

HEATED SYSTEMS

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HEATED GLASS - ELECTRICAL DIAGNOSTICS

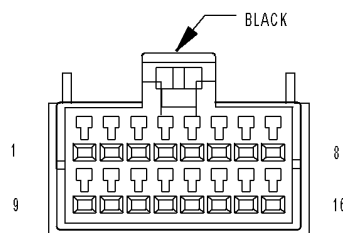
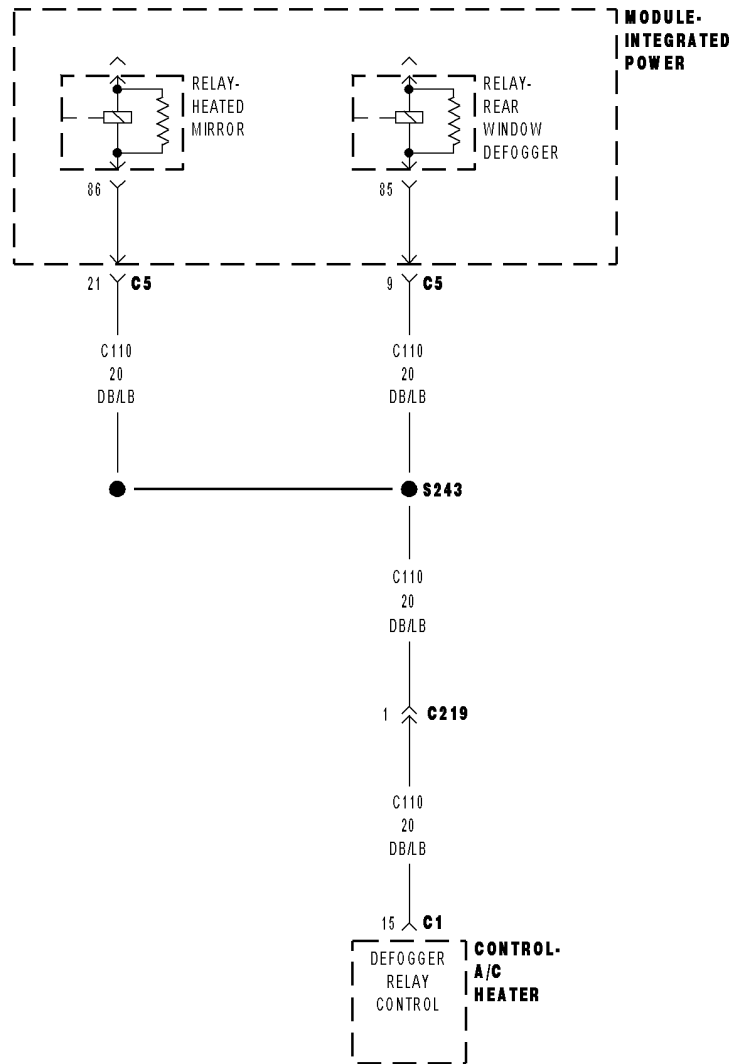
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HEATED GLASS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

DEFOG RELAY CONTROL CKT SHORTED TO BATT



DEFOG RELAY CONTROL CKT SHORTED TO BATT (CONTINUED)

For the Heated Mirror/Rear Defogger circuit diagram (Refer to 8 - ELECTRICAL/HEATED GLASS - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**
With the Ignition on and the EBL (Rear Defogger) switch depressed.
- **Set Condition:**
This DTC will set if the A/C Heater Control senses excessive current on the (C110) Defogger Relay Control circuit.

Possible Causes
HVAC DTCS RELAY SHORTED (C110) DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO BATTERY A/C HEATER CONTROL SHORTED TO BATTERY INTEGRATED POWER MODULE

Diagnostic Test**1. CHECK FOR HVAC DTC'S**

Turn the ignition on.

With the DRBIII®, record and erase DTCs.

Depress the EBL Switch on the A/C Heater Control.

With the DRBIII®, read the active DTCs.

Does the DRBIII® display DEFOG RELAY CONTROL CKT SHORTED TO BATT?

Yes >> Go To 2

No >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Refer to any Hotline letters or Technical Service Bulletins that may apply.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

2. CHECK THE RELAY FOR A SHORT TO BATTERY

Turn the ignition off.

One at a time remove and install a known good relay in place of the Heated Mirror Relay and then the EBL relay if equipped.

NOTE: Do the following steps for each relay.

Turn the ignition on.

With the DRBIII®, record and erase DTCs.

Depress the EBL Switch on the A/C Heater Control.

With the DRBIII®, read the active DTCs.

Does the DRBIII® display DEFOG RELAY CONTROL CKT SHORTED TO BATT?

Yes >> Go To 3

No >> Replace the Relay that set the DTC.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

DEFOG RELAY CONTROL CKT SHORTED TO BATT (CONTINUED)**3. CHECK FOR A SHORTED A/C HEATER CONTROL**

Turn the ignition off.

Remove the Heated Mirror Relay and the EBL relay if equipped from the Integrated Power Module.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

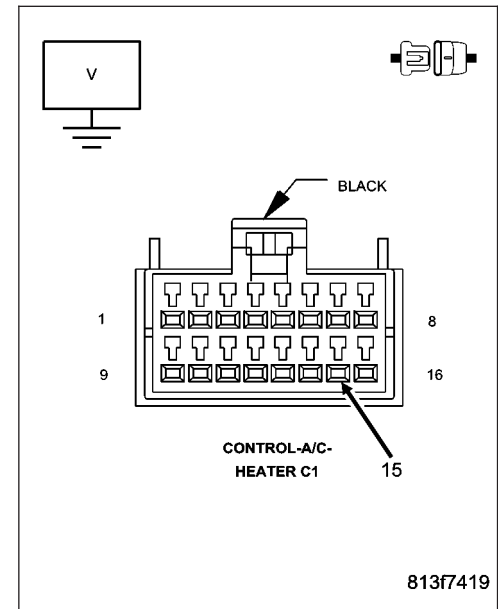
Measure the voltage of the (C110) Defogger Relay Control circuit at the A/C Heater Control C1 harness connector.

Is there any voltage present?

Yes >> Go To 4

No >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**4. CHECK THE (C110) DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO BATTERY**

Turn the ignition off.

Disconnect the Integrated Power Module C5 harness connector.

Turn the ignition on.

Measure the voltage of the (C110) Defogger Relay Control circuit at the A/C Heater Control C1 harness connector.

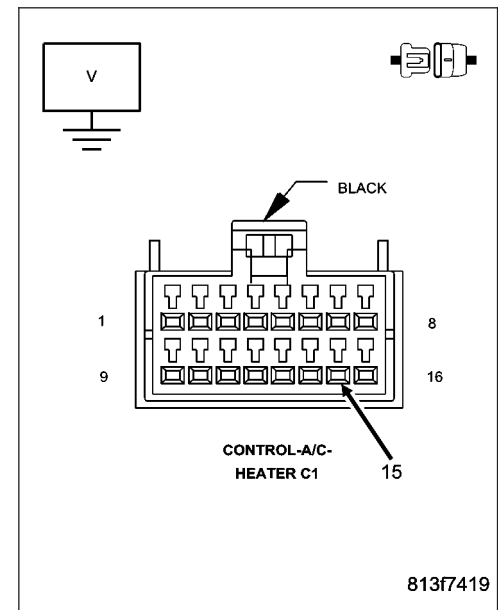
Is there any voltage present?

Yes >> Repair the (C110) Defogger Relay Control circuit for a short to battery.

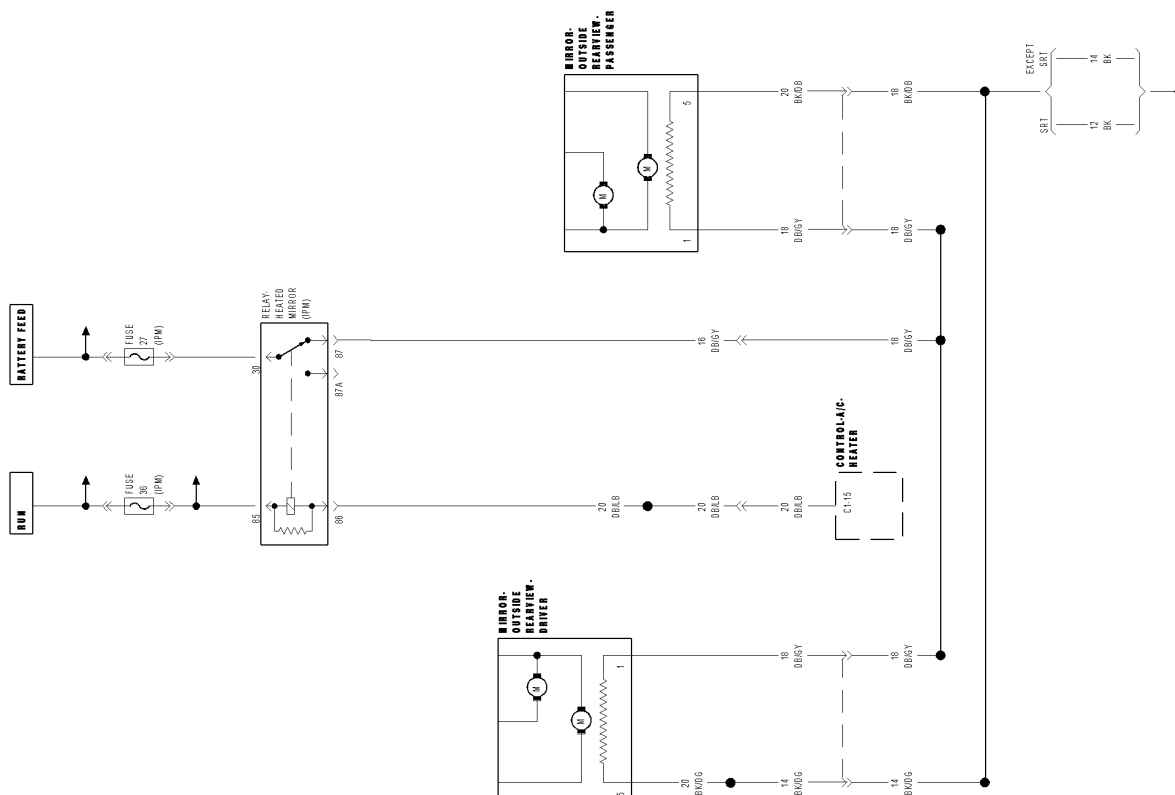
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Replace the Integrated Power Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



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HEATED GLASS SYSTEM

HEATED GLASS - SERVICE INFORMATION

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HEATED GLASS - SERVICE INFORMATION

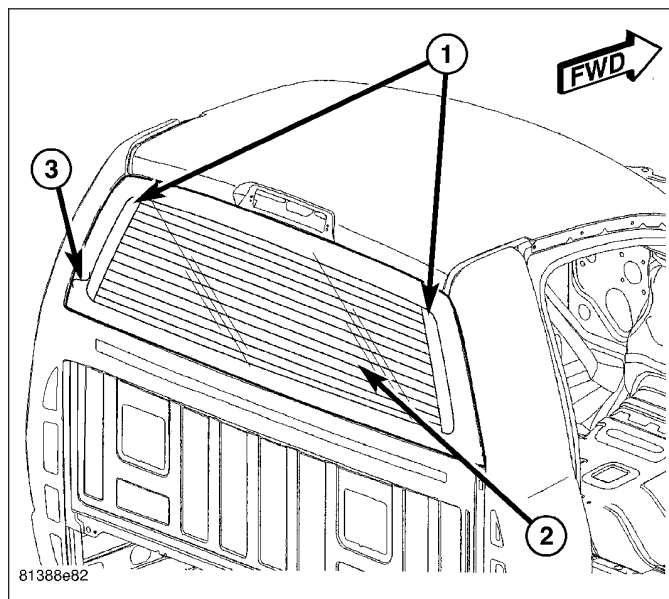
DESCRIPTION

CAUTION: Grid lines can be damaged or scraped off with sharp instruments. Care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

The rear window defogger system, also known as electric backlight (EBL), consists of two vertical bus bars (1) linked by a series of grid lines (2) fired onto the inside surface of the rear window (3).

The EBL system is turned On or Off by a switch and a timing circuit integral to the A/C-heater control located at the center of the instrument panel.

Circuit protection is provided by two cartridge fuses located in the integrated power module (IPM). One fuse is for the control circuit and the other fuse is for the heated grid circuit.



OPERATION

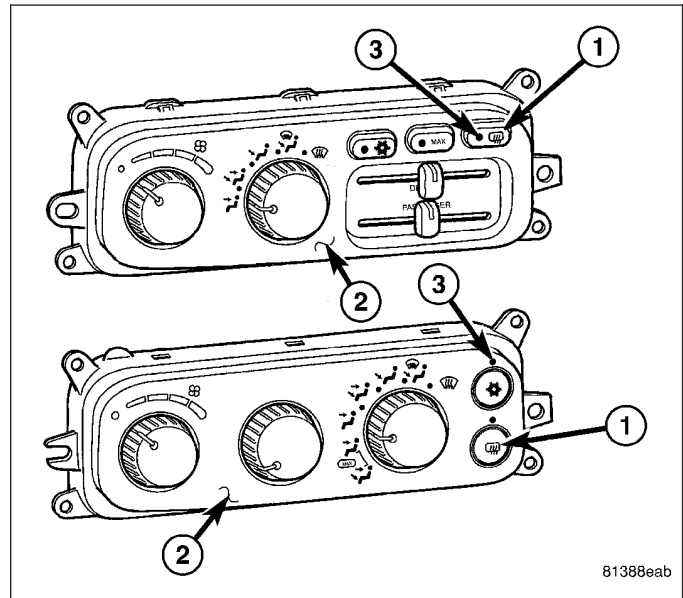
The electric backlight (EBL) system is controlled by a momentary switch (1) located in the A/C-heater control (2) on the instrument panel. When the rear window defogger switch is pressed to the On position, the A/C-heater control energizes the rear window defogger (EBL) relay and the heated mirror relay, which then directs battery current to the rear defogger grid lines and to the heated side view mirrors. The grid lines heat the glass to help clear the rear window and side mirror surfaces of fog or frost.

An amber indicator (3) in the rear window defogger switch will illuminate to indicate when the EBL system is turned on. The A/C-heater control contains the EBL system control circuitry including the timer logic.

NOTE: The EBL system turns off automatically after approximately ten minutes of operation.

The EBL system will be automatically turned off after a programmed time interval of about ten minutes each time the rear window defogger switch is pressed. The EBL system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by pressing the rear window defogger switch a second time.

Repair of the rear window defogger grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER GRID - STANDARD PROCEDURE - GRID LINE AND TERMINAL REPAIR).



DIAGNOSIS AND TESTING

ELECTRIC BACKLIGHT (EBL) AND HEATED MIRROR SYSTEM

NOTE: Illumination of the defogger switch indicator lamp does not necessary mean that electrical current is reaching the rear window glass and/or the outside rear view mirror heating grids.

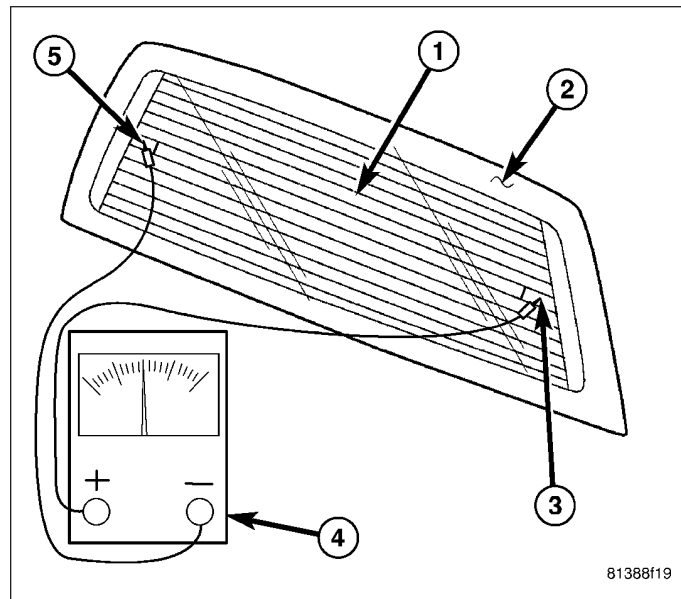
NOTE: For circuit descriptions and diagrams of the rear window defogger (EBL) and heated mirror systems, refer to 8W - WIRING DIAGRAM INFORMATION.

Operation of the electrical backlight (EBL) and heated mirror systems can be confirmed by the following:

1. Use a scan tool and check for diagnostic trouble codes (DTCs) related to the A/C-heater control. If no DTCs are found, go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Turn the ignition switch to the On position. Set the rear window defogger switch in the On position. The rear window defogger and heated outside rear view mirror operation can be checked by feeling the glass surfaces of the rear window or outside rear view mirrors. A distinct difference in temperature between the grid lines (1) and the adjacent clear glass (2) or the mirror glass should be detected within three to four minutes of operation.

3. If a rear window glass temperature difference is not detected, use a 12-volt DC voltmeter (4) and contact the rear glass heating grid power feed terminal A (3) with the positive lead, and the ground terminal B (5) with the negative lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:

- Confirm that the ignition switch is in the On position.
- Make sure that the rear glass heating grid feed wire and ground wire are connected to the terminals. Confirm that the ground wire has continuity to ground.
- Check the EBL relay and fuses located in the integrated power module (IPM) in the engine compartment. The relay and fuses must be tight in their receptacles and all electrical connections must be secure. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relay.



When the above steps have been completed and the rear glass heating grid is still inoperative, one or more of the following is faulty:

- Rear window defogger switch in the A/C-heater control.
 - Rear window defogger grid lines (all grid lines would have to be broken, or the power feed or the ground wire disconnected, for the entire heating grid to be inoperative).
4. If a heated outside rear view mirror glass temperature difference is not detected, use a 12-volt DC voltmeter (4) and contact the rear view mirror glass heating grid power feed terminal 1 with the positive lead, and the ground terminal 5 with the negative lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:
 - Confirm that the ignition switch is in the On position.
 - Make sure that the rear view mirror glass heating grid feed wire and ground wire are fully connected to the terminals. Confirm that the ground wire has continuity to ground.
 - Check the heated mirror relay and fuse located in the integrated power module (IPM) in the engine compartment. The relay and fuse must be tight in their receptacles and all electrical connections must be secure. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relay.

When the above steps have been completed and the rear view mirror glass heating grid is still inoperative, one or more of the following is faulty:

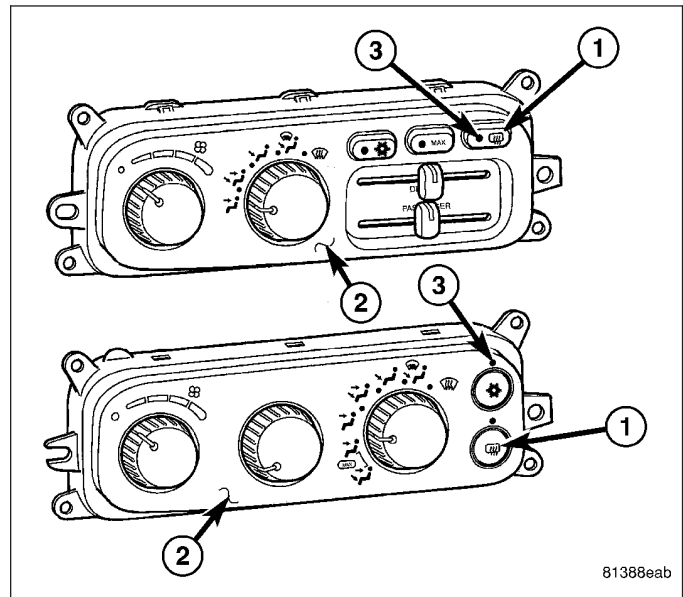
- Rear window defogger switch in the A/C-heater control.
 - Rear view mirror grids (both the left and right mirror grids would have to fail or the power feed or the ground wire disconnected, for the both mirror grids to be inoperative).
5. If the operation of the EBL system and/or the heated mirror system has been verified but the defogger LED indicator does not illuminate, replace the A/C-heater control (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL).

SWITCH-REAR WINDOW DEFOGGER

DESCRIPTION

The switch for the rear window defogger (EBL) system (1) is integrated into the A/C-heater control (2), which is located in the center of the instrument panel. When the rear window defogger switch is activated, the timing circuit integral to the A/C-heater control operates the rear window defogger (EBL) relay and the heated mirror relay.

When the relays are activated, current is directed to the rear window defogger and the outside rear view mirror grids. The grids heat the rear window and rear view mirror glass to help clear the surfaces of fog or frost.



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OPERATION

An LED indicator will illuminate when the rear window defogger switch is activated. When the switch is activated, it energizes the timing circuit integral to the A/C-heater control, which then activates the rear window defogger (EBL) relay and the heated mirror relay. The EBL relay controls the current flow to the grids of the rear window defogger.

The EBL system will be on for approximately ten minutes or until the rear window defogger switch or the ignition switch is turned off.

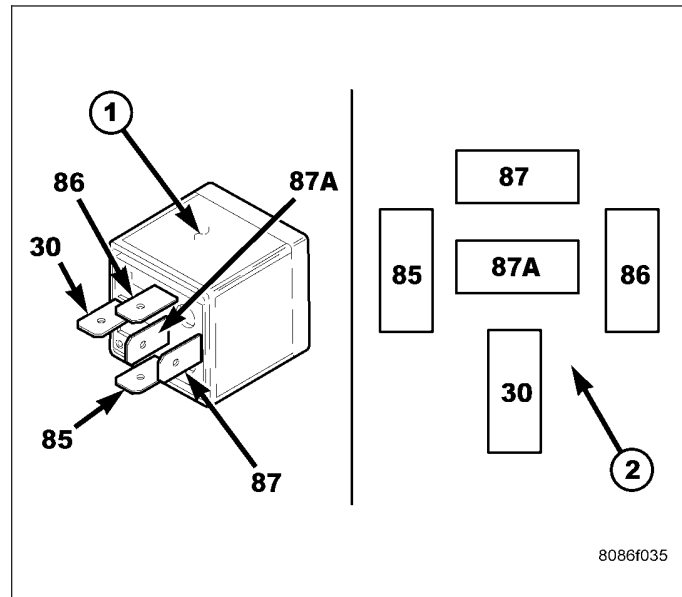
The rear window defogger switch and the rear window defogger LED indicator cannot be repaired and, if faulty or damaged, the A/C-heater control must be replaced (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CONTROL-A/C HEATER - REMOVAL).

RELAY-REAR WINDOW DEFOGGER

DESCRIPTION

The rear window defogger (EBL) relay (1) is a International Standards Organization (ISO)-type relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The EBL relay is an electromechanical device that switches battery current through a fuse in the integrated power module (IPM) to the rear window defogger grid. The EBL relay is energized when the relay coil is provided a ground path by the control circuitry within the A/C-heater control.

The EBL relay is located in the IPM in the engine compartment.



OPERATION

The ISO-standard rear window defogger (EBL) relay is an electromechanical switch that uses a low current input controlled by the A/C-heater control to control the high current output to the rear window defogger grid lines. The movable, common feed relay contact is held against the fixed, normally closed relay contact by spring pressure. When the electromagnetic relay coil is energized, it draws the movable common feed relay contact away from the fixed, normally closed relay contact and, holds it against the fixed, normally open relay contact. This action allows high current to flow to the rear window defogger grid lines.

When the relay coil is de-energized, spring pressure returns the movable relay contact back against the fixed, normally closed contact point. The resistor or diode is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The EBL relay terminals are connected to the vehicle electrical system through a receptacle in the integrated power module (IPM). The inputs and outputs of the EBL relay include:

- Terminal (30) receives battery current through a fuse in the IPM only when the EBL relay coil is energized.
- Terminal (85) receives a ground through the EBL relay control circuit only when the A/C-heater control electronically pulls the circuit to ground.
- Terminal (86) receives battery current through a fused ignition switch output circuit only when the ignition switch is in the Run position.
- Terminal (87) provides battery current to the rear window defogger grid lines through the EBL relay only when the EBL relay coil is energized.
- Terminal (87A) is not connected to any circuit in this application.

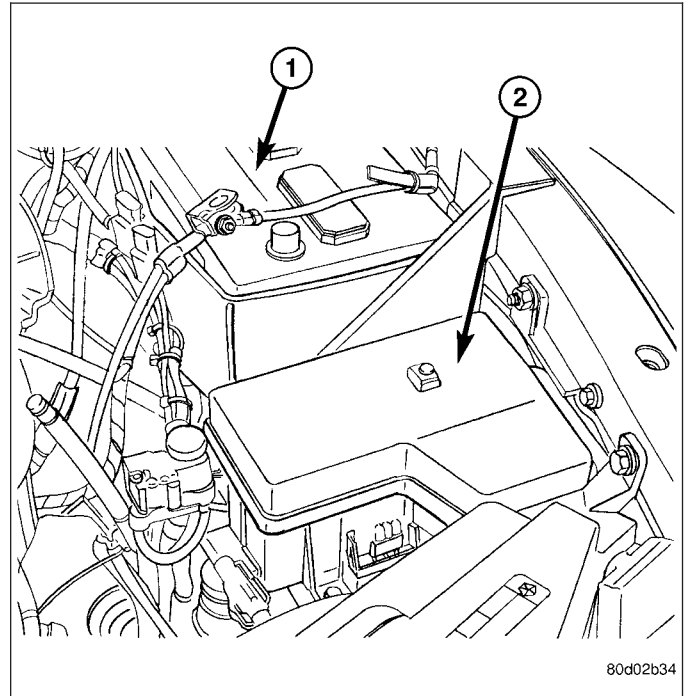
The EBL relay cannot be repaired and, if faulty or damaged, it must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relay and for complete rear window defogger (EBL) wiring diagrams.

REMOVAL

1. Disconnect and isolate the negative battery cable (1).
2. Remove the cover from the integrated power module (IPM) (2) located in the engine compartment.

NOTE: Refer to the fuse and relay layout map on the inside of the IPM cover for EBL relay location.

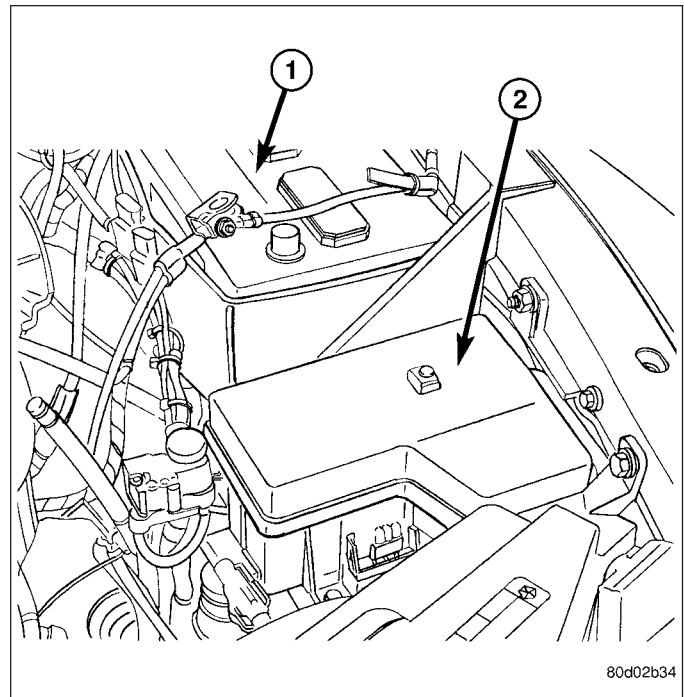
3. Remove the EBL relay from the IPM.



INSTALLATION

NOTE: Refer to the fuse and relay layout map on the inside of the IPM cover for EBL relay location.

1. Position the EBL relay into the proper receptacle of the integrated power module (IPM) (2).
2. Align the EBL relay terminals with the terminal cavities in the IPM receptacle and push down firmly on the relay until the terminals are fully seated.
3. Install the cover onto the IPM.
4. Reconnect the negative battery cable (1).



9. Allow the epoxy to cure 24 hours at room temperature, or carefully use a heat gun for fifteen minutes. When using a heat gun, hold it approximately 25.4 centimeters (10 inches) from the repair and do not allow the glass surface to exceed 204° C (400° F).
10. After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire.
11. Connect the wire harness leads to the grid terminals or pigtail wires and verify EBL operation.

HEATED MIRRORS - SERVICE INFORMATION

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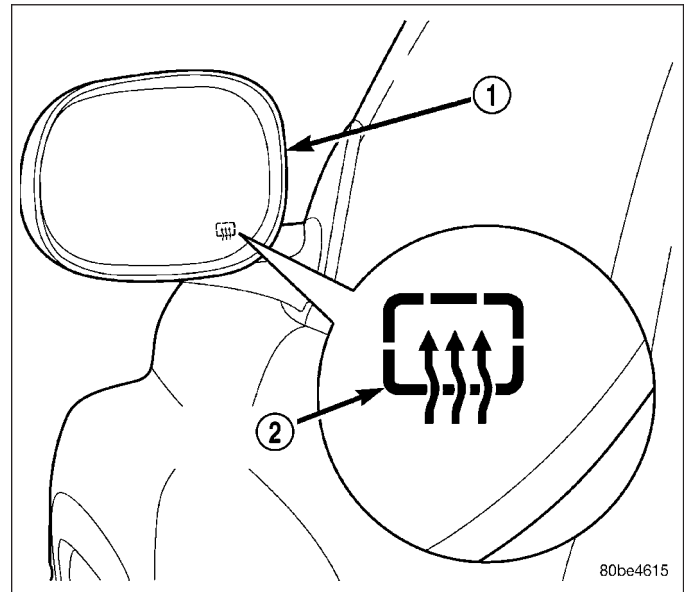
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HEATED MIRRORS - SERVICE INFORMATION

DESCRIPTION

Electrically heated outside rear view mirrors (1) are a factory-installed option on models that are equipped with factory-installed dual power mirrors. Vehicles with this option can be visually identified by the International Control and Display Symbol icon for rear window defogger (2), which appears on the lower inboard corner of each outside rear view mirror glass.

The EBL system operates in concert with the heated mirror system. For more information, refer to 8 - ELECTRICAL/HEATED GLASS - DESCRIPTION.



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OPERATION

When the rear window defogger switch (1) located on the A/C-heater control (2) is pressed, the heated mirror relay located in the integrated power module (IPM) is energized and supplies battery current to the electric heating grid behind the glass of each outside rear view mirror (Refer to 8 - ELECTRICAL/HEATED MIRRORS/RELAY-HEATED MIRROR - DESCRIPTION). When energized, the heating grids produce heat to help clear the outside rear view mirror glass surfaces of ice, snow, or fog.

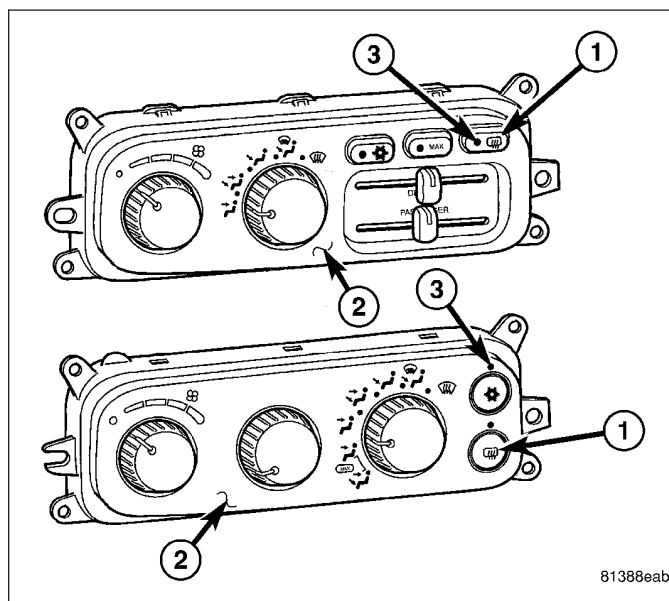
An amber indicator (3) in the defogger switch will illuminate to indicate when the heated mirror system is turned on. The A/C-heater control contains the heated mirror system control circuitry.

NOTE: The heated mirror system turns off automatically after approximately ten minutes of operation.

The heated mirror system will be automatically turned off after a programmed time interval of about ten minutes each time the defogger switch is pressed. The heated mirror system will automatically shut off if the ignition switch is turned to the Off position, or it can be shut off manually by pressing the rear window defogger switch a second time.

If the EBL system and outside mirror heating grids are both inoperative, refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING in this group. If only one of the outside mirror heating grids is inoperative, refer to 8 - ELECTRICAL/POWER MIRRORS - DIAGNOSIS AND TESTING.

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the mirror glass must be replaced (Refer to 23 - BODY/EXTERIOR/OUTSIDE REARVIEW MIRROR GLASS - REMOVAL).

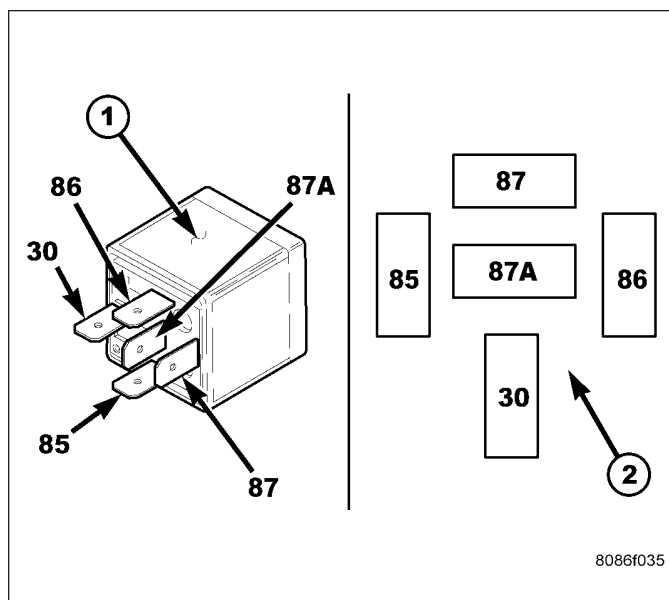


RELAY-HEATED MIRROR

DESCRIPTION

The heated mirror relay (1) is a International Standards Organization (ISO)-type relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The heated mirror relay is a electromechanical device that switches battery current through a fuse in the integrated power module (IPM) to the outside rear view mirror heating grids. The heated mirror relay is energized when the relay coil is provided a ground path by the control circuitry within the A/C-heater control.

The heated mirror relay is located in the IPM in the engine compartment.



OPERATION

The ISO-standard heated mirror relay is an electromechanical switch that uses a low current input controlled by the A/C-heater control to control the high current output to the outside rear view mirror heating grids. The movable, common feed relay contact is held against the fixed, normally closed relay contact by spring pressure. When the electromagnetic relay coil is energized, it draws the movable common feed relay contact away from the fixed, normally closed relay contact and, holds it against the fixed, normally open relay contact. This action allows high current to flow to the outside rear view mirror heating grids.

When the relay coil is de-energized, spring pressure returns the movable relay contact back against the fixed, normally closed contact point. The resistor or diode is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The heated mirror relay terminals are connected to the vehicle electrical system through a receptacle in the integrated power module (IPM). The inputs and outputs of the heated mirror relay include:

- Terminal (30) receives fused battery current at all times.
- Terminal (86) receives a ground through the defogger relay control circuit only when the A/C-heater control electronically pulls the circuit to ground.
- Terminal (85) receives fused battery current through an ignition switch output circuit only when the ignition switch is in the Run position.
- Terminal (87) provides battery current to the heated outside rear view mirror grids through the heated mirror relay output circuit only when the heated mirror relay coil is energized.
- Terminal (87A) is not connected to any circuit in this application, but provides a battery current output only when the heated mirror relay coil is de-energized.

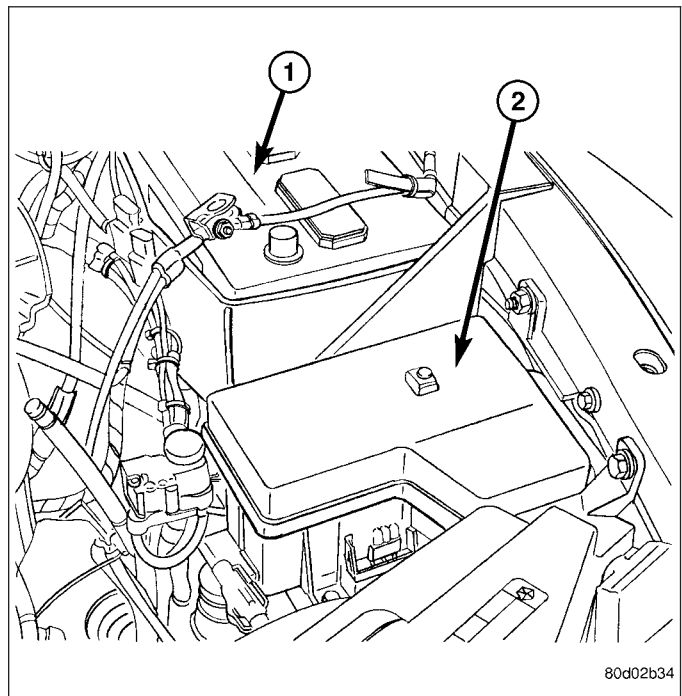
The heated mirror relay cannot be repaired and, if faulty or damaged, it must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relay and for complete heated mirror system wiring diagrams.

REMOVAL

1. Disconnect and isolate the negative battery cable (1).
2. Remove the cover from the integrated power module (IPM) (2) located in the engine compartment.

NOTE: Refer to the fuse and relay layout map on the inside of the IPM cover for heated mirror relay location.

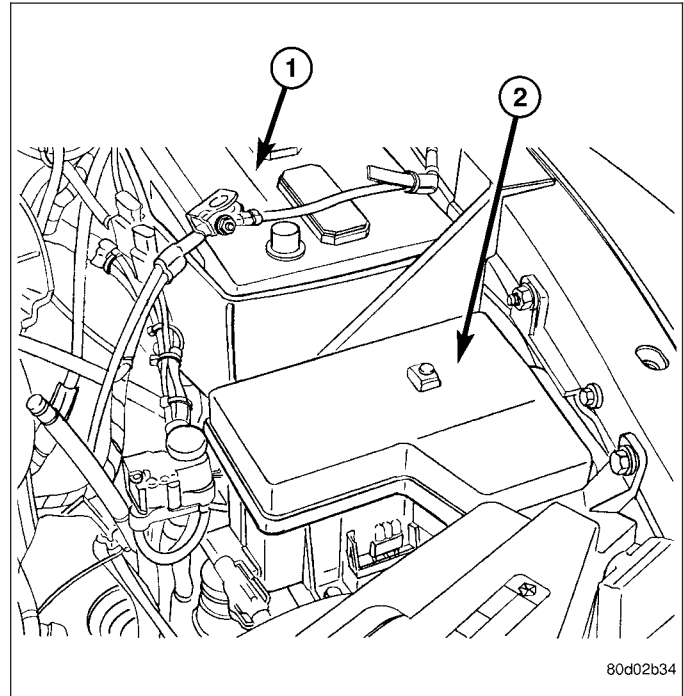
3. Remove the heated mirror relay from the IPM.



INSTALLATION

NOTE: Refer to the fuse and relay layout map on the inside of the IPM cover for heated mirror relay location.

1. Position the heated mirror relay into the proper receptacle of the integrated power module (IPM) (2).
2. Align the heated mirror relay terminals with the terminal cavities in the IPM receptacle and push down firmly on the relay until the terminals are fully seated.
3. Install the cover onto the IPM.
4. Reconnect the negative battery cable (1).



HEATED SEATS - SERVICE INFORMATION

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HEATED SEATS - SERVICE INFORMATION

DESCRIPTION

WARNING: The front passenger seat assembly contains critical components that affect the front passenger airbag deployment. Correctly functioning front passenger seat components are critical for the Occupant Classification System (OCS) to properly classify the front passenger and calculate the proper airbag deployment. Unapproved modifications or service procedures to the front passenger seat assembly, its related components, or trim cover may inadvertently change the airbag deployment in case of a frontal crash. This could result in death or serious injury to the front seat passenger if the vehicle is involved in an accident. The following requirements must be strictly adhered to:

- Do not modify the front passenger seat assembly or components in any way.
- Do not modify the front seat center console or center position seat in any way.
- Do not use prior or future model year seat trim covers not designated for the specific model being repaired. Always use the correct seat trim cover specified for the vehicle.
- Do not replace the seat trim cover with an aftermarket trim cover.
- Do not add a secondary trim cover other than those approved by DaimlerChrysler/Mopar.
- At no time should any Supplemental Restraint System (SRS) component or SRS related component or fastener be modified or replaced with any part except those which are approved by DaimlerChrysler/Mopar.

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the center stack of the instrument panel. The heated seat system allows the driver and front seat passenger 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 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. Each switch also includes two Light-Emitting Diode (LED) indicator lamps and an incandescent back lighting bulb.
- **Heated Seat Module** - 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. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DESCRIPTION) 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. 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 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - REMOVAL) for the detailed procedure.
- **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 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 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - REMOVAL) for the detailed procedure.

OPERATION

The heated seat module receives fused battery current through the Integrated Power Module. The heated seat switches receive battery current from the Cab Compartment Node (CCN) only when the ignition switch is in the On position and the engine is running. The heated seat module shares a common ground circuit with each of the heated seat elements. The heated seat system will control the surface temperature of the seat cushion to within 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 conditions 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 condition identification. The driver heated seat switch indicator lamps will flash if a malfunction occurs in the driver heated seat, and the passenger heated seat switch indicator lamps will flash for a passenger heated seat malfunction. If a monitored heated seat system malfunction 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 inoperative heated seat is depressed in either the Low or High direction. This process will repeat every time the inoperative heated seat switch is actuated until the problem has been corrected.

HEATED SEAT SYSTEM SELF-DIAGNOSIS

Monitored condition	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

Diagnostic logic is built into the heated seat module to help 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 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING) for 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 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING) for the 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 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING) 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 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING) for heated seat module diagnosis and testing procedures.

HEATED SEAT ELEMENT

DESCRIPTION

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 zigzag pattern and captured between a covering and the adhesive foam rubber backing. Short pigtail wires with connectors are soldered to each end of each resistor wire element grid, which connect all of 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

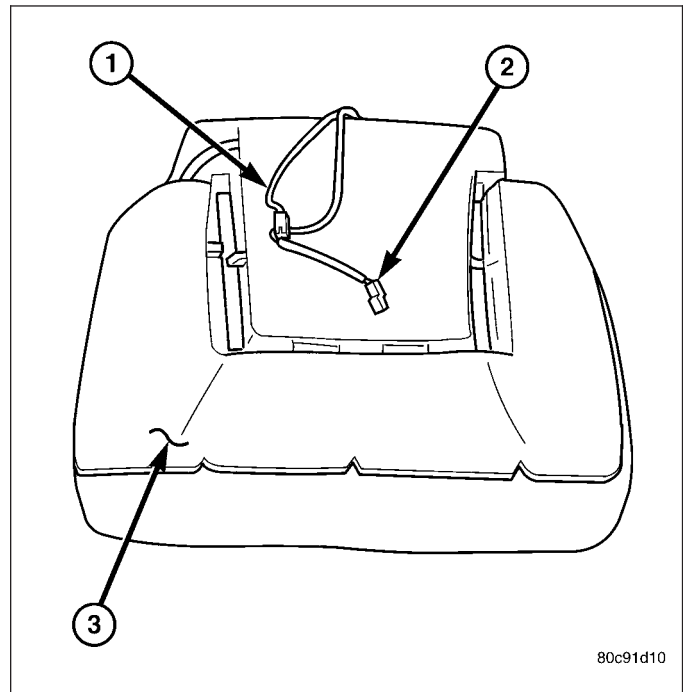
One end of the heated seat element resistor wire is connected to ground at all times through a splice in the heated seat module ground circuit. Battery current is directed to the other end of the heated seat element resistor wire by the energized N-channel Field Effect Transistor (N-FET) located within 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 8 - ELECTRICAL/HEATED SEATS - DIAGNOSIS AND TESTING) 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 the appropriate wiring information** 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 inoperative seat heating element, (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - REMOVAL).
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

CAUTION:

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.

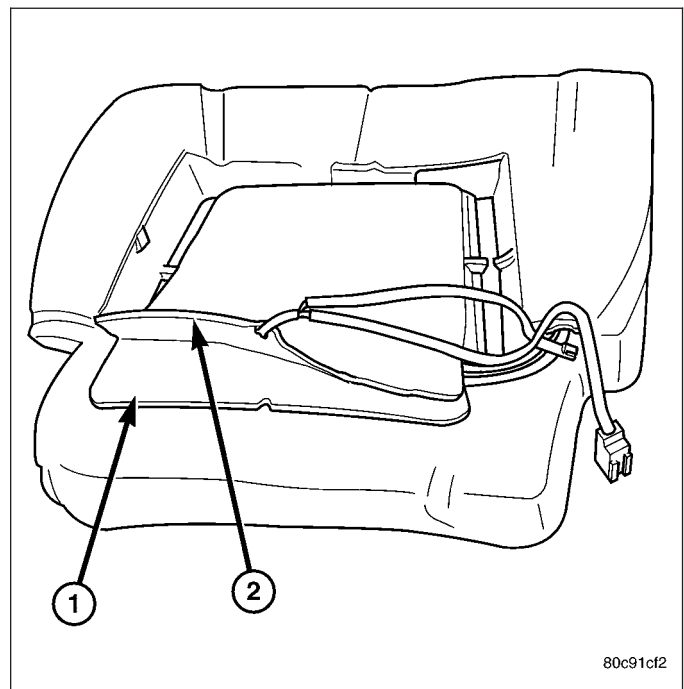
1. Disconnect and isolate the negative battery cable.
2. Remove the appropriate seat cushion or seat back trim cover. Refer to the Body section of this manual for the procedures.
3. Disconnect the inoperative heated seat cushion or seat back element electrical connectors.
4. Locate the wires leading 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 (2) and stick directly over the original heating element (1).

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.

2. Connect the new heating element electrical connectors.
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 inoperative. The heated seat temperature sensor is part of the heated seat cushion element and must be replaced as an assembly. (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - REMOVAL) for the appropriate procedure.

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. Unclip 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 – 3.0 volts. 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 the appropriate wiring information** for the complete heated seat system wiring diagrams. 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 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING) 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).

SWITCH-HEATED SEAT

DESCRIPTION

The momentary, bidirectional rocker-type heated seat switch (1) 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 (2), which indicate the selected mode (Low or High) of the seat heater. These indicator lamps also provide 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.

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.

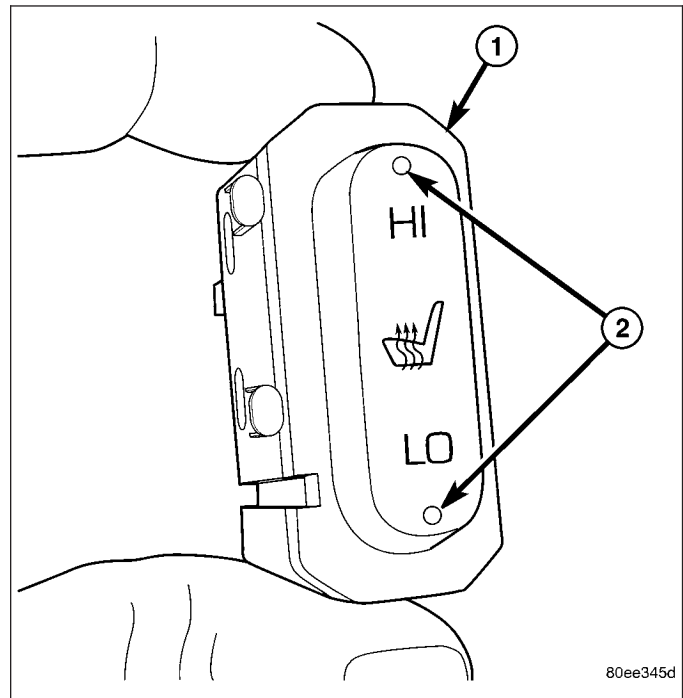
The instrument panel wire harness connectors for the heated seat switches are keyed to match the connector receptacles on the switches so that the two heated seat switches can only be connected to the proper heated seat electrical.

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

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.

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 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 Kiloohms
Low	4 & 6	.415 Kiloohms
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.

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.

MODULE-HEATED SEATS

DESCRIPTION

The heated seat module (2) is also known as the Seat Heat Interface Module. The heated seat module is located under the drivers front seat cushion, where it is secured to a mounting bracket. The heated seat module has a single connector receptacle (3) that allows the module to be connected to all of the required inputs and outputs through the seat wire harness.

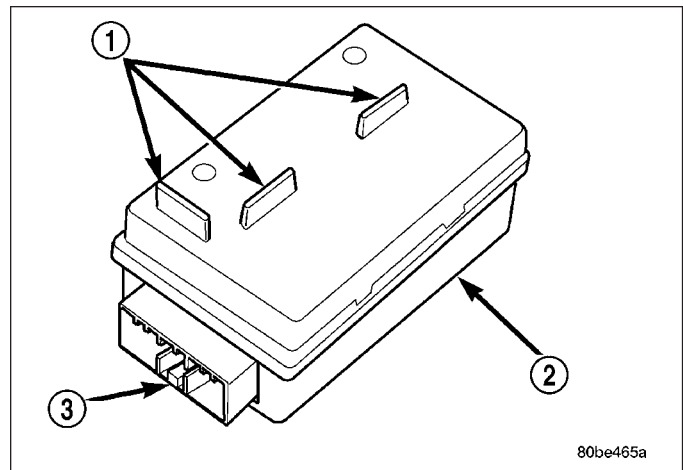
The heated seat module is an electronic microprocessor controlled device designed and programmed to use inputs from the battery, the two heated seat switches and the two heated seat sensors to operate and control the heated seat elements in both front seats and the two heated seat indicator lamp Light-Emitting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

The heated seat module operates on fused battery current received from the integrated power module. Inputs to the module include a resistor multiplexed heated seat switch request circuit for each of the two heated seat switches and the heated seat sensor inputs from the seat cushions of each front seat. In response to those inputs the heated seat module controls battery current feeds to the heated seat elements and sensors, and controls the ground for the heated seat switch indicator lamps.

When a heated seat switch (Driver or Passenger) is depressed a signal is received by 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 selected seat cushion.

The Low heat set point is about 36° C (96.8° F), and the High heat set point is about 42° C (107.6° F). If the seat cushion surface 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.

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 8 - ELECTRICAL/HEATED SEATS - DIAGNOSIS AND TESTING) for flashing LED diagnosis and testing procedures. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DIAGNOSIS AND TESTING) for heated seat module diagnosis and testing procedures.

DIAGNOSIS AND TESTING

HEATED SEAT MODULE

If a heated seat fails to heat and one or both of the indicator lamps on a heated seat switch flash, (Refer to 8 - ELECTRICAL/HEATED SEATS - DIAGNOSIS AND TESTING) for flashing LED 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 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING) 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 Wiring 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 appropriate 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. Position the driver seat to the full rearward and inclined position.
2. Working under the driver front seat, remove the two heated seat module retaining screws. Due to the fact that the retaining screws are installed with the seat cushion pan removed, a small right angle screwdriver will be required to access and remove the screws.
3. Disconnect the seat wire harness connector from the connector receptacle on the back of the heated seat module. Depress the connector retaining tab and pull straight apart.
4. Remove the heated seat module from under the front seat.

INSTALLATION

1. Position the heated seat module under the front seat.
2. Connect the seat wire harness connector on the connector receptacle on the back of the heated seat module.
3. Working under the driver front seat, install the heated seat module retaining screws.
4. Re-position the driver seat.

