

**ABS Booster Unit (Z103)**

The ABS Booster Unit (Z103) contains 2 isolation solenoid valves and 4 pairs of solenoid control valves which are grounded through the harness. When the ETC is fitted, the booster unit also contains an additional 2 solenoid valves. The pairs of solenoid control valves each include a fluid pressure inlet and outlet valves that control ABS braking to one wheel.

The Anti-Lock Brake System ECU (Z108) operates these valves by applying battery voltage to them. The valves are designed to decrease, hold or increase pressure to retain wheel rotation and optimum braking.

The 2 isolation valves consist of 2 solenoid valves that control fluid inlet and outlet. Their function is to disconnect or isolate the master cylinder from the servo cylinder and to connect the servo cylinder to the reservoir return during ABS functions.

**Wheel Speed Sensors (X137, X140, X158, X161)**

A wheel speed sensor is located at each wheel. The speed sensors generate an AC voltage signal as a toothed ring rotates past the stationary sensor pickup. The Anti-Lock Brake System ECU (Z108) calculates the wheel speed by measuring the frequency of the AC voltage signal generated by the sensors.

**ABS Hydraulic Pump (M102)**

The hydraulic boost for the system is provided by the ABS Hydraulic Pump (M102), which is controlled by the ABS Pump Relay (K102) and the ABS Pressure Switch Unit (Z104).

The Pressure Switch unit incorporates three electro-mechanical switches. The first operates the pump, two more illuminate the low pressure condition and signal that ABS and ETC functions should be curtailed. The Hydraulic Pump includes a hydraulic accumulator and non-return valve, as well as a pressure relief valve to protect the system.

When low pressure occurs in the brake system, a switch in the pressure switch unit closes to ground the coil of the pump relay. The pump relay now energizes and applies battery voltage from the fuse to the hydraulic pump through the closed relay contacts. The hydraulic pump runs to increase pressure in the hydraulic accumulator. When sufficient pressure is developed in the system, the pressure switch opens to de-energize the pump relay and to turn off the hydraulic pump.

**ABS Warning Lamp**

The Anti-Lock Brake System ECU (Z108) sends signals to the BeCM which then controls the illumination of the ABS warning lamp. The BeCM also controls the display of the system messages.

**Solenoid Valve Relay**

This is energized by the ABS ECU and sends voltage back to the part of the same ECU which controls the solenoid valves in the booster. When the ABS ECU detects a fault that requires a complete system shutdown, the relay is de-energized.