USER MANUAL

AX2065P

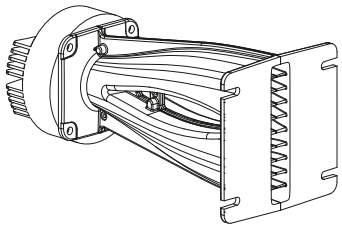
passive vertical array loudspeaker

KEY FEATURES

- High output line array element
- Compact size, very good output-to-weight ratio
- High quality, low compression, low distortion HF driver
- Very stable horizontal coverage
- Transmission Line back loading for clean mid-bass reproduction
- Natural sound Transmission Line HF projection wave-forming device

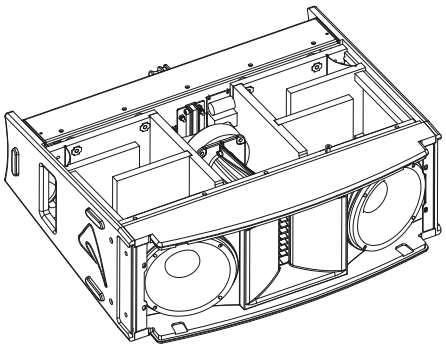
INTRODUCTION

The AX2065P Vertical Line Array element is designed for a wide range of sound reinforcement applications where a flexible and easy to use vertical array systems is needed. The AX2065P has been designed both for rental live sound applications and for fixed installations and has been engineered for the simplest use possible but without sacrificing anything in sound quality and performance.



The high frequency range is reproduced by a low-distortion compression driver, equipped with very light-weight Titanium diaphragms and a special new suspension design for very natural sound. A transmission line wave-forming waveguide has been used to load the HF driver, in order to provide a detailed and natural sound and to achieve a long-distance HF projecting capacity.

The two 6.5” woofers employed in the reproduction of the mid-bass range are equipped with very light-weight cones and rubber suspension to extend the low frequency response. The lightness of the diaphragm is furthermore improved by the use of aluminium voice coil instead of conventional copper. This ensure a fast reproduction of the mid range and of mid-bass musical passages, improving also the thermal capacity of the voice coil and, consequently, controlling the overall power compression. The two 6.5” woofers are back loaded by a short hybrid transmission line that minimizes the effect of the box resonances and eliminates the “boxy” mid-bass sound commonly obtained from regular bassreflex enclosures. The crossover filter approach is based on a “Constant Power” technique. Thanks to a particular phase combination between the two ways around the crossover frequency, this approach is able to provide a very stable horizontal coverage and a very stable off-axys sound image, also minimizing unwanted effects around the crossover frequency. The further application of phase linearization techniques, combined to constant power crossover, yield a linear phase response and a coherent time response. This allows for a natural perception of acoustic instruments and voices and for an improved depth of the sound image.



TECHNICAL SPECIFICATION

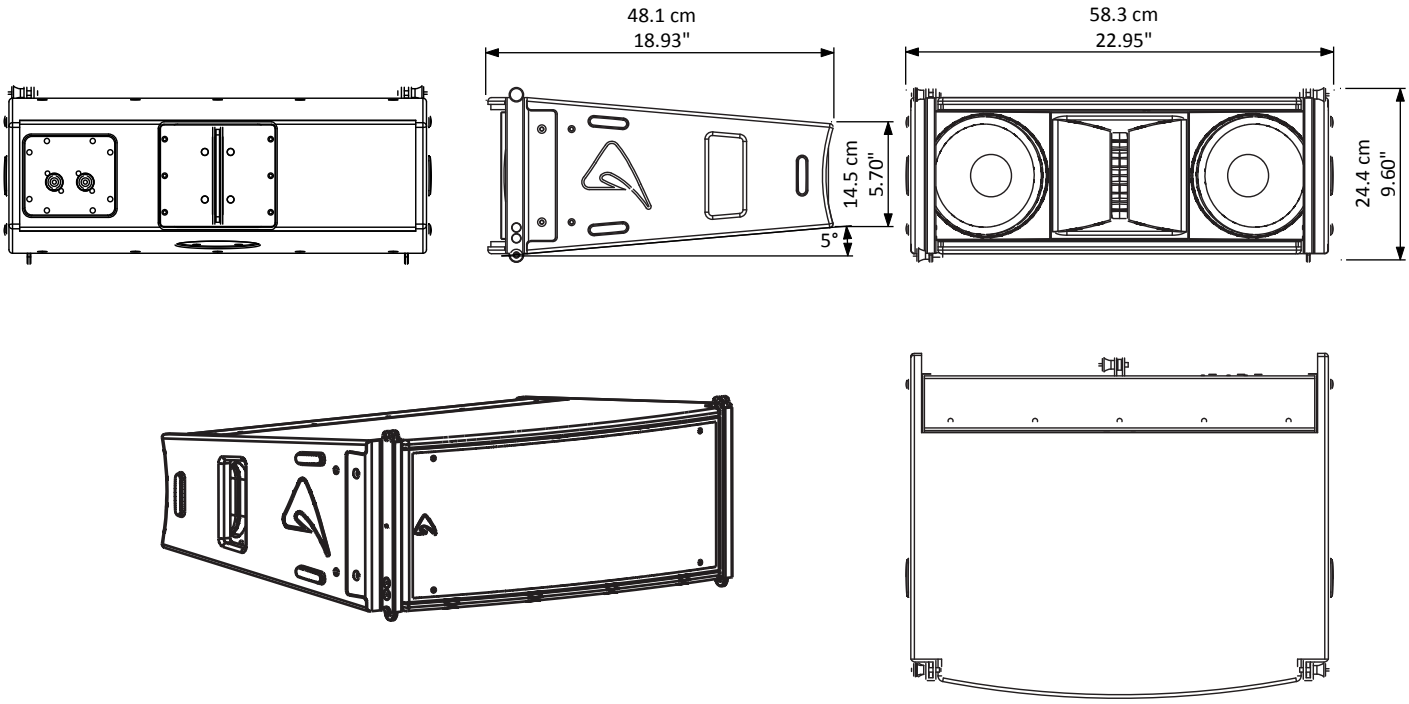
Acoustical	
System type	Line Array Element Short Transmission Line LF Back Loading Acoustic Transmission Line HF Waveguide
Low frequency transducer	Two 6.5” (165 mm), 1.5” (38 mm) aluminium voice coil, 16Ω each, paralleled
High frequency transducer	One 1.4” driver, 2.5” (64 mm) edgewound voice coil, titanium diaphragm, 8Ω each, paralleled
Frequency response (±3 dB)	80 Hz – 18 kHz (Processed)
Sensitivity (2.83 V @ 1m, 2 Pi)	99 dBSPL (LF); 108 dBSPL (HF)
Horizontal Coverage Angle	110° (-6 dB)
Vertical Coverage Angle	12° (-6 dB)
Maximum Peak SPL @ 1m	129 dB
Electrical	
Nominal Impedance	8Ω (LF) + 8Ω (HF)
Minimum Impedance	7.2 Ω @ 340Hz (LF); 7Ω @ 2.5kHz (HF)
Power Handling Continuous*	400 W (LF) + 75 W (HF)
Power Handling Peak	800 W (LF) + 150 W (HF)
LF Power Compression	@ -10 dB Power (70 W) = 0.7 dB @ -3 dB Power (350 W) = 1.8 dB @ 0 dB Power (700 W) = 3.5 dB
Connectors	
Connector Type	Neutrik® Speakon® NL4 x 2
Input Wiring	LF = Pin 1+/1-; HF = Pin 2+/2-
Mechanical	
Width	583 mm (22.95”)
Height	244 mm (9.60”)
Depth	481 mm (18.93”)
Taper angle	5°
Construction	15 mm, reinforced Phenolic Birch
Paint	High resistance, water based paint
Suspension system	
Front Suspension	Aluminium Fast Link structure with ¼ Fast Pin
Back Suspension	High Strength Steel with ¼ Fast Pin
Net Weight	19.2 Kg (42.32 lbs.)

** AES Pink Noise Power*

revision 2014-12-5

AXIOM

MECHANICAL DRAWING

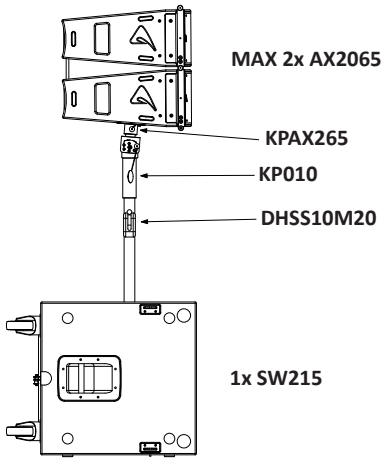


OPTIONAL ACCESSORIES

AXCASE05	Carrying Case for 4 box unit + Flying Bar	**KPTSW215**	Fly bar for Axiom AX2065 and SW215 Loudspeakers
AXCASE06	Carrying Case for 4 box unit	**KPTAX2065**	Fly bar for Axiom AX2065 only
NL4FX	Neutrik Speakon® PLUG	**AXFEETKIT**	Kit Of 6pcs BOARDACF01 M10 foot for stacked installation
AX2065A	Active vertical array loudspeaker	**KPAX265**	Pole Adaptor
SW215P	Passive Subwoofer	**KP010**	0° to 10° tilt adaptor
SW215FP	Flyable Passive Subwoofer	**DHSS10M20**	Sub-Speaker ø35mm Pole with M20 screw
PC260	2 in 6 out digital loudspeaker processor	**RAINCOV2065**	Rain cover for input sockets
USB2CAN	PRONET network converter		

*see **http://www.axiomproaudio.com** for detailed description and other available accessories.*

AX2065 used as conventional system



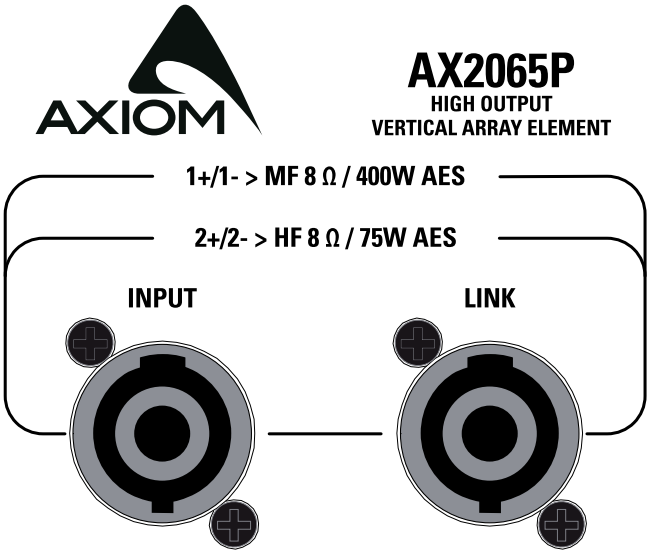
SPARE PARTS

NL4MP	Neutrik Speakon® panel socket	**98AXM6W16**	6.5'' woofer - 1.5" VC
94SPI2265	Locking Pin for AX2265	**98DRI2065**	1.4'' - 2.5" compression driver
PLG716	Straight Shackle 16 mm for Fly bar	**98MBN2065**	titanium diaphragm for 1.4" driver
91CRAIN3	Crossover/protection module		

REAR PANEL

INPUT - Power input for the external amplifier. The AX2065P does not include a passive crossover for filtering the signal, but only an internal protection that applies a gentle high-pass filtering and a limitation for excessive power on the HF section. The connections are the following:

INPUT - LINK	
NL4 pin number	**internal connection**
1+	**LF+**
1-	**LF-**
2+	**HF+**
2-	**HF-**



LINK - Power output in parallel with the INPUT socket for connecting the unit to another speaker.
The number of AX2065P cabinets that can be connected in parallel depends on the amplifier load capacity.

WARNING: In case of using the AX2065P passive module linked with an AX2065A active module DO NOT LINK ANY OTHER AX2065P.

Useful tools to set up properly a vertical array system

This is a list of tools that can be very useful to set properly a vertical array system.

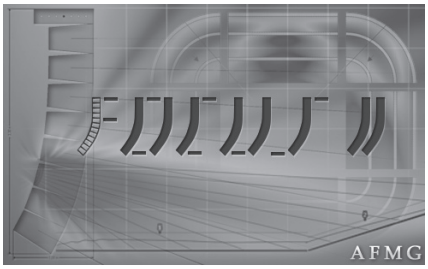
CABLE TESTER
It is a good practice to check all cables before each installation, because even one faulty cable can compromise heavily the system performance.

INCLINOMETER WITH LEVER
This tool can be used to verify the vertical array angle. It can be used at the top or at the bottom of the array In this case you have to sum all splay angles, so the maximum precision is needed for aiming the vertical array, particularly for long throw applications.

LASER DISTANCE METER
This instrument can be useful to measure the height of the vertical array and to know the distance between FOH-Subs and FOH-Array for setting the delay time.

SMAART or similar acoustic measurement system
These are useful to measure delays, phase and response of the system.

PREDICTION: EASE Focus 2



To aim correctly a complete system we suggests to use always the Aiming Software - **EASE Focus 2**:
The **EASE Focus 2 Aiming Software** is a 3D Acoustic Modelling Software that serves for the configuration and modelling of Line Arrays and conventional speakers close to reality. It only considers the direct field, created by the complex addition of the sound contributions of the individual loudspeakers or array components.
The design of EASE Focus is targeted at the end user. It allows the easy and quick prediction of the array performance in a given venue. The scientific base of EASE Focus stems from EASE, the professional electro- and room acoustic simulation software developed by AFMG Technologies GmbH. It is based on the EASE GLL loudspeaker data file required for its use: **AXIOM_AX Series_v2_1.GLL**, please note that the version must be 2.1 or more. The GLL file contains the data that defines the Line Array with regard to its possible configurations as well as to its geometrical and acoustical properties.

Download the EASE Focus 2 app from the AXIOM website at http://www.axiomproaudio.com/ clicking on downloads section of the product.

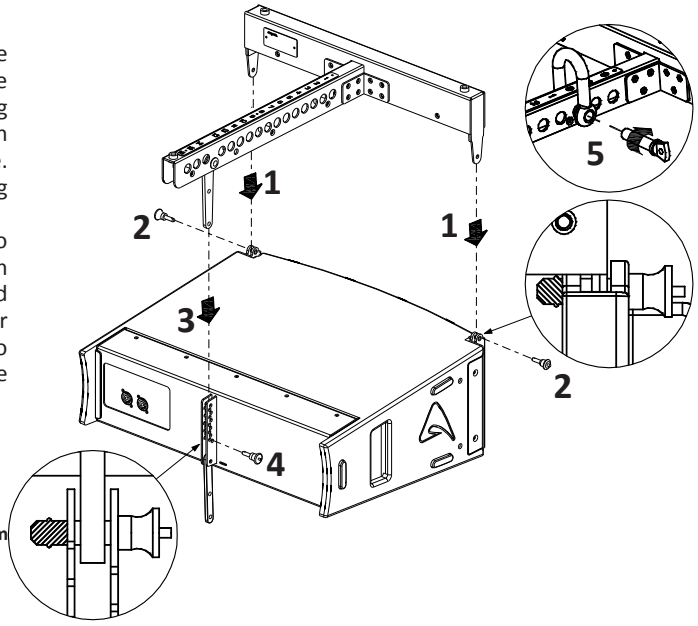
Use the menu option **Edit / Import System Definition File** to import the file **AXIOM_AX Series_v2_1.gll** from the installation Data folder, the detailed instructions to use the program are located in the menu option **Help / User's Guide**.
*Note: Some windows system can require the **.NET Framework 4** that can be download from microsoft website at http://www.microsoft.com/en-us/download/default.aspx.*

WARNING! CAREFULLY READ THE FOLLOWING INSTRUCTIONS AND CONDITION OF USE:
- This loudspeaker is designed exclusively for Professional audio applications. **The product must be installed by qualified personal only**.
- Proel strongly recommends that this loudspeaker cabinet be suspended taking into consideration all current National, Federal, State and Local regulations. Please contact the manufacturer for further information.
- Proel do not accept any liability for damage caused to third parties due to improper installation, lack of maintenance, tampering or improper use of this product, including disregard of acceptable and applicable safety standards.
- During assembly pay attention to the possible risk of crushing. Wear suitable protective clothing. Observe all instructions given on the rigging components and the loudspeaker cabinets. When chain hoists are in operation ensure that there is nobody directly underneath or in the vicinity of the load. Do not under any circumstances climb on the array.

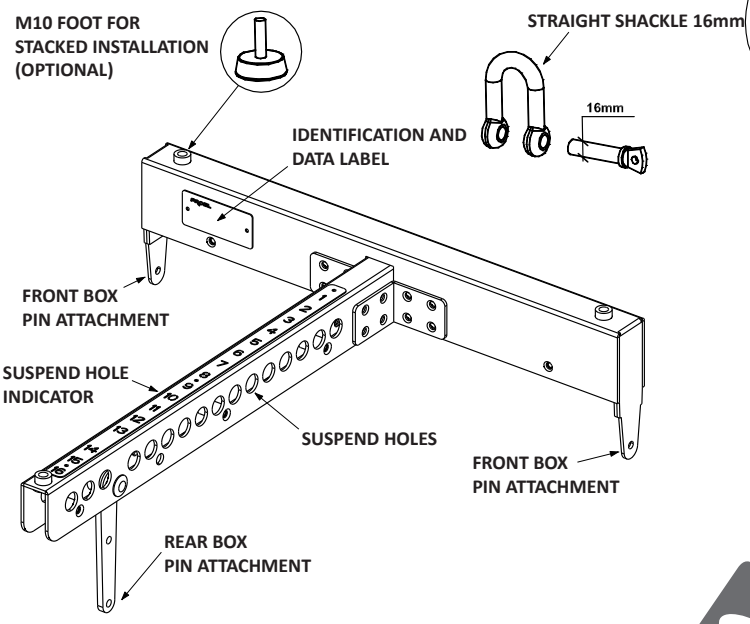
AIMING and SUSPENDING INSTRUCTIONS
Fly Bar and accessories

The AX2065 Systems are built to allow the suspension of array with variable shape and dimensions. Thanks to a suspension mechanism designed to be functional, flexible and safe, each system must be suspended or stacked using the **KPTSW215** or **KPTAX2065** fly bar. The loudspeakers are linked together in a column using a series of couplers integrated in the frame of each enclosure. Each system is set up properly both acoustically and mechanically only using the aiming software.
Coupling system in the front does not require any adjustment: using two locking pins, each loudspeaker box is fixed to the previous. The slotted bar in the back is inserted in a U-shaped frame which features a series of numbered holes. Sliding the slotted bar in the U-shaped frame of the next loudspeaker and inserting a locking pin in one of the numbered holes, it is possible to adjust the relative splay angle between two adjacent loudspeakers in the array column.

KPTSW215 FLY BAR ASSEMBLY SEQUENCE



KPTSW215 FLY BAR AND ACCESSORIES



KPTSW215 fly bar maximum capacity is 540 Kg (1190 lbs) with the 0° angle. It can support, with a safety factor of 10:1, up to:
- **8 AX2065A + 8 AX2065P (flybar from 0° to 10°)**
- **12 AX2065A (flybar from 0 to 10°)**
- **2 SW215AF + 4 AX2065A + 4 AX2065P (flybar at 0°)**
- **2 SW215AF + 8 AX2065A (flybar at 0°)**
- **6 SW215AF (flybar from 0° to 5°)**

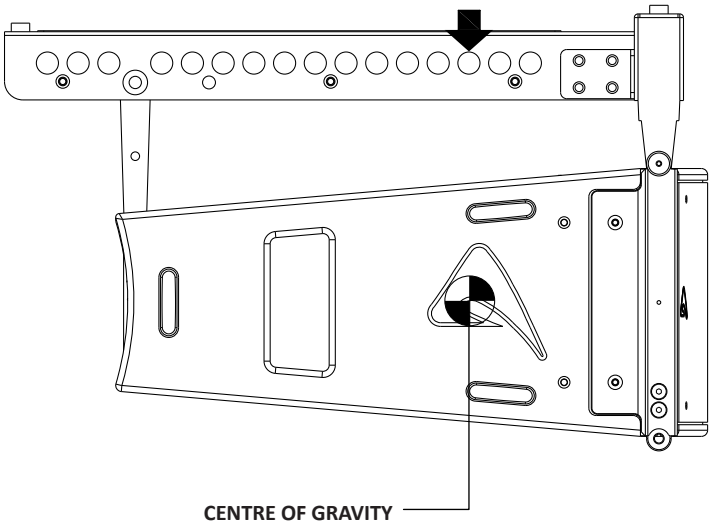
KPTSW215 can be used for stacked array, see further on this manual.

KPTAX2065 fly bar maximum capacity is 200 Kg (441 lbs) with the 0° angle. It can support, with a safety factor of 10:1, up to:
- **6 AX2065 active or passive (flybar from 0° to 10°)**

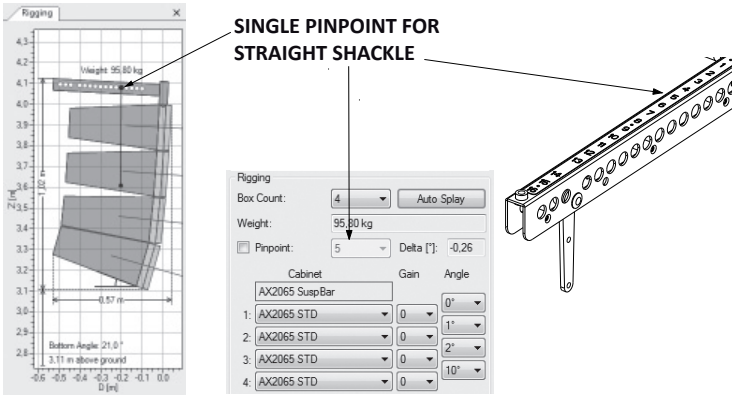
KPTAX2065 can NOT be used for stacked array.

NOTE: The figures illustrate the KPTWS215 only, KPTAX2065 use is similar with capacity limitations.

KPTSW215 FLY BAR FOR FLOWN ARRAY



KPTSW215 FLOWN PINPOINT



Follow the sequence in the figure for fixing the fly bar at the first box. Usually this is the first step before lifting up the system. Be careful to insert properly all the locking pins (1)(2) and (3)(4) then the shackle (5) in the right holes as specified by the aiming software.
When lifting the system always proceed gradually step by step, paying attention to secure the fly bar to the box (and the box to the other boxes) before pulling up the system: this makes easier to insert properly the locking pins. Also when the system is released down, unlock gradually the pins. During the lifting be very careful to not let the cables enter the space between one enclosure and the other, as their compression could cut them.

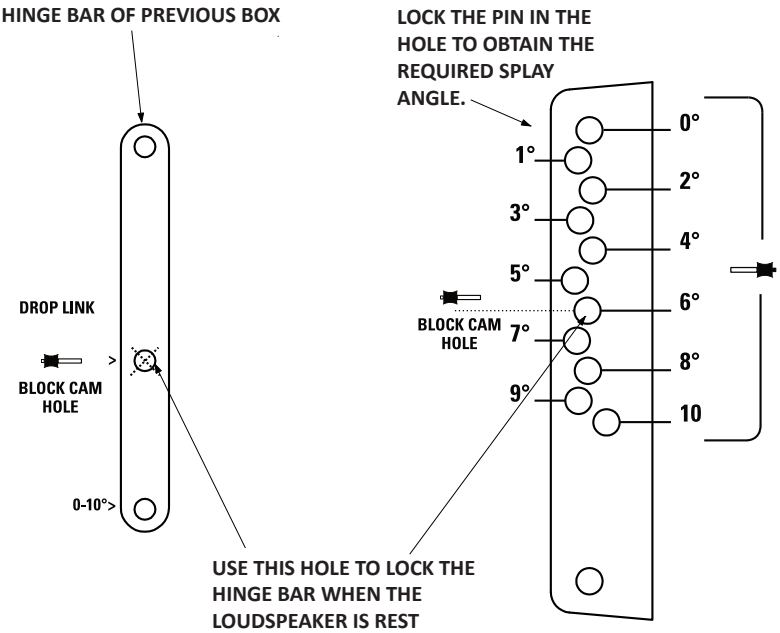
Fly bar suspension and angle setup (centre of gravity)

The first figure shows where the normal centre of gravity is with one box or several boxes arranged in a line. Usually the boxes are arranged to make an arc for the best coverage of the audience, so the center of gravity moves backward. The aiming software suggests the ideal suspension pinpoint taking into account this behaviour: fix the straight shackle in this position.
Note that the ideal aiming angle often doesn't correspond to the pinpoint: there is often a little difference between ideal aiming and real aiming and its value is the Delta angle: positive delta angle can be adjusted a little using two ropes, negative delta angle are self adjusted a little because the cables weighs on the back of the array. With some experience it's possible to consider preventively these required little adjustments.
During the flown set up you can connect the elements of the array to their cables. We suggest to discharge the weight of the cables from the flying pinpoint by tying them with a textile fibre rope, instead of letting them hang freely: in this way the position of the array will be much more similar to the simulation produced by the software.

Pin locking and splay angles set up

The figure below shows how to insert correctly the locking pin and how to set up the splay angle between loudspeakers.

LOUDSPEAKER SPLAY ANGLES SET UP

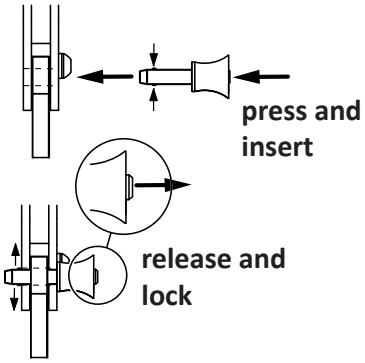


Wind loads

When planning an open-air event it is essential to obtain current weather and wind information. When loudspeaker arrays are flown in an open-air environment, possible wind effects must be taken into account. Wind load produces additional dynamic forces acting on the rigging components and the suspension, which may lead to a dangerous situation. If according to the forecast wind forces higher than 5 bft (29-38 Km/h) are possible, the following actions have to be taken:
- The actual on-site wind speed has to be monitored permanently. Be aware that wind speed typically increases with height above ground.
- Suspension and securing points of the array should be designed to support double the static load in order to withstand any additional dynamic forces.

WARNING!
Flying loudspeakers overhead at wind forces higher than 6 bft (39-49 Km/h) is not recommended.
If the wind force exceeds 7 bft (50-61 Km/h) there is a risk of mechanical damage to the components which may lead to a dangerous situation for persons in the vicinity of the flown array.
- Stop the event and make sure that no person remains in the vicinity of the array.
- Lower and secure the array.

95AXM014 LOCKING PIN



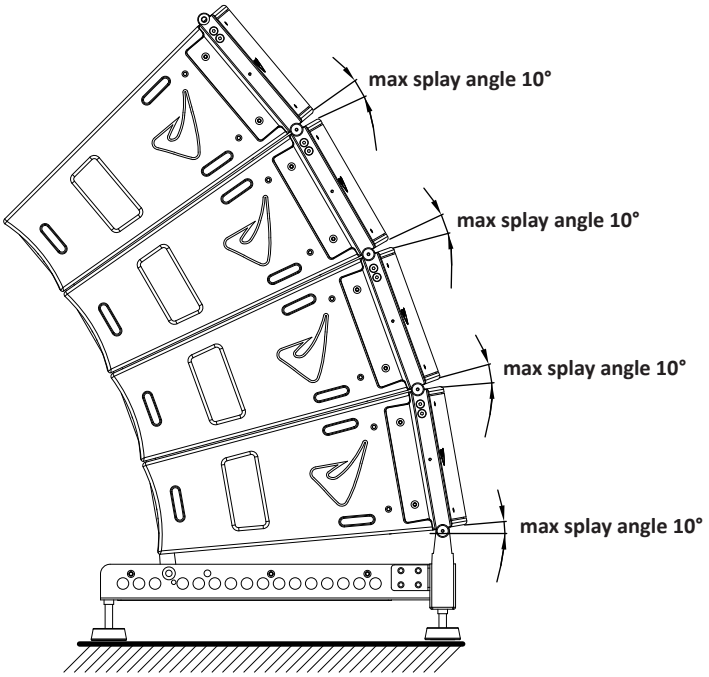
Stacked installation (KPTSW215 only)

WARNING!

- The ground where the KPTSW215 Fly bar serving as ground support is placed needs to be absolutely stable and compact.
- Adjust the feet so to lie the bar perfectly horizontal.
- Always secure ground stacked setups against movement and possible tipping over.
- A maximum of 4 x AX2065 cabinets with the KPTSW215 Fly bar serving as ground support are allowed to be set up as ground stack.

In the stack configuration you have to use the three optional BOARDACF01 feet and the fly bar must be mounted upside down on the ground.
Coupling system in the front do not require any adjustment: using two locking pins each loudspeaker box is fixed to the previous. The slotted bar in the back is inserted in a U-shaped frame which features a series of numbered holes. Sliding the slotted bar in the U-shaped frame of the next loudspeaker and inserting a locking pin in one of the numbered holes, it is possible to adjust the relative splay angle between two adjacent loudspeakers in the array column.
The optimal splay angles can be simulated using the EASE Focus 2 software.

KPTSW215 STACKED ARRAY



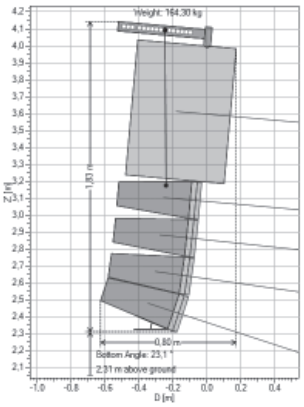
System Processing basic instruction

The AX2065P system does not feature passive filters so it needs an external processor to take care of the filtering, the time alignment and the speaker protection. For the system's processing **PROEL PC260 digital loudspeaker processor** must be used, loaded with dedicated presets for the correct system operation, which offer the best starting point for setting the time alignment, the gain and the equalization. For detailed instructions about the use of PC260 refer to its user's manual. **The presets can be download from the AXIOM web site in the AX2065P download section.**

STANDARD PRESET (name: 2065_4+1_ST01.pcf)

This PRESET is suitable for vertical flown arrays that may range from 4 to 8 boxes or for the centre region of a bigger flown array. It can be used also for stacked arrays.
NOTE: in this preset the subwoofer SW215P is placed at the top of the flown array, in case the sub is placed on ground an additional delay time must be considered (read the PC260 OUT section further in this manual).

System:	AXIOM AX Series
Company:	PROEL S.p.A.
Label:	AXIOM AX Series
Position:	X=0.00 m
	Y=0.00 m
	Z=4.00 m
Orientation:	Hor=0.0°
	Ver=-5.1°
Weight:	164,30 kg
Setup:	SW215 SuspBar
Box Count:	5
Pinpoint Mode:	Best Pinpoint
Pinpoint Number:	7
Remaining Vertical Angle:	0.4°
Bottom Angle:	23,1 °
Above Ground:	2,31 m

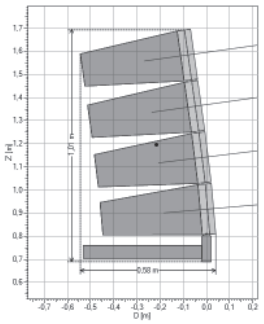


	Box Type	Gain	Rigging Angle	Aiming Angle
	(Frame)			-5.1°
Box 1	SW215F	0.0 dB	0°	-5.1°
Box 2	AX2065 STD	0.0 dB	0°	-5.1°
Box 3	AX2065 STD	0.0 dB	1°	-6.1°
Box 4	AX2065 STD	0.0 dB	2°	-8.1°
Box 5	AX2065 STD	0.0 dB	10°	-18.1°

LONG THROW PRESET (name: 2065_4+1_LT01.pcf)

This PRESET can be used in arrays bigger than 6 or 8 boxes and loaded in the top 1 or 2 boxes in order to obtain a more even distribution of the sound pressure, especially if they point very far away or to the upper deck of a large theatre.

System:	AXIOM AX Series
Company:	PROEL S.p.A.
Label:	AXIOM AX Series
Position:	X=0.00 m
	Y=0.00 m
	Z=0.80 m
Orientation:	Hor=0.0°
	Ver=0.0°
Weight:	96,00 kg
Setup:	AX2065 StackBar
Box Count:	4
Pinpoint Mode:	No Pinpoint



	Box Type	Gain	Rigging Angle	Aiming Angle
Box 4	AX2065 STD	0.0 dB	0°	8.0°
Box 3	AX2065 STD	0.0 dB	1°	8.0°
Box 2	AX2065 STD	0.0 dB	2°	7.0°
Box 1	AX2065 STD	0.0 dB	5°	5.0°
	(Frame)			0.0°

SINGLE/DOWN-FILL PRESET (name: 2065_4+1_SD01.pcf)

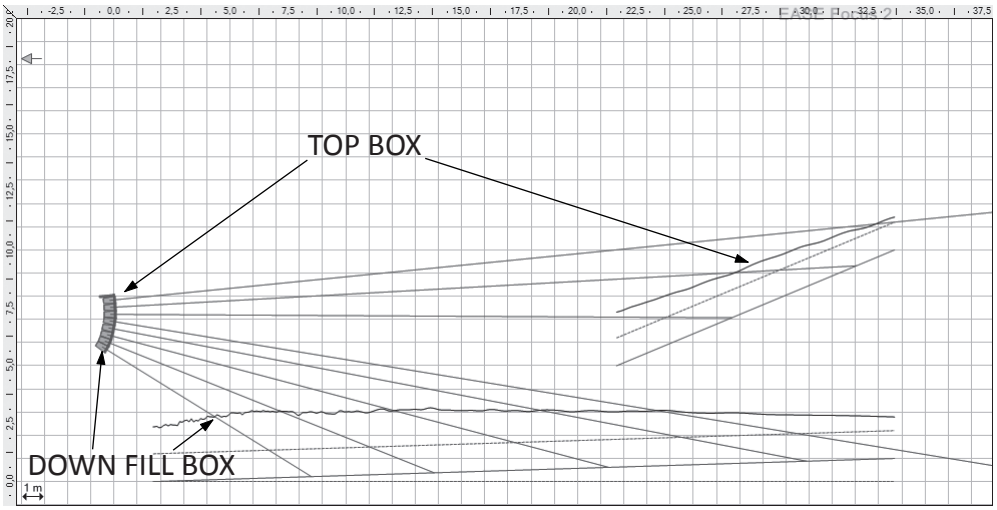
This PRESET, which features a much smoother high frequency response, can be loaded in the bottom boxes (usually 1 or 2 boxes) of a large flown array, in order to reach conveniently the audience close to the stage. It can be used also for the conventional system consisting 1x SW215P at ground and 2x AX2065P on pole.
This preset could be very useful also when the box is used just on its own as a Front Fill element in the front of very large stages.

EXAMPLE OF INSTALLATION IN A THEATRE WITH BALCONY

Here below you can see an example of the use of different PRESETS in an AX2065 flown array installed in a big theatre with balcony. The TOP BOXES of the array are aiming at the balcony while the DOWN FILL box is aiming at the audience close to the stage.

TOP BOXES: the power level at the end of the balcony is lower, as well as the high frequency level.

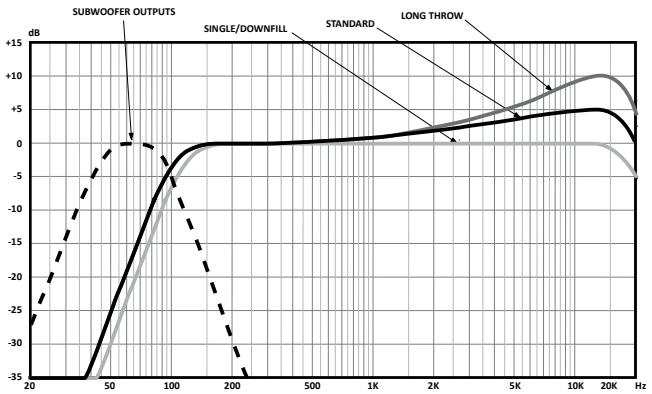
DOWN FILL BOXES: the power level in the proximity of the stage is higher, as well as the high frequency level.



PRESET OPERATIONS

In order to optimize the array performances for this specific application, the PRESETS should be loaded in different PC260 loudspeaker processors used in the following way.
Load the STANDARD preset in the first PC260 processor that drives the amplifiers for the central boxes.
Load the LONG THROW preset in the second PC260 processor that drives the amplifies for the TOP 1 or 2 boxes, in order to compensate the loss of power level and high frequencies of the program sent to the upper deck of the theatre.
Load the DOWN FILL / SINGLE BOX preset in the third PC260 processor that drives the amplifiers for the BOTTOM box in order to smooth the high frequency content of the program sent to the audience close to the stage.
NOTE: the audio signal send to all PC260 processors must be the same so their inputs must be linked with a XLR cable.
NOTE: The outputs 1 and 2 of each PC260 are assigned always to drive the amplifiers for the SW215 subwoofers, so you can use indiscriminately the output 1 and 2 of one of them.

AX2065P - PRESET RESPONSE



IMPORTANT INSTRUCTIONS TO USE GROUPS

If you use more than one PC260 processor to drive the same vertical array system as in the example above, you must always set the same parameters of the input panel for both processors: levels and delay and any other parameter must be always the same. The right way to this is the following:

1) Be sure that each PC260 has not assigned to any device group.
2) Load the STANDARD, SINGLE/DOWN-FILL, LONG THROW preset on each dedicated PC260.
3) Assign every PC260 to the same device group.

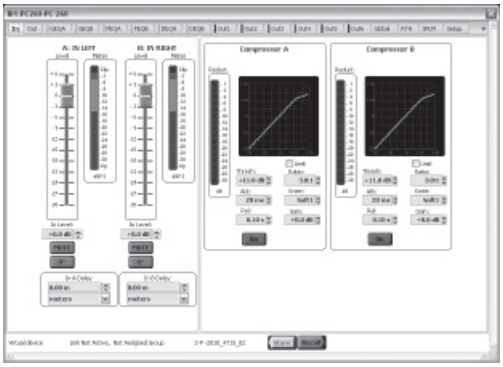
Now any modification made on one PC260 is repeated also on all the others assigned to the same group.

WARNING: After you have assigned all the PC260 to the same group, do not load or save preset, because what you do on one unit will be repeated also on the others (for load and save operations you must remove the units from the groups).

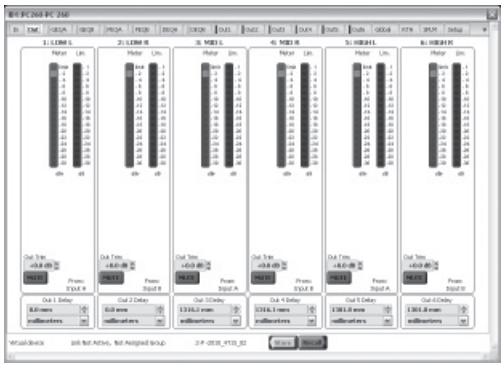
EDIT PARAMETERS

In the PC260 presets some parameters can be customized and some other are protected, this ensure a safe operation of the system. Here is a brief description of customizable parameters:

IN: In this screen you can adjust the input levels, compressors/limiters and delay.
The input range can be optimized in the -30 ÷ +6 dB range. The level is set after the AD conversion, so if you have problems with an excessive input signal use the analog PAD button on the PC260 back panel.
The compressors are set in order to attenuate very high input signals (the threshold is +12 dB), ensuring a more transparent musical behaviour of the system limiting. If needed, the compressor threshold can be freely adjusted.

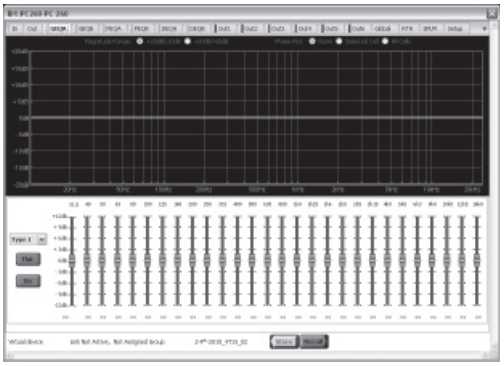


OUT: in this page you can see the level of the output signals and the gain reduction if the limiters are activated. You can also trim (±6 dB) the output signals in order to adjust the balance of LF, MF and HF ranges.



WARNING!
The limiter setting of PC260 and 2065 preset is set for the use of 32 dB fixed gain power amplifiers: contact PROEL if you need a different setting.
The delays are set for the optimal alignment of a standard flown configuration with the vertical array on top of the subwoofers.
If needed, the delay of the subwoofers (LOW-L and LOW-R) can be adjusted in relation to the MID-HIGH outputs for the optimal alignment when the system is installed in a different position.

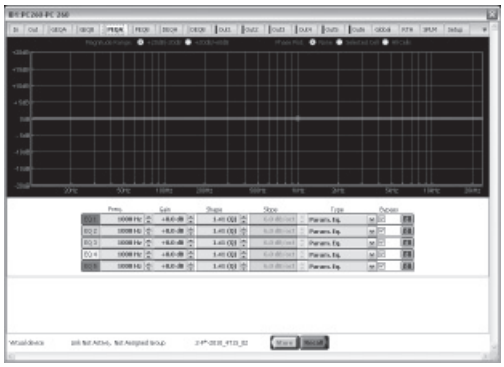
WARNING!
The DELAY difference between MID and HIGH outputs must always be 93 mm (HIGH after MID). If you modify the MID delay to align the tops with the subs, remember always to set the HIGH delay accordingly (+93 mm).



GEQ: this is the graphic equalizer on the processor inputs to be used for equalizing the whole system. It can be used for adjusting the system's response or for fixing particular frequency problems in the environment where the system is installed. The AX2065P preset has been prepared in order to obtain the best performance from the system, so we suggest to avoid extreme use of the GEQ.

PEQ: this is a full parametric 5-band equalizer on the processor's inputs. Each filters can be set also as shelving, notch, allpass, high-pass and lo-pass, so this equalizer can be used to optimize the system response according to the environment characteristics, including temperature, humidity and absorption due to the audience.

DEQ: in the 2065 presets the 3-band dynamic equalizer is used to optimize the system's response so we suggest to do not change its parameters and use it as it is already set.



LIMITED WARRANTY

Proel warrants all materials, workmanship and proper operation of this product for a period of two years from the original date of purchase. If any defects are found in the materials or workmanship or if the product fails to function properly during the applicable warranty period, the owner should inform about these defects the dealer or the distributor, providing receipt or invoice of date of purchase and defect detailed description. This warranty does not extend to damage resulting from improper installation, misuse, neglect or abuse. Proel S.p.A. will verify damage on returned units, and when the unit has been properly used and warranty is still valid, then the unit will be replaced or repaired. Proel S.p.A. is not responsible for any "direct damage" or "indirect damage" caused by product defectiveness.

- This unit package has been submitted to ISTA 1A integrity tests. We suggest you control the unit conditions immediately after unpacking it.
- If any damage is found, immediately advise the dealer. Keep all unit packaging parts to allow inspection.
- Proel is not responsible for any damage that occurs during shipment.
- Products are sold "delivered ex warehouse" and shipment is at charge and risk of the buyer.
- Possible damages to unit should be immediately notified to forwarder. Each complaint for package tampered with should be done within eight days from product receipt.

SAFETY INSTRUCTIONS

– To reduce the risk, close supervision is necessary when the product is used near children.
– Protect the apparatus from atmospheric agents and keep it away from water, rain and high humidity places.
– This product should be site away from heat sources such as radiators, lamps and any other device that generate heat.
– This product should be located so that its location or position does not interfere with its proper ventilation and heating dissipation.
– Care should be taken so that objects and liquids do not go inside the product.
– The product should be connected to a power supply mains line only of the type described on the operating instructions or as marked on the product. Connect the apparatus to a power supply using only power cord included making always sure it is in good conditions.
– WARNING: The mains plug is used as disconnect device, the disconnect device shall remain readily operable.
– Do not cancel the safety feature assured by means of a polarized line plug (one blade wider than the other) or with a earth connection.
– Make sure that power supply mains line has a proper earth connection.
– Power supply cord should be unplugged from the outlet during strong thunderstorm or when left unused for a long period of time.

CE CONFORMITY

Proel products comply with directive 2004/108/EC (EMC), as stated in EN 55103-1 and EN 55103-2 standards and with directive 2006/95/CE (LVD), as stated in EN 60065 standard.

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