

# Digital Theatre Cue Light



A microprocessor based Cue Light system allows Outstations to be daisy chained on a single cable for fast and easy setup. One cable per Outstation not required. All cables continuously monitored for faults.

## Digital Theatre Cue Light

A microprocessor based Cue Light system allows Outstations to be daisy chained on a single 3 pin XLR microphone cable for fast and easy setup. Outstations may also be star wired if required.

The system consists of a master control unit and any number of outstations up to a maximum of 12.

The Master Unit is available in 8 and 12 channel versions.

The Master unit and each of the Outstations has its own inbuilt microprocessor. They are in continuous communication with each other, thereby providing continuous detection of cable faults.

## Master Unit



Each channel on the Master Unit has 3 buttons and 4 LEDs. A white melamine designation strip runs beneath all channels.

### Go and Standby buttons

The *Go* and *Standby* buttons have corresponding LEDs to indicate the response from an outstation. The *Go* and *Standby* LEDs indicate what is actually happening at the outstation. They are not just a local indicator that a button has been pressed. The LEDs respond to data returned from the Outstation. This is known as positive monitoring.

### Channel's Group Button.

When the Group function is selected, as indicated on the associated yellow LED, that particular channel can also be controlled by the Master Group *Go* and *Standby* buttons adjacent to channel 12. The Channel's *Go* and *Standby* buttons still remain fully operational.

The status of each channel's Group button is saved in EEPROM and is restored when the Master Unit is powered up.

### Fault LED.

A red Fault LED at the very top of each channel indicates cable faults. It is lit when an Outstation is not communicating with the Master Unit.

### Master Group Buttons.

Pressing either of the Group *Go* or *Standby* buttons adjacent to channel 12, is exactly the same as pressing the corresponding button on any channel that has its group function selected.

## Master Unit. (continued)



Rear views of the Master Unit.

Male and female 3 pin XLR connectors are provided for connection to the Outstations. Either or both of these connectors may be used as desired.

A 5 pin DIN connector allows the Group buttons on two Master Units to be linked together. It is then possible to control up to 24 Outstations with a single *Go* or *Standby* button.

### A bit of technical stuff

The Master unit sends data consisting of a 16 bit word addressed to each of the Outstations in turn.

The 16 bit word contains the Outstation's address, *Go* and *Standby* button information as well as considerable redundant data used by the Outstation for verifying the integrity of the data. This redundant data provides a high degree of immunity to external electrical interference. The Outstations reply back with the status of the Acknowledge Button and of the *Go* and *Standby* LEDs.

Data communication is via transformer coupled RS485. Transformer coupling allows 30V DC power to be sent over the same wires as the data. It also provides excellent noise immunity as the data is balanced. The principle is similar to Phantom Powering of microphones.

Data modulation is FM and is at a rate of approximately 10K Baud. This relatively low data rate allows very long cables to be used without the need for terminators or special cables as is the case with DMX.

## Outstations



- Anywhere from 1 to 12 remote Outstations.
- Recessed Acknowledge button and LEDs are hard to break and virtually impossible to shear off.
- High intensity wide angle 20mm diameter LEDs for easy visibility and high reliability.
- Acknowledge button is back lit so you can find it in the dark.
- Acknowledge button's back light only comes on when error free communication is established with the Master Unit, providing a cable integrity check.
- Individually numbered to correspond to Master Unit's channels.
- Ability to daisy chain from one outstation to the next.
- Outstations can be wired up in any physical sequence. Outstation #2 does not have to follow #1 in a daisy chain.
- Outstations can be added or removed while the power is on.
- Die cast aluminium case has flanges top and bottom with a total of 4 mounting slots.

## Typical Operation

- 1: Stage manager presses the Standby button on the Master Unit. Standby LEDs on both Master & Outstation flash.
- 2: The talent presses the Outstation's *Acknowledge* button which causes the LEDs to burn steadily.
- 3: S/M presses the Go button.  
The Go LED lights. The Standby LED goes out if it was on. After 3 seconds the Go LED starts to flash quickly. After a total of about 12 seconds, the Go LED turns itself off.

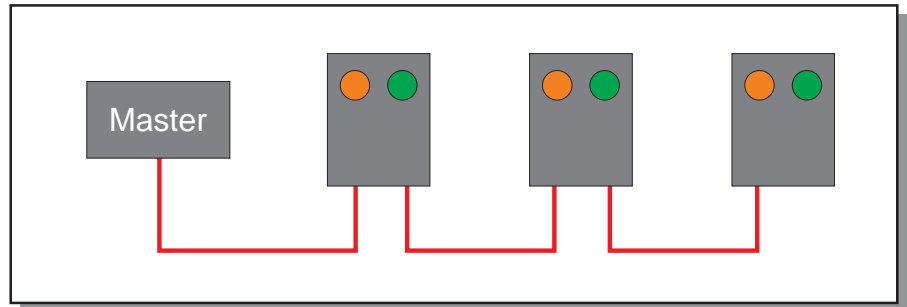
The Go or Standby lights can be turned off by pressing their respective buttons a second time.

It is not necessary to use the Standby Light before activating the Go Light. Multiple tight Go cues are simply done by using the Go button only. Press Go to turn the Go Light on. Press it again a few seconds later to turn the Go Light off. Repeat for the next cue.

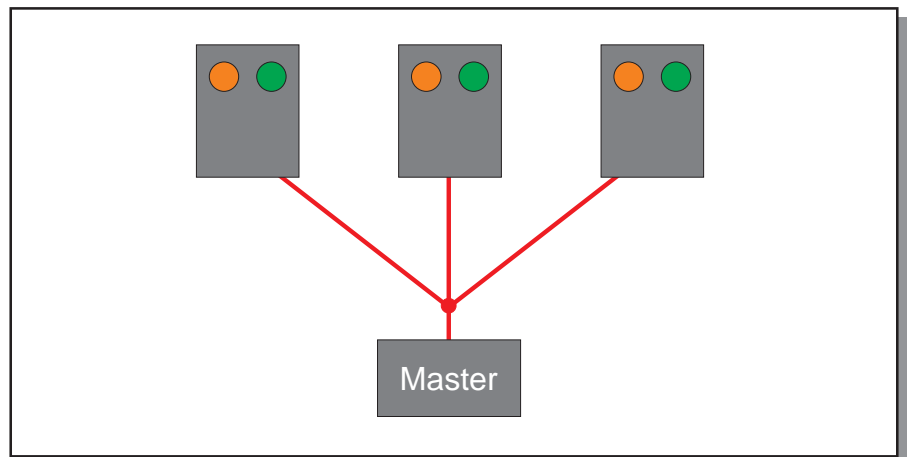
## Interconnection

The Outstations may be interconnected by several different wiring methods.

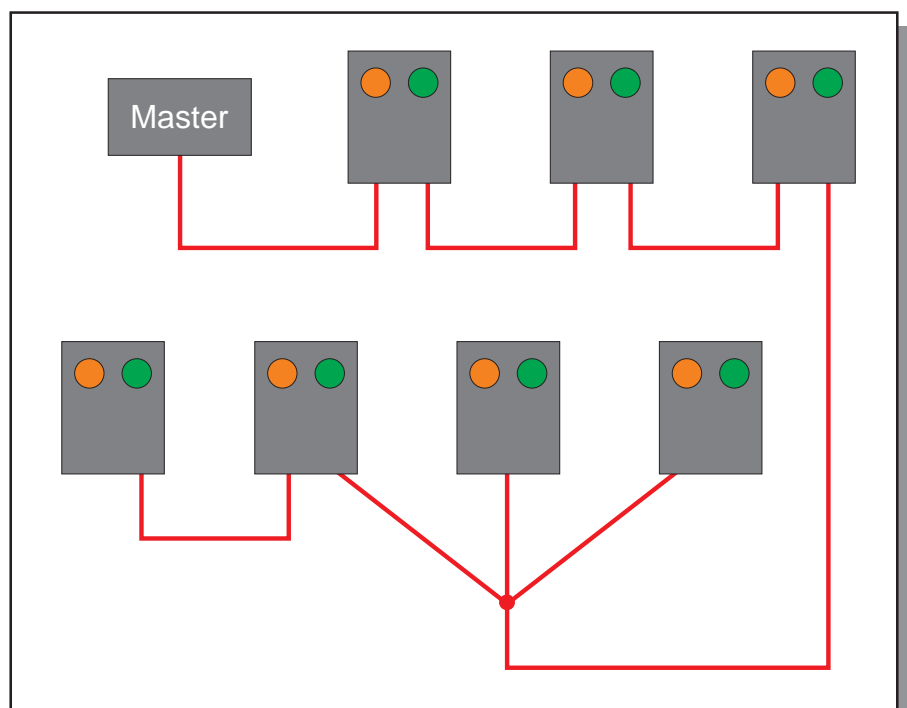
- 1: Daisy chained.
- 2: Star wired.
- 3: A combination of daisy chain and star wiring.



1: Daisy chained.



2: Star wired.



3: A combination of daisy chain and star wiring.

## Interconnection (continued)

- Uses readily available standard 3 pin XLR microphone cables.
- Transformer balanced for maximum interference rejection and high noise immunity.
- Designed to run in electrically hostile environments, such as venues with large quantities of light dimmers. 1km network length (dependant on cable capacitance). No terminators required.
- Daisy-chain, star & tee wiring supported.
- Will work with microphone leads wired incorrectly (i.e. pins 2 & 3 swapped).
- Several levels of software error traps to prevent false commands in the event of cable faults or severe interference. Very tolerant of "crackly" leads.
- Outstations can be wired up in any order anywhere on the network and can be connected/disconnected while the network is live.
- No limits on maximum or minimum cable segment lengths up to a maximum of 1km total length.
- Virtually immune to interference from mobile/cell phones.
- Will run down an audio multicore.
- The Master Unit is mains powered. All of the remote units are powered from the master unit via the same cable that carries the network data.

## Very Long Cables

Very long cable runs may produce an excessive voltage drop, especially when multiple Outstations are at the far end of a long cable run and/or the cable is thin.

If the voltage drop is too great, the Outstations may reset themselves. This is easily seen during their *power on self test* when all 3 lamps light for about 1 second.

Maximum current consumption occurs when the Standby LED is burning steadily.

Two Outstations will work at the far end of 1,000 metres of 24 AWG cable.

Five Outstations will work at the far end of 500 metres of 24 AWG cable.

These tests were done using one pair of CAT5 cable for the data (XLR Pins 2 & 3) and another pair paralleled for the ground (XLR Pin 1) Another 5 Outstations could be run over the remaining 2 pairs in the CAT5 if required, giving a total of 10 over one CAT5 cable.

24 AWG is pretty thin stuff. Typically it is 3mm diameter microphone cable. It is also the same gauge as CAT5 cable.

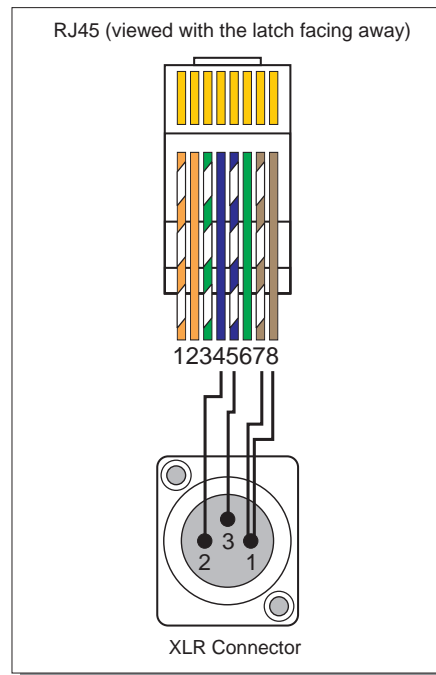
Expected performance will generally be much better than this as the size of the earth conductor in a typical microphone cable will be much greater than 24 AWG.

If more substations are required at the far end, or the cable needs to be longer, try the following...

- 1: Use heavier gauge cables to reduce the voltage drop.
- 2: Use shorter cables to reduce the voltage drop.
- 3: Use multiple cable runs with fewer substations on each run.
- 4: As a last measure, use 3 core mains style cable. Keep it away from other electrical noise sources as it is not screened.

## XLR to CAT5 Adaptor

An XLR to RJ45 adaptor will allow the use of CAT5 cable.



Suggested adaptor wiring

Unused wires on RJ45 pins 1,2,3 & 6 may be connected to XLR pin 1 if desired. This will lower the DC resistance of the Ground conductor and extend the maximum cable length.

Note:

CAT5 cable and are mechanically inferior to professional grade microphone cable and XLR connectors.

## Diagnostic Mode

Press both of the Group Master buttons (for approximately 5 seconds) until all the LEDs on the Master Unit light.

Release the buttons. The diagnostic mode is now active.

The Go and Standby LEDs on all substations will alternately flash for about 500mS each. This allows the correct operation of the LEDs and data communications to be verified.

Any Fault LEDs lighting briefly is an indication of data communication errors. The usual causes are excessive cable lengths and/or too many substations at the end of a long cable run.

Exit the Diagnostic Mode by pressing either of the Group Master buttons or by cycling the mains power.

## Specifications

### **Master Unit.**

#### **Power.**

110/230/240V 50/60Hz mains power. Specify at time of ordering.  
60 watts maximum.

#### **Connectors.**

Output: One each of 3 pin XLR chassis female and male connector.  
Data is between pins 2 and 3.  
Power is +30V DC common mode on pins 2 and 3.  
Power return is via Pin 1.  
Group link: 5 pin DIN female.  
Digital data via nominal 20kHz FM signal.  
Nominal baud rate: 10kBd

#### **Dimensions.**

2 unit high 19" rack mount all metal chassis.

#### **Weight.**

6.0 kg (13.2 pounds)

### **Outstations.**

#### **Power.**

From the master Unit via the interconnecting 3 pin XLR lead.  
Typically 30mA each, rising to a maximum of 80mA each  
when the supply volts are low at the end of very long cable  
runs.

#### **Connectors.**

One each of 3 pin XLR chassis female and male.  
They are both wired in parallel so that either may be used as an input  
and the other for loop through.

#### **Finish.**

Die cast aluminium boxes and are powder coated in satin black.

#### **Dimensions.**

94.0 mm (3.70") wide  
148.1 mm (5.83") tall  
34.2 mm (1.35") thick

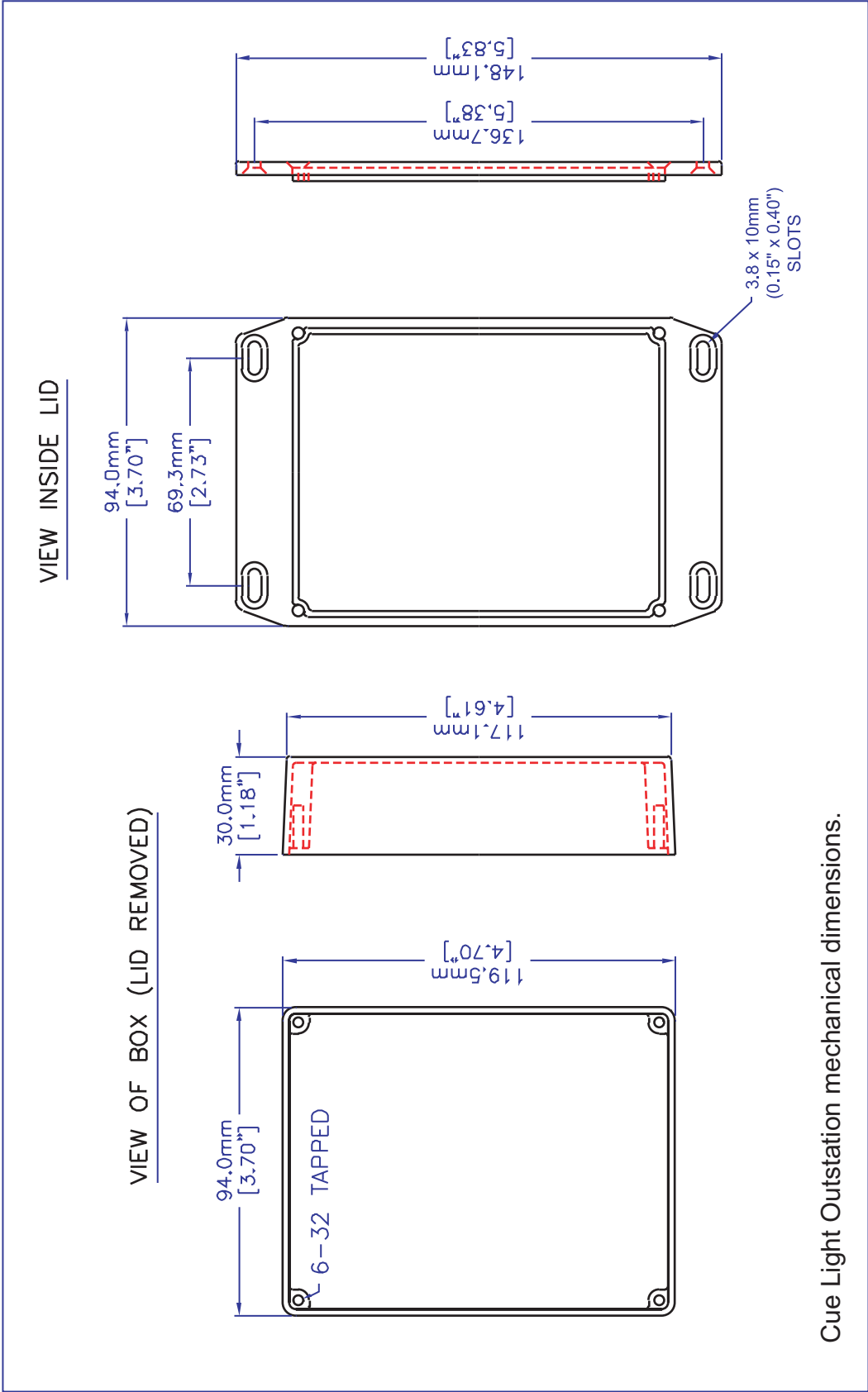
#### **Mounting holes**

4 slots 3.8 mm x 10 mm (0.15" x 0.40")

#### **Weight.**

350g (11.3 ounces)

# Outstation Mechanical Details

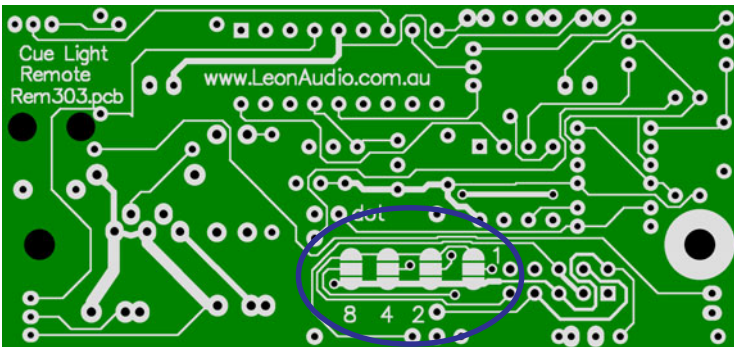


Cue Light Outstation mechanical dimensions.

## Address Programming

**Skip this page unless you need to repair an Outstation.**

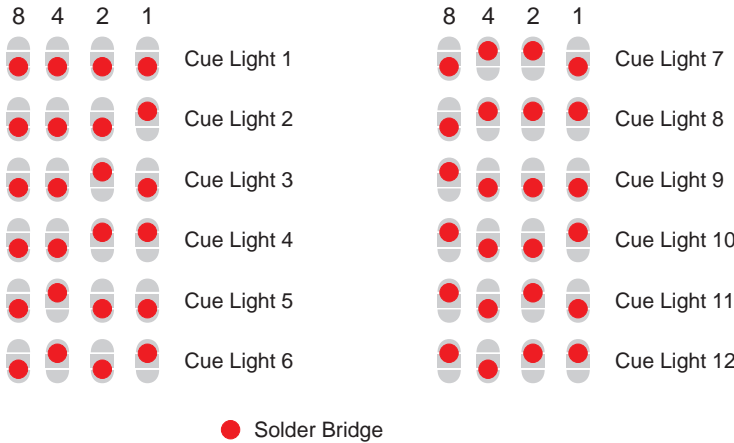
Each Outstation has its address programmed at the time of manufacture. The address is set by applying 4 solder bridges to specially shaped pads on the printed circuit board. Should the address need to be changed, such as when replacing the printed circuit board, the original solder bridges can be easily removed with desoldering braid or a vacuum solder sucker. Apply new solder bridges as per the table at the bottom of the page.



Location of the address programming links.

The centre pad is bridged to either the upper or lower pad. The upper pad is +5V (logic 1), while the lower pad is 0V (logic 0). Take care not to bridge all 3 pads together or you will short out the 5volt power supply, destroying a 10 ohm fusible protection resistor and spoiling your day.

If no solder bridges are fitted, the substation defaults to address #1. The programmed binary address is offset by one from the substation's address as shown on its external panel.  
 Binary address 0000 = Cue Light #1  
 Binary address 1111 = Cue Light #16  
 Cue Lights 13-16 are not supported by the current Master Units.



**Warranty**

The Leon Audio Digital Theatre Cue Light is guaranteed for two years from date of original purchase against defects in workmanship and materials. If such malfunction occurs, the item will be repaired or replaced (at our option) without charge for materials or labour if delivered prepaid to THE LEON AUDIO COMPANY. Unit will be returned prepaid. Warranty does not cover finish or malfunction due to abuse or operation at other than specified conditions. Repairs by other than THE LEON AUDIO COMPANY or authorized agents will void this guarantee.



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