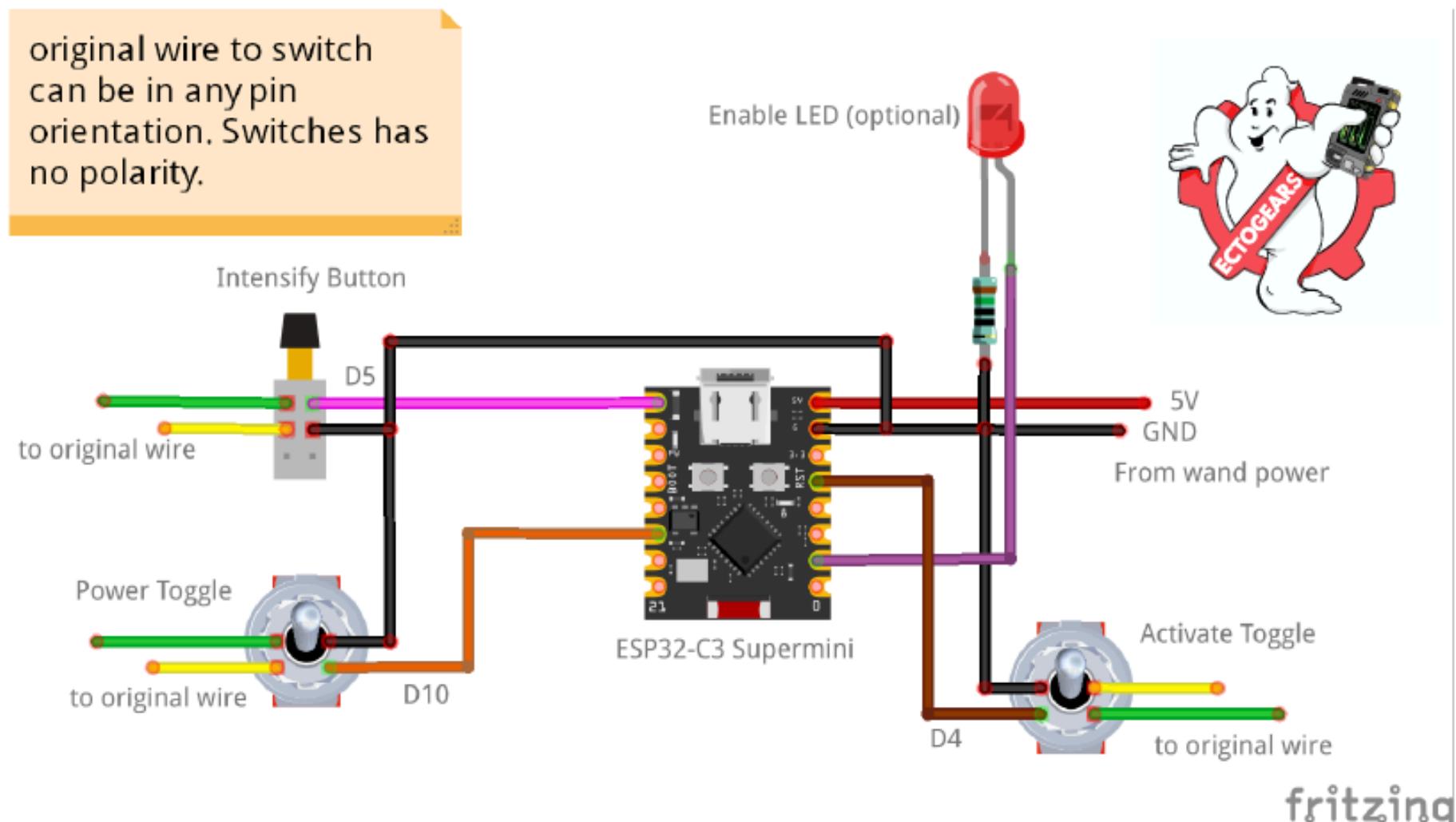


INTRO

What exactly is the purpose of Ectogears switch board ? All proton pack electronic board has different timing, animations and this makes syncing to an add-on external equipment is impossible. Here's where the switch board comes in. The switch board replaces the neutrona wand toggle switches and the intensify pushbutton. When the intensify button is pressed, it send the press to both the original board and to switch board microcontroller.

The switch board has a configuration webpage that adjust the timings. Sync the timing to the original electronic board and switch board. After matching the timing, both board should sync perfectly now. The switchboard now is able to collect data from the neutrona wand, connect automatically (up to 10 devices) to any Ectogears equipment and send data to them.

Without this, Ectogears equipment won't work properly except for those Standalone version. Those has its own code and does not respond to neutrona wand status.



Below are the part lists. The firmwares can be downloaded in download page.

- 1pc x ESP32-C3 microcontroller
- 1pc x 1pf ceramic capacitor
- 3pcs x MTS-202 DPDT Toggle switch
- 1pc x DPDT M6 with 10mm cap pushbutton (you can reuse the black cap from your original pushbutton)
- 1pc x 5v fixed buck (if you don't have regulated 5v source)
- Security Key Writer firmware
- Switch Board firmware

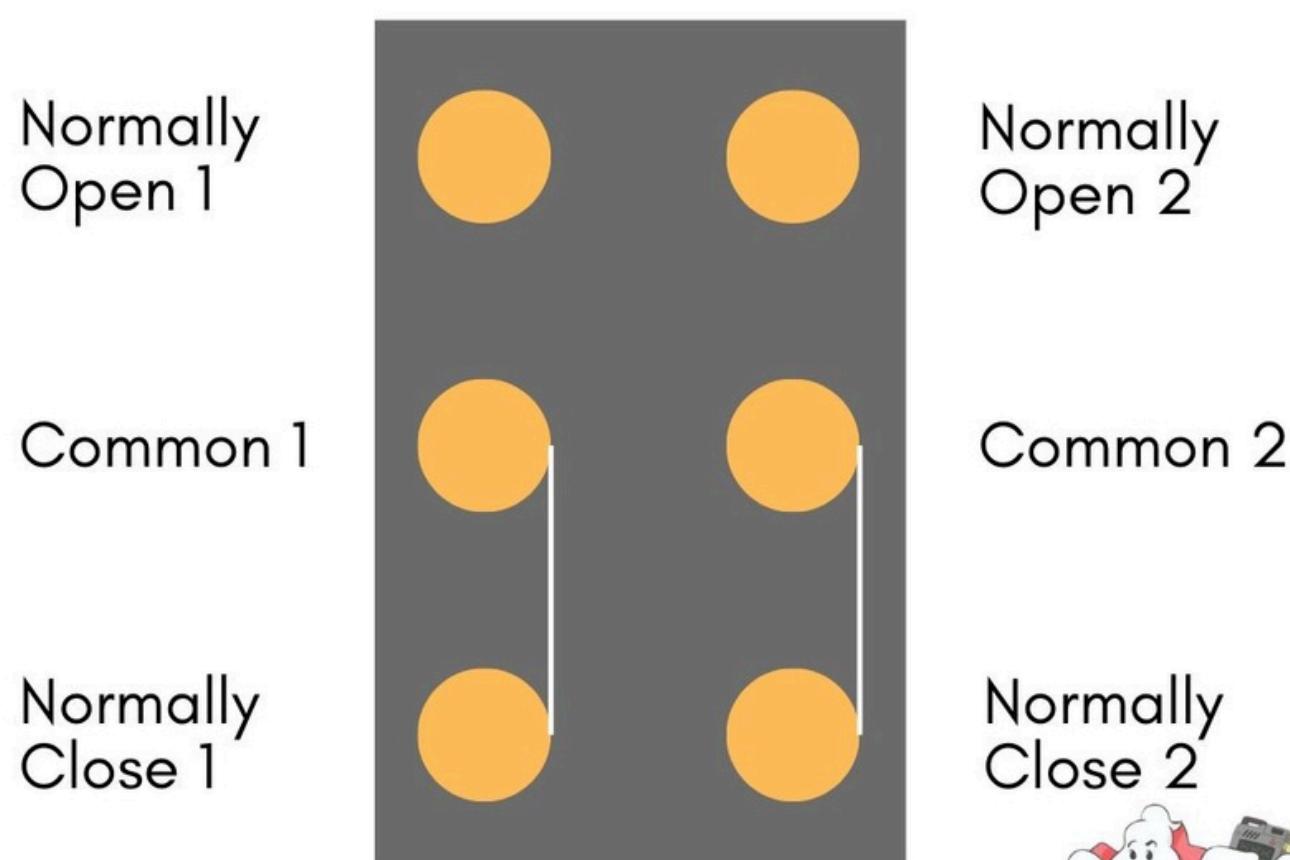


We are using a DPDT switches to make sure that the original electronic board still have access to the switches and isolated from the switch board wirings. Usually this switches has 6 pins and the center is usually the COMMON pin. Don't use the Normally Closed. We only be using the Normally Open.

- Switches has no orientation. As long the wire goes to Common and Normally Open.
- Side 1 goes to the original electronic board wiring.
- Side 2 goes to switch board GND and Digital pin.

Tips : You can use a multimeter in continuity setting to check which is the "COMMON" pin. For toggle switch, pick a side as the OFF position. When testing with a multimeter. any two pins that has continuity when the toggle/switch is at the OFF position is the "Common" and "Normally Close". For pushbutton switch, any two pins that has continuity when the pushbutton is not pressed is the "Common" and "Normally Close".

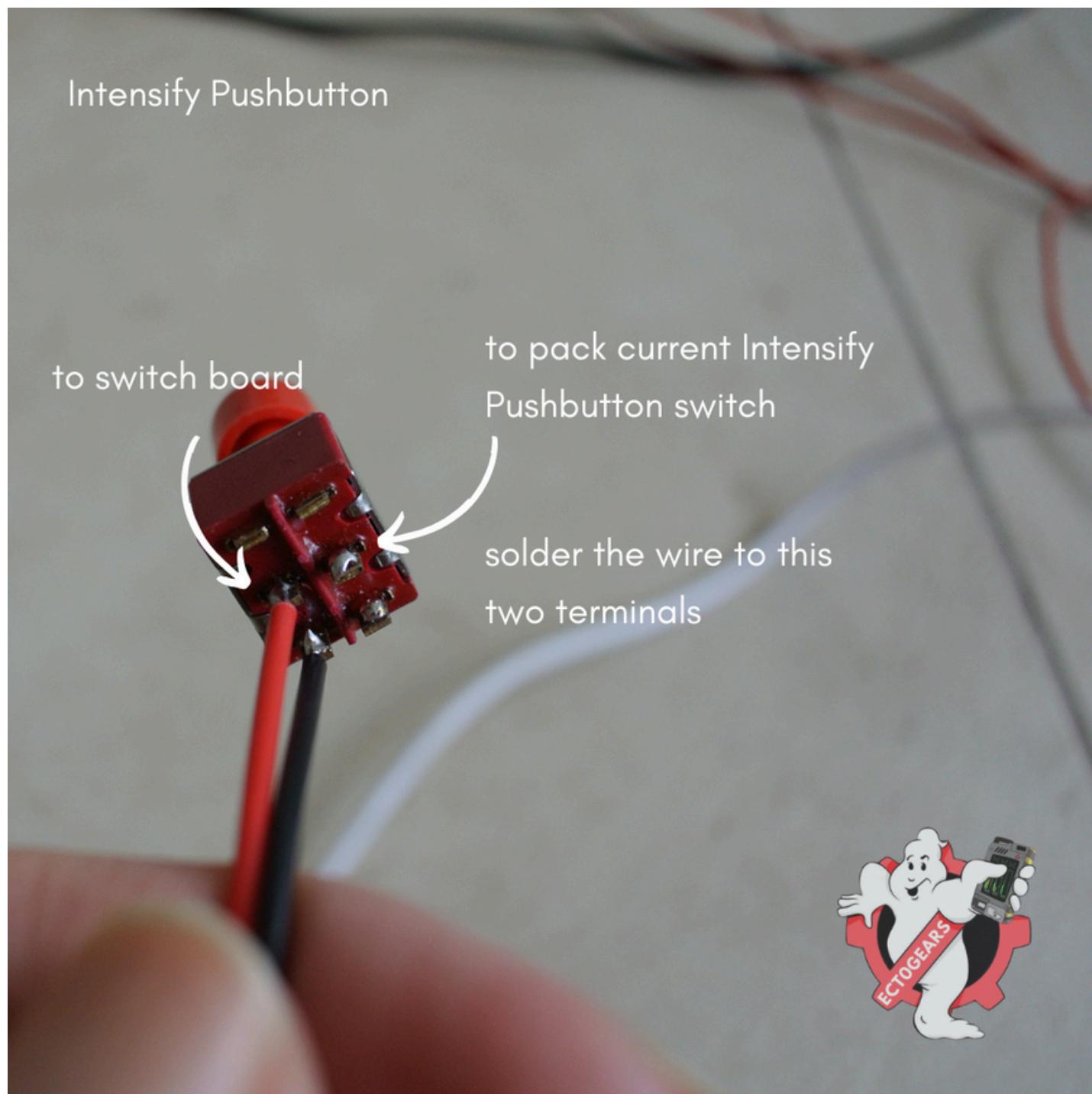
## DPDT Switches



## SWITCH BOARD

Intensify pushbutton has 6 pins too. If you can't get a black color cap, simply swap the cap with your current button. The cap is 10mm and the switch thread is 6mm.

- Switches has no orientation. As long the wire goes to Common and Normally Open.
- Side 1 goes to the original electronic board wiring.
- Side 2 goes to switch board GND and Digital pin D5.



# SWITCH BOARD

When the activate button is at OFF position, switch board considers the neutrona wand firing is disabled. In the switch board schematic, there's a pin for a led. This is optional. Whenever the neutrona wand firing is disabled, this led is OFF. It blinks when neutrona wand is at Overheat state.

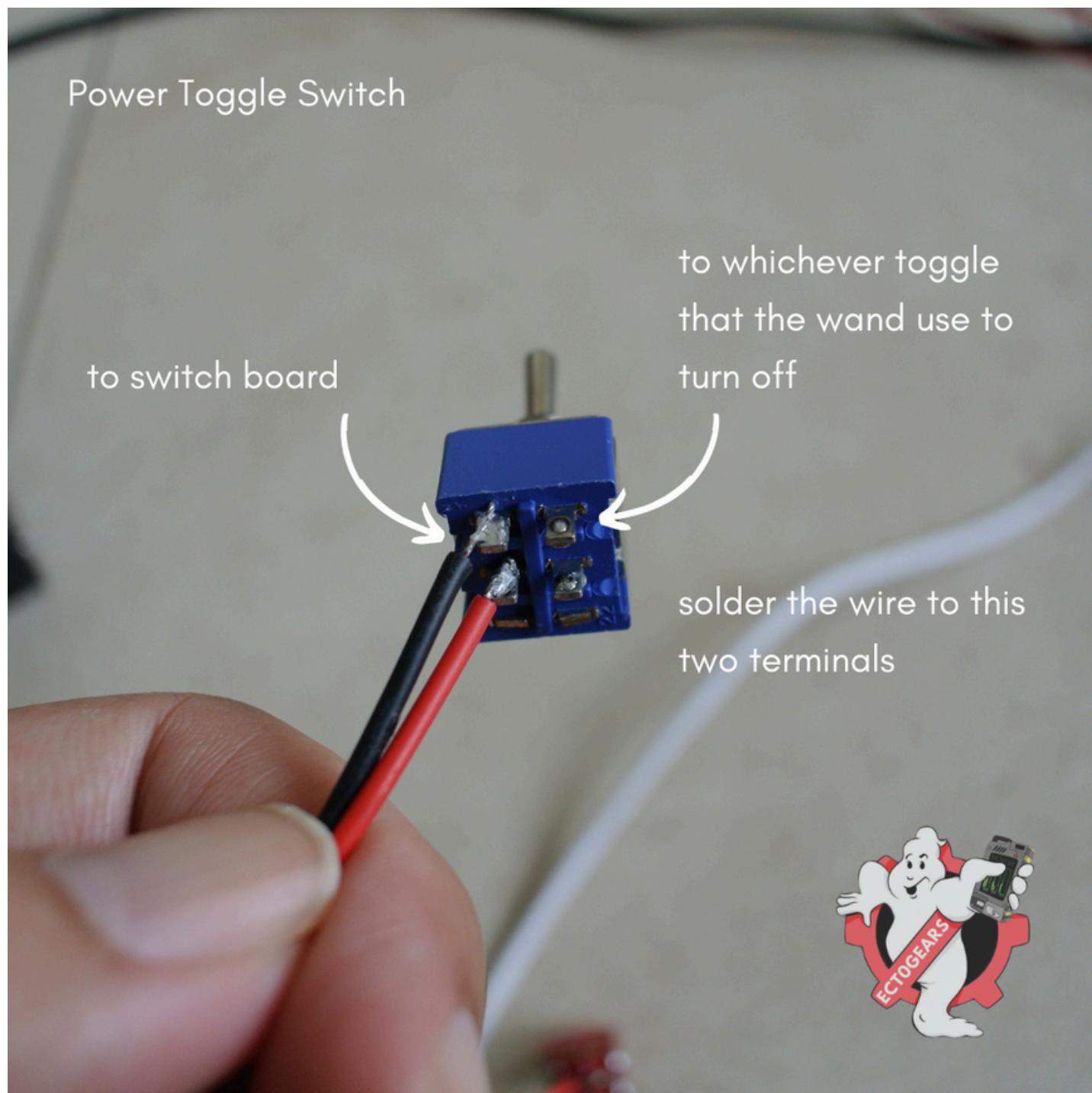
- Switches has no orientation. As long the wire goes to Common and Normally Open.
- Side 1 goes to the original electronic board wiring.
- Side 2 goes to switch board GND and Digital pin D4.



## SWITCH BOARD

When the power button is at OFF position, switch board considers the neutrona wand is currently turned off / standby. If you don't need this, simple add a jumper from GND and D10. No need to replace the toggle switch for this one.

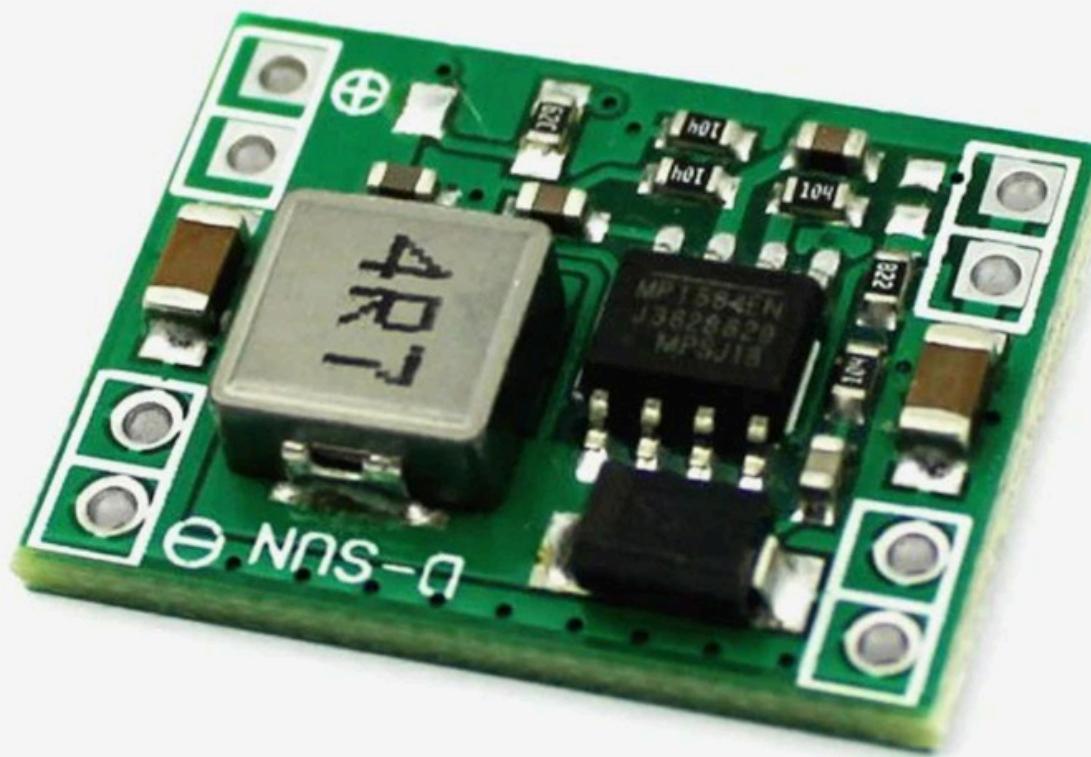
- Switches has no orientation. As long the wire goes to Common and Normally Open.
- Side 1 goes to the original electronic board wiring.
- Side 2 goes to switch board GND and Digital pin D10.



Ectogears electronic requires a regulated 5V. A DC-DC buck is needed if your electronic is running a different voltage than 5V.

- If your current electronic uses lower than 5v, you will need a step-up buck such as MT3608. Do note that this is an adjustable buck. Properly set the voltage to 5V before connecting it to the switch board.
- If your current electronic uses higher than 5v, you will need a step-down buck such as MP1584.
- It's a good practice to add a 330 ohm electrolytic capacitor in between the buck VOUT and GND. This help to stabilize the buck output. Its also a good idea to add a 2A fuse to the VCC line. This protects both the battery and your electronics.
- If you are adding this to a HASLAB Pack and still uses the stock electronic board, do not tab the voltage from the neutrona wand. The stock board uses voltage differences as a trigger. Connecting it to a buck messes with it. My suggestion is to add an extra wires from the pack to the wand.
- If you are using a Talentcell battery, use the 5V USB port and wired it to the switch board VCC and GND.
- If you are still using the D-Cell battery, now seems a good time to upgrade it to a talentcell battery. OR , add an additional 5v power bank just for Ectogears equipments.

DC Buck 5V



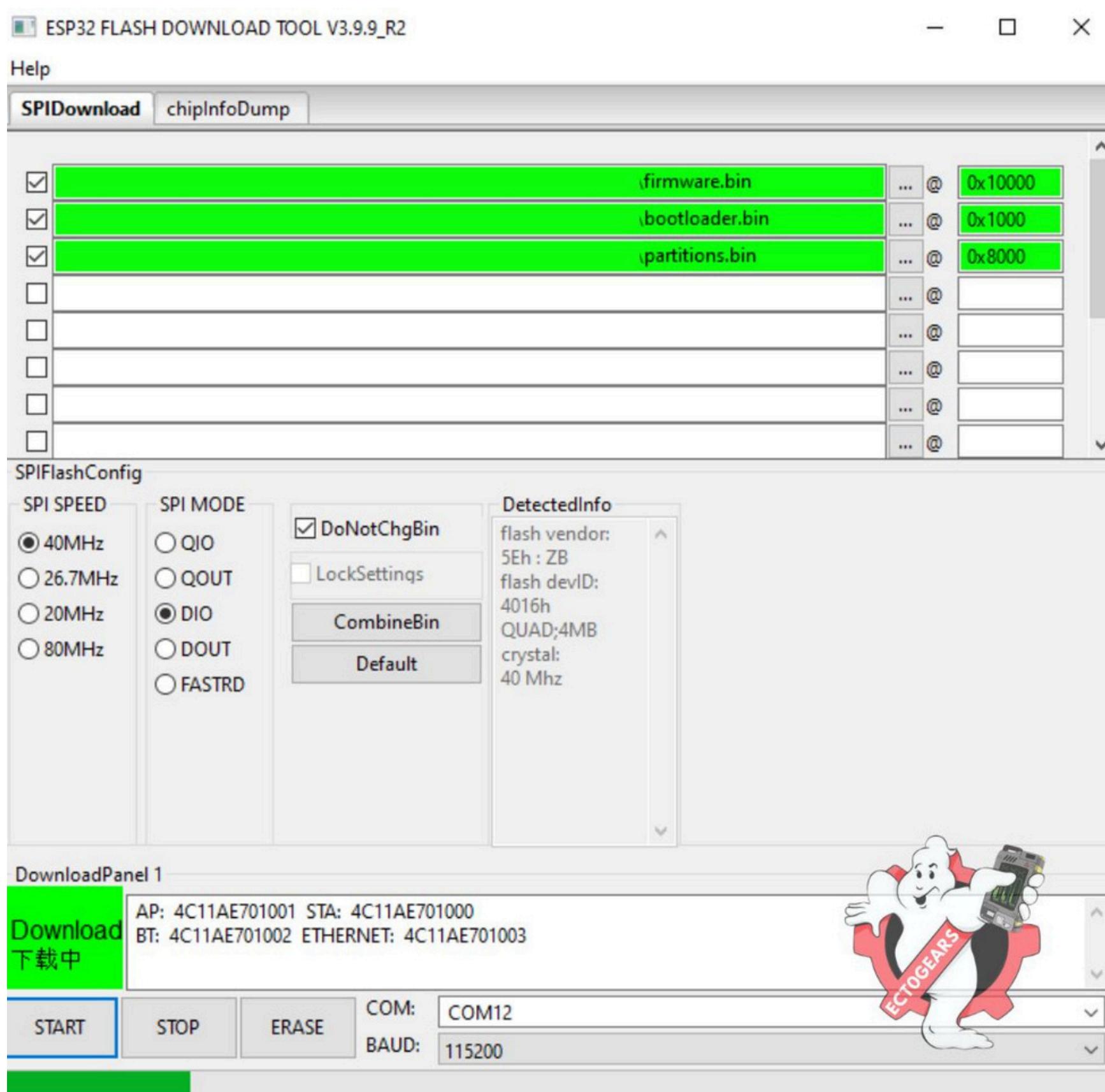
# SWITCH BOARD

After the wiring is done, now moving on to the firmware. You have to make two uploads to the board. The upload guide is in another post.

**Upload 1 :** Security Key. This is crucial to make sure everything works. You need to set the SAME 8 digit security key to all ectogears equipment that you will be using. This is to ensure that the switch board only automatically connects to only your boards.

No need to add mac address or individually ID all the equipments. This makes adding new equipment in the future easier. Note: For switch board , upload the HUB ESP32-C3 firmware.

**Upload 2 :** Equipment firmware. After the security key is done, you can now upload the main switch board firmware.



Now that the switch board completed, it's time to adjust the timing of the switch board to match your current electronics. The timing are on increment of 500ms. Be sure to adjust the timings as close to your current electronic board timing.

- Connect to the Switch board SSID and open browser to 192.168.4.1 for the config page.
- Adjust one state timing at a time and then upload to EEPROM. Then adjust the next timing and repeat.
- Below the timing controls are the timing conditions. Every board has different way of handling state timings and methods. Some boards can resume the firing timing and some don't. The condition description is in the config page.
- Adjust to your current board and after this, you are done !

### EctoGears Switch Board Config

Timing	Default	Current	Adjustment	New Value
Firing	10.0s	10.0s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change
Overheat	15.0s	15.0s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change
Venting	21.0s	18.9s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change
Startup	6.0s	5.0s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change
Shutdown	3.0s	3.0s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change
Delay	0.0s	0.0s	<button style="border: none; padding: 0;">- 500ms</button> <button style="border: none; padding: 0;">+ 500ms</button>	No Change

Timing value for Firing, Overheat and Venting is based on the end of each state from the time Intensify button is pressed.

Setting	Description
<input type="checkbox"/> Skip Initial Startup	If set true, during initial powerup, board goes directly to Idle state. Else, it goes thru a startup state.
<input type="checkbox"/> Skip Subsequent Startup	If set true, after Venting state, board goes directly to idle state. Else, it goes thru a startup state.
<input checked="" type="checkbox"/> Firing Resume	If set true, when firing, then button released, it will continue the firing from where it left off. Else, it goes thru a new firing cycle.
<input type="checkbox"/> Firing Delay	If enabled, adds a delay before starting the firing state when Intensify button is pressed.

Save to EEPROM

You able to configure the wand setting according to your liking.

Then, save it to EEPROM so the wand remembers





The timings for Firing, Overheat and Venting are based on the duration of the Intensify button is being pressed. For example, if Overheat is 15seconds, it need the intensify button being pressed for 15seconds to enter Overheat state.

## Config Timing

Startup 8s    Firing : Press 10s    Duration (10s)

Overheat : Pressed 15s    Duration (5s)

Venting : Pressed 21s    Duration (6s)

- Default value is good enough but feel free to change them
- Connect into the wand board, go to 192.168.4.1
- Startup is a state when board first turned on or to simulate reset after venting state. After venting startup state can be turned off.
- The timing in config is counted from the time Intensify button is pressed not their individual duration.
- Only do the timing changes one state a time
- After everything is done, save to EEPROM

