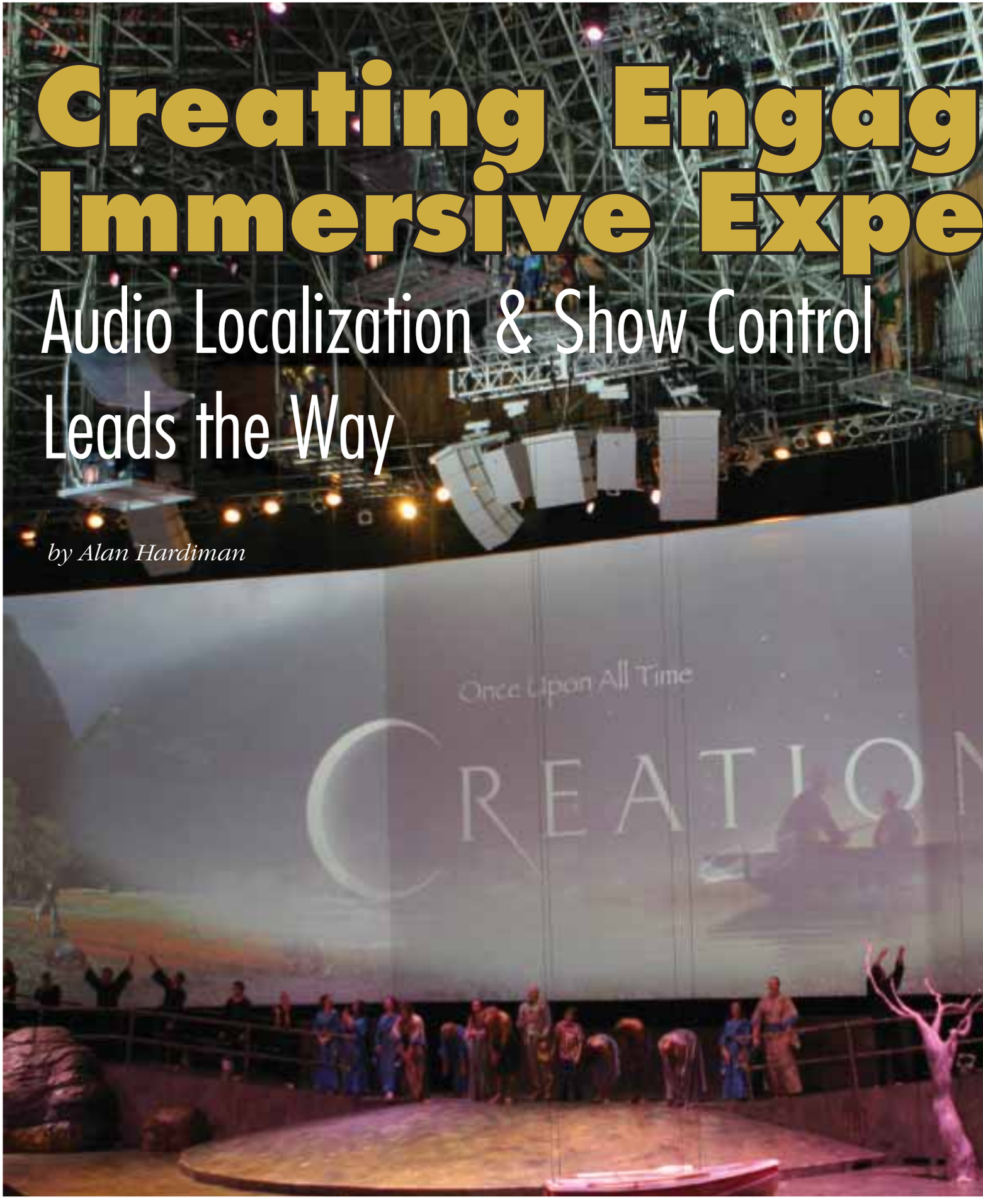
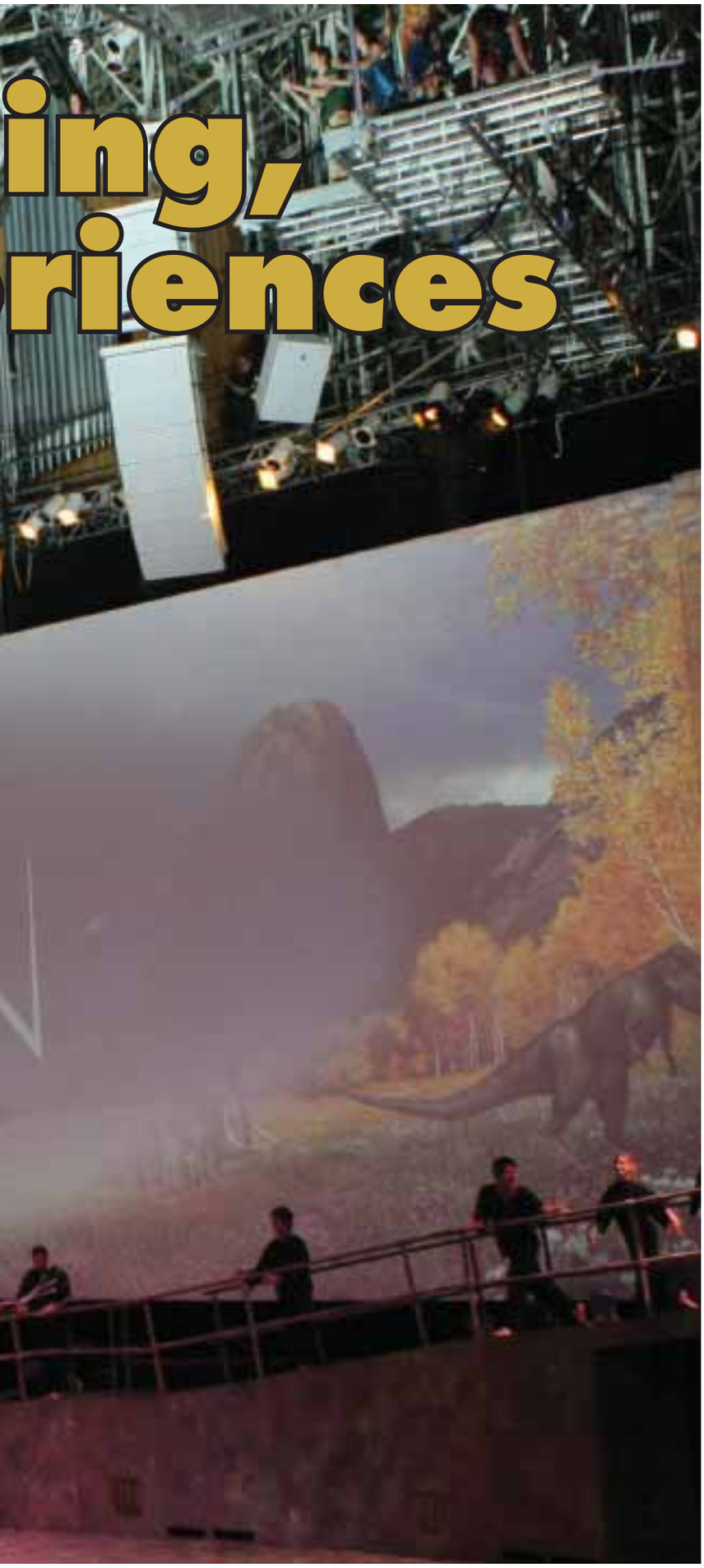


Creating Engag Immersive Expe

Audio Localization & Show Control Leads the Way

by Alan Hardiman



ing, riences

Magazine articles tend to embody one of two modes of discourse—descriptive and prescriptive. Tending to be styled after People magazine, the descriptive mode is employed to recount stories of people, events and products. While I occasionally find these sorts of stories interesting, they're not often of much use. Prescriptive articles, on the other hand, tell you how to do something or how to complete an unfamiliar procedure. Embodying the style of Popular Mechanics or Popular Electronics, such articles are much more valuable to me.

What to Do

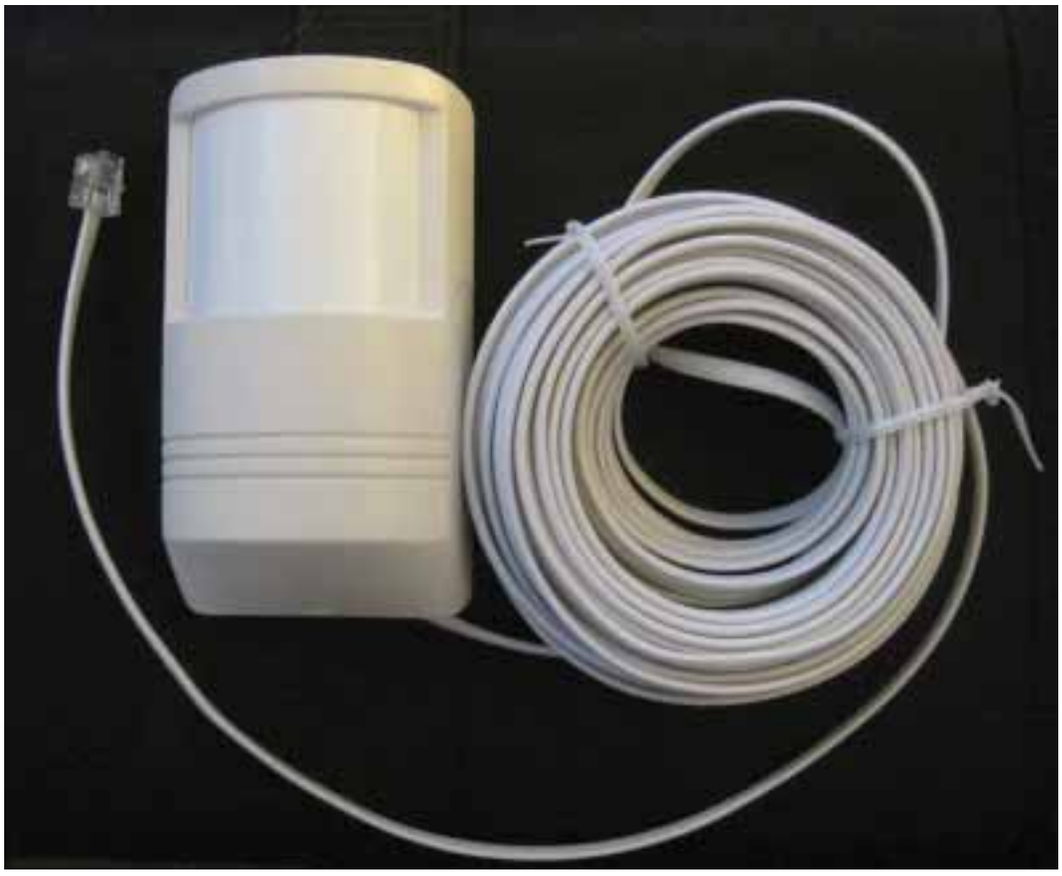
Starting out with a new piece of audio software, for example, I am not so much concerned with all the different ways the software writers have devised to initiate recording. Just tell me the most straightforward way to do it so that I can start using the software and get on with the job. In time, I'm sure I'll learn all the wonderful ways that I can put the thing into record mode, but that's not my immediate concern. So don't merely describe the product—please tell me what to do.

With regard to sound for houses of worship, there's a lot of buzz in the industry these days about source oriented reinforcement, audio localization, spatialization, and show control. My aim in this article is to be more prescriptive than descriptive in detailing three ways that you can use these technologies creatively to engage audiences or worshippers, while simultaneously automating many routine audio transitions, thereby alleviating the need for operator intervention for routine tasks such as switching microphones and adjusting levels.

Eliminate Error

Benefits to reducing operator intervention include the elimination of operator error, which often leads either to annoying feedback or lack of intelligibility; increased confidence for the worship team stemming from the guaranteed repeatability of finely tuned settings; and the inclusion in the worship service of personnel whose attention would otherwise be focused on operating the sound system.

The specific products mentioned are ones that I use or am most familiar with; however, the methods outlined may be applied mutatis mutandis to other products designed for similar applications.



Active devices, such as PIR motion sensors and beam sensors that typically run on 12 volts DC power, require a four-wire hookup—two for power and ground, and two for the contact closure.

Source-oriented Reinforcement (SOR)

Use an SOR system to localize talkers or performers. (I'll use the word "talker" to avoid any confusion that might arise from the use of "speaker" in reference to human beings.) The theoretical background of sound localization was covered in "Focusing on the Speaker—Not on the Loudspeaker" in the January, 2013, issue of TFWM.

In brief, because we localize sound in the direction from which it first arrives, and ignore reflections of the sound occurring 15-25 ms later from the floor, walls, and ceiling, we do not hear these slightly delayed sounds as distinct sounds themselves. Rather, they are fused with the original sound. This applies equally to sound from delay loudspeakers arrayed throughout the building, even if it is 6-8 dB louder than the original sound. At delays longer than 25-30 ms or so, these reflections begin to be heard as distinct echoes.

By using an input-output matrix that routes every microphone to every loudspeaker with unique level and delay settings, we can provide accurate localization of talkers to more than 90 per cent of the seats in the house. This SOR has been refined and proven in difficult theatrical environments, such as theatre-in-the-round at London's Royal Albert Hall. Calibrating an SOR system needs to be done only once, unless additional microphone positions are established.

SOR's flagship device is the TiMax2 Soundhub from Out Board Electronics in the UK. In a 2-RU package, the Soundhub offers matrixes from 16 inputs feeding 16 outputs all the way to 64 x 64, expandable in increments of 16 x 16. The number of level/delay input-output crosspoints therefore ranges from 256 to 4,096. The Soundhub also features 8-band parametric EQ, programmable 16- to 64-channel playback from an internal hard drive, and show control. It can be interfaced via analog, AES digital, MADI, and network systems including Optocore, Ethersound, Cobranet, and Dante. In other words, you can connect it to just about any other piece of audio gear on the planet—if necessary.

Localizing static microphone positions, such as those at pulpit and lectern, is a fairly straightforward matter of filling a supplied Excel spreadsheet with the distances from each loudspeaker to a sample seat in its coverage area. Importing the completed spreadsheet into the Soundhub software immediately populates the matrix with the computed levels and delays—known as image definitions—that lock down accurate localization of each microphone position for just about every seat in the house. This process can also be done simply by entering values directly via the TiMax SoundHub's intuitive software GUI.

The result is an immediate increase in both intelligibility and the level of engagement of the congregation with the worship team, compared with a conventional approach based on mixing sound into a center cluster, left-right, or L-C-R loudspeaker array, with or without delay speakers. Conventional amplitude-based panning using console pan pots works to localize sound sources only for listeners in a sweet spot along the center line of the room. All other listeners will localize the sound to the nearest loudspeaker. By contrast, time-based localization anchors the sound source to its physical location for listeners anywhere in the house.

Out Board director Dave Haydon explained it to me this way: "If there is continuous conflict between what we see and what we hear, this causes confusion. It is distracting to see a performer on the right side of the stage but hear his voice coming from a speaker on the left. Spread this out across multiple performers and you will have an audience stressed by the effort of trying to discern who's saying what. This reduces intelligibility, dramatic

impact, and overall immersion in a performance."

Regarding cost, entertainment production guru Scott Pollard of Palmer Audio in Preston, Ontario pointed out, "The Soundhub's price tag is about what you would otherwise pay for loudspeaker signal processing alone, so all the playback, input-output matrixing, and show control is basically free."

Worship leaders in larger, celebratory churches whose style includes walking through the congregation can be accurately localized using the TiMax Tracker system, which uses power-over-Ethernet (PoE) sensors to automatically locate performers wearing one-inch square, thin plastic radar tags, to within six inches in three-dimensional space—left-right, front-back, up-down. Up to 24 tags can be individually localized using three or four sensors mounted unobtrusively in the building.

Continuously updated location information for each tag is then fed into the Soundhub, which morphs each talker's audio image seamlessly from one pre-programmed image definition to the next in real time.

Control the Show with Show Control

Use show control to automate routine audio operations by triggering audio cues via inexpensive and unobtrusive motion sensors, infrared beam sensors, and pressure mats, all of which are available from electronics and alarm systems suppliers.

Audio cues are triggerable events that contain such elements as changes in level, delay, and equalization, as well as one or more pre-recorded sounds, including music, voice, and sound effects.

Soundhub cue triggers are selectable from MIDI Note On or Program Change messages, time code, show clock, time-of-day, power-up, and manual or hotkey triggers. An inexpensive switch-to-MIDI interface—the F8—is available from MIDI Solutions to interface switches and motion sensor contact closures via ?" jacks. It is easily programmed using a wizard-type utility to output any MIDI message in response to a change in switch state.

One simple application is to control a lectern microphone automatically when someone approaches the lectern to read from Scripture. First, mount an infrared (IR) beam sensor and reflector so that the beam is aimed across the path behind, or leading to, the lectern.

Next, program a Soundhub cue that raises the level of the lectern microphone from minimum to the desired level as an immediate or gradual change, and set the cue trigger to MIDI Note On. Program the same Note On in the F8, with a Note On duration long enough to prevent undesirable retriggering of the cue in the event that the beam is inadvertently interrupted again.

When it comes time for the reading, and the reader interrupts the beam on the way to the lectern, the cue is triggered, and the microphone output is automatically raised to the desired level. Note that this same cue can also be programmed to lower the

level of every unused microphone, thereby increasing the gain-before-feedback of the entire sound system. Automating the cue eliminates the potential for "finger trouble" or fader overshoot causing feedback, as well as late or missed cues causing frustration for the congregation and embarrassment for the operator.

Third, program the next cue, perhaps one that raises the level of the pulpit microphone, to simultaneously fade down the lectern microphone, and continue programming cues in this fashion. Alternatively, a separate cue can be programmed to lower the level of the lectern mic once it is no longer required.

Cues can also contain MIDI messages to trigger preset DMX lighting cues, and via the MIDI Solutions R8 MIDI-to-relay interface, this control can be extended to video players, projectors, fog machines, fountains, motors, and other devices that are initiated by the closing or opening of a switch. Complex interactive sequences are thus easily programmed, and are completely repeatable, rendering show control a perfect adjunct to praise team rehearsals.

Those three elements working together in concert produce an environment where ultimately the people in the crowd are invited into an intimate moment with God.

Make an Impact

Combine show control with immersive spatialization for high emotional impact and engagement.

In his comprehensive book, The Sound of Worship, Douglas R. Jones presents a case study of the 2,600-seat 12Stone Church in Lawrenceville, Georgia, which "is not called a sanctuary; rather it's quite intentionally deemed a 'worship experience center.'"

"The idea is to envelop people in the room with world-class sound, lighting and, of course, HD video," said Michael Wright, president of TI Broadcast Solutions Group of Norcross, Georgia, who served as principal designer for all the HD video systems at 12Stone. "Those three elements working together in concert produce an environment where ultimately the people in the crowd are invited into an intimate moment with God."

Looking at it from a slightly different angle, those of us in smaller or more conventional congregations know that many people who sit at the front are already committed, and it's often shy or tentative newcomers and occasional visitors—the ones who tend to sit at the back—that we are perhaps more eager to reach.

In either case, it is possible to shift the size and immersivity of the sound field dynamically during any part of the service by morphing seamlessly between different image definitions. During congregational singing, for example, the sound field can be ambient and enveloping, where worshippers are touched and included as an entire group. Toward the end of the song, the sound field returns almost imperceptibly to a tight focus at the front to pull their attention forward, and thus draw them in to the upcoming message.

Haydon relates the extensive use of TiMax this way at such events as the North American International Auto Show in Detroit, where Ford, Toyota Lexus, GM, Jeep, and Daimler-Jaguar have all used TiMax (as did Volkswagen at last year's Frankfurt Auto Show), to the objectives of a worship context. He has applied it himself with a subsidiary of a well-known French Canadian circus company: "As each act builds I'd hit a cue to slowly spread out the sound to left and right wide images, in order to fatten and build the excitement. Then when it reverts back to the master of ceremonies, I drop the image back to a tight onstage focus, so you're attentive just to him.

"Sometimes I'd spin the music bed round at various speeds depending on the act, and this could work equally well with worship, especially choirs, but perhaps more subtly. So as a song builds, you can spread it out wide, then for the finale put it into a slow drifting spin so that it stays at a constant energy across the room, floating almost ethereally before being drawn back to the front in preparation for the central spoken message," he said.

If desired, the return of the image to a tight, front-of-house focus can be initiated simply by the worship leader stepping onto a thin pressure mat concealed beneath carpeting, thereby triggering the cue containing that image definition.

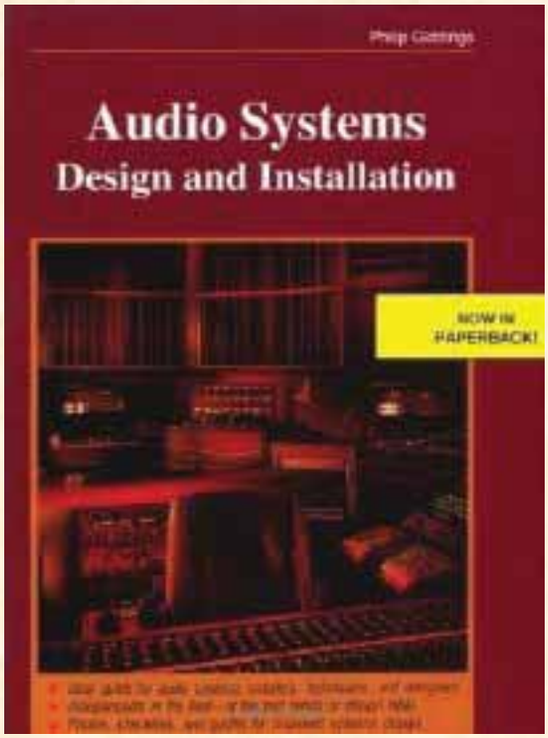
Goals Worth Pursuing

Message impact and audience engagement—fundamental objectives anytime AV technology is applied in contexts where people are gathered together—are goals worth pursuing as much in houses of worship as in live theatre and for corporate events. Implementing a source oriented reinforcement approach incorporating sound localization, spatialization, and show control is the surest route to achieving those goals.

This may also renew the sound team's enthusiasm for their calling, invigorating the work and inspiring the imagination with a whole new set of possibilities for enhancing the entire worship experience. ◆

Veteran sound designer Alan Hardiman is president of Sound Design Devices, providing technology and design services for exhibits, events, and installations. www.sounddesigndevices.com

Audio Systems Design and Installation by Philip Giddings



The classic reference newly republished, September 2013!

"This is the bible of audio interfacing. I truly could not get along without this book" – *Francis P. Biancamano III, New York*

"Still the only place I have found guidelines for interfacing every conceivable combination of audio gear" – *Michael W. Hulbert, Anaheim*

An "instant classic" ... a "must have" ... "perennial" – Ted Uzzle, *Sound & Video Contractor*

"Philip Giddings is the best in the business" – *Richard Pilbrow, Theatre Projects Consultants*

Fully illustrated and indexed, its 550 pages cover power & grounding, rack layouts, patching systems, cable preparation, connectors, wiring, and much, much more!

For complete contents
& advance book orders:

www.posttoronto.com

$69.95