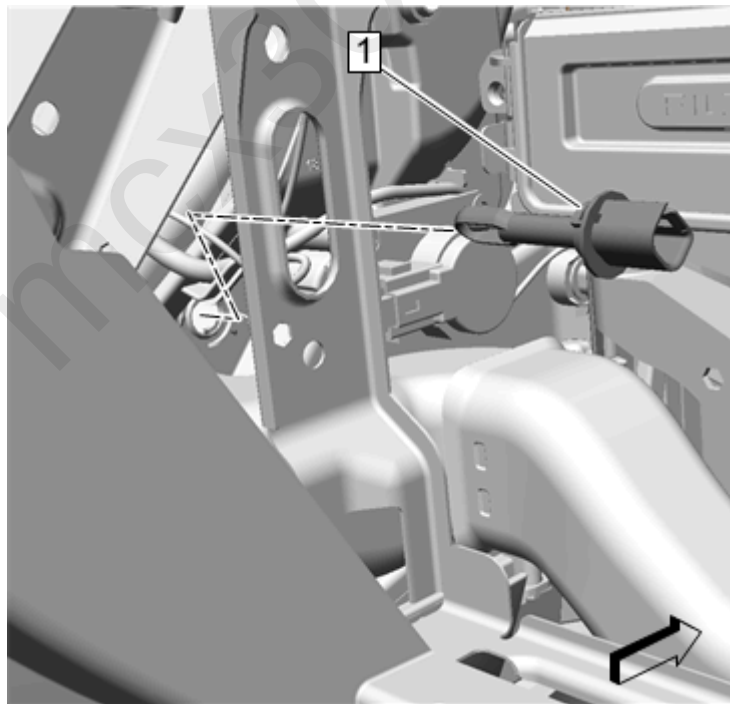


Fig. 223: Right Side Floor Air Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

1. Install Floor Air Temperature Sensor - Right Side (1)
2. Connect the electrical connector.

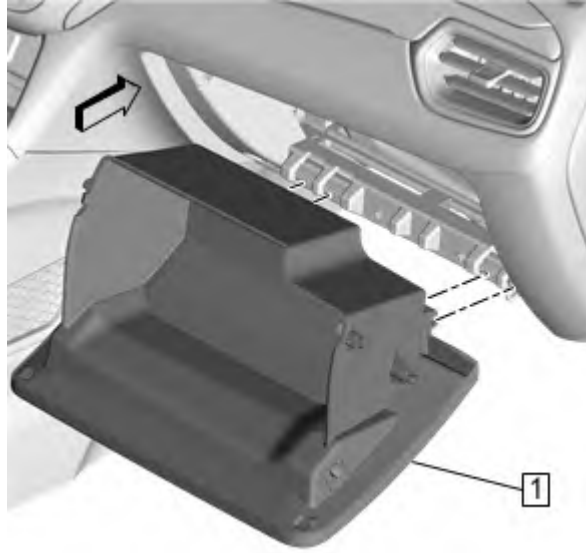


Fig. 224: Instrument Panel Compartment Door
 Courtesy of GENERAL MOTORS COMPANY

3. Install Instrument Panel Compartment Door (1). Refer to **Instrument Panel Compartment Door Replacement (Equinox)**, **Instrument Panel Compartment Door Replacement (Terrain)**.
4. Clear the DTCs from the heater and air conditioning remote control module.

EVAPORATOR AIR TEMPERATURE SENSOR REPLACEMENT

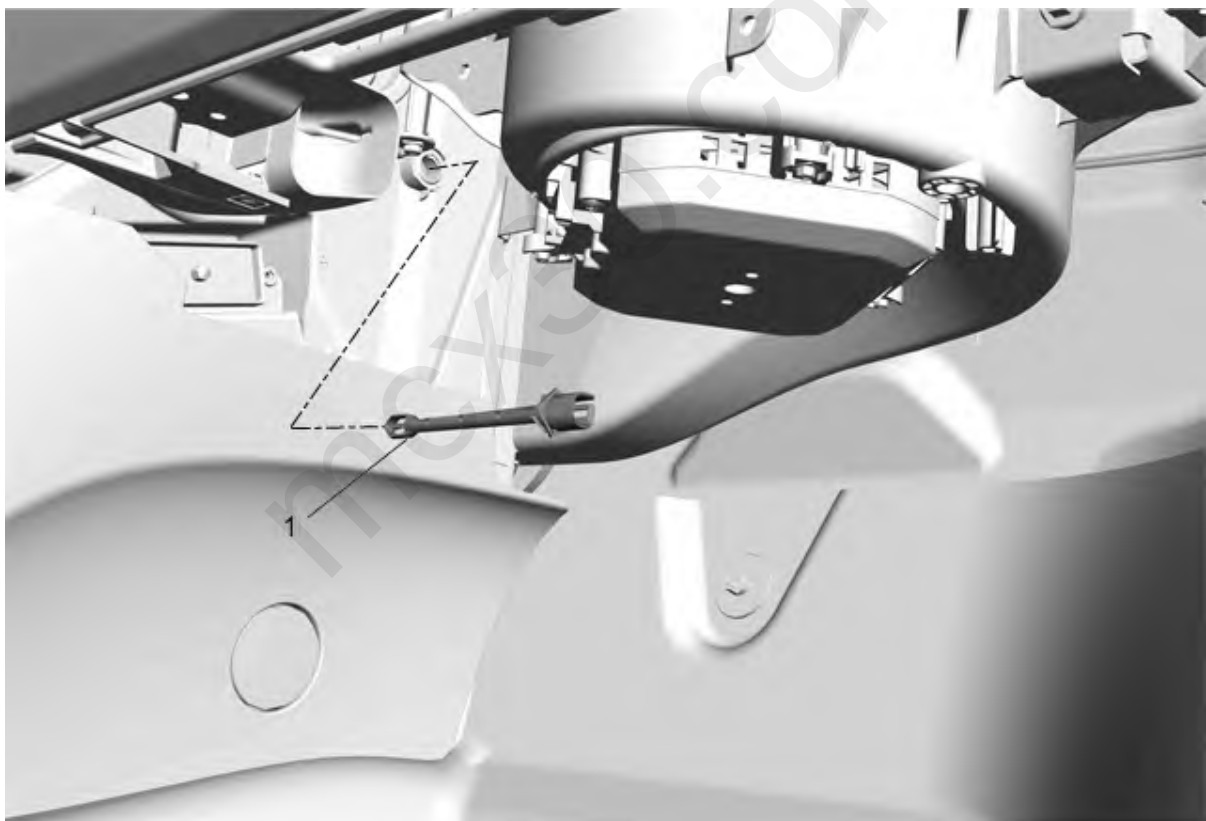


Fig. 225: Evaporator Air Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1	Evaporator Air Temperature Sensor NOTE: The right side front floor air outlet duct is removed for clarity. Procedure 1. Disconnect the electrical connector. 2. Rotate the evaporator air temperature sensor quarter of a turn counter clockwise to remove. 3. Clear the DTCs from the heater and air conditioning remote control module.

INSIDE AIR MOISTURE AND WINDSHIELD TEMPERATURE SENSOR REPLACEMENT



Fig. 226: Inside Air Moisture And Windshield Temperature Sensor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Inside Rearview Mirror. Refer to Inside Rearview Mirror Replacement	
1	Inside Air Moisture and Windshield Temperature Sensor Procedure 1. Unlatch the inside air moisture and windshield temperature sensor, from the inside rear view mirror support bracket. 2. Disconnect the electrical connector.

SUN LOAD TEMPERATURE AND HEADLAMP AUTOMATIC CONTROL AMBIENT LIGHT SENSOR REPLACEMENT (EQUINOX)

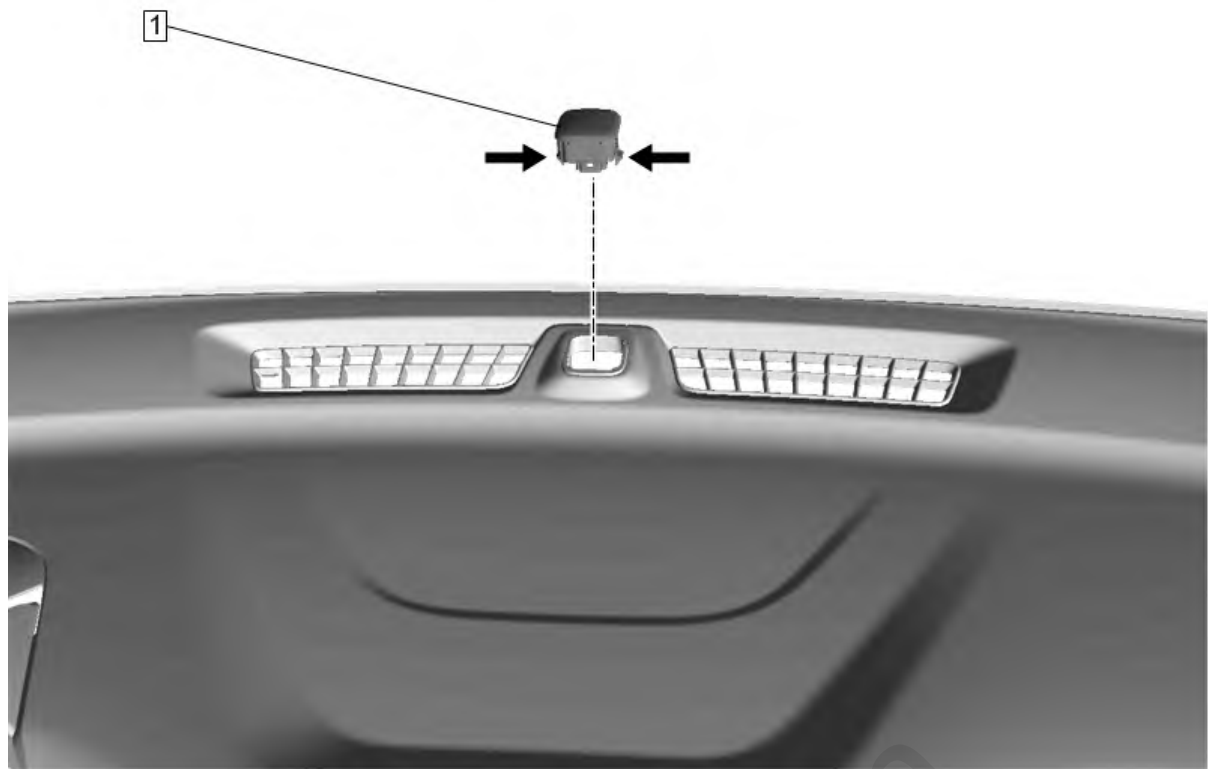


Fig. 227: Sun Load Temperature And Headlamp Automatic Control Ambient Light Sensor (Equinox)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Instrument Panel Upper Trim Panel. Refer to <u>Instrument Panel Upper Trim Panel Replacement (Equinox)</u>	
1	Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Procedure 1. Depress the detents indicated by the arrows using the appropriate tool. 2. Disconnect the electrical connector.

SUN LOAD TEMPERATURE AND HEADLAMP AUTOMATIC CONTROL AMBIENT LIGHT SENSOR REPLACEMENT (TERRAIN)

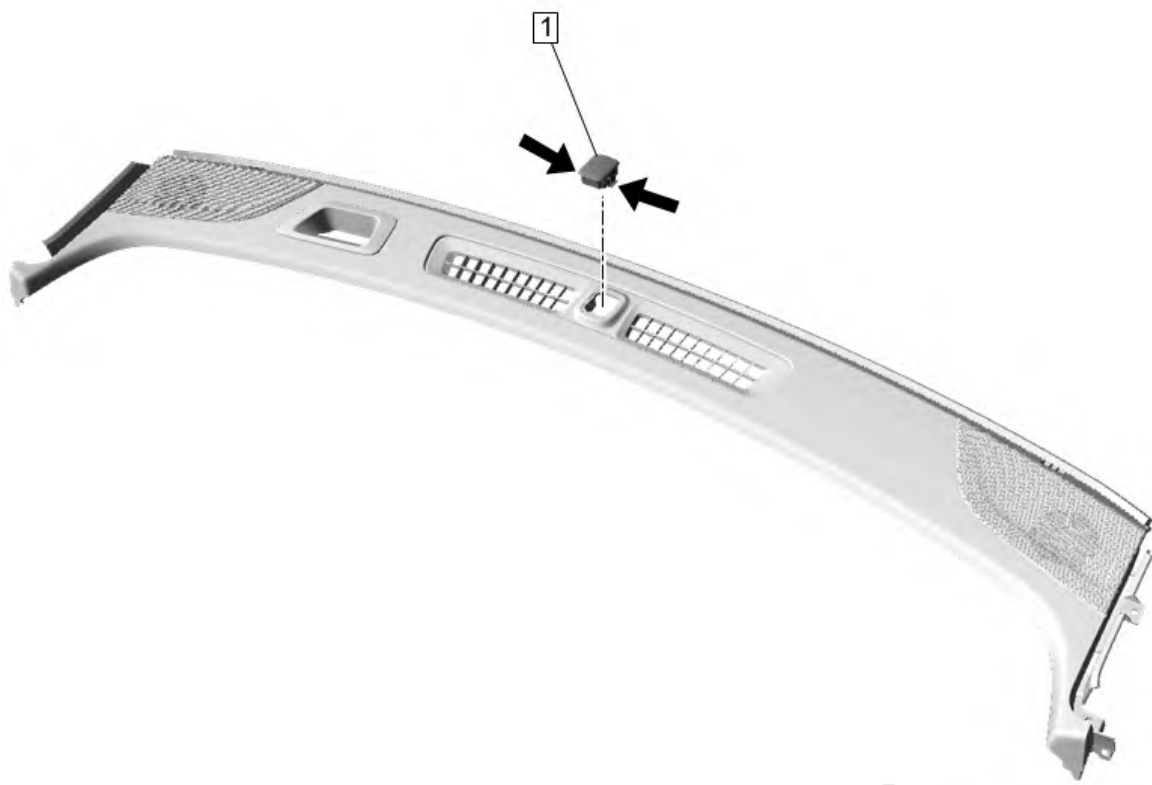


Fig. 228: Sun Load Temperature And Headlamp Automatic Control Ambient Light Sensor (Terrain)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Instrument Panel Upper Trim Panel. Refer to Instrument Panel Upper Trim Panel Replacement (Terrain)	
1	Sun Load Temperature and Headlamp Automatic Control Ambient Light Sensor Procedure 1. Depress the detents indicated by the arrows using the appropriate tool. 2. Disconnect the electrical connector.

DESCRIPTION AND OPERATION

AUTOMATIC HVAC DESCRIPTION AND OPERATION

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

- HVAC Control Components
- Air Delivery
- Heating and A/C Operation
- Recirculation Operation
- Automatic Operation
- Engine Coolant and A/C System Refrigerant

HVAC Control Components

HVAC Controls

The HVAC controls 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.

The HVAC control module supports the following features:

Feature	Availability
Afterblow	Available if enabled
Purge	Yes
Personalization	Yes
Actuator Calibration	Yes

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: front mode, left and right temperature, 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 individual control circuits. The control circuits are operated to move the door to the required 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 door.

Air Speed and Blower Motor

The blower speed control is part of the HVAC control. The selected value is sent to the HVAC control module via LIN-Bus.

The blower motor speed control from the HVAC control module, battery positive and ground circuits enable the blower motor to operate. The HVAC control module provides a low side pulse width modulation (PWM) signal to the blower motor 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.

Duct Air Temperature

Physical duct air temperature sensors are not used with this system. The air temperature in the air distribution ducts is calculated by the HVAC control module based on the engine coolant and evaporator temperature sensors. The HVAC control module uses these values to calculate actuator position.

Evaporator Temperature Sensor

The evaporator temperature sensor is a 2-wire negative temperature coefficient thermistor. The sensor operates within a temperature range of -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$). The sensor is installed at the evaporator and measures its temperature. If the temperature drops under 3°C (38°F), the compressor will be switched off in order to prevent evaporator freezing.

A/C Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0.2 - 4.8 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The engine control module (ECM) converts the voltage signal to a pressure value. When pressure is too high or too low, the ECM will not allow the A/C compressor clutch to engage.

A/C Compressor

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.

This A/C system utilizes a variable displacement solenoid valve to alter the amount of displacement created by the turning of the compressor. The HVAC control module provides both battery voltage and a pulse width modulated ground to the variable displacement solenoid valve. When the A/C switch is pressed, the HVAC control module grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is regulated based on cooling load.

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. It is only needed if the thermal contact between the humidity sensing element and the inside windshield surface is not sufficient.

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
- Elevation
- Azimuth
- Passenger compartment temperature

The sunload sensor is connected to ground and to a 12 V clocked power supply through the HVAC control module. This clocked power supply is to power the sensor electronics and to work as a clock generator to the sunload sensor micro controller. The sensor uses a pulse signal for data identification and transferring the sun intensity measurement. At each positive transition from the clocked supply input, the sunload sensor micro controller will shift channels enabling new intensity measurement on the signal output to the HVAC control module. The signal voltage varies between 0 - 4 V.

The passenger compartment temperature sensor is a negative temperature coefficient 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.

Air Delivery

The HVAC control module controls the distribution of air by the use of the actuators. Temperature may be individually selected for the driver and front passenger.

The HVAC controls delivers the selected settings to the HVAC control module via LIN-Bus. The HVAC control module controls air door actuators to the calculated position to achieve the desired settings. Air flow is then distributed through various ducts leading to the outlets in the dash.

When defrost is selected, the blower motor will be activated, regardless of the coolant temperature. The HVAC control module will move the recirculation actuator to outside air, to aid in reducing window fogging. The HVAC control module enables a high volume of air delivered to the front defrost vents.

A/C is available in all modes.

Heating and A/C Operation

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

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

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

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

- Battery voltage is between 9 - 18 V
- Engine coolant temperature is less than 124°C (255°F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 5500 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 temperature door controls the temperature of the air entering the passenger compartment. Air entering the passenger compartment passes through the heater core and/or the evaporator core. The position of the temperature door determines how much air passes through the heater or evaporator core. As the temperature control is moved to a hotter setting, the temperature door will direct more air through the heater core. As the temperature control is moved to a cooler setting, more air will be passed through the evaporator core.

Recirculation Operation

The recirculation switch is integrated into the HVAC control. The selected recirculation setting 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 is positioned to block outside air from entering and circulate the air within the vehicle. In outside air mode the recirculation door is positioned to route outside air into the vehicle.

Recirculation is only available if the defrost mode is not active. When the defrost mode is active, the recirculation actuator positions the recirculation door so that outside air is circulated to the windshield to reduce fogging.

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

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 switches must be in any other position than 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:
 - Ambient air temperature sensor
 - Ambient light/sunload sensor
 - Calculated duct air temperature
 - Evaporator temperature sensor
 - Windshield temperature and inside moisture sensor
- Controls the following:
 - Regulate the blower motor speed
 - Regulate the rear blower motor speed
 - Position the air control door actuators
 - Request A/C operation
 - Control the A/C compressor solenoid

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.

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 the passenger compartment side of the windshield and ability to reduce fuel consumption by decreasing A/C compressor power to a minimum without causing any fog. The A/C compressor and the defrost mode are activated to prevent or remove fog on the passenger compartment side of the windshield. 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.

Auxiliary Electric Heater (C32 - if equipped)

Models equipped with a diesel engine are also equipped with an auxiliary electric heater grid to provide faster cabin warm-ups in cold climates. The auxiliary heater grid is mounted in the low-center of the HVAC module, where heat is transferred from the grid to air which is directed to the floor outlet ducts.

The auxiliary heater is enabled only when the cabin temperature is set to MAX, the engine coolant temperature is less than 80°C (176°F), and the outside air temperature is below 12°C (54°F). When engine coolant temperature rises above 80°C (176°F), the temperature control is moved away

from the MAX position, or the outside air temperature is above 12°C (54°F), the auxiliary electric heater is disabled, and cabin heat is managed only by the coolant-based heater core and temperature door position. If the auxiliary electric heater is activated and then turns off, it can actuate once again if the engine coolant temperature drops below 75°C (167°F), or the outside air temperature drops below 8°C (46°F).

The actual amount of heat output from the auxiliary electric heater can vary and is dependant upon internal overheating protection, battery state of charge, and other vehicle electrical load requirements.

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**](#) .

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