

# X-Line Rigging Instructions

Rev. 1.0 - April 20, 2001

## Rigging Overview

The X-Line loudspeaker systems have been designed to construct acoustic line-arrays. Acoustic line arrays typically consist of independent columns of loudspeaker systems. Additional columns are sometimes added to cover different seating sections of a venue. Unlike cluster systems, when multiple arrays are used, they are physically separated to minimize the acoustic overlap. This simplifies the rigging system.

The rigging system for a column of X-Line loudspeakers consists of a grid at the top with a column of loudspeakers suspended underneath. There are two pickup points on the grid – one at the front and one at the back. The two grid pickup points are in line and are adjustable front to back to help distribute the loads between the two points. For smaller arrays (8 boxes or less), two one-ton hoist motors are recommended. For larger arrays (more than 8 boxes), two two-ton hoist motors are recommended. Two one-ton hoist motors can be used; however, the front-to-back distribution of the weight becomes much more critical than with two-ton hoists.

The X-Line loudspeaker enclosures have a hinged rigging system. The rear of the enclosures are hinged at the back corners using rigging hardware specially designed for the X-Line system. Adjustable rigging straps are installed at the front of the enclosure that allow the space between the front corners to be adjusted; hence, adjusting the relative angle between the enclosures.

## Enclosure Rigging Hardware

The X-Line loudspeaker systems have rigging at both the front and rear of the enclosures as shown in Figure 1. The rear rigging consists of four pieces of track that run side to side. Two pieces of track are at the top and two pieces are at the bottom. Special hinges are installed into these tracks to attach one enclosure to another. Internal to the enclosure are four aluminum bars that run top to bottom between the rigging tracks to minimize the stress on the wooden enclosures.

At the front of the X-Line enclosures are two aluminum extrusions with tracks that run top to bottom. Rigging straps may be attached at different positions along the track, effectively adjusting the space between enclosures at the front.

## External Rigging Hardware

The X-Line loudspeaker systems utilize separate pieces of rigging hardware, shown in Figure 2, to link one enclosure to another or to attach the top enclosure to the grid. To attach one enclosure to another, two Xvhl linking hinges are used at the back and two Xvsl linking straps are used at the front.

The Xvhl linking hinges are solid hinges that allow the enclosures to hinge at their adjacent rear corners. The Xvsl linking straps consist of two special fittings connected by a chain. The fittings on the linking straps can be installed at different positions along the enclosure front rigging track. By attaching at different positions, the amount of space between the enclosures can be adjusted in 1° increments.

The Xvhg grid hinges are flexible hinges that secure the rear of the top enclosure to the grid. The Xvsg grid straps are just like the Xvsl linking straps, with the exception that they are shorter.

A column of loudspeakers with rigging are shown in Figure 3.

## Special Safety Notes

**Rear Hinge Safety Note:** Both the Xvhg grid hinges and Xvhl linking hinges must be installed in the enclosures so that, when locked in position, the base of the hinge is located in the track at the outside of the enclosure with the locking knobs toward the center as shown in Figure 3. If the hinges are installed

backwards, the structural strength is significantly decreased and an unsafe condition will exist. Before suspending any X-Line enclosure overhead, the operator must always check to make sure that the hinges are installed in the correct orientation and that the locking pins are fully engaged in the track.

**Front Strap Safety Note:** Before suspending any X-Line enclosure overhead, the operator must always check to make sure that the Xvsg and Xvsl front strap fittings are securely installed in the track and that the fitting locking pins are fully engaged in the track.

### **Adjusting the Vertical Angles of the Enclosures**

The vertical angle of an enclosure may be adjusted relative to the enclosure immediately above by the choice of the attachment position of the Xvsl front linking straps in the enclosure track. The locating holes in the enclosure rigging track are spaced 1.00 inches apart. Moving the attachment position one hole results in a 2° change in the enclosure vertical angle. A 1° angle adjustment is possible, however.

The chain on the Xvsl linking straps are secured to the fittings on each end with a pin through a hole on each fitting. Note that there are two holes on each fitting labeled “A” and “B”. These two holes offer two attachment points that change the length of the linking strap assembly. When the chain is connected in the “B-B” position, the Xvsl linking strap is 0.500 inches longer than when connected in the “A-A” position. This 0.500-inch change in length results in a 1° angle adjustment. Thus, by adjusting the length of the Xvsl linking straps and their attachment position on the enclosure front track, the relative angles between boxes can be adjusted in 1° increments. When used with the “A-A” length, even-numbered angles result (0°, 2°, 4°, 6°, etc.) when changing the attachment position of the linking strap along the track, while odd-numbered angles result (1°, 3°, 5°, 7°, etc.) when used with the “B-B” length.

When planning angle adjustments between boxes, the shape of the enclosure must be taken into account. Two rectangular enclosures (either Xvls or Xsub) can be pulled up tight with their sides parallel, a 0° relative angle between the enclosures (i.e., both are facing straight ahead). When two trapezoidal enclosures (Xvlt only) are pulled up tight with their sides parallel, a 5° relative angle exists between the enclosures (because the enclosure shape is a 5° wedge). When a trapezoidal enclosure (Xvlt) and rectangular enclosure (either Xvls or Xsub) are pulled up tight with their sides parallel, a 3° relative angle exists between the enclosures.

To facilitate array design, Table 1 shows all of the possible combinations of rigging attachment locations and linking strap lengths.

### **Rigging an Array Using Boxes with Bottom Dollies**

Two dollies are available for transporting the X-Line loudspeaker systems. The actual array rigging technique will vary depending on which dolly is used.

A “Bottom Dolly” can be used with the rectangular loudspeaker enclosures (either Xvls or Xsub). Up to four loudspeaker systems can be stacked on top of a single bottom dolly. The loudspeakers all are sitting upright, just like they would be arrayed. These dollies have sufficient clearance to allow the enclosures to travel with both the front and rear rigging hardware attached to the loudspeaker systems. This makes rigging set up and tear down extremely easy because the loudspeaker enclosures can be moved in blocks of four units. Figure 4 illustrates the technique used to construct a loudspeaker array with enclosures transported on bottom dollies. The bottom dolly cannot be used with trapezoidal enclosures (Xvlt).

A “Front Dolly” can be used with either the rectangular enclosures (Xvls or Xsub) or trapezoidal enclosures (Xvlt). The front dolly attaches to the front of a single loudspeaker system covering the grille and the enclosure front rigging track. This dolly allows the ease of moving one loudspeaker enclosure at a time; however, the rigging cannot remain attached to the enclosure during transport. Figure 5 illustrates the technique used to construct a loudspeaker array with enclosures transported on front dollies.

Because most arrays typically require more rectangular Xvls and Xsub systems than trapezoidal Xvlt systems, it would be common in a large-scale touring situation for the rectangular boxes to be transported on bottom dollies and trapezoidal boxes to be transported on front dollies. Thus, both rigging techniques may be employed in the same array.

**Rectangular Box (Xvls or Xsub) to Rectangular Box (Xvls or Xsub)**

| Angle Between Boxes | Front Strap Chain Position | Holes Showing in Front Rigging |
|---------------------|----------------------------|--------------------------------|
| 0°                  | A-A                        | 0                              |
| 1°                  | B-B                        | 0                              |
| 2°                  | A-A                        | 1                              |
| 3°                  | B-B                        | 1                              |
| 4°                  | A-A                        | 2                              |
| 5°                  | B-B                        | 2                              |
| 6°                  | A-A                        | 3                              |
| 7°                  | B-B                        | 3                              |

**Rectangular Box (Xvls or Xsub) to Trapezoidal Box (Xvlt)**

| Angle Between Boxes | Front Strap Chain Position | Holes Showing in Front Rigging |
|---------------------|----------------------------|--------------------------------|
| 3°                  | B-B                        | 0                              |
| 4°                  | A-A                        | 1                              |
| 5°                  | B-B                        | 1                              |
| 6°                  | A-A                        | 2                              |
| 7°                  | B-B                        | 2                              |
| 8°                  | A-A                        | 3                              |
| 9°                  | B-B                        | 3                              |
| 10°                 | A-A                        | 4                              |

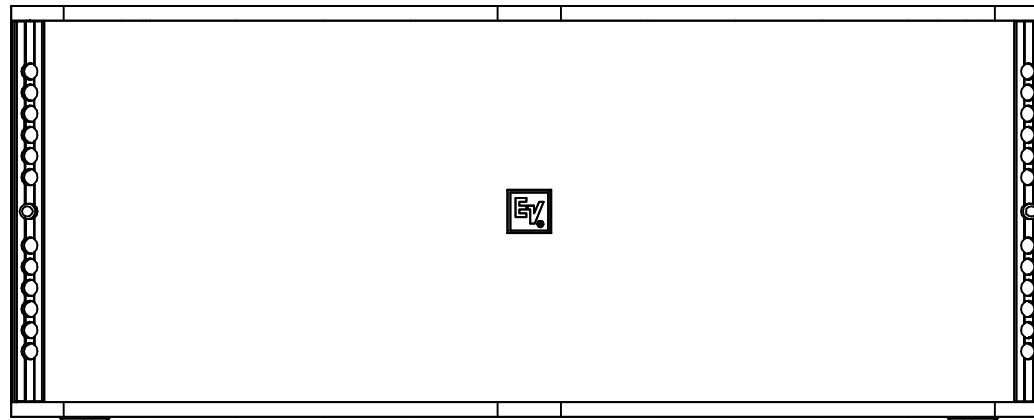
**Table 1:**  
**Adjusting Angles Between Boxes Using the Xvsl Rigging Straps**

**Trapezoidal Box (Xvlt) to Trapezoidal Box (Xvlt)**

| Angle Between Boxes | Front Strap Chain Position | Holes Showing in Front Rigging |
|---------------------|----------------------------|--------------------------------|
| 5°                  | B-B                        | 0                              |
| 6°                  | A-A                        | 1                              |
| 7°                  | B-B                        | 1                              |
| 8°                  | A-A                        | 2                              |
| 9°                  | B-B                        | 2                              |
| 10°                 | A-A                        | 3                              |

FIGURE 1: X-LINE ENCLOSURES

X-LINE ENCLOSURE FRONT SHOWING RIGGING HARDWARE



X-LINE ENCLOSURE REAR SHOWING RIGGING HARDWARE

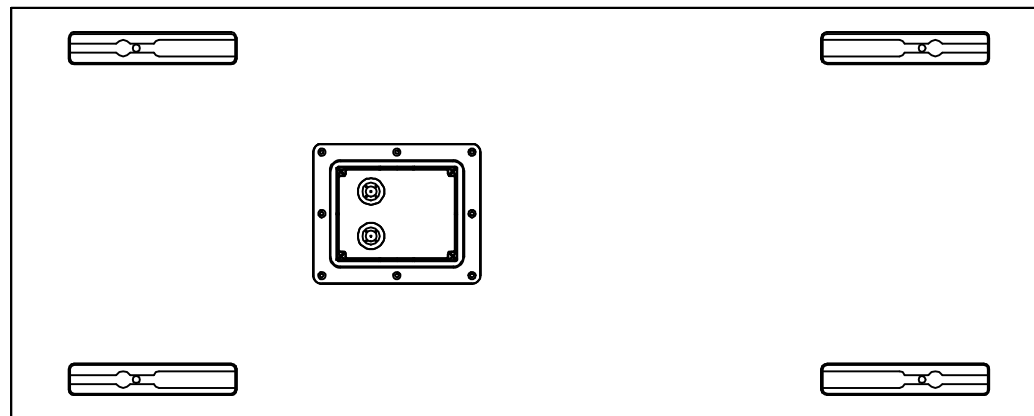
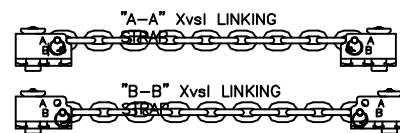


FIGURE 2: X-LINE EXTERNAL RIGGING HARDWARE

#### Xvsl FRONT LINKING STRAP

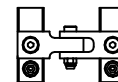


THE Xvsl FRONT LINKING STRAP IS USED TO FOR LINKING ONE BOX TO ANOTHER. TWO ARE REQUIRED FOR EACH BOX.

THE Xvsl FRONT RIGGING STRAP MAY BE ADJUSTED FOR TWO DIFFERENT LENGTHS. THERE ARE TWO HOLES IN THE FITTINGS LABELED "A" AND "B". THE CHAIN IS SECURED TO THE FITTING USING A PIN INSERTED INTO ONE OF THOSE HOLES. TO CHANGE THE LENGTH OF THE RIGGING STRAP, REMOVE THE CIRCULAR COTTER PIN, PULL THE PIN OUT OF THE FITTING AND CHAIN. NEXT, MOVE THE PIN AND CHAIN TO THE NEW HOLE AND INSTALL THE CIRCULAR COTTER PIN.

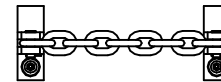
WITH THE CHAIN SECURED IN THE "A-A" POSITIONS, THE VERTICAL ANGLES OF THE BOXES MAY BE ADJUSTED FOR EVEN ANGLES (0°, 2°, 4°, 6°, ETC.). WITH THE CHAIN SECURED IN THE "B-B" POSITIONS, THE VERTICAL ANGLES OF THE BOXES MAY BE ADJUSTED FOR "ODD" ANGLES (1°, 3°, 5°, 7°, ETC.).

#### Xvhl REAR LINKING HINGE



THE Xvhl REAR LINKING HINGE IS USED FOR LINKING TWO BOXES TOGETHER. TWO ARE REQUIRED FOR EACH BOX.

#### Xvhg REAR GRID HINGE



THE Xvhg REAR GRID HINGE IS USED FOR SECURING THE TOP BOX TO THE GRID. TWO ARE REQUIRED FOR EACH BOX.

#### Xvsg FRONT GRID STRAP



THE Xvsg FRONT GRID STRAP IS USED FOR SECURING THE TOP BOX TO THE GRID. TWO ARE REQUIRED FOR EACH BOX. THERE IS NO REASON TO ADJUST THE LENGTH OF THIS STRAP.

FIGURE 3: ATTACHING RIGGING HARDWARE TO THE BOXES

**IMPORTANT SAFETY NOTE:** BOTH THE GRID AND LINKING HINGES MUST BE INSTALLED AS SHOWN WITH THE HINGE AT THE OUTSIDE EDGE OF THE TRACK AND THE LOCATING KNOBS TOWARDS THE CENTER. INSTALLING THE HINGES BACKWARDS WILL RESULT IN SIGNIFICANTLY REDUCED STRUCTURAL STRENGTH.

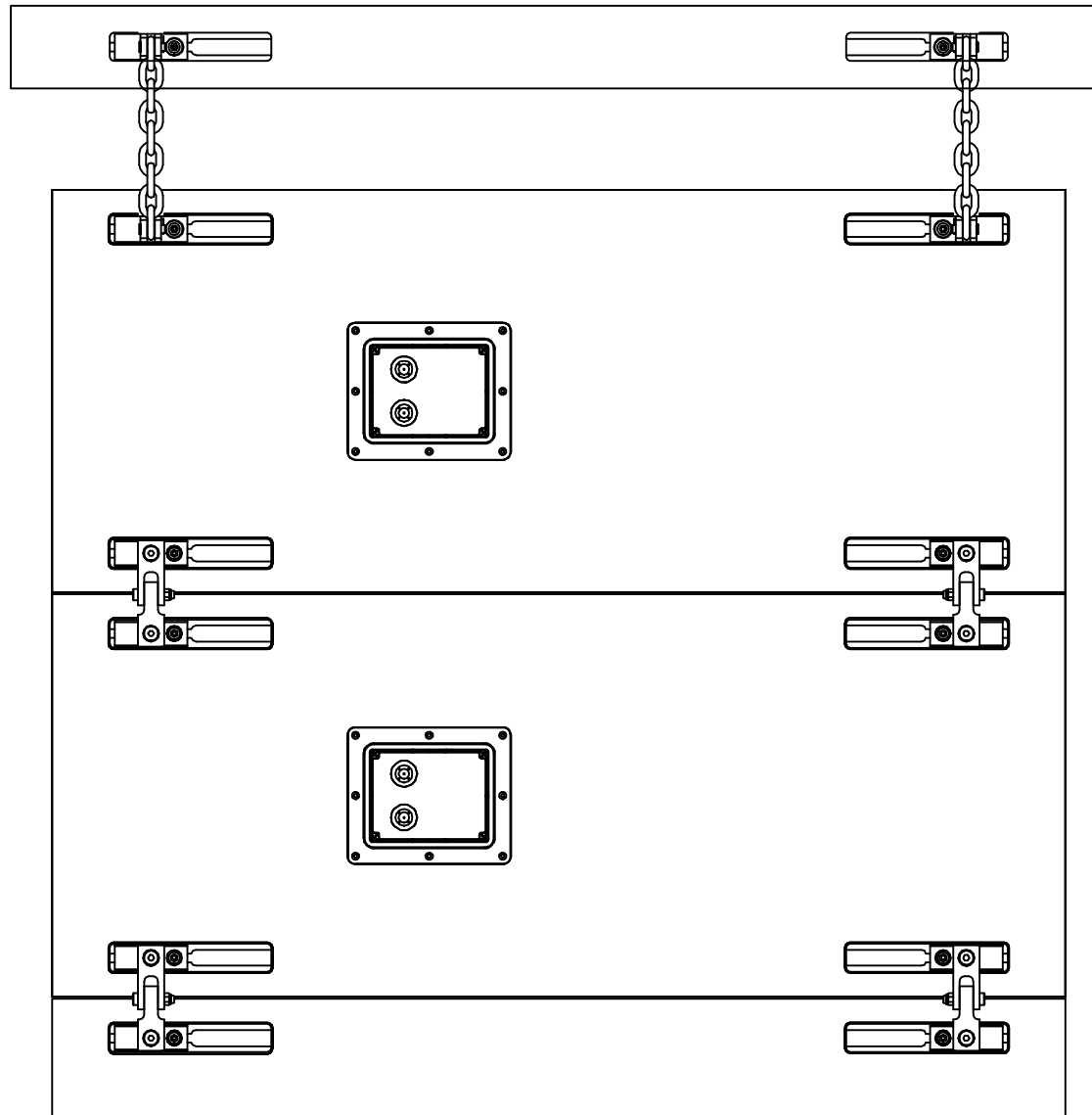


FIGURE 4: RIGGING AN ARRAY USING BOXES WITH BOTTOM DOLLIES

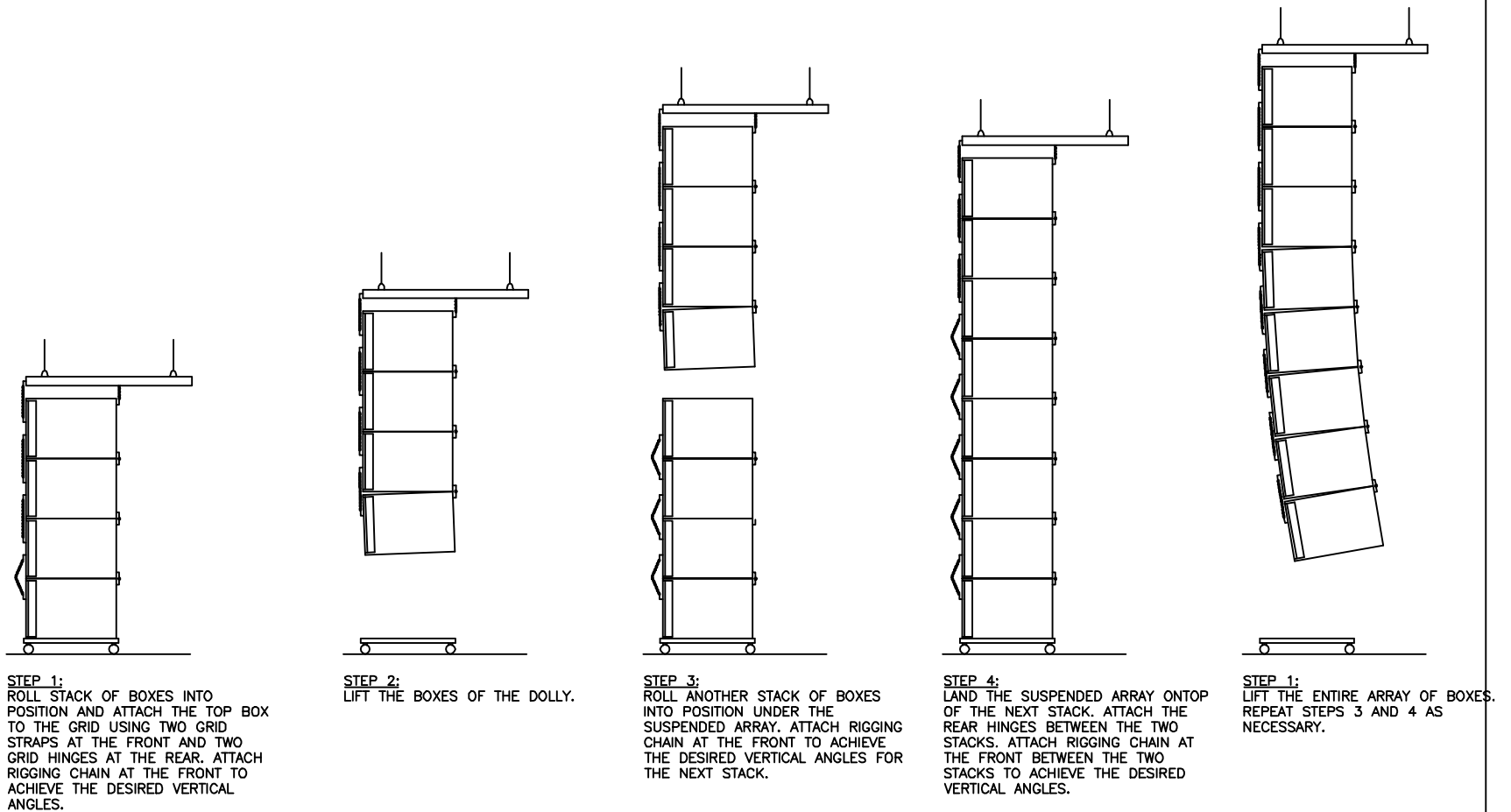
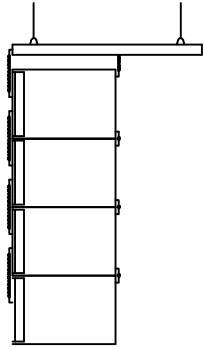
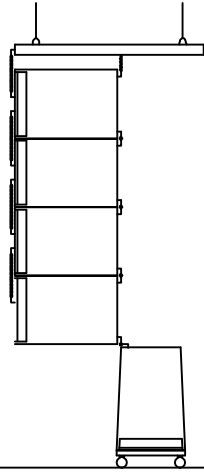


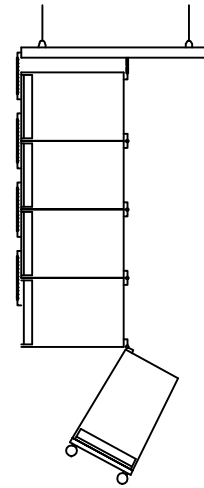
FIGURE 5: RIGGING AN ARRAY USING BOXES WITH FRONT DOLLIES



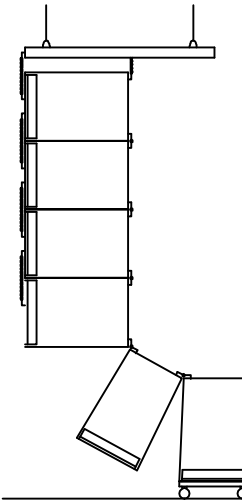
**STEP 1:**  
ATTACH ONE OR MORE BOXES TO THE GRID USING TWO GRID STRAPS AT THE FRONT AND TWO GRID HINGES AT THE REAR. LIFT THE ARRAY.



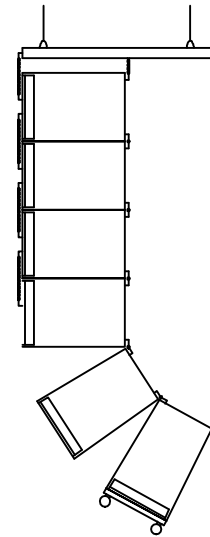
**STEP 2:**  
ROLL ONE BOX WITH THE FRONT DOLLY INTO POSITION AND LOWER THE ARRAY TO ALIGN THE BOTTOM BOX IN THE ARRAY WITH THE BOX WITH THE FRONT DOLLY. INSTALL THE REAR HINGES ONE AT A TIME. TO EASE INSTALLATION THE BOXES MUST BE HELD PARALLEL. LIFT THE SUSPENDED BOX OR THE DOLLY BOX AS NECESSARY TO FACILITATE THE HINGE INSTALLATION.



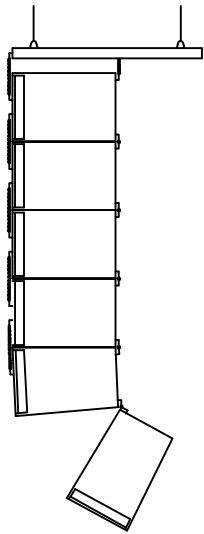
**STEP 3:**  
REMOVE THE DOLLY PIN AND LIFT THE ARRAY.



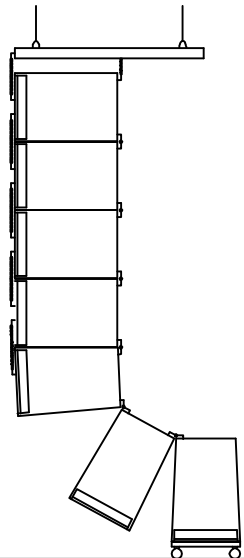
**STEP 4:**  
ROLL THE NEXT BOX ON A FRONT DOLLY INTO POSITION. LOWER THE ARRAY AND INSTALL THE TWO REAR HINGES BETWEEN THE BOTTOM ARRAY BOX AND THE DOLLY BOX AS DONE IN STEP 3.



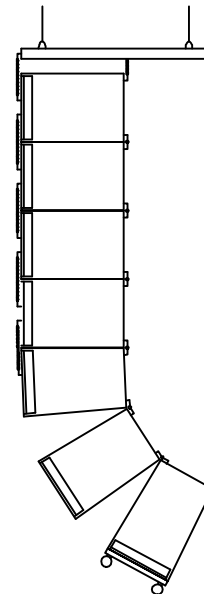
**STEP 5:**  
REMOVE THE DOLLY PIN AND LIFT THE ARRAY.



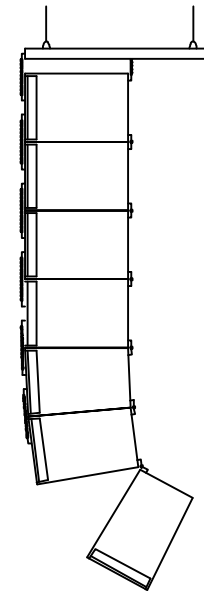
**STEP 6:**  
SWING THE NEXT-TO-BOTTOM BOX UP AND ATTACH THE TWO GRID STRAPS AT THE FRONT TO THE BOX ABOVE.



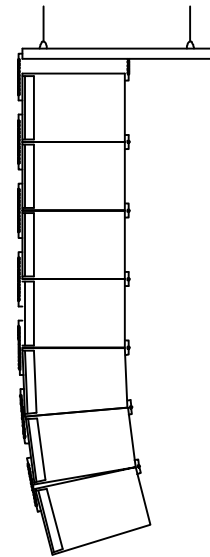
**STEP 7:**  
ROLL ANOTHER BOX WITH A FRONT DOLLY INTO POSITION AND LOWER THE ARRAY TO ALIGN THE BOTTOM BOX IN THE ARRAY WITH THE BOX WITH THE FRONT DOLLY. INSTALL THE TWO REAR HINGES AND TWO FRONT STRAPS AS DESCRIBED IN STEP 2.



**STEP 8:**  
REMOVE THE DOLLY PIN AND LIFT THE ARRAY.



**STEP 9:**  
SWING THE NEXT-TO-BOTTOM BOX UP AND ATTACH THE TWO GRID STRAPS AT THE FRONT TO THE BOX ABOVE. REPEAT STEPS 7, 8 AND 9 UNTIL AS NECESSARY TO BUILD THE ARRAY.



**STEP 10:**  
SWING THE BOTTOM BOX UP AND ATTACH THE TWO GRID STRAPS AT THE FRONT TO THE BOX ABOVE.