# T L Audio

## INDIGO SERIES

*User Manual*

## C-2021 VALVE  COMPRESSOR

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# INTRODUCTION

The T L Audio Indigo Series combines classic valve techniques with low noise solid state circuitry to produce audio processing units offering very high quality signal paths with comprehensive control facilities and the unique valve sound.

The C-2021 is a two channel valve compressor. It may be operated as two independent mono channels or as a full stereo compressor, with ganging of controls and combined control voltages. All parameters of the compressor are variable, and a bargraph meter may be used to display output level or gain reduction.

The block diagram of the unit is shown in fig.1. Each channel has three input sources - a balanced line level input via an XLR connector, an unbalanced line level input via a jack socket, and an instrument input also on an unbalanced jack socket but located on the front panel where it provides a convenient means of patching a guitar or keyboard directly into the compressor. All three inputs may be used simultaneously. The gain of the input stages is controlled by a centre-detented control, calibrated for 0dB nominal gain from the line input sources at the centre and providing +/-20dB of variation. The instrument input has a sensitivity switch associated with it, to match the gain to a low level pickup (e.g. a passive guitar or microphone) or a higher output source such as a keyboard or active guitar, followed by the 40dB variation of the input gain control

After the input stages, the signal is fed to the valve compressor core and the sidechain processing. The sidechain also monitors the output of the compression stage, and generates a control signal which varies the attenuation of the compressor. The sidechain processing includes fully variable control of the compressor threshold and ratio, plus switched fast and slow time constants for attack and release. Frequency dependant compression (for example de-essing) may be achieved by placing an equaliser into the sidechain insertion point.

The channel B sidechain controls normally operate independently, but the comprehensive stereo mode offered by the C-2021 allows the channel A controls to be used for both channels A and B, ensuring accurate tracking and easy adjustment of the parameters. Stereo mode also combines the compressor cell control signals, which always applies the same amount of gain reduction to both channels, thereby preserving the stereo image.

Independent gain make-up controls are provide, to retain the subjective loudness of a compressed signal. Each channel has a balanced line level output on an XLR socket, and an unbalanced output on a jack socket. Twin LED bargraph meters are provided, which may be switched to monitor the output signal level or compression applied.

Please read this manual fully before installing or operating the Compressor.

## PRECAUTIONS

The T L Audio C-2021 Compressor requires very little installation, but like all electrical equipment, care must be taken to ensure reliable, safe operation. The following points should always be observed:

- All mains wiring should be installed and checked by a qualified electrician,

- Ensure the correct operating voltage is selected on the rear panel before connecting to the mains supply,

- Never operate the unit with any cover removed,

- Do not expose to rain or moisture, as this may present an electric shock hazard,

- Replace the fuse with the correct type and rating only.

**Warning: This equipment must be earthed.**

# INSTALLATION

**AC Mains Supply.**

The unit is fitted with an internationally approved 3 pin IEC connector. A mating socket with power cord is provided with the unit, wired as follows:

Brown: Live.

Blue: Neutral.

Green/Yellow: Earth (Ground).

All mains wiring should be performed by a qualified electrician with all power switched off, and the earth connection must be used.

Before connecting the unit to the supply, check that the voltage selector switch on the rear panel is correctly set. The unit may be set for 115V (accepting voltages in the range 110V to 120V, 60Hz AC), or to 230V (for voltages in the range 220V to 240V, 50Hz AC). Adjustment to the operating voltage should be made by sliding the selector switch left or right with a small screwdriver until the desired voltage is displayed. The mains fuse required is 20mm anti-surge, 1AT rated at 250V. If it ever necessary to replace the fuse, only the same type and rating must be used. The power consumption of the equipment is 30VA.

**Warning:** attempted operation on the wrong voltage setting, or with an incorrect fuse, will invalidate the warranty.

**Audio Operating Level.**

The compressor is equipped with inputs and outputs suitable for connection to a wide variety of other audio equipment. Generally, the balanced XLR connections will be required for interfacing to other professional equipment, where the operating level (line-up level or nominal level) will be +4dBu, or about 1.2V rms. The unbalanced jack connectors are generally intended for interfacing to semi-professional equipment and have an operating level of -10dBu, or about 225mV rms.

The compressor may be used to change between operating levels, for example by connecting the unbalanced output of a semi-pro mixing console to the compressor's unbalanced input, and taking the balanced output of the compressor to the balanced input of a tape machine at +4dBu. All inputs and outputs of the compressor may be used simultaneously if required. Balanced interconnection is always preferable to obtain the best headroom and noise rejection, but can only be used if the other equipment in the chain, e.g. the mixing console, also has provision for balanced connections.

**Audio Inputs.**

Each channel has a female, 3 pin XLR connector, suitable for balanced or unbalanced line sources at a nominal level of +4dBu. The mating connector should be appropriately wired as follows for balanced or unbalanced operation:

Balanced inputs:

- Pin 1 = Ground (screen).

- Pin 2 = Signal Phase (also known as "+" or "hot").

- Pin 3 = Signal Non-Phase ("-" or "cold").

Unbalanced inputs:

- Pin 1 = Ground (screen)

- Pin 2 = Signal Phase ("+" or "hot").

- Pin 3 = Signal Ground

When using unbalanced signals, the signal ground may be obtained by linking pins 1 and 3 in the mating XLR connector. If this connection is not made, a loss in level may result.

**Unbalanced Line Inputs.**

An unbalanced line level input at a nominal level of -10dBu is also provided for each channel, on a 0.25" mono jack socket. The mating plugs should be wired as follows:

- Tip = Signal Phase ("+" or "hot").

- Screen = Ground.

**Auxiliary Inputs.**

A 2 pin (mono) jack plug is required, which should be wired as follows:

- Tip = Signal Phase ("+" or "hot").

- Screen = Ground.

The auxiliary input is suitable for direct connection of instruments including guitars and keyboards. Good quality screened cable should be used, particularly for microphone or low level sources, to prevent hum or noise pickup.

**Insertion Points.**

The insertion points are interfaced via a 3 pin, 0.25” switched jack socket on the rear of the unit. The pin connections are:

- Sleeve = Ground,

- Tip = Send,

- Ring = Return.

The insertion point is unbalanced, and operates at a nominal level of -2dBu . If used as an additional send only (e.g. as a send to a tape machine or monitor mixing desk), the Tip and Ring should be wired together, to preserve the signal path through the insertion point. When used in this manner, the send will be post-compressor.

**Balanced Outputs.**

The output is via a balanced, 3 pin male XLR connector. The mating connector should be wired as follows:

- Pin 1 = Ground (screen),

- Pin 2 = Signal Phase (“+” or “hot”),

- Pin 3 = Signal Non-Phase (“-” or “cold”).

**Unbalanced Outputs.**

An unbalanced line output is provided for each channel, on a 0.25” mono jack socket.

- Tip = Signal Phase (“+” or “hot”).

- Screen = Ground.

**Ventilation.**

The unit generates a small amount of heat internally. This heat should be allowed to dissipate by convection through the grills in the side panels and top cover, which must not be obstructed. Do not locate the unit where it will be subject to external heating, for example in the hot air flow from a power amplifier, or on a radiator.

The compressor may be free standing, or mounted in a standard 19” rack.

**Rear Panel.**

The rear panel connectors are identified in fig.3. Make sure that all settings, mains and audio connections have been made as described above before attempting to operate the equipment.

# OPERATION.

**Front Panel.**

The front panel controls are identified in fig.2.

**Input Gain.**

A line level signal should already be at about the correct operating level, but this may be checked by bypassing the compressor (i.e. turning off the COMP IN switch) and monitoring the level on the bargraph meter. The INPUT GAIN should be adjusted until the 0dB LED is illuminated on music of normal loudness, with the red LEDs illuminating occasionally on higher volume peaks.

The front panel auxiliary input sockets may be switched between high level signals ("LO GAIN", suitable for active guitars and keyboards) and low level signals ("HI GAIN", suitable for microphones, pick ups or passive guitars), and are also controlled by the input gain control.

**Compressor Operation.**

A compressor functions by reducing the gain of the signal when it exceeds a certain level, or threshold. The amount of gain reduction may be fairly gentle through to limiting, where the signal is clamped at the threshold level. The amount of gain reduction is determined by the ratio control, which is calibrated as a ratio of the output to input signals.

The gain of the signal is reduced by a voltage-controlled circuit. Variable time constants are applied to the control voltage to adjust the rate at which the gain is reduced, called the attack time, and the rate at which unity gain is restored after the signal returns to below the threshold, referred to as the release time.

The effect of compression is to limit the dynamic range of a signal. It may be used to keep a variable output from a bass guitar, for example, at an even level, or to add punch to vocals, drums, guitar or a complete mix.

Whist the subjective sound quality can be improved by compression, the overall signal level may be reduced. A gain make-up control at the output of the compressor stage allows the signal level to be brought back to the same loudness as the uncompressed signal.

Frequency selective compression may be obtained by inserting an equaliser into the sidechain signal, from which the control voltage is generated. Boosting a range of frequencies will have the effect of lowering the compressor threshold at those frequencies; i.e. making the compressor more sensitive. Note that the equalisation is not applied to the audio output, but is used to modify the control sidechain. A common use of sidechain equalisation is “de-essing” to reduce sibilance on vocals.Suitable equalisers which can be inserted into the sidechain are the TL Audio Indigo Series 2011 or 2012 valve equalisers, which match the 2021 in audio levels and styling.

**Threshold.**

The 2021 compressor has a variable threshold, set by a rotary control calibrated from +20dBu to -20dBu, resulting in increased compression as the control is rotated clockwise.

**Attack and Release.**

The attack time is switchable to 0.5msec or 20msec. At 0.5msec attack, the compressor is fast enough to reduce the gain of a 1KHz signal in less than half a cycle, effectively preventing an overload of any following equipment which has limited headroom, such as a digital processor, tape machine or transmitter.

The release time is switchable to 40msec or approximately 2 seconds. Adjustment of the attack and release times allows unobtrusive compression to be applied to virtually any audio signal, but should very short transients occur the time constants become signal dependant, generally reduced, to prevent a slow release leaving a “hole” in the signal after the transient. Also, a fast release setting will be extended by a slow attack setting. Due to this automatic modification of the time constants, the controls are simply calibrated “fast” and “slow”.

**Ratio.**

The ratio may be varied from 1:1.5 (very gentle compression) to 1:30 (near limiting). The compressor normally operates with a “soft-knee”, i.e. the compression is gradually introduced as the signal passes the threshold, in which case the ratio refers to the compression eventually obtained.

**Gain Make-Up.**

Up to 20dB of gain make-up may be applied, to retain the subjective loudness of the signal.

**Bypass.**

The Compressor In switch allows the processing to be bypassed for comparison of the compressed signal (with any gain make up that has been applied), with the original signal.

**Stereo Operation.**

In normal 2 channel operation, the controls operate independently for each channel. However, operation of the STEREO LINK switch will cause the compressor to be set for full stereo operation, where the Threshold, Attack, Release and Ratio controls for channel A control both channels. The input gain and gain make-up controls remain separate to allow relative input/output gain balance adjustment.

In stereo mode, the control voltages are also linked, ensuring that the same amount of gain reduction is applied to both channels (even if one signal is below the threshold). This ensures that the stereo image is preserved.

**Bargraph Meters.**

The compressor is equipped with twin, LED bargraph meters. These meters normally monitor the audio output from the unit, and are calibrated for nominal level of +4dBu at the balanced output = 0dB. Similarly, 0dB on the meters also corresponds to -10dBu at the unbalanced output. The reference point may be internally adjusted by your dealer if required. The output level scale is printed between the two bargraphs, and applies to both channels.

The meters may be switched to indicate the amount of compression applied to the signal, by operating the GAIN RED'N switch. If the signal is below the threshold, the meters will not illuminate: i.e. no gain reduction is occurring. As the signal passes through the threshold the 0dB LED will illuminate, indicating that gain reduction has started. For further increases in input level, the meter will indicate the gain reduction occurring at the compressor stage. Note that the gain reduction indicated is a measure of the degree of compression, and does not include any gain make-up applied. The gain reduction scale is printed beneath the meters, and also applies to both channels.

# SPECIFICATIONS

**Balanced Line Input:**

Electronically balanced, unbalanced compatible, with input

impedance greater than 5Kohm.
Gain range -20dB to +20dB.
Nominal input level +4dBu.
Maximum input level +26dBu.
3 pin female XLR connector.

**Unbalanced Input:**

Input impedance greater than 5Kohm.
Gain range -20dB to +20dB.
Nominal input levels -10dBu.
Maximum input level +12dBu.
2 pole 0.25” jack socket.

**Auxiliary Input:**

Switchable for high or low gain, plus 40dB gain variation.
Maximum input level +18dBu.
2 pole 0.25” jack socket.

**Compressor:**

Threshold -20dBu to +20dBu,
Attack 0.5msec or 20msec,
Release 40msec or 2 seconds,
Ratio 1:1.5 to 1:30,
Gain Make-Up 0 to +20dB.

**Stereo Operation:**

Ganged Threshold, Attack, Release and Ratio controls,
Linked control voltages.

**Bargraph Meters:**

Switchable to output level or compression,
0dB = +4dBu.

**Outputs:** Electronically balanced, unbalanced compatible.
Output impedance 47 ohms.
Maximum level +26dBu.
3 pin male XLR connector.

**Unbalanced Outputs:**

Output impedance 47 ohms.
Maximum level +18dBu into 10Kohms.
2 pole 0.25" jack socket.

**Frequency Response:**

10Hz to 40KHz, +0, -1dB.

**Noise:** -82dBu (22Hz - 22KHz).

**Dynamic Range:**

108dB.

**Sidechain Insertion Points:**

Unbalanced, switched 3 pin jack socket, tip = send,
ring = return.
Nominal level -2dBu.
Output impedance 47 ohms.
Return input impedance 10Kohms.

**Power Requirements:**

Rear panel selectable for 220-240V 50Hz or 110-120V 60Hz operation.
Rear panel fuse 20mm, 1AT, 250V.
Power consumption 30VA typical.
Detachable 3 pin IEC connector, mating connector and cable supplied.
Front panel On/Off switch with green LED.

**Dimensions:**

19” rack mounting, 1U high.
483mm wide x 44mm high x 250mm deep.

**Weight:** 4Kg.

The above specifications are subject to change without notice.

## SERVICE

Should the compressor require service, it must be taken or posted to an authorised dealer. Please retain the original packing for possible future use, and ensure the unit is suitably protected during transit. The manufacturer cannot accept responsibility for damage caused during transportation.

The compressor is supported by a limited warranty for a period of one year from the date of purchase. During this period, any faults due to defective materials or workmanship will be repaired free of charge. The warranty excludes damage caused by deliberate or accidental misuse, operation on the incorrect mains voltage, or without the correct type and value of fuse fitted. It is the user’s responsibility to ensure fitness for purpose in any particular application. The warranty is limited to the original purchase price of the equipment, and excludes any consequential damage or loss.

Please retain proof of purchase, and record the following details:

Serial Number.....

Date purchased.....

Dealer.....