onpointaudio®

ACOUSTIC EXCELLENCE®

EQUALIZATION AND FILTER RECOMMENDATIONS (Updated March 1, 2012)

On Point Audio professional loudspeaker systems are used in a wide variety of applications and differing venue acoustics. It is frequently necessary to apply active equalization to the speakers to enhance their performance or correct the system/room interactions. This application note will provide filter recommendations for both DSP-based processors as well as 1/3-octave equalizers. Additionally, bi-amp recommendations are provided for adding a subwoofer to the sound system.

On Point Audio always suggests the use of a DSP (Digital Signal Processor) based filter and equalization system to provide the most flexible and tunable filtering and equalization. Our most important recommendation is to always use a high-order high-pass filter to protect the loudspeaker and amplifier from damaging subsonic signals. These subsonic signals are input signals below the natural cutoff frequency of the loudspeaker system and are typically not audible but can produce significant harmonic distortion and loss of system reliability. These subsonic signals also substantially reduce the amplifier's available headroom. The general practice is to employ a 24 dB-per-octave high pass filter 5 Hz to 10 Hz below the loudspeaker's natural cutoff frequency. Loudspeaker systems should NEVER be boosted below the natural cutoff frequency of the enclosure. In a general sense, this cutoff frequency should be taken to be the published -3 dB limit of the loudspeaker. This parameter is always noted on the product's specification sheet.

When a 1/3-octave equalizer is used in a system, the recommendations listed below are "starting points" since individual filter bands may need to be adjusted to deal with system feedback issues related to the position of stage equipment and the loudspeaker systems in a live sound venue. For music playback, the recommended 1/3-octave settings may be set to the values listed.

It is worth noting that individual listener preferences may require modification to these recommended settings. The settings below will achieve relatively smooth free-field

amplitude response but room acoustics and musical preferences may require adjustments

OPA 15 NP

DIGITAL PROCESSOR RECOMMENDATIONS

Frequency	Gain	Bandwidth	Filter Type
37 Hz	N/A	N/A	High Pass 24 dB/octave Butterworth
50 Hz	+1.5 dB	0.3 octave	PEQ
800 Hz	-2.5 dB	0.3 octave	PEQ
1,250 Hz	-2.0 dB	0.3 octave	PEQ
4,400 Hz	-2.5 dB	0.4 octave	PEQ

1/3-OCTAVE GRAPHIC EQ RECOMMENDATIONS

(Any 1/3 octave filter center frequencies not referenced should be left at 0 dB gain)

20 Hz	Full Attenuation	1/3	N/A
25 Hz	Full Attenuation	1/3	N/A
31.5 Hz	Full Attenuation	1/3	N/A
40 Hz	0 dB	1/3	
50 Hz	+1.5dB	1/3	N/A
800 Hz	-2.5dB	1/3	N/A
1,250 Hz	-2.0dB	1/3	N/A
4,000 Hz	-1.5dB	1/3	N/A
5,000 Hz	-1.5dB	1/3	N/A

*PEQ refers to “Parametric EQ”

OPA 15 YNP

DIGITAL PROCESSOR RECOMMENDATIONS

Frequency	Gain	Bandwidth	Filter Type
37 Hz	N/A	N/A	High Pass 24 dB/octave Butterworth
63 Hz	+2.0 dB	0.3 octave	PEQ*
1,250 Hz	-2.0 dB	0.3 octave	PEQ
3,150 Hz	+2.0 dB	0.3 octave	PEQ
5,000 Hz	-2.0 dB	0.3 octave	PEQ

1/3-OCTAVE GRAPHIC EQ RECOMMENDATIONS

(Any 1/3-octave filter center frequencies not referenced should be left at 0 dB gain)

20 Hz	Full Attenuation	1/3	N/A
25 Hz	Full Attenuation	1/3	N/A
31.5 Hz	Full Attenuation	1/3	N/A
40 Hz	0 dB	1/3	N/A
63 Hz	+2.0 dB	1/3	N/A
1,250 Hz	-2.0 dB	1/3	N/A
3,150 Hz	+2.0 dB	1/3	N/A
5,000 Hz	-2.0 dB	1/3	N/A

OPA 15 NPM

DIGITAL PROCESSOR RECOMMENDATIONS:

Frequency	Gain	Bandwidth	Filter Type
45 Hz	N/A	N/A	High Pass 24 dB/octave Butterworth
1,250 Hz	-1.5dB	0.3 octave	PEQ*
4,500 Hz	-2.5dB	0.5 octave	PEQ
7,500 Hz	-3.0dB	0.6 octave	PEQ

1/3-OCTAVE GRAPHIC EQ RECOMMENDATIONS

(Any 1/3 octave filter center frequencies not referenced should be left at 0 dB gain)

20 Hz	Full Attenuation	1/3	N/A
25 Hz	Full Attenuation	1/3	N/A
31.5 Hz	Full Attenuation	1/3	N/A
40 Hz	0 dB	1/3	N/A
1,250 Hz	-1.5 dB	1/3	N/A
4,000 Hz	-2.0 dB	1/3	N/A
5,000 Hz	-2.0 dB	1/3	N/A
6,300 Hz	-1.5 dB	1/3	N/A
8,000 Hz	-2.0 dB	1/3	N/A

OPA 28 NP

DIGITAL PROCESSOR RECOMMENDATIONS:

Frequency	Gain	Bandwidth	Filter Type
80 Hz	N/A	N/A	High Pass 24 dB/octave Butterworth
100 Hz	+3.0 dB	0.3 octave	PEQ
125 Hz	+2.5 dB	0.3 octave	PEQ
160 Hz	+1.5dB	0.3 octave	PEQ
3,150 Hz	-2.0dB	0.3 octave	PEQ
4,000 Hz	-2.0dB	0.3 octave	PEQ

1/3-OCTAVE GRAPHIC EQ RECOMMENDATIONS

(Any 1/3 octave filter center frequencies not referenced should be left at 0 dB gain)

20 Hz	Full Attenuation	1/3	N/A
25 Hz	Full Attenuation	1/3	N/A
31.5 Hz	Full Attenuation	1/3	N/A
40 Hz	-12 dB	1/3	N/A
50 Hz	-8 dB	1/3	N/A
80 Hz	- 3 dB	1/3	N/A

OPA 118 SUB and OPA 218 SUB

The addition of either the OPA 118 Sub or the OPA 218 Sub to a sound system requires an active crossover. Although an analog active crossover may be used, On Point Audio recommends the use of a high-quality DSP (Digital Signal Processor) based active processor with crossover filters in its menu.

LOW OUTPUT

Frequency	Gain	Bandwidth	Filter Type
35 Hz	N/A	N/A	High Pass 24 dB/octave Butterworth
80 Hz	0 dB User Adjustable*	N/A	Low Pass 24 dB/octave Linkwitz-Riley
50 Hz	+3 dB	0.5 octave	PEQ

HIGH OUTPUT

80 Hz	0 dB	N/A	High Pass 24 dB/octave Linkwitz-Riley

NOTE: All other high frequency output gains and EQ settings should be chosen for the specific full-range enclosure used with these subwoofers. See settings above for each On Point Audio system.

*The recommended gain setting for the frequency output of “user adjustable” is based on individual user requirements for the ratio of sub output to high output. The initial setting should be at 0 dB gain and then adjusted upward based on acoustic requirements.

In all cases, level and EQ boost should be used judiciously so as to not “over EQ” the system. Use of EQ uses more amplifier power and this reduces the amplifier’s headroom and potentially lowers the system’s reliability.