

# Chroma-Q™ Cascade™

## User Manual



**Chroma-Q™**  
BRILLIANT SOLUTIONS

**Version 1.3 September 2012**

PN: 109-0500



## Warranty Statement

Chroma-Q warrants to the original purchaser, with proof of purchase, that its delivered products shall be free from defects in material and workmanship under normal use for a period of 12 months from date of shipment.

Chroma-Q will repair, or at its option, provide an equivalent item or replace, the defective product during the stated warranty period. This warranty applies only to the repair or replacement of the product and only when the product is properly handled, installed and maintained according to Chroma-Q instructions. This warranty excludes defects resulting from improper handling, storage, installation, acts of God, fire, vandalism or civil disturbances. Purchaser must notify Chroma-Q in writing within 14 days of noticing the defect. This warranty excludes field labour or service charges related to the repair or replacement of the product.

The warranty contained herein shall not extend to any finished goods or spare parts from which any serial number has been removed or which have been damaged or rendered defective (a) as a result of normal wear and tear, willful or accidental damage, negligence, misuse or abuse; (b) due to water or moisture, lightning, windstorm, abnormal voltage, harmonic distortion, dust, dirt, corrosion or other external causes; (c) by operation outside the specifications contained in the user documentation; (d) by the use of spare parts not manufactured or sold by Chroma-Q or by the connection or integration of other equipment or software not approved by Chroma-Q unless the Customer provides acceptable proof to Chroma-Q that the defect or damage was not caused by the above; (e) by modification, repair or service by anyone other than Chroma-Q, who has not applied for and been approved by Chroma-Q to do such modification, repair or service unless the Customer provides acceptable proof to Chroma-Q that the defect or damage was not caused by the above; (f) due to procedures, deviating from procedures specified by Chroma-Q or (g) due to failure to store, install, test, commission, maintain, operate or use finished goods and spare parts in a safe and reasonable manner and in accordance with Chroma-Q's instructions (h) by repair or replacement of engines without factory training.

The warranty contained herein shall not apply to finished goods or spare parts which are sold "as is", as "second-hand", as used", as "demo" or under similar qualifications or to Consumables ("Consumables" is defined as any part(s) of goods or part(s) for use with goods, which part(s) of goods or part(s) for use with goods are consumed during the operation of the goods and which part(s) of goods or part(s) for use with goods require replacement from time to time by a user such as, but not limited to, light bulbs).

The warranty contained herein shall not apply, unless the total purchase price for the defective finished goods or spare parts has been paid by the due date for payment.

The warranty contained herein applies only to the original purchaser and are not assignable or transferable to any subsequent purchaser or end-user.

This warranty is subject to the shipment of the goods, within the warranty period, to the ChromaQ warranty returns department, by the purchaser, at the purchasers expense. If no fault is found, ChromaQ will charge the purchaser for the subsequent return of the goods.

Chroma-Q reserves the right to change the warranty period without prior notice and without incurring obligation and expressly disclaims all warranties not stated in this limited warranty.

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[www.chroma-q.com](http://www.chroma-q.com)

## Disclaimer

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Chroma-Q products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent. Chroma-Q sole warranty is that the product will meet the sales specifications in effect at the time of shipment. Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

Chroma-Q reserves the right to change or make alteration to devices and their functionality without notice due to our on going research and development.

The Chroma-Q Cascade has been designed specifically for the professional entertainment lighting industry. Regular maintenance should be performed to ensure that the products perform well in the entertainment environment.

If you experience any difficulties with any Chroma-Q products please contact your selling dealer. If your selling dealer is unable to help please contact [support@chroma-q.com](mailto:support@chroma-q.com). If the selling dealer is unable to satisfy your servicing needs, please contact the following, for full factory service:

<b>Outside North America:</b>	<b>North America:</b>
Tel: +44 (0)1494 446000	Tel: 416-255-9494
Fax: +44 (0)1494 461024	Fax: 416-255-3514
<a href="mailto:support@chroma-q.com">support@chroma-q.com</a>	<a href="mailto:support@chroma-q.com">support@chroma-q.com</a>

For further information please visit the Chroma-Q website at [www.chroma-q.com](http://www.chroma-q.com).

Chroma-Q is a trademark, for more information on this visit [www.chroma-q.com/trademarks](http://www.chroma-q.com/trademarks).

The rights and ownership of all trademarks are recognised.

## Approvals



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## 1. Product overview

The Chroma-Q Cascade is a scrolling colour changer designed to operate on the ANSI E1.11 USITT DMX 512-A 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 setting the three rotary BCD switches, on the rear panel. Next to these rotary switches are four DIP switches. These switches are used to select mode of operation, scrolling speed, & cooling fan speed. (Details of these settings are given later in section 3.1)

The unit operates using subtractive colour mixing method. This method relies on having a full spectrum source (white light) & then filtering out some of the colours to achieve the desired hue & saturation. The secondary (subtractive) colours are Cyan, Magenta & Yellow. By mixing two of the basic subtractive filters at different saturations, you are able to mix hundreds of different colours within one unit. To further the creative process, the primary (additive) colours (red, green & blue) have been added to the back gel string.

This unit combines the secondary colours by using two gel strings. The choice was made to get maximum reliability, maximum light output & to keep the dimensions & weight to a minimum.

The Chroma-Q Cascade is supplied power & 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 & ensure even power voltage across all scrollers in that chain.

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

The Chroma-Q Cascade is equipped with two internal cooling fans & two diagnostic LED indicators (found on the underside of the unit) showing Power & DMX signal presence.

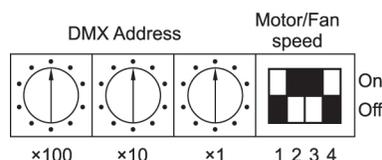
## 2. Operation

- 2.1 DMX addressing
- 2.2 Control and power cables
- 2.3 Troubleshooting
- 2.4 Gel loading/replacement
- 2.5 Technical overview
- 2.6 Technical specifications

### 2.1 DMX addressing

The unit is addressed by setting the three rotary switches to the required DMX address.

Remember to allow for the number of channels used, which is dependant on the units mode of operation. (See below)



## Modes of operation

The Chroma-Q Cascade has two modes of operation, Creative mode & Library mode.

The **Creative mode** is enabled by setting dipswitch #1 to the "off" position.

In this mode you use one DMX channel to control the each individual colour string, giving you maximum flexibility. The first DMX channel will control the front string (Yellow-Cyan) & the second DMX channel controls the back string (Yellow-Magenta). You can speed up the movement of the scrollers by turning dipswitch #2 on in this mode.

The **Library mode** is design to give you quick access to a 100 pre-programmed colours. Turning on the dipswitch #1 "on" will give you access the Library mode. This is achieved by entering a percentage value in the console (from 0% to 100%). You can refer to the chart (section 5.1) to find which percentage matches with which colour. In this mode dipswitch #2 will select between fixed speed between colours when it is in the "off" position, or variable speed controlled by the next DMX channel if it is in the "on" position.

SW1	SW2	SW3	SW4	Mode	DMX Channels
				<b>Creative</b>	2
OFF	OFF	X	X	Regular gel speed	2
OFF	ON	X	X	High gel speed	2
				<b>Library</b>	1 or 2
ON	OFF	X	X	Fixed gel speed	1
ON	ON	X	X	Controlled gel speed	2
				<b>Fan Speed</b>	
X	X	OFF	OFF	High fan speed	
X	X	ON	OFF	Medium fan speed	
X	X	OFF	ON	Medium fan speed	
X	X	ON	ON	Low fan speed	

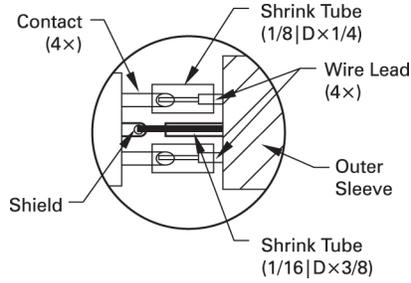
### Note:

- Do not power lights without powering up the scroller first. Fan must be running in order to protect gels from premature failure.
- High fan speed is recommended on all lighting fixtures of 750 Watts & above.
- Use of a high quality IR filter medium on ellipsoidal lighting fixtures is strongly recommended, especially those with beam angles of less than 30 degrees.

## 2.2 Control and power cables

The Chroma-Q Cascade utilises an XLR 4-pin cable system. This is used for power & data transfer. Pins 2 & 3 are for ANSI E1.11 USITT DMX 512-A data. Pins 1 & 4 are for 24VDC power.

Note: It is very important to ensure that the drain wire from the cable shield is connected to both XLR connector cases. When assembling XLR 4-pin cables, heat shrink should be used on each individual pin to prevent short circuits. Damage will occur if power connections short to data connections (see below).



Detail of connector wiring

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

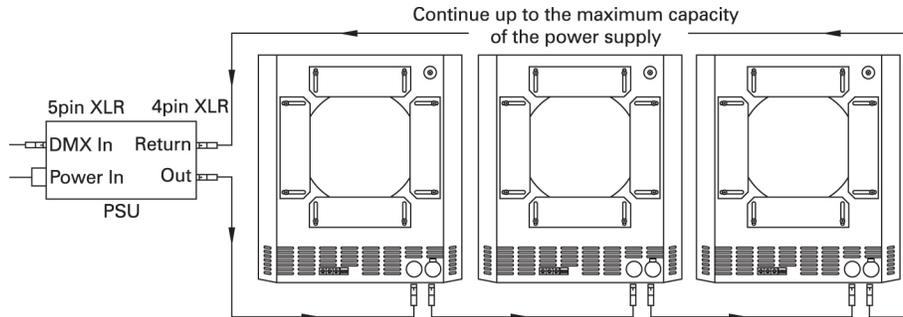
Pin #	Pin #	Minimum Cable size
1	Ground (-ve)	2.00mm <sup>2</sup> (14 AWG)
2	Control data minus (-)	0.35mm <sup>2</sup> (22 AWG)
3	Control data plus (+)	0.35mm <sup>2</sup> (22 AWG)
4	24V DC (+ve)	2.00mm <sup>2</sup> (14 AWG)
Chassis	Cable shield/drain wire	0.25mm <sup>2</sup> (24 AWG)

**Note:** Cable length should not exceed more than 60m/200' 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.

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



## 2.3 Troubleshooting

The 2 LED indicators aid in the trouble shooting of the Chroma-Q Cascade system. Green LED indicator = data, red LED indicator = power. These LED indicators are located on the underside of each unit.

Symptom	Possible Cause	Solution
Unit does not respond to DMX control, but green DMX LED indicator is on.	Rotary switch settings may not be correct. Wrong address selected.	Check rotary switch settings.
Unit does not respond to DMX & green DMX LED indicator is off.	Bad cable. No DMX present at Splitter/PSU unit.	Check cable & DMX run from console.
Units run at different speeds.	Dipswitch settings may be different. Cable lengths are too long.	Check dipswitch settings. Check the cable length configuration. Ensure there is a cable return line in the system.
Units have dim LED indicators & run slowly	Overloading of colour changer chain or cable runs too long. PSU overloaded.	Check voltage levels on last unit. Should not be below 20VDC.
Green DMX LED indicator is off on one unit.	Bad cable or blown transceiver IC in the scroller.	Check cable or send unit for repair.
Only one gel string runs.	Mechanical (or electrical) failure in the unit.	Turn unit on & off. Return unit for repair.
Gel burns too quickly.	Fans have failed. Poorly optimised lamp focus in fixture. IR filter medium not fitted.	Check fans are operating. Optimise lamp focus. Replace gel strings & install IR filter.

**Note:** A high percentage of problems are a direct result of poor cable & corrupt DMX control signals.

## 2.4 Gel loading/replacement

**Note:**

- a) See also the drawing section (4.1) of this manual.
- b) The power does not have to be on to load gels.

### Introduction

The Chroma-Q Cascade comes with two specially graduated colour strings already installed. Should these gel strings become damaged or worn out they must be replaced to ensure the optimum performance of the colour scroller. The gel material is a proprietary design long-life substrate. Replacement gel strings may be purchased from your dealer. Substitute gels strings should not be used as these will effect the operation of the unit & may cause damage to the unit itself.

Each gel string consists of two series of graduated colours. The rear gel string (yellow/magenta) starts with yellow, then clear in the middle, then magenta at the end (plus primary red, green, & blue).

The front gel string (yellow/cyan) starts with yellow, then clear in the middle, then cyan at the end.

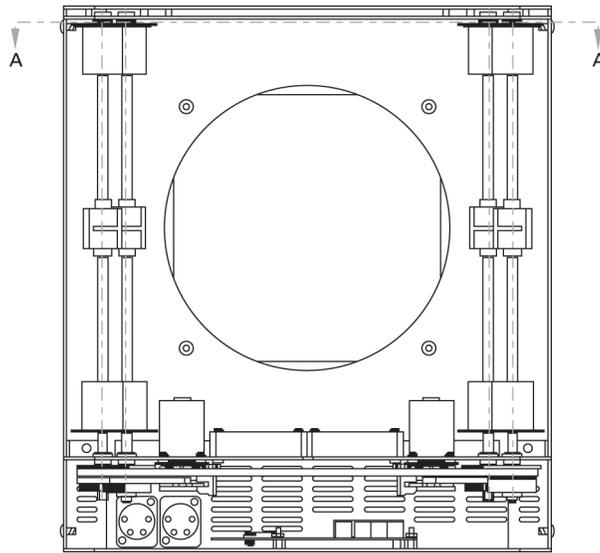
Changing the gel strings is not difficult, but it may take some time & practice to accomplish, if the user is not familiar with these types of scrollers.

You will need:

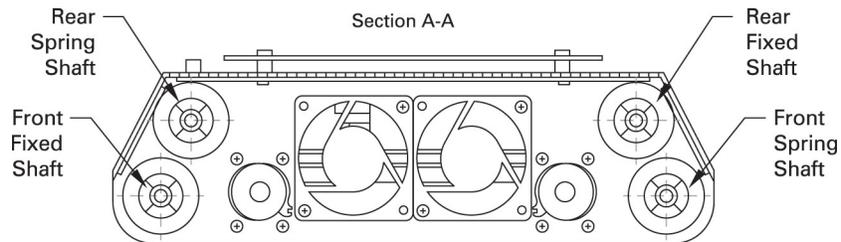
- 1 x Set of Chroma-Q Cascade gel strings
- 1 x Roll of flat back adhesive tape (i.e. 'Artists' tape)
- 1 x Phillips No.1 screwdriver

## Preparation

1. Unplug the unit & remove it from the lighting fixture to which it is attached.  
Using a Phillips No. 1 screwdriver, remove the four M3 × 4mm screws holding the front cover onto the unit. Place the unit, with the mounting plate facing down, on a flat surface & carefully remove the front cover.



2. Remove all the pieces of the old gel strings. This may involve unwinding the gels from the Take-Up Reels (TUR). Exercise caution to avoid damaging the gel transport mechanism.



### Replacing the rear gel string (yellow/magenta)

**Note:** See 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. Take the yellow/magenta gel string & attach the gel tab (on the yellow end) to the hook on the TUR (Take-Up Reel) anchor of the rear fixed shaft.
2. Use a small piece of flat back tape 25 x 25mm (1" x 1") to secure each side of the gel to the TUR hubs on either side.
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 on the TUR.
5. Rotate whole the unit so that the motor/fan/electronics section on your left hand side. Place the gel tab beside the anchor on the rear spring shaft.

6. With your left hand, firmly hold the gel tab next to the anchor hook (do not attach it yet). With your right hand, turn the anchor hub of the spring shaft towards you counter-clockwise for five complete turns (as you turn the shaft you should feel the spring tension increasing).
7. After tensioning, hold the anchor steady & hook the gel tab onto the anchor.
8. Use a small piece of flat back tape 25 x 25mm (1" x 1") to secure each side of the gel to the TUR hubs on either side.
9. Manually roll some of the gel string onto the spring TUR to check it is seating itself properly.

#### Replacing the front gel string (yellow/cyan)

1. Place the unit on a flat surface with the motor/fan/electronics section on your left-hand side. Take the yellow/cyan gel string & attach the gel tab (on the yellow end) to the hook on the TUR anchor of the front fixed shaft.
2. Use a small piece of flat back tape 25 x 25mm (1" x 1") to secure each side of the gel to the TUR hubs on either side.
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 front fixed shaft to stop it moving, gently pull the gel tab towards you. This ensures that the gel is tightly on the TUR.
5. Rotate whole the unit so that the motor/fan/electronics section on your right hand side. Place the gel tab beside the anchor on the rear spring shaft.
6. With your left hand, firmly hold the gel tab next to the anchor hook (do not attach it yet). With your right hand, turn the anchor hub of the spring shaft towards you counter-clockwise for five complete turns (as you turn the shaft you should feel the spring tension increasing).
7. After tensioning, hold the anchor steady & hook the gel tab onto the anchor.
8. Use a small piece of flat back tape 25 x 25mm (1" x 1") to secure each side of the gel to the TUR hubs on either side.
9. Manually roll some of the gel string onto the spring TUR to check it is seating itself properly.

#### Completion and testing

1. Plug in the scroller and check that it goes through the initialisation sequence correctly. Check that the gels run smoothly and do 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 strings to bed-in. The unit does not have to be attached to a lighting fixture to perform this operation. This sequence can either be programmed on your control desk, or you can use the unit's inbuilt test sequence by setting the address switches to 601. It is recommended that you run this sequence for 10 minutes or 4 times end-to-end.

**Note:** The number of turns may vary slightly between take up reel spools due to tolerances in the tension spring, however no more than five turns should be required to tension gel string.

**Note:** Poorly optimised lamps in lighting fixtures may result in premature gel failure.

## 2.5 Technical overview

The Chroma-Q Cascade unit is essentially two scrollers in one package. The colour mixing 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 which 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. The processor is an OTP part containing proprietary software.

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.

## 2.6 Technical specifications

Dimensions:	306mm (w) × 340mm (h) × 100mm (d) 12" × 13.4" × 4"
Weight:	2.6kg/5.6lbs
Rear aperture:	178mm/7"
Front aperture:	241mm/9.5"
Colour media:	Proprietary design long life substrate
Cooling:	2 fan design
Cooling Speed:	4 speeds
DMX protocol:	ANSI E1.11 USITT DMX 512-A
DMX addressing:	3 × rotary BCD switch (512 channels)
Working Voltage:	24VDC (+/- 10%)
Power consumption:	1.5 PU (see note below)
Connectors:	XLR-4 (male) in and XLR-4 (female) through
Body material:	Aluminium
Body color:	Black powder coat (other colours available, P.O.A.)
Mounting plate:	Universal mounting system fits 160mm × 254mm/6¼" x 10"
Approvals:	EN55103-1 and 2, IEC 60950, FCC Part 15 and ICES-003 Class A

**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 Cascade (5 × 1.5PU = 7.5PU) into a PS-08.



