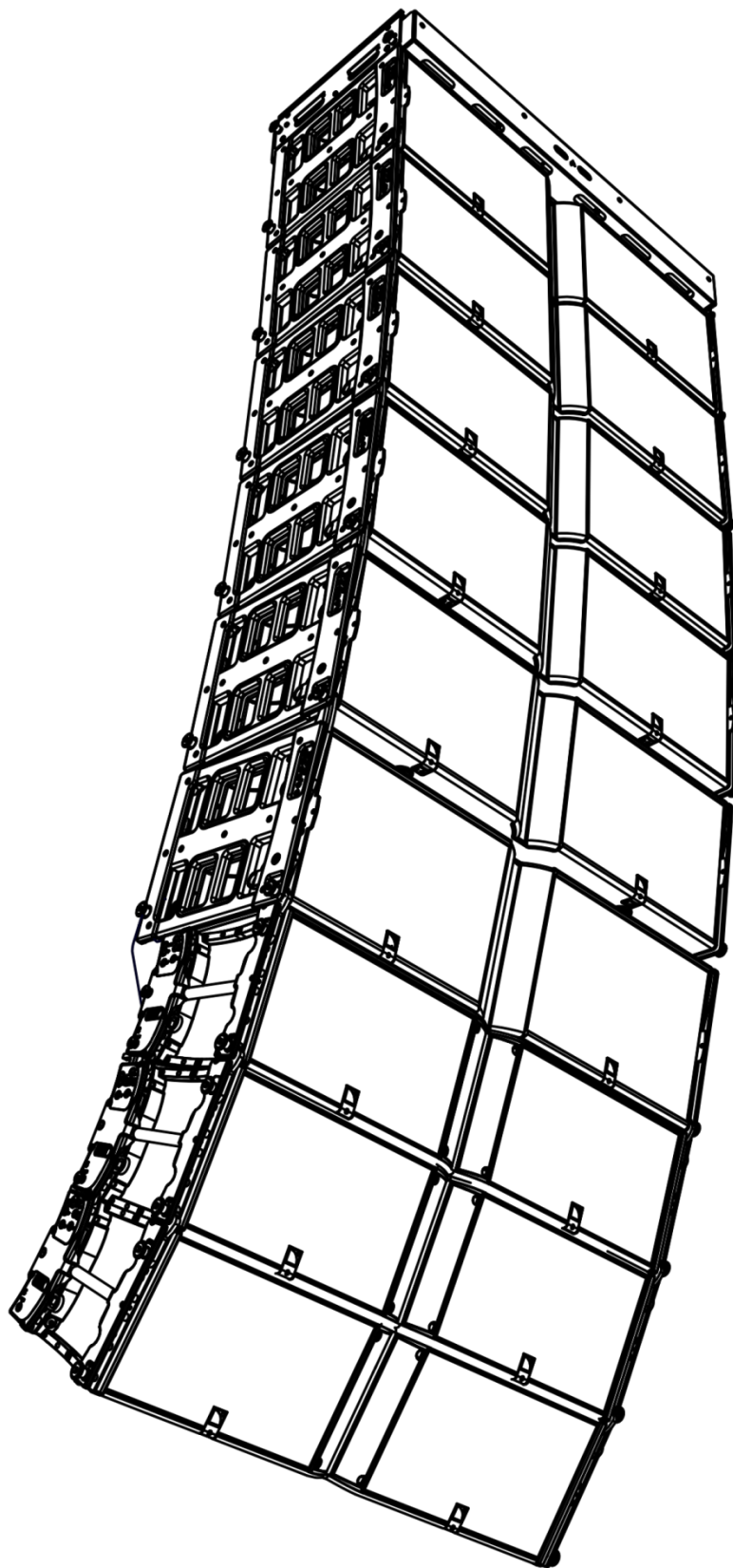


K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

VERSION 1.0



SAFETY INSTRUCTIONS

- 1. Read this manual**
- 2. Follow all SAFETY INSTRUCTIONS as well as DANGER and OBLIGATION warnings**
- 3. Never incorporate equipment or accessories not approved by L-ACOUSTICS®**
- 4. Read all the related PRODUCT INFORMATION documents before exploiting the system**
The product information document is included in the shipping carton of the related system component.
- 5. Work with qualified personnel for rigging the system**
Installation should only be carried out by qualified personnel that are familiar with the rigging techniques and safety recommendations outlined in this manual.
- 6. Ensure personnel health and safety**
During installation and set-up personnel must wear protective headgear and footwear at all times. Under no circumstances personnel is allowed to climb on a loudspeaker assembly.
- 7. Respect the Working Load Limit (WLL) of third party equipment**
L-ACOUSTICS® is not responsible for any rigging equipment and accessories provided by third party manufacturers. Verify that the Working Load Limit (WLL) of the suspension points, chain hoists and all additional hardware rigging accessories is respected.
- 8. Respect the maximum configurations and the recommended safety level**
For safety issue, respect the maximum configurations outlined in this manual. To check the conformity of any configuration in regards with the safety level recommended by L-ACOUSTICS®, model the system in SOUNDVISION and refer to the warnings in **Mechanical Data** section.
- 9. Be cautious when flying a loudspeaker array**
Always verify that no one is standing underneath the loudspeaker array when it is being raised. As the array is being raised, check each individual element to make sure that it is securely fastened to the adjacent element. Never leave the array unattended during the installation process. As a general rule, L-ACOUSTICS® recommends the use of safety slings at all times.
- 10. Be cautious when ground-stacking a loudspeaker array**
Do not stack the loudspeaker array on unstable ground or surface. If the array is stacked on a structure, platform, or stage, always check that the latter can support the total weight of the array. As a general rule, L-ACOUSTICS® recommends the use of safety straps at all times.
- 11. Take into account the wind effects on dynamic load**
When a loudspeaker assembly is deployed in an open air environment, wind can produce dynamic stress to the rigging components and suspension points. If the wind force exceeds 6 bft (Beaufort scale), lower down and/or secure the loudspeaker array.
- 12. Beware of sound levels**
Do not stay within close proximity of loudspeakers in operation and consider wearing earplugs. Loudspeaker systems are capable of producing very high sound pressure levels (SPL) which can instantaneously lead to permanent hearing damage to performers, production crew and audience members. Hearing damage can also occur with prolonged exposure to sound: 8 h at 90 dB(A), 30 min at 110 dB(A), less than 4 min at 130 dB(A).

SYMBOLS

The following symbols are used in this document:



DANGER

This symbol indicates a potential risk of harm to an individual or damage to the product.

It can also notify the user about instructions that must be strictly followed to ensure safe installation or operation of the product.



OBLIGATION

This symbol notifies the user about instructions that must be strictly followed to ensure proper installation or operation of the product.



WELCOME TO L-ACOUSTICS®

This document contains essential information on using and rigging the system properly and safely. Carefully read this document in order to become familiar with these procedures.

As part of a continuous evolution of techniques and standards, L-ACOUSTICS® reserves the right to change the specifications of its products and the content of its documents without prior notice.

Please check the L-ACOUSTICS® web site on a regular basis to download the latest document and software updates: www.l-acoustics.com.

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INTRODUCTION

The K2 system is acoustically and mechanically compatible with the K1 system:

- The K2-LINK is designed as an interface between the K1 and K2 rigging systems.
- The K2-BUMP is natively compatible with the K1 and K1 rigging system.

The objective of this technical bulletin is to provide all the necessary information to install and use a mixed K1 / K2 system.

K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

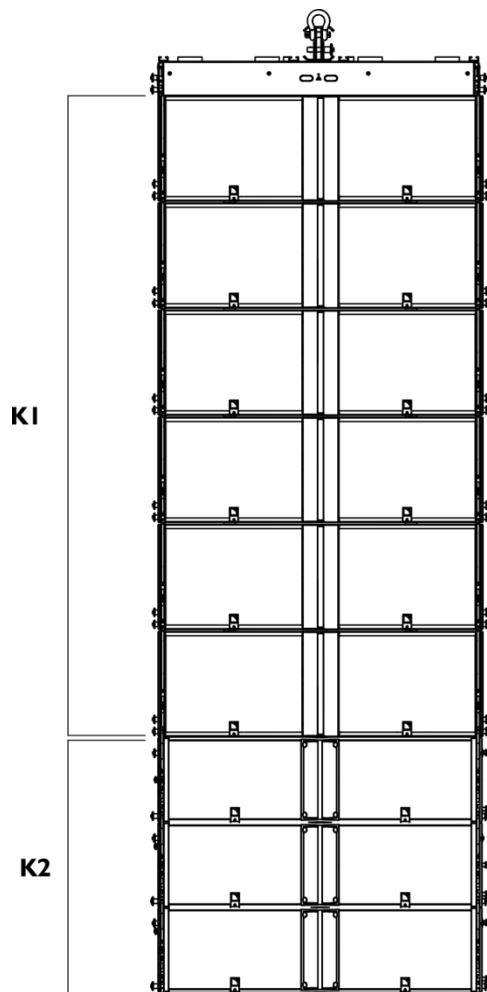
LOUDSPEAKER CONFIGURATION

It is possible to install a K2 line source as a downfill system for the main system of any K1 line source.

The [K2 70], [K2 90] and [K2 110] presets allow for a reference frequency response in long throw applications. Each preset is dedicated to a horizontal directivity setting.

The K1 enclosures are driven by the LA8 amplified controller. The K2 enclosures are driven by LA8 or LA4X.

K2 line source as a downfill system for K1 line source



Optimal K2 array

3 or 6 K2 enclosures

Enclosure | [PRESET]

K1 ▶ [K1]

K2 ▶ [K2 70] / [K2 90] / [K2 110]



All K1 configurations, with K1-SB and/or SB28, are compatible with a K2 line source downfill system.

Refer to the **K1 User manual** for more information.

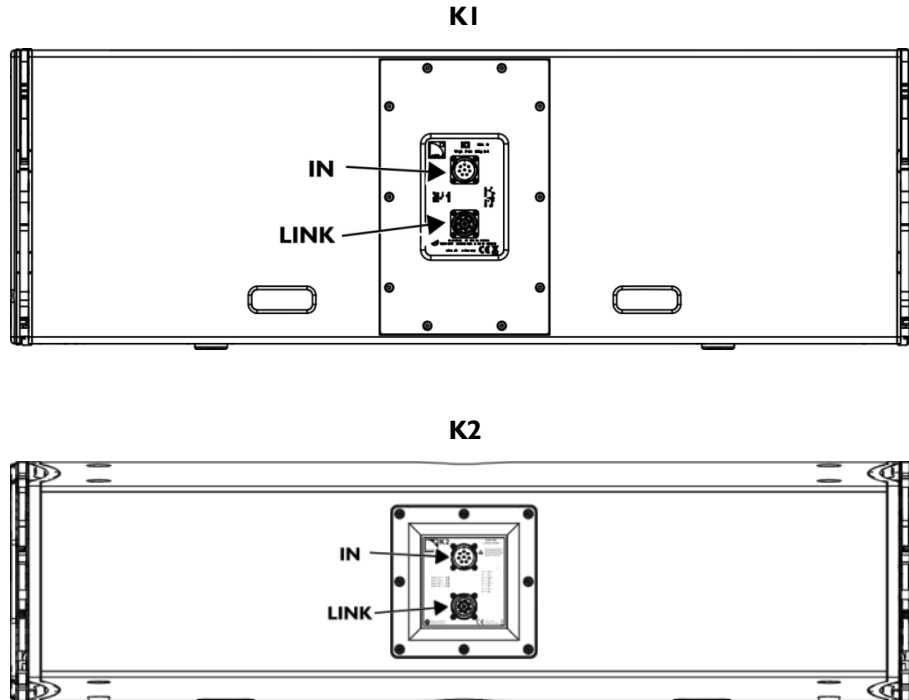


Always use the same preset library version for all the loudspeaker enclosures of a same system.

No pre-alignment delay needed between K1 and K2 enclosures in a mixed line source.

LOUDSPEAKER CONNECTION

Connectors



The K1 and K2 enclosures are equipped with two PA-COM[®] connectors wired in parallel.

The IN connector allows receiving the audio signals, whereas the LINK connector allows routing them to another similar enclosure in parallel.

i Internal pinout for L-ACOUSTICS[®] K1 and K2 enclosures

PA-COM [®] points	A/B	C/D	E/F	G/H
Transducer (as seen from the front)	Left LF speaker	Right LF speaker	MF section	HF section

The K1 and K2 enclosures are quad-amplified by the L-ACOUSTICS[®] LA8 amplified controller.

K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

Connecting K1 or K2 to LA8



Maximum of 2 K1 per LA8

A single LA8 amplified controller can drive up to 2 K1 enclosures in parallel.

Maximum of 3 K2 per LA8

A single LA8 amplified controller can drive up to 3 K2 enclosures in parallel.



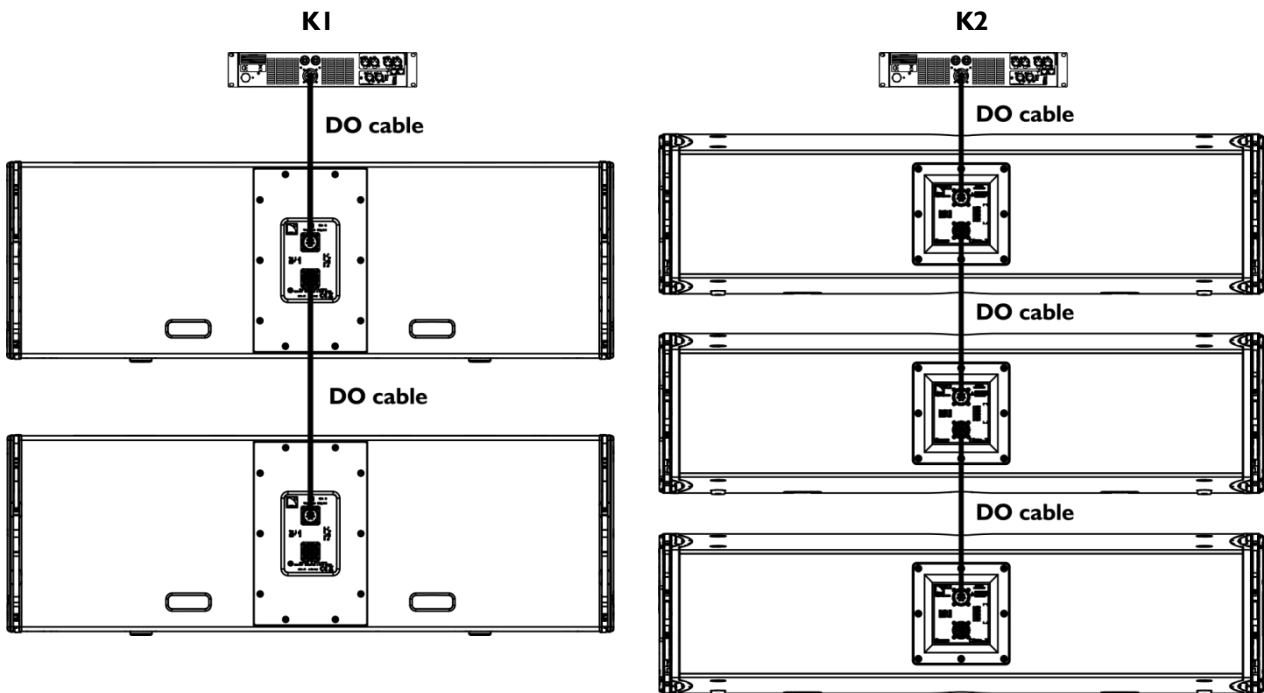
K1 Impedance load

1 enclosure	8 Ω
2 enclosures	4 Ω

K2 Impedance load

	LF	MF	HF
1 enclosure	8 Ω	8 Ω	16 Ω
2 enclosures	4 Ω	4 Ω	8 Ω
3 enclosures	2.7 Ω	2.7 Ω	5.2 Ω

- ▶ Use a **DO** cable (DO.7, DO10 or DO25) to connect the LA8 PA-COM[®] connector to the **K1 / K2 IN** connector.
- ▶ Use **DO** cables to connect **additional K2** enclosures in parallel with the first one.



PRESET DESCRIPTION

[K1] and [K2 70] / [K2 90] / [K2 110]

The [K1], [K2 70], [K2 90] and [K2 110] presets allow for a reference frequency response in long throw applications. Each K2 preset is dedicated to a horizontal directivity setting.

Loudspeaker elements		Amplifier outputs	Channels	Default parameters				
				Routing	Gain	Delay	Polarity	Mute
K1 or K2	Left LF	OUT 1	LF	IN A	0 dB	0 ms	+	ON
	Right LF	OUT 2	HF					ON
	MF	OUT 3	MF					ON
	HF	OUT 4	HF					ON

* Left/right when looking at the front face of the enclosure.



It is not necessary to add pre-alignment delays for K1 / K2 mixed line sources.

Refer to the PRESET GUIDE for the necessary pre-alignment when using additional subwoofers.

MECHANICAL SAFETY

Mechanical limits

The K1 / K2 rigging system complies with 2006/42/EC: Machinery Directive. It has been designed following the guidelines of BGV-C1.

2006/42/EC: Machinery Directive specifies a safety factor of 4:1 against the rupture. The limits specified in the tables below correspond to deployments with a safety factor of 4:1 or higher.

The **safe limit** gives the maximum number of elements for which the safety factor is always compliant with the 2006/42/EC: Machinery Directive, regardless of the other deployment parameters (site angles, inter-enclosure angles, etc.).

The **maximum limit** gives the maximum number of elements for which the safety factor can be compliant with the 2006/42/EC: Machinery Directive, when the other deployment parameters provide the best mechanical conditions.

Flown	Safe limit	Maximum limit
K2-BUMP K2-BUMP + K2-BAR	16 K2 14 K2 + 2 LA-RAK 10 K1 + 2 LA-RAK	24 K2 + 2 LA-RAK 12 K1 + 2 LA-RAK



SOUNDVISION and mechanical safety

To deploy more elements than the safe limits, or when mixing different type of loudspeaker enclosures within the same array, always model the system in SOUNDVISION before installation, and check the Mechanical Data section for any stress warning or stability warning.

Assessing mechanical safety

In order to assess the actual safety of any array configuration before implementation, refer to the following warnings:



Rated working load limit (WLL) is not enough

The rated WLL is an indication of the element resistance to tensile stress. For complex mechanical systems such as loudspeaker arrays, WLLs cannot be used per se to determine the maximum number of enclosures within an array or to assess the safety of a specific array configuration.



Mechanical modeling with SOUNDVISION

The working load applied to each linking point, along with the corresponding safety factor, will depend on numerous variables linked to the composition of the array (type and number of enclosures, splay angles) and the implementation of the flying or stacking structure (number and location of flying points, site angle). This cannot be determined without the complex mechanical modeling and calculation offered by SOUNDVISION



Assessing the safety with SOUNDVISION

The overall safety factor of a specific mechanical configuration always corresponds to the lowest safety factor among all the linking points. Always model the system configuration with the SOUNDVISION software and check the Mechanical Data section to identify the weakest link and its corresponding working load. By default, a *stress warning* will appear when the mechanical safety goes beyond the recommended safety level.



Safety of ground-stacked arrays in SOUNDVISION

For ground-stacked arrays, a distinct *stability warning* is implemented in SOUNDVISION. It indicates a tipping hazard when the array is not secured to the ground, stage or platform. It is user responsibility to secure the array and to ignore this warning.



Consideration must be given to unusual conditions

SOUNDVISION calculations are based on usual environmental conditions. A higher safety factor is recommended with factors such as extreme high or low temperatures, strong wind, prolonged exposition to salt water, etc. Always consult a rigging specialist to adopt safety practices adapted to such a situation.

SYSTEM SETUP



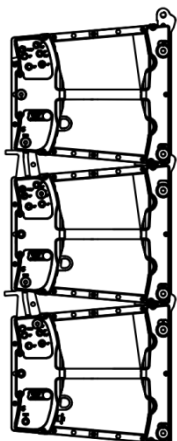
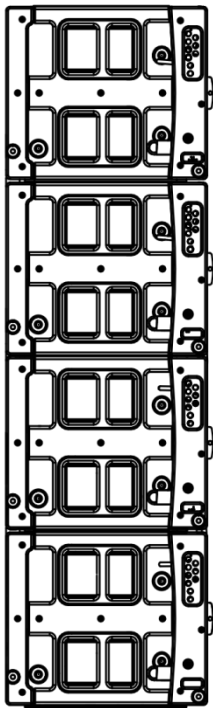
At least one motor for each K2-BAR

When using two K2-BAR, do not implement a bridle between the bars.



Model your configuration in SOUNDVISION before setting up the system.

Refer to your SOUNDVISION simulation to choose a shackle hole and define the position of the K2-BAR, if needed, on the K1-BUMP or K2-BUMP.



K1 array setup

- ▶ Refer to your SOUNDVISION model to define which flying frame to use.

If you are using the K1-BUMP:

- ▶ Refer to the **K1 rigging manual** to set up the K1 part of the array.

Or if you are using the K2-BUMP:

- ▶ Place an open a K2-BUMPFLIGHT under the motor.
- ▶ *If necessary*, attach one or two K2-BAR to the K2-BUMP.
- ⓘ Refer to **PROCEDURE A**.
- ▶ *If necessary*, stack one or two LA-RAK on the K2-BUMP.
- ⓘ Refer to **PROCEDURE G**.
- ⓘ Refer to **APPENDIX PICKUP POINTS GUIDELINES** when stacking only one LA-RAK.
- ▶ Attach the shackles.
- ▶ Refer to SOUNDVISION for the number and position of the shackles.
- ▶ Lift the assembly so you can position a block of K1 under it.
- ▶ Attach the K1 block to the K2-BUMP.
- ⓘ Refer to **PROCEDURE B**.
- ▶ Repeat the last two steps until the K1 array is complete.

K2 array setup

- ▶ Prepare all the blocks of 4 K2 necessary to build the array
- ⓘ *If a block is not built already*, refer to **PROCEDURE C**.
- ▶ Preset the inter-enclosures angles.
- ⓘ Refer to **PROCEDURE D**.

K1 and K2 arrays connection

- ▶ Lift the K1 array so you can position a block of four K2 under it.
- ▶ Using two K2-LINK interfaces, attach the block of K2 under the K1 array.
- ⓘ Refer to **PROCEDURE E**.
- ⚠ Verify that the rear rigging arms are secured by pins and that no yellow label is visible on the front.
- ▶ Lift the array so you can position a block of four K2 under it.
- ⚠ Verify that no yellow label is visible on both sides of the array.
- ▶ Attach the block of four K2 to the bottom enclosure of the array.
- ⓘ Refer to **PROCEDURE F**.
- ⚠ Verify that the rear rigging arms are secured by pins and that no yellow label is visible on the front.
- ▶ Repeat the last two steps until the array is complete.
- ▶ Raise the array to its final trim height.
- ▶ Adjust site and azimuth angles.

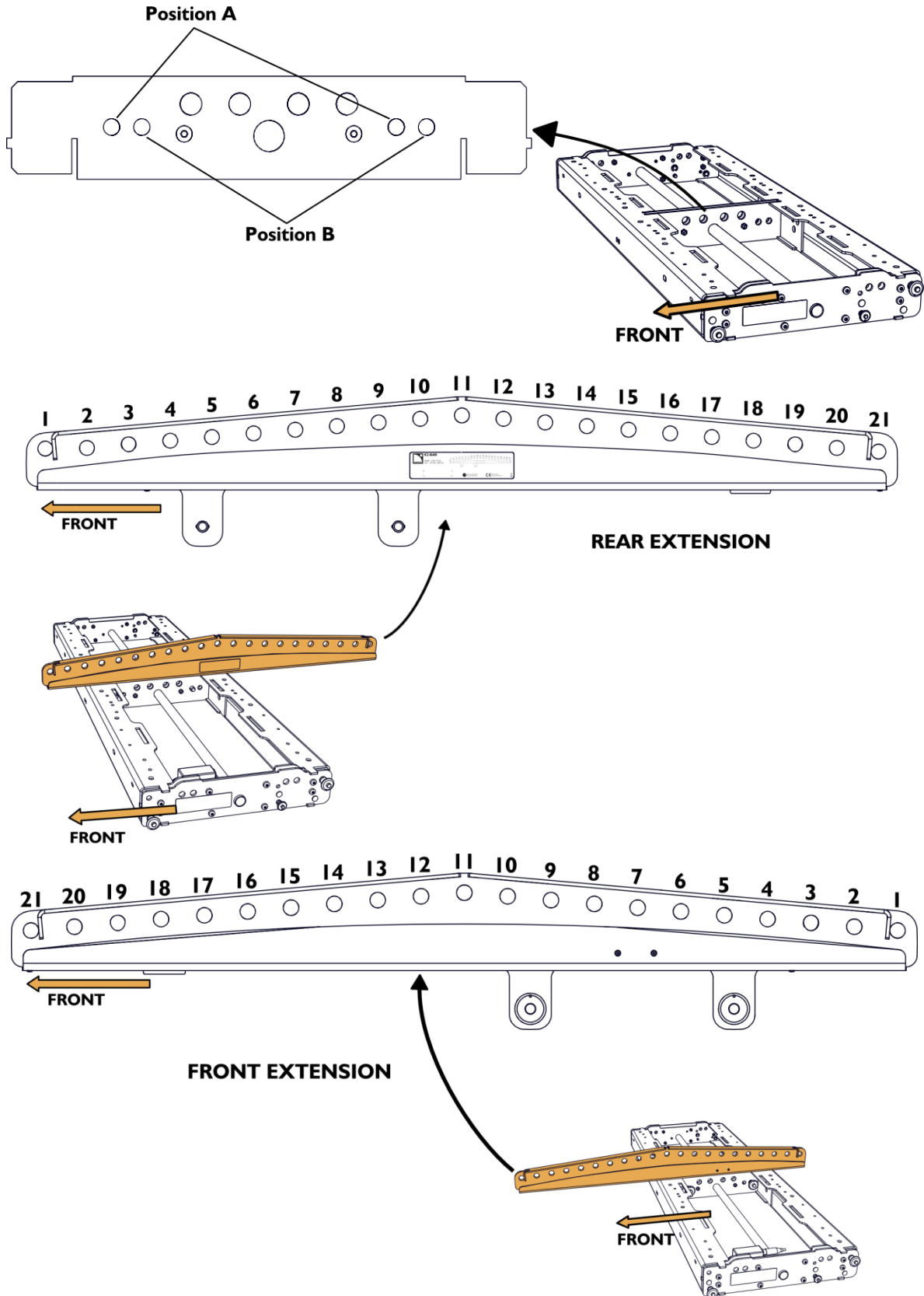
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

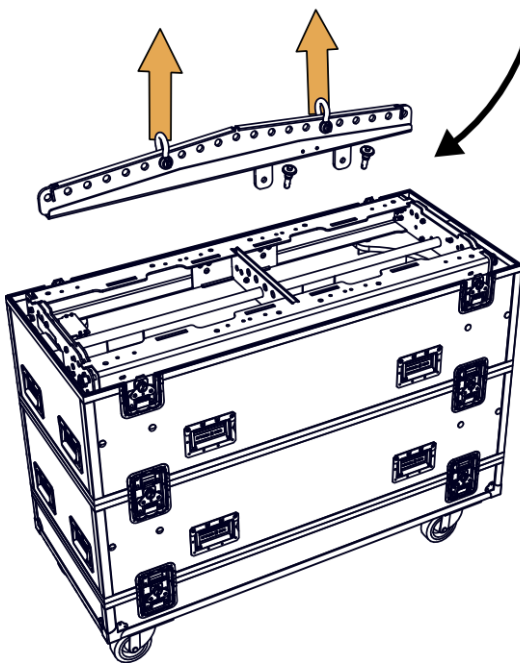
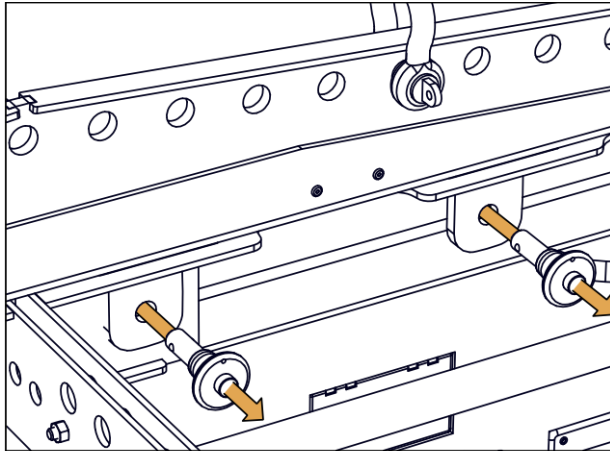
SUBSET PROCEDURES

PROCEDURE A. Attaching K2-BAR on K2-BUMP

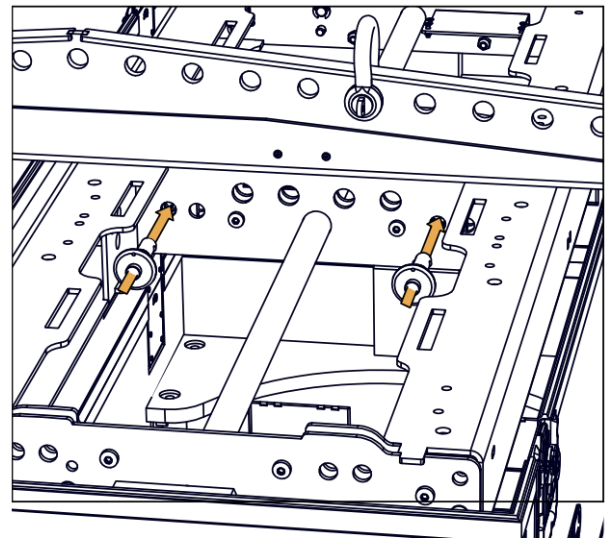
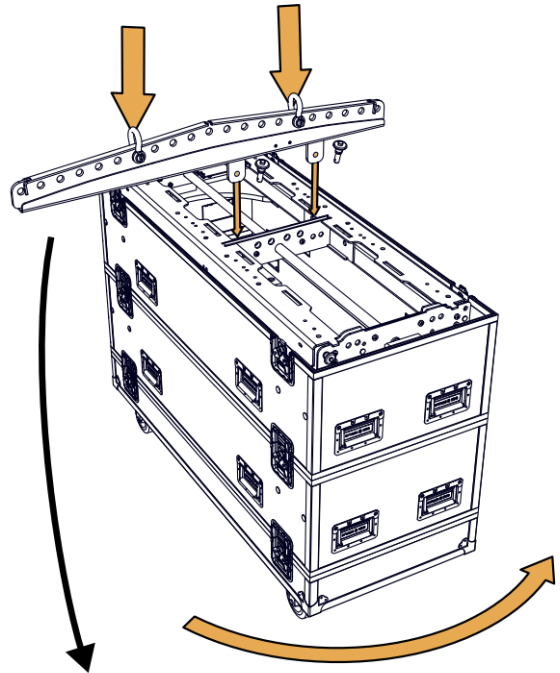
13. Refer to your SOUNDVISION model to identify the extension and position of the bar.



14. Remove the pins and lift the K2-BAR using the motor.



15. Turn the K2-BUMP-FLIGHT 90°, lower the K2-BAR and pin it according to the chosen flying option (position A or B, in front or rear extension)

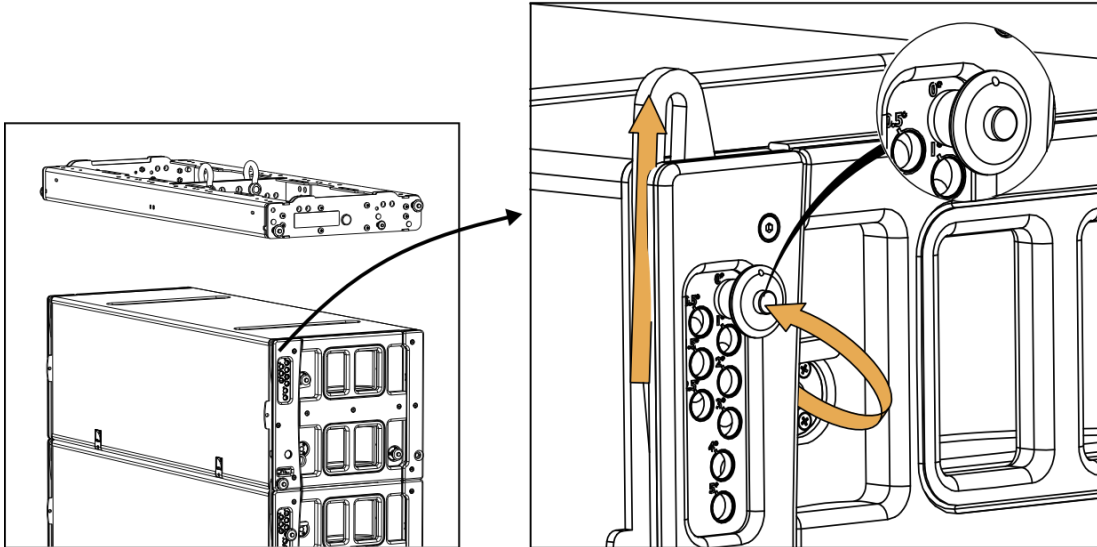


K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

PROCEDURE B. Attaching K1 or KI under K2-BUMP

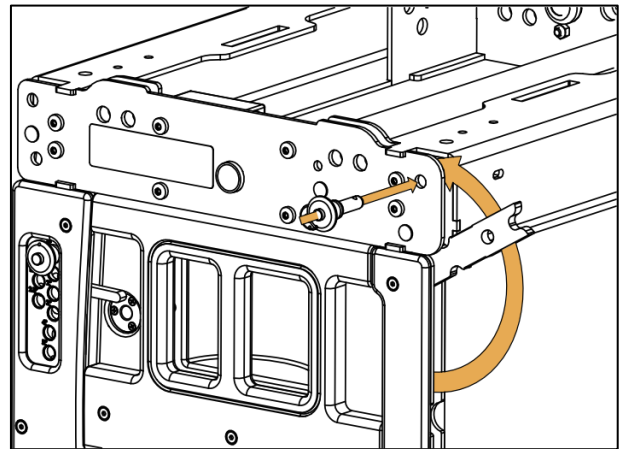
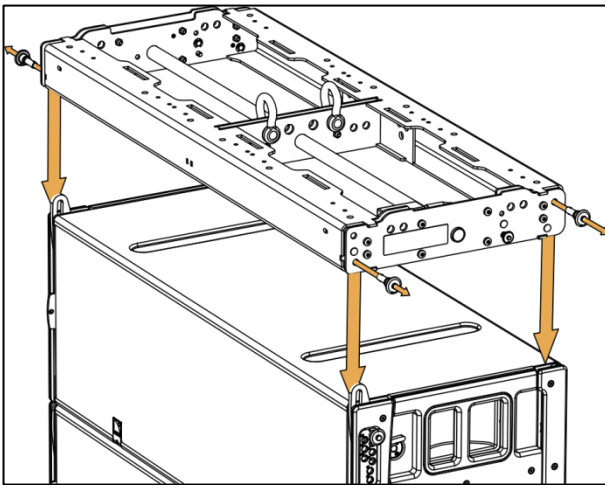
1. Slide out K1 front rigging arm and pin it at 0° on both sides.



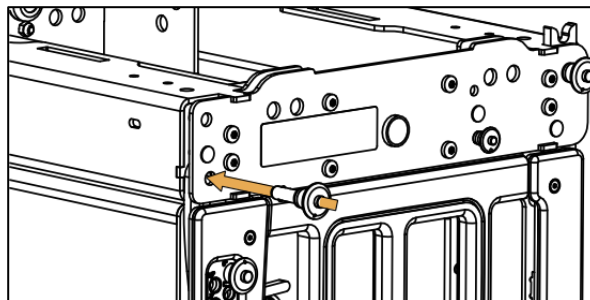
2. Attach the K2-BUMP to the K1 elements block.

*Remove the K2-BUMP rear and front pins on both sides.
Lower the K2-BUMP so it rest on the topmost enclosure.*

Rotate the rear rigging arm and pin it to the frame.



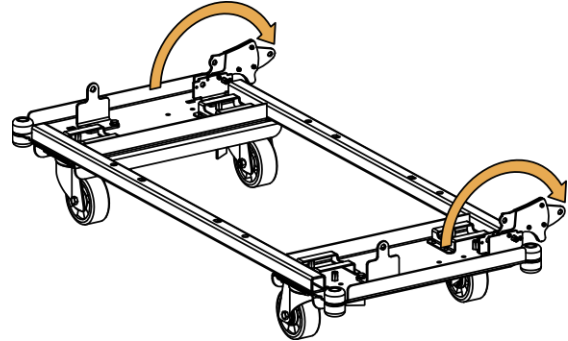
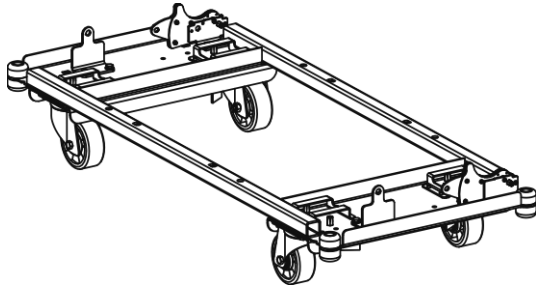
Pin the front rigging arm to the frame.



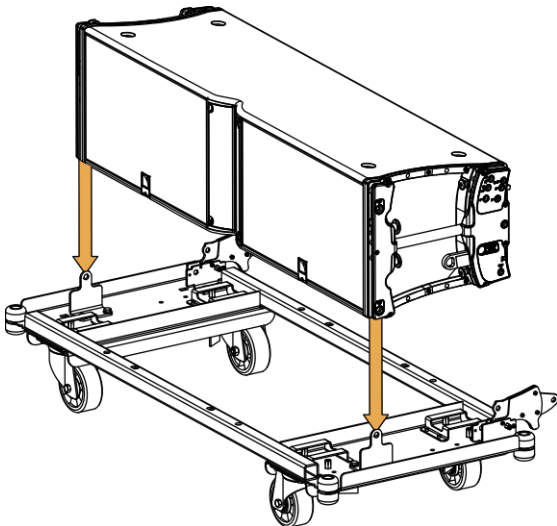
PROCEDURE C. Preparing a block of 4 K2

1. Attach a K2 enclosure on K2-CHARIOT.

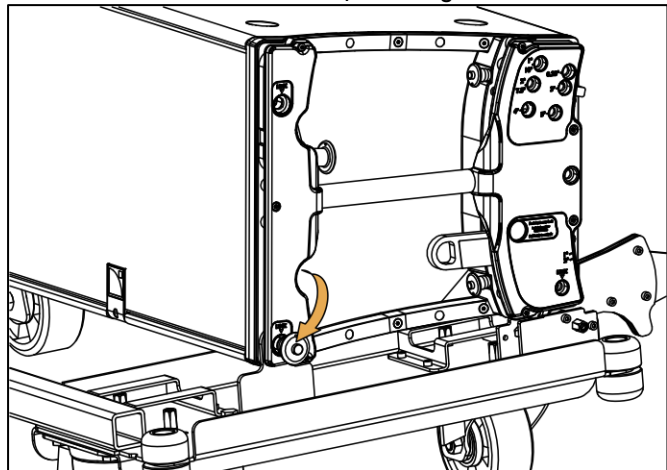
Fully rotate the rear rigging arms of the K2-CHARIOT.



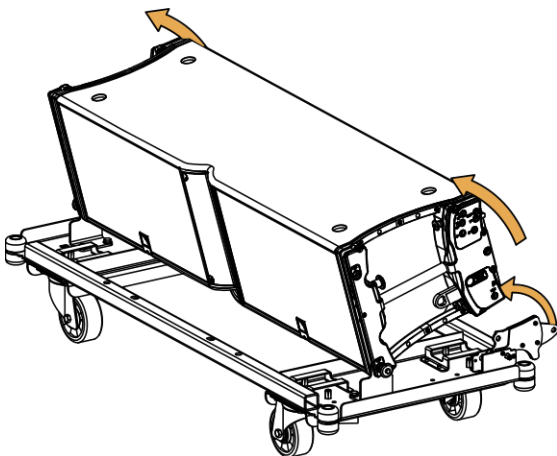
Position the K2 enclosure on the K2-CHARIOT dolly



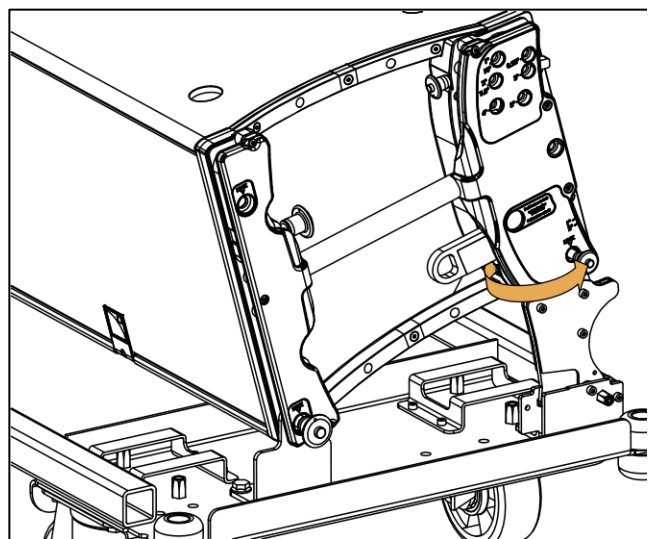
Secure the enclosure at the front using the LINK hole.



Lift the rear of the enclosure and rotate the dolly rear rigging arm in its upward position.



Secure the enclosure using the LINK hole.



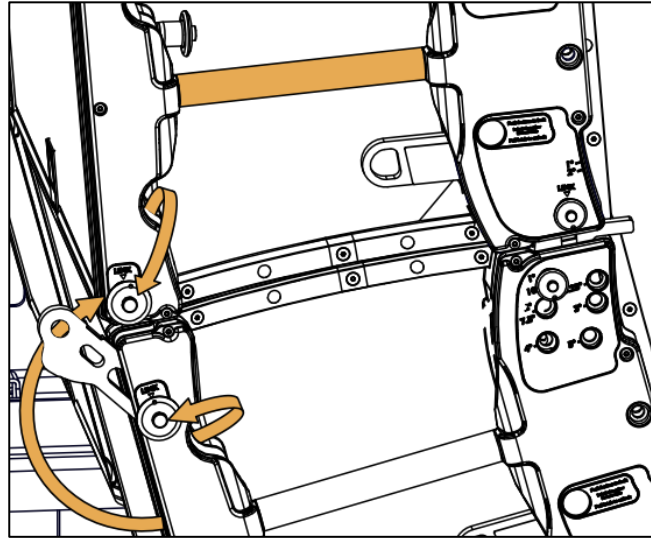
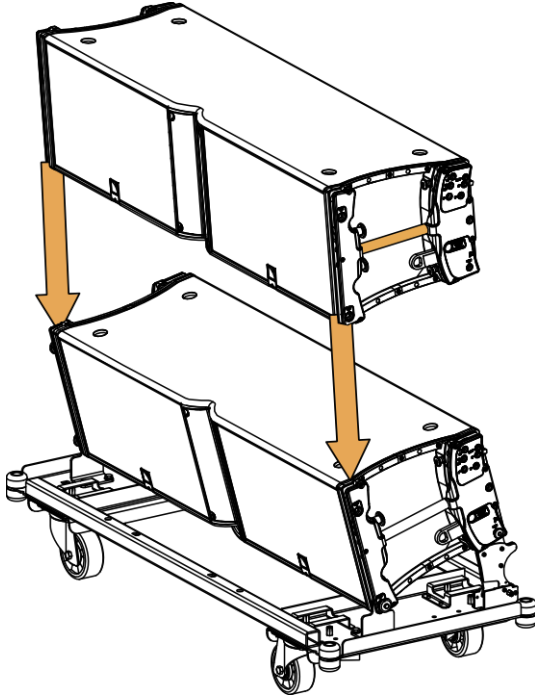
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

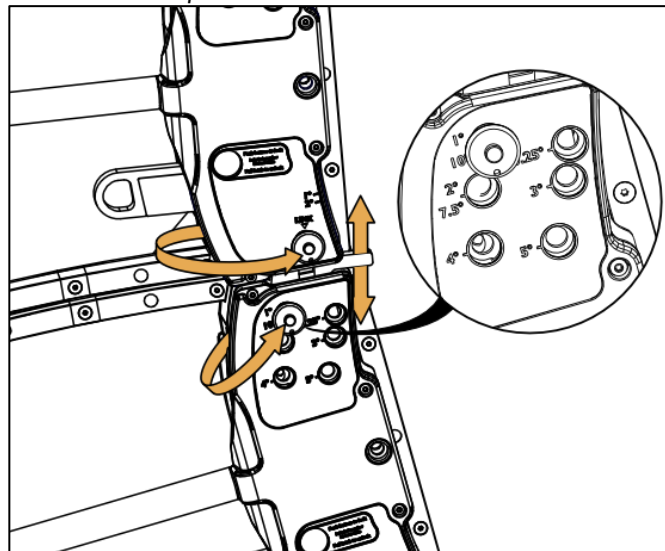
3. Attach the other K2 enclosures on top of each other until the block of four is complete.

While holding the handle, rotate the front rigging arm and secure it with both LINK pins.

Position a K2 enclosure on the first one.

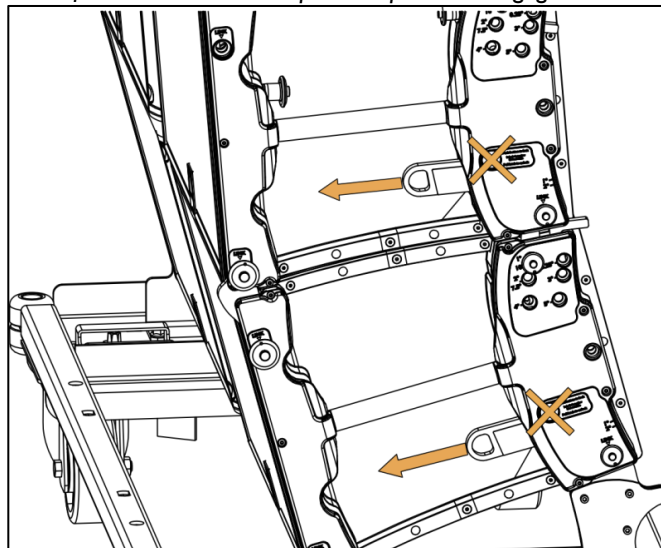


Slide the rear rigging arm and secure it with both pins, in the LINK and 10° holes.



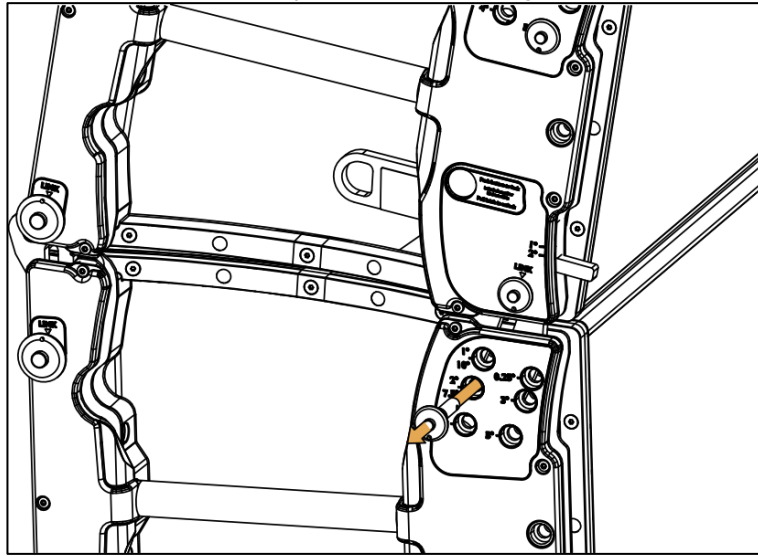
Keep holding the enclosure in position with the handles until the front rigging arm is secured.

4. Make sure the automatic locking system button is unloaded .
If the button has been pressed, pull to disengage the latch

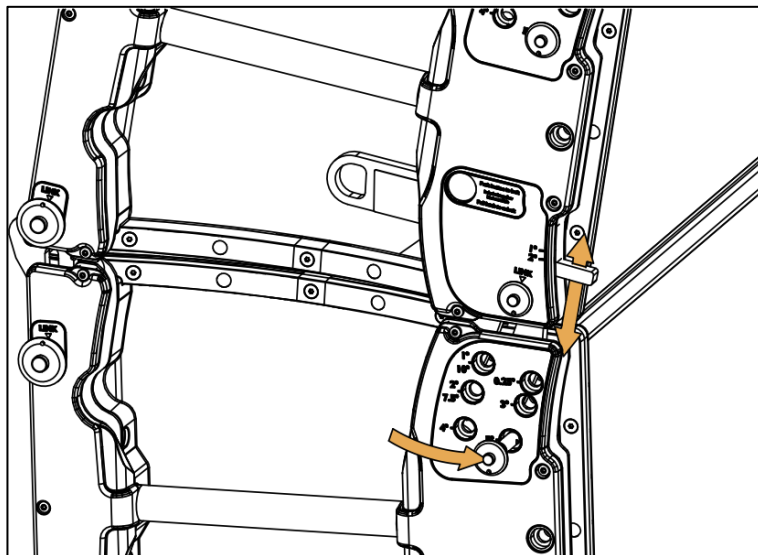


PROCEDURE D. Preset the inter-enclosure angles

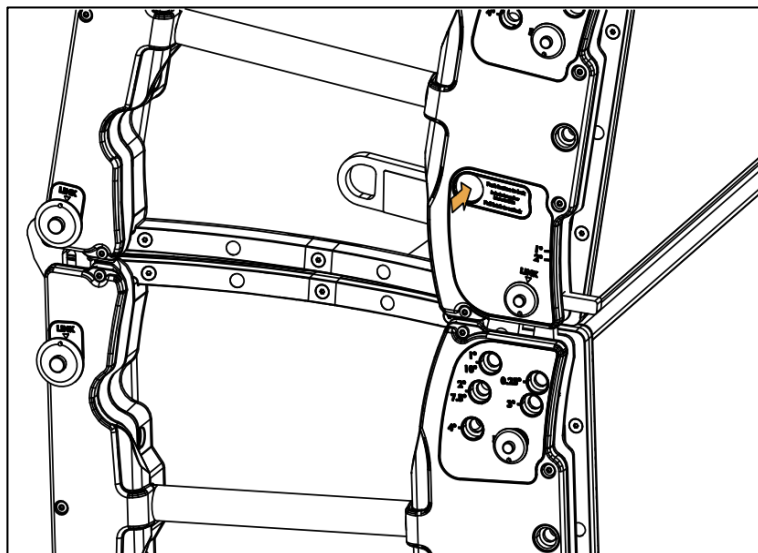
On both sides:
 Remove the pin from its current angle hole



Position the pin at the chosen angle hole and slide the rigging arm until the pin goes in.



Press the lock button



K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

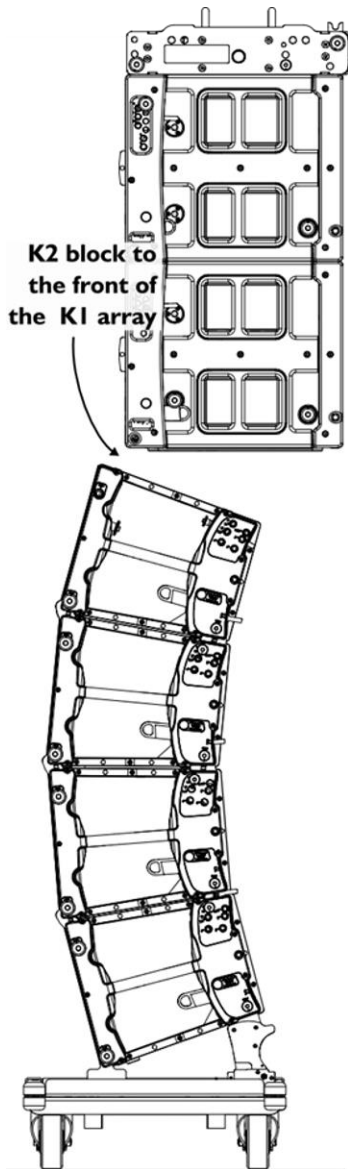
PROCEDURE E. Attaching a block of four K2 under a K1 system element



Preset inter-enclosure angles

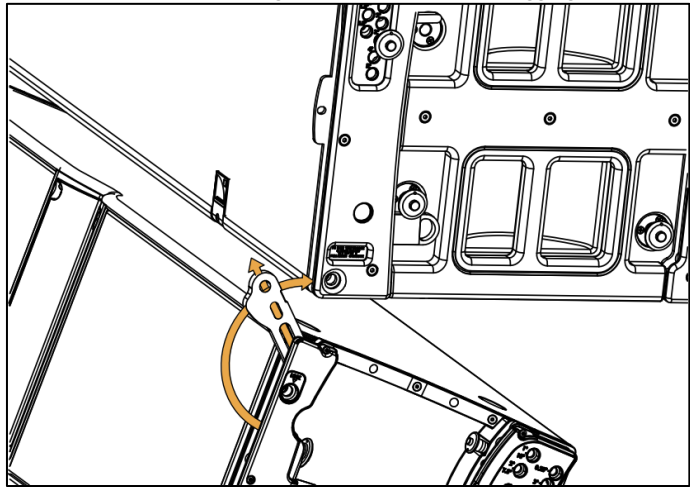
Preset the K2 inter-enclosure angles before performing this procedure.

Refer to **PROCEDURE D**.

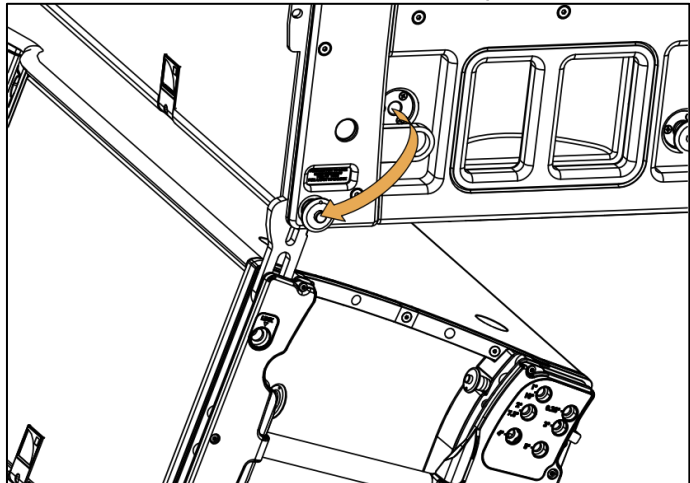


1. Attach the front rigging arm on both sides.

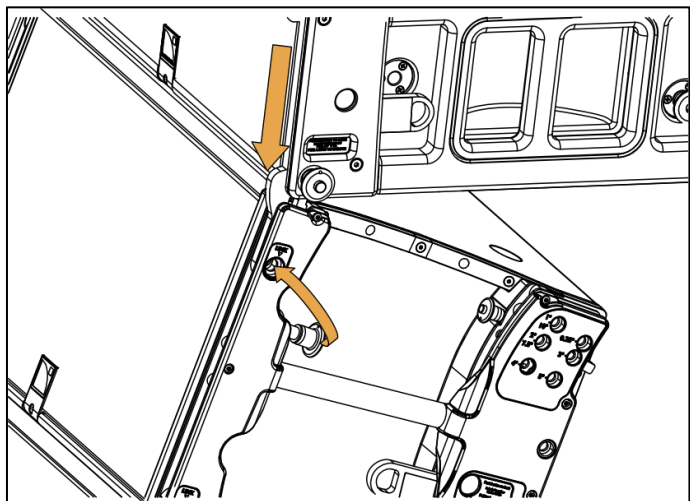
Rotate the arm to align its hole with the K1 rigging hole.



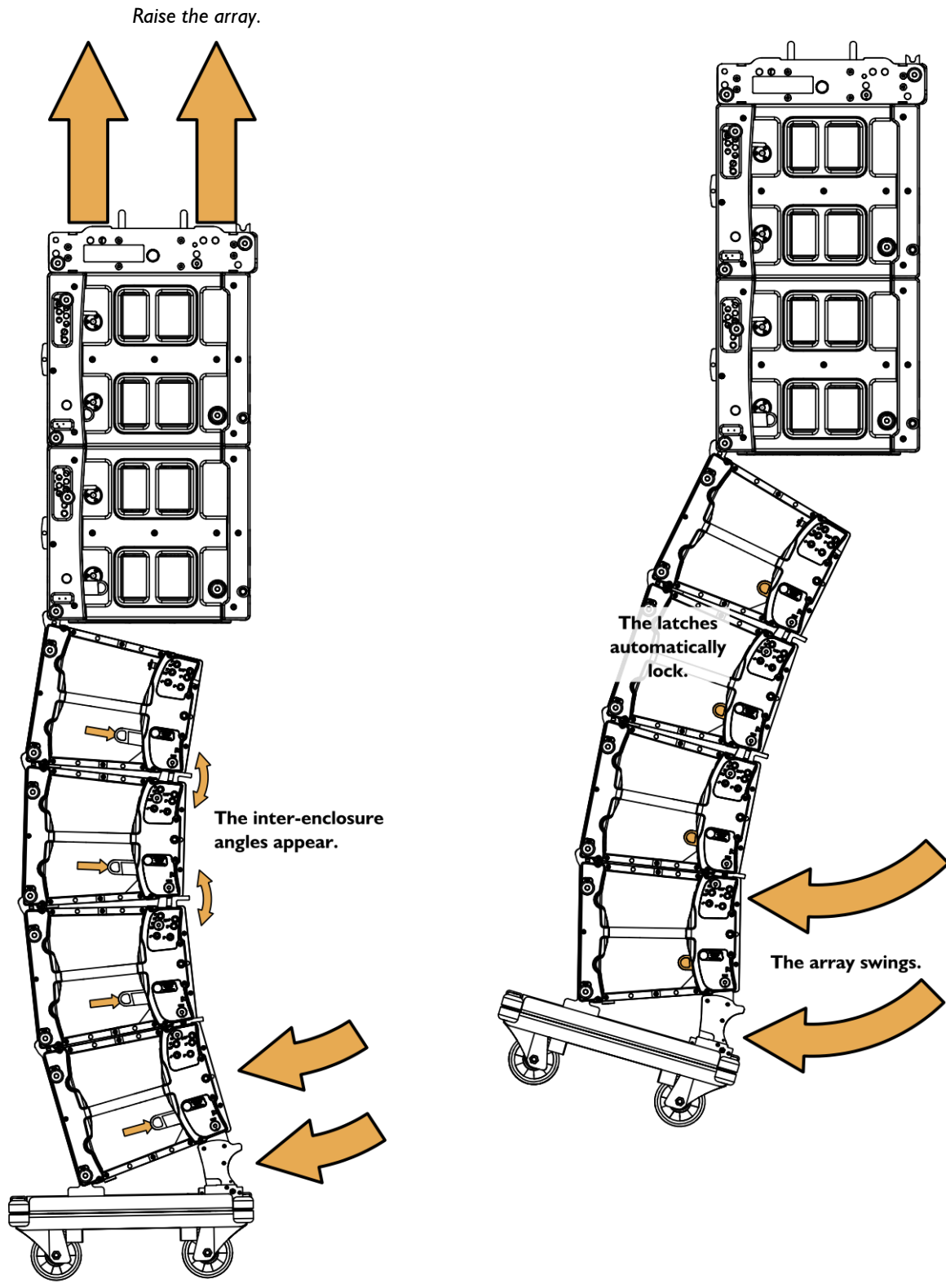
Pin the arm to the flown array.



Lower the flown array and secure the assembly with the LINK pin. If you cannot insert the pin, move the flown array back and forth with enclosure handle.



2. Lock the inter-enclosure angles.

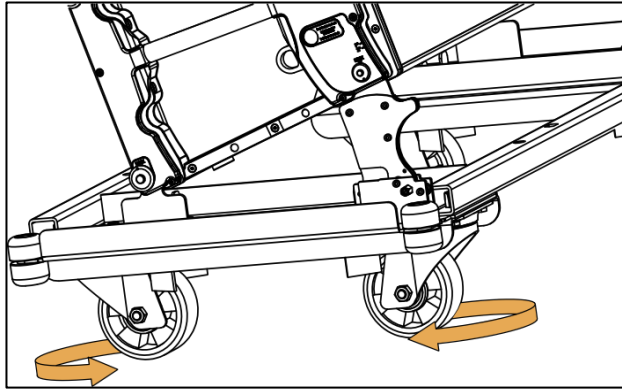


K2 DOWNFILL FOR K1

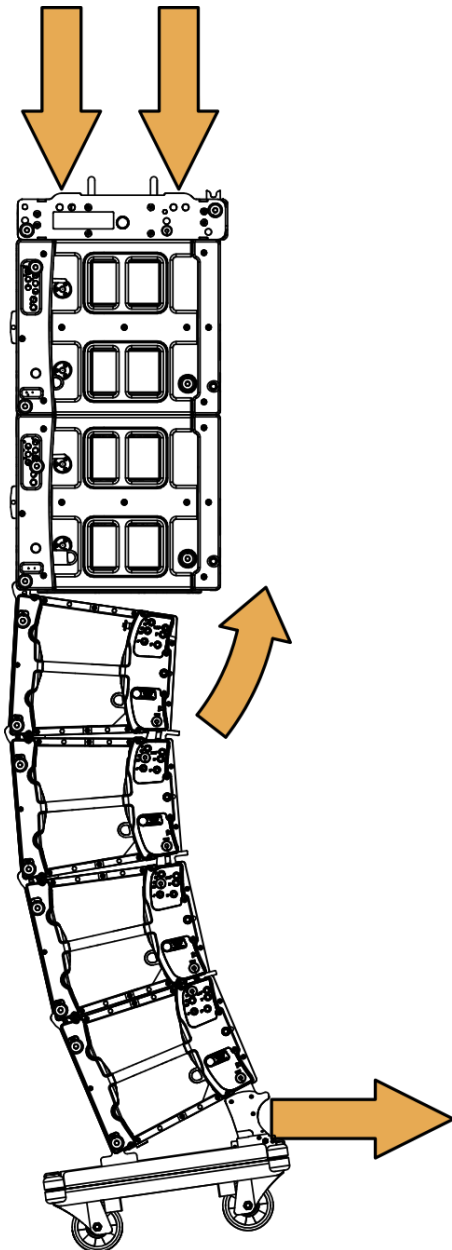
TECHNICAL BULLETIN

3. Attach the K2-LINK interfaces to the K1.

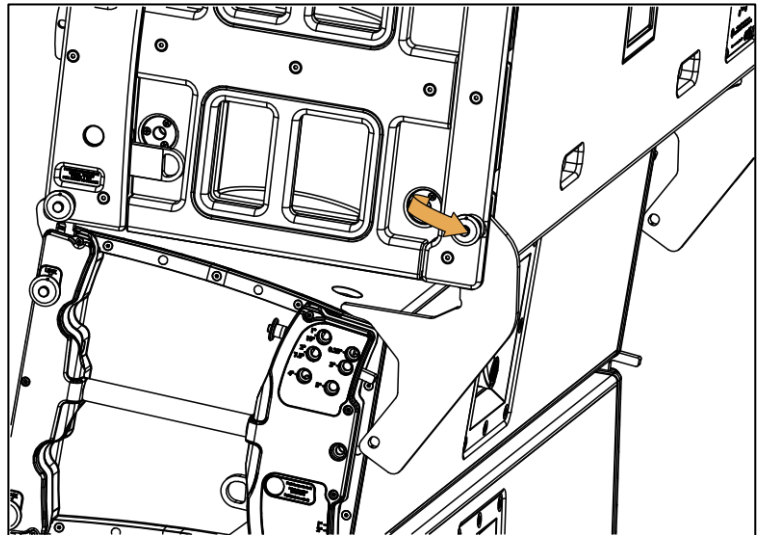
Turn the wheels inside the dolly.



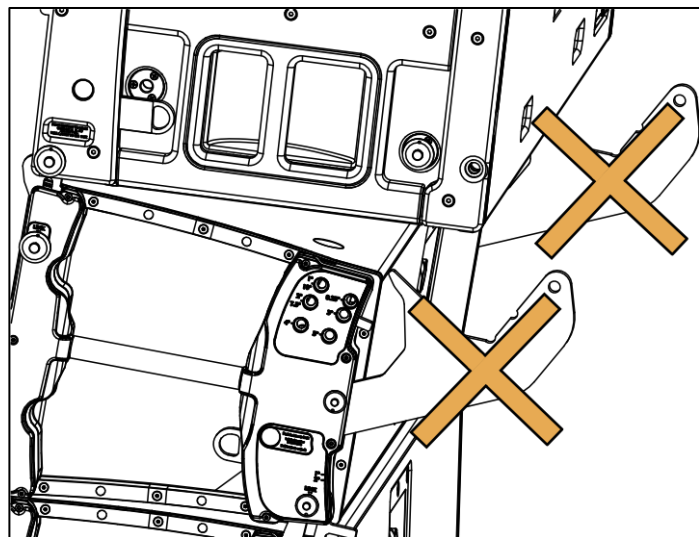
Pull back the bottom enclosures while lowering the array until only the front wheel touches the ground.



On both sides, attach a K2-LINK at the back of the K1 enclosure.

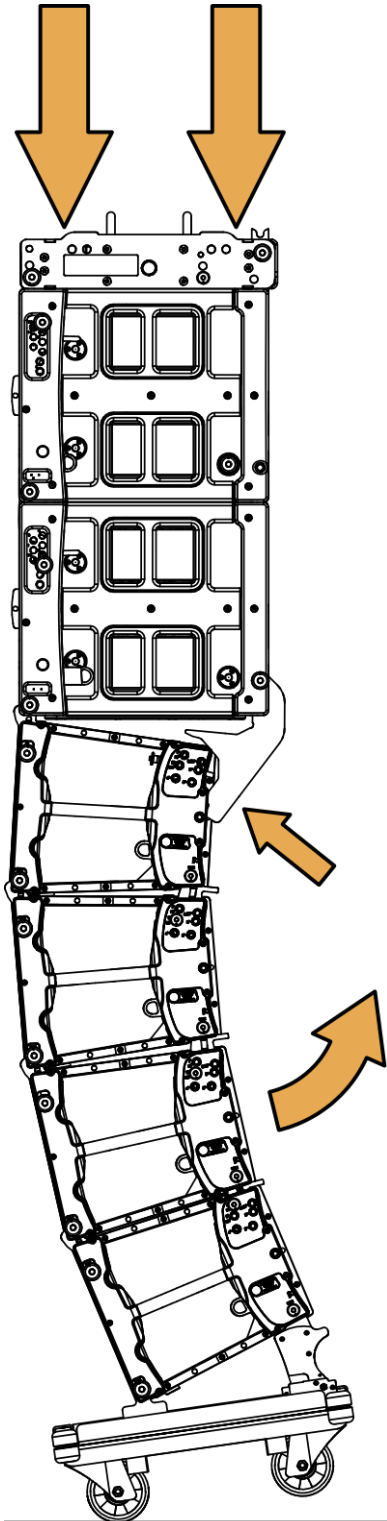


Do not pin K2-LINK to K2.

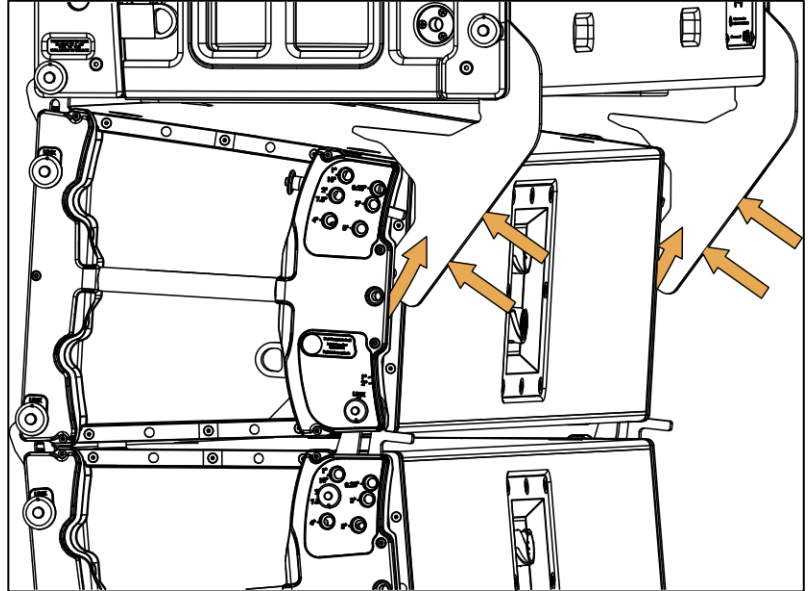


4. Attach the K2-LINK to the K2 enclosure.

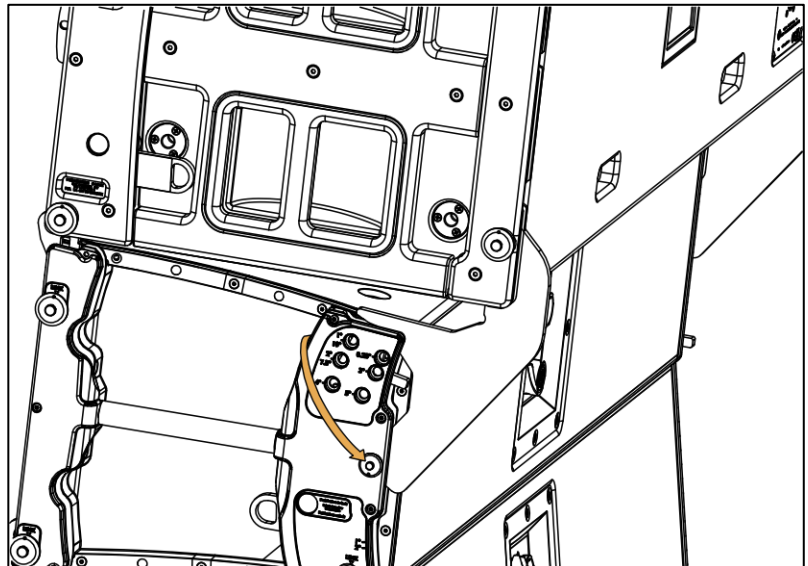
Lower the array



Push the K2-LINK to guide it into the K2 rigging.



Secure the K2-LINK to the K2 rigging middle hole.

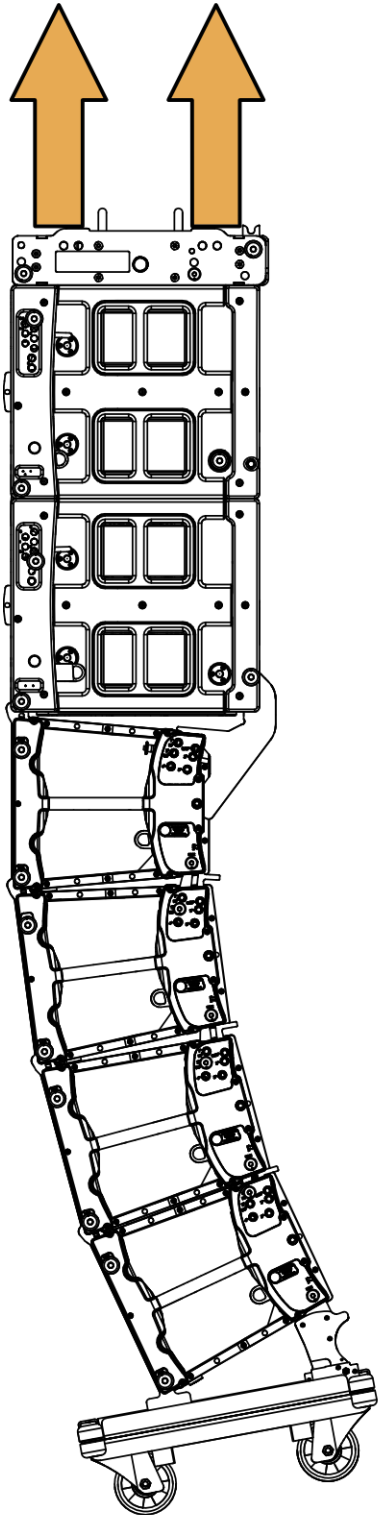


K2 DOWNFILL FOR K1

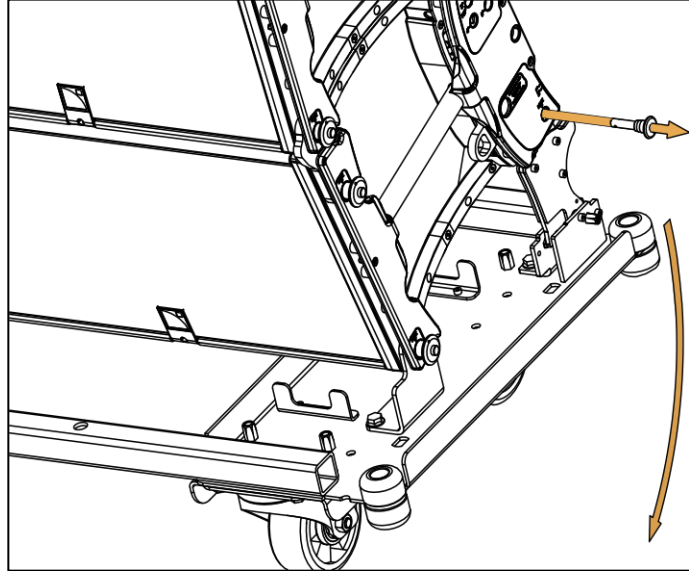
TECHNICAL BULLETIN

5. Remove the K2-CHARIOT

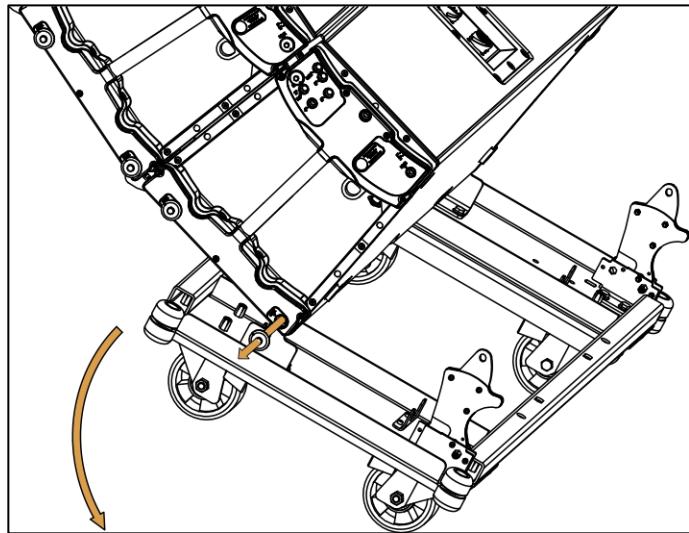
Raise the array



Hold the dolly with one hand.
Remove the back pin on both sides.



Hold the dolly with one hand.
Remove the front pin on both sides.



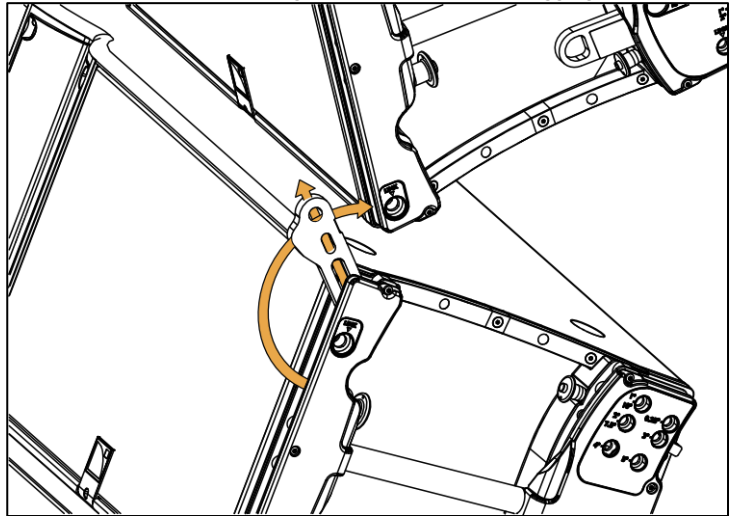
PROCEDURE F. Attaching a block of four K2 under K2

1. Attach the front rigging arm on both sides.

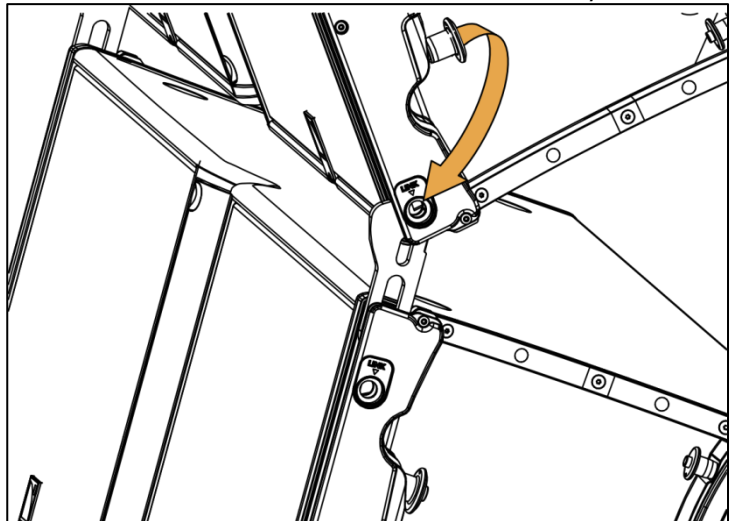


Preset inter-enclosure angles
 Preset the K2 inter-enclosure angles before performing this procedure. Refer to **PROCEDURE D.**

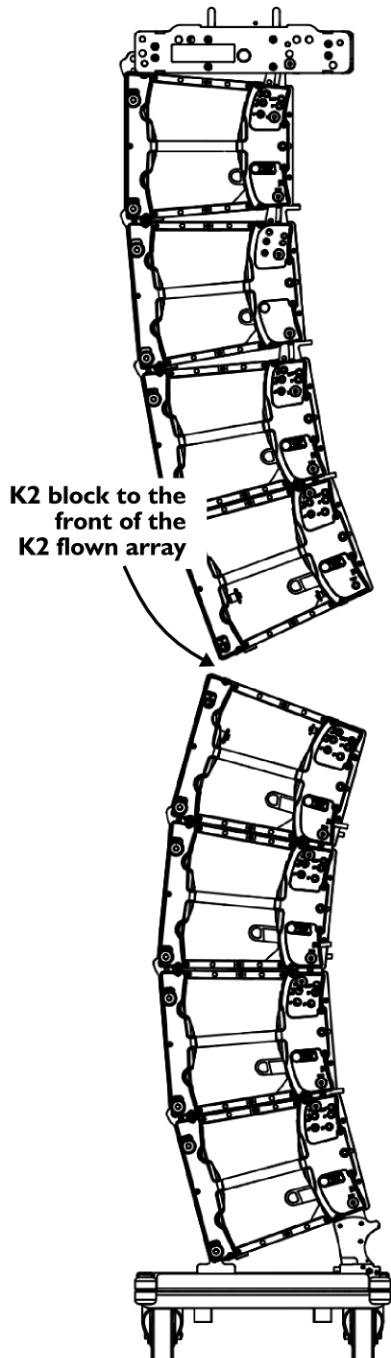
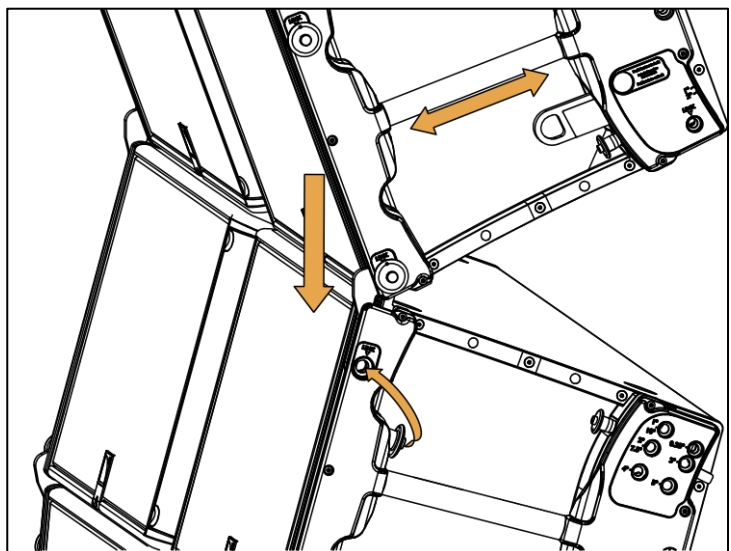
Rotate the arm to align its hole with the K2 rigging hole.



Pin the arm in the LINK hole of the flown array.



Lower the flown array and secure the assembly with the LINK pin. If you cannot insert the pin, move the flown array back and forth with enclosure handle.

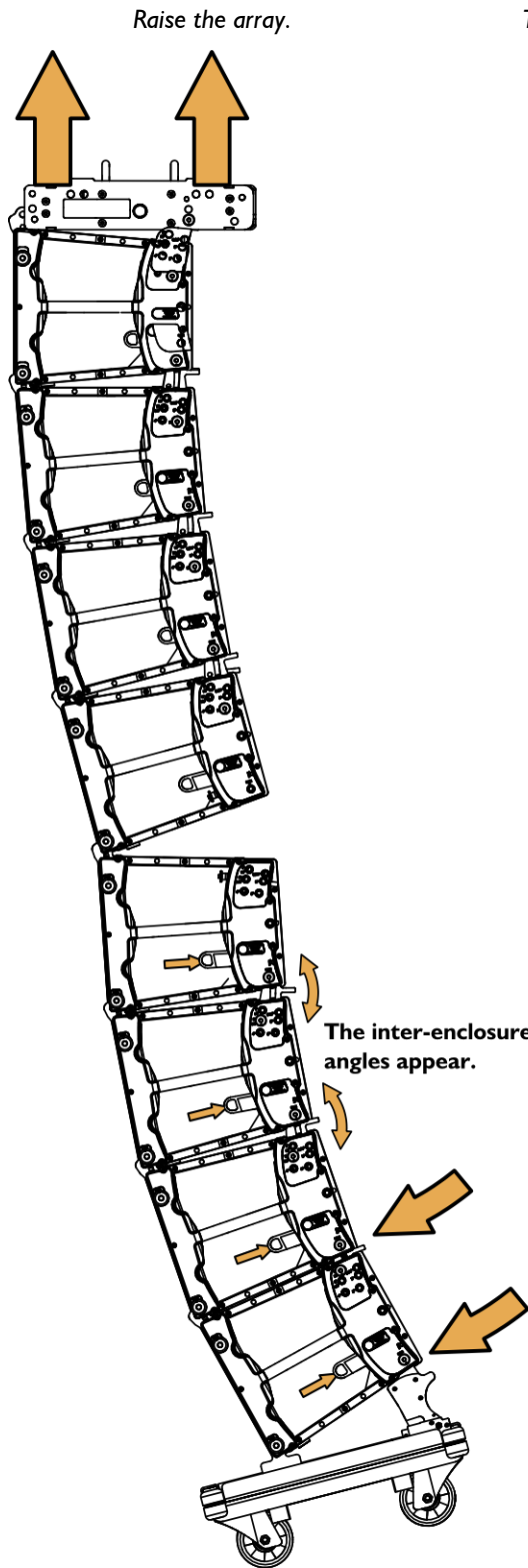


K2 block to the front of the K2 flown array

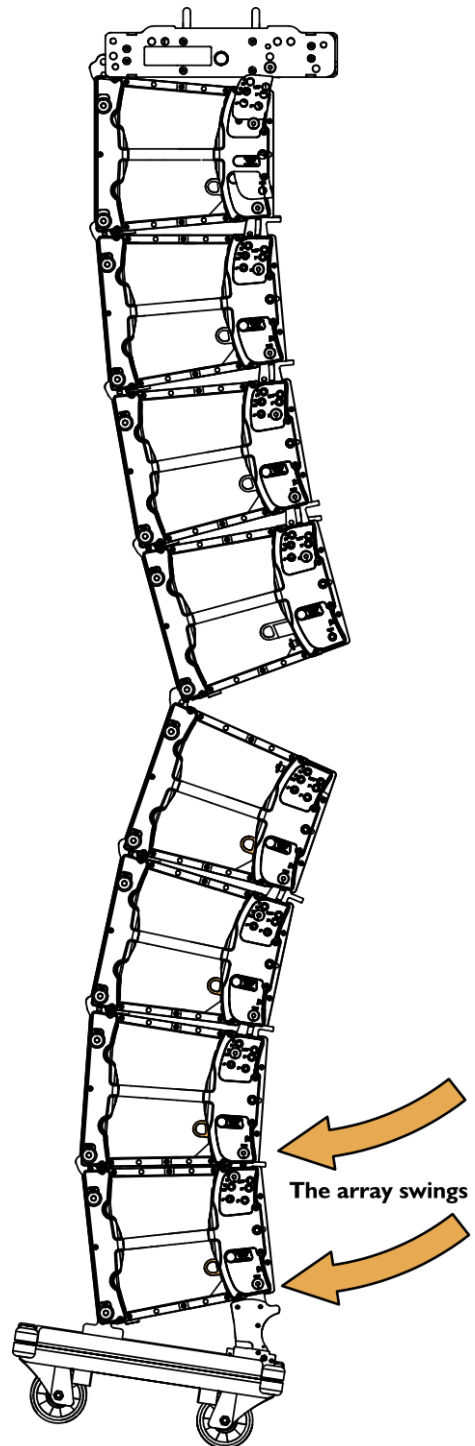
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

2. Lock the inter-enclosure angles of the block

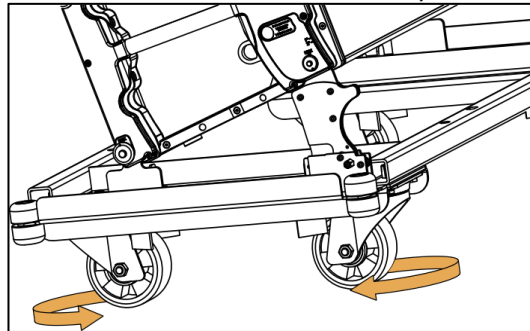


The lower K2 enclosures swing and the latches automatically lock.

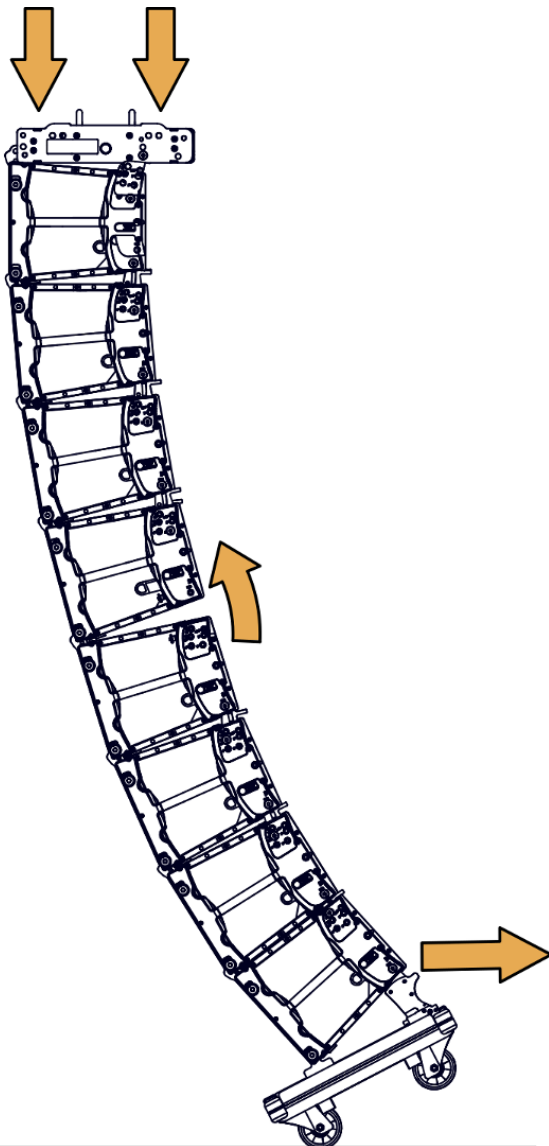


3. Attach the lower K2 enclosures rear rigging arm to the back of the array.

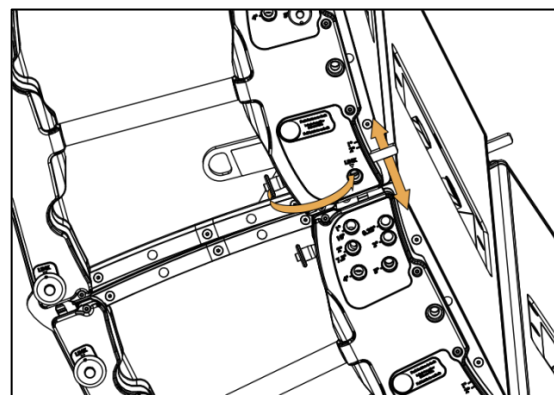
Turn the wheels inside the dolly.



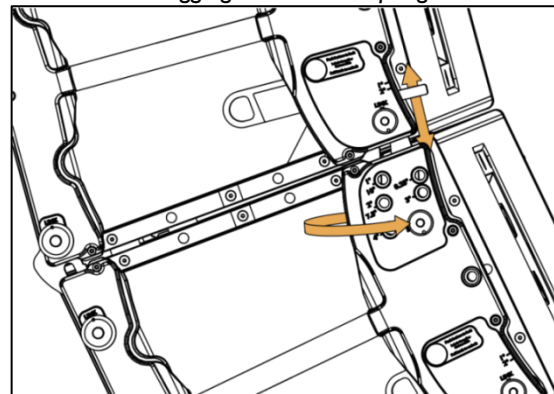
Pull back the bottom enclosures while lowering the array until the array and the top enclosure of the block are in contact.



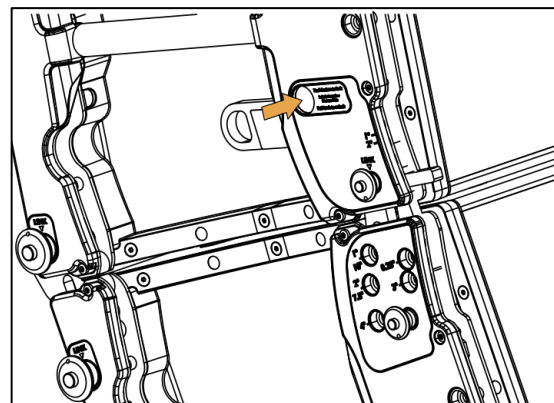
Slide the arm upward and secure it with the pin using the LINK hole.



Position the pin at the entrance of the chosen angle hole and slide the rigging arm until the pin goes in.



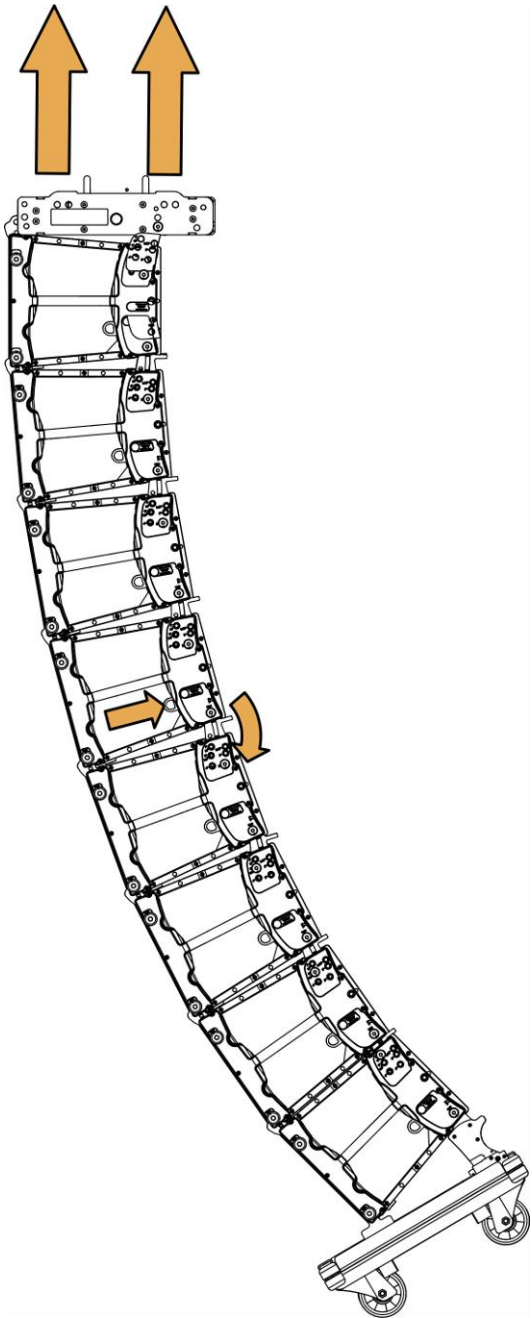
Press the lock button



K2 DOWNFILL FOR K1

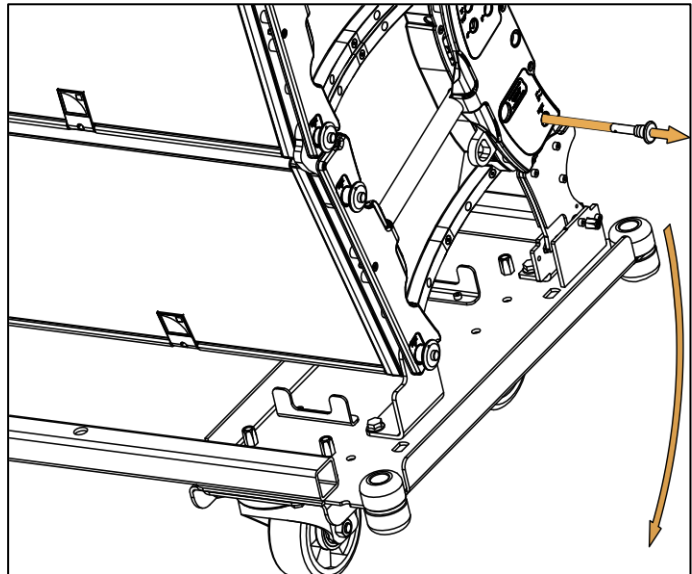
TECHNICAL BULLETIN

4. Raise the array to lock the inter-enclosure angle. *The latches automatically lock.*

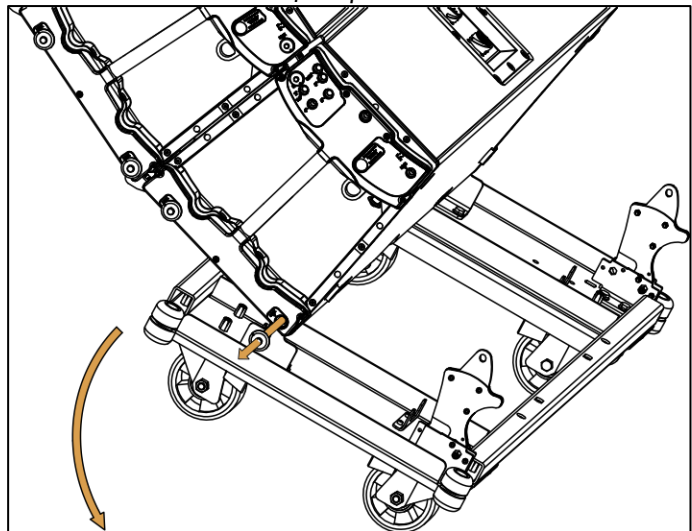


5. Remove the K2-CHARIOT

*Hold the dolly with one hand.
Remove the back pin on both sides.*



*Hold the dolly with one hand.
Remove the front pin on both sides.*



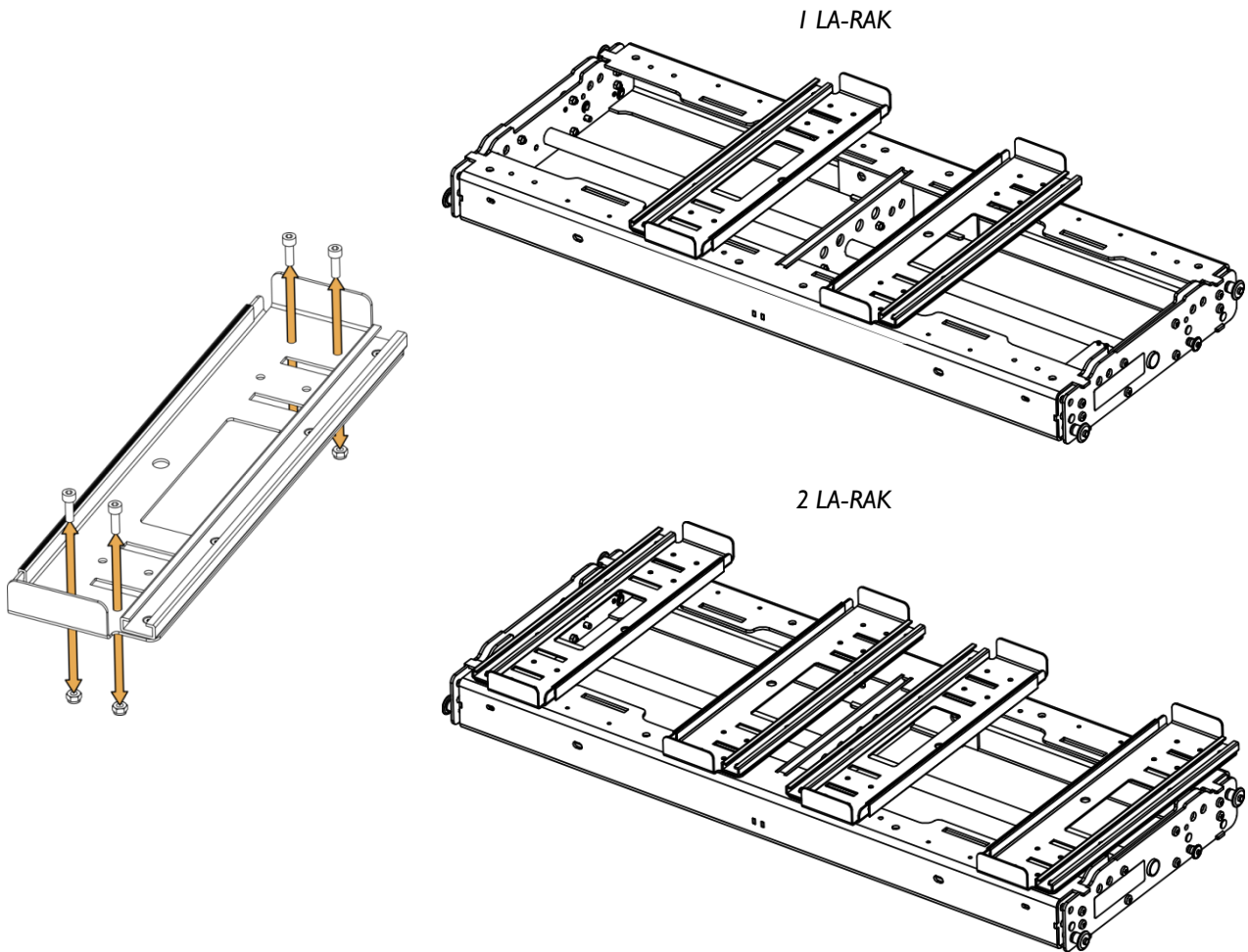
PROCEDURE G. Stacking LA-RAK on K2-BUMP



Tools

- Electric screwdriver with torque selector.
- 6 mm hex bit.
- Wrench with 13 mm hex socket.

5. Remove the nuts and bolts from the K2-RACKMOUNT rails.
6. Position and secure as many rails as necessary on the K2-BUMP.

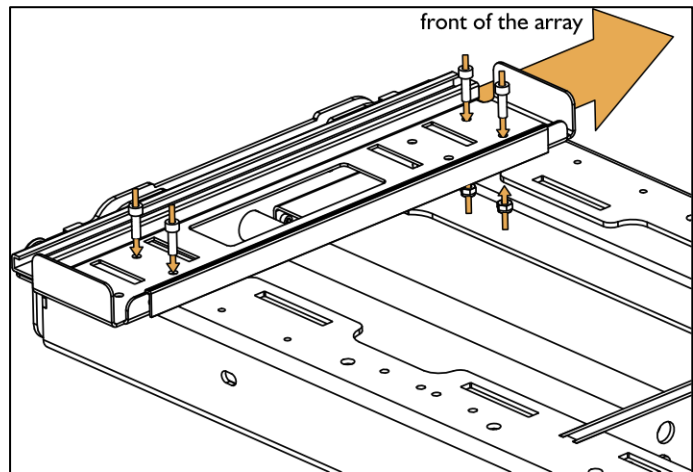
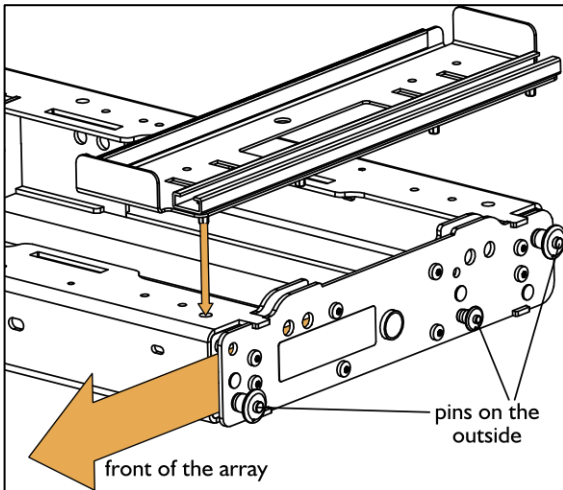


7. Secure the rails to the K2-BUMP.

*Use the wrench with a 13 mm hex socket and the electric screwdriver. Set the torque to 5 N.m.
Before securing the side rails, make sure the frame pins are on the outside.*

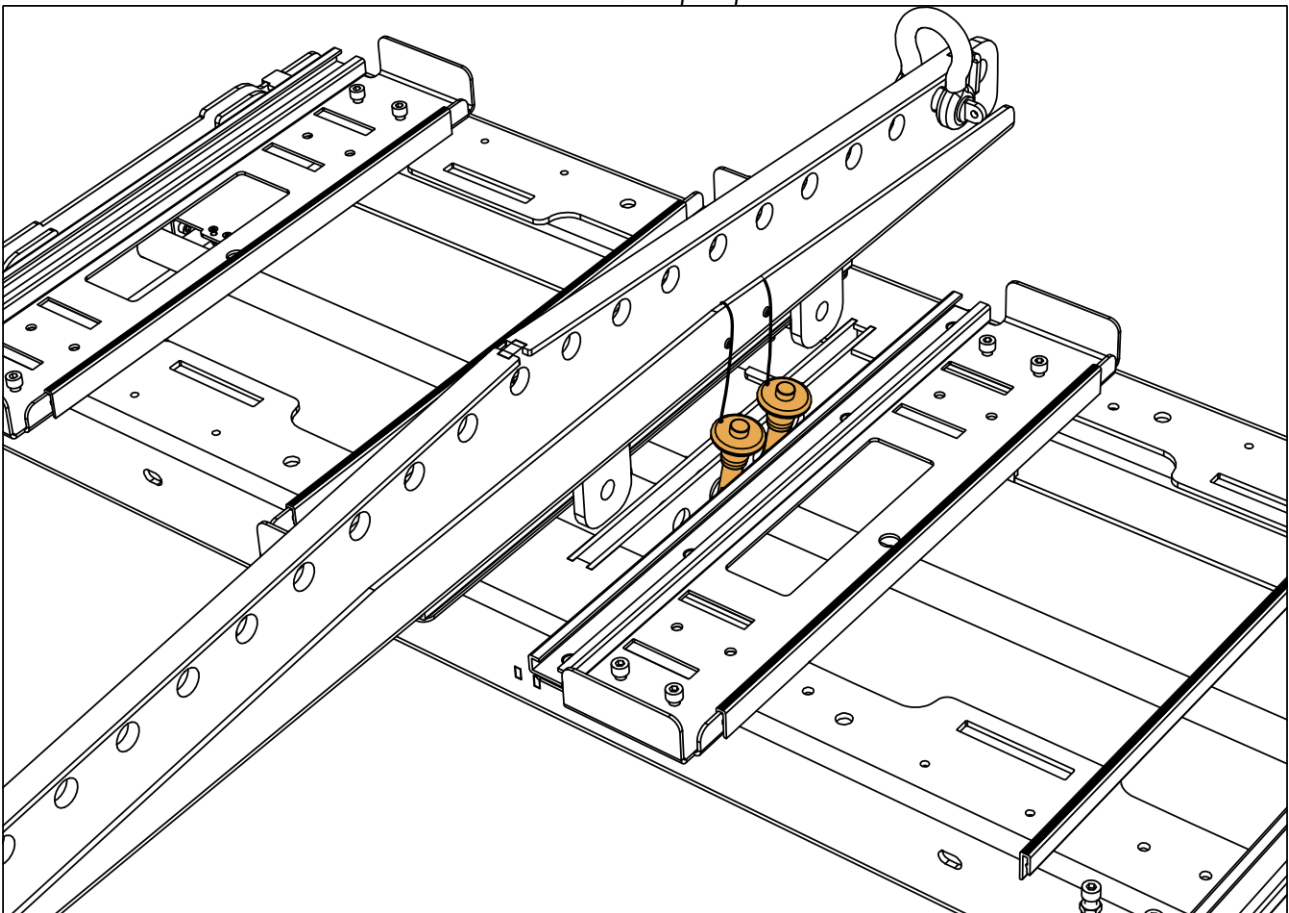
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN



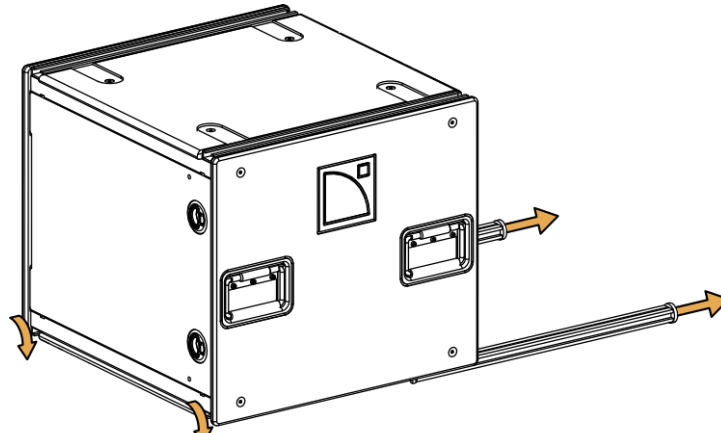
8. Install as many K2-BAR as necessary.

When installing a single K2-BAR at the center of the frame, make sure the pins are inserted between the central bar of the frame and the closest rail.

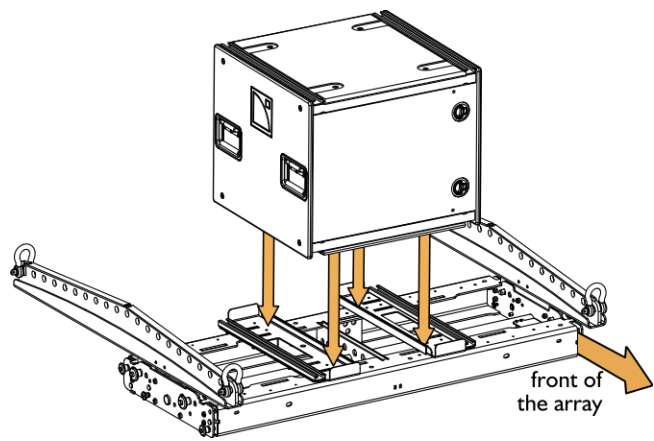
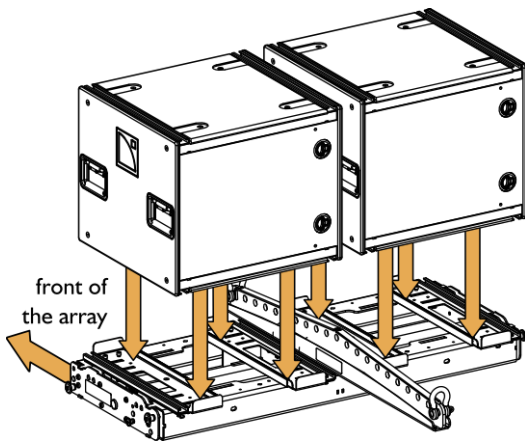


9. Attach the LA-RAK to the K2-BUMP.

Remove the LA-RAK coupling bars
Turn the bars to release the spring-loaded safety and slide them out.

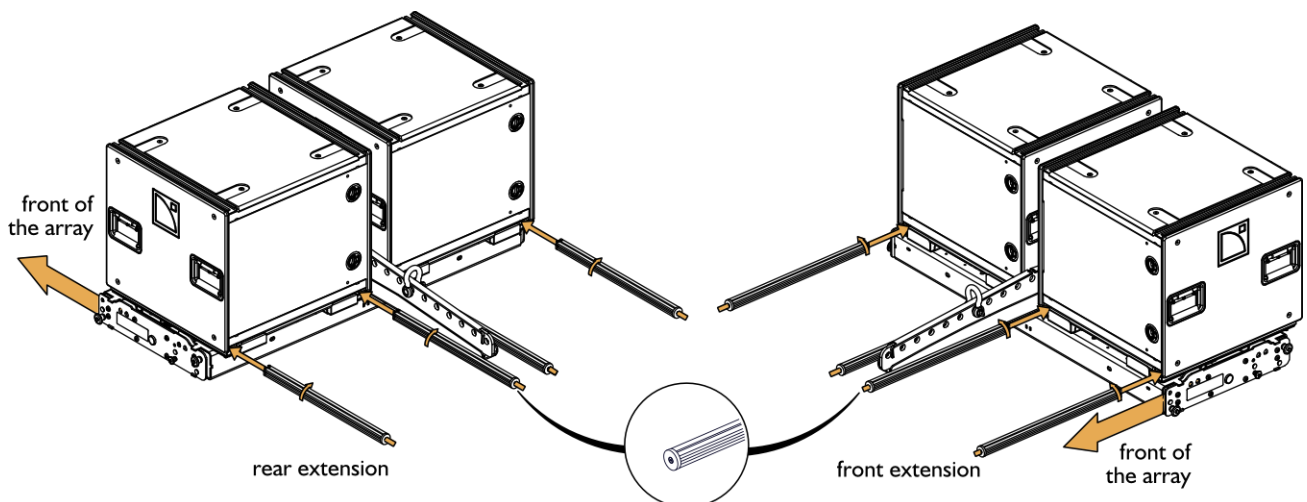


Position the LA-RAK on the rails.



Secure the LA-RAK with the coupling bars.

Insert the spring-loaded safety in the LA-RAK rails, give a quarter turn and slide the bar until the safety locks into place.



Insert the coupling bars:



- from the back for a negative angle (rear extension),
- from the front for a positive angle (front extension).

Always insert so the metallic safety is pointed upward (depending on the tilt angle).

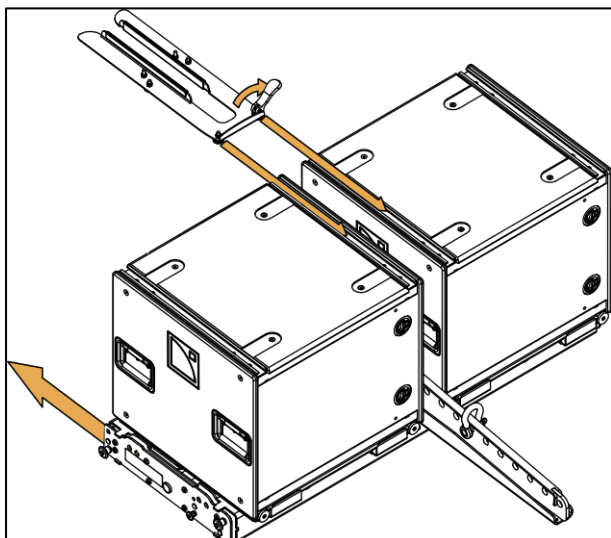
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

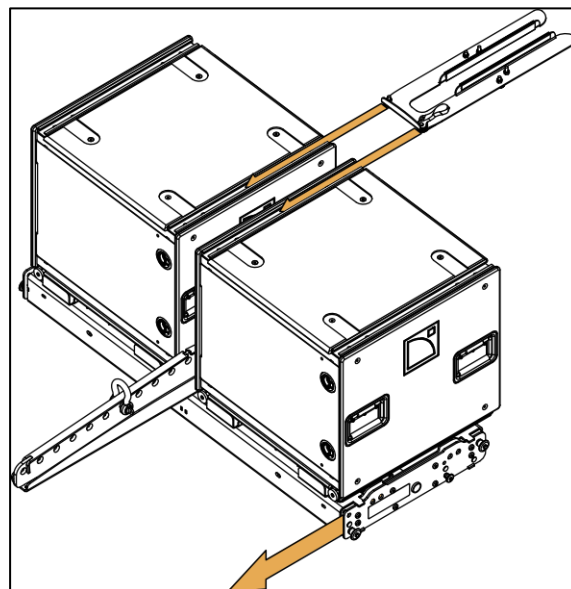
10. If you are stacking 2 LA-RAK side-by-side on K2-BUMP, insert the stabilizer between the two racks.

Release the locking system by raising and turning the handle.
Insert the stabilizer from the side opposite to the K2-BAR extension:

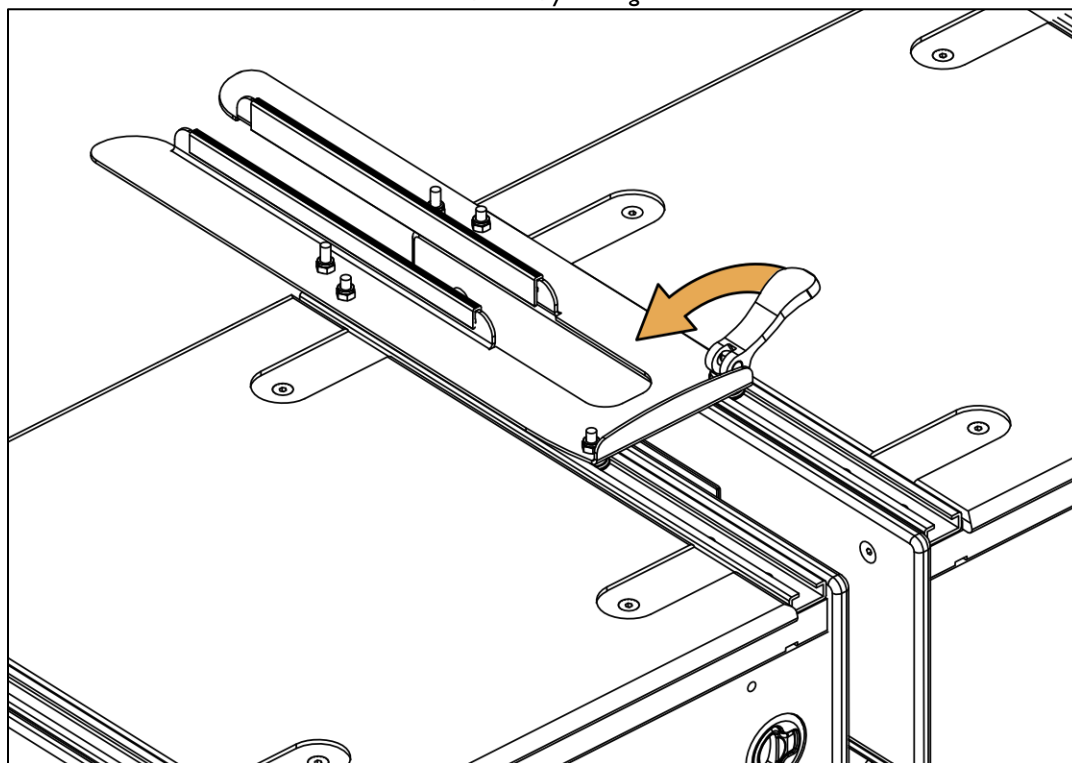
from the front in rear extension



from the rear in front extension.



Secure the stabilizer by locking the handle.



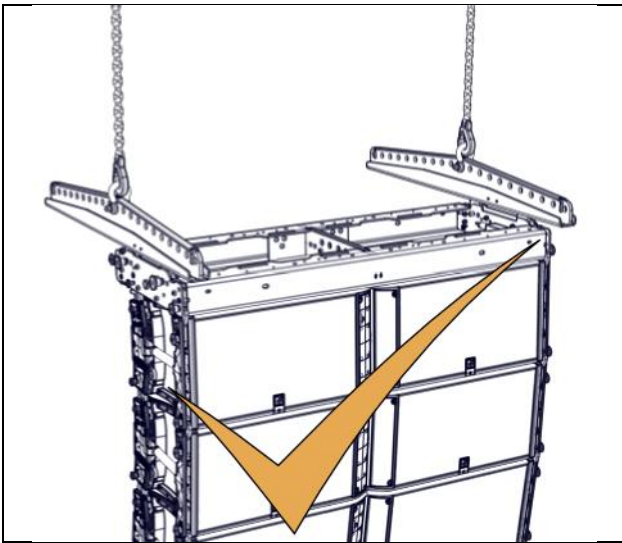
APPENDIX PICKUP POINTS GUIDELINES

A K2 system can be lifted using one or two motors:

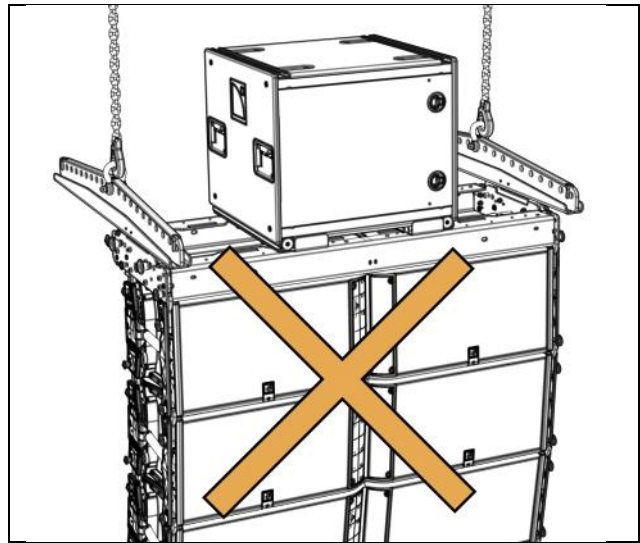
- One or two motors with K2-BUMP alone.
- Two motors with K2-BUMP and one K2-BAR.
- Two with K2-BUMP and two K2-BAR.

K2-BUMP with LA-RAK

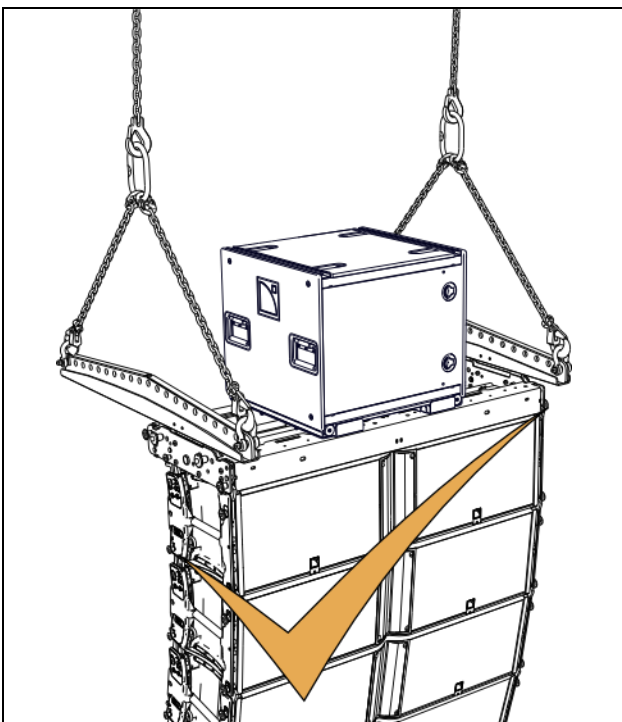
OK



NOT OK



OK



With a single LA-RAK on top of a K2-BUMP, always implement a bridle suspension using two **LA-SLING2T**.

K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

Use two **LA-SLING2T** to implement bridle hangs.



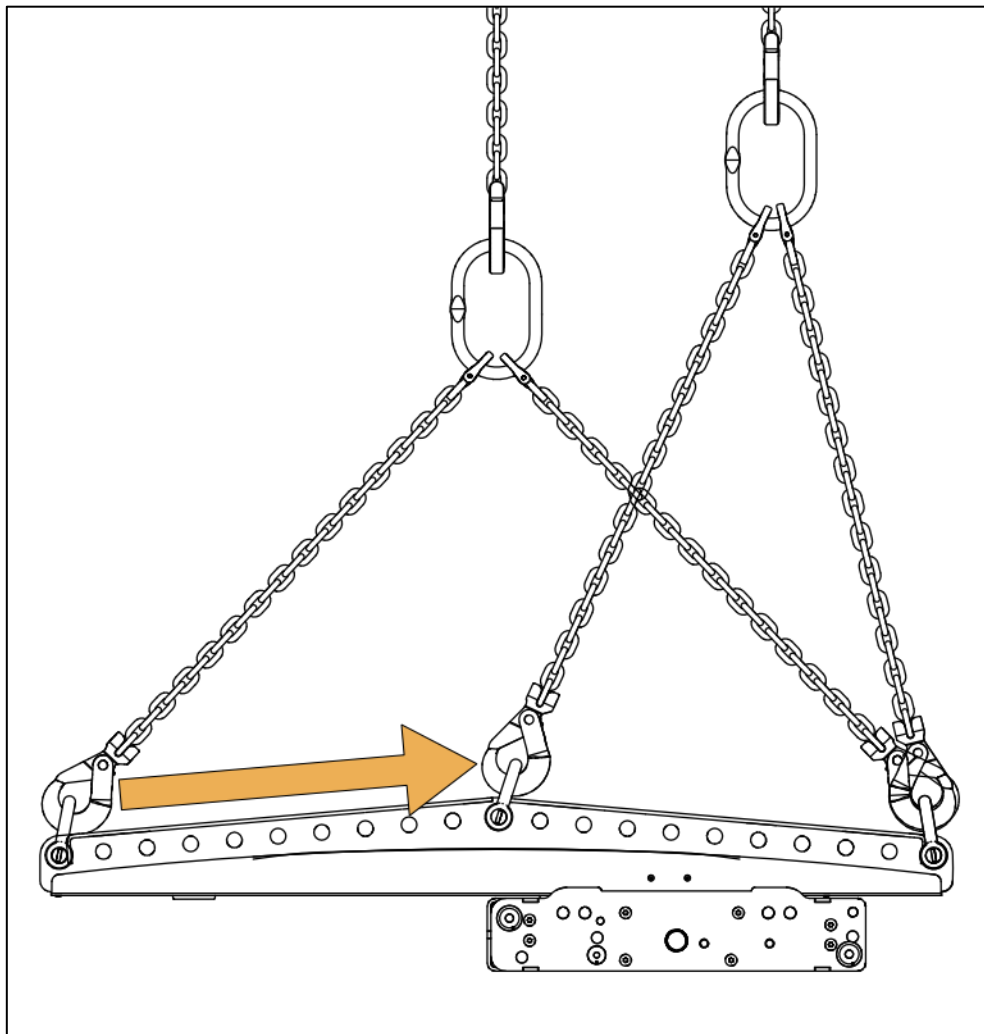
Specifications

Lifting chain (DIN EN 818-4)	2-leg , 8 mm
Steels grade	8
Nominal length incl. hooks	1 m / 39.4 in
Maximum sling angle β_{\max}	60°
Load rating	2.8 t for β : 0° - 45° 2 t for β : 46° - 60°)



Never use slings shorter than 1 m (39.4 in).

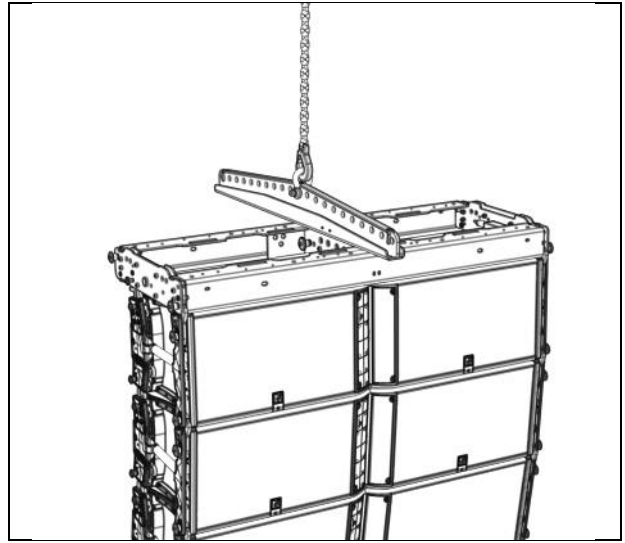
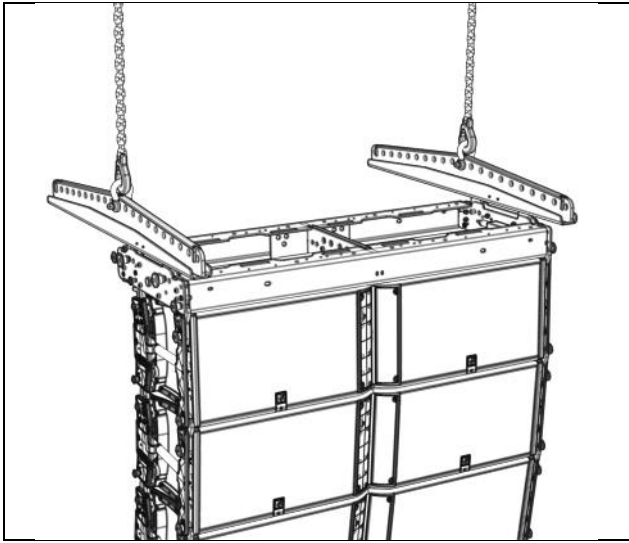
One leg of the **LA-SLING2T** must always be connected to the K2-BAR hole n° 1 (i.e., the closest to the array). The other leg can be connected to **holes n° 11 to n° 21**.



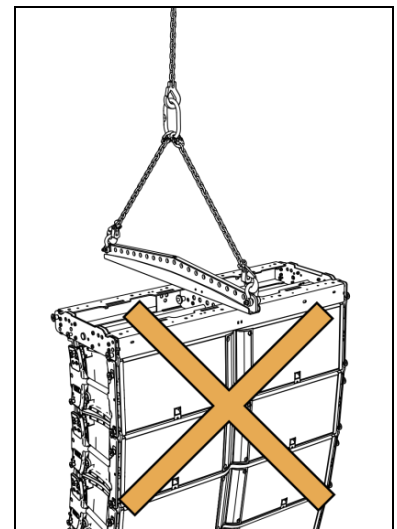
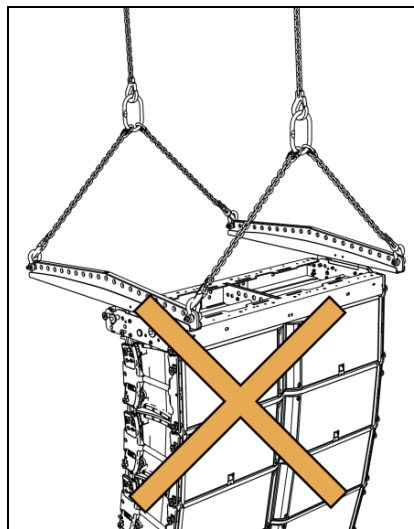
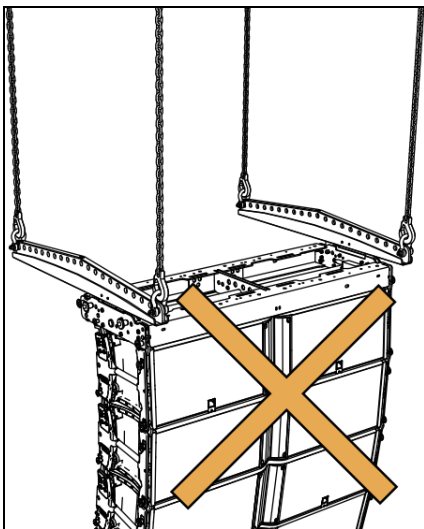
Refer to your SOUNDVISION simulation to choose the hole.

K2-BUMP with no LA-RAK

OK



NOT OK



With two K2-BAR on a K2-BUMP, do not implement a bridled suspension between the two bars.

Do not implement a bridled suspension on a single K2-BAR.

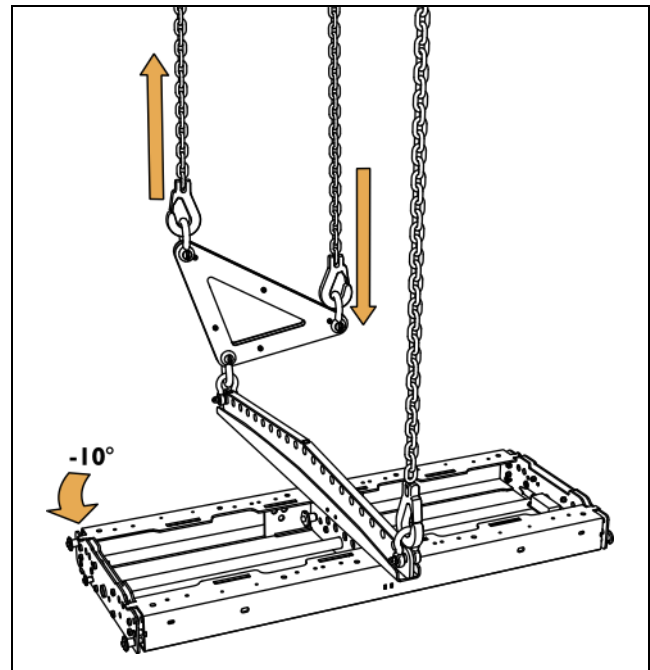
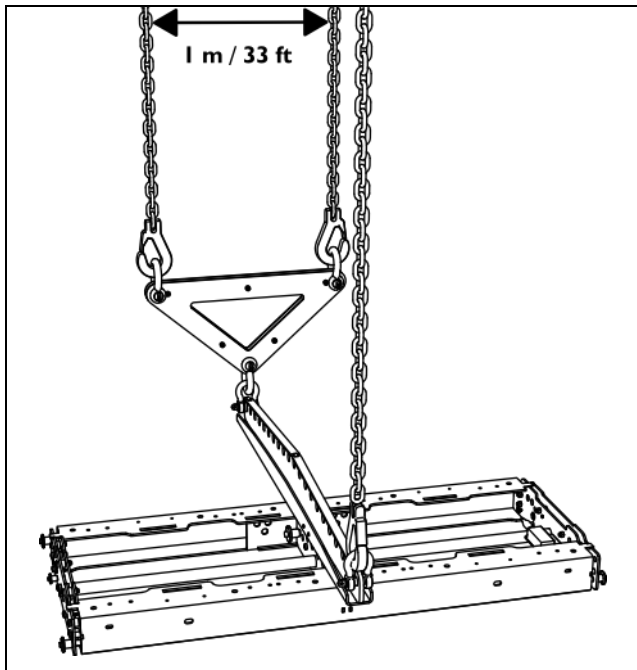
K2 DOWNFILL FOR K1

TECHNICAL BULLETIN

K1-DELTA for azimuth control

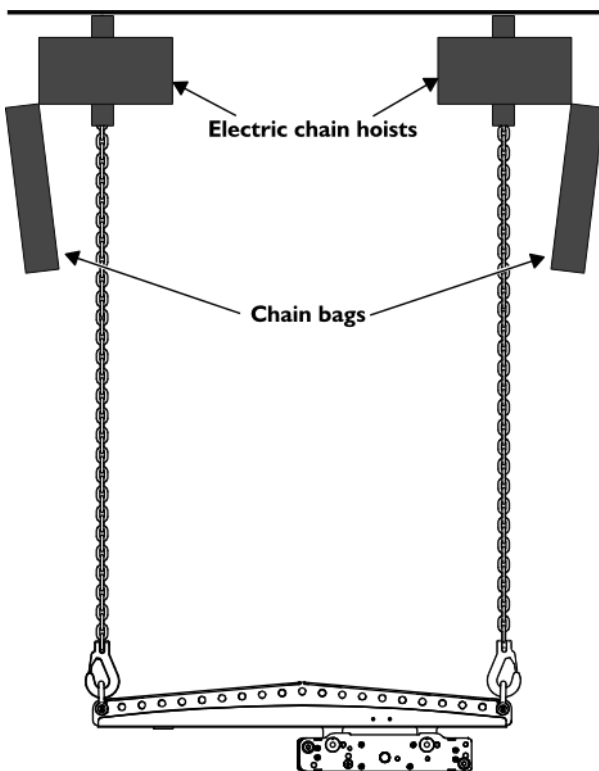
To control the azimuth of a flown K2 line, attach the K1-DELTA to the rear pickup point. The recommended space between the two lifting points is 1 m / 33 ft.

By adjusting the height of both pickup points you can adjust the azimuth angle from -10° to $+10^{\circ}$.

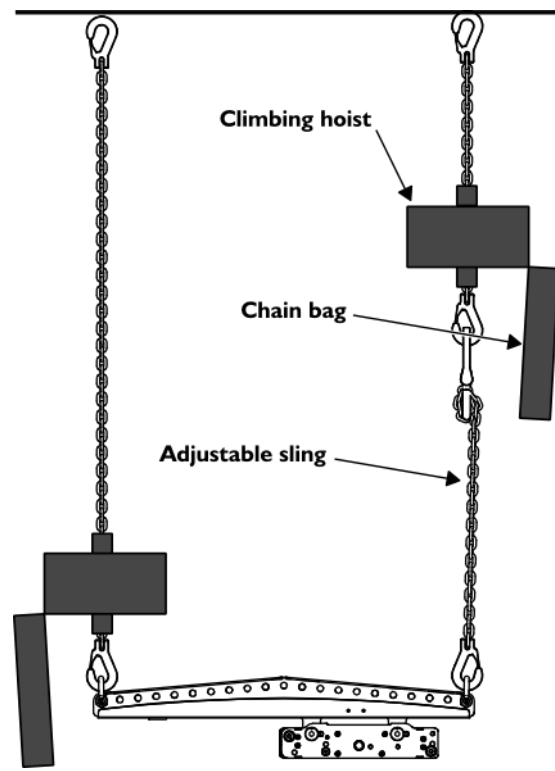


K2-BPCHAIN with a climbing hoist

With a climbing hoist you must use a K2-BPCHAIN adjustable sling to prevent the chain bag from hanging in front of the top enclosures of the array.



Electric chain hoists



Climbing hoists



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