106

ABS COMPONENTS AND OPERATION

Figure 106-1 Maximum braking traction occurs when tire slip is between 10% and 20%. A rotating tire has 0% slip and a locked-up wheel has 100% slip.

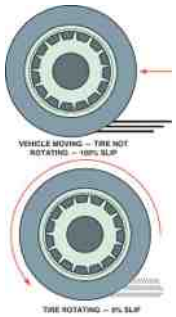
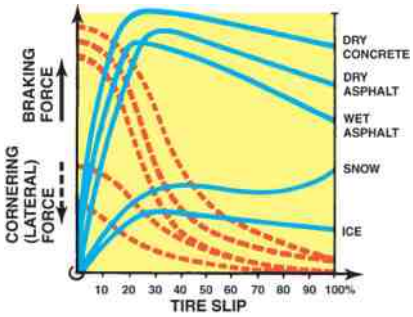


Figure 106-2 Traction is determined by pavement conditions and tire slip.



TECH TIP

Tire "Chirp" Noise during Hard Braking Is Normal

Sometimes customers state that they do not think that their antilock braking system (ABS) is working correctly because they heard the tires making noise (chirping sound) during hard braking. This is normal as the tires slip about 20% during an ABS stop.

Figure 106-3 A good driver can control tire slip more accurately than an ABS if the vehicle is traveling on a smooth, dry road surface.

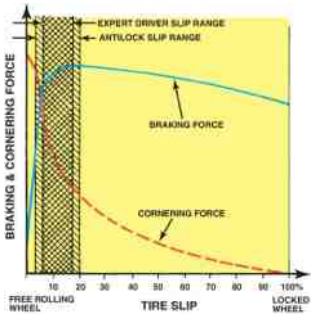
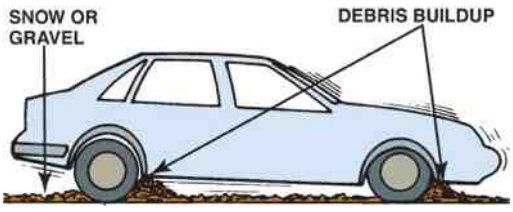


Figure 106-4 A wedge of gravel or snow in the front of a locked wheel can help stop a vehicle faster than would occur if the wheel brakes were pulsed on and off by an antilock braking system.



106 ABS COMPONENTS AND OPERATION

Figure 106-5 Being able to steer and control the vehicle during rapid braking is one major advantage of an antilock braking system.

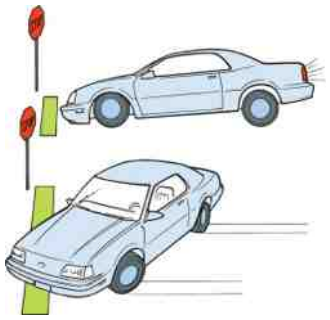


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Figure 106-6 A typical stop on a slippery road surface without antilock brakes. Notice that the wheels stopped rotating and skidded until the vehicle finally came to a stop.

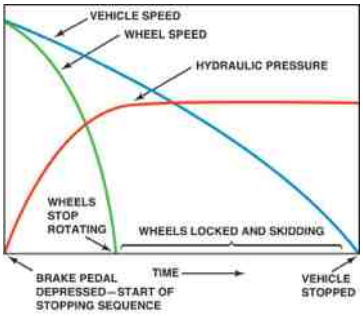

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Figure 106-7 ABS configuration includes four-channel, three-channel, and single-channel.

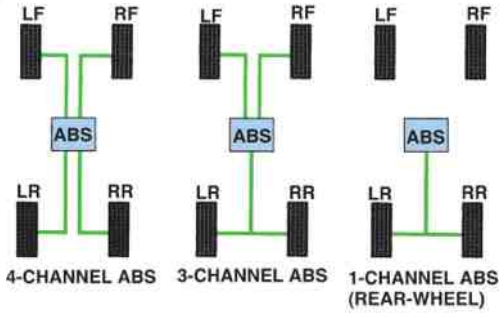

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Figure 106-8 A typical integral ABS unit that combines the function of the master cylinder, brake booster, and antilock braking system in one assembly.

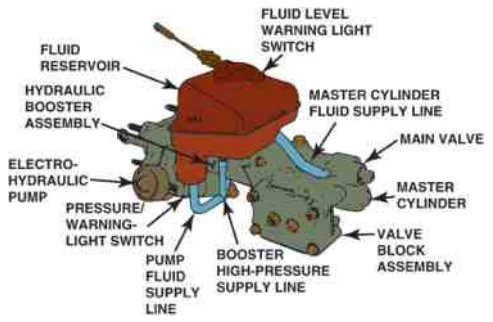

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Figure 106-9 A typical nonintegral-type (remote) ABS.

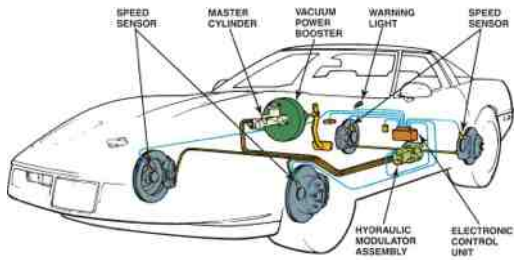

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Figure 106-10 A schematic drawing of a typical antilock braking system.

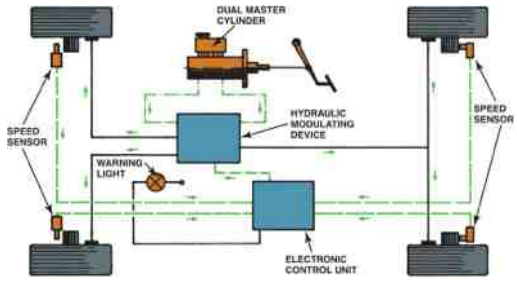

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Figure 106-11 Wheel speed sensors for the rear wheels may be located on the rear axle, on the transmission, or on the individual wheel knuckle.

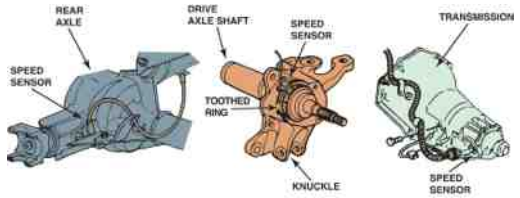

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Figure 106-12 A schematic of a typical wheel speed sensor. The toothed ring is also called a *tone ring*.

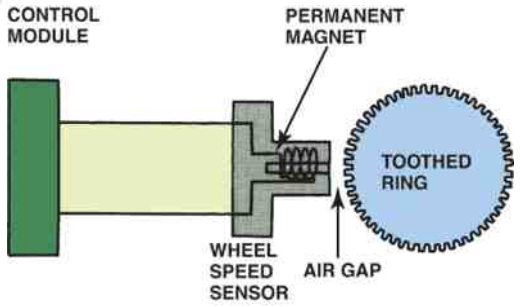

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Figure 106-13 Wheel speed sensors produce an alternating current (AC) signal with a frequency that varies in proportion to wheel speed.

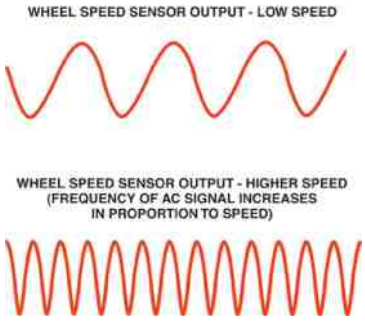


Figure 106-14 A digital wheel speed sensor produces a square wave output signal.

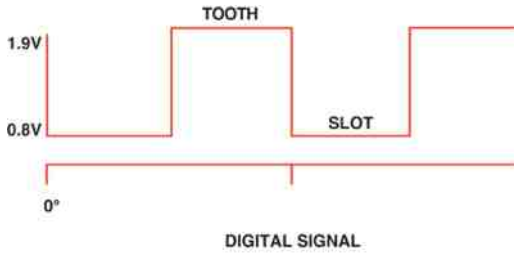


Figure 106-15 Typical inputs and outputs for brake control modules.

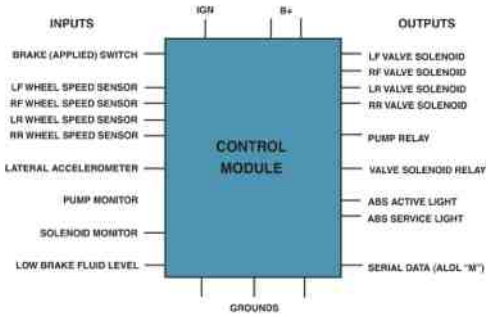
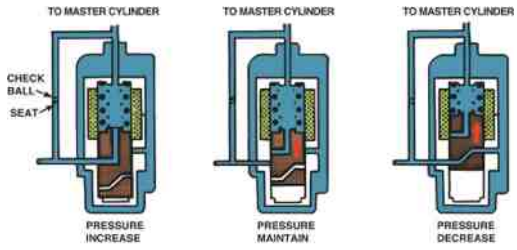


Figure 106-16 An ABS three-way solenoid can increase, maintain, or decrease brake pressure to a given brake circuit.



106 ABS COMPONENTS AND OPERATION

Figure 106-17 The isolation or hold phase of an ABS on a Bosch 2 system.

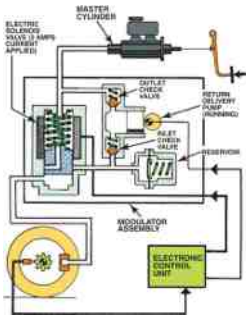


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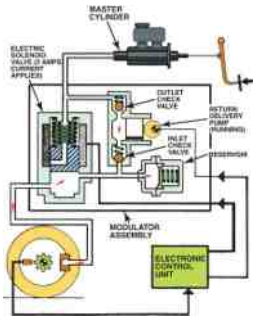
Figure 106-18 During the pressure reduction stage, pressure is vented from the brake circuit so the tire can speed up and regain traction.



106 ABS COMPONENTS AND OPERATION

Figure 106-19 The control module reapplies pressure to the affected brake circuit once the tire achieves traction so that normal braking can continue.

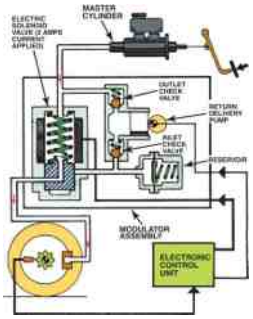
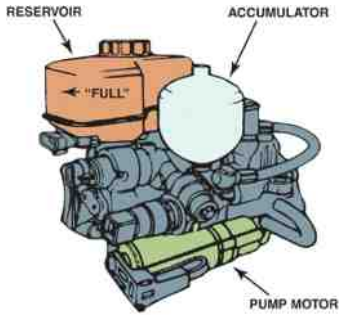


Figure 106-20 An integral ABS unit with a pump motor to provide power assist during all phases of braking and brake pressure during ABS stops.



TECH TIP

Best to Keep Stock Tire Diameter

Vehicles equipped with antilock brakes are "programmed" to pulse the brakes at just the right rate for maximum braking effectiveness. A larger tire rotates at a slower speed and a smaller-than-normal tire rotates at a faster speed. Therefore, tire size affects the speed and rate of change in speed of the wheels as measured by the wheel speed sensors.

While changing tire size will not prevent ABS operation, it will cause less effective braking during hard braking with the ABS activated. Using the smaller spare tire can create such a difference in wheel speed compared with the other wheels that a false wheel speed sensor code may be set and an amber ABS warning lamp on the dash may light. However, most ABS systems will still function with the spare tire installed, but the braking performance will not be as effective. For best overall performance, always replace tires with the same size and type as specified by the vehicle manufacturer.

WHEEL SPEED SENSOR 1 A tone ring and a wheel speed sensor on the rear of a Dodge Caravan.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 2 The wiring from the wheel speed sensor should be inspected for damage.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 3 To test a wheel speed sensor, disconnect the sensor connector to gain access to the terminals.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 4 Pulling down the rubber seal reveals the connector.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 5 The ABS controller (computer) on this vehicle supplies a 2.5-volt reference signal to the wheel speed sensors. Set the meter to read DC volts and test at the computer end of the connector for voltage.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 6 The meter reads about 2.4 volts, indicating that the ABS controller is supplying the voltage to the wheel speed sensor.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 7 Set meter to read Ohms. The test probes are touched to the terminals leading to the wheel speed sensor and the resistance is 1.1032 k ohms or 1,103.2 ohms.

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WHEEL SPEED SENSOR 8 With one lead connected to the sensor terminal and the other to a ground, The meter should (and does) read "OL," indicating that the wheel speed sensor and pigtail wiring is not shorted to ground.

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WHEEL SPEED SENSOR 9 To measure the output of the wheel speed sensor, select AC volts on the digital multimeter.

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WHEEL SPEED SENSOR 10 Rotate the wheel and tire assembly by hand while observing the AC voltage output on the digital mul timeter.

106 ABS COMPONENTS AND OPERATION

WHEEL SPEED SENSOR 11 A good wheel speed sensor should be able to produce at least 100 mV (0.1 V) when the wheel is spun by hand.

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WHEEL SPEED SENSOR 12 After testing, carefully reinstall the wiring connector into the body and under the rubber grommet.