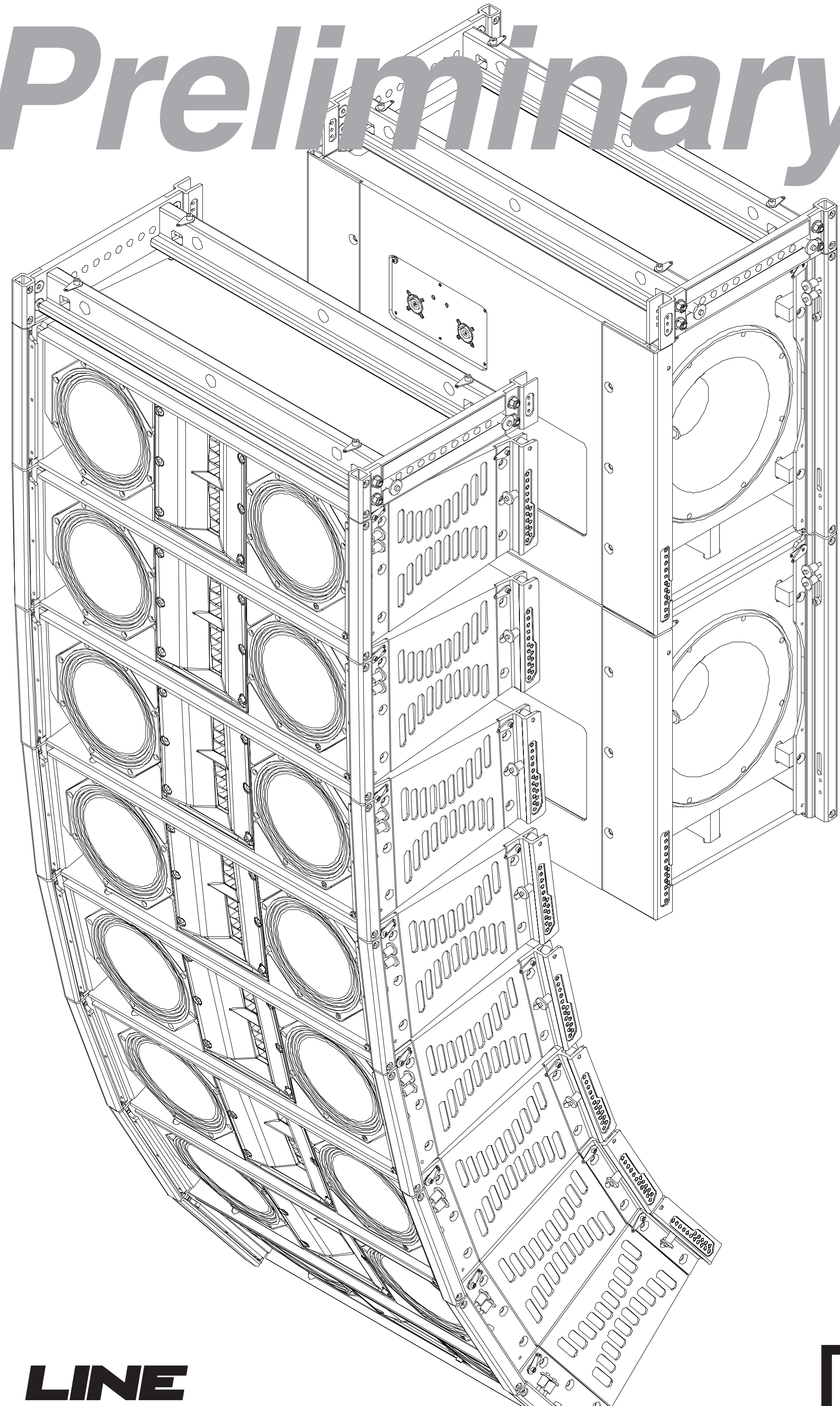
X-Line Very Compact Rigging Manual

Preliminary



LINE
VERY
COMPACT
™

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Rigging-Safety Warning

This document details general rigging practices appropriate to the entertainment industry, as they would apply to the rigging of Electro-Voice X-Line Very Compact (XLVC) loudspeaker systems. It is intended to familiarize the reader with standard rigging hardware and techniques for suspending XLVC loudspeaker systems overhead. Only persons with the knowledge of proper hardware and safe rigging techniques should attempt to suspend any sound systems overhead. Prior to suspending any Electro-Voice XLVC loudspeaker systems overhead, it is essential that the user be familiar with the strength ratings, rigging techniques and special safety considerations outlined in this manual. The rigging techniques and practices recommended in this manual are, of necessity, in general terms to accommodate the many variations in loudspeaker arrays and rigging configurations. As such, the user is expressly responsible for the safety of all specific XLVC loudspeaker array designs and rigging configurations as implemented in practice.

All the general rigging material contained in this manual is based on the best available engineering information concerning materials and practices, as commonly recognized in the United States, and is believed to be accurate at the time of the original printing. As such, the information may not be directly applicable in other countries. Furthermore, the regulations and requirements governing rigging hardware and practices may be superseded by local regulations. It is the responsibility of the user to ensure that any Electro-Voice loudspeaker system is suspended overhead in accordance with all current federal, state and local regulations.

All specific material concerning the strength ratings, rigging techniques and safety considerations for the XLVC loudspeaker systems is based on the best available engineering information concerning the use and limitations of the products. Electro-Voice continually engages in testing, research and development of its loudspeaker products. As a result, the specifications are subject to change without notice. It is the responsibility of the user to ensure that any Electro-Voice loudspeaker system is suspended overhead in accordance with the strength ratings, rigging techniques and safety considerations given in this document and any manual update notices. All non-Electro-Voice associated hardware items necessary to rig a complete XLVC loudspeaker array (grids, chain hoists, building or tower supports and miscellaneous mechanical components) are the responsibility of others.

Electro-Voice
August, 2005

0. Introduction

The X-Line Very Compact (XLVC) loudspeaker systems represent an important step in line-array technology for small- and medium-scale sound reinforcement. The individual loudspeaker drivers, acoustic lenses, acoustic waveguides, enclosures and rigging hardware were all designed specifically for the XLVC product line to not only achieve the highest acoustic output with the highest fidelity, but also to produce a precise wavefront from each element to achieve state-of-the-art line-array performance. A brief description of the product line is included below. The XLVC loudspeaker systems are shown in Figure 1 with key dimensions, weights, and features.

XLD281: Three-way, LF1/LF2/HF loudspeaker system with a 120°H x 10°V coverage pattern. The system includes two DVN2080 8-inch (203-mm) LF drivers and two ND2S-16 2-inch (51-mm) HF drivers. The XLD281 has a switchable crossover that allows either biamp or triamp operation. The XLD281 utilizes an enclosure that is trapezoidal in the vertical plane (with an 10° total included angle) and has XLVC 10° rigging tube and channel modules secured to the left and right enclosure sides.

XLE181: Two-way, LF/HF loudspeaker system with a 120°H x 10°V coverage pattern. The system includes one DVN2080 8-inch (203-mm) LF driver and two ND2S-16 2-inch (51-mm) HF drivers. The XLE181 has a switchable crossover that allows either biamp or passive operation. The XLE181 utilizes a narrower 10° trapezoidal enclosure than the XLD281 and has XLVC 10° rigging tube and channel modules secured to the left and right enclosure sides.

XS212: Dual Side-Firing Bass System with two DVX3120 12-inch (305-mm) woofers. The XS212 utilizes an enclosure that is rectangular in shape and has XLVC elongated 20° rigging tube and channel modules secured to the left and right enclosure sides.

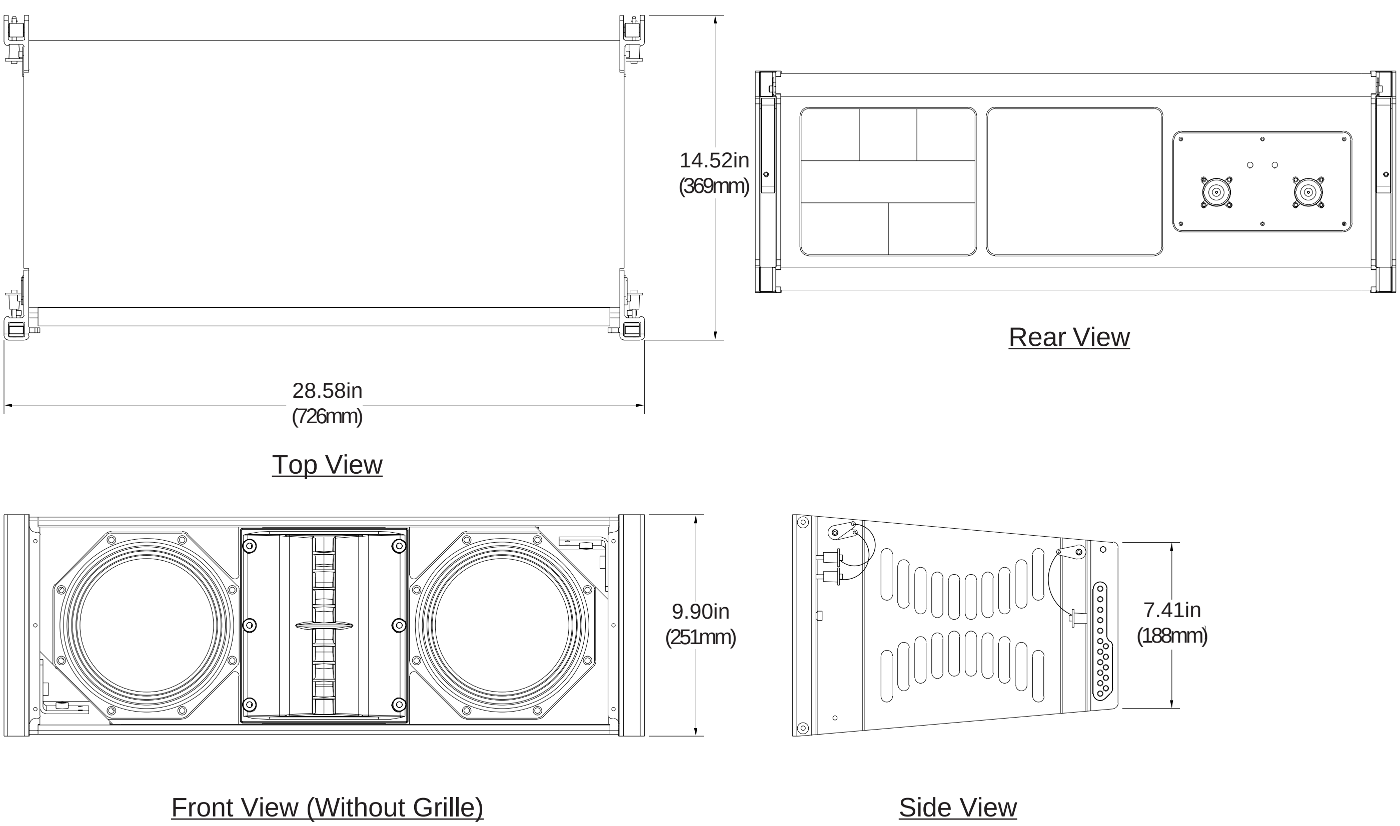


Figure 1a: *XLD281 Loudspeaker System*

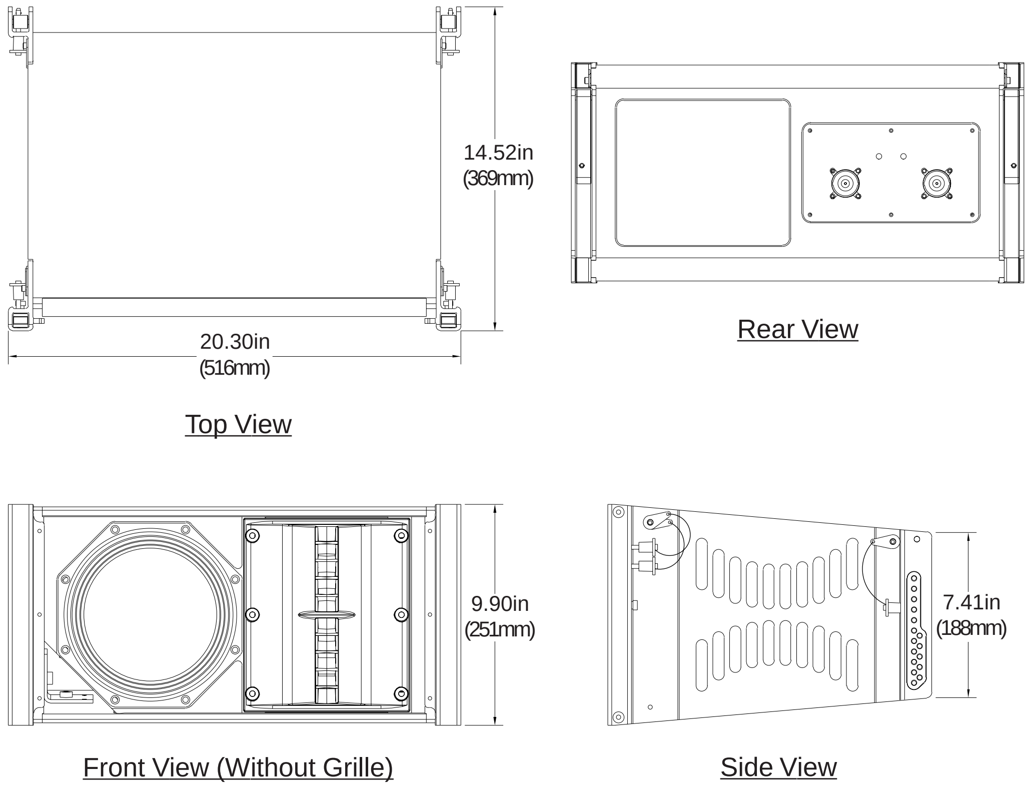


Figure 1b: *XLE181 Loudspeaker System*

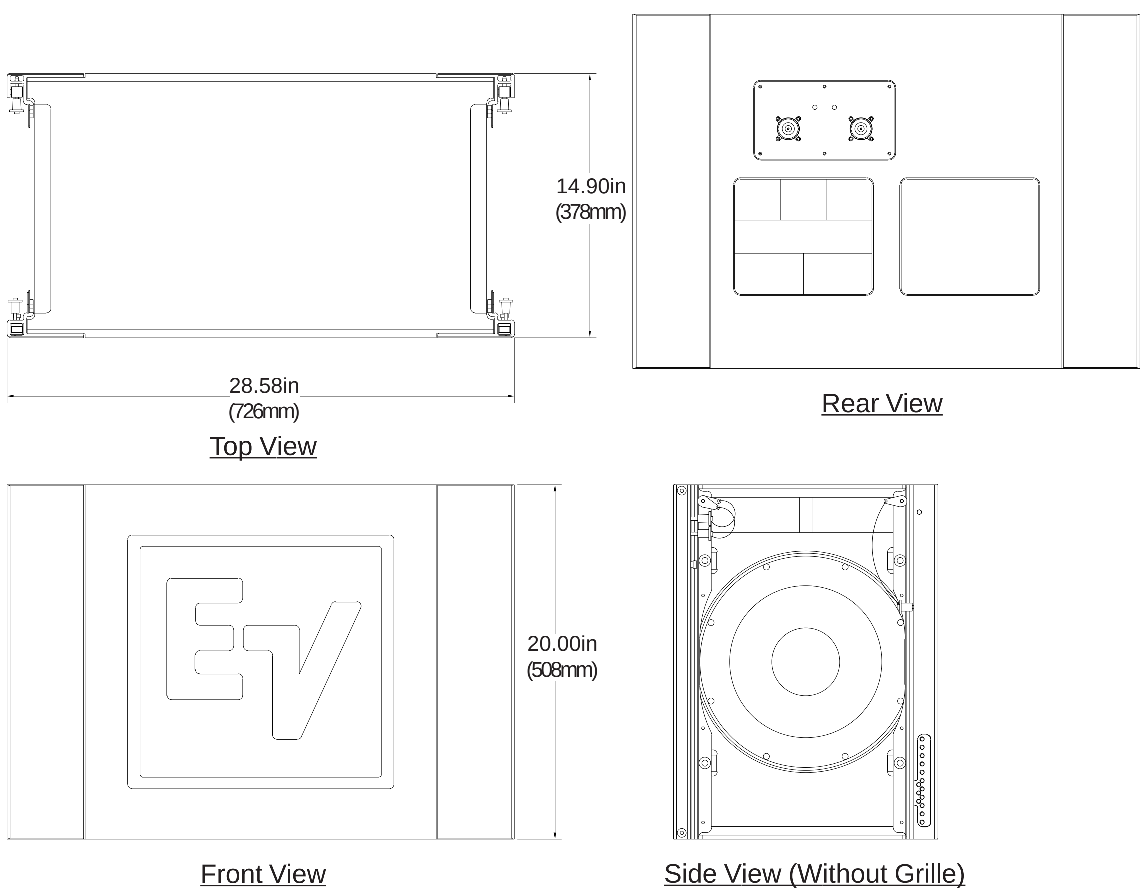


Figure 1c: *XS212 Loudspeaker System*

1. X-Line Very Compact Rigging System

1.1 Overview of the XLVC Flying System

The XLVC loudspeaker systems have been designed to construct correct acoustic line arrays. Acoustic line arrays typically consist of independent columns of loudspeaker systems that acoustically and coherently sum to radiate cylindrical wavefronts. This simplifies the rigging system.

The XLVC loudspeaker enclosures utilize a hinged rigging system that makes constructing arrays easy, predictable and repeatable. This front-hinging rigging concept allows arrays to be accurately constructed with the least possible spacing between enclosures. The front and back rigging hardware for linking two enclosures together are captured as an integral part of the side rigging tube and channel modules.

A basic array is shown in Figure 2 that illustrates the integral components that make up a typical XLVC flying system. The XLD281 and XLE181 enclosures are vertically trapezoidal - taller at the front than at the back. The enclosures are hinged at the front corners using rigging hardware specially designed for the XLVC system. The enclosures are linked at the rear using rigging arms that have multiple attachment positions. The different positions adjust how close the back corners of the enclosures are pulled together; hence, adjusting the vertical angle of the bottom enclosure.

1.2 XLVC Enclosure Rigging Hardware Details

On each side of the enclosure are XLVC rigging tube and channel modules. All the rigging hardware needed to fly a column of XLVC enclosures is an integral part of the high-strength aluminum-alloy rigging tube and channel modules. The structural load is transmitted through the modules minimizing the load on the loudspeaker enclosure shell. Figures 3a and 3b illustrate the XLVC enclosure rigging hardware components. Figures 4a and 4b show key dimensions for the rigging hardware.

At the front rigging module is a rectangular rigging tube. Captured inside the rigging tube is a rigging connector called the hinge bar. The hinge bar is constructed from a high-strength aluminum alloy. The hinge bar can slide out the top of the tube and be locked into position as shown in Figure 2. The portion of the hinge bar sticking out the top would be inserted into the front rigging tube of an enclosure above and pinned into place, linking the two enclosures together and forming a hinging point between the two enclosures. The hinge bar can also be fully retracted inside the tube for transportation.

Each hinge bar has two holes in the bar for rigging box-to-box or securing pins for transport. The front rigging tube has two holes for pinning the bar in place to construct arrays or for transport. As shown in Figures 3a and 3b, the bottom hole and pin on the bar locks the hinge bar in place at the top of the tube. The exposed top hole and pin is then used to lock the hinge bar in the tube of an enclosure above. For transportation, the hinge bar would be slid down inside the tube and would be locked in the tube module using the two “transport holes” on the rear of the front rigging tube.

At the rear is a channel module with a vertical rigging slot. Captured inside the rigging slot is a rigging connector called the swing arm. The swing arm is constructed from a high-strength aluminum alloy. The swing arm can be pivoted to stick out the top as shown in Figures 3a and 3b. At the bottom of the channel from the enclosure above, the rear rigging slot has a series of holes.

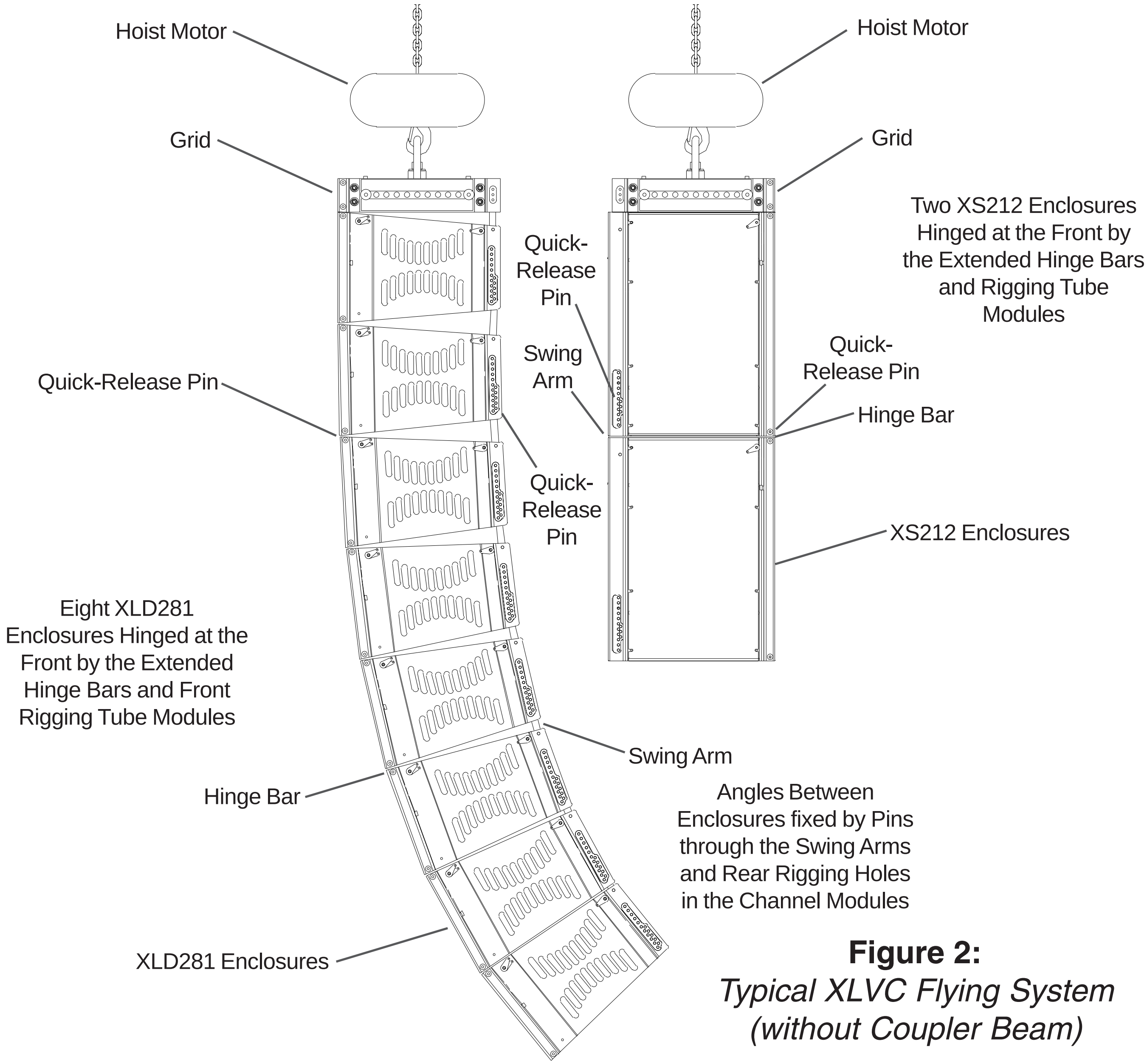


Figure 2:
Typical XLVC Flying System (without Coupler Beam)

The swing arm from an enclosure below can be pivoted up so that the quick-release pin from the enclosure below may be inserted through a hole in the rigging slot on the channel module above, linking the two enclosures together. The vertical tilt angle of the bottom enclosure is then determined by the hole in which the swing arm is pinned. This pin fixes the maximum distance the back corners of the enclosures may be separated. The XLD281 and XLE181 enclosures may be angled from 0° to 10° in 1° increments, while the XS212 enclosure may be angled from 0° to 20° in 2° increments.

The XLD281 and XS212 loudspeaker systems may be rigged together in the same column because they have the same width. However, the XLE181 system may not be rigged to either an XLD281 or XS212 because it is not as wide.

The center of gravity and rigging dimensions for all of the XLVC loudspeaker systems are shown in Figure 4. This figure includes sufficient information to calculate the vertical angle of XLVC enclosures that are rigged together in a column, as well as the weight distribution throughout the column.

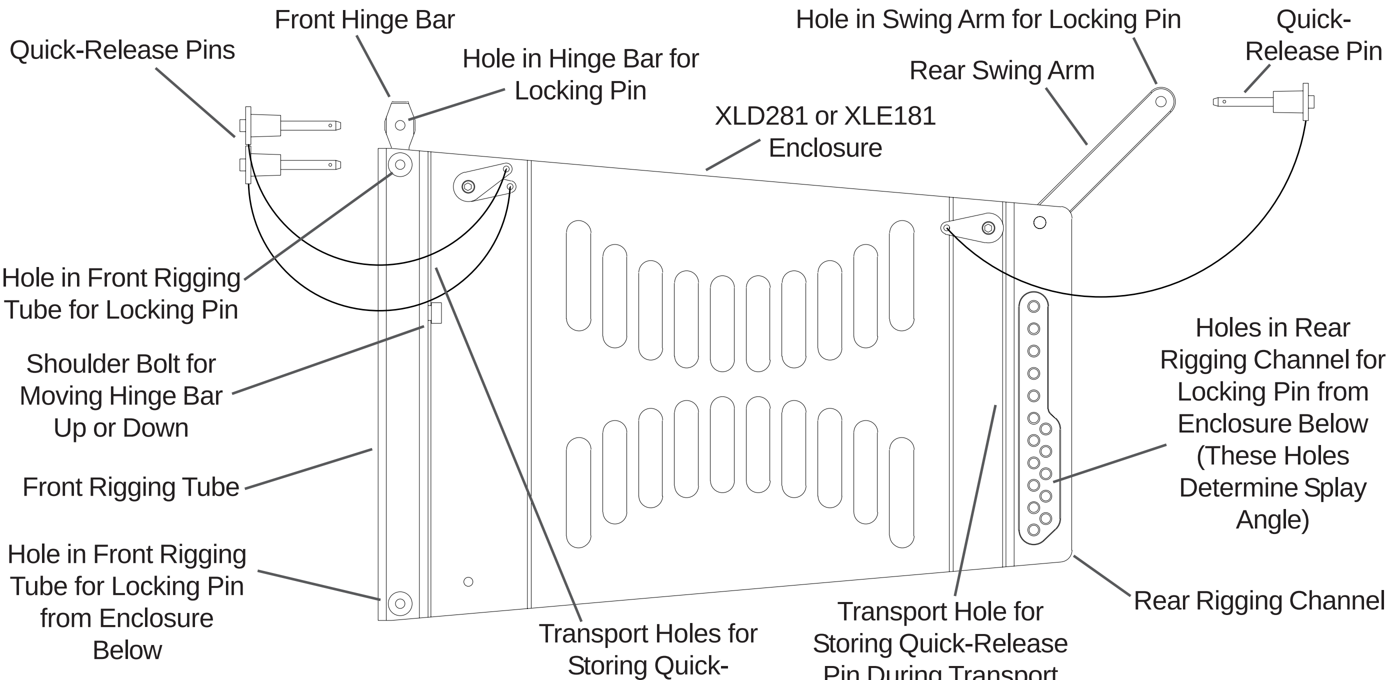


Figure 3a:
XLD281 and XLE181 Rigging Hardware

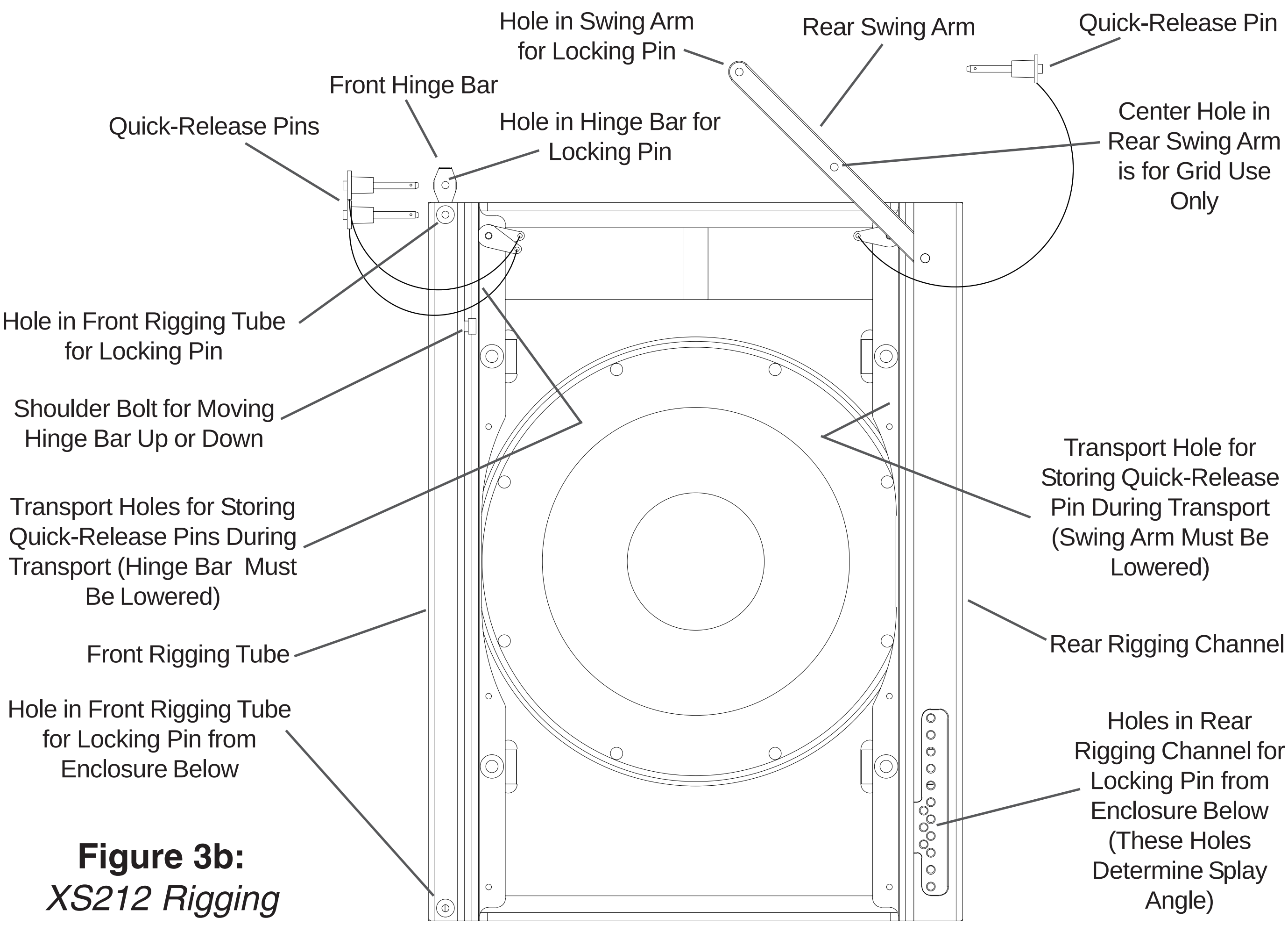


Figure 3b:
XS212 Rigging Hardware

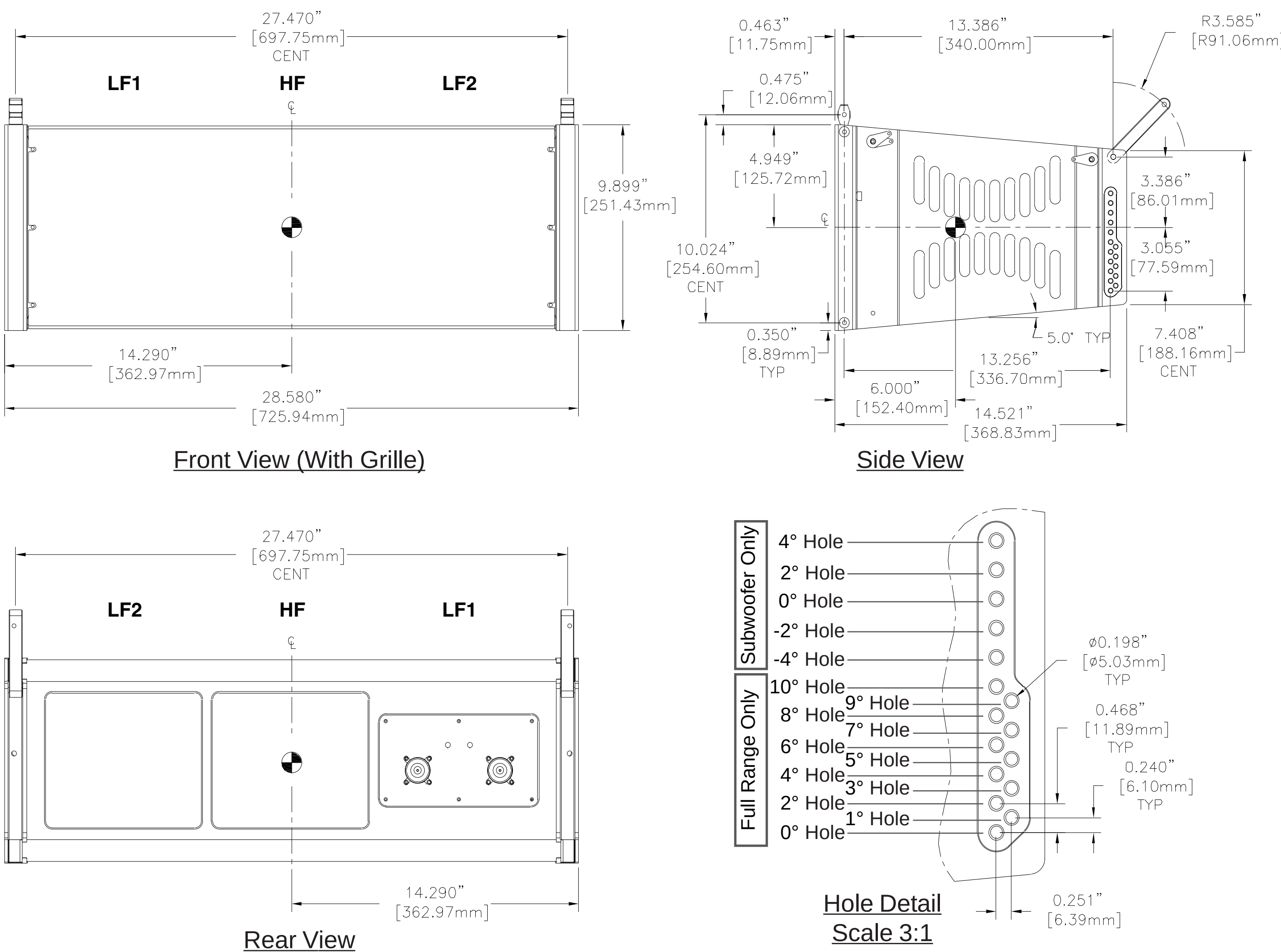
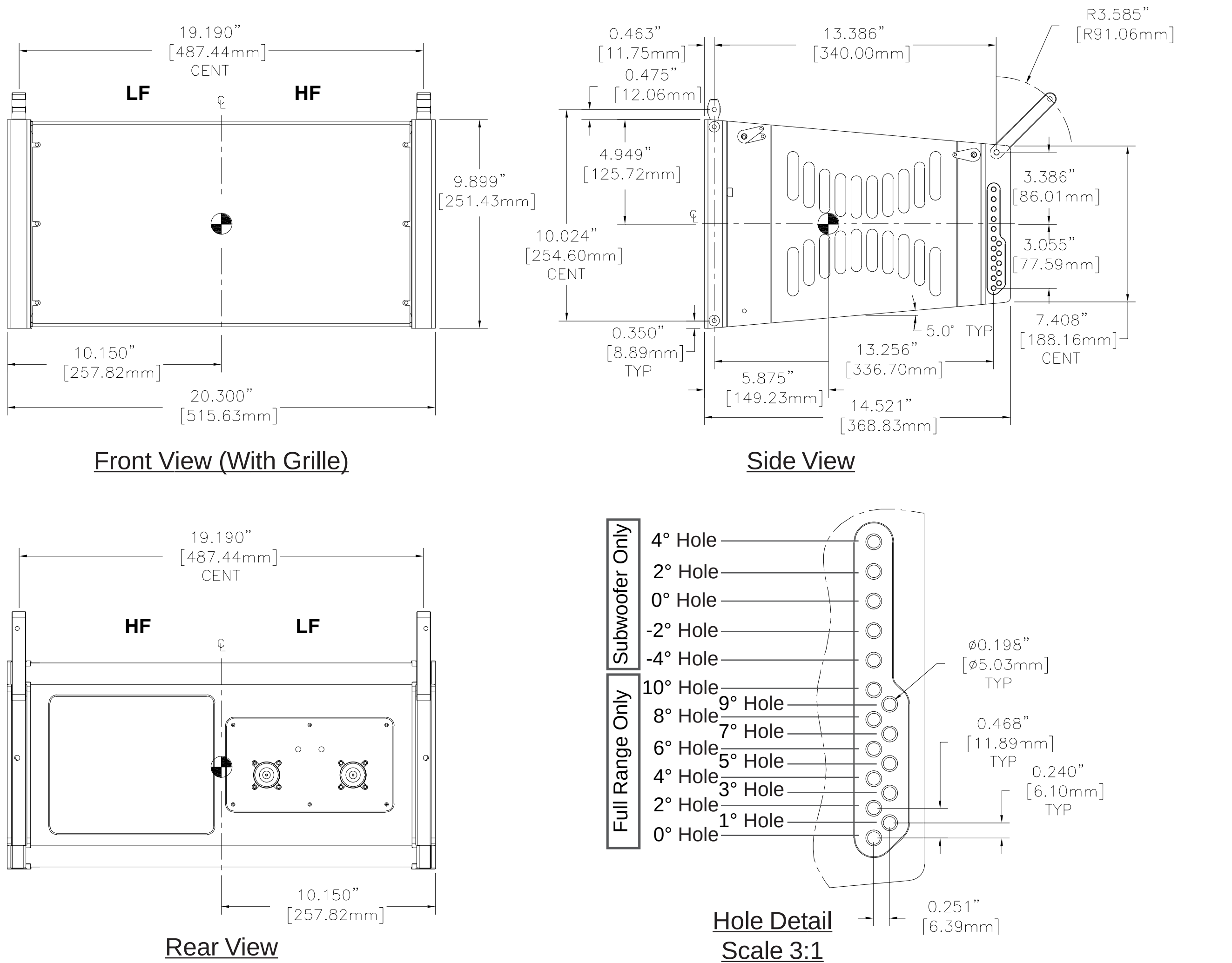


Figure 4a:

XLD281 Rigging Dimensions and Weights



Weight: 38 lb (17.2 kg)

Figure 4b:

XLE181 Rigging Dimensions and Weights

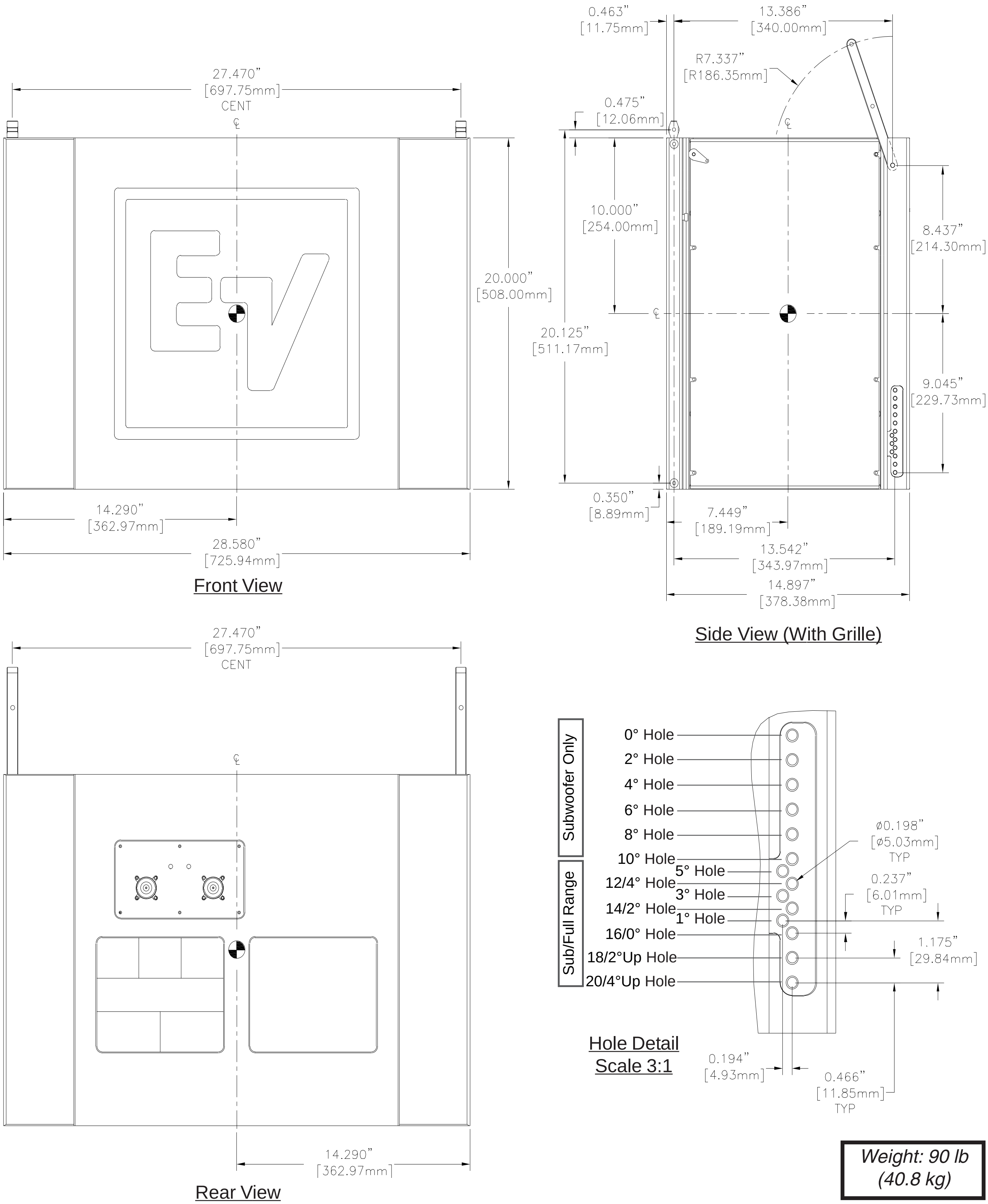


Figure 4c:

XS212 Rigging Dimensions and Weights

1.3 XLVC Rigging Accessory Details

Several accessories for rigging the XLVC loudspeaker systems are shown in Figure 5. This figure includes the center of gravity and rigging dimensions for the accessories and includes sufficient information to calculate the vertical angle of XLVC enclosures that are rigged together in a column, as well as the weight distribution throughout the column.

XLD GRID

The XLD GRID is a grid used for suspending a column of XLD281 or XS212 loudspeaker systems overhead and is shown in Figure 5a. The grid consists of two sidearm assemblies and two spreader bar assemblies. The front of the sidearm has a rectangular tube identical to that on the loudspeaker systems. The hinge bar from the top loudspeaker system is inserted into the grid tube and pinned into place using the same quick-release pins from the loudspeaker. The rear of the sidearm has channel with a vertical slot that is similar to that on the loudspeaker systems. The swing arm from the top loudspeaker system is inserted into the grid tube and pinned into place using the same quick-release pins from the loudspeaker.

The grid sidearms are then attached to either one or two spreader bars. Two spreader bars are used when two front-to-back pickup points are required. One spreader bar is used when two side-to-side pickup points are required or one center pickup point is required.

Quick-release pins are used to secure the sidearms to the spreader bar. The width of the assembly matches the width of the XLD281 and XS212 loudspeaker rigging.

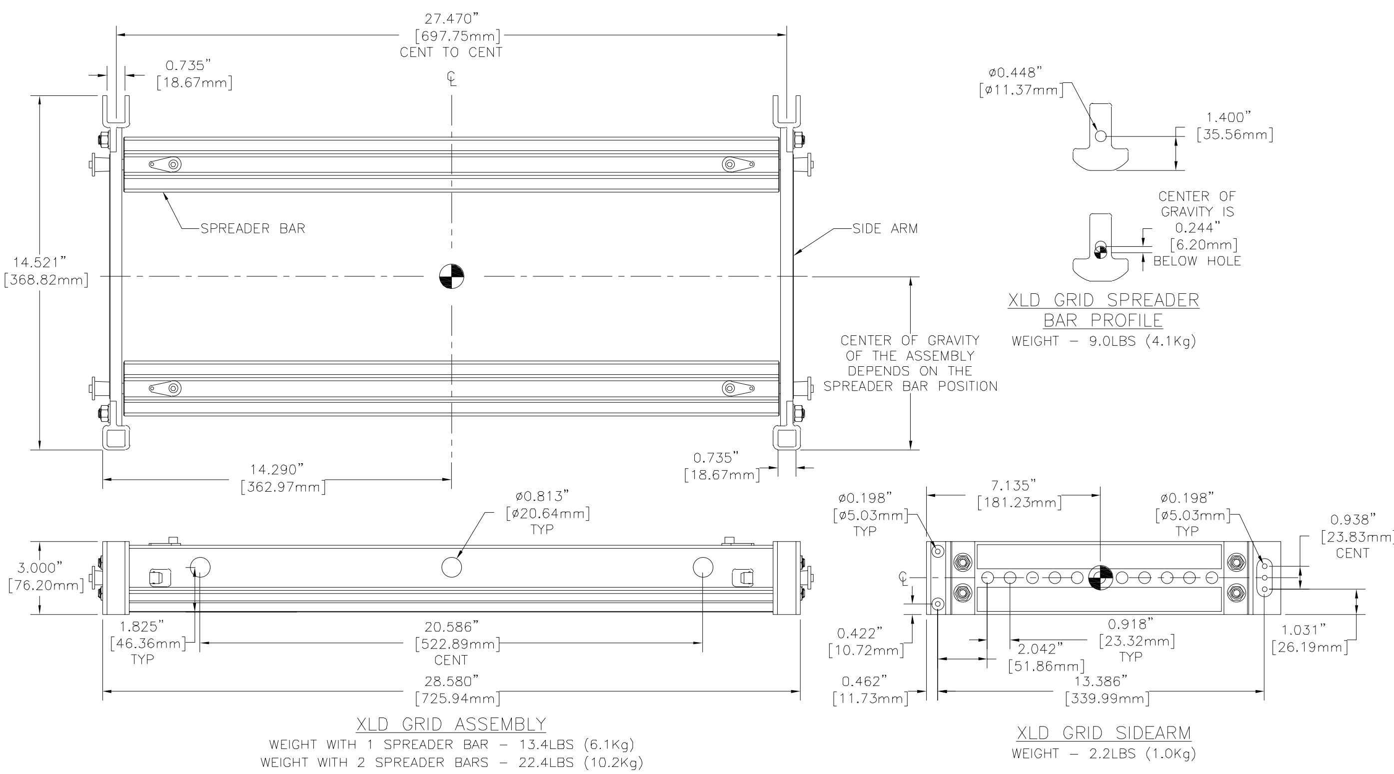


Figure 5a:

XLD GRID Rigging Dimensions and Weights

XLE GRID

The XLE GRID is a grid used for suspending a column of XLE181 loudspeaker systems overhead and is shown in Figure 5b. The XLE GRID sidearms are identical to that of the XLD GRID. However, the XLE GRID spreader bars are shorter to match the width of the XLE181 loudspeaker system rigging.

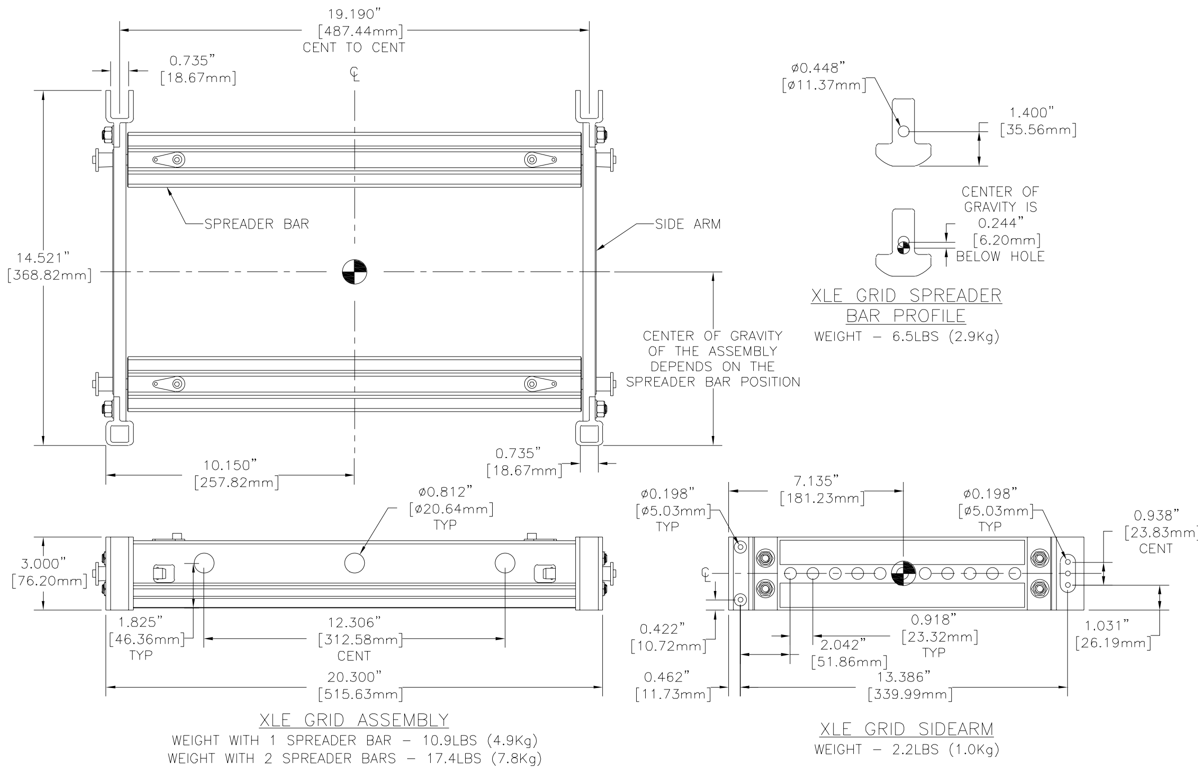


Figure 5b:

XLE GRID Rigging Dimensions and Weights

CBEAM

The CBEAM, shown in Figure 5c, has two functions. It may be used a coupler beam to enable a column of XS212 systems to be hung behind a either a column of XLD281 loudspeaker systems or a column of XLE181 systems. The XLD GRID and XLE GRID grids are used to attach a column of loudspeakers to the CBEAM. The CBEAM may also be used as an extender beam to hang a single column of loudspeaker systems overhead (either XLD281 or XLE181). As an extender beam, the CBEAM allows a single pickup point that is beyond the end of either the XLD GRID or the XLE GRID, enabling the entire array to be tilted downward at greater angles, eliminating the need to use a pull back from the bottom of the column. The CBEAM may also be reversed to enable greater upward angles for the loudspeaker column.

Two yoke assemblies are used to attach each grid (either XLD GRID or XLE GRID) to the CBEAM. Each yoke is fastened the two spreader bars from the grids. Quick-release pins are used to secure the grid spreader bars to the yokes.

When two hoist motors are used to suspend a CBEAM overhead, the two motors are attached to the front and back of the CBEAM. In this case, the hoist motors are used to adjust the vertical angle of the CBEAM and the array underneath. When one hoist motor is used, the vertical angle of the CBEAM and the array underneath is determined by the front-to-back position at which the hoist is attached to the CBEAM. There are a series of holes in the CBEAM the user may select to adjust the vertical angle.

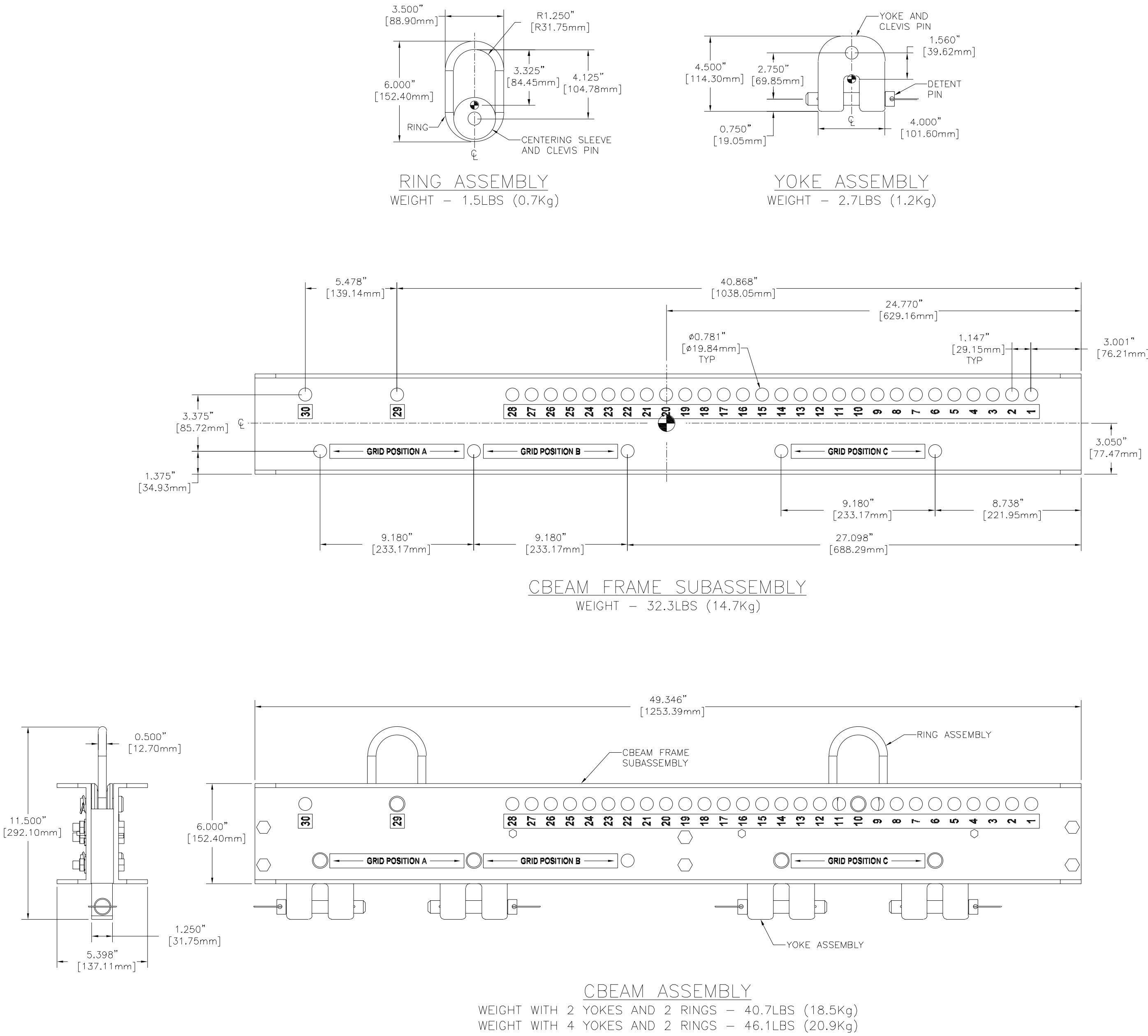


Figure 5c:

CBEAM Rigging Dimensions and Weights

XLVC-BGK

The XLVC-BGK, shown in Figure 5d, is a bottom grid kit that allows the XLD GRID to be attached to the bottom of the XLD281 loudspeaker systems or the XLE GRID to be attached to the bottom of the XLE181 loudspeaker systems. The bottom grid can then be used to pull back a column of XLVC loudspeaker systems to achieve a greater downward tilt than gravity would allow without a pull back.

The top of all XLVC loudspeaker systems have hinge bars mounted in the top of the front rigging tubes and swing arms mounted in the top of the rear rigging channels. However, the rigging tubes and channels are open at the bottom of all XLVC system rigging to accept hinge bars and swing arms from and enclosure below. The XLVC-BGK consists of a pair of XLVC front hinge bars, a pair of XLVC rear swing arms and a set of quick-release rigging pins for those bars and arms.

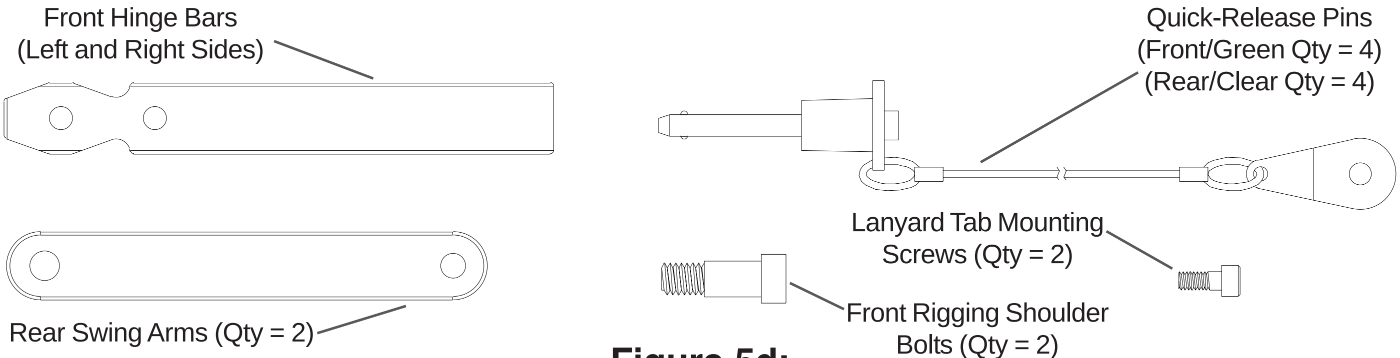


Figure 5d:

XLVC-BGK Bottom Grid Kit Contents

AGCD

The AGCD, shown in Figure 5e, is an adapter grid that allows XLD281 very-compact line-array loudspeaker systems to be rigged below XLC compact line-array loudspeaker systems. A typical example would be to use the AGCD construct a line array with two XLC215 (or XLC118) subwoofer systems at the top of a column with several XLD281 systems suspended below.

At the front of the AGCD are two sets of rigging tubes - one pair of rigging tubes mate with the XLVC front hinge bars and the other pair mate with the XLC front hinge bars. At the rear of the AGCD are two sets of rigging channels - one pair of rigging channels mate with the XLVC rear swing arms and the other pair mate with the XLC rear swing arms. The AGCD includes a pair of front XLC hinge bars and a pair of XLC rear swing arms that can be installed into the top of the adapter grid, allowing the AGCD to be suspended below an XLC215 (or XLC118) system. An XLD281 system can then be hung directly from the bottom of the AGCD.

The AGCD may also be used to place XLD281 loudspeaker systems on top of XLC215 (or XLC118) loudspeaker systems above an XGS-3 groundstack. In this case, the adapter grid is secured to the top of the XLC subwoofer and an XLD281 system may be attached to the top of the AGCD using the XLVC-BGK bottom grid kit.

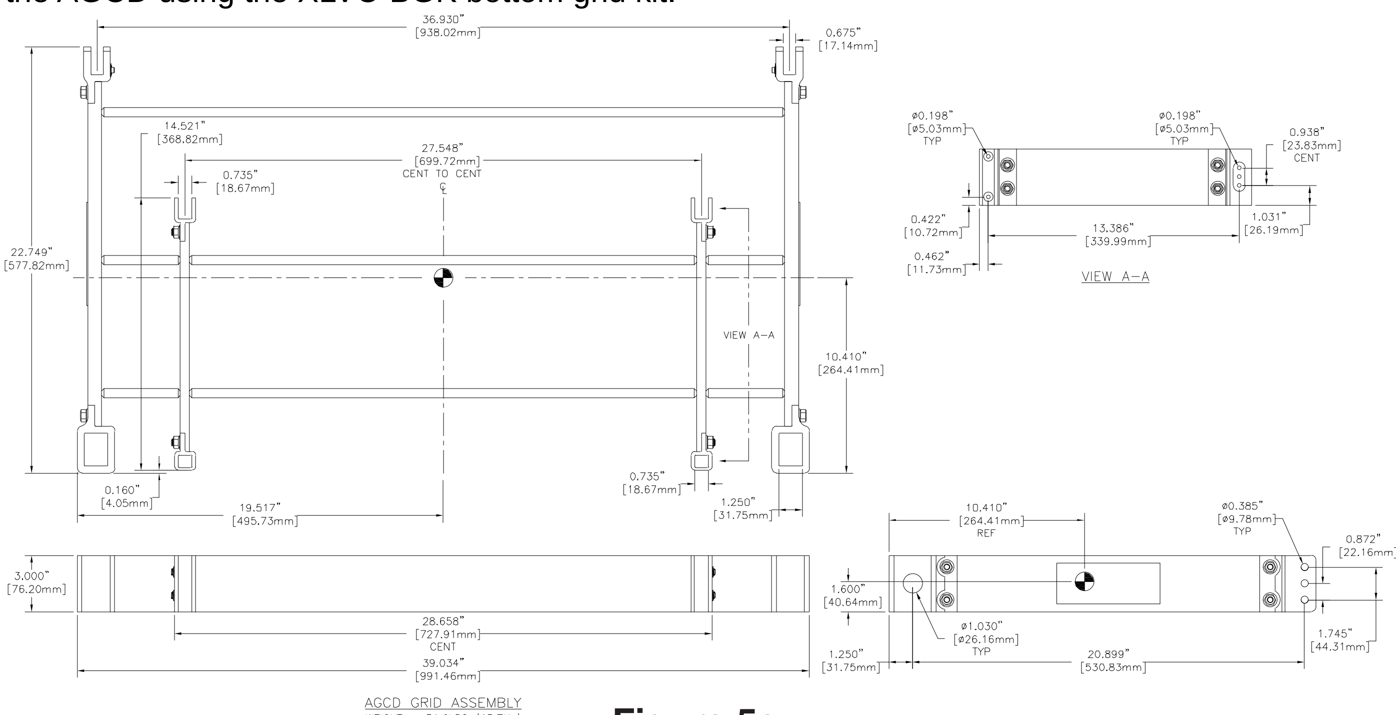


Figure 5e:

AGCD Adapter Grid Dimensions and Weights

XGS-4

The XGS-4, shown in Figure 5f is a pair of rails that may be used to groundstack XLVC loudspeaker systems. Each rail is an L-bracket that has multiple sets of front hinge bar rigging and rear swing arm rigging that mate with the front rigging tube and rear rigging channels on the bottom XLVC loudspeaker enclosure rigging.

The XGS-4 may be used to stack a single column of XLD281 systems, a single column of XLE181 systems or an XLD281 column and XS212 column combined.

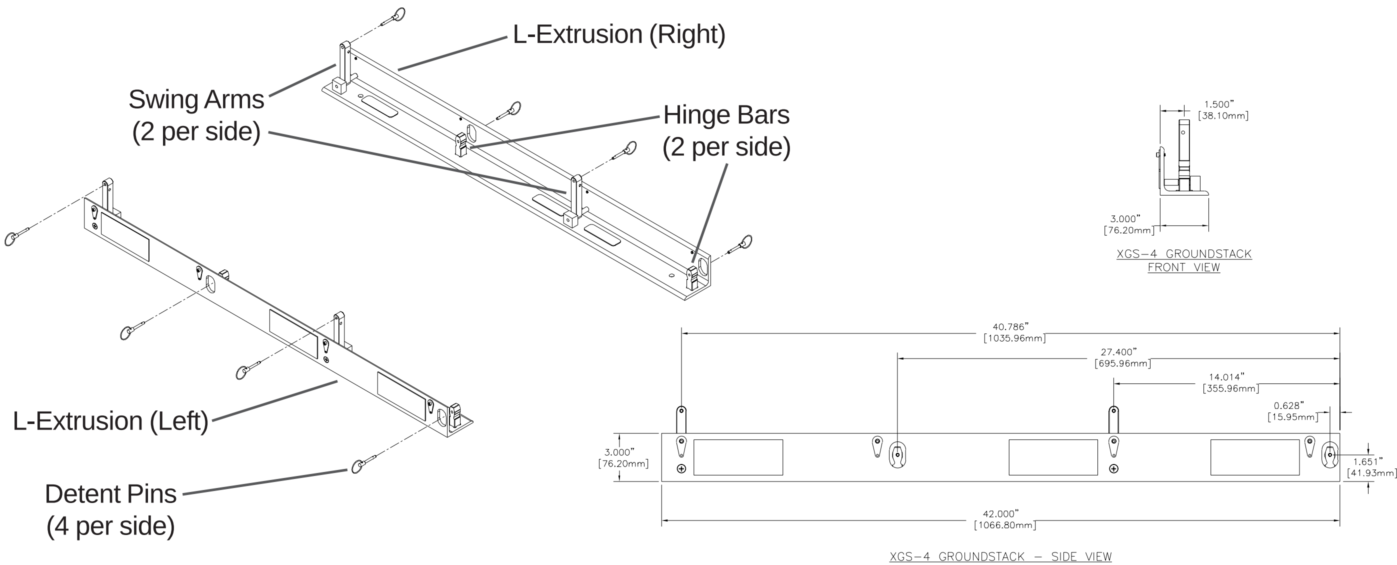


Figure 5f:

XGS-4 Groundstack Details/Dimensions

XLD/XS DOLLY

The XLD/XS DOLLY is a dolly for transporting XLD281 and/or XS212 loudspeaker systems. The dolly will accommodate two columns of loudspeaker systems – two columns of XLD281 systems, two columns of XS212 systems or an XLD281 column and an XS212 column combined. XLD281 systems may be stacked 6 high on the dolly. XS212 systems may be stacked 3 high on the dolly. The systems are strapped down with ratchet straps and offer side panel kits for additional protection during transport.

SP12.6

The SP12.6 is a side panel kit to be seamlessly integrated into the XLD/XS Dolly when additional protection is needed during transport. The SP12.6 allows for protection of two columns of six XLD281 loudspeaker systems for a total of (12) XLD281 loudspeaker systems, for protection of two columns of three XS212 loudspeaker systems for a total of (6) XS212 loudspeaker systems, or for protection of combined columns of (6) XLD281 loudspeaker systems and (3) XS212 loudspeaker systems.

SP8.4

The SP8.4 is a side panel kit to be seamlessly integrated into the XLD/XS Dolly when additional protection is needed during transport. The SP8.4 allows for protection of two columns of four XLD281 loudspeaker systems for a total of (8) XLD281 loudspeaker systems, for protection of two columns of two XS212 loudspeaker systems for a total of (4) XS212 loudspeaker systems, or for protection of combined columns of (4) XLD281 loudspeaker systems and (2) XS212 loudspeaker systems.

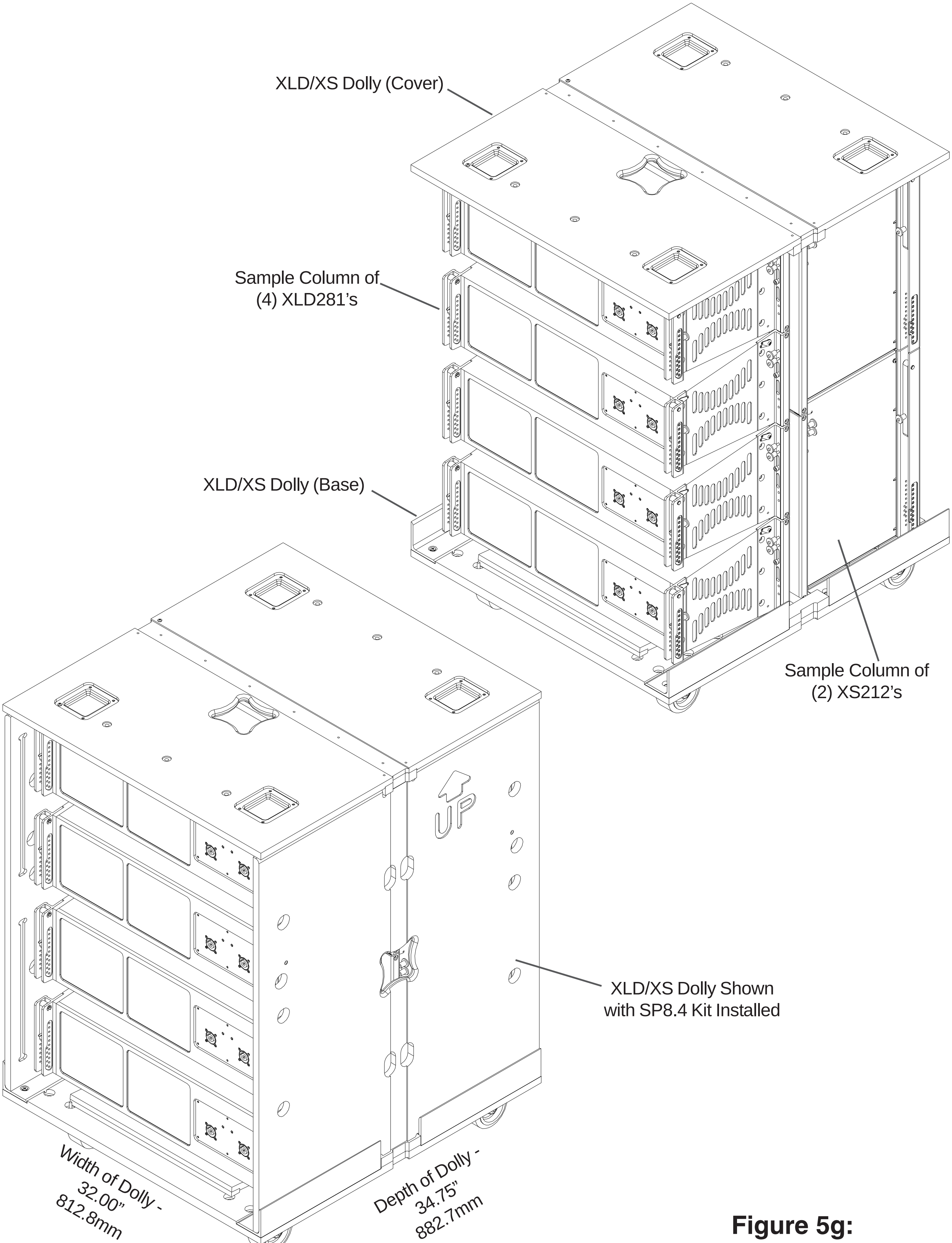


Figure 5g:
XLD/XS Dolly

2. XLVC Rigging and Flying Techniques

2.1 Array Considerations

The XLVC loudspeaker systems have been specifically designed to construct acoustically coherant line-arrays. Line-array systems typically consist of independent columns of loudspeaker enclosures. The most common implementation would be a stereo sound reinforcement system with two columns (left and right). Additional columns of loudspeakers are sometimes added to cover different seating sections of a venue – seating areas that wrap around the side or back of a stage, for example, or for applications with the requirement of a center channel for speech.

The XLVC line arrays will consist of columns of XLD281 or XLE181 120°H x 10°V full-range systems. The exact number of XLVC loudspeaker systems in a column will vary depending on the vertical acoustic coverage required for the specific venue. Furthermore, the relative vertical angles between the boxes will also depend on the venue's acoustic coverage requirements. (Acoustic design techniques are outside the scope of this document and the reader is directed to the XLVC LAPS modeling software available from the Electro-Voice website for acoustic design assistance.) It is also possible to construct subwoofer line arrays using the XS212 systems, or implement subwoofers in the same column as the XLD281 full-range elements. Because the XS212 has side-firing woofers, it is also possible to rig a column of XS212 systems behind columns of XLD281 or XLE181 systems using the coupler beam.

A variety of typical XLVC arrays are shown in Figure 6. Figure 6a shows a column of XLD281 systems with a column of XS212 systems hung behind using two XLD GRID grids and one CBEAM coupler beam. Figure 6b shows a column of XLE181 systems with a column of XS212 systems hung behind using one XLE GRID grid, one XLD GRID and one CBEAM coupler beam. Figure 6c shows a single column with XS212 systems at the top and XLD281 systems at the bottom using one XLD GRID grid. Figure 6d shows a single-column ground stack with XS212 systems at the bottom and XLD281 systems at the top using one XGS-4 ground-stack assembly.

Although the full-range XLVC loudspeaker systems shown in Figure 1 are not completely symmetrical, their acoustical polar responses are substantially symmetrical. Thus, stereo left and right arrays, or left-center-right arrays may be constructed with the loudspeakers in their normal right-side-up orientation as shown in Figure 1.

2.2 Rigging XLVC Enclosures Together

Rigging XLD281 or XLE181 Enclosures Together

An XLD281 enclosure may be rigged to another XLD281 enclosure using the procedure shown in Figure 7a. (XLE181 enclosures may be rigged together in the same exact way.) First remove the quick-release pins from both the front hinge bars and rear swing arms. Extend the front hinge bars up and lock each bar into position by installing one of the front quick-release pins into the holes in the side of the rigging tubes as shown in Step 1.

Lift the XLD281 enclosure underneath an already-suspended XLD281 enclosure and insert both front hinge bars into the rigging tubes of the enclosure above. Lock the extended hinge bars in the above enclosure by installing the remaining quick-release pins into the holes in the rigging tubes at the bottom of the suspended enclosure as shown in Step 2.

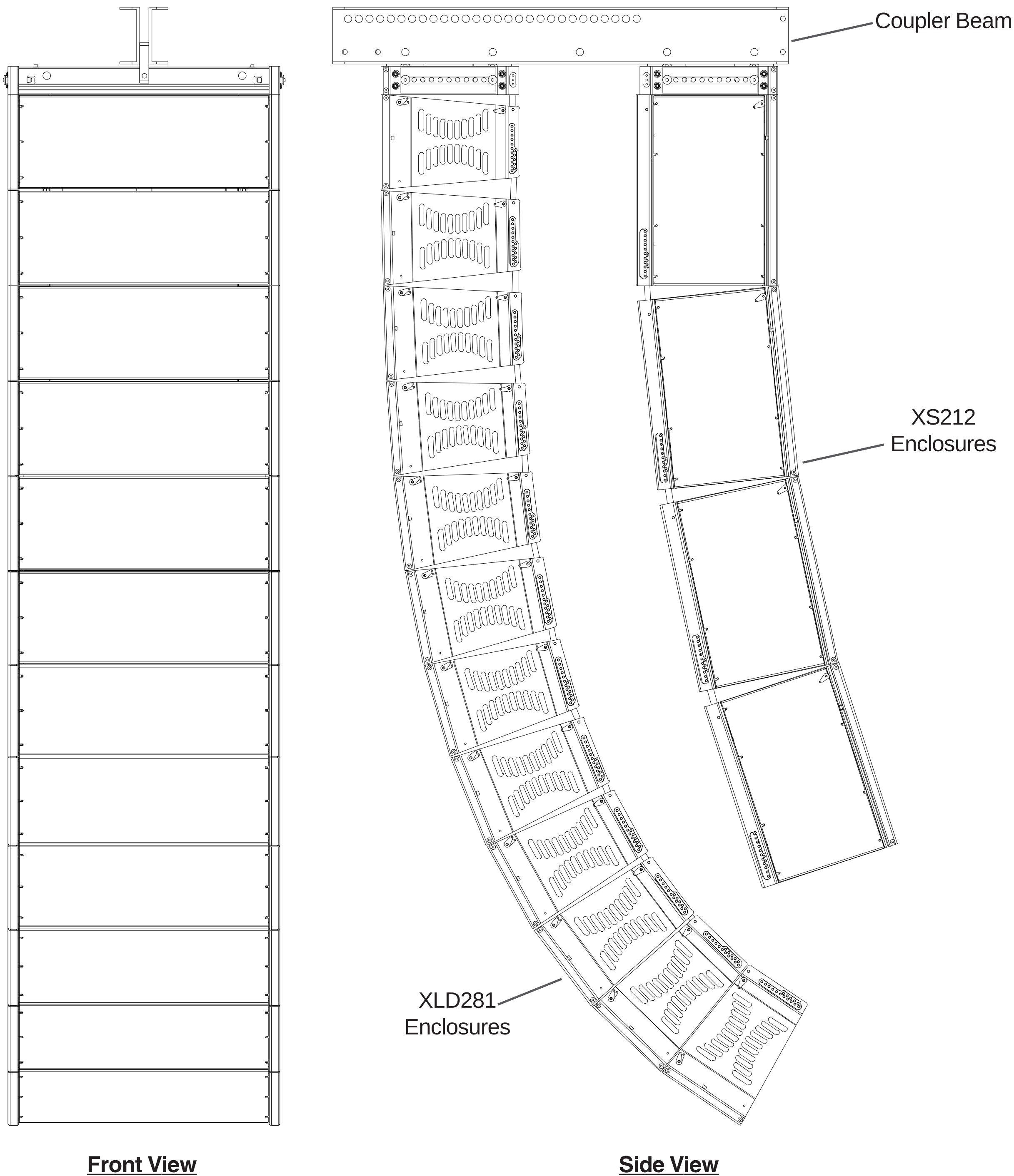


Figure 6a:
Flying an Array of XS212’s behind XLD281’s using the XLVC Coupler Beam (audience only sees XLD281’s)

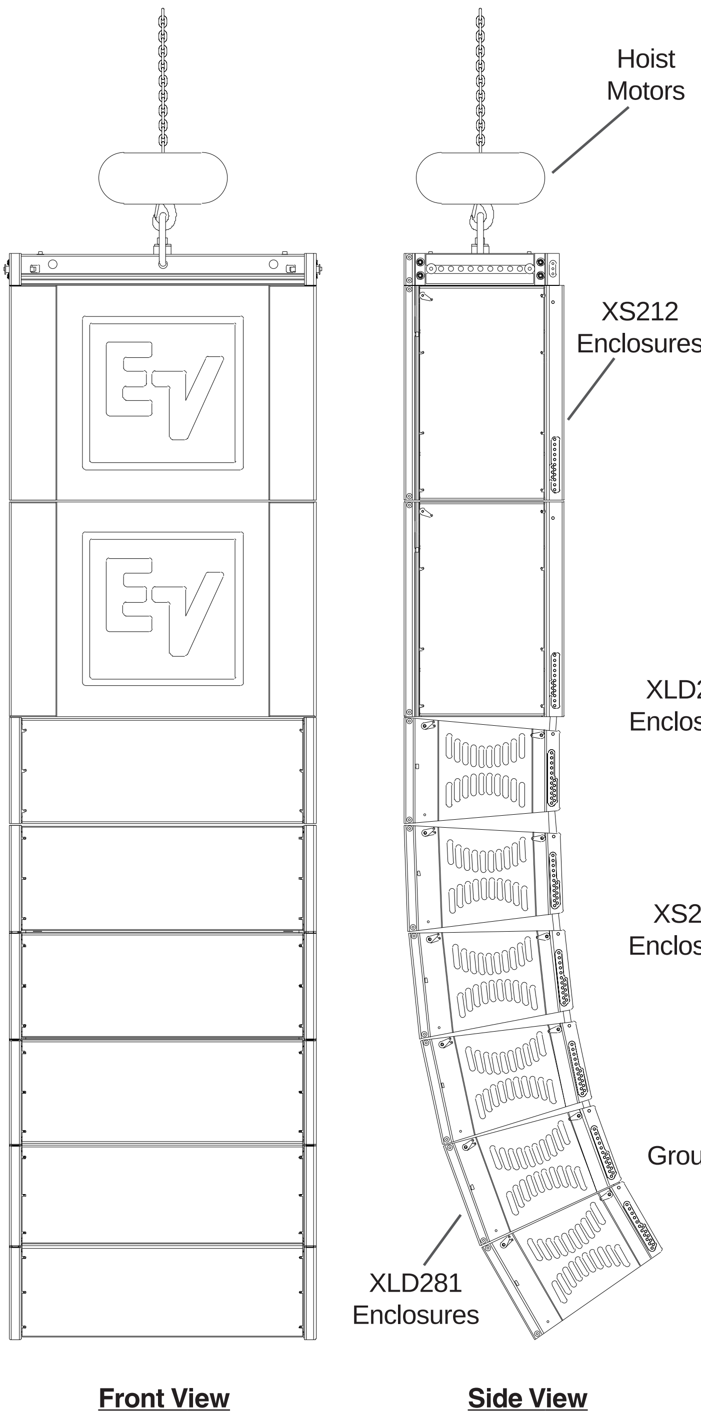


Figure 6b:
Flying an Array of XLD281's under XS212's using Interactive Rigging

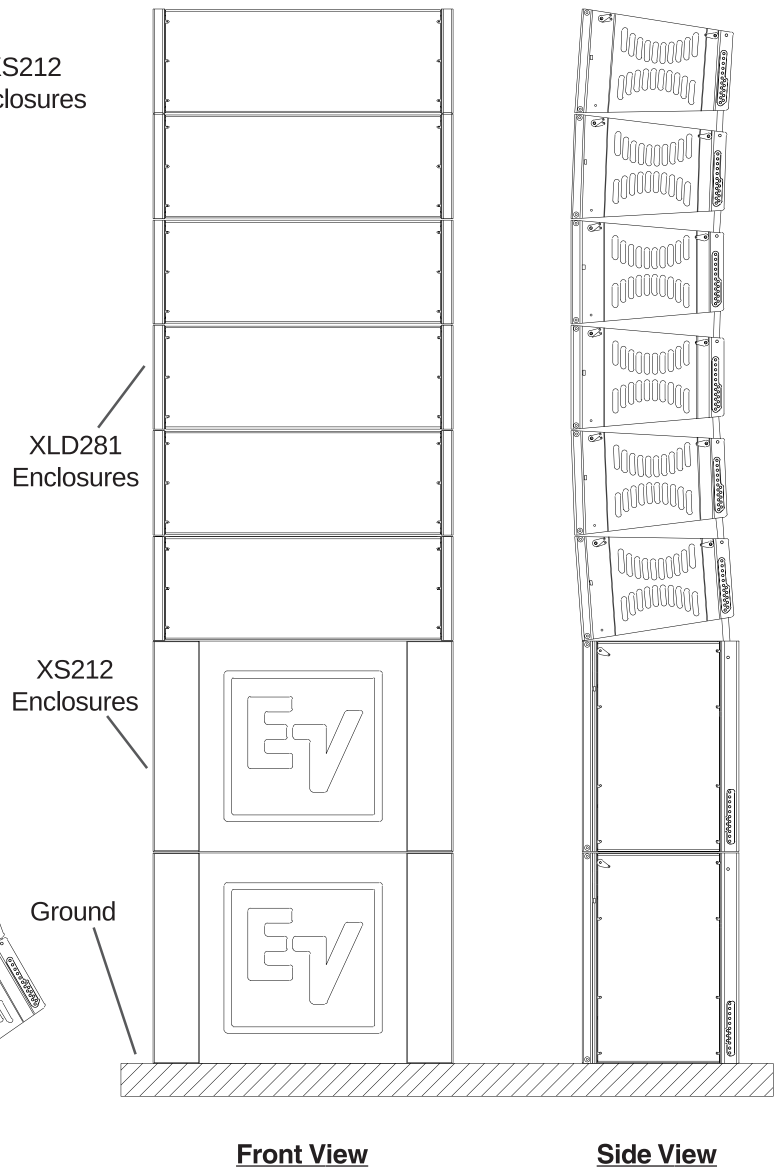


Figure 6c:
Groundstacking XLD281's over XS212's using Interactive Rigging

ALWAYS MAKE SURE THAT TWO QUICK-RELEASE PINS SECURE EVERY HINGE BAR AT THE SIDES OF THE ENCLOSURES AND THAT THOSE PINS ARE FULLY LOCKED IN THE RIGGING TUBES ON ALL ENCLOSURES.

There are a series of holes in the rigging channels on the top enclosure. The angle of the bottom enclosure relative to the top enclosure is determined by the hole in which the swing arm from the bottom enclosure is secured. The available angles are 0° to 10°, adjustable in 1° increments, and are noted on the labels on the rigging channel. In the 0° position, the bottom enclosure is aimed at the same angle as the top enclosure. In the 10° position, the bottom enclosure is aimed 10° down from the top enclosure.

Lift the back of the bottom XLD281 enclosure and hold the enclosure at the desired angle. Rotate the rear swing arms up and insert the arms into the rigging channels of the enclosure above. Install the rear quick-release pins into the rigging channel (in the appropriate hole for the desired angle) and through the hole in the swing arm as shown in Step 3.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS ON ALL ENCLOSURES.

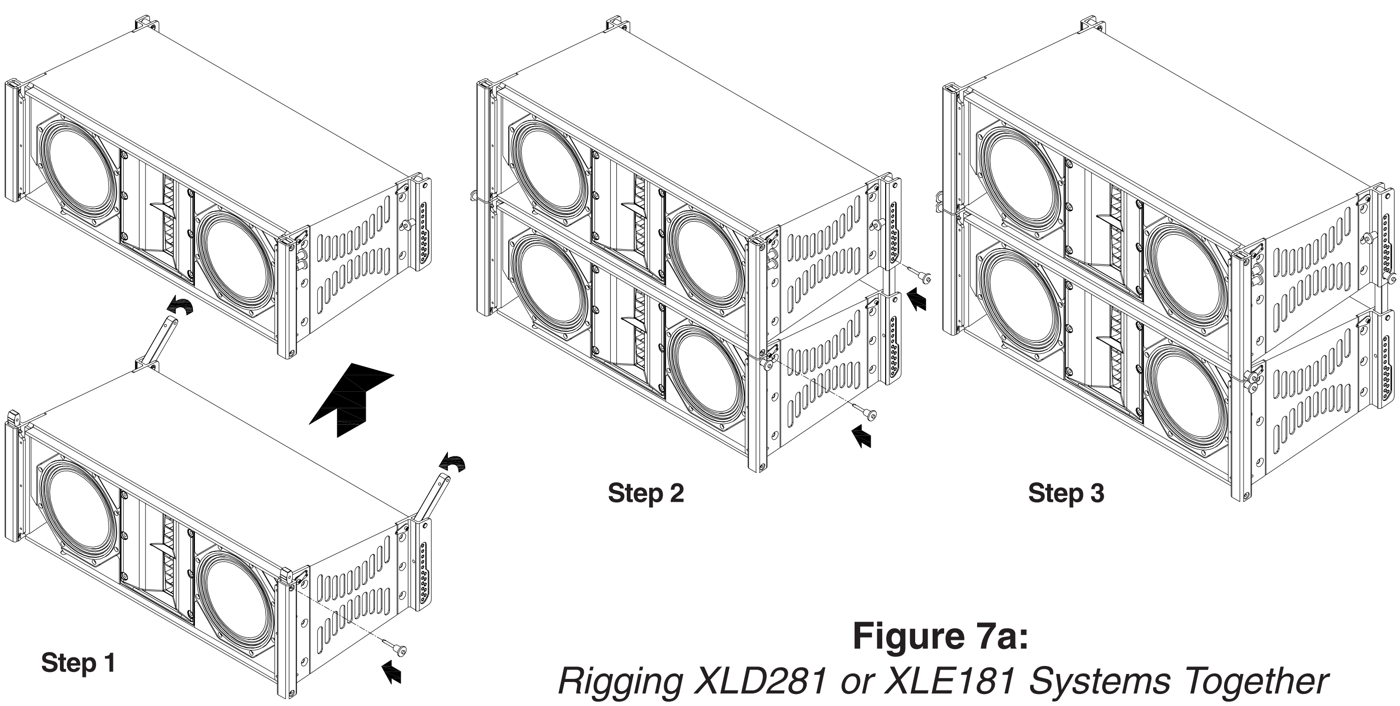


Figure 7a:
Rigging XLD281 or XLE181 Systems Together

Rigging XS212 Enclosures Together

An XS212 enclosure may be rigged to another XS212 enclosure using the procedure shown in Figure 7b. First remove the quick-release pins from both the front hinge bars and rear swing arms. Extend the front hinge bars up and lock each bar into position by installing one of the front quick-release pins into the holes in the side of the rigging tubes as shown in Step 1.

Lift the XS212 enclosure underneath an already-suspended XS212 enclosure and insert both front hinge bars into the rigging tubes of the enclosure above. Lock the extended hinge bars in the above enclosure by installing the remaining quick-release pins into the holes in the rigging tubes at the bottom of the suspended enclosure as shown in Step 2.

ALWAYS MAKE SURE THAT TWO QUICK-RELEASE PINS SECURE EVERY HINGE BAR AT THE SIDES OF THE ENCLOSURES AND THAT THOSE PINS ARE FULLY LOCKED IN THE RIGGING TUBES ON ALL ENCLOSURES.

There are a series of holes in the rigging channels on the top enclosure. The angle of the bottom enclosure relative to the top enclosure is determined by the hole in which the swing arm from the bottom enclosure is secured. The available angles are 0° to 20°, adjustable in 2° increments, and are noted on the labels on the rigging channel. In the 0° position, the bottom enclosure is aimed at the same angle as the top enclosure. In the 20° position, the bottom enclosure is aimed 20° up from the top enclosure.

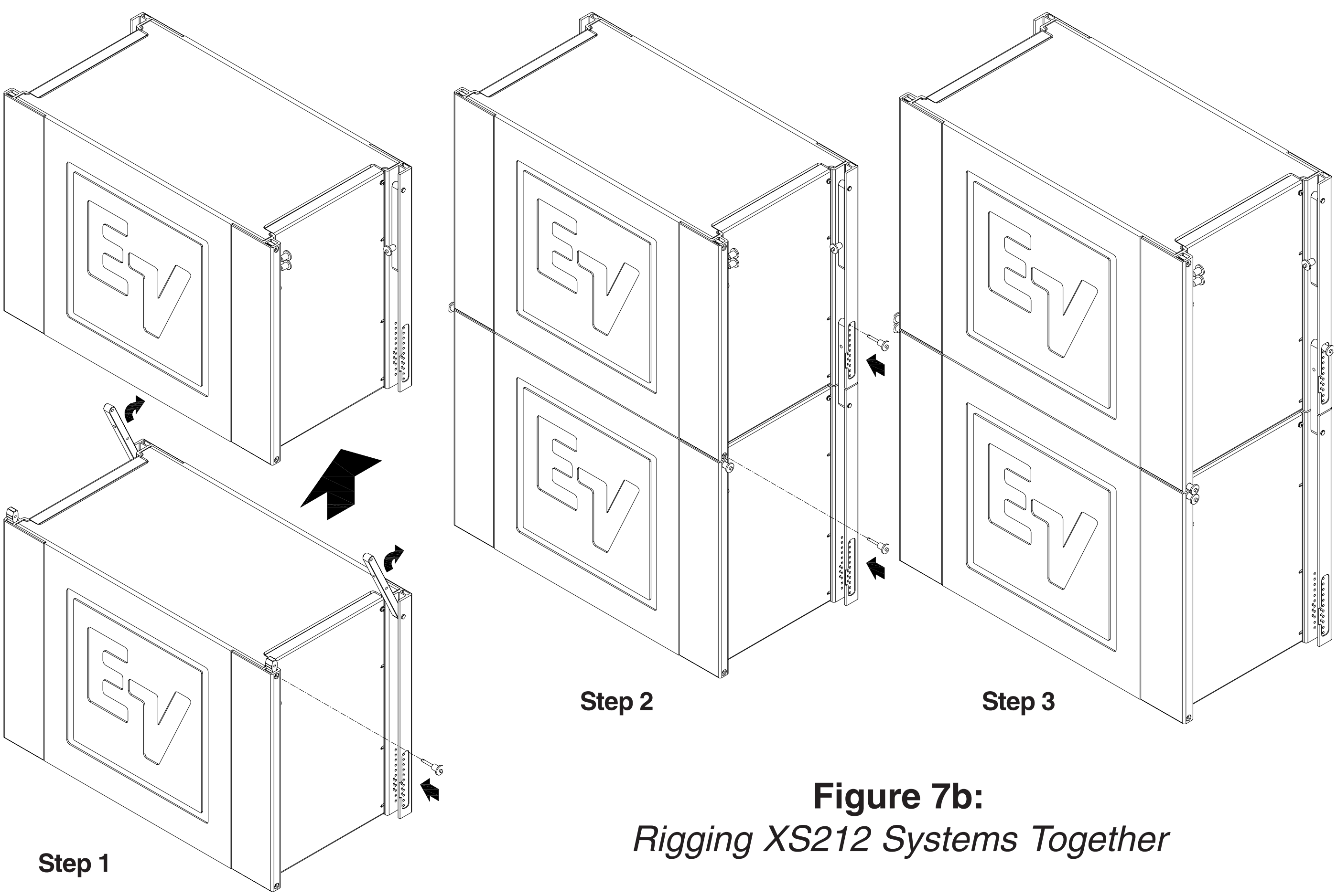


Figure 7b:
Rigging XS212 Systems Together

Hold the back of the bottom XS212 enclosure and adjust the enclosure to the desired angle. Rotate the rear swing arms up and insert the arms into the rigging channels of the enclosure above. Install the rear quick-release pins into the rigging channel (in the appropriate hole for the desired angle) and through the hole in the swing arm as shown in Step 3.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS ON ALL ENCLOSURES.

Because the XLD281 is a trapezoidal enclosure and the rigging hinges from the front, the bottom enclosure is tilted *down* relative to the top enclosure when the rear corners are pulled together. However, because the XS212 is a rectangular enclosure and the rigging hinges from the front, the bottom enclosure is tilted *up* relative to the top enclosure when the rear corners are spread apart. The logic for this becomes apparent when viewing the various array possibilities shown in Figure 6.

Figure 6a shows a column of XS212 systems rigged behind a column of XLD281 systems. In this case, the XS212 systems face backward, allowing the shape of the XS212 array to be adjusted to match that of the XLD281 array. Figure 6b shows a column of XS212 systems rigged above a column of XLD281 systems. In this case, the XS212 systems face forward and would be typically hung at 0°. Figure 6c shows a column of XS212 systems groundstacked underneath a column of XLD281 systems. In this case, the XS212 systems face forward and the ability to angle the XS212 systems up effectively allows the XLD281 systems to be angled downward (which is useful when stacking systems on a stage that is elevated above the audience).

Rigging XS212 and XLD281 Enclosures Together

An XLD281 enclosure may be rigged below an XLD281 enclosure using the procedure shown in Figure 7c. First remove the quick-release pins from both the front hinge bars and rear swing arms of the XLD281. Extend the front hinge bars up and lock each bar into position by installing one of the front quick-release pins into the holes in the side of the rigging tubes as shown in Step 1.

Rotate the rear swing arms of the XLD281 as far forward as they can go, then lift the XLD281 enclosure underneath the XS212 enclosure and insert both front hinge bars into the rigging tubes of the enclosure above. Lock the extended hinge bars in the above enclosure by installing the remaining quick-release pins into the holes in the rigging tubes at the bottom of the suspended enclosure as shown in Step 2.

ALWAYS MAKE SURE THAT TWO QUICK-RELEASE PINS SECURE EVERY HINGE BAR AT THE SIDES OF THE ENCLOSURES AND THAT THOSE PINS ARE FULLY LOCKED IN THE RIGGING TUBES ON ALL ENCLOSURES.

There are a series of holes in the rigging channels on the top enclosure. The angle of the bottom enclosure relative to the top enclosure is determined by the hole in which the swing arm from the bottom enclosure is secured. When suspending an XLD281 below an XS212, the available angles for the XLD281 are 0° to 5°, adjustable in 1° increments, and are noted on the labels on the rigging channel. In the 0° position, the XLD281 enclosure is aimed at the same angle as the XS212 enclosure. In the 5° position, the XLD281 is aimed 5° down from the XS212.

Lower the back of the bottom XLD281 enclosure and hold the enclosure at the desired angle. Rotate the rear swing arms back into the rigging channels of the XS212 enclosure above. Install the rear quick-release pins into the rigging channel (in the appropriate hole for the desired angle) and through the hole in the swing arm as shown in Step 3.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS ON ALL ENCLOSURES.

It is possible to rig an XS212 system underneath an XLD281 system. The procedure would be identical to that described above except that the available range to angle the XS212 relative to the XLD281 above is different. In this case the range is -4° to +4°, adjustable in 2° increments. In the -4° position, the XS212 is aimed 4° down from the XLD281. In the 4° position, the XS212 is aimed 4° up from the XLD281. This configuration is not shown in Figure 7.

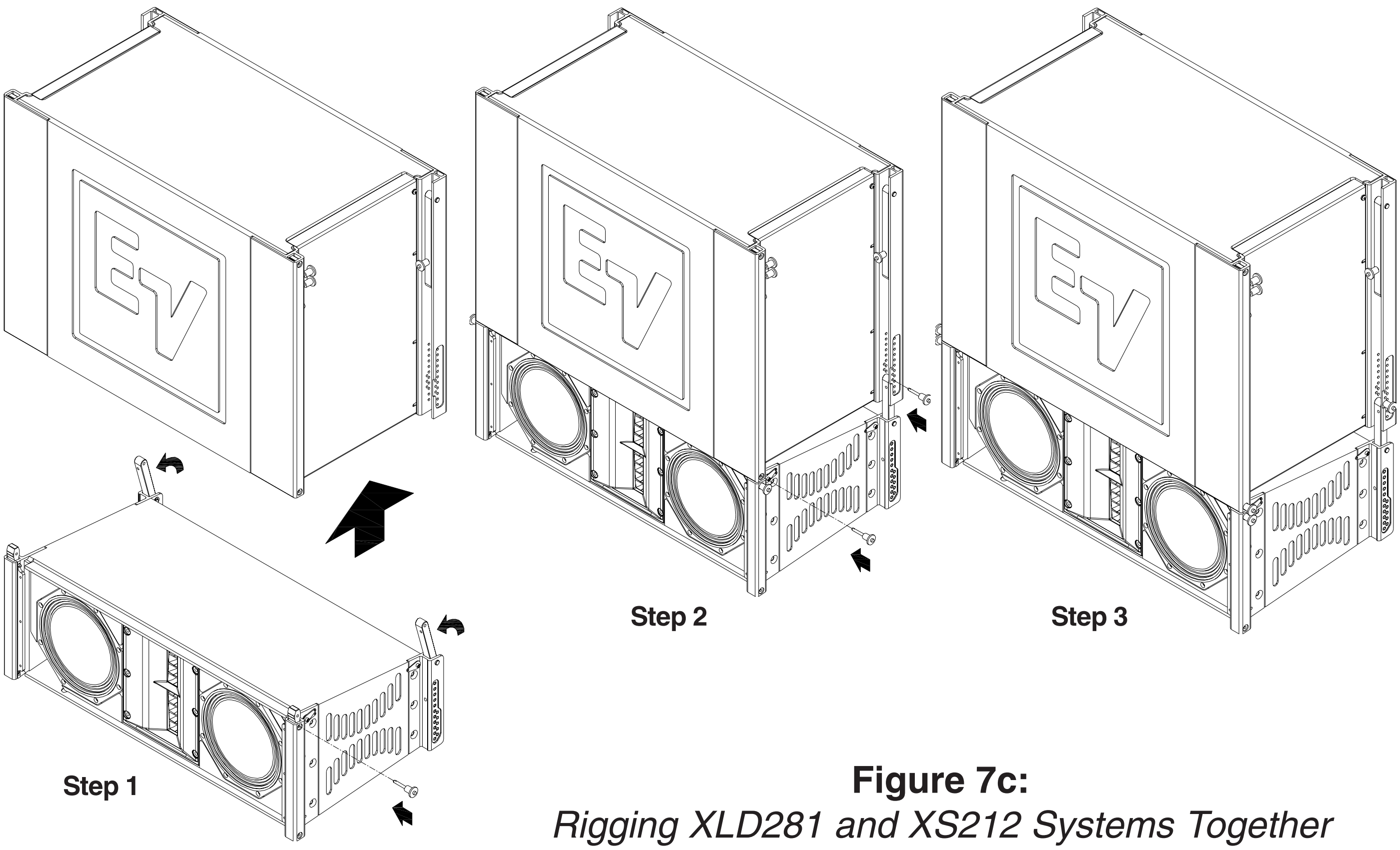


Figure 7c:
Rigging XLD281 and XS212 Systems Together

2.3 Attaching XLVC Loudspeaker Systems to XLVC Grids

Attach the top enclosure in the array to the grid, as shown in Figure 8. (Only an XLVC compatible grid can be used with an XLVC array.) The grid has front rigging tubes similar to the enclosures. Slide the front hinge bar of the top enclosure into the front tube of the grid using the same technique that was used to link two enclosures.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS ON THE HINGE BARS FULLY LOCK INTO THE ROUND HOLES IN THE FRONT RIGGING TUBES ON BOTH THE ENCLOSURE AND THE BOTTOM HOLE OF THE GRID.

The grid also has a rear rigging channel similar to the enclosures, except that the grid only has three attachment holes available. Unlock the rear swing arm from the top enclosure by removing the quick-release pin from the rear rigging channel on the enclosure. Pivot the rear swing arm on the enclosure up into the rear rigging channel on the grid. Insert the quick-release pin from the grid through one of the three holes in the rear rigging channel on the grid (top hole is 0°, middle hole is 2° up, and bottom hole is 4° up) and through the hole in the swing arm. Repeat the process for the other side of the enclosure and grid.

ALWAYS MAKE SURE THAT THE LEFT AND RIGHT SWING ARMS ON THE ENCLOSURE ARE LOCKED INTO THE SAME HOLES FOR THE SAME VERTICAL SPLAY ANGLE ON THE GRID.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS IN THE GRID.

The grid sidearms are the attached to either one or two spreader bars as shown in Figure 8a.

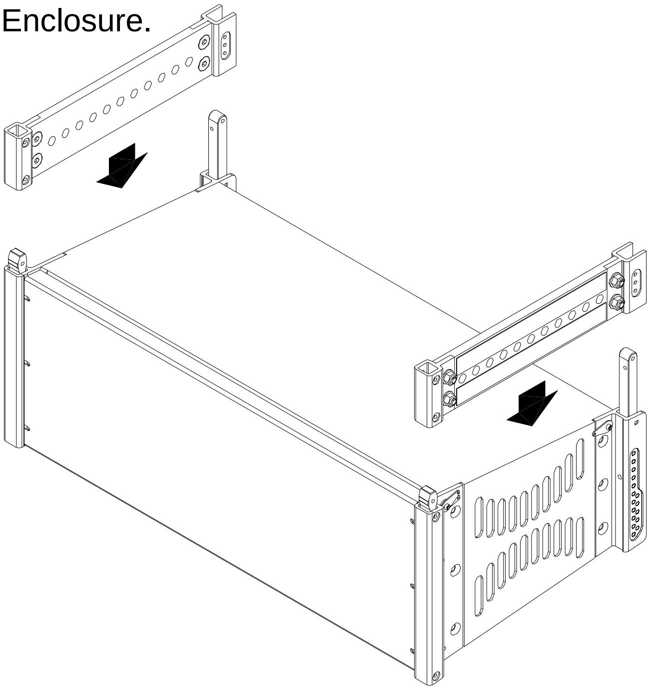
When two spreader bars are used, one is attached to the sidearms at the (one at the front and one at the rear), the spreader bars are attached to the front and rear of the sidearms and two hoist motors are used to lift the array, as shown in Figure 8b. In this case, the hoist motors are used to adjust the vertical angle of the entire column of loudspeakers. When one spreader bar is used, the vertical angle of the entire column of loudspeakers is determined by the front-to-back position at which the spreader bar is attached to the sidearms. There are a series of holes in the sidearms the user may select to adjust the vertical array angle.

When one spreader bar is used, the vertical angle of the entire column of loudspeakers is determined by the front-to-back position at which the spreader bar is attached to the sidearms. There are a series of holes in the sidearms the user may select to adjust the vertical array angle. The grid with a single spreader bar may be picked up using one hoist motor attached to the center hole in the spreader bar, or may be picked up using two hoist motors side-to-side using the two holes at the ends of the spreader bar, as shown in Figure 8b.

Large quick-release pins that are tethered to the spreader bars are used to secure the side arms to the spreader bars.

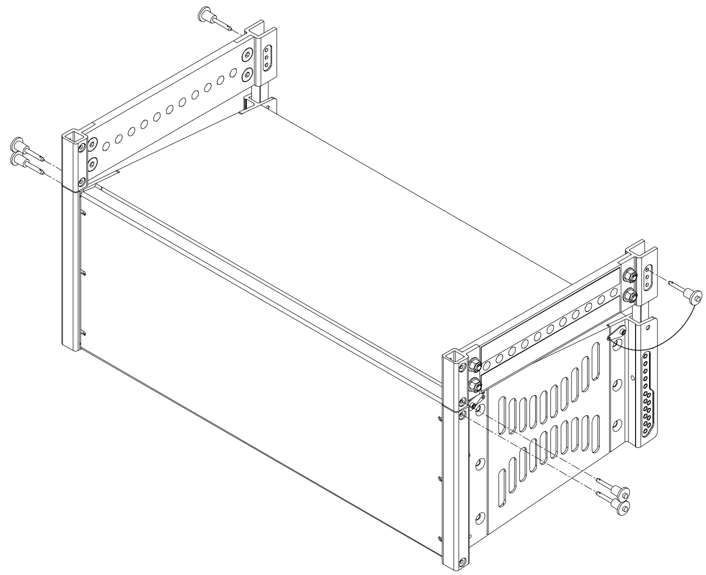
Step 1:

Assemble Sidearms to Rigging at top of the Enclosure.



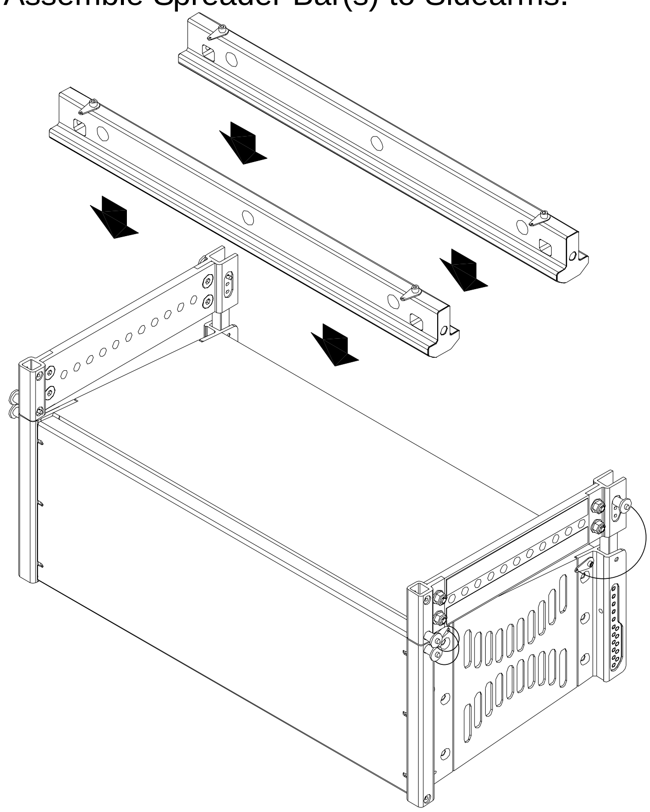
Step 2:

Insert Quick-Release Pins through Enclosure Rigging and Sidearms.



Step 3:

Assemble Spreader Bar(s) to Sidearms.



Step 4:

Insert Quick-Release Pins through Sidearms and Spreader Bar(s) using the hole locations from LAPS.

See next page for fully assembled configurations.

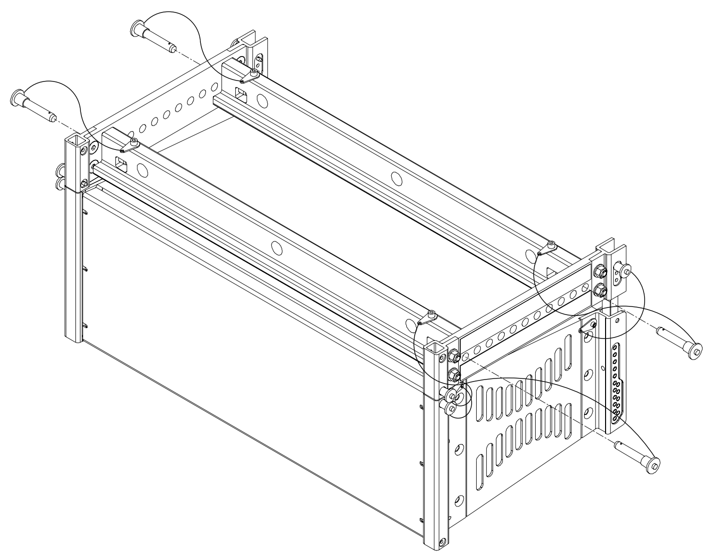


Figure 8a:

XLD GRID and XLE GRID Rigging Assembly

MAKE SURE THAT THE QUICK-RELEASE PINS ATTACHED TO THE GRID SIDEARMS FULLY LOCK INTO THE HOLES IN THE ENDS OF THE SPREADER BARS. ALWAYS MAKE SURE THAT EACH SPREADER BAR IS ATTACHED TO THE SAME HOLE ON THE LEFT AND RIGHT SIDEARMS.

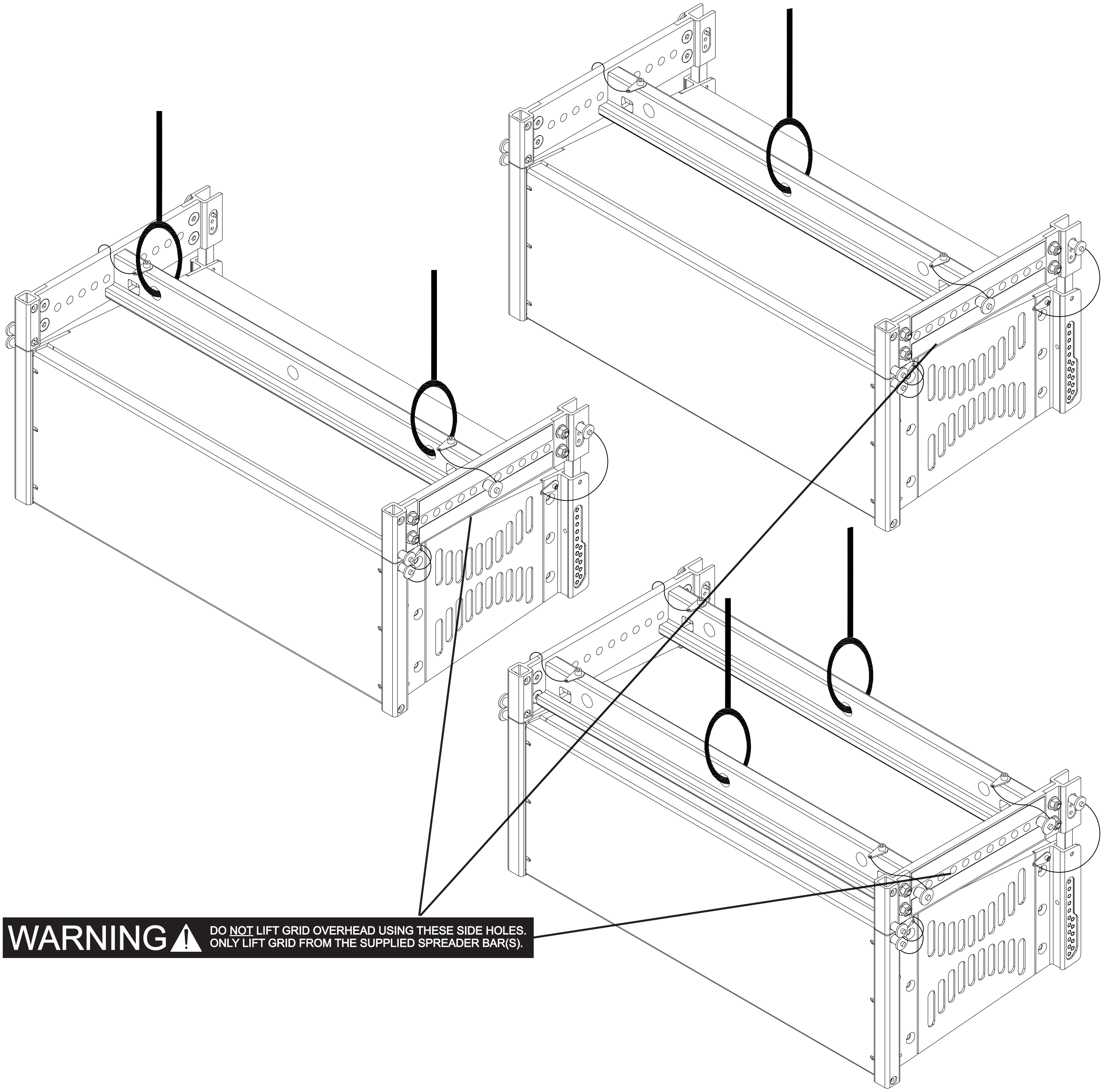


Figure 8b:

XLD GRID and XLE GRID Rigging Configurations

2.4 Attaching XLVC Grids to the CBEAM

The CBEAM, shown in Figure 9a, may be used as either a coupler beam for a dual array to hang a column subwoofer systems behind a column of full-range systems, or may be used as an extender beam to hang a single array of full-range systems where more vertical tilt angle is required than could be achieved from only a grid.

The CBEAM is shown in use as a coupler beam for a dual-array configuration in Figure 9b. Each column of loudspeakers is suspended by an XLVC grid and the two grids are in turn secured to the CBEAM at Grid Position A and Grid Position C. Note that the orientation of the CBEAM will change depending on whether the entire array needs to tilt up or down. If the entire array needs to be tilted down, Hole #1 in the CBEAM must be pointed away from the audience (upstage) and the column of full-range systems (either XLD281 or XLE181) are attached at Grid Position A and the XS212 subwoofers are attached at Grid Position C. If the entire array needs to be tilted up, Hole #1 in the CBEAM must be pointed towards the audience (downstage) and the column of XS212 subwoofers are attached at Grid Position A and the full-range systems (either XLD281 or XLE181) are attached at Grid Position C.

The CBEAM is shown in use as an extender beam for a single-array configuration in Figure 9c. In this case, the column of full-range systems (either XLD281 or XLE181) are always attached at Grid Position B. However, the CBEAM orientation will change depending which way the array needs to be tilted. If the entire array needs to be tilted down, Hole #1 in the CBEAM must be pointed away from the audience (upstage). If the entire array needs to be tilted up, Hole #1 in the CBEAM must be pointed away from the audience (upstage). Because the CBEAM extends beyond the end of the grid, greater tilt angles for the array (either up or down) can be achieved than would be possible with just a grid alone. In fact, for most applications, the CBEAM eliminates the need for a pull back for severe downward angles.

The XLVC grids (either XLD Grid or XLE Grid) must always be attached to the CBEAM using two spreader bars on each grid, as shown in Figure 9a. One spreader bar must be attached to the grid side arms at the last hole at the front and the other at the last hole at the rear. The grid spreader bars are then secured to the CBEAM yoke assemblies.

First select the position on the CBEAM for the grid attachment (Grid Position A, B or C) and install the CBEAM yoke assemblies in those positions. The yoke assemblies are secured to the beam assembly by large clevis pins. To relocate a yoke assembly, remove the cotter pin from the clevis pin and remove the clevis pin from the beam assembly. Move the yoke to the desired hole and reinstall the clevis pin in the beam assembly holes, then secure the clevis pin with the cotter pin.

ALWAYS MAKE SURE THAT THE EACH CLEVIS PIN SECURING EACH YOKE ASSEMBLY TO THE BEAM IS LOCKED IN POSITION BY THE COTTER PIN. DO NOT LIFT ANY ASSEMBLY OVERHEAD WITHOUT A COTTER PIN TO LOCK EACH CLEVIS PIN.

To attach a grid to the CBEAM, remove the quick-release pins from the two yoke assemblies that will support the grid. Position the grid underneath the CBEAM and slide the two yokes over the two spreader bars. Insert the quick-release pins through each yoke and spreader bar. To make sure that the quick-release pins are fully locked into the yoke, always push the pins in all the way in so that spring-loaded balls are visible at the opposite side of the yoke.

ALWAYS MAKE SURE THAT EACH QUICK-RELEASE PIN SECURING EACH GRID SPREADER BAR IS FULLY LOCKED IN EACH YOKE.

As shown in Figure 9d, the CBEAM may be picked up using one pickup point or two pickup points. The two pick up points may be raised and lowered as necessary to adjust the vertical tilt angle. When using two pick up points, the pickup rings are usually installed in Holes #1 and #30 at the extreme ends of the CBEAM for maximum front-to-back stability. However, the pickup rings may be relocated to redistribute the load between the front and back points. In Holes #1 and #30 can only accommodate tilt angles of up to 30° before the rings will contact the spacer bars in the beam assembly. When greater tilt angles are required, the pickup points should be moved towards the center of the CBEAM.

When using one pickup point, the vertical tilt of the array can be adjusted by changing the hole in which the pickup ring is installed in the CBEAM. The LAPS program can be used to determine which hole to use to achieve the desired vertical angle.

Each pickup ring has a centering ring. The centering ring positions the pickup ring in the center of the CBEAM slot so that array will hang straight and not tilt sideways. To relocate the pickup ring, remove the cotter pin from the clevis pin and remove the clevis pin from the beam assembly. Move the pickup ring and centering ring to the desired hole and reinstall the clevis pin in the beam assembly holes, then secure the clevis pin with the cotter pin.

MAKE SURE THAT THE EACH CLEVIS PIN SECURING EACH PICKUP RING TO THE BEAM IS LOCKED IN POSITION BY THE COTTER PIN. DO NOT LIFT ANY ASSEMBLY OVERHEAD WITHOUT A COTTER PIN TO LOCK EACH CLEVIS PIN.

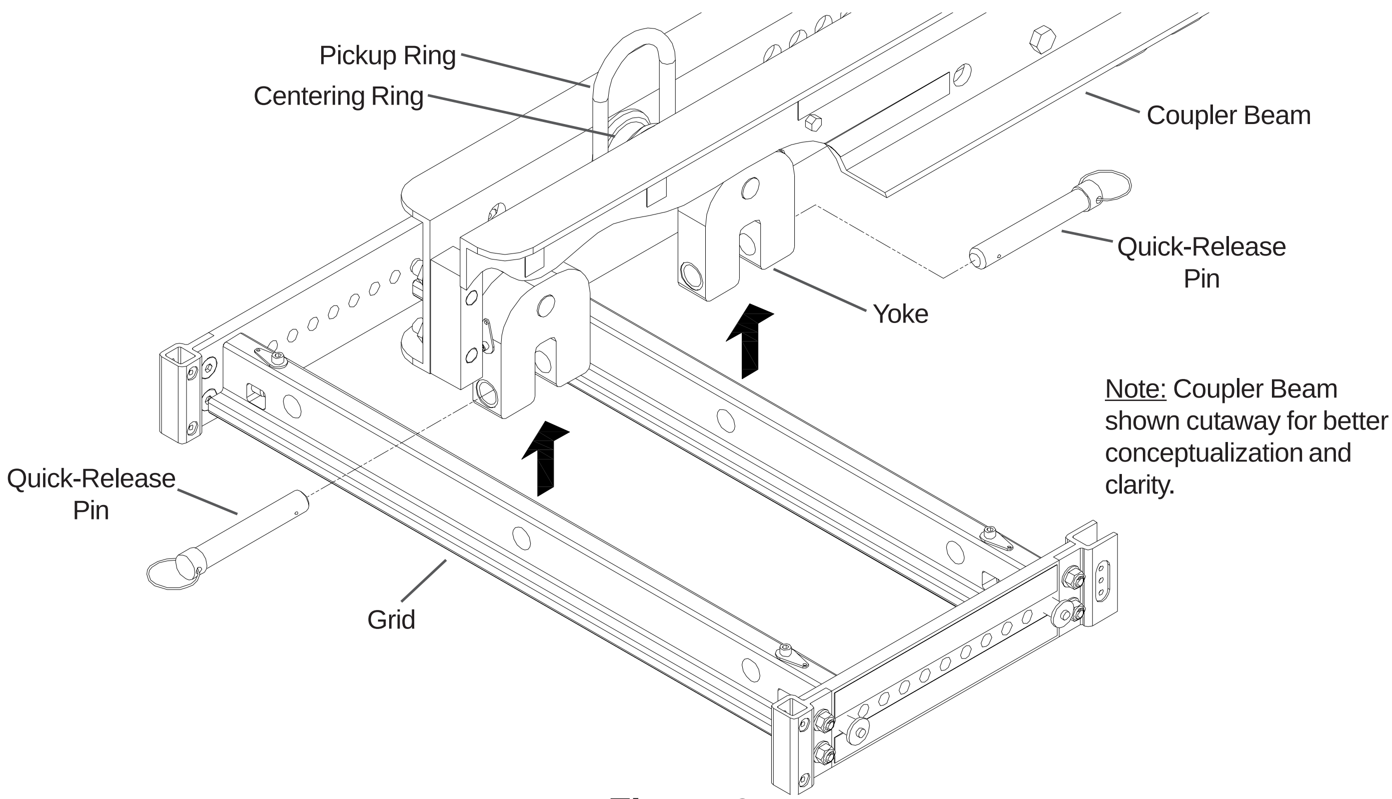


Figure 9a:

CBEAM Rigging Assembly

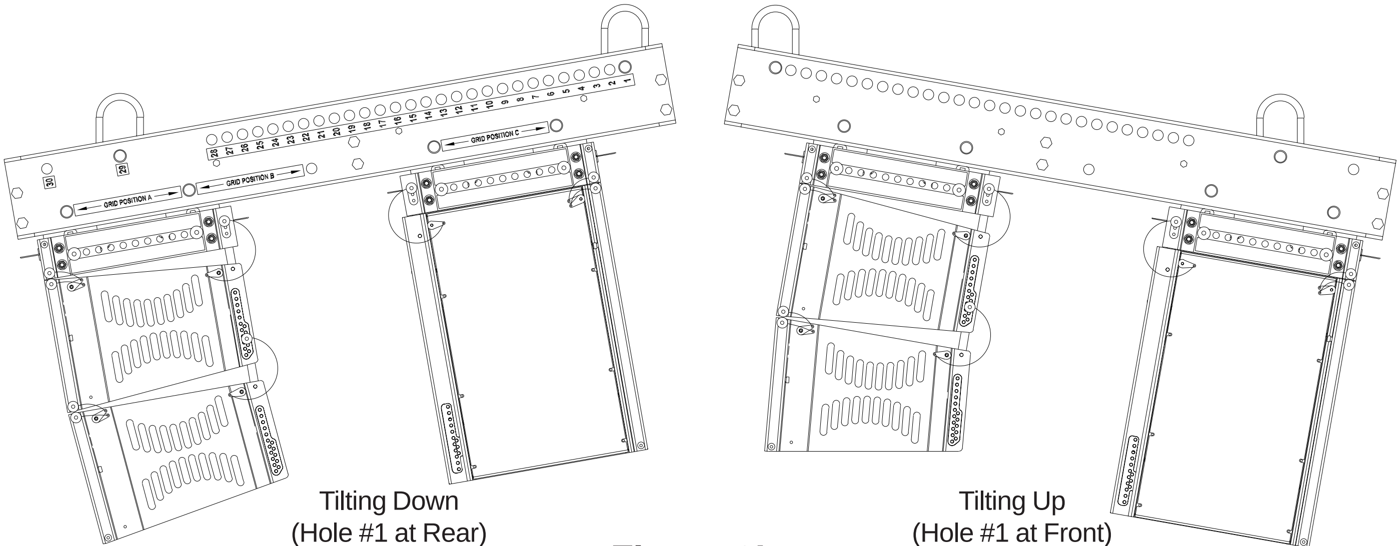


Figure 9b:
CBEAM Dual-Array Configuration Using Grid Positions A and C

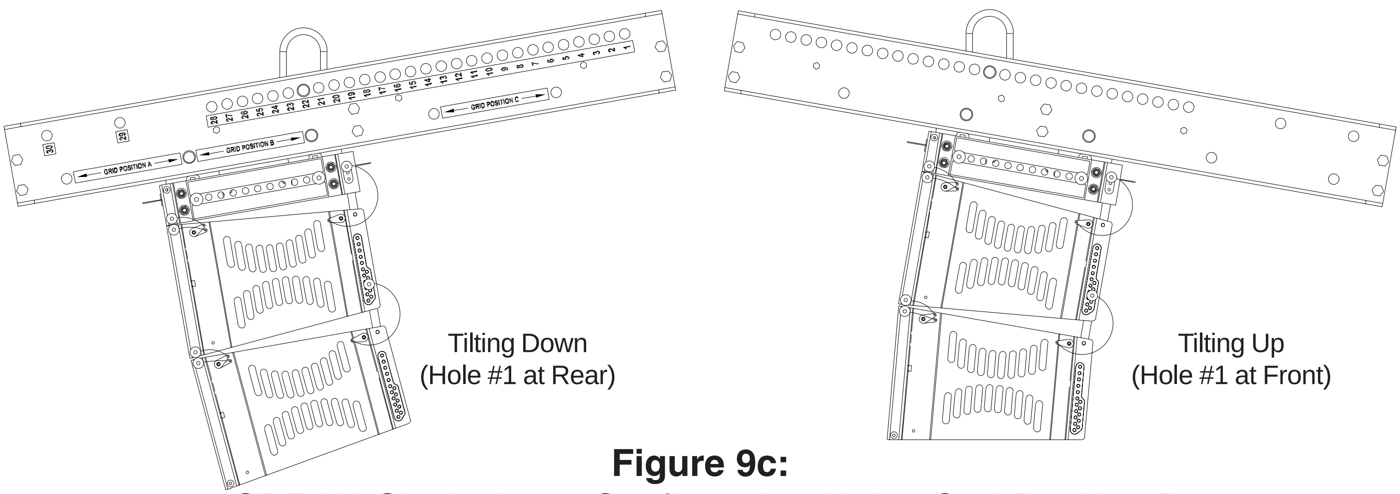


Figure 9c:
CBEAM Single-Array Configuration Using Grid Position B

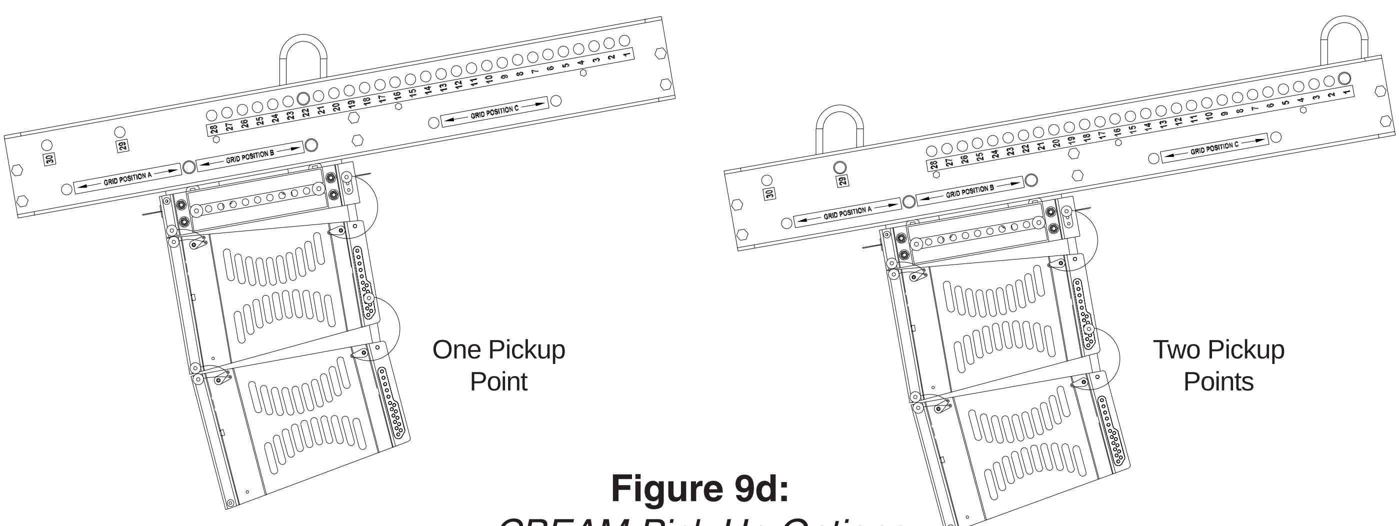
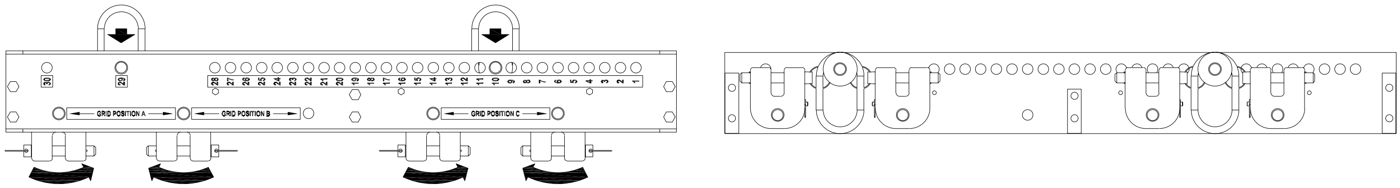


Figure 9d:
CBEAM Pick Up Options



Step 1: Install Pickup Rings in Hole #10 and #29 and Yokes in Positions A and C

Step 2: Rotate Yokes, Then Drop Pickup Rings (View Shown Cutaway for Clarity)

Figure 9e:

CBEAM Shipping/Transport Configuration

2.5 Using the XLVC-BGK and Grid for Pull Up

The XLVC-BGK is a rigging kit with the hardware necessary to install front hinge bars and rear swing arms on the bottom of the XLD281 and XLE181 loudspeaker system enclosures. This makes it possible to attach a grid to the bottom of an enclosure. The bottom grid can be used as a pull back on the bottom of a column to achieve downward tilt angles for the entire array that are greater than could be achieved from just a grid.

The XLVC-BGK consists of two front hinge bars, two rear swing arms, a shoulder bolt for the hinge bars and four sets of quick-release pins with screws to attach the lanyards to the enclosure rigging, as shown in Figure 10a.

Install the rectangular ends of the two hinge bars into the front rigging tubes the XLVC enclosure, as shown in Figure 10a, and secure each in the tubes with a quick-release pin having a green lanyard. Install the large hex-socket-head shoulder bolt through the slot in the rigging tube into the rear of the front hinge bars. The head of this bolt will serve as a handle to move the hinge bars in and out of the tubes. On each side of the enclosure, insert one of the small hex-socket-head bolts through the tab of the lanyard securing the hinge bar and through the tab of another matching quick-release pin having a green lanyard, then screw the bolt into the threaded hole on the side of the enclosure rigging. The extra quick-release pin on each side will be used to secure the hinge bars to the bottom grid. The newly added rigging should match the hinge bar and lanyards at the top of the enclosure. The extra front hinge bars at the bottom can be retracted into the rigging tubes during transport.

Secure the swing arms to rigging channels on each side of the enclosure by inserting a quick-release pin having a yellow lanyard into the 3° hole on the rigging channel, as shown in Figure 10a. The extra quick-release pins having a yellow lanyard will be used to attach the loose end of the swing arms to the bottom grid. There is insufficient room for both sets of swing arms to be retracted into the rear rigging channel during transport. Therefore, the bottom set of swing arms and quick-release pins will need to be removed when the enclosure is transported. Because the extra hardware must be removed, screws are not provided to attach the rear lanyards to the sides of the enclosure rigging.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS ON THE HINGE BARS FULLY LOCK INTO THE ROUND HOLES IN THE FRONT RIGGING TUBES ON BOTH THE ENCLOSURE AND THE GRID.

Position an XLVC grid underneath the XLVC loudspeaker system, as shown in Figure 10a. Insert the loose swing arms on the bottom of the enclosure into the rear rigging channels on the grid and attach the arms to the grid in the top hole with the quick-release pins. Swing the grid up and insert the exposed hinge bars at the bottom front of the enclosure into the front rigging tubes on the grid and secure using the quick-release pins. The standard grid is now attached to the bottom of the enclosure.

ALWAYS MAKE SURE THAT THE LEFT AND RIGHT SWING ARMS ON THE ENCLOSURE ARE LOCKED INTO THE SAME HOLES FOR THE SAME VERTICAL SPLAY ANGLE ON THE GRID.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THEROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS IN THE GRID.

A 5/8-inch shackle can be installed into the center position of the spreader bar on the bottom grid. A ratchet strap can be attached to the shackle to enable adjustment for pull up. The entire array can then be lifted, as shown in Figure 10b, and the vertical tilt angle adjusted as necessary using the ratchet strap.

The XLVC-BGK may also be used with the AGCD adapter grid for groundstacking XLD281 loudspeaker systems on top of XLC loudspeaker systems. See the AGCD section for details.

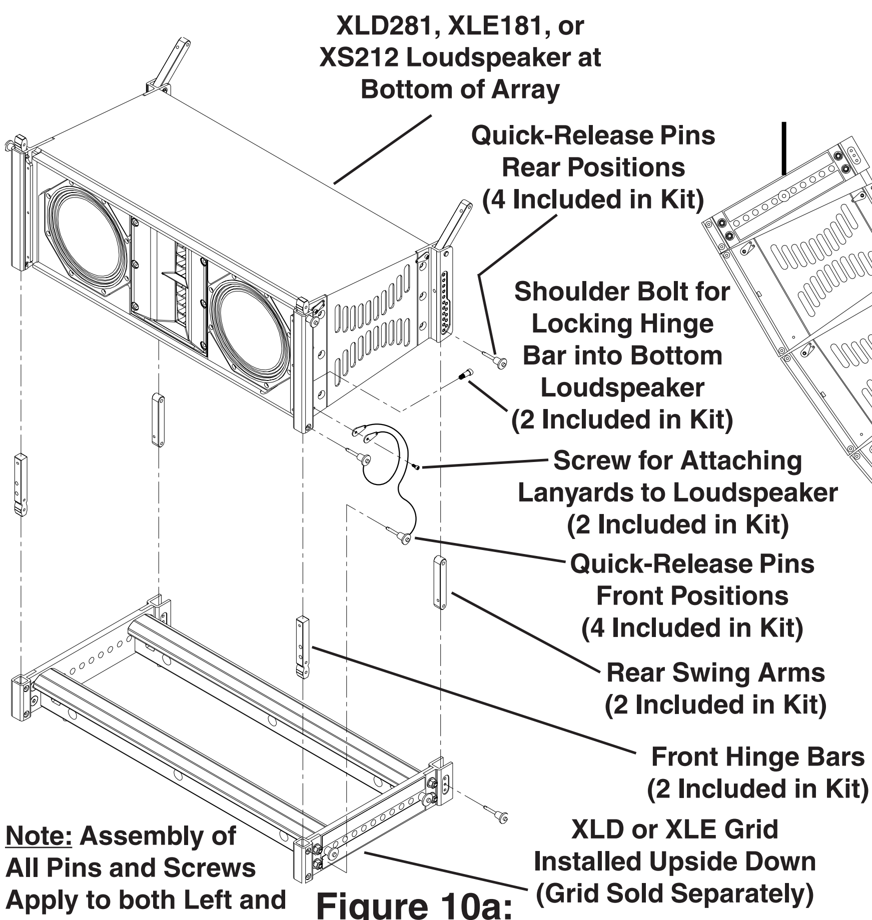


Figure 10a:
Assembling the XLVC-BGK and Secondary Grid at the Bottom of an Array

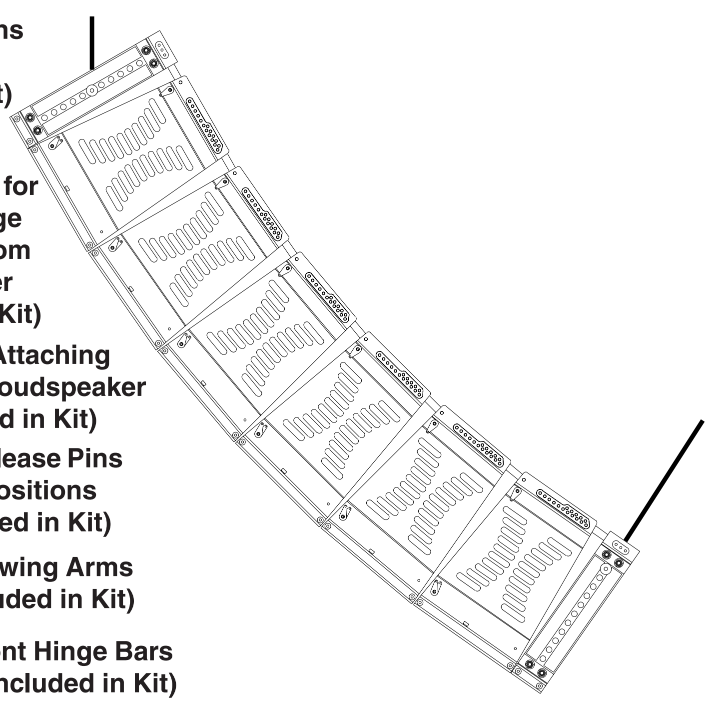


Figure 10b:
XLVC Array with XLVC-BGK and Secondary Grid as a Pull-Up

2.6 Using the AGCD with XLVC and XLC Systems

The AGCD adapter grid may be used to suspend XLD281 loudspeaker systems below XLC loudspeaker systems. Figure 11a shows an XLD281 suspended below an XLC215 subwoofer.

The XLD215 system is suspended using the XLC Grid. Although only one XLC215 loudspeaker system is shown in the figure, multiple XLC loudspeaker systems may be suspended at the top. See the XLC Rigging Manual for instructions on how to suspend the XLC loudspeaker systems.

The AGCD adapter grid includes two front XLC button hinge bars and two XLC rear swing arms that are used to attach the AGCD to the bottom of an XLC enclosure.

First, install the rectangular ends of the two XLC button hinge bars into the front rigging tubes the XLC enclosure, as shown in Figure 11a, and slide in until the buttons lock in the rigging tube holes. Install the large hex-socket-head shoulder bolt through the slot in the rigging tube into the rear of the front hinge bars. The head of this bolt will serve as a handle to move the hinge bars in and out of the tubes. The extra front hinge bars at the bottom can be retracted into the rigging tubes during transport.

Next, install the rear swing arm into the XLC rear rigging channels on the AGCD and lock the arms into position by installing the XLC quick-release pins through the top holes in the rigging channel and through the round hole in the swing arm.

ALWAYS MAKE SURE THAT THE LEFT AND RIGHT SWING ARMS ON THE ENCLOSURE ARE LOCKED INTO THE SAME HOLES FOR THE SAME VERTICAL SPLAY ANGLE ON THE GRID.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS IN THE GRID.

Position the AGCD under the XLC loudspeaker system. Lift the AGCD and, on each side, insert one of the quick-release pins in the 2° hole in the rear channel of the XLC loudspeaker. Swing the adapter grid up and insert the exposed hinge bars at the bottom front of the enclosure into the front rigging tubes on the grid. Slide the button bars in until the button is locked into the hole in the rigging enclosure tube.

ALWAYS MAKE SURE THAT THE SPRING-LOADED BUTTONS ON THE BUTTON BARS FULLY LOCK IN THE ROUND HOLES ON THE ENCLOSURE RIGGING TUBES.

The AGCD has front rigging tubes and rear rigging channels that are identical to that of the XLD Grid. Insert the front hinge bars from an XLD281 enclosure into the rigging tubes on the adapter grid and secure using the quick-release pins on the enclosure. Swing the rear of the enclosure back and insert the XLD281 rear swing arms into the rigging channel on the adapter grid and secure in the top hole on the grid using the quick-release pins on the enclosure.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS ON THE HINGE BARS FULLY LOCK INTO THE HOLES IN THE FRONT RIGGING TUBES ON BOTH THE ENCLOSURE AND THE GRID.

ALWAYS MAKE SURE THAT THE LEFT AND RIGHT SWING ARMS ON THE ENCLOSURE ARE LOCKED INTO THE SAME HOLES FOR THE SAME VERTICAL SPLAY ANGLE ON THE GRID.

ALWAYS MAKE SURE THAT THE QUICK-RELEASE PINS FOR EVERY SWING ARM PASS THROUGH THE HOLE IN THE SWING ARM AND ARE FULLY LOCKED IN THE RIGGING CHANNELS IN THE GRID.

The AGCD adapter grid may also be used to stack an XLD281 enclosure on top of an XLC subwoofer. Figure 11b shows an XLD281 stacked on top of an XLC215 subwoofer.

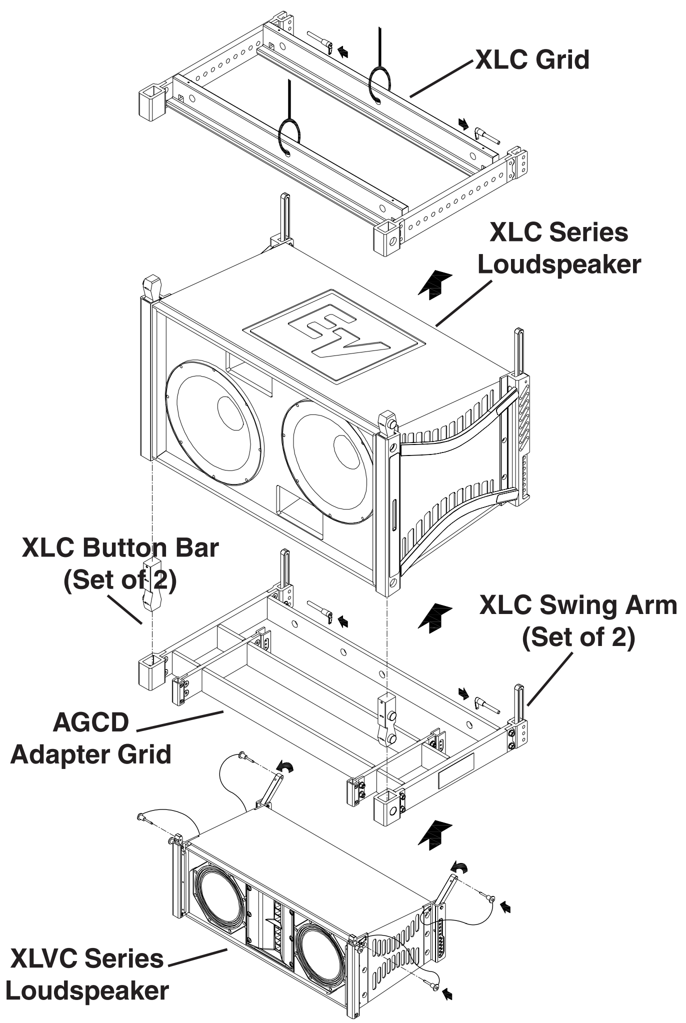


Figure 11a:
Using the AGCD Adapter Grid for Flying Arrays

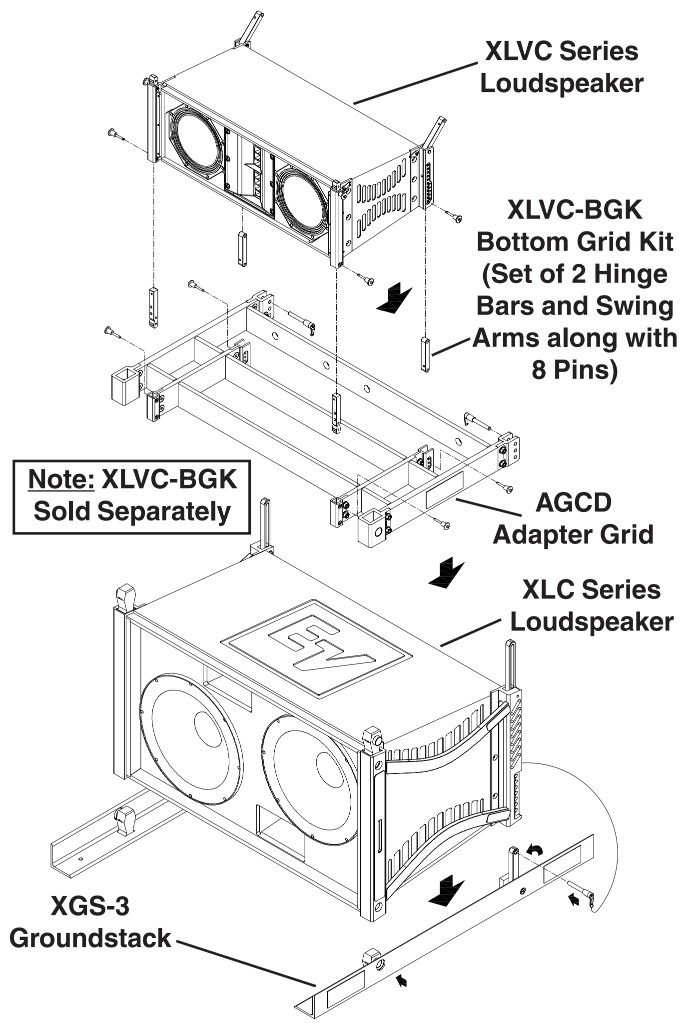


Figure 11b:
Using the AGCD Adapter Grid for Groundstacking Arrays

2.7 Rigging an Array from the XLVC Dollies

The XLD/XS Dolly will accommodate two columns of XLD281 loudspeaker systems stacked up to 6 high, two columns of XS212 loudspeaker systems stacked up to 3 high, or a mixture of the two. Figure 12 shows (6) XLD281 systems and (3) XS212 systems and illustrates the technique for stacking onto the dolly and flying from the dolly.

To stack onto the dolly, simply stack the required systems onto the dolly and attach the grid on top, as shown in Figure 12a.

The best technique for flying from the dolly is illustrated in Figure 12b for a stack of (6) XLD281 systems. First, adjust the angle of the top three boxes while they are still setting on the dolly, as shown in Figure 12b Step 1. Next lift the column of six boxes into the air as shown in Figure 12b Step 2. While the boxes are suspended, adjust the angle of the bottom three boxes, as shown in Figure 12b Step 3. The entire array of XLD281 systems is now ready to lift overhead. Repeat the process in reverse when landing the (6) XLD281 systems on the dolly.

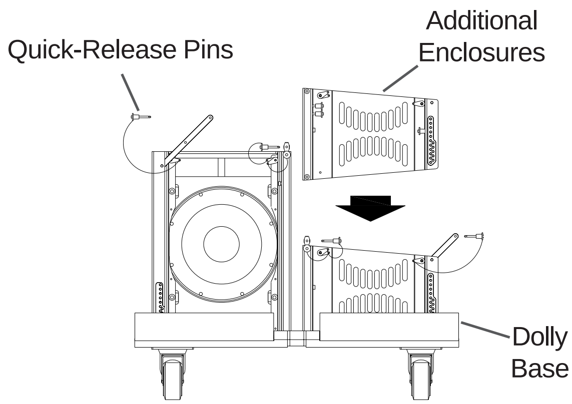


Figure 12a - Step 1:
Stacking Arrays onto the XLD/XS Dolly - Enclosure Attachment

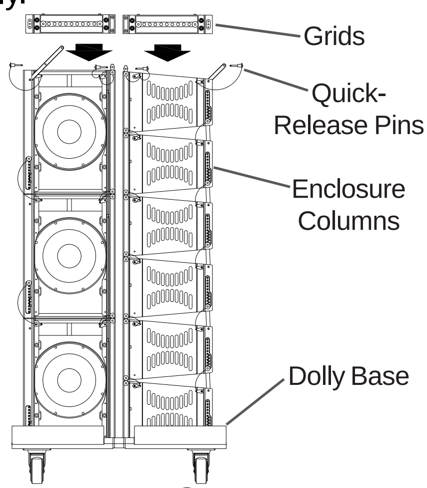


Figure 12a - Step 2:
Stacking Arrays onto the XLD/XS Dolly - Grid Attachment

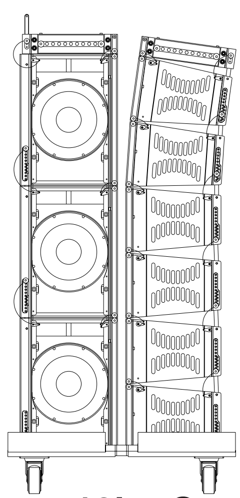


Figure 12b - Step 1:
Flying Arrays using the XLD/XS Dolly - Tilt Top Enclosures

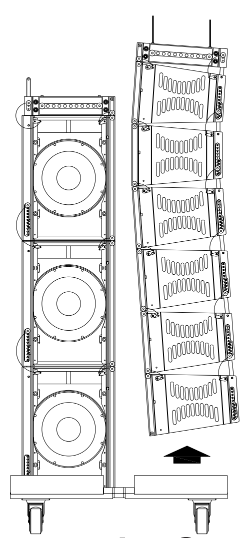


Figure 12b - Step 2:
Flying Arrays using the XLD/XS Dolly - Lift Column of Enclosures

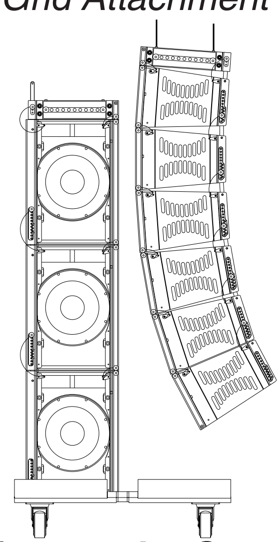


Figure 12b - Step 3:
Flying Arrays using the XLD/XS Dolly - Tilt Bottom Enclosures

3. Rigging-Strength Ratings, Safety Factors, and Special Safety Considerations

3.1 Working-Load Limit and Safety Factor Definitions

The structural ratings for all of the XLVC rigging components and complete loudspeaker systems are based on test results in which parts were stressed to failure. Manufacturers typically present the structural-strength ratings of mechanical components or systems as either the working-load limit (WLL) or the ultimate-break strength. Electro-Voice chooses to present the structural-load ratings of the XLVC loudspeaker systems as the working-load limit. The working-load-limit rating represents the maximum load that should ever be applied to a mechanical component or system.

THE USER SHOULD NEVER APPLY A LOAD THAT EXCEEDS THE WORKING-LOAD LIMITS OF ANY OF THE RIGGING COMPONENTS OR COMPLETE LOUDSPEAKER SYSTEMS DESCRIBED IN THIS MANUAL.

The working-load limits for the XLVC rigging components and complete loudspeaker systems described in this manual are based on a minimum of an 8:1 safety factor. The safety factor is defined as the ratio of the ultimate-break strength divided by the working-load limit, where the ultimate-break strength represents the force at which a part will structurally fail. For example, if a part has working-load limit of 1,000 lb (454 kg), it would not structurally fail until a force of at least 8,000 lb (3,629 kg) was applied, based on a 8:1 safety factor. However, the user should never apply a load to that part that exceeds 1,000 lb (454 kg). The safety factor provides a margin of safety above the working-load limit to accommodate normal dynamic loading and normal wear.

CAUTIONS for Working-Load Limits and Safety Factors

The working-load limits defined by the manufacturer of any rigging component should never be exceeded. Electro-Voice bases the working-load limits of its XLVC products on a minimum of an 8:1 safety factor. Other manufacturers of rigging components may base their working-load limits on safety factors other than 8:1. For example, 5:1 safety factors are fairly common amongst rigging manufacturers because many regulatory agencies call for a minimum safety factor of 5:1.

When an XLVC loudspeaker system is installed where local regulations only require a safety factor of 5:1, Electro-Voice insists that the working-load limits of the XLVC rigging never be exceeded and that an 8:1 safety factor be maintained for the XLVC loudspeakers.

The user is cautioned that some local regulations may require safety factors higher than 8:1. In that circumstance, Electro-Voice insists that the user maintain the higher safety factor as required by the local regulations throughout the entire XLVC installation. It is the responsibility of the user to make sure that any XLVC installation meets any applicable local, state or federal safety regulations.

3.2 Structural Rating Overview

For the XLVC loudspeaker enclosures there are two independent strength ratings that, together, give a complete description of the overall structural capabilities of any loudspeaker system; which are:

1. **The strength of each individual enclosure rigging point;** which is the combined strength of the rigging tube and channel, hinge bars, swing arms, quick-release pins, bolts and enclosure.
2. **The total strength of the overall grid;** which is a function of the combined forces from all of the rigging points acting on the rigging components and the grid as a whole.

For the XLVC grids, there are also two independent strength ratings that, together, give a complete description of the overall structural capabilities of the grid; which are:

1. **The strength of each individual grid rigging point;** which is the combined strength of the rigging tube and channel, hinge bars, swing arms, quick-release pins, bolts, sidearms and spreader bars.
2. **The total strength of the overall grid;** which is a function of the combined forces from all of the rigging points acting on the rigging components and the grid as a whole.

For the CBEAM coupler beam / extender beam, there are also two independent strength ratings that, together, give a complete description of the overall structural capabilities of the beam; which are:

1. **The strength of each individual beam rigging point;** which is the combined strength of the U channels, yokes, quick-release pins, bolts and chain-link rings.
2. **The total strength of the overall beam;** which is a function of the combined forces from all of the rigging points acting on the rigging components and the beam as a whole.

WHEN SUSPENDING ANY XLVC LOUDSPEAKER ARRAY OVERHEAD, THE WORKING-LOAD LIMIT MUST NEVER BE EXCEEDED FOR THE INDIVIDUAL ENCLOSURE RIGGING POINT, FOR THE OVERALL ENCLOSURE, OR FOR ANY OF THE RIGGING ACCESSORIES.

In an XLVC system, the forces acting on each loudspeaker system (on each individual rigging point and on the overall enclosure) and the forces acting on each rigging accessory (grid, coupler beam, extender beam, etc.) will vary with each array configuration. Determining the forces throughout an array requires complex mathematical calculations. Electro-Voice engineers have, however, defined a set of simplified structural-rating guidelines that eliminate the need for the complex calculations for most array configurations. The interaction of the complex forces through-out arrays were analyzed to develop this set of conservative guide-lines, presented below, to enable a rigger to immediately determine on site whether or not an array is safe without having to make weight-distribution calculations. The structural-strength ratings of the individual rigging points and the overall XLVC enclosures are also presented below so that a complex structural analysis can be made for any array configuration. The reader should consult an experienced structural engineer to perform the complex structural analysis.

3.3 Simplified Structural-Rating Guidelines

Electro-Voice engineers have defined a set of simplified structural-rating guidelines that will enable a rigger to immediately evaluate the safety of an XLVC system on site without having to make complex force-distribution calculations. A combination of destructive testing and computer modeling were used to analyze the complex forces throughout arrays. Conservative working-load ratings were utilized to simplify the guidelines. Therefore, array configurations other than those illustrated in these simplified guidelines may be permissible. For those applications, consult section 3.4, Complex Structural-Rating Analysis for a detailed structural analysis.

The simplified structural-rating guidelines for the XLVC loudspeakers are shown in Figure 13. These guidelines provide a simplified rating for typical arrays based on the:

1. Vertical elevation angle of each enclosure.
2. Total weight of that enclosure plus all the enclosures and rigging hung below it.
3. Angled forces on rigging frames, rigging components and enclosures.

The XLD281, XLE181 and XS212 loudspeaker systems each have their own simplified structural rating guidelines. The XLD281 ratings are shown in Figure 13a, the XLE181 in Figure 13b and the XS212 in Figure 13c.

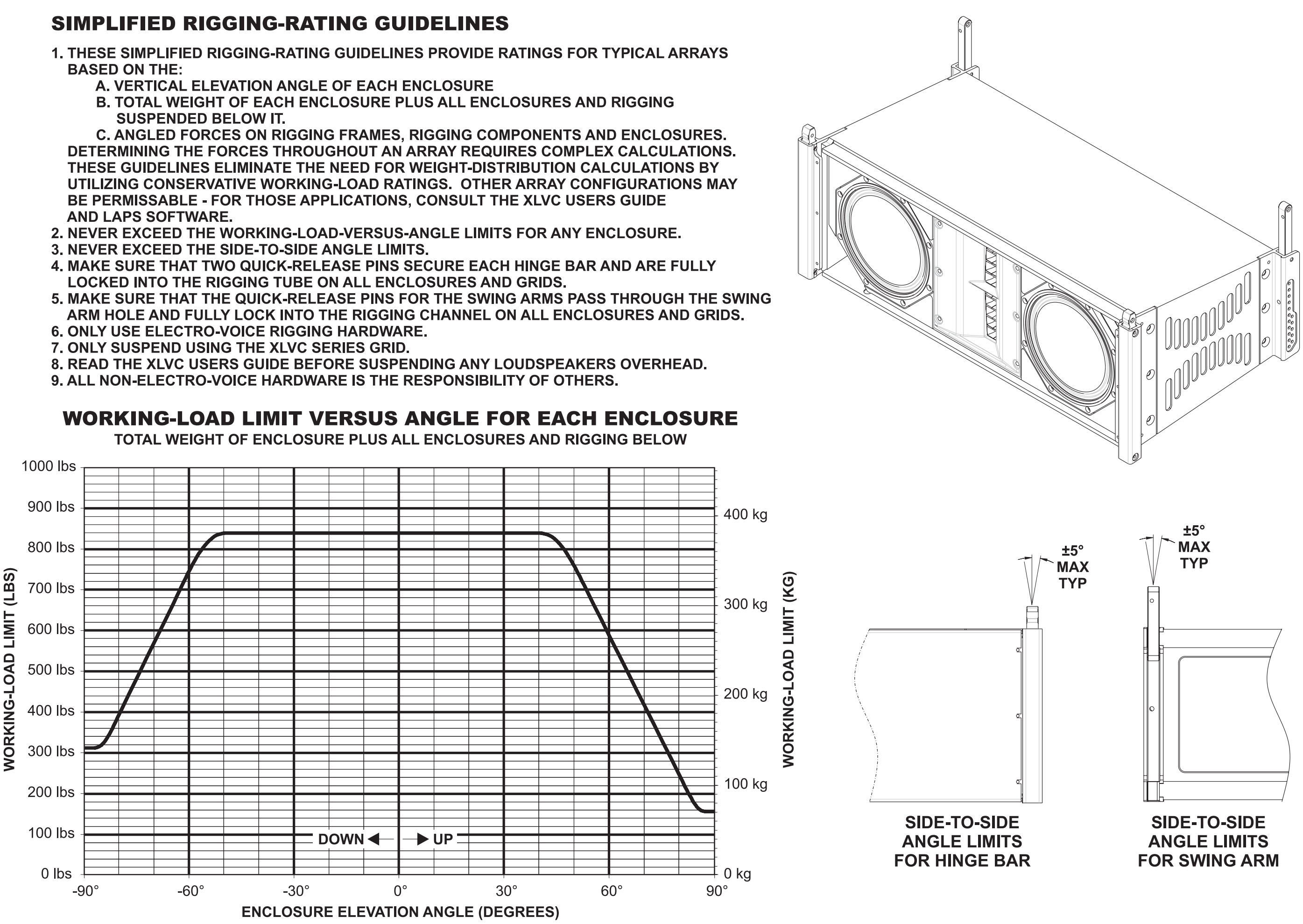
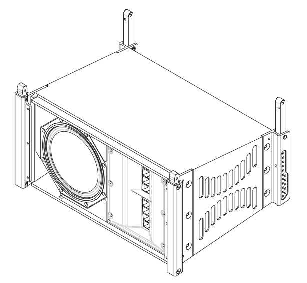


Figure 13a:

XLD281 Simplified Structural Ratings

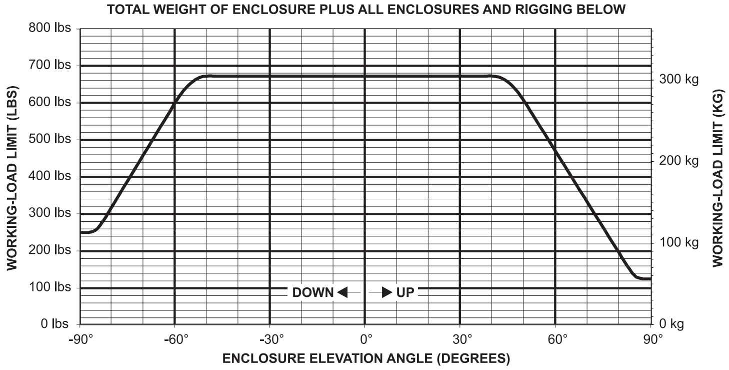
SIMPLIFIED RIGGING-RATING GUIDELINES

1. THESE SIMPLIFIED RIGGING-RATING GUIDELINES PROVIDE RATINGS FOR TYPICAL ARRAYS BASED ON THE:
   A. VERTICAL ELEVATION ANGLE OF EACH ENCLOSURE
   B. TOTAL WEIGHT OF EACH ENCLOSURE PLUS ALL ENCLOSURES AND RIGGING SUSPENDED BELOW IT.
   C. ANGLED FORCES ON RIGGING FRAMES, RIGGING COMPONENTS AND ENCLOSURES.
   DETERMINING THE FORCES THROUGHOUT AN ARRAY REQUIRES COMPLEX CALCULATIONS. THESE GUIDELINES ELIMINATE THE NEED FOR WEIGHT-DISTRIBUTION CALCULATIONS BY UTILIZING CONSERVATIVE WORKING-LOAD RATINGS. OTHER ARRAY CONFIGURATIONS MAY BE PERMISSABLE - FOR THOSE APPLICATIONS, CONSULT THE XLVC USERS GUIDE AND LAPS SOFTWARE.
2. NEVER EXCEED THE WORKING-LOAD-VERSUS-ANGLE LIMITS FOR ANY ENCLOSURE.
3. NEVER EXCEED THE SIDE-TO-SIDE ANGLE LIMITS.
4. MAKE SURE THAT TWO QUICK-RELEASE PINS SECURE EACH HINGE BAR AND ARE FULLY LOCKED INTO THE RIGGING TUBE ON ALL ENCLOSURES AND GRIDS.
5. MAKE SURE THAT THE QUICK-RELEASE PINS FOR THE SWING ARMS PASS THROUGH THE SWING ARM HOLE AND FULLY LOCK INTO THE RIGGING CHANNEL ON ALL ENCLOSURES AND GRIDS.
6. ONLY USE ELECTRO-VOICE RIGGING HARDWARE.
7. ONLY SUSPEND USING THE XLVC SERIES GRID.
8. READ THE XLVC USERS GUIDE BEFORE SUSPENDING ANY LOUDSPEAKERS OVERHEAD.
9. ALL NON-ELECTRO-VOICE HARDWARE IS THE RESPONSIBILITY OF OTHERS.



WORKING-LOAD LIMIT VERSUS ANGLE FOR EACH ENCLOSURE

TOTAL WEIGHT OF ENCLOSURE PLUS ALL ENCLOSURES AND RIGGING BELOW



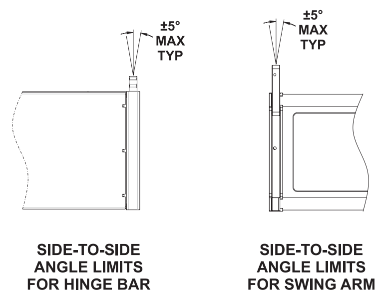
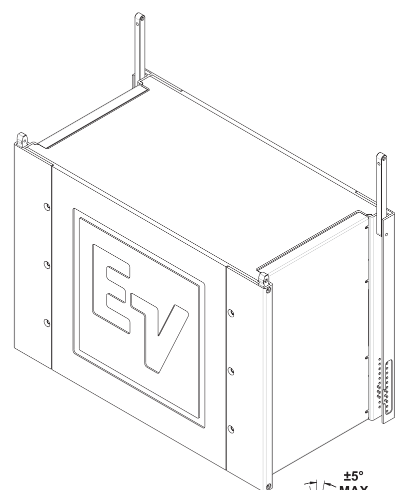


Figure 13b:
XLE181 Simplified Structural Ratings

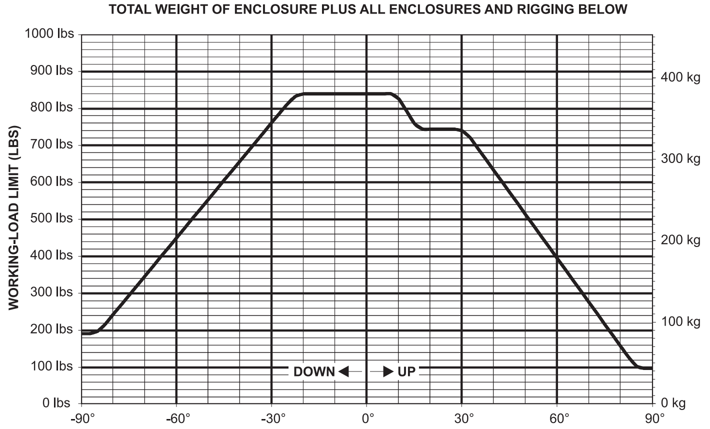
SIMPLIFIED RIGGING-RATING GUIDELINES

1. THESE SIMPLIFIED RIGGING-RATING GUIDELINES PROVIDE RATINGS FOR TYPICAL ARRAYS BASED ON THE:
   A. VERTICAL ELEVATION ANGLE OF EACH ENCLOSURE
   B. TOTAL WEIGHT OF EACH ENCLOSURE PLUS ALL ENCLOSURES AND RIGGING SUSPENDED BELOW IT.
   C. ANGLED FORCES ON RIGGING FRAMES, RIGGING COMPONENTS AND ENCLOSURES.
   DETERMINING THE FORCES THROUGHOUT AN ARRAY REQUIRES COMPLEX CALCULATIONS. THESE GUIDELINES ELIMINATE THE NEED FOR WEIGHT-DISTRIBUTION CALCULATIONS BY UTILIZING CONSERVATIVE WORKING-LOAD RATINGS. OTHER ARRAY CONFIGURATIONS MAY BE PERMISSABLE - FOR THOSE APPLICATIONS, CONSULT THE XLVC USERS GUIDE AND LAPS SOFTWARE.
2. NEVER EXCEED THE WORKING-LOAD-VERSUS-ANGLE LIMITS FOR ANY ENCLOSURE.
3. NEVER EXCEED THE SIDE-TO-SIDE ANGLE LIMITS.
4. MAKE SURE THAT TWO QUICK-RELEASE PINS SECURE EACH HINGE BAR AND ARE FULLY LOCKED INTO THE RIGGING TUBE ON ALL ENCLOSURES AND GRIDS.
5. MAKE SURE THAT THE QUICK-RELEASE PINS FOR THE SWING ARMS PASS THROUGH THE SWING ARM HOLE AND FULLY LOCK INTO THE RIGGING CHANNEL ON ALL ENCLOSURES AND GRIDS.
6. ONLY USE ELECTRO-VOICE RIGGING HARDWARE.
7. ONLY SUSPEND USING THE XLVC SERIES GRID.
8. READ THE XLVC USERS GUIDE BEFORE SUSPENDING ANY LOUDSPEAKERS OVERHEAD.
9. ALL NON-ELECTRO-VOICE HARDWARE IS THE RESPONSIBILITY OF OTHERS.



WORKING-LOAD LIMIT VERSUS ANGLE FOR EACH ENCLOSURE

TOTAL WEIGHT OF ENCLOSURE PLUS ALL ENCLOSURES AND RIGGING BELOW



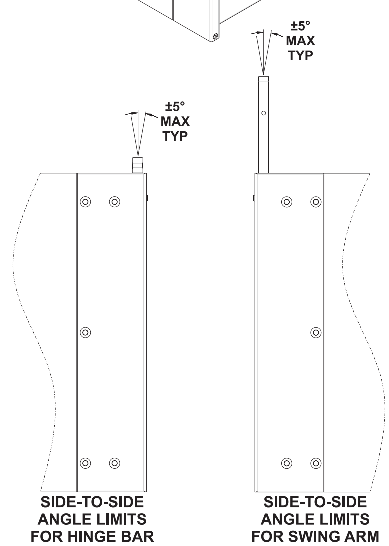


Figure 13c:
XS212 Simplified Structural Ratings

Each Figure 13 includes a graph of the working-load weight-versus-angle limit rating for the XLVC enclosures. This working-load weight limit is applicable to every enclosure in an array, and includes the weight of that enclosure plus the total weight of all enclosures, rigging hardware and cabling suspended below it. The enclosure elevation angle is the vertical angle of that enclosure, where 0° represents an upright enclosure facing straight ahead (0° elevation angle). These working-Ioad-versus-angle limits take into account the complex forces generated in the front hinge bars, the rear swing arms, the quick-release pins, the rigging tubes and channels, the enclosures and the (optional) pull-up line, as a result of the complex weight distribution throughout the array.

Also included in the simplified structural-rating guidelines in each Figure 13 are side-to-side and front-to-back angle limits for the front hinge bars and rear swing arms on the top enclosure.

WHEN APPLYING THE SIMPLIFIED STRUCTURAL RATING GUIDELINES TO ANY XLVC LOUDSPEAKER SYSTEM SUSPENDED OVERHEAD, THE USER MUST OBEY THE FOLLOWING RULES:

1. Never exceed the working-load-versus-angle limit for any loudspeaker enclosure in the array.
2. Never exceed the side-to-side angle limits for the front hinge bar on any loudspeaker enclosure in the array.
3. Never exceed the side-to-side angle limits for the rear swing arm bar on any loudspeaker enclosure in the array.
4. Always make sure that two quick-release pins secure every hinge bar at the side of the enclosures and grids and that those pins are fully locked in the rigging tubes on all enclosures and grids.
5. Always make sure that the quick-release pins for every swing arm pass through the hole in the swing arm and are fully locked in the rigging channels on all enclosures and grids.
6. If a pull-up grid is used at the bottom of the array, never exceed the side-to-side angle limits for the pull-up grid.

Discussion of Array Examples: For example, if the top XLD281 enclosure in a column was angled down 55°, the enclosure working-Ioad-versus-angle limit from the simplified structural-rating guidelines shown in Figure 13a would indicate that a total of **840 pounds (381 kg)** could be safely suspended. This would include the weight of the top enclosure plus all of the enclosures and rigging suspended below.

If, however, the top XLD281 enclosure in a column was angled up 55°, the total allowable weight would then only be **741 lb (336 kg)** - including the weight of the top enclosure plus all of the enclosures and rigging suspended below. The enclosure working-load-versus-angle limit shown in Figure 13 not only applies to the top enclosure in an array column, but also applies to every enclosure in an array column. In arrays where a pull-up grid is not used, the top enclosure is always the limiting factor because it supports the most weight. However, in arrays where a pull-up grid is used to achieve substantial downward angles, it is possible that a lower enclosure could be the limiting factor.

3.4 Complex Structural-Rating Analysis

For a complete structural-rating analysis, the forces in each individual piece of attachment hardware throughout the XLVC system must be determined, as well as the forces on each enclosure. Determining these forces requires complex mathematical calculations. All of these forces must then be compared to the working-load limits detailed below for each of the rigging points and the overall enclosures.

The reader should consult an experienced structural engineer to perform the complex structural analysis.

WHEN SUSPENDING ANY XLVC LOUDSPEAKER SYSTEM OVERHEAD, THE WORKING-LOAD LIMITS MUST NEVER BE EXCEEDED FOR EACH INDIVIDUAL RIGGING POINT, AND THE OVERALL ENCLOSURE.

3.5 XLD281, XLE181 and XS212 Complex Structural-Strength Ratings

There are two independent strength ratings that, together, give a complete description of the overall structural capabilities of the XLVC loudspeaker system - the working-load limits of the individual rigging points (the two hinge-bar assemblies and the two swing-arm assemblies) and the working-load limit for the overall enclosure assembly. The XLD281, XLE181 and XS212 each have unique working-load-limit ratings for the individual rigging points and the overall enclosure, and are shown in Figure 14a for the XLD281, Figure 14b for the XLE181 and Figure 14c for the XS212.

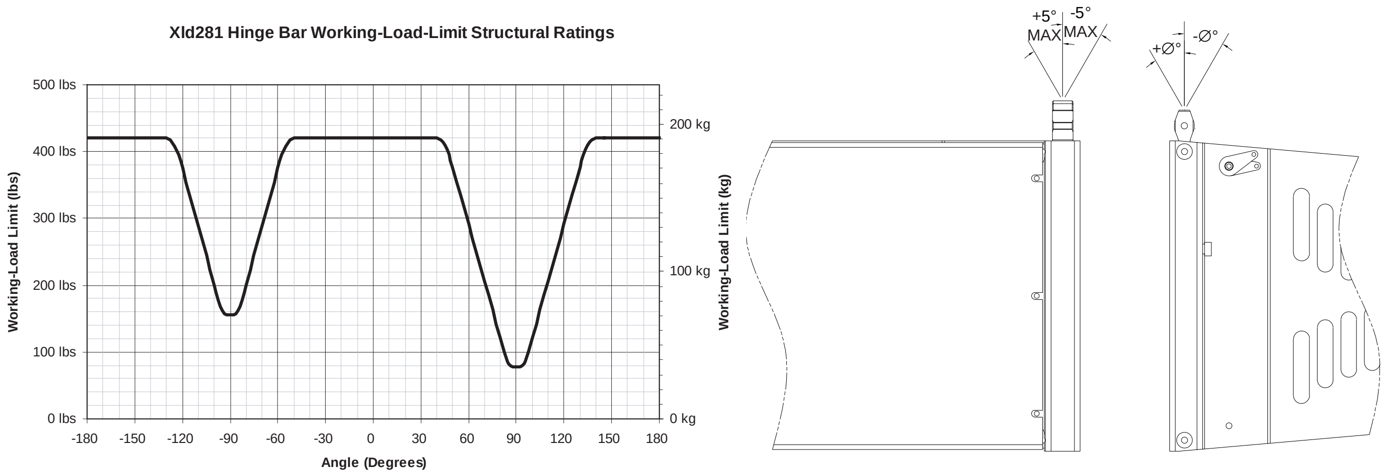
XLD281, XLE181 and XS212 Hinge-Bar Structural-Strength Ratings

The working-load limit of each of the hinge-bar rigging points on the XLVC enclosures is dependent on the hinge bar, the rigging tube, the quick-release pins, the enclosure and the angle of pull. Each enclosure has two hinge-bar rigging points - left and right. The structural ratings shown in Figure 14 are for a single rigging attachment point. That is to say, the left and right front hinge-bar rigging points each have the rating shown in the figure.

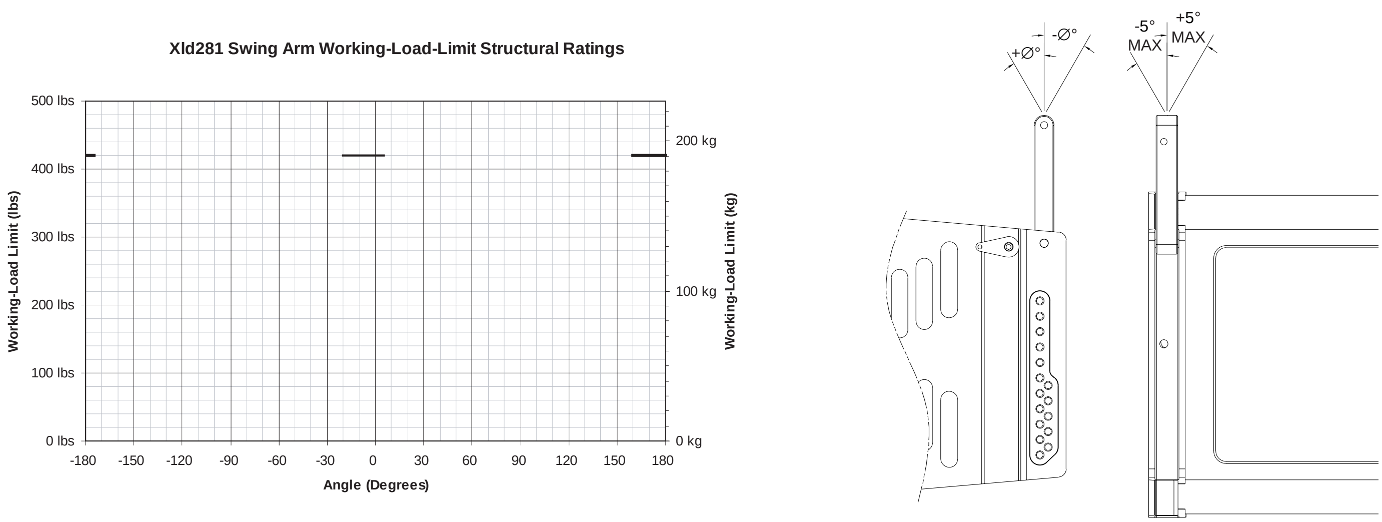
The front-to-back structural-strength ratings for the front rigging points cover a full 360° of rotation. Although it is not possible to put the front hinge bars into tension over 360°, it is possible for the hinge bars to go into compression with some array configurations. Therefore, the 360° rating is necessary to accommodate both tension and compression. It should also be noted from Figure 14 that the front hinge bars are only rated for side-to-side pull angles of a maximum of ±5°.

XLD281, XLE181 and XS212 Swing-Arm Structural-Strength Ratings

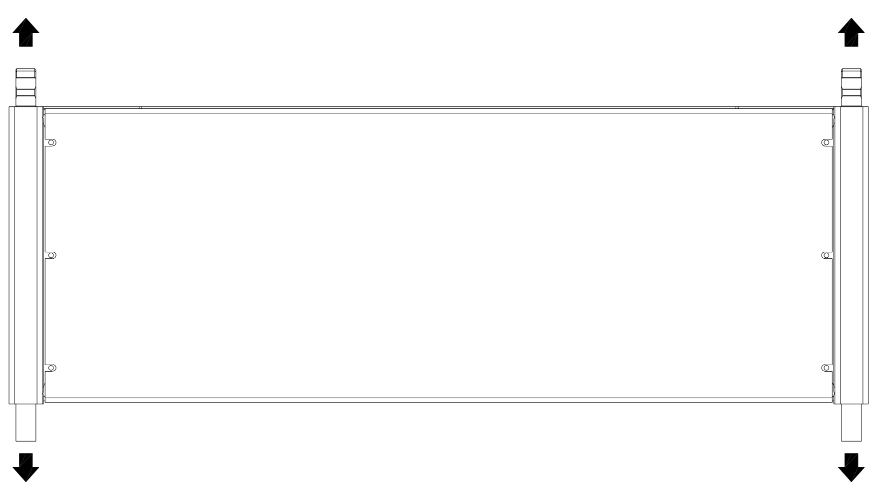
The working-load limit of each of the swing-arm rigging points on the XLVC enclosures is dependent on the swing arm, the rigging tube, the quick-release pins, the enclosure and the angle of pull. Each enclosure has two swing-arm rigging points - left and right. The structural ratings shown in Figure 14 are for a single rigging attachment point. That is to say, the left and right rear swing-arm, rigging points each have the rating shown in the figure.



XLD281 Hinge Bar Structural Ratings



XLD281 Swing Arm Structural Ratings

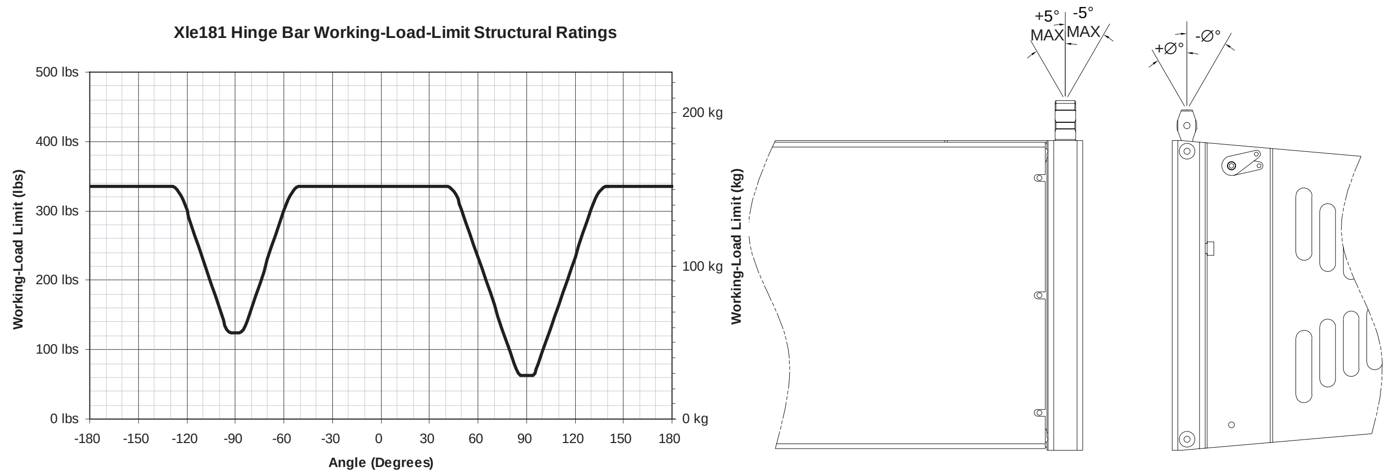


Total Column Weight
Working-Load Limit
900 lb (408 kg)

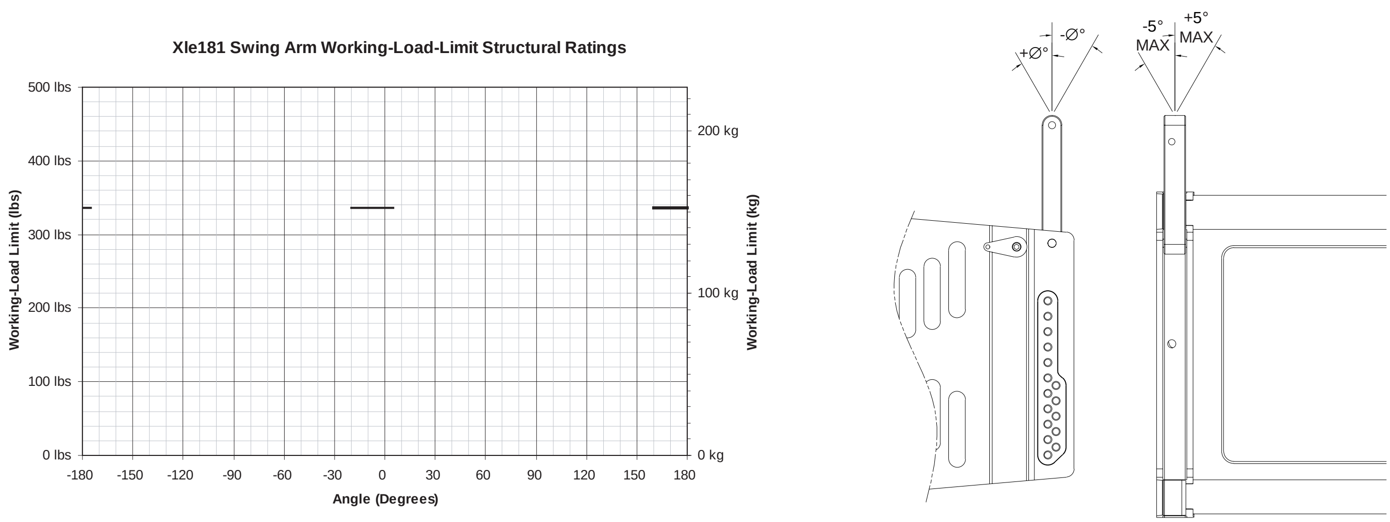
XLD281 Overall Enclosure Structural Ratings

Figure 14a:

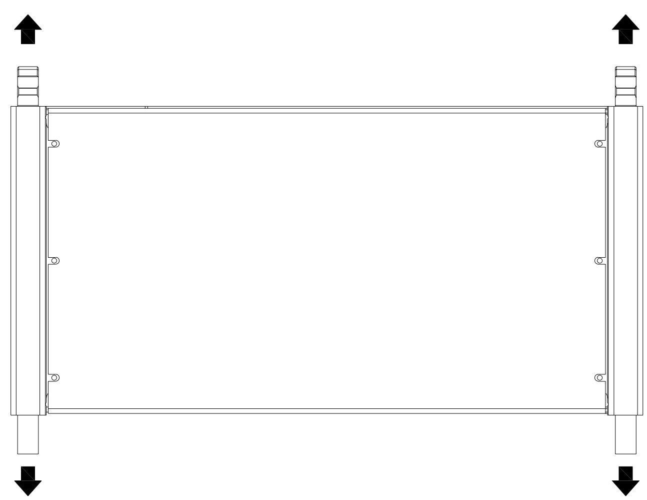
XLD281 Complex Structural Ratings



XLE181 Hinge Bar Structural Ratings



XLE181 Swing Arm Structural Ratings

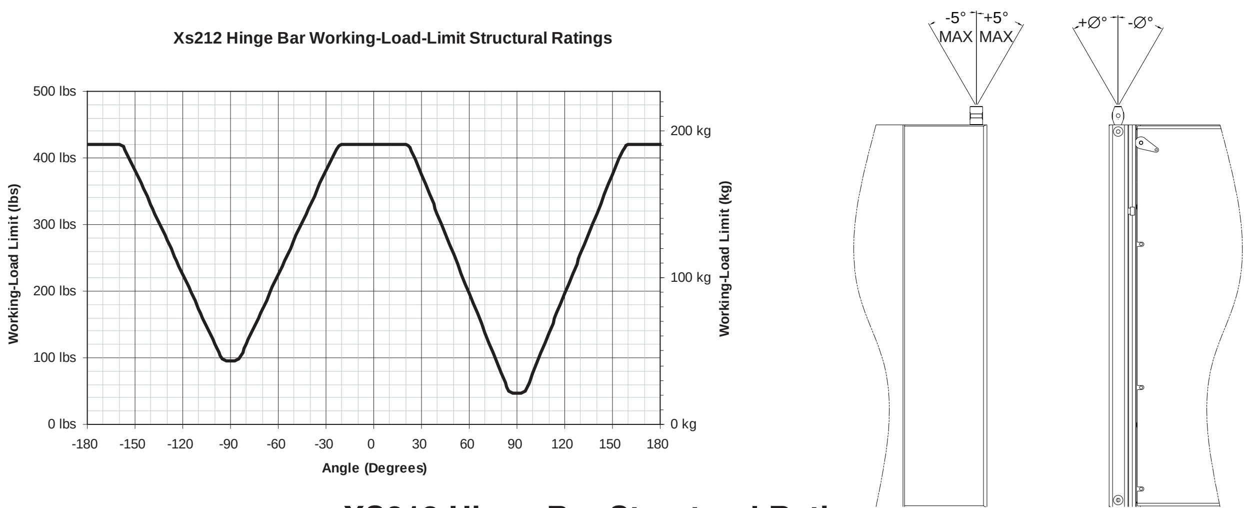


Total Column Weight
Working-Load Limit
720 lb (327 kg)

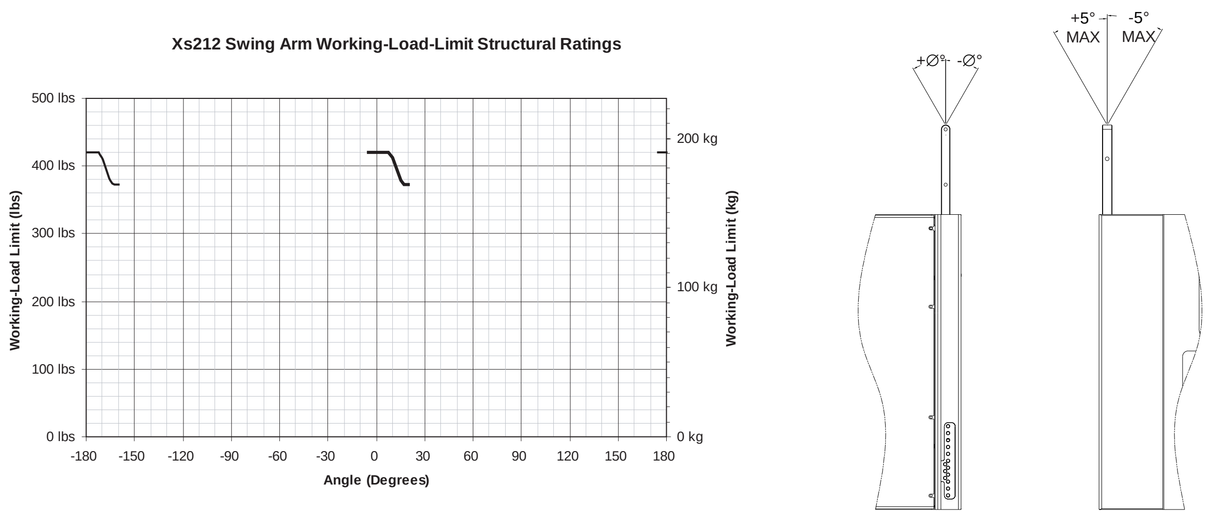
XLE181 Overall Enclosure Structural Ratings

Figure 14b:

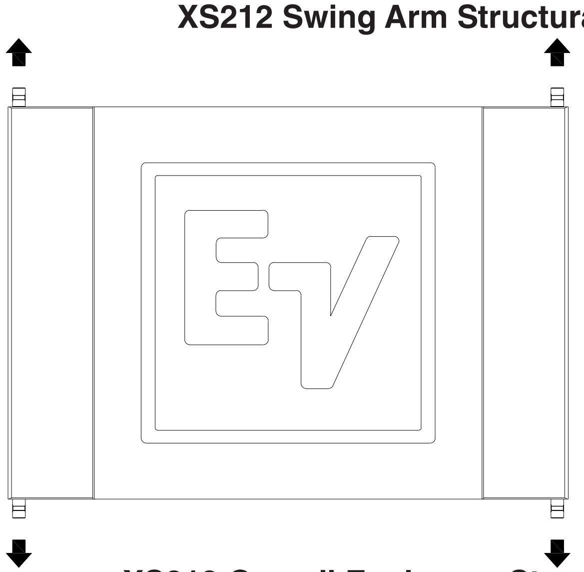
XLE181 Complex Structural Ratings



XS212 Hinge Bar Structural Ratings



XS212 Swing Arm Structural Ratings



Total Column Weight
Working-Load Limit
900 lb (408 kg)

XS212 Overall Enclosure Structural Ratings

Figure 14c:

XS212 Complex Structural Ratings

The XLVC enclosures hinge about the hinge bar and have a limited range of vertical tilt angle adjustment based on the swing-arm attachment positions. For the XLD281-to-XLD281 combination and the XLE181-to-XLE181 combination, the range is limited to 0° to -10°. For the XS212-to-XS212 combination, the range is limited to 0° to -20°. For the XLD-281-to-XS212 combination, the range is limited to +4° to -10°.

When both the front and rear rigging hardware is installed, the hinge bar always prevents the swing arm from having any kind of lateral force. The swing arm is always axially loaded, either in tension or compression. The angle of that axial force, relative to the enclosure, is limited to the range of vertical tilt adjustment described above. Thus, the front-to-back structural ratings for the swing arm rigging points, shown in Figure 14, do not cover a full 360°, but instead are limited to two arc segments that cover the possible range of vertical angle adjustment. (One segment is for tension and the other is for compression.) It should also be noted from Figure 14 that the swing arms are only rated for side-to-side pull angles of a maximum of ±5°.

XLD281, XLE181, and XS212 Overall Enclosure Structural-Strength Ratings
The actual strength of the XLVC enclosures will depend on the complex total of the combined forces from each of the rigging points acting on the enclosure as a whole and will vary with the array configuration. However, for the sake of simplicity, Electro-Voice chooses to define the working-load limit of the overall enclosures as the sum total of the weight of that enclosure plus the weight of all of the enclosures and rigging hardware suspended below. This simplified working-load weight rating of the overall enclosures is defined as being independent of the angles of pull on the individual rigging points. The Electro-Voice engineers have chosen to define the working-load limits of the individual rigging points as a function of pull angle so that they take into account any variations in enclosure strength that might occur as a function of pull angle. This approach allows the enclosure working-load limit to be defined as independent of pull angles, making the complex structural rating analysis easier. The XLD281, XLE181 and XS212 each have unique working-load-limit ratings for the overall enclosure, and are shown in Figure 14a for the XLD281, Figure 14b for the XLE181 and Figure 14c for the XS212.

CAUTIONS for Enclosure Complex Structural Rating Analysis

WHEN APPLYING A COMPLEX STRUCTURAL RATING ANALYSIS TO ANY XLVC LOUDSPEAKER SYSTEM SUSPENDED OVERHEAD, THE USER MUST OBEY THE FOLLOWING RULES:

1. Never exceed the working-load-versus-angle limit for any loudspeaker enclosure in the array.
2. Never exceed the side-to-side angle limits for the front hinge bar on any loudspeaker enclosure in the array.
3. Never exceed the side-to-side angle limits for the rear swing arm bar on any loudspeaker enclosure in the array.
4. Always make sure that two quick-release pins secure every hinge bar at the side of the enclosures and grids and that those pins are fully locked in the rigging tubes on all enclosures and grids.
5. Always make sure that the quick-release pins for every swing arm pass through the hole in the swing arm and are fully locked in the rigging channels on all enclosures and grids.

3.6 XLD Grid, XLE Grid, CBEAM, and AGCD Complex Structural-Strength Ratings

XLD Grid and XLE Grid Complex Structural-Strength Ratings

The XLD Grid can be used to suspend a column of XLD281 or XS212 loudspeaker systems, while the XLE Grid can only be used to suspend a column of XLE181 loudspeaker systems.

The structural strength of a column of loudspeakers suspended from a grid is a function of the strength of the grid spreader bar assemblies, the grid sidearm assemblies, the front and back rigging attachment to the XLVC enclosures, the strength of all of the quick-release attachment pins, the loudspeaker array configuration and the vertical tilt angle of the grid. This is a complex mechanical system, where the strength of the overall system is determined by the strength of the weakest component in the system.

The Electro-Voice engineers have designed the XLVC grids to be stronger than the XLVC loudspeaker systems over the entire mechanical operating range of the loudspeaker systems. This makes the structural analysis of the overall system (grids and loudspeaker enclosures) much easier because the structural rating of the entire mechanical system will be determined solely by the structural strength of the loudspeaker systems.

Specifically, this means that, when the XLD Grid is used in any of the configurations shown in Figure 15a, the structural rating of the grid will always exceed the structural ratings of either the XLD281 or XS212 loudspeaker systems. Thus, if the structural rating is not exceeded for any loudspeaker in the column, the structural rating of the grid will not be exceeded.

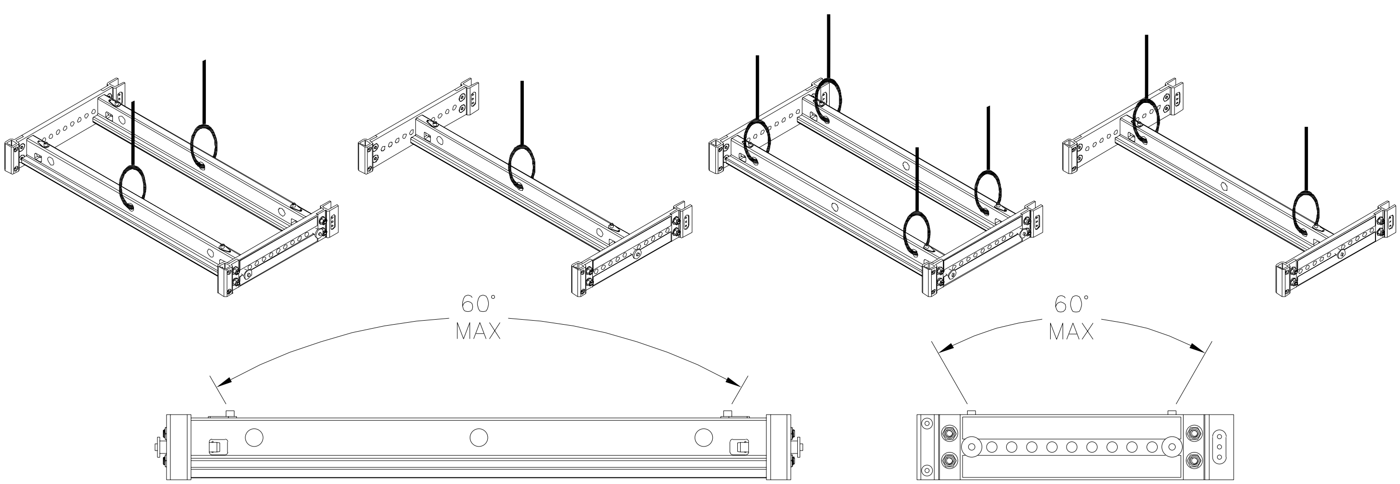


Figure 15a:
XLD GRID Complex Structural Ratings

Likewise, when the XLE Grid is used in any of the configurations shown in Figure 15b, the structural rating of the grid will always exceed the structural ratings the XLE181 loudspeaker systems. Thus, if the structural rating is not exceeded for any loudspeaker in the column, the structural rating of the grid will not be exceeded.

When two side-to-side pickup points, or two front-to-back pickup points are used to suspend an XLD Grid or XLE Grid, the maximum included angle between the pickup points shown in Figures 15a and 15b must not be exceeded.

WHEN USING THE GRID IN ANY OF THE CONFIGURATIONS SHOWN TO SUPPORT A COLUMN OF LOUDSPEAKER SYSTEMS, THE STRUCTURAL RATING OF THE GRID WILL ALWAYS EXCEED THE STRUCTURAL RATING OF THE LOUDSPEAKER SYSTEMS FOR ANY VERTICAL TILT ANGLE. THUS, IF THE STRUCTURAL RATING IS NOT EXCEEDED FOR ANY LOUDSPEAKER IN THE COLUMN, THE STRUCTURAL RATING OF THE GRID WILL NOT BE EXCEEDED. WHEN USING TWO PICK-UP POINTS TO SUSPEND A GRID, DO NOT EXCEED THE ANGLES SHOWN.

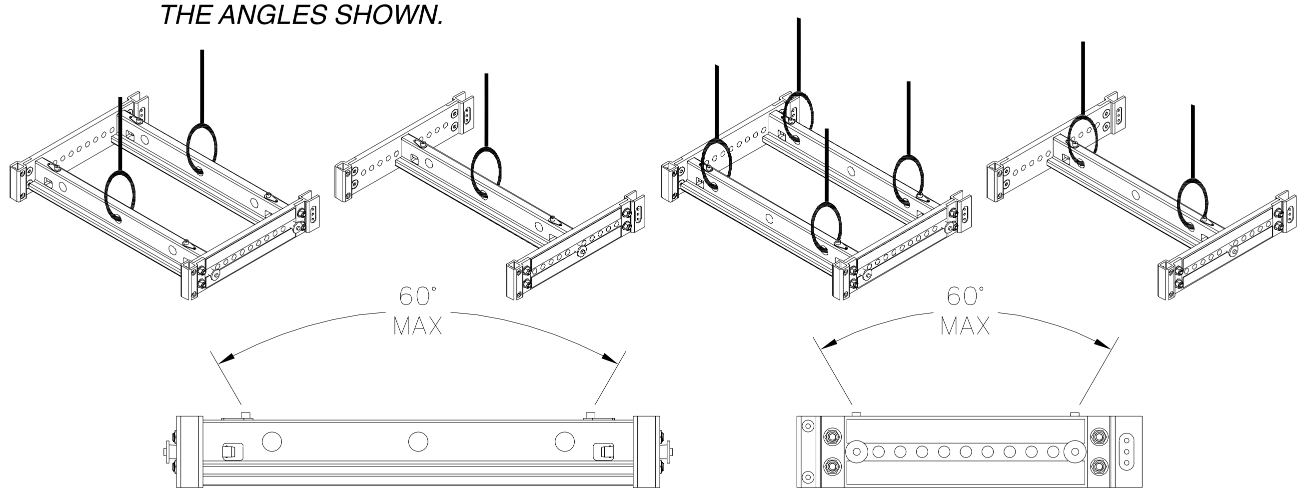


Figure 15b:
XLE GRID Complex Structural Ratings

CBEAM Complex Structural-Strength Ratings
The CBEAM can be used as a coupler beam to suspend a column of XS212 loudspeaker systems behind a column of either XLD281 or XLE181 loudspeaker systems. It can also be used as an extender beam with a single column of either XLD281 or XLE181 loudspeaker systems to enable greater vertical angle tilt of the column than that which could be achieved with a grid alone.

The structural strength of the of a column of loudspeakers suspended from a CBEAM is a function of the strength of the beam frame assembly, the beam yoke assemblies, the beam ring assemblies, the grid spreader bar assemblies, the grid sidearm assemblies, the front and back rigging attachment to the XLVC enclosures, the strength of all of the quick-release attachment pins, the loudspeaker array configuration and the vertical tilt angle of the beam. This is a complex mechanical system, where the strength of the overall system is determined by the strength of the weakest component in the system.

The Electro-Voice engineers have designed the CBEAM to be stronger than the XLD Grids and XLE Grids, which are in turn stronger than the XLVC loudspeaker systems over the entire mechanical operating range of the loudspeaker systems. This makes the structural analysis of the overall system (beam, grids and loudspeaker enclosures) much easier because the structural rating of the entire mechanical system will be determined solely by the structural strength of the loudspeaker systems.

Specifically, this means that, when the CBEAM is used in any of the configurations shown in Figure 15c, the structural rating of the beam will always exceed the structural ratings of either the XLD281 or XS212 loudspeaker systems. Thus, if the structural rating is not exceeded for any loudspeaker in the column, the structural rating of the beam will not be exceeded.

When suspending a CBEAM, the maximum included angle of the pickup points relative to the beam shown in Figure 15c must not be exceeded.

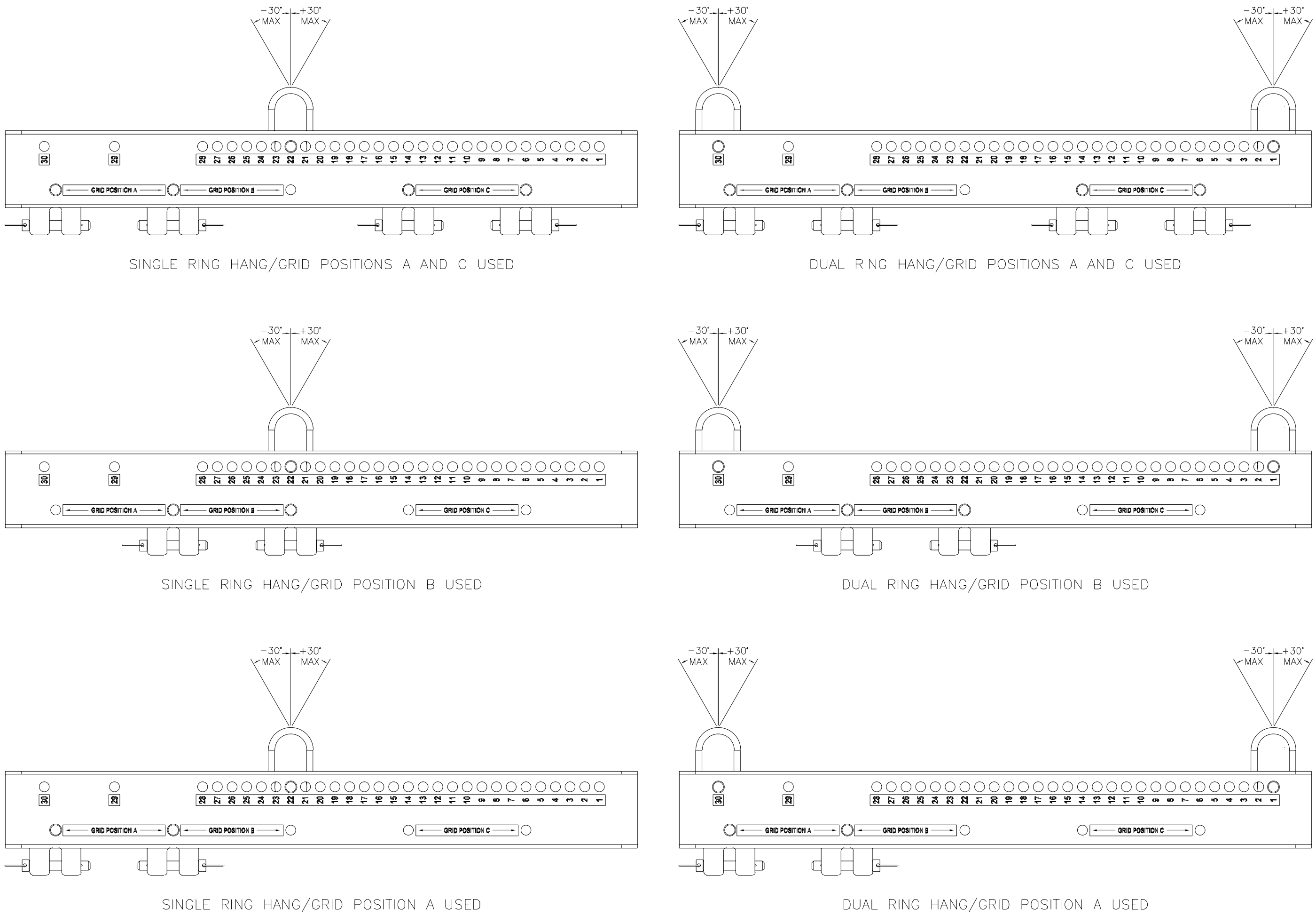


Figure 15c:
CBEAM Complex Structural Ratings

AGCD Complex Structural-Strength Ratings

The AGCD is an adapter grid that allows XLVC loudspeaker systems (XLD281) to be rigged to XLC loudspeaker systems (XLC127+, XLC215 or XLC118) in the same column.

The structural strength of a column of XLVC and XLC loudspeakers linked together using an AGCD is a function of the strength of the adapter grid assembly, the front and back rigging attachment to the XLVC and XLC enclosures, the strength of all of the quick-release attachment pins, the loudspeaker array configuration and the vertical tilt angle of the grid. This is a complex mechanical system, where the strength of the overall system is determined by the strength of the weakest component in the system.

The Electro-Voice engineers have designed the AGCD adapter grid to be stronger than either the XLVC or XLC loudspeaker systems over the entire mechanical operating range of the loudspeaker systems. This makes the structural analysis of the overall system (adapter grid and loudspeaker enclosures) much easier because the structural rating of the entire mechanical system will be determined solely by the structural strength of the loudspeaker systems.

Specifically, this means that, when the AGCD adapter grid is used in any of the configurations shown in Figure 15d, the structural rating of the adapter grid will always exceed the structural ratings of either the XLD281 or XLC (XLC127+, XLC215 or XLC118) loudspeaker systems. Thus, if the structural rating is not exceeded for any loudspeaker in the column, the structural rating of the adapter grid will not be exceeded.

When Using the AGCD Adapter Grid in Any of the Configurations Shown to Support a Column of XLC and XLVC Loudspeaker Systems, the Structural Rating of the Adapter Grid Will Always Exceed the Structural Rating of the Loudspeaker Systems for any Vertical Tilt Angle. Thus, If the Structural Rating Is Not Exceeded for Any Loudspeaker in the Column, the Structural Rating for the Adapter Grid Will Not Be Exceeded.

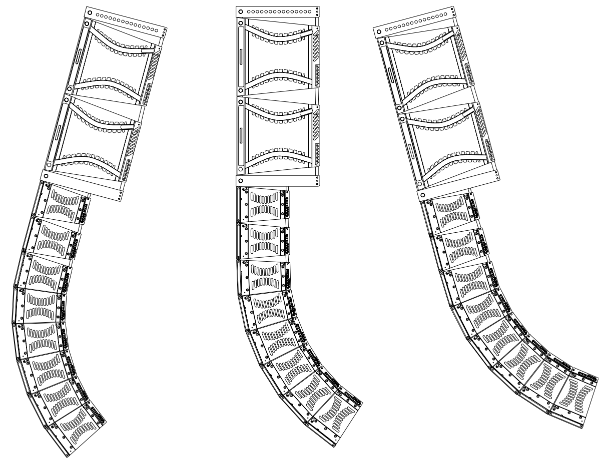


Figure 15d:
AGCD Adapter Grid Complex Structural Ratings

3.7 Wind Loading

The XLVC loudspeaker systems have been designed to withstand winds of up to **60 miles per hour (96.6 kilometers per hour)** if the bottom cabinet is rigidly secured. For obvious safety reasons, Electro-Voice urges the user not to suspend any loudspeaker systems overhead outdoors when high winds are expected. When suspending XLVC loudspeaker systems outdoors, the user is strongly encouraged to rigidly tie off the bottom cabinets in all arrays as a safety precaution against unexpected high winds.

A pull-up grid with an attached strap may be used to secure the bottom cabinets. The tie-off assembly must have a working-load rating of **2,000 lb (907 kg)**. A ratchet strap with a **2,000-lb** working-load rating must be used for the pull-up assembly.

3.8 Electro-Voice Structural-Analysis Procedures

Electro-Voice maintains a structural pull-test facility in Burnsville, Minnesota USA which includes load cells with digital-electronic display and recording. The load cells are calibrated annually by an independent laboratory to a standard traceable to the United States National Bureau of Standards. This pull-test facility is capable of pulling to destruction both individual rigging components and complete loudspeaker systems.

Electro-Voice utilizes state-of-the-art computer-modeling programs for structural analysis throughout the development of loudspeaker systems. The computer modeling enables the complex forces in the rigging components and enclosures to be analyzed for loudspeakers assembled into arrays in both static and dynamic conditions.

Structural testing and computer modeling were used throughout the engineering development of all the XLVC individual rigging components and complete loudspeaker systems described in this manual. Testing and modeling involving both anticipated use and anticipated misuse were performed as part of the analysis. Engineering prototypes were stressed to failure and designs were revised based on those test results. Production systems and components were stressed to failure for verification of the final designs.

4. Rigging Inspection and Precautions

Electro-Voice XLVC Loudspeaker Systems:
Prior to each use, inspect the loudspeaker enclosures for any cracks, deformations, missing or damaged components that could reduce enclosure strength. Inspect the rigging tube and channel assemblies on the enclosures for any cracks, deformations, corrosion, missing or loose screws which could reduce the flying hardware strength. Replace any loudspeaker systems that are damaged or missing hardware. Never exceed the limitations or maximum recommended load for the XLVC systems.

Electro-Voice XLVC Front Rigging Hinge Bar Assemblies: Prior to each use, inspect the front rigging hinge bars and the front rigging tubes for any cracks, burrs, deformations, corrosion or missing or damaged components that could reduce hinge bar assembly strength. Always check to make sure that the hinge bar can move freely in the front rigging tube. Replace any hinge bars that are damaged or missing hardware. Always double check that each quick-release pin on each hinge bar is securely locked into position in the front rigging tubes on the XLVC enclosures and grids before lifting. Never exceed the limitations or maximum recommended load for the XLVC rigging hardware.

Electro-Voice XLVC Rear Swing Arm Assemblies: Prior to each use, inspect the rear rigging swing arms, the rear rigging channels and rear rigging holes for any cracks, burrs, deformations, corrosion or missing or damaged components that could reduce swing arm assembly strength. Always check to make sure that the swing arm bar can move freely in the rear rigging slots and that the quick-release locking pins can be easily inserted in the swing arm holes and rigging holes to lock the arm. Replace any swing arms that are damaged or missing hardware. Always double check that each swing arm is securely locked in the rear rigging holes with a quick-release pin. Never exceed the limitations or maximum recommended load for the XLVC rigging hardware.

Electro-Voice Quick-Release Pins: Prior to each use, inspect the quick-release pins on the rigging frame assemblies any for cracks, burrs, deformations, corrosion or missing or damaged components that could reduce the pin strength. Replace any quick-release pins that are damaged. Always double check that each quick-release pin is securely locked to the front hinge bar and rear swing arm assemblies on the XLVC enclosures before lifting. Never exceed the limitations or maximum recommended load for the XLVC rigging hardware.

Grid Assemblies: Prior to each use, inspect each grid assembly any for cracks, burrs, deformations, corrosion or missing or damaged components that could reduce the grid assembly strength. Replace any grids that are damaged or missing hardware. Always double check that each grid is securely locked to the front hinge bar assemblies and the rear swing arm assemblies on the XLVC enclosures before lifting. Always double check that each quick-release pin attaching the sidearms to the spreader bar(s) are securely locked into place. Never exceed the limitations or maximum recommended load for the grids.

Coupler Beam (CBeam) Assemblies: Prior to each use, inspect the CBeam assemblies for any cracks, burrs, deformations, corrosion or missing or damaged components that could reduce the CBeam assembly strength. Replace any CBeam assemblies that are damaged or missing hardware. Always double check that each CBeam assembly is securely locked to the spreader bar(s) on the grids below. Never exceed the limitations or maximum recommended load for the CBeam assemblies.

Groundstack Assemblies: Prior to each use, inspect each groundstack assembly for any cracks, burrs, deformations, corrosion or missing or damaged components that could reduce the groundstack assembly strength. Replace any groundstack assembles that are damaged or missing hardware. Always double check that each quick-release pin on each front hinge bar and rear swing arm is securely locked into position on the XLVC enclosures when stacking. Never exceed the limitations or maximum recommended configurations for the groundstack assembly.

Chain Hoists: Prior to each use, inspect the chain hoist and associated hardware (including motor, if applicable) for any cracks, deformation. Broken welds, corrosion, missing or damaged components that could reduce the hoist strength. Replace any damaged chain hoists. Never exceed the limitations or maximum recommended load specified by the hoist manufacturer. Always follow manufacturers' recommendations for operation, inspection, and certification. Always raise and lower the load slowly and evenly, avoiding any rapid changes in speed or shifting loads that could result in a sudden jolt to the suspended system.

Building, Tower or Scaffold Supports: Prior to each use, the strength and load-bearing capabilities of the building, tower or scaffold structural supports should be evaluated and certified by a professional engineer as being adequate for supporting the intended rigging system (including the loudspeakers, grids, chain hoists and all associated hardware). Prior to each use, inspect the building, tower or scaffold structural supports for any cracks, deformation, broken welds, corrosion, missing or damaged components that could reduce the structural strength. Damaged structural supports should be replaced or repaired and recertified by a professional engineer. Never exceed the limitations or maximum recommended load for the supports.

Miscellaneous Mechanical Components: Prior to each use, inspect all mechanical components (chain, wire ropes, slings, shackles, hooks, fittings, ratchet straps, etc.) for any cracks, deformation, broken welds, slipping crimps, fraying, abrasion, knots, corrosion, chemical damage, loose screws, missing or damaged components that could reduce the maximum strength specified by the component manufacturer. Replace any damaged mechanical components. Never exceed the limitations or maximum recommended load for the mechanical components.

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Notes

Notes

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