

HEATED SEAT SYSTEM

TABLE OF CONTENTS

	page		page
HEATED SEAT SYSTEM			
DESCRIPTION	3	OPERATION	7
OPERATION	4	DIAGNOSIS AND TESTING - HEATED SEAT	
DIAGNOSIS AND TESTING - HEATED SEAT		SENSOR	7
SYSTEM	4	REMOVAL	7
HEATED SEAT ELEMENT		HEATED SEAT SWITCH	
DESCRIPTION	5	DESCRIPTION	7
OPERATION	6	OPERATION	8
DIAGNOSIS AND TESTING - HEATED SEAT		DIAGNOSIS AND TESTING - HEATED SEAT	
ELEMENT	6	SWITCH	8
REMOVAL	6	REMOVAL	9
INSTALLATION	6	INSTALLATION	9
HEATED SEAT SENSOR			
DESCRIPTION	7		

HEATED SEAT SYSTEM

DESCRIPTION

Individually controlled, electrically heated front seats are available as a factory-installed option on some DR models. Vehicles with this option can be visually identified by the leather trim seats and two separate heated seat switches mounted in the lower center of the instrument panel. The heated seat system allows the front seat driver and passenger to select from two different levels of electrical seat heating, or no seat heating to suit their individual comfort requirements. The heated seat system for this vehicle includes the following major components, which are described in further detail later in this section:

- **Heated Seat Switches** - Two heated seat switches are used per vehicle. One switch is used for each front seat. The switches are mounted in the instrument panel, below the radio (Fig. 1). Each switch also includes two Light-Emitting Diode (LED) indicator lamps and an incandescent back lighting bulb.

- **Heated Seat Module** - also referred to as the Seat Heat Interface Module (SHIM), this module contains the solid state electronic control and diagnostic logic circuitry for the heated seat system. One heated seat module is used per vehicle and is mounted under the drivers front seat cushion (Fig. 1). Refer to the Electronic Control Modules section of the service manual for additional heated seat module information.

- **Heated Seat Elements** - Four heated seat elements are used per vehicle. One element is used for each front seat back and one element and sensor assembly is used for each front seat cushion (Fig. 1). The heating elements are integral to the individual front seat and seat back cushions and cannot be removed once installed at the factory. Replacement seat heating elements are available, without having to replace the entire seat cushion or trim cover. Refer to the detailed procedure later in this section.

- **Heated Seat Sensors** - Two heated seat sensors are used per vehicle. One heated seat temperature sensor is used for each front seat cushion. The sensors are integral to the individual front seat cushion heating elements (Fig. 1) and cannot be removed once installed at the factory. Replacement seat heating elements with the sensors are available, without having to replace the entire seat cushion or trim cover. Refer to the detailed procedure later in this section.

Following are general descriptions and operations of the major components in the heated seat system. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the heated seat system. Refer to **Wiring** for the location of complete heated seat system wiring diagrams.

HEATED SEAT SYSTEM (Continued)

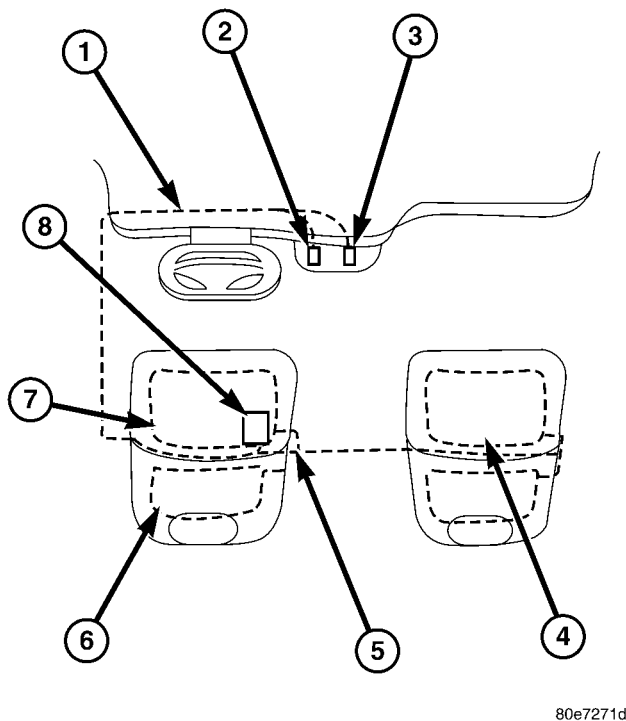


Fig. 1 DR Heated Seat System Diagram

- 1 - WIRE HARNESS
- 2 - DRIVER HEATED SEAT SWITCH
- 3 - PASSENGER HEATED SEAT SWITCH
- 4 - PASSENGER HEATED SEAT CUSHION ELEMENT
- 5 - SEAT CUSHION/BACK ELEMENT ELECTRICAL CONNECTOR LOCATION
- 6 - DRIVER HEATED SEAT BACK ELEMENT
- 7 - DRIVER HEATED SEAT CUSHION ELEMENT
- 8 - HEATED SEAT MODULE

OPERATION

The heated seat module receives fused battery current through the Integrated Power Module only when the engine is running. The heated seat switches receive battery current through fuse #48 in 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 heated seat system will also automatically turn off whenever the ignition switch is turned to any position except On, or if the engine quits running. If the ignition switch is turned to the Off position or if the engine quits running while a heated seat is ON, the heated seat will remain Off after the engine is restarted until a heated seat switch is depressed again. This helps prevent the vehicles battery from being drained by the heated seat system.

The heated seat module monitors inputs from the heated seat sensors and the heated seat switches. In response to these inputs the heated seat module uses its internal programming to control 12v to the heated seat elements in both front seats and to control the heated seat LED indicator lamps located in both of the heated seat switches. The heated seat module is also programmed to provide self-diagnostics, if a problem with the heated seat system is detected. If the module detects certain failures 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 heated seat module will automatically turn off the heated seat elements if it detects a short or open in the heated seat element circuit or a heated seat sensor value that is out of range.

DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM

HEATED SEAT SYSTEM SELF-DIAGNOSIS

The heated seat system is capable of performing some self-diagnostics. The following table depicts the various monitored failures which will be 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 for failure identification. The drivers heated seat switch indicator lamps will flash if a failure occurs in the driver heated seat, and the passengers heated seat switch indicator lamps will flash for a passenger heated seat failure. If a monitored heated seat system failure occurs, the switch indicator lamps will flash at a pulse rate of about one-half second on, followed by about one-half second off for a duration of about 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 High Indicator Lamp	Switch Low Indicator Lamp
Heated Seat Element Shorted	Flashing	Flashing
Heated Seat Element Open	Flashing	Off
Heated Seat Sensor Value Out of Range	Off	Flashing

HEATED SEAT SYSTEM (Continued)

Diagnostic logic is built into the 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. 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. Always, eliminate all other potential problems before attempting to replace the heated seat module.

PRELIMINARY TEST

Refer to **Wiring** for the location of complete heated seat system wiring diagrams. Before testing the individual components in the heated seat system, perform the following preliminary checks:

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

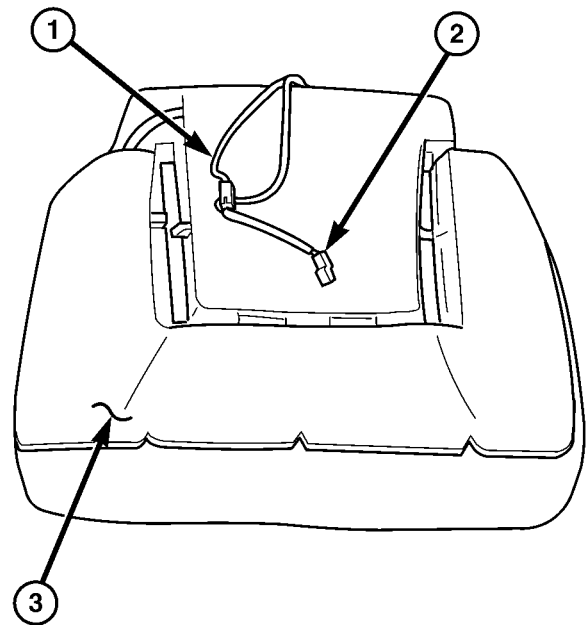
- If the heated seat switch back lighting and the cluster illumination lamps do not illuminate with the headlamps or park lamps turned On, refer to the **Instrument Cluster** section of the service manual for the location of cluster illumination lamp diagnosis and testing procedures. If the heated seat switch back lighting does not illuminate, but the cluster illumination lamps do illuminate with the headlamps or park lamps turned On, refer to **Diagnosis and Testing the Heated Seat Switch** in this section for the location of the heated seat switch diagnosis and testing procedures.

- If a single LED indicator lamp for one heated seat switch does not operate and the heated seat elements do heat, refer to **Diagnosis and Testing the**

Heated Seat Switch in this section for heated seat switch diagnosis and testing procedures.

- If both LED indicator lamps for a heated seat switch operate, but the heated seat elements do not heat, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules for heated seat module diagnosis and testing procedures.

- If the indicator lamp on either heated seat switch remains illuminated after the heated seat has been turned Off, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules for heated seat module diagnosis and testing procedures.

HEATED SEAT ELEMENT**DESCRIPTION**

80c91d10

Fig. 2 Heating Element Installed on Seat Cushion Foam

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

Vehicles equipped with the optional heated seat system have two sets of electrically operated heating element grids located in each front seat, one set for the seat cushion and the other set for the seat back. Each of the heated seat element grids consists of a single length of resistor wire that is routed in a zig-zag pattern and captured between a covering and the adhesive foam rubber backing. Short pigtail wires with connectors (Fig. 2) are soldered to each end of each resistor wire element grid, which connect all of

HEATED SEAT ELEMENT (Continued)

the element grids to the heated seat module through the seat wire harness.

One temperature sensor is used for each front seat, and it is located in the center insert area of the seat cushion element. The heated seat sensors and their pigtail wires are also captured between a covering and the adhesive foam rubber backing. The heated seat sensors are Negative Thermal Coefficient (NTC) thermistors. The sensors for both front seats receive a voltage feed from a single output of the heated seat module, but the module receives individual sensor inputs from the driver side and passenger side sensors.

The heated seat elements and sensors should not be repaired. If damaged or faulty, the heated seat element assembly must be replaced.

OPERATION

One end of the heated seat element resistor wire is connected to ground at all times through a splice in the heated seat module ground circuit. Battery current is directed to the other end of the heated seat element resistor wire by the energized N-channel Field Effect Transistor (N-FET) located within the heated seat module. The heated seat module will energize the N-FET only when the heated seat switch is in the Low or High position and the heated seat sensor indicates that the seat cushion surface temperature is below the selected (Low or High) temperature set point. As electrical current passes through the heating element grid, the resistance of the wire used in the element disperses some of that electrical current in the form of heat. The heat produced by the heated seat element grid then radiates through the seat trim cover, warming its occupant.

The resistance of the heated seat sensor increases and decreases as the surface temperature of the seat cushion cover changes. The heated seat module supplies each sensor with a 5v voltage feed, then uses the sensor resistance to determine when the heated seat element grids need to be cycled on or off in order to maintain the selected temperature set point.

DIAGNOSIS AND TESTING - HEATED SEAT ELEMENT

The heated seat module will self-diagnose shorted or open heated seat element circuits and sensor circuits. Refer to Heated Seat System Diagnosis and Testing in this section for additional diagnosis and testing procedures. To manually check the heated seat element, proceed as follows. The wire harness connectors for the seat cushion and seat back heating elements and sensor are located on the right side of the seat, near the edge of the seat cushion frame. The proper connector can be identified by the foam wrapping.

NOTE: When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as sitting in the seat will eliminate the possibility of an intermittent open in the element which would only be evident if the element was in a certain position. Failure to check the element in various positions could result in an incomplete test.

(1) Position the appropriate seat in the full forward position.

(2) Make certain the ignition switch is in the OFF position.

(3) Disconnect the heated seat element connector which requires testing. Check for continuity between the two heated seat element circuit cavities while moving the appropriate seat cushion. Refer to **Wiring** for the location of complete heated seat system wiring diagrams. There should be continuity. If OK, the elements within the seat assembly test OK, go to Step 4. If not OK, replace the faulty seat heating element, refer to the procedure in this section.

(4) Test the seat wire harness between the heated seat module connector and the appropriate heated seat wire harness connector for shorted or open circuits. If OK, element is OK, proceed with testing the heated seat sensor and module. If not OK, repair the shorted or open seat wire harness as required.

REMOVAL

Do not remove the heating element from the seat or seat back cushion. The original element is permanently attached to the seat cushions and cannot be removed without damaging the cushion. The replacement heating element is designed to be applied directly over the original seat heating element.

(1) Disconnect and isolate the negative battery cable.

(2) Remove the appropriate seat cushion or seat back trim cover. Refer to the Body section of this manual for the procedures.

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

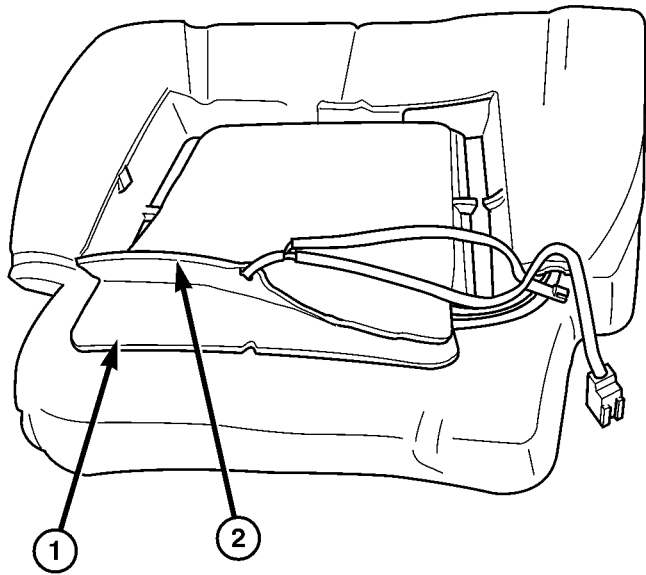
(4) Locate the wires leading from the inoperative heating element and cut them off flush with the edge of the original heating element.

INSTALLATION

(1) Peel off the adhesive backing on the back of the replacement heating element and stick directly over the original heating element (Fig. 3).

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.

HEATED SEAT ELEMENT (Continued)



80c91cf2

Fig. 3 Heating Element Installation

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

- (2) Connect the new heating element electrical connectors (Fig. 2).
- (3) Connect the battery negative cable.
- (4) Verify heated seat system operation.
- (5) Install the appropriate seat cushion or seat back trim cover. Make certain the seat wire harness is correctly routed through the seat and seat back.

HEATED SEAT SENSOR

DESCRIPTION

The heated seat temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. One temperature sensor is used for each seat. This temperature sensor is located in the seat cushion heating element on all models.

The heated seat temperature sensor cannot be repaired or adjusted and must be replaced if defective. The heated seat cushion element must be replaced if the temperature sensor is defective. Refer to the procedure in this section of the service manual.

OPERATION

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 return circuit. The heated seat module uses this temperature sensor input to monitor

the temperature of the seat, and regulates the current flow to the seat heating elements accordingly.

DIAGNOSIS AND TESTING - HEATED SEAT SENSOR

NOTE: Any resistance values (OHMS Ω) given in the following text are supplied using the automatic range generated by a FLUKE® automotive meter. If another type of measuring device is used, the values generated may not be the same as the results shown here, or may have to be converted to the range used here.

- (1) Position the driver seat in the full rearward position.
- (2) Undip the heated seat module from the bottom of the drivers seat cushion pan.
- (3) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity (#7 for passenger, #8 for driver seat) for a range in voltage from approx. 1.72 – 3.0volts. It should be within this range, If OK check the heated seat element. If NOT OK, check for the proper 5 volt supply to the heated seat sensor, from the module. Refer to Wiring for specific information. If 5 volts is not being supplied to the sensor from the module, replace the heated seat module.

(4) Test the seat wire harness between the heated seat module connector and the heated seat wire harness connector for shorted or open circuits. If OK, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules, for the proper heated seat module diagnosis and testing procedures. If not OK, repair the shorted or open heated seat wire harness as required.

REMOVAL

- (1) For heated seat sensor replacement procedure (Refer to 8 - ELECTRICAL HEATED SEATS/ HEATED SEAT ELEMENT - REMOVAL).

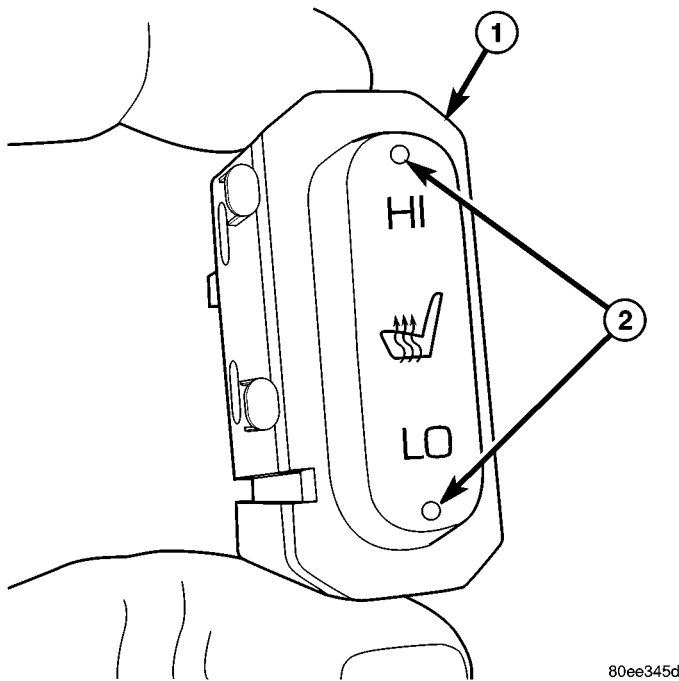
HEATED SEAT SWITCH

DESCRIPTION

The momentary, bidirectional rocker-type heated seat switch (Fig. 4) provides a resistor-multiplexed signal to the heated seat module via a mux circuit. Each switch has a center neutral position and momentary Low and High positions so that both the driver and the front seat passenger 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 seat heater. These indicator lamps also provide

HEATED SEAT SWITCH (Continued)

diagnostic feedback for the heated seat system. Each switch also has an incandescent bulb, which provides dimmer controlled back lighting of the switch when the headlamps or park lamps are on.



80ee345d

Fig. 4 HEATED SEAT SWITCH

- 1 - HEATED SEAT SWITCH
2 - LIGHT-EMITTING DIODE (LED) INDICATOR LAMPS

The heated seat switches are both mounted in the instrument panel center bezel, located in the lower center of the instrument panel. The two switches are snapped into the mounting holes of the heated seat switch bezel, and the heated seat switch bezel is secured with screws to the instrument panel center bezel. The heated seat switches are differentiated by the keyway in the connector receptacle on the backs of the switches and keyway on the switch housing. The instrument panel 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 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 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 momentary High or Low position provides a hard-

wired resistance signal to the heated seat module. This signal tells 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 High and Low LED indicator lamps in the heated seat switches receive battery current through a fused ignition switch output (run) circuit when the ignition switch is in the On position. The ground side of each 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. One side of the incandescent back lighting bulb in each heated seat switch is connected to ground at all times. The other side of the incandescent bulb is connected to the fused panel lamps dimmer switch signal circuit. These bulbs are energized when the park lamps or headlamps are turned on, and their illumination intensity is controlled by the panel lamps dimmer switch.

DIAGNOSIS AND TESTING - HEATED SEAT SWITCH

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

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) If the problem being diagnosed involves inoperative heated seat switch back lighting and the cluster illumination lamps operate, go to Step 2. If the problem being diagnosed involves inoperative heated seat switch back lighting and the cluster illumination lamps are also inoperative, (Refer to 8 - ELECTRICAL INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the problem being diagnosed involves

HEATED SEAT SWITCH (Continued)

inoperative heated seat switch indicator lamps and the heated seat elements do not heat, proceed. If the problem being diagnosed involves inoperative heated seat switch indicator lamps and the heated seat elements do heat, go to Step 6. If the problem being diagnosed involves a heated seat switch indicator lamp that remains illuminated after the heated seat has been turned Off, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING).

(2) Disconnect and isolate the battery negative cable. Remove the heated seat switch and bezel unit from the instrument panel. 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 3. If not OK, repair the open ground circuit to ground as required.

(3) Reconnect the battery negative cable. Turn the park lamps on with the headlamp switch. Rotate the panel lamps dimmer thumb wheel on the headlamp switch upward to just before the interior lamps detent. Check for battery voltage at the fused panel lamps dimmer circuit cavity of the heated seat switch. If OK, go to Step 4. If not OK, repair the open fused panel lamps dimmer switch signal circuit to the fuse in the Integrated Power Module as required.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity of the heated seat switch. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run) circuit as required.

(5) 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 6. If not OK, replace the faulty heated seat switch.

HEATED SEAT SWITCH CONTINUITY

Switch Position	Continuity Between	Resistance
Neutral	4 & 6	2.2 Kilohms
Low	4 & 6	.415 Kilohms
High	4 & 6	33 Ohms

(6) Replace the inoperative heated seat switch with a known good unit and test the operation of the switch indicator lamps. If OK, discard the faulty heated seat switch. If not OK, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING).

REMOVAL

- (1) Disconnect and isolate the negative battery cable.
- (2) Wait two minutes for the system reserve capacitor to discharge before beginning any airbag or instrument panel service.
- (3) Remove the center bezel from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
- (4) Remove the screws that secure the heated seat switch bezel to the instrument panel center bezel.
- (5) Remove the heated seat switch bezel and both switches from the instrument panel as a unit.
- (6) From the back of the heated seat switch bezel, gently pry the switch free and push the heated seat switch out through the front of the bezel.

INSTALLATION

NOTE: When installing the heated seat switches, be certain they are installed in the proper mounting holes of the heated seat switch bezel. The heated seat switches are differentiated by the keyway in the connector receptacle on the backs of the switches and keyway on the switch housing (Fig. 4).

- (1) From the back of the heated seat switch bezel, gently push the heated seat switch in through the front of the bezel.
- (2) Position the heated seat switch bezel to the instrument panel center bezel and install the retaining screws.
- (3) Install the center bezel on the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
- (4) Connect the battery negative cable.
- (5) Verify vehicle and system operation.