# ChurchSound

BROUGHT TO YOU BY THE EDITORS OF LIVE SOUND INTERNATIONAL

NOVEMBER 2015 | PROSOUNDWEB.COM

INSIDE

## A Living Thing

Understanding loudspeakers in their element

**PLUS:**

DIALING IN VOCAL EFFECTS

SOLVING MICROPHONE PROBLEMS

STEPPING UP TO DIGITAL CONSOLES

**WFX NASHVILLE NOVEMBER 18-19**
Demos in Compact (CB5) and Portable (PB4) areas

# MONITORING ESSENTIALS

## **X8, LIVE MONITOR** - L-ACOUSTICS X SERIES

In creating the X Series, we brought all of the experience gained in designing the K2 to bear on a new series of reference coaxials. Optimized design, ergonomics, acoustical performance and weight make the X Series the most advanced coaxials on the market. Four distinct enclosures with format, bandwidth, SPL and coverage angles perfectly adapted to short throw rental or install applications, the X Series offers studio monitor sound quality, compact design, consistent tonal balance, no minimum listening distance and exceptional feedback rejection. **www.l-acoustics.com**

www.yamahaca.com


QL1

QL5

# Easy Enough for Use Every Day, Advanced Enough for Your Busiest Days

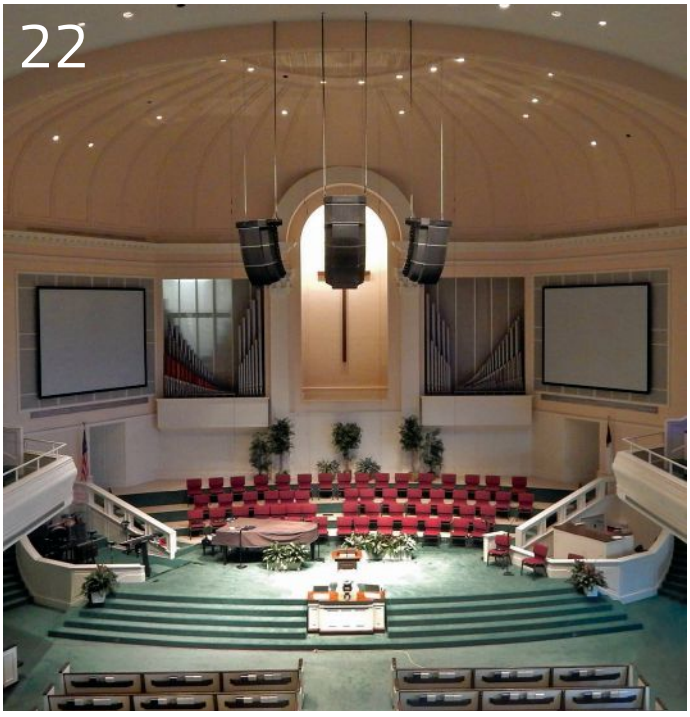
From Youth Groups and Weddings, to Sunday Service and Easter, it's no surprise that your church stays busy and active 365 days a year. With all that goes on sound wise, Yamaha's QL Series has got you covered. Built with ease-of-use in mind, the QL features a simple but refined user interface, touch and turn operation and user access capabilities. Advanced features include Dan Dugan's Automatic Mic Mixer, a state-of-the-art premium rack inclusive of the highly-acclaimed Rupert Neve Designs 5033 EQ and 5043 Compressor, advanced signal routing and Dante integration for Virtual Soundcheck.

No matter what you're mixing or who your audience, rest assured that the QL Series is a value-loaded asset you can consistently rely on.

DIGITAL MIXING CONSOLE
QL SERIES
QL5/QL1

YAMAHA
CA
commercial audio

# In This Issue NOVEMBER 2015






## FEATURES



## DEPARTMENTS



## MISC.

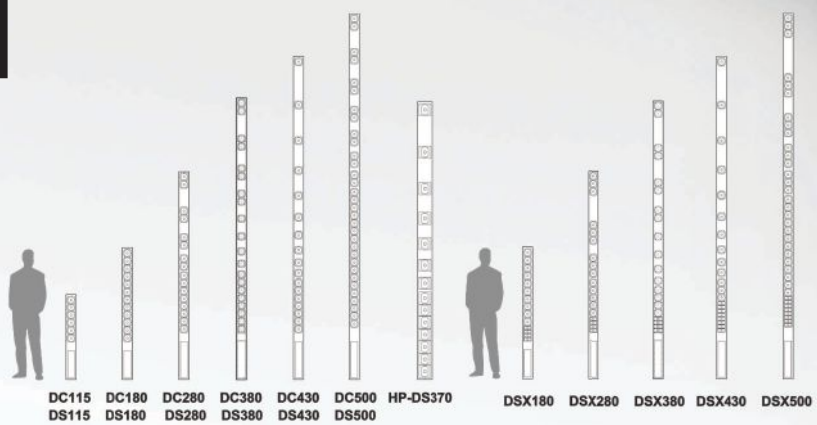
# Intellivox

Digitally Controlled, Beam Shaping Technology

# EXCITE THE AUDIENCE, NOT THE ROOM

The JBL Intellivox Series has revolutionized directivity control. If you need to deliver a clear & intelligible message and/or musical clarity in a large reverberant space, then Intellivox is the solution. Thanks to its small cross section and neutral visual design, Intellivox can blend into any environment, allowing sound system designers, architects and acoustic engineers to work together to deliver systems that not only look great but sound great too. Check out the JBL Intellivox Series at your JBL Professional Dealer.

**Learn more at jblpro.com/intellivox**




Hear the truth.

JBL PROFESSIONAL by HARMAN

# Editor's Note

THE ARTICLES FOR this publication were primarily written by a group of people who have devoted considerable time to sound for worship, both in practice and teaching fledgling techs. The amount of experience under their belts in this regard is astonishing, collectively topping 125 years.

And most/all of them are still active with sound at their churches, and in many cases are also engaged with professional systems design and integration as well as mixing. I bring this up because we're so fortunate to have them onboard, graciously willing to share what they've learned on a wide range of topics over the years.

As you'll see in this issue, the focus extends beyond the technical, and that's simply because so many aspects of church tech involves successfully relating to people, along with teamwork. Gear, systems and mixing need to be understood, but without building relationships, it all just kind of exists in a vacuum.

I was also thrilled to see that Curt Taipale reached out to his Church Soundcheck (churchsoundcheck.com) online discussion group for input for the "top 10 things a church tech should know" article in this issue. The points addressed by these folks, who again collectively possess decades (at least) of real-world experience, are both spot-on and invaluable.

Speaking of online publications, I'd be remiss if I didn't also mention the Church Sound section of ProSoundWeb, where we host more than 500 reference articles, free and available to anyone who visits. Further, expert advice regarding all aspects of church tech can be had by visiting the Church Sound forum on PSW. And on top of all that, many of our authors also run insightful blogs/websites devoted to sound for worship, and I heartily encourage you to visit them as well.

I hope you enjoy this publication, and please don't hesitate to contact me with your thoughts and ideas via my e-mail address.

***Keith Clark***
*kclark@livesoundint.com*

ChurchSound
NOVEMBER 2015

**A supplement of Live Sound International**
111 Speen Street, Suite 200, Framingham, MA 01701
800.375.8015 | *www.livesoundint.com*




***On The Cover:***
***Inside the sanctuary at St. Andrew Lutheran Church in Eden Prairie, MN, where the system's key components implemented by Twin Cities Sound include Powersoft K2 amplifiers driving RCF TTL33 line arrays, with an Allen & Heath iLive console at front of house.***
*(Photo by Charlie B. Ward)*

# THE SHAPE OF THINGS TO COME

Combining the ‘single point-source’ benefits of Coaxial designs with the consistent coverage of Differential Dispersion technology, the CDD installation series delivers perfect sound to every member of the congregation. Oh, and there’s a model and sub for every requirement too.

CDD™

COAXIAL DIFFERENTIAL DISPERSION SERIES

**CLICK HERE TO READ THE INDEPENDENT REVIEW BY MIKE SESSLER**

**Unite Your Audience**

The Martin Audio Experience

MARTIN AUDIO LONDON

# MEMORIES OF MOSCOW

## The many and varied reasons for production success.

***by M. Erik Matlock***

During the late 1990s, Russia was going through some pretty dramatic changes. One of the big ones was opening up to allow churches to come in. Many Americans were arriving to serve as missionaries while that door was open, including a family that we knew. Within a year, they were part of a rapidly growing church that met in a large (rented) theater space in Moscow that held about 1,500 people each Sunday.

Someone donated a sound system along with recording equipment, which none of them had any experience with. The worship leader also possessed more than 100 original worship songs that had never been recorded, prompting my friends to throw my name in the hat.

So I ended up in Moscow for six weeks to record an album while also helping to train the team. Note that I agreed to do this without asking any relevant questions. A good one would have been something like, "Exactly what kind of recording gear will we be using?" Yeah. That would have been a good question. Then I would have known that it was an 8-track portable unit that actually recorded to analog tape.

Another good question would have been, "Hey. How cold is it over there?" Stupid cold. That's how cold Moscow is, even in March. If I had any sense, I might have also asked about sleeping arrangements. Then I would have known that the plan was to park my six-foot-two, 230-pound carcass on a bed designed for a skinny 10-year-old. I might also have asked what we would be eating.

Nope. None of that came up. These are textbook-perfect moments that summarize my decision-making skills back then.

So without a studio-grade recorder, microphones, monitors or even, uh, a studio, we began to create an album. We recorded in the church office and various apartments with whatever gear was available.

It ended up being a pretty good album. Not anything that would win a Grammy, but solid. It wasn't good because I was good, it was good because they were. These were amazing people. Not just because they were incredibly talented and disciplined, but because of their passion.

I went over there to teach them how to record and make an album, but they shaped me in the process, welcoming me into a group of young and passionate believers that hadn't been bogged down with negativity and bad habits. They sincerely loved each other and were excited to be at church. It was something we don't see often enough.

I found out that there was another very important reason for all of this. The church was about to host a Christian pastors conference, possibly the first ever in Moscow. There were clergy coming from all over Russia. Some were spending days traveling on trains to get there. Most were very poor and considered it a miracle that they even made it. Many had minimal contact with other churches and were desperate for this connection.

We finished the album and managed to get it duplicated in time for the conference. Until I actually witnessed them holding the tapes, it still hadn't occurred to me how big of a deal this was. These pastors were able to take something home with them that they'd never had: a Christian worship album recorded in their own language.

It may not have been the best album I ever worked on, but it was probably the most important one, and the entire project still stands as one of the best experiences of my career. CS

---

*Senior editor **M. Erik Matlock** has worked in professional audio for more than 20 years in live, install, and recording; including time as a church tech and media director.*

# Intelligent Steerable Powerful




IC² IC Live Install ICONYX IC Live Mobile

Renkus-Heinz Digitally Steerable Iconyx arrays provide an elegant solution to long standing acoustical problems with slim enclosures that blend into any environment. Individual driver control maximizes the acoustical advantages of this design. The result is unsurpassed vertical pattern control – essential for delivering intelligible speech in reverberant spaces.

Whatever your space or design Renkus-Heinz the World Leader in Steerable Sound is the answer.

Ask Your Local Rep for a Demo.

LIVESOUND LOUDSPEAKER DEMO

Hear for Yourself
Nashville, TN USA
17 - 19, November 2015

wfx Education and Resources for Church Leaders

www.renkus-heinz.com

RENKUS-HEINZ

The World Leader in Steerable Sound

# MORE THAN MACHINERY

## 10 non-tech things every church sound operator should know.

***by Gary Zandstra***

Over the last 30-plus years, I've served on numerous tech teams at various ministries and have learned many things – many of them the hard way. While nothing replaces knowing the tech side of the audio craft, there's a lot more to being successful in the role. Here are some things I've picked up along the way, combined with the results of an informal survey of worship leaders about what they want most from techs.

**1. Pay attention**. Attentiveness is the number one thing worship leaders value. They want to know that someone cares and is looking out for them. When that's not the case, it usually leads to animosity that manifests itself at rehearsal (worship leader yelling, "Hey, gang – down here. Yeah it's me. I need more monitor!) and at services (frustrated look on worship leader's face as he tries to discretely signal that he needs more monitor). It's a recipe for disaster, resulting in frustration on both sides.

The solution is to stay consistently focused on what's happening (of course) and to develop practices to make sure it happens. For example, learning to mix with your head up. Dave Rat, a top front of house engineer in the concert world, positions his console sideways in relation to the stage and even created his own console "Braille" system. This allows him to mix by touch, without continually looking down at the board, so that he can stay focused on the stage.

**2. Positive attitude.** At one church I visited, all of the musicians were quite intimidated by the monitor engineer; in fact, he was so unpleasant that rather than interface with him, they were willing to live with horrible sound in their monitors, rehearsal after rehearsal, service after service. Don't be this person! It's amazing how far good attitude goes. If the musicians know that you care about them and are working to make everything as good as possible, they'll give you a lot of grace. And they'll also be at their best from a performance standpoint.

**3. It's not all about you.** I've encountered several sound operators over the years who actually think the musicians wouldn't be able to perform without them. Wrong. Someone else can and will step up. Being an accomplished tech is a wonderful thing, but the point is to be as useful as possible in supporting the efforts of everyone involved with worship. As top producer Quincy Jones famously said, "Check your ego at the door." I call it "TnT" – Tech and Talent working together.

**4. It's not all about the gear.** A friend recently made this statement: "With great gear comes great responsibility." His point is that with the right tools, there's no excuse not to make it sound as good as possible. To this I add that no matter what gear is available, we still have the responsibility to do our best. It's easy to fall into the "equipment trap," so avoid it.

I recently attended an arena event served by a million-dollar (literally) sound system. The first band sounded awesome. The second band sounded awful. The difference? The techs, not the gear (or the musicians). The first band's tech team knew what it was doing while the second one did not, so a sophisticated sound system wasn't going to save them.

**5. Musicians are not the enemy.** Although at times, it can feel like they are. Some exhibit arrogance and condescension, unwilling to adapt while always ready with a snarky remark. But it doesn't matter. We need to make things work as well as possible for the greater goal. And the truth is, most of them want the exact same thing.

There's no call to be a jerk in kind, or on the opposite end of the spectrum, a pushover. Be ready to kill them, but only with kindness. It takes two sides to go to war, so don't complete the equation. (It's also a war no one wins.) Speak to them with a calm, measured tone, and try to do so with grace and humility. Remember: none of us is perfect.

Further, communicate what you're doing trying to do with their sound, and why. For example, tell them you're moving a monitor two feet to the left so that the output from the monitor is in the non-pickup area of the microphone, and will thus give them a purer sound with less risk of feedback. This type of discussion can go a long way to diffusing tension and reinforcing that you're indeed working together.

**6. Constantly improve your craft.** Musicians rehearse, they practice

at home, and then with others they play in advance of services. We need to take the same approach, studying our systems, increasing our understanding of how they work, reading and researching and then putting it into practice. Another thing that really helps is advancing the material to be used at the upcoming service. I try to get the music in advance, and actually listen to it, critically, and then plan and prepare as to how I can best reproduce what I'm hearing.

**7. Sometimes it requires long hours.** Get over it.

**8. Sometimes it's a thankless job.** Get over it. Both of these points tend to go together. A tech role can take an inordinate amount of time and it's rare when anyone notices all we do. We often seem to be the first ones there, then buried in making things work, and then the last ones left to turn out the lights. But that's the situation, and it's not about us.

Todd Elliot, formerly a technical director at Willow Creek Church, is currently hosting seminars for techs across the country, and I encourage you to attend one. They're called FILO (First In, Last Out), with Todd offering a lot of helpful advice. The key is not getting burned out – get away as needed, spend time with family and friends, and rejuvenate instead of being a martyr.

***We want to make things happen, we want to please, we want to be a hero.***

**9. Relationships are really all that matter.** This applies to the tech team as well as worship leaders, pastors, musicians, and others. More than anything, it determines your success and longevity For example, I often get together for lunch with our pastor just to check in and see how he's doing as a person. I also find out how he thinks things are going and can get a feel for what needs to change. And I have his ear to talk about what the tech team needs.

**10. Sometimes we just have to say no.** Of course, knowing how and when is the tricky part. Most tech people are servants. We want to make things happen, we want to please, we want to be a hero. This leads to making it tough to refuse requests, no matter how difficult.

For example, someone wants to patch in an additional vocal mic five minutes before the service starts. This can probably be done, but it interrupts other prep and there's no chance for a sound check. In other words, it's a recipe for unnecessary problems. So just because we "can" doesn't mean we "should." These things also have a tendency to set a new expectation, and where that stops, nobody knows. CS

***Gary Zandstra*** *has worked in church production and as an AV systems integrator for more than 35 years. He's also contributed numerous articles to ProSoundWeb over the past decade.*

# PARTICULAR ABILITIES

## 10 tech skills every church sound operator should know.

***by Curt Taipale***

Skill: the ability to do something well; expertise. I recently asked the members of the Church Soundcheck (CSC) discussion board for their thoughts on the key technically oriented skills that a church sound tech must have (or strive for). It resulted in a lot of great input, which I've whittled down into this list.

**1. Have a musical ear**. When we say people have "good ears," we mean that they know what a good mix should sound like, as evidenced by their gift of using their knowledge, experience, and all of the tools at their disposal to deliver a musically balanced mix. This skill is at the core of what makes one person's mix sound so good as compared with another.

Having a musical ear also means knowing what an acoustic guitar, or grand piano, or frankly any instrument or voice should sound like. Don't think you have a musical ear? Most people can develop this skill. Start by hanging around musicians as they play their instruments. Listen analytically to your favorite recordings. Listen intently to how the drums are balanced with the bass guitar, and how those lay with the keyboards or guitars, where the backing vocals sit in the mix, if the lead vocal is way out on top or more level with the backing vocals, and so on. Then learn to think that way as you build your mixes.

**2. An ability to mix artistically.** A seasoned tech should be able to balance the art and science side of the task of mixing. The science part focuses on the knowledge of the technical parameters, like ensuring that the audio signals are clean, with no hums or buzzes, certainly no distortion, and so on. The art focuses on achieving a musical balance of each element. Experienced techs will further enhance the sound character of each element through channel EQ, careful use of compression or expanding, and the tasteful use of effects like reverb or echoes.

How about being able to adjust the microphone preamp gain on an input while simultaneously adjusting the channel fader so that no one can tell that you just fixed a problem with the console gain structure? That's a skill every tech should master.

**3. An ability to build a mix fast.** There are no do-overs in live sound. If you're mixing a contemporary worship music style, especially if it's a complex arrangement with lots of players, you have to be able to put a mix together really fast. Being able to throw together a decent monitor mix – or several of them – is a skill worth practicing. Consider "drilling" yourself on how fast you can put together a monitor mix. It will pay off!

**4. An ability to grasp console signal flow logic.** Building a mix really fast also means not having to think about console signal flow. That is, within the console, what path does the signal take to get from point A to point B? What controls does it pass through on the way? A study of signal flow will reveal how the controls on your console interrelate.

For example, is the pick-off point for a pre-fade aux send pre or post EQ? Because it's likely going to be different on the next console you mix on. Study the block diagram of the console that you use each week. Take a highlighter and trace the signal path from the mic input to the main output. Simplify the signal flow drawing and then memorize it. Get to the point of knowing it so well that you can draw it from memory.

Why? Because the day you can meet that challenge is the day you'll start to


# NEW GENERATION AMPLIFIERS FOR INSTALLATION.

The new d&b 10D and 30D four channel amplifiers are tailored for permanent integration. Cost effective d&b solutions for trusted d&b performances. Discover more at www.dbaudio.com/10D30D

d&b audiotechnik

operate the console, instead of the console operating you! You'll be able to walk up to any console and drive it with confidence. It doesn't matter if it's analog or digital. It doesn't matter if it costs $100 or $100,000. Because at their most basic level, every console operates very much the same way.

**5. An understanding of proper gain structure.** Seasoned techs know that proper gain structure starts at the mic preamp. That is where the signal-to-noise environment is established for the rest of the sound system. Then that understanding needs to be extended as to how to achieve proper gain structure for the rest of the chain between the console and the loudspeakers. What's the advantage of building an initial mix with the channel faders at unity? This is vital to know.

**6. An ability to identify frequencies.** Do you know what a 1 kHz tone or feedback sounds like versus a 100 Hz tone? Is that choir mic feeding back at 400 Hz or 800 Hz? And then what's the best way to mitigate that feedback quickly?

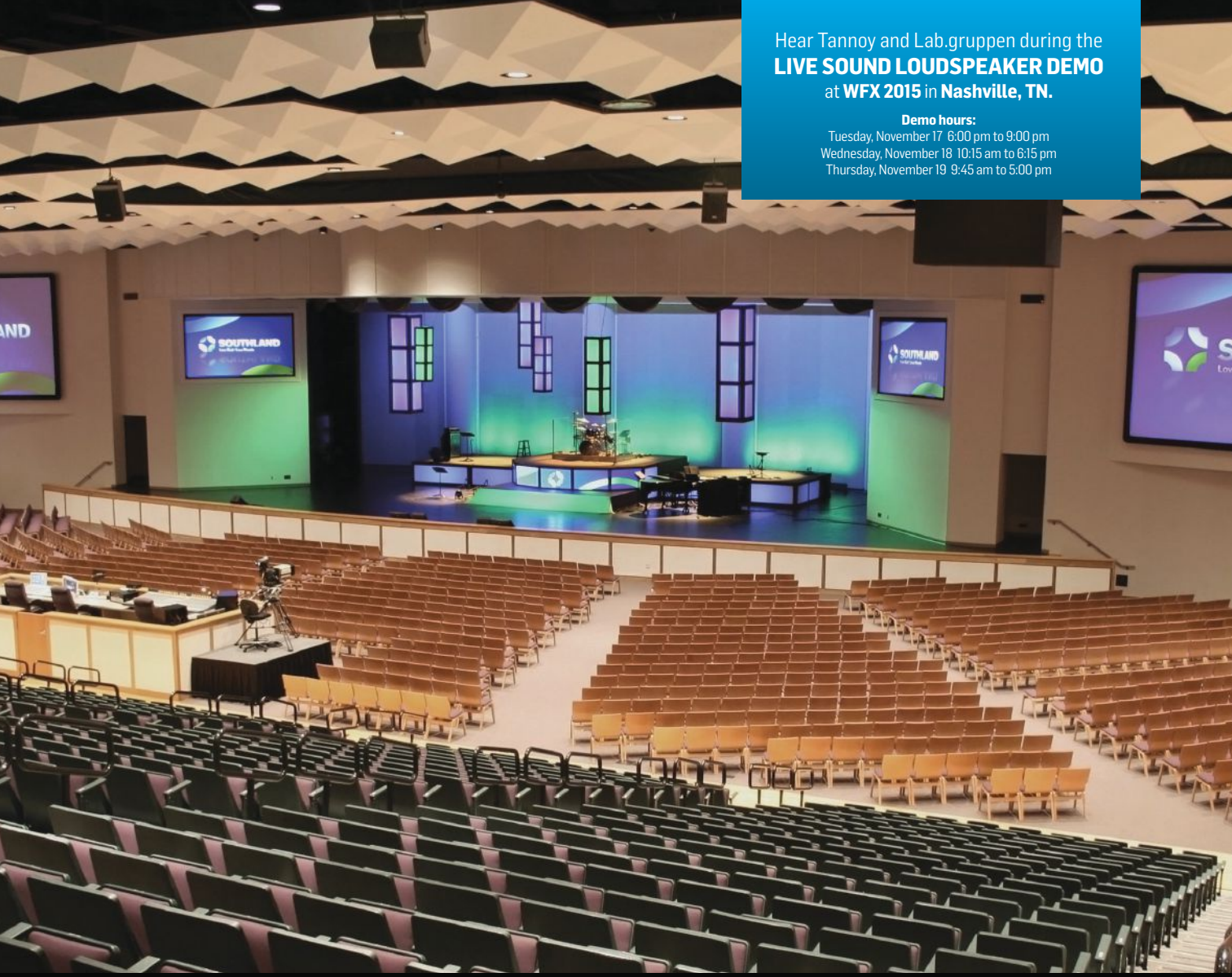
***Is the best solution to move the mic, change to a different mic, or maybe adjust the channel EQ for that mic?***

Will changing the channel EQ fix it, do you just need to pull the channel fader down, and for that matter, can you quickly identify which mic and which channel that the feedback is coming from?

Feedback is typically fairly easy to pinpoint and deal with. What if the issue is a "stuffy" sounding grand piano, or a backing vocal group, or an acoustic guitar? Is the best solution to move the mic, change to a different mic, or maybe adjust the channel EQ for that mic? The ability to find the offending frequency and adjusting to improve its sound may take weeks or even years to fully develop. But enjoy the process because this is a skill that will serve you well over time.

**7. An ability to choose the right mic and place it in the best position to capture the desired sound.** Actually the skill may be in knowing what sound you're going for in the first place, and then applying that knowledge and firsthand experience to choosing the right mic and technique that will deliver the expected result.

This starts with knowing how to read a




Hear Tannoy and Lab.gruppen during the
**LIVE SOUND LOUDSPEAKER DEMO**
at **WFX 2015** in **Nashville, TN.**

**Demo hours:**
Tuesday, November 17 6:00 pm to 9:00 pm
Wednesday, November 18 10:15 am to 6:15 pm
Thursday, November 19 9:45 am to 5:00 pm

# Achieving great sound shouldn't be a test of faith

TANNOY has a longer history than most when it comes to developing premium loudspeaker systems for House of Worship applications, where clarity is crucial to delivering the message. With VQ Series, that renowned clarity is taken to a higher level of performance and when powered by LAB.GRUPPEN's industry standard D Series amplifier technology, you have a perfectly matched system for your worship space that you can have complete faith in.

TANNOY

LAB.GRUPPEN lake

polar plot and understanding the difference in mic designs (dynamic, condenser, or ribbon). Next comes knowing what types of mics are in the church's inventory, especially their polar patterns. The real skill here is the ability to position the mic in such a way that it takes advantage of the polar pattern, aiming it to get great pickup of the intended source while also aiming the maximum rejection point to suppress sound energy from nearby instruments or monitors.

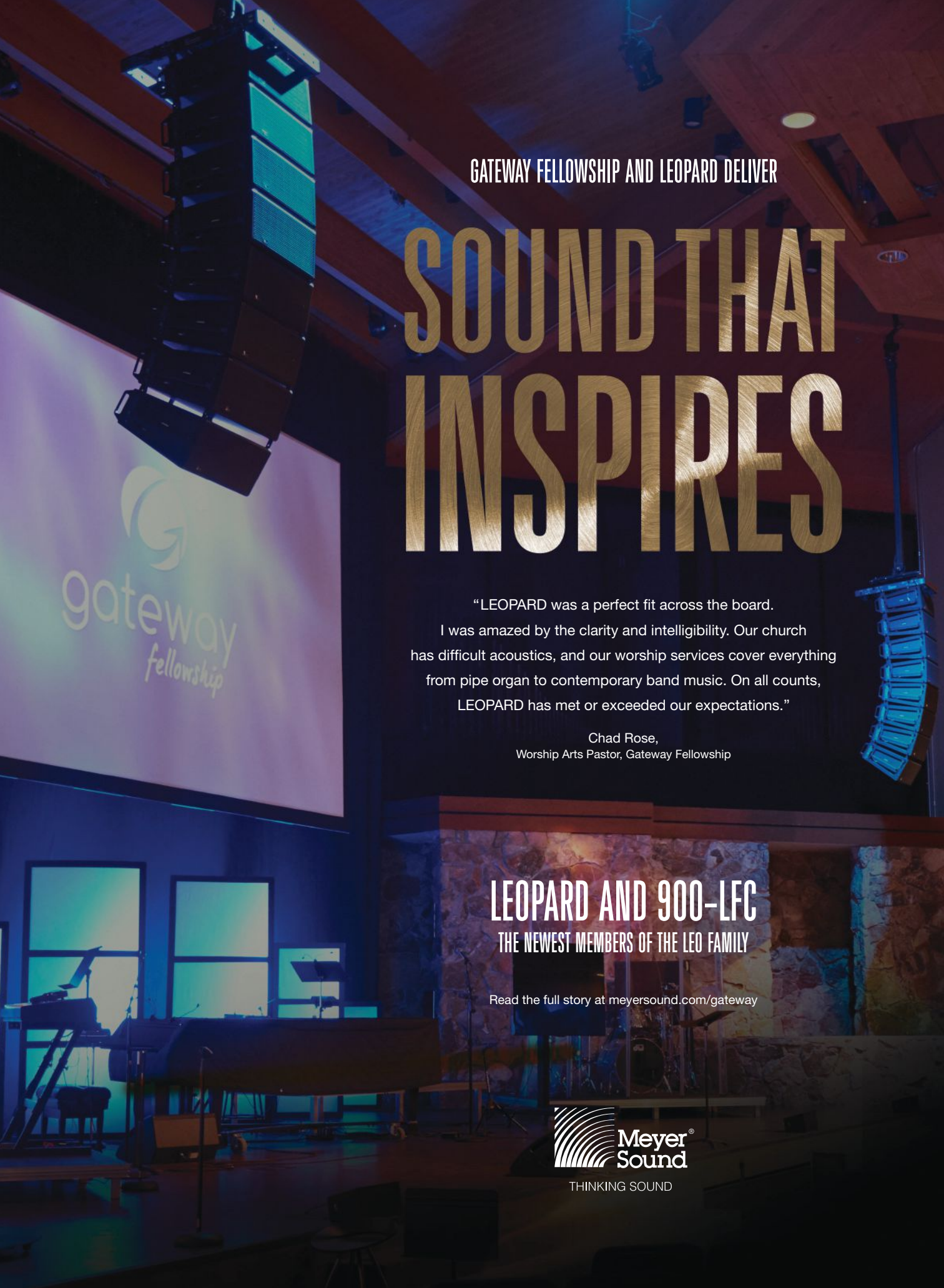
Read up on mics to better understand them, and then experiment to find out with your own ears where they work well and where maybe they don't work so well.

**8. An understanding of wireless system operation.** It doesn't take a ham radio license to use wireless mics (although that knowledge can be helpful), but one should understand some of the basics, such as antenna orientation, antenna types, frequency coordination, and how to prevent intermodulation distortion. Then you can teach your pastor why he should never curl that antenna on his beltpack into a little ball and stuff it in his pocket.

**9. An ability to discern the source of a sound/system problem.** It can sometimes be tough to discern if a "problem" we're hearing is contributed by the loudspeakers, or the room acoustics, or the instrument, or even the player. I wouldn't expect a volunteer tech to have this skill. In fact, I know many seasoned techs who've been mixing for years who would be hard-pressed to tell if the issue was with the acoustics or the loudspeakers. But it's a skill worth having.

**10. Be conversant with common terms.** Working with audio can mean navigating a sea of terms, abbreviations and acronyms. Just for starters, knowing the meaning of AFL, PFL, CUE, prefade, postfade, gain, trim, pad, attenuation, pan, matrix, VCA, DCA, subgroup, bus, aux, pink noise, white noise, RF, intermodulation, CMRR, load, ohm, impedance, millivolts, dB, dBu, dBV, dBFS, SPL, RTA, TEF, FFT, Dante, AVB, crossover, being able to explain the difference between polarity and phase, even PAG-NAG, can make life as a tech easier. CS

***Curt Taipale*** *of Taipale Media Systems heads up Church Soundcheck.com, a thriving community dedicated to helping technical worship personnel, as well as the Church Sound Boot Camp series of educational classes held regularly throughout the U.S.*




GATEWAY FELLOWSHIP AND LEOPARD DELIVER

# SOUND THAT INSPIRES

"LEOPARD was a perfect fit across the board. I was amazed by the clarity and intelligibility. Our church has difficult acoustics, and our worship services cover everything from pipe organ to contemporary band music. On all counts, LEOPARD has met or exceeded our expectations."

Chad Rose,
Worship Arts Pastor, Gateway Fellowship

## LEOPARD AND 900-LFC

THE NEWEST MEMBERS OF THE LEO FAMILY

Read the full story at meyersound.com/gateway

Meyer® Sound

THINKING SOUND

# STEPPING INTO THE DIGITAL CONSOLE WORLD

## Charting the course for a successful investment.

***by Chris Huff***

*Allen & Heath Qu-24*

Ready to migrate into the digital world? Purchase any digital console and mix better, faster, and more confidently than ever before. Read the marketing hype and it's easy to believe this, but the truth is every console is unique in its workflow, functionality, and complexity. Further, what's right for one venue might be wrong for another.

A smart console purchase comes after the consideration of needs and expectations, as well as an evaluation of models to determine which one(s) best meets those requirements. Even if you're working with a reputable systems integration firm on equipment, it's still important to understand the following key factors in order to make the most informed investment.

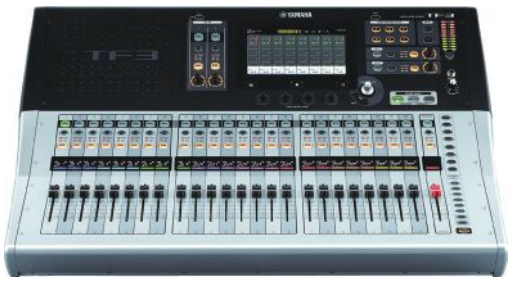
### DEFINE THE NEEDS

Compile a list of the number of current inputs and include everything from vocal microphones to computer inputs. Add the number of outputs such as aux sends and house sends. In short, look at the back of the current console and document what's used.

Next, look at the console's surface. Note the type of EQ control (semi-parametric, parametric) and the amount of control such as the number of mid-range sweeps. Note how many sub-groups are used. After looking at the input/output and the surface, a picture begins to form of current needs.

Move along by checking out off-board components such as effects units. Any time the console sends and returns a signal, add that functionality to the list. Document the immediate needs such as an additional aux send because of a new hallway or "cry room" loudspeaker system. If singers are all over their microphones, causing volume spikes, channel-level compression is necessary.

*Yamaha TF3*



Now it's time for forward thinking. What additional functionality will be needed? Document the needs that will likely come up in the next year. For example, if the size of the band is growing, and next year the drums will be upgraded from a simple electronic set to a fully miked acoustic set, count up those channels.

Watch channel usage. If the current console is 24 channels and 21 or more are already in use, then it's wise to consider upgrading to a 32-channel model.

### BEWARE OVERKILL

The increase in functionality brings more ways of manipulating the audio. The problem: as complexity increases, the skill level of the users also needs to increase. With a volunteer base, this isn't always going to happen. Therefore, complexity should match what the audio team can handle, with a little room for training to take them up a level.

For example, gating a channel takes finesse, and most volunteers won't touch a gate control. However, with a little training, they could. But if the team is made up of people who can barely perform EQ adjustments, then a simpler console is the better choice. Introducing a new console does require a little training but it shouldn't be totally out of their league.

The bottom line: look for a console that meets current and future demands with regards to audio manipulation and channel count. It should also provide ease of use that's appropriate for the level of the tech team, as well as a suitable workflow.

### FURTHER EVALUATION

Analog consoles are WYSIWYG but digital models can bury controls in screen menus or require secondary screens, like iPads, for full functionality. Some provide touch screens, and some use a surface model so a 24-channel console could have 12 faders with a switch to change control channels 1-12 and 13-24.

Digital consoles can also incorporate wireless monitor mix-

ing controls for musicians via wireless devices, and there are limits on the number of monitor mixes. There are several personal monitor mixing systems available, and if one is already employed, this might not be a concern.

There is no single "best" console design. It's a matter of what works for the team and the church's needs, which is a big reason that consoles should be thoroughly evaluated and demoed before purchase.

One more thing: be sure to investigate reliability. Certain models simply aren't as durable as others. There are numerous sources online to do this research, including the Church Sound Forum on ProSoundWeb. Also be sure to purchase from a reputable supplier that will provide support if there are problems.

*PreSonus StudioLive 32.4.2AI*

## THE INVESTMENT

The hardest part of buying new gear is usually the cost. A $7,000 price tag on a digital console might be hard to swallow, but with a 10-year run, that's $13.46 per week. Don't let cost get in the way of making a wise financial decision. Plan for the console to be around for at least 10 years. Too many times I've seen a church "settle" for something less expensive than what they needed, only to regret it just a year later.

## PLAYERS TO CONSIDER

The price of digital consoles runs from below $2,000 to the price of a new home, but for many small- to medium-sized churches, the right console can be found in the $2,500 to $7,000 price range for major brands. Models in this range provide similar capabilities, but they do vary (often widely) in terms of interface and functionality. Following are several models in this range, selected with a focus on usability. (All prices were provided by leading retailers.)

The Allen & Heath Qu-series starts below $2,000, with $2,699 the price for a 24-channel model with a small touch screen

*DiGiCo S21*

*Roland Pro AV M-300*

display and the ability to interface with an iPad (Qu-Pad app). It uses encoders assigned to specific channel tasks such as for gating, compression, and four parametric EQ points. The Qu-series also includes the FX library from the larger iLive Series. It's a very user-friendly design style that's seen with other consoles listed here.

The S21, with 24 input channels, is DiGiCo's first foray into the sub-$10k market ($7,000) and uses two full-size touch screens for the majority of control. It's packed with the functionality one expects from DiGiCo, including four multiband compressors, four dynamic EQs, eight stereo effects, and compression, gating and duckers on each I/O. (Not for the faint of heart.)

The Midas M32 ($4,999) is the "big brother" to the Behringer X32. Produced by the same company, the M32 is outfitted with very good pre-amps (the same as found in the larger PRO1 and PRO2 consoles) and the overall quality that comes with the name Midas. It includes a 7-inch screen (though it's not a touch screen), and uses the knob style similar to the Qu-series.


*Soundcraft Si Impact*

The PreSonus StudioLive 32.4.2AI ($2,999) provides a straightforward knobs and buttons design joined by a unique control approach with LED strips displaying control settings for easy review of a channel's settings. It also includes a small non-touch screen with iPad control; however, unlike the other models included here, it doesn't have motorized faders, which are useful when recalling scenes. It does offer scene recall.

PreSonus also offers the CS18AI control surface ($1,999) with motorized faders, though it's for use with the company's RM32AI rack-mounted mixer ($1,799). This package, with a

full-size touch-screen (around $1,700), makes for a very powerful system of up to 64 channels.

Soundcraft has two entries worthy of consideration, though with significant differences. The Si Expression Series provides the quality and sound expected from Soundcraft, though with a small digital screen

*Midas M32*

that pretty much demands an iPad. The Si Impact, with 32 inputs, includes a 5-inch touch screen as well as scribble strip channel labeling. Both offer the single channel-at-a-glance knob control configuration. The Si Expression 32 lists at $3,199, with the Si Impact is at $2,299.

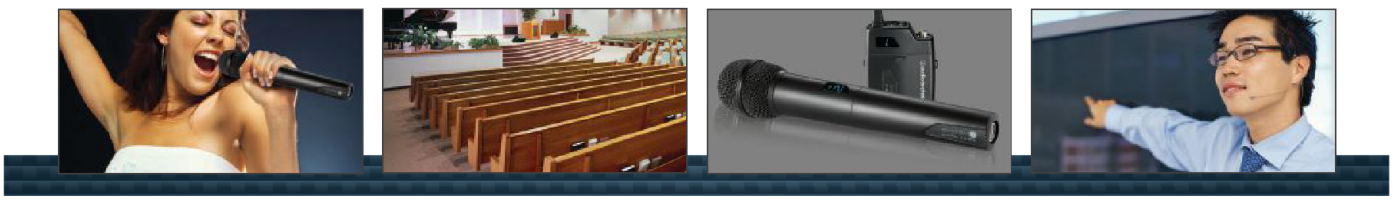
The recently introduced Yamaha TF Series is the biggest departure as far as the control interface. Instead of a knob-heavy design, there's a handful of controls joined by the touch screen as the primary interface. A "touch-one" knob provides easy access to whatever control the user has selected on screen. Also included are two-finger controls such as for setting EQ bandwidth and height, as well as left/right screen swiping to move between control screens. It also includes recallable Yamaha D-PRE preamps. A 24-channel TF3 lists at $2,999.

The V-Mixer Series from Roland Pro AV offers several options, including the M-200i ($2,495) and M-300 ($3,995), both offering 32 channels. The M-200i has a smaller screen onboard and is controllable with or without an iPad. (iPad not included.) It also includes four multi-effect processors and four 31-band graphic EQ units. The M-300 has a larger screen, as well as 4-band parametric EQ and dynamics on all channels. Both also have an array of dedicated buttons and knobs for key functions.

All of these models offer plenty of I/O capability and numerous other handy features. Just remember, the right console is determined only after thoroughly examining all of the factors noted here. Only then will you be able to look back on the purchase in a year and say it was money well spent. CS

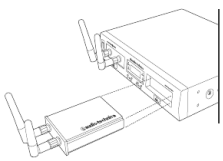
***Chris Huff*** *is a long-time practitioner of church sound and writes at Behind The Mixer (www.behindthemixer.com), covering topics ranging from audio fundamentals to dealing with musicians – and everything in between.*


# ANYWHERE WIRELESS



## SYSTEM 10 PRO | 2.4 GHz Digital High-Fidelity Wireless System

Finally, there's a digital high-fidelity wireless system that simply works – anywhere, in any situation, for anyone. With ground-breaking remote-mountable receiver units and the ability to operate anywhere in the U.S. with no chance of broadcast TV interference, the System 10 PRO digital wireless system offers the flexibility, dependability, and plug-and-play operation to fit any application. Rack efficient (four channels in one rack space), System 10 PRO offers simultaneous use of up to 10 channels with automatic frequency selection and coordination. It truly is the wireless for anywhere. **audio-technica.com**



**Featuring**
Remote-Mountable
Receiver Units

audio-technica
*always listening*


## Southland City Church

*Lakeville, MN*

THE CHURCH UTILIZES the auditorium of Lakeville North High School for its Sunday services, with the two entities teaming up for a sound reinforcement system meeting their needs. They worked with systems integrator Excel AV Group (Maple Grove, MN) on the project, evaluating approaches involving both point source loudspeakers and line arrays.

"I took one look at the 750-seat auditorium with the steep raked floor and soft theater-style seats and knew that a line array solution would be the best for the room," says Excel AV Group owner Kevin Crow, who tasked engineer Caleb Dick with finding an affordable solution. The process revealed that although dBTechnologies DVA-T4 active three-way line arrays were slightly higher in equipment cost, the installation costs were lower, making it an affordable solution.

"We didn't have to fly four traditional point source boxes in the room, two in front and two in back," Crow explains, adding that the approach would have also incurred additional expense of delay configurations, more wiring, amplifiers and rigging. The final design consists of two array hangs of seven DVA-T4 modules, augmented with two dB Technologies DVA-S30N active subwoofers on the floor.

"The coverage is simply amazing," states Justin Vagle, director of worship for Southland City Church. "We've measured only 1 dB difference from front to back. In addition, the subs are tight and impacting." CS

## In His Image Church

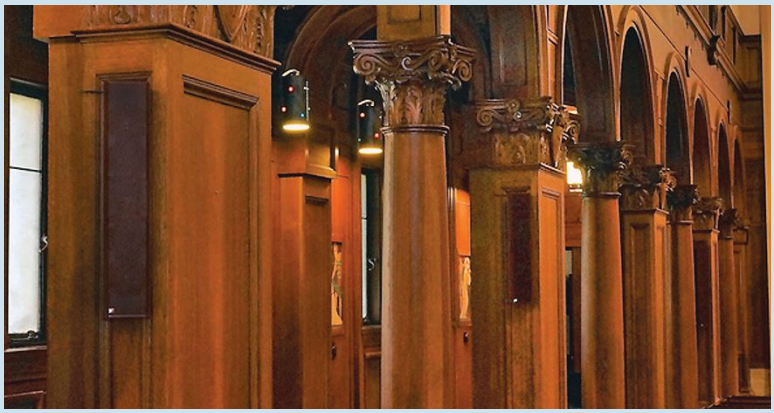
*Kokomo, IN*

THIS BAPTIST CHURCH, about 50 miles north of Indianapolis, continues to transform its recently constructed sanctuary by transitioning from an analog mixer to an Allen & Heath GLD-80 digital console at front of house. Installer Phil Mitchell (Mitchell Design Group, Kokomo & Carmel, IN) made the console recommendation, first pointing the In His Image team to another use of a GLD mixer at a local church for a first-hand look.

"They absolutely loved the features of it. The ability to store scenes for different events, plays, and regular church services was a hit," says Mitchell (pictured at left with the new GLD-80 at the church). "They're able to store the practice sessions in a separate scene and then go back to the regular Sunday scene. They also liked the ability to have scribble strips, name the channels, and color code everything."

The GLD-80 at front of house is linked to a 24-input/12-output Allen & Heath AR2412 audio rack located behind the platform. The two are connected with just a single Cat-5e cable, which helped to simplify the installation.

The console was ordered in advance so the volunteer sound team could get familiar with how it operates before it went live. Mitchell also encouraged them to download the console's GLD Editor control software to practice with. "That really seemed to help them all grasp the concepts a lot more quickly," he notes. CS



## Our Lady of the Presentation Chapel of Carondelet

*St. Paul, MN*

THE ENTIRE PURPOSE of the new system in this classic, beautiful worship space of the Sisters of St. Joseph was to be as unobtrusive as possible. "To be heard and not seen, to turn an old cliché on its head," says John Markiewicz of system installer Audio Logic Systems (South Eden Prairie, MN). "Yes, speech intelligibility was of paramount importance but visual appearance had equal weighting in the mind of our client."

John Viktora-Croke, director of facilities for the Sisters: "The chapel is used mainly for speech oriented service, and it's not uncommon for our guests to have hearing impairments. But I cannot emphasize enough how appearance is a standout point, so I needed a company that supported me in getting the color just right."

Markiewicz elected to deploy d&b audiotechnik xC-Series column loudspeakers. "The adjustable vertical pattern projection in the high frequencies meant we probably could have covered the room with just a pair of 24C columns left and right, near the top end of the chapel," he explains, "but adding delays of 16C extensions down the aisle at the middle and close to the rear achieved two things: a more even sound level coverage from front to back of the congregation, and the ability to create a more natural vocal sound."

To meet the aesthetic requirement, Viktora-Croke built cardboard models of the loudspeaker cabinets, which were then painted to the suggested RAL color and mounted in the space for viewing and approval. "I have to say the Sisters made what we thought at first was an odd choice; instead of matching to the wood of the interior, they matched to the wood of the pews, lectern and other furniture," Markiewicz notes. "But of course they were absolutely right. Just shows you what audio guys know about visual perception." CS

## La Familia de Dios Church

*Ontario, CA*

A RECENTLY IMPLEMENTED SYSTEM is required to serve both traditional and contemporary services at the church, meaning an emphasis on both speech intelligibility and music reproduction characteristics. Music in particular plays a very important role in their services, provided by a dynamic praise band.

Linear Production (Corona, CA), headed by Sean Sheridan, provided design and installation support on the project. The new system is headed by dual D.A.S. Audio Event 208A line arrays, flown six elements per side over the right and left front edges of the platform area. They provide coverage all the way to the back wall of the sanctuary, a distance of almost 100 feet. The space accommodates 850 worshippers between the main floor and the rear balcony.

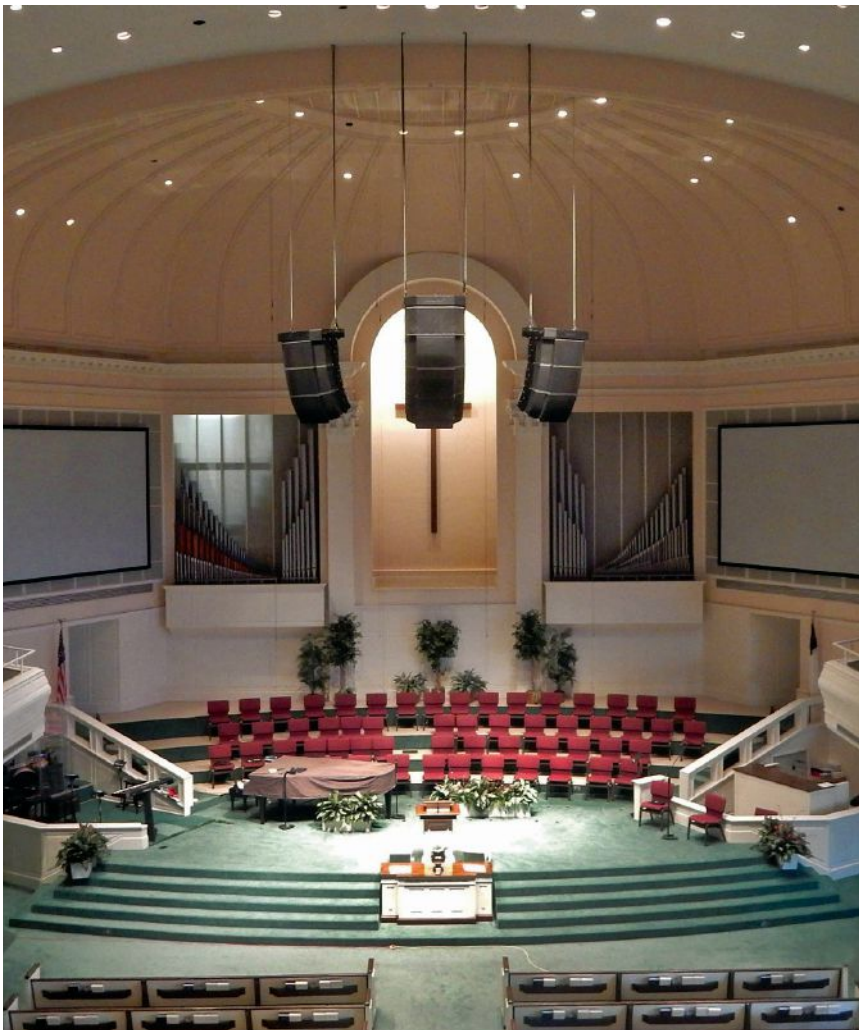
Low-frequency support is supplied by D.A.S. Event 218A active subwoofers, placed one each on the left and right edges of the platform. Rounding out the system, Sheridan implemented a D.A.S. DSP-4080 processor for loudspeaker management, which provides nine parametric EQ bands and crossover filters with 48 dB-per-octave response on every output.

"The church is super happy with the sound and characteristics of the system," Sheridan reports. "You can hear every word clearly from any seat in the room, and musically it delivers a warm and punchy sound. This project has been a win-win for everyone involved." CS

# A LIVING THING

## Key factors to understand about loudspeaker performance.

***by Craig Leerman & Keith Clark***



CREDIT: BOSE PROFESSIONAL

In the world of sound there's an old adage that states, "Your system is only as good as the weakest component in the signal chain." This is especially true of a system's loudspeakers. They are the last link in the chain and are directly responsible for communicating everything that's been done to the signal along the way.

Going beyond simply delivering sound into a room, they actually become a living physical element, dynamically interacting with their surroundings. In other words, what you're usually hearing from a loudspeaker is more than its output, you're also hearing what's happening to that output as it travels through the space.

Selecting the "right" loudspeakers for a given system and room is no simple matter, and there can be more than one "right" answer. The type of programming featured in worship services is one issue; the acoustical nature of the space is another. Budgetary issues are almost always an important factor influencing loudspeaker selection. Aesthetics are yet another concern.

The only certainty is that every single situation is different and needs to be treated as such. That's why there's a constantly growing selection of loudspeaker types and deployments available for church applications, including:

**Point Source.** A single loudspeaker system of two- or three-way design. These provide very good coherence compared to multi-box systems (assuming the single box is well-designed), and present a huge variety of configurations, performance levels and price-points.

**Column.** A loudspeaker system typically consisting of identical smaller drivers arranged vertically in a single enclosure. These can work well with speech, and are small and visually unobtrusive. Some models have advanced digital signal processing that allow their output to be "steered" or more precisely focused on the coverage area.

**Distributed.** Multiple (usually smaller format) loudspeakers spread about the coverage area. These are usually used in conjunction with a main system to provide supplemental coverage to areas that are hard to reach otherwise. They may be a winning solution for acoustically difficult or irregularly shaped spaces, but can add complexity, requiring a good deal of digital signal processing and deft tuning.


Digital Vertical Array

# T8

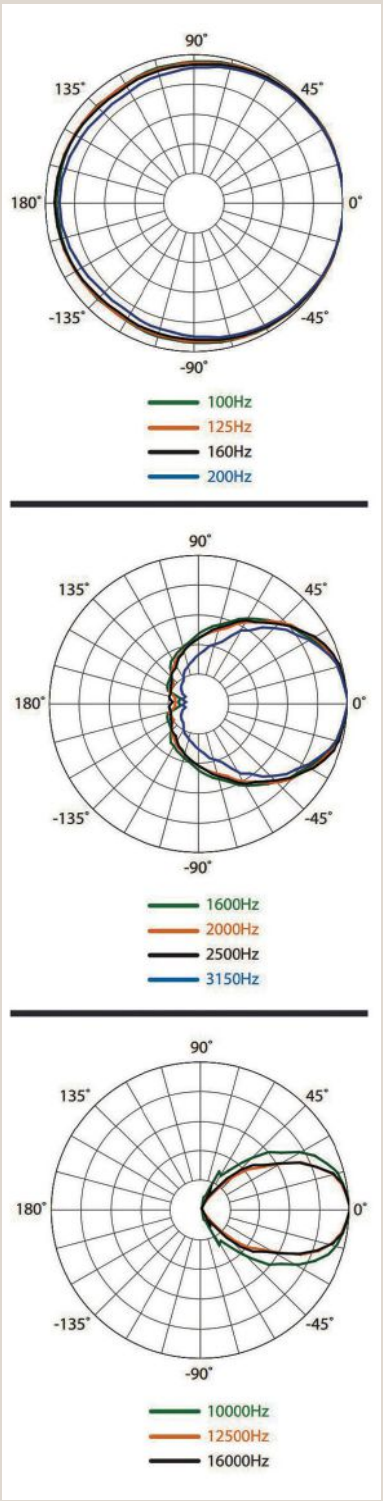
## FEATURES

FULLY POWERED THREE-WAY UNIT 700 W/RMS CLASS-D DIGIPRO G2 AMPLIFIER NETWORK-READY WITH AN INTEGRATED RDNET PORT

56 BIT DSP 24BIT\48KHZ A\D CONV 9 ON-BOARD PRESET EQUALIZATIONS SWITCHED MODE POWER SUPPLY WITH PFC (90V-240V)

ONLY 14.2 KG (31.3 LBS) WEIGHT MECHANICALLY AND ACOUSTICALLY COMPATIBLE WITH ALL DVA SYSTEMS

www.dbtechnologies.com dBTechnologies info@dbtechnologies-aeb.com




*Note the change in dispersion of this loudspeaker from lower to middle to higher frequencies.*

CREDIT: EAW

**Cluster.** Groups of point source loudspeakers, perhaps including individual horns or low-frequency boxes. This is a very flexible option in achieving the desired coverage, and can provide high-acoustic output. However, they often require a skilled system design to work well, and sometimes are not very visually appealing. As a result, it may be preferred to place behind a scrim, which adds complexity and cost.

**Line Array.** Multi-way loudspeaker systems that are specifically designed to be deployed in vertical arrays. Over the past 20 years or so, line arrays have become very popular for church sound applications. They offer good flexibility in achieving the desired coverage, very high acoustic output, and good coherence when properly deployed. The downside is that the arrays can be quite large and may not blend well with décor, and because many loudspeakers are required, cost can add up pretty quickly.

In addition, the number of loudspeakers equipped with their own power and processing (commonly called self-powered) has dramatically expanded. They can deliver extremely good performance because all of the elements can be optimized to work well together, and because they're "closed systems," there's less chance of unauthorized adjustments being made that will degrade system performance.

Self-powered loudspeakers can also reduce or eliminate the need for amplifier rack rooms and long, expensive cable runs. The trade-off (there's always a trade-off in audio) is that AC power must be brought to the loudspeaker location(s). With proper planning this is easily done for new construction, but it may be a bigger undertaking for retrofits.

## TALKING TECH

Let's take a look at key specifications of loudspeakers, starting with the one that gets thrown around (and is misunderstood) the most: watts. Stating "it's a 5,000-watt loudspeaker" (usually followed by an exclamation point) doesn't tell us much except that the loudspeaker is rated (often in some vague way) to handle up to 5,000 watts of audio power. But this does not tell us what the loudspeaker does with that power or how loud it is.

That's the job of the sensitivity specification, which states in decibels (dB) how loud a particular transducer will play given a particular input, usually

*Distributed loudspeakers are great (and often necessary) for reaching further seats, but they can add complexity and cost.*

referenced to 1 watt of input signal measured at 1 meter distance from the driver. Simply put, the higher the number, the louder the output. Thus a loudspeaker with a lower wattage rating but a higher sensitivity rating can have a louder output than one with a higher wattage rating but lower sensitivity.

Note that the dB measurement uses a logarithmic scale where each mark on the scale is the previous mark multiplied by a value or number. In decibels, a 10 dB increase in level is roughly equivalent to a "doubling" of perceived loudness. So if one loudspeaker has a rated sound pressure level (SPL) of 80 dB and another is rated at 90 dB, the second loudspeaker is generally perceived to be about twice as loud to the average person.

Another key specification is coverage pattern, which is stated in horizontal and vertical angles referenced to the centerline of the enclosure. The key here is to remember that dispersion characteristics are frequency dependent, meaning that a loudspeaker may (and usually does) exhibit different patterns at different frequencies.

For example, a basic two-way model with a front-mounted 15-inch woofer and compression driver on a horn may have a stated coverage pattern of 90 degrees horizontal by 60 degrees vertical (90° x 60° for short), but the lower frequencies produced by the woofer are basically omnidirectional. Thus the stated coverage pattern might not actually begin to happen until the point where higher frequencies emanate from the driver/horn, say 1.6 kHz and above. And then at the top range of the audible scale, say 16 kHz, the pattern may actually narrow because higher frequencies tend to be more directional. Reputable manufacturers publish polar plots that detail how their products behave at different frequencies.

Tighter coverage pattern control is important for two primary reasons. First, we want audio energy to go where the audience is located while staying off of walls and ceilings where it can bounce around. This reflected energy hampers clarity and intelligibility, often significantly. Second, we may want to place a few loudspeakers next to each other (in clusters) so that they can cover a wider area. Knowing the coverage pattern helps in this regard in general, and the more controlled the pattern, the less the loudspeakers will destructively interfere with each other.

***Taking care not to overlap the coverage patterns of loudspeakers and keeping unwanted energy off of room boundaries can go a long way in improving audio quality.***

With the same audio signal emanating from two or more transducers (woofers and drivers) in the typical loudspeaker, sound from each transducer arrives at the listener at slightly different times. Depending on the frequency and the distance between the transducers, the signals will be out of phase with each other, with respect to the listener.

This interference is called comb filtering, and it can be constructive (additive) or destructive (subtractive), changing the quality of the audio depending on the listener's location. Indoors, where we hear a mixture of direct and reflected sound, comb filtering can also occur because the reflected sound reaches our ears at a different time than the direct sound. Taking care not to overlap the coverage patterns of loudspeakers and keeping unwanted energy off of room

boundaries can go a long way in improving audio quality.

## DEVELOPING A GAMEPLAN

With all of these choices and factors (and more) in play, selecting loudspeakers for a church system can be a daunting task to say the least. The following suggestions are intended to help point you in the right direction, no matter what type of loudspeaker you're evaluating. Keep in mind that A/B comparisons are quite useful; it's best to compare similar products in similar situations. On their own, most loudspeakers can sound at least "OK," but a side-by-side comparison makes the differences more obvious.

It's also highly recommended that you work with qualified sound system consultants and/or contractors to insure optimum results, both in terms of selection as well as proper (and safe!) installation.

**Decide on standards of comparison.** Next to great sound (which is a subjective decision), determine what is most important to you. Size, price, reliability? Before beginning listening evaluations, narrow the field to a few systems. This list of candidates should be as closely equivalent to each other as possible with regard to the criteria that you determine as most important in your purchasing decision.

**Use familiar material.** If possible, try to arrange for a live comparison of your leading loudspeaker candidates in the space where they'll be used, or at least a space with similar characteristics. Clergy and lay celebrants should speak through the system – when listening, determine which loudspeaker sounds closest to the natural vocal signature of the people talking. With music, choose selections you're familiar with, and ones that mirror the types of music featured at your services.

**Use your ears, not your eyes.** As you look at your potential loudspeaker choices, you'll soon discover that manufacturers use a wide range of measurement standards when creating specifications for their loudspeakers. By all means, read the product literature – it can sometimes offer valuable information. But remember, listening to comparable systems is the only test of actual performance.

**Use your feet as well as your ears.** You'll start out standing right in front of the loudspeaker, but most of the audience will not be sitting there – they spread out far and wide. Listen to how the sound changes as you move to the side, above and below, close up and far away. Ask your contractor how much of the space the system is intended to cover, then walk that space as you listen.

**Listen to collaborators.** Most people can easily recognize a "good" loudspeaker system. Natural, undistorted sound makes a distinctive impression on which you and the other members of your tech and worship teams (as well as pastors and the building committee, if applicable) can agree.

**Focus on the voice.** The spoken word should be reproduced as naturally as possible to accurately convey full content and emotion.

Keep in mind that many loudspeaker manufacturers provide very good technical service and support departments, a valuable resource that can help in sorting through the possibilities. In fact, numerous manufacturers provided us with great input in the course of preparing this article. CS

***Craig Leerman*** *is senior contributing editor and* ***Keith Clark*** *is editor in chief of* Live Sound International *and ProSoundWeb.*

# Need We Say More?

*"The P-Series are built and perform solidly, and are capable of banging out loud and clear audio all day and night."*
**–Sound On Sound**

*"These Speakers bang! They sound extra great with the P-1800SX subs!"*
**–Amazon Customer Review**

*"The Cerwin-Vega! P-Series is an excellent option for those who are looking for a perfect and powerful sound."*
**–Musico Pro**

# P Series
POWERED SPEAKERS

**P-1000X** **P-1500X**

CERWIN-VEGA
PROFESSIONAL AUDIO

**P-1800X**

# GENERATIONAL BLESSING

## Catching up with Jon Beachy, a church tech and much more. *by M. Erik Matlock*

Central Georgia is known for several things, including great food, classic southern culture, and a disproportionate number of churches. One church that's stood as a beacon for many years is Christ Chapel, located on the north side of Macon.

Currently serving as the audio director at the church, Jon Beachy and his family found everything they were searching for after relocating to Macon about 15 years ago. "We'd picked out a few churches to visit, and Christ Chapel was the first," he notes. "From the initial service, we knew we'd found our place."

Upon arriving in the area, the Beachy family (wife Rita, daughters Chloe and Miranda, and sons Garrett and Parker) co-founded a local hotspot known as Joshua Cup Coffee, a partnership with a local youth ministry called The Powerhouse. They also brought a solid history and considerable skills as musicians and audio professionals.

As if that – along with his complex role within the church – wasn't enough to fill his schedule, Beachy also owns and operates LifeSound AV, a professional audio, video and lighting company. And he still freelances with Audio Visual Services of Macon, mixing various shows around the country.

"My background is really more as a musician and a studio guy. Until joining this church, I really had no ambition of becoming the church sound guy or even mixing front of house," he explains.

### FOUNDATIONAL ROOTS

Raised in a family of traveling music ministers, Beachy began his audio career at the ripe old age of three, rolling cables and assisting his father Marvin Beachy's ministry known as the Gospel Echoes, which eventually evolved into the Gospel Echoes Team Prison Ministry in 1976. He eventually joined the group at age nine, singing with his younger sister as the "Little Echoes."

As a necessary extension of the organization, Marvin also founded New Life Sound in Goshen, IN as a recording studio to capture their music and advance the ministry. It gradually grew into a full-service company providing audio support along with sound system design and installation, with Jon naturally learning those skills along the way.

As his ability and family both grew, he searched for the place God wanted him to be, leading to Macon and Christ Chapel.

*Jon Beachy at front of house at Christ Chapel in Macon.*

The hope was to drop in and let everyone rest for a season and get their bearings before committing to anything. Of course, that isn't the way it usually works out for someone with passion and calling. So when the need for a sound system upgrade at the rapidly growing church presented itself, the Beachys were back in the system design and installation business.

"Bryan Nichols was heading up the tech ministry at that time," Beachy says. "After we worked out the new system and had it finished, he asked me to help out and run a few services. From there, it just turned into my regular gig."

Now, there are very few Sundays when he's not mixing at front of house. Jon and Rita already had a full plate with the coffee shop and youth ministry. But the church was now home. He eventually agreed to join the staff and head up the sound team, still working with Nichols.

### FACING CHALLENGES

Yet it hasn't all been calm seas and smooth sailing. Several years ago Christ Chapel embarked on planting several new churches, and while that's led to six successful campus ministries that are growing and thriving, there's also a downside. The cost of the effort affected the budget and resources of the home church to the extent that the staff was reduced dramatically. "We released a lot of key people and resources to make it happen, and it's taking a while to rebuild from that," he states.

After scaling down to a part-time position for a while, Beachy stepped out and returned to volunteer status. "It's actually worked out great," he cheerily explains. "A lot of the stresses involved in a church staff position lifted off, and I was able to mix and serve in a volunteer capacity again."

# ONE SYSTEM

# ANY ENVIRONMENT

NEXO's GEO M6 Compact Sound Reinforcement System is the ultimate chameleon. From theatres and conference halls, to board rooms and live events, GEO M6 is powerful, flexible and suitable for any setting. Featuring a concealed internal rigging system, custom color cabinets and elegant hardware, blending in has never been easier. The only thing standing out is the phenomenal sound quality synonymous with the NEXO name. Find out more at www.yamahaca.com

GEO M6 NEXO YAMAHA CA commercial audio

Meanwhile, the extended workload had prompted the family to sell the coffeehouse. The deal ended up with them losing money and eventually the business, but they persevered through their faith. "We prayed and asked for God to make it absolutely clear which direction we should go," he says. "Whether to try and salvage Joshua Cup, or continue building the AV business. I would say it became pretty clear once all that happened."

With no regrets, the family continues to serve and support Christ Chapel as it gradually returns to the membership and activity level of a few years ago, while also expanding their AV company. In fact, oldest daughter Chloe now serves as a ministry coordinator at the church, while wife Rita and kids Miranda and Parker assist Jon in the daily operation of the company. (After working with both LifeSound and the church over the past few years, Garrett recently accepted an internship at Church on the Move in Tulsa, where he's working with the video production team.)

### ADAPTING TO CHANGE

Another issue the church has been facing is a change in worship style and tone. "Several of our younger musicians and leaders departed to build up the campus ministries," Beachy explains.

***"Pastor loves the sound of that piano behind him at the end of the services, so we make it work."***

"It changed our demographic; we have an older congregation now. The louder and faster music that pulled in the younger crowd isn't always what they want or need, so we had to begin tailoring the mix and the music to suit them."

Keeping the mix at a full but controlled level is definitely an issue, since the sanctuary was originally built as a sports arena. Even with a properly designed system and acoustic treatment, it's still a challenge to create the "perfect mix" for a dynamic praise band playing in a massive space that's shaped like a shoebox.

This is furthered by certain realities, such as pastor John Wood preferring the sound of a grand piano as opposed to a digital keyboard that might help calm the acoustical situation. "Between that open piano, an un-shielded acoustic drum kit, nine front-line singers, a choir, and some guitar amps, it gets difficult some weeks," Beachy says. "But that's just another

part of the job. Pastor loves the sound of that piano behind him at the end of the services, so we make it work."

## FINDING A PLACE

He's also passionate about what he sees as the key attributes of a successful church tech: "Check your motivation and give up the ego. If you have the skills but don't have the desire to treat your position as a ministry or an act of worship, then step out. At least get your head clear and decide if this is really your place.

"I've seen professionals hired to mix for church," he continues, "and they do fine most of the time, but without that passion and desire to serve and worship, it always seems to fall short of what it could be."

The production team at Christ Chapel has a strategy to help ensure that everyone stays on the same page and retains a collaborative approach, instituting regularly scheduled "tech team hangouts." They're largely just get-togethers, hosted at a rotation of tech member homes where there are games, grilling outdoors, and sitting around a campfire to get to know each other better and further relationships.

"The hangouts aren't about Bible studies or any organized ministry," Beachy says. "They're just a way for us to really connect and get to know each other. We get the whole family involved – wives and kids, not just the team. We got away from it for a while but now are back to doing it regularly. It really makes a difference."

## MAKING IT RIGHT

He also stresses that the relationship between production staff and ministry leaders must be addressed on a regular basis. "Get your heart right about your relationship with your pastor and worship leader," he says. "You're on the same team. It's not a competition. Whenever something becomes a competition, there has to be a loser. Competitive and strained relationships create enemies, and that only hurts the church.

"Gossiping, grumbling, complaining ... all of it becomes self-serving and infects everyone. We can't work together like that, and we certainly can't build effective ministries that way."

Not many folks these days can claim to be a third-generation anything, but the Beachy family has done it, and done it well. And from my personal experiences in working with Jon Beachy over the years, I can state emphatically that he's the real deal. Regardless of the size of a church or the tech team, an attitude like his serves as a great example. CS

*Senior editor* ***M. Erik Matlock*** *has worked in professional audio for more than 20 years in live, install, and recording, including time as a church tech and media director.*

# NOT AS SIMPLE AS THEY LOOK?

## Identifying & Solving Microphone Problems. *by Bruce Bartlett*


*Keep a set of "tweakers" handy to tighten down mic screws. (Mic image courtesy of Audio-Technica)*

*Twisted-pair cable reduces pickup of magnetically induced hum.*

Besides sound quality, there really isn't much to think about when it comes to microphones, right? Well, guess again!

Like all elements of a sound system, mics present their own unique set of special problems. Fortunately, a lot of these problems are relatively simple to solve. It's just a matter of identification and appropriate action.

For example, most mic handles include a set-screw near the connector, with many models using this screw to ground the mic handle. If the handle seems to be picking up hum when touched, check that the set-screw is fully secured down (turn clockwise until tight).

Inside the XLR connector on a mic cable is a ground lug, offering option of tying it to pin 1 or leaving it floating. If this ground lug is connected to pin 1, the connector shell is grounded. Then, if the shell touches a grounded metal surface, a ground loop can occur, causing hum. So, a better approach is to float the shell.

Lighting cables and AC power cables radiate strong hum fields, which mic cables can pick up, so keep them well separated from lighting and power cables. If the cables must cross, do so at right angles to reduce the coupling between them. In addition, vertically separate the cables.

If your situation produces severe hum pickup when using dynamic mic models, try ones that include humbucking coils. In addition, twisted-pair mic cable can reduce pickup of magnetically induced hum. The more shield coverage, the less pick up of electrostatically induced hum. Braided shield generally offers the best coverage; double-spiral wrapped is next best, and spiral-wrapped is worst.

Also routinely check mic cables to make sure the shielding is connected at both ends. For outdoor work, tape over cracks between connectors to keep out dust and rain.

### SHOCKING BUT TRUE

At times, electric-guitar players can receive an electric shock when they simultaneously touch their guitar and a mic. This is caused when the guitar amp is plugged into an electrical outlet on stage, and the mixing console (to which the mic is grounded) is plugged into a separate outlet across the room.

These two power points may be at widely different ground voltages, so a current can flow between the grounded mic housing and the grounded guitar strings. This occurrence is especially dangerous when the guitar amp and the console are on different phases of the AC mains.

It helps to power all instrument amps and audio gear from the same AC distribution outlets. That is, run a heavy extension cord from a stage outlet back to the mixing console (or vice versa). Plug all of the power-cord ground pins into grounded outlets. That way, you prevent shocks and hum at the same time.

Also, put a foam windscreen on each vocal mic to insulate the guitarist from shocks. As a bonus, a foam windscreen suppresses breath pops better than a metal grille screen.

If you're picking up the electric guitar direct, use a transformer-isolated direct box and set the ground-lift switch to the position with the least hum. Using a neon tester or voltmeter, measure the voltage between the electric-guitar strings and the metal grille of the microphones. If there

# Design Meets Intuition

With TouchFlow Operation™, new Yamaha TF digital consoles give you the abilitiy to respond to music and artists with unprecedented speed and freedom. It's never been easier to achieve the ideal mix.

The intuitive user interface is optimized for touch panel control.

The touch and turn knob provides precision for fine adjustments.

Mobile applications work seamlessly with the console for wireless mixing.



DIGITAL MIXING CONSOLE

TF SERIES

Learn more about TF1, TF3 and TF5 www.4wrd.it/TFLSCS

YAMAHA

SHARING PASSION & PERFORMANCE

In Stores Now!

is a voltage, flip the polarity switch on the amp or reverse its AC plug in the outlet.

## FUN WITH CLIP-ONS

Nearly all mic companies offer miniature condenser models. These tiny units can provide the sound quality of larger studio mics, but in a compact package. If they're clipped to musical instruments, stage clutter is reduced by eliminating boom stands. Plus, the performer can move more freely around the stage.

Because a miniature clip-on mic is very close to its instrument, it picks up a high sound level. So you can often use an omnidirectional mic without feedback. Omni mics generally have a wider, smoother response than their unidirectional counterparts, and pick up less mechanical vibration.

Try mini mics on a drum set as described earlier. Tape an omni mic near the bottom edge of the sound hole, and roll off some bass for a natural tone quality. Tape one to a flute between the lip plate and finger holes, about 2 inches from the lip plate and 2 inches above the flute. It sounds much more natural than a pickup.

For a grand piano, tape two mini mics to the underside of the raised lid, over the bass and treble strings. If necessary, close the lid for more isolation. And, clutter can be reduced when using regular-sized mics by mounting them in holders that clip to drum rims and mic stands.

## SQUASH THE SQUEAL

Stage monitors are a main cause of feedback, so this is likely not the first time you've been told to keep monitor levels as low as possible. Loud monitors leak into vocal mics, creating feedback in addition to coloring sound. Musicians always want their monitors louder, so start with them as quiet as possible, and then when you're forced to increase levels, they probably (at least hopefully) won't be too loud.

One-third-octave (or even narrower) graphic equalizers can also be deployed to fight feedback. Connect the equalizer between the console's monitor output and the monitor power-amplifier input. With the equalizer controls centered, set up a normal monitor mix. Now slowly turn up the mixer's master monitor volume control to bring up the volume in the monitors. The system will start to feed back at a certain frequency.

Try to find this frequency on the equalizer by pushing down each control knob/fader in turn. The control that stops the feedback is the correct one. Lower this frequency only down to the point where the feedback stops. Then turn up the monitor volume until the system feeds back again (usually at a different frequency). Lower the control for that frequency until feedback stops. (Rinse, repeat!)

Do this procedure several times, turning up the overall volume as feedback is suppressed, so that three to five frequency ranges are cut. The monitors should now be able to be played louder without feedback than before the equalization process.

There are "feedback fighters" that perform this function automatically. In each device, a microprocessor quickly senses feedback and determines its frequency, then assigns a narrow notch filter to that frequency and eliminates the feedback. Typically, several filters are assigned.

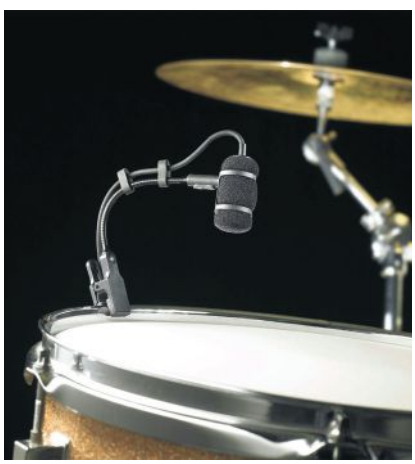
Finally, many sound people have come to love in-ear monitoring (IEM) and personal monitoring systems because they don't leak into stage mics. And, the resulting house sound can be louder and more natural.

One last tip: At a Lenny Kravitz concert, the piano player (Ken Crouch) was playing an upright piano. The piano sound was excellent, and I complimented the sound engineer, Tom Edmonds, on his skill. He later told me his secret: the pianist was really playing a Korg M-1 synthesizer mounted inside the upright piano, which was a prop!

It just goes to show that we just never know everything, and there's something new to be learned every day. CS

***Bruce Bartlett*** *is a recording engineer, audio journalist, and microphone engineer. His latest books are "Practical Recording Techniques 7th Edition" and "Recording Music On Location."*

*Clip-on mics present several advantages, including reducing stage clutter. (Images courtesy of Countryman)*



*Another handy clip-on application: drums. (Image courtesy of Audio-Technica)*

# GLORIOUS SOUND

The award-winning Digital Hybrid Wireless® family just got a new member:
the Venue 2 Receiver.

iQ™ tracking filters for high performance in dense RF environments
Digital Hybrid Wireless® for compandor-free audio
Modules tune across 3 standard blocks (75 Mhz)
Ethernet for control and monitor over IP
Wideband frame (220 MHz)
Up to 6 channels in 1RU
IR Sync for quick setup


*« Scan here to learn more.*

**lectrosonics.com or 1-800-821-1121**

**In Canada, call 877-753-2876**

**In Europe, call +33 (0) 78558 3735**

LECTROSONICS®

**Made in the USA by a Bunch of Fanatics.**

## Idlewild Baptist Church

*Lutz, FL*

A RECENT RENOVATION of an abandoned church has resulted in a multipurpose facility that can be used by the community seven days a week. The room required an audio system for sermons and the praise band, as well as the ability to handle the needs of local artists who might come in to perform. It also needed to be easy for the volunteer staff to use.

Paragon 360 (Springfield, MO) handled the entire renovation, including support on the system design and installation. JBL Professional AM7315 loudspeakers, positioned left and right, serve as mains, supported by two JBL AM5212 loudspeakers on time delay for the balcony and a JBL ASB7128 subwoofer on the floor.

Mark Coble of Paragon 360 notes that these specific loudspeaker models were chosen based on their power handling and SPL capability, along with pattern control and coverage. Also, the church requested that the system have the capability of being operated in stereo, so Coble sought loudspeakers that would deliver a focused stereo sound field.

"Our biggest challenge was that the church did not want any acoustic treatment on the side walls, so we had to overcome the acoustics of what is essentially a rectangular box with hard surfaces," he adds, noting that the original open wood ceiling and rafters were required to be preserved. "However, the loudspeakers are able to overcome much of the room's acoustic problems amazingly well, and the JBL models we chose deliver extremely high speech intelligibility." CS

## First Presbyterian Church

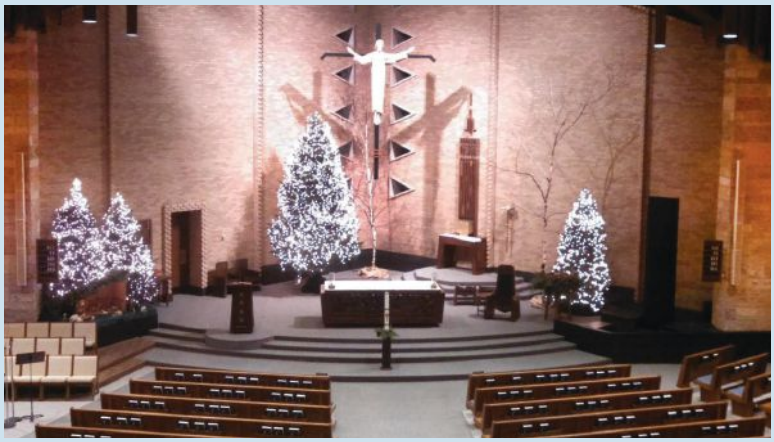
*Grand Haven, MI*

ALTHOUGH IT STILL HOSTS a Sunday morning service complemented by traditional organ, piano and choir music, the church has also implemented a more contemporary service to remain culturally relevant to younger audiences. With this partial shift to electric instrumentation, the church turned to design and integration firm LiveSpace (Grand Rapids, MI) to supply a new house system.

The initial challenges were numerous in the 350-seat sanctuary, notes AJ Sweeny, LiveSpace director of integration operations and design. "The previous sound system was not a good fit for the room; a columnar array mounted two feet off the floor blasted the first two pews and covered very little of the rest of the seating area," he recalls. Further, the sanctuary's stained glass windows, solid wood walls and small expansion area on one side of the room create acoustical challenges.

After attending several Sunday services and analyzing the church's needs and the space's requirements, LiveSpace presented a solution to the church budget committee: an L-Acoustics ARCS WiFo system consisting of just a few components. Two ARCS Wide serve as the main left-right loudspeaker system, with one ARCS Focus as a monitor for the choir and 8XTi and 12XTi coaxial enclosures for fills. Two flown SB18i subwoofers deliver the low end, with two L-Acoustics LA4 amplified controllers handling all power and loudspeaker processing.

Sound is directed where it's needed and no longer hitting the walls. "All of the feedback problems they once had are now gone, and it was the first time the loft had ever clearly heard a sermon," says Sweeney. CS



## St. Michael's Catholic Church

*Wausau, WI*

IT'S RARE FOR A LOUDSPEAKER to get a standing ovation, but that's exactly what happened after the church implement a new system. "I brought in a Tannoy QFlex 40, positioned it with a lift, and left it there for two months," explains Andrew Pierson of Audio Architects (Chippewa Falls, WI). "During a service, the priest asked the congregation what they thought of the sound. They literally got up on their feet and applauded."

That was the deciding factor for the church, says St. Michael's director of worship Tom Lella: "Intelligibility for speech and music was at the top of the list. Our worship is based on ritual prayer, but the music ranges from cantors to small ensembles to our choir accompanied by piano or organ."

The finalized design required two QFlex 48 digitally steerable loudspeakers, placed to either side of the proscenium/altar area roughly seven feet off the floor, with a pair of Tannoy VSX 12.2BP subwoofers tucked in behind the mains. Pierson also relocated some of the church's pre-existing Tannoy i12 loudspeakers to cover the balcony.

In addition, most of the previous amplifiers were replaced by three Lab.gruppen E Series models – one E8:2 to drive the VSX subs and two E4:2s to power the i12s and some ancillary loudspeakers located elsewhere in the building. "Lab.gruppen amps will do either high or low impedance, and the E Series, with the controls on the back of the amps, keep the end user from making unintentional adjustments," Pierson states. "The E Series also comes in at a price point that makes them very competitive. The amount of power you get for the dollar makes them more affordable, and the 1U footprint and power cycling function are extremely convenient." CS

## Beulah Alliance Church

*Edmonton, AB, Canada*

Both front of house and broadcast recording capabilities at this 1,440-seat West Campus sanctuary have been upgraded with Yamaha Commercial Audio CL Series digital consoles. Specifically, Alliance Design (Edmonton), which handled the project, implemented a CL5 console for the house mix and a CL3 console for the broadcast side. The new mixers are joined by a RIO 3224-D input/output box and three Rio 1608-D I/O boxes. (Beulah Alliance pastors Rob Abbott and Mike Jones are shown in the photo at left with the new CL5.)

"The CL consoles were chosen for ease of operation, small footprint, and legendary sonic clarity, with the built-in Dante networking software, which is amazing, nailing our decision," states Dwayne Plishka, system consultant at Alliance Design. "The consoles have been received with high-fives from the staff."

He adds that the church previously owned a Yamaha M7CL console, so the recent upgrade represents a natural progression. The staff is using the consoles' built-in Nuendo Live and Nuendo 6 software to capture the sermon message, which is then re-deployed along with video to facilitate multi-site delivery, multi-track recording for artist evaluation, and broadcast.

"The entire system has far exceeded all performance expectations, with constant compliments from guest artists," Plishka concludes. "At any given time during services, musicians with strings, winds, drums, bass, electric guitar, and piano assist the guest artists and worship choir." CS

# CHANGE IS IN THE AIR

## What's happening with wireless systems, and best practices.

***by Church Sound Staff***

The reshaping of entertainment production wireless operations in the U.S. is currently underway, and it will impact all wireless microphone, in-ear monitoring and intercom system users – including those working in church sound – in the near future.

The shrinking UHF band, where the vast majority of wireless systems currently operate, will get even smaller with the 2016 commencement of the 600 MHz incentive auction to allow the mass introduction of white space devices. Almost all of the remaining UHF spectrum not occupied by digital television, and used by wireless system operators, will be shared with these devices.

A recent report on ProSoundWeb by noted wireless technician and frequency coordinator James Stoffo provides further details, with even more available via a recent PSW Audio Central podcast with Stoffo and other experts. Anyone working with wireless systems is highly encouraged to take advantage of this crucial information.

In light of the situation, it's not surprising that the VHF band is getting renewed interest. Incorporating new manufacturing techniques and sophisticated DSP technology into VHF products eliminates many of the RF (radio frequency) and audio quality issues from a generation ago. In fact, Stoffo notes that at least a few leading manufacturers are already developing VHF systems.

In the meantime, it's more important than ever to follow best practices. Addressing the following common issues greatly improves the reliability of wireless systems and goes a long way toward ensuring trouble-free operation.

**Frequency planning and coordination.** As noted, wireless systems share the RF spectrum with TV stations as well as with several other types of authorized users. As a result, interference is very likely unless appropriate precautions are taken.

The first step is to determine the TV channels that broadcast over the air in your area. When the local TV channels are known, they can be compared to the frequencies of the wireless systems. If there's a conflict, the frequencies must be changed. This is relatively simple for synthesized systems as well as ones that search for vacant frequencies, but is more difficult with fixed-frequency wireless.

**Avoid intermodulation.** Wireless systems can also experience severe interference even when operating on "vacant" frequencies. This is created by intermodulation distortion, called "intermod" for short, which is basically two strong signals on other frequencies combining in the wireless receiver to create an interfering signal.

Intermod is typically caused by other wireless systems, or by other wireless in conjunction with local TV signals. Even single systems can be affected, but the probability of problems grows roughly proportionally to the square of the number of systems in simultaneous use.

The solution is that one or more wireless frequencies will have to change. Again, synthesized systems and autosearch frequency finding can be helpful. However, any frequency can potentially interact with any other, so changing a frequency to solve one problem can create another (or several others).

When changing frequencies or searching, it's critical that all RF systems of any type at the location be turned on and operating. As one clear frequency is found, that system must be left on, and the next system tested until all are operational. Otherwise, the situation can quickly become a snarl of changes and more changes. Some manufacturers offer assistance in this regard, and there are a

number of software packages that aid in calculating frequencies.

**Shielding or covering antennas.** For efficient operation, all antennas must be kept clear of metallic objects that can weaken and distort signals, in addition to reducing range. With bodypack transmitters, the antenna must be kept away from the mic cable, the bodypack case and ideally, the wearer's body.

Securing antennas to the transmitter case and tying antennas to cables can be absolutely deadly to range. Skin can absorb RF energy, so it's best to have the transmitter case and antenna away from the body. Further, receiver antennas must extend away for the receiver case, as well as away from other antennas, equipment racks, other equipment, cabling and, again, metallic objects.

It's best to mount receivers at the top of the rack so that the antennas extend above and away from the rack. Using rear-mounted antennas inside a metal rack will almost always result in poor reception. For multiple receiver installations, the common practice of positioning front-mounted antennas in a "V" configuration, with all the antennas parallel, will also reduce range. It causes them to function together somewhat like a TV antenna that's pointed upwards.

Even worse is when antennas from two different receivers touch. Not only will range be seriously compromised, interference becomes much more likely. In such a situation, it is much better to incorporate a single pair of antennas and then an antenna splitter to distribute the signals to the receivers in the rack.

**No obstructions.** A clear path between the receiver and the transmitter is also required. This is sometimes called a "clear line-of-sight," but remember, light will pass in a straight line through a small hole while radio waves will not.

Similar to the free space needed around an antenna, radio waves require a sizeable space in which to travel. The amount of space depends upon frequency; the lower the frequency, the more space needed. Create an imaginary tunnel of open air between the transmitter and receiver antennas. For UHF systems, a tunnel diameter of 3 feet or so is usually adequate.

There also should be no metallic objects – scaffolding, iron beams, cables, cabinets, pipes, etc. – within this space. In particular, large flat metal objects such as ducts, rows of cabinets and the like that are parallel to the path should be avoided. Even though they might not be in the direct path, they can still act similar to a mirror, reflecting RF energy away from the direct path.

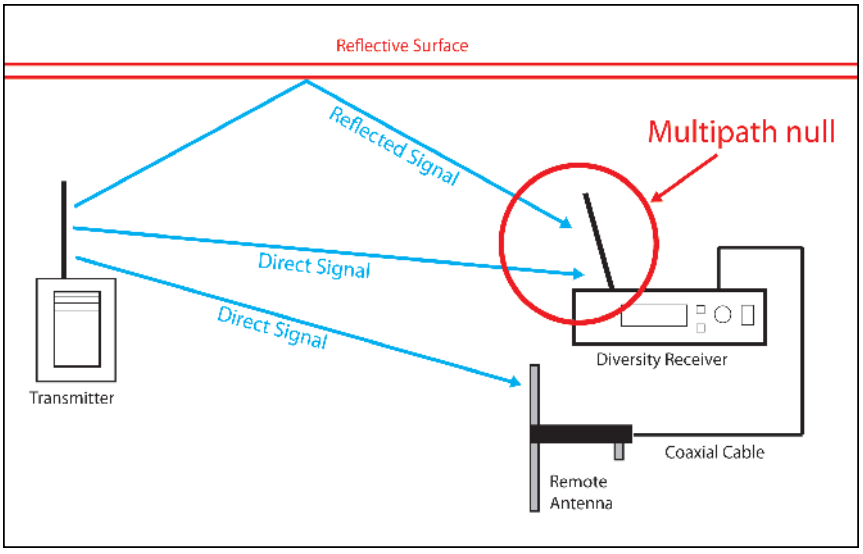
Systems with diversity reception help avoid dropouts in these situations, but range can still be reduced. Diversity simply refers to the fact that for optimum reception, using two antennas in *diverse* locations is beneficial. The reason is that at times, there may be an RF null at the receiver caused by reflections of the transmitted signal off of metal objects or other surfaces.

To counter this, a second antenna in a different place will generally be receiving a slightly different version of the transmitter's signal, and it is very unlikely that a null will happen on both antennas at the same time. But the key is that the two antennas are in slightly different spots, and this is one reason it's often better to use remote antennas for your receiver rather than just the short whips that came with it.

**Avoid long antenna cables.** So sometimes it's necessary or desirable to locate antennas at a farther distance from a receiver, and RF coaxial cables can be used to connect the antennas to the receiver inputs. However, there will be losses that can reduce operating range. The amount of loss depends upon the size, construction and quality of the cable, and upon the operating frequency.

Even high-quality cable will have a loss of about 8 dB per 100 feet at 200 MHz, and since every 6 dB of loss cuts range by half, the working range with 100 feet of this cable will be only 40 percent of normal at 200 MHz.

If long cable runs are a necessity, skimping on the cost of the highest quality cables available is a bad decision. For the best results, a premium foam-dielectric cable from a provider such as Belden should be used.




*The cause and solution for RF nulls by using a diversity antenna arrangement.*

**Don't forget the transmitter batteries!** Simple but true, and most certainly the number one cause of wireless problems the world over. Fortunately, it's the one that's easiest to fix.

Check transmitter batteries prior to every use. Get a battery tester to help determine a good battery from a bad one. And when in doubt, change to a new battery and/or keep those rechargables charged! CS

# DIALING IN VOCAL EFFECTS

## Making it sound better in a quick, efficient manner.

***by Mike Sessler***

I love reverb on vocals. It stands to reason; I grew up in the 1970s and 80s, when there were many records made with tons of reverb on vocals.

Today, the pendulum has swung the other way and vocal reverb has become more minimalist. I'm not necessarily against minimal reverb on vocals, but I do often think that reverb covers a multitude of sins. And when we're mixing audio in churches, having a little extra "awesome sauce" can really help vocals sound better.

There are a ton of approaches to getting vocal reverbs dialed in. I won't begin to tell you that I have the definitive method, but I've learned a few things. While musical styles vary at different churches, one thing that's fairly common is short rehearsal times. At the last church where I mixed regularly, we would get one, maybe two passes through a song during rehearsal before the band moved on. We had about 90 minutes to rehearse the set, and then it was service time. The band and the engineer had to get to the point – quickly.

The challenge, of course, is to get the reverb sounding really good, really fast. It's even more of a challenge when we had volunteers mixing. I was in need of a method I could teach quickly and would deliver consistently good results, even by people who were not career engineers.

### TEMPO-BASED TIME

The key to the process was a tip picked up several years ago from a Dave Pensado podcast. He talked about setting delay times based on the tempo of the song. The idea is to put a straight delay on the vocal and target about 100 milliseconds of delay, but the exact time is based on the tempo of the song. I found an iOS calculator app (Audiofile Calc) that would turn beats per minute (BPM) into milliseconds and gave it a shot. Most of the time, a 1/16th note is about right. If the tempo of the song is very slow, I may deviate from that, but generally speaking a 1/16th note delay sounds quite good.

So that was our trick for getting the delay set for each song. But how about reverb times? One could make the argument that a basic plate reverb with 1.8 to 2.0 seconds of delay would be fine for most worship sets. And I suppose that would be fine. But I'm a perfectionist and I care about my craft, so I'm not really interested in fine. I'm looking for great. Getting there means paying attention to details. And in this case, setting a reverb time that matches the song is a detail worth attending to.

### QUARTER, HALF & WHOLE NOTES – OH MY!

Pulling out my trusty BPM calculator, I started punching in different reverb times. And again, I found that I could quickly get to a pleasing sound. There is more variation here, however, because songs vary so much in energy and tempo. While a 1/16th note is a great general rule of thumb for delay, my reverb decay times vary between a half note and a double whole note.

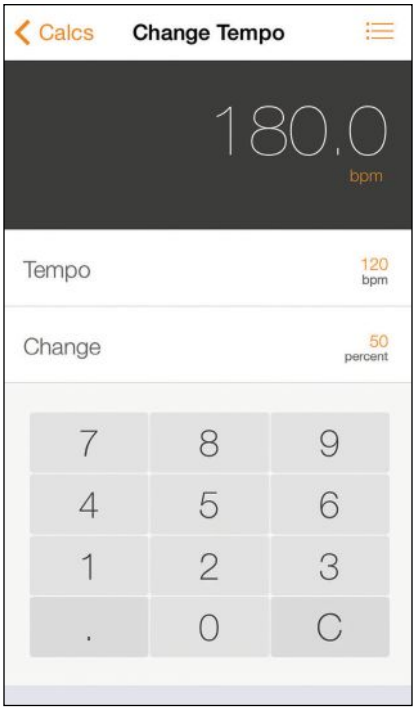
Usually we knew the song well enough to know if we wanted a more subtle reverb or a more pronounced one, so we could pick the time quickly. Sometimes we had to experiment with times, but always got to good results quickly. And sometimes we would even pre-build snapshots with the reverb times programmed in before rehearsal even started, and then

left them alone unless something didn't sound right.

## SPREADSHEET FOR SPEED

While the app was quite useful, it could be a bit tedious to scroll through all the note options. I then borrowed another trick from my friend (and noted church sound tech) Dave Stagl and made up a spreadsheet of tempos between 65 and 120, with all of the time values for 1/32nd to double whole notes. So instead of grabbing the phone, unlocking it, typing in the tempo and scrolling to the right note, I could grab the printout, look to the row with the right tempo and grab the time values. Simple and fast. Laminating the document helps it last longer.

Again, the question might be "Why bother?" but my experience and feedback from others tells me that when the reverb decay times match the tempo of the song, then longer, more lush reverbs can be utilized without creating clarity issues. Longer, more lush reverbs make me happy, and I like to be happy. So this is my process.




*The change tempo function, one of many offered in the Audiofile Calc app.*


*Also keep an eye on EQ with vocal reverb.*

Of course, when there's time to build very custom reverbs for songs, it's worth doing. For big events, we would multi-track rehearsals for the service a week in advance, and I'd spend a few hours really dialing in the reverbs for best results. But when time is of the essence, this really helps.

## FILTER THE 'VERB

Another thing to keep an eye on is the EQ on the vocal reverb. I typically high-pass mine somewhere in the 250 to 400 Hz range, which keeps it from muddying up the vocals. I also usually low-pass them down to anywhere between 3 to 6 kHz, again depending on the vocal, the song, and the sound system. Excessive high end in the verb can be annoying and cause it to stand out as an effect. And usually we don't want that.

## BONUS ROUND

If you really want to have some fun, try stacking reverbs. By this I mean use different reverbs for different parts of the frequency spectrum. It's a trick I learned from my friend Andrew Stone. (In case you haven't noticed, I basically just steal stuff and try to make it my own.) For example, use a plate with a whole to double whole note worth of decay on it, then high-pass it to 350 Hz and low-pass it to 1.5 to 2.5 kHz. Then add in a hall reverb with roughly half the delay of the plate, but high-pass that to 800 to 1000 Hz and low-pass it to 4 kHz.

Note that this is just a general discussion, and you'll need to experiment. But it's a start. The idea is to use a longer reverb for lower frequencies and a shorter one for higher frequencies. This is how reverb works in real life. High frequencies tend to die out quickly, while lower ones will bounce around some more. You don't have to use different types of reverb for this to work, but I like the variation. Also note that there needs to be some crossover between the two, or you'll end up with a weird hole.

Even though it's two reverbs instead of one, I set the times based on tempo, so that goes quickly. Once I'm happy with the high- and low-pass filters, they don't change much from song to song. And with two faders for reverb, you can tilt the sound of the reverb from lower to higher depending on the song or part of the song. It's the best of all worlds: quick, efficient and lush. What's not to like? CS

***Mike Sessler** has been involved with church sound and live production for than 25 years, and is the author of the Church Tech Arts (churchtecharts.org) blog. Based in Nashville, he serves as project lead for CCI Solutions, which provides design-build production solutions for churches and other facilities.*

# PLACING LOUDSPEAKERS IN A SMALL CHURCH

## Just because it "Looks About Right" doesn't mean that it actually is …

***by Curt Taipale***

I coined a phrase circa 1989 known as the "Looks About Right" approach to sound system design. It denotes any design effort that simply "guesses" at where a loudspeaker might work well, lacking any effort to prove it out with the design tools so readily available. Of course it needed an acronym, and soon became known as the LAR factor, and was even included in one of the chapters that I wrote for the Yamaha Guide to Sound Systems for Worship, released in 1990.

Spend a few minutes reviewing online church technology forums and you will discover that audio mythology is alive and well – more in some circles than in others. Sadly, there is a rabid audience for such misinformation. The folks that spin this stuff aren't intentionally trying to mislead anyone. In fact they think they're doing a good thing. They just don't know what they don't know.

One topic that came up recently exemplifies a common issue in churches. A person was seeking confirmation of a design concern that he had for a small church. The church had already purchased some loudspeakers, and his concern was that given the room dimensions and ceiling height, that listeners seated toward the back might not hear the sound system very well.

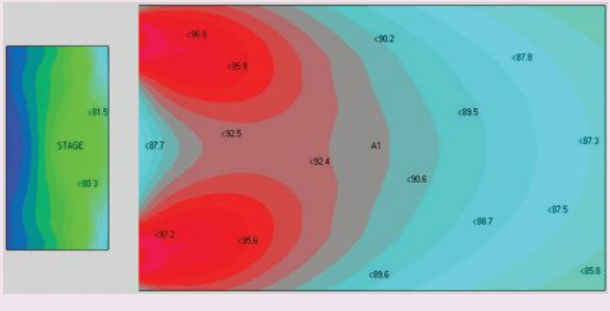



*Figure 1 – Two loudspeakers on stands.*

Individuals quickly jumped in with their LAR solutions. To summarize the LAR advice, "The room is too small to warrant delay speakers, just put up a couple of speakers on sticks near the stage and you'll be fine."

A handful of others tried to offer counsel that a deeper study was warranted, lest the church waste their funds on a system that would not meet their expectations. But those efforts fell on deaf ears.

So I invested about 10 minutes to come up with a room model in EASE to illustrate the various scenarios being discussed. Remember that one of the first rules of a loudspeaker system design is to put sound where listeners are, and to not put sound where listeners aren't (like the walls or ceiling).

### TWO LOUDSPEAKERS ON STANDS

**Figure 1** shows the direct sound coverage at 4 kHz that one might expect with the loudspeakers positioned to either side of the platform, in this case mounted on speaker stands at 7 feet AFF (above finished floor). This was the approach advocated by the LAR group.

As you look at the sound coverage, note that the brighter the color the louder the sound. So "red" means really loud, and "blue" means softer. Each isoline represents a 1 dB change in sound pressure level.

Also note that this is a computer simulation, and in this case shows just the direct sound energy centered at 4 kHz. In real life, the listeners would hear the direct sound combined with the sound reflections and echoes. Having built literally hundreds and hundreds of these models, and getting to experience the real life results after the installation was complete, I can tell you from firsthand knowledge that the models are really quite accurate. If the model reveals an acoustic issue at some point in the room, and if the system gets installed according to the details in the model, that problem will be there in real life. You can expect to walk over and listen to that issue when you stand in that room.

## TWO LOUDSPEAKERS RAISED TO 12 FEET AFF

**Figure 2** raises those loudspeakers to 12 feet AFF, and drops the pitch so that we're aiming at listeners seated in the back row. Note that the sound coverage is much smoother. Why? It's simple geometry and God's laws of physics at work.

Elevating the loudspeakers lessens the difference in distance from the loudspeaker to the listeners down in front as compared with the distance to listeners seated in the back, and therefore lessens the disparity between the sound level across the seating area, evening out the sound coverage.

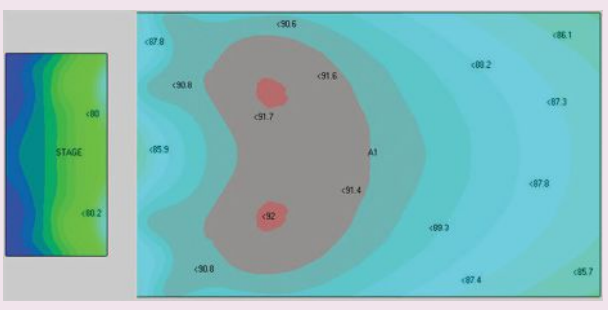



*Figure 2 – Two loudspeakers flown at 12 feet AFF.*

## ADDING LOUDSPEAKERS ON DELAY

**Figure 3** is the same as Figure 2, but adds two delay loudspeakers (time delayed in relation to the front loudspeakers) halfway back into the room specifically to extend coverage to listeners seated in back.

If the goal is achieve even coverage across all listener seats (and given an adequate budget that should be the goal), then Figure 3 is clearly the preferred solution. Will folks seated in the back hear without the delays? Sure, but clearly not as well.

Now think about this for a moment. Let's say that the church has a minimal budget to work with. They can only afford two loudspeakers. They can choose to put those two loudspeakers on speaker stands to the side and just in front of the platform. The result will be that listeners seated toward

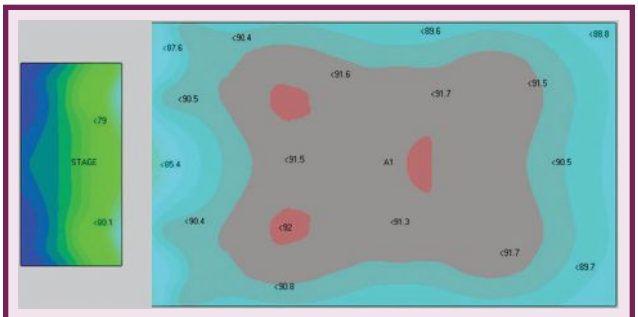



*Figure 3 – Two loudspeakers flown at 12 feet AFF, plus two delay loudspeakers.*

the front will get blasted, and those seated towards the back may strain to hear.

But the good news is that such a scenario could be set up as a live demonstration, allowing the owners to determine with their own ears in their own auditorium if that solution is appropriate for their needs. If they agree, then you just moved from "Looks About Right" to "Sounds About Right," and your design is done.

On the other hand, for literally the same amount of money they might consider suspending the loudspeakers from the ceiling and enjoy much more even sound coverage across the listener areas, especially in the front one-half of the seating area. That takes a little more effort to demonstrate live, but it can be done.

***If someone makes a blanket statement online about some technical "fact" that you know isn't right, don't let it stand.***

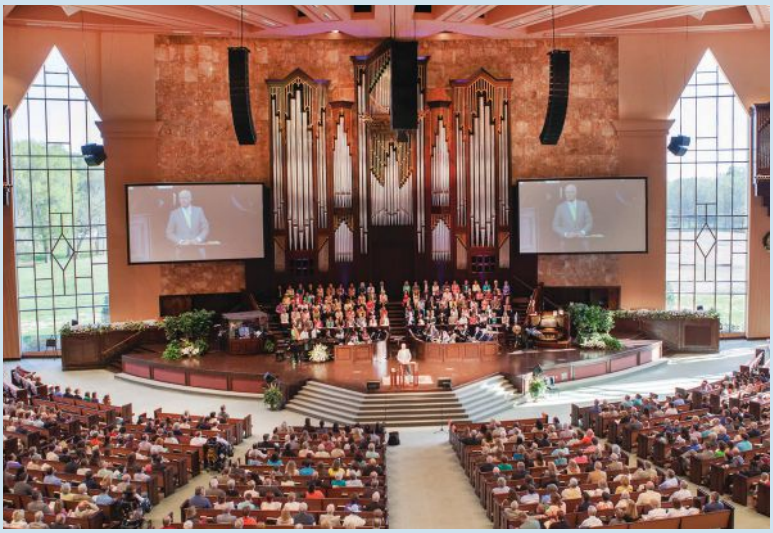
Of course for many churches, flying the loudspeakers may not be a reasonable solution. That is especially true for those that operate as a portable church, or that rent their meeting space. My advice? Stay alert!

There is regrettably a lot of misinformation about sound system design (and other topics) shared via the Internet, in most cases parroted by a person whose only mistake was to mislearn something from someone, who mislearned it from someone else. But when those mislearned concepts get spread around as fact, they can lead to a lot of really bad sound systems. And so it goes.

As much as you can, please help us stamp out audio mythology. If someone makes a blanket statement online about some technical "fact" that you know isn't right, don't let it stand. Challenge them to show the proof. One or both of you will have a teachable moment. CS

---

***Curt Taipale*** *of Taipale Media Systems heads up Church Soundcheck.com, a thriving community dedicated to helping technical worship personnel, as well as the Church Sound Boot Camp series of educational classes held regularly throughout the U.S.*



## Calvary Church

*Charlotte, NC*

A SYSTEM UPGRADE was recently implemented for the 5,000-seat sanctuary that works with the room's natural acoustics as well as one of the largest pipe organs in the world. "Calvary is unusual in that they blend traditional choir, organ and orchestral music with a modern electric band in one service, so we had to make sure the PA was effectively reproducing all of those elements without over-energizing the hall," explains Houston Clark, principal of systems integration firm Clark, which has four offices across the U.S.

The new system includes three line array hangs: 16 Martin Audio MLA enclosures positioned left and right, with six MLX subwoofers in the center. An array of eight smaller MLA Mini boxes facing the choir and orchestra pit is hung behind the subs to provide monitoring for the stage. In addition, two flown Martin Audio H3H+ loudspeakers per side provide out fill coverage to more distant seating, with two Martin Audio XD12 loudspeakers reaching the outer-most sections. Under-balcony support is furthered with six Martin Audio DD6 loudspeakers, with four XD15 loudspeakers for the upper balcony.

"With MLA, you can go from the main floor to the second and third floor balconies and the sound experience is consistent at every floor," Houston Clark concludes. "You have a dream when putting together this type of PA that every seat will have the same audio experience, and it was truly amazing to walk all of those floors and not perceive a difference in the sound." CS

## Trinity Lutheran Church

*Spring, TX*

THE HIGHLY REVERBERANT 1,400-seat sanctuary is now being served by an improved level of speech and music clarity following a recent system project headed by steerable Meyer Sound CAL column array loudspeakers that help in controlling coverage by directing audio energy to congregants. Originally designed for unamplified organ and choral music, the sanctuary has a curved ceiling and marble floors that contribute to an RT60 upwards of 3.3 seconds, while its hard surfaces add to undesired echoes.

Blending well with the room's architecture, two CAL 96 loudspeakers comprise the main front system in a split-beam configuration. Two more CAL 32 loudspeakers are steered with a 10-degree down tilt for rear delay, while an additional CAL 32 provides choir loft delay. Two X-800C subwoofers extend low-frequency coverage for music programming. A Meyer Sound Galileo 616 processor provides drive and processing.

The system, along with a new Soundcraft Vi3000 digital console, was supplied and installed by Houston-based Covenant Communications. (The system was designed by SLR Consulting, also in Houston.)

"The clarity with CAL is immaculate," says Patrick Blake, director of worship arts at the church. "The tonality and musicality of the band are delivered to the entire congregation. Our band had evolved over the years from acoustic to electric with a full drum kit, and it was a constant struggle to hear. It's night and day with CAL. An elderly congregant told me that he could turn off his hearing aid because he didn't need it in here anymore." CS

## Overlake Christian Church

*Redmond, WA*

A NEW SYSTEM replacing the original that operated for close to 20 years since the 5,000-seat sanctuary church opened was implemented by Morgan Sound (Lynnwood, WA) following a comprehensive study of the acoustical space and available rigging points. The project marks the first implementation of new STM line arrays from NEXO in support of spoken word as well as a usual setup seven to eight musicians and additional vocalists. Because the space is large, it's also used for regional large-scale Christian concerts and conferences.

"The OCC technical staff is highly experienced in dealing with tours," notes Stephen Weeks, A/V consultant with Morgan Sound. "Previously, when a tour came through, outside loudspeaker systems and production would be brought in, necessitating a substantial investment of time and resources to fly the PA system. The STM installation is meant to provide a top-of-the-line tour grade audio system for the church, visiting production tours. and conferences."

Specifically, the system incorporates 10 M46 mid-high modules coupled with 10 B112 low-frequency modules per cluster in a left-right configuration. Three M28 loudspeakers per side for down fill to closer seating are attached under the main arrays, while two each of a three-box NEXO GEO S1230s in clusters deliver balcony out fill. A dozen NEXO S118 subwoofers are flown in the center of the room in cardioid mode to facilitate even low-frequency dispersion throughout the space. CS

## Bonita Valley Community Church

*Bonita, CA*

A GROWTH IN THE CONGREGATION, mandating an expansion of facilities, has led to a new 1,400-seat sanctuary outfitted with a system designed to meet a variety of contemporary worship needs. "From worship services to special events for our congregation, we needed a system that would accomplish all those different needs," notes Gabe Terrado, worship director at the church. The new facility also integrates three video walls, motorized trussing, and theatrical lighting comprised of more than six dozen fixtures.

Coppell, TX-based Building God's Way (BGW) partnered with the church on all design aspects, implementing a sound system headed by a left-right-center configuration of RCF TTL33-A line array modules. Further, because the back of the church faces a residential neighborhood, there was concern over sound pressure levels, especially low frequencies emanating from the building. BGW worked with the RCF engineering team to design an end-fire configuration of RCF TTL36-A subwoofers flown behind the center cluster to establish the needed directivity of that low-frequency energy.

"We were familiar with the RCF group's family of products and especially their line arrays," explains BGW technology director Jim Martin, who adds that the new system, with installation, commissioning and training by Texas Integration Systems, has achieved the contemporary audio performance the church desired. CS

## St. Patrick's Catholic Church

*Rockville, MD*

THE 1,000-SEAT SANCTUARY that has served parishioners since 1968 has always presented challenging acoustics. "The sanctuary has an A-frame architecture with 35-foot ceilings and lots of windows," explains Gene Ingham of RCI Systems (Beltsville, MD). "The altar area is in the center, the choir is on one side with the organ and piano, and most of the congregation sits directly in front. The original sound system did not project far enough, so it was like a cloud of sound coming out of the sky, lacking clarity and intelligibility."

A recent upgrade by RCI Systems incorporates a pair of Renkus-Heinz Iconyx IC16-RN digitally steered arrays, marking the first installation of the fifth generation of the company's steered beam technology, is joined by the latest version of the RHAON II System Designer software control and beam steering application.

With high ceilings and a transept, installation and tuning could have been tricky, but the systems company accomplished it with relative ease. "We used two beams for each loudspeaker to cover the room, and the beam coverage was so wide that I only had to put two IC16-RNs in, and it still covers the main room and at least half of the transept," Ingham says.

"Initially I was going to put the loudspeakers closer to the audience," he continues, "but when we looked at the modeling, we found that if we could place the loudspeakers to the left and right of the altar, about nine feet up, we could shoot over everything and still get plenty of sound in the back. The new RHAON II software made it come together very quickly. And with the IC16-RN's low-profile design, half the people don't even know the speakers are there." CS

## Springs First Church

*Colorado Springs, CO*

MUSIC ASSUMES A PROMINENT ROLE in the church's services, engaging the congregation via a blend of traditional and contemporary styles. "Not only is music a vital element of services, the church also hosts a variety of concerts each year, so a quality sound system became increasingly important," notes Doug Hood, president of CSD Group (Fort Wayne, IN), which oversaw the effort to implement a new system from conception to completion.

The previous system was unable to deliver the level of quality worship experience the church wanted because it lacked enough power, particularly in the low-frequency range, and it also exhibited inconsistent coverage. To address these issues, Hood and the CSD crew formulated a design headed by WorxAudio X1i-P compact line array elements, with six enclosures each over the front left and right sides of the platform area.

"While the sanctuary has seating capacity for 1,000 people, services currently run in the 600- to 700-person range," Hood says. "The beauty of the modular line array approach is that, as the congregation grows in size, we can easily expand the system. So the plan is to eventually add another four loudspeakers per side."

Low-frequency support is provided by a pair of WorxAudio TL218SS sub-bass enclosures positioned on the left and right edges of the platform. Completing the coverage picture are three WorxAudio TrueLine V5M-PAS passive loudspeakers for front fill, located along the front edge of the platform. CS

## Hershey Free Church

*Hummelstown, PA*

THE CHURCH SOUGHT TO CREATE a more immersive and inviting atmosphere within the main worship space while keeping the congregation comfortable with the changes. This included designing and building a new, contemporary stage layout, installing a more intelligible sound system, and improving congregational sight lines with updated video accents.

Clair Solutions (Manheim, PA) was chosen to handle the project. The audio upgrade consisted of full-range JBL Professional loudspeakers powered by Lab.gruppen amplifiers and controlled with Symetrix digital signal processing. In addition to the main system renovation, the company also provided a new Aviom personal monitoring system as well as upgrades to the wireless microphone systems. Acoustically, architectural fins were created out of drywall and angled on the sidewalls in order to prevent the flutter and slap back echoes that were present in the space without reducing the overall ambience of the room.

Learning and understanding how the church's budgetary requirements coordinated with its overall goals was a key, as it is with any project of this type. In addition, the multi-phase nature of the assignment meant that Clair Solutions needed to provide enough structural and electrical infrastructure for future additions while being sensitive to the financial boundaries of the church. In the end, Hershey Free was extremely pleased with the outcome and is looking forward to the next phase. CS

# HUMBLE PIE

## There's always something to keep us in line. *by Gary Zandstra*

It's definitely not my favorite thing to tell sound operators how to fix their mixes. But when there's basic stuff happening like constant feedback, EQ that has taken the vocals out of the mix, and so on, I feel compelled to help, and also to spare the ears of those in the audience.

When I go to the booth, I try to be as gracious as possible. Not surprisingly, my "help" is often met with resistance and/or excuses, and the message is loud and clear: get out of here now, buddy! I often ask myself why they're so defensive when all I'm trying to do is help. Well, life has a way of supplying us with answers to these questions, and they're often not what we expect.

Recently I was asked to mix an event for a friend. The musical style was a little different than I normally mix, and further, a scheduling conflict caused me to miss sound check, so I ended up arriving just 15 minutes before the start of the gig. Thankfully, the house audio guy had everything ready for me to still win. The performance started out great, or at least I thought so. It sounded pretty good except the vocals were a bit dull and felt buried in the mix, so I proceeded to brighten them up.

During the third song I noticed someone standing next to the booth, trying to catch my eye. By the fourth song, I leaned over and asked what he wanted. He replied, kind of nervously, "I don't mean to bug you, but the vocals are really ripping my head off."

And immediately – you guessed it – I got defensive. After all, it sounded fine to me. So I did the typical "Sure, O.K., thanks" combined with a head nod, and turned my attention back to the console. About a minute later, he showed up again. I put on my "polite" smile, leaned over, and this time, he was more direct. "The 2K energy in the vocals is killing me and those around me," he said.

My blood pressure went up a couple more points as I fortified my defenses. Undeterred, he continued, "Would you mind stepping down out of the booth and take a listen by my seat to get an idea of what it sounds like?" Reluctantly, I walked down the four steps out of the booth, confident I would be proven correct.

But as soon as I hit the floor, immediately I knew he was right. I grabbed his arm, said, "Thanks, I get it," hopped back up the steps, and quickly began taking out the high frequency boost that I'd added. And I spent the rest of the night regularly leaving the booth to hear what was happening on the floor.

Now, I could make a thousand excuses as to why I made such a terrible mistake, but it really comes down to the fact that I broke a number of my own rules:

1. Because of the schedule problem, I should have never offered to mix. Even though I thought I was helping my friend, was I really helping?
2. When I arrived, I should have walked the room while the pre music was playing. I would have noticed that the booth was lacking high frequency coverage.
3. Since I missed sound check, I never should have mixed. I always tell musicians if they miss sound check they can't go on stage. (Wow, am I a hypocrite!)
4. I should have been more familiar with the musical style.

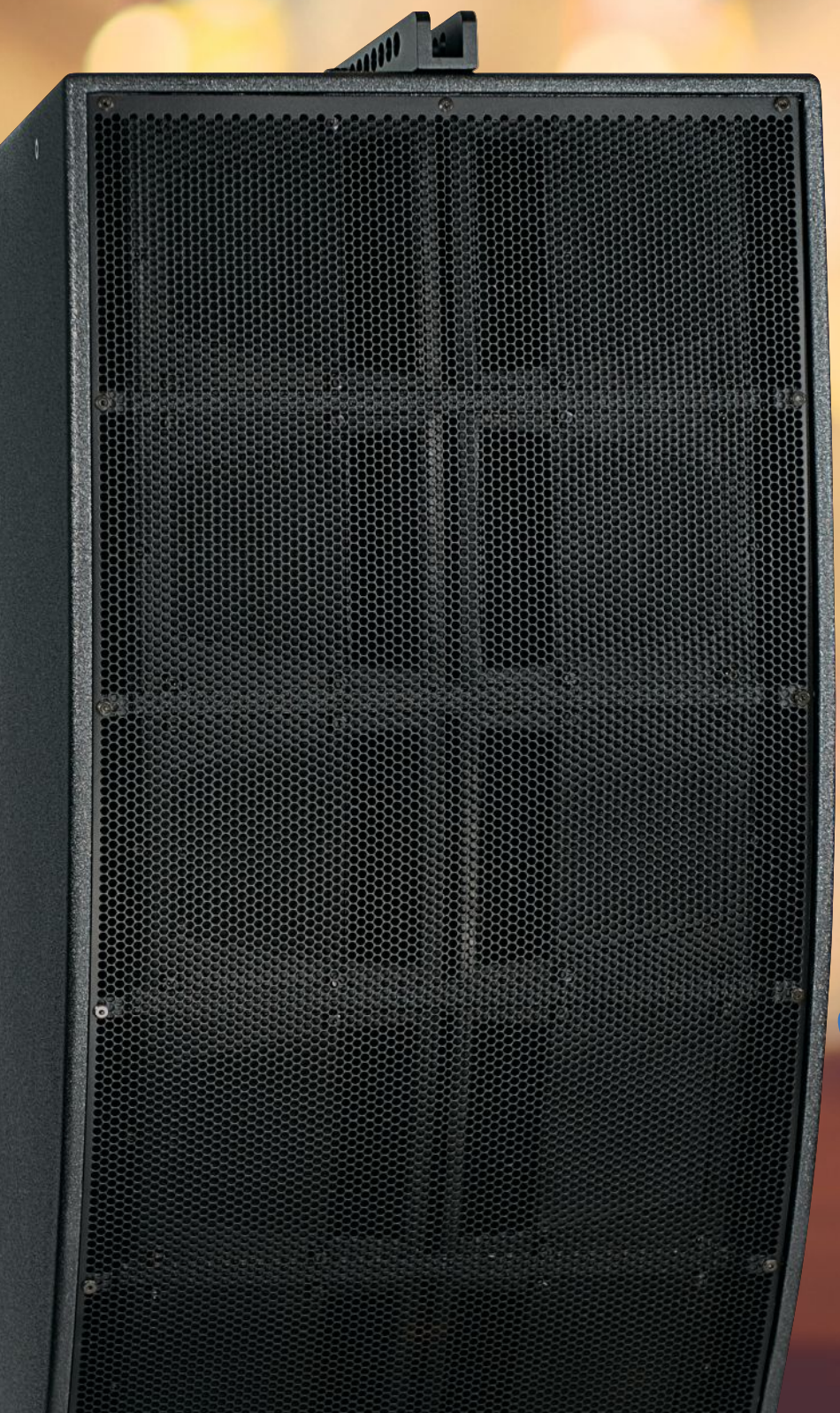
The real saving grace was the gentleman who graciously approached me twice and just asked me to listen to the mix on the main floor – he didn't lecture or tell me what to do. My defenses were high for absolutely no good reason. After the show I tracked down the man to thank him. In the light of the lobby, we both realized we knew each other. In fact, if I'd recognized him, I would have been more attentive the first time he approached the booth, and he said that if he knew it was me in the booth, he would have dragged me by my ear to his seat and made me sit there for a song or two.

Thus the moral of the story: Be humble, and if you aren't, audio has a way of changing that! CS

---

***Gary Zandstra*** *has worked in church production and as an AV systems integrator for more than 35 years. He's also contributed numerous articles to ProSoundWeb over the past decade.*

# Hear Every Word with WorxAudio



Take sound reinforcement for your church to the next level.

WorxAudio solutions deliver superior speech intelligibility, uniform coverage, and natural reproduction of music through streamlined installations that don't interfere the your visual aesthetics of your sanctuary. This is achieved through pristine, state-of-the-art components including digital amplifiers with integrated Dante® and superior array designs that offer wider dispersion with beam steering.

It's time to step up to the system your congregation deserves. Financing options are available to get you there.

WORX AUDIO®
TECHNOLOGIES BY PRESONUS®

worxaudio.com • 336.275.7474

# dLive

## Design for Live


Our design goal for dLive was to create the ultimate mixing system, with plenty of processing and flexibility to handle the most demanding live scenarios, while at the same time giving the engineer intuitive tools to comfortably keep all that power at their fingertips, freeing them to focus on the live mixing experience. Let's arrange to get your fingertips on a dLive mixing system and see what "design for live" is all about.

american music & sound AM&S
A division of Jam Industries Ltd.

**For more information email or call:**
info@americanmusicandsound.com | 800.431.2609

ALLEN&HEATH
www.allen-heath.com