

## A4988 motor current tuning

This tutorial will teach you how to fine tune the stepper motor current using the built-in potentiometer, a screw driver and a multimeter.

### Introduction

---

The A4988 stepper driver, originally made by Pololu, will interrupt the current to the motor for a little while if the it gets too hot. If you haven't tuned your motor current at all, it may happen that the motor doesn't move correctly and starts pulsating, it will stop as soon as you reduce the current by rotating the pot.. this is clearly a sign you need to fine tune the motor current.

### Reference voltage

---

The A4988 allows you to set a target current anywhere between some mA up to a bit less than 2A, this is accomplished by adjusting what is called the  $V_{ref}$  (Reference Voltage) when turning the pot on a clockwise direction the  $V_{ref}$  voltage will increase and decrease when rotating it counterclockwise.

The actual value of  $V_{ref}$  can be calculated using the formula:

$$V_{ref} = I_{max} * 8 * R_s$$

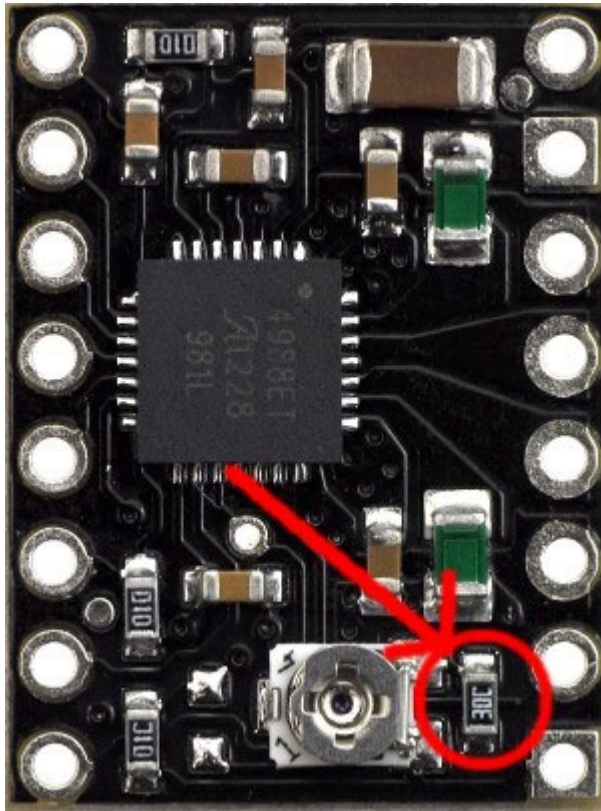
#### DRV8825

The equation for calculating  $V_{ref}$  for this board is  $V_{ref} = I_{max} / 2$  when having a  $0.1 \Omega$  sensing resistor.

### Sensing resistor

---

But first we need to find out the proper value of the current sensing resistor  $R_s$  as it's exact value is dependent of the A4988 board manufacturer. By looking at the number marked on top of  $R5$  you may use a tool such as [this one](#) to find out it's exact value in Ohms. If you dont find  $R5$  search for  $S1$  or  $S2$  .



Original Pololu boards have a  $0.05 \Omega$  resistor while most generic brands use  $0.1 \Omega$ .

Let's take the  $0.1 \Omega$  sensing resistor value as an example, just replace  $R_s$  on the formula like so  $V_{ref}$  using  $V_{ref} = I_{max} * 8 * 0.1$  .

## A word about heat

---

The step stick is such a small board, this is both it's strongest and weakest point. The small form factor makes it a smart choice for projects where overall bulk size matters but also makes it run hot as chilli. Some vendors provide you a stick-in heatsink, the performance improvement using it is rather questionable so your best friend is de-rating the motor current.

If you have a motor which max current is spec at 2A, you should ran it at around 70% to 80% of that, this will not only make your step stick happier but also the motor will run cooler.

## Adjusting the current

---

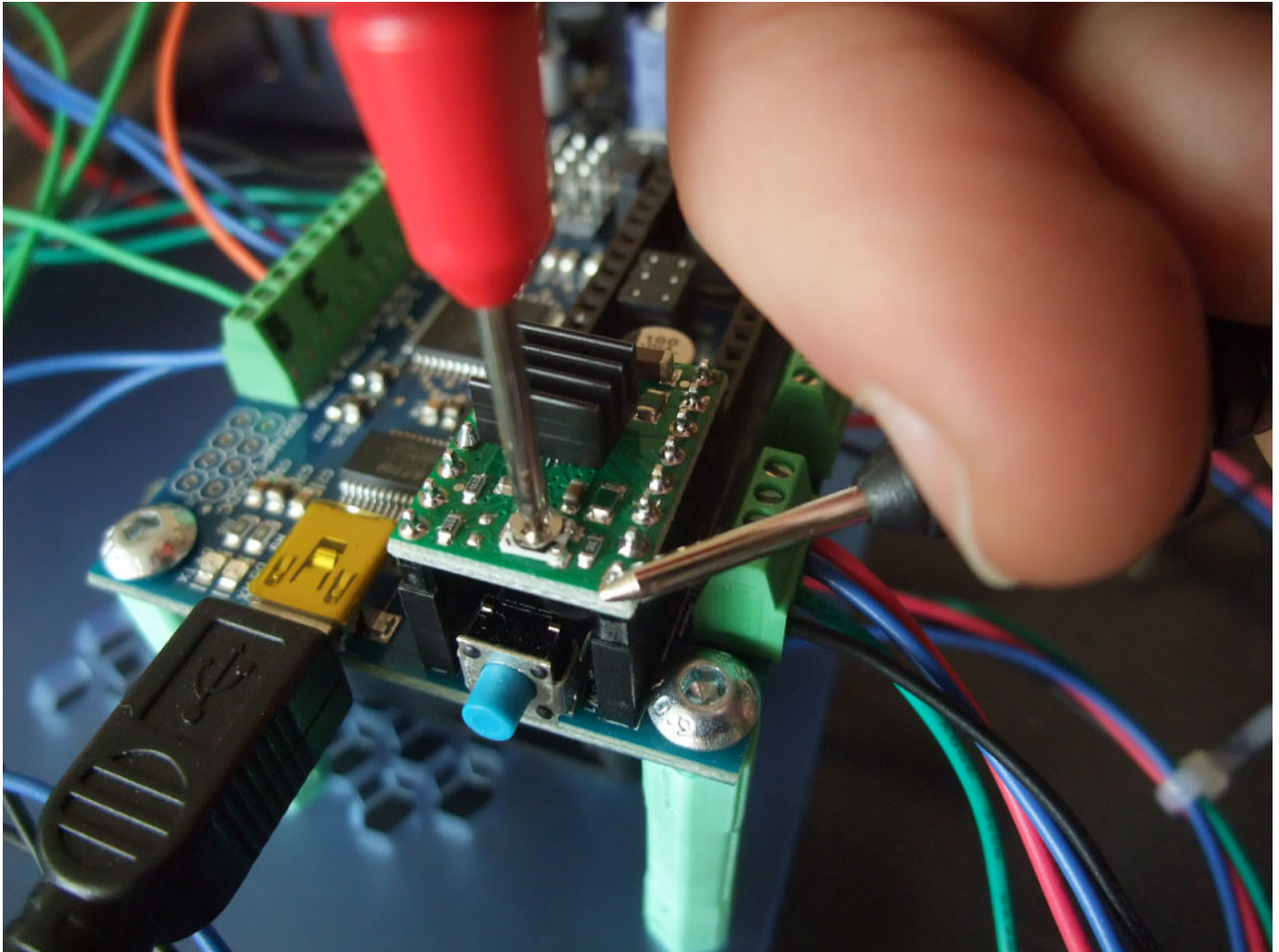
Let's take a 1.5A motor which we want to run at 80% of its rating:

$$I_{max} = 1.5 * 0.8 \Leftrightarrow I_{max} = 1.2A$$

Let's also take a generic step stick having the sensing resistor (  $R_s$  ) value of  $0.1 \Omega$ , take the initial formula  $V_{ref} = I_{max} * 8 * R_s$  and replace  $I_{max}$  and  $R_s$  .

$$V_{ref} = 1.2A * 8 * 0.1 \Leftrightarrow V_{ref} = 0.96$$

Using a multimeter measure the voltage across the top of the potentiometer head and any ground point on the board.



Adjust the pot until you measure, in this example, 0.96V. Now you have your step stick properly adjusted for your motor's current.

All images on this document are copyright rerap.org and licensed under the GNU Free Documentation License.

[← BACK TO HOMEPAGE](#)

# Ardufocus

---

Copyright © 2017-2019 João Brázio. All rights reserved.

Production build 9a5a34b51179ee0ea22ac2b0f6909ea08d2f55f8 at 2019-07-08 10:20:03 +0000

