DOD

SIGNAL PROCESSORS

866 SERIES II GATED COMPRESSOR/LIMITER

OWNER'S MANUAL

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INTRODUCTION :

The DOD 866 Series II is a stereo gated compressor/limiter that can be operated as two independent compressor / limiters or as a single stereo unit. The 866 Series II incorporates "soft knee" characteristics in its compression action to yield natural sound under gain reduction conditions.
Also featured on the 866 is a noise gate to ensure quiet operation when signal is not present. All critical operating parameters are adjustable, allowing maximum flexibility over a wide range of applications.
However you choose to use it, the 866 has been
designed to be an affordable audio tool for the musician, performing group, and small to medium-size recording studio.

INSTALLATION :

Install the 866 in a rack using the provided rack screws. Route the power cordaway from audio lines and plug into a convenient outlet. Connect audio lines to the appropriate channel A and B jacks on the compressor.

FOR BALANCED CONNECTION:

Use 1/4" tip-ring-sleeve phone plugs, wired as follows:

tip: high
ring: low
sleeve: ground

FOR UNBALANCED CONNECTION:

Use either 1/4" mono phone plugs or RCA phono plugs, wired as follows:

tip: hot
sleeve: low

CONTROLS AND FUNCTIONS :

Gate Threshold:

The Gate Threshold controls the level at which the 866 will allow the input signal through to the compressor section of the unit. If the signal level is below the threshold, no signal is allowed to pass. The red LED will light whenever the signal is being gated. To disable the gating action, set the Gate Threshold control to the full counter-clockwise position (the gate control is fully independent of all other controls on the 866).

Input Gain:

The Input Gain control allows you to adjust the signal level to the compressor. This control directly affects the setting of the Gate Threshold control and the Compressor Threshold control, and is active even when the Compress switch is in the out position. With the Input Gain control set to 0 dB, over 20 dB of headroom is available to the compressor.

Compressor Threshold:

This control sets the level at which the compressor begins to act. The Input Gain control affects the Compressor Threshold setting by changing the overall level that the compressor sees. When used in combination with the Input Gain control, the Compressor Threshold control can be adjusted to accommodate a wide range of signal levels.

Ratio:

Determines the amount, or ratio, of compression applied to the incoming signal. A ratio of 1:1 means that no compression is applied; a ratio of less than 10:1 is generally considered compression; a ratio of more than 10:1 is generally considered limiting; a ratio of °:1 allows no signal above the Compressor Threshold level setting.

Attack:

This control adjusts the speed with which the compressor reacts to an increase in input signal level above the threshold. Shorter attack time settings will cause the compressor to react more quickly to transients, giving an added measure of protection to sensitive equipment. Longer attack times allow more of the transient to pass, yielding a more natural sound while still compressing the dynamic range of the signal.

Release:

The Release control adjusts the speed with which the compressor reacts to a decrease in input signal level above the threshold. Faster release time settings can cause a sudden increase in noise on peaks for some program material as the compressor lets go. This effects is known as "breathing". Increasing the Release time setting will help minimize breathing.

Output Gain:

Determines the output level of the compressor. This is useful when making up for gain lost in the compression process. The output level is active only when the Compress switch is depressed.

Gain Reduction:

This six segment LED bar graph indicates the amount of gain reduction by the compressor. It operates even when the Compress switch is in the out position so that the user can preview the action of the 866 before it is inserted into the signal path.

Compress:

The compress switch activates the compressor when depressed.

Stereo Link:

Depressing the Stereo Link switch links the two compressor channels for stereo operation. In stereo mode, the compressor will react to either channel, while reducing gain in both channels. Both channels of the 866 are identical in control and function EXCEPT when placed in the stereo mode. In stereo mode, the channel 1 controls become the master controls for both channels, while the Input Gain controls remain independent for each channel.

INPUTS AND OUTPUTS :

The rear panel inputs and outputs and their functions are as follows:

Input:

The inputs of the 866 will accept line level signals, either balanced or unbalanced. A 1/4" tip-ring-sleeve phone jack and an RCA phono jack are provided for each input. Using the 1/4" input jack disconnects the RCA input jack.

Output:

The outputs of the 866 will drive either balanced or unbalanced lines. A 1/4" tip-ring-sleeve phone jack and an RCA phono jack are provided for each output. Both the 1/4" phone jacks and the RCA jacks may be used at the same time.

Side Chain Input:

Allows access to the signal detector circuit of the compressor, permitting control of the compressor with another signal for such applications as "ducking". When used with the Side Chain Output, the original input signal can be modified for applications such as "de-essing". Inserting a plug into this jack opens the internal side chain path so that the detector will only respond to the signal at this jack. In the stereo mode, both channels of the compressor react as one.

Side Chain Output:

The Side Chain Output is the buffered output normally fed to the detector. It is used in conjunction with the Side Chain Input to modify the detector signal for special applications such as "ducking" and "de-essing". For these applications, the Side Chain Output signal is sent to a signal processor and returned through the Side Chain Input.

APPLICATIONS

The flexibility of the 866 allows it to perform many signal processing tasks with equal ease and clarity. Here are a few concepts necessary to understand before using the 866.

Two of the most common applications for the 866 are simple compression and limiting. Compression and limiting are performed in a similar manner, with two important differences: the Compressor Threshold level and the ratio settings for compression are usually much lower than for limiting.

The Compressor Threshold controls the point above which the compressor begins to reduce the gain. For compression, the Compressor Threshold is set low, so that even low level signal will activate the compression. For limiting, the Compressor Threshold is set high so that all of the dynamics of the signal are preserved, but extremely high levels are reduced to protect amplifiers, speakers, or to prevent tape saturation. In this application, the detector ignores signal level changes below the threshold.

The 866 features a "soft knee" compression curve for more natural sounding compression. This means that as the signal level approaches the threshold setting, the compressor starts to react. The ratio, or slope, of the gain reduction continues to increase gradually as the signal passes above the threshold until it reaches the final gain slope set by the Ratio control. This feature makes the compressor's operation less obtursive by easing into full compression.

As you increase the compression Ratio, the "knee" gets sharper, and the gain reduction increases more rapidly with increased signal. Protective limiting requires a high compression Ratio setting, so that full compression is reached quickly.

The time it takes for the detector to react to an increase in signal level is determined by the Attack control setting. To preserve some of the transient punch of a signal, the Attack time should be set fairly high. This allows the user to compress the overall dynamic range of a signal while still preserving the natural, open feel of the sound. For limiting, the Attack time should be short, so that potentially damaging transients don't get past the limiting protection of the compressor.

Release time is the opposite of attack time. The Release time setting determines the amount of time the detector takes to react to a decrease in signal level and to release the action of the compression. Faster release times will help preserve the original dynamics of the signal, but may cause a problem in some program material. This effect is called "pumping" or "breathing" . As the compressor lets go of the signal, the level of the signal (and the noise floor) is allowed to rise. When the next transient hits, the signal level is pushed down again according to the Attack time setting. Breathing can be minimized using longer Release times, which smooth out the action of the compressor.

Once a signal has crossed the threshold, the compressor must be told how much to reduce the gain. The Ratio control determines the amount of gain reduction, expressed as a ratio, adjustable from 1:1 (no gain reduction) to °:1 (the signal is not allowed to rise above the Threshold level).

Compression ratios express the ratio between the input signal level and the desired outputlevel. A compression ratio of 2:1 means that for an increase of 2dB above the threshold input signal, the compressor output will rise only 1 dB. At a ratio of 5:1, an input increase of 5dB above the threshold will yield an output increase of 1 dB, and so forth. The setting of the Ratio control is dependent upon the application in which the compressor is to be used.

Hiss and signal processor idling noise are common sound reinforcement problems. The more signal processors there are in line with the program material, the more noise is produced at the final output stage. For this reason DOD has incorporated a noise gate in the 866. A gate acts like a compressor in reverse. When a signal crosses the gate threshold, it is allowed to pass unaffected. When the signal level falls below the gate threshold level, the signal gain is attenuated, effectively shutting it off. The Gate Threshold control of the 866 allows the user to adjust the threshold level of the noise gate. When the control is in the fully counter clockwise position, the noise gate is inactive and all signals will pass through. The Output Gain control allows the user to make up for gain lost in the compression process and to set the output level of the compressor for compatibility with other equipment.

SETTINGS :

Here are a few compressor settings that can serve as a starting point for the applications covered up to this point:

Vocal Compression:

Compressor Threshold: low
Ratio: 5:1
Attack: 10 msec
Release: 200 msec

Guitar Compression for Extra Sustain:

Compressor Threshold: low
Ratio: 15:1
Attack: .5 msec
Release: 500 msec

Protective Limiting:

Compressor Threshold: high
Ratio: °:1
Attack: 0.1 msec
Release: 90 msec
For more information on compressors and applications, consult the Yamaha Sound Reinforcement Handbook (Hal Leonard Publishing, #HL 00500964). This book is an invaluable tool for beginners and veterans alike, and contains a wealth of information on sound reinforcement theory and practical application.

STEREO OPERATION :

Compressing a two-channel (stereo) signal with two independent compressors creates a problems: if one channel is compressed more than the other, the stereo image will shift to one side, causing an imbalance in the perceived stereo sound field. To prevent shifting, DOD has incorporated a Stereo Link switch on the 866. This switch allows both channels to track in perfect unison while the detectors for each channel operate independently. When the Link switch is depressed, the detectors are tied together and both channels react to the higher of the two channel signals. This eliminates channel override, and the stereo image is preserved.

SPECIAL APPLICATIONS :

The uses for a compressor don't end with compression and protective limiting. Applications such as "ducking", "de-essing", and "de-thumping" can be achieved with equal ease, and their uses are many.

The 866 provides Side Chain Inputs and Outputs, which allow direct access to each channel's detector circuits. Since the detectors control the compressing VCA (voltage-controlled amplifier), one can control the program material with a completely unrelated signal. This is done by inserting the control signal into the Side Chain Input.

Ducking is a good example of this type of application. Ducking is simply gain reduction of a signal when another is present. This technique is widely used in sports broadcasting to reduce the level of the crowd background signal when the announcer is speaking. The preamplified voice of the announcer is sent to a side chain input to compress the noise of the crowd. The voice and crowd signals are then mixed together. For this type of application, the compression ratio is kept fairly low with long attack and release times.

The Side Chain output is provided so that the controlling signal (not the program material) may be modified before reaching the detectors.

The most common use of this technique is for de-essing. A de-esser reduces the high frequency sibilance in the "s"s and "t"s of speech to prevent tape saturation or high frequency driver damage. Connect the Side Chain Output to an equalizer whose output is connected to the Side Chain Input of the 866.

The areas where most of the "ess" energy is located are between 2.5 kHz and 10 kHz. If these areas are boosted on the equalizer, the gain of the program material will be reduced more by the compressor because of the excess gain in that frequency range, thus reducing the sibilance of the program material.

Attack and Release times should be set fairly short, and the compression ratio should be below 8:1.

SPECIFICATIONS :

Frequency Response: 10 Hz - 30 kHz, ±0.5 dB.

THD+Noise: 0.06%.

Signal-To-Noise Ratio: -97 dB.

Input Impedance: 20 K1/2 unbalanced, 40k1/2 balanced.

Maximum Input Level: +21 dBu (ref.:0.775 Vrms).

Output Impedance: 511/2 unbalanced, 1021/2 balanced.

Maximum Output Level: +21 dBu (ref.: 0.775 Vrms).

Side Chain Input Impedance: 10 k1/2.

Side Chain Maximum Input Level: +21 dBu (ref.: 0.775 rms).

Side Chain Output Impedance: 511/2 unbalanced, 1021/2 balanced.

Side Chain Maximum Output Level: +21 dBu (ref.: 0.775 Vrms).

Gate Threshold: Adjustable from -55 dBu to -10 dBu.