Component Procedures: Suspension Control (Automatic - Electronic)

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Electronic Suspension Control (Article 13510)

Figure 1: Electronic Suspension Control Block Diagram

The BWI electronic suspension control system, individually controls the damping force of each of the 4 shock absorber s in order to keep the vehicle's body as calm as possible. Changes of the damping forces can be accomplished within milliseconds. Suspension characteristics can be changed at any time by activating the sport mode or tour mode.

The electronic suspension control system consists of the following major components:

- The suspension control module
- Four corner height sensors
- Four shock absorber actuators, which are integrated within the shock absorbers
- Suspension Control Switch

The suspension control module controls the damping forces according to the following factors:

- Vehicle speed
- Steering wheel position
- Engine torque
- Brake pressure

The suspension control module evaluates these inputs in order to separately control the shock absorbers, providing an enhanced ride and comfort level over the widest possible range of operating conditions.

Suspension Control Module

The suspension control module controls the system functions and detects failures. The suspension control module receives input information by the four suspension position sensors that are directly connected to the module and by other systems through the serial data. The suspension control module commands variable levels of current to each shock absorber actuator.

Suspension Position Sensors

The suspension control module supplies a common 5 V reference and a ground circuit to each of the four corner height sensors. The height sensors supply a signal of 0.25–4.75 V to the suspension control module.

Shock Absorber Actuators

The shock absorber actuators are integrated within the shock absorbers. The electronic suspension control system uses a proportional valve that is located in the external bypass of the displacement module. Adjustment is performed by current control. The current range is 0–5 A. The actuators respond to commands of the suspension control module within milliseconds.

Driver Information Center Message

The electronic suspension control system uses the instrument cluster for the display functions instead. When the suspension control module detects a fault that sets a DTC, it sends a message on the serial data line to the instrument cluster, which will display the following message:

SERVICE SUSPENSION SYSTEM

The suspension control module has the ability to store DTCs as current or history codes. Most electronic suspension control system malfunctions will display a message in the instrument cluster and set a DTC. As long as the DTC is present, the message will be displayed.

Actions taken when a fault is detected will remain until the ignition is turned OFF, even if the fault condition is not present anymore.

If a fault is no longer present, the DTC will be stored as a history code. After 40 consecutive malfunction-free ignition cycles the DTC will be deleted.

Suspension Control Switch

The Selective Ride buttons are on the center console. Press to select the suspension of your choice. The indicator light will illuminate the current suspension setting.

- TOUR: Use for normal city and highway driving. The TOUR button selects a suspension and Electric Power Steering (EPS) calibration that provides a smooth, soft ride.
- SPORT: Use where road conditions or personal preference demand more control. The SPORT button selects a suspension and EPS calibration that provides more “feel,” or response to the road conditions.

The setting can be changed at any time. Based on road conditions, steering wheel angle, and the vehicle speed, the system automatically adjusts to provide the best handling while providing a smooth ride. The Tour and Sport modes will feel similar on a smooth road. Select a new setting whenever driving conditions change.

The suspension control module only controls the LED lighting of the Suspension Control Switch. The Electronic Brake Control Module controls all other functions of the switch.

Electronic Suspension Control Schematics (Article 13527)

Figure 1: Power, ground, Actuators and Sensors
Figure 2: Control Switch and Serial Data

Electronic Suspension (Article 10982)

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Electronic Suspension Control - Fastener Specifications (Article 13528)

Application Specification
Metric English
Front Electronic Position Sensor Nut 15 Nm 12 lb ft
Rear Electronic Position Sensor Nut 15 Nm 12 lb ft

Electronic Suspension Control Module Programming and Setup (Article 10734)

The following service procedures require either a programming or a setup event performed for a complete repair.

Electronic Suspension Control Module Reprogramming

If the electronic suspension control module needs to be reprogrammed, the following procedures must be performed:

- Connect a scan tool to the vehicle and access SPS . Refer to Service Programming System (SPS) .
- Perform the SPS function Electronic Suspension Control Module – Programming and follow the on-screen instructions.
- Clear DTCs after completing the programming procedure.

Electronic Suspension Control Module Scan Tool Information (Article 10777)

The electronic suspension control module scan tool data parameters list contains all suspension control related parameters that are available on the scan tool. The list is arranged in alphabetical order. A given parameter may appear in any one of the data lists.

Parameter System State Expected Value Description
Operating Conditions: Ignition ON
Battery Voltage — 11–14 V The scan tool displays V. This is the current battery voltage.
Left Front Damper Actuator Command — varies The scan tool displays mA. This is the current applied to the left front damper actuator.
Left Front Suspension Position Sensor — 0.25–4.75 V The scan tool displays V. This is the signal from the left front suspension position sensor.
Right Front Damper Actuator Command — varies The scan tool displays mA. This is the current applied to the right front damper actuator.
Right Front Suspension Position Sensor — 0.25–4.75 V The scan tool displays V. This is the signal from the Right front suspension position sensor.
Left Rear Damper Actuator Command — varies The scan tool displays mA. This is the current from the left rear damper actuator.
Left Rear Suspension Position Sensor — 0.25–4.75 V The scan tool displays V. This is the signal from the left rear suspension position sensor.
Right Rear Damper Actuator Command — varies The scan tool displays mA. This is the current from the right rear damper actuator.
Right Rear Suspension Position Sensor — 0.25–4.75 V The scan tool displays V. This is the signal from the right rear suspension position sensor.
Suspension System Mode — Normal The scan tool displays Normal, Comfort or Sport Mode depending on the selected mode.
Tour mode switch pressed Sport
Sport mode switch pressed Track
Suspension Position Sensor 5 V Reference V 4.8–5.2 V The scan tool displays V. This is the suspension position sensor supply voltage.

Output Control Description
Left Front Damper Actuator Commands the current applied to the left front damper actuator Increase or Decrease.
Left Rear Damper Actuator Commands the current applied to the left rear damper actuator Increase or Decrease.
Right Front Damper Actuator Commands the current applied to the right front damper actuator Increase or

Decrease.
Right Rear Damper Actuator Commands the current applied to the right rear damper actuator Increase or Decrease.