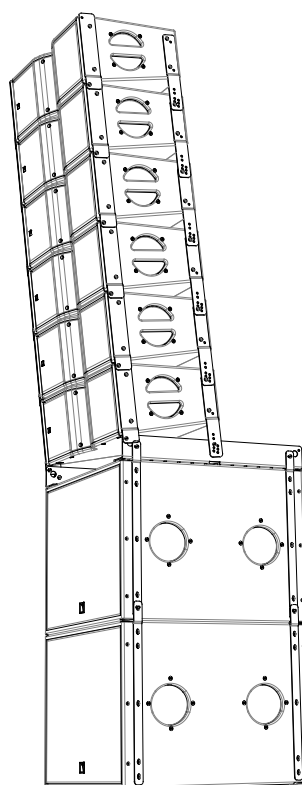
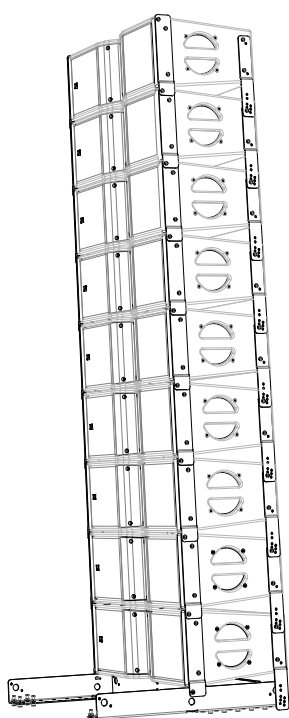
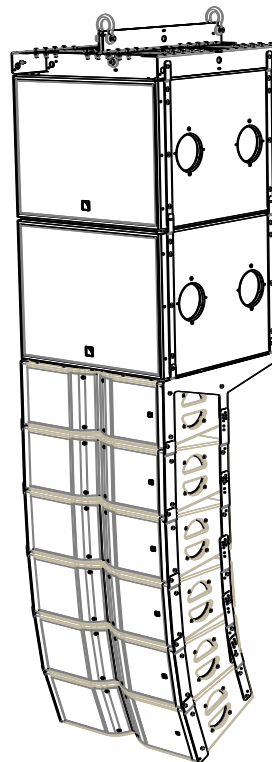
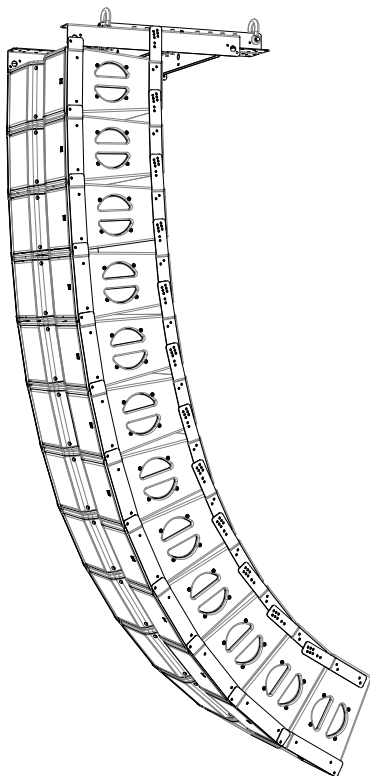


## rigging manual (EN)



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# 1 SAFETY WARNINGS

All safety information hereafter detailed applies for the L-ACOUSTICS® **M-BUMPi** rigging structure and **KARaiSB I8LINK** rigging accessories, 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. Inspect the system before any deployment</b> Perform safety related checks and inspections before any deployment. <b>Perform preventive maintenance at least once a year.</b> 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. Insufficient upkeep of the product can void the warranty. <b>If any safety issue is detected during inspection, do not use the product before performing corrective maintenance.</b> Check for issues. A rigging system part or fastener is missing or loose. A rigging system part exhibits: bends, breaks, broken parts, corrosion, cracks, cracks in welded joints, deformation, denting, wear, holes. A safety cue or label is missing.</p>
	<p><b>6. Personnel qualification</b> Installation and set-up should <u>only</u> 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>7. 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>



#### 8. Additional rigging equipment

L-ACOUSTICS® is not responsible for any rigging equipment and accessories provided by third party manufacturers.

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 ensure 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 assembly

Always verify that nobody is standing underneath the loudspeaker assembly when it is being raised. As the assembly 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 assembly

Do not ground stack the system on unstable ground or platform.

If the assembly is stacked on a structure, platform, or stage always check that the latter can support the total weight of the assembly.

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 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.



### 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-BUMPi  
Rigging accessories, KARAI SB18LINK

Are in conformity with the provisions of:

Machinery Directive 2006/42/EC

Applied rules and standards<sup>1</sup>:

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

Established at Marcoussis, France

September 29<sup>th</sup>, 2010



Jacques Spillmann

Head of Engineering & Design dept.

<sup>1</sup> Maximum **flown** vertical array configurations:

- **General** standard: **12 KARAI** or **4 SB18i/12 KARAI** or **8 SB18i**.
- **BGV** standard: **12 KARAI** or **3 SB18i/9 KARAI** or **8 SB18i**.

Maximum **stacked** vertical array configurations:

- **General** standard: **9 KARAI**.

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## 3 INTRODUCTION

### 3.1 Welcome to L-ACOUSTICS®

Thank you for purchasing the **L-ACOUSTICS® KARAI® 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 section: **Symbol description**.

### 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>KARAI User manual</b>	<a href="http://www.l-acoustics.com/archives-product">www.l-acoustics.com/archives-product</a>
<b>KARAI Rigging manual</b>	
<b>SBI 8i User manual</b>	
<b>KARA Owner's manual</b>	<a href="http://www.l-acoustics.com/soundvision">www.l-acoustics.com/soundvision</a>
<b>SOUNDVISION Software</b>	

## 4 KARAI® SYSTEM

The **L-ACOUSTICS® M-BUMPi** and **KARAI® SB18LINK** elements have been designed to rig the **KARAI® Modular WST® Line Source System**.

The system approach developed by L-ACOUSTICS® for KARAI 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>KARAI®</b>	⇒ Full range active 2-way modular WST® enclosure
<b>M-BUMPi</b>	⇒ Structure for flying KARAI and/or SB18i or stacking KARAI
<b>KARAI® SB18LINK</b>	⇒ Link components between SB18i and KARAI
<b>SB18i</b>	⇒ Compact high-power subwoofer
<b>SB28</b>	⇒ High-power subwoofer
<b>LA8</b>	⇒ Amplified controller
<b>LA NETWORK MANAGER</b>	⇒ Remote control software for amplified controllers
<b>SOUNDVISION</b>	⇒ 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.



**Figure 1: KARAI system components (part 1)**

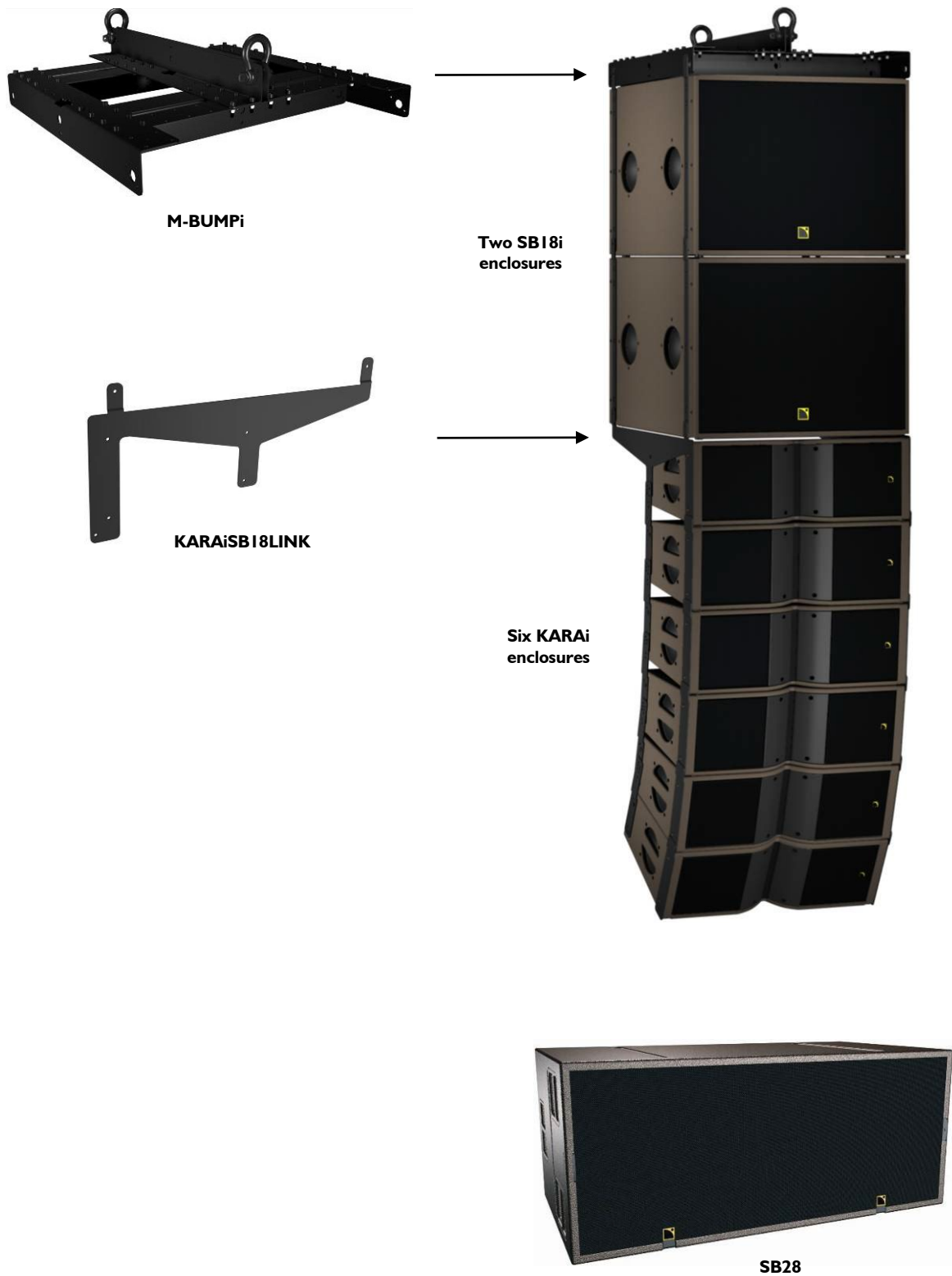


Figure 2: KARAI system components (part 2)

## 5 KARAI® RIGGING COMPONENTS

### 5.1 M-BUMPi

The **L-ACOUSTICS® M-BUMPi rigging structure** has been designed to fly or stack KARAI® enclosures as a variable-curvature, vertical line source array. **Note:** M-BUMPi also can fly straight vertical SB18i arrays.

The M-BUMPi package is composed of:

- Ten **bars**.
- A set of **M8 hex bolts** to assemble the bars and obtain one or two M-BUMPi structures (see notes below).
- Two **shackles** fitted with a 19 mm/0.75 inch-diameter axis
- A set of **M6 hex bolts** and **washers** to attach a KARAI or a SB18i enclosure to the M-BUMPi.
- A set of **screws** to fix a bar to the bottom KARAI of a flown array and obtain a pullback configuration.

**Note 1:** In flown configuration, the M-BUMPi can be assembled according to eight **rigging options** [9.1.1]. In particular, rigging option 0 allows assembling two M-BUMPi. In addition, a bar can be used for aesthetic purposes (see the right box in Figure 3).

**Note 2:** In stacked configuration, the M-BUMPi can be assembled according to two **platform configurations** [9.2.1]. Any of them allows assembling two M-BUMPi.

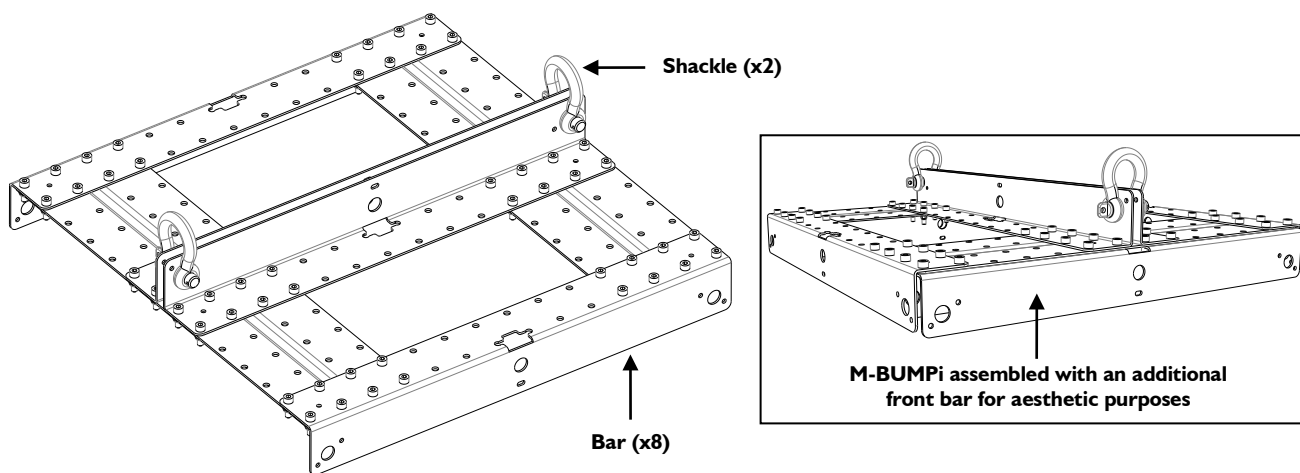


Figure 3: M-BUMPi rigging structure

### 5.2 KARAI SB18LINK

The **L-ACOUSTICS® KARAI SB18LINK accessories** allow rigging a KARAI array below a SB18i array in flown configuration.

The KARAI SB18LINK are two **plates** (KARAI SB18LINK 640 and 917) to fix on the KARAI enclosure sides.

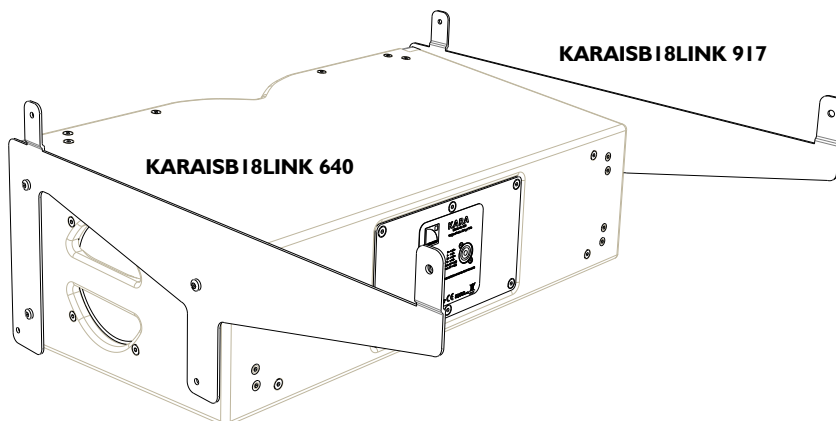


Figure 4: KARAI SB18LINK rigging accessories

## 6 INSTALLATION

### 6.1 Flying a KARAI standalone array

#### 6.1.1 Modeling and safety

Any loudspeaker 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 KARAI enclosures.
- Calculate the M-BUMPi site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.



The M-BUMPi can fly an array of up to **12 KARAI** enclosures along with all loudspeakers cables (refer to the **KARAI User manual** [3.4]). However, this maximum number can decrease in line with the rigging option [9.1.1] and 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 loudspeaker system before installation.

#### 6.1.2 Array assembling procedure

The following procedure describes how to assemble and fly a vertical KARAI array under an M-BUMPi.



All along the procedure:

Strictly follow the sequence of the successive steps.

Systematically verify that each bolt and screw is fully driven to the torque value given in this manual.

Systematically verify that the axis is fully driven on each shackle.



Use a strain relief to avoid mechanical stress at the connector locations due to cable weight.

For clarity purposes:

The loudspeaker cabling procedure will not be described.

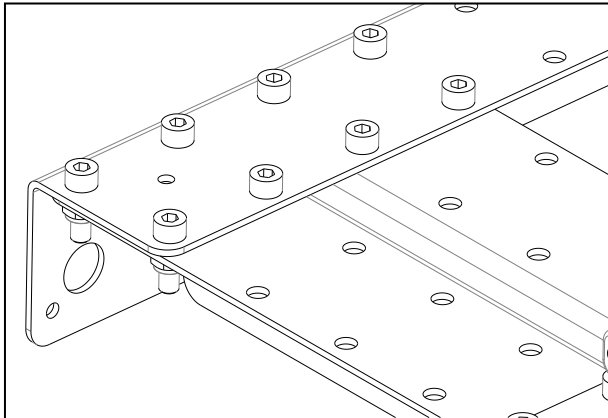
The loudspeaker cables and the external rigging system will not be represented on the figures.

#### **Required components and tools**

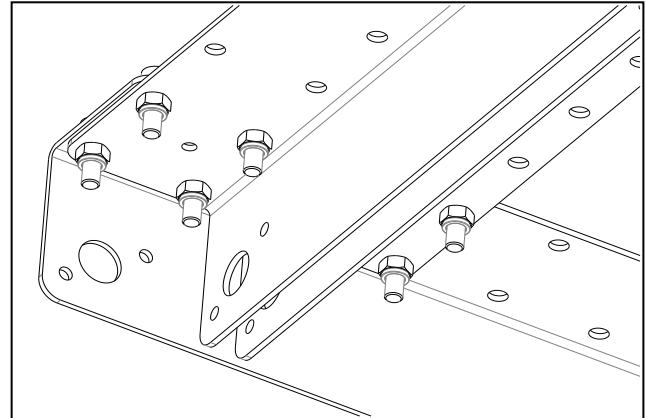
M-BUMPi, electric screwdriver with torque selector (N.m or in.lb<sub>t</sub>), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, KR LOCKBLUE (medium-strength thread-locker, optional, for pullback configuration).

#### Procedure

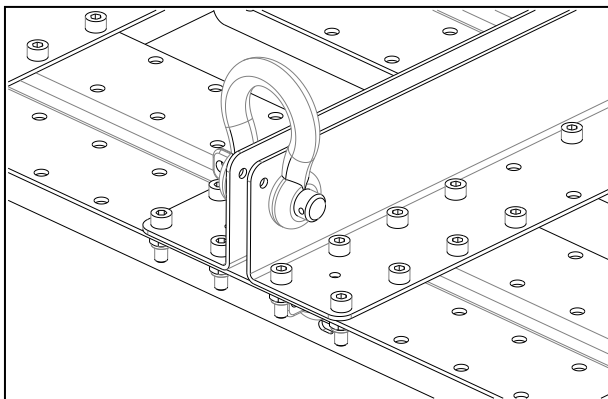
- I. After having selected a **rigging option** [9.1.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 5 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb.) while ensuring that the frame shape remains square.
  - c. Attach the shackles as shown in the bottom left box of Figure 5.



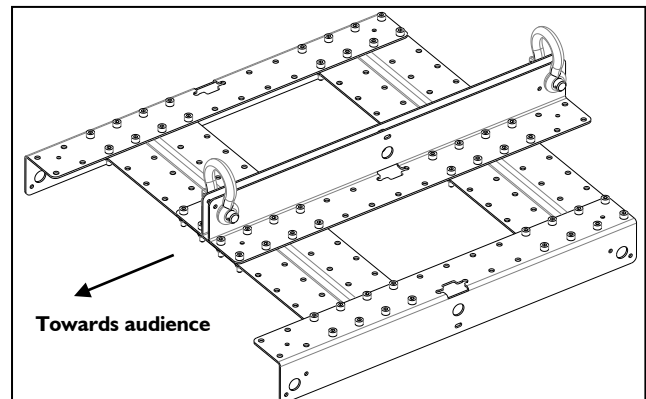
Driving bolts (top view)



Driving bolts (bottom view)



Attaching a shackle



Example of dual-point rear extension configuration

**Figure 5: Assembling M-BUMPi for flying**



2. Mount four arms to a first KARAI (hereafter designated as KARAI#1) as follows (repeat on each enclosure side):



The four arms are different and can be identified by a number engraved on each of them. Mount arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right. Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm and slightly drive both preceding screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm and slightly drive the **top rear screw only**. The position of the arm depends on the angle intended to be set, as shown in Figure 6. **Note:** It is recommended to select the 10° angle on the KARAI intended to be fixed to the M-BUMPi. In that way, the KARAI axis will be parallel to the M-BUMPi.

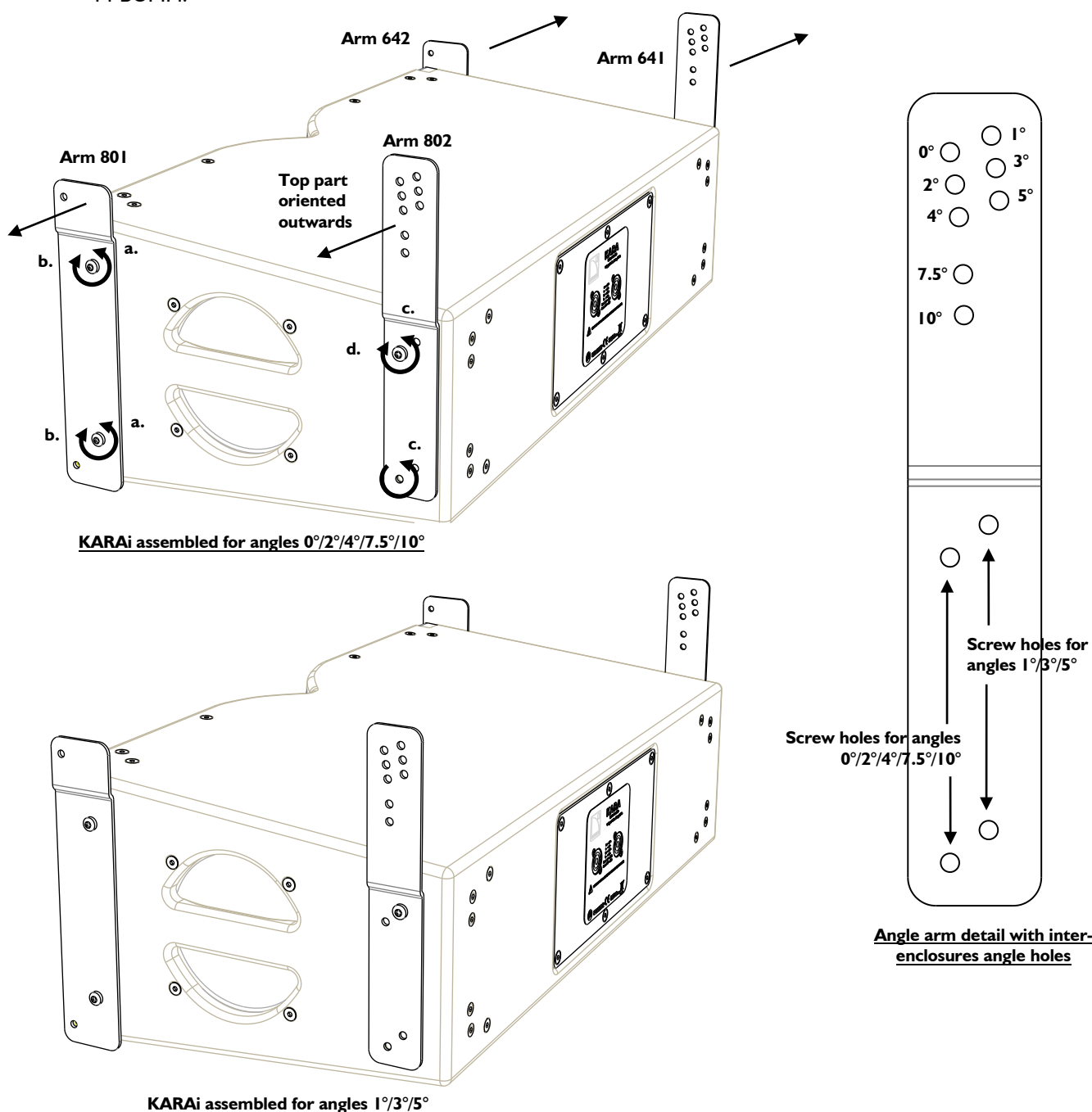
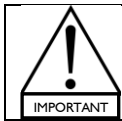
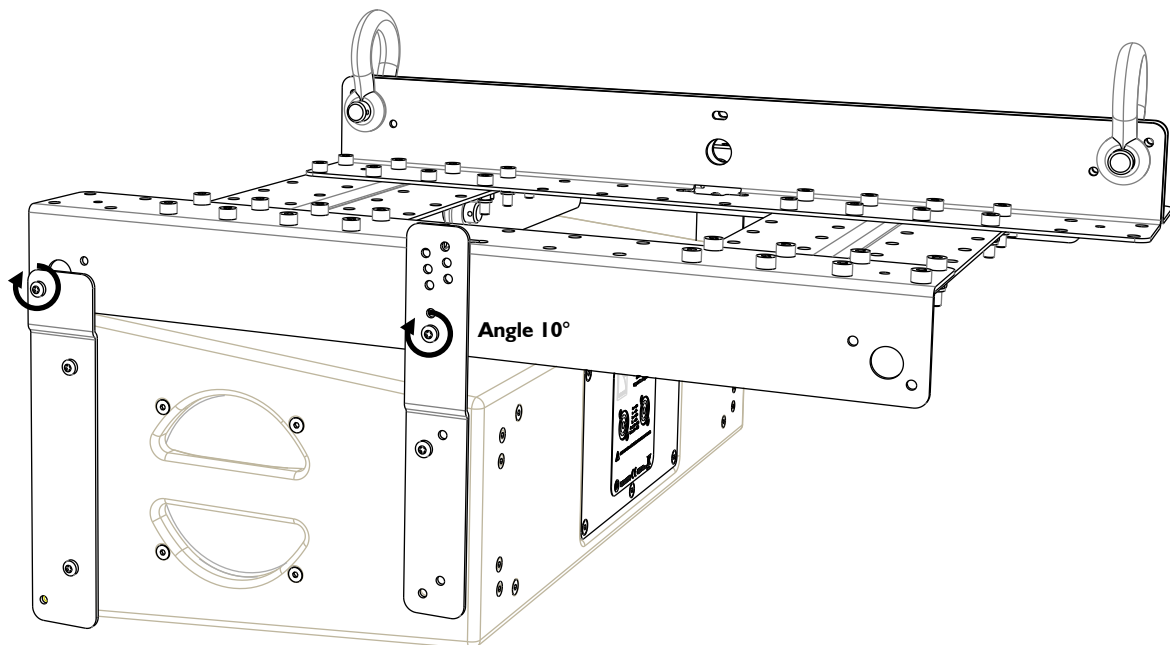


Figure 6: Mounting four arms to a KARAI

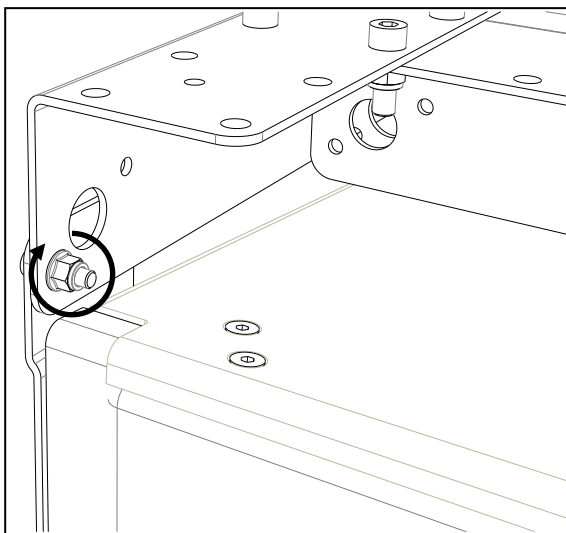
3. Attach KARAI#1 to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the KARAI#1 top link holes and the M-BUMPi link holes (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lbf).



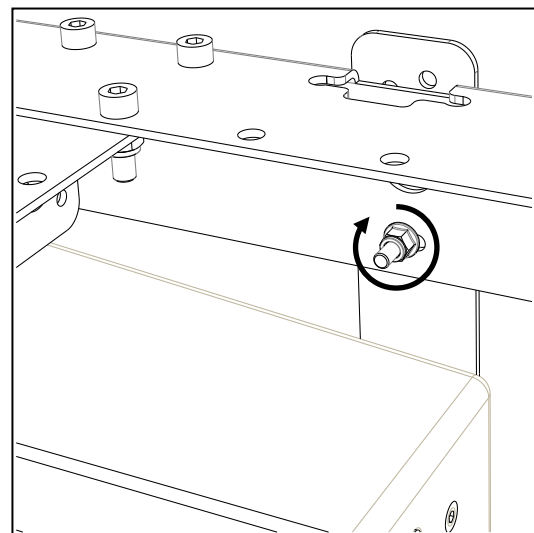
On each angle arm, select hole 10° (KARAI#1 projection axis parallel to the M-BUMPi).  
The angles values corresponding to the different holes are detailed in Figure 6.



Full view




Detailed view of the front left bolt

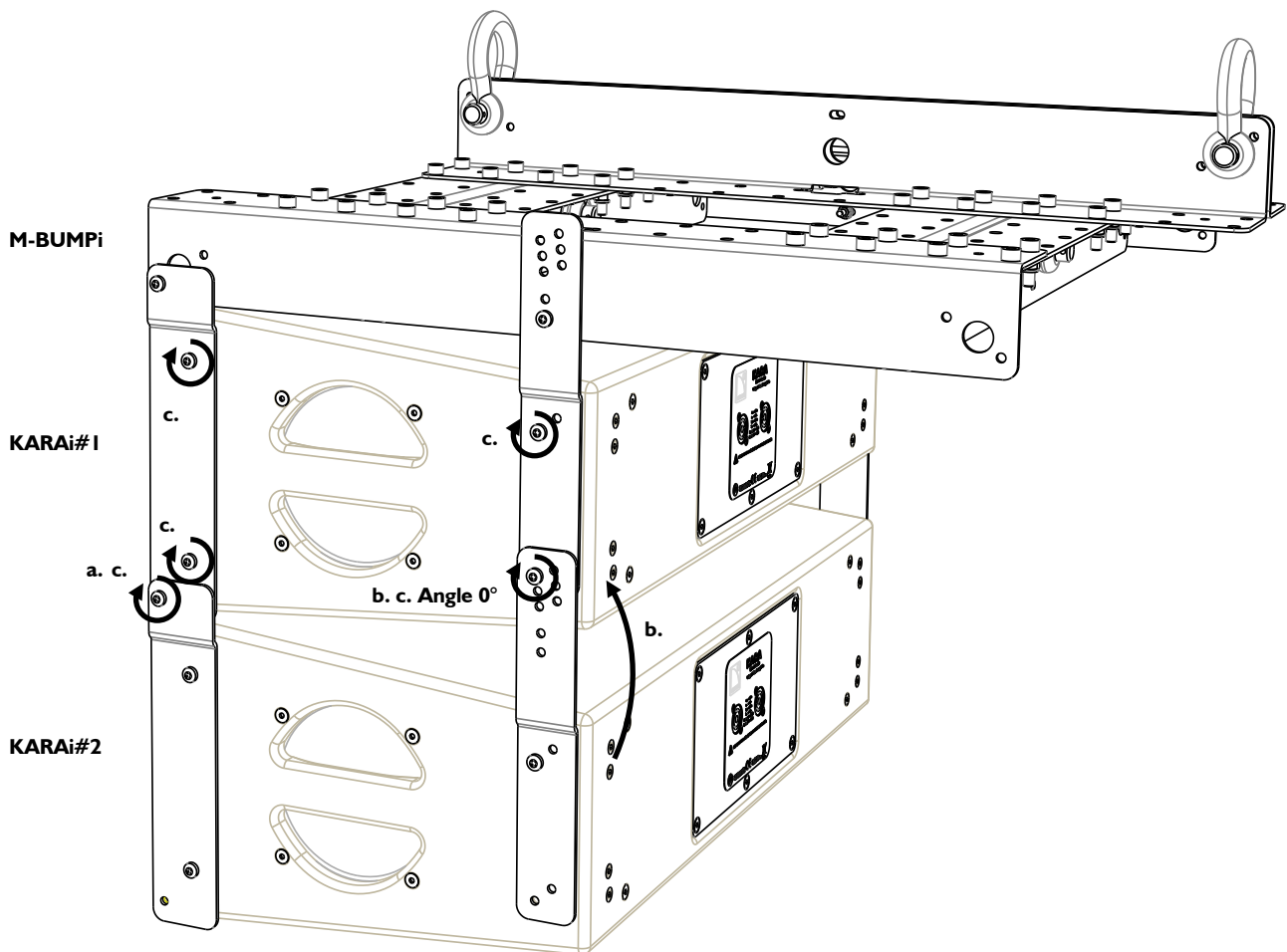


Detailed view of the rear left bolt

Figure 7: Attaching KARAI#1 to M-BUMPi

4. Mount four arms to a second KARAI (hereafter designated as KARAI#2) by applying step 2.
  5. Attach KARAI#2 to KARAI#1 as follows:
    - a. Position both KARAI#2 front top link holes face to both KARAI#1 front bottom link holes and secure each pair by slightly driving a 35 mm Torx® screw (T30 bit).
    - b. Rotate KARAI#2 so as to position its rear top link holes with both KARAI#1 rear bottom link holes and secure each pair by slightly driving a 55 mm Torx® screw (T30 bit).
- 

On both angle arms, select the holes corresponding to the angle intended to be set (refer to Figure 6).  
Figure 8 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).
- c. Fully drive the ten Torx® screws on KARAI#1 (T30 bit, 5 N.m/45 in.lbf).



**Figure 8: Attaching KARAI#2 to KARAI#1**

6. Repeat steps 4 and 5 until all KARAI enclosures composing the array are assembled.
7. Secure the fixation points on the bottom KARAI as follows (repeat on both sides of the enclosure):
  - a. Drive a 35 mm Torx<sup>®</sup> screw into the front bottom hole (T30 bit, 5 N.m/45 in.lbf).
  - b. Drive a 55 mm Torx<sup>®</sup> screw into the rear bottom hole (T30 bit, 5 N.m/45 in.lbf).
  - c. Fully drive the three remaining Torx<sup>®</sup> screws (T30 bit, 5 N.m/45 in.lbf).

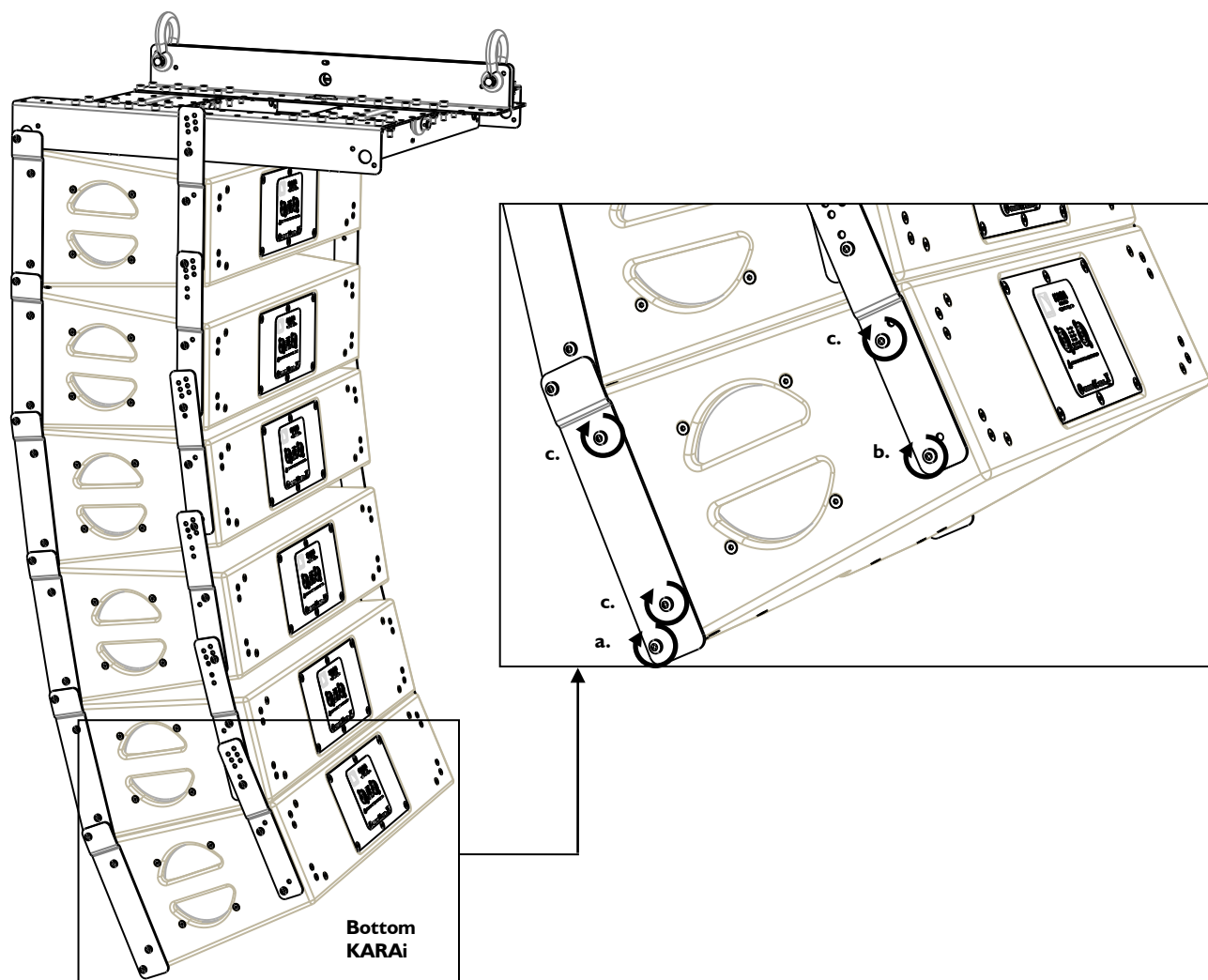
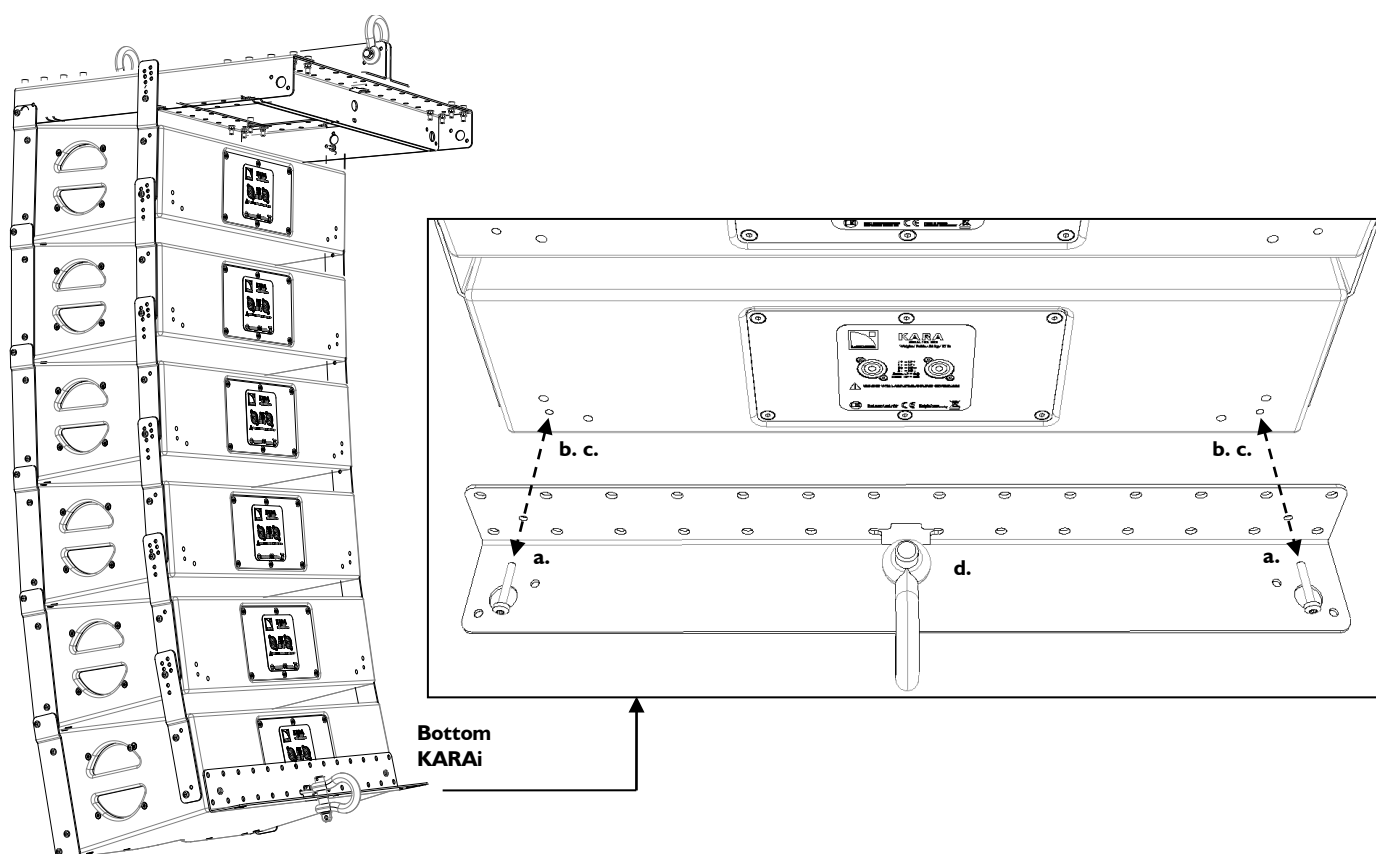
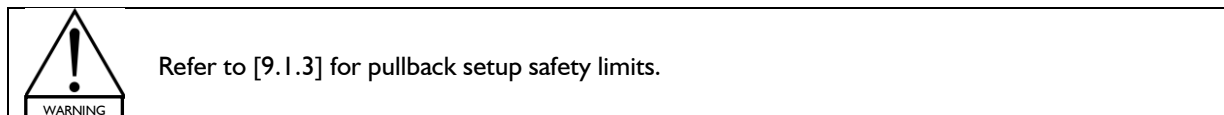


Figure 9: Example of KARAI standalone array

8. If the array is intended to be flown in pullback configuration, mount a M-BUMPi bar to the bottom KARAi as follows:
  - a. Undo the two flat-head Torx® screws on holes shown in Figure 10 (T30 bit).
  - b. Position an M-BUMPi bar face to both holes and drive two round-head 35 mm Torx® screws (included in the M-BUMPi package) (thread-locker, T30 bit, 7 N.m/63 in.lbf).
  - c. Attach a shackle to the rear center point of the bar.
  - d. Attach the hook or stinger of an additional motor to the shackle.



**Figure 10: Setting the array in pullback configuration**

9. Adjust the height and the site angle of the array [9.1.2].
10. Secure the M-BUMPi to the main rigging structure using two safety slings (not included).

### 6.1.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

## 6.2 Flying a SB18i/KARAI mixed array or a SB18i 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 KARAI enclosures (acoustic data not available for subwoofers).
- Calculate the M-BUMPi site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.



The M-BUMPi can fly an array of up to **4 SB18i/12 KARAI** or **8 SB18i** along with all loudspeaker cables (refer to the **KARAI and SB18i User manuals** [3.4]). However, this maximum number can decrease in line with the rigging option [9.1.1] and 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 loudspeaker system before installation.

### 6.2.2 Array assembling procedure

The following procedure describes how to assemble and fly a vertical SB18i/KARAI or SB18i array under an M-BUMPi. Flying a SB18i/KARAI mixed array also requires using the KARAI SB18LINK accessories.



All along the procedure:

Strictly follow the sequence of the successive steps.

Systematically verify that each bolt and screw is fully driven to the torque value given in this manual.

Systematically verify that the axis is fully driven on each shackle.



Use a strain relief to avoid mechanical stress at the connector locations due to cable weight.

For clarity purposes:

The loudspeaker cabling procedure will not be described.

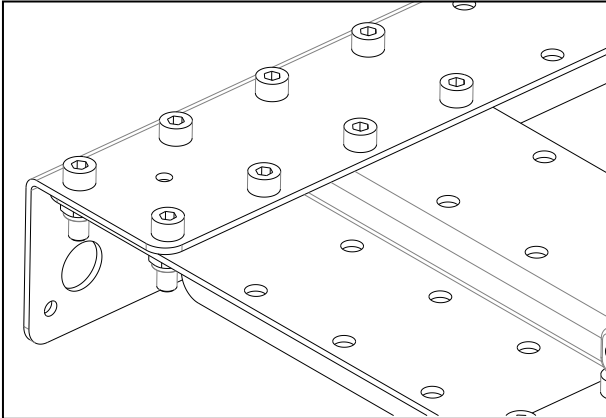
The loudspeaker cables and the external rigging system will not be represented on the figures.

### **Required components and tools**

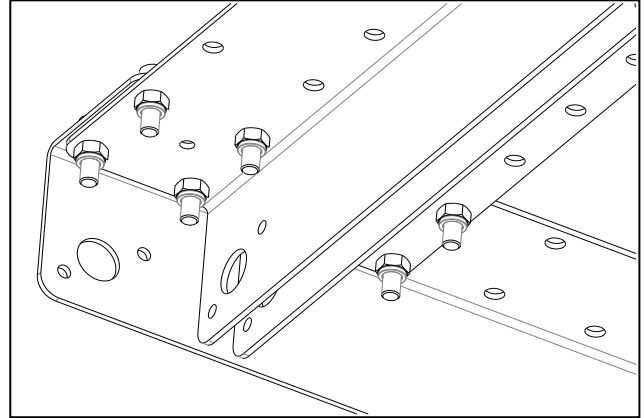
M-BUMPi, KARAI SB18LINK, electric screwdriver with torque selector (N.m or in.lbf), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, KR LOCKBLUE (medium-strength thread-locker, optional, for pullback configuration).

## Procedure

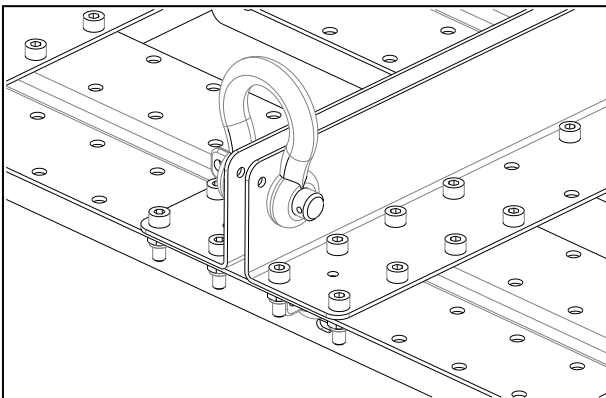
- I. After having selected a **rigging option** [9.1.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 11 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb.) while ensuring that the frame is square.
  - c. Attach the shackles as shown in the bottom left box of Figure 11.



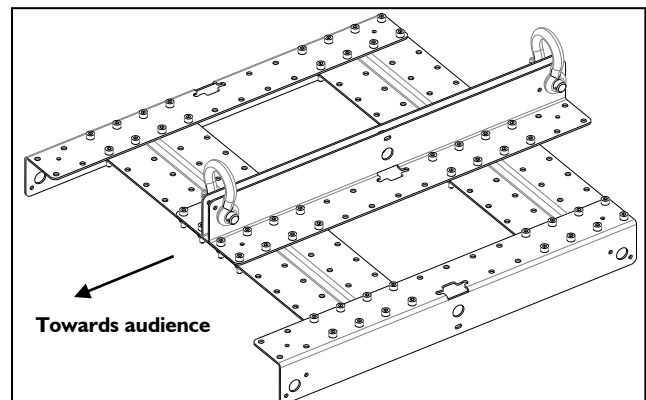
Driving bolts (top view)



Driving bolts (bottom view)



Attaching a shackle



Example of dual-point rear extension configuration

Figure 11: Assembling M-BUMPi for flying

2. Mount four arms to a first SB18i (hereafter designated as SB18i#1) as follows (repeat on each corner of the enclosure):
  - a. Undo the five 35 mm Torx® screws on a corner of SB18i#1 (T30 bit).
  - b. Position an arm as shown in Figure 12 and slightly drive the **four top screws only**. **Note:** The four arms are identical and can be identified by number 611 engraved on each one.



Orient the top part of each arm outwards.

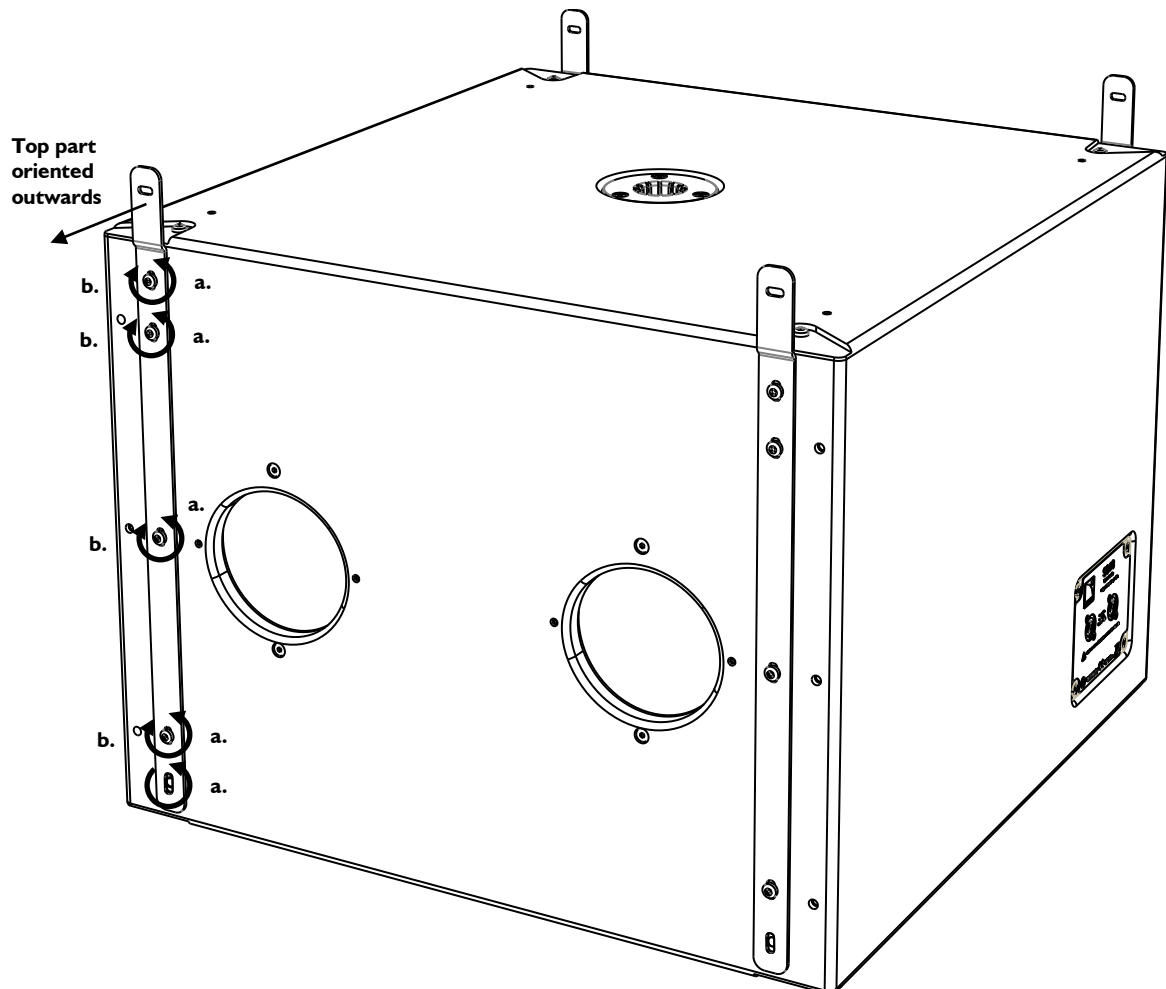
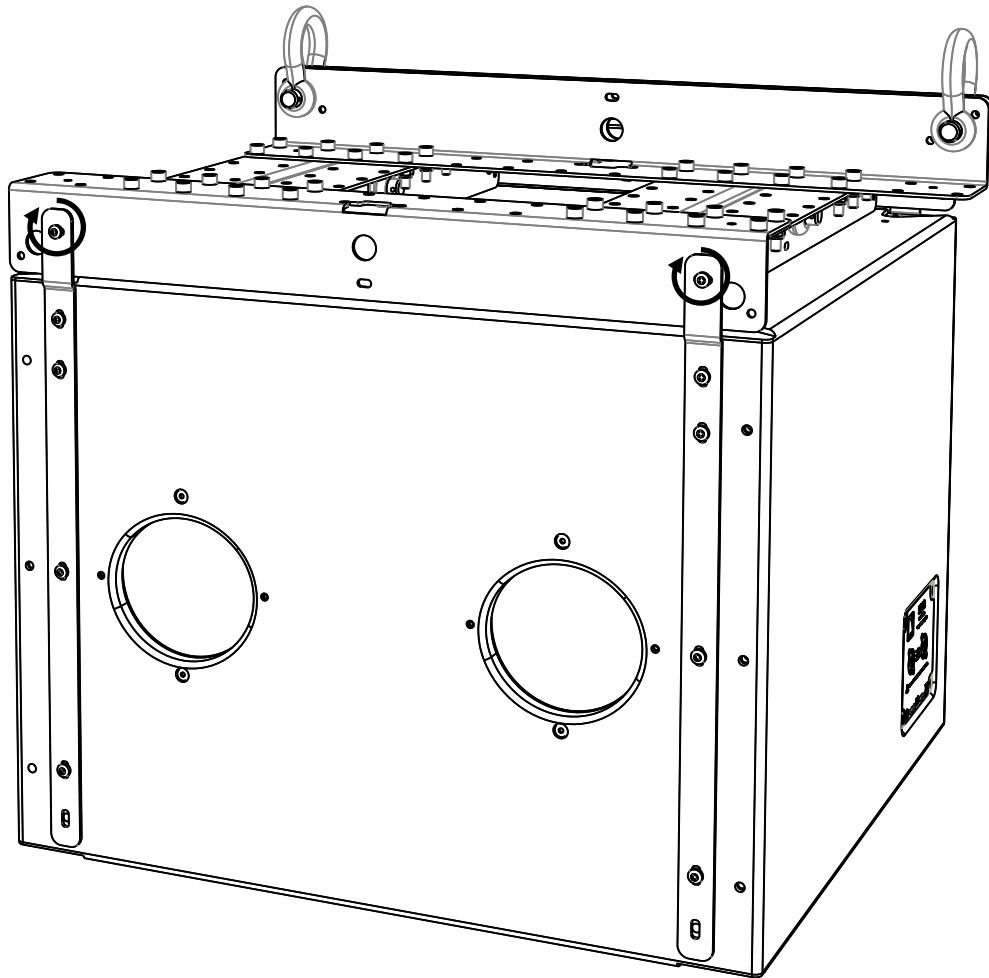


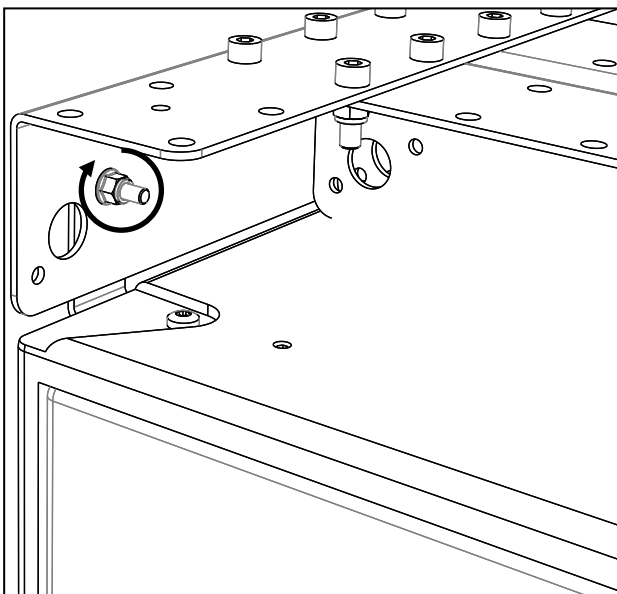
Figure 12: Mounting four arms to a SB18i



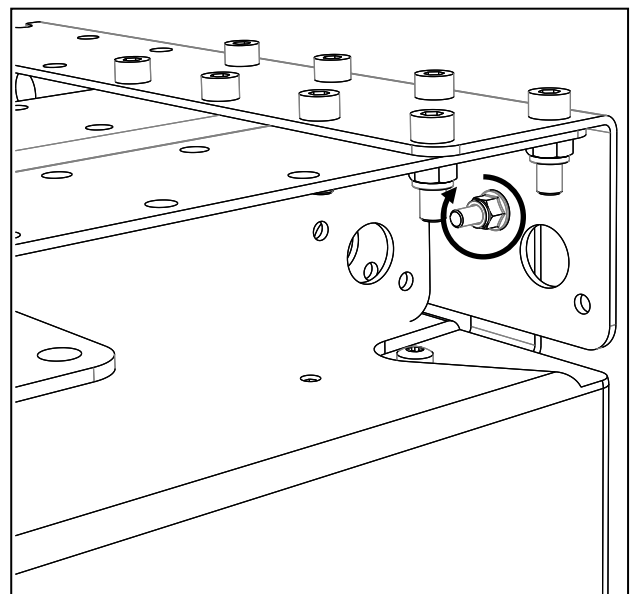
3. Attach SB18i#1 to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the SB18i#1 top link holes and the M-BUMPi link holes (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lbf).



Full view



Detailed view of the front left bolt



Detailed view of the rear left bolt

**Figure 13: Attaching SB18i#1 to the M-BUMPi**

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

## RIGGING PROCEDURES

VERSION 2.1

4. Mount four arms to a second SB18i (hereafter designated as SB18i#2) by applying step 2.
5. Attach SB18i#2 to SB18i#1 as follows:
  - a. Position the four SB18i#2 top link holes face to the four SB18i#1 bottom link holes and secure each pair by driving a 35 mm Torx<sup>®</sup> screw (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Fully drive the four remaining Torx<sup>®</sup> screws on each SB18i#1 arm (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).

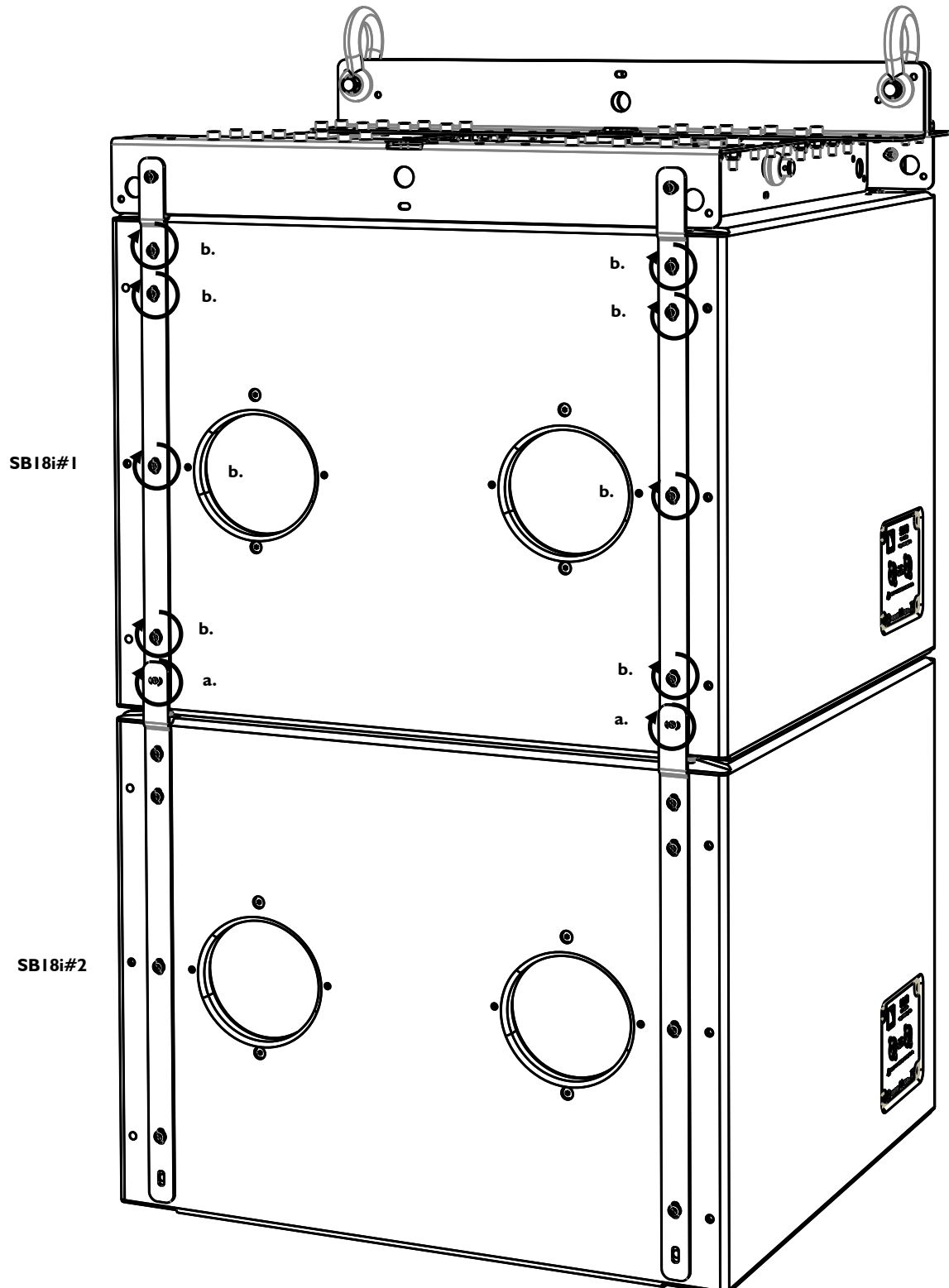


Figure 14: Attaching SB18i#2 to SB18i#1

6. Repeat steps 4 and 5 until all SB18i enclosures composing the array are assembled.

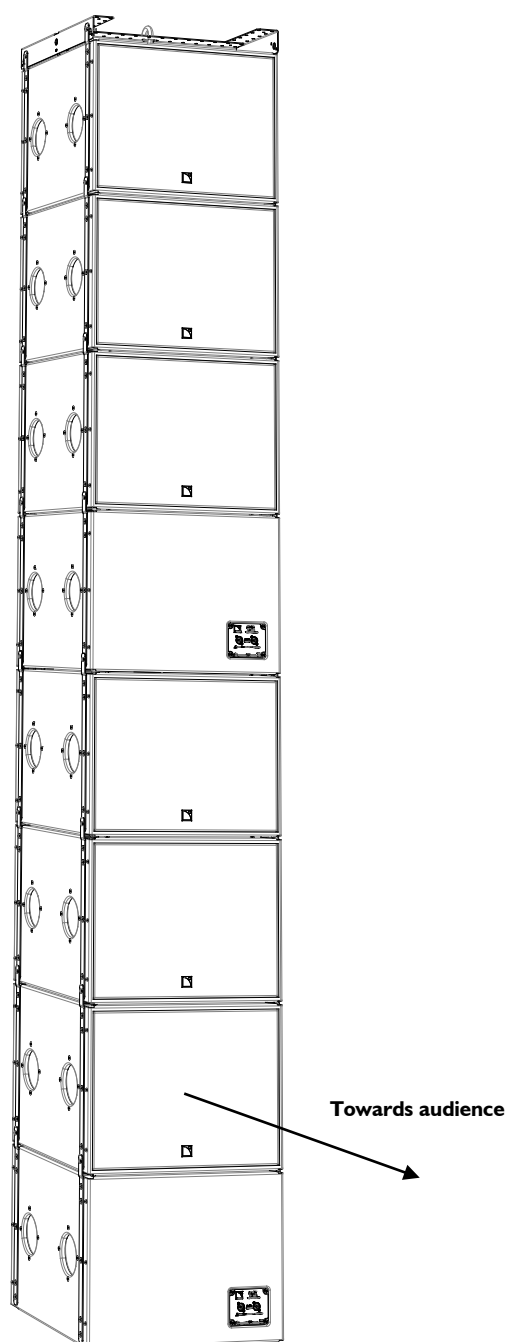


Turn the front grills of all SB18i composing the array towards the audience to obtain an **omnidirectional** acoustic pattern or turn one SB18i every four from front to rear to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]). As an example, Figure 15 shows a cardioid array.

7. If the array is intended to be a SB18i standalone array, apply the following procedure:

- On the bottom SB18i, drive a 35 mm Torx® screws into each of the four bottom holes (T30 bit, 5 N.m/45 in.lbf).
- Raise the array to the chosen height.
- Secure the M-BUMPi to the main rigging structure using two safety slings (not included).

**PROCEDURE END**



**Figure 15: Example of SB18i standalone array (rigging option 0 [9.1.1])**

If the array is intended to be a SB18i/KARAI mixed array, mount two KARAI SB18LINK to a first KARAI (hereafter designated as KARAI#1) as follows (repeat on each side of the enclosure):



The two KARAI SB18LINK components are symmetric about the enclosure central axis. They are differentiated by a number engraved on each of them. Mount component 640 on the right and 917 on the left.

- a. Undo the four 55 mm Torx® screws on a side of the KARAI (T30 bit).
- b. Position the appropriate KARAI SB18LINK and slightly re-drive three screws (do not re-drive the rear bottom one).

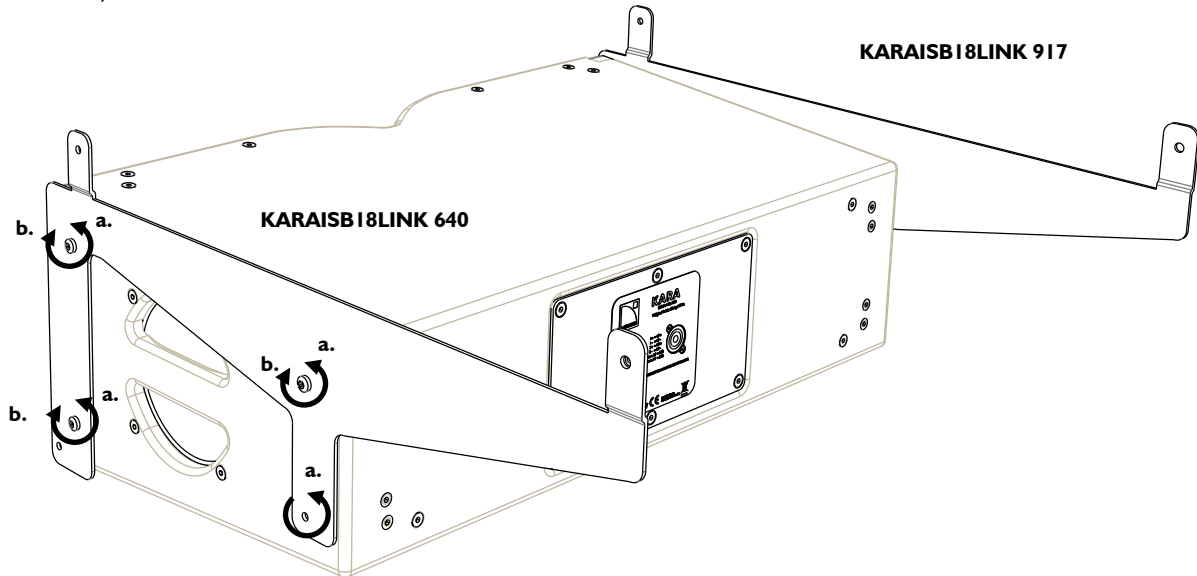


Figure 16: Mounting two KARAI SB18LINK to KARAI#1

8. Attach KARAI#1 to the bottom SB18i as follows:
  - a. Position the four KARAI SB18LINK top link holes face to the four SB18i bottom link holes and secure each pair by driving a 35 mm Torx® screw (T30 bit, 5 N.m/45 in.lbf).
  - b. Fully drive the four remaining Torx® screws on each SB18i arm (T30 bit, 5 N.m/45 in.lbf).

**Note:** The KARAI#1 and SB18i front faces will be parallel.

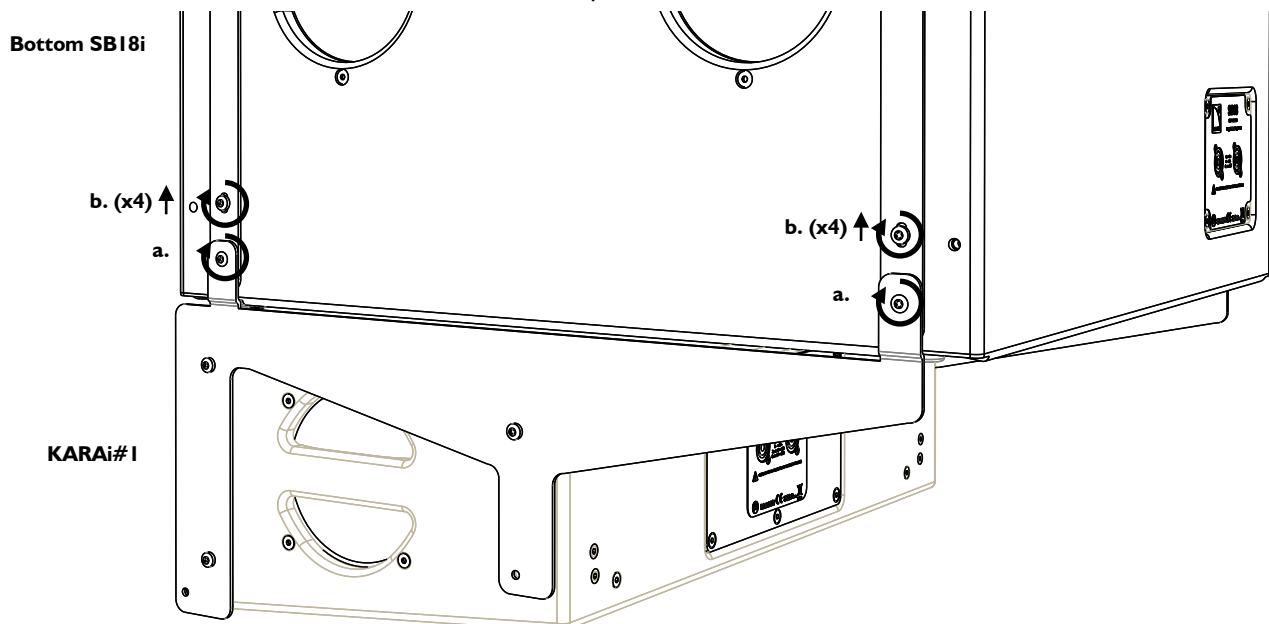


Figure 17: Attaching KARAI#1 to the bottom SB18i

9. Apply procedure [6.1.2, step 4 to 10].

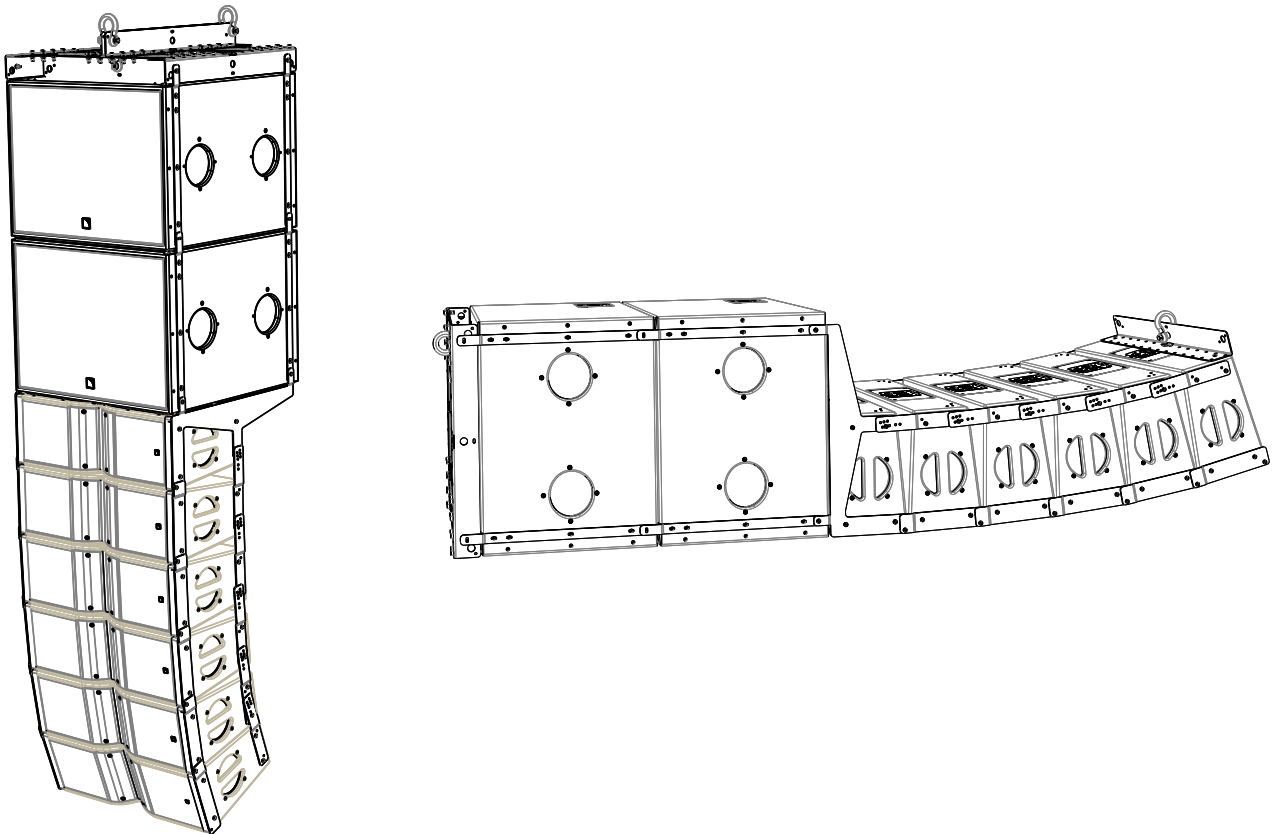


Figure 18: Examples of SB I8i/KARAI mixed arrays

### 6.2.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

### 6.3 Stacking a KARAI standalone array

#### 6.3.1 Modeling and safety

A KARAI array must be stacked onto an M-BUMPi platform (**platform stacked array**).

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 KARAI enclosures.
- Calculate the inter-enclosure angles.



A **platform stacked array** requires to be installed on a perfectly plane and horizontal surface. It can be composed of a maximum of **9 KARAI** enclosures along with all loudspeaker cables (refer to the **KARAI User manual** [3.4]).

The platform must be installed in **rear extension** configuration if the KARAI array is intended to have a **null** site angle (refer to [9.2.1]).

The platform must be installed in **front extension** configuration if the KARAI array is intended to have a **negative** site angle (refer to [9.2.1]) and a **flat** shape (all inter-enclosure angles are close to 0°).

#### 6.3.2 Array assembling procedure

The following procedure describes how to assemble a vertical KARAI **platform stacked array**.



All along the procedure:

Strictly follow the sequence of the successive steps.

Systematically verify that each bolt and screw is fully driven to the torque value given in this manual.



For clarity purposes:

The loudspeaker cabling procedure will not be described.

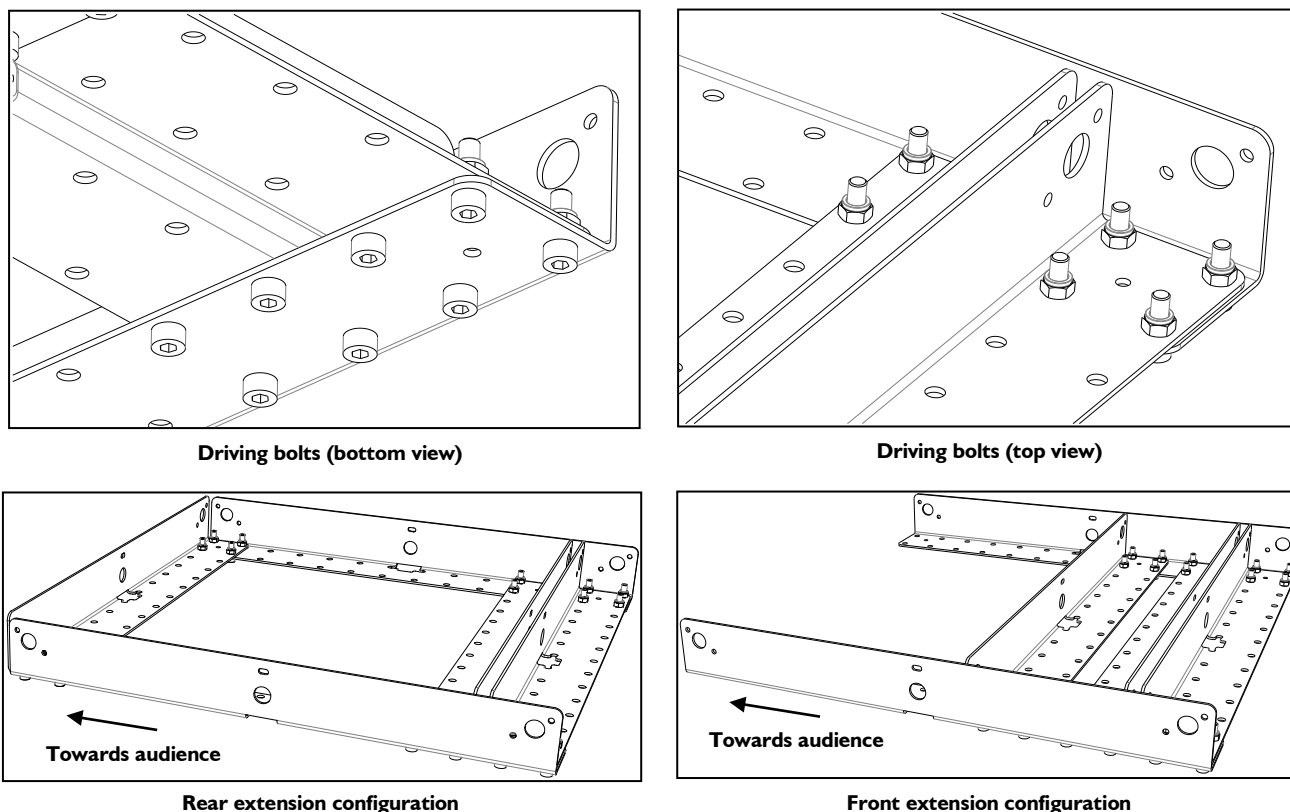
The loudspeaker cables will not be represented on the figures.

#### **Required components and tools**

M-BUMPi, electric screwdriver with torque selector (N.m or in.lb<sub>f</sub>), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, one piece of carpet of 700 x 700 mm (not included), additional support and fixing material (not included).

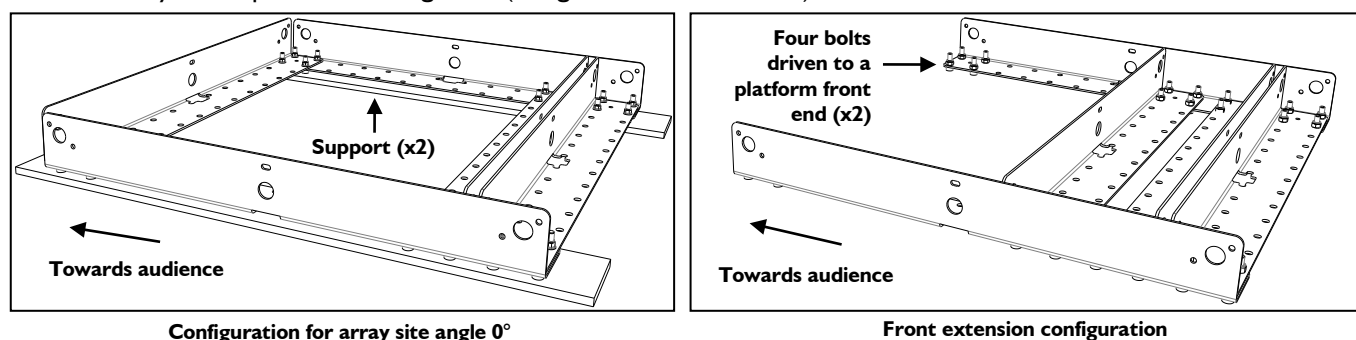
## Procedure

1. After having selected a **platform configuration** [9.2.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 19 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb<sub>f</sub>) while ensuring that the frame shape remains square.



**Figure 19: Assembling the M-BUMPi platform**

2. Position the piece of carpet at the stacking location and position the M-BUMPi on it by applying the following recommendations:
  - a. Respect the final orientation as shown in the bottom left or right box of Figure 19.
  - b. If the bottom KARAi site angle is intended to be 0° (see the left box of Figure 20), raise the platform to approximately 10 mm (support material not included).
  - c. In case of M-BUMPi front extension configuration (see the right box of Figure 20), drive four self-locking M8 hex bolts to both platform front ends to keep it in horizontal position (bolts included in the M-BUMPi package, 6 mm hex bit, 13 mm hex key, 5 N.m/45 in.lb<sub>f</sub>).
  - d. Firmly fix the platform to the ground (fixing material not included).



**Figure 20: Positioning the stacking platform**

3. Mount four arms to a first KARAI (hereafter designated as KARAI#1) as follows (repeat on each enclosure side):



The four arms are different and can be identified by a number engraved on each of them. Mount arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right.

Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm and slightly drive both preceding screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm and slightly drive the **top rear screw only**. The position of the arm depends on the angle intended to be set [9.2.2], as shown in Figure 21.

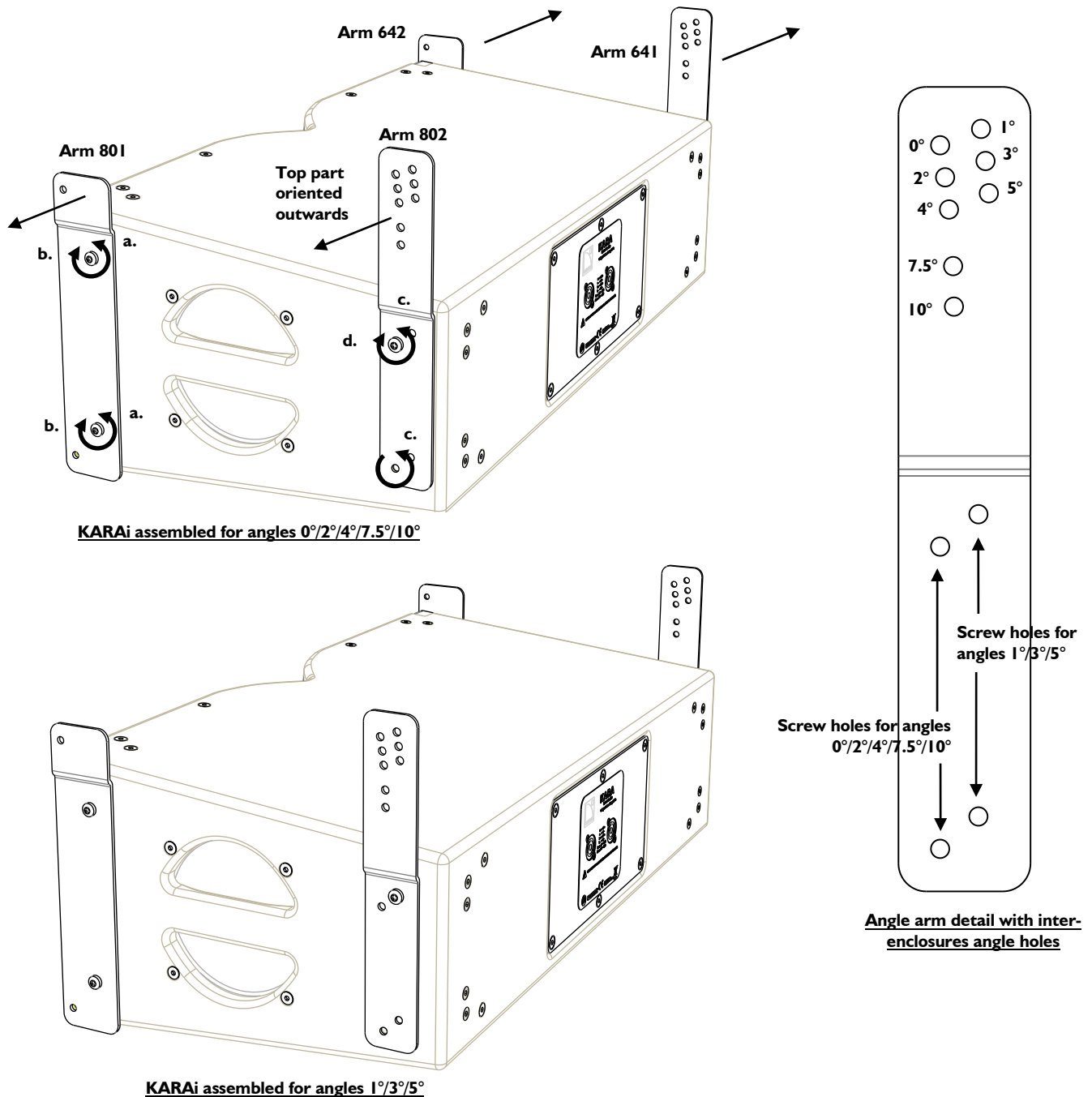
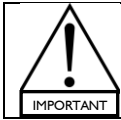


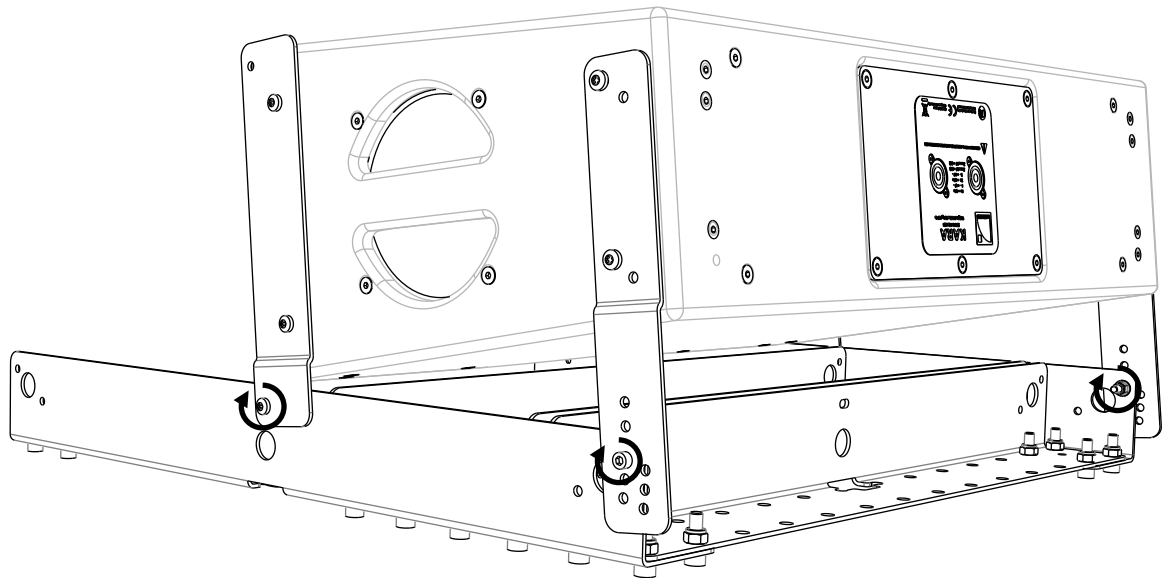
Figure 21: Mounting four arms to a KARAI



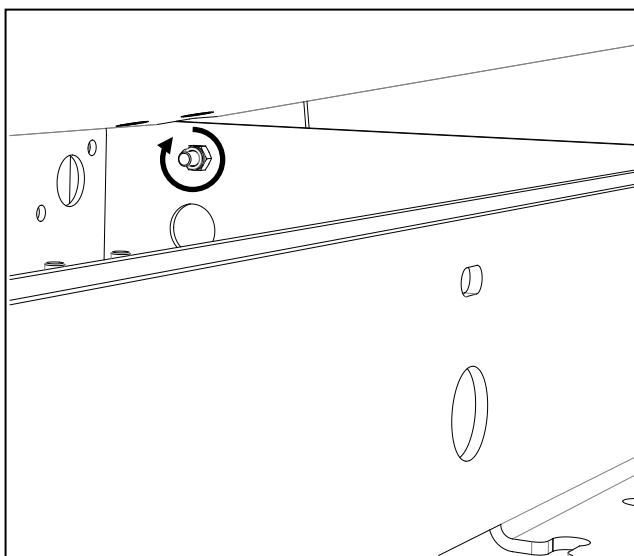
4. Position KARAi#1 upside down and attach it to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the KARAi#1 bottom link holes and the M-BUMPi link holes (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lbf).



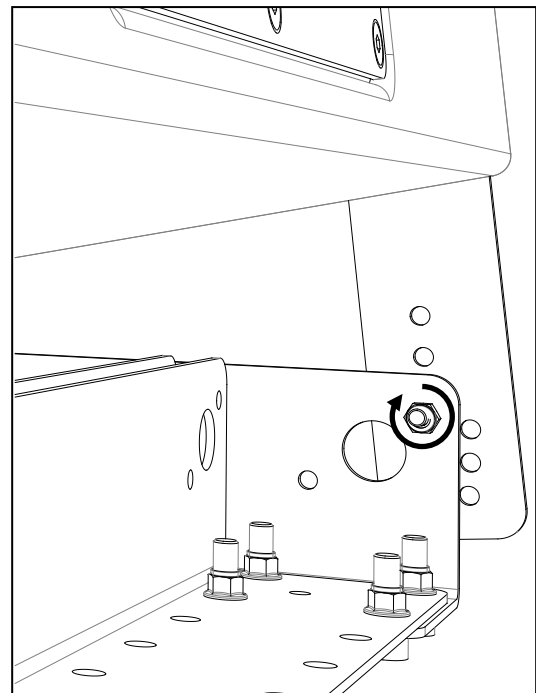
On each angle arm, select the angle hole corresponding to the chosen site angle [9.2.2].  
The angles corresponding to the different holes are detailed in Figure 21.



Full view



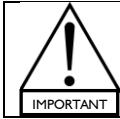
Front bolt detailed view



Rear bolt detailed view

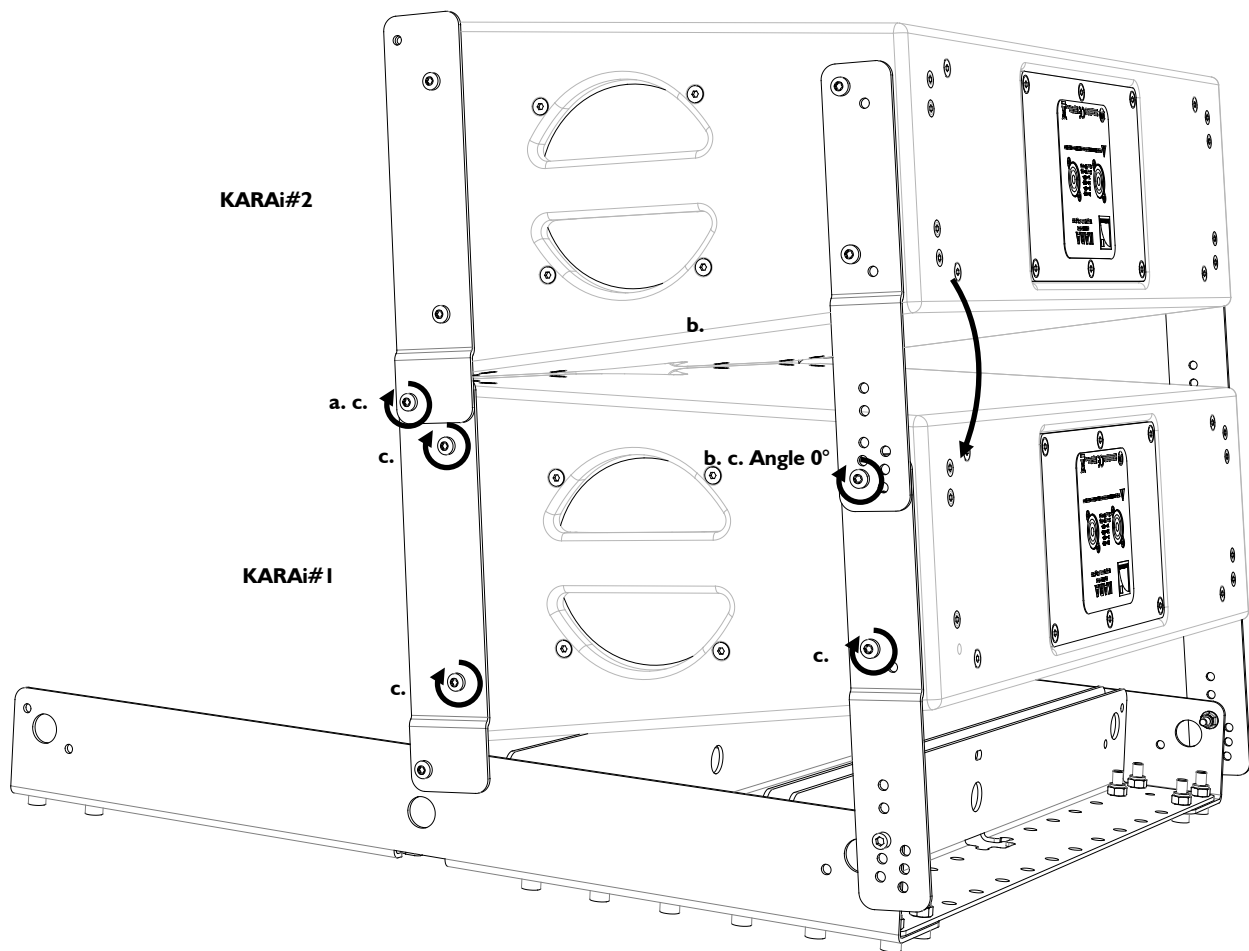
Figure 22: Attaching KARAi#1 to M-BUMPi (front extension configuration example)

5. Mount four arms to a second KARAI (hereafter designated as KARAI#2) by applying step 3.
6. Position KARAI#2 upside down and attach it to KARAI#1 as follows:
  - a. Position both KARAI#2 front bottom link holes with both KARAI#1 front top link holes and secure each pair by slightly driving a 35 mm Torx<sup>®</sup> screw (T30 bit).
  - b. Rotate KARAI#2 so as to position its rear bottom link holes with both KARAI#1 rear top link holes and secure each pair by slightly driving a 55 mm Torx<sup>®</sup> screws (T30 bit).



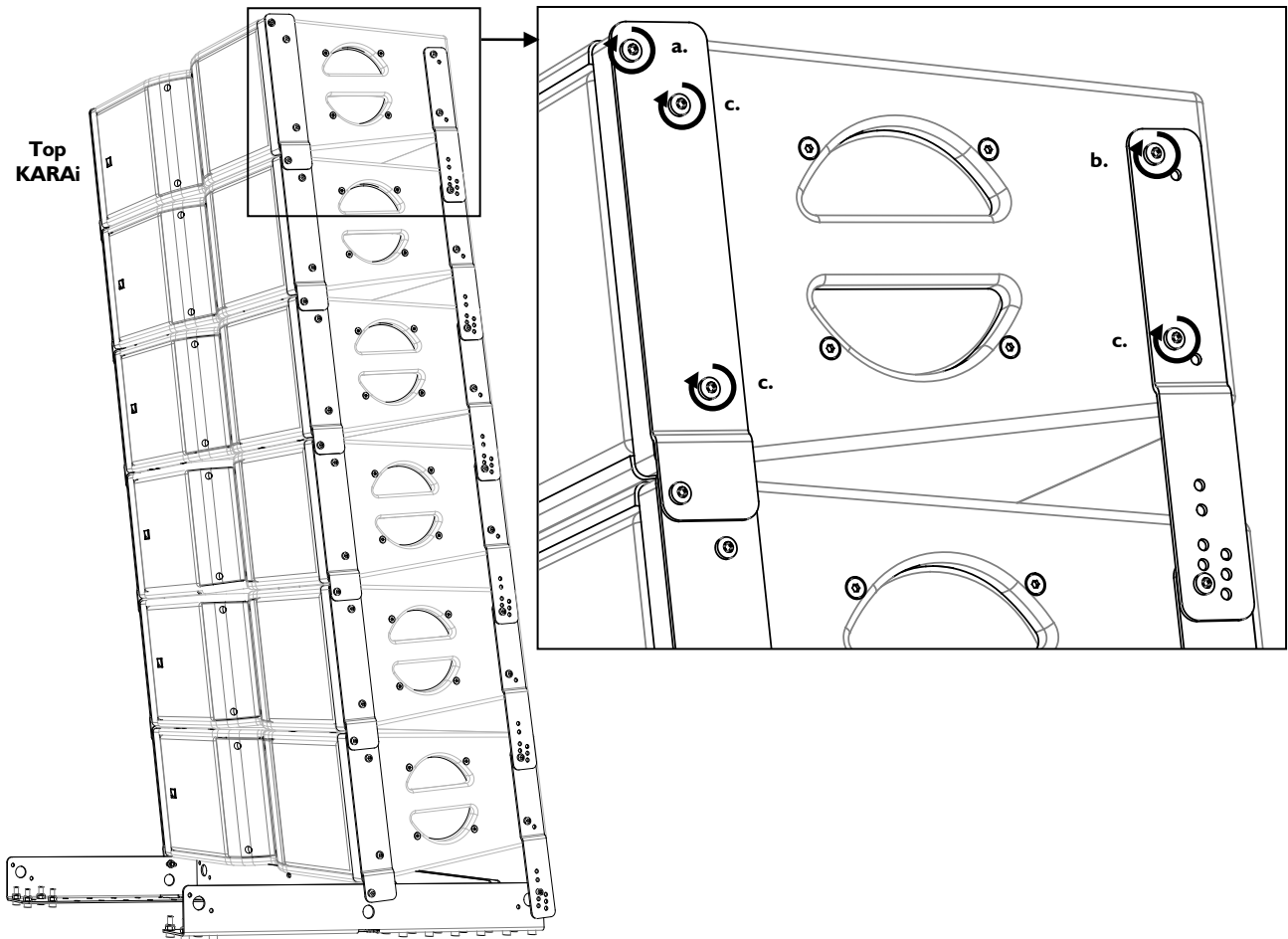
On both angle arms, select the holes corresponding to the angle intended to be set (refer to Figure 21).  
Figure 23 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).

- c. Fully drive the ten Torx<sup>®</sup> screws on KARAI#1 (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



**Figure 23: Attaching KARAI#2 to KARAI#1**

7. Repeat steps 5 and 6 until all KARAI enclosures composing the array are assembled.
8. Secure the fixation points on the top KARAI as follows (repeat on both enclosure sides):
  - a. Drive a 35 mm Torx® screw into the front top hole (T30 bit, 5 N.m/45 in.lbf).
  - b. Drive a 55 mm Torx® screw into the rear top hole (T30 bit, 5 N.m/45 in.lbf).
  - c. Fully drive the three remaining Torx® screws (T30 bit, 5 N.m/45 in.lbf).



**Figure 24: Example of KARAI standalone array**

### 6.3.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

## 6.4 Stacking a SB18i/KARAI mixed array or a SB18i standalone array

### 6.4.1 Modeling and safety

A SB18i/KARAI mixed array or a SB18i standalone array must be stacked directly on the ground (**ground stacked array**).

Any SB18i/KARAI **ground 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 KARAI enclosures (acoustic data not available for subwoofers).
- Calculate the inter-enclosure angles.



A **ground stacked array** requires to be installed on a perfectly plane and horizontal surface. It can be composed of a maximum of **4 SB18i/9 KARAI** or **4 SB18i** enclosures within the setup safety limits given in Table 2 regarding the angle between the top SB18i and the bottom KARAI (refer to [9.2.2] to obtain the array site angle corresponding to the chosen angle value):

**Table 2: Ground stacked SB18i/KARAI array safe configurations**

Number of SB18i	Number of KARAI	Bottom KARAI authorized angle range
1	1 - 2	From -10° to 0°
	3 - 9	From -5° to 0°
2	1 - 8	From -10° to 0°
	9	From -7.5° to 0°
3 - 4	1 - 9	From -10° to 0°

### 6.4.2 Array assembling procedure

The following procedure describes how to assemble and stack a vertical SB18i/KARAI mixed array or a vertical SB18i standalone array.



All along the procedure:  
 Strictly follow the sequence of the successive steps.  
 Systematically verify that each bolt and screw is fully driven to the torque value given in this manual.



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

### Required components and tools

Electric screwdriver with torque selector (N.m or in.lb), T30 Torx® bit, 5 mm hex bit, 10 mm hex key, two M-BUMPi bars and four M6 washers (for mixed arrays).

## Procedure

- I. Mount four arms to a first SB18i (hereafter designated as SB18i#1) as follows (repeat on each corner of the enclosure):
  - a. Undo the five 35 mm Torx® screws on a corner of SB18i#1 (T30 bit).
  - b. Position an arm as shown in Figure 25 and slightly drive the five screws. **Note:** The four arms are identical and can be identified by number 611 engraved on each one.

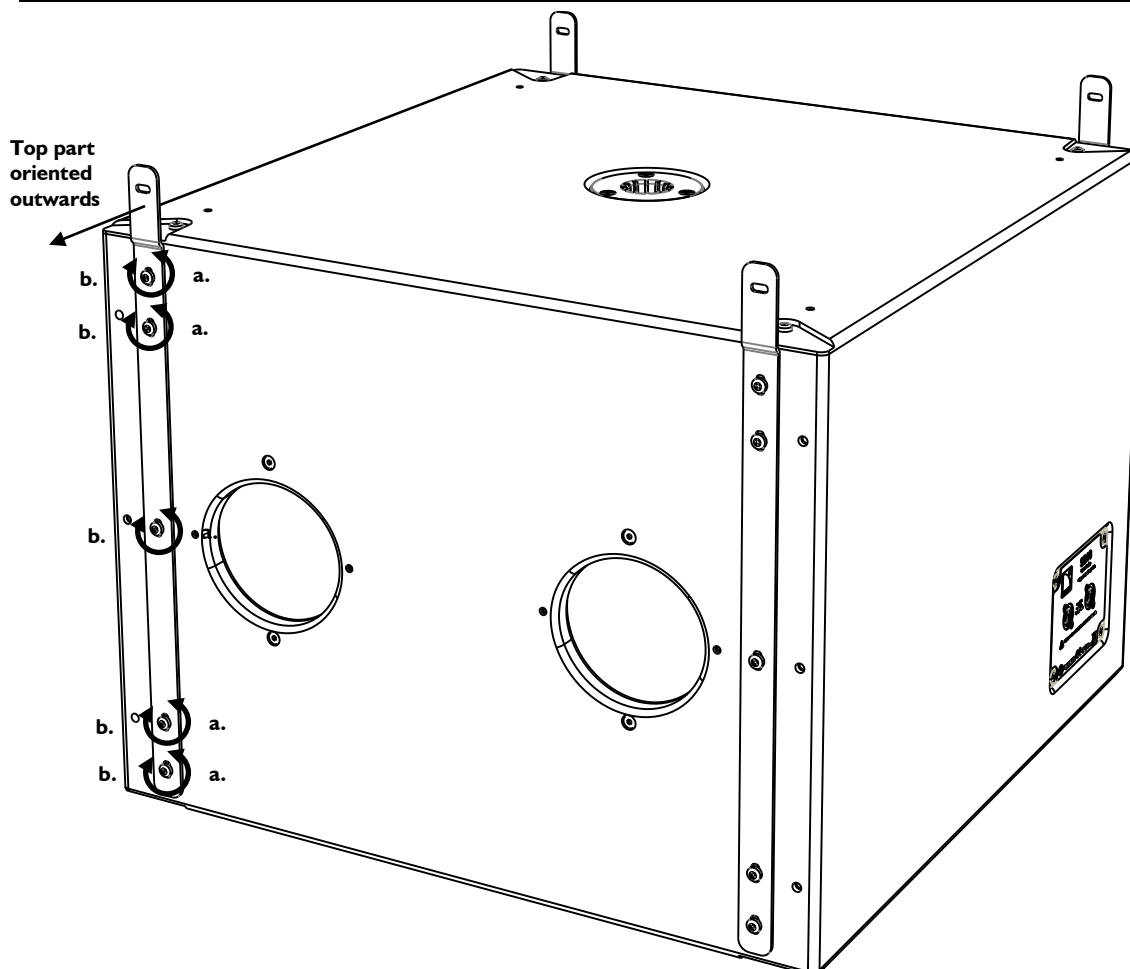
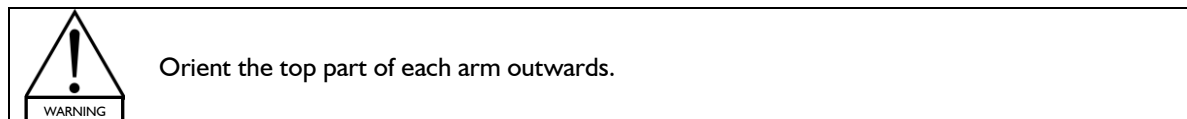


Figure 25: Mounting four arms to a first SB18i

2. Mount four arms to a second SB18i (hereafter designated as SB18i#2) by applying step I **without re-driving the bottom screws.**

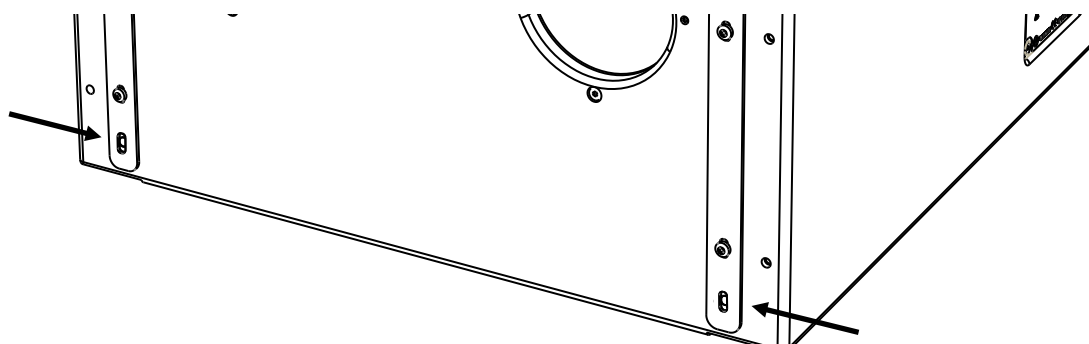


Figure 26: Mounting four arms to a second SB18i

3. Attach SB18i#2 to SB18i#1 as follows:
  - a. Position the four SB18i#2 bottom link holes face to the four SB18i#1 top link holes and secure each pair by driving a 35 mm Torx<sup>®</sup> screw (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Fully drive the five remaining Torx<sup>®</sup> screws on each SB18i#1 arm (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



Turn the front grills of all SB18i composing the array towards the audience to obtain an **omnidirectional** acoustic pattern or turn one SB18i every four from front to rear to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]). As an example, Figure 28 shows a cardioid array.

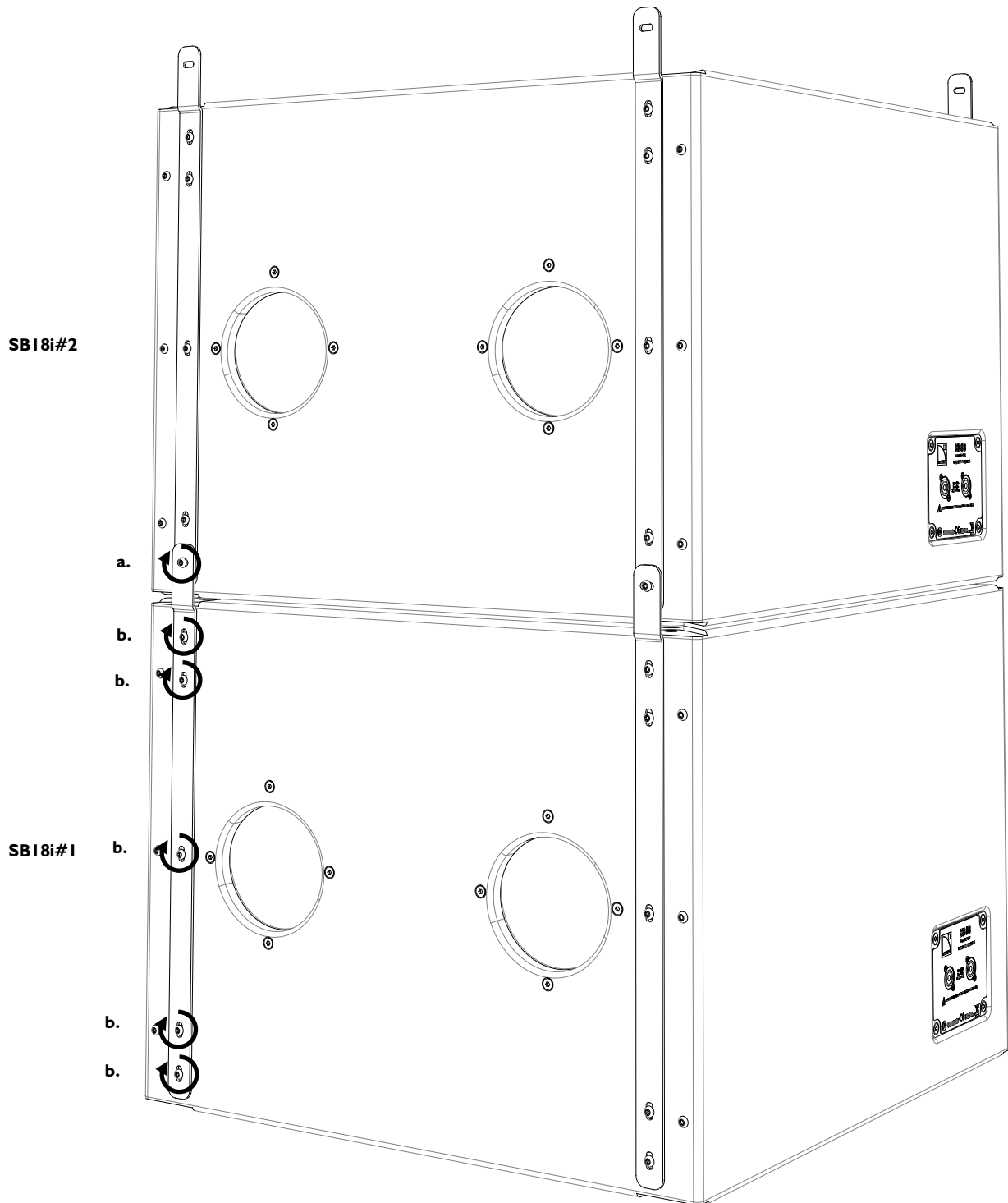
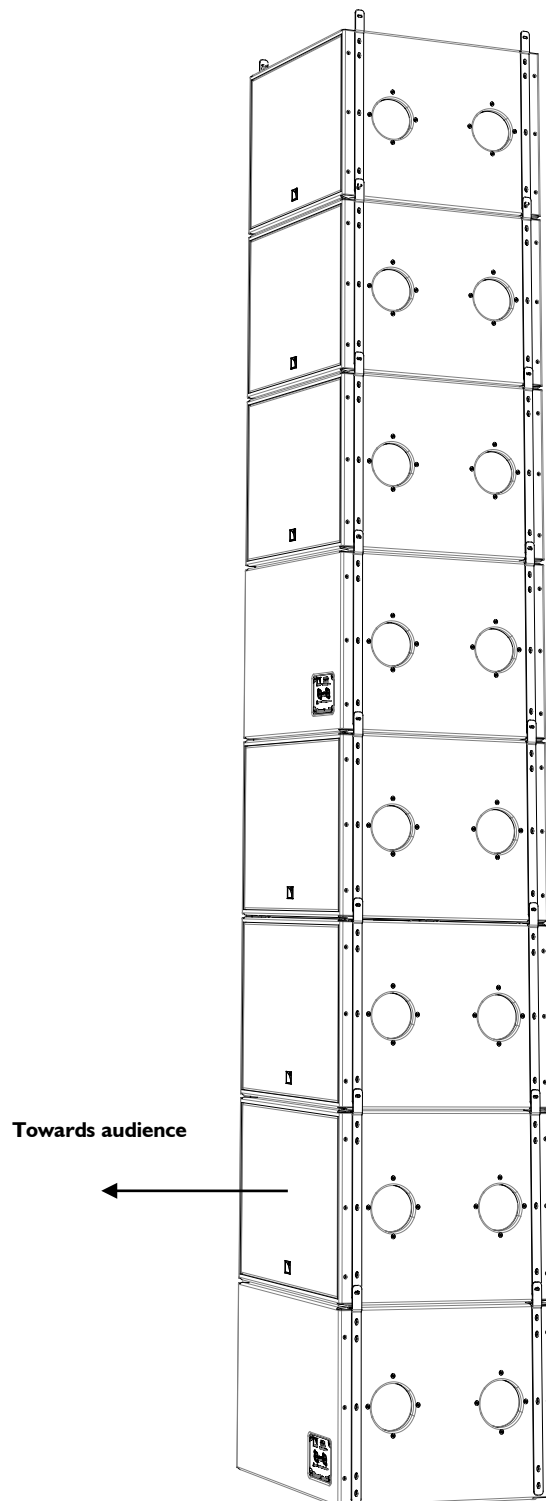


Figure 27: Attaching SB18i#2 to SB18i#1

4. Repeat steps 2 and 3 until all SB I 8i enclosures composing the array are assembled.
5. If the array is intended to be a SB I 8i standalone array, apply the following procedure:
  - a. Fully drive all Torx® screws on the four arms of the top SB I 8i enclosure (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Secure the array to a fixed point by using a ratchet strap or any other equivalent material (not included).

**PROCEDURE END**



**Figure 28: Example of SB I 8i standalone array**

If the array is intended to be a SB18i/KARAI mixed array, attach two M-BUMPi bars to the top SB18i as follows (repeat on each enclosure side):

- a. Position the M-BUMPi bar face to two SB18i arms as shown in Figure 29, and secure it by driving two self-locking M6 hex bolts (included in the M-BUMPi package) (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lbf).
- b. Fully drive all Torx® screws on the enclosure side (T30 bit, 5 N.m/45 in.lbf).

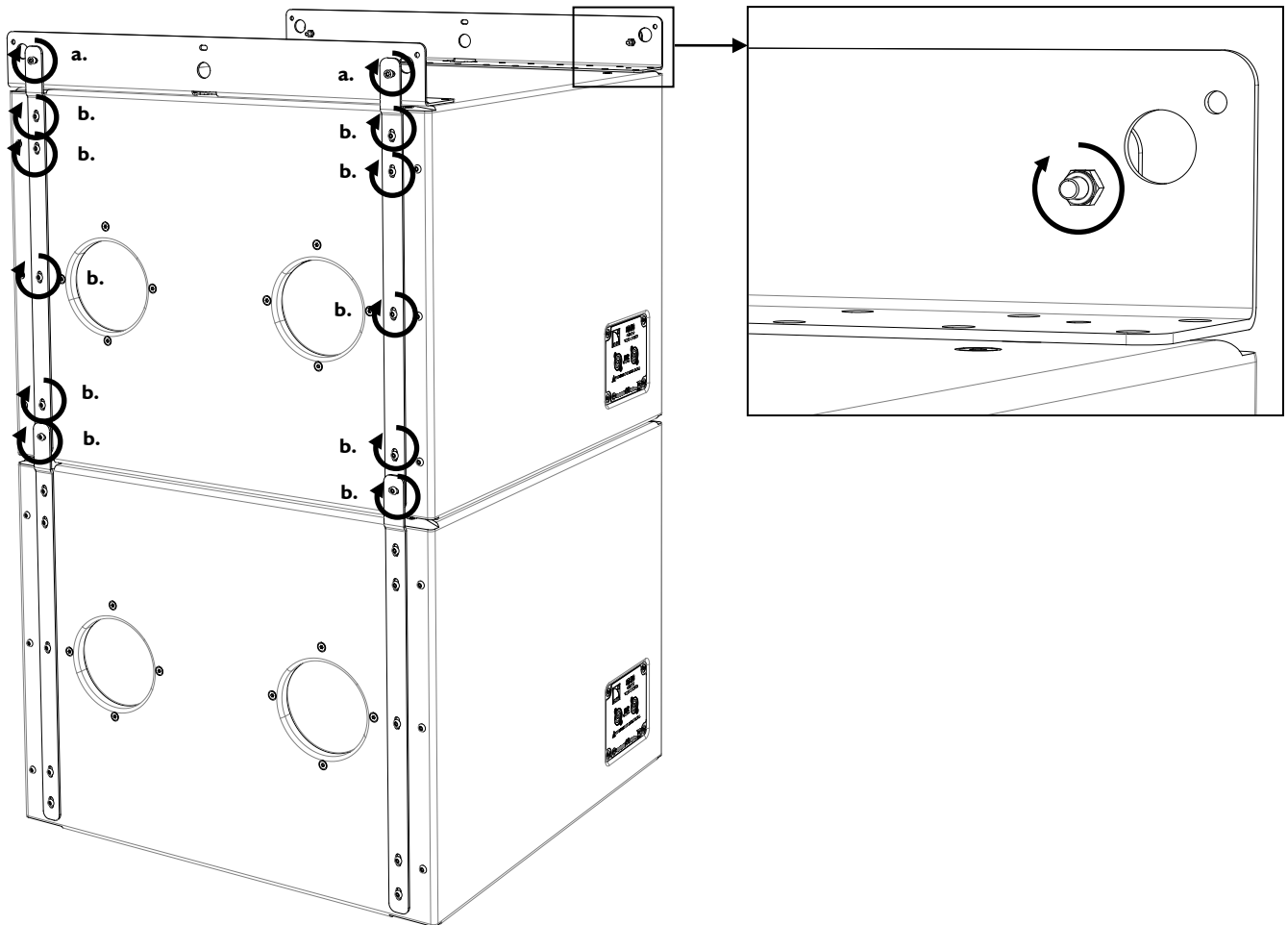


Figure 29: Attaching two M-BUMPi bars to the top SB18i



For clarity purposes, the procedure is continued with an array composed of one SB18i enclosure.



6. Mount four arms to a first KARAI (hereafter designated as KARAI#1) as follows (repeat for each enclosure side):



The four arms are different and can be identified by a number engraved on each of them. Mount arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right. Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm and slightly drive both preceding screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm and slightly drive the **top rear screw only**. The position of the arm depends on the angle intended to be set [9.2.2], as shown in Figure 30.

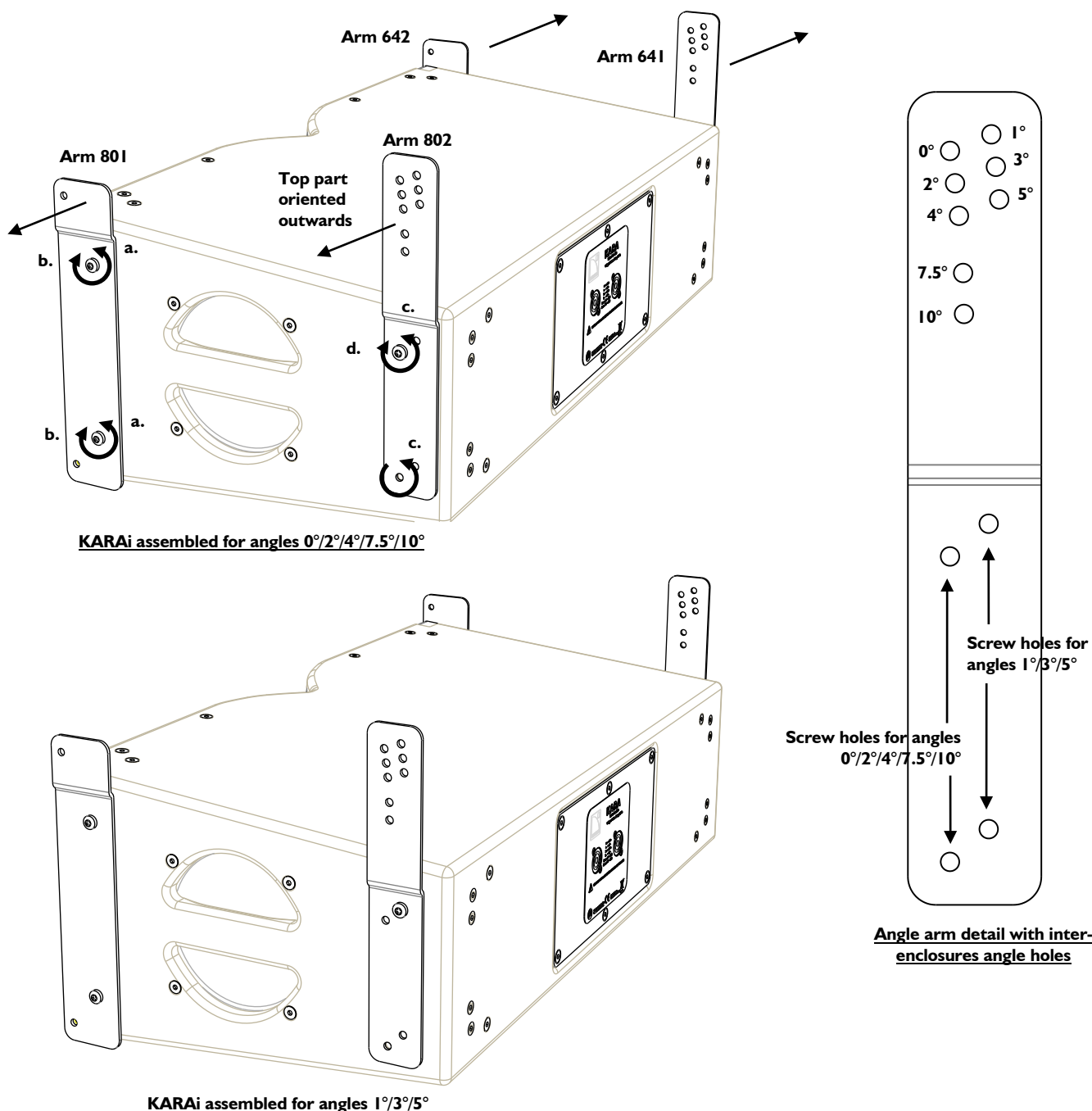
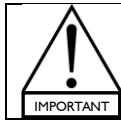
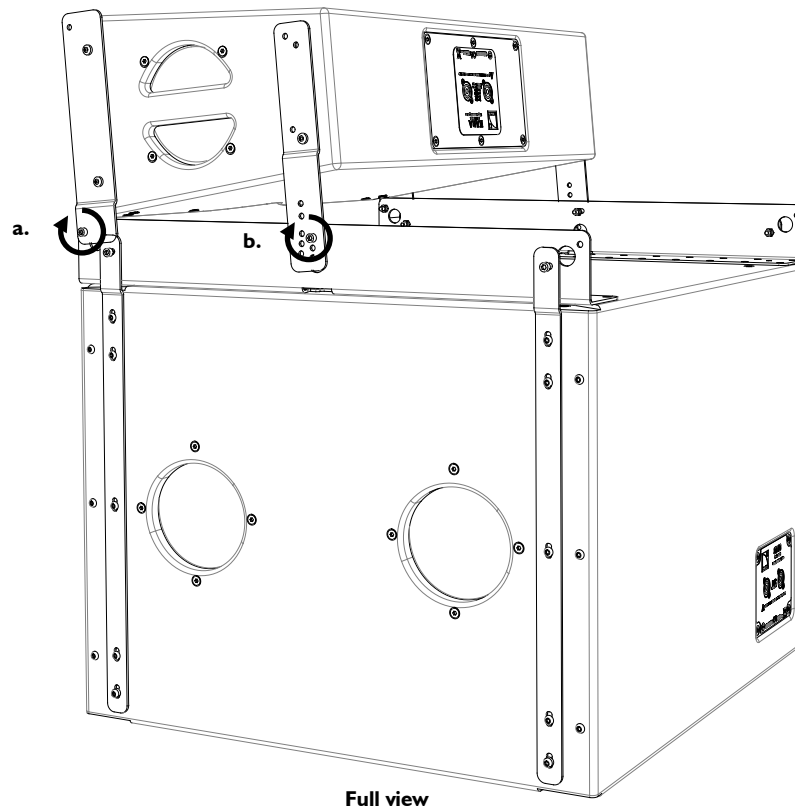


Figure 30: Mounting four arms to a KARAI

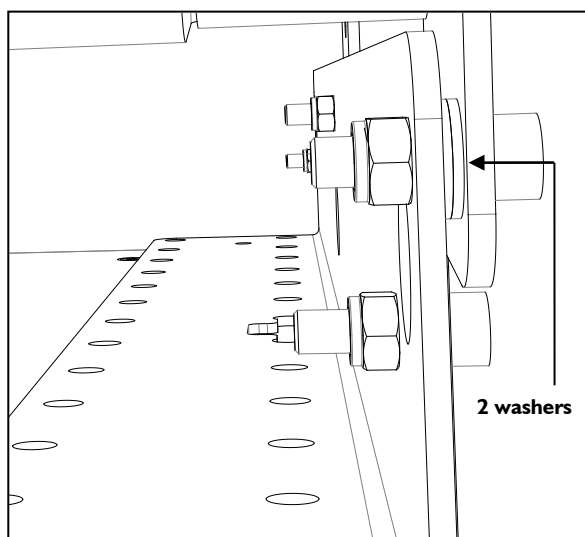
7. Turn KARAI#1 arms downwards, position its bottom link holes face to the M-BUMPi link holes, and then secure as follows:
  - a. Drive a self-locking M6 hex bolt with two M6 washers (included in the M-BUMPi package) into each front link hole pair, as shown in the bottom left box of Figure 31 (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lb.).
  - b. Drive a self-locking M6 hex bolt into each rear link hole pair, as shown in the bottom right box of Figure 31.



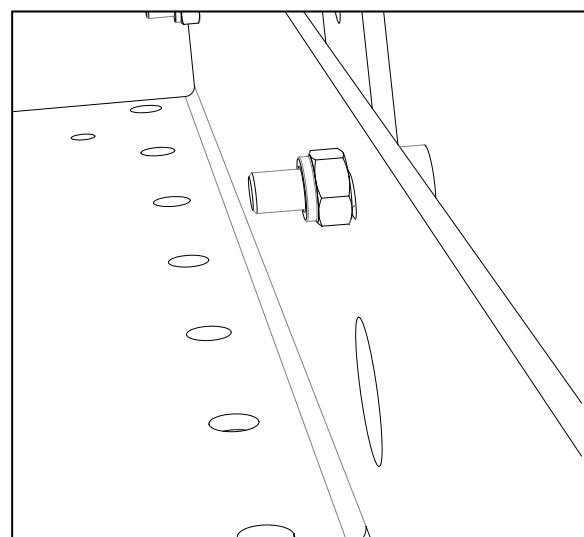
On each angle arm, select the angle hole corresponding to the chosen site angle [9.2.2].  
The angle values corresponding to the different holes are detailed in Figure 30.



**Full view**



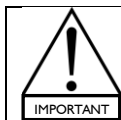
**a. Front bolt detailed view**



**b. Rear bolt detailed view**

**Figure 31: Attaching KARAI#1 to both M-BUMPi bars**

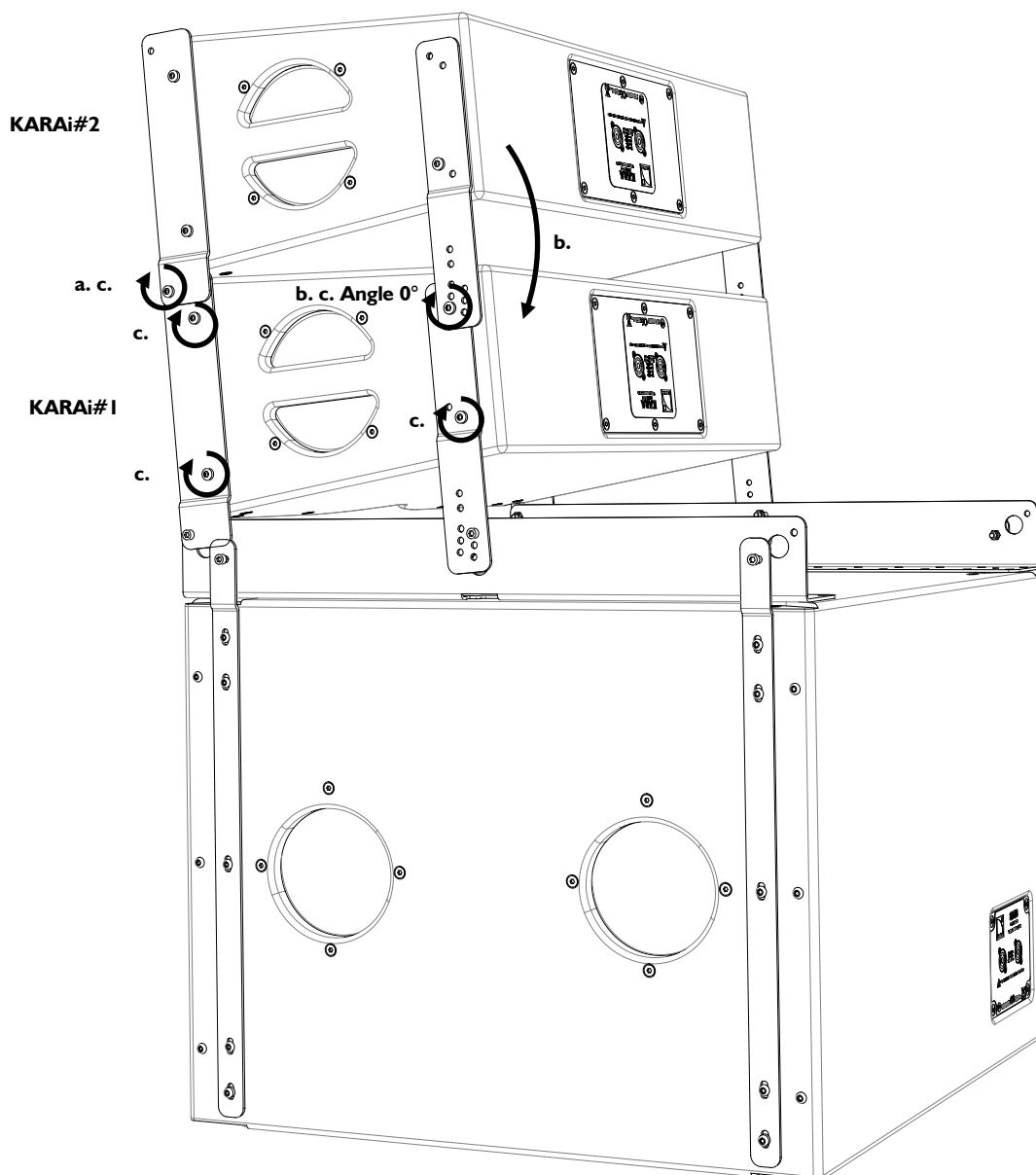
8. Prepare the second KARAI (hereafter designated as KARAI#2) by applying step 6.
9. Turn KARAI#2 arms downwards and fix it to KARAI#1 as follows:
  - a. Position both KARAI#2 front bottom link holes face to both KARAI#1 front top link holes and secure each pair by slightly driving a 35 mm Torx® screw (T30 bit).
  - b. Rotate KARAI#2 so as to position its rear bottom link holes with both KARAI#1 rear top link holes and secure each pair by slightly driving a 55 mm Torx® screw (T30 bit).



On both angle arms, select the holes corresponding to the angle intended to be set (refer to Figure 30).

Figure 32 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).

- c. Fully drive the ten Torx® screws on KARAI#1 (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



**Figure 32: Attaching KARAI#2 to KARAI#1**

10. Repeat steps 8 and 9 until all KARAI enclosures composing the array are assembled.
11. Secure the fixation points on the top KARAI as follows (repeat on both sides of the enclosure):
  - a. Drive a 35 mm Torx<sup>®</sup> screw into the front top hole (T30 bit, 5 N.m/45 in.lbf).
  - b. Drive a 55 mm Torx<sup>®</sup> screw into the rear top hole (T30 bit, 5 N.m/45 in.lbf).
  - c. Fully drive the three remaining Torx<sup>®</sup> screws (T30 bit, 5 N.m/45 in.lbf).

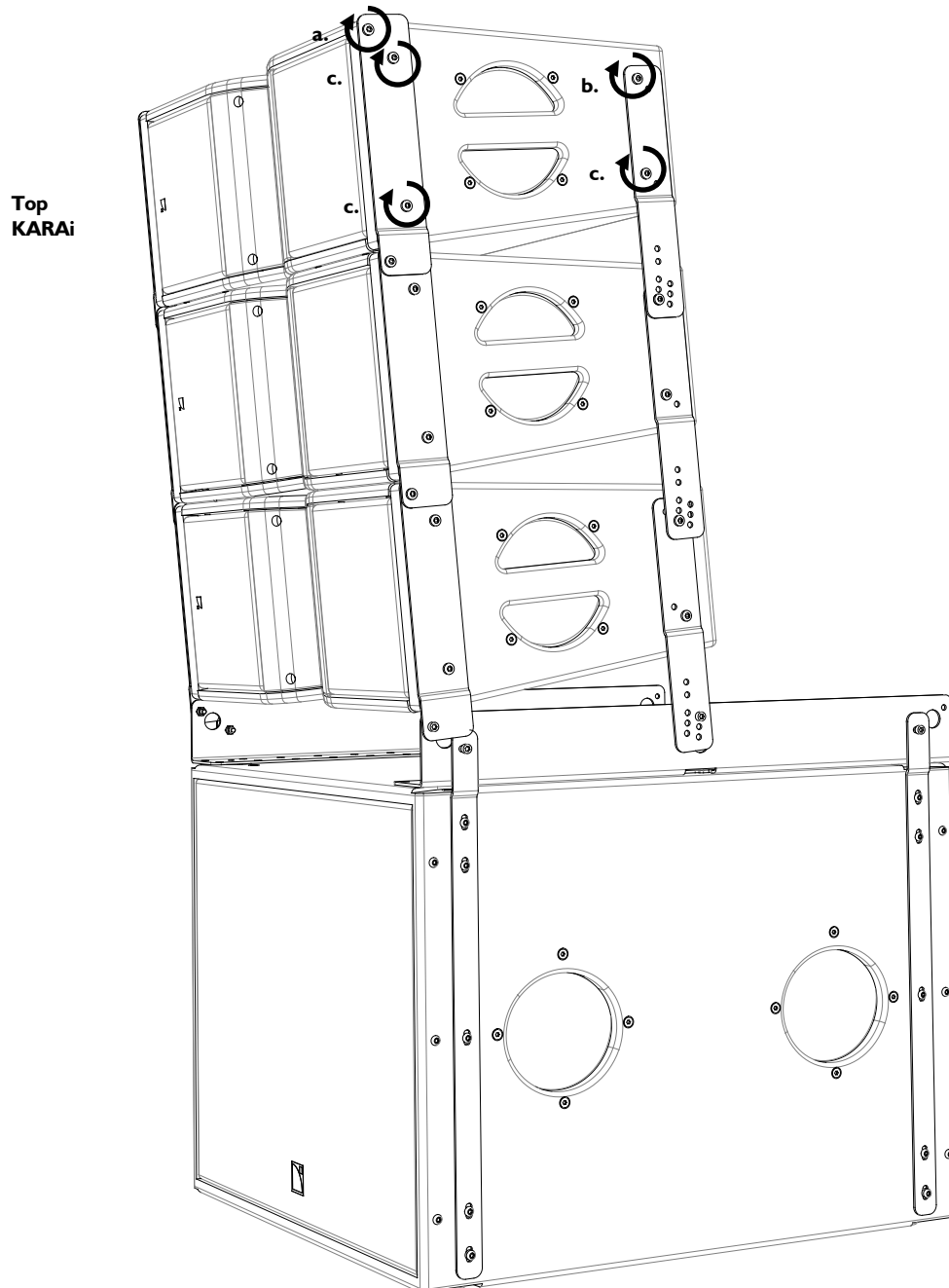


Figure 33: Example of SBI8i/KARAI mixed array

12. Secure the array to a fixed point by using a ratchet strap or any other equivalent material (not included).

### 6.4.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.


## 7 CARE AND MAINTENANCE

### 7.1 Maintenance information

The KARAI® system assembling components are the following:


- M-BUMPi rigging structure with bolts.
- KARAI SBI8LINK accessories with screws.
- KARAI® and SBI8i enclosures with arms and screws.
- Shackles

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-BUMPi and KARAI SBI8LINK elements (including shackles, bolts, and screws) should not show any deformation, fissure, or oxidation.

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



The metal components of the KARAI® and SBI8i enclosures should not show any signs of deformation, fissure, or oxidation. They must be securely fixed to the enclosure.


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



Verify the internal thread on each shackle.

### 7.2 Replacement kit

The replacement kit (KR) available for the customer is detailed in Table 3.

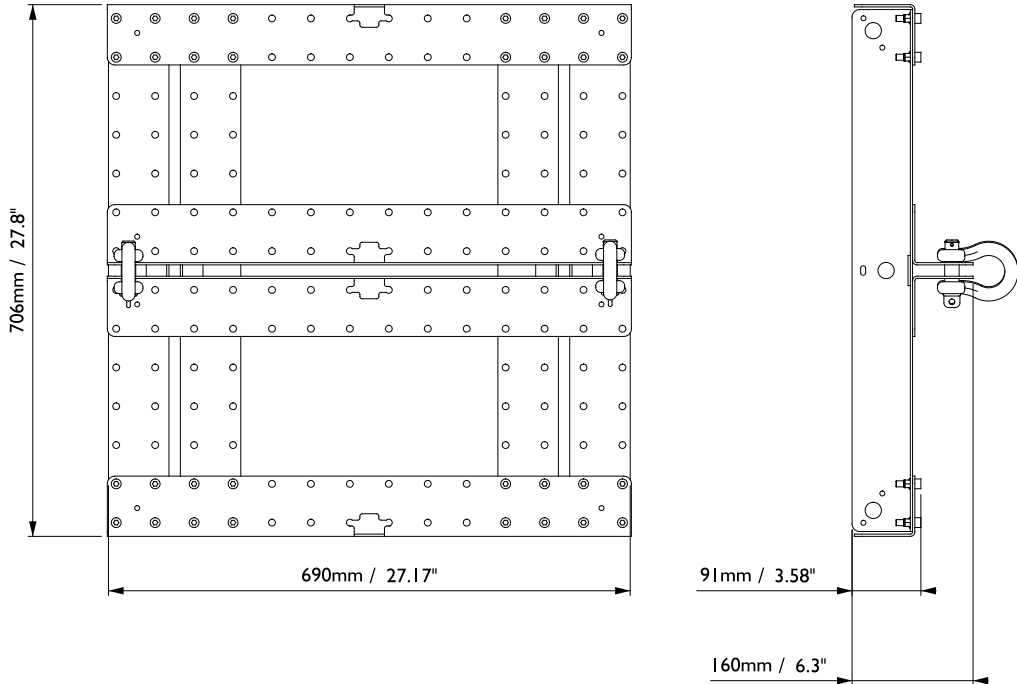


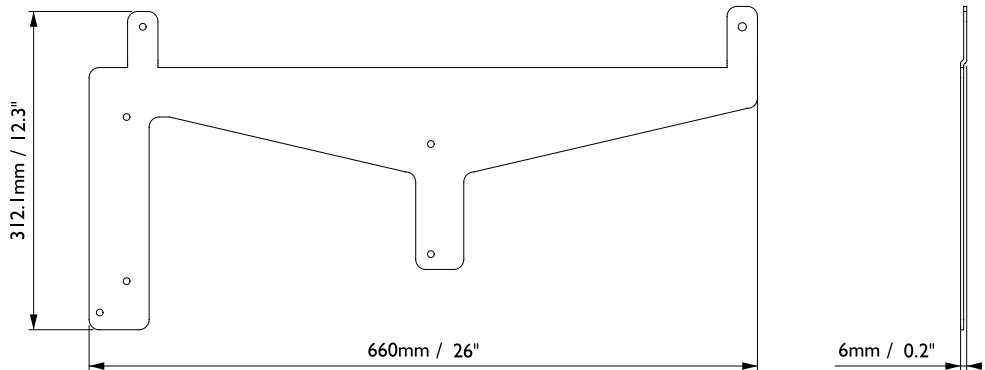
Service and repair work for any other part must be carried out by an L-ACOUSTICS® authorized representative. Otherwise, the customer may be exposed to dangerous situations and the warranty will no longer apply.

**Table 3: Replacement kit**

Reference	Kit description	Kit contents (fixing material included)
	<b>M-BUMPi</b>	
KR MANI9L	19 mm shackle	4 shackles

## 8 SPECIFICATIONS

Reference	M-BUMPi
Dimensions (L x H x D)	706 x 160 x 690 mm / 27.8 x 6.3 x 27.17 inch
	
Weight	21 kg / 46.3 lbs
Setup safety limits	Maximum 12 KARAI or 4 SBI8i/12 KARAI or 8 SBI8i in flown configuration. Maximum 9 KARAI in stacked configuration
Material	High-grade steel coated with polyester powder
Included accessories	10 bars, 2 shackles, M6 and M8 bolts, screws

Reference	KARAI SBI8LINK
Dimensions (L x H x D)	6 x 312.1 x 660 mm / 0.2 x 12.3 x 26 inch
	
Weight	3.2 kg / 7 lbs (set of two pieces)
Material	Steel coated with polyester powder

## 9 APPENDIX

### 9.1 Flown array options and site angle setting

#### 9.1.1 M-BUMPi rigging options

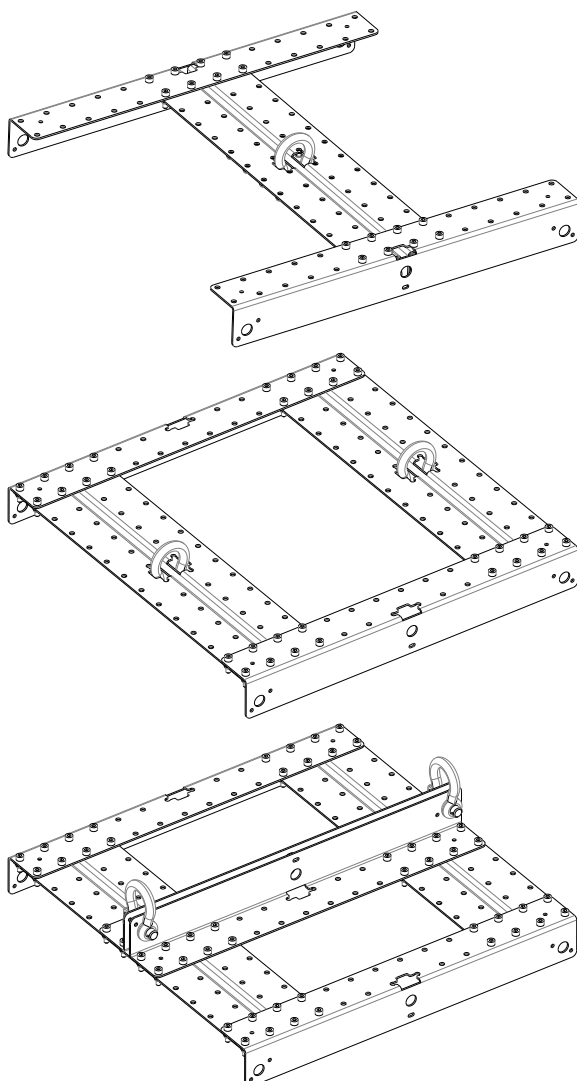
The rigging options for flying a KARAi standalone array, SB18i/KARAi mixed array, or SB18i standalone array are given in Table 4 in which:

- **Option 0** is adapted to SB18i standalone arrays.
- **Options 1 to 7** are adapted to KARAi standalone arrays or SB18i/KARAi mixed arrays.
- All configurations are reversible to obtain a front or rear overhang corresponding to a positive or negative site angle, respectively.



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.

**Table 4: M-BUMPi rigging options for flown array**



#### **Option 0: SB18i only**

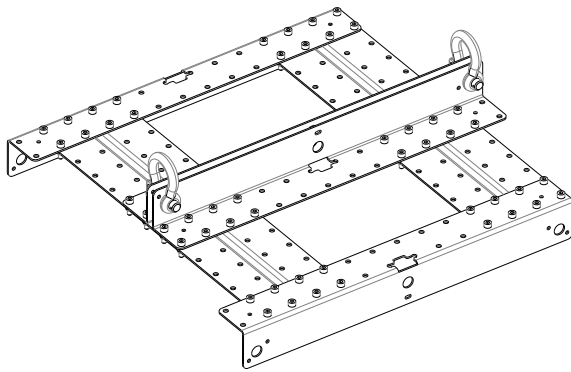
- 1 rigging point (1 position)

#### **Option 1: KARAi or SB18i/KARAi**

- 1 rigging point (2 positions)
- or
- 2 rigging points (spacing = 515 mm/20 inch)

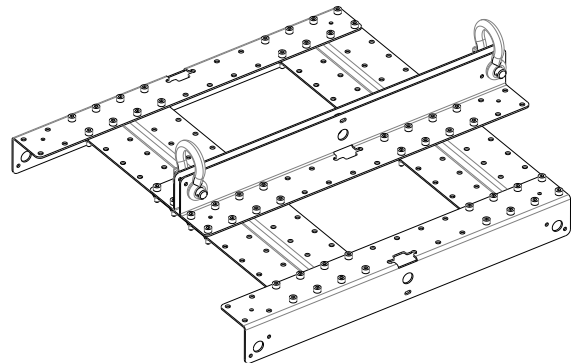
#### **Option 2: KARAi or SB18i/KARAi**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



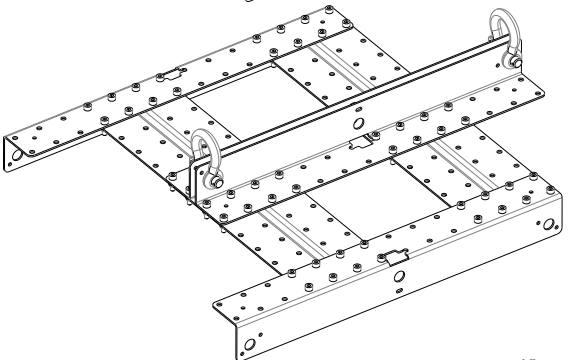
### **Option 3: KARAI or SB18i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



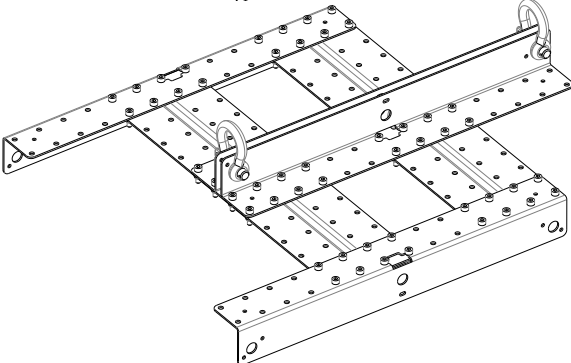
### **Option 4: KARAI or SB18i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



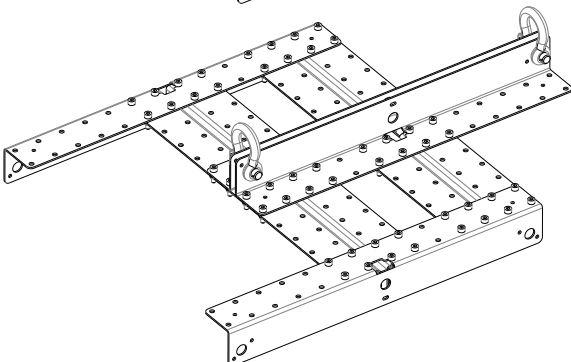
### **Option 5: KARAI or SB18i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



### **Option 6: KARAI or SB18i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



### **Option 7: KARAI or SB18i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



### 9.1.2 M-BUMPi site angle setting

The M-BUMPi site angle setting will be discrete or continuous depending on the desired rigging option [9.1.1].

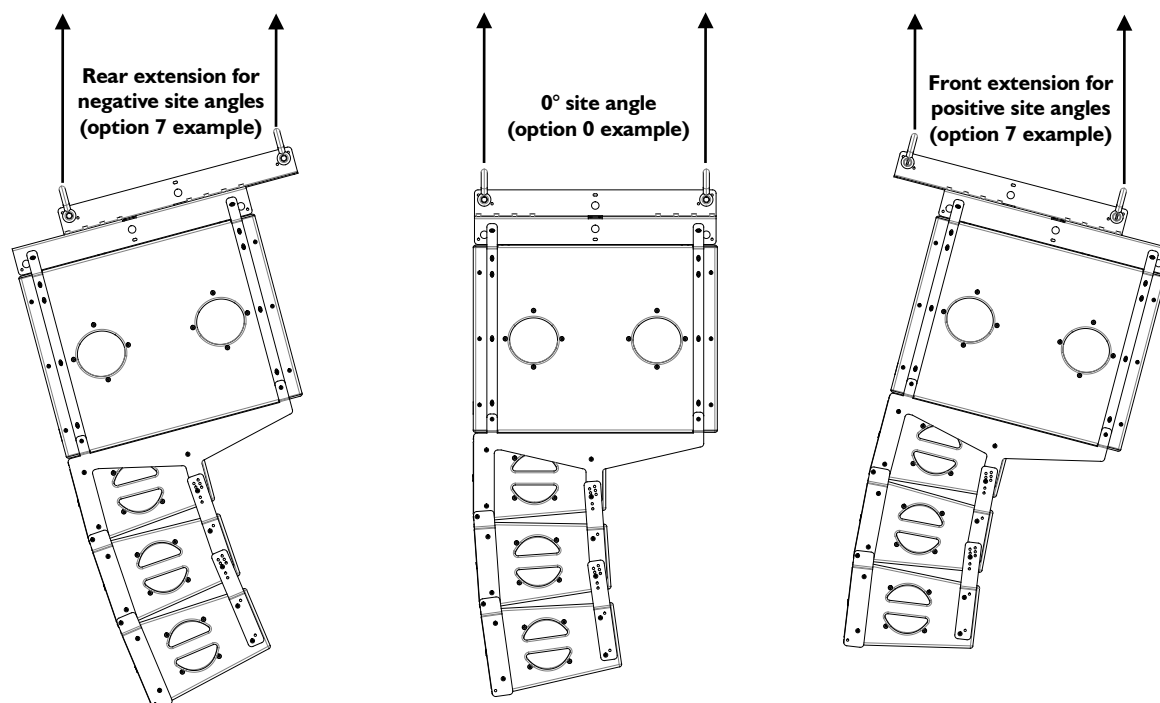
**Rigging option 0** offers one site angle of 0° for a standalone SB18i array.

**Rigging options 2 to 7 with a single rigging point on the rear shackle** offer one site angle each. The site angle depends on the M-BUMPi/SB18i/KARAI array size and shape. It can be calculated in **SOUNDVISION Software** [3.4] using an equivalent **M-BUMP/SB18/KARA** array. The equivalent array must be composed of the same number of enclosures, the same inter-enclosure angles, and the same single rigging point configuration according to the following table:

**Table 5: M-BUMPi and M-BUMP single rigging point equivalent options**

M-BUMPi option with single rear shackle	M-BUMP/M-BAR option and single shackle position (refer to the <b>KARA Rigging procedures</b> [3.4])
2	A 12
3	A 13
4	A 14
5	A 15
6	A 16
7	B 16

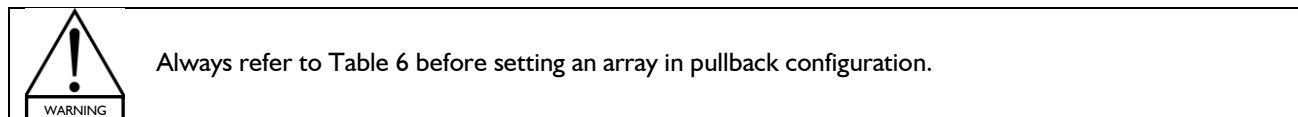
**Rigging options 1 to 7 with a dual rigging point** allow continuous site angle setting depending on the relative heights between the front and rear rigging points (see Figure 34).



**Figure 34: Continuous angle setting**

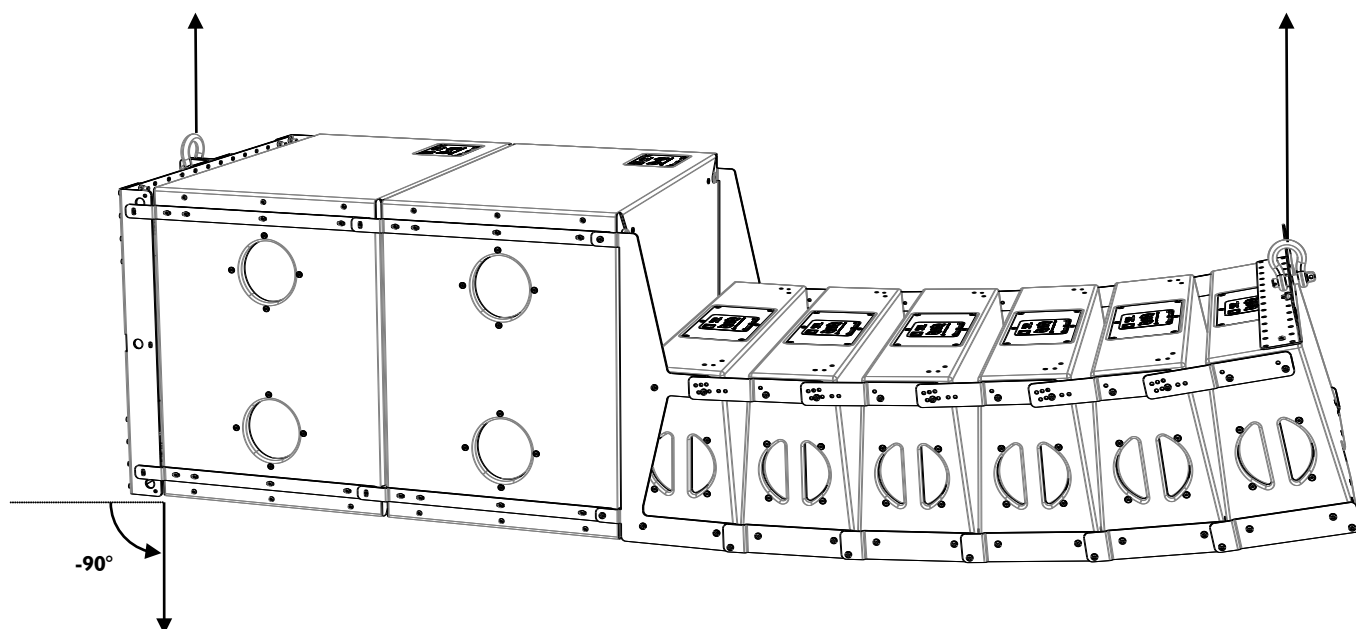
#### 9.1.3 Pullback configuration setup safety limits

An M-BUMPi bar can be fixed to the bottom enclosure of a KARAI array to obtain a pullback configuration (array site angle settable down to  $-90^\circ$ ) within the mechanical safety limits given in Table 6.



**Table 6: Mechanical safety limits in pullback configuration**

Number of KARAI enclosures in the array	12	9	6	3
Number of SB18i enclosures in the array	0	3	2	1
Maximum array negative site angle	$-90^\circ$	$-60^\circ$	$-90^\circ$	$-90^\circ$




**Figure 35: Pullback configuration example with site angle  $-90^\circ$**

## 9.2 Stacked array options and site angle setting

### 9.2.1 Stacking platform configuration

For a stacked array, the M-BUMPi structure is used as a horizontal platform. It can be installed in **front or rear extension configuration** as shown in Figure 36 and Figure 37 (refer to [9.2.2] to obtain the array site angle corresponding to the chosen angle value).



The configurations shown in Figure 36 and Figure 37 are purely indicative.

Refer to [6.3.1] for setup safety limits.

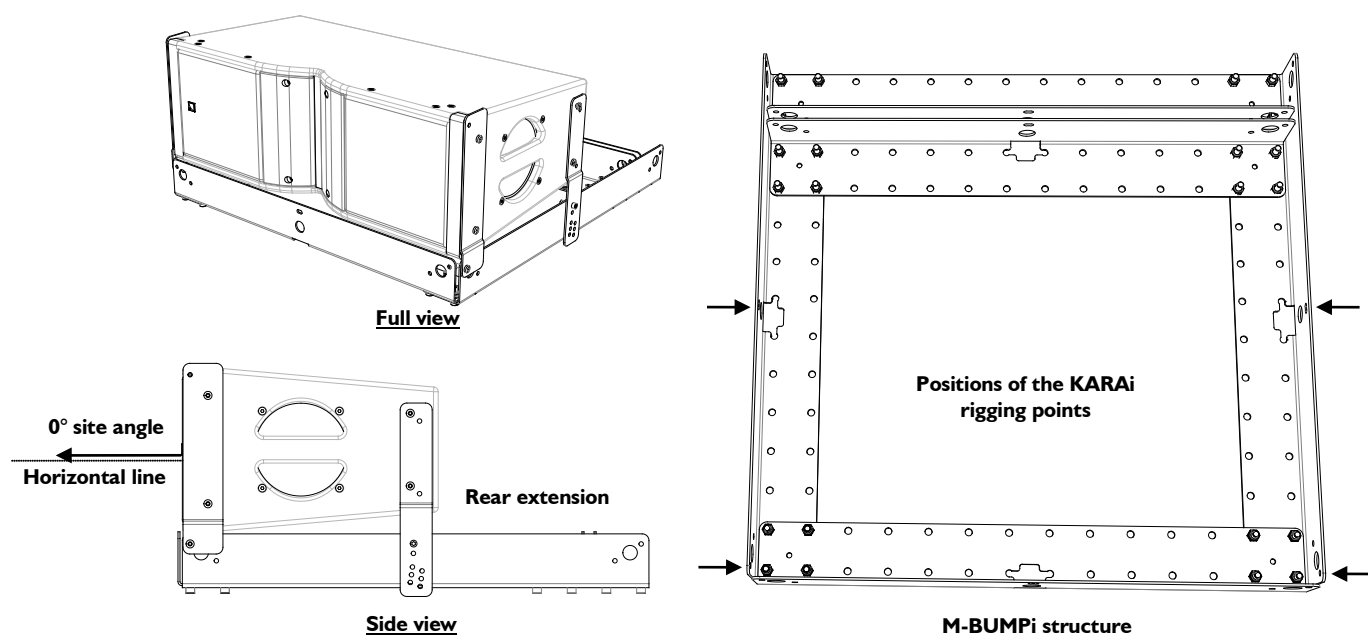


Figure 36: Rear extension configuration

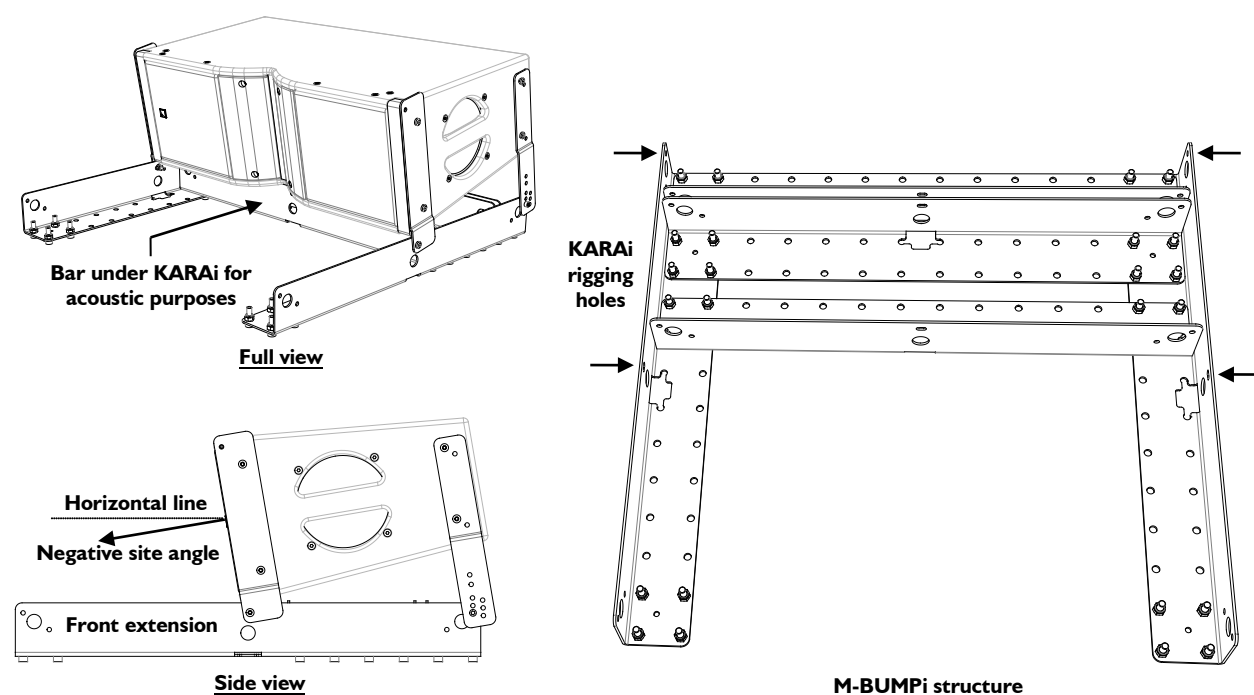


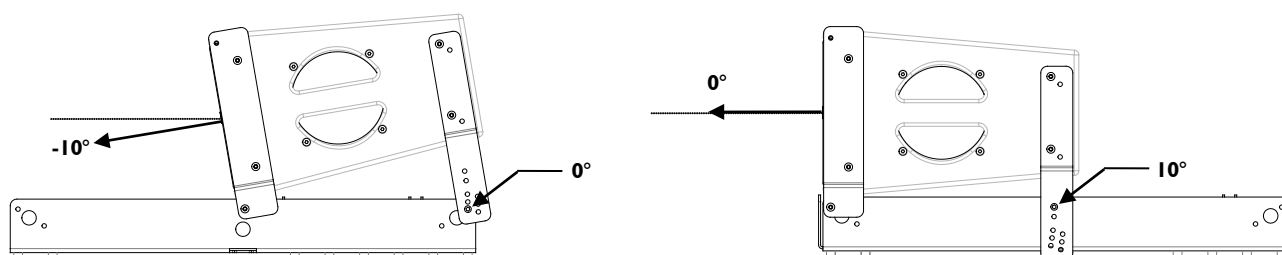
Figure 37: Front extension configuration

### 9.2.2 Array site angle setting

The site angle of the stacked KARAI array will be determined by the angle of the bottom enclosure in the range from  $-10^{\circ}$  to  $0^{\circ}$ . Table 7 gives all possible site angle settings:

**Table 7: Possible site angles for a KARAI stacked array**

KARAI angle arm hole	Resulting site angle (Figure 38)
$0^{\circ}$	$-10^{\circ}$
$1^{\circ}$	$-9^{\circ}$
$2^{\circ}$	$-8^{\circ}$
$3^{\circ}$	$-7^{\circ}$
$4^{\circ}$	$-6^{\circ}$
$5^{\circ}$	$-5^{\circ}$
$7.5^{\circ}$	$-2.5^{\circ}$
$10^{\circ}$	$0^{\circ}$



**Figure 38: Bottom KARAI angle setting**



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