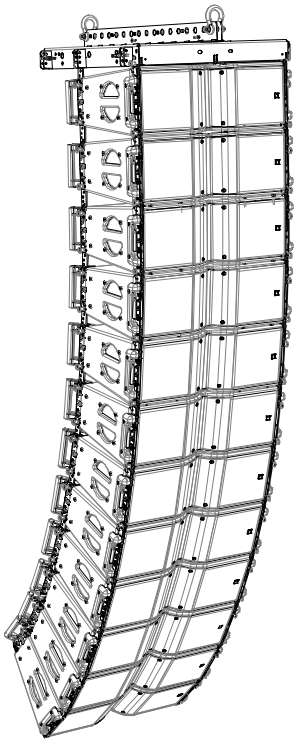
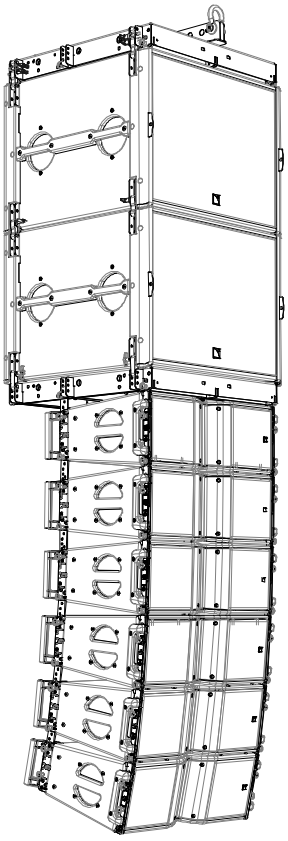
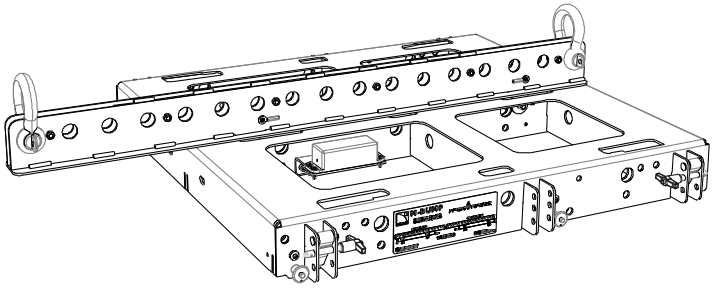
KARA® MODULAR WST® SYSTEM

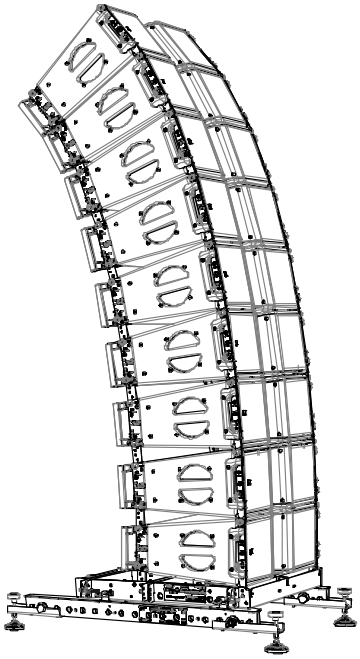
RIGGING PROCEDURES USING M-BUMP

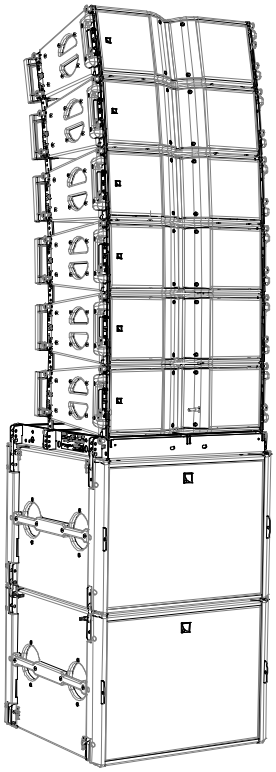
VERSION 1.3











1 SAFETY WARNINGS

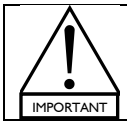
All information hereafter detailed applies for the L-ACOUSTICS® **M-BUMP** rigging structure, **M-BAR** extension bar, **M-JACK** feet, **KARA-ANGARMEX** angle arm extensions, or **KARA-PULLBACK** rigging accessory, designated in this section as **the product**.

1.1 Symbol description

Throughout this manual the potential risks are indicated by the following symbols:

The WARNING symbol indicates a potential risk of physical harm to the user or people within close proximity to the product.
In addition, the product may also be damaged.

The CAUTION symbol notifies the user about information to prevent possible product damage.



The IMPORTANT symbol is a notification of an important recommendation of use.

1.2 Important safety instructions

1. **Read this manual**

2. **Heed all safety warnings**

3. **Follow all instructions**

4. **The user should never incorporate equipment or accessories not approved by L-ACOUSTICS®**

5. **Personnel qualification**
Installation and set-up should only be carried out by qualified personnel that are familiar with the rigging techniques and safety recommendations outlined in this manual. It is recommended to attend the training courses offered by L-ACOUSTICS® before proceeding with the installation of the system.

6. **Personnel health and safety**
During installation and set-up personnel should wear protective headgear and footwear at all times. Under no circumstances personnel should climb on the loudspeaker assembly.

7. **System parts and rigging inspection**
All system components must be inspected before use in order to detect any possible defects.
Please refer to the **Care and Maintenance** section of this manual as well as any other manuals pertaining to the system for a detailed description of the inspection procedure.
Any part showing any sign of defect must immediately be put aside and withdrawn from use to be inspected by qualified service personnel.

8. **Additional rigging equipment**
L-ACOUSTICS® is not responsible for any rigging equipment and accessories that are not manufactured by L-ACOUSTICS®.
It is the user's responsibility to verify that the Working Load Limit (WLL) of all additional hardware rigging accessories is greater than the total weight of the loudspeaker assembly in use.

9. Suspension points

It is the user's responsibility to verify that the Working Load Limit (WLL) of the suspension points and/or chain hoists is greater than the total weight of the loudspeaker assembly in use.

10. System load capacity and setup safety limits

Load capacity and setup safety limits when flying or stacking a loudspeaker assembly should be strictly followed according to the instructions outlined in this manual.
ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION Software (**Mechanical Data** section) [3.4] to verify the mechanical conformity of the system before installation.

11. Local regulations

Some countries require higher Ultimate Strength Safety Factors and specific rigging approvals. It is the user's responsibility to verify that any overhead suspension of L-ACOUSTICS® systems has been made in accordance with all applicable local regulations.

12. Flying a loudspeaker system

Always verify that nobody is standing underneath the loudspeaker assembly when it is being raised. As the system is being raised check each individual component to make sure that it is securely fastened to the component above. Never leave the system unattended during the installation process.

As a general rule, L-ACOUSTICS® recommends the use of safety slings at all times.

13. Stacking a loudspeaker system

Do not ground stack the system on unstable ground or platform.
If the system is ground stacked on a structure, platform, or stage always check that the latter can support the total weight of the system.
As a general rule, L-ACOUSTICS® recommends the use of safety straps at all times.

14. Dynamic load

When a loudspeaker assembly is deployed in an open air environment, wind effects should be taken into account. Wind can produce dynamic stress to the rigging components and suspension points. If the wind force exceeds 6 bft (Beaufort scale) it is highly recommended to lower down and/or secure the loudspeaker assembly.

15. Manual

Keep this manual in a safe place during the product lifetime. This manual forms an integral part of the product. Reselling of the product is only possible if the user manual is available. Any changes made to the product have to be documented in writing and passed on to the buyer in the event of resale.

1.3 EC declaration of conformity

L-ACOUSTICS®
13 rue Levacher Cintrat
Parc de la Fontaine de Jouvence
91462 Marcoussis Cedex
France

States that the following products:
Rigging structure, M-BUMP
Extension bar, M-BAR
Feet, M-JACK
Angle arm extensions, KARA-ANGARMEX
Rigging accessory, KARA-PULLBACK

Are in conformity with the provisions of:
Machinery Directive 2006/42/EC

Applied rules and standards[1]:
EN ISO 12100-1: 2004 (Mechanical Safety)
DIN 18800 (Mechanical Structure)
BGV-C1 (Mechanical Standard applied in Germany)

Established at Marcoussis, France
January 15th, 2010

Jacques Spillmann
Head of Engineering & Design dept.

[1] Maximum **flown** vertical array configurations:
- **General** standard: **24 KARA** or **4 SB18/12 KARA** or **16 SB18**.
- **BGV** standard: **18 KARA** or **3 SB18/9 KARA** or **16 SB18**.

Maximum **stacked** vertical array configurations:
- **General** standard: **9 KARA** or **2 SB18/6 KARA** or **4 SB18**.

2 CONTENTS

3 INTRODUCTION

3.1 Welcome to L-ACOUSTICS®

Thank you for purchasing the **L-ACOUSTICS® KARA® Modular WST® System**.

This manual contains essential information on rigging the product correctly and safely. Read this manual carefully 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 the product and the content of this manual without prior notice.

Should the product requires repair or if information about the warranty is needed, please contact an approved L-ACOUSTICS® distributor. The address of the nearest distributor is available on the L-ACOUSTICS® web site.

3.2 Symbol description

All along the manual, a bracketed number refers to a section. For example [3.2] stands for the present **Symbol description** section.

3.3 Unpacking

Carefully open the shipping carton and check the product for any noticeable damage. Each L-ACOUSTICS® product is tested and inspected before leaving the factory and should arrive in perfect condition.

If found to be damaged, notify the shipping company or the distributor immediately. Only the consignee may initiate a claim with the carrier for damage incurred during shipping. Be sure to save the carton and packing materials for the carrier's inspection.

Refer to [5] for full description of the shipping carton contents.

3.4 Web links

Please check the L-ACOUSTICS® web site on a regular basis for latest document and software application updates. Table 1 provides links for all downloadable items mentioned in this manual.

ALWAYS refer to the latest document version.
ALWAYS use the latest software application version.

Table 1: Links to documents and software applications

KARA User manual **KARA Rigging procedures pack**	www.l-acoustics.com/kara
SB18 User manual	www.l-acoustics.com/sb18
TECH TOOLCASE Product spec sheet	www.l-acoustics.com/tech-toolcase
SOUNDVISION Software	www.l-acoustics.com/soundvision

4 KARA® SYSTEM

The **L-ACOUSTICS® M-BUMP**, **M-BAR**, **M-JACK**, **KARA-ANGARMEX**, and **KARA-PULLBACK** elements are for rigging the **KARA® Modular WST® Line Source System** in the form of flown or stacked vertical arrays.

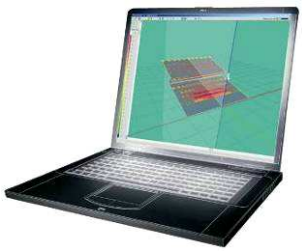
The system approach developed by L-ACOUSTICS® for KARA consists of the elements needed to fully take advantage of the possible configurations and optimize the system. The main components of the system are (see also Figure 1 and Figure 2):

KARA®	⇨	Full range active 2-way modular WST® enclosure
M-BUMP	⇨	Structure for flying or stacking a vertical KARA and/or SB18 array
M-BAR	⇨	Extension bar for M-BUMP
M-JACK	⇨	Feet (x4) for KARA and/or SB18 arrays (including 2 KARA-ANGARMEX)
KARA-ANGARMEX	⇨	Angle arm extensions (x2) for stacked KARA and/or SB18 arrays
KARA-PULLBACK	⇨	Rigging accessory for KARA array pullback configuration
SB18	⇨	Compact high power subwoofer
SB28	⇨	High power subwoofer
LA8	⇨	Amplified controller
LA NETWORK MANAGER	⇨	Remote control software for amplified controllers
SOUNDVISION	⇨	Acoustical and mechanical modeling software

Each system configuration should first be modeled using **L-ACOUSTICS® SOUNDVISION Software** [3.4] to verify the mechanical conformity of the system. Please refer to the SOUNDVISION **Help menu** to obtain a detailed description on software use.

LA8

LA NETWORK MANAGER



SOUNDVISION

Figure 1: KARA system components (part 1)

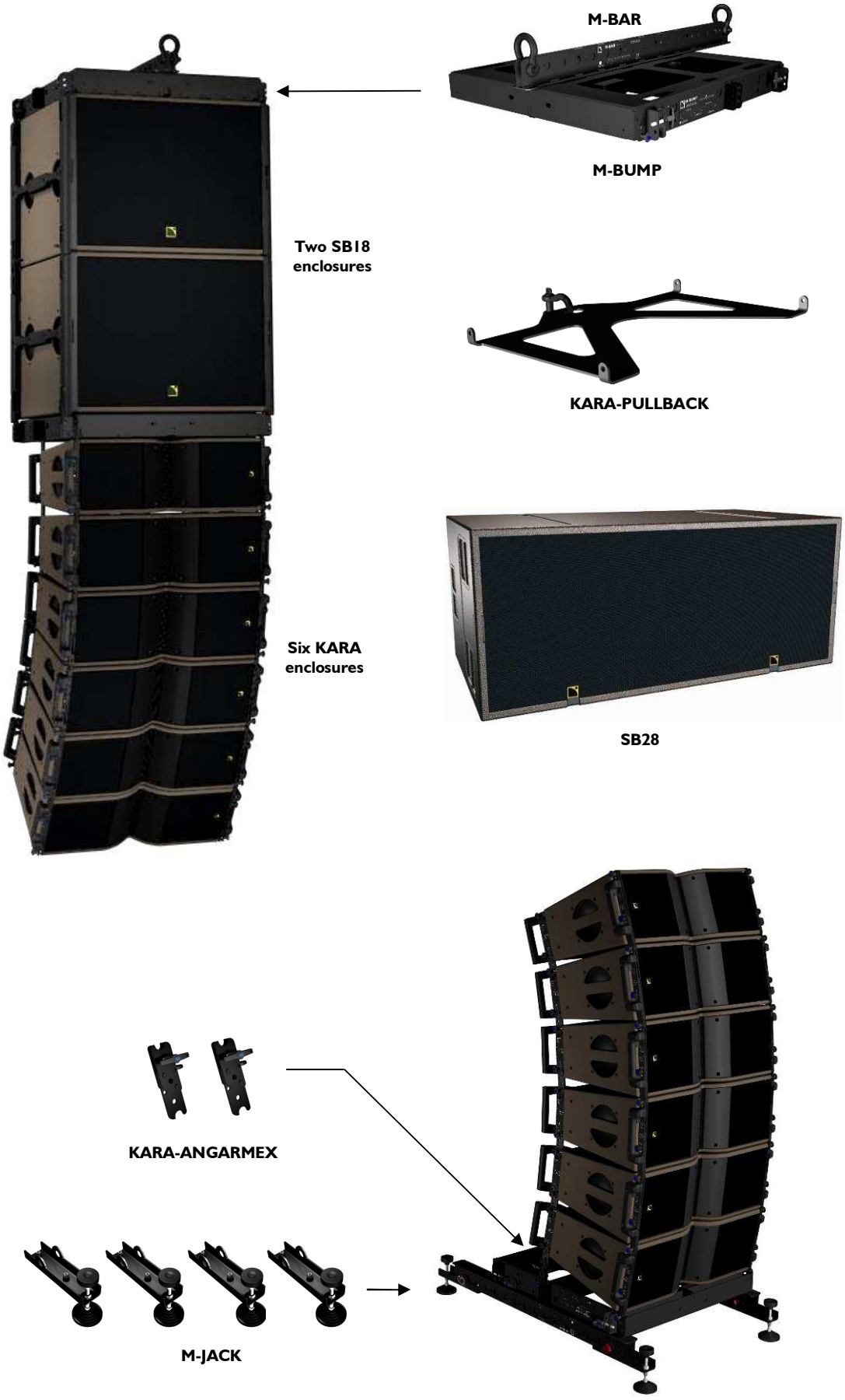


Figure 2: KARA system components (part 2)

5 KARA® RIGGING COMPONENTS

5.1 M-BUMP

The L-ACOUSTICS® **M-BUMP** rigging structure has been designed to fly or stack the **KARA** enclosures as a variable-curvature, vertical line source array. M-BUMP also allows KARA to be rigged to an **SB18** subwoofer array.

Note: M-BUMP also can fly or stack straight vertical SB18 arrays.

The M-BUMP is a **square frame** fitted with the following elements:

- Four 5/16" **R-BLP** (round-shaped ball-locking pins) for KARA rigging.
- Four **rotating arms** with 5/16" **T-BLP** (T-shaped ball-locking pins) for SB18 rigging.
- One **laser support plate** with four **bolts** for optional TEQSAS® LAP-TEQ laser/inclinometer device mounting. The LAP-TEQ is part of the **L-ACOUSTICS® TECH TOOLCASE** (refer to the **TECH TOOLCASE Product spec sheet** [3.4]).
- Two **shackles** fitted with 19 mm/0.75 inch-diameter bolts and safety pins.

Note: Refer to [9.2.1] for distance between shackles.

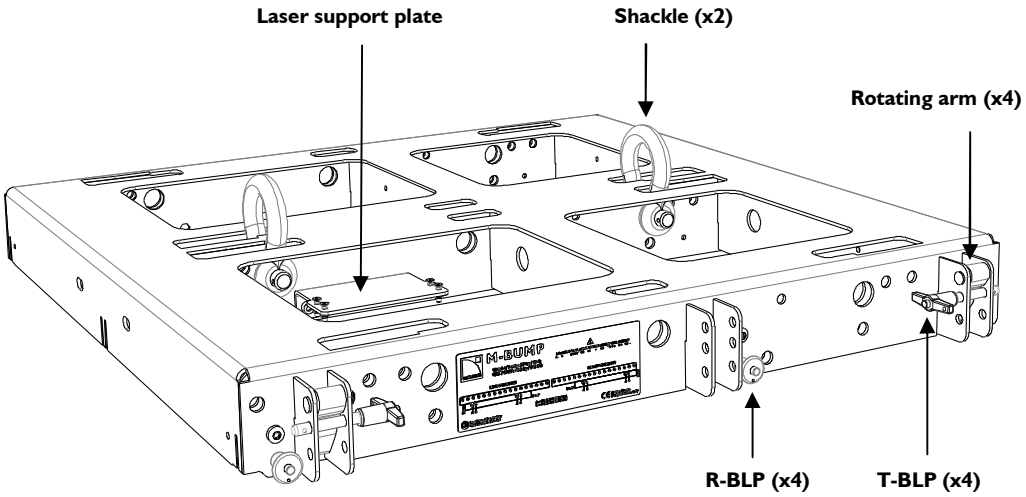


Figure 3: M-BUMP rigging structure

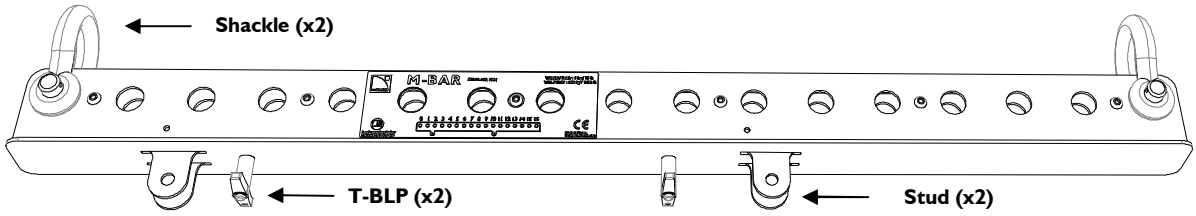
5.2 M-BAR

The L-ACOUSTICS® **M-BAR** extension bar is a complementary rigging element for M-BUMP. Optionally used as a single element or in pair in flown configurations, it will extend the site angle capability of KARA and SB18 arrays. In stacked configurations, its use is required in pairs as part of the stacking platform [5.3].

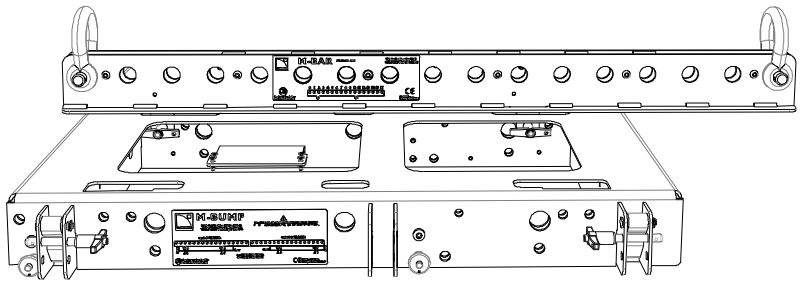
The M-BAR is a **bar** fitted with the following elements:

- Two 3/8" **T-BLP** for M-BUMP rigging.
- Two **shackles** fitted with 19 mm/0.75 inch-diameter bolts and safety pins.

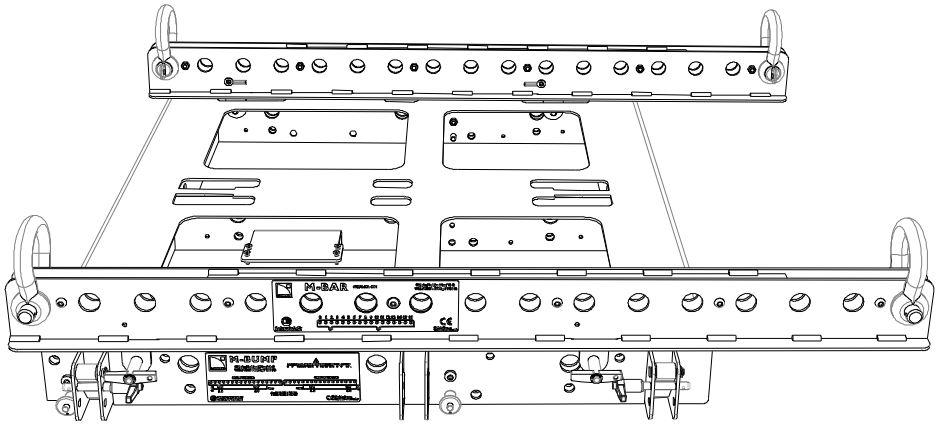
Note: Refer to [9.2.1] for distance between shackles.



M-BAR



One M-BAR mounted to M-BUMP



Two M-BAR mounted to M-BUMP

Figure 4: M-BAR extension bar

5.3 M-JACK, KARA-ANGARMEX

The **L-ACOUSTICS® M-JACK** are **four feet** to be used along with one M-BUMP and two M-BAR so as to form a stacking platform for a variable-curvature, vertical KARA line source array.

The **L-ACOUSTICS® KARA-ANGARMEX** are **two angle arm extensions** providing extra 10° downwards site angle for the bottom KARA in stacked configurations
Note: Two KARA-ANGARMEX are also included in the M-JACK package.

The M-JACK package comprises the following elements:

- Four **feet** fitted with height-adjustment and locking system.
- Two **angle arm extensions** with 5/16" **T-BLP**.

The KARA-ANGARMEX package comprises two **angle arm extensions** with 5/16" **T-BLP**.

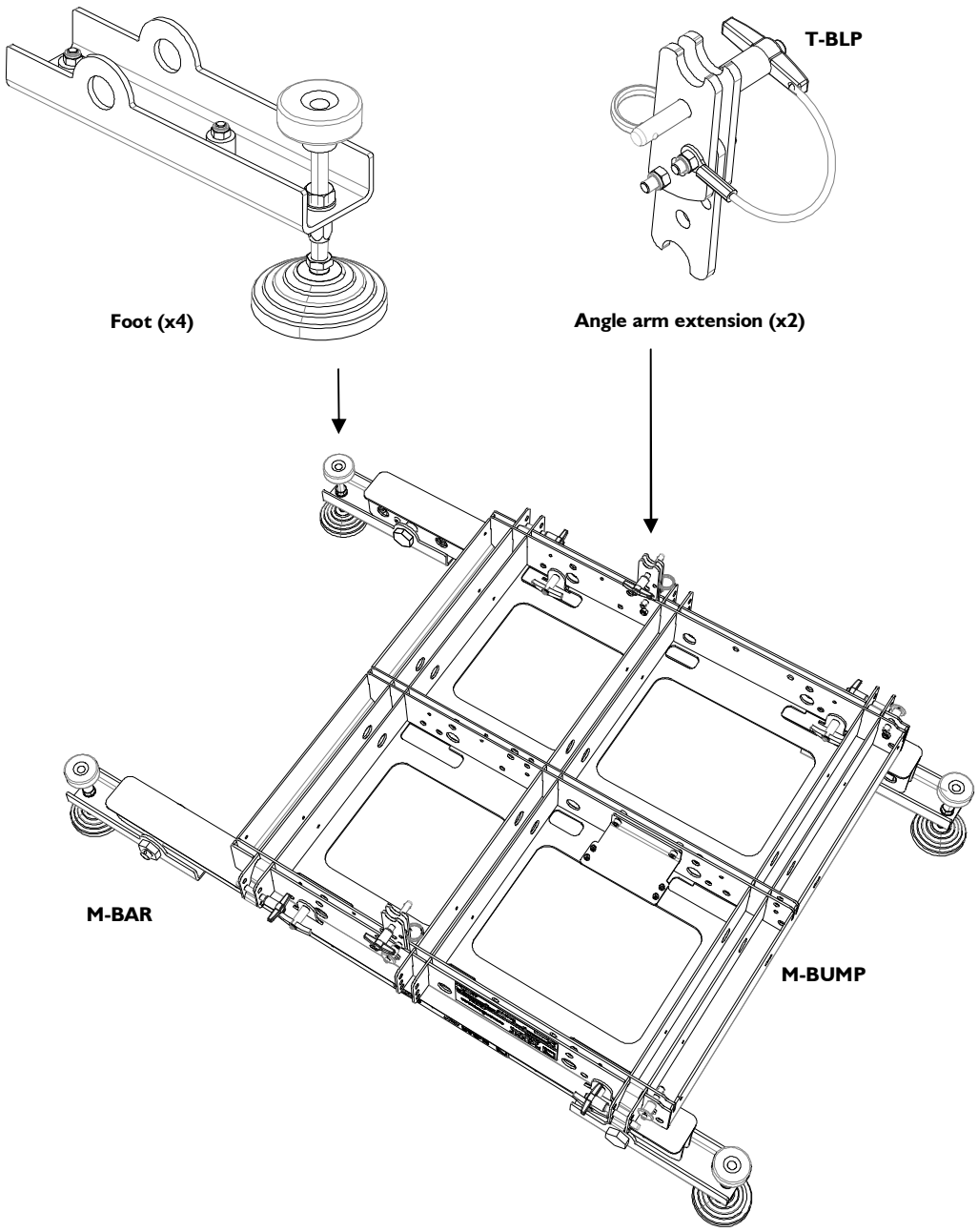


Figure 5: Stacking platform (with optional angle arm extensions)

The KARA-ANGARMEX angle arm extensions are provided with two slings and fixation material to be permanently attached to the M-BUMP. Attach the slings to the holes shown in Figure 6 and respect the orientation:

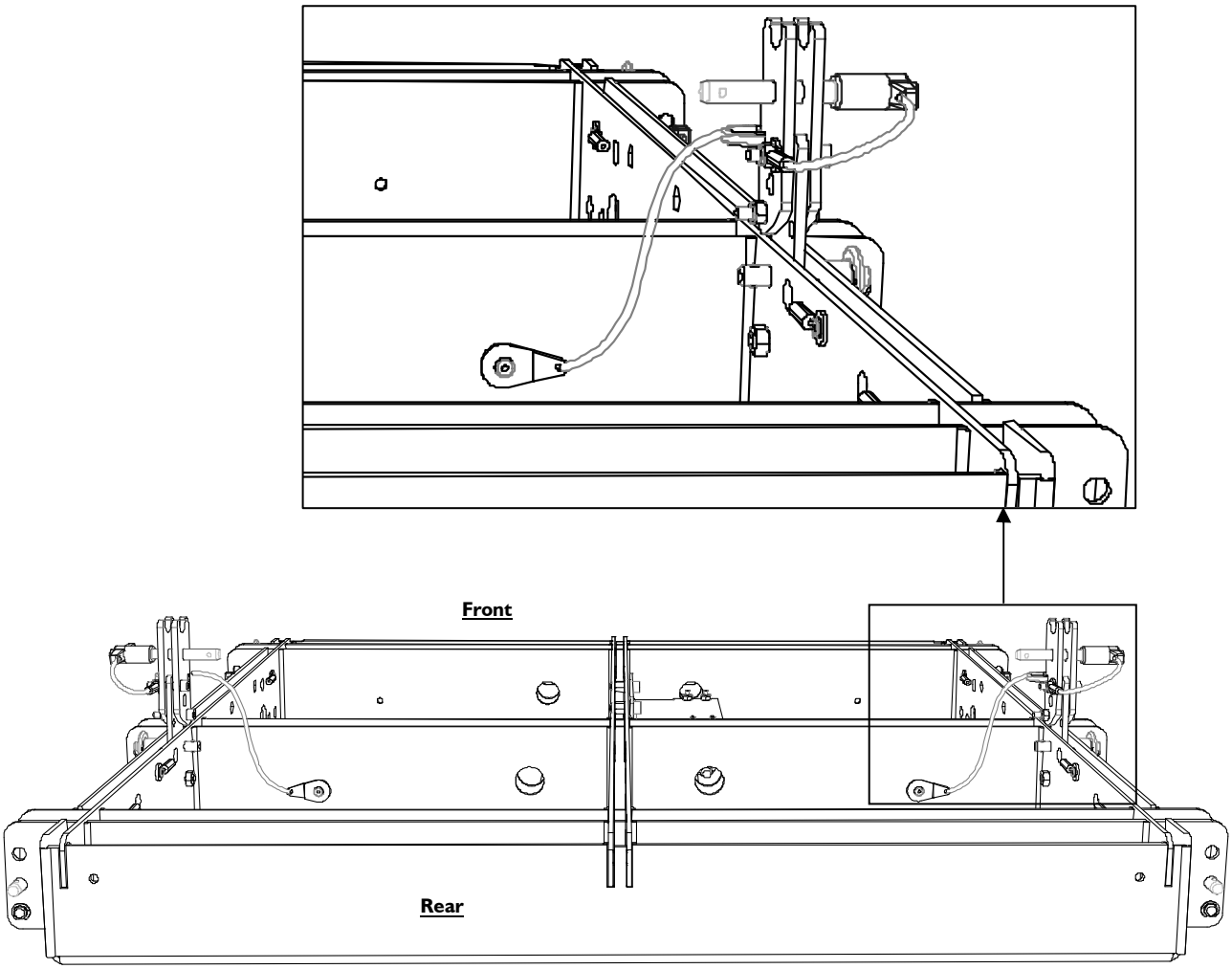


Figure 6: KARA-ANGARMEX attached to M-BUMP

5.4 KARA-PULLBACK

The **L-ACOUSTICS® KARA-PULLBACK rigging accessory** will allow setting the KARA array in a pullback configuration. It connects to the bottom enclosure of the array and to the hook or stinger of an additional motor.

The KARA-PULLBACK is a **plate** on which is fixed one **shackle** fitted with 19 mm/0.75 inch-diameter bolt and a safety pin.

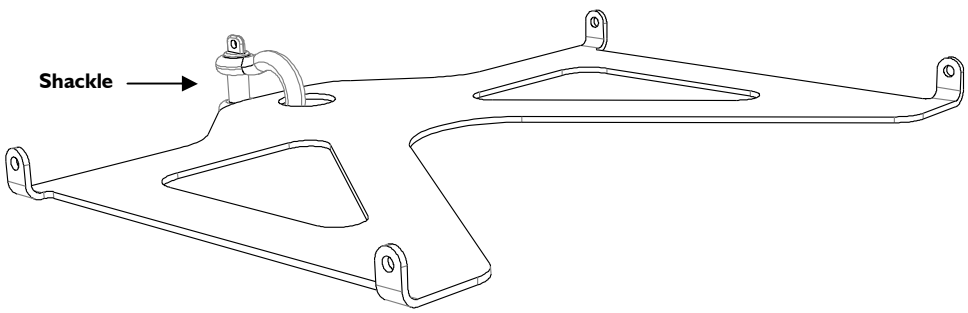
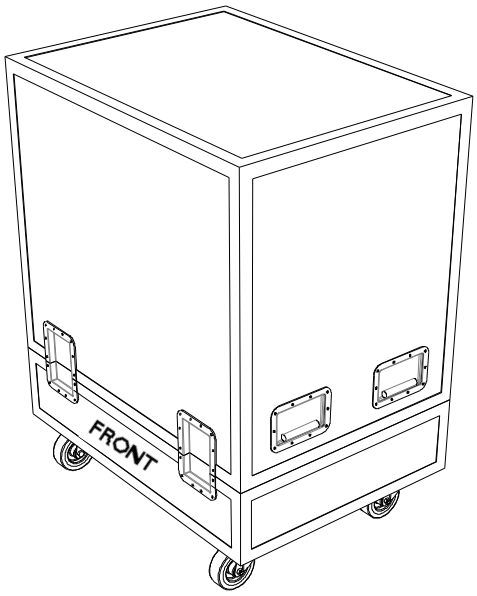


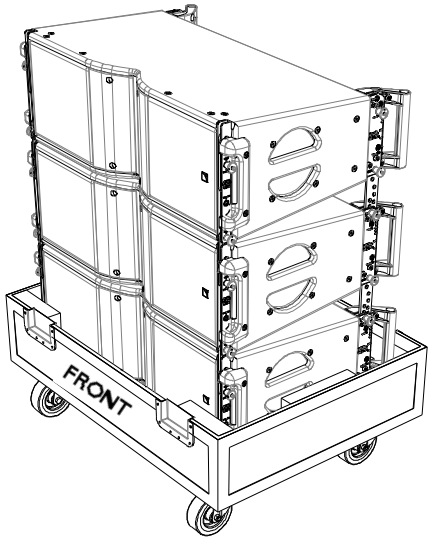
Figure 7: KARA-PULLBACK rigging accessory

5.5 Flight-case

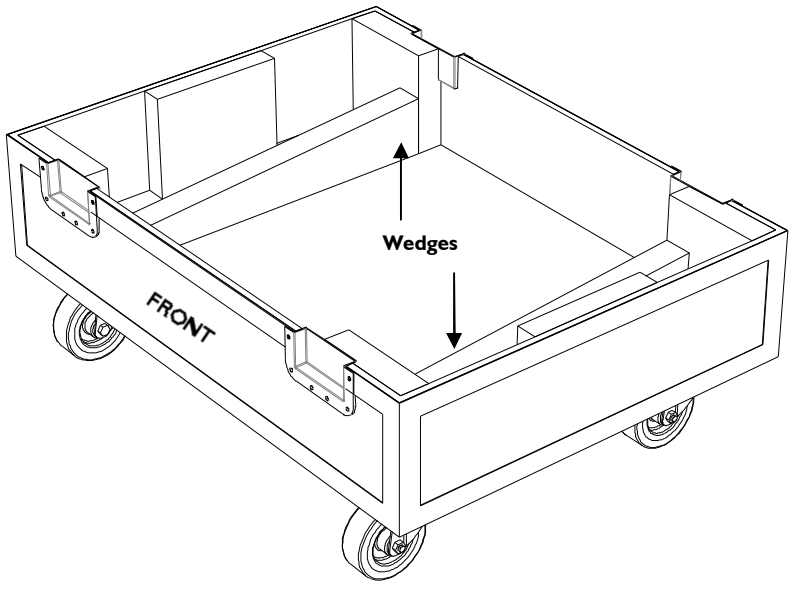
It is recommended to use a flight-case designed to ship a 3-KARA vertical array. It should contain foam inserts to prevent array movement and the tray should be fitted with 2 wedges to keep the array vertical.



Complete flight-case



Tray supporting a 3-KARA array



Tray detail

Figure 8: Recommended flight-case for KARA

6 INSTALLATION

6.1 Flying a KARA standalone array

6.1.1 Modeling and safety

Any system must be modeled before installation so as to ensure acoustical and mechanical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARA enclosures.
- Calculate the M-BUMP site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.

WARNING	The M-BUMP can nominally fly an array of up to **24 KARA** along with all loudspeakers cables (refer to the **KARA User manual** [3.4]). However, this maximum number can decrease in line with the array curvature. ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the system before installation.

The KARA and M-BUMP fully integrated rigging systems allow assembling the array with no need for any external accessory.

The following first procedure describes how to fly a vertical KARA array under an M-BUMP. It is recommended to rig the KARA by successively adding arrays of 3 enclosures (called ARRAY#1, ARRAY#2… in the order of appearance in the procedure).

The second procedure describes how to disassemble the array.

6.1.2 Array mounting

WARNING	All along the procedure: STRICTLY follow the sequence of the successive steps. SYSTEMATICALLY verify that each BLP is fully inserted. SYSTEMATICALLY verify that the bolt is fully screwed in and secured with safety pin on each shackle.
CAUTION	For clarity purposes the loudspeaker cabling procedure will not be described. The loudspeaker cables will not be represented on the figures. Use a strain relief to avoid mechanical stress at the connector locations due to cable weight. The motor hooks or stingers will not be represented on the figures.

1. Place an M-BUMP at the rigging location. Turn it so that the text of the identification plate is readable and the laser slits are directed towards the audience.

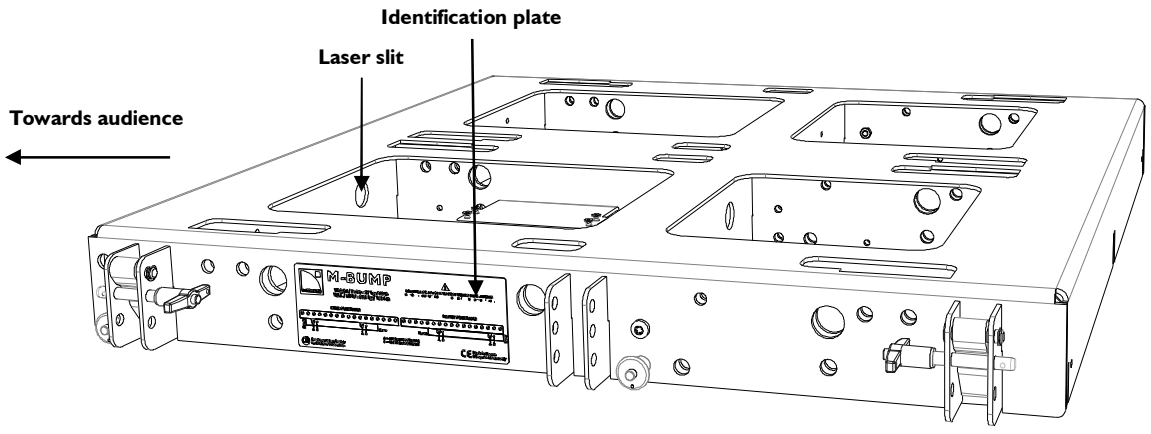


Figure 9: M-BUMP position

2. **(Optional [9.2])** Install one or two M-BAR on the M-BUMP as follows (repeat for each M-BAR):
   - **a.** Remove both T-BLP from the M-BAR.
   - **b.** Insert both M-BAR studs face to the desired M-BUMP holes.
   - **c.** Secure by inserting both preceding T-BLP through M-BAR studs and M-BUMP holes.

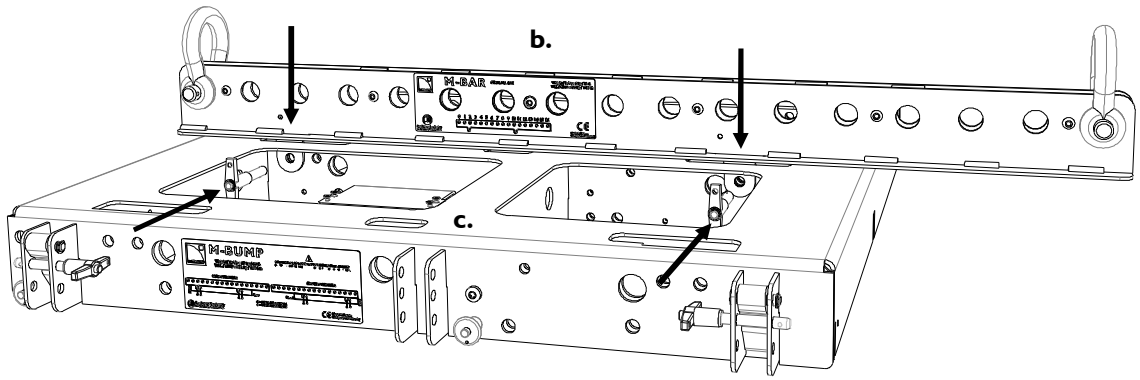


Figure 10: Single M-BAR installation example

3. Attach the shackle(s) to the M-BUMP [9.4] according to the desired configuration [9.2].

4. Place a full flight-case at the rigging location and remove the lid. Direct the front face of the 3-KARA array towards the audience. In the following, the array will be designated as ARRAY#1 and the enclosures as KARA#1 to KARA#3 from top to bottom.

5. Check the inter-enclosure connections in ARRAY#1 (repeat for each side):
   - **a.** For both front rigging points, verify that the front arm is open and locked to 2 KARA by 2 R-BLP inserted in **yellow link holes**.
   - **b.** For both rear rigging points, verify that the angle arm cursor is aligned with the **0°** angle value and locked to 2 KARA by 2 R-BLP, the upper one inserted in a **yellow link hole** and the bottom one inserted into angle hole **0°/2°/4°**.

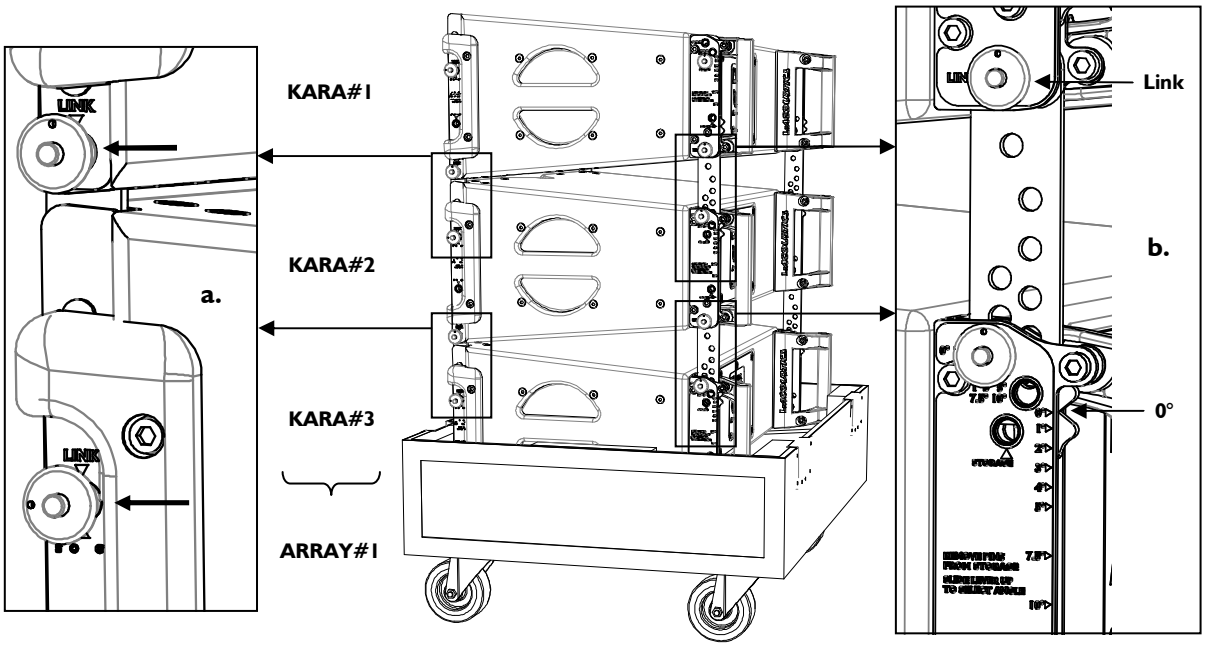


Figure 11: Inter-enclosure connection check for ARRAY#1

6. On KARA#1, take the 4 arms out as follows (repeat for each side):

a. Remove the front top R-BLP from storage position, rotate the front arm up, slide it down, and secure by re-inserting the R-BLP into the **yellow link hole**.

b. Remove the rear top R-BLP, slide the angle arm so as to align the cursor with the 5° angle value, and secure by re-inserting the R-BLP into the corresponding angle hole (**1°**/**3°**/**5°**/**7.5°**/**10°**).

IMPORTANT

It is recommended to select the 5° angle on the KARA intended to be linked to the M-BUMP. In that way the KARA#1 axis will be parallel to the M-BUMP.

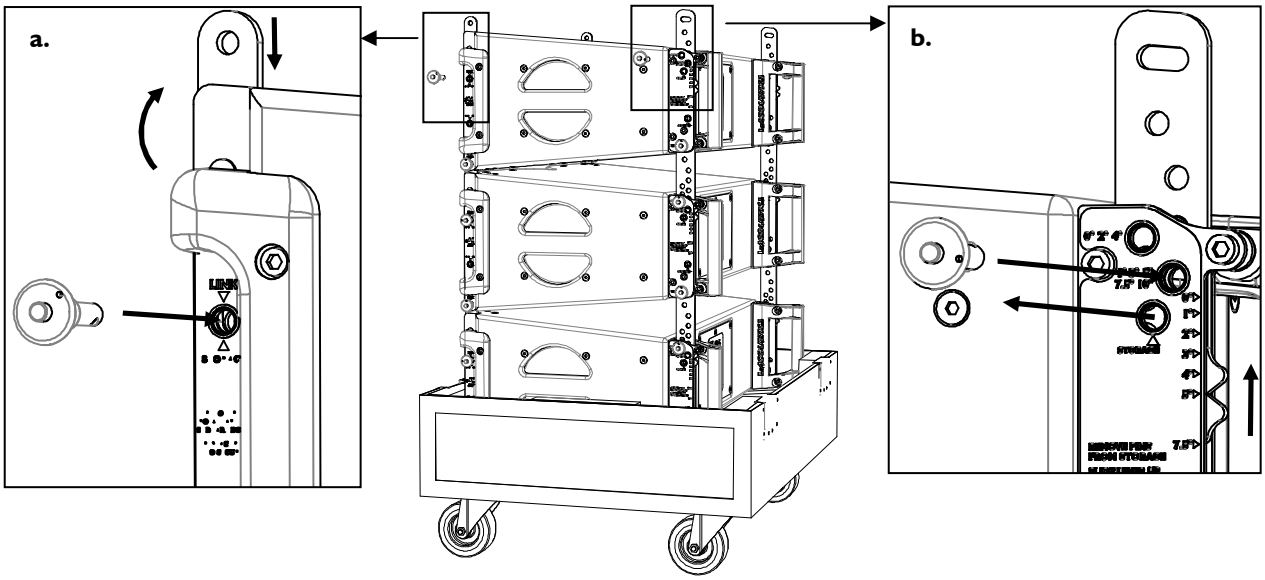


Figure 12: Setting the KARA#1 arms

7. Remove the 4 R-BLP from the M-BUMP, put the M-BUMP on ARRAY#1 by aligning the four rigging points, and secure by re-inserting the 4 R-BLP.

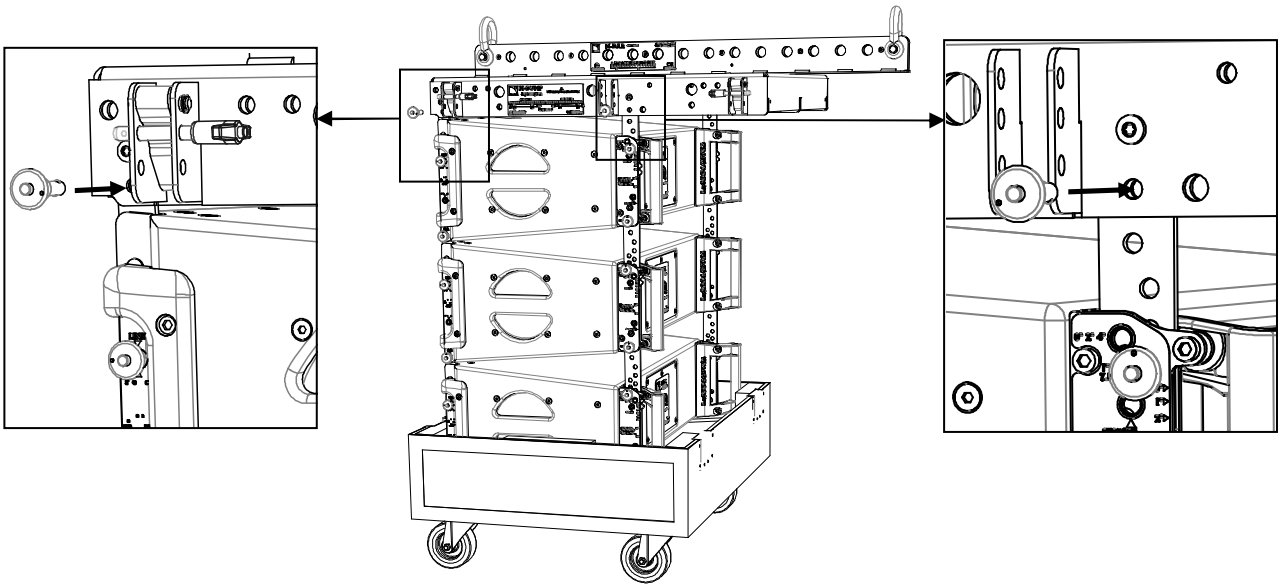


Figure 13: Linking M-BUMP to ARRAY#1

8. Place ARRAY#1 beneath the rigging points, attach the motor hook(s) or stinger(s) to the shackle(s), raise the array to a height for which the angle arms of ARRAY#1 are within comfortable reach, and remove the flight-case from the rigging location.

9. With 2 people working simultaneously on each side of ARRAY#1, set the inter-enclosure angles as follows:

a. While grabbing the back handle of KARA#3, remove the rear top R-BLP from KARA#2.

b. Rotate KARA#2 so as to align the cursor of the angle arm with the desired angle value.

c. Secure by re-inserting the R-BLP into the corresponding angle hole (**0**°/**2**°/**4**° or **1**°/**3**°/**5**°/**7.5**°/**10**°).

d. Repeat the procedure for KARA#3.

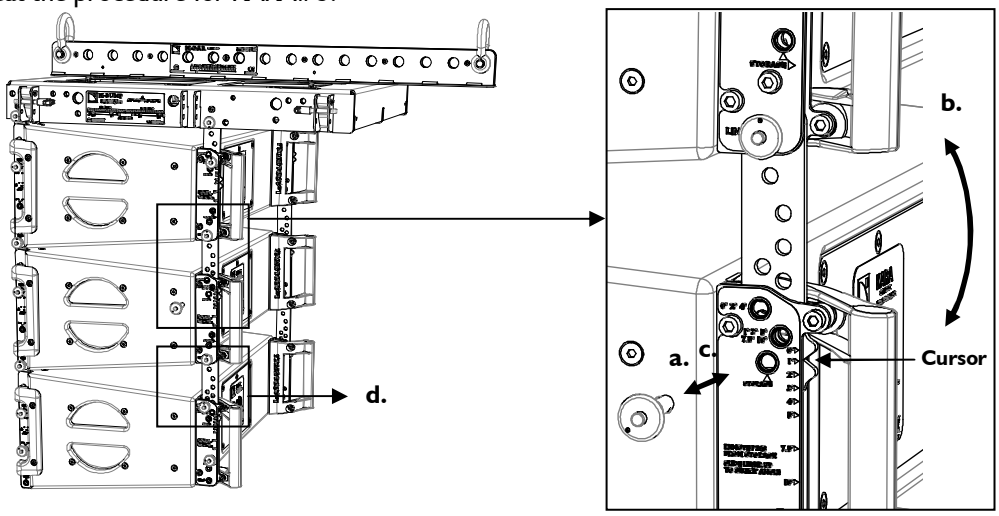


Figure 14: ARRAY#1 inter-enclosure angle setting

10. Place another full flight-case at the rigging location and remove the lid. Direct the front face of the 3-KARA array towards the audience. In the following, the array will be designated as ARRAY#2 and the enclosures as KARA#4 to KARA#6 from top to bottom.

11. Check the inter-enclosure connections in ARRAY#2 by applying step 5.

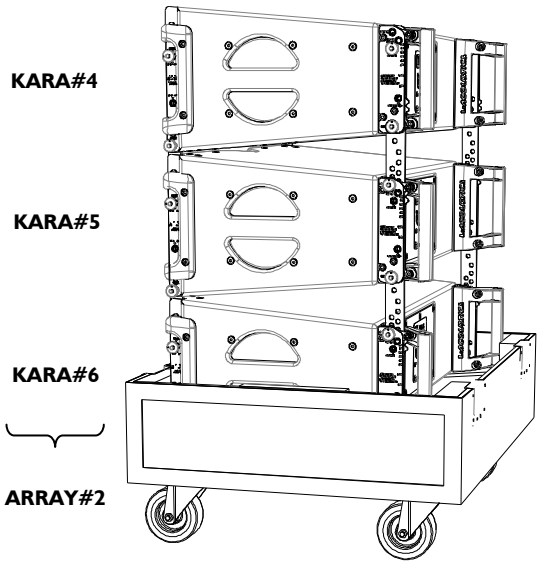


Figure 15: Inter-enclosure connection check for ARRAY#2

12. On KARA#4, take both **front** arms out as follows (repeat for each one): remove the front top R-BLP, rotate the front arm up, and slide it down. Do **not** re-insert the R-BLP.

13. Raise ARRAY#1 slightly higher than the front arms of ARRAY#2 and place ARRAY#2 beneath ARRAY#1.

14. Connect both **front** rigging points between ARRAY#1 and ARRAY#2 as follows:

a. Slide both KARA#4 front arms up and align them with the KARA#3 front bottom rigging points.

b. On KARA#3, remove both front bottom R-BLP from the storage holes and re-insert them into the bottom **yellow link holes** to secure the front arms to KARA#3.

c. Lower the array until the front corners of KARA#3 and 4 are in contact (front arms kept vertical).

d. Secure the front arms on KARA#4 by inserting both top R-BLP into the top **yellow link holes**.

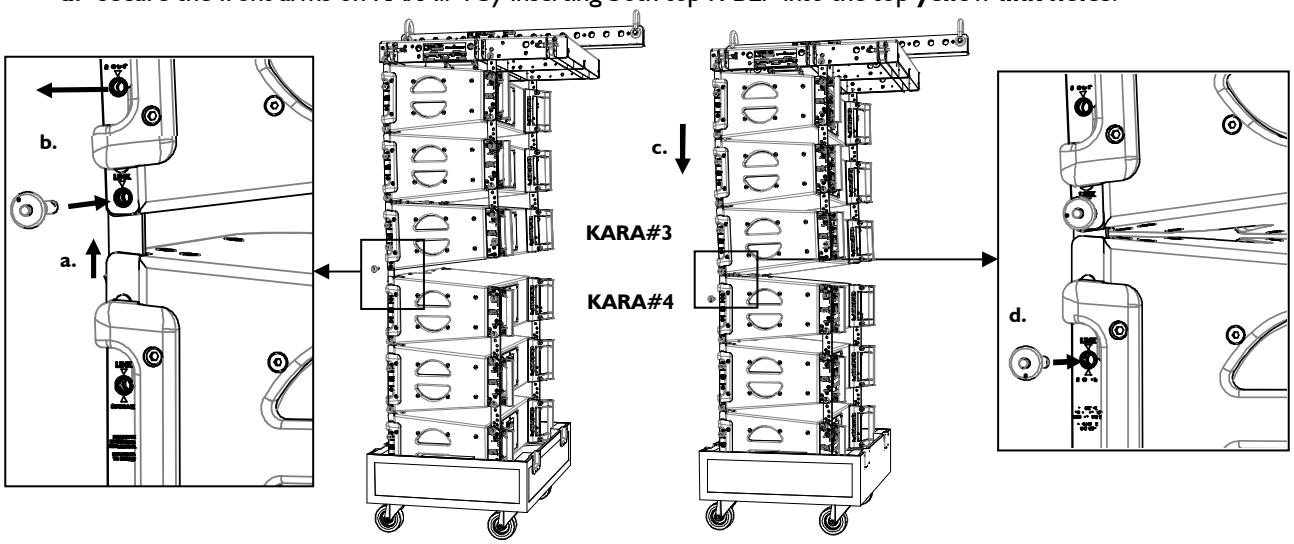


Figure 16: Linking ARRAY#2 and ARRAY#1 front rigging points

15. Raise the array to a height for which the angle arms of ARRAY#2 are within comfortable reach and remove the flight-case from the rigging location.

16. With 2 people working simultaneously on each side of the array, connect both **rear** rigging points between ARRAY#1 and ARRAY#2 as follows:

a. Remove the KARA#4 rear top R-BLP from its storage position, slide the angle arm so as to align the cursor with the desired angle value, and secure by re-inserting the R-BLP into the corresponding angle hole (**0**°/**2**°/**4**° or **1**°/**3**°/**5**°/**7.5**°/**10**°).

b. While grabbing the back handle of KARA#6, rotate ARRAY#2 so as to align the KARA#3 and KARA#4 rear rigging points.

c. Link both rigging points by removing the KARA#3 rear bottom R-BLP from its storage position and re-inserting it into the **yellow link hole**.

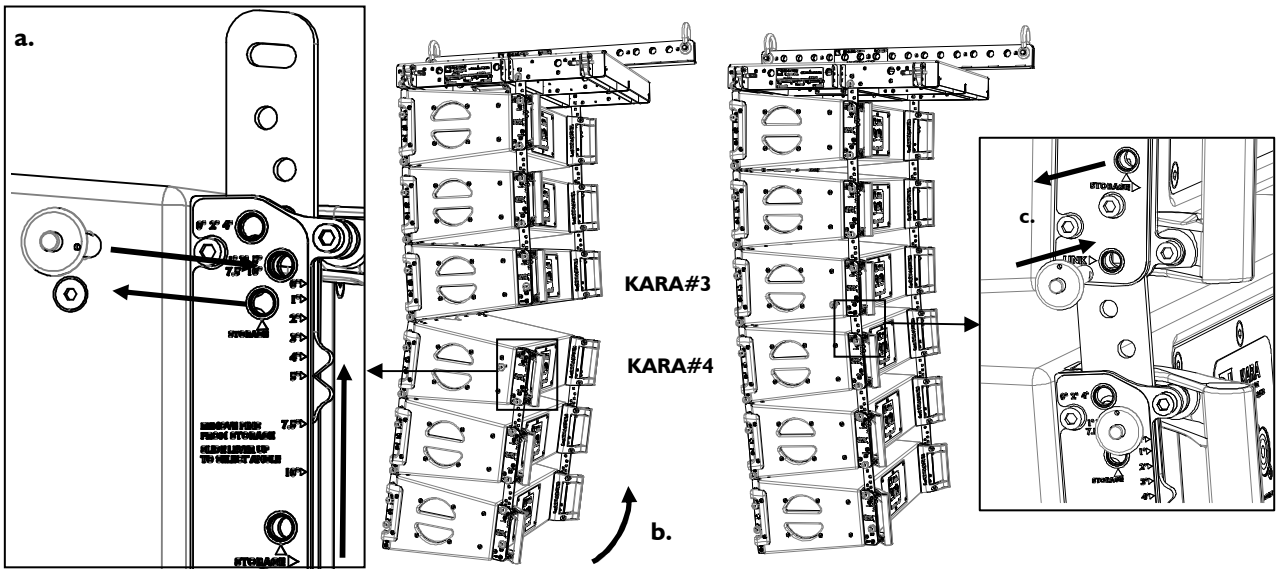


Figure 17: Linking ARRAY#2 and ARRAY#1 rear rigging points

17. Set the inter-enclosure angles in ARRAY#2 by applying step 9.

18. Repeat steps 10 to 17 until all KARA enclosures composing the array are rigged.

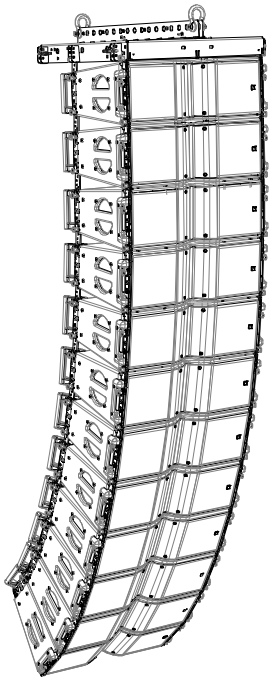


Figure 18: Example of KARA standalone array

19. **(Optional, for pullback configuration)** Attach a KARA-PULLBACK accessory to the bottom KARA as follows: insert the KARA-PULLBACK studs into the KARA rigging points (long studs at the back), remove the 4 bottom R-BLP from the KARA and secure by re-inserting them into the bottom **yellow link holes**. Attach the hook or stinger of an additional motor to the KARA-PULLBACK shackle.

Refer to [9.2.3] for KARA-PULLBACK setup safety limits.

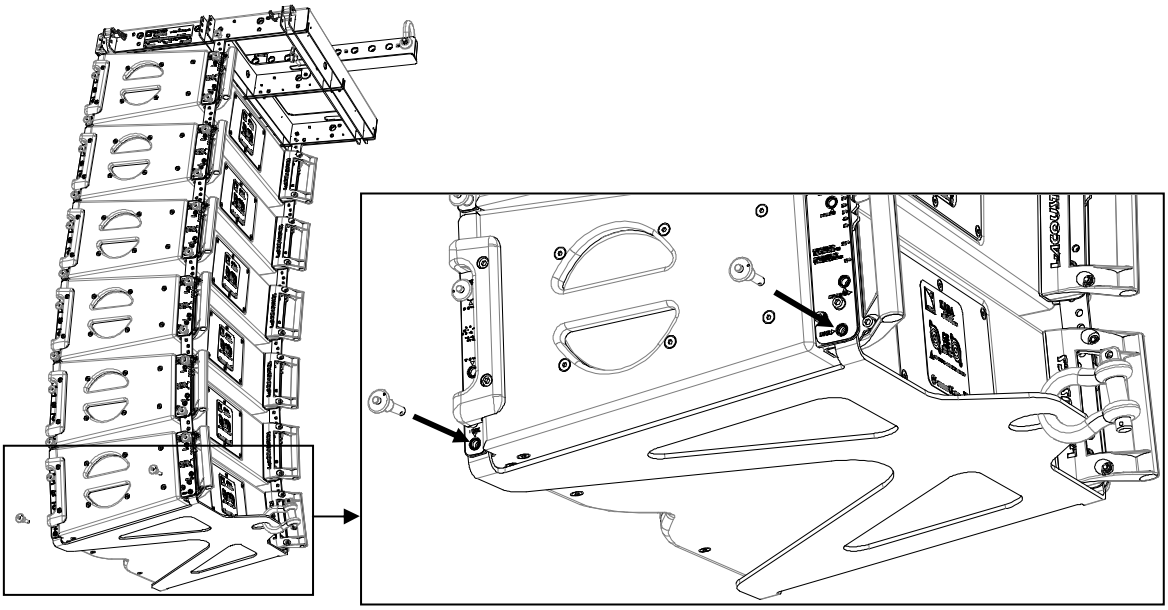


Figure 19: KARA-PULLBACK installation

20. Raise the array to the desired height and adjust the site angle [9.2.2].

21. Secure the M-BUMP to the main rigging structure using two safety slings (not included).

6.1.3 Array removal

WARNING	All along the procedure: STRICTLY follow the sequence of the successive steps. SYSTEMATICALLY verify that each BLP is fully inserted.
CAUTION	For clarity purposes the loudspeaker cable removal procedure will not be described. The loudspeaker cables will not be represented on the figures.

1. Remove both safety slings from the M-BUMP.

2. Lower the array to a height for which the angle arms of the bottom ARRAY (ARRAY#2 for example) are within comfortable reach.

3. **(Optional, for pullback configuration)** Remove the KARA-PULLBACK accessory as follows: lower the pullback chain so as to release tension, remove the motor hook or stinger from the shackle, while holding the KARA-PULLBACK remove the 4 bottom R-BLP from the bottom KARA, re-insert them into the bottom **storage** holes, and remove the KARA-PULLBACK.

4. With 2 people working simultaneously on each side of ARRAY#2, set the inter-enclosure angles to 0° as follows:
   - **a.** While grabbing the back handle of KARA#6, remove the rear top R-BLP of KARA#5.
   - **b.** Rotate KARA#5 so as to align the cursor of the angle arm with the 0° angle value.
   - **c.** Secure by re-inserting the R-BLP into angle hole **0°/2°/4°**.
   - **d.** Repeat the procedure for KARA#6.

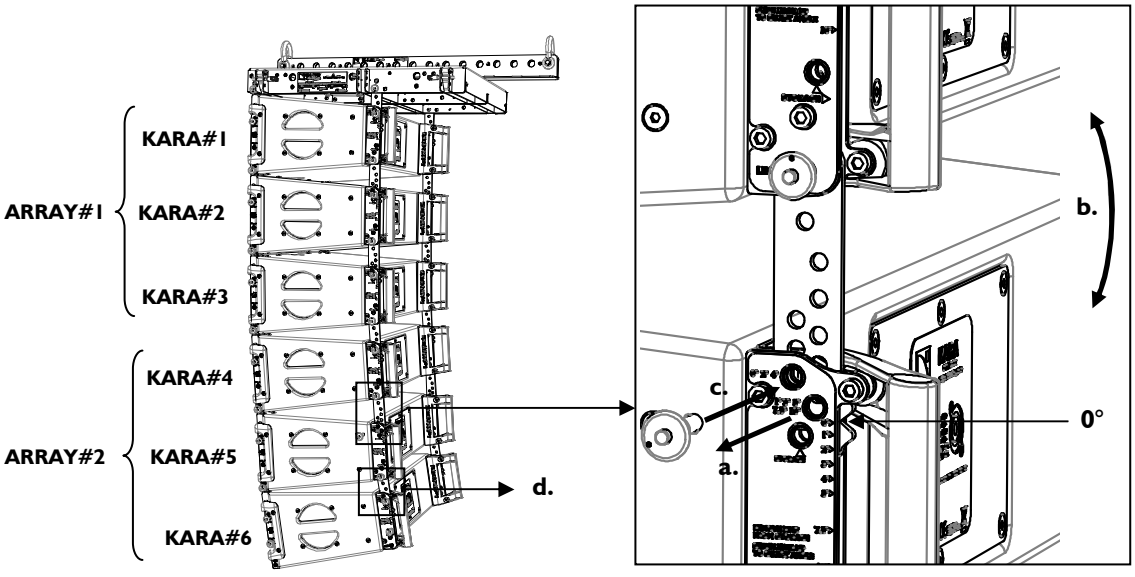


Figure 20: ARRAY#2 inter-enclosure angle setting

5. Place an empty KARA flight-case at the rigging location, remove the lid, and put the tray beneath ARRAY#2.

WARNING	Pay attention to the tray position: both wedges must slope upwards from front to rear [5.5].

6. Lower the array slightly higher than the tray.

7. With 2 people working simultaneously on each side of the array, remove both **rear** rigging points between ARRAY#1 and ARRAY#2 as follows:

a. While grabbing the back handle of KARA#5, remove the rear bottom **link** R-BLP from KARA#3 and re-insert it into the bottom **storage** hole.

b. Rotate ARRAY#2 downwards and place the rear corners into the tray while still suspended from the front rigging points.

c. Remove the rear top angle R-BLP from KARA#4, slide the angle arm so as to align the cursor with the **storage** position, and re-insert the R-BLP into the top **storage** hole.

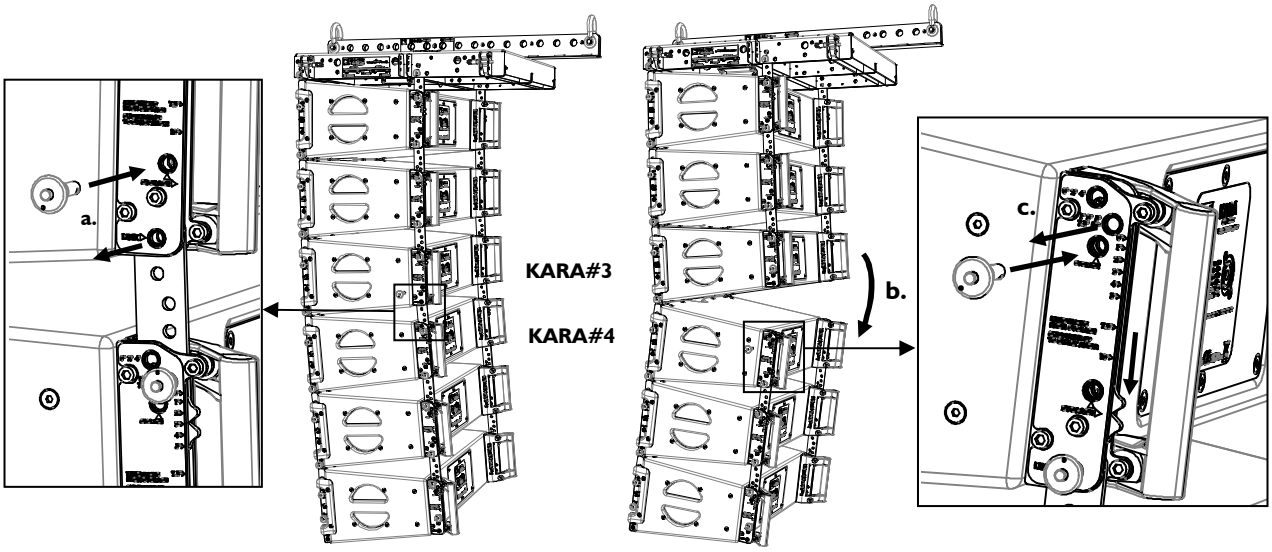


Figure 21: ARRAY#2 and ARRAY#1 rear rigging points separation

8. Lower the array until ARRAY#2 rests in the tray and the front rigging points between ARRAY#2 and ARRAY#1 are in contact.

9. Remove the **front** rigging points between ARRAY#1 and ARRAY#2 as follows:

a. Remove both KARA#4 front top **link** R-BLP.

b. Slightly raise ARRAY#1.

c. Remove both KARA#3 front bottom **link** R-BLP and re-insert them into the bottom **storage** holes.

d. Rotate both KARA#4 front arms down and re-insert both R-BLP into the top **storage** holes.

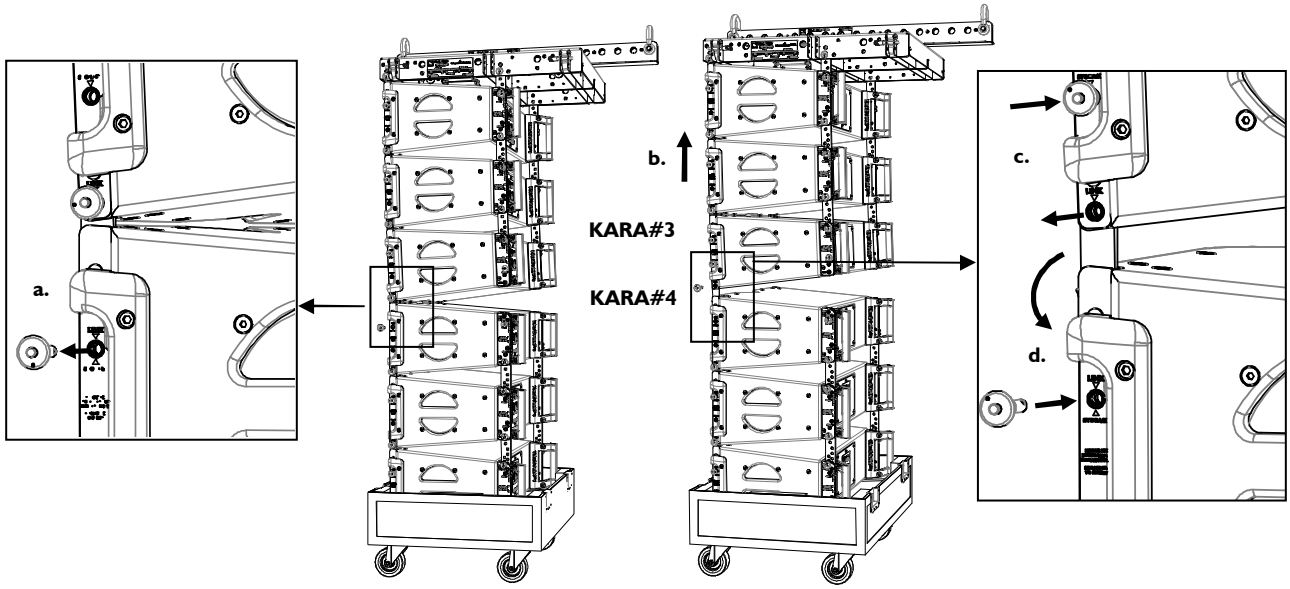


Figure 22: ARRAY#2 and ARRAY#1 front rigging points separation

10. Push ARRAY#2 away from the rigging location and put the flight-case lid on.

11. Repeat steps 2 to 10 to remove the ARRAYs just until ARRAY#1 is remaining attached to the M-BUMP.

12. Lower the array to a height for which the angle arms of ARRAY#1 are within comfortable reach and set the angles to 0° by applying step 4.

13. Place another empty flight-case at the rigging location, remove the lid, and put the tray beneath ARRAY#1.

> WARNING
>
> Pay attention to the tray position: both wedges must slope upwards from front to rear [5.5].

14. Lower ARRAY#1 into the tray. Lower the motor chain(s) so as to release tension.

15. Remove the motor hook(s) or stinger(s), remove the 4 R-BLP from the M-BUMP, and remove the M-BUMP from ARRAY#1.

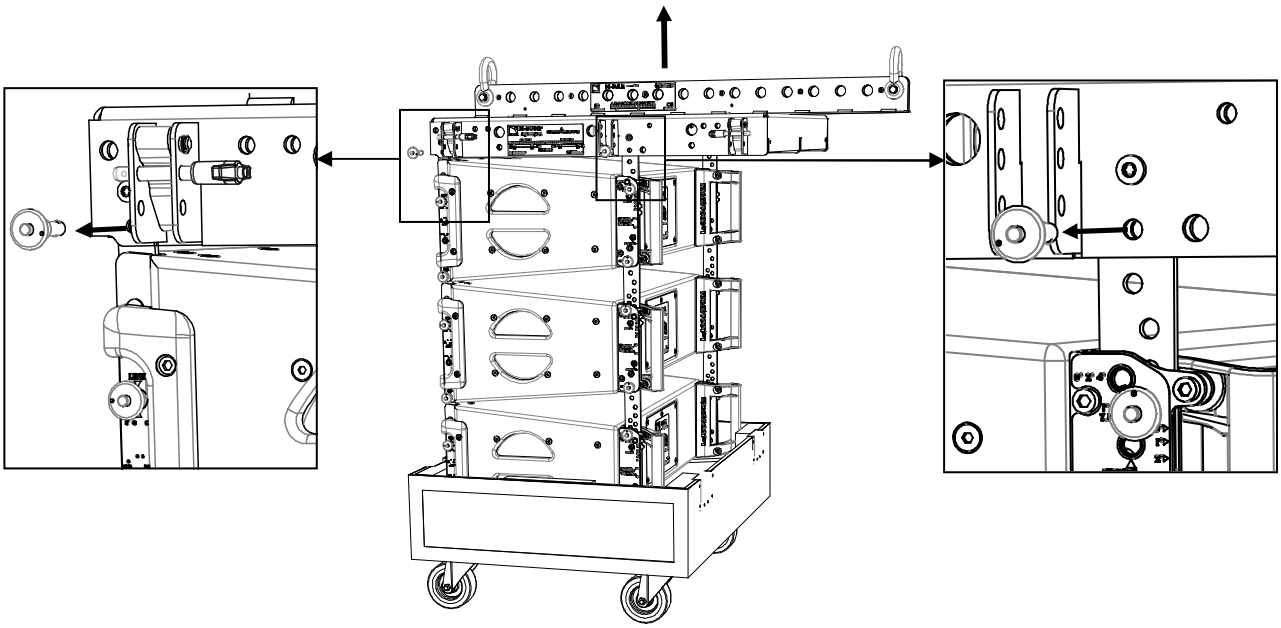


Figure 23: M-BUMP removal

16. Set ARRAY#1 for transport as follows:

- **a.** On each side of KARA#1, remove the front top **link** R-BLP, slide the front arm up, rotate down, and secure by re-inserting the R-BLP into the top **storage** hole.
- **b.** On each side of the KARA#1, remove the rear top angle R-BLP, slide the angle arm so as to align the cursor with the **storage** position, and secure by re-inserting the R-BLP into the top **storage** hole.
- **c.** Put the flight-case lid on.

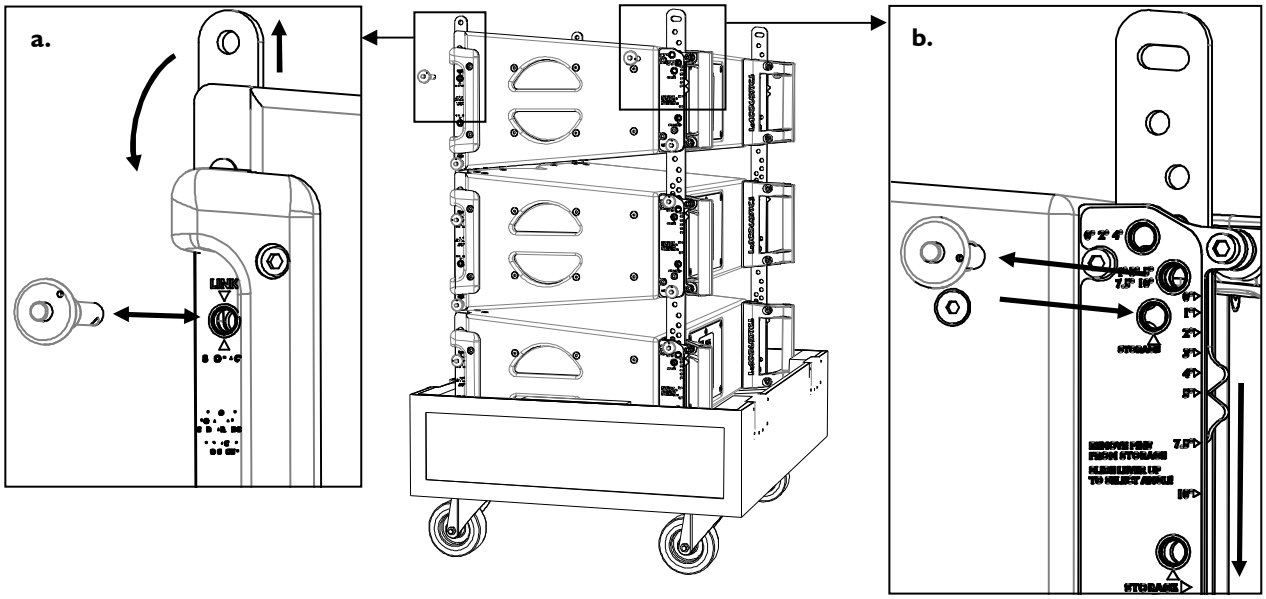


Figure 24: Setting ARRAY#1 for transport

17. Set the M-BUMP for transport as follows:

- **a.** Re-insert the 4 R-BLP in their storage locations.
- **b.** Remove each M-BAR as follows: remove both T-BLP from the M-BAR studs, remove the M-BAR, and re-insert both T-BLP in their storage locations.

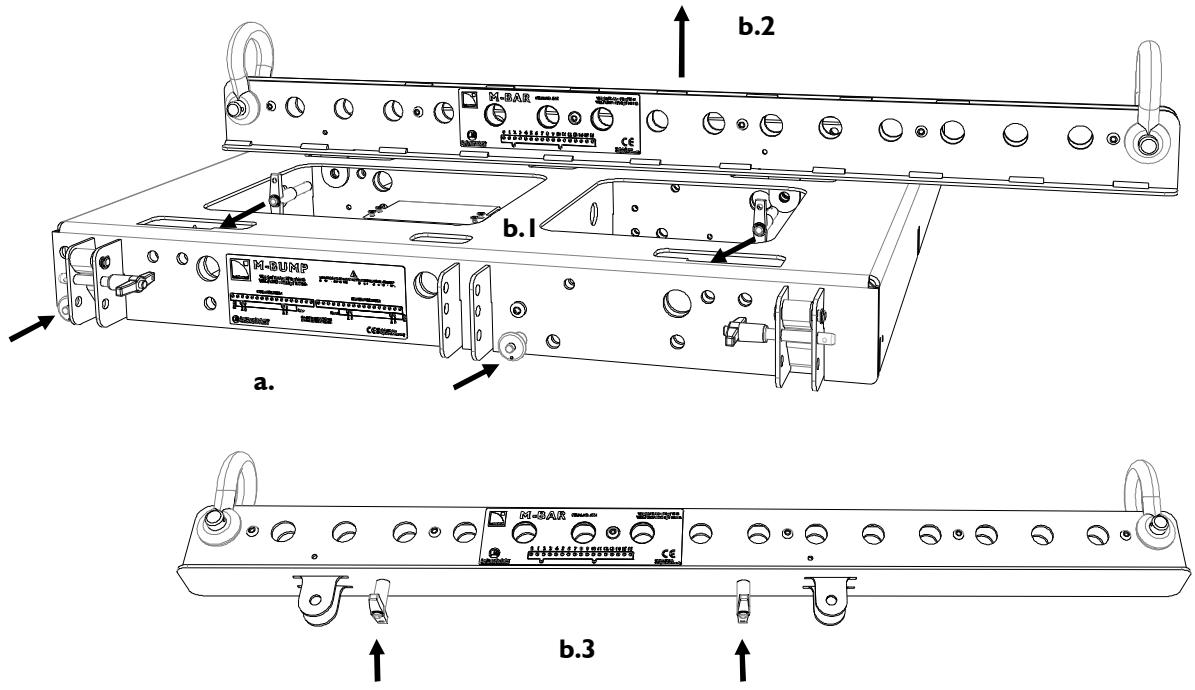


Figure 25: Single M-BAR storage example

6.2 Flying a SB18/KARA mixed array or a SB18 standalone array

6.2.1 Modeling and safety

Any system must be modeled before installation so as to ensure acoustical and mechanical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARA enclosures (acoustic data not available for subwoofers).
- Calculate the array site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.

WARNING	The M-BUMP can nominally fly an array of up to **4 SB18/12 KARA** or **16 SB18** along with all loudspeakers cables (refer to the **KARA and SB18 User manuals** [3.4]). However, this maximum number can decrease in line with the array curvature and/or the acoustic coupling conditions (depending on the selected operation mode as described in the **KARA User manual**). ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the system before installation.
WARNING	NEVER use M-BUMP and KARA-MINIBU within the same array (refer to the **KARA Rigging procedures pack** [3.4] for KARA-MINIBU description).

The KARA, SB18, and M-BUMP fully integrated rigging systems allow assembling the array with no need for any external accessory.

The following first procedure describes how to fly a vertical SB18/KARA array using two M-BUMP. According to the array composition, the SB18 enclosures can be rigged one by one or by pairs (as shown in the procedure). It is recommended to rig the KARA by successively adding arrays of 3 enclosures (called ARRAY#1, ARRAY#2… in the order of appearance in the procedure). The second procedure describes how to disassemble the array.

6.2.2 Array mounting

WARNING	All along the procedure: STRICTLY follow the sequence of the successive steps. SYSTEMATICALLY verify that each BLP is fully inserted. SYSTEMATICALLY verify that the bolt is fully screwed in and secured with safety pin on each shackle.
CAUTION	For clarity purposes the loudspeaker cabling procedure will not be described. The loudspeaker cables will not be represented on the figures. Use a strain relief to avoid mechanical stress at the connector locations due to cable weight. The motor hooks or stingers will not be represented on the figures.

1. Place an M-BUMP at the rigging location. Turn it so that the text of the identification plate is readable and the laser slits are directed towards the audience.

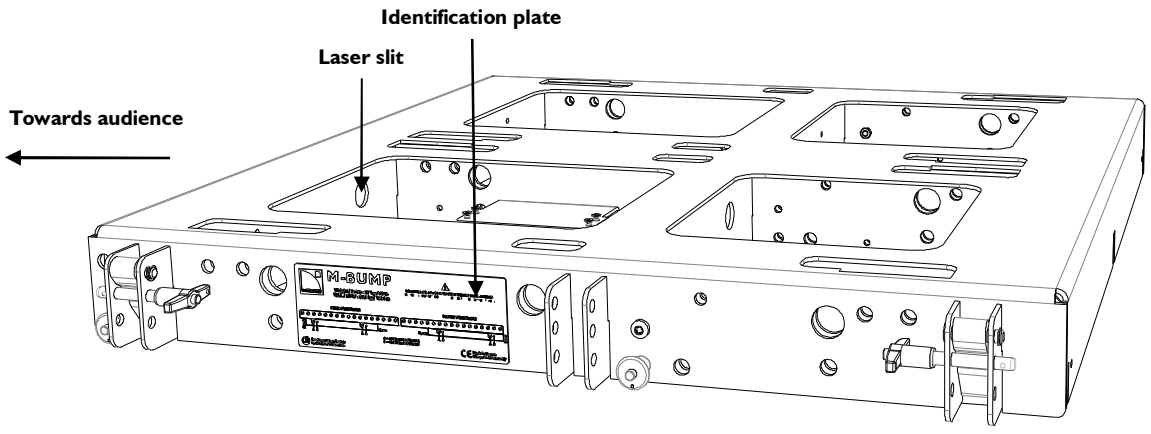


Figure 26: M-BUMP position

2. **(Optional [9.2])** Install one or two M-BAR on the M-BUMP as follows (repeat for each M-BAR):
   - **a.** Remove both T-BLP from the M-BAR.
   - **b.** Insert both M-BAR studs face to the desired M-BUMP holes.
   - **c.** Secure by inserting both preceding T-BLP through M-BAR studs and M-BUMP holes.

   Note: In case of SB18 standalone array rigging, the M-BAR is not useful unless it is intended to modify the distance between the rigging points [9.2].

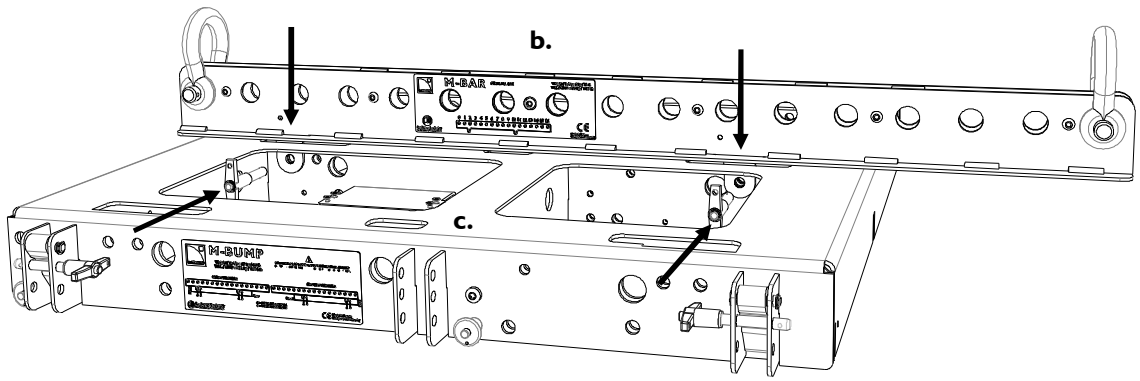


Figure 27: Single M-BAR installation example

3. Attach the shackle(s) to the M-BUMP [9.4] according to the chosen configuration [9.2].

4. Build a stack composed of two SB18 (hereafter called SB18#1 and SB18#2) at the rigging location as follows:
   - **a.** Place two SB18 at the rigging location and remove the dolly boards.
   - **b.** Put SB18#1 onto SB18#2 so that the front grills are facing the audience and the logos are placed at the bottom.
   - **c.** Attach the four rigging arms of SB18#2 to SB18#1 as follows: disconnect a T-BLP from SB18#2, rotate the rigging arm up, re-connect the T-BLP to the SB18#1 rigging point and the rigging arm ; repeat this procedure until all 4 arms are secured.

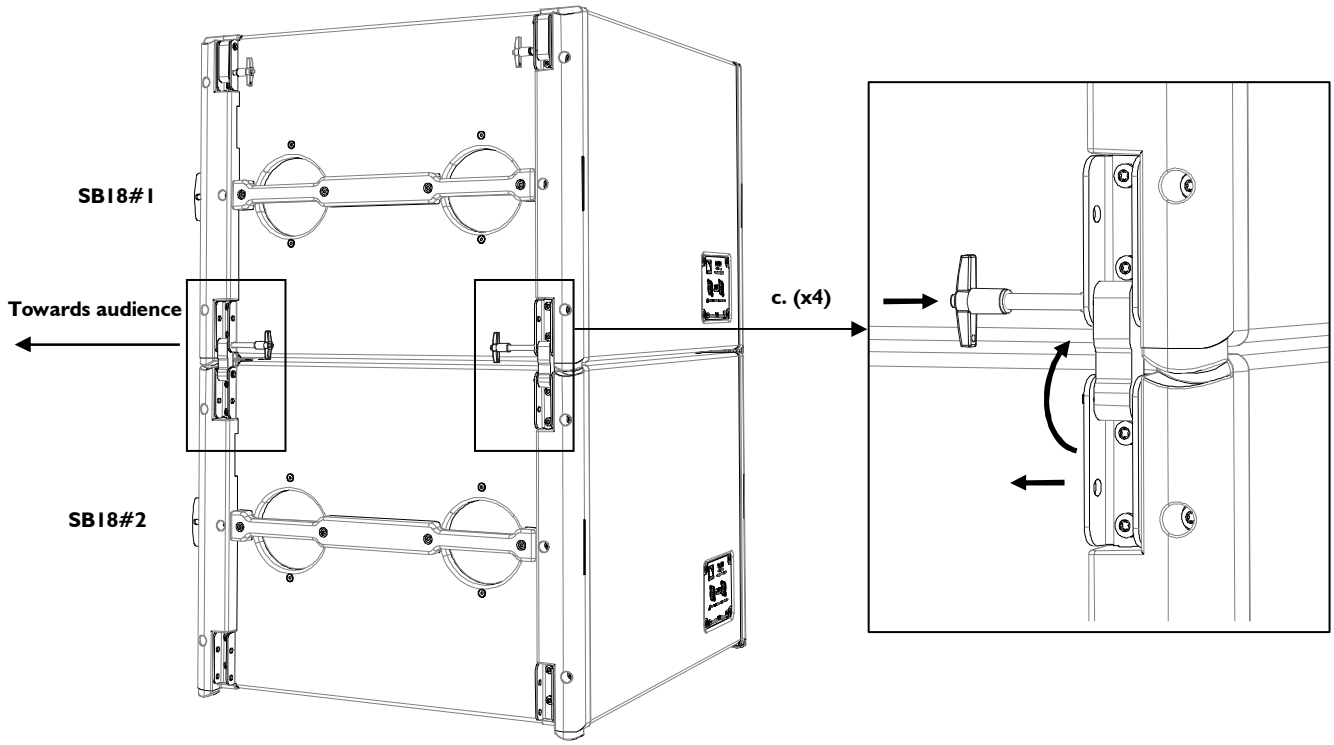


Figure 28: Building a 2-SB18 stack

5. Put the M-BUMP onto SB18#1 by keeping the orientation and attach the four rigging arms of SB18#1 to the M-BUMP as follows: disconnect a T-BLP from SB18#1, rotate the rigging arm up, re-connect the T-BLP to the M-BUMP rigging point and the rigging arm ; repeat this procedure until all 4 arms are secured.

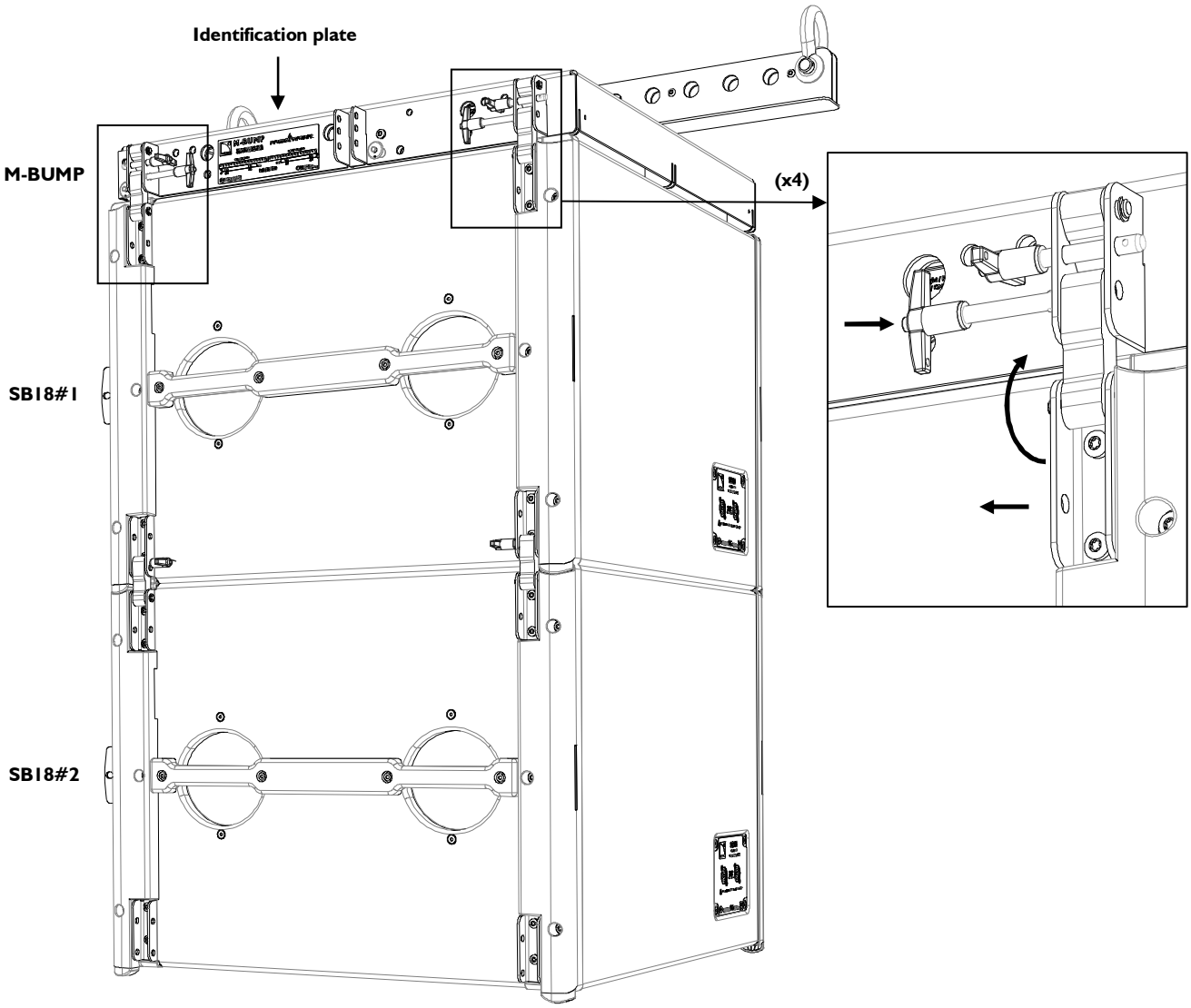


Figure 29: M-BUMP installation

6. Attach the motor hook(s) or stinger(s) to the shackle(s).

7. Raise the array so that it is possible to place another stack of two SB18 under it.

8. Build another stack of two SB18 enclosures (hereafter called SB18#3 and SB18#4) by applying step 4.

IMPORTANT

Orient all SB18 composing the array towards the audience to obtain an **omnidirectional** acoustic pattern or turn one SB18 every four from front to rear to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]). As an example, Figure 30 shows a cardioid SB18 array.

9. Attach SB18#3 to SB18#2 as follows (see also Figure 30):

a. Lower the array onto SB18#3 while aligning the four rigging points between SB18#2 and SB18#3.

b. Attach the four rigging arms of SB18#3 to SB18#2 as follows: disconnect a T-BLP from SB18#3, rotate the rigging arm up, re-connect the T-BLP to the SB18#2 rigging point and the rigging arm ; repeat this procedure until all 4 arms are secured.

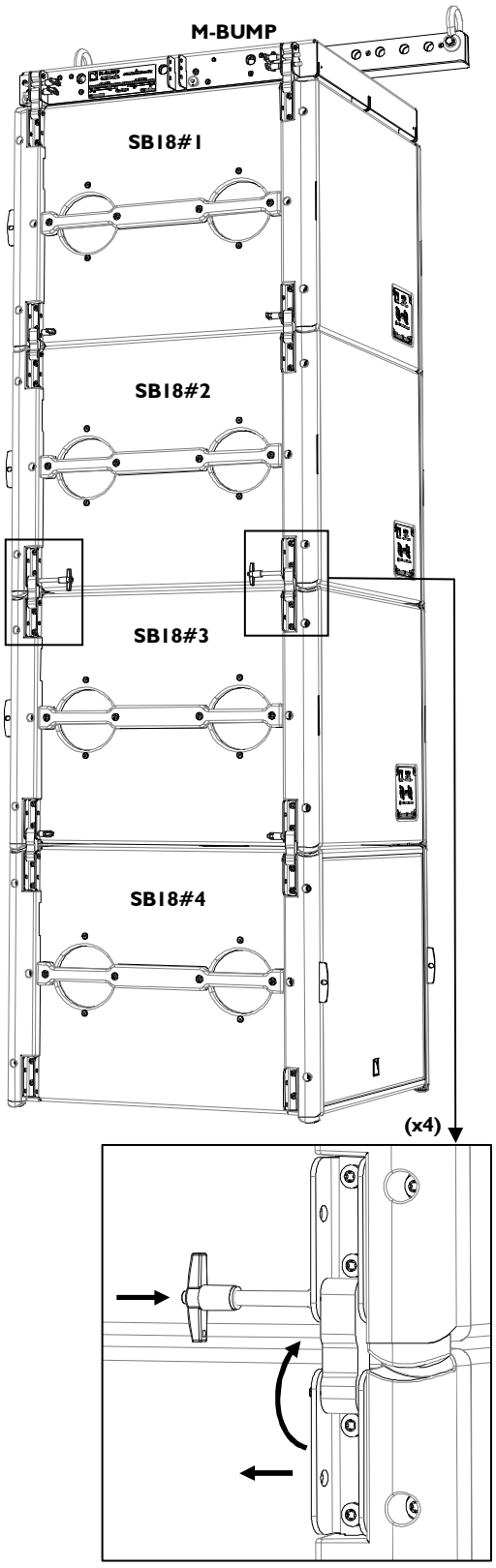


Figure 30: Adding a second 2-SB18 stack to the array (cardioid configuration example)

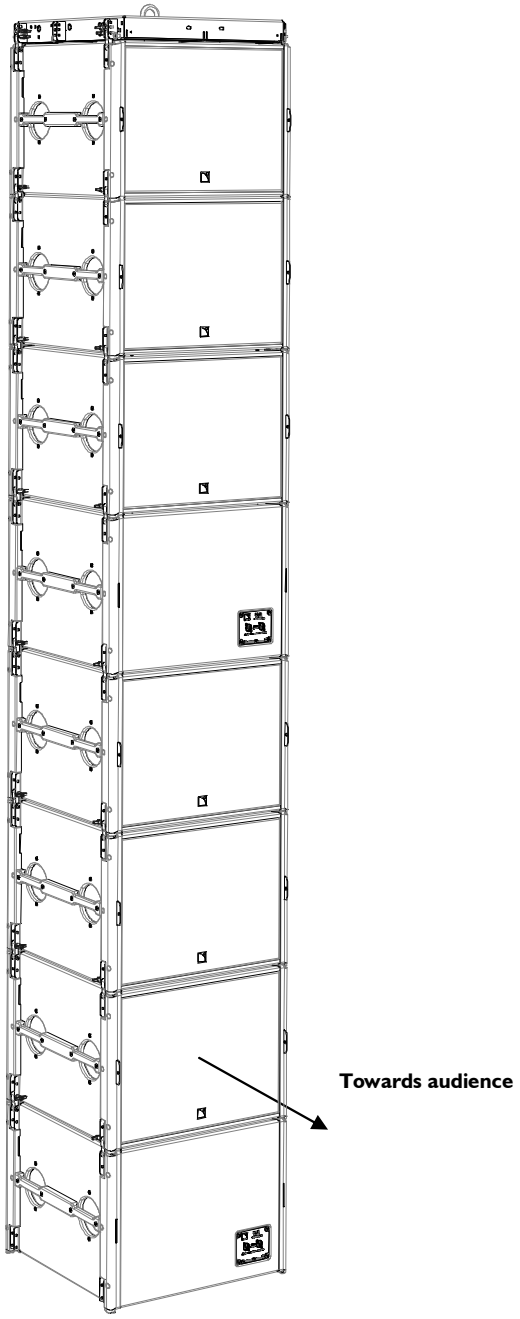


Figure 31: Example of SB18 standalone array (rigging option 0 [9.2.1])

10. If the array is intended to be a SB18 standalone array, apply the following last procedure (see also Figure 31):

a. Repeat steps 7 to 9 until all SB18 composing the array are rigged.

b. Raise the array to the desired height.

c. Secure the M-BUMP to the main rigging structure using two safety slings (not provided). **PROCEDURE END**

If the array is intended to be a SB18/KARA mixed array, place a full KARA flight-case at the rigging location and remove the lid. Direct the front face of the 3-KARA array towards the audience. In the following, the array will be designated as ARRAY#1 and the enclosures as KARA#1 to KARA#3 from top to bottom.

For clarity purposes, the procedure is continued with an array composed of two SB18 enclosures.

11. Check the inter-enclosure connections in ARRAY#1 (repeat for each side):

a. For both front rigging points, verify that the front arm is open and locked to 2 KARA by 2 R-BLP inserted in **yellow link holes**.

b. For both rear rigging points, verify that the angle arm cursor is aligned with the **0°** angle value and locked to 2 KARA by 2 R-BLP, the upper one inserted in a **yellow link hole** and the bottom one inserted into angle hole **0°/2°/4°**.

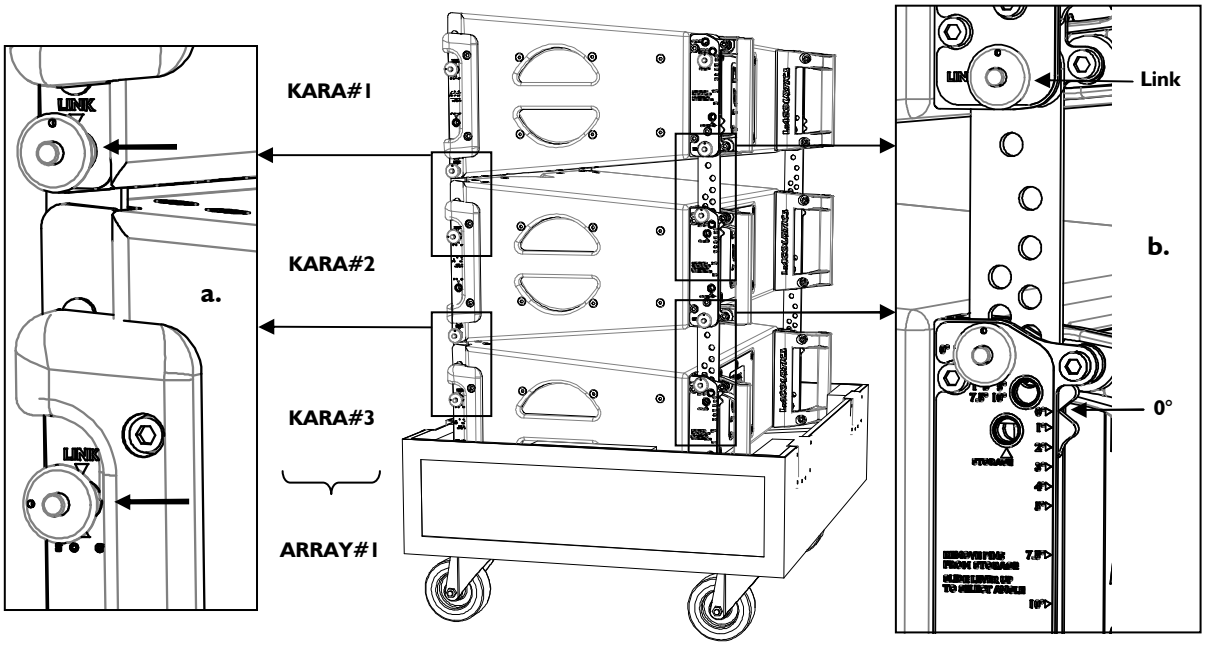


Figure 32: Inter-enclosure connection check for ARRAY#1

12. On KARA#1, take the 4 arms out as follows (repeat for each side):

a. Remove the front top R-BLP from storage position, rotate the front arm up, slide it down, and secure by re-inserting the R-BLP into the **yellow link hole**.

b. Remove the rear top R-BLP, slide the angle arm so as to align the cursor with the 5° angle value, and secure by re-inserting the R-BLP into angle hole **1°/3°/5°/7.5°/10°**.

IMPORTANT

It is recommended to select the 5° angle on the KARA intended to be linked to the M-BUMP. In that way the KARA#1 axis will be parallel to the M-BUMP.

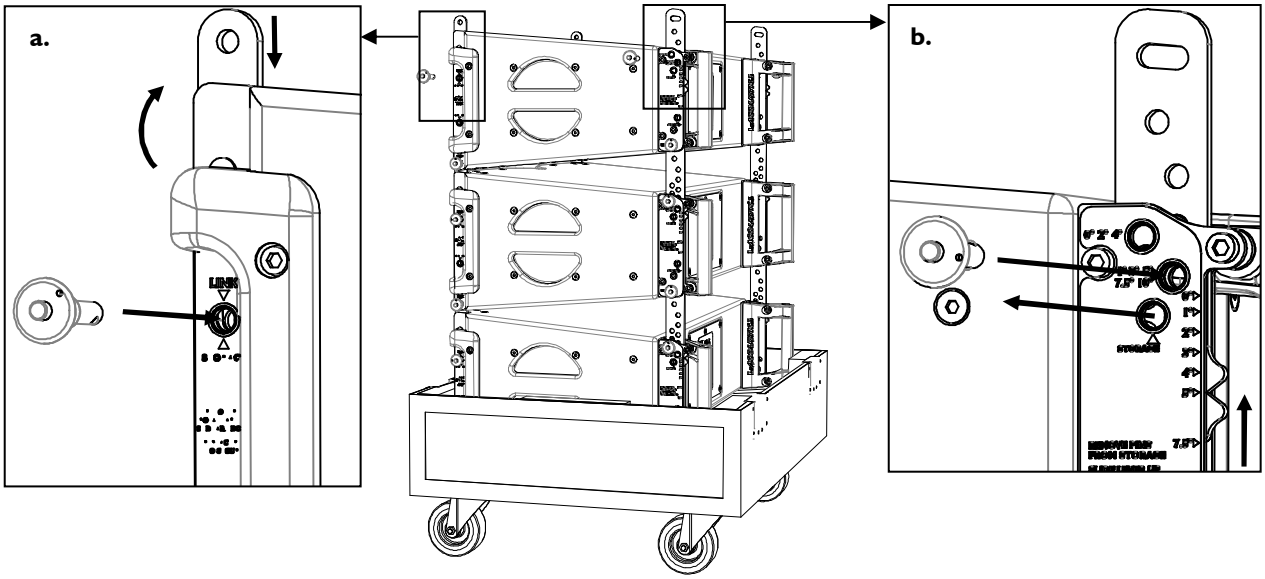


Figure 33: Setting the KARA#1 arms

13. Place another M-BUMP at the rigging location and remove the 4 R-BLP. Put the M-BUMP on ARRAY#1 by aligning the four rigging points and secure by re-inserting the 4 R-BLP.

Note: Turn the M-BUMP so that the text of the identification plate is readable and the laser slits are directed towards the audience.

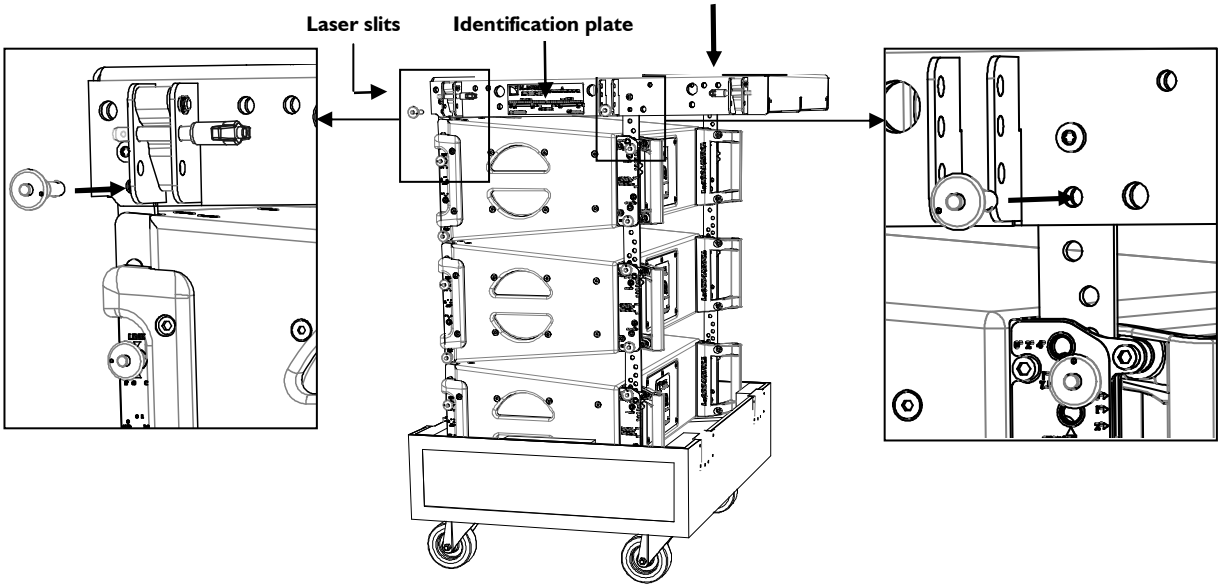


Figure 34: Linking M-BUMP to ARRAY#1

14. Raise the SB18 array slightly higher than ARRAY#1, place ARRAY#1 beneath it, and lower the SB18 array so as to align its 4 rigging points with those of ARRAY#1. The bottom SB18 and the M-BUMP must be in contact.

15. Attach the 4 rigging points between the bottom SB18 and the M-BUMP as follows (repeat for each one):

- **a.** Remove the external T-BLP from the M-BUMP.
- **b.** Rotate the arm out.
- **c.** Secure to the SB18 by re-inserting the T-BLP.

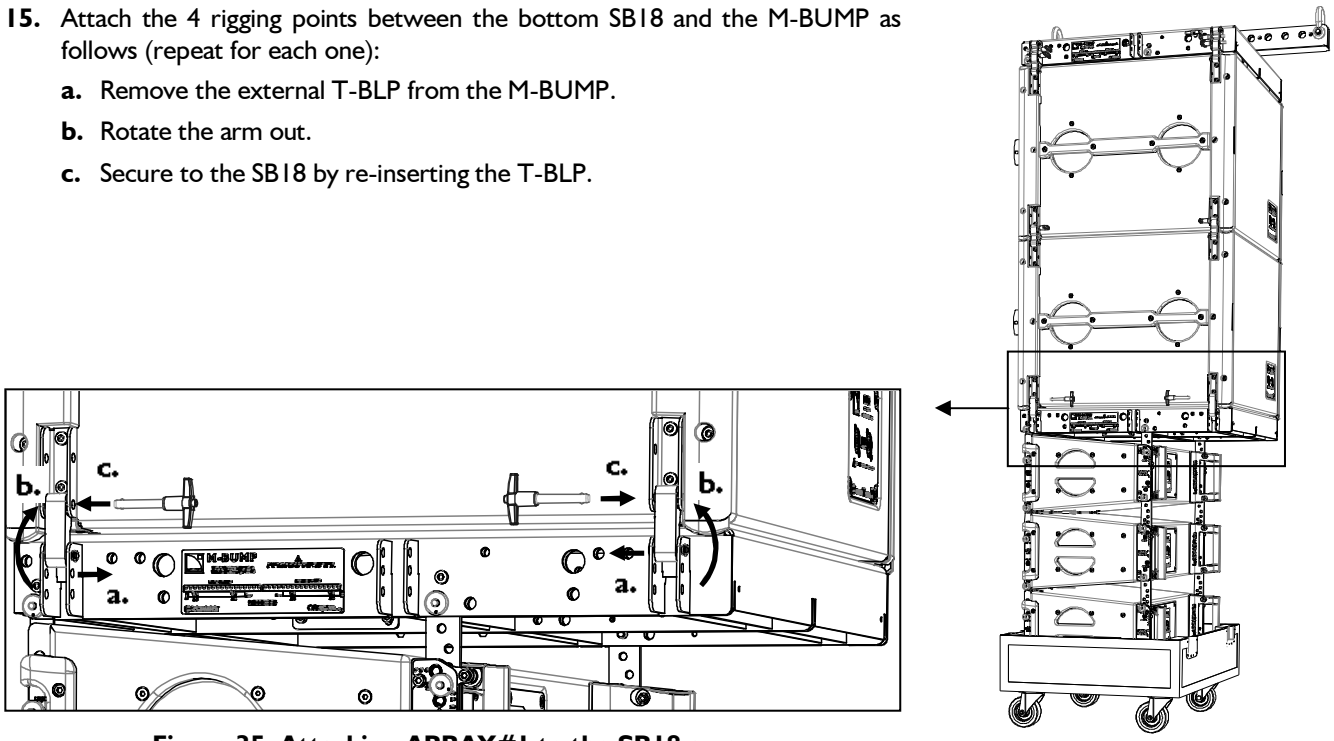


Figure 35: Attaching ARRAY#1 to the SB18 array

16. Raise the array to a height for which the angle arms of ARRAY#1 are within comfortable reach and remove the flight-case from the rigging location.

17. Continue the procedure by applying [6.1.2, steps 9 to 21].

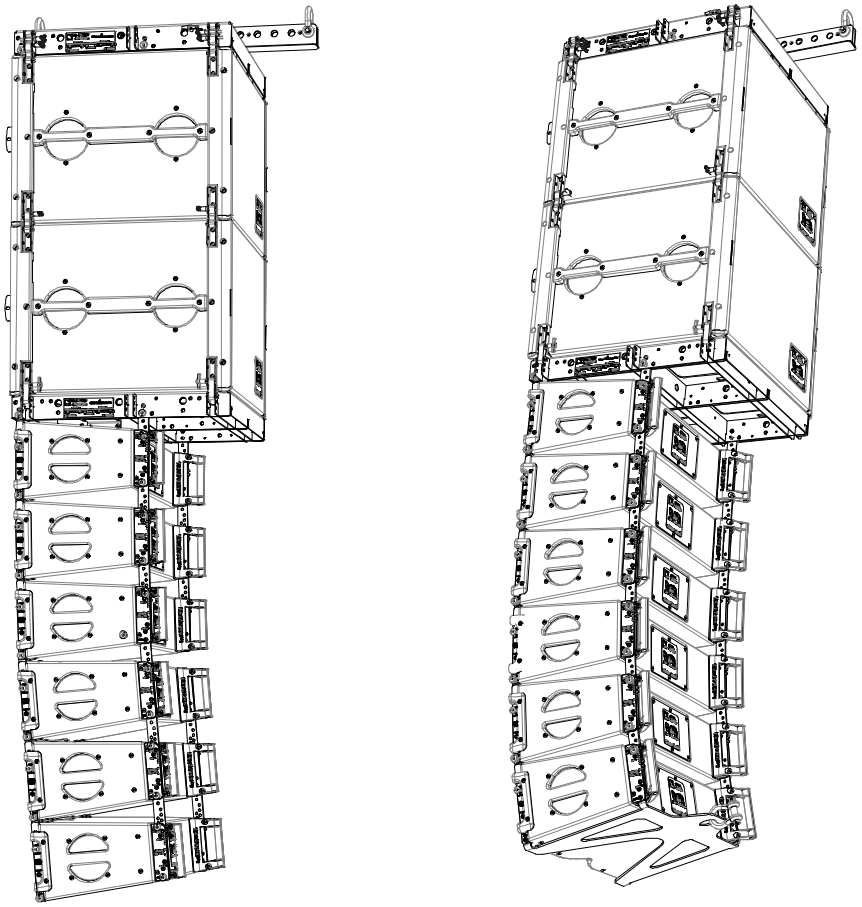


Figure 36: Examples of flown SB18/KARA mixed arrays

6.2.3 Array removal

WARNING	All along the procedure: STRICTLY follow the sequence of the successive steps. SYSTEMATICALLY verify that each BLP is fully inserted.
CAUTION	For clarity purposes the loudspeaker cable removal procedure will not be described. The loudspeaker cables will not be represented on the figures.

1. In case of SB18 standalone array, directly go to step 8.
   In case of SB18/KARA mixed array, begin the procedure by applying [6.1.3, steps 1 to 13] and then continue to next step.

2. Lower ARRAY#1 into the tray. The bottom SB18 must be resting on the M-BUMP.

3. Disconnect the 4 rigging points between the bottom SB18 and the M-BUMP as follows (repeat for each point):
   a. Remove the T-BLP from the M-BUMP.
   b. Rotate the arm down.
   c. Re-insert the T-BLP on the M-BUMP.

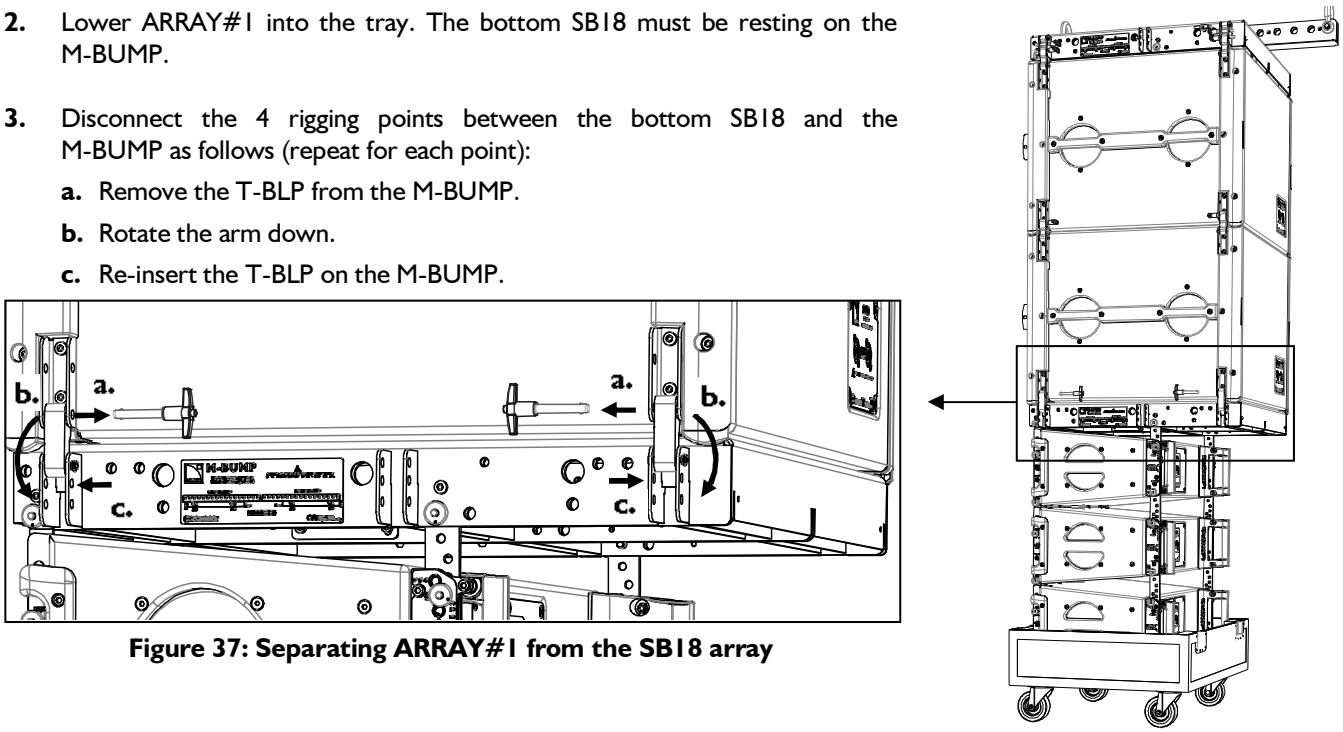


Figure 37: Separating ARRAY#1 from the SB18 array

4. Push ARRAY#1 away from under the SB18 array.

5. Remove the 4 R-BLP from the M-BUMP and remove the M-BUMP from ARRAY#1.

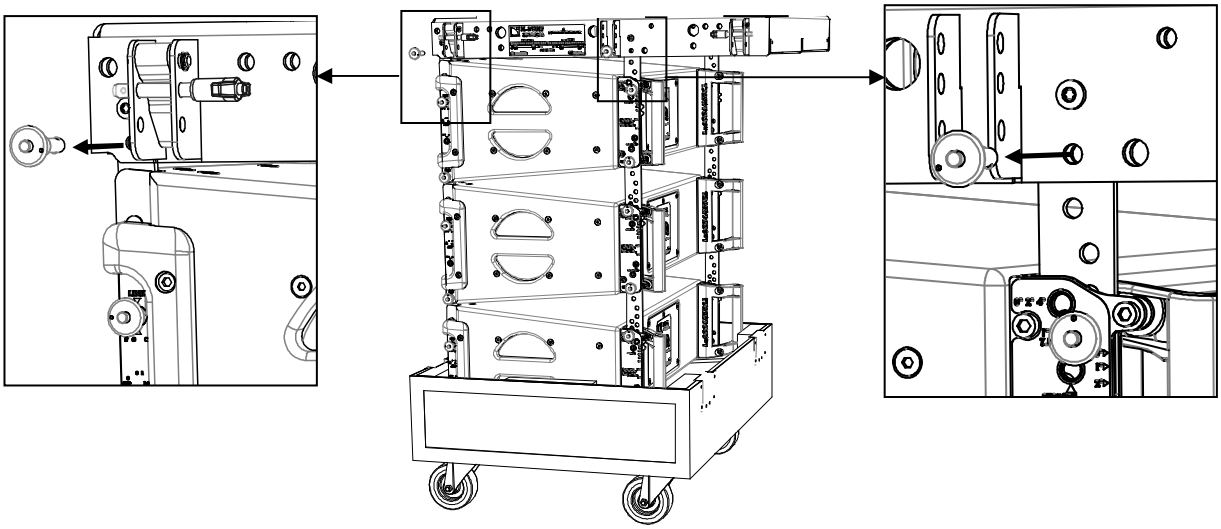


Figure 38: M-BUMP removal

6. Set ARRAY#1 for transport as follows:
   a. On each side of KARA#1, remove the front top **link** R-BLP, slide the front arm up, rotate down, and secure by re-inserting the R-BLP into the top **storage** hole.
   b. On each side of the KARA#1, remove the rear top angle R-BLP, slide the angle arm so as to align the cursor with the **storage** position, and secure by re-inserting the R-BLP into the top **storage** hole.
   c. Put the flight-case lid on.

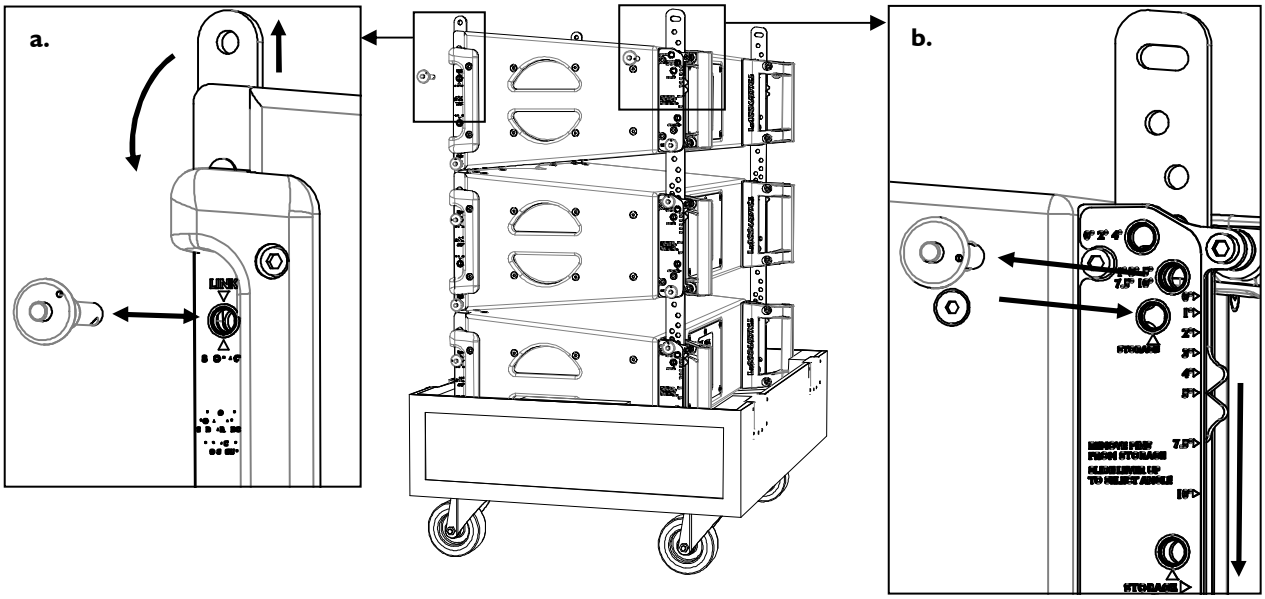


Figure 39: Setting ARRAY#1 for transport

7. Set the M-BUMP for transport by re-inserting the 4 R-BLP into their storage locations.

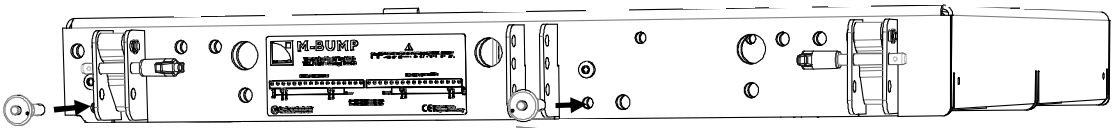


Figure 40: Setting the M-BUMP for transport

IMPORTANT

For precision purposes, the procedure is continued with an array composed of four SB18 enclosures.

8. If not already done, remove both safety slings from the M-BUMP.

9. Lower the array until the bottom SB18 (hereafter called SB18#4 as an example) rests on the ground and the SB18 above (hereafter called SB18#3) rests onto it.

10. Detach SB18#3 from SB18#2 as follows:
    a. Disconnect a T-BLP from the bottom of SB18#2.
    b. Rotate the rigging arm down.
    c. Re-connect the T-BLP to SB18#3 so as to lock the rigging arm in closed position.
    d. Repeat this procedure until all 4 arms are locked in closed position.

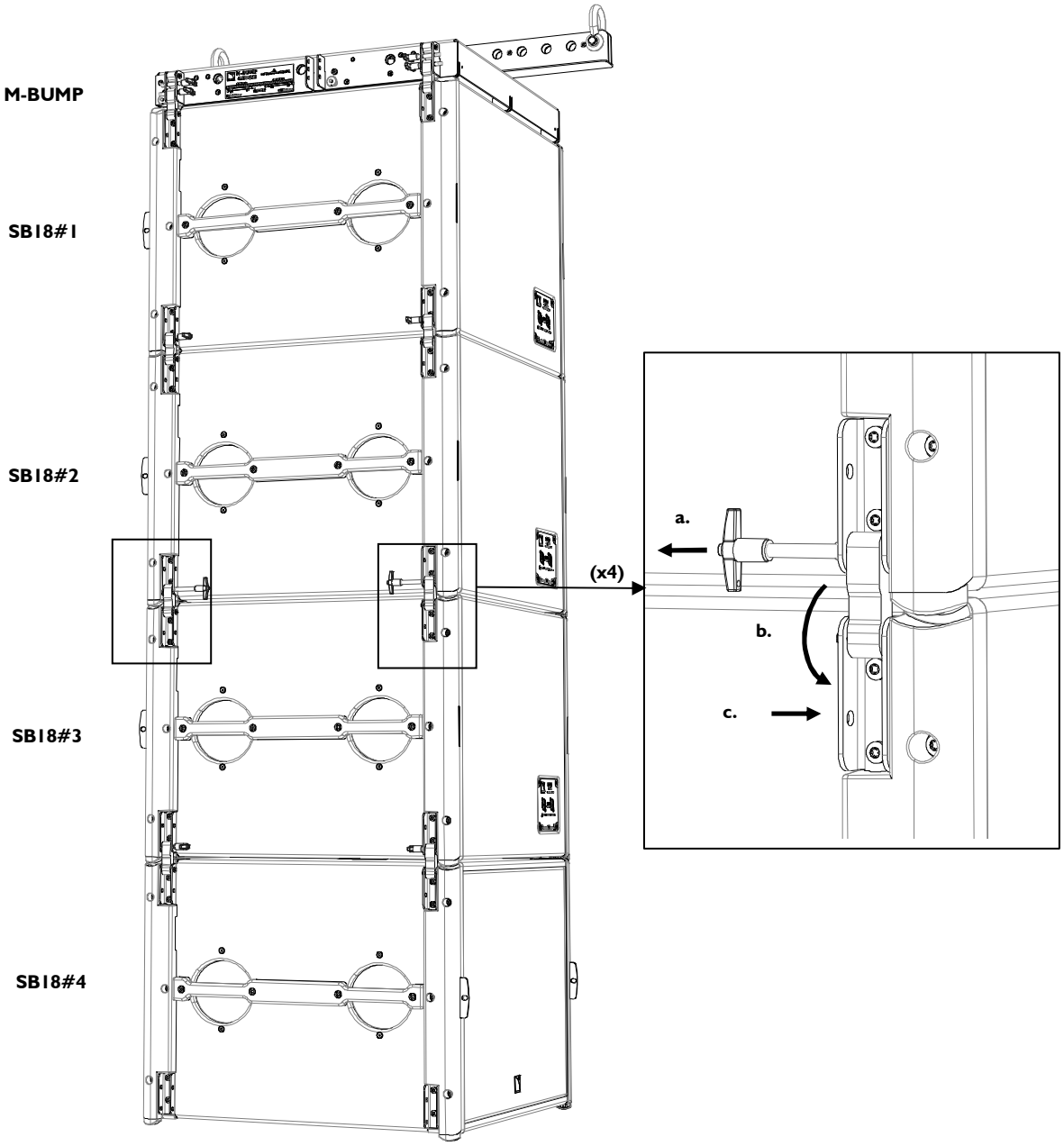


Figure 41: Detaching a 2-SB18 stack from the array

11. Raise the array so that SB18#2 is separated from SB18#3.

12. Attach two dolly boards to SB18#3 and 4.

13. Detach SB18#4 from SB18#3 by applying step 10.

14. Remove SB18#3 and 4 from the rigging location.

15. Repeat steps 9 to 14 to separate the SB18s from the array just until SB18#1 and 2 are remaining attached to the M-BUMP.

16. Lower the array until it rests on the ground.

17. Remove the motor hook(s) or stinger(s) from the shackle(s) of the M-BUMP.

18. Remove the M-BUMP from SB18#1 as follows:

- **a.** Disconnect a bottom T-BLP from the M-BUMP.
- **b.** Rotate the rigging arm down.
- **c.** Re-connect the T-BLP to SB18#1 so as to lock the rigging arm in closed position.
- **d.** Repeat this procedure until all 4 arms are locked in closed position.
- **e.** Remove the M-BUMP from the array.

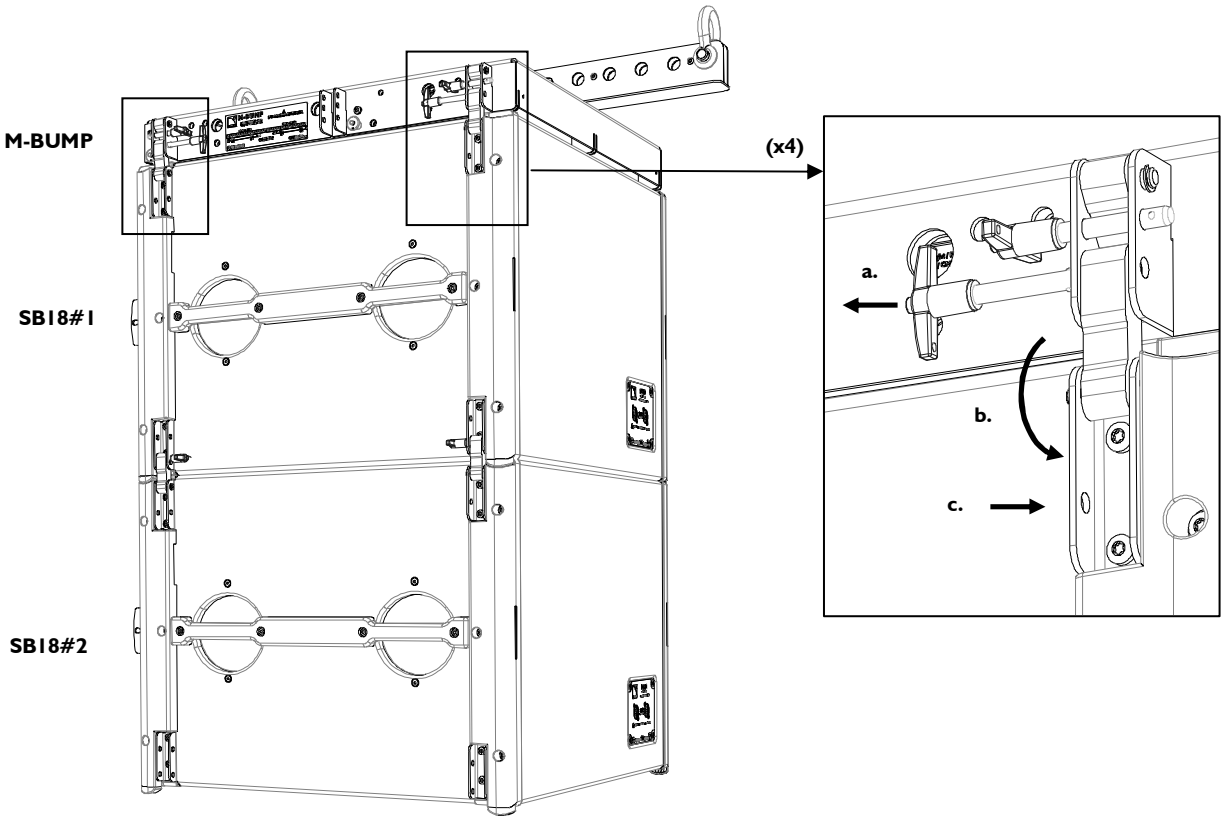


Figure 42: M-BUMP removal

19. If necessary, set the M-BUMP for transport by removing each M-BAR as follows: remove both T-BLP from the M-BAR studs, remove the M-BAR, and re-insert both T-BLP in their storage locations.

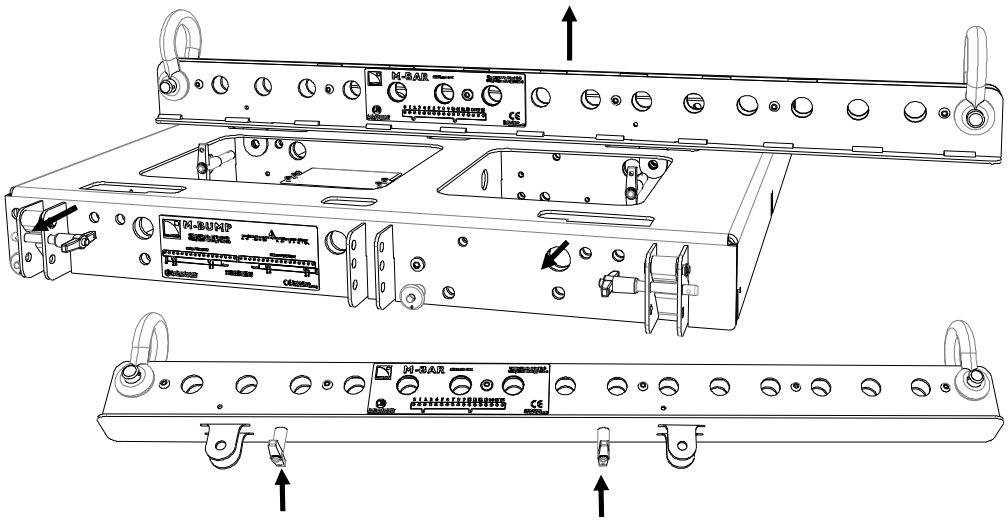


Figure 43: Single M-BAR storage example

20. Attach two dolly boards to SB18#1 and 2.

21. Detach SB18#2 from SB18#1 by applying step 10 and remove both subwoofers from the rigging location.

6.3 Stacking a KARA standalone array

6.3.1 Modeling and safety

A KARA array must be stacked onto an M-BUMP/M-BAR/M-JACK platform (**platform stacked array**). The platform provides tilt adjustments in case of slope surface and increases the array stability.

Any **platform stacked array** must be modeled before installation so as to ensure acoustical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARA enclosures.
- Calculate the inter-enclosure angles.

WARNING

A **platform stacked array** can be composed of a maximum of **9 KARA** enclosures along with all loudspeakers cables (refer to the **KARA User manual** [3.4]).

The platform must be installed in **rear extension configuration** if the KARA array is intended to have a **positive** site angle (refer to [9.3.1]).

The platform must be installed in **front extension configuration** if the KARA array is intended to have a **negative** site angle (refer to [9.3.1]) and a **flat** shape (all inter-enclosure angles are close to 0°).

The KARA and M-BUMP fully integrated rigging systems allow assembling the array with no need for any external accessory. The following first procedure describes how to mount a vertical KARA **platform stacked array**. The second procedure describes how to disassemble the array.

6.3.2 Array mounting

WARNING

All along the procedure:

STRICTLY follow the sequence of the successive steps.

SYSTEMATICALLY verify that each BLP is fully inserted.

SYSTEMATICALLY verify that each bolt is fully screwed in and secured with pin.

CAUTION

For clarity purposes the loudspeaker cabling procedure will not be described.

The loudspeaker cables will not be represented on the figures.

1. Place an M-BUMP at the rigging location. Turn it so that the text of the identification plate is upside down and the laser slits are directed towards the audience.

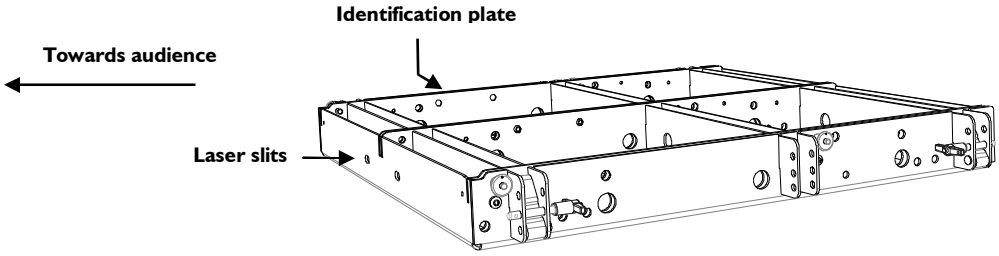


Figure 44: Installing M-BUMP

2. Mount two M-BAR/M-JACK assemblies as follows (repeat for each M-BAR):

a. Remove the safety pin [9.4] and the bolt from a shackle.

b. Place an M-JACK under one end of an M-BAR and align the M-JACK hole with the second M-BAR hole.

c. Secure by inserting the preceding bolt and safety pin.

d. Repeat the procedure to attach a second M-JACK to the other end of the M-BAR.

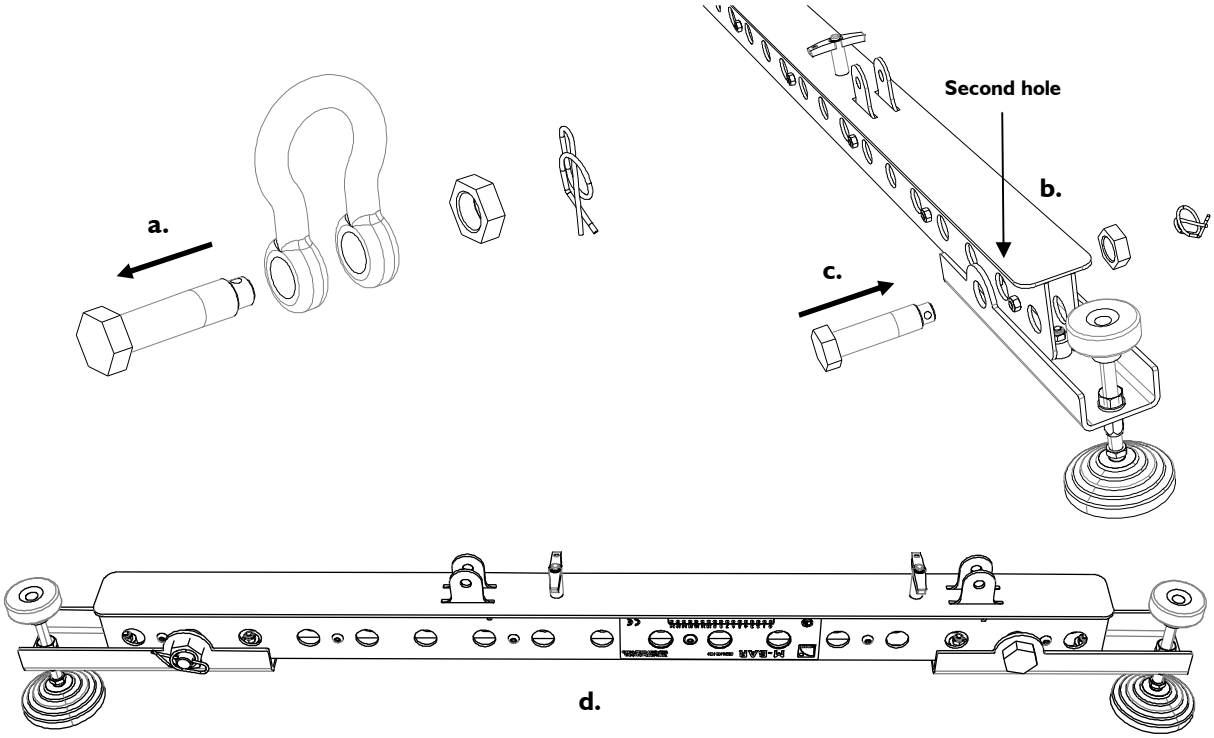


Figure 45: Mounting an M-BAR/M-JACK assembly

3. According to the chosen configuration [9.3.1], mount the stacking platform as follows (repeat for each M-BAR):

a. Remove both T-BLP from an M-BAR.

b. Lift up one side of the M-BUMP, place the M-BAR beneath it with M-JACK on the ground, and lower the M-BUMP so as to insert both M-BAR studs into the M-BUMP slits.

c. Secure by inserting both preceding T-BLP.

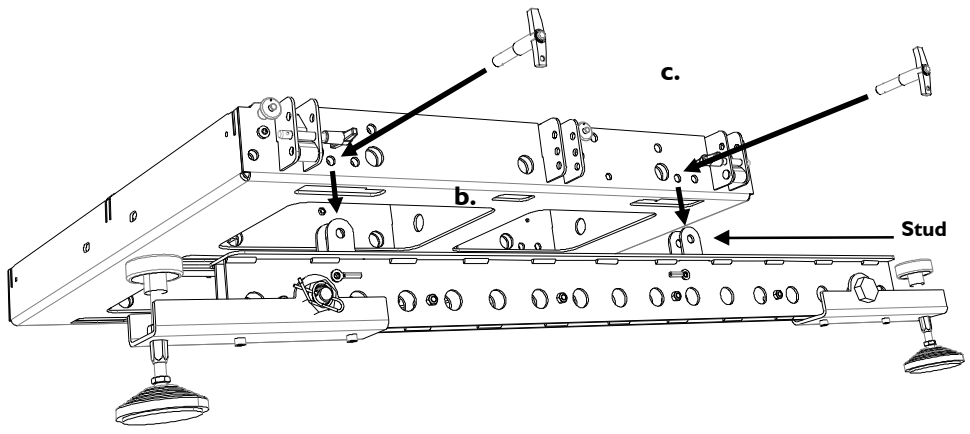


Figure 46: Mounting the stacking platform (rear extension configuration example)

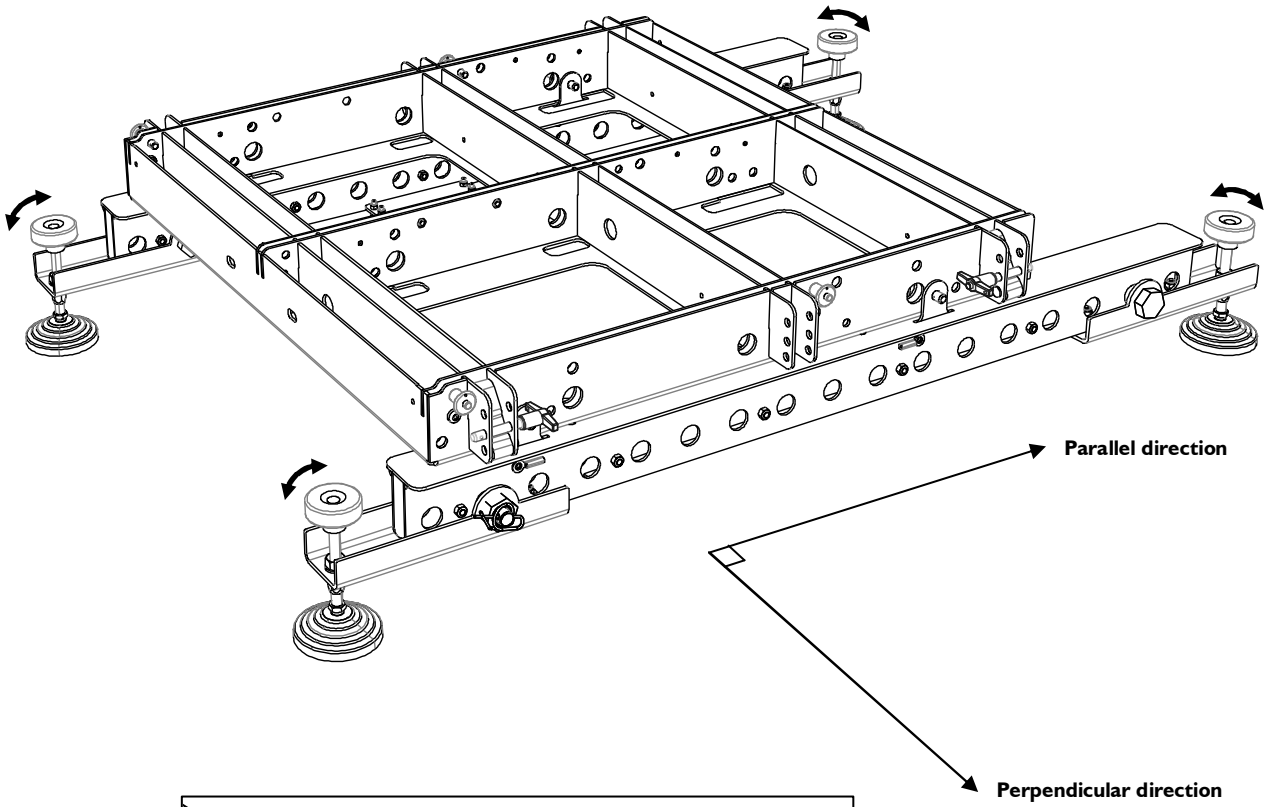
4. Adjust the stacking platform in horizontal position by setting the heights of the 4 M-JACK as follows:

a. Unscrew the locking nut on each M-JACK (16 mm hex key).

b. Place an inclinometer device onto the platform in the direction parallel to the M-BAR and rotate the 4 M-JACK knobs to adjust the platform in the horizontal position. **Note 1:** The inclinometer can be mounted to the integrated laser plate [9.1]. **Note 2:** In case of high resistance the user can also screw the base nut (14 mm hex key) in place of a knob.

c. Put an inclinometer device in the direction perpendicular to the M-BAR and verify that the platform is also horizontal in this direction. **Note:** The handheld inclinometer included in the **TECH TOOLCASE** [3.4] can be used in this step.

d. Lock each M-JACK height by firmly screwing in the locking nut (16 mm hex key).



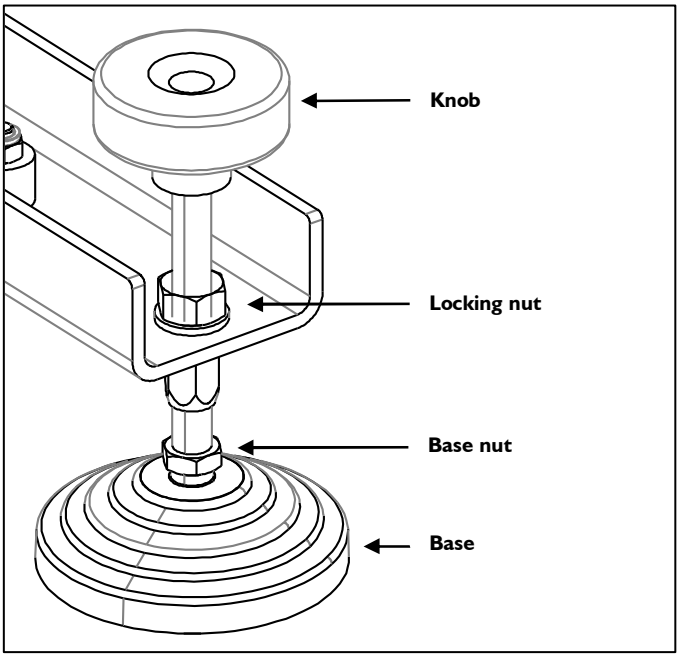


Figure 47: Horizontal adjustment

5. **(Optional [9.3.2])** Mount both KARA-ANGARMEX to the M-BUMP as follows (repeat for each one):
   a. Remove the storage T-BLP and the rear R-BLP.
   b. Insert the single part of the KARA-ANGARMEX into the M-BUMP by putting it vertically with sling ring pointing towards the front and indentation on the spacer.
   c. Align the KARA-ANGARMEX and M-BUMP holes. Insert the R-BLP.

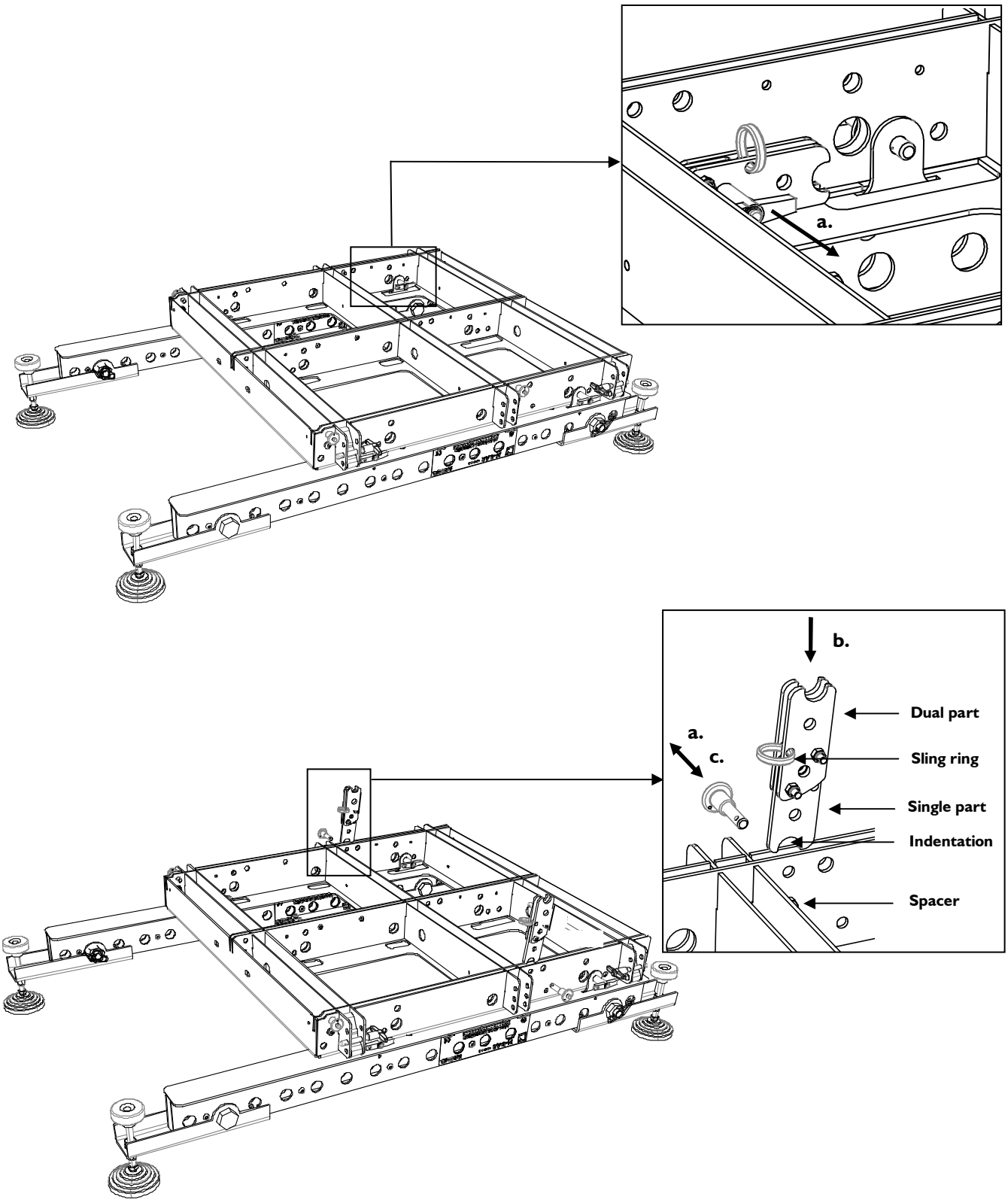


Figure 48: KARA-ANGARMEX installation (front extension configuration example)

6. Remove both front R-BLP from the M-BUMP. If the M-BUMP has been configured **without** KARA-ANGARMEX, also remove both rear R-BLP.

7. Place a full KARA flight-case at the stacking location and remove the lid. In the following, the enclosures will be designated as KARA#1 to KARA#3 from top to bottom.

8. Set KARA#1 in stacking configuration as follows (repeat for each side):

a. Remove the front top R-BLP from its **storage** hole, rotate the front arm up, slide it down, and secure by re-inserting the R-BLP into the top **yellow link hole**.

b. Remove the rear top R-BLP from its **storage** hole, slide the angle arm so as to align the cursor with the chosen angle value, and secure by re-inserting the R-BLP into the corresponding angle hole (**0°**/**2°**/**4°** or **1°**/**3°**/**5°**/**7.5°**/**10°**). Refer to [9.3.2] for equivalence between the chosen angle value and the array site angle.

c. Remove the front and rear bottom **link** R-BLP and re-insert them into the bottom **storage** holes.

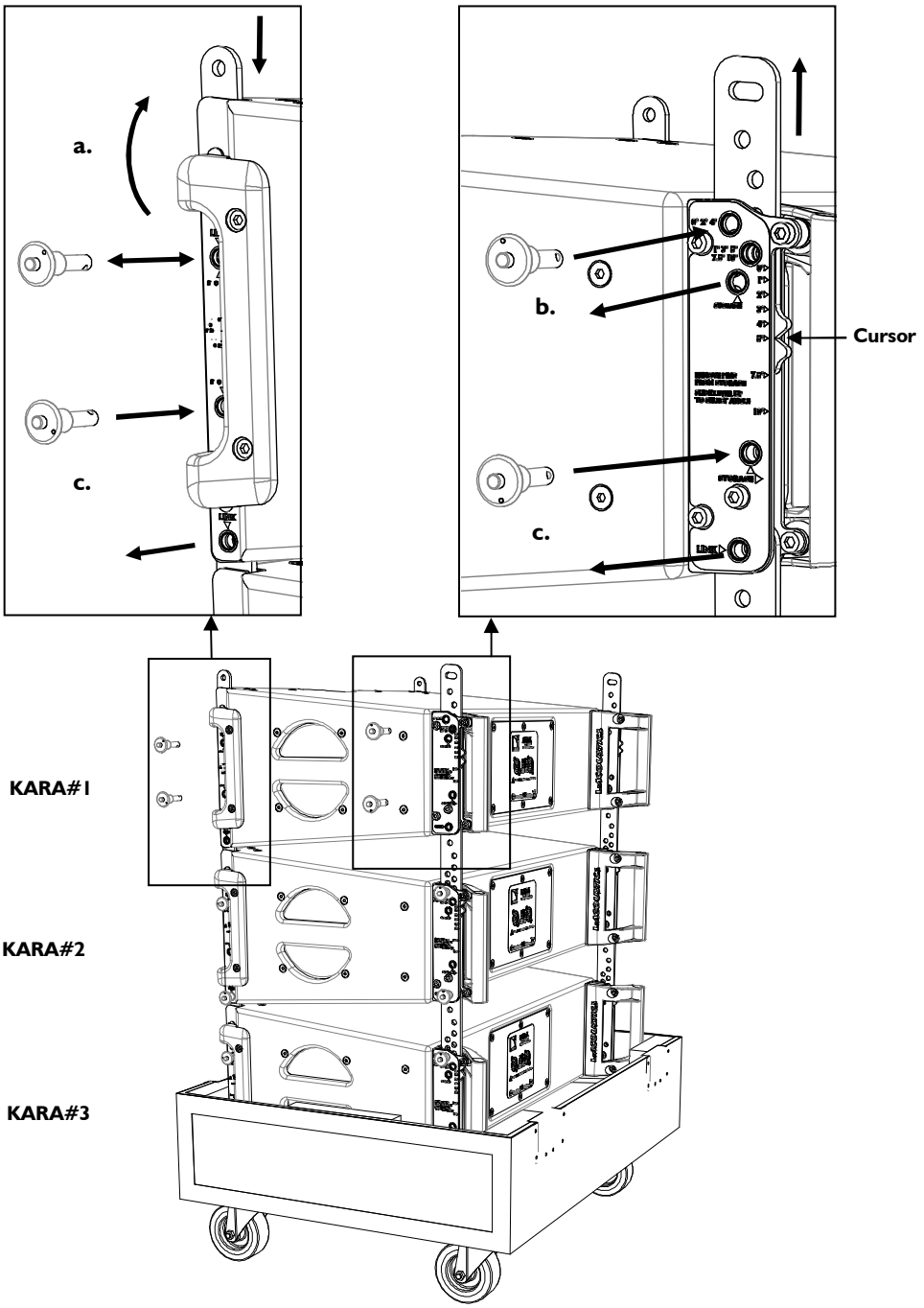


Figure 49: Setting KARA#1 in stacking configuration

9. Link KARA#1 to the M-BUMP as follows:

a. Lift up KARA#1 and turn it arms downwards and front face towards the audience.

b. Insert the four arms into the M-BUMP rigging points. If the M-BUMP has been configured **with** KARA-ANGARMEX, the rear rigging points become those of the KARA-ANGARMEX.

c. Secure both front rigging points by inserting the R-BLP into the M-BUMP. Depending on the configuration, secure both rear rigging points by inserting either both R-BLP into the M-BUMP or both T-BLP into the KARA-ANGARMEX.

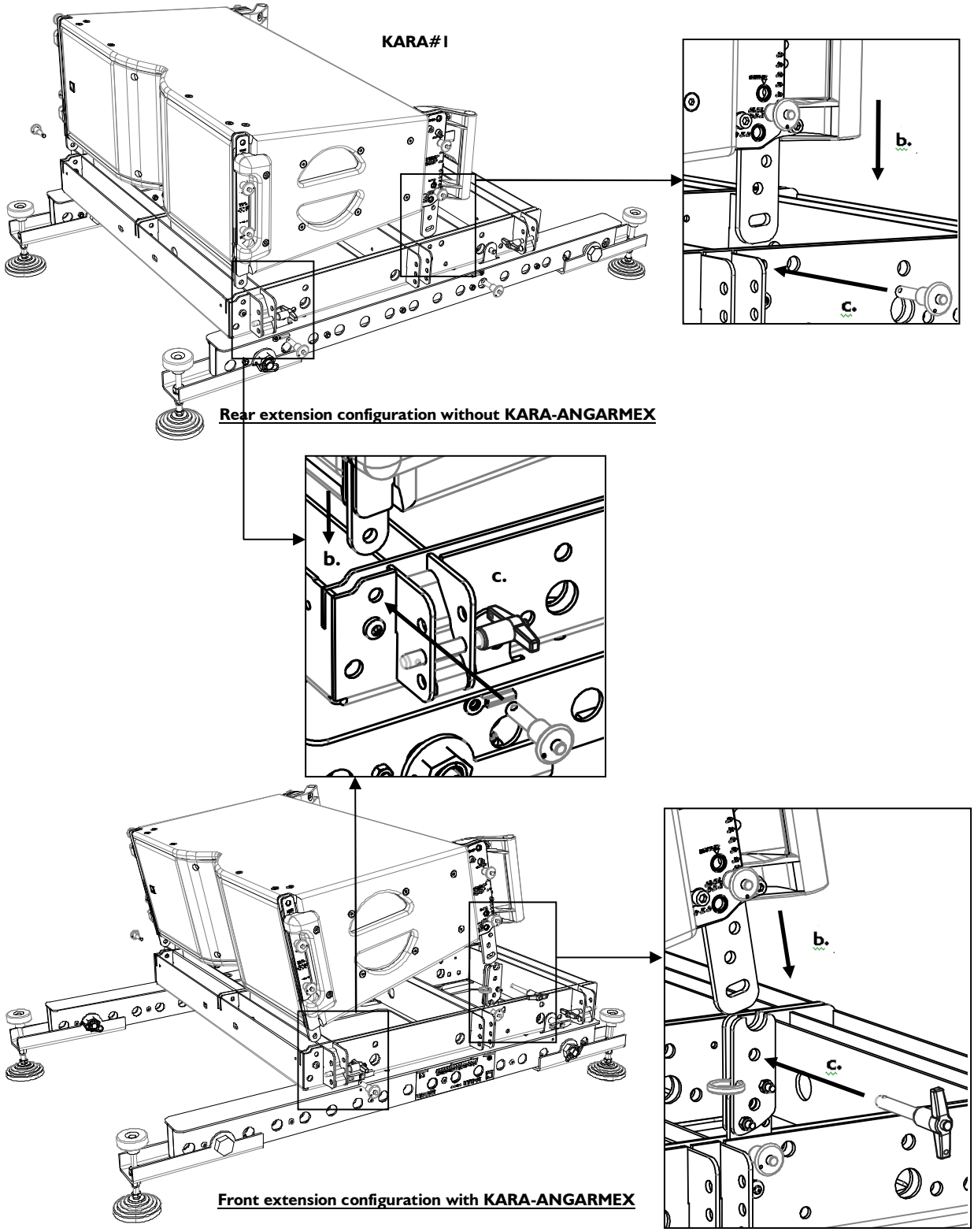


Figure 50: Linking KARA#1 to M-BUMP

10. Set KARA#2 in rigging configuration by applying step 8.

11. Link KARA#2 to KARA#1 as follows:

a. Put KARA#2 upside down and direct the front grill towards the audience.

b. Insert the four arms into the KARA#1 rigging points.

c. Secure the four rigging points by removing the four KARA#1 top R-BLP from their **storage** holes and re-inserting them into the top **yellow link holes**.

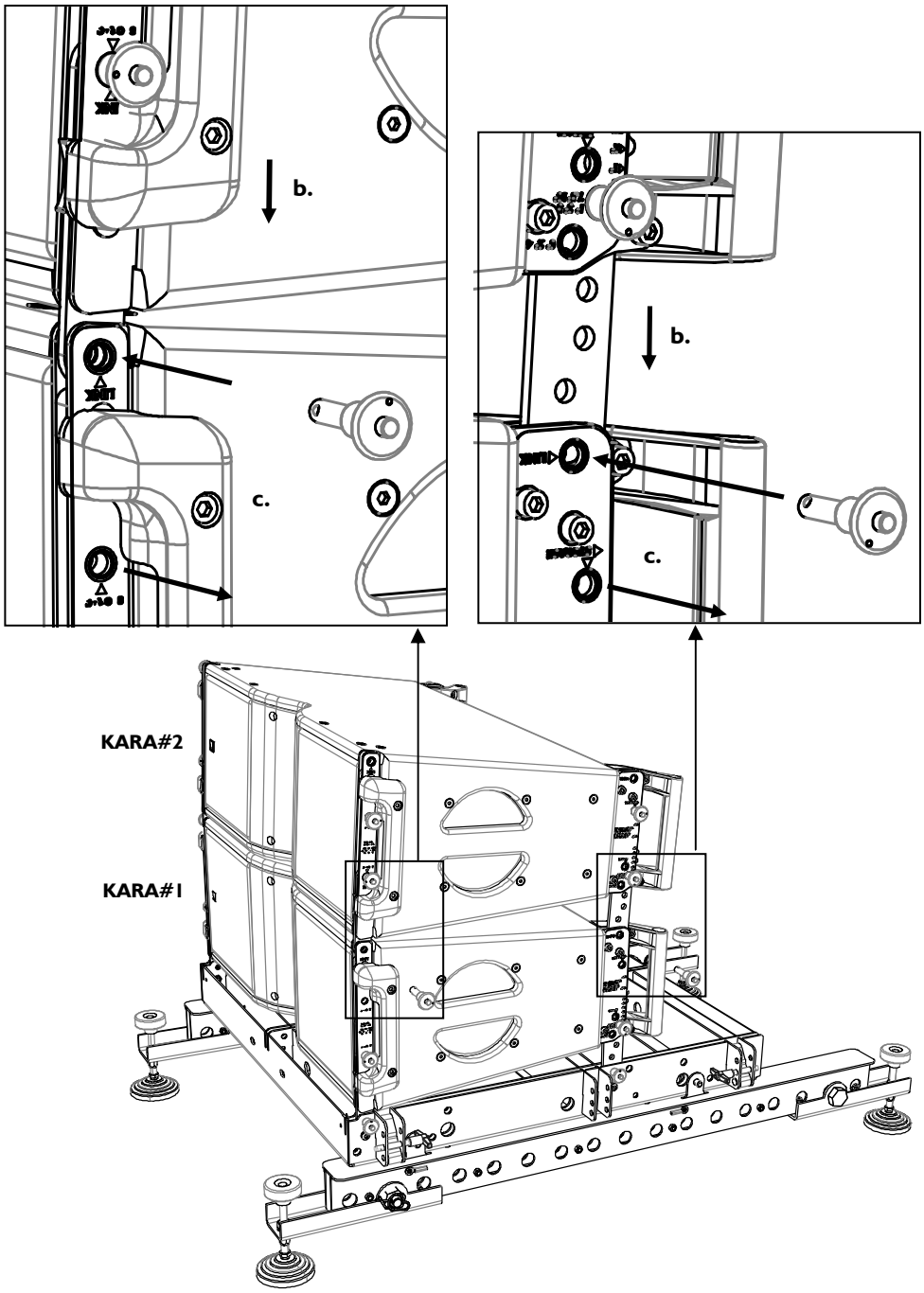


Figure 51: Linking KARA#2 to KARA#1

12. Link KARA#3 to KARA#2 by applying steps 10 and 11 (do not remove the 4 bottom R-BLP from KARA#3).

13. Using other full KARA flight-cases, repeat steps 10 and 11 until all KARA enclosures composing the array are rigged.

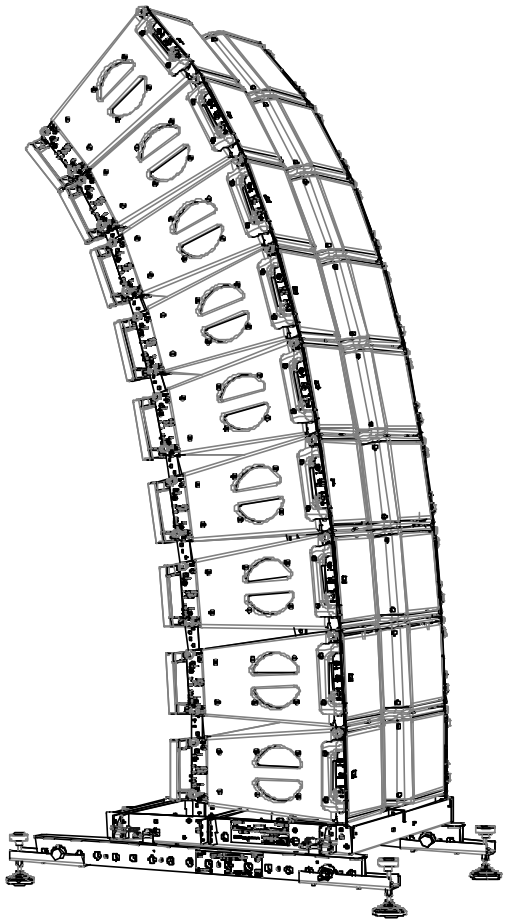


Figure 52: Example of KARA standalone array

14. Check if the stacking platform is still horizontal. If not, refer to step 4.

15. Secure the system to a fixed point using a ratchet strap or any other applicable material (not included).

6.3.3 Array removal

WARNING	All along the procedure: STRICTLY follow the sequence of the successive steps. SYSTEMATICALLY verify that each BLP is fully inserted.

CAUTION	For clarity purposes the loudspeaker cables removal procedure will not be described. The loudspeaker cables will not be represented on the figures.

1. Remove the ratchet strap from the array.
2. Place an empty KARA flight-case at the rigging location and remove the lid.
3. Separate the top KARA (KARA#3 for example) from the KARA below (KARA#2 for example) as follows: remove the 4 top **link** R-BLP from KARA#2 and re-insert them into the top **storage** holes.

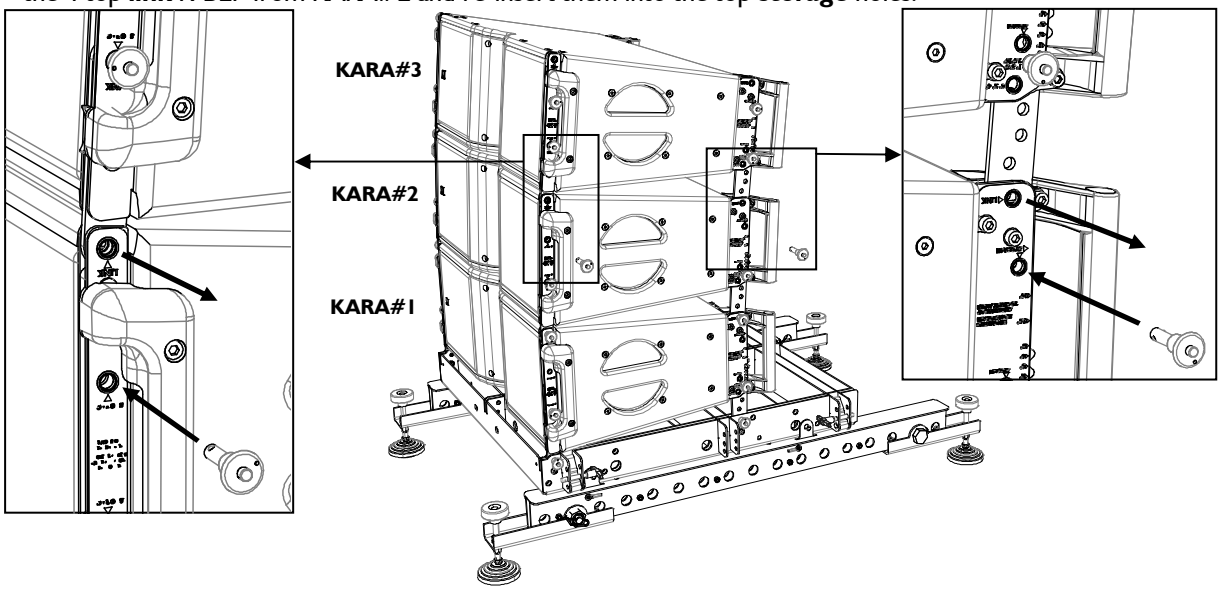


Figure 53: Separating KARA#3 from KARA#2

4. Lift up and turn KARA#3 arms upwards. Put KARA#3 into the flight-case tray.

WARNING	Pay attention to the flight-case position: both wedges must slope upwards from front to rear.

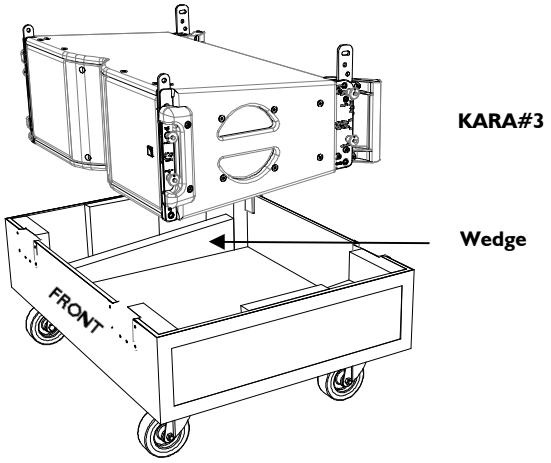


Figure 54: Putting KARA#3 into the flight-case tray

5. Set the angle to 0° on KARA#3 as follows (repeat for each side): remove the rear top angle R-BLP, slide the angle arm so as to align the cursor with the 0° angle value, and secure by re-inserting the R-BLP into angle hole **0**°/**2**°/**4**°.

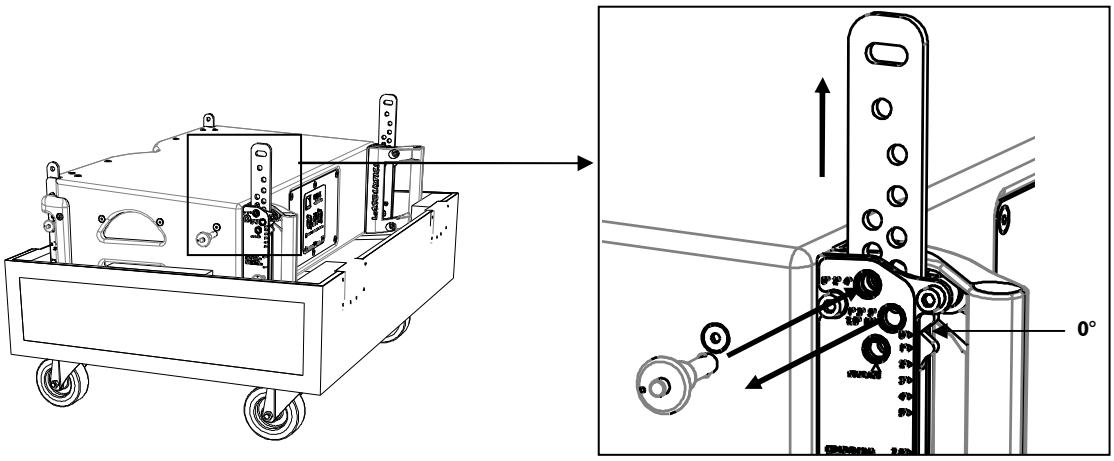


Figure 55: 0° angle setting

6. Separate KARA#2 from KARA#1 by applying step 3.

7. Lift up and turn KARA#2 arms upwards. Connect KARA#2 to KARA#3 (with two grills on the same side) by aligning the 4 rigging points between both enclosures. Remove the 4 R-BLP from the bottom **storage** holes of KARA#2 and secure by re-inserting them into the bottom **yellow link holes**.

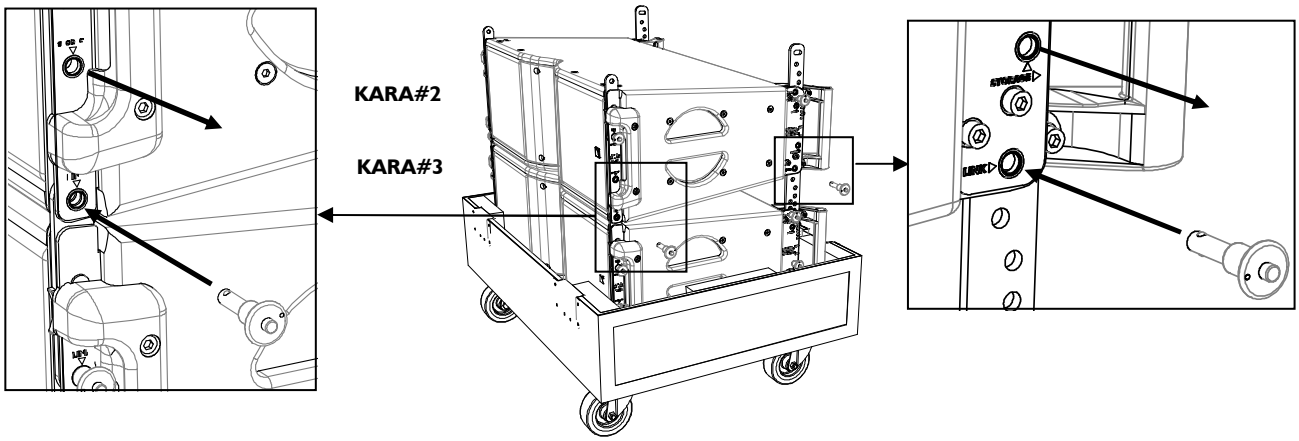


Figure 56: Linking KARA#2 to KARA#3

8. Set the angles to 0° on KARA#2 by applying step 5.

9. Separate KARA#1 from the M-BUMP as follows (or repeat the procedure from step 3 if the top enclosure is not KARA#1):

a. Remove both front R-BLP from the M-BUMP.

b. Depending on the configuration, remove either both rear R-BLP from the M-BUMP or both T-BLP from the KARA-ANGARMEX.

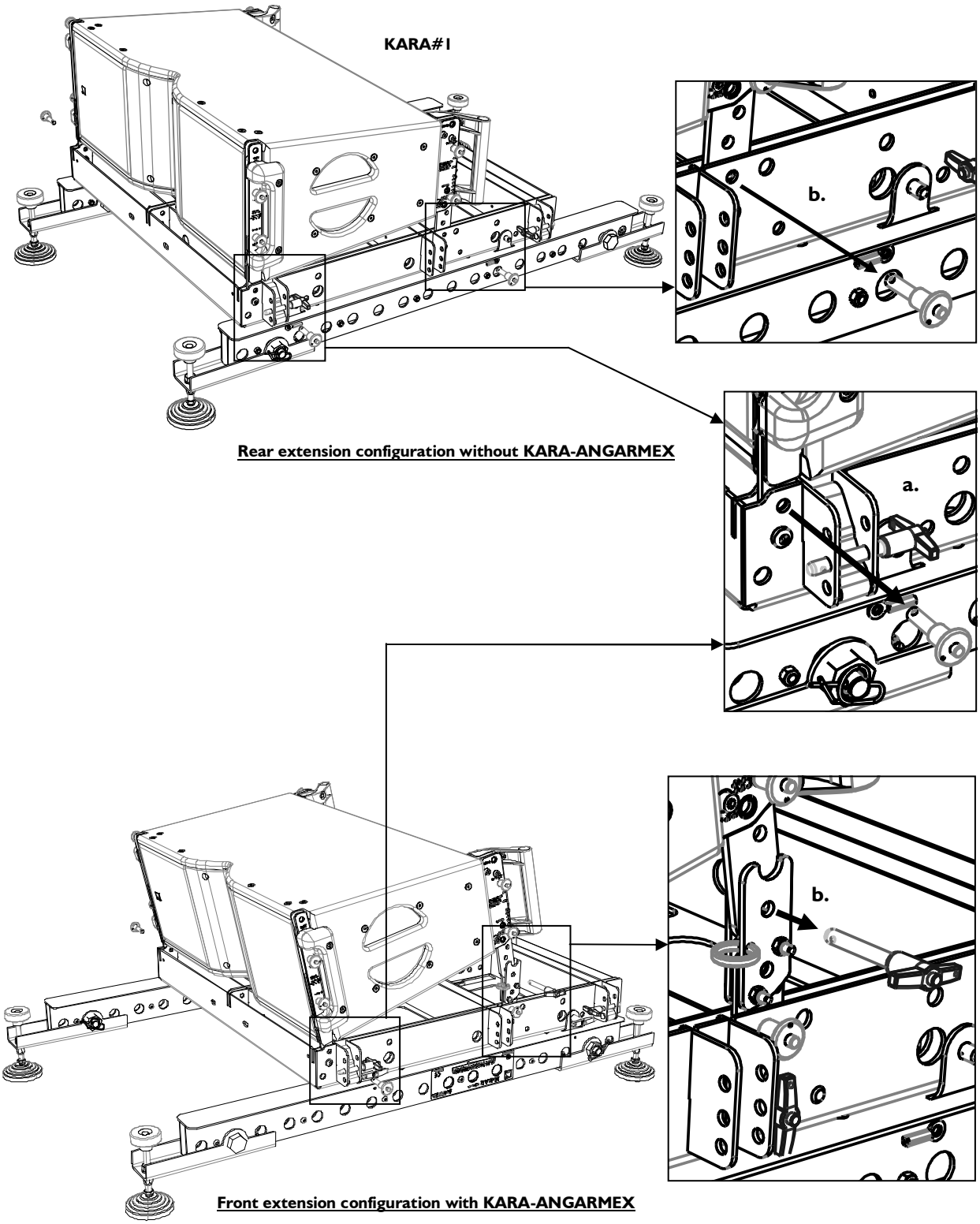


Figure 57: Separating KARA#1 from M-BUMP

10. Attach KARA#1 to KARA#2 by applying step 7.

11. Set the KARA#1-3 array for transport as follows:

a. On both sides of KARA#1, remove the front top **link** R-BLP, slide the front arm up, rotate down, and secure by re-inserting the R-BLP on the top **storage** hole.

b. On both sides of KARA#1, remove the rear top R-BLP, slide the angle arm so as to align the cursor with the **storage** position, and secure by re-inserting the top R-BLP on the top **storage** hole.

c. Put the flight-case lid back in place.

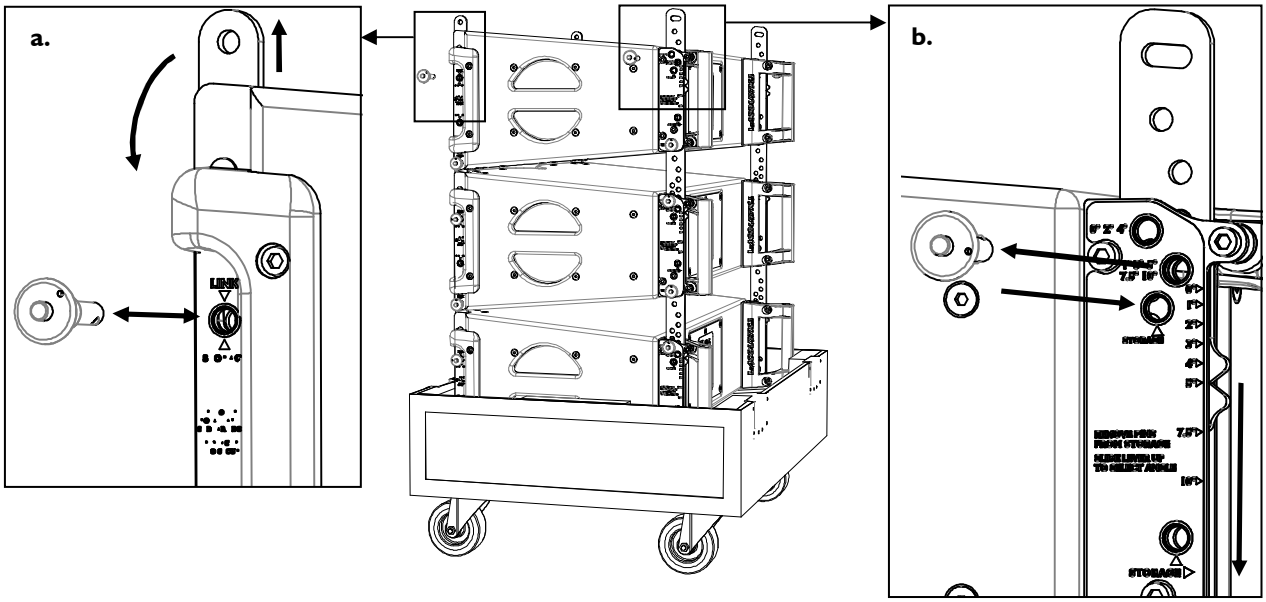


Figure 58: Setting the KARA#1-3 array for transport

12. Repeat steps 2 to 11 until all KARA enclosures are removed.

13. **(Optional)** On the M-BUMP, put both KARA-ANGARMEX in storage position as follows (repeat for each one):

a. Remove the rear R-BLP, remove the KARA-ANGARMEX, and re-insert the R-BLP into the M-BUMP hole.

b. Put the KARA-ANGARMEX horizontally in its storage location and secure by inserting the T-BLP.

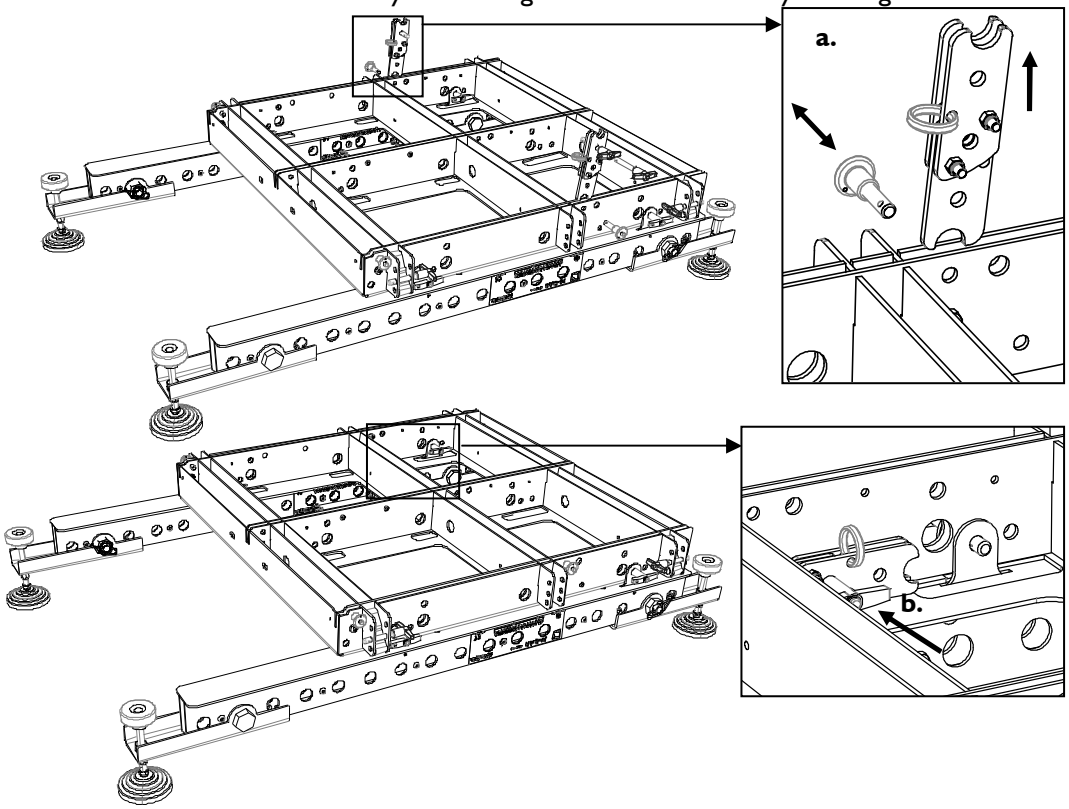


Figure 59: Putting the KARA-ANGARMEX in storage position (front extension configuration example)

14. Remove both M-BAR/M-JACK assemblies from the M-BUMP as follows (repeat for each one):

- **a.** Remove both T-BLP from the M-BAR studs.
- **b.** Lift up the corresponding side of the M-BUMP and remove the M-BAR.
- **c.** Re-insert both T-BLP into their storage holes.

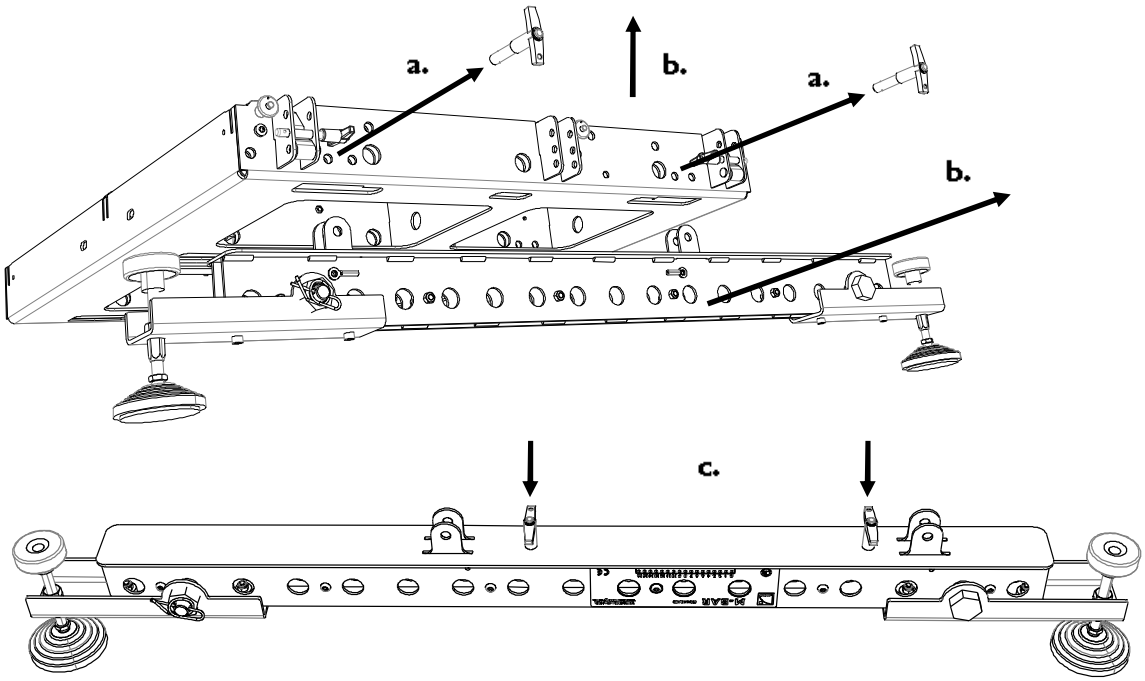


Figure 60: Removing M-BAR/M-JACK assemblies

15. Remove both M-JACK from each M-BAR as follows (repeat for each M-BAR):

- **a.** Remove the safety pin [9.4] and bolt from the M-JACK.
- **b.** Fix the preceding bolt and safety pin to a shackle.
- **c.** Remove the M-JACK from the M-BAR.

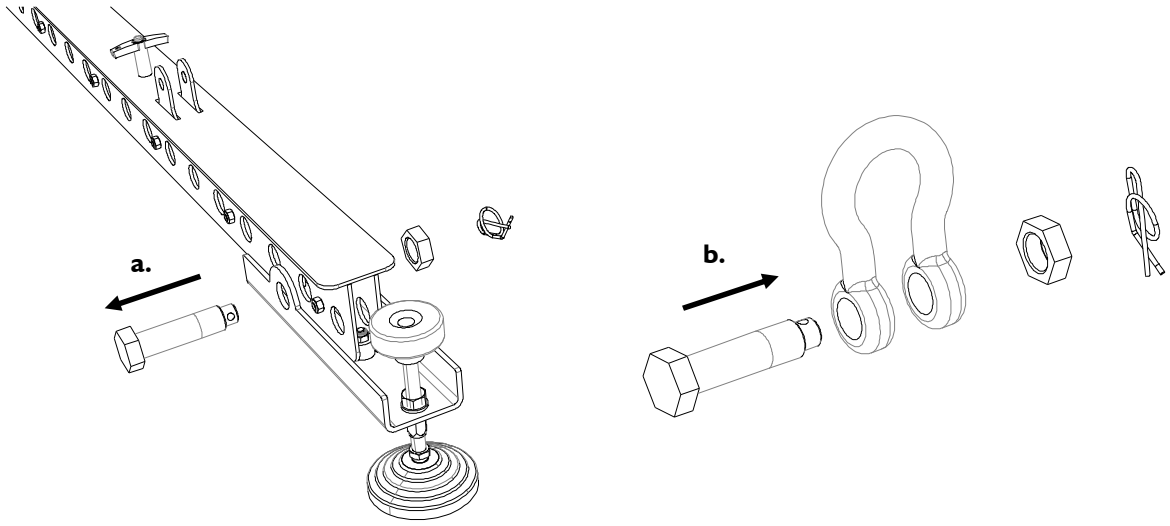


Figure 61: Removing M-JACK from M-BAR

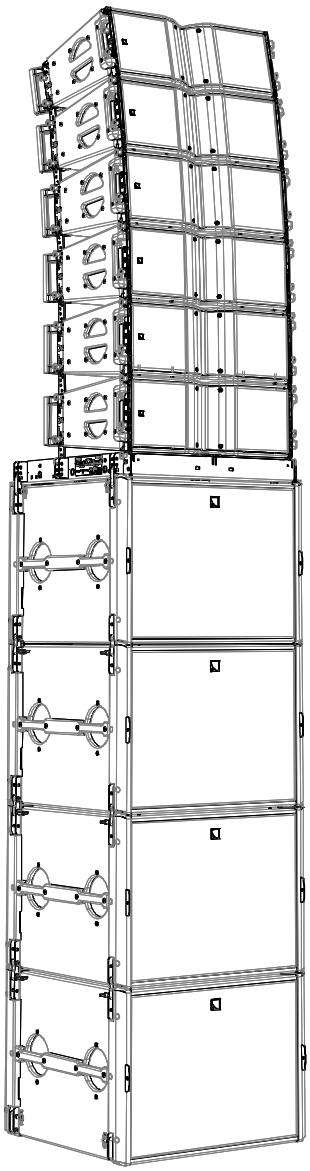
6.4 Stacking a SB18/KARA mixed array or a SB18 standalone array

6.4.1 Modeling and safety

A SB18/KARA mixed array or a SB18 standalone array can be stacked directly on the ground (**ground stacked array**) or onto an M-BUMP/M-BAR/M-JACK platform (**platform stacked array**). Figure 62 shows a mixed array of each type and gives the associated conditions of use.

Ground stacked array

- To be stacked on a perfectly horizontal and regular surface ONLY



Platform stacked array

- Provides tilt adjustments in case of slope surface
- Increases KARA array site angle range

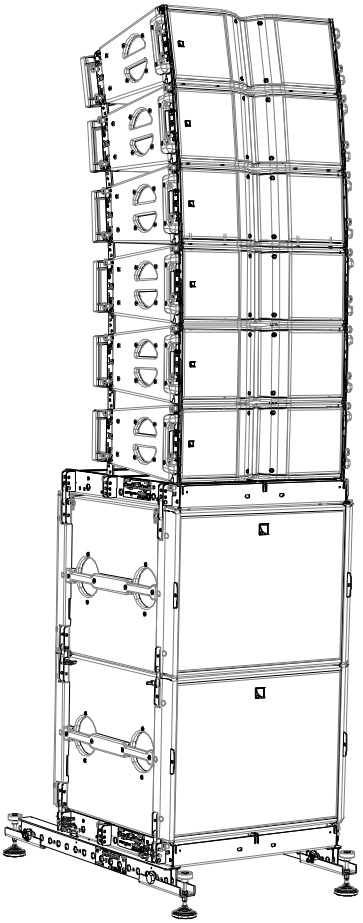


Figure 62: Examples of SB18/KARA stacked arrays

Ground stacked arrays

A **ground stacked array** requires to be installed on a perfectly horizontal and regular surface. It can be composed of a maximum of **4 SB18/9 KARA** or **8 SB18** enclosures along with all loudspeakers cables (refer to the **KARA and SB18 User manuals** [3.4]).

Apply the setup safety limits given in Table 2 regarding the angle between the top SB18 and the bottom KARA (refer to [9.3.2] for bottom KARA angle settings):

Table 2: Setup safety limits for ground stacked SB18/KARA array

Number of SB18	Number of KARA	Bottom KARA authorized angle range
1	1 - 3	From -15° to +5°
	4 - 5	From -7.5° to +5°
	6 - 9	From -5° to +5°
2	1 - 6	From -15° to +5°
	7	From -12° to +5°
	8	From -10° to +5°
	9	From -7.5° to +5°
3	1 - 8	From -15° to +5°
	9	From -12° to +5°
4	1 - 9	From -15° to +5°

SB18/KARA mixed array mounting procedure: Put the bottom SB18 on the ground (front grill logo upside) and apply the [6.4.2] procedure WITHOUT using the M-BUMP/M-BAR/M-JACK platform.

SB18 standalone array mounting procedure: Put a first SB18 on the ground with feet (and front grill logo) downside. Put a second SB18 onto the first one and link both enclosures by applying [6.2.2, step 4c]. Repeat the procedure until all SB18 composing the array are rigged. While installing follow the [6.2.2, step 8, IMPORTANT] indication.

Platform stacked arrays

Any SB18/KARA **platform stacked array** must be modeled before installation so as to ensure acoustical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARA enclosures (acoustic data not available for subwoofers).
- Calculate the inter-enclosure angles.

A **platform stacked array** can be composed of a maximum of **2 SB18/6 KARA** or **4 SB18** enclosures along with all loudspeakers cables (refer to the **KARA and SB18 User manuals** [3.4]).

The platform must be installed in **rear extension configuration** if a KARA array is intended to be rigged with a **positive** site angle (refer to [9.3.1]).

The platform must be installed in **front extension configuration** if a KARA array is intended to be rigged with a **negative** site angle (refer to [9.3.1]) and a **straight** shape (all inter-enclosure angles are close to 0°).

NEVER use M-BUMP and KARA-MINIBU within the same array (refer to the **KARA Rigging procedures pack** [3.4] for KARA-MINIBU rigging structure description).

The KARA, SB18, and M-BUMP fully integrated rigging systems allow assembling the array with no need for any external accessory. The following first procedure describes how to mount a vertical SB18/KARA or SB18 **platform stacked array**. The second procedure describes how to disassemble the array.

6.4.2 Array mounting

WARNING

All along the procedure:
STRICTLY follow the sequence of the successive steps.
SYSTEMATICALLY verify that each BLP is fully inserted.
SYSTEMATICALLY verify that each bolt is fully screwed in and secured with pin.

CAUTION

For clarity purposes the loudspeaker cabling procedure will not be described.
The loudspeaker cables will not be represented on the figures.

1. Place an M-BUMP at the rigging location. Turn it so that the text of the identification plate is upside down and the laser slits are directed towards the audience.

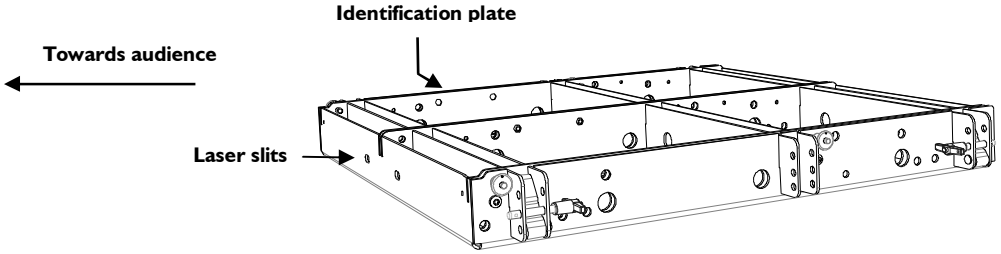


Figure 63: Installing M-BUMP

2. Mount two M-BAR/M-JACK assemblies as follows (repeat for each M-BAR):
   a. Remove the safety pin [9.4] and the bolt from a shackle.
   b. Place an M-JACK under one end of an M-BAR and align the M-JACK hole with the second M-BAR hole.
   c. Secure by inserting the preceding bolt and safety pin.
   d. Repeat the procedure to attach a second M-JACK to the other end of the M-BAR.

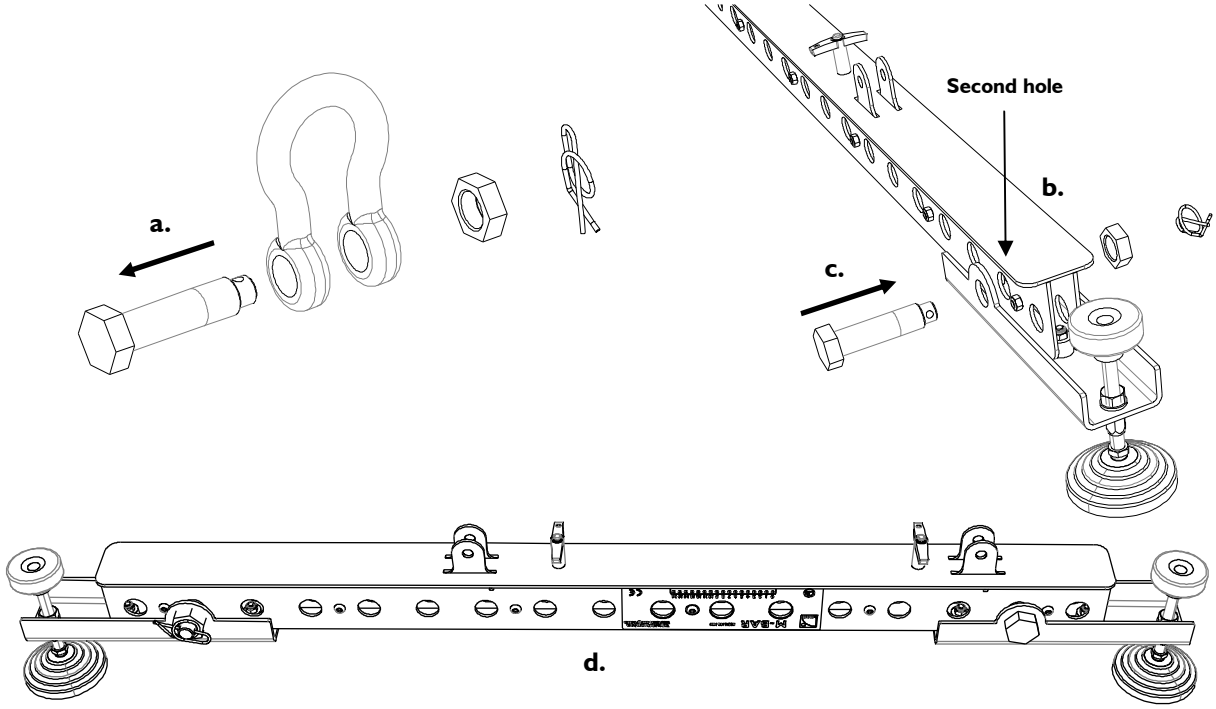


Figure 64: Mounting an M-BAR/M-JACK assembly

3. According to the chosen configuration [9.3.1], mount the stacking platform as follows (repeat for each M-BAR):

a. Remove both T-BLP from an M-BAR.

b. Lift up one side of the M-BUMP, place the M-BAR beneath it with M-JACK on the ground, and lower the M-BUMP so as to insert both M-BAR studs into the M-BUMP slits.

c. Secure by inserting both preceding T-BLP.

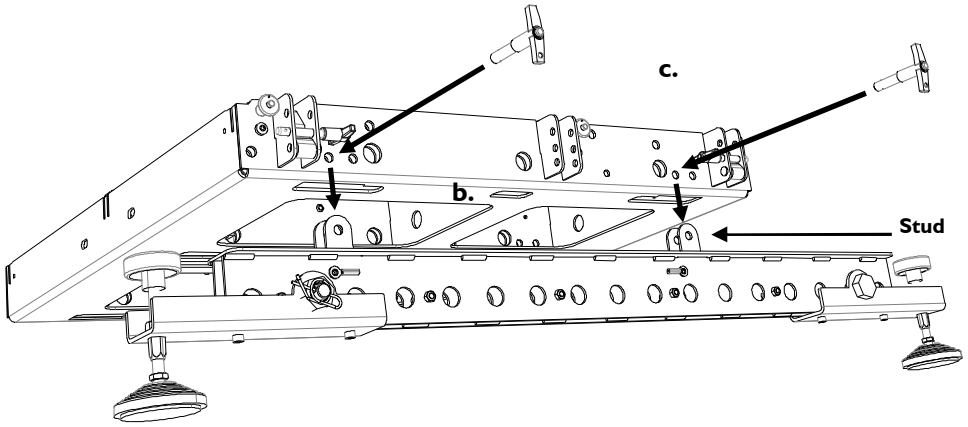


Figure 65: Mounting the stacking platform (rear extension configuration example)

4. Adjust the stacking platform in horizontal position by setting the heights of the 4 M-JACK as follows:

a. Unscrew the locking nut on each M-JACK (16 mm hex key).

b. Place an inclinometer device onto the platform in the direction parallel to the M-BAR and rotate the 4 M-JACK knobs to adjust the platform in the horizontal position. **Note 1:** The inclinometer can be mounted to the integrated laser plate [9.1]. **Note 2:** In case of high resistance the user can also screw the base nut (14 mm hex key) in place of a knob.

c. Put an inclinometer device in the direction perpendicular to the M-BAR and verify that the platform is also horizontal in this direction. **Note:** The handheld inclinometer included in the **TECH TOOLCASE** [3.4] can be used in this step.

d. Lock each M-JACK height by firmly screwing in the locking nut (16 mm hex key).

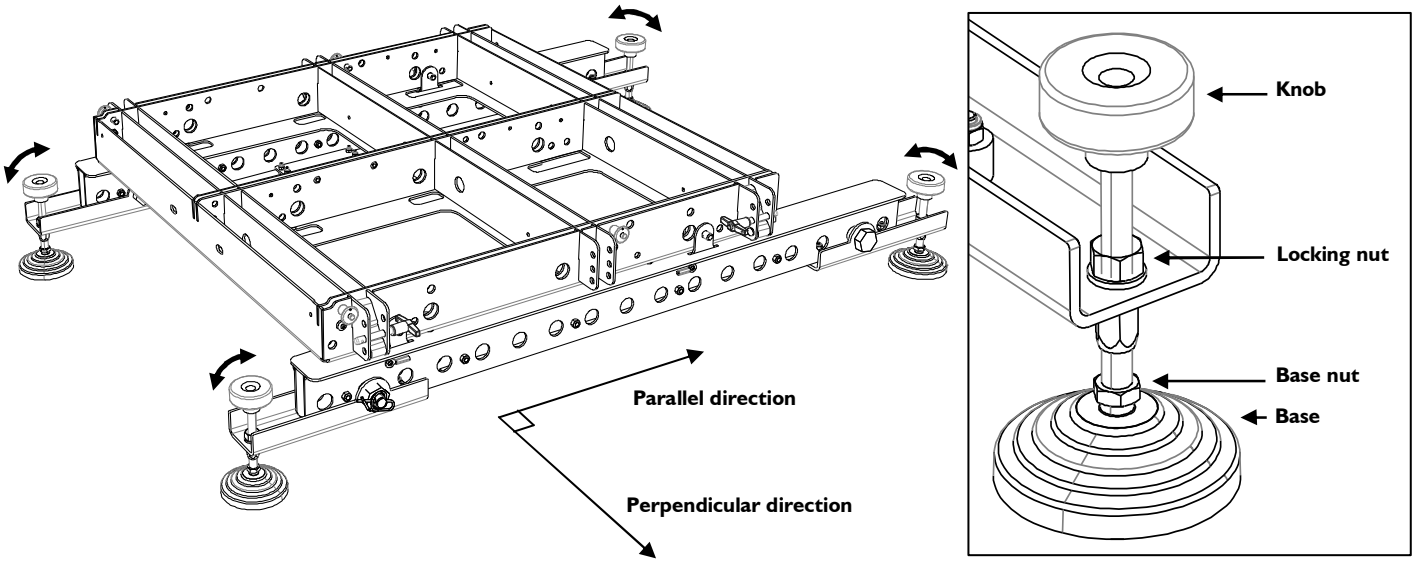


Figure 66: Horizontal adjustment

5. Link a first SB18 (hereafter called SB18#1) to the M-BUMP as follows:

a. Place SB18#1 at the rigging location and remove the dolly board.

b. Turn the SB18#1 logo upwards. Orient the front grill towards the audience or backwards.

> IMPORTANT
>
> Orient all SB18 composing the array towards the audience to obtain an **omnidirectional** acoustic pattern. Orient one SB18 every four backwards to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]).

c. Place SB18#1 on the M-BUMP by aligning the four rigging points.

d. Link the four rigging arms of SB18#1 to the M-BUMP as follows: disconnect a T-BLP from SB18#1, rotate the rigging arm down, re-connect the T-BLP to the M-BUMP rigging point and the rigging arm ; repeat this procedure until all 4 arms are secured.

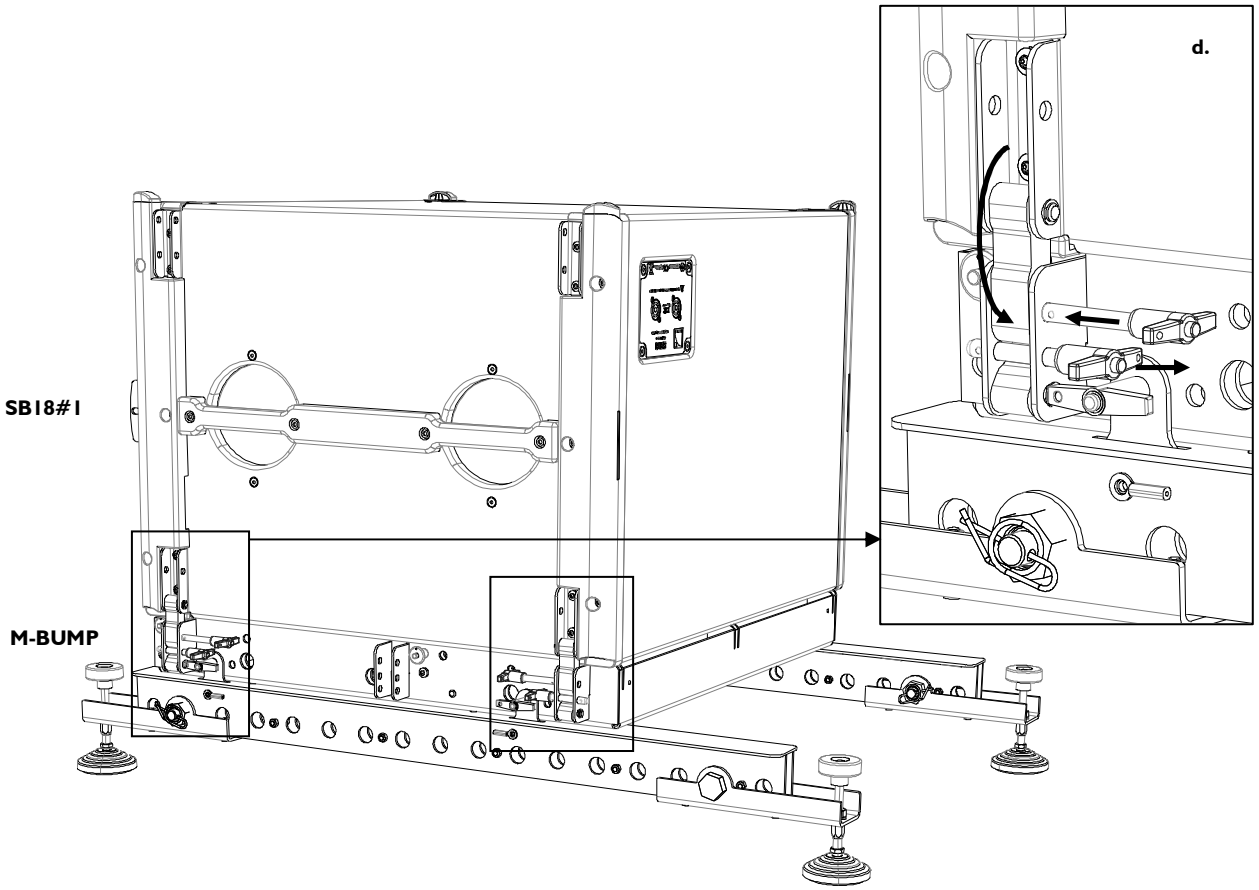


Figure 67: Linking SB18#1 to M-BUMP

6. Attach a second SB18 (hereafter called SB18#2) to SB18#1 as follows:

a. Place SB18#2 at the rigging location and remove the dolly board.

b. Turn SB18#2 logo upwards and front face towards the audience.

c. Place SB18#2 on SB18#1 by aligning the four rigging points.

d. Attach the four rigging arms of SB18#2 to SB18#1 as follows: disconnect a T-BLP from SB18#2, rotate the rigging arm down, re-connect the T-BLP to the SB18#1 rigging point and the rigging arm; repeat this procedure until all 4 arms are secured.

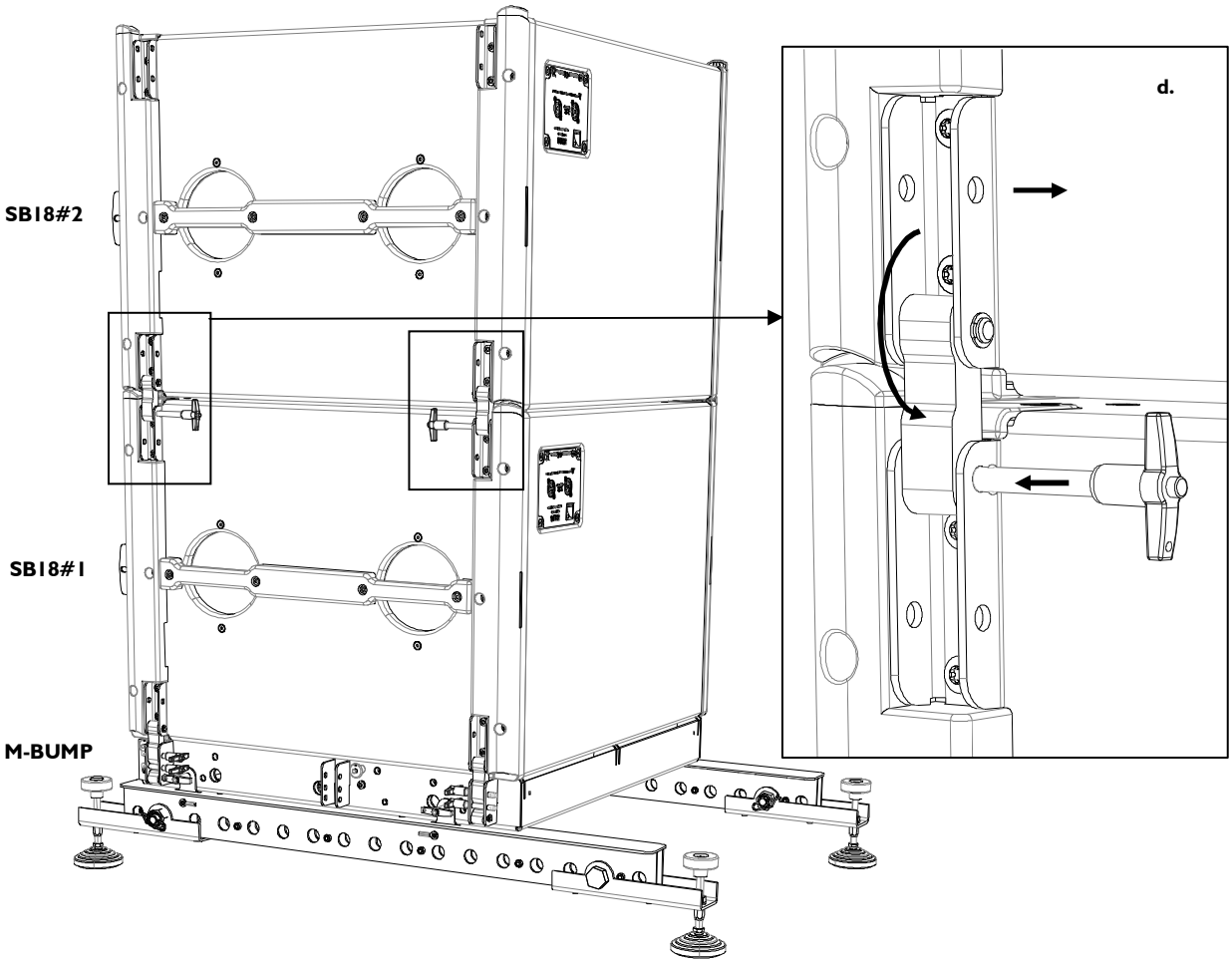


Figure 68: Linking SB18#2 to SB18#1

7. Repeat step 6 until all SB18 enclosures composing the array are rigged.

IMPORTANT

Orient all SB18 composing the array towards the audience to obtain an **omnidirectional** acoustic pattern. Orient one SB18 every four backwards to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]).

8. If the array is intended to be a SB18 standalone array, apply the following last procedure:

a. Check if the stacking platform is still horizontal. If not, refer to [6.3.2, step 4].

b. Secure the system to a fixed point using a ratchet strap or any other applicable material (not provided).

PROCEDURE END

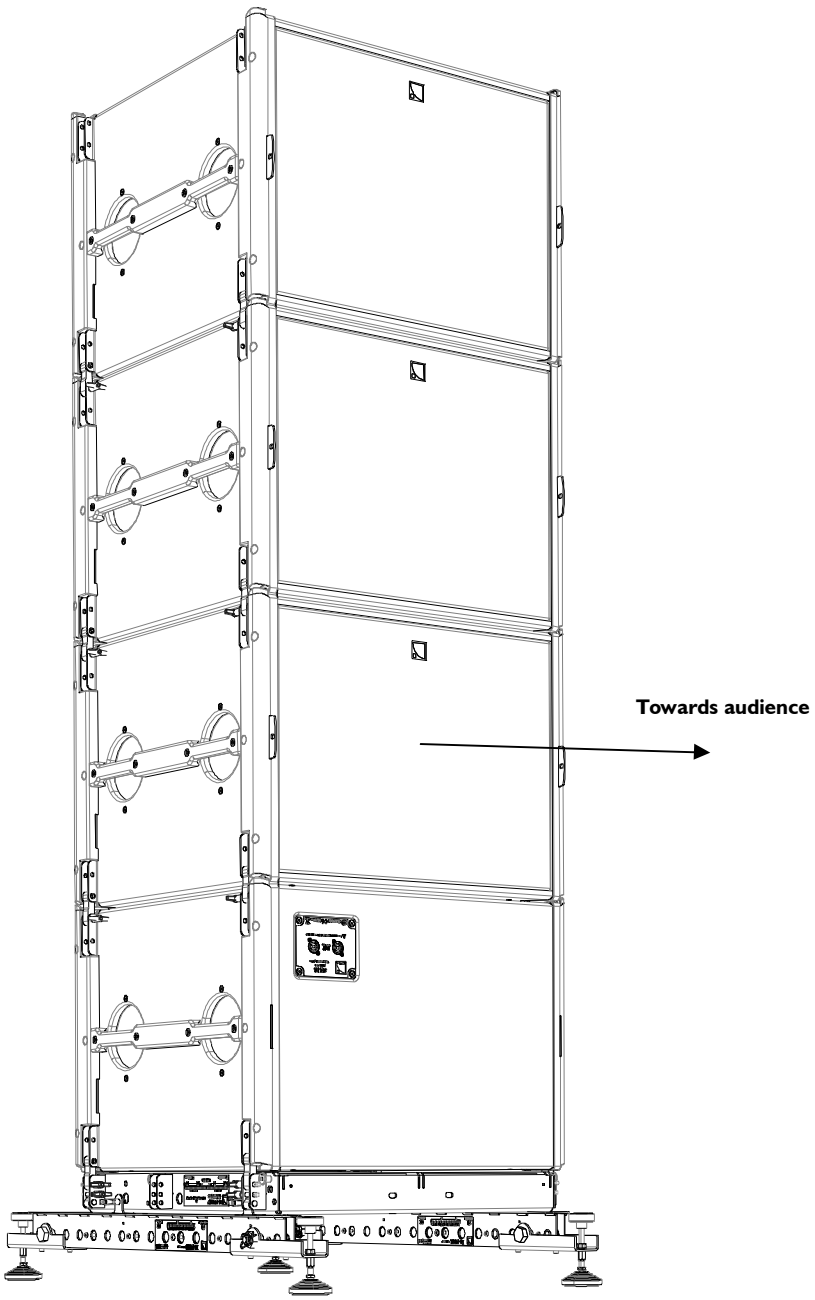


Figure 69: Example of SB18 standalone array (cardioid configuration)

If the array is intended to be a SB18/KARA mixed array, place a second M-BUMP at the rigging location. Turn it so that the text of the identification plate is upside down and the laser slits are directed towards the audience, and place it on the top SB18.

IMPORTANT

For clarity purposes, the procedure is continued with an array composed of one SB18 enclosure.

9. Link the 4 rigging points between the M-BUMP and the top SB18 as follows (repeat for each one): remove the external T-BLP from the M-BUMP, rotate the arm downwards and secure it to the SB18 by re-inserting the T-BLP.

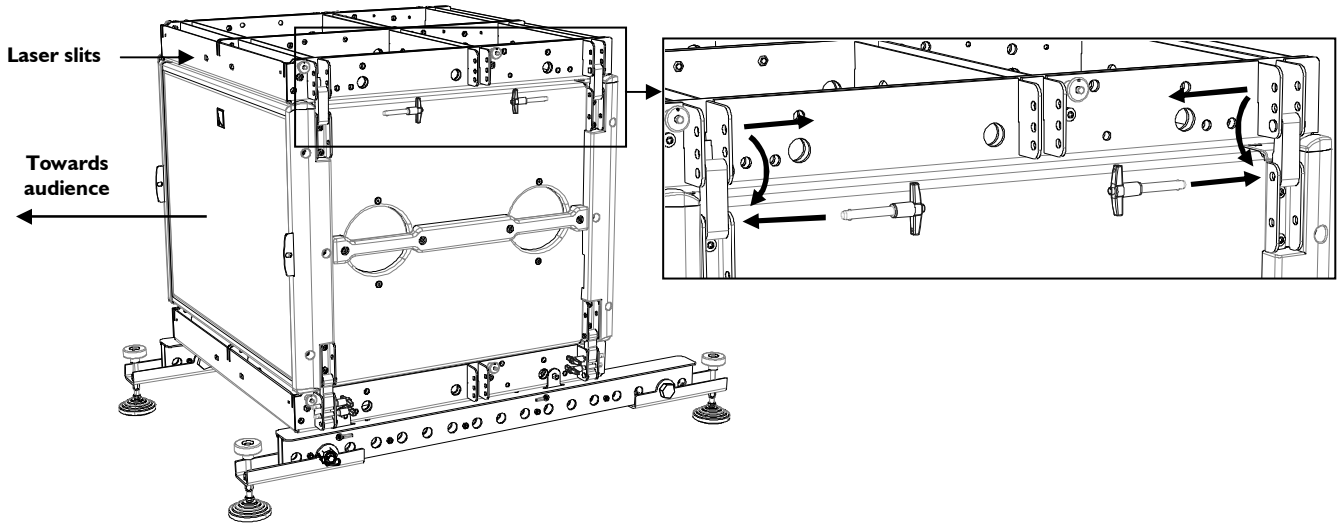


Figure 70: Installing a second M-BUMP (rear extension configuration example for the bottom M-BUMP)

10. Finish the procedure by applying [6.3.2 from step 5 to the end].

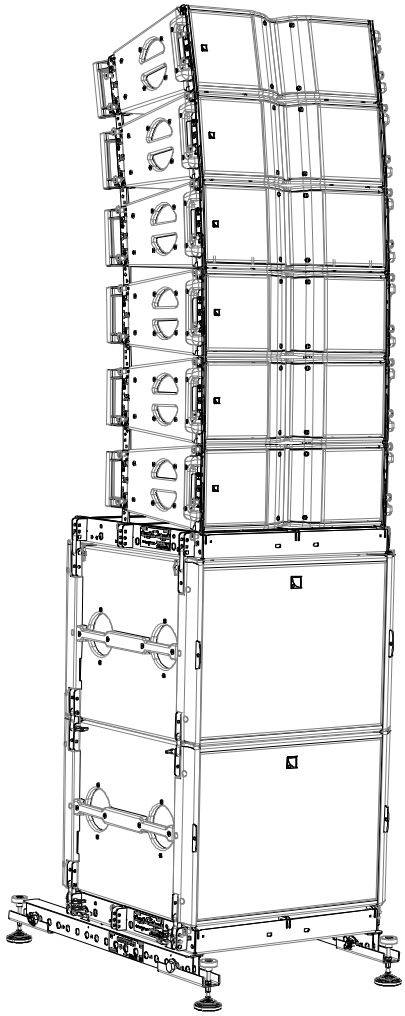


Figure 71: Example of stacked SB18/KARA mixed array

6.4.3 Array removal

WARNING

All along the procedure:
STRICTLY follow the sequence of the successive steps.
SYSTEMATICALLY verify that each BLP is fully inserted.

CAUTION

For clarity purposes the loudspeaker cables removal procedure will not be described.
The loudspeaker cables will not be represented on the figures.

1. In case of SB18 standalone array, directly go to step 4.

In case of SB18/KARA mixed array, begin the procedure by applying [6.3.3, steps 1 to 13] and then continue to next step.

2. Unlink the 4 rigging points between the M-BUMP and the SB18 as follows (repeat for each one): remove the T-BLP from the SB18, rotate the arm upwards and lock it by re-inserting the T-BLP on the M-BUMP.

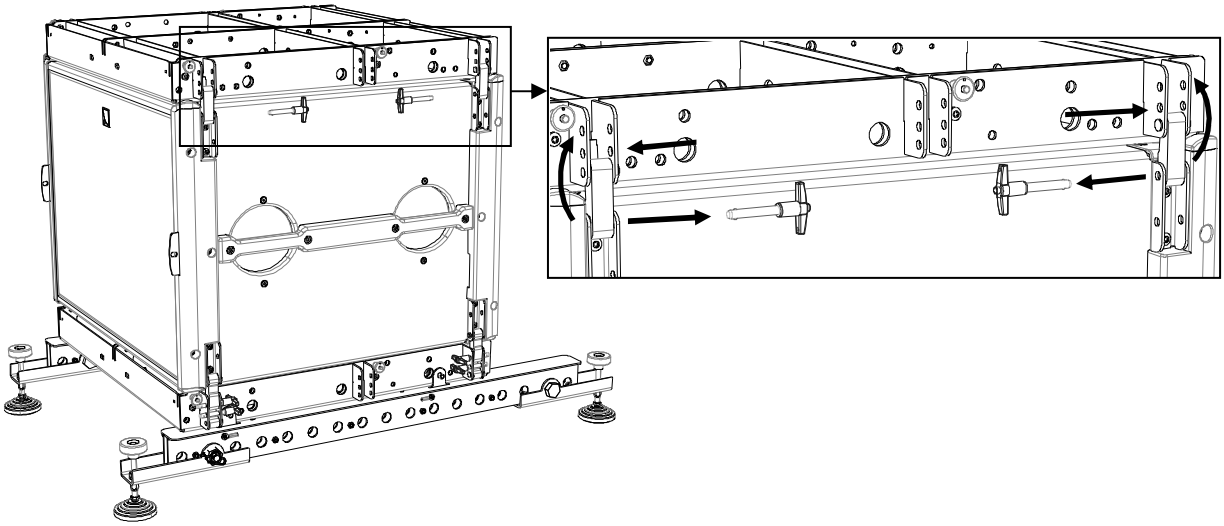


Figure 72: Removing the second M-BUMP

3. Remove the M-BUMP from the SB18.

IMPORTANT

For precision purposes, the procedure will be continued with two SB18 enclosures.

4. If not already done, remove the ratchet strap from the array.

5. Unlink the top SB18 (SB18#2 for example) from the SB18 below (SB18#1 for example) as follows:

a. Disconnect a T-BLP from the top part of SB18#1.

b. Rotate the rigging arm up.

c. Re-connect the T-BLP to SB18#2 so as to lock the rigging arm in closed position.

d. Repeat this procedure until all 4 arms are locked in closed position.

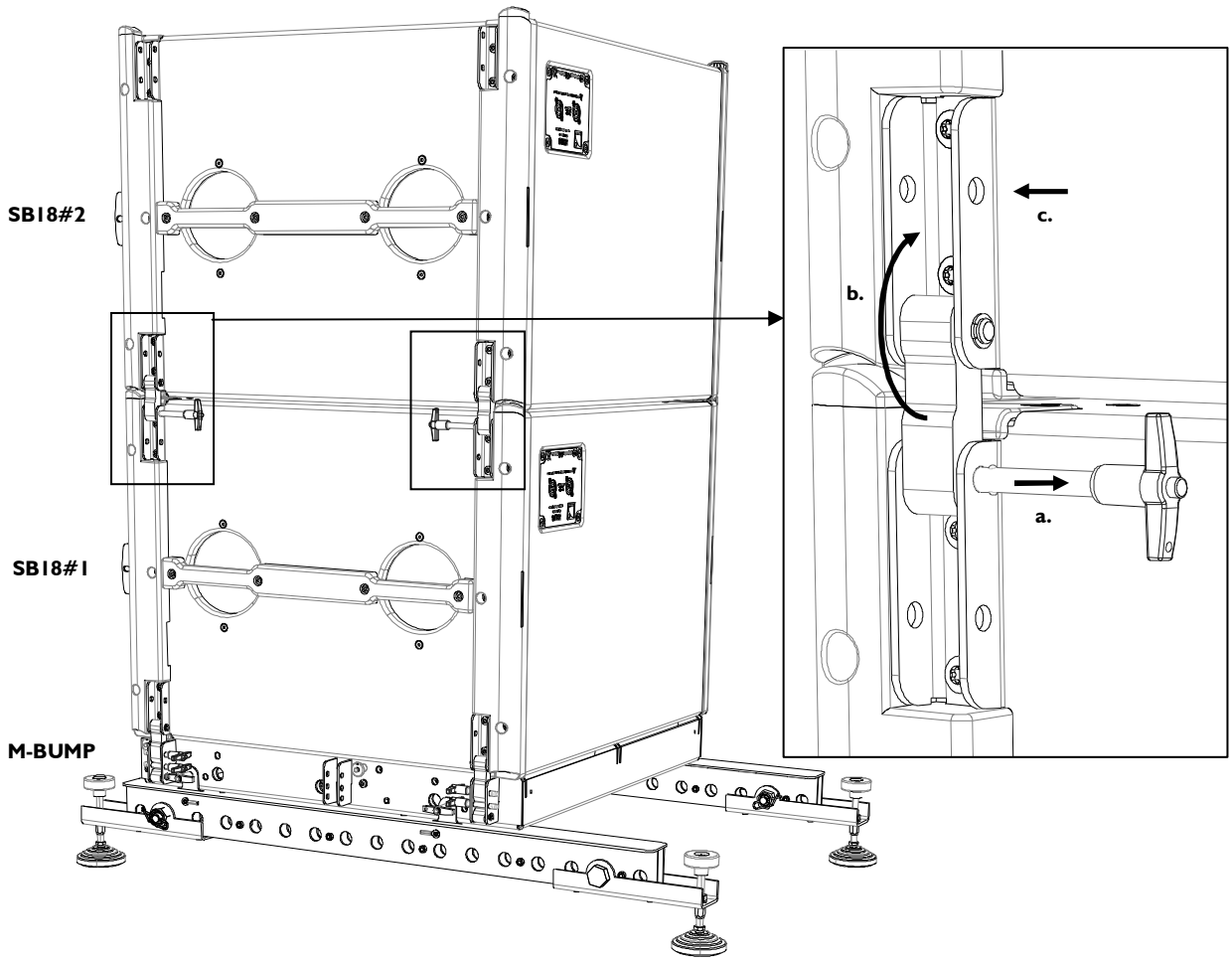


Figure 73: Detaching SB18#2 from SB18#1

6. Attach a dolly board to SB18#2 and remove SB18#2 from the rigging location.

7. Repeat steps 5 and 6 until all SB18 are separated from the array.

8. Remove both M-BAR/M-JACK assemblies from the M-BUMP as follows (repeat for each one):
   a. Remove both T-BLP from the M-BAR studs.
   b. Lift up the corresponding side of the M-BUMP and remove the M-BAR.
   c. Re-insert both T-BLP into their storage holes.

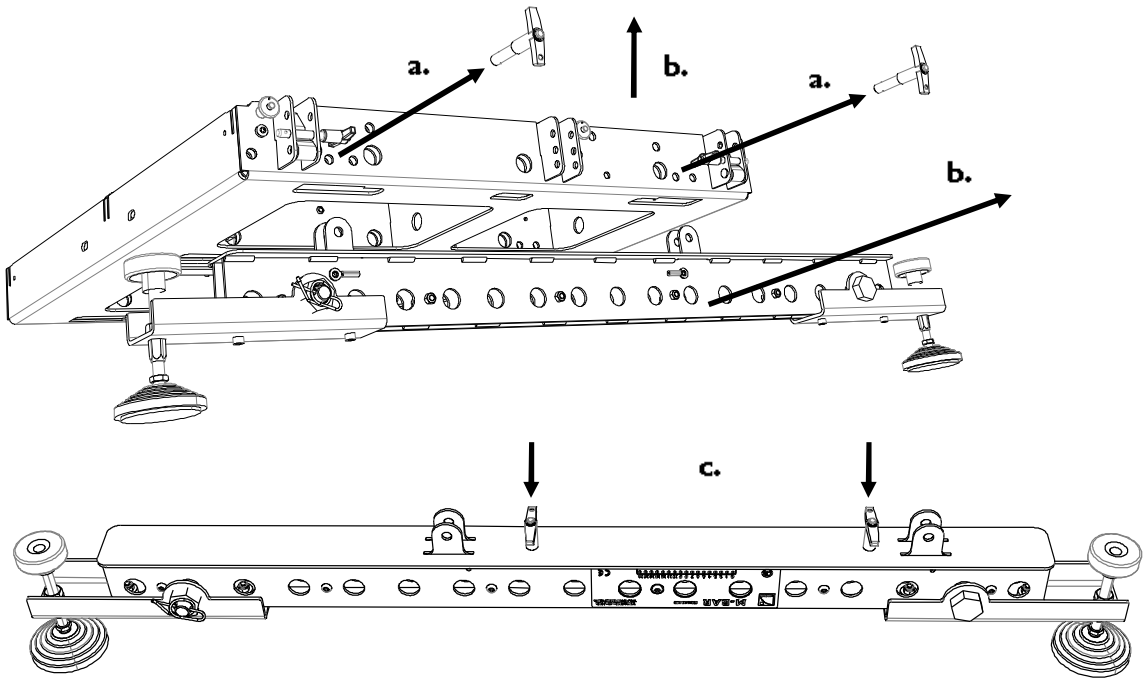


Figure 74: Removing M-BAR/M-JACK assemblies

9. Remove both M-JACK from each M-BAR as follows (repeat for each M-BAR):
   a. Remove the safety pin [9.4] and bolt from the M-JACK.
   b. Secure the preceding bolt and safety pin to a shackle.
   c. Remove the M-JACK from the M-BAR.

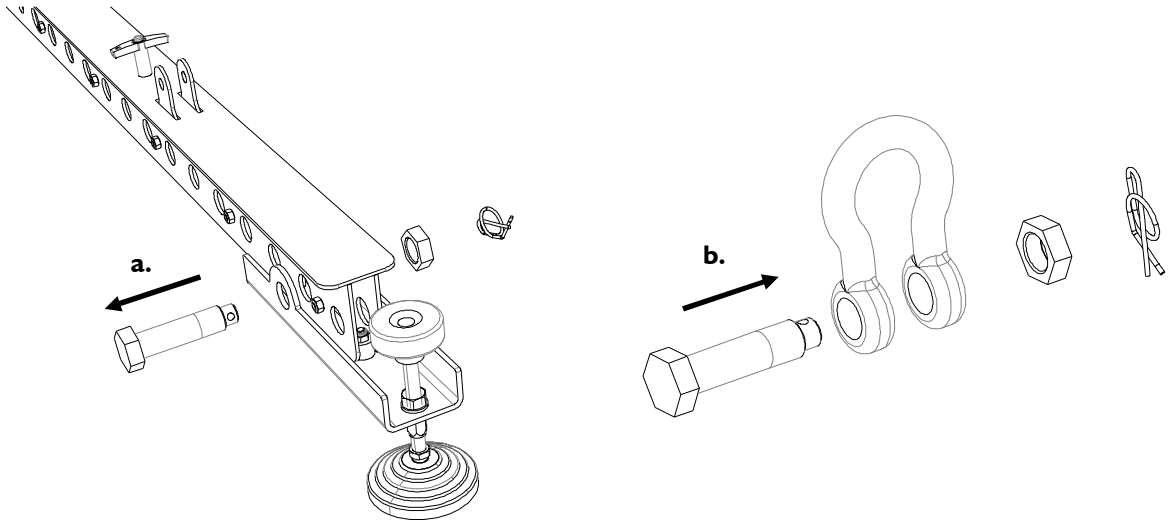


Figure 75: Removing M-JACK from M-BAR

7 CARE AND MAINTENANCE

7.1 Maintenance information

The KARA® system assembling components are the following:

- M-BUMP rigging structure with rotating arms.
- M-BAR extension bar.
- M-JACK feet.
- KARA-ANGARMEX angle arm extensions.
- KARA-PULLBACK rigging accessory.
- KARA® enclosures with rotating arms and angle arms.
- SB18 enclosures with rigging arms.
- Shackles with bolts and safety pins.
- Ball locking pins (R-BLP and T-BLP).

If these components are used as it is described in this manual they will remain fully operational over the enclosures' life. However, it is necessary to regularly check the following points in order to guarantee the system durability:

The M-BUMP, M-BAR, M-JACK, KARA-ANGARMEX, and KARA-PULLBACK elements (including shackles and BLP) should not show any deformation, fissure, or oxidation.

Any component incorporating a part showing signs of defect must immediately be replaced [7.2].

The metal components of the KARA® and SB18 enclosures should not show any signs of deformation, fissure, or oxidation. They must be securely fixed to the enclosures.

Any enclosure incorporating a part showing signs of defect must immediately be put aside and withdrawn from use to be inspected by qualified service personnel.

Verify that each BLP operates normally by moving its mechanism and checking that it automatically returns to nominal position.

Verify the screwing mechanism on each shackle. Verify that the safety pin is present and that it locks correctly [9.4].

7.2 Authorized service procedures

7.2.1 Replacement kits and recommended tools

The replacement kits (KR) available for the customer are listed in Table 3. Table 4 is a list of all tools and material needed for rigging and service (not included).

Service and repair work for any other part must be carried out by an L-ACOUSTICS® authorized representative. Otherwise, the customer may be exposed to dangerous situations and the warranty will no longer apply.

Table 3: Replacement kits and utilities

Reference	Kit description	Kit contents (fixing material included)	Service procedure
	M-BUMP		
KR MBUMPLAS	Laser support plate	1 plate	[7.2.2]
KR MAN19L	19 mm shackle with safety pin	4 shackles	—
KR PIN621	5/16" R-BLP	10 pins	—
KR PIN601	5/16" T-BLP	10 pins	—
KR LOCKBLUE	Medium-strength thread-locker	5 pipettes of 50 g	—
	M-BAR		
KR MAN19L	19 mm shackle with safety pin	4 shackles	—
KR PIN665	3/8" T-BLP	10 pins	—
	M-JACK		
KR PIN601	5/16" T-BLP	10 pins	—
	KARA-ANGARMEX		
KR PIN601	5/16" T-BLP	10 pins	—
	KARA-PULLBACK		
KR MAN19L	19 mm shackle with safety pin	4 shackles	—

Table 4: Recommended tools (not included)

Electric screwdriver with torque selector (N.m or $in.lb_f$)	5 mm hex bit
T20 Torx® bit	7 mm hex key

7.2.2 Laser support plate

Replacement kit and tools

KR MBUMPLAS, handheld inclinometer[1], electric screwdriver with torque selector (N.m or $in.lb_f$), T20 Torx® bit, 5 mm hex bit, 7 mm hex key, KR LOCKBLUE.

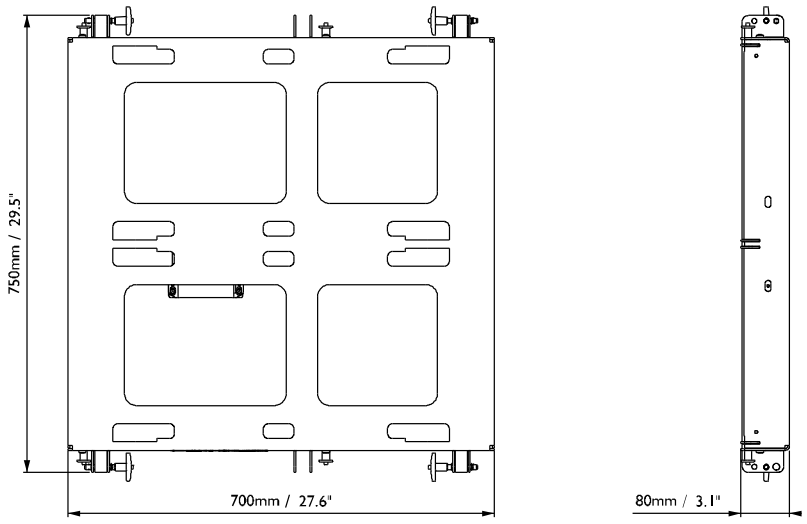
[1] Available in the **L-ACOUSTICS® TECH TOOLCASE** (refer to the **TECH TOOLCASE Product spec sheet** [3.4]).

Laser support plate replacement procedure

1. Place the M-BUMP on a flat horizontal surface (handheld inclinometer).
2. Remove the laser/inclinometer device from the laser support plate by unscrewing the 4 Torx® bolts (T20 bit, 7 mm hex key).
3. Remove the **old** laser support plate from the M-BUMP by unscrewing both hex screws (5 mm hex bit).
4. Secure the **new** laser support plate horizontally to the M-BUMP (handheld inclinometer) by screwing two hex screws (thread-locker, 5 mm hex bit, 5 N.m/45 $in.lb_f$).
5. Mount the laser/inclinometer device on the new laser support plate (laser lens towards the M-BUMP slits) by screwing the 4 Torx® bolts (T20 bit, 7 mm hex key, 3 N.m/27 $in.lb_f$).

8 SPECIFICATIONS

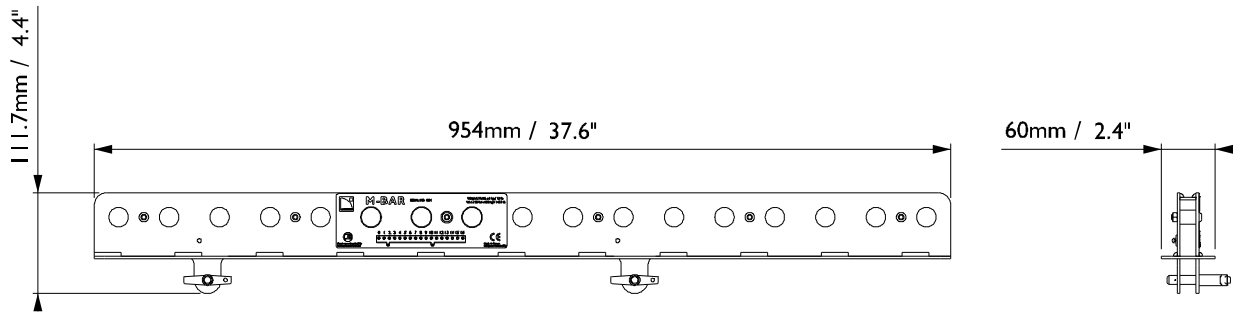
Reference	M-BUMP
Dimensions (L x H x D)	750 x 80 x 700 mm / 29.5 x 3.1 x 27.6 inch



Weight	25 kg / 55 lbs
Setup safety limits [1]	Maximum 24 KARA or 4 SB18/12 KARA or 16 SB18 per M-BUMP in flown configuration. Maximum 9 KARA or 2 SB18/6 KARA or 4 SB18 per M-BUMP in stacked configuration.
Material	High-grade steel coated with polyester powder.
Included accessories	4 R-BLP, 4 rotating arms with T-BLP, 1 laser support plate with 4 bolts, 2 shackles.

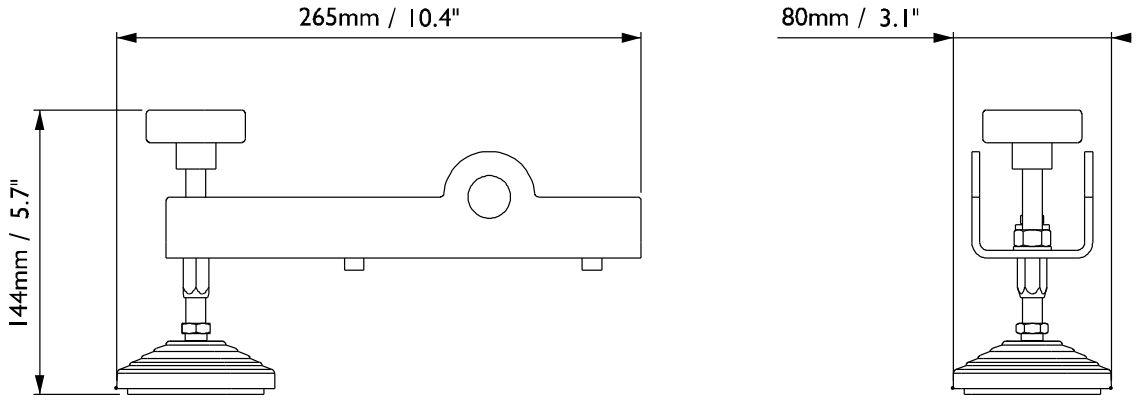
[1] Installation safety limits are specified in SOUNDVISION Software which is designed to help with L-ACOUSTICS® product implementation.

Reference	M-BAR
Dimensions (L x H x D)	954 x 111.7 x 60 mm / 37.6 x 4.4 x 2.4 inch



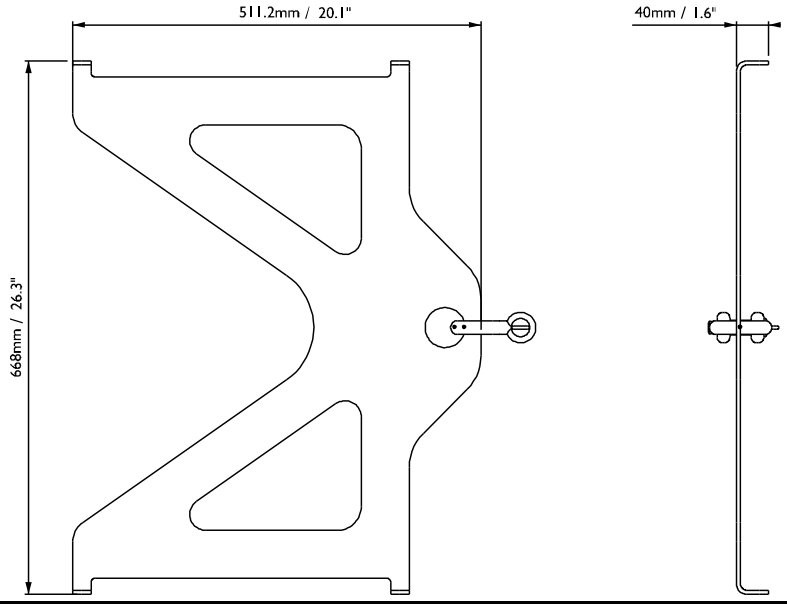
Weight	5 kg / 11 lbs
Material	High-grade steel coated with polyester powder.
Included accessories	2 T-BLP, 2 shackles.

Reference	M-JACK
Dimensions (L x H x D)	265 x 144 x 80 mm / 10.4 x 5.7 x 3.1 inch



Weight	4 x 1.15 kg / 2.5 lbs
Material	High-grade steel coated with polyester powder.
Included accessories	4 foot including height-adjustment system, 2 KARA-ANGARMEX with T-BLP.

Reference	KARA-PULLBACK
Dimensions (L x H x D)	668 x 40 x 511.2 mm / 26.3 x 1.6 x 20.1 inch



Weight	6 kg / 13 lbs
Setup safety limits [9.2.3]	Maximum of 12 KARA or 3 SB18/9 KARA enclosures per KARA-PULLBACK.
Material	High-grade steel coated with polyester powder.
Included accessory	1 shackle.

9 APPENDIX

9.1 LAP-TEQ inclinometer mounting

A **laser support plate** has been integrated inside the M-BUMP for optional TEQSAS® LAP-TEQ inclinometer/laser device mounting. The LAP-TEQ is a remote control device part of the **L-ACOUSTICS® TECH TOOLCASE** (refer to the **TECH TOOLCASE Product spec sheet** [3.4]).

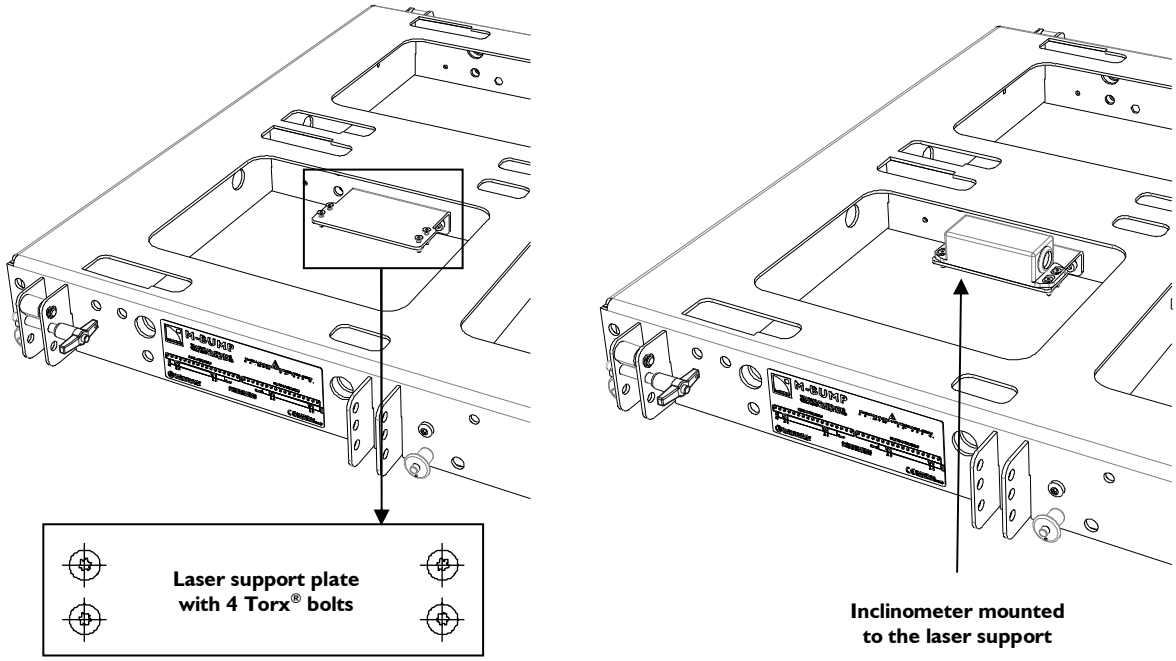


Figure 76: Laser support plate and LAP-TEQ inclinometer mounted to it

LAP-TEQ mounting procedure

Required tools

Handheld inclinometer (available in the **TECH TOOLCASE**), electric screwdriver with torque selector (N.m or in.lb$_f$), T20 Torx® bit, 7 mm hex key, XLR3 cable.

Procedure

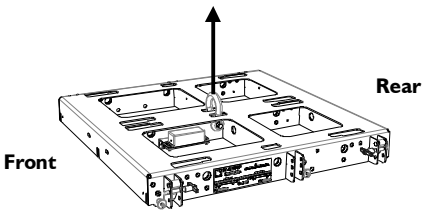
1. Place the M-BUMP on a flat horizontal surface (handheld inclinometer).
2. Unscrew the four Torx® bolts from the laser support plate (T20 bit, 7 mm hex key).
3. Mount the LAP-TEQ sensor on the laser support plate with laser lens towards the M-BUMP slits.
4. Screw the 4 Torx® bolts to the sensor and plate (T20 bit, 7 mm hex key, 3 N.m/27 in.lb$_f$).
5. Connect an XLR 3 cable to the sensor.
6. Calibrate the sensor by following the manufacturer's recommendations.

9.2 Flown array options and site angle setting

9.2.1 M-BUMP rigging options

L-ACOUSTICS® recommends 5 different rigging options to fly the M-BUMP for arrays containing KARA and/or SB18 enclosures. It is possible to use 0, 1, or 2 M-BAR and 1 or 2 rigging points (see Figure 77).

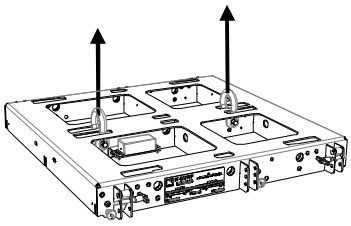
> **WARNING**
>
> ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the system before installation.



Option 1: 0 M-BAR, 1 point

1 motor

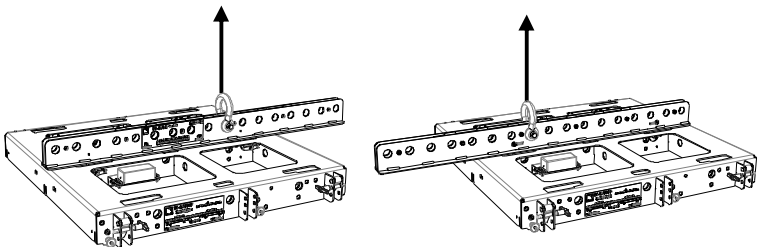
3 positions (front, center, rear)



Option 2: 0 M-BAR, 2 points

2 motors

Fixed front and rear positions (spacing = 400 mm/15 inch)



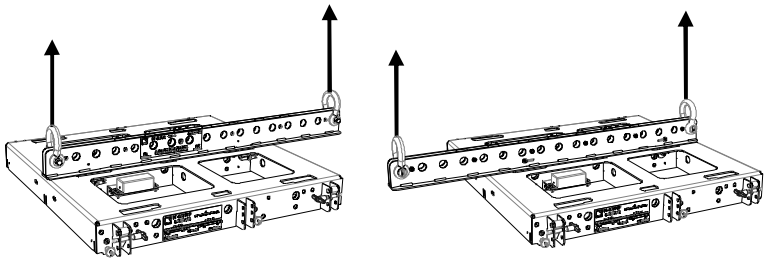
Option 3: 1 M-BAR, 1 point

1 motor

Variable position [9.2.2]

Left view = rear extension configuration

Right view = front extension configuration



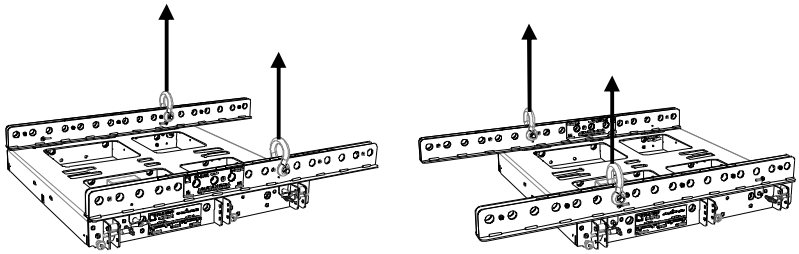
Option 4: 1 M-BAR, 2 points

2 motors

Fixed front and rear positions (spacing = 900 mm/35 inch)

Left view = rear extension configuration

Right view = front extension configuration



Option 5: 2 M-BAR, 2 points

2 motors

Variable position from front to rear

Same hole number for both points [9.2.2] (spacing = 663 mm/26 inch)

Left view = rear extension configuration

Right view = front extension configuration

Figure 77: M-BUMP rigging options

9.2.2 M-BUMP site angle setting

The M-BUMP site angle setting will be discrete or continuous depending on the chosen rigging option.

Rigging option 1 offers three discrete angle values.

Rigging options 3 and 5 offer 34 discrete angle values. First select the M-BAR position (A or B) and then the shackle position (holes 0-16) as shown in Figure 78 (rear extension configuration) or Figure 79 (front extension configuration).

IMPORTANT

For rigging options 1, 3, and 5 the M-BUMP site angle will also depend on the size and shape of the array (number of enclosures and inter-enclosure angles). Refer to **SOUNDVISION Software** [3.4] for site angle calculation.

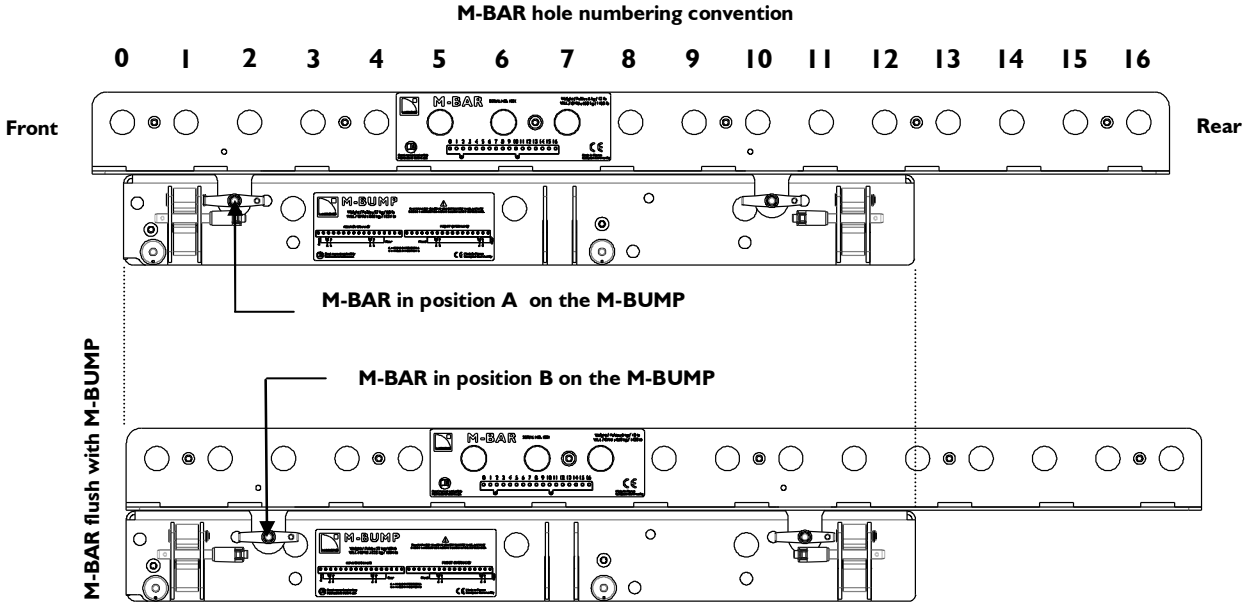


Figure 78: Discrete angle selection (rear extension configuration)

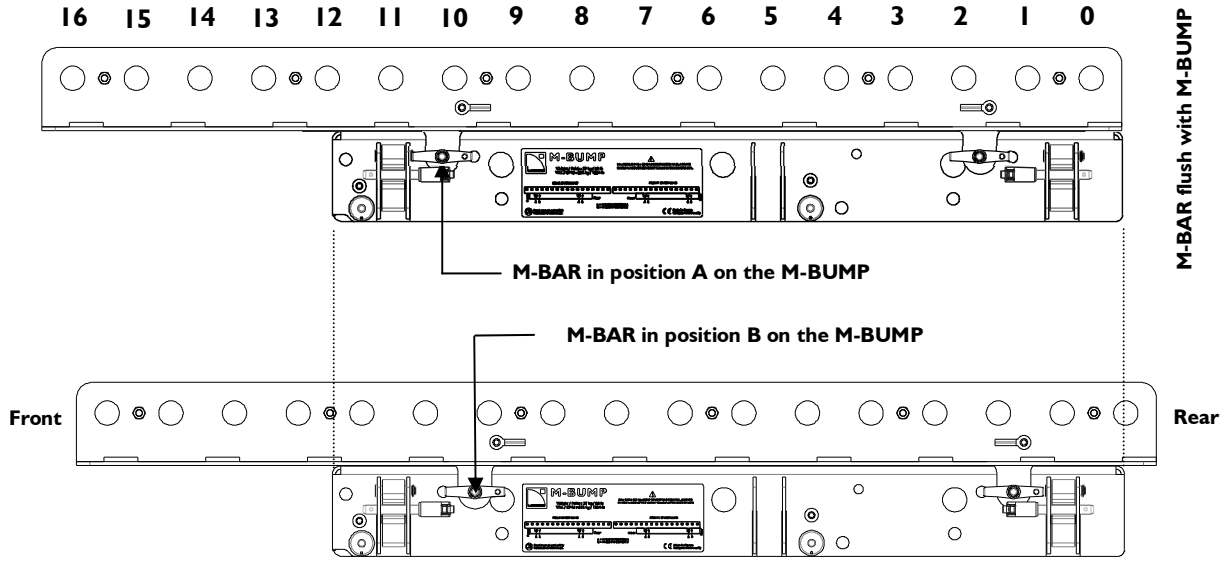


Figure 79: Discrete angle selection (front extension configuration)

Rigging options 2 and 4 allow continuous M-BUMP site angle setting depending on the relative heights between the front and rear rigging points. Option 2 offers a small setting range. Option 4 enlarges the setting range for negative site angles in rear extension configuration and positive site angles in front extension configuration (see Figure 80).

Note: For option 4, it is recommended to position both shackles in holes 0 and 16.

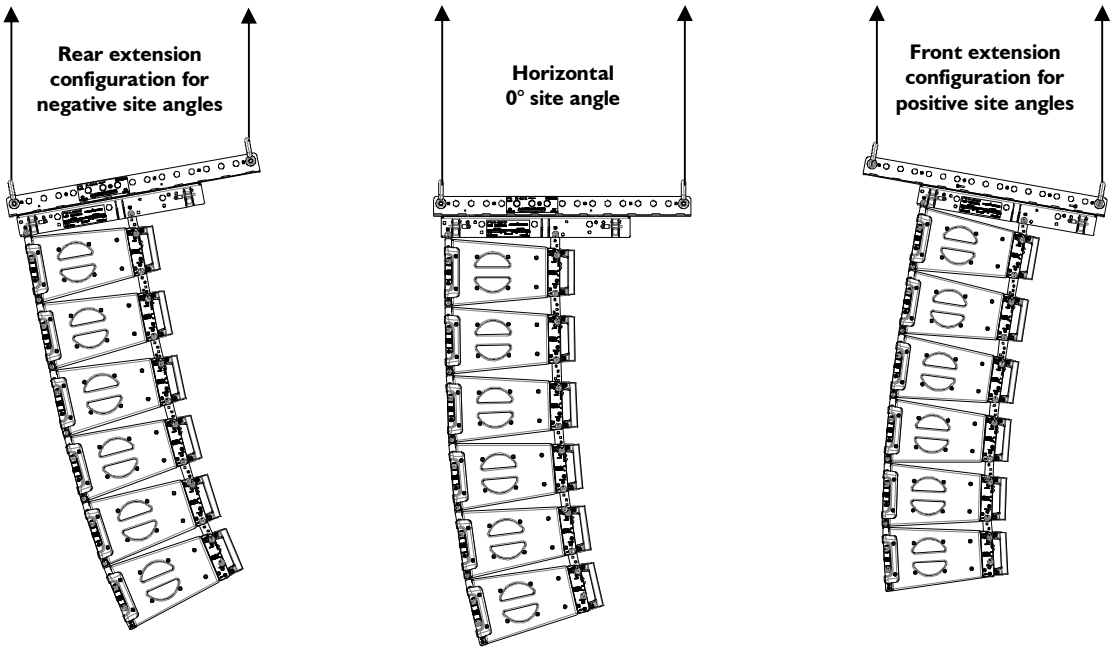


Figure 80: Continuous angle selection (option 4 example)

9.2.3 KARA-PULLBACK setup safety limits

The KARA-PULLBACK accessory mounts to the bottom enclosure of a KARA array to allow setting the site angle down to -90° and obtain a pullback configuration. However, this limit depends on the composition of the array as shown in Table 5.

ALWAYS refer to Table 5 before using the KARA-PULLBACK accessory.

Table 5: Possible downwards site angles with KARA-PULLBACK

Number of KARA enclosures in the array	12	9	6	3
Number of SB18 enclosures in the array	0	3	2	1
Maximum array downwards site angle	-90°	-60°	-90°	-90°

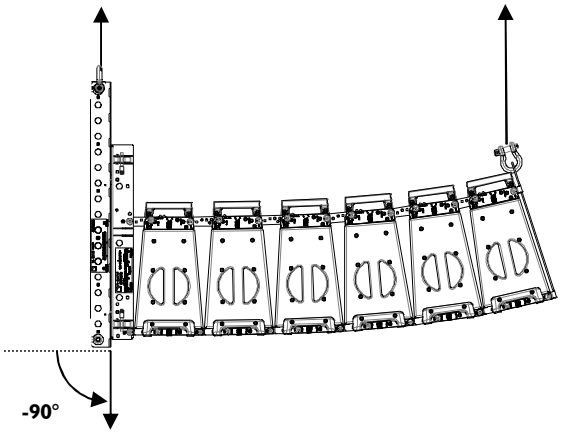


Figure 81: 90° downwards site angle with KARA-PULLBACK

9.3 Stacked array options and site angle setting

9.3.1 Stacking platform configuration

The M-BUMP can be used as a horizontal stacking platform along with two M-BAR and four M-JACK bases in front or rear extension configuration as shown in Figure 82 and Figure 83 (refer to [9.3.2] for bottom KARA angle settings).

The configurations shown in Figure 82 and Figure 83 are purely indicative.
Refer to [6.3.1] and [6.4.1] for setup safety limits.

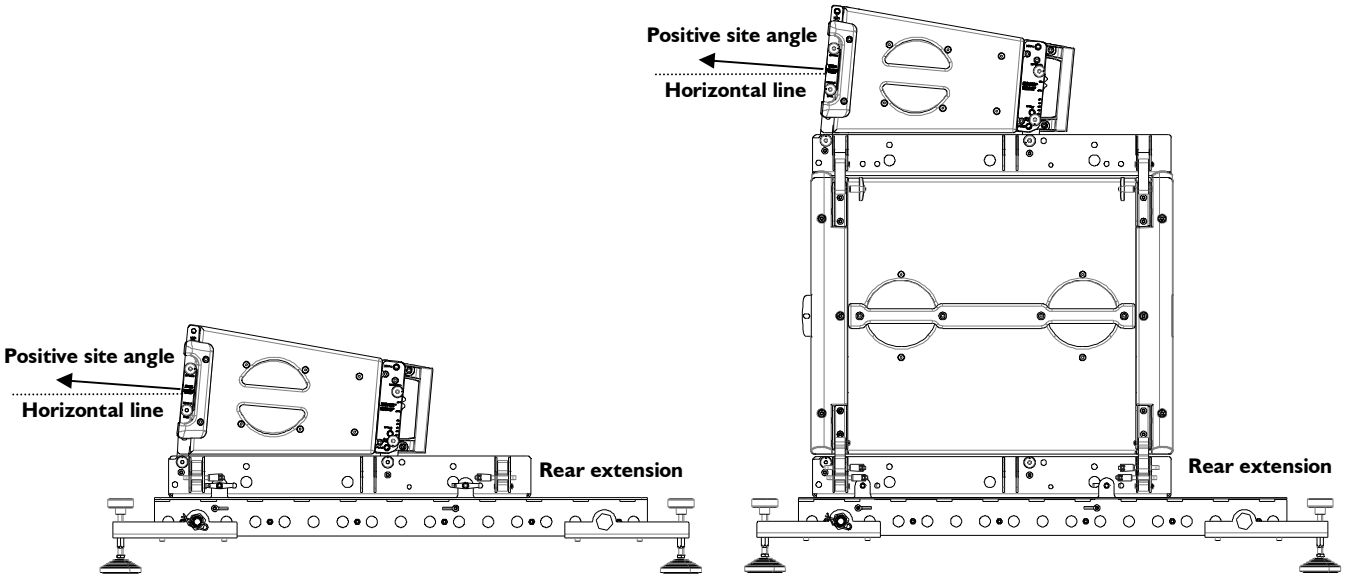


Figure 82: Rear extension configurations

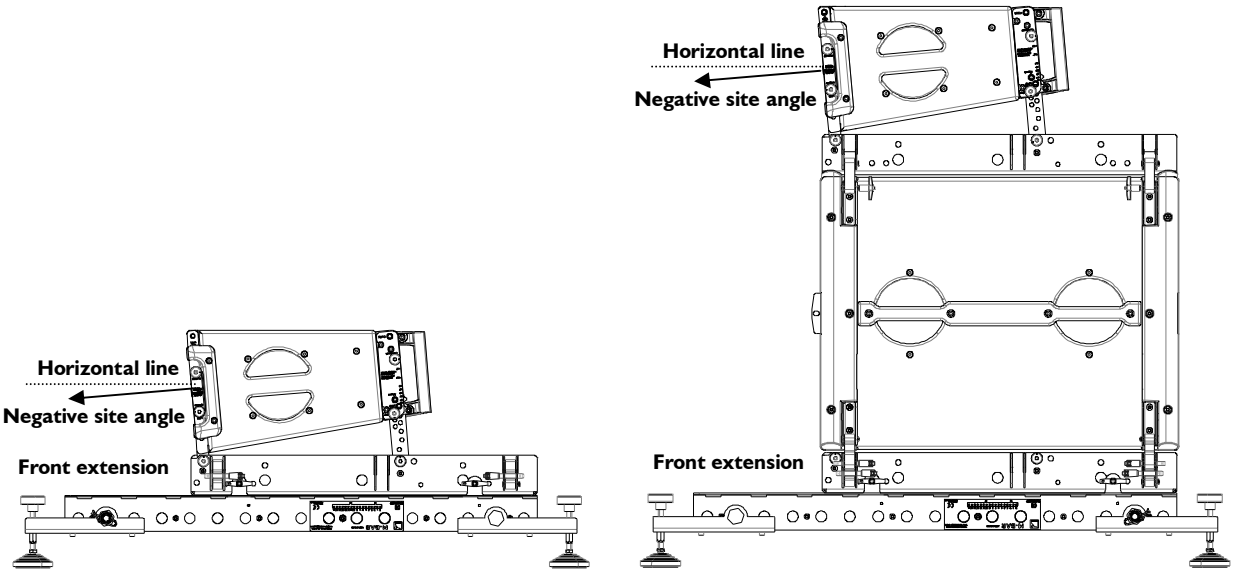


Figure 83: Front extension configurations

9.3.2 Array site angle setting

The site angle of the stacked KARA array will be determined by the angle of the bottom enclosure in the range from -15° to +5°. Install both KARA-ANGARMEX angle arm extensions (also included in the M-JACK package) to obtain angles from -7.5° to -15°. Table 6 gives all possible site angles settings:

Table 6: Possible site angles for stacked array

Angle selection on KARA (angle value facing the cursor)	Resulting site angle without angle arm extension (Figure 84)	Resulting site angle with angle arm extension (Figure 85)
0°	-5°	-15°
1°	-4°	-14°
2°	-3°	-13°
3°	-2°	-12°
4°	-1°	-11°
5°	0°	-10°
7.5°	+2.5°	-7.5°
10°	+5°	—

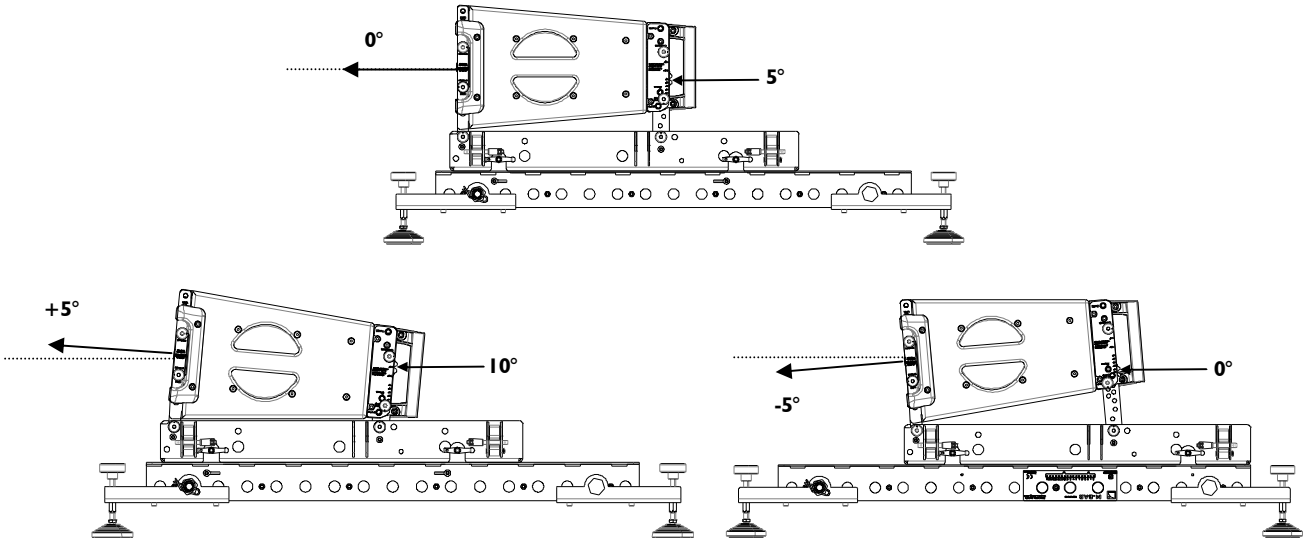


Figure 84: Bottom KARA angle selection without angle arm extensions

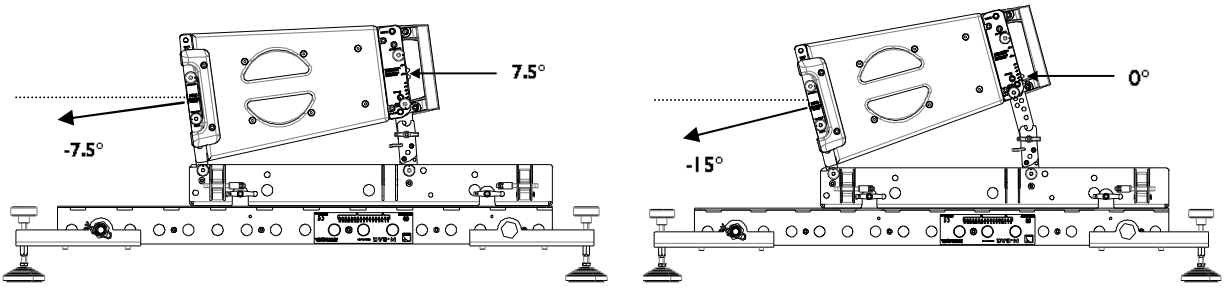


Figure 85: Bottom KARA angle selection with angle arm extensions

9.4 Safety pin removal and insertion

The safety pins part of the shackles have an integrated locking system. Figure 86 presents the removal and insertion procedures.

ALWAYS put the safety pin in locked position before use.

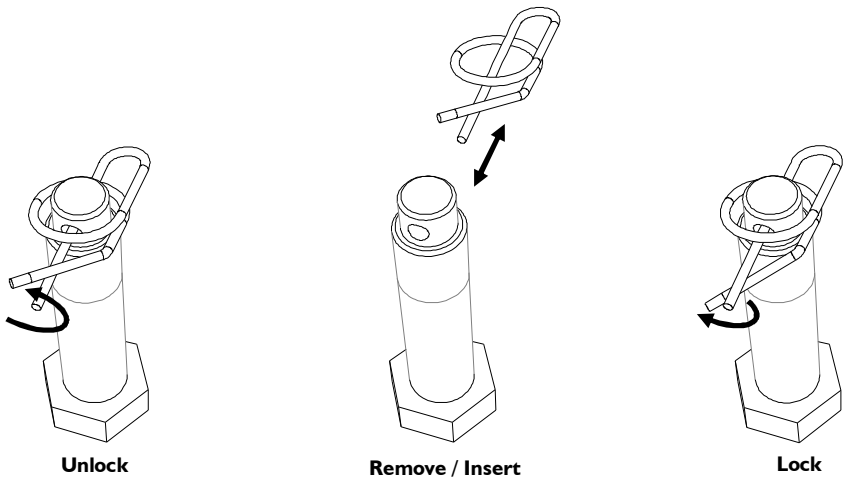


Figure 86: Safety pin removal and insertion procedures

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