

APRIL 2010 | VOLUME 16 | ISSUE 4

# ProAudio Review

The Review Resource for Sound Professionals



## PREMIUM STUDIO HEADPHONES

Featuring AKG,  
Audio-Technica,  
Shure, Sony, &  
Ultrasone

**PAR Bench Test:**  
**Headphones**  
Ear Opening Measurements



### INSIDE:

- **WORSHIP AUDIO:**  
Improving Audio In New Media Video
- **IN USE:** SPL Phonitor



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**FEATURES**

- Natural response ideal for professional monitoring and mixing
- Collapsible design for easy portability and convenient storage
- Proprietary 45 mm large-aperture drivers with neodymium magnet systems
- Closed back cushioned earcups for isolation
- Adjustable padded headband for comfort during long mixing/recording sessions
- Single-sided coiled (ATH-M50) or straight (ATH-M50s) cable terminates to gold-plated mini-plug with screw on 1/4" adapter



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*always listening*



## BURSTING AT THE SEAMS.

We like to pack things in tight. Offering so much for so little, Yamaha's LS9 digital mixing console features a USB recording and playback device, virtual effects rack, a variety of EQ and dynamics, and recallable head amps. In addition, 16 or 32 channel models can be easily doubled to 32 or 64 channels via Mini-YGDAI expansion slots in a wide range of formats. Throw in an intuitive interface and an attractive price tag, and it's easy to see that the LS9 is stuffed with potential.



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Cover Photo: Paul Haggard

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## Phoning It In



Over the past few decades, audio technology has been refined even while it is being diversified. Analog electronics can be as clean and wideband as the designer's tastes and goals dictate. Digital technology has moved from theory to stumbling first attempts to a high degree of effectiveness and quality performance. Audio software is increasingly transparent, where appropriate, and, for many end-users, digital emulations of analog circuits can be indistinguishable from the circuits they are modeling. Microphone design can now be considered an exercise of tailoring character as opposed to wrangling with physics.

An underlying theme in those statements is that we can achieve largely transparent gear designs when we want to. And often, we don't want to. An exception to that exception is in the tail end of the audio chain. Loudspeaker technology has improved over the years, to be sure. New materials and the advanced application of the various sciences involved in moving large volumes of air are getting us closer to the ability to achieve transparency in sound reproduction. That said, when measured, the transparency we can achieve with loudspeakers would appall us if we were forced to live within those standards in earlier stages of the signal path, and ultimate transparency may remain elusive till we discover some new way to move air.

This is especially true with headphones. Accurately reproducing the full range of audio in a package strapped to our heads is a daunting challenge. Giving the performance specifications for headphones a gander should give first warning — the frequency response specs are typically not qualified as falling within a range of levels, for instance. We know loudspeaker technology isn't perfect, but at least expect that the frequency-response rating for a given loudspeaker will fall within a window of, say +/- 3 dB SPL, a range specified in the sales literature. Not so with headphones.

If you were handed literature specifying a loudspeaker with a frequency response of 30 Hz to 20 kHz, +/- 8 dB, you probably would reject it from consideration without even listening. Headphones, based on our measurements in our Session Trial bench test evaluation of headphones, routinely have that sort of deviation from flat performance — and the response curves are jagged, with huge peaks and valleys, and often some apparently deliberate LF boosts of massive proportion. Then there are additional considerations like distortion performance and consistency in performance between left and right ears.

Headphone evaluation is going to remain highly subjective in practice for some time to come. The test data is interesting and somewhat instructive, but in the end, even "pro" headphone performance varies so wildly from the kind of standards we apply to other gear that objective measurement has limited value. The questions then become, "What do I like?" and "What can I work with?" We hope you'll at least find the exercise in objectivity as interesting as we did.

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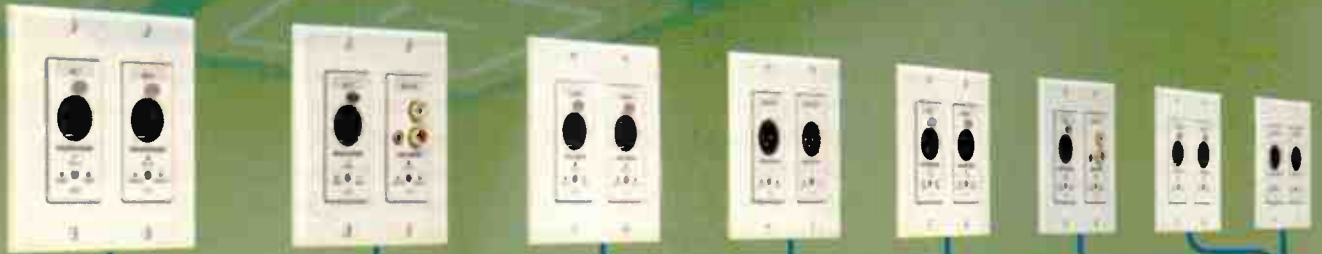
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# Digital audio conversion at the wall ... easily.



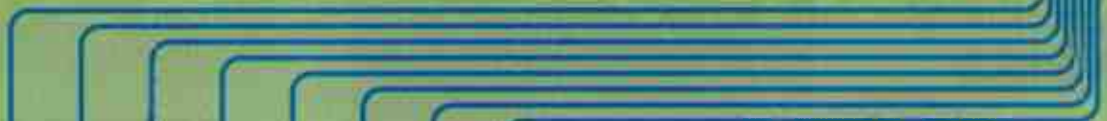
Convert analog audio to digital close to sources and destinations. Mongoose and RADs (Remote Audio Devices) reduce noise, EMI, improve sound quality and simplify termination. RADs self-monitoring cable tester easily identifies connection problems.

RADs use CAT 5 cable to deliver digital audio, potentially reducing or eliminating conduit expenses. While the Mongoose RAD-aggregating head unit is an Ethernet device, RADs are not. This means RADs require no IP addressing or network integration. Powered from the Mongoose, RADs can be placed up to 150 meters (497 feet) from equipment closets – farther than Ethernet devices. And with 70 companies offering CobraNet products, Mongoose is compatible with products you may already be using.

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# new studio products



## Korg MR-2 High-Resolution Mobile DSD Recorder

The Korg MR-2 is a handheld digital recorder that captures high-resolution audio in the ultra-high fidelity DSD format, using a 2.8 MHz sampling rate with its built-in, adjustable, electret, stereo condenser microphone, line-level input, or an external microphone. Using included AudioGate software, the DSD datastream can be repurposed into nearly any audio format with minimal fidelity loss; MR-2 can also record in any of the popular multi-bit formats — from MP2/MP3 up to 24-bit/192 kHz.

Data is recorded directly on an SD/SDHC card — no motor, thus no unwanted drive noise — and over 11 hours of DSD recording is possible using a 32 GB card; the USB 2.0 port allows data transfer to a computer. Other features include onboard analog limiter, low-cut filter, bass EQ, 128 X 128 backlit LCD, power via battery (2 AA) or USB sources.

The MR-2 will be available in July.

For our full review of another Korg DSD product — the Korg MR 2000S — stay tuned to the pages of *Pro Audio Review*.

Price: TBA

Contact: Korg | [korg.com](http://korg.com)

## Universal Audio 4-710D 4-Channel Mic Amp/DI/Dynamics

Universal Audio has announced the 4-710D four-channel “Twin-finity” mic preamp and DI with dynamics, featuring four channels of tone-blending mic preamps with true-bypass 1176-style compression. Based on the original 710 Twin-Finity preamp, each of the four mic preamp channels allows for continuously variable tone between 100 percent tube and 100 percent solid-state.



Other notable 4-710D features include a newly designed 1176-style compression/soft-limiting circuit per mic channel; eight channels of 24-bit, 192 kHz A/D conversion; digital output via dual ADAT optical or AES/EBU DB-25; monolithic balanced output stage; and balanced send/return inserts.

Worldwide release is scheduled for fall 2010.

Price: TBA

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# new studio products



## ◀ DPA 5100 Mobile Surround Mic

DPA Microphones has introduced its mobile surround microphone for 5.1 recording, the 5100. Targeted for capturing surround ambience for HDTV at sporting events, recording at different venues and documentaries, the standalone, plug-and-play mic can be mounted on a camera or microphone stand, suspended or handheld, and reportedly requires no additional signal processing.

Optimum channel separation and directionality are achieved through a combination of DPA's proprietary DiPMic (Directional Pressure Microphone) technology, which employs interference tubes on the L/C/R capsules, while the use of acoustic baffles further preserves the accuracy of levels between the discrete analog output channels.

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## Tannoy Reveal Studio Monitors

Tannoy's well-known and affordable studio monitor line has received a complete makeover and redesign, rebuilt from the ground up, offers the manufacturer. As a result, three new models have been introduced by Tannoy: the 501a (pictured), 601a, and 601p.

Active models 501a and 601a and passive model 601p feature the same one-inch, soft-dome tweeter, five-inch mid/low frequency driver for the 501a, and 6.5-inch mid/low frequency driver for the 601a and 601p. The 501a includes a 60W amplifier; the 601a includes a 90W amplifier. Other Reveal series features include a front-firing bass port; +1.5/0/-1.5 dB HF trim switch; balanced XLR and unbalanced 1/4-inch inputs (on the active models) or binding posts (on the passive model).

Prices: \$249, \$349, and \$179 each, list (501a, 601a, and 601p, respectively)

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S3X-H



S1X



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S3X-H



S3X-V



S4X-H



S4X-V

# new studio products

## ADAM AX Series Studio Monitors

Featuring ADAM Audio's X-ART tweeter alongside new woofers, amplifiers, and completely redesigned speaker cabinets, the new AX Series includes four systems ranging from the ultra-compact A3X through the larger and more powerful A5X, A7X (pictured), and A8X systems. According to ADAM, the X-ART tweeter is more efficient than its predecessors, handling higher SPLs along with a frequency response up to 50 kHz.

ADAM'S smallest monitor, the A3X, is equipped with the X-ART tweeter, a 4.5-inch mid-/low-frequency driver with a very light, but stiff carbon fiber diaphragm and two efficient 25-watt amplifiers to power each driver. The entire line is equipped with XLR and RCA connectors.

The A5X features the proprietary X-ART tweeter and a 5.5-inch, lightweight Carbon/Rohacell/Glass mid/woofer to reproduce frequencies below 2.5 kHz. Two 50W amps drive each of the A5X's speakers directly, and the speakers feature 110 dB max peak SPL per pair.

The new A7X features the X-ART tweeter, a newly designed 7-inch mid/woofer featuring a larger 1.5-inch voice coil. A 50 W A/B amp drives the X-ART tweeter, while a 100 W Pulse Width Modulation amp drives the mid/woofer. The front panel includes a power switch and a control for the volume that retains the volume setting independently from the on/off switch.

The A8X is equipped with the X-ART tweeter and an 8.5-inch carbon/Rohacell/fiberglass mid/woofer. With a 50 W amplifier for the tweeter and a 150 W amplifier for the mid/woofer, the A8X includes a tweeter gain control and two shelf filters on the rear panel; a frequency response of 38 Hz to 50 kHz, and 120 dB max peak SPL per pair.

The entire line comes with a five-year warranty.

Prices: \$299, \$449, \$599, and \$899 each, list (A3X, A5X, A7X, and A8X, respectively)

Contact: ADAM Audio USA | [adam-audio.com](http://adam-audio.com)



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Joe Chiccarelli receives no compensation for his appearance or comments

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# studio events

## ▼ PAR, PSN Co-Sponsor Rupert Neve Designs Event At Vintage King

Vintage King Audio hosted an all-day showcase of Rupert Neve Designs products co-sponsored by *Pro Audio Review* and *Pro Sound News* at Infrasonic Sound's recording studio in Los Angeles on March 25. Infrasonic Sound, Vintage King's West Coast showroom, installed a 32-input Rupert Neve Designs 5088 discrete analog mixer in early 2009.

An evening open house — featuring Sanguis Wines and cheese — was well attended by local engineers and musicians, including Thes One (aka Chris Portugal) of Los Angeles underground hip-hop group, People Under the Stairs. PUTS will return in May to record direct-to-disc at the facility, which includes a mastering room and vintage Neumann lathe.

Jeff Ehrenberg, Infrasonic Sound co-owner and Vintage King's head of West Coast sales, reported that the focus was on one-on-one console demos during the day. "In general, that console is available for private demos all year round," he added.

Vintage King has hosted a couple of product showcases annually since Ehrenberg started the studio with co-owner Pete Lyman six years ago. This year, the company is planning at least one event per quarter. The next event, to be held on April 22 at the Los Angeles Downtown Independent Theater in conjunction with Solid State Logic, will be a panel discussion on music for films, TV, and multimedia.

Contact: Vintage King | [vintageking.com](http://vintageking.com)



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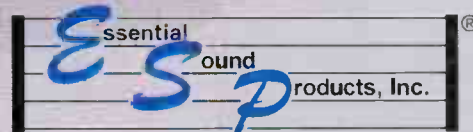
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RETRO



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# PREMIUM STUDIO HEADPHONES

ProAudio Review  
**PAR**  
session trial



Vocalist Deirdre Kroener with her top pick, the AKG K702.

## Featuring AKG, Audio-Technica, Shure, Sony, and Ultrasone

by Rob Tavaglione

In the interest of full disclosure, I don't like using headphones. They often fall off at just the wrong moment, squeeze my earlobes, and/or fatigue my eardrums. Their frequency response is typically too uneven for trustworthiness in mixing, nor voiced right for pleasurable, long-term monitoring when tracking.

That said, our industry's top headphone manufacturers have recently unveiled some ambitious new models flagged specifically for studio use, promising improved sonic performance and better fit as many more audio engineers are monitoring, editing, and mixing in compromised environments or "on the go." Especially within the new breed of young engineers, many headphone mixes

are done simply to avoid the faulty sonics of their working environments (converted bedrooms, for example). Thus, the time is right for a thorough evaluation and possibly some serious reconsideration on my part.

This, our eighth Session Trial — PAR's ongoing series of comparative, real-world gear evaluations — examines the following premium studio headphones: the open-back AKG K702 (\$539 list); the closed-back, collapsible Audio-Technica ATH-M50 (\$199 list); the closed-back Shure SRH840 (\$250 list); the closed-back, collapsible Sony MDR-7509HD (\$265 list); and finally, the closed-back Ultrasone HFI-680 (\$249 list). All are well-built, full-size, ear-surrounding models and are most definitely "professional grade" headphones.

Rob Tavaglione owns and operates Catalyst Recording in Charlotte NC. Please contact him at [rob@catalystrecording.com](mailto:rob@catalystrecording.com) for questions or comments.

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## Tracking Session

With a modern rock trio in for a tracking session, I had ample opportunity to see how universally the cans fit, if they caused any premature fatigue, and if they gave the performers what they needed to hear.

As the musicians warmed up, I had them each try out a pair of phones, record for a spell to get over any initial shock, and then gauge each model's comfort and overall desirability. Right off the bat, our participating contenders showed that great strides have been made in the realm of comfort (unfortunately, we didn't have the Ultrasonics HFI-680 for this session). All four sets not only fit comfortably, they mostly stayed on even if the musicians leaned forward (an important, if dull improvement). Atypically, everybody stayed in their cans the whole session without switching to listen back to monitors — a testament to the long-term comfort these newer designs provide.

As it turned out, the Achilles heel of our testing plan was that I needed more pairs of each headphone, as both our drummer and bassist really wanted to use the Audio-Technica ATH-M50. In my opinion, the M50 proved to be the best tracking cans for one dominant reason: They actually deliver as much bass as these performing musicians wanted to hear. So many modern musicians are used to kick-drum-heavy productions that it's only natural that they want to hear this fundamental timekeeper rather loudly; the ATH-M50 was the only headphone with extended low bass, sufficient mid-bass (for easier bass guitar audibility), and a lack of a singular "bass bump" that "fakes" bass, even if the

overall content is rather low. Our drummer settled on my studio's Sennheiser H0280 headphone (offering high output, but a comparatively "peaky" bass response) as the bassist was using the ATH-M50; our drummer needed lots of kick drum/bass guitar that the other phones could not provide.

This guitarist is one of those fellows who doesn't love so much chesty 80 Hz as he does some "in your face" 2-4 kHz. He gravitated to the Sony MOR-7509. They fit him perfectly, produced a tight and punchy bottom that he likes which accentuated his instrument, even as he shared a cue mix with the bassist; there were no "more me" squabbles since both cans delivered to each performer his preferred frequency range.

The Shure SRH840 nearly secured the top pick from all parties involved, and were only comparatively lacking in bottom-end output. The open-back design of the AKG K702 was just wrong for this loud trio's session (especially since we didn't want any click-track leakage), but I maintain that such open designs are ideal for hearing some of the room *and* getting a "mostly me" mix in the cans that works well for larger group sessions in bigger rooms (especially group vocals).

## Overdub Sessions

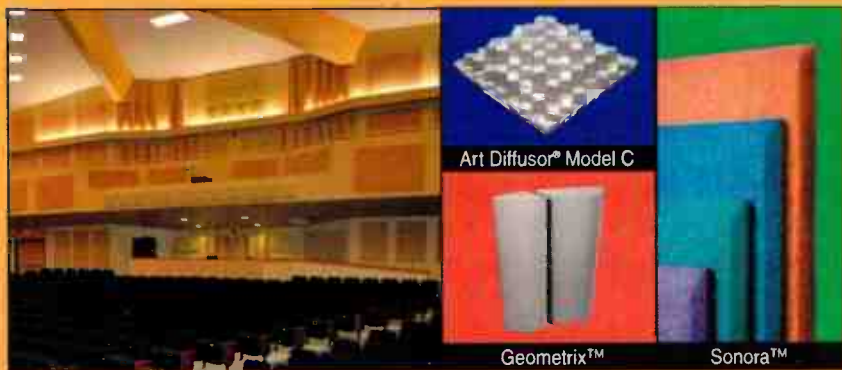
Before using any of them with musicians, I first tried out all our phones on a grab bag of overdub monitoring: everything from electric guitars, bass guitar, lead vocals, backing vocals, and VOs. I used the Aphex Headpod 454 for amplification; it employs four clean headphone amps, which allowed easier volume matching, plenty of headroom, and eliminated any possibility of loading issues. As a result, I discovered a favorite for each individual application.

My overall favorite was the Shure SRH840 for having a good top to bottom balance, minimally fatiguing harshness up top, a comfy fit, and a comparatively neutral voicing that worked well with almost all overdub sources. Close behind were the Sony MDR-7509HD and the Ultrasonics HFI-680; both delivered with a lean bottom that didn't overwhelm and good vocal intelligibility, hindered only by some high-end hype (maybe 10 to 12 kHz) on the HFI-680 and some uneven mids in the MOR-7509HD.

These overdub session tests revealed just how high impedance the HFI-680 and AKG K702 are (at 75 and 62 ohms, respectively), requiring a good 50 percent more power to get up to the same output level. When the levels were matched, the K702 became my favorite for vocals by a wide margin. They may seem a little thin by comparison, but with such open-back designs, one doesn't feel the urge to "half cup" one ear when seeking vocal blends and harmonies; you can actually hear yourself and the room lightly blended in.

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## PREMIUM STUDIO HEADPHONES



Monitoring VOs, the HFI-680 and Shure SRH840 were my favorites for a more compressed sound that allows for better tailoring of the bottom-end bombast with proximity. On VO as well as instruments, the full bottom end of the Audio-Technica ATH-M50 was a bit too much; it seemed to reduce vocal clarity, getting a little clouded at times and even a tad lacking in dynamics overall.

### Vocal Session

Vocalist Deirdre Kroener laid down some vocals using our five phones and shared some insight on her preferences. After run-throughs with all five, she commented that all sounded accurate and she'd be "tickled to have any of them." For her, it seemed that the main issues were comfort and the avoidance of undue pressure on her ears, the latter of which can cause a bassy and muffled sound, forcing her to hear too much of her head's internal vibration and not enough of what the microphone itself had captured.

Deirdre's favorite was the AKG K702 by a long shot. She praised it for "capturing the mic" and said it "sounds just like playback" without any pitch surprises from too much head voice — a testament to the oversized speaker cups and open back design. She also liked the Sony MDR-7509HD for excellent comfort and "good clarity." She found the Shure SRH840 a touch uncomfortable and bassy, the Audio-Technica ATH-M50 being far too thick-sounding and snug-fitting, accentuating head voice. Deirdre clearly preferred the models with a straight cord instead of a coiled cord (I'm neutral on the issue).

### Mix Tests

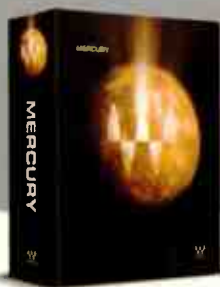
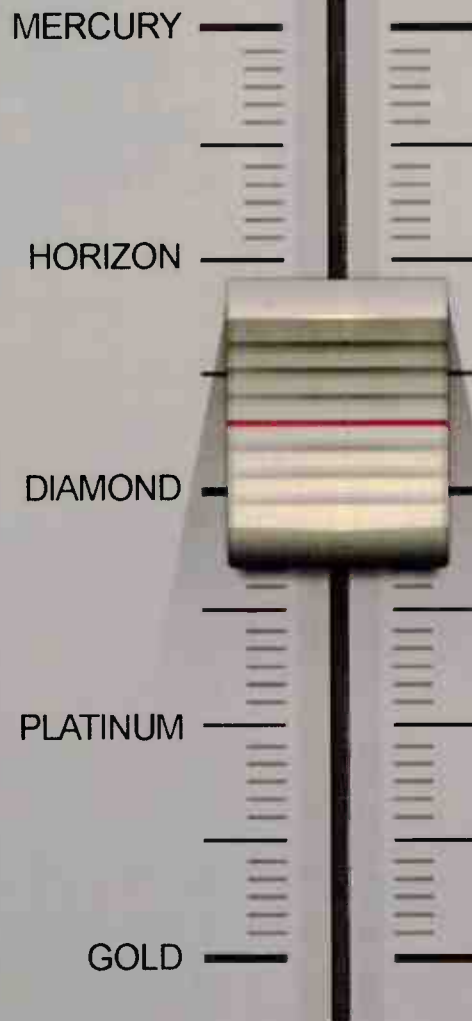
I found myself working on an uptempo pop/rock mix that was difficult to balance out, struggling to get the fundamental elements like kick drum, snare drum, triggered samples of both and the vocal to sit just right, when I realized this was a perfect time to really "learn" these headphones.

Today's pop mixes require lots of bottom end, and none of the tested units deliver as much bottom as the Blue Sky SAT8 (with SUB212) monitoring system I was concurrently reviewing or my own JBL 4328 (with LSR4312 sub) monitoring system. As I slowly got my kick drum/kick trigger/bass guitar thing happening (after additional checks in my car and on my desktop system, too) and I confirmed that all the headphones except the Audio-Technica ATH-M50 provided inadequate bass content for my mixing needs, yet some had much greater accuracy frequency-wise (like the Shure SRH840), while others (like the AKG K702 and the Ultrasone HFI-680) seem to "get" the damping (the looseness vs. punch element) more accurately.

A little bass tilt can be worked around, but each set of phones had not only its own points of "frequency overemphasis," but a distinct frequency where most of the distortion began to become apparent at higher volumes. Working at a reasonable level (that felt like it was about 85 to 88 dB on monitors) that minimized distortion, I still found all the headphones unusable for detailed mix decisions because I just simply could not trust the midrange content. It seems that the inaccuracies are often in narrow frequency ranges, with spots of emphasis and attenuation often at adjacent frequencies, making some response curves feel almost comb-filtered in their midrange nonlinearity. I tried making such mid-heavy decisions — like guitar EQ, snare EQ/placement and vocal placement — only to find that I had degraded an otherwise good mix with largely inappropriate decisions (although some were quirky and interesting — not exactly my ideal).

Nonetheless, I found the imaging and soundstage of the AKG K702 and Sony MDR-7509HD to be the most lifelike and believable, with transient reproduction particularly good on the AKG K702. Both the Audio-Technica ATH-M50 and Ultrasone HFI-680 sounded slightly compressed in their dynamics, a nonlinearity that may be not be so bad for tracking.

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Once I [finally] had a good mix, I could see how, after interpreting their bass tilt and nonlinearities, I could easily put all five headphones to regular mix use in my studio. I often check my mixes on three other headphone models: AKG K240, Grado SR125, and Fostex T50RP. The key word here is “check” — at that point, such mixes are nearly finished and I’m just looking for certain elements to balance. Many mixers use Auratone-style monitors similarly and each of us has our own imperfect, yet important, reference system[s]. (Who doesn’t check mixes in their car?) For such important “translation checks,” I could learn to be comfortable with any of the headphones tested here.

**Summary**

The Audio-Technica ATH-M50 gets my top rating here for easily the best bass response of the group (almost as good as nice monitors); very little distortion (maybe some way up high at 10 to 12 kHz); only moderate mid-combing; and a slightly understated top end that is unobtrusive for long tracking sessions. Although ideal for tracking, they’re still not flat enough for efficient mixing and are a little bassy for many overdub purposes.

I’m hard pressed to pick a second favorite, but the AKG K702 slightly edges out the Shure SRH840 and Ultrasone HFI-680. I personally like the open-back design of the K702, its accurate mid-midrange (best of the five), fantastic imaging (best of the five), and natural-sounding bottom end. If only they had more of this bottom end, more low-mids at 125 to 200 Hz, and less distortion at 3–4 kHz, it could be my top pick.

Conversely, the SRH840 and HFI-680 have pretty darn good bass response, only moderate inaccuracy in their mids, and an excellent lack of leakage. I wish the SRH840 was a little more animated in the top end, and I wish the HFI-680 had more mid-bass content (and less distortion way up high); yet both are more than adequate and way better than my critical observations may imply. I did get an excellent fit from the SRH840 but not the HFI-680, although that may be personal.

I had mixed reactions to the Sony MDR-7509HD, although I thought the fit was the best (no ear or crown pressure, whatever), and my clients chose them based on their sound twice, so we obviously disagreed. There seems to be little below 80 Hz and the midrange is seemingly bumpy, with many peaks and dips. They also seem to “ring” at 6 kHz and distort at about 10 kHz, but (to be fair) many users love this sculpted frequency curve more than I do. These characteristics have made the Sony MDR-7506 (predecessor to the MDR-7509HD) almost an industry-standard headphone. Those who love the 7506 will appreciate the 7509’s similar curve, but with deeper bass, less top-end shrillness, and a bigger soundstage.

There is another critical factor of headphone evaluation that was omitted from this Session Trial — durability. Selecting headphones for performers is often more skewed towards models that take abuse, or at least are easily repairable. I have a half-dozen Foster T20RP headphones for their durability and reparability, but only time will tell if our Session Trial contenders hold

▶▶ On the Ultrasone Edition 8



Ultrasone Edition 8

For this PAR Session Trial, Ultrasone submitted two headphone models for consideration: the aforementioned HFI-680, which we included, as well as the Ultrasone Edition 8 (\$1,499 street). Among other creature comforts, the posh Edition 8 features such unique materials as Ruthenium outer ear cups and Ethiopian sheepskin leather — materials that Rob considered cosmetically and aesthetically impressive, yet ultimately cost-prohibitive for most studio needs. However, it was their decidedly “audiophile” performance that led to their exclusion from the Session Trial evaluations.

“Out of the box, I found them to be consumer-oriented,” explains Rob. “For example, they have a very short cable, one that professionals could not use in the studio. While their fit was killer — I almost considered them for the fit alone — the frequency response was way too sculpted and nowhere near flat. The Edition 8 has a frequency-response curve that is sculpted in a way that only consumer headphones would be; the response, while exciting, is unusable for studio use, especially for mixing.” — Ed.

up to the banging around, sweat, and high SPL of typical rock ‘n’ roll tracking sessions.

I’ll go on the record here: Headphones are still not a viable replacement for mixing on either nearfield or midfield monitors. I know many of you find balances on phones as part of a successful production routine (and I won’t doubt that many mix better on cans than I ever will on the finest monitors). That may evade the point, however, since speed, efficiency, and a lack of “educated guesswork” may be equally important factors to consider. Modern headphones are, by necessity, a workable alternative to finely tuned control rooms; thus, these personal monitoring environments are sure to become even a bigger part of our fast-changing audio landscape.



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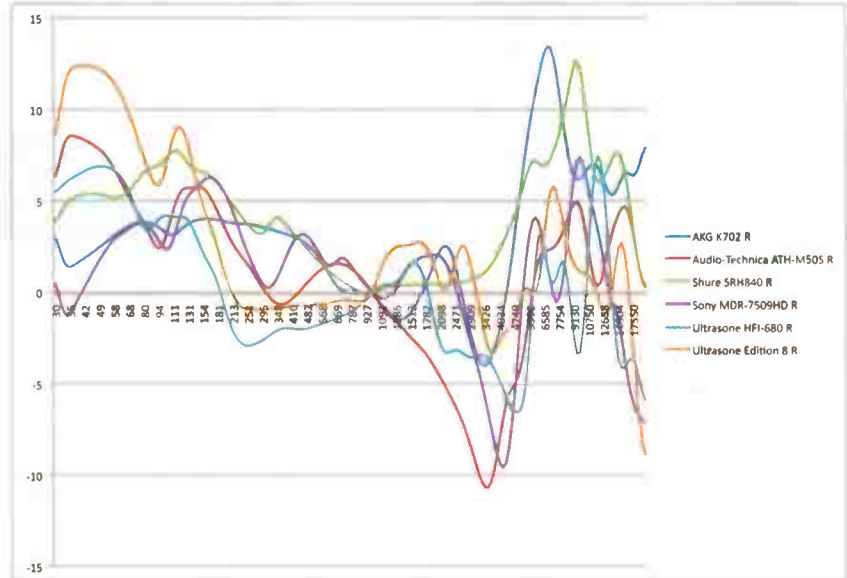
PAR Bench Test

# STUDIO HEADPHONES

by Frank Wells

As an accompaniment to the subjective tests in this month's *PAR* Session Trial, we made inquiries into the methods used for quality-control assessment by manufacturers, resulting in an invitation to utilize Audio-Technica resources at its Stow, OH headquarters. The headphones tested were a second set of the makes and models reviewed by Rob Tavaglione, each fresh out the manufacturers' packaging.

Headphone measurement starts with a reference microphone, but requires additional physical interface for coupling and isolation. Audio-Technica employs a Brüel & Kjær 4153 Artificial Ear, essentially a flat plate with a central mounting for the B&K microphone element. The mic is coupled to an Audio Precision System One test set via a B&K 2608 measuring amplifier. A custom software program controls the System One. Each headset was manually centered on the artificial ear and then the tests run producing a frequency-response plot and measuring sensitivity (output in dB SPL with a 1 mW 1 kHz tone) and impedance. The tests were run on both left and right earpieces.



Plot 1: Frequency response sweeps and measured performance.

The artificial ear was then moved into an anechoic chamber where isolation was measured relative to frequency with a 94 dB SPL loudspeaker source. For this test, the mic is calibrated for a flat response prior to covering the mic element with a given headset — the measurement being the passive attenuation of outside stimulus.

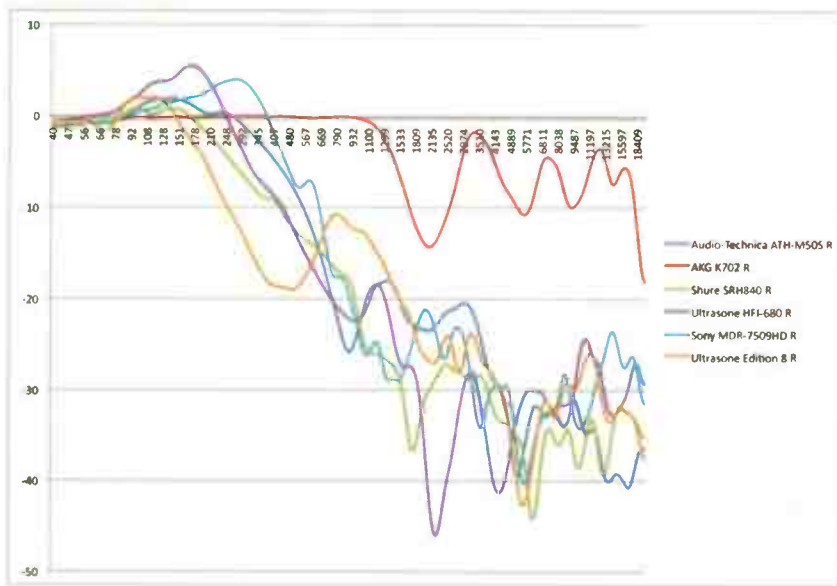
I brought my Prism Sound dScope III test set along as well. The dScope analog outputs drove a Rane HC6 headphone amp for 10 dB of gain; the headphone output was measured using the same microphone interface used for the frequency-response tests. The resulting distortion measurements thus included the performance of the HC6 and should be considered comparatively, not as absolute numbers.

I have personally, as yet, only listened to one of these specific headphone models, but over time I have listened to other models from each of the brands represented. Based on those prior experiences, I expected that there would be significant differences in frequency response between the headphones tested based on design and components used and/or due to deliberate voicing. Despite those expectations, I was still surprised by the degree of both relative differences and the degree of deviation from flat performance. Printed specifications for headphones are generally vague



The B&K 'Artificial Ear' test microphone and physical interface with a pair of Audio-Technica MTH-50Ss mounted for evaluation.

Frank Wells, formerly a radio broadcast and recording studio technician is the editorial director of *Pro Audio Review*.



Plot 2: Testing passive isolation vs. frequency.

with little (if any) qualification against reference levels or other qualifying data.

A-T's test procedure for frequency response (and later, isolation) produced a log plot of the measured data, but also output the raw measurement data. Despite not being able to create logarithmic plots of the measurements, I imported the raw data to Microsoft Excel so that the test data could be graphed in a single illustration [see Plot 1]. Even though the Ultrasonics Edition 8s should probably be considered as outside the test group, I left its data in with the rest. The general shapes of the curves tend to grossly coincide: boosted low end, relatively flat from about 200 to 2,500 Hz, plus an HF bump (or bumps).

Within that trend, there's a lot of variation and a lot of deviation from flat response. Comparing right-channel performance only, the AKG K702s were the flattest to about 3 kHz (+4/-2.7 dB) though having one of the highest HF peaks of +13.5 dB around 6,800 Hz. The Shure SRH840s have the smoothest overall response (less smaller peaks and valleys) and the flattest from 250 to 2,000 Hz, though they have significant low-end

shelf around +5 dB up to 70 Hz, a broad peak of +9.5 centered just above 100 Hz and a major peak on the higher end of +12.4 dB at 9,100 Hz. Across a 30 Hz to 20 kHz bandwidth, using the cumulative maximum positive to maximum negative deviation as the measure [see Chart 1], the Shures have the lowest total deviation at 12.8 dB, followed by the Ultrasonics HFI-680s, then the Sony, AKG, Audio-Technica models in that order. The ultra HiFi Ultrasonics Edition 8s scored last in this test, with a voicing that looks designed for a wow factor.

Looking at left-channel data highlights inconsistency in many of the left/right driver pairs as tested, most significantly with the HFI-680s, where an anomalous-looking sharp valley was measured, -17.5 dB down centered at 4,750 Hz. Comparing each headphone set's left and right channel performance atop one another, the Sonys and A-Ts (followed pretty closely by the AKGs) track the closest together on the high end, where you might expect the relative left/right performance to affect imaging. All in all, these are some pretty eye-opening response curves.

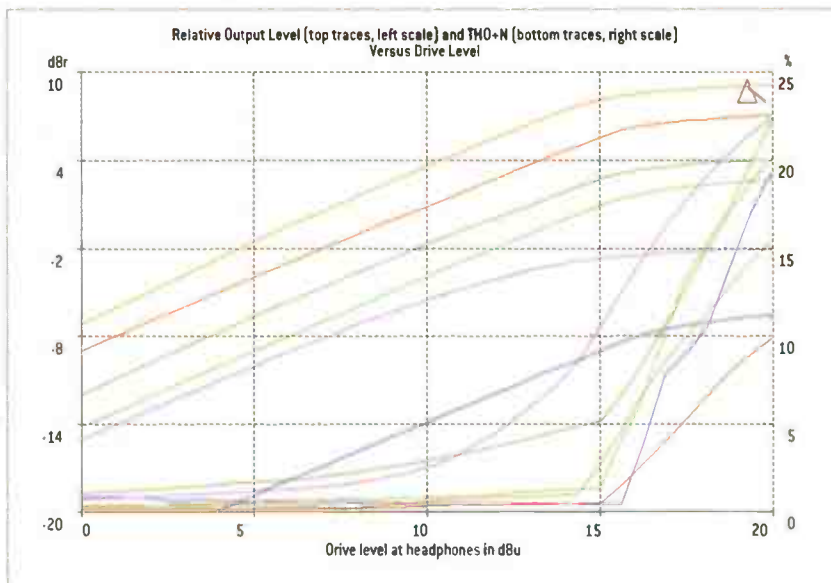
The Edition 8s had the greatest isolation by far — instantly noticeable even before measurement if you simply put the phones on your head. The AKG K702s are open-air phones, so they can't be expected to be a competitor in this test. The Shures performed the best of the studio headphones, with the A-T and Ultrasonics HFI sets' isolation versus frequency graphs intertwining [see Plot 2]. The Sony's joined to make it a three-way, neck-and-neck competition above about 600 Hz.

Plot 3 graphs the relative output level and the THD+N (Total Harmonic Distortion + Noise) of the various phones with a 1 kHz input signal swept from 0 to 20 dBu. The top group of six lines is generally diagonal (indicating a linear relationship from input to relative output) until the headphones begin to overload, with the bottom group of traces showing THD+N, which begins to climb

	MEASURED IMPEDANCE IN OHMS			MEASURED SENSITIVITY IN dB SPL W/ 1mW 1kHz INPUT			MAX +/- DEVIATION, FREQUENCY RESPONSE, 30 Hz - 20 kHz, IN dB	
	LEFT	RIGHT	SPECIFICATION	LEFT	RIGHT	SPECIFICATION	LEFT	RIGHT
AKG Acoustics K702	63.3	62.3	62	88	87	105	19.3/-10.2	13.5/-4
Audio-Technica ATH-M50S	40.9	42	38	100.6	100.7	99	9.1/-10.2	8.5/-10.7
Shure SRH840	39.6	39.8	44	96.5	95.5	102	12.4/-3.4	12.6/-2
Sony MDR-7509HD	28.2	26.9	24	100.1	100.1	107	7.4/-9.4	7.4/-9.6
Ultrasonics HFI-680	78.8	80	75	96	97.2	99	10/-17.5	7.5/-6.5
Ultrasonics Edition 8	33.4	33.5	30	95.9	94.6	96	12.1/-5.9	12.3/-8.9

as the headphone performance becomes nonlinear. The Ultrasone headphones stand out as having the highest initial distortion levels and a more rapid increase in distortion as the tone got louder; the rest of the pack is generally similar, distortion remaining at nominal levels until the onset of clipping, the differences in the curves representing different sensitivity and maximum output/input handling.

The Sony and Audio-Technica models get the nod here for the best combination of output level/efficiency and distortion performance, the Sony's getting somewhat louder, the A-Ts besting the pack on distortion performance. I also ran FFT plots of the phones with 0 and +10 dBu drive levels out of the Rane HC6, the Audio-Technica and AKG phones showing little aberration but baseband noise at the lower level, the Sony, Shure and Ultrasone HFI sets a bit of 2nd and 3rd harmonic. The Ultrasone Edition 8s had significant 2nd harmonic component (typically perceived as euphonic) even at the lower drive level.



**Plot 3: Relative output levels (top traces) and THD+N performance with a level swept 1 kHz input. Color code: AKG-blue, Audio-Technica-red, Shure-green, Sony-orange, Ultrasone (HFI)-violet, Ultrasone (Edition 8)-olive.**

*For help in facilitating our tests, a big thank you is due Audio-Technica's Jeff Firzloff quality assurance manager, and quality department group leader Mark Shaw.*

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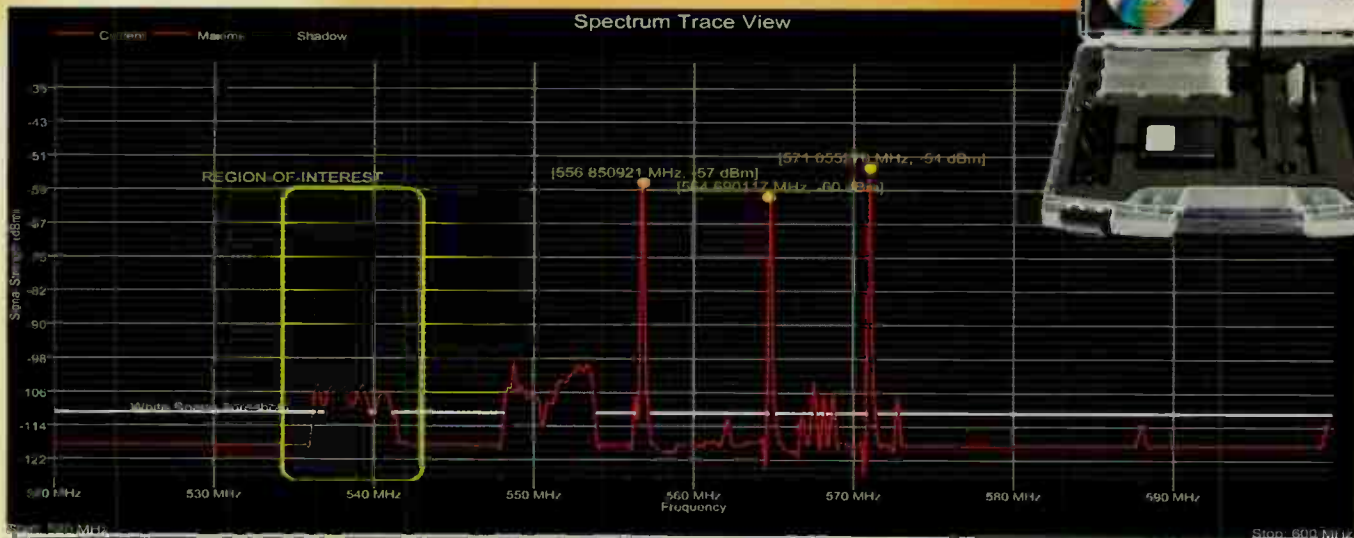
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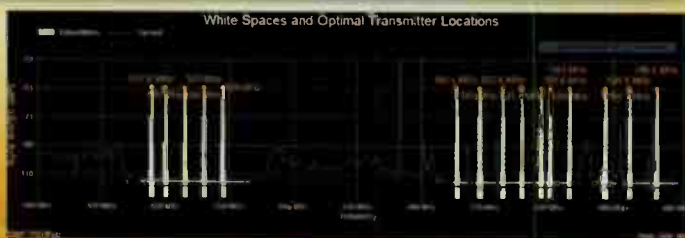
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Have you ever needed to mix on headphones? If so, then you’ve likely experienced that moment of surprise when you realize the “headphone mix” doesn’t sound the same on speakers. If you could be assured that everyone would listen to your mix on headphones or earbuds (an increasingly prevalent proposition these days) then you’d be set, but a lot of music is still listened to on speakers in cars and homes and stages.

So is there a way to help you figure out how your headphone mix will sound when listening on the stereo? There is now. The SPL Phonitor is a headphone amp that offers several unique features to make your headphones resemble the sound of speakers.

### Features

Using SPL’s standard 120V power supply rails, discrete components and Class-A circuitry, the unit is first and foremost a formidable headphone amp. Featuring stereo VU meters that also offer a PPM (Peak Programme Meter) setting, its elegant front panel is dominated by a large non-stepped volume knob that offers markings from -90 to +10 for recalling settings. Other monitoring options include Solo (L, Off, R), Polarity Reverse (L, Off, R) and Mono (Off, On). The meters are switchable between 0 or +6 and the volume can be “dimmed” by 20 dB, to yield greater range. On the back panel are XLR in and outputs (paralleled) and a ground lift and power switch. There are also ingenious folding front feet to angle the unit for desktop use.

To understand what the Phonitor does, we should start with a little background on how our ears interact with stereo speakers. Everybody knows that listening on speakers introduces reflections from the listening room that can greatly impact our perception of the sound. But even in the best control room there are issues that impact the sound — phantom center, HRTF, speaker angle.

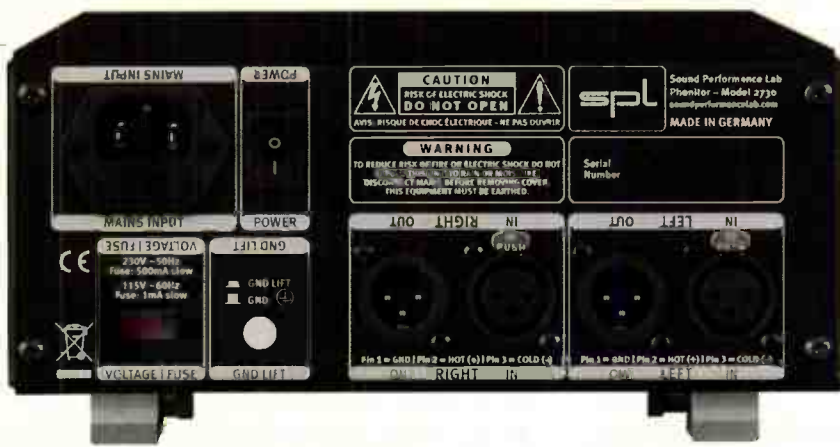
how we make the vocalist “appear” in the center of the mix without a center speaker. I don’t have space here to teach a class on HRTF (Head-Related Transfer Function), but oversimplified it is a description of the effect of having our ears (our sonic receptors) positioned separately on either side of a solid mass (our head). One effect this has when we listen on speakers is a reduction of apparent level (at certain frequencies) of the phantom center due to crosstalk between the speakers and each ear. When our ears get discrete information like when wearing headphones, left channel to the left ear only and the same with the right, then that reduction doesn’t happen, but then we have to deal with the extra-wide soundstage because of the discrete delivery. Then there’s the width/angle of the speaker positions that also have an



Phantom center is the artificial “ghost” center image that is created when the same signal comes out of two equidistant stereo speakers at the same level. It’s

effect. The Phonitor offers unique options to deal with these.

The Phonitor’s monitoring options (Control Elements) are comprised of



three knobs labeled Crossfeed, Speaker Angle, and Center Level with two switches to defeat them. Crossfeed, in six steps from Min(imum) to Max, interacts with Speaker Angle and simulates the frequency-dependent crosstalk between the Left speaker/Right ear and the Right speaker/Left ear. The Speaker Angle control offers six positions with angles from 15-75 degrees. These can be switched in and out together. The Center Level control offers phantom center reduction in six steps from -0.3 to -2 dB.

### In Use

I spent hours with the Phonitor listening to dozens of familiar CDs played from my sole-surviving CD player, a Masterlink ML-9600, using four different headphones (Audio-Technica ATH-M50, Ultrasonne 550, AKG K271, Samson CH700), utilizing the DACs in the Masterlink and a Crane Song HEDD 192 and the speakers were ADAM A-7s. Ultimately, I relied on the ATH-M50s and the Crane Song for my reference playback. As a headphone amp, the Phonitor is very nice with lots of clean power. The Solo, Polarity, and Mono switches are a welcome addition for analyz-

ing mixes, though it would be nice to go from L to R without the audible disruption of going through the center switch position. The VU meters are nice, if dimly lit by LEDs, and the PPM setting may reflect peak values but they seem slower in attack and release than any PPMs I've used, likely not an issue since many are not familiar with PPM meters.

Next, I compared the sound in the headphones to the sound of speakers in the room. While I was skeptical, even after

hours of auditioning the Control Elements, I was very surprised at how closely the Phonitor could match the sound of the speakers when I did direct A/B comparisons. I ended up with settings of Max Crossfeed, 40 degrees and -2 dB Center Level, and the balances were very close when putting on and taking off the phones. Since the Phonitor adjusts left and right channel interaction, I was particularly interested in how it would sound with hard-panned source material. When comparing the timeless classic "Stairway to Heaven" by Led Zeppelin, the hard-panned acoustic guitar (L) and whistles (R) on the intro seemed natural on the speakers but were disturbingly wide in headphones until I switched on the Phonitor's options. Then the balance in the phones seemed just like the speakers. The same was true of the lead-vocal level on all the CDs I auditioned. On headphones, the vocal level was always louder than on speakers, when mixing this would make the vocal too soft, until I switched on the Center Level reduction, which brought the two back in agreement.

The acid test was comparing a mix done on headphones to one on speakers. One of the typical problems I have with mixing on headphones is the relative level of reverb. Picking reverb sounds and settings is not nearly as problematic as accurately determining how much to use. For this test, I pulled up a very accurate remake of Taylor Swift's hit, "Love Song." I compared the mix in the

*(continued on page 42)*

## Fast Facts

### Applications

Studio, project/private studio, location recording work

### Key Features

Stereo XLR input/output; 1/4-inch TRS headphone output; 10 Hz to 200 kHz (-3 dB fall off) frequency response; 0.005 percent THD (@ 1 kHz, 0 dBu input level and unity gain); max. output of 1.7 W @ 1 kHz and 600 ohms; 4.2" X 8.5" X 15.4" (H X W X D); 9 lbs.

### Price

\$2,149 list

### Contact

Network Pro Marketing (SPL U.S. distributor) | 951-272-3465 | spl-usa.com

## Product Points



- ▶ Great-sounding headphone amp
- ▶ Lots of control variables
- ▶ Solidly built; knobs and switches all feel great
- ▶ Elegant-looking design
- ▶ Nothing else on the market offers these options



- ▶ Cost: There are headphone amps that cost more, but not many
- ▶ LED-backlit VU meters are dim even in low light

## Score

Could you mix using just the Phonitor and not be surprised when you listen on your main speakers? Based on my experience, I think so.

## SoundField UPM-1 Stereo to 5.1 Converter



In the world of 5.1 surround sound mixing, there are two basic ways to achieve your end result. The first is to take the multichannel master and break out tracks as needed. The second is to take stereo program material and “convert” it to 5.1.

With that previous approach in mind, the SoundField UPM-1 stereo to 5.1 converter (\$4,500 list) is an easy-to-use, single-rack space hardware unit aimed squarely at audio-for-broadcast applications and targeted for up-converting older (legacy) stereo program for 5.1 HD broadcast standards.

### Features

Fully digital, the stereo source material is fed to the UPM-1 via AES-3 to a single 75-ohm BNC connector. The 5.1 surround outputs are then sent out via three BNC connectors — one each for Left/Right, Center/LFE, and Left Surround/Right Surround. There’s also a pair of BNCs for Word Clock I/O, available at 48 kHz only. Onboard sample rate converters will synchronize to the incoming AES-3 streams or you can provide external clocking.

The front layout consists of a master gain (Level) control, a L/R balance trim and a L/R swap button. The UPMIX Controls section features a Select button for either Upmix Mode or Matrix Decode (for previously encoded Dolby Pro Logic material, etc.). Then there are rotary knobs for Direct Sound, Front and Rear Ambience Sound, and a Width Control with an Active button for A/B compar-

isons. From there you have Center Divergence with an Active button and 5.1 Output Levels for L/R, Center, LFE, and LS/RS. Lastly, there’s a System Bypass button for stereo to 5.1 comparisons and a USB interface, intended to accommodate future software updates.

According to the SoundField, the UPM-1 steers source signal information to its five channels in an interesting way: “The UPM-1 generates 5.1 from two channels by analyzing the original stereo audio using a patented algorithm which separates the audio into its so-called Direct and Ambient components. The former encompasses the ‘drier,’ less reverberant components in the original sound (for example, those elements that would have been close to the microphone when the audio was recorded), while the latter refers to the more reverberant components (i.e., those sound sources that would have been further away at the time of recording). These elements can then be processed separately and routed in different proportions to the 5.1 mix if required, using the UPM-1’s simple front-panel rotary controls.”

### In Use

The key to any “upmixing” unit is not

only the controls offered, but also the quality of the algorithm. However, since it’s primarily a broadcast unit, phase coherency is also critical. The UPM-1 handles all these issues quite well.

Working with engineer Paul Holly at Gizmo Enterprises in New York, we tested the unit out on an upcoming A&E show. Feeding the final stereo mix from Pro Tools, Paul set out to create a useable multichannel mix. “I got a nice 5.1 mix up pretty quickly,” he noted. “Overall, you tweak the knobs a little bit, and you’re up and running. I appreciate the center divergence control with the dialog, as well as the ability to make things wide and/or tight.” I found it to do a good job extracting ambience and leaving the dialog alone, while maintaining good stereo imaging.

### Summary

As a surround mixer, I’ll be the first to argue for doing a full surround mix in the traditional way. But multitrack sessions are not always available, and for a unit that’s geared toward 5.1 upmixing for live sporting and broadcast work, it does a fine job indeed. With a few minutes of tweaking and some experimenting, you’ll have a downward-compatible 5.1 mix that should please clients and end-listeners alike.

Contact: Transamerica Audio Group (U.S. distributor) | 702-365-5155 | [transaudiogroup.com](http://transaudiogroup.com)



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World Radio History

iLive-T  
ALLEN & HEATH

# new live products

## Shure Beta 27 Side-Address Supercardioid Condenser



Shure Incorporated has introduced the Beta 27, a unique offering as the industry's only side-address, supercardioid condenser microphone designed for professional sound reinforcement, according to the manufacturer. It was developed in response to audio engineers' desire for a condenser mic that offers better isolation of the sound source. The Beta 27's supercardioid polar pattern is designed to target the sound source for fine detail in demanding acoustic environments.

Features include a one-inch, externally biased, 24-karat-gold-layered Mylar diaphragm; switchable (three-position) low-frequency filter; -15 dB switchable attenuator; internal pop filter; and more. The Beta 27 carries a two-year limited warranty.

Price: \$499 list

Contact: Shure Incorporated | [shure.com](http://shure.com)

## QSC KW Series Active Loudspeakers

Based on its ABS-molded K Series (reviewed with high marks by *PAR* reviewer Will James in 2009), QSC's new KW Series features the same build philosophy, design elements, and 1,000 W of Class-D amplification (2 x 500 W per cabinet), but features Baltic birch wood enclosures. The KW Series comprises four models — the KW122 (12-inch, 2-way multipurpose loudspeaker), KW152 (15-inch, 2-way trapezoidal loudspeaker), KW153 (15-inch, 3-way trapezoidal loudspeaker) and KW181 (18-inch subwoofer).

Each KW Series cabinet features a four-position mic/line gain switch that allows for connection of a wide variety of devices; combo XLR and 1/4-inch TRS inputs accept both mic- and line-level input while a set of RCA phono inputs (except KW181) allow additional connectivity to portable MP3 players, CD players and line-level mixers. Up to three audio sources can be mixed internally and summed to a balanced output for daisy-chaining of multiple units. Separate direct outputs are also provided on each channel.

Price: TBA

Contact: QSC Audio | [qscaudio.com](http://qscaudio.com)



## DiGiCo SD9 Digital Mixing System

DiGiCo's new SD9 digital mixing system includes its work surface — comparably compact in comparison to its bigger brothers, the SD7 and SD8 — a D-Rack digital stage interface and Cat-5E digital multicore, with the additional ability to simultaneously record 56 channels direct to multitrack software or OAW. The work surface features a color, LCD touch-sensitive screen, 24 full-length motorized faders with touch-sensitive fader caps, high-resolution bar graph meters, quick-access encoders and buttons, plus user-defined RGB backlit LCD scribble strips.

The new D-Rack, which is connected to the work surface by a digital Cat-5E cable, features 32 microphone inputs, eight line outputs and eight modular outputs that can be selected as either analog or AES, providing a capacity of 32 ins and 16 outs.

The console has a standard MADI connection, which allows 56 channels of multitrack recording output to a computer running Logic, Cubase, Nuendo, Samplitude, Reaper, Pro Tools, etc. as well as to any other DiGiCo console or rack.

Price: TBA

Contact: DiGiCo | [digico.biz/SD9](http://digico.biz/SD9)



## Soundcraft Vi1 Digital Mixer

Based on end-user requests, Soundcraft developed the Vi1 digital mixer, the latest, smallest, and most affordable Vi Series mixer to date. With a surface a bit more than three feet wide, Vi1 is a complete standalone console package featuring 32 channels of analog input to 27 analog outputs, six digital inputs, four effects returns, and six digital outputs in one chassis. Vi1 offers 16 motorized channel faders with fixed and user-definable layers, eight output/VCA faders, two master faders, and — most notably — a 22-inch Vistronics touch screen, which displays all parameters for 16 channels side by side.

In standard configuration, input-to-mix capacity is 46 channels, but 64 simultaneous channels are possible with the addition of a Vi-compatible stagebox. Channels are routable to 24 multifunction busses, plus L/R and mono mix busses. Up to eight of the busses can be configured as matrix mixes, each with up to 16 sources.

Price: TBA

Contact: [Soundcraft](http://Soundcraft.com) | [soundcraft.com](http://soundcraft.com)



## Bartlett TM-125C Boundary Mic

Bartlett Microphones has unveiled its TM-125C supercardioid boundary mic, designed for use on the theater stage to pick up actors in drama or musicals. Other intended uses are capturing the footwork of dance groups, and picking up speech in boardrooms, conferences, pulpits, and altar tables.

Miniature capsule technology reportedly prevents phase cancellations due to sound reflections off the stage floor or tabletop. According to the company, this results in a frequency response free of comb filtering, so speech sounds clear and natural. With its steel housing and construction, the TM-125C can withstand heavy footsteps. All electronics are inside the housing. A 6-foot, permanently attached cable exits the side of the mic.

Price: \$209

Contact: [Bartlett Microphones](http://BartlettMicrophones.com) | [bartlettmics.com](http://bartlettmics.com)



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# New Media Gospel: Audio (Via Video)



Don't ever underestimate the power of audio for video. Audio is not there just to support the video; it can be as critical as the video, or more so. New media opportunities provide a great medium to reach those outside of the walls of the HOW, but doing it with a poor audio feed is not sound advice.

## The Ear Does Not Discriminate

Worship-oriented videos are popping up everywhere; from Cross.tv, YouTube, and Facebook to self-hosted videos (on a HOW's own website), availability of such media is now routine. Probably the most common error made when recording audio for a live video shoot starts by listening without an "open ear."

It is really amazing how our minds work in tuning out unnecessary sounds in our living environments: air conditioning, motors, etc. Yet, unfortunately, inanimate tools such as microphones do not. Listening with a critical ear and taking the time to pause our naturally designed filter is a must when recording audio for video. To begin, I will usually take an aural snapshot of the area in which we are shooting. If there is a possibly problematic noise present, the next step is to find another angle where maybe the noise is blocked or less audible. The goal is to capture an organic sound, with equalization tweaks as a last resort to cut extraneous noise.

One trick I use is to always get 10-15 seconds of environment audio — meaning, start recording on the tape, but only to record the sound of the surrounding environment. This audio will come in very handy if you have to replace any dialog later; you'll have it to combine with the VO,

allowing it to sound like same environment as the rest of the shoot.

## New Media Broadcast

The days of having to rent space on TV as the sole way to get the word out are long gone. Video podcasting and web streaming are quickly becoming a popular delivery medium for a HOW to cost-effectively deliver its message. Such low-cost media reaches shut-ins, parents with sick kids at home, members who are out of town, and even those who would like to check out your HOW before they allow their shadow to grace its doorway. With a camcorder or two combined with good bandwidth and a video streaming account (via service providers such as Ustream.tv), a HOW can be set up with a live web stream for very little cost.

However, if you can't do the service justice (sharing it in a most complimentary light), it is best not to go live. One of the lessons I have learned (and have the e-mails in my inbox to prove it) is to get the audio mix correct. People on the other end of the webcast do not have the luxury of being in the room where they can hear the people around them singing to sense the mood of the room. All they may have are some sub-par home computer speakers or worse — laptop speakers — so just sending them any ol' audio feed will reflect badly on your HOW.

This can be a "chicken or egg" scenario when convincing HOW decision makers that investing money into the audio side of your web stream will be fruitful. It may take the reallocation of some equipment from other rooms, closets, etc., to get the stream off of the ground. The optimal audio setup requires a split from

the stage with separate mixer dedicated to the broadcast mix. If this is not an option on the front end, a mix dialed in from a matrix output or console aux sends may do the trick, too.

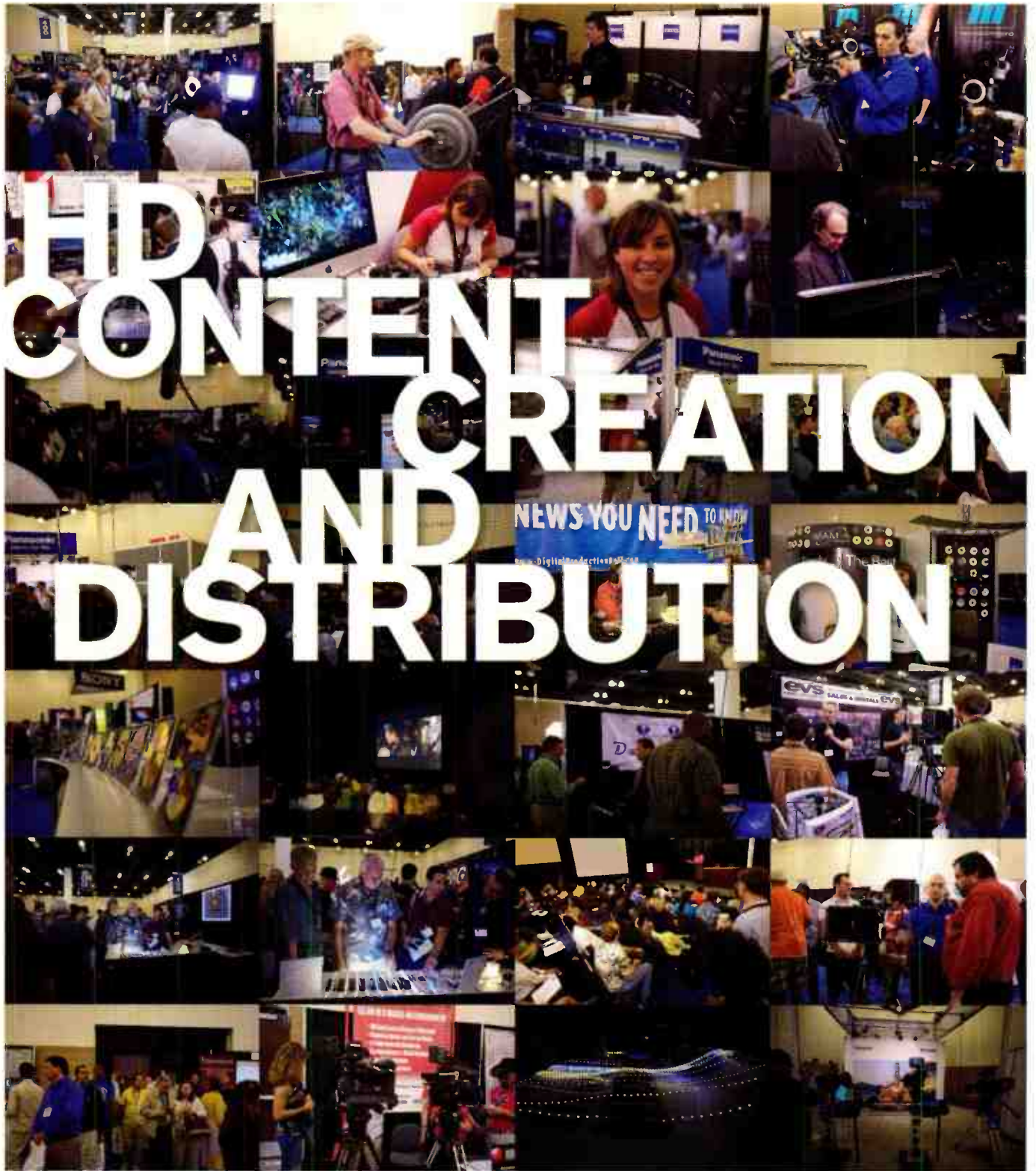
In this case, you should have a 1/3-octave graphic EQ and compressor in line as well as a pair of computer monitors to represent what the average user is hearing. The average HOW worship service usually covers a broad dynamic range — from full music to one person speaking on a microphone — so your broadcast audience will quickly become frustrated if it has to constantly adjust the volume.

## Quality Control Through Education

With smart-phone capabilities growing in popularity as well as increased user-friendliness, anyone in your HOW can make a video and have it posted within minutes. In my role, this makes me nervous, as there is no quality control. Education is the key for staff and pastors who want to use this medium. While smart-phone audio/video capture can be a legit message delivery source, do take the time to communicate with those sharing content to listen carefully to their environment, and do so in such a way that it doesn't sound like the token audiophile sweating minute details that most people will never notice.

Whether the medium is a live stream or pre-recorded video, if they are accompanied with a lousy audio track, it will quickly serve as a detriment and paint your HOW in an unfavorable light. Sure, get the word out and use all tools possible, but allow your new media audience to enjoy listening to what your HOW is saying.

Dan Wothke is the media director for Nashville's Belmont Church and a regular *PAR* contributor. Contact him at [dwothke@yahoo.com](mailto:dwothke@yahoo.com).



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World Radio History

## Sennheiser evolution G3 Wireless Microphone Series

The ew 500-935 G3 wireless microphone kit from Sennheiser is a proven performer for use in any professional setting — especially in “RF hell.”

Sennheiser’s evolution series is a professional grade, yet affordably priced, line of live microphones.

Adding to this impressive line, Sennheiser now offers a complete wireless handheld microphone series, the evolution G3, reviewed here as the ew 500-935 G3 featuring the evolution e 935 dynamic cardioid capsule, SKM 500 handheld transmitter, and EM 500 G3 rackmount receiver. The G3 kit is also available with the e 945 supercardioid capsule, or the flagship e 965 large-diaphragm condenser capsule [see our full e 965 handheld review following this review — Ed.]

### Features

The Sennheiser ew 500-935 G3 is a true-diversity, UHF wireless microphone system incorporating a number of great tools generally found on pricier systems. Most importantly, this new Sennheiser mic is available in six different frequency ranges, depending on your nation of use. Each range offers a wide variance of frequency groups, with each group containing 32 different channels.

The ew 500-935 G3 employs two AA batteries for either the handheld or optional lavalier bodypack; each has an onboard display showing available battery power (the receiver does, too). A rechargeable module is included, which can be used in lieu of standard AA batteries. The e935 capsule is capable of handling a maximum SPL of 154dB.

The SKM 500 transmitter is very solid;



Sennheiser ew 500-935 G3 mic kit

it comes here with the e 935 but also allows for interchangeable capsules. The handheld is Sennheiser’s recognizable evolution slate-blue color, complemented with an orange LCD display window that displays the pertinent information: range, group, frequency, transmit strength, battery strength, a flashing red low batt graphic, and mute. Frequency changes are accessed at the base of the mic, under a protective collar; when the collar is rotated, it locks out control access.

The EM 500 G3 receiver unit is equally stout with similar color schemes and displays. It provides a headphone TRS jack on the front panel alongside a knob for headphone volume, another menu display window, the menu toggle control, a menu escape button, and a Sync button. Sync allows you to align the infrared win-

dow on both the transmitter and receiver, engaging an RF frequency spectrum analyzer and conjoining the two units to the first available frequency with the push of a button. On the rear of the receiver is the jack combo for output, containing an XLR and TRS jack, along with a wall-wart adapter jack, dual antenna BNC jacks, and an Ethernet control jack.

### In Use

At Atlantis Audio, our first test of any new piece of equipment is in the shop. For this particular kit, we plugged the receiver into a Yamaha MG Series mixer’s XLR input. No screwdriver is required to adjust output levels since it is done via the menu switch on the base of the handheld. You can scroll the menu and engage by just depressing the UP/DOWN switch in the middle position.

## Fast Facts

### Applications

Handheld wireless mic for concert/touring vocal

### Key Features

EM 500 G3 rackmount receiver; SKM 500-935 G3 handheld transmitter (cardioid, dynamic); MZQ 1 microphone clip; GA 3 rackmount; NT 2 power-supply unit; 2 antennas; 2 AA size batteries; switchable pattern capsules (optional); auto syncing between handheld or body pack and receiver

### Price

\$1,425 list

### Contact

Sennheiser USA | 860-434-9190 | sennheiser.com

The first real street test came was for the Phoenix Symphony's New Year's Eve 2009 Gala. Held in a huge Westin hotel ballroom, the event was in an area of Phoenix that is RF hell, in close proximity to a busy airport and a host of other resorts. We employed the ew 500-935 G3 kit for the lead vocals for the entire evening, which offered a variety of different voices.

In no time, we had to change channels as we were bombarded with hits from a transmitter on the same frequency. The frequency adjustment took 10 seconds on both the receiver and

## Product Points



▶ Sync operation is wonderful; receiver and transmitter controls are very intuitive; rock-solid construction



▶ Minuses: None noted

### Score

The ew 500-935 G3 is a wireless mic kit of professional quality; highly recommended.

transmitter, thanks to the efficient Sync system. The remainder of setup, a day of rehearsals, and the show itself went flawlessly with no hits, noises or issues. The RF path was clear as glass with only slight coloring from the e 935 capsule; it has a slight 125 to 160 Hz bump, but is very even across the rest of the audio spectrum. Throughout the show, the kit handled at least five different voice ranges and did so with great accuracy with very minor EQ changes on our Midas Legend console.

The e 935's cardioid pattern was very friendly with wedge monitors. We attained levels of 108 dB on stage at rehearsal. The mic was exceedingly well behaved with our Yorkville TX2 monitors. We made minor adjustment to the monitor EQ, with notches at only five points on the graphic EQ.

*[continued on page 42]*

## Sennheiser e 965 Live Vocal Condenser Microphone

by Ben Williams

In the aughts, Sennheiser expanded its line of live performance microphones with the evolution 900 series, which included three models geared toward vocal performance: the e 935 dynamic cardioid, e 945 dynamic supercardioid, and the flagship e 965 large-diaphragm condenser (priced at \$1,050 list, \$699 street) reviewed here.

### Features

The e 965 is a high-end condenser microphone that employs a dual-diaphragm design, allowing for switchable polar patterns. It is also a "true," not an electret, condenser design. [True condensers have a bias voltage running through the capsule to polarize it, while electrets use a pre-polarized material. — Ed.]



Sennheiser  
e 965 mic

Published frequency response is an impressive 40 Hz to 20 kHz and sensitivity is a blazing 7mV/Pa (or 2.3 mV/Pa with pre-attenuation). Max. SPL is 142 dB un-attenuated or 152 dB with pre-attenuation.

The microphone is sleek in appearance, with a black body and dark-blue grille. The grille can be unscrewed to access three switches: a sensitivity switch (10 dB pad); a low-cut switch (the roll-off starts around 180 Hz, and the -6 dB point appears to be somewhere in the neighborhood of 90 Hz, thus the slope is very gentle); and a directivity switch (pattern can be cardioid or supercardioid). The e 965's construction seems to be very robust, and Sennheiser apparently has a high degree of confidence in the microphone's durability since it comes with a 10-

*[continued on page 42]*

## Turbosound Milan M15 Powered Loudspeaker

Legendary tour sound firm enters portable PA market with predictably robust, powerful performer

West Sussex, U.K.-based Turbosound is not a company I can easily associate with portable PA products.

The first thing I think of when I see Turbosound's distinctive logo is Iron Maiden's World Slavery Tour of 1984/1985 — one of the longest tours in rock 'n' roll history — and its massive, incredible Turbosound rig. And that's only the iceberg tip of Turbosound's impression left on the realm of large-scale touring.

What did such trivia mean to me as I unpacked a pair of Milan M15 self-powered portable PA speakers, Turbosound's most affordable speaker in the company's long history? Exceedingly high expectations for performance, power, and build quality. What I found in the M15 was consistently a cut above most common portable PA options, thus worth its cost (\$1,082 list, under \$1k street).

### Features

The Milan M15 is based on a lightweight, digitally controlled Class-D amplifier, offering 450W to its 15-inch, neodymium, low-frequency driver and one-inch, neodymium, high-frequency compression driver on a 90-degree horizontal by 60-degree vertical horn. Measuring 28 x 18.5 x 15.7 inches and weighing in at under 50 lbs., the M15 is a tightly constructed, sturdy-feeling polypropylene enclosure with three recessed carrying handles, dual-angle pole-mount socket, steel-mesh grille, and

six threaded rigging points.

Frequency response is 36 Hz to 17 kHz (+/- 3 dB). Internal DSP operates at 48 kHz and provides parametric EQ and frequency-dependent limiting features, the latter of which allows for higher SPL before distortion and dramatically reduces the possibility of driver damage; continuous and maximum SPL levels are 125 dB and 131 dB, respectively.

On its back panel, the M15 offers two mic/line-level inputs via two Neutrik XLR/TRS combo jacks, each with a rotary level pot and a simple mic/line switch. On rotary pots are Bass and Treble shelving EQ at useful frequencies: +/-12 dB at 200 Hz and +/-12 dB at 4 kHz, respectively. Also available is a three-LED display (blue for "power on," green for "signal detected," and red for "limiter on"); XLR line-level mix-out connector; on/off rocker switch; IEC power connector; and most interestingly, a two-position Bass Mode switch. The latter offers a fourth-order HPF at 36 Hz (setting "A," for use without external subwoofers) and 100 Hz (setting "B," designed for use with an external subwoofer to reducing overlap in bass frequencies, or to reduce boom when using the M15 as a floor wedge).

### In Use

Whether for loud rock gigs as mains (in which I also used a powered subwoofer with the M15 on Bass Mode B), as wedges in various positions, or full-range main monitors in slightly less SPL-demanding applications, the Milan M15 pair per-



formed beautifully, striking me as slightly less feedback prone compared to similar self-powered speakers I've previously used in the same environments. In my use, the M15 got loud, stayed clean, and sounded consistently full, punchy, and smooth up top. Best of all, it doesn't take two people to carry this rather powerful small/medium club main monitor; I did it easily thanks to the M15's reasonable weight and well conceived handles.

I found the M15's built-in two-channel mixers to be quite helpful. For example, for a trio gig in a small wine bar — featuring a small drum kit, acoustic/electric bass guitar, keyboard, and solo vocal — I provided truly full-range sound reinforcement via the M15's rich sound, simple EQ, and level control with, other than instruments, only the necessary cables, one direct box, one mic, and the two enclosures in tow. Using the first M15 as a wedge, the keyboardist/vocalist used inputs 1 and 2 via TRS line-level signal and XLR dynamic mic input, respectively; then, using enclosure one's XLR Mix Out, we used input 1 of enclosure two (pole-

*(continued on page 42)*



## EQUIPMENT

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## Sennheiser e 965

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year warranty. Like all other wired models in Sennheiser's evolution series, the e 965 is built in Germany.

### In Use

My first experience with the microphone was at a concert for which I was mixing front of house. Drew Cline provided the opening set with a few songs from his new solo album, and the headlining act was Audio Talks, a presentation where musicians Will McGinniss and Mark Stewart (formerly of the band Audio Adrenaline), joined by musicians from their church, tell their story and perform some of their hits. We decided to try the e 965 on both Drew's and Mark's vocals. The console was a Roland M400, and monitoring was all in-ears.

I set the low-cut filter to flat, pattern to cardioid, attenuation to 0 dB, and we were off. The e 965 was an instant hit. Drew's voice is extremely powerful, and the microphone handled the transients very effectively, delivering lots of detail without becoming brittle or thin. The microphone performed equally well on Mark Stewart's voice. I was able to get both voices out in front of the band without having to cut any of the low-to-mid spectrum.

While I did not have an opportunity to test the e 965 in a concert setting where live monitors were in use, I did set up a wedge in the shop to see how the microphone performed in that regard. I tested it alongside two other microphones: another handheld condenser, the Shure SM86, and a Shure SM58 dynamic. I zeroed out the three channel strips and set the gains the same. My first observation was that the e 965's output was far hotter than the either of the other two mics. Engaging the 10 dB pad brought the output down to a comparable level. Talking in each of the microphones was a very telling exercise; the e 965 was by far the most natural sounding of the three. Next, I established three monitor EQ curves, one based on each microphone. I was able to achieve a fairly stable loud monitor mix with the e 965 — more so than I had expected.

Lastly, I experimented with the polar pattern switch. I will say that the side rejection is quite pronounced in both modes, so this may not be the microphone for a vocal trio. The frequency response changes slightly between the two modes. In the cardioid mode, there is a slight presence boost at 10k [approximately 3 dB].

### Summary

The e 965 is a very well behaved, transparent, and musical microphone. Its neutral frequency response makes it suitable for a wide range of vocal applications. The only potential pitfall I see is that if your vocal chops are not up to par, you may find it to be unforgiving. Anyone in the market for a high-end vocal condenser microphone should surely give this one a listen.

Contact: Sennheiser USA | 860-434-9190 | [sennheiser.com](http://sennheiser.com)

## Sennheiser G3 Wireless

(continued from page 39)

### Summary

We subjected the ew 500-935 G3 rig to many tests, ultimately finding the experience with wedge monitors to be very pleasant with few EQ issues. The capsule has nice, low-end warmth that sounds equally smooth with both male and female voices. Handling noise was minimal with the mic screen guarding against pops.

Overall, the ew 500-935 G3 is a professional-quality handheld wireless that I would use with any talent. Thus, I give this product my full recommendation.

## SPL Phonitor

(continued from page 31)

phones with no Phonitor options, and it felt too wide and too swimmy — too much reverb. But before I changed anything in the mix, I dialed in these settings: Crossfeed 4, Spkr. Angle 40 degrees and Center Level -1.6. This was the sonic equivalent of what I heard on the speakers, and the reverb seemed just right again. Those elements that were hard-panned didn't make me flinch or want to change the mix. It now sounded in the phones like the mix I had done on the speakers. Very good.

### Summary

So could you mix using just the Phonitor and not be surprised when you listen on your main speakers? Based on my experience, I think so. In conclusion, will the Phonitor save you money compared to spending \$2,000+ on speakers? Likely not. But if you are forced to rely on accurate headphone monitoring for remote recordings or "after hours" mixing while the wife or kids are asleep, then it may be just the ticket. It certainly will allow you to better translate headphone mixes to the real world.

## Turbosound Milan M15

(continued from page 40)

mounted and positioned as a main} for the vocal/keyboard mix, and the second input for the electric bass guitar.

### Summary

The Milan M15 is an impressive performer that would be a good investment for the discriminating live musician, small-scale sound reinforcement provider, or small/medium live music venue (clubs, theaters, and even houses-of-worship) with a need for a flexible, portable, and full-range powered speaker.

Contact: American Music & Sound (U.S. distributor) | 800-994-4984 | [americanmusicandsound.com](http://americanmusicandsound.com)

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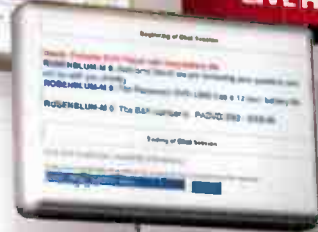
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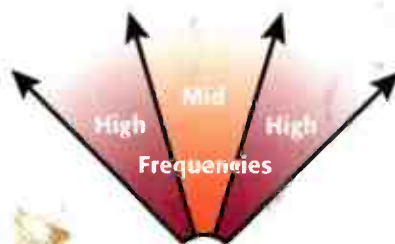
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KB

K10

KSub

K12 shown as monitor

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