CBT 1000 and CBT1000E

Frequently Asked Questions

Pre-Release, August 2016

1) What are the (Preliminary) Performance Specifications?

- **Frequency Range** (-10 dB)
  - CBT1000 alone:
    - 45 Hz – 20 kHz
  - CBT1000 + 1000E:
    - 38 Hz – 20 kHz

- **Power Handling & Nominal Impedance**
  - CBT1000 alone:
    - 1500 Watts (2 hr)
    - 1000 Watts (100 hr)
    - Impedance = 4 ohms
  - CBT1000 + 1000E:
    - 3000 Watt (2 hr)
    - 2000 Watt (100 hr)
    - Impedance = 4 ohms

  (IEC-shaped pink noise, continuous for stated duration [for more information about the impedances see question 2, below])

- **Sensitivity**
  - 102 dB (At highest sensitivity setting: Point pattern up; Point pattern down, Speech)
  - 95 dB (At lowest sensitivity setting: Medium pattern up, Downfill pattern down, Music)

  (2.83V @ 1 meter, averaged 1 kHz to 10 kHz; Same sensitivity in this range for CBT1000 alone and CBT1000 + CBT1000E [for more information see Question 3, below]; Subtract 3 dB for 2.00V/1W@ 1 meter sensitivity.)

- **Max SPL**

  CBT1000 alone
  - At highest sensitivity setting: "Point" pattern up; "Point" pattern down, speech voicing:
    - 131 dB continuous average pink noise
134 continuous program
137 dB peak
  - At lowest sensitivity setting: "Medium" pattern up, "Downfill" pattern down, music voicing:
    - 124 dB continuous average pink noise
127 dB continuous program
130 dB peak

CBT1000

CBT1000E

(Shown with included grilles removed)

Max SPL (cont.)
CBT1000 + CBT1000E

- At highest sensitivity setting: "Point" pattern up; "Point" pattern down, speech voicing:
  - 131 dB continuous average pink noise
    134 continuous program
    137 dB peak

- At lowest sensitivity setting: "Medium" pattern up, "Downfill" pattern down, music voicing:
  - 124 dB continuous average pink noise
    127 dB continuous program
    130 dB peak

(1kHz – 10 kHz, calculated based on power handling and sensitivity, exclusive of power compression, at 1 meter; Same Max SPL for CBT1000 alone and CBT1000 + CBT1000E [for more information about the Max SPL specs see Question 3, below])

- **Maximum Recommended Amplifier Power**
  CBT1000 alone
  - No more than 3000 Watts into 4 ohms

  CBT1000 + CBT1000E driven in parallel
  - No more than 6000 Watts into 4 ohms

  [For more information about amplifier sizes and wiring see Questions 4 and 5, below]

- **Weight**
  CBT1000 alone
  - 24.5 kg, 54 lbs

  CBT1000E
  - 20.0 kg, 44 lbs

  CBT1000 +CBT1000E
  - 44.5 kg, 98 lbs

- **Enclosure Material**
  Fiberglass reinforced ABS, with UV resistant Paint

- **Grille Material**
  Powder-coated 1050 Aluminum, UV resistant

- **Transducers**
  LF Transducers
  - 165 mm (6.5 in) with neodymium magnet and 50 mm (2 in) voicecoil

  HF Transducers
  - 25 mm (1.0 in) extended-range with 1" voicecoil

  CBT1000
  - Six (6) LF drivers and twenty-four (24) HF drivers

  CBT1000E
  - Six (6) LF drivers

  CBT1000 + CBT1000E
  - Twelve (12) LF drivers and twenty-four (24) HF drivers

- **Size (H x W x D)**
  CBT1000 alone
  - 1020mm x 250mm x 350mm (40.2 x 9.8 x 13.8 in)

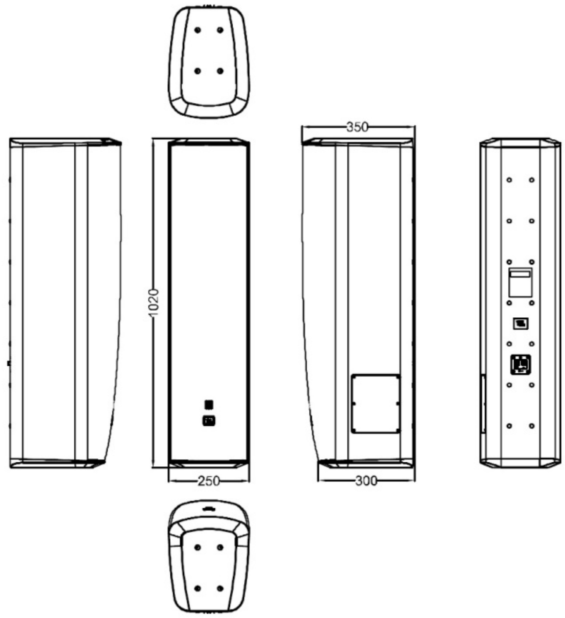
  CBT1000E
  - 1020mm x 250mm x 300mm (40.2 x 9.8 x 11.8 in)

  CBT1000 +CBT1000E
  - 2040mm x 250 mm x 350mm (80.4 x 9.8 x 13.8 in)

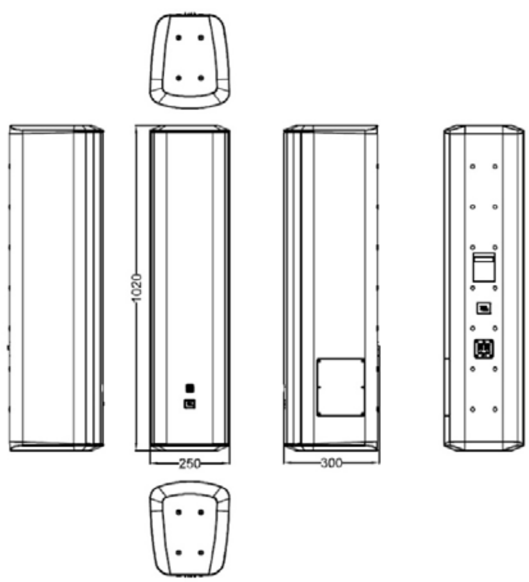
- **Colors**
  Black is RAL9004; White is RAL9016

- **Cabinet drawings:**

CBT 1000



CBT 1000E



- **Rear Mounting Inserts** *(each cabinet)*
  - M8 Brass Inserts, seven (7) rows 5.0 inches apart, two (2) columns 2.75 inches apart
  - M8 Brass Inserts, four (4) on top end-cap and four (4) on bottom end-cap, with same spacing.

2) Why doesn't the impedance change when you add the CBT1000E extender?

The impedance of the CBT1000 alone is nominally 4 ohms above 1 kHz and 8 ohms below 1 kHz. Therefore, it is a 4 ohm cabinet. The impedance of the CBT1000E alone is 8 ohms, but its frequency response does not extend above 1 kHz. So the combined CBT1000 + CBT1000E array is 4 ohms above 1 kHz (from the CBT1000 cabinet alone) and is 4 ohms below 1 kHz (the paralleled 8 ohms impedances of the two cabinets in that frequency band). The result is that both the individual full-range cabinet by itself and the extended two-cabinet system has a nominal impedance of 4 ohms. So when you add the CBT1000E extender, the overall impedance remains the same.

3. Why doesn't the Max SPL increase when you add the CBT1000E extender?

The sensitivity figure is for the frequency band of 1 kHz through 10 kHz. The extender produces only low frequencies and does not extend above 1 kHz. Therefore, the sensitivity remains the same in the 1 kHz to 10 kHz range whether or not there is an extender.

What *does* happen when you add the CBT1000E extender is that the sensitivity in the frequency band *below* 1 kHz increases (but the sensitivity *above* 1 kHz is higher in the lower frequency range, so the general sensitivity does not increase). The power handling in the frequency band below 1 kHz doubles, while output level above 1 kHz remains the same. Full output in the frequency band below 1 kHz depends on the acoustic loading (4π free-space, 2π half-space, or 1π quarter-space), so that output can vary considerably. And lastly, adding an extender increases the length of the array, lowering the frequency of control and expanding the frequency band within which the column array maintains a high degree of vertical pattern control.

4. Do I need to use such a big amplifier to drive it?

No, you can use a smaller amplifier. The specification above states no more than 3000 Watts for the CBT1000 alone and no more than 6000 Watts for CBT1000 + 1000E driven in parallel. JBL recommends (see Tech Note "Danger: Low Power") that if one wants to get all the SPL that a speaker is capable of producing, it's best to drive it with an amplifier that's rated double the speaker's continuous pink noise power handling rating into whatever impedance that loudspeaker is. This keeps the amplifier from limiting clean transient peaks from getting to the speaker. One caveat of this rule-of-thumb is that with such a powerful amplifier, the amplifier should never, ever, be driven into clipping. There must be a limiter, or the gain staging must be such that the amp never clips. As the Tech Note explains, the high frequency drivers of the speaker can be damaged from the high-frequency rich content that results from amplifier clipping.

If you don't need all the SPL that the speaker is capable of producing, then you can always use a smaller amplifier. Lowering the power by ½ results in Max SPL being 3 dB lower than the figures listed. Lowering the power again by ½ results in another 3 dB reduction in Max SPL. So if, for example, you only need Max SPL sound levels that are 6 dB less than the Max SPL figure listed, you can use an amplifier that's 1/4th the size of the listed "no-more-than" power figures.

It may be easier to attain high power levels by using two amplifier channels in bridged-mono mode, as long as the amplifier is rated to drive a 4 ohm load in bridge-mono mode.

5. How should the CBT1000 and CBT1000E be wired from the amplifier for proper performance?

The best way to ensure proper performance is to simply wire the two cabinets in parallel with each other, driving them both from the same amplifier channel. A special multi-slope passive crossover network is built into the CBT1000E ensuring that the two cabinets array together properly in both amplitude and phase relationship.

It is counterproductive to put an external crossover network – such as a line level or DSP-based low-pass filter – onto the CBT1000E (with one exception, see below). The proper crossover functionality is already built into the CBT1000E.

The reason is that crossover filters add phase shift – 1^{st} order (6 dB/oct) adds 90° of phase shift; 2^{nd} order (12 dB/oct) adds 180° of phase shift; 3^{rd} order (18 dB/oct) adds 270° of phase shift; and 4^{th} order (24 dB/oct) adds 360° of phase shift. Adding phase shift will put the LF drivers of the CBT1000E out of the proper phase relationship with the LF drivers of the CBT1000. That, in turn, is likely to: a) severely reduce the low-frequency output capability of the system (for example, with a second order crossover, the output from the drivers in one cabinet will tend to almost fully cancel out the output from the drivers in the other cabinet, resulting in very little bass output at all, even though the drivers are all working hard) , and/or b) can result in unintended “steering” of the low frequencies in undesirable (and sometimes not fully predictable) directions.

If one absolutely *has* to drive the two cabinets from two different amp channels, ensure that the amplifiers have <u>identical</u> input signals in all regards (no different EQ, high-pass, low-pass, or any other analog or DSP filters), add no signal processing from the amp itself (if the amp has built-in DSP, for example), and ensure that the two amplifier channels are driving at the exact same amplitude (with the exact same volume control settings). If for some reason an external low-pass filter absolutely has to be utilized, only use a 4^{th} order (24 dB per octave) filter. The 360° of phase shift of a 4^{th} order filter brings the phase back to its initial state. However, it’s still possible for any number of aspects of signals sent to the two cabinets to not match exactly, and therefore may still hurt the performance.

Rather, if using two different amplifier channels, any EQ and/or other filters *must* be located *before* the signal splits to the two different amplifier channels. Failure to follow this requirement can severely impact the performance of the array.

Again, to make sure the CBT1000 and CBT1000E array together properly, it’s best to simply wire the two cabinets in parallel with each other.

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