

## Give Me Air!

Airing down tires at the beginning of a trail is a common practice among knowledgeable four-wheelers; however at trails end you'll need to air those tires back up. How you accomplish that task has been the subject of many debates. The debate revolves primarily around the use of compressed air versus CO2. Both of these systems will put pressure back in your tires but that's where the similarities end. As a four-wheel drive training instructor I prefer CO2 because it allows me to fill student's tires six times faster than my Viair 450C air compressor; On the other hand your needs will likely be different from mine. In this article I will clarify the pros and cons of each system and dispel a few myths.

Before we can have a meaningful discussion about tire inflation methods such as CO2, Nitrogen, or Compressed air, it's helpful to understand the terminology used to describe these systems. CFM (Cubic Feet per Minute) and LPM (Liters per Minute) are gas volume measurements used to quantify gas flow over time. Some manufactures don't provide this specification or they may provide it in CFM or LPM but not both. To make a valid comparison between air compressor brands and models or CO2 tank systems you'll need to work with just one measurement system. Use the following information to convert CFM or LPM.

**To convert LPM to CFM:**

The compressor you're considering buying has an output of 47 liters Per Minute (LPM). So  $X = 47$

$$47 \div 28.32 = 1.66 \text{ CFM}$$

**To convert CFM to LPM:**

The compressor you're considering buying has an output of 1.66 Cubic Feet per Minute (CFM). So  $X = 1.66$

$$1.66 \times 28.32 = 47\text{LPM}$$

Some air compressor manufacturers calculate CFM/LPM ratings at zero psi because this is where an electric air compressor generates the most volume. As pressure increases CFM/LPM declines. Typically you're not starting to refill your tires at 0 PSI. It's more likely you're starting to refill your tires at around 20 PSI. CFM/LPM output may be substantially reduced at 20 PSI and will continue to decline as pressure increases. Electric air compressors have a few terms that only apply to them; they are Amp (amperage) draw and duty cycle. Amp draw is the amount of electrical energy an electronic component requires to function properly. Be sure your alternator has the capacity to provide the amperage needed to run your air compressor as well as other components operating at the same time. Duty cycle is another important consideration where electric air compressors are concerned; it refers to the length of time an air compressor can be operated in a one hour period. For example; if the duty cycle of an air compressor is 33%, it can be operated for no more than 20 minutes before requiring a forty minute cooling period. Duty cycle is expressed as a percentage of the total duty cycle time. If the duty cycle time is ignored, premature compressor failure is likely. Some compressors are equipped with a thermal overload breaker to protect the unit against high temperature operation, but this should never be used as a substitute for adhering to duty cycle time limitations. Now that you have the necessary terminology and algebra out of the way, let's look at the different systems in a little more detail.

Portable air compressors are easy to use and don't require any installation however their limited to filling tires and toys and not much else. They don't have the CFM/LPM output to run air tools or re-bead a tire. The same is true for permanently mounted air compressors without a tank, the difference being once this type of air compressor is installed they take up little or no passenger/cargo real estate. Adding an air holding tank will expand your compressors capabilities and will allow you to use air tools for short periods of time, operate an air locker, and fill anything that needs compressed air, but an air holding tank won't decrease the time it takes to put air back in your tires. As for re-beading a tire, forget it. The volume of air contained in most compressed air holding tanks is not adequate to re-bead a tire. Whether you plan on installing an air compressor or air compressor with an air holding tank, do yourself a favor and get the air compressor and air holding tank measurements before you purchase them. Make certain that each component will fit within the space you've chosen to mount it. Some vehicles have sufficient space under the vehicle to mount an air holding tank safely but if that's not the case with your 4x4 then you'll have to mount the air holding tank elsewhere. Wiring and plumbing should also be considered carefully, following all manufactures instruction, cautions, and warnings; If you don't, you may severely decrease system performance, have a system that's unreliable, or in the worst case scenario, causing a Chernobyl style meltdown of your vehicles wiring. The installation process for any vehicle mounted air compressor system can be involved and time consuming, but when the installation is completed properly, and the system is used and maintained as directed by the manufacture you'll have free compressed air for years to come.

A CO2 system can't be beat if you want to air up quickly and have a multifunction capability. With a CO2 system you can fill tires at light speed, run a locker, use air tools, and re-bead a tire. A CO2 tank can easily be taken to where it's needed to make trail repairs or inflate tires. If you're not using your CO2 system to run a locker there's no plumbing or wiring needed either, just mount the CO2 tank holding bracket, lock the tank down and hit the trail. CO2 tanks are available in many sizes, but ten and fifteen pound tanks are the most common. How many times you can air up with one tank will depend on your tire size and the number of pounds of CO2 your tank will hold. Power Tank ([www.powertank.com](http://www.powertank.com)) has an excellent chart on their web site that explains this relationship in detail. A common question is will CO2 damage tires, the answer is no. CO2 will not damage tires because it's inert, it can't cause metal corrosion either. A CO2 tank can be filled at fire extinguisher service shops, welding gas suppliers, and some four wheel drive shops. The cost to have a tank filled averages between ten and twenty dollars regardless of whether you get five pounds of CO2 or Twenty. The reason is, you're paying more for the service, than the quantity of CO2 put in your tank. Getting the CO2 tank filled is a minor inconvenience to some people but the utility of a CO2 tank cannot be ignored.

There are a few other methods used for airing up tires such as Nitrogen and heavy duty belt driven air compressors that mount in the engine compartment. It's true that nitrogen was used to fill the tires on the Space Shuttle. Air craft continue to use nitrogen, and there are some appropriate auto racing applications, but the demands placed on these tires far exceeds anything that off-road tires will ever experience. It's also true that nitrogen has found its way into passenger car and truck tires. After researching compressed air, CO2, and Nitrogen for the purpose of inflating street and/or off-road tires I have concluded that none of these gases whether mixed or by themselves have any appreciable benefit

when safety, performance, or tire deterioration are considered. Yet, when we compare CO2 to nitrogen, CO2 has three times the usable energy of nitrogen, which translates into three times the number of tires filled from the same size tank. It's a physics thing. Then there's the heavy duty compressor that mounts in the engine compartment and is belt driven. These compressors are really intended for commercial use, carry a hefty price tag and the engine must be running for the compressor to work. So neither Nitrogen nor heavy duty commercial air compressors will give the most value for your money.

Deciding which tire inflation system is right for you will require some homework. Your satisfaction with the end product will certainly depend on a realistic appraisal of what your needs are. Portable air compressors, OBA's, and CO2 tank systems will all air up tires, but that's where the similarities between these systems end. Air compressors are slow when compared to a CO2 tank filling the same size tire. A CO2 tank will fill a 33 inch tire in about 30 seconds, the average air compressor will take 3 ½ to 5 minutes. A CO2 system can efficiently run air tools or re-bead a tire but the same cannot be said for an air compressor. An air compressor can run air tools for a limited period of time and operate a locker but when it comes to speed and utility an air compressor with or without a tank cannot compete with a CO2 system. Students frequently ask what I use. I have a PowerTank CO2 system that I use for teaching as well as play. I now use the Viair 450C air compressor as a backup system. By carefully considering what your needs are and applying the information provided here you will have a tire inflation system that meets your needs and will last for years to come. Wheel on!

Chuck Davis is a certified four-wheel drive, driving instructor through the International 4 Wheel Drive Trainers Association ([www.I4WDTA.org](http://www.I4WDTA.org)). Chuck has studied desert survival for years and continues his studies with Cody Lundin of Dual Survival on the Discovery Channel. Chuck owns survive off road LLC offering courses in four-wheel drive, driver training, vehicle recovery, and wilderness survival.

©Survive Off Road