



BCL20

Dual/Stereo Broadcast Compressor/Limiter

Operation Manual

August 2004

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1.0 INTRODUCTION

The BCL20 is a stereo compressor-limiter with a de-essing capability which allows the end user to process two different signals or one stereo program.

Applications include : FM transmitter protection, disc mastering, SPL limiting in PA and discotheque applications, tightening of drums and sustain control on guitars and bass.

Main parameters, including threshold, gain, attack and release times and compression ratio are user controllable.

A unique feature of the BCL20 is the continuously variable detection characteristics. A potentiometer allows mixing of RMS and Peak detectors to tailor the timing parameters to the program being processed. The BCL20 takes advantage of a unique transformer distortion cancelling circuit reducing it an order of magnitude compared to conventional designs.

2 bargraphs display the amount of compression and the input/output level. The de-essing functions involves a slew-rate sensitive network which, while keeping operation very simple, allows frequency-conscious compression, in accordance with FM transmission or disc mastering pre-emphasis.

A rear panel jack allows insertion of an external equaliser to achieve more specific frequency-conscious processing.

RFI protection has been a main concern in the design of the BCL20 allowing its use in broadcast installations.

2.0 INSTALLATION

IMPORTANT: PLEASE READ THIS SECTION BEFORE USING THE BCL20

2.1 INSPECTION AND UNPACKING

The BCL20 has been carefully packed at our factory in a carton designed to withstand handling in transit. Should the unit appear to have been damaged in transit notify your dealer immediately and do not discard any of the packing. The carton should contain -

- The BCL20 unit
- Power cord
- Operator Manual (this book)

2.2 OPERATING ENVIRONMENT

The BCL20 is designed to operate between 0 and 50°C (32-122°F) with relative humidity no more than 80%. Should the unit be installed in an equipment rack, ensure that the ambient temperature conforms to these levels.

2.3 CE STANDARDS AND THE LOW VOLTAGE DIRECTIVE (LVD)

The BCL20 has been designed to meet the latest Electromagnetic Compatibility (EMC) regulations. However we recommend you do not operate the unit close to strong emitters of electromagnetic radiation such as power transformers, motors, mobile telephones or radio transmitters.

The unit should only be connected to a power supply of the type described in 2.4 POWER REQUIREMENTS or as marked on the unit. The unit must be earthed for safe operation. Disconnect the mains supply before removing the cover.

2.4 POWER REQUIREMENTS

There is a mains fuse located inside the unit which is accessed by removing the cover. This fuse is for protection against unit

faults and as such will not normally need replacing. If you think you have a power related problem please refer to your dealer.

The voltage and fuse rating have been factory set for -

230V	100mAUK
220V	100mA Republic of Korea
115V	200mA North America

• **The correct voltage and fuse rating is indicated on the rear panel.**

• **Please check that your unit is correctly rated for the voltage of the country of operation.**

If the fuse requires changing at any time please ensure the correct fuse is fitted. An incorrect fuse could cause damage to the unit and may constitute a fire hazard.

If you carry your BCL20 from one country to another it is very important to ensure the voltage is compatible.

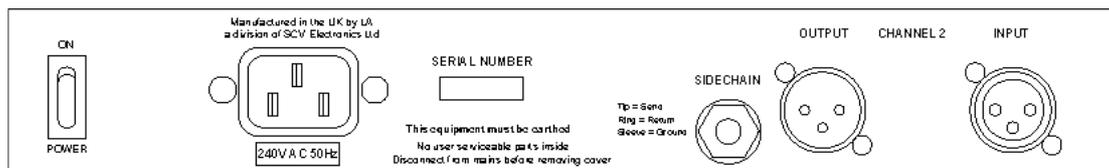
For your information the unit can be internally rewired for use in 230V, or 110-125V countries - contact your dealer for information. A special 100V version is available for Japan and a 220V, 60Hz version for Republic of Korea.

The mains lead connections to the appliance are coloured in accordance with the following code:

Green-and-Yellow	Earth
Blue	Neutral
Brown	Live

• **WARNING: THIS APPLIANCE MUST BE EARTHED**

2.5 EXTERNAL CONNECTIONS



BCL20 rear view showing Channel 2 and Mains connections

The input and outputs of the BCL20 are on XLR connectors. For balanced input and outputs, connections to the unit should be wired as follows:

XLR	+4dBu Pin 1	Screen (Signal ground)
	Pin 2	Hot (+ve)
	Pin 3	Cold (-ve)

For unbalanced operation join pins 1 and 3 on either input or output.

The 'Side chain' connectors are on ¼ inch TRS jacks and are wired as follows

TRS jack	Tip	Send
	Ring	Return
	Sleeve Screen	(signal ground)

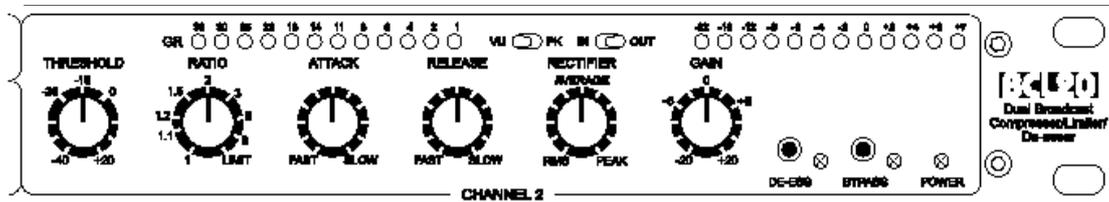
3 WARRANTY

Your LA Audio BCL20 has been manufactured to a high standard using quality components. If correctly installed and operated the unit should give years of problem free operation.

However in the event of a defect in material or workmanship causing failure of the unit within one year of the date of original purchase we will agree to repair, or at our discretion replace, any defective item without charge for labour or parts. To receive service under this warranty it is necessary to return the unit to an LA Audio authorised service centre or to the factory with a dated receipt as proof of purchase. After repair the unit will be returned to you free of charge.

Limitations:

This warranty does not cover damage resulting from accident or misuse. The warranty is void unless repairs are carried out by an authorised service centre. The warranty is void if the unit has been modified other than at the manufacturers instruction. The warranty does not cover components which have a limited life, and which are expected to be periodically replaced for optimal performance. We do not warrant that the unit shall operate in any way other than as described in this manual.



GAIN REDUCTION DISPLAY

This 12 Led bargraph indicates the amount of compression (in dB). The law is expanded at low values.

LEVEL DISPLAY

This 12 Led bargraph indicates either the input level or the output level as selected by the input/output toggle switch. The bargraph can also be switched between peak and VU

BYPASS

This switches the compressor in and out of circuit, so that comparisons may be made between the compressed and uncompressed signal.

IN / OUT

This switches the second bargraph display between input and output level.

DS IN / OUT

This button instantly adds de-essing capability to the BCL20 by adding a filter into the side-chain. This makes the compressor "frequency conscious", which means that it compresses more on the frequency chosen, in this case the frequency where sibilance occurs.

RATIO

This determines the ratio of compression applied. This may be varied from 1:1 to LIMIT (20:1). The ratio of compression may be defined as the ratio which determines how much the output is allowed to increase by in comparison to an increase of the input. For example, with a 10:1 compression ratio, once the input signal is above the threshold level, the output will only rise by 1dB for every 10 dB that the input rises. When the ratio is in excess of 10:1 the action of such large amounts of compression is described as "limiting", because the output is unable to exceed the limit imposed by the compressor.

THRESHOLD

This adjust the signal level above which compression occurs. The lower it is set, the greater is the compression. The threshold range is from -40 dBu to +20 dBu.

ATTACK

This determines how fast the compressor will act upon the incoming signal. This time may be varied from between 0.1 milliseconds and 70 milliseconds. (Caution : Very fast attack times introduce distortion at low frequencies with ANY form of compressor. This is caused by a low frequency signal being longer than the attack time. The low frequency waveform will be distorted by the initial gain reduction because the action is almost certain to occur mid-waveform.)

RELEASE

This determines how fast the action of the compressor will take to be turned off as the incoming signal falls below the threshold. This time may be varied from between 100 milliseconds and 2 seconds.

(Caution : Very fast release times introduce distortion at low frequencies with ANY form of compressor. This is caused by a low frequency signal being longer than the release time. The low frequency waveform will be distorted by the initial release of gain reduction because the action is almost certain to occur mid-waveform.)

RECTIFIER

This controls the respective percentage of RMS detection and Peak detection that will be processed by the side-chain. In the extreme positions, it uses only one of the rectifiers. In the intermediate position, it uses a blend of both.

A very basic rule-of-thumb would be to use RMS detection on individual tracks and Peak detection on mixed program (see applications). As always this is very much open to experimentation.

The unique continuously-variable detection characteristic of the BCL20 makes experimentation as easy as turning a knob.

NB : The Attack and Release controls relate to the Peak rectifier only. Hence, when the Rectifier control is in the full ccw position (RMS), these controls are inoperative.

GAIN

This controls the output gain after compression and is used to match the output with the level of the incoming signal. This may be varied from -20 dB to +18 dB.

STEREO/DUAL

The unit may be switched between stereo mode and two separate mono channels.

POWER

(On rear panel)

This switches the unit ON or OFF and the adjacent led lights when the unit is ON

5 APPLICATIONS

DEFINITIONS OF TERMS USED

Compressor :

A variable gain amplifier whose gain decreases as the input increases beyond a threshold point. A compressor uses ratios of up to 8:1

Limiter :

A limiter is a compressor with very high compression ratios, usually above 10:1. A high ratio maintains an almost constant output level despite large changes in the input level above the threshold point.

Compression ratio :

The ratio in dB of input level change to output level change above the threshold point. A 4:1 compression ratio implies that the output level will only change by 1dB for every 4dB that the input level changes above the threshold point.

Threshold :

This is the point at which compression starts to be applied as the signal rises, or starts to be removed as the signal falls. The Gain Reduction display will indicate when compression commences, and then the threshold can be varied to obtain the desired effect. Reducing the threshold point will give more compression effect than leaving it just below the input level.

Peak detection :

It is closely related to the maximum electric amplitude of the signal.

This characteristic is ideal for compressor-limiters used in protection of transmission lines, amplifiers, broadcast transmitters etc...

RMS Detection :

It is related to the psycho-acoustic perceived "loudness". This characteristic is more suitable for "creative" applications such as drums fattening, bass sustain, vocal processing, etc...

De-essing :

Reducing or removing the sibilance effect produced by some microphones, some people, and certain sound sources. This is achieved by making a compressor "frequency conscious". This means that a pre-emphasis filter is placed in the side-chain, which controls the compressor, making it work harder upon those particular frequencies. In true de-ess mode, the

compressor ONLY acts upon those frequencies and passes all other ones.

GENERAL

The usual purpose of Limiting and Compression is to increase loudness and to provide overload protection and generally to control level.

Limiting

Limiting is used mainly to provide overload protection ; i.e. to limit the output to some desired output level.

The protection required is usually against transients which exceed the peak input level required for a tape recorder or a transmitter. These high energy transients are usually of very short duration (micro-seconds) but may wreck a transmitter or ruin a good recording by introducing distortion.

Control of these transients by limiting does not noticeably affect the dynamic range, since the gain reduction, when it does occur, is momentary and of a relatively low order of magnitude. In most cases, a fast release time will be employed so that the transients are controlled quickly without any apparent change in programme content. This form of compression, using ratios of 10:1 and above allows the engineer to reduce his system headroom, and operate with a higher recording or broadcast level without fear of overload and thus increase the useable dynamic range of a recording or transmission system.

Compression

Compression describes conditions of gain reduction that are more or less continuous, so that the original dynamics are compressed. A low compression ratio is used when it is desirable to preserve a relationship with the original dynamics, but higher ratios provide useful effects, particularly in "pop" recording and the transmission of speech, where the main sound source needs to be brought out clearly. This is effectively increasing the loudness of the signal, and this enhances its presence in a recording or over a background.

Attack and Release time

Attack and release times are important when using compression, since they determine the moment to moment gain change in a system, and therefore the apparent loudness. A fast release time combined with a high ratio will bring more of the lower level signal content up towards peak level, and a fast attack time will really bring out the presence. However, this kind of setting can sometimes be heard to be "breathing" or "pumping". This is the effect where the main sound source is intermittent and you notice the compressor working. (Suddenly the main voice comes through and sounds very full, and then as it pauses, the compressor turns off, allowing the background noise to be heard, and then the voice cuts in again immediately obscuring the background). In these cases it may

be necessary to either reduce the times used or reduce the ratio depending upon the effect required.

Modulation

If more than about 6db of compression is used, it is desirable to treat individual sound sources or groups of similar sound sources separately in order to avoid modulation effects, when a dominant sound modulates the rest of the signal. It is particularly difficult to limit low frequency sounds in a final balance, because the effect on the remaining signal and ambience will be most noticeable. Separate compression will increase the overall compression effect.

THE BCL20 AS A LOUDNESS LIMITER

The perceived loudness (SPL) is not linear as a function of frequency. The human ear is more sensitive to the mid-frequencies than to very low or very high frequencies. This phenomenon must be taken into account when using a limiter to control the maximum loudness in certain areas such as discotheques, clubs and concert halls. To emulate the typical loss of high and low frequency sensitivity of the human ear, a weighting filter must be inserted in the side-chain, according to figure 1. This weighting filter is available from a number of companies manufacturing test equipment. It must be set at "C" weighting (high levels).

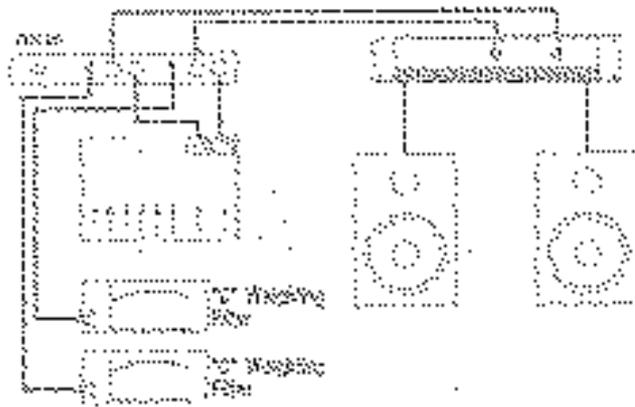


Fig. 1

As an alternative, one can emulate such a filter, using a stereo one-octave equalizer set in such a way that the frequency response approximates that of figure 2.

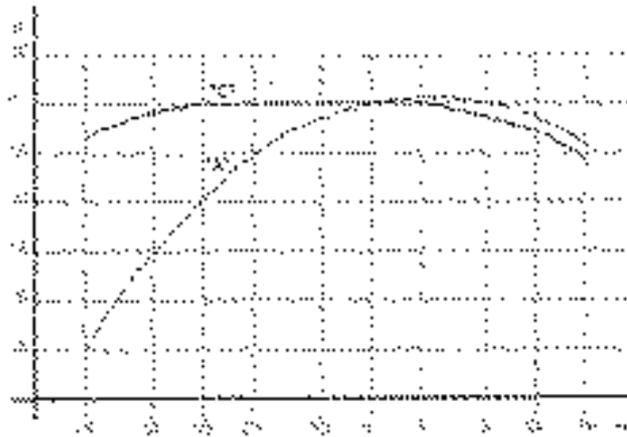


Fig. 2

THE BCL20 AS AN ACOUSTIC NUISANCE LIMITER :

This is a complementary aspect of loudness limiting, but in this instance, the sound pressure level which must be limited is one that remains after attenuation and conduction outside the room or building where the sound is produced.

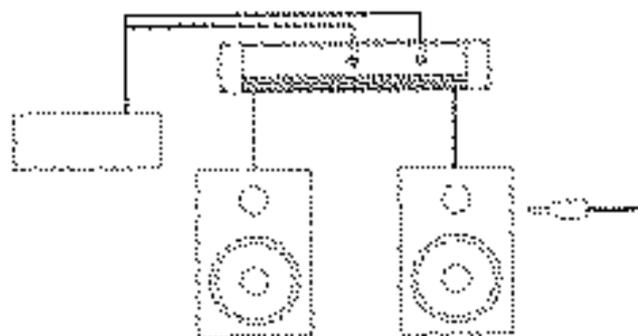
Very often, only certain low frequencies are transmitted, in particular those which excite resonant modes of cavities, walls or structures.

To achieve efficient limiting of those frequencies, it is necessary to measure the noise transmission, using a real-time spectrum analyser (preferrably 1/3yoctave).

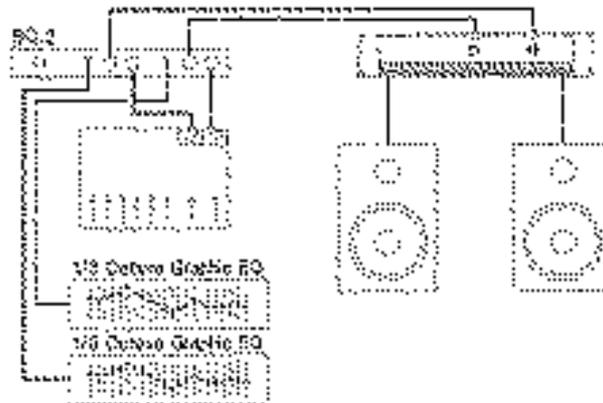
When this is done, one has to copy the frequency response to a graphic equalizer which is inserted in the side-chain.

In operation, limiting will occure predominantly at those frequencies which create a nuisance.

NB : To improve this scheme, it may be necessary to use a parametric equalizer, tuned precisely at the frequencies which excite resonances.

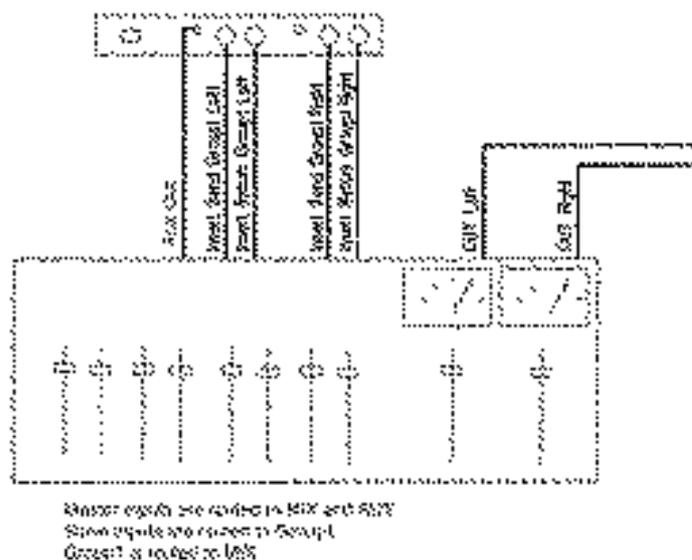


When this is done, one has to copy the frequency response to a graphic equaliser which is inserted in the side-chain.

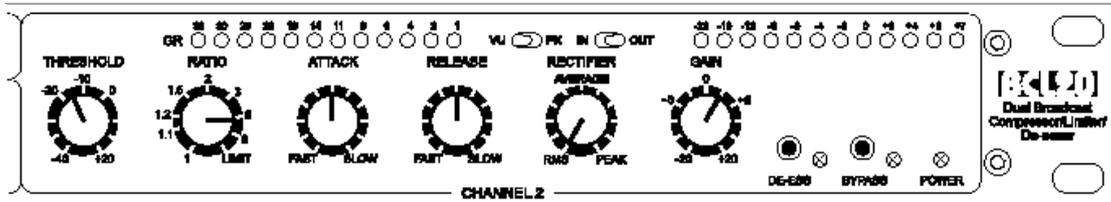


THE BCL20 AS AN AUTOMATIC VOICE-OVER (DUCKER) :

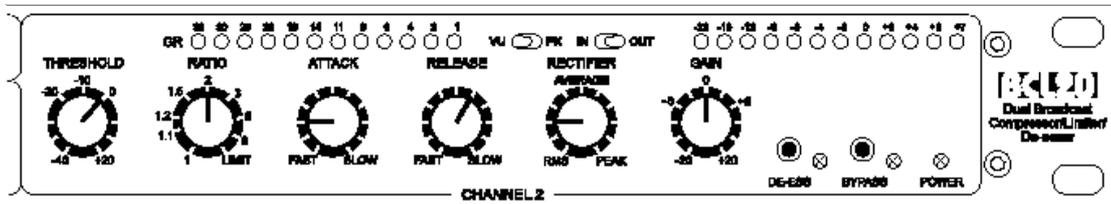
This application is useful in discotheques and radio where it provides an "automatic fader" which reacts to the voice of the disc-jockeys, reducing the background music accordingly. To do this, the music channels must be routed to separate groups which will be processed through the BCL20 and then reinjected to the Mix busses (sub-group). The voice channels must be routed directly to Mix and to an auxiliary output which feeds the Side-Chain insert Return. The BCL20 must be in the Stereo mode. The active front panel controls are those of the channel receiving the auxiliary send. The other controls must be set as to be inoperative ; it is sufficient to set the Threshold at its maximum value.



The following two applications show the BCL20 inserted into an individual channel. After processing, the signal is mixed with the other channels. This is done because the BCL20 is used to modify a sound, not to control its amplitude.

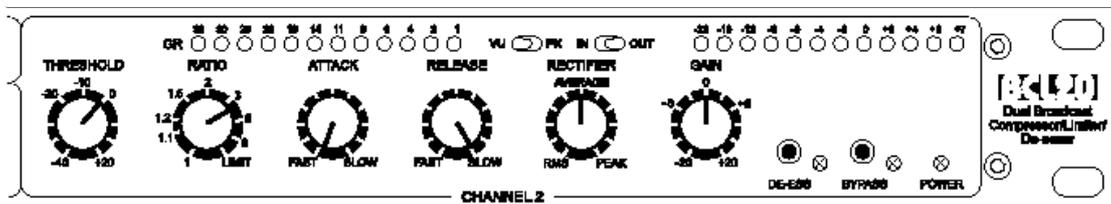


Bass Drum

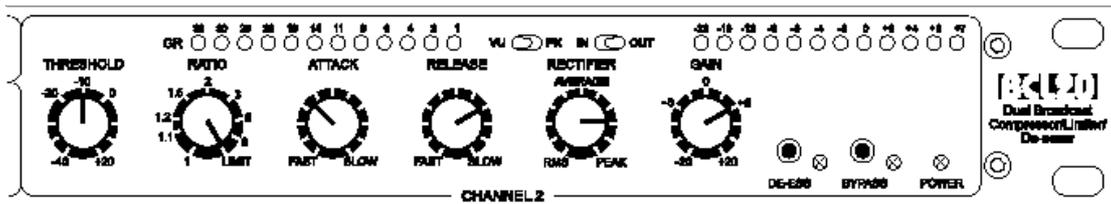


Vocal

The next two applications show the BCL20 connected at the output of the mixer. This is because if the BCL20 was inserted in the Mix inserts the level would vary with the setting Of the Master fader.



Cassette Mastering



FM Transmission

6 SPECIFICATIONS

Frequency Response 20 Hz to 20 kHz	+/- 0.5dB
Signal to Noise Ratio + 4 dBu Input, + 4 dBu Output	-94 dB
Input Impedance	20k Ohms balanced
Output Source Impedance	20 Ohms
Output Load Impedance	600 Ohms to infinity
Maximum Input Level	+ 20 dBu
Maximum output Level	600 Ohms Load, 1 kHz + 20 dBu
Total Harmonic Distortion (THD) + 4 dBu Output, 1 kHz, 10 dB compression 1 kHz, by-pass	0.07 % 0.01 %
Intermodulation Distortion	0.01 %
Compression Ratio	Continuously variable from 2 : 1 to 20 : 1
Attack Time (Peak) Continuously variable	from 0.1 to 70 millisec.
Release Time (Peak) Continuously variable	from 100 millisec to 3 sec.
Attack Time (RMS) Program dependant	Typ. 12 ms for 12 dB. Typ. 4 ms for 24 dB.
Release Time (RMS) Program dependant	Typ. 120 ms for 12 dB Typ. 240 ms for 24 dB
Mains power Consumption (115/220 VAC, 50-60 Hz)	6 Volts-amps
Meter Calibration	0 Vu = + 4 dBu
Maximum Gain Reduction	more than 50 dB

DS Action	12 dB at 8 kHz
Input Connector	XLR 3 pin balanced
Output Connector	XLR 3 Pin balanced
Dimensions	483mm W x 190mm D x 44.5mm H 19"W x 7.5"D x 1.75"H
Weight	3.9kg, 8.6lbs
Shipping Weight	4.8kg, 10.6lbs
Temperature Range Operating	0C to +50C
Storage	-30C to +75198>C

Note:

In these specifications, 0 dBu is referenced to 0.775 V RMS

LA Audio reserves the right to alter any feature or specification without prior notice. E&OE