GML 8900 Dynamic Range Controller

Series III User's Reference

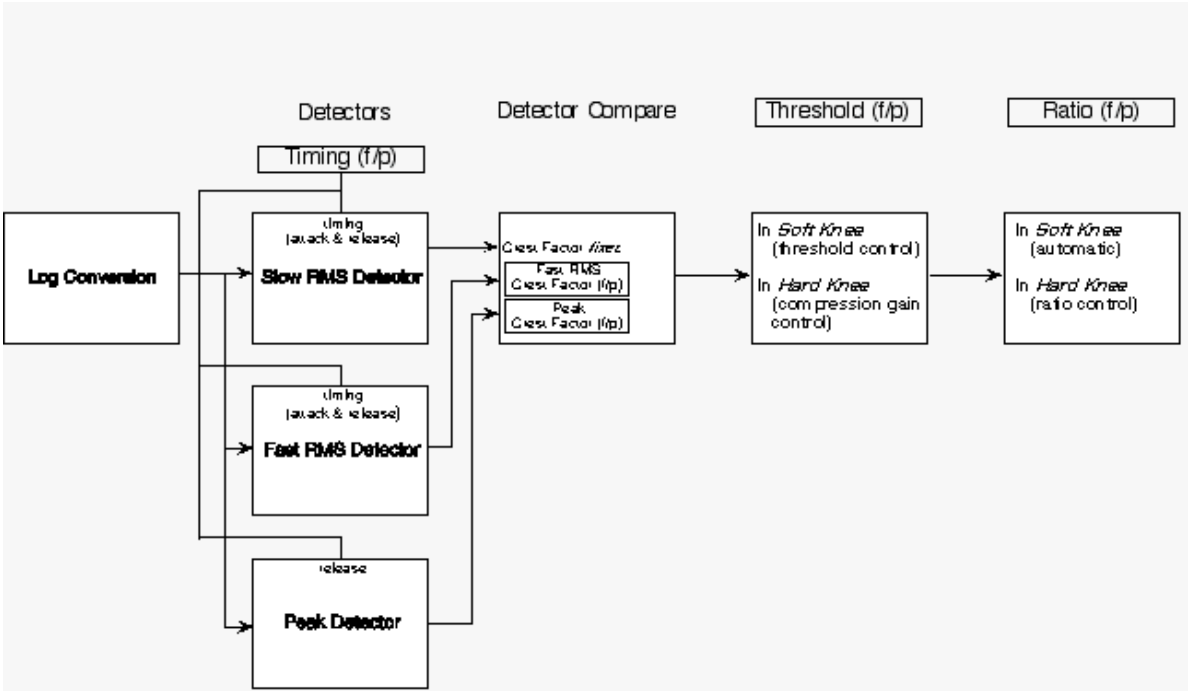
Note: This document is intended to further the user's basic understanding of the operation of the GML 8900 Dynamic Range Controller and should not be construed as a replacement for the complete manual. Additionally, a basic understanding of the fundamental terms and concepts regarding dynamic range devices in general is paramount to the discussion and is presumed to exist for the user.

Introduction:

The GML 8900 Dynamic Range Controller is a powerful and flexible dynamics processor which employs revolutionary methods of affecting dynamic range control. This control is asserted through autonomous detection circuits which act independently and in concert to provide dynamic range control in a decidedly musical manner. The processes behind these actions are described in limited detail in the following sections as they pertain to the discussion at hand; however, it should be understood that this reference's purpose is to further the user's understanding of the unit and not to provide a "how-to" guide (for this purpose, refer to the GML 8900 Layman's Guide).

Operation:

In contrast to most conventional dynamic range devices, the GML 8900 is a complex dynamic range controller which incorporates several powerful features to provide unparalleled flexibility and musicality. Indeed, the GML 8900 may be thought of as two completely different dynamic range controllers in one package: the simple (physically) change of the *Ratio* setting from Soft Knee to Hard Knee style compression affects this complete change in the unit. This difference will be further delineated as it becomes necessary and/or appropriate throughout the following discussion.



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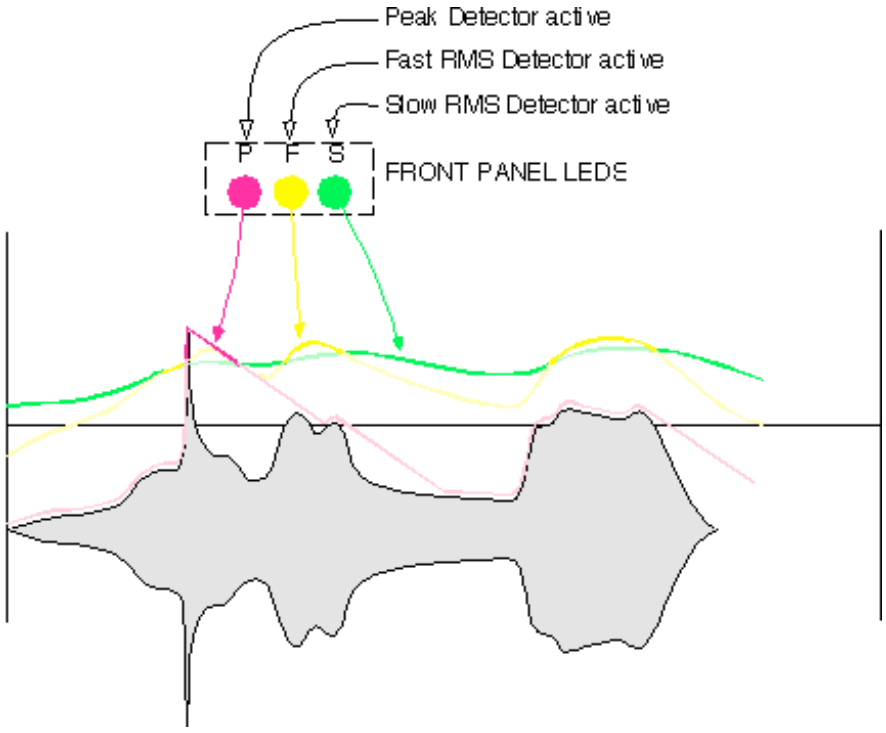
All input signals, whether in Soft Knee or Hard Knee operation, must first undergo conversion to a logarithmic control signal. Logarithmic control, whether peak or RMS, results in the same audible effect--in terms of sonic coloration--over the entire range of compression, in contrast to contemporary dynamic range devices (which produce different audible artifacts varying with the amount of compression employed due to a linear control path signal). In the case of *Sidechain* operation, this logarithmic control signal is derived from the sidechain signal instead of the audio input signal itself, as in normal operation.

The logarithmic control signal generated by the log converter passes next to the GML 8900's three detectors. These independent detection circuits are optimized to affect different transient aspects of any possible audio signal: the Slow RMS Detector acts on the least transient (program level) signals, the Fast RMS Detector responds to more highly transient signals, and the Peak Detector deals with the steepest transients. This control architecture allows for individual circuit optimization in each style of detector, in contrast to more traditional single-detector methods employed in most other dynamic range devices which often exhibit weaknesses in dealing with highly transient musical content. The nature of utilizing RMS-style control signals more closely follows the natural response of the human ear-brain complex, thus resulting in greater musicality and audible integrity, even in cases of drastic compression.

The *Timing* control affects the actions of the detection circuits in an intuitive manner, wherein interrelated attack and release time constants are varied simultaneously for the Slow and Fast RMS Detectors, while timing release values are determined for the Peak Detector. Interestingly, the release of the Fast RMS Detector corresponds to the attack of the Slow RMS Detector, while the Slow RMS Detector's release time may be varied independently of its associated attack time constant by engaging the *Release Hysteresis* control.



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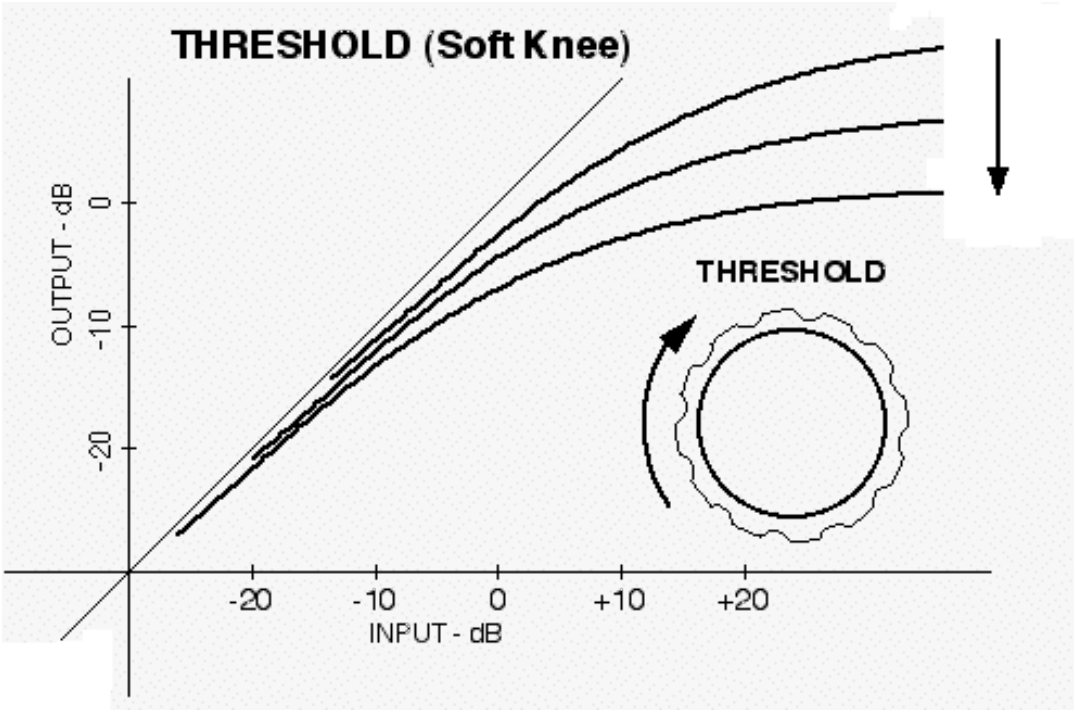
A Detector Compare circuit immediately follows the three detectors in the GML 8900 Dynamic Range Controller. The function served by the comparison circuit is to determine how the dynamic range will be affected in subsequent processing blocks. At this stage, the *Crest Factor* controls--both Fast and Peak--determine at what level the dynamic range will be altered for the corresponding control signals from the RMS Detectors. These "weighting factors" allow the comparison circuit to vary the amount of dynamic range alteration induced by the 8900. This control may actually be seen as a type of predictor to determine the resultant crest factor (peak vs. RMS value) of the output signal as well, within reasonable limits; wherein high values of *Crest Factor* (clockwise potentiometer rotation) will result in more transient preservation at the output, all other factors being equal. Interestingly, the crest factor value is fixed for the Slow RMS Detector in the detector comparison circuit.

The most complex and difficult aspect of the operation of the GML 8900 involves the interrelationship of the *Ratio* and *Threshold* controls. It is best to conceptualize these sections in terms of two different units, each with the same basic control circuitry as described above, but with completely unrelated operational characteristics thereafter.

In terms of straightforward operation, the Soft Knee operation mode is simplest to detail. The operation of the GML 8900 under this condition emulates the operational principle similar to that found in the classic La2a-style compressors, wherein the *Threshold* control behaves as a conventional threshold control to determine the dB threshold value for the dynamic range controller, while the *Ratio* control remains in the "Soft" position. The signal is unaffected by the GML 8900 until the threshold is surpassed, at which point compression begins at a moderate ratio and varies automatically. Continued signal levels increasing above the threshold result in higher and higher compression ratios such that the further a signal goes beyond the threshold, the more severely compressed it gets.



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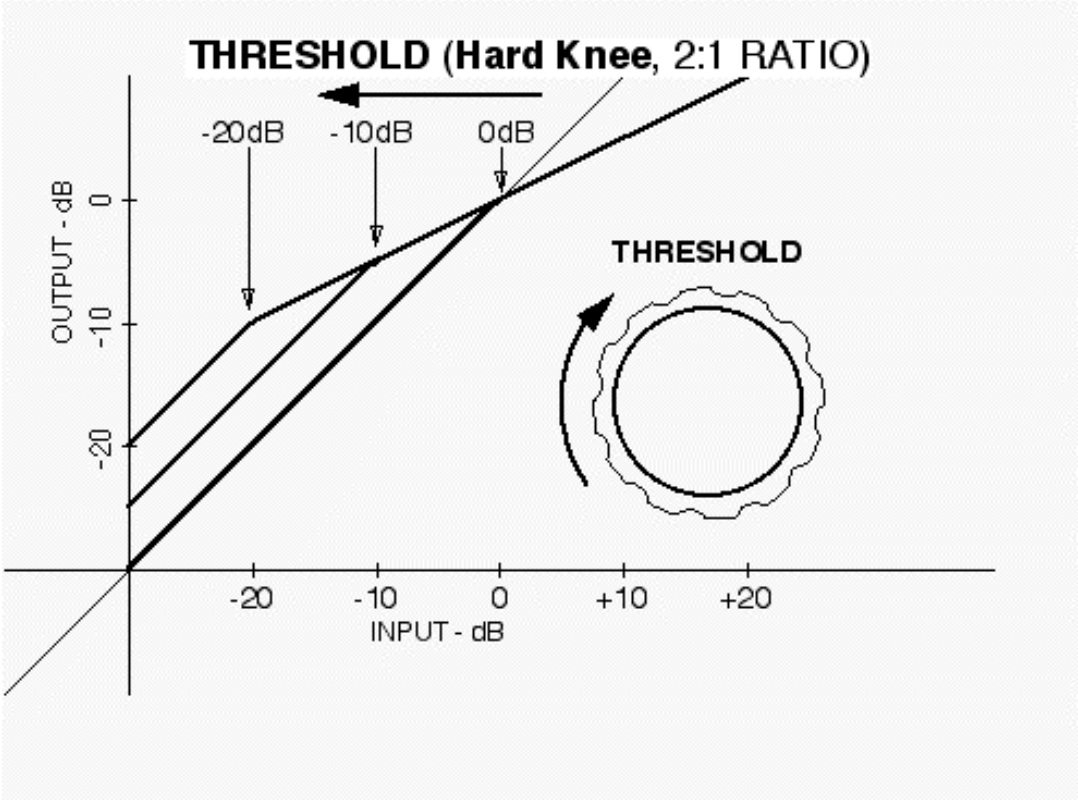
The second mode of operation for the GML 8900, Hard Knee, is less straightforward to explain. Under this condition, the *Threshold* control should be thought of as a compression gain control instead of merely a traditional threshold control, as in the 1176-style compressors. In this case, the effective threshold is predetermined, while the *Threshold* control acts as an input gain stage. This results in the possibility of gain before compression in contrast with Soft Knee operation, and allows for greater sonic flexibility over the resultant dynamic range of the output. The *Ratio* control can be varied from very low values to nearly limiting (infinity to one) in order to attain the most desirable effect for any situation.



The final element in the control path of the GML 8900 dynamic range controller is the *Ratio* control, which has been covered in conjunction with the *Threshold* control previously in this discussion. The importance of this control to the operation of the unit cannot be overstressed: it provides for two entirely different modes of operation. Soft Knee mode performs as described in the preceding sections with a preset non-user definable variable ratio, while Hard Knee mode allows the user to determine the desirable ratio from 1.5:1 to actual limiting (infinity to one) for a great deal of flexibility.

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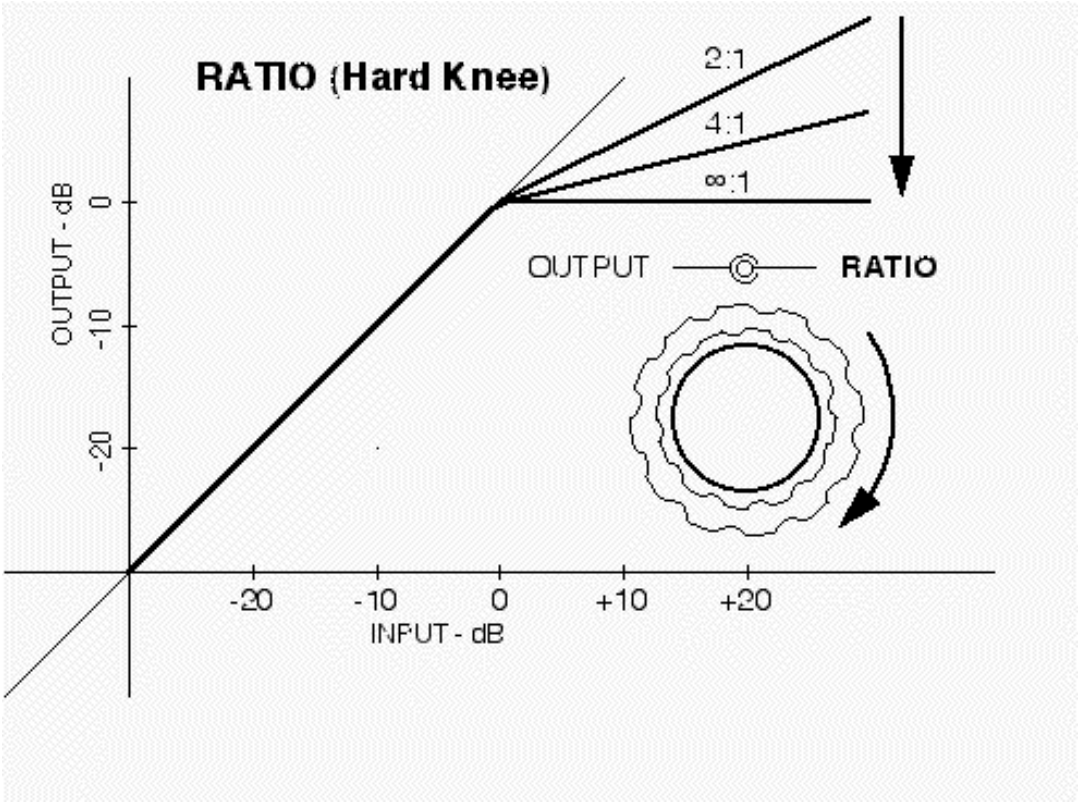

In addition to the aforementioned controls which affect the control signal, one other front panel control remains–the *Output* potentiometer. This control allows for user-determined make-up gain or the possibility of device interconnection level matching as necessary, with the possibility of available gain and attenuation for maximum flexibility. It should be understood that this setting does not affect the dynamic processing functions in any way since it follows the discrete VCA and is merely a function of the output buffering circuits.

Special Operation: Stereo Couple

Engaging *Stereo Couple* will continue to convert the incoming signals (whether the audio inputs or sidechain inputs) as in normal operation, but each channel's resultant logarithmic control signals will affect the other's operation. Thus, signal peaks in *either* channel will affect *both* channels for coupled operation.

Activating *Stereo Couple* affects the GML 8900 in a much different manner than traditional stereo couple switches in most conventional dynamic range devices: the control signals are combined in such a manner as to leave all of the various conversion, detection, and comparison circuits intact and operational in *both* channels simultaneously. Other dynamic control units have a predilection to merely use the control signal generated by one channel in deference to the other channel’s complete control path, thus obviating the second control path and rendering the resultant dynamic control insensitive and impervious to the second channel’s unique dynamic content and unresponsive to desired dynamic content differences between channels. It is important to remember that in order to achieve identical dynamic range control characteristics for both channels the various front panel controls must be adjusted accordingly since these controls still affect the actions of the unit.

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Metering:

Unlike many contemporary dynamic range devices, the GML 8900 Dynamic Range Controller features an accurate meter which displays the continuous state of the VCA (Voltage Controlled Amplifier) instead of merely denoting average gain reduction values. Interestingly, this multi-segment LED meter reflects changes in the *Output* control, since this action directly affects the discrete VCA; therefore, an increase in output gain will correspond with a positive deflection of the meter, from whence the gain reduction will be noted.

Power Supply:

Integral to the superb quality of all GML products is the external power supply. No piece of electronic equipment can operate as designed without an adequate power supply; however, most contemporary dynamic range devices do not feature a supply which can provide clean, quiet power without unduly heating the device. The GML 9015 excels in this respect, providing clean, quiet power for the many complex and sensitive circuits of the GML 8900, while remaining cool and efficient. Internal supply topologies are generally limited by board real-estate and thermal considerations and thus are almost always exclusively of one or another of the switching topologies, which results in more mains-induced noise and less ability to react to highly transient signal content or extreme circuit actions (i.e. massive compression). The internal power distribution scheme employed by the GML 8900 is also responsible--in concert with the external supply itself--for preserving the highest audio quality throughout the many circuits of the Dynamic Range Controller.

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