

## 6.9. Equalizer

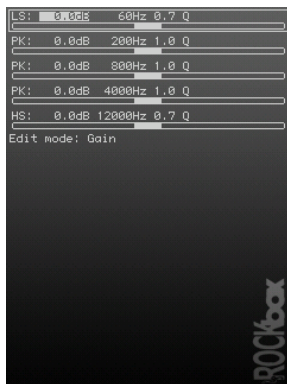
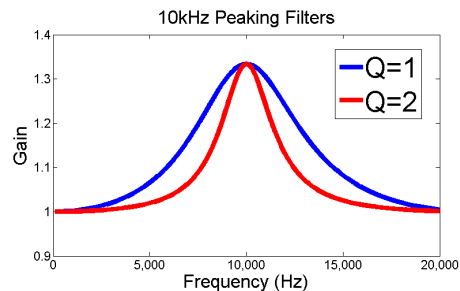


Figure 6.2.: The graphical equalizer

Rockbox features a parametric equalizer (EQ). In contrast to non-parametric equalizers, a parametric EQ enables adjusting the center frequency, gain, and width of EQ bands separately. The ability to adjust the frequency and width of bands enables more precise control of the EQ frequency response while avoiding the use of a large number of bands (often 12+) needed in a non-parametric EQ.

The graphic below illustrates how the width of 10kHz band can be adjusted to cover a wider (lower Q) or narrower (higher Q) range of frequencies.



In some ways the EQ is similar to the BASS and TREBLE settings described earlier, but the EQ allows you to control the sound much more carefully. Note that the parametric EQ bands will be applied in addition to any bass or treble tone controls.

**Note:** A maximum of 10 EQ bands are possible on most devices, but using more than are required will waste battery and introduce additional rounding noise. For best results, use the fewest number of bands required.

Rockbox's parametric EQ is composed of up to ten different bands:

**Band 0: Low shelf filter.** The low shelf filter boosts or lowers all frequencies below a certain frequency limit, much as the “bass” control found on ordinary stereo systems does. Adjust the “cutoff” frequency parameter to decide where the shelving starts to take effect. For example, a cutoff frequency of 50 Hz will adjust only very low frequencies. A cutoff frequency of 200 Hz, on the other hand, will adjust a much wider range of bass frequencies. The “gain” parameter controls how much the loudness of the band is adjusted. Positive numbers make the EQ band louder, while negative numbers make that EQ band quieter. The “Q” parameter should always be set to 0.7 for the shelving filters. Higher values will add a small boost around the cutoff frequency that is almost always undesirable.

**Bands 1-8: Peaking filters.** Peaking EQ filters boost or lower a frequency range centered at the centre frequency chosen. Graphic equalizers in home stereos are usually peaking filters. The peaking filters in Rockbox's EQ lets you adjust three different parameters for EQ bands 1 through 8. The “centre” parameter controls the centre frequency of the frequency range that is affected as described above. The “gain” parameter controls how much each band is adjusted, and works as for the low shelf filter. Finally, the “Q” parameter controls how wide or narrow the affected fre-

quency range is. Higher Q values will affect a narrower band of frequencies, while lower Q values will affect a wider band of frequencies.

**Band 9: High shelf filter.** A high shelf filter boosts or lowers all frequencies above a certain frequency limit, much as the “treble” control found on ordinary stereo systems does. The high shelf filter is adjusted the same way as the low shelf filter, except that it works on the high end of the frequency spectrum rather than the low end.

As a general guide, EQ band 0 should be used for low frequencies, EQ bands 1 through 8 should be used for mids, and EQ band 9 should be used for highs.

**Enable EQ.** This option controls whether the EQ is on or off.

**Graphical EQ.** This option brings up a graphic EQ screen, which allows adjustment of each of the three parameters described above (gain, centre frequency, and Q) for each of the five EQ bands.

Key	Action
	Raises the highlighted parameter.
	Lowers the highlighted parameter.
	Moves to the previous EQ band.
	Moves to the next EQ band.
	Toggles the cursor among the three parameters (gain, centre frequency, Q) for the selected EQ band
	Exits the graphical EQ screen.

**Pre-cut.** If too much positive gain is added through the graphical EQ, your music may distort. The PRECUT setting allows you to apply a global negative gain to decoded audio, cancelling out positive gain from the EQ. This will prevent distortion when boosting certain frequency ranges, at the expense of making audio quieter.

Alternatively, precut can be used with a flat EQ curve to implement a volume cap. For example, on a player that allows overdriving the headphone output to +6dB, maximum volume can be capped to +0dB by applying 6dB of precut. Note that precut is not applied if EQ is disabled.

**Simple EQ.** This option provides an easier alternative for those who are daunted by all of the parameters that can be adjusted using the graphical EQ. With the SIMPLE EQ, the only parameter that can be adjusted is the gain.

**Advanced EQ.** This sub menu provides options for adjusting the same parameters as the GRAPHICAL EQ. The only difference is that the parameters are adjusted through textual menus rather than through a graphic interface.

**Save EQ Preset.** This option saves the current EQ configuration in a .cfg file.

**Browse EQ Presets.** This menu displays a list of EQ presets, as well as any EQ configurations saved using the SAVE EQ PRESET option. Users unfamiliar with the operation of a parametric EQ may wish to use the presets instead of trying to configure the EQ, or use the presets for designing their own custom EQ settings.

## 6.10. Dithering

This setting controls the dithering and noise shaping functionality of Rockbox.

Most of Rockbox' audio file decoders work at a higher bit depth than the 16 bits used for output on the player's audio connectors. The simplest way to convert from one bit depth to another is simply discarding all the surplus bits. This is the default behaviour, and adds distortion to the signal that will vary in character along with the desired sound.

Dithering adds low-level noise to the signal prior to throwing away the surplus bits, which gives the resulting signal a uniform noise floor which is independent of the signal. Most people find this noise preferable to the time-varying noise heard when not performing dithering.

After dithering, noise shaping is performed. This basically just pushes the dithering noise to the parts of the frequency spectrum humans cannot hear so easily. In Rockbox' case, some of the noise is pushed up to above 10 kHz.

This setting will be put to its best use when listening to dynamic music with frequently occurring quiet parts, classical music being a typical example. It is worth noting that the effects of dithering and noise shaping are very subtle, and not easily noticeable.

Rockbox uses highpass triangular distribution noise as the dithering noise source, and a third order noise shaper.

## 6.11. Timestretch

Enabling TIMESTRETCH allows you to change the playback speed without it affecting the pitch of the recording. After enabling this feature and rebooting, you can access this via the PITCH SCREEN. This function is intended for speech playback and may significantly dilute your listening experience with more complex audio. See section 4.3.3 (page 37) for more details about how to use the feature.

## 6.12. Haas Surround

This setting implements the Haas effect with adjustable delay time to enhance the stereo effect of the sound. A full range Haas effect creates the impression that sound starts from one channel and ends in the other. Therefore, four additional functions are provided to move the stage back to the center: BALANCE to change the left-right channel output ratio. A bypass band for frequencies that mostly contain vocals, using F(x1), and F(x2) to set frequencies which are not affected. The SIDE ONLY setting uses mid-side