

AFTERBURNER™ Application Notes

When we designed the Afterburner we listened to what audio professionals had to say about what they wanted in a compressor/limiter, and the limitations of existing products.

So, we made it fast to set up, gave it easy to read wide scale metering, added an Enhance control, and, perhaps best of all, we made it switchable to 2 band (Low/High) compression, opening up a whole new range of gain control options.

To familiarize you with its functions we've taken applications suggested by Audio Engineers and the ARX design team and put them together in some practical notes. These are by no means the only ways of using the Afterburner - experimentation is the only way to fully realise the variety of gain control techniques the Afterburner makes available.

Enhance

One of the special features of the Afterburner is the Enhance function. You may have noticed how often audio signals that have been compressed or limited sound flat and lifeless. The Enhance function provides frequency restoration to preserve the spectral balance of the signal, compensating for the sagging Low and High frequency response of compressed or limited program material.

This returns life to the program material, giving highly compressed program material a more upfront sound, but without any listener fatigue inducing distortion. If you think of it as a smart 'Loudness' control you won't go far wrong.

So strap yourselves in and we'll explore some practical everyday uses for the Afterburner.

Dual Channel Mode: Soft Compression

Uses: Vocal Leveling, fattening Drums, pulling the mix together.

Control positions:

- Enhance IN, stereo link IN, Dual Channel IN
- Threshold depends on input level: For -10dB nominal systems between -20 to -10dB. For 0dB and +4dB nominal systems between -10dB to +4dB.
- Ratio around 1.5:1 to 3:1.
- Output gain to suit desired output level; usually 0dB (unity).



Effect:

Pulls main and harmony/backing vocals together and evens out level differences to give a much fuller together vocal sound; fattens drums to provide more even balance, increased definition between individual drums and enhanced low frequency response.

When used on the overall mix it pulls everything together giving a more even balanced sound and preserving the stereo image even if the input signals vary in level.

This setting also increases apparent volume without reducing headroom as the average level is more constant.

Dual Channel Mode: Hard Limiting

Uses: Speaker Protection, Preventing Tape Overload, Transmitter Overmodulation.

Control positions:

- Enhance IN, Stereo Link IN, Dual Channel IN
- Threshold depends on input level. For -10dB nominal systems between -20 to -10dB; for 0 and +4dB nominal systems between -10dB and +4dB.
- Ratio from 10:1 to ∞:1
- Output Gain to suit desired output level, but usually 0dB (unity)



Effect:

Has no effect on the signal until the Threshold is reached. As soon as it is reached, the Output is held at a constant level until the signal is reduced below the Threshold level.

You can determine the absolute maximum level (the clipping point of amplifiers, tape saturation, transmitter overload, etc.) for system operation and set the Threshold level 1-2dB below to prevent overload.

Single Channel (Dual Band) Mode

This mode of operation opens up a whole new world of gain control. You can make thin sounds fat, fat sounds thin, alter the loudness curve of Sound Reinforcement systems, control low frequency leakage in installations. The possibilities are almost endless.

As the Low and High frequency dynamics of the program material are now controllable separately, you can tailor control settings to suit the varying frequency/amplitude balance of the program material being compressed.

Why would we want to do this?

If we analyze the spectral balance of most modern audio signals we find that they are heavily weighted toward the low frequency end of the spectrum (below 250Hz).

However if we analyze vocals and instruments, we find that most of their energy and ALL of their intelligible differences occur in the mid and high frequencies (above 250Hz).

In single band/single channel (conventional) compressor limiters, this usually means that when we compress or limit program material, we are taking our Threshold cue from the low frequency content of the program signal. This causes the well known and unpleasant pumping or breathing effect, where the Mid and High frequencies are modulated by the Low frequencies because of their greater amplitude.

By splitting the program we can control the two bands of frequencies much more effectively and with negligible interaction.

The Threshold of the Mid and High frequencies is now determined by Mid and High frequencies, and the Low Threshold is determined by Low frequencies, which is a much more logical way of doing things!

Single Channel mode Settings

In this mode of operation the Mono mode switch must be IN, and the Stereo Link switch OUT.

Note that in this mode, Channel B Bypass and Enhance switches are non operative.

Since we are running in Mono, the signal Input and Output is via Channel 1 Input and Output connectors, so don't connect anything to the Channel 2 connectors.

Output metering is via Channel 1 Output meter. Gain reduction of Low Frequencies is shown on the Channel 1 Gain reduction Meter and Gain reduction of High Frequencies is shown on the Channel 2 Gain reduction meter.

Channel 1 controls signals under 250Hz, Channel 2 controls signals above 250Hz. The filter slope is 6dB per octave so the transition between low and high channels is very smooth and transparent

All the settings suggested below are only approximate and will vary slightly with signal level and

frequency content. Don't be afraid to experiment. We'll help you become familiar with the Afterburner's varied capabilities.

Single Channel Two Band Soft Compression

Control Positions:

- Enhance IN Channel 1 Threshold around 0 to +4dB, Channel 2 Threshold around -10 to 0dB
- Channel 1 ratio 4:1, Channel 2 ratio 2:1 Channels 1 and 2 outputs usually 0dB (unity).



Effect:

Pulls the mix together giving a fuller, more dynamic sound for the same overall program level. Vocals and instruments stay upfront as their level is not dictated by low frequency content.

Single Channel Two Band Hard Limiting

Control Positions:

- Enhance IN, Channel 1 Threshold around 0 to +4dB, Channel 2 Threshold around -4 to +4dB
- Channel 1 ratio 10:1 to oo:1, Channel 2 ratio 10:1 to oo:1 Channels 1 and 2 output gains usually 0dB (Unity)



Effect:

Has no effect on the signal until the Threshold set on either band is reached. Once this Threshold is reached, the signal in that band is held at a constant level until it reduces below the Threshold level. You can determine the absolute maximum level (the clipping point of amplifiers, tape saturation, transmitter overload, etc.) for system operation and set the Threshold level 1-2dB below to prevent overload.

This method of operation ensures maximum program output whilst retaining overload control.

Concert Sound from a Small to Medium System

Control Positions: Enhance IN, Channel 1 Threshold around +4 to +8dB, Channel 2 Threshold around 0 to +4dB Channel 1 ratio 2:1, Channel 2 ratio 4:1 to 8:1 Output Gain Channel 1 +3dB, Channel 2 0dB (unity).



Effect:

What we've done here is given the whole system a lift in the Low Frequency Output at the usual operating level. When the system is driven up to 0dB program levels the Mids and Highs start to compress harder than the Low frequencies. This means our vocals and instrument levels stay under control and the Low frequencies still have a few dB to go before they begin compressing, at a more gentle ratio than the mids and highs.

This gives the perceived effect of more Low frequency output. At levels where previously the system was starting to get thin and harsh, we now have a smooth sounding "fat" system with plenty of Low frequency

punch. And isn't that what we're striving for?

PS: The drum sound in this mode has to be heard to be believed.

Cleaning up muddy Vocals

Control positions: Enhance OUT, Channel 1 Threshold around -10dB to -4dB, Channel 2 Threshold around 0dB to +4dB Channel 1 ratio around 10:1, Channel 2 ratio around 2:1 Channel 1 output gain 0dB (unity) Channel 2 output gain 0dB (unity)



Effect:

What we have done here is the reverse of the previous application. We are aiming to reduce the low frequency content of Vocal program in order to improve its intelligibility and reduce its overall amplitude. Excessive low frequency energy, breathing noise, wind, etc. is compressed at a much harder ratio than the mid and high frequency program. Simply EQing this out of the program would leave the Vocal thin, nasal sounding and lifeless.

By controlling the low frequency content of the signal to a constant compressed level, we have a vocal program that has high intelligibility, reduced overall amplitude and a natural sounding amount of low frequency energy.

Keeping Venue Neighbours Happy

Control positions:

- Enhance IN, Channel 1 Threshold variable depending on the situation, Channel 2 Threshold around 0dB to +4 dB Channel 1 ratio ∞:1, Channel 2 ratio 2:1 to 4:1 Channel 1 output gain 0dB (unity), Channel 2 output gain 0dB (unity)



Effect:

When you approach a music venue from the outside, all you can hear from a distance is the steady thump of the low frequencies. Unfortunately, if there are neighbours living fairly close, this is all they can hear too!

The purpose of this mode of operation is to control the absolute Low frequency output of the system by applying a hard limit to it, and the secret is to determine the correct Threshold level to provide this.

Setting the LF Threshold will involve standing around outside the club/ pub/ disco/ or wherever, using your ears to determine the correct level for your own particular circumstance.

What happens in operation is when the system reaches the desired level of Low frequency output it is limited to that level and no more. The Mids and Highs are at a higher Threshold and lesser ratio which ensures the system continues operating at a high level, keeping the patrons happy, but the long distance travelling bottom end is limited in level, keeping the neighbours happy!

What we have outlined in the previous paragraphs are only a small number of the Gain Control applications for the Afterburner. And although we have concentrated on more general uses, the adventurous Audio Engineer will find that it is a great unit to use as an insert on individual channels.

Drums, Bass guitar, Voice, they can all benefit from the Afterburner's smooth control in either Dual Channel or Single Channel, Dual Band mode. For initial settings, find the application that's the closest to the effect that you want, and go from there.
