

## **Signal Processor Help**

### **Commands**

[File Menu](#)

[Crossover Menu](#)

[Windows](#)

[Configure Menu](#)

### **Windows**

[Parametric Window](#)

[Plot Window](#)

### **Glossary**

[Defined Terms](#)

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**Plot Window**

The Plot Window displays the selected frequency versus amplitude curve. This window may be sized, which is useful for viewing extra detail and for printing high resolution screen captures. The x (frequency) and y (gain) coordinates of the mouse cursor are displayed in this window as an additional aid in the equalization process.

## **Parametric Window**

The Parametric Window controls SX, PX, PEQ, or the SPX equalizer and can emulate up to 24 bands of equalization.

### Filter Select scroll bar

The equalizer filter is selected by this scroll bar.

### Frequency Scroll Bar

The filter frequency is controlled by this scroll bar.

### Gain Scroll Bar

The filter gain is controlled by this scroll bar.

### Q Scroll Bar

The filter Q is controlled by this scroll bar.

### Eq Type Group Box

These radio buttons select SX, PX, SPX, or PEQ product characteristics.

### Plot Mode Group Box

These check boxes set the Keep old, lvie, Equalize, Use Ref, and Smooth functions.

### Plot Group Box

These push buttons cause the parametric equalizer or spectrum curves to be plotted.

Double clicking the left mouse button or single clicking the right mouse button also causes the curves to be plotted.

For additional information, see Parametric Window Overview

## **Glossary**

Bandwidth

Boost

Butterworth

Center Frequency

Constant Q

Crossover

Cut

Decibel

Equalize

Filter

Frequency

Gain

Imaging

Linkwitz Riley

Octave

Over Sampling

Parametric

Phase

Q

Spectra

Tandem

**Bandwidth**

The bounding two frequencies where the signal level has dropped 3 dB with respect to a reference frequency and level. In the case of an equalizer filter, the reference frequency is the filter center frequency.

**Boost**

The level of a signal, usually measured in decibels, above a reference level.

**Butterworth**

Butterworth defines the slope and phase characteristics of a crossover. This crossover has a faster roll off but poorer phase response than a Linkwitz-Riley crossover.

**Center Frequency**

The frequency where a filter reaches its maximum or minimum signal level.



**Constant Q**

The Q of a constant Q equalizer filter remains fixed as the filter gain is changed.

**Crossover**

A crossover is a circuit which divides the audio spectrum into two or more spectrums.

**Cut**

The level of a signal, usually measured in decibels, below a reference level.

**Decibel**

The relative level of an audio signal, measured in a logarithmic fashion. A 3 dB increase requires a 100% increase in power.

**Equalize**

The processing of an audio signal to adjust the relative levels across the frequency spectrum to achieve a desired response. In the context of this program the equalize check box causes the system response to be equalized according to the settings of the equalizer filters.

**Filter**

A circuit that adjusts level in a frequency dependent way. When used in context of an equalizer, filter is synonymous with band.

**Frequency**

In audio systems, a tone.

**Gain**

A change in signal level. An increase in gain is often referred as "boost", a decrease in level is referred as "cut".



**Imaging**

The ability of an audio system to reproduce the original studio designated or live musical positions. Imaging is often degraded by phase error introduced by poorly designed crossovers and equalizers. Further degradation of imaging is caused by reflected signals and poor speaker placement.

**Interpolate**

To insert additional data points between finite data points in a digital system. Many algorithms exist for this technique, each with advantages and disadvantages. Also called curve fitting.

**Linkwitz-Riley**

Linkwitz-Riley defines the slope, phase , and damping characteristics of a crossover. This crossover has a slower initial roll off but better phase response than a Butterworth crossover. This crossover is said to have better imaging than the Butterworth crossover.

**Octave**

The interval between two frequencies where one frequency is twice that of the other.

**Over Sampling**

The term "over sampling" is a misnomer. There is only a finite amount of data available in a digital audio system. The correct term would be to interpolate or curve fit.

**Parametric**

When used in the context of parametric equalizer, the meaning is that all three *parameters* (Frequency, Gain, and Q) of an equalizer filter are adjustable.

**Phase**

This term refers to the angular relationship of one wave to another. Phase is measured in degrees or radians. Phase errors introduced by improper crossovers, speaker or equalizers degrade the system imaging.

Q

Q refers to the bandwidth of a filter. It is inversely proportional to bandwidth.



**Spectrum, Spectra**

An array or series of frequencies that comprise a more complex waveform. An audio system is often stimulated with pink noise which represents all frequencies of interest in the audio system.

**Tandem**

When used in the context of Zapcos' SPX, tandem controls both channels simultaneously.

## Parametric Window Overview

The parametric equalizer is controlled by up to 24 filters, and can emulate a variety of [Zapco](#) products. Frequency, Gain, & Q are controlled by their corresponding vertical scroll bars. The Filter Select horizontal selects the filter.

The Eq Type group box selects the PX, SPX, SX, or PEQ product characteristics.

The Plot group box selects Keep old, Ivie, Equalize, or Use Ref check box.

Pushing the Parametric button or clicking the right mouse button plots the equalizer response.

If the Equalize button is not checked:

Pushing the Spectrum button or double clicking the left mouse button plots the input data.

If the Equalize button is checked:

Pushing the Spectrum button or double clicking the left mouse button plots the equalized input data

**Spectrum Push Button**

This button causes the filters to be plotted according to the parameters read in by an input file or manually adjusting frequency, gain, and Q.

**Keep Old** check box    Previous plots will remain if this box is checked.

**lvie** check box

Plots in the bar graph style as seen in many audio analyzers.

**Equalize** check box

Causes the input response to equalized according to the equalizer filter settings and plotted.

**Smooth** push button

The causes the input response to be interpolated for additional data points. This process smooths the data, more accurately reflecting the original response.



**Use Ref** check box

Causes the input response to be compared to another reference system response. For example, one may measure a known "good sounding system" and input this data under the Open Ref command. The system may then be equalized to the reference system. This method also eliminates errors introduced by the microphone, if this microphone is the same one used to measure the reference system.

**Eq Type** group box

One of four different products may be emulated by the Audio3.0:

1. The SX, is a din size 5 band parametric equalizer / crossover.
2. The PX is a 4 band parametric equalizer / crossover
3. The SPX is a 12 band laboratory rack mount programmable parametric equalizer / crossover
4. The PEQ is a 9 band graphic equalizer

## PX

The PX is a 4 band parametric equalizer and electronic crossover.

### Specifications:

Signal to Noise	> 107dB
T.H.D.+ noise	< .005%
Crossover frequency	Variable, 70-1,200 Hz
Crossover levels	Variable
Filter Frequency &Q	Settable, via modules

## SX

The SX is a Din sized, 5 band parametric equalizer and electronic crossover with an electro-luminescent display.

### Specifications:

<u>Signal to Noise ("A" weighed)</u>	
Front & rear channels, full range	> 107 dB
Front & rear channels, highpass	> 105 dB
Subwoofer channels	> 110 dB
<u>Harmonic Distortion + Noise</u>	
Front & rear channels, full range	< .003%, Typ. .0007%
Front & rear channels, highpass	< .003%, Typ. .0009%
Subwoofer channels	< .002%, Typ. .0008%
<u>Highpass Crossover</u>	
Slope	6 or 12 dB/octave
Damping	Bessel (Linkwitz-Riley response)
Crossover frequency	Variable in two ranges: 30-660Hz, 330-7200Hz
<u>Lowpass Crossover</u>	
Slope	12 or 24 dB/octave
Damping	Bessel or Butterworth
Crossover frequency	Variable in two ranges: 30-660Hz, 330-7200Hz
Phase	0 or 180 degrees, selectable
<u>Outputs</u>	
Front	Highpass, full range or blend mode
Rear	Highpass, full range, center, or variable blend
Low	Stereo or monaural
<u>Front Panel</u>	
(10)Volume (5), Equalizer gain (+/-20 dB), front-rear fader, lowpass frequency, highpass frequency, frequency balance.	
<u>I/O Unit</u>	
Control	Battery, Ground, Mute, Dash
Input sensitivity	2, 1, .5, or .25 Vrms
Maximum output level	7 Vrms
Location	Remote via shielded ribbon differential cable
<u>Dimensions</u>	
SX main	(1/2 Din) 6.75" wide x .93" high x 4.6" deep
Sx supply/line driver	3.125" wide x 1.75" high x 5.690" deep

## SPX

The SPX is a 12 band programmable rack mount laboratory equalizer and electronic crossover. This product may be controlled remotely by IEEE-488, RS232 or a Hewlett Packard 48SX calculator for extensive audio systems analysis.

### Specifications:

Signal to Noise	> 98dB
T.H.D.+ Noise	< .0075%
Crossovers	Stereo low pass & stereo high pass
Crossover frequencies	Programmable, 20-20,000 Hz
Crossover levels	Programmable, 20-20,000 Hz
Crossover slopes (dB/octave)	6, 12 (Butterworth), 12 (Linkwitz-Riley) 18, 24
Filter frequency	Programmable, 20-20,000 Hz
Filter Q	Programmable, .5-7.0
Filter gain	Programmable, 15 to -15 dB
I/O connectors	Balanced XLR, Cannon & RCA
Digital interface	IEEE-488 (GPIB), RS232
Display	40 character VFD

## **PEQ**

The PEQ is a 9 band graphic equalizer.

**Filter Select Scroll Bar**

The Frequency, Gain, & Q scroll bars affect the filter selected by the Filter Select scroll bar.

**Frequency Scroll Bar**

The Frequency scroll bar controls the parametric equalizer filter frequency in the range of 20 Hz to 20kHz.



**Gain Scroll Bar**

The Gain scroll bar controls the parametric equalizer filter gain in the range of 20 dB to -20 dB.

**Q Scroll Bar**

The Q scroll bar controls the parametric equalizer filter Q in the range of .5 to 7.0.

## **File Menu**

The File menu includes commands that enable you to open and save equalization parameter files.

For more information, select the file menu command name:

File Open Eq

Open Spectra

Open Ref

Save Eq

Exit

**Crossover Menu**

The Crossover menu includes commands that enable you to configure the crossover. All of the crossover modes of the SX and the PX may be plotted.

For more information, select the crossover menu command name:

Select Slope

Select Frequency

### **Select Slope**

This command selects 6, 12, 18 or 24 dB/octave slopes for the crossover.

Linkwitz-Riley or Butterworth characteristics may be selected for the 12 dB/octave slopes.

**Select Frequency**

The select frequency command selects the cut off frequency of the low pass and high pass crossovers.

## **Windows Menu**

This menu allows you to reopen the parametric equalizer dialog box or the plot window, should they be closed.

## **Configure Menu**

This menu includes commands that configure the number of filters for each product and the maximum and minimum frequency and gain plotting parameters.



## **File Exit Command**

This topic explains the File menu's Exit command.

## File Format

The input spectra file format is compatible with Audio Precision's audio analyzer files. This file may also be created via an editor or word processor.

There are three required fields, which must be delimited by commas and a space or tab. The third field is reserved for future use.

A 1/3 octave data file example:

Frequency	Gain	OFF	
20.0,	-3.4,	0	
25.198,	-2.8,	0	
31.748,	-2.2,	0	
40.0,	-2.1,	0	
50.397,	-2.4,	0	
63.496,	-2.5,	0	
80.0,	-2.5,	0	
100.79,	-2.2,	0	
127.0,	-1.3,	0	
160.0,	0.0,	0	
201.59,	1.8,	0	
253.98,	3.9,	0	
320.0,	6.9,	0	
403.17,	10.8,	0	
507.97,	12.3,	0	
640.0,	4.1,	0	
806.35,	1.6,	0	
1015.9,	2.8,	0	
1280.0,	2.1,	0	
1612.7,	1.6,	0	
2031.9,	.9,	0	
2560.0,	.6,	0	
3225.4,	0.0,	0	
4063.7,	-.4,	0	
5120.0,	-1.5,	0	
6450.8,	-3.9,	0	
8127.5,	-6.0,	0	
10240.0,	-3.6,	0	0
12901.6,	-1.6,	0	0
16255.0,	-.9,	0	0
20000.0,	-2.8,	0	0

### **File Open Eq Command**

Opens the equalizer data file. The Frequency, Gain, and Q scroll bars will now reflect the contents of this file.

## **File Open Spectra Command**

Opens the Input Spectra data file

[Related Topics](#)

[File Format](#)

**File Open Ref Command**

Opens a reference file which will be used as a reference system response. The plot will then reflect the difference between the current system and the reference system.

### **File Save Eq Command**

Save the Parametric Equalizer filter settings.