INSTRUCTION MANUAL – 32 BIT MOTION CONTROLLER

Version: 1.0

July 10th 2023

CONTENTS

GENERAL

OVERVIEW

This is the fourth generation of our in house built motion controller for CNC and Laser systems. Based on next generation GRBL open source firmware, this 32 bit controller is packed with features and abilities. Connect to it directly with USB via Lightburn or Vectric or have a stand alone system and use an SD card or connect to it with a tablet or your phone via Wifi.

Amazing 5 Axis performance with a built in Rotary axis controller to be used with the J Tech Rotary Accessory.

Features:

- J Tech 32Bit Controller with Rotary Axis
- Web Interface for remote management
- Wifi enabled
- SD Card Reader for stand alone operation
- Lightburn and Vectric Laser Module Support
- 4th Axis support
- New Fluid NC (based on GRBL)
- Enclosed case with mounting, USB, SD, and Power Switch

Available Options:

- NEMA 17 Silent Drivers
- NEMA 23 External Cables

The board has 5 slots for stepper drivers. It comes included with TMC2208 stepper drivers.

Stepper Driver Features:

- Power tube built-in drive current 1.4A ,peak current 2A, voltage range 4.75V-36V
- Up to 256 native microsteps (without interpolation)
- CoolStep ™ current dynamic adjustment technology, can save 70% of the energy
- stealthChop2 - faster motor acceleration/deceleration than stealthChop
- dcStep ™, stallGuard2 ™ stall detection technology
- Automatic stealthChop and spreadCycle switchover depending on velocity
- Components on bottom PCB side for better heat emission
- Automatic standby current reduction
- SteaClthhop mute technology
- spreadCycle - highly dynamic motor control chopper

SPECIFICATIONS

Specification	
Native Microsteps	up to 1/256
Logic Voltage (VIO)	3-5V
Motor Voltage (VM)	5.5-36V
Motor Phase Current max	1.2A RMS, 2.0A Peak
RDSon	<=0.3 Ohm
Microstep Setting	1/8
Connectors:	AMP Motor and JST XH Connectors
Operating Temperature:	0 to 40 °C
Storage Temperature:	-40 to 70 °C
Dimensions:	3.25” x 2.25”

SAFETY

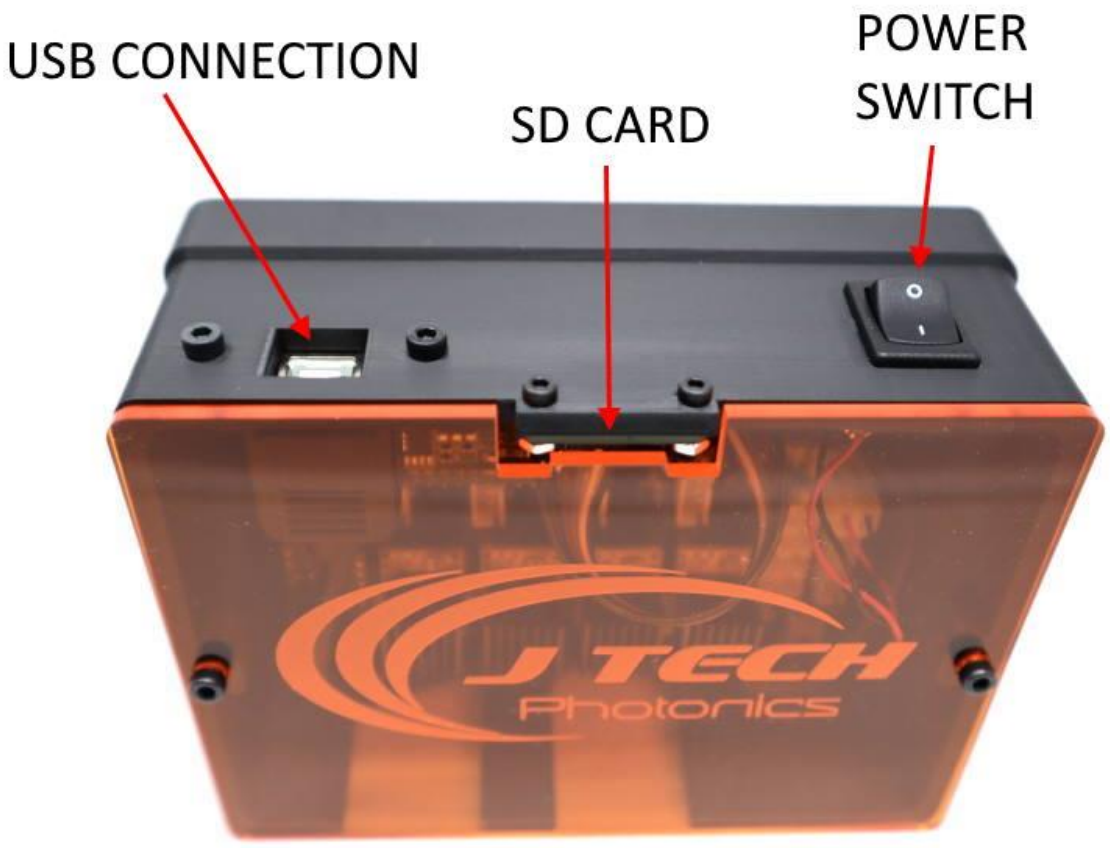
- Operate the 32 Bit Motion controller in an explosion free area.
- The 32 Bit Motion controller may reach high temperatures under operation. Make sure there is adequate airflow to the Driver Board. Also, make sure there is adequate protection around the Driver Board and that it is not in contact with other materials.

DISCLAIMER

- The 32 Bit Motion controller is designed as an OEM product to be integrated into a final solution.
- All statements of safety are only applied when the driver board is used in its intended purpose.
- You are legally responsible for any injury to anybody resulting from the use of or assembly of the GRBL Shield - Breakout Board or their finished products.
- You Accept this driver board as a COMPONENT for integration in a system of YOUR OWN design and will be legally responsible from any and all LIABILITIES.

OUTSIDE OVERVIEW

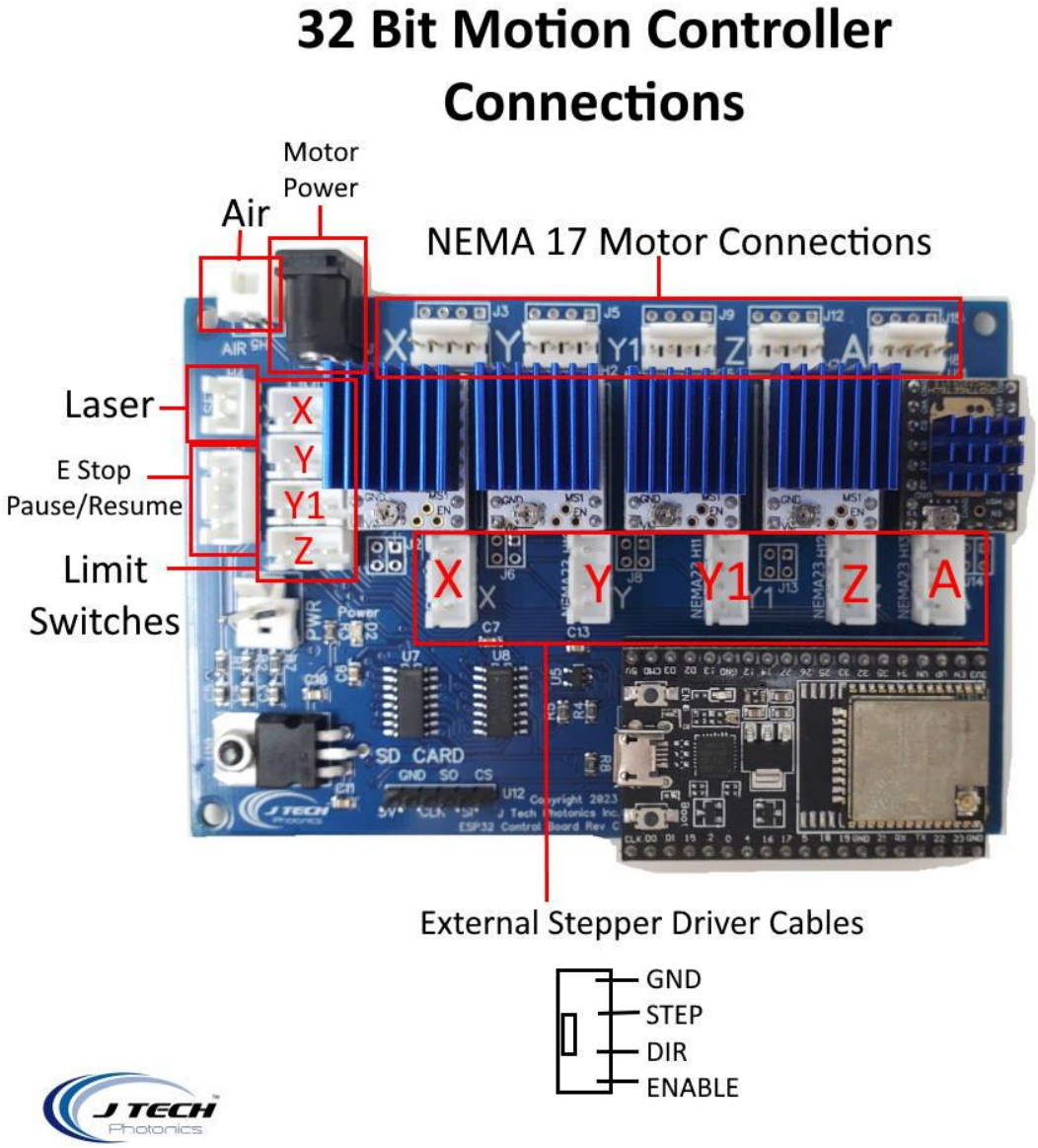
The controller has a connection for a USB cable and a SD Card. You can run the controller from an SD card using the built in WIFI interface. The power switch is located in the front of the controller.



CONNECTIONS

CONNECTION DIAGRAM

You can see the outputs on the GRBL board in the following diagram.



INPUT POWER AND AIR RELAY

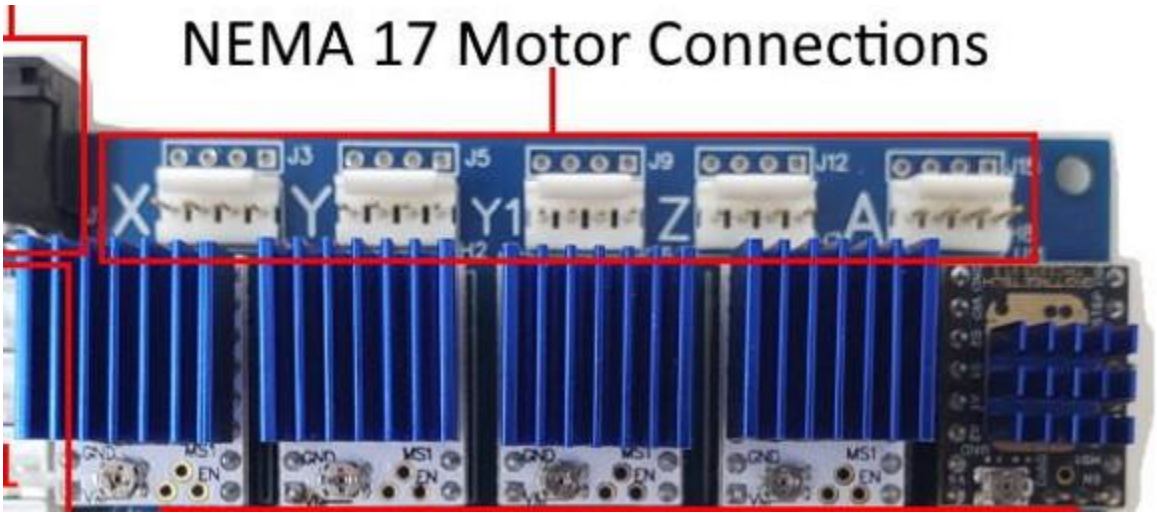
The bullet connector on the back is for the input power adapter. Use the provided power adapter to run the controller.

The air connection is intended to be connected to an IOT relay for an air pump for laser air assist. You can find a suitable IOT relay here:

https://dlidirect.com/products/iot-power-relay

NEMA 17 MOTOR CONNECTION

The motor cables for the NEMA 17 motors connect on the back of the control box. On the board, you can see them labeled X, Y, Y1, Z, and the rotary axis A.

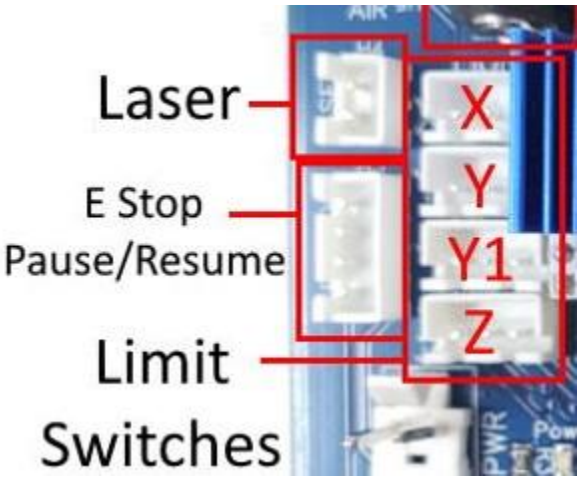


LASER, BUTTON PANEL, AND LIMIT SWITCHES

The laser output signal cable attaches to the “Laser” JST XH port.

If you purchased the E Stop pause resume panel it will connect to the JST XH 4 pin port here.

External limit switches can be installed in the JST XH ports. Current revision of the control software uses the X, Y, and Z limits. The Y1 is currently not used.



For limit switches, you can use a standard three terminal 3D printer limit switch. An example from Amazon is here:

https://www.amazon.com/gp/product/B07ZCSXNF3/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

FYSETC 3pcs Ender 3 Limit Switch Mechanical Endstop Module 3D Printer Part for CNC RepRap Makebot Prus RAMPS 1.4 Board Ender 3 Pro Ender 5 CR-10 S4 S5 Series

Visit the FYSETC Store

4.6 ★★★★½ 167 ratings | 6 answered questions

Price: $9.88
Business Price $8.66
FREE Returns
You Save: $1.22 (12%)

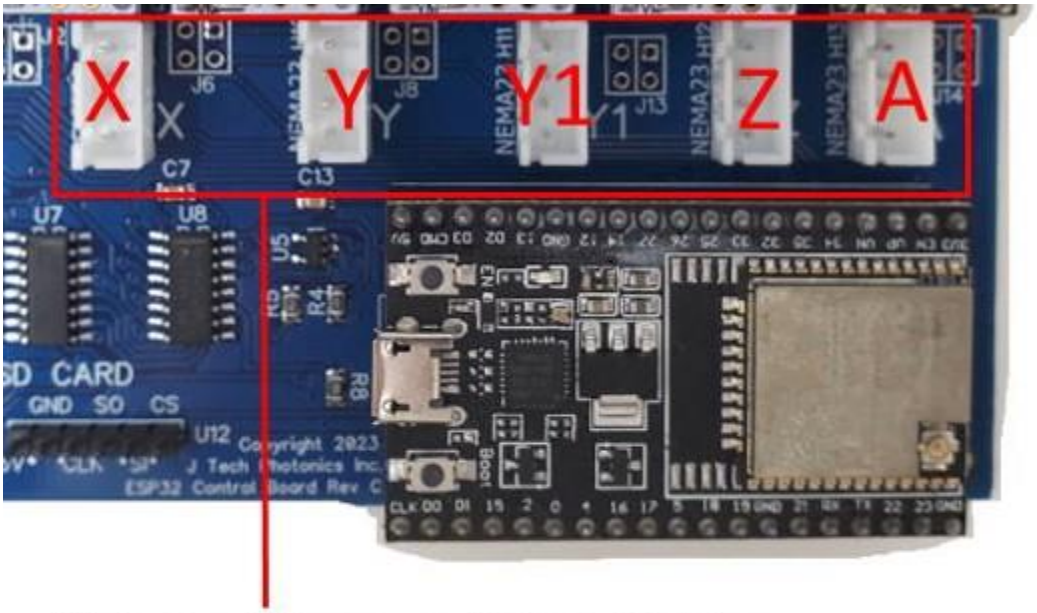
Brand	FYSETC
Voltage	125 Volts
Material	Metal

About this item

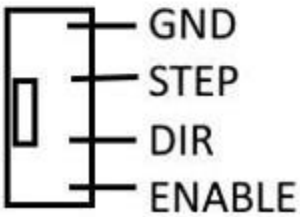
- Applicable Model: 3D Printer Accessories Limit Switch 3Pin N/O N/C control, Drop in replacement for Ender-3/Ender-3 Pro/CR-10/CR-10S/CR-10 S4/CR-10 S5/CR-10S Pro 3D printer.
- Features: Optical Endstops switch with 1*Photoelectric Light Control.
- DIY Must-have 3D Printer switch: With trigger indicator, 3 Pin N/O N/C control, easy to operate, reliable choice. Made of flame retardant material, durable.

EXTERNAL CONNECTIONS

If you want to connect to external stepper drivers, you can use the following ports to connect to them.



External Stepper Driver Cables



SETTING MOTOR CURRENT LIMIT

If you purchased this board as a kit with motors included, then you can skip this as they are already set correctly to drive 1.2amps to the motors.

If you have purchased just the GRBL shield board, then you need to adjust the current limit to match your specific motors. First thing you need to do is see what the current rating of your motors are. The TMC2208 can provide up to 1.2 amps, but never go over this. We recommend using motors that are less than the maximum current level of the driver chip.

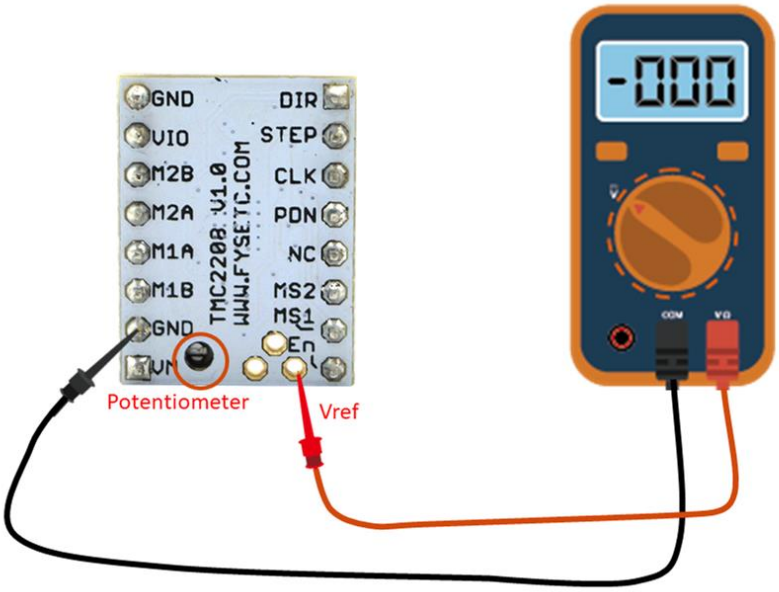
There is a very good video on how to set the current limit here: https://youtu.be/89BHS9hfSUk

The video shows a way to set the current limit by measuring the voltage on the "ref" pin and to calculate the resulting current limit (the current sense resistors are 0.100Ω). The ref pin voltage is accessible on a via that is circled on the bottom silkscreen of the circuit board. The current limit relates to the reference voltage as follows:

Current Limit = VREF × 2

So, for example, if you have a stepper motor rated for 1 A, you can set the current limit to 1 A by setting the reference voltage to 0.5 V.

Note: The coil current can be very different from the power supply current, so you should not use the current measured at the power supply to set the current limit. The appropriate place to put your current meter is in series with one of your stepper motor coils.



SETTING UP YOUR CONTROLLER

DRIVERS

For most windows machines, your controller should be recognized when you connect it. However, if it is not, then use the following link to download the drivers and install them.

https://www.pololu.com/file/0J14/pololu-cp2102-windows-220616.zip

If you have a mac, you can get the drivers here:

https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads

SETTING UP WIFI

In order to get to the configuration page for the controller, you will need to setup the wifi for the controller. You can follow the video located here:

https://youtu.be/ZF-4liISNaI

DOWNLOADING A NEW CONFIGURATION FILE

The controller comes with a configuration file on it already set up. If you want to update your file for any reason, then you can upload a new one. Follow the instructions here on how to do this:

https://youtu.be/KcLulaHiO-A

LIGHTBURN CONFIGURATION

If you want to use lightburn and run the machine from inside the Lightburn program, you will need to connect the controller to a computer using the USB port.

You can find a video for a standard configuration in lightburn here:

https://youtu.be/WRYZGq6_QM4

CONFIGURATION FILE

The controller has a configuration file that loads on startup. The details for all of the motors and the inputs/outputs are all in the file. For details on how the configuration works, you can see them here:

http://wiki.fluidnc.com/

The details of the file are the following few pages.

```
board: J Tech Control
name: J Tech Control Board ESP32 V1
meta: 1-25-2023 J Tech Photonics Inc.

stepping:
  engine: I2S_STATIC
  idle_ms: 255
  pulse_us: 4
  dir_delay_us: 1
  disable_delay_us: 0

axes:
  shared_stepper_disable_pin: NO_PIN
  x:
    steps_per_mm: 80.000
    max_rate_mm_per_min: 5080
    acceleration_mm_per_sec2: 200.000
    max_travel_mm: 812.000
    soft_limits: false
    homing:
      cycle: 2
      positive_direction: false
      mpos_mm: 0.000
      feed_mm_per_min: 1000.000
      seek_mm_per_min: 2000.000
      settle_ms: 500
      seek_scaler: 1.100
      feed_scaler: 1.100

    motor0:
      limit_neg_pin: gpio.39:low
      limit_pos_pin: NO_PIN
      limit_all_pin: NO_PIN
      hard_limits: false
      pulloff_mm: 2.000
      standard_stepper:
        step_pin: I2SO.2
        direction_pin: I2SO.1
        disable_pin: I2SO.0
```

```
y:
  steps_per_mm: 80
  max_rate_mm_per_min: 5080
  acceleration_mm_per_sec2: 200.000
  max_travel_mm: 812.000
  soft_limits: false
  homing:
    cycle: 3
    positive_direction: false
    mpos_mm: 0.000
    feed_mm_per_min: 1000.000
    seek_mm_per_min: 2000.000
    settle_ms: 500
    seek_scaler: 1.100
    feed_scaler: 1.100

  motor0:
    limit_neg_pin: gpio.34:low
    limit_pos_pin: NO_PIN
    limit_all_pin: NO_PIN
    hard_limits: false
    pulloff_mm: 2.000
    standard_stepper:
      step_pin: I2SO.4
      direction_pin: I2SO.3
      disable_pin: I2SO.5

  motor1:
    limit_neg_pin: NO_PIN
    limit_pos_pin: NO_PIN
    limit_all_pin: NO_PIN
    hard_limits: false
    pulloff_mm: 2.000
    standard_stepper:
      step_pin: I2SO.7
      direction_pin: I2SO.6
      disable_pin: I2SO.8
```

```
z:
  steps_per_mm: 401
  max_rate_mm_per_min: 2000.000
  acceleration_mm_per_sec2: 100.000
  max_travel_mm: 160.000
  soft_limits: false
  homing:
    cycle: 1
    positive_direction: true
    mpos_mm: 0.000
    feed_mm_per_min: 250.000
    seek_mm_per_min: 500.000
    settle_ms: 500
    seek_scaler: 1.100
    feed_scaler: 1.100

  motor0:
    limit_neg_pin: NO_PIN
    limit_pos_pin: gpio.35:low
    limit_all_pin: NO_PIN
    hard_limits: false
    pulloff_mm: 2.000
    standard_stepper:
      step_pin: I2SO.11
      direction_pin: I2SO.10
      disable_pin: I2SO.9

A:
  steps_per_mm: 11
  max_rate_mm_per_min: 2000.000
  acceleration_mm_per_sec2: 100.000
  max_travel_mm: 300.000
  soft_limits: false
  homing:
    cycle: 0
    positive_direction: true
    mpos_mm: 0.000
    feed_mm_per_min: 100.000
    seek_mm_per_min: 800.000
    settle_ms: 500
    seek_scaler: 1.100
    feed_scaler: 1.100

  motor0:
    limit_neg_pin: NO_PIN
    limit_pos_pin: NO_PIN
    limit_all_pin: NO_PIN
    hard_limits: false
    pulloff_mm: 1.000
    standard_stepper:
      step_pin: I2SO.13
      direction_pin: I2SO.12
      disable_pin: I2SO.14
```

```
probe:
  pin: NO_PIN
  check_mode_start: true

Laser:
  pwm_hz: 1000
  output_pin: gpio.4
  enable_pin: NO_PIN
  disable_with_s0: false
  s0_with_disable: true
  tool_num: 0
  speed_map: 0=0.000% 1000=100.000%
  off_on_alarm: false

i2so:
  bck_pin: gpio.22
  data_pin: gpio.21
  ws_pin: gpio.17

spi:
  miso_pin: gpio.19
  mosi_pin: gpio.23
  sck_pin: gpio.18

sdcard:
  card_detect_pin: NO_PIN
  cs_pin: gpio.5

coolant:
  flood_pin: I2SO.15
  mist_pin: NO_PIN
  delay_ms: 2000

Control:
  feed_hold_pin: GPIO.25:low:pu
  cycle_start_pin: GPIO.26:low:pu

start:
  must_home: false
```