



biamp™

SPORTS SOUND

Loudspeaker System
Design Reference Guide

Recommended Effective Operating Distances

Reference: 96 dB

Model	Description	Feet		30	40	50	60	70	80	90	100	150	160	170	180	190	200	210	220	230	240	250	300+	
		Meters		9	12	15	18	21	24	27	30	46	49	52	55	58	61	64	67	70	73	76	90+	
R.15-3696	3-way, Triaxial; LF: 1 x 6" MF: 2 x 2.35", HF: 1 x 1"		52' / 16m																					
R.15COAX	2-way, Coaxial; LF: 1 x 6", HF: 1 x 1"	32' / 10m																						
R.35COAX*	2-way, Coaxial; LF: 1 x 10", HF: 1 x 1.25"		52' / 16m																					
R.25-94Z	2-way, LF: 1 x 8", HF: 1 x 1"		49' / 15m																					
R.35-3896*	3-way, LF: 1 x 8", MF: 2 x 2.35", HF: 1 x 1"		83' / 25m																					
R.5COAX66/99**	2-way, LF: 1 x 12", HF: 1 x 1"		60' / 18m																					
R.5-66/94/99Z**	2-way, LF: 1 x 12", HF: 1 x 1"		90' / 27m																					
R1-64/66/94**	2-way, LF: 1 x 12", HF: 1 x 1"		148' / 45m																					
R.5HP	3-way, LF: 1 x 12", MF: 1 x 2"; HF: 1 x 1"		150' / 46m																					
R.5-66/96MAX	2-way, LF: 1 x 12", HF: 1 x 1.4"		150' / 46m																					
R2-64/66/94MAX	3-way, LF: 2 x 12", MF: 1 x 2"; HF: 1 x 1.4"		205' / 61m																					
R2-5Z	3-way, LF: 2 x 12", MF: 2 x 2"; HF: 1 x 1"		205' / 61m																					
R2-5ZMAX	3-way, LF: 2 x 12", MF: 2 x 2"; HF: 1 x 1"		252' / 77m																					
R2-77/94/694/474**	3-way, LF: 2 x 12", MF: 1 x 2"; HF: 1 x 1"		157' / 48m																					
RMG-200A	1-way, MF: 1 x 2"		240' / 73m																					
R.5-V2200	1-way, MF: 2 x 2"		315' / 96m																					
RSH-462	1-way, MF: 4 x 2"		715' / 218m																					
LLVH-906/AS single cabinet array	3-way, LF: 4 x 12", MF: 3 x 2", HF: 4 x 1.5"		368' / 112m																					
L VH-906/AP dual cabinet array	3-way, LF: 6 x 12", MF: 6 x 2", HF: 8 x 1.5"		518' / 158m																					
IV6 six cabinet typical array	2-way, LF: 6 x 12", HF: 12 x 1.7"		335' / 102m																					
IV6 twelve cabinet typical array	2-way, LF: 12 x 12", HF: 24 x 1.7"		480' / 146m																					

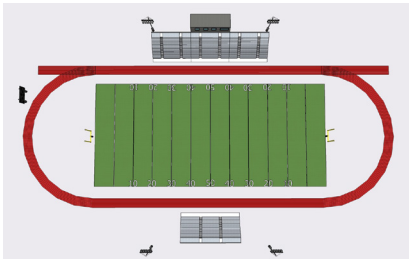
96 dB SPL with no atmospheric effects

* Voicing switch in Music position

** Average Max SPL considered or Max SPL of the lowest output device

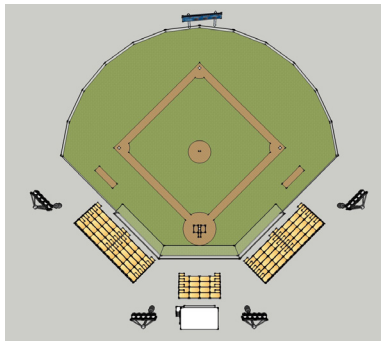
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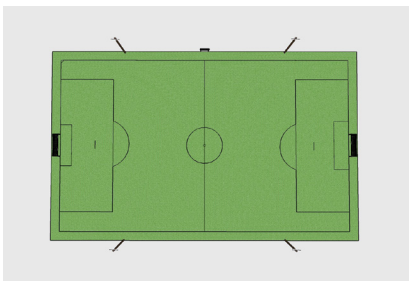
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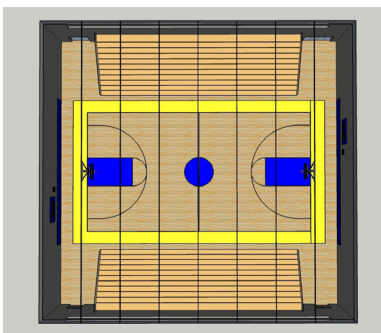
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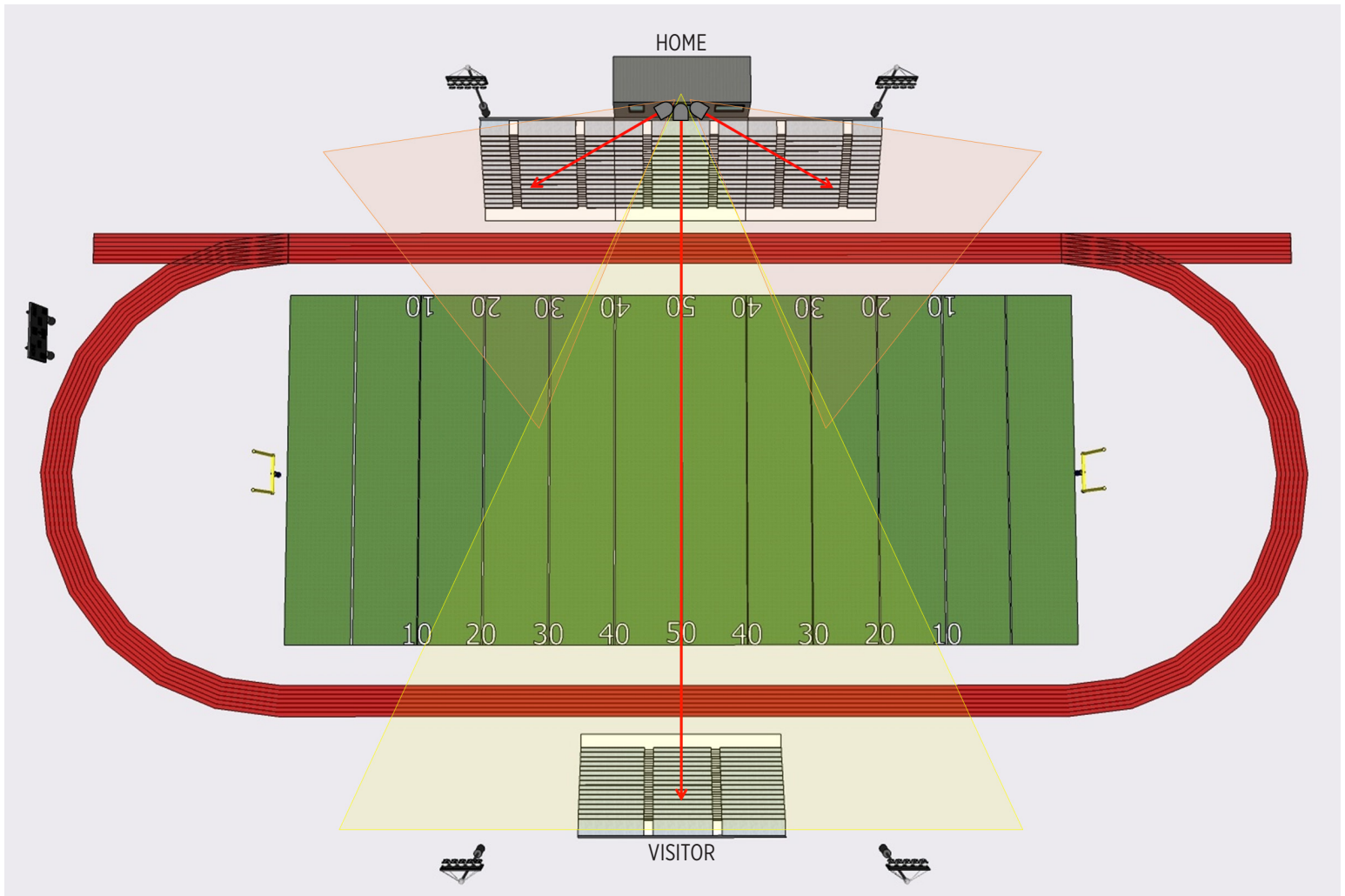
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Football Field 'Press Box'



Installation Description:

- The loudspeakers are mounted on the roof of a press box, preferably at least 16 feet above the highest row of seating.
- The bleachers are assumed to be 20 feet tall at the back row.
- An array of two to four loudspeakers to address the home seating, plus an R2-52Z or R2-52MAX in the center to provide crossfield coverage.

Option A:

- One (1) R2-52MAX (visitor coverage)
- Three (3) R.5-96MAX (home coverage)
- High SPL and best musicality. Addresses larger bleacher areas while projecting uniformly over farther distances.
- Two (2) ALC-1604D*

Option B:

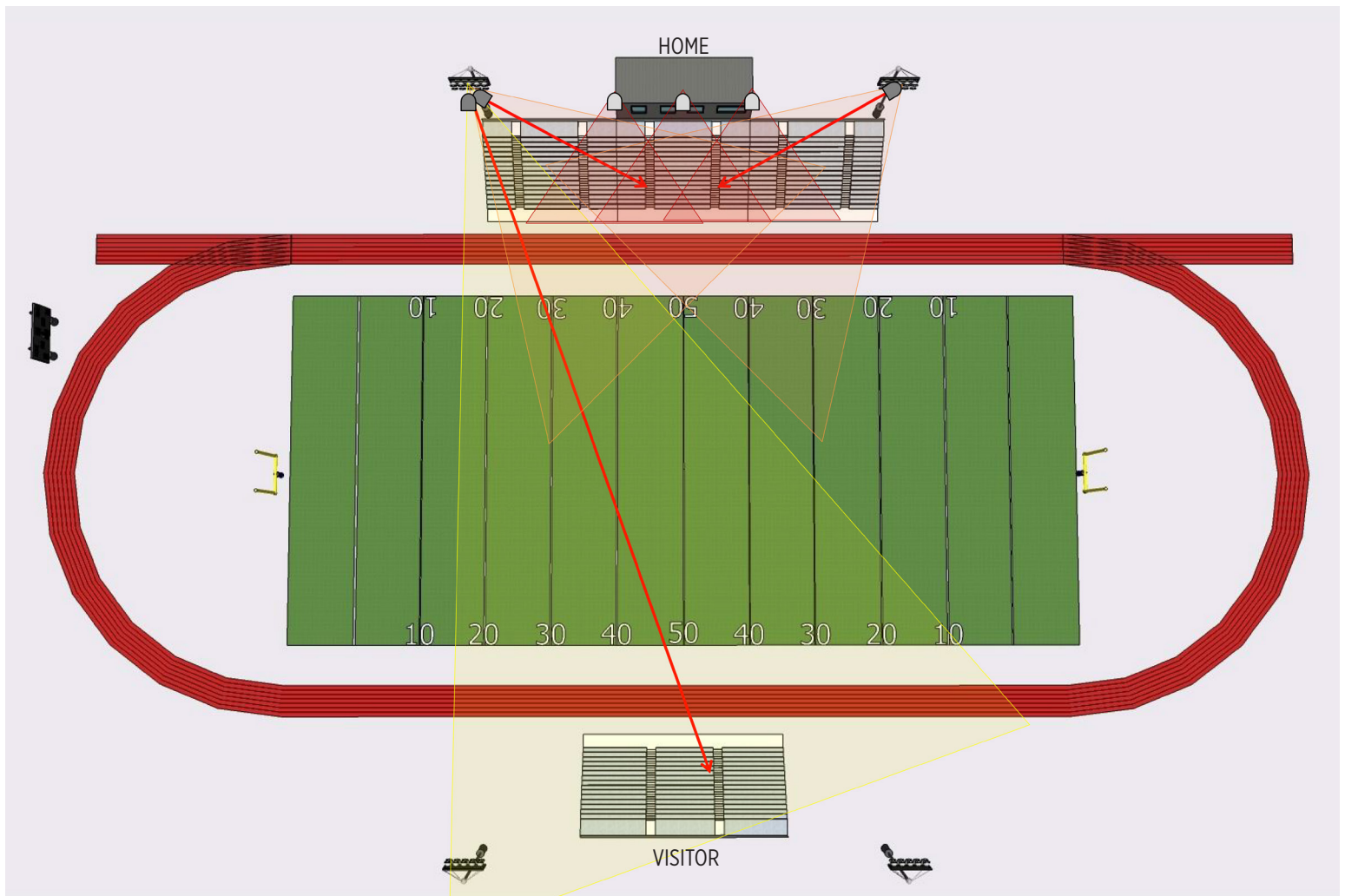
- One (1) R2-52Z (visitor coverage)
- Two (2) R.5-94Z (home coverage)
- Moderate SPL for use in venues with shorter bleachers (i.e., the length of the bleachers does not exceed the 30-30 yard line).
- One (1) Voltera D 1200.4

Option C:

- One (1) R2-52Z (visitor coverage)
- Two (2) R2-94Z (home coverage)
- Two (2) R.5-94Z (center of home)
- Very articulate three-way performance and enhanced LF to the home seating section, while providing more even coverage to wide sections of the home stands.
- One (1) ALC-1604D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Football Field 'Lighting Poles'



Installation Description:

- The loudspeakers are pole mounted at least 25 feet above the back row.
- The bleachers are assumed to be 20 feet tall.
- Because the loudspeakers are mounted at a higher point, this system provides more even home seating coverage than the Football Field 'Press Box' design.
- A single R2-52Z or R2-52MAX provides crossfield coverage.
- Additional matching compact loudspeakers on the press box (Extra Coverage- red triangles) will help reduce artificial echoes. This can be added to either Option A or B.

Option A:

- One (1) R2-52MAX (visitor coverage)
- Two (2) R.5-96MAX (home coverage)
- Higher SPL and enhanced musicality for venues where the light poles are up to 240 feet apart.
- One (1) ALC-1604D*

Option B:

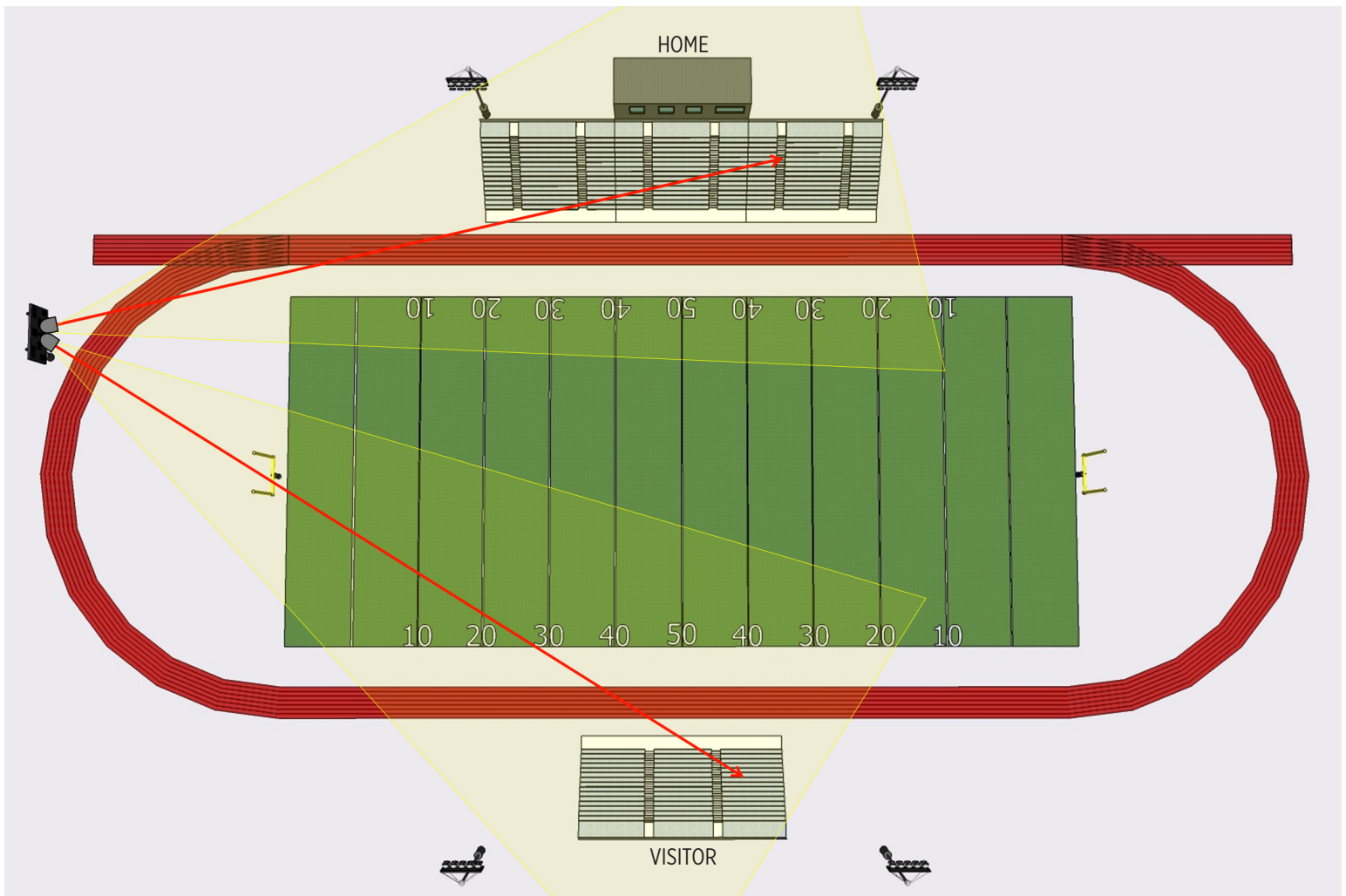
- One (1) R2-52Z (visitor coverage)
- Two (2) R.5-94Z (home coverage)
- Moderate SPL for use in venues with shorter bleachers and light poles up to 180 feet apart.
- One (1) Voltera D 1200.4

Extra Coverage:

- Three or Four (3-4) R.35-3896 (additional home stands coverage)
- Additional signal-delayed coverage of the home stands helps reduce artificial echoes.
- One (1) Voltera D 1200.4

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Football Field 'Scoreboard'



Installation Description:

- R2-52Z, R2-52MAX or LVH-906WR/AP loudspeakers are mounted to the scoreboard 25 feet above the ground.
- The bleachers are assumed to be 20 feet tall at the back row.
- Atmospheric effects such as wind, diffraction, and excess high frequency attenuation are more likely to be noticed in this design.
- If the length of the home or visitor bleachers exceeds the 20-20 yard line, additional R2-52Z loudspeakers should strongly be considered for one or both sides.

Option A:

- Two (2) R2-52MAX
- Best coverage for shorter bleacher sections from a scoreboard location.
- One (1) ALC-1604D*
- One (1) ALC-404D*

Option B:

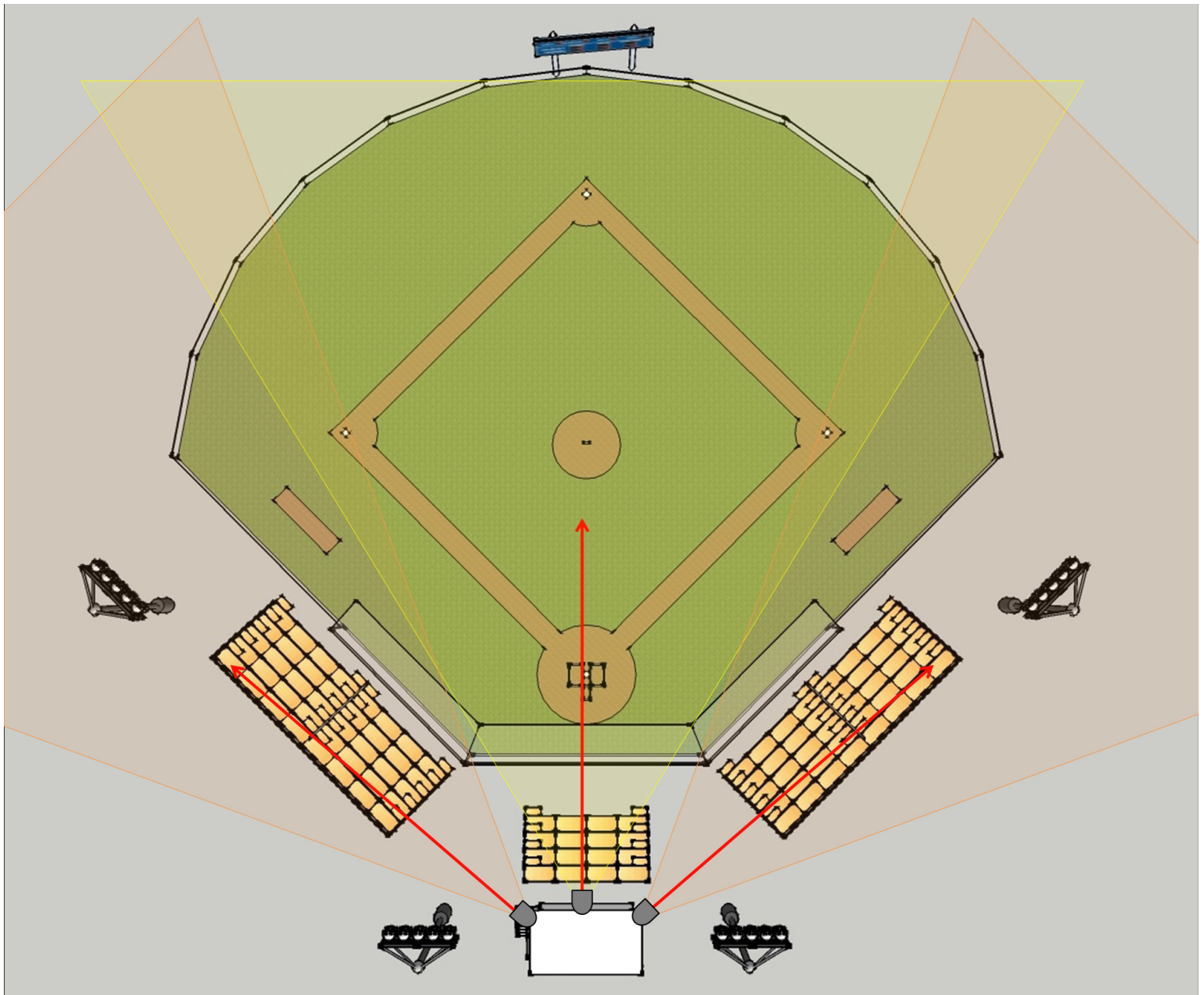
- Two (2) R2-52Z
- Good coverage for shorter bleacher sections from a scoreboard location.
- One (1) Voltera D 1200.4

Option C:

- Two (2) LVH-906WR/AP
- LVH-906WR/AP provides enhanced SPL at long distances or covers longer bleachers.
- Four (4) ALC-404D
- Four (4) ALC-1604D
- Optional IS8-218 subwoofers for full low frequency support.

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Baseball Field 'Press Box'



Installation Description:

- Three (3) loudspeakers mounted on the top of an 18-foot tall press box.

Option A:

- Three (3) R.15-3696
- Good SPL to the infield and the seating, with good speech articulation.
- One (1) Voltera D 1200.4

Option B:

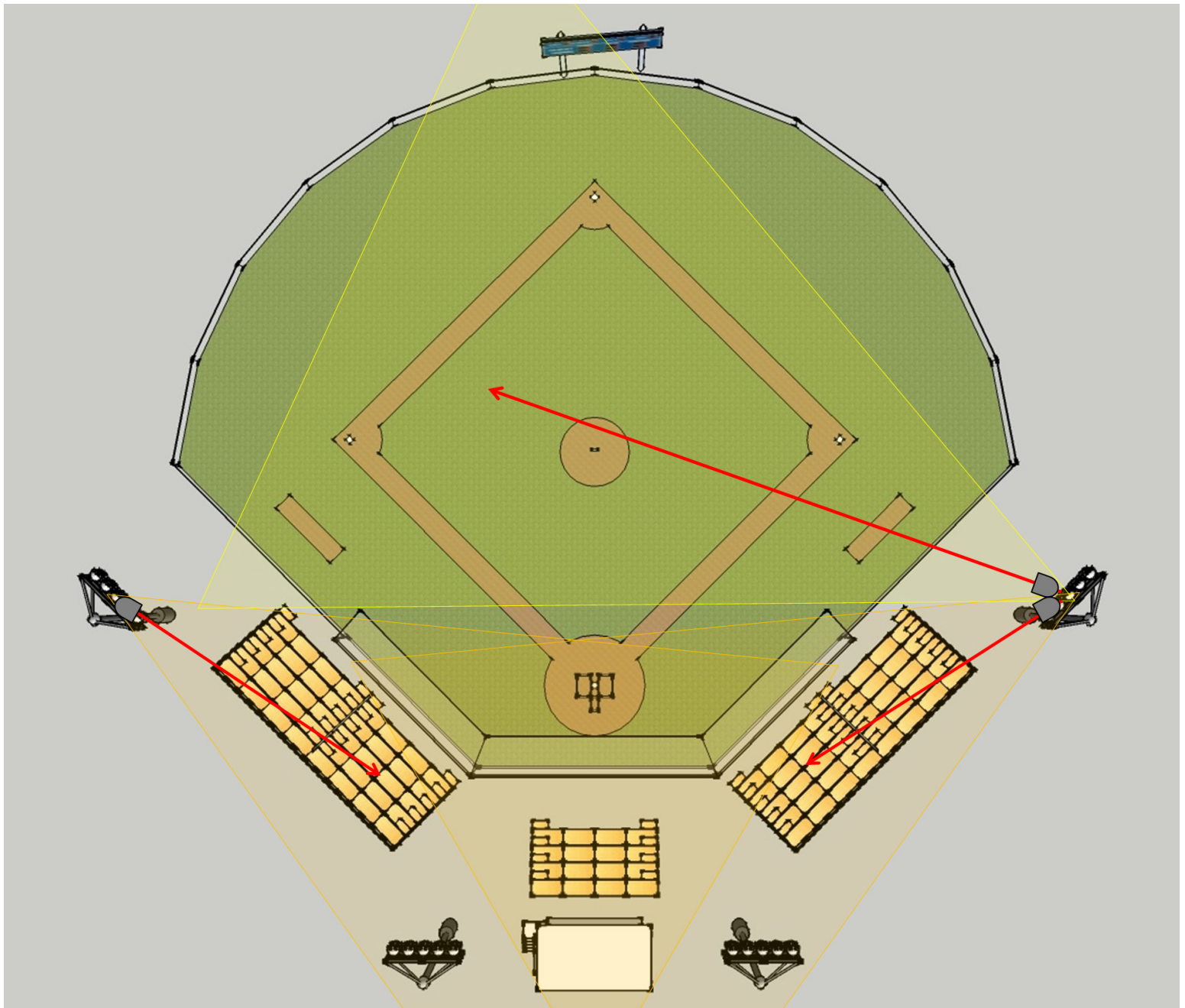
- Three (3) R.5-94Z
- Enhanced SPL and pattern control with better bass extension. Coverage extends up to 160 feet.
- One (1) Voltera D 1200.4

Option C:

- Three (3) R.5-96MAX
- All of the benefits of Options A and B with greater musicality, higher SPL and the ability to address the entire field.
- One (1) ALC-3202D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Baseball Field 'Lighting Poles'



Installation Description:

- Three (3) loudspeakers pole mounted at a height of 30 feet, and up to 90 feet away from the press box.
- Additional matching compact loudspeakers on the press box (*not shown*) will help reduce artificial echoes.

Option A:

- Three (3) R.35-3896
- Good SPL to the infield and the seating, with good speech articulation.
- One (1) Voltera D 1200.4

Option B:

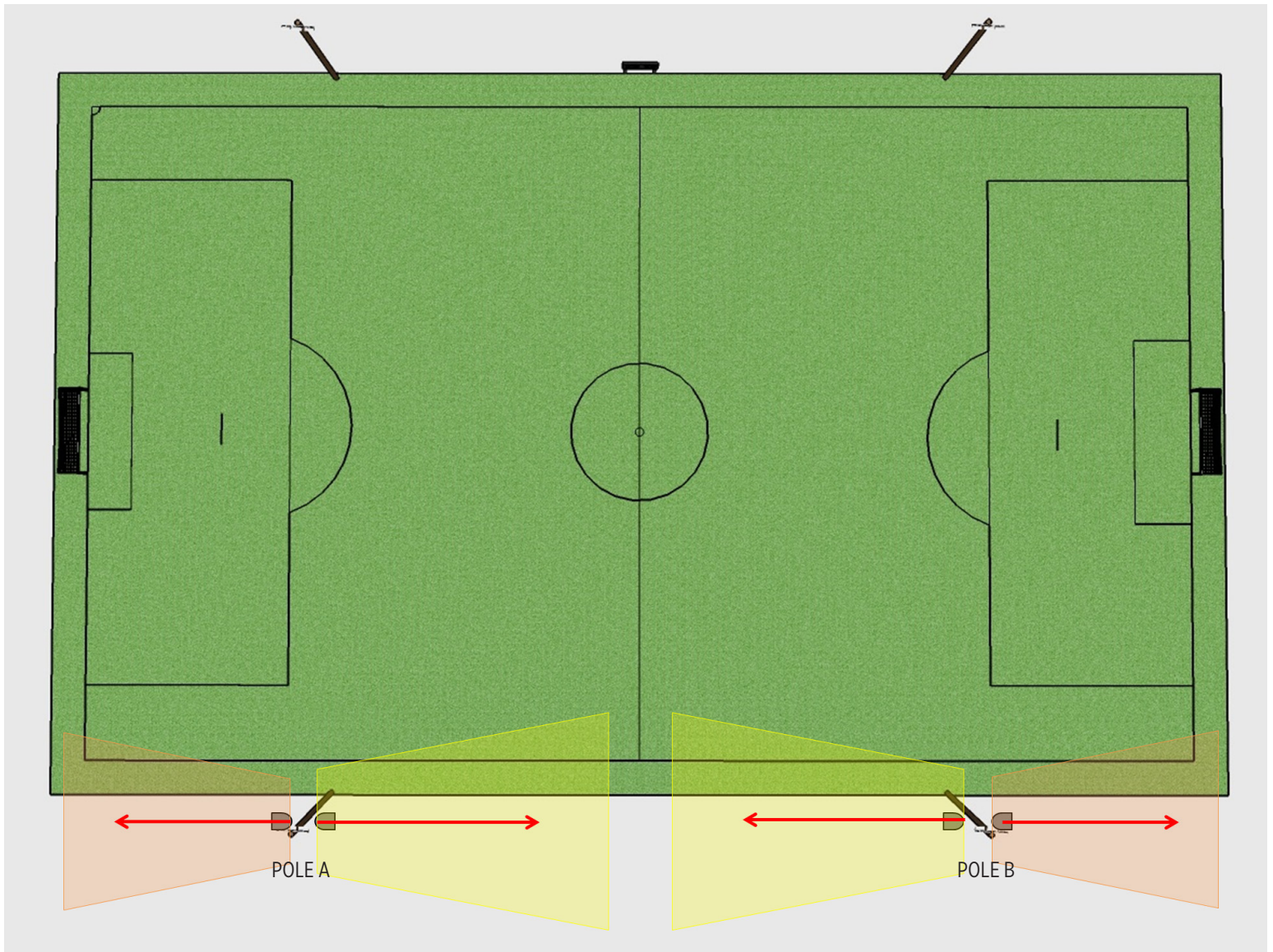
- Three (3) R.5-94Z
- Enhanced SPL and pattern control with better bass extension.
- One (1) Voltera D 1200.4

Option C:

- Three (3) R.5-96MAX
- All of the benefits of Options A and B with greater musicality and higher SPL.
- One (1) ALC-3202D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Soccer Field 'Pole Mount - Sideline Coverage'



Installation Description:

- The loudspeakers are pole mounted 50 feet above the ground on light poles about 180 feet apart.
- Each loudspeaker aims down sharply to focus on an individual zone, minimizing coverage overlap.
- Seating may be on the ground or small bleachers.
- Alternative Coverage (two to three (2-3) loudspeakers - not shown): If mounting heights must be low and not aimed as sharply down, use only one (1) signal-delayed loudspeaker on "Pole B" aimed away from "Pole A". Or, use a larger model on "Pole A" to address the full "Pole B" zone (no loudspeakers on "Pole B").

Option A:

- Four (4) R.15-3696
- Good voice articulation and good musicality.
- One (1) ALC-1604D*

Option B:

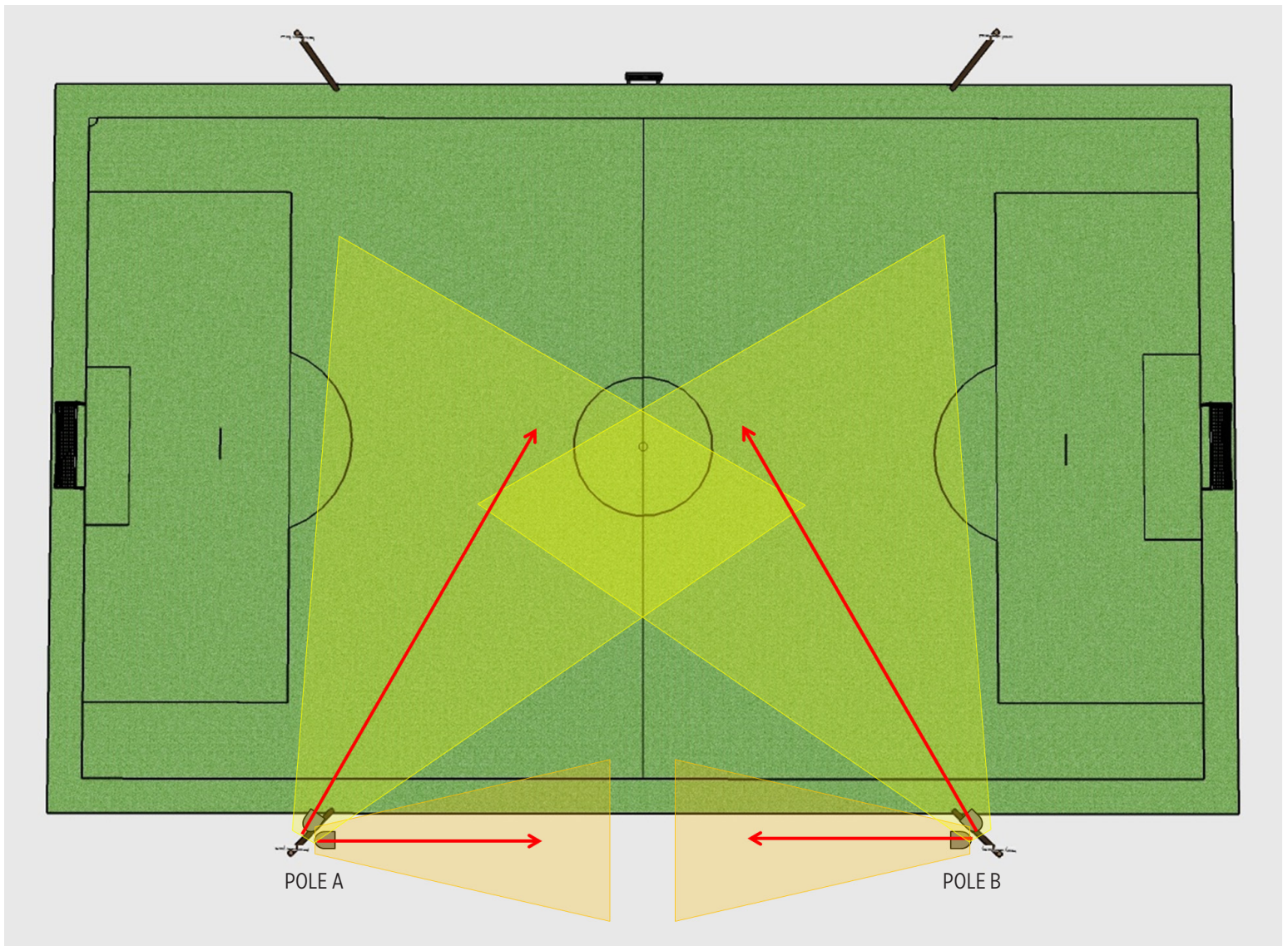
- Four (4) R.35-3896
- Great musicality and excellent voice articulation.
- One (1) ALC-1604D*

Option C:

- Four (4) R.5-66Z
- Very good musicality, enhanced low frequency extension and excellent voice articulation.
- One (1) ALC-1604D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Soccer Field 'Pole Mount - Sideline and Field'



Installation Description:

- The loudspeakers are pole mounted at least 30 feet above the ground on light poles about 180 feet apart.
- Seating may be on the ground between the poles or on small bleachers.
- Higher mounting points are preferred to minimize the effects of artificial echoes, ensuring good intelligibility.
- Another option is using only one loudspeaker array position to cover the sideline area (as explained on page 9) to consolidate the loudspeakers on one pole.

Option A:

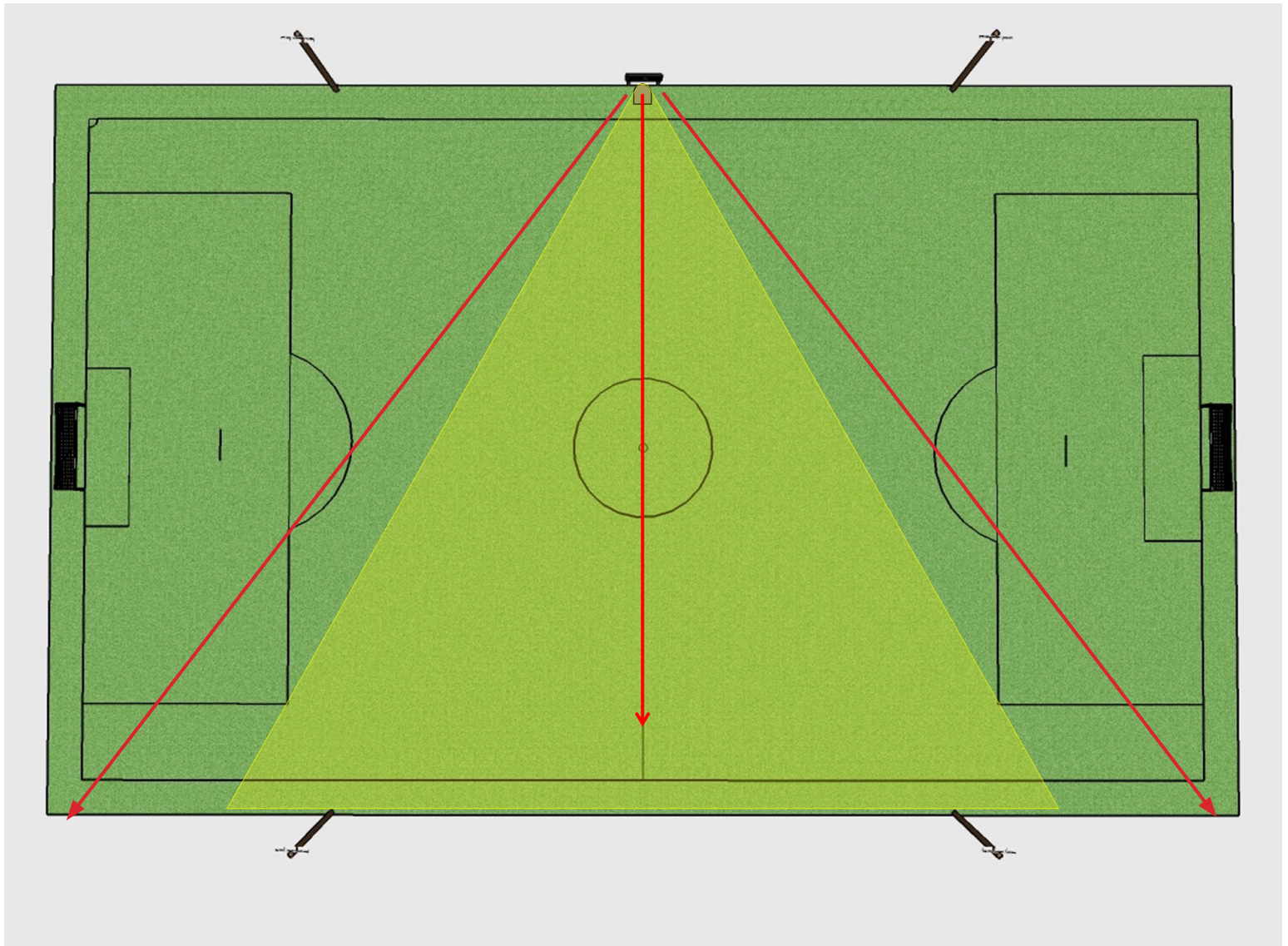
- Two (2) R.15-3696 (sideline coverage)
- Two (2) R.35-3896 (field coverage)
- Great musicality and excellent voice articulation for the seating area and the middle of the field.
- One (1) ALC-1604D*

Option B:

- Two (2) R.5-66Z (sideline coverage)
- Two (2) R.5-94Z (field coverage)
- Very good musicality, enhanced low frequency extension and excellent voice articulation for the seating area and the middle of the field.
- One (1) ALC-1604D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Soccer Field 'Scoreboard'



Installation Description:

- Single or dual R2-52Z or R2-52MAX loudspeakers are mounted on the scoreboard to cover the middle of the field and the far sideline.

Option A:

- One (1) R2-52Z (single cross-field red arrow; light green color coverage)
- Great coverage for the viewing side and great speech intelligibility. Careful consideration should be given to the amplifier-loudspeaker wire gauge.
- One (1) Voltera D 1200.4

Option B:

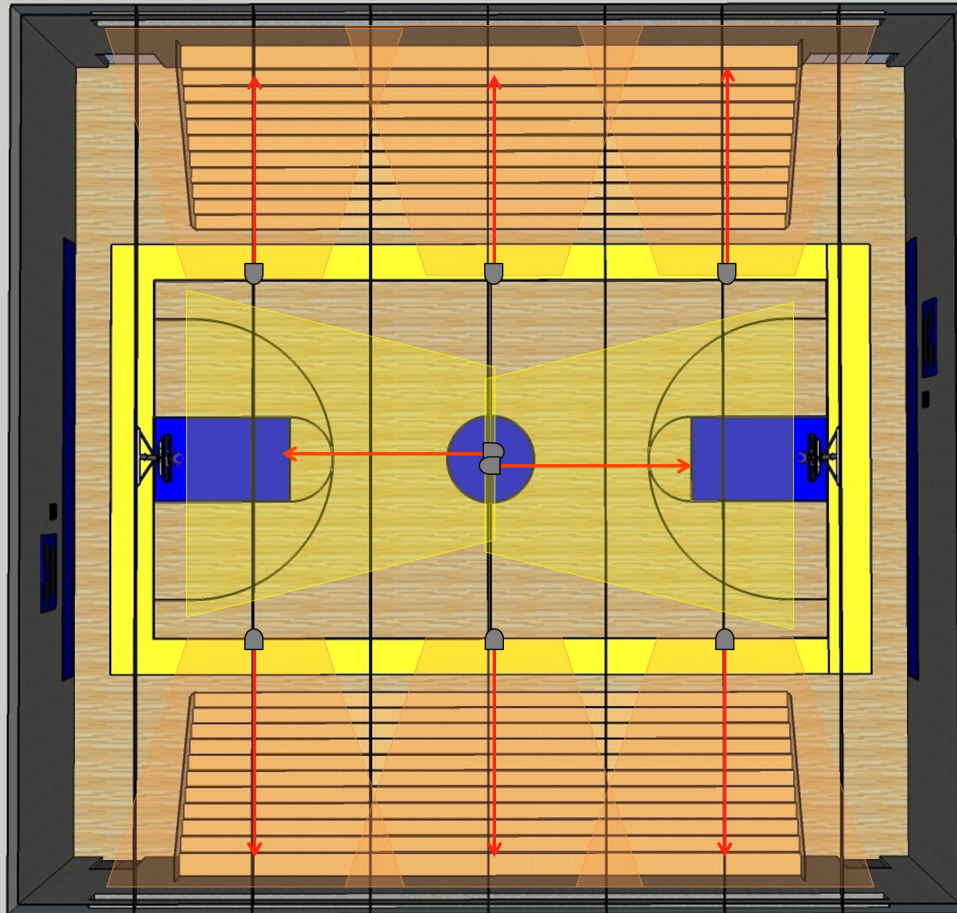
- Two (2) R2-52Z (two yellow arrows from the scoreboard to opposite corners of the field)
- Expanded coverage providing a wider listening area along the entire sideline.
- One (1) Voltera D 1200.4

Upgrade Option:

- One (1) R2-52MAX or
- Two (2) R2-52MAX
- Substitute R2-52MAX models in either Option A or B to enhance musicality and intelligibility.
- One (1) ALC-1604D for one (1) R2-52MAX or one (1) each of ALC-1604D and ALC-404D for two (2) R2-52MAX*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Basketball Court 'General Coverage'



Installation Description:

- A typical 120-foot by 100-foot gymnasium with a 28-foot height to the low steel (bottom of trusses).
- The bleachers are up to 14 feet tall.
- The bleacher loudspeakers are mounted about 20 feet in front of the first row.
- Bleachers longer than 70 feet can require four (4) or more loudspeakers per side.
- The court loudspeakers provide general coverage to the court and floor seating for sporting events.

Option A:

- Six (6) R.5-94Z (bleacher coverage)
- Two (2) R.5-99Z (center court)
- Good pattern control (for intelligibility) and moderate SPL in non-acoustically treated spaces.
- One (1) ALC-1604D*

Option B:

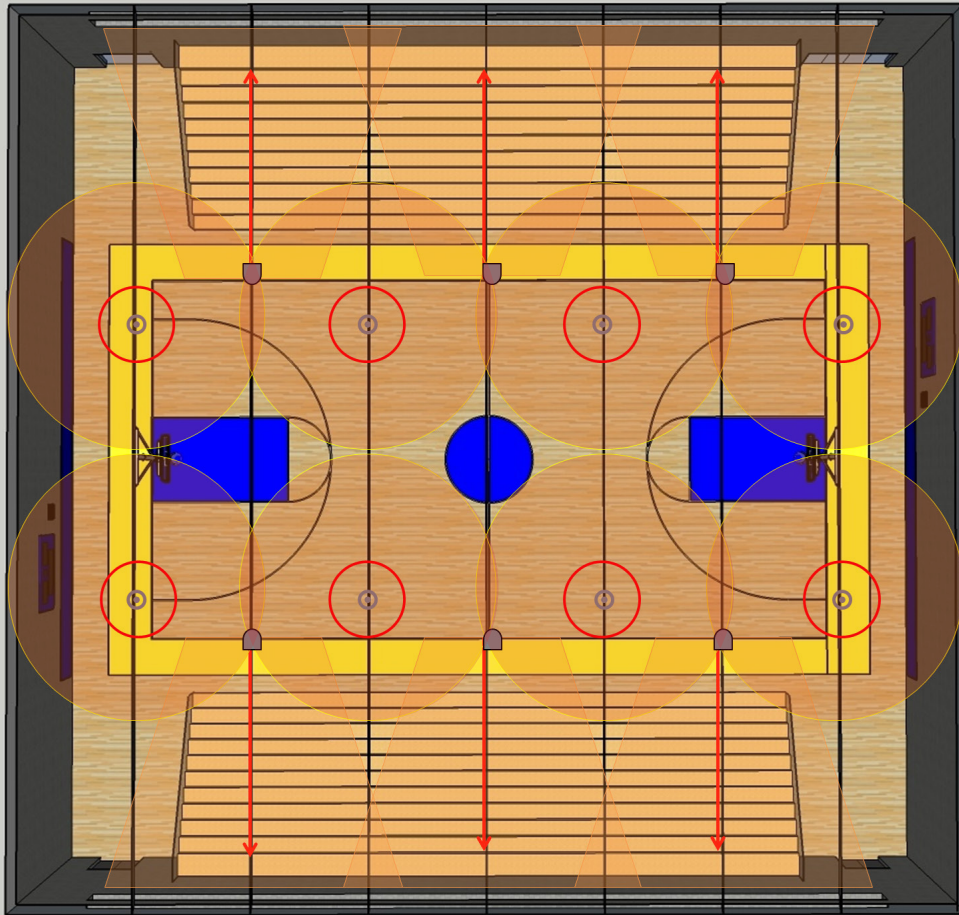
- Six (6) R.35-3896 (bleacher coverage)
- Two (2) R.35-3896 (center court)
- Less low frequency extension, but excellent voice clarity with moderate SPL.
- One (1) ALC-1604D*

Option C:

- Six (6) R.5-96MAX (bleacher coverage)
- Two (2) R.5-99Z (center court)
- Increased musicality, high SPL, and great pattern control. Subwoofers are often added to this system configuration.
- One (1) ALC-1604D*

* Amplified Loudspeaker Controller - minimum recommended for low impedance operation with channels maximized.

Basketball Court 'Enhanced Court Coverage'



Installation Description:

- A typical 120-foot by 100-foot gymnasium with a 28-foot height to the low steel (bottom of trusses).
- The bleachers are up to 14 feet tall.
- The bleacher loudspeakers are mounted about 20 feet in front of the first row.
- Bleachers longer than 70 feet can require four (4) or more loudspeakers per side.
- The court loudspeakers provide enhanced coverage to the court for higher speech intelligibility and allow more zone control to accommodate multi-purpose events.

Option A:

- Six (6) R.5-94Z (bleacher coverage)
- Eight (8) R.25-94Z (court coverage)
- Good pattern control and moderate SPL in non-acoustically treated spaces for the bleachers, court and floor seating.
- Two (2) ALC-404D*

Option B:

- Six (6) R.35-3896 (bleacher coverage)
- Eight (8) R.35COAX (court coverage)
- Less low frequency extension, but excellent voice clarity with moderate SPL for all areas.
- One (1) ALC-1604D* +
One (1) ALC-404D*

Option C:

- Six (6) R.5-96MAX (bleacher coverage)
- Eight (8) R.5-99Z (court coverage)
- Increased musicality, high SPL, and great pattern control across all listening areas.
- Two (2) ALC-1604D*

* Amplified Loudspeaker Controllers- minimum recommended for low impedance operation with channels maximized.

Product Specifications

For loudspeakers referenced in this guide

R.15-3696



Transducers: LF 1 x 6", MF 2 x 2.35", 1 x 1" exit compression driver
Operating Range: 140 Hz to 19.5 kHz
Sensitivity (1W/1m): 100 dB
Power Handling: 100 W Cont. @ 4 ohm or 70/100V Autoformer
Continuous Max Output: 120 dB (132 dB Peak)
Nominal Beamwidth (H x V): 100° x 80°
Dimensions (H x W x D): 9.25" x 9.25" x 14.00" (235 x 235 x 356 mm)

R.25-94Z (R.25-94TZ)



Transducers: LF - 1 x 8"; HF - 1 x 0.75" exit compression driver
Operating Range: 100 Hz - 16 kHz
Sensitivity (1W/1m): 97 dB (96 dB)
Power Handling: 200W continuous @ 8 ohms (Various)
Continuous Max Output: 120 dB (126 dB Peak)
Nominal Beamwidth (H x V): 90° x 40°
Dimensions (H x W x D): 11.3 x 11.3 x 13.3 in. (287 x 287 x 338 mm)

R.35COAX



Transducers: LF - 1 x 10"; coaxial HF - 1 x 1.25" exit compression driver
Operating Range: 70 Hz - 16 kHz
Sensitivity (1W/1m): 97 dB
Power Handling: 200W continuous @ 8 ohms, or 70V/100V Autoformer
Continuous Max Output: 122 dB (128 dB Peak)
Nominal Beamwidth (H x V): 90° x 90° (conical)
Dimensions (H x W x D): 11 x 13 x 13.5 in. (279 x 330 x 343 mm)

R.35-3896



Transducers: LF - 1 x 8"; coaxial MF - 2 x 2.35" and HF - 1 x 1" exit comp. driver
Operating Range: 80 Hz - 16 kHz
Sensitivity (1W/1m): 100 dB
Power Handling: 400W continuous @ 8 ohms, or 70V/100V Autoformer
Continuous Max Output: 126 dB (132 dB Peak)
Nominal Beamwidth (H x V): 90° x 60°
Dimensions (H x W x D): 11 x 13 x 13.5 in. (279 x 330 x 343 mm)

R.5-66Z (R.5-66TZ)



Transducers: LF - 1 x 12"; HF - 1 x 1" exit compression driver
Operating Range: 85 Hz - 16 kHz
Sensitivity (1W/1m): 102 dB - 103 dB (101 dB - 102 dB)
Power Handling: 200W continuous @ 8 ohms (Various)
Continuous Max Output: 126 dB (132 dB Peak)
Nominal Beamwidth (H x V): -66Z (60° x 60°), -94Z (90° x 40°), -99Z (90° x 90°)
Dimensions (H x W x D): 16 x 16 x 16 in. (406 x 406 x 406 mm)

R.5-94Z (R.5-94TZ)

R.5-99Z (R.5-99TZ)

R.5-96MAX



Transducers: LF - 1 x 12"; coaxial HF - 1 x 1.4" exit compression driver
Operating Range: 70 Hz - 20 kHz
Sensitivity (1W/1m): 103 dB
Power Handling: 600W continuous @ 8 ohms
Continuous Max Output: 130 dB (136 dB Peak)
Nominal Beamwidth (H x V): 90° x 60° (Additional horn patterns available)
Dimensions (H x W x D): 16.0 x 16.0 x 16.2 in. (406 x 406 x 411 mm)

R2-94Z



Transducers: LF - 2 x 12"; MF - 1 x 2" exit M200 driver; HF - 1 x 1" exit comp. driver
Operating Range: 70 Hz - 16 kHz
Sensitivity (1W/1m): 105 dB
Power Handling: 400W continuous @ 4 ohms
Continuous Max Output: 131 dB (137 dB Peak)
Nominal Beamwidth (H x V): 90° x 40° (Additional horn patterns available)
Dimensions (H x W x D): 24.75 x 24.75 x 29 in. (629 x 629 x 737 mm)

R2-52Z



Transducers: LF - 2 x 12"; MF - 2 x 2" exit M200 driver; HF - 1 x 1" exit comp. driver
Operating Range: 70 Hz - 16 kHz
Sensitivity (1W/1m): 107 dB
Power Handling: 400W continuous @ 4 ohms
Continuous Max Output: 133 dB (139 dB Peak)
Nominal Beamwidth (H x V): 50° x 20°
Dimensions (H x W x D): 24.75 x 24.75 x 29 in. (629 x 629 x 737 mm)

R2-52MAX



Transducers: LF - 2 x 12"; MF - 2 x 2" exit M200HP driver; HF - 1 x 1" exit comp. driver
Operating Range: 71 Hz - 19.5 kHz
Sensitivity (1W/1m): LF: 102 dB, HF/MF: 110 dB
Power Handling: LF: 1200W cont. @ 8 ohms, HF/MF: 350W cont. @ 8 ohms
Continuous Max Output: 135 dB (141 dB Peak)
Nominal Beamwidth (H x V): 50° x 20°
Dimensions (H x W x D): 24.75 x 24.75 x 29 in. (629 x 629 x 737 mm)

Full specifications for these, and other models, are available at biamp.com.

Loudspeaker data files are available for EASE and EASE Focus acoustic modeling software to facilitate optimum system design. (EASE and EASE Focus are products of AFMG Technologies GmbH.)

Technical Considerations

Biamp Voltera D Amplified Loudspeaker Controllers

Ideal for sports venues, the Biamp Voltera D series of amplified loudspeaker controllers (ALCs) offers powerful onboard digital signal processors, sophisticated tools for tuning rooms, and a host of unique features that enhance reliability and audio performance. Available in 1200-watt or 2400-watt configurations across four or eight channels, the Voltera D line is easy to use and configurable by either Tesira™ or the new Biamp VenueTune™ software, depending on user preference and audio network protocols.

Key features of the Voltera D ALCs include:

- Redundant Network Audio: Supports failover between mains power and backup generators without a reboot.
- Group-Controlled Raised Cosine EQ: Provides precise elimination of room modes and optimization of low-frequency performance.
- High Power and Channel Density: Delivers up to 75% of the total amplifier power on any single channel.
- Flexible Configuration: Supports both AVB and Dante, with options for Lo-Z or Hi-Z per channel to accommodate hybrid systems.
- Compact Design: High power and channel density in a compact 1 RU enclosure for space savings while maintaining high efficiency and low idle power.



VenueTune

VenueTune software offers in-depth control through an intuitive graphical interface, guiding system designers and installers with simple 2D floorplans and a staged workflow. This software also provides extensive performance and usage logging over time, enabling IT personnel, AV pros, and venue managers to optimize performance after installation.

Model	Total Power	No. Channels	Max Symmetric Power	Max Increase	Max Assignable Into			Max Output Voltage	Max Output Current
					70/100W	4 ohm	8 ohm		
D 2400.4	2400 W	4	600	3.0X	1800 W	1800 W	1600 W	160 Vpk	40 Apk
D 2400.8	2400 W	8	300	4.0X	1200 W	1200 W	1200 W	145 Vpk	33 Apk
D 1200.4	1200 W	4	300	3.0X	900 W	900 W	900 W	145 Vpk	29 Apk
D 1200.8	1200 W	8	150	4.0X	600 W	600 W	600 W	145 Vpk	24 Apk

TesiraFORTÉ DAN AI

To eliminate press box control challenges, Biamp recommends **TesiraFORTÉ DAN AI** for all source limiting and system routing. While accommodating level control via built-in GPI, TesiraFORTÉ DAN AI eliminates the need for additional widgets for handling input and level control. Inputs and controls can be easily expanded to a total of 12 within Tesira itself and more with expansion module options.

With the Dante output option on this Tesira model, the only thing needed to connect to a Community Amplified Loudspeaker Controller (ALC) is a non-managed gigabit switch, which makes routing very easy, especially if remote amplifier locations are available. For simpler systems, TesiraFORTÉ AI (analog only) can also be used. This model is a great value for what we can accomplish compared to traditional mixers.

Between the loudspeaker protection we offer in our ALC models and the available limiting and control available in Tesira, we can say with complete confidence that a properly commissioned system using these components would be nearly impossible to damage via operator error, ensuring a long life for the system and great value for our customers.





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