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**IMPORTANT SAFETY INSTRUCTIONS**

**WARNING**

**SHARP EDGES**

Use caution during assembly and operation of the 3D printer to ensure no sharp edges will cut you. Inspect the printer for any damage prior to use.

**WARNING**

**FIRE**

Use caution to minimize risk of fire. Always operate the printer a safe distance away from flammable items. Use in well-ventilated areas. DO NOT place a storage cover on the unit during operation. Only place a cover on the printer after it has thoroughly cooled down.

**WARNING**

**HOT SURFACE**

Motor surfaces become hot during operation. Hotend and heater cartridge become hot during operation. DO NOT touch hot surfaces, because they can cause severe burns. Allow the hotend to cool before touching it without proper tools.

**WARNING**

**SHOCK**

There is a danger of electric shock. Use only undamaged electrical chords. DO NOT touch bare wires or receptacles. DO NOT touch the 3D printer or chords if hands are wet. Ensure that all cords are free of damage before connecting to the power supply. Ensure that you have a sufficient electrical supply for supporting the requirements of the motor.

**WARNING**

**RISK TO BREATHING**

Always use your 3D printer in a well-ventilated and clean area. Gas emitted by melting of Polylactide (PLA) or Acrylonitrile butadiene styrene (ABS) can contain contaminants that are harmful to breathe. Never breathe the air that comes directly out of the hotend. This air is not suitable for breathing. If you feel ill from breathing while operating your 3D printer, stop and seek medical attention immediately.

**WARNING**

**Fragile**

Electrical pins and sensors are delicate. Handle with care. Unless instructed, DO NOT force components together. Read the instructions carefully to prevent damaging parts during assembly or operation.
LITTO AT A GLANCE

- CARRIAGE
- Z-AXIS THREADED ROD
- X-AXIS BEARING CAP
- HOTEND COOLING FAN
- Y-AXIS BEARING CAP
- Z-AXIS SMOOTH ROD
LITTO AT A GLANCE

EXTRUDER MOTOR

POWER SWITCH

EXTRUDER

SPOOL HOLDER

USB CONNECTION

HOTEND

PRINT COOLING FAN

PRINT BED

Z-AXIS PLATFORM

MOTOR COMPARTMENT

POWER SWITCH

USB CONNECTION
Litto Bill of Material

Litto Laser Panels
(1) Hotend
(1) Cartridge heater
(1) Thermistor
(1) Extruder motor
(1) Extruder bearing
(1) Cooling fan ducts
(1) Filament guiding tube
(1) 164mm GT2 belt
(1) 188mm GT2 belt
(2) 423mm GT2 belts
(2) 454mm GT2 belts
(8) Brass slider bushing
(8) 608ZZ ball bearings
(4) LM8 linear bearings
(8) Pulleys + (8) 3x5mm set screws
(2) 36-tooth pulleys
(8) Aluminum rods
(1) Bed plate
(3) Calibration springs
(3) Mechanical endstops
(3) Brass Thumb Screw
(2) LED strips
(2) 40mm cooling fans
(1) 50mm cooling fans
(3) NEMA17 stepper motors
(1) NEMA17 stepper motor with threaded rod
(1) Arduino MEGA 2560
(1) RAMPS 1.4
(4) A4988 stepper drivers
(1) Power supply
(1) Power switch
(1) Female power plug
(1) Power cord
(1) USB cable

(30) M3 x 10 screws
(85) M3 x 16 screws
(12) M3 x 20 screws
(8) M3 x 25 screws
(15) M3 x 35 screws
(3) M3 x 25 flathead
(1) M4 x 16 flathead
(3) M4 x 20 screws
(10) M3 washers
(100) M3 nuts
(1) M4 washers
(10) M4 nuts
(2) Wires (Arduino to Power)

Included In Kit

Tool List
(1) M4 Allen Key
(1) M3 Allen Key
(1) 1.5mm Hex Key
(2) Zip Ties
Before you Start

Before you attempt to assemble any of part the Ditto / Litto 3D Printer, it is imperative that you read the build instructions fully and ensure you understand every part of the instruction. While Tinkerine Studio provides warranty for all parts of the 3D printer, this does not cover damage caused by not following the instruction manual or other end-user error.

Go down the BoM (Bill of Material) and tools checklist and ensure that you have all the required parts to assemble the Ditto 3D Printer. Extra screws have been included into the kit. If you find anything missing, please contact us via e-mail at support@tinkerines.com

Give yourself plenty of room and clean space during the assembly process. This prevents delicate components like the electronics or bearings from being damage by dust or blunt force.

To ensure proper alignment of the panel and overall rigidity of the printer, it is highly recommended that the assembly is done on a flat surface.

Wipe off any excess grease you find on the screws with a napkin or an old towel. Screws are generally greased in order to prevent rusting during production. Cleaning off excess grease will keep your hands and printer clean during assembly.

Ditto is a rigid and robust 3D printer once assembled, however during the assembly process, extra care needs to be taken to make sure delicate parts require more precision than force to come together. If during the assembly process, you are unsure of the instructions, please contact us for support. Remember, unless instructed, no part in the assembly process should you need to exert a high amount of force to fit pieces together.

Before starting calibration, ensure that all screws and pulley setscrews are properly tightened. Common calibration issues such as skipping and backlash are usually caused by loose pulleys and unsecured components.
Z - Platform Assembly

Parts Required

- M3x35 Screw x14
- M3x10 Screw x4
- M3x16 Screw x4
- M4x20 Screw x1
- M3 Nuts x18
- Lead Screw Nut x1
- 45mm Bearing x2
- Bearing Holder
- Z-Arm x4
- Z-Arm x2
- Z-Arm x2
- Z-Bridge x2
- Bed Plate
- Z-Base

Tools Required
- M4 Allen Key
- M3 Allen Key

1. M3x10 (x4)

Screw nut comes attached to the lead screw motor. Remove from screw and wipe off excess grease before installation to bed.
2. Insert a 45mm linear bearing into two bearing clips. Note the rounded edge on the clips should be facing the same direction. Check to make sure the bearing is fully seated into the clip and aligned in the middle. You will need two sets.

3. Similar to Step 2, take two z-axis arms and wedge it into the other side of the linear bearing. At this point, check to see that there is no gaps and both sides are evenly press fitted into the linear bearing. Do this for both sets.

4. Add the side arm panels to the existing assembly, note the different panels + orientation of the arms shown in the picture.
5. One by one, insert the M3 Nut into the T-slots shown in the picture. Screw the four M3x35 screws in but do not tighten them all the way.

6. One by one, insert the M3 Nut into the T-slots shown in the picture. Screw the four M3x35 screws in but do not tighten them all the way.
7. Repeat step 6 and attach the second arm to the assembly.

8. Place the mid section into the respective slots on the assembly. One by one, insert the M3 nuts into the T-slots and secure with the M3x35 screw.
9. During this point, double check to make sure all panels are properly aligned and the top side of the bed is leveled with the arms. Tighten all screws.

10. M3x16 (x4) M4x20 (x1) M3 Nut (x4)
Litto Frame Assembly pt. 1

Parts Required
- M3x16 Screw x39
- M3 Nuts x39

Tools Required
- M3 Allen Key
- Adhesive LED Strips

Right Side Panel
- Top Front Panel
- Left Side Panel
- Motor Bracket
- Central Back Panel
- Top Ring Panel
- Base Panel
- Bottom Bracket
- Bottom Front Panel
- Z-Constraint A
- Z-Constraint C
1. Install the two Z-Constraints B as shown in the picture. Make sure to face the back panel the correct. Insert the constraint into the correct tabs, place the M3 nuts in position and screw in the M3x16 screws from the other side.
Install the top Z-Constraint A. Similar to the bottom Z-Constraint, insert the piece into the slots and secure with nut + screw.
Using the two LED light strip supplied in your kit, one-by-one peel off the backing to reveal the adhesive strip and stick the LED strip in the area shown in the picture. Make sure the LED is applied inbetween the T-Slot and edge of the inner ring.
3.

Insert the top ring and and bottom plate into the back plate, then secure with T-Slots. For the top ring, the side with the led should be facing downward. Thread the LED wires into the hole shown in the picture.
4.

Install the two side panels into the main body. Secure each side with five M3x16 screws and nut. Make sure the panel with the power switch cutout is on the left side.

M3x16 (x10)
M3 Nut (x10)
5.

Install the top front and top bottom panels. At this point, you will want to make sure all the panels are properly aligned and leveled to a flat surface. Due to the natural property of wood you wooden frame may not be perfectly tapered to the surface, however we can correct this later on once the other components are installed.

M3x16 (x12)
M3 Nut (x12)
6.

Install the top and bottom brackets into the main body. You will need to insert some screws from the front of the machine.

M3x16 (x7)
M3 Nut (x7)
Litto Frame Assembly pt.2

**Parts Required**

- M3x10 Screw x6
- M3x16 Screw x6
- M3x20 Screw x4
- M3x25 Screw x2
- M3 Nuts x12
- Z-Constraint D
- Z-Constraint B
- Endstop Switch x3
- Endstop Spacer x7
- Z-Axis Smooth Rod (270mm) x2
- Assembled Z-Platform
- Lead Screw NEMA17 Stepper Motor

**Tools Required**

- M3 Allen Key
Gently insert the Z-Axis smooth rods through the bottom Z-Constraint, linear bearing of the Z-Axis bed and finally the top Z-Constraint. If you feel there is any amount of resistance once you reach the linear bearings within the z-axis arms, do not force it in. Pull the rod backwards gently and retry. Rotating the rod gently while inserting may help it slide in more easily. Take your time with the bearing, forcing the rod in will cause the bearing balls to dislodge.
2.

The Z-Axis rods should now sit flush within the bottom and top Z-Constraint. Attach Z-Constraint D to C, secure the two pieces together with three M3x16 screws each.
3.

The Z-Axis rods should now sit flush within the bottom and top Z-Constraint. Attach Z-Constraint D to C, secure the two pieces together with three M3x16 screws each.
4.

Insert the Z-Axis Motor and lead screw from the bottom and into the Z-Axis platform. To connect the lead screw into the nut within the platform you will need to manually turn the lead screw rod until it threads into the nut. Secure the motor to the frame with four M4x10 screws. Face the pin connectors of the motor toward the front.
Install each endstop trigger as shown. Note the orientation of the trigger and the direction it's pointing. Depending on the trigger, you will need different amounts of spacers with the endstop.

After the endstop trigger is installed, thread the wires through the holes shown in the picture. Use one of the smaller adhesive wooden clips provided in your kit to prevent the wire from slacking/getting caught once the printer is in motion. Insert the wire into the clip and tape it to the bottom side of the top ring beside the LED strip.
Gantry Assembly pt. 1

**Parts Required**
- M3x16 Screw x20

**Tools Required**
- M3 Allen Key

**Parts Required**
- Pulley (Large) x2
- Pulley (Small) x6
- GT2 Belt (417mm) x2
- GT2 Belt (415mm) x2
- GT2 Loop Belt (166mm) x2
- Bearing x8
- Inner Bearing Cap 8 Pieces
- Outer Bearing Cap 8 Pieces
- X-Axis Smooth Rod (270mm) x2
- Y-Axis Smooth Rod (255mm) x2

1.

Insert both ends of the belt onto the Slider B piece. Make sure to line up the belt with the teeth so that there is no spaces left at the end of the slots. Make sure to note the two different sets of belt length during the assembly. The two longer sets will be for the Front and Back slider, and the short sets are for the Left and Right sliders.
2. Front Slider

X Axis Belt - 417 mm

M3x16
3. Back Slider

M3x16

X Axis Belt - 417 mm
4. Left Slider
5. Right Slider

M3x16

Y Axis Belt - 415 mm
6.

Insert eight bearing into the respective slots within the frame. The cutouts are meant to be a snug fit with the bearings, however if you have trouble putting the bearings in there, give the wooden inner ring a very light sand with some sand paper.
With the previously assembly slider unit, you will now need to add the rod, pulleys, inner bearing cap, and depending on the slider you may need to include a looped belt. Assemble the slider units as shown on the picture and note the orientation of the pulley and panel direction of the inner bearing cap. Assembled each and set aside until you have all four slider units ready for the next step.

7. Front Rod

8. Back Rod
9. Left Rod

10. Right Rod
11. Font + Back Slider

Using the previous slider assembly pictures as a reference. Insert the Front and Back slider assembly into the frame. One way to do this would be to skewer the items on one by one as you insert the rods from one end.

For example, to insert the back rod from the right side of the frame, the order would be:
Right Inner Bearing Cap > Small Pulley > Back Slider > Large Pulley > Looped Belt > Left Inner Bearing Cap

To insert the front rod from the right side of the frame, the order would be:
Right Inner Bearing Cap > Small Pulley > Back Slider > Small Pulley > Left Inner Bearing Cap

Make sure to note the orientations of the inner bearing caps, and directions of the pulleys.
12. Left + Right Slider

Similar to the Front and Back rod assembly, installing the Left and Rod right will require you to insert the rod from one end while inserting the parts in order. Here is the tricky part: While skewering the pulleys onto the left and right rods, you will also need to skewer the belts from the front and back sliders.

To insert the left rod from the front side of the frame, the order would be:

**Front Inner Bearing Cap > Small Pulley > Back Slider > Small Pulley > Back Inner Bearing Cap**

To insert the right rod from the front side of the frame, the order would be:

**Front Inner Bearing Cap > Small Pulley > Back Slider > Large Pulley > Looped Belt > Back Inner Bearing Cap**

Once the Left and Right rods are installed, you will need to pop the Front and Back rods back out slightly to loop the belts onto the pulleys. Once the belts are seated onto the pulley, you will need to use a bit of force to insert the rods into the bearing.

After installed the the gantry, all the belts (except for the closed loop belts) should be looping across a pulley on each end.
12.

Install the outer bearing caps to cover the exposed bearing and prevent the rods from sliding out. If you have oriented the inner bearing caps correctly in the previous steps, it will align with the outer bearing caps. If not, you need to flip the inner bearing cap.
Gantry Assembly pt.2

**Parts Required**
- M3x10 Screw x4
- M3x50 Screw x3
- 45mm Bearing x2

**Tools Required**
- M3 Allen Key

**Carriage Bottom**
![Carriage Bottom Image]

**Carriage Top**
![Carriage Top Image]

**Linear Bearing Holder**
![Linear Bearing Holder Image]

X-Axis Carriage Smooth Rod (225mm)

Y-Axis Carriage Smooth Rod (225mm)

If your carriage comes to you partially assembled. Skip ahead to page 40 of the assembly manual and follow the instructions listed for assembled units.
1. Carriage (X-Axis Bearing)

Take extra care when inserting the smooth rod into the linear bearing. Go at it slowly and make sure to not force the rod into the bearing to prevent the ball bearings from dislodging.

2. Carriage (Y-Axis Bearing)
3. Take extra care when inserting the smooth rod into the linear bearing. Go at it slowly and make sure to not force the rod into the bearing to prevent the ball bearings from dislodging.

4.!
5.

The frame has been hidden to give you a clearer view. To insert the cross rods, one by one take the rods and insert it into one end of the slider. Push the rod into the first slider to give you enough room to bring the rod up into the gantry so it becomes leveled with the second slider. Then retract the rod so it can be inserted into the second slider.

For Pre-Assembled Carriage:
Position the carriage in the right direction (Arrow on assembly pointing toward back of printer), take any of the two rods and insert it carefully into the respectively linear bearing. Bring the rod and carriage into the gantry space, and insert one end of the rod into the slider, twist the rod while supporting the slider will help you move the rods easier. Once you have enough clearance to insert the other of the rod into the slider, twist the rod again to insert into the slider on the opposite side. Repeat with second rod.

![Diagram of frame with cross rods inserted into sliders]

Take extra care when inserting the smooth rod into the linear bearing. Go at it slowly and make sure to not force the rod into the bearing to prevent the ball bearings from dislodging.
At this point this is what your gantry should look like from the top. Make sure to aligned the pulleys on both sides of the belt so the belt is sitting parallel with the middle of the sliders. Tighten the sets screws on the pulleys once you have aligned them all.
7.

M3x50 (x3)
You're almost done with the gantry assembly. For the most part you should now have a gantry system that you can move manually by hand. Move on to part three of the gantry assembly to complete the gantry system.
Gantry Assembly pt.3

You may have v.2 timing pulley included in the kit. Follow the instruction as per the v.1 pulley.

### Parts Required
- M3x10 Screw x8
- M3 Washer x8
- M4x16 Screw x1
- M4 Washer x1
- M4 Nuts x1
- NEMA17 Stepper Motor x2
- Motor Bracket
- Motor Wedge

### Tools Required
- M4 Allen Key
- M3 Allen Key

36 Tooth Timing Pulley
- v.1 x2

18 Tooth Timing Pulley
- v.2 x2
As shown in Step 1, fasten the motor bracket to the motor and slide the pulley onto the motor shaft. Lightly tighten the motor bracket screws as you will need to make minor adjustments in the second step.

1. Before inserting the motor bracket into the slot on the frame, insert a M4 nut into the T-slot.

2. Look the belt around the pulley and seat the motor into the slot. You may need to shift the motor forward or backward within the bracket to make sure the belt is tensioned and does not have extra slack. Tighten the screws once the motor is in the correct position.

4. Position the pulley so the belt is perpendicular and not angled in a way that the belt is rubbing against the pulley or the wooden frame. Tighten the set screw on the flat edge of the shaft once you have positioned the pulley.

5. Insert the M4 screw from the button and secure the motor bracket to the frame. Insert the motor wedge to tuck it under the other side of the motor.

6. Connect the 4-pin motor wire to the port located on the bottom edge of the motor.
1. As shown in Step 3, insert the motor from the back with the pulley already sitting in the looped belt from the front. The tapered end of the pulley should be pointing away from the motor.

2. Insert the M3 screws to secure the motor to the frame. Make sure to position the motor on the frame at a point where the belt is properly tensioned to avoid giving the belt any slack.

3. Tighten the setscrew within the pulley on the flat edge of the motor shaft to secure the pulley.

4. As shown in Step 4, take a minute to ensure that all belt are properly aligned. Belt should always sit perpendicular to the pulley and should not be angled in any way. Also make sure the the belt teeth is fully seated into the grooves of the pulley and not chewing into the walls of the pulley. You may need to loosen the sets screws on the pulley to re-adjust the positions.

5. Connect the 4-pin motor wire to the port located on the bottom edge of the motor.
Your printer’s gantry system should be fully assembled now. You should be able to manually move the carriage around on the X+Y axis. Double check to make sure all belts are properly secured + tensioned, and that all setscrews are properly tightened.
Carriage Assembly

Parts Required
- M3x16 Screw x36
- M3x25 Screw x2

Tools Required
- M3 Allen Key

Parts Required
- Fan Shield x1
- Fan Duct x2
- Electric Fan x2
- Thermistor
- Ceramic Heater Cartridge
- Extruder Assembly
- Hotend Assembly

Ceramic Heater Cartridge
1. Place the bottom portion of the extruder onto the carriage and insert the hotend + hotend mount into the center of the carriage through the slot located on the back on the carriage.

With the two M3x20 screws, secure the extruder and hotend to the top plate of the carriage. The screws should thread into the hotend mount, securing all the components together.

Ensure that the acrylic spacer is attached to the top of the hotend and leave the ceramic insulation wrapping attached to the hotend.

2. From the front, your carriage should now look like this. Make sure the larger portion of the extruder is on the left side. The extended portion of the hotend should also be pointing toward the left.
3.

Now that the hotend and the bottom portion of the extruder is secured to the carriage, we’ll now re-assemble the extruder. Place the spring back into the holder pin and pinch it with the top portion of the extruder. Line up the mounting hole and screw in the two M3 screws that we have removed earlier.
From the top of the extruder, look down and check that there is a clear path from the extruder to the nozzle. The groove of the hobbed bolt should be positioned so that it feeds into the hotend. If the alignment of the hob is off, use an Allen key to loosen the setscrew on the hob and reposition. Make sure to set the screw on the flat face of the extruder motor shaft.
5.

Take extra care when tightening the setscrew for the thermistor. Turn the setscrew very slowly as the glass on the thermistor will crack if there is too much pressure applied. There just needs to be enough force applied so the thermistor does not slide out of its slot.

On the back face of the hotend, there will be two slots. The large of the two slot will be for the heater cartridge, and the smaller one is designated for the thermistor. Insert the heater cartridge and therminstor into their respective slots and secure them in place using the setscrews located on the sides of the hotend. Once the thermistor and heater cartridge are in place, route the wire into the wire guide shown in the picture.
To install the print bed fan, grab a fan and point the sticker side downward. Orientate the fan so the wire is pointing toward the back of the printer, doing so will give you a cleaner look when you are performing wire management. Similar to the wires for the hotend, route the fan wire up the wire guide.

With the M3 screws, thread it through the fan duct and fan into the screw holes located on the bottom plate of the carriage. The mouth of the fan duct should be pointed toward the hotend.
To install the hotend cooling fan, grab the fan and point the sticker side toward the hotend. The fan should sit between the two carriage plates so if it does not fit, you will need to loosen the carriage screws. Route the fan wires so that it comes out of the top right corner and sits infront of the fan and wire guide. Secure the fan to the carriage with screw 1 and attach the fan guard to the with screw 2 + M3 Nut.
8.

You have completed the extruder and fan assembly. Double check to make sure all the fans are facing the right way and that all the wires are properly routed to go up the wire guide. All components on the carriage (hotend, motor, fan) should be properly secured and tightened. Connect the 4-pin motor wire to the extruder motor.
You are almost done assembling your printer. Move on to the next step to install the power supply and electronics to printer.
Electronics / Spool Holder Assembly

Parts Required

- M3x10 Screw x3
- M3x15 Screw x15
- M3x20 Screw x3
- M3x25 Screw x2
- M3 Nuts x18

Tools Required

- M3 Allen Key

Motor Compartment 1 of 2

Motor Compartment 2 of 2

Back Bracket

Electric Socket

Power Supply

Power Switch

50mm Electric Fan x1

ARDUINO

Fan Mount

Spool Holder

Arduino Mega 2560

Parts Required:
- Power Supply
- Fan Mount
- Power Switch
- Motor Compartment 1 of 2
- Motor Compartment 2 of 2
- Back Bracket
- Electric Socket
- 50mm Electric Fan x1
- Arduino Mega 2560
- M3 Allen Key

Tools Required:
- M3 Allen Key

Parts and tools for the assembly of the electronics and spool holder assembly are listed above.
1. Insert the power socket and power switch as shown. The power switch is pressure fitted and the power socket will need to be secured by two M3x16 screw + M3 nut.

Connect the L line (White) from the power socket to the middle prong on the power switch. Leave the other wires alone for now as they will be connected to the power supply later.

Above the power switch slot you will see another slot designated for the USB connection. Using two M3x10, secure the USB head to the frame and plug in the other end into the Arduino board once it has been installed.
Secure the fan mount to the power supply with a M3x10 screw and mount the fan onto the fan mount using the two M3x16 screws. The sticker side of the fan should be point away from the power supply.
3.

Secure the power supply and Arduino board to the bottom of the face plate. You will need to use M3 nuts to secure the Arduino board. Orientate the board and power supply so the ports are facing the left side of the machine.

⚠️ The power supply is set to 110v by default for use in North America. To use 220v (Europe), follow the instruction on the power supply to flick the switch to 220v.
4.

After the power socket is in place, install the outer bracket by securing it with the T-Slots shown in the picture. You may also choose to install this bracket as the last step after you have finished all the wire management, doing so will give you a bit more room to work with as you guide the wires into the electronic compartment.
6.

The back motor cover is composed of two pieces, assemble and secure with the two T-Slots on the top edge. The motor cover is then secured with two T-Slots on the sides. The nuts on the side will require more effort to push in as they were intended to be pressure fitted.
To assemble the spool holder, sandwich the smaller of the three spool holder pieces with the other two and secure it with the M3 screw and M3 nut. Do not tighten this yet as it will make it hard to insert the assembly into the main body.
Insert the spool holder assembly to the frame and secure the spool holder with four M3 screws inserted from the front side of the printer. Tighten all screws.
Print Bed Assembly

**Parts Required**

- M3x25 Inset Screw x3
- Calibration Springs x3
- Thumb Screws x3

**Tools Required**

- M3 Allen Key

Filament Guide Tube
Print Bed
One by one, place a spring between the print bed and the wooden platform. Insert the inset M3x25 screw from the top and secure it with a thumb screw. Repeat until you have all three points secured. Turn the thumb screw to tension the spring, ideally you will want the spring to be fairly compressed so the bed is firmly planted onto the platform.
Take the filament guide tube and thread it through the cut out located on the corner of the motor cover and motor bracket. Insert the other end into the top of the extruder. If you are having trouble threading the tube into the top of the motor compartment, lightly sand the inner ring.
You've finished assembly your very own 3D printer (well almost!). With all of the components in the printer, move on to the next step to begin the wiring portion of the assembly.
Remove the motor cover and filament guide.

1. Route the wires from the Left Side LED, X+Y+Z-Axis Endstop, X+Y Motor wire through the wire holes from the front side of the machine to the back. Route the wire so it runs behind the Y-Axis motor and underneath the X-Axis motor. Run all wires through the hole located on the back corner of the motor bracket.

2. Gather all the wires from the carriage fan, heater cartridge, thermister, Right Side LED, and extruder and route the wires through the hole located on the motor bracket.

3. You may choose to label the wires with masking tape before you route them through the hole located on the bottom left corner of the printer. This will help you indentify the wires later on.

NOTE 1: For the wires coming from the extruder units, make sure to leave enough slack so the wires still have some slack once the extruder moves to its homing location (Front left corner).

NOTE 2: Once the wires are all routed and connected to the electronics, use the supplied wire sleeve to clean up the exposed wires on the back and top of the machine. Use the larger sleeve for the back portion of the machine and the smaller wire sleeve to wrap the wires coming from the extruder.

NOTE 3: After the machine is fully wired, apply xx
**IMPORTANT**

There is a small triangle on the rightmost side. Make sure it aligns as shown in the diagram.
*Negative ends of the wire that do not have connector pins are marked with a black ink on the ends*

*After you have thread the endstop wires through the black plate, attach the pins into the connector housing before you plug them in.*

- Heater Cartridge
- Extruder Motor
- Cooling Fans (Print Bed)
- X Endstop
- Y Endstop
- Z Endstop
- Thermistor
- RAMPS 1.4
- X Motor
- Y Motor
- Z Motor
- Power Supply
- Heated Bed
- LED Strips
- Power Socket + Switch
- Cooling Fans (Hotend + Electronics)
That’s it! You have just finished assembling your very own Litto 3D printer. However there are just a few things to check before you power-up the printer for the very first time:

1. Make sure all screws and components are properly screwed down and secured.

2. While manually moving the the gantry system (extruder, belts, pulley, smooth rods, bearings), all components should operate smoothly and not interfere with one another. Check that all sets screws on the pulley are tightened, and all belts are aligned so they are seating fully in the teeths of the pulley.

3. All electronics are properly plugged in and seated into their correct ports. Make sure there are no exposed wires in contact with electronic components, and the electronic cooling fan is properly mounted and directing airflow to the Pololu driver.

4. Make sure there is no foreign objects along the path of moving components. Avoid using lubricant on the linear bearing (Z Axis + Carriage). Most lubricants (especially ones that contain propellants) might absorb dirt and become more viscous over time, which can cause more friction and cause damage to the bearings.
## Preliminary Run-Through

### Stage 1

1. Turn on the printer. Do not turn on the printer yet.

2. Connect the USB from the printer to the USB port on your computer. If you have an LCD/SD card unit, connect it to your printer.

3. Test the X-Axis endstop. Manually move the carriage by hand and push it to the left side of the printer and check to see if the slider will trigger the endstop. You will hear a click when endstop is trigger. Repeat the test with the Y-Axis Endstop. If the endstop does not trigger, you will need to re-adjust the position of the endstop so it makes contact with the trigger pieces on the slider.

4. Tighten the thumb screws underneath the print bed springs. This will tension the springs and prevent the bed from moving around during printing.

5. Test the Z-axis endstop. Manually turn the lead screw to bring the bed upward. As the bed approaches the nozzle, adjust the Z-axis trigger screw located on the back corner of the printer bed so that it makes contact with the endstop leaver before the nozzle touches the surface of the bed. The ideal distance between the nozzle and print surface should roughly be the thickness of a piece of paper.

6. Calibrate the print bed. Using the 3-point leveling system, manually move the hotend to the each of the four corners on the print bed. At each of the four point, adjust the thumb screws so the bed is evenly leveled on all sides.

### Stage 2

1. Turn on the printer.

2. Check that both LED light strip are lit.

3. Check that the hot-end cooling fans are on and directing airflow to the hot-end within the carriage unit.

4. Check that the electronics cooling fans are on and directing airflow to the Arduino board + Pololu drivers.

5. Check that the print bed cooling fan isn’t on. The fan for the print bed should only activate during printing.

6. If the LED or fan do not turn on, turn off the printer and disconnect the power source. Check your wiring to see if all wire are properly seated and secured in their sockets.

### Stage 3

1. Using Coordia (Control Software) or the T.I.M Controller, connect to the printer and test move each axis.

2. Home all axis. If the printer triggers the any of the endstop but doesn’t stop, shut off the printer immediately. Check the endstop pin connector to see if the pins are fully seated into the housing, then make sure the housing are properly connected to the pins on the electronics board. Since the X and Z axis endstop are grouped together, there might be a chance that you have them plugged in reversed.

3. Using Coordia or T.I.M, set the preheat temperature for PLA (180c). Monitor the temperature level and check that the heater cartrige and thermistor is working properly. If the hotend does not heat up, check that the heater cartrige and thermistor is plugged in correctly. Do not touch hotend with your finger to check the temperature as the cartrige can be functioning correctly while the thermistor is providing a false reading.

4. Your printer is ready to start printing. Follow the calibration guide to start printing your first object!