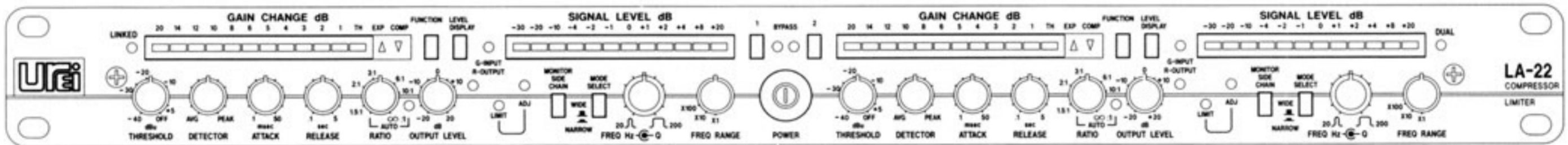




Owner's Manual

LA-22 Two Channel Compressor/Limiter



Safety Precautions

IMPORTANT!

FOR YOUR PROTECTION, PLEASE READ THE FOLLOWING:



The symbols shown above are internationally accepted symbols that warn of potential hazards with electrical products. The lightning flash with arrowhead symbol within an equilateral triangle warns that there are hazardous voltages and the risk of electric shock within the unit. The exclamation point within an equilateral triangle alerts the user to refer to important information in the user manual.

THESE SYMBOLS ARE A WARNING THAT THERE ARE NO USER SERVICEABLE PARTS INSIDE THIS EQUIPMENT AND THAT THERE ARE HAZARDOUS VOLTAGES PRESENT.

DO NOT OPEN THIS EQUIPMENT YOURSELF. REFER ALL SERVICING TO QUALIFIED PERSONNEL. DO NOT MAKE ANY INTERNAL ADJUSTMENTS OR ADDITIONS TO THIS EQUIPMENT AT ANY TIME. DO NOT TAMPER WITH THE INTERNAL ELECTRONICS.

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE A SHOCK HAZARD AND MAY VOID WARRANTY SERVICE TO THIS EQUIPMENT.

This equipment should be operated only at the voltage indicated on the rear panel. Replace the fuse only with the same type and rating as indicated on the rear panel.

This equipment must be grounded for correct operation. Do not defeat the safety ground by using a ground lift adapter or by physically removing the ground prong from the plug.

The power cord should be routed so that it cannot be walked upon or pinched by items placed upon or against it. The power cord should be unplugged from the outlet when the equipment is to be unused for a long period of time.

This equipment should be located away from heat sources and should be properly ventilated.

Do not expose this equipment to rain or moisture.

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Important Information • read this first

Unpacking and Checking

Thank you for purchasing this UREI compressor/limiter.

We encourage you to read and to make use of the material contained in this manual. We welcome your comments and suggestions on our products and on this manual.

Unpack the LA-22 and carefully inspect it for transportation damage. If any physical damage is discovered, save all of the packaging and immediately contact the dealer or distributor from whom it was purchased.

Contents of Shipping Container

The shipping carton should contain:

The UREI Model LA-22 compressor/limiter with model number as shown on the shipping container

This instruction manual

A packet containing rack mounting hardware and Spare Fuse for 120 and 240 V operation.

AC power cord

Security Cover and screws

If any items are missing, contact your dealer

Important Information

● Stereo or Linked Operation

The LA-22 is a very flexible unit that is capable of operating as two independent compressor/limiters or as a linked pair. There are two modes of operation: "Dual" (separate) or "Linked". For example, the linked mode, may be used when two dissimilar signals need to be controlled together for a special effect. Linking may be done via the terminal strip or the rear-panel switch - the result is the same. The Link terminals allow the control voltages of any number of LA-10, LA-12 or LA-22's to be summed so that all units have the same gain change.

The buffered detector signals are fed to independent attack and release shaping circuits. When the Link function is enabled (by wire link or switch), the outputs of these control circuits are summed together. Both channels' variable gain circuits are now fed by a single composite voltage and the amount of gain change will be identical for each channel.

Note - Stereo Operation: It is important to note that the "Linked" mode does not create a Stereo Compressor/Limiter **unless all controls on both channels are set identically.**

Note also, that whenever channels or units are linked, the channel having the greater effect on the gain change circuit at that particular time, will take precedence. As the signals vary and each parameter modifies the control voltage, the dominant channel may alternate from one to the other. Assuming that the signal level on each channel is above its threshold, the gain change characteristics will be a composite of the shorter attack time, the longer release time and the higher ratio. The channel which reaches its threshold first will take control first, however, dependent upon the program content and dynamics, the dominant channel could change as the other channel reaches its threshold.

If the threshold control of a channel is set to "Off", all of its controls are inoperative and its gain change will be controlled by any linked channel(s). If a channel is in Bypass, there is no gain reduction and that channel is not capable of controlling others or being controlled through the Link terminals.

Product Description

LA-22

The UREI LA-22 Compressor/Limiter combines professional performance with multi-configurable function and control parameters.

The LA-22 has all the features of a typical compressor/limiter in addition to several functions which greatly increase its versatility.

The first of these is Narrow-Band compression/limiting. In most compressors, all frequencies are affected equally - this may be referred to as 'Wide-Band' compression. The LA-22 can operate in a Wide-Band mode but also includes a parametric equalizer which enables the user to select a particular section of the audio spectrum to be modified, while other frequencies will pass unchanged. This may be thought of as 'Dynamic Equalization' or 'Narrow-Band' compression. The frequency range and 'Q' of the equalizer are adjustable by front-panel controls and the equalized signal feeding the VCA and the side chain may be monitored through the signal output stage.

In a different operating mode, a rear-panel barrier strip allows the output of the parametric equalizer to be fed to the side chain, while the full signal feeds the VCA. This creates a frequency dependent side chain controlling a full frequency signal.

A second function, which is unique to the LA-22 is the ability of each channel to either compress or expand the audio signal. A selected amount of gain change may be switched as compression or as an equal amount of expansion. In Wide Band operation, all frequencies are treated equally. In the Narrow mode, only the frequency band selected by the equalizer is cut or boosted. The Narrow mode is useful when only certain frequencies need to be controlled, such as, 'de-essing' or 'de-popping' vocals for example. The expansion mode may be used to expand certain frequencies and 'lift' them out of a mix.

A Smart-Slope™ circuit creates a gradual transition between no compression and full compression/limiting to give a smoother audio response.

Each channel has controls for: Threshold, Detector (Average/Peak), Attack, Release, Ratio, and Output Level. The Ratio Control also selects an Auto mode which engages fixed settings for: Peak/Average Detector, Attack, and Ratio and a Program Dependent Release function.

A momentary 'Monitor Side Chain' switch feeds the side chain signal to the signal output.

A separate Output Ceiling Peak limiter has an adjustable threshold. An LED indicates when this limiter is operating. LED bargraph meters display Input or Output level and Gain Change.

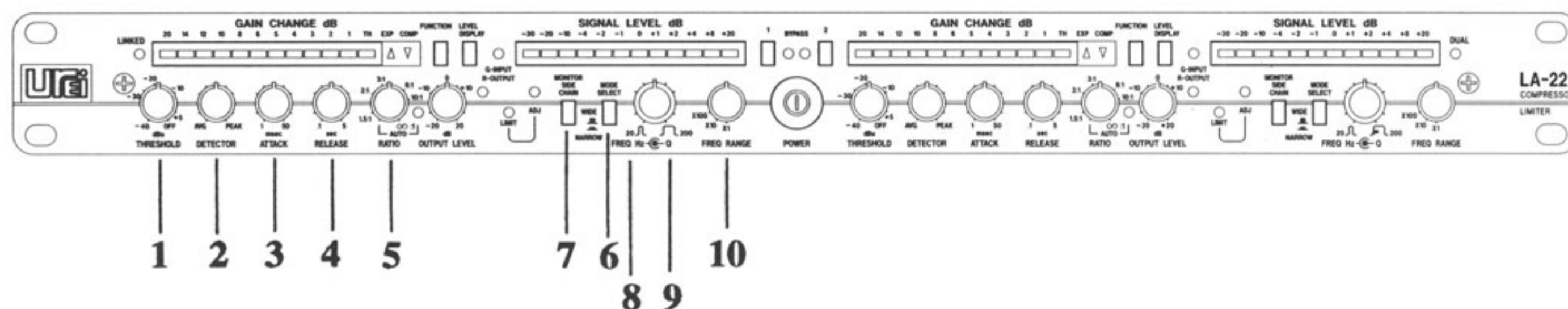
The rear panel carries XLR input output connectors and barrier strips which allow various signals to feed the side chain. A third barrier strip allows optional separation of each channel's signal and chassis grounds and the linking of its control circuits with other LA-10, LA-12 or LA-22 compressors. A switch links the channels for stereo operation. A 'hardwire' bypass relay links input to output and maintains signal flow in the event of a power loss

Balanced differential input circuits substantially reduce input noise. The balanced output is a patented, active transformer-isolated circuit. A toroidal power transformer minimizes AC hum radiation.

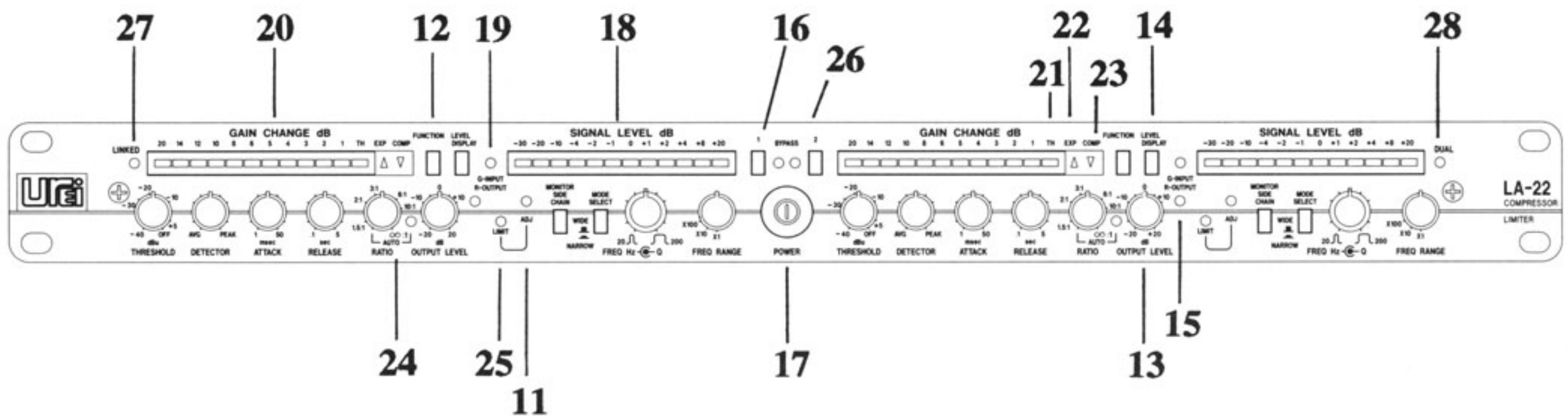
The LA-22 is housed in an industry standard, 1U, EIA, 19" rack-mount chassis.

A security cover may be installed to protect the front panel control settings

Front Panel

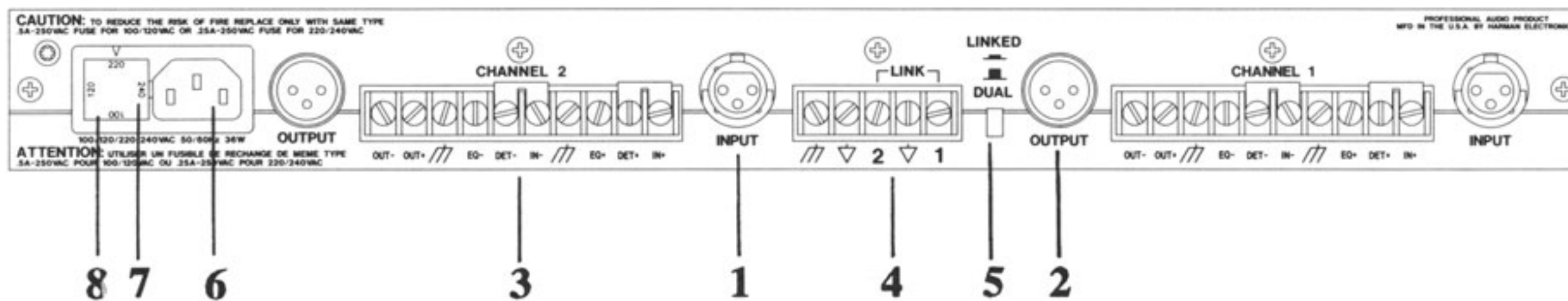


- [1] **THRESHOLD** Determines the level at which compression or expansion begins. Adjustable from -40 dBu to +10 dBu. Turning fully clockwise turns the threshold Off.
- [2] **DETECTOR** Adjustable between Average and Peak sensing.
- [3] **ATTACK** Sets the time taken by the compressor to react to the input signal, once the signal level reaches the set threshold.
 - AVERAGE DETECTOR** Attack time is adjustable from 1 ms to 50 ms.
 - PEAK DETECTOR** Attack and Release times are fixed. 100 μ s Attack and 10 ms Release.
- [4] **RELEASE** Sets the time taken for the compressor to return to unity gain as the signal falls below the threshold level. Adjustable from 100 ms to 5 seconds (for 10 dB of Release)
- [5] **RATIO** Adjusts the ratio of the change in input level to the change in output level. Adjustable from 1.5:1 to ∞ :1. Rotating pot fully counter-clockwise engages **AUTO** mode.
 - AUTO** Presets Peak/Average (Detector), Attack and Ratio controls and engages a program dependent Release function.
- [6] **MODE SELECT** Push-button selects between **WIDE** (full bandwidth) compression/expansion/limiting and **NARROW** (frequency selective) compression/expansion/limiting.
- [7] **MONITOR SIDE CHAIN** Momentary Push-button switch. When depressed, the side chain input signal is routed to the signal output.
- [8] **FREQ** Outer section of concentric control. Continuous sweep from 20 to 200 Hz. The selected frequency is multiplied by the FREQ RANGE control.
- [9] **Q** Center section of concentric control - continuous adjustment of Q from 0.47 to 9.0 (2.5 octave to 0.12 octave)
- [10] **FREQ RANGE** 3-position rotary switch - multiplies the selected center frequency by 1, 10 or 100 to give frequency ranges of: 20 to 200 Hz, 200 Hz to 2 kHz or 2 kHz to 20 kHz.



- [11] **ADJ** (Peak Limit Adjust) Trim pot adjusts maximum output ceiling from -10 dBu (CCW) to +24 dBu (CW). Peak Attack and Release are fixed at 50 μ s and 40 ms. This function can not be linked through the Link port or Link switch and is disabled during Narrow Band operation.
- [12] **FUNCTION** Push-button switch selects Compression or Expansion modes. The maximum expansion is 25 dB.
- [13] **OUTPUT LEVEL** Provides \pm 20 dB of gain to allow level matching.
- [14] **LEVEL DISPLAY** Push-button switches Signal Level meter between Input and Output.
- [15] **METER ADJUST** Trim pot adjusts the Signal Level meter's zero reference from -15 dBu to +4 dBu. The reference is adjustable in Output mode only.
- [16] **BYPASS SWITCH** Push-button switch engages a relay which directly connects the input to the output, bypassing all active circuitry. The relay is also engaged by a turn-on delay and when the power is off.
- [17] **POWER SWITCH** Push-button switches both sides of AC line, for added safety.
- [18] **SIGNAL LEVEL** 12 segment (green, yellow, red) bargraph indicates output level from -30 dB to +20 dB.
- [19] **INPUT/OUTPUT** Dual color LED indicates Signal Level meter mode - lights Green for Input or Red for Output.
- [20] **GAIN CHANGE** 12 segment red bargraph indicates the amount of gain reduction (COMP) or gain increase (EXP) from 1 to 20 dB.
- [21] **TH** Red LED indicates when input level is at or above the Threshold.
- [22] **EXP** Upward pointing LED indicates that the Expansion mode is selected.
- [23] **COMP** Downward pointing LED indicates that the Compression mode is selected.
- [24] **AUTO** Red LED indicates when the channel is in Auto mode.
- [25] **LIMIT** Red LED indicates when the adjustable output ceiling is exceeded and the signal is being limited. See item [11]
- [26] **BYPASS** Red LED indicates when the channel is bypassed.
- [27] **LINKED** Yellow LED indicates that Channels One and Two are linked
- [28] **DUAL** Red LED indicates that Channels One and Two are independent.

Rear Panel



Channel 1 and 2 Inputs and Outputs are identical.

- [1] **INPUT** XLR D3F and Barrier Strip connectors feed electronically-balanced input. XLR pin 2 'hot'.
 - [2] **OUTPUT** XLR D3M and Barrier Strip connectors. Balanced active, transformer-isolated output. XLR pin 2 "hot".
 - [3] **BARRIER STRIP** Contains input and output connectors (in parallel with XLRs), for permanent installation and also allows the connection of various signals to the Detector circuit. The Detector Buffer and Side Chain may be fed by 1) the audio input signal; 2) the output of the parametric equalizer or 3) An external signal. Options 1 and 2 use the supplied links to connect the appropriate terminals.
- NOTE:**
- [4] **BARRIER STRIP** Ground terminals allow the signal ground of one or both channels to be connected to chassis ground. Link terminals allow the Gain Reduction circuits of any number of LA-10, LA-12 or LA-22's to be linked together.
 - [5] **DUAL/LINKED** Push-button switch links Channels One and Two together. The link function is automatically disabled whenever Channel 1 and Channel 2 FUNCTION (Compressor/Expander) switches are set in opposite modes. In this condition, the LINKED indicator is off, the DUAL indicator is on and the internal link is disconnected.
 - [6] **AC RECEPTACLE** accepts IEC NEMA 515P TYPE cord, included (N. America).
 - [7] **VOLTAGE SELECTOR** Allows operation on 100, 120, 220 or 240 V.
 - [8] **FUSE** **USE ONLY THE FUSE VALUE INDICATED ON THE REAR PANEL.**

Circuit Description

Please refer to the Block Diagram.

Each channel has two signal paths: an audio path and a control path.

The level and dynamics of the audio signal are dependent upon the individual control settings and the signal feeding the detector. This signal may be:

1. The Audio input.
2. The output of the parametric equalizer section.
2. A separate signal fed to the Detector Input.

Input

The Audio input has Balanced XLR and Terminal Strip connectors. A differential amplifier provides common mode rejection. In normal operation, the input signal feeds the side chain and the control section reacts to the program material. In the NARROW mode, the output of the Parametric Equalizer feeds the VCA and the side chain. Links also allow the output of the equalizer to feed the side chain while a full bandwidth signal is controlled by the VCA. Alternatively, an external signal may be connected to the Detector Buffer and the limiter/compressor/expander functions will be controlled by the dynamics of the external signal.

Side Chain

The side chain has two main sections; a Peak Detector and an Average (rms) Detector. The rms detector has fully adjustable Attack and Release times while the peak detector has fixed Attack and Release times, which are faster than those of the rms detector. A Smart-Slope™ circuit creates a gradual 'soft knee' transition between no compression and full compression/limiting for a smoother audio response.

Controls

The **Threshold** control sets the level above which Gain Reduction will occur. The **Detector** control allows the user to set the ratio between **Average** (rms) and **Peak** Detector response by controlling the level fed to the Peak Detector section. The drive level to the Average Detector is fixed and is not affected by this control. The **Attack** and **Release** controls vary the reaction times of the rms compressor. The **Ratio** control determines the ratio of Input level change to Output level change.

Auto mode

When the Ratio control is turned fully counter-clockwise, an Auto mode is engaged. In this mode, preset values are used for: Compression Ratio, Average/Peak ratio, and the Attack and Release times of the rms limiter. Front panel controls except Threshold and Output Level are inoperative. These usable controls are distinguished by their blue color. The Auto mode provides an operator with quick and easy access to a setup which should be effective in many applications and which may save time when careful adjustment of the controls is not necessary. The Release time is frequency dependent and is shorter at high frequencies. This allows the release time to be optimized for the signal content while reducing the higher THD normally generated by using fast release times with low frequency signals.

Parametric Equalizer

A switch selects Wide or Narrow modes. The frequency band is selected by a concentric control which adjusts the frequency over a range from 20 to 200 Hz and the bandwidth or 'Q' from 0.12 octave to 2.5 octave. A rotary switch multiplies the frequency range by 1, 10 or 100, thus allowing any center frequency from 20 hZ to 20 kHz to be selected. To aid in set up, a momentary 'Monitor Side Chain' switch allows the operator to listen to only the side chain signal through the signal output stage.

Gain Change and Metering

Based on the signal level and the position of the Threshold, Detector, Attack, Release and Ratio controls, control voltages are generated by the Peak and Average detector sections and summed to form the composite drive voltage used to control the VCA gain. This voltage drives the Gain Change meter and feeds inverting and non-inverting amplifiers. This is also the point at which control voltage linking between other units occurs. The 'Function' switch selects Expansion or Compression and feeds the inverted or non-inverted voltage to the VCA. LEDs indicate the mode selected - an upward arrow showing expansion and downward arrow, compression. A 12 segment bargraph meter shows gain change (compression or expansion) over a range from 1 to 20 dB and an LED indicates when the signal is at the threshold. A second 12 segment meter is switchable to display Input or Output Level. The Output Reference Level is adjustable by a front-panel trim-pot.

Links

Each channel has a barrier strip which allows the side chain input to be selected. In normal, wide band operation, the main audio signal also feeds the detector circuits and the side chain through the terminal strip. These links may be moved to the output of the parametric equalizer or an external signal may be connected to feed the detector. A third barrier strip allows optional separation or linking of each channel's signal and chassis grounds and the linking of its control circuits with any number of LA-10, LA-12 or LA-22 compressors.

A rear-panel switch enables the two channels to operate completely independently or with their control circuitry linked. Front-panel LEDs indicate Dual or Linked modes. For **STEREO** applications, this switch should be engaged and all controls set exactly the same on each channel. This will maintain a stable stereo image by processing both channels identically. In the Linked mode, the control voltages of both channels are summed together so that any gain change caused by the side chain of one channel will cause an equal change in the other channel. Without this link, a stereo image would shift from side to side if one channel were to be compressed or expanded when the other was not.

The Link is automatically disabled if Channel 1 and 2 Compression/Expansion switches are set in opposite modes. In this condition, the LINKED indicator is off, the DUAL indicator is on and the internal link is disconnected.

Please refer to Page 4 for further information on Linked operation.

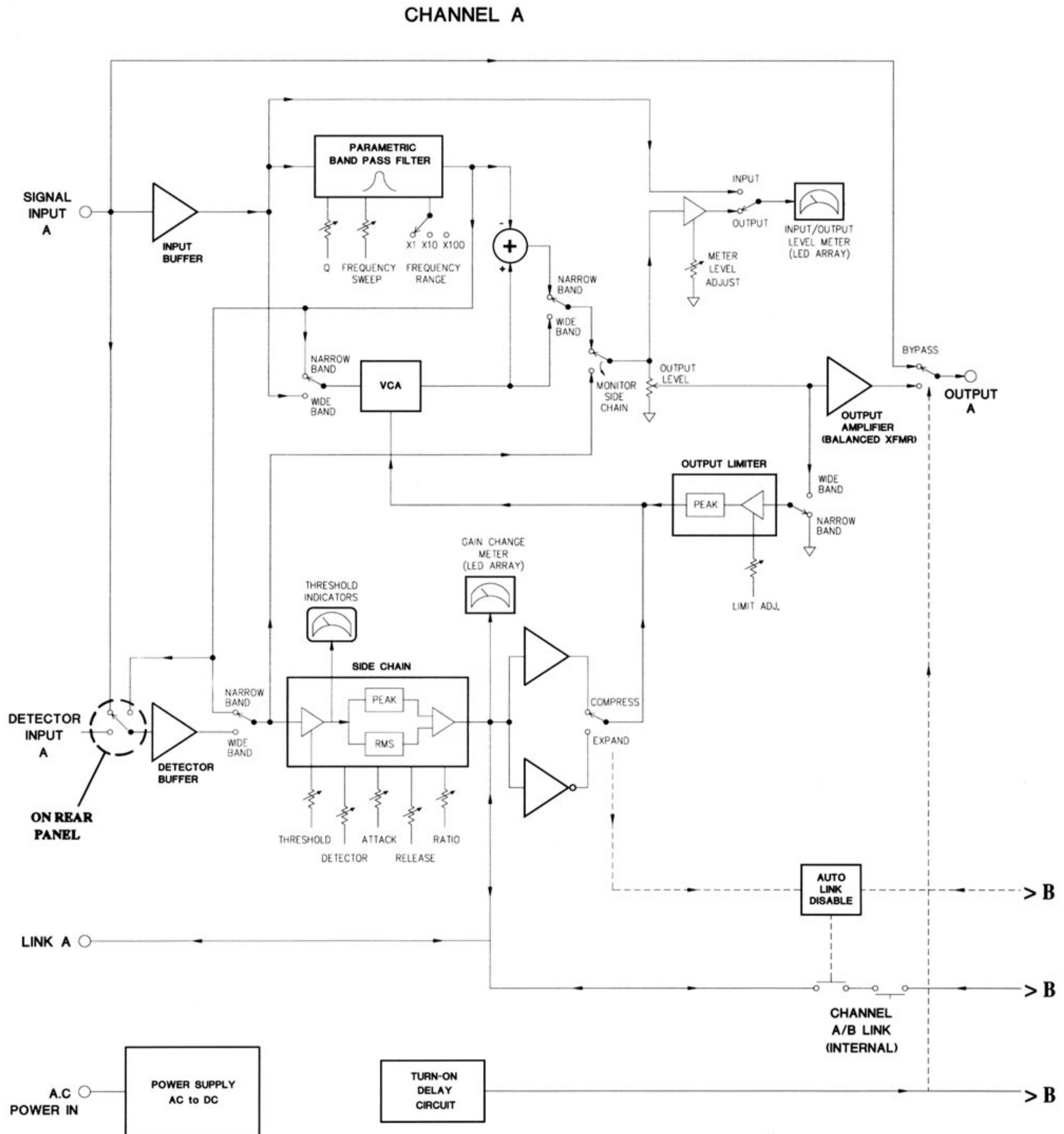
Output Stage and Fast Peak Limiter

An Output Ceiling may be set by means of a separate peak limiter section which quickly suppresses any signal level above its threshold. This is adjusted by a front-panel trim-pot to provide protection for equipment such as compression drivers or digital convertors which may be susceptible to damage or distortion caused by excessive signal peaks. This limiter does not function in the narrow band mode.

The output level control adjusts the gain over a range of -20 dB to +20 dB. The output stage is an advanced, ultra-low distortion, transformer coupled audio line drive circuit. It is capable of delivering +24 dBm into a 600 ohm load with less than 0.001% distortion. Output connection is via 3-pin XLR and terminal strip connectors. A relay provides a 'hardwire' bypass by connecting the input and output in the event of a power loss or when the front-panel switch is engaged. A turn-on delay circuit also engages the bypass relay for approximately two seconds at power-up. In the Bypass mode, no active or passive components are in the signal path and the side chain is inactive and unable to affect any other channel via the Link port. All metering and indicators of the bypassed channel are inoperative.

Block Diagram (Simplified)

Channel A is shown - Channel B is identical



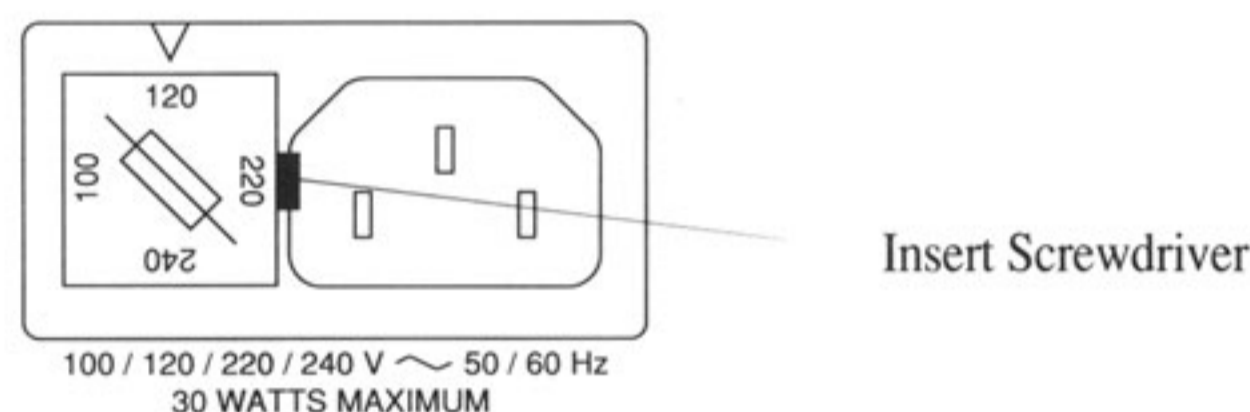
Voltage Selection and Fuse

CAUTION:

CHECK THE AC LINE VOLTAGE AT YOUR INSTALLATION AND IF NECESSARY SET THE REAR PANEL VOLTAGE SELECTOR TO THE CORRECT VOLTAGE. CONFIRM THAT A FUSE WITH THE CORRECT RATING IS INSTALLED.

IMPORTANT:

ORIENTATION OF THE FUSE HOLDER DETERMINES THE OPERATING VOLTAGE.



WARNING: REMOVE THE AC POWER CORD BEFORE REMOVING THE FUSE HOLDER

The LA-22 can be used with nominal power line voltages of 100, 120, 220 or 240 Volts, at 50 to 60 Hz.

Voltage selection is accomplished by inserting the correct fuse, listed below, into the fuse block and installing the block into the IEC power connector on the back panel. Notice that the end cap on the block can be installed in four different orientations. The operating voltage is set by rotating the cap so that the supply voltage is at the top, with the triangle above, pointing to it.

In the illustration above, the cap is oriented for a setting of 120 V. There is a small slot between the right side of the end cap and the line cord socket. The fuse holder is removed by inserting a small flat-bladed screwdriver under the fuse end-cap into this slot and gently prying the cap outward.

Disconnect AC supply before removing the fuse holder.

Fuse Ratings:	[Size: 5 mm x 20 mm]
100/120 V	500 mA 250 V Slow-blow
220/240 V	250 mA 250 V T type

Rack Mounting

Although internal circuitry susceptible to hum pickup is sufficiently shielded from moderate electromagnetic fields, avoid mounting the compressor/limiter near large power transformers or motors etc.

Install the LA-22 in a rack using the rack screws supplied. If the rack is to be transported, the rear of the unit should be supported. Route the AC cord away from audio lines and plug into a convenient outlet.

Security Cover

Once the compressor/limiter is installed, adjusted, and tested, the security cover (Model SC8) may be secured to the front panel of the unit to prevent tampering with the control settings.

The cover is secured by the two screws supplied.

Input and Output Connections

Connectors

Signal: The input and output connectors are XLR and Barrier Strip terminals.

Side Chain: The Side Chain Input is balanced and uses the Barrier Strip terminals. It is normally linked in parallel with the Input Signal but a separate signal may be input here.

Wiring Guide for XLR Connectors			
Balanced		Unbalanced	
Pin 2	+ / Positive	Pin 2	+ / Positive
Pin 3	- / Negative	Pin 3	Connect to Pin 1
Pin 1	Shield	Pin 1	Shield

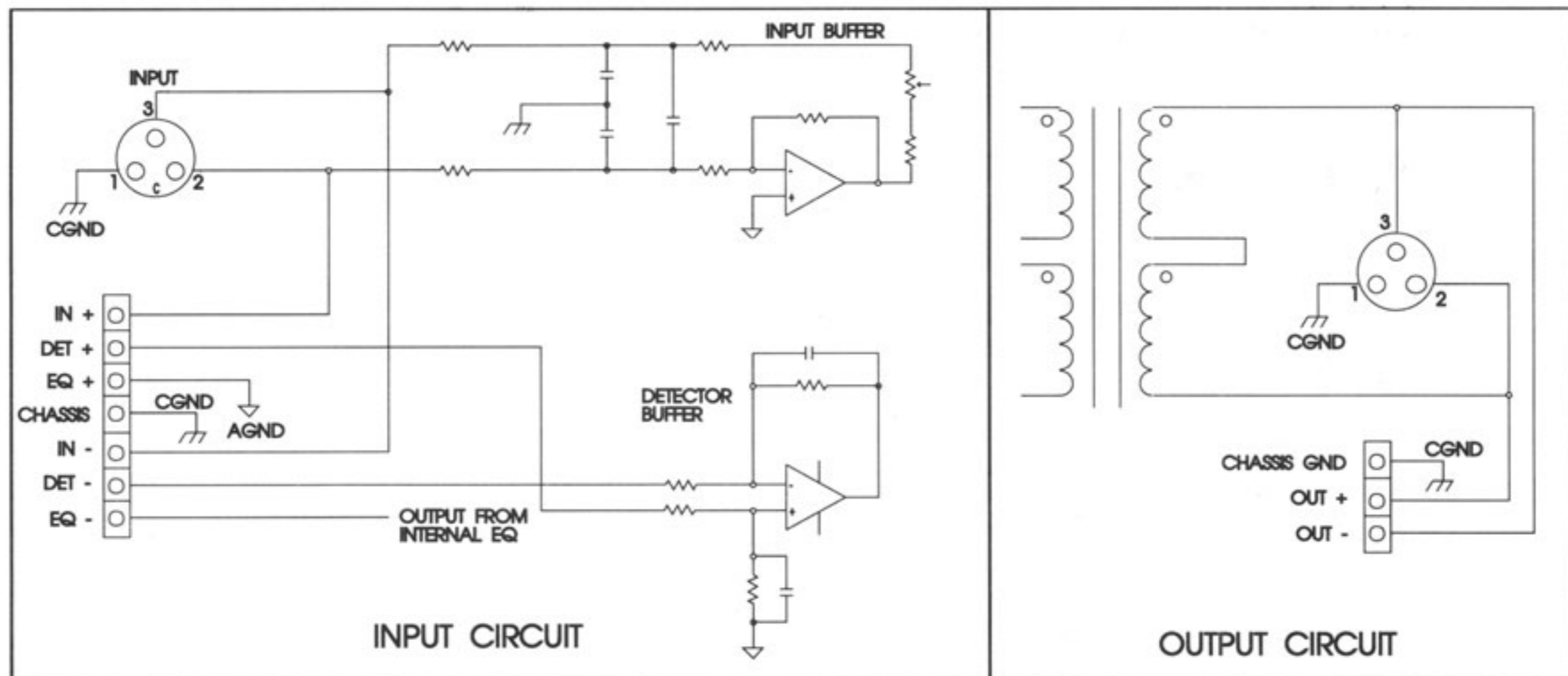
Polarity

IEC standards for balanced wiring designate XLR Pin 2 as Positive or "Hot" with pin 3 as Negative or "Low".

The LA-22 conform to these standards. Other equipment may or may not conform. Check its manufacturer's specifications.

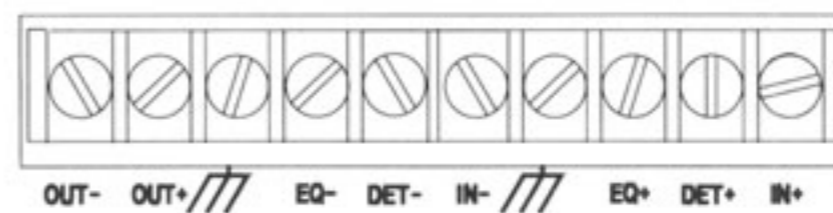
Input and Output Circuits (simplified)

Note: relay bypass circuit etc. omitted for clarity.



Barrier Strip - Channel 1 and 2

- Terminal 1** Signal input +
- Terminal 2** Detector input +
- Terminal 3** EQ output +
- Terminal 4** Chassis Ground
- Terminal 5** Signal input -
- Terminal 6** Detector input -
- Terminal 7** EQ output -
- Terminal 8** Chassis Ground
- Terminal 9** Signal output +
- Terminal 10** Signal output -

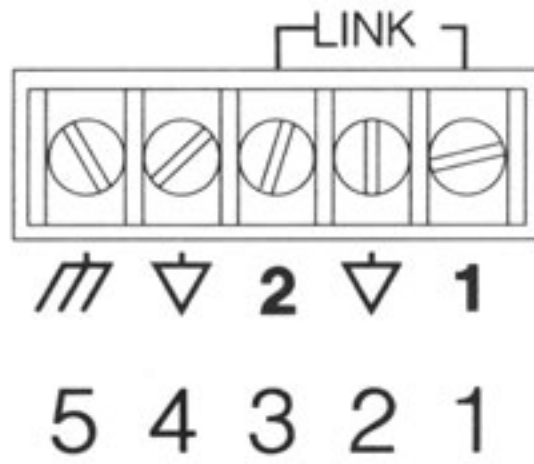


10 9 8 7 6 5 4 3 2 1

Terminals 1 and 5 are normally linked to terminals 2 and 6 respectively to feed the input signal to the detector buffer. Depending upon the application, these links may be removed and an external signal fed to the detector buffer. Terminals 1 and 5 (Input) and 9 and 10 (Output) are in parallel with the respective XLR connectors and may also be used with spade-lug wiring for permanent installation.

Terminal Strips

Barrier Strip - Ground and Link Connections



Terminal 1	Channel 1 Control Voltage Link *
Terminal 2	Channel 1 Signal Ground
Terminal 3	Channel 2 Control Voltage Link *
Terminal 4	Channel 2 Signal Ground
Terminal 5	Chassis Ground

Note: Signal ground and Chassis Ground are internally connected via a 1 k Ω resistor in parallel with 0.1 μ F capacitor.

* Please refer to Page 4 for an explanation of Linked operation

Selecting the Side Chain Input

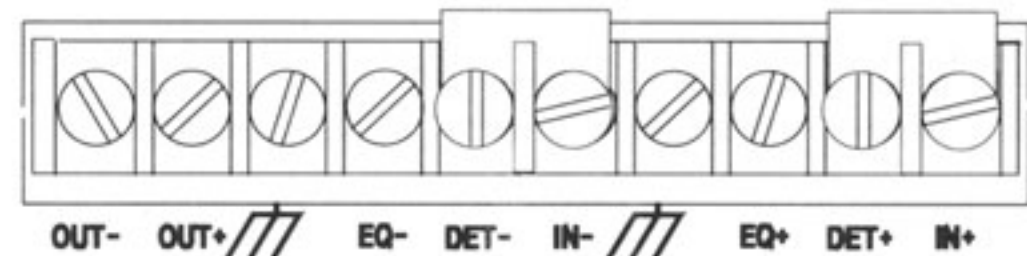
Narrow Band

The Barrier Strip is bypassed and the Side Chain is fed directly by the output of the parametric equalizer.

Wide Band

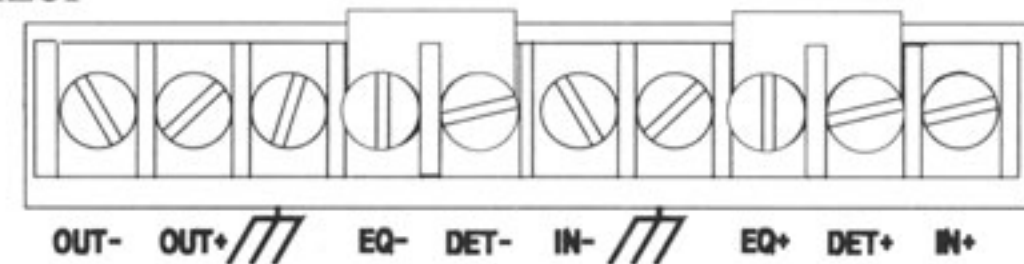
Side Chain Input: Input Signal

When the signal is above the Threshold, the LA-22 will compress (or expand) the full bandwidth signal.



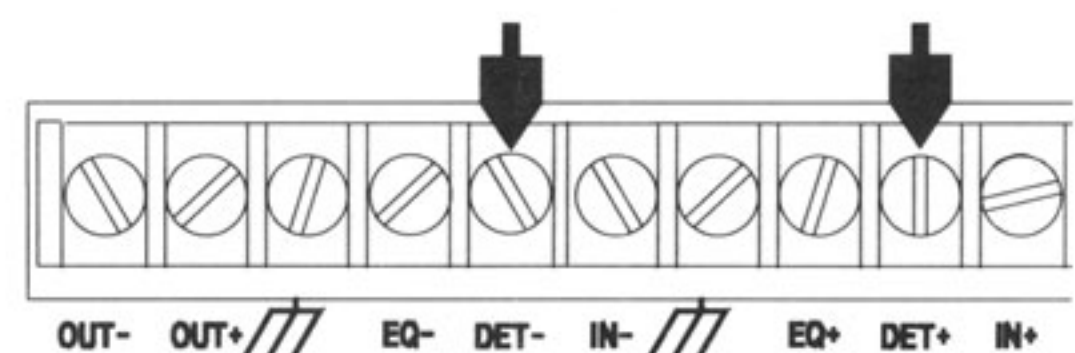
Side Chain Input: Output of Parametric Equalizer

When a signal within the frequency range set by the parametric equalizer exceeds the threshold, the entire wide-band signal is compressed or expanded.



Side Chain Input: External Signal

A separate signal is fed to the detector buffer and triggers the threshold for wide-band compression or expansion.



Grounding and Safety

Grounding

Grounding is a complex subject and is critical to obtaining optimum performance from a sound system. Good grounding practices have three goals:

- 1) Safety.
- 2) Maintenance of system integrity.
- 3) The prevention of oscillation and hum which may be caused by differing potentials within the system, RFI (Radio Frequency Interference) or Electro Magnetic Induction.

Safety

For safe operation, the unit must be connected to a good mechanical *safety* ground. This provides a current path for any voltage which might appear on the chassis due to an electrical fault in the unit. Without this path, the unit might be a shock hazard. In addition, a good quality ground on the chassis provides shielding from external fields and minimizes radiation of internal fields to other components.

To comply with safety regulations and to protect our customers, we provide this product with a ground connection through a three-wire power cord. The rear panel barrier strip allows the audio ground to be separated from this chassis ground to eliminate hum caused by ground loops.

The most common cause of ground loops is duplicate grounding, which occurs when a component is grounded via its own AC connection and has a second path to ground through a cable shield to another component's chassis ground. These different path lengths may cause a significant potential between the **audio** ground of the signal source and the **mechanical** ground to which the unit has been connected. A voltage is developed, which induces a spurious signal - usually hum - into the signal wiring.

Attention to grounding should eliminate ground loops. See also "In Case of Difficulty".

"Telescoped" Shields

By connecting the shield at one end only, each piece of equipment may be grounded for safety while potential ground loops are avoided. Traditionally, the connection is at the destination, so that any induced signals will flow with the signal and take the most direct path to ground. Should you prefer to lift the shields at the destination and ground them at the source, you must be consistent and follow this convention throughout the system.

Twin Conductor Cable - Unbalanced Sources

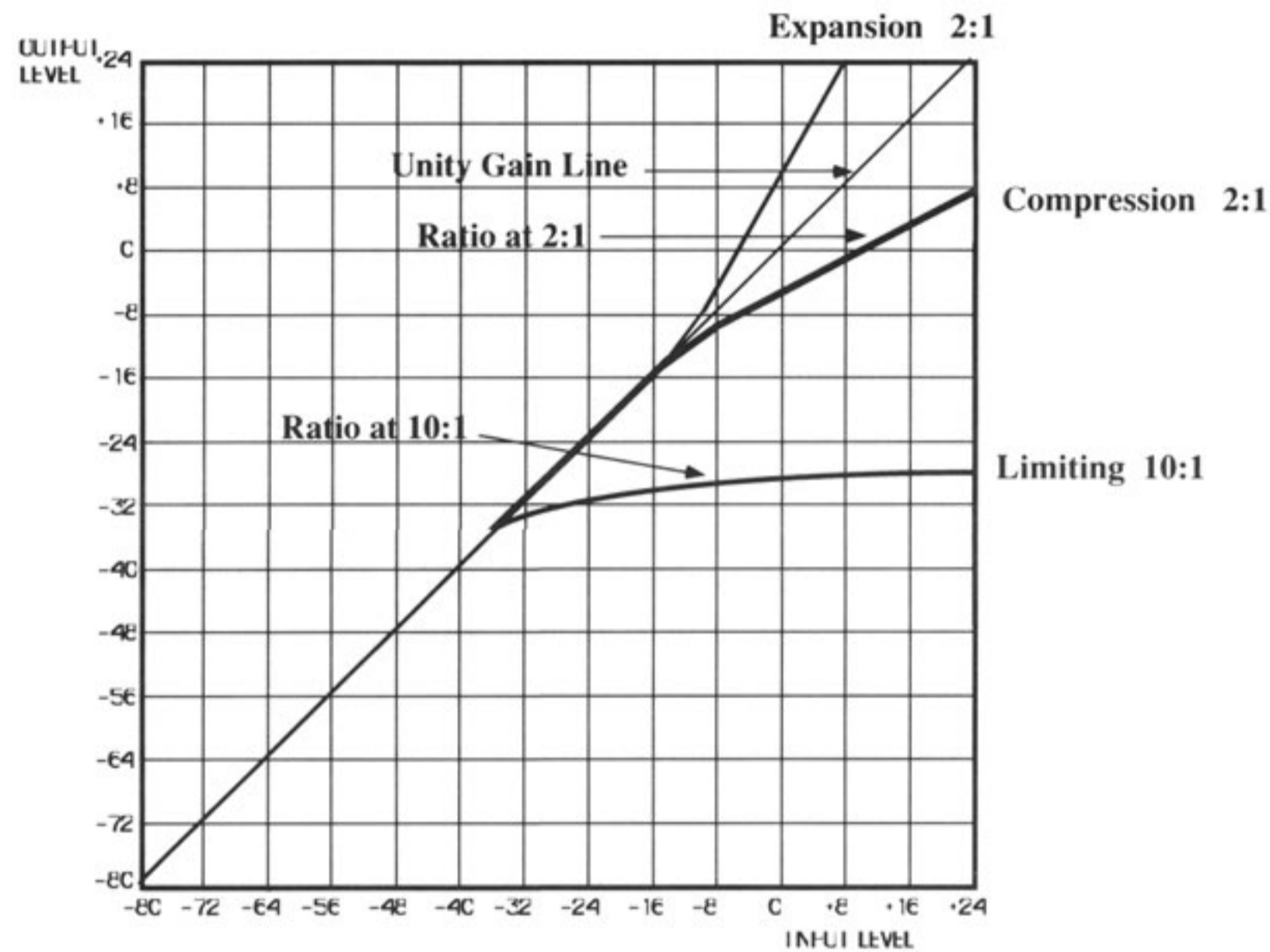
The LA-22 has differential, balanced input circuits. Balanced wiring is recommended, even with unbalanced sources - especially when running long lines. This takes advantage of the ability of a balanced input to reject signals (such as hum fields) which are induced equally into each of the signal carrying conductors (Common Mode Rejection). Also, twin-conductor, shielded cable is more reliable, since it does not depend on the shield wire itself to complete the signal connection. Stranded shield wires are more vulnerable than the protected internal wires, especially in portable installations. A broken ground connection would result in a loss of audio or a very loud hum. Using twin-conductor cable, a broken shield may only result in a slight increase in noise or hum due to the lack of shielding.

Long Cable Runs

Longer input cables should be balanced or floating to reduce susceptibility to RFI and hum. If the output of the device feeding the LA-22 is balanced or floating, simply use a dual-conductor shielded cable. If the source is unbalanced, an isolation transformer may be necessary at the source's output, to supply a balanced signal.

Functional Description

The gain-controlling functions of a compressor or limiter may be represented on a plot of output level vs. input level. As shown below, the input level (in dB) is plotted on the X-axis and the output level on the Y-axis. The straight diagonal line from the lower left corner to the upper right corner represents unity gain. At any point on this line, the output level equals the input level.



Three plots are shown, representing the gain curves of three different setups using the UREI LA-22. The bold lines represent a deviation from unity gain caused by compression or expansion. At low signal levels, the gain curves are identical. When the input signal is above -36 dBu, the curves separate, indicating different threshold and ratio settings.

The lower curve shows the compressor threshold set at -32 dB. When the input signal level rises above this threshold, the curve flattens out and diverges from the unity gain line. The ratio shown here is 10:1. For every 10 dB increase in the input signal, the output increases by only 1 dB. Compression ratios of 10:1 and above are normally described as Limiting. Note that instead of an abrupt change in slope from the unity gain line to the 10:1 compression ratio, there is a rounded corner. This is achieved by the Smart-Slope™ circuit and is referred to as a “soft knee”. Soft-knee compression is more natural sounding and pleasing to the ear since there is a gradual change in signal dynamics when the compressor threshold is reached. In the example above, the soft knee means that compression begins, at a lower ratio, just below the threshold and increases gradually to full compression above the threshold.

The two upper curves show the effects of Compression and Expansion. Both curves have a threshold at -8 dB and a ratio of 2:1 and show the more subtle change in slope that such a ratio produces. With lower ratios, the soft knee is less apparent because there is only a minor change of slope. Note that the Expansion curve indicates a 2 dB increase in output level for every 1 dB increase in input level.

Definition of Terms

Terms used in this manual

THRESHOLD is the point at which compression begins. For example, if the threshold is set at -20 dB, signals below that level are not affected by the compressor. Once the input signal increases above -20 dB, the output signal will be reduced by an amount dependent on the **RATIO** setting and the amount that the signal is above the threshold. For **COMPRESSION**, the threshold is usually set quite low, so that even low level signals will activate the compression. For **LIMITING**, the threshold is usually set quite high, so that the dynamics of the signal are preserved, but extremely high levels are reduced to protect amplifiers, speakers or prevent tape saturation.

A **DETECTOR** generates a DC voltage proportional to the amplitude of an audio signal. This voltage is used to control a variable gain device such as a VCA (Voltage Controlled Amplifier). Detectors may be designed to react to the average (rms) level of the signal or to peak levels.

RATIO is the relationship between input and output level. For example, if the input signal increases by 3 dB, while the output signal increases by only 1 dB, then the compression ratio is 3:1 - Typically, **COMPRESSION** is defined as a ratio of 10:1 or less and **LIMITING** as a ratio greater than 10:1.

One problem with constant ratios, in which the ratio does not vary regardless of input level, is an abrupt or unnatural sounding compression. The **UREI Smart-Slope™** circuit provides **SOFT KNEE** compression and minimizes this problem by actually starting to compress just below the threshold, using a lower ratio and gradually increasing to the full setting of the ratio control as the level increases.

Once the signal level reaches the threshold, the time it takes for the unit to begin compressing is called the **ATTACK TIME**. Conversely, the time taken by the compressor to return to normal gain after the signal falls below the threshold level, is called the **RELEASE TIME**.

COMPRESSION is used to reduce Dynamic Range and hold signals within a given level range or to control signal levels for special effects or other modification purposes.

LIMITING is generally used to automatically reduce peak signal levels that are too great to be handled by succeeding equipment, such as signal processors, digital converters, recording equipment, amplifiers, and speakers.

EXPANSION increases the Dynamic Range by boosting signals above the threshold.

NARROW BAND COMPRESSION or EXPANSION is useful when only certain frequencies need to be controlled. The parametric equalizer in the LA-22 allows precise control of the selected frequency range.

NARROW BAND COMPRESSION may be used to control the level of a particular sound - to reduce sibilance (de-essing) or microphone 'popping' etc.

NARROW BAND EXPANSION can add emphasis to a vocal or a particular instrument to give greater separation.

Q (Quality factor) is a measurement of a filter or equalizer's pass band. It is the ratio of the center frequency to bandwidth. The higher the Q, the narrower the bandwidth.

In Case of Difficulty

Symptom: No Sound

Possible Causes:

Power Off:

Check that a fuse of the correct rating is installed.

Check that the Voltage Selector is set correctly for your AC supply

Check that the various LEDs on the front panel of the compressor/limiter are lit. If not, confirm that the power switch is on (locked in) and that the unit is connected to an active AC power source.

Power On - No Signal Audible:

Confirm that active audio lines are connected to the signal input(s).

Check that the controls are advanced sufficiently to allow signal to pass.

Symptom: Weak and/or Distorted Audio

Check that a clean signal is being fed to the compressor. It is possible that the unit is reproducing problems originating elsewhere in the audio chain.

Confirm that the input wiring is correct. If only one side of a floating audio line is connected to the input, the resultant audio will be weak and distorted, with a poor frequency response.

Check that the input line is not being loaded down by too low an impedance. This can occur if more than one terminating resistor is connected across the line, or if the same line is feeding the inputs of multiple devices without isolation, particularly if the unit feeding the line does not have a low output impedance. Confirm that the output impedance specification of the feeding device and the input impedance specifications of the device(s) connected to it are compatible.

Check by removing other devices.

Symptom: Hum and/or Buzz

Check that the grounds of the audio signal path and the chassis and power line of all units in the system are connected according to your system's grounding scheme.

Try connecting the chassis and audio grounds on the terminal strip. The chassis ground is connected to mechanical *safety* ground for shock protection.

Hum - Ground loop

In some instances, the voltage difference between the grounds will be so great that a direct connection between grounds is not possible without hum in the output.

The use of an isolation transformer in the input signal line may allow the signal to be connected while maintaining ground isolation.

Remember, for safety you must still have a connection to chassis ground. Do not lift a safety ground or remove the ground pin from an AC power cord.

Hum - Other Possible Causes:

Check the audio at an earlier stage in the chain to confirm that the noise is not already in the input signal.

Power amplifiers have large power transformers which handle high currents, and consequently have significant magnetic fields surrounding them. Some low level equipment is susceptible to hum being induced from external magnetic fields. As a general rule, low level equipment should not be mounted in close proximity to power amplifiers to avoid induction of this type of hum.

Be certain that all audio wiring except for loudspeaker lines is well shielded, and that low level wiring is not run parallel to or in close proximity to AC power wiring, particularly high current and/or lighting lines. If the buzzing changes character or intensity when electrical lighting conditions change, the noise is being induced into the audio from the lighting equipment. It is always advisable to run lighting equipment from its own power source and the audio equipment from a separate source. The services of a qualified electrician may be required to solve such problems.

Symptom: Intermittent Audio

Check the other equipment and the wiring to make certain that the signal is not intermittent earlier in the chain and that the connectors are solidly connected to the compressor input and output.

Specifications

Performance

Frequency Response:	±0.2 dB [20 Hz to 20 kHz]
THD:	<0.006% typ. 0.02% max., @ 1 kHz. @ +14 dBu Input
Test Bandwidth	22 Hz to 30 kHz, Signal Below Threshold, 0 dB Gain Setting
Signal to Noise Ratio:	Referenced to Maximum Output (+24 dBu) 110 dBA, 22 kHz A-weighted Noise Bandwidth
Residual Noise Floor:	-86 dBA, 22 kHz Noise Bandwidth, A-weighted
Channel Separation:	≥ 91 dB @ 20 Hz to 20 kHz
Dynamic Range:	>115 dB

Signal Input

Type:	Electronically Balanced
Connectors:	XLR + Terminal Strip
Polarity:	Pin 2 + Tip "hot"
Maximum Input Level:	+24 dBu (12.3 V rms)
Input Impedance	
Balanced:	40 kΩ
Unbalanced:	20 kΩ
Common Mode Rejection:	≥ 60 dB @ 1 kHz

Detector Input

Type:	Balanced
Input Impedance:	100 kΩ
Connector:	Terminal Strip

Output

Type:	Balanced, active transformer-isolated
Connector:	XLR + Terminal Strip
Polarity:	Pin 2 "hot"
Gain:	± 20 dBu
Maximum Output Level:	+24 dBm
Output Impedance:	< 75 Ω
Bypass:	Relay bypass - controlled by switch. Automatic in power-off condition

Controls

Threshold:	-40 dBu to +10 dBu and "Off "
Detector:	Average to Peak
Attack Times:	1 msec to 50 msec (Average Detector) 1 μsec (fixed) (Peak Detector)
Release:	0.1 seconds to 5 seconds for 10 dB of release
Ratio:	1.5:1 to ∞:1 + Auto mode
Maximum Output Ceiling:	Trim pot adjustable from -10 dBu to "Off"

Output Metering:	Peak Attack and Release are fixed at 50 μ sec and 40 msec Zero Reference is adjustable from -15 dBu to +4 dBu
Parametric Equalizer	
Frequency Range:	Continuous Sweep 20 to 200 Hz, 200 Hz to 2 kHz or 2 kHz to 20 kHz.
Q:	A 3-position rotary switch multiplies the center frequency by 1, 10 or 100 to give ranges of: 20 to 200 Hz, 200 Hz to 2 kHz or 2 kHz to 20 kHz. Continuously adjustable from 0.47 to 9.0 (2.5 octave to 0.12 octave)

AC Power

AC Protection:	Fused AC receptacle on rear panel (fuse size 5 mm x 20 mm)
100/120 V:	500 mA 250 V Slow Blow
220/240 V:	250 mA 250 V T type
Operating Range @ 120 V setting:	117 V \pm 10% (105 V - 129 V)

Environment

Operating Temperature:	0° C to 50° C
Cooling:	Natural Convection

Physical

Front Panel:	1U EIA Rack Mounting; 283 x 45 mm (19 in x 1.75 in)
Depth Behind Panel:	260 mm (10.2 in) less connectors
Net Weight:	3.9 kg (8.5 lb)
Shipping Weight:	6.4 kg (14 lb)

Safety

Designed to comply with UL, CSA and TUV Standards.
Approvals pending

Maintenance and Warranty

Maintenance

This UREI product is all solid state, ruggedly constructed and uses the finest components. As such it will provide years of trouble free use with normal care. All parts are conservatively rated for their application. No *special preventive maintenance is required.*

The metal and plastic surfaces of the unit may be cleaned with a damp cloth. In case of heavy dirt, a non-abrasive household cleaner such as Formula 409[®] or Fantastik[®] may be used. Do not spray the cleaner directly onto the front of the unit, as it may destroy the lubricants in the switches and controls! Spray cleaner onto a cloth and then use the cloth to clean the unit.

THERE ARE NO USER SERVICEABLE PARTS INSIDE.

REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

Warranty

This product is warranted by the manufacturer to the original USA purchaser against defects in material and workmanship for a period of two years from the date of purchase. If this product was purchased in another country, contact your UREI dealer or distributor for information on the terms of the warranty applicable in your country. We require that you retain a copy of your dated sales receipt for proof of warranty status.

USA purchasers only:

If your UREI product ever needs service, please write or telephone:

UREI
JBL Professional (Attn: Customer Service Department),
8370 Balboa Boulevard,
Northridge, CA 91329
(818 / 893-8411).

UREI may direct you to an authorized UREI Service Agency, or ask you to return your unit to the factory for repair. In either case, you will need to present the original bill of sale to establish the date of purchase. **DO NOT** ship your UREI product to the factory without prior authorization.

All products shipped to the factory must be accompanied by a Return Authorization (R.A.) Number and must be shipped prepaid. COD shipments will not be accepted.

Field repairs are not normally authorized during the warranty period, and repair attempts by unqualified personnel may invalidate the warranty.

Customers outside the USA should contact their local UREI dealer or distributor for warranty assistance. Do not return products to the factory unless you have been given specific instructions to do so.