DP5235-01-CM

RS Series

RS15 & RS18 Subwoofers

System manual

CONTENTS

Going one step further in low frequency control: Ray Sub Technology

Radiation control of low frequencies is hard to achieve due to wavelength being larger than cabinet size. Consequently, most of current subwoofers available on the audio-professional market are omnidirectional.

Drawbacks in using omnidirectional subwoofers are known by experienced engineers:

- Low Frequency sound pressure level is typically higher on stage than over the audience; high-pass filters are mandatory in almost all microphones inputs to avoid feedback from the microphones to the subwoofers. Moreover, gain from microphone to speakers is highly limited due to that feedback (reinforcing a double-bass can be an enormous challenge)
- Indoor environments typically have much higher reverberation time in the Low Frequency range than in the mid and high Frequencies. This characteristic is emphasized by the omnidirectional pattern of conventional subwoofers (all sound engineers experienced kick drum lasting forever
- Many outdoor shows occur nearby residential areas where noise constraints are very restrictive; in such cases, low frequencies levels over the audience have to be limited so that environment criteria are fulfilled (possibly leading to unacceptable wideband limitations)

Gradient subwoofers provide an elegant solution to the above issues, based on a technology that is a simple transposition to sound sources of what has been applied for decades in microphones: radiated field derives from pressure differences generated from two (or more) sources:

- Rear radiation is lowered by more than 12 dB, which benefits to stage as well as to neighbours
- Direct to reverberant ratio is increased by nearly 6 dB in the low frequency range (which potentially gives back a kick drum its original “punch”)

However, there are efficiency limitations: gain in lower bandwidth is reduced when sources become too close in relation to wavelength, and pattern control is limited in upper bandwidth when both sources interfere destructively in the radiation axis. Operating bandwidth were efficiency combines with pattern control is around 2 octaves.

Poor correlation between cabinet design and targeted specifications leads to two (and eventually more) drivers in directional mode producing less energy than one driver in omnidirectional mode, which is not acceptable for simple practical aspects such as weight and volume.

NEXO released its first gradient subwoofer, the CD12, which has been complemented since then by CD18, GEO SUB and RS15. These have been quickly adopted worldwide as standards and are considered today as state-of-the-art subwoofers. This success is a consequence of proper cabinet design and optimized definition of phase relations through sophisticated DSP algorithms leading to high directional control and SPL output.

With RAY SUB patented technology, NEXO is again moving one step forward. RAY SUB technology is about optimizing positioning and phase relationship of radiating surfaces in vented enclosures, so that acoustic distance from rear to front sections always increases as frequency decreases; consequently, rear and front section always sum up efficiently – typically 5 dB gain from rear section in the forward direction – and cancel in the rearward direction.

Used as a single cabinet, RAY SUB Technology allows the same cabinet to be configured for any polar pattern, omnidirectional as a standard direct radiating subwoofer when speakers are facing the audience, or highly directional when cabinet is rotated speakers sideways or upwards.

Used in arrays, RAY SUB subwoofers can be set back to back, front to front, in vertical columns, and beam-steered upwards or downwards provided column length is sufficient.

NEXO RAY SUB technology brings a never achieved low frequency directional control to the sound reinforcement industry, raising one more time NEXO standards.

PLEASE READ CAREFULLY BEFORE PROCEEDING

BASIC PRECAUTIONS

Do not open the speaker system or attempt to disassemble the internal parts or modify them in any way. The speaker system contains no user-serviceable parts. If it should appear to be malfunctioning or damaged, discontinue use immediately and have it inspected by qualified NEXO service personnel.

Water exposure: Do not expose the speaker system to direct rain, do not use it near water or in wet conditions. Do not place containers with liquid on speaker system as they might spill into openings. If any liquid such as water seeps into the speaker system, have it inspected by qualified NEXO personnel.

Sun exposure: Do not expose the speaker system to direct sun.

Operating temperature with temperate climate: 0°C to +40°C (-20°C to +60°C for storage).

SYSTEM DEPLOYMENT SAFETY RULES

Read User Manual before deployment. Before use of enclosed speaker system, please ensure that anyone involved in system deployment understands the rigging – stacking – pole mounting safety rules as described in the speaker system User Manual. Failure to do this exposes people to potential injury or death.

Please check the web site nexo-sa.com for the latest update.

Always consult qualified NEXO personnel if the device installation requires construction work and make sure to observe the following precautions:

Mounting precautions

- choose mounting hardware and an installation location that can support 4 times the weight of the speaker system;
- do not use speaker system handles for suspended installation;
- do not expose speaker system to excessive dust or vibration, or extreme cold or heat to prevent possibility of component damage;
- do not place the speaker system in an unstable position from which it might fall accidentally;
- if speaker systems use a stand, ensure that stand specifications are adapted, and that stand height does not exceed 1.40m/55”; never move the stand while the speaker is in position.
- in case of wind greater than 8 on Beaufort scale (72km/h – 45mph), a touring system has to be landed or an additional securing has to be implemented.
- for fixed installations, wind loading has to be taken into account in accordance to the national standards.

Connection and powering precautions

- remove all connected cables before moving the speaker system;
- turn off AC power of all power amplifier units before connecting the speaker system;
- when turning on the AC power to the audio system, always turn on the power amplifier last; when turning the AC power off, always turn off the power amplifier first;
- when used in cold conditions, a gradual power ramp up should be applied to the system on a 5 mn period to allow the loudspeaker components to stabilize during the very first minutes of usage.

Inspect the speaker system periodically.

HIGH SOUND PRESSURE LEVELS

Exposure to extremely high noise levels may cause permanent hearing loss. Individuals vary considerably in susceptibility to noise-induced hearing loss but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a sufficient period of time. The U.S. Government's Occupational and Health Administration (OSHA) has specified the following permissible noise level exposures: Sound Duration Per

Day In Hours	Sound Level dBA, Slow Response
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

According to OSHA, any exposure in excess of the above permissible limits could result in some hearing loss. Ear plugs or protectors to the ear canals or over the ears must be worn when operating this amplification system in order to prevent permanent hearing loss, if exposure is in excess of the limits as set forth above. To ensure against potentially dangerous exposure to high sound pressure levels, it is recommended that all persons exposed to equipment capable of producing high sound pressure levels such as this amplification system be protected by hearing protectors while this unit is in operation.

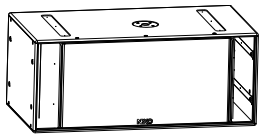
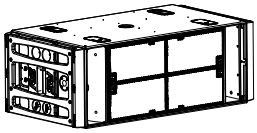
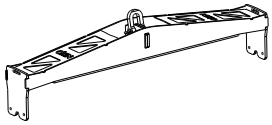
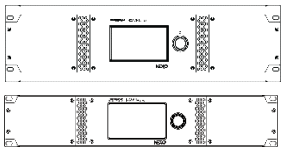
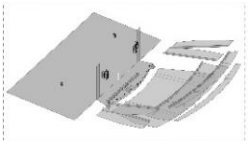
DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT

This symbol on the product or on its packaging indicates that it shall not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequence for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

1 INTRODUCTION

Thank you for selecting a NEXO RS Series Subwoofer.

This manual is intended to provide you with necessary and useful information about your RS System, which includes the following products:

	• RS15 comprises two 15" (38cm) long excursion Neodymium direct radiating drivers mounted in a dual volume vented enclosure with aerodynamic profiled vents.
	• RS18 comprises 2x18'' (46cm) long excursion Neodymium direct radiating drivers mounted in a dual volume vented enclosure with aerodynamic profiled vents.
	• A full range of accessories that provides safe, flexible and simple means of transporting and installing RS subwoofers in fixed installation as well as in touring applications.
	• RS15 and RS18 are controlled, powered and monitored by NEXO TDcontrollers. For a complete description of these controllers, please refer to User Manuals. NEXO TDcontrollers DSP algorithms and parameters are fixed in software and updated regularly. Please consult the NEXO web site (nexo-sa.com) for the latest software releases.
	• NS-1 simulation software assists in the design and implementation of RS subwoofers. Please consult the NEXO web site (nexo-sa.com) for the latest software releases.
	• Available for Mac, iPad and iPhone, NEXO NeMo provides full remote control over a digital audio network from anywhere in the venue, thanks to an intuitive and graphically attractive user interface. NeMo is available on Apple App Store.

Please devote your time and attention to reading this manual. A comprehensive understanding of RS subwoofers specific features will help you to operate your system at its full potential.

2 RS General Set-up Instructions

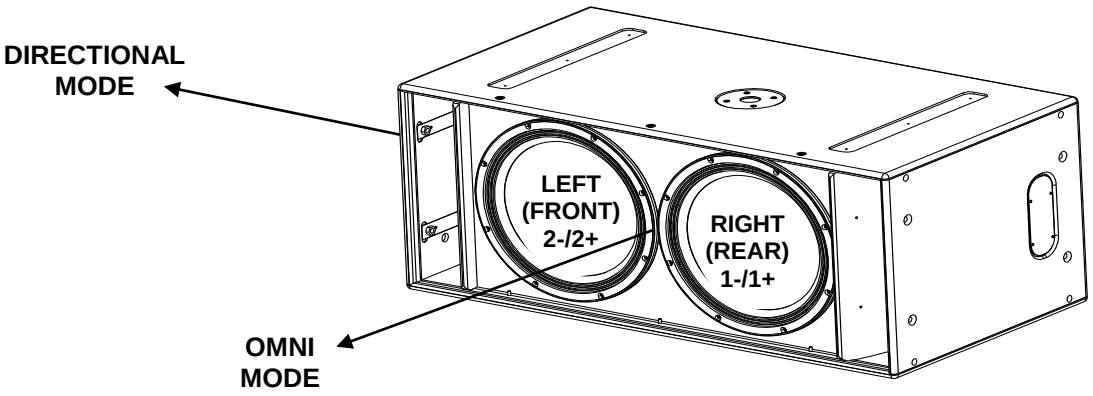
2.1 RS15 and RS18 connections

RS15 and RS18 are connected with Speakon NL4FC plugs (not supplied). A wiring diagram is printed on the connection panel located on the back of each cabinet. The 4 pins of the Speakon sockets identified in / out are connected in parallel within the enclosure.

Either connector can be used to connect amplifier or to link to an additional RS cabinet.

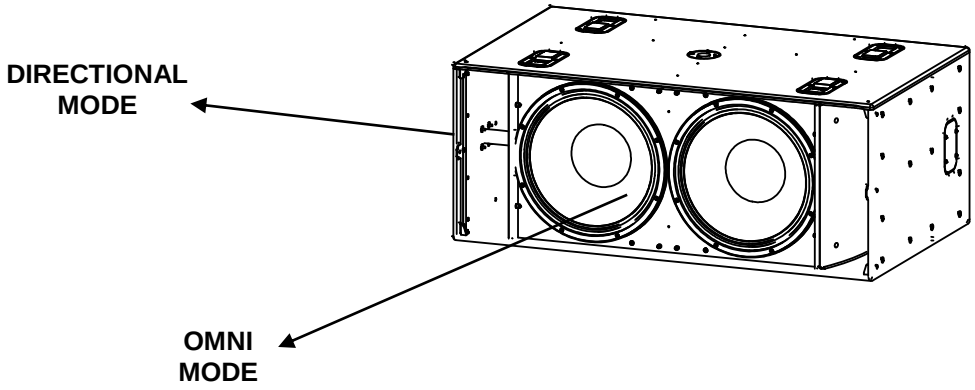
2.1.1 RS15 connectors

Speakon Connector	Omni Mode	Directional Mode	Comment
1(-)	Right driver (-)	Rear driver (-)	Driver next to connector panel
1(+)	Right driver (+)	Rear driver (+)	
2(-)	Left driver (-)	Front driver (-)	Driver opposite to connector panel
2(+)	Left driver (+)	Front driver (+)	



2.1.2 RS18 connectors

Speakon Connector	Omni Mode	Directional Mode	Comment
1(-)	Right driver (-)	Rear driver (-)	Driver next to connector panel
1(+)	Right driver (+)	Rear driver (+)	
2(-)	Left driver (-)	Front driver (-)	Driver opposite to connector panel
2(+)	Left driver (+)	Front driver (+)	

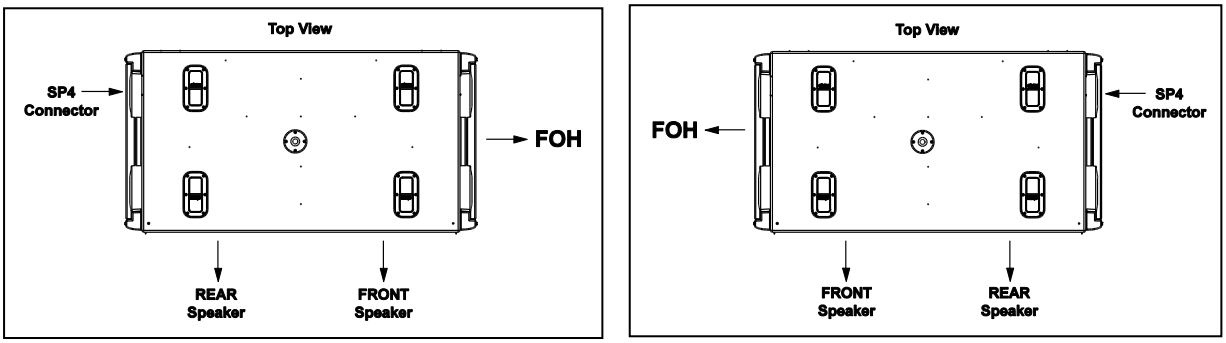


2.1.3 Configuring connector and owner plates

Owner and connector plates can be exchanged depending on chosen directional configuration.

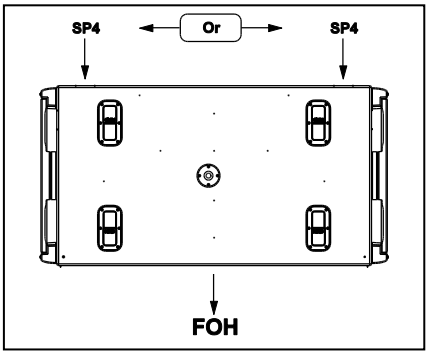
Please note that connector plates can pass through the holes, it is therefore not required to unsolder the connectors.

Directional Mode: it is recommended to install the connector panel on the side which supports the rigging plates. Connection side is always opposite to FOH (main lobe direction)



Connector plate in Directional Mode

Omni Mode: it is recommended to install the connector panel on the side opposite to the drivers (factory default configuration)



Connector PLATE IN Omni Mode

2.2 Cabling

NEXO recommends the exclusive use of multi-conductor cables to connect the system: the cable kit is compatible with all the cabinets, and there is no possible confusion between LF, MF and HF sections.

Cable choice consists mainly of selecting cables of the correct sectional dimension (size) in relation to the load resistance and the cable length. Too small a cable section will increase both its serial resistance and its capacitance; this reduces the electrical power delivered to the loudspeaker and can also induce response (damping factor) variations.

For a serial resistance less or equal to 4% of the load impedance (damping factor = 25), the recommended cable length is given by:

$$L_{max} = Z \times S \qquad S \text{ in } mm^2, Z \text{ in Ohm}, L_{max} \text{ in meters}$$

The table below indicates these values, for 3 common sizes.

Load Impedance (Ω)	2	2.6	4	5.3	8	16
Cable section	**Recommended Cable Length**					
1,5 mm² (AWG #15)	3m/10ft	3m/13ft	6m/20ft	8m/26ft	12m/39ft	24m/79ft
2,5 mm² (AWG #13)	5m/16ft	7m/23ft	10m/33ft	13m/44ft	20m/66ft	40m/131ft
4 mm² (AWG #11)	8m/26ft	10m/33ft	16m/52ft	21m/70ft	32m/105ft	64m/210ft
6 mm² (AWG #9)	12m/40ft	16m/52ft	24m/79ft	32m/104ft	48m/160ft	96m/315ft

Maximum allowed length is 4 times recommended length.

Example:

Each RS18 driver has a 8 Ω nominal impedance; in omni mode, both loudspeakers can be driven in parallel on one amplifier channel, presenting therefore a 4 Ω load impedance.

Recommended length for 4mm² / (AWG#11) is 16m / 52ft, maximum allowed length is 64m / 208ft.

IMPORTANT

Long speaker cables induce capacitive effects – up to hundreds of pF depending on the quality of the cable - with a low-pass effect on high frequencies. If long speaker cables must be used, ensure that they do not remain coiled while in use.

2.3 RS15 and RS18 recommended amplification

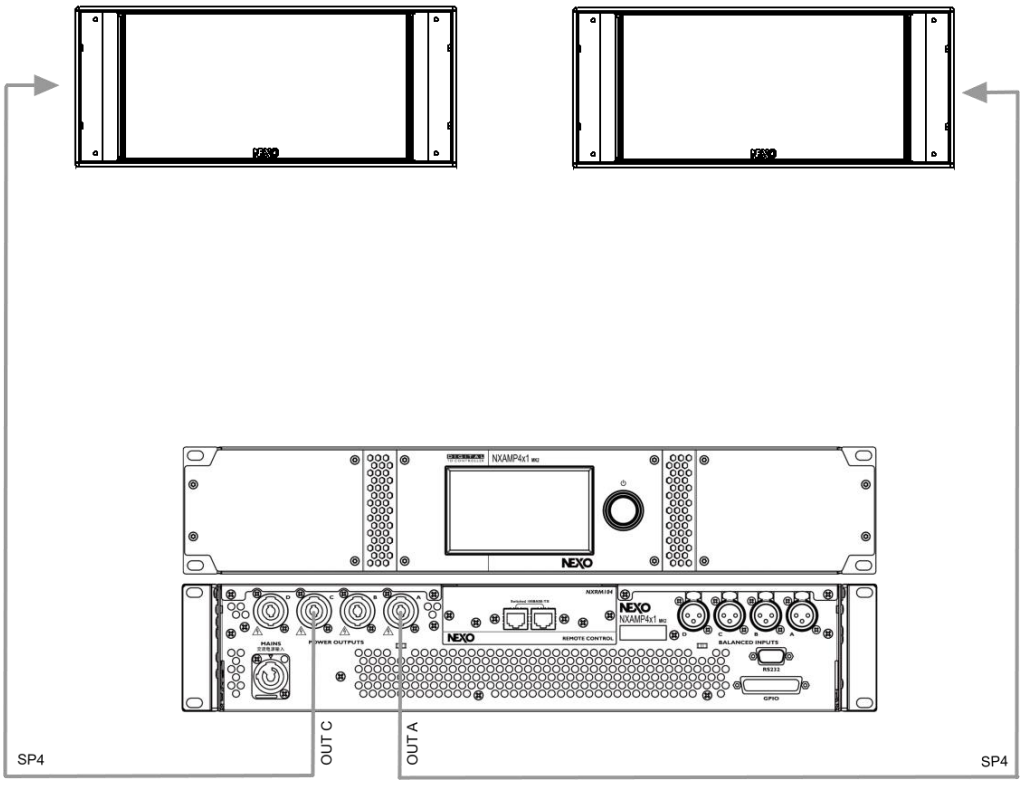
NEXO TD Controllers	Recommended amplification
NXAMP4x1mk2 Powered Controller Bridged Stereo mode (2x2.6kW/4Ω)	1 x RS15 in omni mode (drivers in //) per bridged channels 1 x RS18 in omni mode (drivers in //) per bridged channels
NXAMP4x2mk2 Powered Controller 4 channels mode (4x2.5kW/2Ω)	1 x RS15 in omni mode (drivers in //) per channel 2 x RS15 in directional mode: 2 channels
NXAMP4x4mk2 Powered Controller 4 channels mode (4x4.5kW/2Ω)	2 x RS15 in omni mode (drivers in //) per channel 4 x RS15 in directional mode: 2 channels 1 x RS18 in omni mode (drivers in //) per channel 2 x RS18 in directional mode: 2 channels

2.4 RS15 and RS18 setups on NEXO TD Controllers

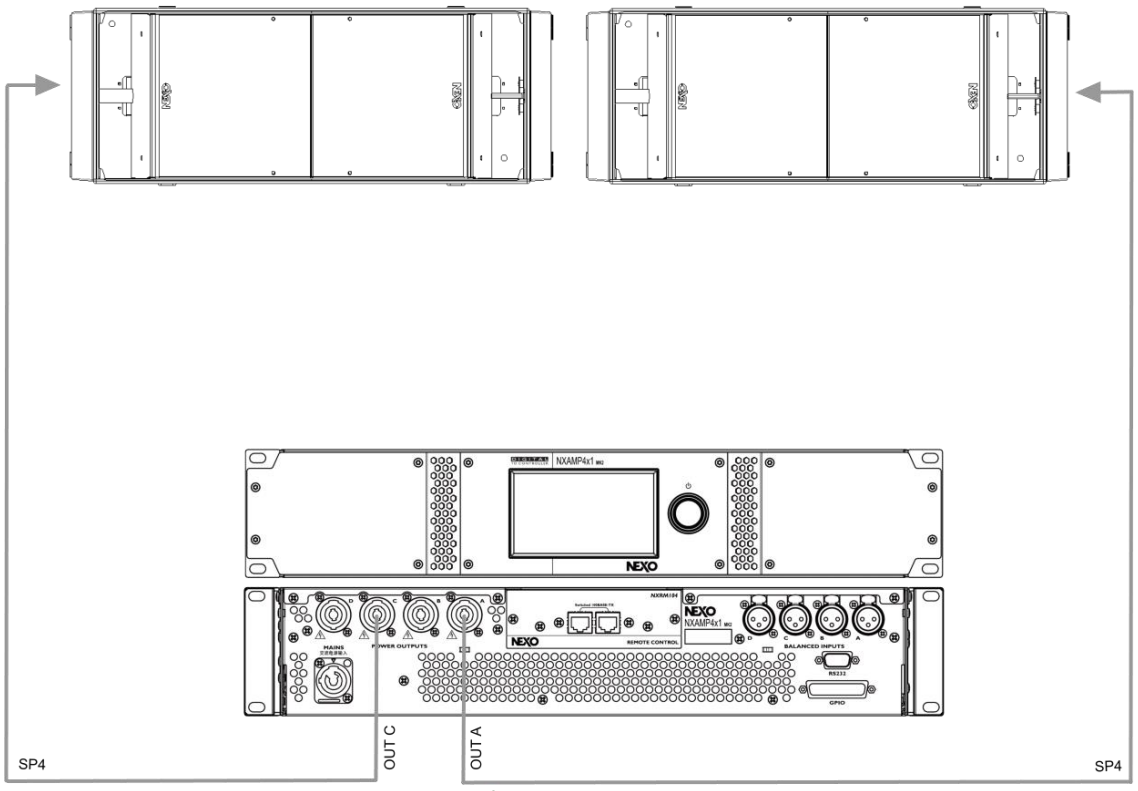
Please consult nexo-sa.com for NEXO TD Controllers firmware information.

3 CONNECTION DIAGRAMS

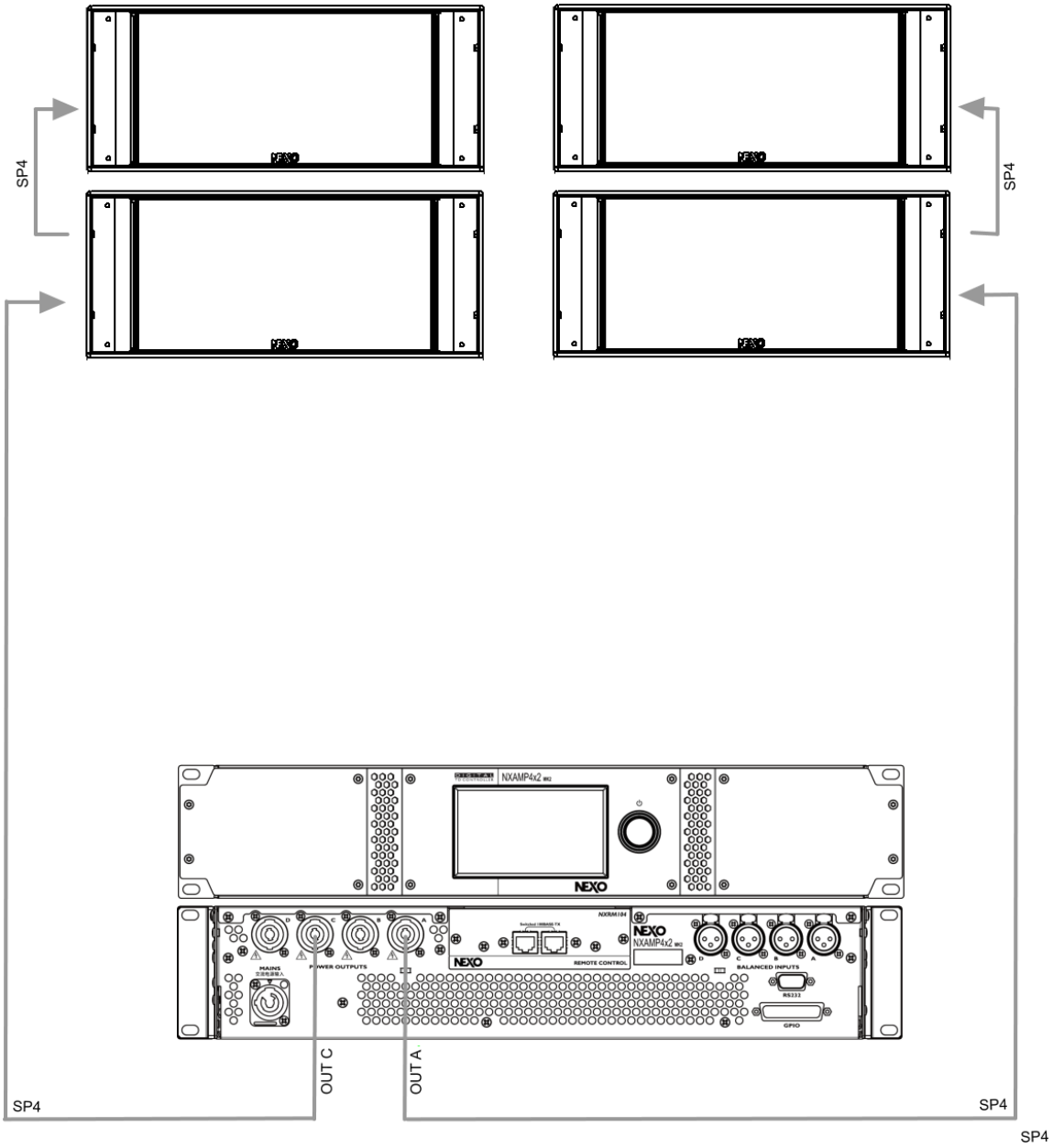
3.1 RS15 / NXAMP4x1mk2 (Bridge Stereo)



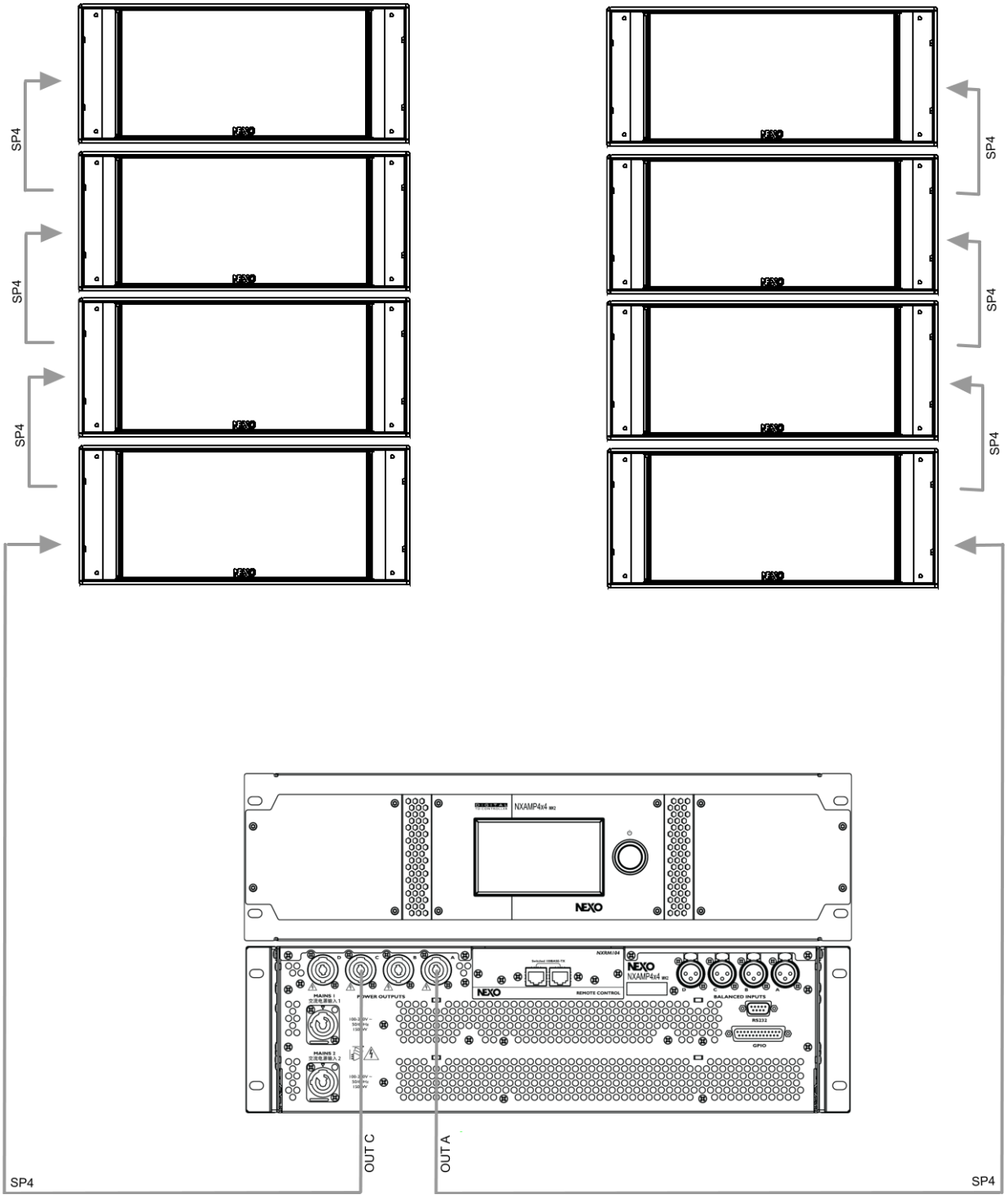
3.2 RS18 / NXAMP4x1mk2 (Bridge Stereo)



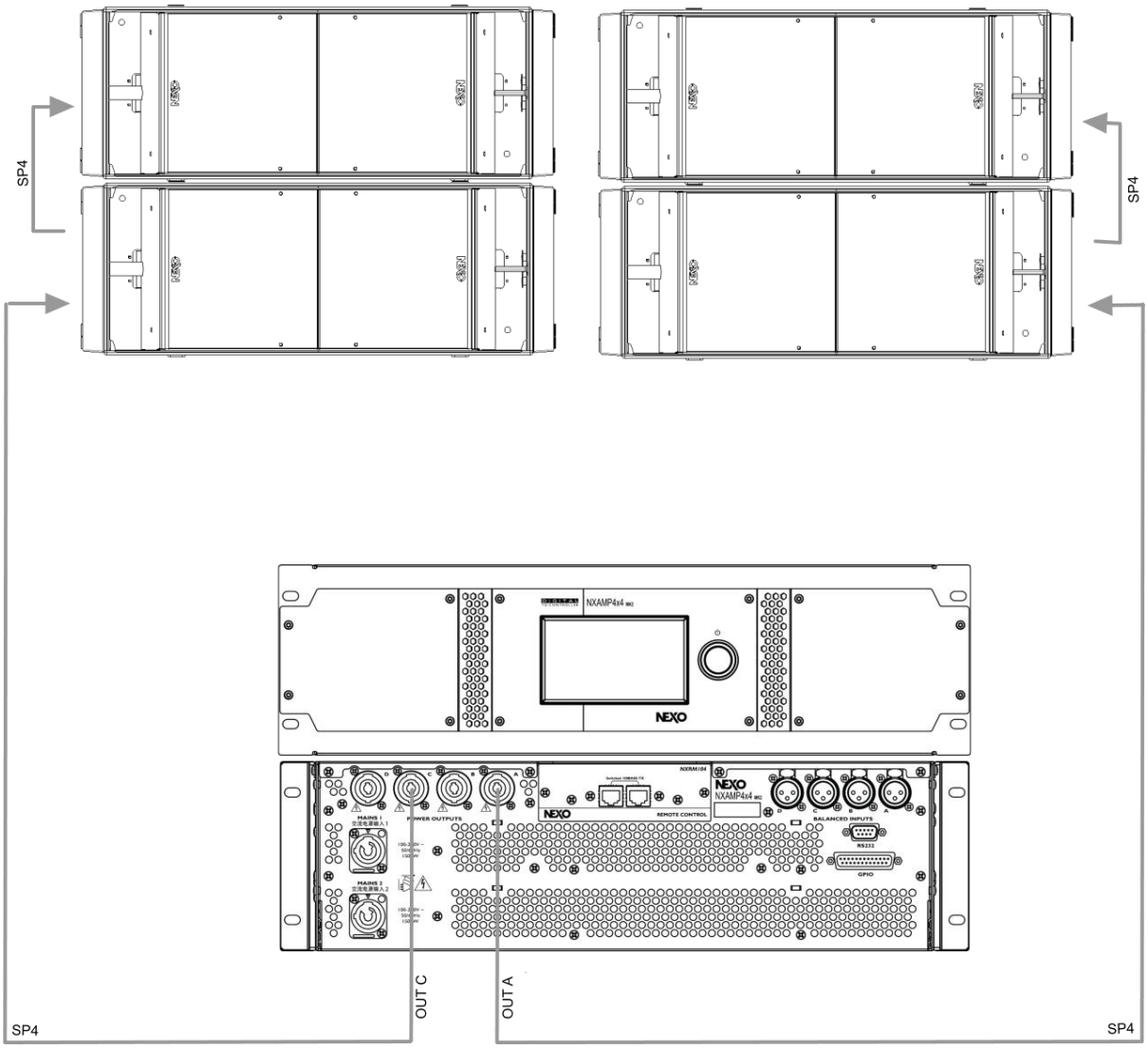
3.3 RS15 / NXAMP4x2mk2 (4 channels mode)



3.4 RS15 / NXAMP4x4mk2 (4 channels mode)



3.5 RS18 / NXAMP4x4mk2 (4 channels mode)



4 NS-1 SIMULATION SOFTWARE

NS-1 software is a R&D simulation tool derived application. It processes measured speaker data with complex mathematical algorithms to assist the user in optimizing system design.

NS-1 is an easy to use tool that allows to shape the energy leaving the cluster to fit the audience. It predicts pressure levels radiated from the system to ensure enough cabinets are provided for the application, as well as mechanical constraints for safe flown systems.

In addition, it provides mechanical information for all clusters in agreement with Structural Analysis Reports (available in the Help section): dimensions, weight, gravity centre position, forces, moments, working load and safety factor.

NS-1 installation package includes all NEXO User Manuals, Structural Analysis Reports and Certificates PDF files.

NS-1 is a freeware available on nexo-sa.com

IMPORTANT

Never install a RS15 or RS18 cluster without checking its acoustical performances and mechanical safety in NS-1 prior to installation.

Any question or bug report please contact technical@nexo.fr

5 RS HARDWARE SETUP PROCEDURE

Before proceeding with assembly of RS arrays, please ensure that the components are present and undamaged. A component list is appended to this manual. In the event of any shortage, please contact your supplier.

For maximum efficiency the RS rigging system requires three experienced persons for set-up: typically, one motor hoist operator, and one operator per side of the array. Good synchronisation and crosscheck between the operators are key elements for a reliable and safe set-up.

5.1 Safety first

RS Rigging System structural computations and related documents are available in NS-1 or at NEXO (info@nexo.fr) upon request.

We include this section to remind you of safe practice when flying the RS system. Please read it carefully. However, user must always apply his or her knowledge, experience and common sense. If in any doubt, seek advice from your supplier or NEXO agent.

This manual offers guidance only for RS systems. References in this manual to other rigging equipment such as motor hoists, steels, shackles etc. are made to clarify the description of rigging procedures. The user must ensure that operators are properly trained by other agencies in the use of these items.

The RS Rigging System has been optimised for the deployment of vertical arrays of RS loudspeakers. No angle adjustment is allowed between cabinets.

The RS Rigging System is a professional RS Rigging System and provided with suitable safety equipment should deploy RS Arrays. Misuse of the RS Rigging System could lead to dangerous consequences.

Used and maintained correctly, the RS Rigging System will give many years of reliable service in portable systems. Please take the time to read and understand this manual. Cluster configuration must be implemented and validated in NS-1 prior to installation.

5.1.1 Flown systems safety

Always inspect all the rigging components and cabinets for damage before assembly. Pay special attention to the lifting points, and safety clips. If you suspect that any of the components are damaged or defective, DO NOT USE THE AFFECTED PARTS. Contact your supplier for replacements.

Read this manual carefully. Also, be familiar with the manuals and safe working procedures for any ancillary equipment that will be used with the RS Rigging System.

Cluster configuration must be implemented and validated in NS-1 prior to installation.

Ensure that all local and National regulations regarding the safety and operation of flying equipment are understood and adhered to. Information on these regulations can usually be obtained from Local Government Offices.

When deploying a RS system always wear protective headwear, footwear and eye protection.

Do not allow inexperienced persons to handle a RS system. Installation personnel should be trained in loudspeaker flying techniques and should be fully conversant with this manual.

Ensure that motor hoists, hoist control systems and ancillary rigging components are currently certified as safe and that they pass a visual inspection prior to use.

Ensure that public and personnel are not allowed to pass beneath the system during the installation process. The work area should be isolated from public access.

Never leave the system unattended during the installation process.

Do not place any object, no matter how small or light, on top of the system during the installation procedure. The object may fall when the system is flown and is likely to cause injury.

Secondary safety steels must be installed once the system has been flown to the operating height. Secondary steels must be fitted irrespective of requirements of the local safety standards applicable to the territory.

Ensure that the system is secure and prevented from pivoting around the motor hoist.

Avoid any form of excessive dynamic loading to the assembly (structural computations on RS Rigging System are based on a 1/1.2 factor for hoist or motor acceleration).

NEVER attach any item to the RS system other than the RS accessories.

When flying outdoor systems ensure that the system is not exposed to excessive wind or snow loads and is protected from rainfall.

In case of wind greater than 8 on Beaufort scale (72km/h – 45mph), a touring system has to be landed or an additional securing has to be implanted.

For fixed installations, wind loading has to be taken into account in accordance to the national standards.

The RS Rigging System requires regular inspection and testing by a competent test centre. NEXO recommend that the system is load tested and certified annually or more frequently if local regulations require.

When de-rigging the system ensure that the same duty of care is given to the procedure as for the installation. Pack RS components carefully to prevent damage in transit.

5.1.2 Ground stacking safety

Statistically, many more injuries occur due to unstable ground stacked PA systems than those associated with flown systems. There are several reasons for this fact, however the message is clear:

Always survey the supporting structure upon which a ground stack is to be built. Always look beneath PA wings to inspect the deck support and if necessary, ask for the stage scrims and dressings be removed to allow access.

If the stage surface slopes, as it does in some theatres, ensure that the system is prevented from sliding forwards due to vibration. This may require the fitting of timber battens to the stage floor.

For outdoor systems ensure that that the system is protected from wind forces which might cause the ground stack to become unstable. Wind forces can be huge, especially upon large systems, and should never be underestimated. Observe meteorological forecasts, calculate the “worst case” effect upon the system prior to erection and ensure that the system is secured appropriately.

Take care when stacking cabinets. Always employ safe lifting procedures and never attempt to build stacks without sufficient personnel and equipment.

Never allow anyone, whether operators, artists or members of the public to climb onto a ground stacked PA system. Anyone who needs to climb over 2m (6 ft) high should be fitted with suitable safely equipment including a clip-on harness. Please refer to local Health and Safety legislation in your territory. Your dealer can help with advice on access to this information.

Apply the same attention to all safety matters when de-stacking systems.

Be aware that safety procedures are as important in the truck and in the warehouse as they are at the venue.

5.1.3 Contacts

Correct training is fundamental to safe practise when working with loudspeakers flying systems. NEXO recommend that users contact local industry associations for information on specialist course.

Information for International training agencies can be obtained by contacting either:

The Production Services Association (PSA),
School Passage,
Kingston-upon-Thames,
KT1 SDU Surrey,
ENGLAND
Telephone: +44 (0) 181 392 0180
www.psa.org.uk/

Rigstar Training and Testing Center
82 Industrial Dr. Unit 4
Northampton, Massachusetts 01060 U.S.A.
Phone: 413-585-9869
www.rigstar.com/

ESTA
Entertainment Services & Technology
Association
875 Sixth Avenue, Suite 1005
NEW YORK, NY 10001 USA
Phone: 212-244-1505
www.esta.org

5.2 RS15 General Instructions

IMPORTANT

IN ORDER TO PREVENT SCREWS FROM GETTING LOOSE, USE BLOCKING LIQUID LOCTITE™ 243 OR EQUIVALENT FOR ALL SCREWS USED WITH RS15 ACCESSORIES.

5.2.1 RS15 “Left” and “Right”

NEXO RS15 Subwoofer is delivered with a pair of skids to be mounted on the cabinet.

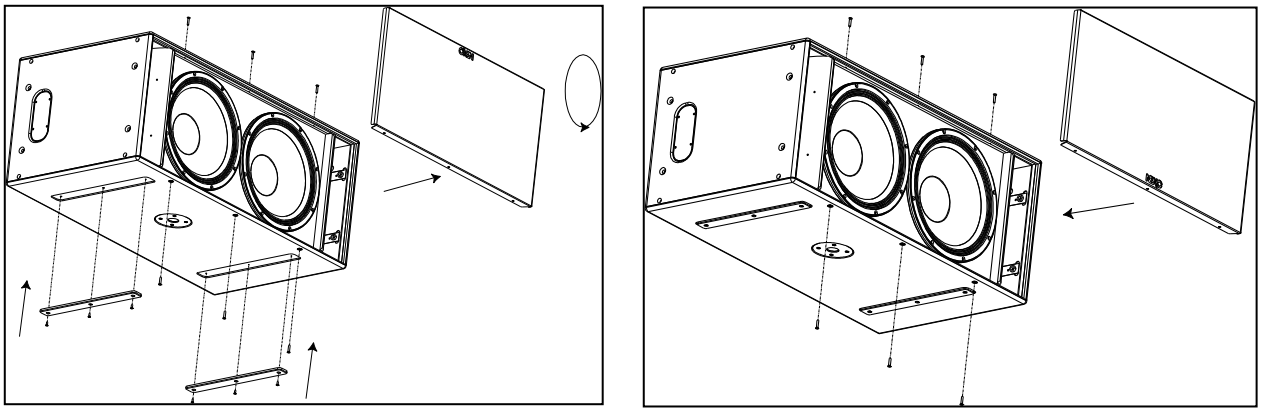
NEXO recommends to create pairs of “RS15 LEFT” and “RS15 RIGHT” for optimized flexibility.

Benefits of such recommendation are related to directional use in array configurations, where RS15s are to be positioned back to back, face to face or in vertical columns alternating speaker side.

However, users might prefer to have all RS15s configured identically, in which case they should all be “RS15 RIGHT” so that skids are opposite to pole stand hole.

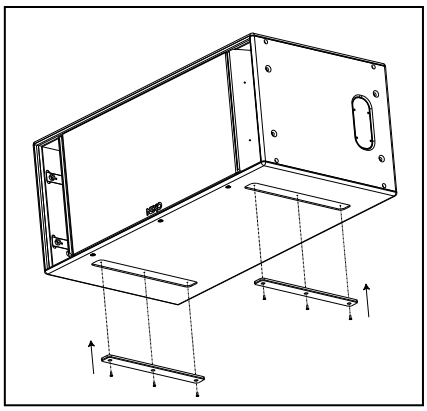
Mounting skids on the pole stand hole side defines a “RS15 LEFT”.

In such a case, front grid must be removed, flipped over and reinstalled so that NEXO logo appears on the same side than the skids.



CONFIGURING RS15 AS LEFT

Mounting skids opposite to the pole stand hole side defines a “RS15 RIGHT”.

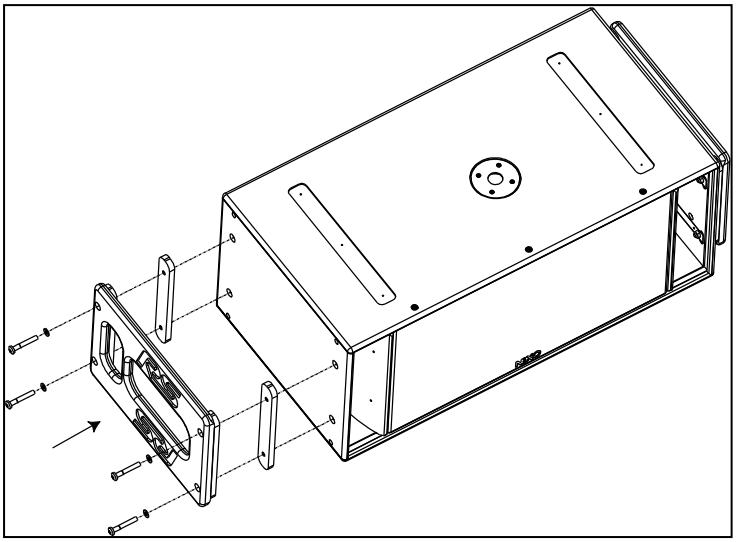


CONFIGURING RS15 AS RIGHT

5.2.2 RS15 handles

Procedure

- Remove the four screws on each side of RS15
- Fill each screw hole with Loctite 243 or equivalent
- Position spacers and handles according to below drawing (vertical opening must be aligned with connector panel or owner's plate)
- Insert the four washers and screws provided with the RST-HANDLES15 kit and tight them



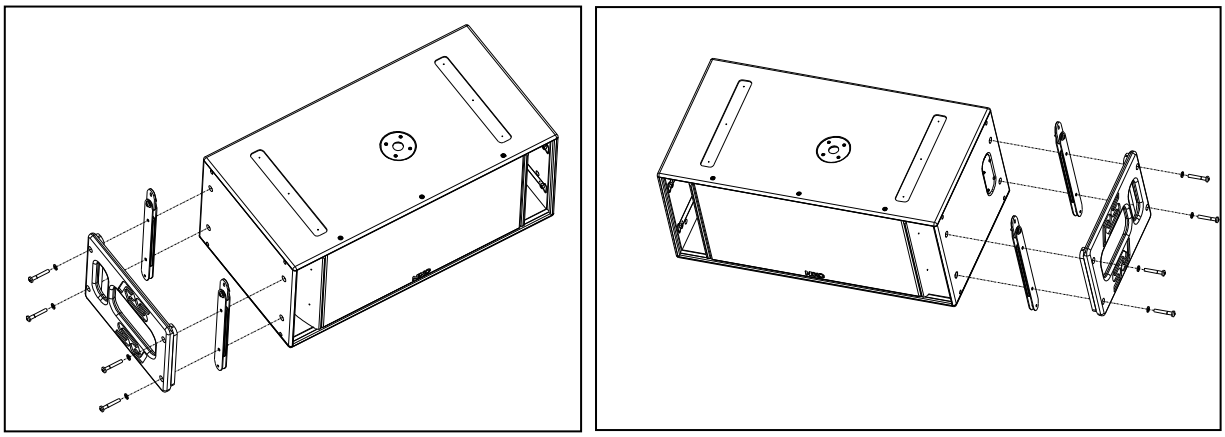
INSTALLING RS15 HANDLES

IMPORTANT
RS15 handles must not be used to fly RS15's (through illegal use of straps for example)

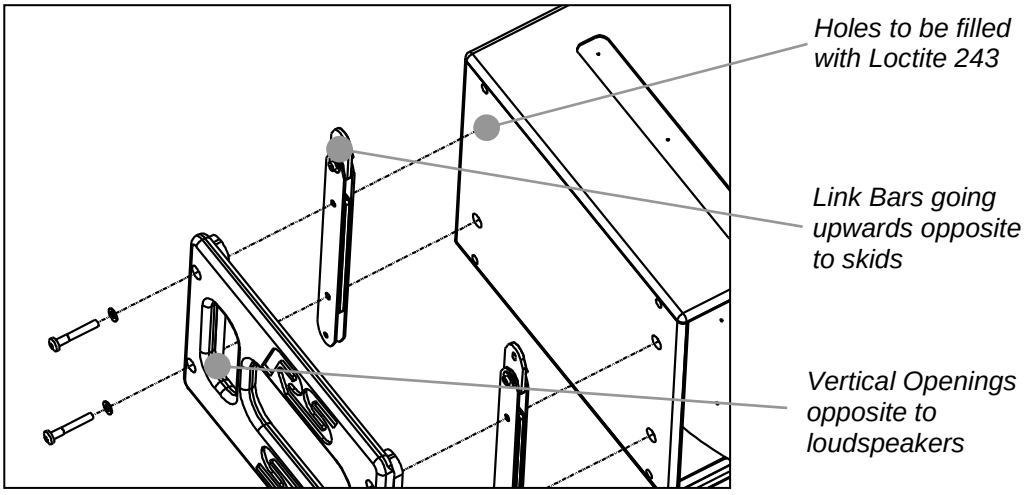
5.2.3 RS15 Flying Plates with handles (touring applications)

Procedure

- Remove the four screws on each side of RS15
- Fill each screw hole with Loctite 243 or equivalent
- Position flying bars so that articulated link bars are opposite to skids, ie at the top of the cabinet
- Position handles according to below drawing (vertical opening must be aligned with connector panel or owner's plate)
- Insert the four washers and screws provided with the RST-FLPLATES15 kit and tight them (torque value must be 10 Nm minimum)



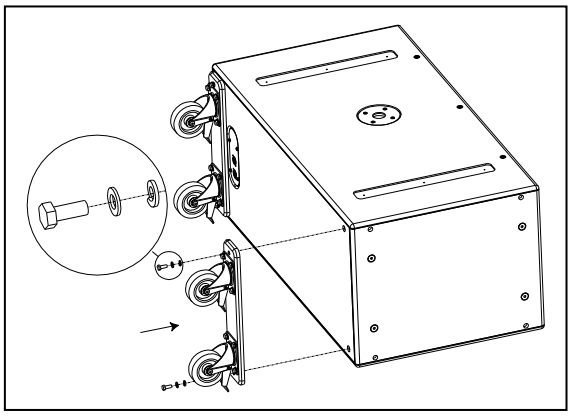
INSTALLING RS15 FLYING PLATES AND HANDLES



5.2.4 RS15 Wheels

Procedure

- Remove the four screws on RS15 back panel
- Fill each screw hole with Loctite 243 or equivalent
- Position wheels according to below drawing
- Insert the 8 washers and 4 screws provided with the RST-WHEELS15 kit (see detail in below drawing) and tight them



5.2.5 RS15 Dolly

IMPORTANT

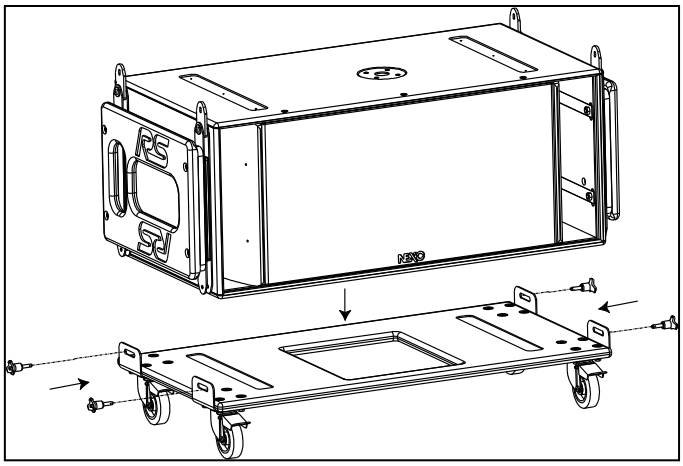
Transporting RS15 on Dolly requires that flying plates are installed on ALL CABINETS so that RS15's can be secured together.

RS15 Dolly is designed for up to 3 RS15's and bumper. Never exceed these quantities.

The first RS15 must be locked to the RS15 dolly using four push-pins according to below drawing.

Subsequent RS15s are stacked on top using four push-pins per additional cabinet to secure the assembly.

Bumper is to be attached to the top cabinet.



5.3 RS18 General Instructions

IMPORTANT

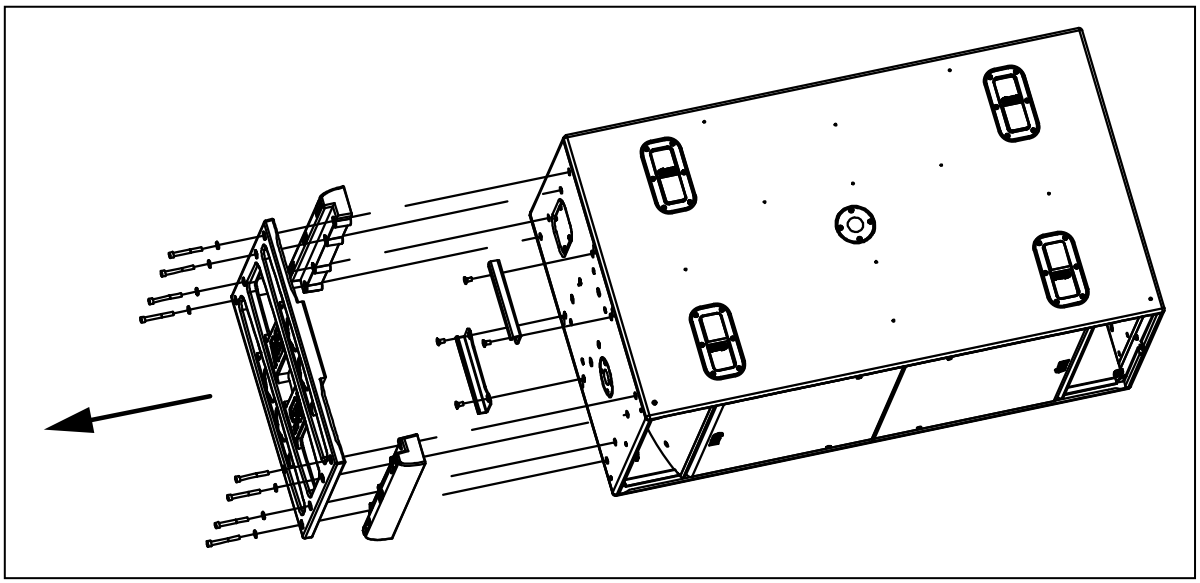
IN ORDER TO PREVENT SCREWS FROM GETTING LOOSE, USE BLOCKING LIQUID LOCTITE™ 243 OR EQUIVALENT FOR ALL SCREWS USED WITH RS18 ACCESSORIES.

5.3.1 Mounting Rigging Plate

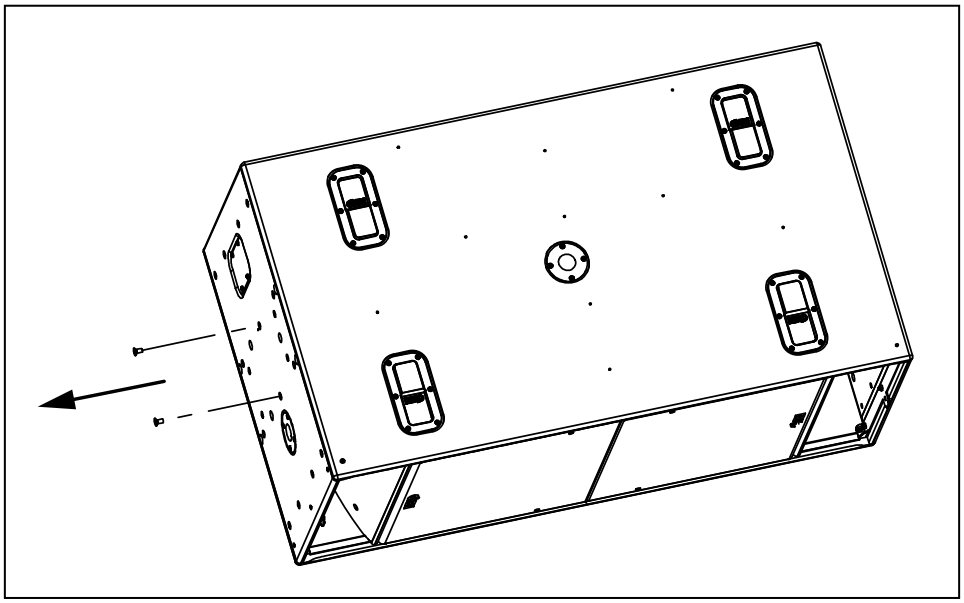
RS18 Painted

Procedure

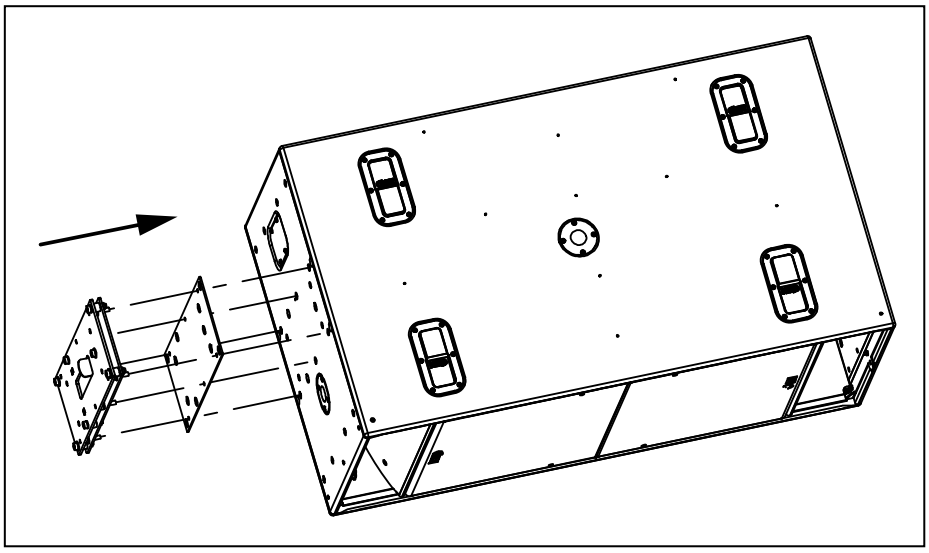
- Remove the twelve screws on each side of RS18



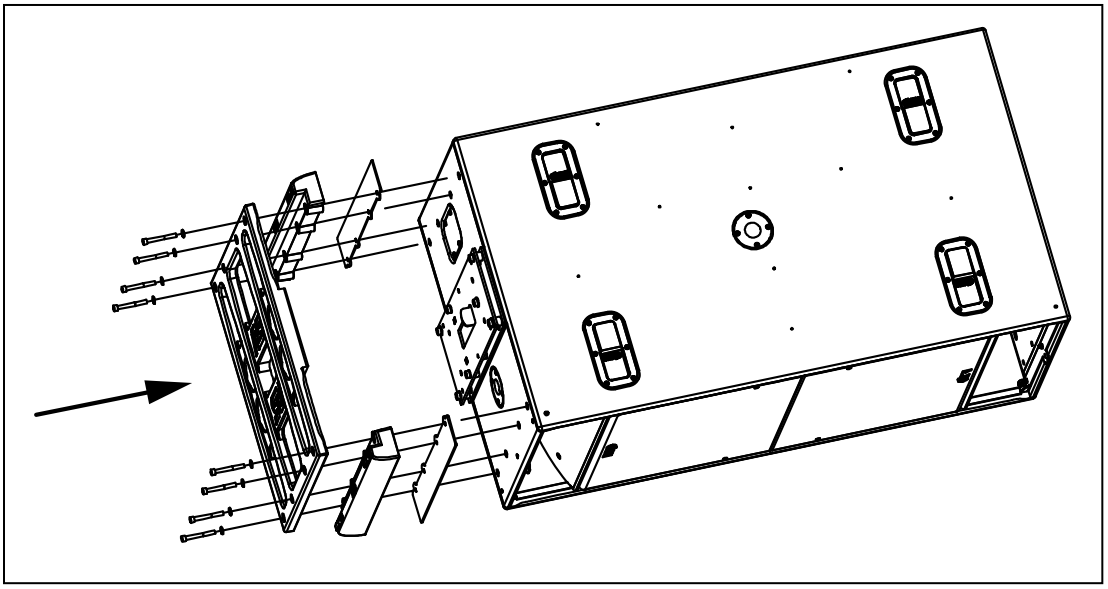
- Remove the four screws on each side of RS18



- Insert Spacer between cabinet and Rigging plates
- Fill each screw hole with Loctite 243 or equivalent
- Tighten the 6 screws alternately, at the rate of 4 revolutions per screw



- Fill each screw hole with Loctite 243 or equivalent
- Insert the 8 handles washers and screws and tight them



INSTALLING PAINTED RS18 RIGGING PLATES

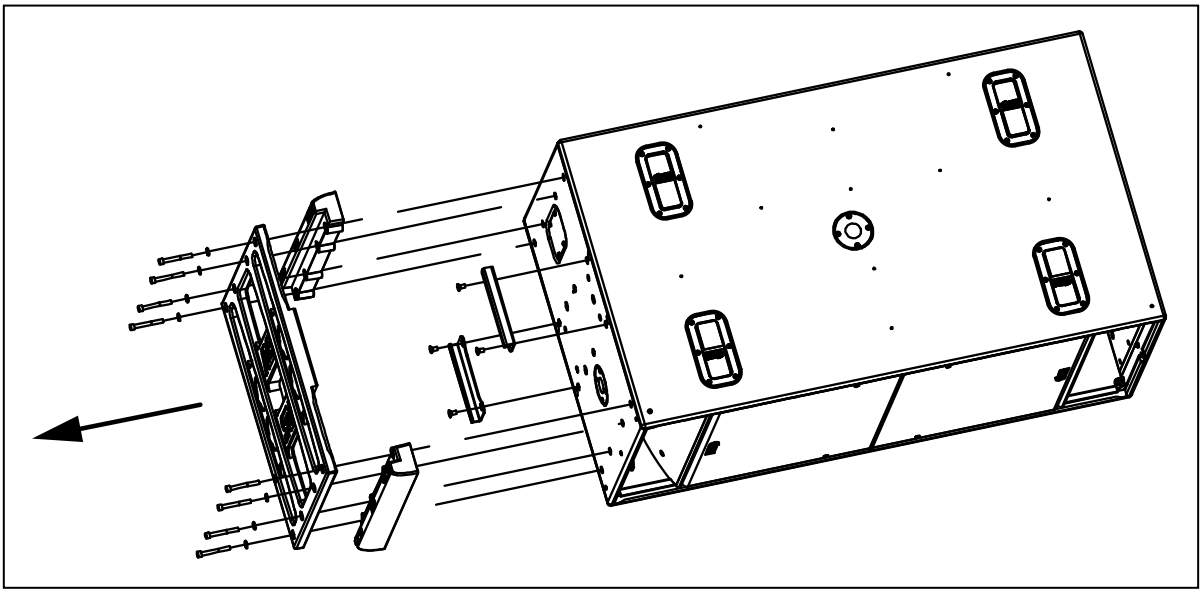
IMPORTANT

RS18 handles must not be used to fly RS18's (through illegal use of straps for example)

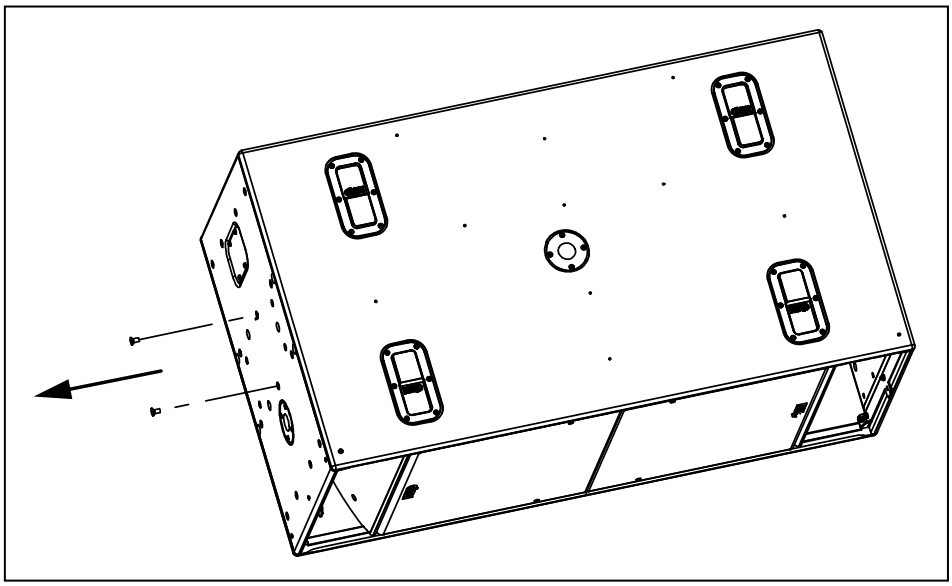
RS18 Carpeted

Procedure

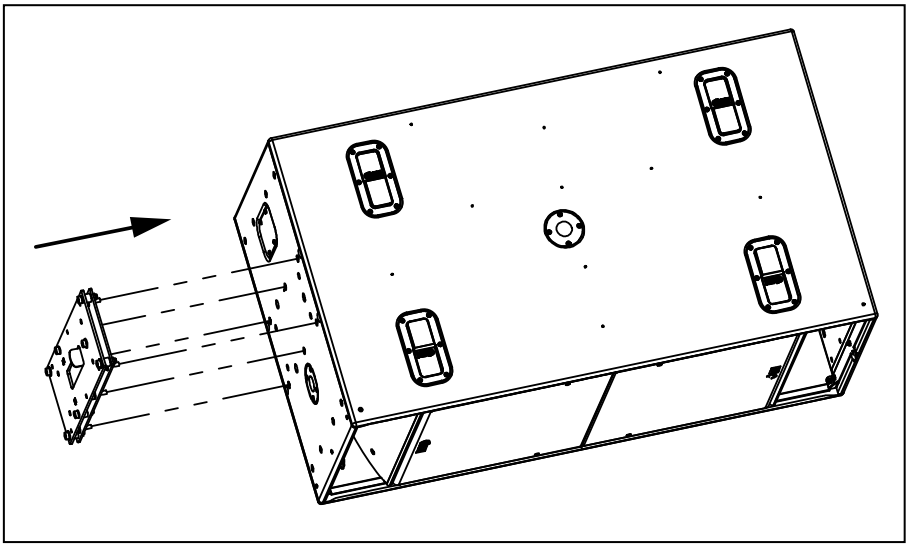
- Remove the twelve screws on each side of RS18



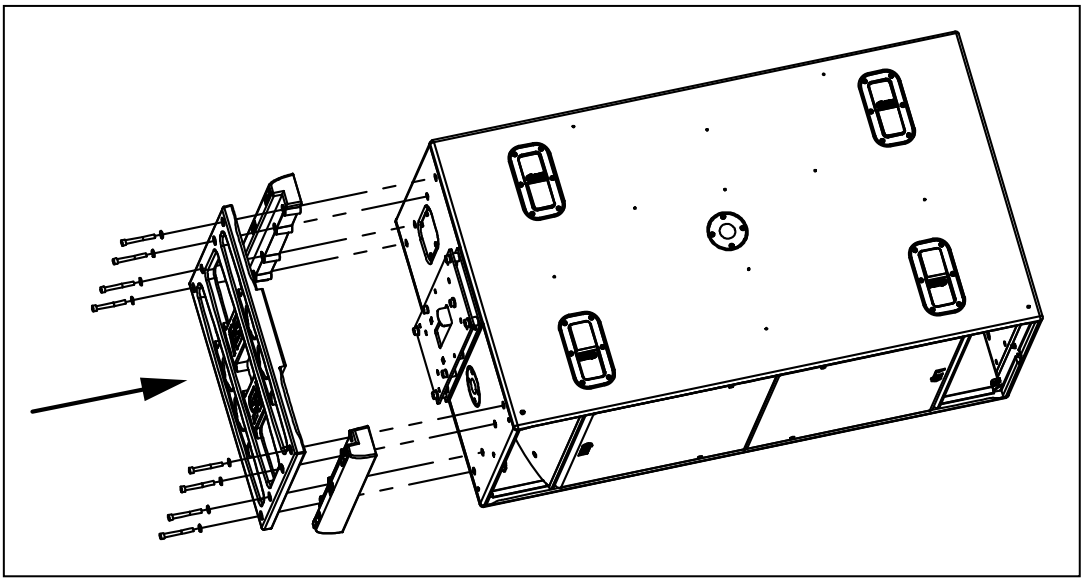
- Remove the four screws on each side of RS18



- Fill each screw hole with Loctite 243 or equivalent
- Tighten the 6 screws alternately, at the rate of 4 revolutions per screw



- Fill each screw hole with Loctite 243 ™ or equivalent
- Insert the 8 handles washers and screws and tight them



INSTALLING CARPETED RS18 RIGGING PLATES

IMPORTANT

RS18 handles must not be used to fly RS18's (through illegal use of straps for example)

5.3.2 RS18 Dolly

IMPORTANT

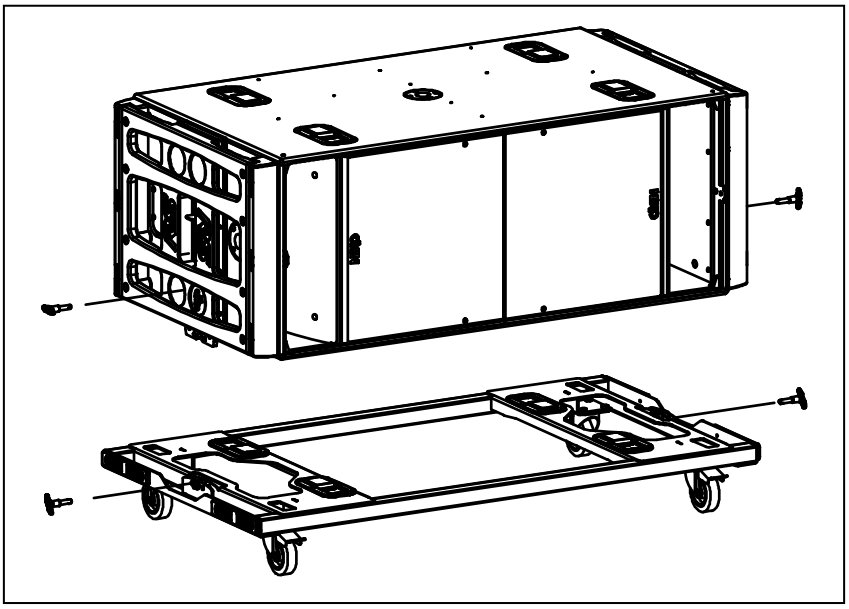
Transporting RS18 on Dolly requires that flying plates are installed on ALL CABINETS so that RS18's can be secured together.

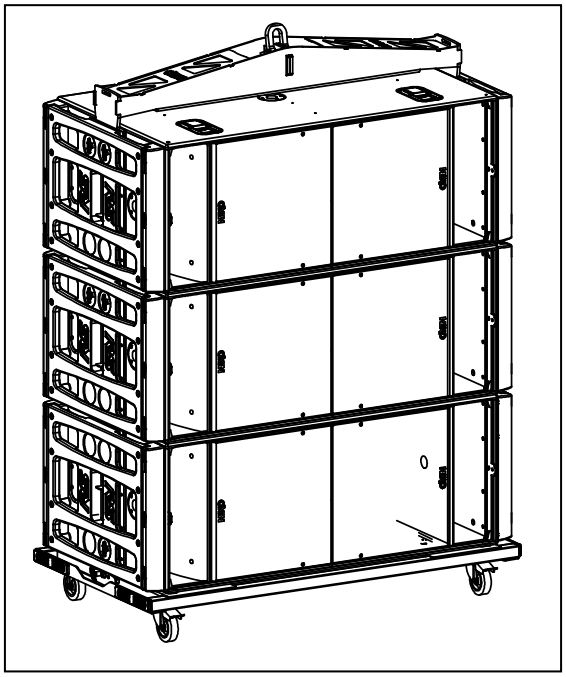
RS18 Dolly is designed for up to 3 RS18's and bumper. Never exceed these quantities.

The first RS18 must be locked to the RS18 dolly using 4 push-pins according to below drawing;

Subsequent RS18s are stacked on top using four push-pins per additional cabinet to secure the assembly.

Bumper is to be attached to the top cabinet.



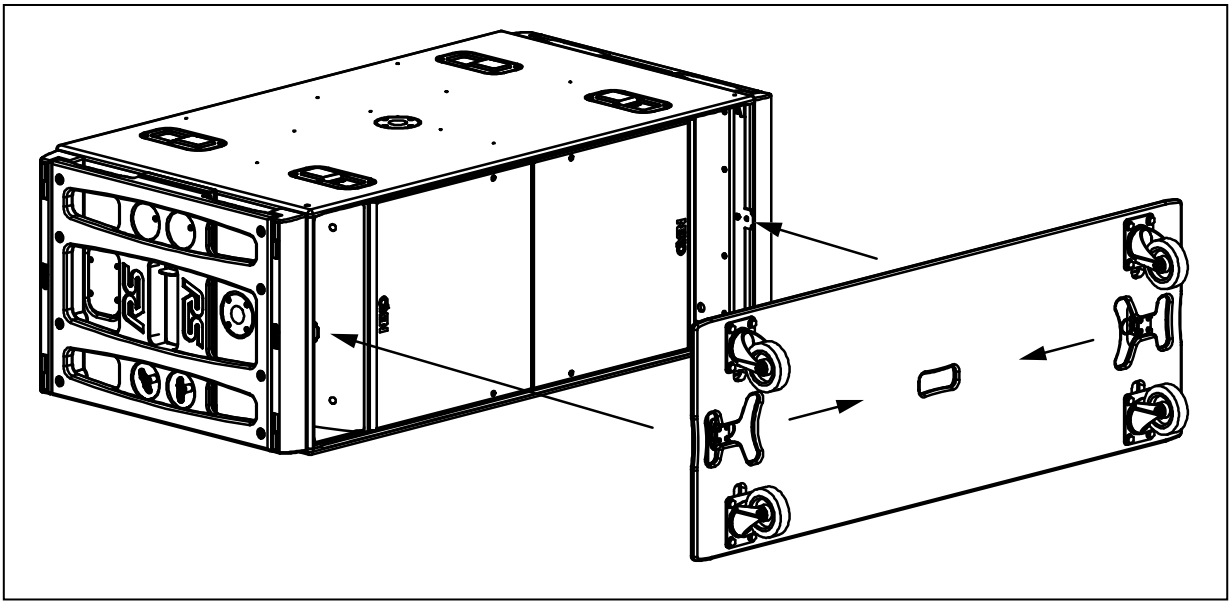


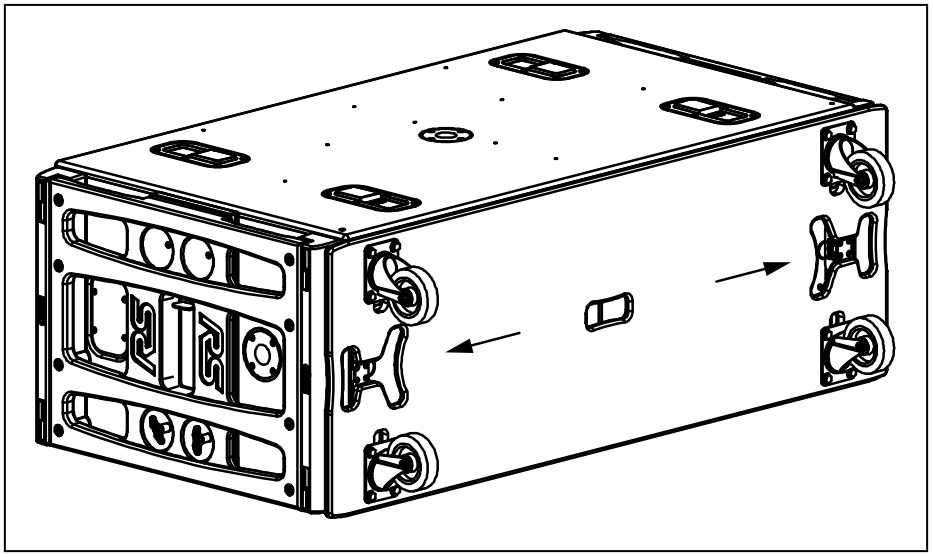
5.3.3 RS18 Wheel Board

Procedure

- Pull wheel board latches inwards
- Maintain lockers while positioning wheel board on RS18 front panel
- Release lockers

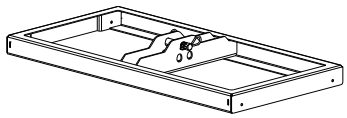
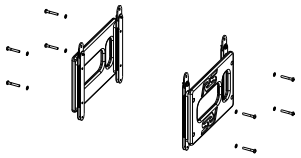
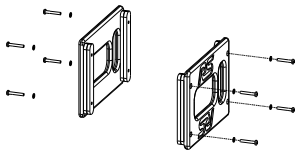
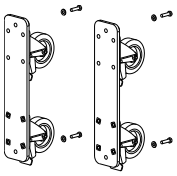
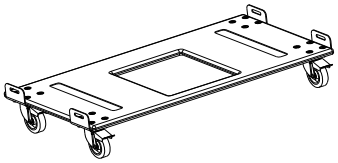
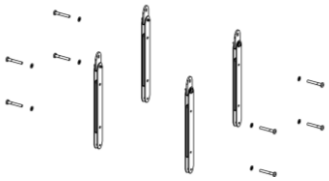
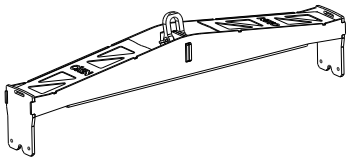
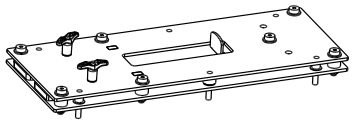
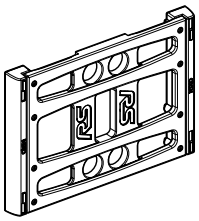
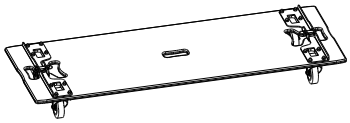
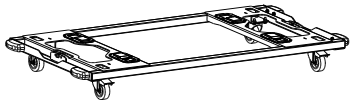
IMPORTANT
Ensure wheel board is properly locked to RS18





5.4 Accessories

RS15 & RS18 accessories are:

RST-BUMPER15 	RST-FPLATES15 	RST-HANDLES15 
RST-WHEELS15 	RST-DOLLY15 	RSI-INSP15 
RST-BUMPER18 	RST-FPLATES18 	RST-HANDLES18 
RST-WB18 	RST-DOLLY18 	VXT-BL820 

5.5 Warnings on RS15 and RS18 accessories

WARNING

All RS15 and RS18 accessories are specifically rated in agreement with structural computations.

Never use other accessories – including push-pins - when assembling RS15 and RS18 cabinets than the ones provided by NEXO: NEXO will decline responsibility over the entire RS115 and RS18 accessory range if any component is purchased from different supplier.

5.6 Flying RS15

IMPORTANT

Maximum allowed RS15 quantity to be flown is 12.
RS15 bumper rigging point must be adjusted so that bumper always remains horizontal.
RS15 flying system forbids angles between adjacent cabinets.

IMPORTANT

RS15 bumper is designed to be flown from one rigging point only.
Motor hoist must be rated to support entire cluster weight.

Required items

- 1 x Bumper (RST-BUMPER15)
- N x pair of RS15 rigging plates (RST-FPLATES15) for N cabinets
- 4 x N Quick release pins (VXT-BL820) for N cabinets
- 1 hoist *(not provided)*

Hoist rating

N being RS15 quantity within cluster, cluster weight is given by:

$W_{cluster}$ = (17kg/38lbs) + Nx(70kg/154lbs)

NB: this formula includes cable weight up to 5kg/11lbs per RS15

Typical cases are:

3 RS15 cluster = ¼ ton hoist

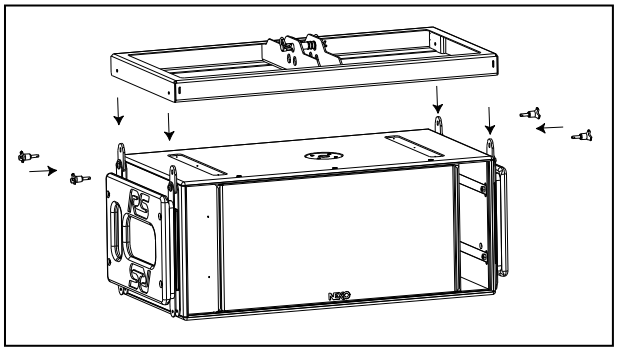
6 RS15 cluster = ½ ton hoist

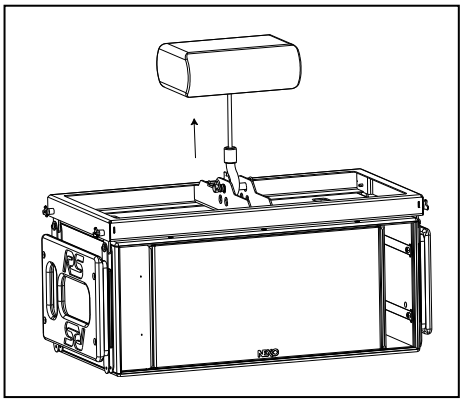
12 RS15 cluster = 1-ton hoist

Procedure

Connecting first RS15 to bumper

- Connect bumper to first RS15 flying system link plates; ensure quick release pins are properly locked
- Insert axis in centre hole and secure it with provided “R” clips
- Connect hoist hook to bumper axis and lift assembly so that RS15 is off the ground





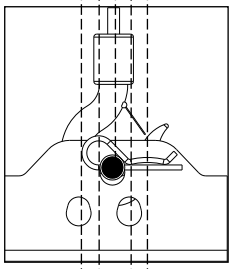
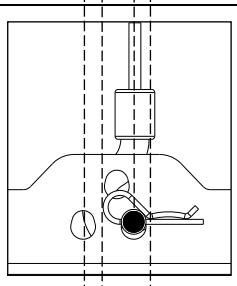
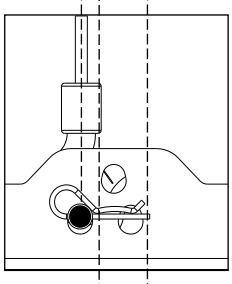
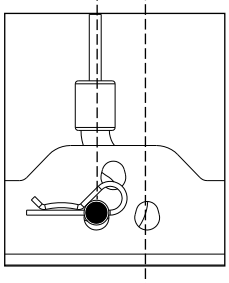
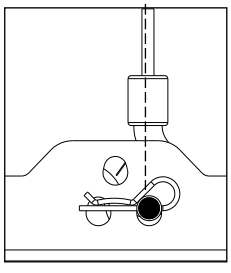
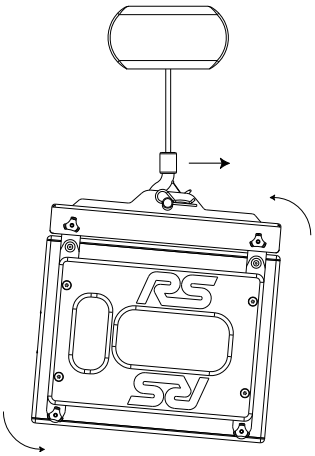
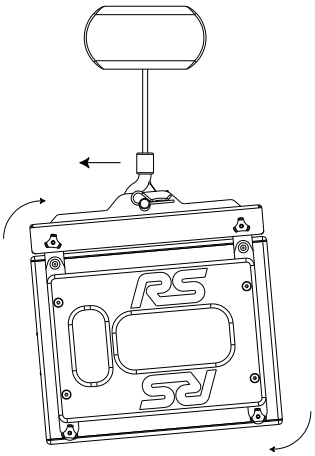
Adjusting rigging point for horizontality

Before connecting a second cabinet, bumper angle has to be adjusted for perfect horizontality.

This requires that the rigging point is adjusted in the two horizontal directions so that the bumper remains horizontal within +/- 1°. Adding cabinets will reduce this tolerance.

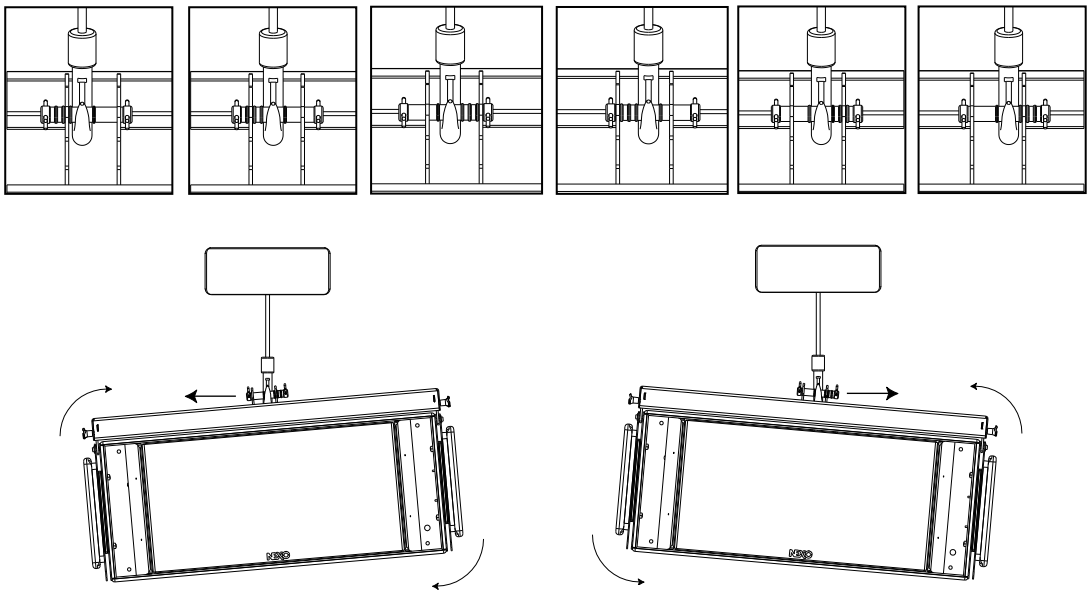
- Adjusting 0° along the cabinet depth

Adjusting horizontality along cabinet depth is done by properly selecting bumper hole:

	**Case Description**
	Top center bumper rigging point centered geometrically (0mm): - RS15 equipped with wheels clusters (gravity center of a single RS15 with wheels precisely matches geometrical center) - Alternated RS15 clusters (speakers alternately turned to the left and to the right, gravity center of a single RS15 is precisely 17mm ahead of geometrical center).
	Top center bumper rigging point 17mm ahead of geometrical center: - RS15 without wheels clusters (all speakers facing same direction, gravity center of a single RS15 is precisely 17mm ahead of geometrical center).
  	Other available rigging point positions: Cable weight influence over gravity center position cannot be precisely anticipated. Additional rigging point configurations are available so that the RS15 bumper is always set horizontally. These rigging point positions are: - 34mm behind geometrical center; - 17mm behind geometrical center *(requires flipping the bumper horizontally)*; - 34mm ahead geometrical center *(requires flipping the bumper horizontally)*.  

- Adjusting 0° along the cabinet width

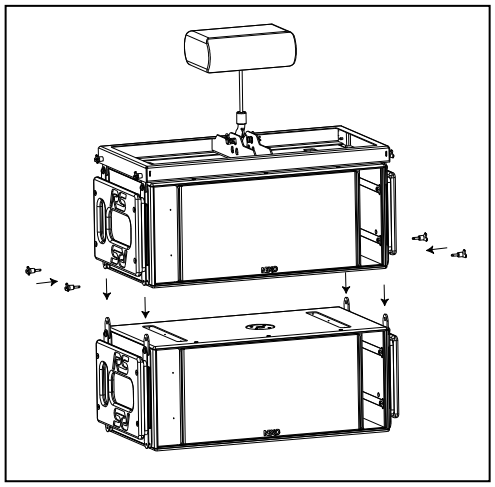
Adjusting horizontality along cabinet depth is done by properly adjusting the bumper axis as described in drawings below:



Do not forget to secure the axis with “R” clips once horizontality is achieved. Assembly is now ready for second RS15 connection.

Flying the second RS15

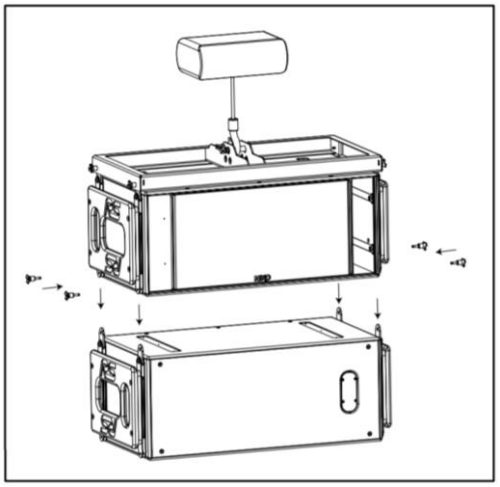
- Lift assembly to sufficient height in order to connect a second RS15
- Connect second RS15 to first RS15 flying system link plates
- Ensure quick release pins are properly locked



OMNI MODE

DIRECTIONAL MODE / BACK TO BACK

DIRECTIONAL MODE / FACE TO FACE



DIRECTIONAL MODE / ALTERNATED

Flying subsequent RS15's

- Repeat above steps for subsequent RS15's
- Lift cluster defined rigging height
- Secure cluster horizontally to prevent it from rotating

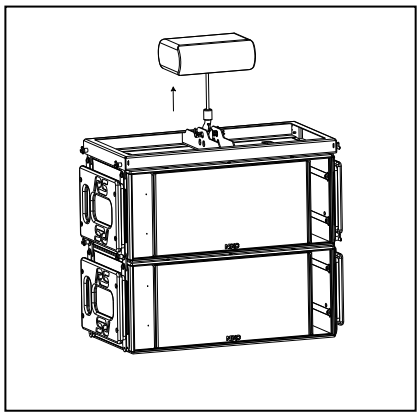
IMPORTANT

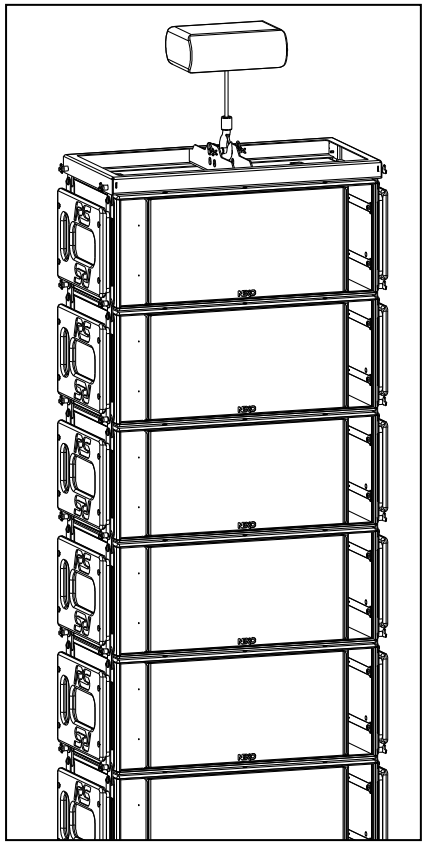
Do not attempt to make any change to the bumper rigging point once the cluster is lifted

- Secure bumper with secondary safety steel.

IMPORTANT

The requirements for secondary safety systems vary with territories. However, the secondary safety steel MUST have a SWL equivalent or greater than that of the rigging system





5.7 Flying RS18

IMPORTANT

Maximum allowed RS18 quantity to be flown is 12.
RS18 bumper rigging point must be adjusted so that bumper always remains horizontal.
RS18 flying system forbids angles between adjacent cabinets.

IMPORTANT

RS18 bumper is designed to be flown from one rigging point only.
Motor hoist must be rated to support entire cluster weight.

Required items

- 1 x Bumper (RST-BUMPER18)
- 4 x Quick release pins 10x25mm (included)
- N x Pair of RS18 rigging plates (RST-FPLATES18) for N cabinets
- 4 x N quick release pins 10x25mm (included)
- 1 hoist *(not provided)*

Hoist Rating

N being RS18 quantity within a cluster, cluster weight is given by:

$W_{cluster}$ = (30kg/66lbs) + Nx(131kg/289lbs)

including cable weight up to 5kg/11lbs per RS18

Hoist rating is:

Up to 3 RS18 cluster = ½ ton hoist;

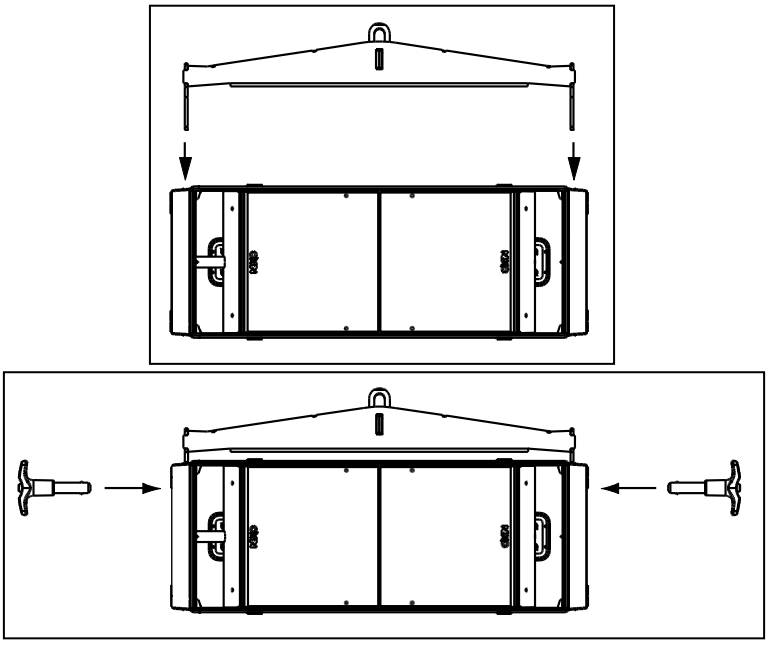
4 to 6 RS18 cluster = 1-ton hoist;

7 to 12 RS18 cluster = 2-ton hoist.

Procedure

Connecting first RS18 to bumper

- Connect bumper to first RS18 flying system link plates by using 4 10x25mm quick release pins
- Ensure the 4 quick release pins are properly locked
- Connect hoist hook to bumper axis (see below)



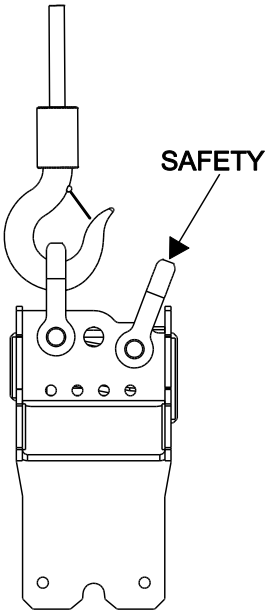
Adjusting rigging point for horizontality

Before connecting a second cabinet, bumper angle has to be adjusted for perfect horizontality.

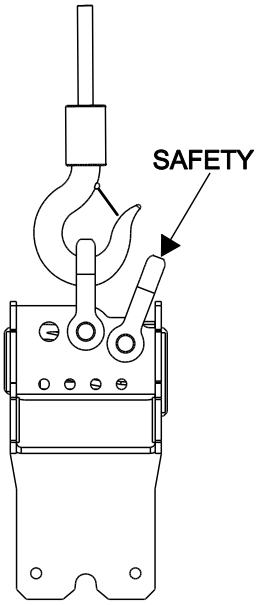
This requires that the rigging point is adjusted in the two horizontal directions so that the bumper remains horizontal within +/- 1°. Adding cabinets will improve this tolerance.

- Adjusting 0° along the cabinet depth

Adjusting horizontality along cabinet depth is done by properly selecting bumper hole:



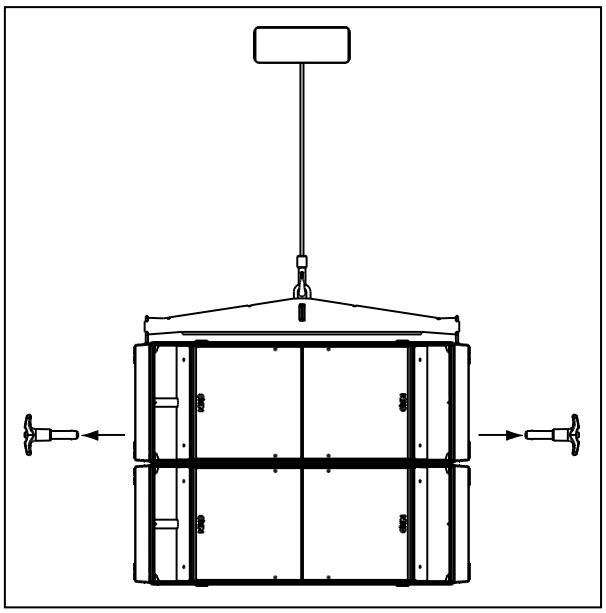
OMNI MODE - GRIDS SAME SIDE



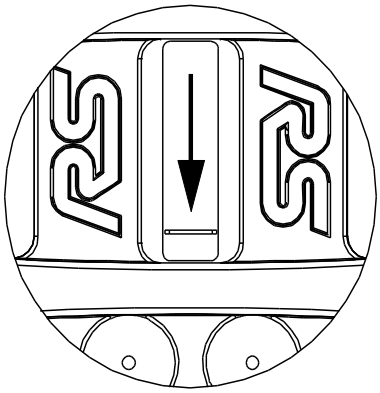
CARDIO MODE – GRIDS ALTERNATED

Flying the second RS18

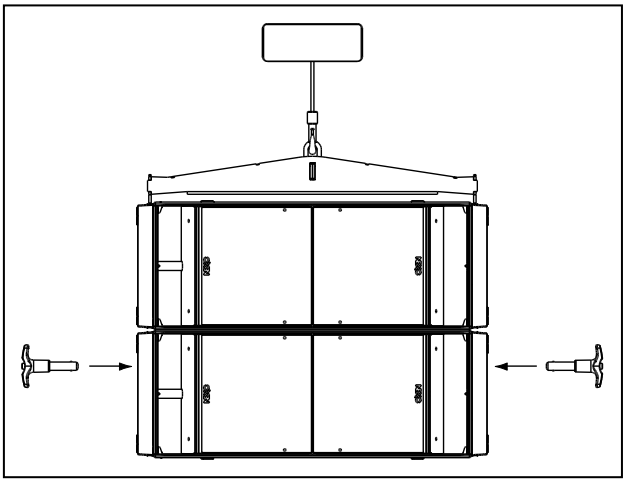
- Lift assembly to sufficient height in order to connect a second RS18
- Position and align second RS18 below assembly
- Remove the 4 quick release pins from the PARKING position so that sliding connector plate can be moved



- On both sides, push the top RS18 sliding connecting plate all the way downwards into the second RS18 rigging system

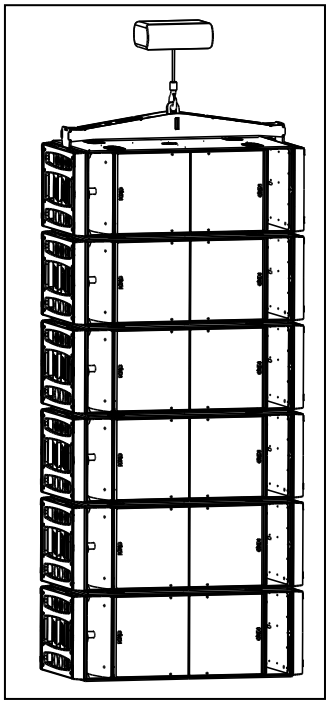


- Insert the 4 quick release pins into the FLOWN position of second RS18
- Ensure quick release pins are properly locked

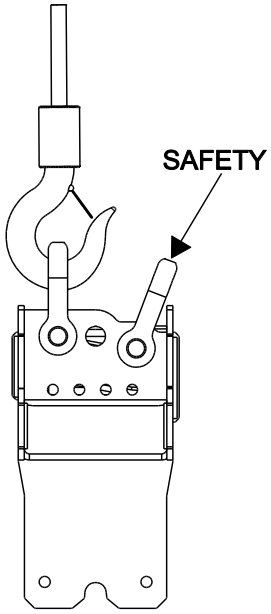


Flying subsequent RS18's

- Repeat above steps for subsequent RS18's
- Lift cluster up to defined rigging height
- Secure it horizontally to prevent rotation



- Secure bumper with secondary safety steel



IMPORTANT

Do not attempt to make any change to the bumper rigging point once the cluster is lifted

IMPORTANT

The requirements for secondary safety systems vary with territories. However, the secondary safety steel MUST have a SWL equivalent or greater than that of the rigging system

5.8 Testing and Maintenance of the system

General: please keep regular maintenance attention to the RS flying system in order to provide long and reliable service. NEXO recommends regular testing of loudspeaker rigging components, preferably using a suitable test rig coupled with a visual inspection.

Fasteners: there are several critical points in the RS cabinets.

Of primary concern are:

a) The grid screws attaching the grid to the cabinet

b) The machine screws attaching the connecting plates to the cabinet.

These fasteners should be regularly checked and tightened as necessary.

Cleaning: The exterior of the cabinet and the rigging system can be cleaned with a damp cloth soaked in mild soapy water. On no account use solvent based cleaners, which may damage the finish of the cabinet

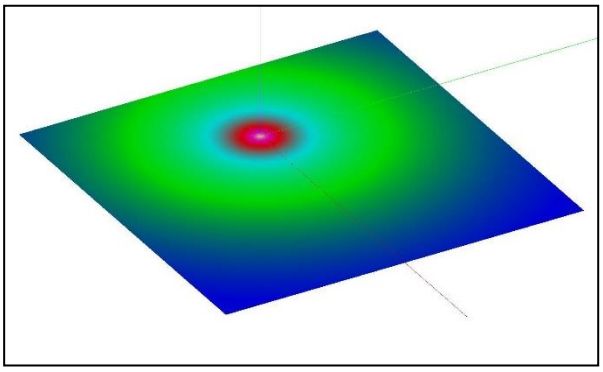
After cleaning, the rigging system must be treated with a suitable lubricant to prevent rusting. NEXO recommends the use of Scottoil FS365 which is a water-based lubricant with a mixture of machine oil, surfactant and anti-rust treatment.

.

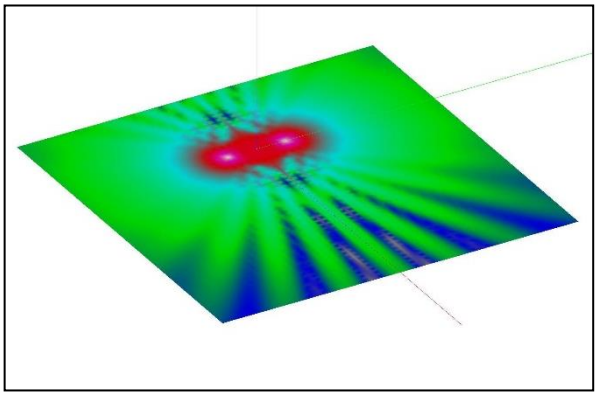
6 GENERAL GUIDELINES FOR SUBWOOFER DESIGN

6.1 Low Frequency Issues

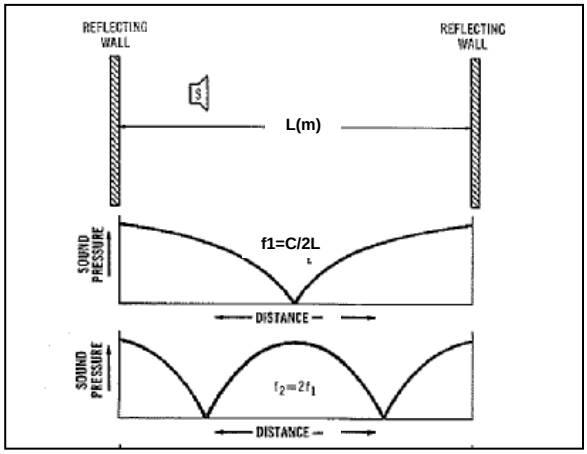
Even low frequency coverage is amongst the toughest issues in sound system design. Common issues that are faced in design are as follow:



Low frequency radiation is hard to control efficiently because of wavelength becoming large (10m / 30ft at 34 Hz) in relation to sources; and most of available subwoofers are omnidirectional; this results in important low frequency feedback on stage, environmental problems in outdoor venues and increased reverberation time in indoor venues;



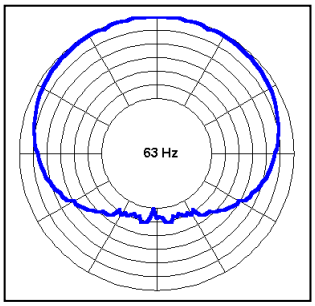
Stereophonic implementation of subwoofers introduces very strong interference patterns; these are related to Left and Right path length difference to listener location while pressure levels are comparable for Left and Right arrays; while always maximum at the center – where distance to Left and Right arrays are equal -, pressure level can severely drop at locations where path length equals half the wavelength of frequency of interest. This effect is well-known from audio-engineers, and often referred to as “Power Alley”;



In closed venues, room eigen modes (nulls and max) are dominant over source location; because these modes depend on accurate characterization of boundary surfaces (walls, ceiling, floor), audience coverage is very hard to predict.

To overcome these difficulties, some common-sense rules can help.

6.2 Gradient Subwoofers benefits



Gradient subwoofers can provide up to 15 dB front to rear average attenuation (Please refer to Ray Sub technical note for in-detail explanation on gradient subwoofers).

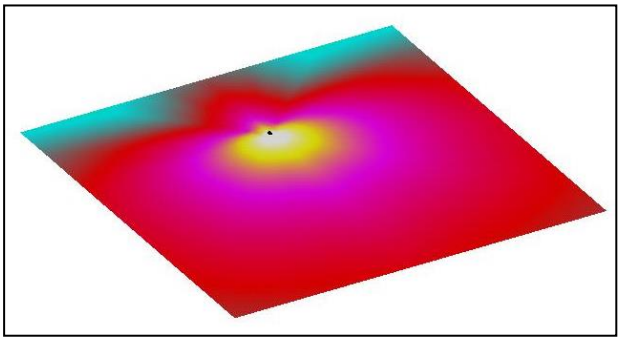
Low frequency level on stage is therefore significantly reduced on stage, and in the neighbouring environment in open air venues.

Because of their directional pattern, Gradient subwoofer are also less sensitive to room eigen modes.

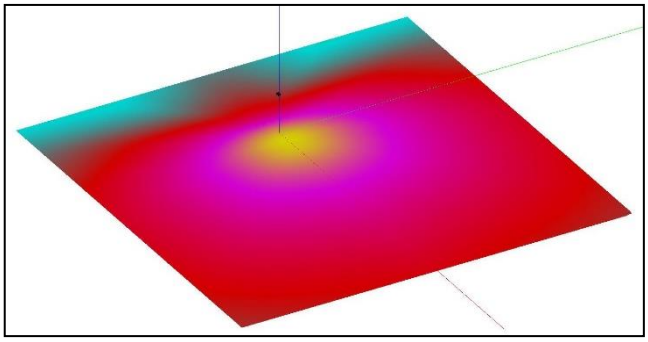
6.3 Monophonic Design

Left and Right subwoofer arrays can be merged into a monophonic system so that interferences no longer exist.

When using few cabinets, this can be done by installing these cabinets at the centre front stage. If cabinets are set on the ground in front of the stage, level discrepancy from first to last rows will be important. Flying cabinets above centre stage will reduce first to last rows discrepancies significantly.

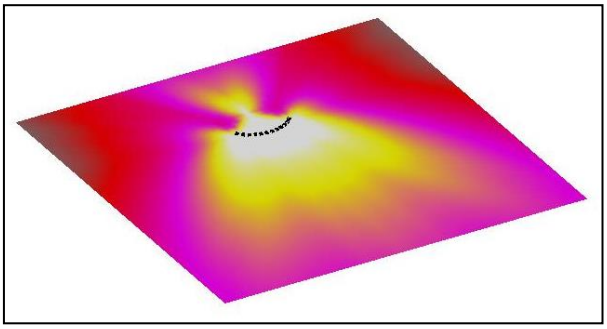


CENTRE STACKED DIRECTIONAL SUBWOOFER

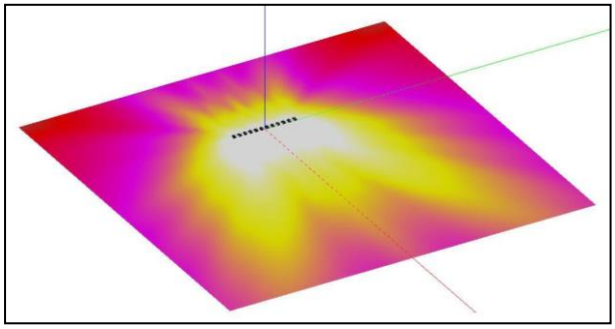


CENTRE FLOWN DIRECTIONAL SUBWOOFER

When using a larger amount of cabinets, these can then be installed all across the stage provided distance between units does not exceed half the wavelength of the upper frequency limit (1.7m/5.6ft at 100 Hz). Array coverage can then be adjusted geometrically (by curving the array horizontally so that it matches the audience area, which creates an asymmetrical front stage to rear stage pattern with a “hot” point on stage) or electronically (by implementing a delay that increase from the centre to the sides, which creates a symmetrical pattern front to rear). In both cases, omnidirectional subwoofers should be avoided so low frequency that level on stage does not exceed level in the audience.



CURVED SUBWOOFER ARRAY ACROSS STAGE

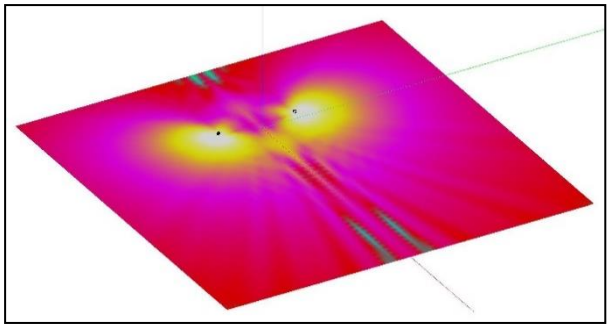


STRAIGHT DELAYED SUBWOOFER ARRAY ACROSS STAGE

Main drawback of monophonic designs as the ones described above is inconsistent phase relationship between subwoofer arrays and main systems over the audience area (lack of impact in the 80Hz-125Hz bandwidth).

6.4 Stereo Design

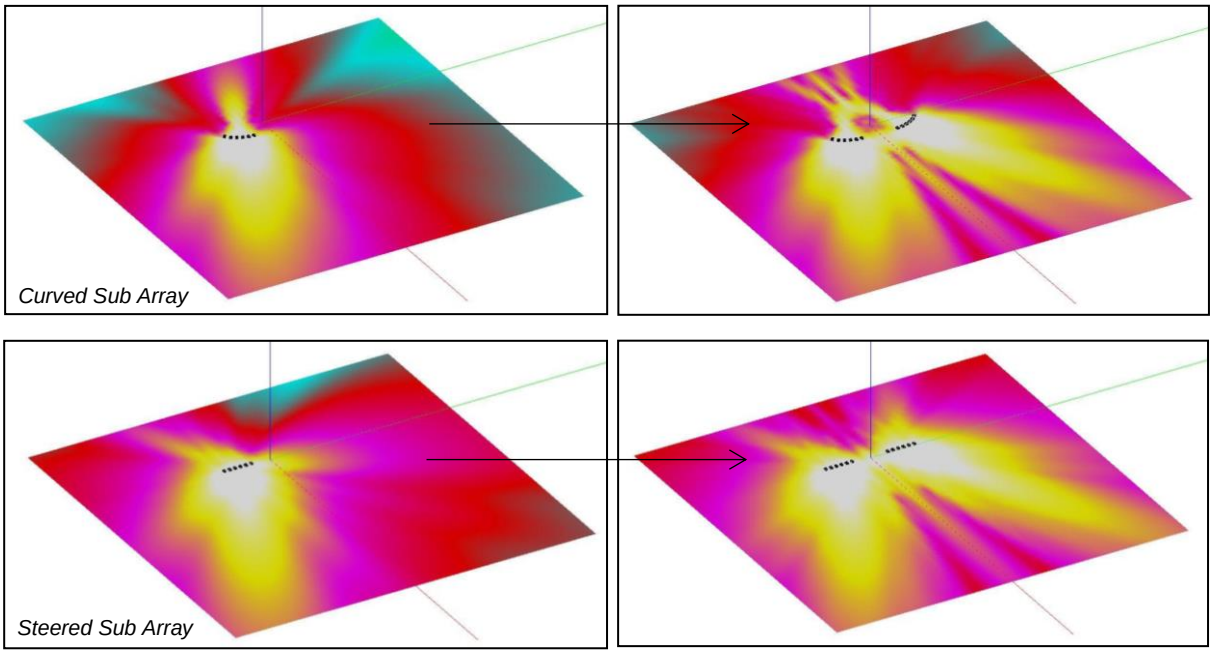
If stereophonic implementation has to be maintained, then Left and Right array coverage patterns have to be as independent as possible – ie coverage overlap from Left to Right has to be minimized.



When using few cabinets, minimizing overlap can only be achieved with directional devices by rotating the subwoofers 30° to 45° outwards (rotating an omnidirectional subwoofer makes no difference in the coverage pattern).

When using a larger amount of cabinets, Left and Right subwoofers arrays must be designed so that level drops as much as possible inwards, and is maintained as going outwards. Therefore, main axis efficiency must be orientated outwards (through use of delays or curving the array outward as in below figure). Such arrays must be experimented playing one side only to check

if above condition is fulfilled, and then summed left and right for interference evaluation (see below drawings). Although pressure level will still drop in the centre vicinity, overall level in the audience area is comparable to what occurs at the centre.



LEFT IMPLEMENTATION MINIMIZING RIGHT COVERAGE *LEFT AND RIGHT SUM*

Advantage of stereo design as oppose to mono design is much improved phase relationship between subwoofer arrays and main systems since distance between them is greatly reduced.

However, it is essential to keep in mind that stereo subwoofer array design always leads to strong interferences in the centre alley vicinity (a couple of steps left and right of mixing position).

A successful design requires minimizing the audience area over which these interferences occur, and therefore lots of on-site experimentation.

7 RAY SUB IMPLEMENTATION

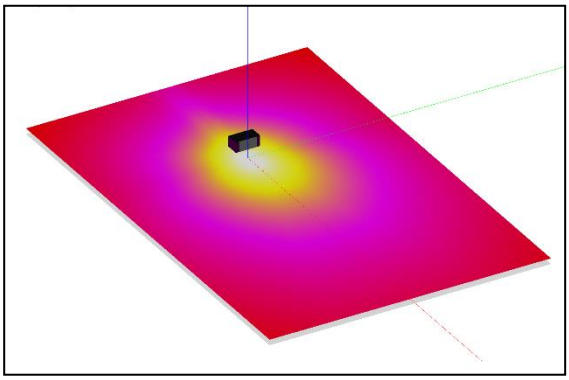
7.1 Omnidirectional Mode

7.1.1 Single RS15 and RS18

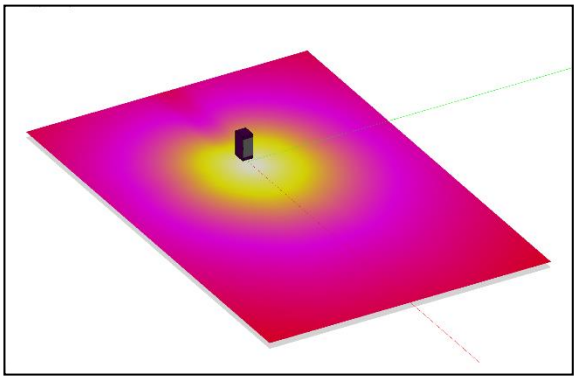
Omnidirectional Mode implementation should be favoured in configurations where:

- sufficient depth is not available for directional implementation (proscenium, front stage etc…)
- strong rear radiation is not critical.

Although wide in both cases, coverage is slightly narrower along RS15's or RS18's width than height (see drawings below).



HORIZONTAL COVERAGE IN OMNI MODE (100 HZ)



VERTICAL COVERAGE IN OMNI MODE (100 HZ)

7.1.2 RS15 and RS18s arrays

IMPORTANT

RS15s and RS18s arrays must be installed with bumper set horizontally and all cabinets at 0°.

Design procedure should be in agreement with what has been described in the preceding section.

See following section on Steered Arrays

7.2 Directional Mode

IMPORTANT

RS15 can be installed “Left” or “Right” (see section 5.2.1):

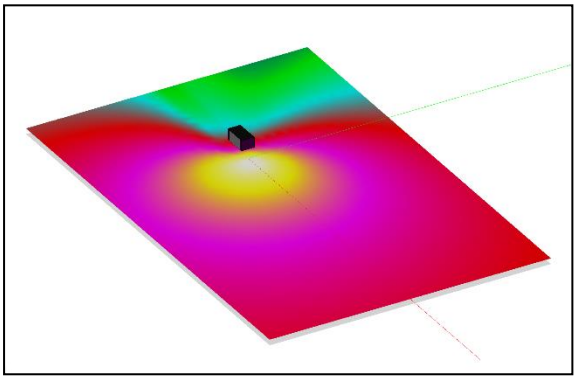
- “Left” means grid is Left when looking from front

- “Right” means grid is right when looking from front

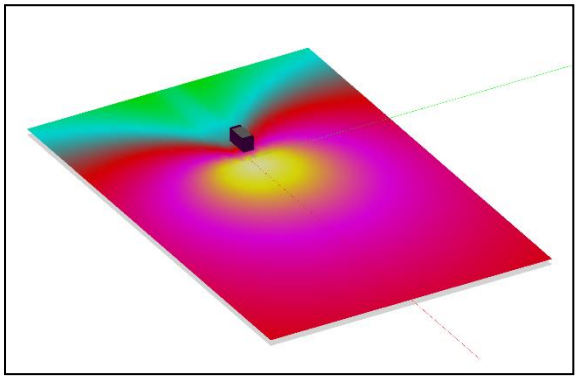
Whenever possible, NEXO recommends symmetrical designs.

7.2.1 Single RS15 or RS18

Single RS15 and RS18 have an asymmetrical pattern in the horizontal plane (ie speakers on the side), which is tilted 30° off-axis towards speakers direction; vertical pattern (ie speakers facing up or down) is symmetrical).



HORIZONTAL COVERAGE IN DIRECTIONAL MODE (100 HZ)



VERTICAL COVERAGE IN DIRECTIONAL MODE (100 HZ)

IMPORTANT

So that directional behaviour and acoustic load are not altered, no reflecting surface should be at less than 50cm (20”) from the RS15 and RS18 side walls and drivers.

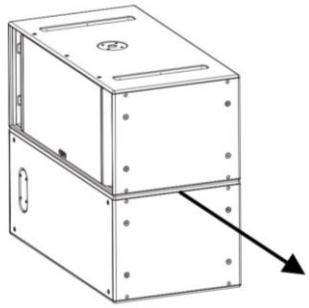
In case of stereo configurations, NEXO recommends that speaker side is set outwards to minimize interference region in stereo designs. (ie “RS15s LEFT” should be installed Left and “RS15s RIGHT” should be installed Right).

7.2.2 RS15s pair

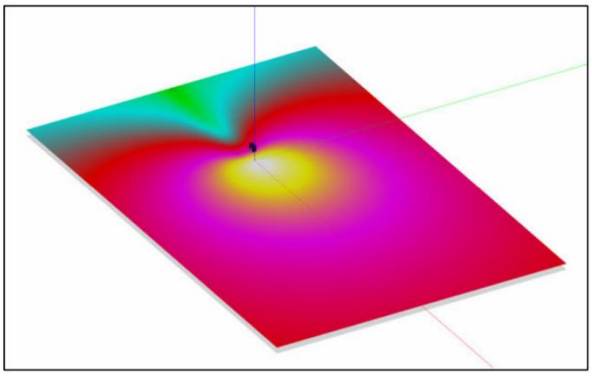
There are three ways of using pairs of RS15s in directional mode: “alternated”, “back to back” and “face to face” (50cm / 20” between grids).

All of these configurations have symmetrical patterns with a smooth 15dB attenuation at the rear over the entire RS15 bandwidth, but significantly different horizontal coverage.

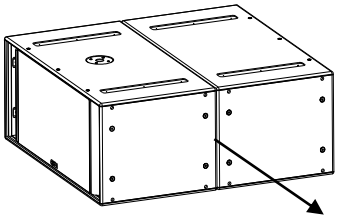
- "alternated" configuration has a constant -3dB coverage of 120° from 31.5Hz to 100Hz
- “back to back” configuration has a -3dB coverage which decreases from 120° at 31.5 Hz to 60° at 100Hz
- “face to face” configuration has a -3 dB coverage which increases from 120° at 31.5 Hz to 180° at 100 Hz



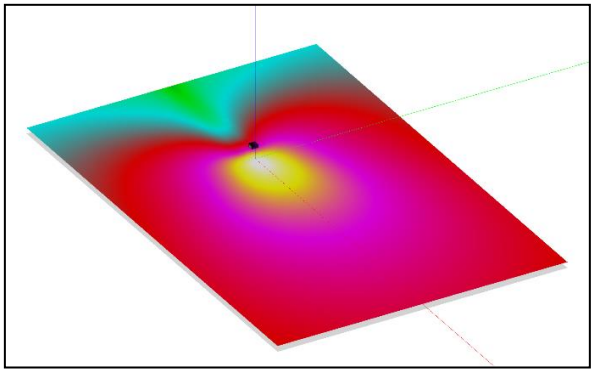
"ALTERNATED" CONFIGURATION



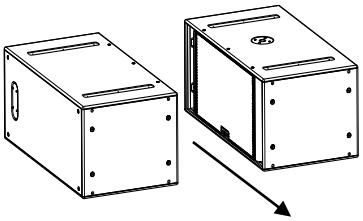
"ALTERNATED" CONFIGURATION AT 100HZ



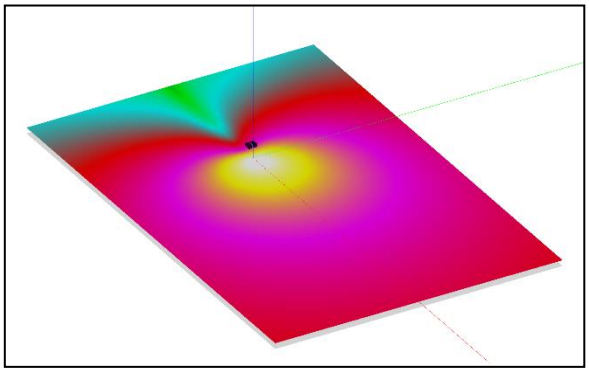
“BACK TO BACK“ CONFIGURATION



“BACK TO BACK” CONFIGURATION AT 100 HZ



“FACE TO FACE“ CONFIGURATION



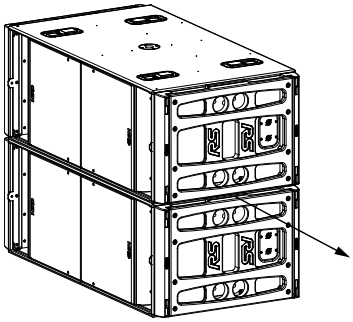
“FACE TO FACE” CONFIGURATION AT 100 HZ

7.2.3 RS18s pair

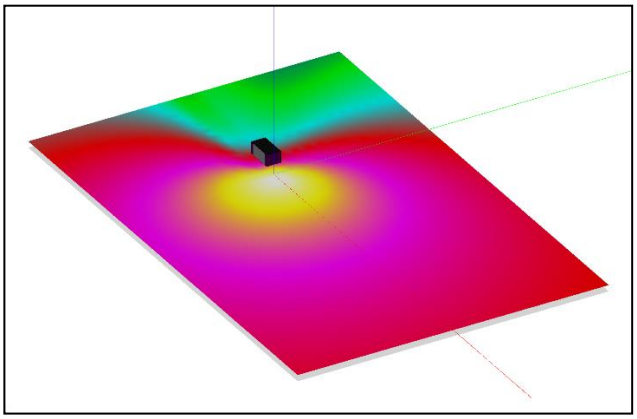
There are three ways of using pairs of RS18s in directional mode: “one side”, “back to back” and “face to face” (50cm / 20” between grids).

All of these configurations have symmetrical patterns with a smooth 15dB attenuation at the rear over the entire RS18 bandwidth, but significantly different horizontal coverage.

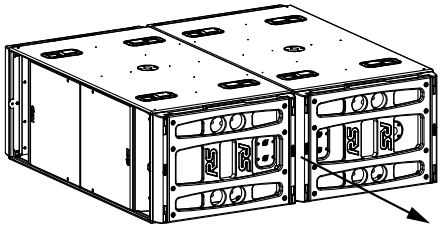
- “one side” configuration has a constant -3 dB coverage of 120° from 31.5 Hz to 80 Hz
- “back to back” configuration has a -3dB coverage which decreases from 90° at 31.5 Hz to 60° at 80Hz
- “face to face” configuration has a -3 dB coverage which increases from 90° at 31.5 Hz to 120° at 80 Hz



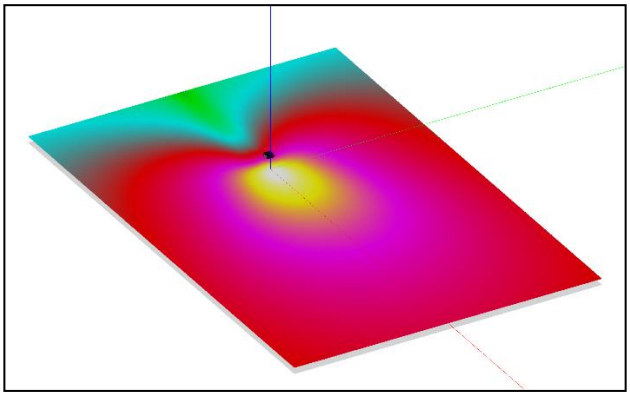
“ONE SIDE" CONFIGURATION



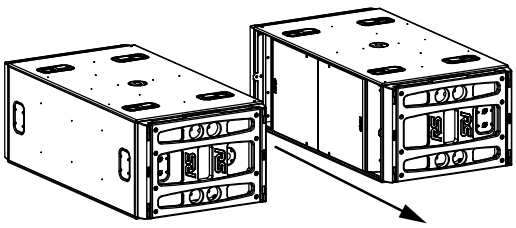
"ONE SIDE" CONFIGURATION AT 80HZ



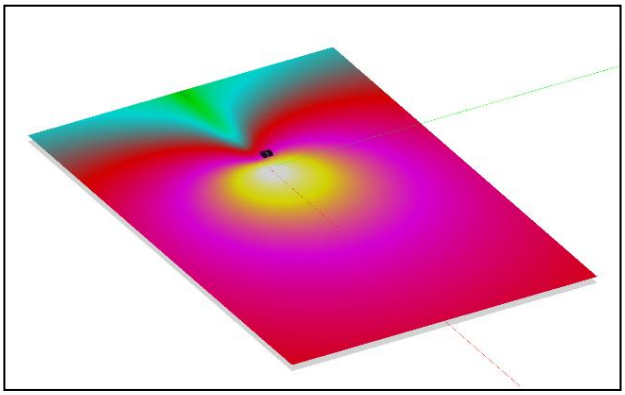
“BACK TO BACK“ CONFIGURATION



"BACK TO BACK" CONFIGURATION AT 80HZ



“FACE TO FACE“ CONFIGURATION



"FACE TO FACE" CONFIGURATION AT 80HZ

7.2.4 RS15s and RS18s arrays

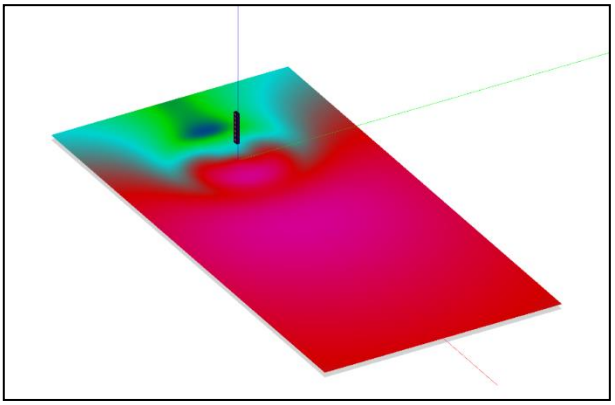
IMPORTANT

RS15s and RS18s arrays must be installed with bumper set horizontally and all cabinets at 0°.

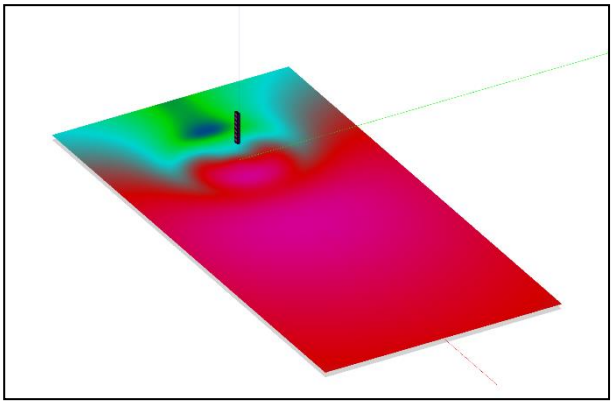
Flying RS15s and RS18s columns can significantly improve low frequency coverage in the vertical plane, and therefore over audience depth provided height is sufficient.

A 12 RS15 cluster flown at 10m/30ft will provide a +/- 3dB pressure level deviation at 100Hz over an audience area 75m/200ft deep while maintaining 15 to 20dB attenuation on stage.

A 10 RS18 cluster flown at 10m/30ft will provide a +/- 3dB pressure level deviation at 100Hz over an audience area 75m/200ft deep while maintaining 15 to 20dB attenuation on stage.



12 RS15 CLUSTER OVER 75M/200FT



10 RS18 CLUSTER OVER 75M/200FT

7.3 Steered RS15s arrays

7.3.1 Steering technique

RS15s arrays must be flown vertically with bumper set horizontally and all cabinets at 0°.

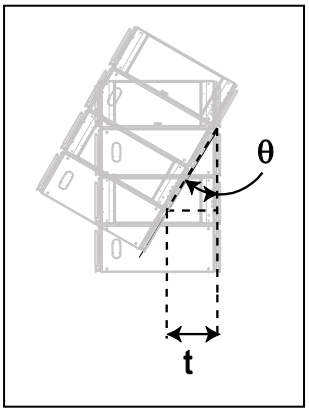
Coverage adjustments can be efficiently implemented through the “steering” technique, which consists in implementing delays in cabinets to tilt coverage up or down.

IMPORTANT

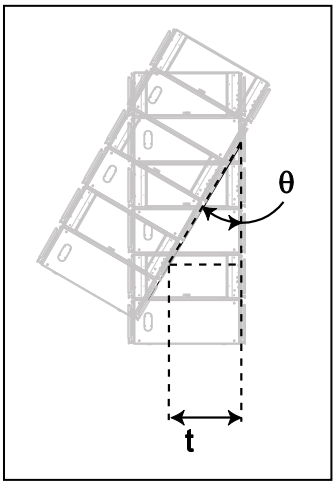
“Steering” techniques should not be applied to clusters of less than 4 RS15.

Coverage control through steering technique increases with cluster height.

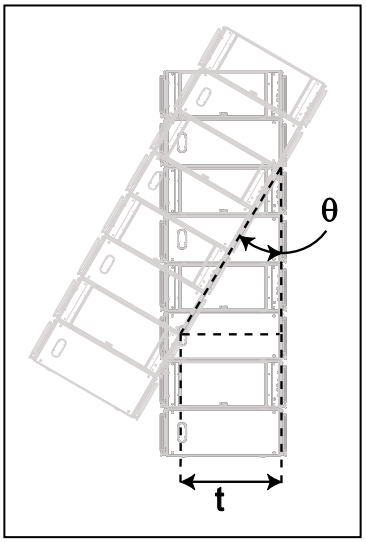
Steering can be applied by group of 2, 3 or 4 RS15s in Omni Mode as well as in Directional Mode.



GROUP OF 2 RS15S STEERING



GROUP OF 3 RS15S STEERING



GROUP OF 4 RS15S STEERING

“Steering” delays values for the pairs can easily be computed according to following formula:

$\tau = h*\sin(\theta)/C$ (metric)

τ is the value to be applied to the second pair

h is the height of tilted elements (0.91m for 2 RS15s, 1.365m for 3 RS15s, 1.82m for 4 RS15s)

C is the speed of sound (343m/s)

7.3.2 Delay values implementation

If the coverage is to be tilted down, then top group delay should be set at 0ms and delay should progressively increase on lower groups.

If the coverage is to be tilted up, then lower group delay should be set at 0ms and delay should progressively increase on upper pairs.

Delay value for first group is always 0ms.

Delay value for second group is τ

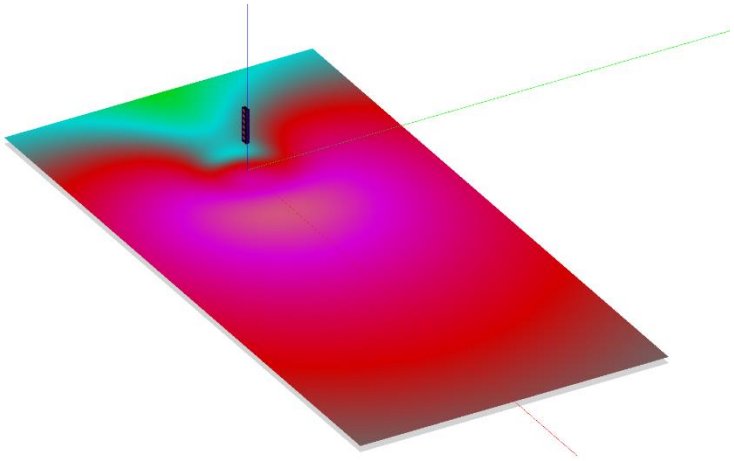
Delay values for subsequent groups are 2τ, 3τ etc…

Table below lists these values for typical angle values:

TILT ANGLE		0°	5°	10°	15°	20°	25°	30°	35°	40°	45°
GROUP 2 RS15s	DELAY τ (ms)	0.0	0.2	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9
	DISTANCE (cm)	0.0	7.9	15.8	23.6	31.1	38.5	45.5	52.2	58.5	64.3
GROUP 3 RS15s	DELAY τ (ms)	0.0	0.3	0.7	1.0	1.4	1.7	2.0	2.3	2.6	2.8
	DISTANCE (cm)	0.0	11.9	23.7	35.3	46.7	57.7	68.3	78.3	87.7	96.5
GROUP 4 RS15s	DELAY τ (ms)	0.0	0.5	0.9	1.4	1.8	2.2	2.7	3.0	3.4	3.8
	DISTANCE (cm)	0.0	15.9	31.6	47.1	62.2	76.9	91.0	104.4	117.0	128.7

7.3.3 Coverage result

Below figure shows coverage control over distance with a “steering” delay sequence corresponding to a 15° tilt down.



12 RS15 CLUSTER OVER 75M/200FT, STEERED 15° DOWN

7.4 Steered RS18s arrays

7.4.1 Steering technique

RS18s arrays must be flown vertically with bumper set horizontally and all cabinets at 0°.

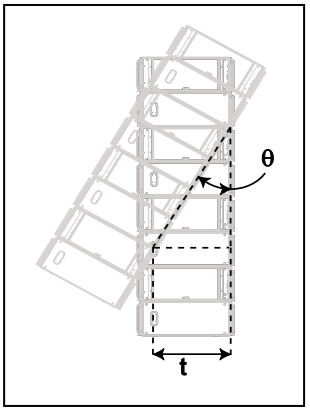
Coverage adjustments can be efficiently implemented through the “steering” technique, which consists in implementing delays in cabinets to tilt coverage up or down.

IMPORTANT

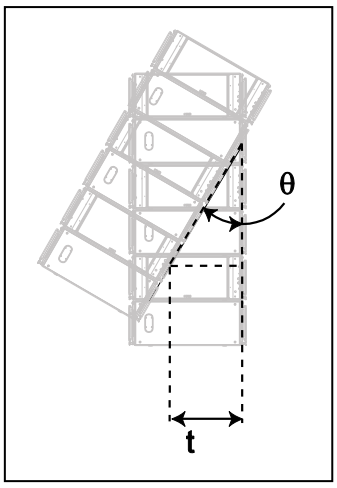
“Steering” techniques should not be applied to clusters of less than 3 RS18

Coverage control through steering technique increases with cluster height.

Steering can be applied by unit, group of 2 or group of 3 in Omni Mode as well as in Directional Mode.



GROUP OF 2 RS18S STEERING



GROUP OF 3 RS18S STEERING

“Steering” delays values for the pairs can easily be computed according to following formula:

$$\tau = h*\sin(\theta)/C \qquad \text{(metric)}$$

τ is the value to be applied to the second pair

h is the height of tilted elements (1.04m for 2 RS18s, 1.56m for 3 RS18s)

C is the speed of sound (343m/s)

7.4.2 Delay values implementation

If the coverage is to be tilted down, then top group delay should be set at 0ms and delay should progressively increase on lower groups.

If the coverage is to be tilted up, then lower group delay should be set at 0ms and delay should progressively increase on upper pairs.

Delay value for first group is always 0ms.

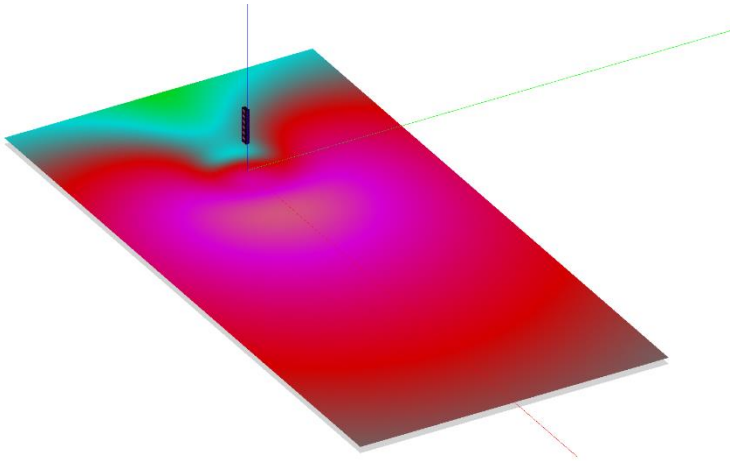
Delay value for second group is τ
Delay values for subsequent groups are 2τ, 3τ etc…

Table below lists these values for typical angle values:

TILT ANGLE		0°	5°	10°	15°	20°	25°	30°	35°	40°	45°
1 RS18	DELAY τ (ms)	0.0	0.1	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.1
	DISTANCE (cm)	0	5	9	13	18	22	26	30	33	37
GROUP 2 RS18s	DELAY τ (ms)	0.0	0.3	0.5	0.8	1.0	1.3	1.5	1.7	1.9	2.1
	DISTANCE (cm)	0	9	18	27	36	44	52	60	67	74
GROUP 3 RS18s	DELAY τ (ms)	0.0	0.4	0.8	1.2	1.6	1.9	2.3	2.6	2.9	3.2
	DISTANCE (cm)	0	14	27	40	53	66	78	89	100	110

7.4.3 Coverage result

Below figure shows coverage control over distance with a “steering” delay sequence corresponding to a 15° tilt down.



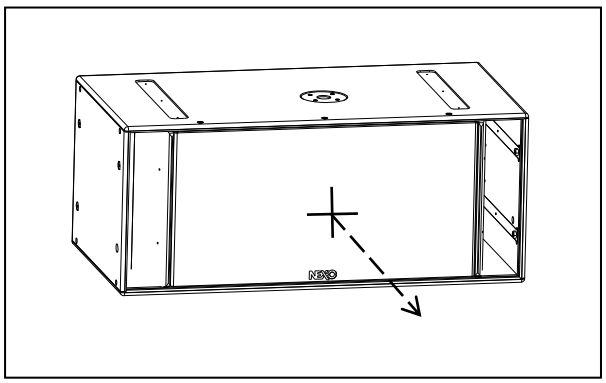
10 RS18 CLUSTER OVER 75M/200FT, STEERED 15° DOWN

7.5 Aligning RS with main system

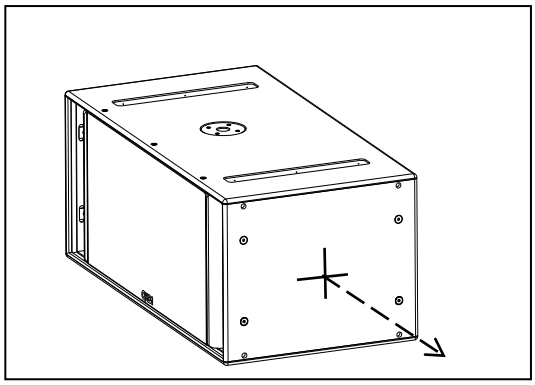
The NEXO TD Controllers factory presets are optimised to provide the best possible crossover between the RS15 and RS18 and other NEXO main systems. These crossover algorithms are defined for speaker acoustic reference points being aligned.

The acoustic reference point on all NEXO products is the front of each cabinet, therefore:

- RS reference point in Omni Mode is center of the front grid
- RS reference point in Directional Mode is center of the face opposite to connector panel



REFERENCE POINT IN OMNI MODE



REFERENCE POINT IN DIRECTIONAL MODE

7.5.1 Alignment with distance measurement

The fastest way to align RS arrays to a main system is simply to measure distance difference from listening point to RS and main system reference points.

r1 being the distance from main array to listener position, and r2 being the distance from RS to listener position, the distance difference is then r1–r2 (specified meters or feet).

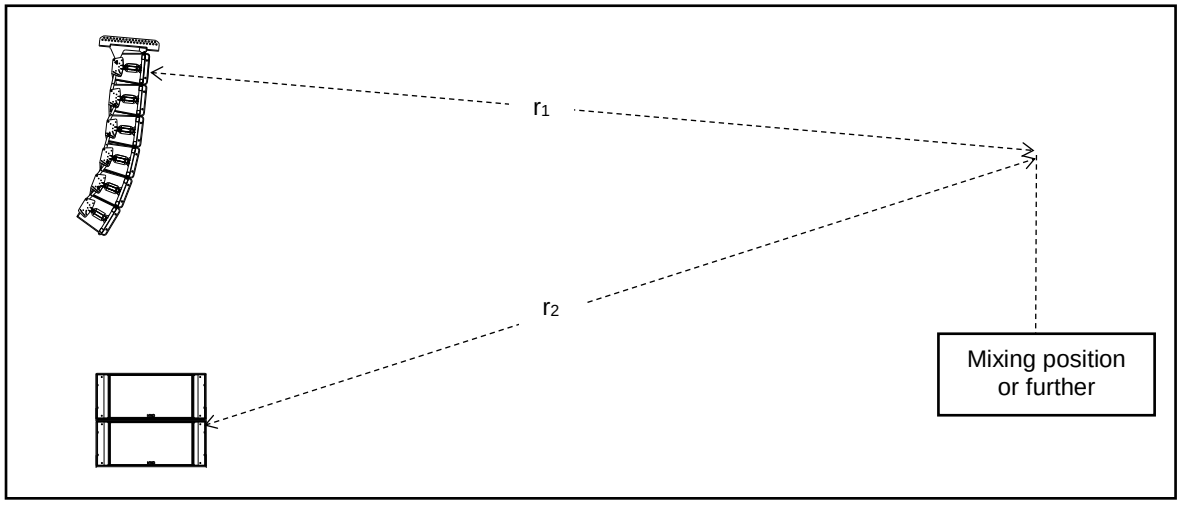
r1 > r2, the delay should be set on the RS TDcontroller channel.

r1 < r2, the delay should be set on the main system TDcontroller channel

$\Delta t = (r1-r2)/C$ gives conversion from distance to delay r1, r2 in meters, C = 343 m/s.

NEXO recommends that main system and subwoofer systems are adjusted so that arrivals from RS and main system are coincident at a fairly distant listening position (mixing position or further).

Because of proper acoustic reference point definition in NEXO TDControllers DSP setups, this method is highly reliable.



7.5.2 Alignment with phase measurement

Phase measurement with real time FFT analyzer can also provide reliable measurements, provided:

- measurement microphone is set on the ground to avoid floor interference in the reading
- floor is perfectly rigid (concrete)
- measurement microphone is set far from any walls / ceiling, or inside angles / corners
- coherence values are high (typically above 75%)

If one of above conditions is not respected, then distance measurement should be preferred.

7.5.3 Driving RS from the AUX send

It is common to use the AUX send of a mixing desk to drive the Sub section of a PA system. This gives the mixing engineer more flexibility to set the level of the subbass relative to the main PA, apply special effects, or to use a different EQ on the Sub. However, it also raises some serious issues for the performance & safety of the system (mostly time alignment).

At NEXO, great care is taken to design optimum phase alignment from one octave above to one octave below the crossover frequency point. By doing so, drivers are working perfectly together and providing the best efficiency possible. It is then up to the user to adjust the delay on the NX TDControllers to match the physical path difference of the different systems. It is thus possible to get a well-adjusted system, even without measuring instruments.

If RS subwoofers are driven form an AUX output, NEXO TDController is fed with two signals coming from different sources. If those two sources (MAIN output & AUX send) are not exactly in phase, delay is introduced into the crossover between main system array and RS subwoofers. It is then mandatory to use proper measurement tool to optimize phase response.

IMPORTANT

Before using different outputs of a mixing desk, ensure that MAIN and SUB outputs are in phase.

Never add additional low pass filtering on the SUB output or high pass filtering on the MAIN output.

Always apply identical processing (EQ etc…) on both outputs, so that the phase relationship between MAIN and SUB is not altered.

7.6 Recommended installation tools and equipment

Tape measure – should be 30m/100ft in length and be of durable fibre material. Have one per array available to speed up the installation process.

Laser Inclinometer – For measuring vertical and horizontal angles in the venue.

Spirit level – used to ascertain the trueness of the surface from which the angle measurements originate.

Rangefinder measuring device – either a Disto type laser measure or an optical laser rangefinder can be used. Devices such as the Bushnell ‘Yardage Pro’ sports rangefinders provide sufficiently accuracy and are easy to use. They have the additional advantage of working very well in bright sunlight.

Electronic calculator with trigonometric functions to calculate the height from ground level to points in the room. The formula to calculate height of a point from measured angle and distance is:

Height of point = Sin (vertical angle in degrees) x distance to point

NB: Take care when using spreadsheets as they calculate using radians by default. To convert degrees to radians, use the formula:

Angle (in radians) =3.142 x Angle (in degrees)/180

Computer – Laptop or Desktop PC running Windows 8 with the current version of NEXO NS-1 installed. It is not possible to configure a GEO tangent array properly without using NS-1. Note that, when NS-1 designs are prepared prior to arrival at the venue, it is often necessary to modify or update the design to accommodate special circumstances. A PC is absolutely essential to make such changes.

Audio Analysis Software – recommended but not absolutely essential, programs such as Systune™, Smaart™ enable rapid and detailed analysis of the installation. Consider taking a training course in using one of these tools if you are not already competent with them – it will pay dividends in increased performance of the system.

7.7 RS System Check List

It is essential to execute all these check steps prior to perform a sound check on the “front end” to the system. Following this checklist step by step will prevent many troubles and will save time in the end.

Are the speakers properly connected?

Attach the first series of modules to the bumper.

Before flying, verify that all channels of all modules are functioning properly.

Make sure that each RS driver is producing proper summation in omni mode:

- the two RS individual driver should sum up by 6 dB
- doubling RS quantity (2, 4 and so on) should also produce 6 dB gain.

Make sure that each RS is producing the proper front/rear summation in directional mode:

- when listening from behind the system, switch the front drivers in and out. You should hear a reduction in the LF range when the both front and rear drivers are on as compared to when the rear drivers only are on
- when listening from the front, you should hear a strong increase in the LF range when connecting the rear drivers

Raise the bumper, attach the next series of modules and repeat the above checks.

Make sure that these series of modules sum properly with the modules above them.

Final Pre-Sound Check Check

Play a CD track (preferably generous and periodic in the LF content) on the SUB output, mono left, mono right and then both sides:

- both sides must sound strictly identical when listening at the center;
- level must not decrease at the center when playing left and right simultaneously as opposed to one side only.

Play the same CD track on the MAIN system, on the SUB system, then on both:

- inverting polarity on one of these outputs – MAIN or SUB - should always result in a massive difference near the crossover point.

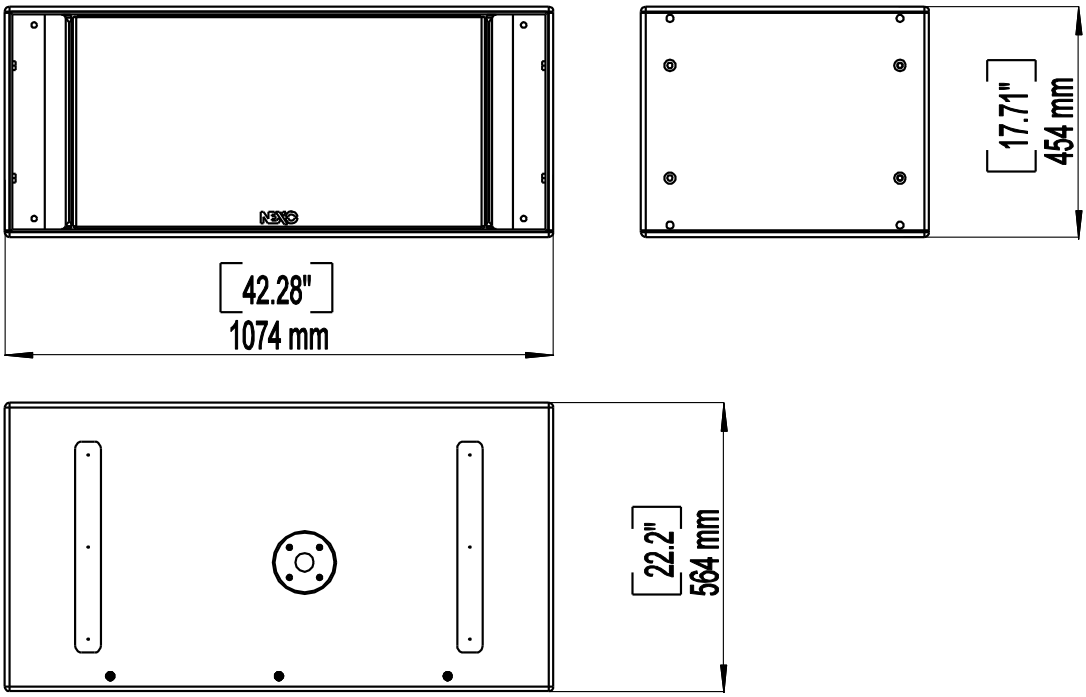
8 TECHNICAL SPECIFICATIONS

8.1 RS15

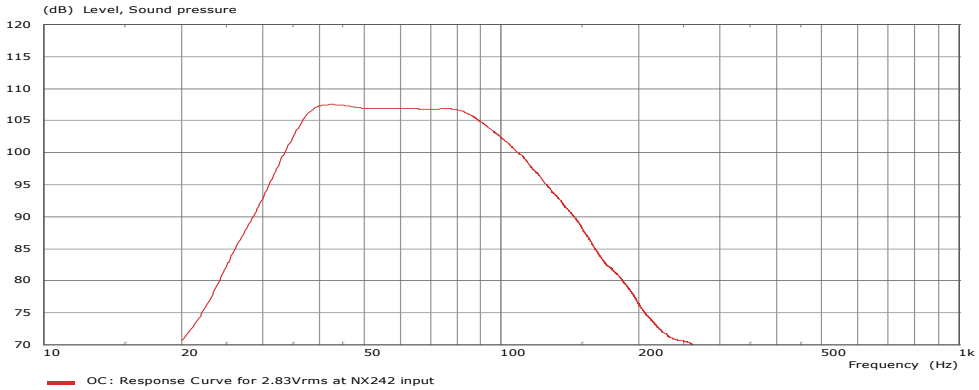
8.1.1 System specifications

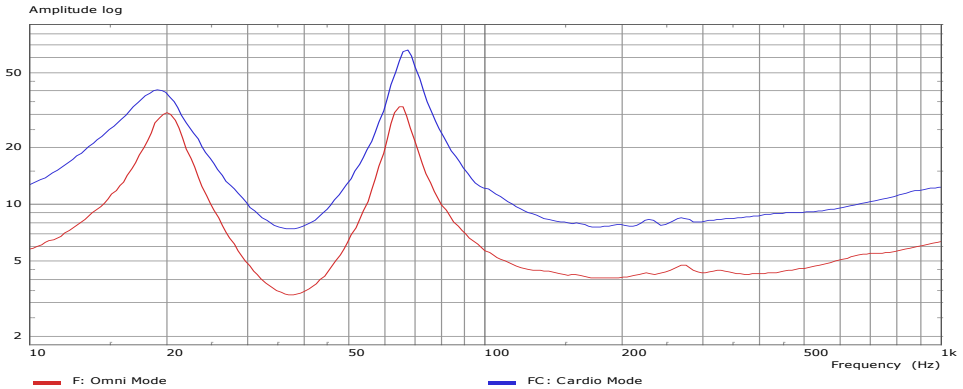
	Omni	Directional
RS15 WITH NEXO TDCONTROLLER SETUP		
Frequency Response @-6 dB	35 Hz to 250 Hz	35 Hz to 150 Hz
Sensitivity 1W@1m	105 dB SPL Nominal	103 dB SPL Nominal
Peak SPL@1m	136 to 139 dB	133 to 136 dB
Available Crossover Frequencies	35-85, 35-120, 35-180 Hz	35-85 Hz
Nominal Impedance	2 x 8 Ohms	
Recommended Power	1700 Watts	
PRODUCT FEATURES		
Component	2 x 15” long excursion neodymium 8 Ohms drivers	
Height x Width x Depth	454 mm x 564 mm x 1074 mm (17.9” x 22.2” x 42.3”)	
Weight: Net	52 kg (115 lb)	
Connectors	2 x NL4, 4 poles connectors (1+/1- right or rear / 2+/2- left or front)	
Construction	Baltic Birch Plywood & structured black coating	
Operating temperature range	0°C - 40 °C (32° F - 104° F)	
Storage temperature range	-20 °C - 60 °C (-4 ° F - 140° F)	
SYSTEM OPERATION		
Recommended powering solution	NXAMP4x4mk2 Powered TD controller: 2 x RS15 in omni mode (drivers in //) per channel 4 x RS15 in directional mode: 2 channels	
Optional powering solution	NXAMP4x2mk2 Powered TD controller: 1 x RS15 in omni mode (drivers in //) per channel	
	NXAMP4x1mk2 Powered TD controller (Bridged): 1 x RS15 in omni mode (drivers in //) per bridged channels	

8.1.2 Dimensions (mm/inches)



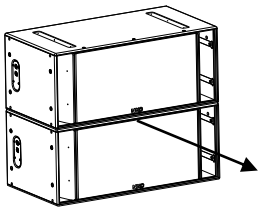
8.1.3 Frequency response and impedance

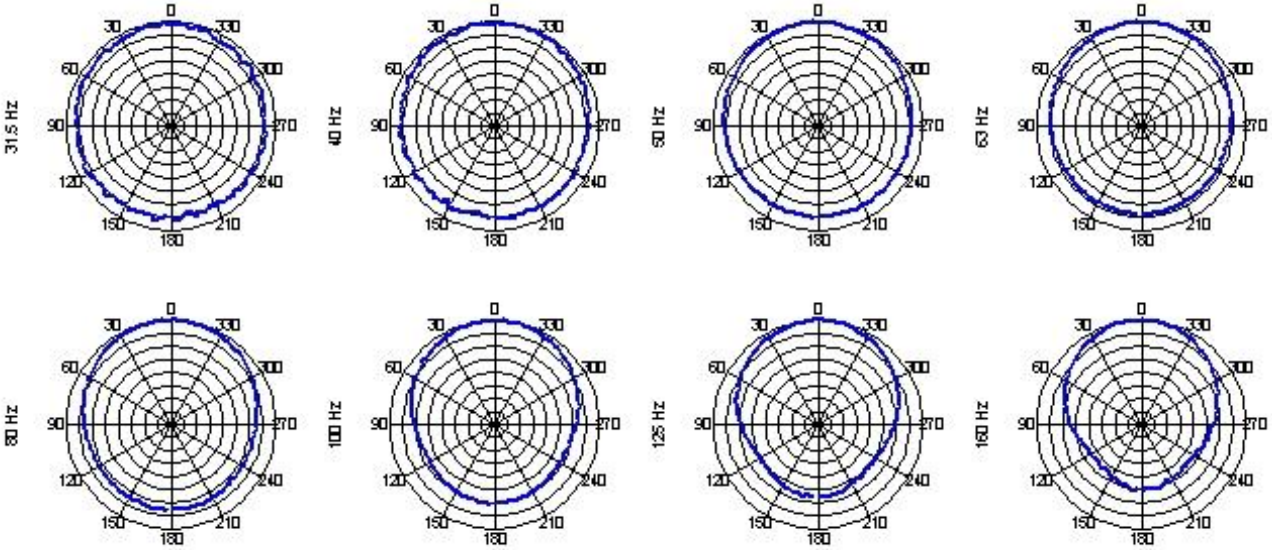




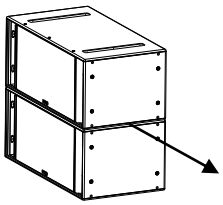
8.1.4 Polar plots

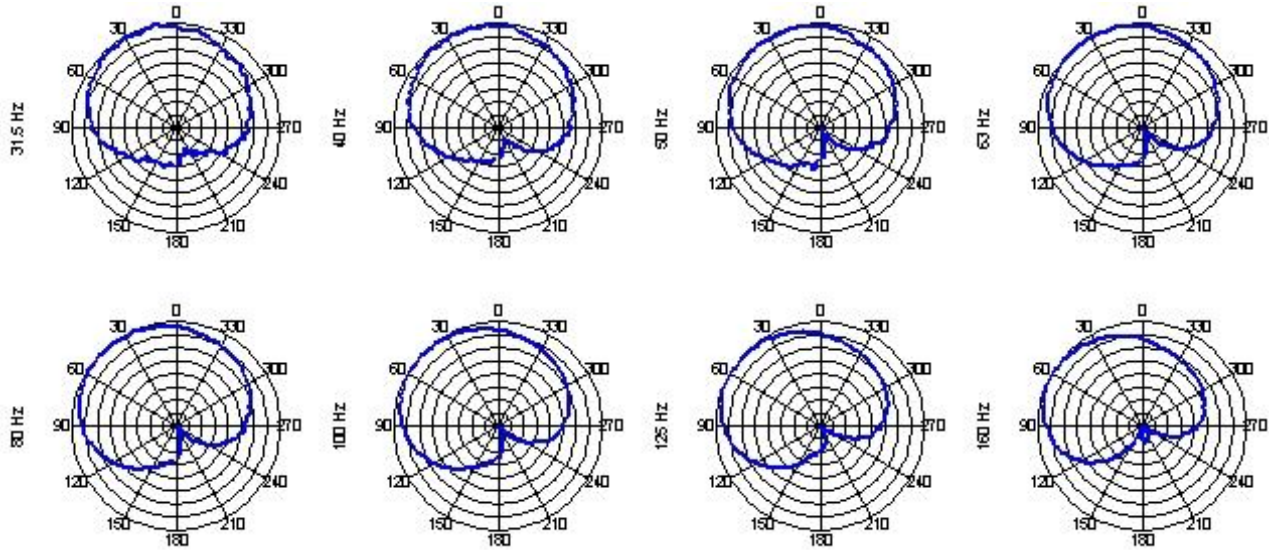
Omni Mode (2xRS15 front)



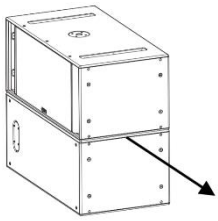


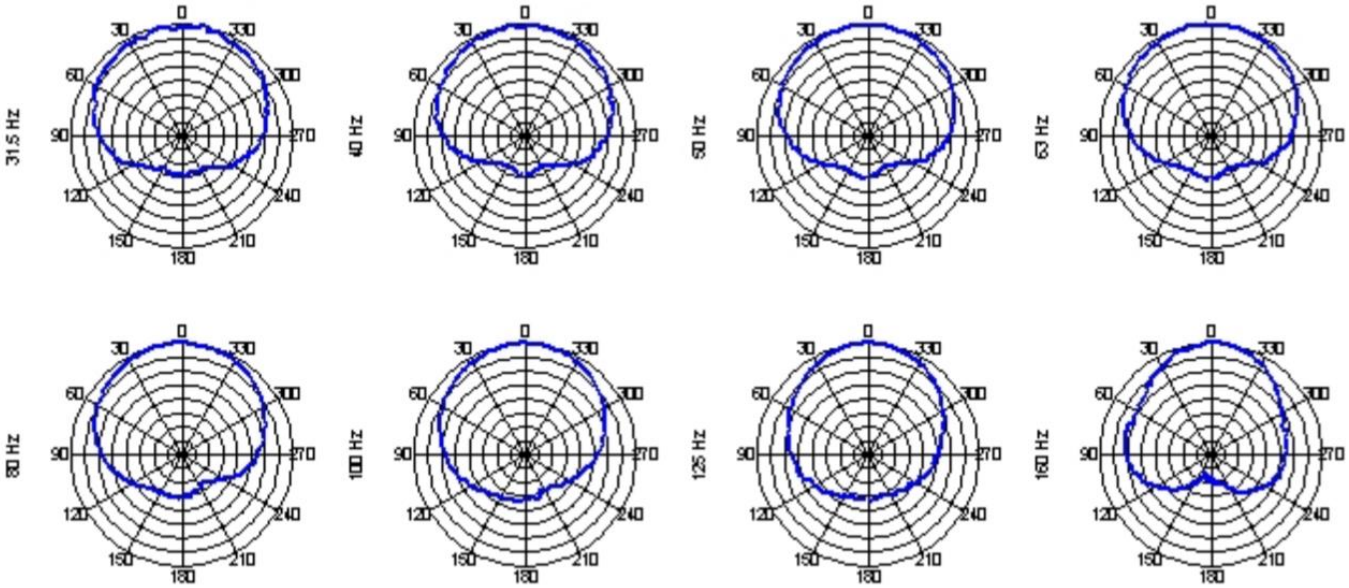
Directional Mode (2xRS15 side)



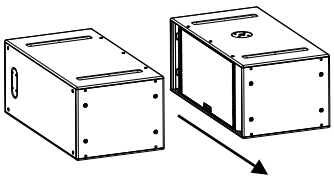


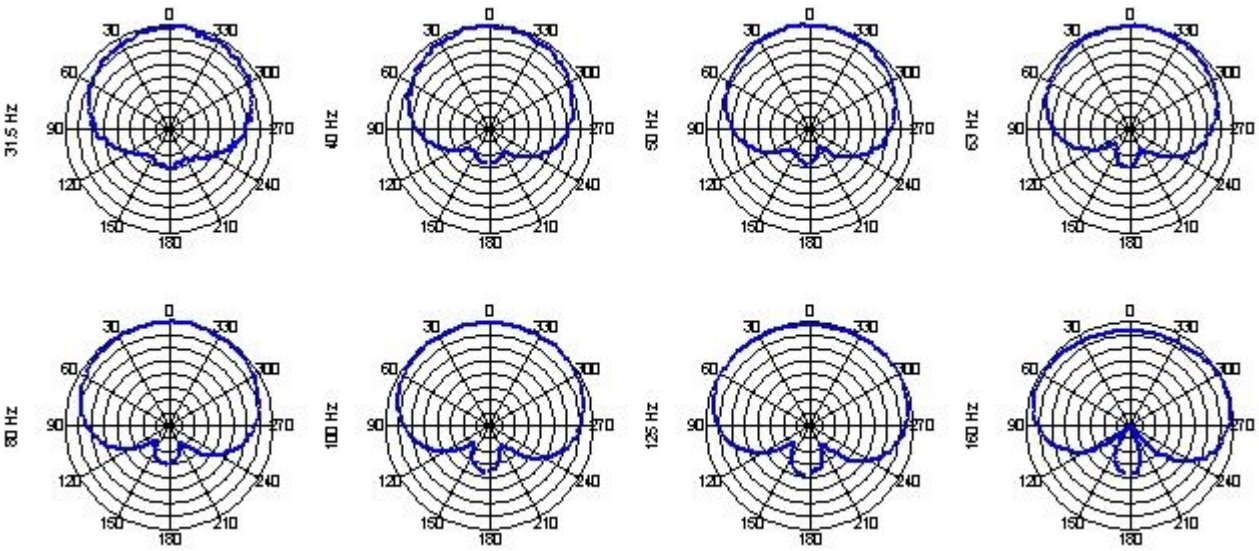
Directional Mode (2xRS15 alternated)



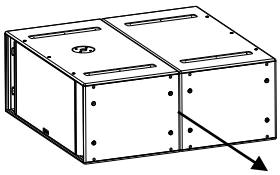


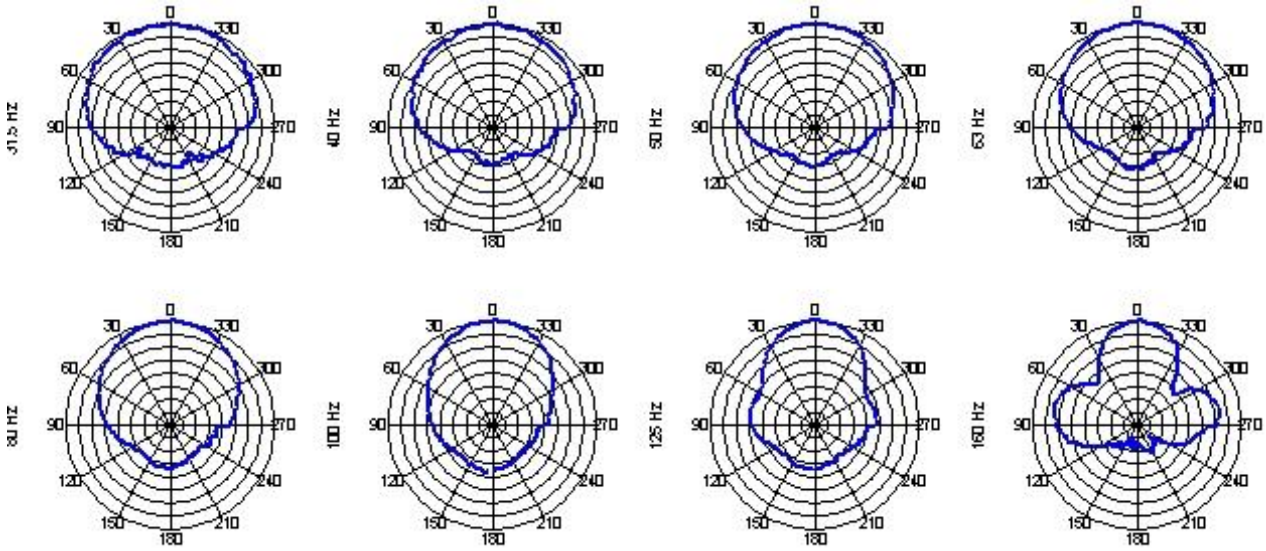
Directional Mode (2xRS15 face to face – 50cm – 20”)





Directional Mode (2xRS15 back to back)



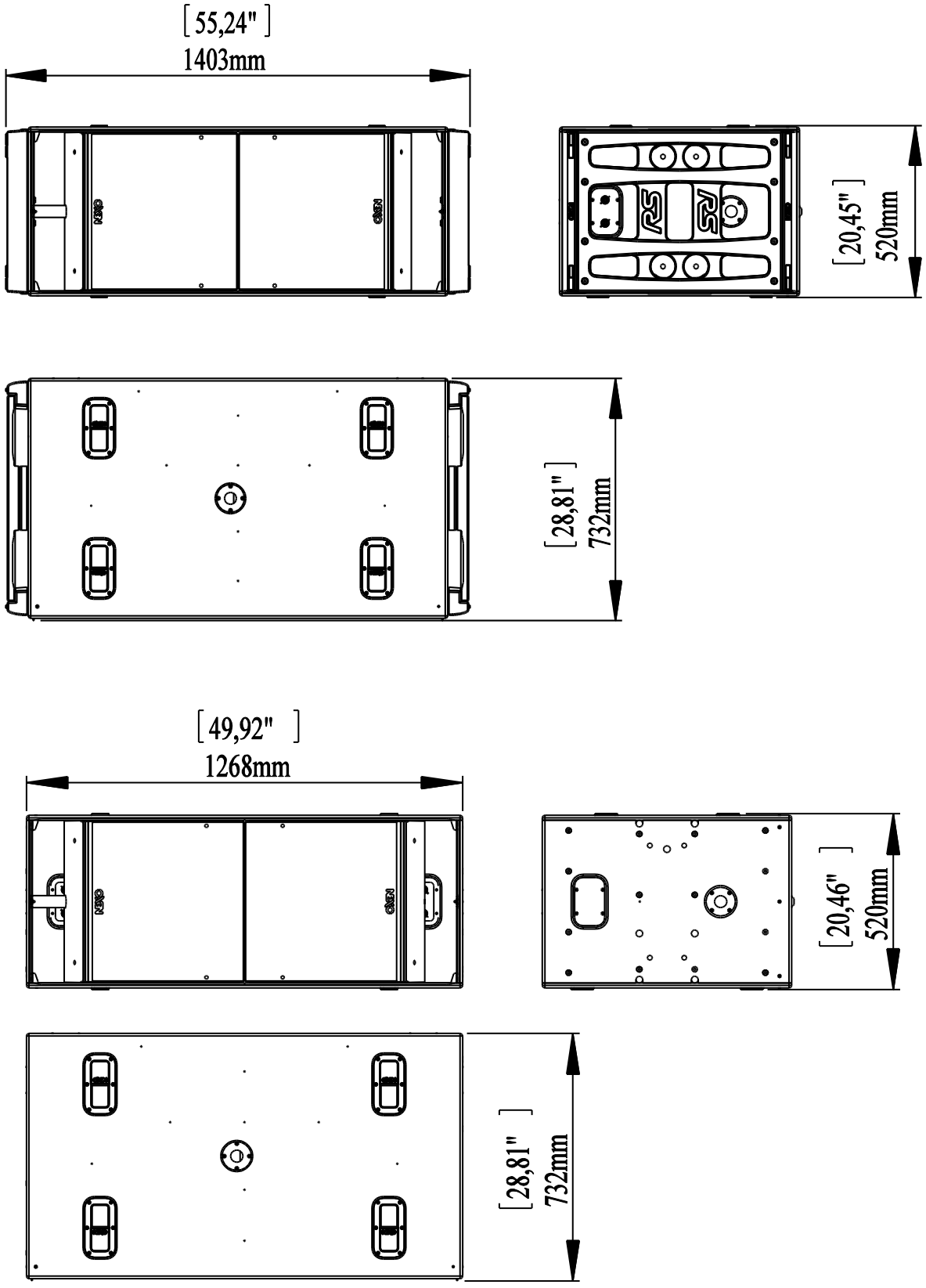


8.2 RS18

8.2.1 System specifications

	Omni	Directional
RS18 WITH NEXO TDCONTROLLER SETUP		
Frequency Response @-6 dB	29 Hz to 250 Hz	29 Hz to 150 Hz
Sensitivity 1W@1m	105 dB SPL Nominal	103 dB SPL Nominal
Peak SPL@1m	143 to 146 dB	140 to 143 dB
Available Crossover Frequencies	30-60, 30-85, 30-120 Hz	30-60, 30-85 Hz
Nominal Impedance	2 x 8 Ohms	
Recommended Power	2500 Watts	
PRODUCT FEATURES		
Component	2 x 18” long excursion neodymium 8 Ohms drivers	
Height x Width x Depth	520 mm x 1403 mm x 732 mm (20.46” x 55.24” x 28.81”) with handles 520 mm x 1238 mm x 732 mm (20.46” x 49.92” x 28.81”) without handles	
Weight: Net	105 kg (231.5 lb) with handles 90 kg (199 lb) without handles	
Connectors	2 x NL4, 4 poles connectors (1+/1- right or rear / 2+/2- left or front)	
Construction	Baltic Birch Plywood & structured black coating	
Operating temperature range	0°C - 40 °C (32° F - 104° F)	
Storage temperature range	-20 °C - 60 °C (-4 ° F - 140° F)	
SYSTEM OPERATION		
Recommended powering solution	NXAMP4x4mk2 Powered TD controller: 1 x RS18 in omni mode (drivers in //) per channel 2 x RS18 in directional mode: 2 channels	
Optional powering solution	NXAMP4x1mk2 Powered TD controller (Bridged): 1 x RS18 in omni mode (drivers in //) per bridged channels	

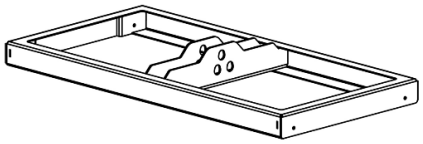
8.2.2 Dimensions (mm/inches)



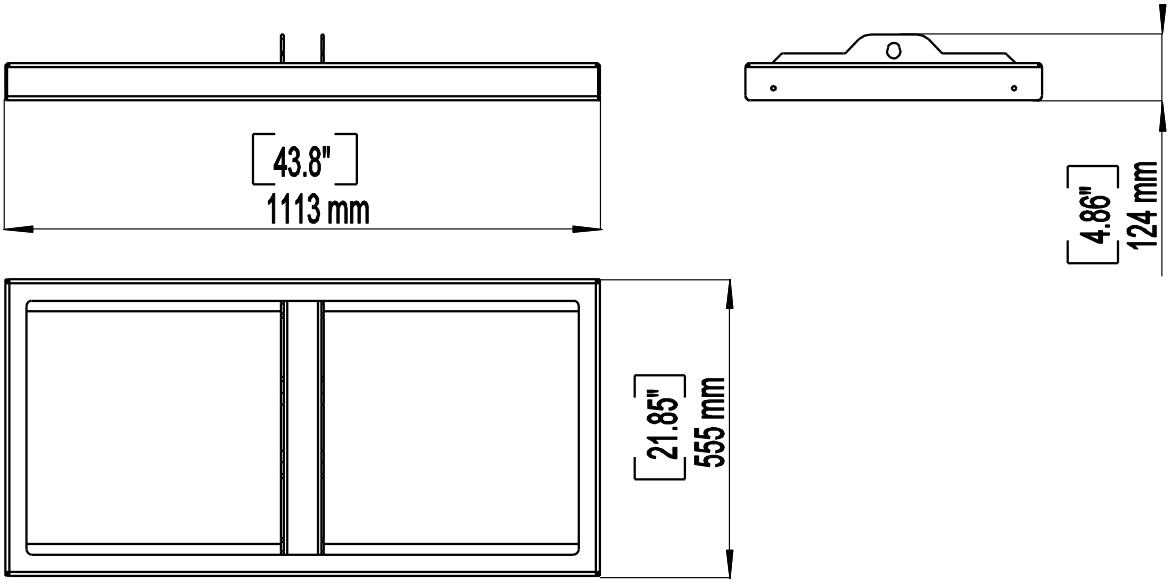
8.3 RS15 and RS18 accessories

8.3.1 RST-BUMPER15

Parts

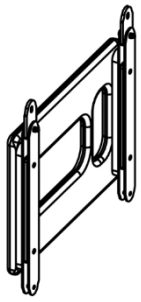
X1	X1	X2
		

Dimensions

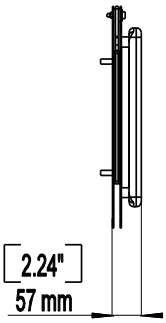


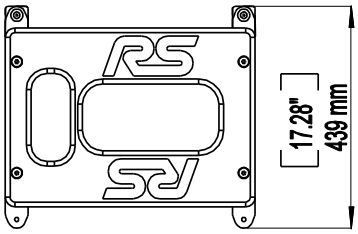
8.3.2 RST-FPLATES15

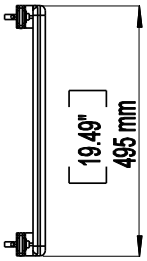
Parts

X2	X8	X8
		

Dimensions

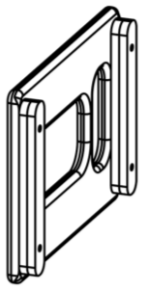




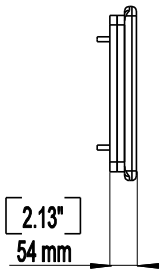


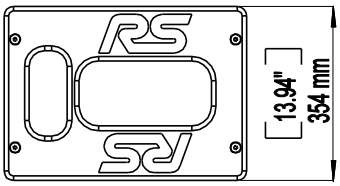
8.3.3 RST-HANDLES15

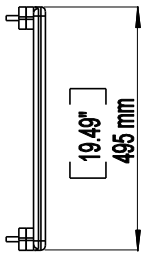
Parts

X2	X8	X8
		

Dimensions

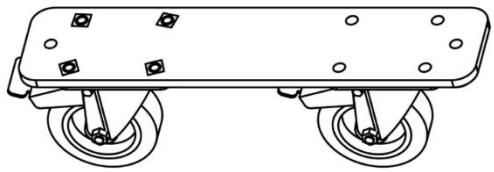




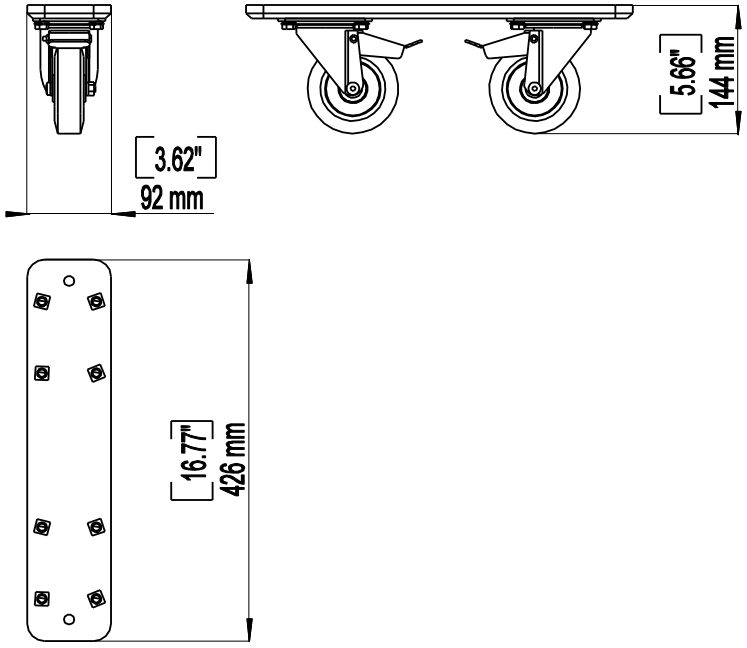


8.3.4 RST-WHEELS15

Parts

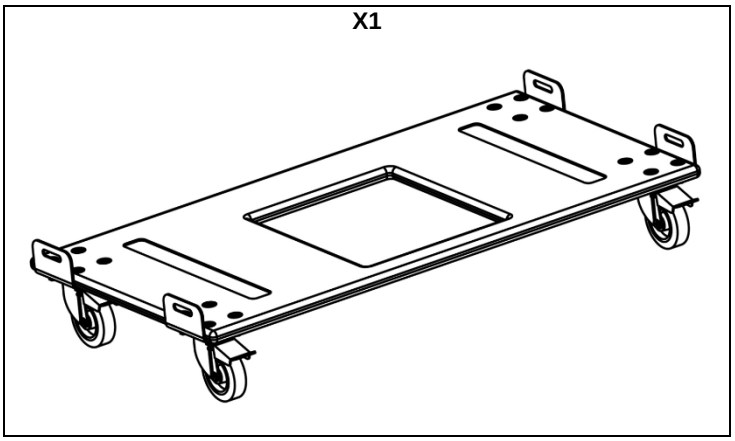
X2	X4	X4
		

Dimensions

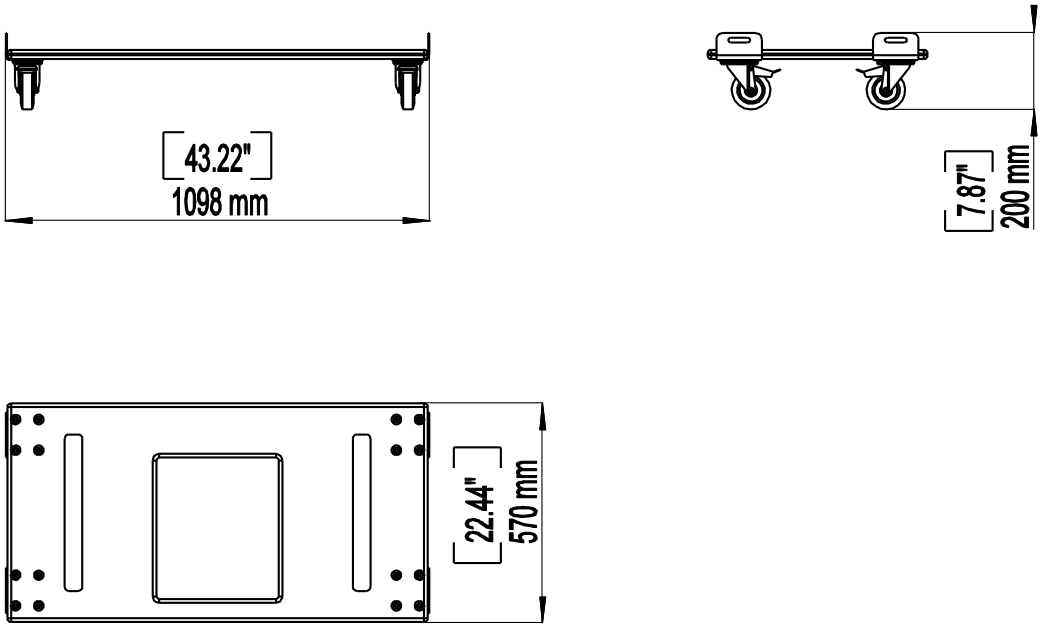


8.3.5 RST-DOLLY15

Parts



Dimensions



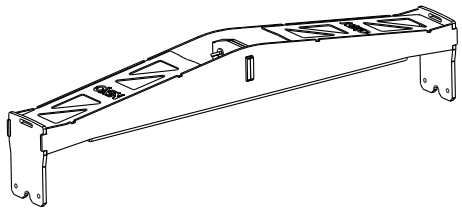
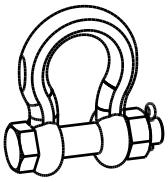
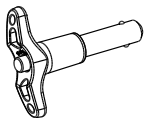
8.3.6 RSI-INSP15

Parts

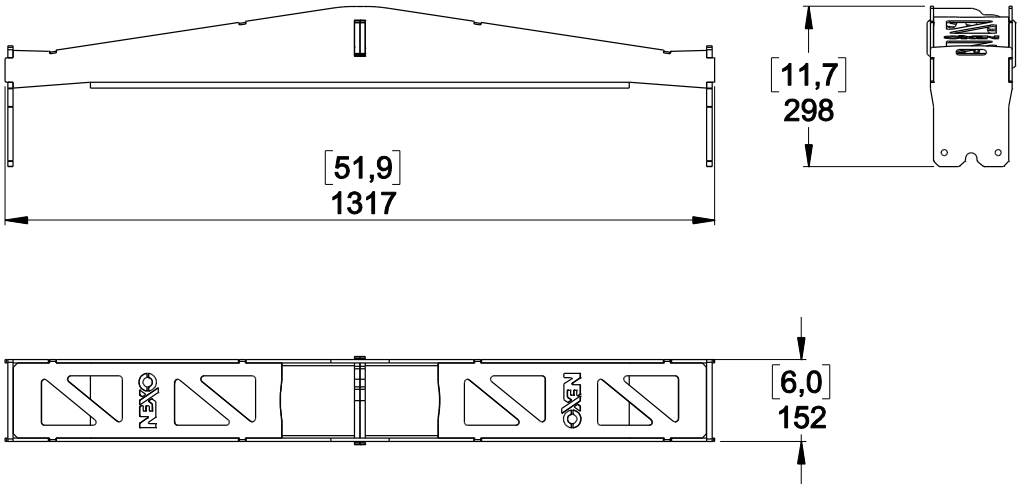
X4	X8	X8
		

8.3.7 RST-BUMPER18

Parts

X1	X2 (3.25T)	X4 (10x25)
		

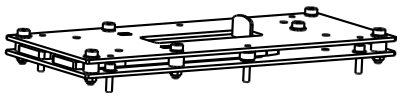
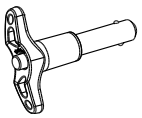
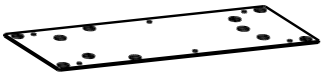
Dimensions



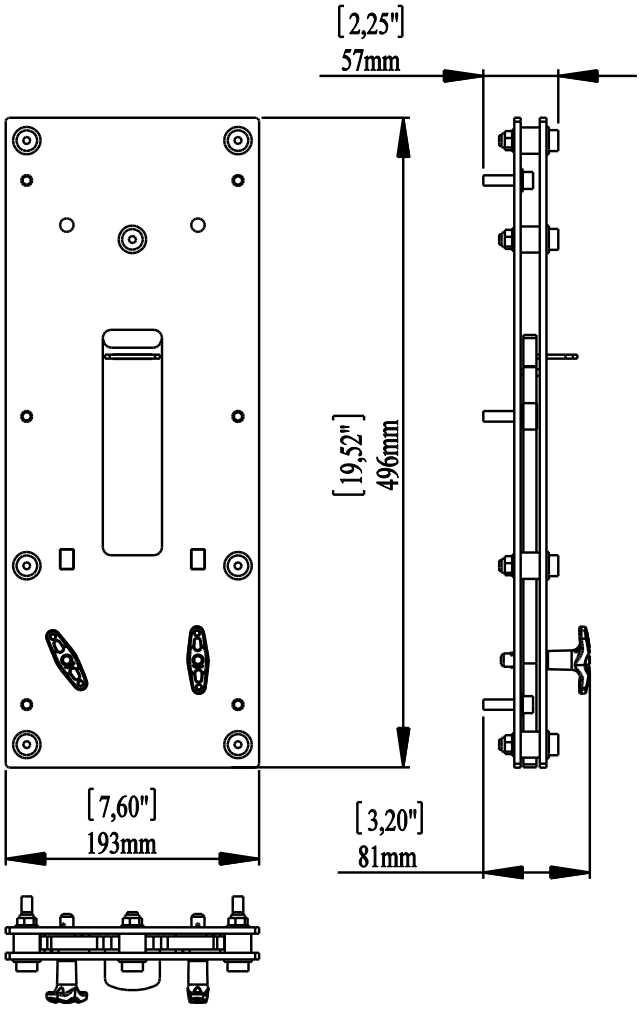
Weight: 38 kg / 84 lb

8.3.8 RST-FPLATES18

Parts

X2	X4 (10x25)	X2	X4
			

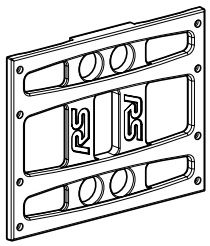
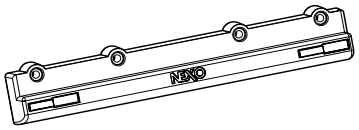
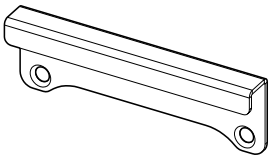
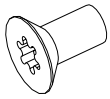
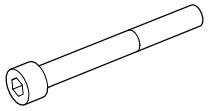
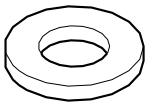
Dimensions



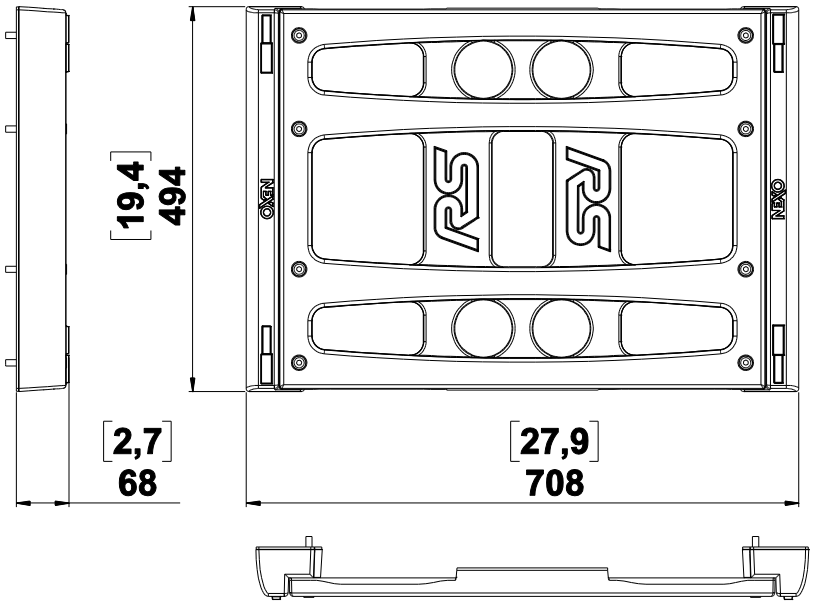
Weight: 18 kg / 40 lb

8.3.9 RST-HANDLES18

Parts

X2	X4	X4
		
X12	**X16**	**X16**
		

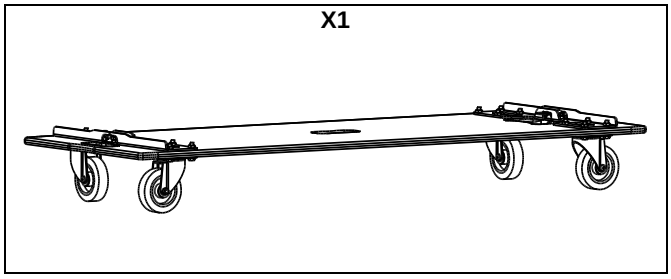
Dimensions



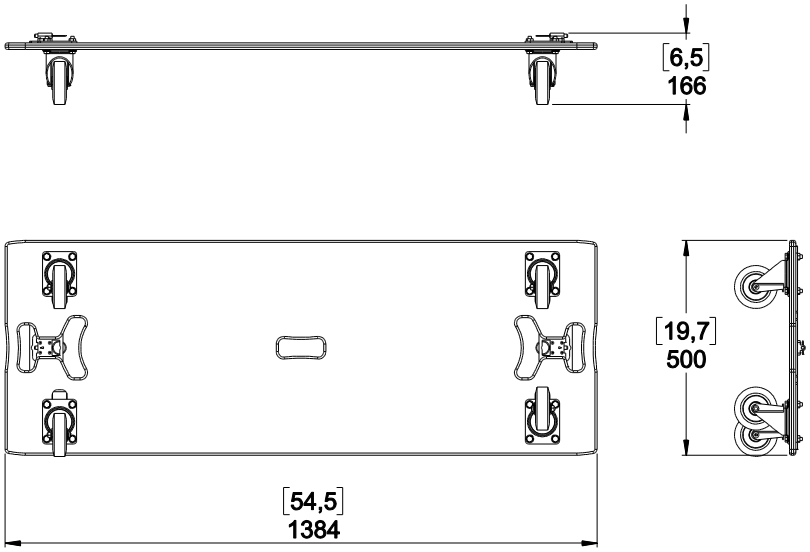
Weight: 16 kg / 35.3 lb

8.3.10 RST-WB18

Parts



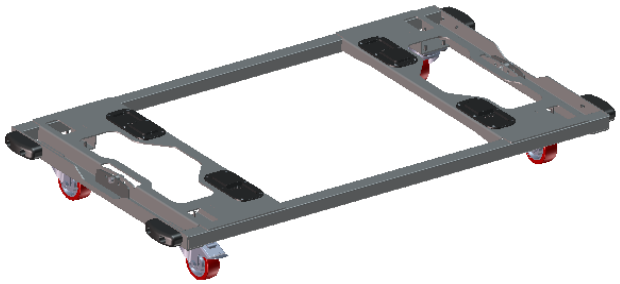
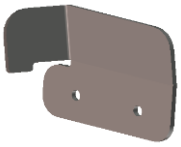
Dimensions



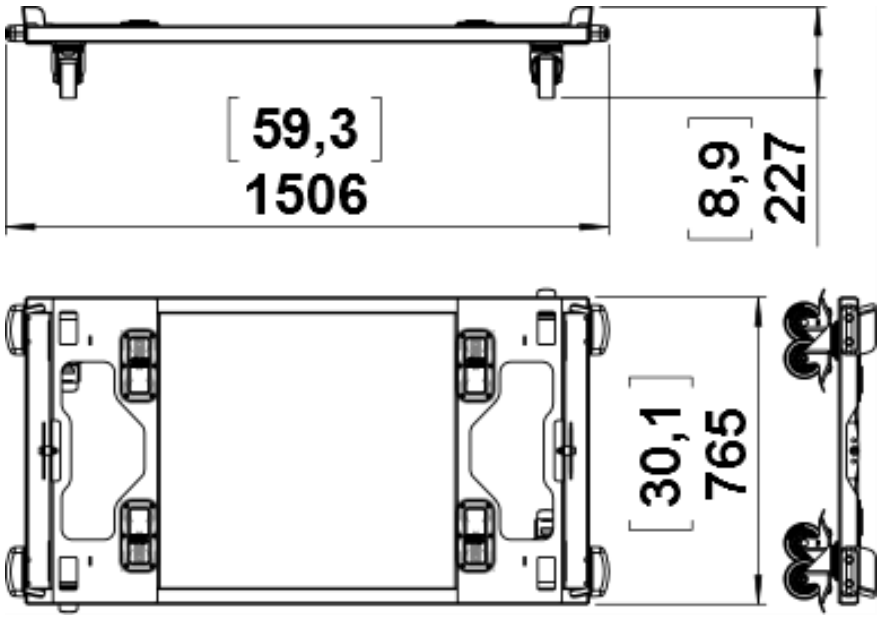
Weight: 16 kg / 35 lb

8.3.11 RST-DOLLY18

Parts

X1	X4
	

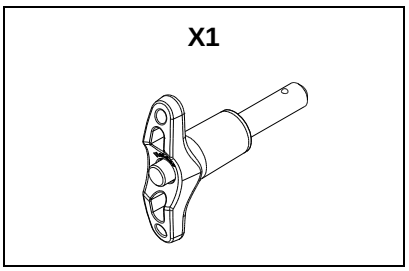
Dimensions



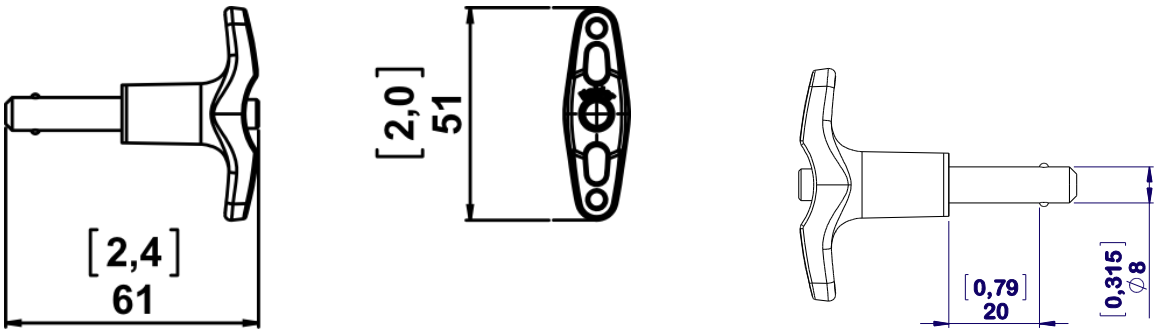
Weight: 31 kg / 68 lb

8.3.12 VXT-BL820

Parts

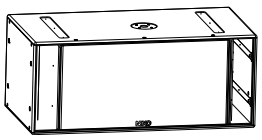
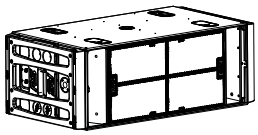
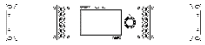
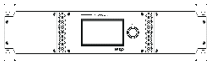
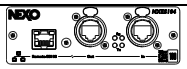
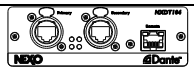


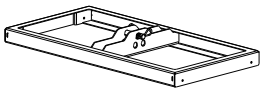
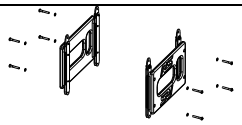
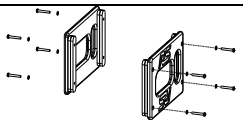
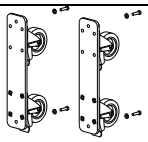
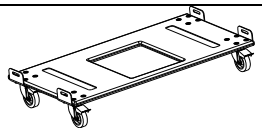
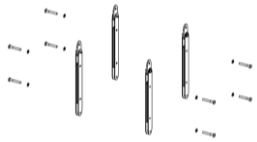
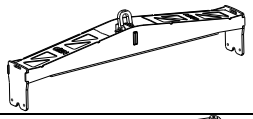
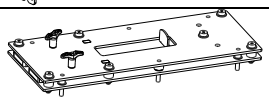
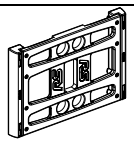
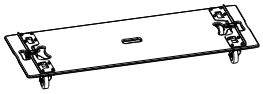
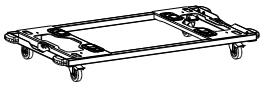
Dimensions



Weight: 0.04 kg / 0.1 lb

9 RS15 & RS18 MODULES & ACCESSORIES LIST

REFERENCE	DRAWING	DESCRIPTION
RS15		2x15” Subwoofer
RS18		2x18’’ Subwoofer
NXAMP4x1mk2		Powered Digital TD Controller 4x1300W
NXAMP4x2mk2		Powered Digital TD Controller 4x2500W
NXAMP4x4mk2		Powered Digital TD Controller 4x4500W
NX.ES104		Ethersound Network Card for NXAMP
NX.DT104MK2		Dante Network Card for NXAMP
NX.AE104		AES Card for NXAMP

REFERENCE	DRAWING	DESCRIPTION
RST-BUMPER15		RS15 Bumper
RST-FPLATES15		RS15 Rigging plates
RST-HANDLES15		RS15 Handles
RST-WHEELS15		RS15 Wheels (single RS15)
RST-DOLLY15		RS15 dolly (3 RS15 max)
RSI-INSPI15		RS15 Installation rigging bars
RST-BUMPER18		RS18 Bumper
RST-FPLATES18		RS18 Rigging plates
RST-HANDLES18		RS18 Handles
RST-WB18		RS18 Wheelboard (single RS18)
RST-DOLLY18		RS18 Dolly (3 RS18 max)
VXT-BL820		Quick release pin

10 USER NOTES

NEXO S.A.

Parc d’activité de la Dame Jeanne
F-60128 PLAILLY

Tel: +33 3 44 99 00 70
Fax: +33 3 44 99 00 30
E-mail: info@nexo.fr

nexo-sa.com