

Section 1: Flashing Bootloader on to Creality CR-10

- In order to flash the Marlin firmware on to the CR-10, a bootloader must be loaded onto the Melzi motherboard. The following steps will explain how to install the bootloader so that the latest version of Marlin firmware can be installed.
- In order to flash the bootloader on to the Melzi board, an Arduino UNO must be used. See below for a link to purchase an Arduino UNO (Figure 1).

https://www.amazon.com/Elegoo-Board-ATmega328P-ATMEGA16U2-Arduino/dp/B01EWOE0UU/ref=sr_1_2_sspa?ie=UTF8&qid=1510445467&sr=8-2-spons&keywords=arduino+Uno&psc=1

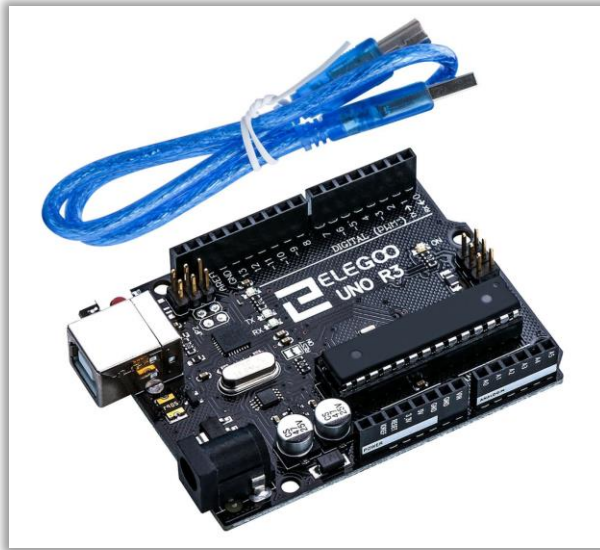


Figure 1: Arduino UNO (Amazon.com)

- By flashing the bootloader onto the machine, this enables you to update the firmware as new versions are released by using the micro USB port on the CR-10 control box.
- The following hardware is needed to flash the bootloader:
 - Five (5) female-to-female jumper wires
 - One (1) male-to-female jumper wire
 - Arduino UNO
 - One (1) USB type B to USB type B micro
- The jumper wires can be purchased here: https://www.amazon.com/Elegoo-120pcs-Multicolored-Breadboard-arduino/dp/B01EV70C78/ref=sr_1_1_sspa?ie=UTF8&qid=1510445954&sr=8-1-spons&keywords=jumper+wires&psc=1
- The steps for flashing the bootloader go as follows:
 1. Unplug the CR-10 control box from any power outlet
 2. Remove spool holder from the top of the control box
 3. Flip the control box over and remove the 5 button head allen screws to remove the cover.
 4. Remove the 4 button head allen screws that secure the power source in place.
 5. Flip the power supply up so that it is out of the way and allows access to the CR-10 motherboard.

6. Move the jumper on the motherboard from “VREG” to “USB”. What this does is allows the computer to power the board rather than the power source. This can be seen in Figure 2.

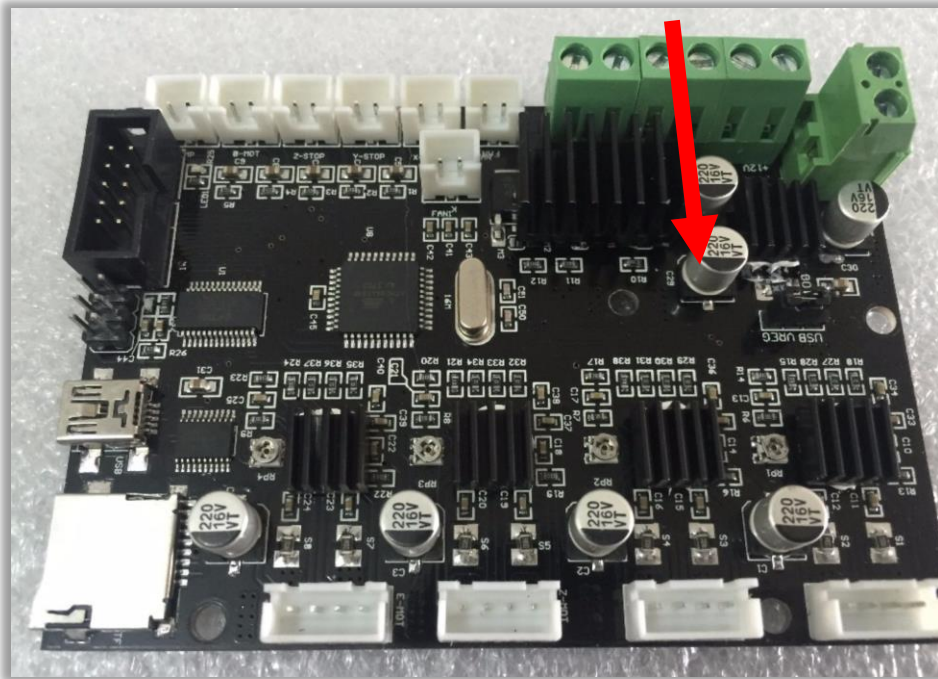


Figure 2: VREG-USB Power Source Jumper

7. There is a 6 pin header on both the Arduino and the Melzi board. We will connect certain pins in order to flash the bootloader. Use the 6 jumper wires to connect the boards by following the diagram in figure 3 below.

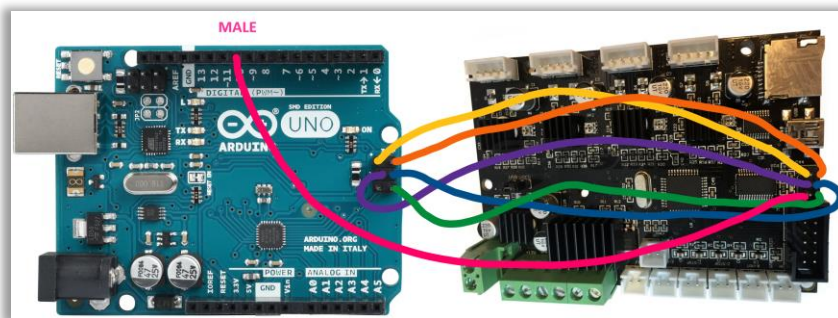


Figure 3: Arduino Bootloader Wiring

8. Connect the Arduino UNO to your PC via USB
9. Open Arduino IDE (Figure 4)
10. Click “File” > “Examples” > “Arduino ISP” > “Arduino ISP”

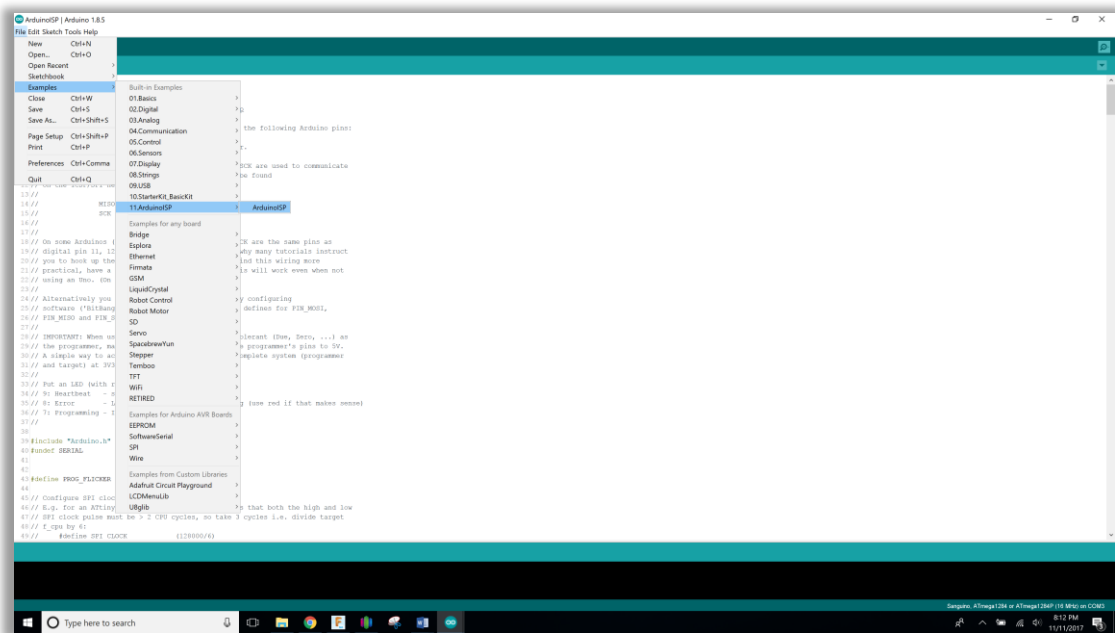


Figure 4: Arduino IDE opening Arduino ISP

11. Click “Tools” > “Board” > “Arduino/Genuino UNO”

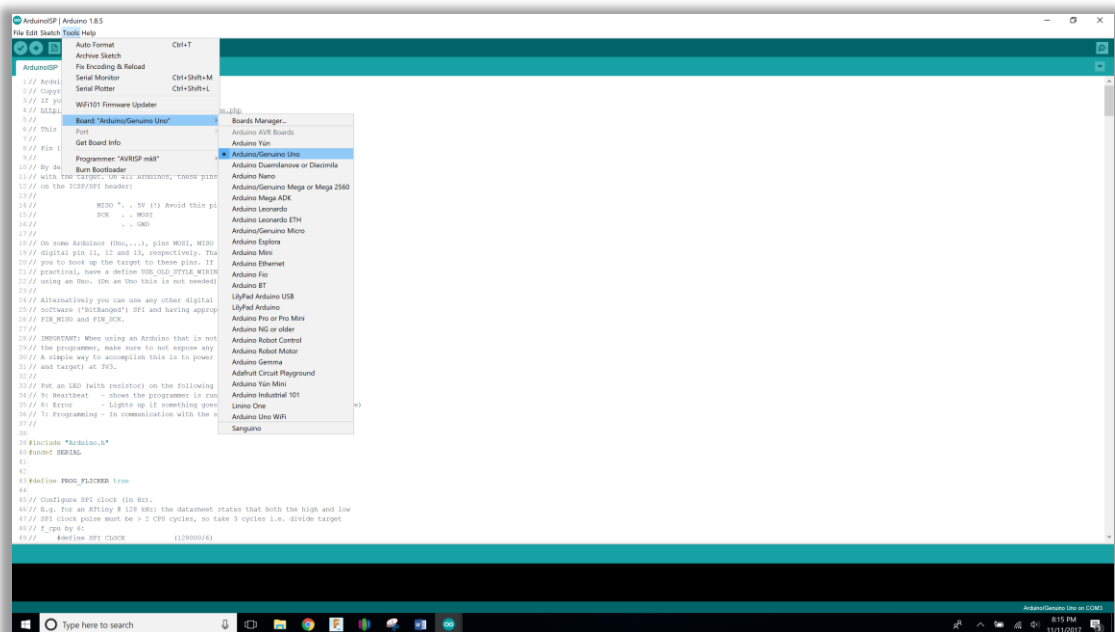


Figure 5: Arduino IDE Selecting Board

12. Select port that your UNO is associated with “Tools” > “Port” > “Port X Arduino/Genuino UNO”
13. Click UPLOAD (The lights should start flashing on your Arduino as it’s compiling and once finishing, your PC should say “done uploading” in the Arduino IDE software.)
14. For the next step, the “Sanguino” profile must be installed on your Arduino IDE software. You can transfer this directory to your computer from the included files.
15. This is a Sanguino third-party hardware add-on for the Arduino IDE.
16. To use it either use the Arduino board manager and add the following url:
https://raw.githubusercontent.com/Lauszus/Sanguino/master/package_lauszus_sanguino_index.json

or simply create a folder named hardware inside your sketchbook directory. Now move the Sanguino directory inside that folder. The structure would look like this:

```
Arduino/  
  hardware/  
    Sanguino/  
      avr/  
      bootloaders/  
      variants/  
      README.md  
      boards.txt
```

17. Now in Arduino IDE go to “Tools” > “Board” > “Sanguino”
18. Go to “Tools” > “Processor” > “ATMega1284 or ATMega1284P (16MHz)”
19. Select the port associated with your Arduino UNO
20. Now click “Tools” > “Burn Bootloader”
21. The LEDs will blink and the bootloader will be added to the Creality CR-10 board

Section 2: Loading Marlin Firmware onto Melzi board

1. Locate the Marlin.ino file in the included files and open it. **NOTE: THIS IS CUSTOM 1.1.6 MARLIN FIRMWARE THAT HAS BEEN CUSTOMIZED FOR BLTOUCH ON CREALITY CR-10. THIS IS NOT STOCK MARLIN.**

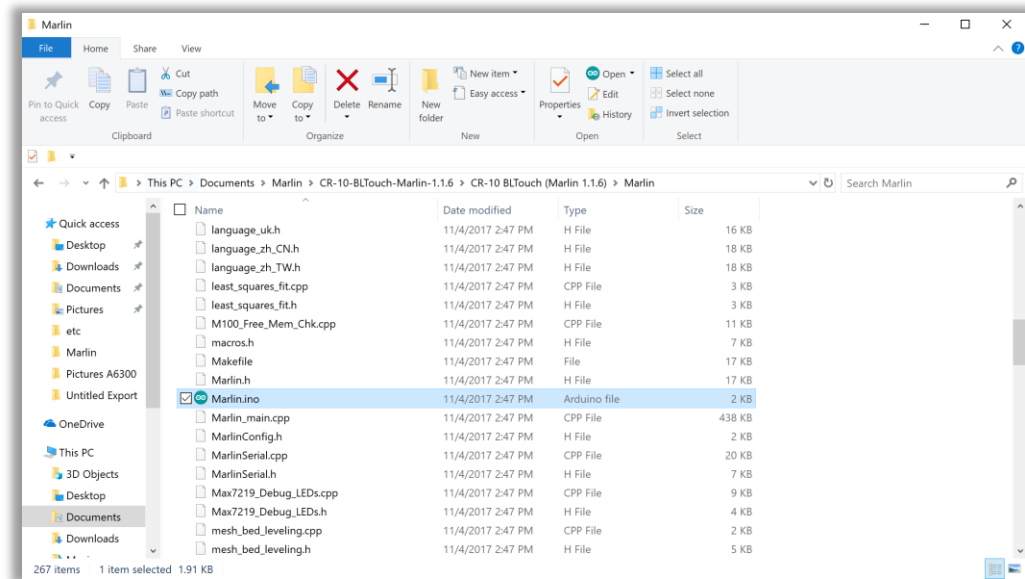


Figure 6: Opening Marlin.ino

2. Select “Tools” > “Board” > “Sanguino”
3. Select “Tools” > “Processor” > “ATMega1284 or ATMega1284P (16MHz)”
4. Select “Tools” > “COM” > COM port associated with your Arduino
5. Click **UPLOAD**
6. **NOTE: ARDUINO IDE AND LIBRARIES MUST BE UPDATED FOR THIS TO WORK. MAKE SURE THE U8GLIB.h DIRECTORY IS UPDATED.**
7. Your CR-10 should now be updated with the latest Marlin firmware with BLTouch enabled.

Section 3: Wiring and Mounting the BLTouch

1. When looking at the BLTouch sensor, you may notice that there are 5 wires. There is one plug with Black/White and another with Brown/Red/Orange. The Black and White Plug simply replaces the ZSTOP XT connector. So unplug Z stop and plug in the Black/White XT connector. Positive and negative can be seen below in Figure 7. On the BLTouch BLACK is GROUND and WHITE is SIGNAL.

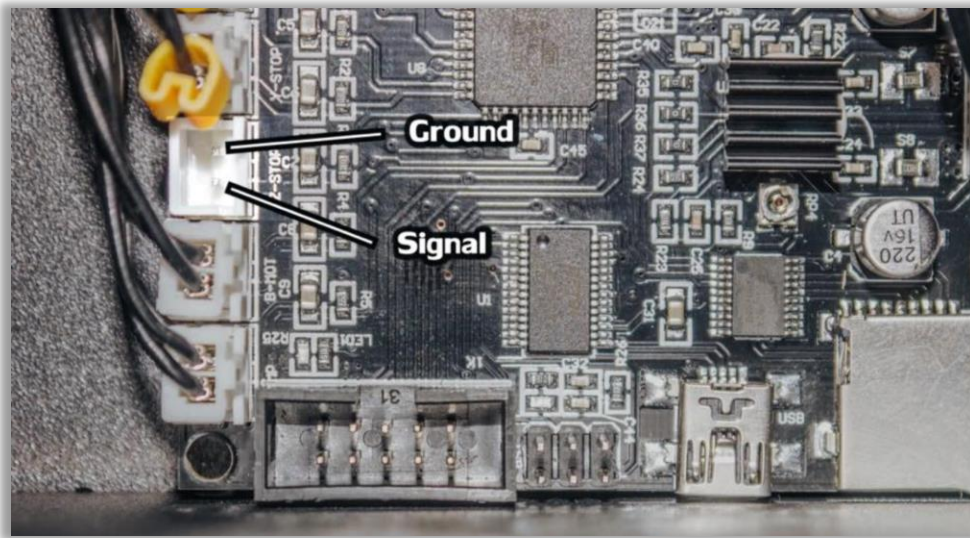


Figure 7: Z-Stop Polarity

2. On the servo plug for the BLTouch, the pinout is as follows:
 - a. BROWN (GROUND)
 - b. RED (+5V)
 - c. YELLOW (SERVO SIGNAL)
3. Connect the brown wire to the GND pin on the MOSI/MISO header on the Melzi board (This is the same header we used for the bootloader).
4. Connect the red wire to the +5V pin on the MOSI/MISO header on the Melzi board (This is the same header we used for the bootloader).

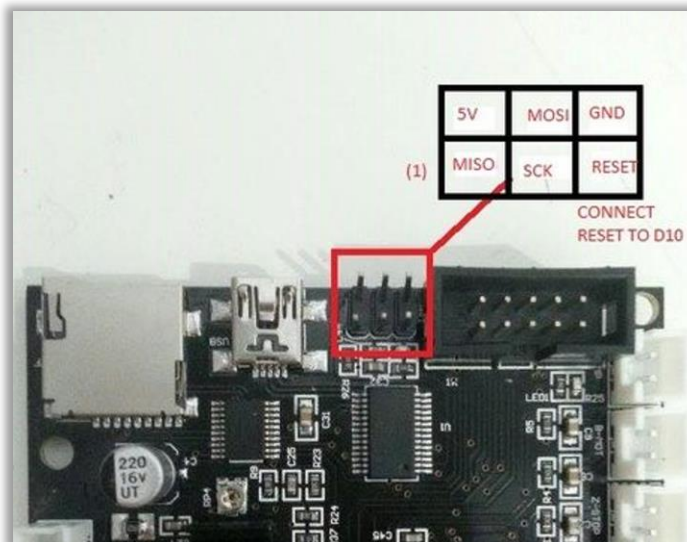


Figure 8: MOSI/MISO Pinout

5. **NOTE: THE MELZI BOARD DOES NOT HAVE A DEDICATED SERVO PIN, SO WE WILL HAVE TO REPURPOSE THE BEEPER PIN FROM THE LCD RIBBON CABLE. THIS IS THE BROWN WIRE.** Cut and solder the YELLOW wire from the BLTouch to the BROWN wire coming off of the Melzi board.



Figure 9: BLTouch Pin 27 Servo Signal Re-Purpose

6. Now we will need to mount the BLTouch to the extruder head. 3D print the bracket .STL file included in the file folder attached.
7. Once the BLTouch is mounted, the printer control box can be re-assembled and powered up. **DO NOT FORGET TO MOVE THE JUMPER BACK TO "VREG" FROM "USB"**. The printer will not power up if this isn't done.
8. Once the printer is re-assembled and powered up follow these steps to set your **Z OFFSET** (Best done in OctoPrint):
 - a. In the control panel, send a G28 GCode to check if the BLTouch is being used as our Z end stop
 - b. Send G1 Z0 (This will bring the nozzle down to what the machine thinks is Z = 0)
 - c. Grab a piece of copy paper and slide it under the hot end.
 - d. Send a G92 Z10 (This tells the printer that the print head is now 10mm above the bed surface)
 - e. Move the Z-Axis down in increments of 0.1mm until there is slight tension between the copy paper and the hot end nozzle.
 - f. Send an M114 code to see the current Z position. For example, initially the head was at 10mm, so if the current value of Z is 9.20mm then your Z offset needs to be set to -0.8mm.
9. Enter your Z offset into "Z_PROBE_OFFSET" in the configuration file in "Marlin.ino" and re-upload the firmware. Make sure that your offset is negative.
10. Now we need to add the auto bed leveling procedure into the start G-Code of your slicer.
11. Navigate to your starting G-Code in your slicer software and add the following code to the end:
 - a. M280 P0 S160 ; BLTouch alarm release

b. G4 P100 ; delay for BLTouch

c. G28 ; home

d. G29 ; auto bed leveling

12. Once this is done, you are ready to print with auto bed leveling.

HAPPY PRINTING!