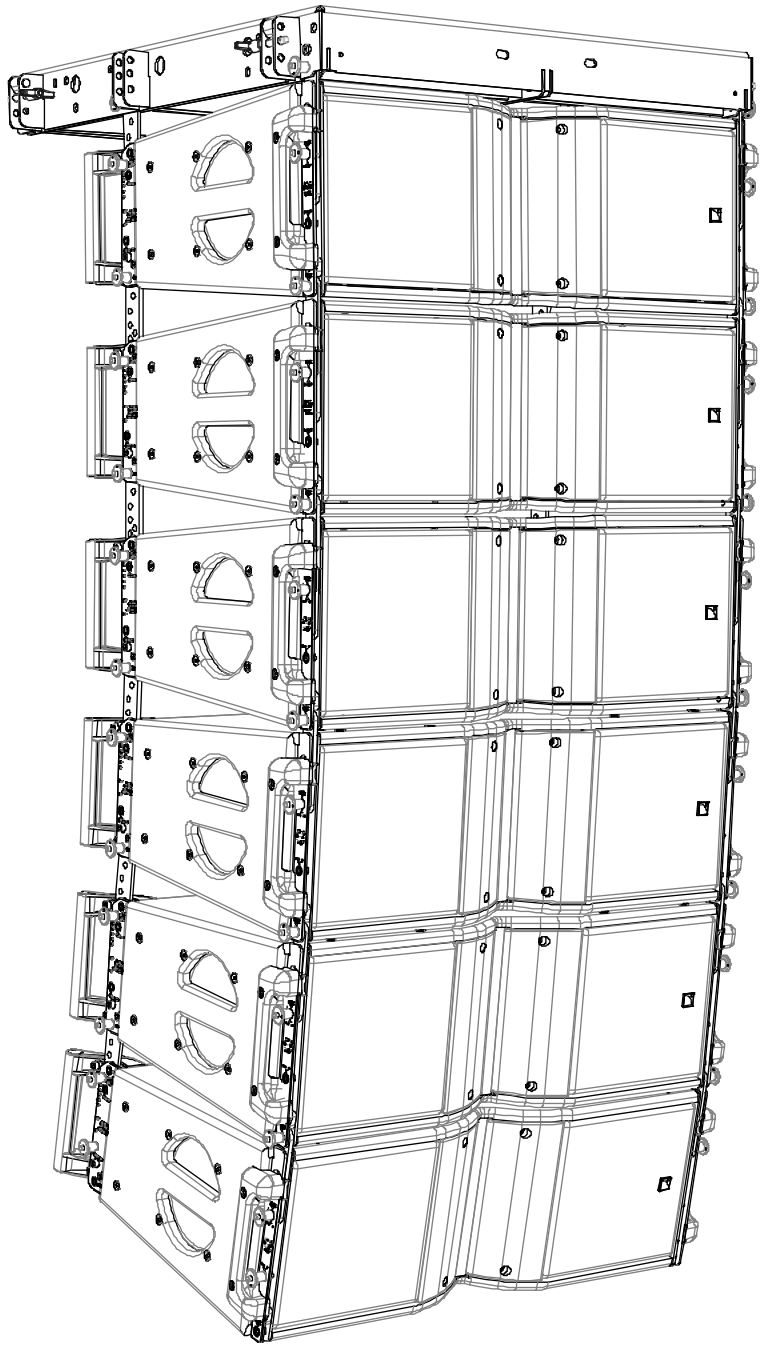
KARA®/KARAi SYSTEM

USER MANUAL

VERSION 2.0



SAFETY INSTRUCTIONS

1. **Read this manual**

2. **Heed all SAFETY INSTRUCTIONS as well as DANGER and OBLIGATION warnings**

3. **Never incorporate equipment or accessories not approved by L-ACOUSTICS®**

4. **Read all the related PRODUCT INFORMATION documents before exploiting the system**
   The product information document is included in the shipping carton of the related system component.

5. **Read the RIGGING MANUAL before installing the product**
   Use the rigging elements described in the rigging manual and follow the associated procedures.

6. **Beware of sound levels**
   Do not stay within close proximity of loudspeakers in operation and consider wearing earplugs.
   Loudspeaker systems are capable of producing very high sound pressure levels (SPL) which can instantaneously lead to permanent hearing damage to performers, production crew and audience members. Hearing damage can also occur with prolonged exposure to sound: 8 h at 90 dB(A), 30 min at 110 dB(A), less than 4 min at 130 dB(A).

SYMBOLS

The following symbols are used in this document:

DANGER
This symbol indicates a potential risk of harm to an individual or damage to the product. It can also notify the user about instructions that must be strictly followed to ensure safe installation or operation of the product.

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

INFORMATION
This symbol notifies the user about complementary information or optional instructions.

CONTENTS

WELCOME TO L-ACOUSTICS®

Thank you for choosing the L-ACOUSTICS® **KARA**® or **KARAi SYSTEM**.

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

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

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

1 KARA WST® SYSTEM

With a design inspired from the K1 stadium system, the KARA WST® system is the high-end modular line source from L-ACOUSTICS®. Utilizing the unrivalled characteristics of WST® (Wavefront Sculpture Technology), the KARA system delivers clarity, precision, and a unique proximity effect, for the audience to enjoy an incomparable listening experience. The main system components consist of the following:

- KARA, full range element, operating from 55 Hz to 20 kHz;
- SB18, low frequency extension, operating down to 32 Hz;
- LA-RAK, touring rack fitted with three LA8 amplified controllers.

The KARA delivers a considerable number of improvements over the previous generation of line sources, particularly with regard to directivity control in the horizontal plane, transducers resources for increased operating bandwidth and coherence, vertical coverage capability and extensive choice of operating modes to accommodate various LF contour requirements.

The compact size and low weight of a KARA line source complies with rigging and visual limitations. Any on-site deployment can be easily and quickly achieved thanks to an extremely ergonomic rigging system.

A wide range of system configurations are available for the sound designer and system engineer, allowing high level of creative freedom. With a fixed horizontal directivity of 110° and a vertical inter-element variation from 0° to 10°, the KARA line source is fully configurable to match any audience geometry. The KARA system can be deployed either as a main system (FOH or distributed) with the SB18 subwoofer, as a compact complementary system (delays or fills), and even as a dedicated K1 downfill extension for stadium and arena concert applications. Before installation, these configurations can be acoustically and mechanically modeled with the SOUNDVISION 3D simulation software.

As a distribution platform for power, audio signals and network, the LA-RAK touring rack is the heart of the system. It houses three LA8 amplified controllers. Thanks to dedicated factory presets, it constitutes an extremely advanced and precise drive system for the enclosures of the KARA system. All L-ACOUSTICS amplified controllers feature the L-DRIVE, a thermal and over-excursion protection circuit.

Up to 253 LA8 amplified controllers can be connected together via the Ethernet-based L-NET protocol. The LA NETWORK MANAGER software allows online remote control and monitoring of all the connected units, via a user-friendly and intuitive graphic interface, and features the Array Morphing EQ. This exclusive tool allows the engineer to quickly adjust the tonal balance of the system to reach a reference curve or to ensure consistency of the sonic signature.

KARA® SYSTEM and **KARAi SYSTEM**
In this document, the KARA term and illustration will refer equally to KARA® or KARAi. In the same way, the SB18 term and illustration will refer equally to SB18 or SB18i.These products are different versions of the same enclosure and share the same operating modes, presets and recommended configurations. The rigging system of each version has been designed to accommodate a different use. KARA and SB18 are optimized for touring market, whereas KARAi and SB18i are optimized for fixed installation.

2 SYSTEM COMPONENTS

The system approach developed by L-ACOUSTICS® consists in offering a global solution that guarantee the highest and most predictable level of performance at any step of loudspeaker system deployment: modeling, installation, and operation. A complete L-ACOUSTICS® system includes enclosures, amplified controllers, cables, rigging system, and software applications. The main components of a **KARA SYSTEM** are the following:

2.1 Loudspeaker enclosures

KARA	Full-range enclosure (50 Hz – 20 kHz), 2-way active, variable curvature WST® line source
SB18	High power compact subwoofer (down to 32 Hz)
SB28	High power subwoofer (down to 25 Hz)

Loudspeaker system design
Sound design aspects are beyond the scope of this document. However, the various applications of the system will be based on the operating modes presented in this document.

2.2 Powering and driving system

LA8	Amplified controller with DSP, preset library and networking capabilities
LA-RAK	Touring rack containing three LA8, for power, audio signals and network distribution

Operating instructions
Refer to the **LA8** and the **LA-RAK user manual**.

2.3 Loudspeaker cables

DO cables (DO.7, DO10, DO25)	8-point PA-COM® loudspeaker cables respective lengths of 0.7m/2.3ft, 10m/32.8ft, and 25m/82ft
DOFILL-LA8	Breakout cable for two 2-way active enclosures PA-COM® < 2 x SpeakON®
DO3WFILL	Breakout cable for one 2-way active enclosure and two passive enclosures PA-COM® < 3 x SpeakON®
DOSUB-LA8	Breakout cable for four passive enclosures PA-COM® < 4 x SpeakON®
SP cables (SP.7, SP5, SP10, SP25)	4-point SpeakON® loudspeaker cables, respective lengths of 0.7m/2.3ft, 5m/16.4ft, 10m/32.8ft and 25m/82ft
SP-Y1	Breakout cable for two passive enclosure SpeakON® < 2 x SpeakON®

Information about the connection of the enclosures to the LA amplifiers is given in this document.
Refer to the **LA8** and the **LA-RAK user manual** for detailed instructions about the whole cabling scheme, including modulation cables and network.

2.4 Rigging elements

Rigging elements or procedures are not presented in this document.
According to the enclosure version, refer to the **KARA**® or **KARAi SYSTEM rigging manual**.

2.5 Software applications

SOUNDVISION	3D acoustical and mechanical modeling
LA NETWORK MANAGER	Remote control and monitoring of amplified controllers

Using L-ACOUSTICS® software
Refer to the **SOUNDVISION user manual** and the **LA NETWORK MANAGER tutorial**.

KARA®

SB18

LA-RAK

LA8

SB28

SP-Y1

DOFILL-LA8

DO.7

SP.7

SP5

DOSUB-LA8

DO10

SP10

DO3WFILL

DO25

SP25

Soundvision

LA Network Manager

KARA® SYSTEM components (excluding rigging elements and modulation cables)
(in a KARAi SYSTEM, KARAi and SB18i enclosures replace KARA® and SB18 enclosures)

3 OPERATING MODES

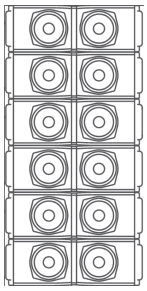
3.1 FULL-RANGE mode

In FULL-RANGE mode, the KARA system operates over the nominal bandwidth of the enclosure.

It corresponds to the use of the KARA line source in standalone configuration, i.e. without complementary subwoofers.

The KARA enclosure is driven by the LA8 amplified controller with a dedicated factory preset.

Standalone KARA line source



Enclosure	[PRESET]
KARA	▶ **[KARA]**

Frequency range (-10dB)
55Hz – 20kHz

3.2 LOW-EXTENSION mode

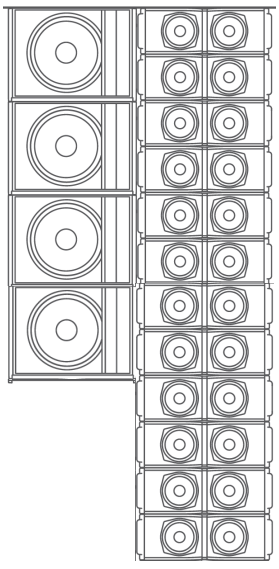
In LOW-EXTENSION mode, the bandwidth of the KARA system is extended in the low end.

It corresponds to the use of a KARA line source in combination with the SB18 subwoofer, the SB28 subwoofer or both the SB18 and the SB28.

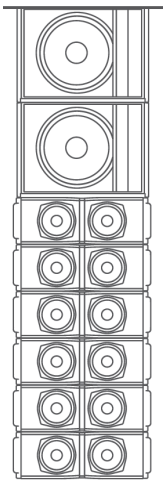
Each enclosure type is driven by the LA8 amplified controller with a dedicated factory preset.
The KARA enclosure is driven by the same preset as in standalone configuration.
The upper frequency limit of the preset driving the SB subwoofer will depend on the coupling conditions.

COUPLED or SEPARATED in sub/main system combination
To achieve close coupling, respect the maximum distance between adjacent lines or the maximum mixed line configuration. When exceeding these limits, refer to the presets and ratios corresponding to separated subs.

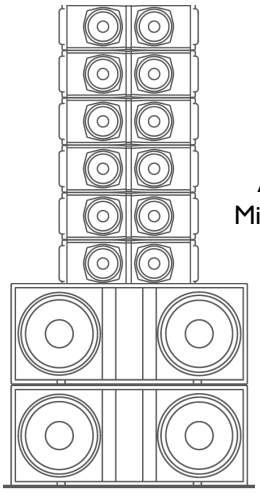
KARA line source + coupled SB subwoofers



Flown KARA array beside flown SB18 array



Flown or ground-stacked KARA/SB18 array



KARA array stacked on SB28

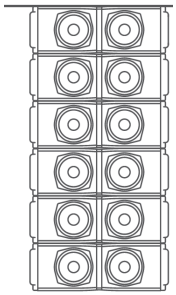
Recommanded ratio
3 KARA : 1 SB××

Limits for close coupling
Adjacent main/sub lines: *distance* < 0,95 m
Mixed main/sub line: *maximum* 9 KARA/ 3 SB××

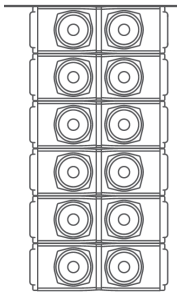
Enclosure	[PRESET]
KARA	▶ **[KARA]**
SB×× subwoofer	▶ **[SB××_100]**

Frequency range (-10dB)
25Hz – 20kHz with SB28
32Hz – 20kHz with SB18

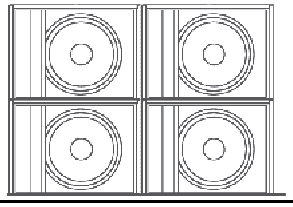
KARA line source + separated SB subwoofers

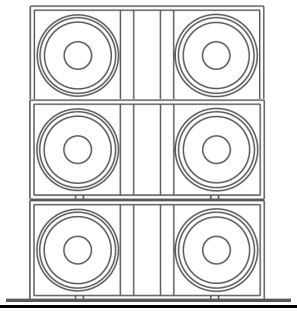


Flown KARA array
with ground-stacked SB18



Flown KARA array
with ground-stacked SB28





Recommanded ratio

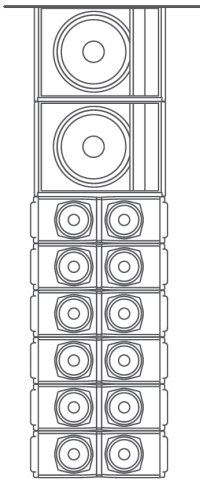
3 KARA : 2 SB18
2 KARA : 1 SB28

Enclosure	[PRESET]
KARA	▶ **[KARA]**
SB×× subwoofer	▶ **[SB××_60]**

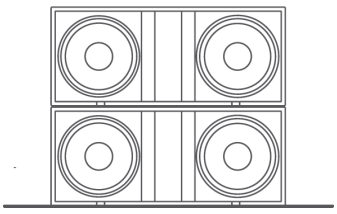
Frequency range (-10dB)

25Hz – 20kHz with SB28
32Hz – 20kHz with SB18

KARA line source + coupled SB18 + separated SB28



Flown KARA/SB18 array
with ground-stacked SB28



Recommended ratio

3 KARA : 1 SB18 : 1 SB28

Enclosure	[PRESET]
KARA	▶ **[KARA]**
SB18	▶ **[SB18_100]**
SB28	▶ **[SB28_60]**

Limits for close coupling

Adjacent main/sub lines: *distance* < 0,95 m
Mixed main/sub line: *maximum* 9 KARA/ 3 SB××

Frequency range (-10dB)

25Hz – 20kHz

Delay settings
When combining a line source with subwoofers, delays may have to be added to the presets.
Refer to the **LA8 PRESET LIBRARY user manual** to obtain the pre-alignment delay values.

Use [SB××_××_C] with a SB subwoofer array in cardioid configuration
The cardioid configuration consists in reversing 1 element in an array of 4 subwoofers.
Refer to the SB×× **user manual** for details about the CARDIOID mode.

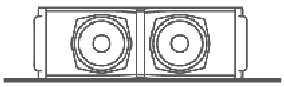
3.3 HIGH-PASS mode

In HIGH-PASS mode, the low end of the KARA bandwidth has been cut off.

It corresponds to the use of KARA enclosure as a single element, typically as a fill system.

The KARA enclosure is driven by the LA8 amplified with a dedicated preset. In addition to a high-pass filter at 100 Hz, the preset provides the enclosure with a neutral frequency response.

Single KARA enclosure



Enclosure	[PRESET]
KARA	▶ **[KARA_FI]**

Frequency range (-10dB)
100Hz – 20kHz

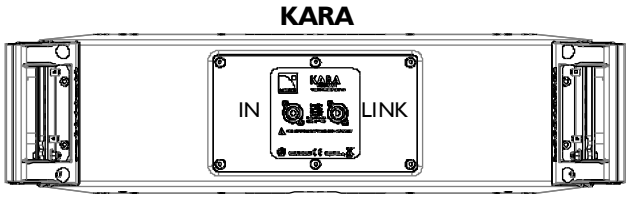
KARA downfill system for K1 main system
A preset allows using a KARA line source in HIGH-PASS mode as a downfill system for K1. In addition to a high-pass filter at 100 Hz, this dedicated preset provides the KARA system with a WST® contour and specific delay settings in order to optimize the acoustic coupling between the KARA and K1 line sources. Refer to the **K1 SYSTEM user manual** for details about the KARA DOWNFILL option.

4 LOUDSPEAKER CONNECTION

4.1 KARA connection

The KARA is a 2-way active enclosure equipped with two 4-point SpeakON® connectors wired in parallel.

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



Internal pinout for L-ACOUSTICS® 2-way active enclosures

SpeakON® points	1+	1-	2+	2-
Transducer connectors	LF +	LF -	HF +	HF -

The KARA is exclusively bi-amplified by the L-ACOUSTICS® LA8 amplified controller.

To cable L-ACOUSTICS® 2-way active enclosures with the LA8, three options are available:

Option A:
▶ Connect a **DO** cable (DO.7, DO10 or DO25) to the PA-COM® connector of the LA8 and use the **DOFILL-LA8** to split the audio signals into two channel pairs, CH(A) and CH(B), each one feeding one enclosure.

Option B:
▶ Use an **SP** cable (SP5, SP10 or SP25) to connect one enclosure to one of the two SpeakON® connectors of the LA8. Repeat with a second enclosure if needed.

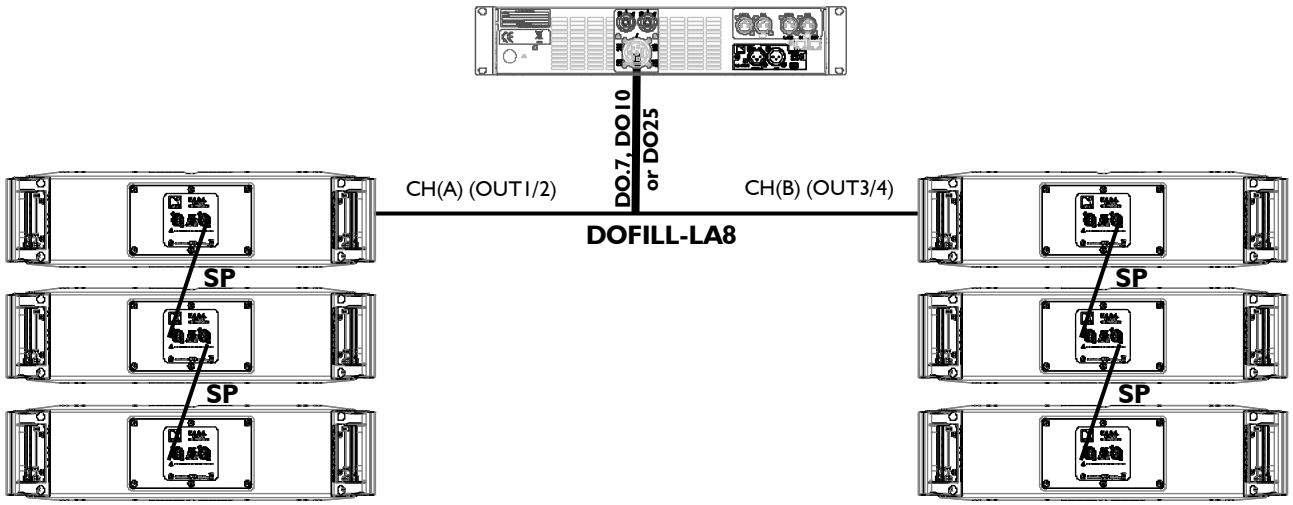
Option C:
▶ Connect a **DO** cable (DO.7, DO10 or DO25) to the PA-COM® connector of the LA8 and use the **DO3WFILL** to split the audio signals into one channel pair, feeding one KARA enclosure, and two single channels, each one feeding one SB subwoofer. ❗ This cabling scheme needs a dedicated custom preset.

Two additional KARA enclosures can be connected in parallel with each of the first ones, by using **SP** cables.

Maximum of 6 KARA enclosures per LA8
3 KARA enclosures can be connected in parallel to each pair of output channels on the LA8 (1/2 and 3/4).

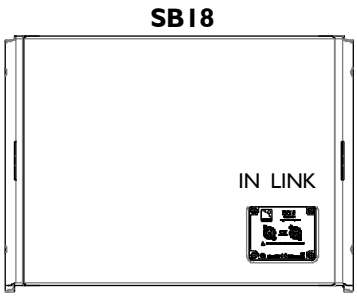
PA-COM® standard
Using cable other than specified in this document to connect a 2-way active enclosure via the PA-COM® connector of the LA8 may lead to speaker damage. Refer to the **LA8 PACOM CABLES technical bulletin**.

Impedance load
8 Ω for 1 enclosure; 4 Ω for 2 enclosures in parallel; 2.7 Ω for 3 enclosures in parallel.



Connecting six KARA to one LA8 with the DOFILL-LA8 (Option A)

4.2 SB18 and SB28 connection



The SB18 subwoofer is equipped with two 4-point SpeakON® connectors.
The IN connector allows receiving the audio signal, whereas the LINK connector allows routing it to another SB18 enclosure in parallel (LA8 only).

SB18 parallel connection is only possible with the LA8 amplified controller. Refer to the **SB18 user manual** for connection to the LA4.

The SB28 subwoofer is equipped with one 4-point SpeakON® connector.

Internal pinout for L-ACOUSTICS® subwoofers

SpeakON® points	1+	1-	2+	2-
Transducer connectors	LF +	LF -	Not used	Not used

To cable L-ACOUSTICS® subwoofers with the LA8, three options are available:

Option A
▶ Connect a **DO** cable (DO.7, DO10 or DO25) to the PA-COM® connector of the LA8 and use the **DOSUB-LA8** to split the audio signals into four channels, each one feeding one SB subwoofer of the same type.

Option B:
▶ Connect an **SP** cable (SP.7, SP5, SP10 or SP25) to one of the SpeakON® connectors of the LA8, and use the **SP-Y1** cable to split the audio signals into two channels, each one feeding one subwoofer. The **CC4FP** adaptor allows interfacing the **SP** and **SP-Y1** cables. Apply the same cabling scheme with the other LA8 SpeakON® connector.

Option C:
▶ Connect a **DO** cable (DO.7, DO10 or DO25) to the PA-COM® connector of the LA8 and use the **DO3WFILL** to split the audio signals into one channel pair, feeding one 2-way active enclosure, and two single channels, each one feeding one SB subwoofer. This cabling scheme needs a dedicated custom preset.

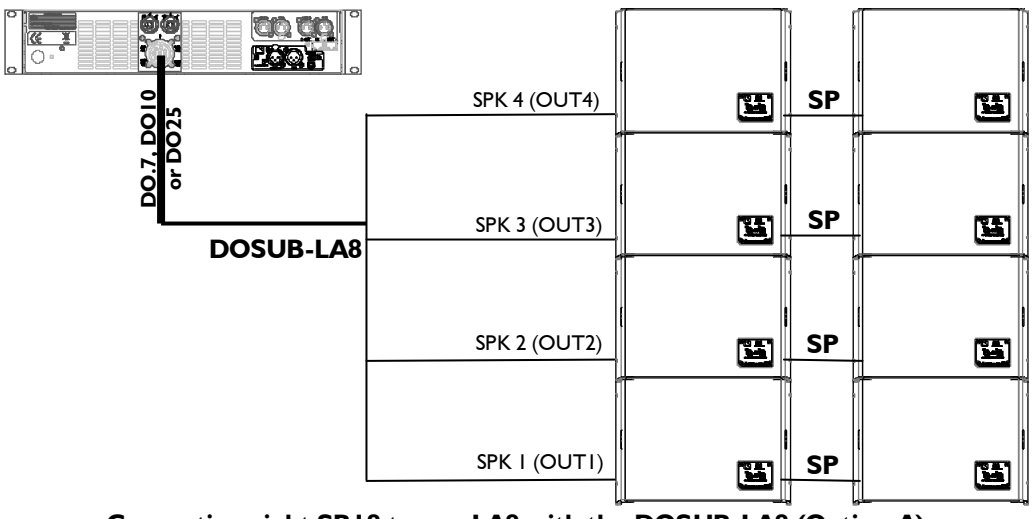
One additional SB18 can be connected in parallel with each of the first ones, by using **SP** cables.

Maximum of 8 SB18 subwoofers per LA8 / Maximum of 4 SB28 subwoofers per LA8
2 SB18 subwoofers in parallel can be connected to each output channel on the LA8.
1 SB28 subwoofer can be connected to each output channel on the LA8.

PA-COM® standard
Using cable other than specified in this document to connect a subwoofer via the PA-COM® connector of the LA8 may affect the acoustic results. Refer to the **LA8 PACOM CABLES technical bulletin**.

CARDIOID mode
By connecting the reversed subwoofer to OUT 1, Option A and Option B allow using the cardioid preset

Impedance load
8 Ω for 1 SB18, 4 Ω for 2 SB18 in parallel / 4 Ω for 1 SB28.



Connecting eight SB18 to one LA8 with the DOSUB-LA8 (Option A)

APPENDIX A: PRESET DESCRIPTION

The latest version of each **PRESET LIBRARY** and the corresponding **user manuals** are downloadable from the L-ACOUSTICS® web site.

[KARA]: full-range

To use the KARA line source in FULL-RANGE mode, in standalone configuration, or in LOW-EXTENSION mode, in combination with SB subwoofers.

LA8 Inputs/Outputs	Elements to connect	Routing *	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.

[KARA_FI]: high-pass

To use KARA enclosures in HIGH-PASS mode, as single elements for a fill system.

LA8 Inputs/Outputs	Elements to connect	Routing *	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.

[SB×× _××]: standard subwoofer

To use SB×× subwoofers in STANDARD mode, as single elements or as an array in standard configuration.

LA8 Inputs/Outputs	Elements to connect	Routing*	Accessible (O) and locked (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	Subwoofer	SB_A	O	O	O	O
OUT 2	Subwoofer	SB_A	O	O	O	O
OUT 3	Subwoofer	SB_B	O	O	O	O
OUT 4	Subwoofer	SB_B	O	O	O	O

* IN: input signal. A, B: channel A, B. SB: subwoofer.

[SB×× _×× _C]: cardioid subwoofer

To use SB×× subwoofers in CARDIOID mode, as an array in cardioid configuration.

LA8 Inputs/Outputs	Elements to connect	Routing*	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	Reversed subwoofer	SR_A	O	X	X	X
OUT 2	Subwoofer	SB_A	O	X	X	X
OUT 3	Subwoofer	SB_A	O	X	X	X
OUT 4	Subwoofer	SB_A	O	X	X	X

* IN: input signal. A, B: channel A, B. SB: subwoofer. SR: reversed subwoofer.

APPENDIX B: SPECIFICATIONS FOR LOUDSPEAKER CABLES

Cable quality and resistance
Only use high-quality fully insulated speaker cables made of stranded copper wire.
Use cables of gauge offering low resistance per unit length and keep the cables as short as possible.

The following table provides the recommended maximum length depending on the cable cross-section and on the impedance load connected to the amplifier.

			Recommended maximum length					
Cable cross-section			**8 Ω** load		**4 Ω** load		**2.7 Ω** load	
mm²	**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

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