

# OWNER MANUAL

**HDL20-A**  
**HDL10-A**

ACTIVE LINE  
ARRAY MODULES





ENGLISH

3



1. All the precautions, in particular the safety ones, must be read with special attention, as they provide important information.

**WARNING:** to prevent the risk of fire or electric shock, never expose this product to rain or humidity.

## 2. POWER SUPPLY FROM MAINS

- a. The mains voltage is sufficiently high to involve a risk of electrocution; install and connect this product before plugging it in.
- b. Before powering up, make sure that all the connections have been made correctly and the voltage of your mains corresponds to the voltage shown on the rating plate on the unit, if not, please contact your RCF dealer.
- c. This unit is CLASS I construction, so it must be connected to a MAIN socket outlet with a protective earthing connection.
- d. Appliance coupler or PowerCon Connector® is used to disconnect device from MAIN power. This device shall remain readily accessible after the installation
- e. Protect the power cable from damage; make sure it is positioned in a way that it cannot be stepped on or crushed by objects.
- f. To prevent the risk of electric shock, never open this product: there are no parts inside that the user needs to access.

3. Make sure that no objects or liquids can get into this product, as this may cause a short circuit.

This apparatus shall not be exposed to dripping or splashing. No objects filled with liquid, such as vases, shall be placed on this apparatus. No naked sources (such as lighted candles) should be placed on this apparatus.

4. Never attempt to carry out any operations, modifications or repairs that are not expressly described in this manual.

Contact your authorized service centre or qualified personnel should any of the following occur:

- The product does not function (or functions in an anomalous way).
- The power cable has been damaged.
- Objects or liquids have got in the unit.
- The product has been subject to a heavy impact.

5. If this product is not used for a long period, disconnect the power cable.

6. If this product begins emitting any strange odours or smoke, switch it off immediately and disconnect the power cable.

7. Do not connect this product to any equipment or accessories not foreseen.

For suspended installation, only use the dedicated anchoring points and do not try to hang this product by using elements that are unsuitable or not specific for this purpose. Also check the suitability of the support surface to which the product is anchored (wall, ceiling, structure, etc.), and the components used for attachment (screw anchors, screws, brackets not supplied by RCF etc.), which must guarantee the security of the system / installation over time, also considering, for example, the mechanical vibrations normally generated by transducers.

To prevent the risk of falling equipment, do not stack multiple units of this product unless this possibility is specified in the user manual.

**8. RCF S.p.A. strongly recommends this product is only installed by professional qualified installers (or specialised firms) who can ensure correct installation and certify it according to the regulations in force.**

**The entire audio system must comply with the current standards and regulations regarding electrical systems.**

## WARNING



## IMPORTANT



**9. Supports and trolleys**

The equipment should be only used on trolleys or supports, where necessary, that are recommended by the manufacturer. The equipment / support / trolley assembly must be moved with extreme caution. Sudden stops, excessive pushing force and uneven floors may cause the assembly to overturn.

**10.** There are numerous mechanical and electrical factors to be considered when installing a professional audio system (in addition to those which are strictly acoustic, such as sound pressure, angles of coverage, frequency response, etc.).

**11. Hearing loss**

Exposure to high sound levels can cause permanent hearing loss. The acoustic pressure level that leads to hearing loss is different from person to person and depends on the duration of exposure. To prevent potentially dangerous exposure to high levels of acoustic pressure, anyone who is exposed to these levels should use adequate protection devices. When a transducer capable of producing high sound levels is being used, it is therefore necessary to wear ear plugs or protective earphones. See the manual technical specifications to know the maximum sound pressure level.

**IMPORTANT NOTES**

To prevent the occurrence of noise on line signal cables, use screened cables only and avoid putting them close to:

- Equipment that produces high-intensity electromagnetic fields.
- Power cables.
- Loudspeaker lines.

**IMPORTANT NOTES****OPERATING PRECAUTIONS**

- Place this product far from any heat sources and always ensure an adequate air circulation around it.
- Do not overload this product for a long time.
- Never force the control elements (keys, knobs, etc.).
- Do not use solvents, alcohol, benzene or other volatile substances for cleaning the external parts of this product.

**IMPORTANT NOTES**

Before connecting and using this product, please read this instruction manual carefully and keep it on hand for future reference. The manual is to be considered an integral part of this product and must accompany it when it changes ownership as a reference for correct installation and use as well as for the safety precautions. RCF S.p.A. will not assume any responsibility for the incorrect installation and / or use of this product.

**IMPORTANT NOTES**



The concept of this unique speaker derives from the touring industry, bringing in a compact cabinet all the experience of RCF professional sound.

The vocals are natural, the sound is clear at longer distances, the spl power is stable at very high levels.

The RCF Precision transducers equipping D LINE have been representing for decades the ultimate performance, the highest power handling and the most advanced technology in the professional and touring industry.

The high power woofer delivers extremely accurate punchy bass, the custom made compression driver offers a transparent midrange and extreme fidelity.

RCF Class-D power amplifiers technology packs huge performance operating with high efficiency into a lightweight solution. D LINE amplifiers deliver ultra fast attack, realistic transient response and impressive audio performance.

The integrated DSP manages crossover, equalisation, soft limiter, compressor and dynamic bass boost.

D LINE cabinets are moulded on a special polypropylene composite material designed to dampen down vibrations even at maximum volume settings.

From moulding to the final texture, D LINE offers the maximum reliability and strength for the intensive use on the road.

The HDL20-A and HDL10-A are very compact, self-powered, 2-way line array loudspeaker modules. The 700-watt Class-D amp modules accurately match the high quality digital signal input boards with precise, complex filter responses that result in the natural, detailed reproduction of the best direct radiating designs. They are the ideal choice when line-array performance is needed but the venue size doesn't call for the very long-throw characteristics of larger line-arrays and a fast and easy setup is a must. The speakers deliver extraordinary power handling, clarity, flexibility and great sound in a compact, easy to handle and affordable package.

**THE INPUT SECTION PROVIDES:**

- Out XLR connectors;
- IN XLR Jack combo
- system volume control;
- 5 configuration switch;
- 4 status LEDs.

**HDL20-A IS A 2-WAY ACTIVE SYSTEM FEATURING:**

- 10" neo woofer, 2,5" voice coil in horn loaded configuration;
- 2" exit, 3" voice coil neo compression driver;
- 100° x 15°, constant directivity coverage angle.

**HDL10-A IS A 2-WAY ACTIVE SYSTEM FEATURING:**

- 8" neo woofer, 2,0" voice coil in horn loaded configuration;
- 2" exit, 2,5" voice coil neo compression driver;
- 100° x 15°, constant directivity coverage angle.

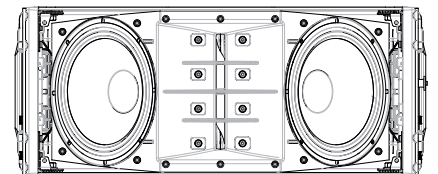
**THE AMPLIFIER SECTION FEATURES:**

- 700 Watt switching power supply module;
- 500 Watt low frequency digital amplifier module;
- 200 Watt high frequency digital amplifier module;
- extra capacitor bus able to sustain the voltage for 100 ms burst signals.

The total available power supply power is 700 Watt and can be distributed to the 2 final amplifier sections. Each amplifier section has a very high maximum output power capability in order to provide, when necessary, maximum output bursts in a specific frequency range.

**D LINE  
TOURING AUDIO SOLUTIONS**

**HDL20-A, HDL10-A  
ACTIVE LINE ARRAY MODULES**



## POWER REQUIREMENTS AND SET-UP

The HDL line arrays Systems are designed to operate in hostile and demanding situations. Nevertheless it is important to take extremely care of the AC power supply and set up a proper power distribution.

The HDL line arrays Systems are designed to be GROUNDED. Always use a grounded connection.

The HDL amplifiers are designed to work within the following AC Voltage limits:

230 V NOMINAL VOLTAGE: minimum voltage 185 V, maximum voltage 260 V

115 V NOMINAL VOLTAGE: minimum voltage 95 V, maximum voltage 132 V.

If the voltage goes below the minimum admitted voltage the system stops working. If the voltage goes higher than the maximum admitted voltage the system can be seriously damaged. To obtain the best performances from the system it is very important that the voltage drop it is as low as possible.

Make sure that all the system is properly grounded. All the grounding points shall be connected to the same ground node. This will improve reducing hums in the audio system.

The module is provided with a Powercon outlet to daisy chain other modules. The maximum number of modules that is possible to daisy chain is:

16 (SIXTEEN) OR 4 HDL 18-AS + 8 HDL 20-A MAXIMUM OR 8

HDL18-A.

**230 Volt NOMINAL VOLTAGE: minimum voltage 185 Volt, maximum voltage 264 Volt (for UK 240V+10%)**

**115 Volt NOMINAL VOLTAGE: minimum voltage 95 Volt, maximum voltage 132 Volt.**

A superior number of modules in daisy chain will exceed the Powercon connector maximum ratings and create a potentially dangerous situation.

When the HDL line arrays systems are powered from a three phase power distribution it is very important to keep a good balance in the load of each phase of the AC power. It is very important to include subwoofers and satellites in power distribution calculation: both subwoofers and satellites shall be distributed between the three phases.

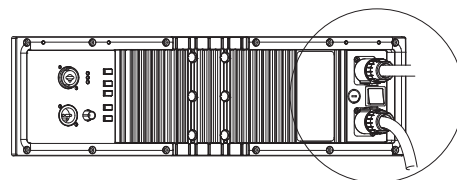
### WARNING



### VOLTAGE

### GROUNDING

### AC CABLES DAISY CHAINS



### WARNING



### POWERING FROM THREE PHASE



- 1** MAIN XLR INPUT (BAL/UNBAL). The system accept male XLR/Jack input connectors with line level signals from a mixing console or other signal source.
- 2** LINK XLR OUTPUT. The output XLR male connector provides a loop trough for speakers daisy chaining.
- 3** VOLUME. Controls the volume of the power amplifier. The control ranges from - (maximum attenuation) to the MAX level ∞ (maximum output).
- 4** POWER INDICATOR. Power on indicator. When the power cord is connected and the power switch is turned on this indicator lights green.
- 5** SIGNAL INDICATOR. The signal indicator lights green if there is signal present on the main XLR input.
- 6** LIMITER INDICATOR. The amplifier has a built in limiter circuit to prevent clipping of the amplifiers or overdriving the transducers. When the peak clipping circuit is active the LED blinks orange. It is okay if the limit LED blinks occasionally. If the LED blinks frequently or lights continuously, turn down the signal level. The amplifier has a built in RMS limiter. If the RMS limiter is active the LED lights red. The RMS limiter has the purpose to prevent damages the transducers. The speaker shall never be used with the limit indicator red, continuous operation with the RMS protection active can cause damages to the speaker.
- 7** HF. The switch gives the possibility to set high frequencies correction depending on target distance (air absorption correction):
  - NEAR (used for pole mount applications or near field)
  - FAR (for farthest field).
- 8** CLUSTER. The combination of the 2 switches gives 4 possibilities of mid low frequencies correction depending on cluster size.
  - 2-3 modules (used for pole mount applications ground stacking)
  - 4-6 modules (small flown systems)
  - 7-9 modules (medium flown systems)
  - 10-16 modules (maximum flown configuration).
- 9** HIGH CURVING. The switch gives the extra possibility to boost mid frequencies depending on a high curving cluster configuration of few pieces.
  - OFF (not active correction)
  - ON (for high curving arrays of few pieces HDL20-A or HDL10-A).
- 10** INDOOR. The switch gives the extra possibility to set low frequencies correction depending on a indoor/outdoor use, in order to compensate room reverberation on lows.
  - OFF (not active correction)
  - ON (correction for reverberant indoor rooms).

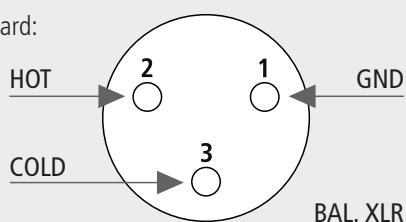
- 11** AC POWERCON RECEPTACLE. RCF D LINE uses a POWERCON locking 3-pole AC mains. Always use the specific power cord provided in the package.
- 12** AC POWERCON LINK RECEPTACLE. Use this receptacle to link one or more units. Always make sure that the maximum current requirement does not exceed the maximum admitted POWERCON current. In case of doubt call the closest RCF SERVICE CENTRE.
- 13** POWER MAIN SWITCH. The power switch turns the AC power ON and OFF. Make sure that the VOLUME is set to - when you turn on the speaker.
- 14** FUSE.

The XLR connectors use the following AES standard:

PIN 1 = GROUND (SHIELD)

PIN 2 = HOT (+)

PIN 3 = COLD (-)



At this point you can connect the power supply cable and the signal cable, but before turning on the speaker make sure that the volume control is at the minimum level (even on the mixer output). It is important that the mixer is already ON before turning on the speaker. This will avoid damage to the speakers and noisy "bumps" due to turning on parts on the audio chain. It is a good practice to always turn on speakers at last and turn them off immediately after the show.

Now you can turn ON the speaker and adjust the volume control to a proper level.

**WARNING:** Always make sure that the maximum current requirement does not exceed the maximum admitted POWERCON current. In case of doubt call the closest RCF SERVICE CENTRE.

**230 Volt, 50 Hz SETUP:** FUSE VALUE T3, 15A - 250V

**115 Volt, 60 Hz SETUP:** FUSE VALUE T6, 30A - 250V

Audio signal can be daisy-chained using the male XLR loop through connectors. A single audio source can drive multiple speakers modules (like a full left or right channel made of 8-16 speaker modules); make sure that the source device is able to drive the impedance load made of the modules input circuits in parallel. The HDL line arrays input circuit presents a 100 KOhm input impedance. The total input impedance seen as a load from the audio source (ex. audio mixer) will be:

- system input impedance = 100 KOhm / number of input circuits in parallel.

The required output impedance of the audio source (ex. audio mixer) will be:

- source output impedance > 10 \* system input impedance;
- always make sure that XLR cables used to feed audio signal to the system are:
  - balanced audio cables;
  - wired in phase.

A single defective cable can affect the performance of the overall system!

## CONNECTIONS

### BEFORE TURNING ON THE SPEAKER

### WARNING



### VOLTAGE SETUP

(RESERVED TO THE RCF SERVICE CENTRE)

### SIGNAL CABLES DAISY CHAINS



The HDL is a flexible system that can be used in ground-supported or suspended applications. The following information will help you set up your HDL system safely and effectively.

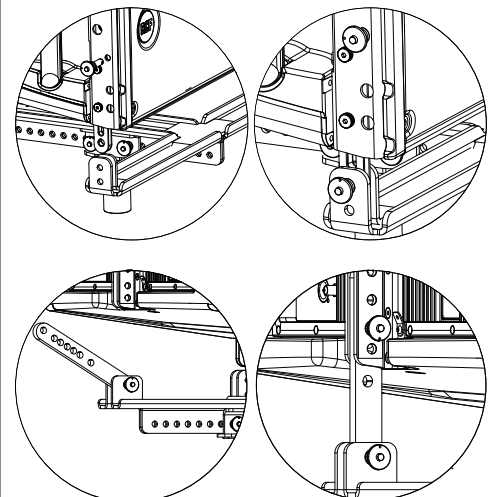
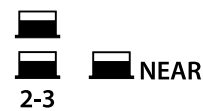
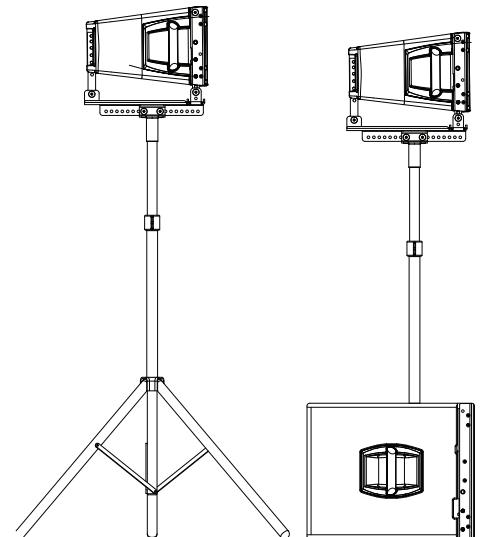
When using stands or poles, be sure to observe the following precautions:

- Check the stand or pole specification to be certain the device is designed to support the weight of the speaker. Observe all safety precautions specified by the manufacturer.
- Be certain that the surface on which the system is to be stacked is flat, stable and solid.
- Inspect the stand (or pole and associated hardware) before each use and do not use equipment with worn, damaged, or missing parts.
- Do not attempt to place more than two HDL loudspeakers on a stand or pole.
- When mounting two HDL speakers on a pole or tripod, integral rigging hardware must be used to secure the speakers to each other.
- Always be cautious when deploying the system outdoors. Unexpected winds may topple a system. Avoid attaching banners or similar items to any part of a speaker system. Such attachments could act as a sail and topple the system.

A single HDL may be used on a tripod stand (AC S260) or on a pole (AC PMA) over its D LINE Series subwoofers. The use of a subwoofer is recommended for applications requiring more low-frequency power and extension and needs a pole (P.N. 13360110).

Usually, the cluster switch on the input panel should be set to the 2-3 position and the HF on NEAR when a single speaker is used. Indoor switch use depends on the speaker placement. Place the speaker or the pole on a tripod using its own hardware LIGHT BAR HDL20-A (P.N. 13360229) or LIGHT BAR HDL10-A (P.N. 13360276) as shown in the following picture.

## POLE AND TRIPOD SAFETY WARNINGS



- Suspending loads should be done with extreme caution.
- When deploying a system always wear protective helmets and footwear.
- Never allow people to pass under the system during the installation process.
- Never leave the system unattended during the installation process.
- Never install the system over areas of public access.
- Never attach other loads to the array system.
- Never climb the system during or after the installation.
- Never expose the system to extra loads created from the wind or snow.

**WARNING:** The system must be rigged in accordance with the laws and regulations of the Country where the system is used. It is responsibility of the owner or rigger to make sure that the system is properly rigged in accordance with Country and local laws and regulations.

**WARNING:** Always check that all the parts of the rigging system that are not provided from RCF are:

- appropriate for the application;
- approved, certified and marked;
- properly rated;
- in perfect condition.

**WARNING:** Each cabinet support the full load of the part of the system below. It is very important that each single cabinet of the system is properly checked.

The suspension system is designed to have a proper Safety Factors (configuration dependent). Using the "RCF Shape Designer" software it is very easy to understand safety factors and limits for each specific configuration. To better comprehend in which safety range the mechanics are working a simple introduction is needed: HDL mechanics are built with certified UNI EN 10025-95 S 235 JR and S 355 JR Steel. RCF prediction software calculates forces on every single stressed part of the assembly and shows the minimum safety factor for every link.

S 235 JR is a structural steel and has a stress-strain (or equivalent Force-Deformation) curve like the following.

The curve is characterized by two critical points: the Break Point and the Yield Point. The tensile ultimate stress is simply the maximum stress attained. Ultimate tensile stress is commonly used as a criterion of the strength of the material for structural design, but it should be recognized that other strength properties may often be more important. One of these is for sure the Yield Strength. Stress-strain diagram of S 235 JR exhibit a sharp break at a stress below the ultimate strength. At this critical stress, the material elongates considerably with no apparent change in stress. The stress at which this occurs is referred to as the yield point.

Permanent deformation may be detrimental, and the industry adopted 0.2% plastic strain as an arbitrary limit that is considered acceptable by all regulatory agencies. For tension and compression, the corresponding stress at this offset strain is defined as the yield.

S 355 J and S 235 JR characteristic values are  $R=360$  [N/mm<sup>2</sup>] and  $R=510$  [N/mm<sup>2</sup>] for Ultimate Strength and  $Rp0.2=235$  [N/mm<sup>2</sup>] and  $Rp0.2=355$  [N/mm<sup>2</sup>] for Yield Strength. In our prediction software the Safety Factors are calculated considering the Maximum Stress Limit equal to the Yield Strength, according with many international standards and rules. The resulting Safety Factor is the minimum of all the calculated safety factors, for each link or pin.

This is where you are working with a SF=4:

Depending on local safety regulation and on situation the required safety factor can vary. It is responsibility of the owner or rigger to make sure that the system is properly rigged in accordance with Country and local laws and regulations. The "RCF Shape Designer" software gives detailed information of the safety factor for each specific configuration.

**WARNING**



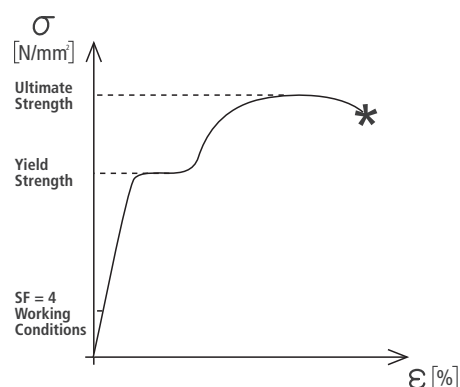
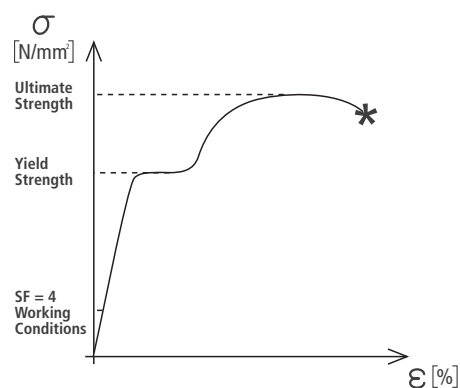
**WARNING**



**WARNING**



### "RCF SHAPE DESIGNER" SOFTWARE AND SAFETY FACTOR



The safety factor is the result of the forces acting on fly bar's and system's front and rear links and pins and depends on many variables:

- number of cabinets;
- fly bar angles;
- angles from cabinets to cabinets. If one of the cited variables change the safety factor MUST BE recalculated using the software before rigging the system.

In case the fly bar is picked up from 2 motors make sure that the fly bar angle is correct. An angle different from the angle used in the prediction software can be potentially dangerous. Never allow persons to stay or pass under the system during the installation process.

When the fly bar is particularly tilted or the array is very curved the centre of gravity can move out from the rear links. In this case the front links are in compression and the rear links are supporting the total weight of the system plus the front compression. Always check very carefully with the "RCF Shape Designer" software all this kind of situations (even with a small number of cabinets).

THE MAXIMUM NUMBER OF SPEAKERS THAT MAY BE SUSPENDED USING THE HDL20-A FRAME IS:

n° 16 HDL20-A;

n° 8 HDL18-AS;

n° 4 HDL 18-AS + 8 (EIGHT) HDL 20-A USING ACCESSORY LINK BAR HDL20-HDL18-AS

THE MAXIMUM NUMBER OF SPEAKERS THAT MAY BE SUSPENDED USING THE HDL10-A FRAME IS:

n° 16 HDL10-A;

n° 8 HDL15-AS;

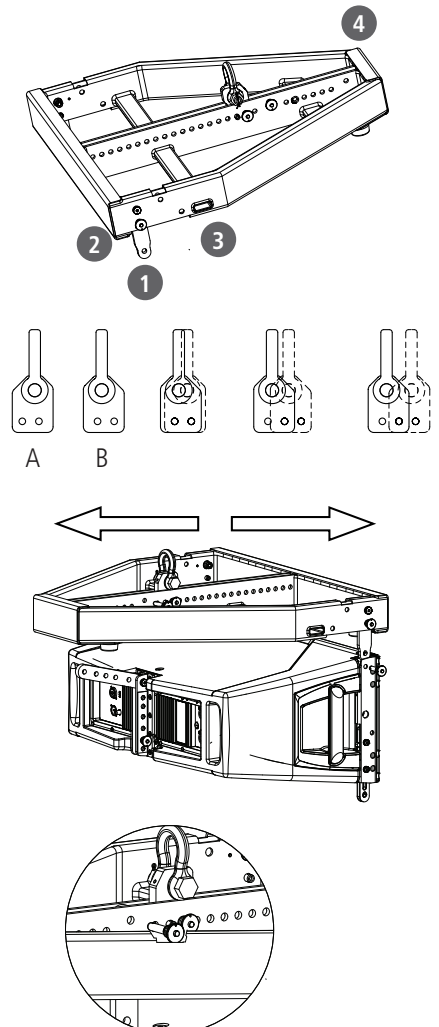
n° 4 HDL 15-AS + 8 (EIGHT) HDL 10-A USING ACCESSORY LINK BAR HDL10-HDL15-AS

## MAXIMUM ARRAY SIZE

## THE HDL FLY BAR

- 1 FRONT FLYING BRACKET. Front mounting.
- 2 QUICK LOCK PIN HOLE. Front mounting (to be used to lock the front bracket before installation).
- 3 FRONT BRACKET - TRANSPORT HOLES.
- 4 CENTRAL PICK UP POINTS.
- 5 The pickup is asymmetric and can be fit in two positions (A and B). A position brings the shackle towards the front. B position allows an intermediate step using the same fixing holes.
- 6 Move the pickup bracket in the position suggested by RCF Shape Designer.
- 7 Fix the pickup bracket with the two pins on the bracket's lanyard to lock the pickup.

### THE HDL FLY BAR FEATURES:



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Check that all the pins are secured and locked.

Rigging the system follow the procedure:

- H** RIGGING CHAIN HOIST.
- S** CERTIFIED SHACKLE.
- F** FLY BAR.

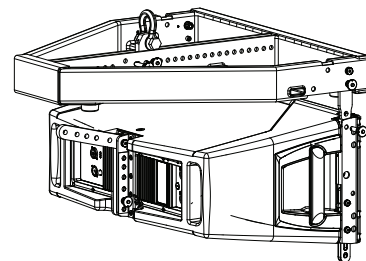
1) Connect the fly-bar F to the chain hoist H (o motors) using the certified shackle. Secure the shackle.

2) Connect the second pin on the front bracket to make sure that the connecting bracket is vertical.

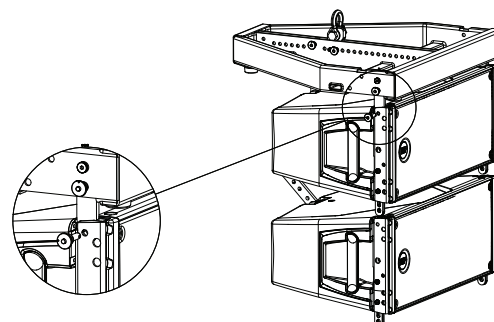
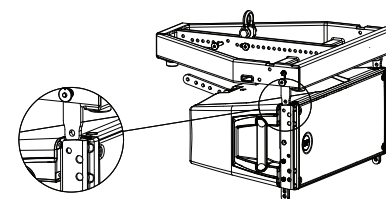
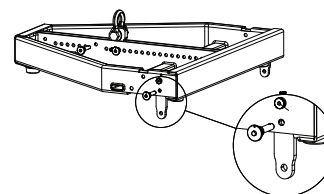
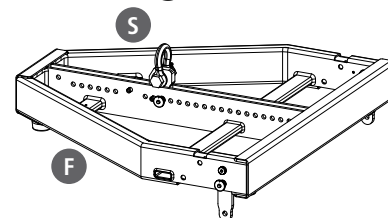
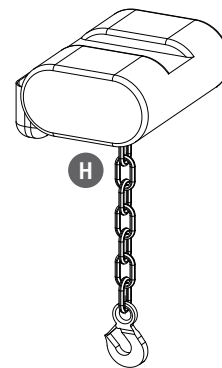
3) Connect the front bracket to the first HD cabinet using 2 quick lock pins.

USING THE FLY BAR HDL 20 LIGHT (P.N. 13360229) IT IS ALLOWED TO CONNECT A MAXIMUM OF 4 HDL 20-A MODULES.

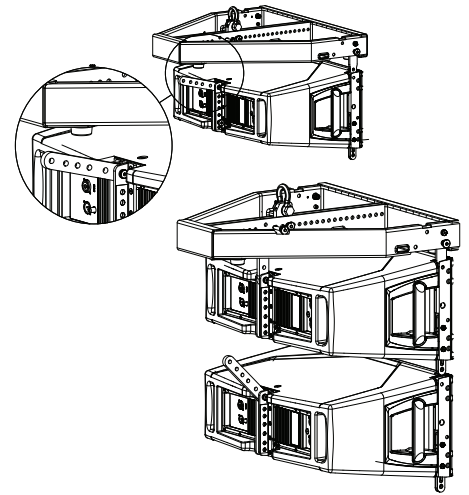
USING THE FLY BAR HDL 10 LIGHT (P.N. 13360276) IT IS ALLOWED TO CONNECT A MAXIMUM OF 6 HDL 10-A MODULES.



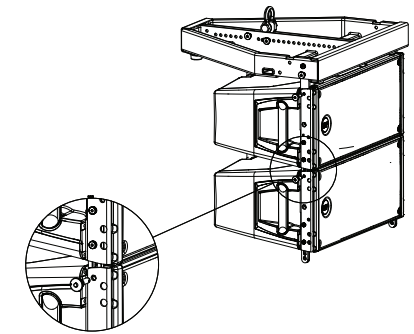
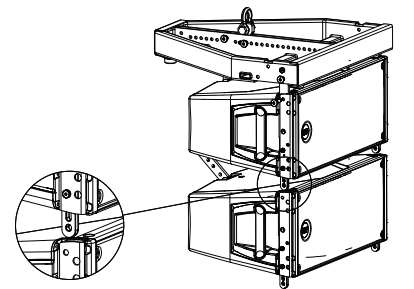
## RIGGING PROCEDURE



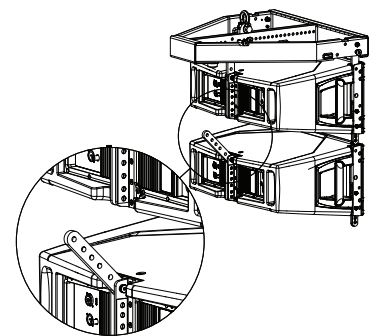
4) Reverse and connect the 1 rear bracket to the fly-bar using 2 quick lock pins.  
The first HDL has to be fixed always starting at 0° with respect of the frame. No other angles are allowed.



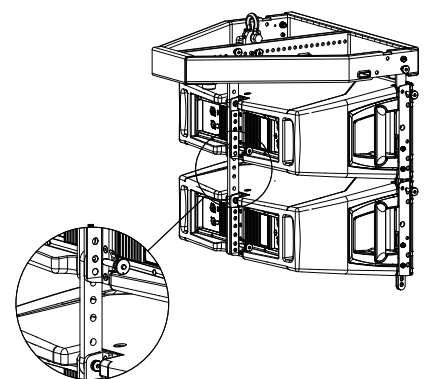
5) Connect the second cabinet to the first always starting from the 2 front brackets.



6) Reverse and connect the rear bracket of the second cabinet using the hole for the proper angle.



7) Connect all the other cabinets following the same procedure and connecting a single cabinet each time.



## ARRAY SYSTEMS DESIGN

HDL allow users to choose from different face-to-face angle adjustments to create arrays with varying curvature. Thus, designers can create arrays custom-tailored to each venue's profile.

The basic approach to array design dependent on three factors:

- Number of Array Elements;
- Vertical Splay Angles;
- Horizontal Coverage.

Determining the number of elements to use is critical: the number of elements greatly affects the SPL available from the system as well as the uniformity of coverage in both SPL and frequency response. The number of elements profoundly effects the directivity at lower frequencies.

The next easy equation, works as an approximation for flat listening planes.

Coverage (x)  $\approx$  8n (m) Coverage distance required = x (metres).

Changing the splay angles between cabinets has a significant impact on vertical coverage for the high frequencies, with the result that narrower vertical splay angles produce a higher Q vertical beamwidth, while wider splay lowers the Q at high frequencies. In general, the splay angles do not affect the vertical coverage at lower frequencies.

The curved array system design can be summarized as:

- flat-front HDL for long throw sections;
- increase curvature as distance decreases;
- add more enclosures for more output.

This approach focuses more transducers mounted on long-throw horns at the farthest seat, gradually focusing fewer transducers as distance decreases. As long as the no gap rule is maintained, arrays constructed according to these principles will provide even SPL and a consistent sonic character throughout the venue without requiring complex processing. This approach, where the same amount of acoustic energy is spread over a larger or smaller vertical angle depending on required throw, typically have the following objectives:

- even horizontal and vertical coverage;
- uniform SPL;
- uniform frequency response;
- sufficient SPL for the application.

This discussion represents, of course, just a basic approach. Given the infinite variety of venues and performers, users will find themselves needing to solve specific problems in specific situations. RCF Shape Designer software designed to help calculate optimum splay angles, aiming angles, and fly-bar pick points (crucial in aiming the array) for a given venue, will be explained later in this Guide.

## SOFTWARE SHAPE DESIGNER

RCF Shape Designer is supplied in a zip folder which contains a setup executable file:



Double-click on this and follow the on-screen prompts.

### INSTALLING RCF SHAPE DESIGNER

## COMPUTER REQUIREMENTS

## INTRODUCTION

## USING RCF SHAPE DESIGNER SOFTWARE

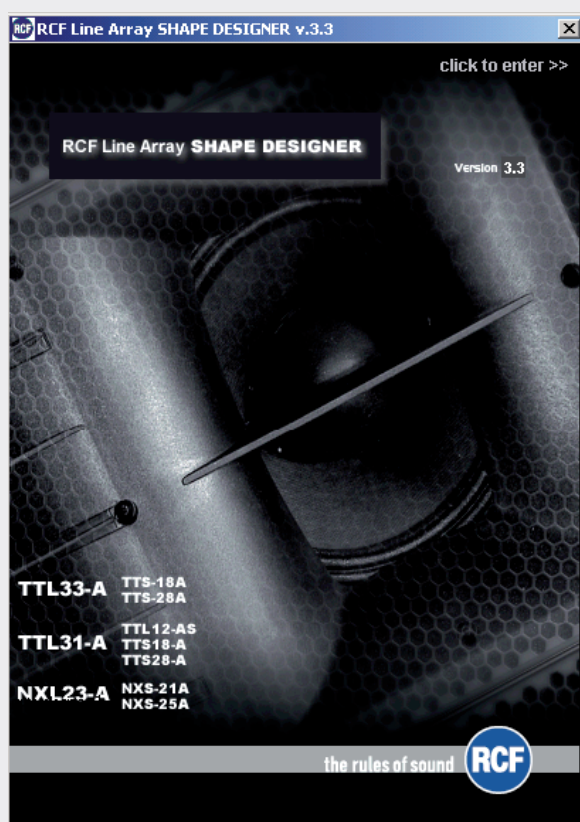
The RCF Shape Designer requires a compatible PC with the Windows® 98, Windows® 98SE, Windows® 2000, Windows® ME, Windows® XP, or Windows NT® operating systems. It is not designed to work with Windows® 3.x, Windows® 95, or Macintosh® operating systems.

Use the RCF Shape Designer for designing HDL arrays. The RCF Shape Designer's primary function is to determine the configuration that will provide the best vertical performance for a given application. Various venue dimensions are entered that allow the RCF Shape Designer to calculate the resultant array performance.

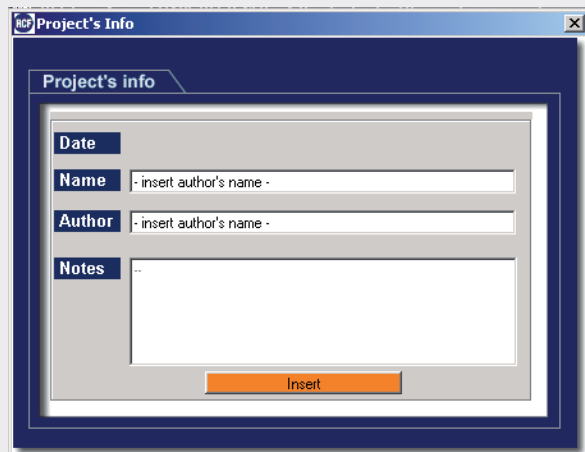
Once you have installed RCF Shape Designer, it will be visible as a shortcut in All Programs via your Windows Start button.



A single click on the RCF Shape Designer tab will open the following page:



A single click on the window will open the following page:



Filling the blank tabs it's possible to start the program.

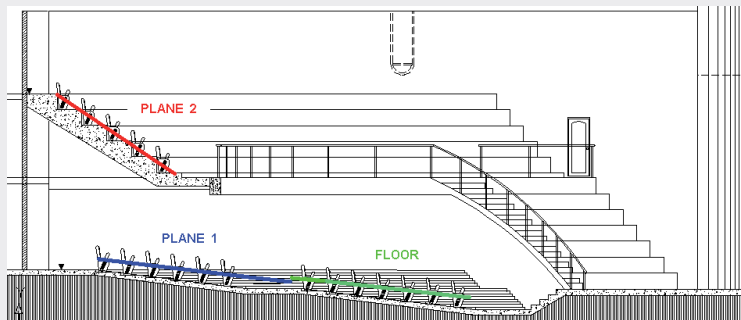
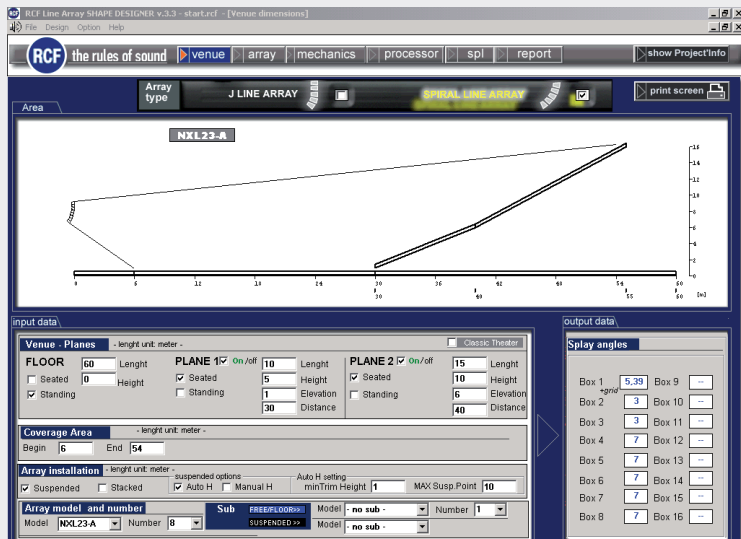
ENTERING VENUE DATA

For best results, planes should be used as follows:

FLOOR is used to simulate the main floor area from the stage to a rear bleacher or boundary.

PLANE 1 is used to simulate any audience continuation behind FLOOR (e.g. a rear bleacher) from the end of the main floor to furthest and highest seat below PLANE 2.

PLANE 2 is used to simulate the furthest/highest audience area.



Enter the height, length and elevation of up to three planes.

Venue - Planes					
- lenght unit: meter -					
<b>FLOOR</b>	60	Lenght	<b>PLANE 1</b> <input checked="" type="checkbox"/> On/off	10	Lenght
<input type="checkbox"/> Seated	0	Height	<input checked="" type="checkbox"/> Seated	5	Height
<input checked="" type="checkbox"/> Standing			<input type="checkbox"/> Standing	1	Elevation
				30	Distance
<b>PLANE 2</b> <input checked="" type="checkbox"/> On/off	15	Lenght	<input checked="" type="checkbox"/> Seated	10	Height
<input type="checkbox"/> Seated			<input type="checkbox"/> Standing	6	Elevation
				40	Distance

For all planes Length refers to the horizontal length of that plane.  
 For all planes Height refers to the height of the rear of the plane.  
 For PLANES 1 and 2 Elevation refers to the elevation (height) of the front of the plane.  
 For PLANE 1 and 2 Distance relates to the actual distance from the front of the array to the start of the plane.  
 For all planes selecting Seated or Standing places ear level at 1.3 or 1.7 m above the respective plane.

Specify the horizontal coverage distances from the front of the array.

Coverage Area		
- lenght unit: meter -		
Begin	6	End 45

Select either Suspended or Stack in the Array installation section to determines how the array is supported.

Array installation					
- lenght unit: meter -					
<input checked="" type="checkbox"/> Suspended	<input type="checkbox"/> Stacked	<input checked="" type="checkbox"/> Auto H	<input type="checkbox"/> Manual H	Auto H setting	minTrim Height 1
					MAX Susp.Point 10

In Suspended mode the grid is suspended and cabinets are attached beneath.  
 In Stack mode the grid forms a base and cabinets are placed on top.

COVERAGE

ARRAY INSTALLATION



**AUTO H SETTING - MIN TRIM HEIGHT**

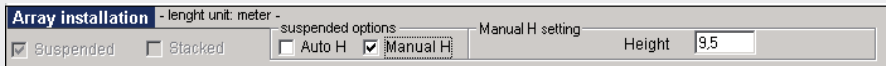
This is the low limit for the array and is defined as the smallest allowable distance from the lowest point of the array to the ground below

**AUTO H SETTING - MAX SUSPENSION POINT**

Set this to the maximum array height allowable (usually the highest part of the flying frame). The maximum pick height is usually chosen to allow for the maximum flying point height minus a sensible allowance for any shackles, stingers, bridles or flying hooks. 1m should be allowed for a stinger between each grid flying lug and the relevant motor hook to ensure that motor chain bags do not rest on the grid or top cabinet and upset its tilt angle.

**MANUAL H SETTING**

In manual installation mode it is possible to enter the height required for flying the system.

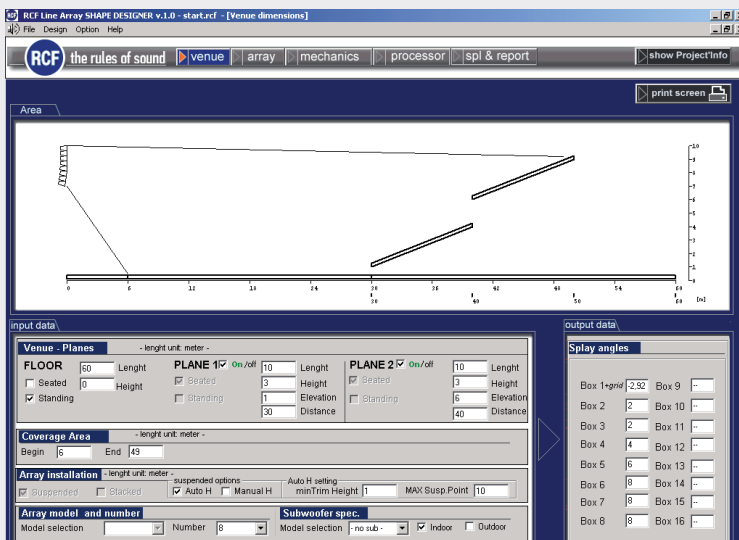


Number of cabinets can be set depending also on cabs availability.

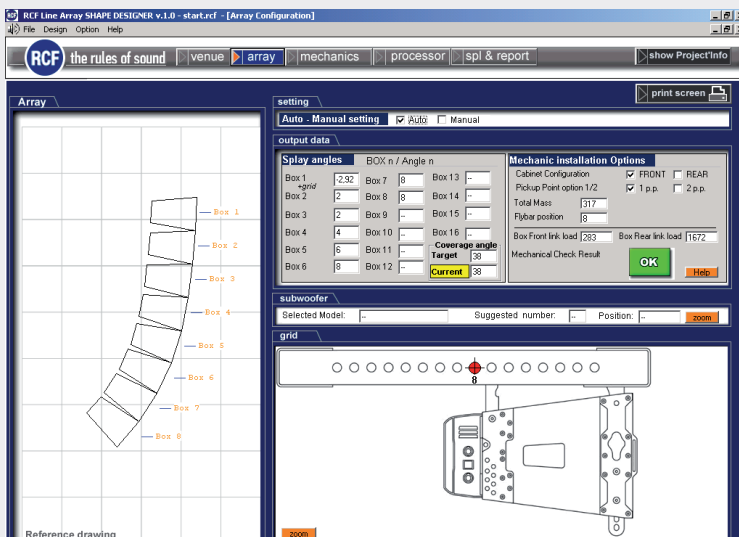


**VENUE PAGE**

- Graphical representations of the array and the venue
- Aiming splay angle between each pair of enclosures



- Height of the array and trim height to the bottom of the array from the floor
- Pick Point on the Fly-Bar to achieve the calculated array angle when suspended
- Weight of the array
- Mechanical check result



**SUSPENDED MODE**

**NUMBER OF CABINETS AND SUBWOOFERS**

**RCF SHAPE DESIGNER RESULTS**

**ARRAY PAGE**

- Cluster Mechanical specifications
- Mechanical safety factors

MECHANICS PAGE

**CLUSTER SPECIFICATIONS**

Cluster Type	Number of Cabinets	8
Flybar Type	Pick-up point	9,5
Flybar Mounting Position	Cluster Length (L)	2,64
Flybar Rigging Hole	Lowest cluster point(LCP)	6,86
Flybar Splay Angle (alfa)	Center of Gravity (Xg; Yg)	(1,04; 0,28)
Cluster Weight	Weight on Front Hoist	--
Weight on Single Hoist	Weight on Rear Hoist	--

**SAFETY FACTOR**

REAR	Applied Tensile Load [N]	1672	
BRACKET	Allowed Tensile Load [N]	31200	
	Safety Factor - Tensile Load	19,4	
FRONT	Applied Shear Load [N]	71	
FLYBAR	Allowed Shear Load [N]	7400	
	Safety Factor - Shear Load	103,8	
BRACKET	Applied Tensile Load [N]	274	
	Allowed Tensile Load [N]	42500	
	Safety Factor - Tensile Load	155	
FRONT	Applied Shear Load [N]	195	
CABINET	Allowed Shear Load [N]	9300	
	Safety Factor - Shear Load	47,6	
LINK	Applied Tensile Load [N]	-155	
	Allowed Tensile Load [N]	28900	
	Safety Factor - Tensile Load	186,6	
	Safety Factor - Combined Load	41,1	

**CLUSTER MINIMUM SAFETY FACTOR 19,4**

OK SF >= 7    OK 2,5 <= SF <= 4    NO SF < 2,5

- DSP preset configuration

PROCESSOR PAGE

Number	Type	HF BOOST	LF SHAPE
Box # 1	NXL 23-A	ARRAY	6-8
Box # 2	NXL 23-A	ARRAY	6-8
Box # 3	NXL 23-A	ARRAY	6-8
Box # 4	NXL 23-A	ARRAY	6-8
Box # 5	NXL 23-A	ARRAY	6-8
Box # 6	NXL 23-A	ARRAY	6-8
Box # 7	NXL 23-A	LINEAR	6-8
Box # 8	NXL 23-A	LINEAR	6-8

- On-axis aiming angle for each enclosure as a difference from 0° horizontal
- Various angles and throw distances calculated from the venue's dimensions
- DSP preset configuration
- SPL representation on the audience area

SPL & REPORT PAGE

**Report**

Number	Type	Relative Angle	Absolute Angle	High Frequency Correction	Cluster size	High Pass
Box # 1		-2,92°	-2,92°	FAR (target dist [m]: 43,8)	7,9	Full Range
Box # 2		2°	43,92°	FAR (target dist [m]: 105,53)	7,9	Full Range
Box # 3		2°	1,06°	FAR (target dist [m]: 40,09)	7,9	Full Range
Box # 4		4°	5,08°	MID (target dist [m]: 34,07)	7,9	Full Range
Box # 5		6°	11,06°	MID (target dist [m]: 28,08)	7,9	Full Range
Box # 6		8°	15,08°	NEAR (target dist [m]: 18,72)	7,9	Full Range
Box # 7		8°	27,06°	NEAR (target dist [m]: 14,03)	7,9	Full Range
Box # 8		8°	35,06°	NEAR (target dist [m]: 11,27)	7,9	Full Range

**WARNING:** It is possible to display different pages only IN SEQUENCE (venue > array > mechanics > processor > spl & report, and back), in order to be sure that all pages will be shown to the user, including the one regarding mechanics.

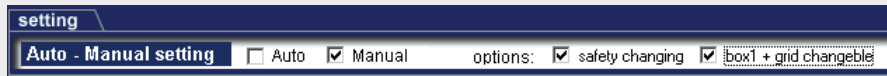
WARNING



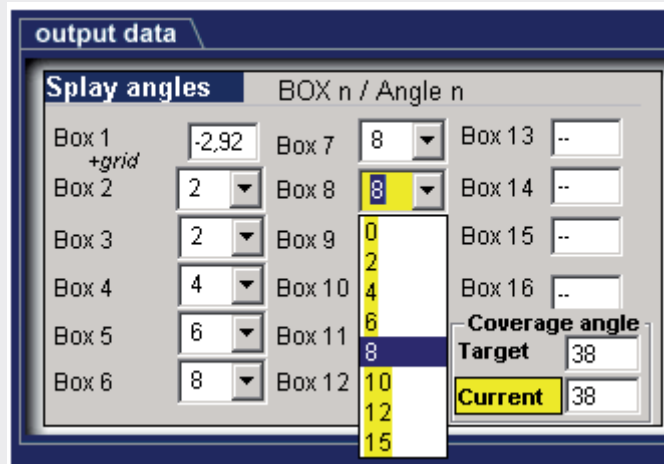
## MANUAL MODE

RCF Shape Designer works in either of two basic ways:

- AUTOMATIC MODE (default setting): The RCF Shape Designer will select the optimum enclosure splays, array aiming angle, fly-bar pick point and DSP preset configurations.
- MANUAL MODE: This provides a partial control over the array's configuration. The enclosure splays can be increased with a progression of 2° steps for each adjacent speaker, in order to maintain a spiral array configuration. Then array aiming angle, and fly-bar pick point can be entered manually by switching on Box1 + grid changeable and MANUAL H flags.



Array window: Manual splays setting



Angles manual changing

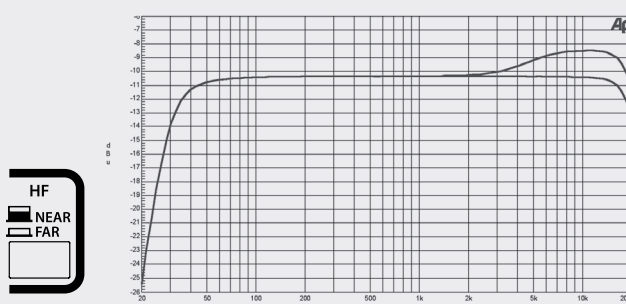
## OPTIMIZING THE ARRAY

Once the design (number of elements and vertical splay angles) has been designed using Shape Designer software, you can effectively optimise the array depending on the environment and the application by driving it using different DSP presets stored onboard. Typically arrays are divided in two or three zones depending the design and size of the array.

To optimise and EQ the array, different strategies are used for high frequencies (long throws and short throws) and low frequencies.

The longer the distance, the greater the attenuation at high frequencies. Generally, high frequencies need a correction to compensate for energy lost over distance; the correction needed is usually proportional to the distance and high-frequency air absorption. In the near- to mid-field, the air absorption is not nearly as critical; in this zone, high frequencies need little additional correction.

In the next figure is shown the equalization that corresponds to HF settings for NEAR and FAR:



## HIGH-FREQUENCY EQUALIZATION STRATEGIES

While wave-guides provide isolated control over various mid- to high-frequency coverage areas, the low-frequency section of a HDL array still requires mutual coupling - with equal amplitude and phase - to achieve better directionality. Low-frequency directionality is less dependent on the array's relative splay angles and more dependent on the number of elements of the array.

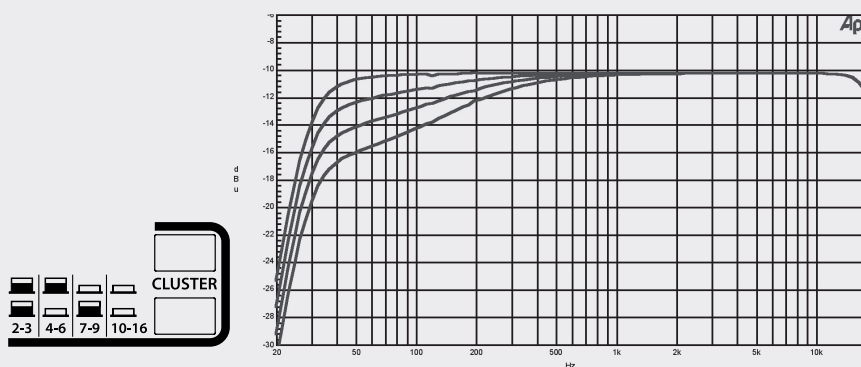
At low frequencies, the more elements in the array (the longer the array), the more directional the array becomes, providing more SPL in this range. The directional control of the array is achieved when the length of the array is similar or larger than the wavelength of the frequencies being reproduced by the array.

Although the array can (and usually should) be zoned for implementing different equalization curves for high frequencies, identical equalization should be maintained in all the low-frequency filters.

Different low-frequency equalization settings in the same array will degrade the desired coupling effect. For the same reason, gain differences are not recommended for line arrays, since adjusting various zones with an overall amplitude control for each results in decrease of Low-frequency headroom and directionality.

In any case, line arrays generally need a correction to compensate for energy sum on lows.

In the next figure is shown the equalization that corresponds to CLUSTER settings, referring to different number of speakers from 2-3 up to 10-16. Increasing the number of cabinets, response curves are decreased in order to compensate the low-frequency section mutual coupling.



## LOW-FREQUENCY COUPLING EFFECTS

## LOW-FREQUENCY STRATEGIES

## HDL20-A GROUND STACKED

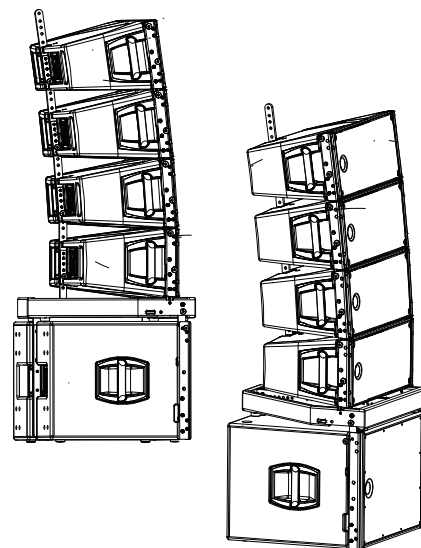
HDL loudspeakers can be stacked on top of RCF subwoofers with the dedicated accessories.

HDL 20-A compatible Subwoofers:

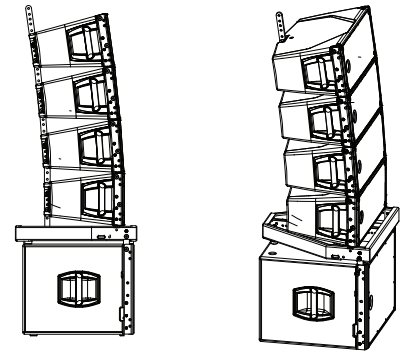
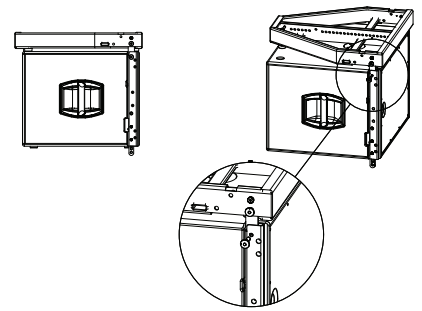
- SUB 8004-AS
- SUB 8006-AS
- HDL 18-AS

HDL 10-A compatible Subwoofers:

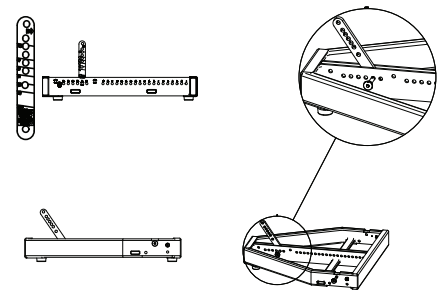
- SUB 8004-AS
- SUB 8006-AS
- HDL 15-AS



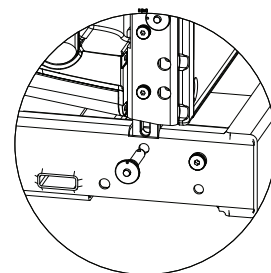
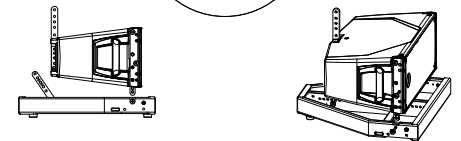
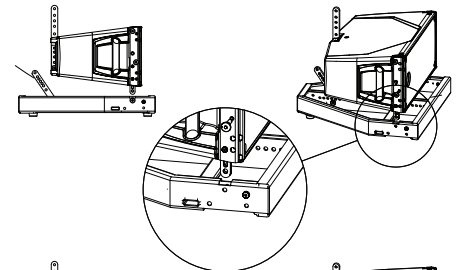
1) Fix the HDL fly bar on subs as shown in the picture.



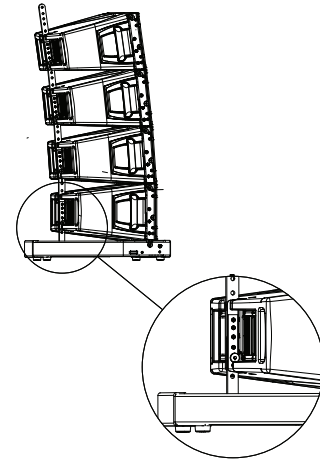
2) The stacking bar adds a fixed amount of up or down tilt to ground-stacked HDL loudspeakers, with additional 15 degrees of adjustment possible (from +7,5° to -7,5°).



3) Connect front bracket of the first HDL cabinet using 2 quick lock pins.

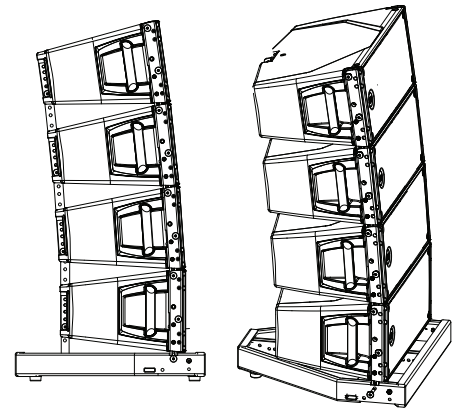


4) The baffle of the bottom box in a stacked array does not necessarily have to be parallel to the stage or the array frame. It can be tilted up or downward if desired. In this way arced arrays can be readily created from a ground stack position.

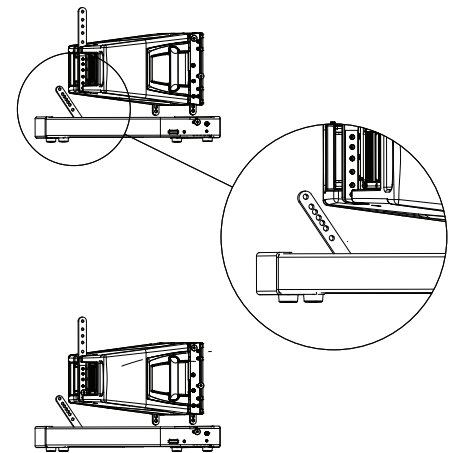


5) The bottom box in a stacked array can be tilted to obtain proper coverage patterns (from  $+7,5^\circ$  to  $-7,5^\circ$ ). Reverse and connect the 1 rear stacking bar bracket to the first enclosure using the hole for the proper angle and quick lock pins.

Add HDL cabinets one by one as indicated for flown configurations. Up to four HDL enclosures can be stacked and interlinked using the standard D LINE rigging components and the D LINE subs as ground support.



6) It is possible to stack HDL speakers on the ground using its own fly bar as shown in the pictures.





	<b>HDL 20-A</b>	<b>HDL 10-A</b>
<b>ACOUSTICAL</b>		
<b>Frequency response</b>	55 Hz - 20 kHz	65 Hz - 20 kHz
<b>Max SPL</b>	135 dB	133 dB
<b>Horizontal Coverage angle</b>	100°	100°
<b>Vertical Coverage angle</b>	15° max	15° max
<b>Compression Driver</b>	2" , 3.0" voice coil	2" , 2.5" voice coil
<b>Midrange</b>	-	-
<b>Woofer</b>	2x10" , 2.5" voice coil	2x8" , 2.0" voice coil
<b>INPUT SECTION</b>		
<b>Input connector</b>	XLR-JACK	XLR-JACK
<b>Output connector</b>	XLR	XLR
<b>Input sensitivity</b>	-2 dBu / +4 dBu	-2 dBu / +4 dBu
<b>PROCESSOR SECTION</b>		
<b>Crossover frequencies</b>	800 Hz	800 Hz
<b>Protections</b>	Thermal, RMS	Thermal, RMS
<b>Limiter</b>	Soft limiter	Soft limiter
<b>Controls</b>	Cluster, HF, High Curving, Indoor	Cluster, HF, High Curving, Indoor
<b>AMPLIFIER</b>		
<b>Total power</b>	1400 W Peak, 700 W RMS	1400 W Peak, 700 W RMS
<b>High frequencies</b>	200 W RMS	200 W RMS
<b>Low frequencies</b>	500 W RMS	500 W RMS
<b>Cooling</b>	Convection	Convection
<b>Connection</b>	Powercon Connector in Powercon Connector link	Powercon Connector in Powercon Connector link
<b>PHISICAL</b>		
<b>Height</b>	294 mm (11.5")	294 mm (11.5")
<b>Width</b>	705 mm (27.7")	569 mm (22.4")
<b>Depth</b>	445 mm (17.5")	434 mm (17.09")
<b>Weight</b>	29 Kg (63.93 lbs)	25.4 Kg (55.99 lbs)
<b>Cabinet</b>	Composite PP	Composite PP
<b>Hardware</b>	Rigging flyware	Rigging flyware
<b>Handles</b>	2 side	2 side



[www.rcf.it](http://www.rcf.it)

**HEADQUARTERS:**

RCF S.p.A. Italy  
tel. +39 0522 274 411  
e-mail: [info@rcf.it](mailto:info@rcf.it)

**RCF UK**

tel. 0844 745 1234  
Int. +44 870 626 3142  
e-mail: [info@rcfaudio.co.uk](mailto:info@rcfaudio.co.uk)

**RCF France**

tel. +33 1 49 01 02 31  
e-mail: [france@rcf.it](mailto:france@rcf.it)

**RCF Germany**

tel. +49 2203 925370  
e-mail: [germany@rcf.it](mailto:germany@rcf.it)

**RCF Benelux**

tel. +49 (0) 2203 9253724  
e-mail: [belgium@rcf.it](mailto:belgium@rcf.it)

**RCF Spain**

tel. +34 91 817 42 66  
e-mail: [info@rcfaudio.es](mailto:info@rcfaudio.es)

**RCF USA Inc.**

tel. +1 732-9026100  
e-mail: [info@rcf-usa.com](mailto:info@rcf-usa.com)