

GM
Gain Manager
Operation Manual

advantage ®

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INTRODUCTION

The ADVANTAGE® GM is a single rack space, multi-function level control device for automatic gain management. The GM provides four gain managing functions including long-term leveling, soft-knee compression, peak limiting, and soft-gating. These functions continually control output gain and dynamic range to provide a consistent, optimum signal level. The GM is ideal for applications requiring unattended volume control, such as conference rooms, churches, and paging systems. The GM is easy to operate, and is sonically transparent and natural.

GM features include:

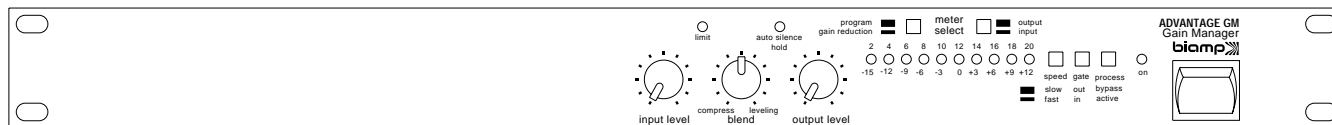
- ◆ leveling function controls long-term average signal levels
- ◆ soft-knee compressor function controls peak signal levels
- ◆ peak limiter function sets absolute ceiling on signal levels
- ◆ soft-gate function reduces output level when system is idle
- ◆ independent bypass switches for processing and gate
- ◆ fast or slow processing, for live or broadcast applications
- ◆ internal independent peak limiter threshold adjustment
- ◆ silence-hold circuitry prevents gain changes during pauses
- ◆ input and output sensitivity selectable by internal jumpers
- ◆ meter indicates average & peak levels, and gain reduction
- ◆ electronic balanced input and output on XLR connectors
- ◆ patch insert and in/out access on ¼" phone connectors
- ◆ DC Out & Expansion jacks provide "system" interfacing
- ◆ covered by Five-Year 'Gold Seal' Warranty
- ◆ **CE** marked and **UL** listed



After reading this manual, if you have any questions or need technical assistance, please call Biamp Systems toll-free (1-800-826-1457).



FRONT PANEL CONTROLS



INPUT LEVEL: This control adjusts the amount of processing the signal receives. Fully clockwise is maximum processing, and fully counterclockwise is minimum processing. Set the desired amount of gain reduction with this control (see Operating Instructions on pg. 5).

BLEND: This control adjusts the mix of leveling and compression applied to the signal. Fully clockwise is leveling only, and fully counterclockwise is compression only. For most applications, Blend is centered for equal amounts of leveling and compression.

OUTPUT LEVEL: This control adjusts the output level over a 20dB range. Adjust the output gain to compensate for the amount of gain reduction set by the Input Level control (see Operating Instructions on pg. 5).

LIMIT INDICATOR: This red LED indicates when the limiter is activated by program signal levels that exceed the threshold.

AUTO SILENCE HOLD INDICATOR: This red LED indicates the Auto Silence Hold (ASH) is inhibiting gain changes. ASH prevents gain changes when the input signal is more than 6dB below the average level.

LED METER: This meter indicates either program levels or gain reduction, depending on the positions of the Program/Gain Reduction and Output/Input switches. In Program mode, the meter shows average signal level by a solid bar and peak signal level by a moving dot. Volume units are indicated by the row of numbers located below the meter. In Gain Reduction mode, the meter shows the amount of leveling by a solid bar and the total amount of gain reduction by a moving dot. The difference between the solid bar and the moving dot indicates the amount of compression. The row of numbers above the meter indicates the amount of gain reduction in dB.

PROGRAM/GAIN REDUCTION: This switch selects the source for the meter display. "OUT" enables the Output/Input switch (8) to select which Program level to display. "IN" selects the amount of gain reduction (leveling and compression) for display.

OUTPUT/INPUT: This switch selects either the output or input signal level for meter display (when the Program/Gain Reduction switch (7) is in the Program position). "OUT" selects Output level for display. "IN" selects Input level.

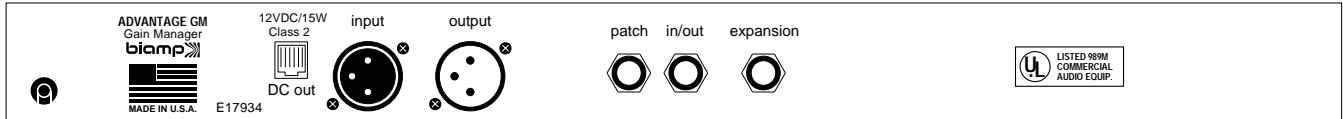
LEVEL SPEED: This switch selects either the Slow or Fast mode for leveling. "OUT" selects Slow, and "IN" selects Fast. Use the Slow speed for studio or broadcast applications, and the Fast speed for most live applications.

SOFT GATE: This switch activates the Soft Gate. Soft gating helps suppress extraneous noise, and increases speech intelligibility in live sound applications.

PROCESS: This switch either bypasses or activates the processing. "OUT" bypasses signal processing. "IN" activates signal processing. Use it to compare processed signal to unprocessed signal, or to remove processing from the signal chain.

POWER SWITCH AND INDICATOR: This red LED indicates the Power Switch is turned on and power is applied to the GM.

REAR PANEL CONNECTIONS



DC OUT: This Modular jack supplies +/-12 volts of DC power for Advantage System One modules. An Advantage GM is capable of supplying power to Advantage System One modules.

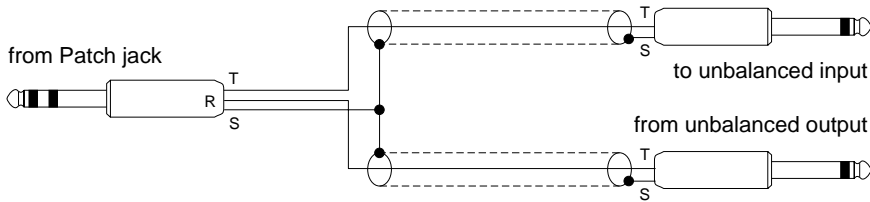
INPUT: This 3-pin XLR jack provides a balanced, RF filtered input. The Input is electronically balanced using differential circuitry. The Input jack is wired to the DIN standard with Pin 2 high (+), Pin 3 low (-), and Pin 1 ground. For unbalanced input, connect to the Input jack with Pin 2 high (+) and Pins 3 and 1 ground.

OUTPUT: This 3-pin XLR jack provides a balanced and floating output, capable of driving 600 ohm loads. The Output is electronically balanced, and is wired to the DIN standard with Pin 2 high (+), Pin 3 low (-), and Pin 1 ground. For unbalanced output, connect to the Output jack with Pin 2 high (+), and Pins 3 and 1 ground.

PATCH: This 3-conductor 1/4" Phone jack is for connection of outboard processing equipment. It is post-output level control, and is wired with Tip being send, Ring being return, and Sleeve being ground. To add processing to the GM output signal, connect processing equipment to the Patch jack using a special 'Patch' cable (see diagram below). The Patch jack may also be connected to any In/Out jack on any Advantage System One modules, using a standard balanced 1/4" Phone cable.

IN/OUT: This 3-conductor 1/4" Phone jack is for connection of the GM to Advantage System One modules. In/Out jacks are wired with Tip being input, Ring being output, and Sleeve being ground. Use standard balanced 1/4" Phone cables for connections. When using an Advantage ONE/EX with an Advantage GM, connect the Main Patch jack of the Advantage ONE/EX to the In/Out jack of the GM, using a standard balanced 1/4" Phone cable. This same connection may be made to any device having patch jacks identical to Advantage System One modules. If only unbalanced 1/4" Phone cables are available, connect to the Advantage GM using In/Out as the input and Patch as the output.

EXPANSION: This 2-conductor 1/4" Phone jack is for connection to the expansion jack of an additional GM module, for stereo operation. This connection ties the leveling circuits of both GM modules together to preserve the stereo image by leveling both sides equally. The levelers in both GM modules function as a single unit. Any time one side triggers more leveling than the other, both sides receive the same amount of gain reduction. Leveling still occurs even if the Blend control on one GM is turned completely to compression, since the other GM continues to drive both levelers. Use an unbalanced 1/4" Phone cable for this connection. Set both Input controls to the same position so each GM is performing an equal amount of processing.



FUNCTIONAL DESCRIPTION

LEVELING

The leveling function controls the long term average signal level. If the average signal level increases, the leveler slowly reduces the gain to compensate for the increase. If the opposite happens, and the average signal level decreases, the leveler slowly boosts the gain. The leveler threshold is set at 15dB below nominal 0VU. The GM has two leveling modes, Slow and Fast. Slow mode is designed for studio and broadcast use, and Fast mode is designed for live sound applications requiring faster attack and release times. The attack time varies from .5-2.5 seconds, and release time varies from 1-15 seconds, depending on mode selection and program material. Attack and release times change in response to program material as the GM automatically adjusts to maintain the average output level.

COMPRESSION

The soft-knee compressor controls peak signal levels by reducing the gain when the signal exceeds the threshold setting of 30dB below nominal 0VU. The compressor responds both to the average and peak signal levels, working with the leveler to maintain a constant output level. The soft-knee compression ratio varies from 1.1:1 just above the threshold, to more than 10:1 at full compression. Attack time is 5-40mS (milliseconds) and release time is 200-500mS, depending on program material.

PEAK LIMITING

The peak limiter sets an absolute ceiling on short-term peak level, providing protection against clipping distortion and the chance of amplifier overload or speaker damage from large transients, such as sudden, loud feedback. The threshold is factory set at 12dB above nominal 0VU, but is user adjustable from 0dB to 15dB (see User Options on pg. 7). The attack time of the limiter is 250uS (microseconds), and the release time is 15mS (milliseconds).

SOFT GATING

The soft gating function expands the dynamic range downwards whenever the signal level falls below the threshold setting of 25dB below nominal 0VU. Soft gating reduces the gain of the GM by 2dB for every 1dB the signal level drops below the threshold. Unlike a standard gate, which cuts off abruptly, soft gating decreases gain in a more natural sounding manner. In the studio, the soft gate can replace an outboard noise gate to minimize unwanted background noise from an input signal. In live applications, the soft gate substantially reduces electronic noise in the system, while preserving the natural decay characteristics of speech or music. In addition, the soft gate increases speech intelligibility in highly reverberant rooms by eliminating the recirculation of reflected signal back through the system. The attack time of the soft gate is 1mS (milliseconds), and the release time is 100mS.

CONTROL CIRCUITS

Two control circuits, Dynamic Silence Hold (DSH) and Auto Silence Hold (ASH), are included to make the leveling and compression as natural sounding as possible. DSH inhibits gain changes during brief periods of silence, such as pauses in speech, but allows gain changes immediately after the signal resumes. DSH is activated whenever the signal falls more than 6dB below the average level. It prevents gain changes for up to 300mS (milliseconds). If the pause lasts longer, ASH is activated. ASH also prevents gain changes, but has no time limit, staying active until the signal rises above the threshold.

USER OPTIONS

The input and output gain of the GM can be set for reference levels of -10, 0, +4, or +8dBu by internal jumpers. These settings accommodate most professional and semi-professional equipment. The input gain setting determines the actual value of 0VU on the input meter, and allows the meter to match the system in which the GM is being used. Input and output levels may be set separately so the GM can match two devices with different operating levels. For example, the GM can receive its input signal from a -10dBu source and send its output signal to a +4dBu device (see User Options on pg. 7). The jumpers are factory set at 0dBu.

The peak limiter threshold is user adjustable from 0dB to 15dB above nominal 0VU. It is factory set 12dB above the nominal level (see User Options on pg. 7).

OPERATING INSTRUCTIONS

CONNECTIONS

To connect the GM to an Advantage ONE, EX, or other Advantage System One module: 1) Set both the Input and Output Reference jumpers to 0dBu (this is the default setting as the unit is shipped from the factory). 2) Connect the Advantage GM In/Out jack to the Main Patch jack of the Advantage ONE or EX, or to an individual channel patch jack of any other module (see Rear Panel Connections on pg. 3).

To connect the GM to other mixers or devices: 1) Move the Input and Output Reference jumpers inside the GM to match the expected system levels. Input and output levels can be set to match different operating levels (see User Options on pg. 7). 2) Adjust the peak limiter threshold setting, if desired (see User Options on pg. 7). 3) Connect the signal source to the Advantage GM XLR Input jack (see Rear Panel Connections on pg. 3). 4) Connect the Advantage GM XLR Output jack to the input of the next device in the system (see Rear Panel Connections on pg. 3).

SETTING CONTROL LEVELS

The Input Level and Blend controls determine the dynamic range (the difference in dB between the loudest and quietest signal levels). The Input Level control sets the amount of processing, and the Blend control sets the ratio of leveling to compression.

The Input Level control adjusts the amount of input signal sent to the processor. At full clockwise rotation, maximum processing can be achieved. Use the Input Level control only to set the desired amount of gain reduction. Do not use the Input Level control to adjust input or output levels of the GM.

Use the Output Level control to compensate for the amount of gain reduction, or adjust the overall system output to the desired level (see Stability Check for Live Sound Applications on this page).

When the expansion jacks of two GM modules are connected together for stereo operation, set both Input Level controls to the same position, so each side of the stereo image receives an equal amount of processing.

As the Blend control is moved counterclockwise toward compression, the dynamic range becomes progressively more restricted. Just how restricted the dynamic range is for any given position depends upon the amount of gain reduction set by the Input Level control. With the Blend control at full counterclockwise, the GM is functioning as a compressor. As the Blend control is moved clockwise, the dynamic range is less restricted. At full clockwise, only the average level is controlled, and the GM is functioning as a leveler. For most applications, an equal amount of leveling and compression provides the best sonic results, because the leveler enables the compressor to do a minimum of dynamic reduction.

To set the initial control levels: 1) Set the Input and Output Reference jumpers inside the GM, to match the nominal levels of the other devices (see User Options on pg. 7). 2) Set the Process switch to the Active position. 3) Set the Program/Gain Reduction switch to the Program position. 4) Set the Input/Output switch to the Input position. 5) Adjust the output level of the device driving the GM, so the GM meter reads average input levels of 0VU. 6) Move the Program/Gain Reduction switch to the Gain Reduction position. 7) Adjust the Blend control for the desired ratio of compression to leveling. The center position is a good starting place for most applications. Use the meter for a visual reference. Leveling is shown by the solid bar, and total gain reduction is shown by the moving dot (compression is the difference between the two). 8) Adjust the Input Level control for the desired amount of total gain reduction (10dB of gain reduction is usually adequate to control most program material). Use the meter for a visual reference. 9) Set the Program/Gain Reduction switch to the Program position. 10) Set the Input/Output switch to the Output position. 11) Adjust the Output Level control to compensate for the amount of gain reduction, or to adjust overall system level. Use the meter as a visual reference, and the Process switch to compare actual input and output levels.

STABILITY CHECK FOR LIVE SOUND APPLICATIONS

Because the GM can add gain to a system, some precautions must be taken to prevent feedback. As the level of the input source decreases, the gain of the GM increases. The sound system must be stable when the input signal is minimal and the GM meter shows no gain reduction is occurring. It is at this point that gain reaches its highest level.

For systems where automatic gating implements NOM attenuation, perform the stability check with one microphone open. For non-automatic systems, perform the check with as many microphones open as will be used at one time.

Place the GM meter in the Gain Reduction mode and speak softly into the system until the GM meter shows no gain reduction (no LED display). If ringing or feedback occurs, either attenuate the offending frequencies, using notch filters or some other type of equalization, or reduce the system gain (by adjusting the GM Output Level control, or by reducing the overall system level at the amplifier).

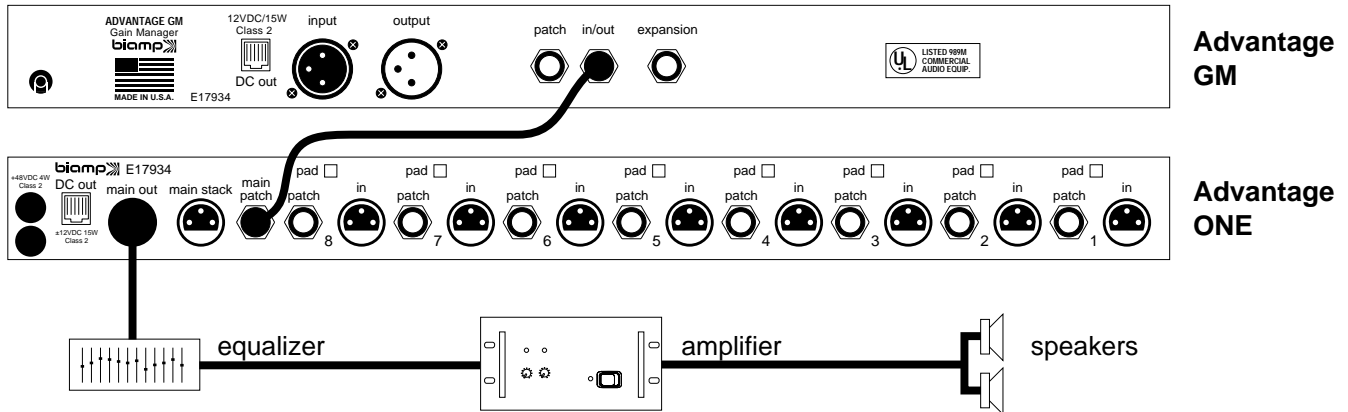
NOTE: It is extremely important to do the "Stability Check", otherwise, erratic behavior can begin to occur long after the installation and set-up have been completed.

CAUTION: *Once the system is stable, DO NOT increase the GM output level or add gain to the system after the GM.*

An alternative to using a GM on the output of a system is to use one on each microphone. This approach is especially attractive for small systems with only one or two mics. Using the Soft Gate feature of the GM will give results similar to a fully gated automatic system. Perform the stability check as previously described with all mics open and the Soft Gate off.

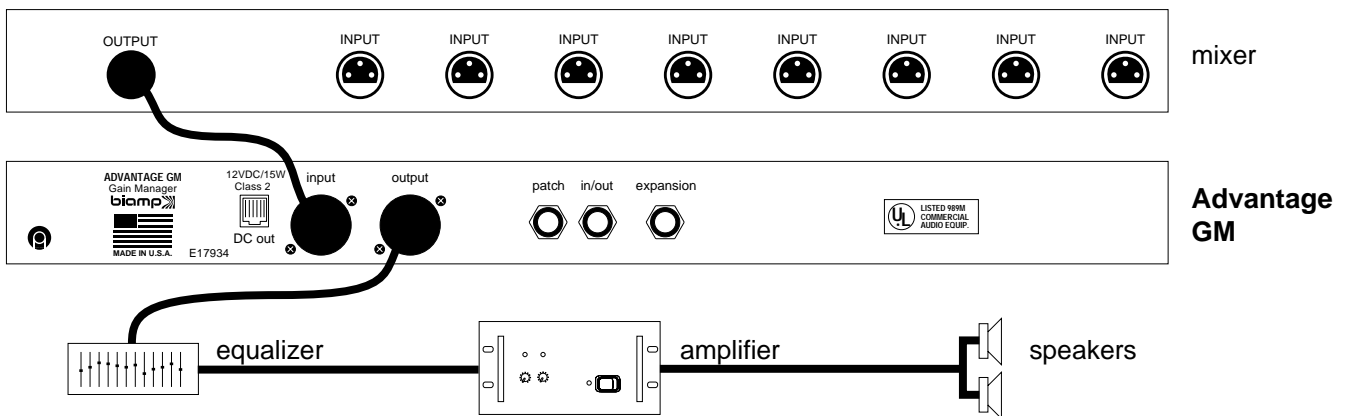
APPLICATIONS

Advantage GM with an Advantage ONE mixer



- 1) Connect microphones to channels 1-8 of the Advantage ONE mic/line mixer.
- 2) Adjust the Advantage ONE Trim controls so the Peak Indicators (+10) are activated only by occasional peaks in signal level.
- 3) Adjust the Advantage ONE channel and Main Level controls for desired levels (typical settings are near the 1 o'clock position).
- 4) Set the GM Input and Output Reference jumpers to 0dBu (the default setting as shipped from the factory).
- 5) Connect the Advantage ONE Main Patch jack to the GM In/Out jack, a balanced 1/4" Phone cable.
- 6) Adjust the GM Blend control to set the ratio of compression to leveling (the center position is good for most applications).
- 7) Adjust the GM Input Level control for desired amount of gain reduction (10dB is usually adequate for most applications).
- 8) Adjust the GM Output Level control to compensate for the amount of gain reduction (see Operating Instructions on pg. 5).
- 9) Perform the "Stability Check for Live Sound Applications" on the GM (see Operating Instructions on pg. 5).

Advantage GM with an existing system



- 1) Set the GM Input and Output Reference jumpers to match the expected system levels (+4dBu for most mixers and amplifiers).
- 2) Connect the mixer output to the GM Input jack, using a balanced XLR cable.
- 3) Connect the GM Output jack to the equalizer/amplifier input, using a balanced XLR cable.
- 4) Adjust the equalizer/amplifier output for the desired overall system level.
- 5) Adjust the GM Blend control to set the ratio of compression to leveling (center position is good for most applications).
- 6) Adjust the GM Input Level control for desired amount of gain reduction (10dB is usually adequate for most applications).
- 7) Adjust the GM Output Level control to compensate for the amount of gain reduction (see Operating Instructions on pg. 5).
- 8) Perform the "Stability Check for Live Sound Applications" on the GM (see Operating Instructions on pg. 5).

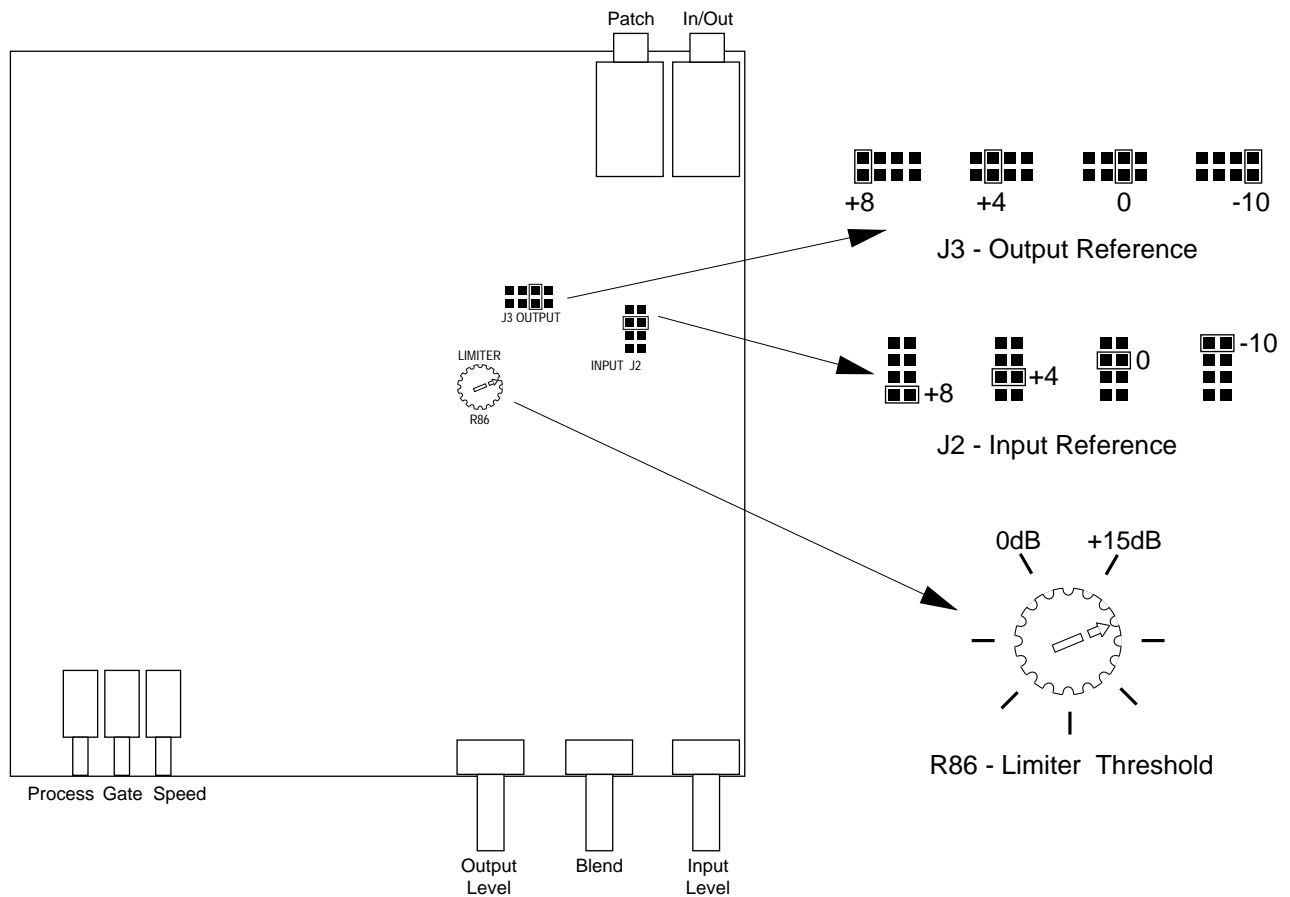
USER OPTIONS

INPUT & OUTPUT REFERENCE JUMPERS

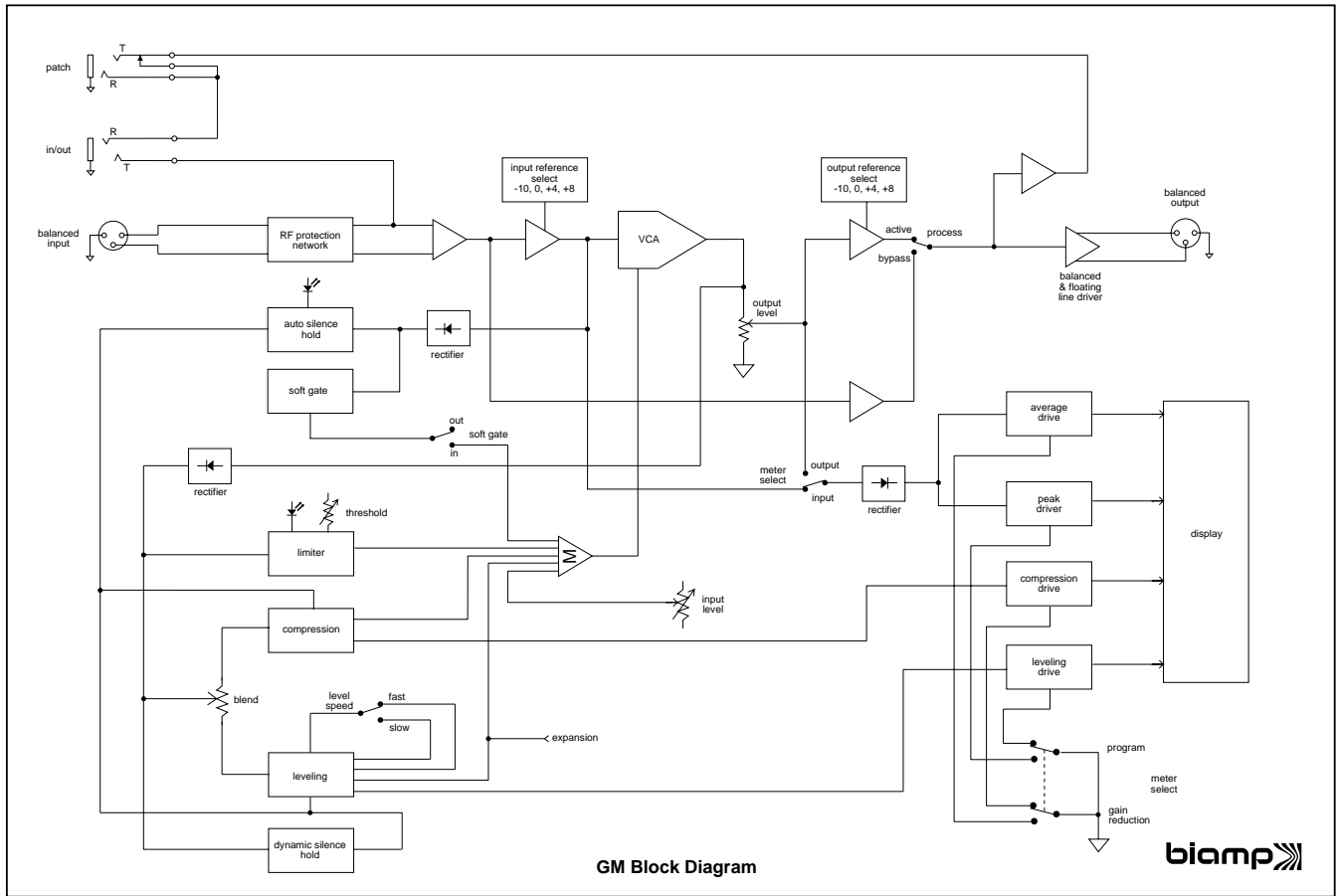
The input and output gain can be set for reference levels of -10, 0, +4, or +8dBu by removing the bottom cover and changing the jumpers (see diagram below). The jumpers are factory set at 0dBu. Input and output levels may be set separately to match two devices with different operating levels. For proper operation, the Input Reference jumper must be set so the device driving the GM can easily provide average input levels of 0VU, as indicated by the GM meter.

PEAK LIMITER THRESHOLD ADJUSTMENT

The peak limiter threshold setting may be adjusted from 0dB to 15dB by removing the bottom cover and rotating the trimpot. The limiter threshold is factory set at 12dB above nominal 0VU. Clockwise rotation lowers the threshold, and counterclockwise rotation raises it (see diagram below). The limit LED on the front panel indicates when the limiter is activated. Use it for a visual reference when adjusting the limiter threshold.



BLOCK DIAGRAM



SPECIFICATIONS

INPUT:		LEVELING:	
Input Impedance		Attack Time (program dependent)	
(balanced)	48k ohms	(fast)	0.5-0.75 seconds
(unbalanced)	24k ohms	(slow)	1.0-2.5 seconds
Nominal Level @ 0VU (selectable)	-10, 0, +4, or +8dB	Release Time (program dependent)	
Maximum Input Level	+27dBu	(fast)	1.0-5.0 seconds
Common Mode Rejection Ratio (20Hz-20kHz)	>40dB	(slow)	2.5-15.0 seconds
		Rate (program dependent)	
		(fast)	2-20dB/second
		(slow)	0.5-10dB/second
OUTPUT:		Threshold	15dB below 0VU
Output Impedance			
(balanced)	200 ohms		
(unbalanced)	100 ohms		
Maximum Output	+19dBu	COMPRESSION:	
Frequency Response (10Hz-50kHz)	+0/-1dB	Attack Time (program dependent)	5-40mS
Hum & Noise (20Hz-20kHz @ unity gain)	<-90dBu	Release Time (program dependent)	200-500mS
Total Harmonic Distortion (20Hz-20kHz)		Ratio	1.1:1-10:1
(+4dBu output/10dB of compression)	<0.15%	Threshold	30dB below 0VU
Intermodulation Distortion (SMPTE)			
(+4dBu output/10dB of compression)	<0.3%	PEAK LIMITER:	
		Attack Time	250µS
POWER CONSUMPTION (120/240VAC):	12 Watts max.	Release Time	15mS
		Threshold (adjustable)	0-15dB above 0VU
DIMENSIONS:			
Height (1 rack space)	1.75 inches (44mm)	SOFT-GATE:	
Width	19 inches (483mm)	Attack Time	1mS
Depth	7 inches (178mm)	Release Time	100mS
		Threshold	25dB below 0VU
WEIGHT:	5 lbs. (2.27kg)	Gain (dB reduction/dB signal below threshold)	20dB/10dB

WARRANTY

BIAMP SYSTEMS IS PLEASED TO EXTEND THE FOLLOWING 5-YEAR LIMITED WARRANTY TO THE ORIGINAL PURCHASER OF THE PROFESSIONAL SOUND EQUIPMENT DESCRIBED IN THIS MANUAL.

BIAMP Systems expressly warrants this product to be free from defects in material and workmanship for a period of 5 YEARS from the date of purchase as a new product from an authorized BIAMP Systems dealer under the following conditions.

1. The Purchaser is responsible for completing and mailing to BIAMP Systems, within 10 days of purchase, the attached warranty application.
2. In the event the warranted BIAMP Systems product requires service during the warranty period, BIAMP Systems will repair or replace, at its option, defective materials, provided you have identified yourself as the original purchaser of the product to any authorized BIAMP Systems Service Center. Transportation and insurance charges to and from an authorized Service Center or the BIAMP Systems factory for warranted products or components thereof to obtain repairs shall be the responsibility of the purchaser.
3. This warranty will be VOIDED if the serial number has been removed or defaced; or if the product has been subjected to accidental damage, abuse, rental usage, alterations, or attempted repair by any person not authorized by BIAMP Systems to make repairs; or if the product has been installed contrary to BIAMP Systems's recommendations.
4. Electro-mechanical fans, electrolytic capacitors, and the normal wear and tear of appearance items such as paint, knobs, handles, and covers are not covered under this warranty.
5. BIAMP SYSTEMS SHALL NOT IN ANY EVENT BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, LOSS OF USE, PROPERTY DAMAGE, INJURY TO GOODWILL, OR OTHER ECONOMIC LOSS OF ANY SORT. EXCEPT AS EXPRESSLY PROVIDED HEREIN, BIAMP SYSTEMS DISCLAIMS ALL OTHER LIABILITY TO PURCHASER OR ANY OTHER PERSONS ARISING OUT OF USE OR PERFORMANCE OF THE PRODUCT, INCLUDING LIABILITY FOR NEGLIGENCE OR STRICT LIABILITY IN TORT.
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7. No action for breach of this warranty may be commenced more than one year after the expiration of this warranty.

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Biamp Systems
14130 N.W. Science Park
Portland, Oregon 97229
(503) 641-7287