1. Download the required software.

http://arduino.cc/en/main/software
https://github.com/ErikZalm/Marlin/archive/Marlin_v1.zip
http://slic3r.org
https://github.com/kliment/Printrun - precompiled is easiest

2. Install pronterface (printrun)
3. Firmware setup
   a. Preparation

Plug in the USB cable and install the drivers (they are located in "arduino-1.0.4\drivers") if required.

   b. Setting up to calibrate

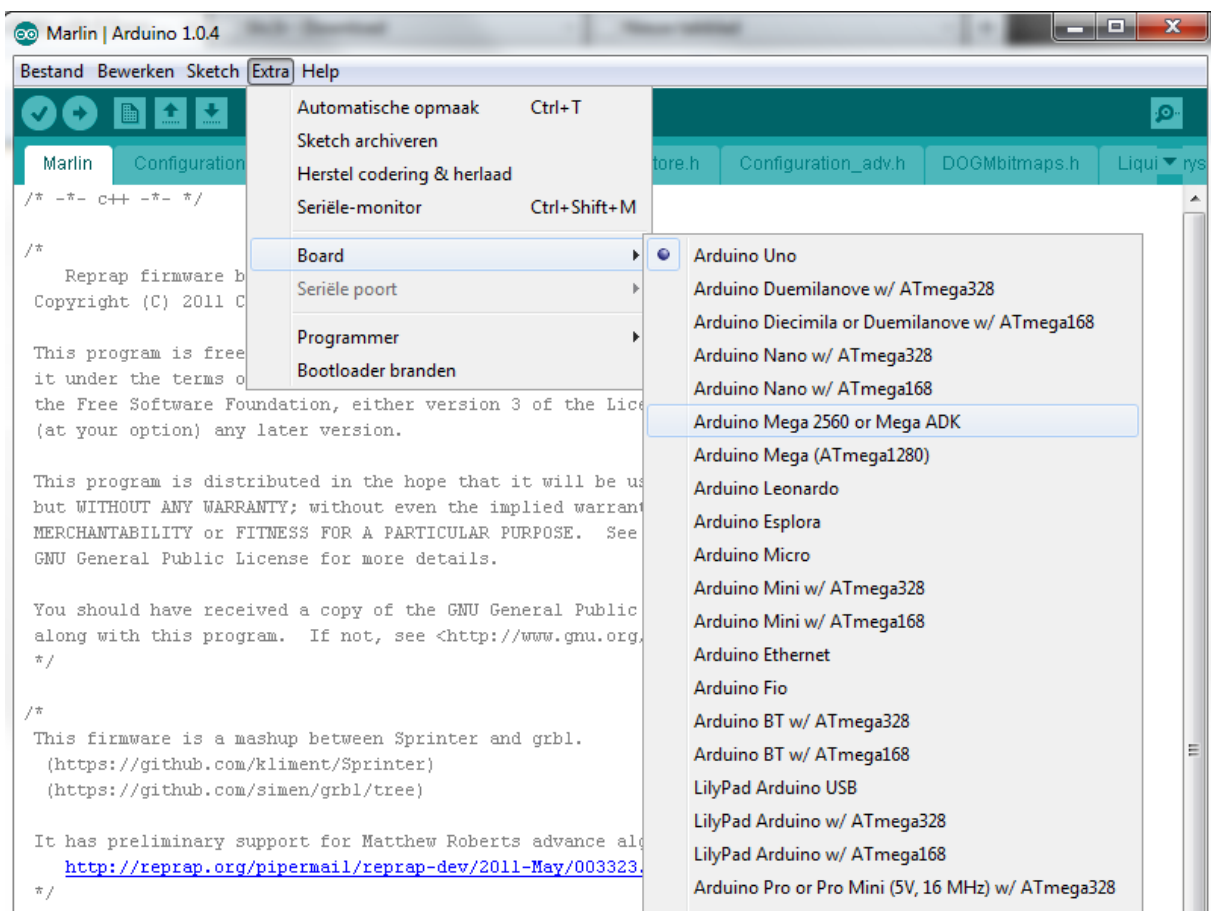Extract the firmware (we will use Marlin) in a location of your choosing.

Extract the arduino software in a location of your choosing, and run "arduino.exe".
Select "File", "Open", and navigate to where you extracted marlin.

Now open "Marlin/Marlin.pde".
This will open a second arduino screen, so you can close the first one.

First, select the board you are using.

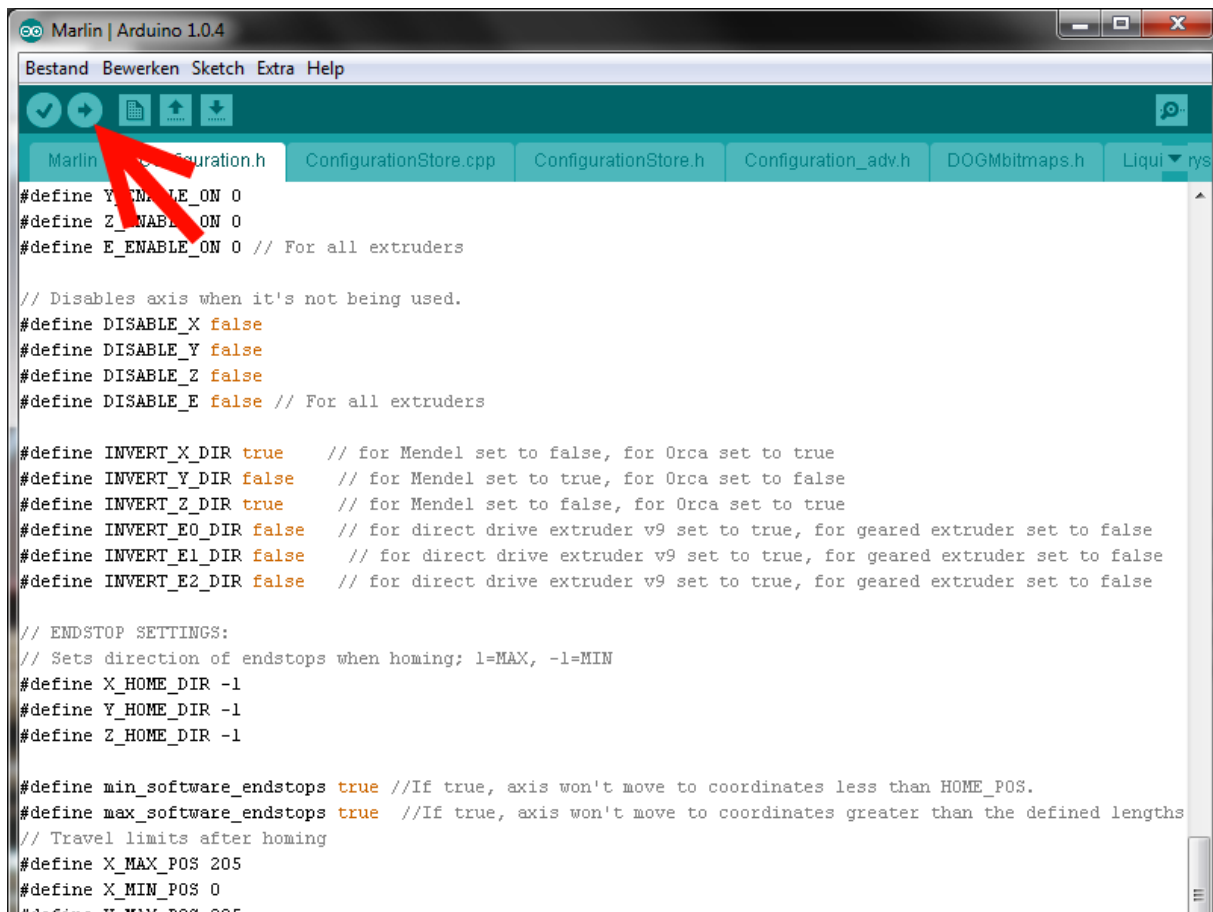Go to the "Configuration.h" and change the settings to match your kit.

change these settings:

- motherboard: **#define MOTHERBOARD 7** should be **#define MOTHERBOARD 33** if you are using the RAMPS 1.4 controller
- Thermistors: change the **TEMP_SENSOR_0** and **TEMP_SENSOR_BED** to be either 5 or 7 depending on the thermistor you received.
  Use 7 if the thermistor looks like this:

reprapsource.com
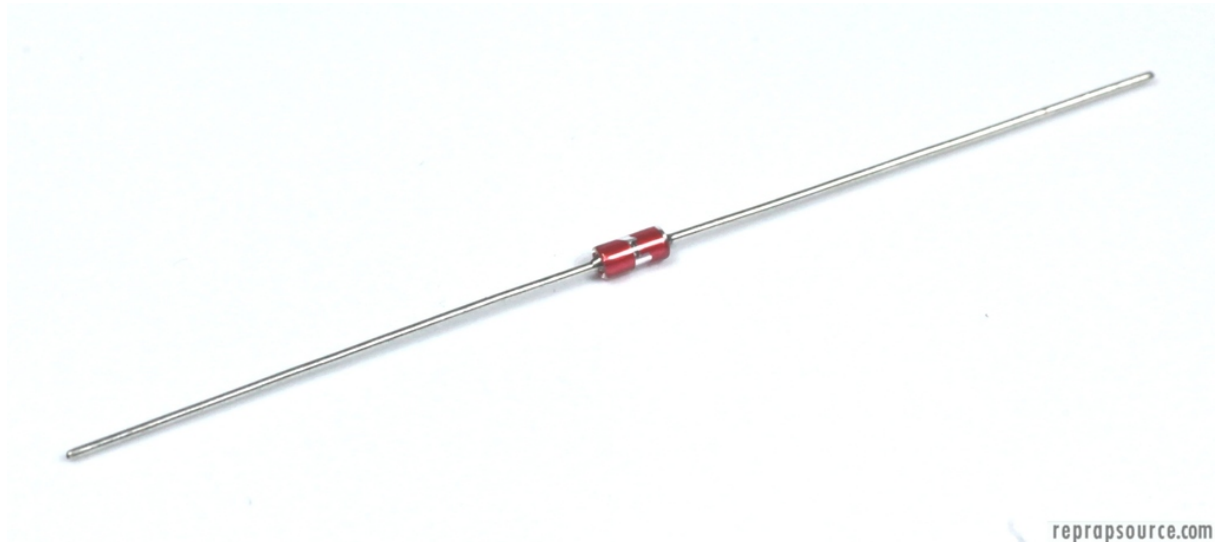
- Motors: change the **DEFAULT_ACCELERATION** and **DEFAULT_RETRACT_ACCELERATION** to 900
- Change the #define DEFAULT_AXIS_STEPS_PER_UNIT   {78.7402,78.7402,200.0*8/3,760*1.1} to #define DEFAULT_AXIS_STEPS_PER_UNIT   {78.7402,78.7402,4000,760*1.1}

Connect your RAMPS via a USB cable, select the correct serial port in the "extra" menu, and click "Upload"

```
#define Y_ENABLE_ON 0
#define Z_ENABLE_ON 0
#define E_ENABLE_ON 0 // For all extruders

// Disables axis when it's not being used.
#define DISABLE_X false
#define DISABLE_Y false
#define DISABLE_Z false
#define DISABLE_E false // For all extruders

#define INVERT_X_DIR true     // for Mendel set to false, for Orca set to true
#define INVERT_Y_DIR false    // for Mendel set to true, for Orca set to false
#define INVERT_Z_DIR true     // for Mendel set to false, for Orca set to true
#define INVERT_E0_DIR false   // for direct drive extruder v9 set to true, for geared extruder set to false
#define INVERT_E1_DIR false   // for direct drive extruder v9 set to true, for geared extruder set to false
#define INVERT_E2_DIR false   // for direct drive extruder v9 set to true, for geared extruder set to false

// ENDSTOP SETTINGS:
// Sets direction of endstops when homing; 1=MAX, -1=MIN
#define X_HOME_DIR -1
#define Y_HOME_DIR -1
#define Z_HOME_DIR -1

#define min_software_endstops true //If true, axis won't move to coordinates less than HOME_POS.
#define max_software_endstops true  //If true, axis won't move to coordinates greater than the defined lengths
// Travel limits after homing
#define X_MAX_POS 205
#define X_MIN_POS 0
#define Y_MAX_POS 205
```

c. Calibration

Open printrun and connect to your printer (select the same baudrate as you have set in your configuration.h file)

Try to move the motors to see if they go in the right direction. (don't forget the extruder motor)

Printer Interface

File Settings

Port COM3 @ 250000 Disconnect Reset ☐ Monitor Printer Mini mode

Load file Compose SD Print Pause +

Motors off

mm/min
XY: 3000 Z: 200

Heater: Off 0 (off) Set Check temp
Bed: Off 0 (off) Set T:19.4 /0.0 B:19.5 /0.0 @:0
Extrude 5 mm
Reverse 300 mm/min

250
200
150 **Graph offline**
100
50

Heater: T° 19/0
Bed: T° 19/0

Printer is online. Hotend:19.4 /0.0 Bed:19.5 /0.0 @:0

```
„Zä ˆĨ¨ˆĨˆŽJý[ˆXñ:&Ĩéð^>HŠ$P|░░▒%░ý%░▒%░%ˆXñ¬é
+^Jðéð^ŸIJO.Xé+^XñJ„Jã%HJà%HJP|@_aƒf——ˆ$M▓M6 ЧĨ$M^ð
J<6 ЧĨð¬Xo+h>C¬4äfh•ˆHJÆ&(N¬L*xñJ„zbŽJj░░ĵ ˆ(Jˆ HjKàŽ•
¬jo6—FñConnecting...
HÁˆJ§ĶµÚ|ÿjèæ•¬Ã&Ãø'¬ƒ&føConnecting...
start
Printer is now online.
echo: External Reset
Marlin 1.0.0 RC2
echo: Last Updated: 2012-05-02 | Author: erik
echo: Free Memory: 4485 PlannerBufferBytes: 1232
echo:Stored settings retreived:
echo:Steps per unit:
echo:  M92 X79.56 Y79.56 Z2560.00 E673.88
echo:Maximum feedrates (mm/s):
echo:  M203 X500.00 Y500.00 Z5.00 E45.00
echo:Maximum Acceleration (mm/s2):
echo:  M201 X9000 Y9000 Z100 E10000
echo:Acceleration: S=acceleration, T=retract acceleration
echo:  M204 S1000.00 T1000.00
echo:Advanced variables: S=Min feedrate (mm/s), T=Min travel
feedrate (mm/s), B=minimum segment time (ms), X=maximum xY
jerk (mm/s),  Z=maximum Z jerk (mm/s)
echo:  M205 S0.00 T0.00 B20000 X20.00 Z0.40 E5.00
echo:PID settings:
echo:  M301 P20.86 I1.29 D84.07
echo:SD card ok
ok T:19.4 /0.0 B:19.5 /0.0 @:0
echo:SD card ok
```

Send

```
#define X_MAX_POS 205
#define X_MIN_POS 0
#define Y_MAX_POS 205
```

This should move the hotend to the right for X+, the bed towards you for Y+, and the hotend up for Z+.

If they move in the wrong direction, change the settings in your firmware accordingly, and upload again.

#define INVERT_X_DIR true   // for Mendel set to false, for Orca set to true

#define INVERT_Y_DIR false   // for Mendel set to true, for Orca set to false

#define INVERT_Z_DIR true   // for Mendel set to false, for Orca set to true

#define INVERT_E0_DIR false   // for direct drive extruder v9 set to true, for geared extruder set to false

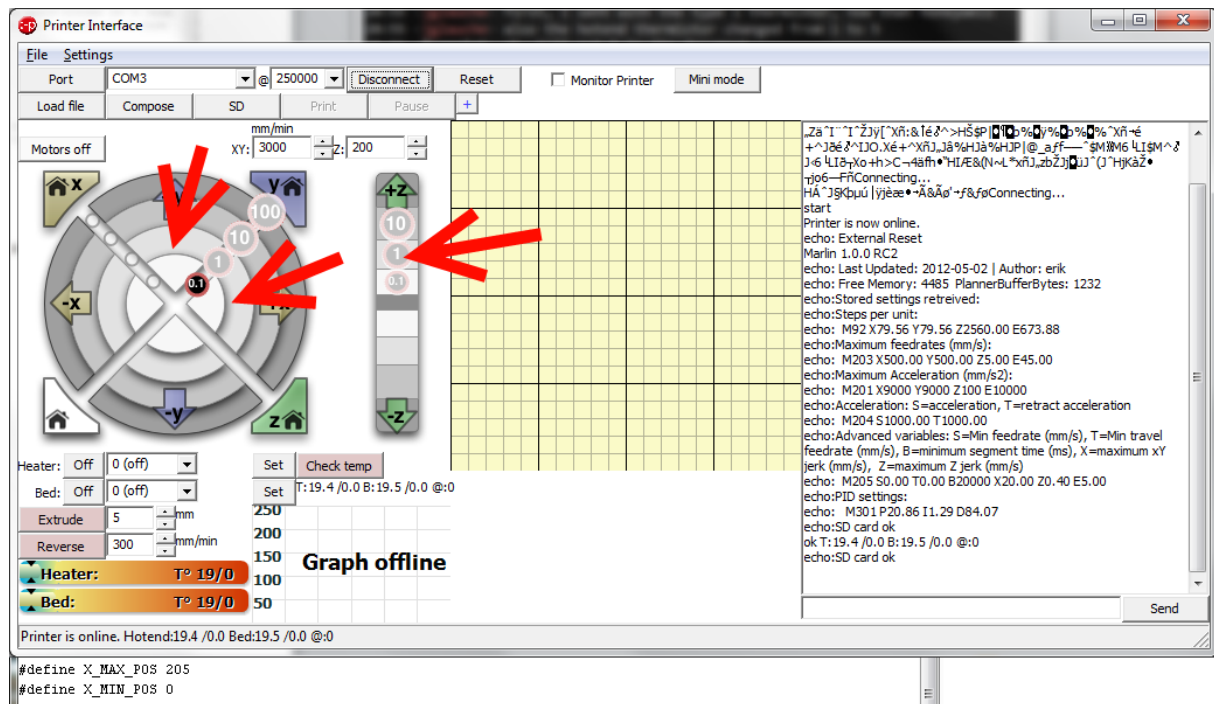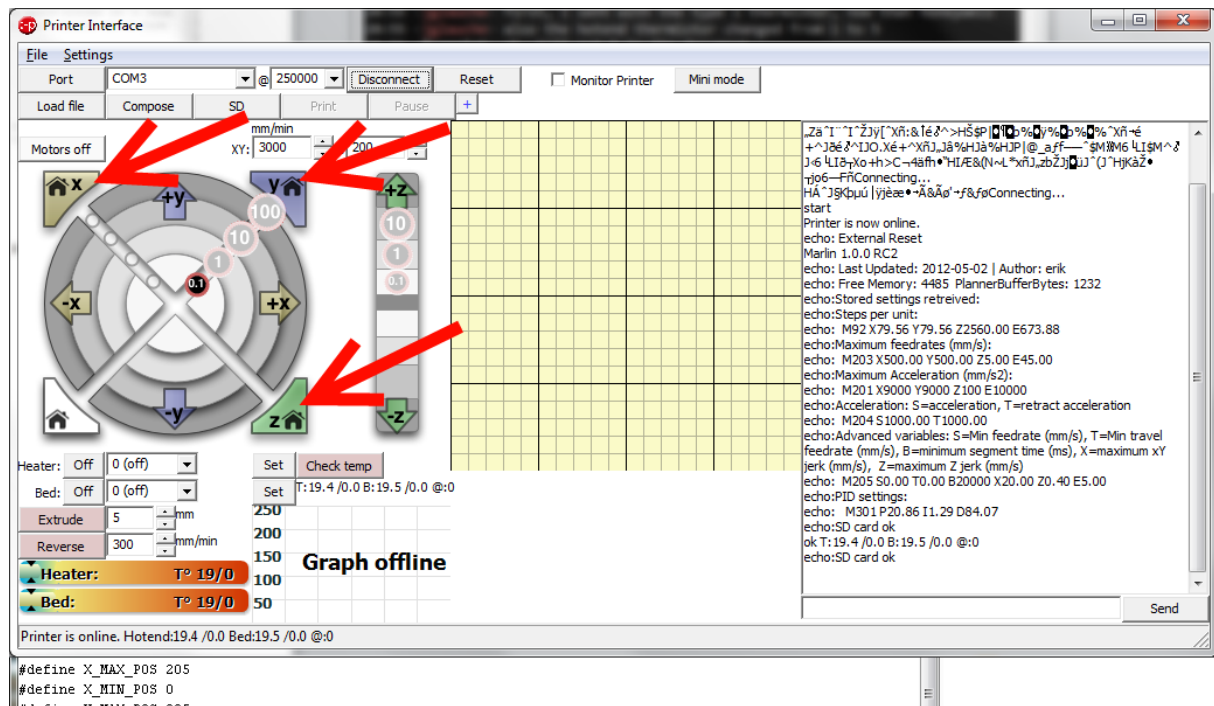Now try homing each axis.

```
#define X_MAX_POS 205
#define X_MIN_POS 0
#define Y_MAX_POS 205
```

Be ready to hit the endstop yourself, or to switch off the power if your motor moves in the wrong direction.

If the motor does not stop when you've hit an endstop, switch off the power immediately and check your wiring.

   d.   Actual calibration!

Move your X axis to it's home position, mark this position and type "G0 X150" in the command field and hit send.
Now measure how far it REALLY went.

Change the X axis E_STEPS to be: new_esteps = (measured_distance * current_esteps / desired_distance)

Now do the same thing again and see if it's correct.

Do this for all the axis.

For the extruder, it's easiest to remove the hotend first when doing this.

Trim the filament flush with the bottom of the extruder, extrude 100mm, and measure how much came out, and adjust accordingly.

Re-assemble the hotend, set the temperature for your filament (180°C for PLA, 230°C for ABS), and manually feed the filament through until it starts extruding.

Now let the hotend cool down again.

Type M303 in the command field and let the printer find the PID settings for your specific hotend.

Change these settings to match what your printer has found:

 #define DEFAULT_Kp 22.2

 #define DEFAULT_Ki 1.08

 #define DEFAULT_Kd 114

4. Slic3r

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