



**XO-231**

Crossover

ENGLISH

**USER'S MANUAL**

## IMPORTANT SAFETY INSTRUCTIONS

For your own safety you should read this section in full first!

### **Risk of electrical shock!**

- Connect the device only to a properly wired and earthed electrical wall socket providing a mains voltage of 230 V~/ 50 Hz.
- NEVER operate the device if the power plug or power the cord is damaged.
- NEVER submerge the device in water. Wipe it only with a slightly damp cloth.
- NEVER expose the device to rain or moisture and never use it in a damp or wet environment.
- Ensure that the power cord does not become wet during operation.
- You must NEVER open the housing of the device or try to repair it. There are no user serviceable parts inside. Warranty will become void if you open the housing.
- Do not place objects containing fluids, e.g. flower vases or beer bottles, on or near the device.
- Notice regarding power disconnection:  
To switch the device off and to disconnect it from the power source the power plug must be removed from the power socket. For this reason the device should be placed in a position where a constant unobstructed access to the power socket is assured, thus in an emergency situation you are able to immediately pull out the power plug. To eliminate the risk of fire you must completely disconnect the power plug from the power socket after the device has been used.

- Always grasp the power cord by the plug. Do not pull on the cord itself and never touch the power cord with wet hands as this could result in a short circuit or an electrical shock. Do not place the device, speaker cabinets or anything else on the power cord and make sure that it does not become clamped. Place the power cord in a position where it can not be trod on. A damaged power cord can cause a fire or an electrical shock. Check the power cord from time to time. Should it become damaged contact our customer service centre to have it replaced.
- Never manipulate the power cord of the plug. If a power cord is provided with an earth lead, this is mandatory to ensure safe operation!

### **Risk of fire!**

- NEVER leave the device unattended while it is switched on.
- Never cover the ventilation slots of the device while it is switched on. Avoid placing this device in locations that provide insufficient ventilation or hot locations and do not place the device in direct sunlight or under strong artificial light sources. Otherwise, it may overheat and become irreparably damaged.
- Do not operate or store the device in hot locations or near heat sources like stoves, radiators or the like.
- Do not place any open sources of fire, like candles, on the device.
- When a thunderstorm with the risk of lightning threatens please disconnect the device from the mains power.

### **Risk of personal injury!**

- Keep the power cord and device away from children. Children frequently underestimate the dangers of electrical equipment.
- Ensure a safe location for the device.
- Do not operate the device if it has sustained a fall or is damaged. Arrange for the device to be checked and/or repaired by qualified technicians.

### **WARNING:**



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

# XO-231

## USER'S MANUAL

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## INTRODUCTION

Congratulations on your purchase of the XO-231, a quality high precision 2-way stereo 3-way mono crossover with a multitude of built-in features, such as low pass filters, phase invert switches, and an additional subwoofer channel. This user's manual is specially designed to provide you with the best possible information on using the device. We strongly suggest reading the manual carefully before attempting to handle this device, and then store it in an easily accessible place for future reference.

## FEATURES

- Professional, high-precision stereo 2-way/mono 3-way crossover with separate subwoofer output
- Separate subwoofer section with independent frequency control
- World-class performance 24dB per octave Linkwitz-Riley filters
- Absolutely flat summed amplitude response, zero phase difference
- Individual output level controls for all bands
- Individual output mutes for easy band adjustment
- Individual phase reverse switches for instant phase correction
- Switchable 25Hz subsonic filter on each input for low frequency driver protection
- Servo-balanced, XLR connectors for all inputs and outputs
- Ultra-high precision potentiometers for ultimate accuracy and repeatability
- Ultra low-noise audio operational preamplifiers for outstanding sound performance
- Illuminated switches for secure operation in dark stage environments
- High-quality components and exceptionally rugged construction for long life and reliability
- Shielded toroidal mains transformer for minimal noise interference

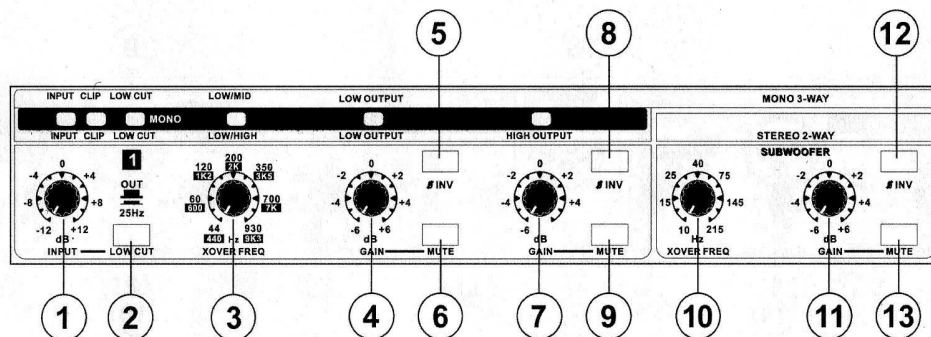
## QUICK SETUP

1. Make sure your unit is off. Preferably remove the AC power cable.
2. Connect your required output device to the XO-231's input connector. Commonly, this would be a mixer's auxiliary or main output.
3. Connect all of your required input devices to the device's output connectors. Commonly this would be amplifiers or active speakers/subwoofers.
4. Set the mode button on the rear to your needs. There are two modes total: 2-way stereo and 3-way mono.
5. Turn your devices on in this order: instruments, mixer, signal processors (including the XO-231), amps/speakers.

## OPERATING THE XO-231

As the XO-231 runs in a variety of different modes, we have separated this user's manual by these different modes and highlighted the control elements pertaining to each mode as to help better make the distinction between critical.

**Note:** on the rear of the device, the labels located above or below any of the connectors refer to different crossover modes available. Ensure the MODE switch and the corresponding connectors are properly configured as to prevent damage occurring to your speakers.



## 2-WAY STEREO OPERATION

Set the XO-231 to 2-way stereo by ensuring the Mode button on the rear of the device is pressed down. When set correctly, the stereo LED on the front of the device will light up, as well as the corresponding function buttons. When set to stereo, both channels will work in an identical manner.

### Front Panel

#### 1. Input Control

This control will adjust the input gain between -12 and +12 dB.

#### 2. Low Cut Button

Pushing this button will activate a low cut (high pass) filter, set at 25 Hz, which will help protect woofers from extremely low frequency signals.

#### 3. Low/High Crossover Frequency Control

This control will determine the crossover frequency between the low and high frequency signals. When the Crossover Frequency button on the rear of the device is pushed in, the frequency range is multiplied by a factor of 10.

#### 4. Low Output Control

This controls the level of the low-band output between -6 and +6 dB.

#### 5. Low Phase Invert Control

This button reverses the phasing of the low-band output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 6. Low Mute Button

Pushing this button will mute the low-band signal.

#### 7. High Output Control

This controls the level of the high-band output between -6 and +6 dB.

#### 8. High Phase Invert Button

This button reverses the phasing of the high-band output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 9. High Mute Button

Pushing this button will mute the high-band signal.

#### 10. Subwoofer Crossover Frequency Control

This control will determine the crossover frequency between the low and subwoofer frequency signals between 10 and 215 Hz.

#### 11. Subwoofer Gain Control

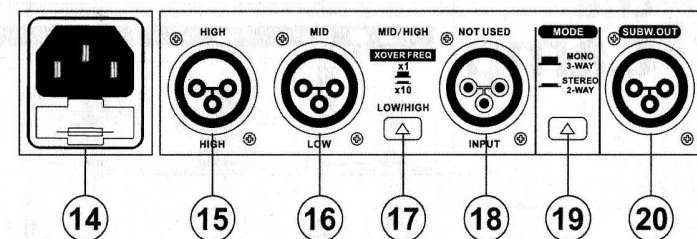
This control is used to set the output level of the subwoofer output.

#### 12. Subwoofer Phase Invert Button

This button reverses the phasing of the subwoofer output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 13. Subwoofer Mute Button

Pushing this button will mute the subwoofer signal.



### Rear Panel

#### 14. AC Connector and Fuse Holder

This connector is used to supply power to the XO-231 through the AC cable provided along with this unit. The fuse holder located below this connector is used to house the connector's fuse. If for some reason the fuse blows, replace it with a fuse of identical type and rating.

#### 15. High Output Connectors

This connector will output the high-band signal.

#### 16. Low Output Connectors

This connector will output the low-band signal.

#### 17. Crossover Frequency Button

Pushing this button will raise the control range of frequencies adjustable by the high/low crossover frequency control by 10 times (i.e. when the button is released, the control range will be between 44 and 930 Hz; pushed-in, the range will be between 440 Hz and 9.3 kHz).

#### 18. Input Connector

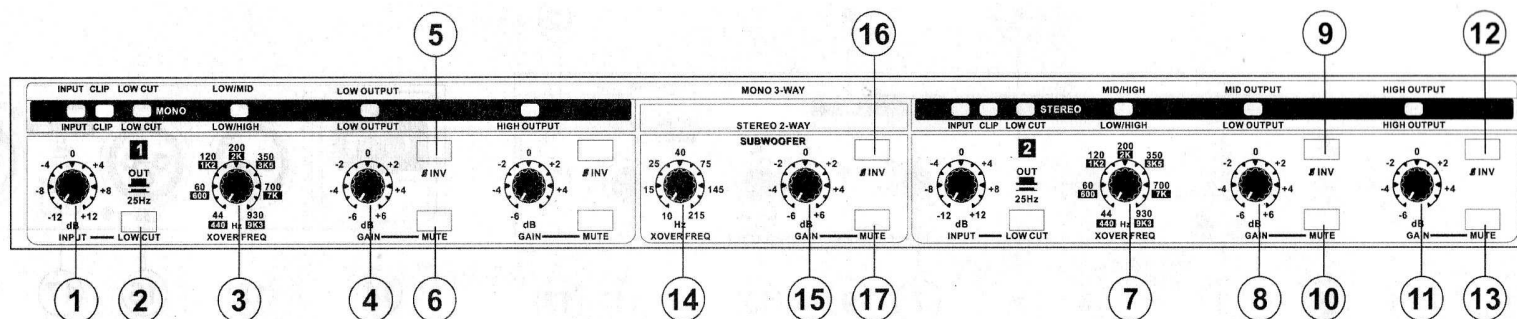
Users can connect their balanced or unbalanced input signals here.

#### 19. Mode Button

This button determines the operating of the crossover. For 2-way stereo operation, the button should be pressed. Release, the XO-231 will be set to 3-way mono. **Note:** Be sure to turn your system off before changing the setting of this button as it produces interference that may have a negative effect on speakers or other equipment.

#### 20. Subwoofer Output Connectors

This connector will output the subwoofer signal. This signal remains constant when in mono or stereo mode.



## 3-WAY MONO OPERATION

Set the XO-231 to 3-way mono by releasing the Mode buttons on the rear of the device. When set correctly, the mono LED on the front of the device will light up, as well as the corresponding function buttons.

### Front Panel

#### 1. Input Control

This control will adjust the input gain between -12 and +12 dB.

#### 2. Low Cut Button

Pushing this button will activate a low cut (high pass) filter, set at 25 Hz, which will help protect woofers from extremely low frequency signals.

#### 3. Low/Mid Crossover Frequency Control

This control will determine the crossover frequency between the low and mid frequency signals. When the Crossover Frequency button on the rear of the device is pushed in, the frequency range is multiplied by a factor of 10.

#### 4. Low Output Control

This controls the level of the low-band output between -6 and +6 dB.

#### 5. Low Phase Invert Control

This button reverses the phasing of the low-band output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 6. Low Mute Button

Pushing this button will mute the low-band signal.

#### 7. Mid/High Crossover Frequency Control

This control will determine the crossover frequency between the mid and high frequency signals. When the Crossover Frequency button on the rear of the device is pushed in, the frequency range is multiplied by a factor of 10.

#### 8. Mid Output Control

This controls the level of the mid-band output between -6 and +6 dB.

#### 9. Mid Phase Invert Button

This button reverses the phasing of the mid-band output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 10. Mid Mute Button

Pushing this button will mute the mid-band signal.

#### 11. High Output Control

This controls the level of the high-band output between -6 and +6 dB.

#### 12. High Phase Invert Button

This button reverses the phasing of the high-band output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 13. High Mute Button

Pushing this button will mute the high-band signal.

#### 14. Subwoofer Crossover Frequency Control

This control will determine the crossover frequency between the low and subwoofer frequency signals between 10 and 235 Hz.

#### 15. Subwoofer Gain Control

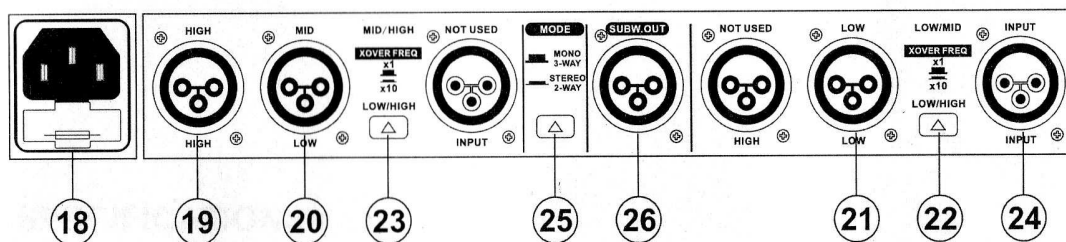
This control is used to set the output level of the subwoofer output.

#### 16. Subwoofer Phase Invert Button

This button reverses the phasing of the subwoofer output, making the signal appropriate for out-of-phase or incorrectly wired speakers.

#### 17. Subwoofer Mute Button

Pushing this button will mute the subwoofer signal.



## Rear Panel

### 18. AC Connector and Fuse Holder

This connector is used to supply power to the XO-231 through the AC cable provided along with this unit. The fuse holder located below this connector is used to house the connector's fuse. If for some reason the fuse blows, replace it with a fuse of identical type and rating.

### 19. High Output Connectors

This connector will output the high-band signal.

### 20. Mid Output Connectors

This connector will output the mid-band signal.

### 21. Low Output Connectors

This connector will output the low-band signal.

### 22. Crossover Frequency Button

Pushing this button will raise the control range of frequencies adjustable by the low/mid crossover frequency control by 10 times (i.e. when the button is released, the control range will be between 44 and 930 Hz; pushed-in, the range will be between 440 Hz and 9.3 kHz).

### 23. Crossover Frequency Button

Pushing this button will raise the control range of frequencies adjustable by the mid/high crossover frequency control by 10 times (i.e. when the button is released, the control range will be between 44 and 930 Hz; pushed-in, the range will be between 440 Hz and 9.3 kHz).

### 24. Input Connector

Users can connect their balanced or unbalanced input signals here.

### 25. Mode Button

This button determines the operating of the crossover. For 3-way mono operation, the button should be released.

When pressed down, the XO-231 will be set to 2-way stereo.

**Note:** Be sure to turn your system off before changing the setting of this button as it produces interference that may have a negative effect on speakers or other equipment.

### 26. Subwoofer Output Connectors

This connector will output the subwoofer signal. This signal remains constant when in mono or stereo mode.

## APPLICATION

### Measurement & Setup Tools

By using a hand-held spectrum analysing tool along with pink noise, users are able to better perfect their system's sound. Check the operation manuals for your analyser and pink-noise generator for many more useful tips on set up. Play the pink noise through your system and stand about 5 meters from your speaker to take measurements with the spectrum analyser.

### Setting Input Levels

The input level can be cut and boost by up to 6 dB. Provided the output level of your mixer is set to an acceptable degree, setting all input controls to 0 dB should be perfectly acceptable. In the event that the device you connect to the XO-231's input is a consumer level device (i.e. signal level is as low as -10dBV), using the full amount of boost that the input level control allows may be necessary.

### Setting Output Levels

Output levels of each individual band can be cut and boost by up to 6 dB. With the help of an analyser, all output levels can be set to achieve a linear frequency response in the system. First mute each output, leaving the one you wish to set active, and check crossover frequencies and levels by playing pink-noise through your system. Then, when switching on an adjacent band, the level measured at the crossover frequency should immediately go up by 3 dB. This can then be repeated for all output channels.

### Setting the Crossover Frequency

The first thing to keep in mind when setting your crossover is what frequencies can my speakers handle? Be sure to check your subwoofer, full-range speaker or driver's user's manual before setting your crossover frequencies. Keeping the signal sent to the speaker in the frequency range ascribed in the user's manual will ensure your speakers function smoothly and correctly.

The Linkwitz-Riley filter employed by the XO-231 employs a slope of 24 dB per octave. It may be interesting to note that, due to the Crossover Frequency Button on the rear of the device, the crossover frequency for the low frequency band is adjustable between 44Hz and 9.3 kHz. This allows for the low output to be used with full-range speakers as well as subwoofer speakers.

### Subwoofer Output

The XO-231 features an individual subwoofer output that runs whether in stereo or mono operation. The subwoofer output, featured in addition to the low frequency output, allows exceptionally loud and deep bass to be played through your system. The subwoofer signal is a combined mono signal of the channel 1 and 2 input signals.

## SPECIFICATIONS

### Audio Inputs

Connectors	XLR
Type	Electronically servo-balanced, HF filtered
Input Impedance	Balanced >50 kohm, unbalance >25 kohm
Max. Input Level	+22 dBu typical, balanced or unbalanced
CMRR	>40dB, typical >55dB at 1 kHz

### Audio Outputs

Connectors	XLR
Type	Electronically servo-balanced, HF filtered
Output Impedance	Balanced 60 ohm, unbalance 30 ohm
Max. Output Level	+20 dBu, balanced or unbalanced

### Performance

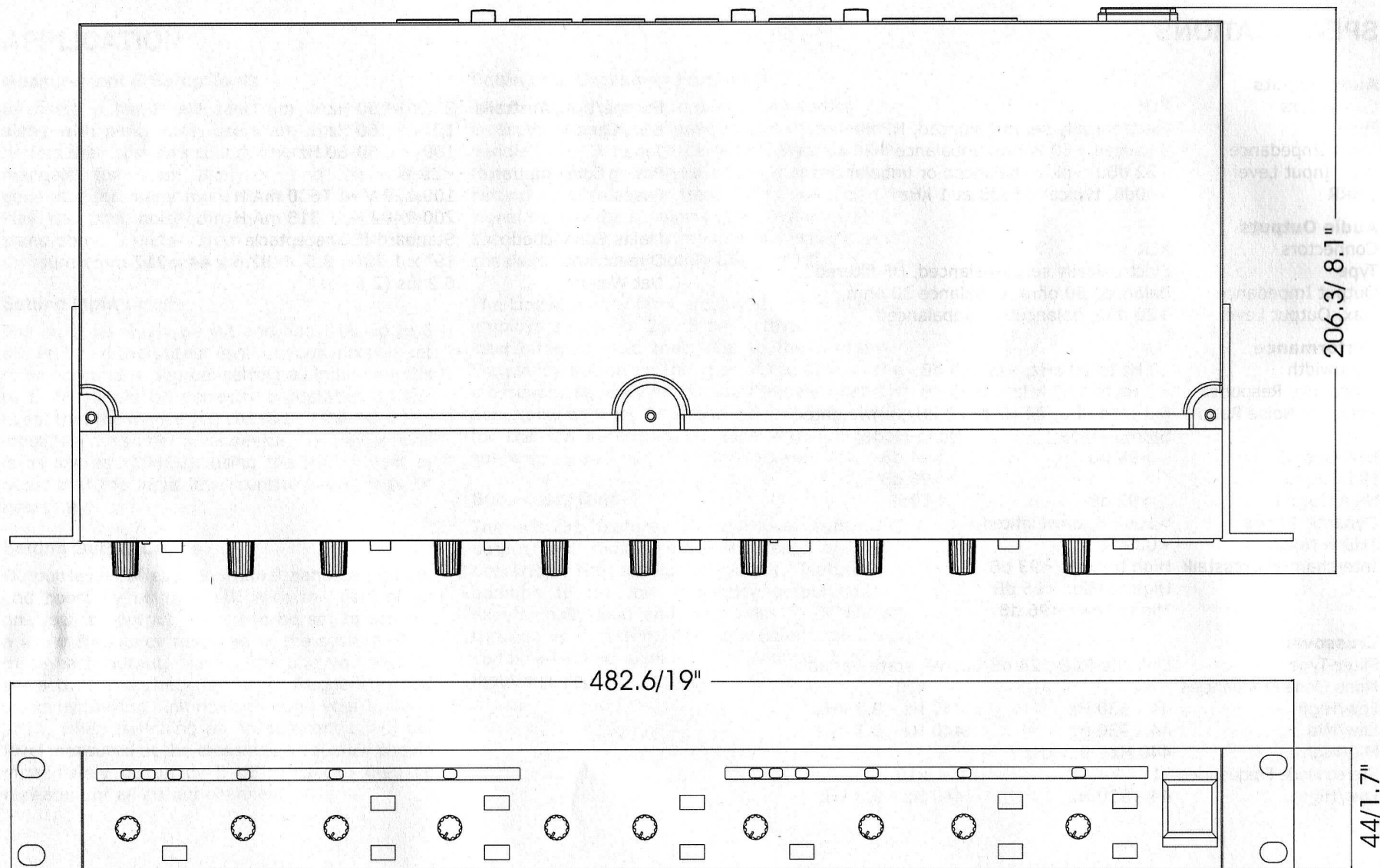
Bandwidth	20 Hz to 20 kHz, +0/-0.5 dB	
Frequency Response	<5 Hz to >60 kHz, +0/-3 dB	
Signal to Noise Ratio	Ref.: +4 dBu, 20 Hz to 20 kHz, unweighted	
	<u>Stereo-Mode:</u>	<u>Mono-Mode:</u>
Low Output	>94 dB	>94 dB
Mid Output		>96 dB
High Output	>92 dB	>92dB
Dynamic Range	>106 dB, unweighted	
THD & Noise	<0.04%	
Interchannel Crosstalk	High to Low: <93 dB	
	High to Mid: <95 dB	
	Mid to Low: <96 dB	

### Crossover

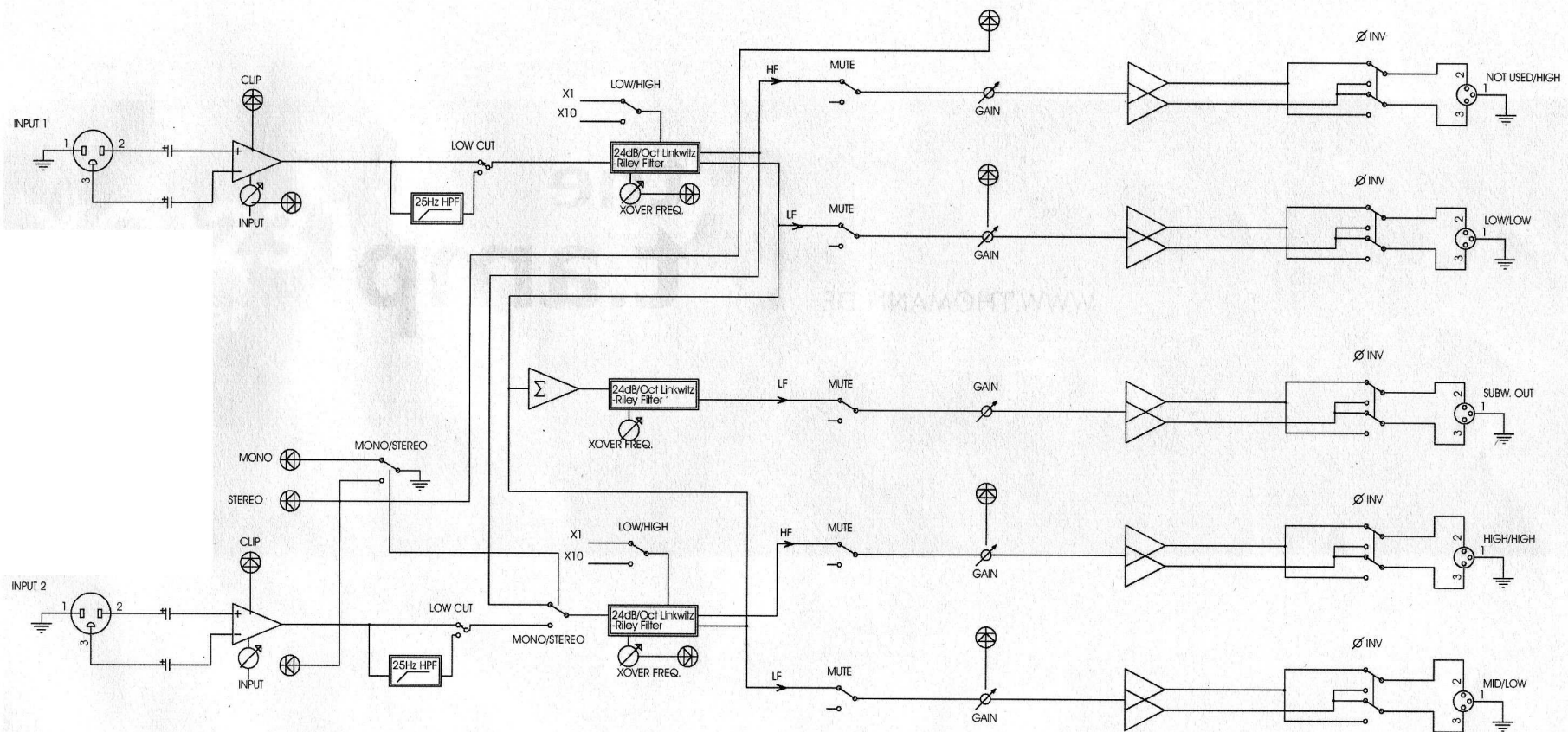
Filter-Type	Linkwitz-Riley, 24 dB/octave, state-variable	
Mono Mode Frequencies	x1	x10
Low/High	44 - 930 Hz	440 Hz - 9.3 kHz
Low/Mid	44 - 930 Hz	440 Hz - 9.3 kHz
Mid/High	440 Hz - 9.3 kHz	
Stereo Mode Frequencies	x1	x10
Low/High	44 - 930 Hz	440 Hz - 9.3 kHz

Europe/U.K./Australia	230V ~, 50 Hz
USA/Canada	120V ~, 60 Hz
Japan	100V ~, 50-60 Hz
Power Consumption	<20 W
Fuses	100-120 V ~, T630 mA H
	200-240V ~, T 315 mA H
Mains Connection	Standard IEC receptacle
Dimensions	19" x 1.75" x 8.5" (482.6 x 44 x 217 mm)
Net Weight	6.2 lbs (2.8 kg)

## DIMENSIONS



## BLOCK DIAGRAM



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 **the  
t.amp**