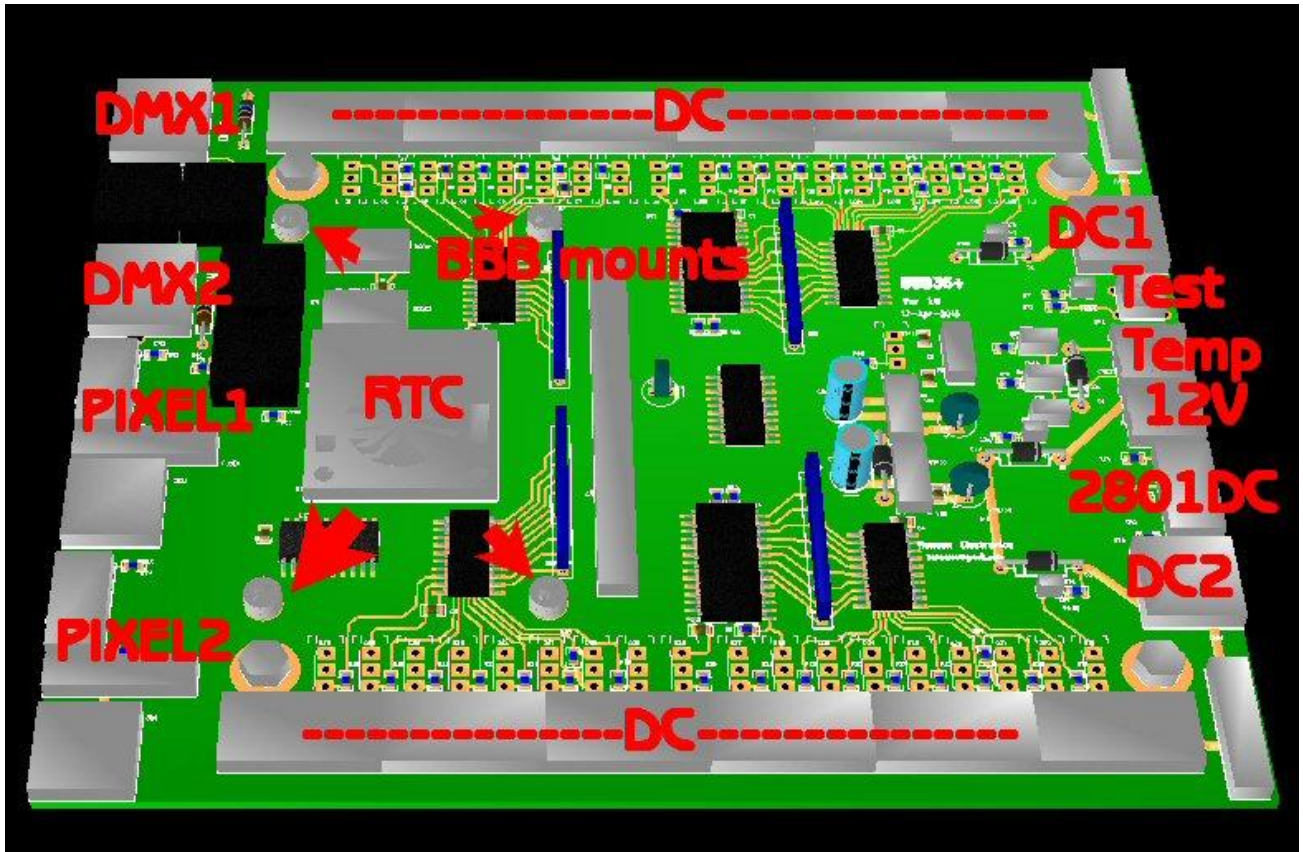


# BBB36+

## Beagle Bone Black Cape/ Standalone Lighting Controller



## USER MANUAL

### Features

- Mates with a BeagleBoneBlack (BBB) running the Falcon Player (previously Falcon Pi Player, FPP)
- BBB is powered by the onboard regulator.
- BBB mounts above the board with "easy" access to the USB, Ethernet, SD, audio and video connectors.
- 36 DC channels rated at 30A per 18 channels. Individual channels rated at 3A.
- 2 Pixel outputs configurable as 2 4 wire outputs or 4 3 wire outputs
- 2 Electrically isolated RS485 outputs configurable as DMX or Pixelnet
- 2801 output for carry over to 2801DC15 or 2801DC30 boards. Alternatively 2801 pixels could be hooked up to this output.
- 7-36V DC input. If only 5V outputs are used there is a power input for powering the board.
- Test switch with a matching LED to turn on or off a test mode.
- Power LEDs for the 2 DC inputs and the 5V power.
- Real time clock onboard for show scheduling.
- 30A (max) ATO (automotive) blade fuse
- Common anode (positive) configuration.
- Output terminals arranged as V+, Ch, Ch, Ch (particularly suits RGB)

This manual, updates and further information on the BBB36+ are on  
[www.hansonelectronics.com.au/product/BBB36/](http://www.hansonelectronics.com.au/product/BBB36/)

## Contents

Note:.....	2
Connections.....	2
CN4-BBB Header.....	2
DC Power Input.....	2
5V Power.....	2
Dimmer Outputs.....	2
LEDS.....	3
PIXEL OUTPUTS.....	3
RS485 OUTPUTS.....	3
USING THE BBB36+.....	3
How it works.....	3
Data.....	3
Power.....	3
DC Output configuration within Falcon Player (FPP).....	3
Clock configuration within Falcon Player (FPP).....	3
Test Mode.....	4
Temperature Switch.....	4
User Headers.....	4
BeagleBoneBlack IO STUFF.....	4
FAULTFINDING.....	5
CONNECTION EXAMPLES.....	6
WARRANTY.....	8

### Note:

**Throughout this manual the BeagleBoneBlack is referred to as BBB for the sake of brevity.**

## Connections

### **CN4-BBB Header**

The connector CN4 on the BBB36+ connects to a BeagleBoneBlack (BBB) via a 46 way ribbon cable. This is the only connection between the 2 boards. The ribbon cable should be connected to the BBB36+, then the BBB and then the BBB attached to the 4 standoffs on the BBB36+. See page 4 for location.

### **DC Power Input**

The 2 large 2 way green connectors (CN13, CN14) are the DC inputs from your power supply/s. The +V terminal is positive and the GND terminal is negative or ground. Any DC voltage in the range of 7V to 36V can be used. There is a standard ATO (automotive) fuse adjacent to the power terminals. The board comes supplied with 10A fuses fitted. Fuses up to 30A can be used. It is recommended changing the fuse to the closest size for the total current that the board is controlling. See page 4 for locations.

### **5V Power**

If both DC dimmer banks are running off 5V then it is necessary to connect a voltage supply of between 7V and 36V DC to CN26 the PWR connector. If either of the DC dimmer banks has a supply of greater than 7V it isn't necessary to connect to CN26. See page 4 for location.

### **Dimmer Outputs**

There are 36 channel outputs. The maximum load per channel is 3 Amps, but the overall limit is 30 Amps per bank of 18. This means that you can't turn on all 18 outputs with the maximum load. In reality, this should not be a problem as most loads will be less than 2 Amps.

Each group of 3 outputs is grouped into 4 terminals. These are the 3 outputs and a common positive. RGB lights with a single common anode should have the common wire connected to the terminal +V and the red, green and blue wires to

channels 1,2,3 (or 4,5,6 etc). The order and specific channels is actually dependant on what is configured in your sequencing software. For lights that have single colours (or single channels) per pair of wires then 1 wire gets connected to the +V and 1 gets connected to the channel output. For led lights which require the polarity to be around the right way then the anode (positive) gets connected to +V and the cathode (negative) goes to the channel. For lights that do not have three channels commoned then 3 wires will be joined and fitted to the +V for the 3 channels. See connection examples later in the manual for examples.

## **LEDS**

There are 4 LEDs on the BBB36+ as well as a number on the BBB. See the falconchristmas website for details on the LEDs on the BBB. The leds on the BBB36+ are 2 for the power for the 2 banks of DC dimmers. These are labelled PWR1 and PWR2. There is 1 to indicate that there is a regulated 5V on the board and there is 1 to indicate that test mode is running.

## **PIXEL OUTPUTS**

There are 2 pixel outputs on the BBB36+. Under control of the Falcon Player these can be configured as a combination of 2 or 4 wire pixel outputs. The outputs are labelled as A and B rather than Data and Clock as they can both potentially be configured as Data.

## **RS485 OUTPUTS**

There are 2 electrically isolated RS485 outputs on the BBB36+. Both of these outputs have the optocoupler (6N137) and RS485 driver chip (MAX1483 or compatible) in IC sockets to allow replacement if they are damaged. The 2 outputs can be configured as DMX or alternatively as Pixelnet from within Falcon Player. The 2 outputs are labelled as DMX1 and DMX2 and they are wired to an RJ45 socket as per ESTA standard (Data + 1, Data - 2, Common 7+8). The universe/s for each output are configured within Falcon Player. See page 4 for locations.

## **USING THE BBB36+**

### **How it works**

The smarts of the BBB36+ are actually within the BBB and the Falcon Player software. Sequences are created and copied to the **USB thumbdrive** and the BBB either runs by itself as a standalone playback device with the onboard scheduler in the Falcon Player. Alternately it can be configured as an E1.31 device with the sequence playback occurring on a computer or another Raspberry Pi, BeagleBoneBlack or similar. This is in bridge mode within the Falcon Player.

The official home of the Falcon Player software is [falconchristmas.com](http://falconchristmas.com). Information on configuring the Falcon Player, downloads etc are hosted there.

### **Data**

The pcb has a terminal block (CN5) for getting the data out of the pcb to expansion DC boards. It is a removable screw terminal and the wire that goes into each position is marked on the pcb. The data into the pcb goes out to other boards or pixels.

### **Power**

The pcb can be powered by any DC voltage in the range of 7V to 36V from either the DC dimmer bank/s or CN26. If all the LEDs on the DC dimmer outputs are 5V then the user must connect 7-36V to the terminals on CN26 (PWR). The BBB is powered via the BBB36+ board via the expansion GPIO header of the BBB and it doesn't need 5V connected via the BBB power connector.

## **DC Output configuration within Falcon Player (FPP)**

The 36 outputs of the BBB36+ are connected to the **XXXX** connection of the BBB. Within the FPP you need to go to the **XXXX** tab, go down to **XXXX** and select **XXXX**. To enable more than the 36 channels on the BBB36+ if a 2801DC15, 2801DC30, 2801 pixels or a combination of the previous then the required number of channels should be selected.

## **Clock configuration within Falcon Player (FPP)**

The BBB36+ has a battery backed real time clock on it. The 2302 battery used is specified to give about 12 years of battery backup. If the battery isn't installed or if the battery is flat/failed the time in the BBB will be lost and schedules will not run on time. The clock is configured as a **DX1307** within Falcon Player and the time is set **somewhere**.

## Test Mode

The BBB36+ has an inbuilt test mode and a LED to indicate that it is currently running in test mode. Pushing the test mode pushbutton on the pcb will enable the test mode, the LED will turn on **and something will happen**. Pressing it again will turn off test mode and the LED.

## Temperature Switch

The BBB36+ has a temperature “switch” built in. It uses the inbuilt temperature sensing within the BBB to turn on a Mosfet switch which can be used to drive a relay, fan, heater, alarm or whatever depending on the user. The alarm temperature and whether it goes off above or below the set temperature is configured within Falcon Player.

## User Headers

The BBB36+ has 3 pairs of header pins that allow access to special features. The 3 header pins should only be connected to via a switch or relay output (voltage free outputs). The first pair of header pins is CN1 (Power SW). This is a power switch input that allows the BBB to do a soft power off under its own control rather a hard power off.

The second pair of header pins is CN27 (User SW1) and its operation can be configured within Falcon Player.

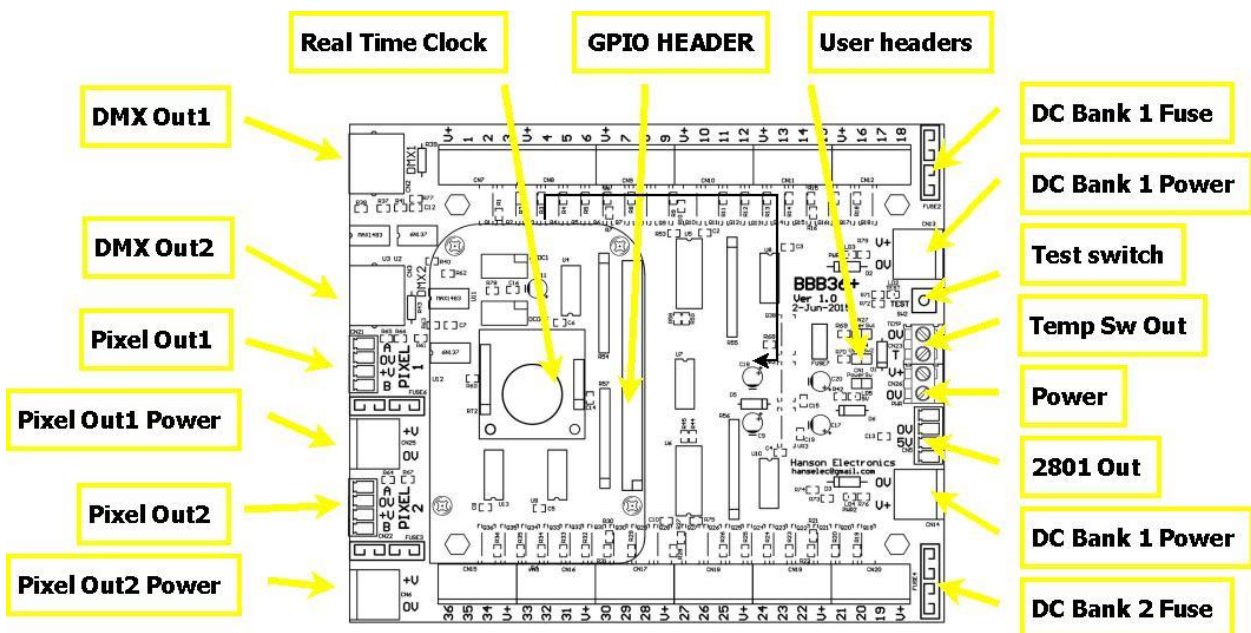
The third pair of header pins is CN24 (User SW2) and its operation can be configured within Falcon Player.

The user headers may be used to change between sequences for differing brightness levels etc.

## BeagleBoneBlack IO STUFF

The BBB is powered via the P9 expansion header of the BBB and doesn't need the power to be applied via BBB power connector. This information is required for configuring Falcon Player. The table below shows the functions, pins and the BBB GPIO number. The user switches all switch to gnd and require pullups enabled within the BBB. The -ve of the LED is connected to gnd and the +ve is connected to GPIO1-19. The 36 DC channels on the BBB36+ are configured as 2801 pixel channels as are any pixels or other connected 2801DC channels.

BBB36+ Function	BBB P9 Header Pin No	BBB GPIO Number
CN1 (Power SW)	Pin 9	Power button
CN27 (User SW1)	Pin 12	GPIO1-28 (1k to gnd)
CN24 (User SW2)	Pin 11	GPIO0-30 (1k to gnd)
DMX1	Pin 25	GPIO3-21
DMX2	Pin 27	GPIO3-19
2801DC clock	Pin 22	GPIO0-2
2801DC data	Pin 21	GPIO0-3
Pixel 1A	Pin 18	GPIO0-4
Pixel 1B	Pin 17	GPIO0-5
Pixel 2A	Pin 23	GPIO1-17
Pixel 2B	Pin15	GPIO1-16
Test switch	Pin 14	GPIO1-18 (1k to gnd)
Test LED	Pin 16	GPIO1-19 (1k to gnd)
Real time clock SCL	Pin 19	I2C2_SCL
Real time clock SDA	Pin 20	I2C2_SDA
Temperature Mosfet	Pin 24	GPIO0-15



## FAULTFINDING

### **Fault**

Magic smoke is released

### **Solution/solutions**

-Go to jail. Do not pass go. Do not collect \$200  
-Apply for magic smoke restocking. Fee will be charged

5V LED is not lit

-Both fuses are blown  
-Power is not connected in the right polarity  
-A short is on the 5V terminal  
-A short is on the 2801 pixel output or too great a load is connected

Dimmer bank LED is not lit

-Fuse is blown  
-Power to the connector is less than approximately 2.7V  
-Power is connected in the wrong polarity

BBB Leds not lit installed

-Cable between BBB GPIO header and BBB36+ CN1 misaligned or not

No output lights working

-Fuse/s is blown  
-Data is not being sent out by computer or Falcon Player. Try test mode.  
-The schedule within the Falcon Player isn't active

Channel failing to turn on

-Mosfet transistor has been damaged. The mosfet must be replaced with the exact same type to ensure correct operation  
-PCB track has been fused. Should be evident if bottom of the pcb is inspected

Channel turned on all the time

-Mosfet transistor has been damaged. The mosfet must be replaced with the exact same type to get correct operation

Fuse blowing

-Fuse selection too low for lights that are connected  
-1 or more lights connected have short circuited wires

No DMX or Pixelnet output

-Configured as the wrong type DMX/Pixelnet  
-Universe/s not setup correctly within Falcon Player  
-RS485 or optocoupler damaged

No Pixel output

-Configured as the wrong pixel type  
-Fuse blown  
-Power injection to pixels not wired correctly  
-Universe/s not setup correctly within Falcon Player



# CONNECTION EXAMPLES

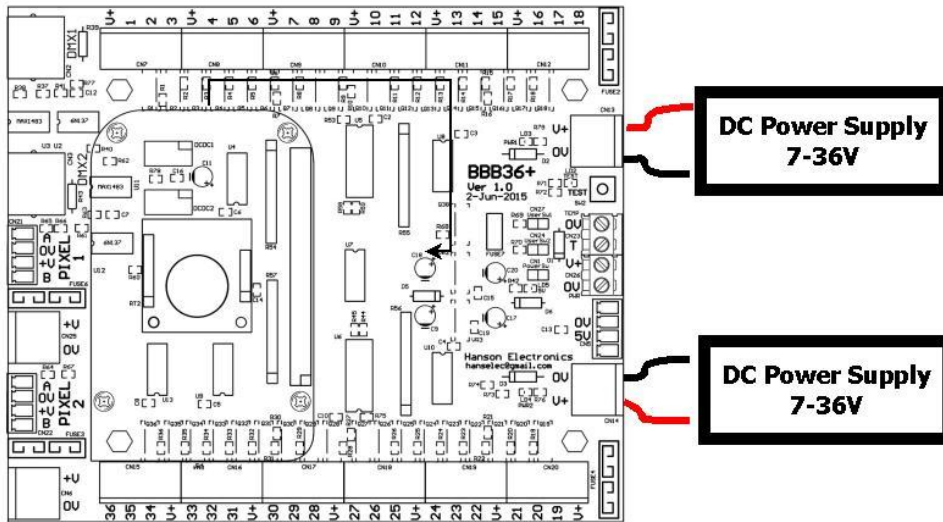


Figure 1- Typical power connection

Figure 1 shows the typical power supply connections. 1 of the power supplies needs to be in the 7-36V range. If the power supply has sufficient power available then it can be used to power both output banks. If 1 power supply is in the 7-36V range then the other power supply can be any voltage in the 0 to 36V range.

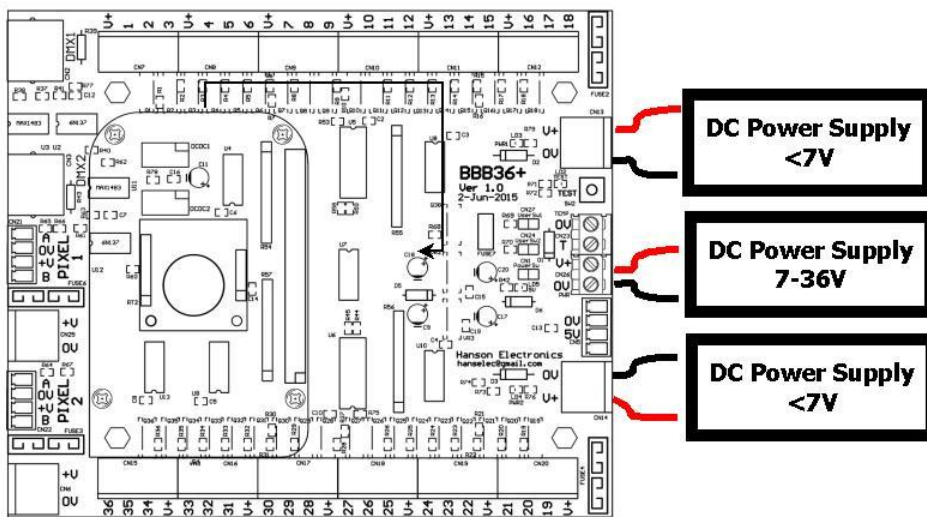


Figure 2 shows how the power is connected if only 5V lights are used. In this case the 5V power connector must be connected to. If only the PI and the board (but no DC outputs) are to be powered then a 5V power supply connected to the 5V connector is all that is required.

Figure 2 - Connection when only lights below 7V are used

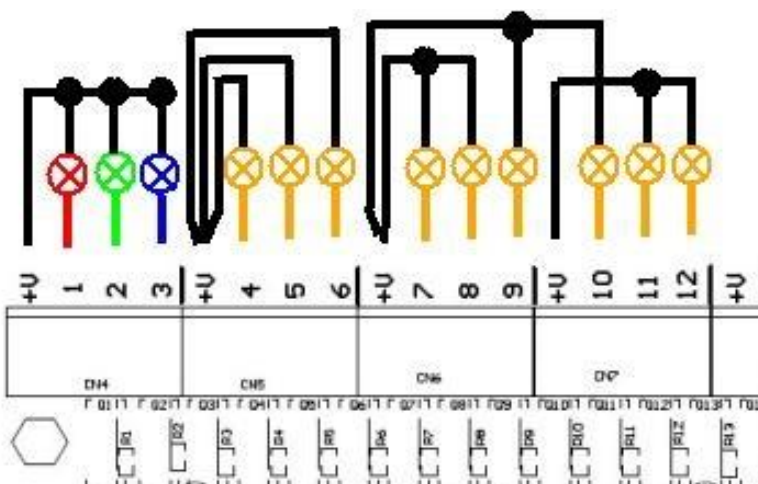


Figure 3 shows the 3 common method of connecting lights to output channels. Channels 1 to 3 show a RGB 3 channel set of leds connected with the common positive connected to the +V terminal. Channels 4 to 6 show 3 single channel lights connected with the 3 positives connected to the 1 +V terminal. Channels 6 to 12 show 3 pairs of 2 channel lights connected.

Figure 3 - 3 channel, 1 channel and 2 channel

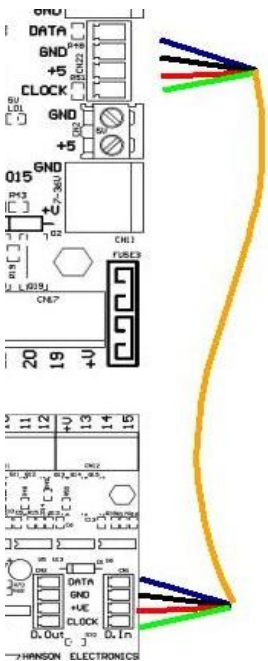


Figure 4 shows how to connect between a BBB36+ and a 2801DC15 to add additional DC channels. Further 2801DC15 or 2801DC30 boards can be added or alternatively 2801 pixels can be connected. If 2801 pixels are added then the GND connection for the pixels should be connected to both the pixels and also the BBB36+ GND connection. The +5 should not be connected to either the pixels or the pixel power supply.

Figure 4 – BBB36+ to 2801 DC output

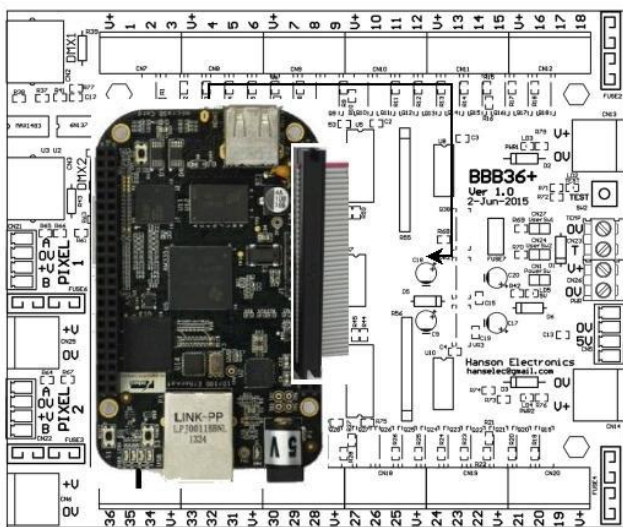


Figure 5 shows the BBB mounted in its position on top of the BBB36+. The BBB is connected via the supplied IDC cable and connects to the GPIO header of the BBB and CN1 on the BBB36+. See the BBB documentation or falconchristmas.com for info on the micro SD connector, video output, audio output etc.

Figure 5 - BBB36+ with BBB mounted

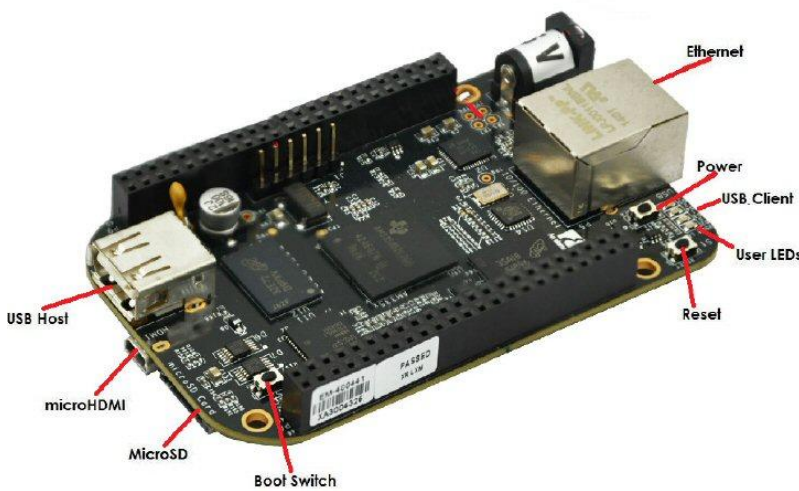


Figure 6 – BBB Connectors and switches

## WARRANTY

This light controller is covered by a warranty for a period of 12 months from the time of purchase.

The warranty covers only the BBB36+ controller and not any connected lights, power supplies or BeagleBoneBlack.

The warranty covers only faulty material and workmanship if properly setup and operated in accordance with the specifications and setup sections of this document.

The repair and or replacement of this controller will only be at the workshop of Alan Hanson. The cost of freight to/from will be borne by the user.

The warranty does not cover damage to the controller due to misuse i.e.. shorting of outputs, connecting an AC supply, connecting a supply higher than the rated voltage etc

The controller is supplied as is. Alan Hanson and Hanson Electronics reserves the right to make changes to the specifications and the design without notification.

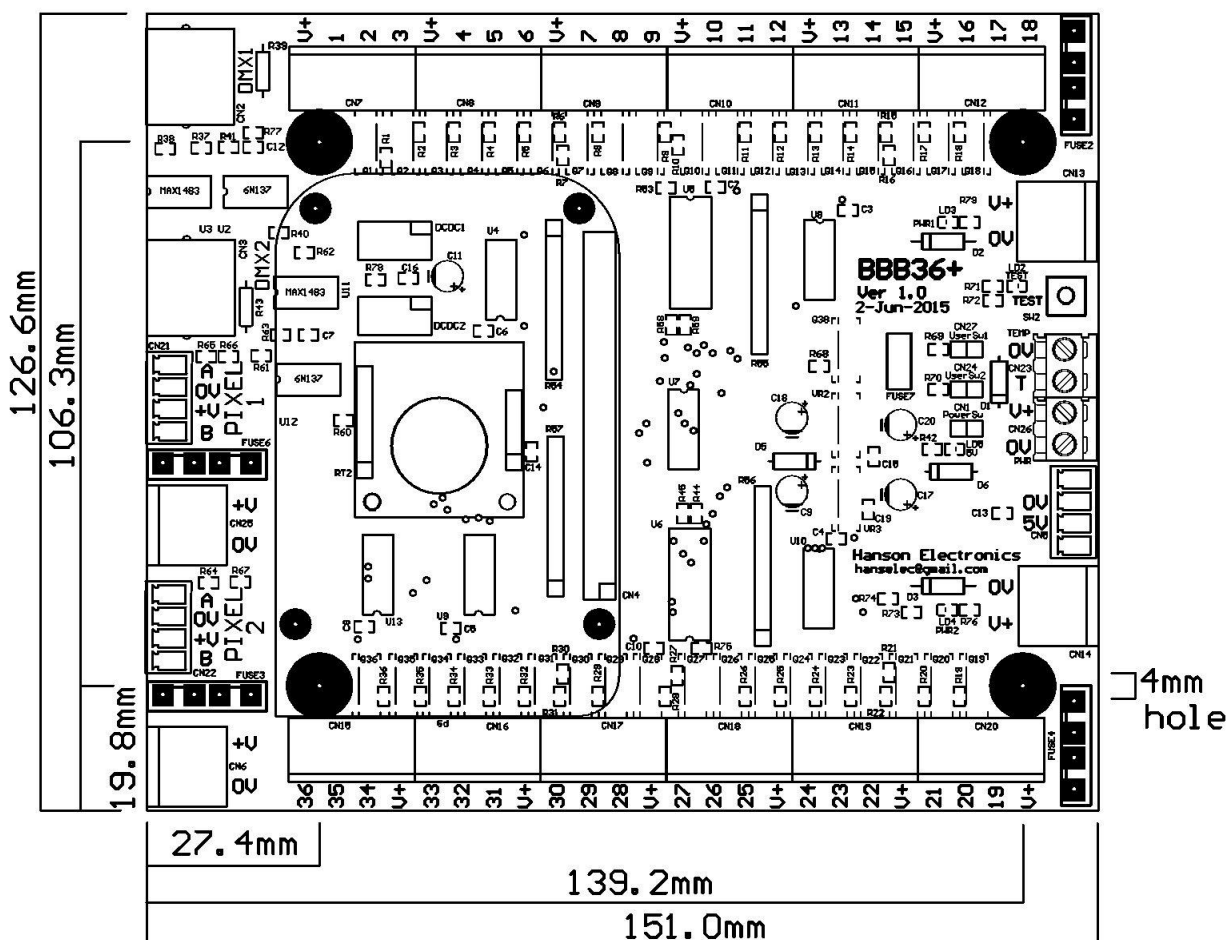
Misuse, using this for other than its designed use, water damage, mechanical damage or attempting to modify or repair your controller will void this warranty.

Alan Hanson and Hanson Electronics shall not be liable for any incidental damage, inconvenience, rental, loss of profits or any other loss due to the unsuitability, failure or use of this controller.

If the user does not agree to these terms the cost of the product (minus freight) will be refunded on the return of the product. The controller must be in unused condition and must be returned within 14 days.

Please return this controller with a copy of your invoice if it develops a fault. Any controller returned without a copy of the invoice will be charged at a standard repair rate. The warranty does not cover freight.

Mounting standoff drilling patterns . (Scaled. Not 1:1)



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