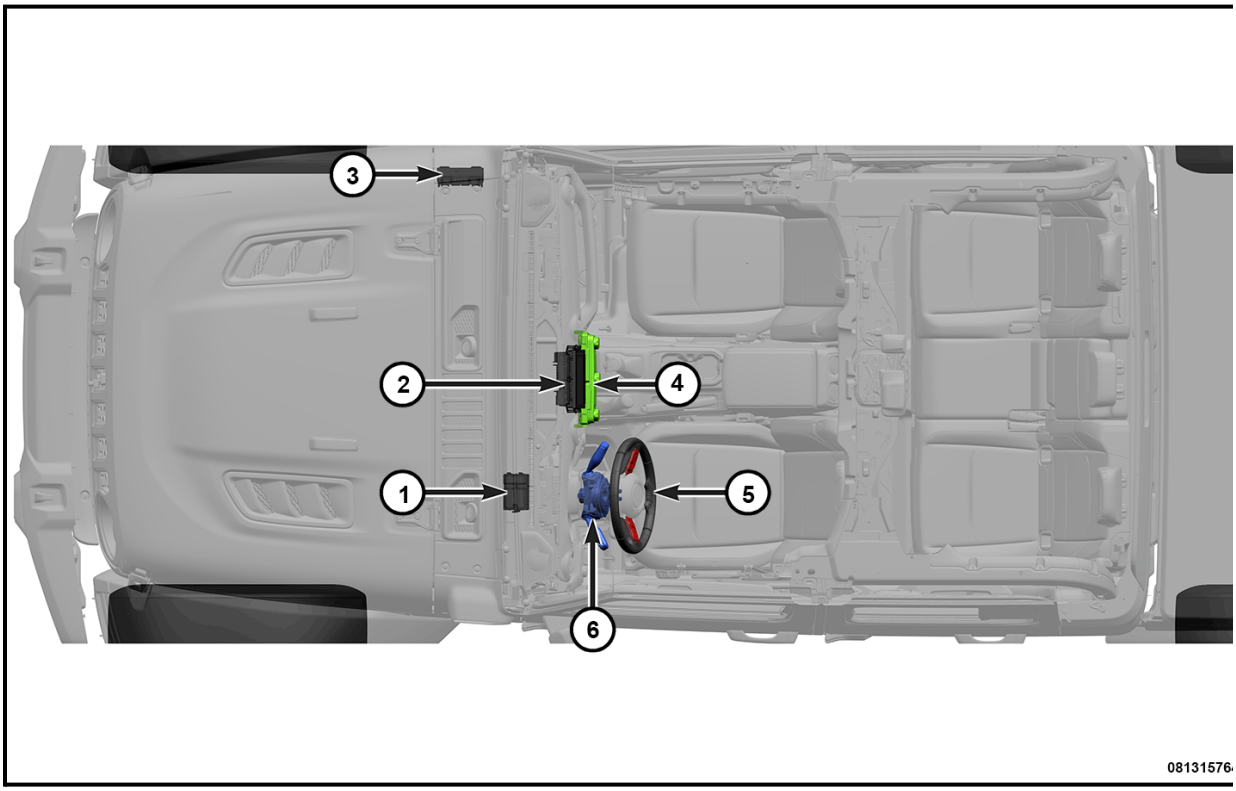
DESCRIPTION AND OPERATION

DESCRIPTION



The Heated Steering Wheel system is comprised of several different components. Those components are:

Component Index

1.	Comfort Seat and Wheel Module (CSWM)
2.	Radio - Certain radios contain a soft button heated steering wheel switch

3.	**Body Control Module (BCM)**
4.	**Integrated Center Stack (ICS) Module** - Contains the hard button heated steering wheel switch
5.	**Heated Steering Wheel**
6.	**Steering Column Control Module (SCCM) with Steering Wheel Switch**

OPERATION

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 inserted 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 instrument panel or, when equipped, within the radio climate control touch screen. When the heated steering wheel switch is pressed on, the heated steering wheel switch illuminates.

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 ambient 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) .

For vehicles equipped with Engine Stop Start (ESS) functionality, the CSWM will deactivate the heated seats and steering wheel during a ESS event if the battery voltage dips below 9v. Once the battery has reached 9.5v, the CSWM reactivated all the heated outputs to the same levels they were operating at prior to the voltage dip.

Drive Comfort System Feature

The Drive Comfort System feature is customer programmable. This system has three settings:

1. Remote start only - When the remote start only feature is enabled, the CSWM activates the driver heated seat and steering wheel outputs during a remote start vehicle engine start event only based on ambient temperature.
2. Remote start and normal start - When the remote start and normal start feature is enabled, the CSWM activates the driver heated seat and steering wheel during both remote and normal

vehicle engine start events based on ambient temperature. The ambient temperature will need to be less than 4.4 °C (40 °F).
3. Disabled - If the Driver Comfort System feature is disabled, the CSWM will only activate the driver heated seat and steering wheel when the customer activates the system.

If the ambient temperature is less than 4.4 °C (40 °F), the CSWM will set the heated seats and steering wheel to HIGH and will continue with control of the heated seats and steering wheel for a specified period of time. After this time has expired, normal CSWM heated seat and steering wheel operation will resume. If the ambient temperature is above 4.4 °C (40 °F) when the engine start event occurs, normal CSWM heated seat and steering wheel operation will commence. The Driver Comfort System feature default setting is set to “Remote start and normal start”.

Load Shedding - The heated seat and steering wheel outputs participate in the load shed reduction strategy. The CSWM monitors several bus signals to determine which type of load shedding is needed, if any. There are four levels of load shed reduction strategy and the CSWM responds differently to each level:

1. Level 1 - If output is active, no change will occur. The CSWM retains the current setting(s).
2. Level 2 - If the output is active and the setting is Low, the CSWM will behave normally. If the output is High or Medium, the CSWM will turn off the PWM signal until the temperature reaches the low steady state. Once the low steady state has been achieved, the CSWM resumes its timer operation and diagnostic monitoring of the heated seat and steering wheel system.
3. Level 3 **or** Level 7- If the outputs are active, the CSWM sets these outputs to not active. If the outputs are already inactive, the CSWM prevents this state from changing to active until the load shed event has completed.

The heated seat and steering wheel 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 certain heated steering wheel input signals between the SCCM and the CSWM. The BCM is also the vehicle configuration master.

Inputs

- Internal input commanded ignition state
- Heated steering wheel temperature sensor status from the steering wheel switch over the LIN bus
- Heated steering wheel temperature from the steering wheel switch over the LIN bus

Outputs

- Vehicle configuration data to the CSWM
- Vehicle configuration data to the Radio
- Gated ESS information to the CSWM
- Heated seat type with heated steering configuration to the CSWM
- Ignition state to the CSWM, ICS and Radio
- Remote Start active to the CSWM
- Average ambient temperature to the CSWM
- Engine run state gated to the CSWM
- Load shed strategy to the BCM
- ICS present configuration to the CSWM
- Steering wheel temperature sensor state and steering wheel temperature signal to the CSWM

Comfort Seat and Wheel Module (CSWM)

Component Index

For heating the steering wheel, the CSWM shall provide power and return to the steering wheel heating element using hardwired signals through the SCCM. In order to achieve temperatures based on three configurable settings (High, Medium, Low), the CSWM uses hardwired PWM control signals. The CSWM regulates the steering wheel heated PWM outputs using a closed loop feedback controller. The CSWM allows control of the heated steering wheel independent of the heated seats.

Inputs

- ICS hard button requests
- Heated steering wheel temperature sensor data from the BCM
- Heated steering wheel temperature from the BCM
- Heated Seats with heated steering wheel configuration
- Vehicle interior temperature signal from the Radio
- CAN-IHS ICS Module equipped
- Load shed active and level
- Ignition state from the BCM
- Remote start active from the BCM
- Average ambient temperature from the BCM
- ESS present gated from the BCM
- ESS state gated from the BCM
- Heated steering soft button requests from the Radio
- Vehicle configuration from the BCM
- Engine run state gated from the BCM

Outputs

- Heated steering wheel state to the ICS
- Heated steering wheel state to the Radio

- Remote start/normal start signal to the Radio
- Remote start signal to the Radio
- Heated steering wheel power feed to the SCCM

Heated Steering Wheel

Component Index

The heated steering wheel contains a heating element in the steering wheel. Power to the heated steering wheel heating elements are provided using hardwired signals from the SCCM, via the steering wheel switch. The heated steering wheel contains a Negative Temperature Coefficient (NTC) type of thermistor. The thermistor is used for temperature sensing of the heated steering wheel element. The heated steering wheel provides thermistor feedback to the steering wheel switch using hardwired signals.

Integrated Center Stack (ICS) Module

Component Index

The ICS can a monetary non latching hard button for the heated steering wheel activation or deactivation. This switch has two states, pressed and not pressed. The ICS is placed on the CAN-IHS bus for communication with the CSWM.

Inputs

- Internal ON/OFF input from the hard button heated steering wheel switch located on the ICS
- Heated steering wheel status signals from the CSWM

Outputs

- CAN-IHS messages containing the hard button heated steering wheel switch ON/OFF requests to the CSWM
- Internal output to the hard button heated steering wheel switch for LED illumination strategy

Radio

Component Index

Certain radios allow for a climate control touch screen menu that includes a heated steering wheel soft button. When this button is pressed, a CAN-IHS signal is sent to the CSWM for the selected heated steering wheel operation.

The Radio also contains the customer programmable Drive Comfort System Feature menu options that includes heated seat and wheel operation under engine start events.

Inputs

- Remote start/normal start signal from the CSWM
- Remote start signal from the CSWM
- Heated steering wheel status signals from the CSWM
- Configuration data from the BCM

Outputs

- Soft button heated steering wheel switch ON/OFF requests to the CSWM

Steering Column Control Module (SCCM) with Steering Wheel Switch

Component Index

For heating the steering wheel, the SCCM provides power and return to the steering wheel heating element using hardwired signals. The steering wheel switch monitors the heated steering wheel temperature through hardwired circuits connected to a thermistor. The thermistor is what detects the temperature of the heated steering wheel. The steering wheel switch, via the SCCM, reports the heated steering wheel temperature on a signal sent over the Local Interface Network (LIN) bus. The steering wheel switch is also used to detect and report faults, via the SCCM, in the thermistor.

Inputs

- Heated steering wheel command signal from the CSWM
- Internal heated steering wheel return signal from the heated steering wheel
- Internal steering wheel temperature sense signal from the steering wheel switch to the heated steering wheel

Outputs

- Heated steering wheel return feed to the CSWM
- Internal output for the steering wheel heater command to the heated steering wheel
- Internal heated steering wheel temperature return signal to the steering wheel switch
- Steering wheel temperature sensor and steering wheel temperature from the steering wheel switch to the BCM