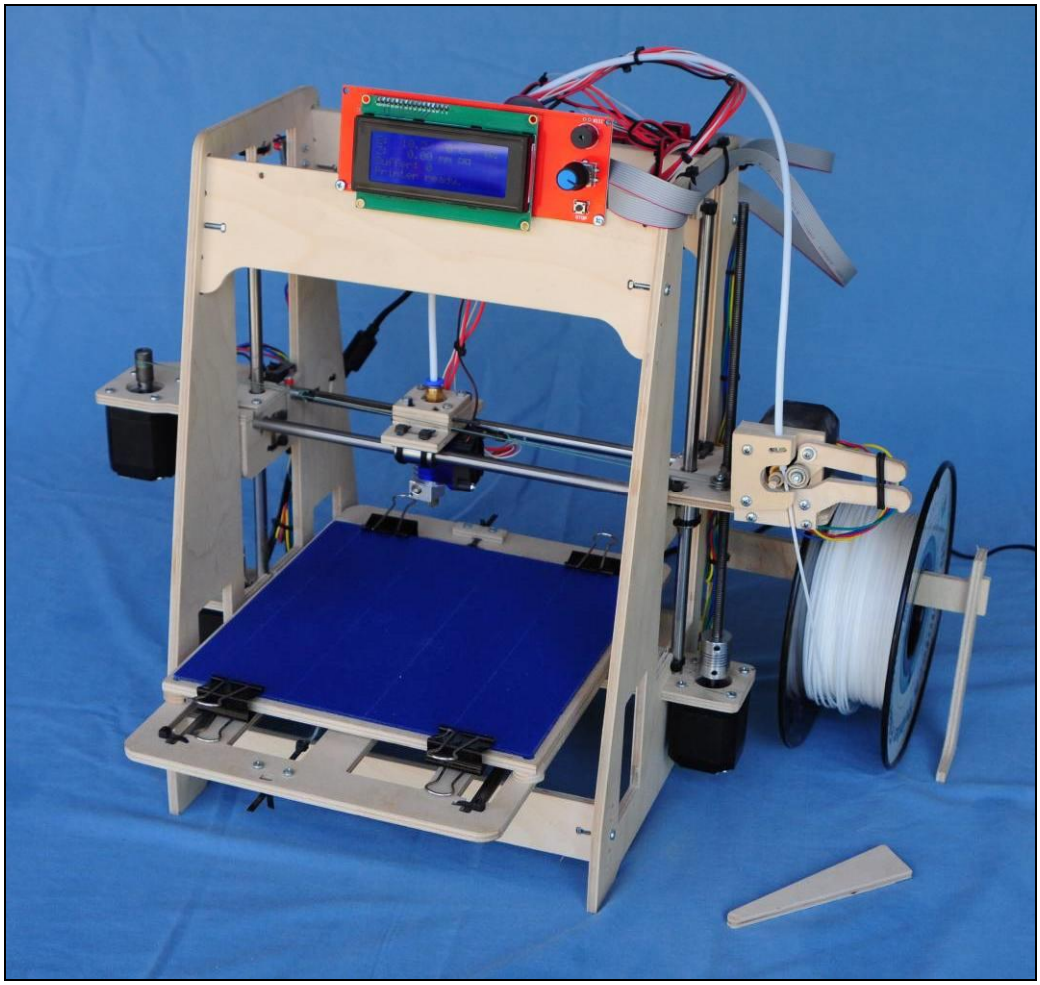
RP9V3 Assembly Instructions



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Specifications

5 ply Baltic birch frame
Oil hardened drill rod linear rails
Filament drive with high grip v-groove threaded coupler drives
Remote extruder with 1.75 mm drive

Foot print
Width 520 mm (20.5") - including spool holder
Depth 550 mm (21.7" - with max travel
Height 660 mm (26") - room for filament guide tube

Print Area
X 200 mm (7.9")
Y 200 mm (7.9")
Z 200 mm (7.9")
The complete printer part list can be found in the appendix.

Getting Started

Safety first

Safety is your responsibility. Always use the proper protective equipment and "safety sense" when building or operating a 3D printer.

Printers have high voltage power supply, and extruder operating temperatures can be over 250 degrees Celsius (482 F). The operator should understand the hazards before operating a printer.

Required tools

Please browse through the instructions and get familiar with the steps before you begin.

To put the kit together you will need:

- a Phillips screwdriver for the screws
- a pair of pliers to hold the nuts
- a sharp knife or a pair of side cutters to trim the zip ties and string
- sand paper to clean up the plywood parts and remove sharp edges.

Tools you may need for the electronic setup include:

- 25 to 40 watt soldering iron/solder
- Diagonal Cutters (dikes)
- multimeter to correctly set up the power supply and stepper motors and general trouble shooting.

For the printing you will want to have:

- computer with a USB to program and run the printer
- calipers to measure motion distance and extrusion width
- calibration block STP file that can be modeled or downloaded at BobsCNC.com

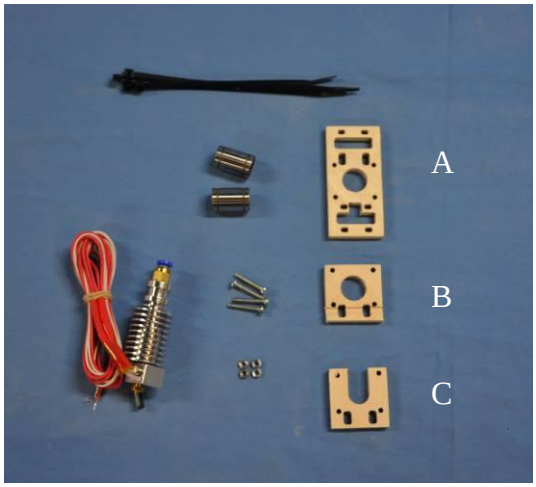
Building the Printer

We recommend a large working surface for assembling the printer. The plywood may require some minor sanding and can be painted, stained or finished for a different look. A coat of sealer or lacquer on all surfaces of the plywood will add stability.

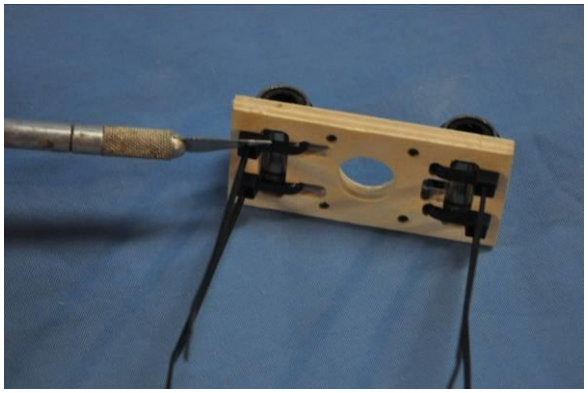
Extruder Assembly

Parts for the extruder mount assembly include:

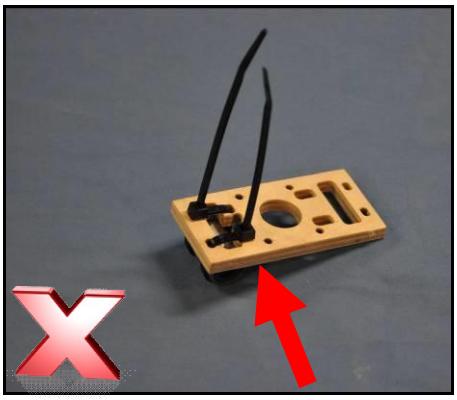
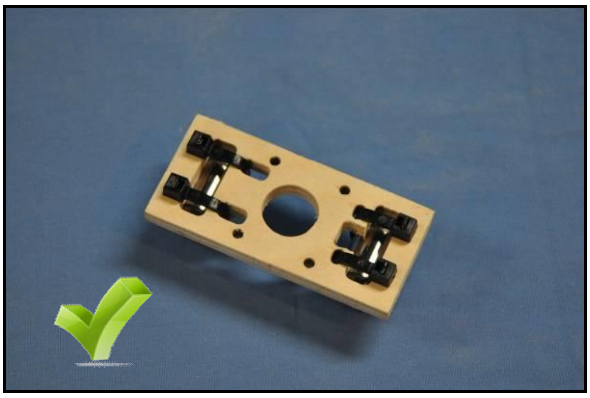
A. 1 Extruder mount
B. 1 Extruder top mount
C. 1 Extruder lock
D. 4 M3 x 20 machine screws
E. 4 M3 nuts
F. 2 LM8UU bearings
G. 4 Large nylon ties
H. 1 Extruder



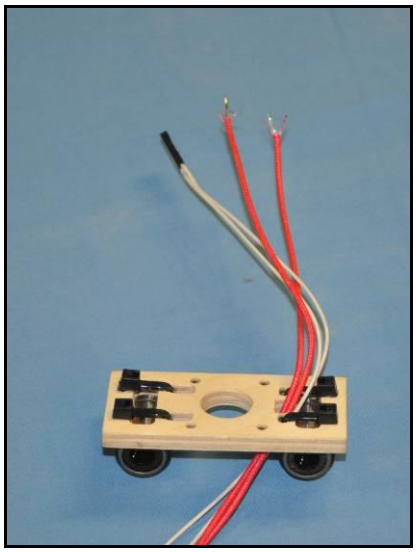
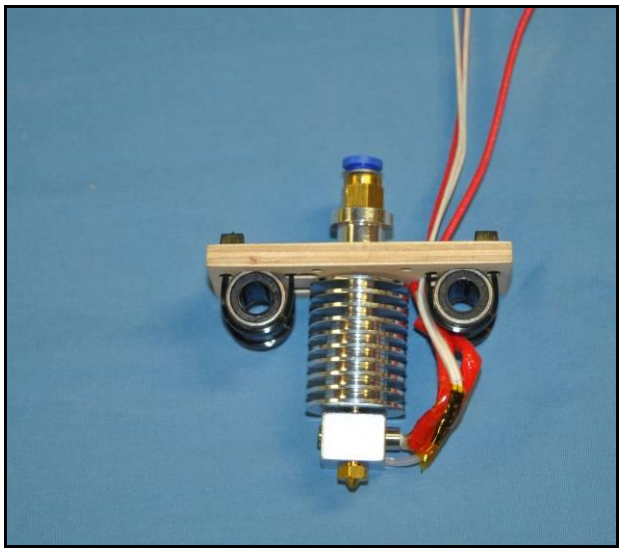
1. Place the bearings into the rectangular slots of the extruder mount.
2. Wrap the 2 bearings by inserting large nylon ties through the side opposite of the bearing into the slotted holes of the extruder mount. The slots on one side are larger to make room for nylon ties during a later step.



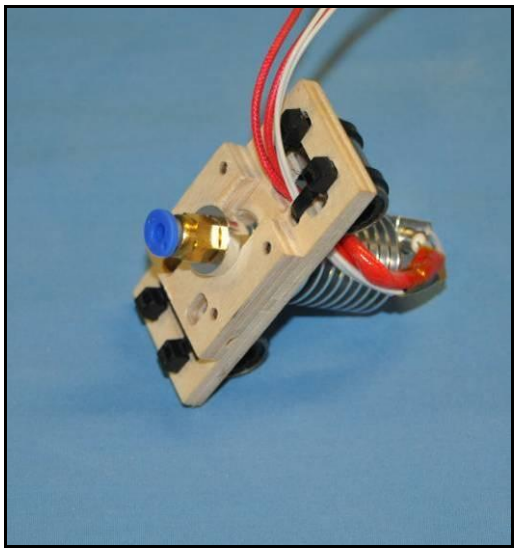
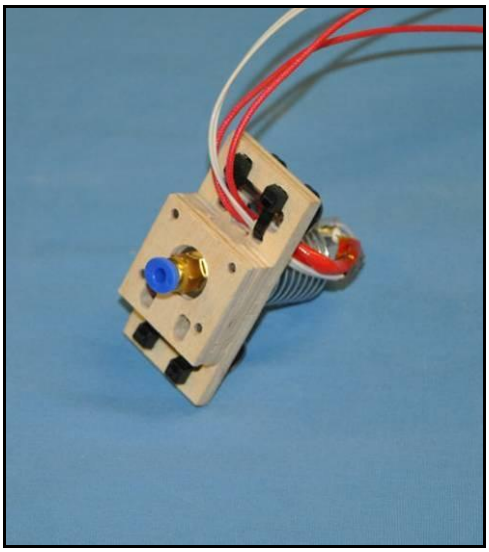
3 Pull the bearing snug against the extruder mount (use pliers if needed).
4. Cut off the excess of the nylon tie.

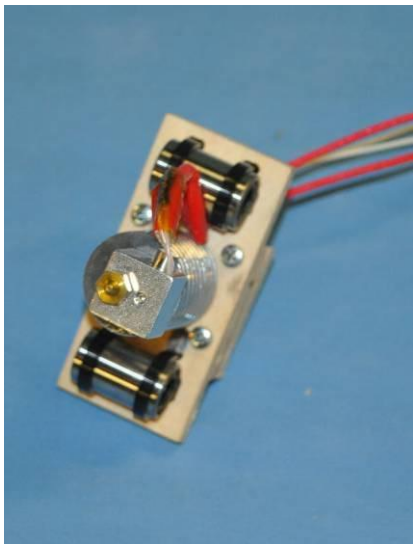
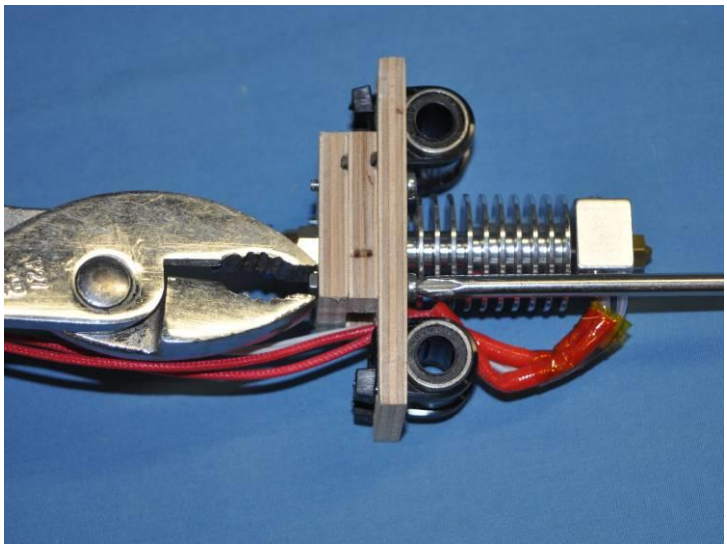
For a clean look and string clearance, insert the nylon straps first in the inboard holes.

5. Insert the 4 extruder wires through the extruder mount from the same side as the bearings through the wire slot as shown.
6. Place the extruder through the extruder plywood mount.
7. Pull the wires through and re-coil them to keep them out of the way and undamaged.

8. Install the extruder lock as shown. The extruder lock should have a tight fit when sliding onto the aluminum. It may need to be sanded thinner for easer assembly fit.
9. Install the extruder top mount.

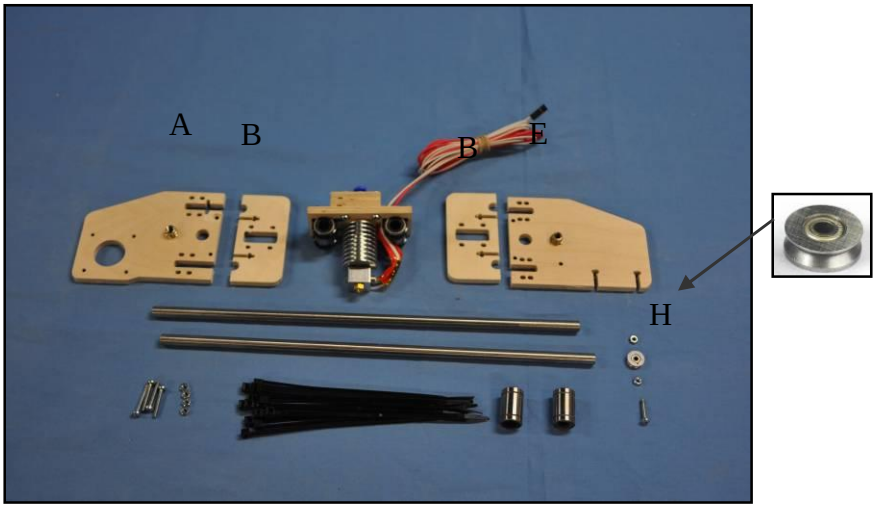
11. Insert the 4 M3 x 20 screws into the holes.
12. Install the 4 nuts and tighten.

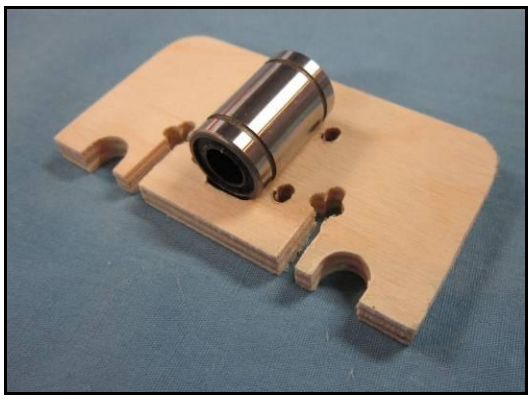
Check to ensure that the thermistor is inserted into the small hole in the aluminum block.

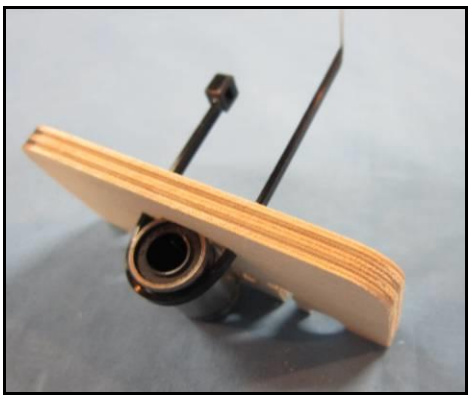
Y Sub-assembly

Parts for the Y sub-assembly include:

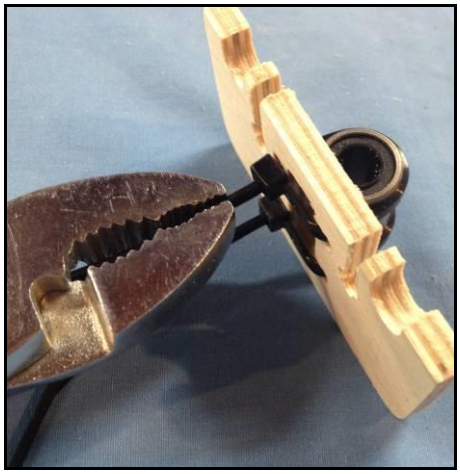
A. 1 Left mount
B. 2 Bearing holders
C. 1 Extruder assembly
D. 1 M3 x 16 machine screw
E. 1 Right mount
F. 4 M3 x 20 machine screws
G. 6 M3 nuts
H. V groove bearing 623VV
I. 2 LM8UU bearings
J. 12 Large nylon ties
K. 2 8mm rods

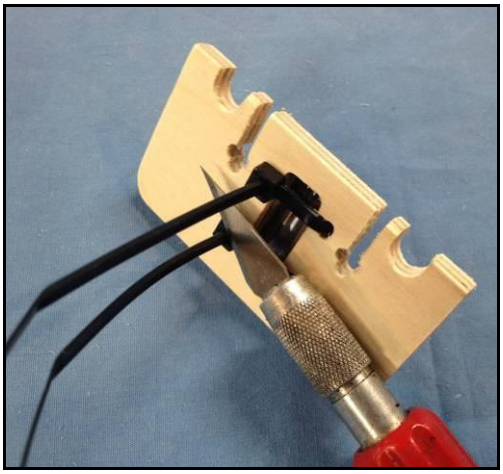




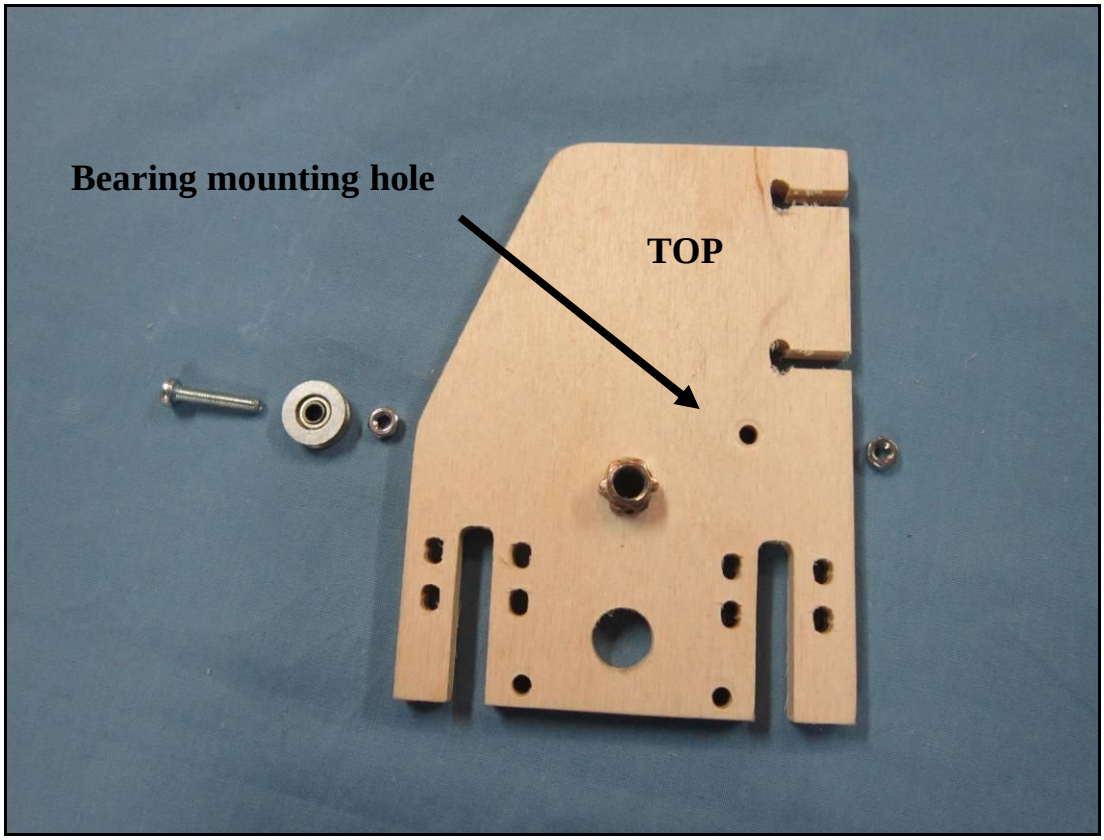


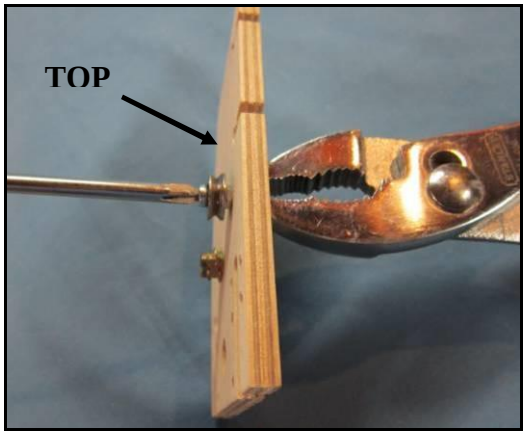
1. Place the bearings in the rectangular slots of the 2 plywood bearing holders.
2. Wrap the bearings by inserting large nylon ties through the side opposite of the bearing into the slotted holes of the bearing holders.





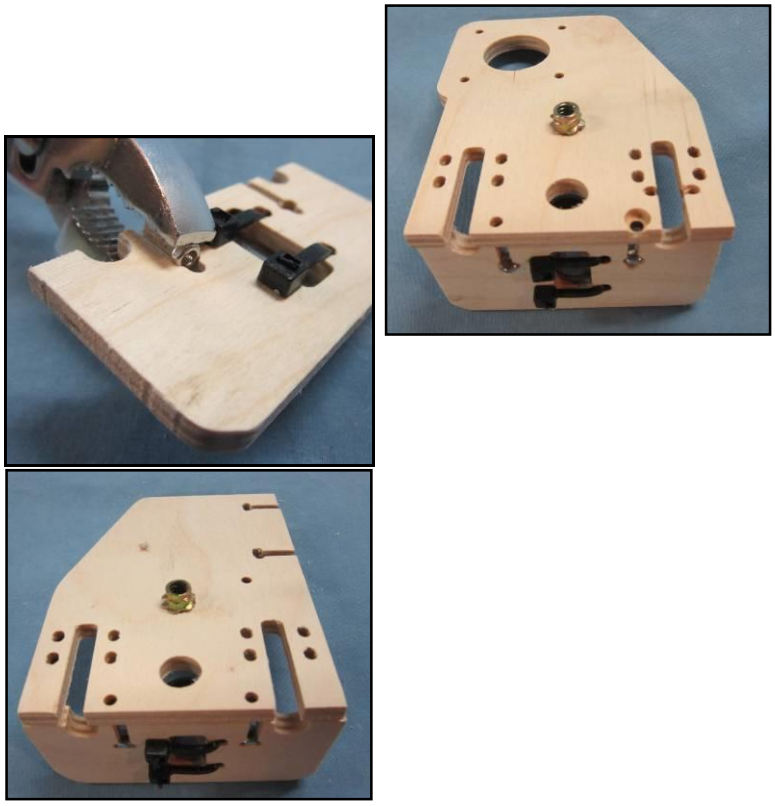
3. Pull the bearing snug against the 2 bearing holders (use pliers if needed).
4. Cut off the excess of the nylon tie.





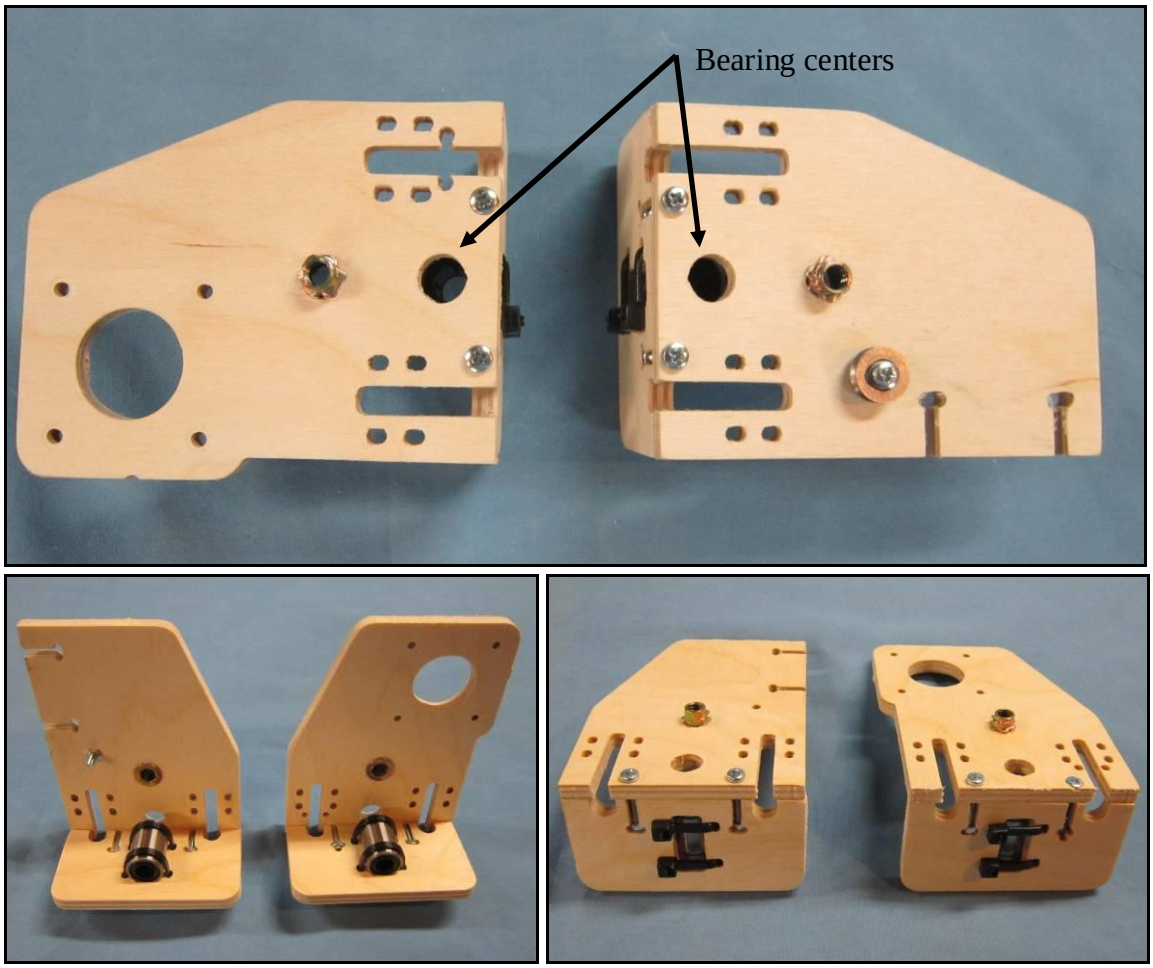
5. Insert the v- groove bearing and nut on the M3 x16 machine screw.
6. Tighten the nut as shown.
7. Install the screw and bearing through the top of the right mount through the bearing mounting hole.
8. Install and tighten the second nut.

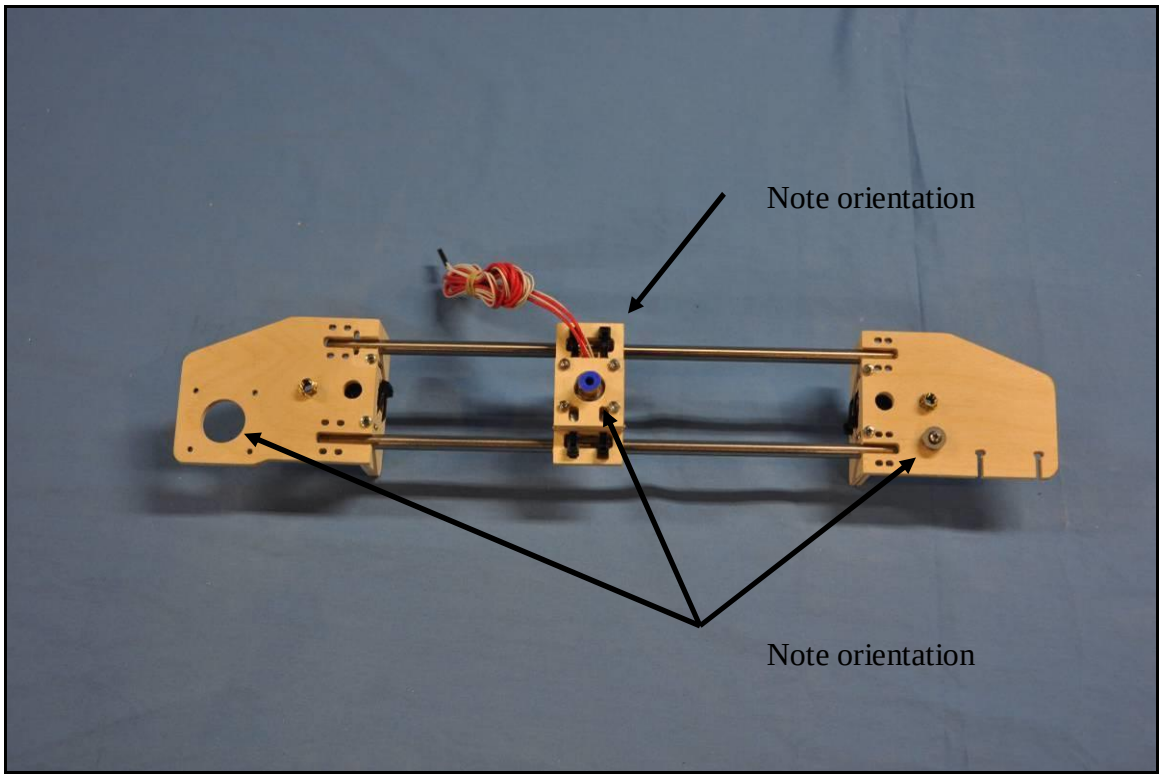
The bearing should rotate freely once installed.



9. Press in the 2 M3 nuts into the slots on both of the 2 bearing holders.
10. Assemble the left and right mounts to the bearing holders with 2 M3 x20 machine screw.
11. Tighten the screws.

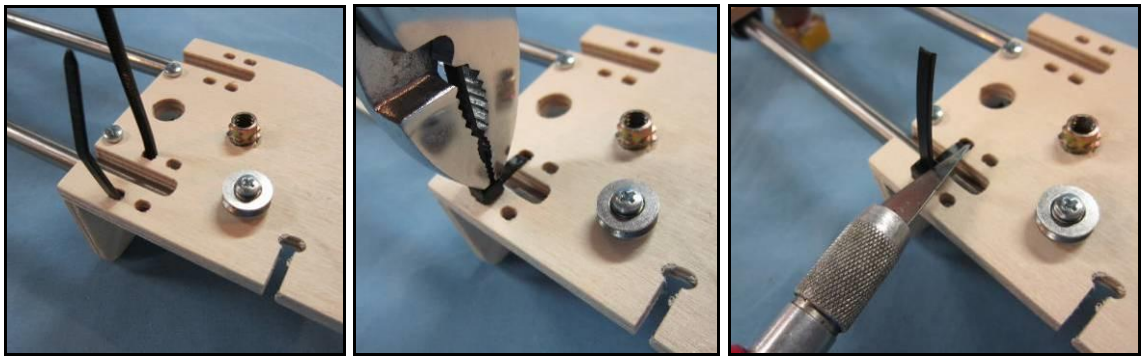
Note orientation is important. The bearing center should line up with the hole on the left and right mounts.


Bearing centers

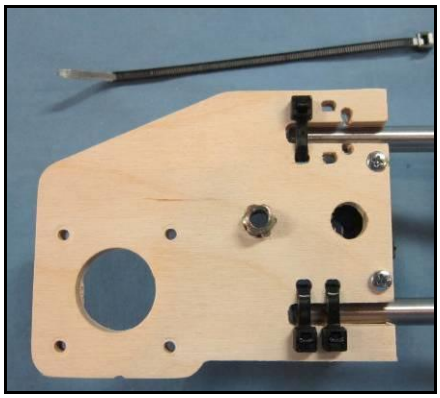
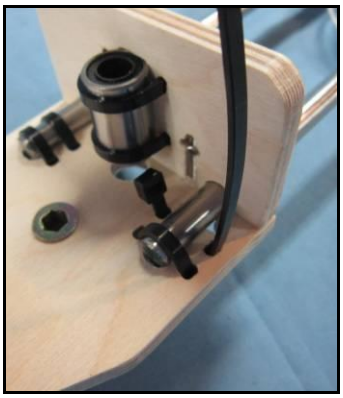


12. Slide both 8mm rods through the bearings on the extruder assembly.
13. Slide both rods into the left and right assemblies with the extruder nozzle facing down. The large slots in the extruder, bearing and large stepper motor hole are on the same side as shown.

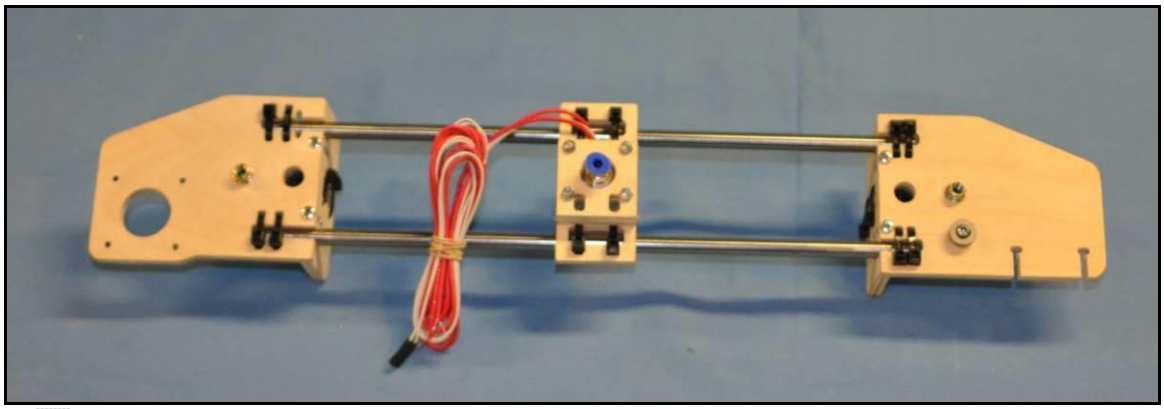
Note that the nylon tie under the Y limit (see page 25) switch slots will be installed differently.



14. For 7 of the nylon ties, wrap the rods by inserting large nylon ties through the side opposite of the rods into the slotted holes of the left and right mounts.
15. Pull the rods snug against the left and right mounts (use pliers if needed).
16. Cut off the excess of the nylon tie.

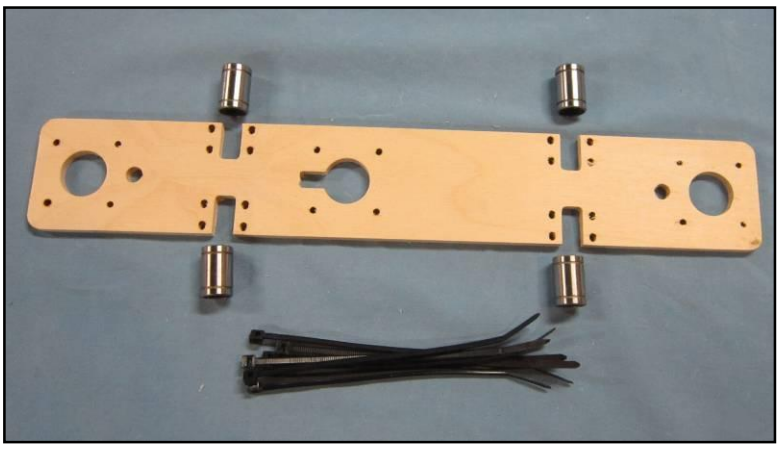
17. Wrap the rod by inserting the last large nylon tie through the same side as the rod into the remaining slotted holes of the left mount.
18. Pull the rod snug against the left mount (use pliers if needed).
19. Cut off the excess of the nylon tie.

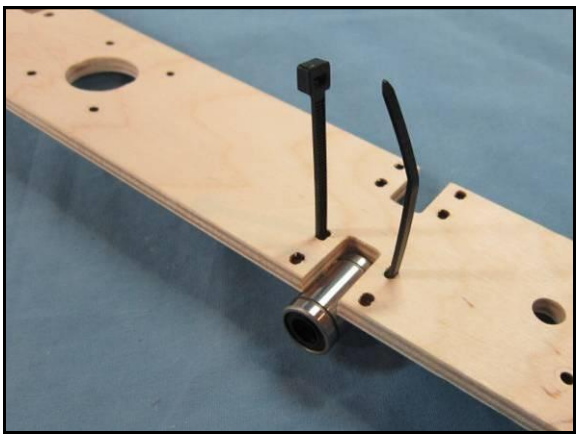


The extruder assembly should slide on the 8mm rods freely.

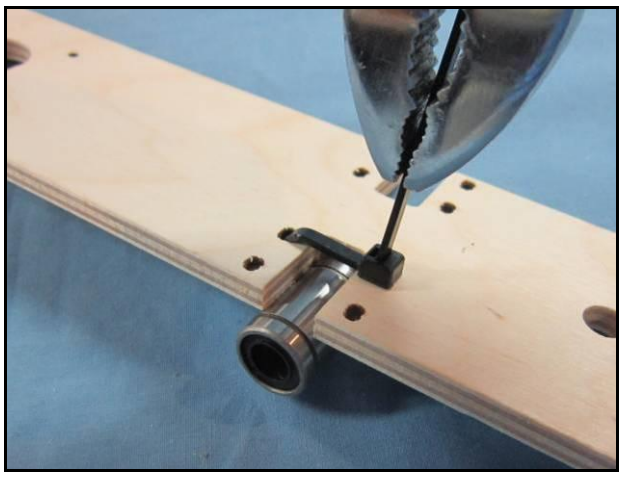
X-Subassembly

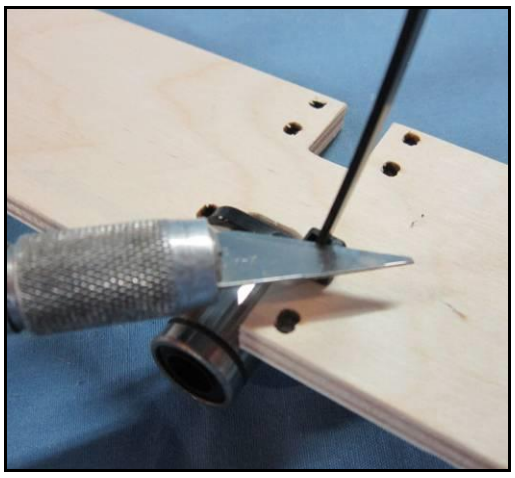
Parts for the x-subassembly include:
1 Plywood cross member
4 LM8UU bearings
8 Large nylon ties





1. Place the bearings in the u-shaped slots of the cross member.
2. Wrap the bearings by inserting large nylon ties through the side opposite of the bearing into the slotted holes of the bearing holders.



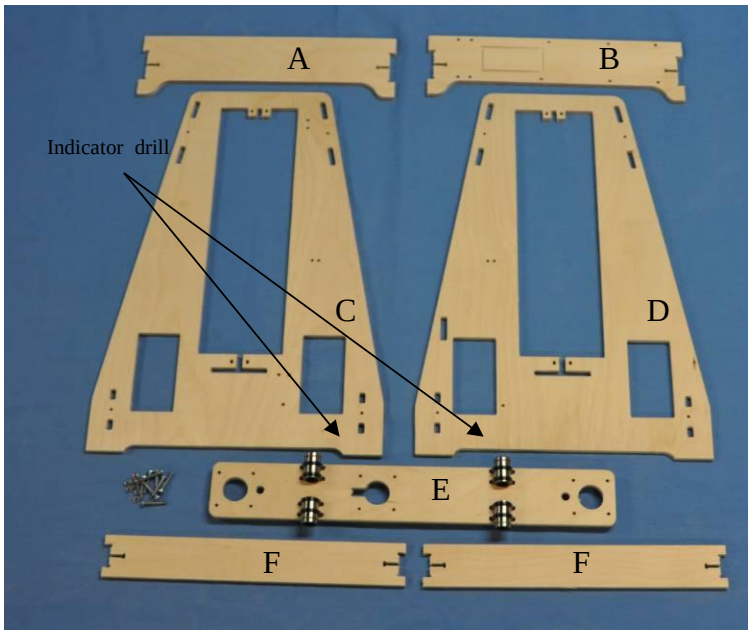


3 Pull the bearing snug against the extruder mount (use pliers if needed).
4. Cut off the excess of the nylon tie.

Frame assembly

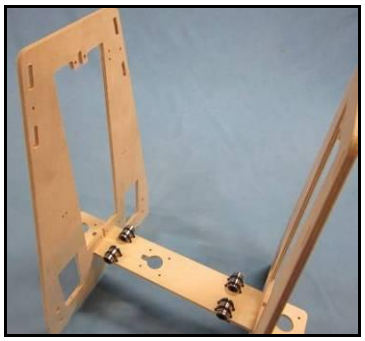
Parts for the frame assembly include:

A. 1 Top front brace
B. 1 Top rear brace
C. 1 Left frame
D. 1 Right frame
E. 1 X sub-assembly
F. 2 Bottom braces
G. 8 M3 x 20 machine screws
H. 8 M3 x 20 nuts

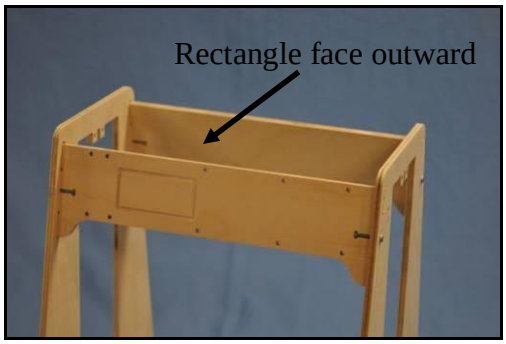


The orientation of B, C, D and E is important.

- Indicator marks on the frame should be at the back facing inward.
- The middle stepper mount (key hole shaped hole) should be closer to the left frame
- The top rear brace rectangular mark should face outward as shown below.

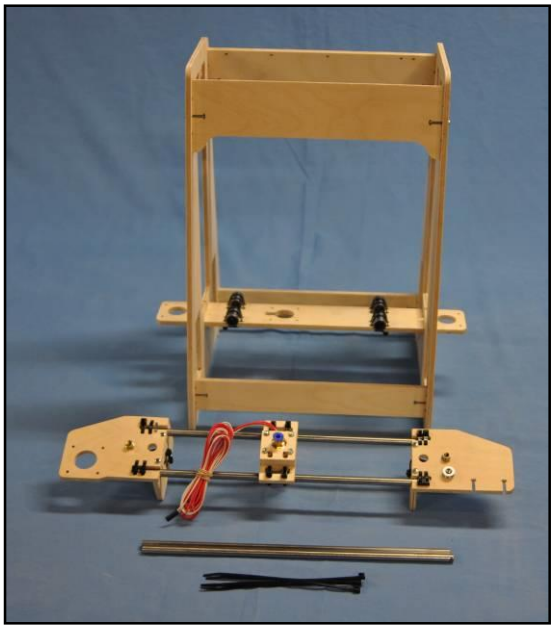


1. Properly orient and insert x sub-assembly into the left and right frame.
2 Press with pliers or tap the 8 M3 nuts into the 8 slots of the 4 braces. (the handle of the screw drive works well)



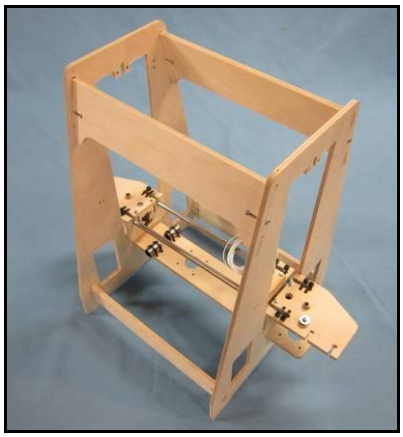
3. Insert the top and bottom plywood braces into the slots as shown.
4. Install and tighten the 8 M3 x20 machine screws.

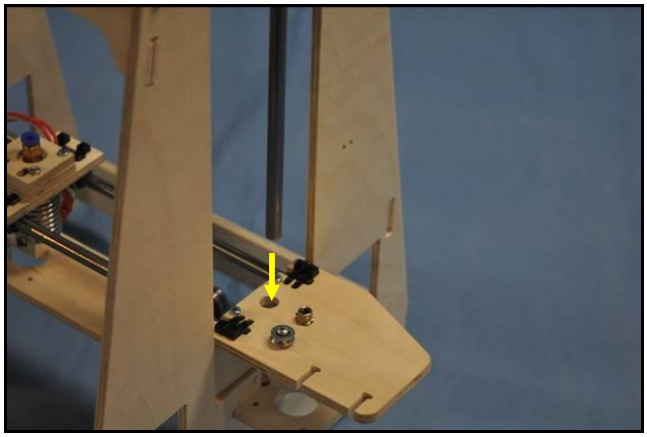
Z Assembly



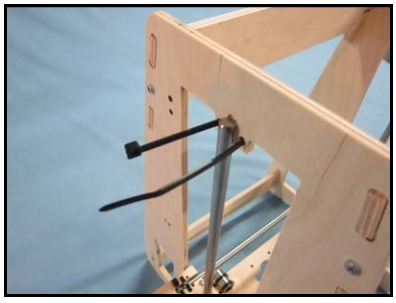
Parts for the z assembly include:
1 Frame assembly
1 Y assembly
2 8mm rods
4 Large nylon ties

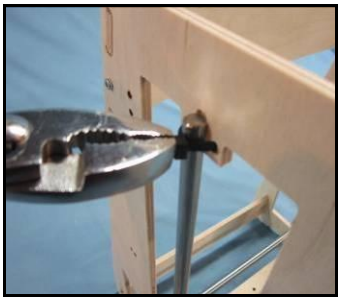
The orientation of top nylon ties is important. The nylon locking block needs to be on the outside to give maximum Y axis travel.

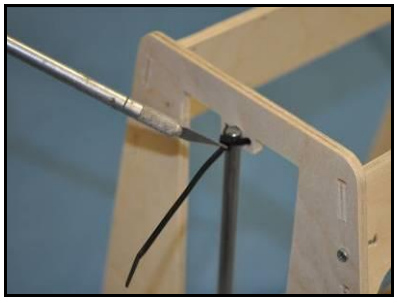




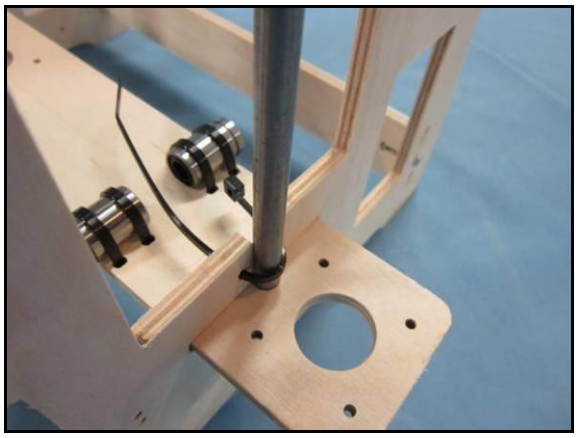
1. Place the Y assembly into the frame.
2. Insert the rods through the Y assembly and position them into the holes of the cross member at the bottom and u-shaped slots at the top of the frame

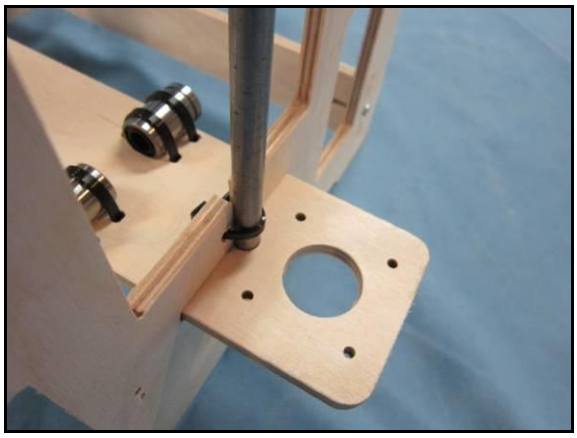






2. Wrap the top of the rods by inserting large nylon ties through same side as the rod into the slotted holes of the extruder mount.
3. Pull the rods snug against the frame (use pliers if needed).
4. Cut off the excess of the nylon ties.





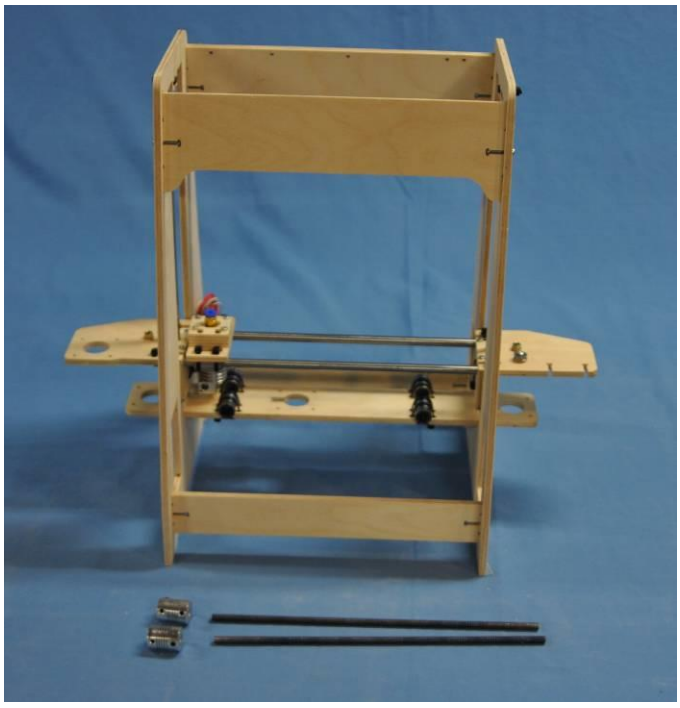
5. Wrap the bottom of the rods by inserting large nylon ties through the side opposite as the rod into the slotted holes of the extruder mount.
6. Pull the rods snug against the frame (use pliers if needed).
7. Cut off the excess of the nylon ties.

The Y assembly should slide on the 8mm rods freely.

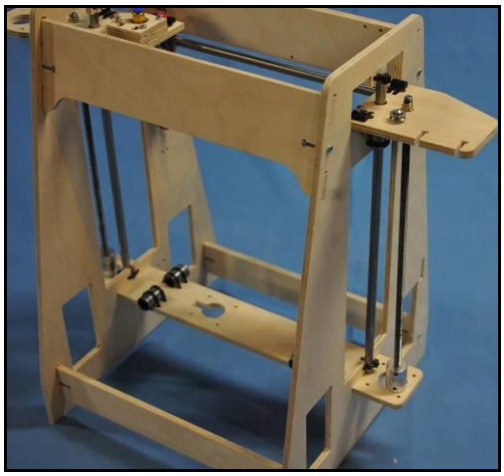
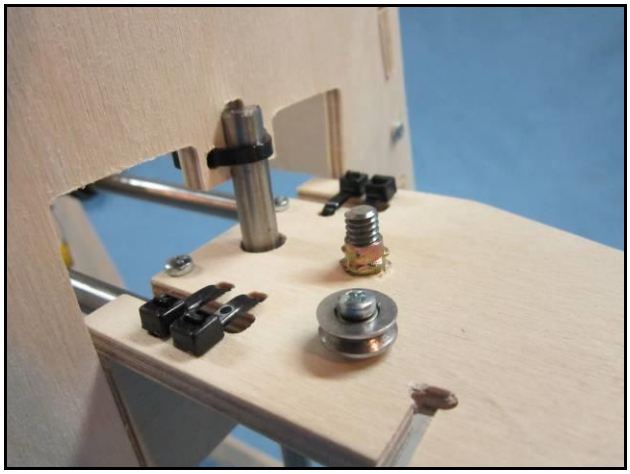
Z - Rod Assembly

Parts for the Z rod assembly include:
1 Frame assembly
2 1/4-20 threaded rods
2 Aluminum couplers

.



1. Insert the threaded rod into the larger end of the aluminum coupler.
2. Tighten both of the Allen screws.
3. Repeat for the other rod and coupler.

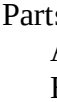



4. Thread both of the coupler assemblies into the threaded inserts on the Y assembly as shown.

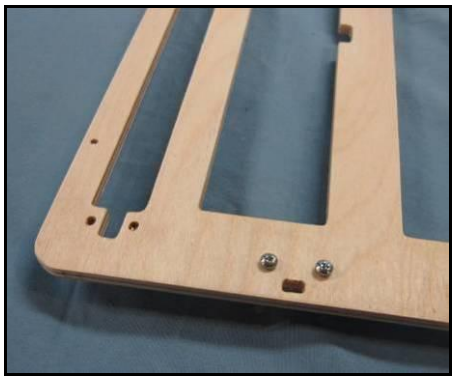
X Assembly

Parts for the x assembly include:

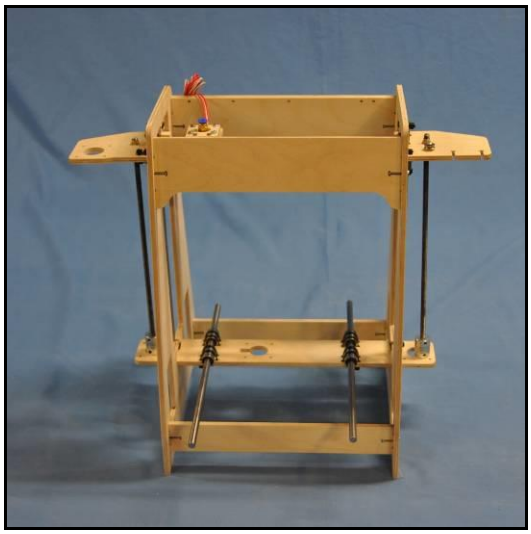
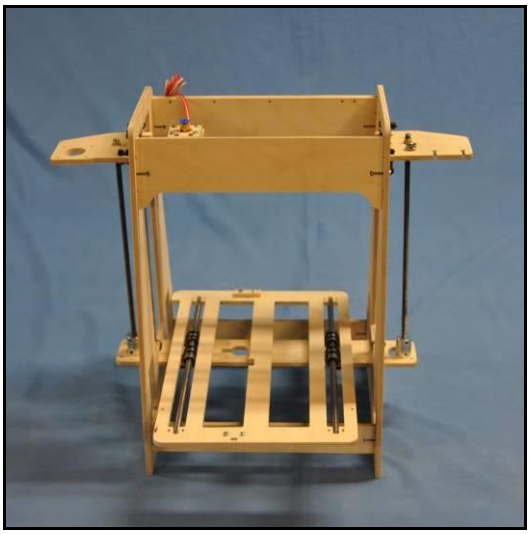
A. 2 X string holders
B. 1 X bed mount
C. 1 Frame assembly
D. 2 8mm rods
E. 4 Large nylon ties
F. 4 M3 x16 machine screws
G. 4 M3 nuts



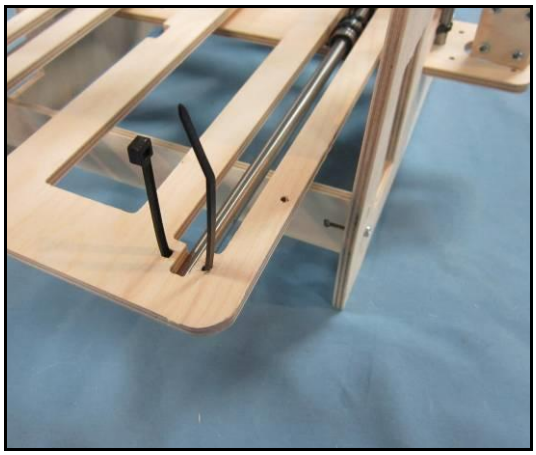
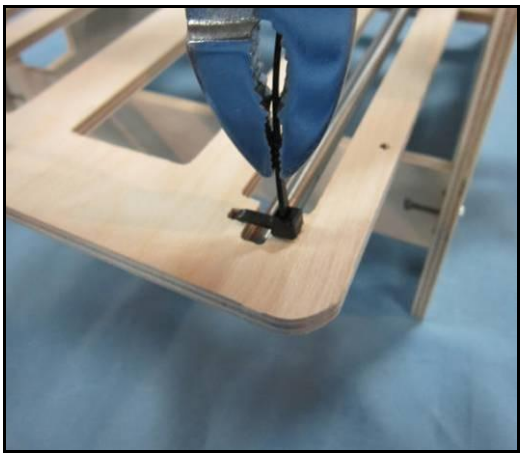
Note orientation. The string holder is mounted on bottom on the front and it is mounted on top in the rear. The cut groove in the string holder mates with the bed mount.



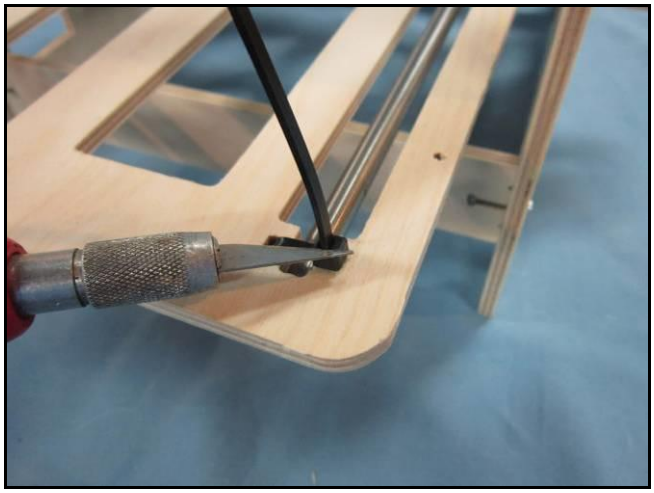
1. Install the string holders into the bed mount using 2 M3 x 16 machine screws.
2. Install the M3 nuts and tighten

3. Insert the rods into the bearings on the cross member and install the bed.

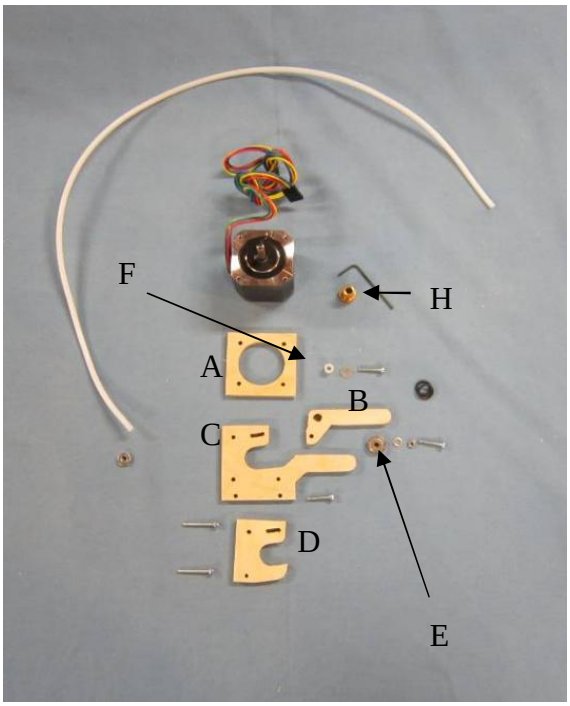



4. Wrap the bottom of the rods by inserting large nylon ties through the side opposite of the rod into the slotted holes of the extruder mount.
5. Pull the rods snug against the frame (use pliers if needed).



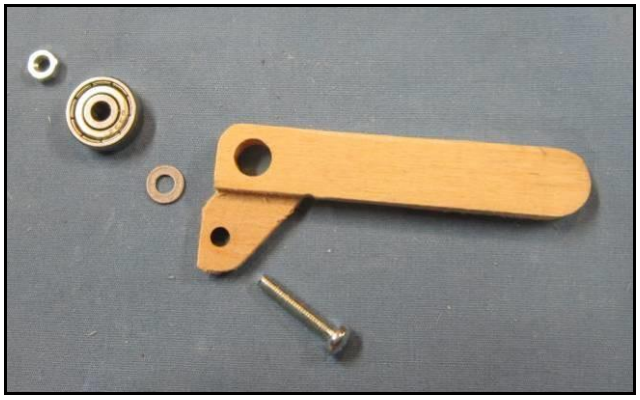
6. Cut off the excess of the nylon ties.

Extruder (cold end) Assembly

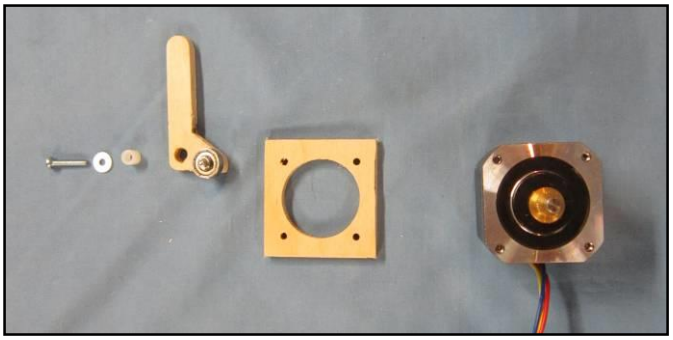


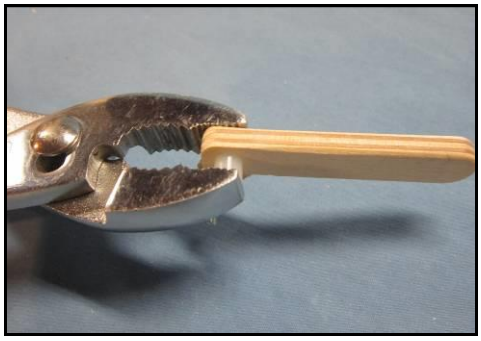
Parts for the cold end include:

A. 1 Backing plate
B. 1 Bearing arm
C. 1 Mid plate
D. 1 Front plate
E. 1 Drive bearing
F. 1 Nylon bushing
G. 1 Stepper motor
H. 1 Extruder drive gear
I. 1 Filament guide tube
J. 1 Filament guide tube nut
K. 1 Large washer
L. 2 M3 x16 machine screws
M. 1 Small washer
N. 1 M3 nut`
O. 2 M3 x 20 machine screws
P. 2 O-rings

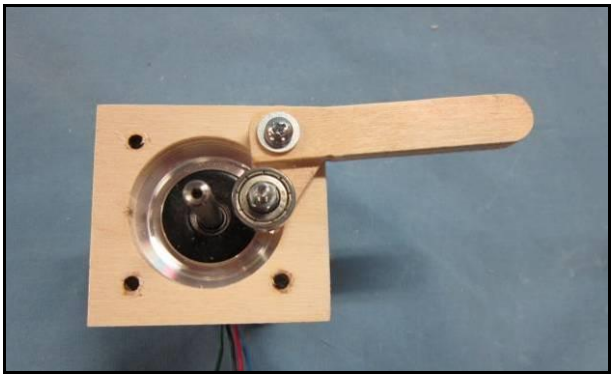


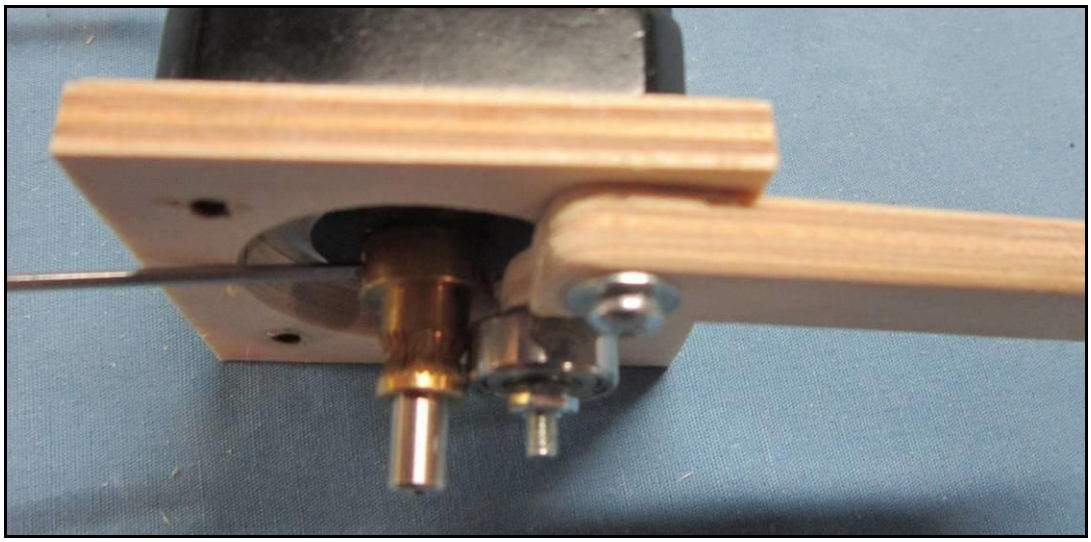
1. Insert the M3 x 16 through the extruder arm.
2. Install the small washer on the screw.
3. Install the bearing on the screw.
4. Install the nut on the screw and tighten



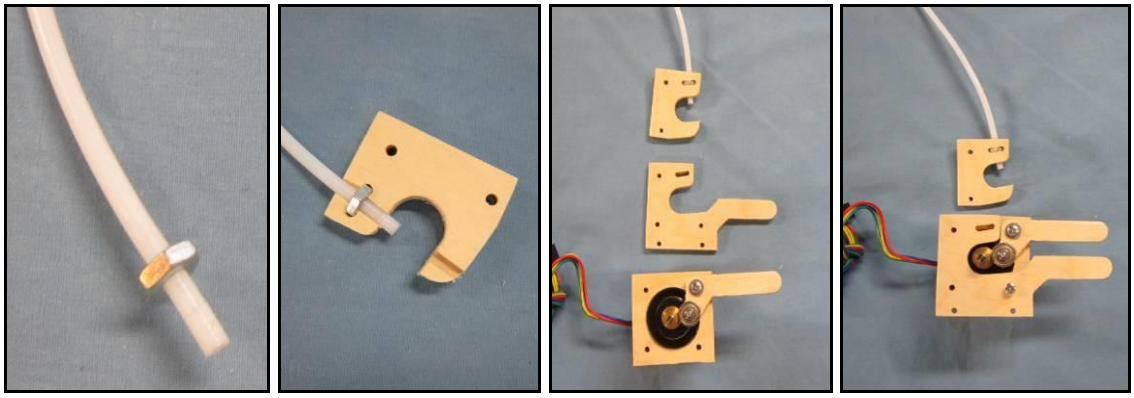


5. Press the nylon bushing into the extruder arm.
6. Insert the big washer onto the M3 x 16 machine screw.

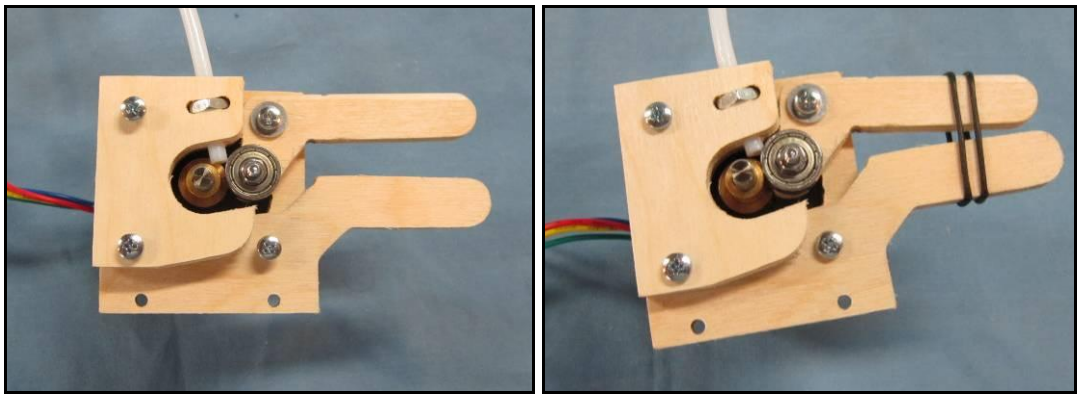




7. Insert the screw and washer thru the nylon bushing on the extruder arm.
8. Insert the screw through the backing plate and screw into the stepper mounting hole.
9. Insert the extruder drive gear and adjust the height so that the bearing is centered on the knurled part of the wheel. Tighten the extruder drive wheel with the Allen wrench.

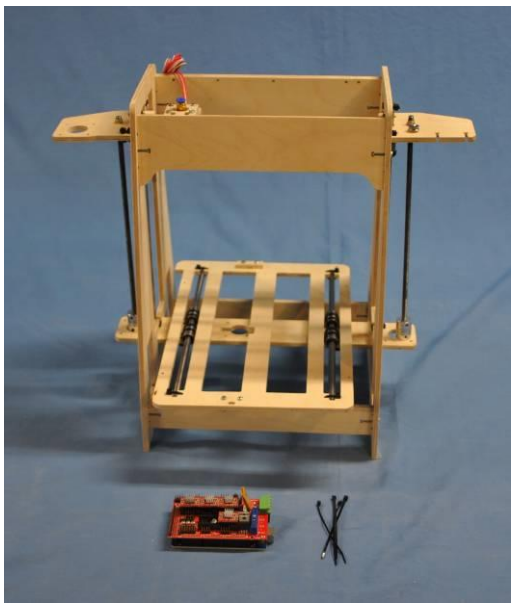


10. Thread the filament guide nut onto the filament guide tube so that 10 to 12 mm (0.4 - 0.5") is through
11. Insert the tube and nut into the front plate groove.
12. Stack the mid plate on the backing plate and insert the M3 x16 into the lower right mounting hole.



13. Stack the top plate onto the mid plate and insert 2 M3 x 20 machine screws.
14. Tighten all 4 of the screws.
15. Add 2 o-rings as shown.
16. Adjust the guide tube so that it is close to the drive wheel without touching it.

Adding the Electronics

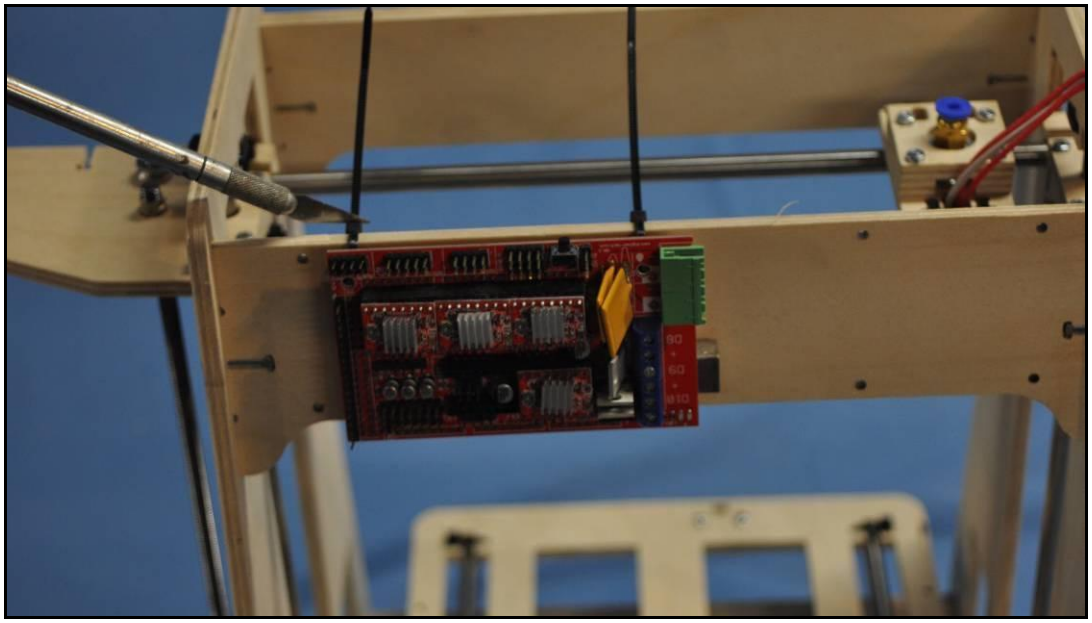


Controller Assembly

Parts for the Ramps:

A. 1 Frame assembly
B. 1 Controller assembly
   1 Arduino
   1 Ramps1.4
   4 Stepper drivers
C. 4 Small nylon ties

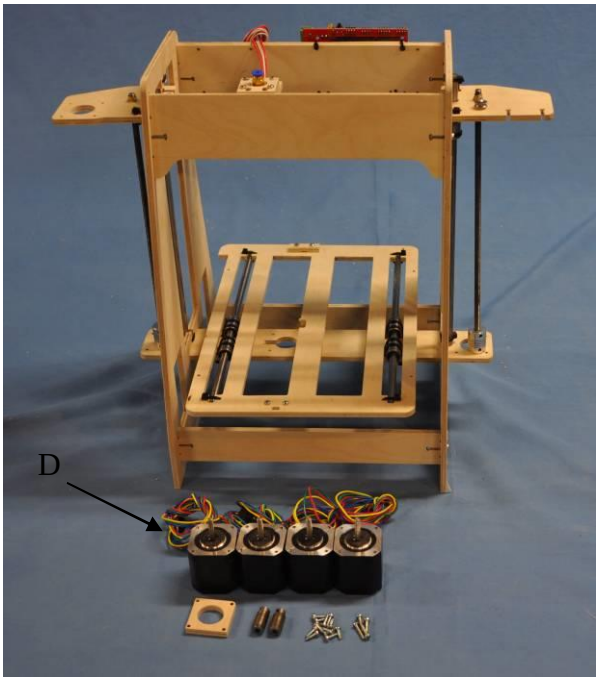
Snug up board against the frame until if is firm. Do not over tighten the ties as this will damage the control board.



1 Install the controller board on the back of the top brace as shown. It will cover the rectangle grove.
2. Insert and loosely tie the top two small nylon ties through the frame and Arduino mounting holes.
3. Insert the 2 bottom small nylon ties.
4. Gently snug the control board up against the frame.

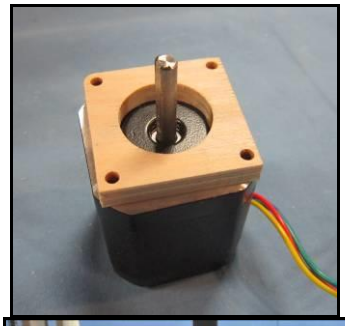
5. Cut off the excess of the nylon tie.

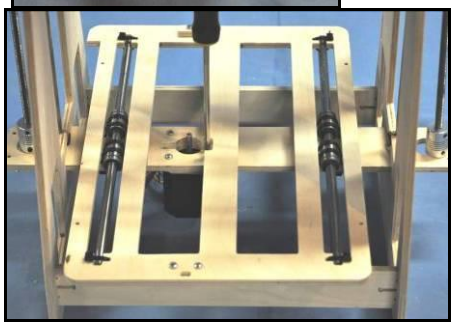
Motion Stepper motors

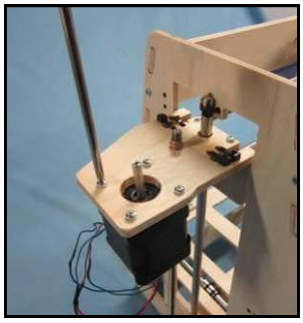


Parts for the motion stepper motors:

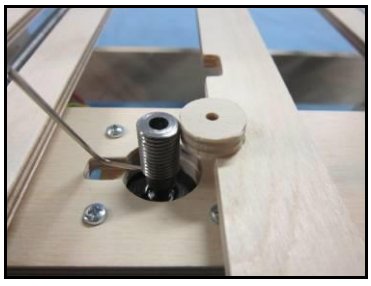
A. 1 Frame assembly
B. 4 Stepper motors
C. 2 threaded couplers (x & y stepper motors)
D. 1 X stepper spacer
E. 4 M3 x 16 (x-stepper motor)
F. 12 M3 x 10 machine screws

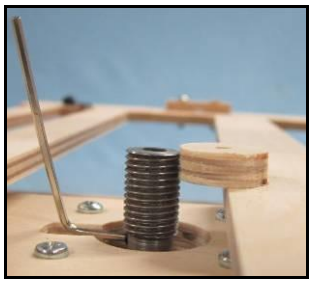




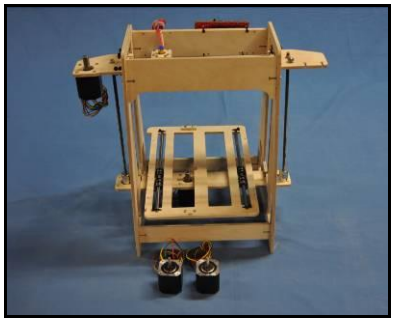
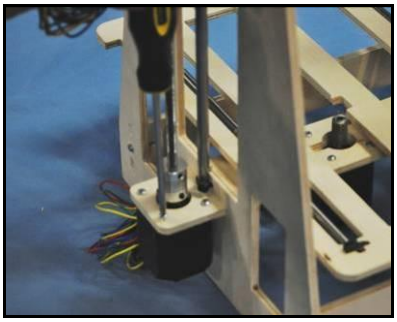
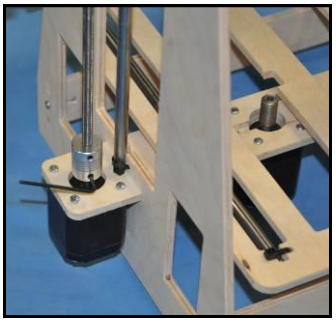


1. Place the spacer on the X stepper motor and install the assembly onto the middle mount of the cross member.
2. Install and tighten the 4 M3 x16 machine screws.
3. Install the Y stepper motor to the Y assembly with 4 M3 x 10 machine screws.
4 Tighten the machine screws.





5. Set the height on the Y threaded coupler so that the Allen key is flat against the top of the Y assembly.
6. Set the height of the X threaded coupler so that it is approximately 1 mm less than the round spacer thickness. (This will give the build platform clearance)

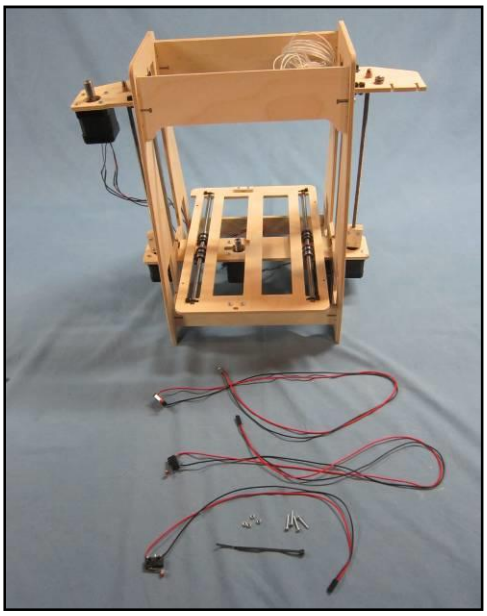




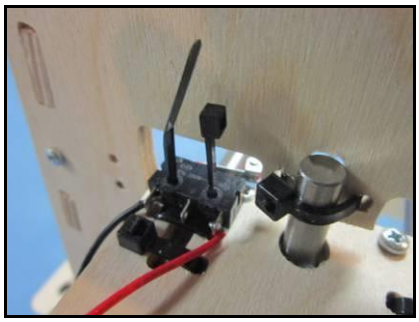
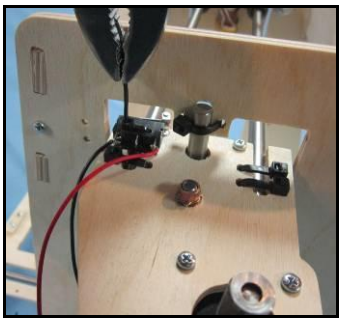
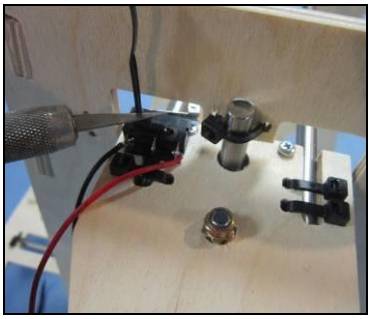
7. Install and tighten both of the Z stepper motors 4 M3 x10 mm machine screws.
8. Tighten the 2 couplers Allen screws

Home Switches

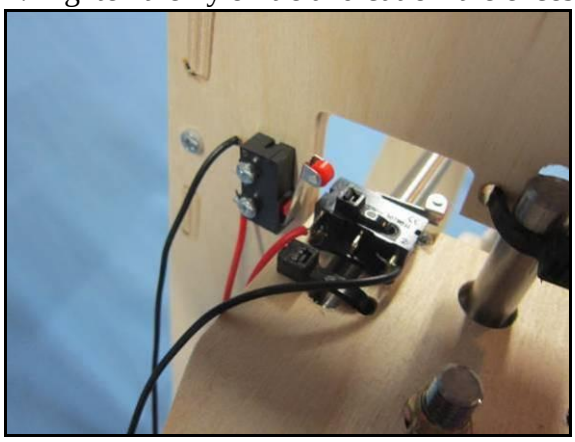
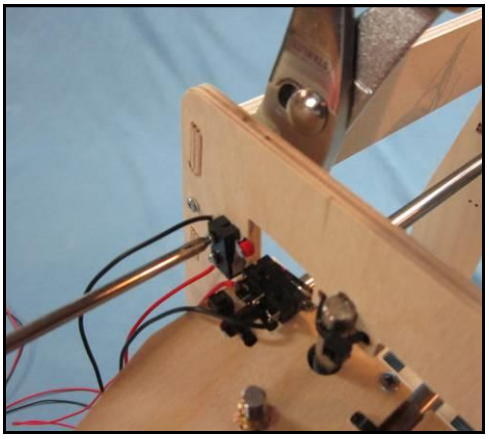
Parts for the motion stepper motors:

A. 1 Frame assembly
B. 2 Home switches (long wires)
C. 1 Home switch (short wire)
D. 4 M2.5 x16 machine screws
E. 4 M2.5 nuts
F. 1 small nylon tie

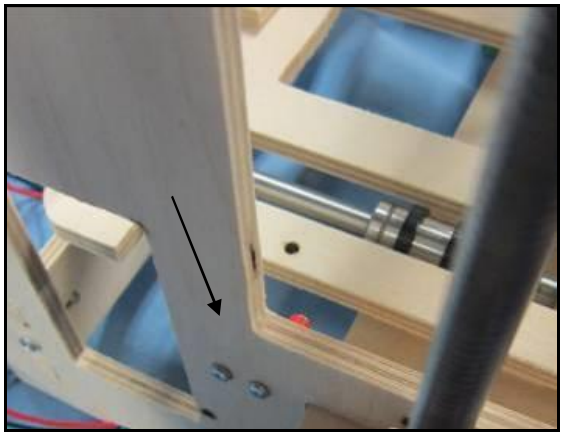
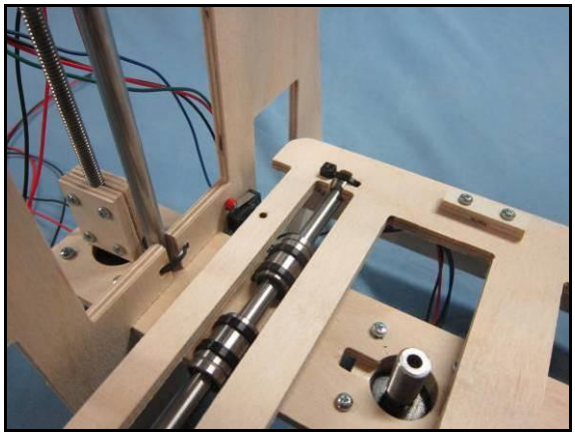


1. Insert the small nylon tie through the Y Home switch (long wires) hole, loop around the rod and back up through the second limit switch hole. (Left side)
2. Tighten the nylon tie and cut off the excess.

3. Place the Z Home switch (short wires) on the left frame near the top with 2 M2.5 x16 screws and nuts.
4. Tighten the nuts.

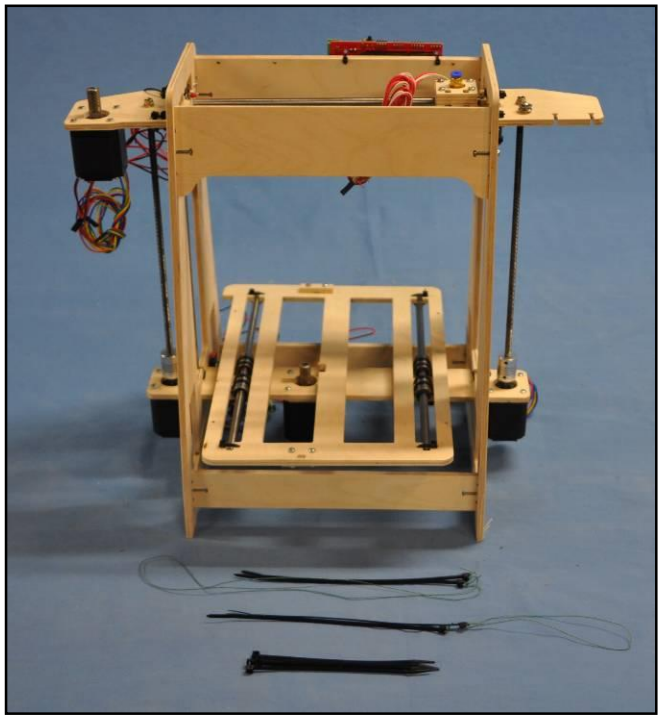



5. Install the X Home switch (long wires) on the inside of the lower left frame. 2 M2.5 x 16 screws and nuts.
6. Tighten the nuts

Adding The String Drive

Parts for the string drive assembly include:

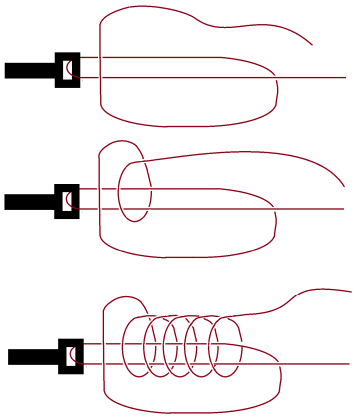
A. 1 X drive string assembly (shorter)
B. 1 Y drive string assembly (longer)
C. 4 large nylon ties



The kit includes 2 sets of tied string. The instruction for tying the knot has been added for reference.

Tying the knots (Uni-knot)

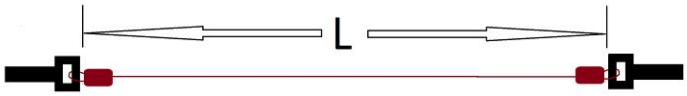
This knot is called the Uni-knot and has "how to" videos on You-Tube.



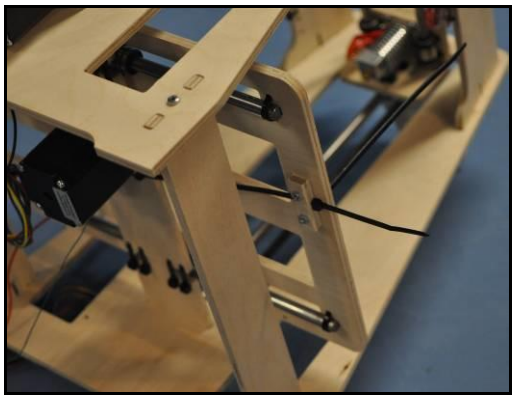
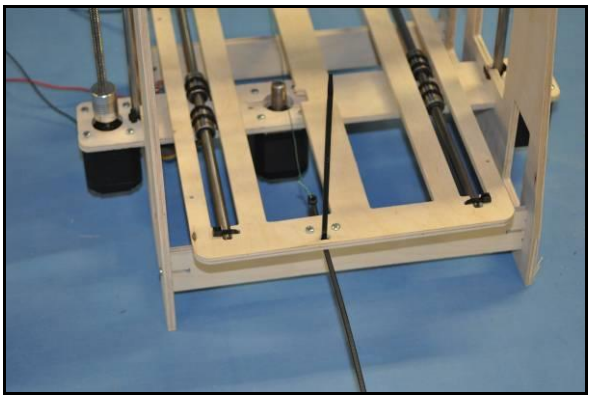
1. Loop the string through the locking block of the nylon tie.
2. Loop the same string behind the horizontal stationary string, bring it up over both horizontal strings
3. Repeat step 2 for a total of 5 loops.
4. pull the knot tag end and tighten the knot.

The tied length of the string from one nylon tie to the other is:

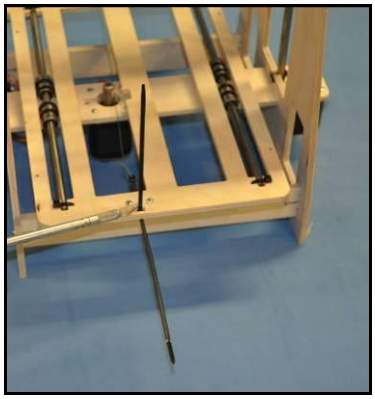
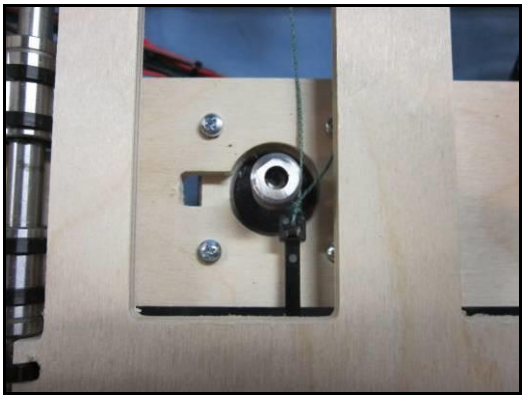
X-string L = 330 - 350 mm
Y-string L = 690 - 710 mm



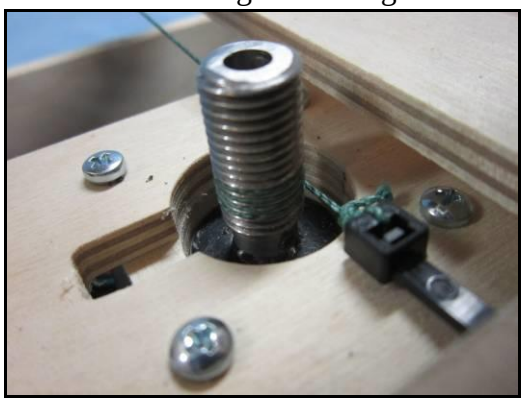
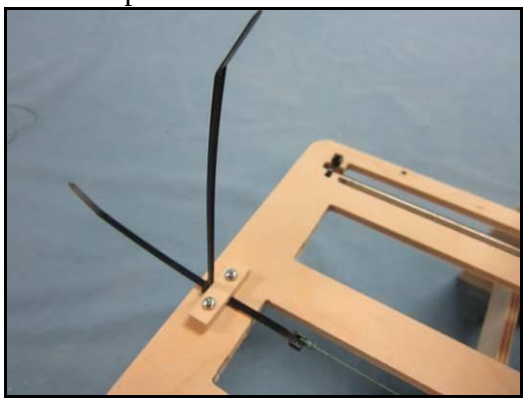
X string Drive

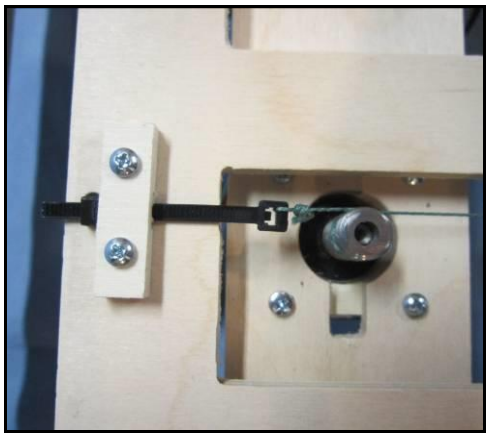
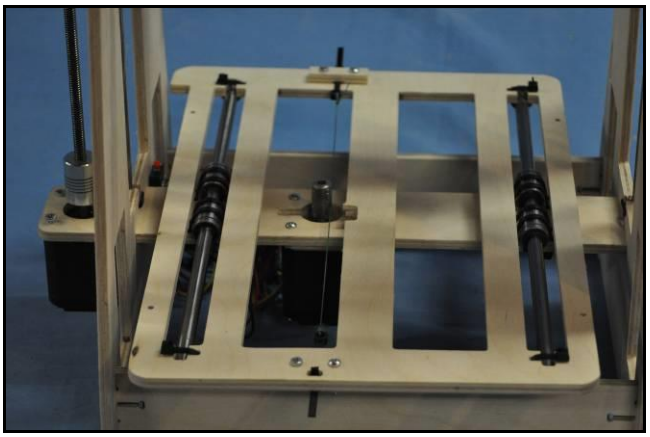
1. Place a large nylon tie into behind the string holder, then thread the large tie connected to the string through the string holder into the loose nylon tie

2. Push the bed to the rear stop making the coupler closer to the nylon tie.
3. Push the nylon tie connected to the sting into the string holder until the nylon tie is close but is no longer touching the X threaded coupler.

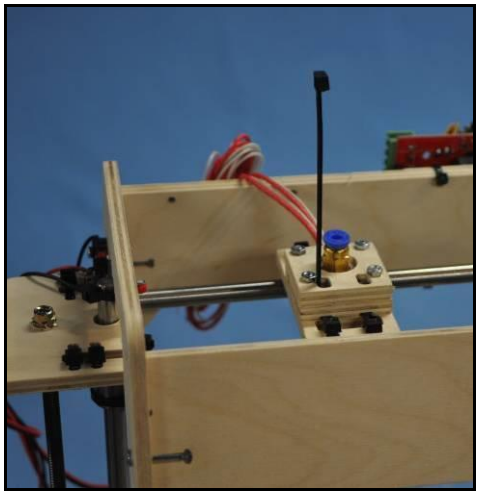
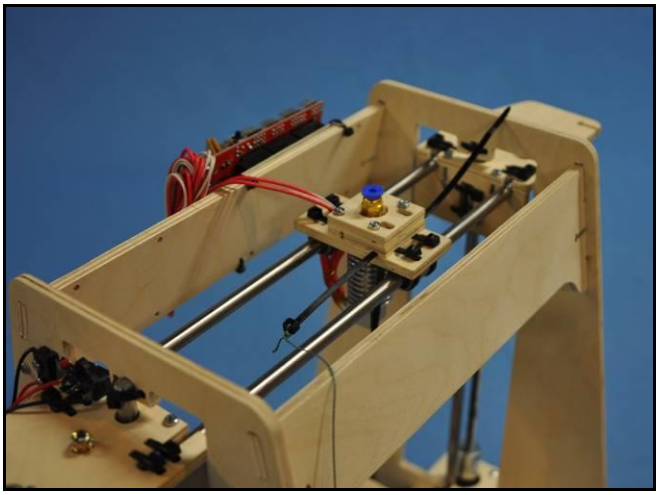
4. Wrap the string around the threaded coupler 4 to 5 times close to the bottom of the threaded coupler.
5. Insert the large nylon tie with the string attached through the rear string holder and the loose nylon tie.

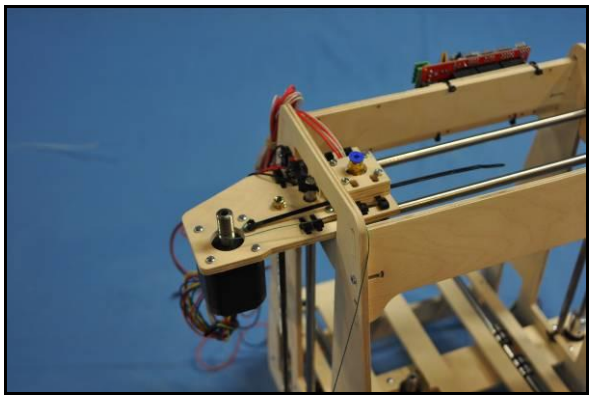
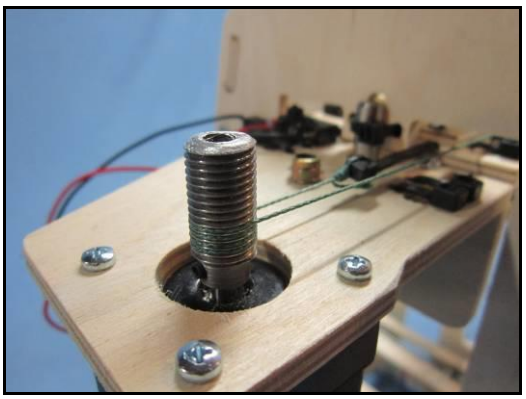
6. Snug up the string and slide the bed back and forth to ensure that the sting rides in the threads of the coupler with full travel (threads will move up as the bed moves rearward)
7. If needed, adjust the string moving it up or down the threaded coupler.
8. Tighten the sting by pushing the nylon tie into the string holder.
9. Cut off the excess of the nylon ties.

The string should be on the right side of the threaded coupler and form a straight line as shown in the picture above.

Y String Drive

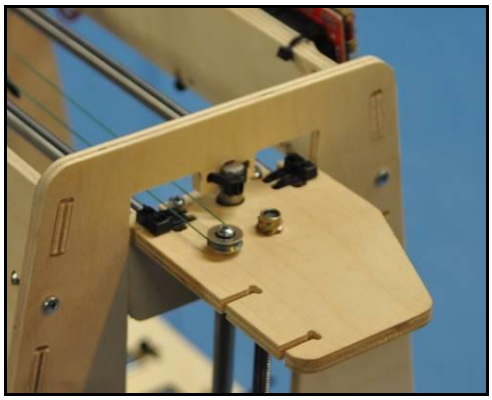
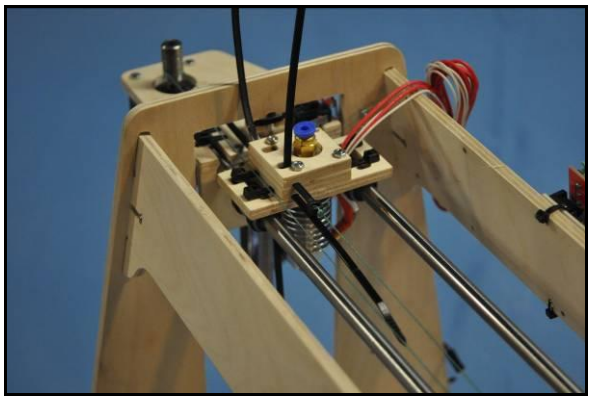
1. Insert the large loose nylon tie into the top of the left hole and align the box end to the bottom hole of the extruder mount.
2. Insert the large nylon tie with the string attached into the bottom slot on the left side of the extruder. This nylon tie should be placed entirely through the bottom slot as shown.

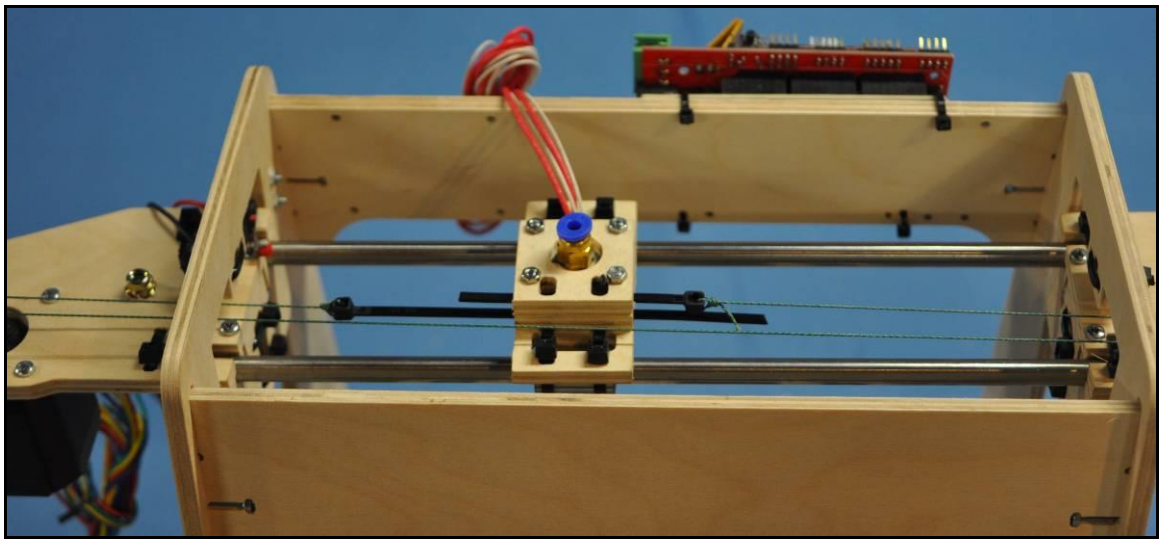
3. Move the extruder to the left stop and push the nylon tie connected to the string into the string holder until the nylon tie is no longer touching the threaded coupler.
4. Wrap the string around the threaded coupler 4 to 5 times close to the bottom of the threaded coupler.

The string should be higher on the front side of the threaded coupler as shown in the picture above.

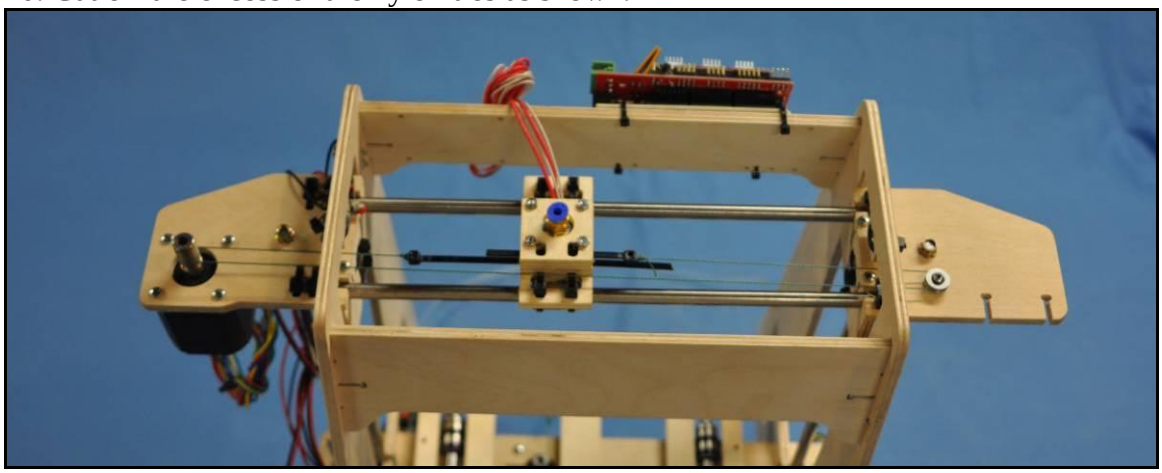
.

5. Route the string across the printer to the right hand mount around the v-groove bearing then back to the extruder.
6. Insert the large loose nylon tie into the right hole and align it with the top slot on the right side of the extruder.



7. Snug up the string and slide the extruder back and forth to ensure that the sting rides in the threads of the coupler with full travel with nylon tie clearance.
8. If needed, adjust the string moving it up or down the threaded coupler.
9. Tighten the string by pushing the nylon tie into the extruder slots.
10. Cut off the excess of the nylon ties as shown.

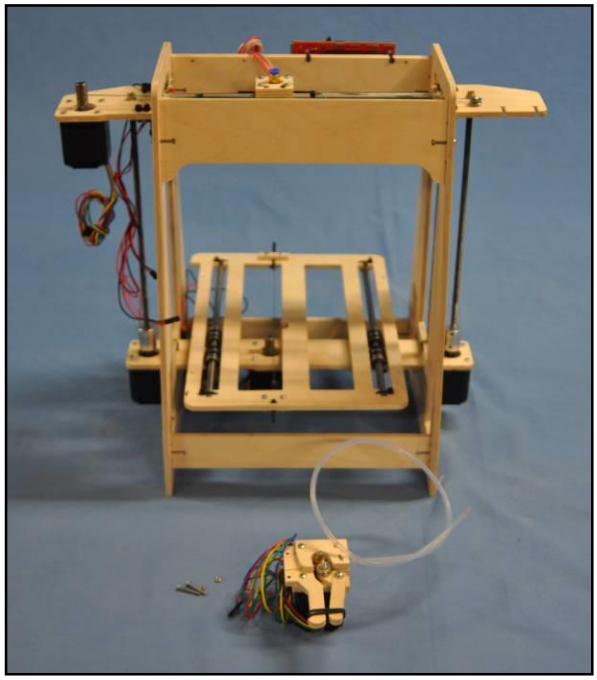


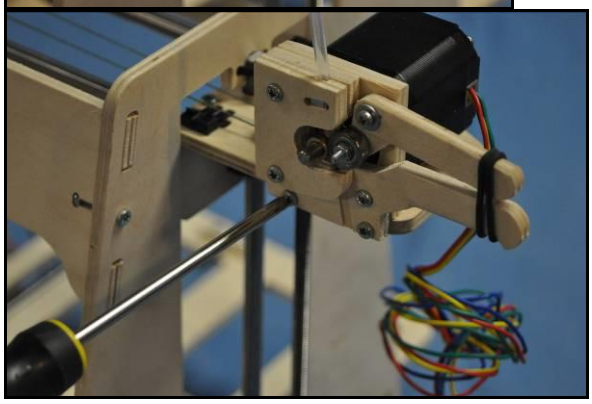
The extruder should move from left to right without contacting any parts of the frame or Y assembly parts. The string on the nylon ties may need to be adjusted if there nylon tie hits the frame. Please note that the string orientation.

Adding the Extruder Driver

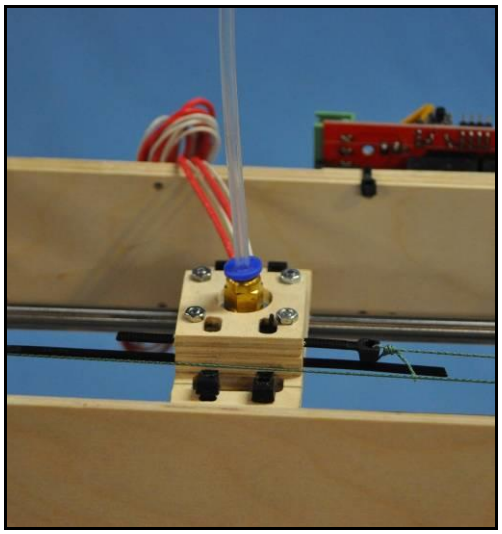
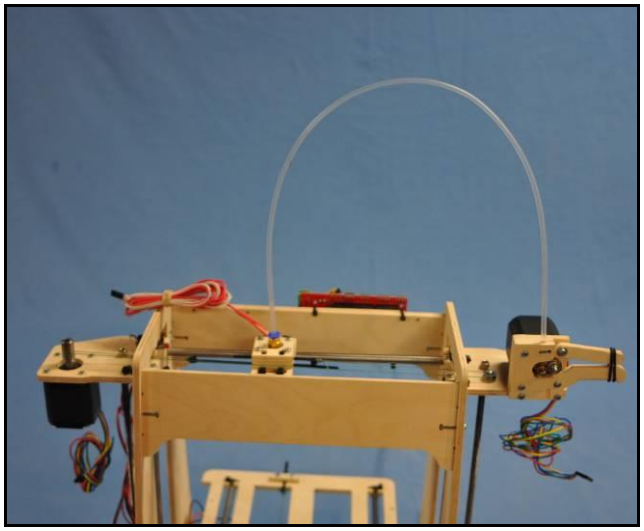
Parts for adding the extruder driver include:

D. 1 Frame assembly
E. 1 Extruder assembly
F. 2 M3 X 20 machine screws
G. 2 M3 Nuts





1. Press the 2 M3 nuts into the right mounts.
2. Insert and tighten 2 M3 X20 machine screws.

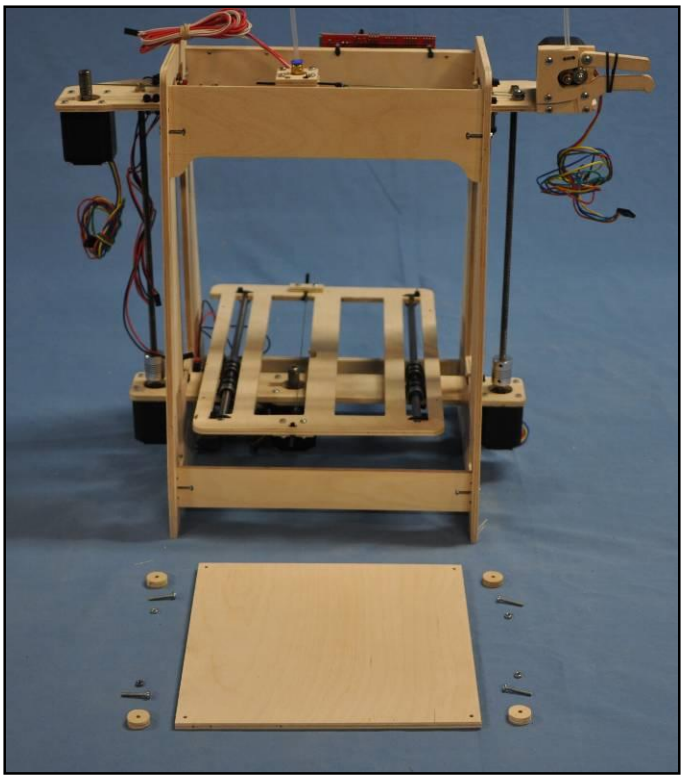
3. Insert the tube into the SMC.

The SMC fitting will release the tube if the blue ring is pushed into the fitting as the tube is gently pulled. This allows for quick filament changes.

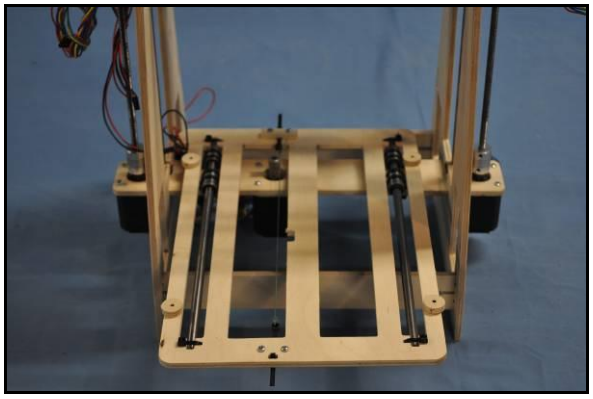
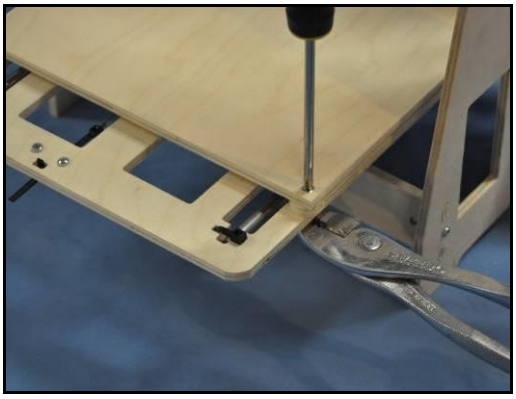
Build Platform Assembly

Parts for adding the build platform include:

A. 1 Build Platform
B. 4 Round Spacers
C. 4 M3 X 20 machine screws
D. 4 M3 Nuts



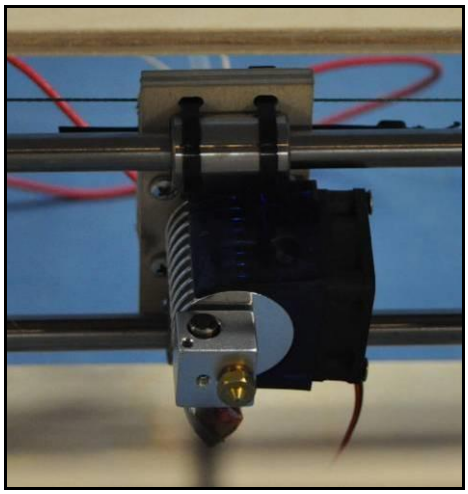
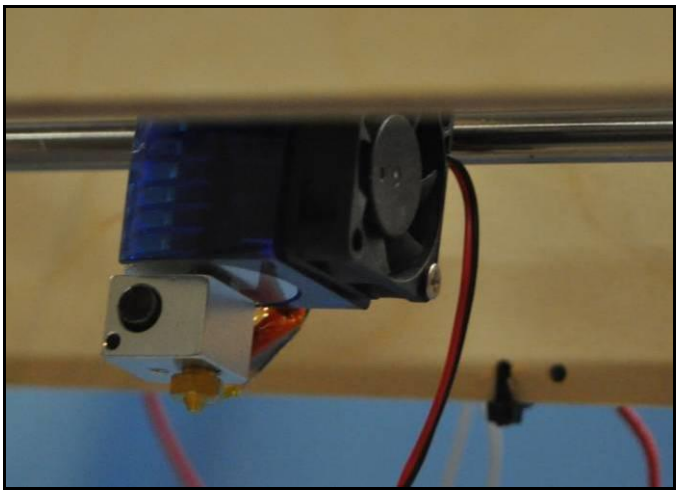
The Build platform has counter bored holes. These holes should be facing up.

1. Place the 4 spacers over the holes in the bed mount.
2. Insert 4 M3 X 20 machine screws through the build platform, spacers, and then the bed mount.
3. Install and tighten the 4 M3 Nuts

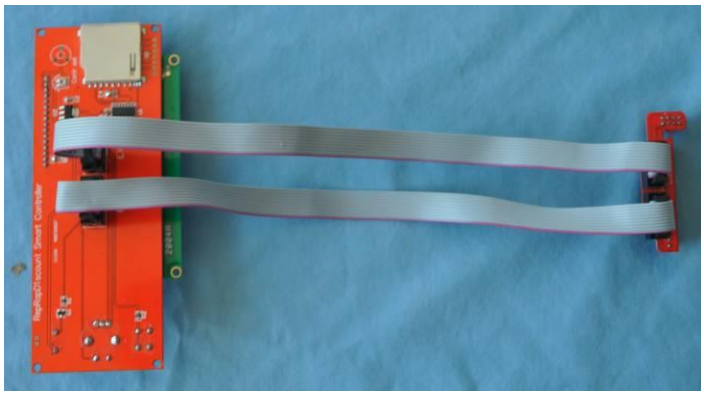
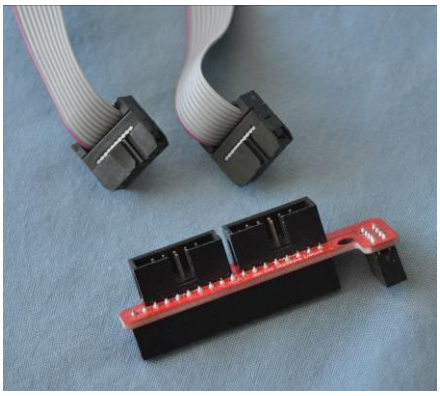
Connecting the Controller, LCD and Extruder Fan

Connecting the Fan

1. Snap the extruder fan on to the extruder so that it is aligned with the bottom of the aluminum heat sink and facing left as shown.

Connecting the LCD/SD Card

1. Connect the 2 ribbons as shown. Please note the orientation red wire on the ribbons and the orientation of the connector and LCD. The connectors have a slot so to show correct connection.

Ramps1.4 Connections

Each controller power, stepper controllers and home switches are tested before they are shipped. The main power (F), home switches (G,H,I. Improper connection can

permanently damage the board. The diagram and pictures show the correct connections. Please double check before supplying power to the board.

Please note:

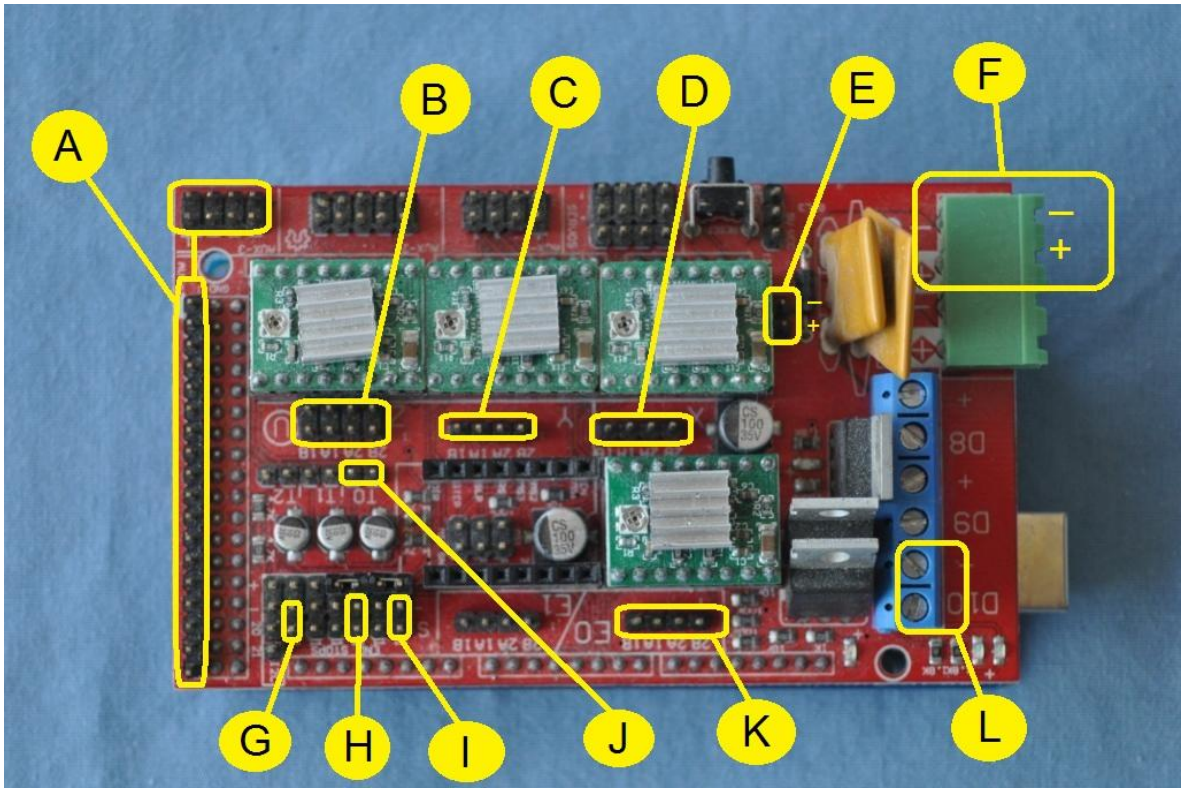
For the main power and fan: (Polarity is - Black wires, + Red wires)

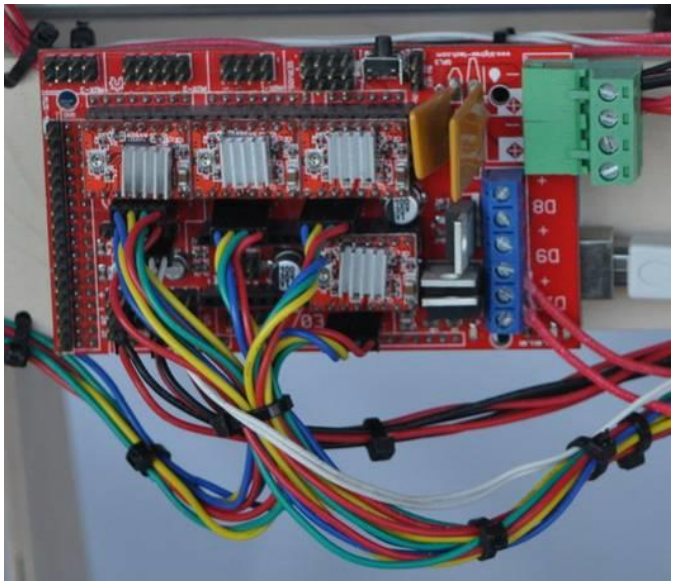
Home switches, thermistor, and extruder power do not have polarity
(Connection orientation is not important)

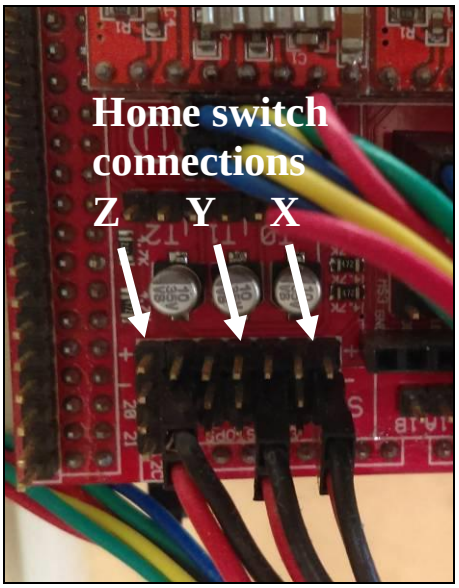
Stepper motors change direction with connection is flipped.

The connections are:

A. LCD adapter
B. Z - stepper motors
C. Y - stepper motor
D. X - stepper motor
E. Extruder fan
F. Main Power
G. Z-max home switch
H. Y-min home switch
I. X-min home switch
J. Extruder thermistor
K. Extruder stepper motor
L. Extruder power





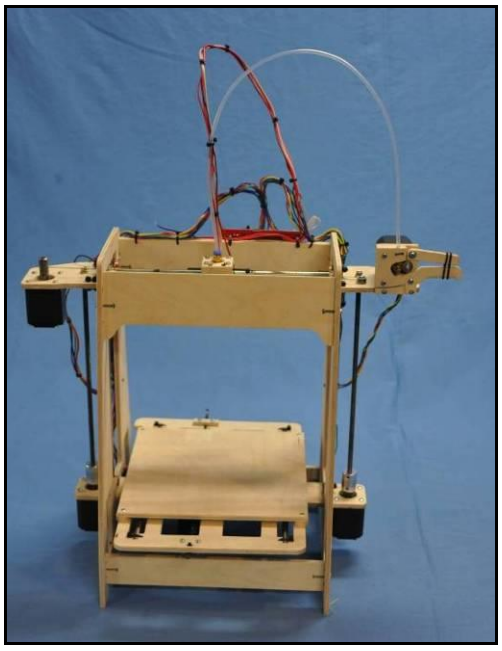


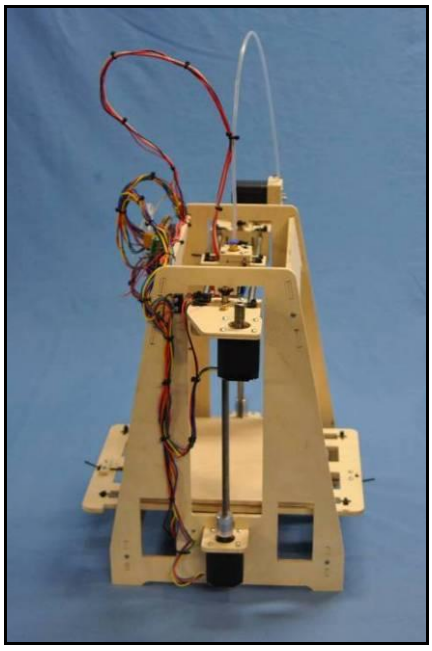
Wire Routing With Nylon Ties

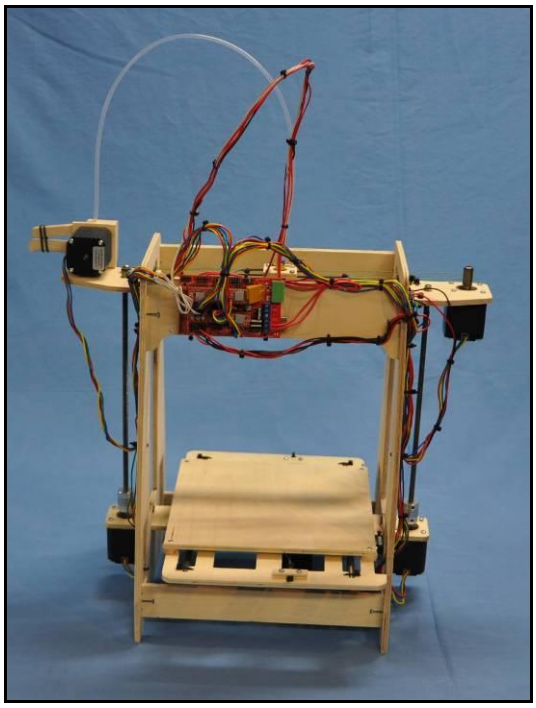
There are drilled holes in the frame and small extra small nylon ties included in the kit to secure the wires. Several sets of wires will need clearance to move with the Y-assembly. They included the:

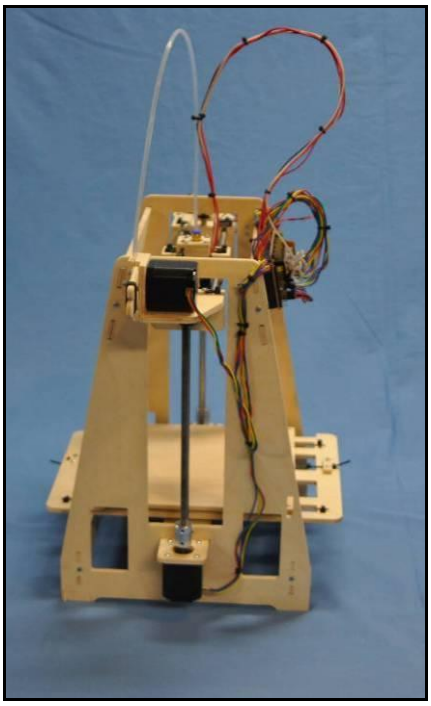
- Extruder and Y stepper motor wires.
- Z limit switch wires.
- The Extruder heater and sensor wires.

While there are several ways to correctly route the wires, below are pictures of typical wire routing. I have found the key is to start from the controller move outward.

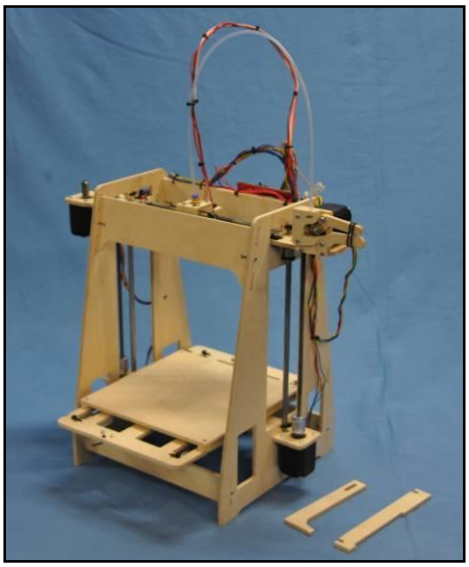








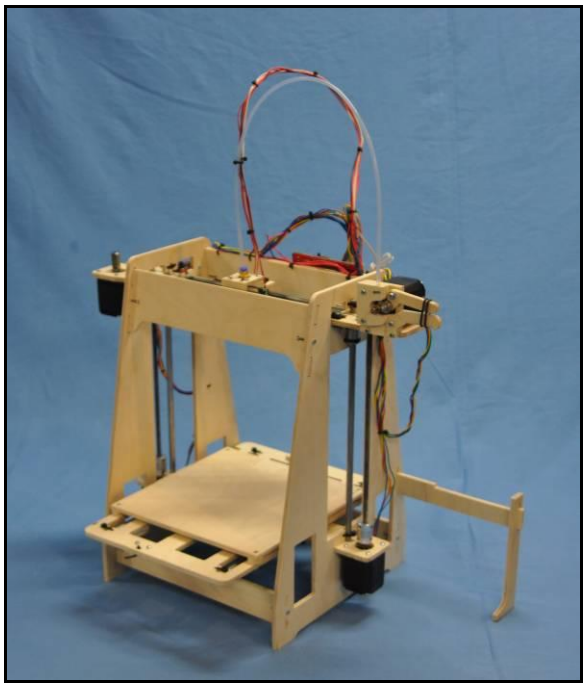
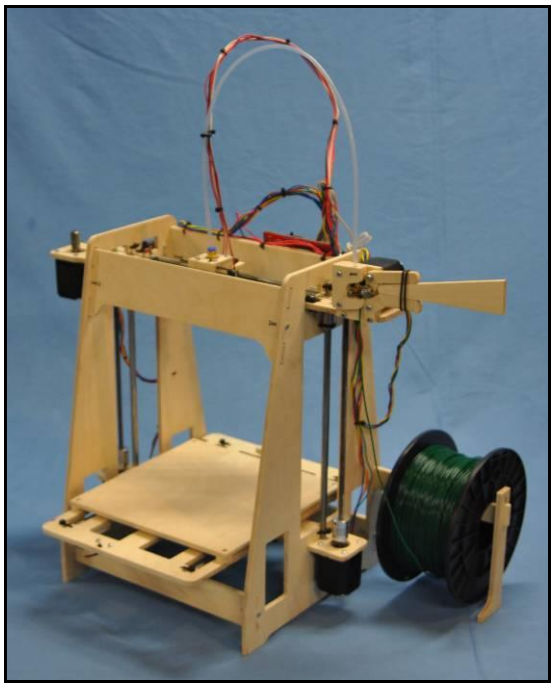
Filament Spool Holder



Parts for adding the filament spool holder include:

A. 1 Printer
B. 1 Spool leg
C. 1 Spool support

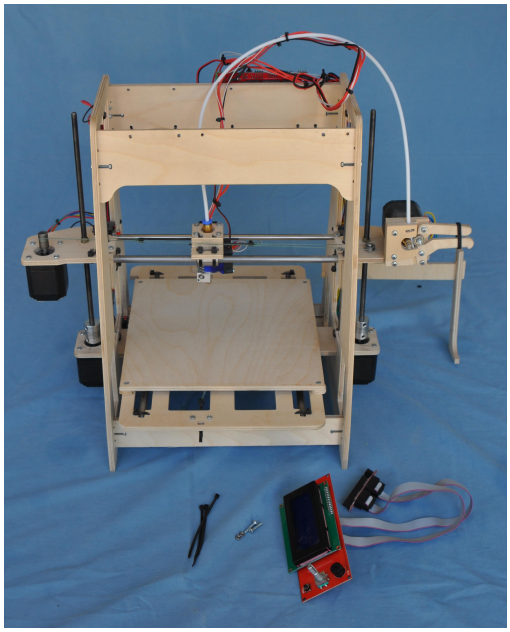
The reel holder is designed to quickly change spools of filament. The groove in the top of the spool support should be oriented to the outside to ensure spool clearance with the frame.

1. Insert the spool support into the right frame and spool leg rectangular slots.

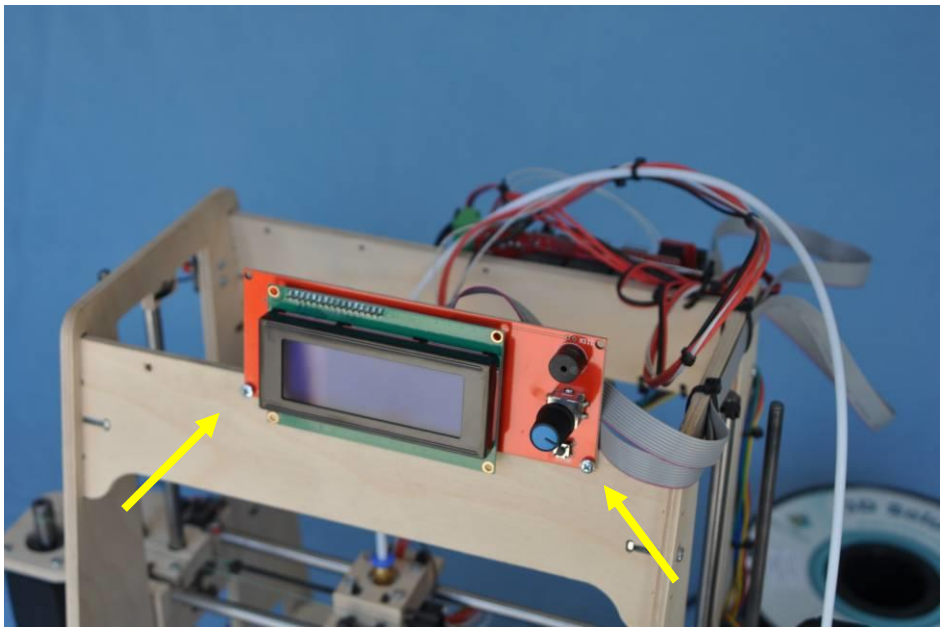
LCD/SD Card installation

This step is optional. Some may want to leave the LCD loose. Others may want to 3D print a housing and mount it differently.

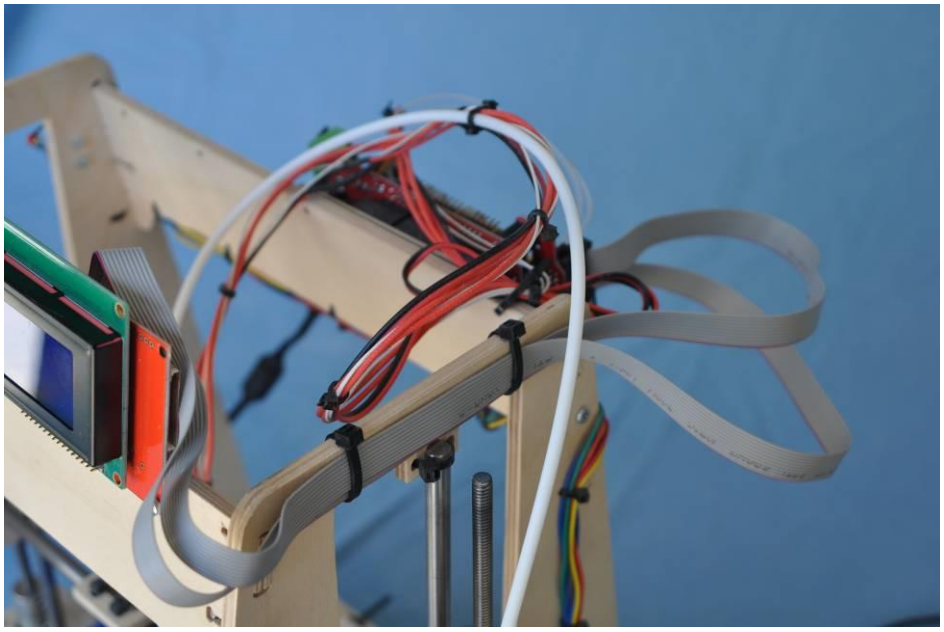


Parts for mounting the LCD include:

D. 1 LCD with connector adapter
E. 2 M3 x 16 mm machine screws
F. 2 M3 nuts



1. Insert the 2 M3 screws into the bottom corners of the LCD board thru the top mount. The LCD can be mounted to the left or the right depending on what holes are used for the mounting. Install the nuts and gently tighten the nuts.



2. Connect the LCD adapter to the controller board.
2. Route the ribbons and zip tie them to keep the out of the way and in order.

Congratulations your Printer is assembled!

If you are new to 3D printers, there is a lot of learning ahead. The good news is that there are many resources online to help you with questions. You will need to choose software and firmware that suits your needs.

First print (quick guide)

The deluxe kit, the board has been **tested** and the **firmware has been up loaded** to the controller and configured for the RP9. However, you may need to download the Arduino software to get the driver for your computer.

If a computer driver is needed:
1. Download and install Arduino Software
2. Browse to the drivers folder
2. Connect the controller to the computer via the USB.

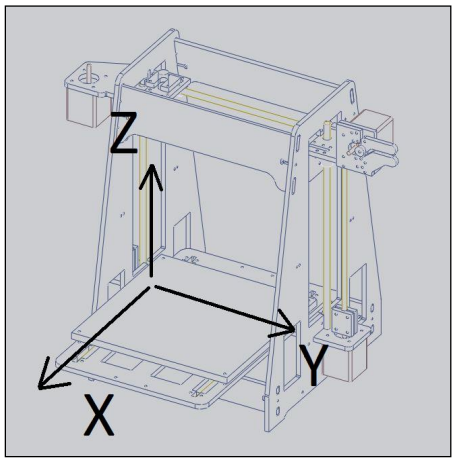
If you decide not to use a computer bit print directly from the SD card please see the LCD section on page 44

Initial setup and calibration of the printer will takes some time but once you understand the parameters you will be able to diagnose printing issues quickly. We have included some basic steps to get you started.

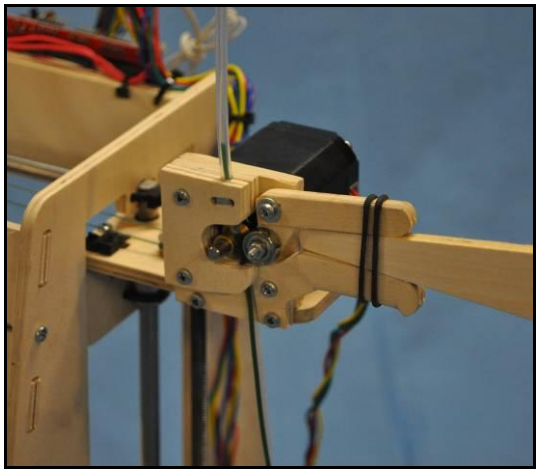
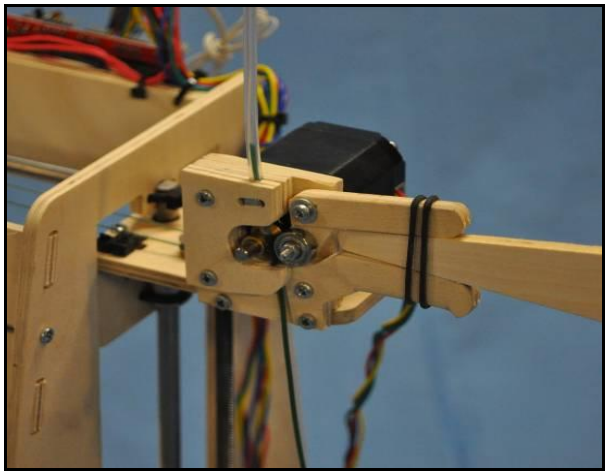
Connecting the printer
1. Connect the power supply
2. Connect the controller to the computer via USB
3. Open the controller software and connect the printer (250,000 baud rate)

Moving the X, Y, and Z axis
1. Use the software controls to move the X,Y and Z steppers. make sure the move in the correct direction. The diagram has arrows showing the positive axis directions.

If the motors move in the incorrect direction, it can be changed with a firmware setting or turning the stepper motor connectors 180 degrees. The power



Loading the 1.75 mm filament

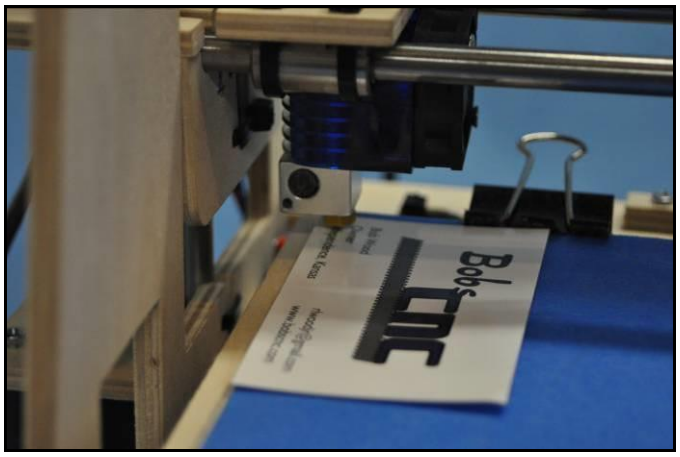
1. Insert the wedge tool (included in the kit) into the extruder driver releasing the force of the drive bearing onto the extruder drive as shown.
2. Insert the 1.75 mm filament into the bottom hole of the top mount through the filament extruder drive tube until it reaches the extruder.
3. Use the software controls to set the extruder to the correct working temperature of the filament. Once the extruder reaches the set temperature, use the software control to feed the filament into the nozzle. Check to make sure the extruder stepper motor rotates in the correct direction.

Homing and Z Height Adjustment

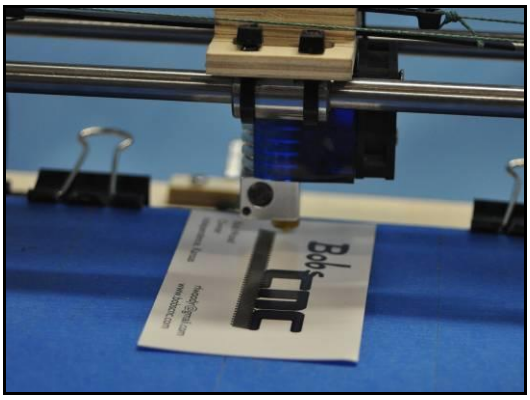
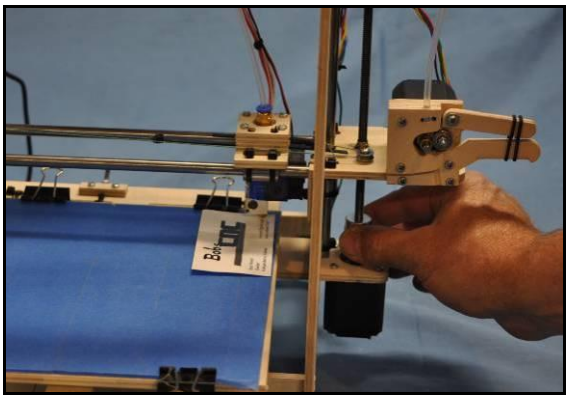
1. Install the glass build surface and binder clips (not included)
2. Home the axles to ensure that the limit switches are connected correctly

Note that the switches are wired normally closed. If the limit switches do not function, troubleshoot the switches using the M119 code.

3. Set the firmware for Z max length to 210 mm.
4. Use the G0 Z20 command to move the printer close to the bed.



5. Slowly move the Z axis close to the bed. Use a gauge or business card to get the right side of the bed the set distance to the nozzle. (business card is around 0.35 mm thick)

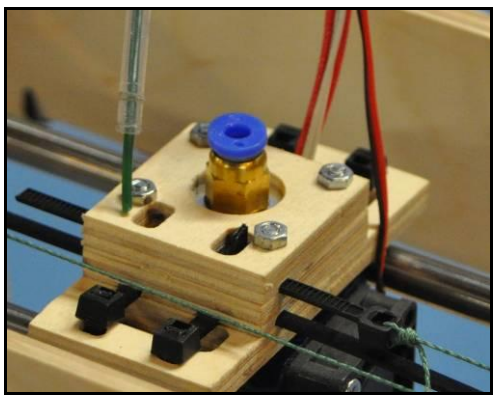
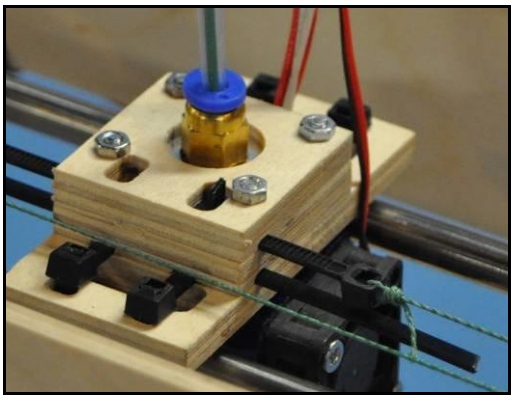
6. Once you get the height set for the left side, move the Y axis to the right a little at a time while adjusting the height of the nozzle from the bed to the set height by manually adjusting the right Z stepper motor.
7. Repeat steps 4 and 5 until the nozzle is the same distance from the bed for Y travel.
8. Note the Z position displayed in the software. If the number is positive, then subtract this number and add the gauge thickness from the Z max length. For example, if the Z max length was set to 210 and once moved to the set position the software position reads 7.1 mm. then the Z max length would need to be set to 210 - 7.1 + 0.35 = 203.25
9. Set this value in the EEPROM for the Z max length.
10. Home the Z axis and use the G0 Z0.35 command to verify.

Using Repetier firmware to Edit the Z max height

To store the Z axis max height value into EEPROM, use the Repetier Software menu ***config >>firmware EEPROM configuration*** to open up the printers EEPROM settings. Once it opens up (printer needs to be connected), then scroll down and find the Z max height. This is the number that defines the distance from the limit switch to the nozzle touching the build surface. Enter the calculated number and apply the changes. Re-home in the manual mode and ensure the Z value is updated correctly.

Tips and tricks

- Isopropyl alcohol to clean blue painters tape on the glass bed to ensure first layer sticking
- First layer is key. Experiment to learn what is the best layer height.
- Different colors will have different printing characteristics

- Push to connect (SMC) will quickly release the filament guide tube and allows for quick filament changes.

The printer should be ready, but you will need to configure your slicer to match he RP9. The important parameters to get started are:

Nozzle diameter	0.4 mm
Filament diameter	1.75 mm
Exrtruder retraction	6 to 8 mm
Skirt	1 or 2 loops
Layer heights	less than 0.4 mm

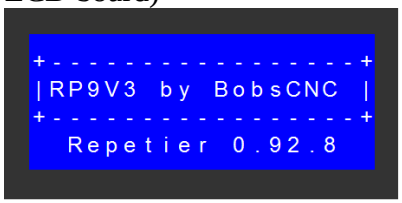
These parameters can be found in the configuration of most slicing programs. The one I recommend is Slic3r. It has a very good manual that will get you started.

Other supplies that you will need are:

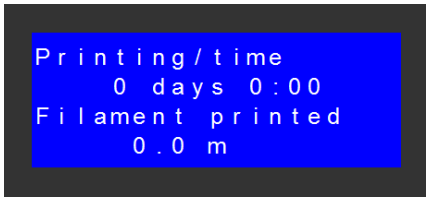
- Build plate can be glass or aluminum
  - Size is 200 to 215 mm square
- Blue painters tape (or a glue stick) and build plate clips
- 1.75 mm PLA with 0.05 mm or less tolerance

LCD Main Screens

When you plug the power supply you should get the splash screen showing the Printer and software version. (The contrast may need to be adjusted. The adjustment is on the back of the LCD board)



After a few seconds it will display the main menus which can be flipped through by turning the encoder knob. Note: The last screen is for multiple extruders and is not needed for the RP9

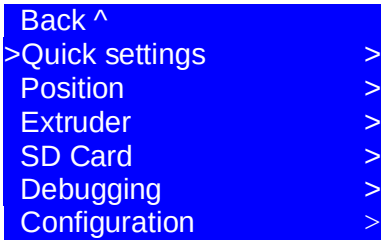


There are 2 main screens that display needed information when printing.

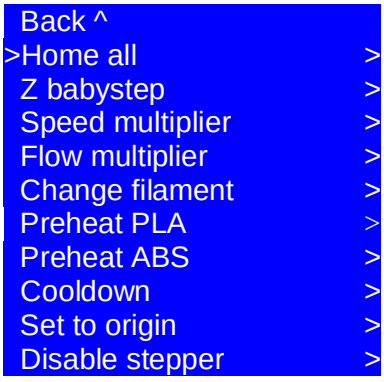
Line 1: Extruder temperature, set temperature, and power as %
Line 2: Z position and home switch status
Line 3: Number of commands waiting in the buffer
Line 4: Printer status

Line 1: X position and home switch status
Line 2: Y position and home switch status
Line 3: Z position and home switch status
Line 4: Printer status

If you click the encoder knob the screen will display the sub menu:



Quick settings Menu



Home All

Moves the printer to the home position and sets the values for X, Y, and Z. Homing is the first step and must be run before a print is started.

Z Baby Step

The baby step feature will allow you to make fine adjustments in the Z height moving the extruder up or down. This is a great feature for getting the first layer perfect.

Speed Multiplier

This feature allows the printer speed to be changed while printing.

Flow Multiplier

This feature allows the printer extruder flow to be changed while printing.

Change filament

This feature allows you to change the filament during the print

Preheat PLA

This feature set the extruder temperature to 190 C.

Preheat ABS

This feature set the extruder temperature to 240 C.

Cooldown

This feature turns off the extruder

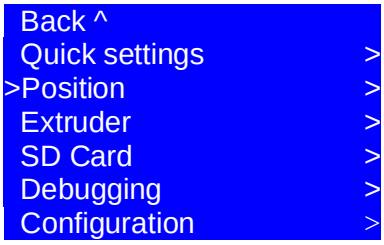
Set to Origin

This feature will reset the extruder feed position counter

Disable Stepper

This feature turns off power to the steppers so that you can turn them by hand.

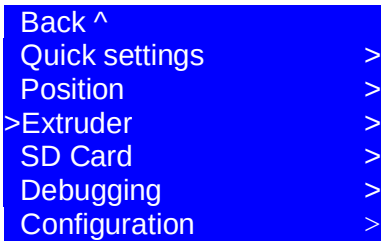
Position Menu



This menu will allow you to:

- Home all or each axis
- Move each axis (fast and normal settings)
- Move extruder stepper motor
- Set printer offsets

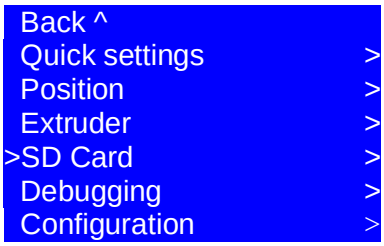
Extruder Menu



This menu will allow you to:

- Set the extruder temperature
- Turn the extruder off
- Move the extruder stepper motor
- Set extruder origin

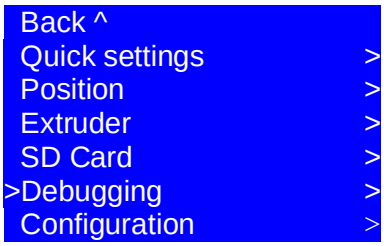
SD Card Menu



This menu will allow you to:

- Print file
- Delete file

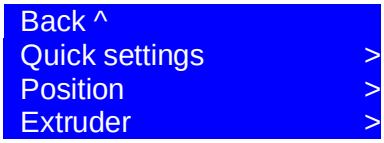
SD Card Menu



This menu will allow you to:

- Turn on/off ECHO
- Turn on/off INFO
- Turn on/off ERRORS

Configuration Menu



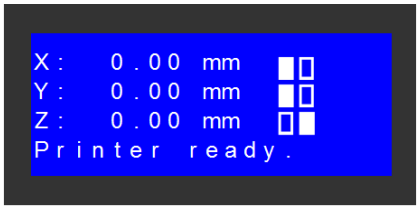
This menu will allow you to:

- Set language
- Set axis acceleration
- Set axis feed rates
- Set extruder parameters
- Store to EPPROM
- Load from EEPROM
- Z calibration

Printer Configuration

Home switch verification

This screen will update the values for the printer location. However, the home switch status will display the current status and can be used to make sure the switches are connected and working properly. The RP9 used switches that are normally closed. This means that when the get activated by physically pressing the switch they are in the open position.



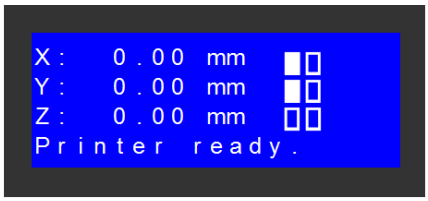
The screen above displays that the:
X min home switch is closed
Y min home switch is closed
Z max home switch is closed

This configuration will occur when none of the switches are active (being pressed by the axis stop). Please note that the printer does not require the X max, Y max, or Z min switches

Please use your fingers to physically press the X home switch and the screen will update to show that the X home switch is active (open)

Please use your fingers to physically press the Y home switch and the screen will update to show that the Y home switch is active (open)

Please use your fingers to physically press the Z home switch and the screen will update to show that the Z home switch is active (open)



Please use this screen to verify that each home switch is:

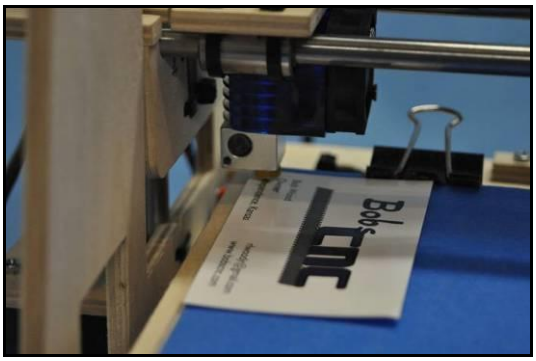
- Connected properly
- Working correctly
- Working on the correct axis

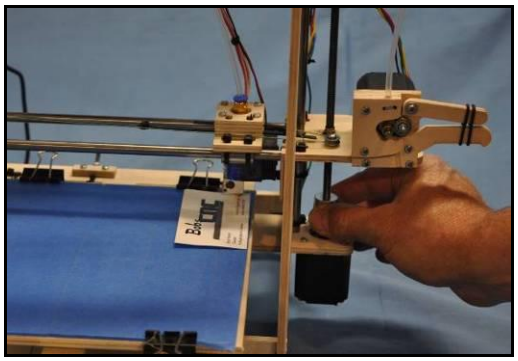
The printer will not function properly until the switches are working correctly.

Setting the Z level

There are 2 Z screws that move the extruder down to the build surface. These will need to be set so that the nozzle is at an equal distance during the entire Y range. In this step we will move the extruder nozzle close to the build surface and level the extruder by adjusting the Z threaded screws.

- Click the encoder and scroll to `Position`
- Click the encoder and scroll to `Z position fast`.
- Click the encoder and turn the encoder counter clockwise until the Nozzle is a "business card" thickness away from the build surface.
- Click and scroll up to the back until you get to the `Quick settings` menu
- Click the `Quick settings` and scroll to the `Disable stepper`.
- Click the encoder to disable the stepper motors.
- You should be able to easily, by hand, move the extruder back and forth on the Y axis. By hand move the z threaded rods to set the distance from the extruder nozzle to the build surface so that it is equal on both the left and right side





Calibrating the Z Height

The next step is calibrating the Z height. We will want to store the height from the Z max home switch to the nozzle tip touching the build platform (typically glass covered with blue tape).

From the main menu

1. click the encoder and scroll down to the `configuration` menu
2. click the encoder and scroll down to the `Z calibration` menu
3. click the encoder once more
4. click the `Home all` menu
5. Once homed move to the `Z position fast` menu.
6. Click the encoder and turn the encoder counter clockwise until the extruder nozzle is within a mm or 2 of the build surface
7. Click the encoder and scroll to the `Z position`.
8. Click the encoder and carefully adjust the Z height until the nozzle just touches the bed.
9. Click the encoder and scroll to the `Set Z=0`
10. Click the encoder and scroll to the `Home All`
11. Scroll up to the `Back` menu
12. Click the encoder and scroll to the `Store to EEPROM` menu
13. Click the encoder to store the values.

Before you save your first file to the SD card

The printer should be ready, but you will need to configure your slicer to match he RP9. The important parameters to get started are:

Nozzle diameter	0.4 mm
Filament diameter	1.75 mm
Exrtruder retraction	6 to 8 mm
Skirt	1 or 2 loops
Layer heights	less than 0.4 mm

These parameters can be found in the configuration of most slicing programs. The one I recommend is Slic3r. It has a very good manual that will get you started.

Recommendations for beginning the print

The first layer is real important for a quality print. There is a process that I have developed that can help get you started. The main purpose of this process is to slow things down and get everything just right before the part starts to print.

- Load the SD card and click the encoder to print the selected file.
- Wait until the printer homes and is on its way down.
- Click the encoder and select the `Quick settings` menu
- Scroll down to the `Speed multiplier` and reduce the speed to 25%
- Click the encoder and move into the `Babystep` menu.
- Once the extruder starts printing the skirt (1 to 2 loops) you can make the fine adjustments to the Z height to set the extruded filament to the perfect height.
- Once it is set scroll back to the `Speed multiplier` and set it back to 100%

So what is the perfect height? That's not so easy to explain, but with a little experimenting you will soon be able to set it quickly. I have found that blue tape works the best for me. If the nozzle is too close, the part will tear the tape when you remove the print. If it is too far, the print will come loose sometime before the print is thru. If the height is correct, the part will snap off the tape and the tape will be undamaged. The best way to explain the correct height is the filament should be a little squished.

Appendix

Arduino 2560 Firmware settings

The firmware can be up loaded to the Arduino board using the Arduino software that can be downloaded at: http://arduino.cc/en/main/software

There are several good choices in firmware. Repetier is a good choice and can be located at: http://www.repetier.com/ It includes the software and firmware for a complete package.

The firmware will need to be configured. Good starting values are:

X Velocity	100 mm/s
Y Velocity	100 mm/s
Z Velocity	4.5 mm/s
E Velocity	100 mm/s

X Homing Velocity	100 mm/s
Y Homing Velocity	100 mm/s
Z Homing Velocity	4.5 mm/5

X Acceleration	2000 mm/s^2
Y Acceleration	2000 mm/s^2
Z Acceleration	100 mm/s^2
E Acceleration	100 mm/s^2

With micro stepping set to 16

X stepper motor	98.5 steps/mm
Y stepper motor	98.5 steps/mm
Z stepper motors	2519.685 steps/mm
E stepper motor	164.7 steps/mm

Warranty and Return Policy

30 Day Warranty

BobsCNC will guarantee all supplied parts for 30 days after the delivery date. If there are missing or defective parts, the buyer must contact Bobs CNC during this 30 day time frame using the "Contact Us" form located at BobsCNC.com. After 30 days, no warranty is given nor will any refund be given. In order to receive a refund, the kit must not have been assembled or attempted to have been assembled. Bobs CNC will have the sole discretion to determine if a kit or any part of the kit is eligible for a refund.

Technical Assembly

BobsCNC cannot guarantee the buyer's ability to assemble the kit or calibrate the printer. The quality of the prints are dependent on proper set up and understanding of the printing parameters, and therefore results may vary. The assembly, calibration, and understanding of these parameters requires technical and mechanical proficiency. Please review the instruction manual and this return policy prior to purchase as there can be no refund for a kit that has been attempted to be assembled or assembled fully.

Return Shipping Damage

Bobs CNC will not be liable for any damage incurred during shipping for a return. It is suggested that in case of a return that the buyer purchase shipping insurance.