

Seat Heating and Cooling - Impala

HEATED/COOLED SEAT WIRING SCHEMATICS

Courtesy of GENERAL MOTORS COMPANY

Front Seat Heating KA1+(KU1/KU3)

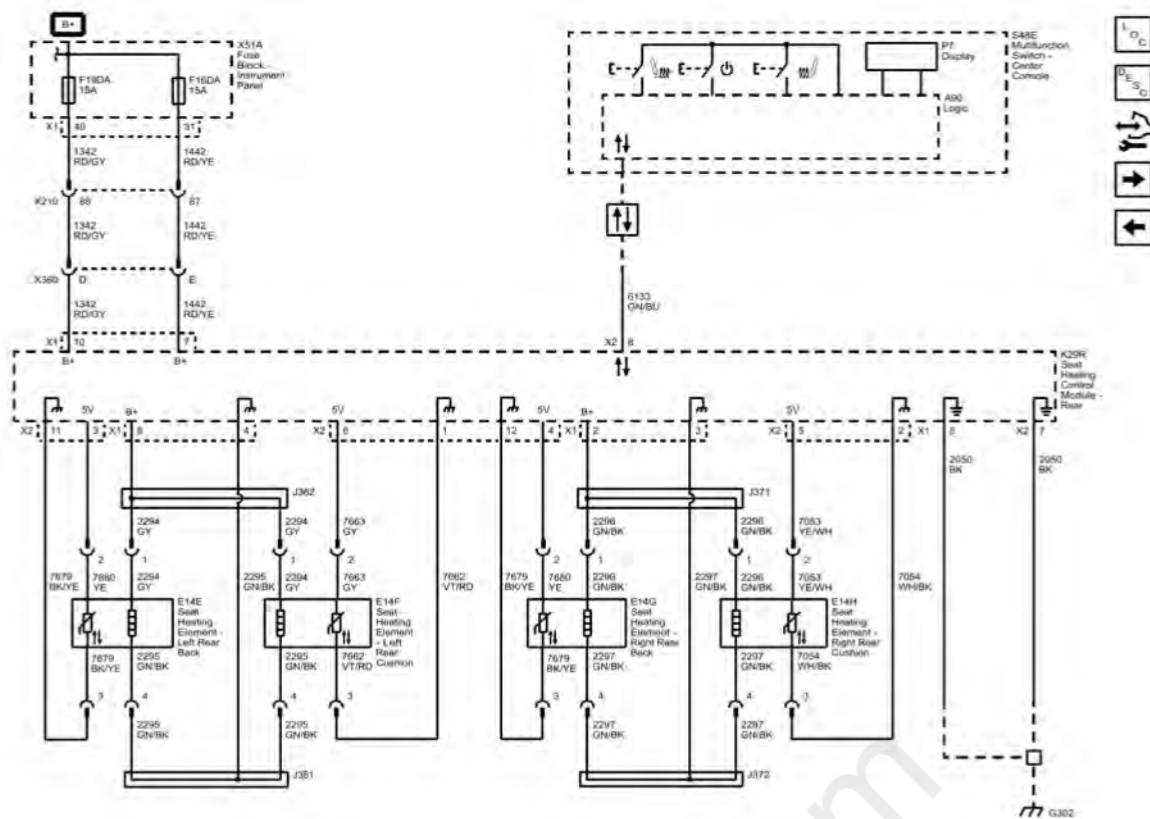


Fig. 4: Rear Seat Heating (KA6)

Courtesy of GENERAL MOTORS COMPANY

Driver Seat Ventilation (KU1)

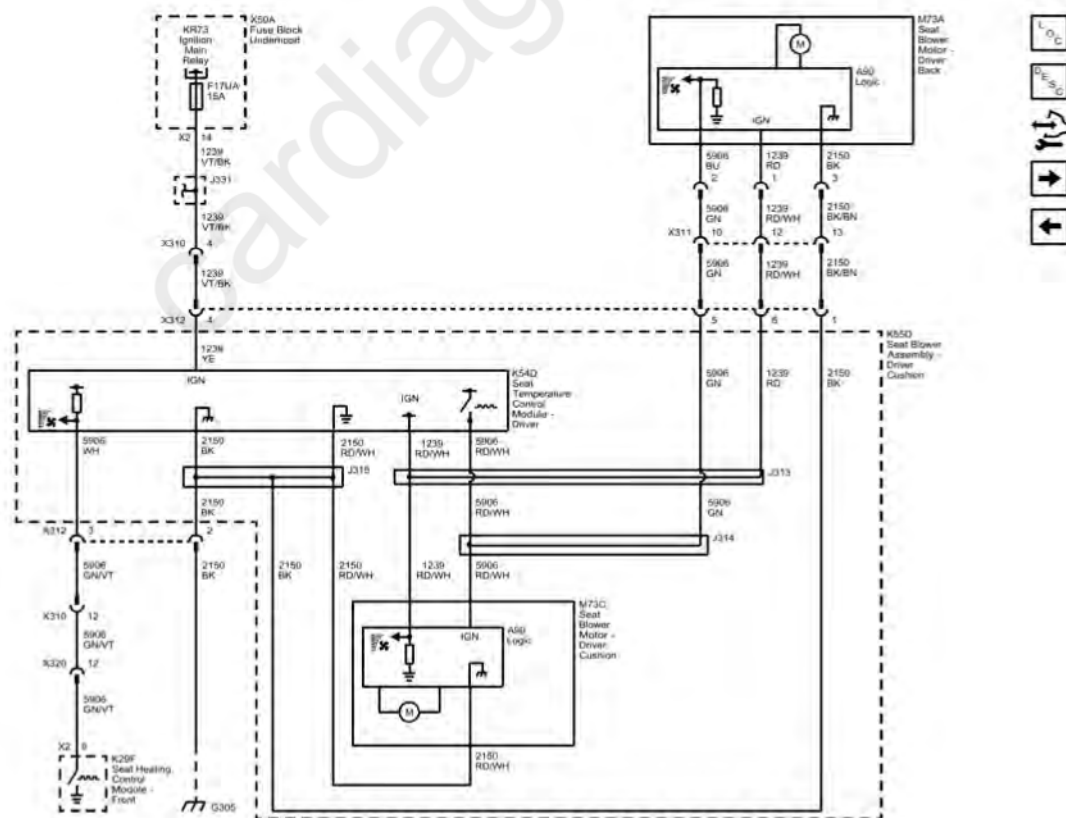
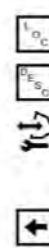


Fig. 5: Driver Seat Ventilation (KU1)

Courtesy of GENERAL MOTORS COMPANY

Passenger Seat Ventilation (KU3)



Courtesy of GENERAL MOTORS COMPANY

DTC B191A OR B191B: FRONT/RIGHT HEATED SEAT MODULE

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

DTC B191A 39

DTC B191B 39

The seat heating control module will disable all heated seat functions.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Heated/Vented Seat Description and Operation](#)
- [Rear Heated Seats Description and Operation](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

DTC B191A

1. Ignition ON.
2. Verify DTC B191A is not set.
 - **If the DTC is set**

Replace the K29F Seat Heating Control Module - Front.
 - **If the DTC is not set**
3. All OK.

DTC B191B

1. Ignition ON.
2. Verify DTC B191B is not set.
 - **If the DTC is set**

Replace the K29R Seat Heating Control Module - Rear.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

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

[Control Module References](#) for K29F Seat Heating Control Module - Front or K29R Seat Heating Control Module - Rear replacement, programming and setup

SYMPTOMS - SEAT HEATING AND COOLING

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

1. Perform the **Diagnostic System Check - Vehicle** before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control module(s) can communicate via the serial data link.
2. Refer to the system description and operation from the following list in order to familiarize yourself with the system functions:
 - **Heated/Vented Seat Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the power seats. Refer to **Checking Aftermarket Accessories**.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the seat adjuster track for conditions which may cause binding or objects within the seat adjustment range which obstruct movement or interfere with wiring.

Intermittent

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

Symptom List

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

- **Front Heated Seat Malfunction (With KU1 and KU3)****Front Heated Seat Malfunction (Without KU1 and KU3)**
- **Vented Seat Malfunction (Driver)****Vented Seat Malfunction (Passenger)**

FRONT HEATED SEAT MALFUNCTION (WITH KU1 AND KU3)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ Terminal 10 X1	1	1	-	-
B+ Terminal 7 X1	6	6	-	-
Driver Heated Seat Switch Signal	2	2	2	-
Driver Heated Seat Back Temperature Sensor Signal	2	5	5	-
Driver Heated Seat Back Temperature Sensor Low Reference	-	5	-	-
Driver Heated Seat Element Voltage Control Terminal 6 X1	1	2	1	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Driver Heated Seat Element Ground Control Terminal 4 X1	1	2	1	-
Driver Seat Back Heating Element Voltage Control	1	3	1	-
Driver Seat Back Heating Element Ground Control	1	3	1	-
Driver Heated Seat Cushion Temperature Sensor Signal	2	5	5	-
Driver Heated Seat Cushion Temperature Sensor Low Reference	-	5	-	-
Driver Heated Seat Cushion Element Voltage Control	1	4	1	-
Driver Heated Seat Cushion Element Ground Control	1	4	1	-
Passenger Heated Seat Switch Signal	6	6	6	-
Passenger Seat Back Temperature Sensor Signal	6	9	9	-
Passenger Seat Back Temperature Sensor Low Reference	-	9	-	-
Passenger Heated Seat Element Voltage Control Terminal 2 X1	1	6	1	-
Passenger Heated Seat Element Ground Control Terminal 3 X1	1	6	1	-
Passenger Seat Back Heating Element Voltage Control	1	7	1	-
Passenger Seat Back Heating Element Ground Control	1	7	1	-
Passenger Heated Seat Cushion Temperature Sensor Signal	6	9	9	-
Passenger Heated Seat Cushion Temperature Sensor Low Reference	-	9	-	-
Passenger Heated Seat Cushion Element Voltage Control	1	8	1	-
Passenger Heated Seat Cushion Element Ground Control	1	8	1	-
Front Seat Heating Control Module Ground	-	1	-	-

1. Driver and passenger heated seats are inoperative.
2. Driver heated seat is inoperative
3. Driver seat back heat function is inoperative
4. Driver seat cushion heat function is inoperative
5. Degraded driver heated seat operation
6. Passenger heated seat is inoperative
7. Passenger seat back heat function is inoperative
8. Passenger seat cushion heat function is inoperative
9. Degraded passenger heated seat operation

Circuit/System Description

The driver and passenger heated seats are controlled by separate heated seat switches located on the center console. When a heated seat switch is pressed, the heated seat switch signal circuit from the body control module (BCM) is pulled low through a series of resistors indicating the heated seat command. The BCM serves as the heated seat system master to determine the requested operating mode. The BCM then sends a LIN bus serial data message to the seat heating control module indicating the heated seat command. In response to this message, the seat heating control module attempts to drive the appropriate seat heating elements per the BCM command.

The seat heating control module controls heated seat operation for the driver and passenger seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The seat heating control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

Diagnostic Aids

- A short to ground or B+ in either the heating element voltage control circuit or ground control circuit will cause both the driver and front passenger heated seats to be inoperative.
- An open in either the voltage control circuit or ground control circuit between the module and the splice will cause the seat cushion and seat back the heated seat function to be inoperative for that seat.
- A short to ground on either the seat cushion or seat back temperature sensor signal circuit will cause the heated seat function to be inoperative for that seat.
- An open in either the voltage control circuit or ground control circuit between the splice and the heating element will cause just that one heating element to be inoperative.
- The following faults will cause a degraded heated seat operation for both the seat back and seat cushion.
 - An open or a short to voltage on either the seat cushion or seat back temperature sensor signal circuit.
 - An open in either the seat cushion or seat back temperature sensor low reference circuit.
 - A fault in either the seat cushion or seat back temperature sensor.
- A broken wire in a heating element may cause a degraded heated seat operation for that particular heating element.
- When inactive the seat heating control module connects the heating element low side outputs to a common reference point internal to the module which is biased to approximately 3.5 V. The module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the driver and passenger seat heating elements.
- With both the seat cushion and seat back heater elements disconnected, if the high side output of the module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.
- If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Heated/Vented Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: Review the Diagnostic Fault Information table and Diagnostic Aids in order to get a better understanding of the possible heated seat system faults before proceeding Circuit/System Verification and Circuit/System Testing.

1. Ignition ON.
2. Verify the scan tool Body Control Module Driver Seat Heating/Venting/Cooling Mode parameter changes state when pressing the driver heated seat switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
3. Verify the scan tool Passenger Seat Heating/Venting/Cooling Mode parameter changes state when pressing the passenger heated seat switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
4. Verify the driver and passenger heated seats operate.
 - **If the driver and passenger heated seats are inoperative**
Refer to Circuit/System Testing - Both Heated Seats are Inoperative.
 - **If the seat cushion and back heating elements are inoperative of one seat**
Refer to Circuit/System Testing - One Heated Seat is Inoperative.
 - **If just one of the heating elements is inoperative**
Refer to Circuit/System Testing - One Heating Element is Inoperative.
 - **If the driver seat exhibits a degraded heated seat operation**
Refer to Circuit/System Testing - Degraded Heated Seat Operation Driver Seat.
 - **If the passenger seat exhibits a degraded heated seat operation**
Refer to Circuit/System Testing - Degraded Heated Seat Operation Passenger Seat.

- If both heated seats operate

5. All OK.

Circuit/System Testing

Front Heated Seat Switch Circuit Test

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the S48E Multifunction Switch - Center Console.
2. Ignition ON.
3. Test for greater than 9 V between each signal circuit terminal listed below and ground:
 - Driver heated seat switch signal terminal 5
 - Passenger heated seat switch signal terminal 6
 - **If less than 9 V**
 1. Ignition OFF, disconnect the appropriate X2 or X3 harness connector at the K9 Body 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 K9 Body Control Module.
 - **If 9 V or greater**
4. Ignition OFF, disconnect the X2 and X3 harness connectors at the K9 Body Control Module, ignition ON.
5. Test for less than 1 V between each signal circuit terminal listed below and ground:
 - Driver heated seat switch signal terminal 5
 - Passenger heated seat switch signal terminal 6
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
6. Test or replace the S48E Multifunction Switch - Center Console.

Both Heated Seats are Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29F Seat Heating Control Module - Front.
 - **If the test lamp illuminates**
3. Test for infinite resistance between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **If infinite resistance**
 4. Ignition ON.
 5. Test for less than 1 V between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
 6. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 7. Test for 2 V or greater between the serial data circuit terminal 8 and ground.
 - **If less than 2 V**
 1. Ignition OFF, disconnect the X6 harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the serial data circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 2 V**
 8. Replace the K29F Seat Heating Control Module - Front.

One Heated Seat is Inoperative

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29F Seat Heating Control Module - Front.
 - **If the test lamp illuminates**
3. Ignition OFF, connect the X1 harness connector at the K29F Seat Heating Control Module - Front. Disconnect the harness connector at the E14 Seat Heating Element - Cushion and the E14 Seat

NOTE: When performing this test ensure that you are testing from the correct terminal. Testing from the incorrect terminal will cause a misdiagnosis of the circuit. Three of the four terminals in this connector will not only display a voltage reading but a different voltage reading.

4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.

- E14 Seat Heating Element - Cushion terminal 2
- E14 Seat Heating Element - Back terminal 2

• **If less than 4.8 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.

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 K29F Seat Heating Control Module - Front.

• **If greater than 5.2 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.

• **If between 4.8 - 5.2 V**

5. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4 of the E14 Seat Heating Element - Back, ignition ON.

NOTE: The test lamp should turn ON for approximately 10 s after the heated seat is commanded ON.

6. Verify the test lamp turns ON after pressing the heated seat switch.

• **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front.

2. Test for less than 2 Ω in each 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 K29F Seat Heating Control Module - Front.

• **If the test lamp turns ON**

7. Ignition OFF, connect the harness connector at the E14 Seat Heating Element - Cushion, ignition ON.

8. Verify the test lamp turns ON after pressing the heated seat switch.

• **If the test lamp is always OFF**

NOTE: Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.

Test or replace the E14 Seat Heating Element - Cushion.

• **If the test lamp turns ON**

NOTE: Because of the type of material used in the heater element, a reliable

resistance value is unavailable for a component test.

9. Test or replace the E14 Seat Heating Element - Back.

One Heating Element is Inoperative

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the harness connector at the appropriate E14 Seat Heating Element.
2. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4, ignition ON.
3. Verify the test lamp turns ON after pressing the heated seat switch.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front.
 2. Test for less than 2 Ω in each control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - **If the test lamp turns ON**

NOTE: **Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.**

4. Test or replace the E14 Seat heating Element.

Degraded Heated Seat Operation Driver Seat

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the harness connector at each component listed below. It may take up to 2 min for all vehicle systems to power down.
 - E14B Seat Heating Element - Driver Cushion
 - E14A Seat Heating Element - Driver Back
2. Test for less than 40 Ω between each low reference circuit terminal listed below and ground, one at a time.
 - E14B Seat Heating Element - Driver Cushion terminal 3
 - E14A Seat Heating Element - Driver Back terminal 3
 - **If 40 Ω or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 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 K29F Seat Heating Control Module - Front.
 - **If less than 40 Ω**
3. Ignition ON.
4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.
 - E14B Seat Heating Element - Driver Cushion terminal 2
 - E14A Seat Heating Element - Driver Back terminal 2
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 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 K29F Seat Heating Control Module - Front.

• **If greater than 5.2 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.

• **If between 4.8 - 5.2 V**

5. Ignition OFF, connect the harness connector at the E14B Seat Heating Element - Driver Cushion and the E14A Seat Heating Element - Driver Back. Disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.

6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.

- E14B Seat Heating Element - Driver Cushion terminal 6 and terminal 1
- E14A Seat Heating Element - Driver Back terminal 3 and terminal 11
- **If not between 500 Ω - 300 k Ω**

Replace the E14 Seat Heating Element.

• **If between 500 Ω - 300 k Ω**

7. Replace the K29F Seat Heating Control Module - Front.

Degraded Heated Seat Operation Passenger Seat

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

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

- E14D Seat Heating Element - Passenger Cushion
- E14C Seat Heating Element - Passenger Back

2. Test for less than 40 Ω between each low reference circuit terminal listed below and ground, one at a time.

- E14D Seat Heating Element - Passenger Cushion terminal 3
- E14C Seat Heating Element - Passenger Back terminal 3
- **If 40 Ω or greater**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.

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 K29F Seat Heating Control Module - Front.

• **If less than 40 Ω**

3. Ignition ON.

4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.

- E14D Seat Heating Element - Passenger Cushion terminal 2
- E14C Seat Heating Element - Passenger Back terminal 2
- **If less than 4.8 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.

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 K29F Seat Heating Control Module - Front.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.
 - **If between 4.8 - 5.2 V**
 5. Ignition OFF, connect the harness connector at the E14D Seat Heating Element - Passenger Cushion and the E14C Seat Heating Element - Passenger Back. Disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.
 - E14D Seat Heating Element - Passenger Cushion terminal 5 and terminal 2
 - E14C Seat Heating Element - Passenger Back terminal 4 and terminal 12
 - **If not between 500 Ω - 300 k Ω**
Replace the E14 Seat Heating Element.
 - **If between 500 Ω - 300 k Ω**
 7. Replace the K29F Seat Heating Control Module - Front.

Repair Instructions

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

- [Front Seat Heater Switch Replacement](#)
- [Driver or Passenger Seat Back Heater Replacement](#)
- [Front Seat Cushion Heater Replacement](#)
- [Control Module References](#) for K29F Seat Heating Control Module - Front replacement, programming and setup

FRONT HEATED SEAT MALFUNCTION (WITHOUT KU1 AND KU3)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ Terminal 10 X1	1	1	-	-
B+ Terminal 7 X1	6	6	-	-
Driver Heated Seat Switch Signal	2	2	2	-
Driver Heated Seat Back Temperature Sensor Signal	3	5	5	-
Driver Heated Seat Back Temperature Sensor Low Reference	-	5	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Driver Heated Seat Element Ground Control Terminal 4 X1	1	2	1	-
Driver Heated Seat Back Element Voltage Control	1	3	1	-
Driver Heated Seat Back Element Ground Control	1	3	1	-
Driver Heated Seat Cushion Temperature Sensor Signal	4	5	5	-
Driver Heated Seat Cushion Temperature Sensor Low Reference	-	5	-	-
Driver Heated Seat Cushion Element Voltage Control	1	4	1	-
Driver Heated Seat Cushion Element Ground Control	1	4	1	-
Passenger Heated Seat Switch Signal	6	6	6	-
Passenger Heated Seat Back Temperature Sensor Signal	7	9	9	-
Passenger Heated Seat Back Temperature Sensor Low Reference	-	9	-	-
Passenger Heated Seat Element Ground Control Terminal 3 X1	1	6	1	-
Passenger Heated Seat Back Element Voltage Control	1	7	1	-
Passenger Heated Seat Back Element Ground Control	1	7	1	-
Passenger Heated Seat Cushion Temperature Sensor Signal	8	9	9	-
Passenger Heated Seat Cushion Temperature Sensor Low Reference	-	9	-	-
Passenger Heated Seat Cushion Element voltage Control	1	8	1	-
Passenger Heated Seat Cushion Element Ground Control	1	8	1	-
Front Seat Heating Control Module Ground	-	1	-	-
1. Driver and passenger heated seats are inoperative. 2. Driver heated seat is inoperative 3. Driver seat back heat function is inoperative 4. Driver seat cushion heat function is inoperative 5. Degraded driver heated seat operation 6. Passenger heated seat is inoperative 7. Passenger seat back heat function is inoperative 8. Passenger seat cushion heat function is inoperative 9. Degraded passenger heated seat operation				

Circuit/System Description

The driver and passenger heated seats are controlled by separate heated seat switches located on the center console. When a heated seat switch is pressed, the heated seat switch signal circuit from the body control module (BCM) is pulled low through a series of resistors indicating the heated seat command. The BCM serves as the heated seat system master to determine the requested operating mode. The BCM then sends a LIN bus serial data message to the seat heating control module indicating the heated seat command. In response to this message, the seat heating control module attempts to drive the appropriate seat heating elements per the BCM command.

The seat heating control module controls heated seat operation for the driver and passenger seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The seat heating control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

Diagnostic Aids

- A short to ground or B+ in either the heating element voltage control circuit or ground control circuit will cause both the driver and passenger heated seats to be inoperative.
- An open in the ground control circuit between the module and the splice will cause the seat cushion and seat back the heated seat function to be inoperative for that seat.
- An open in the ground control circuit between the splice and the heating element will cause just that one heating element to be inoperative.
- The following faults will cause a degraded heated seat operation for a particular heating element.
 - An open or a short to ground on the temperature sensor signal circuit.
 - An open in either the seat cushion or seat back temperature sensor signal or low reference circuit.
 - A fault in the temperature sensor.
- A short to B+ on a temperature sensor signal circuit may cause a degraded heated seat operation for both the seat back and seat cushion or just one heating element.
- A broken wire in a heating element may cause a degraded heated seat operation for that particular heating element.
- When inactive the seat heating control module connects the heating element low side outputs to a common reference point internal to the module which is biased to approximately 3.5 V. The module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the driver and passenger seat heating elements.
- With both the seat cushion and seat back heater elements disconnected, if the high side output of the module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.
- If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Heated/Vented Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: Review the Diagnostic Fault Information table and Diagnostic Aids in order to get a better understanding of the possible heated seat system faults before proceeding Circuit/System Verification and Circuit/System Testing.

1. Ignition ON.
2. Verify the scan tool Body Control Module Driver Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back and Cushion Heating when pressing the Driver Heated Seat Back and Cushion Switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
3. Verify the scan tool Driver Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back Heating when pressing the Driver Heated Seat Back Only Switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
4. Verify the scan tool Passenger Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back and Cushion Heating when pressing the Passenger Heated Seat Back and Cushion Switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
5. Verify the scan tool Passenger Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back Heating when pressing the Passenger Heated Seat Back Only Switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Heated Seat Switch Circuit Test.
 - **If the parameter changes**
6. Verify the driver and passenger heated seats operate.
 - **If the driver and passenger heated seats are inoperative**
Refer to Circuit/System Testing - Both Heated Seats are Inoperative
 - **If the seat cushion and back heating elements are inoperative of one seat**

Refer to Circuit/System Testing - One Heated Seat Inoperative

- **If just one of the heating elements is inoperative**

Refer to Circuit/System Testing - One Heating Element is Inoperative.

- **If the driver seat exhibits a degraded heated seat operation**

Refer to Circuit/System Testing - Degraded Heated Seat Operation Driver Seat

- **If the passenger seat exhibits a degraded heated seat operation**

Refer to Circuit/System Testing - Degraded Heated Seat Operation Passenger Seat

- **If both heated seats operate**

7. All OK.

Circuit/System Testing

Front Heated Seat Switch Circuit Test

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the S48E Multifunction Switch - Center Console.
2. Ignition ON.
3. Test for greater than 9 V between each signal circuit terminal listed below and ground:
 - Driver heated seat switch signal terminal 5
 - Passenger heated seat switch signal terminal 6
 - **If less than 9 V**
 1. Ignition OFF, disconnect the appropriate X2 or X3 harness connector at the K9 Body 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 K9 Body Control Module.
 - **If 9 V or greater**
4. Ignition OFF, disconnect the X2 and X3 harness connectors at the K9 Body Control Module, ignition ON.
5. Test for less than 1 V between each signal circuit terminal listed below and ground:
 - Driver heated seat switch signal terminal 5
 - Passenger heated seat switch signal terminal 6
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
6. Test or replace the S48E Multifunction Switch - Center Console.

Both Heated Seats are Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29F Seat Heating Control Module - Front.
 - **If the test lamp illuminates**
3. Test for infinite resistance between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
4. Ignition ON.
5. Test for less than 1 V between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
6. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, ignition ON.
7. Test for 2 V or greater between the serial data circuit terminal 8 and ground.
 - **If less than 2 V**
 1. Ignition OFF, disconnect the X6 harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the serial data circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 2 V**
8. Replace the K29F Seat Heating Control Module - Front.

One Heated Seat is Inoperative

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing**

1. Ignition OFF, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29F Seat Heating Control Module - Front.

• **If the test lamp illuminates**

NOTE: When disconnecting the heating element, choose the easiest one for you to get to.

3. Ignition OFF, connect the X1 harness connector at the K29F Seat Heating Control Module - Front. Disconnect the harness connector at either the E14 Seat Heating Element - Cushion or the E14 Seat Heating Element - Back.

4. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4, ignition ON.

NOTE: After commanding the heated seat ON, the test lamp should turn ON for approximately 10 s then turn OFF.

5. Verify the test lamp turns ON after pressing the heated seat switch.

• **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front.

2. Test for less than 2 Ω in each 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 K29F Seat Heating Control Module - Front.

• **If the test lamp turns ON**

6. All OK.

One Heating Element is Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the appropriate E14 Seat Heating Element, ignition ON.

NOTE: When performing this test ensure that you are testing from the correct terminal. Testing from the incorrect terminal will cause a misdiagnosis of the circuit. Three of the four terminals in this connector will not only display a voltage reading but a different voltage reading.

2. 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 X2 harness connector at the K29F Seat Heating Control Module - Front.

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 K29F Seat Heating Control Module - Front.

- **If greater than 5.2 V**
- 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.
- **If between 4.8 - 5.2 V**
- 3. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4, ignition ON.

NOTE: After commanding the heated seat ON, the test lamp should turn On for approximately 10 s then turn OFF.

- 4. Verify the test lamp turns ON after pressing the heated seat switch.
 - **If the test lamp is always OFF**
 - 1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29F Seat Heating Control Module - Front.
 - 2. Test for less than 2 Ω in each control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - **If the test lamp turns ON**

NOTE: Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.

- 5. Test or replace the E14 Seat Heating Element.

Degraded Heated Seat Operation Driver Seat

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing

- 1. Ignition OFF, disconnect the harness connector at each component listed below. It may take up to 2 min for all vehicle systems to power down.
 - E14B Seat Heating Element - Driver Cushion
 - E14A Seat Heating Element - Driver Back
- 2. Test for less than 40 Ω between each low reference circuit terminal listed below and ground, one at a time.
 - E14B Seat Heating Element - Driver Cushion terminal 3
 - E14A Seat Heating Element - Driver Back terminal 3
 - **If 40 Ω or greater**
 - 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 - 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 K29F Seat Heating Control Module - Front.
 - **If less than 40 Ω**
- 3. Ignition ON.
- 4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.
 - E14B Seat Heating Element - Driver Cushion terminal 2
 - E14A Seat Heating Element - Driver Back terminal 2
 - **If less than 4.8 V**
 - 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 - 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 K29F Seat Heating Control Module - Front.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.
 - **If between 4.8 - 5.2 V**
 5. Ignition OFF, connect the harness connector at the E14B Seat Heating Element - Driver Cushion and the E14A Seat Heating Element - Driver Back. Disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.
 - E14B Seat Heating Element - Driver Cushion terminal 6 and terminal 1
 - E14A Seat Heating Element - Driver Back terminal 3 and terminal 11
 - **If not between 500 Ω - 300 k Ω**

Replace the E14 Seat Heating Element.
 - **If between 500 Ω - 300 k Ω**
 7. Replace the K29F Seat Heating Control Module - Front.

Degraded Heated Seat Operation Passenger Seat

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing**

1. Ignition OFF, disconnect the harness connector at the appropriate component listed below. It may take up to 2 min for all vehicle systems to power down.
 - E14D Seat Heating Element - Passenger Cushion
 - E14C Seat Heating Element - Passenger Back
2. Test for less than 40 Ω between the low reference circuit terminal 3 and ground.
 - **If 40 Ω or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
 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 K29F Seat Heating Control Module - Front.
 - **If less than 40 Ω**
3. Ignition ON.

NOTE: **When performing this test ensure that you are testing from the correct terminal. Testing from the incorrect terminal will cause a misdiagnosis of the circuit. Three of the four terminals in this connector will not only display a voltage reading but a different voltage reading.**

4. 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 X2 harness connector at the K29F Seat Heating Control Module - Front.
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 K29F Seat Heating Control Module - Front.
- **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 K29F Seat Heating Control Module - Front.
- **If between 4.8 - 5.2 V**
5. Ignition OFF, connect the harness connector at the E14D Seat Heating Element - Passenger Cushion and the E14C Seat Heating Element - Passenger Back. Disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front.
6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.
 - E14D Seat Heating Element - Passenger Cushion terminal 5 and terminal 2
 - E14C Seat Heating Element - Passenger Back terminal 4 and terminal 12
 - **If not between 500 Ω - 300 k Ω**

Replace the E14 Seat Heating Element.
 - **If between 500 Ω - 300 k Ω**
7. Replace the K29F Seat Heating Control Module - Front.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Front Seat Heater Switch Replacement**
- **Driver or Passenger Seat Back Heater Replacement**
- **Front Seat Cushion Heater Replacement**
- **Control Module References** for K29F Seat Heating Control Module - Front replacement, programming and setup

REAR HEATED SEAT MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ Terminal 10 X1	1	1	-	-
B+ Terminal 7 X1	6	6	-	-
Left Rear Heated Seat Back Temperature Sensor Signal	2	5	5	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Rear Heated Seat Back Temperature Sensor Low Reference	-	5	-	-
Left Rear Heated Seat Element Voltage Control Terminal 6 X1	1	2	1	-
Left Rear Heated Seat Element Ground Control Terminal 4 X1	1	2	1	-
Left Rear Heated Seat Back Element Voltage Control	1	3	1	-
Left Rear Heated Seat Back Element Ground Control	1	3	1	-
Left Rear Heated Seat Cushion Temperature Sensor Signal	2	5	5	-
Left Rear Heated Seat Cushion Temperature Sensor Low Reference	-	5	-	-
Left Rear Heated Seat Cushion Element Voltage Control	1	4	1	-
Left Rear Heated Seat Cushion Element Ground Control	1	4	1	-
Right Rear Heated Seat Back Temperature Sensor Signal	6	9	9	-
Right Rear Heated Seat Back Temperature Sensor Low Reference	-	9	-	-
Right Rear Heated Seat Element Voltage Control Terminal 2 X1	1	6	1	-
Right Rear Heated Seat Element Ground Control Terminal 3 X1	1	6	1	-
Right Rear Heated Seat Back Element Voltage Control	1	7	1	-
Right Rear Heated Seat Back Element Ground Control	1	7	1	-
Right Rear Heated Seat Cushion Temperature Sensor Signal	6	9	9	-
Right Rear Heated Seat Cushion Temperature Sensor Low Reference	-	9	-	-
Right Rear Heated Seat Cushion Element Voltage Control	1	8	1	-
Right Rear Heated Seat Cushion Element Ground Control	1	8	1	-
Rear Seat Heating Control Module Ground	-	1	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
1. Left and right rear heated seats are inoperative. 2. Left rear heated seat is inoperative 3. Left rear seat back heat function is inoperative 4. Left rear seat cushion heat function is inoperative 5. Degraded left rear heated seat operation 6. Right rear heated seat is inoperative 7. Right rear seat back heat function is inoperative 8. Right rear seat cushion heat function is inoperative 9. Degraded right rear heated seat operation				

Circuit/System Description

The left and right rear heated seat switches are located in the rear audio control module. When a heated seat switch is pressed, a serial data message is sent to the body control module (BCM) indicating the heated seat command. The BCM serves as the heated seat system master to determine the requested operating mode. The BCM then sends a LIN bus serial data message to the rear seat heating control module indicating the heated seat command. In response to this message, the rear seat heating control module attempts to drive the appropriate seat heating elements per the BCM command.

The rear seat heating control module controls heated seat operation for the left and right rear seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The rear seat heating control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

Diagnostic Aids

- A short to ground or B+ in either the heating element voltage control circuit or ground control circuit will cause both rear heated seats to be inoperative.
- An open in either the voltage control circuit or ground control circuit between the module and the splice will cause the seat cushion and seat back the heated seat function to be inoperative for that seat.
- A short to ground on either the seat cushion or seat back temperature sensor signal circuit will cause the heated seat function to be inoperative for that seat.
- An open in either the voltage control circuit or ground control circuit between the splice and the heating element will cause just that one heating element to be inoperative.
- The following faults will cause a degraded heated seat operation for both the seat back and seat cushion.
 - An open or a short to voltage on either the seat cushion or seat back temperature sensor signal circuit.
 - An open in either the seat cushion or seat back temperature sensor low reference circuit.
 - A fault in either the seat cushion or seat back temperature sensor.
- A broken wire in a heating element may cause a degraded heated seat operation for that particular heating element.
- When inactive the seat heating control module connects the heating element low side outputs to a common reference point internal to the module which is biased to approximately 3.5 V. The module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the driver and passenger seat heating elements.

- With both the seat cushion and seat back heater elements disconnected, if the high side output of the control module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.
- If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Rear Heated Seats Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.

NOTE: Review the Diagnostic Fault Information table and Diagnostic Aids in order to get a better understanding of the possible heated seat system faults before proceeding Circuit/System Verification and Circuit/System Testing.

2. Verify the scan tool Body Control Module Left Rear Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back and Cushion Heating when pressing the left rear heated seat switch.
 - **If the parameter does not change**
Replace the A13 Rear Audio Control Module.
 - **If the parameter changes**
3. Verify the scan tool Right Rear Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Back and Cushion Heating when pressing the right rear heated seat switch.
 - **If the parameter does not change**
Replace the A13 Rear Audio Control Module.
 - **If the parameter changes**
4. Verify the left and right rear heated seats operate.
 - **If the left and right rear heated seats are inoperative**
Refer to Circuit/System Testing - Both Rear Heated Seats are Inoperative.
 - **If the seat cushion and back heating elements are inoperative of one seat**

Refer to Circuit/System Testing - One Rear Heated Seat is Inoperative.

- **If just one of the heating elements is inoperative**

Refer to Circuit/System Testing - One Heating Element is Inoperative.

- **If the left rear seat exhibits a degraded heated seat operation**

Refer to Circuit/System Testing - Degraded Heated Seat Operation Left Rear Seat.

- **If the right rear seat exhibits a degraded heated seat operation**

Refer to Circuit/System Testing - Degraded Heated Seat Operation Right Rear Seat.

- **If both rear heated seats operate**

5. All OK.

Circuit/System Testing

Both Rear Heated Seats are Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the X1 harness connector at the K29R Seat Heating Control Module - Rear, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29R Seat Heating Control Module - Rear.
 - **If the test lamp illuminates**
3. Ignition OFF.
4. Test for infinite resistance between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
5. Ignition ON.
6. Test for less than 1 V between each control circuit terminal listed below and ground, one at a time.
 - Terminal 2
 - Terminal 6
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**

7. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.

8. Test for 2 V or greater between the serial data circuit terminal 8 and ground.

- **If less than 2 V**

Refer to [DTC U1500-U15FF](#).

- **If greater than 2 V**

9. Replace the K29R Seat Heating Control Module - Rear.

One Heated Seat is Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the K29R Seat Heating Control Module - Rear, ignition ON.

2. Verify a test lamp illuminates between the B+ circuit terminal 7 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 OK 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 K29R Seat Heating Control Module - Rear.

- **If the test lamp illuminates**

3. Ignition OFF, connect the X1 harness connector at the K29R Seat Heating Control Module - Rear. Disconnect the harness connector at the E14 Seat Heating Element - Rear Cushion and the E14 Seat Heating Element - Rear Back, ignition ON.

NOTE: When performing this test ensure that you are testing from the correct terminal. Testing from the incorrect terminal will cause a misdiagnosis of the circuit. Three of the four terminals in this connector will not only display a voltage reading but a different voltage reading.

4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.

- E14 Seat Heating Element - Rear Cushion terminal 2
- E14 Seat Heating Element - Rear Back terminal 2

- **If less than 4.8 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.

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 K29R Seat Heating Control Module - Rear.

- **If greater than 5.2 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear, 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 K29R Seat Heating Control Module - Rear.

- **If between 4.8 - 5.2 V**

5. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4 of the E14 Seat Heating Element - Rear Back, ignition ON.

NOTE: The test lamp should turn ON for approximately 10 s after the heated seat is commanded ON.

6. Verify the test lamp turns ON after pressing the rear heated seat switch.

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

1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29R Seat Heating Control Module - Rear.

2. Test for less than 2 Ω in each 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 K29R Seat Heating Control Module - Rear.

- **If the test lamp turns ON**

7. Ignition OFF, connect the harness connector at the E14 Seat Heating Element - Rear Cushion, ignition ON.

8. Verify the test lamp turns ON after pressing the rear heated seat switch.

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

NOTE: Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.

Test or replace the E14 Seat Heating Element - Rear Cushion.

- **If the test lamp turns ON**

NOTE: Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.

9. Test or replace the E14 Seat Heating Element - Rear Back.

One Heating Element is Inoperative

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the appropriate E14 Seat Heating Element.

2. Connect a test lamp between control circuit terminal 1 and control circuit terminal 4, ignition ON.

3. Verify the test lamp turns ON after pressing the heated seat switch.

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

1. Ignition OFF, remove the test lamp, disconnect the X1 harness connector at the K29R Seat Heating Control Module - Rear.

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

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

- **If the test lamp turns ON**

NOTE: Because of the type of material used in the heater element, a reliable resistance value is unavailable for a component test.

4. Test or replace the E14 Seat heating Element.

Degraded Heated Seat Operation Left Rear Seat

NOTE:**Circuit/System Verification must be performed before proceeding with Circuit/System Testing**

1. Ignition OFF, disconnect the harness connector at each component listed below. It may take up to 2 min for all vehicle systems to power down.
 - E14F Seat Heating Element - Left Rear Cushion
 - E14E Seat Heating Element - Left Rear Back
2. Test for less than 40 Ω between each low reference circuit terminal listed below and ground, one at a time.
 - E14F Seat Heating Element - Left Rear Cushion terminal 3
 - E14E Seat Heating Element - Left Rear Back terminal 3
 - **If 40 Ω or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
 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 K29R Seat Heating Control Module - Rear.
 - **If less than 40 Ω**
3. Ignition ON.
4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.
 - E14F Seat Heating Element - Left Rear Cushion terminal 2
 - E14E Seat Heating Element - Left Rear Back terminal 2
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
 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 K29R Seat Heating Control Module - Rear.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear, 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 K29R Seat Heating Control Module - Rear.
 - **If between 4.8 - 5.2 V**
5. Ignition OFF, connect the harness connector at the E14F Seat Heating Element - Left Rear Cushion and the E14E Seat Heating Element - Left Rear Back. Disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.
 - E14F Seat Heating Element - Left Rear Cushion terminal 6 and terminal 1
 - E14E Seat Heating Element - Left Rear Back terminal 3 and terminal 11
 - **If not between 500 Ω - 300 k Ω**

Replace the E14 Seat Heating Element.
 - **If between 500 Ω - 300 k Ω**
7. Replace the K29R Seat Heating Control Module - Rear.

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing**

1. Ignition OFF, disconnect the harness connector at each component listed below. It may take up to 2 min for all vehicle systems to power down.
 - E14H Seat Heating Element - Right Rear Cushion
 - E14G Seat Heating Element - Right Rear Back
2. Test for less than 40 Ω between each low reference circuit terminal listed below and ground, one at a time.
 - E14H Seat Heating Element - Right Rear Cushion terminal 3
 - E14G Seat Heating Element - Right Rear Back terminal 3
 - **If 40 Ω or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
 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 K29R Seat Heating Control Module - Rear.
 - **If less than 40 Ω**
3. Ignition ON.
4. Test for 4.8 - 5.2 V between each signal circuit terminal listed below and ground, one at a time.
 - E14H Seat Heating Element - Right Rear Cushion terminal 2
 - E14G Seat Heating Element - Right Rear Back terminal 2
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
 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 K29R Seat Heating Control Module - Rear.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear, 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 K29R Seat Heating Control Module - Rear.
 - **If between 4.8 - 5.2 V**
5. Ignition OFF, connect the harness connector at the E14H Seat Heating Element - Right Rear Cushion and the E14G Seat Heating Element - Right Rear Back. Disconnect the X2 harness connector at the K29R Seat Heating Control Module - Rear.
6. Test for 500 Ω - 300 k Ω between the signal circuit and the low reference circuit terminals listed below, one at a time.
 - E14H Seat Heating Element - Right Rear Cushion terminal 5 and terminal 2
 - E14G Seat Heating Element - Right Rear Back terminal 4 and terminal 12
 - **If not between 500 Ω - 300 k Ω**

Replace the E14 Seat Heating Element.

 - **If between 500 Ω - 300 k Ω**

7. Replace the K29R Seat Heating Control Module - Rear.

Repair Instructions

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

- [Rear Seat Audio Control Replacement](#)
- [Rear Seat Back Cushion Heater Replacement \(40%\)Rear Seat Back Cushion Heater Replacement \(60%\)](#)
- [Rear Seat Cushion Heater Replacement](#)
- [Control Module References](#) for K29R Seat Heating Control Module - Rear replacement, programming and setup

VENTED SEAT MALFUNCTION (DRIVER)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Driver Heated/Vented Seat Switch Signal	1	1	-	-
Driver Seat Cushion Blower Assembly Ignition	2	2	2	-
Driver Seat Vent Motor Control	2	2	2	-
Driver Seat Cushion Blower Assembly Ground	-	2	-	-
Driver Seat Back Vent Motor Ignition	4	3	4	-
Driver Seat Back Vent Motor Control	3	5	5	-
Driver Seat Back Vent Motor Ground	-	3	-	-
1. The heated and vented seat functions are inoperative. 2. The seat cushion and seat back blower motors are inoperative. 3. The seat back blower motor is inoperative. 4. The seat back and cushion blower motors are always ON. 5. The seat back blower motor is always ON.				

Circuit/System Description

The driver and front passenger vented seats are controlled by separate vented seat switches that are located on the center console. When a vented seat switch is pressed, the signal circuit from the body control module (BCM) is pulled low through a series of resistors in the switch indicating the vented seat command. The BCM serves as the heated and vented seat system master to determine the requested operating mode. The BCM sends a serial data message to the seat heating control module indicating the vented seat command. In response to this message, the seat heating control module applies a low side pulse width modulation (PWM) signal through the seat vent motor control circuit to the seat temperature control module indicating the vented seat command. The temperature control module sends a high side pulse width modulation (PWM) signal through the seat blower motor control circuits to the seat back and cushion blower motors indicating the vented seat command. The logic in the blower motors set the blower speed to the switch set point.

Reference Information

Heated/Cooled Seat Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Heated/Vented Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the heated seat system operates.
 - **If the heated seat system does not operate**

Refer to Front Heated Seat Malfunction (With KU1 and KU3)Front Heated Seat Malfunction (Without KU1 and KU3)
 - **If the heated seat system operates**
3. Verify the scan tool Body Control Module Driver Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Venting/Cooling - High when pressing the driver vented seat switch.
 - **If the parameter does not change**

Test or replace the S48E Multifunction Switch - Center Console.
 - **If the parameter changes**
4. Verify the seat cushion and seat back blower motors turn ON and OFF.
 - **If either one or both the seat cushion and seat back blower motors are inoperative**

Refer to Circuit/System Testing.
 - **If the blower motors do not change speed or are always ON**

Refer to Circuit/System Testing.
 - **If the seat cushion and seat back blower motors operate**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K55D Seat Blower Assembly - Driver Cushion. 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.

- **If less than 10 Ω**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition circuit terminal 4 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF.

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 OK and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If the test lamp illuminates**

5. Connect a DMM between the control circuit terminal 3 and B+.

NOTE: With the vented seat system OFF, the DMM reading may display approximately 8 V before pressing the switch.

6. Verify the DMM reading changes to 12 V when pressing the driver vented seat switch.

- **If less than 12 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 infinite resistance between the control circuit and ground.

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

5. 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 K29F Seat Heating Control Module - Front.

- **If 12 V or greater**

7. Ignition OFF and all vehicle systems OFF, connect the harness connector at the K55D Seat Blower Assembly - Driver Cushion. Disconnect the harness connector at the or M73A Seat Blower Motor - Driver Back. It may take up to 2 min for all vehicle systems to power down.

8. 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 connector at the K55D Seat Blower Assembly - Driver Cushion.

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 , test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If less than 10 Ω**

9. Connect a test lamp between the ignition circuit terminal 1 and ground, ignition ON.

10. Verify the test lamp turns ON when pressing the vented seat switch through the High, Medium, and Low blower speed positions then OFF when the OFF position is reached.

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

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K55D Seat Blower Assembly - Driver Cushion.

2. Test for infinite resistance between the ignition 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 ignition 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 K55D Seat Blower Assembly - Driver Cushion.

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

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K55D Seat Blower Assembly - Driver Cushion, ignition ON.

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

- if 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If the test lamp turns ON and OFF**

11. Connect a DMM between the control circuit terminal 2 and ground, ignition ON.

12. Test for 2 - 5 V when pressing the vented seat switch through the High, Medium, and Low positions.

- **If less than 2 V**

1. Ignition OFF, disconnect the harness connector at the K55D Seat Blower Assembly - Driver Cushion.

2. Test for infinite resistance between the control circuit and ground.

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If greater than 5 V**

1. Ignition OFF, disconnect the harness connector at the K55D Seat Blower Assembly - Driver Cushion, 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, test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If between 2 - 5 V**

13. Ignition ON.

14. Verify the seat cushion blower motor operates when pressing the driver vented seat switch through the High, Medium, and Low positions.

- **If the seat cushion is inoperative**

Test or replace the K55D Seat Blower Assembly - Driver Cushion.

- **If the seat cushion operates**

15. Test or replace the M73A Seat Blower Motor - Driver Back.

Repair Instructions

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

- [Front Seat Vent Fan Switch Replacement](#)
- [Front Seat Cushion Vent Fan Replacement](#)

- [Front Seat Back Cushion Vent Fan Replacement](#)
- [Control Module References](#) for K29F Seat Heating Control Module - Front replacement, programming and setup

VENTED SEAT MALFUNCTION (PASSENGER)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Passenger Heated/Vented Seat Switch Signal	1	1	-	-
Passenger Seat Cushion Blower Assembly Ignition	2	2	2	-
Passenger Seat Vent Motor Control	2	2	2	-
Passenger Seat Cushion Blower Assembly Ground	-	2	-	-
Passenger Seat Back Vent Motor Ignition	4	3	4	-
Passenger Seat Back Vent Motor Control	3	5	5	-
Passenger Seat Back Vent Motor Ground	-	3	-	-
1. The heated and vented seat functions are inoperative. 2. The seat cushion and seat back blower motors are inoperative. 3. The seat back blower motor is inoperative. 4. The seat back and cushion blower motors are always ON. 5. The seat back blower motor is always ON.				

Circuit/System Description

The driver and front passenger vented seats are controlled by separate vented seat switches that are located on the center console. When a vented seat switch is pressed, the signal circuit from the body control module (BCM) is pulled low through a series of resistors in the switch indicating the vented seat command. The BCM serves as the heated and vented seat system master to determine the requested operating mode. The BCM sends a serial data message to the seat heating control module indicating the vented seat command. In response to this message, the seat heating control module applies a low side pulse width modulation (PWM) signal through the seat vent motor control circuit to the seat temperature control module indicating the vented seat command. The temperature control module sends a high side pulse width modulation (PWM) signal through the seat blower motor control circuits to the seat back and cushion blower motors indicating the vented seat command. The logic in the blower motors set the blower speed to the switch set point.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Heated/Vented Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the driver and front passenger heated seat systems operates.
 - **If the heated seat system does not operate**

Refer to [Front Heated Seat Malfunction \(With KU1 and KU3\)](#)[Front Heated Seat Malfunction \(Without KU1 and KU3\)](#)
 - **If the heated seat system operates**
3. Verify the scan tool Body Control Module Passenger Seat Heating/Venting/Cooling Mode parameter changes between Off and Seat Venting/Cooling - High when pressing the passenger vented seat switch.
 - **If the parameter does not change**

Test or replace the S48E Multifunction Switch - Center Console.
 - **If the parameter changes**
4. Verify the seat cushion and seat back blower motors turn ON and OFF.
 - **If either one or both the seat cushion and seat back blower motors are inoperative**

Refer to Circuit/System Testing.
 - **If the blower motors do not change speed or are always ON**

Refer to Circuit/System Testing.
 - **If the seat cushion and seat back blower motors operate**
5. All OK.

[Circuit/System Testing](#)

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion. 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.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 4 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF.

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 OK and there is voltage at the fuse.

• **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the K55P Seat Blower Assembly - Passenger Cushion.

• **If the test lamp illuminates**

5. Connect a DMM between the control circuit terminal 3 and B+.

NOTE: With the vented seat system OFF, the DMM reading may display approximately 8 V before pressing the switch.

6. Verify the DMM reading changes to 12 V or greater when pressing the passenger vented seat switch.

• **If less than 12 V**

1. Ignition OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module - Front, 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 infinite resistance between the control circuit and ground.

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

5. 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 K29F Seat Heating Control Module - Front.

• **If 12 V or greater**

7. Ignition OFF and all vehicle systems OFF, connect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion. Disconnect the harness connector at the M73B Seat Blower Motor - Passenger Back. It may take up to 2 min for all vehicle systems to power down.

8. 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 connector at the K55P Seat Blower Assembly - Passenger Cushion.

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 , test or replace the K55P Seat Blower Assembly - Passenger Cushion.

• **If less than 10 Ω**

9. Connect a test lamp between the ignition circuit terminal 1 and ground, ignition ON.

10. Verify the test lamp turns ON when pressing the vented seat switch through the High, Medium, and Low blower speed positions then OFF when the OFF position is reached.

• **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion.

2. Test for infinite resistance between the ignition 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 ignition 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 K55P Seat Blower Assembly - Passenger Cushion.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion, ignition ON.
 2. Test for less than 1 V between the ignition circuit and ground.
 - if 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, test or replace the K55P Seat Blower Assembly - Passenger Cushion.
 - **If the test lamp turns ON and OFF**
11. Connect a DMM between the control circuit terminal 2 and ground, ignition ON.
 12. Test for 2 - 5 V when pressing the vented seat switch through the High, Medium, and Low positions.
 - **If less than 2 V**
 1. Ignition OFF, disconnect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the K55P Seat Blower Assembly - Passenger Cushion.
 - **If greater than 5 V**
 1. Ignition OFF, disconnect the harness connector at the K55P Seat Blower Assembly - Passenger Cushion, 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, test or replace the K55P Seat Blower Assembly - Passenger Cushion.
 - **If between 2 - 5 V**
 13. Ignition ON.
 14. Verify the seat cushion blower motor operates when pressing the passenger vented seat switch through the High, Medium, and Low positions.
 - **If the seat cushion is inoperative**
 Test or replace the K55P Seat Blower Assembly - Passenger Cushion.
 - **If the seat cushion operates**
 15. Test or replace the M73B Seat Blower Motor - Passenger Back.

Repair Instructions

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

- [Front Seat Vent Fan Switch Replacement](#)
- [Front Seat Cushion Vent Fan Replacement](#)
- [Front Seat Back Cushion Vent Fan Replacement](#)
- [Control Module References](#) for K29F Seat Heating Control Module - Front replacement, programming and setup

REPAIR INSTRUCTIONS

WIRE TO WIRE REPAIR - SEATS

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.

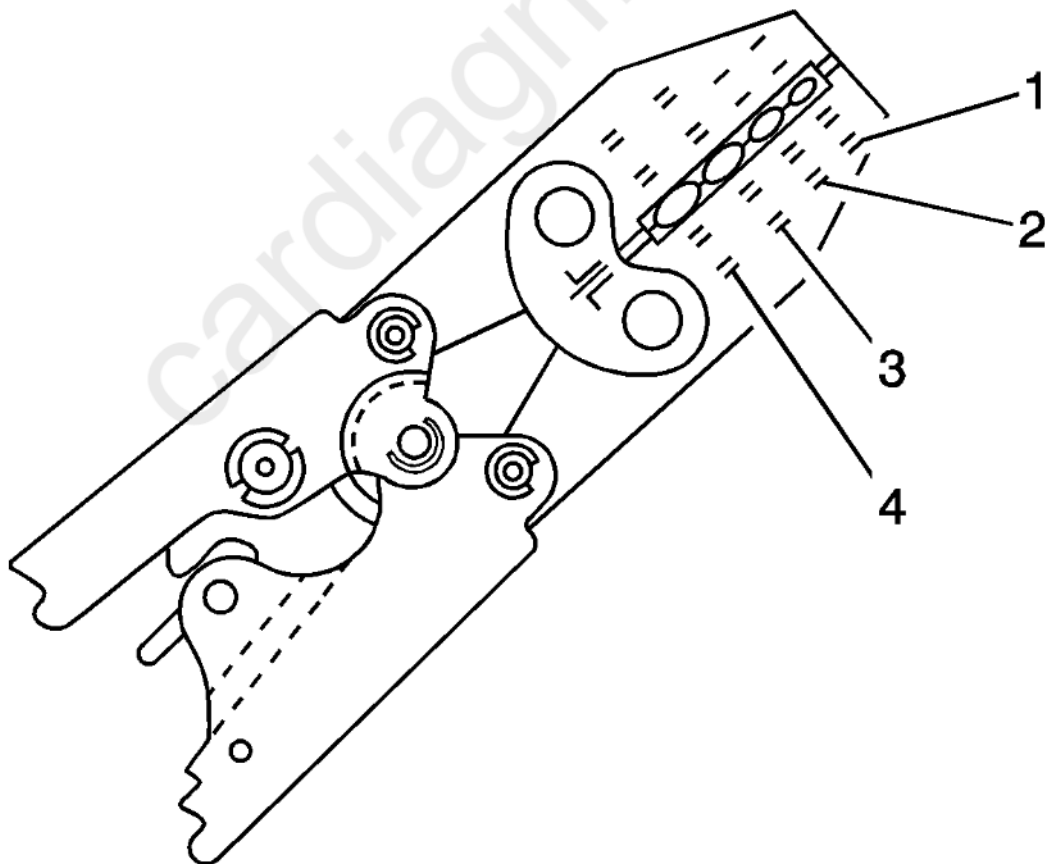


Fig. 7: Splice Sleeve Crimping Tool With 4 Crimp Nests

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.

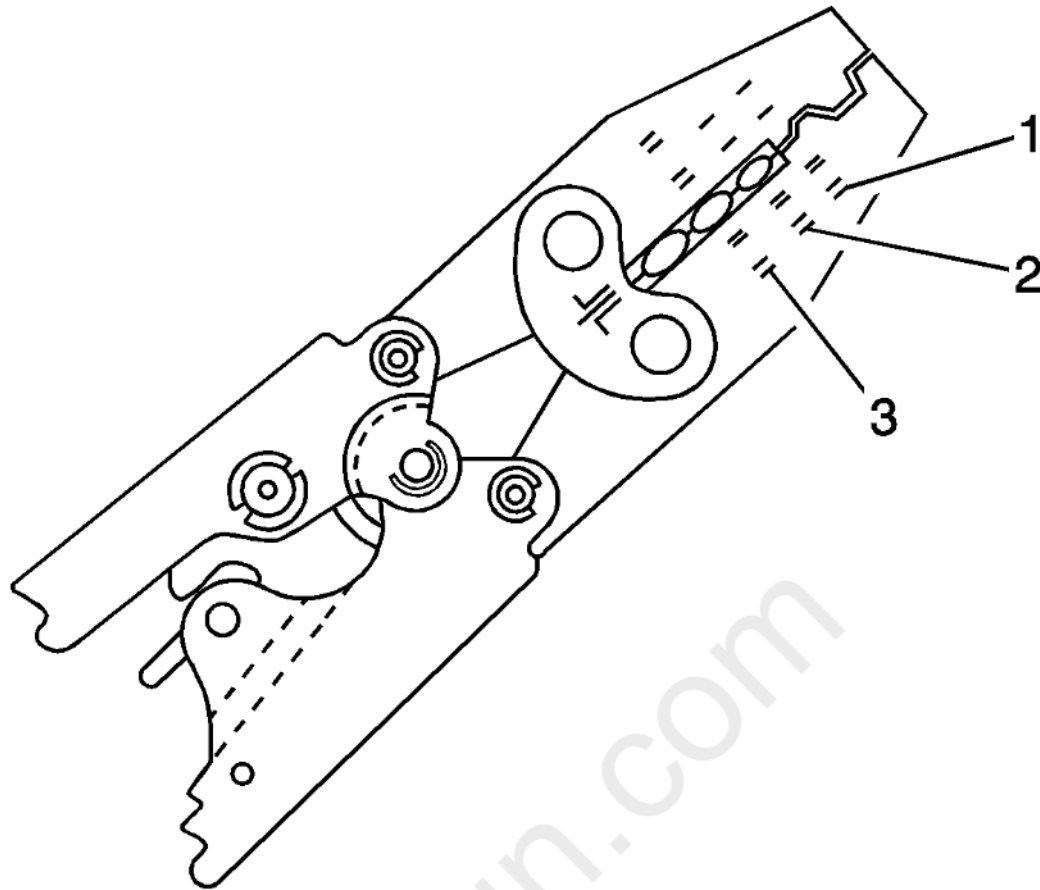


Fig. 8: Splice Sleeve Crimping Tool With 3 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

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).

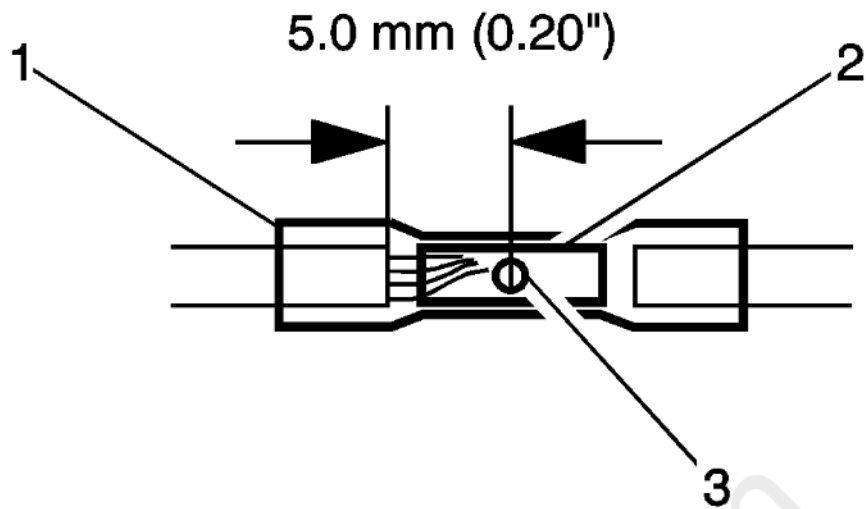


Fig. 9: Identifying Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

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. 10: 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. 11: Crimped Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

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

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.

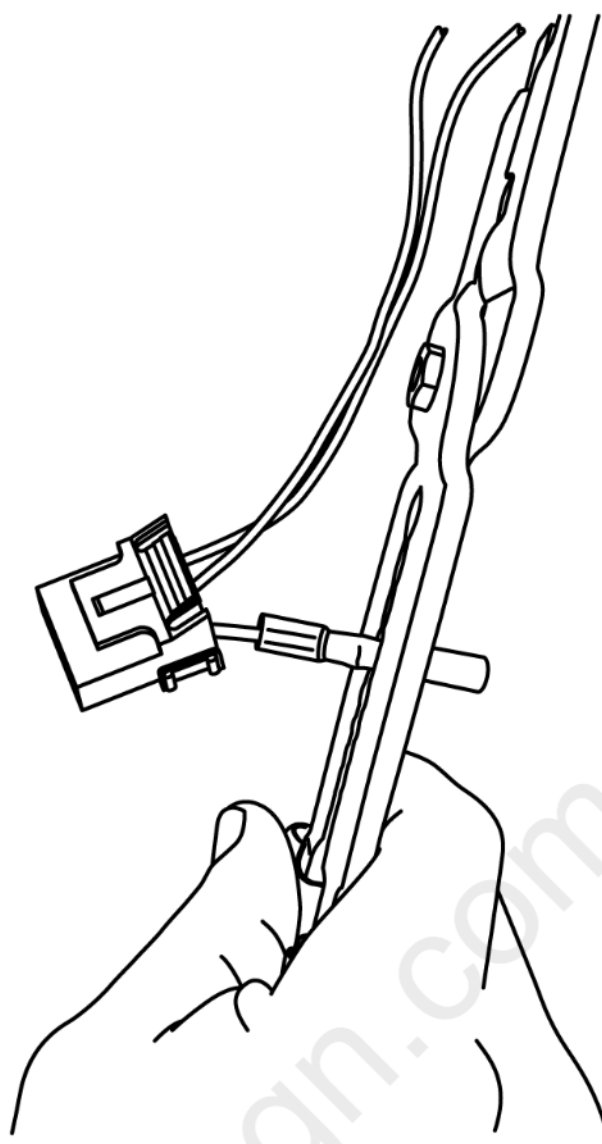


Fig. 12: Tightly Close Handles Of Crimp Tool
Courtesy of GENERAL MOTORS COMPANY

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.

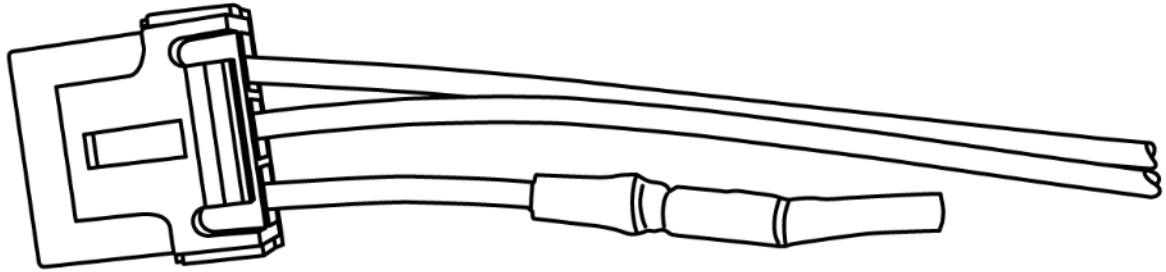


Fig. 13: Heat To Crimped Area Of Barrel

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.

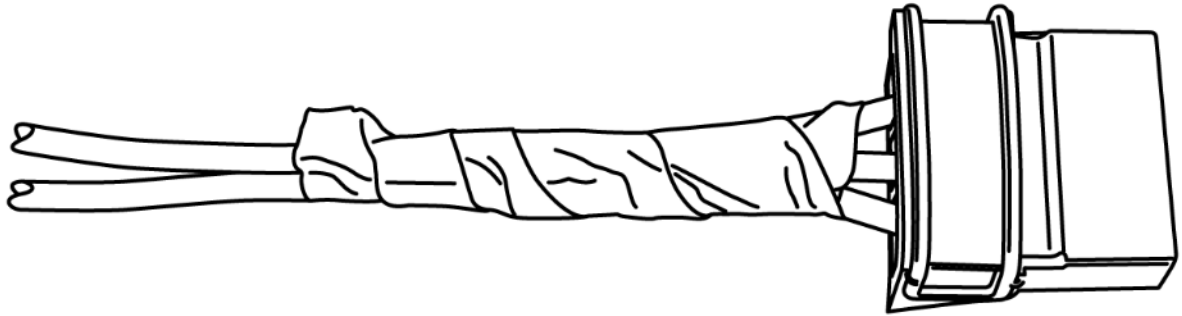


Fig. 14: Taping Extra Terminated Leads Back Into Harness
Courtesy of GENERAL MOTORS COMPANY

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 - SEATS

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 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 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.

FRONT SEAT HEATER SWITCH REPLACEMENT

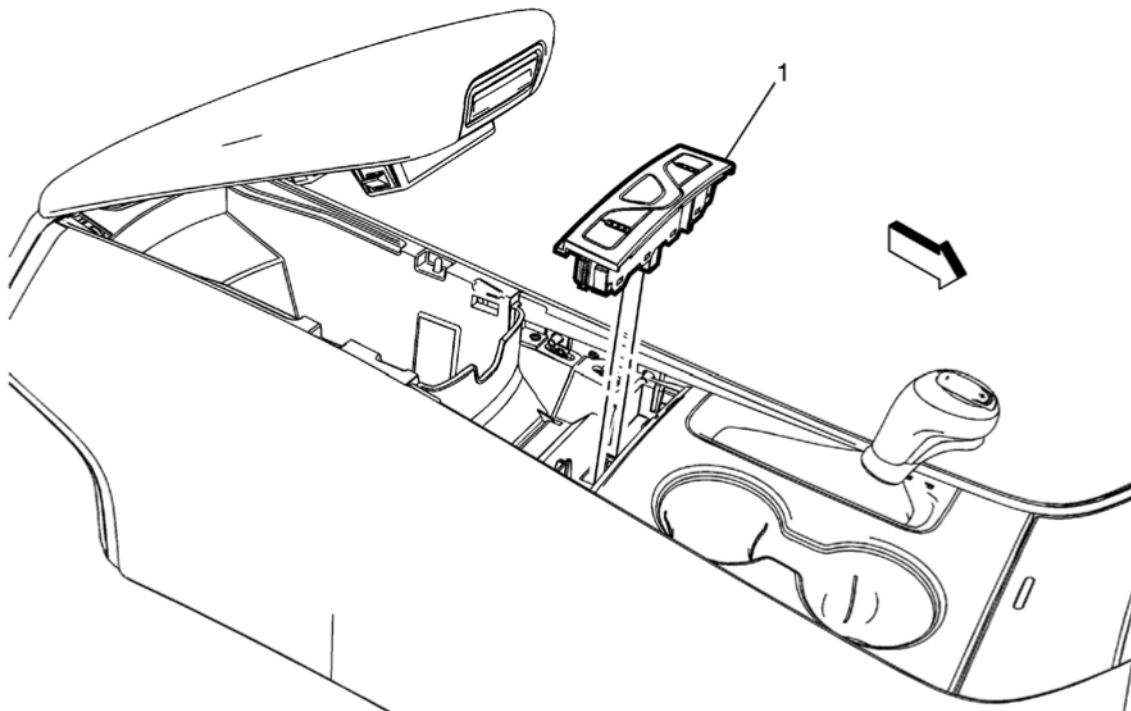


Fig. 15: Front Seat Vent Fan Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front floor console insert. Refer to Front Floor Console Insert Replacement .	
1	Front Seat Heater Switch Procedure Using the appropriate tool, depress the tabs on the switch, disconnect the electrical connector and gently remove.

FRONT SEAT HEATER CONTROL MODULE REPLACEMENT

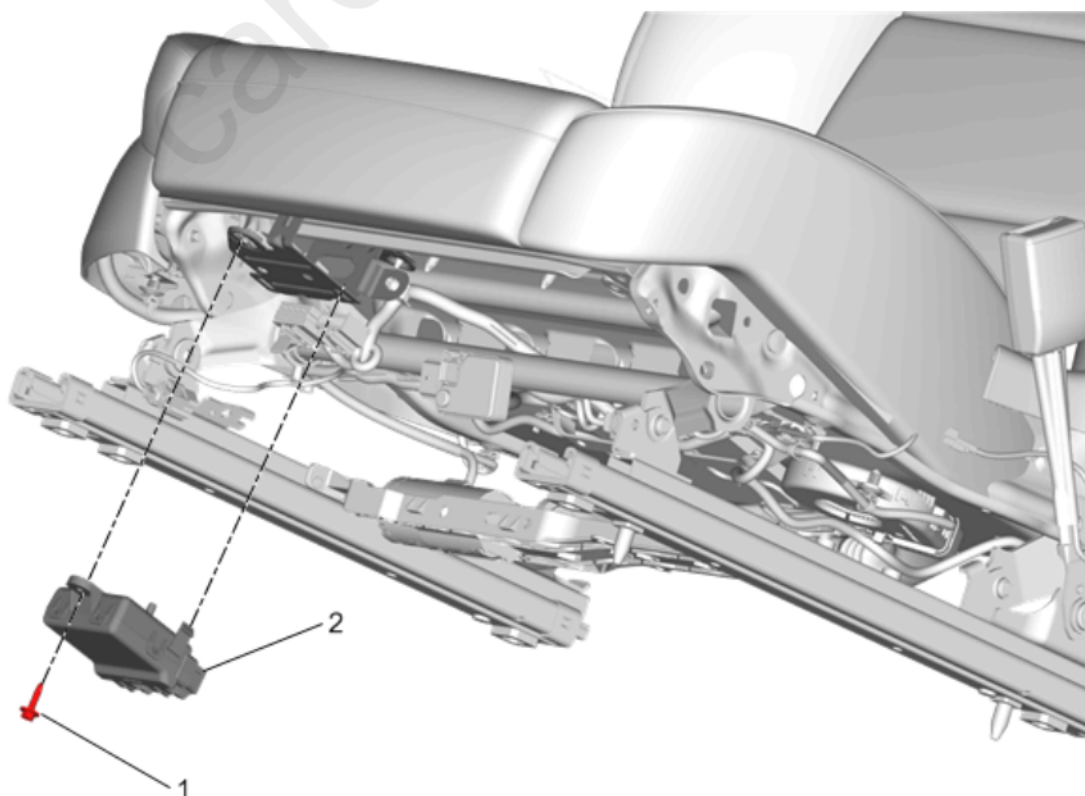


Fig. 16: Front Seat Heater Vent Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Seat Heater Vent Control Module Fastener CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Front Seat Heater Control Module Procedure 1. Set the seat to its highest position. 2. Release the retaining tabs. 3. Disconnect the electrical connector.

DRIVER OR PASSENGER SEAT BACK HEATER REPLACEMENT

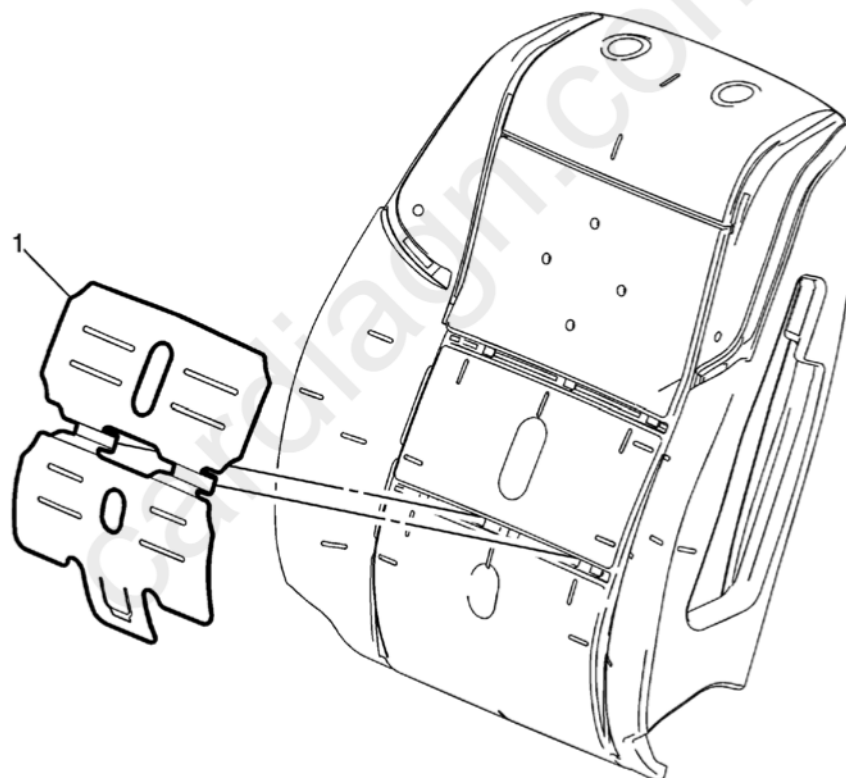


Fig. 17: Driver or Passenger Seat Back Cushion Heater
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
	WARNING: Refer to SIR Warning . Preliminary Procedure 1. Remove the driver or passenger seat. Refer to Driver or Passenger Seat Removal and Installation . 2. Remove the driver or passenger seat back cushion cover and pad. Refer to Driver or Passenger Seat Back Cover and Pad Replacement .

Callout	Component Name
1	Driver or Passenger Seat Back Cushion Heater Procedure 1. Remove the heater element by peeling it off the seat back cushion pad. Apply service heater by removing the adhesive backing and attach to the gray strips of fabric inside the cushion trim. Align the notches in the fabric strips to those in the service heater. Place heater so that copper colored wires face the trim cover. 2. If this is the second time for servicing, then remove the heater leaving the old adhesive strips intact on the seat cushion trim. The new seat heater adhesive strips will be placed over the old adhesive strips.

FRONT SEAT CUSHION HEATER REPLACEMENT

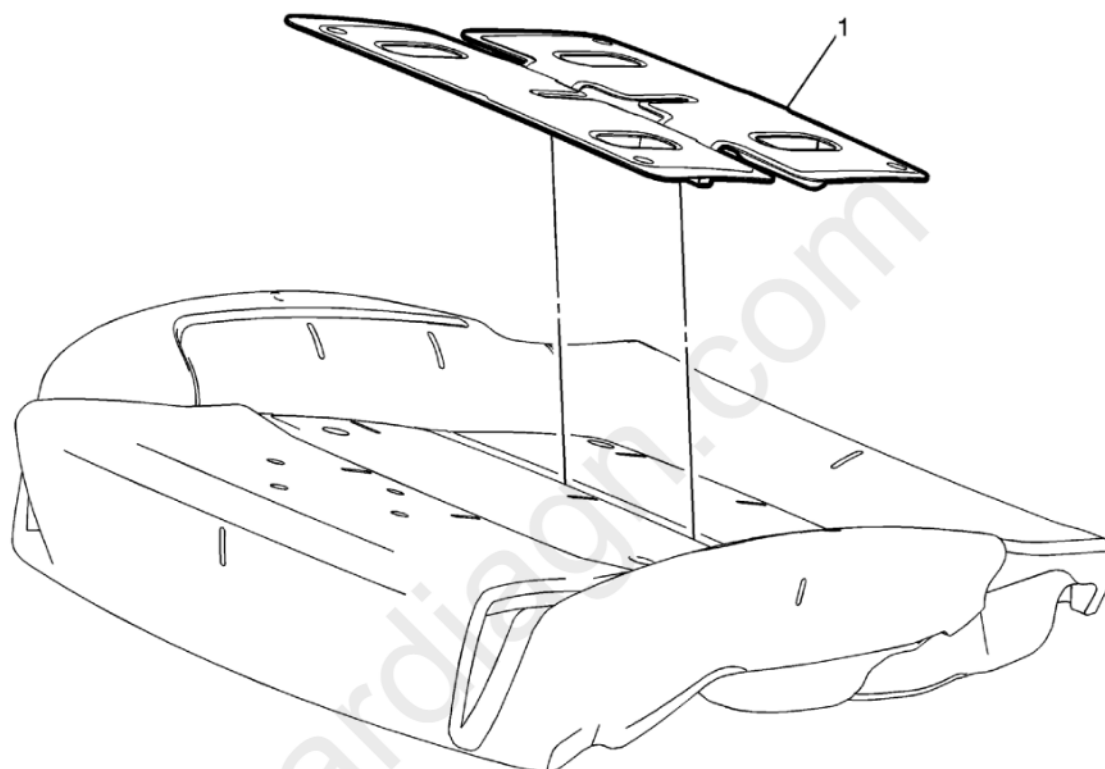


Fig. 18: Driver or Passenger Seat Cushion Heater
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to SIR Warning . Preliminary Procedure NOTE: This procedure only applies to the front driver seat. If working on the front passenger seat refer to airbag front passenger presence sensor. Airbag Front Passenger Presence Sensor Replacement 1. Disable the SIR system. Refer to. SIR Disabling and Enabling 2. Remove the driver or passenger seat. Refer to. Driver or Passenger Seat Removal and Installation 3. Remove the front seat cushion cover and pad. Refer to Front Seat Cushion Cover and Pad Replacement .	

Callout	Component Name
1	Driver or Passenger Seat Cushion Heater Procedure 1. The passenger presence system and heater element are both integral parts of the pad on the passenger seat cushion. 2. Note the routing of the wiring harness and connector location for installation. 3. Whenever the inflatable restraint passenger presence system or any component of the passenger presence system is removed. Refer to Control Module References

REAR SEAT HEATER CONTROL MODULE REPLACEMENT

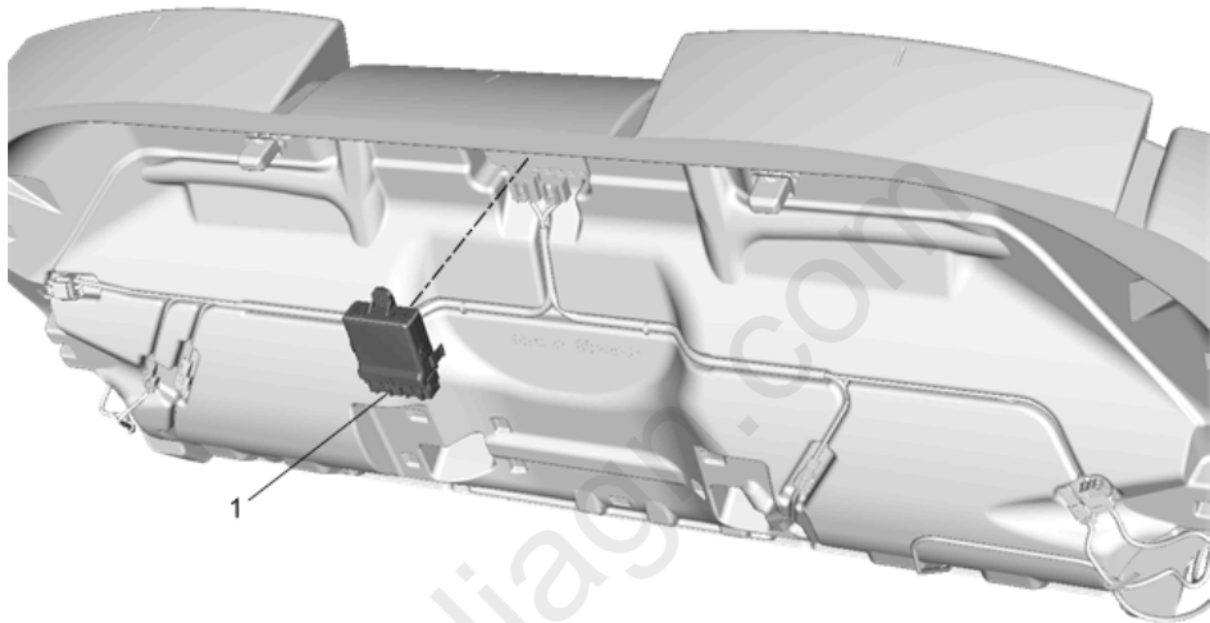


Fig. 19: Rear Seat Heater Control Module
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Seat Cushion Removal and Installation</u> .	
1	Rear Seat Heater Control Module Procedure Disconnect the electrical connectors.

REAR SEAT BACK CUSHION HEATER REPLACEMENT (40%)

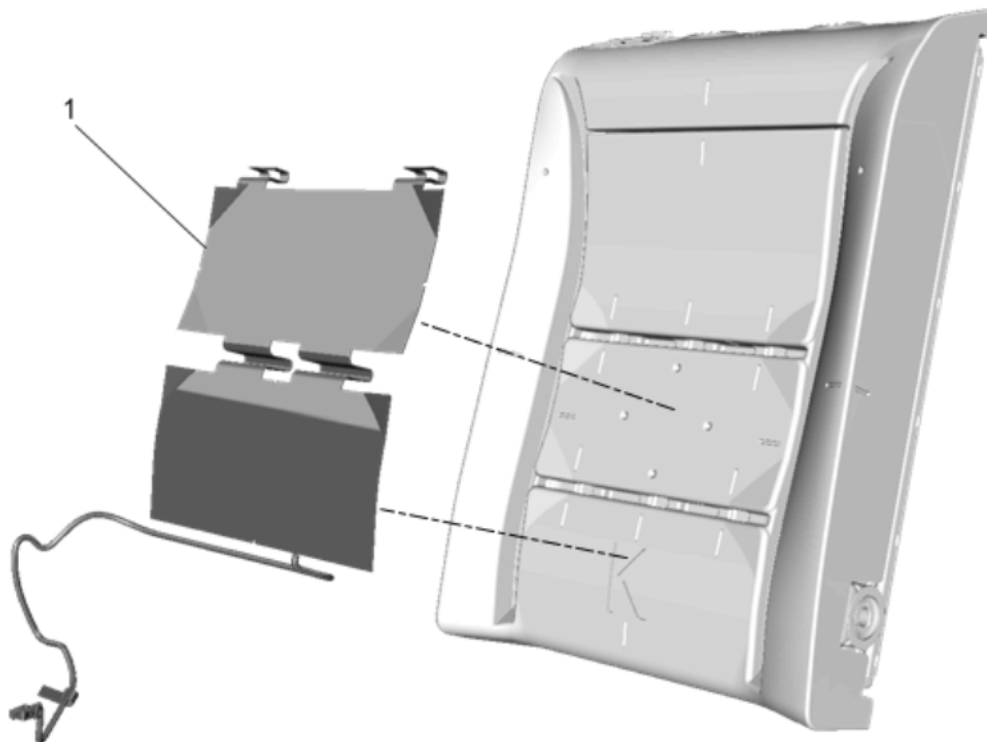


Fig. 20: Rear Seat Back Cushion Heater (40%)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. <u>Rear Seat Back Cushion Removal and Installation (40%)</u> . 2. <u>Rear Seat Back Cushion Cover and Pad Replacement (40%)</u> .	
1	Rear Seat Back Cushion Heater Procedure 1. Disconnect the electrical connector. 2. Remove the heater element leaving the old adhesive strips intact on the seat cushion. The new seat heater adhesive strips will be placed over the old adhesive strips.

REAR SEAT BACK CUSHION HEATER REPLACEMENT (60%)

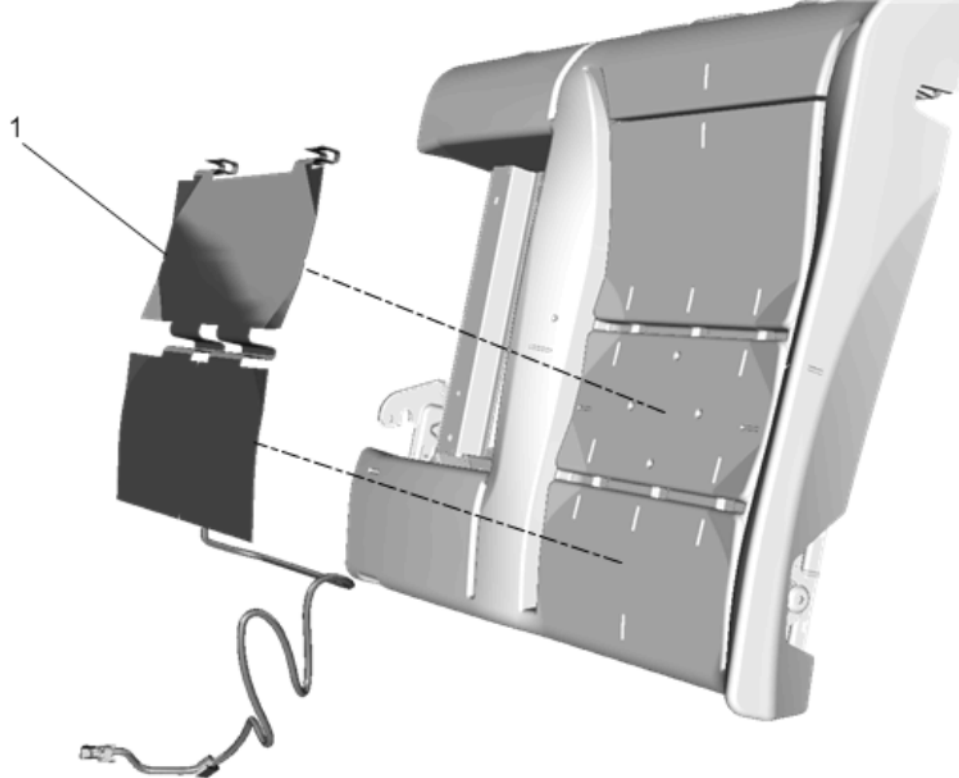


Fig. 21: Rear Seat Back Cushion Heater (60%)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. <u>Rear Seat Back Cushion Removal and Installation (60%)</u> . 2. <u>Rear Seat Back Cushion Cover and Pad Replacement (60%)</u> .	
1	Rear Seat Back Cushion Heater Procedure 1. Disconnect the electrical connector. 2. Remove the heater element leaving the old adhesive strips intact on the seat cushion. The new seat heater adhesive strips will be placed over the old adhesive strips.

REAR SEAT CUSHION HEATER REPLACEMENT

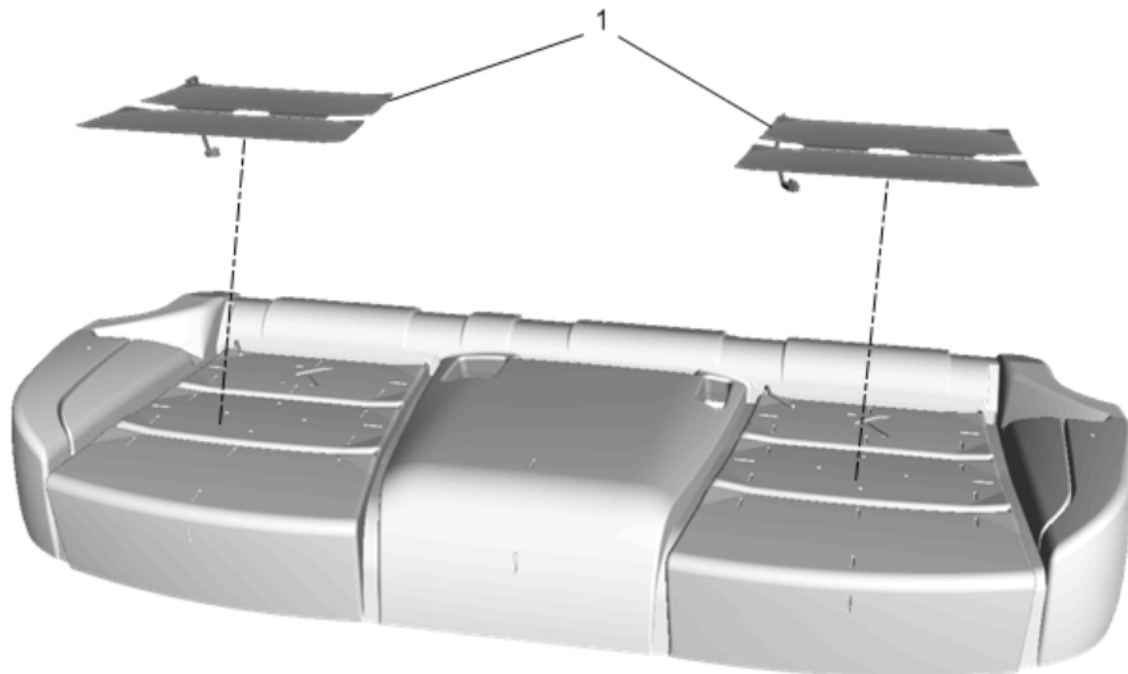


Fig. 22: Rear Seat Cushion Heater

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Rear Seat Cushion Removal and Installation</u> . <u>Rear Seat Cushion Cover and Pad Replacement</u> .	
1	Rear Seat Cushion Heater Procedure 1. Disconnect the electrical connector. 2. Remove the heater element leaving the old adhesive strips intact on the seat cushion. The new seat heater adhesive strips will be placed over the old adhesive strips.

FRONT SEAT CUSHION VENT FAN REPLACEMENT

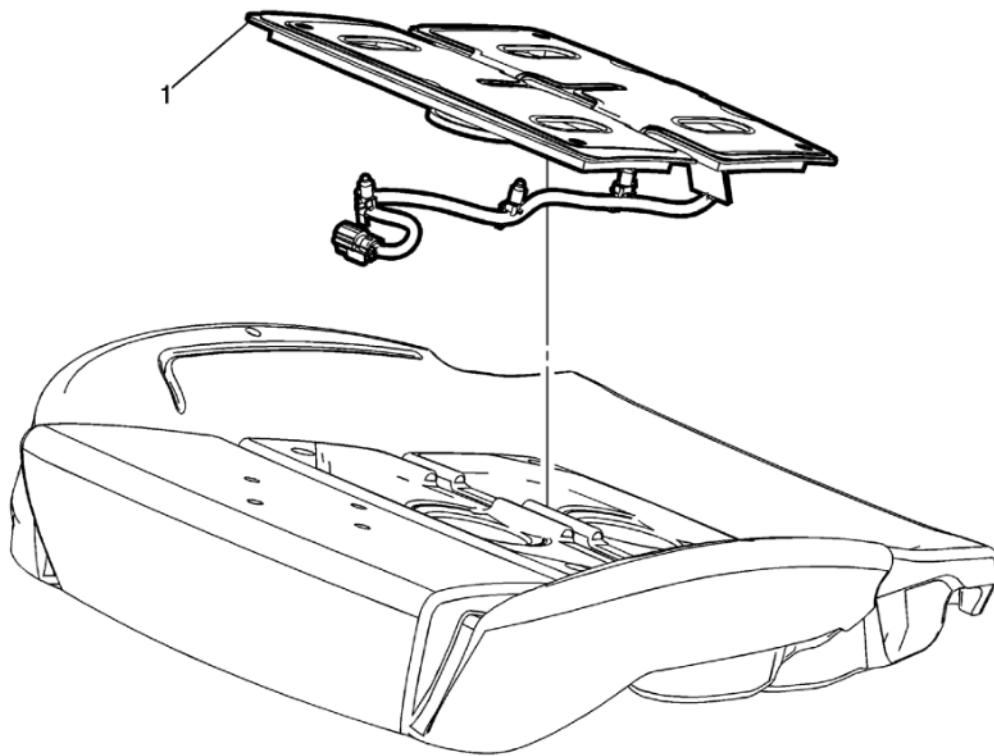


Fig. 23: Front Seat Cushion Vent Fan
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to SIR Warning .	
Preliminary Procedure 1. Remove the driver or passenger seat. Refer to Driver or Passenger Seat Removal and Installation . 2. Remove the front seat cushion cover and pad. Refer to Front Seat Cushion Cover and Pad Replacement .	
NOTE: This procedure only applies to the front driver seat. If working on the front passenger seat refer to airbag front passenger presence sensor. Airbag Front Passenger Presence Sensor Replacement	
1	Front Seat Cushion Vent Fan Procedure 1. Separate the seat cushion cover from the seat cushion pad. 2. Remove the heater element and fan mat as one unit from the seat cushion pad.

FRONT SEAT VENT FAN SWITCH REPLACEMENT

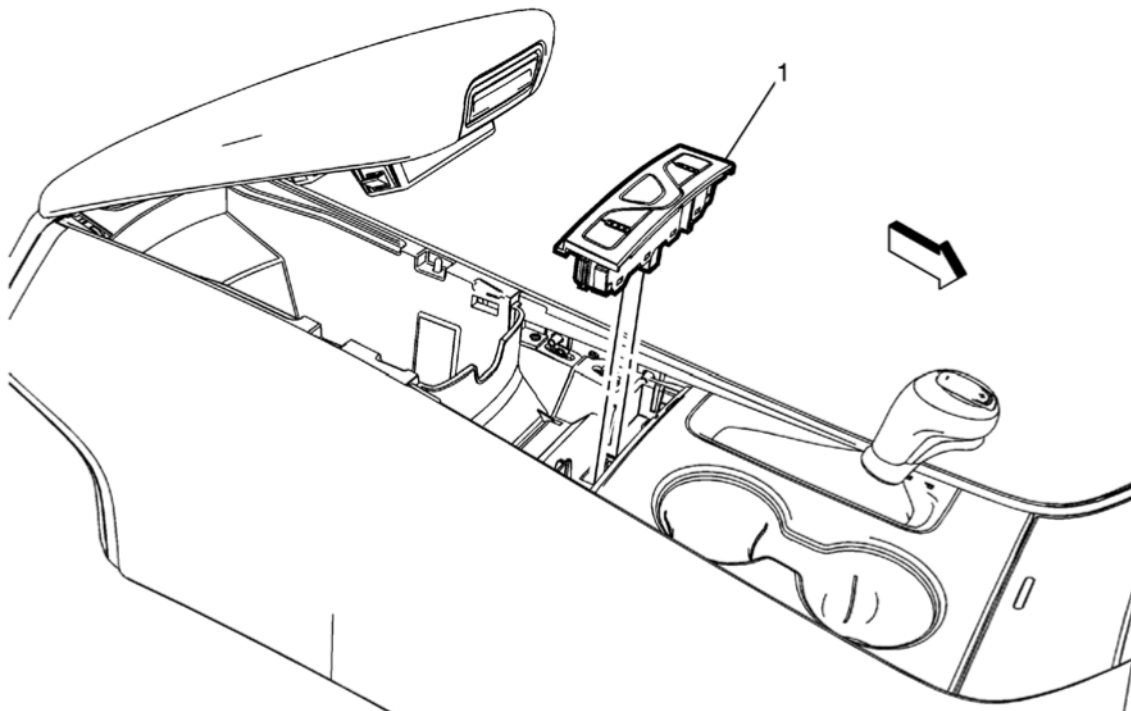


Fig. 24: Front Seat Vent Fan Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front floor console insert. Refer to Front Floor Console Insert Replacement .	
1	Front Seat Vent Fan Switch Procedure 1. Using the appropriate tool, depress the tabs on the switch and gently remove the switch. 2. Disconnect the electrical connector. NOTE: A hook type trim tool or equivalent is suggested to aid in the switch removal.

FRONT SEAT BACK CUSHION VENT FAN REPLACEMENT

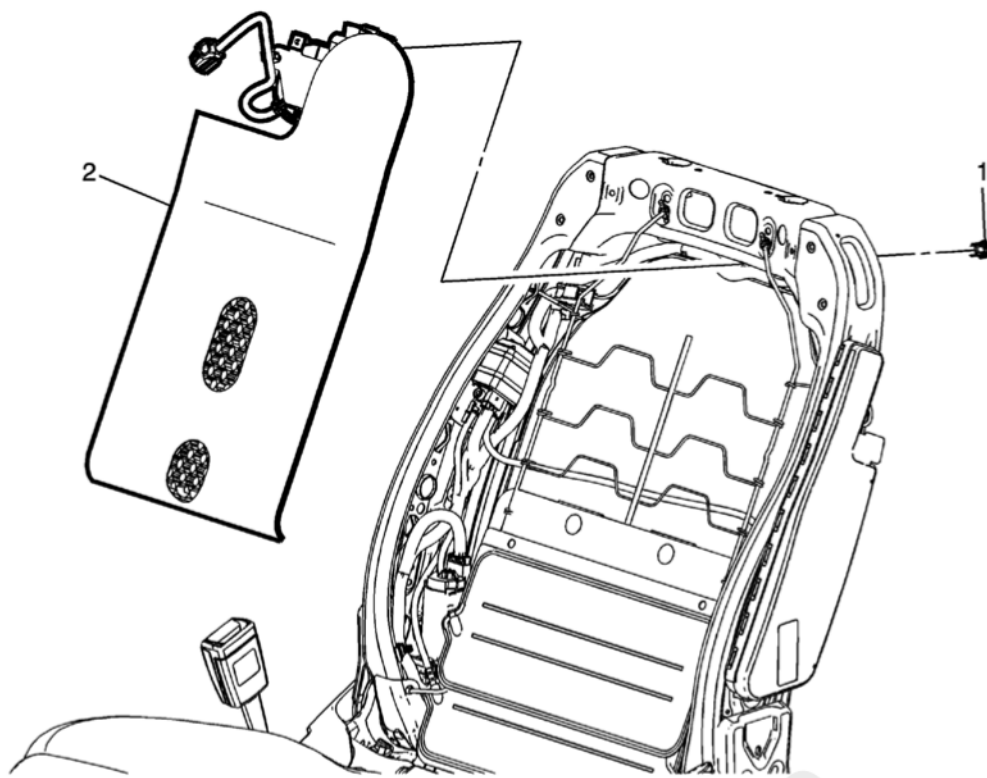


Fig. 25: Front Seat Back Cushion Vent Fan
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove the driver or passenger seat. Refer to Driver or Passenger Seat Removal and Installation . 2. Remove the driver or passenger seat back cover and pad. Refer to Driver or Passenger Seat Back Cover and Pad Replacement .	
1	Front Seat Back Cushion Vent Fan Retainer CAUTION: Refer to Fastener Caution . NOTE: The removal of this retainer might have already been accomplished in the seat back cushion cover and pad removal steps.
2	Front Seat Back Cushion Vent Fan Procedure 1. Remove the vent fan by peeling it off the seat back cushion pad. 2. Note the routing of the wiring harness and connector location for installation.

DESCRIPTION AND OPERATION

HEATED/VENTED SEAT DESCRIPTION AND OPERATION

Heated/Vented Seat Components

The heated/vented seat system consists of the following components:

- Heated and vented seat switches

- Body control module
- Seat heating control module
- Driver seat cushion heating element
- Driver seat cushion temperature sensor
- Driver seat back heating element
- Driver seat back temperature sensor
- Driver seat cushion blower assembly
- Driver seat back blower motor
- Passenger seat cushion heating element
- Passenger seat cushion temperature sensor
- Passenger seat back heating element
- Passenger seat back temperature sensor
- Passenger seat cushion blower assembly
- Passenger seat back blower motor

Heated/Vented Seat Switches

The driver and front passenger heated and vented seats are controlled by separate heated/vented seat switches that are located on the center console. When a heated or vented seat switch is pressed, the switch signal circuit from the body control module (BCM) is pulled low through a series of resistors indicating the heated/vented seat command. The BCM serves as the heated/vented seat system master to determine the requested operating mode. The BCM then sends a LIN bus serial data message to the seat heating control module indicating the heated/vented seat command.

Heated Seat Operation

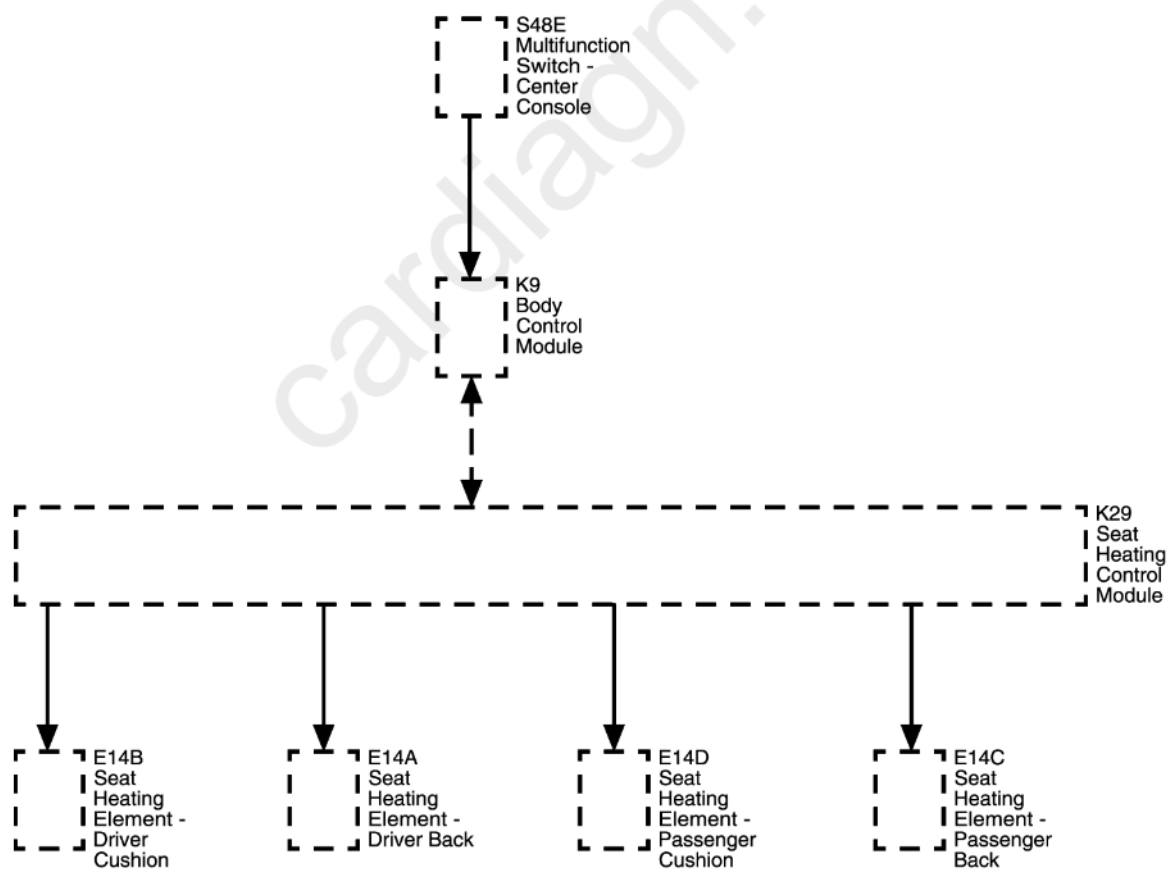


Fig. 26: Heated Seat Block Diagram
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
DJ	Serial Data - Local Interconnect Network

Callout	Component Name
S48E	S48E Multifunction Switch - Center Console
K9	K9 Body Control Module
K29	K29 Seat Heating Control Module
E14B	E14B Seat Heating Element - Driver Cushion
E14A	E14A Seat Heating Element - Driver Back
E14D	E14D Seat Heating Element - Passenger Cushion
E14C	E14C Seat Heating Element - Passenger Back

The seat heating control module controls heated seat operation for the driver and passenger seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

When inactive the seat heating control module connects the heating element low side outputs to a common reference point internal to the module which is biased to approximately 3.5 V. The module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the driver and passenger seat heating elements. During heated seat operation, the seat heating control module interrupts control of the heating elements every 10 s for approximately 10 ms to make this biased voltage check.

With both the seat cushion and seat back heater elements disconnected, if the high side output of the module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.

Temperature Regulation

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The seat heating control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Vented Seat Operation

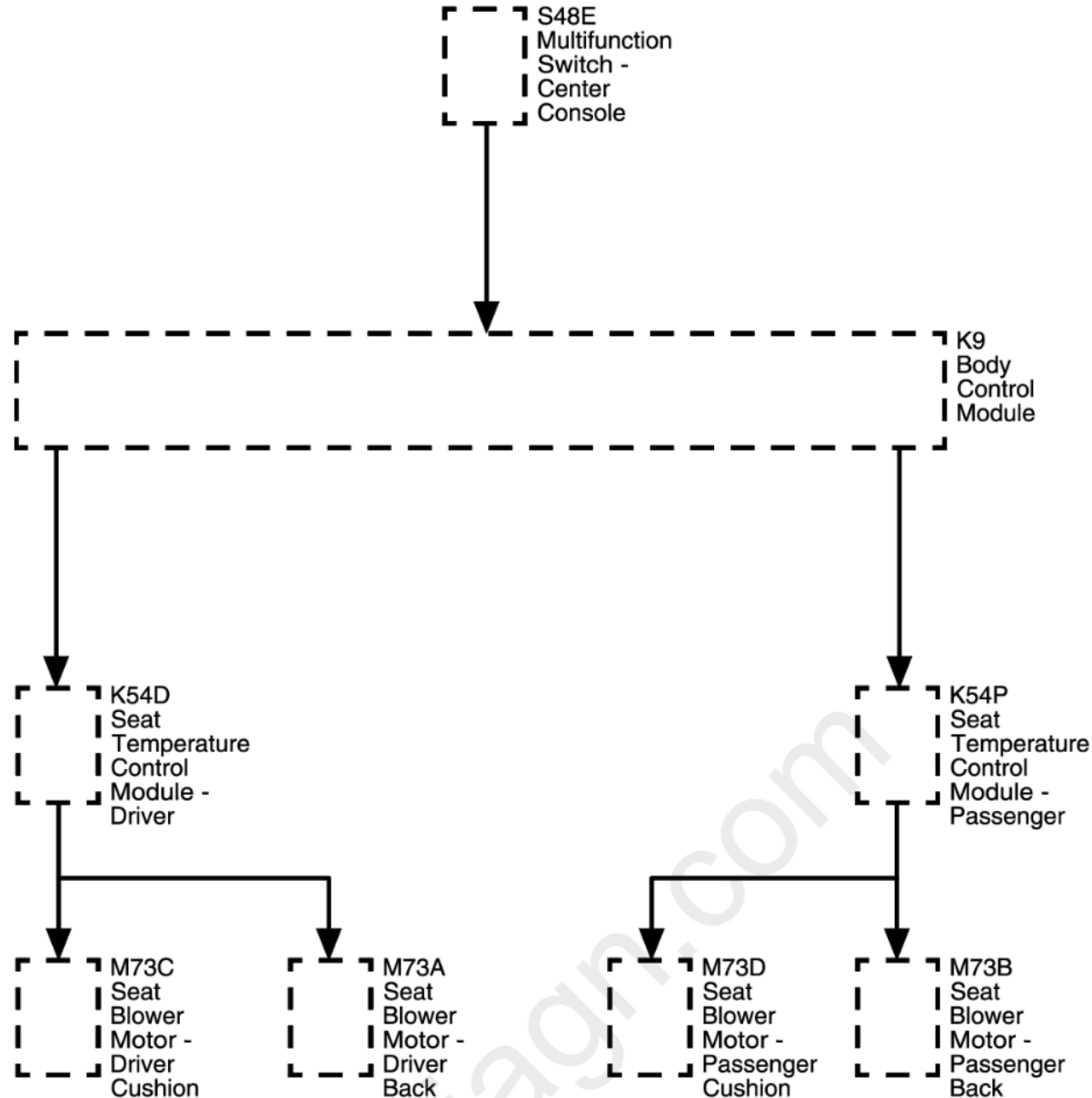


Fig. 27: Cooled Seat Block Diagram

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
S48E	S48E Multifunction Switch - Center Console
K54D	K54D Seat Temperature Control Module - Driver
K54P	K54P Seat Temperature Control Module - Passenger
M73C	M73C Seat Blower Motor - Driver Cushion
M73A	M73A Seat Blower Motor - Driver Back
M73D	M73D Seat Blower Motor - Passenger Cushion
M73B	M73B Seat Blower Motor - Passenger Back
K9	K9 Body Control Module

Each vented seat system consists of 2 blower motors and 1 seat temperature control module. The seat cushion blower motor is packaged with the seat temperature control module which both are an internal part of the seat cushion blower motor assembly. The seat back blower motor is located in the seat back cushion. During vented seat operation, the vented seat blower motors run to move cabin air through channels in the foam pad and small holes in the seat covers causing a cooling effect to the occupant.

With the ignition ON, battery voltage is applied from the ignition main relay and through a 15 A fuse to the seat temperature control module. Ground for both blower motors is provided from the ground circuit and the seat temperature control module.

When the seat heating control module receives a ventilation seat command, it sends a low side drive pulse width modulation (PWM) signal through the blower motor control circuit to the seat temperature control module indicating the seat ventilation command. The seat temperature control module interprets this signal then applies ignition voltage to the blower motors and sends a high side drive PWM signal to the seat back and cushion blower motor indicating the vented seat command. The logic in the blower motor then sets the blower speed to the switch set point. The blower motors run causing a cooling effect to the occupant.

Heated and Cooled Seat Operation During Remote Start

Refer to Vehicle Personalization in the Owner's Manual for Remote Start Auto Heated and Ventilation Seats.

During remote start, the heated seats will turn ON when the ambient temperature is below 10 $\text{Å},\text{Å}^{\circ}\text{C}$ (50 $\text{Å},\text{Å}^{\circ}\text{F}$).

During remote start, the seat ventilation system will turn ON when the ambient temperature is above 27 $\text{Å},\text{Å}^{\circ}\text{C}$ (80 $\text{Å},\text{Å}^{\circ}\text{F}$).

Load Shed Management

The electrical power management function is designed to monitor the vehicle electrical load and determine when the battery is potentially in a high discharge condition. The heated seat system is one of the vehicle loads that is subject to reduction during a battery discharge condition. For more information on load management refer to [Electrical Power Management Description and Operation](#) .

REAR HEATED SEATS DESCRIPTION AND OPERATION

Heated Seat Components

The rear heated seat system consists of the following components:

- Rear heated seat switches
- Body control module
- Rear seat heating control module
- Left rear seat cushion heating element
- Left rear seat cushion temperature sensor
- Left rear seat back heating element
- Left rear seat back temperature sensor
- Right rear seat cushion heating element
- Right rear seat cushion temperature sensor
- Right rear seat back heating element
- Right rear seat back temperature sensor

Heated Seat Switches

The left and right rear heated seat switches are located in the rear audio control module. When a heated seat switch is pressed, a serial data message is sent to the body control module (BCM) indicating the heated seat command. The BCM serves as the heated seat system master to determine the requested operating mode. The BCM then sends a LIN bus serial data message to the rear seat heating control module indicating the heated seat command. In response to this message, the rear seat heating control module attempts to drive the appropriate seat heating elements per the BCM command.

Rear Heated Seat Operation

The rear seat heating control module controls heated seat operation for the left and right rear seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

When inactive the rear seat heating control module connects the heating element low side outputs to a common reference point internal to the control module which is biased to approximately 3.5 V. The control module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the left and right rear seat heating elements. During heated seat operation, the control module interrupts control of the heating elements every 10 s for approximately 10 ms to make this biased voltage check.

With the seat cushion and seat back heater elements disconnected, if the high side output of the module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.

Temperature Regulation

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The rear seat heating control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The control module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the rear seat heating control module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Load Shed Management

The electrical power management function is designed to monitor the vehicle electrical load and determine when the battery is potentially in a high discharge condition. The heated seat system is one of the vehicle loads that is subject to reduction during a battery discharge condition. For more information on load management refer to [**Electrical Power Management Description and Operation**](#) .
