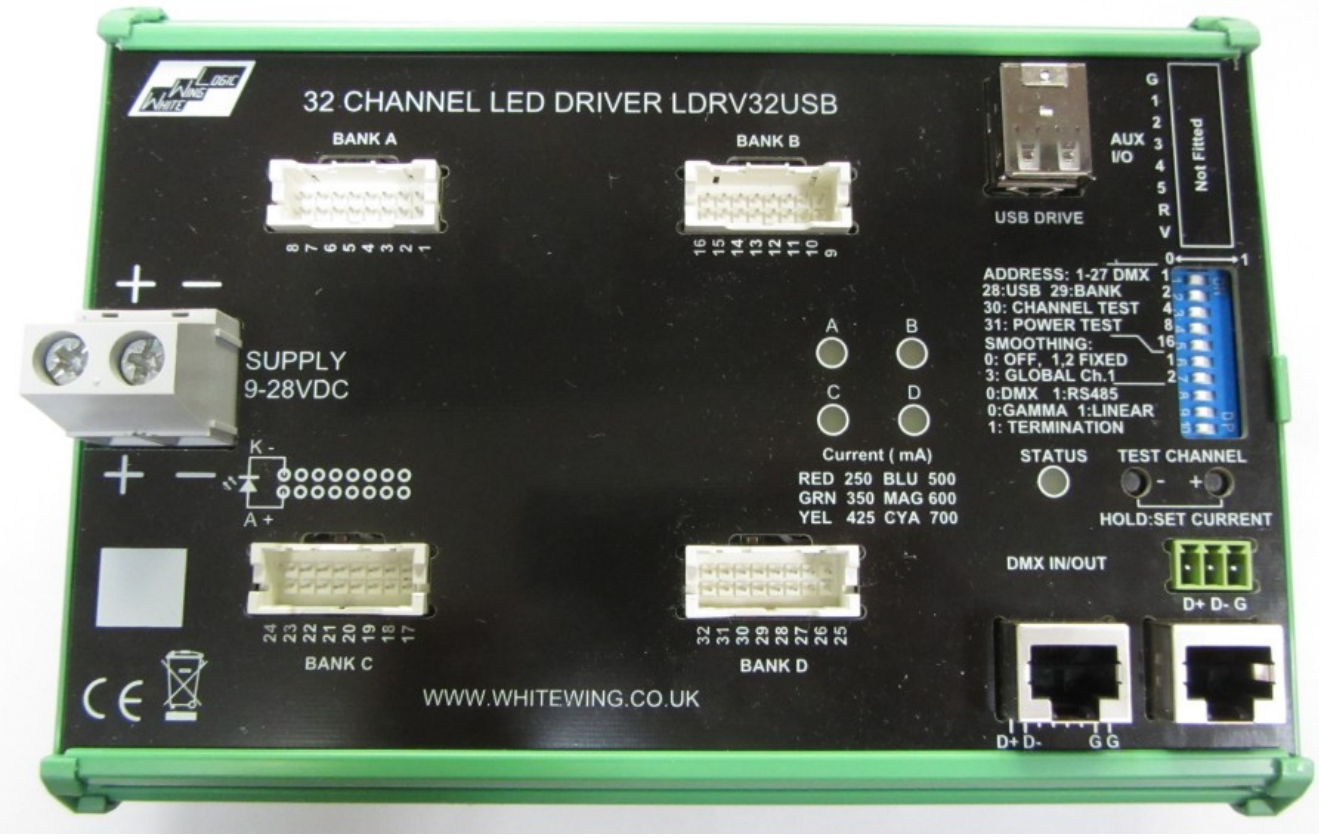
White Wing Logic LDRV32 32 channel Constant-Current DMX/RS485 LED dimmer
www.whitewing.co.uk
Provisional documentation. 25-Nov-2020



The dimmer is intended for DIN rail mounting.

Power supply is 12-28VDC. The dimmer and the output loads are protected from reverse polarity. For maximum efficiency and output capability, a 24V supply is recommended.

Output connections and ratings

Output is via JST XAD connectors.
The mating connector shell is XADRP-16V (RS 175-5604)
Pin contact SXA-001T-P0,6 (22-28AWG) (RS 123-5951)
SXA-01T-P0,6 (20-24AWG) (RS 917-4652)

An alternate option (built to order) is 16 way IDC connectors, for connection via IDC ribbon cables, or plug-in breakout boards for other connectors (see 96 channel dimmer documentation for some examples of possible options)

Outputs are grouped into 4 sets of 8 outputs. Output current can be set for each bank.

Maximum output voltage : Currently tested to 9V – further characterisation to be completed for other output voltages.

Data formats
Data format is selected using the DMX/RS485 switch.
DMX :
Standard DMX512 at 250kbaud. In addition to standard DMX, extended frames up to 864 channels are supported.

RS485 :
1Mbaud, RS422 or 485 (RS485 may require line biasing).
This allows low-cost RS422/485 interfaces to be used instead of typically more expensive DMX hardware.
Two data formats are supported.

1) <0xff> <00> <channel1> <channel2>….<channel n>
2) <BREAK> <0x00> < channel1> <channel2>….<channel n>
   In both cases, channel data MUST NOT contain 0xff (255) values as this is used as a start character

Up to 864 channels per universe (bus) are currently supported . This can be extended if required with custom firmware. Readback of external control inputs is possible via RS485 using custom firmware

Format 1 avoids the use of the DMX break, which can causes latency issues and problems when converting between data formats (e.g. Ethernet to RS485)
Format 2 is essentially just faster DMX

The DMX ground is connected to supply negative. A fully isolated data input can be specified as an option at time of ordering.

The DMX-in sockets are connected directly to DMX out for loop-through to additional dimmers. RJ45 pinout is ESTA standard, as shown on the front panel. Note that there are several DMX RJ45 pinout conventions that differ from the standard, e.g. Color Kinetics and E:Cue.
In addition to the RJ45 connectors, a 3.5mm pluggable terminal block is provided as an alternate connector. Mating connector Camden CTB92HD/3 or similar.

<u>DIP switch settings</u>
SW1-5 : Address/test mode

Dimmer Number	Addr 16	Addr 8	Addr 4	Addr 2	Addr 1	Start address Note : if smoothing mode 3 (ch1 smoothing) selected, all addresses start one channel higher
0	OFF	OFF	OFF	OFF	OFF	Factory test mode
1	OFF	OFF	OFF	OFF	**ON**	1
2	OFF	OFF	OFF	**ON**	OFF	33
3	OFF	OFF	OFF	**ON**	**ON**	65
4	OFF	OFF	**ON**	OFF	OFF	97
5	OFF	OFF	**ON**	OFF	**ON**	129
6	OFF	OFF	**ON**	**ON**	OFF	161
7	OFF	OFF	**ON**	**ON**	**ON**	193
8	OFF	**ON**	OFF	OFF	OFF	225
9	OFF	**ON**	OFF	OFF	**ON**	257
10	OFF	**ON**	OFF	**ON**	OFF	289
11	OFF	**ON**	OFF	**ON**	**ON**	321
12	OFF	**ON**	**ON**	OFF	OFF	353
13	OFF	**ON**	**ON**	OFF	**ON**	385
14	OFF	**ON**	**ON**	**ON**	OFF	417
15	OFF	**ON**	**ON**	**ON**	**ON**	449
16	**ON**	OFF	OFF	OFF	OFF	481
17	**ON**	OFF	OFF	OFF	**ON**	513*
18	**ON**	OFF	OFF	**ON**	OFF	545*
19	**ON**	OFF	OFF	**ON**	**ON**	577*
20	**ON**	OFF	**ON**	OFF	OFF	609*
21	**ON**	OFF	**ON**	OFF	**ON**	641*
22	**ON**	OFF	**ON**	**ON**	OFF	673*

23	**ON**	OFF	**ON**	**ON**	**ON**	705*
24	**ON**	**ON**	OFF	OFF	OFF	737*
25	**ON**	**ON**	OFF	OFF	**ON**	769*
26	**ON**	**ON**	OFF	**ON**	OFF	801*
27	**ON**	**ON**	OFF	**ON**	**ON**	833*
28	**ON**	**ON**	**ON**	OFF	OFF	USB Playback mode
29	**ON**	**ON**	**ON**	OFF	**ON**	Test mode : Bank check
30	**ON**	**ON**	**ON**	**ON**	OFF	Test mode : Channel check
31	**ON**	**ON**	**ON**	**ON**	**ON**	Test mode : Power check

* settings only valid in Extended DMX or RS485 mode

SW8 : OFF : DMX mode, 250kbaud , ON : RS485/RS422 1Mbaud mode

SW9 : ON : Linear brightness curve (use for RGB) , OFF : gamma corrected brightness curve (use for monochrome)

SW10 : DMX termination : ON = terminated (must be ON for the last device on the cable, OFF for all others).

Smoothing

The dimmer incorporates an internal intensity-smoothing function, which can provide significant improvement of the aesthetic appearance of a lighting installation when displaying dynamic content, especially where the source frame rate is low or erratic.
The smoothing is effectively a crossfade between successive DMX frames, the speed of this crossfade being selectable either from fixed values via the DIP switch, or set by the control system via an extra DMX channel. The latter mode is controlled globally across all dimmers from DMX channel 1.

Setting	Sm2	Sm1	Smoothing value	Approx time constant
0	OFF	OFF	0	0
1	OFF	**ON**	192	50ms
2	**ON**	OFF	220	100mS
3	**ON**	**ON**	Global smoothing on DMX Ch1	

The best way to determine the optimum smoothing value is visually on the final installation, as it is a very subjective function, and will be a tradeoff between smoothness and speed of fast changes. It will usually be fairly obvious where the ‘sweet spot’ setting is with some experimentation.

Creative use of smoothing can also simplify the task of content creation and reduce data bandwidth requirements. Content can be simplified as transitions as crude as a simple on/off can become a smooth fade with a suitably high smoothing value.
Reduction of bandwidth (by reducing frame rate) can be useful in large installations to reduce overall data processing workload, or where DMX data is passing through an IP network or wireless link, which may have variable bandwidth or latency limitations. For slow-moving content, source frame rates as low as 10 frames per second can produce perfectly fluid results with no visible jerkiness with careful choice of smoothing value.

Linear/gamma mode

Due to the non-linear relationship between LED input power and perceived brightness, dimming LEDs using the conventional 0 to 255 DMX brightness range to control power linearly will result in a somewhat “steppy” appearance at the lower end of the range, where small steps produce large changes in perceived brightness.
To compensate for this, a nonlinear (gamma-corrected) dimming curve function is available, which maps the 256-level DMX channel range to a non-linear range of power values which better represents

the perceived brightness, giving a much more even range of brightnesses (greyscale), and virtually eliminates visible stepping even at very slow transition speeds.

A consequence of this is that where accurate colour mixing is required, the proportions of each colour required to produce a desired shade may be different to what would normally be expected (e.g. on screen). For situations where this is an issue, an option is provided to select a linear brightness curve.

Data timeout
All outputs will be switched off if there is no DMX signal for 10 seconds. The LED will light continuously yellow in this mode.
The timeout is reset when any DIP switch setting is changed.
In USB playback mode, outputs will blank 10 seconds after USB stick is removed or a file read error occurs.

Status LED indications
Dim white : power on, DMX or RS485 mode, no data

Green flash : Complete DMX data frame received. The LED will only flash if sufficient channels for the dimmer have been received, taking account of the DMX start address.
Yellow : DMX timeout
Magenta : Mounting/reading USB device.
Flashing Magenta /red indicates USB error.
White flash : DIP switch change.
Red : USB error

Test modes
Test modes allow testing & faultfinding of installations without DMX data (or overriding any data being received).

In all test modes, the test pattern cycles automatically.
If a button is pressed, it stops cycling and can be stepped up or down manually using the Ch- and Ch+ buttons.
Pressing both buttons together resets the cycle to the start
Changing the DIP switch restarts the auto-cycling.

Bank check mode
All channels within a bank are turned on at 25% in turn. The status LED indicates which bank is on (a = red, b = green, c = yellow, d = blue)

Channel check mode
Each of the 8 outputs in each bank is set to 25% white in turn, In the sequence <off>, 1,2 .. 8 to verify that each fixture is connected to the correct output. To select a specific channel, press both buttons together to reset to the “off” state, then count button presses up/down

Power check mode
This mode is used for testing of heating, measuring power supply load, and burn-in testing.
All outputs are initially set off, then increase in 15 steps to maximum

Factory test mode
All panel LEDs cycle r/g/b off
Outputs cyele test pattern at configured output current
Pressing both buttons overrides configured current and sets current to minimum.
Once overridden, pressing left sets current to 425mA, right sets to 700mA.
Note that that once override is enabled, the unit must be power-cycled to restore configured current settings. Current mode LEDs are blanked once override is active.
Any DIP switch change will flash the status LED white

NOTE : This mode transmits data and will cause interference on a running system!

Setting output current.

Output current for each bank is indicated by one of four RGB LEDs. The current corresponding to each colour is indicated on the front panel (this may vary for custom versions, so is not documented here).
To set the current, ensure the dimmer is NOT in test mode (channel switches must be in range 1-27).
Press & hold both buttons until the current indicator LEDs all go out, then the release the buttons.
If all banks were previously set to the same current, all LEDs will flash, otherwise only the bank A LED will flash.
Pressing the right button increments the current for the bank(s) indicated. The left button changes to the next bank.
To exit this mode and update the current settings, press and hold the left button until the LEDs go out. When the button is released, the dimmer will restart with the new settings.
The LED current is NOT updated while the current is being set, to avoid possible overcurrent damage to the LEDs. Powering down the dimmer without exiting the current-set mode will leave the settings unchanged.

Firmware updates
The dimmer's internal software can be updated using a USB memory stick.
Copy file "firmware.bin" to a memory stick
Press and hold both buttons.
Insert memory stick while both buttons are pressed
Release buttosn when LED turns blue
LED sequence should show violet, blue, yellow then green. (Approx 5 seconds), and then the dimmer will restart.

DO NOT remove the USB stick or disconnect power until the LED has gone to green.

To determine the current firmware version, press and hold both buttons, then insert a memory stick which does NOT contain a file called "firmware.bin".
The LED should flash violet briefly. Wait 2 seconds then remove the memory stick.

The memory stick should now contain a text file "version.txt" containing firmware version information.

Differences between LDRV24 and LDRV32		
	LDRV24	LDRV32
Channels	24, 8 banks of 3	32, 4 banks of 8
Connectors	5.08mm pluggable terminal block Common Anode	16 pin JST XAD Individual anode/cathode
Interface	DMX	DMX or RS485
RGB limit function	Yes	No
Current setting	350,450,620,700mA Factory configured.	250, 350,425,500,600,700mA User settable per bank of 8 channels
Supply Must be at least 2V above LED Vf	12-48V	12-24V
PWM frequency	250Hz (500Hz with special firmware)	250Hz (500Hz with special firmware)

USB playback
** Only basic test functionality at present – contact WWL if you require this **
RGB file formats are not currently supported.

Standalone playback from USB stick allows standalone operation. The dimmer can also act as a master to control additional slave dimmers for increased channel count.

The USB stick must be formatted as FAT16 or FAT32.
The following files must be present. Both are text files, which must have <CR><LF> at the end of each line.

1) Config.txt
Sample file : some values are not relevant to this version.

```
; config file for player
; parameter type, value
;
*      ; start of data marker, looks for this and then numerics
1,1    ; config file version
2,250  ; baud rate, kbaud. only 250 and 333 supported
3,0    ; protocol : 0=DMX
4,1    ; Number of buses (universes) ignored used in this version
5,32   ; Nodes per universe = length of DMX frame
6,0    ; options : b0: warning only on out-of-range mappings, b1: error on unmapped nodes
7,96   ; AVI X pixel size, MUST be multiple of 4
8,1    ; AVI Y pixel size
9,0    ; mapping type 0 = use csv mapping file
0,0    ; end marker - must be present
```

2) maptable.csv
Pixel mapping is determined by the "maptable.csv" file. This file contains 4 fields per line :

<dmx universe> , <dmx channel>,<x co-ordinate>, <y co-ordinate>
Sample :

```
1,1,0,0
1,2,1,0
1,3,2,0
1,4,3,0
1,5,4,0
```

Entries may be in any order. <dmx universe> will always be 1 in this version. DMX channels start at 1, X/Y co-ordinates start at 0. 0,0 is top-left corner.
The above example shows the start of a simple 1:1 channel mapping for a 1 pixel high AVI.

Error reporting
If there is a problem with the config.txt or map.csv files, the LED will light red and magenta after card insertion
A diagnostic log file can be written to the card to trace problems. To enable this, press the Ch- button while inserting the USB stick. A log file LOG.TXT will be written, which should indicate the cause of the error, as well as listing the configuration values being used.
Typical errors may include duplicate mappings, pixel addresses outside the frame size, or no files found with valid AVI format or size.
Warning : Logging has been seen to occasionally corrupt a USB drive, requiring reformatting, so be sure to keep copies of all files! If you see odd things happening when logging has been enabled, reformat the USB drive.

AVI files and behaviour
Current functionality just loops a single file, and buttons can select other files. Files are named F01.AVI, F02.AVI etc. Future versions will allow external triggers via the remote connector to change files.
<To be completed>

External control interface (optional – specified at time of ordering)

The “Remote” connector is used to sense external events, in particular for use with standalone playback mode. Custom firmware is required to use this connector.
Inputs are contact-closures or open-drain, to connect the pin to ground (the G pin on the connector).
There is also provision for one analogue input (e.g. ambient light sensor) and RS232 data input and output.

AVI file format

AVI files must be in the following exact format : Uncompressed, 8bpp monochrome,
Width and height as specified in the config.txt file.
They will be played at the framerate indicated in the AVI file where possible (up to approx. 100fps)

It is strongly recommend that virtualdub (http://www.virtualdub.org/) is used to process content down to the final display resolution as this is known to create files in the correct format, and very easy to use.

Use the following settings XX and YY are the X/Y pixel size specified in config.txt:
Audio->no audio
Video->compression : uncompressed
Video->colour depth : Luminance only (Y8)
Video->Filters->add resize filter. Aspect ratio disabled, absolute size, XX x YY pixels.
Video->Frame rate : Change frame rate to 45fps for maximum speed (faster rates will display at 45fps)

Optional tweaks :
Use video->filters->resize->cropping if required to select area of source frame to use.
Select in/out time points with markers if required

File->save as AVI

Note that monochrome AVI files from Virtualdub do not use intensity values 0-15 or 240-255.
The player maps the used range of 16-239 to the full 0-255 intensity range of the display.