



# Titan Aqua RepRap Firmware Configuration

Set up your RepRap Firmware to support your new Titan Aero.

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## Step 1 — Download RepRap Firmware



- First things first: you're going to need a copy of RepRap Firmware.
  - Either download a fresh version from GitHub, or edit your existing one.
  - You can edit your existing firmware either through the [online configuration tool](#), or through G-Code.
- ⚠ If you download a fresh version of RepRap Firmware you'll have to configure more settings than the ones mentioned in this guide so that it will work well with your printer.

## Step 2 — Extruder Direction

```

M569 P0 S1 ; Drive 0 goes forwards (change to S0 to reverse it)
M569 P1 S0 ; Drive 1 goes backwards
M569 P2 S1 ; Drive 2 goes forwards
M569 P3 S1 ; Drive 3 goes forwards
M569 P4 S1 ; Drive 4 goes forwards
M350 X10 Y10 Z10 E10 I1 ; SET 10x MICROSTEPPING WITH interpolation
M574 X0 Y1 Z0 S1 ; set homing switch configuration (Y homing switch only, at low en
d, active high)
M906 X800 Y1000 Z800 E800 ; Set motor currents (mA)
M201 X800 Y800 Z15 E1000 ; accelerations (m/s^2)
M203 X15000 Y15000 Z100 E3600 ; Maximum speeds (mm/min)
M560 X600 Y600 Z30 E20 ; Maximum jerk speeds mm/minute
M208 X100 Y200 Z200 ; set axis maxima and high homing switch positions (adjust to suit
your machine)
M208 X-8 Y0 Z-0.5 S1 ; set axis minima and low homing switch positions (adjust to make
X=0 and Y=0 the edges of the bed)
M92 X80 Y80 Z4000 ; set axis steps/mm
M92 E420:420 ; set extruder 0 and 1 steps/mm
G21 ; Work in millimetres.
G90 ; Send absolute coordinates...
M83 ; ...but relative extruder moves
  
```

The M569 commands are optional: drives go forward by default. In the M569 command you can also change the polarity of the driver: Enable signal or lengthen the step pulse time, which you may need to do if you use external stepper motor drivers. See the list of supported gcodes for details.

The M350 command to set microstepping should come before the M202 commands to set steps/mm, because the steps/mm are adjusted automatically when microstepping is changed. Microstepping is fixed at 16x on the Duet 0.1 and Duet 0.8.5. On the Duet WiFi and Duet Ethernet you can choose microstepping of 1, 2, 4, 6, 16, 32, 128 or 256, and when using 16x microstepping only, the I1 parameter causes the microstepping to be interpolated to 256x.

The M202 parameters to the M574 command are 0 if there is no homing switch for the axis, 1 if there is a low-end homing switch, and 2 if there is a high-end homing switch. S1 indicates active high inputs (e.g. normally-closed switches), while S0 indicates active low inputs.

The M208 command with parameter S0 or no S parameter defines the maximum coordinate of each axis. These are also the coordinates at which the head is assumed to be when a high-end homing switch is triggered. The M208 command with S1 parameter sets the minimum axis coordinates and low-end homing switch positions in the same way.

The M906 command is required. Without it, motor currents will remain at zero. It also takes an optional I parameter, which is the percentage of normal current used to hold the motors in position when the motors have been idle for 30 seconds, default 30%.

- Flip the corresponding line in your config.g file from S1 to S0 or vice versa: M569
- You can also simply send the M569 command through your favourite printer control software.

## Step 3 — Extruder Steps-per-mm 1

$$\text{E-Steps-per-MM} = \frac{\text{Motor Steps} * \text{Micro-stepping} * \text{Gear Ratio}}{(\text{Hobb Diameter} * \pi)}$$

- Standard motor steps / rev = 400
- Standard micro-stepping = 16x
- Gear Ratio = 3
- Hobb Diameter (Effective) = 7.3

$$400 * 16 * 3 / (7.3 * 3.142) = \mathbf{837 \text{ E-steps-per-mm}}$$

(For the motor sold with the Titan)

- The next thing we'll have to update is your printer's E-steps-per-mm.
- ⓘ Your slicer will generate G-Code for your printer, which will tell it to extrude a certain length (in millimeters) of filament. Your printer takes those lengths of filament and calculates how much it should rotate your Titan's stepper motor to push out the expected amount filament. This number is used to make that conversion
- First, we'll start with a ball-park estimate of your E-steps-per-mm, and then we'll fine-tune it.
- If you're using the standard Titan Slimline motor, start with 837 Steps-per-mm

## Step 4 — Update E-Steps

Change the final O/E/D in the M540 command to a unique 2-digit hex number for each one.

### Movement section

Example:

```

M569 P0 S1 ; Drive 0 goes forwards (change to S0 to reverse it)
M569 P1 S0 ; Drive 1 goes backwards
M569 P2 S1 ; Drive 2 goes forwards
M569 P3 S1 ; Drive 3 goes forwards
M569 P4 S1 ; Drive 4 goes forwards
M350 X16 Y16 Z16 E16 I1 ; set 16x microstepping with interpolation
M574 X0 Y1 Z0 S1 ; set homing switch configuration (V homing switch only, at low end, active high)
M906 X800 Y1000 Z800 E800 ; Set motor currents (mA)
M201 X800 Y800 Z15 E1000 ; accelerations (mm/s²)
M203 X15000 Y15000 Z100 E3600 ; Maximum speeds (mm/min)
M566 X600 Y600 Z30 E20 ; Maximum jerk speeds mm/minute
M208 X100 Y200 Z200 ; set axis maxima and high homing switch positions (adjust to suit your machine)
M208 X-8 Y0 Z-0.5 S1 ; set axis minima and low homing switch positions (adjust to make X=0 and Y=0 the edges of the bed)
M92 E420:420 ; set axis steps/mm
M92 E420:420 ; set extruder 0 and 1 steps/mm
M57 ; more in M572/E1/E5
G90 ; Send absolute coordinates...
M83 ; ...but relative extruder moves

```

The M569 commands are optional, drives go forward by default. In the M569 command you can also change the polarity of the driver. Enable signal or lengthen the step pulse time, which you may need to do if you use external stepper motor drivers. See the list of supported codes for details.

The M350 command to set microstepping should come before the M201 commands to set steps/mm, because the steps/mm are adjusted automatically when microstepping is changed. Microstepping is fixed at 16x on the Duet 0.6 and Duet 0.8.5. On the Duet WiFi and Duet Ethernet you can choose microstepping of 1, 2, 4, 16, 32, 128 or 256, and when using 16x microstepping only the I1 parameter causes the microstepping to be interpolated to 256x.

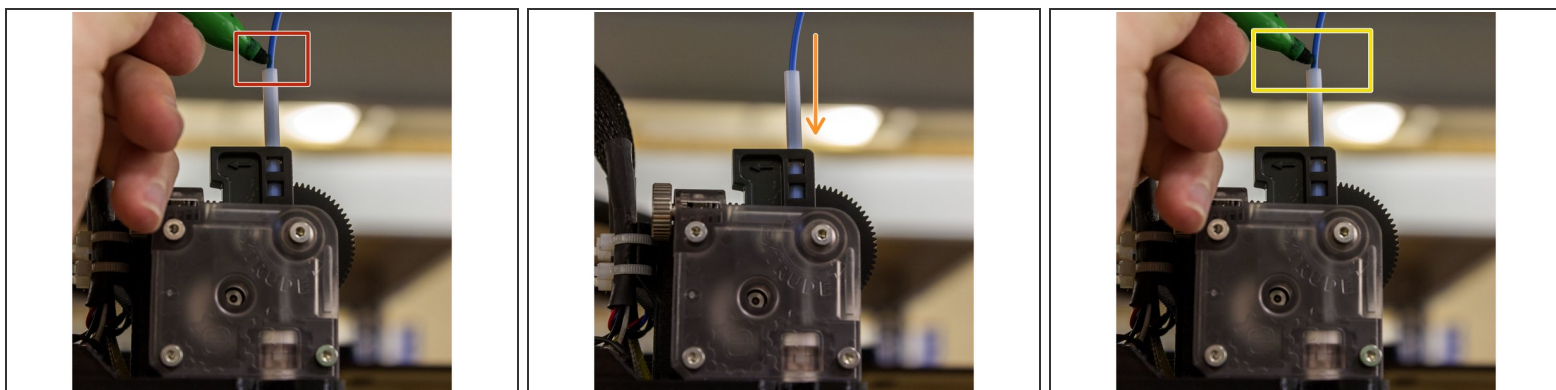
The X/Y/Z parameters to the M574 command are 0 if there is no homing switch for the axis, 1 if there is a low-end homing switch, and 2 if there is a high-end homing switch. S1 indicates active high inputs (e.g. normally-closed switches), while S0 indicates active low inputs.

The M208 command with parameter S0 or no S parameter defines the maximum coordinate of each axis. These are also the coordinates at which the head is assumed to be when a high-end homing switch is triggered. The M208 command with S1 parameter sets the minimum axis coordinates and low-end homing switch positions in the same way.

The M906 command is required. Without it, motor currents will remain at zero. It also takes an optional I parameter, which is the percentage of normal current used to hold the motors in position when the motors have been idle for 30 seconds, default 30%.

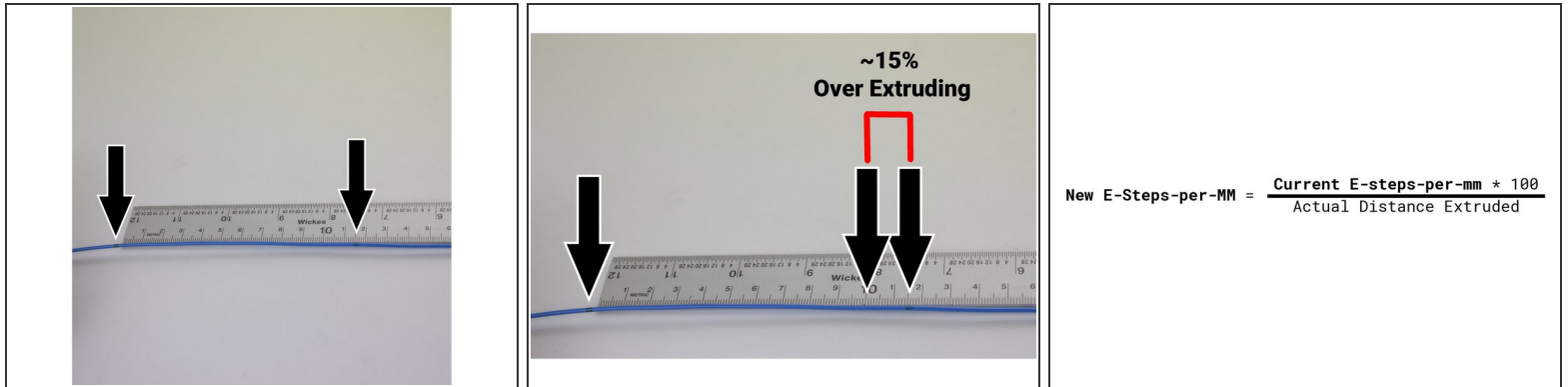
- Over USB Connection
  - Use a printer control software to connect to your printer. Send the command M92 E<your number here> to your printer.
  - Then, send M500 to store your settings
- Update your config.g file manually:
  - Update the following line with your new number: M92.

## Step 5 — Extruder Steps-per-mm Tune



- ① To get a more exact value for your E-steps-per-mm, measure the exact amount of filament that is pushed out of your extruder.
  - Load filament into your extruder, just until it is gripped by the drive shaft (you can't pull it out without moving the large gear turning)
  - Mark your filament at the top of the idler arm or PTFE tubing with a pen or permanent marker .
  - Tell your printer to extrude 100mm of filament. Use your printer's LCD screen, or send it: `G92 E0`, then `G1 E100` via your printer control software.
- ① You may need to heat your HotEnd before your printer allows you to extrude filament. You can use [M302](#) command to get around that.
  - Mark your filament again at the top of your idler arm or PTFE tubing
  - Eject your filament.

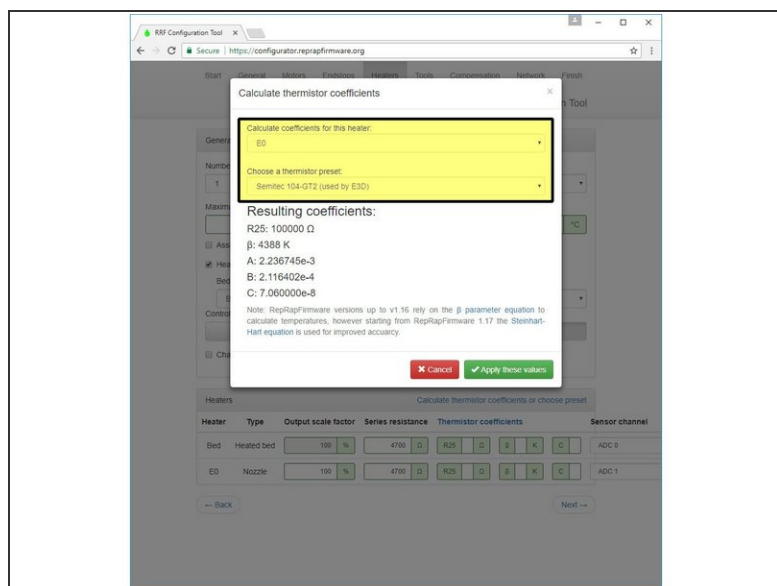
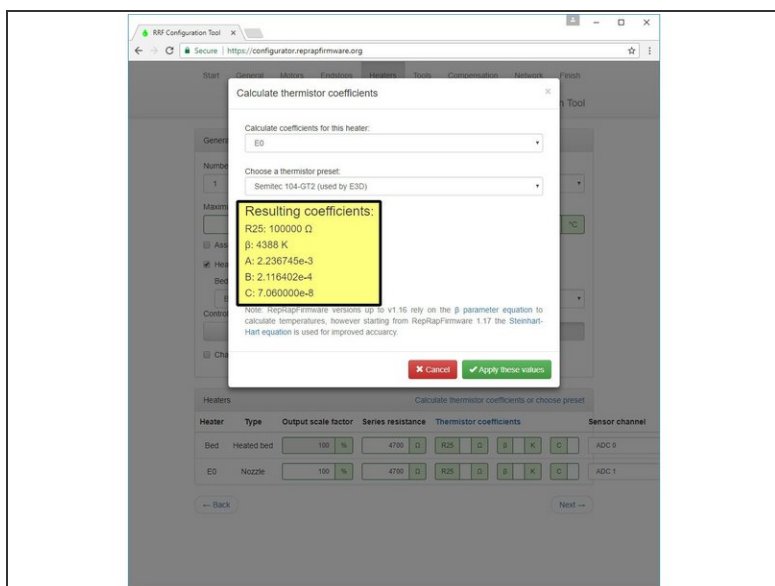
## Step 6 — Extruder Steps-per-mm Tune 2



$$\text{New E-Steps-per-MM} = \frac{\text{Current E-steps-per-mm} * 100}{\text{Actual Distance Extruded}}$$

- With a ruler or calipers, measure the distance between the two marks on your filament.
- If the distance wasn't exactly 100mm, use a proportion to calculate a more precise E-steps-per-mm value.
- Enter that new value into your firmware or EEPROM as you did before.

## Step 7 — Thermistor Settings



- Manual Editing:
  - For firmware versions 1.16 and earlier, send the following G-Code command to your printer:  
M305 P1 B4388
  - For firmware versions 1.17 and later, send the following command instead: M305 P1 B4725  
C7.060000e-8
- Online Tool:
  - Click on the Calculate Thermistor Coefficients button in the Heaters tab, and select Semitec 104-GT2 (used by E3D) from the drop-down menu.

## Step 8

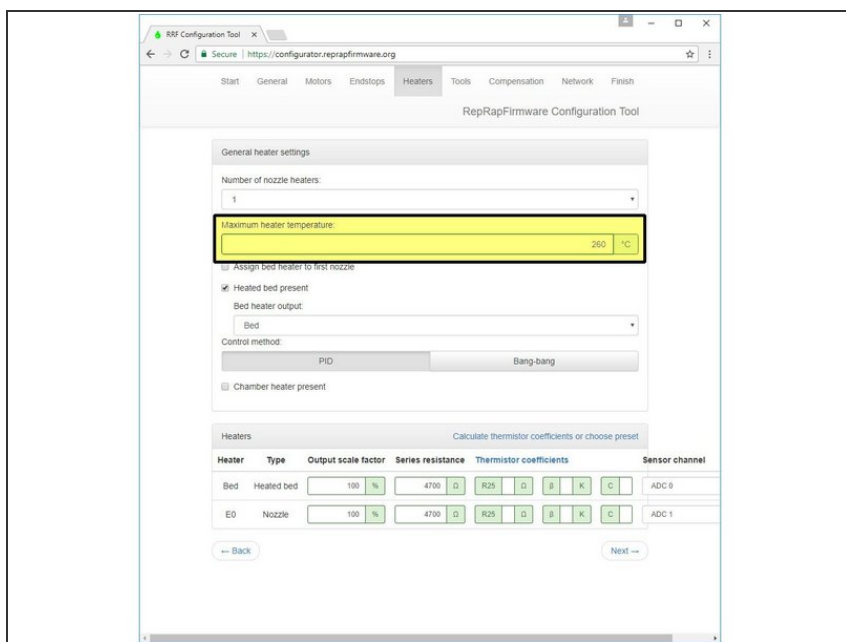


**i** Update, For the most recent version of the reap rap firmware you should be using the following parameters for the thermistors.

- T parameter: 100 000
- B parameter: 4725
- C parameter: 7.06e-8



## Step 9 — Update Safety Settings



- Manual editing:
  - Update your maximum temperature by sending the following G-Code command to your printer: M143 S285
  - While the Titan Aero's metal components can handle very high temperatures, the included thermistor cartridge will struggle with temperatures over 285°C (if you want to go higher, get a PT100).
- Online Editing:
  - Update your maximum temperature by going to the heaters tab and changing the option to 285.

## Step 10 — Upload Firmware



- Save the firmware to your SD card as you normally would. If you're having issues, check with your printer's manufacturer.
- If you're unsure of how to update your printer's firmware, check with its manufacturer.

You're all done. Enjoy your new Titan!