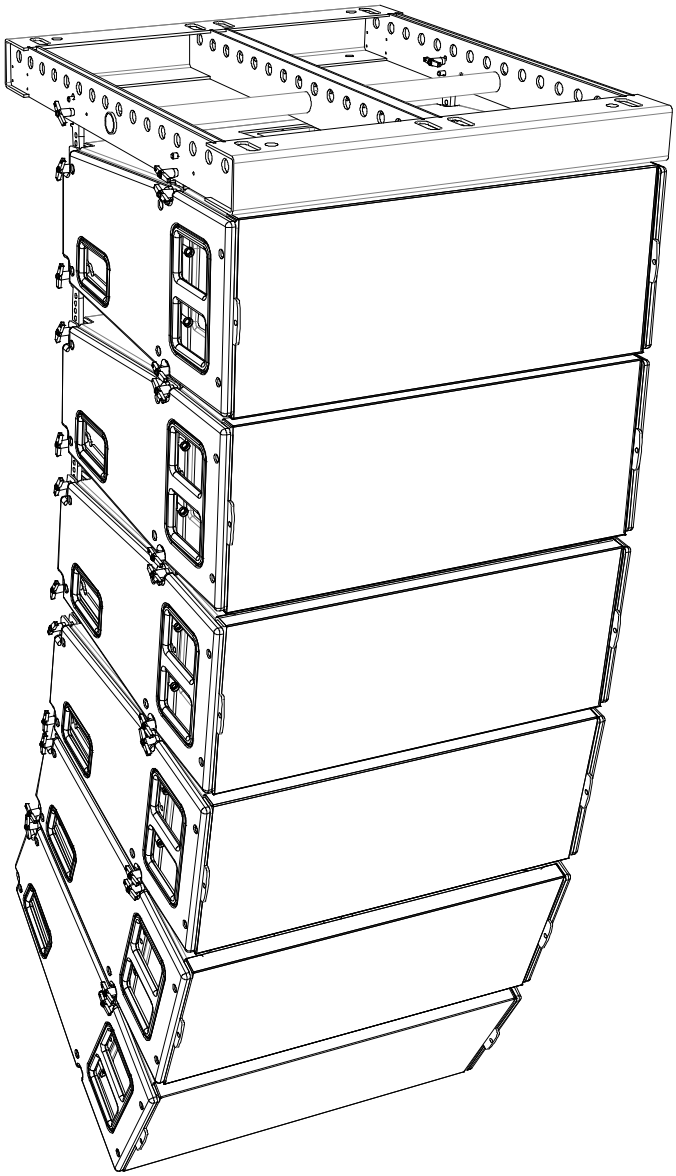
KUDO® Multi-Mode WST® Enclosure
KUDO® Enceinte Multi-Mode WST®

VERSION 2.0

USER MANUAL EN



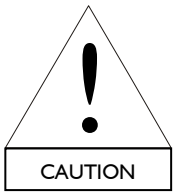
1 SAFETY WARNINGS

All information hereafter detailed applies for the **L-ACOUSTICS® KUDO® Multi-Mode WST® Enclosure**, designated in this section as **"the product"**.

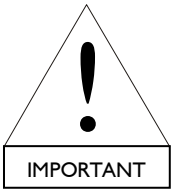
1.1 Symbol description

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

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.



The CAUTION symbol notifies the user about information to prevent possible product damage.



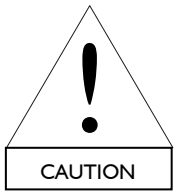
The IMPORTANT symbol is a notification of an important recommendation of use.

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®**

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.

6. Heat
Do not operate the product near any heat source, such as radiators or other devices.



7. Water and moisture

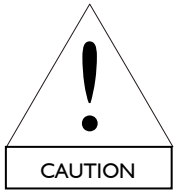
Even if the product is weather-resistant, it can not be exposed to moisture (rain, sea spray, shower, steam) for a long period of time, nor put in direct contact or partially immersed in water. This would cause irreversible damage to exposed components.

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.

9. Mounting instructions

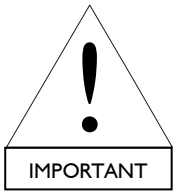
Do not place the product on an unstable cart, stand, tripod, bracket, or table. The product may fall and be seriously damaged, and may cause serious human injury. Any mounting of the product should follow the manufacturer's instructions given in this manual, and should use a mounting accessory recommended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

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State that the following product:
Loudspeaker enclosure, KUDO®

Is in conformity with the provisions of:
Machinery Directive 2006/42/EC
Low Voltage Directive 2006/95/EC

Applied rules and standards:
EN ISO 12100-1: 2004 (Mechanical Safety)
EN60065 (Electrical Safety)

Established at Marcoussis, France
November 25th, 2009

Christophe Pignon

2 CONTENTS

3 INTRODUCTION

3.1 Welcome to L-ACOUSTICS®

Thank you for purchasing the **L-ACOUSTICS® KUDO® Multi-Mode WST® Enclosure**.

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. Please, check the L-ACOUSTICS® web site at www.l-acoustics.com on a regular basis for latest updates.

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 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.

4 KUDO® SYSTEM

The **L-ACOUSTICS® KUDO® enclosure** belongs to the **KUDO® Line Source System** and has an operating frequency bandwidth from 35 Hz to 20 kHz. When operated in conjunction with the **L-ACOUSTICS® SB118 or SB28** subwoofer enclosure the combined system operating range is lowered down to 32 Hz and 25 Hz respectively.

The system approach developed by L-ACOUSTICS® for KUDO® 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):

KUDO®	⇨	Full range active 3-way WST® enclosure
KBUMP	⇨	Rigging structure to fly or stack a KUDO® array in the vertical orientation
KJACKx2	⇨	Rigging accessories (x2) used with the KBUMP to stack a vertical array
KLIFT	⇨	Rigging accessory to fly a KUDO® array in the horizontal orientation
KPLA-2, KCOV	⇨	Front dolly board and protective cover to ship the KUDO®
SB118, SB28	⇨	Subwoofer enclosures
LA-RAK	⇨	Touring rack containing three **LA8** amplified controllers
LA NETWORK MANAGER	⇨	Remote control software
SOUNDVISION	⇨	Acoustical and mechanical modeling software

The KUDO® system components are compatible with standard L-ACOUSTICS® accessories. These accessories include the **L-ACOUSTICS® DO.7**, **DO10**, and **DO25** loudspeaker cables with respective lengths of 0.7 m/2 ft, 10 m/30 ft, and 25 m/80 ft. These cables allow connection of the KUDO® enclosure to the LA8 amplified controller. Each cable is an 8-conductor cable with 4 mm^2 conductor cross-section (13 SWG, 11 AWG) and features 8-point PA-COM® connectors. **Note:** The PA-COM® and CA-COM® standards are fully compatible.

The KUDO® system is exclusively driven and powered by the **L-ACOUSTICS® LA8** amplified controller. This ensures intelligent protection, filtering, and equalization of the enclosures. Four channels of amplification are provided along with the OEM factory preset library, ensuring the optimization and performance of the system within the limits of the recommended configurations.

The **L-ACOUSTICS® LA-RAK** touring rack offers an advanced solution for all L-ACOUSTICS® systems covering signal and power distribution in a comprehensive plug and play touring package. The LA-RAK was created as a universal platform designed to facilitate cross-rental and to ensure compatibility with the L-ACOUSTICS® legacy analog cabling standard.

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

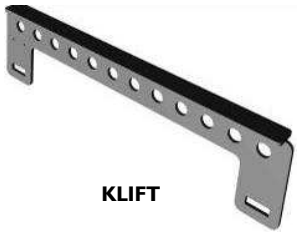
Up to 253 amplified controllers can be interconnected and monitored through the proprietary **L-ACOUSTICS® L-NET** network using the **L-ACOUSTICS® LA NETWORK MANAGER** software.

Detailed description on using the LA8 amplified controller, SOUNDVISION and LA NETWORK MANAGER software is beyond the scope of this manual. Please, refer to the applicable documentation available on the L-ACOUSTICS® web site at www.l-acoustics.com.

KUDO®

KBUMP

KJACKx2



KLIFT

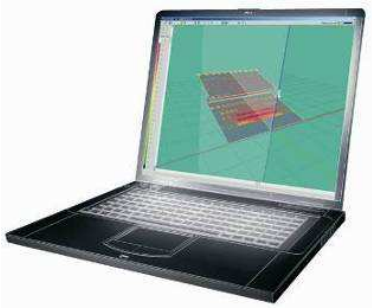
SB118

KPLA-2

SB28

KCOV

Figure 1: KUDO® system components (part 1)



SOUNDVISION

DO.7

LA NETWORK MANAGER

DO10

LA-RAK

DO25

Figure 2: KUDO® system components (part 2)

5 KUDO® ENCLOSURE

The **L-ACOUSTICS® KUDO® enclosure** contains two 1.75" HF diaphragm compression drivers coupled to individual **DOSC®** waveguides, four 5" MF transducers mounted in a V-shaped configuration, and two direct-radiating 12" LF transducers mounted in a bass reflex-loaded enclosure. Based on a quad amplified 3-way design, the nominal impedance of the KUDO® enclosure is 8 ohms for each of the HF and MF sections and each of both LF sections.

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Fulfilling **WST®** (Wavefront Sculpture Technology) coupling conditions with a coplanar transducer configuration and a dual DOSC® waveguide the KUDO® can be qualified as a true line source array. This configuration also provides even coverage without secondary lobes over the KUDO® coverage pattern.

The KUDO® is unique in the sense that in conjunction to WST® coverage pattern adjustment can now be performed in the perpendicular plane of the DOSC® waveguides using the **K-LOUVER® Modular Directivity Technology**. Four coverage pattern settings can be mechanically adjusted: 50° (symmetric), 110° (symmetric), 25° x 55° (asymmetric), and 55° x 25° (asymmetric).

The KUDO® fully integrated rigging allows KUDO® enclosures to combine the functions of a variable curvature vertical line source array (like **V-DOSC®**) and a constant curvature horizontal line source array (like **ARCS®**).

Given the choice of four directivity settings and 2 orientations the KUDO® **multi-mode** WST® enclosure is offering an unrivaled level of flexibility that represent the equivalent of 8 different products. The Figure 4 shows three vertical line source array configurations, the fourth one being the symmetric of the 55° / 25° picture. The other four configurations are obtained by setting the enclosures as horizontal line source arrays.

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

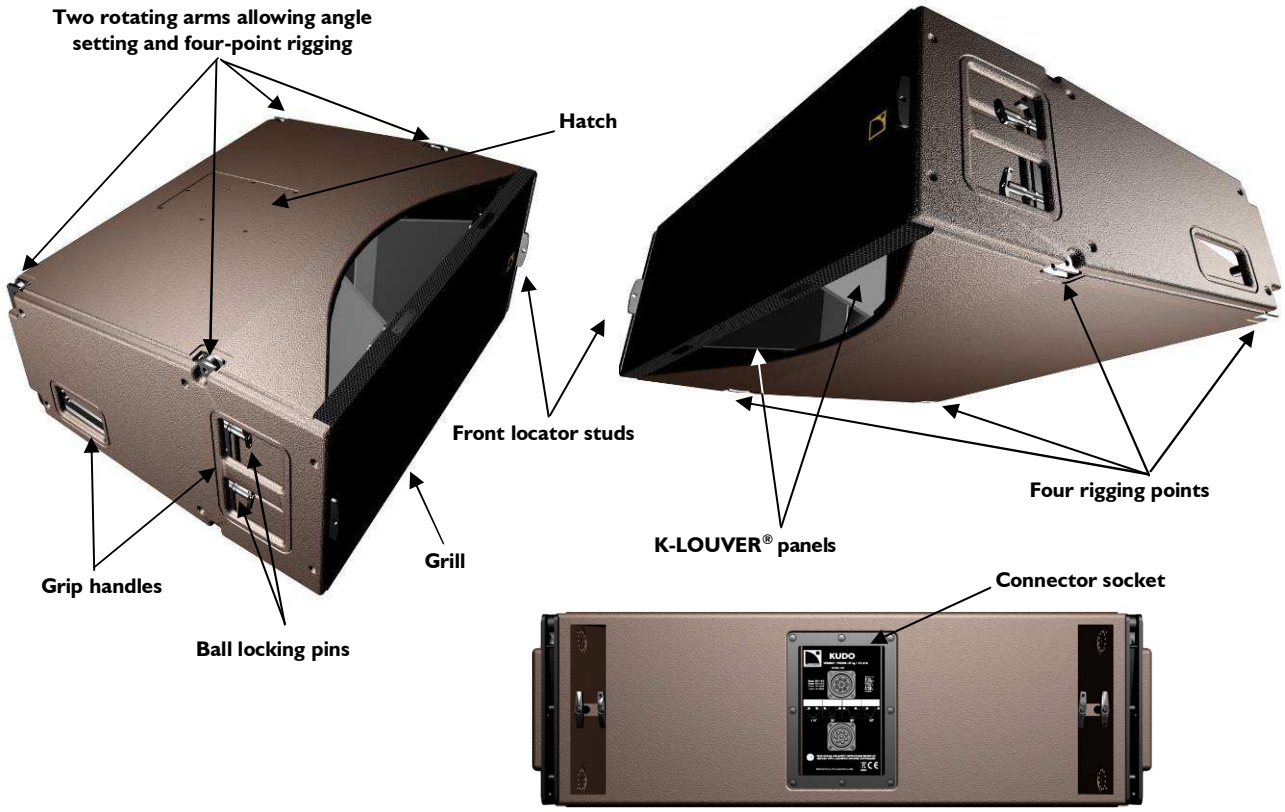
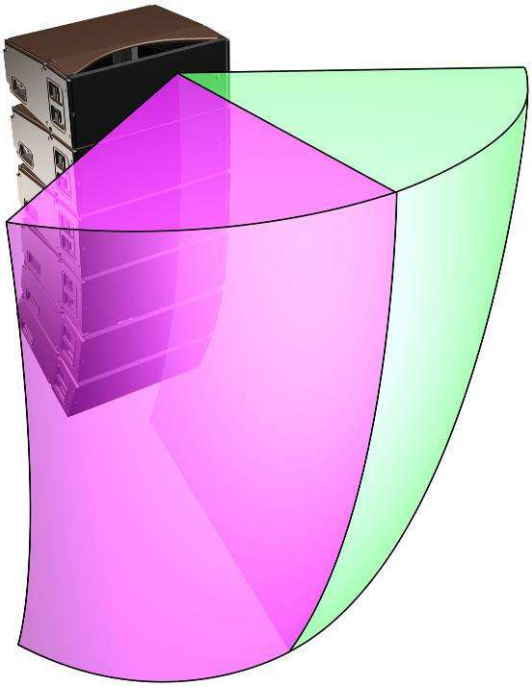
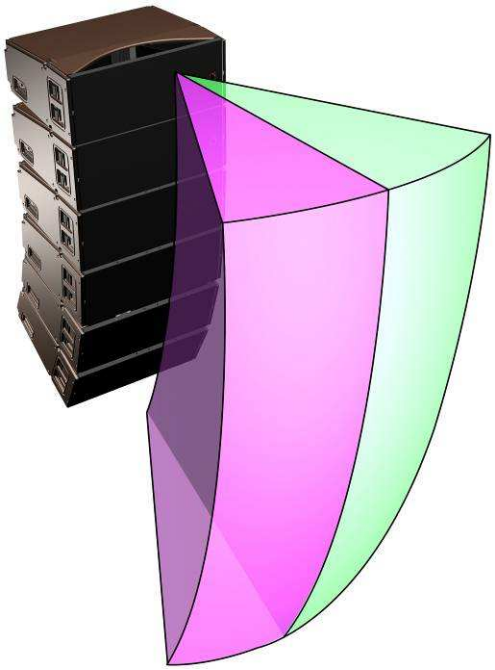


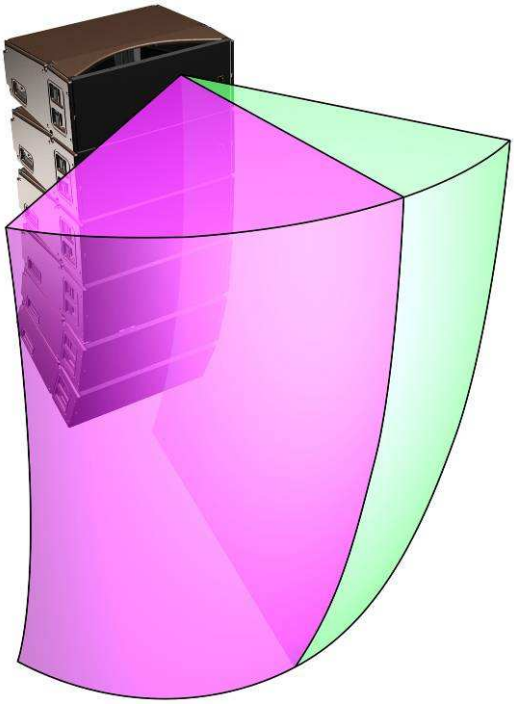
Figure 3: The KUDO® enclosure



55° / 55° symmetric coverage pattern



25° / 25° symmetric coverage pattern



55° / 25° asymmetric coverage pattern

Figure 4: Three KUDO® vertical line source array configurations

6 INSTALLATION

6.1 Shipping and setting-up the KUDO®

6.1.1 Shipping the KUDO®

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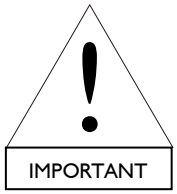
The optional **L-ACOUSTICS® KPLA-2** dolly board (see Figure 1) secures to the KUDO® enclosure by inserting both captive dolly board's ball locking pins in the enclosure's front locator studs, thus allowing easy transportation and protection of the enclosure.



It is recommended to use the **L-ACOUSTICS® KCOV** protective cover in conjunction with the **KPLA-2**.

6.1.2 K-LOUVER® coverage pattern adjustment

KUDO® incorporates K-LOUVER® modular directivity technology that allows the enclosure to be configured with 4 different directivity settings: 50° or 110° symmetric patterns or 80° left or right asymmetric patterns, as shown in the following figure:

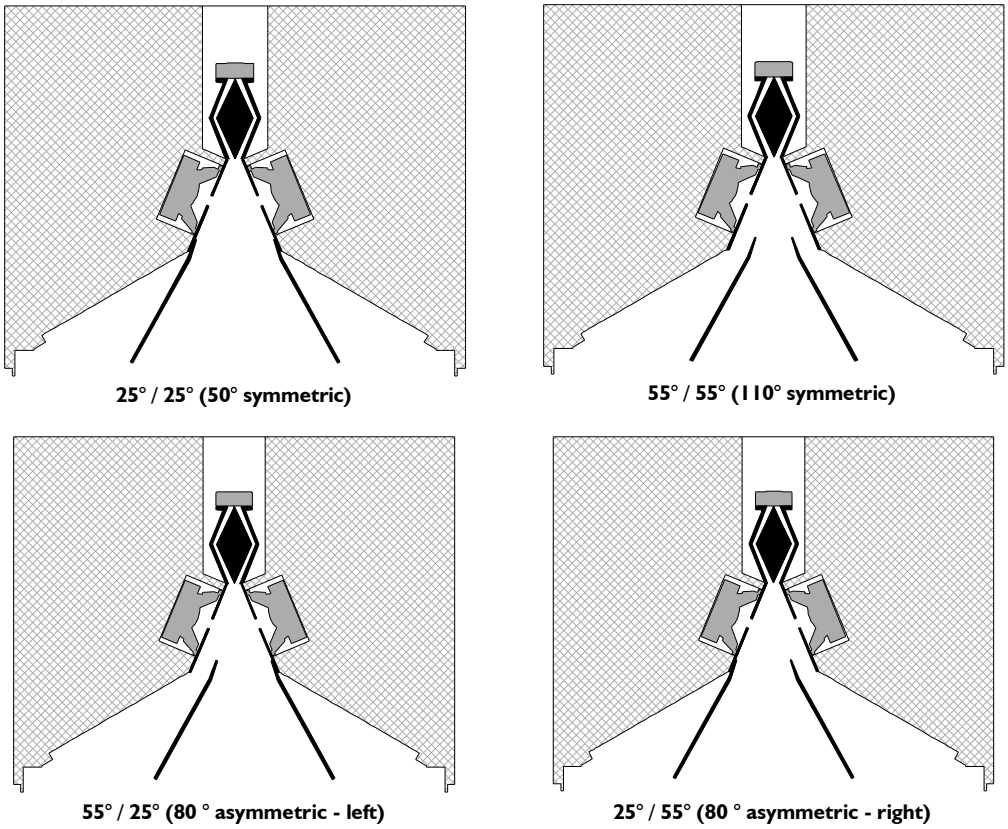


Figure 5: K-LOUVER® directivity configurations

A simple mechanical operation allows the user to configure each K-LOUVER® in the desired position: rotate both K-LOUVER® latches and slide the K-LOUVER® towards interior (to obtain 55° coverage pattern) or towards exterior (25° pattern) until the latches lock automatically (see Figure 6).

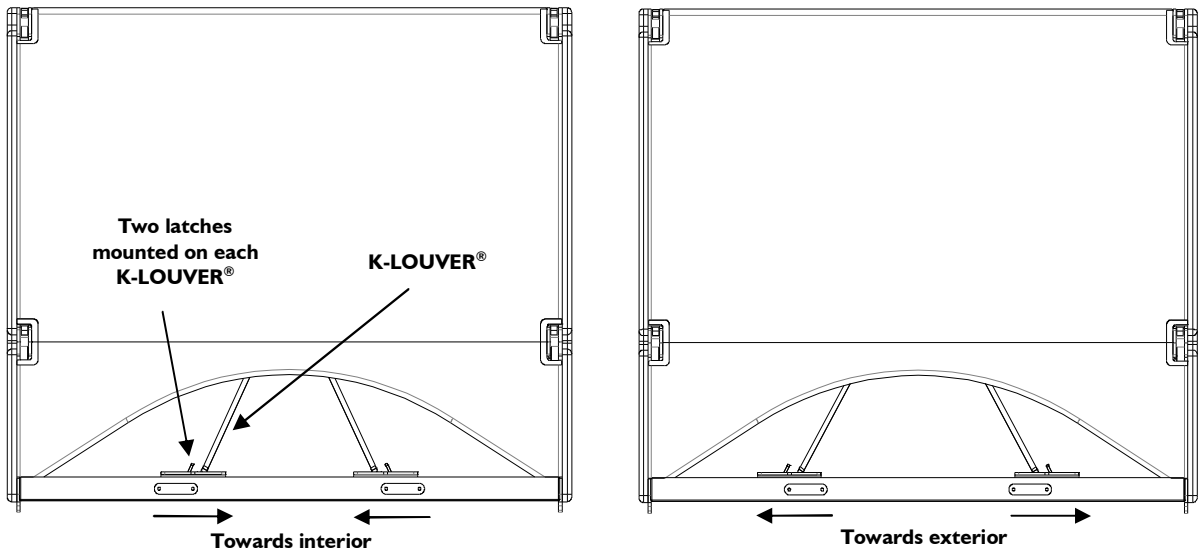


Figure 6: K-LOUVER® setting procedure

6.1.3 Stacking or flying the KUDO®

The KUDO® fully integrated four-point rigging (Figure 3) features one rotating arm per side allowing to assemble multiple enclosures with inter-enclosure angles from 0° to 10° in 1° increments. This allows various setups in flown or stacked configurations such as:

- Flying a vertical array of up to 21 KUDO® enclosures using the L-ACOUSTICS® KBUMP rigging structure (see Figure 1).
- Flying a horizontal array of up to 7 KUDO® enclosures per L-ACOUSTICS® KLIFT rigging accessory.
- Stacking a vertical array of up to 6 KUDO® enclosures onto the L-ACOUSTICS® KBUMP rigging structure, using the complimentary L-ACOUSTICS® KJACKx2 rigging accessories.

Refer to the **"KUDO®" rigging procedures manual** to get acquainted with the KUDO® system specific rigging procedures.

6.2 Connecting speakers

The KUDO® enclosure is driven and powered by the dedicated **L-ACOUSTICS® LA8** amplified controller. For more details please refer to the **"LA8" user manual** also available on the L-ACOUSTICS® web site at www.l-acoustics.com.

The KUDO® enclosure is equipped with two 8-point PA-COM® sockets wired in parallel. The male socket allows connection with the LA8 using the **L-ACOUSTICS® DO10** or **DO25** cable. The female socket allows connection with another KUDO® enclosure in parallel using the **L-ACOUSTICS® DO.7** cable (see Figure 2 and Figure 7).

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IMPORTANT

A maximum of **three** KUDO® enclosures can be connected per LA8.

The L-ACOUSTICS® wiring convention is as follows:

PA-COM® connector labels	Connection to transducers
A / B	Left*-mounted LF transducer (+/-)
C / D	Right*-mounted LF transducer (+/-)
E / F	MF section (+/-)
G / H	HF section (+/-)

* To locate the "left" and "right" sides put the enclosure horizontally with hatch on top and stay in front of the gill.

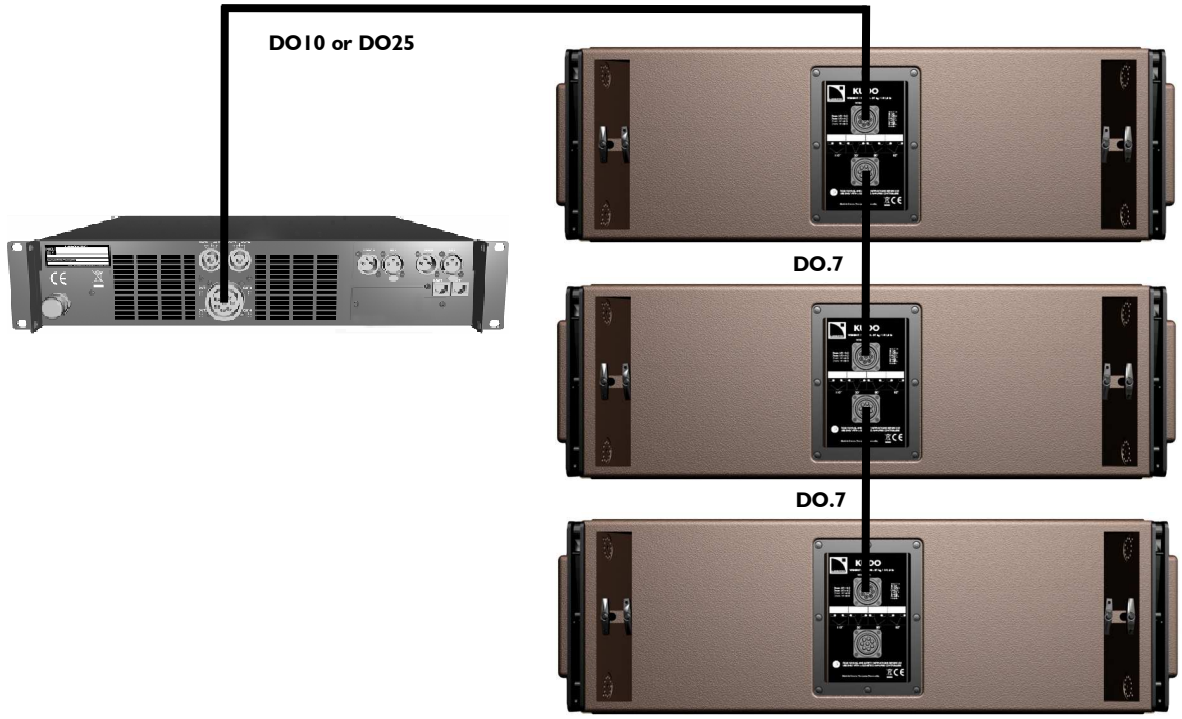
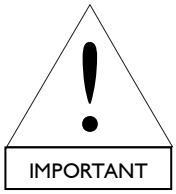


Figure 7: Connecting three KUDO® in parallel to an LA8 amplified controller



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 cable length versus conductor cross-section. Three cases are possible depending on the impedance load connected to the LA8 (8 Ω for a single KUDO® enclosure, 4 Ω for two KUDO® enclosures in parallel, and 2.7 Ω for three KUDO® enclosures in parallel):

Table 1: Maximum cable length versus conductor cross-section for Damping Factor > 20

Cross-section			Length for one KUDO® (8 Ω load)		Length for two KUDO® (4 Ω load)		Length for three KUDO® (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

According to the calculation in Table 1, one DO25 cable (4 mm², 25 m) can be used to power two KUDO® in parallel (4 Ω load) with a damping factor still greater than 20.

7 OPERATION

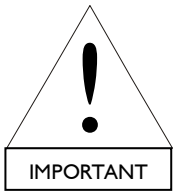
7.1 KUDO® system configuration

The choice of a KUDO® 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.

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

The KUDO® enclosure can be used as a standalone system in the **"FULL RANGE"** mode or in combination with the L-ACOUSTICS® SB118 or SB28 subwoofers in the **"HIGH PASS"** mode.

For each mode a distinction is drawn between the **[50]**, **[80]**, or **[110]** presets as they respectively match K-LOUVER® directivity settings of 50° (25°/25°), 80° (25°/55° or 55°/25°), or 110° (55°/55°).



The development of dedicated presets has been made possible since the **L-ACOUSTICS® LA8** new integrated system approach is offering a DSP per four channel amplifier allowing to easily recall the correct preset upon the chosen K-LOUVER® setting.
The LA8 also features linear phase FIR filters allowing different presets to be simultaneously used within the same array. Since no phase shift occurs between enclosures such blend of settings is now possible without breaking the wavefront generated by the DOSC® waveguides.

Note: The latest version of the preset library can be supplied by an L-ACOUSTICS® authorized representative and is also downloadable on the L-ACOUSTICS® web site at www.l-acoustics.com.

7.2 "FULL RANGE" mode

7.2.1 Description

The "FULL RANGE" mode features a 25 Hz or 40 Hz high-pass filter combined with optimized LF shelving equalization to provide maximum low-end frequency extension.

In this mode significant low-end energy can be obtained from the KUDO® itself allowing standalone configuration without additional subwoofers in a large number of applications.

7.2.2 Connecting the KUDO® to the LA8

The first KUDO® enclosure is connected to the CA-COM® connector of an LA8 amplified controller. A maximum of two additional cabinets can be grouped in parallel with the first one. Therefore a single LA8 amplified controller can drive up to 3 KUDO® enclosures (see Figure 8).

Driving 3 KUDO® enclosures with a single LA8 amplified controller will solicit system resources to their limits and can trigger the thermal protection feature of the controller. This configuration has to be avoided when the power requirements are extreme and continuous over a long period.

Note: The system resources are optimized when the line source contains a multiple of 3 KUDO® enclosures. As a general rule if the array does not contain a multiple of 3 KUDO® enclosures, the amplified controllers solicited with the smaller load should power enclosures dedicated to long throw application (typically located on top of the array) as the acoustic signal should be reinforced in the HF domain.

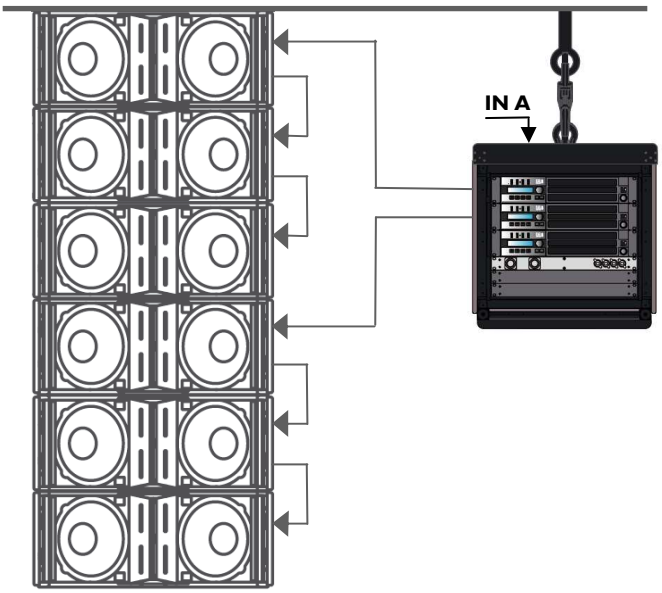


Figure 8: A 6-KUDO® vertical line source array connected to two LA8 controllers

7.2.3 [KUDO××_25] and [KUDO××_40] presets

The [KUDO50_25], [KUDO80_25], and [KUDO110_25] presets feature a 25 Hz high-pass filter resulting in a low frequency limit of 35 Hz.

The [KUDO50_40], [KUDO80_40], and [KUDO110_40] presets feature a 40 Hz high-pass filter resulting in a low frequency limit of 40 Hz.

The [KUDO50_××], [KUDO80_××], and [KUDO110_××] presets are specifically equalized to optimize the frequency response of the KUDO® system whether the K-LOUVER® directivity setting is respectively 50°, 80° or 110°.

Always ensure that the K-LOUVER® panels are set in accordance with the selected preset.

Activate the LOAD PRESET menu from the LA8 amplified controller front panel and then select the desired preset. Refer to the **"LA8" user manual** for additional instructions. The presets are also accessible using the LA NETWORK MANAGER software (refer to the **"LA NETWORK MANAGER" user manual**). The accessible parameters in "FULL RANGE" mode are shown in the following chart:

Table 2: Accessible parameters in "FULL RANGE" mode

LA8 Inputs / Outputs	Elements to connect	Preset Assignment*	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

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

7.3 "HIGH-PASS" mode

7.3.1 Description

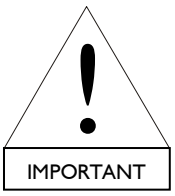
The "HIGH-PASS" mode features a 60 Hz high-pass filter for the low section combined with optimized low frequency shelving equalization allowing for perfect coupling with the L-ACOUSTICS® SB118 or SB28 companion subwoofers. The combined system operating range is lowered down to 32 Hz or 25 Hz, respectively, for applications requiring an extended sub-low frequency response.

The choice of the subwoofer model and KUDO® to subwoofers ratio will depend on the application and desired system overall tonal balance. For most applications the recommended ratios are 3 KUDO® for 2 SB118 or 1 SB28. For applications requiring an increased energy in the sub-low frequency range the recommended ratios become 2 KUDO® for 2 SB118 or 1 SB28.

The "HIGH-PASS" mode can also be suitable in standalone applications without subwoofers that do not require a maximum low-end frequency extension.

7.3.2 Connecting the KUDO® to the LA8

The first KUDO® enclosure is connected to the CA-COM® connector of an LA8 amplified controller. A maximum of two additional cabinets can be grouped in parallel with the first one. Therefore a single LA8 amplified controller can drive up to 3 KUDO® enclosures (see Figure 9).



Driving 3 KUDO® enclosures with a single LA8 amplified controller will solicit system resources to their limits and can trigger the thermal protection feature of the controller. This configuration has to be avoided when the power requirements are extreme and continuous over a long period.

Note: The system resources are optimized when the line source contains a multiple of 3 KUDO® enclosures. As a general rule if the array does not contain a multiple of 3 KUDO® enclosures, the amplified controllers solicited with the smaller load should power enclosures dedicated to long throw application (typically located on top of the array) as the acoustic signal should be reinforced in the HF domain.

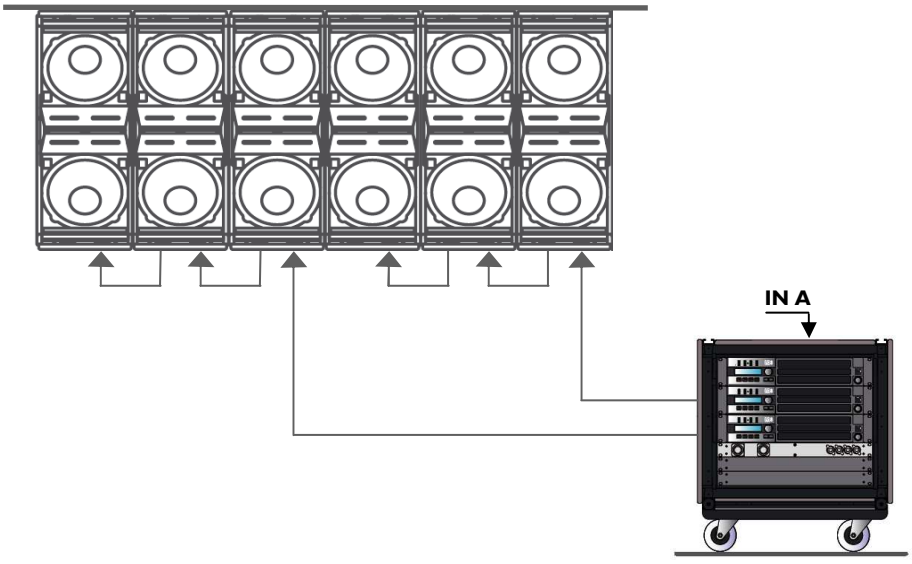


Figure 9: A 6-KUDO® horizontal line source array connected to two LA8 controllers

7.3.3 [KUDO×× 60] presets

The [KUDO50_60], [KUDO80_60], and [KUDO110_60] presets features a 60 Hz high-pass filter and specific components equalization to optimize the frequency response of the KUDO® system whether the K-LOUVER® directivity setting is respectively 50°, 80°, or 110°.

Always ensure that the K-LOUVER® panels are set in accordance with the selected preset.

Activate the LOAD PRESET menu from the LA8 amplified controller front panel and then select the desired preset. Refer to the **"LA8" user manual** for additional instructions. The presets are also accessible using the LA NETWORK MANAGER software (refer to the **"LA NETWORK MANAGER" user manual**). The accessible parameters in "HIGH-PASS" mode are shown in the following chart:

Table 3: Accessible parameters in "HIGH-PASS" mode

LA8 Inputs / Outputs	Elements to connect	Preset Assignment*	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

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

Note: Any complimentary subwoofer system should be connected to additional amplified controllers. Please, refer to the applicable manuals.

8 CARE AND MAINTENANCE

8.1 Maintenance information

The **L-ACOUSTICS® KUDO®** enclosure is a technical product designed for various, intensive indoor and outdoor sound reinforcement applications. To fulfill such demanding conditions, L-ACOUSTICS® has designed the KUDO® with high-grade and reliable components:

EN

- Weather-resistant transducers.
- Baltic birch plywood cabinet.
- Polyester-coated steel grill covered by a non biodegradable "Airnet" fabric.
- Oxidation-resistant screws and rigging points.

However, in order to ensure product performance and safety, it is essential to frequently inspect the KUDO® cabinet and its internal components. These checks need to be done on a regular basis depending on the conditions of system use. The testing procedure consists of three steps as described in section 8.2. If a transducer needs to be repaired or replaced, apply the corresponding procedure in section 8.3.

8.2 Testing procedure

8.2.1 Check of transducer and enclosure acoustic behavior

Connect a sweep frequency generator to the active input of the LA8 amplified controller. Apply a sweep from 35 Hz to 20 kHz with a **maximum voltage** of 0.2 volts (-12 dBu, -14 dBV): the sound should remain pure and free of any unwanted noise. If not, check the mechanical assemblies and, if necessary, contact an L-ACOUSTICS® authorized representative to repair or replace the damaged components (see also section 8.3).

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.

Whenever a transducer is reconnected, ALWAYS check its wiring polarity using a phase checking device. If it is out of phase, invert the cables connected to its electrical sockets. The connecting procedures are given in section 8.3.

8.2.2 Check of mechanical assembly and rigging parts

Inspect the general aspect of assembly and check that screws are locked tight (on rigging elements, loudspeakers, diaphragms, grills, rear plate, and top hatch). Check the quality of contact and locking action of the PA-COM® sockets. Also check the integrity of mobile parts (ball locking pins, rotating arms, K-LOUVER®) and of rigging elements (no signs of deformation, fissure, or corrosion). If necessary, contact an L-ACOUSTICS® authorized representative to replace the damaged components.

8.2.3 Check of external aspect

Remove the dust from the front fabric with a vacuum device. If needed, repaint the cabinet.

If paint is applied, protect the mechanical parts.
Do not apply paint to the front grill fabric as it could fill the fabric holes and deteriorate the acoustic transparency of the material.

8.3 Transducer service

8.3.1 LF service

If damaged, an LF 12" loudspeaker should be removed and repaired or replaced as described below. Recone kits are available. Alternatively, reconing can be performed by L-ACOUSTICS® (see section 8.4).

LF loudspeaker removing procedure

1. Slide the K-LOUVER® towards exterior (25°) as described in section 6.1.2.
2. Remove the front grill by removing the 4 hex screws located on both sides of the enclosure.
3. Remove the grill protecting the LF loudspeaker to be serviced by removing the 5 Torx® screws.
4. Remove the LF loudspeaker by removing the 8 hex screws and 16 washers.
5. Disconnect both red and black cables from the loudspeaker electrical sockets.

LF loudspeaker installation procedure

1. Connect both cables to the replacement LF loudspeaker electrical sockets: **connect the red cable to the red-labeled pin and the black cable to the unlabeled pin**.
2. Install the LF loudspeaker in the enclosure and screw in the 8 hex screws with flat and split washers: into each hex screw insert a split and then a flat washer (**follow this sequence**) and screw in the assembly to one of the 8 locations (5 N.m/45 in.lb_f).
3. Install the grill protecting the LF loudspeaker and screw in the 5 Torx® screws (3 N.m/27 in.lb_f).
4. Install the front grill, paying attention for the "Airnet" fabric to slide along the inside of the cabinetry, and screw in the 4 hex screws on both sides of the enclosure (3 N.m/27 inch.lb_f).
   Note: The logo should be oriented downwards when the hatch is located on the right side of the enclosure.

8.3.2 MF service

If damaged, an MF 5" loudspeaker should be removed and repaired or replaced as described below.

MF loudspeaker removing procedure

1. Remove the front grill as well as the second grill and LF loudspeaker located on the same side as the MF loudspeaker to be serviced. Refer to the **LF removing procedure** of section 8.3.1 for instructions.
2. Remove the MF module by removing both nuts with washers located inside the enclosure.
3. Disconnect the red, black, and blue cables from the loudspeakers electrical sockets.
4. Remove the MF loudspeaker to be serviced from the MF module by removing the 4 hex screws and washers.
5. Remove the grub screw from the MF loudspeaker.

MF loudspeaker installation procedure

1. Screw in the grub screw on the replacement MF loudspeaker until the external length has reached 26 mm/1 in (high-strength thread-locker).
2. Install the MF loudspeaker on the MF section module with the electrical sockets towards interior and screw in the 4 hex screws with split washers (3 N.m/27 in.lb_f).
3. **Connect the blue cable with one side to the red-labeled pin of a first loudspeaker and the other side to the unlabeled pin of the second loudspeaker. Connect the red cable to the remaining red-labeled pin and the black cable to the remaining unlabeled pin**.
4. Install the MF section module and **slightly** screw in both nuts with flat washers inside the enclosure.
5. Install the LF loudspeaker and both grills as described in the **LF installation procedure** of section 8.3.1.

8.3.3 HF service

If damaged, an HF 1.75" driver or diaphragm should be removed and repaired or replaced as described below.

HF driver or diaphragm removing procedure

1. Remove the rear PA-COM® plate by removing the 8 Torx® screws.
2. Disconnect the 4 cables from the HF compression drivers' electrical sockets.
3. Remove the hatch located on the top face of the enclosure by removing the 7 Torx® screws.
4. Remove the HF section module with both waveguides.
5. To only remove a diaphragm
   Unscrew the 6 Phillips® screws from the back side of the driver and remove the diaphragm.

   To remove a full compression driver
   a. Remove the damaged driver assembly from the waveguide by removing both nuts with split washers.
   b. Remove the heat dissipation block from the driver.
   c. Remove both threaded studs from the driver.

HF driver or diaphragm installation procedure

1. To install a full compression driver
   a. Fix both threaded studs to the front side of the driver (3 N.m/27 in.lb_f, medium-strength thread-locker).
   b. Put a circle of thermal paste at 10 mm/0.4 inch from the edge of the groove.
   c. Install the heat dissipation block on it (foam facing the user) and remove the thermal paste surplus.
   d. Install the assembly on the waveguide plate (with foam side towards the waveguide) and screw in both nuts with split washers to the threaded studs (5 N.m/45 in.lb_f).

   To only install a diaphragm
   a. Ensure that the voice coil gap on the driver is free from any particles. If necessary, clean out the gap by using 2-sided tape.
   b. Install the diaphragm in the gap and screw in the 6 Phillips® screws (5 N.m/45 in.lb_f, medium-strength thread-locker).
2. Install the HF section module into the enclosure.
3. Install the hatch and screw in the 7 Torx® screws (5 N.m/45 in.lb_f).
4. From the PA-COM® plate, **connect both red cables to both drivers' red-labeled electrical sockets, and connect both black cables to both drivers' unlabeled electrical sockets**.
5. Install the PA-COM® plate and screw in the 8 Torx® screws (5 N.m/45 in.lb_f).

8.4 Spare parts and recommended tools

Table 4: Main available spare parts

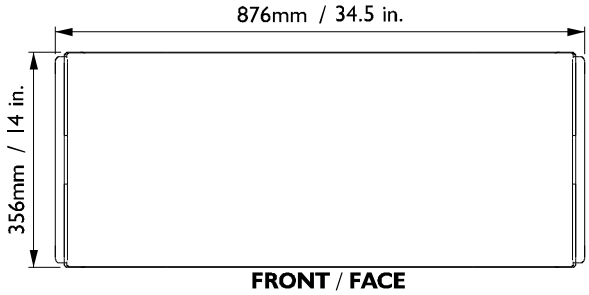
HP BM11	1.75" driver - 16 Ω	HS BC122	12" recone kit
HS BM11	Diaphragm for 1.75"driver - 16 Ω	HR BC122	Factory reconed 12" (kit and service)
HP BE51	5" speaker - 8 Ω	SE GRKUDO	Complete front grill, black
HP BC122	12" speaker - 8 Ω	SE GRKUDO W	Complete front grill, white (RAL 9010®)

Table 5: Recommended tools for service

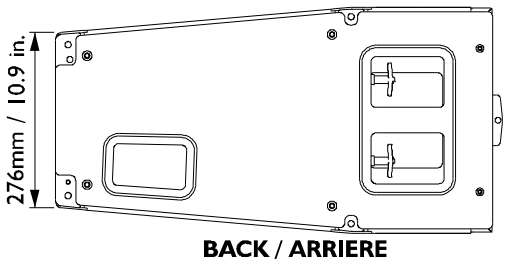
Torque wrench (N.m or in.lb_f)	
T20 Torx® bit	PH.2 Phillips® bit
T25 Torx® bit	10 mm hex socket
3 mm hex bit	13 mm hex socket with drive extension
5 mm hex bit	Medium-strength thread-locker (blue)
6 mm hex bit	High-strength thread-locker (green)

9 SPECIFICATIONS

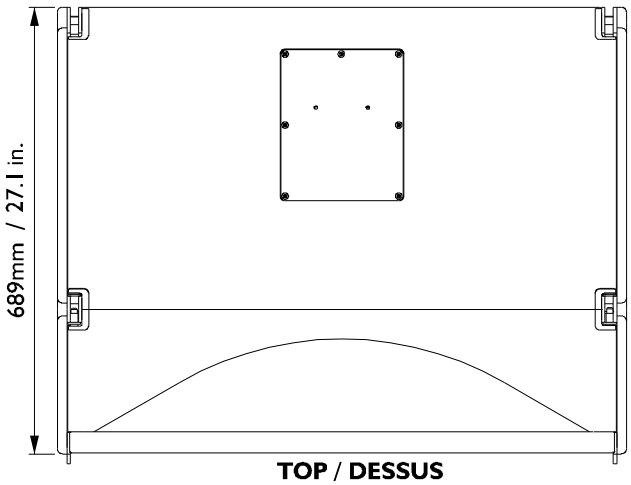
Reference		**KUDO®**
Frequency Response		
Usable bandwidth (-10 dB)		35 Hz - 20 kHz ([KUDO50_25] preset)
Maximum SPL [1]		140 dB ([KUDO50_40] preset)
Nominal Directivity (-6 dB)		
(Vertical array)	Horizontal	50° or 110° symmetric, 25°/55° or 55/25° asymmetric.
	Vertical	Dependant upon number of elements and line source curvature (between 0° and 10° inter-element angles at 1° resolution).
(Horizontal array)	Horizontal	10° x number of enclosures.
	Vertical	50° or 110° symmetric, 25°/55° or 55/25° asymmetric.
Transducers		
LF		2 x 12" weather-resistant, direct-radiating transducers mounted in a bass reflex-tuned enclosure.
MF		4 x 5" weather-resistant, high efficiency, V-shape mounted transducers.
HF		2 x 1.75" diaphragm compression drivers coupled to DOSC® waveguides.
Filtering		Active 3-way quad-amplified enclosure
Nominal impedance		LF: 2 x 8 Ω MF section: 8 Ω HF section: 8 Ω
Long term RMS power handling capacity		LF: 2 x 450 W MF: 312 W HF: 75 W ([KUDO50_40] preset)
Connectors		2 x 8-point PA-COM® (male and female, wired in parallel)
Dimensions (W x H/h x D)		876 x 356/276 x 689 mm / 34.5 x 14/10.9 x 27.1 inch



FRONT / FACE



BACK / ARRIERE



TOP / DESSUS

Weight		87 kg / 191.8 lbs
Shipping	⇨	L-ACOUSTICS® KPLA-2 dolly board (available as an option).
	⇨	L-ACOUSTICS® KCOV protective cover (available as an option).
Vertical flying[2]	⇨	L-ACOUSTICS® KBUMP rigging structure (available separately). Certified for up to 21 KUDO®. Inter-element angles: 0°-10° in 1° steps.
Horizontal flying[2]	⇨	L-ACOUSTICS® KLIFT rigging accessory (available separately). Certified for up to 7 KUDO® per K-LIFT. Fixed inter-element angle: 10°.
Vertical stacking[2]	⇨	L-ACOUSTICS® KBUMP rigging structure and KJACK rigging accessories (available separately). Certified for up to 6 KUDO®. Inter-element angles: 0°-10° in 1° steps.
External Structure		
Material		15, 18, and 30 mm Baltic birch plywood.
Finish		Grey Brown RAL 8019® or Pure White RAL 9010®.
Front		Polyester-coated steel grill, acoustically transparent “Airnet” fabric.
Rigging		Polyester-coated high-grade steel.
Handles		Integrated into the cabinet.

[1] Peak level measured at 1m 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 the SOUNDVISION software which is designed to help with L-ACOUSTICS® product implementation.