ADVATEK LIGHTS
Creative Digital Lighting Solutions

PixLite 16 MkII

Hardware Rev 1.0

User Manual

V1.0

Contents

1 – Introduction

This is the user manual for the hardware version 1.0 PixLite 16 MkII pixel control board.

The PixLite 16 MkII controller converts the E1.31 (sACN) or Art-net protocols from a lighting console, media server or computer lighting software into various other data protocols and outputs that data in real time to control pixel lighting fixtures.

The PixLite 16 MkII features an output capacity of up to 96 universes of multicast/unicast E1.31 or Art-net data. It can also output an additional 4 universes of data on 4 DMX512 outputs in sACN/E1.31 mode, bringing the total E1.31 universes up to 100. This combined with an advanced feature-set and very easy to use configuration software make the PixLite 16 MkII an excellent choice for your pixel lighting application.

Note that this manual covers the PixLite 16 MkII controller with hardware revision V1.0 only. It only contains information specific to this physical control board, not the software configuration of PixLite controllers in general which can be found in the 'PixLite Configuration Guide'.

Separate manuals for other PixLite controllers and the PixLite Configuration Guide may be downloaded from here: http://www.advateklights.com/resources

2 – Safety Notes

2.1 – Static Electricity

The board comes shipped in an anti-static bag and has a number of static-sensitive components on it. Appropriate anti-static measures should be observed when handling the board. For example, you should never sit the controller on carpet and you should avoid touching components on the controller unnecessarily.

2.2 – Supplying Power

Power to the controller and outputs is applied via power bank screw terminal connectors, located on the left-hand edge of the board as shown in Figure 1 on the following page. They are both clearly marked on the PCB with the polarity and the power bank number.

Outputs on channels 1-8 are powered via power bank 1 and outputs on channels 9-16 are powered via power bank 2. The voltage on each bank can be anywhere between 5V and 30V DC independently and it is the user's responsibility to ensure that the power supply used matches the voltage of the pixel fixture they are using and that it can supply the correct amount of power/current. The total maximum current per power bank is 32 Amps, giving the board a total maximum current capacity of 64 Amps.
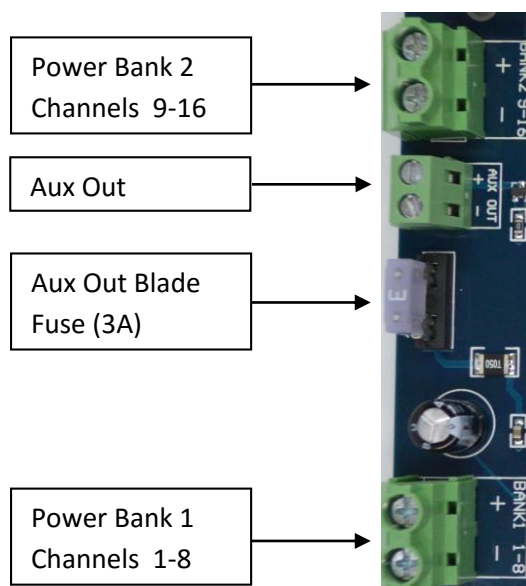

Power Bank 2
Channels 9-16

Aux Out

Aux Out Blade
Fuse (3A)

Power Bank 1
Channels 1-8

Figure 1

3 – Installation

3.1 – Power

3.1.1 - Power Banks

The PixLite 16 MkII has two split power banks, each with 8 individual outputs. The split banks allow two different voltages to be used on the controller simultaneously. (You could run 5v lights off one bank and 12v lights off the other one for example.)

3.1.2 - Output Fuses

Each individual output is protected by a 4A mini blade fuse. These may be changed to a higher or lower value depending on your specific application, provided any individual output does not exceed 7.5A and the total bank current capacity does not exceed 32A.

3.1.3 - Logic Power

No on board power configuration is required. Power to the logic circuitry is automatically regulated from the bank 1 power input. Simply connect your power supply of between 5V and 30V DC to the power bank 1 screw terminal (as shown in Figure 1). Logic power is fused using an on-board 500mA self-resetting polyfuse. This fuse will automatically trip very quickly in a fault condition and then re-set once normal operation resumes.

3.2 - Control Data

Control data to the PixLite 16 MkII is achieved via the via the single horizontal Ethernet jack. The controller supports Streaming ACN (sACN / E1.31) or Art-Net data.

3.3 – Installing the Lights

The pixel lights are connected directly via the pluggable screw terminal connectors along the top and bottom edges of the board. Each connector is labelled with its output channel number (1-16) and pin 1 is also clearly marked. (There is also a pin-out for the connectors clearly marked on the PCB silk-screen for quick reference.) Simply wire your lights into each screw terminal and then plug them into the mating sockets. The pin-out for the connectors in normal mode is also shown in Figure 2 on the following page.

+Ve |Clock | Data| GND
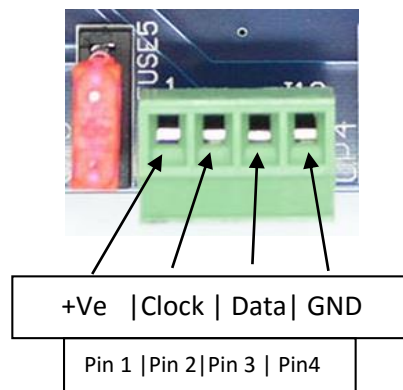
Pin 1 |Pin 2|Pin 3 | Pin4

Figure 2 – Normal mode pinout

Some pixel protocols do not use the clock line and lights of this type will only have 3 wires. In this case you can leave the clock line disconnected.

Warning: It is very important not to short +ve onto the clock or data lines when using pixels greater than 5v. Given this mistake can happen, additional protection circuitry has been added to prevent any damage to the main CPU. However, if the output buffer part is damaged due to shorting, it has been designed for easy replacement by the user. The part is cheap to replace and Advatek support will guide you through the process if you believe this has happened. Note that this can also happen from poor waterproofing when rain shorts the higher voltage onto either of those wires in your pixels/wiring.

3.4 – Expanded Mode

If your pixels do not have a clock line, you may optionally activate expanded mode on the controller. In expanded mode, the clock lines are used as data lines instead. This means the controller effectively has twice as many pixel outputs (thirty-two). Physically this means there are two pixel outputs per connector and fuse.

In this mode the maximum number of pixels per output is halved (510 pixels max), so the total number of controllable pixels remains the same.

It is advantageous to use this mode with data-line only pixels compared to normal mode, because the refresh rates will be improved. Pixels that only use a data line are very slow compared to clocked pixels, so improving the refresh rate is beneficial. This is especially important if you are using or close to the maximum number of pixels per output.

The pinout for expanded mode is shown below in figures 3 and 4.

+Ve | Data 1 | Data 2 | GND

Pin 1 | Pin 2 | Pin 3 | Pin4

Figure 3 – Expanded mode pinout

Data 32
Data 31
Data 30
Data 29
Data 28
Data 27
Data 26
Data 25
Data 24
Data 23
Data 22
Data 21
Data 20
Data 19
Data 18
Data 17

Data 1
Data 2
Data 3
Data 4
Data 5
Data 6
Data 7
Data 8
Data 9
Data 10
Data 11
Data 12
Data 13
Data 14
Data 15
Data 16
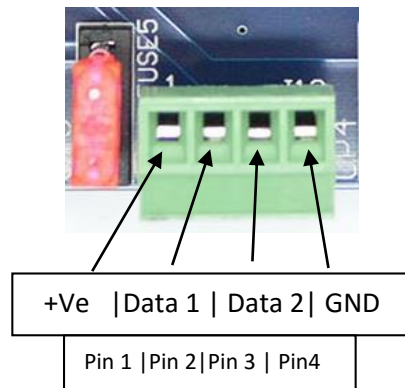
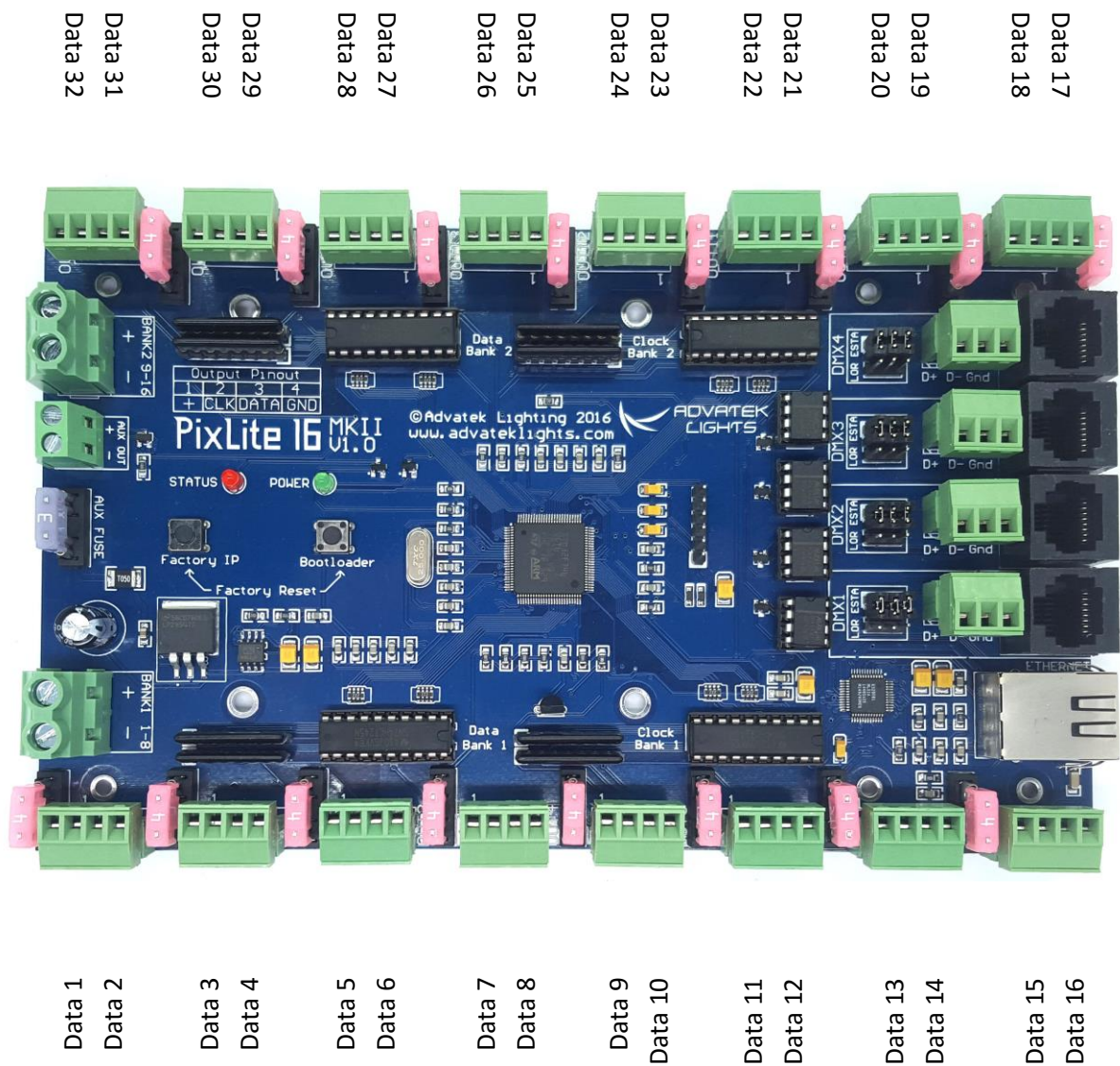Figure 4 – Expanded mode output order

4 – Network Configuration

4.1 – Network Layout
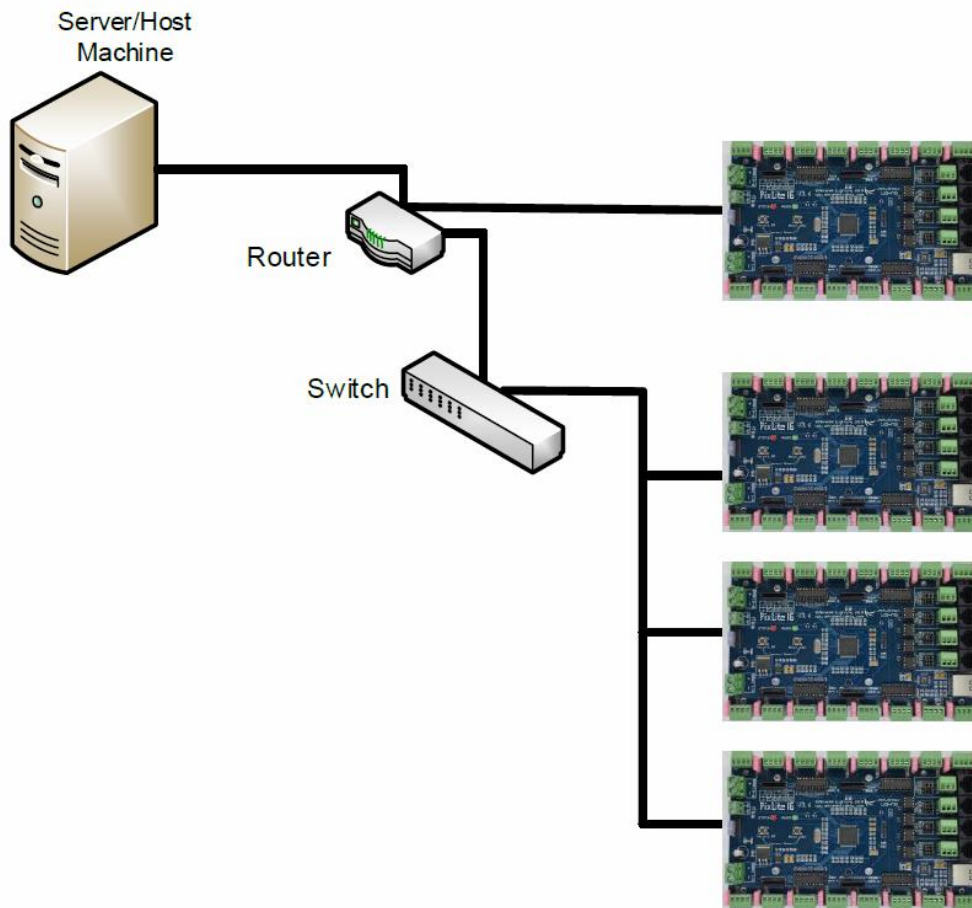
Figure 5

Figure 5 shows a typical network topology for the PixLite 16 MkII controller(s) LAN. The host machine typically connects to a router and then to the controller(s). If you are only using a few controllers, they can be connected straight to the router. Larger installations will benefit from using a network switch between the router and controllers. Very large installations (E.g. 50 or more universes in multicast mode) will also benefit from the use of an IGMP snooping enabled network switch and router.

In a single controller installation it may be preferable to connect the controller directly to the host machine's network adapter using a crossover network cable.

The PixLite 16 MkII controller(s) can also be integrated straight into any pre-existing LAN such as your media, home or office network.

4.2 – IP Addressing

4.2.1 - Using a Router

Routers have a DHCP server in them – this means they will tell a device plugged into them what IP address to use, if asked.

DHCP is always enabled by default on a PixLite MkII controller so it can immediately connect to any existing network with a router. However it is recommended that you assign a static IP address once communications have been established via the Advatek Assistant. If the controller is in DHCP mode and is not assigned an IP address by a DHCP server, it will timeout and default to a static IP of 192.168.0.50

If DHCP mode is enabled, both LEDs will flash together until the controller receives an IP address, at which point the power LED will remain on solid and the status LED will flash slowly indicating it is in run mode and ready for use.

If a static IP address is assigned to the board, then the power LED will be solid from power up. If a DHCP timeout occurs the power LED will stop flashing and go solid also.

4.2.2 - Using A Switch/Direct

It may be desirable to connect the controller directly to a switch or even directly to the host machine instead of using a router. In this case (for first time configuration) you will need to ensure that the network adapter of your computer is set in the IP range that the controller will default to (controller defaults to 192.168.0.50). This means you PC's IP should be 192.168.0.xxx where xxx is anything between 1 and 254 other than 50. The subnet mask on your PC should be set to 255.255.255.0.

Once you can successfully discover the controller in the Assistant, we recommended setting the controller to a static IP address other than the default.

Figure 6 shows a screenshot of typical computer network settings to communicate with a PixLite 16 MkII for the first time without a router.
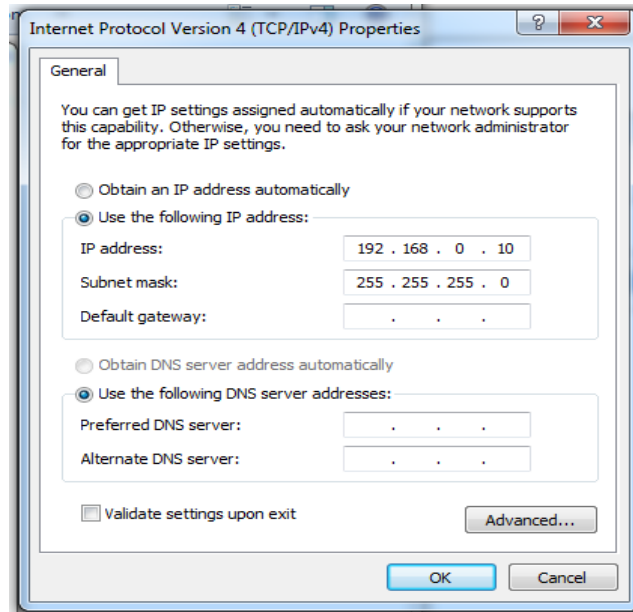
Figure 6

If you want to connect the PixLite 16 MkII directly to a PC then in addition to setting the computer's IP range as specified above, you may also need to use a crossover network cable as opposed to a straight-through cable.

4.2.3 - Forcing the Default IP Address

In the event that you forget the IP of a controller and you can't see it in the Assistant, it can be forced to its default IP. A simple procedure can be employed on power up:

1. Hold down the "Factory IP" button and power up the board
2. After a few seconds release the button. The controller's IP address will now be 192.168.0.50.

You should now be able to setup your PC's network settings to find the controller at this IP and change the IP settings to what you prefer. After changing the settings or if you power the controller off and on again, the controller will revert to using the saved settings.

5 – Operation

5.1 – Startup

Upon applying power, if you already have pixels connected they may flash very briefly and then immediately turn off as the controller takes control of the pixels. If no data is being sent to the controller then the pixels will remain turned off until valid data is received. During normal operation the green power LED will remain on solid and the status LED will flash slowly to indicate the controller is connected to a valid network and is ready to run.

If no incoming data is received for a period of time, the pixels will be turned off automatically unless that option has been disabled in your configuration.

5.2 - Sending Data

Input data is sent from the control PC/server/lighting console to the controller via Ethernet using a "DMX over IP" protocol such as sACN (E1.31) or Art-net.

5.3 – Outputs

5.3.1 – Pixel Outputs

Each of the 16 outputs can drive up to 1,020 individual pixels (6 DMX Universes of data). This allows for a total of 16,320 pixels to be driven out of the one controller (in addition to 4 DMX512 Universe outputs.) In expanded mode this limit drops to 510 pixels per output but the number of outputs is doubled, equaling the same number of total pixels. Driving a full 1,020 pixels out of a single output would also likely require some kind of power injection. How much power you need to inject and how often will typically vary depending on the number of pixels used, their voltage and their individual power consumption.

The refresh rate of the pixels will depend on the operating frequency of the specific pixel chip type. Higher speed chips will result in higher refresh rates. PIXELS WITH NO CLOCK LINE ARE SLOW. The refresh rates on these pixels is unavoidably slower than clocked pixels. Advatek recommends the use of clocked pixels whenever using a large number of sequential pixels on any output. Typically, the refresh rate can vary from 20 fps at the low end and up to 100 fps at the higher end.

5.3.2 – Pluggable Resistor Networks

Each output features a pluggable resistor array to limit current and increase transmission distance by helping to prevent unwanted signal reflections in the clock and data lines. Each resistor array pair controls 4 of the 16 outputs. These arrays may be changed to a different optimum value depending

on the characteristics of the wire used. The controller comes with 51 ohm resistors loaded by default as this is a suitable value for most typical installations.

If you require this value to be changed you may remove them by hand and insert new ones into the sockets. You should ensure you find a suitable isolated bus resistor array to replace it with. The pluggable resistor arrays can be identified below in figure 7.
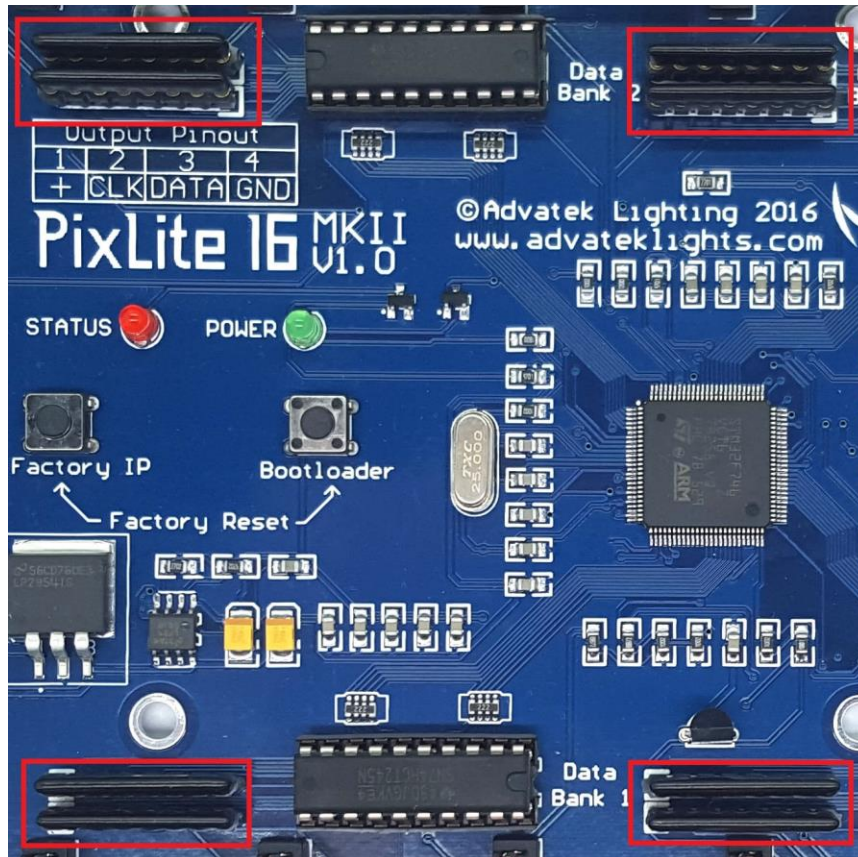

Figure 7

5.3.3 – DMX512 Outputs

The PixLite 16 MkII provides DMX512 outputs which can be accessed either by pluggable screw terminal connectors or by RJ45 jacks. The hardware layer on which the DMX 512 protocol operates is the RS485 electrical communications standard. This is a differential transmission system consisting of a two wire differential twisted pair and single wire ground connection. The D+, D- and ground connections are clearly labelled on the PCB for the screw terminal connectors.

There are 4 dedicated DMX outputs. These outputs act as 4 individual DMX512 universe outputs, effectively providing the user with an E1.31 to 4x DMX512 bridge (**in addition** to the normal pixel outputs). These do **not** convert Art-net data to DMX, only sACN (E1.31).

The DMX outputs are **not** electrically isolated and are not recommended for commercial/industrial use.

DMX512 signal data is also connected via the four vertical RJ45 sockets. On-board jumper links (highlighted in red in Figure 6) allow each RJ45 DMX output to use either the 'LOR' wiring or the 'ESTA' wiring configuration. (All boards are shipped with the links in the 'ESTA' configuration.)

All these connectors and jumper links are located on the far right-hand edge of the board as shown in figure 8.
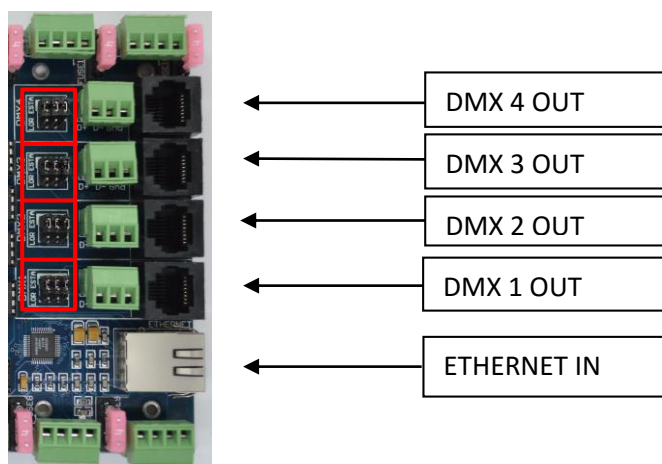

Figure 8

Below is the RJ45 socket pin-out for the DMX connectors when the "LOR" wiring is selected:
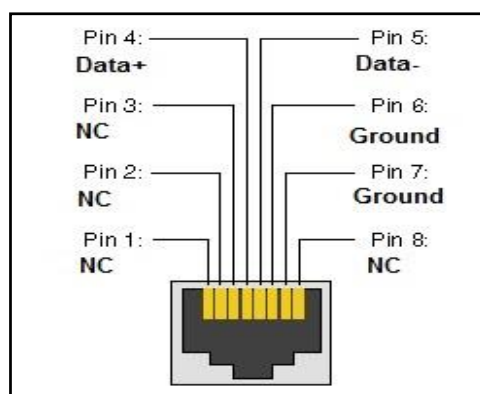

Figure 9

Below is the RJ45 socket pin-out for the DMX connectors when the "ESTA" wiring is selected:
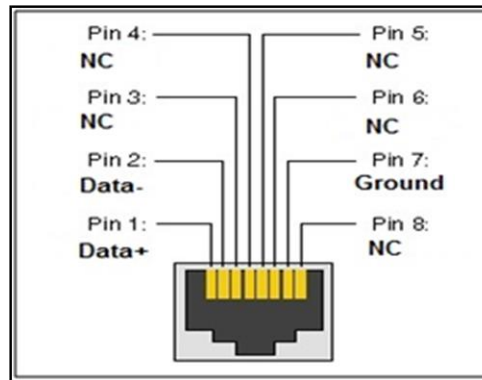
Figure 10

5.4 – Hardware Test Pattern

The controller features a built-in test pattern to assist in troubleshooting during an installation. To put the controller into this mode, press and hold the 'Factory IP' button for 3 seconds (*after* the controller is already running.) The controller will then enter the test pattern mode and will display red, green, blue and white sequentially in a repeating pattern on all pixels on each of the 16 outputs.

Pressing the button while in this mode will then cycle through each of the four colors successively (on all outputs simultaneously) before returning to the current pattern again.

To exit the test mode press and hold the 'Factory IP' button down again for 3 seconds and then release.

The hardware test requires that the pixel driver chip type and number of pixels per output are set correctly in the configuration. In this way you can test if that part of your configuration is correct and isolate other possible problems with the incoming Ethernet data side.

5.5 – Auxiliary Output

The controller features an auxiliary output that can power an external fan(s) for cooling the enclosure that the controller is mounted in. This output is located on the far left edge of the board and is show in Figure 11. This feature is useful in order to keep the temperature regulated when you mount the control board and a high wattage power supply together in a small, confined space.

The output voltage of the auxiliary power is taken from the Bank 1 voltage input. So to run a 12V fan for example, you would need to use a 12V input voltage for your Bank 1 supply. The auxiliary output can supply up to 15W of continuous output power, and is PWM controlled. The output is also protected by a 3A mini-blade fuse.

Basic operation is as follows: In the Assistant configuration software (see the PixLite Configuration Guide), the user can set a target temperature that the enclosure will ideally not exceed. The controller will then automatically adjust the fan speed based on the current temperature as measured by the controller's on-board temperature sensor.

For example, if the target temperature is set at 30°C then sometime before that temperature, the controller will turn the fan on and slowly ramp up the speed until it reaches 100% if required, in an attempt to maintain the temperature either at or below 30°C. If the temperature were to then slowly drop back down then the fan will also reduce speed until it switches off completely. The same process will be repeated if the temperature begins to rise again.

If the detected temperature reaches the set temperature, the fan output will be on 100% at this point.

Figure 11

6 - Firmware Upgrades

The controller is capable of having its firmware upgraded (new software). An upgrade is typically performed to add new features and to fix any bugs that may have been overlooked in previous versions.

6.1 - Physical Setup

To perform a firmware upgrade, ensure that you have your PixLite 16 MkII controller connected to the LAN network as per section 4.1.1.

6.2 - Obtaining New Firmware

The latest firmware is available from the Advatek Lights website at the following link: http://www.advateklights.com/resources

The file you need comes in a ".hex" format that must be first unzipped from the ".zip" file you download.

6.3 - Performing an Update

1. Open the Advatek Assistant. Click "Search" and once the desired controller appears in the main window, double click on it.

2. A configuration window will appear. Click on the "Misc" tab and then locate the "Upgrade Firmware" button and click on it. A "firmware update" window will appear (as shown in Figure 12).

3. Click "browse" to locate the firmware file you wish to download.

4. Click on the "update" button.

5. Once the download is complete, a message box will pop up saying it has completed successfully.

6. The controller will automatically reboot itself and then start running the new firmware application immediately.

7. The settings will be kept from before.

If there is something wrong with the upgraded firmware, repeat the process again if it is still visible in the Assistant. Otherwise, refer to the troubleshooting section for further information.
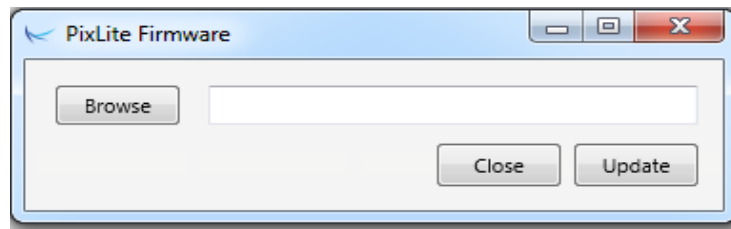
Figure 12

6.4 - Performing a "Forced Boot" Update

1. Power down the controller.

2. Hold down the "Bootloader" button.

3. Apply power, the status and power LEDs should be flashing alternately to indicate the controller is in bootloader mode. It is now ready for a firmware upgrade.

   The bootloader will default to an IP address of 192.168.0.50 so you must **ensure you are running it on a network in the same address range as this IP address** (eg. 192.168.0.10).

4. Using the Assistant, click search in the main window and you should see the controller appear with "bootloader" in the firmware column. Double clicking on it will bring up the file browse window as shown in Figure 12.

5. Click browse to locate the firmware file.

6. Click on the "update" button.

7. Once the download is complete, a message box will pop up saying it has completed successfully.

8. The controller will automatically reboot itself and then start running the new firmware application immediately.

9. The settings will be kept from before.

If you have performed a forced update and there are still problems then you should try a factory reset as described in section 8.5. This will reset all settings back to the factory default ones after you've updated already to the latest firmware.

7 - Specifications

7.1 Operating Specifications

The table below specifies the recommended operating conditions for a PixLite 16 MkII controller.

PARAMETER	VALUE/RANGE	UNITS	TOLERANCE
Power Bank Input	5-30	V DC	+/-5%
Max Capacity Per Power Bank	32	A	+/-5%
Logic Current Consumption (@ 5V)	150	mA	+/-10%
Aux Output Max	15	W	+/-10%
Operating Temperature	-40 to +80	°C	+/-5%
Storage Temperature	-50 to +150	°C	+/-5%
Individual Outputs (Max)	7.5	A	NA

Table 1

7.2 - Mechanical Specifications

The control board dimensions and locations of all mounting holes are shown in figure 13 on the following page. There are 6 x 3mm mounting holes, and 4 x 4mm mounting holes. The 4 x 4mm holes will allow the board to be mounted directly into a CG-1500 enclosure.
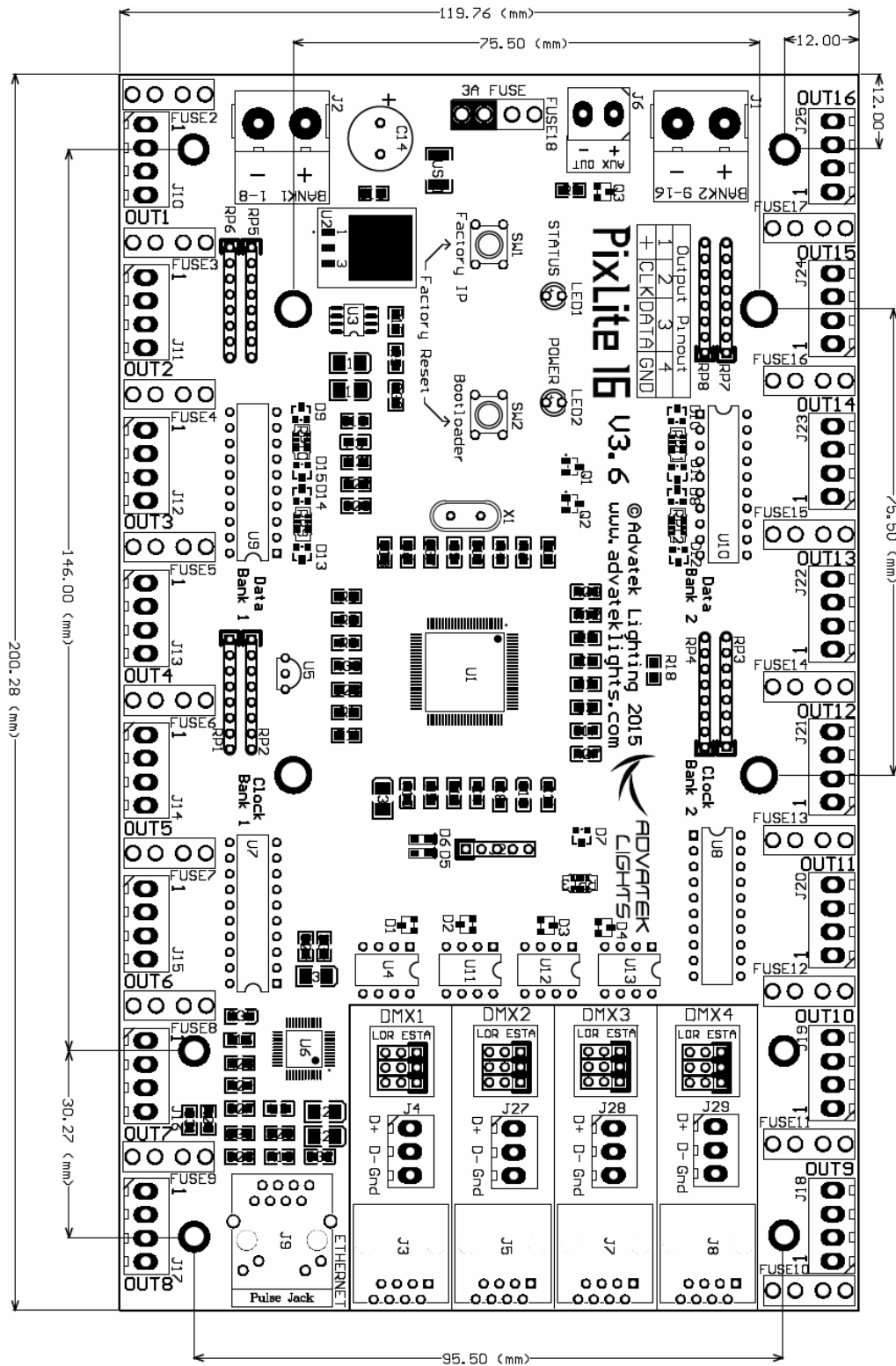
Figure 13

8 – Troubleshooting

8.1 - LED Codes

Generally, controller status troubleshooting requires looking at the status and power LEDs on the controller.

Please refer to the table below for condition codes for the onboard status and power LEDs.

POWER LED (GREEN)	STATUS LED (RED)	CONDITION
SOLID	FLASHING	NORMAL OPERATION, MAIN APPLICATION RUNNING OK
SOLID	SLOW FLASHING	TEST MODE RUNNING
FLASHING TOGETHER	FLASHING TOGETHER	LOOKING FOR IP ADDRESS (DHCP MODE)
SOLID	SOLID	MAIN APPLICATION NOT RUNNING
SOLID	OFF	MAIN APPLICATION NOT RUNNING
OFF	SOLID	MAIN APPLICATION NOT RUNNING
ALTERNATE FLASHING	ALTERNATE FLASHING	BOOTLOADER MODE
OFF	OFF	NO POWER

Table 2

Please refer to the table below for condition codes for the Ethernet jack status LEDs.

LINK LED (GREEN)	DATA LED (YELLOW)	CONDITION
SOLID	RAPID FLASHING	CONNECTED OK, RECEIVING DATA
SOLID	OFF	CONNECTED OK, NO DATA
OFF	OFF	NO LINK ESTABLISHED OR POWER IS OFF

Table 3

8.2 - No Status/Power LEDs On

Ensure that your power supply is supplying correct voltage as per section 3.1.1. Also ensure that it can supply enough power to drive the lights that are connected as well. You should also try disconnecting all outputs and see if the controller starts then. If the supplied power is correct try performing a forced firmware update as per section 6.4.

8.3 - Other Issues

If the device fails to perform as expected, please check the LED codes as per section 8.1. For the latest more specific troubleshooting information and other help, you should refer to our online knowledgebase here: http://www.advateklights.com/support/kb

If you can't resolve your problem with the help of our knowledgebase, you can open a support ticket here for assistance: http://www.advateklights.com/support

You can also send an e-mail to support@advateklights.com and a ticket will be automatically created for you.

If you create your ticket through the website you will have the ability to login and manage past and existing tickets.

8.4 - Reset To Factory Defaults

To reset the controller to its factory default settings do the following:

1. Hold down the "Factory IP" button AND the "Bootloader" buttons together before applying power.

2. Power up the board.

3. Wait for both LEDs to flash together.

4. Release both buttons.

5. Power cycle (turn power off, wait 5 seconds then turn it on again).

9 - Warranty and Service

If you require support or warranty, please refer to section 8.3 for information on creating a support ticket. For warranty cases the support staff will usually require you to perform some troubleshooting steps first. If we cannot solve your problem remotely we will issue you with an RMA number through the support ticket system. You may then either return the device to a local distributor or return it to us directly for warranty services.

The PixLite 16 MkII control board is supplied with a full 3 year factory warranty.