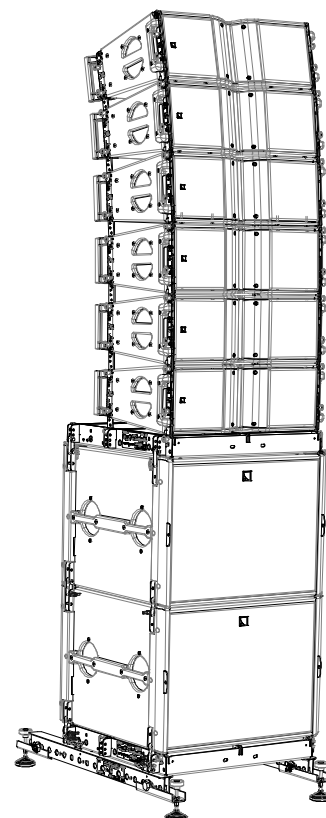
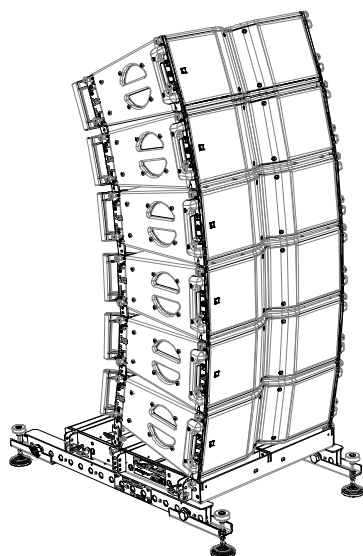
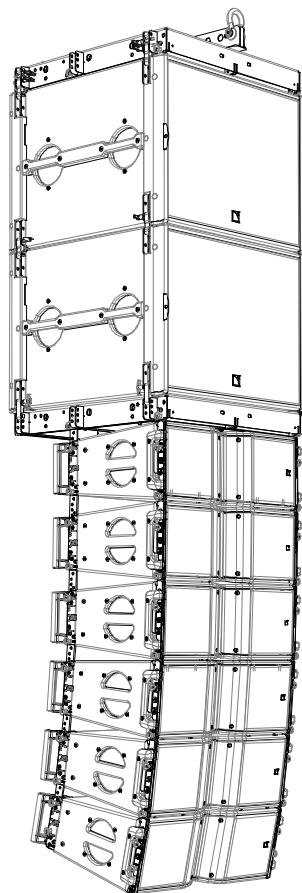
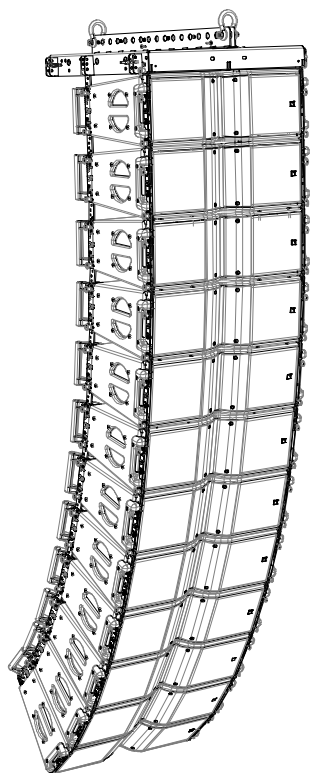


# KARA<sup>®</sup> MODULAR WST<sup>®</sup> SYSTEM

RIGGING PROCEDURES

VERSION 1.1





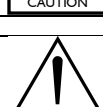


# 1 SAFETY WARNINGS

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


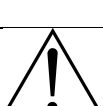
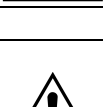
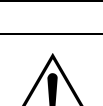
## 1.1 Symbol description

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

	<p>The <b>WARNING</b> 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.</p>
	<p>The <b>CAUTION</b> symbol notifies the user about information to prevent possible product damage.</p>
	<p>The <b>IMPORTANT</b> symbol is a notification of an important recommendation of use.</p>

## 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®**

	<p><b>5. Personnel qualification</b> 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.</p>
	<p><b>6. Personnel health and safety</b> 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.</p>
	<p><b>7. System parts and rigging inspection</b> All system components must be inspected before use in order to detect any possible defects. Please refer to the <b>Care and Maintenance</b> 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.</p>
	<p><b>8. Additional rigging equipment</b> 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 ensure that the Working Load Limit (WLL) of all additional hardware rigging accessories is greater than the total weight of the loudspeaker assembly in use.</p>



#### 9. Suspension points

It is the user's responsibility to ensure 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 ensure that any overhead suspension of L-ACOUSTICS<sup>®</sup> systems has been made in accordance with all applicable local regulations.

As a general rule, L-ACOUSTICS<sup>®</sup> recommends the use of safety steel at all times.



#### 12. Flying a loudspeaker assembly

Always ensure 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.



#### 13. Ground stacking a loudspeaker assembly

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 this last can support the total weight of the system.



#### 14. Dynamic load

When a loudspeaker assembly is deployed in an open air environment, wind effect 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.



### I.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  
Stacking bases, 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:

EN ISO 12100-1: 2004 (Mechanical Safety)  
DIN 18800 (Mechanical Structure)  
BGV-C1 (Mechanical Standard applied in Germany)

Established at Marcoussis, France

March 1<sup>st</sup>, 2010



Jacques Spillmann  
Head of Engineering & Design dept.

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## 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 I 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 I: Links to documents and software applications**

<b>KARA User manual</b>	<a href="http://www.l-acoustics.com/kara">www.l-acoustics.com/kara</a> (USER MANUAL)
<b>KARA Rigging manual</b>	<a href="http://www.l-acoustics.com/kara">www.l-acoustics.com/kara</a> (RIGGING MANUAL)
<b>SB18 User manual</b>	<a href="http://www.l-acoustics.com/sb18">www.l-acoustics.com/sb18</a> (USER MANUAL)
<b>SB18 Rigging manual</b>	<a href="http://www.l-acoustics.com/sb18">www.l-acoustics.com/sb18</a> (RIGGING MANUAL)
<b>TECH TOOLCASE Product spec sheet</b>	<a href="http://www.l-acoustics.com/tech-toolcase">www.l-acoustics.com/tech-toolcase</a> (PRODUCT SPEC SHEET)
<b>SOUNDVISION Software</b>	<a href="http://www.l-acoustics.com/soundvision">www.l-acoustics.com/soundvision</a>

## 4 KARA<sup>®</sup> SYSTEM

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

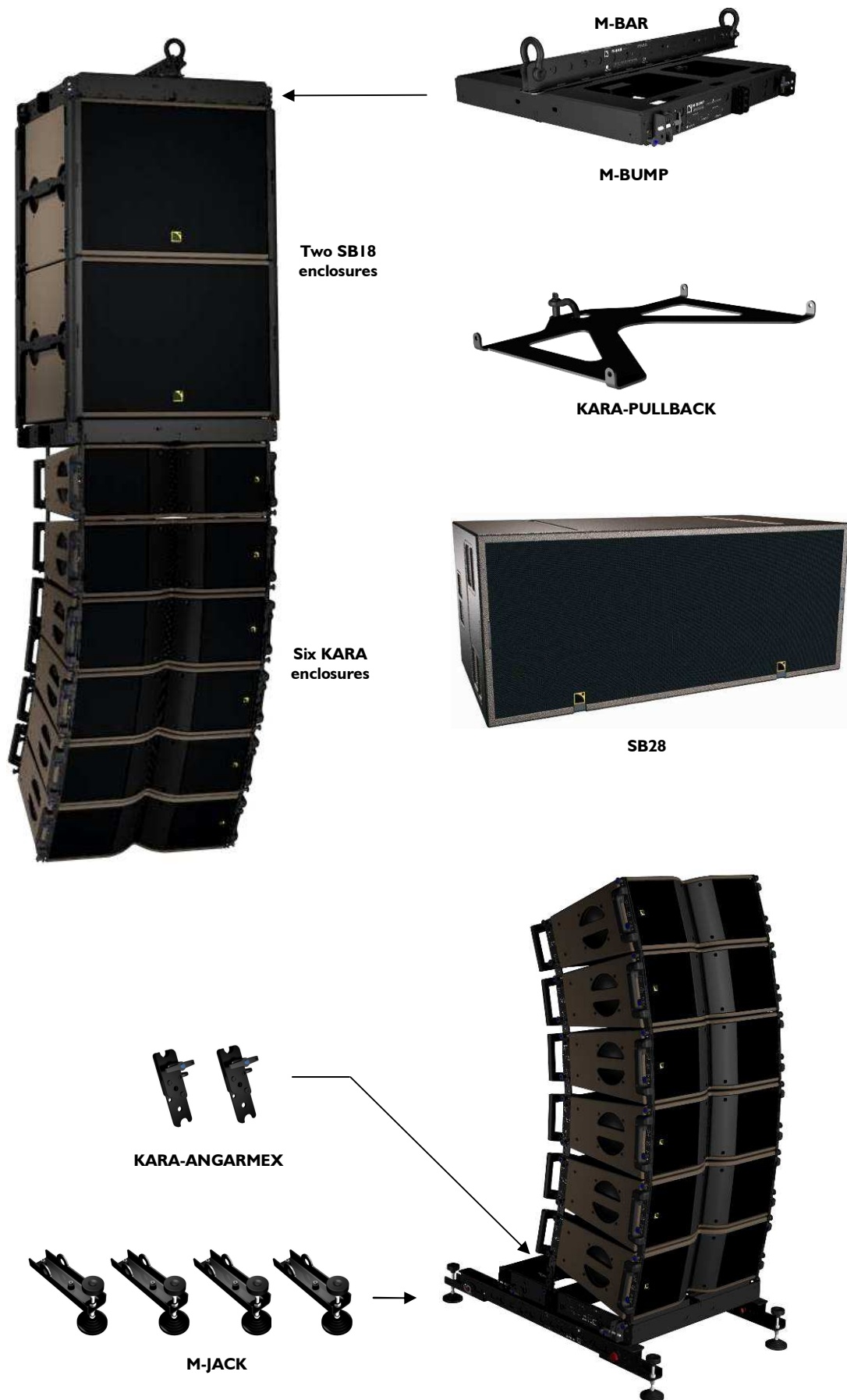
The system approach developed by L-ACOUSTICS<sup>®</sup> for KARA consists of the elements needed to fully take advantage of the possible configurations and optimize the system. The main components of the system are (see also Figure 1 and Figure 2):

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

Each system configuration should first be modeled using **L-ACOUSTICS<sup>®</sup> 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.



**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 **L-ACOUSTICS® KARA®** enclosures as a variable-curvature, vertical line source array. M-BUMP also allows KARA to be rigged to an **L-ACOUSTICS® SB18 subwoofer** array.

**Note:** M-BUMP also can fly or stack straight vertical SB18 arrays (refer to the **SB18 Rigging manual** [3.4]).

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.

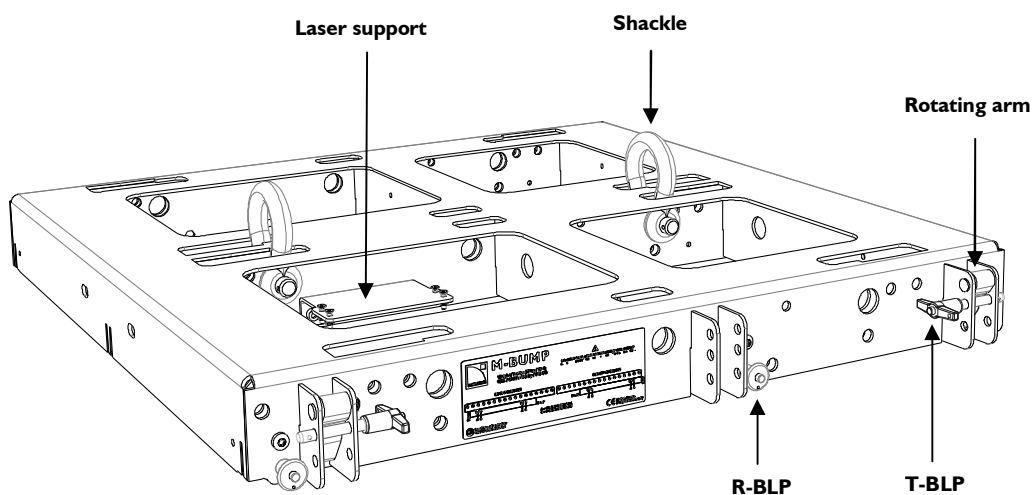


Figure 3: M-BUMP rigging structure

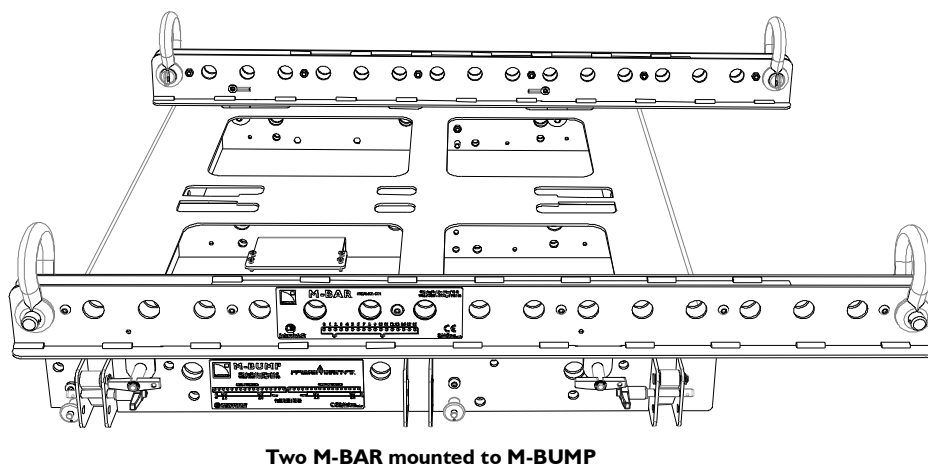
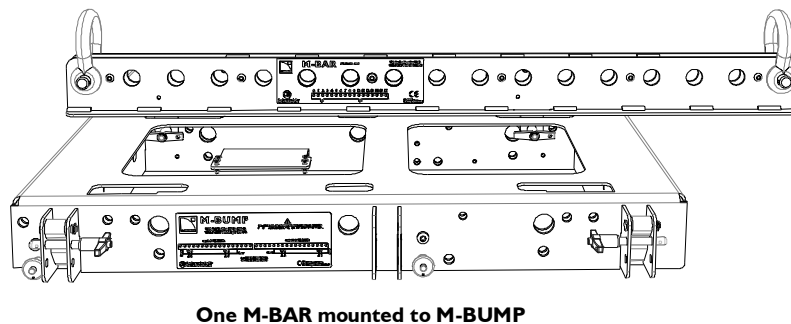
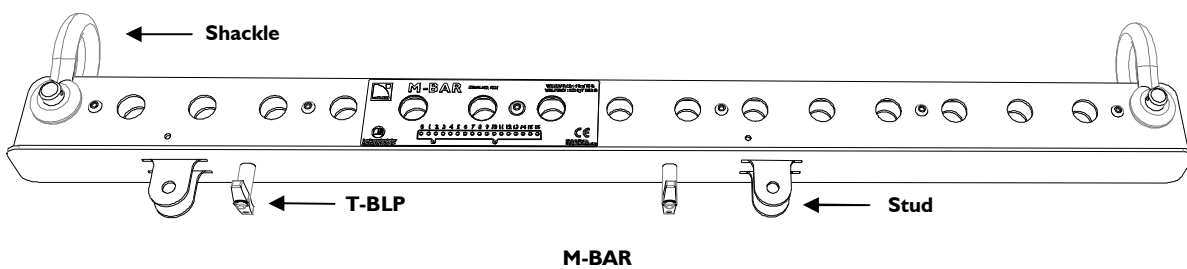
## 5.2 M-BAR

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/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.



**Figure 4: M-BAR extension bar**

### 5.3 M-JACK, KARA-ANGARMEX

The **L-ACOUSTICS<sup>®</sup> M-JACK** are **four stacking bases** 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.

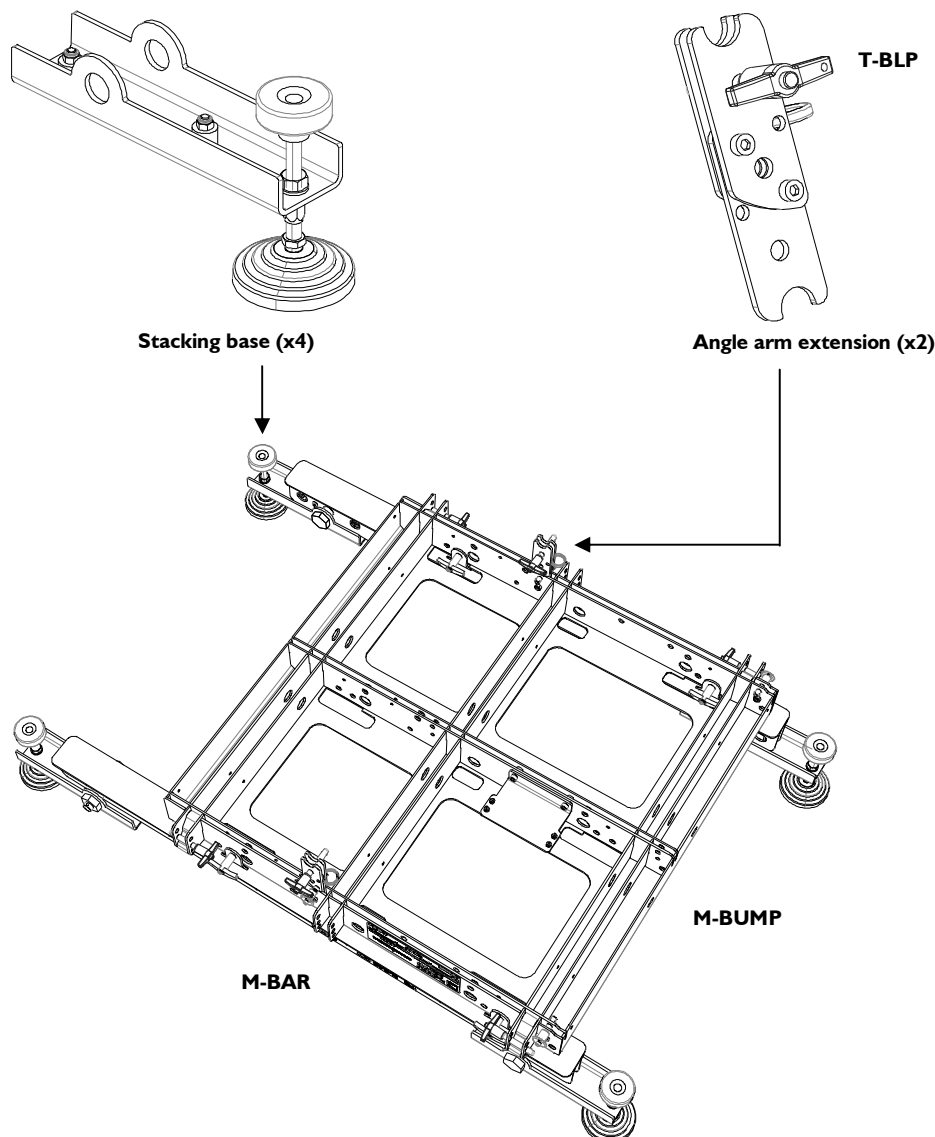
The **L-ACOUSTICS<sup>®</sup> KARA-ANGARMEX** are **two angle arm extensions** providing extra 10° downwards site angle for the bottom KARA in stacked configurations.

**Note:** Two angle arm extensions are also included in the M-JACK package.

The M-JACK package comprises the following elements:

- Four **stacking bases** fitted with height-adjustment and locking system.
- Two **angle arm extensions** with 5/16" **T-BLP** (provided with **slings** and **fixation material** to be permanently attached to the M-BUMP).

The KARA-ANGARMEX package comprises two **angle arm extensions** with 5/16" **T-BLP**. They are provided with **slings** and **fixation material** to be permanently attached to the M-BUMP.



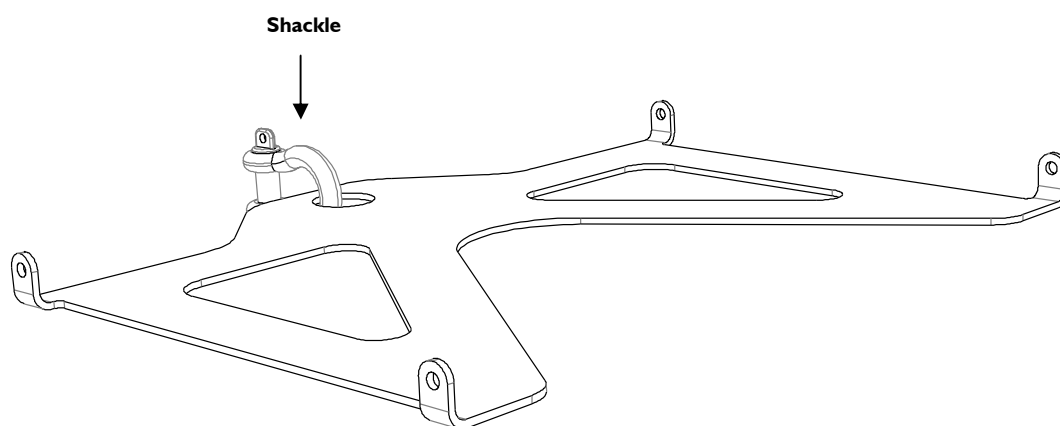
**Figure 5: Stacking platform (with optional angle arm extensions)**



## 5.4 KARA-PULLBACK

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

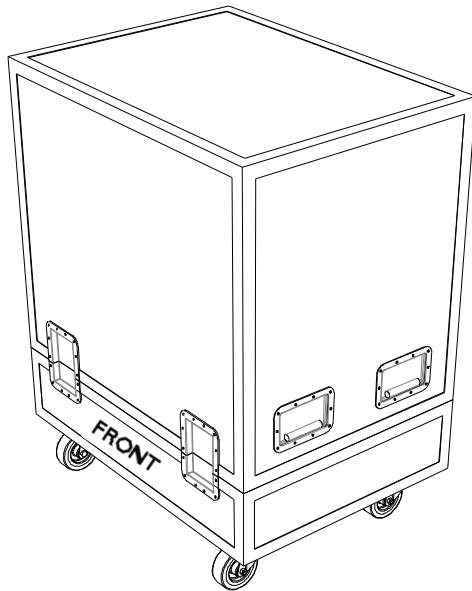
The KARA-PULLBACK is a **plate** on which is fixed one **shackle** fitted with 19 mm/0.75 inch-diameter bolt and a safety pin.



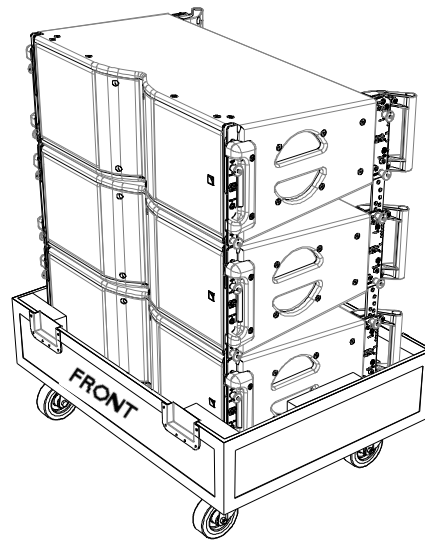
**Figure 6: KARA-PULLBACK rigging accessory**

#### 5.5 Flight-case

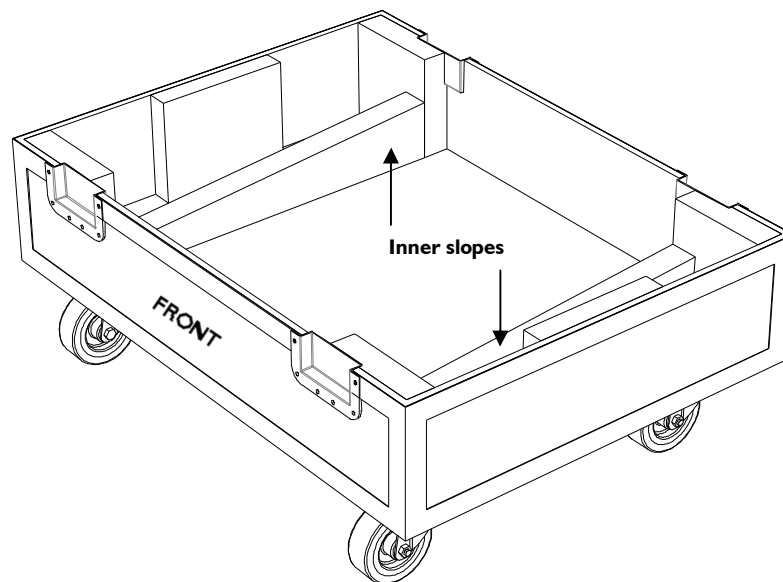
It is recommended to use a flight-case designed to ship a 3-KARA vertical array. It should contain foam inserts to prevent array movement and the tray should be fitted with 2 slopes to keep the array vertical.



Complete flight-case



Tray supporting a 3-KARA array



Tray detail

**Figure 7: Recommended flight-case for KARA**

## 6 INSTALLATION

### 6.1 Flying a standalone KARA array

#### 6.1.1 Modeling and safety

Any system must be modeled before installation so as to ensure acoustical conformity and mechanical safety. 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.



M-BUMP can nominally fly an array of up to 24 KARA enclosures along with all loudspeakers cables (see the **KARA User manual** [3.4]). However, this maximum number can decrease in line with 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 6-KARA array under an M-BUMP by successively adding two 3-KARA arrays, called ARRAY#1 and ARRAY#2 in the order of appearance. The second procedure describes how to disassemble the array. Both procedures will remain the same for larger arrays.

#### 6.1.2 Array mounting



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



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.

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

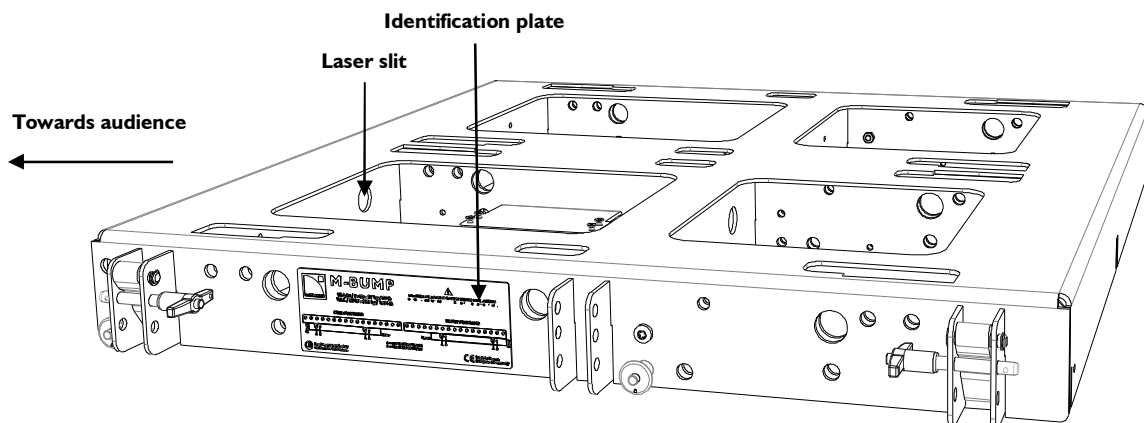
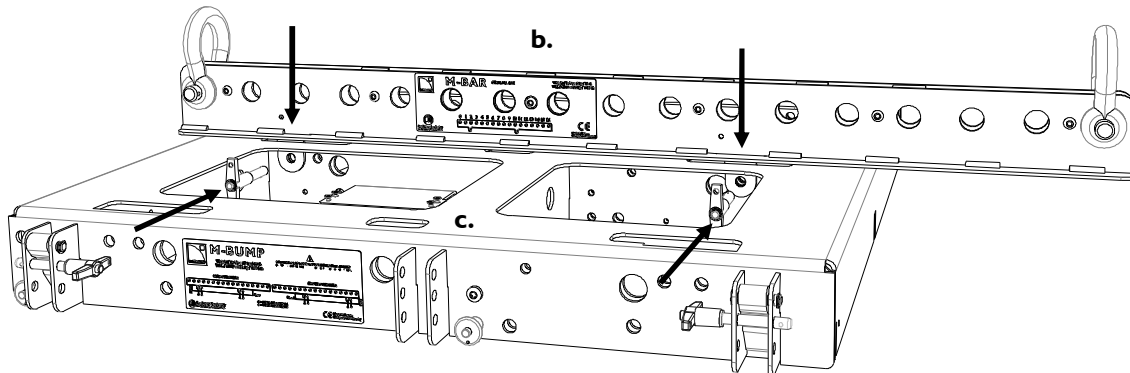


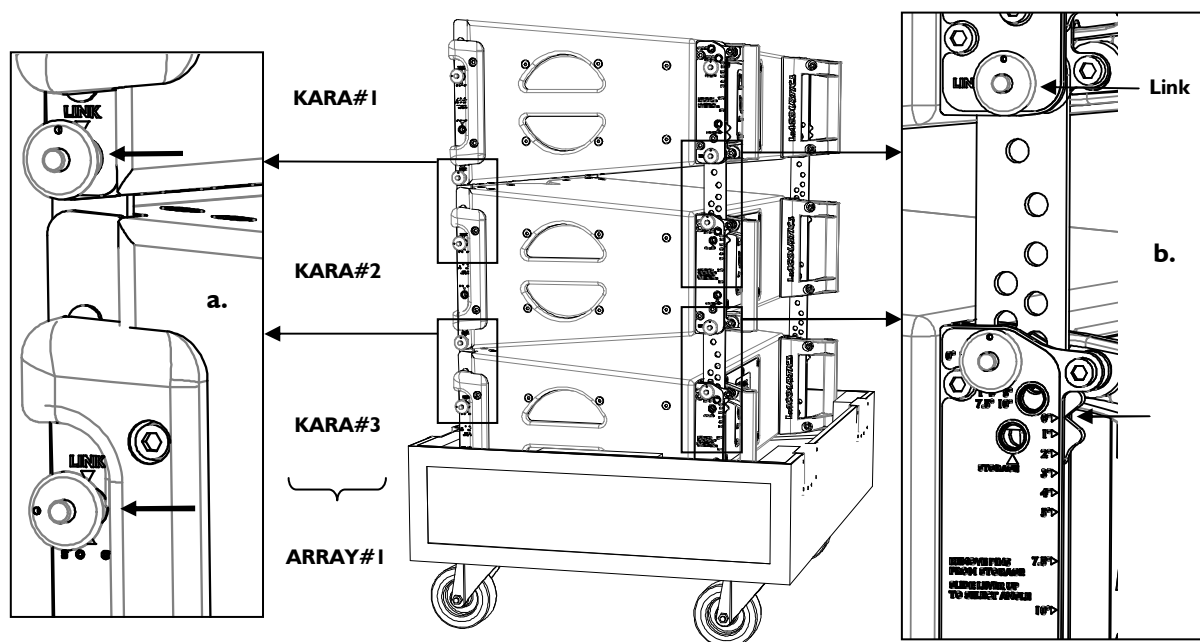
Figure 8: M-BUMP position

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 9: Single M-BAR installation example**

3. Attach the shackle(s) to the M-BUMP according to the desired configuration [9.2].
4. Place a full flight-case at the rigging location and remove the cover. 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 connecting 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 connecting 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 10: 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°).



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.

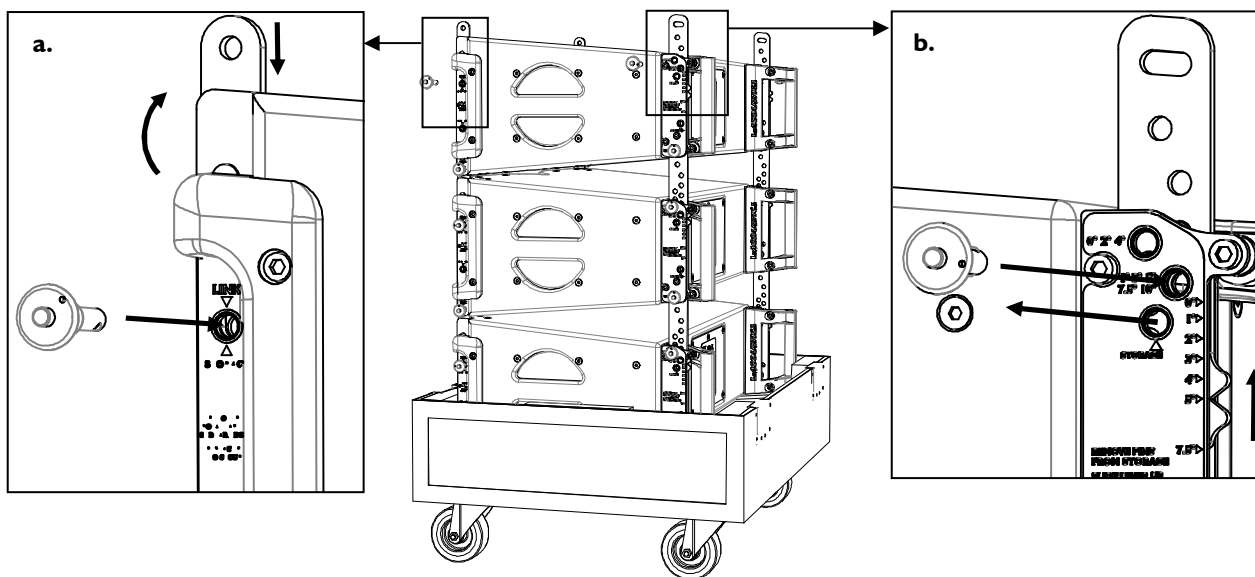


Figure 11: Setting the KARA#1 arms

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

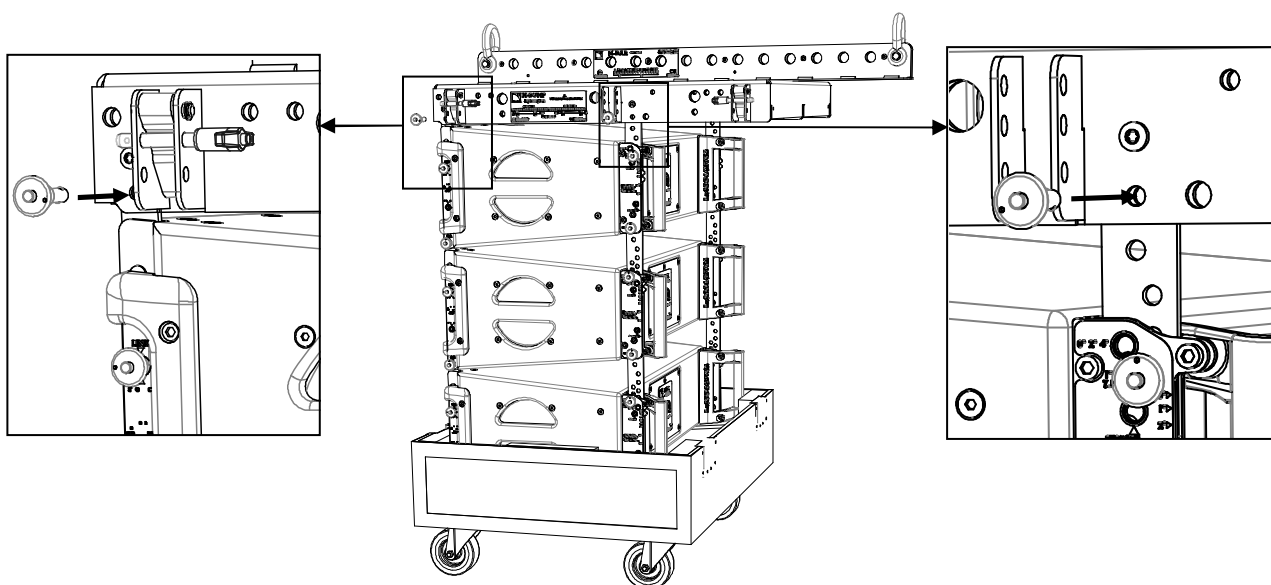


Figure 12: Connecting M-BUMP to ARRAY#1

8. Place ARRAY#1 beneath the connecting points, attach the motor hook(s) or stinger(s) to the shackle(s), raise the array to a reachable height, 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 for KARA#3.

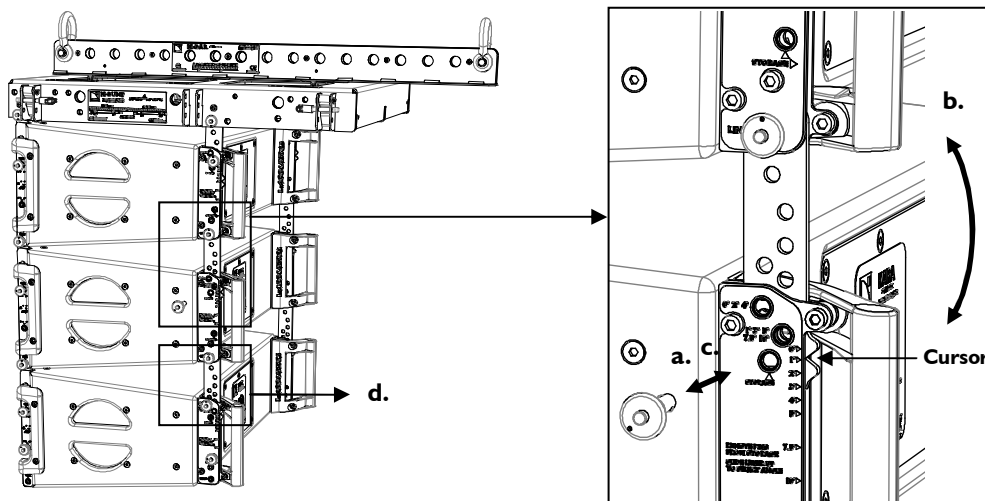


Figure 13: ARRAY#1 inter-enclosure angle setting

10. Place another full flight-case at the rigging location and remove the cover. 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.

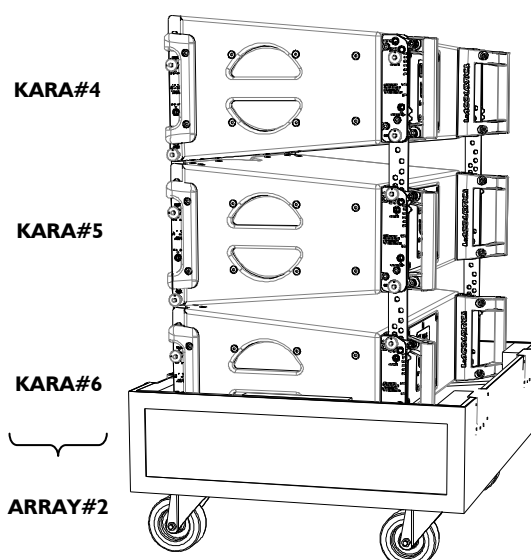


Figure 14: Inter-enclosure connection check for ARRAY#2

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** connecting points between ARRAY#1 and ARRAY#2 as follows:
- Slide both KARA#4 front arms up and align them with the KARA#3 bottom front connecting points.
  - On KARA#3, remove both front bottom R-BLP from the storage holes and secure by re-inserting them into the bottom **yellow link holes**.
  - Take the array down until KARA#3 and KARA#4 front corners are in contact (the front arms must remain vertical).
  - Secure the front arms on KARA#4 by inserting both top R-BLP into the top **yellow link holes**.

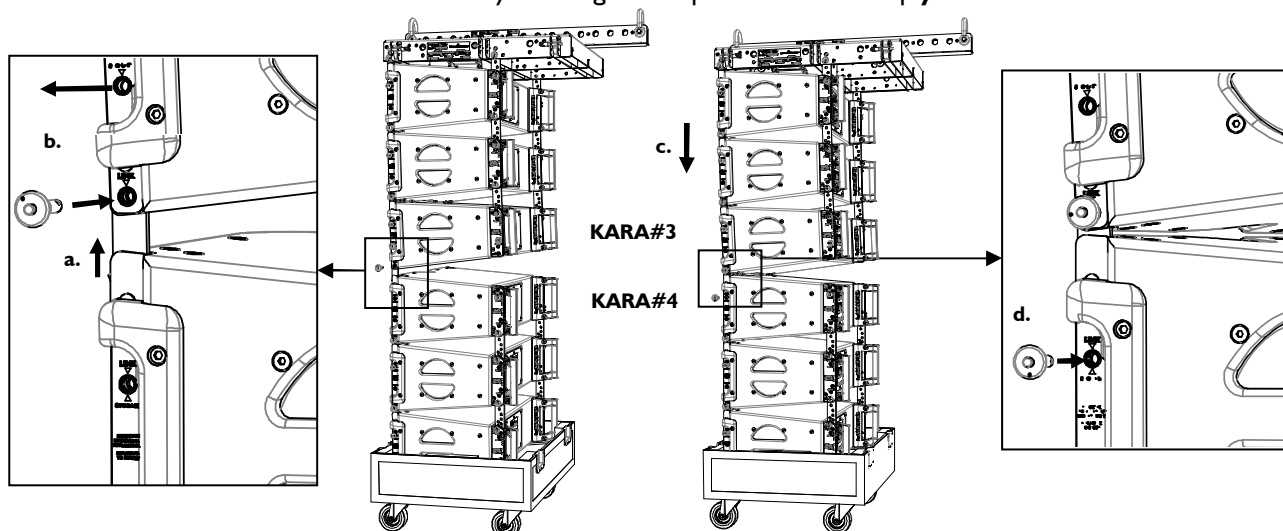


Figure 15: Connecting ARRAY#2 and ARRAY#1 front connecting points

15. Raise the array to a reachable height and remove the flight-case from the rigging location.
16. With 2 people working simultaneously on each side of the array, connect both **rear** connecting points between ARRAY#1 and ARRAY#2 as follows:
- Remove the KARA#4 rear top R-BLP from 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 ( $0^{\circ}/2^{\circ}/4^{\circ}$  or  $1^{\circ}/3^{\circ}/5^{\circ}/7.5^{\circ}/10^{\circ}$ ).
  - While grabbing the back handle of KARA#6, rotate ARRAY#2 so as to align the KARA#3 and KARA#4 rear connecting points.
  - Remove the rear bottom R-BLP from KARA#3 and secure by re-inserting it into the KARA#3 **yellow link hole**.

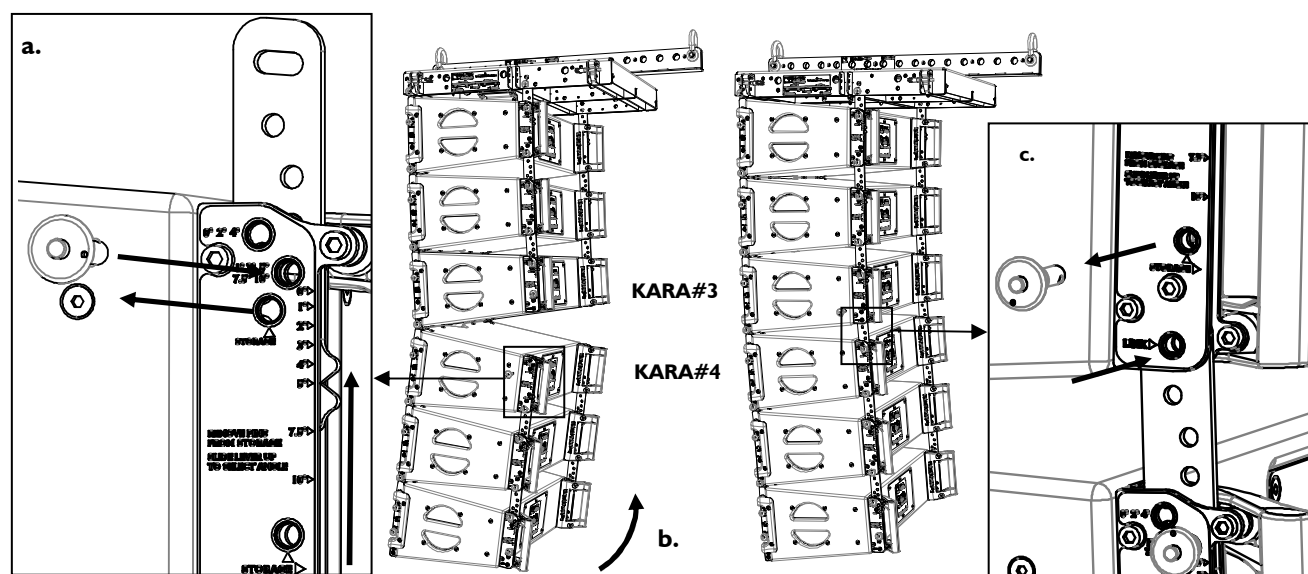
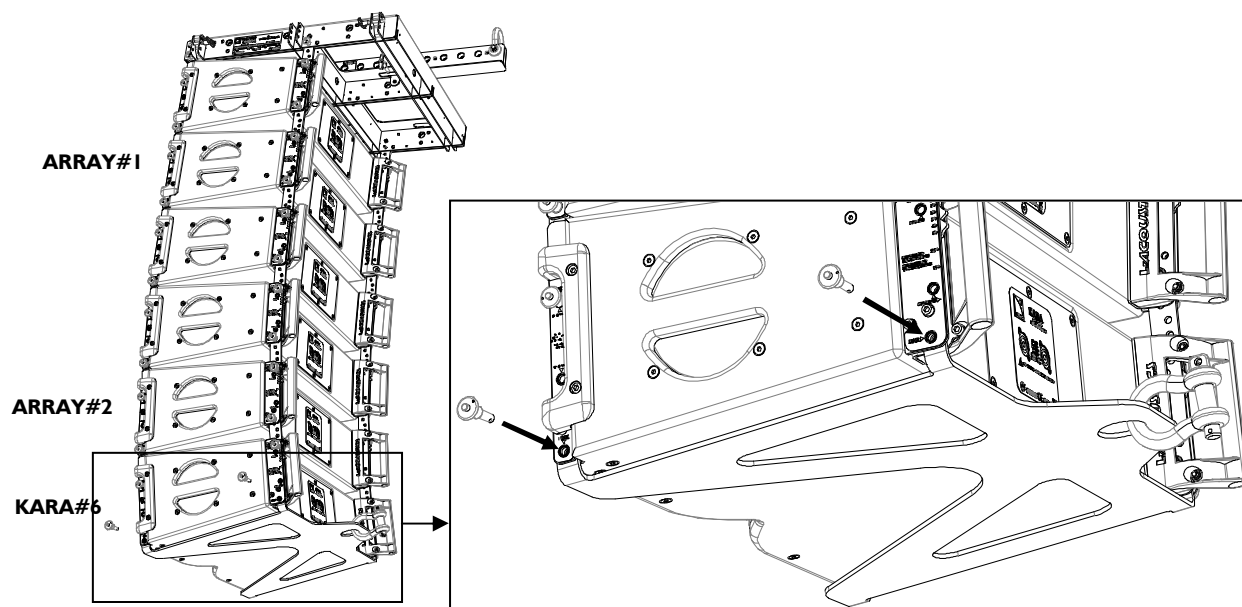


Figure 16: Connecting ARRAY#2 and ARRAY#1 rear connecting points

17. Set the inter-enclosure angles in ARRAY#2 by applying step 9.
18. **(Optional, for pullback configuration)** Attach a KARA-PULLBACK accessory to KARA#6 as follows: insert the KARA-PULLBACK studs into the KARA#6 connecting points (long studs at the back), remove the 4 bottom R-BLP from KARA#6 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.





**Figure 17: KARA-PULLBACK installation**

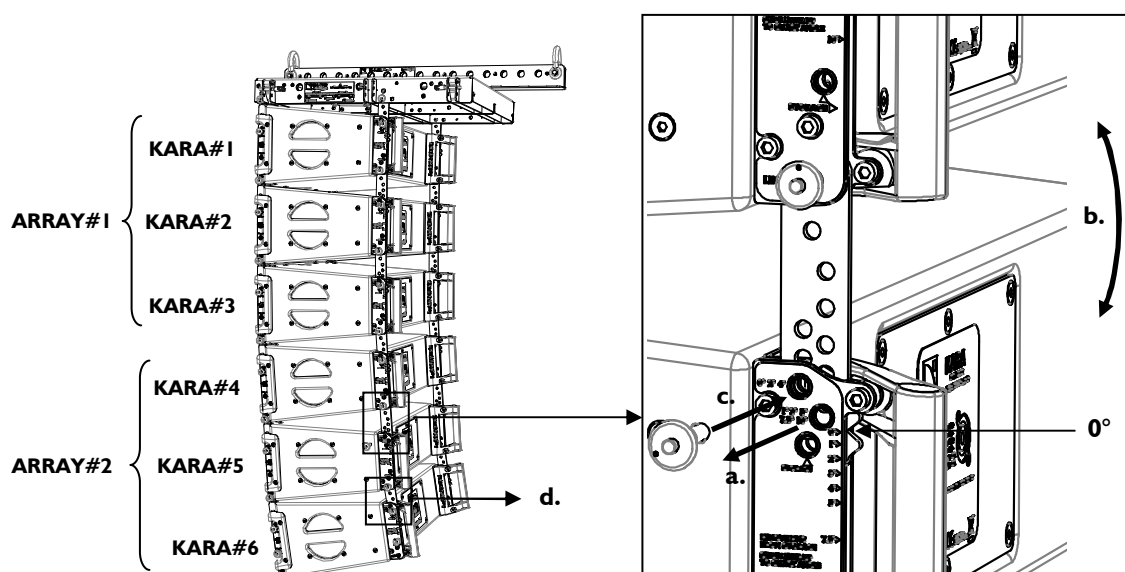
19. Raise the array to the desired height and adjust the site angle [9.2.2].
20. Attach two safety slings (not provided) to the M-BUMP and the main rigging structure. Refer to [1.2, point 11].



### 6.1.3 Array removal


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

1. Remove both safety slings from the main rigging structure.
2. Lower ARRAY#2 to a comfortable height.
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 KARA#6, 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 for KARA#6.



**Figure 18: ARRAY#2 inter-enclosure angle setting**

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

 <b>WARNING</b>	<p>Pay attention to the tray position: both inner slopes must be inclined upwards from front to rear [5.5].</p>
---	---

6. Lower the array slightly higher than the tray.

7. With 2 people working simultaneously on each side of the array, remove both **rear** connecting 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 connecting 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.

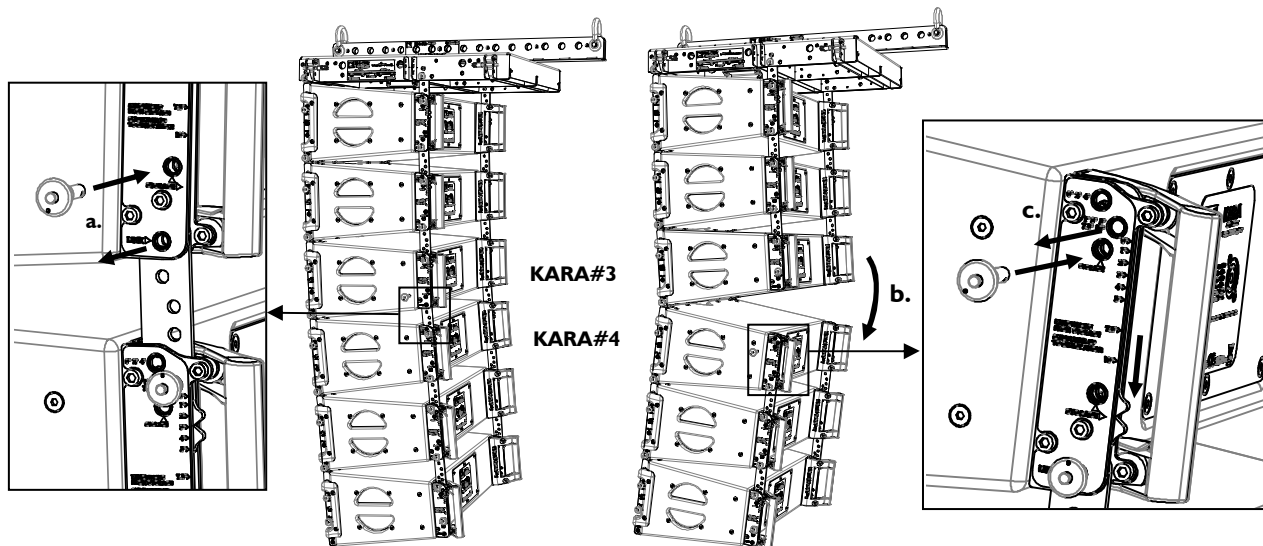


Figure 19: ARRAY#2 to ARRAY#1 rear connecting point detachment

8. Lower the array until ARRAY#2 is totally placed in the tray and the front rigging points between ARRAY#2 and ARRAY#1 are in contact.
9. Remove the **front** connecting 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.

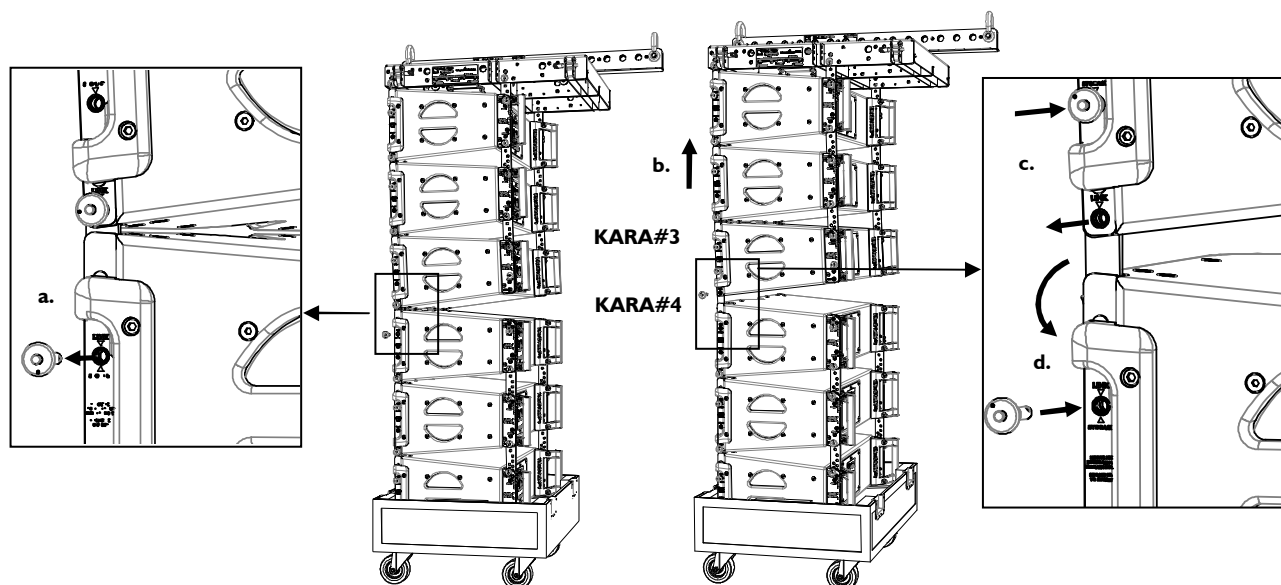


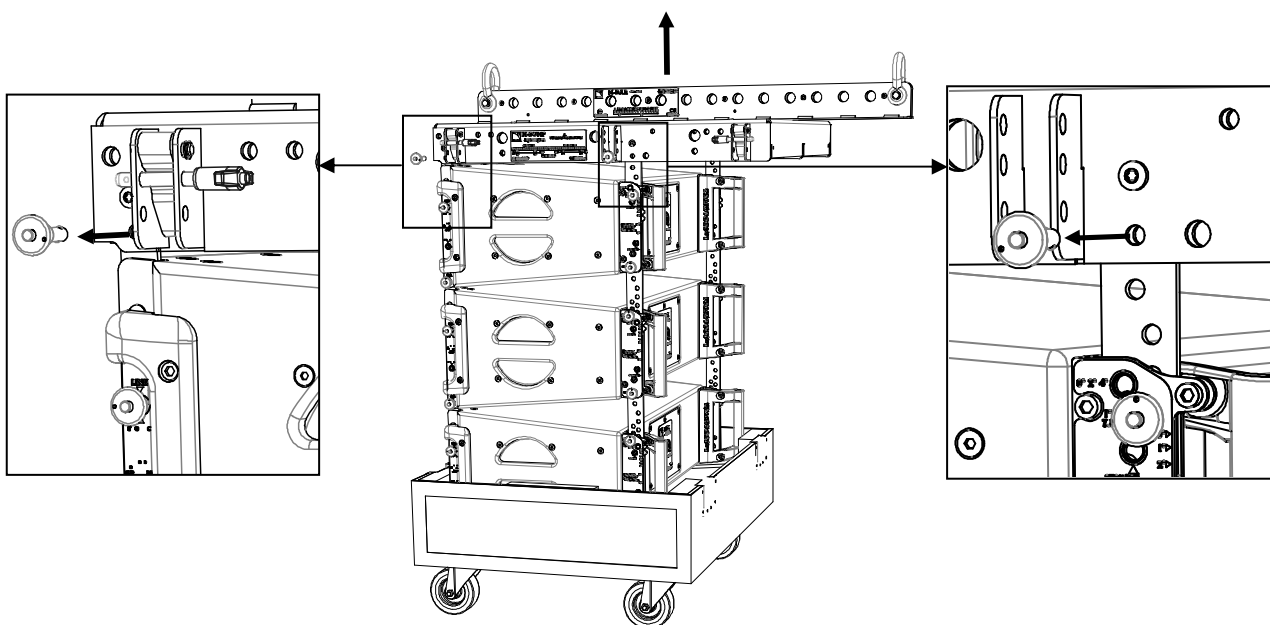
Figure 20: ARRAY#2 to ARRAY#1 front connecting point detachment

10. Push ARRAY#2 away from the rigging location and put the flight-case cover on.
11. Lower ARRAY#1 to a comfortable height and set the angles to 0° by applying step 4.
12. Place another empty flight-case at the rigging location, remove the cover, and place the tray beneath ARRAY#1.



Pay attention to the tray position: both inner slopes must be inclined upwards from front to rear [5.5].

13. Lower ARRAY#1 into the tray. Lower the motor chain(s) so as to release tension.
14. 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 21: M-BUMP removal**

#### 15. Set ARRAY#1 for transport as follows:

- 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.
- 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.
- Put the flight-case cover on.

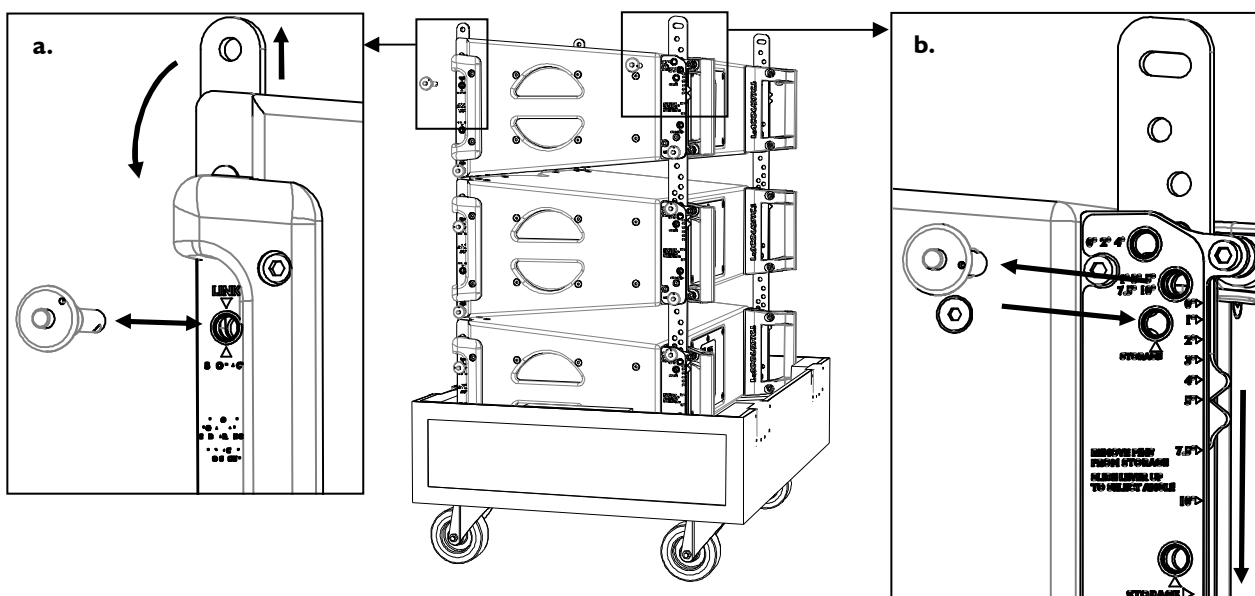


Figure 22: Setting ARRAY#1 for transport

#### 16. Set the M-BUMP for transport as follows:

- Re-insert the 4 R-BLP in their storage locations.
- 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.

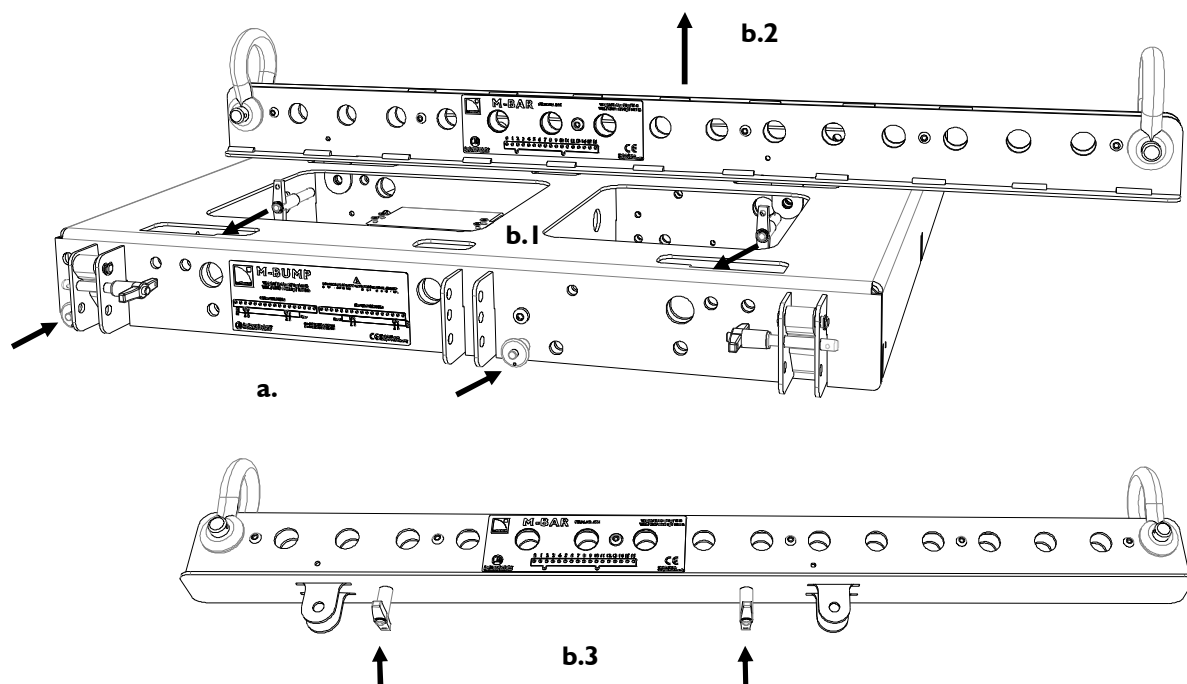


Figure 23: Single M-BAR storage example

## 6.2 Flying a KARA array under an SB18 array

### 6.2.1 Modeling and safety

Any system must be modeled before installation so as to ensure acoustical conformity and mechanical safety. 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 array site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.



M-BUMP can nominally fly an array of up to 4 SB18 and 12 KARA enclosures along with all loudspeakers cables. However, this maximum number can decrease in line with array curvature and acoustic coupling conditions depending on the selected operation mode (see the **KARA and SB18 User manuals** [3.4]).

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, 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 6-KARA array under a 2-SB18 array using a second M-BUMP. In the procedure two 3-KARA arrays, called ARRAY#1 and ARRAY#2 in the order of appearance, will be successively added.

The second procedure describes how to disassemble the array. Both procedures will remain the same for larger arrays.

### 6.2.2 Array mounting



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



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. Fly an SB18 vertical array to an M-BUMP by applying the corresponding procedure given in the **SB18 Rigging manual** [3.4].
2. Place a full flight-case at the rigging location and remove the cover. 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.

3. Check the inter-enclosure connections in ARRAY#1 (repeat for each side):
  - a. For both front connecting 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 connecting 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°**.

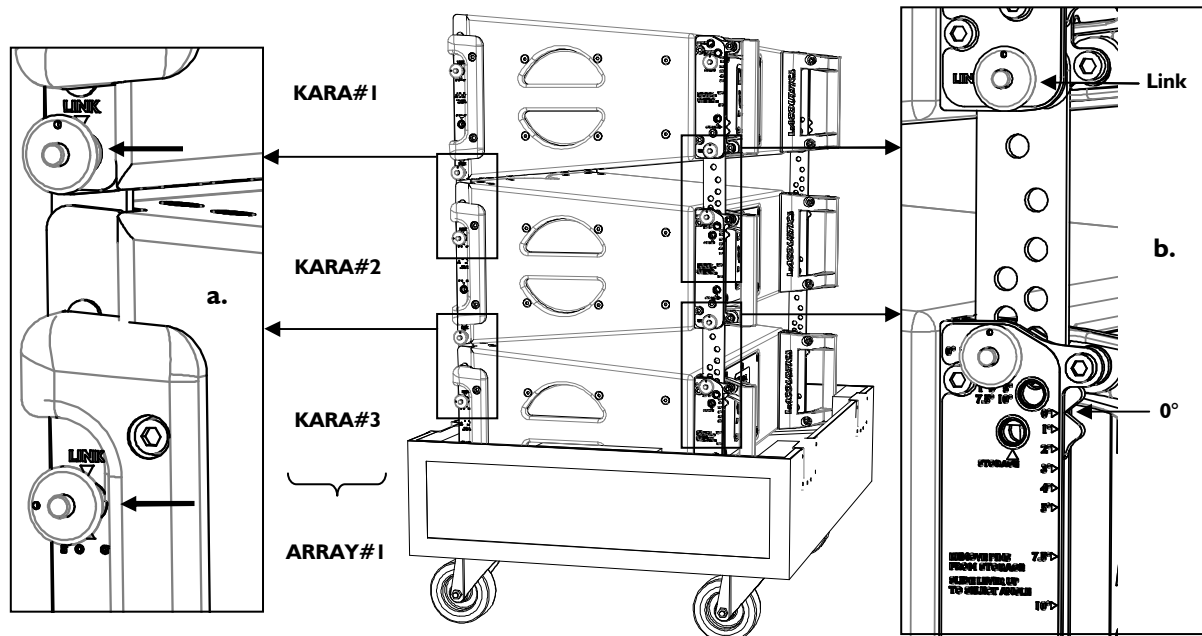



Figure 24: Inter-enclosure connection check for ARRAY#1

4. 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.

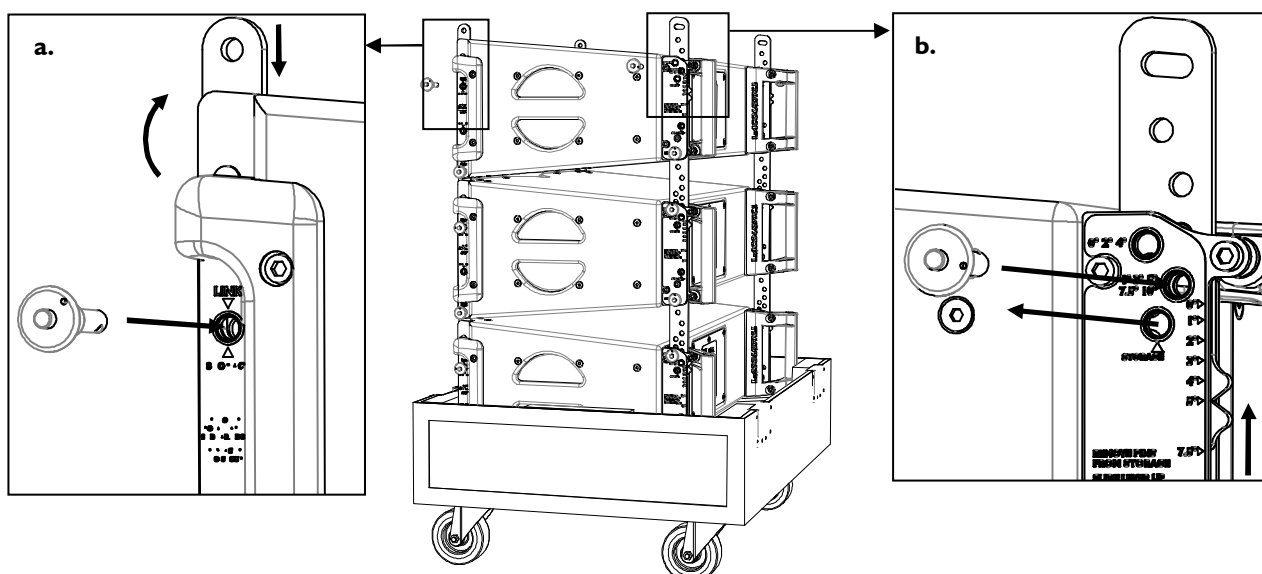
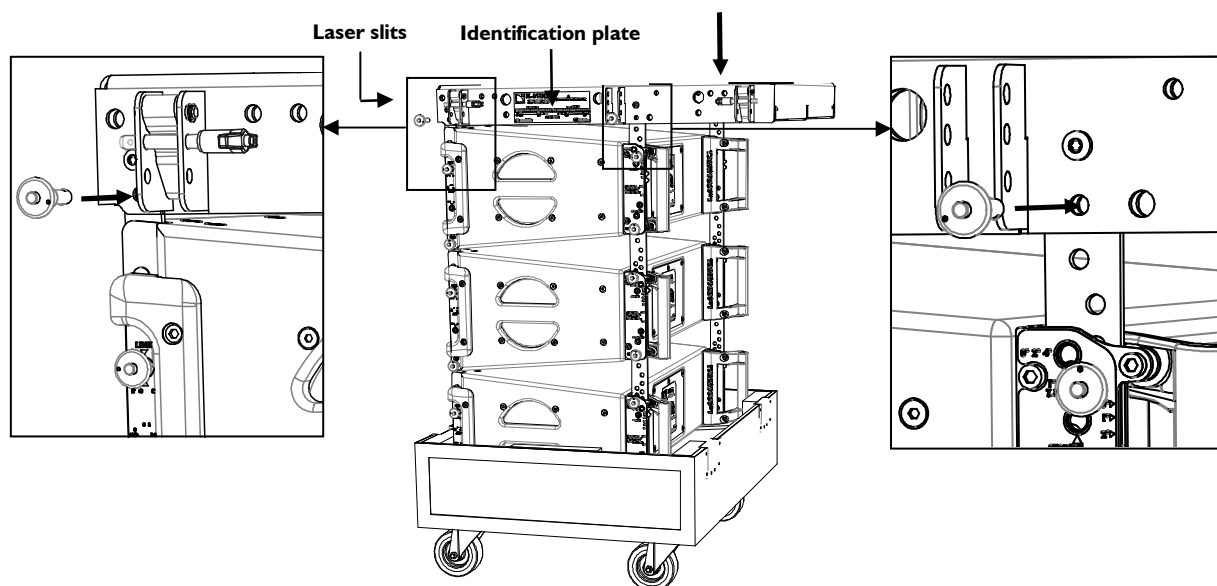


Figure 25: Setting the KARA#1 arms

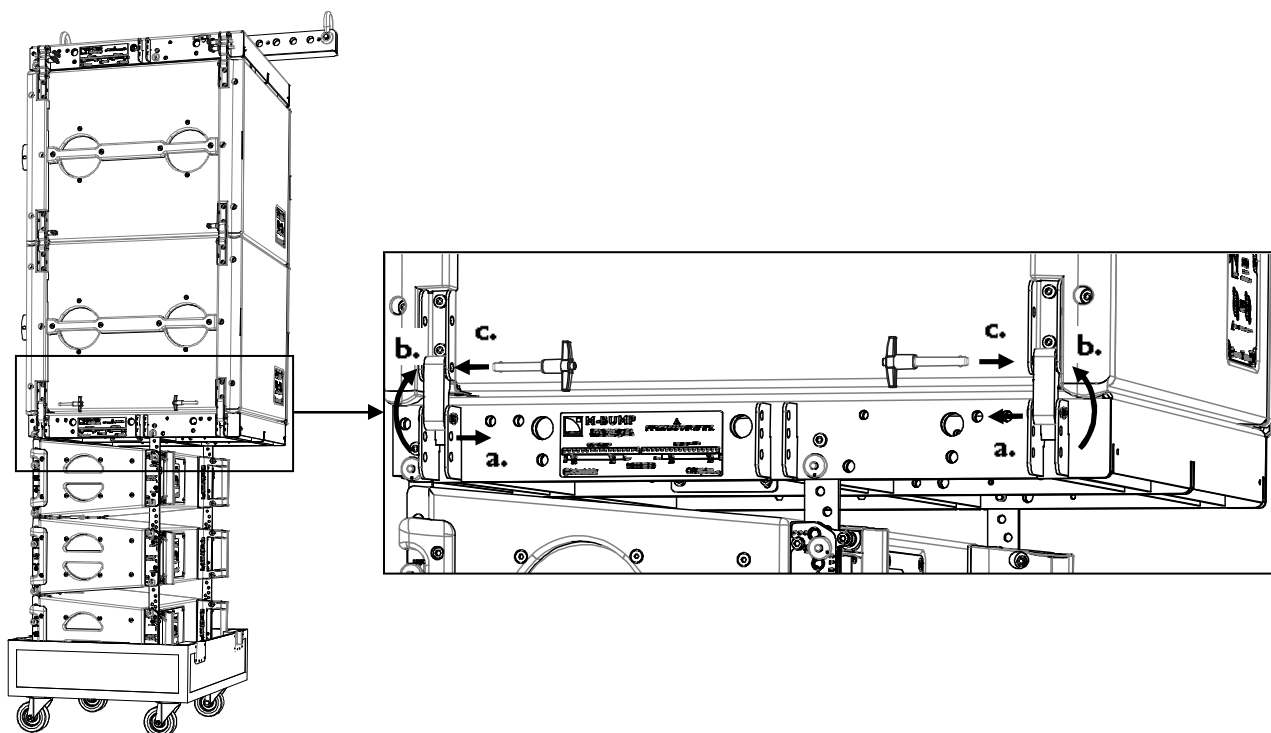
5. Place another M-BUMP at the rigging location and remove the 4 R-BLP. Put the M-BUMP on ARRAY#1 by aligning the four connecting points and secure by re-inserting the 4 R-BLP.

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



**Figure 26: Connecting M-BUMP to ARRAY#1**

6. 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 connecting points with those of ARRAY#1. The bottom SB18 and the M-BUMP must be in contact.
7. Attach the 4 connecting points between SB18 and 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 bottom SB18 by re-inserting the T-BLP.



**Figure 27: Attaching ARRAY#1 to the SB18 array**

8. Raise ARRAY#1 to a reachable height 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 storage R-BLP of 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 for KARA#3.

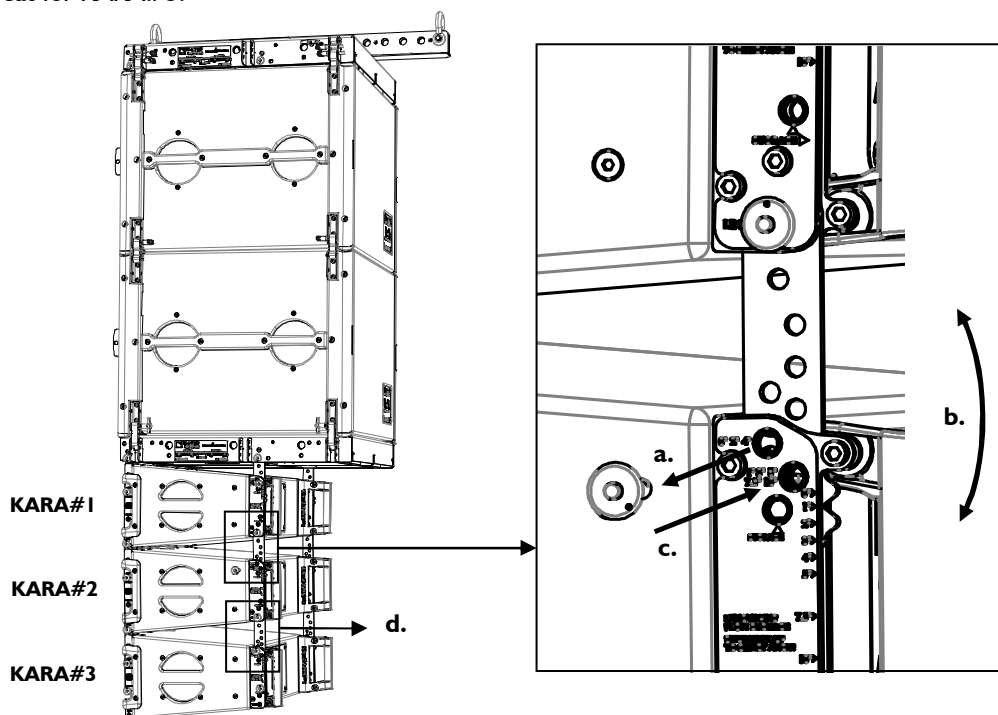


Figure 28: ARRAY#1 inter-enclosure angle setting

10. Place another full flight-case at the rigging location and remove the cover. 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 attachment in ARRAY#2 by applying step 3.

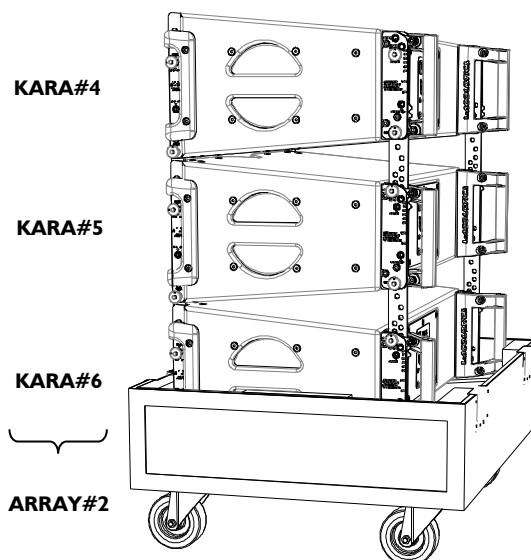
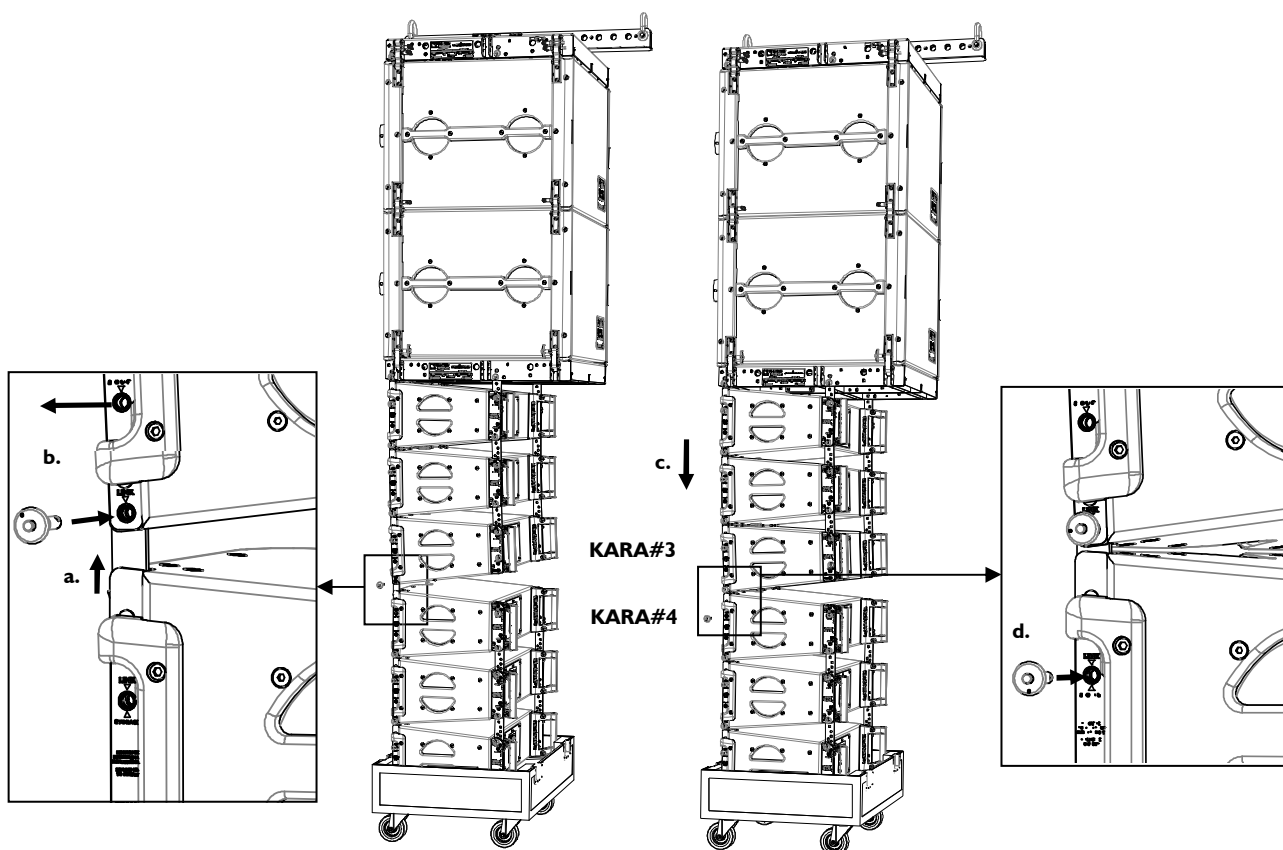


Figure 29: Inter-enclosure connection check for ARRAY#2



12. On KARA#4, take both **front** arms out as follows (repeat for each one): remove the front top storage 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. Attach both **front** connecting points between ARRAY#1 and ARRAY#2 as follows:
  - a. Slide both KARA#4 front arms up so as to align them with the KARA#3 bottom front connecting points.
  - b. Remove both front bottom R-BLP from KARA#3 storage holes and secure by re-inserting them into the bottom **yellow link holes**.
  - c. Take the array down until KARA#3 and KARA#4 front corners are in contact (the front arms must remain vertical).
  - d. Secure the front arms on KARA#4 by re-inserting both front top R-BLP into the top **yellow link holes**.



**Figure 30: Connecting ARRAY#2 and ARRAY#1 front connecting points**

15. Raise the array to a reachable height and remove the flight-case from the rigging location.

16. With 2 people working simultaneously on each side of the array, attach both **rear** connecting points between ARRAY#1 and ARRAY#2 as follows:
- Remove the rear top R-BLP from KARA#4, 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°**).
  - While grabbing the back handle of KARA#6, rotate ARRAY#2 so as to align the KARA#3 and KARA#4 rear connecting points.
  - Remove the rear bottom R-BLP from KARA#3 and secure by re-inserting it into the **yellow link hole**.

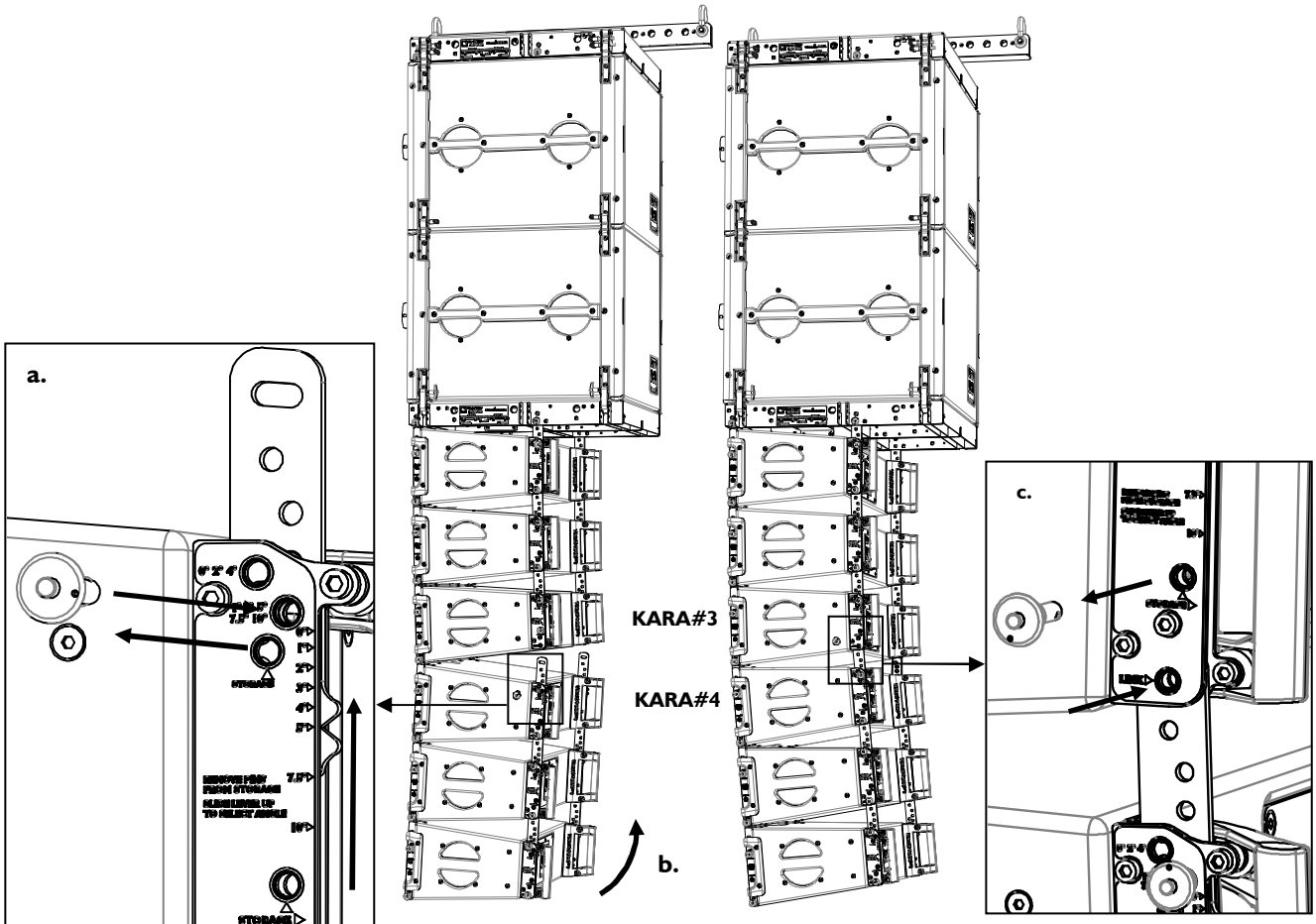


Figure 31: Connecting ARRAY#2 and ARRAY#1 rear connecting points

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

18. **(Optional, for pullback configuration)** Attach a KARA-PULLBACK accessory to KARA#6 as follows: insert the KARA-PULLBACK studs into the KARA#6 connecting points (long studs at the back), remove the 4 bottom R-BLP from KARA#6 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.

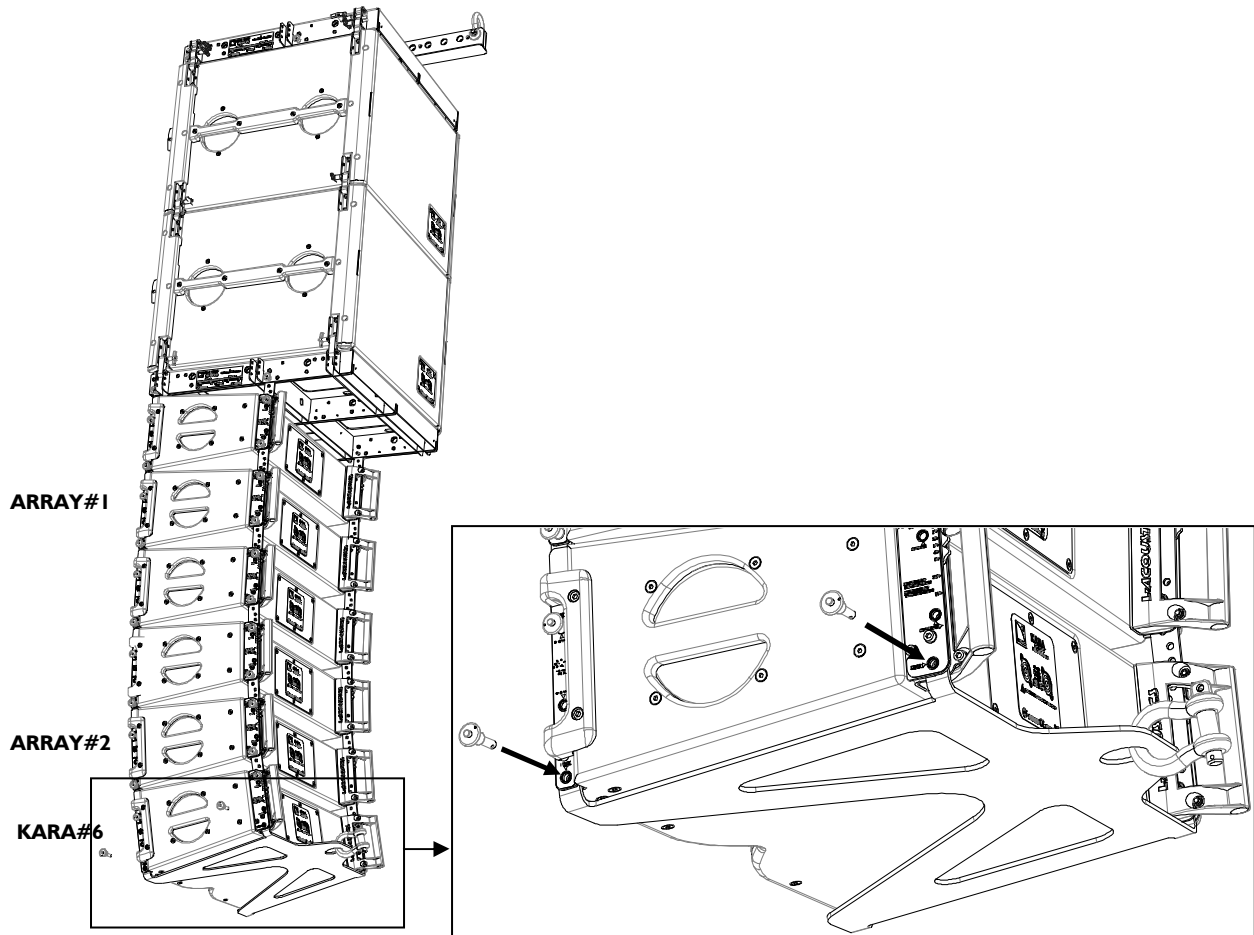


Figure 32: KARA-PULLBACK installation

19. Raise the array to the desired height and adjust the site angle [9.2.2].
20. Attach two safety slings (not provided) to the M-BUMP and the main rigging structure. Refer to [1.2, point 11].

#### 6.2.3 Array removal



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



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 main rigging structure.
2. Lower ARRAY#2 to a comfortable height.
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 KARA#6, 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 for KARA#6.

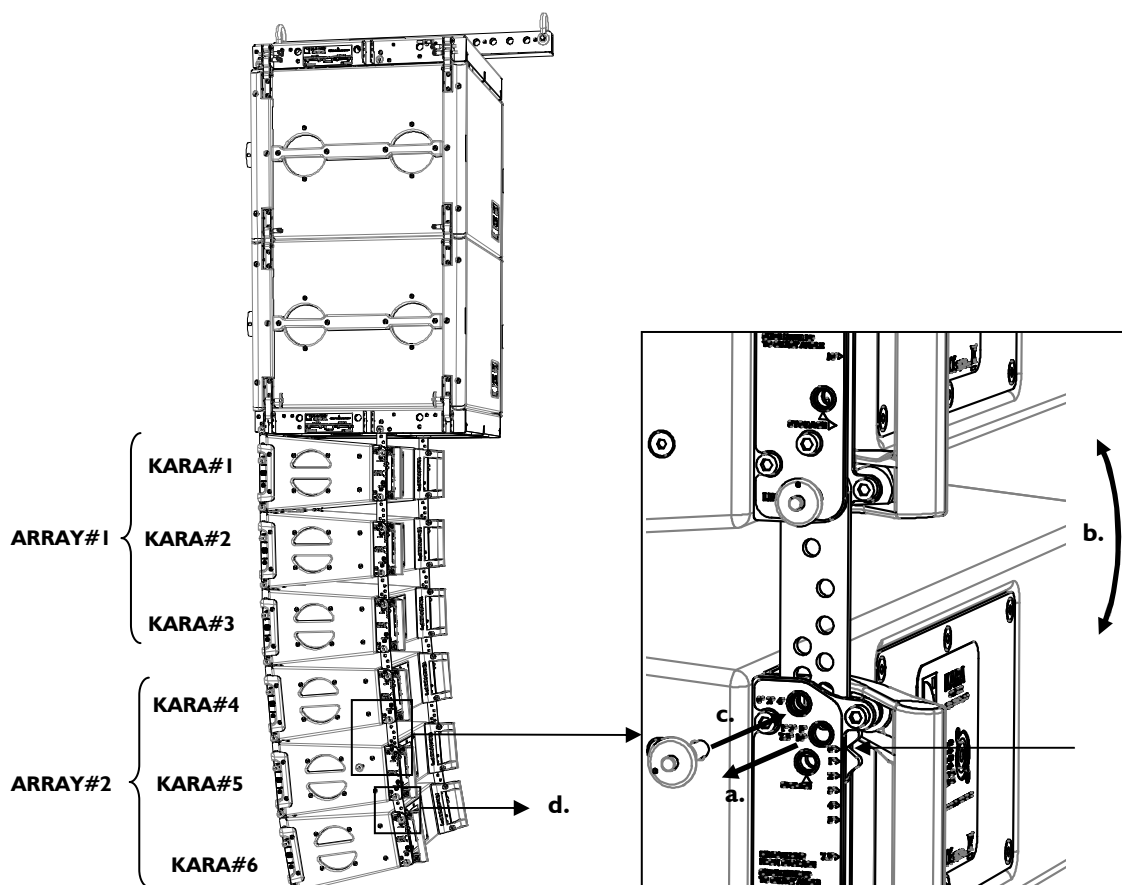


Figure 33: ARRAY#2 inter-enclosure angle setting

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



Pay attention to the tray position: both inner slopes must be inclined 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** connecting 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 connecting 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.

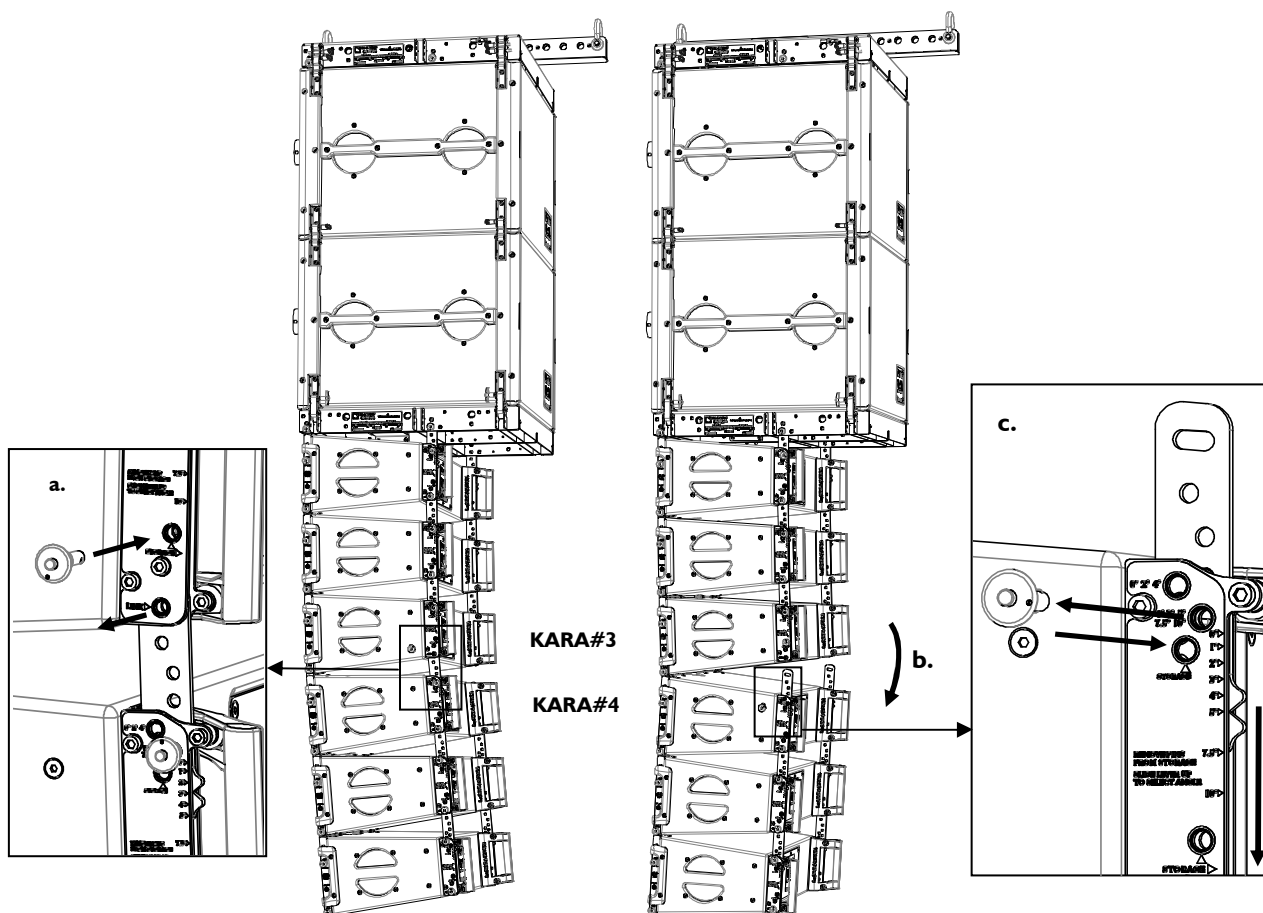
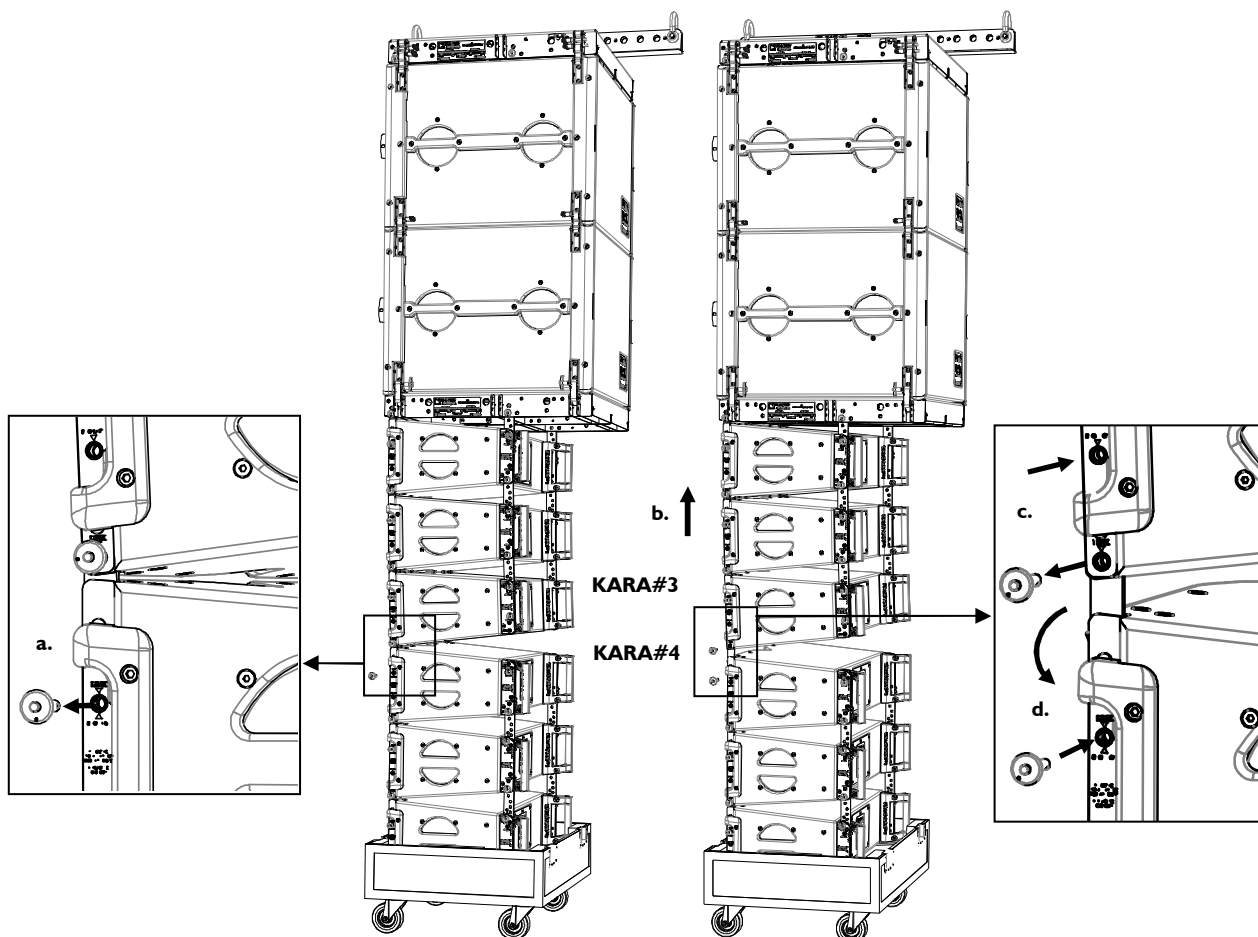


Figure 34: ARRAY#2 to ARRAY#1 rear connecting point detachment

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

9. Remove the **front** connecting 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 35: ARRAY#2 to ARRAY#1 front connecting points removal**

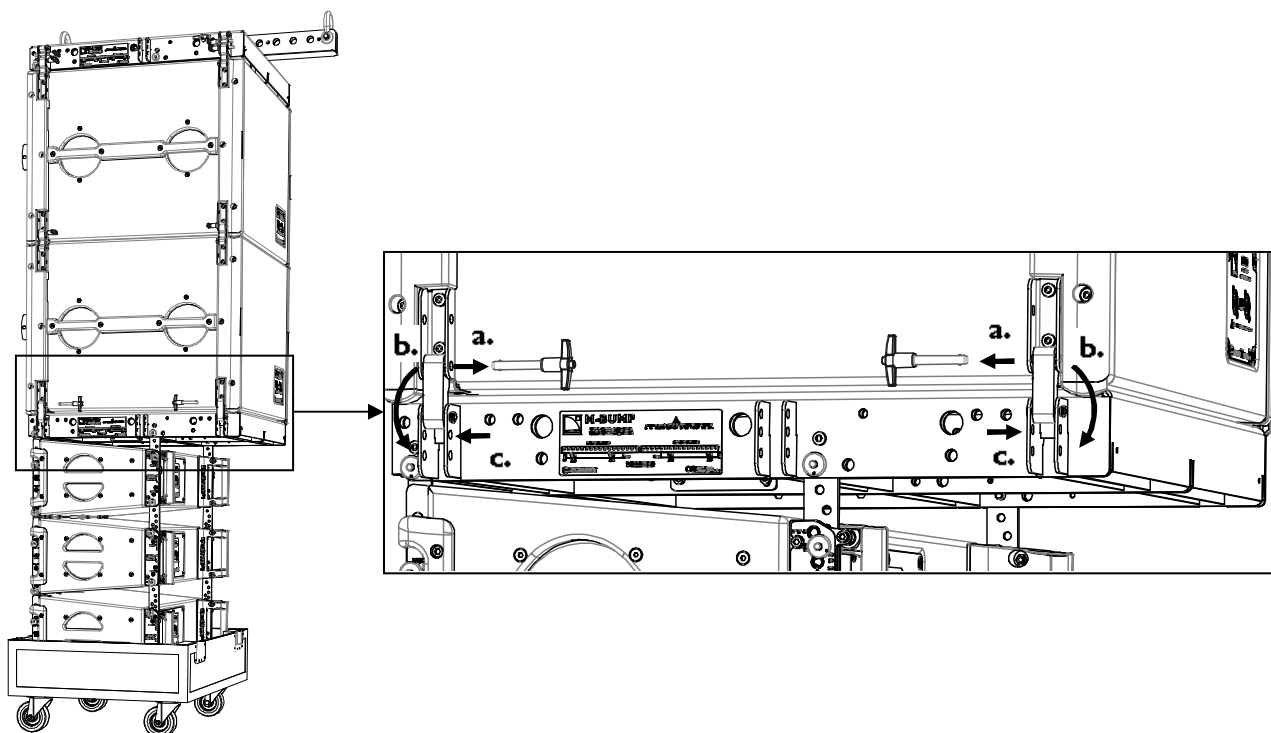
10. Push ARRAY#2 away from the rigging location and put the flight-case cover on.
11. Lower ARRAY#1 to a comfortable height and set the angles to 0° by applying step 4.
12. Place another empty flight-case at the rigging location, remove the cover, and place the tray beneath ARRAY#1.



Pay attention to the tray position: both inner slopes must be inclined upwards from front to rear [5.5].

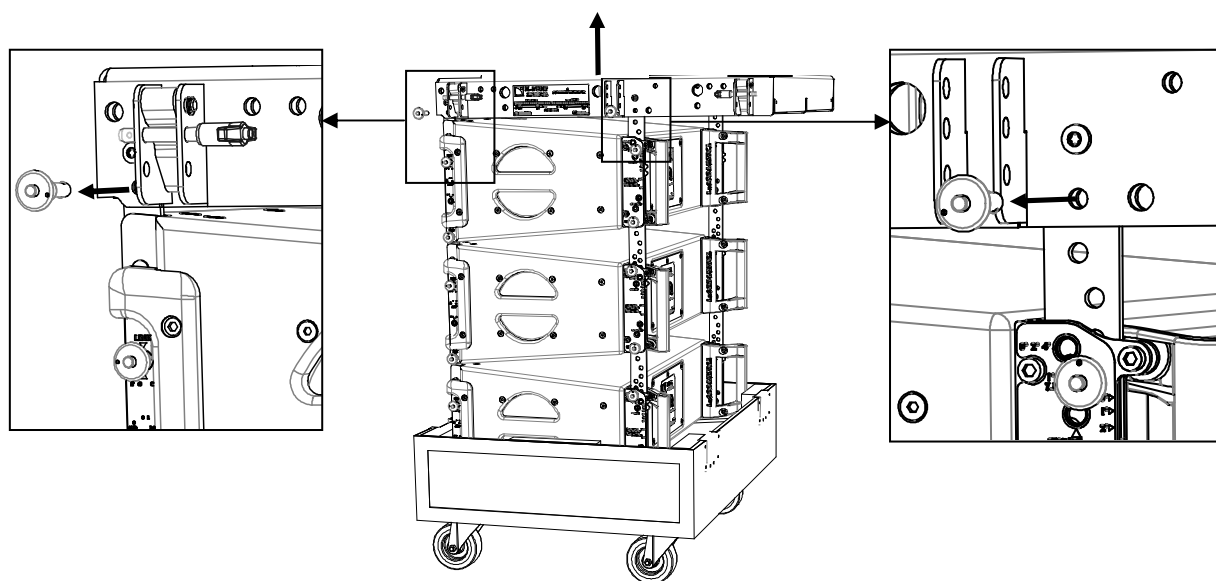
13. Lower ARRAY#1 into the tray. The bottom SB18 must be resting on the M-BUMP.

14. Disconnect the 4 connecting 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 36: Separating ARRAY#1 from the SB18 array**

15. Push ARRAY#1 away from the rigging location.
16. Remove the 4 R-BLP from the M-BUMP and remove the M-BUMP from ARRAY#1.



**Figure 37: M-BUMP removal**

#### 17. Set ARRAY#1 for transport as follows:

- 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.
- 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.
- Put the flight-case cover on.

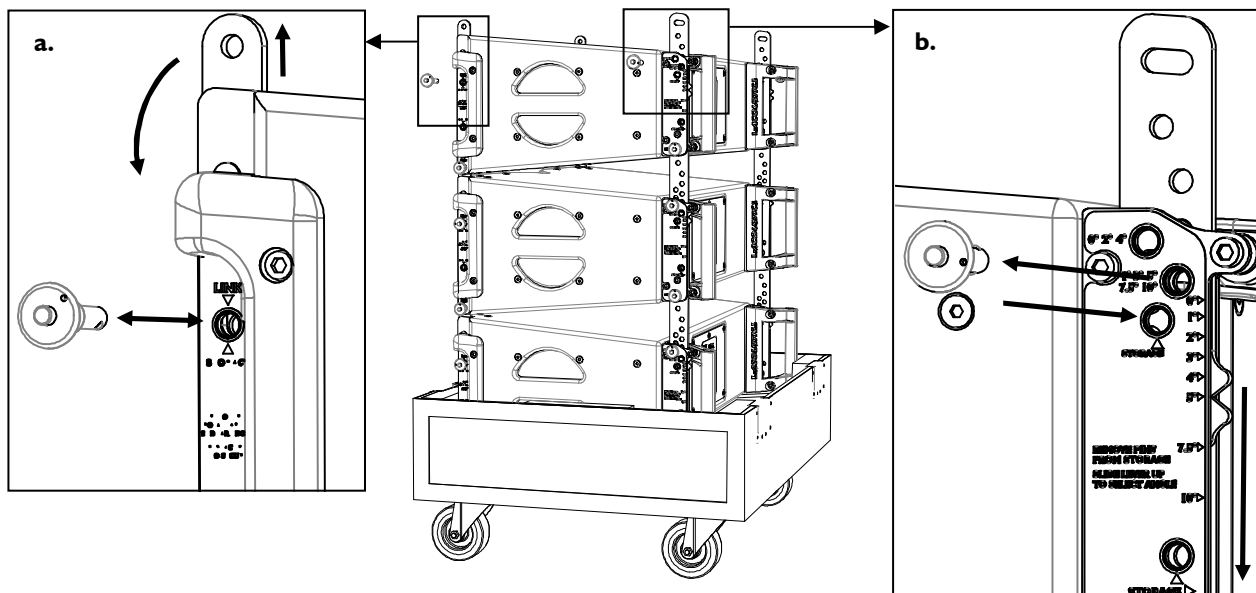


Figure 38: Setting ARRAY#1 for transport

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

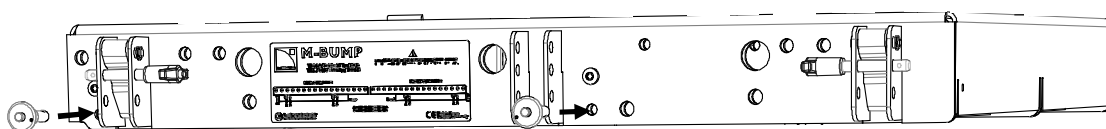


Figure 39: Setting the M-BUMP for transport

#### 19. Disassemble the SB18 array by applying the corresponding procedure given in the **SB18 Rigging manual** [3.4].




## 6.3 Stacking a standalone KARA array

### 6.3.1 Modeling and safety

A KARA array can be stacked onto an M-BUMP/M-JACK platform (**platform stacked array**). The platform provides horizontal basis in case of ground level variations and increases the array stability.



Any **platform stacked** array must be modeled before installation so as to ensure acoustical conformity and mechanical safety. 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.
- Check the mechanical conformity of the system.

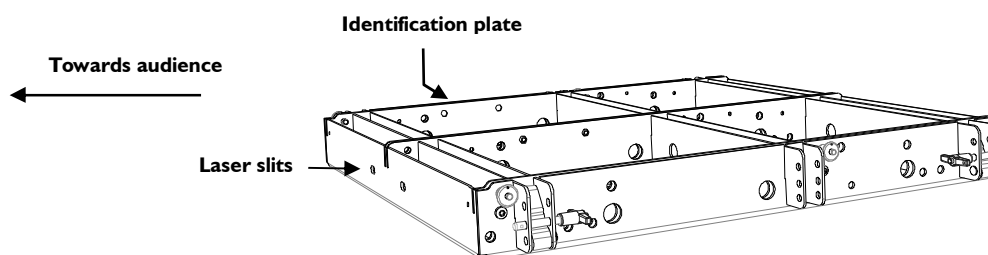
	<p>A <b>platform stacked</b> array can nominally support up to 9 KARA enclosures along with all loudspeakers cables (see the <b>KARA User manual</b> [3.4]).</p> <p>The M-BAR should be installed in rear or front overhang configuration whether the stacked array site angle is intended to be positive or negative, respectively (refer to [9.3])</p> <p>ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (<b>Mechanical Data</b> section) to verify the mechanical conformity of the system before installation.</p>
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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 stack a vertical 3-KARA array onto an M-BUMP/M-JACK platform. The second procedure describes how to disassemble the array. Both procedures will remain the same for larger arrays.

### 6.3.2 Array mounting

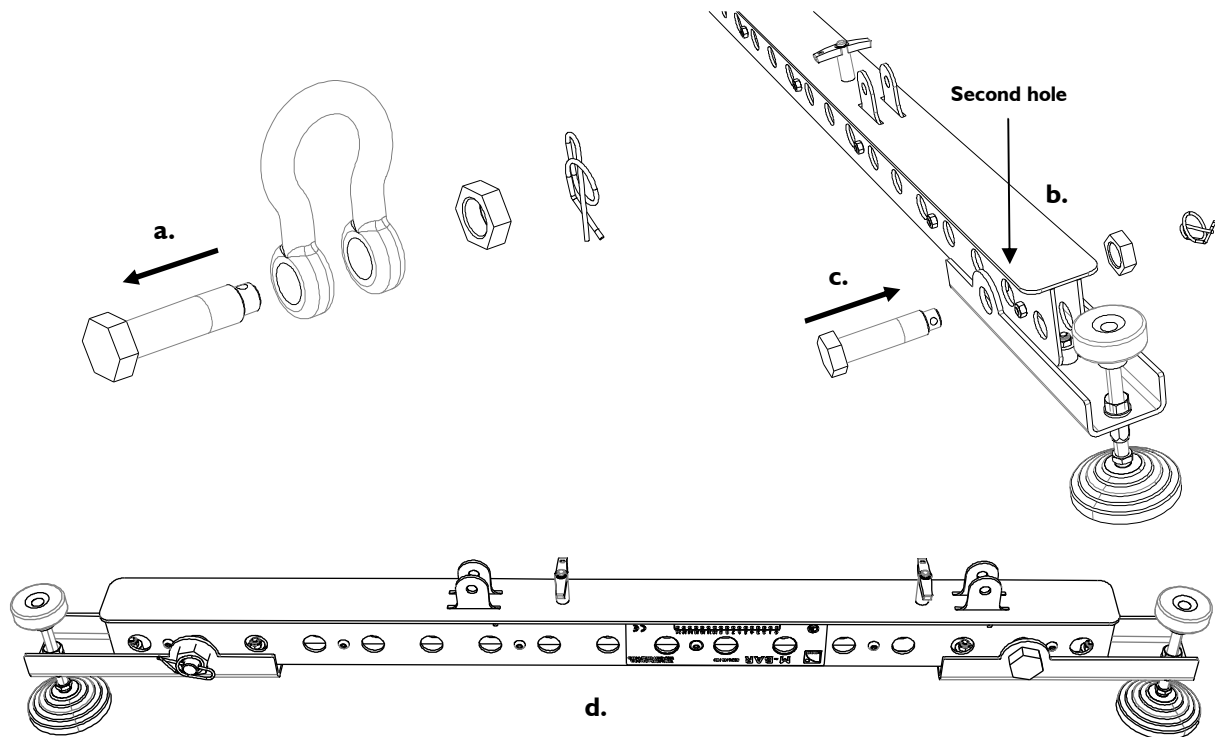
	<p>All along the procedure:</p> <p>STRICTLY follow the sequence of the successive steps.</p> <p>SYSTEMATICALLY ensure that each BLP is fully inserted.</p> <p>SYSTEMATICALLY ensure that each bolt is fully screwed in and secured with pin.</p>
	<p>For clarity purposes the loudspeaker cabling procedure will not be described.</p> <p>The loudspeaker cables will not be represented on the figures.</p> <p>Only the Rear overhang configuration will be shown.</p>

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



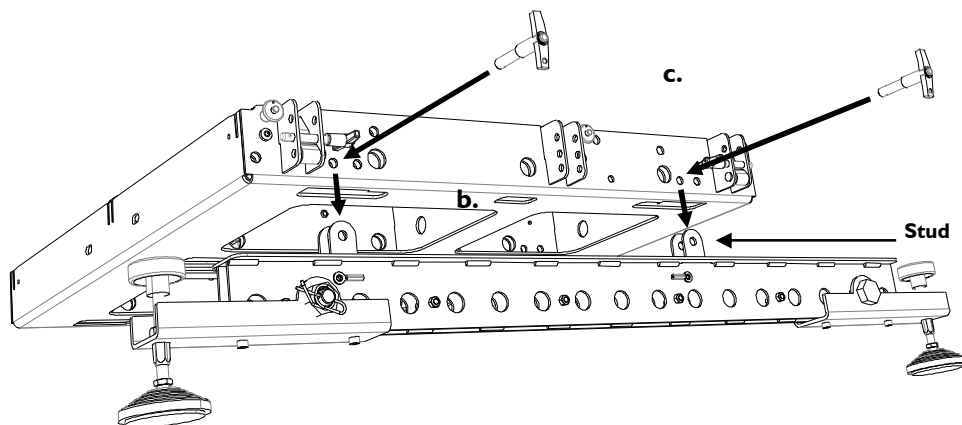
**Figure 40: Installing M-BUMP**

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



**Figure 41: Preparing an M-BAR/M-JACK assembly**

3. According to the desired configuration [9.3], install both M-BAR/M-JACK assemblies beneath the M-BUMP 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 the slits into both M-BAR studs.
  - c. Secure by inserting both preceding T-BLP.



**Figure 42: Mounting the M-BAR/M-JACK assembly (rear offset example)**

4. Put the stacking platform in horizontal position by setting the height of the 4 M-JACK as follows:
  - a. Unscrew the top nut (16 mm hex key) on each M-JACK.
  - b. Based on the data given by an inclinometer device [9.1], rotate the 4 knobs so as to reach the horizontal position. **Note 1:** Also use a hand-held level to ensure that both side heights are identical. **Note 2:** The user can also use the base nut (14 mm hex key) in place of the knob in case of high resistance.
  - c. Secure each M-JACK base by screwing the top nut (16 mm hex key).

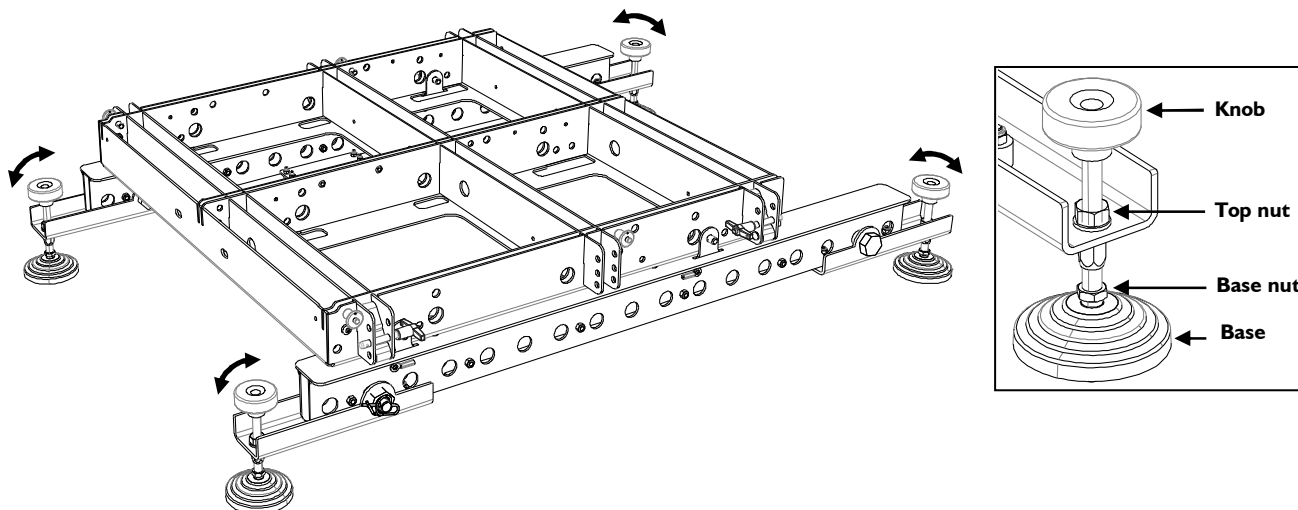


Figure 43: Horizontal adjustment

5. (Optional [9.3]) Mount both angle arm extensions 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 angle arm extension into the M-BUMP by putting it vertically with sling ring pointing towards the front and indentation on the spacer.
  - c. Align the angle arm extension and M-BUMP holes. Insert the R-BLP.

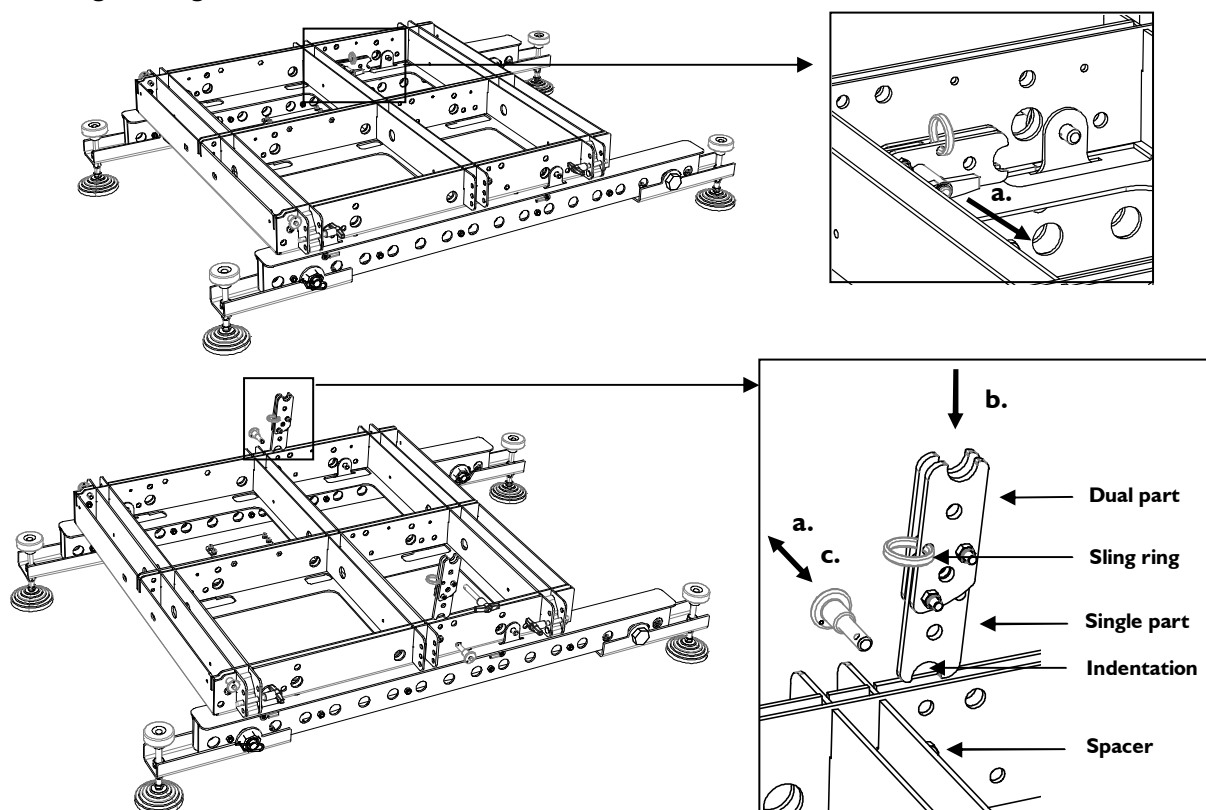


Figure 44: Angle arm extensions installation

6. Remove both front R-BLP from the M-BUMP. If the M-BUMP has been configured **without** angle arm extensions, also remove both rear R-BLP.
7. Place a full flight-case at the stacking location and remove the cover. 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 storage position, 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 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 ( $0^{\circ}/2^{\circ}/4^{\circ}$  or  $1^{\circ}/3^{\circ}/5^{\circ}/7.5^{\circ}/10^{\circ}$ ). Refer to [9.3] for equivalent angle positions.
  - c. Remove the front and rear bottom link R-BLP and re-insert them into the bottom **storage** holes.

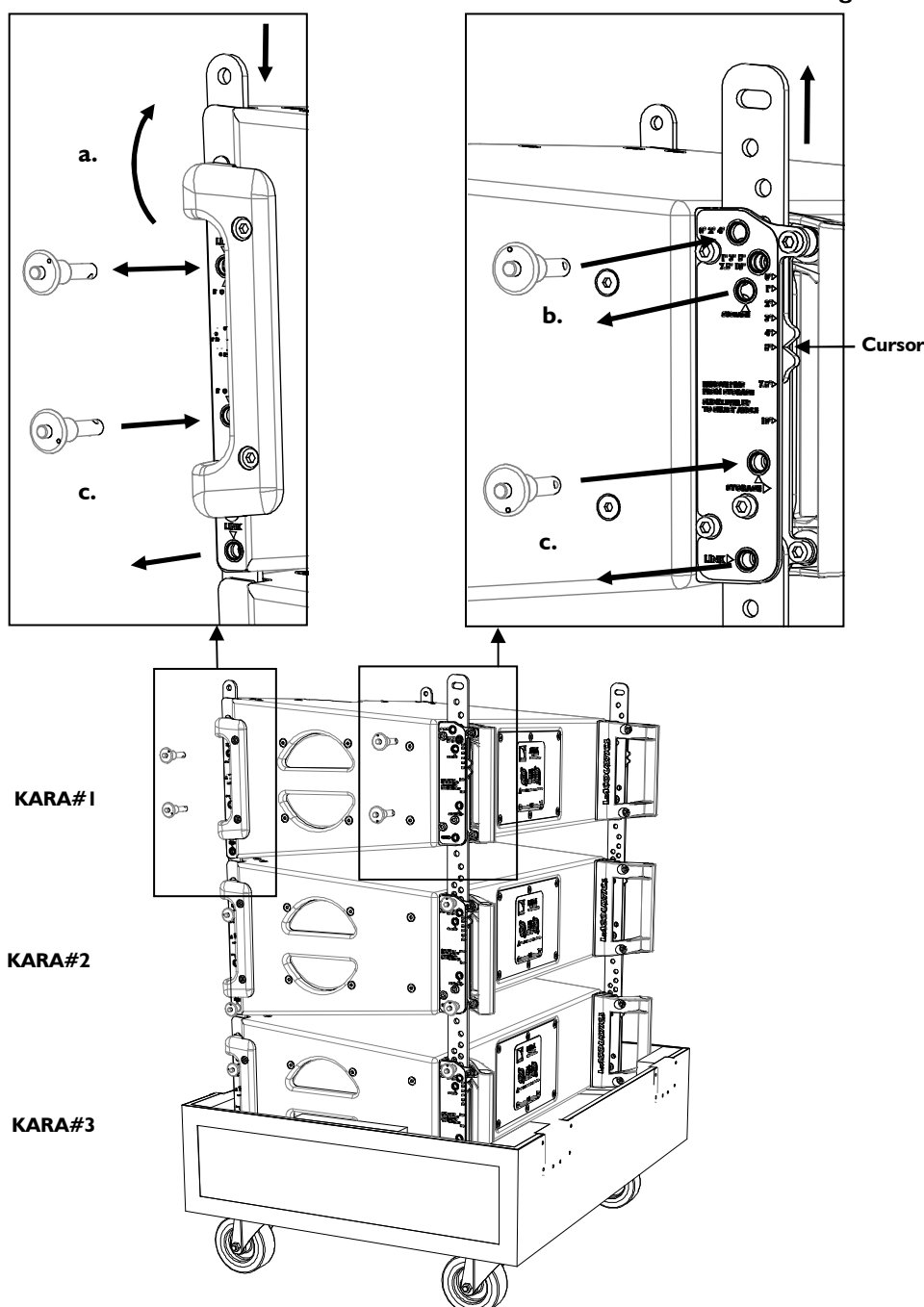


Figure 45: Setting KARA#1 in stacking configuration

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

- a. Lift up and turn KARA#1 arms downwards and front face towards the audience.
- b. Insert the 4 arms into the M-BUMP connecting points. If the M-BUMP has been configured **with** angle arm extensions, the rear connecting points become those of the angle arm extensions.
- c. Secure both front connecting points by inserting the R-BLP on M-BUMP. Depending on the configuration, secure both rear connecting points by inserting either the R-BLP on M-BUMP or the T-BLP on the angle arm extensions.

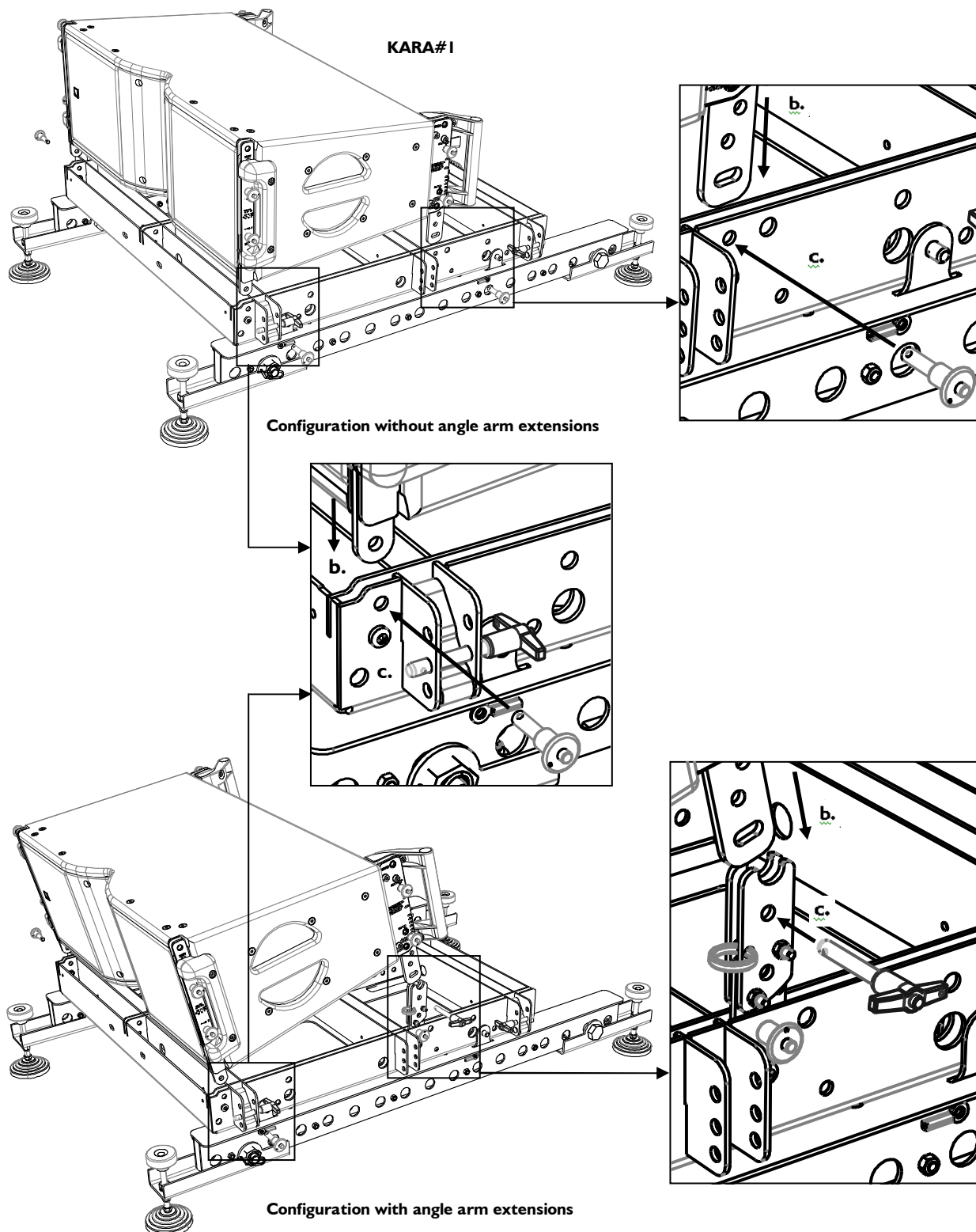
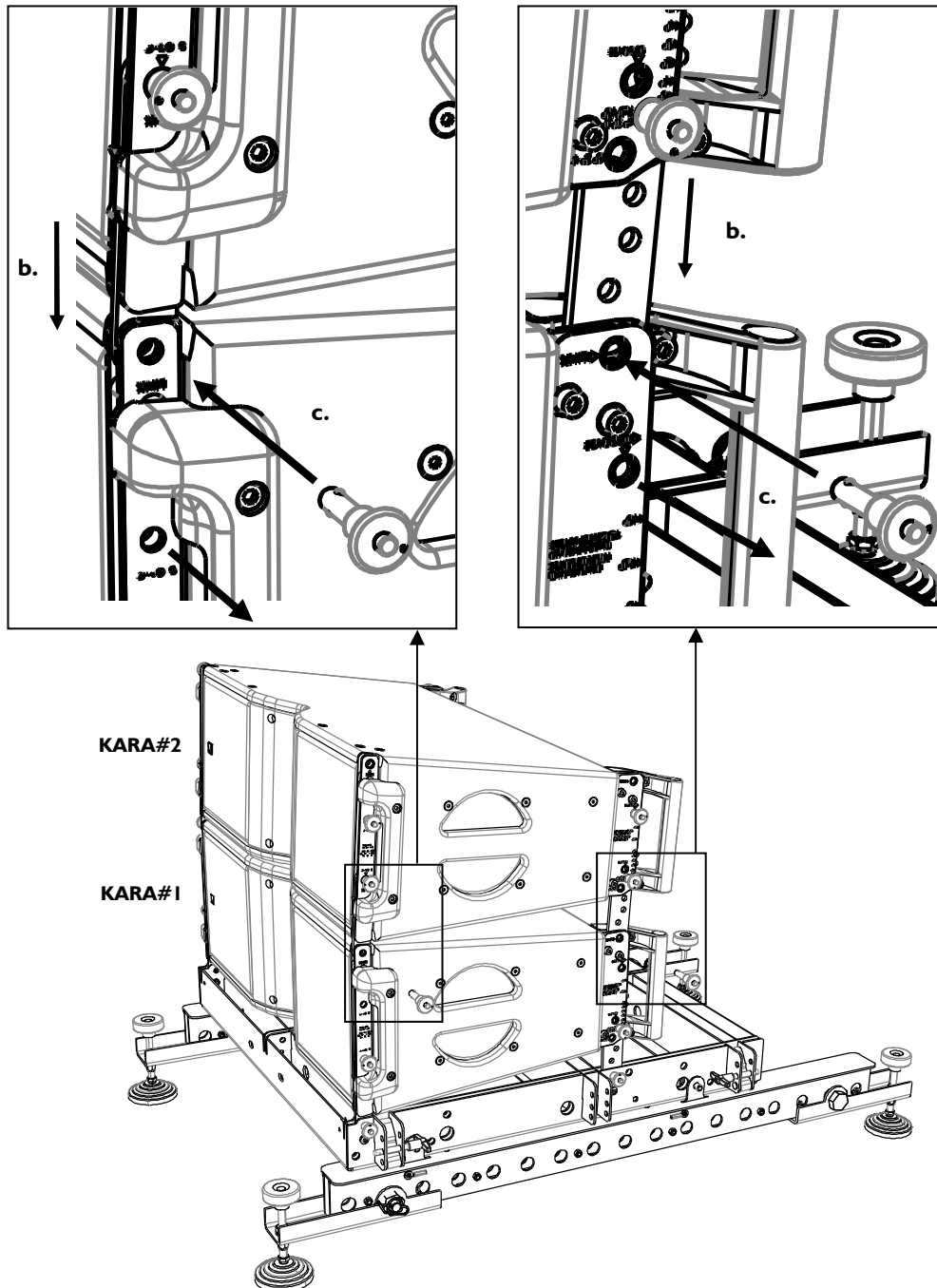


Figure 46: Connecting KARA#1 to M-BUMP


10. Set KARA#2 in rigging configuration by applying step 8.
11. Connect KARA#2 to KARA#1 as follows:
  - a. Put KARA#2 upside down with front face towards the audience.
  - b. Insert the four arms into the KARA#1 connecting points.
  - c. Remove the 4 top storage R-BLP from KARA#1 and secure by re-inserting them into the top **yellow link holes**.




**Figure 47: Connecting KARA#2 to KARA#1**

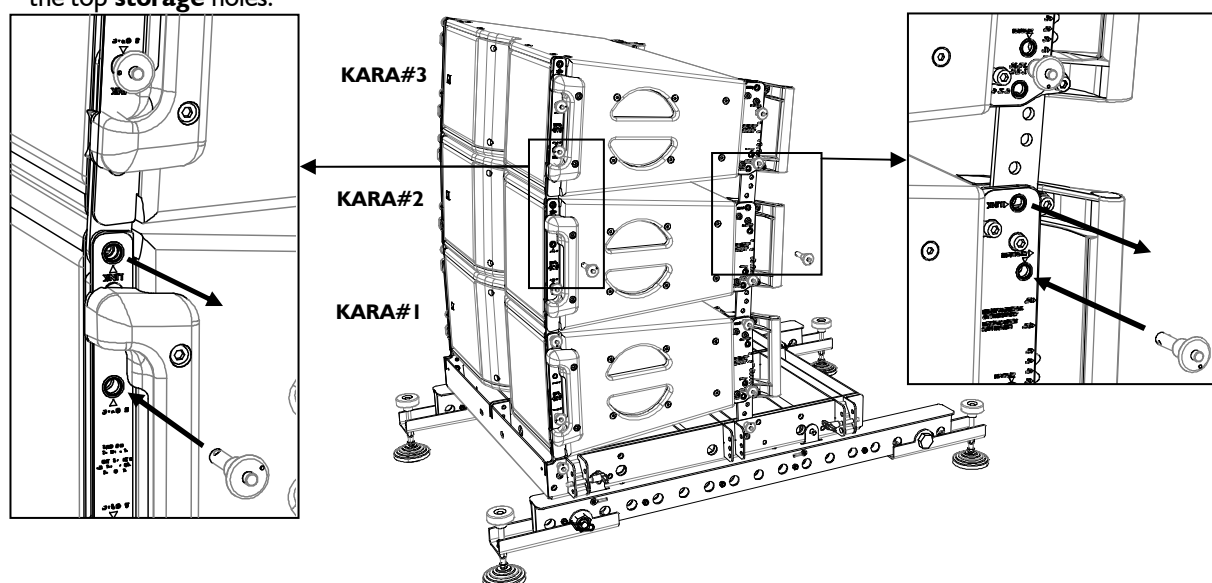
12. Connect KARA#3 to KARA#2 by applying steps 10 and 11 (do not remove the 4 bottom R-BLP from KARA#3).
13. Check if the stacking platform is still horizontal. If not, refer to step 4.

### 6.3.3 Array removal

 <b>WARNING</b>	<p>All along the procedure:  <b>STRICTLY</b> follow the sequence of the successive steps.  <b>SYSTEMATICALLY</b> ensure that each BLP is fully inserted.</p>
---	--


 <b>CAUTION</b>	<p>For clarity purposes the loudspeaker cables removal procedure will not be described.          The loudspeaker cables will not be represented on the figures.</p>
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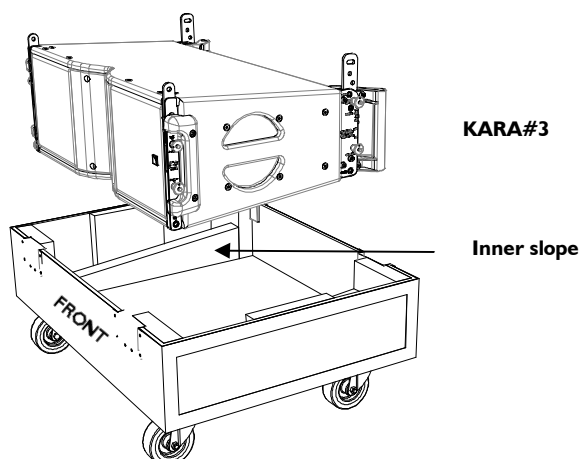
1. Place an empty flight-case at the stacking location and remove the cover.
2. Separate KARA#3 from KARA#2 as follows: remove the 4 top link R-BLP from KARA#2 and re-insert them into the top **storage** holes.



**Figure 48: Separating KARA#3 from KARA#2**

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

 <b>WARNING</b>	<p>Pay attention to the flight-case position: both inner slopes must be inclined upwards from front to rear.</p>
---	--



**Figure 49: Putting KARA#3 into the flight-case tray**

4. 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°.

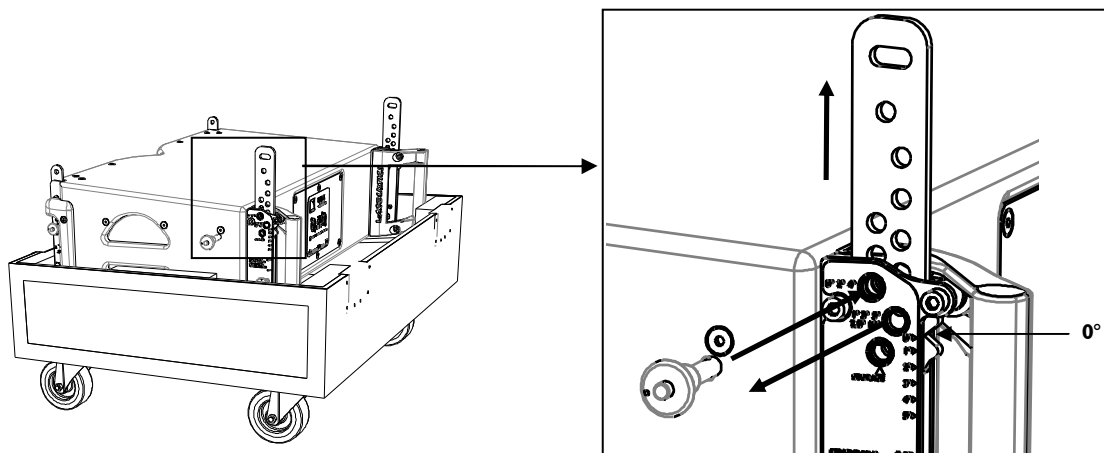


Figure 50: 0° angle setting

5. Separate KARA#2 from KARA#1 by applying step 2.
6. Lift up and turn KARA#2 arms upwards. Connect KARA#2 to KARA#3 (facing front) by aligning the 4 connecting points between both enclosures. Remove the 4 bottom storage R-BLP from KARA#2 and secure by re-inserting them into the bottom **yellow link holes**.

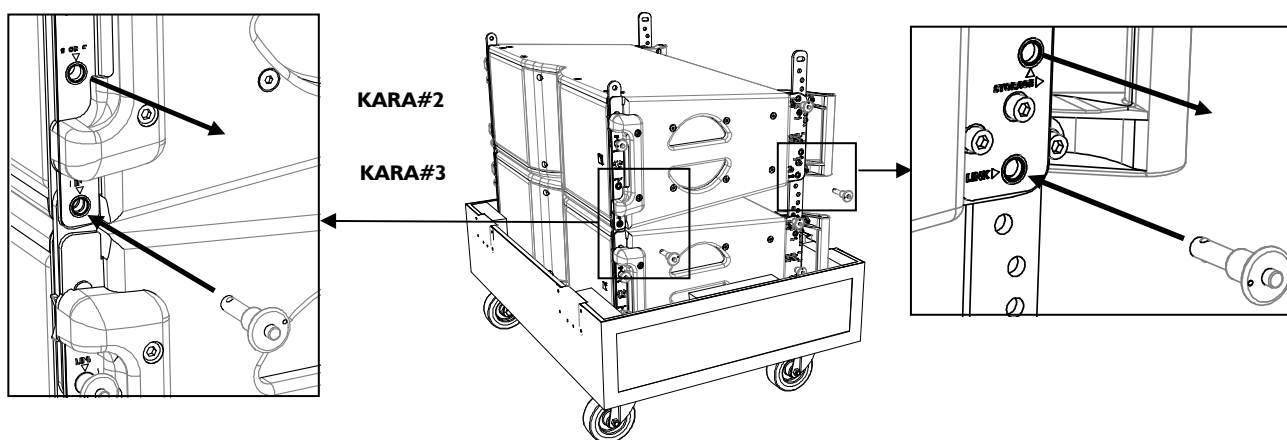
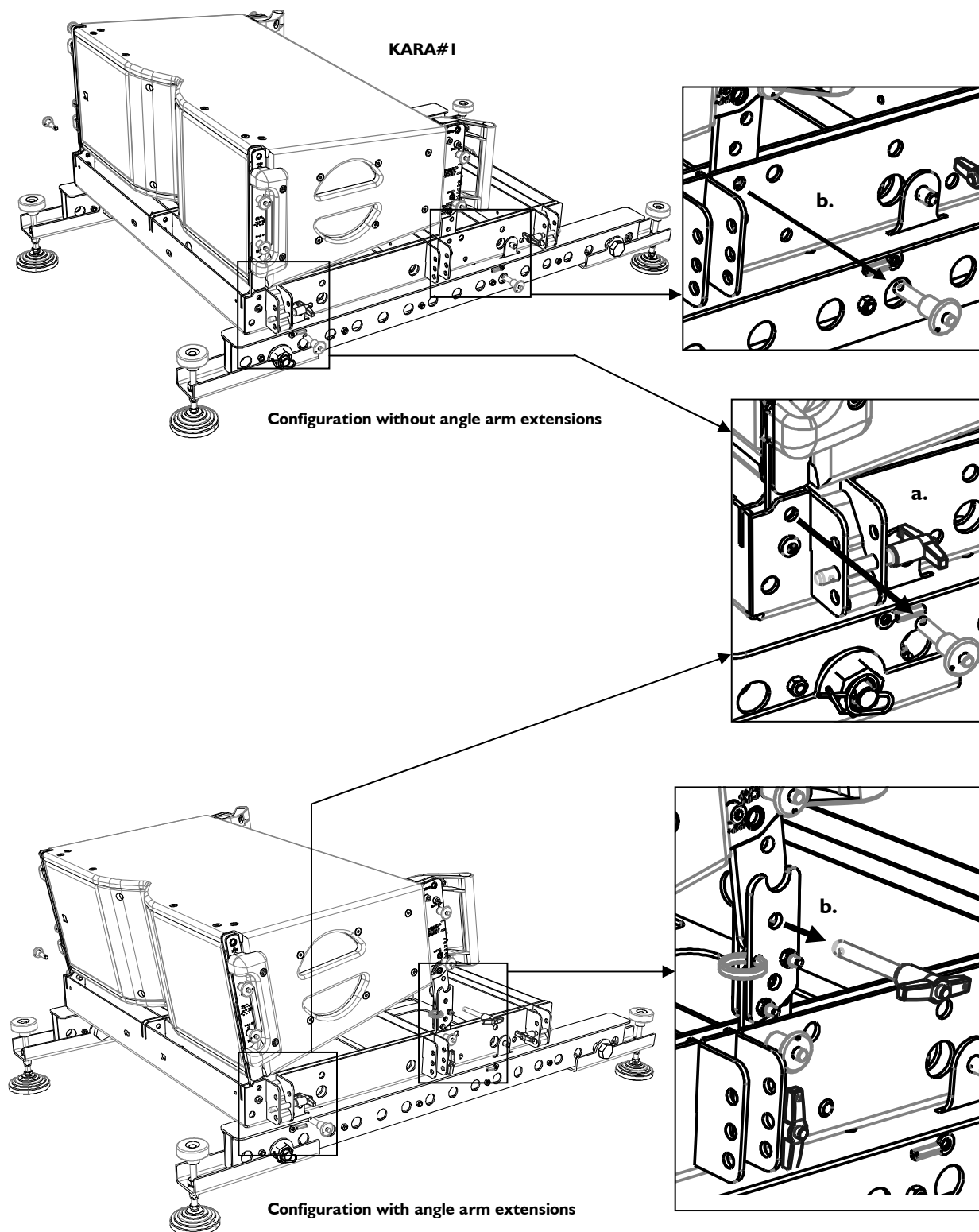


Figure 51: Connecting KARA#2 to KARA#3

7. Set the angles to 0° on KARA#2 by applying step 4.



8. Separate KARA#1 from the M-BUMP as follows:
  - a. Remove both front R-BLP from the M-BUMP.
  - b. Depending on the configuration, either remove both rear R-BLP from the M-BUMP or both T-BLP from the angle arm extensions.



**Figure 52: Separating KARA#1 from M-BUMP**

9. Attach KARA#1 to KARA#2 by applying step 6.

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

- 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.
- On both sides of 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 top R-BLP on the top **storage** hole.
- Put the flight-case cover back in place.

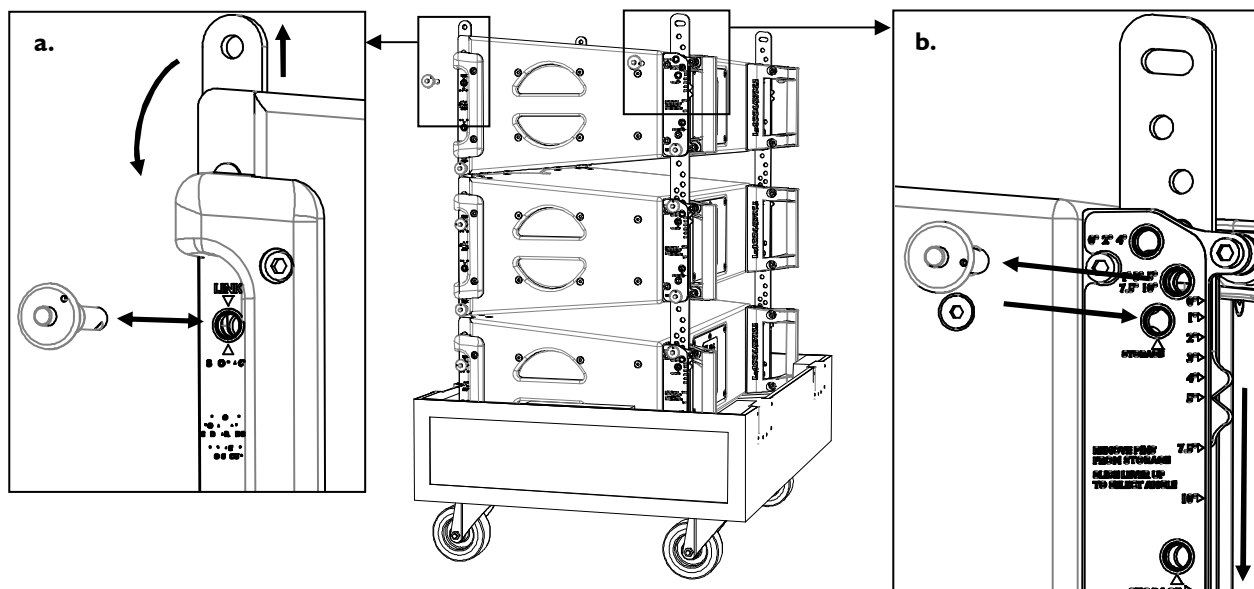


Figure 53: Setting the KARA#1-3 array for transport

#### 11. (Optional) On the M-BUMP, put both angle arm extensions in storage position as follows (repeat for each one):

- Remove the rear R-BLP, remove the angle arm extension, and re-insert the R-BLP into the M-BUMP's hole.
- Put the angle arm extension horizontally in its storage location and secure by inserting the T-BLP.

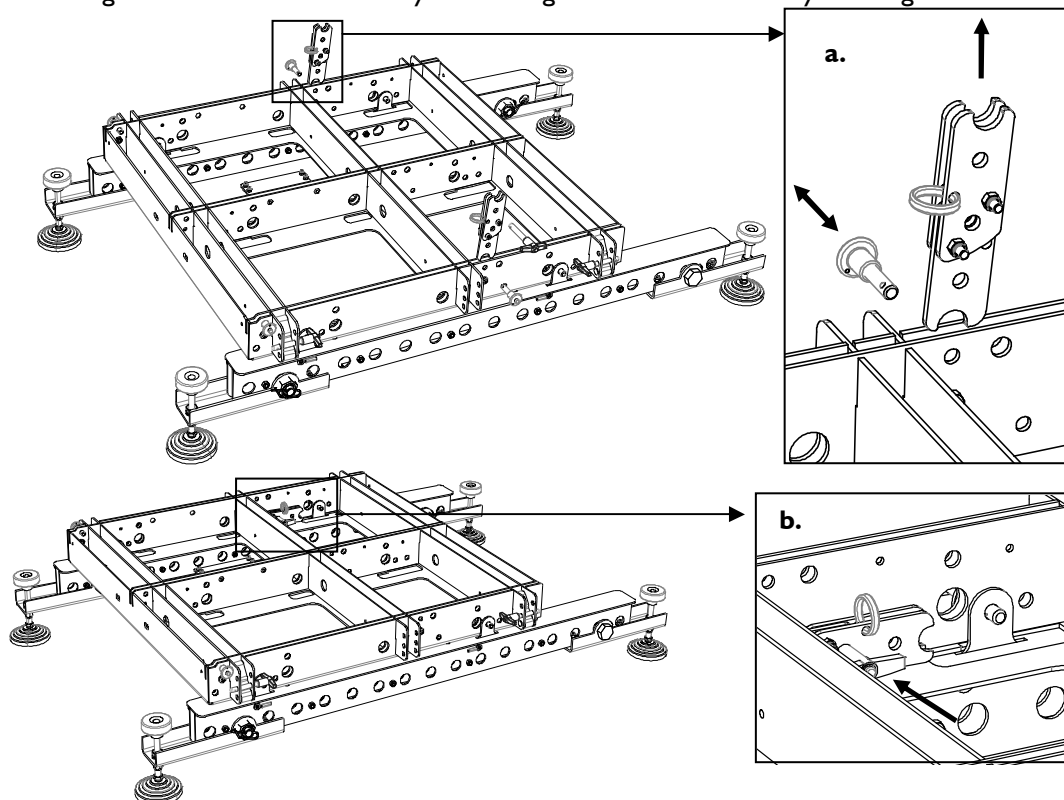
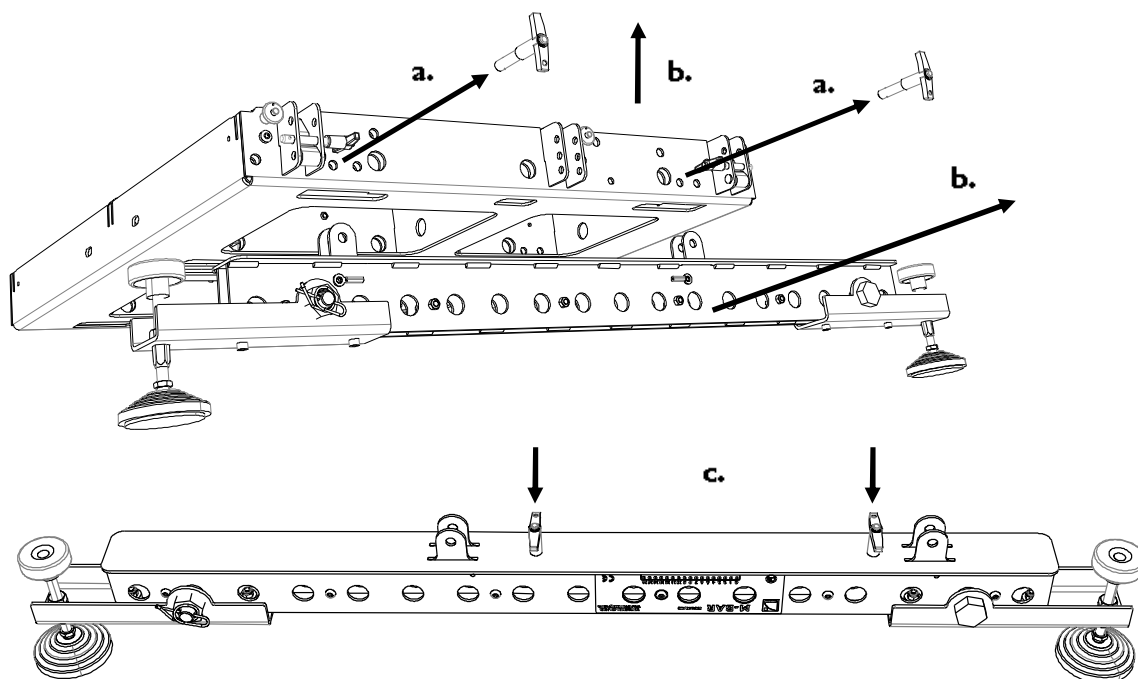


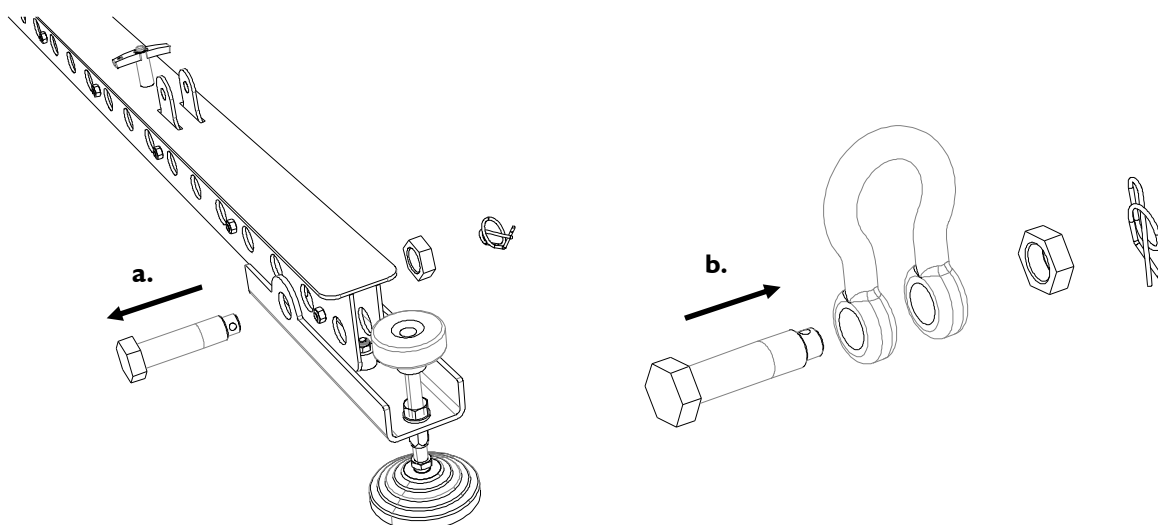
Figure 54: Putting the angle arm extensions in their storage positions

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



**Figure 55: Removing M-BAR/M-JACK assemblies**

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



**Figure 56: Removing M-JACK from M-BAR**

## 6.4 Stacking a KARA array onto an SB18 array

### 6.4.1 Modeling and safety

An SB18/KARA array can be stacked onto an M-BUMP/M-JACK platform (**platform stacked array**) or directly on the ground (**ground stacked array**). The platform provides horizontal basis in case of ground level variations and increases the array stability.

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

- Determine the number of required KARA and SB18 enclosures.
- Calculate the inter-enclosure angles.
- Check the mechanical conformity of the system.



A **platform stacked** array can be composed of a maximum of 2 SB18 and 6 KARA.

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.



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 and 9 KARA within the setup safety limits given in Table 2 regarding the angle between the top SB18 and the bottom KARA (refer to [9.3] to get acquainted on how to set the bottom KARA angle):

**Table 2: Ground stacked SB18/KARA array safe configurations**

Number of SB18	Number of KARA	Bottom KARA authorized angle range
1	1 - 3	From -15° to +5°
	4	From -11° to +5°
	5	From -10° to +5°
	6 - 8	From -7.5° to +5°
	9	From -5° to +5°
2	1 - 6	From -15° to +5°
	7	From -13° to +5°
	8	From -11° to +5°
	9	From -10° to +5°
3	1 - 8	From -15° to +5°
	9	From -13° to +5°
4	1 - 9	From -15° to +5°

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 stack a vertical 3-KARA array onto a **platform stacked** single SB18 (or simply put the SB18 on the ground in case of **ground stacked** configuration). The second procedure describes how to disassemble the array. Both procedures will remain the same for larger arrays (refer to the **SB18 Rigging manual** [3.4] to mount an SB18 array).

## 6.4.2 Array mounting

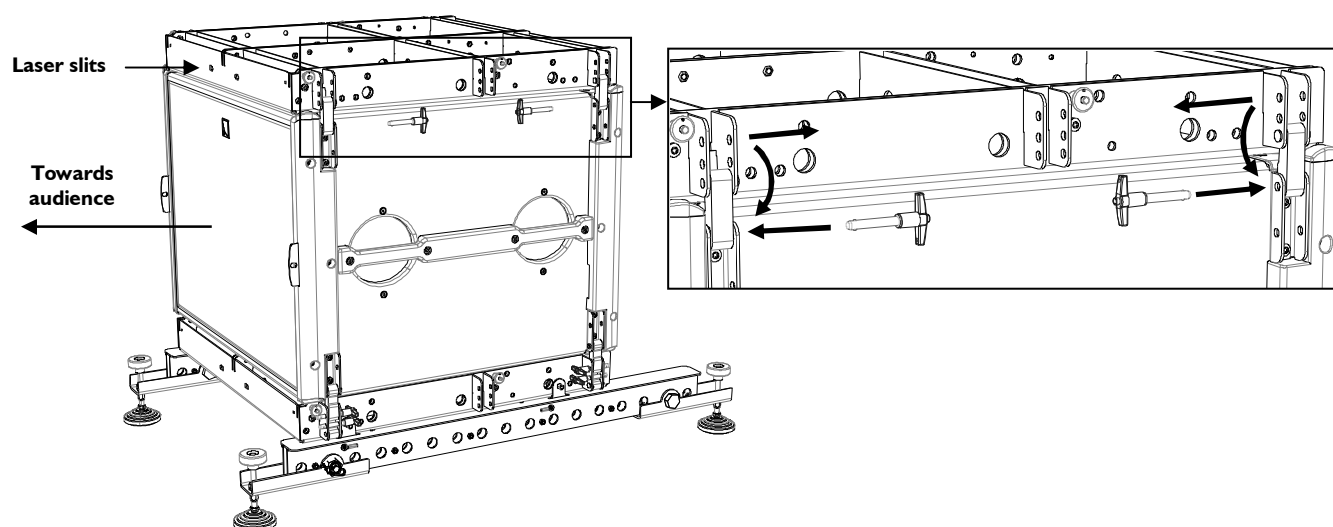


All along the procedure:  
STRICTLY follow the sequence of the successive steps.  
SYSTEMATICALLY ensure that each BLP is fully inserted.



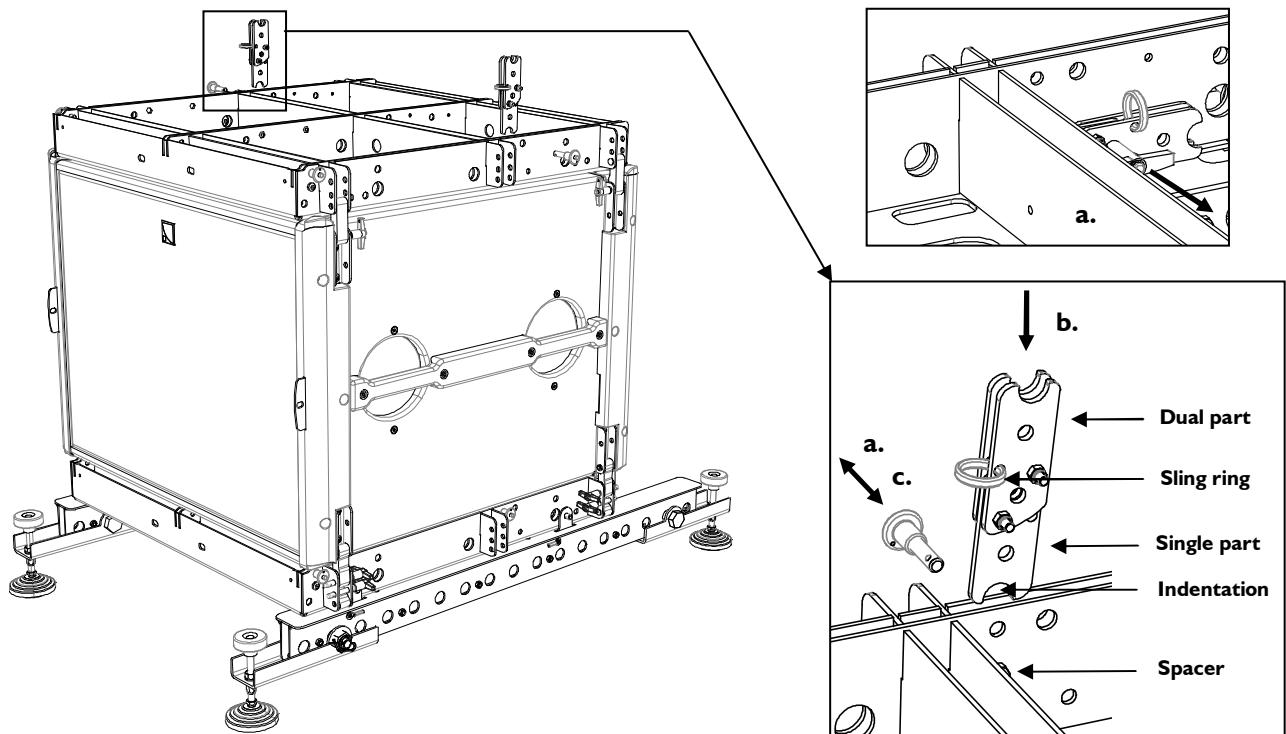
For clarity purposes the loudspeaker cabling procedure will not be described.  
The loudspeaker cables will not be represented on the figures.

1. Stack an SB18 enclosure onto an M-BUMP/M-BAR/M-JACK horizontal platform by applying the corresponding procedure given in the **SB18 Rigging manual** [3.4].
2. Place a second M-BUMP at the rigging location. Turn it so that the text of the identification plate is upside down, direct the laser slits towards the audience, and place it on the SB18.
3. Connect the 4 connecting points between M-BUMP and SB18 as follows (repeat for each one): remove the external T-BLP from the M-BUMP, open the rotating arm and secure it to the SB18 by re-inserting the T-BLP.



**Figure 57: Installing a second M-BUMP**

4. **(Optional [9.3])** Mount both angle arm extensions 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 angle arm extension into the M-BUMP by putting it vertically with sling ring pointing towards the front and indentation on the spacer.
  - c. Align the angle arm extension and M-BUMP holes. Insert the R-BLP.



**Figure 58: Angle arm extensions installation**

5. Remove both front R-BLP from the M-BUMP. If the M-BUMP has been configured **without** angle arm extensions, also remove both rear R-BLP.
6. Place a full flight-case at the stacking location and remove the cover. In the following, the enclosures will be designated as KARA#1 to KARA#3 from top to bottom.

7. Set KARA#1 in stacking configuration 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 in the top **yellow link hole**.
  - b. Remove the rear top R-BLP from 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 ( $0^{\circ}/2^{\circ}/4^{\circ}$  or  $1^{\circ}/3^{\circ}/5^{\circ}/7.5^{\circ}/10^{\circ}$ ). Refer to [9.3] for equivalent angle positions.
  - c. Remove the front and rear bottom link R-BLP and re-insert them into the bottom **storage** holes.

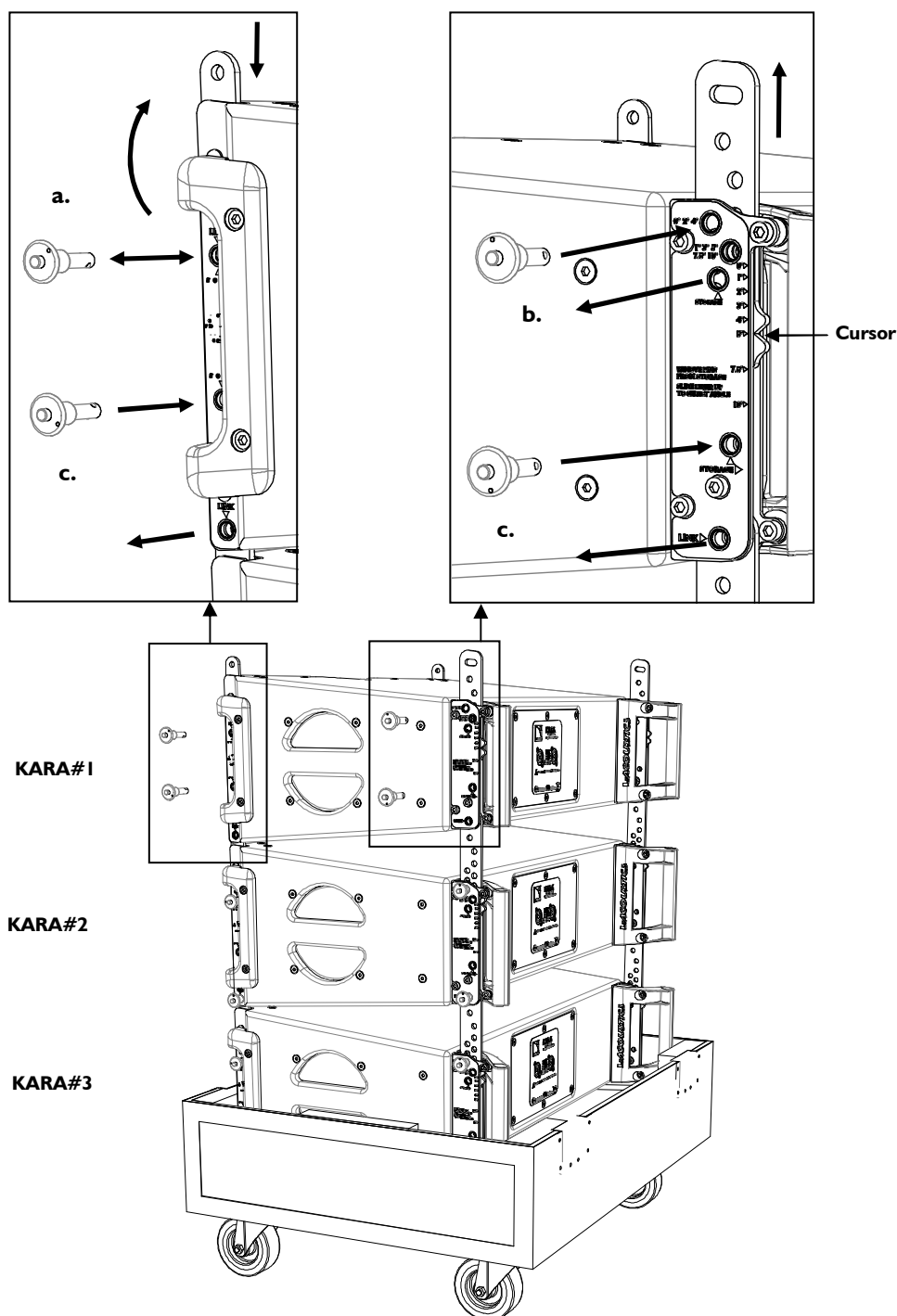


Figure 59: Setting KARA#1 in stacking configuration

#### 8. Connect KARA#1 to the M-BUMP as follows:

- a. Lift up and turn KARA#1 arms downwards and front face towards the audience.
- b. Insert the 4 arms into the M-BUMP connecting points. If the M-BUMP has been configured **with** angle arm extensions, the rear connecting points become those of the angle arm extensions.
- c. Secure both front connecting points by inserting the R-BLP on M-BUMP. Depending on the configuration, secure both rear connecting points by inserting either the R-BLP on M-BUMP or the T-BLP on the angle arm extensions.

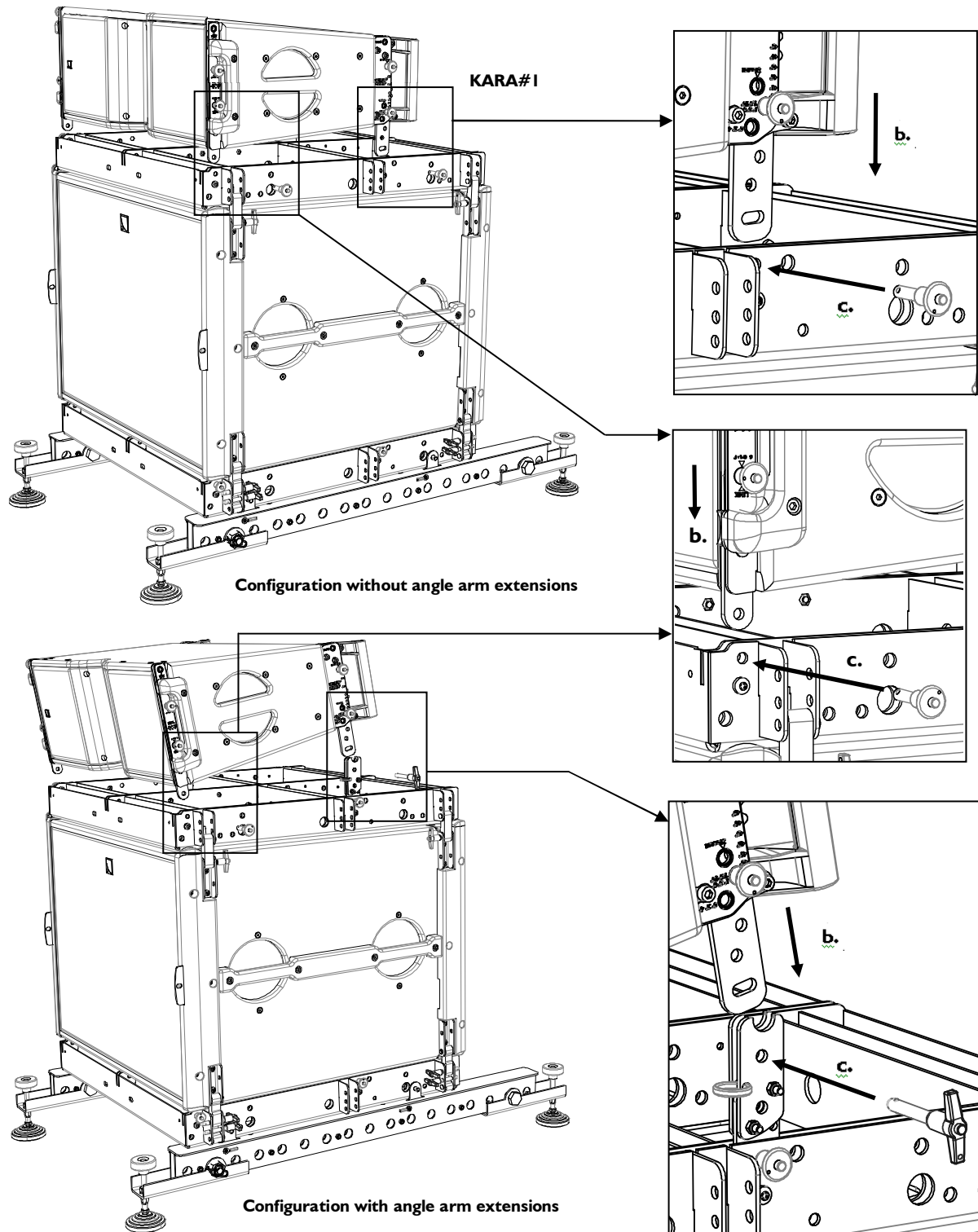
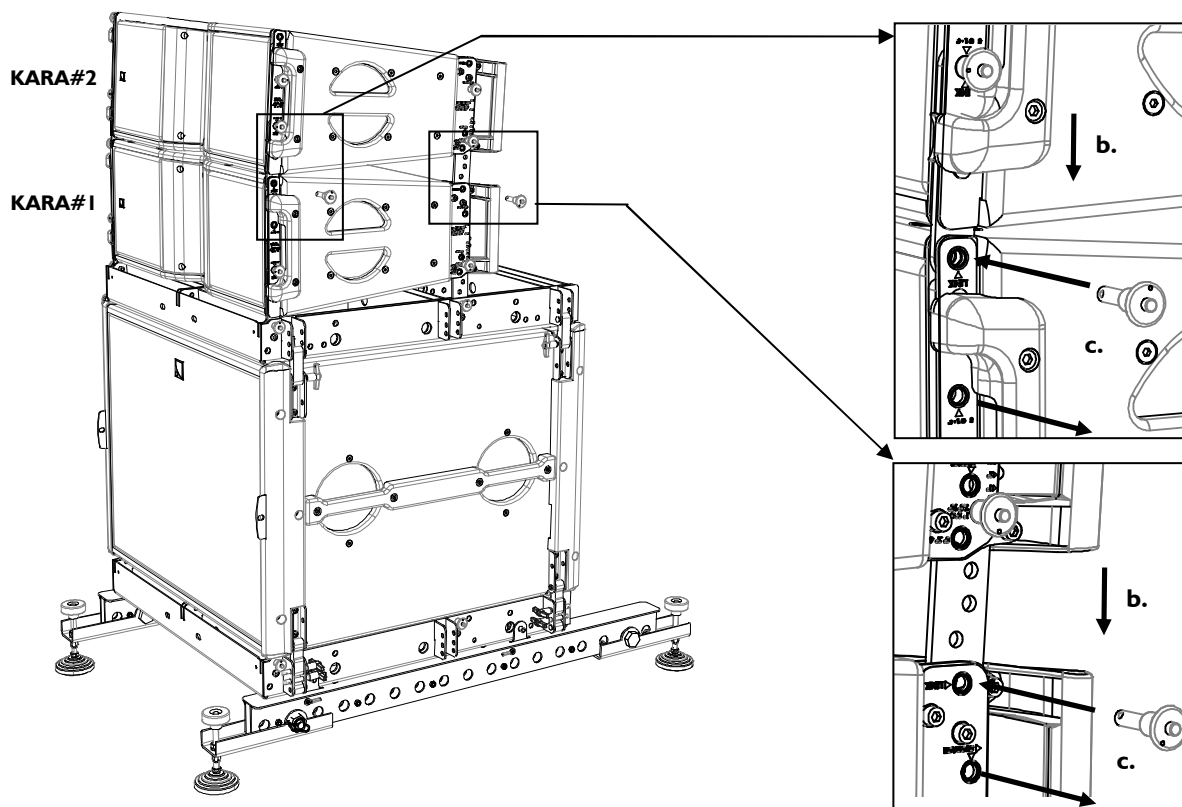


Figure 60: Connecting KARA#1 to M-BUMP



9. Set KARA#2 in rigging configuration by applying step 7.
10. Connect KARA#2 to KARA#1 as follows:
  - a. Put KARA#2 upside down with front face towards the audience.
  - b. Insert the four arms into the KARA#1 connecting points.
  - c. Remove the 4 top R-BLP from KARA#1 and secure by re-inserting them into the top **yellow link holes**.



**Figure 61: Connecting KARA#2 to KARA#1**

11. Connect KARA#3 to KARA#2 by applying steps 9 and 10 (do not remove the 4 bottom R-BLP from KARA#3).
12. Check if the stacking platform is still horizontal. If not, refer to [6.3.2, step 4].

#### 6.4.3 Array removal



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



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

1. Place an empty flight-case at the stacking location and remove the cover.
2. Separate KARA#3 from KARA#2 as follows: remove the 4 top link R-BLP from KARA#2 and re-insert them into the top **storage** holes.

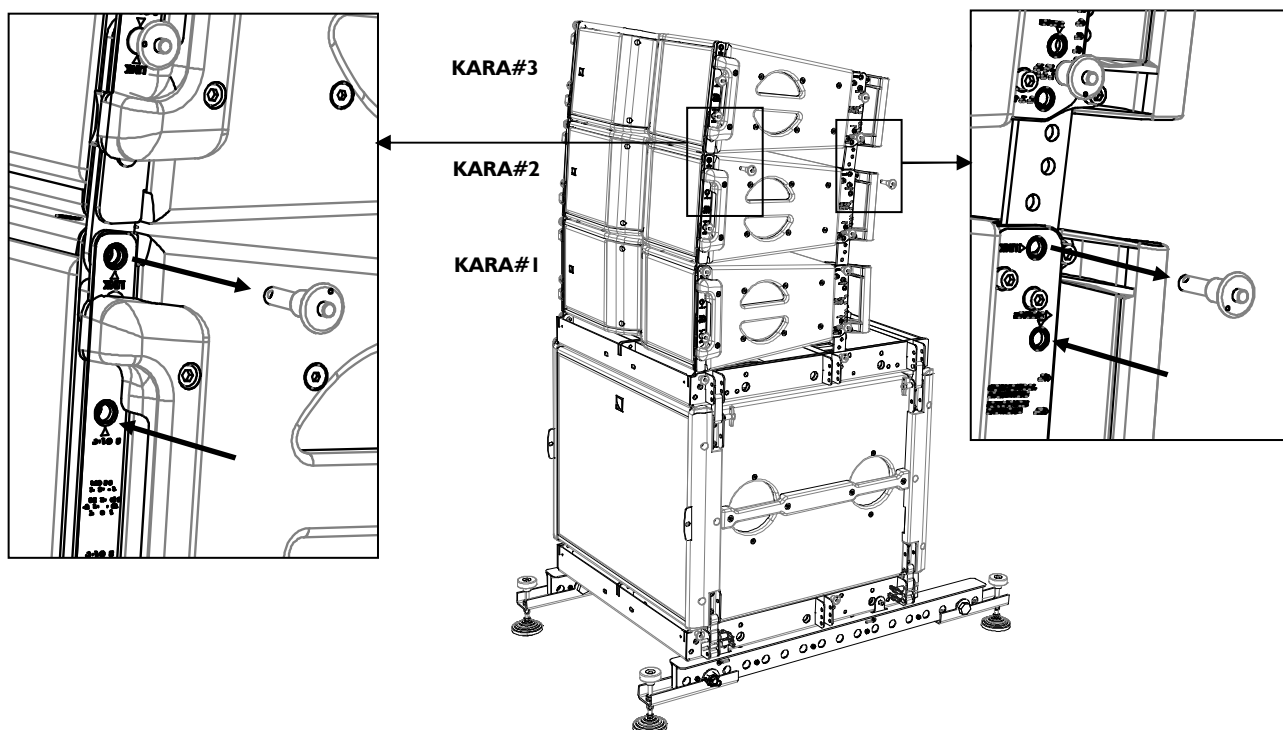


Figure 62: Separating KARA#3 from KARA#2

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



Pay attention to the tray position:  
both inner slopes must be inclined  
upwards from front to rear.

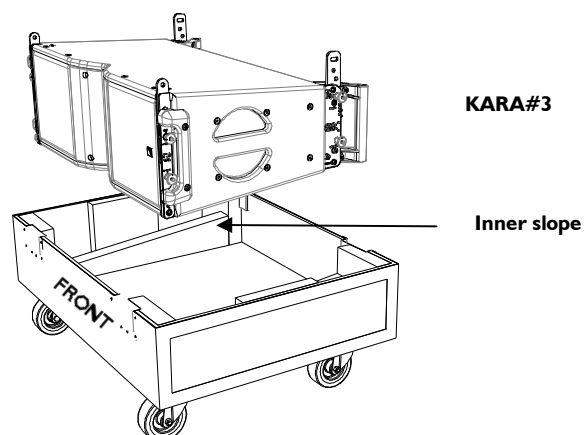


Figure 63: Putting KARA#3 into the flight-case tray

4. Set the angle to  $0^\circ$  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  $0^\circ$  angle value, and secure by re-inserting the R-BLP into angle hole  $0^\circ/2^\circ/4^\circ$ .

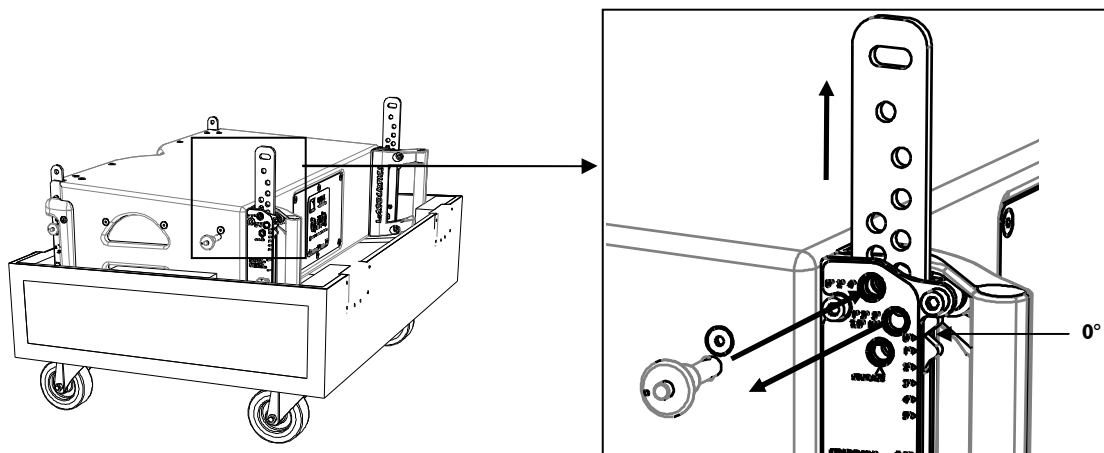


Figure 64:  $0^\circ$  angle setting

5. Separate KARA#2 from KARA#1 by applying step 2.
6. Lift up and turn KARA#2 arms upwards. Connect KARA#2 to KARA#3 (facing front) by aligning the 4 connecting points between both enclosures. Remove the 4 bottom R-BLP from KARA#2 storage positions and secure by re-inserting them into the bottom **yellow link holes**.

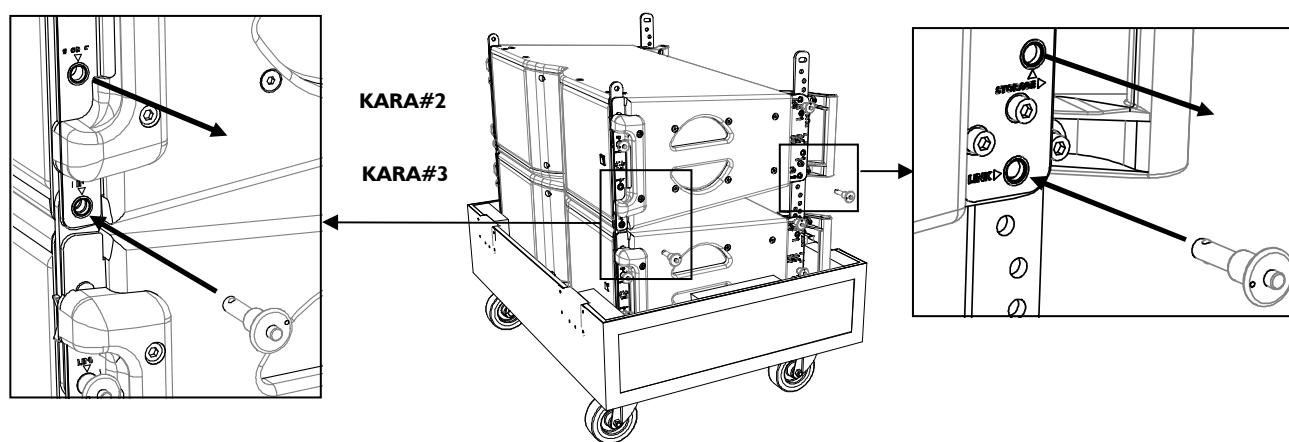
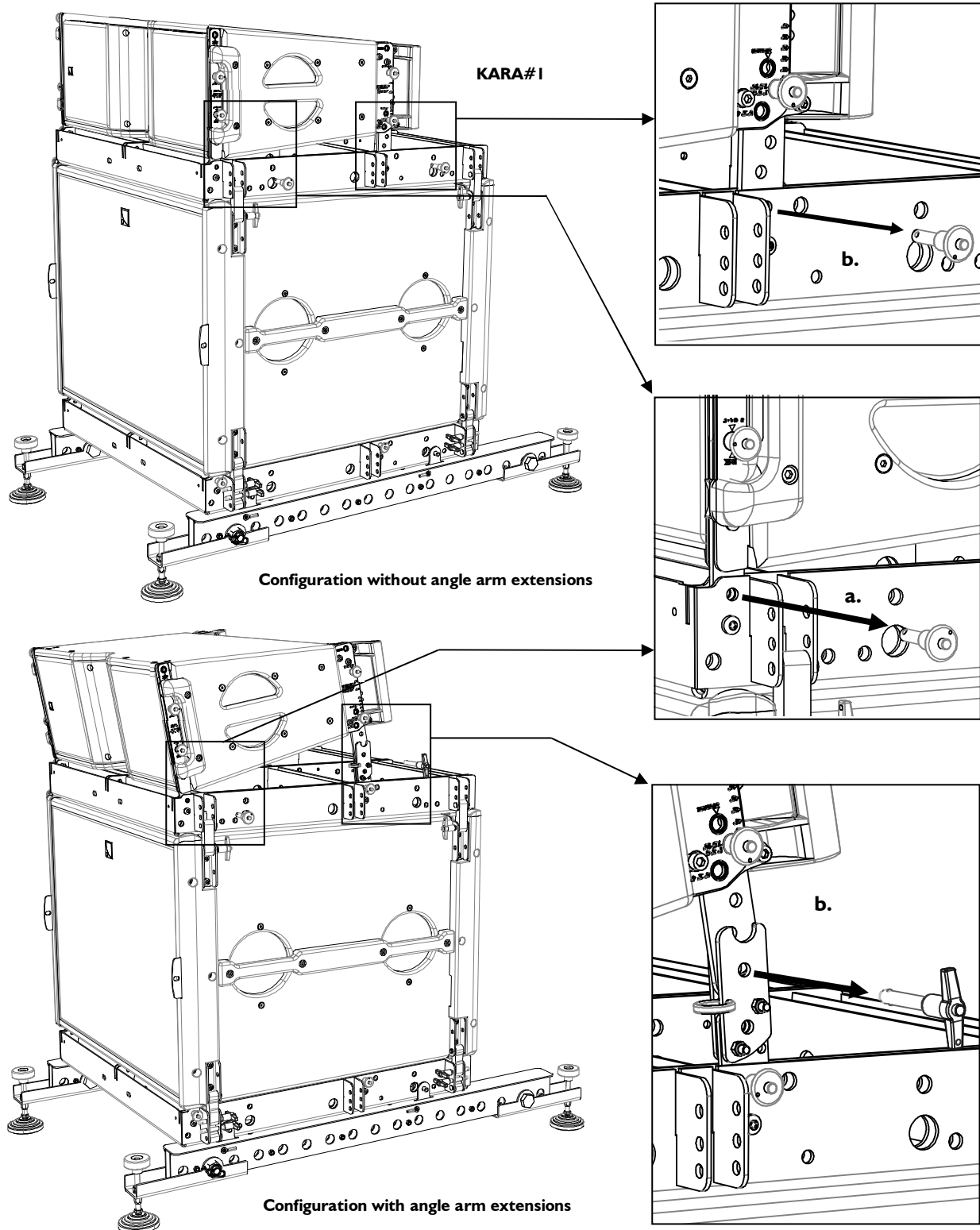


Figure 65: Connecting KARA#2 to KARA#3

7. Set the angles to  $0^\circ$  on KARA#2 by applying step 4.

8. Separate KARA# I from the M-BUMP as follows:
  - a. Remove both front R-BLP from the M-BUMP.
  - b. Depending on the configuration, either remove both rear R-BLP from the M-BUMP or both T-BLP from the angle arm extensions.



**Figure 66: Separating KARA# I from M-BUMP**

9. Attach KARA#1 to KARA#2 by applying step 6.

10. 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 into the top **storage** hole.
- b. On both sides of KARA#1, remove the rear top link 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 into the top **storage** hole.
- c. Put the flight-case cover back in place.

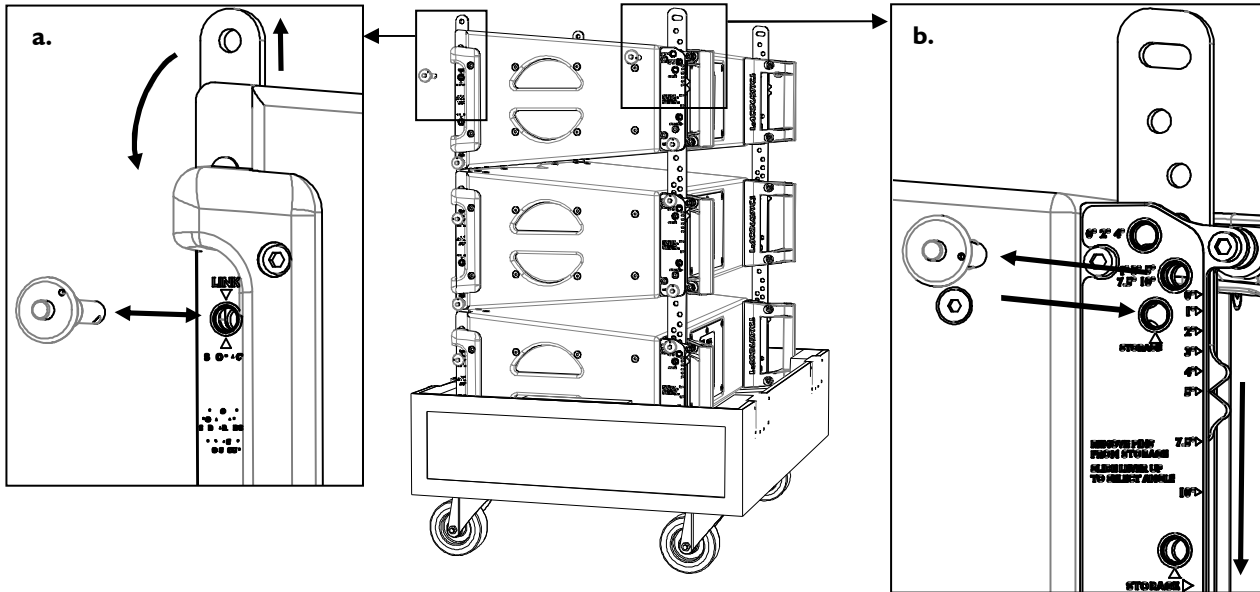
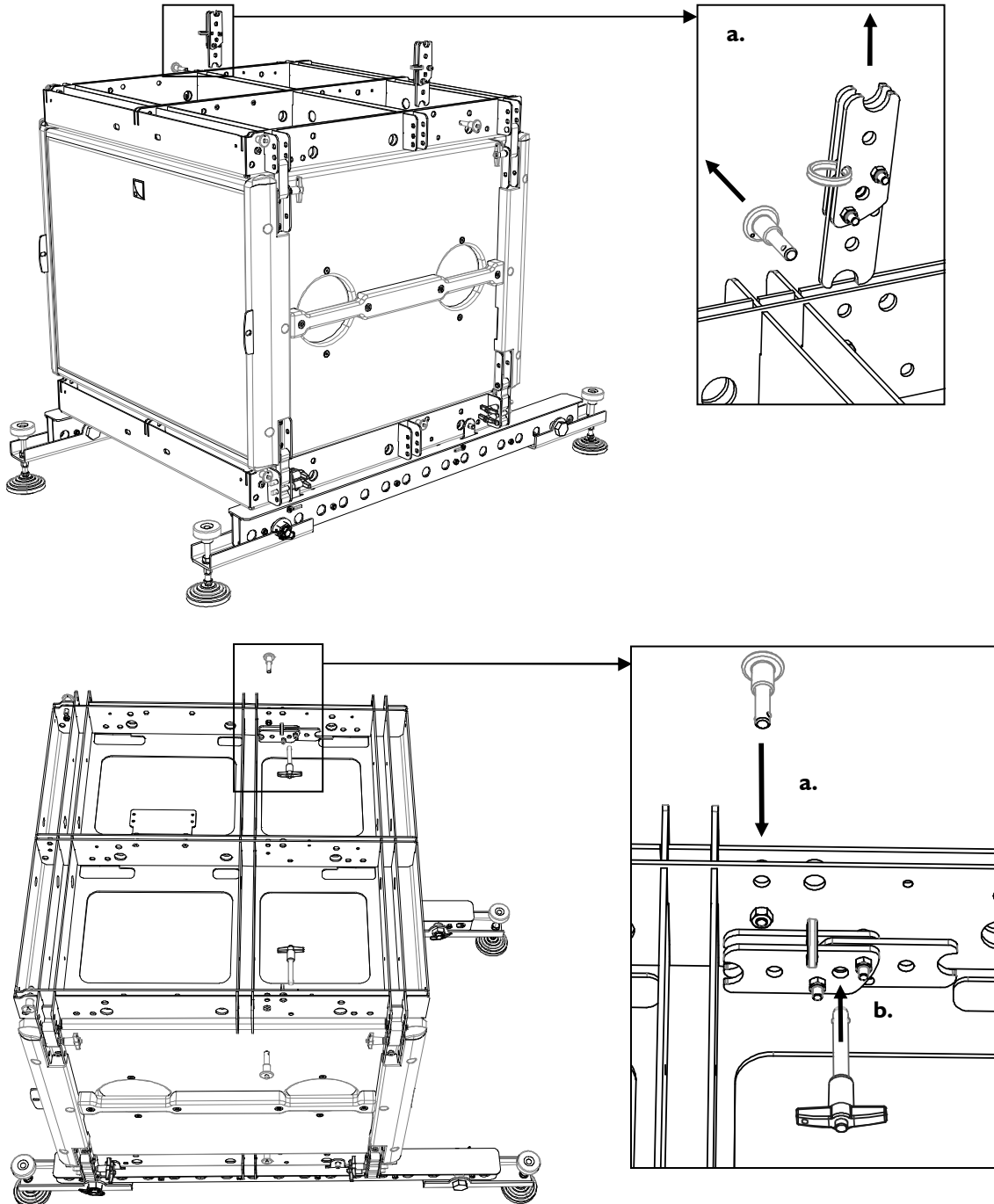


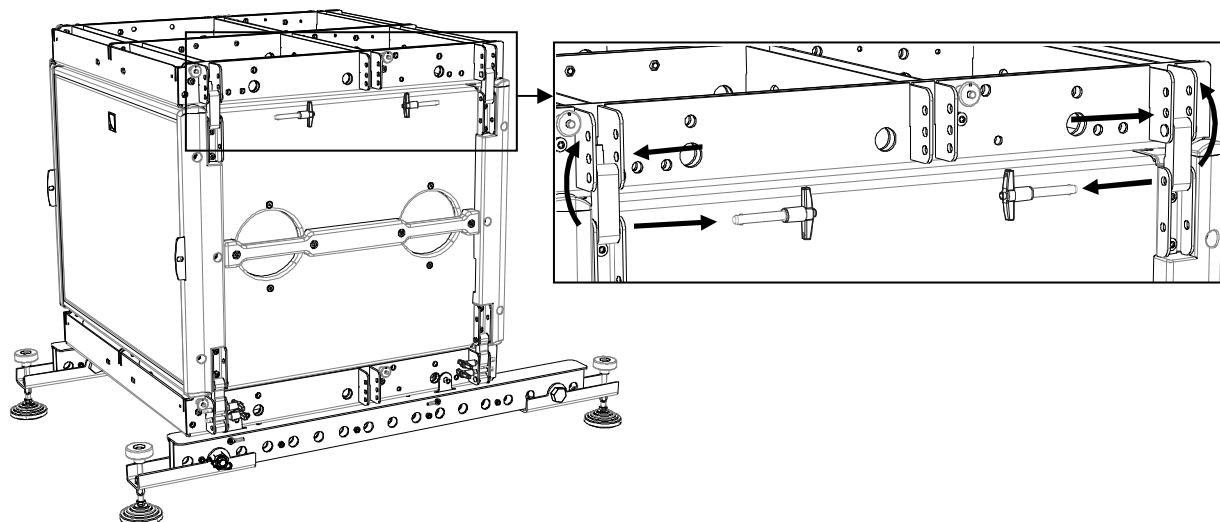
Figure 67: Setting the KARA#1-3 array for transport

- II. (Optional)** On the M-BUMP, put both angle arm extensions in storage position as follows (repeat for each one):
- Remove the rear R-BLP, remove the angle arm extension, and re-insert the R-BLP into the M-BUMP's hole.
  - Put the angle arm extension horizontally in its storage location and secure by inserting the T-BLP.



**Figure 68: Putting an angle arm extension in their storage positions**

12. Disconnect the 4 connecting points between M-BUMP and SB18 as follows (repeat for each one): remove the T-BLP from the SB18, close the rotating arm and lock by re-inserting the T-BLP on the M-BUMP.



**Figure 69: Removing the second M-BUMP**

13. Remove the M-BUMP from the SB18.
14. Disassemble the SB18 stack by applying the corresponding procedure given in the **SB18 Rigging manual** [3.4].

## 7 CARE AND MAINTENANCE


### 7.1 Maintenance information


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The KARA<sup>®</sup> system assembling components are the following:

- M-BUMP rigging structure with rotating arms and angle arm extensions.
- M-BAR extension bar.
- M-JACK stacking bases.
- KARA-ANGARMEX angle arm extensions.
- KARA-PULLBACK rigging accessory.
- KARA<sup>®</sup> enclosure with rotating arms and angle 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:

	<p>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.</p> <p>Any component incorporating a part showing signs of defect must immediately be replaced.</p>
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	<p>The metal components of the KARA<sup>®</sup> enclosures should not show any signs of deformation, fissure, or oxidation. They must be securely fixed to the enclosure.</p> <p>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.</p>
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	<p>Ensure that each BLP operates normally by moving its mechanism and checking that it automatically returns to nominal position.</p> <p>Verify the screwing mechanism on each shackle. Ensure that the safety pin is present and that it locks correctly.</p>
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## 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 provided).



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	Description	Service procedure
	<b>M-BUMP</b>	
KR MBUMPLAS	Laser support plate	[7.2.2]
KR MANI9L	Set of ten 19 mm shackles with safety pins	—
KR PIN62I	Set of ten 5/16" R-BLPs with fixing material	—
KR PIN60I	Set of ten 5/16" T-BLPs with fixing material	—
KR LOCKBLUE	Medium-strength thread-locker (5 pipettes of 50 g)	—
	<b>M-BAR</b>	
KR MANI9L	Set of ten 19 mm shackles with safety pins	—
KR PIN665	Set of ten 3/8" T-BLPs with fixing material	—
	<b>M-JACK</b>	
KR PIN60I	Set of ten 5/16" T-BLPs with fixing material	—
	<b>KARA-ANGARMEX</b>	
KR PIN60I	Set of ten 5/16" T-BLPs with fixing material	—
	<b>KARA-PULLBACK</b>	
KR MANI9L	Set of ten 19 mm shackles with safety pins	—

**Table 4: Recommended tools (not provided)**

Electric screwdriver with torque selector (N.m or in.lb <sub>f</sub> )	5 mm hex bit
T20 Torx® bit	7 mm hex key

### 7.2.2 Laser support plate

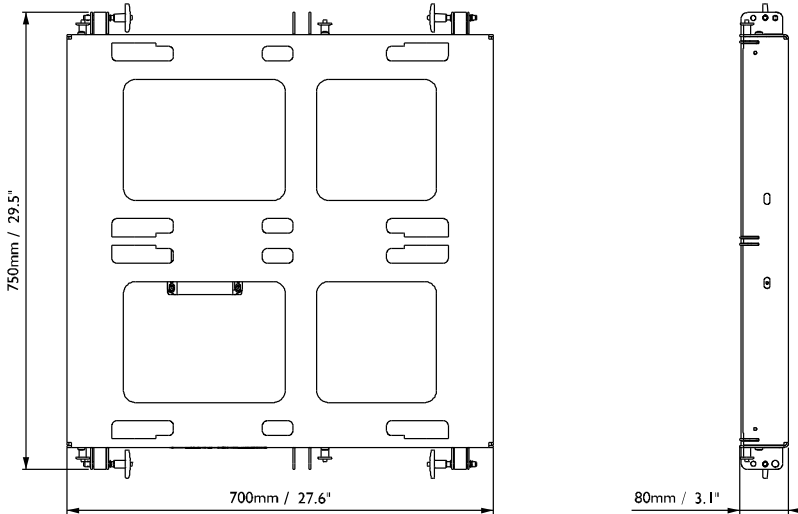
#### Replacement kit and tools

KR MBUMPLAS, electric screwdriver with torque selector (N.m or in.lb<sub>f</sub>), T20 Torx® bit, 5 mm hex bit, 7 mm hex key, KR LOCKBLUE.

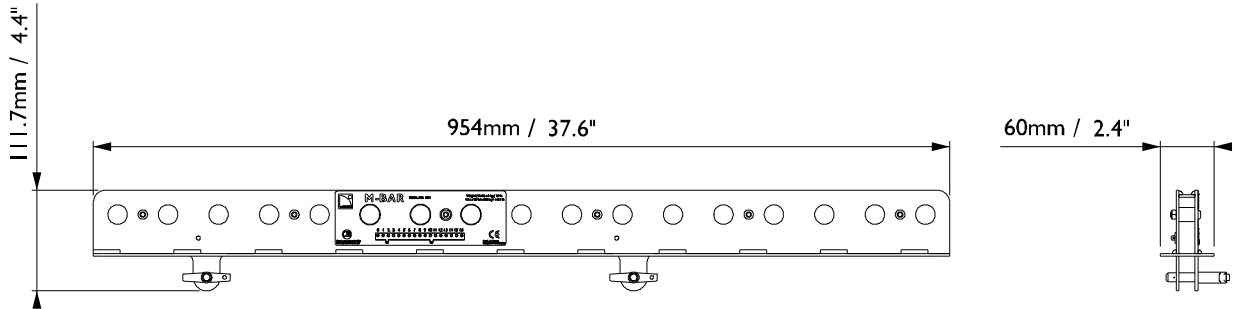
#### Laser support plate replacement procedure

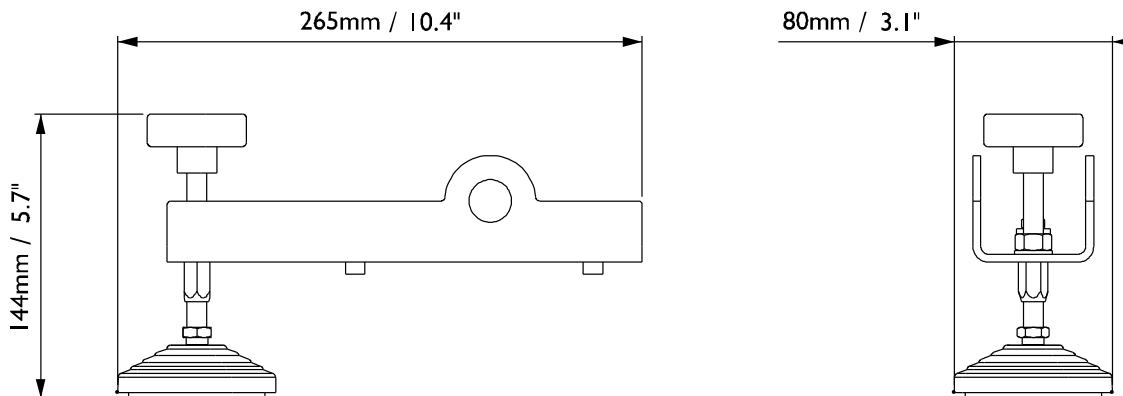
1. Remove the laser/inclinometer device from the laser support plate by unscrewing the 4 Torx® bolts (T20 bit, 7 mm hex key).
2. Remove the **old** laser support plate from the M-BUMP by unscrewing both hex screws (5 mm hex bit).
3. Fix the **new** laser support plate to the M-BUMP as follows: screw both hex screws (thread-locker, 5 mm hex bit, 5 N.m/45 in.lb<sub>f</sub>).
4. Mount the laser/inclinometer device on the new laser support plate by screwing the 4 Torx® bolts (T20 bit, 7 mm hex key, 3 N.m/27 in.lb<sub>f</sub>).

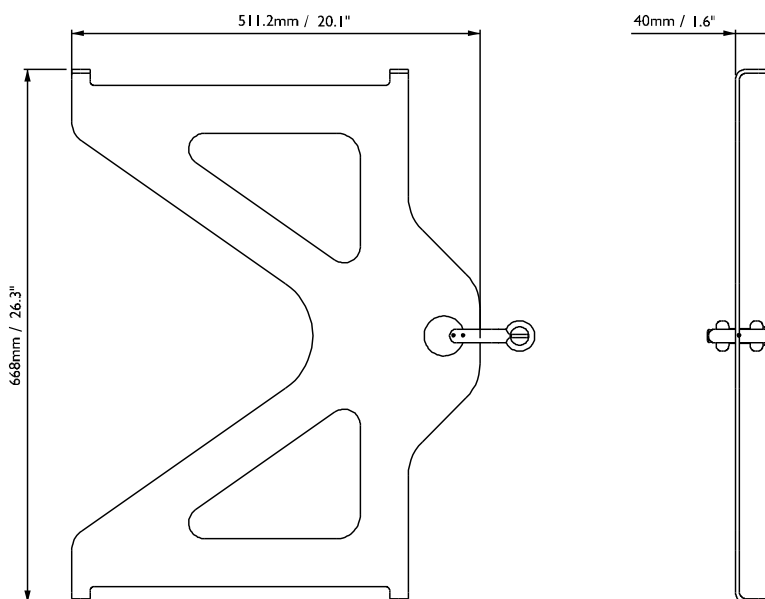
## 8 SPECIFICATIONS

Reference	M-BUMP
<b>Dimensions (L x H x D)</b>	750 x 80 x 700 mm / 29.5 x 3.1 x 27.6 inch
	
<b>Weight</b>	25 kg / 55 lbs
<b>Setup safety limits <sup>1</sup></b>	Maximum of 24 KARA or 4 SB18/12 KARA per M-BUMP in flown configuration. Maximum of 9 KARA or 2 SB18/6 KARA per M-BUMP in stacked configuration.
<b>Material</b>	High-grade steel coated with polyester powder.
<b>Included accessories</b>	4 R-BLP, 4 rotating arms with T-BLP, 1 laser support plate with 4 bolts, 2 shackles.

<sup>1</sup> Installation safety limits are specified in the SOUNDVISION software which is designed to help with L-ACOUSTICS<sup>®</sup> product implementation.

Reference	M-BAR
<b>Dimensions (L x H x D)</b>	954 x 111.7 x 60 mm / 37.6 x 4.4 x 2.4 inch
	
<b>Weight</b>	5 kg / 11 lbs
<b>Material</b>	High-grade steel coated with polyester powder.
<b>Included accessories</b>	2 T-BLP, 2 shackles.

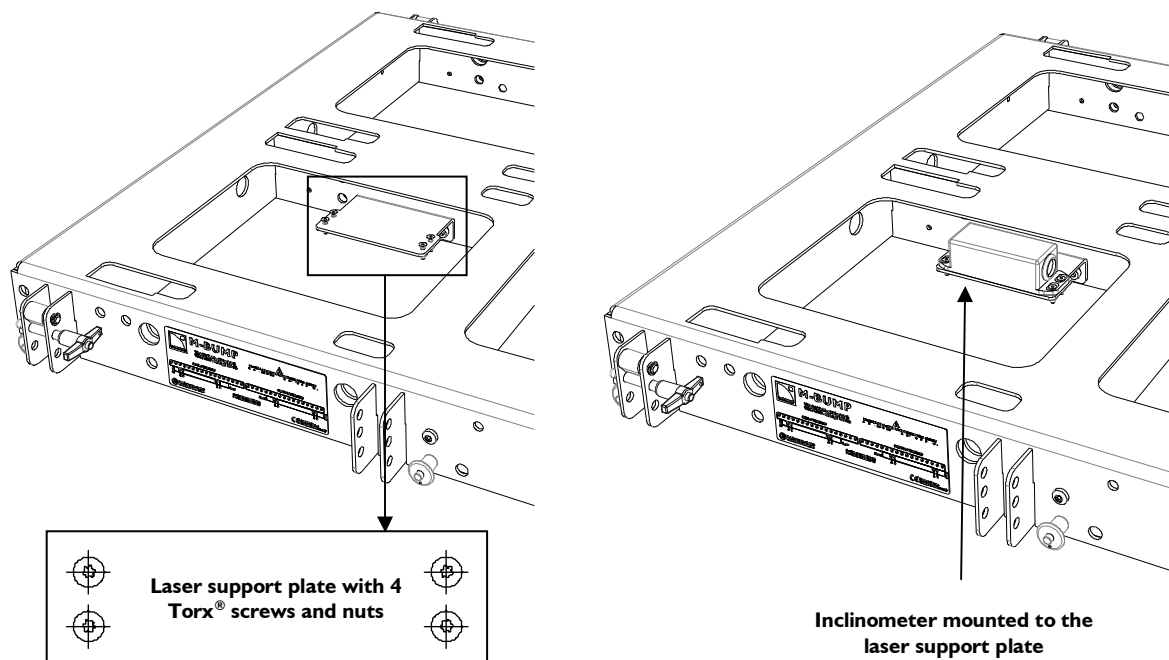
<b>Reference</b>	<b>M-JACK</b>
<b>Dimensions (L x H x D)</b>	265 x 144 x 80 mm / 10.4 x 5.7 x 3.1 inch
	
<b>Weight</b>	4 x 1.15 kg / 2.5 lbs
<b>Material</b>	High-grade steel coated with polyester powder.
<b>Included accessories</b>	4 bases including height-adjustment system, 2 angle arm extensions with T-BLP.

<b>Reference</b>	<b>KARA-PULLBACK</b>
<b>Dimensions (L x H x D)</b>	668 x 40 x 511.2 mm / 26.3 x 1.6 x 20.1 inch
	
<b>Weight</b>	6 kg / 13 lbs
<b>Setup safety limits [9.2.3]</b>	Maximum of 12 KARA or 3 SBI 8/9 KARA enclosures per KARA-PULLBACK.
<b>Material</b>	High-grade steel coated with polyester powder.
<b>Included accessory</b>	1 shackle.

## 9 APPENDIX

### 9.1 LAP-TEQ inclinometer mounting

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



**Figure 70: Laser support plate and LAP-TEQ inclinometer mounted to it**

#### LAP-TEQ mounting procedure

1. Unscrew the four Torx<sup>®</sup> bolts from the laser support plate (T20 bit, 7 mm hex key).
2. Install the LAP-TEQ sensor horizontally on the laser support plate with laser lens towards the M-BUMP slits.
3. Screw the 4 Torx<sup>®</sup> bolts to the sensor and plate (T20 bit, 7 mm hex key, 3 N.m/27 in.lb.).
4. Connect an XLR 3 cable to the sensor.
5. Calibrate the sensor by following the manufacturer's recommendations.

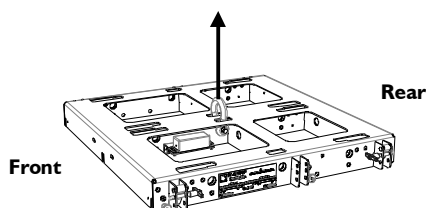
## 9.2 Flown array options and site angle setting

### 9.2.1 M-BUMP rigging options

L-ACOUSTICS® recommends 5 different rigging options to fly the M-BUMP for arrays containing KARA® enclosures. It is possible to use 0, 1, or 2 M-BAR and 1 or 2 connecting points (see Figure 71).



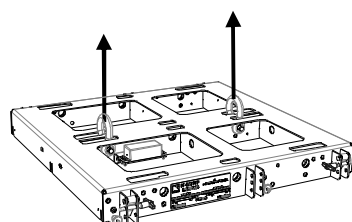
ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the system before installation.



#### **Option 1: 0 M-BAR, 1 point**

1 motor

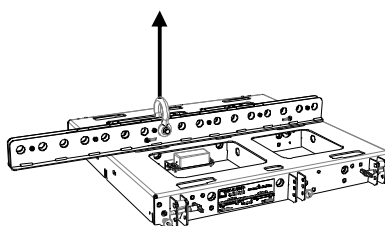
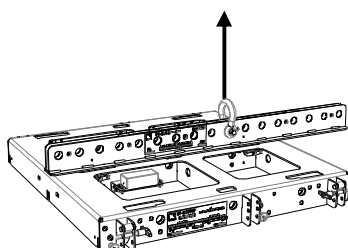
3 possible positions (front, center, rear)



#### **Option 2: 0 M-BAR, 2 points**

2 motors

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



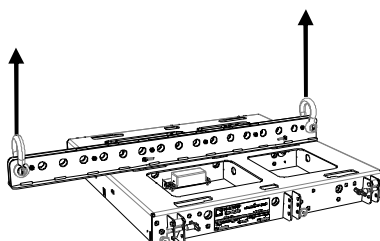
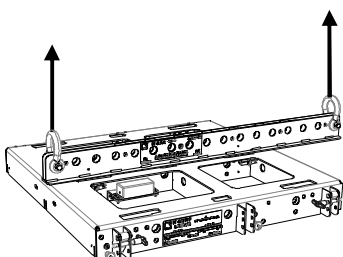
#### **Option 3: 1 M-BAR, 1 point**

1 motor

Variable position [9.2.2]

Left view = rear overhang

Right view = front overhang



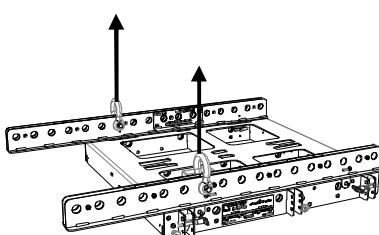
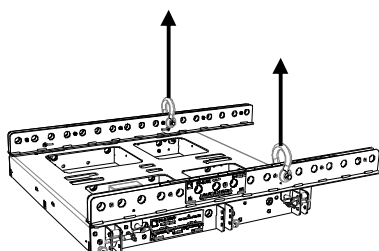
#### **Option 4: 1 M-BAR, 2 points**

2 motors

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

Left view = rear overhang

Right view = front overhang



#### **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 overhang

Right view = front overhang

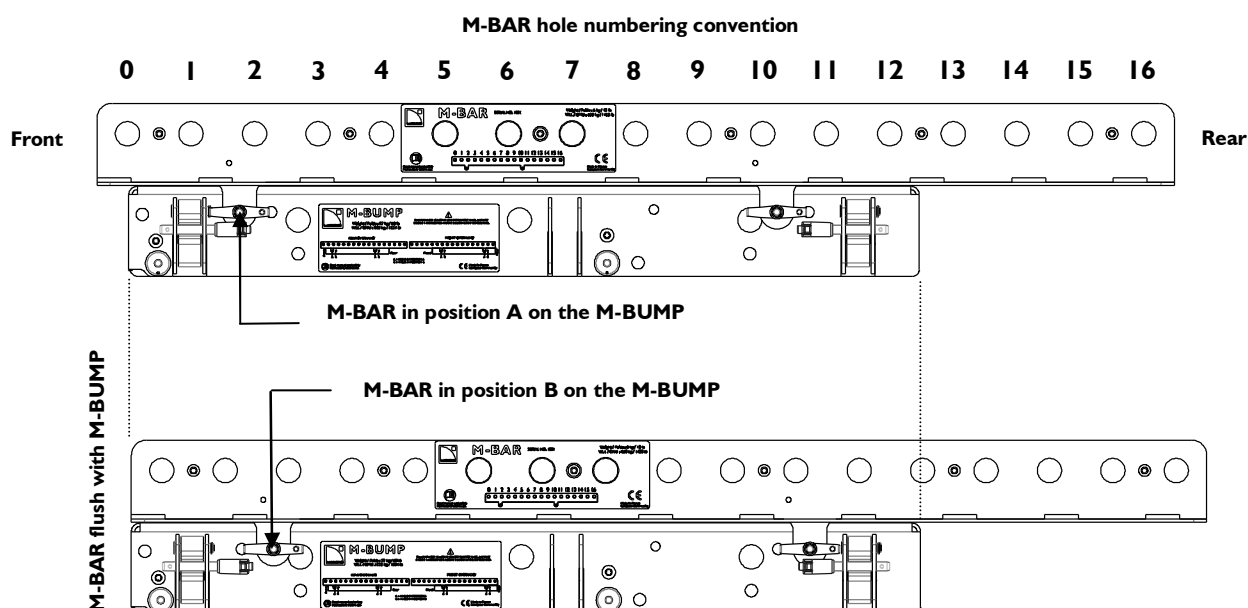
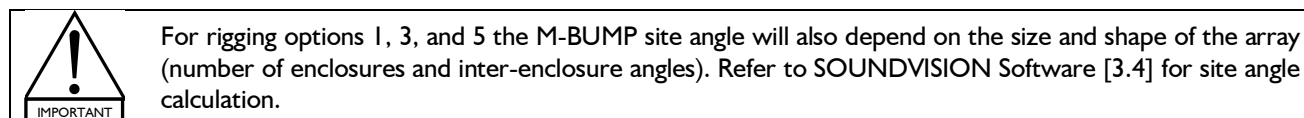
**Figure 71: M-BUMP rigging options**

#### 9.2.2 M-BUMP site angle setting

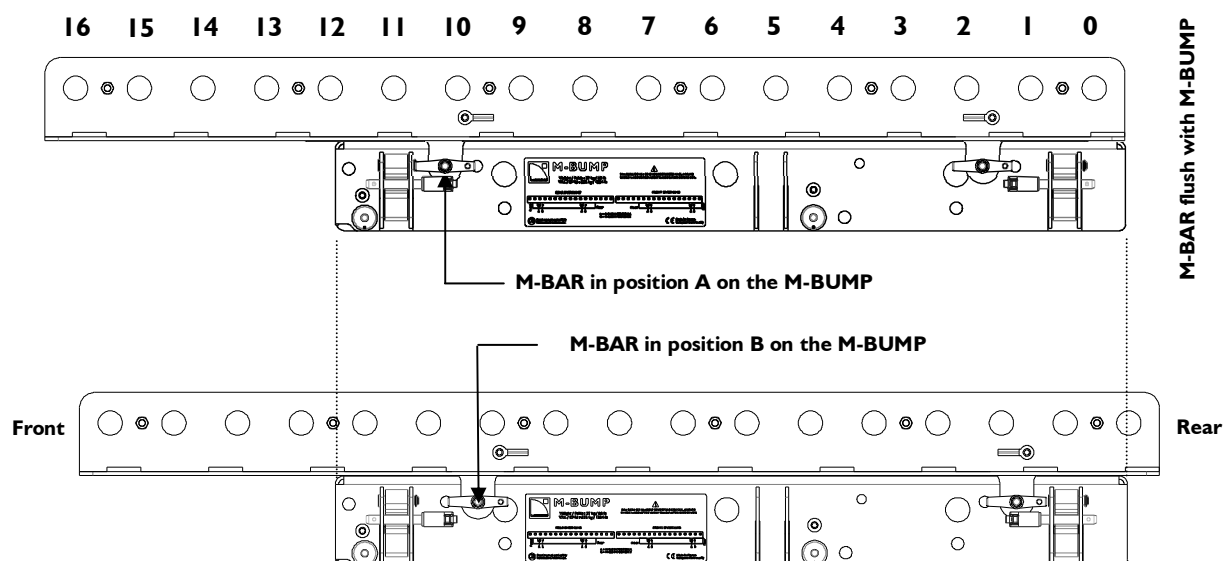
The M-BUMP site angle setting will be discrete or continuous depending on the desired rigging option.

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 72 (rear overhang) or Figure 73 (front overhang).



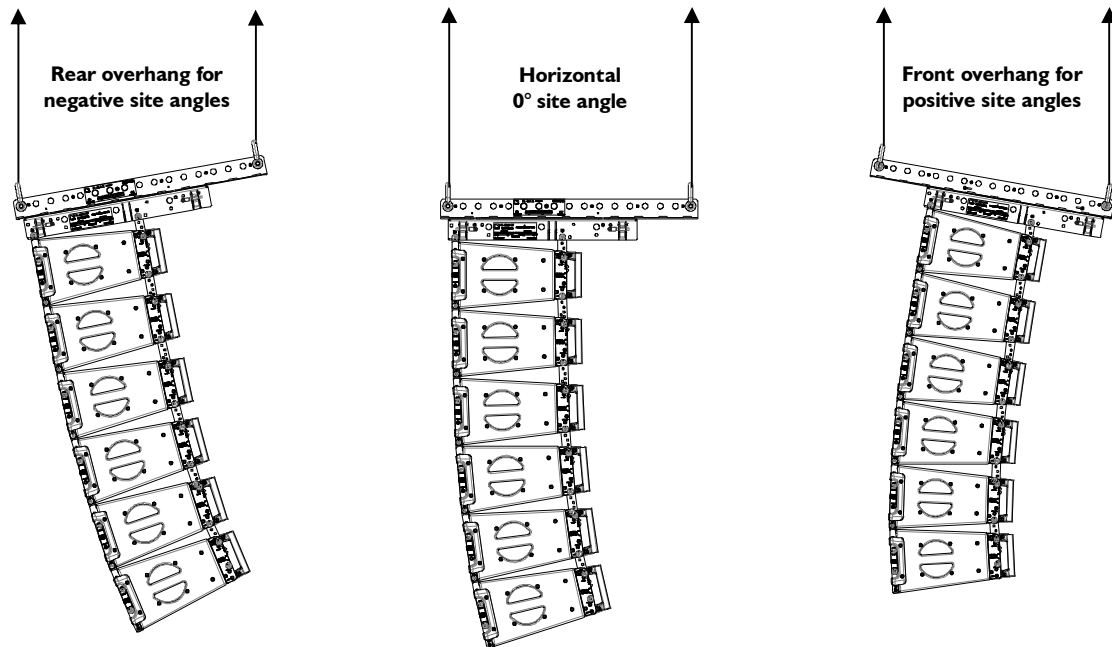
**Figure 72: Discrete angle selection (rear overhang)**



**Figure 73: Discrete angle selection (front overhang)**

Rigging options 2 and 4 allow continuous M-BUMP site angle setting depending on the relative heights between the front and rear hang points. Option 2 offers a small setting range. Option 4 enlarges the setting range for negative site angles in rear overhang and positive site angles in front overhang (see Figure 74).


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



**Figure 74: Continuous angle selection (option 4 example)**

### 9.2.3 **KARA-PULLBACK setup safety limits**

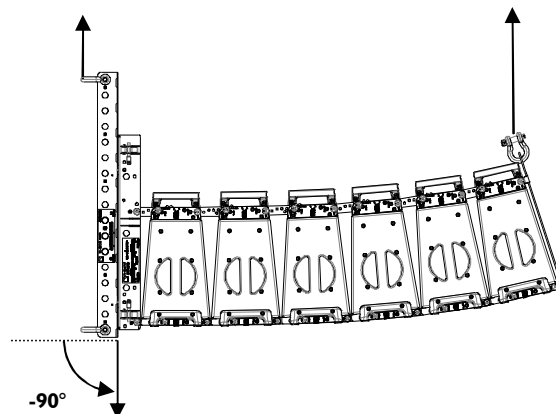
The KARA-PULLBACK accessory mounts to the bottom enclosure of a KARA array to allow setting the site angle down to  $-90^\circ$ . However, this limit depends on the composition of the array as shown in Table 5.



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 site angle	$-90^\circ$	$-60^\circ$	$-90^\circ$	$-90^\circ$



**Figure 75:  $90^\circ$  downwards site angle with KARA-PULLBACK**

### 9.3 Stacked array options and site angle setting

The M-BUMP can be used as a horizontal stacking platform along with two M-BAR and four M-JACK bases. The M-BAR should be installed in rear or front overhang configuration whether the stacked array site angle is intended to be positive or negative, respectively (see Figure 76).

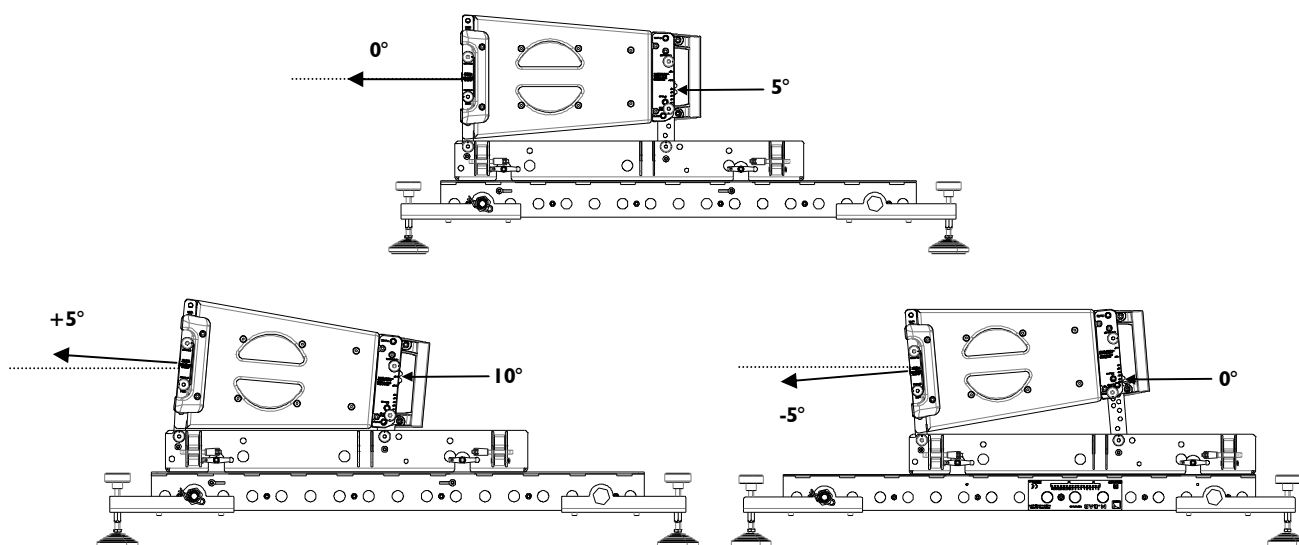


ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION Software (**Mechanical Data** section) [3.4] to verify the mechanical conformity of the system before installation.

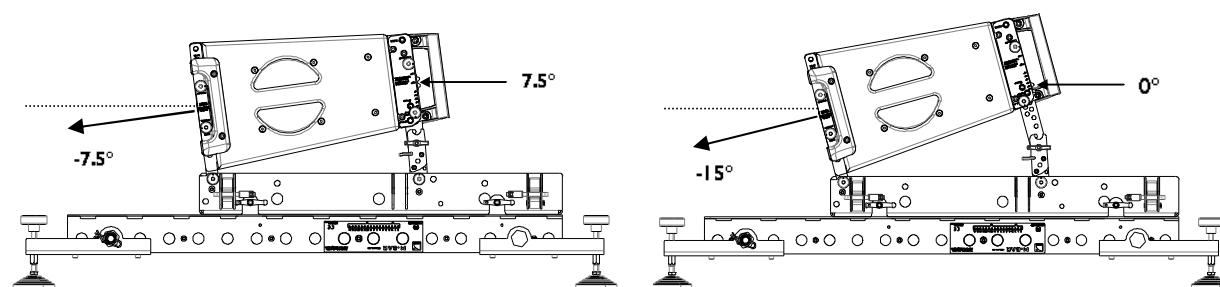
The site angle of the stacked KARA® array will be determined by the angle of the bottom enclosure in the range from -15° to +5°. Install both KARA-ANGARMEX angle arm extensions (also included in the M-JACK package) to obtain angles from -7.5° to -15°. Table 6 gives all possible site angles settings:

**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 76)	Resulting site angle with angle arm extension (Figure 77)
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 76: Bottom KARA angle selection**

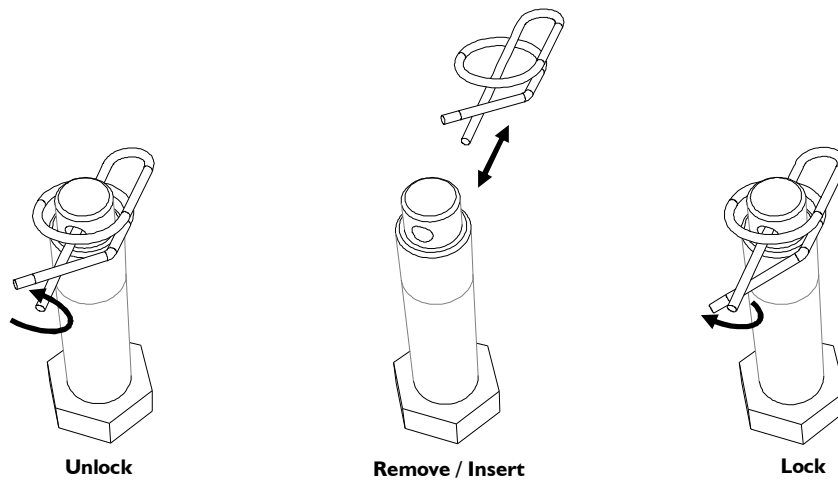
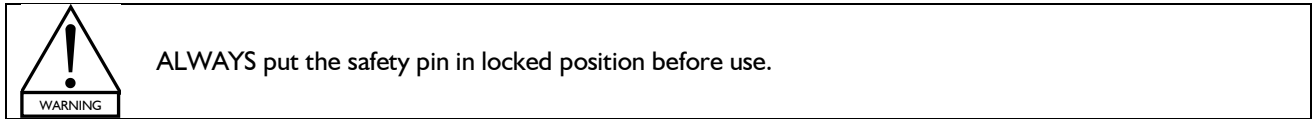


**Figure 77: Angle selection with angle arm extensions**



## 9.4 Safety pin removal and insertion

The safety pins provided with the shackles have an integrated locking system. Figure 78 presents the removal and insertion procedures.



**Figure 78: Safety pin removal and insertion procedures**





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