Subject: Re: RatShack 40-1034 Sub
Posted by Herbsbuddy on Sat, 24 Mar 2007 12:54:23 GMT
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Hello, Assuming your posted driver parameters are correct, I also typed them into WinISD (version 0.44) and modelling a single driver in a sealed box it recommends a 41 cu. ft. box for a Qtc of 0.93. Since the EBP (Efficiency Bandwidth Product) is 22.1 for that driver, that is on the lower end of the scale and a sealed box is recommended for that. To help solve your problem of getting a reasonable size box, you can mount both of your woofers in a face to face "clamshell" arrangement which is one of the simplest implementations of isobaric (equal pressure) alignments. By doing this, you can then reduce your box size to half of 41 cu. ft without changing the frequency curve. So now we are down to 20.5 cu. ft. Still a rather large box although I have made a 24 cu. ft. box before and it worked very well. The 2 driver isobaric setup can be taken a step further by using a double clamshell arrangement. You will need 4 identical woofers for this. I actually have four 40-1026As. You basically mount the pair of clamshells so that only 1 woofer is outside the box (with magnet end sticking out) and the other ones are inside the box. There would be a very small subenclosure inside the box to isolate all but one of the woofers from the large part of the box. That is, you basically "cram" the woofers into a small section of the box so that only 1 woofer sticks out the front of the box and only 1 woofer "sees" the large internal part of the box. The small subenclosure effectively couples the pair of clamshells so they operate as 1 big "team" of 4 drivers. It sounds a little complicated but if you see a picture it is actually quite simple both conceptually and to build. Now with 4 identical woofers in this arrangement, the Vas of the quad setup is basically 1/4 that of a single driver which means now you only need a box 1/4 of the single driver requirement for the same freq SPL curve! So our original 41 cu. ft. requirement is now down to 10.25 cu. ft. That is a very reasonable size to build. I currently have a pair of these 40-1026A 12" Radio Shack poly woofers in a 6.67 cu. ft. sealed box in an isobaric face to face "clamshell" arrangement and am getting decent bass down to about 25Hz which is the F3. If I go with the quad isobaric setup, the F3 will drop to 23.5Hz. I model the quad isobaric setup in WinISD ver 0.44 (free download by the way) by selecting iso-barik (compound) driver, then "artificially" doubling the actual box volume. So in my case with 4 woofers, instead of typing 6.67 cu. ft. as the actual box size, I type 13.34 cu. ft. for the 4 woofers even though it is really only 6.67 cu. ft. actual box internal volume. This is a correct modelling technique as far as I know. You might think that a few Hz difference is trivial but that is not true. Around 20Hz, every 1Hz represents a different musical note. For example, 19.4Hz is an Eb and 18.4Hz (1 Hz lower) is a D. Since the lowest note on some pipe organs is a super low C (16.3Hz), when I design a subwoofer, I try to make it have an F3 of 16.3Hz or lower so that note will have some "growl" to it. 2 other "side" benefits of this quad isobaric setup is the 4 woofers can be wired so the impedence matches that of a single woofer. In my 40-1026A case, a single woofer is 8 ohm nominal so wiring 4 of them together in series+parallel would also yield an 8 ohm nominal impedence but with much more thermal power handling. The 2nd "side" benefit is cancellation of some distortion. The woofers working together in a "push-pull" setup help cancel some distortion that a single woofer has. There is a technical name for this like 2nd order linear distortion or something but the bottom line is you are improving the quality of sound over a single woofer although I am not sure if the distortion of a 4 woofer clamshell setup is better, worse, or simliar to that of a 2 woofer clamshell setup. I am also somewhat suspicious of the 2.9mm maximum excursion (Xmax) parameter you posted on this woofer. That seems very low for a 12" woofer since that is only a little over 1 inch. I dont think that will affect the box size calculations but it doesn't seem to me to

be enough to move large volumes of air. Another 12" woofer I have has an Xmax of 13.0mm which is about 5 inches (peak to peak). That seems much much better especially for sealed boxes because excursion is "intense" near Fb (fun to watch too). Another solution to your smaller box requirement (although not recommended by WinISD) is to use a ported box. This will allow you to use your 6 cu. ft. setup using a pair of 40-1026A equivalent woofers in an isobaric alignment. Tune the box/port combo to 20 Hz using an 11" long 4" internal diameter round duct such as PVC pipe. This should give you a +4dB peak at 40Hz but a F3 of 21.5Hz. The peak you can "fix" with an EQ. The last solution which I haven't really tested yet but might work (at reasonable volume levels) is to just put the woofers in any reasonable size sealed box and EQ it. For example, if you use a 6 cu. ft. sealed box for an isobaric pair of 40-1026A equivalent woofers, you will have an F3 of about 26Hz but for pipe organ music, you will be down about 12dB at 16Hz. Just buy an EQ with a 16Hz band and boost it +12dB. I am a little suspicious that this will actually work because usually a woofer will not make much output below it's resonant frequency (for this woofer it is 25Hz) unless you port it in which case the output of the woofer is almost silent at Fb and the sound comes almost exclusively from the port (at Fb). Also, by boosting the 16Hz aggressively with the EQ, excessive cone excursion of a sealed system will probably cause mechanical noise which will ruin the bass output. Bass is only good if it is clean sounding and not "mechanical" sounding. Hope this helps I have been playing around with this type of stuff off and on for about 20 years with success. Anyone can contact me directly at my AOL account regarding this or similar subwoofer topics. My knowledge and experience is mostly in sealed and simple ported system although I recently purchased a speaker book detailing other designs (bandpass, passive radiator...). Current projects I am working on are building a ported subwoofer for my apt with a F3 of 15Hz and a box size of only 8.2 cu. ft. I already have the woofers and did the design I just have to build the box out of 3/4" thick MDF and port it. I will also be transferring the 6.67 cu. ft. box to my van and possibly porting that too although I will try it sealed first to hear how low it goes. Good luck to all in your speaker endeavors.