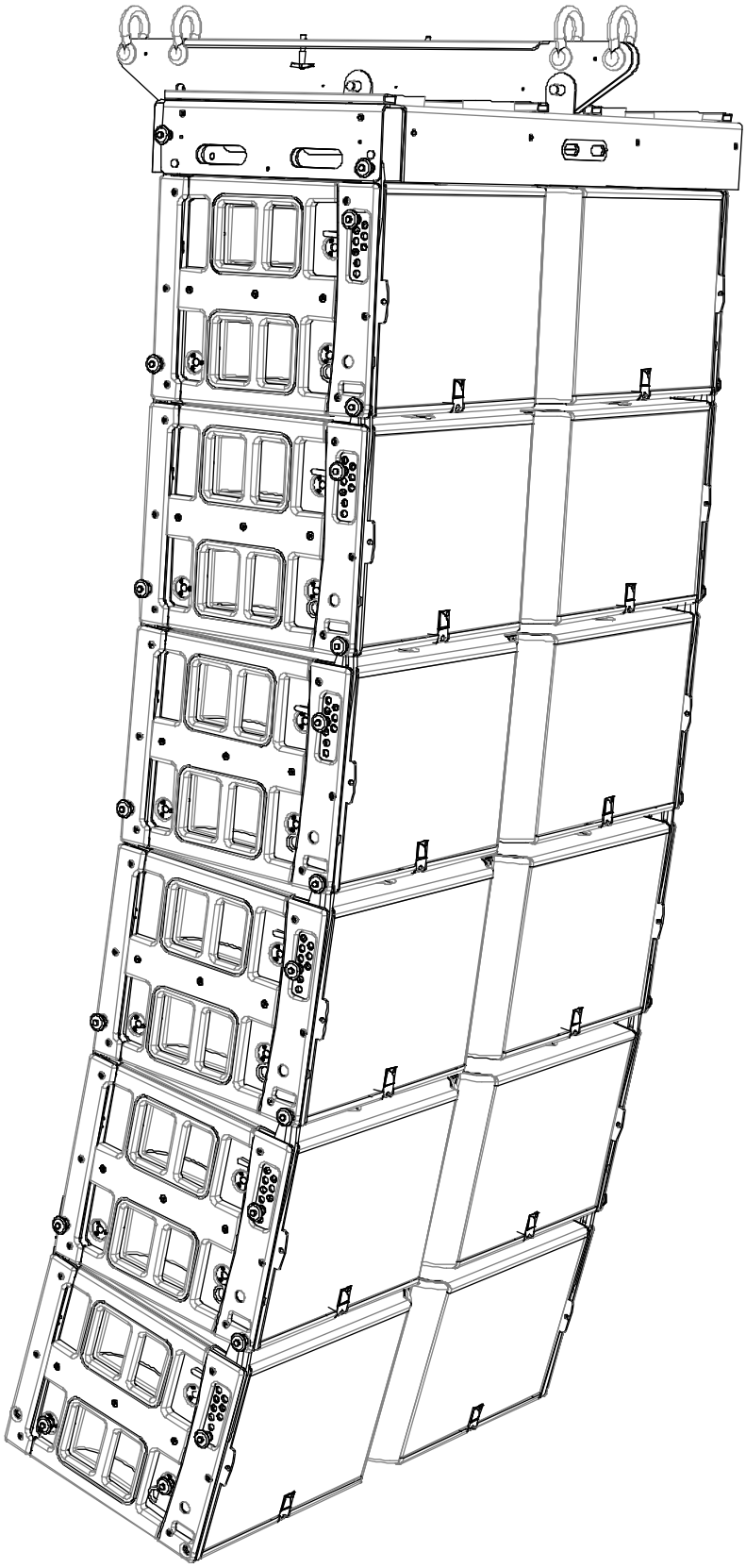
K1 SYSTEM K1 K1-SB

USER MANUAL

VERSION 3.1



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® **K1 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 K1 WST® SYSTEM

The K1 has benefited from a design exploiting Wavefront Sculpture Technology® in a large format line source solution. The K1 system soon established a new reference in the world of sound reinforcement. Intended for very large concert stadium applications and outdoor festivals, the KI system delivers an unequalled level of performance to the touring market, setting the benchmark of coherence and tonal balance control over distance.

The main system components consist of the following:
- K1, full range element, operating from 35 Hz to 20 kHz;
- K1-SB, low frequency extension, operating down to 34 Hz;
- LA-RAK, touring rack fitted with three LA8 amplified controllers.

A wide range of system configurations is available for the sound designer and system engineer, allowing high level of creative freedom. Packaged as a complete system, the K1 enclosure is typically combined with its dedicated LF extension (K1-SB) to offer an unprecedented level of directivity control and throw in the sub/low frequency range. K1 has also been designed to seamlessly combine with other L-ACOUSTICS enclosures: the KUDO® for complementary fills or delays, the KARA for an optional downfill, and the SB28 subwoofer for additional low-frequency extension. Before installation, any system configurations can be acoustically and mechanically modeled with 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 K1 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.

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 **K1 SYSTEM** are the following:

2.1 Loudspeaker enclosures

K1	Full range (35 Hz – 20 kHz), 3-way active, variable curvature WST® line source,
KI-SB	Dedicated subwoofer (down to 34 Hz)
SB28	Subwoofer (down to 25 Hz)
KARA	Full range (55 – 20 kHz), 2-way active, variable curvature WST® line source

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 and configurations presented in this document.

2.2 Powering and driving system

LA8	Amplified controller with DSP 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 **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 amplifiers is given in this document.
Refer to the **LA8** or 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.
Refer to the **K1 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**.

K1

K1-SB

KARA

LA-RAK

SB28

SP-Y1

DOFILL-LA8

DO.7

SP.7

SP5

DOSUB-LA8

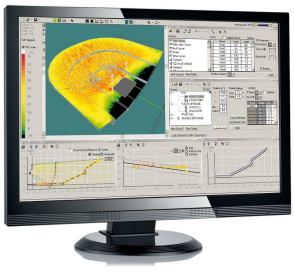
DO10

SP10

DO3WFILL

DO25

SP25



Soundvision

LA Network Manager

K1 SYSTEM components (excluding rigging elements and modulation cables)

3 OPERATING MODES

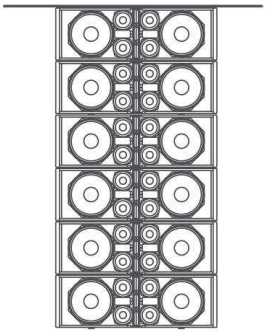
3.1 FULL-RANGE mode

In FULL-RANGE mode, the K1 system operates within the nominal bandwidth of the enclosure.

It corresponds to the use of the K1 line source in standalone configuration, i.e. without complementary subwoofers.

The K1 enclosure is driven by the LA8 amplified controller with a dedicated factory preset.

Standalone K1 line source



Enclosure	[PRESET]
K1	▶ **[K1]**

Frequency range (-10dB)
35Hz – 20kHz

3.2 EXTENDED mode

In EXTENDED mode, the bandwidth of the K1 system is reinforced or extended in the low end.

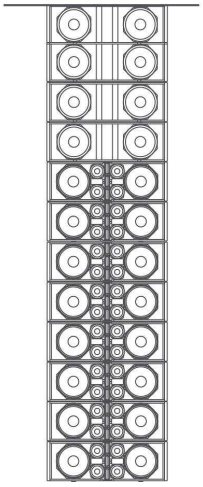
It corresponds to the use of a K1 line source in combination with the KI-SB extension, and with the optional addition of the SB28 subwoofer.

Each enclosure type is driven by the LA8 amplified controller with a dedicated factory preset. The K1 enclosure is driven with the same preset as in standalone configuration. The K1-SB enclosure is driven with a choice of two presets corresponding to two distinct configurations: THROW or CONTOUR. The SB28 enclosure is driven with a preset featuring an upper frequency limit at 60 Hz, for an optimized acoustic coupling with the line source.

THROW configuration

With a K1-SB line array installed on top of a K1 line array, the line source length is increased, enhancing the sub-low throw capability of the K1 system.

K1 and K1-SB in THROW configuration



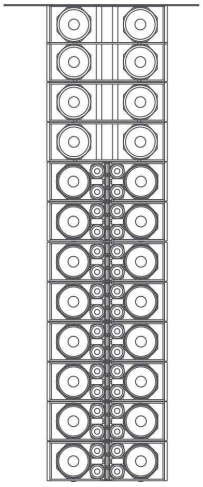
K1/ K1-SB array

Recommended ratio
1 K1-SB: 2 K1

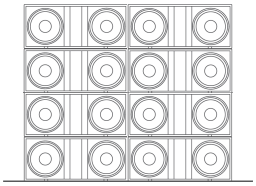
Enclosure	[PRESET]
K1	▶ **[K1]**
K1-SB	▶ **[K1SB_X]**

Frequency range (-10dB)
35Hz – 20kHz

K1 and K1-SB in THROW configuration + SB28



Flown K1/ K1-SB array
with ground-stacked SB28



Recommended ratio
2 SB28: 1 K1-SB: 2 K1

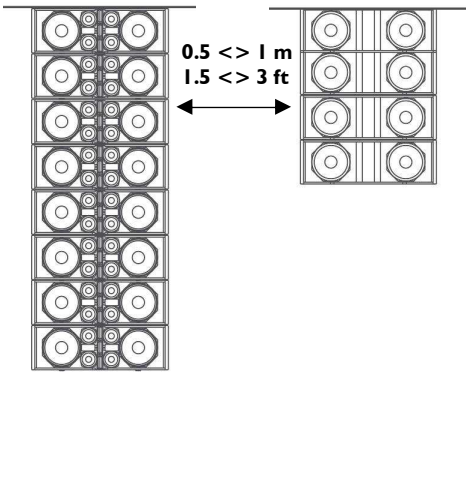
Enclosure	[PRESET]
SB28	▶ **[SB28_60]**
K1	▶ **[K1]**
K1-SB	▶ **[K1SB_X]**

Frequency range (-10dB)
25Hz – 20kHz

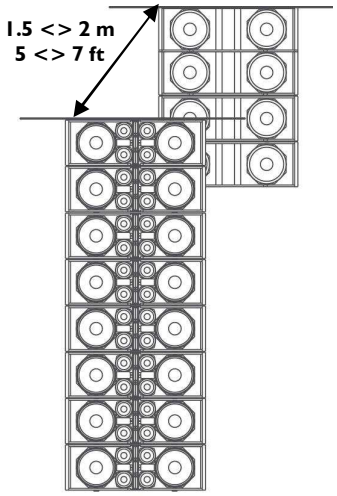
CONTOUR configuration

This configuration reinforces the system sub-low frequency response and improves either the side or rear LF rejection, when the K1-SB array is installed beside or behind the K1 array respectively.

K1 and K1-SB in CONTOUR configuration



K1 array
with K1-SB array beside



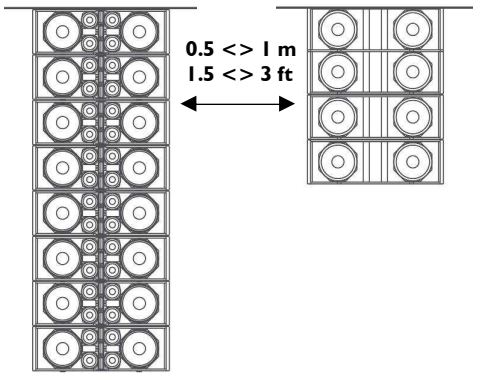
K1 array
with K1-SB array behind

Recommended ratio
1 K1-SB: 2 K1

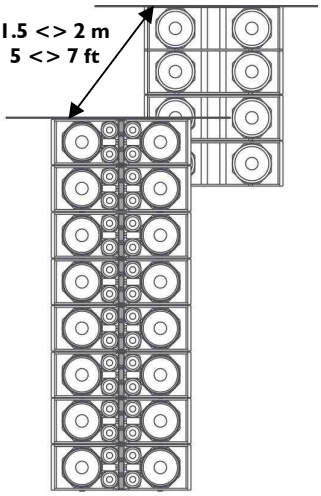
Enclosure	[PRESET]
K1	▶ **[K1]**
K1-SB	▶ **[K1SB_60]**

Frequency range (-10dB)
30Hz – 20kHz

K1 and K1-SB in CONTOUR configuration + SB28



K1 array
with K1-SB array beside
and ground-stacked SB28



K1 array
with K1-SB array behind
and ground-stacked SB28

Recommended ratio
1 SB28: 1 K1-SB: 2 K1

Enclosure	[PRESET]
SB28	▶ **[SB28_60]**
K1	▶ **[K1]**
K1-SB	▶ **[K1SB_60]**

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 [SB28_60_C] with an SB28 subwoofer array in cardioid configuration

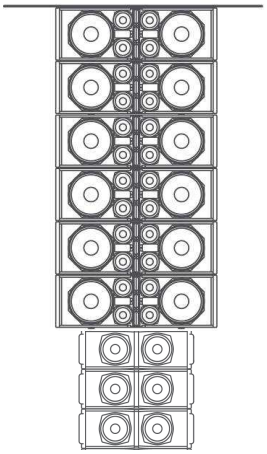
The cardioid configuration consists in reversing 1 element in an array of 4 subwoofers.
Refer to the **SB28 user manual** for details about the CARDIOID mode.

3.3 KARA downfill option

In both K1 operating modes, FULL RANGE and EXTENDED, it is possible to install a KARA® line source as a downfill system for the main K1 system.

The KARA enclosure is driven by the LA8 amplified controller with a dedicated preset. This preset features a high-pass filter at 100Hz for the low section, along with specific delay settings, in order to optimize the acoustic coupling between the KARA and K1 line sources.

KARA line source as a DOWNFILL system for K1 line source



K1 array in line with KARA array

Optimal KARA array

3 or 6 KARA enclosures

Enclosure	[PRESET]
KARA	▶ **[KARADOWNK1]**

❗ The other system enclosures (K1, K1-SB, SB28) are driven according to the chosen operating mode for the K1 main system.

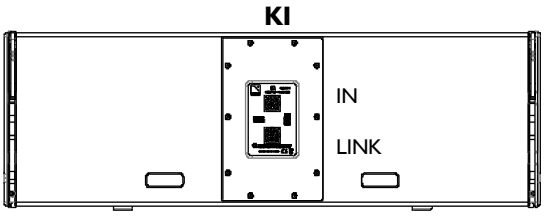
Using the KARA system
Refer to the **KARA SYSTEM user manual** for the operating modes of KARA as a main system and the KARA loudspeaker connection.

4 LOUDSPEAKER CONNECTION

4.1 K1 connection

The K1 enclosure is equipped with two PA-COM® connectors wired in parallel.

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



K1 internal pinout

PA-COM® points (+/-)	A/B	C/D	E/F	G/H
Transducer (as seen from the front)	Left LF speaker	Right LF speaker	MF section	HF section

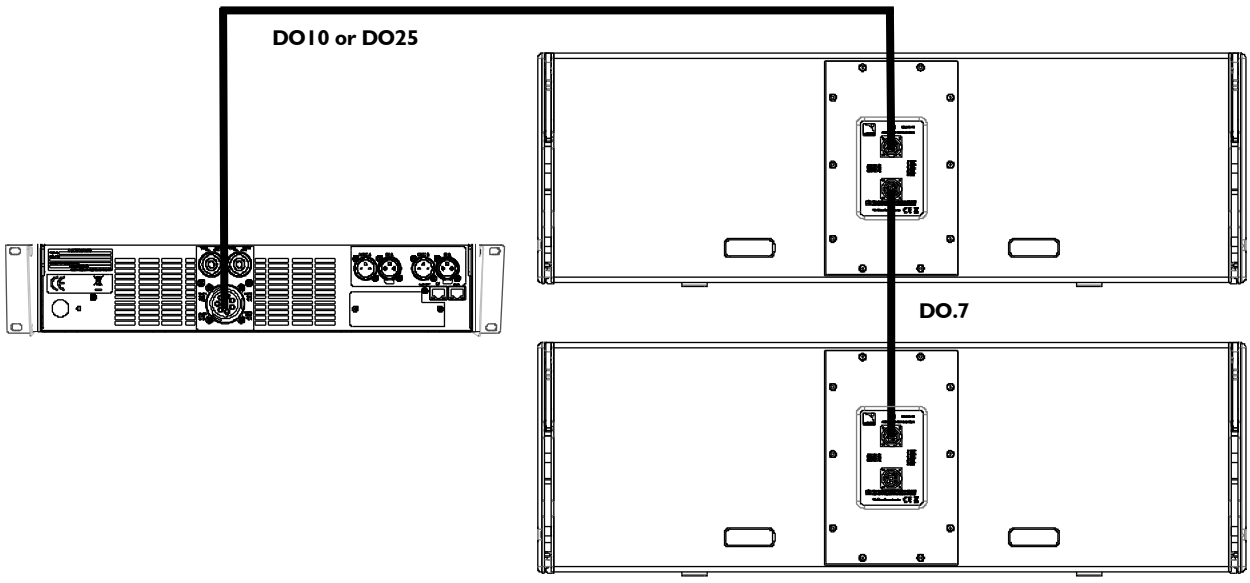
The K1 enclosure is exclusively quad-amplified by the L-ACOUSTICS® LA8 amplified controller.

To connect a K1 enclosure to the LA8:
▶ Use a **DO** cable (DO10 or DO25).

To connect an additional K1 enclosure in parallel with the first one:
▶ Use a **DO.7** cable.

Maximum of 2 K1 enclosures per LA8
A single LA8 amplified controller can drive up to two KI enclosures in parallel.

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



Connecting two K1 enclosures to one LA8 with DO cables

4.2 K1-SB or SB28 connection

The KI-SB and SB28 enclosures are 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

Both are exclusively amplified by the **LA8** amplified controller.

To cable these L-ACOUSTICS® subwoofers with the LA8, two 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 subwoofer.

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.

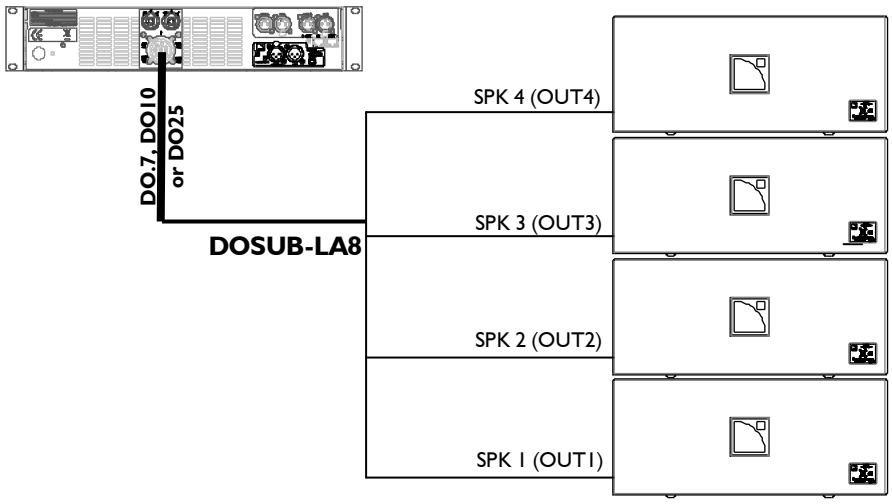
Option C:
▶ Connect a **DO** cable (DO.7, DO10 or DO25) to the PA-COM® connector of the LA8 and use the **DO3WFILL** to split the audio signals into one channel pair, feeding one two-way enclosure, and two single channels, each one feeding one subwoofer. ❗ This cabling scheme needs a dedicated custom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

Maximum of 4 K1-SB or SB28 subwoofers per LA8
1 K1-SB or 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 with SB28
By connecting the reversed subwoofer to OUT 1, Option A and Option B allow using the cardioid preset

Impedance load
4 Ω for 1 K1-SB or 1 SB28.



Connecting four K1-SB or SB28 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.

[KI]: full-range

To use the K1 line source in FULL-RANGE mode, in standalone configuration, or in EXTENDED mode, in combination with the K1-SB or SB28 subwoofer enclosures.

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	Left LF transducer	LF_A	O	X	X	X
OUT 2	Right LF transducer	LF_A	O	X	X	X
OUT 3	MF section	MF_A	O	X	X	X
OUT 4	HF section	HF_A	O	X	X	X

* Left/Right: as seen from the front face

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

[K1SB_X] and [K1SB_60]: low extension

To use the K1-SB enclosures in the EXTENDED mode of the KI system, combining K1 and K1-SB enclosures in THROW configuration for [K1SB_X], or in CONTOUR configuration for [K1SB_60].

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	K1-SB subwoofer	SB_A	O	X	X	X
OUT 2	K1-SB subwoofer	SB_A	O	X	X	X
OUT 3	K1-SB subwoofer	SB_A	O	X	X	X
OUT 4	K1-SB subwoofer	SB_A	O	X	X	X

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

[SB28_60]: standard subwoofer

To use SB28 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.

[SB28_60_C]: cardioid subwoofer

To use SB28 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.

[KARADOWNK1]: downfill

To use the KARA® line source in HIGH-PASS mode, as a downfill system for a K1 main 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_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.

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.

Cable cross-section			**Recommended maximum length**					
			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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