



**User Manual for  
Chroma-Q™ Universal**

Version 1.0 April 2003

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The information contained herein is correct at the time of going to press, however as we are constantly refining our product range we reserve the right to change the specification without notice.

The rights and ownership of all trademarks are recognised.

## **(1) Product Overview**

The Chroma-Q™ Universal is designed to give years of trouble free use, providing that it is regularly maintained and is used in accordance with the instructions detailed in this manual. If you should experience any problems that fall outside of the scope of this manual, please contact the selling dealer for further details.

If the selling dealer is unable to satisfy your servicing needs, please contact the following, for full factory service:

### **Outside North America:**

A.C. Lighting Ltd.  
Centauri House,  
Hillbottom Road, High Wycombe,  
Buckinghamshire, HP12 4HQ.  
United Kingdom  
Tel: +44(0) 1494 446000  
Fax: +44(0) 1494 461024  
support@aclighting.com  
www.aclighting.com

### **North America:**

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Unit #1, 435 Horner Avenue,  
Toronto, ON.  
M8W 4W3  
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Tel: +1 416-255-9494  
Fax: +1 416-255-3514  
support@aclighting.com  
www.aclighting.com

## **(2) Product Description**

The Chroma-Q™ Universal is a scrolling colour changer designed to operate on the USITT DMX512 (1990) protocol. This multiplexed serial data system allows for the individual addressing of multiple units on one data cabling system. The unit utilises one or two DMX channels depending on the mode of operation.

The unit is addressed by using the three push button switches and LED display on the rear panel. These switches are also used to select mode of operation, scrolling speed and cooling fan speed.

The Chroma-Q™ Universal is supplied power and control signals by means of two 4-pin XLR style connectors on the rear panel, allowing multiple units to be 'daisy-chained' into the same line of cabling. Patching the output from the last unit back into the power supply will terminate the DMX for each chain line and ensure even power voltage across all scrollers in that chain.

**Note:** The quantity of Chroma-Q™ Universal colour changers, and maximum cable length per power supply output is dependant upon the size of PSU/splitterbox used (see later in this manual for details).

The rear of the unit incorporates an integral universal mounting bracket, which allows the unit to be easily configured to fit on fixtures from 160-275mm (6¼"-10¾") frame size.

The Chroma-Q™ Universal is equipped with two internal cooling fans and a diagnostic section on the LED display showing power, DMX signal and level presence.

### **(3) Operation**

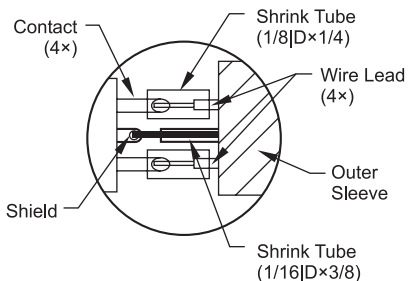
- (3.1) Control and power cables
- (3.2) Operating the unit
- (3.3) Modes of operation (inc. DMX addressing)
- (3.4) Gel loading
- (3.5) Mounting the unit
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#### **(3.1) Control and power cables**

The Chroma-Q™ Universal utilises an XLR 4-pin cable system. This is used for power and data transfer. Pins 2 and 3 are for DMX (USITT 1990) data. Pins 1 and 4 are for 24VDC power.

Damage will occur if power connections short to data or ground/shield connections. When assembling XLR 4-pin cables, heat shrink should be used on each individual pin to prevent short circuits (see diagram below).

**Note:** It is very important to ensure that the drain wire from the cable shield is connected to both XLR connector cases.



*Detail of connector wiring*

The correct wiring between male and female connectors is 'one to one'.

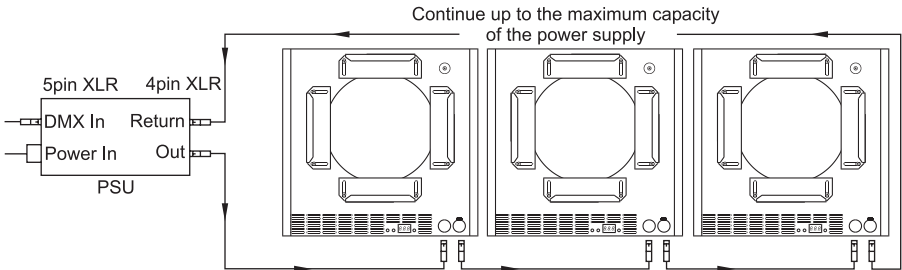
Pin #	Pin #	Minimum Cable Size
1	Ground (-ve)	2.50mm <sup>2</sup> (14 AWG)
2	Control data minus (-)	0.35mm <sup>2</sup> (22 AWG)
3	Control data plus (+)	0.35mm <sup>2</sup> (22 AWG)
4	24VDC (+ve)	2.50mm <sup>2</sup> (14 AWG)
Chassis	Cable shield/drain wire	0.25mm <sup>2</sup> (24 AWG)

**Note:** Cable length should not exceed more than 75m (250') with return line.

### Connections

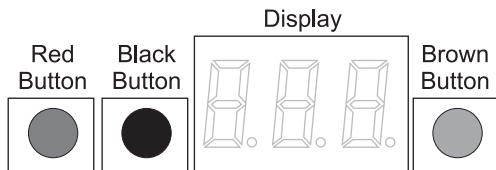
Correct connection of the units to the power supply will decrease the chances of units malfunctioning due to cabling problems. Please follow these basic rules.

- Use the correct type and gauge of cable and connectors.
- Keep cable runs as short as possible to reduce line loss.
- Always use a return cable for each run. This will ensure balanced DC power to all units, that the line is correctly terminated, and all units receive power if one link of the chain is faulty.



### (3.2) Operating the unit

All the unit functions are accessed using the LED display and the three push-button switches on the rear panel.



Control	Function
Red Button	Mode access and record
Black Button	Decreases (-) the mode level or value
Brown Button	Increases (+) the mode level or value
3 digit display	Displays mode, monitor or blank display

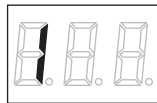
#### Push button operation:

The red button is used to scroll through the different modes of operation. The brown or black buttons are used to select the level or value in that mode. If any mode or value is changed, the display will flash until the red button is pushed to save the change.

#### Display operation:

##### **Power-up display**

On power-up, the unit will go through its self-calibration mode and the display will show the units software version.

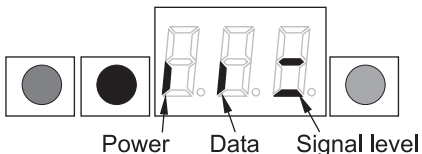


After the self-calibration finishes, the display will show the DMX address.



##### **Monitor display**

If left undisturbed for 5-7 seconds, the display will revert to 'Monitor Mode'



The first vertical bar indicates that there is power (24VDC) at the unit.  
 The second vertical bar indicates that there is data (DMX) at the unit.  
 The horizontal bars indicate the data (DMX) signal level at the unit.  
 (See also: 'Troubleshooting' section of this manual)

##### **Display flip**

The display can be flipped through 180° by pressing and holding the red button, then pressing the black button.

### **Display blank**

The display can be set to auto-blackout after short time. This is selected through the Display mode menu (see later in this section).

### **Reset**

If the red button is held down and the brown button pressed, the unit will reset to the factory default settings. This feature is particularly useful when the units are used in many different configurations or shows. The reset function is also available via DMX (see remote operation section of this manual).



## **(3.3) Modes of Operation**

### **Note:**

- a) The red button is used to scroll through the different modes of operation and the brown or black buttons are used to select the level or value in that mode.
- b) If any mode or value is changed the display will flash until the red button is pushed to save the change.
- c) When the red record button is pressed, the unit will save the change and these new User defaults will take precedence on the next power cycle or remote reset.
- d) The unit will not save any change made by remote operation after the next power cycle.
- e) Resetting the unit will return all of the user settings to factory defaults. Press and hold the red and brown buttons at the same time to reset the unit.

### ➤ **DMX addressing mode**

This mode is used to set DMX data address of the unit. The unit uses one or two DMX channels depending which mode it is operating. The display shows the current DMX address (between 1-512).

To alter the value, press the brown or black button once to step the value; hold down the buttons for fast adjustment. Press red to save the new setting.

### ➤ **Fan speed mode (Fn)**

Fan speed mode is used to set the gel cooling-fan speed of the unit. This feature can be used in environments where a lower noise level is required. The display shows the current gel cooling fan speed. There are four fan speeds, 1 is the slowest and 4 the fastest (the default is 4). To alter the value, press the brown or black button once to step the value; hold down the buttons for fast adjustment. Press red to save the new setting.

This feature is also available via DMX (see "Remote operation" section of this manual).

**Note:** reducing the fan speed may reduce the life of the gel string.

➤ **Gel saver mode (GL)**

Gel-saver mode is used to switch the gel-saving mode on or off. This feature slowly moves the chosen gel frame back and forward slightly so that the heat build-up is dissipated over a larger area, extending the life of the gel string. Press the brown or black buttons once to switch between On (1) and Off (0) (the default is Off). Press red to save the new setting.

This feature is also available via DMX (see "Remote operation" section of this manual).

➤ **Speed mode (SP)**

Speed mode is used to set the maximum scrolling speed of the unit. This feature allows the gel string to move at a higher speed for more rapid changes. Use of the high speed will generate more noise from the unit. Press the brown or black buttons once to switch between Standard (1) and Fast (2) (the default is Standard). Press red to save the new setting.

This feature is also available via DMX (see "Remote operation" section of this manual).

➤ **Display mode (dP)**

This mode is used to switch the default display On or Off. This feature can be used to blank the display when in normal use. However the display will re-activate when any button is pressed. Press the brown or black buttons once to switch between On (1) and Off (0) (the default is On). Press red to save the new setting.

➤ **Remote operation mode (ro)**

Remote operation mode is used to select between the 3 control modes. The use of these different modes greatly enhances the versatility of the unit by giving the user remote control of the most of the functions. Press the brown or black buttons to switch between the modes (the default is Mode 1). Press red to save the new setting.

Mode 1 =	Single channel DMX operation. The channel controls the colour selection.	
Mode 2 =	Dual channel DMX operation. The 1st channel controls the colour selection. The 2nd channel controls the fan speeds: 0-24% = Fn 4 (fast), 25-39% = Fn 3, 50-74% = Fn2, 75-100% = Fn 1 (slow)	
Mode 3 =	Dual channel DMX operation. The 1st channel controls the colour selection. The 2nd channel controls the units other functions.	
	<b>Channel 2 level</b>	<b>Feature</b>
	0-5%	= No feature
	6-15%	= Fan off
	16-25%	= Fan speed 1 (slowest)
These functions	26-35%	= Fan speed 2
initialise two	36-45%	= Fan speed 3
seconds after the	46-55%	= Fan speed 4 (fastest)
channel level	56-65%	= Gel Saver off
entered.	66-75%	= Gel Saver on
	76-85%	= Motor speed normal, see Speed mode (SP)
	86-95%	= Motor speed fast, see Speed mode (SP)
	96-100%	= Reset (reset to user defaults)



## Default Settings

### User default settings

Each time the red record button is pressed, the unit will save that change and these User defaults will take precedence on the next power cycle or remote reset.

### Factory default settings

If the unit is reset, using the red button (held down) and the brown button pressed, the unit will reset to the Factory default settings.



The Factory default settings put the unit in its safest operating mode.

Fan speed = 4 (fast)

Gel saver = 0 (off)

Gel speed = 1 (slow)

Display = 1 (on)

Remote operation = 1 (normal)







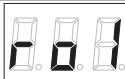
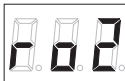
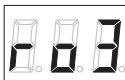
Display flip = standard

## Summary of control functions

Operation or mode	Operation description	Actions required	Display
Power-Up	Software version - shown on the unit at power-up.	This shows the software version while the unit is self-calibrating, before displaying the 'Monitor Mode'.	
rESet	This will reset the unit to the default settings.	While holding down the red button, press the brown button.	
Power Assisted Loading (EZ Load)	Used to load a gel string into the unit.	Hold down the red button during power-up. Pressing the black button will advance the gel in that direction. Pressing the brown button will advance the gel in the opposite direction. Press both brown and black buttons, or cycle the power, to recalibrate.	

## Modes (use the red button to scroll through these modes)

DMX addressing mode	Used to set the units DMX addresses	The display shows DMX address (1-512). Press brown or black <u>once</u> to increment/decrement the value, <u>hold down</u> the brown or black for fast advance/retreat.	
Press red to save the new setting.			
Fan speed Mode	Used to set the fan speed of the unit.	The display shows the current gel cooling fan speed. There are four fan speeds, 1 is the slowest, 4 is the fastest. Press brown or black <u>once</u> to increment/decrement the value.	 
Press red to save the new setting.			

'GeL Saver' Mode	Switches on/off the gel saving mode.	The display shows the current gel saver mode. Press brown or black once to switch between on (1) and off (0).	 
Press red to save the new setting.			
'SPeed' Mode	Used to set the scrolling speed of the unit.	The display shows the current gel scrolling speed. There are two scrolling speeds. 1 is the slowest, 2 is the fastest. Press black or brown once to increment/decrement the value.	 
Press red to save the new setting.			
'disPlay' Mode	Switches on/off the display.	Switches on/off the display. Display will re-activate when any button is pressed. Press brown or black to switch between on (1) and off (0).	 
Press red to save the new setting.			
'remote operation'	Mode 1 = single DMX channel operation. Mode 2 = Dual DMX channel operation (Colour/Fan speed) Mode 3 = Dual DMX channel operation (Colour/Function)	The display shows the current DMX mode of the unit. There are three DMX modes. Press brown or black button to increment/decrement the mode setting.	  
Press red to save the new setting.			

### (3.4) Gel loading

#### Introduction

Changing the gel string on the Chroma-Q™ Universal is not difficult, but it may take some time and practice to accomplish, if the user is not familiar with the unit.

There are two methods of loading gel strings on the Chroma-Q™ Universal, manually or using the power assisted loading method (EZ Load).

**Note:** It is suggested that new users of this product load the gel strings by the manual method until they become familiar with the units.

To change the gel string you will need:

- 1 x Gel string for a Chroma-Q™ Universal
- 1 x Roll of flat back adhesive tape 25mm (1") wide ("Artists" tape)
- 1 x Phillips No.1 screwdriver

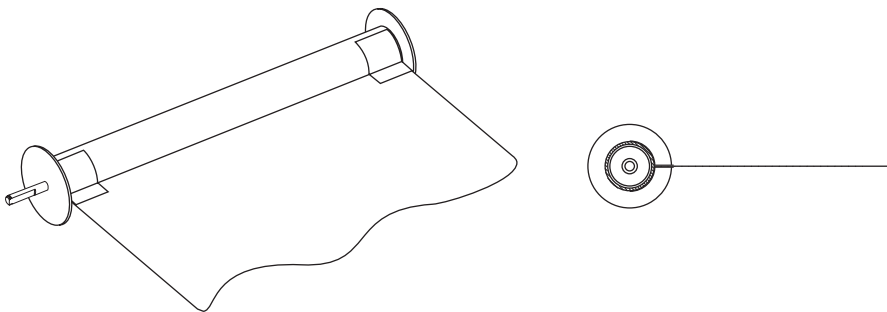
## Preparation

- 1) Unplug the unit and remove it from the lighting fixture to which it is attached. Using the screwdriver, remove the four M3 x 4mm screws holding the front cover onto the unit and carefully remove the front cover.
- 2) Remove all pieces of the old gel string if necessary. This may involve unwinding the gel from the Take-Up Reels (TUR). Exercise caution to avoid damaging the gel transport mechanism.

## Replacing the gel string (manual mode)

**Note:** See also the drawing section of this manual.

- 1) Place the unit on a flat surface with the motor/fan/electronics section on your right-hand side (assuming you are loading the gel string from the 'tail' end, reverse the position if starting with the 'leader' end of the string).
- 2) Using 25mm (1") long pieces of tape, attach the leading edge of the gel string to the plastic TUR at the top and bottom of the string, ensuring that the gel is centred on the TUR. Move the gel string to the side and attach the other side string to the TUR with tape (a black line has been scribed along the TUR to assist with this).



- 3) Manually turn the fixed gear of the shaft to slowly roll the gel string onto the TUR. Continue rolling the gel onto the TUR until the other end is reached.
- 4) Firmly holding the gear of the rear fixed shaft (to stop it moving), gently pull the gel tab towards you. This ensures that the gel is tightly rolled onto the TUR.
- 5) Rotate whole the unit so that the motor/fan/ electronics section on your left-hand side. Place the gel beside TUR.
- 6) Use 25mm (1") pieces of tape to secure the gel to the TUR top and bottom, and on both sides (a black line has been scribed along the TUR to assist with this).
- 7) Manually roll some of the gel string onto the TUR to check it is seating itself correctly.

## Completion and testing

- 1) Plug in the unit, and check that it goes through the initialisation sequence correctly. Check that the gel runs smoothly and does not bind up on the TUR's.
- 2) Unplug the unit, replace the front cover and secure with the M3 screws.
- 3) Run a test sequence to allow the gel string to 'bed' in. The unit does not have to be attached to a lighting fixture to perform this operation. It is recommended that run this sequence for a few minutes (or 3/4 times, end-to-end).

## Replacing the gel string (EZ-Load)

**Note:** See the drawing section of this manual.

- 1) Follow steps 1+2 in the preparation section.
- 2) While pressing down the red push button, apply power to the unit.

The display will show the legend PAL



- 3) Using 25mm (1") long pieces of tape attach the leading edge of the gel string to the plastic TUR at the top and bottom of the string, ensuring that the gel is centred on the TUR. Move the gel string to the side and attach the other side string to the TUR with tape (a black line has been scribed along the TUR to assist with this).
- 4) Press the black push button to advance the gel string onto the TUR.
- 5) Continue this process until you see the other end of the gel string approaching.
- 6) Firmly holding the gear of the rear fixed shaft (to stop it moving), gently pull the gel tab towards you. This ensures that the gel is tightly rolled onto the TUR.
- 7) Use 25mm (1") pieces of tape to secure the gel to the TUR top and bottom, and on both sides (a black line has been scribed along the TUR to assist with this).
- 8) Press the brown push button to move the gel string back onto the TUR. Use the push buttons to move the gel to and fro, checking that the gel is sitting correctly on the TUR's.
- 9) Allow the unit to self-calibrate by pressing the brown & black buttons simultaneously or by cycling power to the unit.

### **Completion and testing**

- 1) Plug in the unit and check that it goes through the initialisation sequence correctly. Check that the gel runs smoothly and does not bind up on the TUR's.
- 2) Unplug the unit, replace the front cover and secure with the M3 screws.
- 3) Run a test sequence to allow the gel string to 'bed' in. The unit does not have to be attached to a lighting fixture to perform this operation. It is recommended that run this sequence for a few minutes (or 3/4 times, end-to-end).

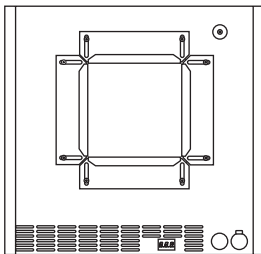
### **Note:**

- a) For normal operation, the start of the gel string is on the left-side TUR and the end of the string on the right-side TUR, when viewed from the front of the unit.
- b) Do not power lights without powering up the unit first. The fans must be running in order to protect gels from premature failure.
- c) High fan speed is recommended on all lighting fixtures of 750 Watts and above.
- d) Use of a high quality IR filter on ellipsoidal lighting fixtures is strongly recommended, especially those with beam angles of less than 30 degrees.
- e) Poorly optimised lamps in some fixtures may result in premature gel failure.

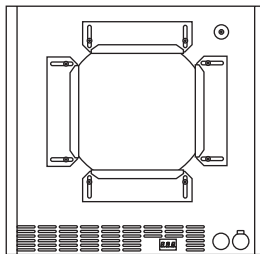
### (3.5) Mounting the unit

**Note:** See drawing section of this manual.

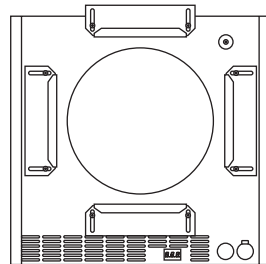
The Chroma-Q™ Universal is designed for mounting in an upright position with the base of the unit below the fixture. Do not mount in an inverted position with the base of the unit above the fixture, as the rising heat from the fixture may cause the gel string damage.



Mounting Brackets set for 8 1/4"  
eg ETC Source 4



Mounting Brackets set for 10 1/8"  
eg ETC Source 4 PAR

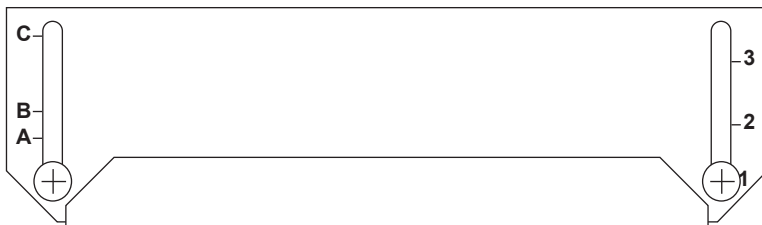


Mounting Brackets set for 10 3/4"  
eg Parcan

The rear of the unit incorporates an integral universal mounting system, which allows the unit to be easily configured to fit on fixtures from 158mm (6 1/4") to 275mm (10 3/4") frame size. This system consists of four brackets, held by eight screws, fixed to eight (of possible sixteen) mounting stand-off fixings.

To alter the mounting brackets, simply loosen the two screws on each bracket, move the bracket to the required position and re-tighten the screws. The brackets have a combination of letters & numbers stamped on them so that you can record the particular sizes you use. Some examples of these bracket positions are given below and in the drawing section of this manual:

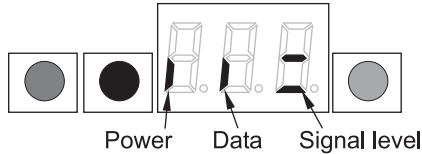
Bracket Position	Standoff Position	Light Fixture
3	Inside	Source 4™
A	Inside	Source 4 PAR™
C	Outside	Euro 215mm
B	Outside	Silhouette™ 2K
A	Outside	Variour PAR 64
1	Outside	Strand™ 2K



**Note:** The Chroma-Q™ Universal should always be used with the safety wire provided.

### (3.6) Troubleshooting

The LED display aids in the troubleshooting of the Chroma-Q™ Universal system. These indicators are located on the on the rear panel of each unit.



The first vertical bar indicates that there is power (24V DC) at the unit.

The second vertical bar indicates that there is data (DMX) at the unit.

The horizontal bars indicate the data signal level (DMX) at the unit.

**Note:** The signal level changes during normal operation of the unit. 1st bar = 25%, 2nd bar = 50% and 3rd bar = 75%

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Unit does not respond to DMX control, but DMX display indicator is on.	Unit set to a wrong or different DMX address.	Check DMX address settings.
Unit does not respond to DMX, DMX display indicator is off.	Bad cable. No DMX present at Splitter/PSU unit.	Check cable and DMX run from console.
Units run at different speeds.	Scroller speed settings may be different. Cable lengths are too long. No cable return line.	Check all scroller speed settings. Check the cable length and configuration. Ensure there is a cable return line in the system.
Units have dim display indicators and run slowly.	Over loading of colour changer chain or cable runs too long. PSU overloaded.	Check voltage levels on last unit. Should not be below 20VDC.
DMX display indicator is off on one unit.	Bad cable or blown transceiver IC in the scroller.	Check cable or send unit for repair.
Display indicators appear OK but gel string does not move.	Mechanical (or electrical) failure in the unit.	Turn unit on and off. Return unit for repair.
Gel burns too quickly.	Fans have failed or are too slow. Poorly optimised lamp focus in fixture. IR filter medium not fitted.	Check fans are operating. Optimise bulb focus. Replace gel strings & install IR filter.

**Note:** A high percentage of problems are a direct result of poor cable, corrupt DMX control signals and lack of suitable signal termination.

### **(3.7) Technical overview**

The colour transport system employs an opto-electronic system for accurate positioning of the gel. When the unit initially receives power it will go through a calibration sequence. The purpose of the initial calibration sequence during power up is to determine the total length of the gel string and therefore the position of the different gels.

**Note:** Over time the gel string may warp slightly. This may alter the positions of the gels relative to their pre-programmed DMX values and therefore some 'fine-tuning' may be required.

The motors have an optical encoder feedback system. The purpose of this is to convert motor revolutions in to electronic pulses, and also to determine which direction the motor is turning.

The electronic cards consist of three key components: L298 motor driver, 75176 Transceiver and a processor. The L298 is a true digital device receiving two PWM signals to operate speed and direction. The 75176 transceiver operates in the receive configuration to convert serial protocol to a TTL level. All data relevant to the operation of the unit is stored onboard in 'flash' memory.

The majority of electronics problems are usually created by external factors such as shorted cables, etc. The 75176 transceivers are susceptible to damage if 24VDC is present on the DMX signal lines.

Routine maintenance can prevent most mechanically based problems. The motor mounting plate can be adjusted to control tension on the belt. Excessive belt tension is often the cause of noise and poor performance. Conversely, loose motor belts can cause accuracy problems.

Troubleshooting is a process of elimination. First, rule out the other field factors (i.e. faulty cables, power sources). If an electronics problem is suspected try replacing the electronics card first. If accuracy problems should occur and mechanical problems have been ruled out, replace optical sensors. For technical advice and/ or parts, please contact your selling dealer or the offices listed in this manual.

### **(3.8) Technical specifications:**

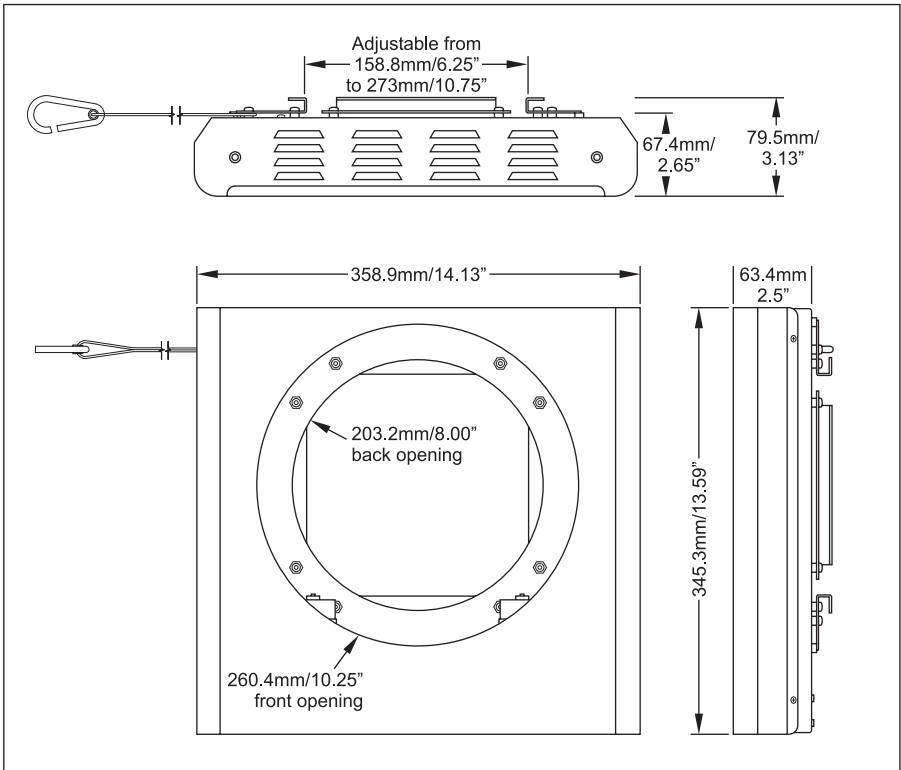
Dimensions:	345mm (w) × 360mm (h) × 85mm (d) 13.6" × 14.1" × 3.4" inc. mounting brackets
Weight:	2.5kg/5.5 lb inc. gel string & mounting brackets
Rear aperture:	203mm/8"
Front aperture:	260mm/10.25"
Colour Media:	Most commercially available gel media
Gel capacity:	2-24 gels
Cooling:	2 fan design
Cooling speed:	Multiple speeds
Addressing:	Digitally via 3 push buttons and LED display
Working voltage:	24 VDC (+/- 10%)
Power consumption:	1.5PU (see note below)
Protocol:	USITT DMX512 (1990)
Body material:	Aluminium
Unit Colour:	Black powder coat (other colours available, P.O.A.)
Mounting Plate:	Universal mounting system fits 160-275mm (6¼"-10¾") fixtures
Connectors:	XLR-4 (male) in and XLR-4 (female) through
European approvals:	Pending
North American approvals:	Pending

**Note:** To simplify the choice of power supply we use the "PU" (Power Unit) to calculate the load requirements of the Chroma-Q™ system. For example a PS-08 will supply up to 8 PU's, so you can plug-in 5 Chroma-Q™ Universals (5 x 1.5PU = 7.5PU) into a PS-08.

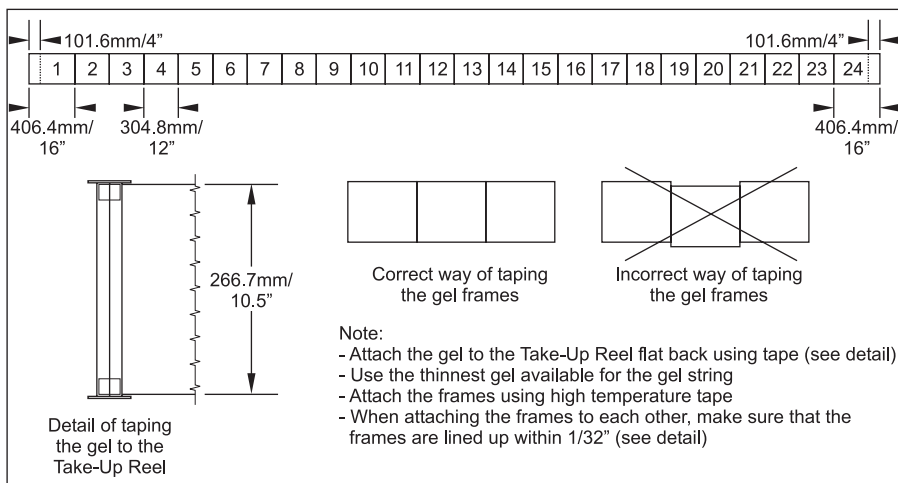


#### (4) Drawings

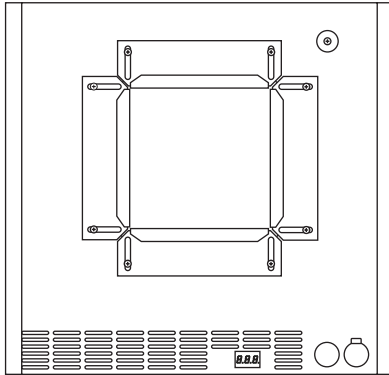
#### Outside dimensions of the Unit.



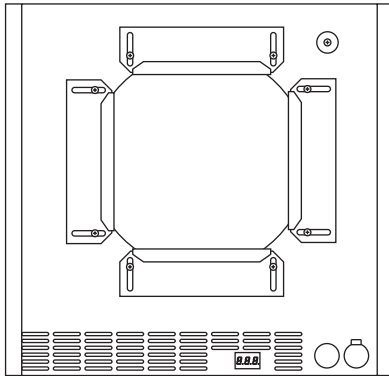
## Gel string dimensions



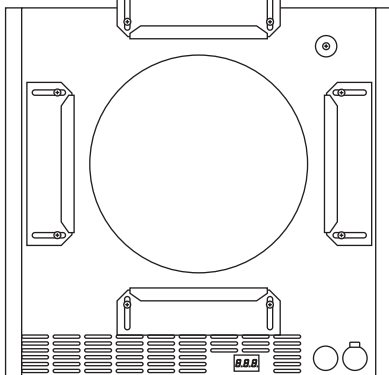
# Examples of Mounting Bracket Positions



Mounting Brackets set for 8 1/4"  
eg ETC Source 4



Mounting Brackets set for 10 1/8"  
eg ETC Source 4 PAR



Mounting Brackets set for 10 1/4"  
eg Parcan

