Low Voltage Dimmer

LVD-12/24

Artistic Licence (UK) Ltd.

Software Version V1.0 Manual Revision V1.2

ARTISTIC LICENCE PRODUCT REGISTRATION FORM

Product: LVD	Version No.
Serial No.	Date Purchased:

Supplier:

Name:	
Company Name:	
Address:	
Post/Zip Code:	Phone No.

Comments:

Please return to: Artistic Licence (UK) Ltd.
B1 & B3 Livingstone Court, Peel Road, Harrow, Middlesex HA3 7QT. England.
Fax: +44 (0)20 84 26 05 51

C O N T E N T S

INTRODUCTION

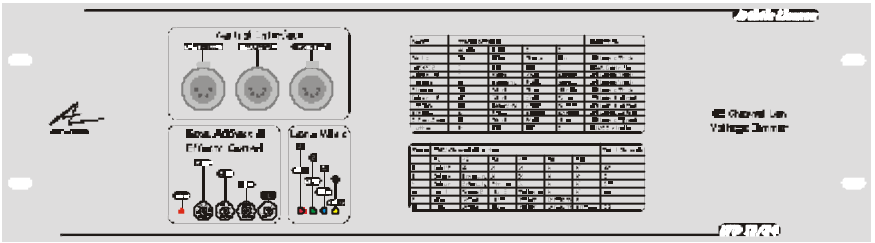
QUICK START

Welcome to the LVD manual. The LVD is an intelligent low voltage dimmer. LVD can be used to power and dim any non-inductive loads at 24 VDC. It is also able to control up to twelve Artistic Licence LED fixtures including Water-Fill, Water-Pipe, Terra-Fill and Colour-Pipe.

LVD provides 48 individual dimming channels.

Tables 2 & 3 are stencilled on the front panel for ease of reference.

Please remember to return your product registration card, so that we can keep you informed of new developments.



FEATURES

The Water-Fill, Water-Pipe, Terra-Fill and Colour-Pipe digital luminaires generate coloured light by mixing the three primary colours Red, Green and Blue. The three primary colours provide over sixteen million colour combinations

LVD provides a dimmed 24 VDC output to each of the red, green and blue channels allowing the overall colour and intensity to be varied. LVD also provides a fourth colour output to allow for future LED products that use white or yellow in addition to the primaries.

LVD can be controlled by an external DMX512 controller or operate in stand-alone mode. The LVD provides an in-built controller that can operate another ten LVD's.

LVD provides outputs that are electronically protected against over-voltage, over-current and over-temperature faults.

LIGHT & COLOUR PRIMER

Before describing the LVD product in detail, a brief resume of light and colour is worthwhile.

The human eye perceives colour based on the wavelength of light (that is the distance between two peaks of the light wave). Light with a smaller wavelength is seen at the blue end of the spectrum. As the wavelength increases the eye perceives the warmer colours as the light moves towards the red end of the spectrum. In it's travel from one end of the spectrum to the other, the colours move through red, orange, yellow, green, blue, indigo and violet. ("Richard Of York Gave Battle In Vain" or "ROY-G-BIV").
White light is perceived when the eye sees a combination of all these colours.

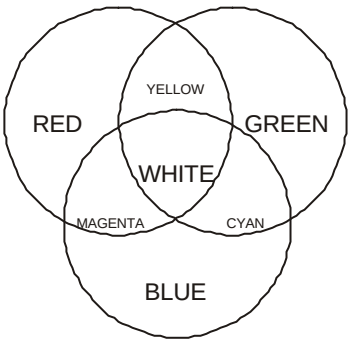
There are two methods for generating a specific colour:

1. Subtractive: Start with white light and remove the colours that you do not want.
2. Additive: Start with the primary colours and add the correct proportions to mix the colour you require.

The first option, Subtractive mixing, is used by the majority of 'Intelligent Luminaires'. A white light source is passed through multiple dicroic filters until the required colour is produced. This is very wasteful as most of the light is simply thrown away.

ADDITIVE COLOUR MIXING

The second option, Additive mixing, is used by LVD. This is the most efficient way to produce a specific colour as no light is wasted by filtering.
The following diagram shows how the three primary colours mix together to produce a specific colour.



GLOSSARY OF TERMS

The following terms are used in this manual. The definitions given are to make the manual easier to read, so if you require the scientific definition please refer to a Dictionary of Physics!

COLOUR	A colour defines the extent to which the light you see differs from white light. A specific colour is defined by the three attributes: Hue, Saturation and Intensity.
HUE	The Hue of a colour is an expression of the wavelength of the light or where the colour is positioned within the spectrum. The eye can detect approximately 130 different hues in the spectrum. All the other colours are combinations of saturation and intensity.
SATURATION	Saturation describes the purity of a colour. It can also be thought of as the amount of white mixed with a colour. A pure continuous spectrum is a continuous variation fully saturated hues.
INTENSITY	Intensity is also referred to as brightness and luminosity (in the US, the word luminance is frequently used in place of luminosity although these words are not identical). The intensity of a colour depends both on the power output by the lamp and also the fact that the eye is more sensitive to some colours.
LUMINOUS INTENSITY	The Luminous Flux emitted per unit solid angle by a point source in a given direction. It is measured in *Candela*. Prior to 1948, Luminous Intensity was known as 'Candle Power' and measured in the units 'International Candle'.
CANDELA	The Candela (Cd) is the SI unit of Luminous Intensity. The unit is also occasionally referred to as the 'New Candle'
LUMINOUS ENERGY	The product of the Luminous Flux of a lamp and the time for which it is on. It is measured in *Lumen-seconds.*
LUMINOUS FLUX	The rate of flow of luminous energy The Luminous Flux varies depending upon the colour of the light, it is therefore important to define the colour when specifying this property. It is measured in *Lumens*.
LUMENS	The Lumen (lm) is the SI unit of Luminous Flux. It is defined as the luminous flux emitted by a point source of intensity 1 Candela in a cone of angle 1 Steradian. The conversion is therefore 1 Lm = $(1/4\pi)$Cd.
ILLUMINATIO	The Luminous Flux incident on a surface per unit area. It is measured in Lux

N (ILLUMINANCE)	area. It is measured in Lux.
LUX	Lux (Lx) is the SI unit of Illumination. It is defined as the illumination of 1 Lumen uniformly over 1 m^2. The conversion is then 1 Lx = 1 Lm / m^2. (In the US, the unit Foot Candle is often used. The conversion is 1 Foot Candle = 10.56 Lux)
LED	Light Emitting Diode. This is the electronic device that produces the coloured light of LVD.
MODE	The Mode switch is located on the left side of the LVD rear panel. It is used to set the operating mode of LVD. The Mode switch for the LVD has sixteen positions labelled 0 - 9 and A - F.
DMX / DMX512	The digital communication system used by LVD for external control by a lighting console. LVD will accept both DMX512 and DMX512 (1990).
BASE ADDRESS	The Base address is the three digit number in the range 001 - 512 which defines the DMX512 channel at which control of a single LVD will start. The three rotary switches on the rear panel set the base address.
SCROLLER	A Scroller or Colour-Changer is a mechanical device that positions a coloured gel in front of a luminaire to generate a specific colour.
COLOUR ROLL	Colour Roll is one of the in-built effects available with LVD. The Colour Roll allows a controlled luminaire to automatically fade between a sequence of colours. The colours are defined by selecting the Start and End Colours. The LVD can control up to 60 other LVDs in Colour Roll mode allowing moving 'rainbow' effects to run automatically.
COLOUR CONE	Colour Cone is one of the in-built effects available with LVD. The Colour Cone is similar to Colour Roll but instead the Start and End colours are identical with the Mid Colour specified instead. The LVD can control up to 60 other LVDs in Colour Cone mode allowing moving 'cones' of colour to run automatically.

RANDOM	Random mode is one of the in-built effects available with LVD. The Random mode allows a controlled luminaire to automatically fade between a sequence of random colours. The LVD can control up to 60 other LVDs in Random mode allowing moving colour wash effects to run automatically.
STROBE	Strobe is an effect whereby LVD flashes at an extremely fast rate causing a 'Stop Motion' effect. Strobe effects are available in both self controlled mode and in DMX512 controlled mode. In Strobe mode, LVD can vary the rate and also sequence through colours whilst strobing.
START / END COLOUR	The Start and End colours are used in Colour Roll mode. The Start colour defines the first colour in the sequence whilst the End colour defines the last.
MID COLOUR	The Mid colour defines the colour which will be generated in the middles of the Colour Cone effect.
FIXED COLOUR	A Fixed colour is generated by LVD when in Mode 0. The colour is set using the three control wheels on the rear panel.

POWER & DATA

OVERVIEW

The LVD provides the 24VDC outputs using 5.12mm Wiedmuller connectors. The connectors are internal to the product, with cable entry via 6.3mm glands on a rear mounted removable cable plate.

The choice of output cable gauge is dependent upon the number of lamps to be connected and the total length of cable.

Table 1 - Cable Types

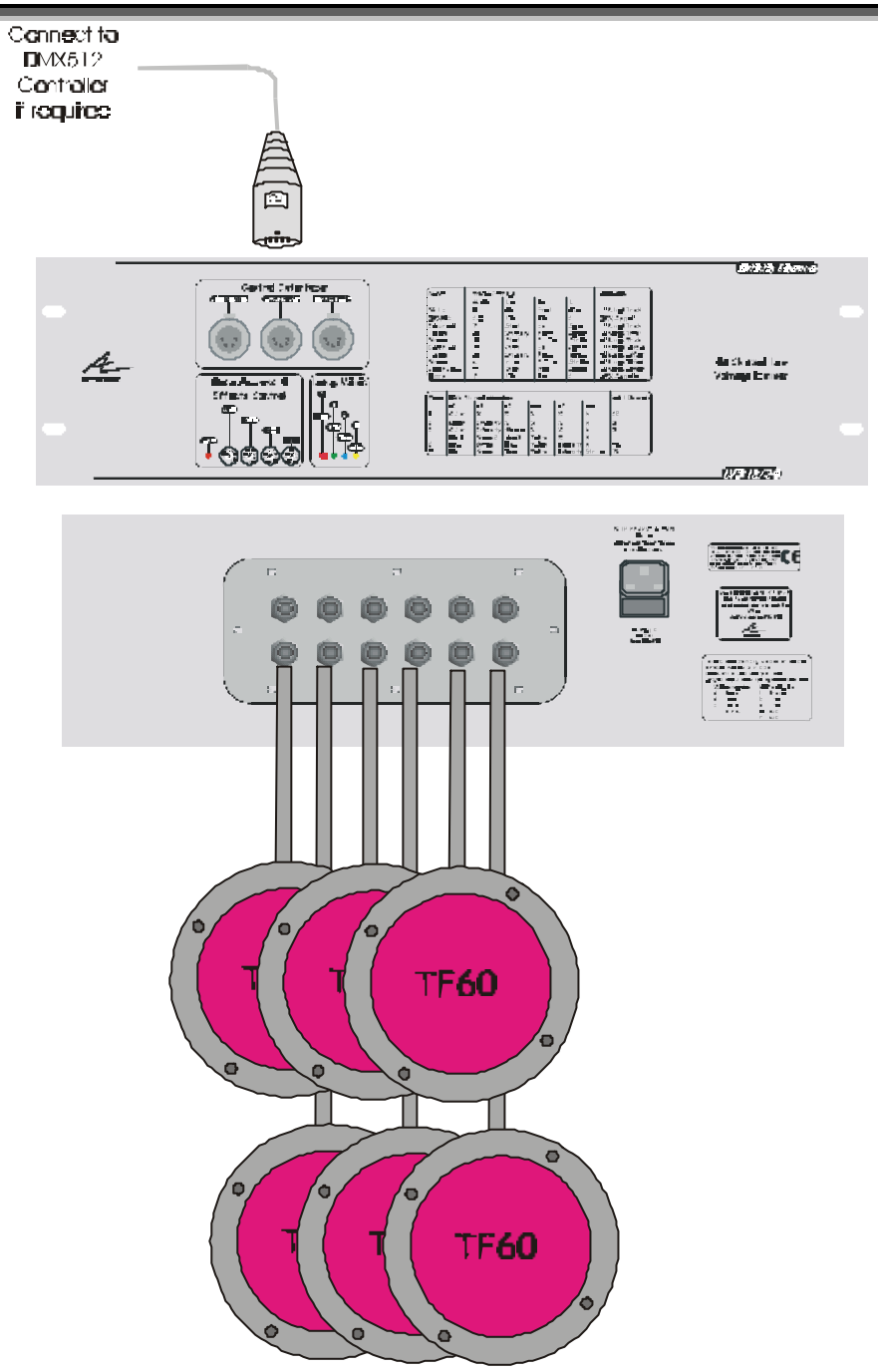
Percentage of full load	Cable Distance	Cable Type
0 - 100%	1m - 20m	1.5 mm^2 cable.
0 – 40%	21m - 40m	1.5 mm^2 cable.
41 - 100%	21m - 40m	2.5 mm^2 cable.

TOPOLOGY

The following diagram shows the connection topology for LVD, Water-Fill, Water-Pipe, Terra-Fill and Colour-Pipe.
The total number of lamps that can be connected to a LVD is dependent upon the lamp type.
The following table shows the maximum numbers:

Product	LVD
WP/CP300	36
WP/CP600	24
WP/CP1000	12
WF250	10
TF60	25
TF250	10

TOPOLOGY DRAWING



OPERATING MODES

OVERVIEW

LVD can be operated in a number of different modes which are categorised as follows:

1. DMX512 Controlled
2. Stand-Alone Operation
3. Self Controlled Network

The following table provides an overview of the operating modes:
The majority of modes are only relevant to control of colour mixing devices. When the LVD is to be used as a 48 channel dimmer, Mode 4 must be selected. The dimmer is then controlled by 48 consecutive DMX512 channels.

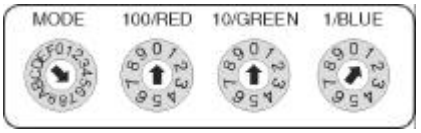
Table 2 – Operating Modes

Mode	Name	Operation	Description
0	Static	Stand-alone	Stand-alone static colour. The wheel controls are used to select a static colour.
1	C	DMX512	A single DMX channel selects 1 of 32 colours from the internal colour palette. This mode is analogous to the operation of a colour scroller.
2	CI	DMX512	As above with the addition of a separate intensity channel.
3	CIS	DMX512	As above with the addition of a separate strobe control channel.
4	RGBX	DMX512	Four channels of DMX512 control the red, green, blue and white mix of the generated colour. This mode is also used when 48 channel dimmer operation is desired.
5	RGBXI	DMX512	As above with the addition of a separate intensity channel.
6	RGBXIS	DMX512	As above with the addition of a separate strobe control channel.
7	Colour Roll	Stand-alone	The wheel controls allow the selection of a start and end colour along with a fade time. LVD then continuously fades through the selected rainbow pattern.
8	Random	Stand-alone	The wheel controls allow the selection of a start colour along with a fade time and cross fade percentage. LVD then continuously fades or snaps between random rainbow patterns.

Mode	Name	Operation	Description
9	Strobe	Stand-alone	The wheel controls allow the selection of a start colour along with a strobe rate and colour sequence rate. LVD then continuously strobes on either a single colour or a sequence of colours.
A	M-Colour Roll	Self Controlled Network	The wheel controls allow the selection of a start and end colour along with a fade time. The LVD then continuously fades through the selected rainbow pattern whilst controlling all other LVDs on the network to operate in sync. The result is an array of lamps displaying a synchronised moving rainbow.
B	M-Random	Self Controlled Network	The wheel controls allow the selection of a start colour along with a fade time and cross fade percentage. The LVD then continuously fades or snaps between random rainbow patterns whilst controlling all other LVDs on the network to operate in sync. The result is an array of lamps displaying a synchronised moving rainbow with random start and end colours.
C	M-Strobe	Self Controlled Network	The wheel controls allow the selection of a start colour along with a strobe rate and colour sequence rate. The LVD then continuously strobes on either a single colour or a sequence of colours whilst controlling all other LVDs on the network to operate in sync. The result is an array of lamps displaying a synchronised colour pattern with random strobe effects.
D	M-Colour Cone	Self Controlled Network	The wheel controls allow the selection of a start and end colour along with a mid colour and a fade time. The LVD then continuously fades through the selected rainbow pattern whilst controlling all other LVDs on the network to operate in sync. The result is an array of lamps displaying a synchronised moving cone shaped rainbow.
F	Button Control	Self Controlled Network	The LVD receives DMX512 and interprets the data to select one of the Self Controlled Network modes. This is typically used when an installation requires a simple 'Mode Select' button panel, rather than a sophisticated lighting console.

DMX512 CONTROLLED MODES

The LVD can operate in one of seven distinct DMX512 modes. The reason for the wide range of operating modes is to allow flexibility of control and choice of lighting console. In order to ease patching of the units, all DMX information is entered using rotary wheel controls rather than DIP switches. It is also worth noting that the Mode numbers 1 through 6 are also the number of DMX channels used. Mode 6 offers the widest range of control and is therefore the preferred option unless control channels are scarce.



In all DMX modes, the channels used are a consecutive block following the base address. The base address is set to a value in the range 001 to 512 using the control wheels on the rear panel. The diagram above shows an example of Mode 6 and start address 001.

The following table shows the channel assignments in each of the DMX modes:

Table 3 - DMX512 Channel Allocation

Mode	Name	DMX512 received data usage					
		Base Addr	Base+1	Base+2	Base+3	Base+4	Base+5
1	C	**Select 1 of 32 colours (Table 4)**	Not Used				
2	CI	**Select 1 of 32 colours (Table 4)**	**Intensity**	Not Used			
3	CIS	**Select 1 of 32 colours (Table 4)**	**Intensity**	**Strobe (Table 5)**	Not Used		
4	RGBX	**Red**	**Green**	**Blue**	**White**	Not Used	
5	RGBXI	**Red**	**Green**	**Blue**	**White**	**Intensity**	Not Used
6	RGBXIS	**Red**	**Green**	**Blue**	**White**	**Intensity**	**Strobe (Table 5)**
F	Button Control	**Mode select A0,B0,C0, D0,E0.**	**As Switch 100**	**As Switch 10**	**As Switch 1**	**Intensity**	Not Used

MODE 1

Mode 1 (C) uses a single DMX channel to select 1 of 32 colours from the internal colour palette. Table 4 shows the available colours. This mode of operation is analogous to the operation of a colour scroller.

Table 4 - Pre-Programmed Colour Palette

Palette	DMX Level		Colour
	Decimal	Percentage	
1	0-7	0	Black
2	8-16	5	Red

3	16-23	8	Green
4	24-31	11	Blue
5	32-39	14	Cyan

Palette	DMX Level		Colour
	Decimal	Percentage	
6	40-47	17	Magenta
7	48-55	20	Yellow
8	56-63	23	Amber
9	64-71	27	Orange
10	72-79	30	Half Magenta
11	80-87	33	Blush
12	88-95	36	Ochre
13	96-103	39	Light Yellow
14	104-111	42	Light Magenta
15	112-119	45	Hot Flame
16	120-127	48	Spring Green
17	128-135	52	Apple Green
18	136-143	55	Turquoise
19	144-151	58	Aquamarine
20	152-159	61	Steel
21	160-167	64	Ice
22	168-175	67	Russet
23	176-183	70	Dark Blue
24	184-191	73	Salmon
25	192-199	77	Light Mauve
26	200-207	80	Bahamas
27	208-215	83	Apricot
28	216-223	86	Sunset
29	224-231	89	Deep Orange
30	232-239	92	Gold
31	240-247	95	Rose
32	248-255	100	White

MODE 2

Mode 2 (CI) uses two consecutive DMX channels. The first selects 1 of 32 colours from the internal colour palette as described in Mode 0. The second channel controls overall intensity. This allows a controller to select a colour and then modify the colour's intensity.

This mode of operation is analogous to the combination of a standard luminaire and a colour scroller.

MODE 3

Mode 3 (CIS) uses three consecutive DMX channels. The first two channels operate as described in Mode 2. The third channel selects a range of special strobe effects. The effects are detailed in Table 5.

Table 5 - Strobe Effects Palette

Palette	DMX Level Decimal	Effect	Rate	Colour Change per no Strobes	Colour Sequence	Are Colour Channels Used
1	0-3	No Affect	-	None	Static	Yes
2	4-7	Pulse Strobe	1 Hz	None	Static	Yes
3	8-11	Pulse Strobe	2 Hz	None	Static	Yes
4	12-15	Pulse Strobe	3 Hz	None	Static	Yes
5	16-19	Pulse Strobe	4 Hz	None	Static	Yes
6	20-23	Pulse Strobe	5 Hz	None	Static	Yes
7	24-27	Pulse Strobe	6 Hz	None	Static	Yes
8	28-31	Pulse Strobe	7 Hz	None	Static	Yes
9	32-35	Pulse Strobe	8 Hz	None	Static	Yes
10	36-39	Pulse Strobe	9 Hz	None	Static	Yes
11	40-43	Pulse Strobe	10 Hz	None	Static	Yes
12	44-47	Pulse Strobe	12 Hz	None	Static	Yes
13	48-51	Pulse Strobe	14 Hz	None	Static	Yes
14	52-55	Pulse Strobe	16 Hz	None	Static	Yes
15	56-59	Pulse Strobe	18 Hz	None	Static	Yes
16	60-63	Pulse Strobe	20 Hz	None	Static	Yes
17	64-67	50/50 Strobe	1 Hz	None	Static	Yes
18	68-71	50/50 Strobe	2 Hz	None	Static	Yes
19	72-75	50/50 Strobe	3 Hz	None	Static	Yes
20	76-79	50/50 Strobe	4 Hz	None	Static	Yes
21	80-83	50/50 Strobe	5 Hz	None	Static	Yes
22	84-87	50/50 Strobe	6 Hz	None	Static	Yes
23	88-91	50/50 Strobe	7 Hz	None	Static	Yes
24	92-95	50/50 Strobe	8 Hz	None	Static	Yes
25	96-99	50/50 Strobe	9 Hz	None	Static	Yes
26	100-103	50/50 Strobe	10 Hz	None	Static	Yes
27	104-107	50/50 Strobe	12 Hz	None	Static	Yes
28	108-111	50/50 Strobe	14 Hz	None	Static	Yes
29	112-115	50/50 Strobe	16 Hz	None	Static	Yes
30	116-119	50/50 Strobe	18 Hz	None	Static	Yes
31	120-123	50/50 Strobe	20 Hz	None	Static	Yes
32	124-127	50/50 Strobe	22 Hz	None	Static	Yes
33	128-131	Pulse Strobe	1 Hz	1	R,O,Y,G,B,I,V	No
34	132-135	Pulse Strobe	7 Hz	1	R,O,Y,G,B,I,V	No
35	136-139	Pulse Strobe	12 Hz	1	R,O,Y,G,B,I,V	No
36	140-143	Pulse Strobe	18 Hz	1	R,O,Y,G,B,I,V	No
37	144-147	Pulse Strobe	1 Hz	2	R,O,Y,G,B,I,V	No
38	148-151	Pulse Strobe	7 Hz	2	R,O,Y,G,B,I,V	No
39	152-155	Pulse Strobe	12 Hz	2	R,O,Y,G,B,I,V	No
40	156-159	Pulse Strobe	18 Hz	2	R,O,Y,G,B,I,V	No
41	160-163	Pulse Strobe	1 Hz	4	R,O,Y,G,B,I,V	No
42	164-167	Pulse Strobe	7 Hz	4	R,O,Y,G,B,I,V	No
43	168-171	Pulse Strobe	12 Hz	4	R,O,Y,G,B,I,V	No
44	172-175	Pulse Strobe	18 Hz	4	R,O,Y,G,B,I,V	No
45	176-179	Pulse Strobe	1 Hz	8	R,O,Y,G,B,I,V	No
46	180-183	Pulse Strobe	7 Hz	8	R,O,Y,G,B,I,V	No
47	184-187	Pulse Strobe	12 Hz	8	R,O,Y,G,B,I,V	No
48	188-191	Pulse Strobe	18 Hz	8	R,O,Y,G,B,I,V	No
49	192-195	50/50 Strobe	1 Hz	1	R,O,Y,G,B,I,V	No
50	196-199	50/50 Strobe	7 Hz	1	R,O,Y,G,B,I,V	No
51	200-203	50/50 Strobe	12 Hz	1	R,O,Y,G,B,I,V	No
52	204-207	50/50 Strobe	18 Hz	1	R,O,Y,G,B,I,V	No
53	208-211	50/50 Strobe	1 Hz	2	R,O,Y,G,B,I,V	No
54	212-215	50/50 Strobe	7 Hz	2	R,O,Y,G,B,I,V	No
55	216-219	50/50 Strobe	12 Hz	2	R,O,Y,G,B,I,V	No
56	220-223	50/50 Strobe	18 Hz	2	R,O,Y,G,B,I,V	No
57	224-227	50/50 Strobe	1 Hz	4	R,O,Y,G,B,I,V	No
58	228-231	50/50 Strobe	7 Hz	4	R,O,Y,G,B,I,V	No
59	232-235	50/50 Strobe	12 Hz	4	R,O,Y,G,B,I,V	No
60	236-239	50/50 Strobe	18 Hz	4	R,O,Y,G,B,I,V	No
61	240-243	50/50 Strobe	1 Hz	8	R,O,Y,G,B,I,V	No
62	244-247	50/50 Strobe	7 Hz	8	R,O,Y,G,B,I,V	No
63	248-251	50/50 Strobe -	12 Hz	8	R,O,Y,G,B,I,V	No
64	252-255	No Affect	0	None	Static	Yes

		(Power Led Off)				

MODE 3 cont.

The effects generated by the strobe channel are split into four sections:

1. Pulse Strobe

The Pulse Strobe provides a variable rate flashing light. The light stays on only for a short time in each cycle. This means that as the rate is adjusted, it is the 'Off' time which changes. The colour is as set by the first DMX channel.

2. Flash Strobe

The Flash Strobe provides a variable rate flashing light whereby the light is on for the same time that it is off in each cycle. The colour is as set by the first DMX channel.

3. Colour Pulse Strobe

The Colour Pulse Strobe operates as Pulse Strobe but the colours sequence through the spectrum. The number of consecutive strobe cycles per colour can also be controlled.

4. Colour Flash Strobe

The Colour Flash Strobe operates as Flash Strobe but the colours sequence through the spectrum. The number of consecutive strobe cycles per colour can also be controlled.

MODE 4

Mode 4 (RGBX) uses four consecutive DMX channels to mix the colours red, green, blue and white. Table 6 shows a selection of the potential sixteen million colour mixes.

Table 6 - Example Colour Mixing

Desired Colour	Red (Decimal)	Green (Decimal)	Blue (Decimal)
Red	255	0	0
Green	0	255	0
Blue	0	0	255
Cyan	0	255	255
Magenta	255	0	255
Yellow	0	255	255
White	200	255	235
Pink	255	0	20
Orange	255	120	120

MODE 5

Mode 5 (RGBXI) uses five consecutive DMX channels. The first 4 channels are as described in Mode 4. The final channel controls overall intensity. This allows a controller to select a colour and then modify the colour's intensity.

MODE 6

Mode 6 (RGBXIS) uses six consecutive DMX channels. The first 5 channels operate as described in Mode 5. The final channel selects a range of special strobe effects. The effects are detailed in Table 5.

MODE F

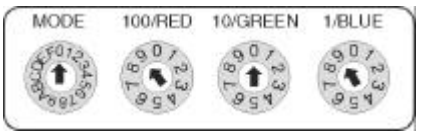
Mode F (Button) is a specialist control mode available only in the LVD. It allows the 'Self Controlled Network' modes to be remotely triggered by DMX512. This is the mode of operation used by the Artistic Licence 'Colour-Button' control panel.

The LVD receives five DMX512 channels and interprets the data as if it were switch settings. The channel usage is detailed in Table 3. Please refer to the section on Self Controlled Network for more detail.

STAND-ALONE OPERATION

The LVD can operate in one of four distinct Stand-alone modes. The stand-alone modes allow a single LVD to operate independently and without a DMX512 controller.

In the stand-alone modes, the right most three control wheels are used to select specific features of the mode.

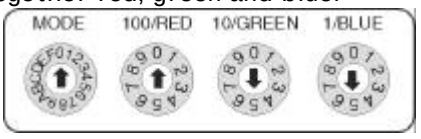


The diagram above shows an example of a LVD in Mode 0 and selected to output magenta.

Mode 0

Mode 0 (Static) is the simplest of the stand-alone modes. The three control wheels are adjusted to mix together red, green and blue.

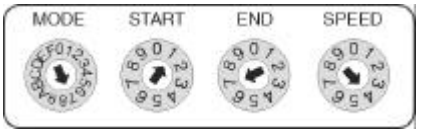
This mode provides selection of any one of a thousand static colours. The diagram shows an example of a LVD selected to output cyan at 50% intensity.



Mode 7

Mode 7 (Colour Roll) is the first of the 'dynamic' stand-alone modes. This mode allows the LVD to fade continuously through the colours of the spectrum. The three control wheels are used to set the start colour, end colour and speed of fade.

The diagram shows an example of a LVD selected to fade between red and violet with a cycle time of 21 seconds



The Start and End wheels select the colours detailed in Table 7.

Table 7 - Start - End Colours

Wheel Position	Start/End Colour	Wheel Position	Start/End Colour
0	Black	5	Blue
1	Red	6	Indigo
2	Orange	7	Violet
3	Yellow	8	Pink
4	Green	9	White

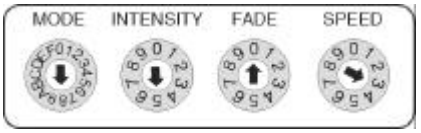
The Speed wheel selects the fade time detailed in Table 8.

Table 8 - Fade Times

Wheel Position	Time of step between colours	Total cycle time for Red (1) to Violet (7)
0	Static	Static
1	0.25 seconds	1.75 seconds
2	0.5 seconds	3.5 seconds
3	1 second	7 second
4	3 seconds	21 seconds
5	10 seconds	1 minute 10 seconds
6	30 seconds	3 minutes 30 seconds
7	1 minute	7 minute
8	10 minutes	1 hour 10 minutes
9	30 minutes	3 hours 30 minutes

Mode 8

Mode 8 (Random) allows the LVD to fade or snap continuously through random colours of the spectrum. The three control wheels are used to set the intensity of light output, the 'smoothness' of the fade and speed of fade.



The diagram shows an example of a LVD selected to snap between random colours with a dwell time of 1 second in each colour. The Intensity wheel scales the intensity such that '0' is off and '9' is 100%.

The Speed wheel sets the time spent in each colour and is detailed in Table 8.

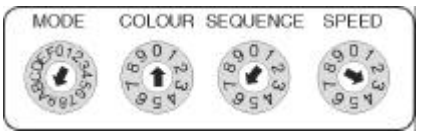
The Fade wheel sets the 'smoothness' of the fade. Set to '0' the colours switch from one to the next. Set to '9', the colours fade continuously from one to the next. The values in between allow combinations of the two as detailed in Table 9.

Table 8 - Fade Times

Wheel Position	Percentage Fade
0	0% Snap Change
1	20%
2	30%
3	40%
4	50%
5	60%
6	70%
7	80%
8	90%
9	100% Full Cross Fade

Mode 9

Mode 9 (Strobe) allows the LVD to strobe at a variable rate and a variable colour sequence.



The diagram shows an example of a LVD selected to pulse strobe at 18 pulses per second with the colour changing every 6 pulses.

The Colour wheel is only used when the Sequence wheel is set to '0'. In this case, the strobe effect is a static colour as detailed in Table 7.

The Sequence wheel defines the number of consecutive strobe pulses before a colour change as detailed in Table 9.

The Speed Wheel selects the strobe rate and type of strobe as detailed in Table 10.

Table 9 - Colour Sequence

Wheel Position	Number of Strobe Pulses per colour
0	0 (Static)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Table 10 - Strobe Rate

Wheel Position	Strobe Frequency	Pulse - 50/50
0	1 Hz	P
1	6 Hz	P
2	12 Hz	P
3	18 Hz	P
4	24 Hz	P
5	1 Hz	50/50
6	6 Hz	50/50
7	12 Hz	50/50
8	18 Hz	50/50
9	25 Hz	50/50

SELF CONTROLLED NETWORK OPERATION

The Self Controlled Network modes allow a single LVD to control a number of additional LVDs. In this mode, the additional controlled LVDs are referred to as 'Slaves'.

This style of operation allows the LVDs to produce synchronised effects without an external controller.

Topology

To use Self Controlled Network mode, all Slaves must be set to operate in Mode 6 at specific DMX addresses. It is the DMX start address that defines the slave's position in the network.

Table 11 describes the Slave addresses which should be used dependent upon the total number of units connected.

Consider a system where a single LVD controls an additional seven slave LVDs. By looking at the horizontal line in the Table 11 for a total of 8 units, it can be seen that the slaves should be addressed to: 67, 127, 259, 319, 385 ,451.

Any number of lamps between 2 and 85 can be used in a network.

Table 11 - Slave addresses

	Address Slave Lamps																				
Total Number of Lamps controlled (inc master)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

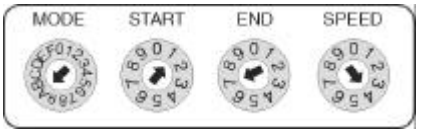
2	256																					
3	169	343																				
4	127	259	385																			
5	103	205	307	409																		
6	85	169	259	343	427																	
7	73	145	223	295	367	439																
8	67	127	193	259	319	385	451															
9	55	115	169	229	283	343	397	457														
10	55	103	157	205	259	307	361	409	463													
11	49	97	139	187	235	283	325	373	421	469												
12	43	85	127	169	217	259	301	343	385	427	469											
13	43	79	121	157	199	235	277	319	355	397	433	475										
14	37	73	109	145	181	223	259	295	331	367	403	439	475									
15	37	67	103	139	169	205	241	277	307	343	379	409	445	481								
16	31	67	97	127	163	193	223	259	289	319	355	385	415	451	481							
17	31	61	91	121	151	181	211	241	271	301	331	361	391	421	451	481						
18	31	55	85	115	145	169	199	229	259	283	313	343	373	397	427	457	487					
19	25	55	79	109	133	163	187	217	241	271	295	325	349	379	403	433	457	487				
20	25	55	79	103	127	157	181	205	229	259	283	307	331	361	385	409	439	463	487			
21	25	49	73	97	121	145	169	199	223	247	271	295	319	343	367	391	415	439	463	487		
22	25	49	73	97	115	139	163	187	211	235	259	283	301	325	349	373	397	421	445	469	487	
23	25	43	67	91	115	133	157	181	199	223	247	271	289	313	337	355	379	403	421	445	469	493
24	25	43	67	85	109	127	151	169	193	217	235	259	277	301	319	343	361	385	409	427	451	469	493

Mode A

Mode A (Master Colour Roll) operates identically to Mode 7 (Colour Roll) with the exception that the DMX512 output of the LVD can synchronise other slave LVD's to the same effect. This mode allows the LVD's to fade continuously through the colours of the spectrum producing a moving rainbow effect across the array of lamps. The three control wheels are used to set the start colour, end colour and speed of fade.

The Start and End wheels select the colours detailed in Table 7. The Speed wheel selects the fade time detailed in Table 8.

The diagram shows an example of a LVD selected to fade between red and violet with a cycle time of 21 seconds



If an additional six LVD's are connected and addressed as described in Table 11, each of the seven units will start on a specific colour. As the fade progresses, the colour sequence will be maintained, but the colours will appear to move along the line of LVD's.

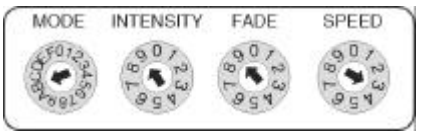
Table 12 shows the effect. The direction of the effect can be reversed by swapping the Start and End Colours.

Table 12 - Mode A Example

Lamp Step	LVD 1	LVD 2	LVD 3	LVD 4	LVD 5	LVD 6	LVD 7
1	Red	Orange	Yellow	Green	Blue	Indigo	Violet
2	Orange	Yellow	Green	Blue	Indigo	Violet	Red
3	Yellow	Green	Blue	Indigo	Violet	Red	Orange
4	Green	Blue	Indigo	Violet	Red	Orange	Yellow
5	Blue	Indigo	Violet	Red	Orange	Yellow	Green
6	Indigo	Violet	Red	Orange	Yellow	Green	Blue
7	Violet	Red	Orange	Yellow	Green	Blue	Indigo

Mode B

Mode B (Master Random) operates identically to Mode 8 (Random) with the exception that the DMX512 output of the LVD can synchronise other slave LVD's to the same effect. This mode allows the LVD's to snap or fade continuously through random colour sequences producing varying colour washes. The three control wheels are used to set the intensity of light output, the 'smoothness' of the fade and speed of fade.



The diagram shows an example of a LVD selected to fade between random colours with a dwell time of 1 second in each colour. The Intensity wheel scales the intensity such that '0' is off and '9' is 100%.

The Speed wheel sets the time spent in each colour and is detailed in Table 8.

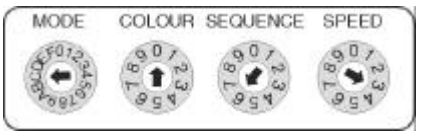
The Fade wheel sets the 'smoothness' of the fade. Set to '0' the colours switch from one to the next. Set to '9', the colours fade continuously from one to the next. The values in between allow combinations of the two as detailed in Table 9.

If additional LVD's are connected and addressed as described in Table 11, each of the slave lamps will produce a synchronised colour to produce the overall moving colour wash effect.

The direction of the effect can be reversed by swapping the Start and End Colours.

Mode C

Mode C (Master Strobe) operates identically to Mode 9 (Strobe) with the exception that the DMX512 output of the LVD can synchronise other slave LVD's to the same effect. This mode allows the LVD's to strobe with an optional colour sequence. The individual LVD's will strobe asynchronously, however the colour sequence will be synchronised.



The diagram shows an example of a LVD selected to pulse strobe at 18 pulses per second with the colour changing every 6 pulses.

The Colour wheel is only used when the Sequence wheel is set to '0'. In this case, the strobe effect is a static colour as detailed in Table 7.

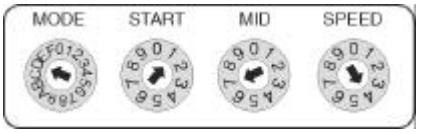
The Sequence wheel defines the number of consecutive strobe pulses before a colour change as detailed in Table 9.

The Speed Wheel selects the strobe rate and type of strobe as detailed in Table 10.

Mode D

Mode D (Master Colour Cone) operates in a similar way to Mode A (Master Colour Roll). However in this mode, the Start and End colours are identical and the Middles colour is adjusted. This produces a 'Colour Cone' of light.

The Start/End and Mid wheels select the colours detailed in Table 7. The Speed wheel selects the fade time detailed in Table 8.



The diagram shows an example of a LVD selected to cone between red and violet with a cycle time of 21 seconds

If an additional six LVD's are connected and addressed as described in Table 11, each of the seven units will start on a specific colour. As the fade progresses, the colour sequence will be maintained, but the colours will appear to move out from the middle of the line of LVD. Table 13 shows the effect. The direction of the effect can be reversed by swapping the Start and End Colours.

Table 13 - Mode D Example

Lamp Step	LVD 1	LVD 2	LVD 3	LVD 4	LVD 5	LVD 6	LVD 7
1	Red	Yellow	Blue	Violet	Blue	Yellow	Red
2	Orange	Green	Indigo	Blue	Indigo	Green	Orange
3	Yellow	Blue	Violet	Indigo	Violet	Blue	Yellow
4	Green	Indigo	Red	Violet	Red	Indigo	Green
5	Blue	Violet	Orange	Red	Orange	Violet	Blue
6	Indigo	Red	Yellow	Orange	Yellow	Red	Indigo
7	Violet	Orange	Green	Yellow	Green	Orange	Violet

TECHNICAL DATA

MECHANICAL

- Mass: 4.400Kg
- Size: 3RU 19" Rack
- Depth: 257mm (Allow additional for cable entry)

ELECTRICAL

- Power Consumption: 300 W (600 W LVD-24)
- Input Voltage: 95-260 VAC
- Output Voltage: 24 VDC
- Max. Operating Current: 12 A (24 A LVD-24)
- Duty Cycle: 80% (70% LVD-24)
- Maximum current per channel: 4A subject to total power

DMX512

5 pin male XLR

- Pin 1: Ground
- Pin 2: DMX512 Data - input
- Pin 3: DMX512 Data + input
- Pin 4: N/C
- Pin 5: N/C

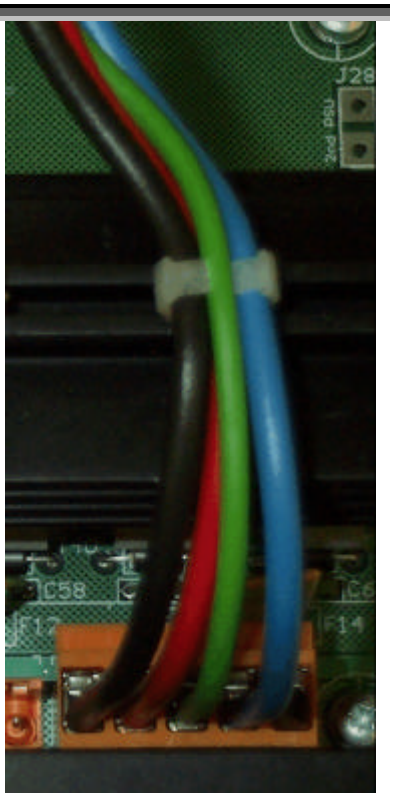
COLOUR BUTTON

4 pin female XLR

- Pin 1: Ground
- Pin 2: DMX512 Data – input
- Pin 3: DMX512 Data + input
- Pin 4: 24 VDC power input/output

INSTALLATION

WIRING



Cable entry is via a removable gland plate. The standard gland plate includes entry for twelve 6.3mm diameter cables. Blank gland plates are available should customers require other options.

Each group of 4 outputs is wired to an individual 5 pin screw terminal connector.

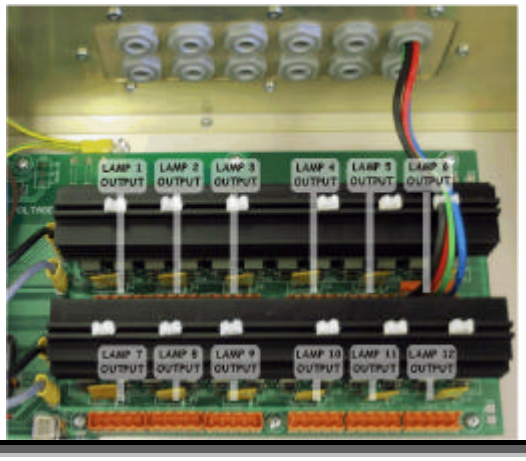
Cable retaining clips are mounted on the top of the heatsink. These clips are used to ensure that the cables are held clear of the heatsink. See drawing.

Output Wiring

- Pin 1: Common +24VDC
- Pin 2: Red Chan 1
- Pin 3: Green Chan 2
- Pin 4: Blue Chan 3
- Pin 5: White Chan 4

LAYOUT

The following illustration shows the channel arrangement within the product. Lamp numbers and pin functions are also stencilled on the pcb.



EMC

The LVD is supplied with a kit of ferrite rings and miniature cable ties. These are supplied for the installer to fit over each lamp group of output cables.

In addition, an in-line mains EMC filter is supplied.

Both of the above components must be fitted to ensure compliance with FCC and CE requirements.

I N D E X

M

N

O

P

R

S

T

V

W

Artistic Licence (UK) Ltd.

CERTIFICATE OF CONFORMITY TO THE EU EMC DIRECTIVE

The Product **LVD** has been designed and manufactured using good engineering practises.

It have been tested and found compliant with the following
EU Harmonised standards:
EN 50081-2 EMC Emission Standard
EN 50082-2 EMC Immunity Standard

Issued by Artistic Licence (UK) Ltd. on
1/7/2000
Signatory:

Wayne D Howell
Managing Director

Federal Communications Commission (FCC) Notice (USA)

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference including interference that may cause undesired operation.

Artistic Licence

B1 & B3 Livingstone Court
Peel Road
Harrow
Middlesex
England
HA3 7QT
Tel: +44 (0)20 88 63 45 15
Fax: +44 (0)20 84 26 05 51
Email: Sales@ArtisticLicence.com

PROFESSIONAL LIGHTING AND SOUND ASSOCIATION

ESTA