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Featuring an installation by Southeastern Sound, Inc.

Balanced Distribution

By Jim Stokes

TSU's Gentry Center evens the audio.



Tennessee State University's multipurpose 10,500-seat arena within the Gentry Center is located on the university's main campus in Nashville TN.

Our story takes place in Tennessee State University's (TSU) 10,500-seat arena within the Gentry Center. Situated on the university's main campus in Nashville TN, the arena is a multipurpose space, accommodating sports, commencement and special events activities. It's the home court for the TSU Tigers basketball team.

Built in 1980, Gentry Center was named for Howard C. Gentry, Sr., who served a 27-year span as a TSU professor, coach and athletic director. In addition to the arena, the complex houses the university's department of health, physical education and recreation, indoor track, indoor Olympic pool, dance studio, racquetball courts, and a training and weight room. Getting a wider perspective, TSU is a comprehensive, coeducational, land-grant university founded in 1912. The 500-acre main campus offers more than 65 buildings in a residential setting. There's also the Avon Williams campus, located downtown, near the center of Nashville's business and government district.

Overview

The arena's installation is comprised of a new speaker system and accompanying sound-reinforcement components, including such key items as a mixer and a wide assortment of microphones. Versatility characterizes the sound system, which can configure speakers for a variety of uses and has portable carts that double for arena and classroom use. Thus, intelligibility and flexibility are hallmarks of the new install.

Southeastern Sound, Inc. (SSI), Nashville, was the contractor. Install team members included project manager Rick Redfern and DeWayne Curle. Brian Cook was the project designer. At One Systems loudspeaker systems in Nashville, credits go to president Doug MacCallum and engineer/speaker designer Mike O'Neill.

Upgrade Search

According to SSI's Cook, TSU was trying to utilize the original sound-reinforcement system that was installed in the early 1980s. This original system was comprised of a central cluster just below the center court scoreboard and a second loudspeaker cluster just above the stage, which was used for graduation.

Because of component failure and other maintenance issues over the years, the system had become virtually unusable. For sporting events, a portable system comprised of loudspeakers on stands was used to provide speech reinforcement, and a local production company would hang temporary line arrays for graduation commencement.

Cook related that, in Fall 2007, TSU issued requests for proposals (RFPs) for the replacement and upgrade of the reinforcement system. As part of the request, each integrator's proposal was required to have the support and approval of the selected loudspeaker manufacturer with respect to design and overall performance. The university provided a basic loudspeaker performance guideline, along with an equipment list specifying the number of wireless microphone systems, mixers, outboard processing equipment and other AV items. Subsequently, SSI was awarded the Gentry Center project. Next, we'll see why SSI chose a certain loudspeaker line for the install.

Speaker Selection

According to Cook, Southeastern Sound first used the company's speakers on a football field installation in Nashville, with MacCallum suggesting the 212 CIM model. After listening to it on a demo, SSI agreed to use the product. "The intelligibility was outstanding and the overall tonal quality was exceptional," said Cook.

During the first phases of that field install, Mike O'Neill, One Systems engineer, provided input about performance expectations, and suggestions about installation techniques. Once installation was completed, he did some final adjustments with the loudspeaker processor. Southeastern Sound's second project with the company's products was for a local high school gymnasium.

Thus, with these two experiences, SSI was comfortable with the product and its technical support.

The TSU Gentry system design by Southeastern Sound was based on simplicity and using a speaker manufacturer that could provide local support in the preliminary design, and also during the integration stage of the system and final system commissioning.

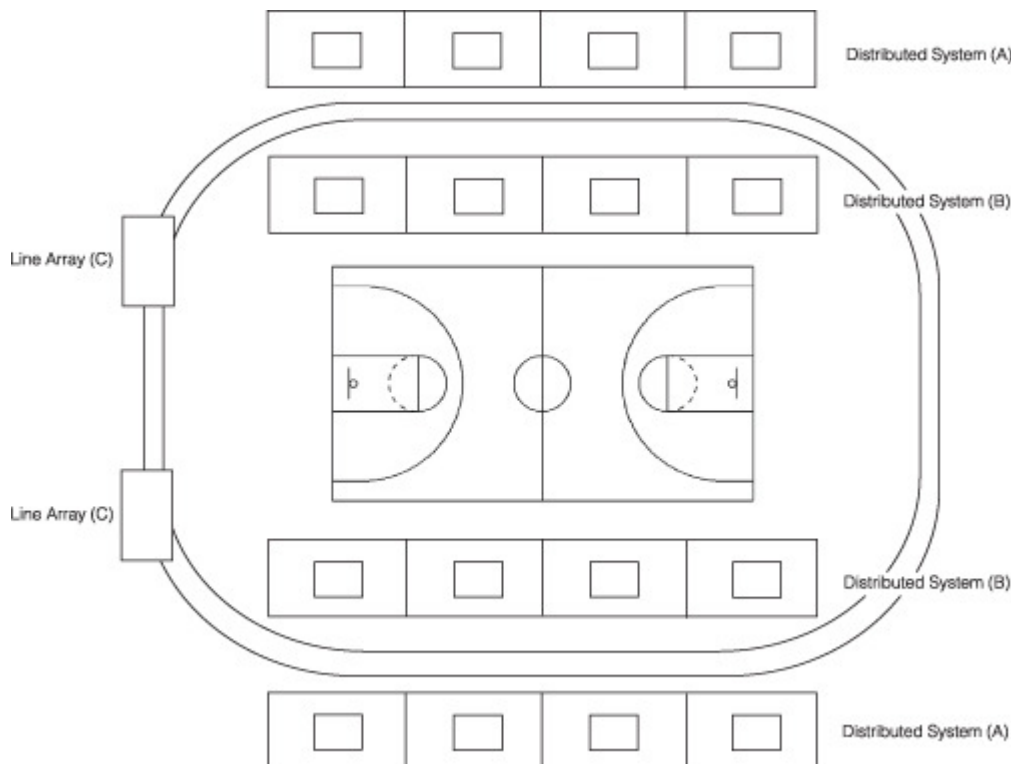


Diagram A. Gentry Center bowl area.

Speaker Configuration

"One of TSU's requirements was that it wanted us to come up with a design," said Cook. "And [the school] wanted input and

assurance from the loudspeaker manufacturer.” He explained that One Systems’ O’Neill designed the line arrays and integrator Southeastern Sound handled everything else: The distributed system, amplifiers and all other design work was attributed to Cook. It was decided to have the facility operate in two basic modes: sports and commencement.

Typical Example

Cook noted that Gentry Center gymnasium, with seating capacity of more than 10,000 and about 8500 square feet for university basketball games, is a typical example of a high-noise sports and convocation center requiring highly intelligible speaker systems.

For a graphic representation of the speaker install, see Diagram A. Let’s look at sports mode first. For university basketball games, the gymnasium is covered in a distributed system in six zones. Thus, each individual seating section has its own speaker overhead. There’s a delayed ring of 16 112IMs with low Q horns in a 105x60 pattern for the top bleachers (Distributed System (A)). And the main floor/lower bowl bleachers are covered by 10 212CIMs with 60x60 patterns (Distributed System (B)).

The commencement mode includes convocations, TSU and high school graduations, and other special events. In this mode, according to O’Neill, the dual seven-element line array using 212IM-Ls covers the gym, with part of the distributed system used for fill up in the front corners of the upper bleacher section (Line Array (C)). O’Neill made site visits during the system installation and final commissioning to fine-tune the line arrays when the room was set up for commencement ceremonies. According to Cook, “University officials met Mike throughout the project and this was exactly the type of manufacturer support that they had outlined in their request for proposal.”

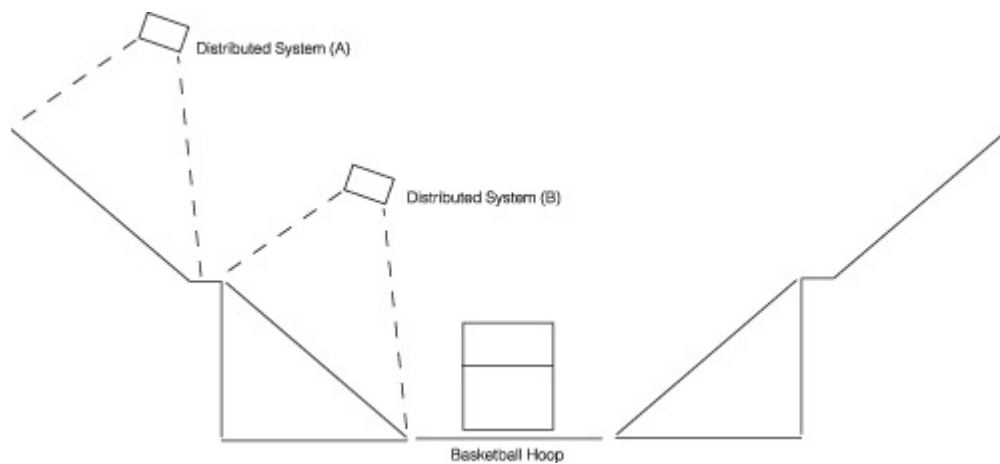


Diagram B. Gentry Center

Touchpanel Control

Various modes and each loudspeaker zone can be muted or fed from presets via a QSC NAC touchpanel located at the main equipment rack and in the facilities manager’s office. Some preset examples include the aforementioned sports and commencement settings. For a volleyball tournament, they might want to mute all of the loudspeaker zones except for those in the lower bowl closest to the playing floor. There’s a preset for a small meeting, where people congregate on the north side of the main/lower bowl. In that preset, only the speakers above the participants’ heads are turned on.

A small portable equipment rack with wireless microphones, six-channel mixer and a dual transport CD player are used for sporting events. “We went with an Astatic dynamic for their sports announce mic,” according to Cook. “We found those dynamic goose mics don’t overload like a condenser does. It’s used by their sports announcer for introductions and such for ballgames. He can get his mouth right up to it and not get a lot of distortion.” The rack, which sits next to the announcer, has a handle that pops up like a suitcase you roll along into the airport.”

In addition, a larger portable equipment rack can be used as a standalone system for use elsewhere in the building. As a result, not only can they plug it into the main system, it can also be moved down the hallway to a classroom or a lecture room. “When needed for classroom sound reinforcement, there would be mics to choose from for different applications. We tried to put diversity into the system,” Cook added.

“[The instructor] may need a warmer-sounding mic in a room that has 75 people, where reverberation is not that big a factor. And a shotgun mic might not be the best choice. Not knowing every application [instructors] might dream up, we tried to give them just a smattering of options. Thus, there’s a wide assortment of wired and wireless mics available.” Cook added that the Audio-Technica small shotgun mic “worked best on the podium for graduation,” as a result of their final checkout evaluation.

Highlighting other essential equipment, there’s an Allen & Heath 16-channel mixer. The podium and main graduation mics are routed through the Aphex 230 voice processor for a little more presence and articulation. A stellar example of the Aphex DA (distribution amplifier) was its use for a recent special event: It was 47 years ago in September 2008 that 14 black TSU students were beaten and arrested during the Freedom Rides that helped integrate the South. For their courage, they were expelled from

school and informed of that decision by letter while jailed in Mississippi. The university made amends by presenting the former students with honorary degrees, three of them posthumously (source: usatoday.com, 9/19/2008). The Aphex DA provided multiple media feeds to CNN, NBC and other news entities.

Tuning, Mounting

"The challenges we had were in the room acoustics," Cook pointed out. "There's a buildup of low frequency energy, which is typical. So it was how to balance the system between giving [people] the low ends, speech and music they want within the room [versus] the buildup of low-end frequencies. We're 'old school.' We still use TEF analysis for distributed speaker setup and everything else. We balanced everything back to the line arrays that Mike did." Roll-off was in the 150Hz and 200Hz range.

Because the system is not intended for concerts, "the position of the line arrays had to be such that, when [others] would come in to do full-scale concerts, they could hang other speaker systems and light trusses in front of ours.

Getting back to rigging the new system, Cook emphasized that project manager Rick Redfern did "such a good job. We had scissor lifts and boom lifts in there." Redfern designed the line array support structures, which were then built off of existing beams, allowing them to use the existing catwalks and other areas to hang the distributed speakers. "Rick came up with industry-approved certified hardware and integrated it into existing structures." The system was up and running for Summer graduation in August.

O'Neill observed that there's a tendency to want to put "scoreboard systems" or central clusters into sports facilities. "But we're starting to see a trend back to distributed systems. Thus, there's a large oval ring over the floor seating for sports venues. And there's a second delayed ring on the upper track level." Taking a colorful but worst-case echoey scenario in a certain church that would be akin to a similarly highly reverberant enclosed sports facility, he noted a "Saint Ready-Mix" had nothing but concrete inside like a reverb chamber. And a lot of worship spaces are that way. Unfortunately, even when you get absorptive bodies in there, there's not enough absorption to deal with so much reflection. That's also the case in a lot of sports, especially the basketball-centric venues."

Systems Made Sense

O'Neill pointed out that, with the advent of digital delays, distributed systems make sense in very reverberant rooms. "The first step [element] in the process of good intelligibility is simply maximizing the direct-to-reflected ratio that you present to [the audience]. The second element is dealing with time domain issues in the loudspeakers themselves. [For example], there's that classic 'horn sound.' And there are lots of things you can do to start to take some of the time distortion out.

"Once you have speakers with a high direct-to-reflected ratio, the next step is to deal with the loudspeakers themselves and present systems that have well-damped mechanical and acoustical resonances [to the audience ears]. And if you can damp a lot of those resonances out, people will look up and say, 'Gosh! This sounds like someone's talking to me!'"

Southeastern Sound, Inc.

Southeastern Sound, Inc. (SSI), Nashville TN, is an electronics system contractor/integrator offering design, engineering, sales, installation and service. SSI is comprised of a team dedicated to remaining on the cutting edge of technology to provide sound solutions for its customers. The company is committed to leading the industry through innovation and customer satisfaction. SSI has been a member of NSCA since 1980. Examples of recently completed projects in Nashville include Frist Center for the Visual Arts and Metro Nashville Main Library.

For more information, go to www.southeasternsound.com.

Equipment

- 1 Allen & Heath Mix Wiz 16 audio mixer
- 1 Aphex 120A servo-balanced distribution amp
- 3 Aphex 230 master voice channel processors
- 2 Astatic 40-118 hi-mass, heavy-duty portable desk stands
- 1 Astatic 727-18 18" dynamic mic
- 3 Audio-Technica AEW 5233C dual-channel HH mics
- 3 Audio-Technica AEW 5111C dual-channel lapel systems
- 6 Audio-Technica AT 831CW lapel elements for AEW 5111C
- 1 Audio-Technica ATW-A49 dipole antenna
- 2 Audio-Technica AEW-DA550C UHF antenna distribution systems
- 1 Audio-Technica AT 831B cardioid lavalier
- 1 Audio-Technica AT 897 small shotgun mic
- 14 One Systems 212IM-L line arrays
- 16 One Systems 112IM 70 speakers w/brackets

10 One Systems 212CIM 70 speakers w/brackets
1 One Systems System Supervisor 4x8 speaker processor
6 QSC PLX 3602 line array amps
6 QSC ISA800Ti power amps
1 QSC DSP 322 DSP control box
2 QSC NAC-100 network audio controllers
2 RDL RU-SC2 RS232/422 serial converters (full-duplex)
2 Shure Beta 58 mics
1 Shure KSM9/CG podium mic
2 TASCAM CD-X1500 dual CD players
West Penn speaker cable