

UPtanium

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## About This Kit

This is an Auto Bed Leveling kit to install Auto Bed leveling on the Creality Ender 5 3D printer.

ABL will be used throughout this documentation to refer to Auto Bed Leveling.

This kit includes a capacitive sensor to sense print bed distances on all surfaces including glass. In order for the best performance, we have included an optocoupler installed inside of the case. This is used to isolate electrical noise from the capacitive sensor.

Capacitive sensors are prone to electrical interference and the optocoupler solves this issue by electrically isolating the signal and transmitting the signal through a light therefore creating isolation and excellent signal transfer characteristics.

ABL is an excellent solution to create consistent prints even on surfaces that are not even. Although ABL is a great addition to your 3D printer, it is not used to find the perfect nozzle-to-bed clearance. You must find this distance through trial and error just the same as traditional manual bed leveling. What ABL DOES do is provide repeatable prints and excellent repeatability after the nozzle-to-bed clearance is tuned in. ABL is designed to remove the constant adjustments needed in order to simply start a print.

The steps and procedures in this kit will flash your Ender 5 with a customized firmware version of Marlin 1.1.9 configured by Uptanium. Ultimately the credit is given to the Marlin project for the excellent contributions they have made to the open source community on github. We have also included STL files sourced from thingiverse for this kit and would like to give thanks to the contributors. We have included all shared files on the USB drive.

For best practices, we have included a back out procedure to restore your firmware to the stock version that was shipped with the Ender 5. If for any reason you need to revert to the stock firmware, the steps are covered in the **RESTORE FACTORY FIRMWARE** section along with the firmware needed.

Please check out our other Uptanium products on Amazon. We sell exclusively on Amazon to leverage the extremely fast shipping times and excellent customer service.

### Anet A8 ABL Kit [Amazon Prime Click Here](#)



UPtanium Anet A8 Complete Auto Bed Leveling Kit  
Glass Compatible with Detailed Installation  
Instructions - Firmware Included  
by Uptanium  
★★★★★ 15 customer reviews | 12 answered questions  
Price: \$48.95  prime  

- Complete kit
- Comprehensive, easy to follow directions
- Pre-wired you only need to attach 2 wires for power and swap z min endstop connector
- Free email support should you have any issues or concerns.

New (1) from \$48.95  prime

### USBasp Bootloader and Snapshot Kit [Amazon Prime Click Here](#)



by Uptanium  
3D Printer Burn Bootloader Kit - Firmware Snapshot and Recovery Tool - PDF Instructions Included  
Be the first to review this item  
by Uptanium  
★★★★★ 15 customer reviews | 12 answered questions  
Price: \$24.99  prime  
Specifications for this item

Part Number	8656
Brand Name	Uptanium

### Stepper Motor Parallel Y Cable [Amazon Prime Click Here](#)

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Please leave feedback .This helps us greatly in continuing to deliver more quality products. If you have any issues, please contact us before leaving negative feedback. Our goal is to help with any issues you have. Email us at [Uptanium@gmail.com](mailto:Uptanium@gmail.com). We will reply promptly to resolve any issues and use fast shipping if any parts need replacement.

## 01 –BUILD PREPARATION

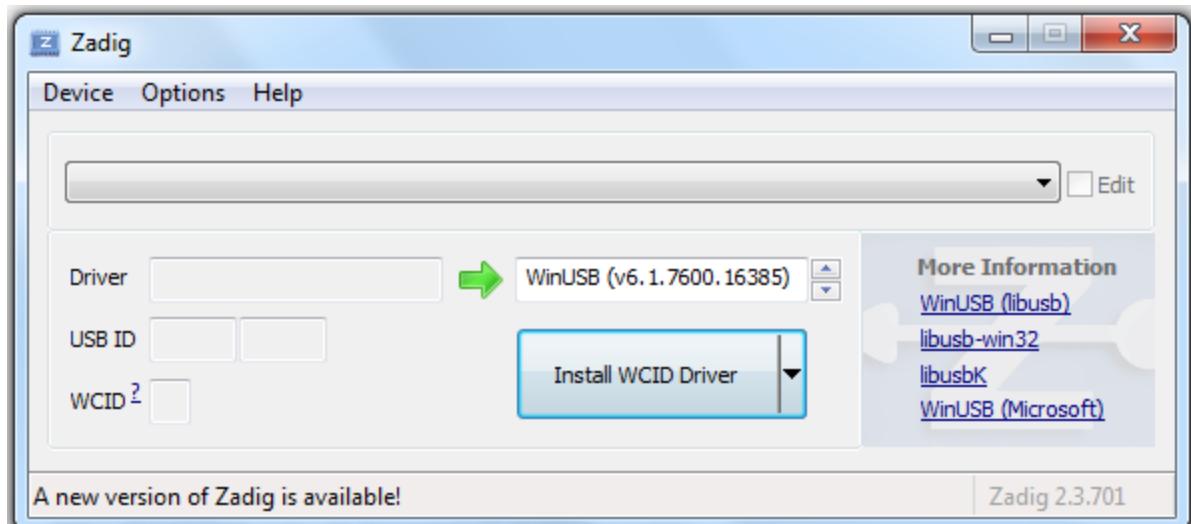
### Install bootloader and firmware flash tool driver

1. Plug the bootloader/firmware flash tool into an open USB port on your PC. Allow Windows to install the generic driver. Windows should find and install a driver.

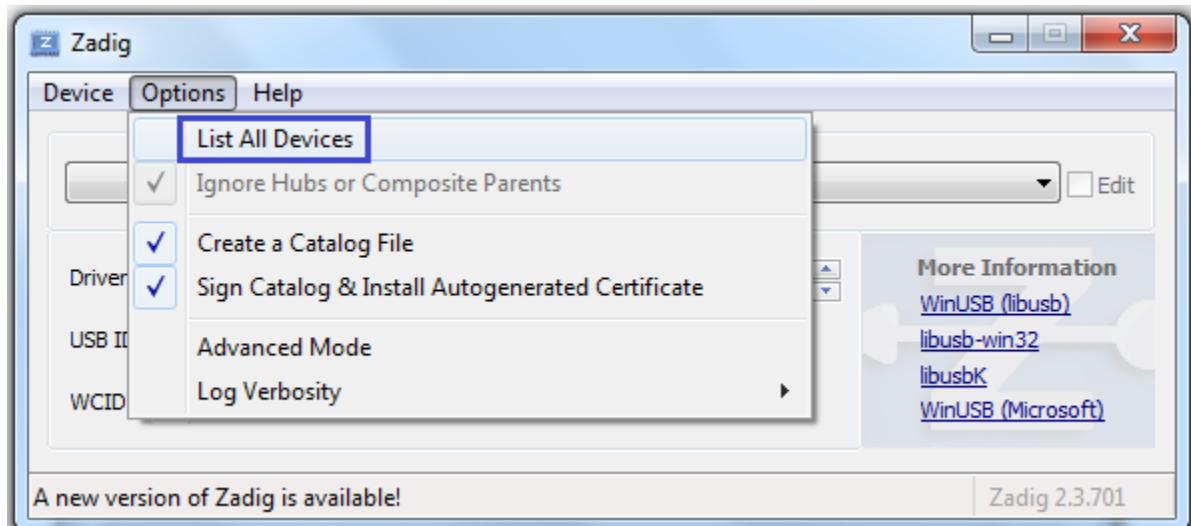


We will be replacing this driver in the next step so do not worry if it fails to install. Once installed, unplug the USBasp from the USB port and plug it back in.

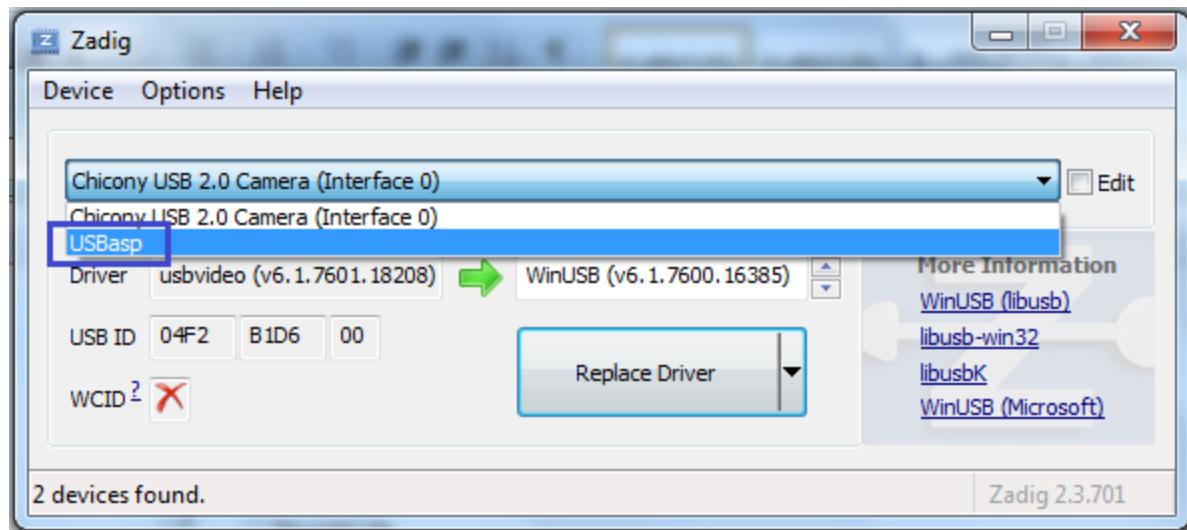
2. On the supplied USB drive, navigate to the **Software** folder and double click on [zadig-2.3.exe](#) to run the Zadig app.
3. Zadig will open. If prompted to update, close the prompt without updating. You will now see the screen below.



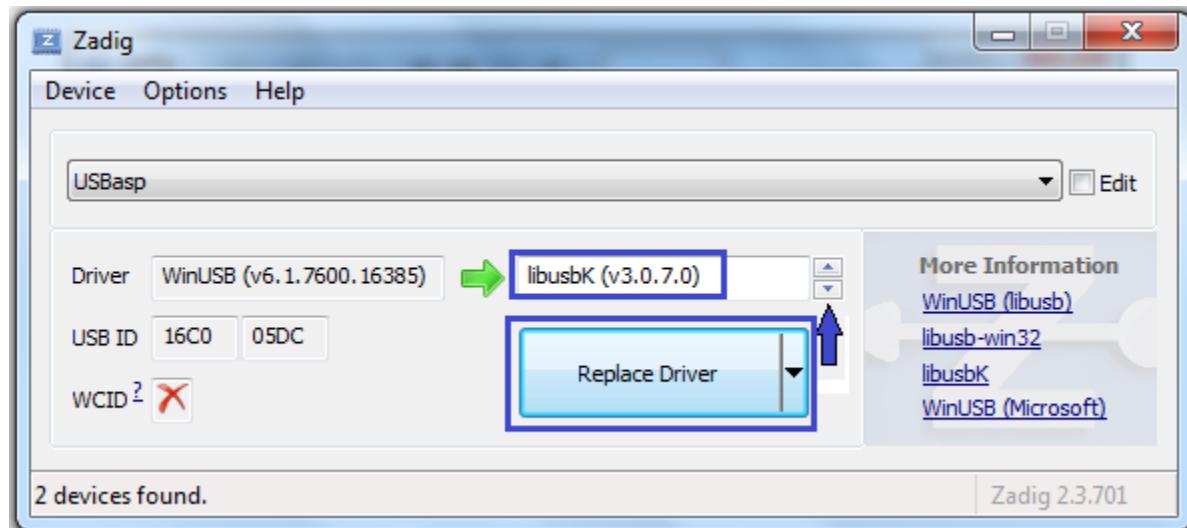
4. Click on the **Options** tab then click **List All Devices**.



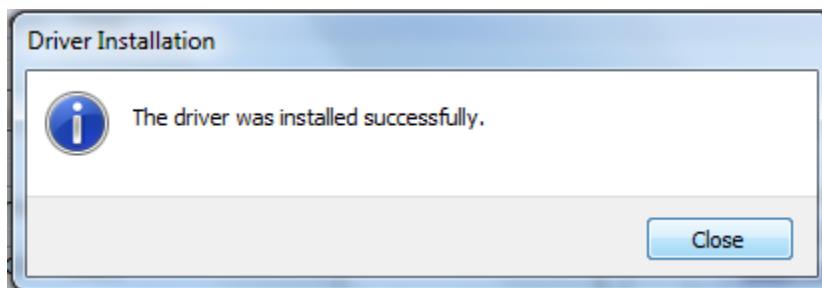
5. After clicking the **List All Devices** tab, select **USBasp** from the dropdown. If you do not see it, unplug the USBasp device from your USB port and plug it back in. Occasionally, Zadig will need to be closed and opened again to recognize the USBasp device.



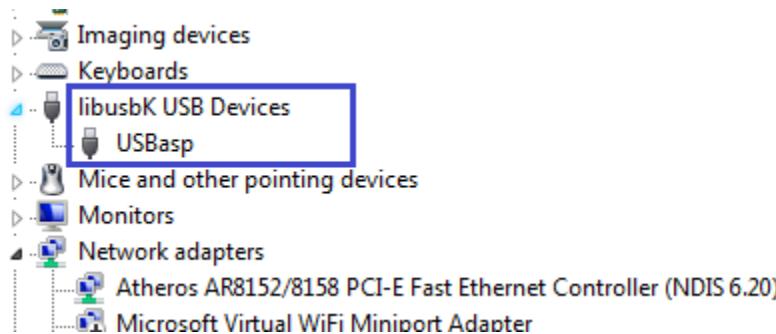
6. Once the USBasp device is selected, use the down arrow key in the dropdown to select the **libusbK(v3.0.7.0) driver** as shown below. Once selected, click the **Replace Driver** button to install the driver.



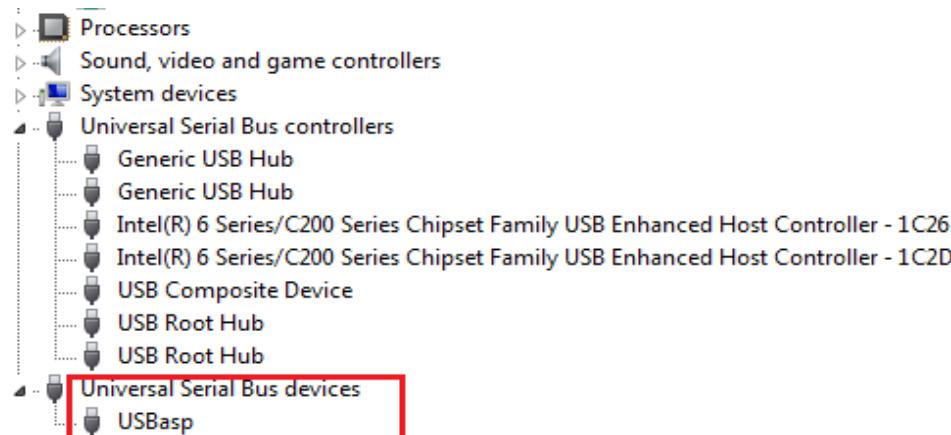
7. You should see this if you have successfully installed the driver.



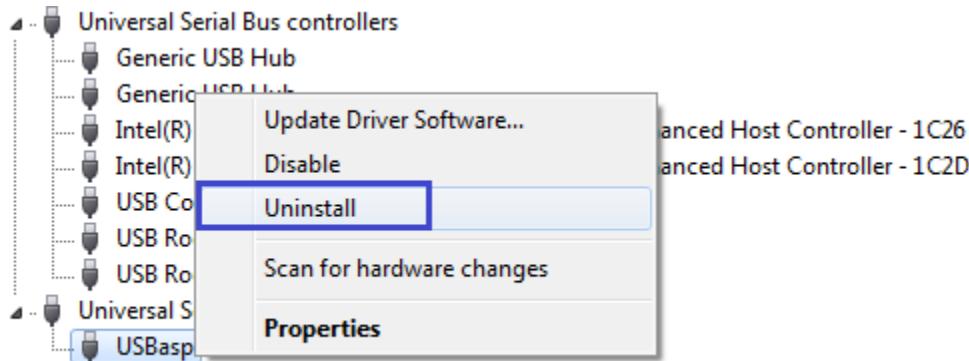
8. To validate the correct driver is installed, go to device manager and locate this entry.



If the wrong driver is installed, you will find this entry in the device manager.



If you have the wrong driver, keep the USBasp device plugged in and right click on USBasp as shown below and uninstall.



Make sure to check the box to **Delete the driver software for this device** then click OK.

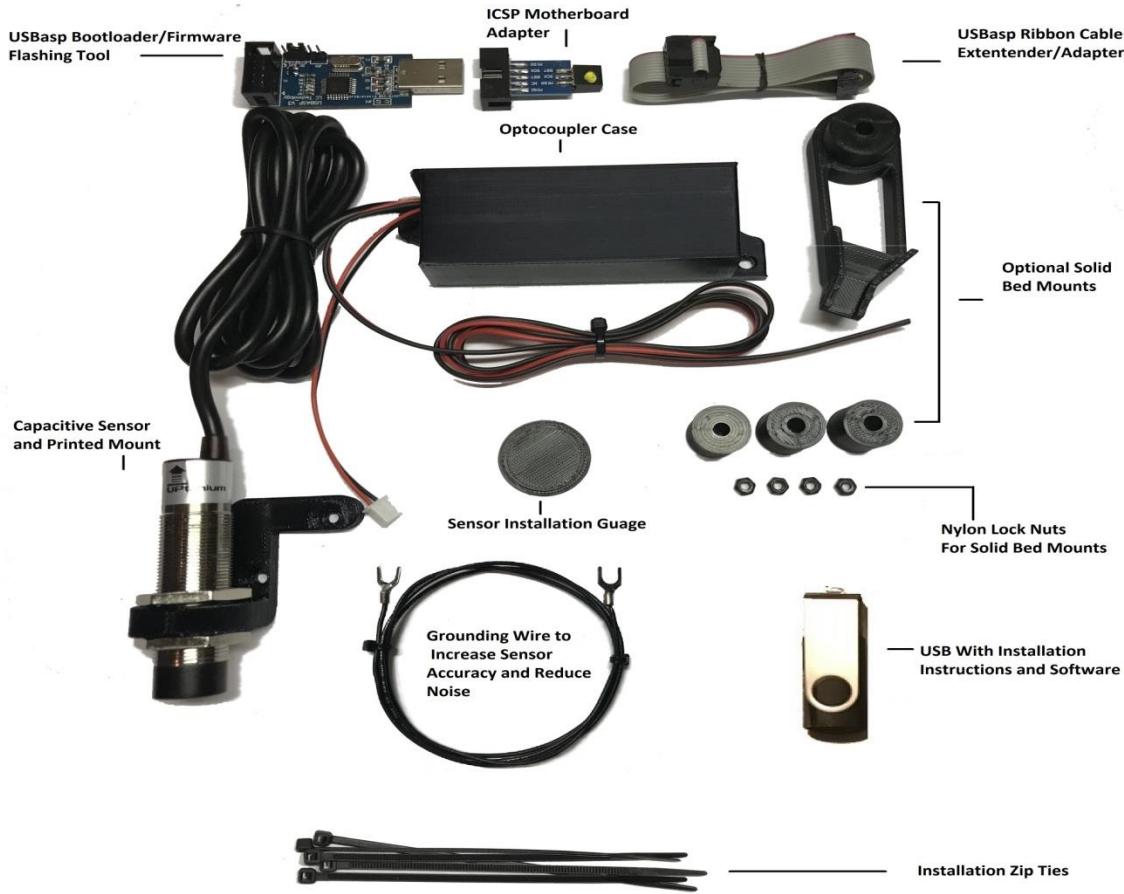


Repeat steps 1-7 in this section to install the correct driver and validate as shown in step 8.

9. Done

## 02 –INSTALLATION GUIDE

### Kit Contents Diagram

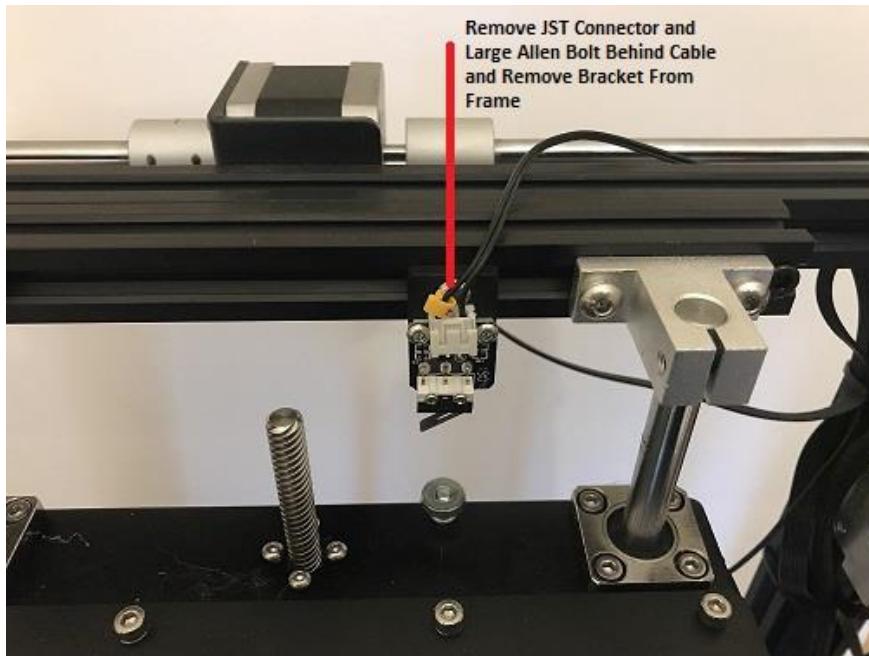


### Overview of the installation steps

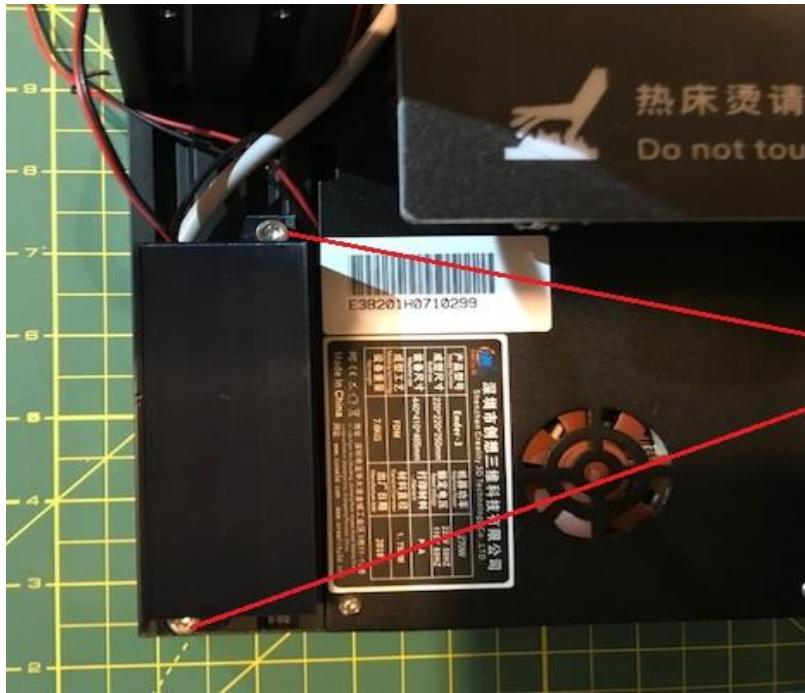
1. Remove Z Endstop
2. Install Optocoupler Case
3. Plug ABL into Motherboard
4. Connect Power to PSU
5. Install Ground Wire
6. Install ABL Sensor
7. Install Solid Bed Mounts
8. Upload Firmware
9. Adjust Z Offset

## 1. POWER OFF YOUR MACHINE

2. Remove the Z endstop as pictured below. Remove the white JST connector and large allen bolt holding the bracket to the frame.



3. Using the supplied allen bolts and hammer head nuts, install the provided optocoupler case next to the motherboard case as shown below. Make sure to install the case with the wires facing towards the back of the machine as shown. It is easier to slide the case in from the back and leave the wires at the back of the machine for the moment.



Mount the Case

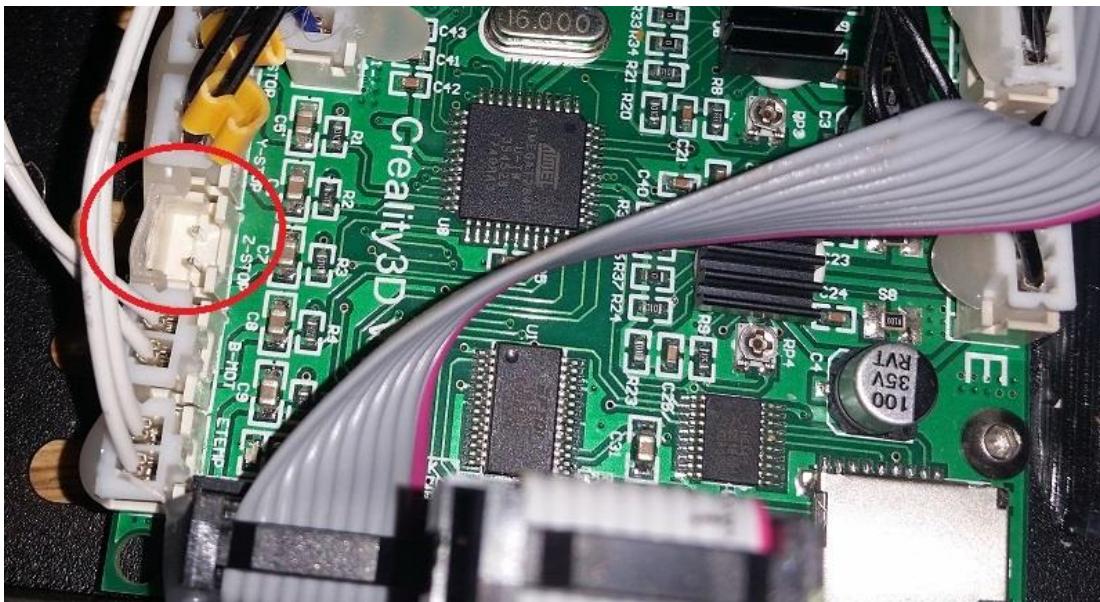
4. Tilt the Ender 5 back and expose the bottom of the printer. It is safe to rest the printer on its back to perform this operation. Remove the 4 screws of the motherboard/ PSU case cover indicated below.



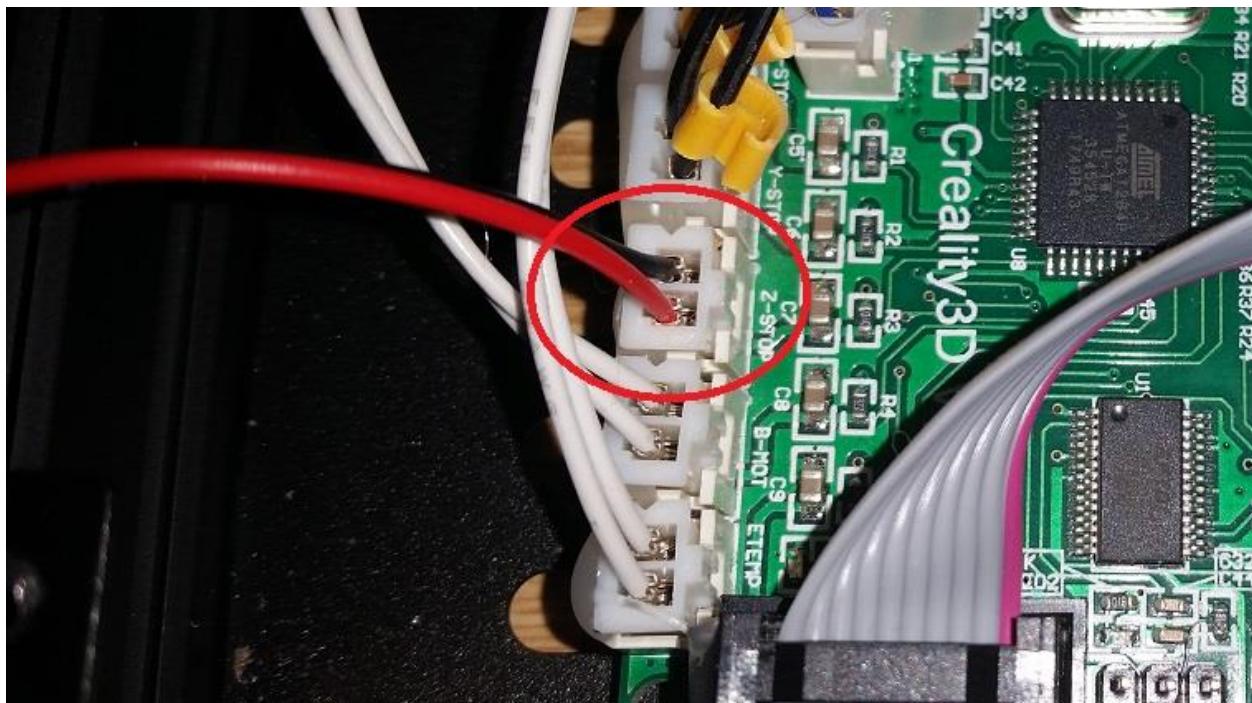
5. Move the case cover off to the side to expose the motherboard.

**\*ATTENTION\*** The connections on the Ender 5 motherboard have been hot glued to ensure connections are secured during shipping. You will need to gently remove the glue from the Z endstop connector before unplugging it.

6. Locate the Z endstop cable that you unplugged previously from the endstop assembly. Follow that down to the connection on the motherboard as shown below. It will have a plastic yellow clip label with a "Z". Remove the hot glue around the JST connector with an X-acto knife or a small sharp tool. Gently try to remove the connector. If there is resistance, check for more glue and remove it. The connector should come out with light to moderate force.



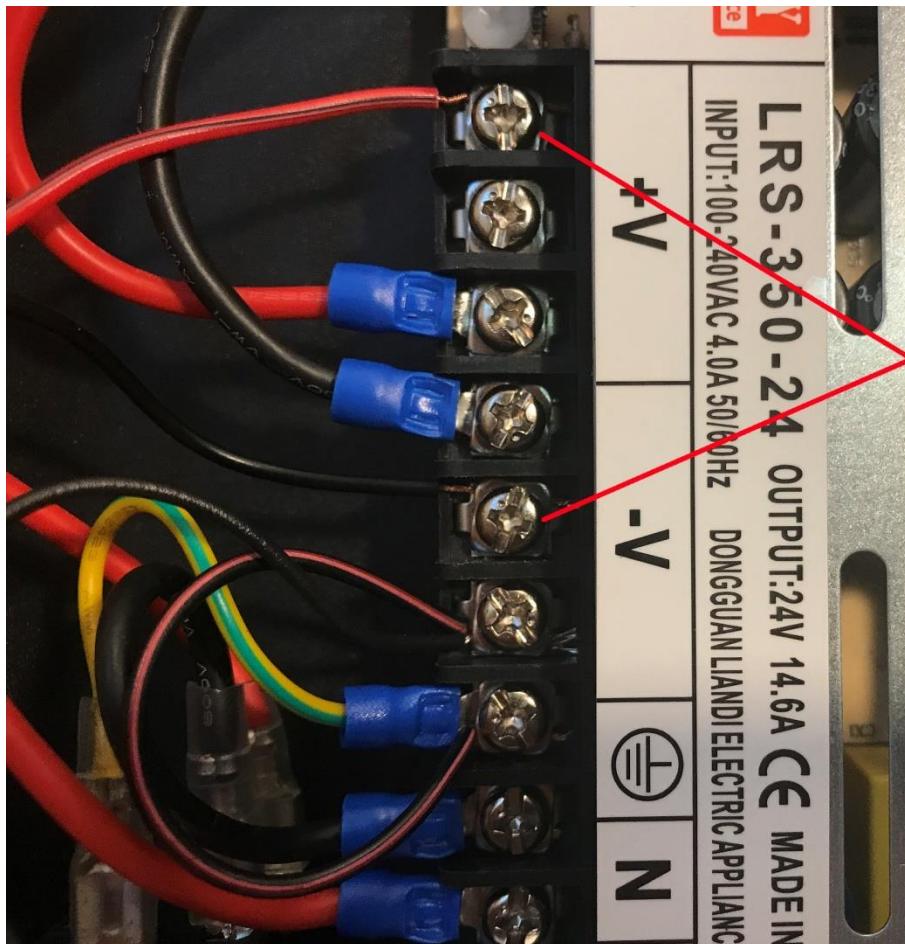
7. Route the new Z endstop wire through the square access hole where all of the other wires enter the motherboard and PSU case. Connect the white JST (black-red wires) connector that comes out of the optocoupler case into the old Z endstop slot on the motherboard.



**\*ATTENTION\*** Leave the motherboard case off for the moment. After the installation of the hardware, the firmware will need to be updated. The supplied bootloader/firmware flashing tool will need to be plugged into the motherboard.

8. Locate the unused 24v DC power connectors as shown below.

**\*ATTENTION\*** Observe the correct positive and negative polarity marked on the power supply! The power cables coming from the ABL kit are marked for correct polarity. Red is positive and black is negative. Reversing the polarity (connecting them backwards) will destroy your ABL kit and potentially your printer.

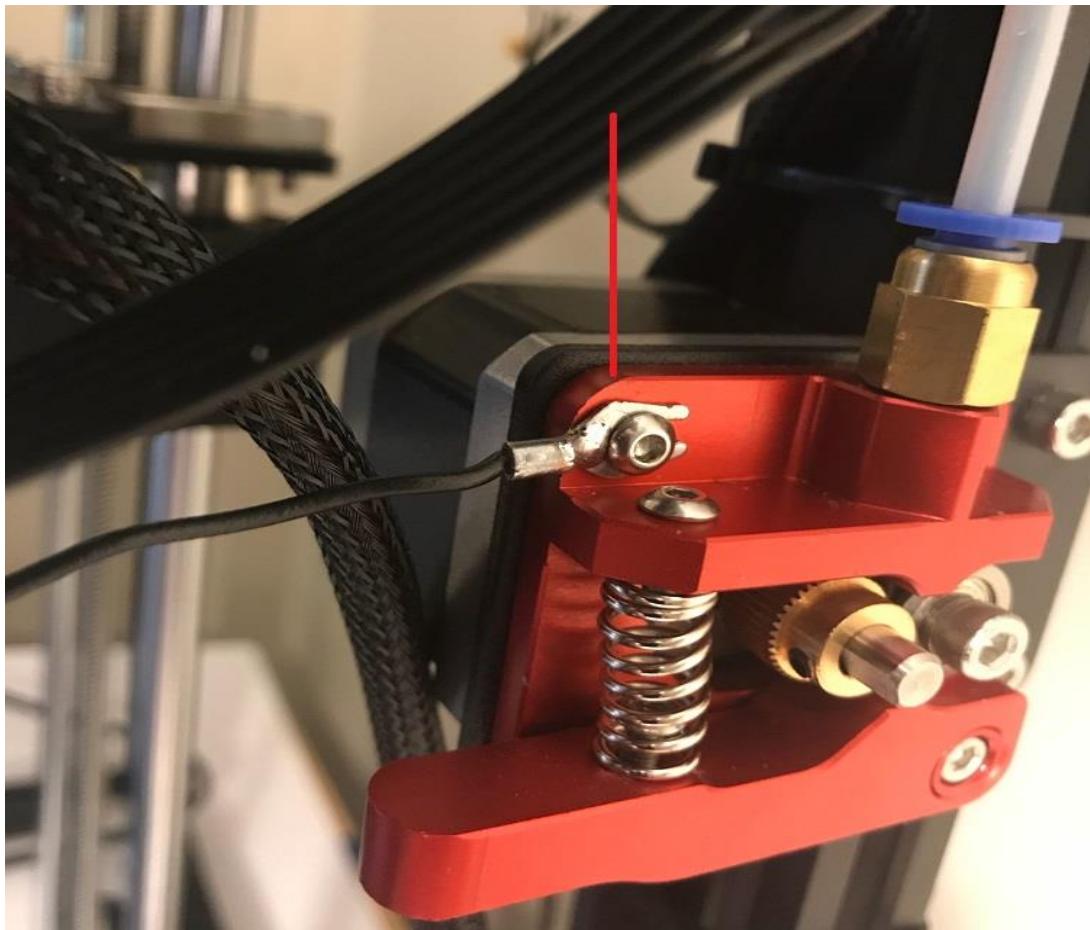


Install power to the optocoupler case using the shown connections. Red wire goes to V+ and black wire to V-.

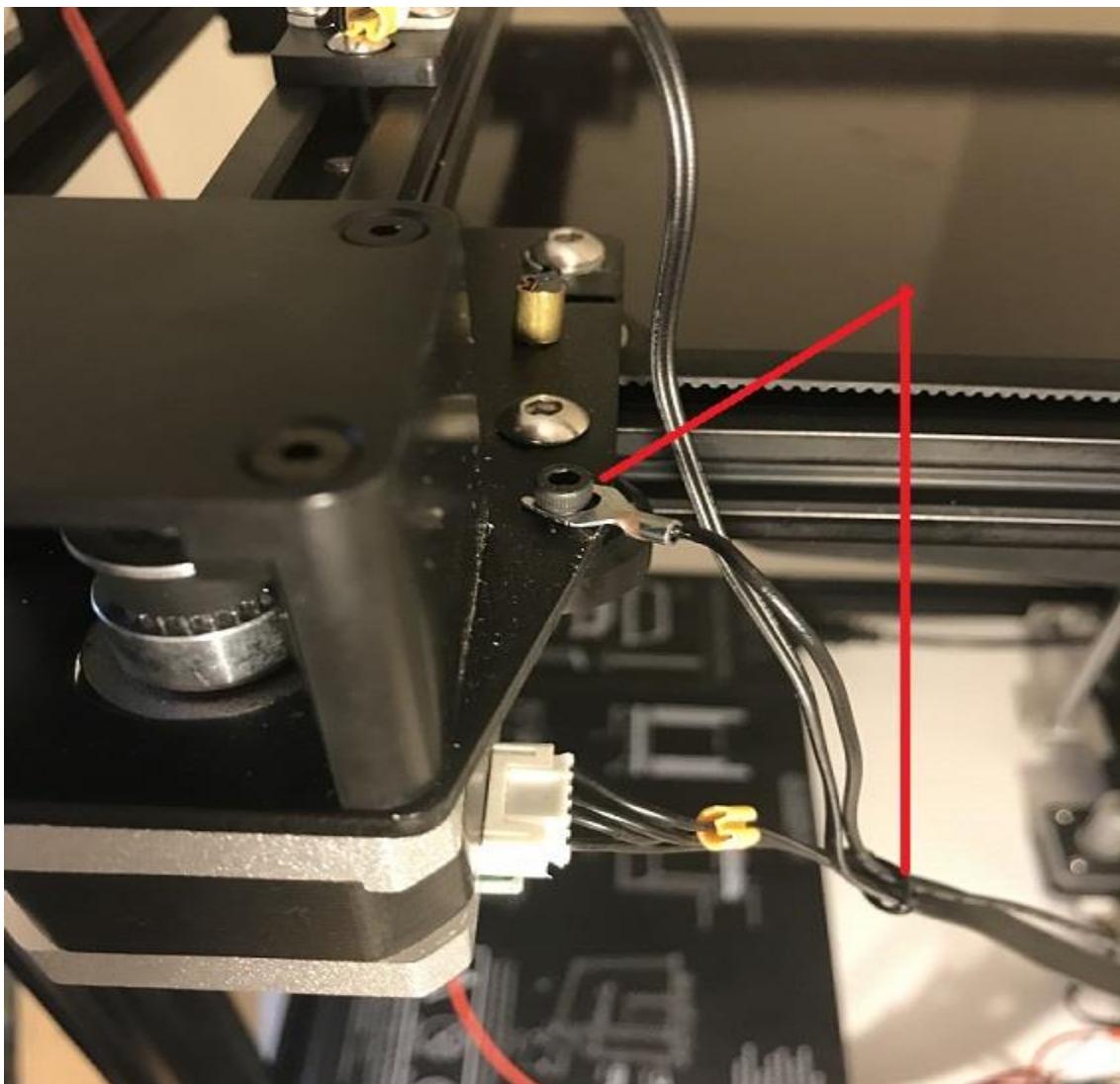
## Install Ground Wire !

This step CANNOT be skipped. The Ender 5 has a well known grounding issue that is caused by the X and Y axis being conductively isolated from the rest of the printer. This will cause an imbalance in grounding potential between the print head (X and Y axis) assembly and ultimately the power supply unit. Since the ABL sensor is capacitive, this causes a major issue that will trigger the sensor prematurely. It has been observed that the sensor will trigger even when nothing is close by. The problem does not always present itself immediately. **IF YOU EXPERIENCE A CONSTANT TRIGGERED CONDITION (LIGHT ON), PLEASE INSPECT THE GROUND WIRE.**

9. Locate the extruder stepper motor and install one end of the supplied grounding wire as shown below.

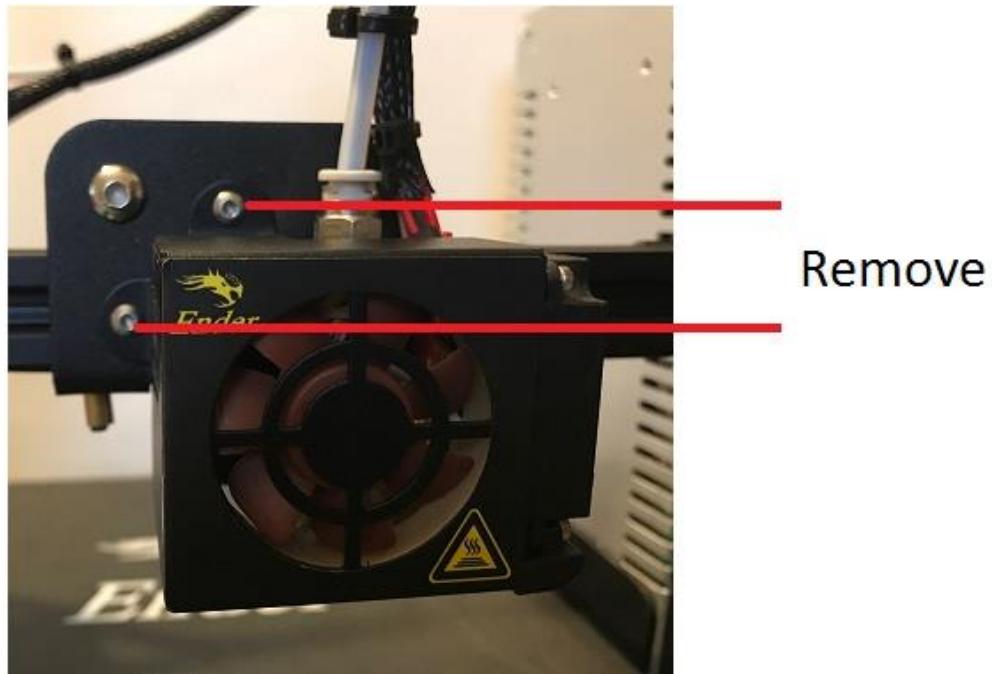


10. Now, locate X stepper motor on the top of the printer and install the other end of the ground wire as shown below. After the wire is installed, move the X and Y assembly all the way to the front of the printer and make sure the ground wire can reach. Install a couple of zip ties to the stepper cable to secure the ground wire to keep it away from the moving assembly.

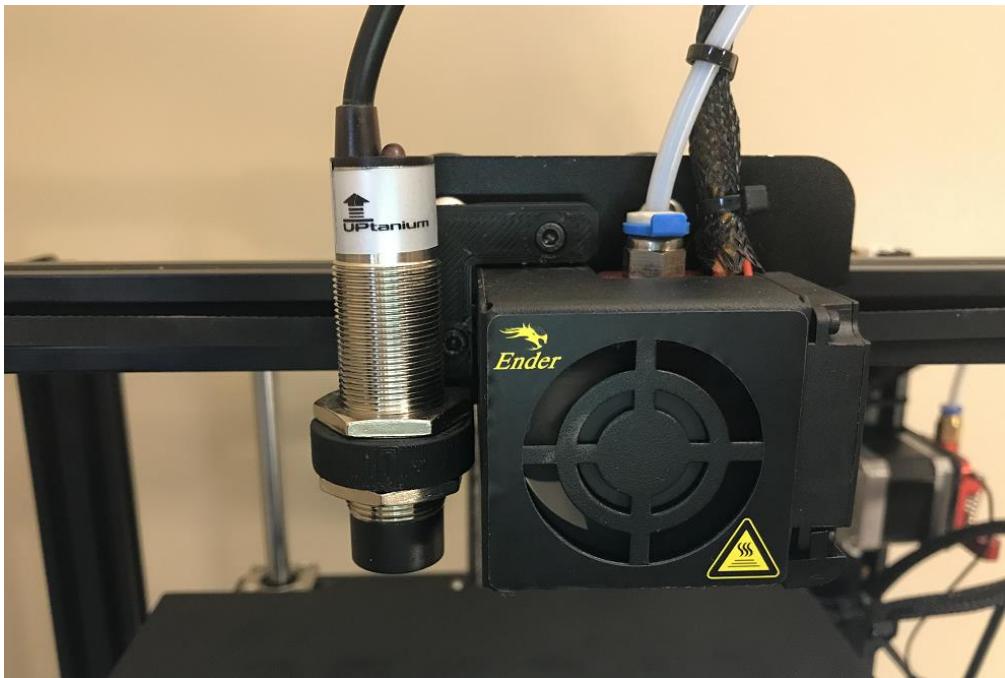


## Install the Sensor

12. Remove the 2 screws holding the extruder fan case in place.



12. Using the existing screws, install the sensor as shown below.



**\*ATTENTION\*** While it may be tempting to zip tie the sensor wire to the extruder/fan wires, resist the temptation. The sensor is sensitive to electromagnetic interference produced by the extruder/fan wires. You need to zip tie the sensor wire to the plastic PTFE tubing that the filament runs through.

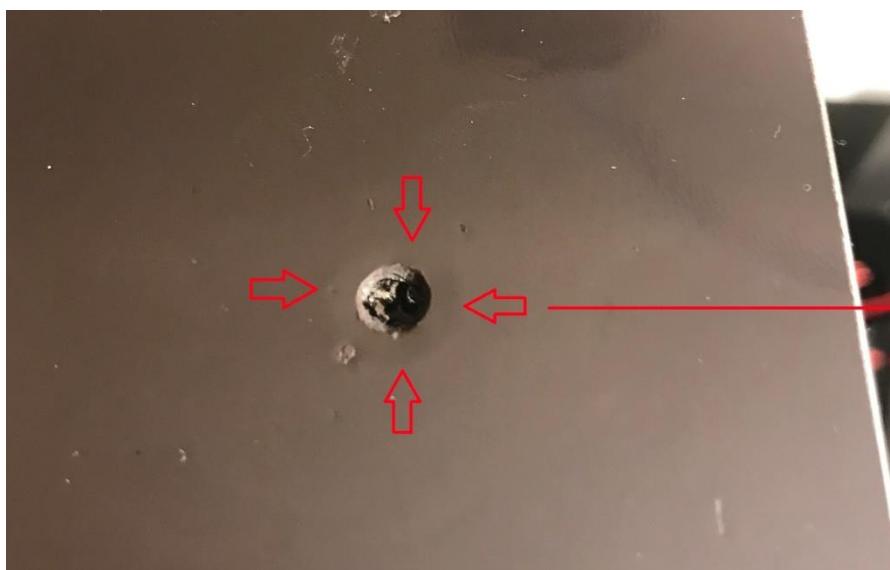
13. Move the Z axis to the bottom of the printer and check for cable length and possible interference and adjust the sensor cable accordingly.

14. Zip tie the remaining loose wires. Be careful to keep the wires out of the way of the print bed. Once the wires are secured, move the print head back and forth to check that the wires do not interfere with the bed or X-Y travel.

15. Install the solid bed mounts. (Recommended but optional)

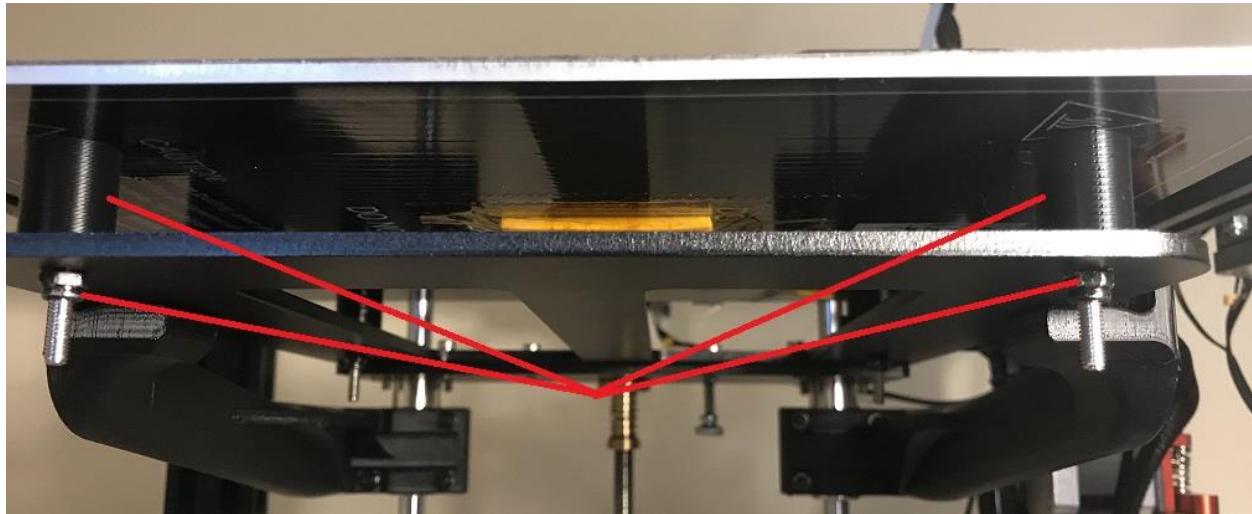
The solid bed mounts will permanently semi-level the bed. Supplemented with the ABL functions, the mounts can give a very repeatable and flat surface for printing. But, in some cases the solid mounts will only amplify any frame abnormalities that came from the factory. If your printer frame or bed are warped more than usual, the stock springs and adjustment wheels may work better.

Locate the adjustment wheels and bed springs and install the solid bed mounts. In order to locate the screw heads that are covered by the magnetic surface, rub the corner with your finger until a faint outline of the hole appears. Use an X-acto knife or similar sharp pointed cutting tool to remove the magnetic material exposing the screw head as show below.

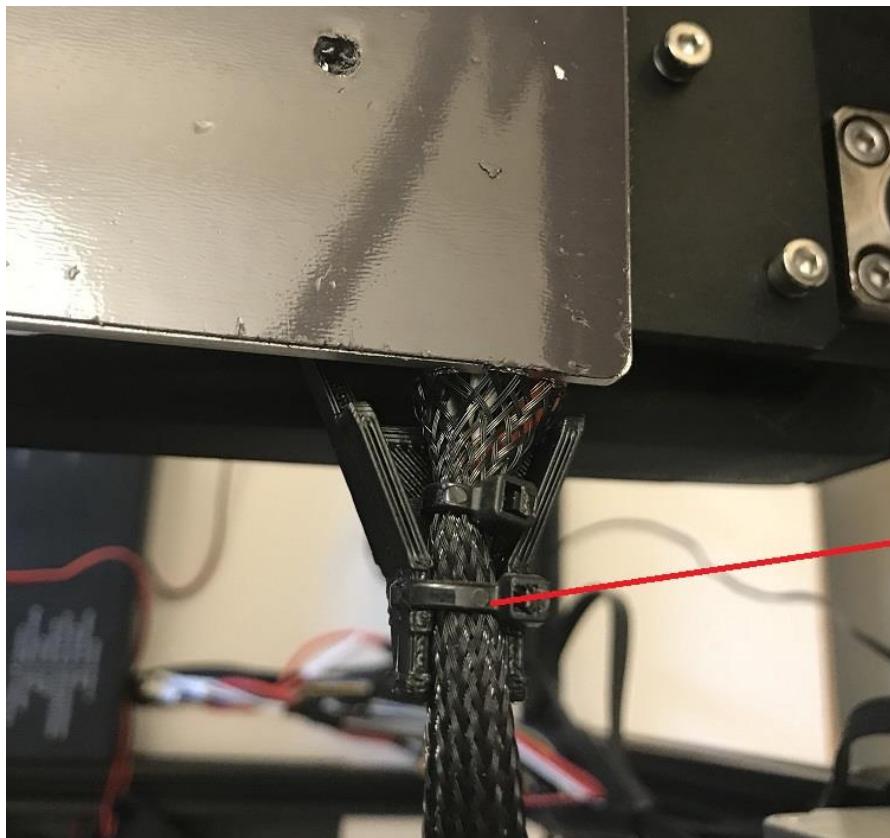


Locate faint  
outline and  
remove  
material  
exposing  
screw head

16. Remove both front adjustment wheels and springs and lift the front of the bed up and install the solid bed mounts with the supplied nylon lock nuts as shown below. Do not tighten all of the way as shown below until all bed mounts are installed.



17. Cut the zip tie on the back mount and remove the large cable organizer/bed mount and spring.

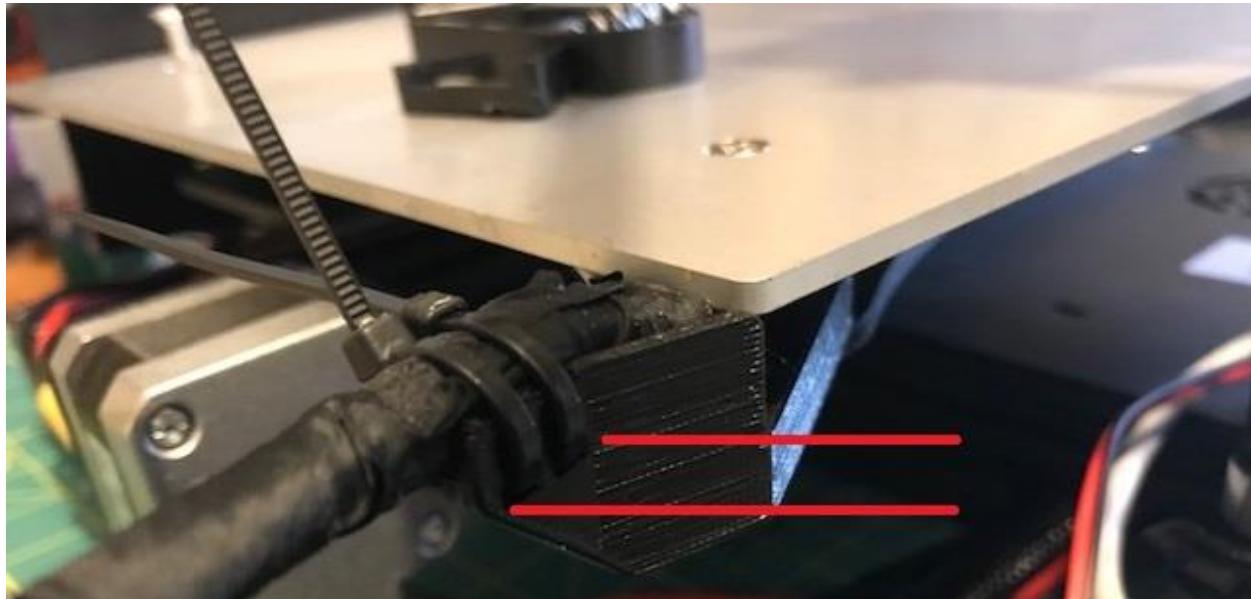


**Cut and remove  
Zip tie**

18. You should have these parts after successfully removing the stock cable organizer and bed mount.



19. Install the supplied cable organizer and bed mount and use the slots on the mount to install new zip ties as shown below. Below is an Ender 3 but the steps are identical.



20. Repeat the installation of the last rear solid bed mount using the same steps that were covered in the steps above for the front two solid bed mounts.

21. Gently tighten all four of the nylon lock screws. You will want to tighten them only to the point where the bed is flat against the solid bed mounts and the mounts do not wiggle.

**\*Attention\*** Do not over tighten the nylon nuts! Although the solid bed mounts are printed with a higher heat resistant ABS filament, over tightening may cause them to deform. Also, over tightening can cause the aluminum bed to slightly deform.

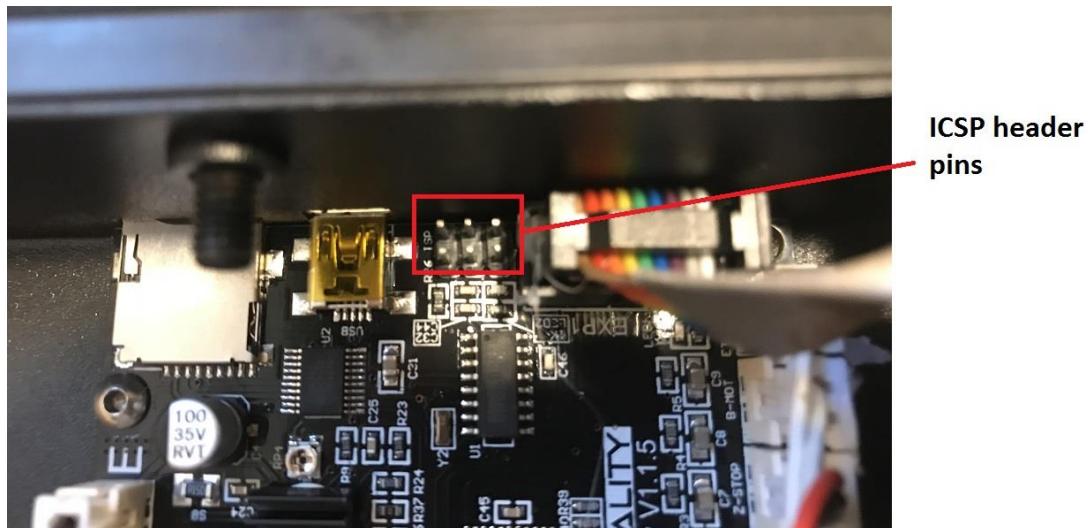
22. Replace the Ender 5 magnetic build surface.

**\*Attention\*** The capacitive sensor will detect any objects that are close while performing the probing process. Please make sure to watch the probing process and place any metal clips as far away from the probing locations to ensure the sensor does not get a false reading. A metal binder clip that is used to clip the build surface to the heat bed could interfere with the bilinear mesh and ruin the ABL probing grid. This will result in severe first layer issues.

## Upload Firmware

These steps are dependent on section **01 –BUILD PREPARATION** steps. Make sure to complete the build preparation steps in the beginning of this document before proceeding.

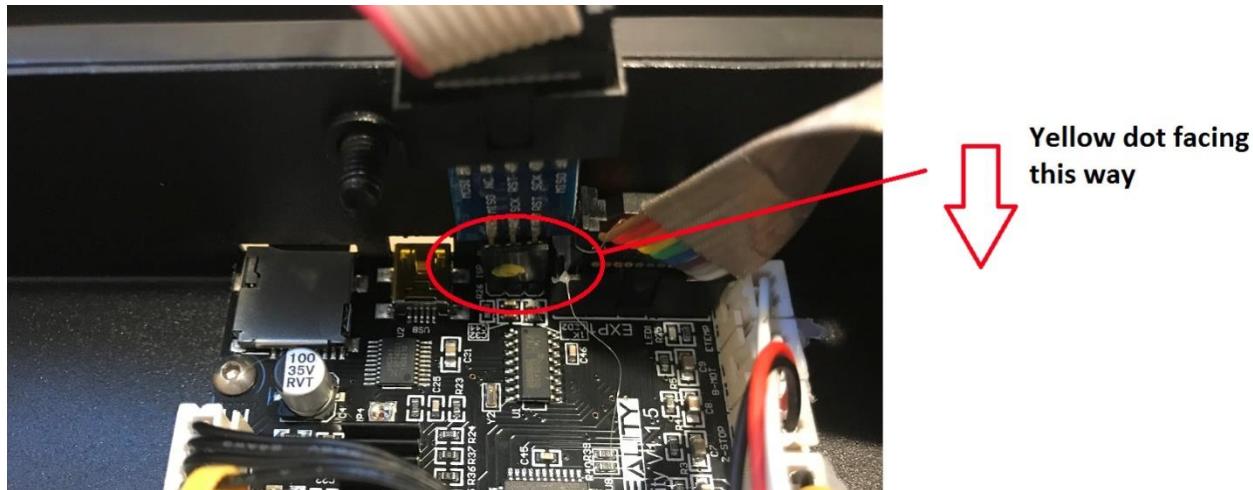
There are 6 pins on the motherboard. These are called ICSP pins (In Circuit Serial Programming). You will need to make sure to insert the adapter exactly over the pins making sure that they are lined up. Damage may result from the pins not being aligned. If needed, the ribbon cable for the display can be removed if you are having issues lining the adapter up to the ICSP port.



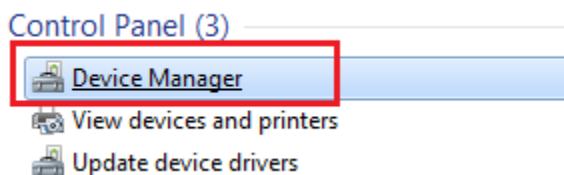
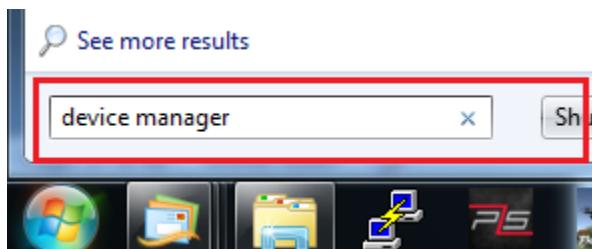
23. Connect the supplied bootloader/firmware tool to your PC's USB port. Connect the other end to your Ender 5 motherboard ICSP port as shown **below**.

You will notice the printer will be powered on from the programmer once you plug it in. This is normal since the USBasp programmer supplies power.

The adapter that will connect to the printer's motherboard needs to be specifically oriented as shown below. **The yellow dot on the adapter must be pointing towards center of motherboard.**



24. Go to the device manager (in windows, start/search and type device manager)

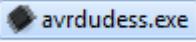


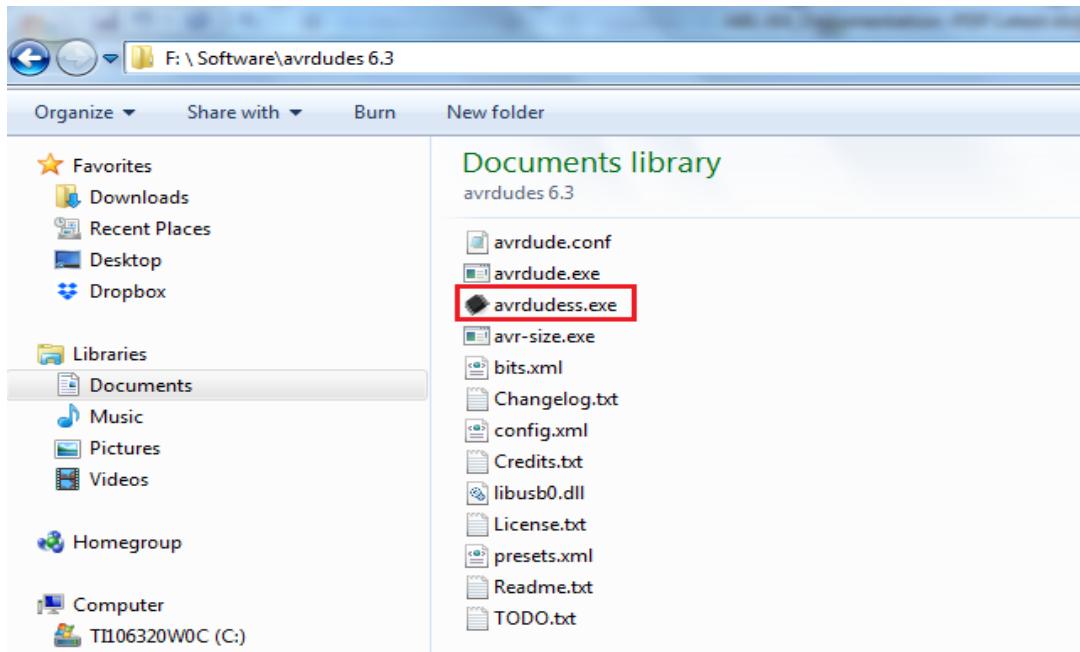
25. Check to make sure that window recognizes the bootloader/firmware upload tool. If the drivers were installed correctly, you should see the same as below.



If you are not seeing this, make sure the bootloader/firmware upload tool is connected to the USB port of your PC. If the bootloader/firmware upload tool is still not recognized. Go back to the **01 –BUILD PREPARATION** section and re-install the driver. If the issue still is not resolved, contact us via email support at [uptanium@gmail.com](mailto:uptanium@gmail.com) and we will promptly help you solve any issues.

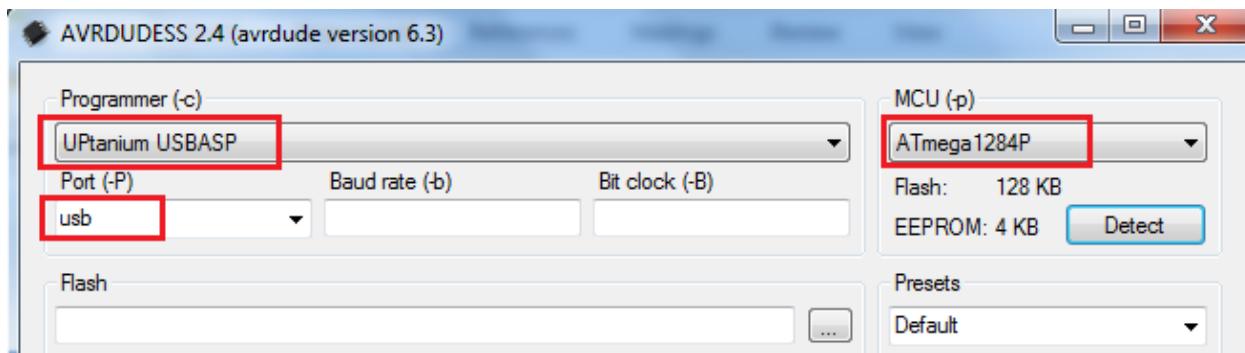
26. Once you have the connection, it is time to upload the Uptanium ABL firmware. Navigate to the supplied USB and locate the **software** folder. **Inside** the **software** folder, double-click on the

**avrdude 6.3** folder and locate the  icon to launch avrdude.exe. Double click it to open avrdude. The correct folder should look like this below.

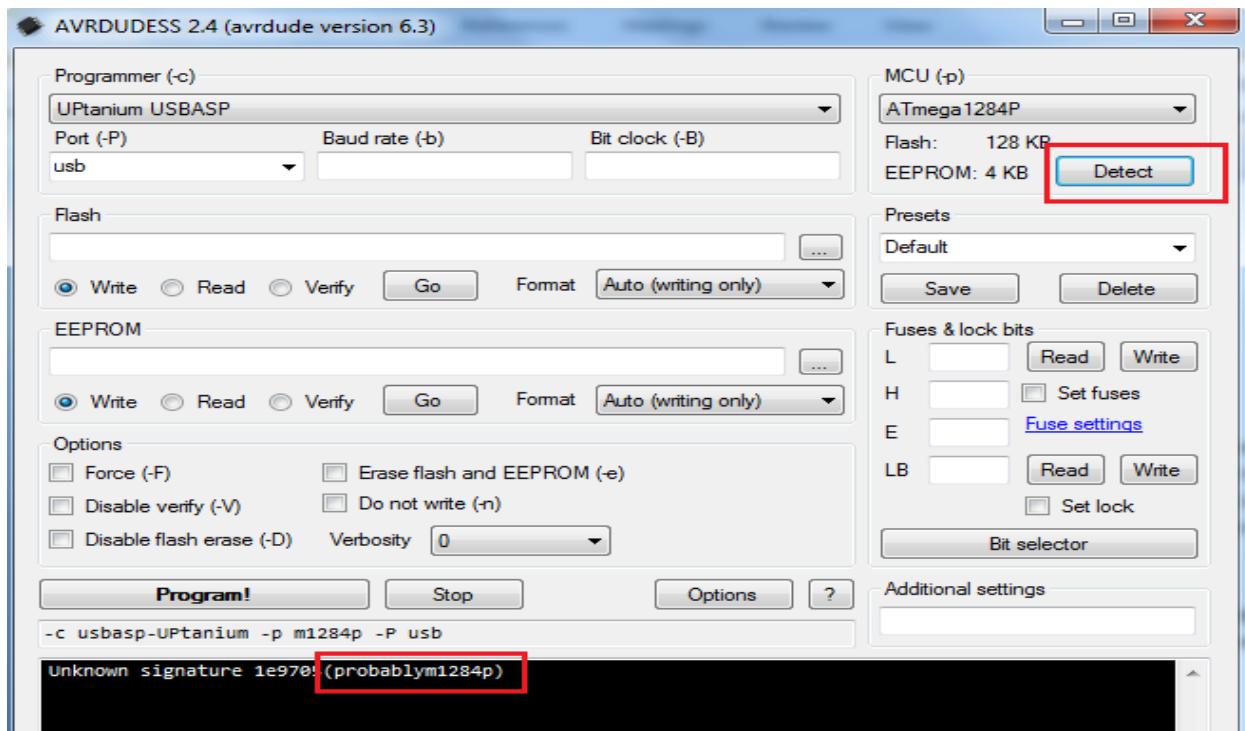


If you are prompted to update click NO.

27. Once avrdudess opens, make the following selections below in red.



28. Test that avrdudess is able to communicate with the Ender 5 motherboard by clicking detect as shown below.

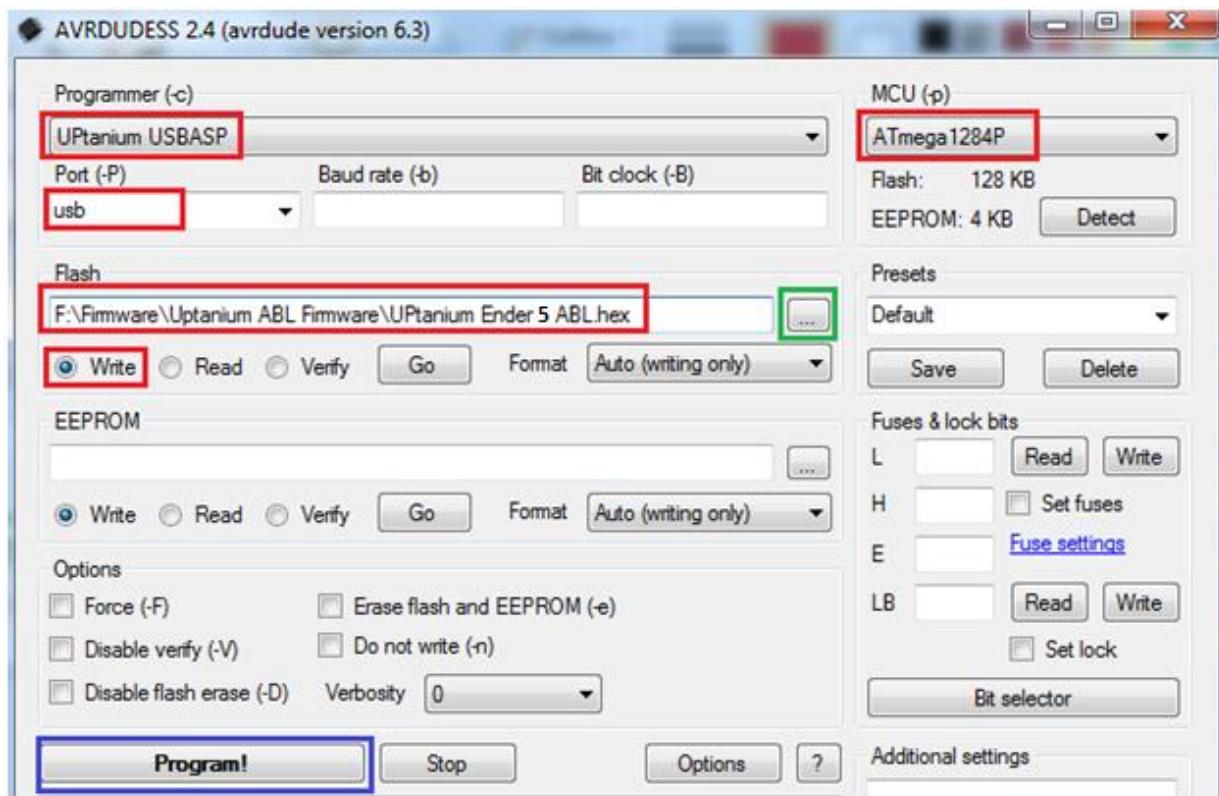


If you are successfully connected, you should see the message above “**Unknown signature 1e9705 (probably m1284p)**”. If you are having issues seeing this message, double-check the driver in device manager then try closing avrdudess/remove programmer from PC and printer/power cycle printer and try again. If the issue persists, contact [uptanium@gmail.com](mailto:uptanium@gmail.com) for assistance. We will be happy to assist

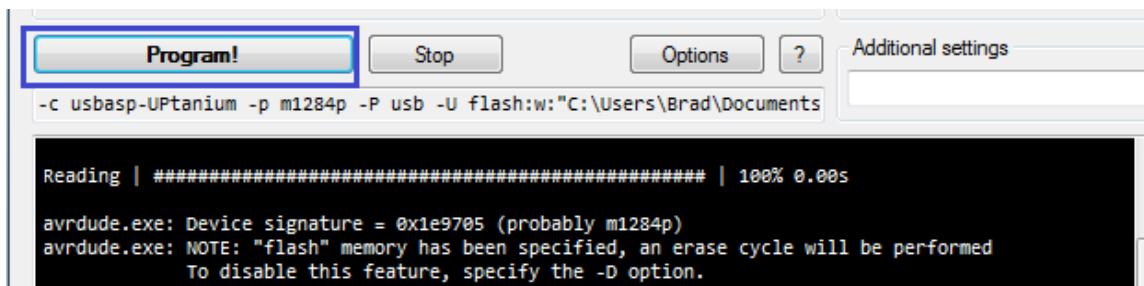
29. Once connectivity is established, we will upload the firmware. Make the following selections in red below (same as above).

Click the browse button shown in **green** below and navigate to the supplied USB drive again. Go to **F:\Firmware\Uptanium ABL Firmware** and select **UPtanium Ender 5 ABL.hex** once you are inside the folder. The path should look like below in the flash text input field next to the green browse button.

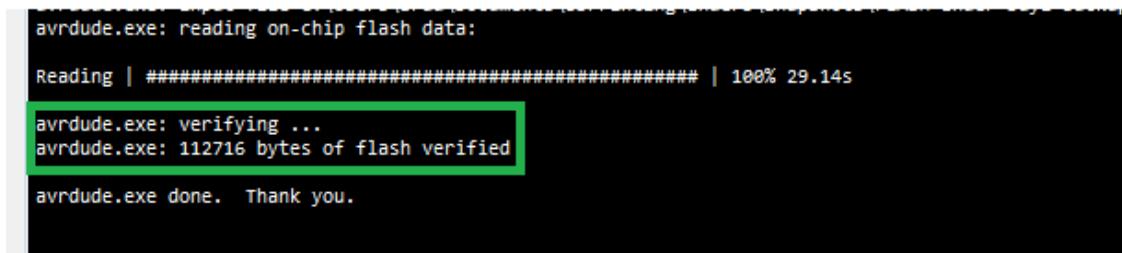
**UPtanium Ender 5 ABL.hex** is your new Auto Bed Leveling firmware that you are selecting to upload.



30. Click the **Program!** button. This will begin uploading the Uptanium ABL firmware to your Ender 5.

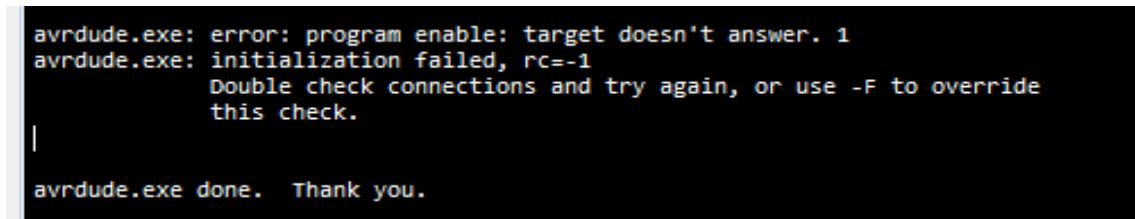


Successful programming will give the message below.



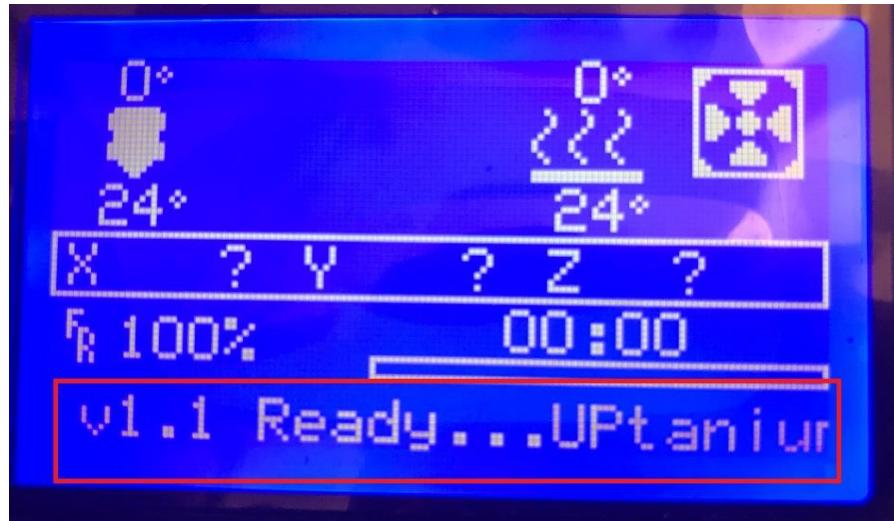
If the firmware upload is successful, you will see the above message.

**\*Attention\*** If you are seeing the error below, double check that the bootloader/firmware tool is connected correctly to the motherboard. You should see a blue light illuminate on the motherboard if the tool is correctly connected to the ICSP pins on the motherboard.



**\*Attention\*** If you are seeing the error below, check to ensure that the correct driver is installed. To fix this error below, repeat the build preparation section in the beginning of this document and verify the **libusbk(v3.0.7.0)** driver is installed correctly.

If the firmware upload was successful, you will also see the printer reboot and the LCD screen should look like below with a scrolling message at the bottom. Congratulations! The firmware is installed! Unplug the programmer from your PC and remove the motherboard connection. Replace the motherboard cover and power off the printer.

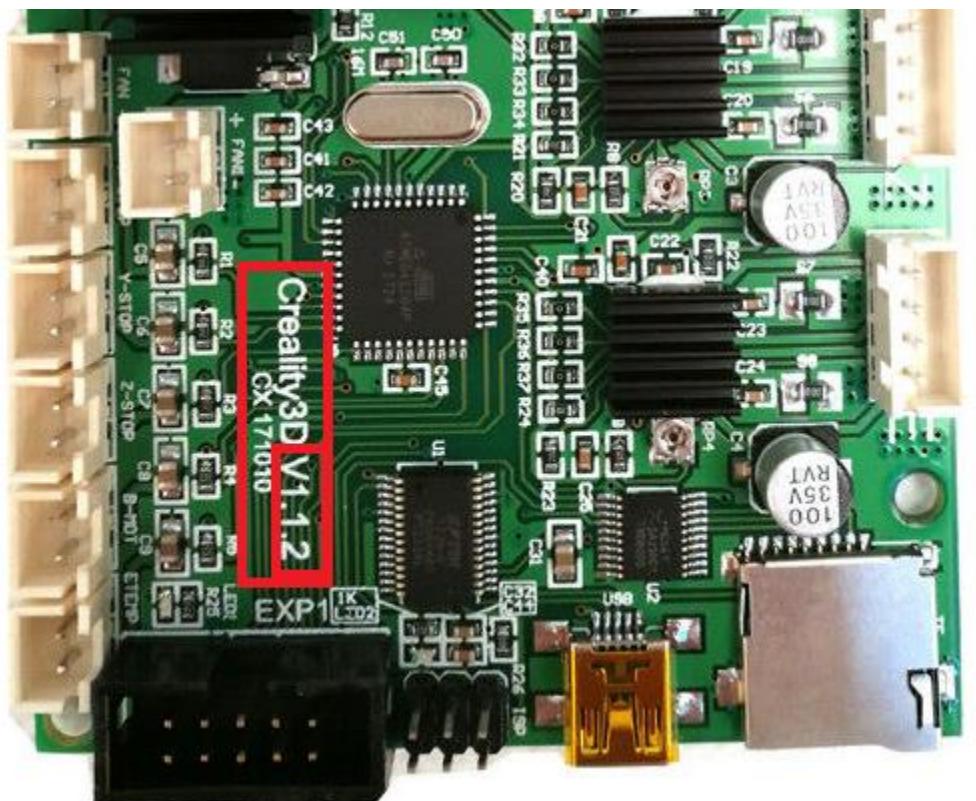


## Tune the Z Offset

For this section, we will be using a tool called Pronterface to make some adjustments and get the printer tuned in. You can use these steps in the future to make Z offset adjustments to fine tune your first layer adhesion and quality. The Z offset is the amount of travel PAST the ABL sensor TRIGGER depth. The sensor must trigger higher than the print nozzle in order to avoid colliding with printed parts during the print process.

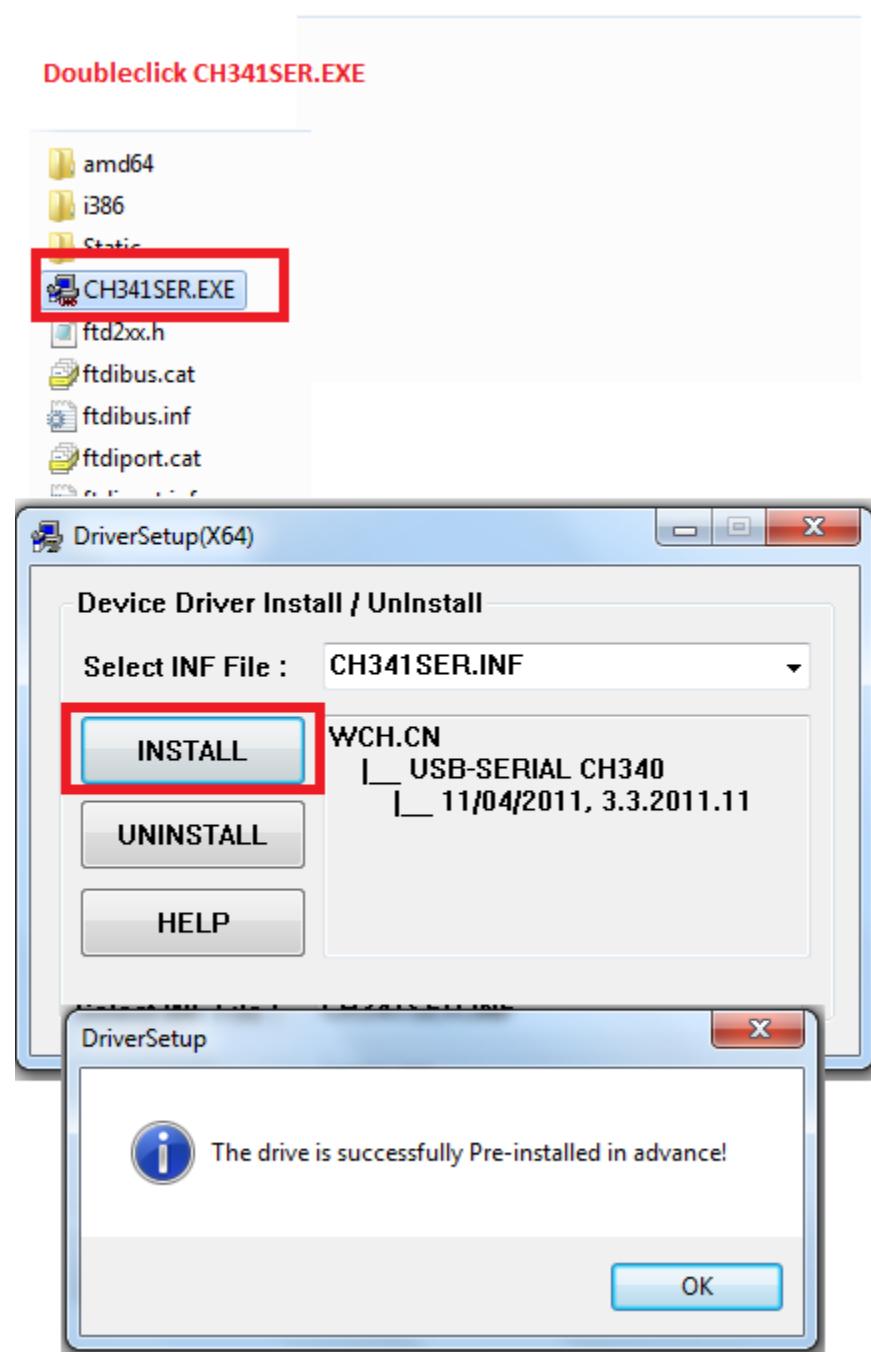
31. Power the 3D printer back on and connect your 3D printer via **Mini USB cable** (usb port next to SD card opening) to your PC. If this is your first time connecting to the Ender 5, you should see Windows automatically install the driver for the motherboard.

**NOTE** – You will need to identify which motherboard you have before proceeding. You will have either a 1.1.4 board or higher which will need a CH340 driver in order for your PC to connect. We have included the driver on the USB drive. See below where to find the motherboard version. Below is just an example of a CR10 but the motherboard version screen print will be in the same place. You will either have 1.3.3 or higher. If you have the **1.1.4 version or above**, follow the next steps. If you have the 1.1.3 skip to step 6.



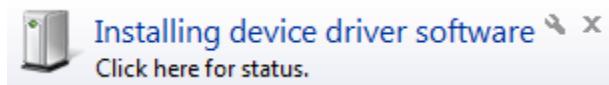
**CH340 Driver install for boards 1.1.4 and above**

Navigate to the supplied USB drive that was included with the kit. Go to **Software/Drivers** and within the drivers, click on the CH341SER.EXE executable as seen below to install the CH340 driver.



**FTDI driver install for board version 1.1.3 and above**

If you have board version **1.1.3**, windows will typically find and install the driver easily. However, if your PC is having problems locating and installing the FTDI driver automatically, we have provided the Creality factory version FTDI driver in the Software/Drivers folder.

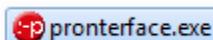


If Windows fails for some reason to install the driver, unplug the USB cable and plug it back in. If it fails a second time, we have included the correct FTDI driver that Creality ships in the supplied USB Uptanium drive. Right click on the device in device manager and update the driver. Select browse my computer for the location and navigate to Software\Drivers. Make sure the drivers folder is selected and attempt to install again.

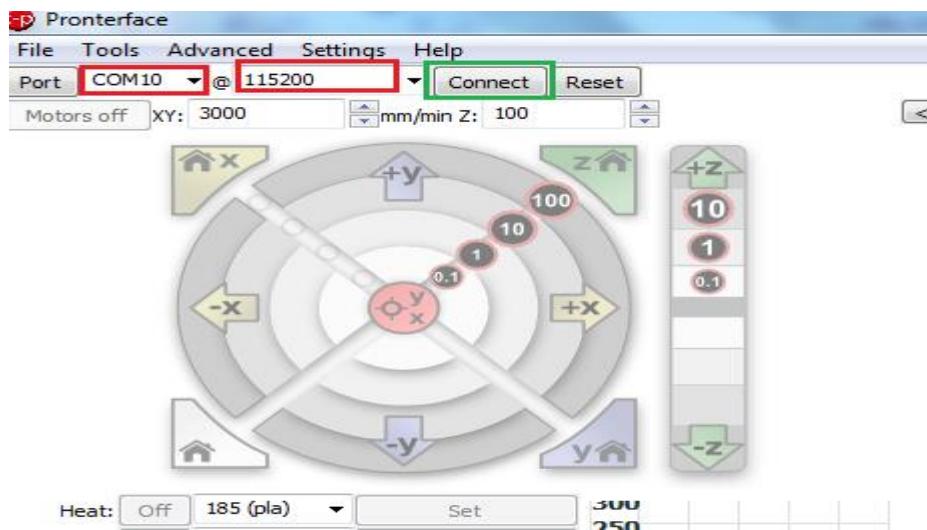
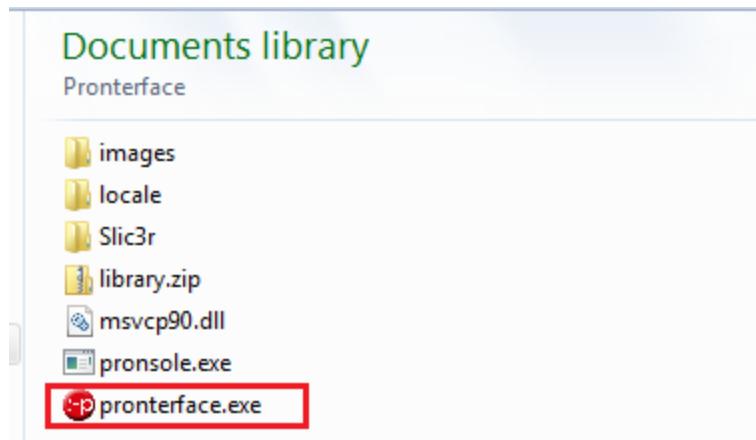
Once the driver is installed, Go to **Device Manager** and expand the plus sign next to **Ports (COM & LPT)** as shown in the image below. Next to the **USB Serial Port**, make note of which **COM** port your 3D printer is connected to. If **USB Serial Port** is not available, make sure you have the USB cable connected to your PC and the printer is powered on.



Once you have identified and noted your COM port, navigate back to the supplied USB drive. Open the **Software** folder then open the **Pronterface** folder. Within the Pronterface folder, double click on the



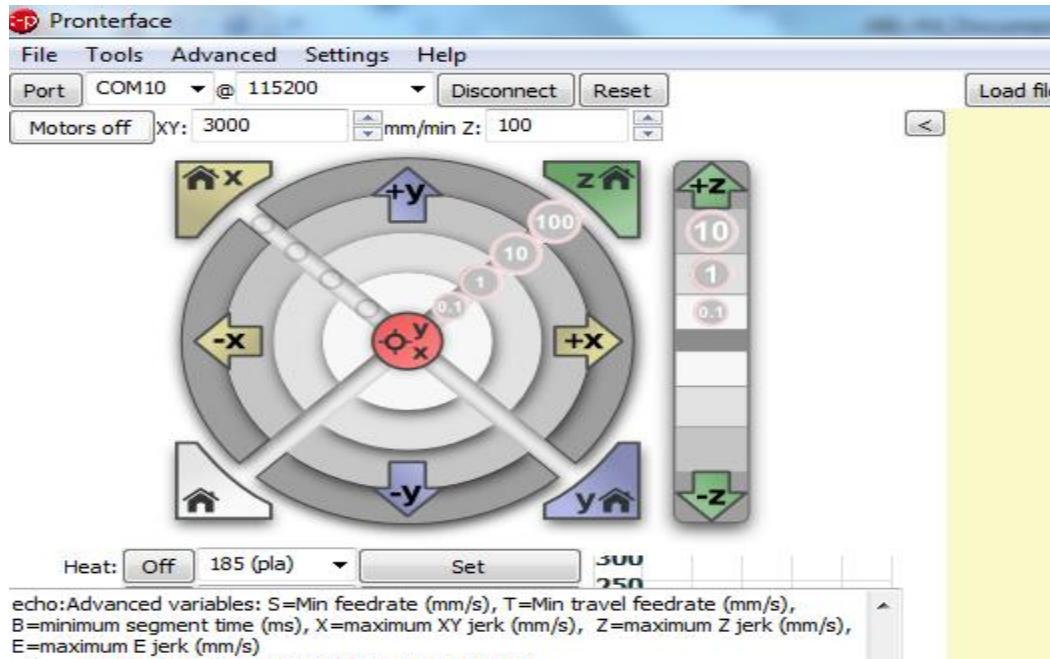
icon as shown below. This will open the Pronterface tool.



Make the following selections in red above but substitute the **COM** port number with your own. Select **115200** as the baud rate.

**\*Attention\*** Notice the controls are grayed out. This is indicating that Pronterface is not connected to the printer yet.

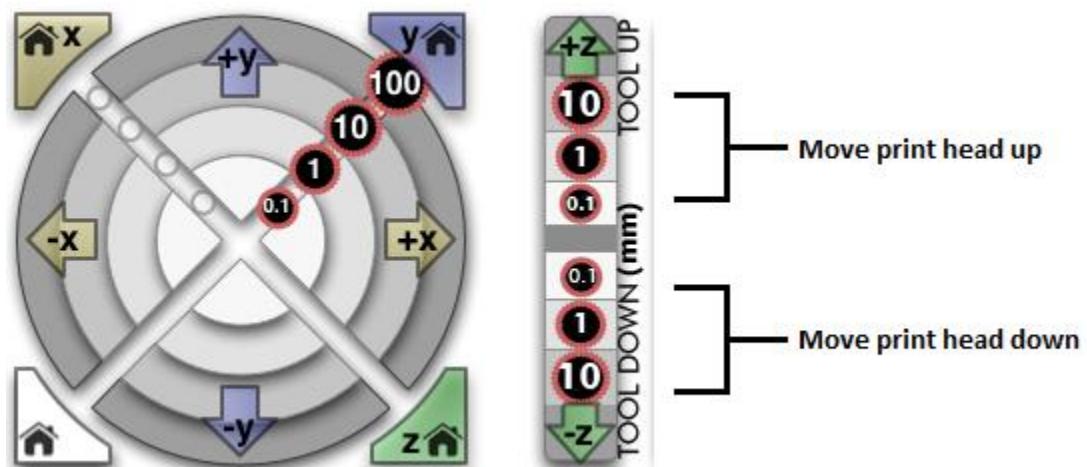
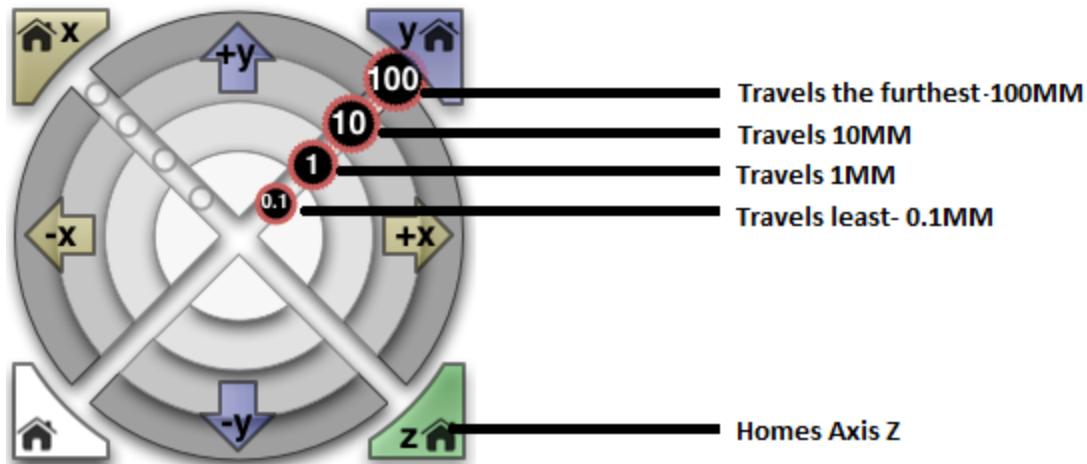
Click the **Connect** button highlighted in green above. Once connected, the navigation will become activated like below.



Now that you are connected to the printer with Pronterface, you can now manually control the printer. The navigation controls will move based on the distance and circle you click. Towards the center is the smallest movement. Moving out toward the edges will increase the distance.

**\*Attention\*** If you select a distance to travel outside of the printers capability, the printer will blindly go wherever it is told to go. BE CAREFUL. Keep your hand close to the power switch until you are comfortable with this interface!

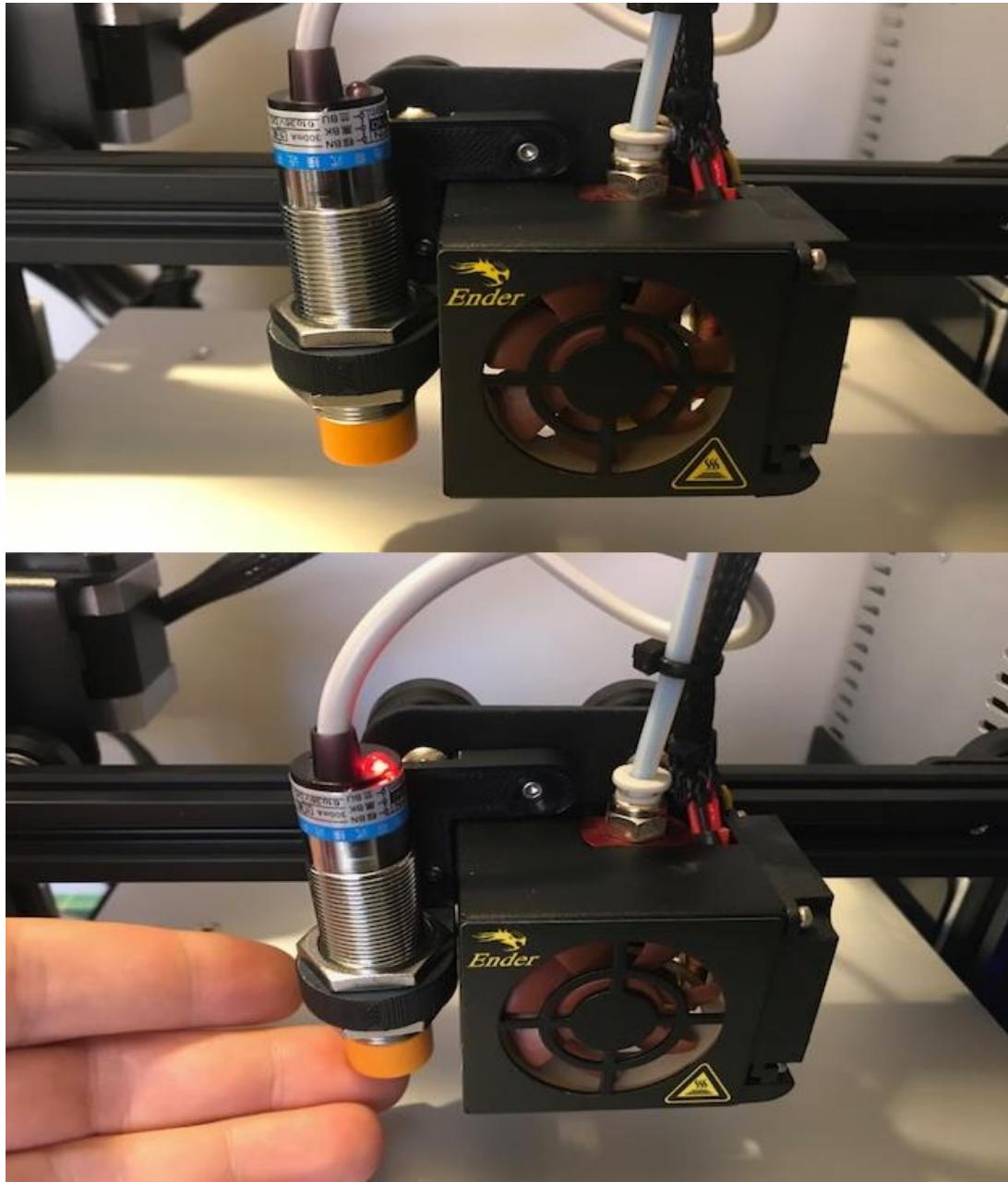
**\*Attention\*** Use **.1mm** increments to make small movements to understand and get familiar with the controls! **\*Attention\***



**\*Attention\*** Use **.1mm** increments to make small movements to understand and get familiar with the controls! **\*Attention\***

32. Using the controls, center the print head to roughly the center of the bed. Once you have the extruder head in the center of the bed, lift the nozzle approximately 5 inches from the work surface using the **Tool Down/Up Z** control.

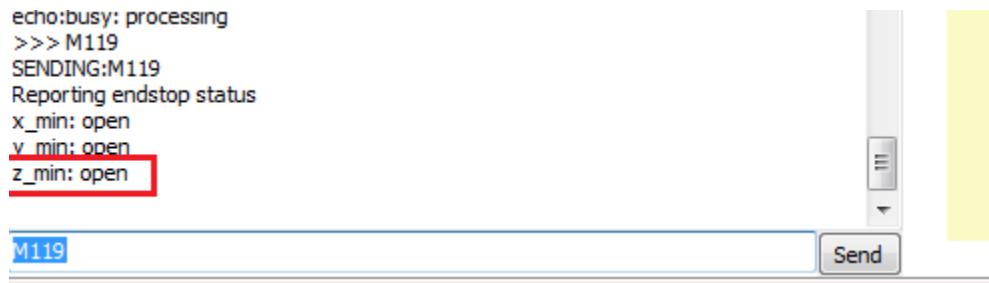
You should notice that the light on the sensor is **OFF**. Test the sensor by placing your hand near or under the sensor. The light should come on indicating that the sensor is activating.



**\*CAUTION\*** If you are not seeing a red light by placing your hand near or underneath the sensor with the nozzle 5 inches away from the bed, please re-visit the **installation** steps above before proceeding. You need to make sure the sensor is installed and activating correctly before proceeding. **THIS WILL RESULT IN A NOZZLE CRASH IF THE SENSOR IS NOT ACTIVATING!** The sensor replaces the Z stop switch and will not know when to stop.

Go back to Pronterface.

33. Enter **M119** in the Pronterface command window (at the bottom) as seen in the image below and press enter to see if the firmware sees an **open** sensor state under **reporting endstop status**.

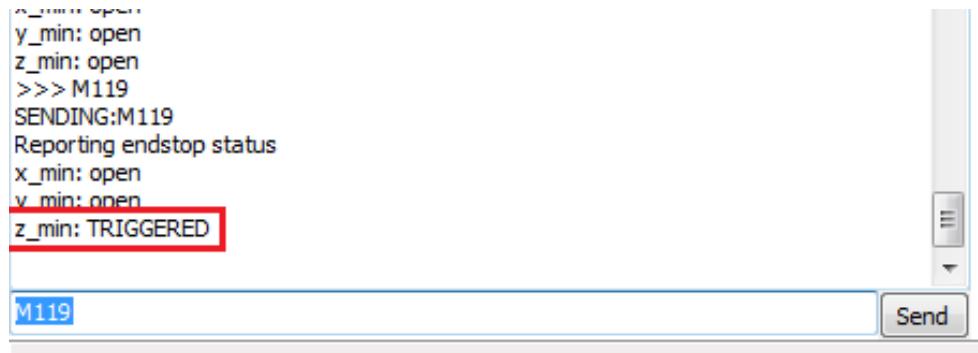


```
echo:busy: processing
>>> M119
SENDING:M119
Reporting endstop status
x_min: open
y_min: open
z_min: open
```

The command window shows the text: echo:busy: processing, >>> M119, SENDING:M119, Reporting endstop status, x\_min: open, y\_min: open, z\_min: open. The z\_min: open line is highlighted with a red box. Below the command window is a text input field containing 'M119' and a 'Send' button.

Now move the head **SLOWLY** towards the bed in increments of **.1MM** on the **-Z Tool Down** interface until the **RED** light illuminates on the sensor indicating the sensor sees the bed. If you notice that the light is not illuminating before the nozzle touches the bed, adjust the small brass screw on top of the sensor **CLOCKWISE** until the light comes on.

Once the light comes on, issue the **M119** command again. You should now see **TRIGGERED** next to **z\_min**. This means the sensor is working! If you are not seeing a red light when trying to trigger the sensor manually with your hand or by moving print head towards the bed, double check the wiring from the Optocoupler case. Check the Connection diagram for wire outputs and installation.

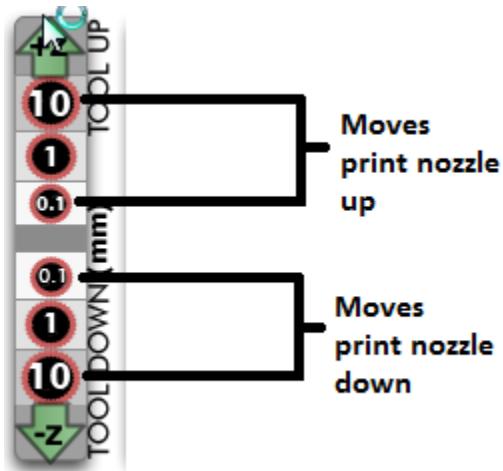


```
echo:busy: processing
y_min: open
z_min: open
>>> M119
SENDING:M119
Reporting endstop status
x_min: open
y_min: open
z_min: TRIGGERED
```

The command window shows the text: echo:busy: processing, y\_min: open, z\_min: open, >>> M119, SENDING:M119, Reporting endstop status, x\_min: open, y\_min: open, z\_min: TRIGGERED. The z\_min: TRIGGERED line is highlighted with a red box. Below the command window is a text input field containing 'M119' and a 'Send' button.

Now let's fine tune the sensor-to-bed distance.

34. Using the Pronterface controls, move the print nozzle down **SLOWLY** using **.1MM** movement distances until the print nozzle is **just touching the bed**. Don't worry, the sensor light will activate during this process. This is expected.

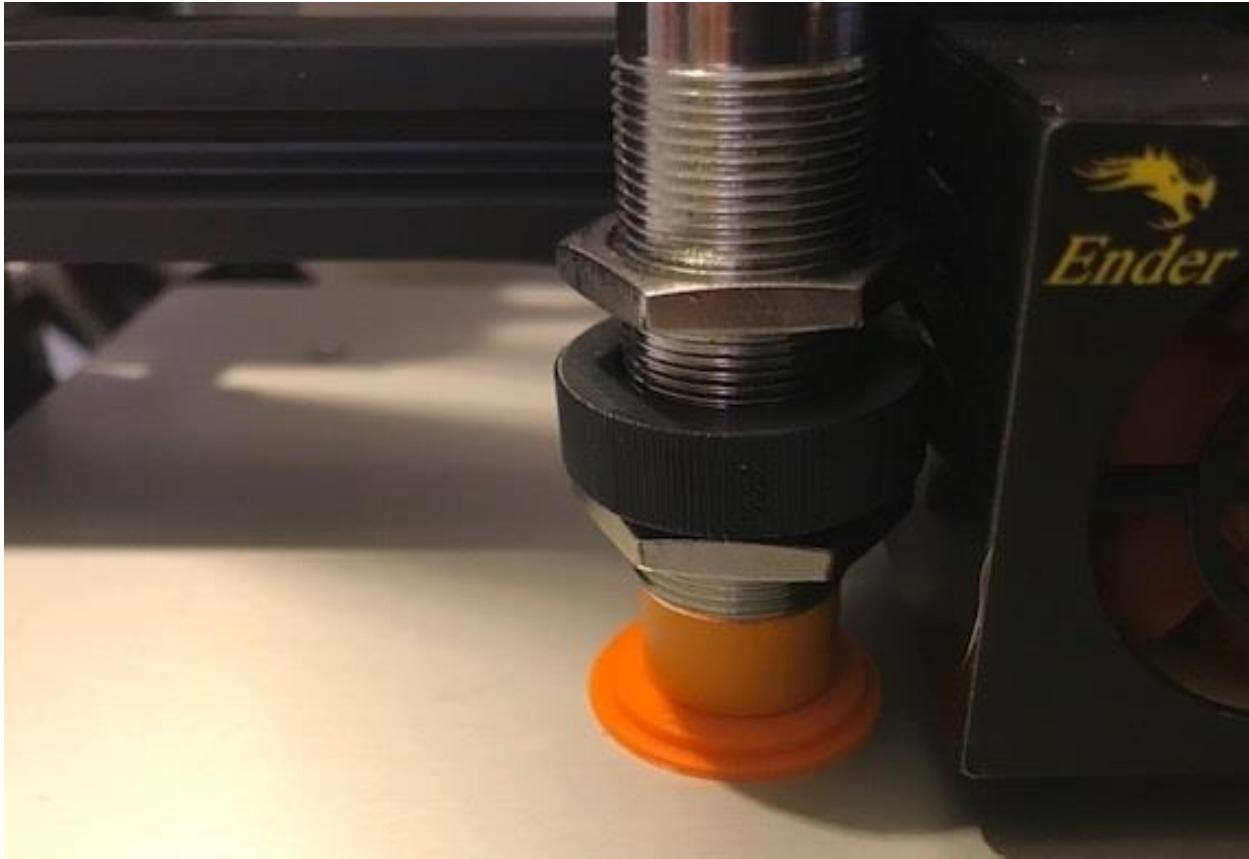


If you have adjusted the nozzle-to-bed distance before, you are looking for a distance from the bed to be about the same as a piece of A4 printer paper. The exact distance is not critical here since we will adjust the  $-Z$  offset in the next step.

The kit provides a sensor-to-bed distance gauge (small printed circle) to ensure correct distance between the sensor and print bed is achieved.

## Sensor Distance Adjustment

35. Place the provided sensor height gauge on the print bed and loosen the large top and bottom sensor mount nuts as shown in the picture below. Adjust the sensor nuts until the sensor is touching the provided sensor gauge. Tighten the sensor nuts until snug.



Once the sensor is installed and the distance from the bed is about 2.5MM, you can now adjust the sensor to trigger at this new height.

**!ATTENTION!** Remove the sensor gauge before proceeding and make sure no tools or parts are lying near the sensor. The sensor is sensitive to anything within proximity.

The sensor has a copper adjustment screw located near the red light that will need to be adjusted. Once the sensor-to-bed clearance is established and the sensor nuts are tight, check the light (Make sure to remove the gauge).



36. You will have one of two scenarios that you will need to adjust for.

#### Light ON

If the red light is **ON**, move the adjustment screw **COUNTERCLOCKWISE** until the red light turns **OFF**. Once the light is **OFF**, move the screw back in **CLOCKWISE** until the light just comes **ON**. Move the screw an **additional 1** turn (360 degrees) after the light illuminated.

#### Light OFF

If the red light is **OFF**, move the adjustment screw **CLOCKWISE** until the red light comes **ON**. Once the red light comes **ON**, move the screw an **additional 1** turn (360 degrees) **CLOCKWISE** after the light comes back **ON**.

The sensor screw adjustment is complete.

## Adjusting the -Z offset

37. Preheat the bed and extruder using the LCD display before settings the Negative Z-offset.

Select Prepare>Preheat PLA> Preheat PLA **End**

Select Prepare>Preheat PLA> Preheat PLA **BED**

**\*ATTENTION\*** This step is necessary in order to get a precise -Z Offset readout. Without preheating, the measurements will NOT be accurate. The Ender 5 has an aluminum bed that will expand when heating.

Once you have preheated, issue the following commands in the Pronterface command field like you did above with the M119 command.

Issue the following commands.

- Issue the **M502** command. This will load default settings to clean everything up.
- Issue the **M851 Z0** command. This sets the Z offset to Zero. We will set this later.
- Issue the **M500** command. This saves the new information to memory.
- Issue the **G28** command. This will Home the machine. Once this command is entered, the printer will home and then begin lowering the print head until the sensor is TRIGGERED. Once the machine finds the distance at which the sensor is triggered, the printer head stops and the sensor light is on.

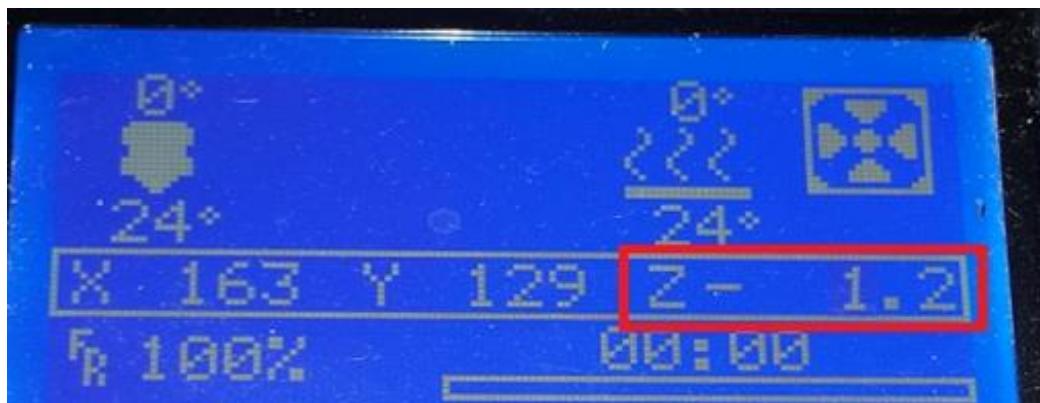
This will set the Z travel back to where we set it at the **Z zero** position. You will notice on the LCD that you will see **Z 0** indicated as the Z position. That is because we told it Z zero position is now where the sensor is triggered.

38. Find the new (negative) -Z offset. (Once printer is up to operating temperature)

The -Z offset will be the exact distance the nozzle has to travel **after** the sensor detects the bed. This is important because the sensor needs to be higher than the nozzle to avoid hitting your printed parts.

39. Place a standard piece of A4 printer paper on the printer bed. Using the TOOL DOWN option in Pronterface, lower the nozzle **SLOWLY** using **.1MM** increments until the print nozzle is slightly touching the paper. Use the **.1MM** steps to fine tune the print nozzle-to-bed clearance that is optimal for printing. You are looking for a distance that gives resistance when trying to move the paper but still allows movement.

Once you are satisfied with the proper nozzle-to-bed clearance, record the new -Z offset from the LCD.



Note: Every time you move the print nozzle with the TOOL DOWN option, you can observe the Z-number on the display **INCREMENTING**.

You will be entering a **NEGATIVE** number below. This number is negative since Auto Bed Leveling uses a new **Z 0** (Z Zero) value that is now where the **nozzle is relative to the sensor**. In this scenario, the exact -Z offset came out to be -1.20.

40. Save the -Z Offset.

- Issue the **M851 Z-X.XX** command. (substitute **X.XX** with your unique -Z offset found on your LCD) In this example ours turned out to be M851 Z-1.20 since our LCD display showed Z-1.20 after we fine tune the nozzle distance.

**\*ATTENTION\*** Do not use this exact number from above! The -Z offset will be slightly different for every printer. You must record the -Z offset specific to your 3D printer.

- Issue the **M500** command. This will save the new -Z offset to the printer's memory. This setting will keep the new -Z offset in the printer's memory through reboots.
- Issue the **G29**. This command will activate the bed leveling sequence for the first time. BEHOLD! Your 3D printer will now begin learning where the bed is and begin to record any variations in bed height.

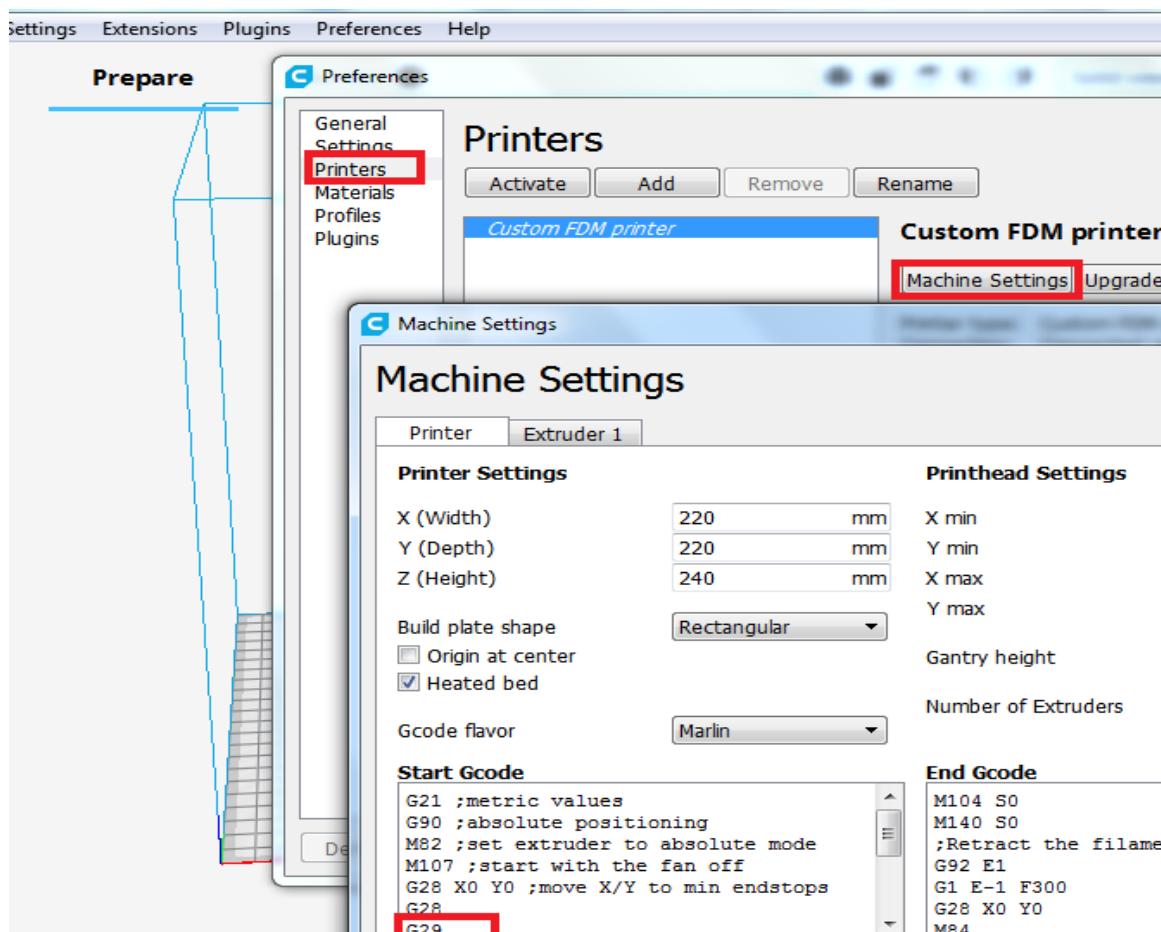
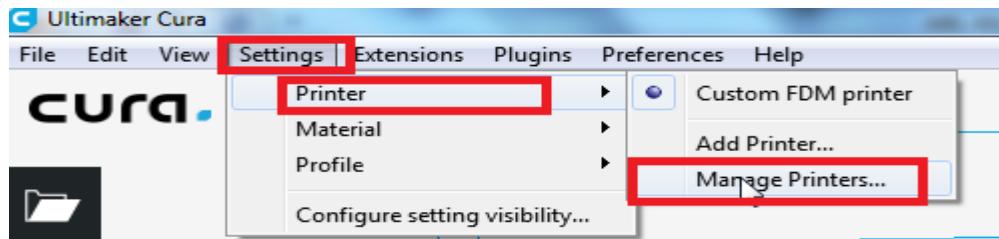
**\*ATTENTION\*** Auto Bed Leveling will **not** automatically find your perfect nozzle-to-bed distance. The purpose of ABL is to take the manual leveling steps out of the 3D printing process. You will have to tell Marlin the perfect nozzle-to-bed distance in order for great repeatability.

Once you have found the perfect -Z offset, ABL will accurately level your bed at the beginning of every print.

41. Next, you will have to add the Auto Bed Leveling command to your starting Gcode to activate ABL.

**\*ATTENTION\*** You will need to update your start gcode to include **G29 After the G28** command in your start gcode to activate auto bed leveling. **You need to add G29 after G28 in your favorite slicers start Gcode or ABL will not be activated.** Example on the newer Cura would look like this below.  
**Settings>Printer>Manage Printers...Then Printers Tab Machine Settings**

And under **Printer** tab you will find the **Start Gcode** window which you can edit and add **G29**. You don't need to click save, Cura will save the addition of **G29** once you enter it. Select close.



You can now start printing! Upload an STL and and test the  $-Z$  offset and adjust as needed.

**\*ATTENTION\*** You will need to adjust your  $-Z$  offset a few times to get it tuned in.

If your  $-Z$  offset needs tuning, stop the print and issue the **G28** command to home the machine. Once the machine is homed, Issue the desired  $-Z$  offset using **M851 Z-X.XX** command in Pronterface. Once you have entered the desired  $-Z$  offset, issue the **M500** command to save the new settings. Reboot the printer and run another test print.

Happy Printing!

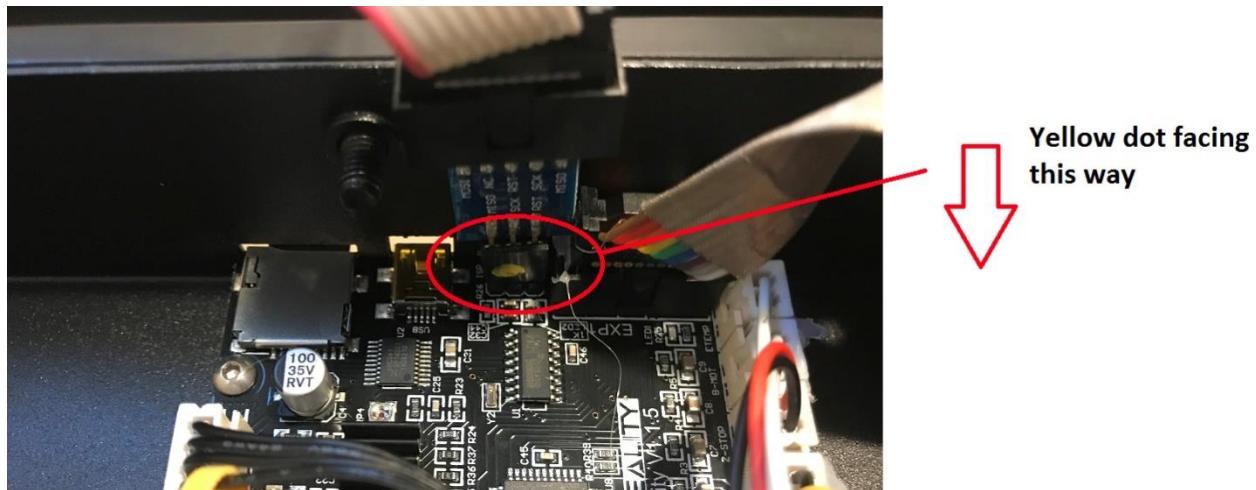
Amazon Feedback Appreciated! 

Please leave feedback . This helps us greatly in continuing to deliver more quality products. If you have any issues, please contact us before leaving negative feedback. Our goal is to help with any issues you have. Email us at [Uptanium@gmail.com](mailto:Uptanium@gmail.com). We will reply promptly to resolve any issues and use fast shipping if any parts need replacement.

### 03 –RESTORE FACTORY FIRMWARE

1. Connect the supplied bootloader/firmware upload tool as shown in the installation steps.

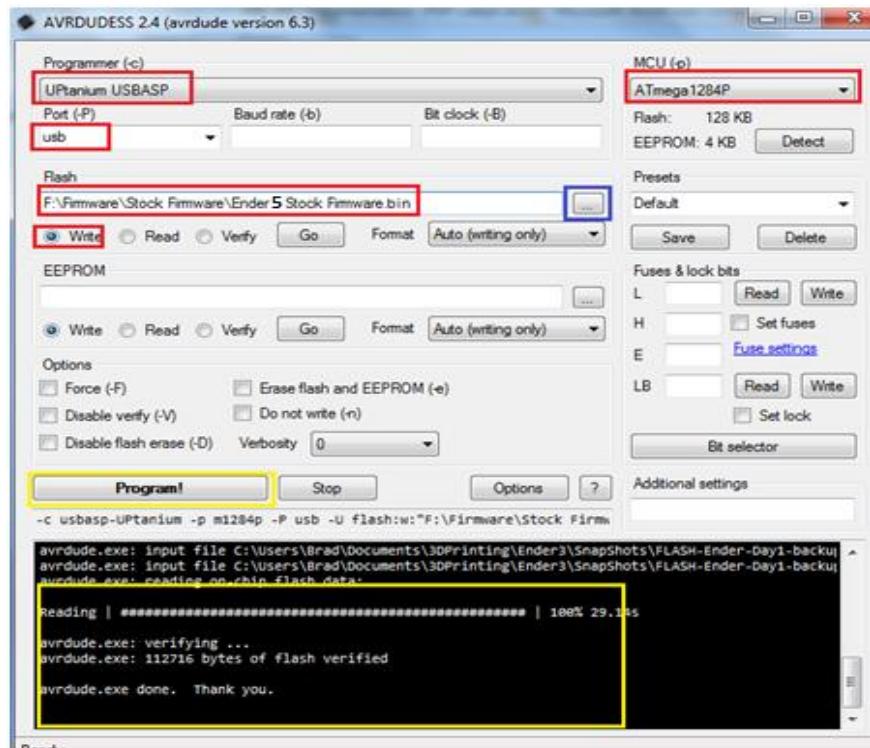
Make sure the yellow dot is facing towards the back of the printer.



2. Navigate to the supplied USB drive.

3. In the supplied USB drive, navigate to Software/ AVRDUDESS and launch **avrdudeSS.exe**.

4. Once avrdudeSS.exe has opened, select the parameters shown below in red.



5. Once the selections in red have been made, click the browse button highlighted in blue. Navigate to the supplied USB drive and locate the file below. This is the stock Creality Ender 5 firmware.

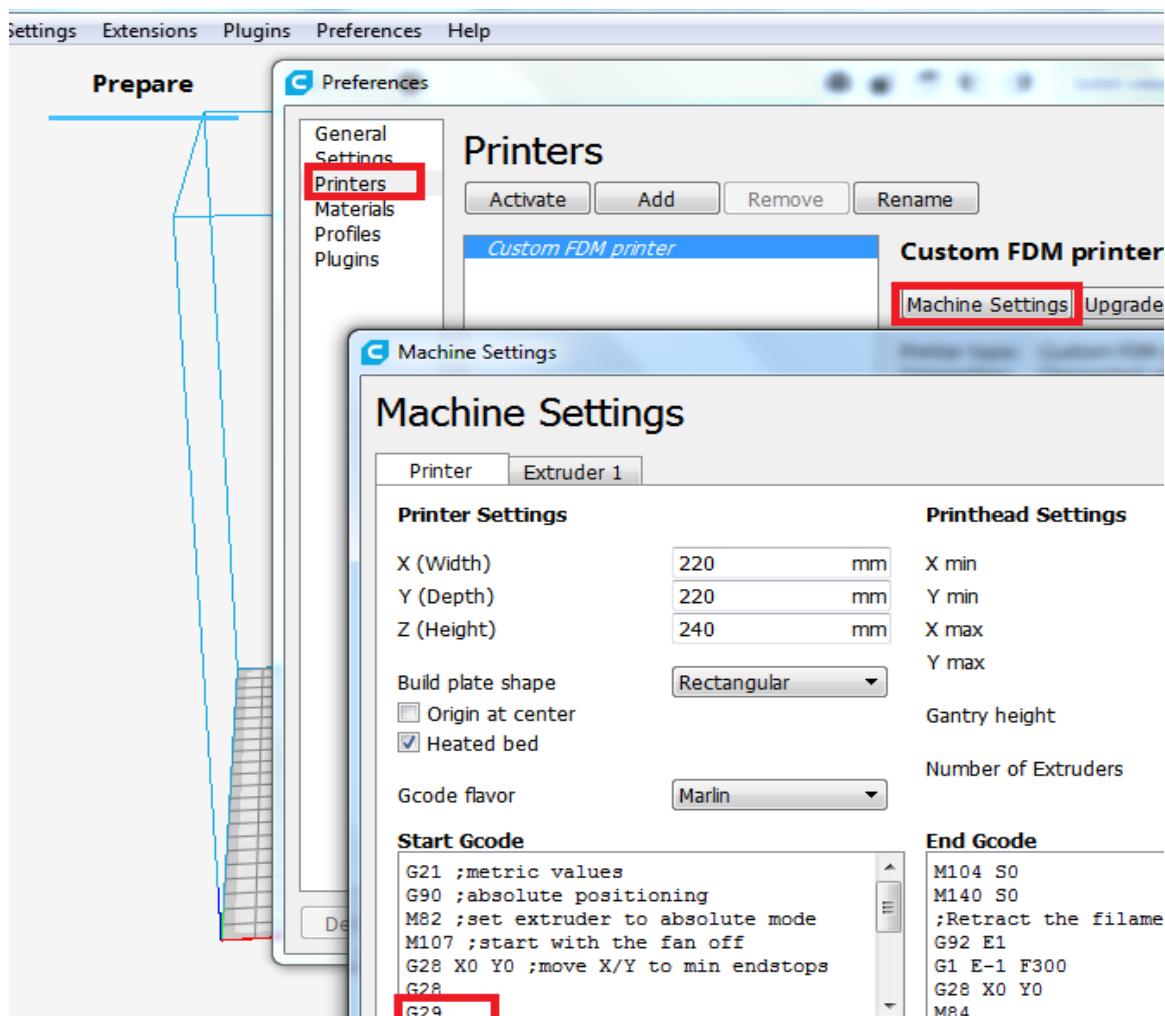
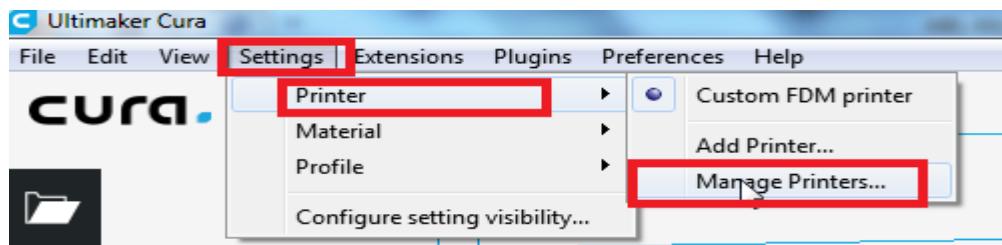
F:\Firmware\Stock Firmware\Ender 5 Stock Firmware.bin

Once the **Ender 5 Stock Firmware.bin** file is loaded, click **Program!** This will install the stock firmware back onto your printer.

6. You will now have the original firmware installed.

**\*CAUTION\*** You will need to update your start gcode to **REMOVE G29 After the G28** to **de-activate** auto bed leveling sequence! Make sure that your favorite slicer has the **G29 After the G28** start gcode removed as well. See Below for a Cura example.

7. Remove **G29** as seen below.



## 04 – INCLUDED HARDWARE

QUANTITY	PART DESCRIPTION
1	Proximity Sensor LJC18A3-B-Z/BX NPN NO Capacitive 1-10MM
1	3D Printed Sensor mount
1	3D Printed Optocoupler Case
1	Optocoupler 24V 1 Channel 80 HZ
1	USB drive containing Software/Installation Instructions
4	M4 nylon locking nuts
4	Solid bed mounts
1	Bootloader/firmware installation tool
1	10 pin ribbon cable
1	6-10 pin adapter
1	Ground Wire

## 05 – REQUIRED TOOLS

QUANTITY	TOOL DESCRIPTION
1	Phillips head screw driver
1	Small Flat Head Screw Driver
1	2.5mm hex wrench