

User's Manual

CLE8.0

COMPRESSOR /LIMITER /GATE



www.altoproaudio.com
Version 2.4 September 2005

— English —

SAFETY RELATED SYMBOLS



This symbol, wherever used, alerts you to the presence of un-insulated and dangerous voltages within the product enclosure. These are voltages that may be sufficient to constitute the risk of electric shock or death.



This symbol, wherever used, alerts you to important operating and maintenance instructions. Please read.



Protective Ground Terminal



AC mains (Alternating Current)



Hazardous Live Terminal

ON: Denotes the product is turned on.

OFF: Denotes the product is turned off.

WARNING

Describes precautions that should be observed to prevent the possibility of death or injury to the user.

CAUTION

Describes precautions that should be observed to prevent damage to the product.



Disposing of this product should not be placed in municipal waste and should be placed in a separate collection.

WARNING

• Power Supply

Ensure that the mains source voltage (AC outlet) matches the voltage rating of the product. Failure to do so could result in damage to the product and possibly the user.

Unplug the product before electrical storms occur and when unused for long periods of time to reduce the risk of electric shock or fire.

• External Connection

Always use proper ready-made insulated mains cabling (power cord). Failure to do so could result in shock/death or fire. If in doubt, seek advice from a registered electrician.

• Do Not Remove Any Covers

Within the product are areas where high voltages may present. To reduce the risk of electric shock do not remove any covers unless the AC mains power cord is removed.

Covers should be removed by qualified service personnel only.

No user serviceable parts inside.

• Fuse

To prevent fire and damage to the product, use only the recommended fuse type as indicated in this manual. Do not short-circuit the fuse holder. Before replacing the fuse, make sure that the product is OFF and disconnected from the AC outlet.

• Protective Ground

Before turning the product ON, make sure that it is connected to Ground. This is to prevent the risk of electric shock.

Never cut internal or external Ground wires. Likewise, never remove Ground wiring from the Protective Ground Terminal.

• Operating Conditions

Always install in accordance with the manufacturer's instructions.

To avoid the risk of electric shock and damage, do not subject this product to any liquid/rain or moisture. Do not use this product when in close proximity to water.

Do not install this product near any direct heat source.

Do not block areas of ventilation. Failure to do so could result in fire.

Keep product away from naked flames.

IMPORTANT SAFETY INSTRUCTIONS

Read these instructions

Follow all instructions

Keep these instructions. Do not discard.

Heed all warnings.

Only use attachments/accessories specified by the manufacturer.

• Power Cord and Plug

Do not tamper with the power cord or plug. These are designed for your safety.

Do not remove Ground connections!

If the plug does not fit your AC outlet seek advice from a qualified electrician.

Protect the power cord and plug from any physical stress to avoid risk of electric shock.

Do not place heavy objects on the power cord. This could cause electric shock or fire.

• Cleaning

When required, either blow off dust from the product or use a dry cloth.

Do not use any solvents such as Benzol or Alcohol. For safety, keep product clean and free from dust.

• Servicing

Refer all servicing to qualified service personnel only.

Do not perform any servicing other than those instructions contained within the User's Manual.

PREFACE

Dear Customer:

Thanks for choosing ▲LTO CLE 8.0 Compressor/Limiter/Gate and thanks for choosing one of the results of ▲LTO AUDIO TEAM job and researches.

For our ▲LTO AUDIO TEAM, music and sound are more than a job...are first of all passion and let us say...our obsession! We have been designing professional audio products for a long time in cooperation with some of the major brands in the world in the audio field.

The ▲LTO line presents unparalleled analogue and digital products made by Musicians for Musicians in our R&D Centers in Italy, Netherlands, United Kingdom and Taiwan. The core of our digital audio products is a sophisticated DSP (Digital sound processor) and a large range of state of the art algorithms which have been developed by our Software Team for the last 7 years.

Because we are convinced you are the most important member of ▲LTO AUDIO TEAM and the one confirming the quality of our job, we like to share with you our work and our dreams, paying attention to your suggestions and your comments.

Following this idea we create our products and we will create the new ones! From our side, we guarantee you and we will guarantee you also in future the best quality, the best fruits of our continuous researches and the best prices. Our ▲LTO CLE 8.0 is the result of many hours of listening and tests involving common people, area experts, musicians and technicians.

The results of this effort is that you can acquire an extremely efficient and universal dynamics processor. It Contains several new circuits design which make the unit an ultimate dynamic processor: intelligent program recognition, smart Expander/Gate and super low distortion VCA (Voltage Controlled Amplifier).

Nothing else to add, but that we would like to thank all the people that made the ▲LTO CLE 8.0 a reality available to our customers, and thank our designers and all the ▲LTO staff, people who make possible the realization of products containing our idea of music and sound and are ready to support you, our customers, in the best way, conscious that you are our best richness.

Thank you very much.

▲LTO AUDIO TEAM

TABLE OF CONTENTS

1. INTRODUCTION.....	4
2. THE CONCEPT BEHIND.....	4
2.1 Some technical stuff	
2.2 Voltage Controlled Amplifier (VCA)	
2.3 Inputs	
3. CONTROLS.....	6
3.1 Master Control Section	
3.2 Expander / Gate Section	
3.3 Compressor Section	
3.4 Peak Limiter Section	
3.5 The Rear Panel	
4. READY TO ROLL?.....	10
4.1 Expander/Gate Section	
4.2 Compressor Section	
4.3 Peak Limiter Section	
5. INSTALLATION AND CONNECTION.....	12
5.1 Mains Connection	
5.2 Audio Connection	
5.3 Rack Mounting	
6. TECHNICAL SPECIFICATIONS	15
7. WARRANTY	17

1. INTRODUCTION

You are now the Owner of an ▲LTO CLE 8.0 Compressor/Limiter/Gate. The CLE 8.0 is a very powerful dynamic processor. We have included in it several innovative circuit designs that make the CLE 8.0 a very versatile processor: smart and fast recognition of the program, adjustable Expander/Gate and very low distortion Voltage Control Amplifier (VCA).

Feature List:

- **Smart Knee Control Compressor (SKC)**

Soft knee or hard knee? This is the question! SKC combines both: In the "soft knee" mode you control the program material so that the compression will be the most musical and inaudible. ON the other end, the hard knee function is used for better precision, limiting signal peaks with precision and will allow you to add creativity to the dynamic processing. This function also allows you to protect other equipment in the signal loop against distortion.

- **The AUTO Function**

Your CLE 8.0 includes AUTO function switch on the front panel. Thanks to the AUTO function attack and release times of the program materials are automatically analysed. Then the dynamic range of the program is heavily compressed in a very musical way so that there will not be any audible breathing or pumping effect.

- **Attack and Release Controls:**

Ok,Ok, you do not want to get advantage of our AUTO function and be the Master of your own mix. We have provided your CLE 8.0 with User Adjustable attack and release time for the best total manual control.

- **Smart Ratio Control expander (SRC)**

During music pauses or when a quiet session occurs, the noise floor maybe highly amplified and this effect may be exaggerated because of inappropriate use of the expansion ratio. The SRC control will adjust the expansion depending on the input signal so that those signals, which are slightly above the noise floor level, will get the major benefits.

- **Smart Gain Control peak limiter (SGC)**

This function includes two important functions: Clipper and program limiter. The peak limiter will be activated above a certain threshold that is adjusted by the User and will radically restrict signal peaks. But what about if the threshold of the Limiter is surpassed only for a few milliseconds? SGC will turn on automatically and reduce the output signal so that you will not hear any distortion. Smart, isn't it? The SGC proves to be very efficient in loudspeaker protection and to reduce undesired peaks in digital situations.

2. THE CONCEPT BEHIND

2.1 Some technical stuff

Good old analog technology: It will allow us to manufacture audio equipment with a very high dynamic range: up to 125 dB. But the dynamic range of digital equipment is more or less 25 dB less. A further reduction in dynamic range occurs with the use of tape recorders and/or vinyl records.

2.1.1 It is not just Music

Yes, a piece of electronic will produce some noise. When the current flows through a conductor this will generate a certain movement of the electrons and therefore: noise. And throughout the whole spectrum of audio. Imagine what happens when this inherent noise will be amplified. Yes, today one can use "low-noise" components but still such components will present a certain level of residual noise.

For example with tape recorders it will not be possible to get an S/N (signal to noise) ratio better than 70dB. This level would not be accepted today by the increased sensitivity of the Listeners. It is possible to improve the performance of a tape recorder: Absolutely no!

2.1.2 Introducing Audio Dynamics

The human ear can detect the noise generating by falling leaves as well as the roar generated by the taking off space shuttle. Unfortunately no analog, nor digital device can reproduce such wide spectrum. Please look at Chart.1 and you will see the difference if dynamic capacity of various devices when compare to the human ear. More problems occur when handling high level signals and low level signals. When you reach the high level limit you may incur in distortion because of the dynamic range of the instrument therefore a certain "reserve" must be maintained to avoid distortion. This reserve is known as "headroom" and it is usually set at 10-20dB. Would not be easier just to reduce the operating level? Yes it would but you would put low level music signals at the same level of the basic noise floor so the overall quality of the signal would be highly deteriorated. Please look at Chart.2 and note the Usable dynamic range (including headroom) versus high level distortion generated by peaks, and Noise floor level.

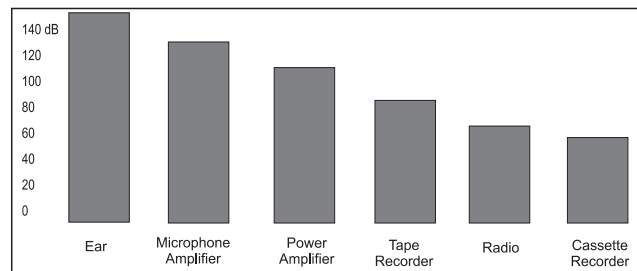


Chart.1: The dynamic range capabilities of various devices

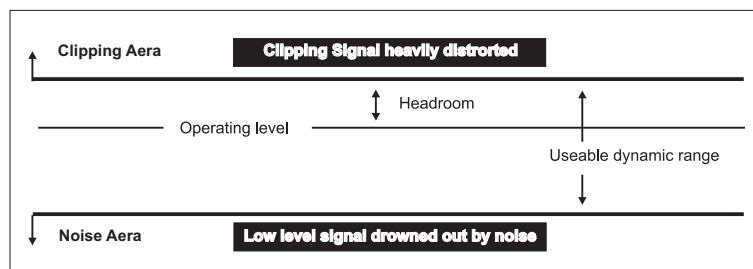


Chart.2: The interactive relationship between the operating level and the headroom

So the operating level must be as high as possible but not high enough to generate distortion. Thriky uh?

There is a very easy way to obtain this. With the volume knob in hand you increase the volume during low passages and decrease the volume during loud passages. Unfortunately even the Great Houdini would not be fast enough to monitor carefully the speed of the musical signal and it would be impossible to detect signal peaks and consequently levelling them out. Manual control is therefore out of question. The answer is AGC (automatic gain control); a device that will monitor the signal in real time and that will adjust the gain for the best S/N ratio without producing distortion. So, the name of this device is "Compressor/limiter".

2.1.3 More technical stuff about Compressor/Limiters

Try to measure the dynamic range of musical instruments. You will find out that your ear will handle such range during which the distortion and overloading will be generated in your audio equipment.

To avoid these, compressor/Limiters will be used. Both Compressors and Limiters more or less do the same job but Limiters brutally limit the audio signal above a set threshold, while Compressors handle signal in a much more civilised way and over a wide range of levels. If an audio signal exceeds the threshold set by the User the limiter will kill any audio signal above that threshold. Period! Also Compressors perform their function when the audio signal exceed a certain threshold but the signal is not killed brutally. The audio signal will be reduced in gain in proportion with the amount above the set threshold.

2.1.4 More about noise: Expanders and Noise-Gates

A lot of instruments such as microphones, amplifiers, guitar pickups, etc generate some noise, either at low frequencies (hum) or at high frequencies (hiss) Such noise will inevitably interfere with the quality of your audio signal. Now, if you scream into a microphone you will not hear the noise generated by such microphone because such noise will be "masked" by the higher level of the signal, your voice in this case.

But if you sing into your microphone more gently in a soft passage, the level of the signal generated by your voice will get much closer to the floor noise level and such floor noise will become disturbing. In order to kill this problem Expanders and noise-gates are used. An expander is the opposite of a compressor: attenuating the signal when the amplitude drops they can limit the floor noise.

Now, we do not need dramatic expansion of a signal across the range, This would generate a resulting dynamic range of over 150dB. For this reason the amplitude control will be applied only to those audio signals which are below a set threshold. Those audio signals above the set threshold will not be affected. Noise-gate can be regarded as a simple Expander. But the Expander will attenuate the audio signal continuously below the set threshold while the noise-gate will simply dramatically cut-off the audio signal completely.

2.2 Voltage Controlled Amplifier (VCA)

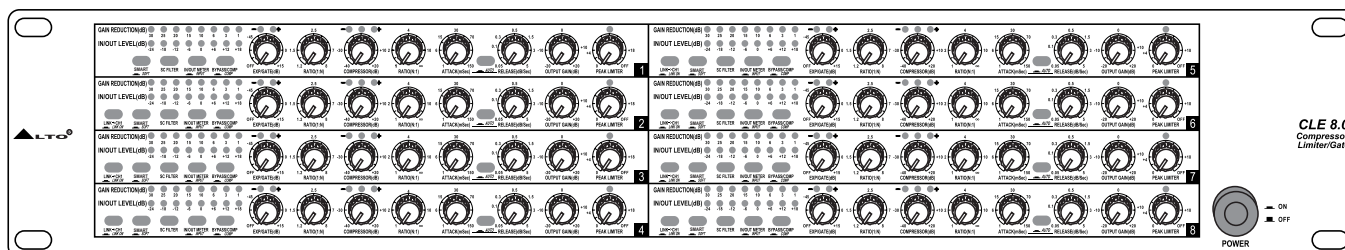
The VCA is the soul of the CLE 8.0 and it is one of the best components available today in his category thanks to its excellent performances in terms of distortion, linearity, noise and temperature stability

2.3 Inputs

2.3.1 Take it easy: Balanced Inputs

To make your life easy and clean we have provided CLE 8.0 with electronically balanced inputs. Even if you operate at high signal levels, hum and noise will be reduce automatically. There is also a servo-function that will automatically adjust the internal level when unbalanced connectors are detected. The correction if of 6dB and it will avoid differences in level in between input and output signal.

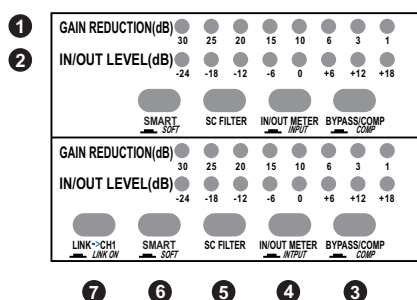
3. CONTROLS



Pic.1: Front Panel of The CLE8.0

The CLE 8.0 presents with 8 channels. Each channel is equipped with the same control elements: 6 push-button switches, 8 rotary controls and 22 LEDs except channel 1 which short of the LINK→CH1 push-button only.

3.1 Master Control Section



Pic.2: The Master Control Section

1. Gain Reduction Meter

It indicated the gain reduction. The range displayed is 1 to 30 dB.

2. Input / Output Level Meter

It will read the actual Input or Output Level. The range goes from -24dB to +18dB.

3. Bypass Switch

This switch simply turns off the correspondent channel. It can also be used to make an A/B comparison in between processed and unprocessed signal.

4. Input / Output Meter Switch

When the switch is ON the level indicator will read the input level. When it is OFF the level indicator will read the output level.

5. SC Filter switch

Engaging this switch to insert a Low-cut filter in the sidechain path and thus limits the influence of low frequencies on the CLE 8.0's control processes.

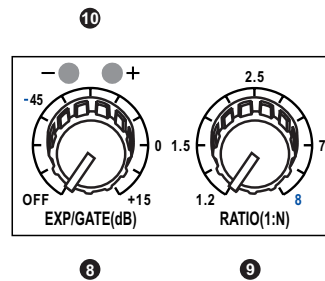
6. Smart switch

Engaging this button to switch the "Hard Knee" characteristics to SKC (Smart Knee Control). SKC provides a compression of the program material and should therefore be used whenever compression should be more or less inaudible.

7. Link →CH 1 switch

Every channel contains the Link →CH1 switch except the CH1. Activating this switch will link the corresponding channel to CH1, and the CH1 will take control of the corresponding channel.

3.2 Expander / Gate Section



Pic.3: Expander/Gate Section

8. EXP/GATE control

This control adjust the threshold level for the Expander / Gate Section in the range of Off to +15dBu. Signals below this level cause expansion.

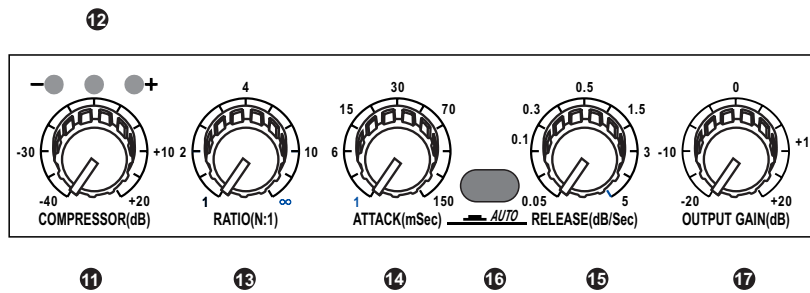
9. Ratio Control

This control determines the expansion ratio when the signal drops below the threshold level. The expansion ratio can be set from 1:1.2 to 1:8 (Low ratio for Expander application or 1:8 for Gate application).

10. Threshold LED

The "+" Led lights up when an audio signal is below the set threshold. The "-" Led lights up in presence of an expansion

3.3 Compressor Section



Pic.4: Compressor Section

11. Compressor Control

This control adjusts the threshold level for the Compressor section in the range of -40dB to +20dB. The SKC (Smart Knee Control) is applied to the audio signal, which is a maximum of 10dB above the set threshold. Above such level (10dB) a hard knee compression will be applied.

12. Compressor LED

These LED's will show you the state of the input signal in relation to the threshold level. If the input signal falls below the set threshold level, the left "-" LED will light up. This means that no signal is being compressed. When the input signal reach the set threshold level, the middle LED lights up. This means the compression function hasn't been activated. If the input signal rises above the set threshold level, this signal will be compressed and the "+" LED lights up.

13. Ratio Control

The ratio between the input and output level of audio signals exceeding the set threshold level is determined by this control. This control is manually adjustable from 1:1 to ∞:1.

14. Attack Control

This control determines how fast the compressor is to respond to audio signals that will exceed the set threshold. It can be manually adjusted from 1 to 150 milliseconds.

15. Release Control

This control determines how fast is the compressor to return to unity gain when the audio signal falls below the set threshold level. It can be manually adjusted from 0.05 to 5 seconds.

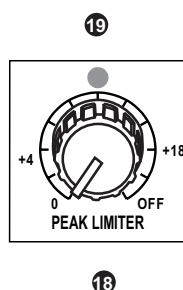
16. Auto Switch

Who needs Attack and release control? Activate this switch and these controls will be deactivated. Attack and release controls will be automatically set by the unit depending on the program material.

17. Output Gain Control

Through this control you can vary the output signal by a maximum of 20 dB. In this way you can recover a level that had been lost because of the compression process.

3.4 Peak Limiter Section



Pic.5: Peak Limiter Section

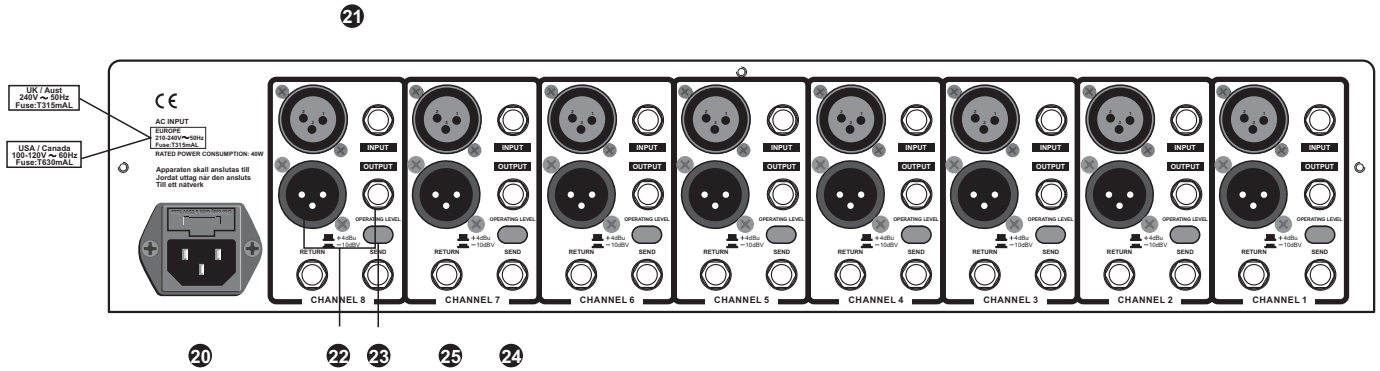
18. Peak Limiter Control

The threshold level of the Peak Limiter is adjusted by this control.

19. Peak Limiter LED

This Led will light up when the Limiter function is activated.

3.5 The Rear Panel



Pic.6: Rear Panel Of The CLE8.0

20. AC Inlet and Fuse Holder

This connector is used to connect the supplied power cord. Please check the Voltage accepted by the unit and the Voltage available from your AC sockets before connecting the unit to the Mains.

21. Audio In

These connectors are used to input the signal source. You can input the signal via the balanced 1/4" TRS phone jack or XLR connector.

22. Audio Out

These connectors are used to output the signal. You can output the signal via the balanced 1/4" TRS phone jack or XLR connector.

23. Operating Level Control

This control is used to adapt this unit to either the -10dBV home recording operating level or the +4dBu professional studio operating level.

The Input / Output Level Meter (2) is referenced automatically to the selected level, i.e. an optimum operating range of the meter will always be ensured.

24. Send

Through this 1/4" unbalanced jack the audio signal can be routed to an external processor for sidechain effect.

25. Return

The return signal from an external processor will be inputted through this 1/4" jack.

4. READY TO ROLL?

4.1 Expander/Gate Section

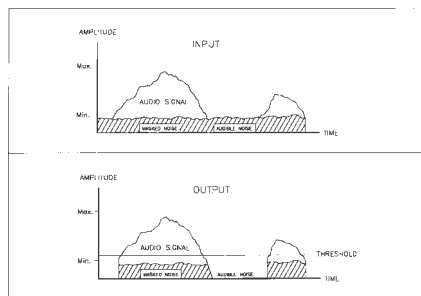


Chart.3: Function of an expander

As we told you previously in this Manual the downward expander will reduce automatically the level of the audio signal when such signal is below a set threshold. So the expander is the opposite of the compressor/limiter. We also explained to you how the ratio curve of the expander is flat while a noise gate it is more brutal processor: It simply cut-off the entire signal below a certain set threshold. The CLE 8.0 is equipped with a new kind of expander, the SRC (Smart Ratio Control). The ratio of the SRC is automatically adjusted according to the audio signal level. In fact, conventional expanders could easily cut part of the musical program with unacceptable result: The gain changes become audible. We have equipped the SRC with a non-linear ratio curve, which is soft and adjustable by the User. Thanks to the SRC low passages close to noise floor level will be processed with a minimum ratio of expansion while for signals of reduced level a higher ratio will be used with resultant greater attenuation.

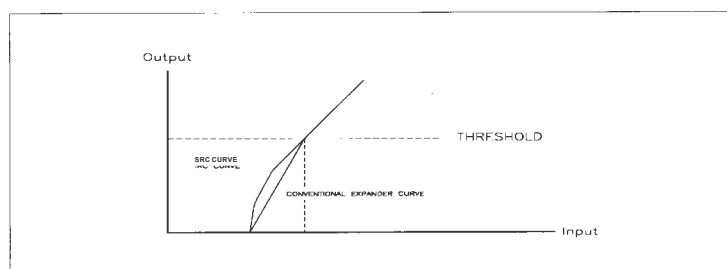


Chart.4: SRC Curve characteristics of the Adaptive Expander

4.1.1 EXP/GATE Adjustment

The EXP/GATE control covers a very wide range and it is efficient with any working level. Turn the threshold control fully counterclockwise and the Expander/Gate section will be completely off.

4.2 Compressor Section

4.2.1 Another Threshold Control?

The compressor threshold control sets the point where the input level starts to be reduced. Let's say the level is +12dBu and the threshold control is set at +2dBu: In this case up to 10dB can be compressed. If the input level is the same and the control is set at -10dBu the maximum compression will be 22dB, The operating range of the threshold control is -40 to +20dBu. Turn the threshold control fully clockwise and you will get a threshold level of +20dBu.

You must remember that the degree and the type of compression not only depend by the threshold control but also by other controls such as Ratio, Attack and Release.

4.2.2 Ratio control

This control sets the change of input level to output level but only for the signals that exceed the threshold. The scale of the ratio control on the front panel (calibrated in dB) indicates how much input level is required to increase the output level by 1dB. If you have a ratio equal to 1:1 you will get the same level of input and output signal: So, no level change.

If you have a ratio of 2:1 this means that for every 2dB increase of the input level (above threshold) you will get an increase of output level of 1dB. ON the same way, a ratio of 10:1 means that for every 10dB increase of the input level (above threshold) you will get an increase in output level equal to 1dB, and so on.

You need to be aware that higher ratio settings produce less natural sounds so if you wish a more minute effect on the dynamic range of a program you should use a Ratio of 4:1 or lower.

With the SKC circuit (Smart Knee Control) you can avoid aggressive compression generated by using high ratios. How we achieve this? Introducing a "soft knee" curve in the range of up to 10dB above the threshold level. Hard Knee compression is then used beyond this range.

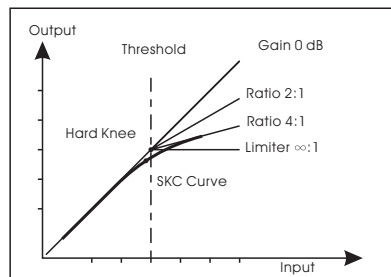


Chart.5: SKC characteristic of the compressor section

4.2.3 Attack control

The attack time represents the amount of time that passes before the compressor start to lower the output level when the signal is above the threshold point. For very fast transients such as drums, handclaps, etc. a short attack time will be used. These peaks are consequently carefully regulated by the compressor.

Sounds of other nature will get advantages if longer attack times are used. Anyway, our advice is always to begin the process with longer attack times. Then you can start gradually to reduce the attack time. In the CLE 8.0 the attack time can be set in a range of 1 to 150 milliseconds.

4.2.4 Release Control

This control determines how much time the compressor needs to get back to normal gain when the audio signal falls below the set threshold.

A too short release time will make the volume to fluctuate and you will experience pumping effect. A too long release time will give you pumping and breathing effect especially when you have loud passage followed by a quite passage. The release time on CLE 8.0 can be set from 0.05 to 5 seconds.

4.2.5 Auto switch

This switch turns off the possibility of manually set the attack and release times. An intelligent program recognition circuit will automatically set the attack and release times. In such way, undesirable effects such as distortion and pumping will be avoided.

4.2.6 Output control

This Control is indispensable to compensate the loss of level at output level generated by the gain reduction caused by the compression and limiting processing

4.2.7 Bypass Switch

This switch simply turns off the processing of the corresponding channel. This is useful to compare quickly the processed and unprocessed signal.

4.2.8 Gain Reduction Meter

This consists of 8 LED on the front of the CLE 8.0. Through this Led meter you can visualise the amount of gain reduction at any given time.

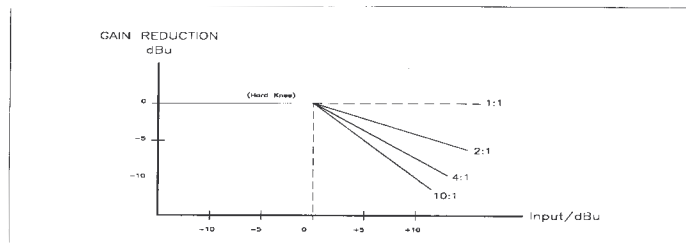


Chart.6: The effect of a compressor can be expressed as the amount of gain reduction that is taking place for any given input

4.3 Peak Limiter Section

How fast is the compressor to react to a signal which is above the threshold point? This is determined by the attack time. A longer attack time is advisable to process low frequencies while shorter attack time is preferable for high frequencies. In this way you will avoid undesired dynamic distortion. But what about if you are mixing a program with a wide range of frequencies? In this case you should choose a setting that would benefit the low frequency better.

Well, life is not that easy for conventional compressor/limiters. Ok you handle an audio signal made by a wide range of frequencies and you have chosen a longer attack time. But, if are using your CLE 8.0 as a limiter the fast high frequencies will pass through untouched because the attack time is too slow and such transients could cause distortion when the unit is connected to broadcast devices or taper recorders. The solution in CLE 8.0 is represented by our Smart Gain Control (SGC) limiter circuit. The curve in bold is the output signal and the dashed curve above it is the input signal. The area in between the two is the amount of gain reduction.

The unit will activate the limiter when the signal exceeds the threshold for more than 15 microseconds. Then 1 second after that the signal is below threshold again, reduction goes back to 0dB and in this case input and output signals are again identical.

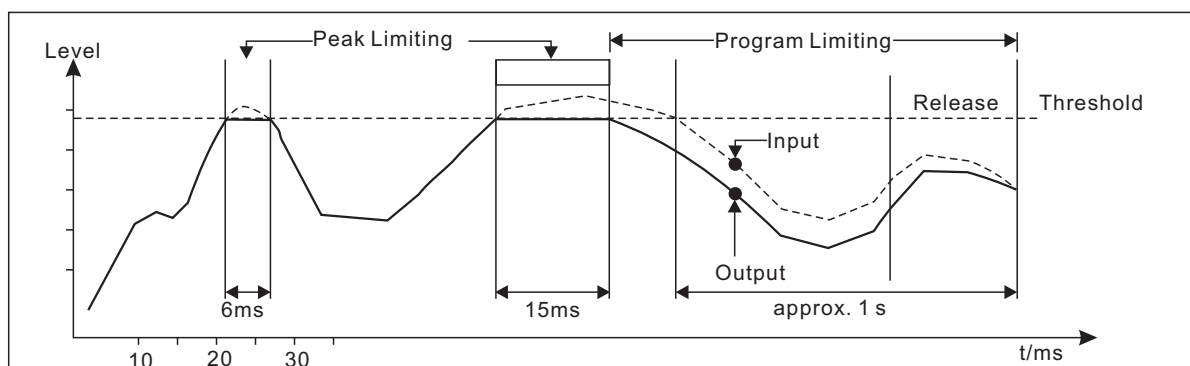


Chart.7: SGC characteristic of the limiter section

5. INSTALLATION AND CONNECTION

5.1 Mains Connection

You must check the power supply Voltage available in your Country before connecting the unit to the Mains.

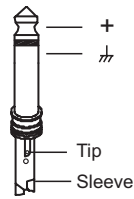
5.2 Audio connection

The CLE 8.0 Compressor/Limiter/Gate is equipped with balanced XLR connectors as well as 1/4" phone jack and can be connected with other units in different ways to support a vast range of applications without experiencing a signal loss.

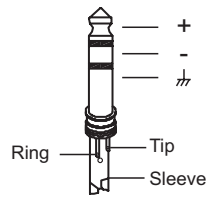
a. Wiring Configuration

Both types of connectors available on CLE 8.0 can be wired in balanced and unbalanced modes. Please see following drawing for details:

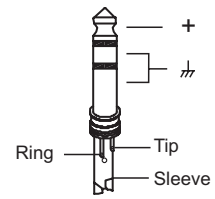
- For 1/4" Phone jack



TS Type Unbalanced

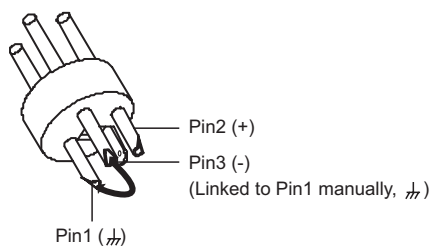


TRS Type Balanced

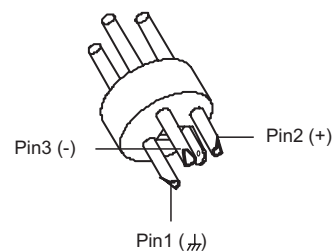


TRS Type Unbalanced

- For XLR connector



XLR Type Unbalanced

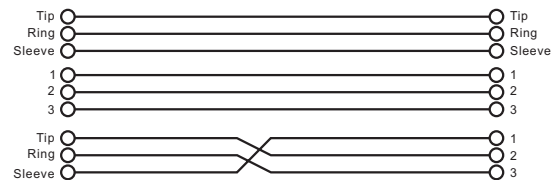
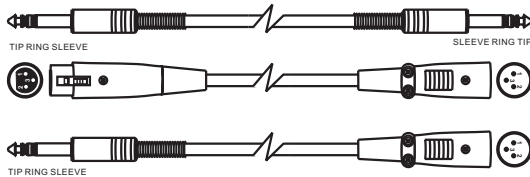


XLR Type Balanced

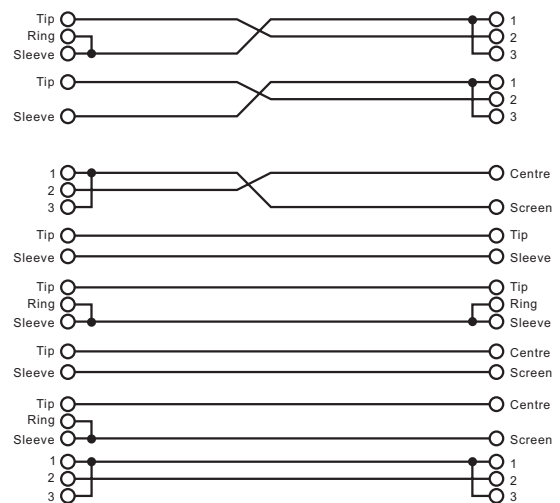
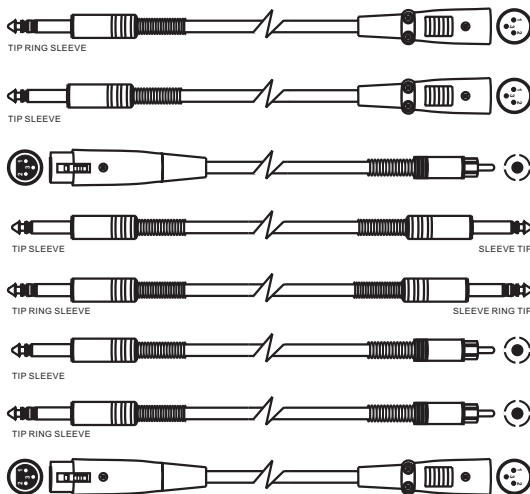
b. In Line Connection

Please see following drawing for details.

- Balanced



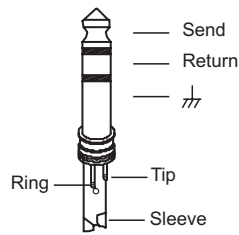
- Unbalanced



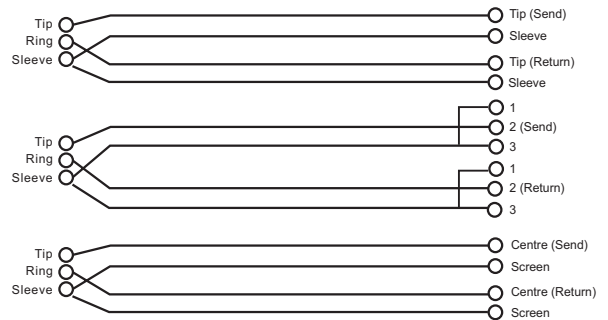
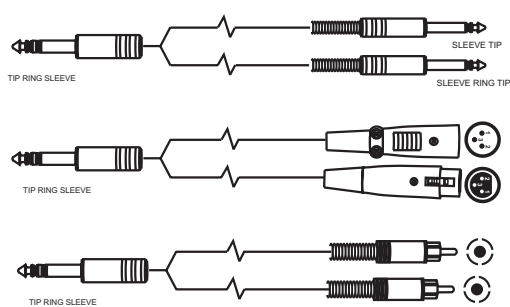
c. Insert Points Connection

In case you are using the main inserts of your mixing console and you have a single jack for SEND and RETURN, you can use an insert Y cable . Please see following drawing.

- 1/4" TRS insert



- Insert Leads



5.3 Rack Mounting

The most secure mounting is on a universal rack shelf available from various rack manufactures or your music dealer. The CLE 8.0 Compressor /Limiter /Gate fits into one standard 19" rack unit of space, and its height is 4H.

Please allow at least an additional 4" depth for the connectors on the rear panel. Be sure that there is enough air space around the unit for sufficient ventilation and please do not place the CLE 8.0 Compressor /Limiter /Gate on high temperature devices such as power amplifiers etc. to avoid overheating.

6. TECHNICAL SPECIFICATIONS

INPUT		
	Type	Active balanced XLR and 1/4"JACK
	Impedance	Balanced >50KOhm, Unbalanced>25KOhm
	Operating level	+4dBu/ - 10dBV
	Max input level	+21dBu balanced and unbalanced
	CMRR	Typically>55dB at 1KHz
OUTPUT		
	Type	XLR and 1/4" JACK
	Impedance	Balanced 60 Ohm, Unbalanced 30 Ohm
	Max output level	>+21dBu
RETURN		
	Type	1/4" JACK
	Impedance	>10KOhm
	Max input level	>+24dBu
SEND		
	Type	1/4" JACK
	Impedance	2KOhm
	Max output level	>+21dBu
SYSTEM SPECIFICATIONS		
	Bandwidth	20HZ to 20kHz, +0/ - 0.5dB
	Noise	> - 90dBu, unweighted, 22Hz to 22kHz
	THD	<0.01% Typical at +4dBu, 1kHz, unity gain
		<0.04% Typical at +20dBu, 1kHz, unity gain
	IMD	<0.01% Typical SMPTE
	Crosstalk	< - 100dB, 22Hz to 22KHz
EXPANDER/GATE SECTION		
	Type	Smart Ratio control Expander
	Threshold	variable (OFF to +15dB)
	Ratio	variable (1:1.2 to 1:8)
COMPRESSOR SECTION		
	Type	Smart Knee control Compressor
	Threshold	variable (- 40dB to +20dB)
	Ratio	variable (1:1 to ∞:1)
	Threshold Characteristic	variable (Smart knee control)
	Manual Attack Time	variable (1ms to 150ms)
	Manual Release Time	variable from 0.05s to 5s
	Auto Attack Time	Typical 15ms at 10dB, 5ms at 20dB, 3ms at 30dB
	Auto Release Time	Program dependent, typical 125dB/s
	Output level	variable (- 20dB to +20dB)
PEAK LIMITER SECTION		
	Type	Smart Gain Control Peak Limiter
	Threshold	variable (0 to OFF (+22dBu))
	Ratio	∞:1
	Stage 1 Limiter Type	Clipper
	Attack Time	"zero"
	Release Time	"zero"
	Stage 2 Limiter Type	Program Limiter
	Attack	program dependent, typ. <5ms
	Release	program dependent, typ. 20dB/s

FUNCTION SWITCHES		
	SMART	Enables the "Smart Knee Control" characteristics.
	SC FILTER	Allows for frequency dependent processing.
	AUTO	Enable the automatic and program dependent setting of the Attack - /Release times, disengaging the manual Attack - /Release controls
	I/O METER	Switches between input and output for the Level Meter
	BYPASS	Bypass switch.
	OPERATING LEVEL	Changes the internal reference level from +4 dBu to - 10dBu.
	LINK	Linking both channels for stereo operation. Channel 1 becomes master.
INDICATORS		
	GAIN REDUCTION	8 element LED display: 1/3/6/10/15/20/25/30 dB.
	INPUT/OUTPUT LEVEL	8 element LED display: -24/-18/-12/-6/0/+6/+12/+18 dB
	Expander/Gate Threshold	2 LED for under "+" and above " - "
	Compressor Threshold	3 LEDs for under "+", Interactive "0" and above " - "
	Peak Limiter Threshold	1 LED for indication of limiter function.
	Function switch	LED indicator for each
POWER SUPPLY		
	Mains Voltages	USA/Canada ~120VAC, 60Hz
		U.K./Australia ~240VAC, 50Hz
		Europe ~230VAC, 50Hz
		General Export Model ~100 - 120VAC
		~200 - 240VAC, 50 - 60Hz
	Fuse	100 - 120VAC : 630mA (SLOW - BLOW)
		200 - 240VAC : 315mA (SLOW - BLOW)
	Power consumption	40Watts
	Mains Connection	Standard IEC receptacle
PHYSICAL		
	Dimension	485.0(W) × 233.0(D) × 90.0(H)mm
	Net Weight	5.2Kg

7. WARRANTY

1. WARRANTY REGISTRATION CARD

To obtain Warranty Service, the buyer should first fill out and return the enclosed Warranty Registration Card within 10 days of the Purchase Date.

All the information presented in this Warranty Registration Card gives the manufacturer a better understanding of the sales status, so as to purport a more effective and efficient after-sales warranty service.

Please fill out all the information carefully and genuinely, miswriting or absence of this card will void your warranty service.

2. RETURN NOTICE

2.1 In case of return for any warranty service, please make sure that the product is well packed in its original shipping carton, and it can protect your unit from any other extra damage.

2.2 Please provide a copy of your sales receipt or other proof of purchase with the returned machine, and give detail information about your return address and contact telephone number.

2.3 A brief description of the defect will be appreciated.

2.4 Please prepay all the costs involved in the return shipping, handling and insurance.

3. TERMS AND CONDITIONS

3.1 ▲LTO warrants that this product will be free from any defects in materials and/or workmanship for a period of 1 year from the purchase date if you have completed the Warranty Registration Card in time.

3.2 The warranty service is only available to the original consumer, who purchased this product directly from the retail dealer, and it can not be transferred.

3.3 During the warranty service, ▲LTO may repair or replace this product at its own option at no charge to you for parts or for labor in accordance with the right side of this limited warranty.

3.4 This warranty does not apply to the damages to this product that occurred as the following conditions:

- Instead of operating in accordance with the user's manual thoroughly, any abuse or misuse of this product.
- Normal tear and wear.
- The product has been altered or modified in any way.
- Damage which may have been caused either directly or indirectly by another product / force / etc.
- Abnormal service or repairing by anyone other than the qualified personnel or technician.

And in such cases, all the expenses will be charged to the buyer.

3.5 In no event shall ▲LTO be liable for any incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.

3.6 This warranty gives you the specific rights, and these rights are compatible with the state laws, you may also have other statutory rights that may vary from state to state.

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