This guide walks through the instructions for loading a custom Cleanflight v1.10 .hex file onto a Naze32 rev5 flight controller. This will not work for any other flight controllers or any other versions of Cleanflight. This is a completely unofficial hack and is in no way supported or endorsed by the Cleanflight team. If you decide to do this mod, it is at your own risk!

Description

This custom Cleanflight build replaces the existing "Modes and Orientation" LED functionality which in the stock Cleanflight code allows the LEDs to change color in response to a change in flight mode. *If you require your LEDs to change color in response to a change in flight mode, do not install this custom .hex file!*

The "Modes and Orientation" functionality within the LED driver software is replaced with a new feature that ties the "hue" of the LEDs to AUX4 from your receiver. This is hard-coded, the receiver channel that is used cannot be changed. So for example if you have a system with only 6 channels you will not be able to use this custom .hex file.

Hardware Installation

Wire up your LEDs with power, signal, and ground wires. The signal wire should connect to pin 5 on your Naze32 rev5 flight controller.

The Naze32 rev5 board has a 3.3V logic level on the soft serial port we'll be using to drive the LEDs. This unfortunately requires the reduction in supply voltage to the LED strip from 5V down below ~4.7V in order for the LED driver to reliably read the serial commands coming from the flight controller. This can be accomplished by driving the LEDs using an adjustable 5V regulator and simply turning down the voltage below 4.8V. Alternately, a diode can be installed on the 5V feed from a fixed regulator to reduce the voltage arriving at the LEDs by one diode drop. However you accomplish this, the LED strip must be powered by 4.7V or less in order to work properly.

Note that newer flight controllers typically have a dedicated LED output that incorporates a built-in logic level shifter to eliminate this issue.

Firmware Installation

Perform a CLI dump or manually note all board settings before performing any firmware update to your flight controller in case of a parameter wipe. Open the Cleanflight configurator and plug your flight controller into your computer using a USB cable. Don't click "connect"! Instead, select the "Firmware Flasher" from the left hand menu. At the bottom of the page, click "Load Firmware [Local]" and navigate to the .hex file you want to flash. Click "Flash Firmware".

Cleanflight Setup

Open the Cleanflight configurator and check the "LED Strip" box in the bottom right corner of the Configuration tab. Save these changes and then switch to the LED Strip tab. Configure any LEDs you want to be able to adjust on the fly by enabling them with the "Modes and Orientation" property. Click Save. You should now be able to adjust the color of these LEDs using a pot on your transmitter connected to channel AUX4.

Advanced Note

What follows assumes you understand the "HSV" or "Hue, Saturation, Value" system for color definition that is used in Cleanflight. If you don't know what these terms mean, read the Wikipedia article on HSV before continuing.

This mod allows the "hue" to be dynamically set by AUX4, but what about "saturation" and "value"? These parameters are inherited according to the color swatch that is selected from the menu on the right. These can be adjusted through the CLI, but cannot be changed dynamically during aircraft operation. An example of this is described in detail below.

Enter the CLI and type "color". You should see a text output of each of the 16 color presets that are available for customization.

```
color 0 0,0,0
color 1 0,255,255
color 2 0,0,255
color 3 30,0,255
color 4 60,0,255
color 5 90,0,255
color 6 120,0,255
color 7 150,0,255
color 8 180,0,255
color 9 210,0,255
color 10 240,0,255
color 11 270,0,255
color 12 300,0,255
color 13 330,0,255
color 14 0,0,0
color 15 0,0,0
```

Note that saturation and value for all of the colors in the stock palate are 0 and 255 respectively, with the exception of colors #0, #14, and #15 which are all set to black (off). While you can re-define HSV values for any of the presets, I prefer using these three available slots for my custom definitions - since if I want an LED to be black I just won't turn it on in the first place.

You can modify the contents of a color preset; by typing the following:

```
color 0 240,0,120
```

you can modify preset #0 so that it has the same blue hue as preset #10, but is approximately half the brightness. Continuing in this pattern, you can redefine presets #14 and #15 as follows:

```
color 14 240,0,60
color 15 240,0,30
```

With these definitions complete, type "save" and then return to the LED Strip tab. Now define a strip of lights along your aircraft using these presets as follows:

15	14	0	10	0	14	15
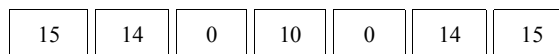
Doing this will create a neat fade effect where the lights are all the same color, but are brightest towards the middle and fade towards the edges. You can see the results of this effect in the intro video here:

```
https://youtu.be/M4BOHdEiRlE
```

All of this was possible with stock Cleanflight. The new bit is that now by defining these LEDs as having the "Modes and Orientation" property, and then selecting your modified color presets, the result will still be an LED strip that has a fade effect, but you will now be able to change the color (hue) of the lights using AUX4 on your transmitter. The saturation and value properties are inherited from the color presets specified from the right hand panel.