G E O R G E M A S S E N B U R G L A B S

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The GML 8900 Dynamic Range Controller

Operation Summary

Before operation, make sure that the rear panel operating level switches are set correctly! It is extremely important to use this device at the proper nominal operating level.

When using this device in **professional recording studios** (tape machine inputs, console inserts, & etc.) the operating level switches should be set to **+4dBm.**

For many applications in **sound reinforcement** and **semi-pro** and **MI audio** consoles, and sometimes in professional recording console channel inserts, the operating level switches should be set to **-10dBm.**

For best results, use this limiter following devices which provide for a fine-level gain trim (NO 10dB steps!).

George Massenburg
for GML, Inc.
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Introduction.

The GML Dynamic Range Controller is the result of 22 years of research, prototyping, and limited manufacturing. The unit combines highly accurate log converters, true RMS detectors, and other modern analog processing techniques in a stable “feed-forward” topology.

This unit reflects significant Improvements in at least three areas:

* distortion reduction in the signal level determination processor.
* improved smoothness of the “soft knee” transition generator.
* increased transparency and low-level performance of the VCA circuitry.

In addition, the unit’s design fully exploits modern analog processing elements, and surface-mount construction to offer unprecedented accuracy, reliability, and calibration stability.

Controls.

The **OUTPUT** level control changes the operating point of the VCA directly in either mode, and is always indicated by the **LED METER.**

The **RATIO** control selects between two distinctly different modes of operation:

SOFT KNEE:

When the **RATIO** control is switched fully counter-clockwise, the 8900 exhibits a factory-preset **SOFT** gain transition which closely resembles that of popular “tube” compressors such as the Fairchild 668 Limiter-Compressor or the Teletronix LA-2 (in “compression” mode). When the 8900 is set to the **SOFT** position the **THRESHOLD** control behaves as any other device’s control: rotated clockwise, it reduces the compression “threshold” level thereby increasing the amount of compression at the same time reducing the perceived output level. The output level is then adjusted with the **OUTPUT** level control.

HARD KNEE:

When rotated away from the detent (clockwise) such that the **RATIO** control is functional, the unit curve exhibits a sharp departure from the transfer characteristic below threshold to that above threshold. The behavior of the unit in this mode more closely resembles the gain characteristic of old NEVE compressors, various DBX compressors, or the UREI 1176. The **THRESHOLD** control in this mode behaves more like the **COMPRESSION GAIN** control in the Model II GML Compressor; that is, should the input signal level fall below the hard knee preset threshold, the **THRESHOLD** control will supply additional input level.

The **TIMING** control replaces typical “attack” and “release” controls. This control changes the RMS time constants of two precision TRUE RMS detectors, FastRMS and SlowRMS, changing both attack and release times simultaneously. With the **RELEASE HYSTERESIS** control turned off, the speed of the faster detector, FastRMS, is almost always approximately 30x faster than the slower detector, SlowRMS.

With the **RELEASE HYSTERESIS** control turned on, varying degrees of program-controlled release are enabled. The release characteristic of the SlowRMS detector depends on the degree by which the input signal falls after a “peak”, releasing faster for a more precipitous signal fall. In effect, this will shape the decay, changing the rate of return relative to the input signal decay. Also this tends to minimize waveform-generated distortion (especially for low frequency signals) for fast release times.

The VCA is most often controlled by the SlowRMS processor. The SlowRMS processor is set by the **TIMING** control to:

* optimize detector time constant (how quickly and severely the signal is tracked),
* minimize distortion at low frequencies,
* minimize “pumping”.

There are two **CREST FACTOR controls, one for FAST RMS and one for PEAK.** Each **CREST FACTOR** control changes the relative threshold of either the FastRMS and PEAK detectors with respect to the SlowRMS detector. The **PEAK** crest factor is internally-calibrated 8dB above the **SlowRMS** detector for equivilant settings of the two controls. We offer two controls so that users can optimize their application of dynamic control to incoming signal. This is best done by ear.

Enabling the **STEREO LINK** switch instructs the GML Limiter/Compressor to track the highest input level of any channel so linked such that lower level channels will dynamically follow the channel with the highest input. There is a set of rear panel connectors providing for multiple unit tracking. Since the **RATIO** and **OUTPUT LEVEL** controls follow the stereo command line in the circuit, the user must be aware of and manually set all channels of these controls to be the same.

Inserting a signal into the **SIDECHAIN** input on the back panel and enabling the front panel **SIDECHAIN** switch replaces the input signal as the source control of the limiter for that channel. The standard audio input for that channel will throughput but will be affected by the dynamic envelop of the **SIDECHAIN** input.

It should be kept in mind that the **SIDECHAIN** input is unbalanced and unbuffered.

Indicators and Theory of Operation.

The **METERS.**

The main front panel LED **GAIN CONTROL** meter indicates the actual instantaneous gain/ loss of the **VCA.** Like the GML Mic-Preamp and Equalizer, the maximum input and output levels of the unit are in excess of +27dBm, thus the unit itself is unlikely to distort under normal conditions.

The four LED **RATIO** meter indicates the instantaneous ratio of how steep an effect is being utilized by the soft knee. Generally, the rightmost green LED lights at the slightest onset of compression, approximately a 1.1:1 ratio, while the far left LED represents a ratio in excess of 20:1.

The three LED '**P**', '**F**' and '**S**' meters indicate the 'impact' of the individual **PEAK**, **FastRMS** and **SlowRMS** detectors.

The **VCA.**

GML has made substantial improvements in the topology surrounding the basic Blackmer (DBX-Valley People) gain cell. First among these is the array of discreet transistor amplifiers surrounding the cell. This provides much extended high-frequency response and also reduces non-linearity at small signal amplitudes.

The **SOFT KNEE** processor.

There are two general modes of operation: **SOFT KNEE**, which is selected by turning the **RATIO** control fully counterclockwise, and **HARD KNEE**, selected by all other positions of the **RATIO CONTROL.**

The **SOFT KNEE** processor is a proprietary curve generator which provides a perfectly smooth (no piece-wise linear approximation methods) and selectively broad transition between a subtle effect at the onset (threshold) of compression and a virtually flat (20:1) ratio characteristic at maximum compression. It's effect closely simulates that of the "knee" of some of the most popular limiter/compressors, notably the Fairchild 668 or Teletronix LA-2 Limiters. With the **TIMING** control properly set, the unit's effect is quite subtle, becoming barely audible for small amounts of compression.

Operational Examples.

This device is a general-purpose automatic level controller. The controls have been chosen to offer an unprecedented degree of control over signal detector characteristics and application for the widest range of uses.

For those of our customers who are not familiar with the GML Limiter/Compressor, we would like to offer a few operational hints.

Start with the suggested settings that follow, and use the hints that follow to vary them.

All of the following examples assume operation at +4dBm, or “0 VU” with the rear panel switches set accordingly.

For all examples adjust microphone / mic-preamp / equalizer so that the *maximum* level (peak) is approximately “0 VU” at the insertion point. Start with the suggested settings that follow, and use the hints that follow to vary them.

VOCALS:

RATIO control to **SOFT KNEE.**
COMPRESSION THRESHOLD at **-15dB.**
OUTPUT GAIN control at **+5dB**.
TIMING to **30ms** (~10 o’clock).
RELEASE HYSTERESIS switch to **OFF.**
CREST FACTOR to **+8dB.**
STEREO/MONO as apropos.

BASS GUITAR (heavy compression):

RATIO control to **20:1**.
COMPRESSION THRESHOLD at **-10dB**.
OUTPUT GAIN at **0dB**.
TIMING to **30ms** (~11 o’clock).
REL HYSTERESIS to **8db** (~9 o’clock).
CREST FACTOR to **+8dB.**

PERCUSSION (normal):

RATIO control to **4:1**
COMPRESSION THRESHOLD at **-5dB**
OUTPUT GAIN at **0dB**.
TIMING to **10ms** (~1 o’clock).
REL HYSTERESIS to **4db** (~1 o’clock).
CREST FACTOR to **+4dB.**

STEREO MIX:

RATIO control to **SOFT KNEE.**
COMPRESSION THRESHOLD at **-2dB.**
OUTPUT GAIN control at **0dB**.
TIMING to **40ms** (~8 o’clock).
RELEASE HYSTERESIS switch to **OFF.**
CREST FACTOR to **+12dB.**
STEREO/MONO switch to **ON**.

STEREO ACOUSTIC PIANO:

RATIO control to **SMOOTH KNEE.**
COMPRESSION THRESHOLD at **-8dB.**
OUTPUT GAIN control at **+3dB**.
TIMING to **10ms** (~10:00 o’clock).
RELEASE HYSTERESIS switch to **OFF.**
CREST FACTOR to **+8dB.**
STEREO/MONO switch to **ON**.

BASS GUITAR (light limiting):

RATIO control to **4:1**.
COMPRESSION THRESHOLD at **-5dB**.
OUTPUT GAIN at **0dB**.
TIMING to **50ms** (~9 o’clock).
RELEASE HYSTERESIS to **OFF.**
CREST FACTOR to **+8dB.**

PERCUSSION (live overdub effect):

RATIO control to **20:1**
COMPRESSION THRESHOLD at **-20dB**
OUTPUT GAIN at **0dB**.
TIMING to **10ms** (~3:00 o’clock).
REL HYSTERESIS to **7dB** (~5 o’clock).
CREST FACTOR to **+6dB.**