FUNCTION SWITCHES		
FRONT PANEL		
Low Cut	Activates 25 Hz Butterworth, 12 dB/Octave high-pass filter	
Phase Invert	Inverts the phase at the individual output	
REAR PANEL		
X-Over Frequency	Multiplies crossover frequency range by 10	
Mode	Selects stereo/mono and 2/3/4 way operation	
LF Sum	Selects normal stereo or mono summed low frequency operation	
	ON=Channel 1 +6 dB louder / Channel 2: same as before	
CONTROLS		
Input	Controls the input gain (+/- 12 dB)	
X-Over Frequency	Controls the crossover frequency	
Delay	Controls the delay at the low output (0 to 2 msec)	
Gain	Controls the output gain (+/- 6 dB)	
POWER SUPPLY		
Main voltages	230 V - 50 Hz	
Power consumption	Max 22 W	
Fuse	T 315 mA H	
Main connection	Standard IEC receptacle	
Dimensions	44,5 x 486,2 x 217 mm	
Net Weight	2,5 Kg	
Shipping weight	3,1 Kg	

Service
All Audio Design PRO products have been inspected and tested before leaving the factory and , if properly used, they will work for many years. However, in case of any problem, please proceed in the following way:

Contact your dealer and inform about the defect you found
In case it won't be possible to solve the problem with the dealer, the product needs to be returned, preferably in its original packaging or in a proper packing to protect it during the transport. Purchase documents must be produced too.
Your dealer will arrange the shipment to our service centre.

PROFESSIONAL SPEAKERS, POWER AMPLIFIERSS
AND ACCESSORIES

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User's Manual

Professional Crossover



PA XO

OVERVIEW

For years, our engineers worked hard at the project of this professional crossover.
PA XO, thanks to top level components can meet the most exigent needs for professional installation.
Simple and easy control make the PA XO become the first choice in professional audio field.

ATTENTION

WARNING - using electric product, basic precautions should always be followed, including the following:

(1) Read all the SAFETY INSTRUCTIONS before using the product

(2) To reduce the risk of injury, close supervision is necessary when the product is used near children

(3) Do not use this product near water-for example, near a bathtub, washbowl, kitchen sink, in a wet basement or near a swimming pool or the like.

(4) This product is capable of producing sound levels that could cause permanent hearing loss. DO NOT operate for a long period of time at high volume or at a level that is uncomfortable. If you experience any hearing loss or ringing in the ears, you should consult an audiologist.

(5) This product should be located so that its location or position does not interfere with its proper ventilation

(6) This product should be located away from heat sources such as radiators, heat registers or other products that produce heat

(7) The product should be connected to a power supply only of the type described on the operating instructions as marked on the product. Always ensure that a good quality mains lead is used applicable for your country

(8) If the mains fuse need be replaced, DISCONNECT THE PRODUCT FROM THE MAINS SUPPLY. The fuse is above the mains IEC socket, and must be replaced with a fuse of the type and rating stated on the rear panel. If a replacement fuse fails immediately, contact your local service agent. DO NOT replace with a higher value

(9) The power-supply cord of the product should be unplugged from the outlet when left unused fro a long period of time. When unplugging the power-supply cord, DO NOT pull on the cord, but grasp it in the plug.

(10) Ensure the mains isolation switch is readily accessible when the product is in use

(11) Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

(12) The product should be serviced by qualified service personnel when:

A. The power-supply cord or the plug has been damaged; or

B. Object have fallen, or liquid has been spilled into the product; or

C. The product has been exposed to rain; or

D. The product does not appear to operate normally or exhibits a marked change in performance; or

E. The product has been dropped or the enclosure damaged.

(13) DO NOT attempt to service the product beyond that described in the user maintenance instructions. All other servicing should be referred to qualified service personnel.

(14) WARNING-DO NOT place objects on the product' s power cord or place it in a position where anyone could trip over, walk on or roll anything over it. DO NOT allow the product to rest on or to be installed over power cords of any type. Improper installations of this type create the possibility of fire hazard and / or personal injury.

AudioDesign PRO
PROFESSIONAL SOUND SYSTEM
PROFESSIONAL CROSSOVER PA XO

Main Features

INPUT		
Connectors	XLR	
Type	Electronically servo-balanced RF filtered	
Impedance	Balanced > 50 kOhms, Unbalanced > 25 kOhms	
Max Input level	+ 22 dBu typical, Balanced or Unbalanced	
CMRR	> 40 dB, typically > 55 dB at 1 kHz	
OUTPUT		
Connectors	XLR	
Type	Electronically servo-Balanced, RF filtered	
Impedance	Balanced 60 Ohms, Unbalanced 30 Ohms	
Max Output level	+ 20 dBu Balanced or Unbalanced	
PERFORMANCE		
Bandwidth	20 Hz ÷ 20 kHz, + /- 0,5 dB	
Frequency Response	5 Hz ÷ 90 kHz + /- 0,3 dB	
Signal to Noise	Ref.: + 4 dBu, 20 Hz to 20 kHz, Unweighted	
	Stereo Mode	**Nono Mode**
Low Output	> 93 dBu	> 93 dBu
Low-Mid Output		> 94 dBu
Mid Output	> 95 dBu	
High-Mid Output		> 94 dBu
High Output	> 90 dBu	> 88 dBu
Dynamic Range	> 106 dB, Unweighted	
THD & Noise	< 0,04%	
Interchannel Crosstalk	High to Low	< 93 dB
	High to Mid	< 94 dB
	Mid to Low	< 95 dB
	High to High-Mid	< 95 dB
	High-Mid to Low-Mid	< 95 dB
	Low-Mid to Low	< 92 dB
CROSSOVER		
Filter Type	Linkwitz-Riley, 18 dB/Octave, state-variable	
Stereo Mode Frequencies	x 1	x 10
Low/High	44 to 930 Hz	440 Hz to 9,3 kHz
Low/Mid	44 to 930 Hz	440 Hz to 9,3 kHz
Mid/High	440 Hz to 9,3 kHz	
Mono Mode Frequencies	x 1	x 10
Low/Low-Mid	44 to 930 Hz	440 Hz to 9,3 kHz
Low-Mid/High-Mid	440 Hz to 9,3 kHz	
High-Mid/High	440 Hz to 9,3 kHz	

Generator/Analyzer
In combination with a measuring microphone and a generator producing pink noise that is fed into a channel in your PA console, an analyzer gives you a graph that shows how the acoustic energy is distributed among the various frequency bands.

Your ears
When you listen to the overall sound of your system, you should walk around the audience area and try to detect resonance frequency or cancellations. The sound should be optimized for the position where most of the audience will be gathered, however, without neglecting other areas. This often means that the system must be operated in mono. Whenever you use technical aids, such as analysers, measuring microphones etc., you should check the results with your ears.

Setting the input levels.
Both inputs provide a gain boost/cut of up to 12 dB. Normally the output level of the mixing console and the input sensitivity of the power amp are the same, i.e. 0 dB in the console correspond to 0 dB in the amplifier. In this case, the power amp is fully driven and the PA XO should have no influence on the system level, as all input/output controls are set to 0 dB. However, in a home recording or discotheque environment using operant levels of -10 dBV, the power amp would still need +4 dBu, which requires some additional gain of 12 dB. If so, the PA XO's INPUT control must be set to maximum.

Setting the output levels
The output levels of the single bands can be raised/lowered by as much as 6 dB. To achieve a linear frequency response in the system, all output levels should be adjusted with the help of an analyzer. Then, mute all outputs except for one to check the crossover frequencies and levels, play back pink noise over the system at an appropriate volume level. Now, when you switch on the adjacent band, the level measured around the crossover frequency should go up by 3 dB. Repeat this process for all crossover frequencies

Finding "drop-outs" in the frequency response
Check the entire frequency response of the system. Rooms have quite an impact on the frequency response of the speakers systems, due to resonance and various reflections. So, you cannot expect to achieve a linear frequency response right from the start. Use an equalizer. Look for a drop-outs around the crossover frequencies.
However if the frequency response shows some irregularities, it can be useful to correct it with a crossover network, before using an equalizer (EQ). Subsequently, the crossover frequencies must be correct with an EQ as far as this is possible.

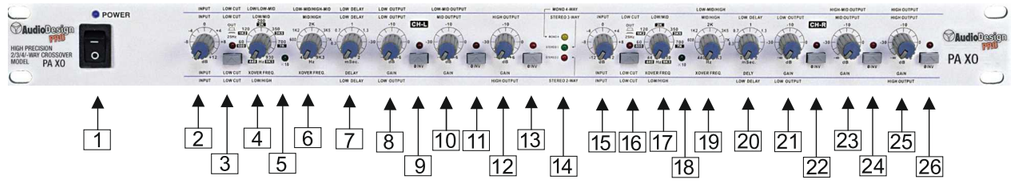
Setting the crossover frequencies
The use of extremely high grade potentiometers, made unnecessary to install a fixed-frequency plug-in modules. Thus, you have a wide range of setting options available that even more expensive crossover networks hardly give you. The PA XO works in two specific frequency ranges: 44 through 930 Hz and 440 Hz through 9.3 kHz. The Linkwitz-Riley filters employed in the PA XO feature a slope of 24 dB/Oct. High grade components such as 1% tolerance metal film resistors ensure a perfect phase and amplitude response at all crossover frequencies. Pls consult the manufacturer's specifications of the various speaker components to set the crossover frequencies When polar plots of the specific speaker or horns are available, use them too. Don't set the crossover frequencies around peaks or drop-outs in the frequency response. But try to find a range that is largely linear. When folded woofer horns are used, you also need to take the horn length into account.

IMPORTANT: Never operate speaker/horn drivers below the frequency range specified by the manufacturer !!



INTRODUCTION
Thanks you very much for expressing your confidence in Audio Design Pro products by purchasing the PA XO.
This manual first describes the terminology used, so that you can fully understand the PA XO and it's functions. Please read the manual carefully and keep it for future reference.
The PA XO is a high quality active crossover network that can be used for 2, 3 or even 4 way sound reinforcement systems.
Whether you need to set up a system, for small clubs or large halls, improve an on stage monitoring system or enhance your studio monitors with an additional subwoofer, your PA XO is the ideal choice for all of these applications.
Your PA XO requires a 1 height unit of a rack space. Pls allow for an additional 10 cm of the rack depth for the rear panel connectors. Be sure that there is enough spare around the unit for cooling and please do not place the PA XO on high temperature devices such as radiators etc. to avoid overheating.
Before you connect your PA XO to the mains, please make sure that your local voltage matches the voltage required by the unit! The main connection of the PA XO is made by using the enclosed mains cable and standard IEC receptacle. It's meets all the international safety certification requirements.
Please make sure that all the units have a proper ground connection. For your safety

- **MAIN FEATURES**
- Professional High Precision Stereo 2 way / 3 way - Mono 4 way crossover
- World class performance Linkwitz-Riley filters with 24 dB/Oct slope
- Absolutely zero phase difference
- Individual output GAIN controls for all bands
- Individual LIMITER on each output for optimal loudspeaker protection
- Individual output MUTE switches for easy band adjustment
- Individual PHASE reverse switches for instant phase correction
- Switchable 25 Hz LOW CUTTER on each output for low frequency driver protection
- "LOW SUM" function provides low level mono output for subwoofer operation
- Adjustable time delay for phase alignment between drivers
- CD horn equalization for constant directivity horn compensation
- Servo balanced, gold plated XLR connectors for all inputs and outputs
- Ultra high precision potentiometers for ultimate accuracy and repeatability
- Ultra low noise 4580 audio operational amplifiers for outstanding sound performance
- Illuminated switches for secure operation in dark stage environments
- Shielded toroidal main transformer for minimal noise interference
- High quality components and exceptionally rugged construction ensure long life



Front Panel

1 POWER Switch: Switch on the X-Over

2 15 INPUT controls: These controls adjust the input gain from +12 to - 12 dB

3 16 LOW CUT button: These buttons activate the 25 Hz high pass filter protecting the woofers against low frequency signals

4 17 LOW/MID X-OVER FREQ. control: These controls govern the crossover frequency between the Low and Mid bands. When the X-Over frequency button on the rear of the unit is pressed, the frequency range is multiplied by 10.

6 19 MID/HIGH X-OVER FREQ. control: These controls govern the crossover frequency between the Mid and High bands.

7 20 DELAY control: This control delay the Low signal by as much as 2 ms which is useful to align the speaker systems in phase

8 21 LOW OUTPUT level: Control the output level of the Low band from + 6 to - 6 dB

9 22 LOW PHASE INVERT buttons: These buttons reverse the polarity of the Low output

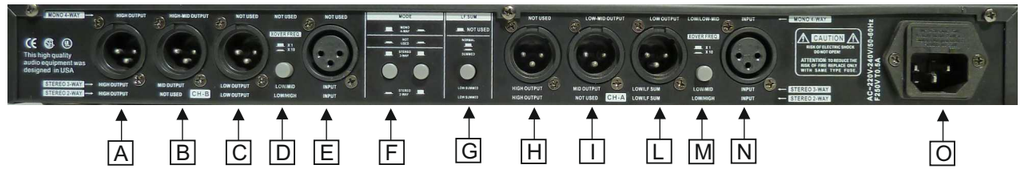
10 23 MID OUTPUT level: Control the output level of the Mid band from + 6 to - 6 dB

11 24 MID PHASE INVERT buttons: These buttons reverse the polarity of the Mid output

12 25 HIGH OUTPUT level: Control the output level of the High band from + 6 to - 6 dB

13 26 HIGH PHASE INVERT buttons: These buttons reverse the polarity of the High output

14 LED Lights: dependeing on the position of MODE push buttons (F) on the back side, show the selection made (2 or 3 ways stereo / 4 ways mono)



Rear Panel

A H HIGH OUTPUT connector: Output for the HIGH band signal (all MODE selection

B I MID OUTPUT connector: Output for the MID band signal (CH 2 3 ways selection or MID HIGHT band in mono 4 ways

C L LOW OUTPUT connector: Output for the LOW band signal (CH 2 in 2 or 3 way selection.

D M X-OVER FREQ. button: This button serves to switch over the control range of the front panel LOW/MID X-OVER FREQ: control from 44 to 930 Hz or 440 Hz to 9,3 kHz.

E N INPUT connector: Ch 2

F MODE button: In stereo 3 way mode, both buttons must be out. Pls observe the labels on the rear panel of the unit.
IMPORTANT: Always switch off the entire system before you press this button as it produces heavy interference noise to the Low output of channel 1, which is particularly useful in system using additional subwoofer.

G LOW SUM button: In stereo mode, the two LOW paths can be summed with the and routed to the Low output of channel 1.

O VDE Power Socket: 220 VAC

Suggestion for the best use

Tools

The following tools are indispensable for a perfect system alignment. You should by all means try to obtain the speaker specifications from the manufacturer, in order to operate the system in their proper mode and level ranges. Use the manufacturer's documentation to adjust the operating mode and crossover frequencies.
Important: Audio Design does not assume any responsibility for speaker damage caused by improper use of the PA XO.

Measuring microphone.

For making measurements you need a high grade microphone with a frequency response that should be as linear as possible, over the entire frequency range or at least between 90 Hz and 15kHz. Place the microphone about 5 m in front of the speaker system to be measured in a high where it is on axis with the drivers of the two frequency bands you wish to measure. When setting the levels for the individual frequency bands, delay times and crossover frequencies by means of measuring microphone, you should operate only one speaker stack each. Usually the measuring microphone needs to be repositioned between two specific measurements.