

# HEATED SEAT SYSTEM

## TABLE OF CONTENTS

	page		page
<b>HEATED SEAT SYSTEM</b>		<b>HEATED SEAT MODULE - FRONT SEATS</b>	
DESCRIPTION .....	7	DESCRIPTION .....	14
OPERATION .....	8	OPERATION .....	14
DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM .....	9	DIAGNOSIS AND TESTING - HEATED SEAT MODULE - FRONT SEATS .....	15
<b>FRONT HEATED SEAT SWITCH</b>		REMOVAL .....	15
DESCRIPTION .....	10	INSTALLATION .....	16
OPERATION .....	11	<b>HEATED SEAT MODULE - 2ND ROW SEATS</b>	
DIAGNOSIS AND TESTING - DRIVER HEATED SEAT SWITCH .....	11	DESCRIPTION .....	16
REMOVAL .....	11	OPERATION .....	16
INSTALLATION .....	11	DIAGNOSIS AND TESTING - HEATED SEAT MODULE - 2ND ROW SEATS .....	16
<b>HEATED SEAT ELEMENTS</b>		REMOVAL .....	17
DESCRIPTION .....	11	INSTALLATION .....	17
OPERATION .....	12	<b>HEATED SEAT SWITCHES - 2ND ROW SEATS</b>	
DIAGNOSIS AND TESTING - HEATED SEAT ELEMENTS .....	12	DESCRIPTION .....	17
REMOVAL .....	12	OPERATION .....	18
INSTALLATION .....	12	DIAGNOSIS AND TESTING - HEATED SEAT SWITCHES - 2ND ROW SEATS .....	18
<b>HEATED SEAT SENSOR - 2ND ROW SEATS</b>		REMOVAL .....	18
DESCRIPTION .....	13	INSTALLATION .....	19
OPERATION .....	14		
DIAGNOSIS AND TESTING - HEATED SEAT SENSOR - 2ND ROW SEATS .....	14		

## HEATED SEAT SYSTEM

### DESCRIPTION

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the front door trim panels. A second set of heated seat switches are located in the rear seat center console. The front door trim panel mounted switches control the front seats, while the rear console mounted switches control the second row seats. The heated seat system allows the driver, front seat passenger and 2nd row seat passengers to select from two different levels of electrical seat heating (HI/LO). The heated seat system for this vehicle includes the following major components, which are described in further detail later in this section:

- **Heated Seat Elements** - Eight heated seat elements are used per vehicle, two for each heated seat. Two heated seat elements are integral to each seat, one in the seat back and the other in the seat cushion. The rear heated seat cushion elements contain integral heated seat sensors.

- **Heated Seat Modules** - Two heated seat modules are used per vehicle. A Memory Heated Seat Adjustable Pedal Module (MHSAPM) is mounted under the drivers seat cushion pan. This module controls the two front heated seats as well as other vehicle functions. A second heated seat module is located in the 2nd row seat center console and it is used to control the 2nd row heated seats. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEM/HEAT SEAT ADJ PEDAL MODULE - DESCRIPTION) for additional information.

- **Rear Heated Seat Sensors** - Two heated seat sensors are used per vehicle, one for each rear heated seat. The heated seat sensors are integral to the rear heated seat cushion elements. (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT SENSOR - DESCRIPTION) for additional information.

- **Heated Seat Switches** - Four heated seat switches are used per vehicle, one for each heated seat. One switch assembly is mounted in each of the front door trim panels. The driver side switch assembly is used to control the driver heated seat, power/memory seat and adjustable foot pedal systems. The passenger side switch assembly is used to control the

## HEATED SEAT SYSTEM (Continued)

passenger heated seat and power seat systems. The 2nd row heated seat switches are mounted in the 2nd row seat center console. The 2nd row switches are used to control the 2nd row heated seat system only. Refer to heated seat switches later in this section for additional information. Refer to driver and passenger seat switches in the Power Seat section for additional information.

- **Door Modules** - A door module is concealed behind the trim panel of each front door. The module on the driver side is referred to as the Driver Door Module (DDM), while the module on the passenger side is the Passenger Door Module (PDM). The DDM and PDM each utilize integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus network. In regards to the front seat heated seat system, the door modules communicate between the front seat heated seat switch assemblies and the memory heated seat adjustable pedal module. The door modules are not used in the 2nd row heated seat system. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION) for additional information.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

## OPERATION

### FRONT SEAT HEATED SEAT SYSTEM OPERATION

The front heated seat system operates on battery current received through a fuse in the Integrated Power Module (IPM). Fused ignition switch output (run-acc) circuits are used, so that the systems will only operate when the ignition switch is in the On or Accessory positions. The heated seat system will turn Off automatically whenever the ignition switch is turned to any position except On or Accessory. The Low heat position set point is about 36° C (97° F), and the High heat position set point is about 41° C (105° F).

When either of the front heated seat switches are depressed a resistance signal is sent to the applicable Door Module (Driver or Passenger). The applicable Door Module then sends a message via the Programmable Communications Interface (PCI) data bus network to the Memory Heated Seat Adjustable Pedal Module (MHSAPM), signaling the module to energize the heating element for the selected seat. Light Emitting Diodes (LEDS) in each switch indicate the level

of heat in use. The switch LEDs are controlled by the applicable Door Module.

The MHSAPM energizes an integral solid-state relay, which supplies battery current to the seat heating elements. When high-temperature heating is selected, the heaters provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal selected-temperature level. If high-level heating is selected, the control system will automatically switch to the low level after two hours of continuous operation. Operation on the low setting turns off only when the ignition switch is turned off or the heated seat switch is pressed a second time indicating an off command.

The module will automatically turn off the heating elements if it detects an OPEN or LOW short in the heating element circuit.

### 2ND ROW HEATED SEAT SYSTEM OPERATION

The 2nd row heated seat system operates independently from the front heated seat system. The 2nd row heated seat module receives fused battery current through the Integrated Power Module only when the ignition switch is in the ON position. The heated seat module shares a common ground circuit with each of the heated seat elements. The heated seat system will only operate when the surface temperature of the seat cushion is below the designed temperature set points of the system. The Low heat position set point is 35° C (95° F), and the High heat position set point is 40° C (104° F).

A separate heated seat module contains the control logic for the 2nd row heated seat system. The module responds to the heated seat switch status, ignition switch status, and the heated seat element sensor inputs by controlling the output to the 2nd row seat heating elements through integral solid-state relays.

When either of the 2nd row seat heated seat switches are depressed a resistance signal is sent to the heated seat module, signaling the module to energize the heating element for the selected seat.

The heated seat sensor provides the heated seat module with a low-voltage input indicating the surface temperature of the seat cushion. If the surface temperature is below the temperature set point for the selected Low or High heated seat switch position, the module energizes the integral solid-state relay, which supplies battery current to the heating elements. When the sensor input indicates the correct temperature set point has been achieved, the module de-energizes the solid-state relay. The module will continue to cycle the solid-state relay as needed to maintain the temperature set point.

The heated seat system will automatically turn off whenever the ignition switch is turned to any posi-

## HEATED SEAT SYSTEM (Continued)

tion except On. If the ignition switch is turned to the Off position while a heated seat is ON, the heated seat will remain Off after the engine is restarted until a 2nd row seat heated seat switch is depressed again. This prevents the vehicles battery from being drained by the heated seat system.

The 2nd row heated seat module also controls the heated seat LED indicator lamps, located in both of the 2nd row heated seat switches. The module is programmed to provide self-diagnostics, if a problem with the 2nd row heated seat system is detected. If the module detects faults within the heated seat system, it will provide a visual indication of the failure by flashing the indicator lamps in the appropriate heated seat switch.

The module will automatically turn off the heating elements if it detects an OPEN or HI/LOW short in the sensor circuit, or an OPEN or LOW short in the heating element circuit. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the front seat heated seat system.

## DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM

### FRONT SEAT HEATED SEAT SYSTEM DIAGNOSIS

In order to obtain conclusive testing of the front seat heated seat system, the Programmable Communications Interface (PCI) data bus circuit must be checked.

The most reliable, efficient, and accurate means to diagnose the front seat heated seat system requires the use of a DRB III® scan tool and the Appropriate Diagnostic Information. The DRB III® scan tool can provide vital information to the technician trying to find a problem with the heated seat system. Diagnostic logic is built into the Memory Heated Seat Adjustable Pedal Module (MHSAPM) and both door modules to help locate the problem by the most efficient means possible. Anytime a problem is suspected, a DRB III® scan tool should be obtained and used to retrieve any stored fault codes in the MHSAPM and door modules. If the front heated seat lights blink the MHSAPM did not respond to the door modules command to turn on the heated seats.

If diagnostic fault codes are present in the module, record them on a piece of paper immediately before proceeding any further. Then, use these fault codes to identify the problem by verifying the fault code. Example, If the module records "DRIVER SEAT HEAT OUTPUT OPEN" fault code, locate the diagnostic procedure for this code in the Appropriate Diagnostic Information and follow the flow chart until the specific problem is located and resolved. Once the problem is thought to be corrected, erase

the stored fault code using the DRB III® scan tool and verify correct system operation. If the front seat heated seat system is functioning correctly, verify that there are no other stored codes in the module and return the vehicle to service.

If the fault code could not be verified, this is a good indication that a INTERMITTENT problem may be present. You must than attempt to find the intermittent problem, such as moving the heating element within the seat while testing continuity or wiggling the wire harness/electrical connectors under the seat while testing continuity. Always, eliminate all other potential problems before attempting to replace the MHSAPM or door modules.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

### PRELIMINARY TEST

Before testing the individual components in the heated seat system, check the following:

- Using the DRB III® scan tool, check the memory heated seat adjustable pedal module (MHSAPM) for any stored fault codes. Record these codes on paper for reference and resolve using the Appropriate Diagnostic Information.
- Check the vehicles battery open-circuit voltage and charging system performance. If the vehicles electrical system is defective or weak it may not be supplying sufficient energy to operate the heated seat system.
- If the heated seat switch backlighting does not light with the ignition switch in the On position, check the fused ignition switch fuse in the integrated power module. If OK, refer to **Heated Seat Switch Diagnosis and Testing** in this section. If not OK, repair the shorted circuit or component as required and replace the faulty fuse or repair the open ground circuit as required.
- If the heated seat switch HI/LO LED indicators do not light with the ignition switch in the On position and the heated seat switch in the Low or High position, check the fused ignition switch fuse in the integrated power module. If OK, refer to **Heated Seat Switch Diagnosis and Testing** in this section. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

### 2ND ROW HEATED SEAT SYSTEM DIAGNOSIS

The 2nd row heated seat system is capable of performing some self-diagnostics. The following table depicts the various monitored faults which will be

HEATED SEAT SYSTEM (Continued)

reported to the vehicle operator or technician by flashing the individual heated seat switch Light Emitting Diode (LED) indicator lamps. Refer to the HEATED SEAT SYSTEM SELF-DIAGNOSIS table below for failure identification. The left side heated seat switch indicator lamps will flash if a failure occurs in the left rear heated seat, and the right side heated seat switch indicator lamps will flash for a right rear heated seat failure. If a monitored heated seat system fault occurs, the switch indicator lamps will flash at a pulse rate of one-half second on, followed by one-half second off for a duration of one minute after the switch for the faulty heated seat is depressed in either the Low or High direction. This process will repeat every time the faulty heated seat switch is actuated until the problem has been corrected.

HEATED SEAT SYSTEM SELF-DIAGNOSIS

Monitored Failure	Switch HI Indicator Lamp	Switch LO Indicator Lamp
Heated Seat Element Shorted	Flashing	Flashing
Heated Seat Element Open	Flashing	Off
Heated Seat Sensor Value Out of Range	Off	Flashing

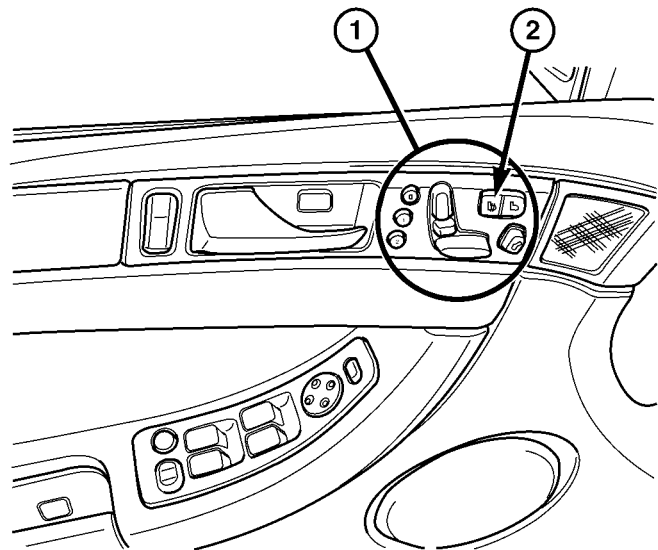
Diagnostic logic is built into the 2nd row heated seat module to help the person trying to locate the problem by the most efficient means possible. Anytime a problem is suspected, locate the diagnosis and testing procedure for the component in question and follow the steps until the specific problem is located and resolved. Always eliminate problems in this order; sensors, wiring, element, switch, switch wiring, heated seat module. Once the problem is thought to be corrected, verify correct system operation. If the heated seat system is functioning correctly return the vehicle to service.

If a problem could not be verified such as not finding anything wrong when following the diagnostic procedure, this is a good indication that an INTERMITTENT problem may be present. You must then attempt to find the intermittent problem, such as moving the heating element within the seat while testing continuity or wiggling the wire harness's/electrical connectors under the seat while testing continuity.

FRONT HEATED SEAT SWITCH

DESCRIPTION

The heated seat switch assemblies are mounted in the left and right side front door trim panels. One switch assembly is used for each front heated seat. The two momentary position switches, are incorporated into one large switch assembly that also includes other switches. The drivers side switch assembly (Fig. 1) includes the memory, heat and power seat switches as well as the adjustable foot pedal switch. The passenger side switch assembly includes the power seat and heated seat switches only. The heated seat switches provide a resistive multiplexed signal to the appropriate Door Module through separate hard wired circuits. Each switch has an Low and High position so that both the driver and the front seat passenger can select a preferred seat heating level. Each switch has two Light-Emitting Diodes (LED) which light to indicate that the heater for the seat is turned on.



810bef81

Fig. 1 CS Driver Heated Seat Switch

- 1 - Switch Assembly
- 2 - Driver Heated Seat Switch

The heated seat switches and their LEDs cannot be repaired. If either switch or LED is faulty or damaged, the entire switch assembly must be replaced.



## FRONT HEATED SEAT SWITCH (Continued)

**OPERATION**

There are two momentary positions that can be selected with each of the heated seat switches, Low and High. When the switch closest to the driver/passenger is depressed, the Low position is selected and the "LO" position LED indicator illuminates. When the switch farthest from the driver/passenger is depressed, the High position is selected and the "HI" position LED indicator illuminates. If the switch is depressed a second time in the same direction, Off is selected and both LED indicators are extinguished.

Both heated seat switch assemblies provide separate resistive multiplexed inputs to the appropriate door module. The Door Module then sends a PCI Data Bus message to the Memory Heated Seat Adjustable Pedal Module (MHSAPM) to indicate the selected switch position. The module responds to the heated seat switch messages by controlling the 12v output to the front seat heating elements. The Low heat position set point is about 35° C (97° F), and the High heat position set point is about 40° C (105° F).

**DIAGNOSIS AND TESTING - DRIVER HEATED SEAT SWITCH**

For complete circuit diagrams, refer to **Wiring**.

**CHECKING SWITCH SIGNAL AND WIRING AT THE DOOR MODULE**

(1) Disconnect and isolate the battery negative cable.

(2) Access and disconnect the connector from the driver door module. Visually inspect wiring terminals for damage that would prevent positive connection. If not OK, repair or replace the necessary components.

(3) Reconnect the negative battery cable and the driver door module. Turn heated seat ON in the LO position. Using an Ohmmeter, check the resistance between the driver heated seat switch mux circuit and fused ignition switch output circuit. Resistance should be about 8 kilohms (8020 ohms ±4%). If not OK, check resistance directly at switch. If OK, go to Step 4. If NOT OK replace the switch or faulty wiring.

(4) Turn heated seat ON in the HI position. Using an Ohmmeter, check the resistance between the driver heated seat switch mux circuit and fused ignition switch output circuit. Resistance should be about 2.4 kilohms (2400 ohms ±4%). If not OK, check resistance directly at switch. If OK, go to Step 5. If NOT OK replace the switch or faulty wiring.

(5) With the system ON in the HI position, Check for proper battery voltage and ground at the appropriate cavities. If OK, test heated seat element. If NOT OK, repair open or wiring short.

**CHECKING SWITCH ONLY**

(1) The heated seat switch assembly used on CS vehicles includes other switches. (Refer to 8 - ELECTRICAL/POWER SEATS/DRIVER SEAT SWITCH - DIAGNOSIS AND TESTING)

**REMOVAL**

(1) Disconnect and isolate the battery negative cable.

(2) Remove the front door trim panel. Refer to Front Door Trim Panel Removal in the Body section for the procedure.

(3) Disconnect the harness from the door module.

(4) Remove the heated seat switch assembly by pressing in the four clips.

**INSTALLATION**

(1) Install the heated seat switch assembly.

(2) Connect the harness to the door module.

(3) Install the front door trim panel. Refer to the Body section for the procedure.

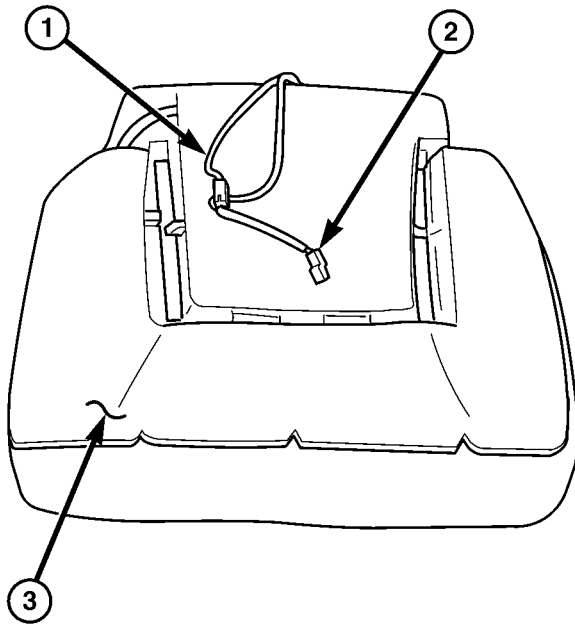
(4) Reconnect the battery negative cable.

**HEATED SEAT ELEMENTS****DESCRIPTION**

The heated seat system utilizes two heated seat elements in each seat, one for the seat cushion (Fig. 2) and the other for the seat back. Although two different heated seat systems are used for the front and 2nd row rear seats, the heated seat elements function the same way. The two elements for each 2nd row rear seat are connected in series with the 2nd row Heated Seat Module (HSM). The two elements for each front seat are connected in parallel with the Memory Heated Seat Adjustable Pedal Module (MHSAPM). One temperature sensor is used for each rear seat only, and it is located in the rear seat cushion heated seat element. The front heated seat system does not utilize a temperature sensor the heated seat elements. The heated seat temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT SENSOR - DESCRIPTION) for more information on the rear heated seat sensor.

The heated seat elements are glued onto the seat cushion and seat back cushion foam. The heated seat elements and the temperature sensor cannot be adjusted or repaired and, if faulty or damaged, the heated seat element assembly must be replaced. Refer to the procedure later in this section.

## HEATED SEAT ELEMENTS (Continued)



80c91d10

**Fig. 2 Heated Seat Element - Typical**

- 1 - Seat Back Wire Harness
- 2 - Heated Seat Wire Harness Connector
- 3 - Heated Seat Cushion Element

## OPERATION

The heated seat elements resist the flow of electrical current. When battery current is passed through the elements, the energy lost by the resistance of the elements is released in the form of heat.

The rear heated seat temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. When the temperature of the rear seat cushion cover rises, the resistance of the sensor decreases. The rear heated seat module supplies five-volts to one side of each sensor, and monitors the voltage drop through the sensor on a dedicated hardwired return circuit. The module uses this temperature sensor input to monitor the temperature of the seat cushion, and regulates the 12v current flow to the heated seat elements accordingly.

## DIAGNOSIS AND TESTING - HEATED SEAT ELEMENTS

The wire harness connectors for the heating elements are located under the seat. For circuit descriptions and diagrams, refer to section 8W, Wiring.

**NOTE:** When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as would occur by sitting in the seat, will check for the possibility of an intermittent open in the element which would only be evident if the element was in a cer-

tain position. Failure to check the element in various positions could result in an incomplete test.

## FRONT SEAT SYSTEM

(1) Locate the memory heated seat adjustable pedal module. Disconnect the appropriate connector from the module. Refer to the wiring section for details.

(2) Check for continuity between the two wires leading to and out of the appropriate heated seat element. There should be continuity. Less than 6 ohms. If OK, refer to Memory Heated Seat Adjustable Pedal Module (MHSAPM) Diagnosis and Testing in the Electronic Control Modules section of the service manual for complete system testing procedures. If not OK, install a replacement heated seat element. Refer to the procedure in this section.

## 2ND ROW SEAT SYSTEM

(1) Locate the heated seat element connector, located under the seat. Disconnect the appropriate connector. Refer to the wiring section for details.

(2) Check for continuity between the two wires leading to and out of the appropriate heated seat element. There should be continuity. Less than 6 ohms. If OK, refer to Heated Seat Module Diagnosis and Testing in this section for complete system testing procedures. If not OK, install a replacement heated seat cushion element. Refer to the procedure in this section.

## REMOVAL

**NOTE:** Do not remove the factory installed heating elements from the seat or seat back cushions. The original element is permanently attached and cannot be removed without permanent damage. The replacement heating element is designed to be applied directly on top of the factory installed heating element.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the appropriate seat cushion or seat back trim cover.

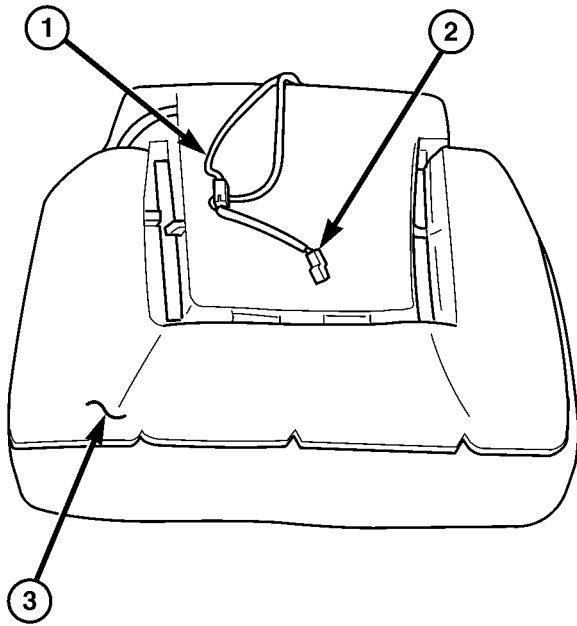
(3) Disconnect the inoperative heated seat cushion or seat back element electrical connectors (Fig. 3).

(4) Locate the wires leading from the inoperative heating element and cut them off flush with the edge of the original heating element.

## INSTALLATION

(1) Peel off the adhesive backing on the back of the replacement heating element and stick directly on top of the factory installed heating element (Fig. 4).

HEATED SEAT ELEMENTS (Continued)

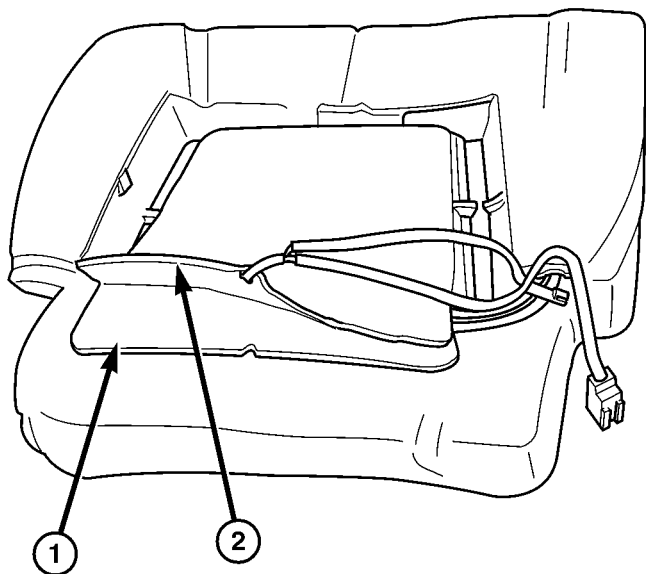


80c91d10

**Fig. 3 HEATING ELEMENT INSTALLED**

- 1 - SEAT BACK WIRE HARNESS
- 2 - HEATED SEAT WIRE HARNESS CONNECTOR
- 3 - HEATED SEAT CUSHION ELEMENT

**CAUTION:** During the installation of the replacement heating element, be careful not to fold or crease the element assembly. Folds or creases will cause premature failure.

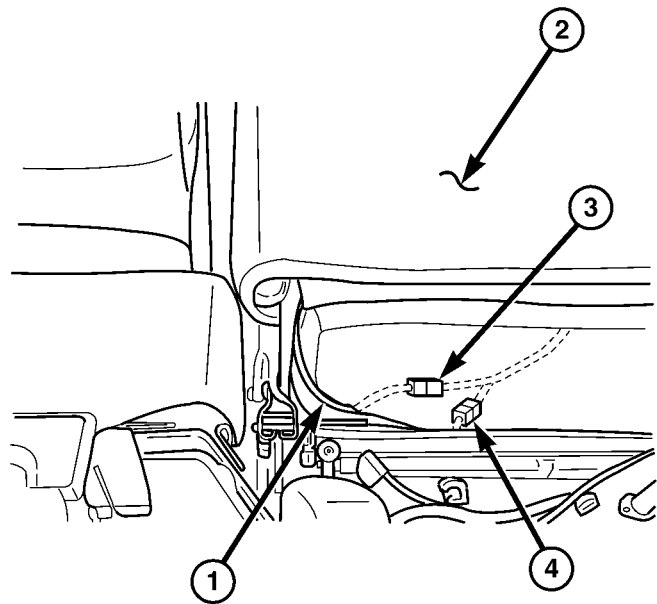


80c91cf2

**Fig. 4 HEATING ELEMENT INSTALLATION**

- 1 - ORIGINAL (INOPERATIVE) HEATING ELEMENT
- 2 - REPLACEMENT HEATING ELEMENT

(2) Connect the new heating element electrical connectors (Fig. 5). **Passenger seat shown, driver seat similar.**



80c91d46

**Fig. 5 HEATED SEAT WIRE HARNESS ROUTING**

- 1 - SEAT BACK HEATED SEAT WIRE HARNESS
- 2 - PASSENGER SEAT BACK
- 3 - SEAT BACK ELEMENT CONNECTOR
- 4 - SEAT CUSHION ELEMENT CONNECTOR

- (3) Connect the battery negative cable.
- (4) Verify heated seat system operation.
- (5) Install the appropriate seat cushion or seat back trim cover.

**NOTE:** Make certain the seat wire harness is correctly routed through the seat and seat back. The excess wire between the cushion and back elements should be securely tucked between the rear of the cushion foam and the rear carpet flap of the trim cover.

HEATED SEAT SENSOR - 2ND ROW SEATS

DESCRIPTION

Two heated seat sensors are used per vehicle. One sensor is located in each heated seat cushion. The heated seat temperature sensors are Negative Temperature Coefficient (NTC) thermistors. The 2nd row seat heated seat sensors are hardwired to the rear heated seat module, located in the 2nd row center console.

## HEATED SEAT SENSOR - 2ND ROW SEATS (Continued)

The heated seat sensors cannot be repaired or adjusted and if found to be faulty, the complete heated seat cushion element must be replaced.

**OPERATION**

The heated seat temperature sensor is a NTC thermistor. When the temperature of the seat cushion cover rises, the resistance of the sensor decreases. The heated seat module supplies five-volts to one side of each sensor, and monitors the voltage drop through the sensor on a dedicated return circuit. The module uses this temperature sensor input to monitor the temperature of the seat and regulate the 12v current flow to the heated seat elements accordingly.

**DIAGNOSIS AND TESTING - HEATED SEAT SENSOR - 2ND ROW SEATS**

For complete circuit diagrams, refer to **WIRING**.

(1) Locate the 2nd row seat heated seat module. Refer to Heated Seat Module in this section for information.

(2) Back-probe the heated seat module wire harness connector, do not disconnect. With the heated seat system "ON", check the heated seat temperature sensor input cavity for a range in voltage from approx. 1.72 – 3.0 volts. It should be within this range, If OK go to Step 3. If NOT OK, check for the proper 5 volt supply to the heated seat sensor, from the module. Refer to the Wiring section for specific information. If the module has the proper 12v and ground supply and 5 volts is not being supplied to the sensor from the module, replace the heated seat module.

(3) Test the seat wire harness between the module connector and the heated seat element wire harness connector for shorted or open circuits. If OK, refer to Diagnosis and Testing the Heated Seat Element, for the proper heated seat element diagnosis and testing procedures. If not OK, repair the shorted or open heated seat wire harness as required.

**HEATED SEAT MODULE - FRONT SEATS****DESCRIPTION**

A Memory Heated Seat/Adjustable Pedal Module (MHSAPM) is used on vehicles that are equipped with the heated seat system option. A Memory Seat/Adjustable Pedal Module (MSAPM) is used on vehicles that are not equipped with the heated seat system option. This module contains all the software and control logic for the front memory/heated and power seat systems, as well as the adjustable foot pedal system. The memory heated seat/adjustable pedal module contains a central processing unit and

interfaces with the Programmable Communications Interface (PCI) data bus circuit. Refer to the **Heated Seat System** section for more information on the heated seat system. Refer to the **Power Seat System** section for more information on the power/memory seat system.

The module is packaged in a black molded plastic case which is mounted under the edge of the driver side front seat cushion. This location makes it somewhat difficult to access because it sits between the power seat track and the seat cushion frame. Refer to the following procedure in this section for detailed removal and installation instructions.

For diagnosis of the MHSAPM or the PCI data bus, a DRB III® scan tool and the Diagnostic Procedures Manual are recommended. The Memory Heated Seat/Adjustable Pedal Module cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

**OPERATION**

The Memory Heated Seat/Adjustable Pedal Module controls the heated, power and memory seat systems as well as the adjustable foot pedal system. However different, these systems share some software inside the module. Refer to the following text which explains how the different systems are controlled by the memory heated seat/adjustable pedal module.

**FRONT HEATED SEAT SYSTEM OPERATION**

When either of the front heated seat switches are depressed a resistor multi-plexed signal is sent to the corresponding door module (Driver or Passenger). The applicable Door Module then sends a message via the Programmable Communications Interface (PCI) data bus network to the Memory Heated Seat Adjustable Pedal Module (MHSAPM), signaling the module to energize the heating element for the selected seat. Light Emitting Diodes (LEDS) in each switch indicate the level of heat in use. The switch LEDs are controlled by the applicable Door Module.

The MHSAPM energizes an integral solid-state relay, which supplies battery current to the seat heating elements. When high-temperature heating is selected, the heaters provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal selected-temperature level. If high-level heating is selected, the control system will automatically switch to the low level after two hours of continuous operation. Operation on the low setting turns off only when the ignition switch is turned off or the heated seat switch is pressed a second time indicating an off command.



## HEATED SEAT MODULE - FRONT SEATS (Continued)

## MEMORY SEAT SYSTEM OPERATION

Depressing any of the drivers front door trim panel mounted, memory seat switches sends a hardwired, resistor multi-plexed signal to the drivers door module. The door module then sends a PCI data bus message to the Memory Heated Seat/Adjustable Pedal Module (MHSAPM). The module detects the memory seat switch status via the PCI data bus circuit and energizes the appropriate power seat motors. The programmed software in the MHSAPM allows it to know the location of the seat track by a resistance value generated from the seat track mounted potentiometers. When the correct preset location is achieved the module will de-energize the power seat track motors. The MHSAPM will prevent the seat memory recall function from being initiated if the transmission gear selector lever is not in the Park or Neutral positions, or if the vehicle is moving. These inputs are monitored over the PCI data bus circuit.

## ADJUSTABLE FOOT PEDAL SYSTEM OPERATION

Depressing the adjustable foot pedal switch sends a hardwired, resistor multi-plexed signal to the drivers door module. The door module then sends a PCI data bus message to the Memory Heated Seat/Adjustable Pedal Module (MHSAPM). The module detects the adjustable pedal switch status via the PCI data bus circuit and energizes the appropriate foot pedal motor. When the foot pedal switch is released the module will stop the motor.

Depressing the memory switch will signal the module to move the pedal assembly to the preprogrammed position. The programmed software in the MHSAPM allows it to know the location of the foot pedal assembly by a resistance value generated from the pedal assembly mounted potentiometer. When the correct preset location is achieved the module will de-energize the foot pedal motor. The MHSAPM will prevent the adjustable foot pedal function from being initiated if the transmission gear selector lever is not in the Park or Neutral positions, or if the vehicle is moving. These inputs are monitored over the PCI data bus circuit also.

## DIAGNOSIS AND TESTING - HEATED SEAT MODULE - FRONT SEATS

In order to obtain conclusive testing of the memory heated seat adjustable pedal module, the Programmable Communications Interface (PCI) data bus circuit and any components that provide inputs to the module must be checked.

The most reliable, efficient, and accurate means to diagnose the module requires the use of a DRB III® scan tool and the Service and Body Diagnostic Procedures Manuals. The DRB III® scan tool can provide vital information to the technician trying to find a

problem with the module. Diagnostic logic software is built into the memory heated seat adjustable pedal module to help the person trying to locate the problem by the most efficient means possible. Anytime a problem is suspected, a DRB III® scan tool should be obtained and used to retrieve any stored fault codes in the memory heated seat adjustable pedal module. If diagnostic fault codes are present in the module, record them on a piece of paper immediately before proceeding any further. Then, use these fault codes to identify the problem by verifying the fault code. Example, If the module records "DRIVER SEAT HEAT OUTPUT OPEN" fault, locate the diagnostic procedure for this code in the appropriate Body Diagnostic Procedures Manual and follow the flow chart until the specific problem is located and resolved. Once the problem is corrected, erase the stored fault code using the DRB III® scan tool and verify correct heated seat system operation. If the heated seat system appears to be functioning correctly, verify that there are no other stored codes in the module and return the vehicle to service.

If the fault code could not be verified, such as not finding anything wrong when following the diagnostic flow chart in the Body Diagnostic Procedures Manual. This is a good indication that a INTERMITTENT problem may be present. You must than attempt to find the intermittent problem, such as moving the heating element within the seat while testing continuity or wiggling the wire harness's/electrical connectors under the seat while testing continuity. Always, eliminate all other potential problems before attempting to replace the memory heated seat adjustable pedal module.

For complete circuit wiring diagrams, refer to **Wiring**.

## PRELIMINARY TEST

Before testing the individual components in the suspect system, check the following:

(1) Using the DRB III® scan tool, check the memory heated seat adjustable pedal module (MHSAPM) for any stored fault codes. Record these codes on paper for reference and resolve using the appropriate Body Diagnostic Procedures Manual.

(2) Check the vehicles battery open-circuit voltage and charging system performance. If the vehicles electrical system is defective or weak it may not be supplying sufficient voltage to operate the system in question.

## REMOVAL

(1) Position the drivers seat as far upward and rearward as possible.

(2) Open hood, disconnect and isolate the negative battery cable.

## HEATED SEAT MODULE - FRONT SEATS (Continued)

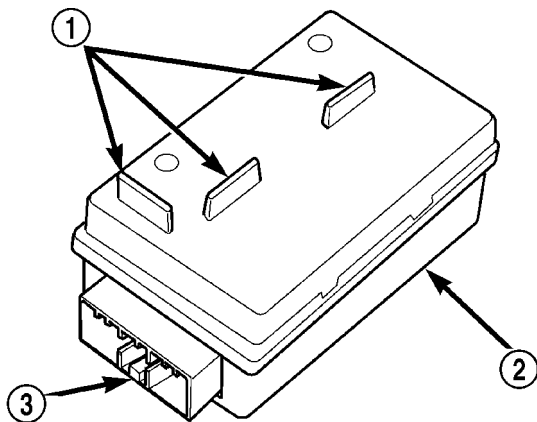
- (3) Remove the memory heated seat adjustable pedal module attaching screws.
- (4) Disconnect the module electrical connectors.
- (5) Remove the module from under drivers seat.

## INSTALLATION

- (1) Position the memory heated seat adjustable pedal module under the drivers seat.
- (2) Connect the module electrical connectors.
- (3) Install the module attaching screws.
- (4) Connect the negative battery cable.
- (5) Position the drivers seat in its original position.
- (6) Verify correct system operation.

## HEATED SEAT MODULE - 2ND ROW SEATS

## DESCRIPTION



**Fig. 6 Heated Seat Module - 2nd Row Seat**

- 1 - MOUNTING TABS (NOT USED ON CS)
- 2 - HEATED SEAT MODULE
- 3 - ELECTRICAL CONNECTOR RECEPTACLE

The 2nd row seat heated seat module (Fig. 6) is located in the rear seat center console, where it is secured by two retaining fasteners. The heated seat module has a single electrical connector receptacle that connects all of the inputs and outputs through the seat and body wire harnesses.

The heated seat module is an electronic microprocessor controlled device designed and programmed to use inputs from the battery, the two heated seat switches and the two heated seat sensors to operate and control the 2nd row seat heated seat system. The module is also designed to provide outputs to the heated seat elements in both 2nd row seats and the two heated seat indicator lamp Light-Emitting Diodes (LEDs) in each 2nd row heated seat switch. The heated seat module is able to perform some self-diagnosis of certain heated seat system faults and

provide feedback of that diagnosis through the heated seat switch indicator lamps.

The heated seat module cannot be repaired. If the heated seat module is damaged or faulty, the entire module must be replaced.

## OPERATION

When a 2nd row heated seat switch is depressed a resistance (ohms) signal is sent to the heated seat module, the module energizes the proper indicator LED (Low or High) in the switch by grounding the indicator lamp circuit to indicate that the heated seat system is operating. At the same time, the heated seat module energizes the selected heated seat sensor circuit and the sensor provides the module with an input indicating the surface temperature of the seat cushion.

The Low heat set point is about 35° C (95° F), and the High heat set point is about 40° C (104° F). If the heated seat sensor temperature input is below the temperature set point for the selected temperature setting, the heated seat module energizes an N-channel Field Effect Transistor (N-FET) within the module which energizes the heated seat elements in the selected seat cushion and back. When the sensor input to the module indicates the correct temperature set point has been achieved, the module de-energizes the N-FET which de-energizes the heated seat elements. The heated seat module will continue to cycle the N-FET as needed to maintain the selected temperature set point. The 2nd row heated seat module operates on fused battery current received from the integrated power module.

If the heated seat module detects a heated seat sensor value input that is out of range or a shorted or open heated seat element circuit, it will notify the vehicle operator or the repair technician of this condition by flashing the High and/or Low indicator lamps in the affected heated seat switch. Refer to **Diagnosis and Testing Heated Seat System** in the Heated Seat System section for flashing LED diagnosis and testing procedures. Refer to **Diagnosis and Testing Heated Seat Module** in the Electronic Control Module section for heated seat module diagnosis and testing procedures.

## DIAGNOSIS AND TESTING - HEATED SEAT MODULE - 2ND ROW SEATS

If a heated seat fails to heat and one or both of the indicator lamps on a heated seat switch flash, refer to **Diagnosis and Testing Heated Seat System** in the Heated Seat section for the location of flashing LED heated seat system diagnosis and testing procedures. If a heated seat heats but one or both indicator lamps on the heated seat switch fail to operate, test the heated seat switch. Refer to **Diagnosis and**

## HEATED SEAT MODULE - 2ND ROW SEATS (Continued)

**Testing Heated Seat Switch** in Heated Seats for heated seat switch diagnosis and testing procedures. If the heated seat switch checks OK, proceed as follows.

(1) Check the heated seat element (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - DIAGNOSIS AND TESTING).

(2) Check the heated seat sensor (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT SENSOR - DIAGNOSIS AND TESTING).

(3) Check the heated seat switch (Refer to 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING).

**NOTE:** Refer to the Wiring section for the location of complete heated seat system wiring diagrams and connector pin-out information.

(4) Using a voltmeter, backprobe the heated seat module connector, do not disconnect. Check for voltage at the appropriate pin cavities. 12v should be present. If OK go to Step 5, if Not, Repair the open or shorted voltage supply circuit as required.

(5) Using a ohmmeter, backprobe the heated seat module connector, do not disconnect. Check for proper continuity to ground on the ground pin cavities. Continuity should be present. If OK replace the heated seat module with a known good unit and retest system, if Not OK, Repair the open or shorted ground circuit as required.

## REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the 2nd row seat center console. Refer to the Body section for the procedure.

(3) Disconnect the wire harness connector from the heated seat module. Depress the connector retaining tab and pull straight apart.

(4) Remove the heated seat module retaining fasteners and remove.

## INSTALLATION

(1) Position the heated seat module and install retaining fasteners.

(2) Connect the wire harness connector on the heated seat module.

(3) Install the 2nd row seat center console. Refer to the Body section for the procedure.

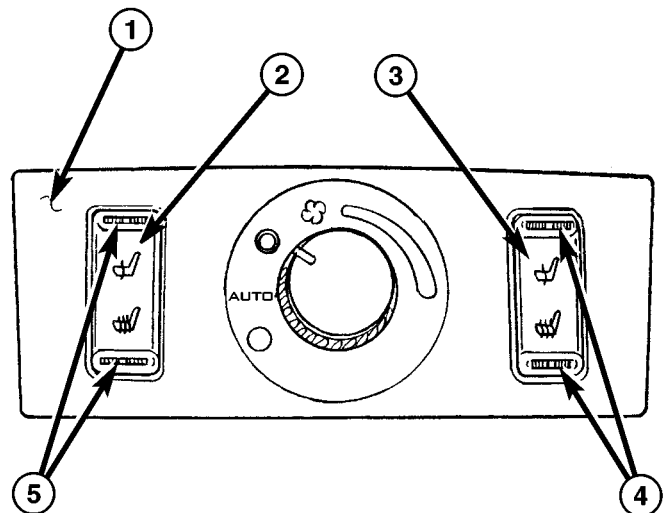
(4) Connect the negative battery cable.

(5) Verify correct 2nd row heated seat system operation.

## HEATED SEAT SWITCHES - 2ND ROW SEATS

### DESCRIPTION

The two momentary, bidirectional rocker-type heated seat switches (Fig. 7) provide a resistive multi-plexed signal to the heated seat module via a hard-wired mux circuit. Each switch has a center neutral position and Low and High position so that both 2nd row seat passengers can select a preferred level of seat heating. Each heated seat switch has two Light-Emitting Diode (LED) indicator lamps, which indicate the selected mode (Low or High) of the system. These indicator lamps also provide diagnostic feedback for the 2nd row heated seat system. Each switch also contains an incandescent bulb, which provides back lighting of the switch when the headlamps or park lamps are on.



8108ce7c

**Fig. 7 2nd Row Heated Seat Switches and Bezel**

- 1 - Switch Bezel
- 2 - Left 2nd Row Seat Switch
- 3 - Right 2nd Row Seat Switch
- 4 - Right LED Indicator Lamps
- 5 - Left LED Indicator Lamps

The heated seat switches are both mounted in the 2nd row seat center console. The two switches are snapped into mounting holes in the console switch bezel (Fig. 7). The heated seat switches are differentiated by the keyway in the electrical connector receptacle on the backs of the switches and a keyway on the switch housing. The wire harness connectors for the heated seat switches are keyed to match the connector receptacles on the switches so that the two

## HEATED SEAT SWITCHES - 2ND ROW SEATS (Continued)

heated seat switches can only be connected to the proper heated seat electrical.

The two LED indicator lamps and the incandescent bulb in each heated seat switch cannot be repaired. If the indicator lamps or back lighting bulb are faulty or damaged, the individual heated seat switch must be replaced.

**OPERATION**

The 2nd row heated seat switches receive battery current through a fused ignition switch output (run) circuit when the ignition switch is in the On position. Depressing the heated seat switch rocker to its High or Low position provides a hard-wired resistance signal to the heated seat module. This signals the module to energize the heated seat element of the selected seat and maintain the requested temperature setting. If the heated seat switch is depressed to a different position (Low or High) than the currently selected state, the heated seat module will change states to support the new selection. If a heated seat switch is depressed a second time, the heated seat module interprets the second input as a request to turn the seat heater OFF.

The ground side of each LED indicator lamp is controlled by the heated seat module. This control of the switch indicator lamps also allows the module to provide diagnostic feedback to the vehicle operator or technician to indicate heated seat system faults by flashing the indicator lamps on and off. Refer to Heated Seat System Diagnosis and Testing for more information.

**DIAGNOSIS AND TESTING - HEATED SEAT SWITCHES - 2ND ROW SEATS**

Refer to Wiring for connector pin-outs and the location of complete heated seat system wiring diagrams.

(1) Disconnect and isolate the battery negative cable. Remove the 2nd row seat center console switch to access the heated seat switch. Disconnect the heated seat switch to be tested. Check for continuity between the ground circuit cavity of the heated seat switch and a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open ground circuit as required.

(2) Reconnect the battery negative cable. Turn the park lamps "ON". Check for battery voltage at the fused panel lamps dimmer circuit cavity of the heated seat switch. If OK, go to Step 3. If not OK, repair the open fused panel lamps dimmer circuit as required.

(3) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition feed circuit cavity of the heated seat switch. If OK, go to Step 4. If not OK, repair the open fused ignition feed circuit as required.

(4) Check the continuity and resistance values of the heated seat switch in the Neutral, Low and High positions as shown in the Heated Seat Switch Continuity chart. If OK, refer to Step 5. If not OK, replace the faulty heated seat switch.

*TESTING HEATED SEAT SWITCH*

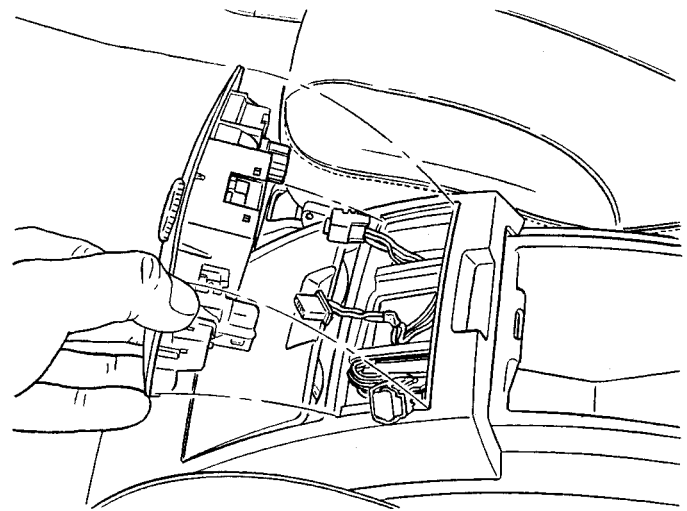
Switch Position	Continuity Between	Resistance $\pm$ 4%
Neutral	4 & 6	2.2 Kilohms (2200 Ohms)
Low	4 & 6	.415 Kilohms (415 Ohms)
High	4 & 6	33 Ohms

(5) Replace the inoperative heated seat switch with a known good unit and test the operation of the system and switch indicator lamps. If OK, discard the faulty heated seat switch. If not OK, refer to Diagnosis and Testing Heated Seat Module - 2nd Row Seats.

**REMOVAL**

(1) Disconnect and isolate the negative battery cable.

(2) Remove the 2nd row seat center console switch bezel (Fig. 8) it will be necessary to remove entire top cover. Refer to the Body section for the procedure.



8108ce8d

**Fig. 8 Removing 2nd Row Heated Seat Switch Bezel**



## HEATED SEAT SWITCHES - 2ND ROW SEATS (Continued)

(3) From the back of the heated seat switch bezel, gently pry the switch free (Fig. 9) and push the heated seat switch out through the back of the bezel.

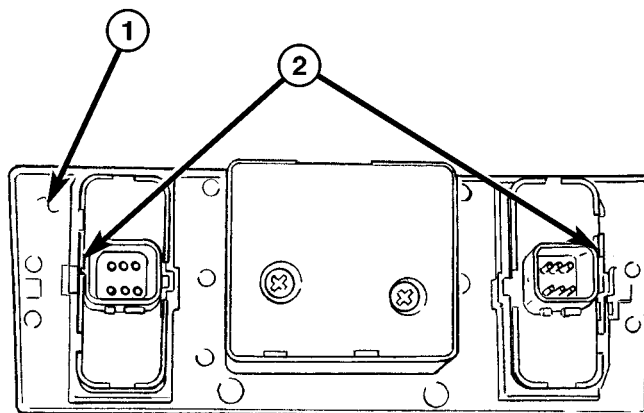
**INSTALLATION**

(1) From the back of the heated seat switch bezel, gently push the heated seat switch in through the front of the bezel.

(2) Install the 2nd row seat center console top cover in the vehicle. Refer to the Body section for the procedure.

(3) Connect the negative battery cable.

(4) Verify 2nd row heated seat system operation.



8108ce65

**Fig. 9 Removing 2nd Row Heated Seat Switches**

- 1 - Switch Bezel  
2 - Insert Flat-Bladed Pry Tool Here