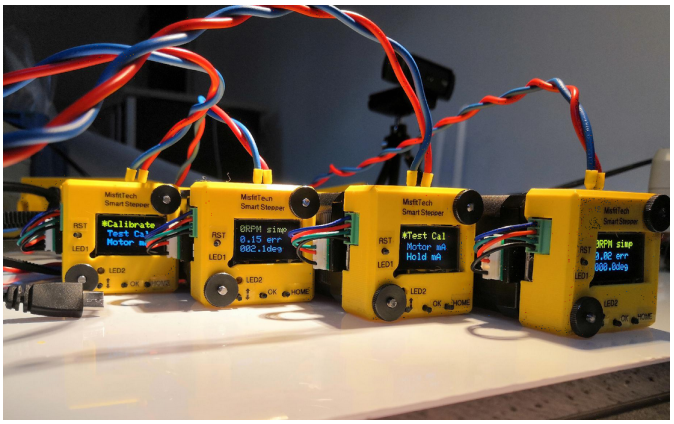
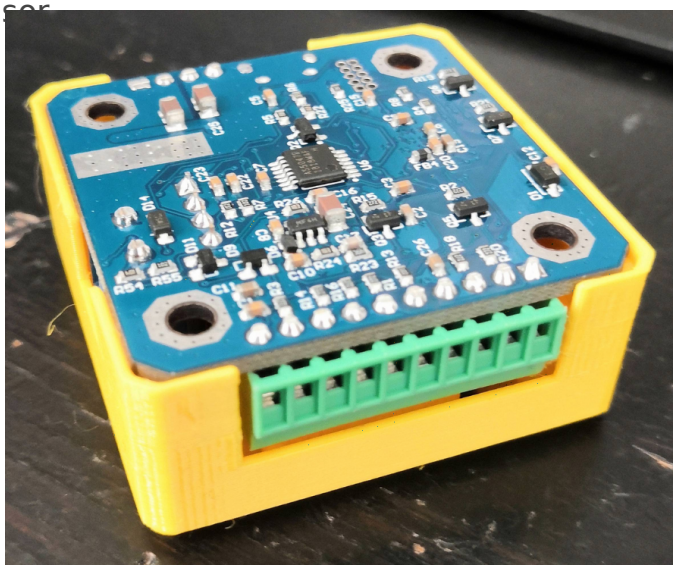
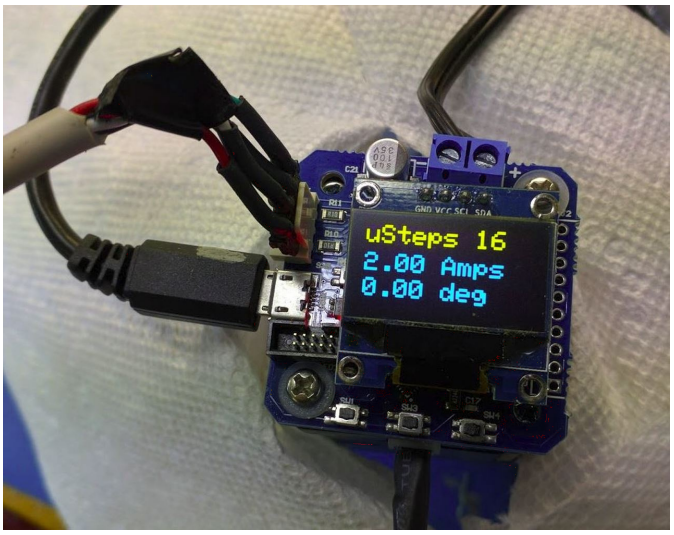
Ceiling module | Smart Stepper rev 1/20/2019 by MisfitTech

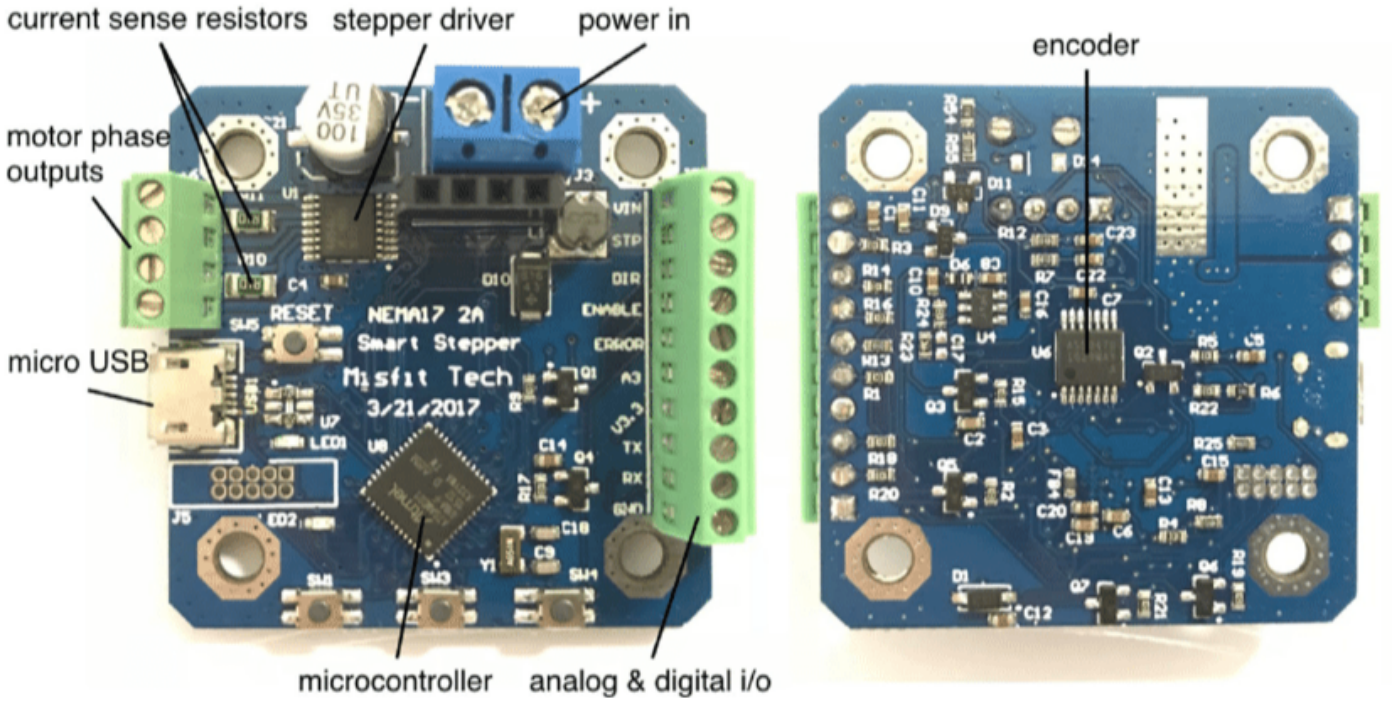
Electrical Components on the MisfitTech Smart Stepper Board

- Allegro 4954LPT DMOS PWM Motor Driver
- AMS AS5047D High Speed Position Sensor
- Atmel ATSAMD21G18 Cortex MCU









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Neodymium magnets and encoder sensor

The reference magnet for the AS5047D encoder is a magnet of strength N35H with dimensions of 8 mm diameter and 3 mm thickness. Tropical Labs uses https://www.kjmagnetics.com/proddetail.asp?prod=D42DIA for their Mechaduinos. The used magnet for Smart Stepper has size of 6.35 x 3.175 mm to fit into usual holes of Nema 17 motors. You need to use diametral ("diamagnetic") neodynium magnets instead of usual axial magnets because the magnetic field direction is important for the encoder. The Hall array center is located in the center of the IC package.and has an array radius of

1.1 mm. The required orthogonal component of the magnetic field strength measured at the die's surface along a circle of 1.1 mm is 35 - 70 mT. Without a good working encoder data the whole Smart Stepper would be useless. See also

https://github.com/Misfittech/nano_stepper/issues/56

Hardware + firmware forks

MisfitTech Smart Stepper were called "nano zero stepper" before they were changed into "Smart Stepper". They represent a fork of the open hardware project called Mechaduino by Tropical Labs. Smart Stepper were forked too. The forking roughly looks like this

- https://github.com/jcchurch13/Mechaduino-Firmware
  - https://github.com/Misfittech/nano_stepper
    - https://github.com/thmjpr/nano_stepper
    - https://github.com/makerbase-mks/MKS-SERVO42A
    - https://github.com/makerbase-mks/MKS-SERVO42B

You can find more forks by checking out this: https://techgaun.github.io/active-forks/index.html. It is good to know about fork projects to find useful firmware modifications or hardware updates. A lot of good tips for operating closed loop steppers and information or ideas about mounting hardware parts can be found at the root project Mechaduino. Have a loot at https://github.com/jcchurch13/Mechaduino-Firmware/blob/master/Mechaduino%20Manual%200.1.3.pdf.

Finding more help

- https://groups.google.com/forum/#!forum/smart-stepper
- https://github.com/Misfittech/nano_stepper

Buttons and colors

- LED1 = Reset LED (rot)
- LED2 = Status / Error (orange)

Tips for installation

- Smart Stepper have ground pads: The PCB design layout has ground pads such that the motor housing is grounded to the PCB, this reduces the noise and possibility of ESD. Screw them down metal to metal (no washer required).

Bootup times (measured)

- 4-5 seconds after powering on the USB interface is online
- 12-13 seconds after powering the OLED display shows up the screen

Troubleshooting typical problems with hardware and software

1. OLED display is blank
    1. reset button stucks physically
    2. firmware has a problem (some older versions included a bug)
2. reset LED is on all the time
    1. reboot Smart Stepper to fix this problem
3. capacitor gets really hot (> 80°C) and Smart Stepper does not react as exspected
    1. re-flash the firmware
4. motor does not move
    1. check the A/B phase wiring of the 4 leads
5. stepper motor moves randomly
    1. check the wiring. If the DIR cable is not fixed properly it leads to un-wanted signal generation
6. USB serial interface does not respond
    1. happens if the interface does not get handled properly by the connected device (Raspberry Pi in this case). Only possibility is to power off and repowering the Smart Stepper, or
    2. reset button stucks which may lead to permently red lighting LED. Unstuck the button and try to reset until LED goes off
7. loud noise
    1. calibration is bad, or
    2. magnet was not mounted well on the motor, or
    3. Smart Stepper PCB is not correctly fixed on the motor back. If it does not sit tight errors by vibrations have high influence on encoder accuracy.
8. Smart Stepper sounds like doubling the steps while running calibration
    1. do a factory reset by entering the command on console
9. Smart Stepper is moving endless and never reaches it's target position
    1. do a factory reset by entering the command on console
10. current settings do not apply when changing at display or console

1. do a factory reset by entering the command on console

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