Haynes shows you how

BMW 3-Series and Z4 (99-05) Includes 2006 325ci/330ci Coupe and Convertible models Haynes Online Manual.

19 Anti-lock braking system (ABS) - general information

Note:
On models equipped with traction control, the ABS unit is a dual function unit, and works both the anti-lock braking system (ABS) and traction control function of the Automatic Stability Control plus Traction (ASC+T) system.

1 Most models are equipped with ABS as standard, and was available as an option on all others. The system consists of a hydraulic block that contains the hydraulic solenoid valves and the electrically-driven return pump, the four wheel sensors (one installed to each wheel), and the electronic control unit (ECU). The purpose of the system is to prevent the wheel(s) locking during heavy braking. This is achieved by automatic release of the brake on the relevant wheel, followed by re-application of the brake.

2 The solenoids are controlled by the ECU, which itself receives signals from the four wheel sensors (one installed on each hub), which monitor the speed of rotation of each wheel. By comparing these signals, the ECU can determine the speed at which the vehicle is travelling. It can then use this speed to determine when a wheel is decelerating at an abnormal rate, compared to the speed of the vehicle, and therefore predicts when a wheel is about to lock. During normal operation, the system functions in the same way as a non-ABS braking system. In addition to this, the brake pedal position sensor (which is installed to the vacuum power brake booster) also informs the ECU of how hard the brake pedal is being depressed.

3 If the ECU senses that a wheel is about to lock, it operates the relevant solenoid valve in the hydraulic unit, which then isolates the brake caliper on the wheel which is about to lock from the master cylinder, effectively sealing-in the hydraulic pressure.

4 If the speed of rotation of the wheel continues to decrease at an abnormal rate, the ECU switches on the electrically-driven return pump operates, and pumps the brake fluid back into the master cylinder, releasing pressure on the brake caliper so that the brake is released. Once the speed of rotation of the wheel returns to an acceptable rate, the pump stops; the solenoid valve opens, allowing the hydraulic master cylinder pressure to return to the caliper, which then re-applies the brake. This cycle can be carried out at up to 10 times a second.

5 The action of the solenoid valves and return pump creates pulses in the hydraulic circuit. When the ABS system is functioning, these pulses can be felt through the brake pedal.

6 The operation of the ABS system is entirely dependent on electrical signals. To prevent the system responding to any inaccurate signals, a built-in safety circuit monitors all signals received by the ECU. If an inaccurate signal or low battery voltage is detected, the ABS system is automatically shut down, and the warning light on the

instrument panel is illuminated, to inform the driver that the ABS system is not operational. Normal braking should still be available, however.

7 If a fault does develop in the ABS system, the vehicle must be taken to a BMW dealer or suitably-equipped specialist for fault diagnosis and repair.

8 On models equipped with ASC+T, an accumulator is also incorporated into the hydraulic system. As well as performing the ABS function as described above, the hydraulic unit also works the traction control side of the ASC+T system. If the ECU senses that the wheels are about to lose traction under acceleration, the hydraulic unit momentarily applies the rear brakes to prevent the wheel(s) spinning. In the same way as the ABS, the vehicle must be taken to a BMW dealer or suitably-equipped specialist for testing if a fault develops in the ASC+T system.