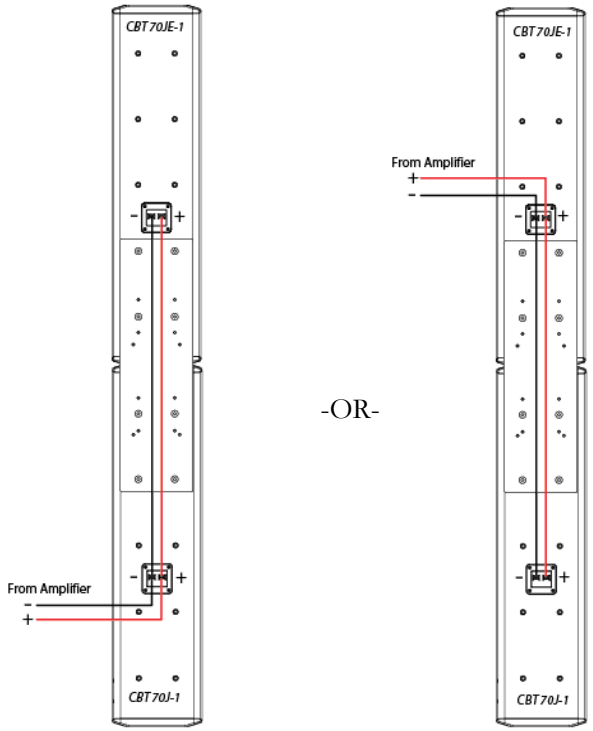
Hookup Guide for CBT 70J-1/70JE-1 Arrays

(also applies to CBT 70J/70JE original version)

For the CBT 70J-1/70JE-1 array, it is **very important** for the proper functioning of the array that the cabinets be wired with the **same full-range signal to both cabinets, in parallel, at the same level**. Do not use an external crossover.

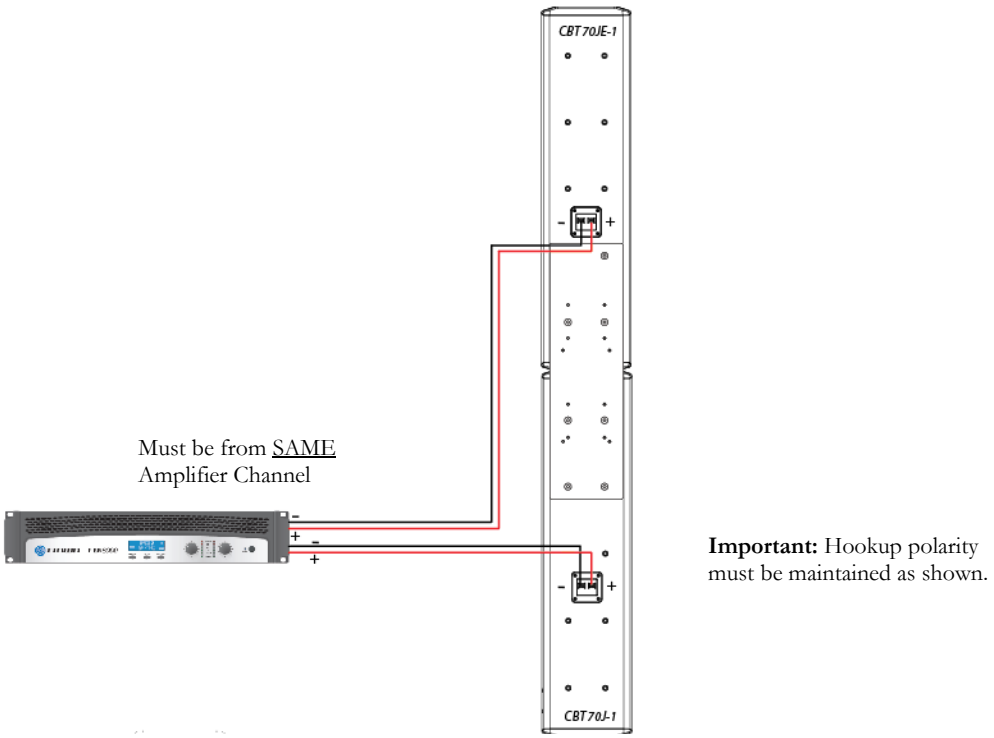
The easiest and surest way is to simply wire a jumper (speaker cable) between the two cabinets (In same polarity: "+" to "+" and "–" to "–") and to wire the speaker cable from the amplifier channel to either of these sets of terminals.



Important: Connect cabinets in parallel with each other. Hookup polarity must be maintained as shown.

Stated from the amplifier side, wire from the amplifier to one of the cabinets (it doesn't matter which cabinet) and use a jumper speaker wire ("+" and "-") to run the plus and minus in parallel to the other cabinet.

Home Runs -- Another hookup method for accomplishing the proper parallel hookup – albeit more costly for cable and with more potential for something to get accidentally connected wrong – is to run two "home run" cables from the **same** amplifier channel, one cable to each cabinet.. This method may be preferred for long cable runs because it puts more cable "copper" between the amplifier and the speakers for lower cable resistance (for better damping factor and less signal loss through the cable). However, it brings with it the risk that someone might accidentally connect these two cables to two different amp channels, which then could send different signals – or different *levels* of signals – to the two cabinets. Or it could open the possibility of someone thinking that they can put a crossover in circuit between the two cabinets, or any number of other potential mistakes. It is also a bit more difficult to double-check the polarity in that simply paralleling the cabinets directly is fairly easily to inspect visually. But if hooked up correctly, from the same amplifier channel and in correct polarity, then this works fine.



Important: Hookup polarity must be maintained as shown.

Why Proper Hookup is Crucial – For proper functioning of the array, the proper phase relationship must be maintained between the low-frequency (LF) drivers in the CBT 70J-1 and the LF drivers in the CBT 70JE-1. The low-frequency drivers must work together in a certain way, and this parallel hookup is required for accomplishing that. If this phase relationship is not maintained (due to not following these hookup instructions), then some aspect of the array performance will be impaired, probably significantly.

The CBT 70JE-1 has the passive circuitry inside it to maintain the correct phase relationship between the low-frequency drivers of itself and of the CBT 70J-1. The CBT 70JE-1's circuitry also provides the correct frequency-band overlap characteristics so that the combination of the two cabinets function as a proper line array with CBT (Constant Beamwidth Technology) functioning. In addition, the built-in passive circuitry includes a complex multi-slope crossover function. The end result is a column line array that is optimized, not only on-axis, but for all off-axis points, for proper functioning.

Do Not Use an External DSP Crossover -- It is almost impossible to accomplish the proper functioning described above in the field with an external DSP. In addition, you should NOT use any crossover network between the cabinets because: a) the phase shift inherent in all electronic crossovers (90 degree phase shift for every 6 dB per octave of slope) will put the low-frequency drivers of one of the cabinets out of proper phase relationship with each other, b) you wouldn't be able to accurately emulate the built-in multi-slope crossover, and c) depending on how you set it, you could lose the required overlap characteristic between the two cabinets which allows it to provide constant directivity control.

The Science -- The science of how the system works is something the installer and users don't have to worry about and don't necessarily have to know. The important thing is simply that the system is designed to work properly when you send the exact same full-range signal to both cabinets in a CBT 70J-1/70JE-1 array.

However, if you want to know more about the science of why this is the case, here is some simplified information about the functioning of the CBT 70J-1 and CBT 70JE-1 as a constant beamwidth line array. In the CBT 70JE-1, the LF drivers operate from 45 Hz all the way up to 800 Hz. The LF drivers in the CBT 70J-1 operate over most of this entire range, too, as well as going up higher in frequency. The reason that the CBT 70JE-1 drivers go up so high in frequency (up to 800 Hz) is that the CBT 70J-1 by itself behaves as a line array that has a total height of 70 cm (28 inches). Based on that height (and some other factors, such as the coverage switch position), the vertical coverage typically starts broadening around 800 Hz.

One of the advantages of adding a CBT 70JE-1 is that is makes the array behave like a line array that is twice as tall, or 140 cm (56 inches). This taller line array maintains the same pattern control down to a much lower frequency. Therefore, it is necessary for *all* the drivers (in both cabinets) to be operational throughout the entire frequency band, all the way from 800 Hz on down. Unless the LF drivers in these two cabinets are in exactly the right phase relationship, you could end up having the drivers in one cabinet cancelling out the sound from the drivers in the other cabinet, either throughout the entire CBT 70JE-1 operational frequency band or at some significant band of frequencies. Or, you could end up accidentally "steering" the LF sound a certain direction upward or downward. Neither one of these is a good thing.

Using with External Subwoofer – There are some applications where you may need more – or deeper – bass than the CBT 70J-1/70JE-1 array can provide, so you may want to add an external subwoofer. For these applications, you *can* add a high-pass filter but it absolutely must be *before* the signal gets to the power amplifier. For example, you can high-pass the CBT 70J-1/70JE-1 array at 80 Hz (via a DSP high-pass filter that is, again, *before* the amplifier in the signal chain) and low-pass the external subwoofer at 80 Hz. If you do that, then any phase shift from the high-pass filter imposes itself identically on both cabinets, resulting in the *relative* phase relationships between the two cabinets remaining constant. This is fine to do.

Protective High-Pass Filter – Similarly, a protective high-pass filter (45 Hz or so, 24 dB/oct, Butterworth) is recommended and can be implemented, but again, it needs to be *before* the signal goes to the power amplifier, and the same amplifier output channel needs to be paralleled to both the CBT 70J-1 and CBT 70JE-1 cabinets.

It is NOT OK to run the same signal from two different amplifier channels and turn down the CBT 70JE-1 because you want less bass (or turn up the CBT 70JE-1 because you want more bass) – Don't try to reduce (or increase) bass by sending a different *level* of signal to the CBT 70JE-1. It will make the array not function correctly. Again, the signals to the CBT 70J-1 and CBT 70JE-1 *must* be identical, including the identical *level* (voltage). If you want less bass or more bass, the solution is to engage an EQ at a line level *before* the signal goes to the power amplifier.

Special Note for Crown CDI Amplifiers – The DSP section built into the CDI amplifier is indeed *before* the signal goes to the power amplifier, so this DSP can be used for the external crossover for adding an external subwoofer, for setting a protective high-passive, or for adjusting the EQ, as long as you use only one channel such that the same channel output then gets sent to both the CBT 70J-1 and CBT 70JE-1.

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