Signal Processor Help

Commands

- File Menu
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Windows

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Glossary

- Defined Terms

ZAPCO - Zeff Advanced Products Company
413 Yosemite Blvd. Ste. D
Modesto California, 95355
Phone (209) 577-4268, ext. 101
FAX (209) 577-8548, 522-8566
CompuServe: 70323,1251

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, Ivie, 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.

Ivie 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:

Signal to Noise ("A" weighed)	
Front & rear channels, full range	> 107 dB
Front & rear channels, highpass	> 105 dB
Subwoofer channels	> 110 dB
Harmonic Distortion + Noise	
Front & rear channels, full range	< .003%, Typ. .0007%
Front & rear channels, highpass	< .003%, Typ. .0009%
Subwoofer channels	< .002%, Typ. .0008%
Highpass Crossover	
Slope	6 or 12 dB/octave
Damping	Bessel (Linkwitz-Riley response)
Crossover frequency	Variable in two ranges: 30-660Hz, 330-7200Hz
Lowpass Crossover	
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
Outputs	
Front	Highpass, full range or blend mode
Rear	Highpass, full range, center, or variable blend
Low	Stereo or monaural
Front Panel	(10)Volume (5), Equalizer gain (+/-20 dB), front-rear fader, lowpass frequency, highpass frequency, frequency balance.
I/O Unit	
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
Dimensions	
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
12901.6,            -1.6,         0
16255.0,            -.9,          0
20000.0,            -2.8,         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.