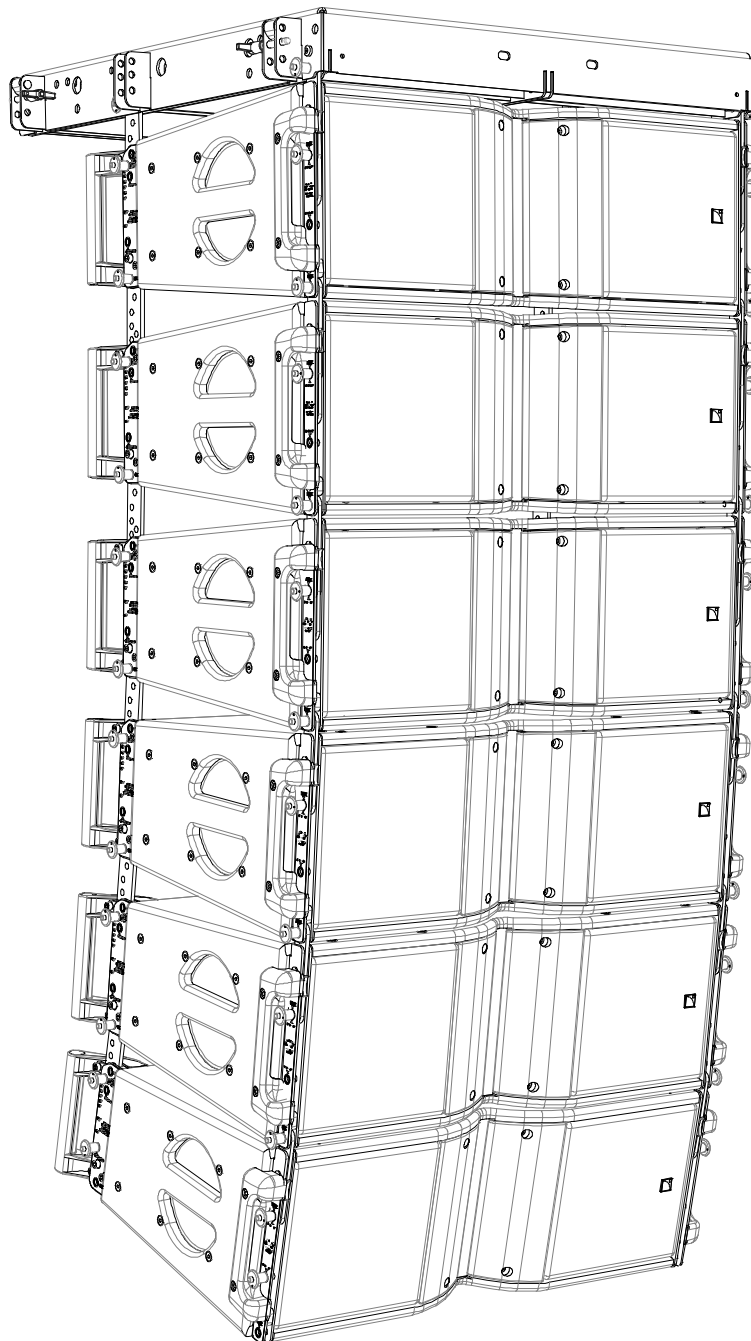


KARA[®] MODULAR WST[®] LINE SOURCE

USER MANUAL

VERSION 1.1





1 SAFETY WARNINGS


All information hereafter detailed applies for the **L-ACOUSTICS® KARA® Modular WST® Line Source**, 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 WARNING symbol indicates a potential risk of physical harm to the user or people within close proximity to the product. In addition, the product may also be damaged.</p>
---	---


	<p>The CAUTION symbol notifies the user about information to prevent possible product damage.</p>
---	--


	<p>The IMPORTANT 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>5. Sound Levels Sound systems are capable of producing high Sound Pressure Levels which can be dangerous and potentially cause hearing damage especially when exposed to them over a long period of time. Do not stay within close proximity of the loudspeakers when operating.</p>
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	<p>6. Heat Do not operate the product near any heat source, such as radiators or other devices.</p>
---	--

	<p>7. Water and moisture Even if the product is weather-resistant, it can not be exposed to moisture (rain, sea spray, shower, steam) for a long period of time, nor put in direct contact or partially immersed in water. This would cause irreversible damage to exposed components.</p>
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	<p>8. System parts and rigging inspection All system components must be inspected before use, in order to detect any possible defects. Please refer to the Care and Maintenance section of this manual as well as any other manuals pertaining to the system for a detailed description of the inspection procedure. Any part showing any sign of defect must immediately be put aside and withdrawn from use to be inspected by qualified service personnel.</p>
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9. Mounting instructions

Do not place the product on an unstable cart, stand, tripod, bracket, or table. The product may fall and be seriously damaged, and may cause serious human injury. Any mounting of the product should follow the manufacturer's instructions given in this manual, and should use a mounting accessory recommended by the manufacturer.



10. Conditions which require immediate service

Servicing is required when the product has been damaged in any way such as:

- The product has been exposed to rain or moisture.
- The product was dropped or the enclosure is damaged.
- The product does not operate normally.



11. 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 product:

Loudspeaker enclosure, KARA®

Is in conformity with the provisions of:

Low Voltage Directive 2006/95/EC

Applied rules and standards:

EN60065 (Electrical Safety)

Established at Marcoussis, France

March 1st, 2010

Christophe Pignon

Head of Research & Development dept.

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3 INTRODUCTION

3.1 Welcome to L-ACOUSTICS[®]

Thank you for purchasing the **L-ACOUSTICS[®] KARA[®] Modular WST[®] Line Source**.

This manual contains essential information on installing and operating 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.

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

KARA User manual	www.l-acoustics.com/kara (USER MANUAL)
KARA Rigging manual	www.l-acoustics.com/kara (RIGGING MANUAL)
SB18 User manual	www.l-acoustics.com/sb18 (USER MANUAL)
LA8 User manual	www.l-acoustics.com/la8 (USER MANUAL)
LA8 PRESET LIBRARY Pack	www.l-acoustics.com/la8 (LA8 PRESET LIBRARY)
LA NETWORK MANAGER User manual	www.l-acoustics.com/la-network-manager (USER MANUAL)
SOUNDVISION Software	www.l-acoustics.com/soundvision
LA8 CACOM CABLES Technical bulletin	www.l-acoustics.com/download (Technical publications)

4 KARA® SYSTEM

The **L-ACOUSTICS® KARA® enclosure** belongs to the **KARA® Modular WST® Line Source System** and operates over the 55 Hz to 20 kHz nominal frequency bandwidth. This response can be extended down to 32 Hz with the addition of the **L-ACOUSTICS® SB18 subwoofer**.

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

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

The KARA® system components are compatible with standard L-ACOUSTICS® accessories. These accessories include the **L-ACOUSTICS® DOFILL-LA8 Loudspeaker cable** allowing connection of the KARA enclosure to the LA8 amplified controller. This cable features 8-point PA-COM® and 4-point SpeakON® connectors and must be extended using one of the **L-ACOUSTICS® DO10 or DO25 Cables** with respective lengths of 10 m/32.8 ft and 25 m/82 ft. Each DO cable is an 8-conductor cable with 4 mm² conductor cross-section (13 SWG, 11 AWG) and features 8-point PA-COM® connectors. **Note:** The PA-COM® standard is fully compatible with the CA-COM® standard.

The **L-ACOUSTICS® SP.7, SP10, and SP25 Loudspeaker cables** with respective lengths of 0.7 m/2.3 ft, 10 m/32.8 ft, and 25 m/82 ft will allow connecting KARA to KARA and can also be used to connect KARA to LA8. Each cable is 4-conductor cable with 4 mm² conductor cross-section (13 SWG, 11 AWG) and features 4-point SpeakON® connectors.

The KARA system is exclusively driven and powered by the **L-ACOUSTICS® LA8 Amplified controller** [3.4]. This ensures intelligent protection, filtering, and equalization of the enclosures. Four channels of amplification are provided along with the **factory LA8 PRESET LIBRARY** [3.4], ensuring the optimization and performance of the system within limitations of the recommended configurations.

Each system design configuration should first be modeled and studied using **L-ACOUSTICS® SOUNDVISION Software** [3.4]. Software predictions are based on the preset parameters stored in the amplified controllers.

Up to 253 amplified controllers can be interconnected and monitored through the proprietary **L-ACOUSTICS® L-NET Network** using **LA NETWORK MANAGER Software** [3.4].

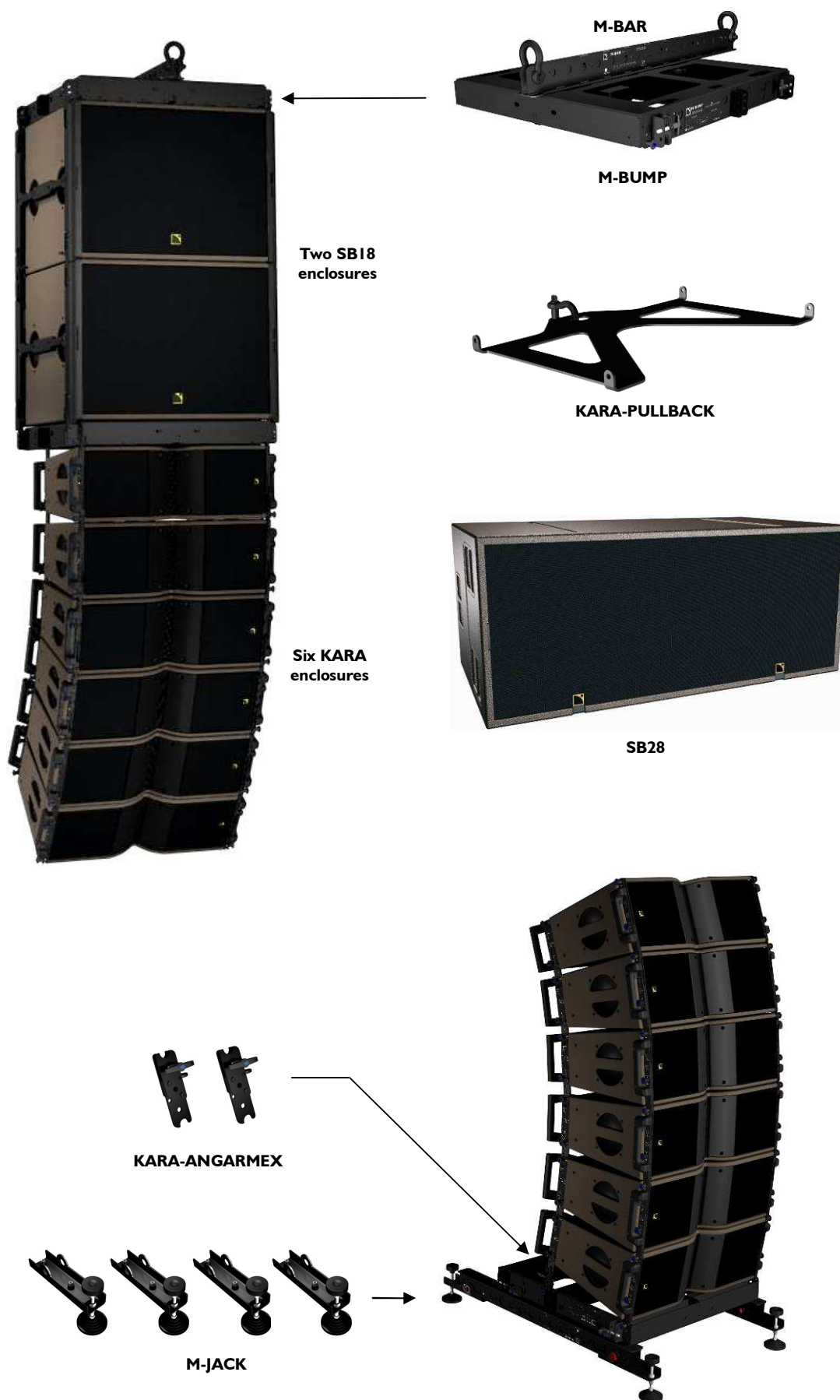


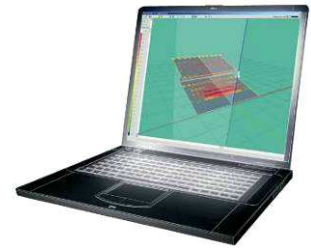
Figure 1: KARA system components (part I)



LA8



LA NETWORK MANAGER



SOUNDVISION

EN



SP.7



SPI0



SP25



DOFILL-LA8

+



DOI0

or



DO25

Figure 2: KARA system components (part 2)

5 KARA[®] ENCLOSURE

The L-ACOUSTICS[®] KARA[®] enclosure contains two direct radiating 8" LF transducers mounted in a bass-reflex tuned enclosure and one 3" HF diaphragm compression driver coupled to DOSC[®] waveguide. Based on a bi-amplified active 2-way design, the nominal impedance of the KARA enclosure is 8 ohms for each of the HF and LF sections.

With a coplanar transducer configuration in the LF region and a DOSC[®] waveguide in the HF region KARA fulfills the WST[®] (Wavefront Sculpture Technology) coupling conditions and thus can be qualified as a true line source array. This configuration also provides 110° coverage pattern as well as smooth tonal response free of secondary lobes over the entire frequency range.

The KARA fully integrated rigging allows combining enclosures as a variable curvature, vertical line source array.

The KARA cabinet is made of high grade Baltic birch plywood with remarkable mechanical and acoustical properties for improved long term durability.

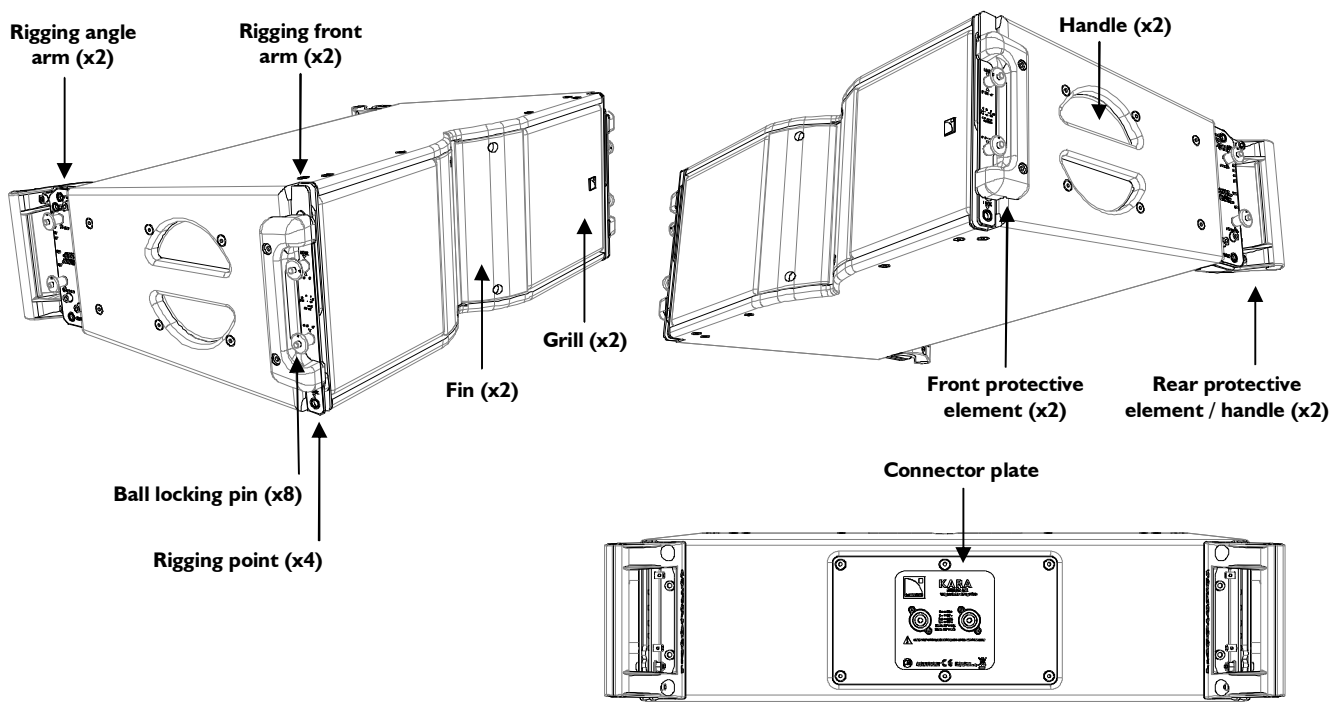



Figure 3: KARA enclosure

6 INSTALLATION

6.1 Flying or stacking KARA

The KARA fully integrated four-point rigging system (Figure 3) with inter-enclosure angular adjustment from 0° to 10° allows the following setups:

- Flying a vertical array of up to 24 KARA or 4 SB18/12 KARA using the L-ACOUSTICS® M-BUMP/M-BAR rigging structure and eventually the KARA-PULLBACK rigging accessory.
- Stacking a vertical array of up to 9 KARA or 2 SB18/6 KARA using the L-ACOUSTICS® M-BUMP/M-BAR/M-JACK/KARA-ANGARMEX platform.




Refer to the **KARA® Rigging manual** [3.4] to get acquainted with KARA system specific rigging procedures and mechanical limits.

6.2 Connecting KARA

The KARA enclosure is driven and powered by the dedicated **L-ACOUSTICS® LA8** amplified controller. Each of the LA8 amp channel pairs 1/2 and 3/4 can drive up to three KARA enclosures in parallel. For more details please refer to the **LA8 User manual** [3.4].

The KARA enclosure is equipped with two 4-point SpeakON® connectors wired in parallel allowing connection with another KARA enclosure in parallel using the **L-ACOUSTICS® SP.7, SPI0, or SP25** cables.

It is recommended to use the **L-ACOUSTICS® DOFILL-LA8** cable to connect the KARA enclosure to the LA8 amplified controller. This cable must be extended by one of the **L-ACOUSTICS® DO10 or DO25** cables (see Figure 2 and Figure 4).



A maximum of **three KARA** enclosures can be connected to each of the **LA8 1/2 and 3/4 output channel pairs**.
 ALWAYS connect the new **DOFILL-LA8** cable on the LA8 amplified controller for active 2-way applications, as using the old DOFILL cable may result in **damaging the loudspeaker components** (refer to the **LA8 CACOM CABLES Technical bulletin** [3.4]).

The L-ACOUSTICS® wiring convention is as follows:

SpeakON® connector labels	Connection to transducers
1 +	LF +
1 -	LF -
2 +	HF +
2 -	HF -

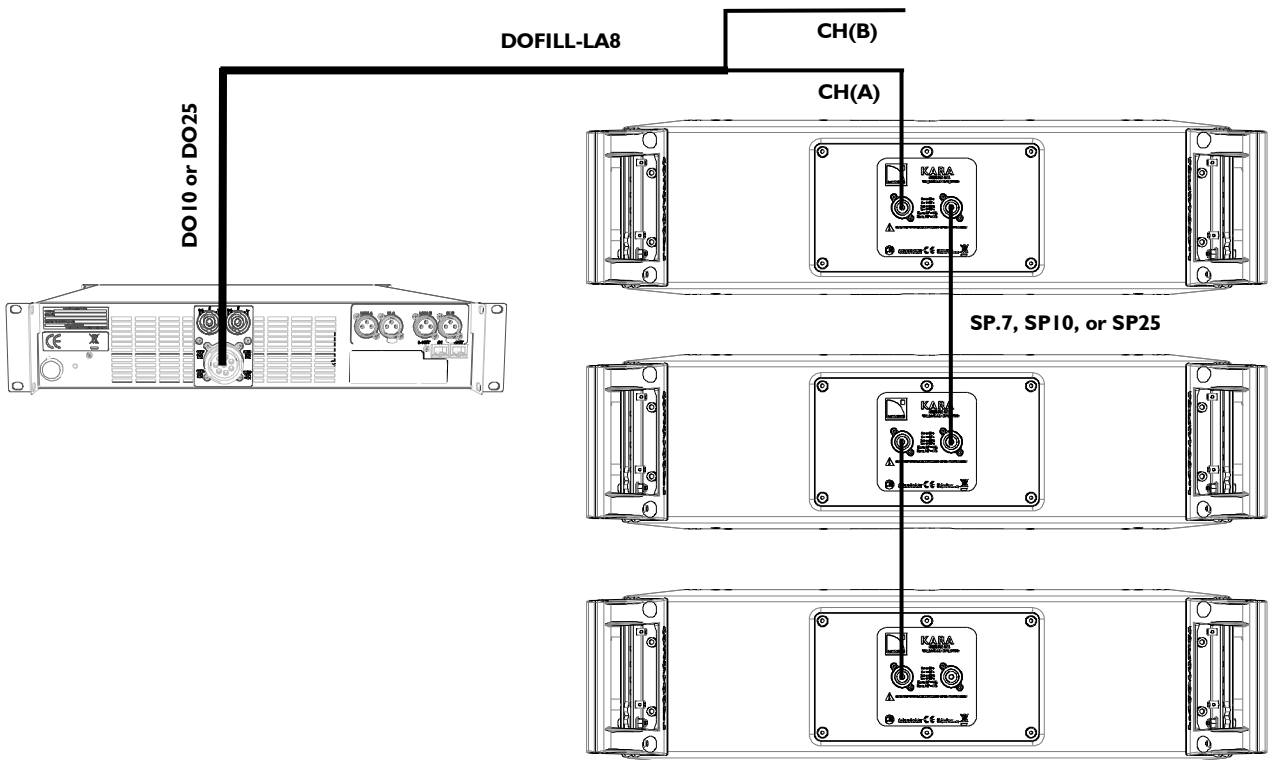


Figure 4: Connecting three KARA in parallel to the channel pair 1/2 of an LA8 controller



To ensure both high performance and safety, L-ACOUSTICS[®] recommends the exclusive use of high-quality, fully insulated speaker cables made of stranded copper wire.

In order to preserve a high damping factor it is desirable to keep loudspeaker cables as short as possible and with a gauge offering low resistance per unit length.

The following table provides information regarding the recommended length versus wire cross-section. Two cases are possible depending on the impedance load connected to the LA8 (8 Ω for a single KARA enclosure, 4 Ω for two KARA enclosures in parallel, 2.7 Ω for three KARA):

Table 2: Maximum cable length versus conductor cross-section for Damping Factor > 20

Cross-section			Length for one KARA (8 Ω load)		Length for two KARA (4 Ω load)		Length for three KARA (2.7 Ω load)	
mm ²	SWG	AWG	m	ft	m	ft	m	ft
2.5	15	13	30	100	15	50	10	33
4	13	11	50	160	25	80	17	53
6	11	9	74	240	37	120	25	80
10	9	7	120	390	60	195	40	130

According to the calculation in Table 2, one DO25 cable (4 mm², 25 m) can be used to power two KARA in parallel (4 Ω load) with a damping factor still greater than 20.


7 OPERATION

7.1 System configuration

The choice of a system configuration should be the result of an electro-acoustic study conducted by an expert (System Engineer or Audio Consultant). However, this will not be discussed here as sound-design aspects are beyond the scope of this manual. This study can rely on the simulations modeled in SOUNDVISION software, yielding electro-acoustic predictions which take into account the enclosures' manufacturer data and particular situational usage, as well as the projected environment.

Three operation modes (FULL RANGE, HIGH-PASS, and LOW EXTENSION), each one associated with a set of factory presets, will allow building all the common configurations (C, LR, LCR, distributed...).

The KARA® enclosures can be used as a standalone system in the **FULL RANGE** mode or as a reinforcement system in the **HIGH-PASS** mode or in combination with L-ACOUSTICS® SB18 or SB28 subwoofers in the **LOW EXTENSION** mode.



ALWAYS check that the KARA enclosures are connected to correct LA8 output channels before operating.

Note: The latest version of the LA8 PRESET LIBRARY is downloadable from the L-ACOUSTICS® web site [3.4].

7.2 FULL RANGE mode

7.2.1 Description

In FULL RANGE mode KARA operates within its nominal bandwidth (55 Hz – 20 kHz) for standalone applications not requiring low frequency extension.

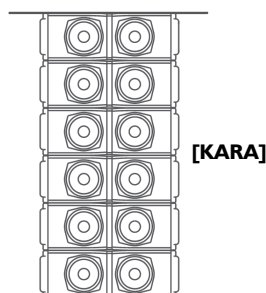


Figure 5: Standalone KARA line source system example

7.2.2 Connecting KARA to LA8

The first two KARA enclosures are connected to the output channel pairs 1/2 and 3/4 of the LA8 controller. Two additional KARA enclosures can be connected in parallel with each first one. Therefore a single LA8 amplified controller can drive up to six KARA enclosures (see Figure 6).

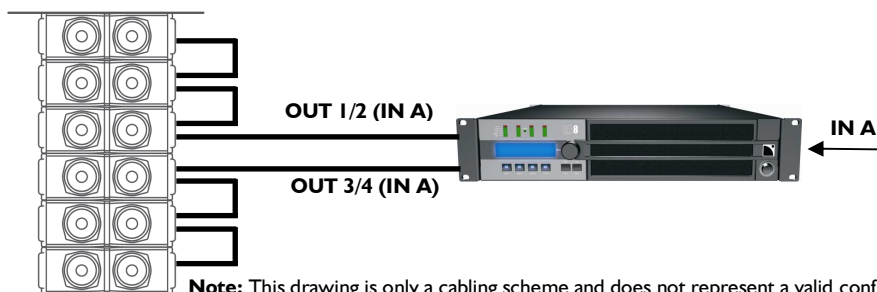


Figure 6: Six KARA enclosures connected to an LA8 controller

7.2.3 [KARA] preset

The [KARA] preset features a dedicated system contour for mid and long throw applications within the 55 Hz-20 kHz frequency range.

Activate the LOAD PRESET menu from the LA8 amplified controller front panel and then select the [KARA] preset. Refer to the **LA8 User manual** [3.4] for additional instructions. The preset is also accessible using LA NETWORK MANAGER Software (refer to the **LA NETWORK MANAGER User manual** [3.4]). The accessible parameters in FULL RANGE mode are shown in the following chart:

Table 3: Accessible parameters in FULL RANGE mode

LA8 Inputs/ Outputs	Elements to connect	Preset assignments*	Accessible (O) and blocked (X) parameters			
			Mute	Gain	Delay	Polarity
IN A	Input signal A	IN_A	X	O	O	O
IN B	Input signal B	IN_B	X	O	O	O
OUT 1	KARA enclosure	LF_A	O	X	X	X
OUT 2		HF_A	O	X	X	X
OUT 3	KARA enclosure	LF_A	O	X	X	X
OUT 4		HF_A	O	X	X	X

* IN: input signal. A, B: channel A, B. LF: low frequency transducer. HF: high frequency transducer.

7.3 HIGH-PASS mode

7.3.1 Description

In HIGH-PASS mode, the KARA is 100 Hz high-pass filtered and is intended to be used as a fill distributed system to reinforce a main system.



Figure 7: KARA distributed reinforcement system example

7.3.2 Connecting KARA to LA8

The first two KARA enclosures are connected to the output channel pairs 1/2 and 3/4 of the LA8 controller. Two additional KARA enclosures can be connected in parallel with each first one. Therefore a single LA8 amplified controller can drive up to six KARA enclosures (see Figure 8).

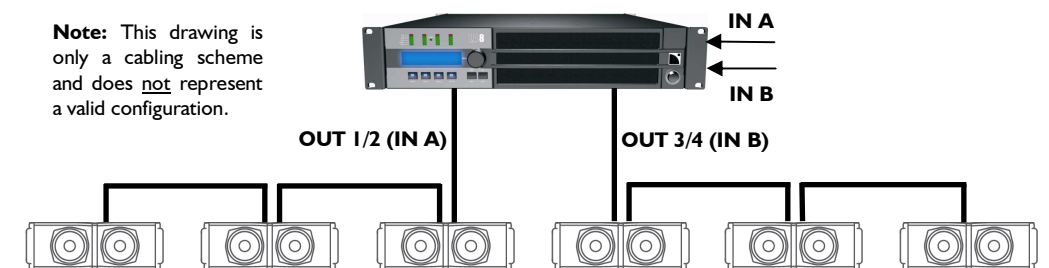


Figure 8: Six KARA enclosures connected to an LA8 controller

7.3.3 [KARA FI] preset

The [KARA_FI] preset features a nominally flat system contour down to 100 Hz for short and mid throw distributed configurations. This preset is designed for a single element.

Activate the LOAD PRESET menu from the LA8 amplified controller front panel and then select the [KARA_FI] preset. Refer to the **LA8 User manual** [3.4] for additional instructions. The preset is also accessible using LA NETWORK MANAGER Software (refer to the **LA NETWORK MANAGER User manual** [3.4]). The accessible parameters in HIGH-PASS mode are shown in the following chart:

Table 4: Accessible parameters in HIGH-PASS mode

LA8 Inputs/Outputs	Elements to connect	Preset assignments*	Accessible (O) and blocked (X) parameters			
			Mute	Gain	Delay	Polarity
IN A	Input signal A	IN_A	X	O	O	O
IN B	Input signal B	IN_B	X	O	O	O
OUT 1	KARA enclosure	LF_A	O	X	X	X
OUT 2		HF_A	O	X	X	X
OUT 3	KARA enclosure	LF_B	O	X	X	X
OUT 4		HF_B	O	X	X	X

* IN: input signal. A, B: channel A, B. LF: low frequency transducer. HF: high frequency transducer.

7.4 LOW EXTENSION mode

7.4.1 Description

In LOW EXTENSION mode KARA operates within its nominal bandwidth (55 Hz – 20 kHz) to allow combinations with the dedicated complementary SB18 subwoofer and/or the high-power SB28 subwoofer. The bandwidth of the system is extended down to 32 Hz with the SB18 and 25 Hz with the SB28.

The combination of the extended bandwidth of the [KARA] preset and the SB18 will allow reaching the greatest sub-low contour within some physical restrictions due to the frequency overlap between both systems. The LOW EXTENSION mode comprises 5 preset combinations:

I - When combining [KARA] with [SB18_100] the KARA is associated with the SB18 in closely coupled configurations only. The SB18:KARA recommended ratio is 1:3.



When SB18 are flown in a column above KARA, the maximum authorized configuration when using [KARA] preset along with the [SB18_100] or [SB18_100_C] preset is 3 SB18 and 9 KARA in order to keep an acceptable distance between both KARA and SB18 acoustic centers (see the left side of Figure 9).

When SB18 are flown in close proximity beside KARA this limitation does not occur anymore (see the right side of Figure 9).

Note: Two SB18 array arrangements are possible whether the directivity pattern is intended to be omni-directional or cardioid. The cardioid arrangement is recommended within arrays containing a multiple of four SB18 enclosures and in that case the [SB18_100] preset must be replaced by [SB18_100_C] (see Figure 9 and refer to the **SB18 User manual** [3.4]).

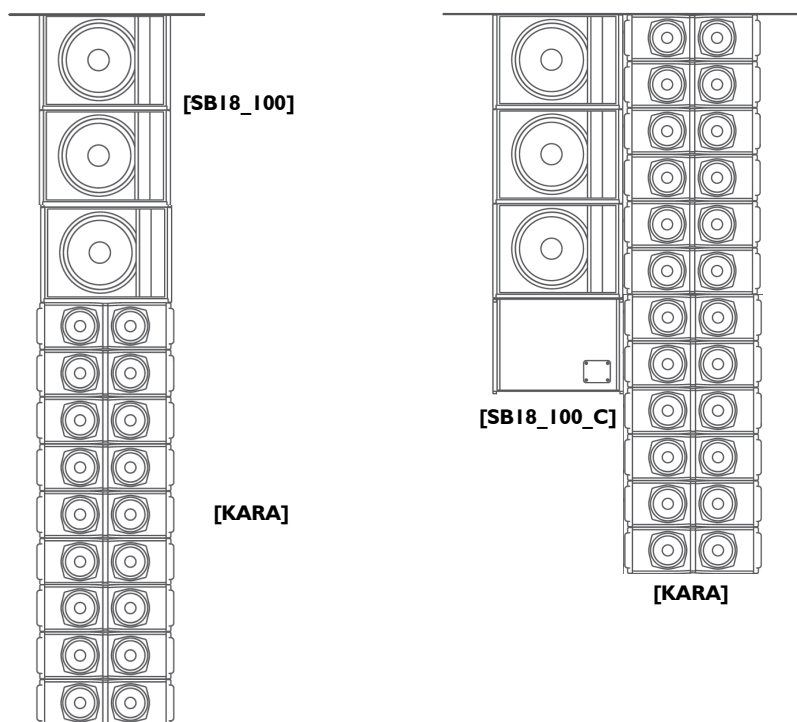


Figure 9: KARA/SB18 combination examples in LOW EXTENSION mode (part I)

2 - When combining [KARA] with [SB18_60] the KARA is associated with the SB18 in decoupled configurations. The SB18:KARA recommended ratio is 2:3.

Note1: Two SB18 array arrangements are possible whether the directivity pattern is intended to be omni-directional or cardioid. The cardioid arrangement is recommended within arrays containing a multiple of four SB18 enclosures and in that case the [SB18_60] preset must be replaced by [SB18_60_C] (see Figure 10 and refer to the **SB18 User manual** [3.4]).

Note2: A small KARA array (typically composed of 6 enclosures as shown in Figure 10) of standard curvature provides a flat contour. If needed, the KARA contour can be reinforced in the low frequency domain using the LF CONTOUR tool (refer to the **LA NETWORK MANAGER User manual** [3.4]) with frequency set at 180 Hz and gain set between 0 and 4 dB.

The association of KARA and LF CONTOUR allows reaching some unprecedented results when KARA are flown and SB18 are stacked due to the extended bandwidth and low-end capabilities of KARA.

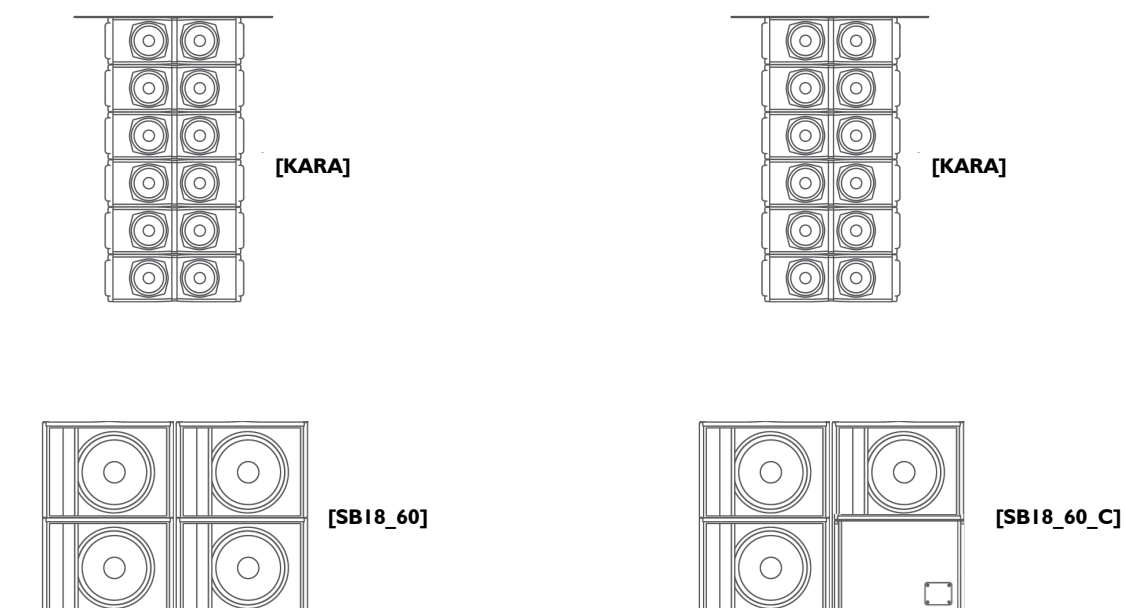


Figure 10: KARA/SB18 combination examples in LOW EXTENSION mode (part 2)

3 - When combining [KARA] with [SB28_100] the KARA is associated with the SB28 in coupled configurations only. The SB28:KARA recommended ratio is 1:3.

Note: This configuration is possible but not optimized. Due to the lower sensitivity and additional LF extension of SB28 versus SB18, it requires a SB28:KARA ratio of 1:3 (two times more 18" drivers are needed).

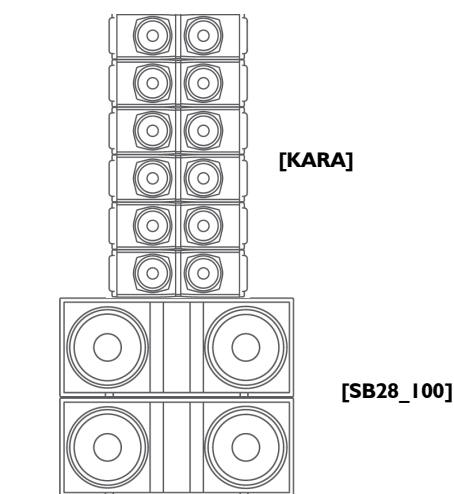


Figure 11: KARA/SB28 combination examples in LOW EXTENSION mode (part 1)

4 - When combining [KARA] with [SB28_60] the KARA is associated with the SB28 in decoupled configurations only. The SB28:KARA recommended ratio is 1:2.

Note1: A small KARA array (typically composed of 6 enclosures as shown in Figure 12) of standard curvature provides a flat contour. If needed, the KARA contour can be reinforced in the low frequency domain using the LF CONTOUR tool (refer to the **LA NETWORK MANAGER User manual** [3.4]) with frequency set at 180 Hz and gain set between 0 and 4 dB.

The association of KARA and LF CONTOUR allows reaching some unprecedented results when KARA are flown and SB28 are stacked due to the extended bandwidth and low-end capabilities of KARA.

Note2: This configuration is possible but not optimized. Due to the lower sensitivity and additional LF extension of SB28 versus SB18, it requires a SB28:KARA ratio of 1:2 (a third more 18" drivers are needed).

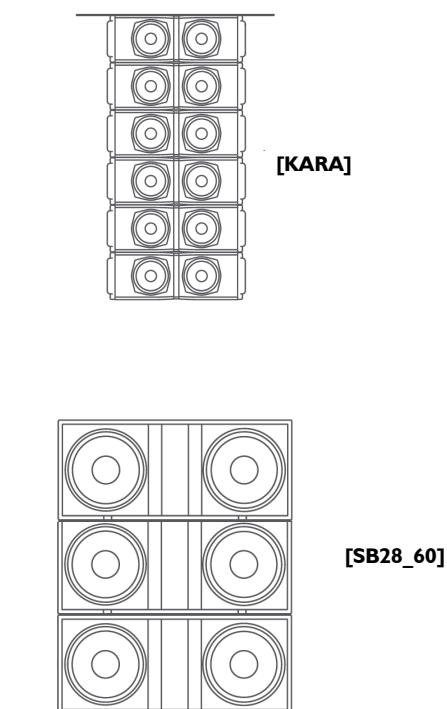


Figure 12: KARA/SB28 combination examples in LOW EXTENSION mode (part 2)

5 - When combining [KARA] with [SB18_100] and [SB28_60] the KARA is associated with the SB18 in flown closely coupled configurations only. The SB28 is stacked so that it is decoupled from the KARA/SB18 assembly. The SB28:SB18:KARA recommended ratio is 1:1:3. The bandwidth of the system is extended down to 25 Hz.



When SB18 are flown in a column above KARA, the maximum authorized configuration when using [KARA] preset along with the [SB18_100] or [SB18_100_C] preset is 3 SB18 and 9 KARA in order to keep an acceptable distance between both KARA and SB18 acoustic centers (see the left side of Figure 9).

When SB18 are flown in close proximity beside KARA this limitation does not occur anymore (see the right side of Figure 9).

Note1: Two SB18 array arrangements are possible whether the directivity pattern is intended to be omni-directional or cardioid. The cardioid arrangement is recommended within arrays containing a multiple of four SB18 enclosures and in that case the [SB18_100] preset must be replaced by [SB18_100_C] (see Figure 13 and refer to the **SB18 User manual** [3.4]).

The same remark applies for the SB28 where the [SB28_60] preset must be replaced by [SB28_60_C] (see Figure 13 and refer to the **SB28 User manual** [3.4]).

Note2: A small KARA array (typically composed of 6 enclosures as shown on the left side of Figure 13) of standard curvature provides a flat contour. If needed, the KARA contour can be reinforced in the low frequency domain using the LF CONTOUR tool (refer to the **LA NETWORK MANAGER User manual** [3.4]) with frequency set at 180 Hz and gain set between 0 and 4 dB.

The association of KARA and LF CONTOUR allows reaching some unprecedented results when KARA/SB18 assemblies are flown and SB28 are stacked due to the extended bandwidth and low-end capabilities of KARA.

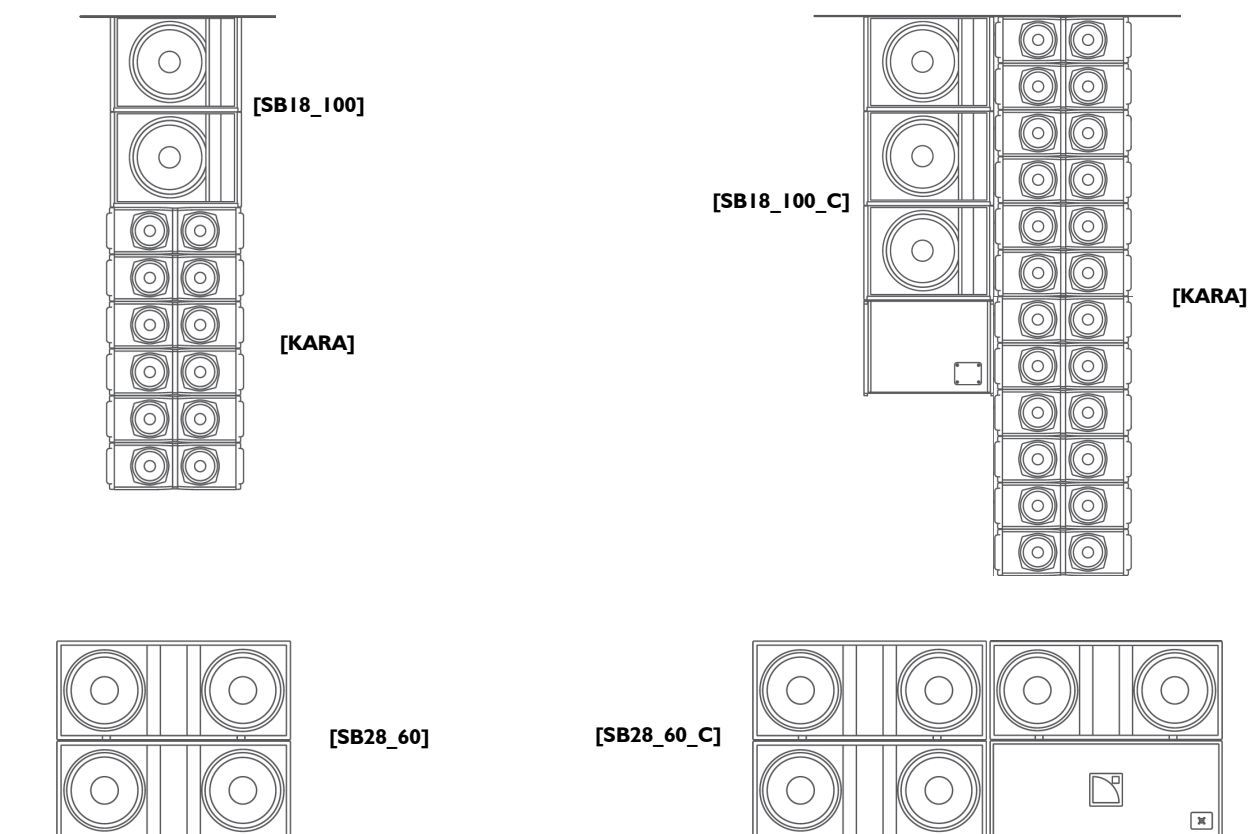


Figure 13: KARA/SB18/SB28 combination examples in LOW EXTENSION mode

7.4.2 Connecting KARA to LA8

The first two KARA enclosures are connected to the output channel pairs 1/2 and 3/4 of the LA8 controller. Two additional KARA enclosures can be connected in parallel with each first one. Therefore a single LA8 amplified controller can drive up to six KARA enclosures (see Figure 14).

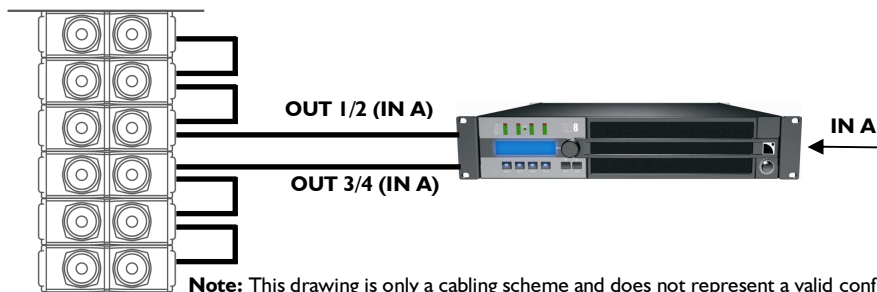



Figure 14: Six KARA enclosures connected to an LA8 controller

7.4.3 [KARA] preset

The [KARA] preset features a dedicated system contour for mid and long throw applications within the 55 Hz-20 kHz frequency range allowing it to be used along with the SB18 and/or SB28 presets.

Note: The same [KARA] preset is used in both FULL RANGE and LOW EXTENSION modes.



Depending on the chosen configuration, delays may have to be added in the presets. Refer to the **LA4-8 PRESET LIBRARIES User manual** embedded in the **LA8 PRESET LIBRARY Pack [3.4]** to obtain the delay values.

Activate the LOAD PRESET menu from the LA8 amplified controller front panel and then select the [KARA] preset. Refer to the **LA8 User manual [3.4]** for additional instructions. The preset is also accessible using LA NETWORK MANAGER Software (refer to the **LA NETWORK MANAGER User manual [3.4]**). The accessible parameters in LOW EXTENSION mode are shown in the following chart:

Table 5: Accessible parameters in LOW EXTENSION mode

LA8 Inputs/ Outputs	Elements to connect	Preset assignments*	Accessible (O) and blocked (X) parameters			
			Mute	Gain	Delay	Polarity
IN A	Input signal A	IN_A	X	O	O	O
IN B	Input signal B	IN_B	X	O	O	O
OUT 1	KARA enclosure	LF_A	O	X	X	X
OUT 2		HF_A	O	X	X	X
OUT 3	KARA enclosure	LF_A	O	X	X	X
OUT 4		HF_A	O	X	X	X

* IN: input signal. A, B: channel A, B. LF: low frequency transducer. HF: high frequency transducer.

8 CARE AND MAINTENANCE

8.1 Maintenance information

The **L-ACOUSTICS® KARA®** enclosure has been designed for various, intensive indoor and outdoor sound reinforcement applications. To fulfill such demanding conditions KARA contains high-grade and reliable components:


- Weather-resistant transducers.
- Baltic birch plywood cabinet.
- Polyester powder-coated steel grill.
- Airnet® high-resistant, non-biodegradable front grill fabric.
- Oxidation-resistant screws and rigging points.

However, in order to ensure product performance and safety, it is essential to frequently inspect the KARA cabinet. These checks need to be done on a regular basis depending on the conditions of use. The testing procedure consists of three steps as described in [8.2].

8.2 Testing procedure

8.2.1 Acoustical check

Connect a sweep frequency generator to the active input of the LA8 amplified controller. Apply a sweep from 55 Hz to 20 kHz with a **maximum voltage** of 0.2 volts (-12 dBu, -14 dBV): the sound should remain pure and free of unwanted noise.

	<p>0.2 volts is a maximum value that can generate very high sound levels at given frequencies. Use ear protection to set the sound level before testing.</p>
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In case of acoustical trouble, apply the **Mechanical check** [8.2.2] to verify if it is due to a structural vibration. If the problem persists, replace the faulty electrical component [8.3.4-8.3.7].


8.2.2 Mechanical check

1. Inspect the general aspect of the enclosure and attached parts (no signs of deformation, fissure, or corrosion).
2. Check that all fixed parts are locked tight to the enclosure (rigging elements, protective handles, grill, rear panel, and transducers).
3. Check that all mobile parts operate normally (ball-locking pins, front arms, angle arms).
4. Check the quality of contact and locking action of the SpeakON® sockets.

In case of mechanical trouble, lock tight or replace the faulty component **IF it is authorized** [8.3]. Otherwise, contact an L-ACOUSTICS® authorized representative.

8.2.3 External aspect check


1. Remove the dust from the front face (two grills and HF fabric) with a vacuum device.
2. If necessary, replace the HF protection fabric [8.3.2].
3. If necessary, repaint the cabinet (paint reference given in [8.3.1]).

	<p>If paint is applied, protect the mechanical and plastic parts. Do not apply paint to the front grill fabric as it could fill the holes and deteriorate the acoustic transparency.</p>
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8.3 Authorized service procedures

8.3.1 Replacement kits and recommended tools

The replacement kits (KR) available for the customer are shown in Figure 15 and listed in Table 6 with reference to the corresponding service procedures. Table 7 is a list of all tools and material needed for KARA 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.

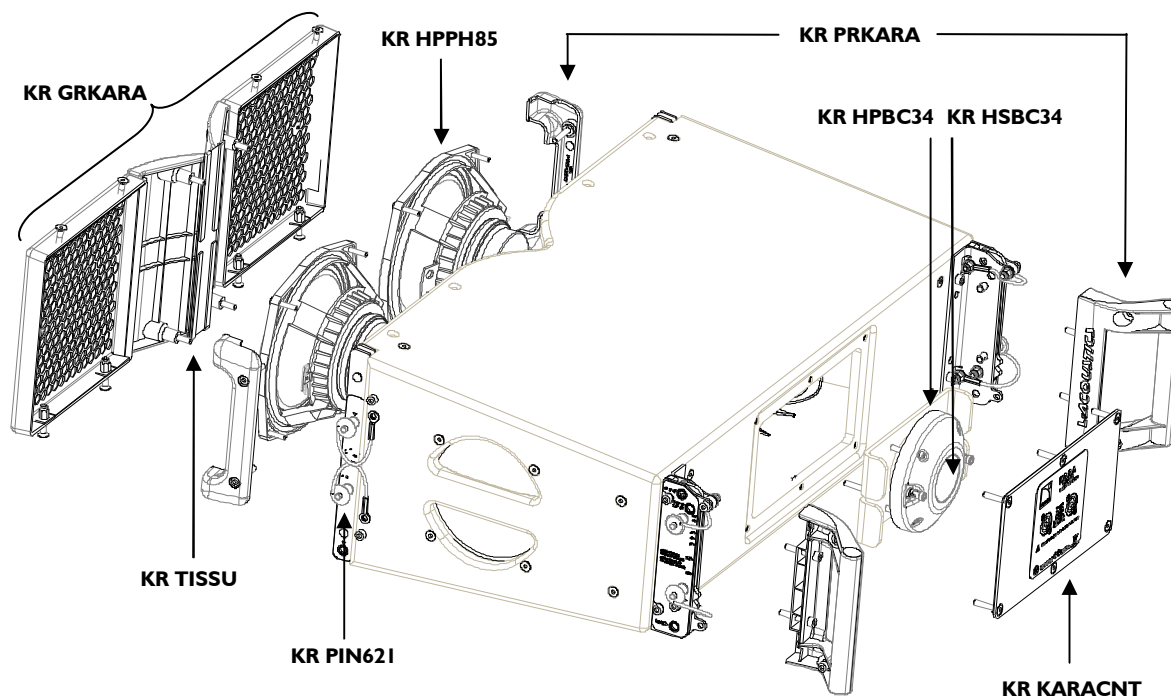


Figure 15: KARA exploded view

Table 6: Replacement kits and utilities

Reference	Description	Service procedure
KR GRKARA	Complete front face replacement kit (including HF protection fabric)	[8.3.2]
KR TISSU	HF protection fabric replacement kit	[8.3.2]
KR PRKARA	Protective elements replacement kit	[8.3.3]
KR HPPH85	LF transducer replacement kit	[8.3.4]
KR HPBC34	HF transducer replacement kit	[8.3.5]
KR HSBC34	HF diaphragm replacement kit	[8.3.6]
KR KARACNT	Connector plate replacement kit	[8.3.7]
KR PIN621	Set of ten 5/16" R-BLPs (round-shaped ball-locking pins) with fixing material	—
KR LOCKBLUE	Medium-strength thread-locker (5 pipettes of 50 g)	—
KR PAINT8019	Grey brown RAL 8019® paint (12 kg)	—

Table 7: Recommended tools and material

Electric screwdriver with torque selector (N.m or in.lbf)	3 mm hex bit	13 mm hex socket key
Sine wave generator	4 mm hex bit	T30 Torx® bit
	5 mm hex bit	2-sided tape

8.3.2 Front face (including HF protection fabric)

Replacement kit and tools

KR GRKARA or KR TISSU, electric screwdriver with torque selector (N.m or in.lb_f), 5 mm hex bit, T30 Torx® bit, KR LOCKBLUE.

Front face removal procedure

1. Put the enclosure vertically with front side facing the user and logo oriented rightwards.
2. Remove a fin on one side by removing both hex screws (5 mm hex bit).
3. Remove the corresponding grill by removing the 4 Torx® screws (T30 bit).
4. Repeat steps 2 and 3 for the fin and grill on the other side.
5. Remove the HF protection fabric from the center of the front face (fabric and joint frame).

Front face mounting procedure

1. Stick two foam joints around both large sides of the new fabric.
2. Install the new HF protection fabric on the enclosure with cut part facing the enclosure.
3. Mount a grill (grill with logo on the right) with BLP holes oriented outwards and screw in four Torx® screws (T30 bit, thread-locker, 3 N.m/27 in.lb_f).
4. Mount a fin and screw in two hex screws (5 mm hex bit, thread-locker, 3 N.m/27 in.lb_f).
5. Repeat steps from 3 to 4 for the other side of the front face.

8.3.3 Protective elements

Replacement kit and tools

KR PRKARA, electric screwdriver with torque selector (N.m or in.lb_f), 5 mm hex bit, 13 mm hex socket key, KR LOCKBLUE.

Front protective elements removal procedure

1. Put the enclosure horizontally with left or right side facing the user.
2. Remove the front protective element by removing both hex screws (5 mm hex bit).
3. Turn the enclosure on the other side and repeat step 2 for the other front protective element.

Front protective elements mounting procedure

1. Insert two hex screws into a front protective element and then insert two BLP sling ends into them (arrange both slings as shown in Figure 15).
2. Install the protective element on the enclosure side and screw in both hex screws (5 mm hex bit, thread-locker, 3 N.m/27 in.lb_f).
3. Turn the enclosure on the other side and repeat the procedure for the second front protective element.

Rear protective elements removal procedure

1. Put the enclosure horizontally with rear side facing the user.
2. Remove both screw/nut assemblies from a rear protective element and the corresponding rigging element (5 mm hex bit, 13 mm hex socket).
3. Remove both hex screws from the rear side of the enclosure.
4. Remove the rear protective element. Pay attention not to loose the upper rigging spacer and steel bar and put them in a safe place as these are not provided in the replacement kit.
5. Repeat steps from 2 to 4 for the second rear protective element.

Rear protective elements mounting procedure

1. Place the small spacer on the rigging piece.
2. Place a steel bar on a rear protective element and insert two hex screws.
3. Install the protective element on the enclosure (handle oriented outwards and BLP slings underneath) and screw in both hex screws (5 mm hex bit, thread-locker, 5 N.m/45 in.lb_f).
4. Install and screw in two screw/nut assemblies across the rigging and the protective element (5 mm hex bit, 13 mm hex socket, 5 N.m/45 in.lb_f) by paying attention that the upper screw slides into the spacer.
5. Repeat the procedure for the second rear protective element.

8.3.4 LF transducers**Replacement kit and tools**

KR HPPH85, electric screwdriver with torque selector (N.m or in.lb_f), 4 mm hex bit, 5 mm hex bit, T30 Torx[®] bit, KR LOCKBLUE.

LF transducer removal procedure

1. Remove the grill and fin facing the transducer [8.3.2, **Front face removal procedure**, steps from 1 to 3].
2. Remove the transducer from the enclosure by removing the 4 hex screws with split and flat washers (4 mm hex bit). Pay attention no to bend the terminals.
3. Disconnect both cables from the terminals.

LF transducer mounting procedure

1. **Connect the red cable to the large terminal of the transducer and the black cable to the narrow terminal.**
2. Mount the transducer in the enclosure (terminals oriented towards the enclosure's side) and screw in four hex screws with split and flat washers: into each hex screw insert a split washer and then a flat washer (**follow this sequence**) and screw in the assembly (4 mm hex bit, 3 N.m/27 in.lb_f).
3. Mount the grill and fin facing the transducer [8.3.2, **Front face mounting procedure**, steps 3 and 4].

8.3.5 HF transducer**Replacement kit and tools**

KR HPBC34, electric screwdriver with torque selector (N.m or in.lb_f), 5 mm hex bit, T30 Torx[®] bit, KR LOCKBLUE.

HF transducer removal procedure

1. Remove the connector plate by removing the 6 Torx[®] screws (T30 bit).
2. Disconnect both cables from the transducer (push the spring-loaded terminal, slide the cable out, and release the terminal).
3. Remove the HF assembly by removing both hex screws with split and flat washers (5 mm hex bit).

HF transducer mounting procedure

1. Mount a HF assembly to the back side of the waveguide and screw in two hex screws with split and flat washers: into each hex screw insert a split washer and then a flat washer (**follow this sequence**) and screw in the assembly (5 mm hex bit, 5 N.m/45 in.lb_f).
2. **Connect the red cable to the red terminal of the transducer and the black cable to the black terminal** (push the spring-loaded terminal, slide the cable in, and release the terminal).
3. Mount the connector plate and screw in six Torx[®] screws (T30 bit, thread-locker, 3 N.m/27 in.lb_f).

8.3.6 HF diaphragm

Replacement kit and tools

KR HSBC34, sine wave generator, electric screwdriver with torque selector (N.m or in.lb_i), 3 mm hex bit, T30 Torx[®] bit, KR LOCKBLUE, 2-sided tape.

HF diaphragm removal procedure

1. Remove the connector plate by removing the 6 Torx[®] screws (T30 bit).
2. Disconnect both cables from the transducer (push the spring-loaded terminal, slide the cable out, and release the terminal).
3. Remove the back cover from the transducer by removing the 4 hex screws (3 mm hex bit) and pull the diaphragm out from the magnet.

HF diaphragm mounting procedure

1. Ensure that the voice coil gap on the transducer is free from any particles. If necessary, clean out the gap by using 2-sided tape.
2. Install the diaphragm in the gap.
3. Install the back cover and screw in four hex screws (3 mm hex bit, 2 N.m/18 in.lb_i). Balance the torques between screws while screwing so as to properly center the diaphragm.
4. Apply a low level LF sine wave (for example: 1 volt at 440 Hz) to ensure that the diaphragm is properly centered in the gap (a pure sound should be heard). If not, slightly unscrew, center, screw, and make another test.
5. **Connect the red cable to the red terminal of the transducer and the black cable to the black terminal** (push the spring-loaded terminal, slide the cable in, and release the terminal).
6. Mount the connector plate and screw in six Torx[®] screws (T30 bit, thread-locker, 3 N.m/27 in.lb_i).

8.3.7 Connector plate

Replacement kit and tools

KR KARACNT, electric screwdriver with torque selector (N.m or in.lb_i), 4 mm hex bit, 5 mm hex bit, T30 Torx[®] bit, KR LOCKBLUE.

Connector plate removal procedure

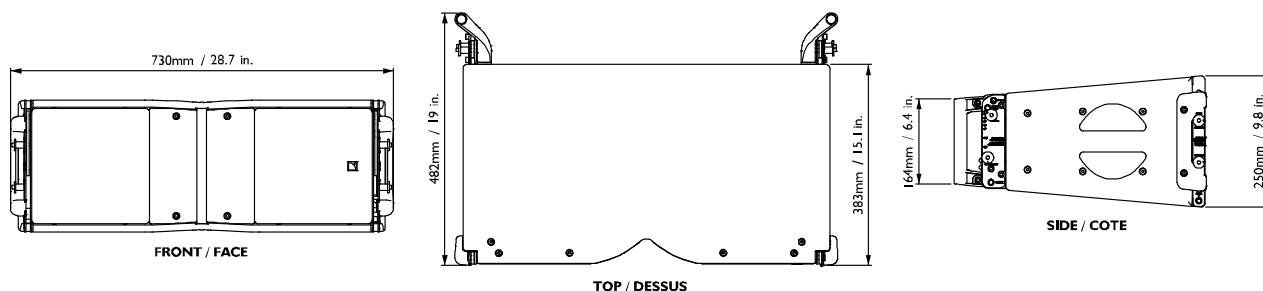
1. Remove the connector plate by removing the 6 Torx[®] screws (T30 bit).
2. Disconnect both cables from the HF transducer (push the spring-loaded terminal, slide the cable out, and release the terminal).
3. Remove both LF transducers [8.3.4, **LF transducer removal procedure**].
4. Remove the connector plate with its cables.

Connector plate mounting procedure

1. Pre-install the cables of the connector plate in the enclosure with a long red cable and a long black cable for each LF transducer and the short red and black cables for the HF transducer.
2. Mount both LF transducers [8.3.4, **LF transducer mounting procedure**].
3. On the back side of the enclosure, **connect the red cable to the red terminal of the LF transducer and the black cable to the black terminal** (push the spring-loaded terminal, slide the cable in, and release the terminal).
4. Mount the connector plate and screw in six Torx[®] screws (T30 bit, thread-locker, 3 N.m/27 in.lb_i).

9 SPECIFICATIONS

Reference	KARA [®]	
Frequency response		
Usable bandwidth (-10 dB)	55 Hz - 20 kHz	([KARA] preset, line source configuration)
Maximum SPL¹	139 dB ([KARA] preset)	
Nominal Directivity (-6dB)		
Horizontal	110° symmetric (350 Hz - 16 kHz).	
Vertical	Dependant upon number of elements and line source curvature.	
Transducers		
LF	2x 8" neodymium, mounted in a bass-reflex tuned enclosure	
HF	1x 3" neodymium, diaphragm compression driver, mounted to a DOSC [®] waveguide	
Filtering	Active	
Nominal impedance	LF section: 8 Ω	HF transducer: 8 Ω
Long term RMS handling	LF: 2 x 450 W	HF: 80 W ([KARA_100] preset)
Connectors	2 x 4-point SpeakON [®] (wired in parallel)	
Dimensions (W x H/h x D)	730 x 250/164 x 482 mm / 28.7 x 9.8/6.4 x 19 inch	



Weight	26 kg / 57.2 lbs	
Vertical array rigging²	<ul style="list-style-type: none"> ⇒ L-ACOUSTICS[®] M-BUMP rigging frame. Certified for flying up to 24 KARA or 4 SB18/12 KARA and stacking up to 9 KARA or 2 SB18/6 KARA. Inter-enclosure angles: 0, 1, 2, 3, 4, 5, 7.5, 10°. First enclosure angle range in stacked configuration: from -5° to +15°. ⇒ L-ACOUSTICS[®] M-BAR extension bar for M-BUMP. ⇒ L-ACOUSTICS[®] M-JACK stacking bases (x4) for M-BUMP (including 2 angle arm extensions). ⇒ L-ACOUSTICS[®] KARA-ANGARMEX angle arm extensions (x2) for stacked configurations. ⇒ L-ACOUSTICS[®] KARA-PULLBACK rigging accessory. 	
External structure		
Material	15 mm Baltic birch plywood.	
Finish	Grey brown, RAL 8019 [®] .	
Front	Polyester powder-coated steel grill, Airtex [®] acoustically transparent fabric.	
Rigging	Zinc and polyester powder-dual coated steel.	
Protective elements and fins	Polyamide.	
Handles	Integrated into the cabinet and the protective elements.	

¹ Peak level measured at 1 m under free field conditions using 10 dB crest factor pink noise with specified preset and corresponding EQ settings.

² Installation safety limits are specified in SOUNDVISION Software which is designed to help with L-ACOUSTICS[®] product implementation.

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