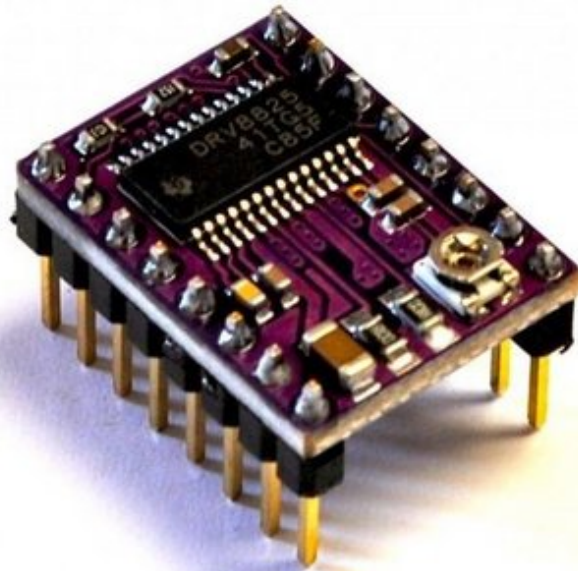


# Duet3D

## Connecting External Drivers

How to wire up external driver breakout boards to the Duet 2.

Written By: Jason Znack



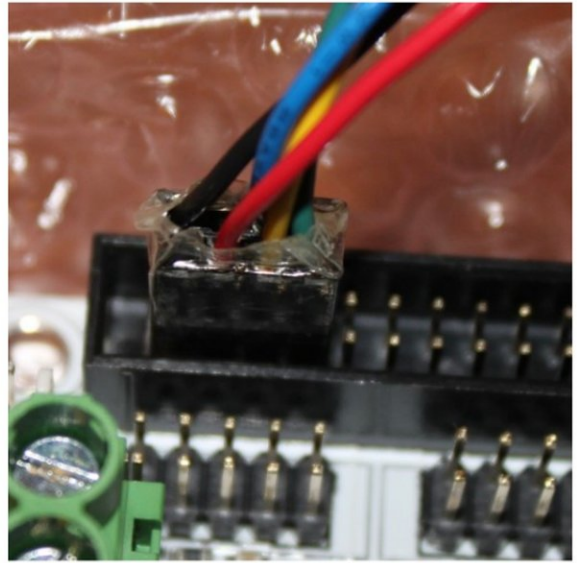
## INTRODUCTION

This example shows how to add one external stepper driver to drive a third extruder on a Duet 2 Wifi using the E2 pin connectors. Guide originally written by user Exerqtor.

<https://forum.duet3d.com/topic/6732/exte...>

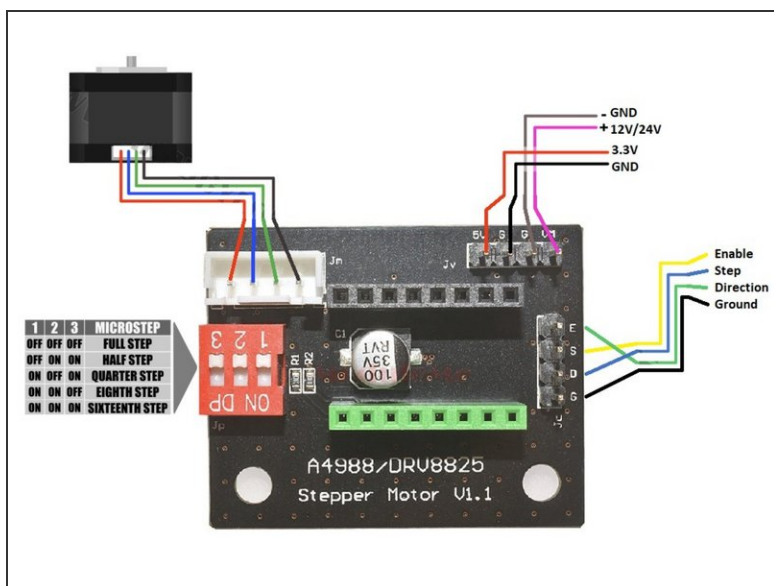
## Step 1 — Connecting driver to the Expansion header

EXPANSION			
1) +5V	2) GND	3) +3.3V	4) E2_STOP
5) E2_STEP	6) E2_DIR	7) E2_EN	8) HEATER3
9) E3_STOP	10) E3_STEP	11) E3_DIR	12) E3_EN
13) HEATER4	14) E4_STOP	15) E4_STEP	16) E4_DIR
17) E4_EN	18) HEATER5	19) E5_STOP	20) E5_STEP
21) E5_DIR	22) E5_EN	23) HEATER6	24) E6_STOP
25) E6_STEP	26) E6_DIR	27) E6_EN	28) ENN
29) PB6/TMS	30) GND	31) HEATER7	32) SPI1_SCK_BE
33) SPI1_MOSI_B	34) SPI1_MISO	35) THERMISTOR3	36) THERMISTOR4
37) THERMISTOR5	38) THERMISTOR6	39) THERMISTOR7	40) VSSA
41) ADVREF	42) GND	43) +3.3V	44) RESET
45) TWD0	46) TWCK0	47) SPI0_SCK	48) SPI0_MOSI
49) SPI0_MISO	50) CS5		



- On the Duet 2 Wifi and Ethernet these are the pins you need to connect to (text highlighted yellow):
- A custom cable must then be made that connects these pins to the breakout board:

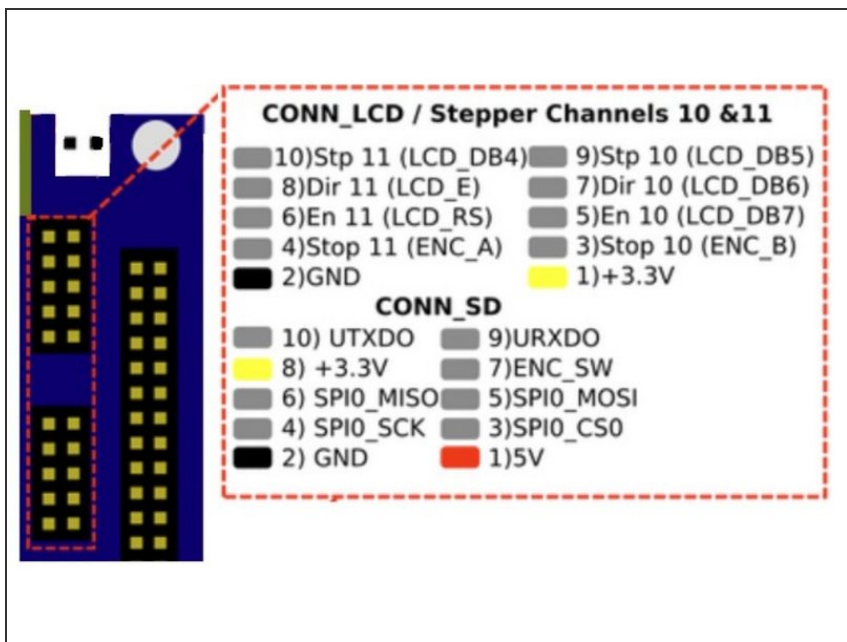
## Step 2 — Connecting to the Breakout Board



3.3V	=	PIN 3) +3.3V
GND	=	PIN 2) GND
- GND	=	Ground from power supply
+ 12V/24V	=	12V/24 from power supply
Enable	=	PIN 7) E2_EN
Step	=	PIN 5) E2_STEP
Direction	=	PIN 6) E2_DIR
Ground	=	PIN 2) GND

- Now we need to wire up our external driver breakout board.
- 3.3V and GND (Note: The pin labelled 5V on the breakout board must be connected to 3.3V on the Duet, not 5V!)
- 12V/24V (vin) and GND
- ESDG wires (Enable, Step, Direction, Ground)
- Note: It's strongly recommend clearly marking your wires, so as not to short out something or otherwise plug them in improperly!

### Step 3 — Connecting drivers to the CONN\_LCD connector



- The generation2 Duets also support two additional drivers connected to the CONN\_LCD connector.
- A custom cable must be made to connect the pins on the CONN\_LCD and the breakout board as if you were to use the Expansion header.

### Step 4 — Using External Drivers for X/Y/Z Axis

Number	Name
0	X Axis
1	Y Axis
2	Z Axis
3	E0 Axis
4	E1 Axis
5	E2 Axis (Expansion Header)
6	E3 Axis (Expansion Header)
7	E4 Axis (Expansion Header)
8	E5 Axis (Expansion Header)
9	E6 Axis (Expansion Header)
10	10 (LCD_CONN Header)
11	11 (LCD_CONN Header)

- Which Expansion you want to use for your purpose is pretty much up to you, do what suits your needs

best. You just have to adapt RepRapFirmware accordingly.

- To use external drivers to drive X, Y and/or Z axes instead of the internal ones, you need to remap the X/Y/Z axis to the external driver. The drive numbers are shown in the picture. To remap the X, Y or Z motors to external drivers in RepRapFirmware 1.14 or later, use the M584 command.
- **Configuring the Enable polarity and step timing** The Enable signals on the expansion connector are active low by default but you can change this using the R parameter in the M569 command. You can also set a minimum step pulse width and other timings in the M569 command using the T parameter; try 1us to 4us when using external drivers.
- M584\_Set\_drive\_mapping: [Gcode](#)
- M569\_Set\_motor\_driver\_direction [Gcode](#)

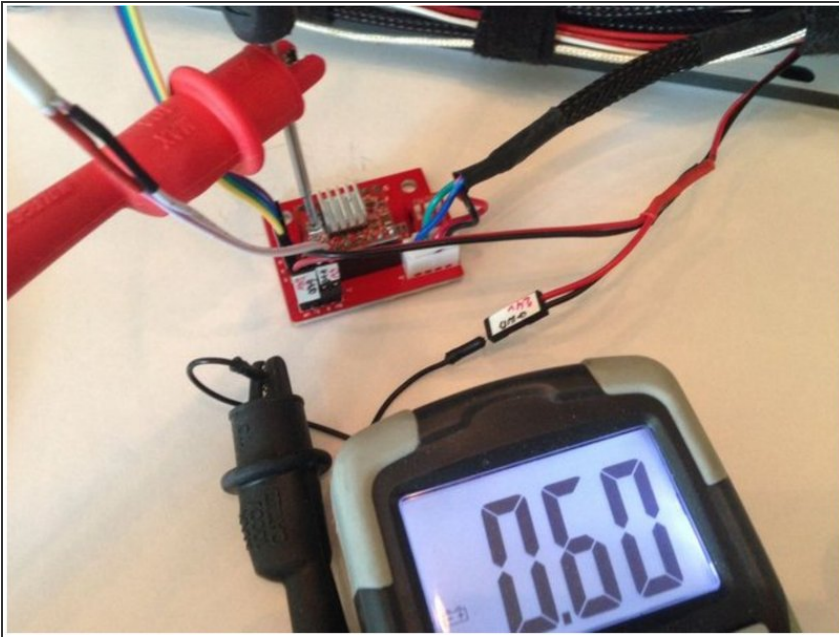
## Step 5 — Installing the Drivers to the breakout board



- The orientation of the drivers is really important. You are going to fry the drivers if they are inserted incorrectly. Remember to always have all power turned off, that includes any USB, whenever you handle the drivers - aside from adjusting the vref.
- The A4988 is inserted with trimpot facing away from dipswitches.
- The DRV8825 is inserted with trimpot facing towards the dipswitches.
- SilentStepStick TMC2100 is inserted with trimpot facing towards the dipswitches.



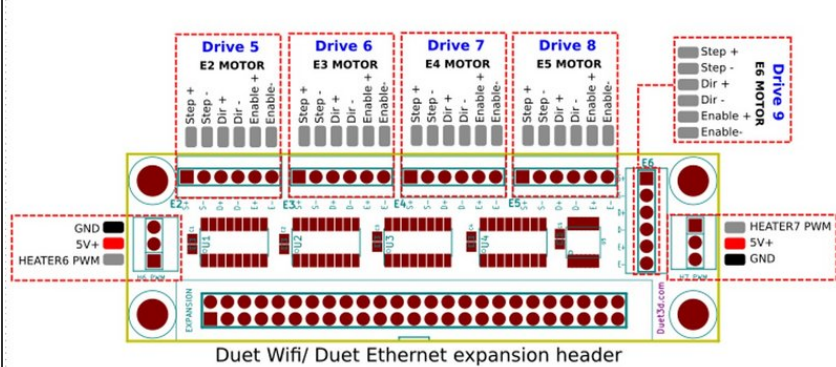
## Step 6 — Measure vRef - good Practice



- This is not about what value to set it at, but about a good practice to avoid accidents. Use 2 clamps on your Multimeter.
- Connect the black one to a GND on your printer. Easy to use is directly from PSU or from a GND from endstop pins.
- Attach the red one to a small screw-driver fitting for your trimpot.
- This way you have your hands free to actually adjust the trimpot and not having to hold multiple wires and worry about something slipping and making a short circuit somewhere:

## Step 7

Wiring: Duet Expansion Breakout Board v1.1



- For many external drivers the wiring is simplified by using the [Duet Expansion Breakout Board](#). This provides differential signals for up to 5 step/dir/enable connections for external stepper drivers.



