

to three times as large. The Helmholtz frequency chosen prevents the cabinet from being underdamped, and forms a sort of narrow EBS. This tends to raise the deepest bass a little around the f10 point. It acts something like an overdamped curve, in that there's a lot of area between f3 and f10. You can raise the Helmholtz frequency some, but it will tend to shift the alignment towards being underdamped. Lowering is a bit safer, but it doesn't extend response much deeper, it just reduces output at the Helmholtz frequency. The large Altec horns tend to work better at 800Hz than the smaller H290 horns. That makes 800Hz to 1200Hz crossover pretty reasonable. I like to keep the midrange covered by a single driver, so I don't like to push the crossover much under 1kHz. DI matching is also something to think about if you're crossing a direct radiator to a horn. You can expect a direct radiator to have a 90° pattern at the frequency where wavelength equals the diameter of the radiator. A 90x40 horn has a little tighter pattern than that, because the vertical spread is only 40°. A 10" driver typically has a radiating surface about 7.5" diameter, 12" driver has about 9" diameter radiator and 15" driver has about 12" radiating diameter. So the frequency where wavelength equals diameter is 1765Hz for a 10" driver, 1500Hz for a 12" driver and 1130Hz for a 15" driver. That makes a 90x40 horn matched to a 10" driver between 2.0kHz and 2.4kHz, a 12" driver between 1.8kHz and 2.1kHz and a 15" driver between 1.3kHz and 1.6kHz. There's a little bit of wiggle room in the octave between 1kHz and 2kHz. Smaller horns shouldn't be pushed low because they get peaky, and some compression drivers sound bad when crossed over too low. But your Altec horns have no trouble at all with 1kHz. So the next thing to consider is the midwoofer. If it sounds very smooth in the overtone region, you might want to let it cover as much of the midrange and overtones as possible and choose a higher crossover frequency. If not, crossover down low. In practice, I've found that using a crossover between 1kHz and 2kHz sounds really good with 90x40 horns and 12" and 15" direct radiating midwoofers. Naturally, this requires that the drivers chosen are smooth through the midrange and overtone region. I also like to use asymmetrical slopes and fairly high orders because of the geometries involved. The two drivers won't be coupling fully at the crossover frequency because of their directionality, but you still want summing to be good. Might be good to calculate phase angles considering the length of the horn and the crossover shifts and choose a network that provides summing better than +/-3dB variance. Programs like LSPcad will model the crossover for you and make these calculations easy. If the program reports less than +/-3dB variance, you can expect summing to be great because the program assumes mutual coupling. The drivers aren't pointing at one another, so coupling won't be as strong. After you find a configuration that appears to work for you, you can check it with measurements if you have Speaker Workshop or something like that.

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