

Bose® LT Series Loudspeakers

Array Application Guide

With Indoor Rigging Hardware Recommendations

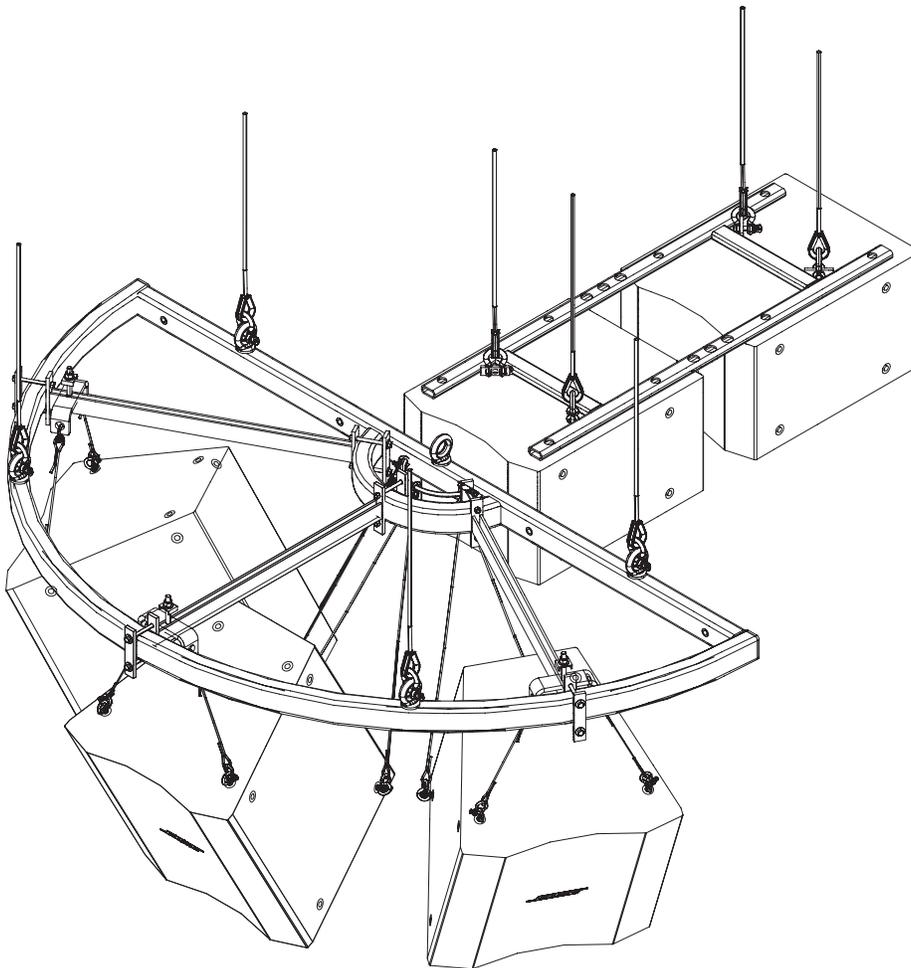


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Section 1 | Safety

Important Safety Warnings

Please read this safety information before installing the Bose LT Series loudspeakers.

-  **WARNING:** All Bose® products must be used in accordance with local, state, federal and industry regulations.
-  **WARNING:** Bose LT Series loudspeakers must be attached or secured to brackets or rigging devices for permanent or seasonal use. It is the installer's responsibility to ensure installation of the mounting and rigging system is performed in accordance with all applicable codes, including local building codes, and regulations.
-  **WARNING:** Mounting or rigging should only be carried out by experienced professionals. Unsafe mounting or overhead suspension of any heavy load can result in serious injury and equipment damage. It is the installer's responsibility to evaluate the reliability of any mounting or rigging method for their application.

The information contained in this guide is for informational purposes only and is not intended as a representation or warranty by the Bose Corporation. Only persons with the knowledge of proper hardware and safe rigging techniques should attempt to install any loudspeaker overhead. While Bose Corporation cannot be held responsible for the proper design and use of non-Bose mounting or rigging systems, we offer the following information and guidelines for the permanent indoor installation of Bose LT Series loudspeakers.

Prior to installation, the installer must be familiar with the load-limit ratings, rigging techniques and safety considerations contained in this guide. Additionally, the rigging techniques and practices contained in this document are only general guidelines and cannot, as such, represent all requirements and precautions. Accordingly, anyone using this material assumes all liability and is expressly responsible for the safety of all loudspeaker array designs and rigging configurations applied in practice.

Safety Guidelines

1. Obtain your mounting or rigging system from a reputable manufacturer. Before using a custom-designed mounting or rigging system, a licensed professional engineer should review the design and fabrication for structural integrity and safety in the intended application.
2. Prior to the installation of any overhead loudspeaker, a licensed professional engineer must approve the location and method of attachment to the building structure and confirm they are consistent with local building codes and regulations. Ensure the mounting surface and the method of attaching the loudspeaker array to the surface is capable of supporting the total weight of the array (loudspeakers, rigging hardware, and loudspeaker cables). A safety factor of 10:1 is recommended.
3. Bose LT Series loudspeakers are supplied with built-in internal brackets and threaded inserts, which are designed to facilitate the suspension of the loudspeaker by a professional person familiar with rigging hardware and industry practices. The attachment points on the top, bottom, and sides of each loudspeaker utilize SAE 3/8"-16 threaded inserts. Do not use M10 threaded hardware; they are not interchangeable with SAE 3/8"-16 threads.
4. Use a minimum of four threaded-insert hang points per loudspeaker for single cabinet hangs.
5. Use only graded hardware. Fasteners should be SAE Grade 5 or ASTM designation A354, Grade BC minimum. Unmarked (not graded) fasteners should not be used.
6. Fasteners should be tightened using torque not to exceed 50 pounds/inch (5.6 Newton-meters). Over-tightening the fastener could result in irreparable damage to the cabinet and create an unsafe assembly.
7. Fasteners should be long enough to engage a sufficient number of threads at the attachment point. Using a fastener that is too short provides inadequate holding power and may strip the mounting threads, resulting in an unsafe assembly. Recommended thread engagement is calculated as follows:
 $(1.5 \times \text{fastener diameter}) / \text{fastener threads per inch}$.
8. Do not attempt to alter the threaded attachment points. Do not attempt to re-thread the attachment points to accommodate any other thread size or type; doing so will compromise the safety of the installation while permanently damaging the loudspeaker.
9. Lock washers or a locking compound (such as Loctite® 242) should be used for a vibration resistant assembly on fasteners intended for disassembly using hand tools.

Safety Guidelines (continued)

10. Use a safety cable, separately attached or secured to an enclosure hang point, at a point not in common with the load bearing attachment points of the mounting or rigging system to the loudspeaker. This is recommended even if not required by local regulation. The safety cable and its attachment points must be suitable for supporting the weight of all attached components to up to the safety factor mentioned in item 1 above. If you are unfamiliar with the proper design, use and purpose of a safety cable, consult a licensed professional engineer or a rigging professional.
11. Additional loudspeakers may be suspended below a Bose LT Series loudspeaker provided that:
 - A. All 8 threaded-insert hang points on the top and bottom of speakers are properly engaged; and
 - B. Total weight of all suspended loudspeakers and rigging does not exceed the working load limit (WLL).

3202® WR Loudspeaker = 395 lb. (179 kg.)	6403 Loudspeaker = 454 lb. (205 kg.)
4402® WR Loudspeaker = 299 lb. (135 kg.)	9403 Loudspeaker = 454 lb. (205 kg.)
9402™ WR Loudspeaker = 261 lb. (118 kg.)	6400 Loudspeaker = 420 lb. (190 kg.)
9702® WR Loudspeaker = 381 lb. (173 kg.)	9400 Loudspeaker = 420 lb. (190 kg.)
MB12 WR Loudspeaker = 350 lb. (158 kg.)	MB24 WR Loudspeaker = 520 lb. (236 kg.)

Additional Precautions

-  **CAUTION:** Installed loudspeaker arrays require regular inspection and routine maintenance to ensure proper function and safe operation.
-  **CAUTION:** Inspect annually for fatigue including any signs of cracking, water damage, de-lamination or any other condition that may decrease the structural integrity of the loudspeaker enclosure.
-  **CAUTION:** Inspect rigging hardware and insert-point attachments regularly for signs of corrosion, bending or any other condition that may decrease their structural integrity. Immediately replace worn or damaged components.
-  **CAUTION:** Make no modifications to the speakers or rigging accessories. Unauthorized alterations may compromise safety, regulatory compliance and system performance.
-  **CAUTION:** For additional safety precautions, please refer to the Owner's Guide included with each Bose LT Series loudspeaker.

Section 2 | Introduction

Intended Use of This Document

The Array Application Guide is intended to assist qualified professionals, such as sound system designers and audio system integrators, in the design of *indoor, permanently-installed arrays* for specific Bose® loudspeakers. The reader is assumed to have general knowledge of sound system design, installation of professional audio equipment, and safe rigging techniques.

The recommended array configurations presented in this guide provide suggestions for the most common venue types. However, each venue may present unique requirements and challenges. It is beyond the scope of this document to cover all the parameters that affect proper sound system design, installation, and operation. Bose Professional Systems Division provides many additional resources to assist qualified professionals. Please contact your local Bose Professional Systems Division representative if you require additional assistance.

Scope of Products and Applications

This guide provides recommended applications of Bose LT Series loudspeakers in typical small to mid-size indoor venues, ranging from approximately 300 to 1,200 seating capacities. Additionally, the recommended arrays can be scaled to many larger venues using distributed cluster design approaches. All presented arrays provide full-range reinforcement suitable for both voice and music sources. The design approaches favor speech intelligibility and uniform coverage of listening areas. Additional subwoofer support may be required for high-impact, high-level music content with extended low-frequency spectral content.

The rigging hardware specified in this guide is manufactured by the Adaptive Technologies Group and marketed using the ATM Fly-Ware® brand name. These products are available directly from Adaptive Technologies Group for purchase by professional sound system contractors and integrators.

Contact Information

Adaptive Technologies Group

1635 E. Burnett Street
Signal Hill, CA 90755 USA

Telephone: 1 (562) 424-1100

www.adapttechgroup.com

Adaptive Technologies Group can also provide application and design assistance for custom rigging hardware, including outdoor-rated rigging structures and accessories.

Bose Professional Systems Division

The Mountain
Framingham, MA 01701 USA

Telephone: 1 (877) 428-BOSE (2673)

Within the U.S. and Canada

1 (508) 879-7330

Outside the U.S. and Canada

pro.Bose.com

For application recommendations for other Bose Loudspeakers, such as FreeSpace®, Panaray® or Panaray MA12 Modular Array Series, please contact your Bose Professional Systems Division representative.

Additional Bose sales and technical support offices are located globally. Please refer to pro.Bose.com for a list of global sales offices and contact information.

Section 3 | Bose® LT Series Loudspeakers

Product Line Overview



Bose LT 4402 WR, LT 6403 WR, LT 9702 WR, MB 24 WR, LT 9403, LT 9402 WR, LT 3202 WR

Bose® LT Series loudspeakers are comprised of 6 mid/high-frequency loudspeakers, 2 full-range loudspeakers and 2 low-frequency subwoofers, all designed for permanently installed sound systems that provide precise coverage pattern control, with high intelligibility and excellent tonal balance for music sources. The flexible product line provides scalable solutions appropriate for venues ranging from small 300-seat auditoriums to large stadiums and arenas. The classic point-source design approach of Bose LT Series loudspeakers provide an effective alternative to multiple-cabinet line arrays for many venues, often providing more uniform coverage for complex seating area geometries.

All Bose LT Series mid/high-frequency and full-range loudspeakers feature the Bose V2 Midrange Manifold. This proprietary Bose technology combines the output of two (2) 4.5-inch extended-range cone drivers in a combination heat-sink/acoustic summation manifold, to significantly lower cone breakup distortion and improve transient response as compared to single 8" to 12" woofer designs. The result is a smoother, more natural vocal range response.



Bose V2 Midrange Manifold

Bose LT 3202 WR and Bose LT 4402 WR loudspeakers utilize proprietary Bose Coherent Zone Waveguide technology to provide precise directivity control over a wide frequency range and minimize coverage overlap from adjacent loudspeakers in array applications. This technology reduces comb-filter interference and provides more even tonal balance throughout the listening area.

Specification	LT 3202® WR	LT 4402® WR	LT 9402™ WR	LT 9702® WR	LT 6400	LT 9400	LT 6403	LT 9403	MB12 (WR)	MB24 (WR)
Type	Mid/High	Mid/High	Mid/High	Mid/High	Mid/High	Mid/High	Full Range	Full Range	LF/Sub	LF/Sub
Configuration	2-way	2-way	2-way	2-way	2-way	2-way	3-Way	3-Way	1-Way	1-Way
HF (voice coil)	3"	3"	3"	3"	1.75"	1.75"	1.75"	1.75"	None	None
Midrange Manifold	4 x V2	2 x V2	2 x V2	2 x V2	1 x V2	1 x V2	1 x V2	1 x V2	None	None
LF driver	None	None	None	None	None	None	1 x 15"	1 x 15"	1 x 12"	2 x 12"
Response (+/- 3dB)	220 -16kHz	180 -16kHz	180 -16kHz	220 -16kHz	190 -16kHz	190 -16kHz	50 -16kHz	50 -16kHz	40 -280 Hz	40 -280 Hz
Coverage Pattern	30° x 20°	40° x 40°	90° x 40°	90° x 70°	60° x 40°	90° x 40°	60° x 40°	90° x 40°	Omni	Omni
Sensitivity (SPL/W/m)	110 dB	108 dB	106 dB	105 dB	105 dB	104 dB	96 dB	95 dB	91 dB	94 dB
Max SPL (1m, peak)	140 dB	135 dB	133 dB	132 dB	131 dB	130 dB	129 dB	128 dB	123 dB	129 dB
Height (inches)	42.2	34.0	34.6	34.6	25.2	25.2	34.4	34.4	14.7	34.4
Width (inches)	22.5	18.5	22.5	22.5	24.1	24.1	24.1	24.1	20.0	24.1
Depth (inches)	39.2	27.3	27.1	17.8	22.6	22.6	22.6	22.6	25.4	22.6
Net Weight (lbs)	195	112	114	93	82	82	148	142	78	142
Color	Black	Black	Black	Black	Black/White	Black/White	Black/White	Black/White	Black/White	Black/White
Outdoor Rating	IPX5	IPX5	IPX5	IPX5	None	None	None	None	IPX5 (WR)	IPX5 (WR)

Section 4 | Designing The System

Overview of Sound System Design

Specific information about the desired coverage area must be obtained before starting the loudspeaker array and rigging design. While not exhaustive, the following design factors, constraints and requirements must be considered during the design of a permanently-installed sound-reinforcement system:

- Seating area coverage angles, both horizontal and vertical
- Seating area floor rake (angle)
- Loudspeaker-to-seating distance, closest and farthest
- Array rigging-point location and height (may be more than one)
- Room reverberation time (RT60) and ambient background noise level
- Source material bandwidth and dynamic range (speech only, light music, high-impact music, etc.)
- Desired average sound pressure level throughout coverage area
- Desired consistency of tonal balance throughout coverage area
- Speech intelligibility measurement methods such as STI, STI-PA, or %AL_{CONS}
- Aesthetics of loudspeakers and fit with interior design

Using Bose® Modeler® Software for Array Design and Coverage Prediction

Bose Modeler software provides the sound system designer with an excellent tool for assisting in the selection and placement of loudspeakers within an acoustic space. With this technology, designers can create an acoustical model of the facility, lay out a sound system, and predict system performance in key acoustic dimensions including tonal balance, loudness, localization and the audibility of reflections. With Modeler software, loudspeakers can be visually placed in the room model. Designers have the ability to adjust loudspeakers in the same way they would in the actual acoustic space, adjusting parameters such as aiming, phase, signal delays, equalization and gain. In addition, a proprietary algorithm allows for accurate predictions of speech intelligibility.

Bose Modeler Plus software builds on the capability of Modeler software with algorithms that enable auralization with the Bose Auditor® playback system. These powerful tools enable designers and customers to hear how the proposed system will sound before it is installed. With the portable Bose Auditor playback system, simulations can be heard where it is most convenient – from the designer’s work space to the customer’s office. As a result, designers and clients can evaluate the right sound systems solutions for the project and the appropriate budget.

Signal Processing and Power Amplifier Requirements

All Bose LT Series loudspeakers require active digital signal processing (DSP) equalization and some require active DSP crossovers and delays. Bose ControlSpace® engineered sound processors are modular DSP systems that provide up to 32 analog and 64 digital audio channels with flexible Input, Output, GPIO, and DSP expansion cards. Bose ControlSpace Designer software uses intuitive, drag-and-drop programming methods and includes preset libraries of the equalization, crossover, delay and limiting parameters required for all Bose LT Series loudspeakers.

For simple systems, the Bose Panaray® System Digital Controller Series II provides fixed-block equalization, crossover and limiting with presets for all Bose LT Series loudspeakers, in a 2-input / 4-output configuration.

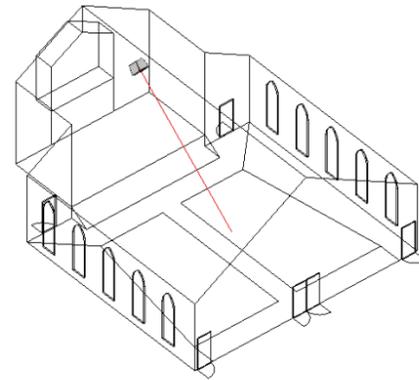
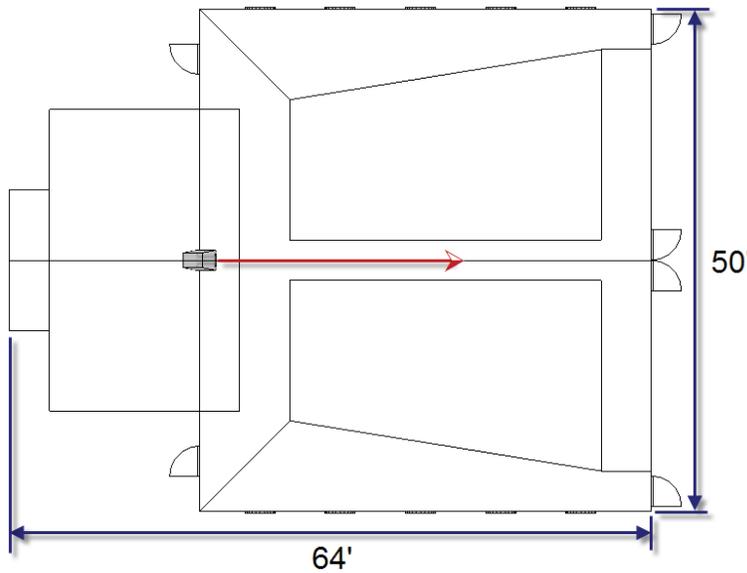
Bose LT Series loudspeakers are conservatively rated for power handling using IEC 529 pink noise, 6dB crest factor, for 100 hours. Accordingly, Bose LT Series loudspeakers may be driven by professional audio power amplifiers with power ratings exceeding the power handling rating of the loudspeaker, when used with typical music and voice program material. For additional information on matching power amplifiers with Bose LT Series loudspeakers, please contact your local Bose Professional Systems Division representative.

Section 5 | Recommended Arrays & Rigging

Single Full-Range Using Bose® LT 9403 with ATM One-Way Array™ Rigging			
Sample Venue Type	House of Worship	Full-range loudspeakers	1 x LT 9403
Typical Seating Capacity	150 to 300	Mid/High loudspeakers	None
Room Aspect Ratio	Square or rectangle	Low-frequency/subwoofers	None
Room Dimensions (L x W)	64 ft. x 50 ft.	Number suspension points	2
Speaker Height	26 ft.	Array weight with rigging	188 lb. (85 kg.)



Bose® LT 9403 Loudspeaker and ATM One-Way-Array™



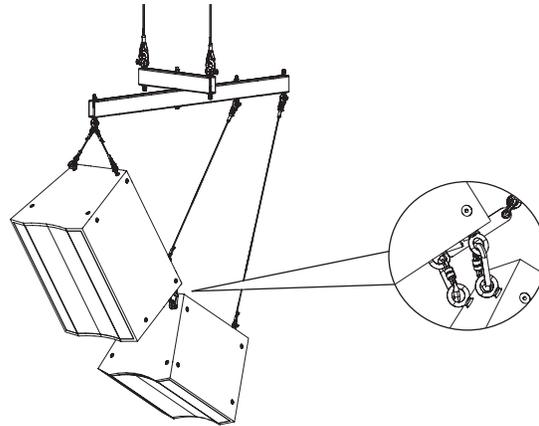
Bose Modeler® Software Room Plan and 3D Views

Array Equipment List

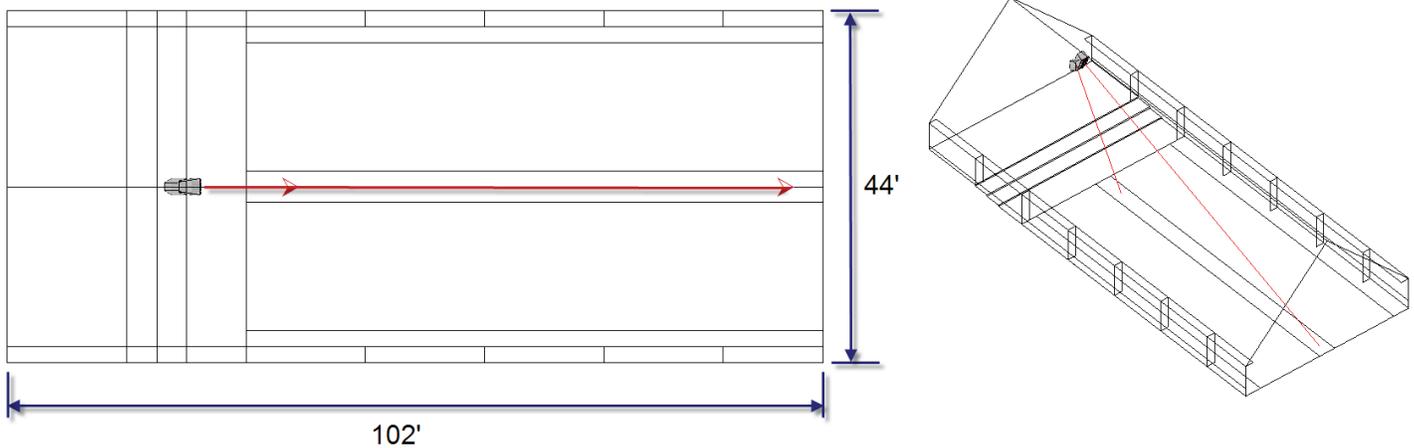
Qty	Brand	Model	Description	Qty	Brand	Model	Description
1	BOSE	LT 9403	Full-range 3-way Loudspeaker	2	ATM	EB-375	3/8" forged shoulder eyebolt
1	ATM	SAS-1WA-20	One-Way-Array	2	ATM	SK-375	3/8" forged shackle (screw-pin)
1	ATM	TCK-018	Tilt cable kit, 18"	2	ATM	WRS-3/8x (varies)	Wire rope sling
1	ATM	LTIII-RBL	Pull-back bracket				

Section 5 | Recommended Arrays & Rigging

2-Element Vertical Array (Long-Throw/Short-Throw) with ATM GridLink™ Rigging Beams			
Sample Venue Type	Meeting Hall	Full-range loudspeakers	1 x LT 6403
Typical Seating Capacity	400 to 600	Mid/High loudspeakers	1 x LT 9400
Room Aspect Ratio	Narrow and long	Low-frequency/subwoofers	None
Room Dimensions (L x W)	102 ft. x 44 ft.	Number suspension points	2
Speaker Height	28 ft.	Array weight with rigging	290 lb. (132 kg.)



Bose® LT 6403 and LT 9400 with ATM GridLink™ Rigging Beams



Bose Modeler® Software Room Plan and 3D Views

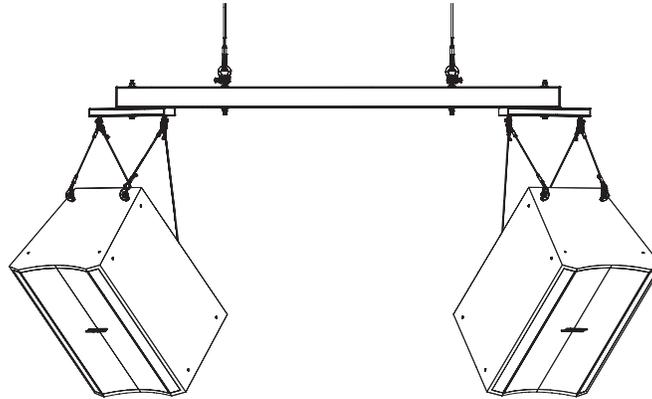
Array Equipment List

Qty	Brand	Model	Description	Qty	Brand	Model	Description
1	BOSE	LT 6403	Full-range 3-way Loudspeaker	6	ATM	EB-375	3/8" forged shoulder eyebolt
1	BOSE	LT 9400	Mid/High 2-way loudspeaker	4	ATM	SK-375	3/8" forged shackle (screw-pin)
1	ATM	SAS-066-RB	GridLink rigging beam, 66"	2	ATM	CC-096	Cable tilt/coupler, 96"
1	ATM	SAS-024-RB	GridLink rigging beam, 24"	2	ATM	FC-014	Wire rope fixed cable kit
1	ATM	SAS-GL-BK	Rigging beam pivot bolt kit	2	ATM	OPS Carabiner	Load-rated locking carabiner
2	ATM	LTIII-RBL	Pull-back bracket				

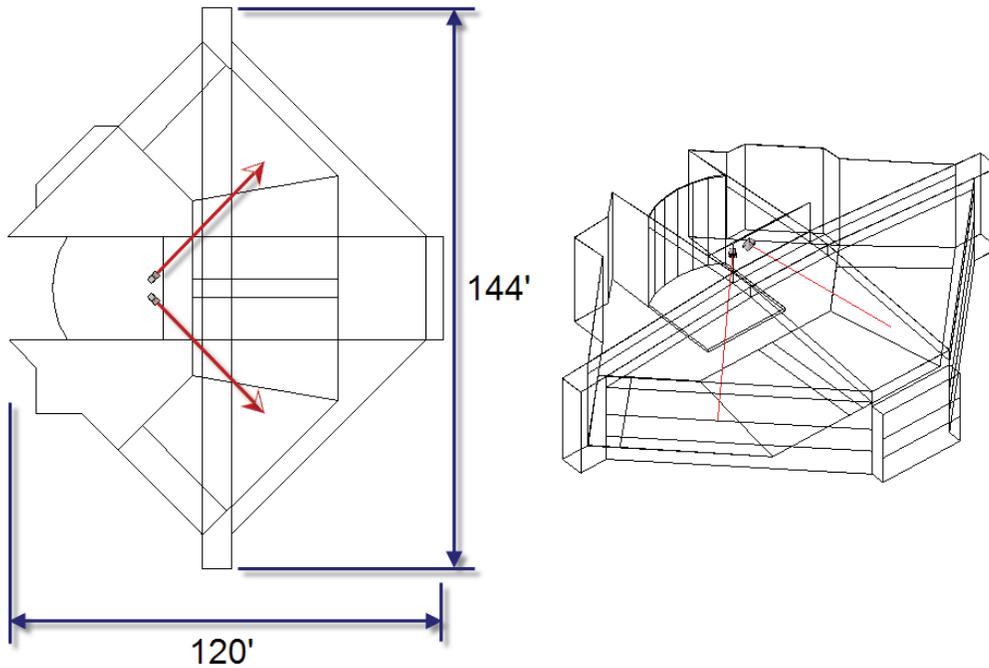
Section 5 | Recommended Arrays & Rigging

2-Element Horizontal Array Using Bose® LT 9403 with ATM Two-Way Array™ Rigging

Sample Venue Type	House of Worship	Full-range loudspeakers	2 x LT 9403
Typical Seating Capacity	500 to 800	Mid/High loudspeakers	None
Room Aspect Ratio	Fan Shaped	Low-frequency/subwoofers	None
Room Dimensions (L x W)	120 ft. x 144 ft.	Number suspension points	2
Speaker Height	29 ft.	Array weight with rigging	321 lb. (146 kg.)



Bose LT 9403 horizontal array with ATM Two-Way Array™ rigging



Bose Modeler® Software Room Plan and 3D Views

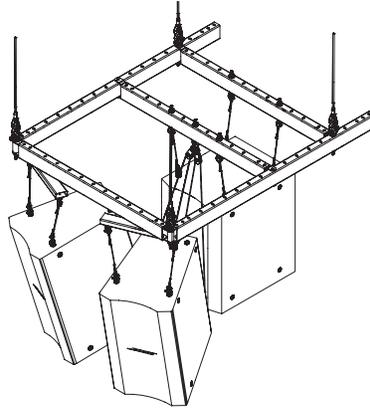
Array Equipment List

Qty	Brand	Model	Description	Qty	Brand	Model	Description
2	BOSE	LT 9403	Full-range 3-way Loudspeaker	4	ATM	EB-375	3/8" forged shoulder eyebolt
1	ATM	SAS-2WA-86	Two-Way-Array rigging beam	4	ATM	SK-375	3/8" forged shackle (screw-pin)
2	ATM	TCK-018	Tilt cable kit, 18"	2	ATM	WRS-3/8x (varies)	Wire rope sling
2	ATM	LTIII-RBL	Pull-back bracket				

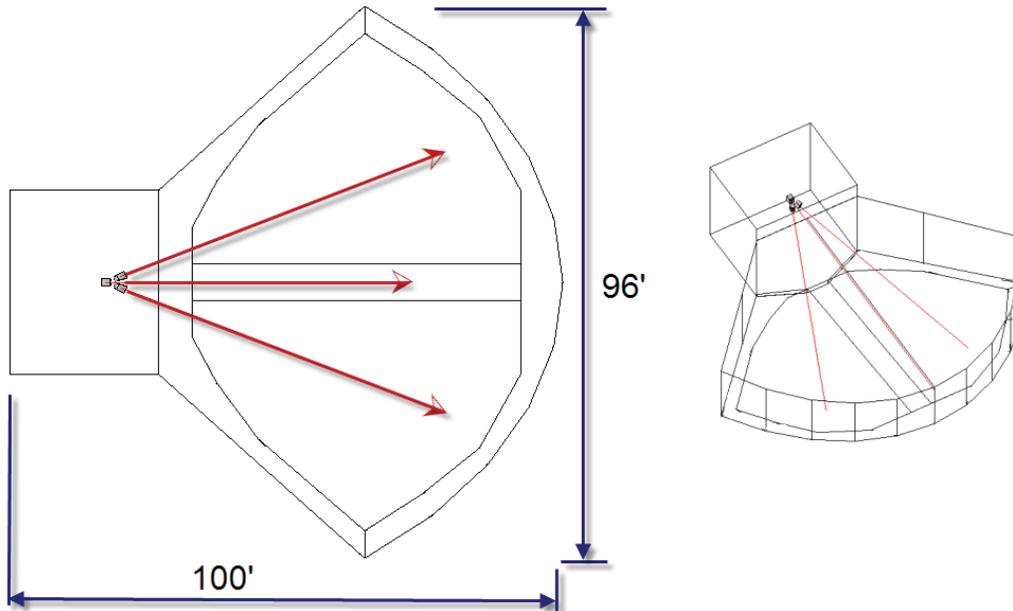
Section 5 | Recommended Arrays & Rigging

2-Element Horizontal Mid/High Array with Low Frequency Using ATM GridLink™ Rigging

Sample Venue Type	Auditorium	Full-range loudspeakers	None
Typical Seating Capacity	750 to 1200	Mid/High loudspeakers	2 x LT 4402 WR
Room Aspect Ratio	Fan Shaped	Low-frequency/subwoofers	1 x MB24
Room Dimensions (L x W)	100 ft. x 96 ft.	Number suspension points	4
Speaker Height	30 ft.	Array weight with rigging	539 lb. (244 kg.)



Bose LT 4402 WR Array and MB24 with ATM GridLink™



Bose Modeler® Software Room Plan and 3D Views

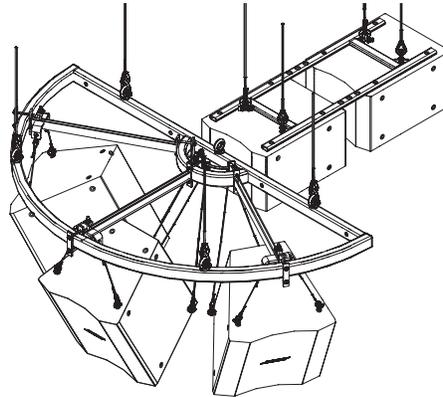
Array Equipment List

Qty	Brand	Model	Description	Qty	Brand	Model	Description
2	BOSE	LT 4402 WR	Mid/High Loudspeaker	2	ATM	LTIII-RBRA	Pull-back bracket
1	BOSE	MB24	Low-frequency loudspeaker	2	ATM	CC-096	Cable tilt/coupler, 96"
2	ATM	SAS-066-RB	Gridlink rigging beam, 66"	2	ATM	FC-018-S	Fixed cable kit
3	ATM	SAS-048-RB	Gridlink rigging beam, 48"	2	ATM	TCK-018	Tilt cable kit, 18"
2	ATM	SAS-GL	Gridlink beam connector	8	ATM	EB-375	3/8" forged shoulder eyebolt
2	ATM	SAS-GLT	Gridlink beam t-connector	8	ATM	SK-375	3/8" forged shackle (screw-pin)
2	ATM	SAS-100-CA	Gridlink cross-arm kit	2	ATM	WRS-3/8x (varies)	Wire rope sling
4	ATM	SAS-EB-KT	GridLink eyebolt kit				

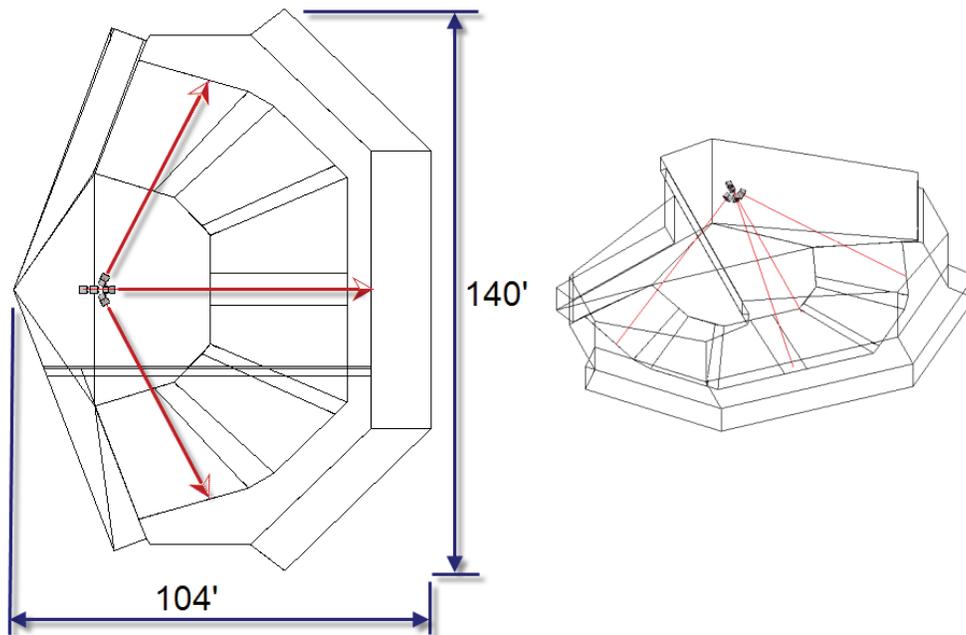
Section 5 | Recommended Arrays & Rigging

3-Element Horizontal Mid/High with Cardioid Bass Array Using ATM AFGS Rigging

Sample Venue Type	Large house of worship	Full-range loudspeakers	None
Typical Seating Capacity	800 to 1200	Mid/High loudspeakers	3 x LT 6400
Room Aspect Ratio	Fan Shaped	Low-frequency/subwoofers	2 x MB12
Room Dimensions (L x W)	104 ft. x 140 ft.	Number suspension points	8
Speaker Height	25 ft.	Array weight with rigging	910 lb. (413 kg.)



Bose® LT 6400 and MB12 Cardioid Bass Array with ATM AFGS Rigging



Bose Modeler® Software Room Plan and 3D Views

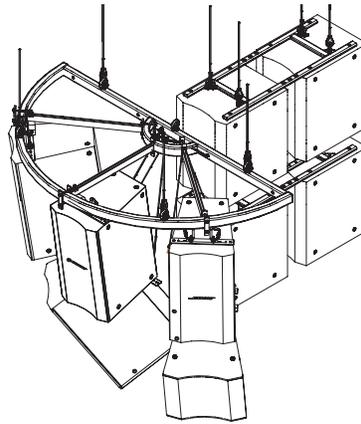
Array Equipment List

Qty	Brand	Model	Description	Qty	Brand	Model	Description
3	BOSE	LT 6400	Mid/High Loudspeaker	1	ATM	LTMB24-X2-RK	Bass array grid
2	BOSE	MB12	Low-frequency loudspeaker	2	ATM	CC-096	Cable tilt/coupler, 96"
2	ATM	AFGS-46G	Array grid	16	ATM	SK-500	1/2" Forged shackle, screw pin
3	ATM	AFGS-46S	Array grid spoke	8	ATM	SK-375	3/8" forged shackle (screw-pin)
2	ATM	AFGS-24A	Array grid steering arm	8	ATM	WRS-3/8x (varies)	Wire rope sling
3	ATM	LTIII-RBL	Pull-back bracket				

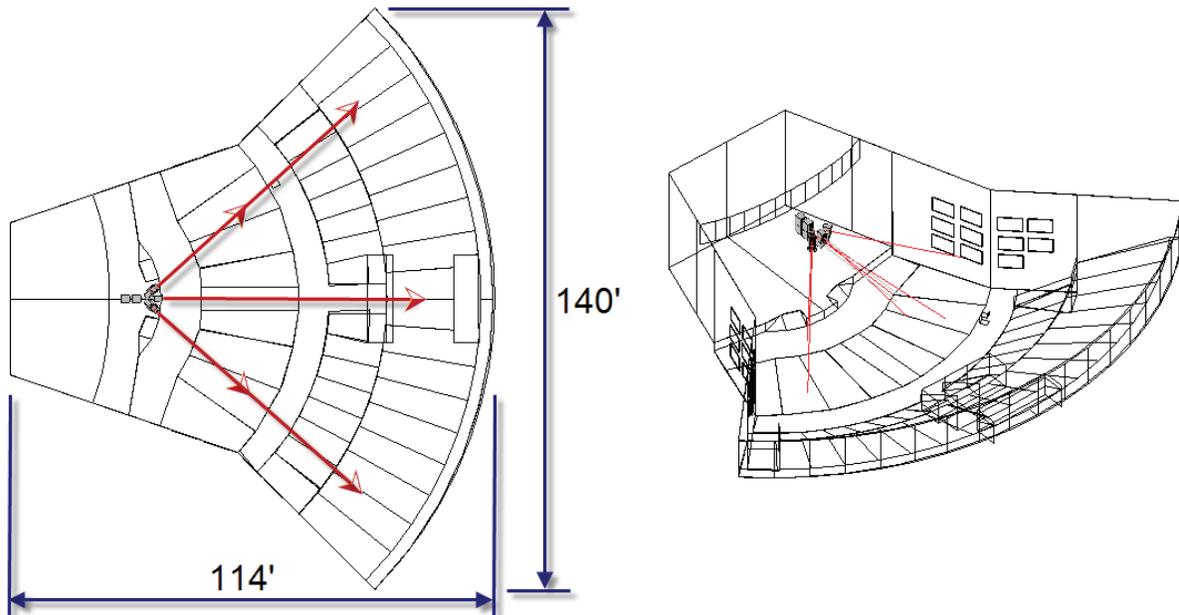
Section 5 | Recommended Arrays & Rigging

5-Element 2-Tier Mid/High with Compound Bass Array Using ATM AFGS Rigging

Sample Venue Type	Large House of Worship	Tier 1 Mid/High loudspeakers	2 x LT 4402 WR
Typical Seating Capacity	800 to 1200	Tier 2 Mid/High loudspeakers	2 x LT 9402 WR
Room Aspect Ratio	Fan Shaped	Low-frequency/subwoofers	4 x MB24
Room Dimensions (L x W)	114 ft. x 140 ft.	Number suspension points	8
Speaker Height	25 ft.	Array weight with rigging	1739 lb. (789 kg.)



Bose® LT 4402 WR, LT 9402 WR and MB24 WR Compound Bass Array with ATM AFGS Rigging



Bose Modeler® Software Room Plan and 3D Views

Array Equipment List

Qty	Brand	Model	Description	Qty	Brand	Model	Description
3	BOSE	LT 4402 WR	Mid/High Loudspeaker	3	ATM	LTMB24-X2-RK	Bass array grid
2	BOSE	LT 9402 WR	Mid/High Loudspeaker	1	ATM	LTMB24-ROD-KT	Cable tilt/coupler, 96"
4	BOSE	MB24	Low-frequency loudspeaker	5	ATM	CC-096	Cable tilt/coupler, 96"
2	ATM	AFGS-46G	Array grid	16	ATM	SK-500	1/2" Forged shackle, screw pin
3	ATM	AFGS-46S	Array grid spoke	8	ATM	EB-375	3/8" forged shoulder eyebolt
2	ATM	AFGS-14A	Array grid steering arm	8	ATM	SK-375	3/8" forged shackle (screw-pin)
5	ATM	LT-RBRA	Pull-back bracket	8	ATM	WRS-3/8x (varies)	Wire rope sling

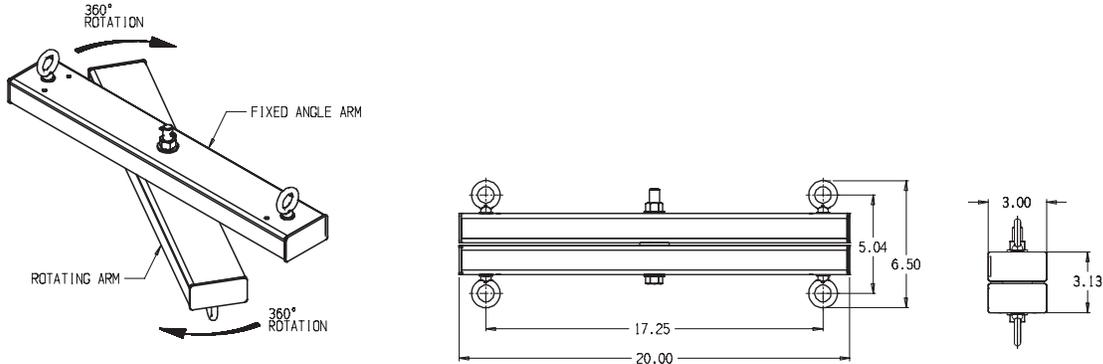
Section 6 | Appendix

ATM FLY-WARE® Rigging Component Dimensions

The following section provides dimensions for the ATM Fly-Ware components referenced in this guide:

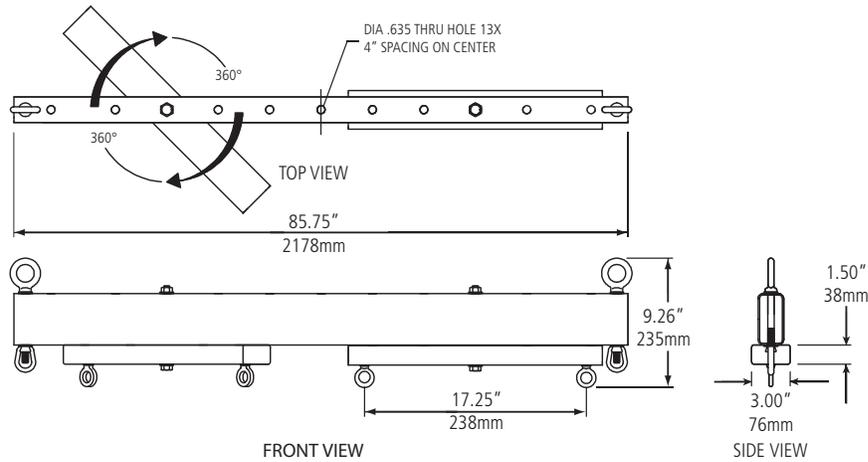
One-Way-Array™ SAS-1WA-20

- Easy to use, load rated rigging and aiming system for single loudspeakers
- Requires 2 structural suspension points
- Lower cross arm rotates independently for horizontal loudspeaker aiming
- Supports both vertical and horizontal loudspeaker orientations



Two-Way-Array™ SAS-2WA-86

- Forms simple 2-element horizontal arrays for central cluster applications
- Requires 2 structural suspension points
- Lower cross arms rotate independently for horizontal loudspeaker aiming
- Supports both vertical and horizontal loudspeaker orientations

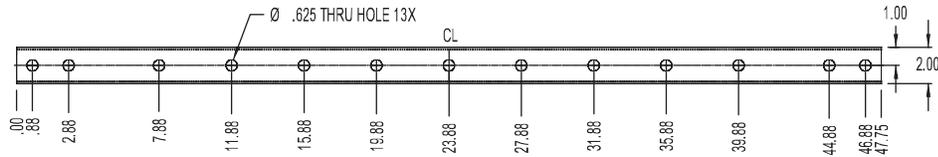


Section 6 | Appendix

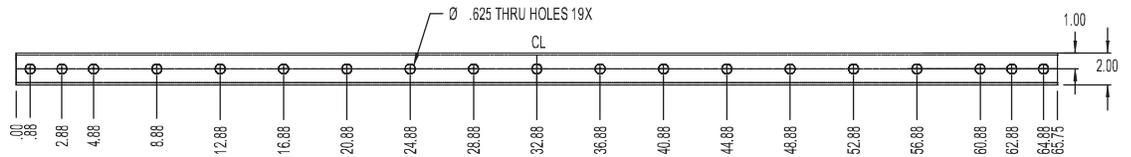
GridLink™ Rigging Beam System

- Foundation for building quick and reliable suspension grids using load-rated, modular components
- Requires 4 structural suspension points when assembled as square grid
- Front cross arms rotate independently for horizontal loudspeaker aiming

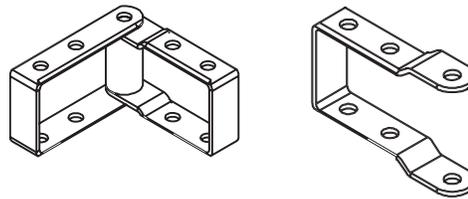
SAS-048-RB
48" Rigging Beam



SAS-066-RB
66" Rigging Beam

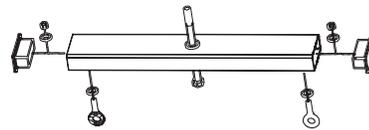


SAS-GL
Connector Kit



SAS-GLT
T-Connector Kit

SAS-100-CA
Cross Arm Kit



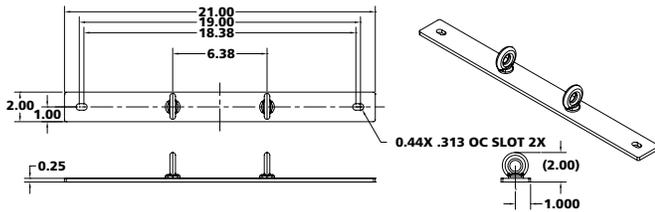
SAS-EB-KT
Eyebolt Suspension Kit



Section 6 | Appendix

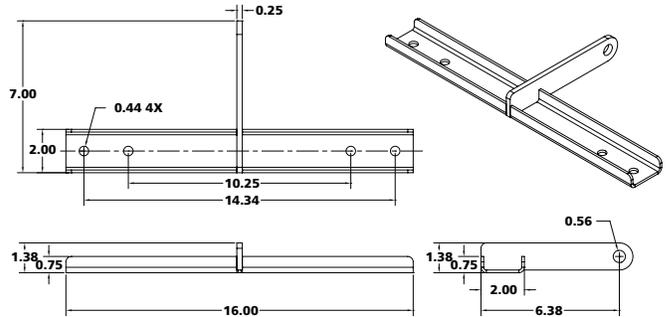
LTIII-FBL

Provides attachment points aligned to AFGS-B for fast OPS carabiner connection to Bose LT 6400/9400 and Bose LT 6403/9403 loudspeakers.



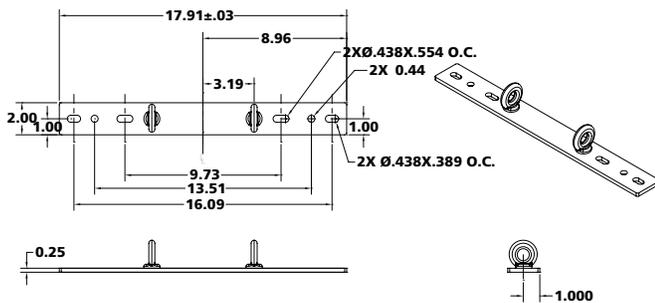
LTIII-RBL

Provides rear pull up attachment point to permit three point hanging configurations for all Bose LT 6400/9400 and Bose LT 6403/9403 loudspeakers.



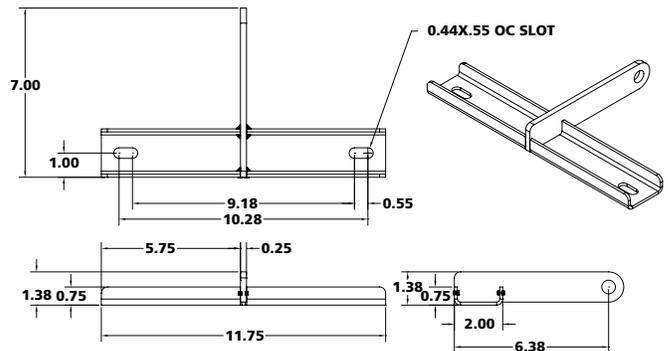
LTIII-FBRA

Provides attachment points aligned to AFGS-B for fast OPS carabiner connection to Bose LT 02 Series loudspeakers.



LTIII-RBRA

Provides rear pull up attachment point to permit three point hanging configurations for all Bose LT 02 Series loudspeakers.



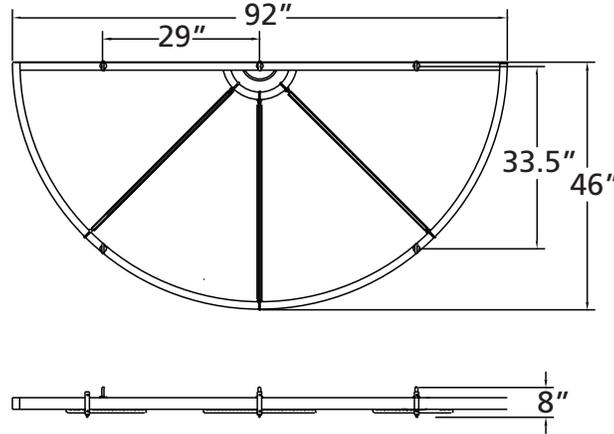
Note:

The brackets shown on this page are manufactured by Adaptive Technologies Group and marketed using the ATM Fly-Ware® brand name. These products are available directly from Adaptive Technologies Group for purchase by professional sound system contractors and integrators.

Section 6 | Appendix

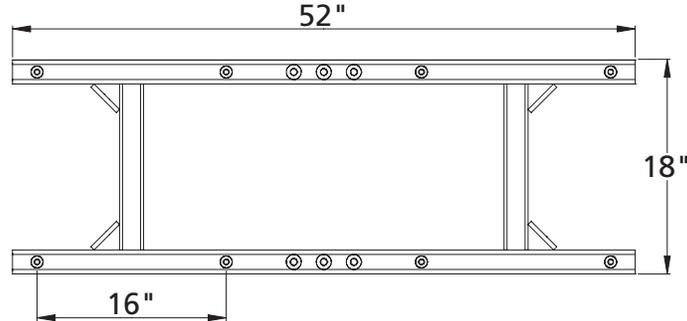
AFGS-46G and AFGS-46-S

- Modular “wagon wheel” rigging grid system for spherical loudspeaker arrays
- Requires 4 structural suspension points (8 for back-to-back “wheel” configurations)
- Adjustable spokes and steering arms provide ease of installation and precise aiming



LTMB24-X2-RK

- Suspension grid for 2 x Bose® MB12 or MB24 low-frequency loudspeakers
- Precise physical spacing designed for cardioid bass-array configurations
- Manufactured and available directly from ATM Fly-Ware



Note Regarding Installation of Bose LT Series Loudspeakers in Outdoor Applications

The rigging solutions presented in this guide utilize wire-rope suspension and off-the-shelf components to ease the installation of **indoor, permanently-installed loudspeaker arrays**. However, wire-rope suspension is **not** recommended for outdoor installations due to wind-loading effects. Custom designed and fabricated rigging solutions constructed of weather-rated materials are required for outdoor installations. Please contact your local Bose Professional Systems Division representative for information regarding outdoor applications of Bose LT Series loudspeakers. Adaptive Technologies Group also provides custom rigging design and fabrication services.

Sling Length Tables for Loudspeaker Tilt Angles

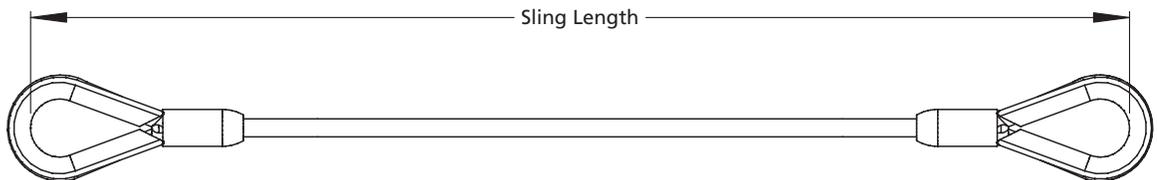
The following tables list wire rope sling length for three and four point suspension methods according to loudspeaker pitch angle.

Usage

Use the tables to match your preferred measurement system and product as shown in the example below:

1. Loudspeaker type
2. Cabinet orientation (vertical or horizontal)
3. Cabinet degrees of pitch (0° to -90°)
4. Sling length and attachment point
5. Number of hang points

Loudspeaker	Orientation	Cable Length (inches)	Cabinet Degrees of Pitch										
			0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
LT 9403	Vertical	Front	8.2	9.5	10.8	12.0	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	
		Pull Up	-	-	-	36.4	34.8	32.9	30.9	28.7	26.4		
	Hang Points		4	4	4	4	3	3	3	3	3	3	
	Horizontal	Front	5.9	7.2	8.4	9.7	10.9	12.1	13.2	14.3			
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2			
		Pull Up	-	-	-	-	-	-	-	-			
		Hang Points	4	4	4	4	4	4	4	4			



Fixed Cable Kits

ATM Fly-Ware® offers fixed cable kits which include 2 wire rope slings and 4 load-rated screw-pin shackles for supporting front or back hang points as shown on the table above. The standard kit lengths are:

- FC-08 Fixed Cable Kit, Length = 8.2 in. (210 mm.)
- FC-10 Fixed Cable Kit, Length = 10 in. (254 mm.)
- FC-14 Fixed Cable Kit, Length = 14 in. (356 mm.)
- FC-18 Fixed Cable Kit, Length = 18 in. (457 mm.)
- FC-22 Fixed Cable Kit, Length = 22 in. (559 mm.)

Standard Slings

ATM Fly-Ware also maintains a comprehensive inventory of standard length wire rope slings in a variety of diameters to accommodate various working load requirements. Wire rope assemblies from 3/16" to 3/8" in diameter and in lengths of 12 inches to 50 feet, provide an economical way to span and bridle from overhead structures to the suspension grids illustrated in this guide.

Section 6 | Appendix | Sling Length (inches)

Loudspeaker	Orientation	Cable Length (inches)	Cabinet Degrees of Pitch																			
			0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60	-65	-70	-75	-80	-85	-90	
LT 3202 [®] WR	Vertical	Front	8.2	10.2	12.1	14.0	15.8	17.6	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	42.1	39.8	37.1	34.3	31.3	28.1	24.7	21.2	17.6	14.0	10.3	6.6	2.9	3
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Front	5.0	7.0	8.9	10.8	12.6	14.4	16.1	17.8	19.3	20.7	22.1	23.2	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	9.7	11.1	12.4	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	36.8	35.0	33.0	30.8	28.5	26.0	23.3	20.6	17.7	14.8	11.9	8.9	5.9	2.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LT 4402 [®] WR	Vertical	Front	8.2	9.5	10.7	11.9	13.1	14.2	15.3	-	-	-	-	-	-	-	-	-	-	-	-	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	38.7	37.1	35.3	33.3	31.1	28.8	26.2	23.6	20.8	17.9	15.0	12.0	8.9	5.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Front	5.9	7.2	8.4	9.7	10.9	12.1	13.2	14.3	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	9.5	10.7	11.9	13.1	14.2	15.3	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	25.8	24.1	22.3	20.3	18.3	16.2	14.0	11.8	9.6	7.3	5.1	2.9	-	-
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LT 6400	Vertical	Front	8.2	9.5	10.8	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	38.7	37.1	35.3	33.3	31.1	28.8	26.2	23.6	20.8	17.9	15.0	12.0	8.9	5.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Front	5.9	7.2	8.4	9.7	10.9	12.1	13.2	14.3	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	9.5	10.7	11.9	13.1	14.2	15.3	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	25.8	24.1	22.3	20.3	18.3	16.2	14.0	11.8	9.6	7.3	5.1	2.9	-	-
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LT 9400	Vertical	Front	8.2	9.6	10.9	12.2	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	37.3	35.5	33.5	31.3	28.9	26.4	23.7	20.9	18.0	15.0	12.0	9.0	5.9	2.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Front	4.8	6.2	7.5	8.8	10.0	11.3	12.4	13.6	14.6	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	9.5	10.8	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	38.7	37.1	35.3	33.3	31.1	28.8	26.2	23.6	20.8	17.9	15.0	12.0	8.9	5.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LT 9402 [™] WR	Vertical	Front	8.2	9.5	10.8	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	38.7	37.1	35.3	33.3	31.1	28.8	26.2	23.6	20.8	17.9	15.0	12.0	8.9	5.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Front	5.9	7.2	8.4	9.7	10.9	12.1	13.2	14.3	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	9.5	10.8	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	38.7	37.1	35.3	33.3	31.1	28.8	26.2	23.6	20.8	17.9	15.0	12.0	8.9	5.9
		Hang Points	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LT 9702 [®] WR	Vertical	Front	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	5.2	5.9	6.5	7.2	7.9	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	Horizontal	Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Front	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Back	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
		Pull Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hang Points	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Additional Resources

Web Sites

	Description
pro.Bose.com	Bose® Professional Systems Division
www.adapttechgroup.com	Adaptive Technologies Group, Inc. (ATM FLY-WARE®)
www.rigging.net	Independent web site listing graded fasteners
www.thecrosbygroup.com	Supplier of accessories used in the lifting industry
www.cmworks.com	Supplier of chain hoists and accessories
www.synaudcon.com	Seminars for sound system design and acoustics
www.handbookforriggers.com	Pocket size rigging information from Newberry Investments Co. LTD.
www.riggingbooksandprograms.com	Entertainment Rigging Books, Reference Cards, and Rigging Software

Books

Davis, Don, and Eugene Patronis. *Sound System Engineering*. Third Edition. Focal Press, 2006. Print. ISBN-13: 978-0240808307

Donovan, Harry. *Entertainment Rigging: a Practical Guide for Riggers and Managers*. H.M. Donovan, 2008. Print. ASIN: B000OYJGWU

Avallone, Eugene A., Theodore Baumeister, and Ali M. Sadegh. *Marks' Standard Handbook for Mechanical Engineers*. 11th Edition. McGraw-Hill, 2007. Print. ISBN-13: 978-0071428675

Newberry, William Guy. *Handbook for Riggers*. Newberry Investments, 1989. Print. ISBN: 0-9690154-1-0

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