



PROFESSIONAL

by HARMAN

DESIGN GUIDE

LOUDSPEAKERS FOR SPORTS FACILITY APPLICATIONS



LOUDSPEAKERS FOR SPORTS FACILITY APPLICATIONS

AN INTRODUCTION TO SOUND REINFORCEMENT FOR SPORTS FACILITIES

For sports fans, there's nothing quite like the feeling you get when you walk into the stadium or arena on game day to cheer on your favorite team. From outdoor football, baseball and soccer stadiums to indoor basketball and hockey arenas, the thrill of being among thousands of fans all gathered for the same reason is a visceral experience unlike any other. Anyone who's attended such an event can tell you that the noise from the crowd alone can reach overwhelming volume levels.



When providing sound reinforcement for sporting events, the screaming fans are just one of many challenges faced by the design and installation teams. This design guide will address the most important factors to take into account in order to deliver optimal audio coverage and high intelligibility to every seat in the house, including the following:

- Important considerations to weigh when designing a system and choosing the loudspeakers for the job.
- Common types of installed systems found in sports facilities and the challenges associated with them.
- How facilities all over the world are using [VLAi Series](#), [VLA Compact](#), and the broad range of JBL Professional loudspeakers to overcome challenges with unprecedented ease and efficiency.

WHAT TO CONSIDER WHEN CHOOSING SPEAKERS

The overall goal in all sports facilities is essentially the same: to deliver announcements and music to every spectator in the arena or stadium with a high degree of sound quality, balanced audio coverage and clarity of speech. However, when identifying the appropriate design approach, multiple factors must be taken into account, including:

- The architecture of the facility.
- The role amplified audio plays in each sporting event.
- The amount of bass or low-frequency energy needed.
- The location and weight limitation of speaker mounting options.
- The client's overall budget.



HIGHLY DISTRIBUTED SPEAKER SYSTEMS

The highly distributed speaker system is perhaps the most common type of sound reinforcement solution found in large sports facilities. As its name implies, this system utilizes a large number of speakers distributed at strategic locations throughout the facility. Each seating section requires a dedicated speaker, and every spectator should reside within the direct coverage of one of those speakers.

When done correctly, highly distributed speaker systems provide fans with immersive audio experiences, but they also come with a unique set of challenges:

- Because they involve so many speaker locations and require a significant amount of cabling, highly distributed systems can be expensive to install.
- Some facilities may not have the proper infrastructure to mount each individual speaker.

- It can be challenging to properly signal-align (sometimes referred to as time-align) multiple speakers to minimize multiple arrivals.
- Because the speakers tend to be small in size, the coverage pattern is only accurate down to a certain frequency. Below that, the signals from multiple speakers can interfere with each other.

SCOREBOARD SPEAKER SYSTEMS

Many open-air facilities, such as college football stadiums, lack any type of overhead infrastructure to mount distributed systems. In these situations, a common solution is to install large scoreboard speaker systems. These systems utilize large speaker arrays to blast high sound pressure levels throughout the stadium from one or two centralized locations—typically the scoreboards in the endzones or a center video screen.

In the right venue, this type of system can work well and doesn't require as much processing behind the scenes for time alignment. However, achieving perfectly uniform coverage at every listening location can be a great challenge. Also, because sound loses power over long distances, this solution requires high levels of amplification and excellent pattern control to produce adequate volume throughout the stadium.

JBL VLA AND VLAI SERIES SPEAKERS

JBL answered these challenges by introducing VLA (Versatile Line Array) loudspeakers. VLA Series speakers combine modern line array technology with a traditional horn-loaded design, resulting in improved horizontal pattern control. Because various seating sections in a stadium require variable horizontal coverage to account for the differences in distance from the speaker, VLA speakers are available with 40-, 60- and 90-degree coverage patterns to cover short, medium and long distances respectively.

Thanks to their innovative design, VLA Series speakers offer great sound pressure capabilities, sound quality and consistency of coverage. The full-range cabinets are trapezoidal (tapered) on the top and bottom, allowing for convenient curved array capability. Subwoofers are sometimes installed along with the main speakers but it's also common for the subwoofers to be installed either behind or beside the main cabinets. For this reason, VLA Series speakers excel in a wide range of scenarios, including both partially distributed central systems as well as centralized scoreboard systems. Today, VLA Series speakers are utilized in many notable facilities, such as:

- Soldier Field, home stadium of the Chicago Bears, National Football League
- Moda Center (formerly the Rose Garden), home arena of the Portland Trailblazers, National Basketball Association
- US Bank Stadium, home stadium of the Minnesota Vikings, National Football League
- BC Place, home stadium of the Vancouver Whitecaps FC, Major League Soccer, and BC Lions, Canadian Football League, and many other top venues

JBL replaced the original VLA models with the VLAI Series, which improved rectangular sides, yielding more cabinet space for greater low frequency extension of the new, even higher performance, low-frequency drivers. Some of the featured highlights of the VLAI Series include:

- Advanced neodymium differential drivers
- Dual voice coils
- Deeper bass response
- Higher sensitivity and power handling
- Better heat dispersion



JBL VLAI Series
Variable Line Array
Loudspeakers

JBL VLA COMPACT SERIES SPEAKERS

To address the need for speakers that deliver the high performance of the VLA and VLAi Series with smaller sizes and lower system costs, JBL developed the VLA-C Series of compact variable line array speakers. In addition to being smaller and easier to install, the VLA-C Series also reduces overall system costs in the following ways:

- Greater vertical coverage angle per cabinet reduces the number of cabinets needed for the same coverage.
- Fewer speakers can be driven by a single amplifier channel, reducing number of amplifiers required.
- Included weather treatment allows systems to be deployed outdoors without the need for additional weather protection.

VLA Compact Series (VLA-C) speakers come in two coverage options—the VLA-C2100 offers 100 degrees of horizontal coverage for short throw distances, while the VLA-C265 provides 65 degrees of horizontal coverage for longer throw distances. In addition, both models offer:

- 15 degrees of vertical coverage
- Advanced FIR tunings for improved phase response and arrayability
- Internal acoustic horn-loading for coherent wavefront alignment

While VLA-C full-range cabinets can be used in some configurations without the need for dedicated low-frequency cabinets, VLA-C125S subwoofers offer extended low frequency response. With the exact same width as the VLA-C2100 and VLA-C265, VLA-C125S subwoofers integrate naturally into any VLA-C Series array.

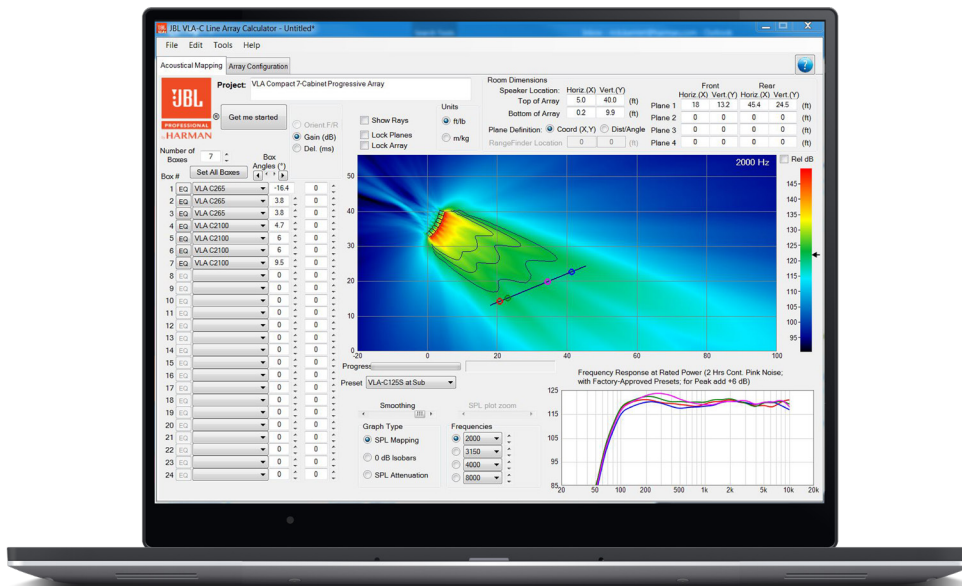
Additionally, the VLA-C125S-ACC Cardioid Kit allows the system to be deployed in a cardioid configuration, focusing the bass in a single direction and preventing spillage behind the array.

JBL VLA COMPACT LINE ARRAY CALCULATOR

To get started designing JBL VLA-C systems, use the JBL VLA Compact Line Array Calculator software, available at the [JBL website](#). This software helps you determine:



JBL VLA-C2100
Two-Way Full Range
Loudspeaker with 2 x 10"
Differential Drive® LF



- Array location and elevation
- Number and types of enclosures needed
- Precise angles between enclosures
- SPL mapping and frequency response at up to six locations
- Safety factors related to weight, balance and mounting
- Settings for gain, delay, EQ and more

Detailed instructions on how to use JBL Line Array Calculator software can be found [here](#).

JBL LOUDSPEAKER TYPES FOR ANY SPORTS FACILITY NEED

JBL also provides many types of speakers that can be used as main speakers in various types and sizes of stadiums, in smaller distributed systems, and of course the wide variety of back-of-house applications.

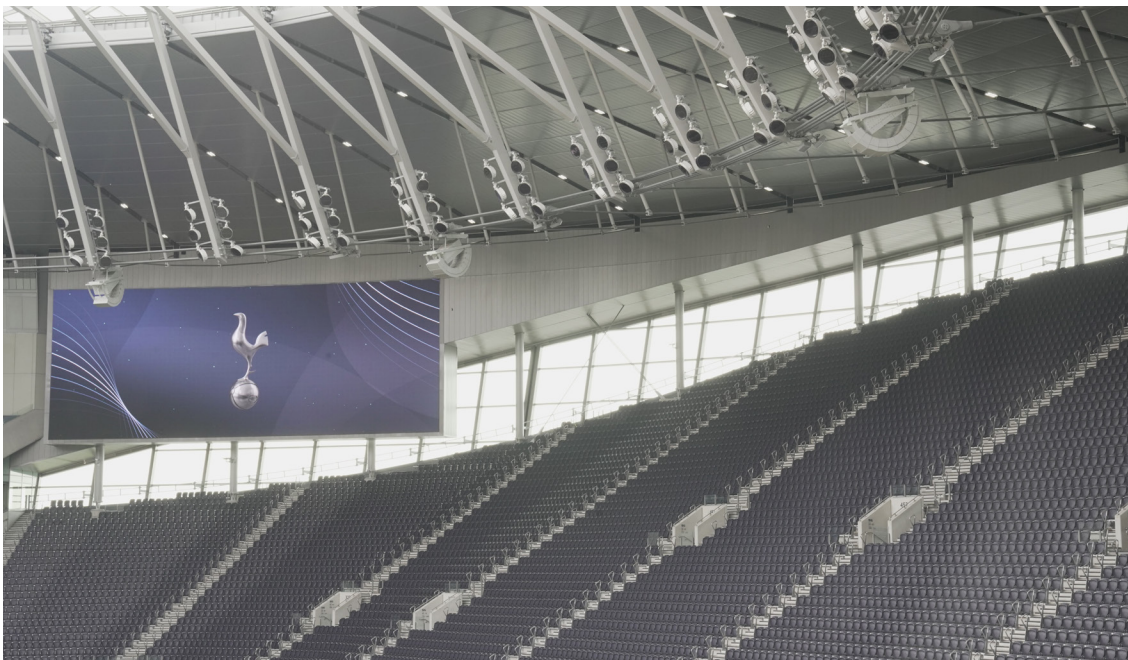
- VTX Series line arrays
- AW and AW Compact (AWC) weather-resistant speakers
- PD Precision Directivity 6000, 700, and 500 Series large-horn large-horn 2-way and 3-way speakers for pattern control
- AE Application Engineered speakers with a wide selection of configurations and coverages
- VRX affordable arrays with integral rigging and available suspension array frame
- CBT Series column speakers for defineable vertical patterns with wide horizontal coverage
- Intellivox steerable/shapeable columns for precise, adjustable directivity pattern control
- A wide variety of commercial installation speakers – ceiling, surface-mount, pendant, landscape, and others.



INTEGRATED HARMAN SOLUTIONS

JBL loudspeakers are just one part of a wide range of HARMAN solutions for arenas and stadiums, including Crown amplifiers, BSS processors, Soundcraft mixers and AMX networked AV, video and control solutions. Integrated HARMAN systems can be found in facilities around the world, including:

- [Tottenham Hotspur FC Stadium](#), London
- [Incheon SK Happy Dream Stadium](#), South Korea
- [Mitr Phol Stadium](#), Thailand
- [Rajamangala National Stadium](#), Thailand
- Sofi Stadium, Los Angeles
- Allegiant Stadium, Las Vegas



Learn more at jblpro.com
