

## TEST REPORT

## Line 'Em Up

By Daniel Kumin

## RATING

Dayton Audio Epique CBT24 Speaker System

Performance ★★★★★

Build Quality ★★★★★

Value ★★★★★

## Dayton Audio Epique CBT24 Speaker System

**PRICE** \$1,995 pr (assembled); \$1,295/ pr (kit)

**AND NOW** FOR SOMETHING completely different: Dayton Audio's Epique CBT24.

What's an Epique CBT24? A 24-driver, no-crossover, one-way tower loudspeaker that stands 5 feet tall yet is no more than 3.5 inches wide over its full, dramatically arched length. A tower speaker with a unique geometry, pedigree, visual aesthetic, and equally unique technical story (and even marketing plan).

The CBT24 is the first product in a new Epique line offered by Dayton Audio and is sold via that brand's Parts Express website (parts-express.com), known for its array of direct-to-consumer parts, drivers, kits, and audio products for the value and DIY buyer. Like many of Dayton's speakers, Epique is offered in both assembled and kit forms. (We opted for the former: They don't pay me enough to screw 48 tiny drivers into baffles and then wire them without making a mistake, and as for woodworking...).

But in point of fact, the CBT24 reviewed here, is entirely the baby of D.B. Keele, a well-known electrical engineer and all-around hi-fi mad scientist who has worked at various times for Harman (the JBL parent), Electro-Voice (twice), Crown/Techron (where he developed the TEF spectrum analyzer) and the U.S. Navy (navigation technology). Yet, if the

## AT A GLANCE

## + Plus

- Remarkable, panel-speaker-like stereo imaging
- Neutral tonal balance
- Complete absence of "floor-bounce" thickening

## - Minus

- Curtailed bass requires subwoofer support
- Needs custom- or auto-equalization for best performance
- Modest subwoofer localization

name sounds familiar, it's most likely because Don Keele was also Senior Editor and lead loudspeaker reviewer for *Audio*—the most technical of S&V's several progenitors—through much of the 1990s. Full disclosure: I also freelanced for *Audio* at roughly the same time. I admired Don's work, and though we met only at trade shows, he was unfailingly and cheerfully generous with his time and his seemingly limitless knowledge and expertise, which I occasionally solicited by phone and for which I was grateful then and remain so today. That said, we've neither met nor conversed for at least a decade.

The CBT24 is the commercial manifestation of an acoustical principle Keele has been refining for decades, the constant-beamwidth transducer; a concept enshrined right in the speaker's name.

The ideal—which he first encountered, underwater, in the Navy while working with surveillance tech (presumably sonar), is a sound source whose

spectral content, and thus its perceived timbre, remains substantially unchanged whether you hear it (or measure it) from straight ahead or off axis to one or the other side. This is a popular speaker-

design goal—difficult to realize via conventional designs—because in typical listening rooms much of what we hear is reflected sound from a speaker's off-axis output, and if this is substantially different in tonality than the direct sound reaching our ears straight from the loudspeaker, the realism suffers.

Another design ideal is to eliminate sound vertically off axis, that is, angled toward the floor and ceiling. These surfaces, especially the floor, are usually much closer to the speaker than the walls are. The speaker is, in most cases, standing on it, so the floor is the closest of all. In nearly all conventional designs, this induces "floor-bounce" as this first-reflection sound bounces back into the path of the direct output. It interferes both by reinforcing frequencies whose wavelengths are close to this reflection's total angular distance and by attenuating adjacent ones. (The mechanism is

analogous to interfering ripples in still water: Throw a quarter into a swimming pool near one wall, and watch the patterns as the ripples bounce off the wall, creating areas of deeper waves and regions of flat water.) Floor-bounce usually results in a strong peak/dip somewhere around 150 to 300 hertz, usually with adjacent ripples, that



● Sturdy matching bases screw into the bottom of the speaker.

● Plenty of support prevents the curved towers from toppling.





## THE VERDICT

**A genuine rarity—a truly** distinct take on consumer loudspeaker design—Dayton Audio's Epique CBT24 delivers exceptional performance with exceptional stereo imaging. Extremely unusual looks and the need for modest equalization and a subwoofer shouldn't deter adventurous listeners.



combine for the strongest single coloration in the vast majority of real-world installations.

Keele's CBT24 claims to address both of these issues with constant-beamwidth transducer magic. His design places 24, 2.5-inch drivers, spaced as closely as their physical dimensions allow, along an arched baffle just 3.5 inches wide, which describes about 36 degrees of the arc of a vertical circle. A circle whose diameter, its chord measuring some 60 inches...I could tell you if I could remember more—any—of my high-school trigonometry.)

Every one of the 24 drivers is run equally full-range, unfiltered by any crossover, but they are not driven equally full-level. Divided into three amplitude "shelves" dictated by a mathematical arcana called the Legendre function, the drivers nearest the floor, at the bottom of the arc, play full-level, with groups of drivers higher up stepped down by roughly 3.5 and 8 decibels. The CBT24 does this passively, through clever series-parallel driver wiring arrangements and just a couple of carefully specified resistors. (The mathematical ideal calls for smoothly attenuating level; while this could be accomplished via DSP and individually addressable driver inputs, you'd still need 48 channels of amplifier power.) As I understand things, this "shading" of levels (combined with the curved physical array)

is a critical factor in transforming a tightly packed column of drivers, whose outputs interact with one another and lobe wildly, into a coherent line source with astonishingly constant directivity and broad, wide-frequency coverage, though exactly how (and why) the math works here is well over both my head and my pay grade.

Now, in actual fact, the CBT24 is only half of a constant-beamwidth source: A full example would have the unattenuated drivers smack in the center (height-wise) and "shade" descending levels toward both ends. But it turns out that because the line of transducers extends right down to the floor, and since the floor is, at the lower frequencies that matter most, a near-perfect acoustic reflector, the behavior of this "half-CBT" is nigh on indistinguishable from what a full-array CBT would deliver, at substantially less cost and with real-world-acceptable height (a full CBT of the 24's design would be some 11 feet tall). This, at least, is Keele's assertion. (Imagine half of a light bulb placed flat on a perfectly mirrored floor; it would appear, and illuminate, exactly like a full light bulb. The principle's the same.)

### Setup

But you didn't come here for a lecture on acoustical physics (though there'll be a quiz next Thursday). You came here to learn what the

CBT24 sounds like. The answer—or answers, since there will be multiples—are not quite so simple.

Multiples, because Dayton Audio freely admits that the CBT24 requires equalization to show its best. To that end, they, in their Parts Express persona, also loaned us a miniDSP, an inexpensive (\$105) two-channel 2-in/4-out digital equalizer. This is mostly used by speaker hobbyists as an outboard digital crossover/equalizer/delay, but in this case, Dayton preprogrammed it with simple, stereo-in/out compensation for the CBT24's roll-offs at both the bass and treble extremes. I had no data for this smile-shaped curve, nor did I measure it (see our measurement results in the Test Bench box), but the data set is downloadable from Dayton's Epique page for you and yours to tap as needed. The company also claims that you can get fairly close with simple tone controls, though I feel the need to point out that tone-control curves can vary a good deal from design to design and often change "shape" from low to high settings, so I should think Dayton's designed, downloadable EQ is clearly preferable. In the absence of this, and perhaps as a preference to this, Dayton also recommends the auto room-correction scheme in virtually every

## SPEAKER SYSTEM

### DAYTON AUDIO EPIQUE CBT24 SPEAKER SYSTEM

**PRICE:** \$1,995 pr (assembled); \$1,295/pr (kit); optional miniDSP 2x4, \$105

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modern A/V receiver, which I also tried and about which I'll say more later. As for the bass end of things, I determined that my long-term sub, the SVS PB12-Plus—a cylindrical design with massive output to below 20 Hz and very flexible crossover/filtering facilities—would suffice for the "with-sub" portion of the program.

I set up the CBT24s in my studio's usual tower locations, about 9 feet apart and some 3 or 4 feet from the front wall at floor level—this put the backwards-arching top within a foot of the wall—and 10 or 11 feet from my listening seat. The speakers arrive with simple wooden bases that screw securely into their bottom ends (you'll want a power-driver, as the screws are long and fine-pitched), and despite their somewhat entomological look, the CBT24s proved perfectly stable, even on my room's carpeting. The CBT24 bases have no provisions for floor pads or carpet spikes, and I employed none, but adding either would be a simple matter. (My sub remained in its long-proven location, to the right of and behind the right speaker.)

The CBT24s are plainly finished in semi-gloss black enamel, with nary a visual bell nor whistle. There's no grille, so the main visual element is that arc of 24 little, dark gray, inverted domes. It's a look that's unlikely to turn up as a prop in an *Architectural Digest* shoot any time soon, but after a few days' acclimatization, I came to quite appreciate it. Your taste may vary.

### Listening...and More Listening

I began my evaluation with simple, unprocessed (no EQ), full-range stereo with no subwoofer. Listening from a typical position about 10 feet distant—and



● The optional miniDSP EQ/crossover is a petite black box.

**Despite their svelte profile, the CBTs played quite loudly.**



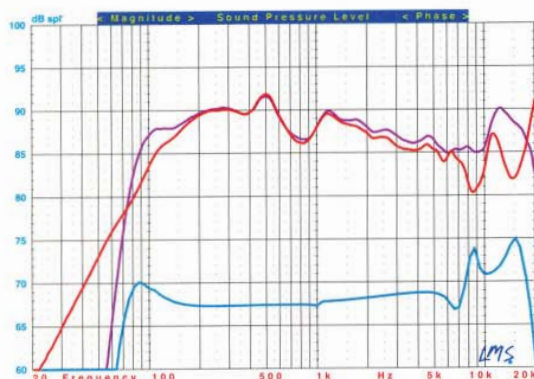
## TEST REPORT



See [soundandvision.com/TestBench](http://soundandvision.com/TestBench) for full lab results and technical definitions.

# Test Bench

## Dayton Audio Epique CBT24 Speaker System



**EPIQUE CBT24 w EQ (purple)** +3.53/-3.16 dB, 200 Hz to 10 kHz; -3 dB @ 88 Hz, -6 dB @ 79 Hz; impedance minimum 4.52 ohms @ 625 Hz, phase angle -37.39° @ 208 Hz; sensitivity 88 dB, 500 Hz to 2 kHz.

**EPIQUE CBT24 wo EQ (red)** +3.78/-7.73 dB, 200 Hz to 10 kHz; -3 dB @ 110 Hz, -6 dB @ 91 Hz; impedance minimum 4.52 ohms @ 625 Hz, phase angle -37.39° @ 208 Hz; sensitivity 88 dB, 500 Hz to 2 kHz.

**MINIDSP EQ (blue)** Electrical output.—MJP

## SPECS

**Driver:** 2.5-inch aluminum-magnesium inverted-dome full-range (24) • **Dimensions (WxHxD, inches):** 3.5 x 60 x 25 (depth incl. base) • **Weight (Pounds):** 27.5 (each)

trying to think the speakers out of sight behind an imaginary screen—I heard what might have been a very respectable but substantially bass-limited mini-monitor, though one with an unusually broad stereo image. There was not much bass below 120 Hz or so, so pop/rock like Greenday's "Longview" sounded decidedly light, and top-treble air and sparkle were very slightly reduced from the levels I'm accustomed to hearing from typical "hi-fi" speakers. But, otherwise, the overall tonal balance, subjectively speaking, was devoid of any strong colorations.

I did a good deal more listening to the CBTs naked and alone (the speakers, not me) to get a good handle on them, but I won't spend too

many words on that here: Without subwoofer reinforcement and modest but important EQ correction, the limited low range and slightly curtailed treble extension obviate the need for much discussion. With the miniDSP connected and engaged, however, things were considerably different. Now the Dayton evinced the kind of sparkle and air we expect from high-end loudspeakers, such that a recording like my CD-resolution rip of the *Sheffield Drum Record* sprang fully to life, with snare hits cracking with authority and cymbal rides floating, fully detailed, above.

The next step, obviously, was to add the subwoofer. As supplied by Dayton Audio, the miniDSP EQ/crossover was a classic black box. I had no data as to its crossover point,

● Each CBT24 bears the signature of its designer, D.B. Keele.



filter, or EQ curves, so I was left to balance my SVS sub, connected by its unfiltered line input, with level alone, by ear. A surprisingly little amount of fiddling yielded a very satisfying blend. The crossover point, at a guess set somewhere between 100 and 150 Hz, was slightly higher than I might have preferred were the CBTs able to muster a tad more bass extension. It left just a breath of noticeable sub localization on lower-frequency voices or instruments if I sat much closer than my usual 10 to 11 feet, or if I balanced the sub higher than my usual, quite lean preference—but otherwise the blend was excellent.

And so was the net result. With solid bass underpinning, the CBTs' midrange clarity and depth sprang into sharp focus on material like Paul Simon's "Under African Skies," delivering impressively detailed sonic texture and delineation of musical lines, as well as convincing dynamic snap.

Pop recordings of comparable quality yielded similar pleasures. On Mark Knopfler's "Baloney Again," a fine, tight-perspective studio mix with a nod to naturalistic imaging, each instrument inhabited its own space in the broad, rather tall image.

And Knopfler's unmistakable bass-baritone was all there, his rich, slightly nasal tone color and expressive, articulate phrasing hanging solidly, three-dimensionally front and center, with all its characteristic roundness and depth on full display.

Or were they? I set up a carefully level -matched A/B with my everyday Energy Veritas 2.3 stand-mount monitors

running full-range, and the long-discontinued Canadians clearly showed a fuller, heavier sound to both the lower half-octave or so of Knopfler's voice and to the strongly recorded but delicately played Fender bass that underpins the track. And yet—and this is difficult to convey in words—the actual tone color of both the voice and the bass were identical, and in every other regard the timbral match was exceedingly close, though the CBTs' deeper/broader/rounder image was always in evidence.

I cross-checked this finding with numerous other recordings, as well as with a favorite quick-ref option—TV announcers—and the results were consistent. Despite their near-perfect timbral match, the CBT24s always sounded, well, not lighter exactly, in the bass, but less forward, less weighty, almost less thuddy than the Energys, even though the Veritas are very far indeed from being bass-heavy or boomy.

The conclusion I reached was obvious: floor-bounce. Even though my Energys are a thoroughly engineered design of superb accuracy, both by ear and by measurement, and were mounted on stands at the recommended height and placed at a distance carefully derived from years of listening, they are no doubt still subject to floor-bounce. As noted, this produces a hump/dip somewhere around 150 to 200 Hz. The CBT24s, according to both my ears and Dayton Audio's published curves, did not: Their response (as shown on Dayton's website) looks, and then

sounded, smooth and continuous, with nary a serious squiggle in its 6 dB/octave roll-off below about 200 Hz. In consequence, midbass-rich music—like most pop and much jazz—sounded not precisely *more lifelike*, but somehow *less recorded*.

And now I'll move on to imaging. Put plainly, the Epique



● The Epique is a half-array design that places the highest-output drivers at the bottom of the speaker.



## TEST REPORT

imagined like no direct-radiating system I'd ever heard, producing the kind of depth, breadth, and float-in-the-ether sound bubble I associate more with panel speakers—electrostatics in particular, and most particularly one of my all-time favorite loudspeakers, the Quad ESL-63 phase-aligned concentric 'stats. For just one example, an oldie-but-goodie Reference Recordings CD of the too-little-heard Weber Clarinet Quintet painted a seriously lifelike aural portrait: The violins, viola, and cello were each clearly delineated by left-right location and stage depth, but were deliciously united in their grouped-string timbre and woody resonance, while the clarinetist (the brilliant, two-way jazz/classical threat Eddie Daniels), grounded firmly just right of center, soared over and through. This was goose-bumping stuff, and the timbral solidity and continuity of the clarinet in particular, over its full range, was impressive.

### Some New EQ

I next wished to know whether an outboard equalizer like the miniDSP was an absolute requirement, or, per Dayton Audio's recommendation, how the auto-correction found in most modern A/V receivers and preamps could suffice. I set up a Marantz SR7007, a flagship model of a couple years back, to avail myself of its top-level Audyssey MultEQ XT, which, at least in my studio, I've found to be one of the most effective such systems. I let the Marantz run its auto setup /room/speaker-EQ correction procedure, exploiting the maximum of eight mic positions, for the 2.1-channel system, i.e., the CBTs with my SVS sub. (I then rebalanced the sub's level by ear, as I inevitably do with every auto-EQ system.)

I cannot say that the result was indistinguishable from what I heard using Dayton's recommended equalization preset to the supplied miniDSP. For one thing, making any such A/B comparison was not really practicable. But my sense was that it was very, very close: I heard the same lifelike bass alacrity (without any bass deficit). If anything, the image's breadth, depth, and detail were better

with the Audyssey, likely due to its having measured and corrected, to some degree at least, real-world conditions in my room. Whatever the case, the CBTs sounded terrific with the Audyssey/Marantz correction. I found a new ease in listening into the stereo image on an ultra-familiar track like Norah Jones' "Come Away With Me." And the deliciousness of its string bass with no attendant floor-bounce thickening—something most of us are so inured to, we don't even know we're hearing it—is difficult to overstate. This track's opening moments feature brushed ride-cymbal, and I did wonder if the CBT24s might not be highlighting, however slightly, an element of "spit" in its timbre, possibly due to a modest response peak, perhaps around 6 to 8 kilohertz. Nevertheless, the air, presence, and detail of the backing track, and the spooky realism of Jones's holographic voice, were exceptional by any measure.

Despite their svelte profile, the CBTs seemed perfectly happy playing quite loudly—not too surprising for a design with 48 drivers, each rated for 15/30 RMS peak watts power handling. An excellent full-orchestra recording like a Reference Recordings set of the Rachmaninoff Symphonic Etudes/Tableaux could clearly deliver its full dynamic shadings, with strong, air-blast brass attacks and powerful *crescendi* from material like the "March," even at verifiable front-of-house levels. And concert-level rock was equally well presented: I could dial up the Allmans' "Fillmore" live set at very nearly you-are-there volume on a hard-punching track like "You Don't Love Me" (R.I.P., Gregg!), with no complaints from the speakers, or from my ears.

Some additional random thoughts: The CBT pair's phantom center image, such as on announcers' voices, was as solid and stable as any I've heard. I could stand 7 feet from the right-hand speaker, directly on axis, and still hear a strong origin point for the voice well to the left, though not quite strictly centered. Nevertheless, that's impressive. Another benefit claimed for the CBT design is near-uniform vertical dispersion of sound. I checked this, casually, via the classic squat-sit-stand test while playing a pink-noise

● Including its deep base, the CBT24 measures a full 25 inches deep.

signal. Here, nearly all conventional multi-way speakers' sound will vary in a "shoo, shee, shaw" fashion as your ears move into and then out of the in-phase lobe(s) of ideally combined non-coincident-tweeter-and-midrange output. (This is something that concerned designers go to some pains to engineer, causing it to be directed to seated-ear height when their speakers are installed and located properly.) From my everyday Energys, the treble formant changed in just this way as my head moved up and down. But via the CBT24s, the mid-treble timbre remained completely unchanged: It became louder as I went from standing to sitting to floor-sitting height—remember, the level-shading of the CBT24s half-array design puts the highest-output drivers at the bottom—but otherwise there was simply no change. I had to put my ear closer than 1 foot away to hear any trace of driver-to-driver lobing, and even that was small.

According to designer Keele, another interesting effect of a CBT design is that its output does not follow the mean-square law that applies to a theoretical point-source, which most conventional speakers are, more or less. That is, the speakers' loudness (in free space) does not fall off the expected 6 dB for each doubling of listening distance, but rather by about half that amount. I confirmed this effect semi-scientifically by listening comparisons with my everyday three-way speakers, carefully level-matched at 7 feet, from a bit over twice that distance; from that point, the CBT24s sounded slightly but obviously louder. (Keep in mind that this effect, heard in a room's reflective space, should be less marked than would be the case in free space.)

I noticed that the CBT24s were in the low range of sensitivity for typical

dynamic speakers (again, see our Test Bench for measured details). The design is rated to have a nominal 4-ohm impedance; neither my 150-watt-per-channel power amp nor the Marantz receiver displayed the slightest difficulty in driving them to high levels, and I briefly tried a rated 30-watt-per-channel integrated amp and achieved excellent volume and quality of sound.

And lastly, to return to the CBTs' stereo image for a moment: Given true stereo production, the image was invariably deep, as well as broad, reaching fully from speaker to speaker (but always remaining in between them), and as you would expect, quite tall. But in the vertical dimension, it was slightly diffuse, lacking a bit of the tight, "flashlight" origin-point—some might call it image specificity—for a centered soloist that the best monitors can conjure. And on the best big-image stereo recordings—like the aforementioned Rachmaninoff—I kept imagining that the depth dimension had a slightly sloped feel, as if the orchestra's seating stage sloped slightly upward from the proscenium to the backstage direction. This never intruded, though, and I can't promise that the visual element of the starkly curved CBTs wasn't influencing my auditory conclusion.

### And Then There Was One

I hate to call any product "utterly unique"; for one thing, *unique* is that part of speech known as a superlative and thus not susceptible to qualification. (It drives me sputtering-crazy when TV reporters and other so-called professionals refer to this or that as "even more unique"; if it's unique, there's only one. Period.) But I dare say that Dayton Audio's Epique CBT24 is even *uniquer* than that. Keele's design, obviously, will not be for everyone. (I mean, just look at them....) Nonetheless, any audio-head who is deeply interested in the evolution of the loud-speaker and in sound reproduction in general will want to hear a set. ♦



**The Epique CBT24's design is even *uniquer* than that.**