

## General System Description

The purpose of the Bosch 5.3 Antilock Brake System (ABS) is to minimize wheel slip during heavy braking. The Bosch 5.3 performs this function by monitoring the speed of each wheel and controlling the brake fluid pressure to each wheel independently during a braking event. This allows the driver to retain directional stability and better steering capability. The Traction Control System (TCS) also monitors rear wheel speed and compares the speed to the speed of the front wheel. If excessive rear wheel speed is detected in either rear wheels the TCS will be activated.

## Abbreviations and Definitions

**ABS:** Antilock Brake System

**ASM:** Accelerator and Servo Control Module

**B+:** Battery Voltage

**BPMV:** Brake Pressure Modulator Valve

**CKT:** Circuit

**DLC:** Data Link Connector

**DTC:** Diagnostic Trouble Code

**DMM:** Digital Multimeter

**EBCM:** Electronic Brake Control Module

**EBD:** Electronic Brakeforce Distribution

**EBTCM:** Electronic Brake and Traction Control Module

**IPC:** Instrument Panel Cluster

**PCM:** Powertrain Control Module

**TCS:** Traction Control System

**WSS:** Wheel Speed Sensor

## Basic Knowledge Required

Before using this section, it is important that you have a basic knowledge of the following items. Without this basic knowledge, it will be difficult to use the diagnostic procedures contained in this section.

If you need a review of basic electrical troubleshooting knowledge, Refer to General Electrical Diagnosis Procedures in Wiring Systems. Additionally, electrical/electronic courses are offered through General Motors Service Training.

## Basic Electrical Circuits

- You should understand the basic theory of electricity and know the meaning of voltage, current (amperes) and resistance (ohms).
- You should understand what happens in a circuit with an open or shorted wire.
- You should be able to read and understand a wiring diagram.

## Use of Circuit Testing Tools

- You should be familiar with the Digital Multimeter (DMM) *J 39200*, and be familiar with the meter controls and how to use them correctly.
- You should be able to measure voltage, resistance and current.
- You should know how to use jumper wires to bypass components for testing circuits.

**Important:** When measuring the resistance to ground of circuit or component, make sure to use a solid, unpainted chassis ground or the negative battery terminal.

## ABS Description

### Brake Pressure Modulator Valve (BPMV)

The Brake Pressure Modulator Valve (BPMV) mounted on the left side of the engine compartment, provides brake fluid modulation for each of the individual wheel circuits as required during Antilock braking. During the Antilock mode, the BPMV can maintain or reduce brake fluid pressure independent of the pressure generated in the master cylinder. The BPMV does not provide more pressure than is applied by the master cylinder during braking.

The BPMV supplies Electronic Brakeforce Distribution (EBD). This function takes the place of the proportioning valve(s).

With the exception of the EBCM/EBTCM, the Brake Pressure Modulator Valve (BPMV) is an integral, non-serviceable component. The BPMV should never be disassembled.

If the vehicle is not equipped with traction control the BPMV uses a three circuit configuration with a front-rear split. Individual circuits are provided for the left front and right front wheels, and the rear wheels use one circuit.

If the vehicle is equipped with traction control the BPMV uses a four circuit configuration with a front-rear split. Individual circuits are provided for the left front and right front wheels, and left rear and right rear wheels.

The BPMV consists of several other components which are described as follows:

### Pump Motor

The BPMV contains a motor driven recirculation pump. The pump serves two purposes: 1) During ABS Reduce Pressure events, it transfers fluid from the brake calipers back to the master cylinder; and 2) During traction control, it transfers fluid from the master cylinder reservoir to the rear brake calipers. The pump and motor are located within the BPMV and are not serviced separately.

### ABS Valves

The ABS valves decrease or maintain brake fluid pressure at the individual wheel circuits. If the vehicle is not equipped with traction control there are three Inlet, and three Outlet solenoid valves. If the vehicle is equipped with traction control there are four Inlet, and four Outlet solenoid valves. The solenoid valves maintain, increase, or decrease brake fluid pressure to the individual wheel circuits. The EBCM/EBTCM commands the valves to their correct position during an antilock or traction event. During antilock mode, the pressure in each hydraulic circuit can be held or released by activating the appropriate valves. The normal state of the inlet valves is open, while the normal state of the Outlet valves is closed. This allows direct master cylinder pressure to the brakes during normal braking. The ABS valves are located within the BPMV and are not serviced separately.

### TCS Master Cylinder Isolation Valves

If the vehicle is equipped with Traction Control there is one TCS Master Cylinder Isolation Valve within the BPMV. This valve isolates the master cylinder so the pump motor can build brake fluid pressure for the rear brakes during a traction event.

### TCS Prime Valves

If the vehicle is equipped with Traction Control there is one TCS prime valve within the BPMV. This valve allows the pump to draw fluid from the master cylinder reservoir, through the compensating ports in the master cylinder bore.

### Electronic Brake And Traction Control Module

The EBCM/EBTCM performs the following primary functions:

- Detects wheel slip tendencies
- Detects wheel speed differences
- Controls the brake system while in the antilock or traction control mode
- Controls the Electronic Brakeforce Distribution (EBD)
- Monitors the system for proper electrical operation

The EBCM/EBTCM also controls the display of the ABS and traction control DTCs while in diagnostic mode. The EBCM/EBTCM continuously checks the speed of each wheel in order to determine if any wheel is beginning to slip. If a wheel slip tendency is detected, the EBCM/EBTCM commands the appropriate valve positions to modulate the brake fluid pressure in some or all of the hydraulic circuits.

This action prevents wheel slip and provides optimum braking. The EBCM/EBTCM continues to control pressure in the individual hydraulic circuits until a slipping tendency is no longer present. The EBCM/EBTCM continuously monitors the ABS/TCS for proper operation. If an error is detected, the EBCM/EBTCM can disable the ABS/TCS and turn on the ABS or TCS OFF Indicators in the IPC.

### Wheel Speed Sensors

A wheel speed sensor is located at each front wheel bearing assembly. If the vehicle is equipped with traction control a wheel speed sensor is located at each rear wheel bearing assembly. If the vehicle is not equipped with traction control then a single rear wheel speed sensor is located in the differential housing. The sensors use AC voltage in order to transmit wheel speed information to the EBCM/EBTCM. Passing a toothed sensor ring past a stationary sensor causes the magnetic induction that generates the voltage. A pair of wires carries the signal to the EBCM/EBTCM. The wheel speed sensors are located in their respective assemblies and are not adjustable.

### Traction Control System ON/OFF Switch

The Traction Control On/Off Switch is a momentary on switch that allows the driver to shut off the TCS for personal or diagnostic reasons. Turning the switch to off places the TCS in the passive mode while maintaining ABS functions. With the TCS system on, pressing the switch disables the TCS and the TRACTION OFF indicator turns on.

### Stoplamp Switch

The stoplamp switch is an input to the EBCM/EBTCM. The EBCM/EBTCM uses the stoplamp switch in order to tell when the brake pedal is being applied.