HEATED/COOLED ACCESSORIES - DESCRIPTION AND OPERATION

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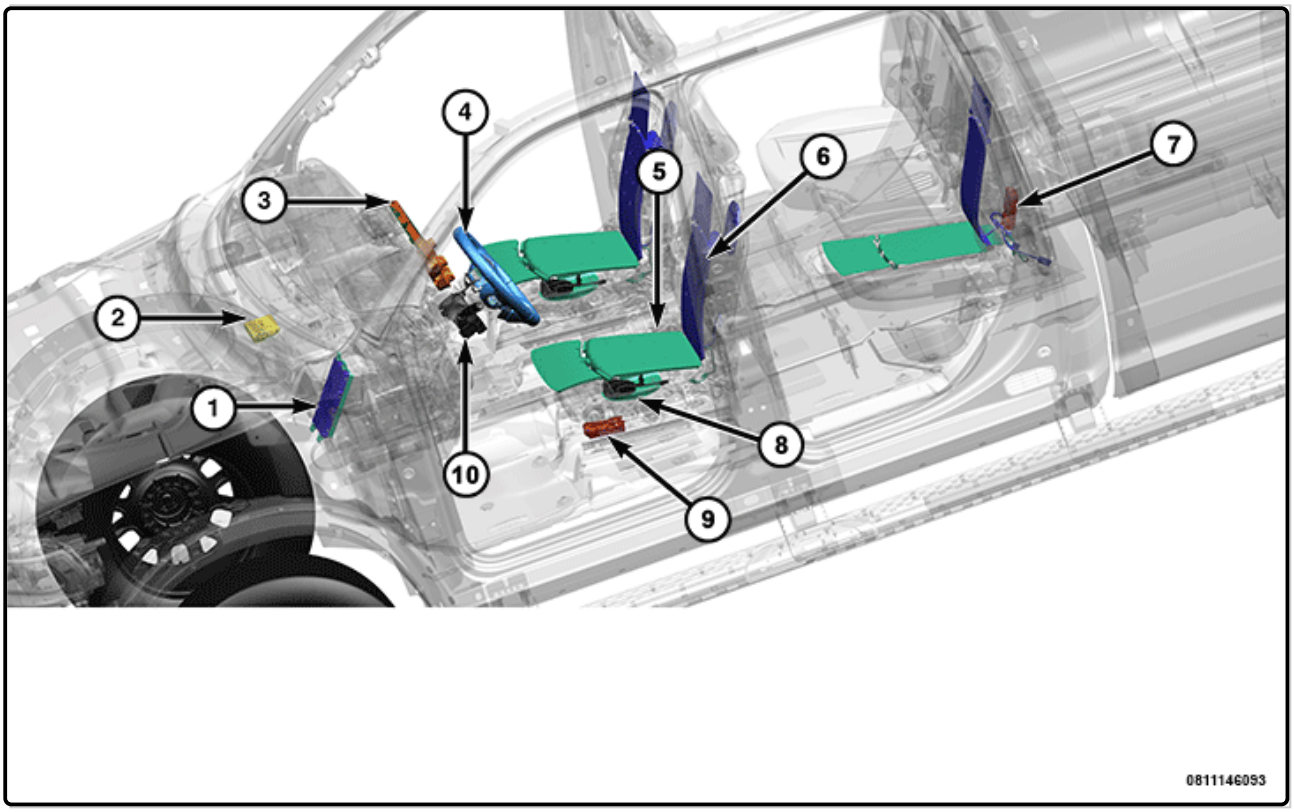
DESCRIPTION



The Heated and Cooling Accessories system is comprised of several different components. Those components are:

Component Index

1.	**Body Control Module (BCM)**
2.	**Heating Ventilation and Air Conditioning (HVAC) Module**
3.	**Heated/Vented Seat Switch** - Integrated Center Stack (ICS) Module, Display Screen Module (DSM), Radio, Rear Center Console End Cap Switch Bank
4.	**Heated Steering Wheel**
5.	**Heated/Vented Seat Pad Bottom**
6.	**Heated/Vented Seat Pad Back**

7.	**Comfort Rear Seat Module (CSRM)**
8.	**Vented Seat Motor**
9.	**Comfort Seat Wheel Module (CSWM)**
10.	**Steering Column Control Module (SCCM)**

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the ICS in the center of the Instrument Panel (IP). Also have two heated seat switches on the rear center console end cap. The heated seat system allows the driver and passenger, and rear seats to select from three different levels of heat (low, medium, and high).

OPERATION

A CSWM is used to control the front heated seat system. The CSWM responds to heated seat switch messages and ignition switch status inputs by controlling the 12 volt Direct Current (DC) output to the front seat heating elements through integral solid-state relays.

A CRSM is used to control the rear heated seat system. The CSRM responds to heated seat switch messages and ignition switch status inputs by controlling the 12 volt Direct Current (DC) output to the front seat heating elements through integral solid-state relays.

When either of the heated seat switches are pressed, a switch status message is sent to the ICS and radio over the CAN Interior High Speed (IHS) data bus. The ICS and radio then sends a message via the IHS data bus to the CSWM, signaling the module to energize the heating element for the selected seat. Amber Light Emitting Diodes (LEDs) in each switch indicate the level of heat in use: three LEDs are illuminated for high, two for medium, one for low, and none for OFF. The CSWM or CSRM sends the LED illumination message to the ICS over the CAN-IHS data bus. The ICS and radio then sends the LED illumination message to the Heated Seat Switch so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select medium level heating. Pressing the switch a third time will select low level heating. Pressing the switch a fourth time will shut the heating elements OFF.

The CSWM energizes an integral solid-state relay, which supplies battery current to the heated seat elements. When either high, medium or low temperature heating is selected, the heating elements ramp quickly to the target temperature for the selected set points. Once the ramp target is reached, the element is controlled by the CSWM to a steady-state temperature for the selected set point. The heated seats will stay in the selected temperature until a different level is chosen (high/medium/low/OFF) or the vehicle ignition is turned off.

The CSWM or CSRM will automatically turn OFF the heating elements if it detects an open or low short in the heating element circuit.

Vehicles equipped with the optional front (and rear) heated seat system have two elements per optioned seat. One heating element is used for each seat bottom, and another heating element is used for each seat back.

Each heated seat surface is one element wire routed through-out the trim underneath the surface and connected directly to the specified power driver of the CSWM for that surface. The elements are grounded to the seat frame circuit.

On all models, an Occupant Detection Sensor (ODS) is located directly below the passenger side front seat cushion. This sensor provides information to the Occupant Restraint Controller (ORC) used for control of the passenger belt alert feature.

Whenever the ODS has been removed from the seat cushion foam or heater element, it must be replaced with a new ODS unit.

The CSWM operates on fused battery current received from the ignition switch. The CSWM is grounded to the body at all times through the electrical connector. Inputs to the CSWM include IHS data bus messages and standard hard wired 12 volt power and ground. In response to the IHS inputs the CSWM will control the battery current to the appropriate heated seat elements.

When a heated seat switch IHS data bus signal is received by the CSWM, the module energizes the selected heated seat element. After 30 minutes of occupied operation, the low heat surface set point is about 35C (95F), the medium heat surface set point is about 38C (100.4F), and the high heat surface set point is about 43C (109.4F). These temperatures may slightly vary depending on the system components, battery voltage, surrounding environment starting temps, and occupant conditions.

In addition to operating the heated seat elements, the CSWM sends LED illumination messages to the instrument cluster, sometimes referred to as the ICS over the IHS data bus. The ICS then sends the LED illumination message to the ICS buttons so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

The heated seat control system is diagnosed using a scan tool (Refer to 28 - DTC-Based Diagnostics/MODULE, Comfort Seat and Wheel (CSWM) /Diagnosis and Testing).

Body Control Module (BCM)

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The BCM provides gateway functionality for heated input signals from the seat switches. The BCM will receive the Local Interconnect Network (LIN) signals for each switch, either front or rear send the IHS input to the CSWM or CSRM for the heated/vented control.

Inputs

- Vehicle Interior temperature from the HVAC module
- Ambient air Temperature
- Left rear heated/vented switch request from CSRM
- Right rear heated/vented switch request from CSRM
- Left front heated/vented switch request from CSWM
- Right front heated/vented switch request from CSWM

Outputs

- Left rear heated/vented switch status to CSRM
- Right rear heated/vented switch status to CSRM
- Left front heated/vented switch status to CSWM
- Right front heated/vented switch status to CSWM
- Right front light command for heated/vented switch light on
- Left front light command for heated/vented switch light on
- Right rear light command for heated/vented switch light on
- Left rear light command for heated/vented switch light on
- Heated steering wheel light command heated switch light on

Comfort Seat Wheel Module (CSWM)

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The CSWM is a microcontroller designed to use the CAN-IHS data bus messages from the heated/vented seat switches. The BCM receives inputs from the heated/vented seat switches and in turn, signals the CSWM to operate the heated/vented seat elements or motors for both front seats.

Inputs

- Vehicle Interior temperature from the HVAC module
- Ignition State from BCM
- Ambient Air Temperature from BCM
- Vehicle Configuration from BCM
- Left front heated/vented switch request gated from BCM
- Right front heated/vented switch request gated from BCM
- Remote Start status gated from BCM
- Engine run state gated from BCM

Outputs

- Left front heated status
- Right front heated status
- Left front vented status
- Right front vented status

Hardwire

- Left front heated seat switch to pad/cushion
- Right front heated seat switch to pad/cushion
- Left front vented seat switch to pad/cushion
- Right front vented seat switch to pad/cushion
- Heated Steering Wheel feed command
- Heated Steering Wheel feed return

Comfort Rear Seat Module (CSRM)

Component Index

The CSRM is a microcontroller designed to use the CAN-IHS data bus messages from the heated/vented seat switches. The BCM receives inputs from the heated/vented seat switches and in turn, signals the CSRM to operate the heated/vented seat elements or motors for the rear seats.

Inputs

- Vehicle Interior temperature from the HVAC module
- Ignition State from BCM
- Ambient Air Temperature from BCM
- Vehicle Configuration from BCM
- Left rear heated/vented switch request gated from BCM
- Right rear heated/vented switch request gated from BCM
- Remote Start status gated from BCM

- Engine run state gated from BCM

Outputs

- Left rear heated status
- Right rear heated status
- Left rear vented status
- Right rear vented status

Hardwire

- Left rear heated seat switch to pad/cushion
- Right rear heated seat switch to pad/cushion
- Left rear vented seat switch to pad/cushion
- Right rear vented seat switch to pad/cushion

Heated Steering Wheel

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The heated steering wheel system is designed to enhance the thermal comfort of the driver by heating the steering wheel, when desired. The steering wheel heating element is made of copper wire and is sandwiched between the leather and the substrate material of the steering wheel. A vehicle with a heated steering wheel can easily be identified by the heated steering wheel switch located in the ICS, at the center of the IP. When the heated steering wheel switch is pressed, the heated steering wheel switch illuminates on the ICS.

The Auto ON feature is a customer configurable feature that, when enabled, will activate the driver heated seat and heated steering wheel on engine start based on ambient temperature. If Auto ON feature is enabled, and the ambien temperature is at or below 4°C (40°F) the CSWM will activate the driver heated seat and heated steering wheel feature at the high level after engine start. This feature also works with Remote Start.

The heated steering wheel system is diagnosed using a scan tool (Refer to 28 - DTC-Based Diagnostics/MODULE, Comfort Seat and Wheel (CSWM) /Diagnosis and Testing). The steering wheel heating element is not serviced separately from the steering wheel and if inoperative or damaged, the entire steering wheel assembly must be replaced (Refer to 19 - Steering/Column/WHEEL, Steering/Removal and Installation) .

Inputs

- Heated Steering Wheel Command
- Heated Steering Wheel Temperature Sensor

Outputs

- Heated Steering Wheel Switch

Heated Steering Wheel Switch

Component Index

The heated steering wheel is an option only available on vehicles that have at least 2 heated seats. To easily verify if the vehicle has the heated steering wheel option look for the heated steering wheel switch located on the ICS. The heating element is not serviced separately from the steering wheel (Refer to 19 - Steering/Column/WHEEL,

Steering/Removal and Installation) .

Inputs

- Heated Steering Wheel Temperature Sensor

Outputs

- Heated Steering Wheel Temperature

Heated/Vented Seat Pad Bottom

Component Index

Both the front and rear seats have a heated and cooled seat. The heated pad can be replaced and serviced and also the vented seat pad can be serviced.

Inputs

- Right front heated pad/cushion command from CSWM
- Left front heated pad/cushion command from CSWM
- Right front vented pad/cushion command
- Left front vented pad/cushion command
- Front right heated seat status to CSWM
- Front left heated seat status to CSWM
- Front right vented seat status to CSWM
- Front left vented seat status to CSWM
- Driver comfort system remote start status

Outputs

- Front right heated seat status to CSWM
- Front left heated seat status to CSWM
- Front right vented seat status to CSWM
- Front left vented seat status to CSWM
- Driver comfort system remote start status

Heated/Vented Seat Pad Back

Component Index

Both the front and the rear seats have a heated and cooled seat. The heated pad can be replaced and serviced and also the vented seat pad can be serviced.

Inputs

- Right rear heated pad/cushion command from CRSM
- Left rear heated pad/cushion command from CRSM
- Right rear vented pad/cushion command from CRSM
- Left rear vented pad/cushion command from CRSM

Outputs

- Rear right heated seat status to CRSM
- Rear left heated seat status to CRSM
- Rear right vented seat status to CRSM
- Rear left vented seat status to CRSM

Heating Ventilation and Air Conditioning (HVAC) Module

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Inputs

- Vehicle Interior temperature to CSRM
- Vehicle Interior temperature to CWSM

Heated/Vented Seat Switch

Component Index

Each of the heated and vented seat switch depending on the switch type either hard switch or soft switch, will allow the switch to send a signal to turn on the heated seat pads, or the vented seat pads. Depending on the switch that is pressed. Each press of the switch will change the level of cooling, or the level of heating from LO to HI to OFF.

Inputs

- Right front heated pad/cushion command from CSWM
- Left front heated pad/cushion command from CSWM
- Front right heated seat status to CSWM
- Front left heated seat status to CSWM
- Front right vented seat status to CSWM
- Front left vented seat status to CSWM
- Driver comfort system remote start status
- Right rear heated pad/cushion command from CRSM
- Left rear heated pad/cushion command from CRSM
- Right rear vented pad/cushion command from CRSM
- Left rear vented pad/cushion command from CRSM

Outputs

- Front right heated seat status to CSWM
- Front left heated seat status to CSWM
- Front right vented seat status to CSWM
- Front left vented seat status to CSWM
- Rear right heated seat status to CRSM
- Rear left heated seat status to CRSM
- Rear right vented seat status to CRSM
- Rear left vented seat status to CRSM

Steering Column Control Module (SCCM)

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The SCCM in this vehicle is connected to the CAN-C data bus and has one dedicated LIN data bus used by the steering wheel switches for transmission of resistor multiplexed momentary signals to the Body Control Module (BCM). All other circuits used by the steering wheel components are hard wire pass-through circuits. The SCCM is connected to a fused B(+) circuit and receives a path to ground at all times. These connections allow it to remain functional regardless of the ignition switch status. Any input to the SCCM that controls a vehicle system function that does not require that the ignition switch status be ON such as pressing the horn switch, prompts the BCM to wake up and transmit on the CAN-C data bus.

Inputs

- Heated Steering Wheel status return

Outputs

- Heated Steering Wheel Command
- Heated Steering Wheel

Vented Seat Motor

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The Vented Seat assembly is located internally to the seats and are intended to enhance the thermal comfort of the seat occupant by ventilating seat to occupant interface. Occupant comfort is achieved by pulling air from the seat surface to the back and underside under side of the seat.

The vented seats are controlled by the CSWM for the front seats and the CSRM for the rear seats. These modules provide variable analog voltages driving the 12V vented seat motors in the seats. The vented seats have 2 selectable speeds with a hidden intermediate speed for the fans. For seat venting, each press of the vented seat switch will cause the vented seat to change venting modes. From OFF to HI, from HI to LO and from LO to OFF. The CSWM or CSRM will turn on the vented seats only with the engine running. The vented seats operate separately from each other, and will not operate at the same time as the heated seats.