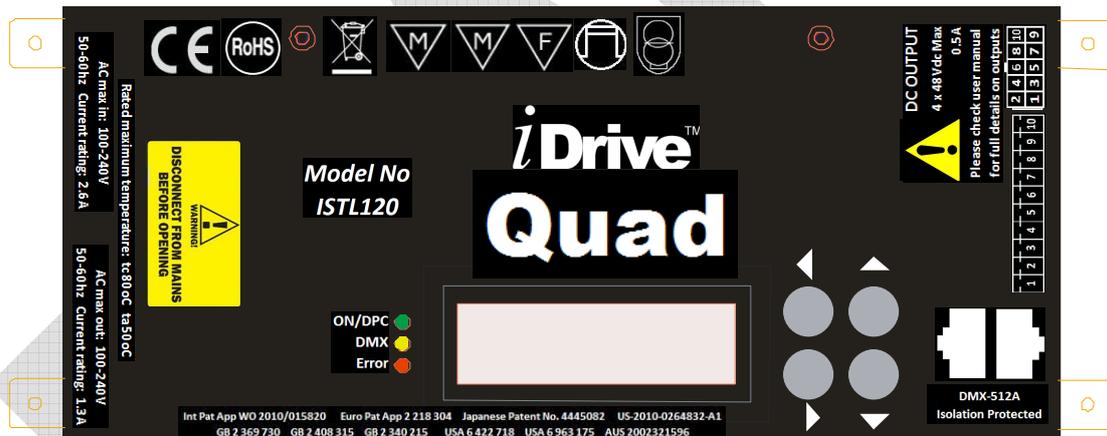




**Integrated System Technologies Ltd**

# iDrive™ Quad

User Manual



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## **Integrated System Technologies Limited Patent Portfolio**

Integrated System Technologies Limited strongly respect innovation and know-how and the organisation continues to invest significantly in developing an intellectual property portfolio covering Lighting, LED fixtures, power supplies and LED drivers in order to protect its innovation.

### **Related Patents**

The following patents and patent applications may apply:

United Kingdom Patent No(s): 2,340,215; 2,369,730; 2,408,315; 1,433,363; 0720488.6; 0814255.6

Japan Patent No: 4445082

United States Patent No(s): 6,422,718; 6,963,175; 11/912 098; 12/738 750; US-2010-0264832-A1

Australia Patent No(s): 2002321596;

Czech Republic Patent No: 1,433,363

Denmark Patent No: 1,433,363

France Patent No: 1,433,363

Germany Patent No: 602 31 418.6

Ireland Patent No: 1,433,363

Italy Patent No: 1,433,363

Luxembourg Patent No: 1,433,363

Monaco Patent No: 1,433,363

Switzerland Patent No: 1,433,363

The Netherlands Patent No: 1,433,363

Sweden Patent No: 1,433,363

European Patent Application No(s): 05735894.7; 08750475.9;

PCT Patent Application No: PCT/GB2009/001923

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## **Chapter 1: Introduction**

The iDrive™ Quad is a multiple current source solution, which caters for applications for up to 120W (at 25°C). The 4 channel DMX-512 controllable independent current sources, allow all the flexibility you need in driving your high brightness LEDs.

### **1.1 Features**

- DMX512-A compliant with auto-addressing functionality
- RDM – Remote Device Management
- Setup via front panel LCD interface
- Smooth LED light dimming
- Continuous current output eliminates flickering
- Very high efficiency (up to 95%)
- Auto Load Detection – Allowing connection of multiple LEDs per channel
- Self diagnostics prevent damage to the unit and to the LEDs
- Wrong wiring, open/short protection for each output with indication on LCD
- TP – Thermal protection of LEDs on each output (on supported LED luminaires)
- DRTP – Thermal Protection algorithm prevents driver from overheating

### **1.2 Applications**

- Architectural illuminations
- LED Lighting effects
- Theatrical LED lighting
- Commercial Lighting
- Home Lighting

### **1.3 Safety Warnings**

1. The unit is intended for maximum operating ambient temperature 35°C.
2. 10A shall be provided in building installation for connection to the mains supply.

## **Chapter 2: Mounting and Installation**

The iDrive™ Quad is a stand-alone or wall mountable solution (fixings not included).

For proper installation and subsequent operation of each unit, pay special attention to the following recommendations:

- ✓ Upon unpacking the product, inspect the contents of the carton for shipping damages. Do not install damaged units.
- ✓ Ensure proper ventilation of each unit and avoid areas where corroding, deteriorating or explosive vapours, fumes or gases may be present.
- ✓ Allow for proper clearance of unit enclosure and wiring terminals for easy access, hardware configuration and maintenance.
- ✓ Ensure the unit is securely attached, properly mounted if positioned in a rack enclosure, and free of excessive vibration.
- ✓ Avoid touching the chassis surface during the operation, power down the unit and allow it to cool down before touching the chassis.
- ✓ The chassis can get hot during a continuous operation with a connected load
- ✓ Ensure that the power is disconnected before installing, wiring, or servicing the unit.
- ✓ Do not attempt to install or use the unit until you read and understand the installation instructions and safety labels.
- ✓ Do not use the product if power cables are damaged

The instructions and precautions set forth in this user manual are not necessarily all-inclusive or relevant to all applications as IST cannot anticipate all conceivable or unique situations.

### **2.1 Installation considerations**

The iDrive™ Quad model may be mounted on any of two surfaces using standard M4 screws. The driver chassis comes with four mounting points on the base as shown in figure 2.1a with maximum allowable torque of 2Nm. Ideally, the driver should be firmly secured to a permanent wall or ceiling and is suitable for indoor purposes only but if there are aspects of the installation environment that may cause concern please contact IST on [support@istl.com](mailto:support@istl.com) for further installation support.

When selecting a mounting location and orientation, the unit should be positioned so air flow is not restricted. Maintain a 50mm minimum clearance around all sides of the driver and route all cables so airflow is not obstructed. If the unit is mounted in a horizontal position with the LCD screen facing upwards, this could cause permanent heat damage to the LCD display and the driver SHOULD be mounted or freestanding vertically so the LCD is on the side of the driver. (see fig 2.1a)

If a large number of units are installed in a very small area it is essential that there is adequate ventilation and airflow to ensure that any excess heat generated from the PSU units should be removed from the area otherwise the drivers may not operate as intended.

Avoid excessive bending of input or output power cables after they are connected to the iDrive™ Quad drivers.

For high-current outputs, use cable-ties to support heavy cables and minimize mechanical stress on output connectors. Be careful not to short-out to neighbouring output connectors.

Avoid applications in which the unit is exposed to water or high humidity levels that exceed the specified levels. In such applications, an IP enclosure mounting design is required taking into account the thermal considerations of the driver. The iDrive™ Quad has been designed for indoor use only.

Avoid applications in which the unit is exposed to excessive shock or vibration levels that exceed the specified levels. In such applications, a shock absorption mounting design is required.

**INSTALLTION MOUNTING GUIDE**

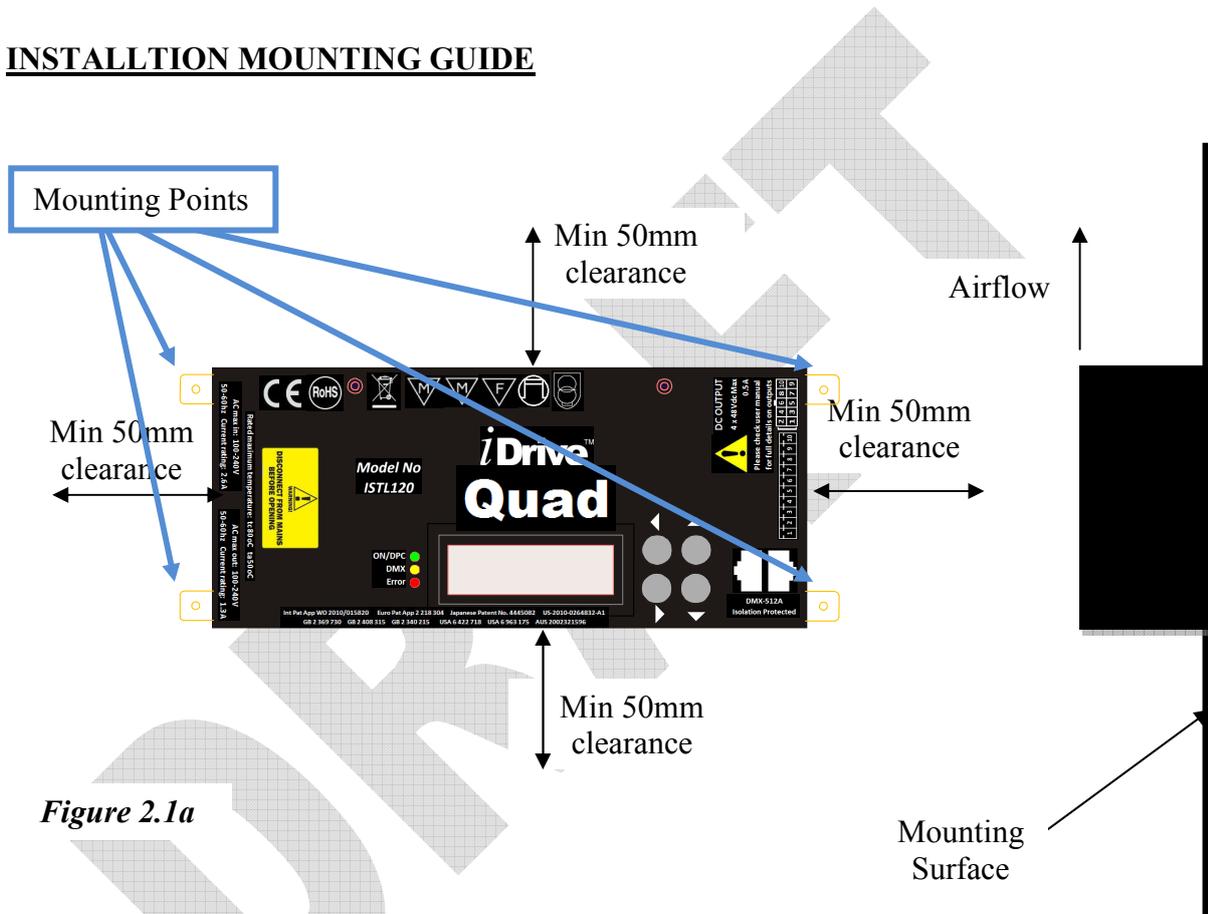


Figure 2.1a

**2.2 QUAD DOs and DON'Ts**

- Do not unplug the LED driver while input power is applied to the iDrive™ Quad as transient spikes to the driver may cause damage.
- Do not restrict airflow to the unit as high power, high efficiency LED drivers still require heat to be dissipated from the unit in order to meet expected operation. Keeping LED drivers well below maximum operating temperature will improve the lifetime characteristics. If large numbers of LED driver units are placed in a small area such as a maintenance area then ensure there is adequate ventilation and airflow in order to dissipate any excess heat.
- Always ensure that output connector to the LED fixture are properly wired and connected to the unit before applying power. Some types of LED emitters can fail if plugged directly into a PSU that is already switched on.

- Positive and Negative power cables should be run next to each other to minimize inductance.
- Always wait until the LEDs within an LED fixture have gone off after shutting off power to the LED driver.
- The LED driver assemblies do not have user serviceable components. They must be returned to the factory for repairs. Contact Customer Service for a RMA number before returning the unit. Do not attempt to repair or modify the power supply in any manner as this will void any warranty.
- Use proper size wires to avoid overheating and excessive voltage drop.
- Do not spill or expose the iDrive™ Quad LED driver to water or high levels of humidity.
- Do not power the iDrive™ Quad unit from a mains dimmer switch as the unit is not designed for such devices.
- Only use the iDrive™ Quad units on the appropriate input voltage supplies. Please check the AC voltage range is compatible with the specifications outlined for the driver.

### **2.3 Guidelines for Optimum EMC Performance**

The iDrive™ Quad LED Driver series is designed to comply with European Normative limits (EN) for conducted and radiated when correctly installed in a system. However, power supply compliance with these limits is not a guarantee of system compliance and it is recommended that the full system is designed to meet the relevant EMC EN standards. System EMC performance can be impacted by a number and combination of items. Design consideration such as PCB layout and tracking, cabling arrangements and orientation of the power supply amongst others all directly contribute to the EMC performance of a system.

Cabling arrangements and PCB tracking layouts are the greatest contributing factor to system EMC performance. It is important that PCB tracks and power cables are arranged to minimise current carrying loops that can radiate, and to minimise loops that could have noise currents induced into them.

All cables and PCB tracks should be treated as radiation sources and antennae and every effort should be made to minimise their interaction

- a. Keep all cable lengths as short as possible.
- b. Minimise the area of power carrying loops to minimise radiation, by using twisted pairs of power cables with the maximum twist possible..
- c. Run PCB power tracks back to back.
- d. Minimise noise current induced in signal carrying lines, by twisted pairs for sense cables with the maximum twist possible.
- e. Do not combine power and sense cables in the same harness
- f. Ensure good system grounding. System Earth should be a “starpoint” and all other earths should go to the ‘starpoint”

The Quad LED driver has been tested and approved to relevant EN standards.

## 2.4 Unit Connection

The iDrive™ Quad has an AC mains IEC input and also a mains IEC output to link the AC supply to additional units. It also has 2 x RJ45 connectors for the DMX-512A. The lighting fixture can be connected to the DC output via a 10 pin terminal connector or a 10 pin molex connector.



*Please ensure that all cables are wired correctly and the cables are supported if they are long or heavily bent in order to reduce stresses on the driver PCB board.*

### MAINS INPUT

The product can be connected to 100V ~ 240V mains supplies with an AC mains outlet for connection to additional units.



*Make sure the number of units connected in series from a single loop-in loop-out power cable does not exceed the current rating of the power cable or the circuit breaker specifications, otherwise normal operation may be affected.*

### DMX-512A

The DMX-512A is connected via RJ45 connectors, configuration as below:

Function	RJ45 Pin	Colour	XLR Pin	Colour
Ground	7	White/Brown	1	Black
Ground	8	Brown	1	Black
Data -	2	Orange	2	Blue
Data +	1	White/Orange	3	Red
Aux Data -	6	Green	4	-
Aux Data +	3	White/Green	5	-

PLEASE NOTE: Before connecting any DMX controller, refer to the installation guide of the DMX controller manufacturer.

### OUTPUTS

The fixtures are connected using 10 pin terminal connectors or 10 pin molex connectors.

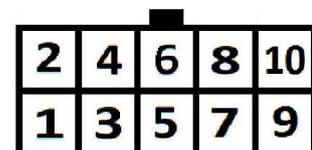


Pin 1

Pin 10

10 Pin Terminal

10 Pin Molex



The quad is capable of controlling fixtures using common anode cabling. Pin details for standard cabling and common anode cabling as follows:

Pin Details for standard wiring		Pin details for Common Anode	
Pin 1	Channel 1 +	Pin 1	Common Anode
Pin 2	Channel 1 -	Pin 2	Channel 1 -
Pin 3	Channel 2 +	Pin 3	Not connected
Pin 4	Channel 2 -	Pin 4	Channel 2 -
Pin 5	Channel 3 +	Pin 5	Not connected
Pin 6	Channel 3 -	Pin 6	Channel 3 -
Pin 7	Channel 4 +	Pin 7	Not connected
Pin 8	Channel 4 -	Pin 8	Channel 4 -
Pin 9	Thermistor	Pin 9	Thermistor
Pin 10	Thermistor	Pin 10	Thermistor

The Quad driver features the TP – Fixed Thermal Protection which protects the LED fixture from overheating while maintaining light output. For more information about thermal protection, please see the *TP – Fixture Thermal Protection* section.

PLEASE NOTE: If the NTC sensor is not connected, TP protection will be disabled for that output.

**DRAFT**

## 2.5 Cable type / length limitations for different LED loads

LED wiring should use AWG18 cable. Please refer to cable type / length limitations tables below for selecting the correct cable type.

### At driving current 350mA

Vf(LED)	3.20		If(LED)	0.35A		MAX VLED				48			
AWG Copper	Diameter (mm)	Ohms Per Km	Max Current (A)	Voltage Drop @ 100m	Max LEDs 50m	Max LEDs 100m	Max LEDs 150m	Max LEDs 200m	Max LEDs 250m	Max LEDs 300m	Max LEDs 400m	Max LEDs 500m	Max LEDs 1Km
12	2.053	5.211	9.30	0.18	14	14	14	14	14	14	14	14	13
15	1.45	10.45	4.70	0.37	14	14	14	14	14	14	14	13	12
18	1.024	20.95	2.30	0.73	14	14	14	14	13	13	13	12	10
22	0.644	52.96	0.92	1.85	14	13	13	12	12	11	10	9	3
24	0.511	84.22	0.58	2.95	14	13	12	11	10	9	7	5	X
26	0.405	133.9	0.36	4.69	13	12	10	9	7	6	3	X	X

### At driving current 700mA

Vf(LED)	3.40		If(LED)	0.7A		MAX VLED				47			
AWG Copper	Diameter (mm)	Ohms Per Km	Max Current (A)	Voltage Drop @ 100m	Max LEDs 50m	Max LEDs 100m	Max LEDs 150m	Max LEDs 200m	Max LEDs 250m	Max LEDs 300m	Max LEDs 400m	Max LEDs 500m	Max LEDs 1Km
12	2.053	5.211	9.30	0.36	13	13	13	13	13	13	12	12	11
15	1.45	10.45	4.70	0.73	13	13	13	12	12	12	12	11	9
18	1.024	20.95	2.30	1.47	13	12	12	12	11	11	10	9	5
22	0.644	52.96	0.92	3.71	12	11	10	9	8	7	5	2	X
24	0.511	84.22	0.58	5.90	12	10	8	6	5	3	X	X	X
26	0.405	133.9	0.36	9.37	11	8	5	2	X	X	X	X	X

### At driving current 1000mA

Vf(LED)	3.60		If(LED)	1.0A		MAX VLED				46.25			
AWG Copper	Diameter (mm)	Ohms Per Km	Max Current (A)	Voltage Drop @ 100m	Max LEDs 50m	Max LEDs 100m	Max LEDs 150m	Max LEDs 200m	Max LEDs 250m	Max LEDs 300m	Max LEDs 400m	Max LEDs 500m	Max LEDs 1Km
12	2.053	5.211	9.30	0.52	12	12	12	12	12	11	11	11	9
15	1.45	10.45	4.70	1.05	12	12	11	11	11	11	10	9	7
18	1.024	20.95	2.30	2.10	12	11	11	10	9	9	8	7	1
22	0.644	52.96	0.92	5.30	11	9	8	6	5	4	1	X	X
24	0.511	84.22	0.58	8.42	10	8	5	3	1	X	X	X	X
26	0.405	133.9	0.36	13.39	9	5	1	X	X	X	X	X	X

- ❖ All max. LEDs' values are per channel
- ❖ LED figures are based upon 2 x voltage drop to cover the voltage drop to and from the fixture

## **Chapter 3: Unit Setup and Operation**

### **3.1 Unit Power-Up Sequence**

After applying power to the unit, it will perform a quick self test for correct output LED wiring and a proper voltage from the DC power supply. Each of these tests is followed by corresponding messages on the LCD screen.

#### **LED Wirings Test**

The product has a unique, algorithm for detecting load type and wrong LED connections. It can detect if the LED's (+) and (-) lines are having a short circuit between them or mixed connection with a neighbour channel inside the plug terminal. If the unit detects an incorrect wiring on one of the outputs, that group of channels will not be operational until the problem is fixed.

If during normal operation some of the LEDs are reconnected, the LED wiring test will be initiated on the group which the disconnected channel belonged to. That way LEDs can be hot-plugged into system, however connecting/disconnecting LED while powered on is not recommended. It is always better to make all of the connections first and then turn the power on.

#### **Auto Load Detection**

Each channel of the Quad is capable of auto-detecting the LED load type connected to it and selecting the appropriate operating mode to control that load.

#### **Driver Thermal Protection**

The Quad has internal temperature sensor which allows it to monitor the temperature of the internal power circuitry. If by any reason external ambient temperature rises above the permitted limit, the unit will not allow the internal circuitry to overheat by reducing the output power. By doing so, it's avoiding driver malfunction caused by overheating, still driving the LEDs even at worst conditions and preserving the Quad unit's lifetime.

### 3.2 Quad LCD Control Panel



#### **ON/DPC Indicator**

Lights up to show the power is on. If LED flashes the driver is compensating for the power as the selected output power by the user is too great.

#### **DMX Indicator**

Lights up to show the unit is receiving DMX signal

#### **Error Indicator**

This light will flash to indicate there is a problem with the setup and one of the output channels is not setup correctly. If no fixture is connected to an output, ensure the settings are changed for this output to UNUSED (*Refer to DMX Setup*)

#### **Back / Cancel**

Use this button to go back one level in the menu or to move back and cancel the changes you are about to make.

#### **Enter / Accept**

This will take you through to the next menu/options available. When in a menu showing the value of the settings, pressing this button again will allow you to change the settings.

#### **Scroll Up / Down**

The scroll Up and Down buttons can be used to move up and down through menus and also to move up and down to change settings.

**3.3 Menu Map**

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	SUB MENU 4
DMX SETUP	Control Mode	<b>Settings</b>		
	DMX Address	<b>Settings</b>		
	DMX Lost Mode	<b>Settings</b>		
	MASTER Offset	<b>Settings</b>		
	RED Offset	OP1 DMX MODE	<b>Settings</b>	
	GREEN Offset	OP2 DMX MODE	<b>Settings</b>	
	BLUE Offset	OP3 DMX MODE	<b>Settings</b>	
	AMBER Offset	OP4 DMX MODE	<b>Settings</b>	
EFFECT SETUP	EFFECT Preset	<b>Settings</b>		
	EFFECT			
	(Effect Settings)	<b>Settings</b>		
FIXTURE SETUP	PASSWORD	R max curr	<b>Settings</b>	
		G max curr	<b>Settings</b>	
		B max curr	<b>Settings</b>	
		A max curr	<b>Settings</b>	
		Thermistor	<b>Settings</b>	
		Derate min	<b>Settings</b>	
		Derate mex	<b>Settings</b>	
		Reposnse	<b>Settings</b>	
		Screen Saver	<b>Settings</b>	
		Password	<b>Settings</b>	
		Standby Time	<b>Settings</b>	
		Reset defaults	<b>Settings</b>	
OBSERVE	LED Supply	<i>Review observations</i>		
	LED Status	<i>Review observations - Use scroll buttons</i>		
	LED TEMPS	<i>Review observations - Use scroll buttons</i>		
	DRIVER TEMP	<i>Review observations</i>		
	DMX VALUES	<i>Review observations - Use scroll buttons</i>		
	ON TIME	<i>Review observations</i>		
	ON/OFF	<i>Review observations</i>		
	SOFTWARE VERSION	<i>Review observations</i>		
	EVENT LOG	<i>Review observations</i>		
LCD Contrast	<b>Settings</b>			

### **3.4 Menu Options and Descriptions**

#### **DMX SETUP**

##### Control Mode

This sets the DMX mode for the driver. The options are:

- |            |  |
|------------|--|
| Standalone | Will operate as a standalone unit  |
| Master     | The Quad will act as a Master DMX controller and will pass the signal to any slave units set to receiver, therefore any other units will produce the same sequence as the master |
| Receiver   | The unit will operate from instructions received from a Quad acting as a Master Controller or instructions received from a DMX controller.                                       |

##### DMX Address

Use this option to set the DMX address of the Quad

##### DMX Lost Mode

This tells the Quad what to do if the DMX signal is lost. The settings are as follows:

- |      |   |
|------|---|
| OFF  | All fixtures will be powered off if DMX signal is lost  |
| ON   | All fixtures will maintain the last instruction received  |
| 1-60 | This is the number of seconds the Quad will maintain the last instruction before turning off all fixtures |

##### Master Offset

"Master Offset" sets the offset of a DMX master channel. A DMX value sent to this channel affects **ALL** the other channels as a multiplier.

If the master offset is set to X then no master channel is used and will then revert to the standard DMX Offsets

##### Red Offset, Green Offset, Blue Offset, Amber Offset

Here you can select each output (1 to 4) and tell the Quad what DMX offsets to use on each channel. Default is Red Offset = 0 Green Offset = 1 Blue Offset = 2 Amber Offset = 3

If you wanted to set the DMX address and run all the channels on the same instruction, all of the above (all channels) would be set to offset = 0. This would mean all the channels on the Quad would respond to instructions from the first channel on the DMX controller assigned to the Quad.

#### **EFFECT SETUP**

##### Effect Preset

This allows you to set up an effect preset such as rainbow, step or random.

##### Effect

This area allows you to set the internal program/sequence to be used. The options available are Static, Random, Step, Cyclic and X-Fade.

##### Settings

Any further options below the effect will change dependent upon which effect has been selected. The various options that will be available will colour, type and length/time. All of these settings will change the routine of the effect selected.

## **FIXTURE SETUP**

The fixture setup area is password protected to stop anyone changing the current settings, etc. The default password is 1 2 3 4. To enter this use the scroll buttons to move up and down to select the number, then press the Enter/Accept button to move to the next number.

Once in the Fixture Setup menu, you will be able to set/change any of the following settings:

- Red maximum current (Channel 1)
- Green maximum current (Channel 2)
- Blue maximum current (Channel 3)
- Amber maximum current (Channel 4)
- Thermistor settings
- Derate minimum
- Derate maximum
- Response (Linear/Curve)
- Screen Saver (Set screen saver title)
- Password
- Standby Time
- Reset Defaults

*See the section Example scenarios for Current Setup*

## **OBSERVE**

The observe menu lets you check the status on several areas of the Quad. By scrolling down the menu and entering into a submenu, you will see the current operating parameters.

Areas for observation are LED Supply, LED Status, LED temperatures, Driver temperature, DMX values, On time, On/Off count, Software version and event log.

## **LCD CONTRAST**

This will allow you to adjust the LCD contrast to make it more visible from the viewing when changing settings.

**3.5 Example scenarios for Current setup**

**Scenario 1:**

12 LEDs per channel, assuming average 3.2V per LED

**EFFECT = STATIC, FIXTURES MAX CURRENT = 350mA per channel**

Channel No	1	2	3	4	
Current (mA)	350	350	350	350	TOTAL
Voltage	38.4	38.4	38.4	38.4	WATTS
Watts	13.4	13.4	13.4	13.4	53.6

**Scenario 2:**

12 LEDs per channel, assuming average 3.2V per LED

**EFFECT = STATIC, FIXTURES MAX CURRENT = 500mA per channel**

Channel No	1	2	3	4	
Current (mA)	500	500	500	500	TOTAL
Voltage	38.4	38.4	38.4	38.4	WATTS
Watts	19.2	19.2	19.2	19.2	76.8

**Scenario 3:**

12 LEDs per channel, assuming approx 3.2V per LED

**EFFECT = STATIC, FIXTURES MAX CURRENT = 700mA per channel**

Channel No	1	2	3	4	
Current (mA)	700	700	700	700	TOTAL
Voltage	38.4	38.4	38.4	38.4	WATTS
Watts	26.9	26.9	26.9	26.9	107.6

### **3.6 RDM Functionality (From software version 1.28 onwards)**

Remote Device Management (RDM) is an ANSI Standard and protocol enhancement to USITT DMX512A that allows bi-directional communication between a lighting or system controller and attached RDM compliant devices over a standard DMX line. This protocol will allow configuration, status monitoring, and management of these devices in such a way that does not disturb the normal operation of standard DMX devices that do not recognize the RDM protocol.

RDM data packets of information are inserted in-between the existing DMX data packets being used to control the lighting data. The DMX 512 specification always requires that DMX packets begin with the start code. The default Start Code is 0x00 (also known as the Null Start Code). By using the start code 0xCC, RDM packets can be safely inserted between DMX data packets without older non-RDM aware devices attempting to read them

The RDM standard ensures that in all cases (except discovery) only one device is authorized to be transmitting at any given time. Only the controller (of which there can be only one) can start an RDM exchange. Responders can speak only if spoken to. The controller will always initiate all RDM communication.

The RDM protocol is changing the way lighting systems are installed and commissioned as it can provide:

- Addressing of devices controllable by DMX512A
- RDM devices can be automatically "discovered" by the controller, allowing an automated "equipment check" to be performed.
- Parameters which are set using "DIP switches" or a display on the drivers, such as DMX512 starting slot (address), personality, etc., can now be set directly from the console or RDM controller.
- Status and Error messages from RDM devices can be reported back to the controller, alerting the user to a potential problem.
- An RDM controller could display lamp status and lamp hours of all of the moving lights in a rig.
- Devices, such as LED lights, can be manufactured without DIP switches or controls of any type and be installed in inaccessible locations because, by using RDM, the DMX512 slot (address) can be set or changed at any time through an RDM controller.

#### **RDM Functions**

The Quad driver supports ANSI E1.20 – 2006 RDM and is implemented as a ROOT device and 4 sub-devices, 1 for each LED Channel. The Quad also includes full RDM device discovery enabling all RDM devices to be detected on a system.

#### **ROOT Device Implemented Functions**

The ROOT Device Implementation supports the following functions:

- DEVICE\_INFO
- IDENTIFY\_DEVICE
  - This function flashes the backlight of the LCD display.
- DMX\_START\_ADDRESS

- This function enables the DMX start address value to be read or set
- **DMX\_MASTER\_OFFSET**
  - This function enables the DMX master channel offset value to be read or set
- **SOFTWARE\_VERSION\_LABEL**
  - This function will show what the current software version is running on the driver
- **SUPPORTED\_PARAMETERS**
- **PARAMETER\_DESCRIPTION**
  - **DEVICE\_LABEL**
    - This function Gets/Sets the label used as screen-saver on LCD display.
  - **MANUFACTURER\_LABEL**
  - **DEVICE\_HOURS**
    - This function shows how many hours the driver has worked
  - **DEVICE\_POWER\_CYCLES**
    - This function shows how many times the driver has switched on and off
  - **SENSOR\_DEFINITION**
    - 1 Motherboard temperature sensor
    - 2 Power Supply 1 Output Voltage
    - 3 Power Supply 2 Output Voltage
- **SENSOR\_VALUE**
- **FACTORY\_DEFAULTS**
  - This function sets the driver device to factory default values.
- **DMX\_PERSONALITY**
  - 1) Every channel has its own offset, 0-23
  - 2) Every channel has the same offset, 0
  - 3) Custom, Offsets have been altered using the drivers LCD menu.
  - 4) 3 DMX channels used, offsets = 0, 1, 2, 0, 1, 2, 0, 1, 2....
  - 5) 4 DMX channels used, offsets = 0, 1, 2, 3, 0, 1, 2, 3....
- **Control Mode**
  - This function sets up the control mode as outlined in section 3.4
  - 0 = Receiver Mode, 1 = Stand-alone Mode or 2 = Master Mode
- **EFFECT\_TYPE**
  - This function sets up the type of effects used in standalone mode
  - 0 = X-Fade, 1 = Cyclic, 2 = Step, 3 = Random, 4 = No function
- **EFFECT\_SPEED**
  - This function defines the transition speed of the EFFECT\_TYPE chosen
  - 0 = 6 seconds to 15 = 24 hours
- **EFFECT\_FROM\_COLOUR**
  - This function reads or sets the start transition colour
- **EFFECT\_TO\_COLOUR**
  - This function reads or sets the finish transition colour
- **THERMISTOR**
  - This function reads or sets the thermistor type used in the LED fixture as discussed in section 3.8
  - 0 = (Beta Value 3630), AVX – NB20K00103KBA or AVX – NB12K00103JBB
  - 1 = (Beta Value 3892), BetaTherm - 10K3A1
  - 2 = (Beta Value 4000), EPCOS - B57321V2103J60

- 3 = (Beta Value 4480), EPCOS - B57371V2103J060
- DERATE\_MIN
  - This function reads or sets the temperature (in °C) at which de-rating will start having limit values between 25°C to 100°C.
- DERATE\_MAX
  - This function reads or sets the temperature (in °C) with limit values between 100°C and 150°C at which the power to the LED fixture should be 0% or fully off.

### **Sub-Device Implemented Functions (4 Channels)**

The 4 Sub-Device Implementation supports the following functions:

- DEVICE\_INFO
- IDENTIFY\_DEVICE
  - Similar to ROOT device as it flashes the LCD display backlight.
- DMX\_START\_ADDRESS
- SOFTWARE\_VERSION\_LABEL
  - This function will show what the current software version is running on the driver
- SUPPORTED\_PARAMETERS
- PARAMETER\_DESCRIPTION
  - SENSOR\_DEFINITION
    - 1) LED Output Current
    - 2) LED Output Voltage
- SENSOR\_VALUE

Further RDM commands can be implemented in the Quad upon request.

### **3.7 LED Driver Thermal Protection**

The Quad driver operates world leading thermal protection to ensure that the 4 channel LED driver will not fail prematurely due to high operating ambient temperatures in excess of standard operating conditions. The following are the different methods employed by the Quad for driver protection enabling the system to operate safely within harsh operating environments:

#### **Motherboard Thermistor**

The Quad utilises a thermistor located on the motherboard of the driver system which measures the ambient temperature within the driver chassis. The thermistor is measured continuously and its values can be accessed from the Observe menu on the front LCD panel and also via RDM (from version 1.28 onwards). The Quad driver will use the thermistor temperature sensor to provide a “power safe” mode to limit the maximum amount of LED output power and switches off at 70°C ambient temperature internally. The Quad driver will stay off until the driver temperature reads below 65°C.

#### **Output Stage Digital Temperature Sensors**

This independent thermal control system monitors the temperature of high precision digital temperature sensor built into the DSP output stage. The digital sensor measures the actual temperature of the electronics across the driver and is representative of the temperature of the electronics. If the temperature of the electronics board reaches 80% of the rated temperature the electronics system will shut down the set of 4 output channels. The DSP electronics are rated to

125°C so the shutdown temperature will be ~100°C. This ensures that most of the electronic circuits will be switched off before failure can occur. The resolution of the DSP digital temperature sensor is 0.18°C.

### **3.8 LED Fixture Thermal Protection**

The iDrive Quad enables up to 8 input ports for thermal feedback protection from the connected LED fixture's temperature providing the LED fixture contains a thermistor.

If the ambient temperature or incorrect fixture settings are applied to the LED fixture which causes the fixture to overheat (maximum set by Thermistor Settings in Fixture setup), the LED fixture Thermal Protection will reduce the level of the LED current (or power) through the fixture until the fixture's temperature is stabilized within the allowed limitations. If after that the ambient temperature reduces, the LED fixture Thermal Protection feature will automatically raise the level of LED current (or power) passing through the fixture. The changes in the amplitude of the LED current will not affect the colour of the LED Light fixture; it will only affect the intensity of the light from the LED fixture.

It should be noted that the intensity of the light closely depends on the LED junction temperature. For example, if the LED driven at 700mA current reaches high temperature, its light output may degrade by up to 70% depending upon which LED manufacturer is used within the LED fixture. In most cases, lowering the current through an LED, will in fact obtain the same light intensity while the temperature of the LED will be able to stabilize.

The LED Fixture Thermal Protection mode enables the LED system to automatically adapt itself to the ambient temperature around the LED fixture enabling the LEDs to operate within manufacturer's tolerances increasing life of the LED fixture and preventing premature failures.

- ❖ The Quad has been calibrated using the following NTC sensors:

- Thermistor 1: (Beta Value 3630), AVX – NB20K00103KBA or AVX – NB12K00103JBB

- Thermistor 2: (Beta Value 3892), BetaTherm - 10K3A1

- Thermistor 3: (Beta Value 4000), EPCOS - B57321V2103J60

- Thermistor 4: (Beta Value 4480), EPCOS - B57371V2103J060

**PLEASE NOTE:** If the NTC sensor is not connected to a particular LED fixture the Thermal Protection will be disabled for that particular LED Fixture output.

The status of Thermal Protection can be viewed in the Observe menu (*see Observe Menu in section 3.4*). Thermal Dimmer value represents the percentage of the output current rating (in reference to the nominal current rating value set in Fixture Setup).

For example, if the current rating is set to 700mA, then the normal current rating value is 700mA. If the Thermal Dimmer value is at 80% (as a result of Thermal Protection), then the maximal output current (at FL) shall be 80% of 700mA which is  $700 \times 80\% = 560\text{mA}$ .

**Setting LED Fixture Thermal Protection**

The LED fixture thermal protection can be set by creating a de-rating curve for each LED fixture that utilises two temperatures as follows:

- 1) "**Derate Min**" sets the temperature (in °C) at which de-rating will start. Up to this temperature 100% power will be provided to the LED fixture.
- 2) "**Derate Max**" sets the temperature (in °C) at which the power to the LED fixture should be 0%.

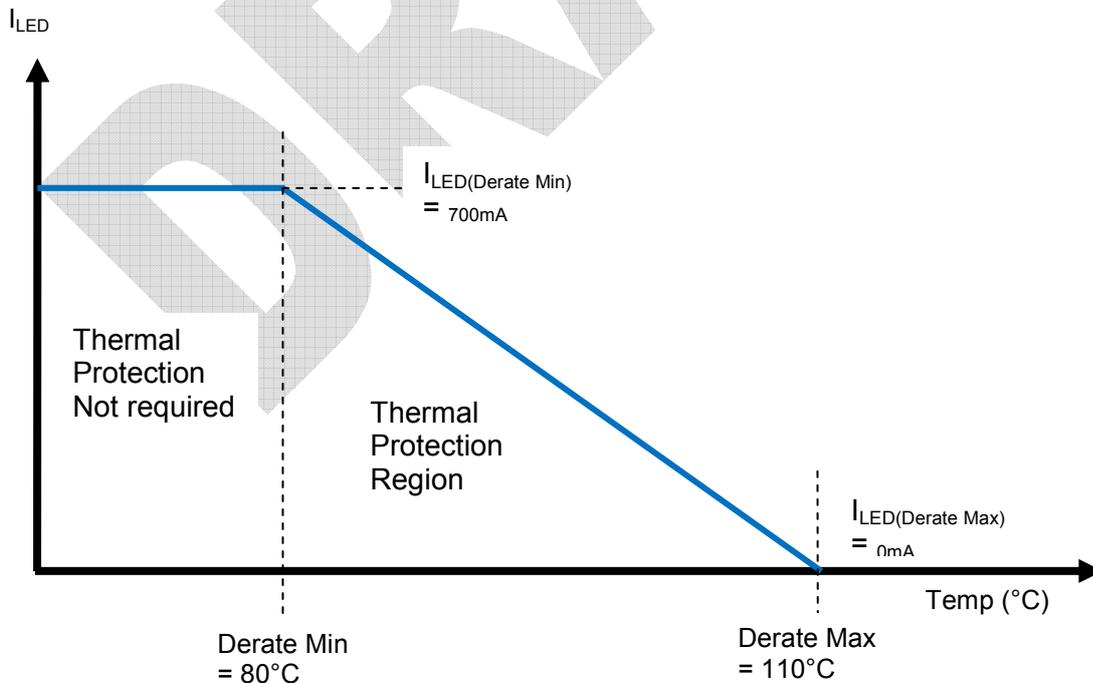
The iDrive Quad is able to define up to 8 thermistor inputs per driver.

Therefore, once the user has selected the type of thermistor used within the LED fixture they should select the Derate Min temperature in degrees C followed by the Derate Max temperature in degrees C.

For example, as shown in the figure below, an LED fixture running at a maximum forward current of 700mA may require the power to start to de-rate at a temperature of 80°C and completely switch off the LED fixture if the temperature of the fixture reaches 110°C or more.

Therefore, the average current through the LED can be determined as follows:

- 0°C < Thermistor Temp. < Derate Min means  $I_{LED} = 700mA$
- Derate Min ≤ Thermistor Temp. < Derate Max means  $I_{LED} = I_{LED}(\text{Derate Min}) - \text{Thermistor Temp.} * (\text{Derate Max} - \text{Derate Min}) / (I_{LED}(\text{Derate Min}) - I_{LED}(\text{Derate Max}))$
- Thermistor Temp. > Derate Max means  $I_{LED} = 0mA$



### **3.9 LED Driver Standby Mode (Energy Efficiency Mode)**

The iDrive Quad utilises an advanced Power Standby Mode when the system is not being used effectively which enables the power consumed by the system to be reduced down to only 2 Watts or less. The standby mode is entered automatically by the Quad system according to which mode the system was setup to operate in as follows:

#### **DMX Receiver Mode - Standby**

In DMX Receiver Mode the standby facility will be entered if the DMX signal to the driver stops for more than the standby time setting specified in the menu system.

The default setting for the standby setting time is XX seconds within a range of 1 to 60 seconds.

It is important to clarify the Standby Mode will not be entered if all DMX channel values are set to zero by the DMX controller it will only occur if the DMX signal is stopped from reaching the driver for a specific reason. For example, this event may occur due to a cable being unplugged or if a DMX controller becomes faulty.

The Standby Mode will be exited and the driver will enter full power mode when a DMX signal is detected.

#### **Stand-Alone Mode or DMX Master Mode- Standby**

In DMX Receiver Mode the standby facility will be entered if all the DMX channel values are set to zero for a period longer than that set by the standby time setting in the menu system.

The default setting for the standby setting time is XX seconds within a range of 1 to 60 seconds.

The Standby mode will be exited and the driver will enter full power mode if any DMX channel value is set to a value above zero.

It will take approximately 5 seconds for the Quad LED driver to power up to full output from the standby power mode.

Chapter 4: Technical Data

Description		Specification
INPUT	Power Supply	100 ~ 240V AC
	Frequency Range	50 ~ 60 Hz
	Power Factor (Typ.)	PF>0.92/230VAC PF>0.99/115VAC at full load
	AC Current (Typ.)	10A/115VAC 5A/230VAC
	Inrush Current	+/-70A @ 115VAC -119.5A + 136.6A @ 230VAC
	Leakage Current	<1.2mA / 240VAC
	Efficiency (Typ.)	>85% at full load
OUTPUT	DC Voltage	48V
	Maximum Current	1A per channel
	Maximum Power	120W
	Load Regulation	+/- 0.5%
	Output Channels	4 channels
	Fixture Output	1 output
ENVIRONMENT	IP Rated	IP20 – dry location
	Working Temperature	-30 ~ + 80 °C (Refer to output derating curve)
	Storage Temperature	-40 ~ + 85 °C
	Working Humidity	20-90% RH non-condensing
	Storage Humidity	10-95% RH
COMMS	Communication Protocol Support	DMX-512A, Auto-addressing, RDM ANSI E1.20
	DMX Working Mode	4 channels
	Colour Grades	256 level (each colour) total 16,770,000 colours
PROTECTION	Fixture Protection	Open circuit, Short Circuit, Wrong interconnection
	Output Protection	Over voltage, Over temperature, Overload
	Thermal Protection (Unit)	Reduces output current to eliminate unit overheating
	Thermal Protection (Fixture)	Reduces light output to eliminate fixture overheating
CONNECTIONS	DMX Connection Type	RJ45
	Power In Connection Type	IEC Mains Inlet
	Output Connection Type	8 pin terminal block, pitch 3.5mm / 8 pin molex
STANDARDS	Approvals	TBA
Start Up Time	Start-up time to 100% output	4.9 Seconds

