



**DUAL COMPRESSOR
NOISE GATE**

OPERATION MANUAL



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The GCX20 is a dual channel soft knee compressor and fast acting noise gate. The compressors have fully variable Threshold and Ratio, two auto attack/release modes for solo instruments or program mixes and sidechain inserts for frequency conscious compression.

The two integral noise gates have variable Threshold and Release.

The compressors and gates can be linked for stereo operation and the true RMS summing side chain of the GCX20 ensures perfect stereo imaging.

The facilities provided by the GCX20 are summarised as follows:

The two Gate sections feature -

- Variable Threshold and Release
- Fast attack
- Stereo linking
- Gate threshold LED
- Side chain insert for connection of an external equaliser
- Balanced inputs and outputs on XLR and TRS jack connectors

The two Compressor sections feature -

- Soft knee compression.
- Two Auto Attack/Release modes
- Variable Threshold, Ratio and Gain
- Gain reduction metering
- Stereo linking
- Side chain insert for connection of external equaliser
- Balanced inputs and outputs on XLR and TRS jack connectors

Typical Gate applications include:

- Reducing background noise
- Tightening percussion sounds
- Improving mic separation
- Feedback avoidance
- Modifying signal decay

Typical Compressor applications include:

- Limiting PA systems
- Preventing tape and digital overload
- Signal levelling
- Fattening bass drum sounds
- Bringing sounds forward in the mix
- Vocal de-essing

IMPORTANT: PLEASE READ THIS SECTION BEFORE USING THE GCX20

2.1 INSPECTION AND UNPACKING

The GCX20 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 GCX20 unit
- Power cord
- Operator Manual (this book)

2.2 OPERATING ENVIRONMENT

The GCX20 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 GCX20 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 any 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 | 50mA | UK |
| 220V | 50mA | Republic of Korea |
| 115V | 100mA | 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 GCX20 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 SIGNAL LEVELS

The GCX20 will accommodate both -10dB and +4dB operating levels without the need for level switching.

PLEASE NOTE: the XLRs are set for +4dBu and the TRS jacks for -10dBV operating levels. Use the appropriate connector/level to interface between your equipment and the GCX20.

Using the TRS jack input with +4dB signal levels may in some set-ups will over drive the GCX20 and cause distortion.

The GAIN control on the compressor section allows -20dB to +20dB of level adjustment which should allow the GCX20 to interface to most equipment types.

Signals in excess of +20dB will cause the unit to distort.

2.6 EXTERNAL CONNECTIONS

The input and outputs of the GCX20 are balanced on both XLR and 1/4" TRS jack 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 un-balanced operation join pins 1 and 3 on either input or output.

| | | | |
|----------|--------|-----|----------------|
| TRS jack | -10dBV | Tip | Hot (signal +) |
|----------|--------|-----|----------------|

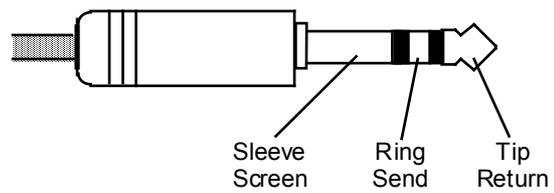
Ring Cold (signal -)
Sleeve Screen (signal ground)

For un-balanced operation join Ring and Sleeve on either input or output.



Fig 2.6.1 GCX20 rear view showing Input and Output connections

The GCX20 side chain connectors are wired as follows -



Plugging into the GCX20's side chain automatically breaks the signal path to the side chain circuitry. This path must be completed by the external connected equipment.

The side chain in-out signal path affects both the Compressor and the Gate response.

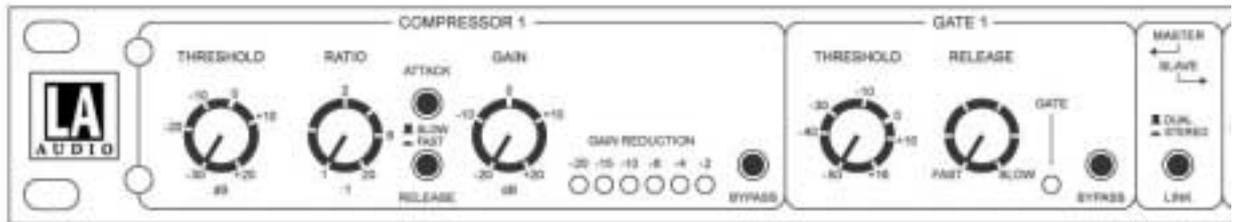
Your LA Audio GCX20 has been manufactured to a high standard using quality components. If correctly installed and operated the unit should give years of problem free operation.

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.

4.1 GATE SECTION



THRESHOLD control

Sets the signal level at which the gate opens, letting signals pass. Most sensitive (-50dB) setting is counter-clockwise (CCW). Turning Threshold fully clockwise to +20dB effectively stops the gate opening.

If the Gate appears not to fully open try reducing the Threshold level (CCW).

RELEASE control

The RELEASE control sets the rate at which the gate closes (attenuates the signal) after the input signal has fallen below the Threshold level. Minimum release time (30mS) is with the control CCW and maximum (3S) with it fully CW.

Short release times used with long decay sounds (such as bass guitar) can cause the gate to repeatedly close and open (chatter). To avoid this effect, lengthen the RELEASE time. A more sensitive THRESHOLD setting will also reduce the chances of chatter.

Short Release settings will give an abrupt ending to gated signals which may sound un-natural on signals such as vocals, string sounds etc.

N.B. The use of fast attack or release times with some signals may result in an audible click. This is not a fault of the gate design but an acoustic effect caused by introducing a fast rising or falling edge to the signal waveform.

Attack time on the GCX20 is fixed at 1mS.

BYPASS switch

Pressing BYPASS disables the gate.

In LINK mode Channel 2 BYPASS is in-operative.

GATE led

Lights to show the gate is open and stays lit whilst the input signal is above Threshold.

The led still indicates Gate open-Gate closed but is dimmed when BYPASS is 'in'.

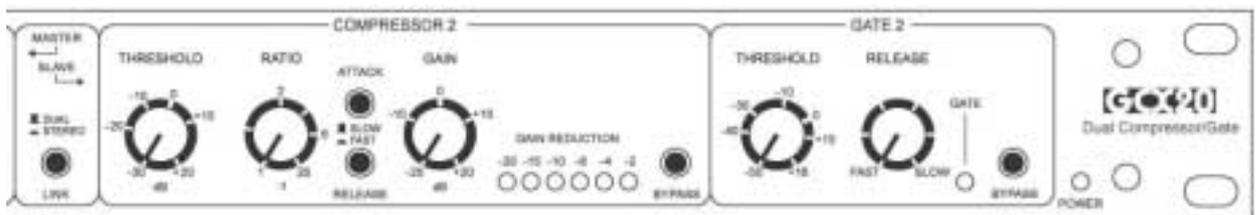
Range on the GCX20 is fixed at -80dB so gated signals are effectively muted.

LINK switch

In LINK mode Channel 1 becomes the MASTER controller for both channels. The controls, switches and leds associated with Channel 2 are in-operative in this mode.

The GCX20 combines the signals from both channels so that the input to either channel (exceeding Threshold) triggers the gate.

4.2 COMPRESSOR SECTION



THRESHOLD control

This control sets the signal level above which compression starts. The Threshold range is -30dBu (CCW) to +20dBu (CW).

RATIO control

Ratio defines the amount of compression applied to the input signal once it has exceeded the Threshold level. A Ratio setting of 2:1, for example means that for every 2dB that the input exceeds the Threshold, the output will increase by 1dB. The following graph shows the relationship between input and output levels for various Ratios -

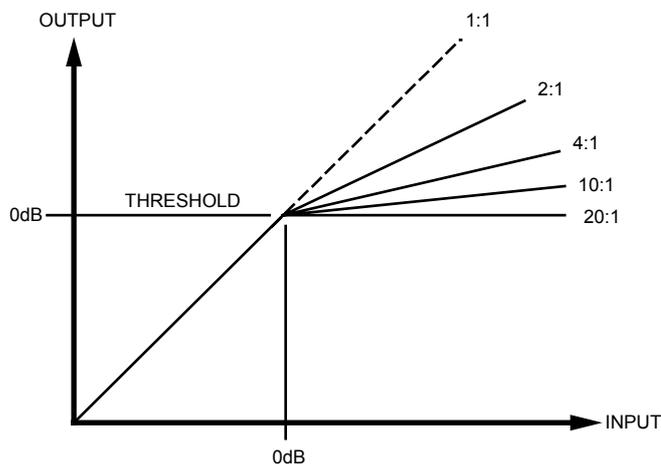


Fig: 4.3.1 Effect of Ratio control on O/P levels.

A RATIO of 1:1 gives no compression and 20:1 gives no increase in output level no matter how far the signal increases above Threshold.

The ratio curves shown in Fig 4.3.1 are Hard-knee where the change in gain is abrupt. The GCX20 has a Soft-knee control system which provides a gradual change between compression levels.

GAIN control

Because compression is a gain reduction process, the output of the compressor is often at a lower level than the normal operating level.

Some way of restoring the signal to its pre-compressed level is required. The Gain control provides adjustment to restore output level after compression.

GAIN can also be used to level match between equipment connected to the GCX20. GAIN range is -20dB to +20dB.

BYPASS switch

Switches the compressor in and out of the signal path so that comparisons can be made between compressed and un-compressed signals.

Channel 1 BYPASS switch operates on both channels in LINK mode.

AUTO switch

The GCX20 compressor has two program dependant Auto Attack/Release settings -

SLOW mode (switch 'out')

Attack = 10mS to 100mS Release = 3S

FAST mode (switch 'in')

Attack = 5mS to 70mS Release = 0.5S

In SLOW mode the compressor reacts to the average level of the input signal and is the normal setting for most signal types. Fast transient signal peaks will pass unaffected.

Using FAST attack, the compressor reacts more to signal peaks and will control all but the fastest transients.

SLOW mode has been tailored for mixed program material. FAST mode is suitable for solo instruments.

GAIN REDUCTION meter

The led meter displays the applied gain reduction (GR) in dBs.

In BYPASS the display is dimmed but still displays the amount of gain reduction which would be applied if the compressor were to be switched in.

In LINK mode Channel 1 meter displays the Gain Reduction for both channels.

STEREO switch

In link mode Channel 1 becomes the MASTER controller for both channels. The Compressor controls, switches and leds on Channel 2 are in-operative in LINK mode.

POWER indicator

The blue POWER indicator is lit whenever power is applied to the unit.

5.1 COMPRESSOR APPLICATIONS

A compressor works by applying increasing levels of attenuation (compression) to signals which exceed a set volume level. The level above which the compression occurs is called the Threshold and the amount by which the signal is compressed is governed by the Ratio. For example -

With an input signal at nominal level (+4dB or -10dB according to which input connector is used), Threshold set to -10dB and Ratio set to 2:1, the signal will be compressed by 5dB. And the RATIO setting of 2:1 ratio means that for every 2dB the input signal increases above the Threshold, the output will increase by only 1dB.

By enabling low level signals to be increased without a corresponding increase in the high level signals, a compressor is able to increase the average sound level without risk of high level distortion. This fundamental principle of compression can be used for many applications.

Limiting PA systems

This is a basic application of compression as described above known as limiting. Inserting the GCX20 compressor before the main PA amplifiers will allow the system to be driven harder without driving the amp into clipping, producing unpleasant and damaging distortion. In this application it is necessary to apply high degrees of compression at a high Threshold level.

Set the RATIO to 10:1 or 20:1. Set the THRESHOLD to minimum sensitivity (fully CW). Reduce the THRESHOLD until around 15-20dB of compression is achieved (around 3dB below the amplifier clipping point).

N.B Compressing program material with a high energy bass beat can result in the beat triggering rhythmic compression or 'pumping'.

To avoid this effect use an external Hi pass filter in the Sidechain insert set to around 200-300Hz. This prevents the low frequencies from dominating the amount of compression.

Preventing tape and digital overload

Analogue tape is quite tolerant to overloading, producing its own tape compression effect. However sending too much level to tape will result in tape saturation distortion and track bleeding. This can be effectively controlled with the GCX20 .

Use the GCX20s compressor with a RATIO setting of 10:1 or higher and THRESHOLD set to produce compression just below clipping.

Digital recorders, although handling a much wider dynamic range, are highly intolerant to excessive levels and produce unpleasant distortion when overdriven.

Use a RATIO of 20:1 and THRESHOLD set to reduce signal levels just before the recorder reaches clipping. Start with AUTO set to fast mode.

Signal levelling

Signal level variations can occur when the distance between the vocalist and microphone changes. The GCX20 compressor can be used to level out the result of poor microphone technique, producing an even sound.

*Set **RATIO** to around 4:1 and adjust **THRESHOLD** for a gain reduction of 6 to 10 dBs at maximum signal level.*

N.B. If vocals sound thin after being compressed as described, use an external Hi pass filter, patched into the Sidechain insert, set to reduce the sensitivity of the compressor to low frequencies. This allows more low frequency signals to pass unaffected and fattens the sound.

This technique can also be used to reduce level variations in bass, lead guitars, and horns.

Fattening bass-drum sounds

Bass drums often suffer from too much boom and lack of leading edge slap. To tighten-up use a **RATIO** of around 6:1 and adjust **THRESHOLD** for 10-15dB gain reduction. Use the **SLOW** mode to emphasise the leading edge before compression becomes effective.

Bringing sounds forward in the mix

The use of a compressor to reduce the dynamic range of a sound source increases the average level of the sound. This principle can be used to accentuate a vocal or other lead track in a multitrack recording.

*Use a gentle **RATIO** of around 2:1 and a **THRESHOLD** of approximately -20dB to achieve gain reduction of no more than 6dB. Restore the compressed signal to its original level using the **GAIN** control.*

NB. Avoid over compression as this may produce a dull sound. It is better to apply gentle compression twice (passing the signal through both GCX20 compressors) than a lot of compression in one go.

Vocal de-essing

Some microphone/vocalist combinations produce significant 'ess' sounds (sibilance). The GCX20 compressor can be used to reduce these sounds by making the compressor more sensitive to these frequencies.

*Use an external Hi pass **FILTER** (via Sidechain insert), set to around 3-6kHz to make the compressor more sensitive to the 'ess' frequencies. Use moderate to high **THRESHOLD** and **RATIO** settings and **FAST** mode.*

5.2 NOISE-GATE APPLICATIONS

The fundamental application of a Noise-Gate is to eliminate unwanted ambient noise from the recording or PA signal path by closing when the desired signal drops below a defined level.

However a noise-gate can do far more than this simple task. By carefully controlling the settings of the Threshold and Release controls a noise-gate can become a highly creative tool.

Basic set up - reducing background noise

Start with the THRESHOLD set CCW to its most sensitive (-60dB) which will pass signals of all levels.

Slowly increase the THRESHOLD until only the required signal opens the gate. Vary the RELEASE until the desired effect is achieved, faster for percussive instruments and slower for vocals and acoustic instruments or instruments with desirable sustain.

Tightening percussion sounds

A drum in its natural form will include a lot of sustain. This is often undesirable and it is therefore necessary to use a noise gate to tighten up the sound.

Set the THRESHOLD so that the gate opens only in response to the main percussive sound of the drum. Set RELEASE to its fastest setting for maximum punch or slightly slower for a more natural sound.

Improving mic separation

In multitrack recording it is most important to maintain good mic separation. Microphones in close proximity, handling high energy sounds such as in the recording of a drum kit, are bound to suffer from overspill from one mic to another. This can be greatly reduced by the use of the GCX20 Gate.

The technique for reducing mic leakage is identical to those above for tightening drum sounds, although the settings of THRESHOLD and RELEASE for acoustic and vocal mics will vary from the drum kit mic separation ones.

Feedback avoidance

Feedback can occur in live PA environments when signals from main or monitor speakers is allowed to enter open microphones. Good engineering and microphone techniques will reduce the risk of feedback but as an added precaution mic channels should be passed through the GCX20 Gate, set to close the channel when not in use.

Modifying signal decay

A common technique used to 'dry-up' a sound is to set RELEASE to be shorter than the natural decay of the gated signal. The sound is now forced to decay more quickly eliminating reverb and ringing.

5.2 OTHER APPLICATIONS

The GCX20 as a line amplifier

To use the GCX20 as a line amplifier (for matching signal levels between equipment) set-up as follows -

THRESHOLD fully CW
RATIO fully CCW
Gate BYPASS switch 'in'

This ensures that the Compressor and Gate will not operate. The Compressor GAIN control can now be used to vary the signal level by up to $\pm 20\text{dB}$.

Remember that excessive gain may cause to the output to clip.

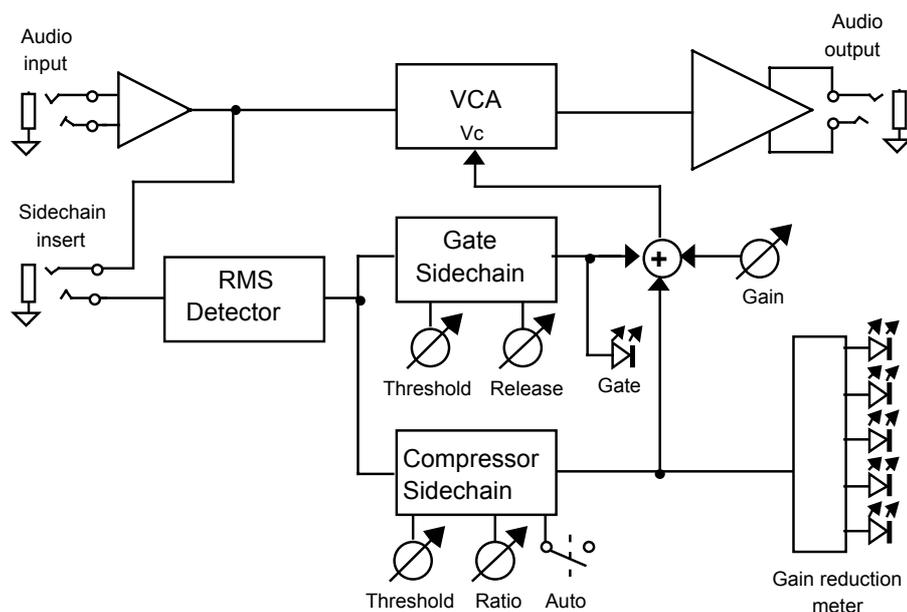


Fig: 6.0.1 Block diagram of the LA GCX20 showing the main signal paths

6.1 AUDIO PATH

The input signal first passes through the electronically balanced input stages and then directly to the VCA (Voltage Controlled Amplifier). The signal then passes to the Ground Sensing output section.

6.2 SIDE CHAIN

The input signal is also fed to the RMS detector via the Side Chain insert connector. The RMS detector produces a DC voltage level proportional to the RMS value of the incoming signal. This voltage feeds both the Gate and Compressor side chains.

The level of signal leaving the VCA is controlled by the sum of the Gate and Compressor sidechains and the GAIN control.

6.3 GATE

THRESHOLD

The Gate Threshold control adjusts the reference level for the gate. This reference is compared with the RMS voltage and used to trigger a fast acting switch. When the incoming signal exceeds the Threshold level this switch closes, rapidly discharging the timing capacitor (Gate opens) and remains on whilst the input signal is above Threshold.

RELEASE

When the input signal falls below Threshold the switch opens and allows the timing capacitor to charge via the RELEASE control (Gate closes).

6.4 COMPRESSOR

THRESHOLD

The Threshold control sets a DC reference level above which compression can start. This is compared to the RMS voltage and when this exceeds the reference the difference is forwarded to the Ratio control

RATIO

The difference voltage from the Threshold stage is amplified or attenuated depending on the setting of Ratio. This control voltage defines the amount of compression once Threshold has been exceeded

ATTACK-RELEASE

Attack and Release are based around two time constants. An initially short time which reacts to lower level and/or short duration signals, and a longer time constant for higher levels and/or longer duration.

STEREO

In stereo mode the RMS voltages are combined and fed into the controls of channel 1. The resulting control voltage feeds the VCAs of both channel 1 and 2

INPUTS

| | |
|---------------|-------------------------------------|
| Type | electronically balanced |
| XLR-F | +4dBu, wired pin 2 = hot (signal +) |
| 1/4" TRS jack | -10dBV, wired Tip = hot |
| Impedance | 20k Ω |
| Maximum input | +20dBu |
| Sidechain | unbalanced, TRS jack, >10k Ω |

OUTPUTS

| | |
|---------------|-------------------------------------|
| Type | Ground sensing |
| XLR-M | +4dBu, wired pin 2 = hot (signal +) |
| 1/4" TRS jack | -10dBV, wired Tip = hot |
| Impedance | 100 Ω |
| Max. output | +20dBu |
| Sidechain | unbalanced TRS jack, <100 Ω |

PERFORMANCE

| | |
|--------------------|--------------------------|
| THD | < 0.05%, 6dB compression |
| Noise | < -87dBu |
| Frequency response | \pm 1dB, 20Hz to 20kHz |

GATE CONTROLS

| | |
|-----------|----------------|
| THRESHOLD | -50dB to +20dB |
| RANGE | -80dB |
| ATTACK | <1mS |
| RELEASE | 30mS to 3S |

COMPRESSOR CONTROLS

| | |
|-----------|--|
| THRESHOLD | -30dB to +20dB |
| RATIO | 1:1 to 20:1 |
| ATTACK | Fast = 5 - 70mS, program dependant Slow = 10 - 100mS, program dependant |
| RELEASE | Fast = upto 0.5S, program dependant Slow = upto 2.5S, program dependant |
| GAIN | -20dB to +20dB |

POWER SUPPLY

| | | |
|-----------------|-------------------------|---------------|
| Mains voltages | 220VAC, 60Hz, 6VA | Europe |
| | 115VAC, 60Hz, 6VA | North America |
| | 220VAC, 60Hz, 6VA | ROK |
| Mains connector | Standard IEC receptacle | |

MECHANICAL

| | |
|------------|--|
| Dimensions | 1.75" (44mm)H x 19" (482mm)W x 6.5" (165mm)D |
| Weight | Unit = 2.2kg, Shipping = 2.85kg |