

# Proper Maintenance Helps Extend Vehicle Life!



Your driving type or vehicle usage may affect the maintenance intervals below. You should follow the manufacturer's service schedule that best matches your vehicle's operating conditions.

Those recommendations may include:

- Change your engine oil every 3 months or 3,000 miles
- Check your tire inflation pressure monthly
- Rotate your tires every 6 months or 5,000 to 8,000 miles
- Change the engine air filter annually or when visibly restricted.
- Inspect Brake System every 12 months or 15,000 miles

## How Long Does It Take to Stop an Automobile?

MPH	Reaction Time (ft)	Braking Distance (ft)	Total (ft)
15	16	12	28
25	27	32	59
30	33	47	80
45	50	104	154
55	61	155	216
70	77	252	329

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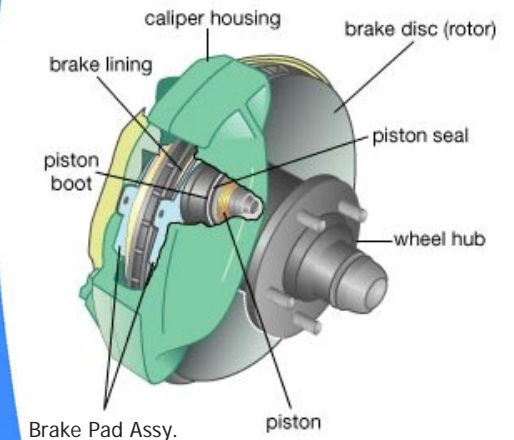
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Good Maintenance  
Adds Extra Mileage



## Brake Time



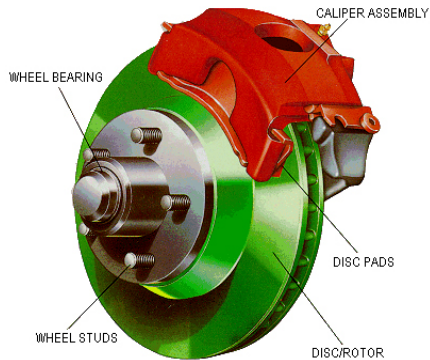
# Preventive Maintenance

The Automotive Maintenance and Repair Association (AMRA) recommends to its members that (1) Brake fluid be tested for contamination at OEM recommended brake system inspection intervals, and (2) that a Brake fluid replacement service be performed, for most vehicles, when testing shows copper content exceeds 200 ppm. The AMRA Technical Committee reached these conclusions after extensive study of industry data, including a review of SAE Papers, US Government reports (NHTSA and NIST) and independent laboratory studies, among other resources. The data showed that this increased presence of copper contamination predetermines the rapid growth of iron contamination and corrosion which has shown to impede future brake system performance.

## Brake Components

### Disc Brakes

Disc Brakes are comprised of a disc or rotor, a caliper assembly, disc brake pads and the wheel bearings and hardware necessary to mount the components on the vehicle. The caliper is connected to the master cylinder through tubes, hoses and valves that conduct brake fluid through the system.



### Brake Fluid

Brake fluid is a type of hydraulic fluid used in brake applications for automobiles and light trucks. It is used to transfer force under pressure from where it is created through hydraulic lines to the braking mechanism near the wheels. Braking applications produce a lot of heat, so brake fluid must have a high boiling point and also remain effective in freezing temperatures.

**Caliper Assembly** - Contains the caliper piston, seal and dust boot. Caliper bolts connect the assembly to the steering assembly and align the housing with the rotor. Caliper hardware provides a slide surface for the caliper to move across the bolt and hold the brakes together.

**Disc Pads** - Various compounds for the friction material which is bonded or riveted to a metal plate.

**Rotor** - A metallic disc that rotates with the wheel. When the brakes are applied the disc pads grab the rotor. The friction between the disc pads and rotor slows or stops the vehicle.

**Wheel Bearings** - Support and hold the rotor in alignment with the disc pads and caliper assembly and allow wheel rotation.

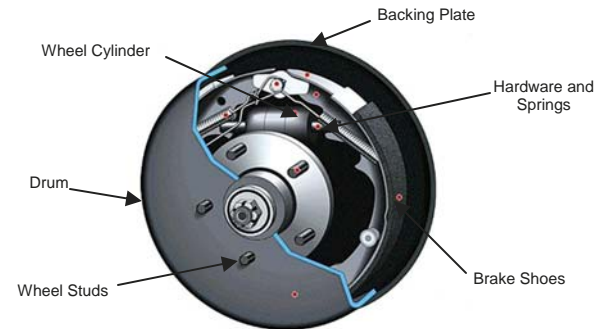
**Wheel Studs & Lug Nuts** - Support the wheel/tire assembly and secure it on the automobile.

### Anti-Lock Brakes

A typical ABS is composed of a central electronic unit, up to four speed sensors (one for each wheel), and two or more hydraulic valves on the brake circuit. The electronic unit constantly monitors the rotation speed of each wheel. When it senses that any number of wheels are rotating considerably slower than the others (a condition that will bring it to lock) it moves the valves to decrease the pressure on the braking circuit, effectively reducing the braking force on that wheel. The wheel(s) then turn faster and when they turn too fast, the force is reapplied. This process is repeated continuously, and this causes the characteristic pulsing feel through the brake pedal. A typical anti-lock system can apply and release braking pressure up to 20 times a second or more.

### Drum Brakes

Drum Brakes are comprised of a drum & backing plate, a hub or axle assembly, brake shoes, wheel cylinder, wheel bearings and hardware necessary to mount these components on the vehicle. The wheel cylinder is connected to the master cylinder through tubes, hoses and valves that conduct brake fluid through the system.



**Backing Plate** - Provides a mounting and sliding surface for the shoes, hold down hardware and wheel cylinder.

**Wheel Cylinder** - Contains the spring, pistons, seals and dust boots.

**Brake Shoes** - Various compounds for the friction material which is bonded or riveted to a metal plate.

**Drum** - A metal cylinder that rotates with the wheel. When the brakes are applied the brake shoes press against the drum and the friction between the shoes and the drum slows or stops the vehicle.

**Hardware and Springs** - Several springs that pull brake components back to the proper position when the brake pedal is released and holds the shoes against the backing plate.

**Wheel Studs & Lug Nuts** - Support the wheel/tire assembly and secure it on the automobile.

## Things to watch for

- Scraping or grinding noise coming from the brakes
- Test of Brake fluid indicates a copper content of 200 ppm or greater, indicating the requirement for a fluid replacement
- Brake pedal feels soft or spongy when the brake pedal is depressed
- Vehicle pulls to one side when the brakes are applied
- Brake fluid level in master cylinder low
- Brake system Warning Lamp stays illuminated



Taking the Mystery out of Maintenance