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# LIVE SOUND

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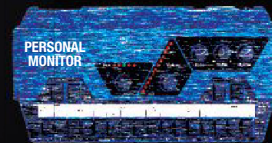
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aNet 16 compatilby, 16 channel requires option cards

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16 channel 16 button, non expandable, no onboard mic, cheap plastic construction, limited audio capabilities, lower power headphone amp and convertors.



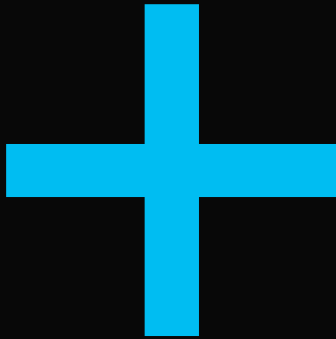


THINKING SOUND

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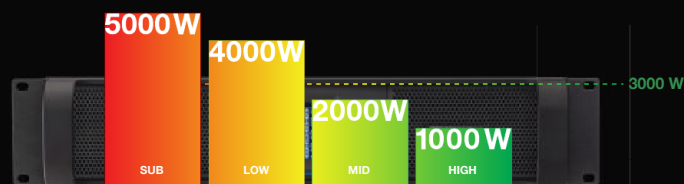
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## FEATURES

### 14 | **Bigger Than Life**

New sonic directions on the latest Maroon 5 world tour. **by Live Sound staff**

### 30 | **St. Louis Jazz**

A room and system designed to enhance jazz artistry. **by Kevin Young**

### 34 | **Monitoring 101**

Essentials of getting it right onstage with consistency. **by Craig Leerman**

### 40 | **Brilliant Execution**

Exceptional recent applications of newer audio technology. **by Live Sound staff**

14

## DEPARTMENTS

### 8 | **Loading Dock**

**EQUIPMENT** New loudspeakers, apps, software upgrades and more. **by Live Sound staff**

### 12 | **First Look**

Detailing the just-released JBL Professional VTX V25-II line array. **by Live Sound staff**

### 20 | **Backstage Class**

Festival preparation tips and insights into knowns and unknowns. **by Mark Frink**

### 26 | **Tech Topic**

Loudspeaker enclosures and horns — what they do, how they do it. **by Ken DeLoria**

### 46 | **Road Test**

Evaluating the new Audio-Technica System 10 PRO digital wireless system. **by Craig Leerman**

### 50 | **Real World Gear**

**EQUIPMENT** A variety of microphones for instruments and vocals. **by Craig Leerman**

### 56 | **Show Report**

The Live Sound loudspeaker demo at the recent USITT show in Cincinnati. **by Live Sound staff**

### 6 | **From the Editor's Desk**

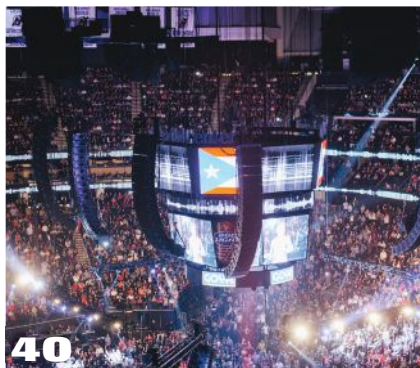
### 60 | **NewsBytes**

### 63 | **Advertiser Index**

### 64 | **Back Page**



20



40



30





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# From the Editor's Desk...

As I write this, we're just coming off of another Live Sound Loudspeaker Demo, this one in Cincinnati at the 2015 USITT (Theatre Technology)



Expo. It's been a lot of fun watching this concept gain traction, which I primarily attribute to the unique yet highly useful nature of the event.

As we've seen with the demo at WFX (Worship Facilities Expo), attendance is strong both in terms of folks on hand for the specific show as well as sizeable traffic from the pro audio community in general. At USITT, we incorporated smaller, ground-based systems for the first time, joining the larger flown systems, and this is something we'll be growing even further at the demo slated for

Nashville this November. Be sure to check out the report and photos from USITT in this issue for further info.

Speaking of useful, this issue also presents a pair of articles that, taken individually or together, provide a range of insights about stage monitoring. Mark Frink steps up with a discussion on effectively working festivals, timely since that season is now upon us, and given Mark's heritage as a top monitor engineer, it slants more that way.

At the same time, Craig Leerman delivers a primer on the world of stage monitoring, with tips and concepts for those with less familiarity that can also serve as helpful reminders for veterans. There's a lot of be gained from these contributions by individuals with more than 60 years of combined experience in the pro audio world.

We've also got interesting takes on a variety of applications, ranging from the audio approach for the Maroon 5 world tour to Kevin Young's report on the acoustical and sound designs for a revitalized jazz venue in St. Louis.

And as always, there's much more. Enjoy the issue...

Keith Clark

Editor In Chief, Live Sound International/ProSoundWeb  
kclark@livesoundint.com



**ON THE COVER:** Adam Levine of Maroon 5 performing (with Shure wireless) on the band's current world tour. Coverage begins on page 14.  
*(Photo by Vic Wagner)*



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## Lake Controller Version 6.3.1 ↑

The latest update of the software providing a unified interface for several Lab.gruppen amplifier models and Lake processing offers several upgrades and adds functionality, including Auto RPM and Custom RPM in conjunction with new CAFE configuration software. There's also support for improved LoadPilot, with the impedance analysis of pilot tone impedances more accurate and the measurable impedance range extended upwards. In addition, OEM products are now supported in public Lake releases (Virtual Files, Updater, Preset Manager). Lake Controller v6.3.1 can be downloaded from the company website. [labgruppen.com](http://labgruppen.com)



## d&b audiotechnik MAX2 ↑

A passive stage monitor with a 15-inch neodymium LF driver and a coaxially mounted 1.4-inch compression driver that share the same magnet structure, contributing to a compact and unobtrusive footprint. The design is optimized for high feedback stability and SPL capabilities, with notable vocal presence and overall sonic consistency. Conical dispersion is stated as 75 degrees, with frequency response extending from 55 Hz to 18 kHz. The MAX2 can be driven by d&b amplifiers using the MAX2 setup or by a linear power amplifier. The enclosure is made of marine plywood and can also be pole mounted on a d&b subwoofer and used as a small full-range system. [www.dbaudio.com](http://www.dbaudio.com)

## Adamson Systems S-Series →

Consists of the S10 line array, S119 subwoofer, E-rack, and Blueprint AV control software. The S10 is a 2-way compact line array enclosure loaded with two newly designed ND10-LM 10-inch Kevlar neodymium cone drivers and an NH4TA2 1.5-inch-exit compression driver mounted on a wave shaping sound chamber that produces a slightly curved wavefront with a nominal dispersion pattern of 110 x 10 degrees (h x v). It measures 10.4 x 29 x 20.7 inches and weighs 60 pounds. The S119 sub is front-loaded with an ND19 long-excursion 19-inch Kevlar neodymium cone driver. Both cabinets are constructed of marine grade birch plywood, aircraft grade steel, and aluminum. Proprietary SlideLock rigging allows angles to be set prior to lifting. The E-Rack incorporates Lab.gruppen amplification, I/O and power connections, as well as a 20-port managed Ethernet switch to route dual-redundant Dante and control signal.



[www.adamsonsystems.com](http://www.adamsonsystems.com)



## Waves Tracks Live ↑

Multitrack recording software for live sound applications that enables simultaneous multitrack and master bus recording, making a quick stereo mix recording of a performance instantly available. The software also provides multichannel and stereo out automatic re-routing, making it easy to toggle back and forth between recording and virtual sound check playback. Tracks Live is compatible with ASIO/Core Audio, working with virtually any audio interface, and it's also PC- and Mac-compatible. It provides track count of up to 512 I/Os, and supports sample rates of up to 192 kHz. File formats are compatible with all popular DAWs. [www.waves.com](http://www.waves.com)



# Products Fresh Off the Truck

## One Systems OPA-5 ↓

A compact, coaxial 2-way loudspeaker with a 90-degree conical HF horn radiation pattern that provides wide coverage in near field applications. The enclosure is loaded with a single coaxial 5.25-inch woofer and a titanium compression driver, and measures 8 x 6 x 7.1 inches (h x w x d). The OPA-5 is user-configurable for either low-impedance (8-ohm) or high-impedance operation (either 70 volts or 100 volts, both RMS). Cabinets include multiple M8 rigging points, and an optional U bracket for mounting is available.

[onesystems.com](http://onesystems.com)



## D.A.S. Audio Event M210A ↓

A self-powered 3-way stage monitor in a double 10-inch, dual-band configuration. The configuration permits the twin 10-inch woofers to work in tandem for maximum power at low frequencies. They are teamed with a single M-60 compression driver attached to a new asymmetric waveguide offering 20-degree up/30-degree down vertical coverage. The onboard 3-channel Class D amplifier provides 360 watts per channel (peak), working with a high-end DSP chipset for processing and control. The enclosure is made of Baltic plywood that's finished with an ISO-flex protective coating.

[www.dasaudio.com](http://www.dasaudio.com)



## Sonnox LIVE →

A plug-in bundle designed specifically for use with Avid VENUE and S3L consoles. It's comprised of five plug-ins (plus a bonus) that support both TDM and AAX DSP formats, including: Oxford EQ, a digital 5-band parametric EQ plus filters; Oxford Dynamic, a multi-functional suite that includes compressor, gate, limiter, expander, side-chain EQ and "warmth" control; Inflator, which enhances presence, loudness, and warmth; TransMod, for enhanced transient control and punch; Oxford Reverb, a reverb that includes a parametric EQ for added control; and SuprEsser DS, a de-essing plug-in designed specifically for live sound (AAX DSP only). [www.sonnox.com](http://www.sonnox.com)



## Beyma WR Series ↓

Includes 10-inch (10WR300), 12-inch (12WR400) and 15-inch (15WR400) low-frequency drivers incorporating ceramic magnet structures that are designed for applications ranging from low-frequency to mid-bass reinforcement. The 10WR300 has a 2-inch copper coil and delivers an optimum response in compact bass reflex cabinets. Power handling is stated as 600 watts (program), and sensitivity is 95 dB (1W/1m). The 12WR400 and 15WR400 are outfitted with 3-inch copper coils and deliver a wider frequency range and tonal accuracy in the mid frequencies, making them well-suited for a variety of LF systems. Power handling for both models is stated as 800 watts, with 97 dB sensitivity for the 12WR400 and 99 dB sensitivity for the 15WR400 (both 1W/1m).

[www.beyma.com](http://www.beyma.com)



## Studer Vista Version 5.2 ↓

The latest software upgrade adds new features to the company's Vista X, V, 1 and 5 M3 digital consoles, including the ability to assign Strip Setups as CUE events; support of the Soundcraft Realtime Rack (loaded with UAD plug-ins); support of Lexicon PCM96 surround reverbs with Infinity Core; Input Gain unfold for multi-format channels; Spill Zone for contributing channels; GUI enhancements and new patch groups; A-Line embedded Ethernet; and contribution PAN in stereo channels to mono aux buses.

[www.studer.ch](http://www.studer.ch)



## :: Loading Dock ::

### Allen & Heath v1.7 ArcLight ↓

A firmware upgrade for Qu series digital mixers paired with enhancements to the Qu-Pad and Qu-You apps. It makes a channel ducker available on all channels, inputs and stereo

groups, and Qu users with Audio-Racks connected over dSnake can now source input channels from any remote socket. A customizable control screen can be set up in Qu-Pac with “widgets” for

channel levels, mutes and assignment switches. New features in Qu-Pad include save and recall of processing and FX libraries, as well as a third custom layer. Master PEQ, GEQ and compressor settings have been added to the Qu-You app. v1.7 ArcLight is available as a free download.

[www.allen-heath.com](http://www.allen-heath.com)



### Tascam TRACKPACK 2x2 ↓

A bundled portable recording system that includes the company's US-2x2 USB audio interface, TM-80 condenser microphone, and TH-02 headphones, joined by Cakewalk Sonar X3 LE and Ableton Live Lite 9 DAW software. The US-2x2 is a 2-input/2-output USB interface,

bus powered from a Mac or Windows computer. Class-compliant drivers enable use with tablets like an iPad when using an optional power supply. A pair of Ultra-HDDA mic preamps provide up to 57 dB of gain. The interface also includes MIDI in and out, balanced audio outputs, and a headphone amp. The TM-80 condenser mic includes a shock-mount and desktop stand, while the TH-02 closed-back headphones provide isolation while recording and a solid reference during mixdown. The two DAW applications also include dozens of plug-in instruments, effects, and loops. [www.tascam.com](http://www.tascam.com)



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## Radial Engineering Trim-Two ↓

A passive stereo isolator designed to simplify use of laptop computers for keyboard players, DJs and AV presenters by providing a “ready access” volume control for on-the-fly adjustments in live applications. It includes dual 1/4-inch jacks, left and right RCAs, and a stereo 3.5 mm input. These are wired in parallel to allow the signal to be split off to feed an alternate signal path such as monitors. Outputs are dual XLR. Two Eclipse transformers provide isolation and balancing of signal, capable of handling up to +15 dB signal levels. Volume is adjusted via a front panel stereo level control. The enclosure is made of 14-gauge steel with proprietary book-end design that creates protective zones around the connectors and controls.



[www.radialeng.com](http://www.radialeng.com)

## Mackie My Fader Version 3.0 ↓

The latest version of a control app that works with the company’s DL32R, DL1608 and DL806 digital mixers in providing engineers with quick mobile control over a mix while allowing performers to control their own monitors. Now included is support for the main Master Fader v3.0 app that provides total control over the mixers, with a user interface that’s in step with Master Fader. In addition, Channel ID can now be configured using My Fader, with users able to add custom names, icons or photos for effective ID. Channel colors and output colors are also supported. In the mixer view, there’s access to subgroups and VCAs for additional mix management, while the view group selector is also accessible, allowing users to view only the channels needed for a particular song or setup. Access limiting has also been updated, providing more control over what each device can control. My Fader v3.0 is available as a free download directly to iPhone or iPod touch. [www.mackie.com](http://www.mackie.com)



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- 8 x 2" Full-range Satellite Cabinet



sound culture



## JBL PROFESSIONAL VTX V25-II

The successor to the original V25 line array

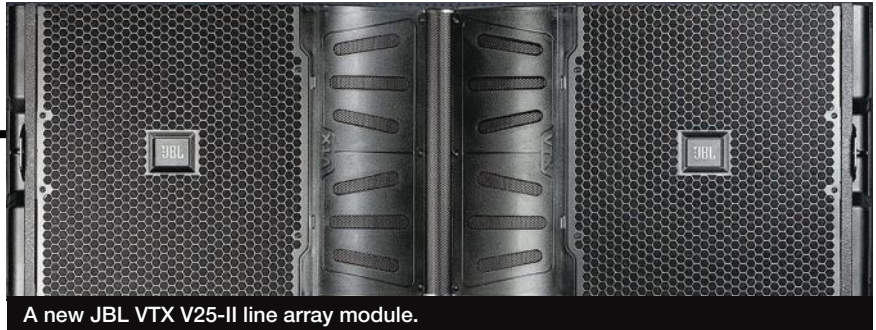
by Live Sound Staff

At Prolight & Sound 2015 in Frankfurt this month, JBL Professional is publicly unveiling the new VTX V25-II, the successor to the V25 full size line array loudspeaker. The highlight is a newly developed waveguide for improved long-throw performance as well as improved wavefront control and improved power matching with companion Crown Audio I-Tech 4x3500HD 4-channel amplifiers.

VTX V25-II maintains the same horizontal coverage performance of the original V25 (90 degrees nominal, 250 Hz-16 kHz), and in welcome news for current V25 owners, their cabinets can be retrofitted with the upgrade in a matter of minutes with the VTX-V25-WG-UK Waveguide Upgrade Kit.

The new waveguide provides design improvements motivated by the smaller format VTX V20 line array's waveguide. The internal acoustical path geometry has been revised and the number of acoustic transmission paths has been doubled. In addition, JBL notes that the waveguide's exponential geometry assists with wavefront expansion while providing improved wavefront control and line source array coupling in the vertical plane at higher frequencies.

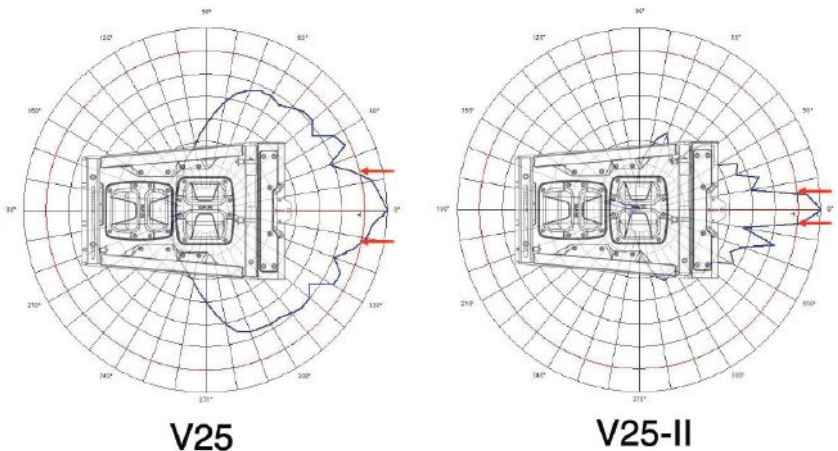
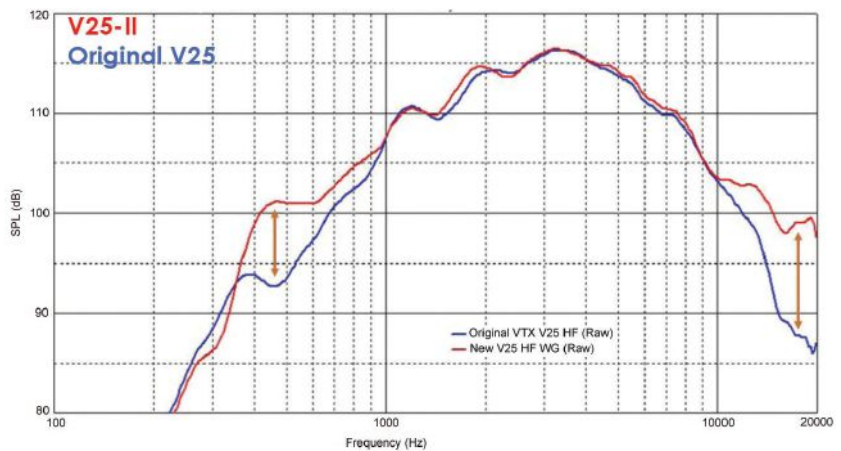
There are also improved acoustic loading conditions for JBL's D2 dual-diaphragm, dual-voice coil compression drivers, with a measured 10 dB increase in sensitivity above 10 kHz. This sensitivity increase translates to less high-frequency shelving equalization needed in order to achieve the same acoustic output response, and as a result, there is



A new JBL VTX V25-II line array module.

a significant increase in amplifier headroom. Limiter thresholds can also be adjusted so there is less peak limiting activity and reduced distortion.

“All of this combines to provide higher maximum SPL and improved system packaging density since there is a better power match when V25-II



Above, sensitivity comparison of the original with the VT25-II, and below, measured polar response of the two at 12.5 kHz.

CREDIT: JBL



is used with Crown I-Tech 4x3500HD 4-channel amplifiers,” states Paul Bauman, associate director, tour sound, JBL Professional.

He adds that polar characteristics and wavefront control are also obtained with the new waveguide that translate to improvements in long-throw performance and more even coverage, front to back. Improvements can also be found underneath and behind the array, where V25-II focuses significantly less high-frequency energy. *(Editor’s note: I can verify these improvements, having attended a demo of the V25-II at Harman headquarters this past January.)*

The VT25-II retains the same components as the original, including two 15-inch Differential Drive woofers mounted in die cast aluminum baffles, four 8-inch Differential Drive cone

transducers, and three of the aforementioned D2 compression drivers that are now mounted on the new waveguide.

Simultaneously, JBL has announced the VTX V25-II-CS, which includes the optional V25-CS-K compression suspension kit pre-installed at the factory. It’s intended for use with V25-VTC vertical transporters and accessories.

“VTX V25-II and V25-II-CS offer clients the choice between individual enclosure or vertical transporter conditioning,” Bauman explains. “Existing V25 enclosures can be upgraded to the V25-II standard with the VTX-V25-WG-UK and with the addition of the optional VTX-V25-CS-K compression suspension kit, V25 enclosures can be further modified to the VTX V25-II-CS standard.



Paul Bauman of JBL Professional.

“Vertical transporters are not necessarily the right solution for all applications, but we’re now able to offer clients a highly effective solution that suits either requirement. The waveguide upgrade program has been underway since February, and VTX owners have been extremely pleased with the improvements,” he concludes. ■

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A perspective of the system for Maroon 5 within an arena.

# BIGGER than LIFE

▶▶▶▶▶ New sonic directions on the latest Maroon 5 world tour.

by Live Sound Staff,  
photos by Vic Wagner

**W**hat's important to Adam (Levine) and the rest of the band is providing the audience with an incredible, bigger than life experience," states Jim Ebdon, front of house engineer for Maroon 5, currently on the "V" world tour. "You can tell when you're in the audience that the guys are having fun – they really, really enjoy playing together and it comes across in their performance. They are excellent musicians, which makes my job a bit easier."

Ebdon has held his current role Maroon 5 for the past seven years, and prior to that he worked with a host of top artists, including Aerosmith, Sting, Annie Lennox, Matchbox Twenty and the Pet Shop Boys. A live sound professional who started in the studio, he absorbed a great deal about microphone placement, drum miking and signal flow in his early years that translates nicely to the present.

"I was a drummer many, many years ago and my mix always starts there," he notes. "If I get a great drum sound, it all pulls together naturally, with everything else just finding its way in the mix."

The tour marks Maroon 5's first outing with Sound Image (Escondido, CA and Nashville), which is supplying the systems and support, including system tech Andrew Dowling riding herd over an EAW Anya main system. Ebdon heard the system



when it was out with Tom Petty and the Heartbreakers last year (*Live Sound*, October 2014) and was intrigued with both the coverage and size aspects. After some initial testing, the sound team decided to give it a try during rehearsals, where the final decision was made.

“I like to embrace new technology, and Anya is something quite clever – almost a smart PA,” Ebdon explains. “I’ve had a ton of calls from my peers in the industry asking me about it, and I do think it’s the next thing. If you remember, we were all equally intrigued when L-Acoustics came out with V-DOSC many years ago, and this seems to be like that – the next step in live sound reinforcement.”

### Exciting Modern Sound

“When on the road, Maroon 5 transitions from studio pop-rock to a slightly more serious rock band,” Ebdon states. “The music is definitely louder, punchier with a very full range, more of an exciting modern sound.”

He mans a DiGiCo SD7 digital console with redundant Waves Sound-Grid Extreme Servers located about 90 feet from the stage for each show, which have been in arenas to this point of the tour. From there that he continues his goal of keeping the sound natural while also loud and energetic.

“I try not to overcomplicate the mix, representing what’s really going on rather than an over-polished, flat sound,” he says. “Adam wants it roughened up a bit, too – if it’s too perfect, it doesn’t seem live. With a little help from Waves plug-ins, I’m good to go.”

A Waves CLA-76 comp/limiter followed by a Waves DeEsser are applied to Levin’s vocals, which then run through a PreSonus ADL700 tube channel strip as a way to “pop out of the digital domain.” The treatment provides more warmth and depth to the vocal signature. A PreSonus ADL600 tube preamp serves the same purpose on his guitar groups.

A George Massenburg GML8200

stereo EQ serves a “mastering” role, adding a little “air” to the PA. “It gives it a bit of sparkle that’s quite nice,” Ebdon notes. A Pro Tools HD Native digital audio workstation along with a Tascam SS-R200 assist with recording each show live, with a secondary back-up mix to Waves Tracks Live that is great for virtual sound checks. Ebdon also has a studio set up in the back of the tour bus where he can do one-off mixes on an as-needed basis.

Monitor engineer Kevin Glendinning

also helms a SD7 console. Another engineer who doesn’t require much in out-board gear, he has a Yamaha SPX2000 for effects processing, a TC Electronic TC 2290 dynamic digital delay and a Tascam CD-RW901 recorder in his rack.

“The SD7 is a terrific console – it really provides just about everything I could need,” Glendinning says. “With the band on in-ears, the only wedges we have on stage are Sound Image MA112s for the bass player, who’s stationary and really prefers wedges.”



One side of EAW Anya columns being assembled into an array.



Above, Adam Levine making his way out on the stage thrust with Shure UHF-R transmitter in hand on the current tour. Above right, The SB2001 subwoofer configuration, with Powersoft K Series amplifiers rack-mounted alongside. Below right, System tech Andrew Dowling (left) and house engineer Jim Ebdon at front of house.

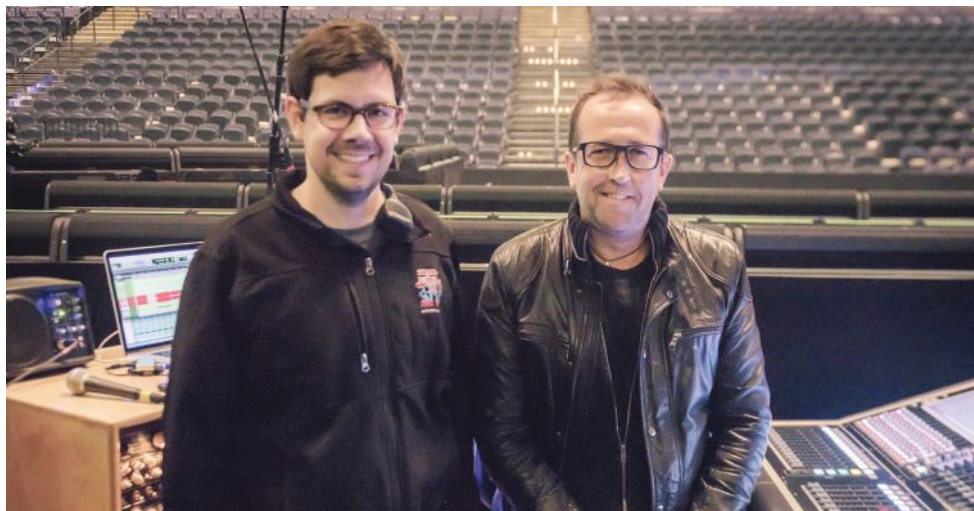


### Attaining Coverage

The tour is carrying 54 EAW Anya loud-speaker modules, joined by 24 SB2001 subwoofers and eight KF364 self-powered loudspeakers for front fill. Main left-right columns are made up of three hangs of 12, eight and four modules that provide 240 degrees of coverage, with the three columns hanging together as one array. And an additional three module column per side can be added to expand coverage to 270 degrees when needed.

“Even though the left and right arrays are made up of multiple columns, they sound coherent, like one array. It’s pretty amazing,” says Dowling, who also served as the system engineer on the previous Tom Petty tour. “The smoothness across the audience is quite impressive, definitely smoother than anything else I’ve heard.”

Briefly, each Anya module includes 22 customized transducers. Fourteen HF compression drivers provide a continuous line of apertures on a horn that expands to fill the entire face of the enclosure, joined by six 5-inch MF cone transducers utilizing proprietary technologies to sum coherently with the HF wave-



front. Dual 15-inch LF cone transducers employ Offset Aperture loading to extend horizontal pattern control into the lower octaves. Each of the 22 transducers is powered and processed independently.

“The rejection on the system is also quite remarkable,” Ebdon adds. “During at least a third of each concert, Adam is out on a 118-foot thrust with a small performance stage at the end of it, yet the show is still comfortably loud with good vocal clarity and zero feedback.”

Engineers use Resolution software to

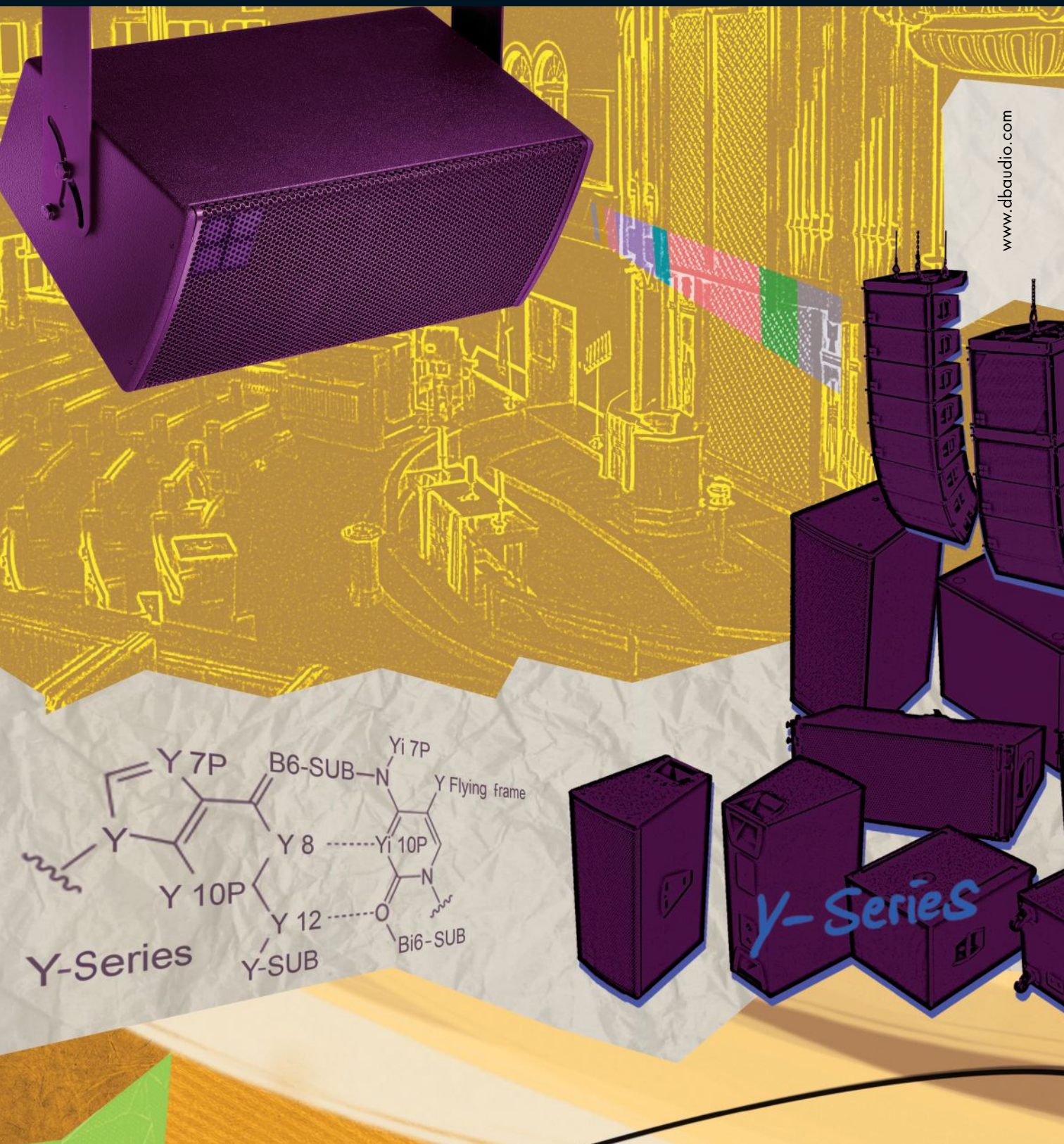
tell the Anya arrays about the venue they wish to cover and their sonic goals, and it determines the optimal wave front shape and processing to achieve those goals. As a result, the only day-to-day changes are done in the software, not with the system, and if something changes last minute, new parameters can be entered to modify the coverage.

“The system hasn’t changed from rehearsals. It’s small, it hangs in a very sexy, very straight column, and there’s never a height issue,” Ebdon says. “We



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hang it the same height every day and it seamlessly covers each room. From a production point of view, that's fantastic. Never having to worry about how many boxes if there is a low trim? It's so small that it fits anywhere with an output that is astonishing."

The SB2001 dual 21-inch subwoofers provide low end that adds a "juicy liquid low," he adds. The subs are ground stacked, left and right in front of the stage, each stack made up of nine units stacked three over three, with another group of two at the inner sides. The subs are powered by Powersoft K Series amplifiers, rack-mounted next to each stack.

"I always give credit to the Powersoft amplifiers because I can almost forget they are there – we fire them up every day and never have to touch them again," Dowling says. "Rock solid, a ton of power and never have to worry about them. That's what everyone wants to work with."

### Choices On Stage

As noted, Ebdon focuses first on the drum kit with his mix, and he starts his miking process there as well. After trying out a couple of different drum kits during rehearsals as well as several drum mikes and positions, he's pretty pleased with the end result



Monitor engineer Kevin Glendinning setting things up on his DiGiCo SD7 console prior to a show.

"I put a (Shure) SM57 on the snare drum, which may not work for everyone but works great for our drummer," he says. "Then I put a AKG C 414 under it to get the quality of the snare rattle. The toms have Sennheiser e 904s, which really work on this kit. Neumann KSM 105s takes care of hi-hat and ride cymbal, with Mojave MA-101fet condensers overheads. I wrap it up with a Sennheiser e 902 on the kick drum outside the hole and a Shure SM91 inside, which provides super low end. An SSL stereo bus comp applied over the group tightens it up."

Guitars are covered with an assortment of Royer 121s, Shure SM7s and

newer TUL G12 purpose-designed dynamic guitar amp mics. "The G12s are really fantastic. They look very retro and sound quite natural," notes Ebdon. "Very clever in that they don't color the sound at all, and they're not expensive. It's a new find that I'm quite pleased with."

Vocalists sing through hard-wired Audio-Technica AE6100 hypercardioid dynamics, while Levine goes wireless with a Shure UHF-R system, with the transmitter outfitted with an SM58 element. All band members except the bass player wear JF Audio Roxanne custom in-ear monitors fed by Shure PSM 1000 personal monitoring systems.

### Going From Here

The tour kicked off in Dallas and is currently making its way through North America before moving along to Europe, Africa and Asia through at least October of this year. To Ebdon, the primary story to this point has been the Anya main system.

"I think it's important to take new technology out on the road, try it out and pass on information to our peers," he concludes. "Anya is exciting, bringing to the table technology we've never had before, which is really quite remarkable. I'm learning more and more about it every day, and I'm going to be intrigued to see where EAW takes it from here." ■



Jim Ebdon working with the house mix mid-show on the SD7.





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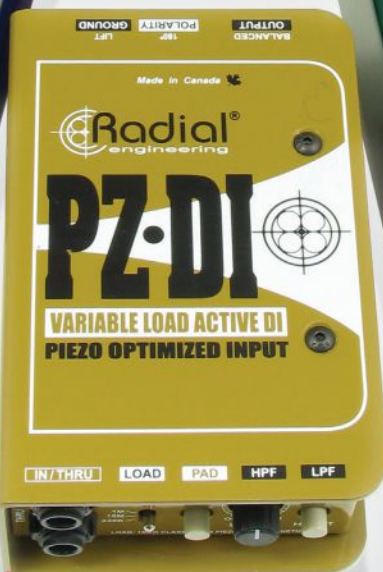


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## Festival Strategies

Preparation tips and insights into knowns and unknowns

by Mark Frink

THIS MONTH, COACHELLA heralds the start of the American music festival season, showcasing a wide range of musical styles to fans and talent buyers from around the country. Although Summerfest in Milwaukee and the New Orleans Jazz & Heritage Festival have had multiple stages over two weekends for decades, Coachella helped show the U.S. market 10 years ago that genre-spanning, multiday, multistage open-air festivals can be a success.

Since Coachella, similar and divergent events have appeared around the country and laid claim to specific weekends of the season. While a few have come and gone, others have replaced them. Festivals typically have multiple staggered stages for

two or three days over a weekend, culminating each evening in two or three increasingly popular headliners who bring their own consoles and backline.

### CONSOLES

Blues, jazz, folk or bluegrass often have far simpler requirements, so other than boutique events, these smaller festivals are the last bastions of analog consoles, where lower channel-count acts are more easily managed on the fly by artist engineers.

The all-digital trend for large festivals that began in the UK is now well-established in the U.S., where there are three primary festival desks: Avid, Yamaha or whatever the artist is carrying. Most touring vendors maintain a seldom-used inventory of classic Midas consoles, so it's not unusual to see an XL4 or Heritage console come in with older headline engineers, as well as Soundcraft or the new SSL Live.

Carrying both house and monitor consoles requires their snake be run out, which for the crews of earlier performers can mean waiting for the headliner to finish before packing the last trunk, unless special arrangements have been made to pull the snake during changeover, a

Coachella courtesy that's one of its specialties. Alternatively, advancing a pair of locally provided BNC or Cat-5 runs makes it simple for earlier bands with digital consoles to "get the flock out."

Bands that frequently find themselves in support slots often buy an inexpensive 24- or 32-channel digital console to mix in-ear monitors in order to defend against the inevitability of scarce festival setup and sound check time. These smaller monitor rigs sometimes include sub-snakes, microphones and stands, but still need a split (and a snake) to patch stage inputs to the festival front of house console, which again is better if it's file-based.

Avid VENUE Profile and SC48 consoles are popular and most touring bands have a file for using them on fly-ins. Yamaha PM5D and M7CL desks are gradually being replaced by the CL Series, which offers a convenient Console File Converter that easily transforms old files to work on the new desks. Though file-based touring can be stressful, as it relies on a lot of locally provided pieces to the puzzle, it allows the luxury of simply walking away from all of the equipment-du-jour.

### MONITORS

Typical floor monitor rigs for pop, rock and country festivals have six or more separate mixes, with two wedges per mix, as well as a drum monitor mix, usually a subwoofer with two more wedges. The



Avid VENUE, a staple of festivals, this one provided by Southern Sound And Lighting of Jacksonville, FL.

CREDIT: SOUTHERN SOUND AND LIGHTING





Dave Rat and plenty of consoles at the main stage at a recent Coachella festival.

stage is supplemented by a pair of side fills, often a previous decade's modular full-range box stacked on its companion dual 18-inch sub. This is sufficient for most wedge-based bands and requires a monitor desk with at least 10 mix sends.

Output EQ for floor monitors is normally handled by 1/3-octave graphic equalizers, one for each aux send or "mix." These are an included feature on today's digital consoles and enjoy the usual digital workflow benefits: copy and paste, archive, group or gang. Output EQ for IEMs isn't being used to manage gain before feedback, rather simply tone and band-pass, if anything, and while graphic equalizers can be used for IEMs, way fewer than 30 bands are needed and the flexibility of a few fully parametric equalizers can be more useful than fishing through the graphic filters.

The same band using IEMs instead of wedges needs a stereo auxiliary send for each musician, plus three or four effects sends, since now the drums, vocals and maybe one or two instruments benefit from reverb. Most drummers prefer hard-wired in-ear monitors, often supplemented by a nearby sub. There may also be a requirement for one or two floor monitors in addition to the IEMs, and side fills might even be helpful. Modern festivals require vendors to supply a moni-

tor desk with at least two-dozen aux sends to fulfill the requirements for stereo IEMs, effects sends, drum subs and wedge mixes.

Locally provided in-ear monitoring ("festival ears") is normally file-based, because it's simply too hard to write an accurate file from scratch on the day of a show, though everyone's done it once. Start of the day festival questions for arriving artist engineers always include "Do you have a file?" – meaning for an Avid or Yamaha desk, since the lack of a file means one will need to be built before line check.

With so many touring acts bringing monitor desks, the logistics of loading in headliners early and then pushing back their backline to stack support acts in front consumes the entire day before doors open. In addition to consoles and backline, it's not unusual for headliners to bring a full floor package of video, lights and risers, as well as entire lighting rigs, requiring multiple semis to be unloaded and lots of dead case storage backstage.

Some festivals pay a headliner with enough production to carry the day, loading in a full tour package from multiple semis before giving the stage to the support acts. If all of the support acts bring their own snake, consoles, mics and stands, wedges and/or ears, the hardest thing is simply passing around the front of house "LRFS" (left, right, front fill

and sub) inputs and having enough sets of Camlock feeder connections on stage for band distros (and dock space).

## DRIVE

Another international festival standard that has developed is the use of Lake LM processors to serve as an input matrix for the various house consoles, as well as to provide drivelines to return signals to the main amps on stage. Lake's use of Dante and AES allows system engineers to provide all-digital drive lines that eliminate additional DA/AD conversions and are impervious to electromagnetic interference, high-frequency attenuation, and voltage drop over typical 300-plus-foot festival cable runs. This trend has received unanimous endorsement for its improvement in large-scale festival sound quality. Redundant analog fail-over schemes are easily implemented for the unlikely event of digital failure.

The Lake Controller's familiar interface for controlling house EQ has also become an industry standard. In festival situations, after the system engineer has tuned the PA with the headliner's house engineer, additional EQ overlays for support acts can be created as each of their house engineers takes a turn to tune the PA prior to line check.

Standard for most festival system engineers is to take four feeds from each house console: LRFS. Experienced festival system techs know a Profile console requires TRS/XLR adapters to get LRFS out if its rack, unless it has the IOx expansion card and its digital AES connections are used.

## STAGE PLOTS

No festival can run smoothly without a plan for managing inputs. Other than headliners and support acts carrying everything they need, festival planning relies on accurate information about each performing artist's stage setup in advance, with day-of-show reconfirma-

## :: Backstage Class ::

tion. Artist engineers should provide an accurate stage plot and input list, preferably a 1-page document, so inputs and plot can both be seen at once.

A stage plot is a “plan view” with graphic illustrations of a live performance stage setup: symbols indicating relative locations for backline, monitors, electrical connections and audio inputs. On the same page as the plot, the artist’s input list indicates each audio input with stage location and microphone and stand (or DI) preferences.

Festival stage crews don’t care about the names of the musicians but are very interested in how many inputs are needed for each kind of input. That’s because each band’s inputs are plugged into pre-labeled sub-snakes connected to pre-named channels on shared consoles. The channels are grouped by instrument type and proceed in a standard order, with drums first, followed by bass, keyboards and guitars, any horns or acoustic instruments and vocals last.

Some festival inputs are genre-specific. Blues festivals will have three inputs for Leslie cabinet mics upstage and country festivals will also have dedicated steel guitar and fiddle inputs, while pops festivals will have eight inputs for “Pro Tools” sweetening tracks and a click track. (Last week I had a bodhrán mic.)

Most sub-snakes have 12 channels, so the first 12 channels are a standard festival drum patch, with two kick drum microphones, two snare mics followed by hi-hat, up to five toms, and ending with two overheads and maybe a drum vocal.

Festival consoles and snakes commonly have 48 channels, so three more 12-channel sub-snakes cover inputs on the downstage edge and on each side of the drum riser. In addition to how many of each type of input a band has, stage crews are also very interested in where they’re located on stage: downstage-left, -center or -right (DSL, DSC or DSR) and upstage-left or -right (USL

INPUT LIST (1 to 1)			
Kick -sm 91	Bongos -sm 57	Keys 3 L (at Acc Pno) -DI	Dvd Click
Snr 1 -sm 57	Conga L -sm 57	Keys 3 R (at Acc Pno) -DI	CD Playback
Snr 2 -sm 57	Conga R -sm 57	Keys 4 L Stage L -DI	CD Click
HH -km 184	Timbales -sm 57	Keys 4 R Stage L -DI	input 46 M/C - RF sm 58
Rack 1 -beta 98	Perc OHL -Akg 414	BGV 1 -Ksm 9	input 47 DFR Rtn
Rack 2 -beta 98	Perc OHR -Akg 414	BGV 2 -Ksm 9	input 48 VOG - FOH -sm 58
Floor 1 -beta 98	Acc Piano LO -beta 98	*NATALIE - Main Voc-Ksm 9	
OHL -Our VP 88	Acc Piano HI -beta 98	* Spare -Ksm 9	
OHR -Our VP 88	Keys 1 Stage R mono -DI	Hard Wired SPARE -sm 87	
	Keys 2 Stage R mono -DI	Dvd Playback	

A stage plot for Natalie Cole generated with StagePlot Pro by front of house engineer Howie Lindeman.

or USR), so each channel name on an artist’s input list should include one of these 3-letter designations.

In addition to putting the year and season across the top in bold letters, artist engineers should also consider putting their name, email address and mobile phone number on the document. I always add the phrase “Supercedes all prior information, especially from previous years.”

Though it’s possible to make input plot documents using Microsoft Word Tables and SmartArt features, StagePlot Pro, available for both Windows and Macs for \$40, has become an industry standard. On several festivals last summer, every act’s paperwork was produced by it, providing a familiar look. (A free 30-day demo is available at StagePlot.com.)

### PLUG-INS

Avid consoles make using plug-ins easy due to their tight integration. However, there’s little expectation that locally provided festival consoles will have plug-ins other than standard included ones, and the limited windows of time available to work on consoles at most festivals, espe-

cially shared consoles, can make installing third-party plug-ins a stressful chore. Though Avid consoles come standard with the D-Verb plug-in and its Windows 3 interface, other reverb choices are available.

The VENUEPack plug-in bundle that comes with Avid consoles includes the Impact bus compressor, Reverb One, ReVibe and Smack! Since D-Show consoles don’t come with a dedicated reverb, Reverb One and ReVibe have become default choices for many users. ReVibe has nine reverb algorithms and is especially good for vocals and acoustic instruments, while Reverb One is a favorite for drums. Smack! is a software compressor modeled after the Distressor with optional distortion and optical emulation, and is a favorite on kick drum, bass and vocals.

Though there are three types of Avid consoles, and they all share the same files, the original large-format D-Show is less welcome at festivals due to the space it takes up. Besides, it scares tadpoles that have only seen Avid’s newer desks. The 33-fader Profile’s control surface is better suited to mixing larger festivals than the 26-fader, all-in-one SC48.



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### NEW FAVORITE

The Yamaha CL5 console is a new favorite large-format festival console. At 72 mono plus eight stereo channels, it has more than enough inputs for any festival patch, plus it has 24 mix buses (plus eight matrixes that can be used as aux sends). Its Custom Fader Banks –

16 faders on the left and another 8-fader bank on the right – allow the operator to quickly land just the inputs needed for monitors (and just the left fader of stereo pairs) from an expanded festival patch into just one or two 16-fader banks on the left. Eight faders on the right for the needed IEMs or wedges

is usually enough for quickly building monitor mixes in Sends on Fader mode.

At front of house, the CL5's custom fader banks allow operators to quickly assign instruments on the left and vocals on the right from the festival patch. Its eight FX engines and eight stereo channels allow an operator to take a generic approach to effects, assigning a wide range of purpose-specific effects ahead of time that cover almost any application, so that they're all "on deck" and ready.

Most console operators are well familiar with Yamaha's ecosystem of effects, dynamics, EQ, and even iPad apps, so they're usu-



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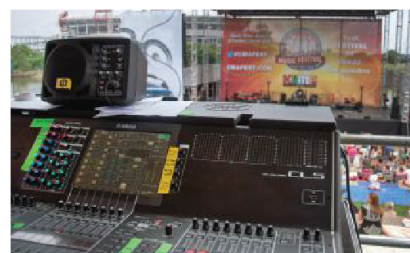
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A Yamaha CL5 deployed at a recent CMA Festival in Nashville by Morris Light & Sound.

ally quickly comfortable on a Yamaha CL5, especially after a festival operator has set up its Custom Fader Banks. While there are other consoles with custom fader banks, the CL5's combination with the Yamaha environment is powerful.

Instead of plug-ins, it's Premium Rack is equipped with Virtual Circuitry Modeling (VCM) digital reproductions of the analog circuitry of popular classic outboard equipment, including an optical compressor, a tube passive equalizer, a bus compressor, a new dynamic EQ, and an 1176, as well as Rupert Neve Portico 5033 EQ and 5043 compressor – though there may not be time to explore them in the "hectic fun" that is the typical festival. ■

MARK FRINK ([livesound@markfrink.com](mailto:livesound@markfrink.com)) is a long-time monitor engineer for numerous top artists, and he's available for tours and festivals this summer as an IEM engineer.



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## Loudspeaker Enclosures And Horns

What they do, how they do it.

by Ken DeLoria

### IN VIRTUALLY ALL MODERN

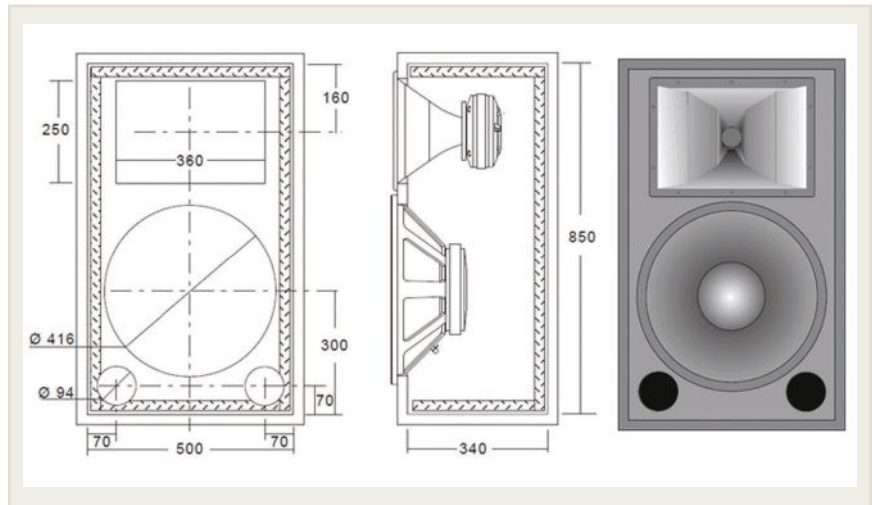
loudspeaker systems, the enclosure contains some or all of the driver elements that comprise the system, and it separates the rear radiation of one or more cone-type drivers from their front radiation. It may also limit the rear radiation of horns and compression drivers to avoid acoustical energy returning back towards the stage.

Why separate front cone radiation from rear radiation? When a cone driver moves forward it provides positive pressure to the atmosphere, exhibiting excursion. When it moves rearward it provides negative pressure, or recursion. It does this a lot – like 1,000 times per second for a 1 kHz wavelength. If the front and rear radiated energies are not separated from each other, each will cancel the other's output because they are 180 degrees out of phase.

There are several ways to keep cancellations from happening. The simplest is a flat baffle, an approach dating back to the early 1900s. The first baffles were nothing more than a flat surface for mounting the cone driver, its purpose being to isolate front radiation from rear radiation. The larger the baffle, the lower the frequency range the cone driver could reproduce (within its other limits, of course).

As frequency decreases, wavelengths become longer. The baffle, if it's large enough, separates even LF front radiation that is positive from rear radiation that is negative, thus stopping front-to-rear acoustical cancellations.

As time went on, it became clear that 18- x 18-foot baffles weren't very practical, except perhaps in fixed cinema installations. Loudspeaker design-



CREDIT: LEAN AUDIO

ers instead came up with the idea of an infinite baffle, which is little more than a sealed box. It works. I remember the first time I heard the infinite baffles in a friend's Acoustic Research AR-3 loudspeakers. (I was about 14 at the time, and the record playing was Jimi Hendrix.) Since then, I've spent my life involved with music and sound.

As rock 'n' roll displaced vocal groups and big band music in the 1960s, more output was sought from loudspeakers. The bass reflex enclosure helped to fulfill the new demands for power, clarity, and extended bass. A bass reflex enclosure uses a port that captures the rear energy of the cone driver and sends it outwards by means of a relatively small, and often ducted, vent arrangement. This is not particularly intuitive (how are those long wavelengths getting through that small port?) so worry not if you can't quite grasp it. It requires complex pressure dynamic equations to properly explain.

### BY ANOTHER OTHER NAME

Bass porting (or venting as it's often called) can be used to increase LF out-

put, though the output from the port is not in phase with the output of the pistonic pressure from the cone. In real life this doesn't matter much, though you would think it should. An "optimally vented bass reflex enclosure," a term used for years to describe LF loudspeakers in marketing brochures, can sound very good.

But if you measure its phase response, it will show a complete inversion in the frequency range where the port energy takes over from the directly radiated cone energy. Fortunately, in this same frequency range, the cone driver is moving minimally and most of the sonic energy is output through the port.

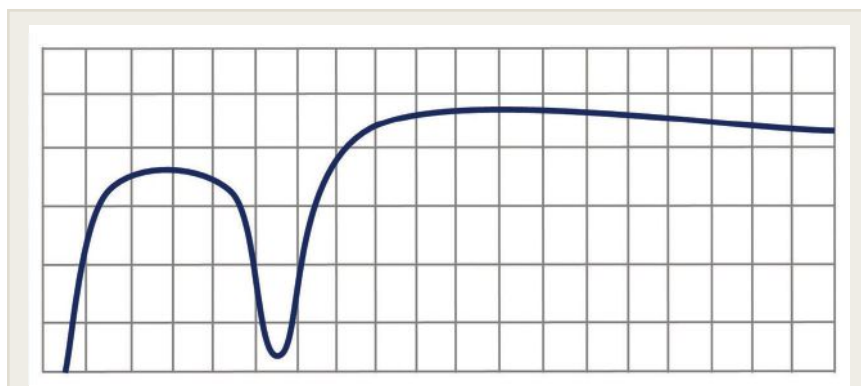
In fact, the way to measure the port tuning center frequency, called Fb in Thiele-Small terminology (the resonance frequency of driver and box combined), is to put a measurement mic at the apex of the cone and look at the response on a high-resolution spectrum analyzer. A pronounced dip in the spectral response will be apparent. The center frequency of the dip is the box tuning frequency, and the depth of the



dip roughly indicates the construction merits of the box.

Even a small air leak will decrease the depth of the dip, which should be as deep as possible for maximum energy transfer to the port. An irregular shape indicates parasitic resonances such as vibrating panels. A heavily braced, rigid enclosure will produce a smoother, better looking curve than a poorly built cabinet (**Figure 1**). In general, loudspeaker enclosures should always be as solid and inert as possible. Energy that's absorbed by vibrating cabinet panels is wasted energy that's not getting out front.

An alternate use of bass reflex porting is to limit excursion in a cone driver



**Figure 1:** The bottom of the dip is the box tuning frequency. This enclosure is sealed and braced well, indicated by the depth and smooth shape of the dip.

at a frequency where it might otherwise bottom out from over-excursion. In this case the port is used more for excursion control than to add output. And that leads to horn loading, which is often coupled with bass reflex enclosures in the LF range.

### THE ACOUSTICAL HORN

Starting with cinema loudspeakers, designers such as James B. Lansing built LF horn flares made of formed wood to increase the output of their systems. In those early days, 25-watt amplifiers were about all that were available, so loudspeaker efficiency was an extremely important issue.

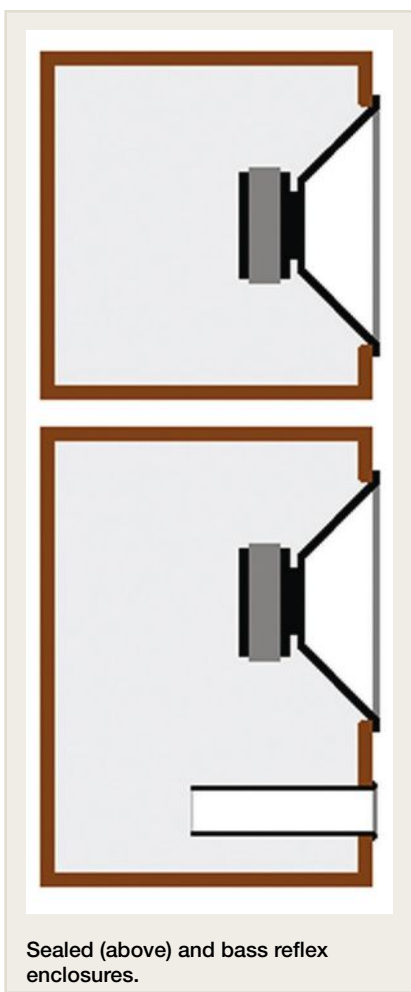
Horns were also used in the upper frequencies, usually cast in malleable metal. A well-known example is the venerable Altec Lansing 511B multicellular horn. Later, fiberglass layups became the material of choice for most manufacturers (but not all). Some HF horns were constructed from machined wood, a wonderful material actually, turned on a lathe. On the flip side, other horn materials used today include plastic moldings, sometimes vacuum formed if the draft is short enough, which is a very inexpensive process compared to injection molding but only usable with thin materials.

### HOW HORNS WORK

An acoustical horn is essentially a transformer. The horn serves to convert the high pressure and relatively small radiating area of a cone or compression driver to the vastly larger area of the external atmosphere, which by nature is a low pressure environment. By way of its expanding flare rate, the horn transforms the high pressure, high particle velocity vibrations present at the small throat of the horn into low pressure, low particle velocity vibrations distributed over a correspondingly larger area at the mouth, thus more efficiently coupling the wavefront to the air.

The flare rate – that is, the curve that the designer has chosen for the horn design – serves to transform the driver's energy in some preferred manner. There are many classic curves, such as exponential, hyperbolic, conical, and others, each with its own properties. Some flare rates favor LF output, others overall efficiency, and still others uniformity of frequency response and/or low distortion.

All flare rates exhibit some measure of directivity. It's never a simple matter of saying, "This is the one perfect flare rate." Instead, the flare rate and horn size should be chosen by the designer to best accomplish the task that the horn



CREDIT: MELANCHOLIE

is intended for.

Horn designs can be “straight” (you can look down the mouth and see the throat), or folded forward, sideways, or even backwards upon themselves and then forward again. Folding conserves space within the enclosure while keeping the horn length long enough to reproduce low frequencies.

One downside of folding is that energy above a certain frequency, depending on the shape and abruptness of the folds, will reflect back on itself and cancel. Therefore, most folded horns have a limited range of operation, usually not more than two octaves.

#### DIRECTIVITY

In addition to increasing the transfer efficiency of the driver to the atmosphere, often as much as 10 dB or more, acoustical horns provide the added benefit of pattern control of the radiated energy. A horn's flare angle can be selected to control radiation to almost any horizontal and vertical pattern. I once saw an old horn design at the Cow Palace in San Francisco that employed a 360-degree flare angle. The compression driver was mounted on the top where the throat emerged. (It worked well for voice paging.)

Though a given flare angle may provide the desired coverage pattern, the horn's length and mouth area must both



An Altec Lansing 511B multi-cellular horn.

be large enough to control the wavelengths in the lower frequencies near the crossover region. Most are not. They become something of a labyrinth in the range below which they provide effective LF control, and can also be a serious impediment in the higher frequencies.

It's a tough gig, horn design. I remember testing a proprietary 2-inch-throat driver on a commercial horn and being very disappointed that the claim of extended HF response was not met. Nothing over 10 kHz was present. Only when I unbolted the driver from the horn and saw that suddenly the HF response above 10 kHz was almost perfectly flat to 18 kHz (fortunately, the measurement mic and analyzer were still running) did I realize how detrimental the horn flare was to propagating the driver's HF energy.

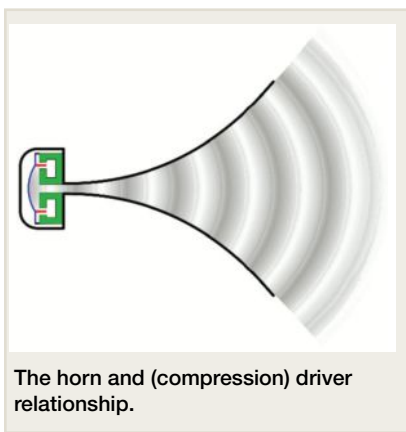
#### MAKING TRANSITIONS

The long-standing domain of horns in concert loudspeakers, from mid bass to the upper extent of hearing, has now been usurped in most line arrays by the use of direct radiating cone driv-

ers for bass and small-format cone drivers for midrange. They're often arranged in separated pairs for LF, and in an array of four that cover MF, typically two on either side of the HF waveguide. Modern cone, former, and spider materials, supported by high-intensity magnets and durable voice coils, allow very high SPL and power handling from the relatively new breed of small cone drivers.

At various times some astoundingly novel approaches to loudspeaker design have crossed my desk, usually in the form of patent grants or patent applications. To what extent they offer performance advantages, few may ever know. The effort at innovation, however, is a tribute to the imaginative powers of the human mind. It will be interesting to see what new trends will next emerge in the pro audio sector. ■

*Over the course of more than four decades, KEN DELORIA has tuned hundreds of sound systems, and as the founder of Apogee Sound, he developed the TEC Award-winning AE-9 loudspeaker.*



The horn and (compression) driver relationship.

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A view of the stage during a performance at the completely renovated Ferring Jazz Bistro in St. Louis.

## St. Louis Jazz

A room and system designed to enhance the artistry.

by Kevin Young

»»» TWENTY YEARS AGO, Jazz at the Bistro launched in the former in a former cafeteria in midtown St. Louis, and since then has been lauded by many as one of the premiere live jazz spots in the U.S. The venue is operated by Jazz St. Louis, a not-for-profit organization established after the closing of the Just Jazz program at the Hotel Majestic.

The Jazz St. Louis mandate is straightforward: "Present jazz the way it's meant to be experienced." In service of that mandate, the venue has undergone a complete transformation spearheaded by executive director Gene Dobbs Bradford and World Wide Technology founder Dave Steward.

Named for Steward's parents, the new Harold and Dorothy Steward Center for Jazz has expanded into an adjacent building. Audience capacity for the main performance space, which is called The Ferring Jazz Bistro, has increased

from 150 to 220. Additional facilities include the new Centene Jazz Education Center and a separate, 75-capacity jazz lounge that can also host performances in addition to serving as a place to remotely view a video feed of performances happening in the bistro.

### PROMOTING INTERACTION

The physical layout of the bistro has been completely reconfigured. The stage was relocated from the south wall of the venue to its wider east wall to increase the intimacy of the venue by allowing more people to sit close to the stage, and the balcony was opened up for additional seating. The intent, explains Sam Berkow, founding partner of SIA Acoustics (New York & Los Angeles), who designed the sound system and acoustic treatments for the facility, was to provide a stage environment that promoted interaction between both the players on stage

and the audience. An important goal of the stage design creating an acoustical environment enabling them to hear and react organically to each other.

Berkow worked closely with SIA senior consultant Jeffrey Friedlander as well as with the project's architects, engineers and designers to ensure the result of a significantly improved live music experience. Cignal Systems, a leading integrator based in nearby Valley Park, MO, made these plans a reality by providing the installation as well as custom engineering work.

"What we did immediately upon getting involved was to understand the program," Berkow explains. "We looked at the range of musical styles, from solo artists to big band, from lightly to heavily amplified, and what became clear to us is that people wanted to hear the music off the stage. So the audio system couldn't be the primary source of sound. For most shows, the stage had to be a significant source of sound."

SIA helped create a space where the musicians can hear each other through acoustical reinforcement provided by a wall behind the stage and a canopy above, both equipped with sound scattering surfaces similar to a sound diffusing wall in a recording studio. "We eliminated all of the strong reflections coming off the upstage wall and the ceiling," Berkow



Sam Berkow (right) and Jeffrey Friedlander of SIA Acoustics onsite during construction at the bistro.



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## :: Project Memo ::

adds. “For a traditional orchestra you sometimes want those reflections, so for example, the cellos can hear the oboes, but in a jazz ensemble you have much more power in a much smaller area, so diffusion is a better choice.”

The canopy contains 10 acoustical diffusive elements and is covered with an acoustically transparent fabric to provide an aesthetically pleasing look. It also serves as the support structure for the flown portion of the house loud-speaker system.

“We were trying to create a stage that was comfortable for musicians and projected into the audience with a canopy that would reflect energy out, without strong reflections creating uneven spots in the audience,” he continues. “The canopy itself is made of wood and the acoustical panels were created by Real Acoustix, and these helped in creating a live sounding room without hard reflections.”

Additional acoustic treatments were applied to the ceilings throughout the venue, and background noise from the new HVAC system was minimized with extra lining throughout and in-line duct silencers for sound-critical walls. “In a jazz venue, when the band gets quiet you really hear background noise,” Berkow observes.

### CHARACTER & QUALITY

Several options were considered for house system loudspeakers, but ultimately Berkow went with VUE Audio-



A pair of two VUE h-12N main loudspeakers, and above that, one of the VUE h-8 compact loudspeakers covering the balcony.

technik models to provide appropriately subtle sound reinforcement. Specifically, the design incorporates two VUE h-12N 2-way, single 12-inch active loudspeakers per side, each pair flown together left and right about 14 feet above the stage. Each provides 60- x 40-degree (h x v) coverage combined with integrated amplification, DSP and network/control capability.

“A primary reason we selected these loudspeakers is their use of new technology for the high-frequency driver, which features both a neodymium compression driver with a 4-inch voice coil and a Truextent beryllium diaphragm,” Berkow states. “The result is lower distortion and more efficiency, which means, for the lis-

tener, the sound of the system will closely match the stage sound and allow the nuance and tone of acoustic instruments to be heard clearly.”

Two VUE hs-20 dual 10-inch subwoofers are integrated within the stage, one per side. “We cut the corners of the stage out, and the subs come up about 4 inches above that,” Berkow says. “I like to keep the subwoofers on the ground if possible. When low frequencies come from above, it feels like the image moves up.”

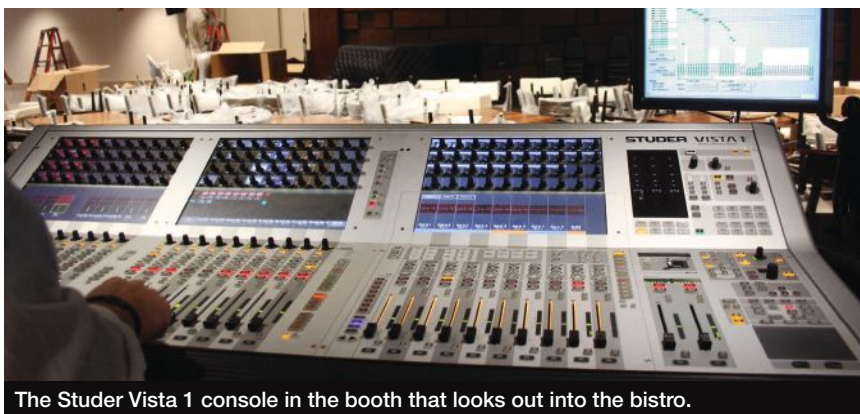
Eight VUE h-8 compact 2-way loudspeakers, utilizing the same HF drivers as the mains, provide fill on delay, mounted in a “U” configuration that follows the contour of the stage. “There’s one h-8 per side mounted on the upstage wall, just under where the balcony wraps around the stage, serve the main floor,” adds Chip Self, vice president of Cignal Systems. “The other six are flown above the dance floor and serve the balcony.”

Overall, the selection of the VUE loudspeakers came down to a strict requirement not to alter the true sonic character of the instruments. “Tone and nuance, the individual characteristics of specific instruments, really matter to jazz fans,” Berkow notes. “The even, smooth coverage and very low distortion of the drivers in these loudspeakers allow the character and tonal quality of each instrument to be amplified without coloration. A bonus is that we were seeking a self-powered solution to help save rack space.”

Aesthetics were also a concern, he adds. “People don’t want to be looking at a giant sound system, but we wanted to ensure there’s enough PA that when they bring in bands that are more fusion or rock oriented they can rock the room.”

### ADDITIONAL ELEMENTS

A Studer Vista 1 is the new system’s digital console, housed in a booth roughly 40 feet from the stage that also houses rack-mounted BSS Soundweb London



The Studer Vista 1 console in the booth that looks out into the bistro.



processors that provide main system management. Although the booth is a discreet room, it's acoustically treated to match the performance area, fronted by a 10- x 4-foot (w x h) opening. The Vista 1 was chosen by Bob Bennett, the venue's artistic director and director of operations, who notes, "The Vista 1 was most natural sounding board I've heard. It's also the first digital console I've used, but it's extremely easy to work with."

Most of the time, monitors are also mixed via the Vista 1, which can provide up to 10 mono and four stereo mixes to up to six Fulcrum Acoustic FA28ac self-powered coaxial wedges. If necessary, Bennett can also deploy the pre-existing Midas Venice analog console from the previous system for monitors.

Only a few elements were added to the existing microphone package, notably a pair of Schoeps MK4 cardioid mics that Bennett uses in conjunction with an AKG 414 condenser for the venue's 7-foot Yamaha grand piano. "I place the 414 on the low end of the piano, about halfway back on the soundboard, with the two Schoeps mics closer to the hammers," he explains.

Although some mics are typically deployed during performances, most are only used in the lounge. "I like to use as few mics as possible, because the more open mics on stage, the crazier it's going to be," Bennett notes. Kick drum is handled with a Shure BETA 52 and Electro-Voice RE20s for overheads. When there's need for a snare mic, it's a Shure SM57, and horns can be captured individually with RE20s. For true big bands, the choice is two C 414s across the horn sections.

A Shure BETA 58 and Neumann KMS 105 are available for vocalists, and guitars are captured with either SM57s or SM58s. "For bass, if miking the F hole, I'll use an RE20, but for electric bass usually the choice is a BSS AR-133 DI or taking the line out from the amp, joined by an

acoustic mic, depending on the player," he says, adding that he uses AR-133s exclusively for bass, keyboards and electro-acoustic instruments. "But again, what's miked is mostly going to the lounge. In the house system there may be no drums. We're heavy on keys and vocals – light on horns, bass and guitar – depending on the band and stage volume."

"It's very much an enhancement system," Self adds. "It would be unusual to have a full mix in the mains because the acoustics of the room are so good that very few instruments need to be amplified."



Another perspective of the room, including the balcony overlooking the stage.

### FUTURE CONSIDERATIONS

SIA also provided the design for the electronic and architectural infrastructure for the third floor's educational facility, which includes a full recording studio, a large live/rehearsal room and various practice rooms and teaching spaces. All of the rooms are interconnected so performances in any room or combination of rooms, including the bistro, can be recorded in stereo and/or 48-channel multitrack as well as HD video. Signal Systems did the hard work of putting all of this together.

"There's an inordinate amount of copper for a space this size," Self notes. "I asked early in the project, 'Why don't we do this digitally?' But Sam was

directed to create an infrastructure that was going to last; you never know what digital transport method or format is going to be in use 10 or 20 years from now, but an XLR is still going to be an XLR. So essentially we future-proofed by using older technology."

All who worked on the project agree that a significant challenge was the timeline; the venue closed in May 2014 and needed to be ready to reopen by October for previously booked events, including a show by Wynton Marsalis.

"The timeline was absolutely insane,

but the folks working with us did an incredible job," Bennett concludes. "We had to evaluate a variety of consoles and loudspeakers in the old room to figure out what would work best for the new space, and went from there. This room was never intended to be a live venue, so when we first started booking shows it was acoustic music – nothing electric. The previous system worked fine for that, but as our programming evolved, our needs changed, and this new room design and system will serve us very well into the future." ■

*Based in Toronto, KEVIN YOUNG is a freelance music and tech writer, professional musician and composer.*



## MONITORING 101

Essentials of getting it right onstage with consistency

by Craig Leerman

IT CAN BE TOUGH performing live on a stage – all the noise, Noise, NOISE. This is the first thing in my mind when doing stage monitoring because too much noise can compromise performances and presentations. It's hard to be at your best when you can't hear, let alone think, due to a sonic assault, and no amount of magic monitor mixing or technique is going to fix it.

The noise comes from everywhere. The backside of the house mains. The subwoofers. Various (and numerous) delayed signal reflecting back from the house. Stage sources. The audience. There's only so much we can do, but minimizing stray energy on stage is a top priority, and then comes the work of devising a monitoring approach that's best for the performers and production.

When setting up the house system, placement and people are the keys. Placement is where the main loudspeakers are stacked or flown, and people

refers to the performers and the audience – we need to serve both. If possible, the loudspeakers shouldn't be too close to the stage, helping keep their excess energy off the stage while still insuring they fully cover the audience. Flying/stacking them even a few feet forward can make a significant difference. (Also

try to keep their output off of reflective surfaces in the room.)

Loudspeakers on delay further out in the house, as well as front fills, are a good way to get even coverage throughout the listening area without having to crank up the mains too high. Digitally steerable arrays, which my company deploys regularly for both music performances and corporate events, provide an extra degree of welcome control. Cardioid and end fire configurations for the subs can help direct their energy outward rather than backward.

### VARIOUS APPROACHES

Now it's time to turn our attention to the stage monitoring needs of the performers. Wedges, in-ear monitors, stage fills, or a combination? It's a direction determined by the specific gig, performer preferences, and what we (and perhaps the venue) have available in terms of gear. Everything but in-ear monitoring increases the noise quotient, but that's usually (and simply) the reality; plus, some artists like amped-up monitoring.

Over the past several years, a wide range of active 2-way boxes have hit the market with cabinets offering a monitoring angle. They're quite useful in being able to perform wedge, stage fill and small system main duties. Onboard



Welcome to the hot seat, otherwise known as monitor beach.



DSP means they can be optimized for the specific application. We're also seeing more active options with traditional wedges. Active does require both a signal and power cable, but there are now options offering both within the same jacket, which can help reduce clutter. Otherwise, the choice is passive wedges and loudspeakers. They can also be bi-amped (2-way, lows and highs) or tri-amped (3-way, lows, mids, highs), requiring separate amp channels for each section, and may also require an external crossover or processor. Active or passive, options include:

- **Mini/personal monitors.** Designed to be used very close to a performer, they can be located on the floor, placed on an instrument like a keyboard, or mounted on a microphone stand. The object is to enhance certain parts of the mix (i.e., the vocal), not usually provide the entire mix.
- **Standard wedges.** Purpose designed and positioned on the floor in mono or sometimes stereo configuration. The most popular types are 2-way designs with a 10-, 12-, or 15-inch woofer and a 1-, 1.5- and 2-inch compression driver mounted on a horn. This category also includes the previously mentioned active loudspeakers. And, a popular variation are coaxial designs that align the LF and HF drivers while occupying a smaller footprint.
- **Larger wedges.** Usually 3-way systems with a bit more thump and oomph, with the trade-off of being larger and heavier.
- **Drum boxes.** A specialty loudspeaker to reproduce low frequencies to help drummers better hear the kick (and sometimes bass guitar).
- **Drum fills.** A single larger loudspeaker, or a group of loudspeakers, to better serve the drummer. Often accompanied by a sub for extra thump.



- **Side fills.** Also called stage fill, loudspeakers at the sides of the stage, often joined by subwoofers, to augment the output of the wedges and/or IEMs. Some bands prefer side fill exclusively.
- **Stage subs.** Smaller subs used underneath or alongside a wedge to help augment LF, and these can also be deployed as part of the drum fill or side fill.

These options can be used alone or in any combination, and with IEMs. Just remember, the more loudspeakers on stage, the louder it's going to be, and there's increased chance of feedback, both in general and if stationary mics aren't carefully placed. Plus more boxes can clutter the stage.

### MAKING IT PERSONAL

Some performers love IEMs, others won't use them, still others are in between, wearing them in tandem with monitoring via loudspeakers. Obviously IEMs cut stage noise and can protect hearing (if they're not abused) through isolation. A lot of drummers prefer to wear headphones for further isolation.

Earbud options range from generics with replaceable tips of either foam or plastic to custom units molded for the user's ears. The key is getting a good fit to provide adequate isolation as well as enough comfort so they can be worn for the duration of a show. IEM/personal monitoring systems are usually wireless, with the performers wearing a small belt pack receiver with volume control. Wired systems are a less expensive option for relatively stationary musicians.

Systems are available in mono or stereo, the latter being the more popular choice. One way to deal with performers feeling too isolated is to add some ambience from the audience into their mixes, captured via an audience microphone or two placed on stage and pointed at the crowd, or flown/placed on stands in the audience area (or front of house).

Several personal mixing systems provide individual mini mixers to performers so they can tailor their own mixes. And a cool recent development is that many digital consoles/mixers now work with custom apps that allow performers to tailor their mixes via tablet or smartphone. Make sure these onstage devices can only access the one mix, and not

## :: Gig School ::

affect other monitor mixes (or the house mix) by accident.

I mentioned that IEMs offer hearing protection via isolation, but keep in mind that they shouldn't be turned up too loud. (Kind of defeats the whole purpose.) Also note that a squeal of feedback or loud thud from a dropped mic can be damaging to hearing, so compression and limiting, even brick wall limiting, may be needed to control any unexpected spikes.

### SHARED LABOR

Some shows may just use a few aux sends from the house console to feed the monitors. This can work well for smaller gigs with simple monitoring requirements, but on larger shows, a monitor console is necessary. It should be manned by a dedicated operator, and is usually placed



A very clean deployment of monitors and fills.

stage side in sight of the performers.

Inputs are shared between the consoles via a split snake in an analog transport system or just grabbed off the network in a digital transport system. The better analog splitters use transformers between the consoles to

eliminate hum or buzz, but hard-wired splits can work OK if the system has no grounding and noise issues.

Monitor engineers can make use of a cue wedge at the console to hear each mix if there are wedges used onstage, or they may use IEM to cue up each mix and hear

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what the performers hear. Many digital consoles allow remote control via tablet, a boon for engineers because they can stand onstage next to performers during sound check and fine tune their mixes.

### LESSONS LEARNED

I'll conclude with some tips that I've picked up over the years in working with

monitoring over the years.

**Acoustic Aiming Devices.** I always carry some AADs (black painted pieces of wood) to tilt wedges to put the performers into the coverage pattern. If they can't hear it clearly, they'll want more volume.

**Shakers.** Some performers (drummers in particular) want to really feel the

low end, and a seat shaker (a.k.a., butt kicker) can provide this while eliminating the need to add subs. They can also be used with smaller wedges to keep down stage volume.

**Directional Subs.** With monitor engineers usually at the side of the stage, the wash from the side fill subs can be problematic. A cardioid approach with these subs can help, and some manufacturers offer single cardioid units.

**Parametric.** Not every problematic tone falls right on the center frequencies, so parametric equalizers deliver added (and needed) precision.

**Backup Wedge.** Even if all performers are on IEMs, having an extra wedge comes in handy for use with announcers, guest artists and audience members brought onstage, as well as for talkback communication and in case an IEM system goes south.

**Identification.** Label all wedges with their respective mix numbers. It's way easier and clearer for a performer to ask for more cowbell in mix 9 than ask for more "in that box." Also label all IEM belt packs with mix numbers and performers names so they don't accidentally grab the wrong pack.

**Better Reception.** Deploying quality antennas with IEM systems can help eliminate dropouts and other RF problems. Directional "paddle-style" (a.k.a., log-periodic dipole array) antennas can provide up to 6 dB of gain and Helical antennas can provide up to 10 dB.

**In The Pan.** Stereo IEM mixes have more depth and are easier to listen compared to mono. I place performers center in their own mixes and pan the other instruments to the left and right (depending on where those instruments are onstage). And we tailor it together from there... ■

*Senior contributing editor CRAIG LEERMAN is the owner of Tech Works, a production company based in Las Vegas.*

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## Brilliant Execution

Exceptional applications of audio technology

by *Live Sound Staff*

A LOOK AT SOME of the many recent sound reinforcement projects of note from around the globe.

### MARC ANTHONY IN THE ROUND

At the request of front of house engineer Jose Rivera, Meyer Sound LEO and LYON linear line arrays were deployed for Marc Anthony's recent mini tour of North America, including 360-degree productions in New York and New Jersey. VER Tour Sound provided the systems for all shows.

The largest deployment was at the Prudential Center in Newark, with eight main hangs each comprised 10 LEO-M, four LYON-M main, and two LYON-W wide-coverage line array loudspeakers. Sixteen MICA loudspeakers served as front fills, with cardioid configurations of eight—each 1100-LFC low-frequency control elements at each stage corner.

"I was concerned about the time it would take to fly the system for the 360-degree shows, but everything was up in the air by noon," says Rivera. "That's very impressive." The system was tuned and driven via a Galileo Callisto loudspeaker management system with 13 Galileo Callisto 616 and four Galileo Callisto 616 AES array processors.

"Everybody was extremely happy with the performance of LEO and LYON, both on stage and throughout the audience," reports Rivera, who first used LEO at a stadium concert in Peru. "The overall sound was very transparent and open. Vocal intelligibility was impressive, and the separation of instruments made it easy to achieve clarity in the mix."

### MONITORS FOR MASSIVE ATTACK

Engineer Paul Hatt utilized a Soundcraft Vi4 console to mix monitors for the recently concluded international tour by musical duo Massive Attack. Hatt also deployed a 32-channel Soundcraft Compact Stagebox for the input extension beyond the fully loaded Vi stage rack, plus a 64-channel Soundcraft Stagebox for additional inputs.



Meyer Sound LEO and LYON in the round for Marc Anthony.

"The shows we do are dynamic and scene-heavy from a mixing perspective," says Hatt. "Everyone is on IEMs and there are two drum kits, acoustic and electric, the latter providing what can be quite radically different triggered sounds from one song to the next. It's actually been great on this tour to really get a bit deeper into the snapshot capabilities of the Vi4. I've used this desk as a layered analog console for years, but now I've had the chance to deal with it on a more technical level, and I've been very pleased with the results."

He also had the chance to use a Soundcraft Realtime Rack over the course of the tour, providing UAD studio plug-ins to the Soundcraft platform while its SHARC-based processors



Soundcraft Vi4 ready for monitor duty with Massive Attack.



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Hey Marsailles, Nectar Lounge, Seattle, WA, 09.17.2014

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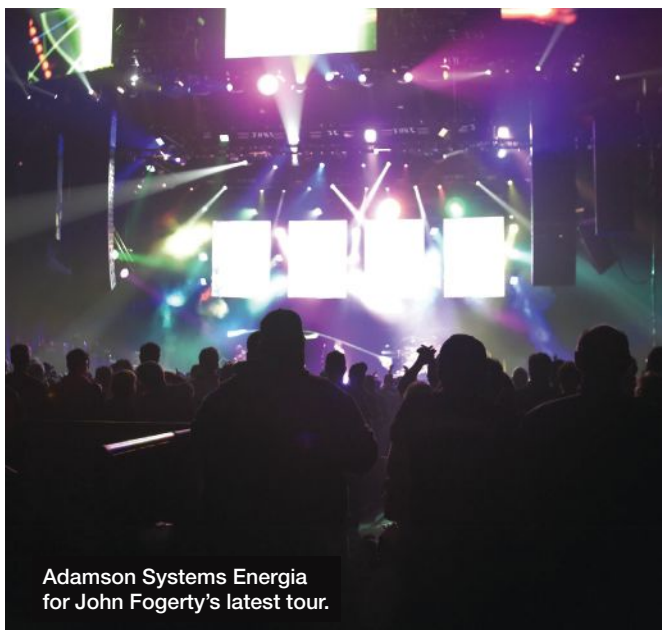
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## :: World Stage ::



Adamson Systems Energia  
for John Fogerty's latest tour.



Fred Vogler (seated)  
and Kevin Wapner at  
Walt Disney Concert  
Hall's new DiGiCo SD5  
house desk.

run audio over MADI.

“The Realtime Rack gives me a blank canvas to introduce some very high-end plug-ins to the mix,” Hatt notes. “Though I’m only scratching the surface of this technology on this tour, it’s a very elegant solution, and the more I use it the more I like it. Ultimately, it hooks up easily via MADI connections and is a very exciting addition to the Vi environment.”

### A LEGEND MAKES A CHANGE

The legendary John Fogerty’s recent tour marked a departure from his regular audio system of many years, this time going on the road with an Adamson Systems Energia PA provided by Atomic Pro Audio (Rutland, VT).

The main system, under the direction of system tech George Perone of Atomic Pro Audio, usually consisted of up to 32 E15s for the main arrays and 20 E12s for out fill. Twelve E218 subs were flown – six per side – while 10 E219s were ground stacked (5 x 2) placed equidistant across the width of the stage. Ten SpekTrix modules for front fill completed the package.

Fogerty is known for his attention to detail, particularly when it comes to the audio system. He regularly walks the room working with the system tech, production manager Tim Schad, and front of house engineer Felix Brenner to make sure that all seats in the house are being delivered quality sound reinforcement.

“The move to the E15 rig is a huge change – it sounds so good John doesn’t comment on system tuning anymore. It completely eliminates the need for me to walk the room with him and the system tech, freeing up valuable time,” Schad says. “He basically just works with drummer Kenny Aronoff on his snare sound for the day, then gives George a thumbs

up and heads to the stage – we are all very, very happy with the new Energia PA.”

### UPGRADING A CONCERT HALL

The Music Center in downtown Los Angeles has upgraded its front of house and monitor mixing consoles at 2,252-seat Walt Disney Concert Hall to fiber-networked DiGiCo digital consoles. ATK AudioTek (Valencia, CA) supplied and installed an SD5 at front of house, an SD10 at the monitor position, and a shared SD Rack at the hall, one of four venues that comprise The Music Center campus that opened in 1964.

“With our success at the Hollywood Bowl using DiGiCo, we considered the consoles pretty seriously when it was time to look at what we could do for the concert hall,” explains Fred Vogler, principal sound designer and mixer for LA Philharmonic. “We wanted a desk that was easy to use, had good input/output flexibility, and provided future expandability. It also made sense for us to have the same type of consoles at the summer home of the LA Phil when we’re at the concert hall during the winter season.”

The resident concert hall engineers, Randy Piotroski (front of house) and Leland Alexander (monitors), make extensive use of the DiGiCo system’s snapshot capabilities, according to Kevin Wapner, the hall’s head of audio/video: “We have starting templates, because the distribution of the PA is so complex, and we don’t want to reinvent it for each show.”

Snapshot templates have been defined for the concert hall’s Symphonies for Schools schedule; Casual Fridays, which includes a Q&A session between the artists and the audience; jazz and other amplified ensembles; choral and opera performances; and other events.



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## :: World Stage ::



### ABATING NOISE AT THE ZOO

Over the past three years, Entertainment Installations has been supporting the Twilight at Taronga summer concert series in Sydney (Australia) with production services, including a sound reinforcement system that's now headed by Martin Audio MLA Compact arrays.

Held in the middle of the Taronga Park Zoo, off-site noise had been an issue with the animals as well as residences in the vicinity.

Although Equipment Installations managing director Neale Mace first introduced MLA Compact to his inventory two years ago, he has been running the company's the Wavefront W8C Compact system before moving onto a conventional W8LC line array.

But in switching to MLA technology this year, he says that the traditional sound escape problems have disappeared. "MLA's ability to fit the audio to a designated area, with very little audio beyond that space, is a revelation for this event, coupled with the fact that it sounds amazing," he states. "There's an 85 dB limit at the perimeter, but with MLA Compact we can achieve this and still reach 100 dB at the front of house desk."

Entertainment Installations rigged eight MLA Compact elements per side in the PA towers on 1-ton chain blocks. Three DSX subs were stage-stacked each side under the main hangs. "The towers aren't totally weatherproof and this is another reason that the MLA Compact works here – it's weatherized," Mace adds.



## WIRELESS MIXING FROM ANYWHERE

Long before wireless digital console control was an option, independent front of house engineer Richard Forte created his own, rigging a system using a computer and USB. So it shouldn't be surprising that Forte has recently adopted a Mackie iPad-controlled, rack-mount DL32R digital mixer.

"I wanted a platform that was designed from the ground up to physically do what I need to do most of the time, which is to go wireless," Forte explains. "The DL32R is the first digital console I've used that offers a purpose-built app for wireless control, with full iOS control of every parameter on the desk."

Based in Montreal, and noted for his work with artist Nikki Yanofsky, Forte has mixed live events for more than 35 years, including a host of international tours and high-profile corporate events. "I have a 64-channel rig, and I do some pretty large-scale shows, but that's overkill for a lot of clients," he says. "With the DL32R, instead of bringing out a van full of gear, I can offer an affordable, 32-channel rig I can fit into a flight-case-style briefcase."

The ability to control the system wirelessly with the Mackie



Richard Forte mixing wirelessly with the Mackie Master Fader app.

Master Fader app has made Forte's work easier. "Obviously, the ability to mix from anywhere is something I've long appreciated," he notes. "Space can be at a premium with corporate gigs, but with no need for a mixing station, I don't worry about that. I can even set up the DL32R onstage so we don't need to run a snake. And the sound quality is pro all the way." ■

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# Audio-Technica System 10 PRO

Checking out a new 2.4 GHz wireless microphone system *by Craig Leerman*



THE NEW AUDIO-TECHNICA System 10 PRO digital wireless system (not to be confused with the System 10, released a couple of years ago) offers numerous advanced features, including dual channel units, the ability to remotely locate the receivers/antennas, rack-mounting, and a total of 10 units that can be used together.

A durable metal body, half-rack-sized chassis unit can house two receiver units, and the receivers can also be located up to 328 feet away from the chassis, linked via standard Ethernet cable. Each receiver comes with a remote housing that also allows it to be securely wall mounted. Because the antennas are located on each receiver, this allows the user to place them in an optimal position while securing the chassis in a rack.

In addition, up to five chassis (10 receiver units) can be linked using an included RJ12 cable, creating a multi-channel system with simultaneous use of up to 10 channels without the need for frequency coordination or group selection issues.

The System 10 PRO operates in automatically selected frequencies in the 2.4 GHz ISM band, providing digital 24-bit/48 kHz wireless operation. Every time a receiver/transmitter pair is powered on, they automatically select clear frequencies and also have the ability to change transmitting frequencies automatically during power-up or performance if interference is encountered.

Three levels of diversity assurance are provided: frequency, time, and space. Frequency diversity sends the signal on two dynamically allocated frequencies for interference-free communication. Time diversity sends the signal in multiple time

The Audio-Technica System 10 PRO digital wireless system.



slots to maximize immunity to multipath interference. Space diversity uses two antennas on each transmitter and receiver unit to enhance signal integrity.

## PLENTY OF OPTIONS

Systems are available configured as either single- or dual-channel, and with handheld and belt pack transmitters (or one of each). My test system was the ATW-1312 package, which includes two ATW-RU13 receivers, an ATW-RC13 chassis, an ATW-T1001 UniPak body pack and an ATW-T1002 Unidirectional handheld.

Out of the box the first thing I noticed is the ruggedness of the dual-receiver chassis. Because it's a half-rack unit, up to four channels of wireless can now be had in a single rack space. If you're constantly running out of rack

space (like me), that's a great feature. The receivers easily plug into the chassis, and pop out by pushing a button.

And as noted earlier, the receivers and their antennas can be remotely mounted with the included holders that are designed to mount to a flat surface like a wall, but I'm sure the more resourceful types among you will have no trouble adapting the housings to fit on a microphone stand or other support. The bottom line is that it's no problem to mount them for line of sight with the transmitters.

Operating in the 2.4 GHz, there's no concern about TV station interference or other production wireless systems. Note, however, that routers can generate interference, so it's best not to locate the receivers within about 30 feet of a wireless access point.



The ATW-T1001 body pack is light but the plastic body is rugged, taking a pair of AA alkaline batteries. My system was supplied with an MT830cW omnidirectional condenser lavalier mic, with headworn, instrument, and guitar cables also available from A-T. The ATW-T1002 handheld transmitter is also powered with dual AA alkalines. I really like the recessed single switch at the base of the mic in helping to thwart inadvertent muting or turn off.

## SETTING UP

Hooking up the system was a breeze. The rear chassis offers both XLR and 1/4-inch outputs as well as output volume, a ground switch for each channel, and a power supply jack. There are also jacks for running the receivers remotely and for linking up the units. The very skinny wall-wart power supply does not block adjacent outlets.

The front of the chassis includes a power switch, central screen, pair and ID buttons, and the two docks for the receivers. It was easy to pair the receiver to the mic. Assign the channel an identity from 1 to 10, press the pair button on the receiver, then press the pair button on the transmitter within 30 seconds, and they link. The screen displays RF strength, transmitter battery strength and signal with clip light.

Having evaluated the body pack in a previous Road Test, this time I focused on the handheld transmitter. It's a nice looking unit with a plastic body, and feels comfortable in the hand. The element is dynamic with a cardioid pattern. The transmitter is rated at 10 mW of output, with battery life for normal usage rated at 7 hours. There's a window on the side of the body that displays the ID channel as well as LEDs for active (green) and mute (red).

Unscrewing the battery cover reveals the pair button and adjustable input level control. A small screwdriver is provided that stores in the transmitter (same for the belt pack) to adjust the recessed input trim.



The receivers easily slide in and out of the half-rack chassis.

The mic sounds very good, with excellent off-axis rejection. While it's stated as a cardioid, I found the pattern to be a little more narrow, which I like. I tested the range in my shop and had no dropouts even with rows of loaded pallet shelving in between the transmitter and receiver. Satisfied that everything was working correctly, I packed up the system and took it out to a few shows.

## DIVERSE APPLICATIONS

First up was a day-long trade expo at a hotel ballroom with a variety of entertainment, including comedians, game shows, solo and duo acoustic artists, and bands. We employed the System 10 PRO as the main announcer mic, also providing it for the comedians and the lead singers of the bands. The mic sounded great no matter who used it, including folks who "cupped" the mic head.

After five hours we still had a bar of battery life left, but swapped in fresh batteries because it was a 10-hour event. A few performers stepped into the audience area in front of the main PA during their sets but there were no issues with feedback.

Next we utilized the System 10 PRO with a female singer at a fundraising concert. Her repertoire consisted of everything from ballads to show tunes to pop and rock. At sound check it was easy to get a good sound with her voice and it required way less EQ than the hard-wired backup mic placed onstage "just in case." She commented on the great sound quality, and the RF performance was rock solid.

Finally, we used the system as the primary announcer mic at the Live Sound Loudspeaker Demo at the recent USITT show in Cincinnati, held in a

very large ballroom at the downtown convention center. A quick scan of the airwaves showed that the 2.4 GHz spectrum was extremely crowded (like it is at every convention center), so we decided to remotely locate the receiver and antennas a bit closer to where I would be using the mic. The receiver/antenna unit was attached (with gaff tape) to an upright drape pole on an exhibitor's booth, linked via a 30-foot Cat-5 cable to the chassis at front of house.

We didn't have any drop-out issues until I was more than 100 feet away from the receiver, which was more than enough distance to walk around the area and present the loudspeakers to the audience. At a standard gig, the receiver would be located next to the stage, with the transmission distance at about 40 feet or so.

Some of the participating manufacturers also used the system during their individual demonstrations, which generated nothing but compliments regarding the sound quality. It's hard to think of a tougher test for a digital wireless system than operating in a packed downtown convention center with dozens of discerning audio professionals on hand.

So if you're looking for a versatile wireless system with high sonic quality and solid RF performance, and at a price that won't break the budget and still capable of problem-free operation after the next round(s) of FCC spectrum auctions, then put the System 10 PRO at the top of your list.

*U.S. estimated street pricing: \$429-\$899, depending on configuration. ■*

*Senior contributing editor CRAIG LEERMAN is the owner of Tech Works, a production company based in Las Vegas.*

# Dynamics & Condensers

A variety of microphones for instruments and vocals. *by Craig Leerman*

»»»» MICROPHONES COME IN A WIDE VARIETY of shapes and sizes, but many of us typically categorize them in two basic groups: vocals and instruments. And the truth is that many models can excel at either task.

Take the ubiquitous Shure SM57. It's a "go-to" instrument mic found in almost every live and studio mic kit yet it also handles vocals and speech quite well. Ever see the podium for the president of the United States? It's long incorporated a pair of SM57s in a VIP dual holder, so every presidential administration since Lyndon B. Johnson has deployed an (gasp) instrument mic for voice. (Or maybe the rest of us have been using a podium mic on snares, toms and guitar amps for decades...)

Multipurpose models may also have switches to adjust the response for specific uses. A low-cut or "roll-off" switch is a popular feature that can help reduce bass frequencies. Other models offer switches that further tailor the response for a particular instrument, such as kick drum.

Mics that are optimized for a particular application are also great to have in the kit. They can really shine in helping to fully and more accurately capture a specific sound. For example, a large-diaphragm, bulky mic with a built-in stand mount designed for kick drum will probably be a better choice in that role than a general purpose model.

Dynamics and condensers are by far the most popular types for live applications. Dynamics work on the principle of electromagnetic induction, similar to loudspeakers but in reverse. Because the diaphragm is physically attached to a voice coil, it may not be quite as responsive with higher pitched and softer sounds, but dynamics offer plenty of pick-up for vocals and instruments, along with the requisite ruggedness.

Condensers have gained in popularity in the live world, with many newer models robust enough to withstand abuse. The diaphragm, which can be lighter and thinner in comparison to a dynamic, is not connected to a coil mass. It responds to transients and higher frequencies very well, but a power source (phantom power or batteries) is needed. Ribbons suspend a very thin aluminum diaphragm between two strong magnets.

The vast majority of vocal and instrument mics are unidirectional, with pickup patterns including cardioid, supercardioid and hypercardioid. In general, they reject sounds from directions other than the front (at various degrees), and this is highly desirable given all of the noise on a typical stage as well as from the house.

Cardioids are more forgiving to a singer's technique and the angle at which the mic is addressed. Supercardioids are more focused to favor sounds from the front and have greater attenuation at their sides – about 10 dB – exhibiting minimum sensitivity 140 to 150 degrees off-axis, with a minor secondary response lobe at their rear. Hypercardioids are even slightly more focused and distinguished by minimum response 110 to 120 degrees off-axis at the expense of a slightly larger rear lobe.

What the sensitivity rating tells us is the loudness of the mic's output. The lower the negative dB number, the louder



the output. For very soft instruments, choosing a mic that has a louder output may keep you from having to crank up the preamp and raising the noise floor on that channel.

The best advice is to trust your ears over anything else. Also work with positioning because any mic's location in relation to the sound source can be a critical factor in how it sounds. Enjoy this Real World Gear look at recent dynamic and condenser models of many types for vocal and instrument applications. Our list is by no means all-inclusive but can serve as a starting point for your own investigation.

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*Senior contributing editor* CRAIG LEERMAN *is the owner of Tech Works, a production company based in Las Vegas.*



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**AE5400**

**Format/Style:** Handheld vocal  
**Transducer Type:** Condenser (externally polarized)  
**Polar Pattern:** Cardioid  
**Frequency Response:** 20 Hz–20 kHz  
**Sensitivity:** -40 dB (10 mV, re 1V at 1 Pa)  
**Maximum SPL:** 157 dB SPL (with 10 dB pad, nominal)



**ATM250DE**

**Format/Style:** Stand-mount instrument  
**Transducer Type:** Dynamic/condenser dual-element  
**Polar Pattern:** Hypercardioid (dynamic)/cardioid (condenser)  
**Frequency Response:** 40 Hz–15 kHz/40 Hz–20 kHz  
**Sensitivity:** -53 dB/-49 dB  
**Maximum SPL:** 148 dB (condenser)

**Shure** >> [www.shure.com](http://www.shure.com)

**KSM9HS**

**Format/Style:** Handheld vocal  
**Transducer Type:** Dual-diaphragm condenser  
**Polar Pattern:** Switchable hypercardioid/subcardioid  
**Frequency Response:** 50 Hz–20 kHz  
**Sensitivity:** -50.5 dB  
**Maximum SPL:** N/A



**BETA 56A**

**Format/Style:** Compact instrument microphone  
**Transducer Type:** Dynamic  
**Polar Pattern:** Supercardioid  
**Freq. Response:** 50 Hz–16 kHz  
**Sensitivity:** -51 dB  
**Maximum SPL:** N/A

**Countryman** >> [www.countryman.com](http://www.countryman.com)

**I2**

**Format/Style:** Miniature multipurpose instrument  
**Transducer Type:** Condenser  
**Polar Pattern:** Omni, cardioid, hypercardioid, bidirectional  
**Freq. Response:** 20 Hz–20 kHz (omni), 50 Hz–20 kHz (directional)  
**Sensitivity:** -57 dB  
**Maximum SPL:** 150 dB



**H6**

**Format/Style:** Headset vocal  
**Transducer Type:** Condenser  
**Polar Pattern:** Omni, cardioid or hypercardioid  
**Frequency Response:** 20 Hz – 20 kHz (omni) / 30 Hz – 15 kHz (directionals)  
**Sensitivity:** -43 dB/-54 dB/-63 dB (omni W5, W6, W7)  
**Maximum SPL:** 120 dB/130 dB/140 dB (omni W5, W6, W7)



**AKG** >> [www.akg.com](http://www.akg.com)

**D12 VR**

**Format/Style:** Instrument (kick drum in particular)  
**Transducer Type:** Dynamic  
**Polar Pattern:** Cardioid  
**Frequency Response:** 17 Hz–17 kHz  
**Sensitivity:** -74 dB  
**Maximum SPL:** 164 dB



**C535 EB**

**Format/Style:** Handheld vocal  
**Transducer Type:** Condenser  
**Polar Pattern:** Cardioid  
**Frequency Response:** 20 Hz–20 kHz  
**Sensitivity:** -43 dB  
**Maximum SPL:** N/A



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DPA's d:fine headset microphones set the standard when it comes to headworn microphone applications. The d:fine series offers both omni and cardioid miniature microphone solutions for performing talent of all types. A natural response ensures you hear the natural sound of the voice right away – not the mic. The d:fine series also tackles the challenges of acoustically demanding live performance environments, eliminating concerns about background noise and feedback. A smooth, elegant design makes the d:fine headset the most concealable and comfortable headworn mic available.

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**KEY SPECIFICATIONS**

**DPA d:facto II**  
**Format/Style:** Handheld vocal microphone  
**Transducer Type:** Condenser  
**Polar Pattern:** Supercardioid  
**Frequency Response:** 100 Hz – 16 kHz (with 3 dB soft boost at 12 kHz)  
**Sensitivity:** -46 dB  
**Maximum SPL:** 160 dB



**TECHNOLOGY FOCUS:** The d:facto has the ability to adapt to all major wireless systems. It also has a built in rubber shock-mount to decrease handling noise and a high quality triple-stage pop filter to nearly eliminate pops and plosives.

**KEY SPECIFICATIONS**

**DPA d:fine**  
**Format/Style:** Headset/headworn vocal microphone  
**Transducer Type:** Condenser  
**Polar Pattern:** Both omnidirectional & cardioid available  
**Frequency Response:** 20 Hz – 20 kHz  
**Sensitivity:** -44 dB  
**Maximum SPL:** 144 dB



**TECHNOLOGY FOCUS:** The modular design allows for parts to be added or replaced, and it can be worn on either the right or left ear, as well as changed from single-ear to dual-ear and vice versa. The d:fine series now offers DPA's classic 4066 and 4088 capsules in addition to the new Broadcast models that come equipped with discreet in-ear drivers.

**Sennheiser** >> [www.sennheiserusa.com](http://www.sennheiserusa.com)

**e965**

**Format/Style:** Handheld vocal  
**Transducer Type:** Condenser  
**Polar Pattern:** Switchable cardioid/supercardioid  
**Frequency Response:** 40 Hz–20 kHz  
**Sensitivity:** -43 dB  
**Maximum SPL:** 142 dB



**e906**

**Format/Style:** Side-fire instrument  
**Transducer Type:** Dynamic  
**Polar Pattern:** Supercardioid  
**Frequency Response:** 40 Hz – 18 kHz  
**Sensitivity:** -53 dB  
**Maximum SPL:** N/A



**Electro-Voice** >> [www.electrovoice.com](http://www.electrovoice.com)

**RE320**

**Format/Style:** Multipurpose vocal or instrument  
**Transducer Type:** Dynamic  
**Polar Pattern:** Cardioid  
**Freq. Response:** 30 Hz (or 40 Hz depending on switch setting) – 18 kHz  
**Sensitivity:** -52 dB  
**Maximum SPL:** N/A



**RE510**

**Format/Style:** Handheld vocal  
**Transducer Type:** Condenser  
**Polar Pattern:** Supercardioid  
**Freq. Response:** 50 Hz–20 kHz  
**Sensitivity:** -52 dB  
**Maximum SPL:** N/A





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**Telefunken M60 FET & M82**

[www.t-funk.com](http://www.t-funk.com)

The M60 FET (Field Effect Transistor) small diaphragm microphone is TELEFUNKEN's first non-vacuum tube, FET-based solid-state condenser model.

This re-interpretation of the classic FET mic amplifier produces an exceptional transient response and SPL handling capabilities. Carefully selected and tested components are hand-plugged into gold-plated circuit board traces to provide an ultra-clean true Class A discrete amplifier with a frequency response of +/- 2 dB from 20 Hz to 50 kHz.

Meanwhile, the M82 end-address dynamic mic offers two separate EQ switches – KICK EQ and HIGH BOOST, which yield four unique settings, giving the user the ability to tailor the response to the source with ease. Though it was designed with the kick drum as a primary application, where it is both fat and punchy, the two EQ switches make the M82 equally suited for a multitude of sources such as vocals, percussion, broadcast voice, guitar and bass amplifiers, organ, and brass instruments.

**KEY SPECIFICATIONS**

**TELEFUNKEN M60 FET**  
**Format/Style:** Field Effect Transistor small diaphragm  
**Transducer Type:** Condenser  
**Polar Pattern:** Cardioid  
**Frequency Response:** 20 Hz-20 kHz  
**Sensitivity:** -41 dB  
**Maximum SPL:** 130 dB  
**TECHNOLOGY FOCUS:** The output is matched with a custom transformer that offers very low self-noise and typical THD+N of 0.015 percent or better. TK61 omnidirectional and TK62 hypercardioid capsules also available.



**KEY SPECIFICATIONS**

**TELEFUNKEN M82**  
**Format/Style:** End-address instrument & vocal microphone  
**Transducer Type:** Dynamic (moving coil)  
**Polar Pattern:** Cardioid  
**Frequency Response:** 25 Hz – 18 kHz  
**Sensitivity:** 1.85 mV/Pa  
**Maximum SPL:** >146 dB  
**TECHNOLOGY FOCUS:** The large 35 mm diaphragm provides superb low frequency capabilities. When placed just inside the hole of the resonant kick drum head, the M82's tailored frequency response captures both the beater attack and shell resonance without the need for multiple mics.



**Earthworks >> [www.earthworksaudio.com](http://www.earthworksaudio.com)**

**WL40V**

**Format/Style:** Wireless capsule (for handheld)  
**Transducer Type:** Back-electret condenser  
**Polar Pattern:** Hypercardioid  
**Frequency Response:** 30 Hz-40 kHz  
**Sensitivity:** Dependent upon wireless system  
**Maximum SPL:** 135 dB



**DP30/C**

**Format/Style:** Drum "periscope" for snare/toms  
**Transducer Type:** Condenser  
**Polar Pattern:** Cardioid  
**Frequency Response:** 30 Hz-30 kHz (±2 dB at 6 inches)  
**Sensitivity:** -40 dB  
**Maximum SPL:** 145 dB

**Carvin >> [www.carvin.com](http://www.carvin.com)**

**M68**

**Format/Style:** Handheld vocal  
**Transducer Type:** Dynamic  
**Polar Pattern:** Cardioid  
**Frequency Response:** 45 Hz-15 kHz  
**Sensitivity:** -74 dB  
**Maximum SPL:** N/A



**CTM100**

**Format/Style:** Instrument microphone  
**Transducer Type:** Condenser  
**Polar Pattern:** Multi-pattern  
**Frequency Response:** 20 Hz-20 kHz  
**Sensitivity:** N/A  
**Maximum SPL:** 125 dB





## Point Source Audio SERIES8

[www.point-sourceaudio.com](http://www.point-sourceaudio.com)

Since their introduction, SERIES8 miniature microphones have seen wide adoption from distinguished users such as the New York Philharmonic at Lincoln Center, Universal Studios, Chase Oaks Church, the Kravis Center, Shiki Theater Company Tokyo, and many others.

“Our old headsets were continually snapping. It was very frustrating,” recounts Kevin Sanchez, audio engineer at Chase Oak, a megachurch in Plano, TX, before discovering Point Source Audio’s SERIES8 and its proprietary Unbreakable Boom. “The help I received from PSA’s customer support CHAT just blew me away,” he adds. “Every question I asked came back with a ‘yes’ and a ‘here’s how you can do it’.”

The CO-8WD is part of the SERIES8 collection of miniature headset, earworn and lavalier mics. Its flagship 360-degree bendable boom is one of four features in a unique combination with the omnidirectional mics’ IP57 waterproof rating against water, sweat and makeup, 148 dB max SPL, and interchangeable X-connectors for swapping wireless terminations.

### TECHNOLOGY FOCUS

The headset offers the ability to reverse for left or right ear wearing, with the ear hooks folding flat for compact and well-protected storage and travel. The boom bends a full 360 degrees. Each mic comes with an X-Connector of the user’s choosing for connection to a range of popular wireless systems. Available in beige or black.

### OF NOTE

It was from user accounts like that from Kevin Sanchez that resulted in Point Source Audio winning the Worship Facilities 2014 Best Microphone Award last October. The CO-8WD headset microphone was selected based on a two-part evaluation of the product’s attributes, design, and functionality, as well as its impact and benefits to the church market.



### KEY SPECIFICATIONS

**Model:** CO-8WD  
**Format/Style:** Headset vocal  
**Transducer Type:** Back Electret Condenser  
**Polar Pattern:** Omnidirectional  
**Frequency Response:** 20 Hz–20 kHz  
**Sensitivity:** - 43dB  
**Maximum SPL:** 148 dB

### beyerdynamic M 88 TG >> [www.beyerdynamic.com](http://www.beyerdynamic.com)

**Format/Style:** Multipurpose vocal and instrument  
**Transducer Type:** Dynamic  
**Polar Pattern:** Hypercardioid  
**Freq. Response:** 30 Hz–20 kHz  
**Sensitivity:** -50 dB  
**Maximum SPL:** N/A



### Neumann KK 204/KK 205 >> [www.neumannusa.com](http://www.neumannusa.com)

**Format/Style:** Capsules for Sennheiser 2000 wireless transmitters  
**Transducer Type:** Condenser  
**Polar Pattern:** Cardioid/Supercardioid  
**Frequency Response:** 40 Hz–20 kHz  
**Sensitivity:** - 51 dB  
**Maximum SPL:** 150 dB



### Audix SCX25A >> [www.audixusa.com](http://www.audixusa.com)

**Format/Style:** Side-address instrument  
**Transducer Type:** Condenser  
**Polar Pattern:** Cardioid  
**Frequency Response:** 20 Hz–20 kHz  
**Sensitivity:** -31 dB  
**Maximum SPL:** 135 dB



### Heil Sound PR 20 >> <http://www.heilsound.com>

**Format/Style:** Handheld vocal  
**Transducer Type:** Dynamic  
**Polar Pattern:** Cardioid  
**Frequency Response:** 50 Hz–18 kHz  
**Sensitivity:** -55 dB  
**Maximum SPL:** 145 dB



## Making Noise In Cincy

The LSI Loudspeaker Demo comes to USITT 2015.

by Live Sound Staff



Scenes from the LSI Loudspeaker Demo at USITT, held in an expansive ballroom with eight systems in the air and smaller systems on the ground. Attendance for the two-day event topped 500.



»»» THE POPULAR Live Sound International (LSI) Loudspeaker Demo, presented to thousands of attendees at recent WFX (Worship Facilities) Expos in Dallas and Atlanta, was invited to Cincinnati last month for the USITT 2015 Annual Conference & Stage Expo at the Duke Energy Convention Center.

More than 500 attended the two-day event, open to all audio professionals, church sound personnel and USITT (United States Institute for Theatre Technology) attendees, presenting the unique controlled environment offering side-by-side listening opportunities to evaluate 16 top loudspeaker systems,

in addition to getting further technical details and pricing information from qualified representatives of each company.

In a new wrinkle at USITT, each full demo session featured two parts: first, a focus on smaller systems, followed by a focus larger systems. In each part, all participating systems were played in a round-robin, random format, supplied with identical audio tracks. Listeners could move from system to system, evaluating what they were hearing and also observing each system's scale, components and other important details. Manufacturers also presented custom individual demo sessions on both days.



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The demo also included a focus on smaller, ground-based loudspeaker systems.

and video), and Yamaha Commercial Audio (QL Series console, Rio boxes).

USITT Stage Expo manager Ron Procopio notes that the organization was thrilled to be able to present this audio offering, calling loudspeaker demonstrations a rare commodity. "It takes a lot of logistical work and expense for the speaker manufacturers and organizers," he states. "Theatres, concert venues, event spaces, and houses of worship can all benefit by experiencing the different systems available to them in one location. This is the equivalent of having the super store come to you!"

USITT 2015 attracted a record 280 exhibitors, welcoming many companies new or returning after years away. The event filled some 45,000 square feet of the convention center.

The next LSI Loudspeaker Demo is slated for this coming November in conjunction with the WFX Expo 2015 in Nashville at the Music City Center, with all audio personnel invited to attend. This demo will feature demonstrations devoted to both larger and smaller systems. Keep an eye on ProSoundWeb for more details. ■





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## ML Procise, 1953-2015

Martin Luther ("ML") Procise III, legendary live engineer and executive director of touring for Clair Global, died peacefully in his sleep at his home in Dallas in early March at the age of 62.

Procise was a fixture in the live sound industry, beginning his work in the early days of Showco and enjoying a career that spanned more than four decades and 4,500 shows. He rightly earned a reputation as not only an innovator, but also a dedicated mentor



who introduced many of today's top engineers to the touring industry as young protégés.

Procise served as a live engineer for a roster of superstar artists that included Genesis, The Bee Gees, Michael Jackson and The Jacksons, The Beach Boys, ZZ Top, Guns 'N Roses, Green Day, Rage Against The Machine and Soundgarden. He also worked as senior VP of sales for Showco, prior to the company's acquisition by Clair in 2000. ■

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(John R. Borja, Engineering Consultant at Systems Integration Engineering & Sales)

*"This Carvin TRC600A setup actually sounds quite good. These sound every bit as good as the Italian-made array. How much are these again?"*  
(Sonny Maupin, Front of House engineer at the Palms Casino in Las Vegas, NV)



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### COMPANIES

► **Rational Acoustics** has announced upcoming training dates, including a 3-day session on April 21-23 hosted by Wigwam Acoustics at the **SSE Audio Group** facilities in Redditch, UK. **Jim Cousins** will be the instructor, covering Smart Operator Fundamentals and the System Alignment Practicum.

On May 4-7 at Tyrone Farm in Pomfret, CT, **Jamie Anderson** will be presenting Smart Operator Fundamentals and the System Alignment Practicum, with a fourth day dedicated to the new Multi-Channel Measurement Practicum, providing attendees with hands-on practice in setting up and controlling multi-channel Smart measurement configurations.

Additional training dates for May and June have also been set for Brazil, Spain, France, and Norway, as well as at



PRG in Secaucus, NJ. Find out more and register at [www.rationalacoustics.com](http://www.rationalacoustics.com).



▶ **Adamson Systems** has appointed **Anew Communications Technology**

(Anew C.T.) as its sales representative firm for the Southwest region of the U.S. The announcement was made by **Mick Whelan**, Adamson director of U.S. operations. Anew C.T. is headquartered in Colorado with a sales force covering nine Western states and offices located in strategic metropolitan markets throughout the region. (Members of the Anew C.T. team are shown in the accompanying photo.)

▶ **Stewart Independent Production** of Saugatuk, MI has added eight **RCF** TTL33-A line array modules and a dozen **RCF** TTS18-A subwoofers to its live sound inventory. The company also utilizes **RCF** HDL20-A line arrays.

"We had need for a small footprint, medium-format line array having tremendous adjustability with regard to hangs and ground-stacks alike," says company owner **Shannon Stewart**. "Several upcoming projects required a line array effective in large and small numbers, flown and in deck-stack arrays, and in both cases as house PA and side fills for various rooms."

## ▶ PEOPLE



▶ **Renkus-Heinz** has expanded its sales and marketing team with the appointment of **Dan Hughley** as sales and marketing assistant.

He joins the company after several successful years at Manley Labs. Hughley is reporting to VP sales & marketing **Rik Kirby** (pictured above left with Hughley) and is based at the company's headquarters in Foothill Ranch, CA.



▶ **Michelle Grabel-Komar** is the new vice president of sales at **Full Compass Systems**, overseeing the company's vertical sales channels. Most recently, she held the title of vice president product planning & procurement,

where she oversaw the purchasing, product management, and merchandising departments.

In addition, Full Compass has named **Ryan Mauer** as sales manager, where he's heading up the company's National Sales Division, and **Laura Lawrence** as marketing manager.



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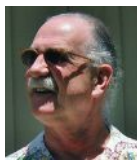
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## :: News Bytes ::



► **Eighteen Sound** has named **Dawwinder Sheena** as director of sales, Middle East, Asia and Pacific Rim, and



**Jeffrey Cox** as director of sales, North America. Based in Singapore, Sheena has guided sales

leadership in various market quadrants in the Asian region for a number of pro audio brands from the U.S. and Europe.

Cox, who has been handling marketing and business development duties for the company, further expands his role by bolstering sales efforts and availability in North America. His goal is to more broadly develop Eighteen Sound's

client and market relationships in North America while continuing to strengthen the brand worldwide.



► **Meyer Sound** has announced two new hires: **John Zhang** as sales manager, China and Korea,



and **Tim Boot** as business development manager, Asia-Pacific. Bilingual in English and Mandarin, Zhang brings 15 years of

sales experience in the global AV industry, including prior high-level positions with Shanghai Media Group, Micronas (USA), and Philips Electronics.

A 25-year veteran in audio, video, and acoustical design, Boot is responsible for connecting Meyer Sound technology with architects, AV consultants, sound designers, systems integrators, and acousticians throughout the region. Previously he was CEO of KHz Design and principal at Sonitus Consulting.



► **TC Group** has expanded its Applications, Engineering and Training (AET) team with the addition of **Shawn Watts** as

senior technical manager for install and tour. The appointment was announced by **Graham Hendry**, vice president of AET, TC Group. Based in the U.S., Watts' new role will involve him in all facets of high level application, support, education and training of TC Group brands **Lab.gruppen**, **Lake**, and **Tannoy**.

► **LOUD Technologies** has appointed **Sean Humphries** to the position of sales director, APAC Region. Based in Hong Kong, he joins LOUD after several years as APAC sales manager for Asia Pacific Music Marketing. In addition, **Craig Lewis** has been named sales director, U.S. National Accounts, working with the **Mackie** and **Ampeg** brands out of his office in San Diego.



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<b>Clair Brothers</b> . . . . .	13	www.clairbrothers.com	—
<b>Countryman</b> . . . . .	62	countryman.com/H6	—
<b>d&amp;b audiotechnik</b> . . . . .	17	www.dbaudio.com	—
<b>D.A.S. Audio of America, Inc.</b> . . . . .	36	www.dasaudio.com	888-DAS-4-USA
<b>DiGiCo</b> . . . . .	7	www.digico.biz	877-292-1623
<b>DPA Microphones</b> . . . . .	38	www.dpamicrophones.com/dscreet	—
<b>Earthworks</b> . . . . .	10	earthworksaudio.com/mseries	603-654-2433
<b>EAW</b> . . . . .	49	www.eaw.com	—
<b>Faital Pro</b> . . . . .	44	www.faitalpro.com	—
<b>Full Compass</b> . . . . .	57	fullcompass.com	800-356-5844
<b>Full Compass/Shure</b> . . . . .	31	fullcompass.com/shurepromo	800-356-5844
<b>JBL</b> . . . . .	29	jblpro.com/V25-II	—
<b>Lab.Gruppen</b> . . . . .	2	thenewtouringicon.com	—
<b>Lectrosonics</b> . . . . .	58	lectrosonics.com	800-821-1121
<b>Mackie</b> . . . . .	41	mackie.com/DL32R	—
<b>Martin Audio</b> . . . . .	25	martin-audio.com	—
<b>Meyer Sound</b> . . . . .	1, 53	www.meyersound.com	—
<b>MIPRO</b> . . . . .	45	www.avlex.com	816-581-9103
<b>Outline</b> . . . . .	IBC	www.outline.it	516-249-0013
<b>Point Source Audio</b> . . . . .	24	www.point-sourceaudio.com	—
<b>QSC Audio Products, LLC</b> . . . . .	51	qsc.com	—
<b>Radial Engineering</b> . . . . .	19	www.radialeng.com	604-942-1001
<b>Ramsdell Pro Audio</b> . . . . .	62	www.RamsdellProAudio.com	727-823-8037
<b>RCF</b> . . . . .	11	www.rcf-usa.com	—
<b>Renkus-Heinz</b> . . . . .	39	www.renkus-heinz.com	—
<b>Riedel</b> . . . . .	43	www.riedel.net	—
<b>Shure</b> . . . . .	5	www.shure.com/americas	—
<b>Sound Productions</b> . . . . .	44	www.soundpro.com	800-203-5611
<b>Soundcraft</b> . . . . .	3	www.soundcraft.com	888-251-8352
<b>Waves</b> . . . . .	61	waveslive.com	—
<b>Yamaha Commercial Audio Systems, Inc.</b> . . . . .	23	www.yamahaca.com	—

## Delaying Mains To Backline

Worth trying or sheer folly? *by The Gang In The Lab*

»»»» We recently came across this interesting thread on the Live Audio Board (LAB) forum on ProSoundWeb, and present it here with a very light copy edit and trim for space. Perhaps you'll actually want to experiment with the concept discussed here!

**Question posted by John L Nobile:** I've done a search on this and found a few things, but wanted to know if delaying the mains to the backline will cause any problems for the performers. I'm planning on trying it but just wanted to know what issues (good or bad) anyone has come across.

**Reply by Dick Rees:** I've never had anyone even notice it from the stage. If anything, it should make it better.

**Reply by Mac Kerr:** How so? Now they not only have the time of flight delay, but whatever you add. It seems like a losing proposition for the musicians.

**Reply by Steve M Smith:** It depends where you stand on stage. If you stand at the backline, you will get double the delay. At the front of the stage, not so much (depends how far apart the speakers are).

**Reply by Ivan Beaver:** Let's say you're downstage center – 20 feet from the backline and the speakers are 40 feet apart. If there is no delay (assuming no delay in processing, console, etc.), then the backline will arrive to you at the same time as the sound from the PA. If you delay the PA by 20 ms, then it will arrive at your position 20 ms late. While this is not long enough to sound like a delay, it will affect the tonal character of the sound. Of course this depends on many different factors – how much spill the PA has on stage (lack of pattern control in the horizontal, which many systems exhibit), how loud the PA is in relation to the backline/monitors, are the musicians wearing IEMs, and so forth.

**Reply by Kevin Maxwell:** I do it all of the time and it really helps the house sound. I've never had a musician complain. Of course it will depend on how much the musicians are hearing the sound coming from the house speakers. At the level most musicians have their monitors, this isn't usually an issue. I've never had an issue even when doing it at big band type events, where the only thing usually in a monitor is the singers mic to themselves.

**Reply by Tim McCulloch:** Also who are the lucky 4-6 folks that get to be in the sweet spot? Making things "better" in one place



means it's "unbetter" everywhere else. While the OP didn't ask about what happens in the house, my advice is the same: Try it and go for a walk to hear what the players and all of the audience will be listening to.

**Reply by Douglas R Allen:** I delay the mains and find it works well for the most part. The only thing I'd recommend is you don't ask the performers if they notice anything. "Sometimes" when you mention the word "delay" to less educated performers, they might hear things that are maybe not there: "I couldn't play well tonight because the sound person added delay to my rig..." Of course, should you know the bunch you're working with, they may like your approach. Try it as a blind test. If they notice and don't like it, then stop. Should they not notice anything or give positive comments how things just sound better, then explain how you're doing things to get better sound for "them" on the stage.

**Reply by John Chiara:** I find it can work well on smaller stages, and seems to help on noisier stages to pull the "room" sound together. Depends on the room a lot. Works better in narrow rooms where most of the sound is going forward and not out to side fills. Try it.

**Reply by Mark Oakley:** I've had good results delaying mains on deeper stages. If the drums are only 4 to 6 feet back from the frontline of the PA, then there's not much difference. If the drums are 16 to 20 feet back, then delaying the mains brings the drums (and backline) into "focus." Try this the next time you're on a deep stage: measure the distance from the kick drum to the front of the PA and delay the mains that distance. When the band is playing, try bypassing the delay, and see if you notice a difference. ■



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