

BRAKES – ABS AND EBS

The idea behind ABS is simple. The system monitors wheel speeds at all times and controls brake application pressures when wheel lock is imminent. The main benefits of an ABS system are better vehicle stability and control during severe braking.

Should a malfunction occur in the electronic system, the system is designed to operate exactly as a non-ABS system. Failures tend not to be total.

Basics of ABS Operation Split-Coefficient Stops

Because in many systems the brakes on each side of the vehicle are individually controlled, ABS permits maximum efficiency stops even when the vehicle is run on a split-coefficient surface. A split-coefficient surface might occur when one side of the vehicle was running on ice and the other on bare pavement. This type of braking situation is hazardous even for experienced drivers.

The ABS module is capable of cycling the brakes on the ice side of the vehicle at a different rate from that on the dry side. This enables it to obtain maximum road traction through the stop.

Caution: When driving an ABS-equipped truck, drivers have a tendency to expect too much. Always exercise care when braking, especially under bobtail conditions, even when the ABS is fully functional.

ABS Failures and Diagnosis

In all North American applications, ABS is required to revert to normal airbrake operation when in failure mode.

Types of ABS – Speed and Weight Facts

Speed and weight affect the stopping power required to stop any vehicle and how far it will travel before it stops. You need more stopping power whenever the speed you are traveling and/or the weight of your vehicle increases.

- 2 times the vehicle speed required 4 times the stopping power
- 2 times the vehicle weight requires 2 times the stopping power
- 2 times the vehicle speed and 2 times the vehicle weight requires 8 times the stopping power



"It's a note from the bus driver. He wants all students to stop eating sugar cereals for breakfast. He says he can't deal with 30 sugar highs early in the day."

Downgrades

- You must control your speed all the way down every hill so you can respond to any emergency.
- Select an appropriate gear and use the vehicles retarding device, if equipped, to allow you to go down the hill at your chosen speed without using the service brakes.
- Using the “snub and roll” technique rather than applying a constant brake application will help ensure all brakes do their share.

Why Air Brakes?

- Air brake systems use a much greater force to apply the brakes than hydraulic braking systems do. This greater force is needed to cope with the heavy loads of commercial vehicles.
- Air brake systems are more tolerant to small leaks. The smallest leak in a hydraulic system could result in brake failure.
- Air brakes are used on heavy vehicles because they have proven they are capable of stopping these vehicles safely.

Basic Air Brake Components

- A compressor to pump air, with a governor to control the compressor.
- Air lines to allow the pressurized air to flow between the air brake system components.
- A reservoir to store the compressed air.
- A brake pedal (usually called a foot valve) to apply the brakes by directing compressed air from the reservoir to the brakes.
- Foundation brakes, including brake chambers, slack adjusters, brake linings and drums or rotors, transfer the force generated by the compressed air through a mechanical linkage to apply the brakes. The most common device used to apply truck air brakes – the air brake chamber. It converts the force of compressed air into a strong mechanical force through the pushrod and slack adjuster. Long stroke back chambers can usually be identified by square-shaped inlet ports or a nametag on the clamp bolt. The compressor is capable of compressing air to over 500 psi (3448 kPa). This is far higher than is needed to operate an air brake system. Most current air brake systems operate with a maximum pressure of 125 psi (862 kPa).

Governor

- This is the job of the governor. When sufficient pressure has been built up, the governor causes the compressor to go into an “unloading” stage.
- Governor pressure 105-135
- Pump pressure to 85 psi
- Although the maximum pressure on different vehicles may vary between 105 and 135 psi (724 and 931 kPa), the range between minimum and maximum pressure should be approximately 20 psi (138 kPa).
- At any rate, the governor must restart the compressor if the air pressure drops below 80-85 psi (552-586 kPa) ½ tank pressure.

Reservoirs

The safety valve is sometimes called a pop-off valve.

- A Safety valve will be installed on the first reservoir to protect the reservoirs from being over-pressurized and bursting if the governor was to fail to unload the compressor.
- Valves are normally set to vent the excess pressure at approximately 150 psi (1034 kPa).

- The air that is delivered from the compressor usually contains some water vapor that condenses into liquid water. This is why the supply reservoir is often called the wet tank.
- An excess of water in the system causes trouble with valves and other parts. In winter, water in the system may freeze, causing malfunction of valves or brake chambers.
- Most manufacturers recommend that reservoirs be drained daily.

How Air Brakes Work

Dual Air Brake Systems

The two sections of the dual foot valve are named primary and secondary. The primary section is located closest to the pedal and, in many systems, operates the drive axle brakes. The secondary section usually operates the steering axle brakes.

Low Air Warning Device

The low air warning device must come on when air pressure drops below 60 psi (414 kPa).

Quick Release Valve

A quick release valve allows the brakes to release quickly and fully by allowing the pressurized air to exhaust near the brake chambers. A quick release valve is placed close to the front brake chambers between the foot valve and the air chambers.

Relay Valve

A relay valve has been installed between the reservoir and the rear brake chambers.

Dual System with Primary System Failure

If the low air warning system activates at any time...**stop immediately** and do not proceed until a repair has been made.

Parking Brake Control Valve

A parking brake control valve (usually a yellow button) is mounted on the dashboard. In most cases, pushing this valve in allows air pressure to flow to the spring brake chambers, causing these spring brakes to release.

Adjusting S-Cam Brakes with Automatic Slack Adjusters

As part of our "Preventive Maintenance Program" all brake adjustments and settings are verified during our routine maintenance checks which take place every 5,000 km's.

Six Great Air Brake Myths

- 1) That Brake Adjustment Can Be Checked From The Cab. Various manuals state that checking the reservoir pressure drop caused by full brake application is a good method of deciding when brakes need adjusting. The maximum allowable drop before brake adjustment is needed is stated to be from 8 to 12 psi. Because virtually all trucks built since 1975 (see Federal Motor Vehicle Safety Standard 121 Section) have reservoir volumes that are at least 12 times the volume of all service chambers when measured at the full stroke position, it can be seen that the 8 or 12 psi pressure drop method could result in the brakes being dangerously out of adjustment. **There is no reliable substitute for a physical check of brake adjustment.**

- 2) That An Angle of 90 Degrees Between The Centre Of The Slack Adjuster And The Air Chamber Pushrod Is An Indication Of Good Brake Adjustment. The existence of a 90 degree angle between the centre lines of the slack adjuster and chamber pushrod with the brakes applied has long been thought to be a reliable indication that the brakes are in proper adjustment. **This assumption is unreliable.** If the chamber pushrod has not been precisely cut to the proper length when the chamber was installed, the angle can be somewhat less than, or more than 90 degrees, even with the brakes properly adjusted. Replacement chambers, particularly spring brake chambers are frequently cut incorrectly.
- 3) That A Clockwise Turn Of The Adjusting Bolt Of A Slack Adjuster Will ‘Set Up’ The Brakes. Most current slack adjusters have their internal gearing cut in such a way that a clockwise turn of the adjusting bolt will reduce brake shoe to drum clearance IF the adjusting bolt faces away from the air chamber. If the slack adjuster is mounted so that the adjusting bolt faces the chamber, most require a counter-clockwise turn to ‘set-up’ the brakes. However, in the past some slack adjusters have been built that have reverse cut gears. **Check carefully to be sure you are adjusting in the proper direction.**
- 4) That Part Of A Pre-Trip Inspection Should Include A Full Throttle Test To Check That Compressor Buildup Time From 85 To 100 PSI Is 25 Seconds Or Less. This is a case of a regulation being taken totally out of context. MVSS 121 do require that a vehicle manufacturer perform a similar test on a prototype unit for certification purposes. However, the 25 second build-up time can be extended depending on reservoir size (see Motor Vehicle Safety Standard 121 section for further details). This test was never intended to be part of a pre-trip inspection.
- 5) That Spring Parking Brakes Must Apply Automatically If Reservoir Pressure Is Lowered. Although the majority of trucks and tractors do use systems that apply automatically, a number of vehicles have been built using manual dash valves and a separate protected reservoir for the spring brake system. Loss of pressure in the service brake systems will not cause the spring parking brakes to apply on these vehicles. Both MVSS 121 and CMVAA 121 consider spring brakes to be parking brakes, not emergency brakes. There is no requirement in either regulation for automatic application.
- 6) That Alcohol Containing A Lubricant Should Be Used In Alcohol Evaporators. The manufacturers of alcohol evaporators (and air valves) recommend that only pure methyl hydrate be used. The alcohol is vaporized before being delivered to the air system. It is doubtful that a lubricant would vaporize and be carried through the system.



“And that one is for driving a school bus.”