Input

User Input
- **Macro 0**
- **Macro 1**
- **Macro 2**
- **Macro 3**

Machine control
- **Limits**
- **Probe**
- **Safety door**
- **Reset**
- **Feed hold**
- **Cycle start**

Macros can be used to execute some commands with the click of a button. These commands can be most gcode and FluidNC commands including running a file from the SD card. If you have more than one command, separate them with an ampersand "&". The use of "&" to split a line into multiple GCode commands only works for startup lines; it is not a general GCode feature.

Setup control pins in config

```
control:
  safety_door_pin: NO_PIN
  reset_pin: NO_PIN
  feed_hold_pin: NO_PIN
  cycle_start_pin: NO_PIN
  macro0_pin: NO_PIN
  macro1_pin: NO_PIN
  macro2_pin: NO_PIN
  macro3_pin: NO_PIN
```

Physical
3v3 GND *GPIO*

Setup macros in config

```
macros:
  macro0: G90&G53G0Z-1&G0X0Y0
  macro1: $SD/Run=drill.nc
```

- Control (Inputs)
- Homing and limit switches
- Probe
- Configuring IO pins

To do: Realtime commands

Startup line 0
Startup line 1
These are legacy features from Grbl, which called them $N0 and $N1. These run when the firmware enters idle for the first time.

Setup startup lines in config

```
macros:
  startup_line0: G90&G53G0Z-1&G0X0Y0
  startup_line1: $SD/Run=startup.nc
```

Startup
internal

Serial Terminal
USB

To do: info
and examples

XModem file upload
USB

You can use xmodem via serial port to upload files to the localfs. This can be helpful to upload config files. you must be in the Idle or Alarm states.

Send to FluidNC
`$Xmodem/Receive=<filename>`

Download from FluidNC
`$XModem/Send=<filename>`

WebUI
WIFI/Bluetooth

The WebUI is the web browser based user interface. The WebUI is stored as a file, index.html.gz, on the local file system.

Set hostname via fluidterm
`$Hostname=<hostname>`

Open WebUI in browser
`<hostname>.local`

Serial over Telnet
WIFI/Bluetooth

If you have `$Telnet/Enable=True`, you can communicate via telnet with the same protocol as serial. The default port is 23 and set by `$Telnet/Port`.
If enabled, you should see it in your startup messages:
`[MSG:INFO: Telnet Started on port 23]`

Open Telnet session in Terminal
`<hostname>.local`

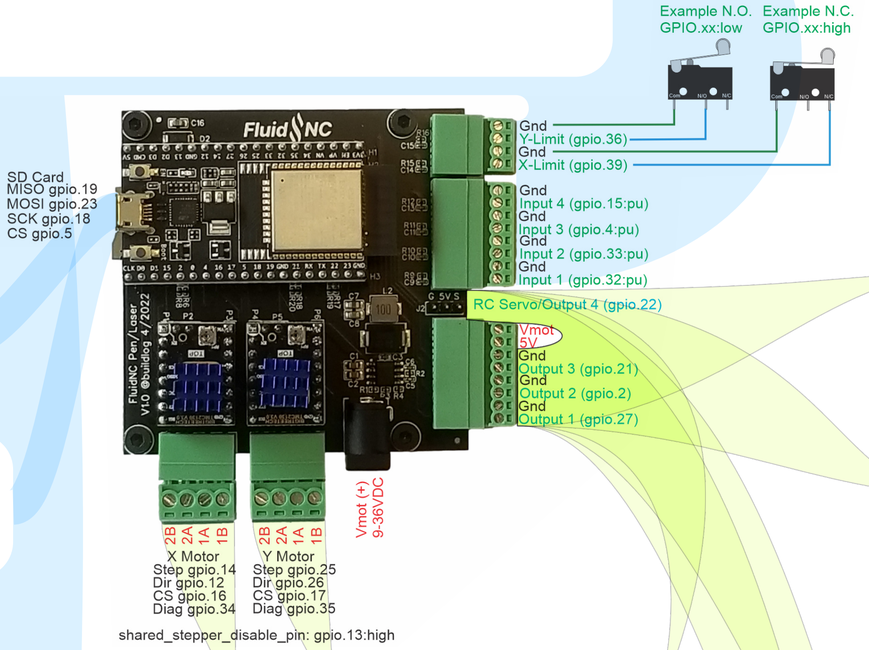
Websockets
WIFI/Bluetooth

if you connect via a websocket (on $http/port +1, e.g. 81), you have a streaming connection to FluidNC that behaves just like serial. You send newline-delimited lines just like you would over serial, and get back the same ok or error responses. Flow control is the same as for serial, as documented on the plain old Grbl wiki.

curl file upload
WIFI/Bluetooth

Upload file test.nc to the SD card at address 192.168.1.31
`curl -F upload=@test.nc http://192.168.1.31/upload`

Upload file test.nc to the ESP32 localfs (flash) at address 192.168.1.31
`curl -F file=@test.nc http://192.168.1.31/files`



Axis

FluidNC I/O Cheatsheet

- FluidNC Pen/Laser Controller Source files at OSHWLab
- FluidNC Pen/Laser Controller on Tindie

Link Colors

FluidNC Wiki
LinuxCNC Docs
other

General Documentation

- G-Codes
- M-Codes
- Supported G-Codes
- ESP32 Pin reference

Useful links

- Set up FluidNC using macOS

Most texts and examples derived from the FluidNC Wiki

The controller pinout image comes from the OSHWLab project page.

M-Code examples derived from the LinuxCNC Docs

Output

Physical
GPIO/I2SO

I2SO only available on controller hardware that implements them, like the 6 Pack.

- User outputs allow you to output digital (on/off) and analog (PWM) signals via gcode.

Analog outputs
(PWM works only on GPIO pins)

- **M67** Analog output, syncronized
- **M68** Analog output, immediate

A PWM signal is output on this pin. It is controlled by the **M67** command.
M67 E0 Q23.87 would turn on `analog0` with a 23.87% percent duty cycle.
M67 E0 Q0 would turn off `analog0`.

Digital outputs

M62 Digital output, ON, synchronized
M63 Digital output, OFF,synchronized
M64 Digital output, ON, immediate
M65 Digital output, OFF, immediate

The **M62** & **M63** commands will be queued. Subsequent commands referring to the same output number will overwrite the older settings.

M64 & **M65** happen immediately as they are received by the motion controller. They are not synchronized with movement, and they will break blending.

M62 P0 Would turn `digital0` pin on.
M63 P0 Would turn `digital0` pin off.
Like all output pins, you can set the active state with the `:high` or `:low` attribute.

Coolant (digital)

M7 Mist on
M8 Flood on
M9 Mist and flood both `off`

These outputs are traditionally called mist and flood, but many people use them for other things, like dust extraction, etc.

Spindles

FluidNC supports multiple spindles on one machine. Spindles can be controlled by different hardware interfaces like relays, PWM, DACs, or RS485 serial interfaces to VFDs. Lasers are treated as spindles.