

# Booming Bass

## *Knowing, Learning, and Deciphering Subwoofer Enclosures*

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Choosing the correct style, type, and encasement for a subwoofer is a lot like picking a correctly sized wheel and tire combination for your truck or SUV. With numerous styles, options, and designs out there, it is hard to know right from wrong. We will try to explain many of the often confusing terminology related to subwoofers and their enclosure styles.

Whenever you pick up some sort of audio-related magazine selling products or making disclaimers about subwoofers and their enclosures, you often read terms such as sealed, ported, or isobaric boxes. At this point, the size of the 'woofer in each enclosure is irrelevant to our discussion. You can also ask any of your friends or hit the local stereo shops. We can guarantee that each source will offer varied opinions about what they think works the best for an entire range of people, musical styles, musical tastes, and vehicle configurations. In addition, if you think these people's opinions vary greatly, hit a regional or national IASCA (International Audio Sound Competition Association) show and check out the top contenders' choice of style in subwoofer



We are talking subwoofers and enclosures here, but with so many styles and configurations out there, it is hard to know exactly what to choose from. Get the facts before planning, building, or purchasing any audio-related components.



enclosures. It is practically guaranteed that each will have something different and will swear by his or her systems.

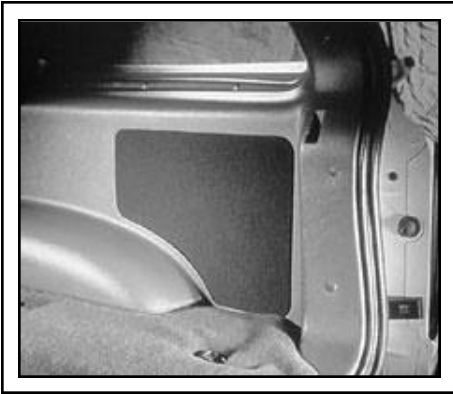
The single most important factor to understand about subwoofer enclosures of any type and style is that there is no single magic box offering you the highest sound frequencies, the best all-around bass tones, power efficiency, and transient response. We will try to explain the benefits and the drawbacks of sealed and ported enclosure styles. While there are certainly many additional styles, these two are the most common for the at-home, do-it-yourselfer who has ever built his or her very own sub enclosure.

### SEALED ENCLOSURES

A sealed enclosure, which is also known as an air-acoustical suspension enclosure, is a very basic and classic box design. Originally patented in 1949 by Harry Olson, this style was

popularized in the '50s, and the design has stood the test of time as the most popular method of sub enclosures; it's been adopted by many home and car audio companies. In a sealed enclosure, the 'woofer is tightly controlled by a trapped volume of air in the enclosure and acts as a spring when a noise vibration (sound) is produced. The 'woofer must literally pull the air with it as it moves outward, decreasing the air pressure inside the box when it moves inward, thus increasing the internal air pressure. As a result, the air inside the box wants to be equal to the barometric pressure of the atmosphere, or the outside of the 'woofer. This internal air pressure acts as a controlling force over the motion of the speaker. The more the speaker moves inward or outward, the greater the pressure exerted by the air spring in the respective opposite direction.

This is where the size of the 'woofer dictates the internal and the



external dimensions of the sealed enclosure. By making the box too large for a small 'woofer, the air spring will limit the 'woofer's cone travel, which will make bass sounds seem slightly flat even when a big-wattage amplifier is supplying the system power. However, if you build the sealed enclosure too small for a larger 'woofer, the air spring exerts more control over the movement of the 'woofer, but does not allow the system to play as low and produces an abnormal tonal quality. This is why it is so important to properly fine tune the sealed enclosures to take maximum advantage of internal and external air pressures of the 'woofer.

## PORTED ENCLOSURES

The other common enclosure is called a ported system. Also known as a bass-reflex or a vented system,



Although not as common, ported subwoofer enclosures are slightly harder to work with and understand. Typically, a port's size is controlled by a tube of varying size depending upon the size of the 'woofer, how much air is needed to fire the air spring, and the amount of amplified power that is being put to the speaker itself. Ports can be round, square, or rectangular.

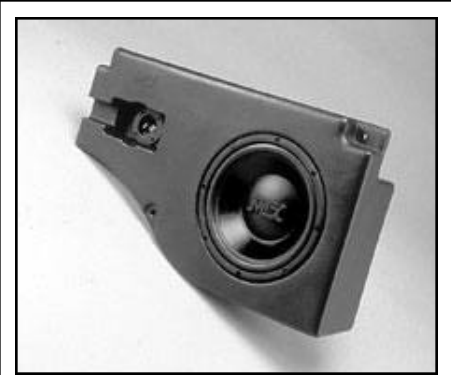
the ported method of enclosures has actually been around longer than the sealed designs. Patented in 1932 by A.C. Thuras, the ported enclosures have certainly evolved since then. By adding a port to the box, this allows the enclosure to further take advantage of the work being done by the rear of the woofer cone to help reinforce the woofer's low bass tone. The amount of cone travel is further controlled by the size of the port opening. For more movement, a smaller opening is desirable, while less cone movement will require a larger port. This same effect can be controlled in a sealed enclosure using a flat-coned 'woofer.

However, in a ported enclosure, there is a delicate relationship between the volume of air in the box and the resonance affect of the port and the size and limitations of the speaker being used. Correctly integrated, these three factors can greatly influence the overall sound quality and can produce the desired low-frequency range. A low-frequency sound is one of the biggest advantages of a ported enclosure. The down side of a low-frequency ported system is that if the speaker does not produce enough frequency, the entire enclosure will act as if it were not enclosed at all. A plus to a ported system is that it allows for much finer tuning of sound. This is why so many professional recording studios and super high-end home audio systems use ported style speakers.

As you can tell, adding a ported style subwoofer enclosure means considerably more planning. If you are thinking of going this route, we highly advise consulting an experienced enclosure manufacturer designer. It is very easy to mess up a ported box if you are simply guessing at the correct port size. Not only can a poorly designed box sound bad, but it can also easily damage the speaker if it is played hard enough.

Now that you understand the basics in subwoofer enclosures, the

next time you hear about your friend's sub system, you can understand the terminology and probably be able to educate the so-called educators. In the end, only you will know how to produce a booming bass system or achieve just the desired amount of bass for you system.



Two of the most common forms of sub enclosures are sealed and ported. Sealed enclosures have been around just slightly less time than ported enclosures. However, sealed enclosures are much more common with car and home audio companies.

## The Source

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