LEAMING INDUSTRIES AGC432
STEREO/DUAL MONO
AUTOMATIC GAIN CONTROL

INSTRUCTION BOOK
IB 173432-21B

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AGC432

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WARNING

The AGC432 is powered by 120 volts AC. Contact with 120 volts can cause injury or death. Disconnect the AGC432 from electric power before opening the cover.

Refer service and internal adjustments to qualified personnel.

1.0 INTRODUCTION

The AGC432 is a stereo (or dual mono) automatic audio gain control designed to maintain average program levels within a reasonable range without reducing the dynamic range to the extent that quiet passages are no longer quiet and loud passages are no longer loud.

The AGC432 includes a programmed gain controller. When the audio level falls over 20 dB below normal, the AGC432 assumes that there is a pause in the program and holds its gain setting for 10 seconds. This maintains the ambient background levels in their original perspective during brief program pauses. If the program level has not returned to normal after that 10 seconds, the AGC432 resets its gain to the bypass value, in preparation for a new program.

The AGC432's gain controller responds quickly to reduce higher-than-normal program levels, which avoids audible distortion. For additional protection against over-modulation by sudden peaks, a limiter clamps any remaining spikes. Conversely, the gain controller responds gradually to increase lower-than-normal program levels.

The AGC432 offers three gain-control mode options: Internal jumpers may be positioned to provide a 2:1 (dB) output compression ratio (Mode 1), or a Constant-Level output (Mode 2), or an Adaptive-Slope output (Mode 3).

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With this third method, which is the standard configuration, the control slope makes a gradual transition from a 2:1 compression ratio at low levels to a constant-level output at elevated input levels. Therefore, a realistic dynamic range is preserved at normal program levels while very significantly reducing excessively high program levels.

Each AGC may be used to independently process two monaural inputs, or it may be configured to process a stereo (L & R) input. In both cases, alternate inputs ("A" & "B") are provided for local ad insertion or backup audio.

A stereo synthesizer is built-in. The synthesizer may be used, when in the stereo mode, for the second program input and/or the main program audio.

2.0 CONFIGURATION

NOTE: The toggle switches used on the AGC432 may have self-locking levers; to actuate, gently pull out on handle, then move lever to selected position and release.

The AGC432 is shipped ready-to-run in the dual-mono, adaptive-slope mode. However, you may wish to configure it differently for your application. If not, you may skip this section and proceed to the Installation section.

The AGC432 may be configured for either dual mono, or true stereo, or synthesized stereo. This may be done by connecting jumpers to the control connector on the rear panel, as detailed below. In addition, internal jumper jacks permit independent selection of any of three gain control curves, as well as selecting any of three release times for each channel. If in the dual mono mode, the control curves and release times may be set differently for each channel, if desired.

The two channels are totally independent in the dual mono mode; whatever is done to channel 1 will have no effect on channel 2. However, when configured for the stereo mode, both the left and the right channels can be simultaneously switched to either the "A" or the "B" program inputs and to either the AUTOmatic or BYPass mode. By placing both of the the right-channel switches in their center REMote positions, the left channel switches will act as masters, controlling both channels simultaneously.

2.1 CONFIGURATION, DUAL MONO

Configure the AGC432 for dual mono operation by removing all straps from the 8-pin control connector on the rear panel. (Pins 2 & 3, 5 & 6, and 7 & 8 may have been strapped together for stereo operation, and pin 4 may have been strapped to pins 2 & 3, or to pins 5 & 6, to enable the stereo synthesizer. The stereo synthesizer should not be enabled in the dual mono mode; the result would be crosstalk between channels.)

2.2 CONFIGURATION, STEREO

Configure the AGC432 for stereo by strapping the 8-pin control connector on the rear panel as follows:

Pins 2 & 3 connected together to enable the stereo mode;

Pins 5 & 6 connected together to select the "B" inputs simultaneously;

Pins 7 & 8 connected together to activate the AGC's simultaneously.

Set the Right/Channel 2 A/REM/B input selector and the Right/Channel 2 AUTO/REM/BYP switches in their center REMote positions.

The right channel will then track the switch settings of the left channel.

NOTE: If a remote control is connected to pins 5 & 6 or 7 & 8, the remote control may over-ride the tracking of the left channel by the right channel; in this case, the remote control can be over-ridden by setting the switches for both the left and the right channels in the desired mode ("A" or "B", AUTOmatic or BYPass).

2.3 CONFIGURATION, SYNTHESIZED STEREO

Configure as for true stereo, and, on the input connector(s) which are being fed mono audio, strap the left and right channel program inputs together: pins 1 to 4 and 2 to 5 (Right High to Left High, and Right Low to Left Low).

In addition, enable the stereo synthesizer by either connecting pin 4 to ground at pin 2 or, to automatically switch from true stereo to synthesized stereo when the "B" program input is selected, strap pin 4 to pins 5 & 6.

2.4 CONFIGURATION, GAIN CONTROL SLOPE (INTERNAL)

WARNING: To avoid electric shock hazard, disconnect the AGC432 from electric power before opening the cover.
Refer internal adjustments to qualified personnel.

The AGC432 may be configured to any one of three gain control slopes (2:1, Constant Output, or Adaptive Slope) by positioning jumper jacks on quads of pins on the circuit board. The four pins arranged in a quad on the left half of the board (as you look down from the front) are for the left channel (Channel 1); those in the quad on the right half are for the right channel (Channel 2). The compression mode is normally factory-set to Adaptive Slope (Mode 3). This is optimum for most applications.

2.4.1 Mode 1 (2:1) is selected by installing two jumper jacks to connect the front and rear pins of both sides of the appropriate quad.

2.4.2 Mode 2 (Constant Output) is selected by installing just one jumper jack, to connect the front and rear pins on the right side of the appropriate quad. Store the remaining jumper jack on one of the remaining pins.

2.4.3 Mode 3 (Adaptive Slope) is selected by installing just one jumper jack, to connect the front and rear pins on the left side of the appropriate quad. Store the remaining jumper jack on one of the remaining pins.

Mode 3 is a combination of the most desirable characteristics of both modes 1 & 2. Mode 3 preserves most of the apparent dynamic range of programs at normal audio levels by gently increasing the gain when the level drops below normal. However, if the input level rises above normal, the gain is decreased by a considerably greater factor. For a more thorough discussion of the gain control curves, refer to the Theory of Operation section of this manual.

2.5 CONFIGURATION, RELEASE TIME (INTERNAL)

WARNING: To avoid electric shock hazard, disconnect the AGC432 from electric power before opening the cover.
Refer internal adjustments to qualified personnel.

The AGC432 may be configured to any one of three release times (10, 15, or 25 seconds). The release time can be set by positioning jumper jacks on a row of three pins on the circuit board. The three pins arranged in a row on the left half of the board are for the left channel (Channel 1); those in the row on the right half are for the right channel (Channel 2).

The selection of release time always involves compromise: A faster release time may make the operation of the gain control more obvious, and a slower release time may result in prolonged recovery when a different program source at substantially lower level is encountered. The factory setting of 10 seconds is optimum for most TV audio programs.

2.5.1 10 seconds is selected by installing a jumper jack to connect the two pins on the left end of the row.

2.5.2 15 seconds is selected by installing a jumper jack to connect the two pins on the right end of the row.

2.5.3 25 seconds is selected by not connecting any of the three pins. Store the jumper jack on one of the pins.

2.6 CONFIGURATION, OUTPUT LEVEL (INTERNAL)

WARNING: To avoid electric shock hazard, disconnect the AGC432 from electric power before opening the cover.
Refer internal adjustments to qualified personnel.

The peak program output level of the AGC432 may be adjusted from zero up to greater than +18 dBm. The standard factory setting is +10 dBm.

The level controls are located on the AGC432's circuit board, at the right rear of the unit as you look down from the front. The control on the left affects the left channel (channel 1) and the control on the right affects the right channel (channel 2).

Accurate adjustment requires the use of an external audio generator and meter. Set the AUTO/REM/BYP switch to BYPass. Connect the generator to the input of the channel(s) to be re-calibrated and adjust the generator's output to 1000 Hz at a level which will illuminate the yellow 0 dB LED(s) at approx. half-intensity. Connect the meter to the output to be calibrated. Adjust the appropriate level control on the AGC432's circuit board as required.

3.0 **INSTALLATION**

3.1 MOUNTING

The AGC432 is intended to be mounted on a Leaming PMU401 Mainframe. Each unit requires one-third of the PMU401.

To mount the AGC432 in a PMU401, remove the blank front plate (if any) from the PMU401, place the AGC432 in the selected position, and secure it with the four #6-32 screws provided.

3.2 CONNECTORS, SCREW-TERMINAL PLUG BLOCKS

The connectors on the AGC432 are a combination plug/screw-terminal type. To wire the connector, simply pull the body of the connector straight back, off the plug inside the chassis. Strip the insulation off the wire (approx. 3/16"), slip the wire into the clamp, and tighten the screw. After each wire has been secured, push the connector body onto the plug in the chassis.

NOTE: The AGC432 uses four separate connectors. Observe the pin/body alignment when installing, to avoid possible connector damage. The connector groups and pin assignments are noted on the chassis. They are as follows, as observed from the rear of the chassis:

3.2.1 REMOTE CONTROL CONNECTION

The remote control connector uses 8 pins:

Pin 1, Reserved for optional +24 V Input
Pin 2, Ground
Pin 3, Stereo Mode
Pin 4, Synthesized Stereo
Pin 5, Select "B", Ch. 2
Pin 6, Select "B", Ch. 1
Pin 7, Activate AGC, Ch. 2
Pin 8, Activate AGC, Ch. 1

The remote controls are active-low. Grounding the respective remote control line selects the alternate mode, such as SYNTHesizer on, and/or Input "B". To enable each remote control pin, the respective switch on the front panel must be in the REMote (center) position.

The remote ground may be by hard-contact switch or relay, or by any suitable solid-state device which can pull a 10 k-ohm line from +5 V to within 1 V of ground, and release it with over 100 k-ohms.

3.2.2 AUDIO INPUT "A", AND AUDIO INPUT "B" CONNECTION

Each input ("A" & "B") uses a 5-pin connector:

Pin 1, Right/Channel 2 High
Pin 2, Right/Channel 2 Low
Pin 3, Ground
Pin 4, Left/Channel 1 High

Pin 5, Left/Channel 1 Low

Be sure that the chassis of the AGC432 and the source are both grounded. Usually this is done with the power cord safety ground and/or the mounting rack frame ground.

For optimum results, use twisted-pair cable with an overall shield. Connect the Right and Left shields together to the common ground terminal on the AGC432.

If driving from an unbalanced source, the AGC432's High terminal carries the signal and the AGC432's Low terminal is to be connected to the shield.

Input "B" can either be used for local ad insertion or for backup audio. The "B" input is wired in the same procedure as the "A" input, with the exception that it is plugged into the "B" Input connector on the back of the AGC432 (rather than Input "A"). See Section 4.2 for information regarding the selection of A/B inputs and stereo synthesis.

3.2.3 AUDIO OUTPUT CONNECTION

The audio output uses a 4-pin connector with the same sequence as the inputs, except the center Ground pin has been eliminated:

Pin 1, Right/Channel 2 High
Pin 2, Right/Channel 2 Low
Pin 3, Left/Channel 1 High
Pin 4, Left/Channel 1 Low

Be sure that the chassis of the AGC432 and the load are both grounded. Usually this is done with the power cord safety ground and/or the mounting rack frame ground.

If driving to a balanced load, the shield should be connected at one end only, that being at the load end, in order to minimize ground loops.

If driving to an unbalanced load, the AGC432's High terminal carries the signal and the AGC432's Low terminal is to be connected to the shield, which should be grounded at the load end only, in order to minimize ground loops.

4.0 **OPERATION**

NOTE: The toggle switches used on the AGC432 may have self-locking levers; to actuate, gently pull out on handle, then move lever to selected position and release.

4.1 AUDIO INPUT LEVEL SETTING

The AGC432 is furnished with two sets of input level controls on the front panel: LEFT/CH 1 "A" & "B", and RIGHT/CH 2 "A" & "B". Audio program levels are monitored with peak-reading LED bargraphs, one for LEFT/CH 1 and one for RIGHT/CH 2.

4.1.1 Set the AUTO/REM/BYP switch to the BYPass mode. Before switching the AGC to the AUTOmatic mode, be sure that the input levels have been set.

4.1.2 Set the A/B Input Selector switch to correspond with the input you are using.

4.1.3 Adjust the appropriate Level control (Left/Channel 1, Input "A" or "B" or Right/Channel 2, Input "A" or "B") on the AGC432 so the peak-reading VU meter reads approximately 0 dB (yellow LED) and the red LED flashes only rarely and only on very loud program material. Be sure that the AGC mode switch on the front panel is in the "BYP" position when making any level adjustments.

NOTE: If the AGC was just in the active mode, and if the meter was reading above mid-scale, wait 10 seconds after switching to "BYP" for the gain to return to normal before positioning the input level control. This wait may be shortened to one second by momentarily switching to the other input. (Whenever the input selector is switched, the release time is momentarily reduced to permit rapid recovery and accomodation of any program level change.)

4.1.4 Set the AUTO/REM/BYP switch to AUTO. The green AUTO LED will illuminate. If your levels were set high, you may notice them drop down; otherwise, there should be no noticeable level changes. If the program pauses or the input level drops over 20 dB below normal, the VU meter LED will extinguish, indicating that the automatic level control is holding the gain at the last setting. If the program level remains at or below this level for 10 seconds, the AUTO LED will extinguish and the gain setting will change to 0 dB, the same as in the bypass mode. The unit will automatically be re-activated when the program returns.

NOTE: The operation of the AGC432 is nearly transparent; consequently it is extremely difficult to detect, as over-modulation is quickly reduced, and low levels are raised very slowly, in order to retain the apparent dynamic range and eliminate audible gain changes. To demonstrate that the unit is indeed functioning, intentionally apply a noticeably stronger-than-normal signal with the AGC432 in the bypass mode, then switch the AGC432 to the active mode. There should be a noticeable reduction in the audio level. When the AGC is switched off, the audio level will gradually recover. It is convenient to use an input level control of the AGC432 to do this; just re-set this control as outlined above when the demonstration is completed, in order to set the AGC432 into its optimum range.

4.2 AUDIO INPUT SELECTION (AD INSERTION)

In the REMote position of the A/REM/B selector switch, when terminal A/B CH 1 (pin 6) or A/B CH 2 (pin 5) is grounded, the AGC432 switches that channel from Input "A" to Input "B". The front panel A/REM/B switch will override any remote control connections on the back panel if placed in either the "A" or "B" position.

To switch from Input "A" to Input "B" by remote control, such as when using ad insertion equipment, connect the appropriate A/B terminal(s) on the AGC432 to the relay(s) which you are using to control the audio switch. The relay(s) must be capable of pulling a 10 k-ohm line normally at +5 volts to within 1 volt of ground.

4.3 TRUE STEREO/SYNTHESIZED SELECTION (AD INSERTION)

The AGC432 is equipped with a built-in stereo synthesizer, for use whenever the desired output is stereo but the source programming is mono (e.g. many local commercials are mono, while the main program audio is stereo). The AGC432 is normally in true stereo. By simply installing one jumper on the remote connector, combinations of true and synthesized stereo can be selected: "A" & "B" true stereo; "A" true & "B" synthesized, or both "A" & "B" synthesized.

To automatically select synthesized stereo whenever the "B" inputs are selected (either locally or remotely), connect pin 4 (SYNTH) to pins 5 & 6 (A/B CH 1 & A/B CH 2) on the Remote Control connector. Then, when pins 5 & 6 are grounded (e.g. by local commercial insertion equipment or VideoCipher bypass) pin 4 is also grounded, selecting the "B" inputs and stereo synthesis together.

CAUTION: If the stereo synthesizer is also to be used with both ad insertion and backup VideoCipher audio (as follows in Section 4.4), replace the wire between pin 4 and pins 5 & 6 with any standard silicon diode (1N4148 or 1N4001 or similar) to avoid selecting the "B" input when only the stereo synthesizer is desired; the cathode of the diode must be connected to pins 5 & 6 and the anode must be connected to pin 4 (The diode's arrow should point toward pins 5 & 6).

OPERATIONAL NOTE: If the program source is mono and the corresponding AGC432 input is configured for synthesized stereo, the listener will hear an apparently stereo source with considerable ambience and some (artificial) directionality.

If a stereo program source is fed through the synthesizer, some directionality remains, and the ambience will be changed. If the original stereo had very little ambience, it will be increased noticeably; if the original program had considerable ambience, it will be reduced somewhat. The overall effect is generally quite pleasing.

4.4 VIDEOCIPHER BACKUP AUDIO WITH STEREO SYNTHESIS

If you are using stereo audio from a VideoCipher, a typical backup setup would be to run the mono audio output from the TVRO into both the left & right "stereo" inputs of the VideoCipher (Jump the wires so the mono goes into both the left and the right inputs, + to + and - to -). Connect the stereo outputs of the VideoCipher into the AGC432 normally, as described in Section 3.2.2. In addition, run a pair of control wires, one from the VideoCipher's Bypass N.O. terminal (pin 8 of TB1) to the AGC432's "SYNTH" terminal (#3), and run the other control wire from the VideoCipher's Bypass COM terminal (pin 9 of TB1) to the AGC432 Ground terminal (#2). Since the relay on the VideoCipher is closed when in backup (mono) operation, this automatically switches the AGC432 to synthesized stereo when in the backup mode.

With the above configuration the AGC432 will process true stereo from the VideoCipher left and right signals, through your system. If the VideoCipher goes into the bypass mode (shuts down), the mono backup audio will be sent through you system as synthesized stereo. Input "B" remains available for local commercial insertion.

NOTE: If the selection of "B" inputs is by remote control, the selection of the stereo synthesizer will automatically follow if the remote control pins are strapped together by jumping pin 4 to pins 5 & 6. The stereo synthesizer will not automatically follow if the remote controller is forcing pins 4, 5, & 6 to either high or low and the front panel A/B selector is used to override the remote controller. Under these conditions the input will be as selected on the front panel of the AGC432, but the stereo/synthesis will be as forced by the remote controller. Typically, this is of little consequence, and is likely to occur only if the remote controller is attempting to select the "B" input, but the AGC432's input selectors have been placed in "A" to prohibit remote selection. The result will be the desired program ("A"), but in synthesized stereo. This can be overcome, if necessary, by inhibiting the remote controller.

4.5 ACTIVATING AUDIO AGC REMOTELY

The AGC can be remotely activated by running a wire to a user-supplied switch from the terminal(s) labeled "ACT CH 1" (pin 8) and/or "ACT CH 2" (pin 7). Connect the return from the switch to the AGC432's Ground terminal (pin 2). The front panel AUTO/REM/BYP switch must be in the REMote (center) position to enable the remote switch. Closing the remote switch activates the AGC.

5.0 THEORY OF OPERATION

WARNING
The AGC432 is powered by 120 volts AC. Contact with 120 volts can cause injury or death. Disconnect the AGC432 from electric power if it is necessary to open the cover.
Refer service and internal adjustments to qualified personnel.

The AGC432 can both increase and decrease its gain setting in response to program level. The amount of increase and decrease is proportional to the change in program level, and to the AGC gain control mode selected. The AGC432 offers three gain control modes, internally programmable: 1) 2:1 companding; 2) constant-level; and 3) adaptive-slope, which is a combination of the most desirable characteristics of the first and second modes, approaching 2:1 at lower levels, and approaching constant-level at higher levels, thus preserving a good dynamic range at normal levels, but preventing significant over-modulation even if the levels far exceed normal.

5.1 Mode 1 is a nominal 2:1 compression range, over an input range of ±20 dB from normal. This mode is very satisfactory for most program conditions, as it is nearly transparent to the listener under all conditions. Mode 1 reduces over-modulation by a factor of 2 (dB), which is quite significant. For example, if the income program level were to increase 6 dB, the output would only increase 3 dB, which is a considerable improvement: Instead of 100% overmodulation, it would only be 40% overmodulation. Similarly, it improves under-modulation by the same amount. There is minimal reduction of perceived dynamic range in Mode 1.

5.2 Mode 2 is a nominal constant-level output, varying only 7 dB over an input range of approximately 40 dB (±20 dB from normal). This mode is recommended primarily for speech and certain music which is intended to be at a uniform level. Mode 2 very effectively prevents over-modulation by reducing the gain quickly when peak levels exceed 100%. Due to the seeking of a constant level, there will be a slow increase of background sounds during long periods of low-level program audio containing no significant peaks. The gain in Mode 2 may increase up to 20 dB over a 20 second period. This is ideal for general speech and popular music, but is not suitable for classical music or motion pictures, due to the intentional decrease of peak-to-valley dynamic range, which should be preserved in serious works of art.

5.3 Mode 3 is a combination of the most desirable characteristics of both modes 1 & 2. As mentioned earlier, Mode 3 preserves most of the dynamic range by slowly increasing the gain, and only by a factor of 2 (dB) as the level drops below normal. However, as the input level rises above normal, the gain is decreased by a considerably greater factor, such that over-modulation is held to only a few dB even with an input greater than 20 dB above normal.

5.4 These gain control slopes are nominal descriptions. The control range is intentionally limited to prevent excessive gain increases at low signal levels, which, if permitted, could detract from the program by noticeably reducing the dynamic range and increasing the background noise.

For a graphical illustration of the differences between the three AGC modes, see the specifications section of this manual. Note that 0 dB on the curves is the nominal match-level. That is the point at which a steady-state single tone level is unaffected when switching to or from Active and Bypass modes. This is -5 dB on the AGC's LED bar, not 0 dB. (The LED bar is calibrated to read 0 dB when the AGC's peak output is at 100% modulation, and the automatic gain control is programmed to deliver equal loudness and peak levels when switched on when the LED bar is indicating peak program levels of 0 dB. Because of this, the indicated peak level of a steady tone is lower than that of typical program material at the match-level point of the AGC.

5.5 Level sensing, control, and limiting in the AGC432 is done following 75 microsecond pre-emphasis, which matches the pre-emphasis used in most transmitters. Complementary de-emphasis restores the frequency response to "flat" at the output of the AGC432.

The AGC's maximum gain increase has been limited to approximately 20 dB above normal, to avoid excessively increasing the gain under any conditions. The AGC's maximum linear gain decrease exceeds 20 dB from normal, which very adequately covers any anticipated potential signal level variations. In addition, the peak output level is automatically hard-limited at approximately 4 dB above 100% peaks. This limiting is seldom active, due to the fast attack of the AGC.

5.6 In all three AGC modes, there is a delay following gain reduction during which the gain will not increase. This delay is nominally one-third of the release (gain increase) time. The release time is typically ten seconds, internally programmable to 15 and 25 seconds. The release delay significantly improves the smoothness of the program level by maintaining a constant gain between speech syllables and pauses, and between music downbeats and during rests. Following the delay, the gain gently rises until a new program peak halts the rise, initiating a new delay. The delay applies to gain increases only. Any new and higher program peak will reduce the gain rapidly (5 mS), so that the human ear does not perceive the change.

The release time is decreased briefly whenever the input is switched from A to B or vice-versa, in order to quickly accomodate the new program source level. The A-B/B-A release rate is typically 10 dB/sec, with a duration of one second.

5.7 In order to avoid unnecessarily increasing the gain during program pauses (when the average peak level drops over 20 dB), an additional 10 second delay is initiated. During this period, the gain is held constant at the last setting prior to the pause. If the program returns within this 10 second period, the AGC action resumes where it left off. However, if the program has not returned within 10 seconds, the AGC silently switches to the bypass ("normal") gain setting. If the bypass gain is lower than its last active setting, the reduction will be sudden. If the bypass gain is higher than its last active setting, the increase will be gradual, at its programmed release rate, typically ten seconds per 10 dB. The AGC then waits at the bypass gain setting for the program to return, at which time the AGC returns to the active mode; adjusting the gain upward or downward as appropriate. Indications of these modes are on the front panel: If both the -21 dB and the AUTO LED's are illuminated, the AGC is in its normal active mode. If the -21 dB LED is illuminated and the AUTO LED is dark, the AGC has been manually switched to the BYPass mode. If the -21 dB LED is dark and the AUTO LED is illuminated, the AGC is in the 10-second gain hold period at the beginning of a program pause. If both the -21 dB and the AUTO LED's are dark, the AGC is in the bypass gain setting, from which it may automatically switch to the active mode when program returns, if not manually switched to the BYPass mode.

6.0 PERFORMANCE EVALUATION

When verifying performance specifications of the AGC432, be sure that none of the features interfere with the item being tested. Specifically, single-tone frequency response tests should run in the BYPass mode and at a level approximately 20 dB below 100% modulation. The reason is that the standard pre-emphasis and de-emphasis used within the processor will cause apparent frequency response errors, when running at 100% modulation at high frequencies, due to over-modulation limiting. Additionally, if the AGC is on, the apparent steady-state sine-wave frequency response will be in error (at any signal level) due to the gain changing in an attempt to "correct" the modulation level difference caused by the pre-emphasis. In normal operation, this is not a problem, as actual program material typically consists of rapidly-changing complex tones, unlike the slowly-changing simple tone customarily used to verify correct frequency response. This may be verified by using white or pink noise to test frequency response, with or without the AGC active.

7.0 SPECIFICATIONS

NOTE: All audio levels are in dB re 0.775 V & 1000 Hz (0 dBm_{600})

OVERALL PERFORMANCE

FREQUENCY RESPONSE:
20 Hz to 15 kHz, ±0.5 dB

DISTORTION:
0.3% maximum THD

NOISE (15 kHz BW):
-80 dB re PPL

CHANNEL SEPARATION:
80 dB minimum, "A"-"B"
70 dB minimum, L-R

AUDIO CONTROL

GAIN, NOMINAL:
0 dB (+5 dB in, +5 dB out),
may be changed by adjusting
Input and/or Output levels

COMPRESSION RATIO:
(Selectable via jumpers)
Mode 1: 2:1 (dB) nominal
Mode 2: Constant output
Mode 3: Adaptive-slope

LIMITER:
Peak clipper at 4 dB above PPL

PEAK-TO-NOMINAL RATIO:
5 dB

PRE-EMPHASIS & DE-EMPHASIS:
75 microseconds
(Internal, flat thruput)

ATTACK TIME:
5 milliseconds nominal

HOLD TIME:
10 seconds nominal (gain holds after level drops 20 dB, then goes to bypass gain)

RELEASE RATE:
Normal: 10 dB/10 secs, nominal, programmable internally to 10, 15, or 25 seconds
A-B/B-A Transition: 10 dB/sec. for 1 sec.

AUDIO INPUT

INPUT LEVEL, PEAK:
(10 dB above APL)
+10 dB, ±10 dB
adjustable on front panel.

INPUT IMPEDANCE:
100 k-ohms, balanced

AUDIO OUTPUT

OUTPUT LEVEL, PEAK:
+10 dB +8/-10 dB
adjustable internally

OUTPUT IMPEDANCE:
60 ohms, balanced
30 ohms, unbalanced

LOAD IMPEDANCE:
600 ohms minimum

FRONT PANEL

(Duplicated for both Channel 1 and Channel 2)

INDICATORS:
LED bargraph, peak-reading, 5-segment
A/B input LEDS
AGC ON (AUTO) LED

CONTROLS:
A/REM/B input select switch
AUTO/REM/BYPASS select switch
A level potentiometer
B level potentiometer

REAR PANEL

CONNECTORS, Detachable screw-terminal plug-blocks:

Two 5-pin blocks: "A" & "B" Audio Inputs

Pin 1	Right/Ch 2 High
Pin 2	Right/Ch 2 Low
Pin 3	Ground
Pin 4	Left/Ch 1 High
Pin 5	Left/Ch 1 Low

One 4-pin block: Audio Output

Pin 1	Right/Ch 2 High
Pin 2	Right/Ch 2 Low
Pin 3	Left/Ch 1 High
Pin 4	Left/Ch 1 Low

One 8-pin block: Power & Remote Controls
(Active when grounded)

Pin 1	"N"only:+24 V Input
Pin 2	Ground
Pin 3	Stereo Mode
Pin 4	Synthesized Stereo
Pin 5	B Inp. Select, Ch 2
Pin 6	B Inp. Select, Ch 1
Pin 7	Activate AGC, Ch 2
Pin 8	Activate AGC, Ch 1

POWER:
105-125 V, 50-60 Hz, 10 VA std.,
+24 VDC, 150 mA optional

SIZE:
1.6" H x 5.5" W x 10.5" D
Mounts on 1/3 of a PMU401 19" panel mount