

Heated Seats Description and Operation

Heated Seat Components

The heated seat system consists of the following components:

- HVAC controls with heated seat switches
- Body control module
- Seat heating control module
- Seat cushion heating element
- Seat back heating element
- Seat temperature control module

Heated Seat Switches

The driver and passenger heated seats switches are located in the HVAC controls. The body control module (BCM) monitors each switch activation to determine which seat is activated and at what temperature level. With each press of the switch, the system will cycle through High, Medium, Low, and then back to Off again.

When a heated seat switch is pressed, a serial data message is sent from the HVAC controls to the 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 seat heating control module indicating the heated seat command. The BCM also controls the seat temperature and mode indicators, via the serial data line, used to provide the operator with feedback as to the operating status of the system.

Heated Seat Operation

When the seat heating control module receives a heated seat command, it applies a high side drive pulse width modulated (PWM) signals driven at the required duty cycles to generate the appropriate effective voltage to the heating elements to attain the commanded seat temperature.

This heated seat system utilizes a self-regulating heating element system, which is different from the non-regulated heating element systems with seat temperature sensors previously used on GM vehicles. In the self-regulating type of system, temperature feedback to a control module is not required for temperature regulation. The heating element material itself regulates the surface temperature based on the effective voltage applied to the heating element.

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](#).

DTC B191A

Diagnostic Instructions

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

DTC Descriptors

DTC B191A 00

Front Heated Seat Module

Circuit/System Description

An internal fault is detection inside the control module. No external circuits are involved.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The control module detects an internal fault.

Action Taken When the DTC Sets

- 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](#)

Description and Operation

[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

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1. Ignition ON.
2. Verify DTC B191A is not set.
⇒ **If the DTC is set**
Replace the K29 Seat Heating Control Module.
⇓ **If the DTC is not set**
3. All OK.

Repair Instructions

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

[Control Module References](#) for K29 Seat Heating Control Module 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 [Heated Seats Description and Operation](#) in order to familiarize yourself with the system functions:

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 the [Front Heated Seat Malfunction](#) diagnostic procedure in order to diagnose the symptom:

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Front 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 2 X2	4, 5	4, 5	—	—
B+ Terminal 3 X2	U1524 00, 1	U1524 00, 1	—	—
Driver Heated Seat Back Element Control	2	2	6	—
Driver Heated Seat Back Element Ground	—	2	—	—
Driver Heated Seat Cushion Element Control	3	3	6	—
Driver Heated Seat Cushion Element Ground	—	3	—	—
Passenger Heated Seat Back Element Control	4	4	6	—
Passenger Heated Seat Back Element Ground	—	4	—	—
Passenger Heated Seat Cushion Element Control	5	5	6	—
Passenger Heated Seat Cushion Element Ground	—	5	—	—
Ground	—	1	—	—
1. The driver and front passenger heated seats are inoperative. 2. The driver seat back heat function is inoperative 3. The driver seat cushion heat function is inoperative 4. Front passenger seat back heat function is inoperative 5. Front passenger seat cushion heat function is inoperative 6. Heated seat is always ON.				

Circuit/System Description

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When a heated seat switch is pressed, a serial data message is sent from the HVAC controls 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 seat heating control module indicating the heated seat command. The BCM also controls the seat temperature and mode indicators, via the serial data line, used to provide the operator with feedback as to the operating status of the system.

When the seat heating control module receives a heated seat command, it applies a high side drive pulse width modulated (PWM) signals driven at the required duty cycles to generate the appropriate effective voltage to the heating elements to attain the commanded seat temperature.

Reference Information

Schematic Reference

[Heated/Cooled Seat Schematics](#)

Connector End View Reference

[Component Connector End Views](#)

Description and Operation

[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. Engine ON.
2. Verify the scan tool Body Control Module Driver Seat Heating Switch parameter changes between Inactive and Active when pressing the S32D Seat Heating Switch – Driver.
⇒ **If the parameter does not change**
Refer to Circuit/System Testing – Heated Seat Switch Test.
⇓ **If the parameter changes**
3. Verify the scan tool Passenger Seat Heating Switch parameter changes between Inactive and Active when pressing the S32P Seat Heating Switch – Passenger.
⇒ **If the parameter does not change**
Refer to Circuit/System Testing – Heated Seat Switch Test.
⇓ **If the parameter changes**
4. Verify that both the driver and front passenger heated seats operate.
⇒ **If both the driver and front passenger heated seats are inoperative**
Refer to Circuit/System Testing – Both Heated Seats are Inoperative
⇒ **If just one of the heated seats is inoperative**
Refer to Circuit/System Testing – One Heated Seat Inoperative
⇓ **If both heated seats operate**
5. All OK.

Circuit/System Testing

Heated Seat Switch Test

1. Engine ON.
2. Verify the appropriate scan tool Body Control Module Driver or Passenger Seat Heating Switch parameter changes between Inactive and Active when pressing the S32 Seat Heating Switch.
 - ⇒ **If the parameter does not change**
 - 2.1. Ignition OFF, replace the S32 Seat Heating Switch, engine ON.
 - 2.2. Verify the scan tool Seat Heating Switch parameter changes between Inactive and Active when pressing the S32 Seat Heating Switch.
 - ⇒ If the parameter does not change, replace the A26 HVAC Controls.
 - ⇓ If the parameter changes
 - 2.3. All OK.
 - ⇓ **If the parameter changes**
3. All OK.

Both Heated Seats are Inoperative

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

1. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the K29F Seat Heating Control Module – Front. 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 7 and ground.
 - ⇒ **If 10 Ω or greater**
 - 2.1. Ignition OFF.
 - 2.2. Test for less than 2 Ω in the ground circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.
 - ⇓ **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuit terminals listed below and ground.
 - Terminal 2
 - Terminal 3
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is good**
 - 4.1. Ignition OFF, remove the test lamp.
 - 4.2. Test for less than 2 Ω in the B+ circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - ⇒ **If the test lamp does not illuminate and the circuit fuse is open**
 - 4.1. Ignition OFF, remove the test lamp.
 - 4.2. 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**
5. Connect a 5 A fused jumper wire between each control circuit terminal listed below and B+, one at a time.
 - Driver seat cushion terminal 4
 - Driver seat back terminal 8

- Passenger seat cushion terminal 5
 - Passenger seat back terminal 6
6. Verify the fuse does not open between each test.
- ⇒ **If the fuse opens**
Repair the short to ground on the circuit.
- ⇓ **If the fuse does not open**
7. 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 X2 harness connector at the K29F Seat Heating Control Module – Front, ignition ON.
 2. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.
- ⇒ **If the test lamp does not illuminate and the circuit fuse is good**
- 2.1. Ignition OFF, remove the test lamp.
 - 2.2. Test for less than 2 Ω in the B+ circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
- ⇒ **If the test lamp does not illuminate and the circuit fuse is open**
- 2.1. Ignition OFF, remove the test lamp.
 - 2.2. Test for infinite resistance between the B+ circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇒ If infinite resistance, replace the K29F Seat Heating Control Module – Front.
- ⇓ **If the test lamp illuminates**
3. Ignition OFF and all vehicle systems OFF, connect the X2 harness connector at the K29F Seat Heating Control Module – Front and disconnect the harness connector at the appropriate E14 Seat Heating Element. It may take up to 2 min for all vehicle systems to power down.
 4. Test for less than 10 Ω between the ground circuit terminal B and ground.
- ⇒ **If 10 Ω or greater**
- 4.1. Ignition OFF.
 - 4.2. 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**
5. Connect a test lamp between the control circuit terminal A and ground, engine ON.
 6. Verify the test lamp turns ON and OFF when commanding the appropriate Driver or Passenger Seat Heating element ON and OFF with a scan tool.
- ⇒ **If the test lamp is always OFF**
- 6.1. Ignition OFF, remove the test lamp, disconnect the X2 harness connector at the K29F Seat Heating Control Module – Front.
 - 6.2. 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
 - 6.3. Test for less than 2 Ω in the control circuit end to end.
 - ⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
 - ⇒ If less than 2 Ω , replace the K29F Seat Heating Control Module – Front.

⇒ **If the test lamp is always ON**

- 6.1. Ignition OFF, remove the test lamp, disconnect the X2 harness connector at the K29F Seat Heating Control Module – Front, ignition ON.
- 6.2. Test for less than 1 V between the control circuit and ground.
 - ⇒ If 1 V or greater, repair the short to voltage on the circuit.
 - ⇒ If less than 1 V, replace the K29F Seat Heating Control Module – Front.

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

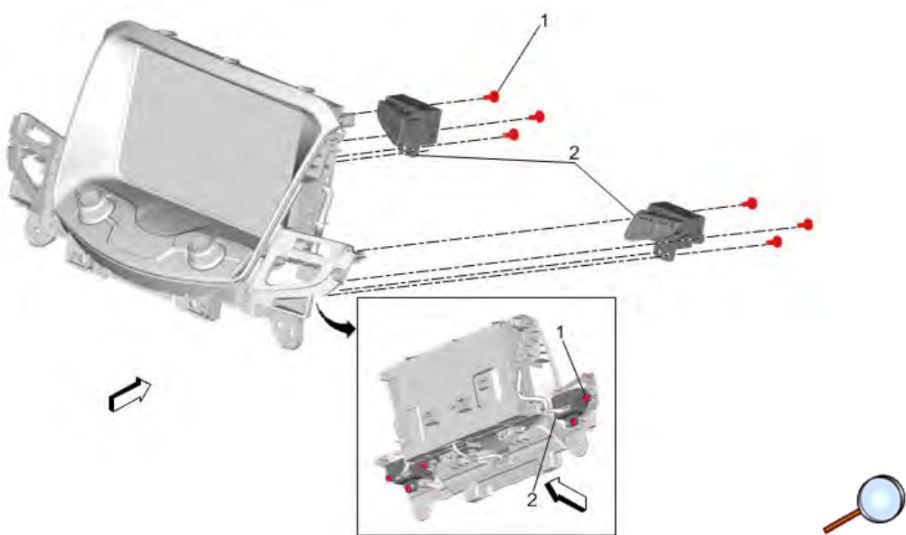
7. Test or replace the E14 Seat Heating Element.

Repair Instructions

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

- [Front Seat Heater Switch Replacement](#)
- [Driver or Passenger Seat Back Cushion Heater Replacement](#)
- [Driver or Passenger Seat Cushion Heater Replacement](#)
- [Control Module References](#) for K26 HVAC Controls and K29F Seat Heating Control Module
 - Front replacement, programming and setup

Front Seat Heater Switch Replacement

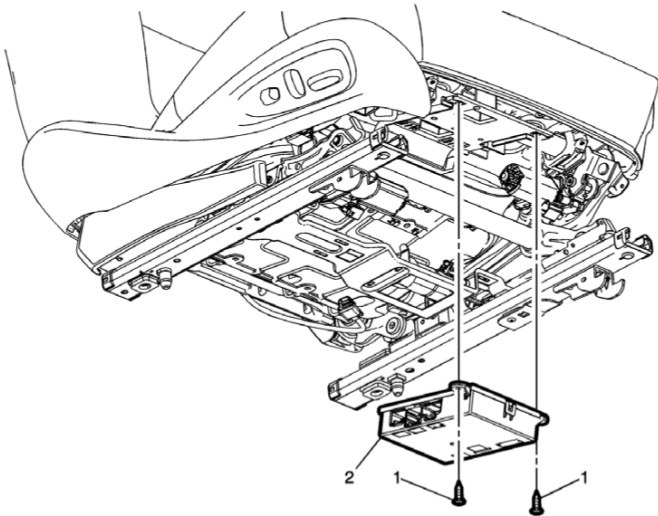


Front Seat Heater Switch Replacement

Callout	Component Name
1	Front Seat Heater Switch Screw (Qty: 6) Caution: Refer to Fastener Caution .
2	Front Seat Heater Switch (Qty: 2) Procedure 1. Disconnect the electrical connectors. 2. Use a flat-bladed plastic trim tool to remove the switch from the trim plate.

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Front Seat Heater Control Module Replacement

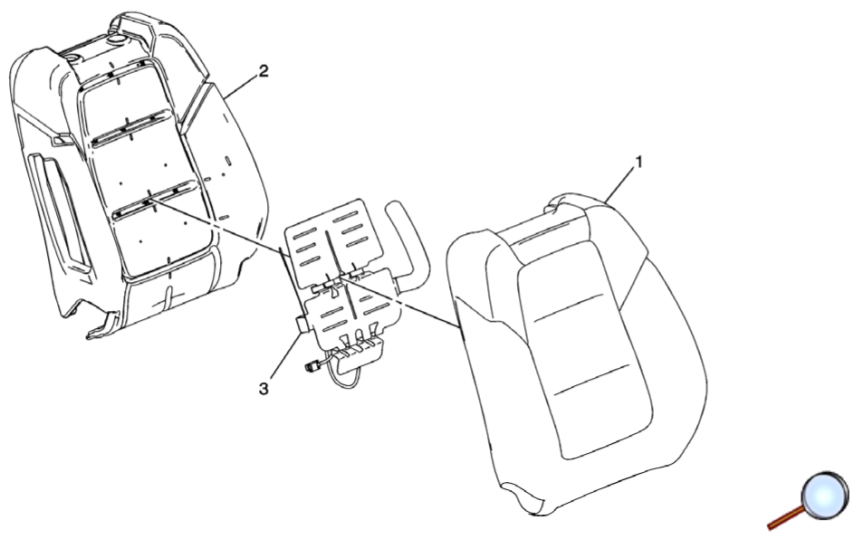


Front Seat Heater Control Module Replacement

Callout	Component Name
1	Front Seat Heater Control Module Fastener (Qty: 2) Caution: Refer to Fastener Caution .
2	Front Seat Heater Control Module Procedure 1. Disconnect the electrical connectors. 2. Remove the heater control module from the wiring harness and module bracket. 3. Refer to Control Module References for programing and setup information.

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Driver or Passenger Seat Back Cushion Heater Replacement (with KA1)

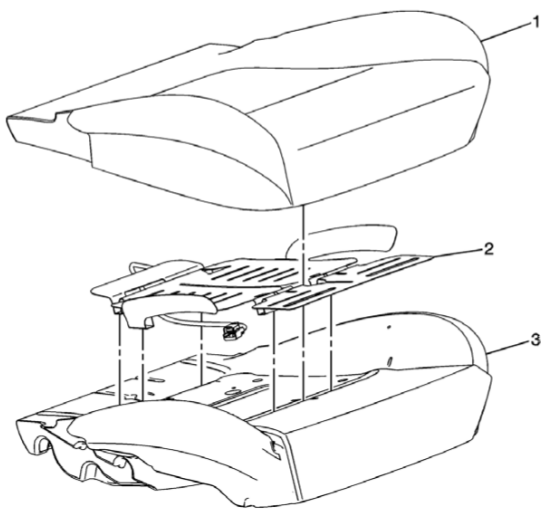


Driver or Passenger Seat Back Cushion Heater Replacement

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.	
1	Driver or Passenger Seat Back Cushion Cover Procedure Separate the seat cushion from the seat cushion pad.
2	Driver or Passenger Seat Back Cushion Pad
3	Driver or Passenger Seat Back Cushion Heater Procedure 1. Disconnect the electrical connector. 2. Using a pair of scissors cut the faulty original pigtail wire flush to the faulty heater element. 3. Remove the original pigtail from the faulty heater element and discard it. 4. Leave the faulty heater element in tack on the seat cushion pad.

Callout	Component Name
	5. Apply the new heater element double stacked on top of the original faulty heater element. 6. Note the routing of the original pigtail and connector location for installation. Note: In case of a broken heating wire, DO NOT repair by soldering the two ends. Note: Only one service heater element is allowed to be stacked on the original heater element. If a service heater element is already present, replace the seat back cushion.

Driver or Passenger Seat Cushion Heater Replacement
(with KA1)

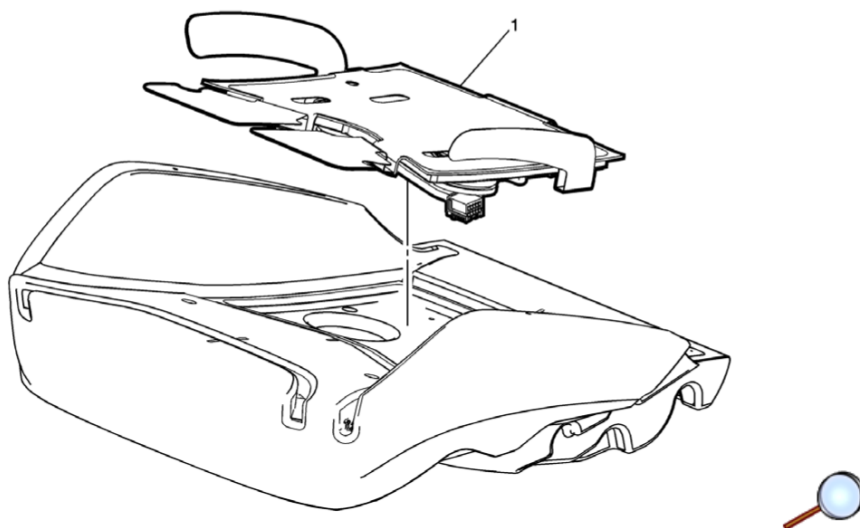


Driver or Passenger Seat Cushion Heater Replacement

Callout	Component Name
Warning: Refer to SIR Warning. Preliminary Procedure 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.	
1	Driver or Passenger Seat Cushion Cover Procedure Separate the seat cushion cover from the seat cushion pad by pulling the cover away from the pad.
2	Driver or Passenger Seat Cushion Heater Warning: Only cut the heater element pigtail wire, and do not cut the occupant presence sensor pigtail wire. If the occupant presence pigtail wire is cut, the passenger airbag may not deploy and may cause personal injury. 1. Disconnect the electrical connector. 2. Using a pair of scissors, cut the original pigtail wire flush to the faulty heater element.

Callout	Component Name
	3. Remove the original pigtail from the faulty heater element and discard. 4. Leave the faulty heater element in place on the seat cushion pad. Note: Only one heater element may be stacked on top of the original heater element. Replace the seat cushion and heater element if more than one service heater element replacement is required.
3	Driver or Passenger Seat Cushion Pad

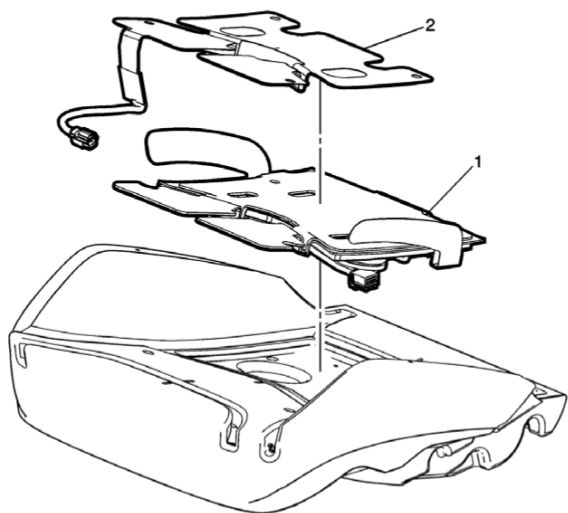
Front Seat Vent Fan Mat Replacement (Passenger with KU3)



Front Seat Vent Fan Mat Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the 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 .	
1	Front Seat Vent Fan Mat Procedure 1. Disconnect the electrical. 2. Separate the seat cushion cover from the seat cushion pad. 3. Remove the heater element and fan mat as one unit from the seat cushion pad.

Front Seat Vent Fan Mat Replacement (Driver with KU1)

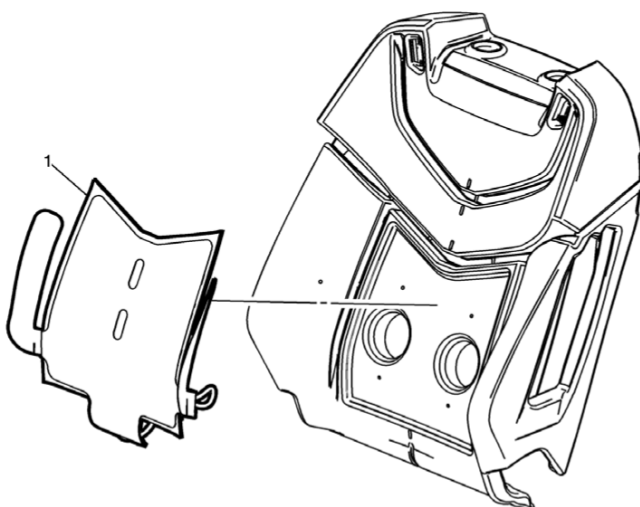


Front Seat Vent Fan Mat Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the driver 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 .	
1	Front Seat Vent Fan Mat Procedure 1. Disconnect the electrical connections. 2. Separate the seat cushion cover from the seat cushion pad. 3. Remove the heater element, bladder and fan mat as one unit from the seat cushion pad.
2	Front Seat Bladder Sensor Procedure Remove the bladder sensor unit from the front seat vent fan mat.

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Front Seat Back Cushion Vent Fan Mat Replacement



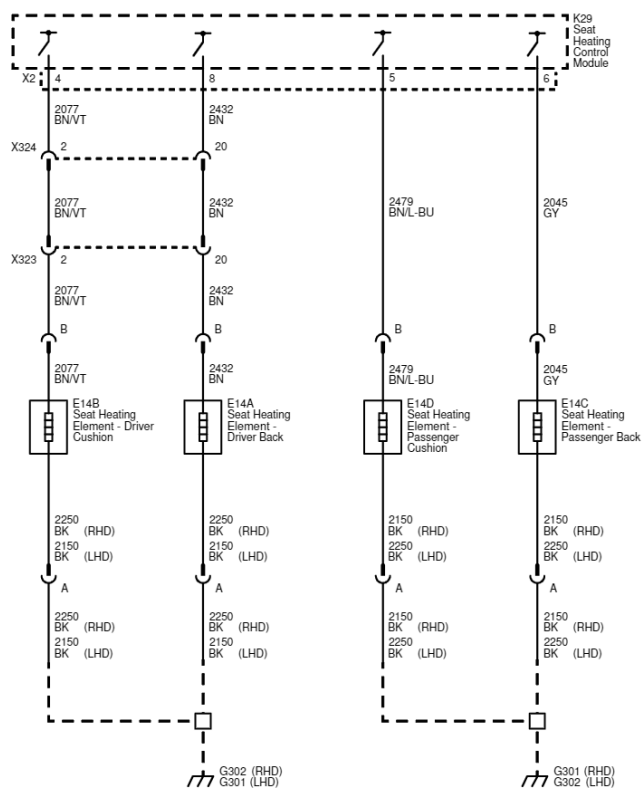
Front Seat Back Cushion Vent Fan Mat Replacement

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 cushion cover and pad. Refer to Driver or Passenger Seat Back Cover and Pad Replacement.	
1	Front Seat Back Cushion Vent Fan Mat Procedure 1. Disconnect the electrical. 2. Separate the seat back cushion cover from the seat back cushion pad. 3. Remove the heater element and fan mat as one unit from the seat back cushion pad.

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LOG

DESIGN



Heated/Cooled Seat Schematics

Figure 1: [Power, Ground, Serial Data, and Controls \(KA1\)](#)

Figure 2: [Front Seat Heating \(KA1\)](#)

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