Operation manual

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1 Warnings

Do not power on the device without the motors attached as shown in figure 1. The Arduino can be powered on without issues, the dedicated motor supply can not.

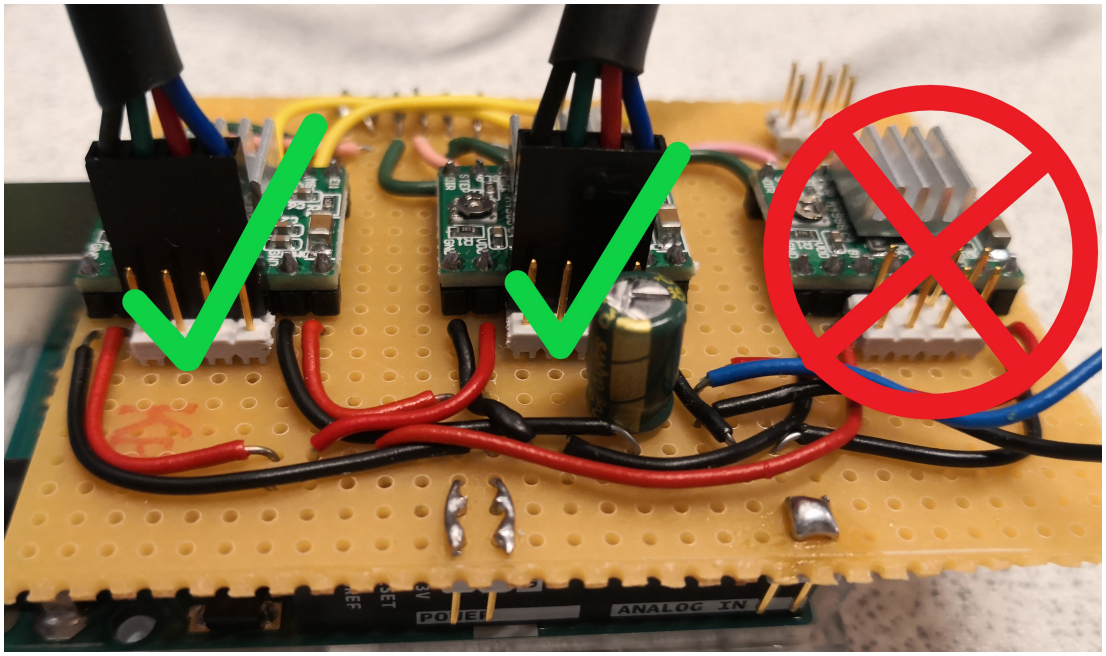

Figure 1: Never power on the device with nothing connected to the controller outputs. Doing so will burn out the controllers instantly.

2 Basic operation

Plug in the Arduino, the separate power supply for the motors and start the Python-script. The script should automatically detect the Arduino and connect to it [1]. You should see "Arduino is ready" and a pygame window appearing when it is working correctly.

Operation is done through the Python-script in https://github.com/oyvinmt/Automating-microscope-stages that sends information from keyboard inputs through a serial interface to the Arduino.

[1] Note that any programs running that connect through a serial interface to an Arduino (like the Arduino IDE) may autoconnect and block the script from doing so.

By default, x-y and directional control is done with the arrow keys and o,l. Stepsize is controlled with 1, 2, 3 (1/8, 1/2, 1/1), the number of steps per second is changed with +,- [2].

3 Connections and adjustments

This section contains information that may be necessary for repairs reassembly.

For connecting the controller board to the Arduino, figures 2 and 3 shows the correct pin plugin. The connections to the fan and switch is shown in figure 5.

See figure 4 for current adjustments. See the datasheet for A4988 controller for further details.

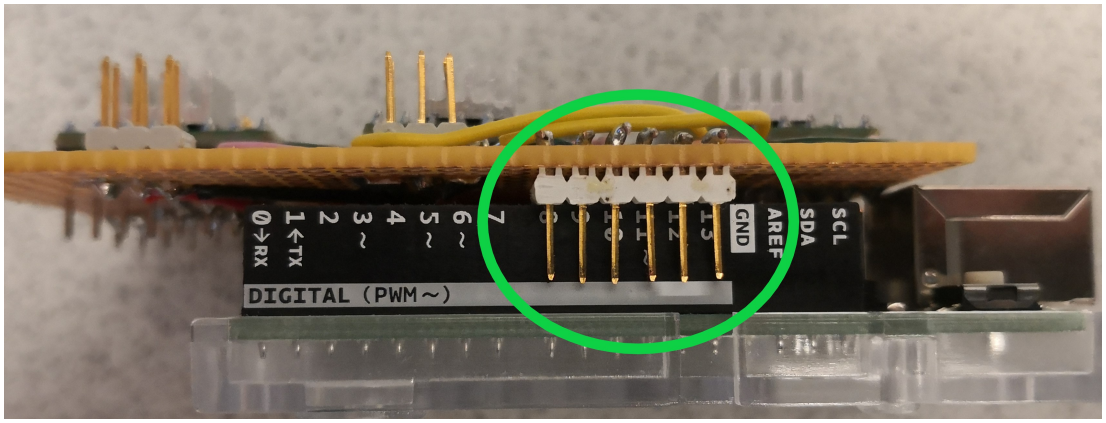

Figure 2: Highlight of the correct pins for mounting the controller card on the Arduino.

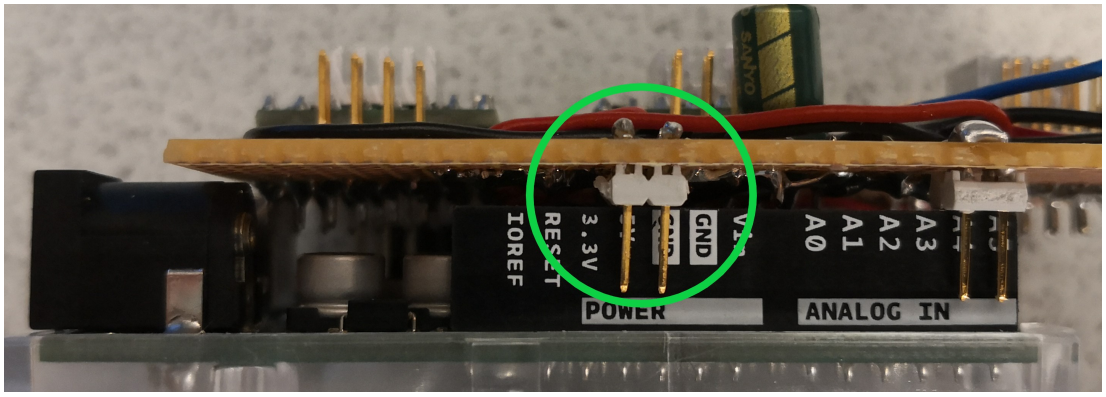

Figure 3: Highlight of the correct pins for mounting the controller card on the Arduino.

[2]Keybindings can be changed by modifying the script.

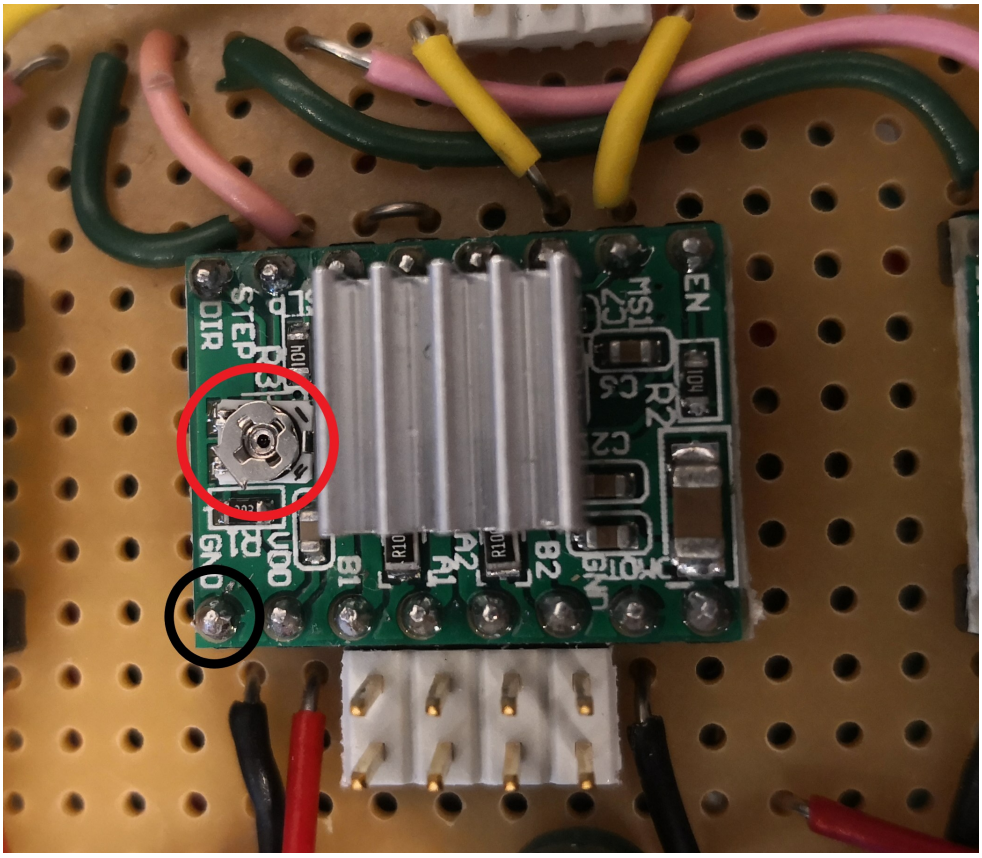

Figure 4: Red highlights the potentiometer for adjusting the current. Measure voltage between red and black with +5V power if adjustment without motor power is required. Too much current can damage the motors and drivers.

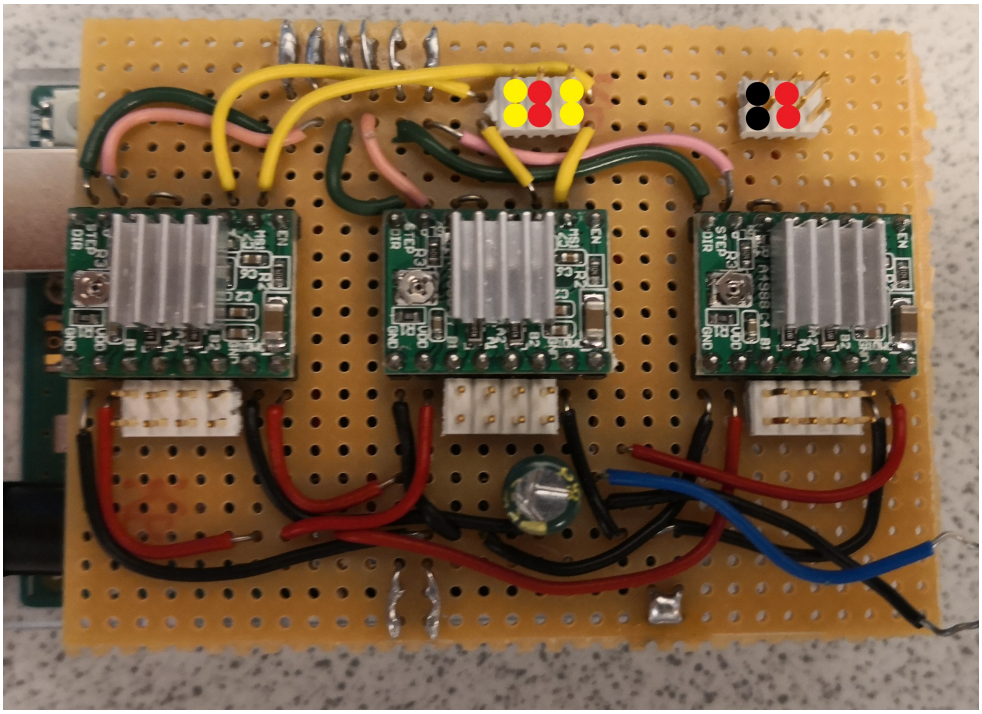

Figure 5: Pin outs for the fan (top right) and step-size switch (top middle). Red indicates +5V, black indicates logic ground, yellow indicates controller pins.

4 Parts list

- 2x NEMA 14 1A stepper motors
- 1x NEMA 23 2A stepper motor
- 1x Arduino UNO
- 3x A4988 or equivalent controller boards
- 1x 100μF 25V capacitor
- 1x 13.5V 1A power supply
- Wire, solder etc.

Note that the power supply may be exchanged for any unit delivering up to 30V, capacitor must then be changed accordingly. Significantly lower voltage supplies will still work, but are not recommended as the motors will have very low torque.