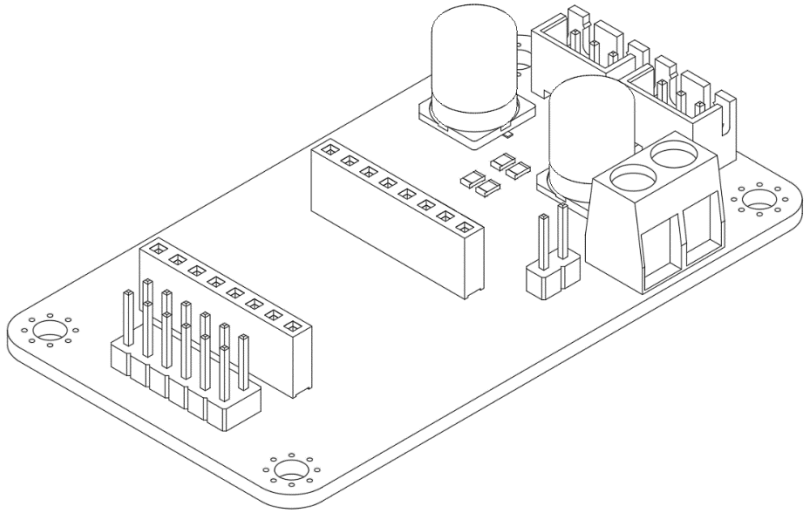
RAINBOWSHIFT GUIDE

Instruction manual for RainbowShift RGB controller



Version 1.0

Contents

Introduction

Congratulations on getting started with RainbowShift! This documentation exists to help you through the purchase, setup, and usage of RainbowShift. Hopefully it will answer any questions you currently have and serve as a reference for any troubleshooting you need to do in the future.

Printing This Manual

If you need to print this guide out onto real paper then you can do it. It has been written in black and white so use of a laser printer is suggested, however, I would strongly recommend against printing the manual out in light of considering the environmental impact and having the latest information available. Please don't print it unless you absolutely have to, even then consider printing part of it and not the whole thing.

Getting Help

You can ask on the Vector 3D discord in the #rainbowshift channel, we're here to help so come and join us using this link: https://discord.gg/xXmuUpJhxc

Giving Feedback

An important part of making RainbowShift the best it can be is to collect feedback and create improvements based on that. You don't have to provide feedback if you don't want to, but it is always welcome. You can send an email, chat via discord, or use the 'contact us' page on the website at Vector3d.co.uk.

Reviews

If RainbowShift has been useful to you, or you just want to share your opinions, the Vector 3D website now has an area for reviews by validated purchasers. If you have purchased and used RainbowShift I would love to see your opinions shared in a written review on the shop page, you can keep it short, but it will help both myself and future buyers so please consider doing so.

Latest Version

Over time there may be updates to this manual. If you find an issue and it's been a while since you downloaded, you might want to re-download to ensure you have the latest version. The best way to get the latest version is to head over to Vector3D.co.uk

and login to your account, head to the downloads section and download the version shown there which will always be the latest one available. The link sent to you upon purchase should also always link to the latest version.

Sharing

Once you have setup your RGB using RainbowShift, please share you pictures and videos with me on twitter, Instagram, TikTok, the Vector3D.co.uk reviews, or in the discord by tagging me and using #rainbowshift. I love hearing about your experiences.

Updates and Change Log

If you are wondering about the changes in the latest version of this manual or the PCB design, the change notes are listed at the end of this document.

What is RainbowShift?

RainbowShift is a shield for an ESP8266 microchip module to enable easy use of WLED. It takes the potentially complex task of wiring up the ESP8266 to use RGB and makes it very simple. Electrically it utilises a logic level shifter for each data line to change the 3.3v logic to 5v logic and uses a smoothing capacitor to ensure consistent power to the LEDs.

While RainbowShift was designed for use in 3D printers running Klipper, which this manual will focus on, it has many applications beyond this as a simple yet powerful RGB controller.

The PCB is supplied fully assembled and soldered and can optionally be supplied with a fully soldered ESP8266 module so no soldering is required.

General Specifications

Output

- 2 x 5V 3A fused power output
- 2 x Level shifted RGB Data outputs
- JST XH compatible connectors
- ESP8266 GPIO header (optional)

Input

- 5V up to around 7A
- Pin Socket for D1 Mini type ESP8266 Module

Where to get RGB LEDs

If you're looking for some quality RGB LEDs to use with your RainbowShift controller, check out Daybreak Neo and Daybreak Neo Mini. These are PCB LED strips designed specifically for use with Voron 3D printers and will be compatible with many others.

Compatibility

The type of RGB LEDs that this work with RainbowShift are the three pin addressable type, also known as aRGB, addressableRGB or Digital RGB. RGBW that uses 3 pin arrangement are also supported. The pinout is for 5V, Data, and GND and will not work with 4 pin or 12/24V LEDs.

The ESP8266 module optionally supplied with RainbowShift is the D1 Mini USB-C. Other D1 Mini type ESP8266 modules should work provided their pinout and the separation between the two rows of 8 pins is the same. The pin pitch is 2.54mm. On the module I have, this separation between the rows is 22.7mm and this is what the RainbowShift PCB design is based on.

Check the pinout diagram for details.

Setup Guide

WARNING: A note about connecting USB

If 5V is being supplied directly to RainbowShift via the screw terminals, **remove the ESP power header from RainbowShift BEFORE plugging in the USB**. If you don't do this it may cause damage to your hardware as there will be two conflicting 5V supplies with slightly different voltage.

Also, do not connect only USB power if you have a large number of LEDs as this will draw a lot of current through the USB port and may damage the power source, ESP, or something else.

Alternatively, never plug in USB to the ESP8266 module while it is connected to RainbowShift, simply pull the ESP8266 from RainbowShift, then connect USB. Do not re-insert with USB connected.

How to Flash and Setup WLED

For the most complete and detailed instructions on how to use WLED it is recommended to view their own site here. This guide will cover the specifics of how to flash and setup the RainbowShift hardware and the ESP8266 module.

1. With the ESP power header removed, or with the ESP8266 module removed from RainbowShift, plug the ESP8266 module into a PC using a USB cable.
2. Open this link to the WLED web installer

3. Click install
4. Select the correct COM port for your ESP8266 and click connect
    a. To identify the correct COM port on windows: right click the start button, click device manager, find and expand the item in the list called "Ports (COM & LPT)", the device should be listed. If these is more than one, simply unplug and reconnect the ESP8266 and you'll see which one disappears and reappears.
5. Now that firmware is flashed we will configure WLED.
6. Click 'Change Wi-Fi'
7. Enter your Wi-Fi SSID and Password and click connect.
8. Next click 'Visit Device' and it will take you to the IP address of the ESP module. You'll want to make a note of this.
9. Click 'Config' at the top of the screen, followed by 'LED Preferences' so that we can configure the LED setup.
10. Here we can set a current limit. Follow the instructions provided by WLED for this.
11. The LED voltage should be set to 5V, this is default.
12. In the LED Outputs section there is one setup by default to GPIO 2 but will also need to enable a second. Click the '+' button to add a new led output pin and set its GPIO pin to 1.
    a. If using Daybreak LEDs, set the type to WS281x and colour order to GRB.
    b. Set the length as per the number of individual LEDs in the chain.
13. Once the LED outputs are configured, scroll to the bottom of the page and click Save.
14. Back in the config page, select Wi-Fi-setup and disable Wi-Fi sleep, and click save.

How to connect ESP8266 to RainbowShift

If you purchased ESP8266 module soldered, all you need to do is press the exposed header pins on the ESP8266 into the corresponding pin sockets on the RainbowShift. There is labelling on the silkscreen of RainbowShift to help you.

How to Connect LEDs

Unlike 'normal' LEDs, digital RGB LEDs will not turn on simply by powering them, so it's recommended to get the ESP8266 setup first so that you can configure an output to ensure everything works. Digital RGB LEDs work by sending data to them. There is a small microchip on each LED which reads some data, and passes the rest on to the next LED so each strip of LEDs must be connected in a continuous chain.

To connect LEDs to RainbowShift you'll need JST XH compatible female terminals with 3 pin male connectors. You'll need to connect the 5V on the LED strip to the pin labelled 5V, the data in of the LED strip to the pin labelled 'S' for signal, and connect the ground pin of the LED strip to the pin labelled G.

To connect one LED strip to the next, connect 5v to 5v, GND to GND and Data Out (DO) to Data In (DI).

How to Connect Power

There are two ways to connect power, the first and recommended way is to use the screw terminal block on RainbowShift. The second option is to use the USB connection on the ESP8266.

The screw block terminal is recommended as it is capable, along with the rest of the PCB design, of sustaining high currents needed for a fairly large number of LEDs. Connect 5V and GND to the screw terminal using appropriate gauge wire and use bootlace ferrules for the best connection. Using this method will allow you to supply around 50 LEDs per chain at maximum full white brightness, or up to around 120-130 LEDs per chain with most effects (according to WLED calculator). When using large numbers of LEDs double check all specifications before proceeding.

If you are using less than 6 total RGB LEDs from both chains then you could just use the USB power though the ESP8266 but as you can see, this is highly restrictive in the LED quantity, so it's not recommended.

How to test WLED functionality

The section assumes that your ESP8266 module is flashed and connected to your RainbowShift and that RainbowShift is receiving sufficient 5V power from a supply connected to the screw terminals to light your LEDs.

1. Use a web browser on your phone or computer to access the WLED web interface using the IP address.
2. On the colours tab, select a red, green, and blue colour for the three colour options labelled as 1, 2 and 3.
3. Also select Color Gradient as the colour palette.
4. Select the effects tab and choose the android pattern. You should find that your RGBs start doing a nice scrolling effect using the colours you selected.

Check to make sure that brightness looks even across all LEDs, that all LEDS are turning on as expected, and that all LEDs are showing all three colours at some point in the pattern cycle. You can change the pattern to solid, and use individual colours if that helps diagnose any specific issues. Basically just have a play around and test it out!

If not all the LEDs in your chain are lighting up, make sure to check the chain length in the LED configuration page as this sets the length of lights that will illuminate in the chain.

How to connect to your 3D printer

You might expect that this is connected to your 3D printer using USB, but if you've observed the documentation fully you might also notice that this is not the case. ESP8266 will connect to your printer over Wi-Fi.

Moonraker is the API web server for Klipper. It allows other things to interact with the 3D Printer Klipper firmware. If you are using RainbowShift for something other than 3D printer lighting then you can probably skip this section.

For configuration you need to modify the moonraker.conf file found on your machine. This is typically accessed with the other firmware configuration files via the web interface.

You need to add a [wled] section along with a name of the LEDs, the IP address of the ESP8266 module, initial colours between 0 and 1, and the chain_count. Obviously change the name and IP address as needed. Low initial colours prevent max power draw on start-up. Optionally add 'initial_white: 0.2' if you are using RGBW.

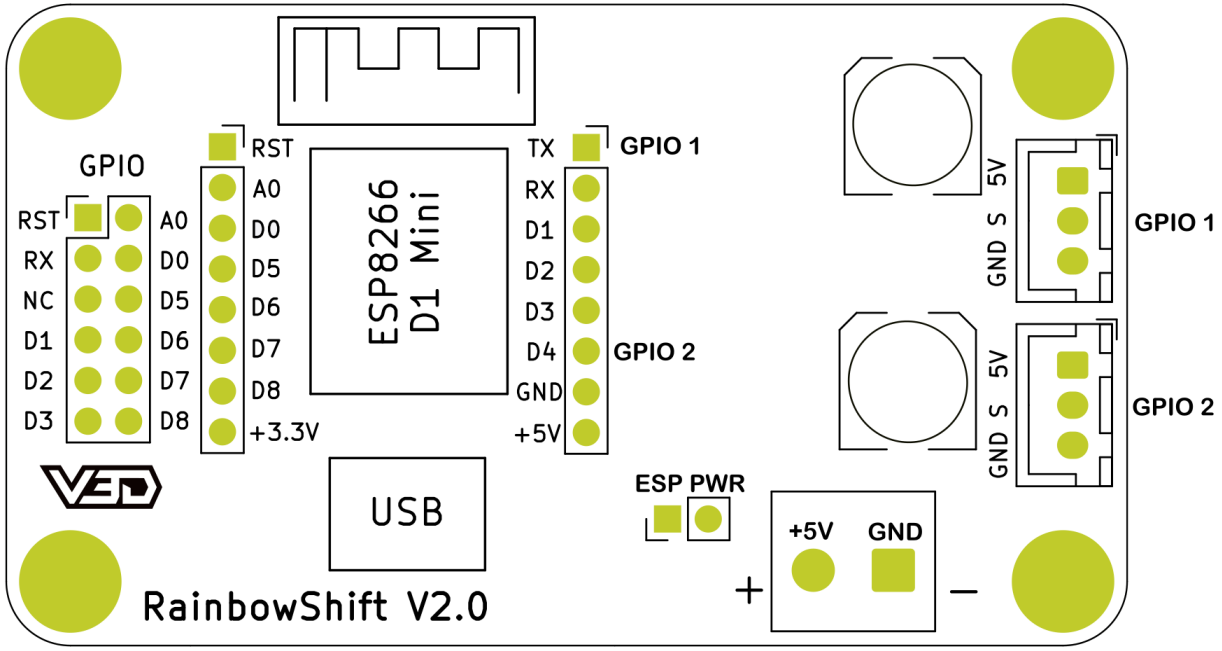
Here is an example:

```
[wled DaybreakNeos]
type: http
address: 192.168.1.115
initial_red: 0.2
initial_green: 0.2
initial_blue: 0.2
chain_count: 26
```

Save and reboot for the changes to take effect. Klipper should now be able to control your WLED module. For details on how to send commands from Klipper to WLED, check the official documentation here.

Board Pinout

All the pinout labels are shown on the circuit board itself, but I've also included a pinout diagram here with some additional details



Share results

Be sure to share your success in the discord, twitter or anywhere else you fancy! Don't forget to leave a review too.

Troubleshooting

If one of the LED outputs does not work, check that you have configured both LED outputs from the ESP8266.

If only part of the LED chain is illuminating, check that you have set the correct number of LEDs in the chain.

Change Log

This Document

- V1.0
  - First Production Release

RainbowShift PCB

- V2.0
  - First Production Release