

# Electronic Suspension Control Description and Operation

The electronic suspension control (ESC) system is bi-state real time damping system. The ESC module controls the suspension damper solenoids and suspension position sensors, along with parts of the automatic level control (ALC) system, if 1500 series.

The ESC system consists of the following:

- The ESC module
- The compressor/leveling module, if 1500 series
  - The air pressure sensor, if 1500 series
  - The exhaust solenoid, if 1500 series
- The compressor motor relay, if 1500 series
- The steering handwheel speed/position sensor
- The suspension damper solenoids
- The suspension position sensors

## Electronic Suspension Control (ESC) Module

The objective of the ESC module is to provide ride and handling results that are superior to a passive damper system, both on and off road at all load conditions. The ESC module monitors body-to-wheel height, vehicle speed, handwheel position/speed, lift/dive status and a driver tow/haul input switch status in real time and instantly selects a "normal" or "firm" mode. This is done for each of the front and rear shock absorbers in order to adjust the vehicle for specific road and driving conditions.

The ESC module will also use the rear body-to-wheel displacements and vehicle speed inputs to keep the rear trim height of the vehicle at its desired level. The ESC module will stay awake for approximately ten minutes after ignition off on 1500 series equipped with Automatic Level Control. For more information on the ALC system, refer to [Automatic Level Control Description and Operation](#) in Automatic Level Control.

Ignition cycle counting is used by the ESC module to detect faults in the system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display the "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

## Position Sensors

The ESC module provides a common regulated voltage of approximately 5 volts to all 4 of the body-to-wheel suspension position sensors and to the air pressure sensor. The ESC module receives vehicle speed sensor (VSS) discrete output from the PCM. The suspension position sensors provide an analog signal voltage between 0.5 and 4.5 volts to the ESC module. This signal voltage represents the wheel's position relative to the body. The ESC module provides a 5 volt reference and a low reference to the suspension position sensors.

## **Shock Absorbers**

The damper consists of an in-piston two position solenoid with a 1.5-3.3 ohm coil. The response time of the damper is less than 40 ms. The damper is using movement of oil through an orifice for the damping effect.

The suspension damper solenoid is driven ON and OFF by the ESC module. To activate the solenoid, it is initially subjected to full battery voltage for a short period of time. Once the solenoid is pulled-in, the supply voltage is pulse width modulated (PWM). The amount the suspension damper solenoid is activated is based on inputs from the driver Tow/Haul switch, road inputs, position sensor inputs and the powertrain control module (PCM). The ESC module provides a common ground for all 4 of the suspension damper solenoids.

## **Vehicle Speed**

The ESC module receives a vehicle speed input. It is obtained over the CLASS 2 serial communication buss. Vehicle speed is used to determine the amount of damper control necessary.

## **Warning Message**

The SERVICE RIDE CONTROL message is displayed in the IPC message center, depending on the fault that has been encountered. The warning message will be continued to be displayed, until the fault has been corrected.