Air. In our buses we use air for many purposes. We warm ourselves and cool ourselves with it. We supply it to our engines so they will run. Air is what holds our bus up, levels our bus, and makes the ride smooth.

Air helps us come to a stop. On some coaches it makes the wipers go back and forth. It makes our step cover slide open and closed. It moves our pocket doors and lifts our bed. Sometimes we use it to flush the toilet. We use it to blow the horn. It tightens the belts on our engine and makes our generators quieter.

Unless we have air we cannot even move our coach because we need air to not only apply our brakes, but that is how we release our brakes. But how does all this work?

For this we will not consider how air is used for creating our comfortable environment, or even for opening and closing doors. We are only going to consider the chassis braking system, the suspension system and an overview of how they work.

**BRAKES**

Without air pressure our brake system will not function. Without air we cannot release the emergency or parking brake, and without air we cannot apply the service brakes.

The air required of course is compressed air and for our coaches that compressed air is provided by an engine driven air compressor. The brakes require air within a range of about 75 PSI to a maximum of about 125 PSI. Once the bus air pressure is within the operating range we can begin to travel and use our brakes. The first thing we do before traveling is to release the emergency or parking brake. Without discussing the pre-trip inspection of the braking system, let me say that releasing the parking brake means we apply air to a brake chamber to compress a spring which had been applying pressure to a rod that held the brakes on the drive axle and on the tag axle also on some coaches.

The parking or emergency brakes are sometimes called spring brakes because in the absence of air to release them or hold them released the heavy internal springs will apply the brakes automatically.

So the key to understanding parking (or emergency or spring) brakes is that when you
push the yellow knob down you are actually applying air to a brake chamber, and that air pushes against a diaphragm which in turn pushes against a heavy spring releasing the spring pressure that had applied the parking brake.

With the springs compressed the brakes are released and the coach will roll.

But what happens if something is wrong? What can go wrong? Several things can go wrong. For some reason the bus cannot build or maintain air pressure. If the air pressure in the coach is below the minimum pressure required to release the emergency brake the brakes will not release, or if they have been released, they will automatically be re-applied. Unless and until you have sufficient system air pressure your emergency or parking brakes are going to be applied.

The lack of air pressure can be caused by an air leak. The air leak can be in the hose for the emergency brake, in the diaphragm in the emergency brake chamber, or elsewhere in the air system of the bus.

But lets assume we release the parking brake and everything is working. The next portion of the braking system we will use is the service brakes The service brakes use air pressure to apply them, unlike the emergency or parking brakes which use air pressure to release them. The service brakes are on two separate braking systems. If one system has a substantial leak, the remaining system will continue to function. To prevent a bad leak from draining air from a good system the coach has what are called protection valves which will stop air on the good system from leaking down or into the leaking system.

The same applies if the auxiliary air system has a sudden serious leak. The protection valves will isolate the portion of the system that is leaking and will not allow the air pressure in the braking systems to drop below a safe level.

So you want to stop and you apply pressure to the brake pedal. The bus slows and stops. What just happened? A chain of events occurred when the brake pedal was depressed. Air from the brake pedal assembly went out as a pilot signal to an air relay valve. The relay valve is located close to the air tanks under the bus, and close to the brake chambers that are going to apply the actual braking force. When the relay valve receives the air signal from the brake pedal, it opens proportionate to the amount of pressure applied to the brake pedal and supplies an air flow to the brake chamber. That in turn causes a diaphragm in the brake chamber to exert pressure on a push rod that in turn will actuate the brakes. The brakes may be all drum brakes, drum and disc brakes or all disc brakes, but regardless of the type of brakes air pressure applied to a brake chamber will push the pads or shoes into contact with the drums or discs and the bus will slow and stop.
Simple, effective, and easily serviced is a combination of words that can describe our braking system. It is actually oversimplified in the description but once we get past the associated parts and systems and condense it down to what is happening in normal conditions our air operated braking systems are relatively simple.

I mentioned the brake pedal, protection valves, relay valves and brake chambers. There are more components to the system and there are systems piggy backed on the braking system. But the critical thing to understand is the basic system so any component failure may not be the cause of disabling the bus.

In addition to the components listed above our brake systems have in most of our coaches an ABS system which is integral with the braking system. We also have more valves than what was mentioned such as quick release valves and check valves. We also have an air dryer and multiple air tanks. We have in some cases slack adjusters which actually actuate the brakes in some cases when the rod from the brake chamber applies pressure to the slack adjuster arm, which in turn is part of the linkage which actually forces the brake pad or shoe into play.

But brake systems sometimes break.

What is critical for an owner to know and understand is how to interpret what the air pressure gauges are saying to us and how to deal with problems that may occur. When driving the air pressure gauges should be relatively stable. They should not be cycling up and down frequently. If it is noticed that the air pressure gauges are cycling up and down often enough to be noticeable there is a problem if the reason is not evident such as the use of air powered wipers or a twisty road that requires air bags in the suspension to be constantly filled and emptied.

When the parking or emergency brake is released, and intact system with no leaks will show a slight drop in air pressure, but after that initial change in pressure there should be no further drop in indicated air pressure. So the first thing to check is if the cycling of the air pressure is related to the parking brake system. Apply the parking brake. That releases air from the emergency or parking brake system and if the air pressure gauges stop cycling up and down the leak which is causing the cycling is likely related to the parking brake system.

The leak can be in an air hose or at the brake chamber. This is something you as an owner or a service tech can temporarily repair to keep you going. The parking brake spring can be “caged” or retracted using the “T” bolt supplied with all brake chambers. Once the spring is “caged” the air supply to the parking brake side of the brake chamber can be plugged or capped and the bus can be driven (carefully) to a
point where permanent repairs can be made.

If you work on your coach this is something you can learn how to do so if you should have a problem while traveling you can make the temporary repair. If you do not a service tech can easily do this. The point is to not become a victim and allow an unscrupulous service tech convince you that you need to be towed or put on a trailer.

But let’s say when you step on the brake pedal you notice the air pressure drops and keeps dropping as long as you have your foot on the brake pedal. That is a sign the service brakes are leaking somewhere in the system. Like the temporary repair on the emergency brake system, a leak in the service brake system can also be field repaired to enable you to continue to drive cautiously until permanent repairs can be made.

A service brake leak is fixed temporarily by plugging the system ahead of the leak. If it is a hose or brake chamber diaphragm simply plug the air supply ahead of the leak. Again, if you service your own coach this is something you can do, or a service technician can easily do this temporary repair. Once the system is plugged ahead of the leak, the coach will be driveable, but stopping distance will be adversely affected requiring substantial care.

The following was a pre-trip brake inspection procedure taken from a PA CDL test manual. A search of the internet will find videos and other procedures that are essentially like the one below.

☐ With the engine running, build the air pressure to governed cut-out (typically 100-125 psi). Shut off the engine. Turn on the key but do not start the engine, chock your wheels, if necessary, release the parking brake(s). Check the air gauge to see if the air pressure drops more than two (2) psi in one minute.

☐ Then, fully apply pressure to the foot brake and hold for one (1) minute. Check the air gauge to see if the air pressure drops more than three (3) psi in one (1) minute. If the air loss is greater, check for leaks and fix before driving the vehicle. You could lose your brakes while driving.

☐ Begin fanning off the air pressure by rapidly applying and releasing the foot brake. Low air warning devices (buzzer, light, flag) should activate before air pressure drops below 60 PSI.

☐ Continue to fan off the air pressure. At approximately 40 PSI the parking brake valve should close (pop out).

☐ Check rate of air pressure buildup. When the engine is at operating RPM, the pressure should build from 85 to 100 psi within 45 seconds in dual air systems.

**AUXILIARY AIR SYSTEM**
Our Prevost coaches all have an auxiliary air system. In almost every case the converter will tap into that system to use air for purposes beyond what the chassis uses.

Our Prevost coaches use auxiliary air for the suspension, belt tensioners, door lock, the transmission retarder, and other uses. Converters then tap into the auxiliary air system at a point designated by Prevost for their purpose. Some examples would be for the step well floor slide, generator air bags, dump valves, the driver’s seat, pocket doors, bed lift, etc.

The auxiliary air system only receives air from the engine driven compressor when the brake systems are satisfied. The brake systems (primary and secondary) each have to have about 75 PSI before air will flow into and pressurize the auxiliary air system. The auxiliary air system is essential in our coaches because if it suffers a catastrophic loss of air that prevents pressurization it is probable the coach will not have functioning belt tensioners, it will not be able to maintain air pressure in the suspension and the coach may not be driveable. It is important to be aware of the aux. air system and if equipped with an aux air gauge note if the pressure is constantly cycling up and down. This is an indication of leakage within the aux air system that could lead to a loss of air pressure beyond what the engine driven compressor can restore.

If the coach is not equipped with a gauge for aux air note how quickly aux air pressure is lost after the coach shuts down. If the system loses pressure in minutes as opposed to holding it for hours or even overnight there is an issue that does require attention. It is not the purpose of this article to discuss leak detection, but it should be noted that an awareness of the health of the aux air system is important and maintaining a relatively leak free aux air system while difficult is far easier than allowing numerous leaks to develop over time and then expending the effort or money to restore the integrity of the system.

The pre-trip inspection procedure listed above applies only to the air brakes, but to the extent possible owners should also verify the condition of the auxiliary air system in coaches as well.

Just as a reminder, keep in mind the loss of air in the aux system and the “leans” may not be related at all. It is possible for a coach with a tight aux air system to lose air in the suspension system causing the bus to lean, and it is just as possible for a coach with zero pressure in the aux air system to hold itself up and level for days or weeks.

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