

V18:2005:08

# car audio AND ELECTRONICS

THE LEADING MONTHLY MOBILE A/V SOURCE  
Electronically reprinted from August 2005



## CLASS WARS

### Pros & Cons of Different Class Amps

**REVIEWED**

**Bravox UXP Subwoofer  
JVC KD-AVX1 Head Unit**


**PLUS**

**Richie Sambora's Stealth H2 System on a Budget  
XM Satellite Radio 2005**

**PRIMEDIA**  
*The Authoritative Source*

**VISIT** [WWW.CARAUDIOMAG.COM](http://WWW.CARAUDIOMAG.COM)

**LOOK INSIDE FOR BRAVOX'S INNOVATIVE PRODUCT, THE UXPI2D-4!**

 **In an era in which China** produces the vast majority of car audio drivers, Bravox stands out with its disclaimer, "Made in Brazil." For most people, Brazil brings to mind soccer, coffee, Latin jazz and maybe the annual Carnival festival (Brazil's version of Mardi Gras). All these things aside, Brazil also happens to be the home of Bravox, one of the best driver manufacturers in the loudspeaker business.

Founded in 1953, Bravox is one of the industry's old-timers. Over the years it has been both a car audio brand name in Brazil (it has also supplied drivers to car manufacturers in Brazil, like Ford and Volkswagen) and a woofer/midrange/tweeter supplier to American, Canadian and European manufacturers. You probably haven't heard the name before because Bravox car audio products were only introduced in the U.S in 2004. Over the past 10 years, however, many of the best reviewed loudspeakers in home audio have had Bravox drivers, including models from Polk Audio, MB Quart, M&K, Atlantic Technology, Niles Audio, Harman Kardon, Energy and Mirage. If you purchased an aSAS (Bazooka) speaker seven or eight years ago, it very likely had a Bravox woofer (Bravox no longer sells to SAS). In addition to home audio achievements, the company has been very active in 12V audio. Bravox organized Brazil's first IASCA meet in a Sao Paulo soccer stadium and over 50,000 people attended! Why do I know so much about Bravox, you ask? My answer can serve also as disclosure. For the last 10 years, I have been its U.S. representative. To read more information on Bravox, visit [www.bravoxaudio.com](http://www.bravoxaudio.com).

The first thing that catches your eye when you



# BRAVOX UXP12D-4

TEXT: VANCE DICKASON & ERIC HOLDAWAY + PHOTOGRAPHY: CASEY THORSON

TEST REPORT | SUBWOOFER

pull the UXP12D-4 out of its factory carton is the hot diamond-faceted cone surface, a Bravox trademark. The woofer is built on a six-spoke stamped steel frame that has an injection-molded frame cover. Unlike the standard rubber magnet boot, the frame cover covers about 50 percent of the frame while hiding the magnet area. Built for excursion and cooling, this frame has 22mm of depth below the spider-mounting shelf to the front plate, giving more than ample room for any rearward motion the music can dish out. In order to provide a convection-cooling pathway over the top plate and the outward motion of the voice coil, there are a series of twelve 3/8" holes around the perimeter of the frame area below the spider-mounting shelf. These are adjacent to the six large 2" x 1 1/4" screened vents in the injection-molded frame cover.

Unlike many of the woofers I analyze featuring a single-piece T-yoke with pole vent, the Bravox motor structure uses a two-piece rear plate and pole assembly. The main reason for the two-part pole/plate is the unique peripheral venting system employed in this woofer. Peripheral venting, a technique used a lot by pro sound woofer engineers in high-powered PA and musical instrument speakers, consists of a series of lateral vent holes in the pole rather than the typical pole vent hollowed out from the center of the pole piece. Air is forced across the voice coil and squeezes out these later-

al holes, past the inside diameter of the magnets and out the four 3/4"-wide half-moon-shaped vent holes formed by the backplate and the pole piece. This airflow is also channeled to the six vent screens in the black frame cover. With this venting above the frontplate area and the peripheral venting system, Bravox has created a substantial convection path for cooling the voice coil in the UXP12D-4. Other features of the FEA (Finite Element Analysis) computer-optimized motor structure include a pair of stacked ferrite magnets, a 5.5mm pole extension and a bump-out on the backplate to make certain the voice coil former will not mechanically bottom (hit the backplate on long

rear excursions).

The business end of this high-powered sub consists of a cone made from a proprietary compound called PGFC, an injection-molded polypropylene material with the addition of glass fibers and ceramic. This results in not only great cosmetics (the diamond pattern is tooled into the cone mold), but a very stiff cone that is much more rigid than the typical injection-molded polypropylene cone. At 8 1/4" in diameter, this silver-colored cone is large when compared to 12" woofers that utilize a wide surround to achieve long excursion. This is very important, as the larger the cone, the less distance it has to move to reach a given SPL at a given frequency. Adding to the already stiff cone is a large 4 1/4"-diameter and 2"-high injection-molded poly dust cap that uses the same glass fiber and ceramic fill as the cone.

Suspending this unique cone and dust cap combination is a fairly narrow 7/8"-wide (3/4"-high) proprietary parabolic-shaped injection-molded Santoprene surround with a co-molded trim ring that includes the Bravox logo. The remaining compliance is provided by the 7"-diameter flat linear cloth (Conex) spider.

Driving this rather sophisticated cone assembly is a 2.5" diameter four-layer dual voice coil wound with round copper wire on a fiberglass voice coil former. Thick, braided tinsel wire connects the



voice coil to a pair of color-coded gold-plated push-terminals. Departing from the current trend of weaving tinsel wire into the spider, Bravox stitches the tinsel leads at about mid-point on the spider, which prevents the lead wires from slapping the cone and making that nasty whacking noise.

## IN THE LAB

This section of the Bravox USP12D-4 subwoofer review is divided into two types of testing: Klippel analysis and LEAP 5 analysis. Using the Klippel analyzer (on loan from Klippel GmbH), Pat Turmire, CA&E reviewer and CEO of Redrock Acoustics, executed the large signal analysis on the UXP12D-4 subwoofer and provided the BI(x) curve shown in Figure 1. The black curve is the BI curve and shows the motor strength of the woofer as it moves in both directions from center rest position. The lighter curve is a type of displacement curve, and if both curves were identical, the motor system's motion in and out of the frame would be perfectly symmetrical. When a woofer is totally linear (linear would mean that the woofer motion matches the input signal exactly), the BI curve should be centered on the 0mm point (where the cone is positioned when there is no signal) and symmetrically decrease with the same slopes in both directions of voice coil travel. It is not uncommon, however, for a manufacturer to deliberately offset the voice coil a few millimeters, which tends to keep the motor more linear as it hits its primary operating range at 90-110dB.

As I have mentioned several times in past CA&E subwoofer reviews, your ears are not very sensitive to low-frequency distortion. As much as 20% THD (Total Harmonic Distortion) is really not audible with program material below 80-100Hz. While the UXP12D-4 BI (x) curve is not exactly centered on the rest position, the curve itself is very symmetrical with nearly equal slopes in either direction. The displacement at operating SPL is slightly less than 3mm, which will have a minimal effect on the woofer's performance. BI can drop to about 70 percent of its small signal value and the woofer will still

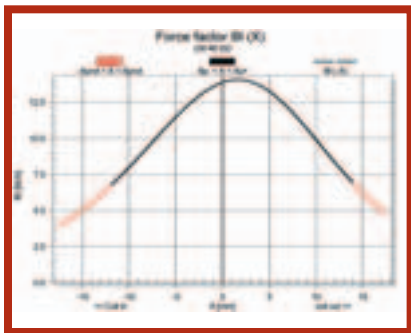


Figure 1: BI(x)

perform in a satisfactory manner, only with an elevated level of distortion (that you really can't perceive anyway). The 70 percent of maximum BI displacement limit for the UXP12D-4 is 7.5mm, just slightly below the physical Xmax of 8mm.

The Kms(x) or compliance symmetry curve (see Fig. 2) for the UXP12D-4 shows a somewhat lesser degree of symmetry in both directions of travel. The displacement curve is at 4-5mm for the operating range of this sub, which could be significant except that the compliance limit dropping to 50 percent of its rest value is 11.8mm. This means that compliance will not be a significant contributor to distortion. Both "limit" numbers are the level at which distortion climbs to above 20 percent, which is an acceptable criteria for subwoofers (10 percent is

used for full-range drivers).

Next, I measured the Thiele/Small (T/S) parameters. I used the LinearX Loudspeaker Measurement System (LMS) analyzer, LEAP 5.0 Enclosure Shop CAD software and LinearX VIBox for measuring dynamic impedance (impedance at different voltages). Testing is done by executing a series of impedance sweeps (actually both voltage and current sweeps are used to produce impedance curves) at increasing voltage levels with the driver clamped to a rigid test stand. For the Bravox subwoofer, measurements were taken at 1V, 3V, 6V, 10V, 15V, 20V, 25V and 30V. Since Bravox supplied the actual measured weight of the cone assembly (cone, dust cap, voice coil and 50 percent of the surround and 50 percent of the spider put on a

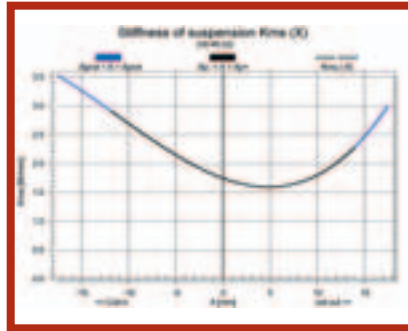


Figure 2: Kms(x)

scale like a Ohaus Triple Beam), the usual added mass measurements were not required. This group of 16 curves was loaded into the LEAP 5 software and the Transducer Model Derivation menu was used to generate the T/S parameters. These in turn were used to create the computer box simulation data provided in the Data Chart.

The UXP12D-4 parameters shown in the Data Chart were used to produce computer box simulations using LEAP Enclosure Shop. I set up LEAP 5 to simulate the woofer's dynamic performance in the two different volume sealed enclosures, both with 50% fiberglass fill material. Please note that you don't have to put fiberglass in a subwoofer enclosure to damp "standing waves," but it does effectively give you the same performance in a slightly smaller volume box. The smaller sealed box had a volume of 1.25ft<sup>3</sup> and the larger sealed box had 1.8ft<sup>3</sup>; again, both with 50 percent fill material.

Mounted in the simulated 1.25ft<sup>3</sup> closed box, the Bravox 12" sub delivered a low-frequency roll-off of 48Hz with a box Qtc of 0.78 for the series connection. In Figure 3, the blue curves show the SPL at 2.83V in half-space (imagine your woofer mounted in a car door that measured about 50' x 50' and you get an idea of what an engineer calls "half-space"). The black curves show the SPL at 2.83V in a 154ft<sup>3</sup> car compartment (about the size of a family sedan). Lastly, the red curves show the SPL at a power level required to get maximum linear excursion (also half-space). The 1.25ft<sup>3</sup> sealed box curves are solid lines and the larger closed box curves are the dashed curves. Increasing the input voltage for the 1.25ft<sup>3</sup> computer simulation to 80V pushed the SPL to 113dB.

The larger 1.8ft<sup>3</sup> sealed box computer simulation produced a lower cutoff frequency of 44Hz with a box "Q" of 0.70, which is pretty much the ideal damping number for good transients at a mid volume level of 87dB. As the voice coil heats up with increased voltage (more clicks on the volume knob), the box "Q" number will start increasing. Larger boxes produce more excursion, so it only took 60v to get this simulation to its max excursion level at 111dB. Because these numbers are based on sine

## DATA CHART

**Brand:** Bravox  
**Model:** UXP12D-4  
**MSRP:** \$215  
**Warranty:** 1 year

### MECHANICAL SPECIFICATIONS

**Weight:** 14 lbs.  
**Rear Mounting Clearance:** 6.63"  
**Woofer Magnet Dim. (dia. X ht. in mm):** 145 x 15 x 2

**Voice Coil Diameter:** 63.5mm (2.5")  
**Voice Coil Winding Layers:** 2x2 (two, two-layer coils)

### MEASURED T/S PARAMETERS

**Nominal Impedance (ohms):** 8  
**Revc (ohms):** 6.26 (both 3.4-ohm voice coils connected in series)  
**Sd (cone area in square meters):** 0.0491  
**Bl (motor strength in Tesla Meters):** 18.4  
**Vas (in liters):** 62.1  
**Cms (micrometers per Newton):** 180.5  
**Mms (grams):** 151.0  
**Fs (Hz):** 30.13  
**Qms:** 3.42  
**Qes:** 0.54  
**Qts:** 0.47

### POWER AND EXCURSION DATA

**Sensitivity (2.83V/1M in dB):** 86.7 series/92.7 parallel  
**Continuous Power Handling (watts RMS):** 400  
**Peak Power Handling (watts):** 800  
**Xmax (coil length - gap height)/2 in mm):** 8

### COMPUTER SIMULATION DATA

#### Enclosure size for simulation (cubic feet)

Sealed 1: 1.25 (50% fill material)  
 Sealed 2: 1.80 (50% fill material)

#### -3dB (F3) at 2.83V

Sealed 1: (Qtc=0.78): 48.0Hz  
 Sealed 2: (Qtc=0.70): 44.0Hz

#### Voltage to achieve Xmax + 15%

Sealed 1: 80V  
 Sealed 2: 60V

#### SPL at Xmax + 15%: (24.92mm)

Sealed 1: 113.0dB  
 Sealed 2: 111.0dB

wave-type analysis, the maximum SPL with program material will be at least 2-3dB greater before noticeable distortion. Of course, we are talking about 115dB, which is OK once in a while, but sustained and repeated listening at this volume can sometimes cause permanent hearing damage.

I have seen a lot of impressive innovation and engineering over the years from Bravox, and the UXP12D-4 is no exception. All the performance measurements point to a very well-designed subwoofer. However, all the performance numbers in

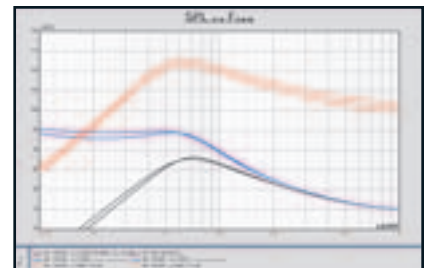


Figure 3: LEAP

the world don't mean a thing if it doesn't rock and roll. So Eric, how did it sound?

## SUBJECTIVE

"Bravox is a Brazilian speaker company," Casey tells me, "you know, as in South America?" As if I didn't know that's where Brazil is located—geez. I think he was just reacting to my blank stare of surprise—I thought only great racecar drivers came out of Brazil.

That being the case, I wanted to get a quick look at the UXP12D-4 and see the type of engineering employed to build it. Constructed of high-quality heavy-duty cardboard, the shipping carton is very nice, while the woofer itself looks very, very nice. Bravox has done a good job of hiding the fact that the UXP12D-4 uses a stamped steel frame instead of a cast frame by adding an attractive magnet cover that flows into the frame. The cone is stiff and the surround looks like a great design to increase cone area and improve linearity. At a retail price of \$215, it is at the top of the price range for a stamped frame woofer, but if the performance is right, it will be worth every penny.

### INSTALLATION

The installation manual is fairly complete and gives all the dimensions you could want. The manual calls for a 1.75ft<sup>3</sup> box sealed for sound quality. Since the big size took me aback, I spoke to Kevin Siegel, Bravox's North American sales manager, and asked him for his recommendation. After a call to Brazil, he informed me that we could go with a sealed enclosure of 1.23 to 1.73ft<sup>3</sup> and that the optimal for sound quality would be 1.5ft<sup>3</sup>, still large for today's subwoofers.

I had my guys at Speaker Works bust out a 1.5ft<sup>3</sup> sealed enclosure and wire the subwoofer in parallel for a 2-ohm load. Pat Holdaway, one of our

**“Bravox has produced a great-looking subwoofer at the top of its price range that delivers with solid performance.”**

master installers was pleased to see that the UXP12D-4 used a standard size cutout for mounting. This means the UXP12D-4 would easily fit into most pre-made enclosures, saving time and labor. He also liked the nice gold-plated, spring-loaded, push-button terminals on opposite sides of the basket, making hook-up quick and easy.

Once the UXP12D-4 was securely in its enclosure, I headed out to my Ford F-350 to finish up the installation and set up the listening test. The UXP12D-4 worked best with the enclosure on the floor of the cab between the front and back seat, with the subwoofer facing the rear of the cab.

To power the UXP12D-4, I installed a Zapco C2K-9.0XD amplifier. The 9.0XD features a 24dB-per-octave crossover and pumps out a throbbing 2,000 watts of power at 2 ohms mono. The front



### SUBJECTIVE SCORE CHART

	Points Possible	Bravox UXP12D-4
Overall Sound Quality	50	31
Tonal Balance	10	06
Low-Frequency Extension	10	05
Clarity at Low Volume	10	06
Clarity at High Volume	10	06
Impact	10	06
<b>Total Subjective Score</b>	<b>100</b>	<b>60</b>
Ratings: 00 Poor 05 Average 10 Superior		

### MUSIC SELECTION

Artist	Title	Music Type	Points Possible	Bravox UXP12D-4
Tracy Chapman	Heaven's Here on Earth	Folk/Rock	17	10
Diana Krall	Love Scenes	Jazz	17	10
Usher	Yeah!	Pop Rap	16	10
<b>Total</b>			<b>50</b>	<b>30</b>
Ratings: 01 Poor 08 Average 17 Superior				

half of my reference speaker system consisted of a pair of USD Audio B-72pro WaveGuide separates. I powered these with a Zapco C2K-6.0X amplifier at 150 watts per channel. The built-in highpass crossover filter was used to block the bass to the component system. The amps were fed via Zapco's Symbilink balanced line driver SLB-U. There were no other signal processors in the signal path.

On Diana Krall's *Love Scenes* album, the frequency shifts of the upright bass were not as apparent as they should have been. The note-to-note definition was good, with minimal hang over and no blurring. In fact, the punchy and taut bass plucks were a bit one note-ish. They didn't convey the string bass' body tones, thus affecting the realism of the sound reproduction. Now, I have been a touch spoiled by all the top-of-the-line subwoofers I have tested lately. At its price range, the UXP12D-4 performed wonderfully!

Finishing up, I put in Usher's latest album and cranked up the intro track and "Yeah!" The intro track is mostly acoustic instruments, closely mic'd with super dynamics. The UXP12D-4 delivered good punch and jolt for the money. On "Yeah!" the UXP12D-4 energized the cab pretty well, with solid impact and a full tactile sense of the system's power. The bass line did not overpower in loudness, but it was tight and concise. The only real failing in sound reproduction I can fault in the UXP12D-4 is that it rolled off too soon on the deep, deep bass notes.

### CONCLUSION

Bravox has produced a great-looking subwoofer at the top of its price range that delivers with solid performance. Its box sizes are a bit large compared against similarly sized subwoofers, but I feel that if you can fit it, its sound will well reward you. I would even venture to try it in a free-air or what people call an infinite-baffle installation. It may be ideal for that type of setup. ✦

### LISTENING

I started off with an old favorite, Tracy Chapman's "Heaven's Here on Earth." An awesome recording, the track opens with a bass drum, one beat in every other bar as a pick-up note for the next phrase. A bass guitar and toms join in and maintain the bass line for the phrase. The UXP12D-4 sounded very good. The bass drum was tight and reached down pretty well, but not as convincingly as some of the more expensive subwoofers I have tested. The bottom tones of the acoustic guitar's body were full and rich, but in the upper bass frequency range. I mention this because the bass guitar was solid and well damped, but its deepest tones just weren't there. The impact response was pretty good, especially when pushed.

CAR AUDIO  
**BRAVOX** ≡≡≡  
WWW.BRAVOXAUDIO.COM