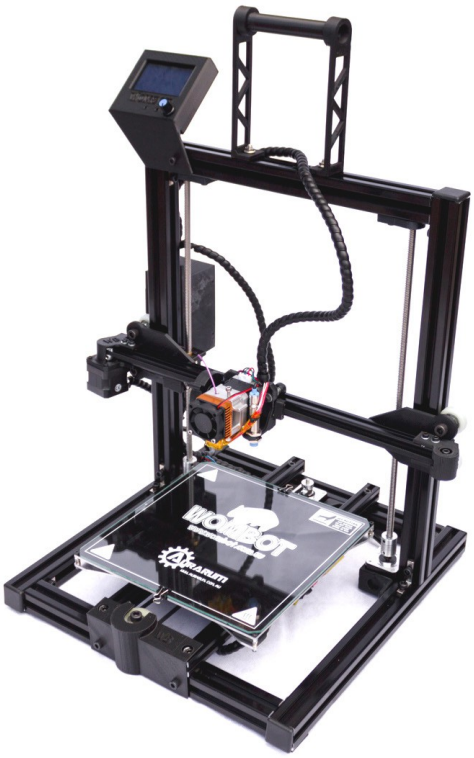
WOMBOT

Exilis



Kit

Assembly Instruction Manual

Wombot™ is a brand of

AURARUM

Introduction

Thank you for purchasing the Wombot Exilis Kit. Please read this assembly manual fully before beginning assembly of your printer and ensure that you understand every step of the assembly process. Please check that all required components are present before beginning assembly. Every care has been taken to ensure that you have a complete kit of components which will enable to you assemble your printer however should you find anything missing or damaged, please contact us at sales@aurarum.com.au to request replacements. Please note that support for the Wombot Exilis Kit is limited to email services. Because of the nature of this product, telephone support is not practical.

Health & Safety

Your health and safety are important to us and should be your top priority at all times. Please take care while assembling your kit, take your time and be careful when using hand tools and while handling the components used to assemble your printer. Personal safety is ultimately your responsibility. Please ensure that your workspace is clean, tidy and free of any safety hazards prior to beginning the assembly of your Exilis. Please take care when using sharp tools or handling aluminium extrusion pieces – they can have sharp edges. Please also keep in mind that 3D Printers have two main areas which can reach high temperatures – the heated bed which is capable of sustaining 110 degrees Celsius, and the Nozzle/Hot End/Extruder, which is designed to operate at a maximum of 250 degrees Celsius. Instant and serious burns will result from contact with the skin. Once you have completed the assembly of your Wombot Exilis, please also familiarise yourself with the User Manual before attempting to print for the first time as it contains useful information on how to calibrate and operate your Exilis as well as troubleshooting information.

Assembly Sequence Overview

Assembly needs to take place in the sequence outlined below so that each step is completed correctly and in order. This will allow you to get your kit assembled in the shortest possible time and reduce the chances that you will have to disassemble the printer later in order to repeat an important missed step. This applies especially to the sliding nuts used throughout the frame assembly because once assembled, sliding nuts cannot be fitted later without disassembling the whole frame.

Please take the time to read each step carefully before beginning assembly to make sure that you understand the requirements of each module and that the required components have been laid out on your workspace along with the appropriate tools.

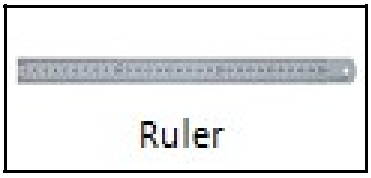
Required Items to complete the build

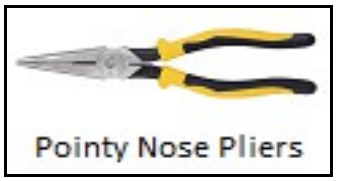
All components and fasteners required to complete assembly are included with your Exilis Kit. You will also require some basic hand tools and equipment as follows:


Hex Keys


Adiustable Wrench


Measuring Tape

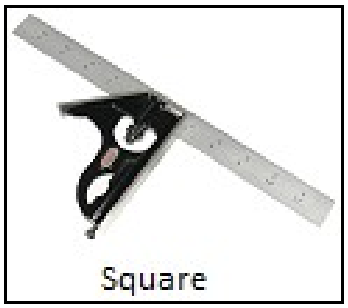

Ruler


Pointy Nose Pliers


Side Cutters

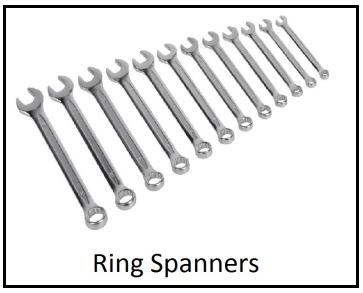

Hot Glue Gun


Metric Socket Set


Square


Screwdriver Set


Cordless Drill with 3mm Drill Bit


Ring Spanners


Knife


Scissors


Multimeter

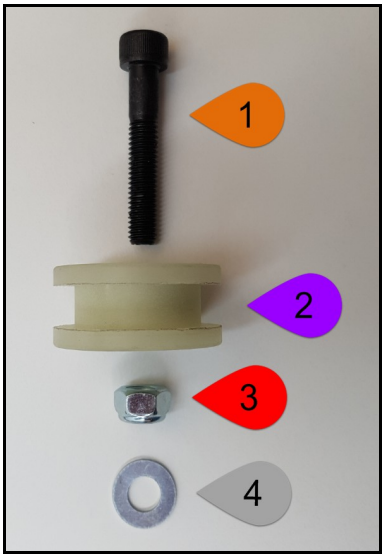
Base Frame Module

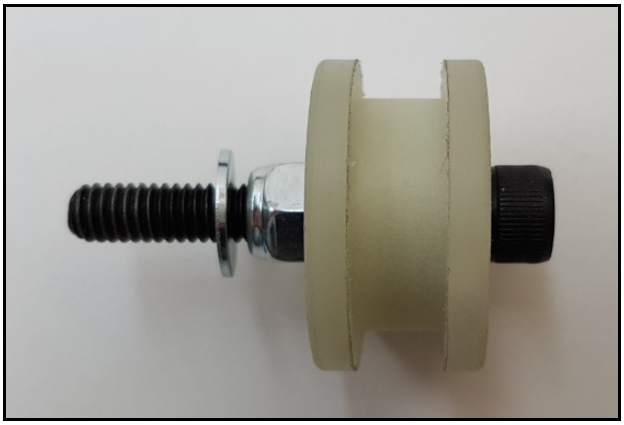
Step 1 – Y Idler Module Pre-Assembly

In your kit of parts, locate the following items.

ITEM	DESCRIPTION	QTY
1	BOLT M8 X 45mm CAP HEAD	1
2	IDLER PULLEY LARGE NYLON	1
3	NUT M8 NYLOC	1
4	WASHER M8 FLAT	1

Assemble the Y Idler Module as per the following image then set it aside to be fitted later. Only tighten the lock nut until it touches the bearing centre on the idler. If this is too tight, the idler pulley will bind rather than spinning freely.

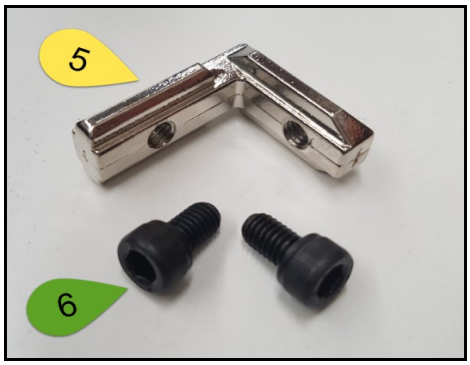




Step 2 – Right Angle Bracket Preparation

In your kit of parts, locate the following items.

ITEM	DESCRIPTION	QTY
5	3030 INTERNAL R/ANGLE BRACKET	8
6	BOLT M6 x 10mm CAP HEAD	16



Screw the bolts into the brackets just enough to hold them in place. Repeat for all 8 brackets.

Step 3 – Base Frame Layout

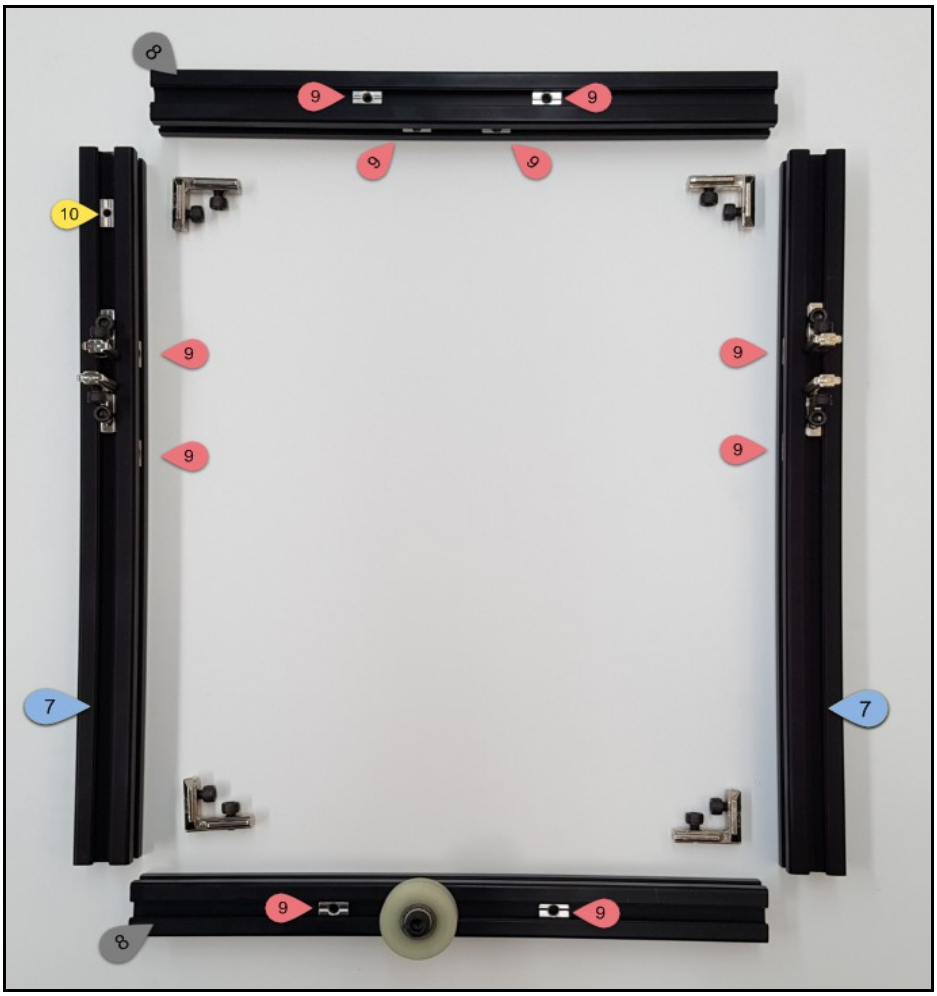
In your kit of parts, locate the following items.

ITEM	DESCRIPTION	QTY
7	3030 EXTRUSION 410mm LENGTH	2
8	3030 EXTRUSION 340mm LENGTH	2
9	3030 SLIDING NUT M6	10
10	3030 SLIDING NUT M5	3

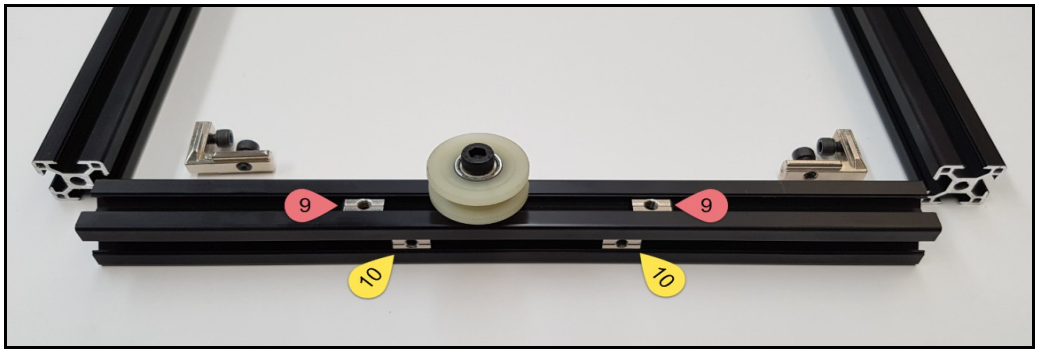
Lay out all Base Frame components on a clean flat surface. Arrange the Aluminium Extrusion pieces by length and insert all Sliding Nuts and Right Angle Joints as per the images according to the Item Number in the component listing. Secure the Y Idler Module to the frame firmly.

The Y Idler Module should be towards the left of the front rail.

TOP VIEW



FRONT VIEW



Step 4 – Base Frame Assembly

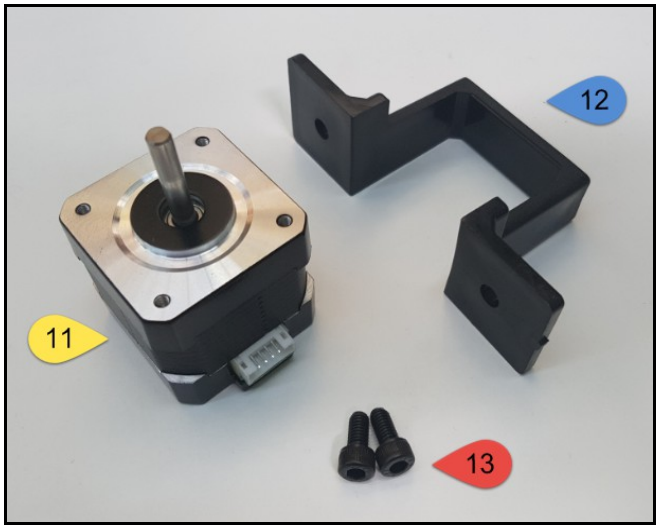
Once all sliding nuts, right angle brackets and Y idler have been fitted, gently slide together the frame on a flat surface and gently tighten each of the cap head screws in the right angle brackets so that they can still be adjusted or moved. Make sure that the frame is true and square before tightening the four corner brackets in the base of the frame using a square as follows:

All corner joints must be at 90 degrees (perpendicular). Left and Right rails must be parallel as must the front and rear rails. Use a measuring tape or ruler to make sure that the distance between each set of rails remains constant from end to end – even if this results in a slight gap at one end where extrusion pieces meet.

Step 5 – Fitting the stepper motors.

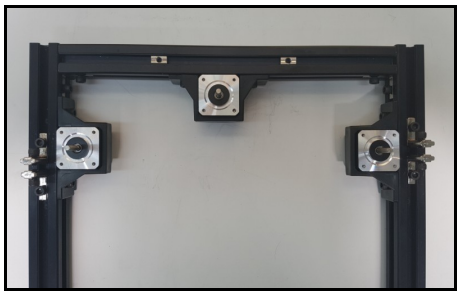
Once the bed base components have been tightened, locate the following items in your kit as per the below image.

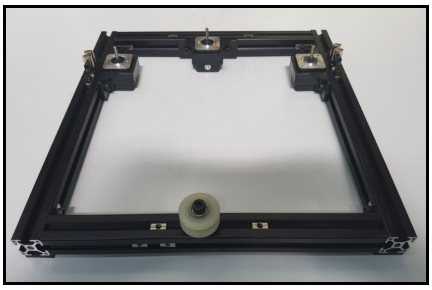
ITEM	DESCRIPTION	QTY
11	STEPPER MOTOR NEMA 17	3
12	STEPPER MOTOR BRACKET	3
13	BOLT M6 x 12mm CAP HEAD	6

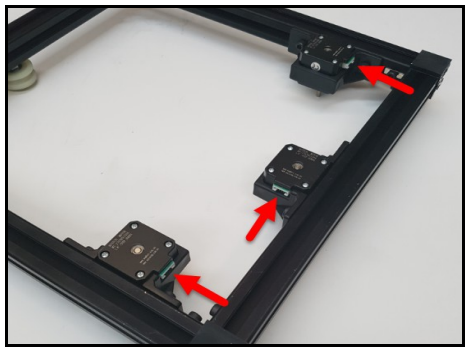


Fit the motors into their brackets and fasten the stepper motors to the base frame loosely at the rear of the base as per the following images, utilising the sliding nuts you fitted to the frame at the beginning. Fit but do not tighten these motors in place yet, they must be able to slide into their final position later for correct alignment with other components.

Please note that the Y motor bracket (the one in the middle) is modified - it has a small notch cut out in one mounting arm to avoid the bed rail which will be fitted in the next step. Please also observe the orientation of the connectors on the stepper motors when fitting, as per the below images:



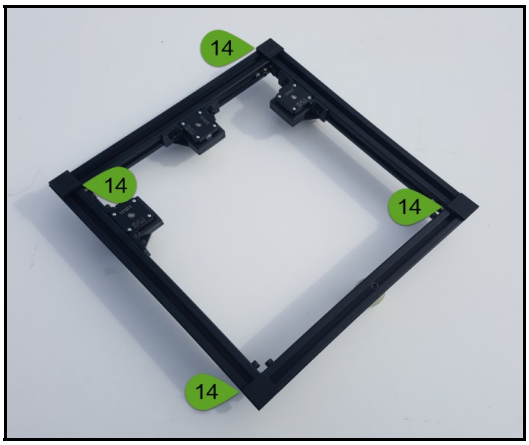


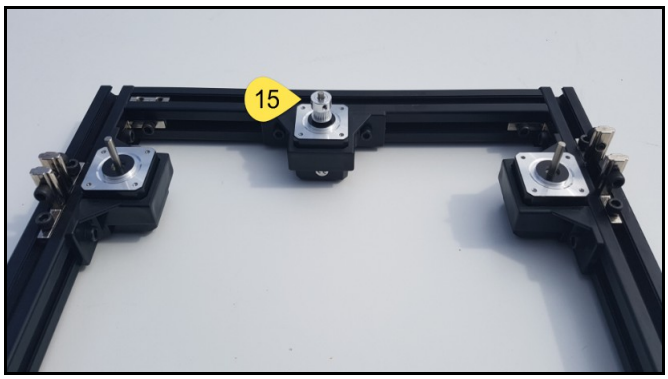


Locate the following items in your kit and fit them as per the below images:

ITEM	DESCRIPTION	QTY
14	SELF ADHESIVE RUBBER FOOT	4
15	PULLEY GT2 20 TOOTH	1

Fit the small rubber feet to the base in each corner of the printer frame
as well as the GT2 20 tooth pulley for the Y motor. Pulley final position may need to be adjusted later to align with belt.



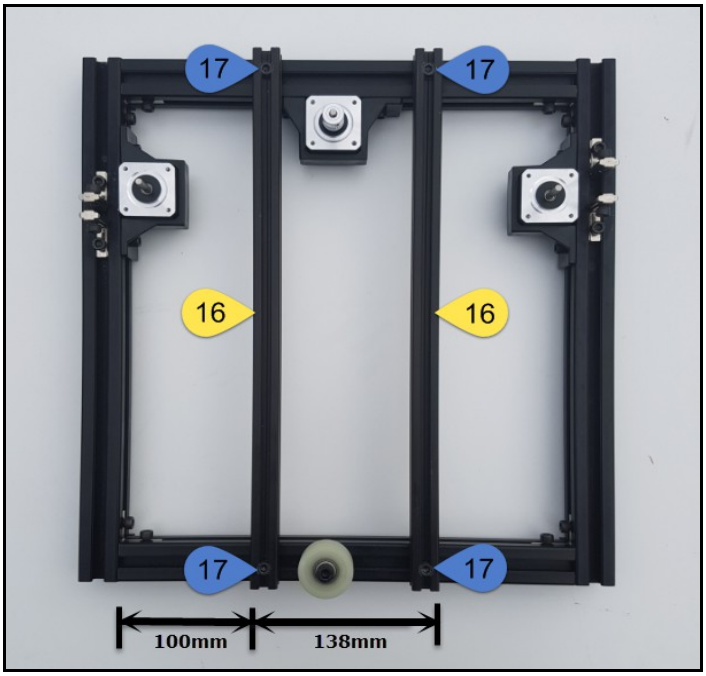


Step 6 – Fitting the bed rails.

Locate the following items in your kit of parts:

ITEM	DESCRIPTION	QTY
16	2020 EXTRUSION BLACK 410mm – PRE-DRILLED BED RAILS	2
17	BOLT M6 x 20mm CAP HEAD	4

Fit the pre-drilled rails to the top of the base frame utilising the sliding nuts that were positioned in the frame at the beginning (do not tighten them yet, they must be able to slide into their final position). Measure out the distances as per the image and once they are the correct distance from the side rail and each other, tighten them in place firmly. Keep in mind that these two rails must be perfectly parallel to the side rails of the printer as well as each other in order for the printer bed to travel correctly and under a uniform tension while printing.

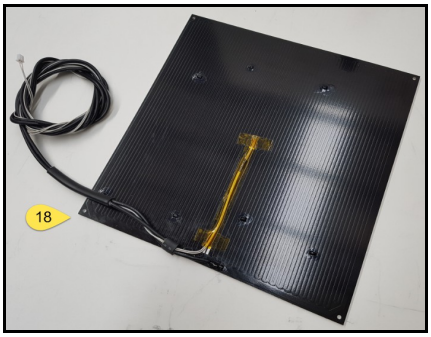


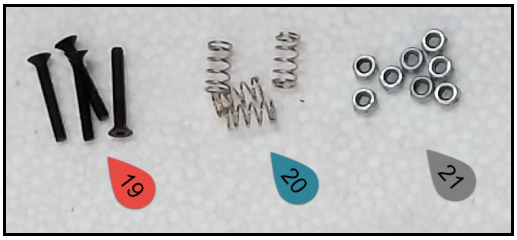
Step 7 – Assembling the Heated Bed Platform.

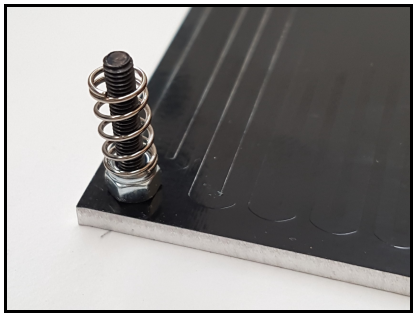
In your kit of parts, locate the following items:

ITEM	DESCRIPTION	QTY
18	PRE-WIRED WOMBOT MK4 HEATED BED	1
19	SCREW COUNTERSUNK M3 x 20mm	4
20	BED SPRING	4
21	NUT M3 NYLOC	4

Fit the Countersunk M3 screw from the top side of the heated bed (side with the Wombot Logo and warning symbols) and secure in place on the underside of the bed (side with tracks) with nyloc nuts firmly. Then simply place the spring over the screw so that it rests on the nyloc nut as per the below image. Repeat this for all four corners of the bed and set aside (springs up so that you don't lose them) for for the next step of the bed assembly.



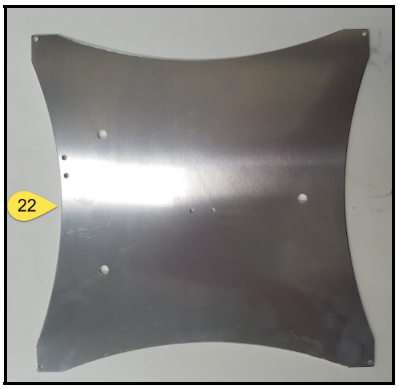


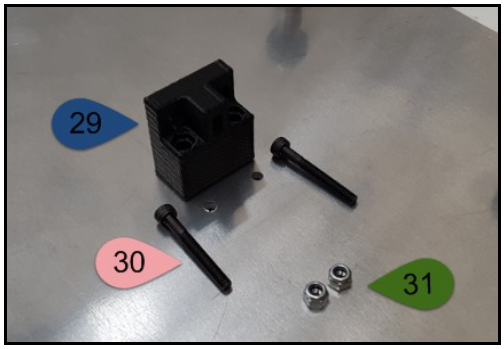


In your kit of parts, locate the following items and lay them out on your table:

ITEM	DESCRIPTION	QTY
22	PRE-MILLED BED TROLLEY	1
23	BOLT M5 x 40mm CAP HEAD	3
24	DELRIN WHEEL BLACK	3
25	WASHER M5 FLAT	3
26	ECCENTRIC NUT M5	3
27	NYLOC NUT M5	6

28	BED SPACER ALUMINIUM	3
29	BED BELT MOUNTING BLOCK	1
30	BOLT M3 x 20mm CAP HEAD	2
31	NUT M3 NYLOC	6



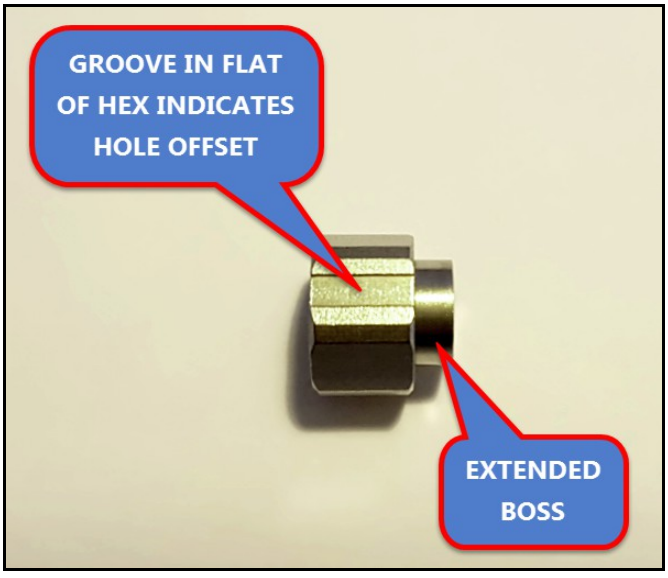


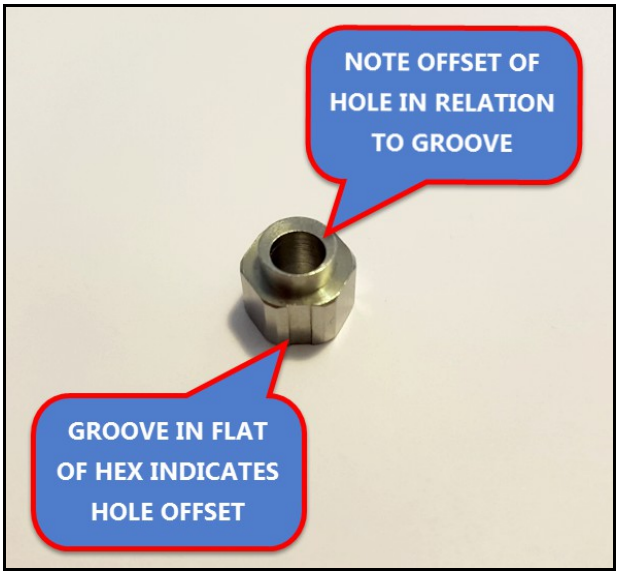
An Important Note on Eccentric Nuts and their function:

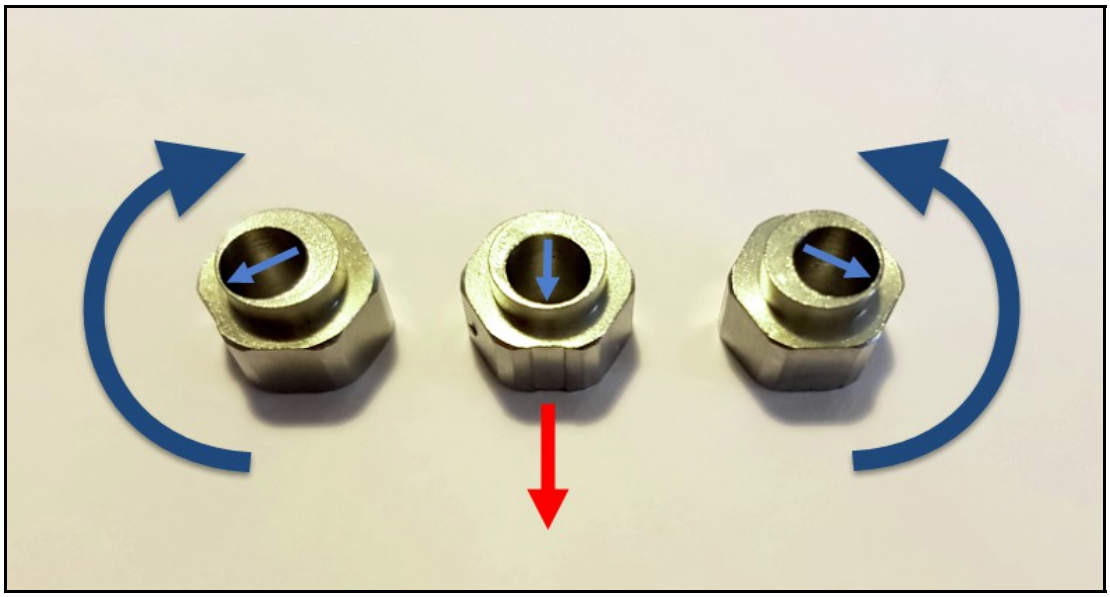
Before beginning assembly of your Heated Bed Platform (or Extruder Carriage Module in a later step), it is essential that you understand the installation and correct operation of Eccentric Nuts. Eccentric Nuts are small mechanical devices which resemble a normal nut. There are however three important differences which must be observed: 1. They have an extended cylindrical boss (smooth external barrel) which extends past the body of the "Hex Shaped" portion of the Nut, 2. The hole through the middle of the Eccentric Nut is not actually in the centre – it is offset to one side (indicated by a groove in one side of the hex of the nut closest to the perimeter of the hole). This is also referred to as being "off-centre" and 3. there is no thread in the centre of the nut, it is a smooth bore through which a bolt or shaft can be inserted.

The purpose of an eccentric nut is to provide minor adjustment to the final position of an attached device or assembly (in this case, a black delrin wheel/bearing). This is achieved by securing the device under tension and rotating the nut to achieve a shift in the location of the component - hence moving the position of the attached device proportionate to the degree of rotation applied to the nut and dependent on the starting position of the off-centre hole.

Please see below images illustrating these principals and make sure you understand them before proceeding.
The same principals can be applied at a later stage to the eccentric nuts used on the Extruder Carriage Module:

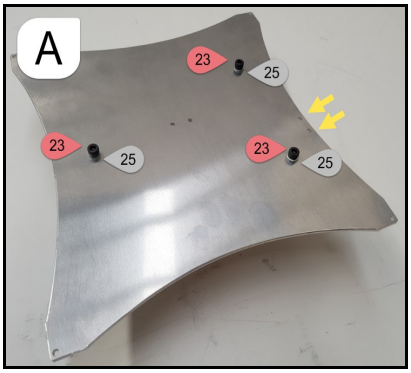


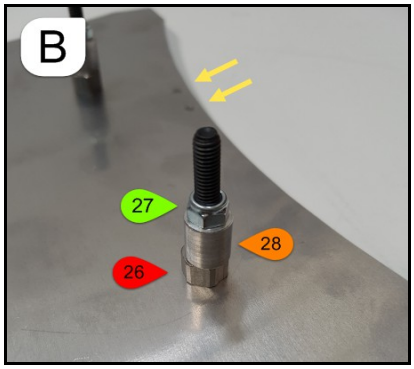


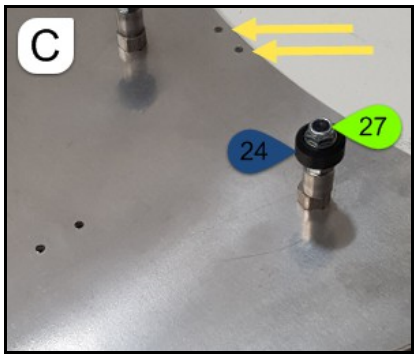


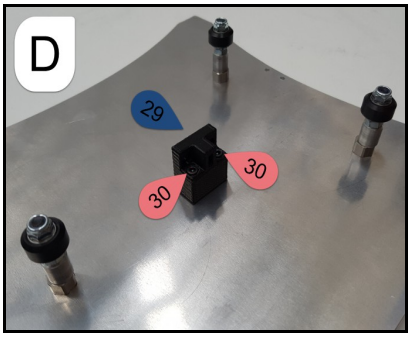
Proceed by fitting the Bolts, Eccentric Nuts, Spacers and Black Delrin Wheels to the bed trolley as per the below images while noting the orientation of the aluminium bed trolley in relation to the mounting holes in the centre and along the edge (yellow arrows). Please also note that while the eccentrics and delrin wheels must be held in place firmly, – they should not be over tightened so that free movement is impeded. Please also take extra care that the eccentric nuts are orientated correctly to allow for the greatest flexibility for rotation during tightening of the completed bed assembly to the base frame.

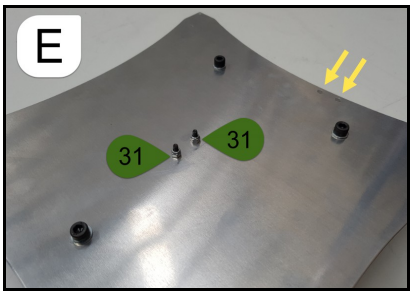
Important Note on tensioning down the Black Delrin Bearings: This must be done very gently and with great care. Only tighten down the Nyloc Nuts onto the Bearing as much as is needed to stop any play between the inner bearing hubs and the faces of the two Nyloc Nuts. They must be free spinning, but not allowed to move up and down the bolt shaft. Over-tightening these bearings will result in too much friction, restricted rotation and permanent damage to the bearings which you will then be required to purchase separately to replace.





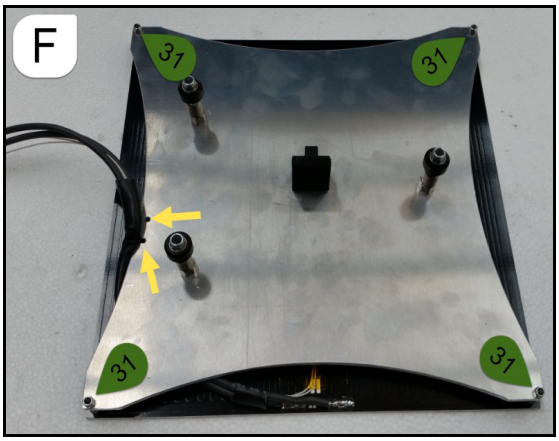


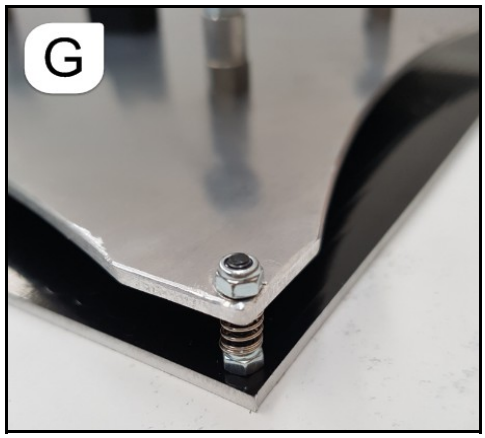




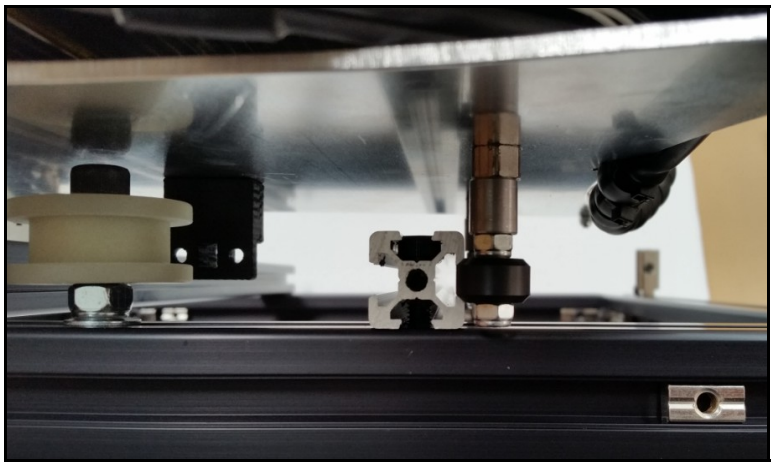
Place the heated bed assembly from the previous step on your work surface (springs upward). Install the assembled aluminium bed trolley onto the heated bed so that the M3 screws pass through the pre-drilled holes in the trolley. Fasten with Nyloc Nuts as per the below images. Please observe the correct orientation of the heated bed to the trolley and the path of the wiring loom from the heated bed. Temporarily cable tie the loom to one of the two holes on the aluminium trolley to secure it as per the yellow arrows in the following images.

The M3 Nyloc Nuts holding the heated bed to the aluminium trolley should have between ½ mm and 1mm pass-through of thread from the bolt. Do not concern yourself with making each corner of the heated bed the same distance from the trolley at this point, they will need to be adjusted later to level the bed manually prior to printing.





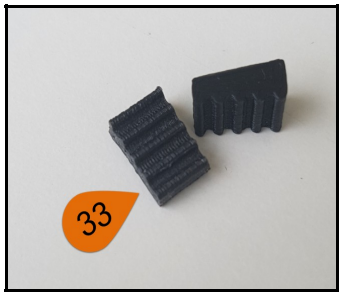
Gently guide the completed bed trolley assembly onto the bed rails of the Base Frame so that the black delrin wheels run along the external side grooves of the extrusion, as per the below images.

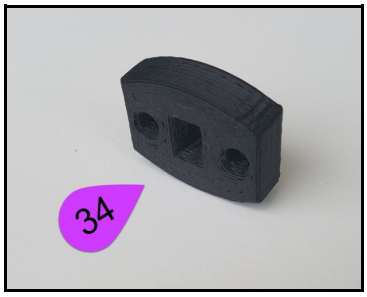


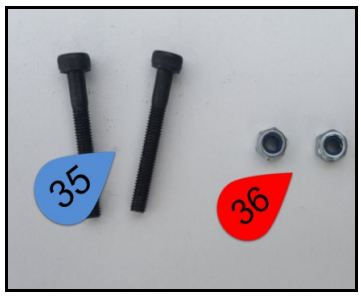
Once fitted, you can adjust the eccentric nuts to provide the correct tension between the Delrin wheels and the Bed Rails by turning either clockwise or counter-clockwise using an open-end spanner. We suggest that you begin with the eccentric on the left hand side of the bed (the one on it's own) which should provide sufficient adjustment to give adequate tension. The opposing two eccentrics can be adjusted if additional tightening is required as well as providing adjustment of the bed to achive squareness in relation to the base frame. The bed should be reasonably free moving, but require some effort to dis-lodge if pushed downwards towards the rails. It should be tight enough to remain flat and travel from front to back without becoming either over-tight, or loose enough to wobble at full travel.

Turn your printer base over so that the heated bed is on the table and you can access the underside of the frame.
In your kit of parts, locate the following parts:

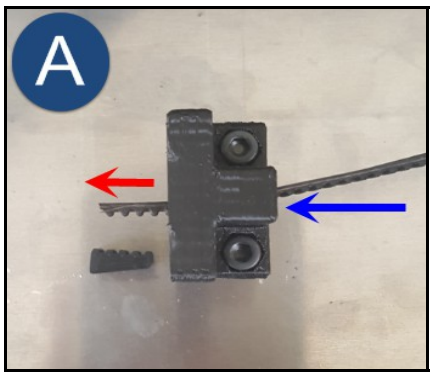
ITEM	DESCRIPTION	QTY
32	GT2 BELT 6mm WIDTH	1 Metre
33	GT2 BELT WEDGE	2
34	GT2 BED BUCKLE	1
35	BOLT M3 x 25mm CAP HEAD	2
36	NUT M3 NYLOC	2

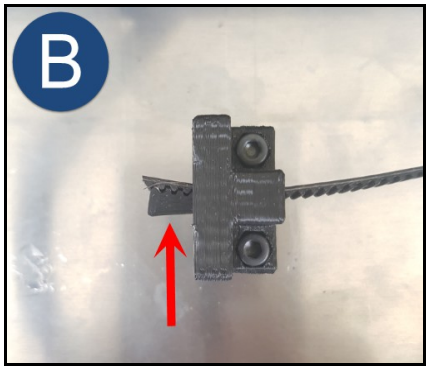


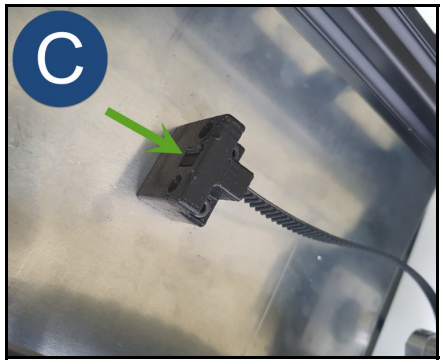


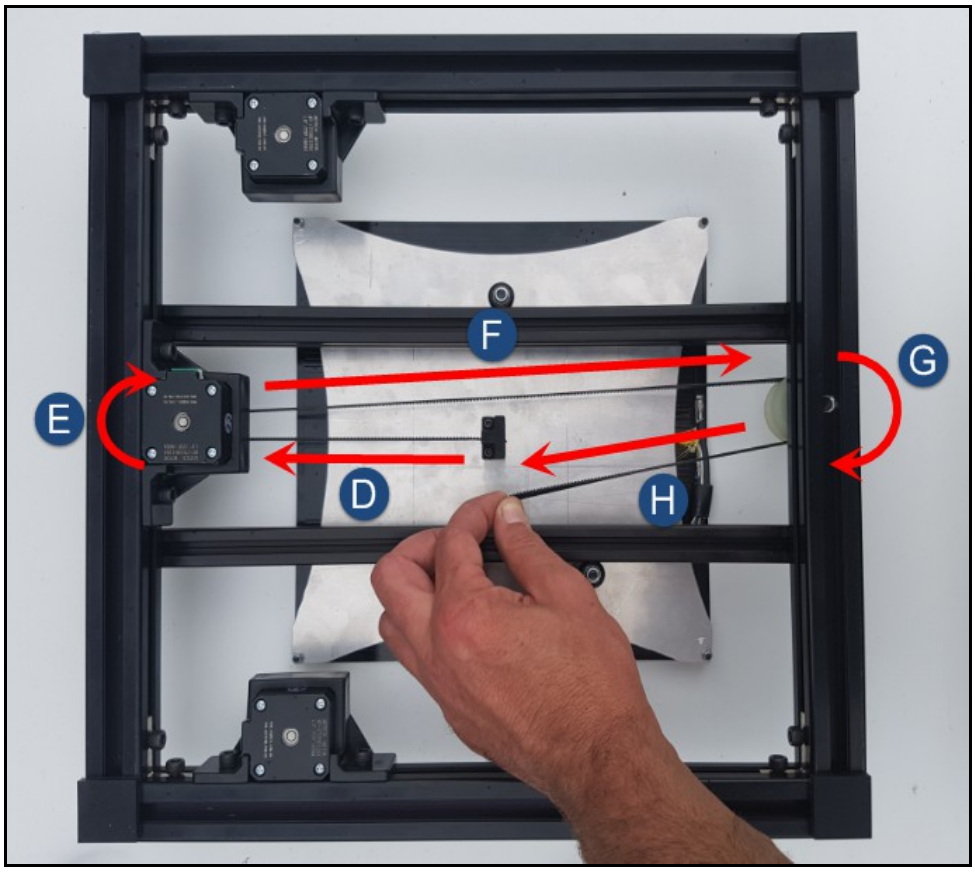


Pass the GT2 Belt through the Bed Belt Mounting Block with the teeth (rounded portions of the belt) in such a way that the belt will travel towards the Y motor and engage with the pulley. Place the GT2 Belt Wedge on the belt so that it engages with the belt – all teeth on the Belt Wedge must be covered by the Belt. Insert the Belt with mated into the gap in the Mounting Block. Pull it towards the Y motor until tight. Use pointy nose pliers to achieve a tight fit. Run the belt around the Y motor pulley, back along the side of the Bed Mounting Block, around the Y idler and back again towards the Bed Mounting Block as per the below images:

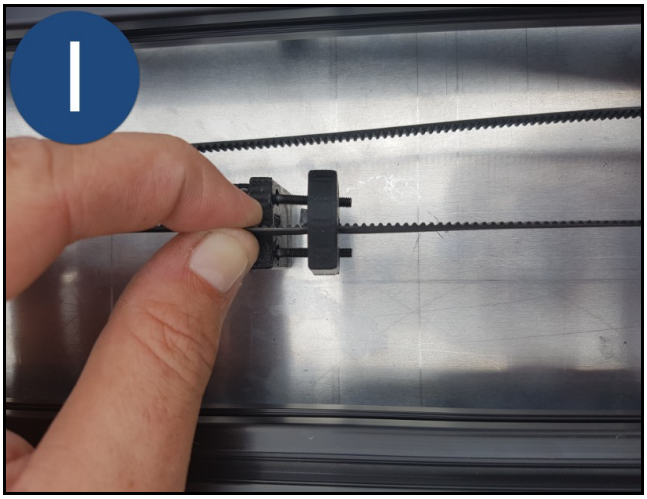


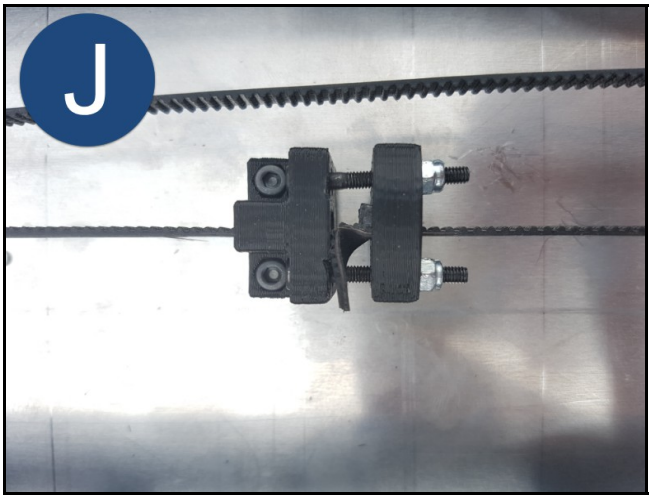




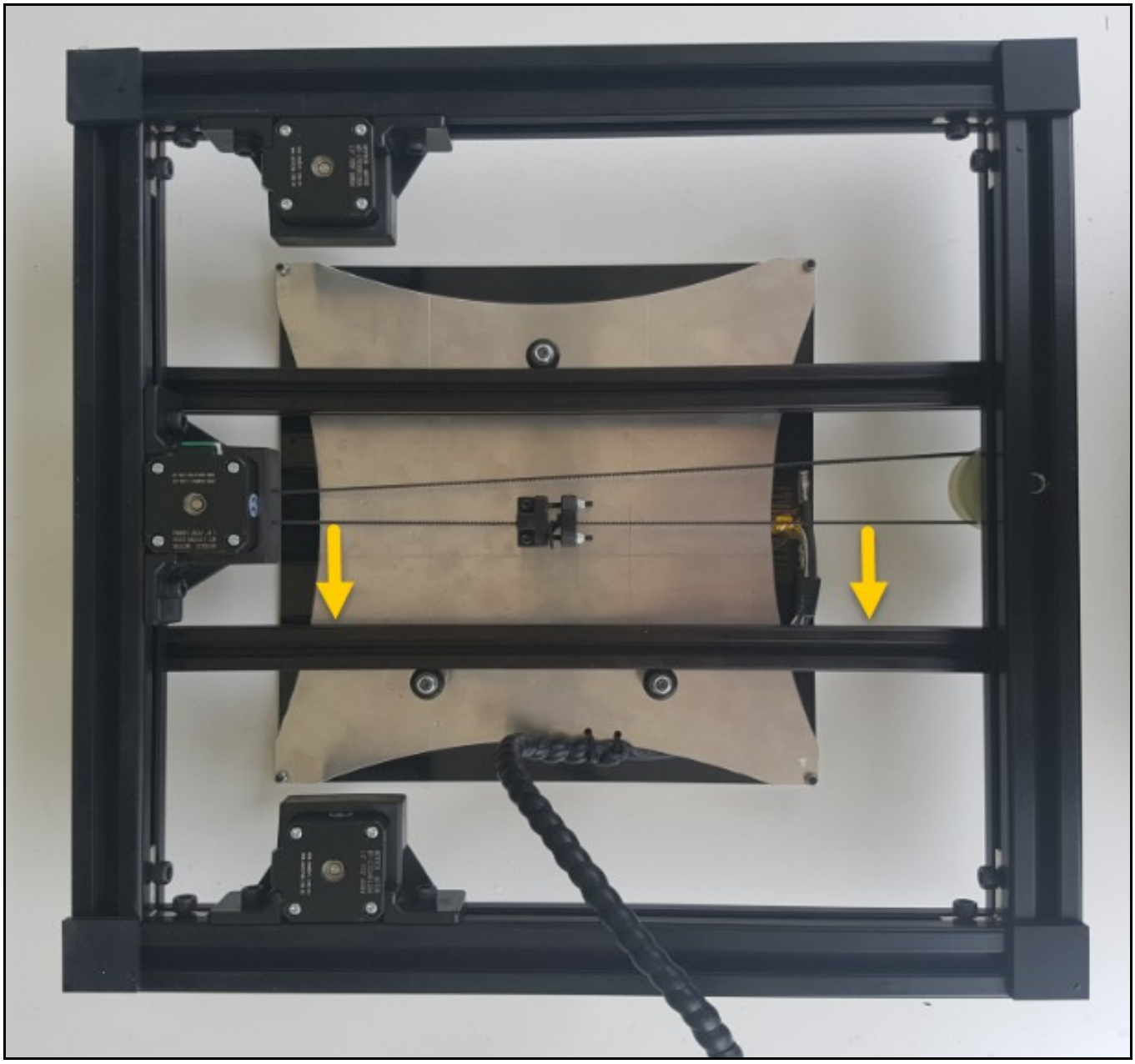


Place the GT2 Bed Buckle over the Belt with the wider opening towards the Bed Belt Mounting Block. Insert the two M3 x 20mm Cap Head Bolts through the Mounting block and into the Bed Buckle. Note that there must be sufficient thread left on the screws to fit the M3 Nyloc Nuts. Insert the GT2 Belt Wedge in an appropriate position so that when inserted and pulled tight, there is still at least a 10mm gap between Block and Buckle. Fit the M3 Nyloc Nuts and tighten as per the following images so that the belt is under tension, but not over tightened.

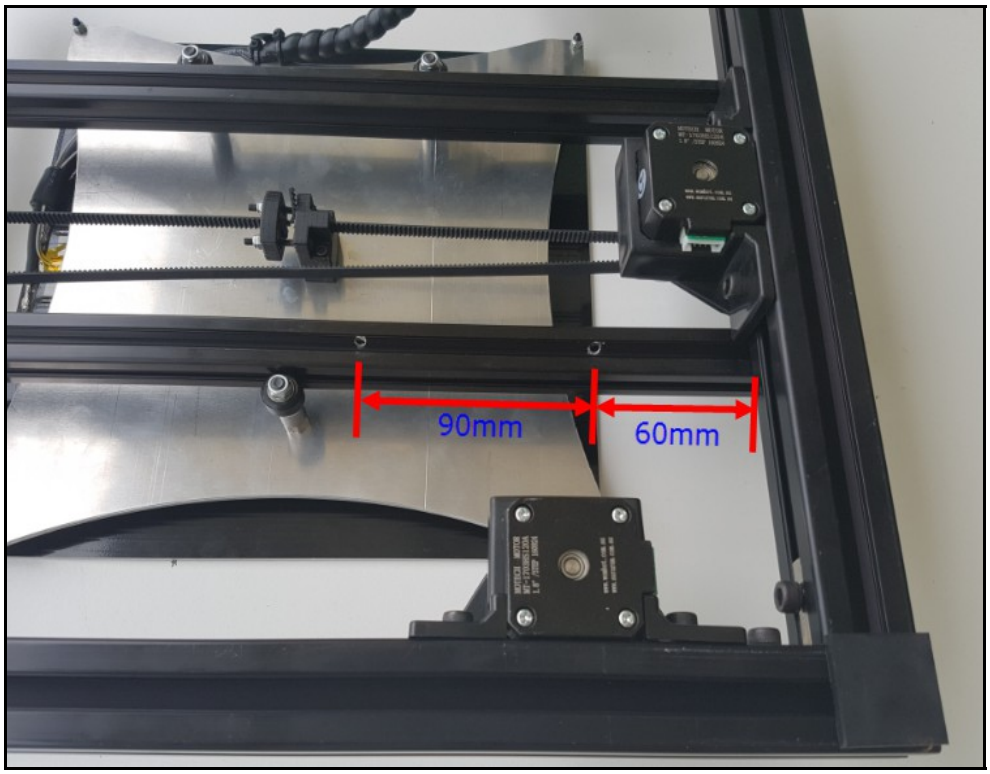




The underside of your frame should look like this once the Y Belt work is finished. Adjust the position of the Y motor so that the belt runs perfectly straight and parallel to the bed rail as indicated by the yellow arrows below. Adjust the height of the GT2 Pulley on the Y motor shaft so that the belt is flat and straight in relation to the rail and Y Idler. This will eliminate chaffing of the belt and promote smooth operation and long belt life.

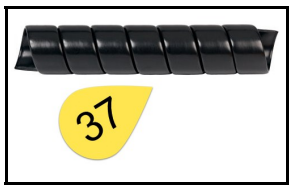


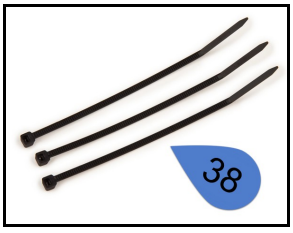
Using a cordless drill fitted with a 3mm diameter drill bit, drill two holes as per the below image so that the loom coming from the heated bed assembly can be anchored with cable ties to the bed rails:

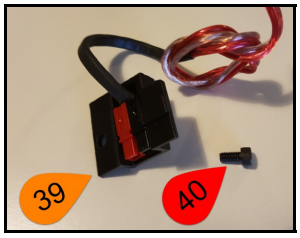


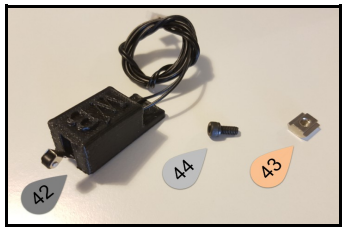
Locate the following items in your kit of parts for the next step:

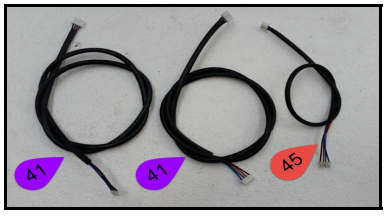
ITEM	DESCRIPTION	QTY
37	SPIRAL WRAP BLACK NYLON	1
38	CABLE TIE 2.5mm x 100mm	2
39	ANDERSON CONNECTOR ASSEMBLY	1
40	BOLT M5 x 10mm CAP HEAD	1
41	STEPPER MOTOR CABLE 900mm	2
42	END STOP ASSEMBLY	1
43	2020 SLIDING NUT M4	1
44	BOLT M4 x 8mm CAP HEAD	1
45	STEPPER MOTOR CABLE 400mm	1
46	COVER STRIP BLACK SYSTEM 30	1
47	3D PRINTED EXTRUSION CLIP	1

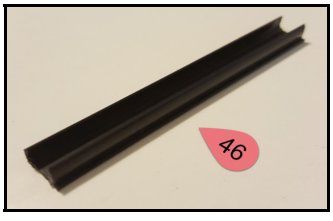


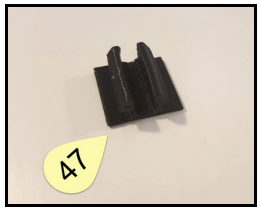




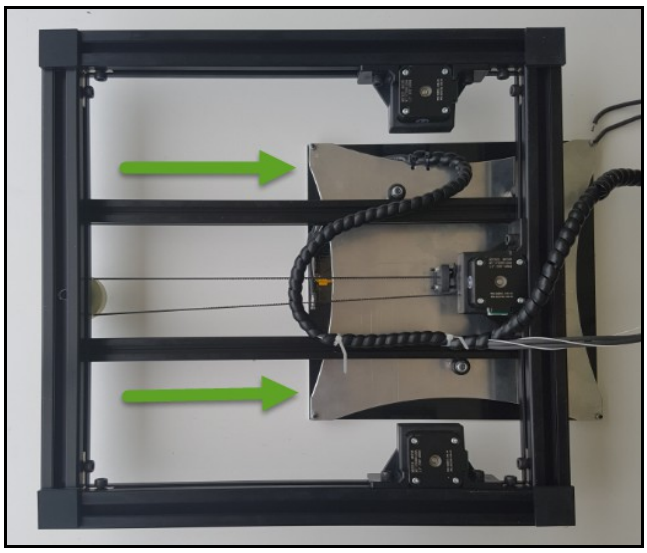


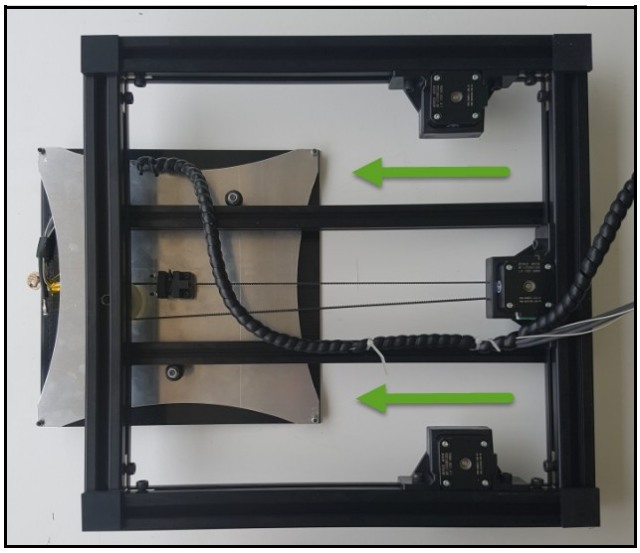






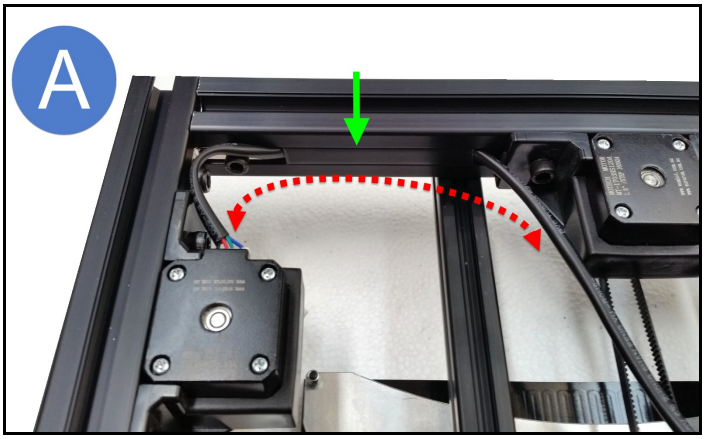
Wrap the heated bed wires with spiral wrap as a protective sheath. Cable tie the loom to the bed rail as per the below images making sure that there is sufficient strain relief (extra length) on the loom so that it can travel the full length of the bed, front to rear, without any tension or binding:

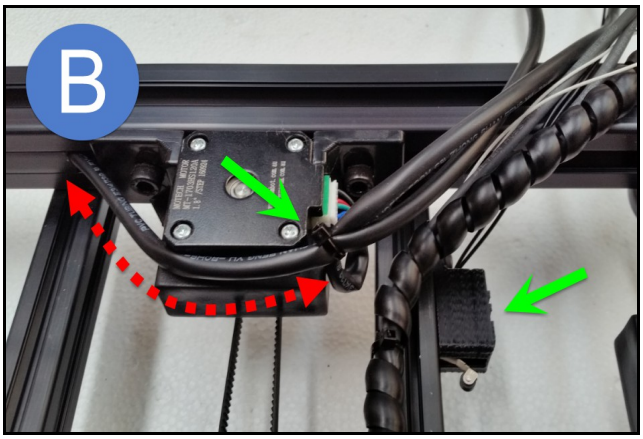




Fit one of the 900mm stepper looms to the R/Hand Z motor. Clip the loom into the frame as per the below image using the cover strip to keep the loom in place. Pass the loom around the Y motor bracket. Fit the second 900mm stepper loom to the Y motor and cable tie it to the first stepper loom to secure the two looms together. Fit the Y end stop assembly using a 2020 M4 Sliding Nut and M4 x 8mm Cap head screw. Don't worry about the final position of the Y end stop – it will be adjusted later prior to printing, just make sure that you allow a little spare cable so that it can slide back and forth 30mm or so.

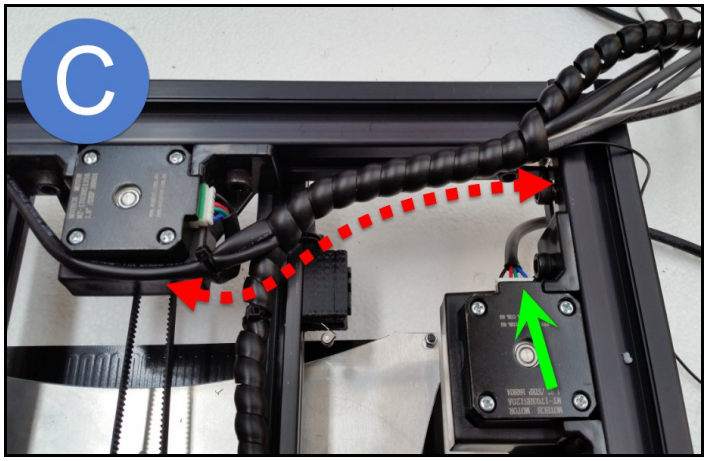
Helpful Hint – Mark the stepper motor looms and endstops according to their function – this will make wiring up the motherboard simpler and faster later on.

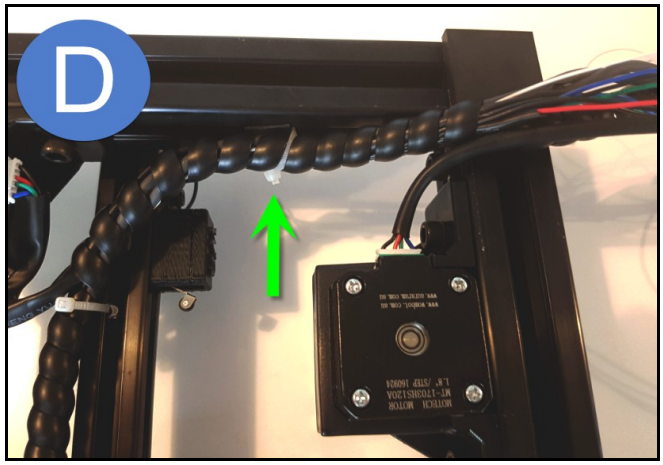


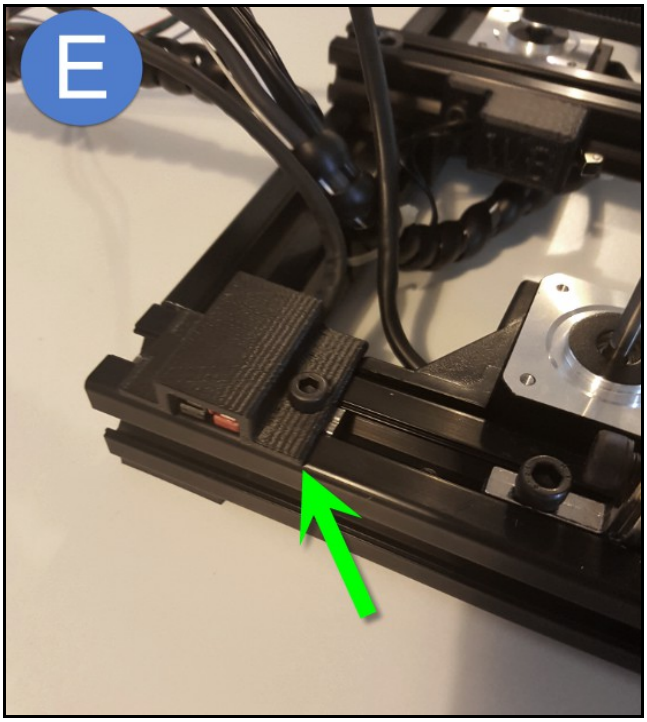


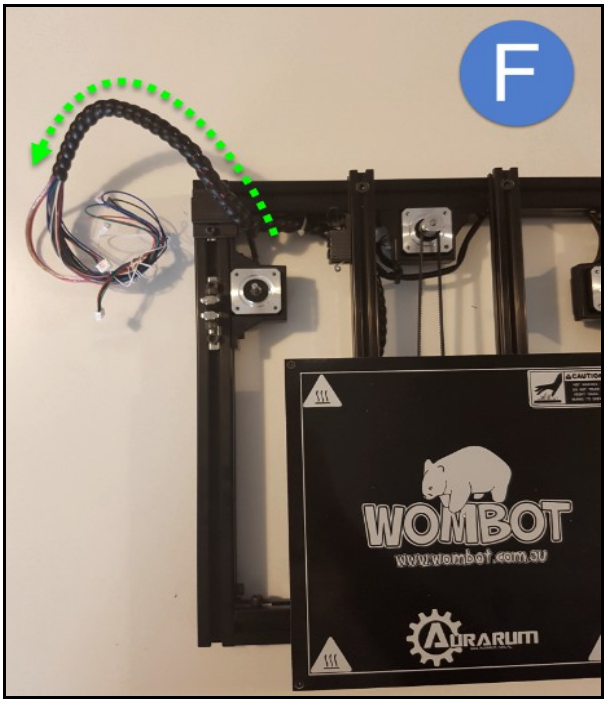
Join together the stepper motor looms and Y end stop loom. Wrap them together with the black spiral wrap coming from the Heated Bed Assembly. This piece of spiral wrap will continue up to the bottom of the motherboard enclosure at a later stage. Plug in the 2nd Z motor loom (400mm length) and pass it through the frame to the top. Using the 3D Printed Extrusion Clip as an anchor, cable tie the wrapped loom to the rear of the frame as per the following images. Turn over your printer frame. Fit the Anderson Main Power connector to the top side left of the frame using the sliding nut fitted previously and continue to wrap the wiring looms together, including the 2nd Z motor loom as per the image below.

Please ensure that there is not excessive strain on any of the cables and that they flow around corners rather than being pulled tight or bent harshly. 3D printers are subject to regular vibration and constant movement – an overly tight or tensioned wiring loom can lead to connector failure or wire breakage during printing which can also lead to irreparable damage to stepper drivers if disconnected while powered up!









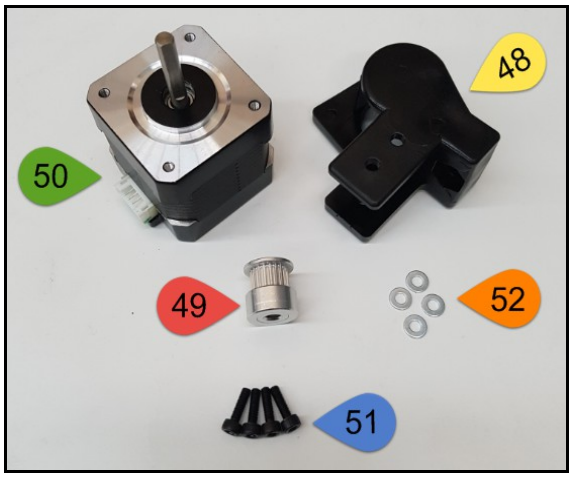
Your Exilis Printer Base Frame can be set aside for now while you pre-assemble the remaining modules before fitting them to the printer frame.

Step 9 – X Rail

In your kit of parts, please locate the following items and lay them out on your table:

ITEM	DESCRIPTION	QTY
48	X MOTOR BRACKET	1
49	PULLEY GT2 20 TOOTH	1
50	STEPPER MOTOR NEMA 17	1
51	BOLT M3 x 10mm CAP HEAD	4
52	WASHER M3 FLAT	4

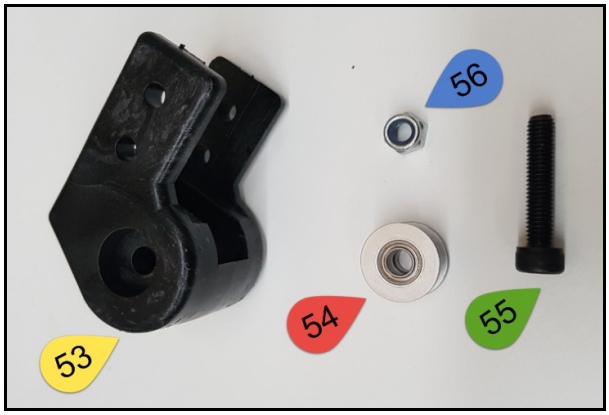
Place the Pulley on the motor shaft with the grub screws towards the motor body but do not tighten yet. Load one flat washer onto each M3 Bolt and fit the motor bracket to the motor face as per the following images. Note the orientation of the motor connector to the bracket arms:



Set aside the assembled motor and locate the following items in your kit of parts:

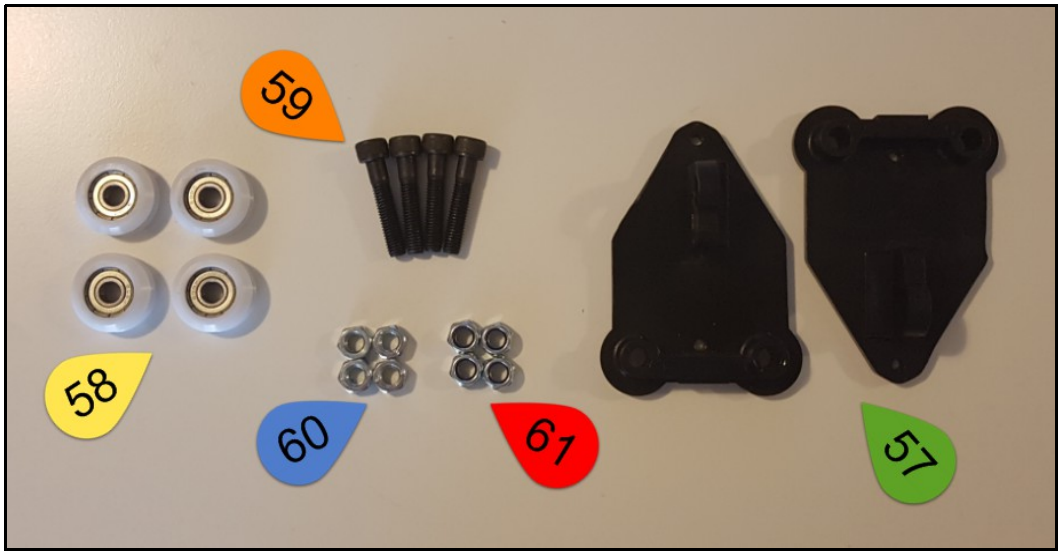
ITEM	DESCRIPTION	QTY
53	X IDLER HOUSING	1
54	IDLER PULLEY GT2 16 TOOTH	1
55	BOLT M5 x 25mm CAP HEAD	1
56	NUT M5 NYLOC	1

Place the Idler Pulley inside the Housing and insert the M5 bolt from the top of the housing. Make sure it passes through the centre of the idler pulley and out through to the other side of the housing. Fasten the bolt in place with the nyloc nut from the bottom. Please note orientation of the bolt and nut in relation to the arms on the housing. Please don't over-tighten, the nut only needs to be tight enough to stop the bolt from turning or shifting up or down.

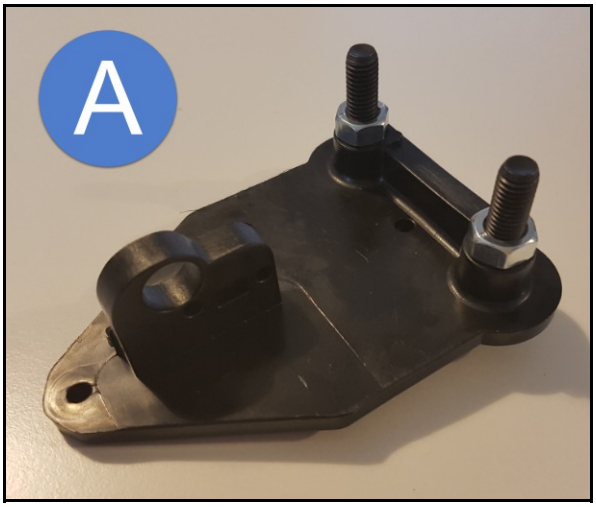


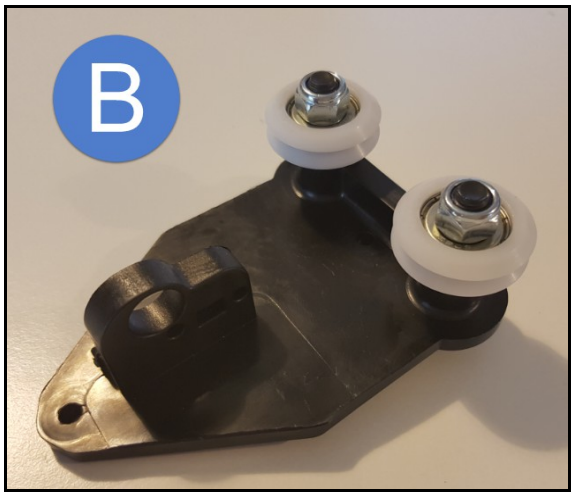
Please set aside the assembled X idler assembly and locate the following items in your kit of parts:

ITEM	DESCRIPTION	QTY
57	X RAIL BRACKET	2
58	DELRIN BEARING WHITE	4
59	BOLT M8 x 40mm CAP HEAD	4
60	NUT M8 STANDARD HEX	4
61	NUT M8 NYLOC	4



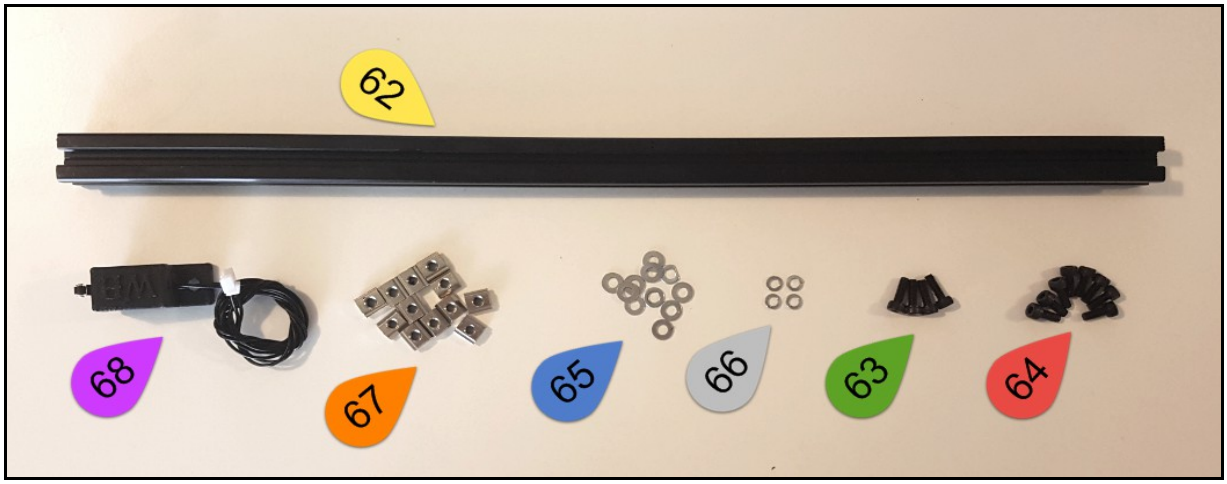
Assemble the X Rail Brackets by inserting the M8 Bolts into the bracket from the flat side of the bracket. Lock them in place using M8 Standard Hex Nuts. Gently lock in place by using a ring spanner or adjustable wrench and a hex key. Please do not over-tighten them as this may cause the bracket to compress and split over time. Next, place the White Delrin Bearings over the bolts and fasten in place tightly with the M8 Nyloc Nuts. Please see the images below for correct orientation of components.



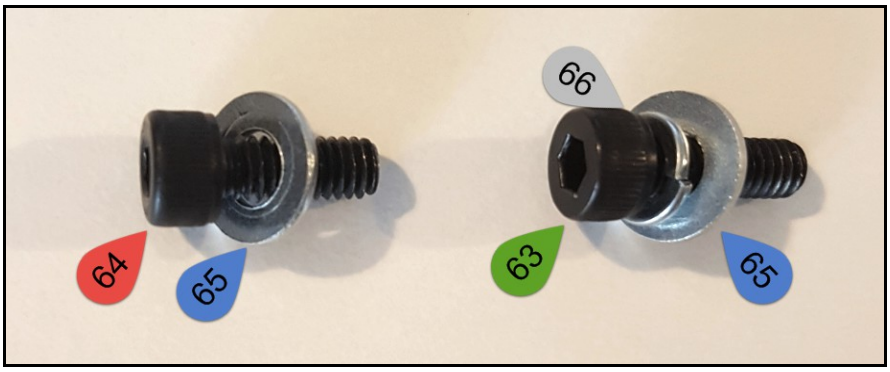


Please set aside the X rail brackets for now and locate the following items in your kit of parts:

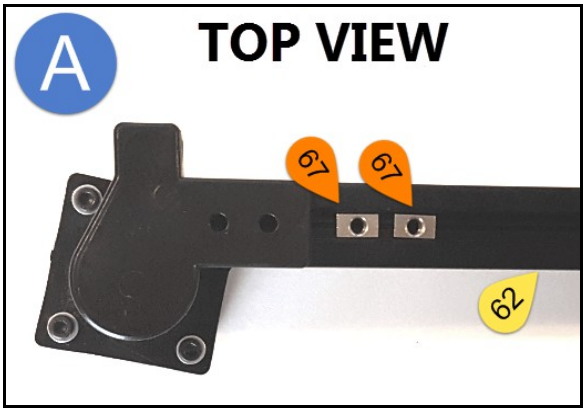
ITEM	DESCRIPTION	QTY
62	2020 EXTRUSION BLACK 445mm	1
63	BOLT M4 x 12mm CAP HEAD	4
64	BOLT M4 x 10mm CAP HEAD	8
65	WASHER M4 FLAT	12
66	WASHER M4 SPRING	4
67	2020 SLIDING NUT M4	12
68	END STOP ASSEMBLY	1
69	STEPPER MOTOR CABLE 550mm	1
70	SPIRAL WRAP BLACK NYLON	1

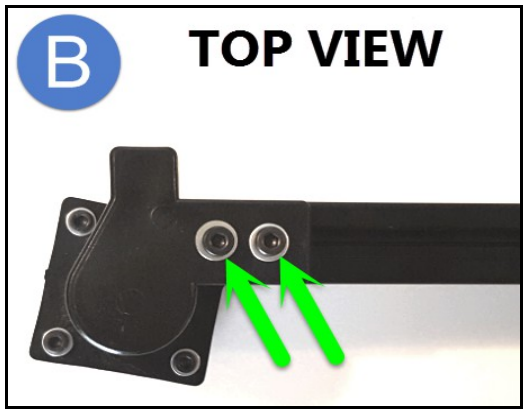


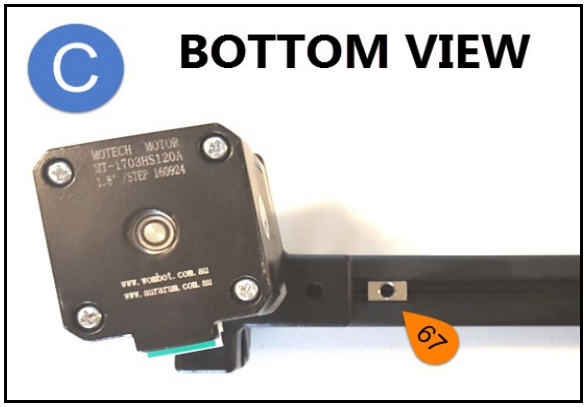
Place Flat Washers on the M4 x 10mm Cap Head Screws and set them aside, then place Spring Washers and Flat Washers on the M4 x 12mm Cap Head Screws and set them aside as per the following images:

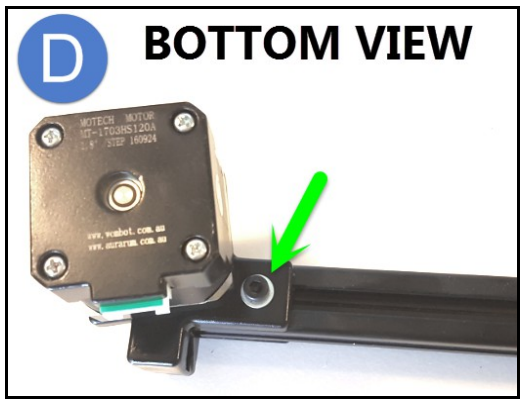


Locate the piece of 445mm long 2020 Black Extrusion – this serves as the chassis of the X rail which will travel up and down on the Z axis while serving as the carriage for the extruder to move left to right while printing (X Axis). Please take the X Motor Module and slide it over the end of the extrusion as per the below images. Slide 2 of the M4 sliding nuts into the 2020 extrusion and fasten the bracket in place using the 10mm long M3 screws you prepared in the previous step. Flip the extrusion over and slide one sliding nut along the extrusion to secure the bottom of the motor bracket:

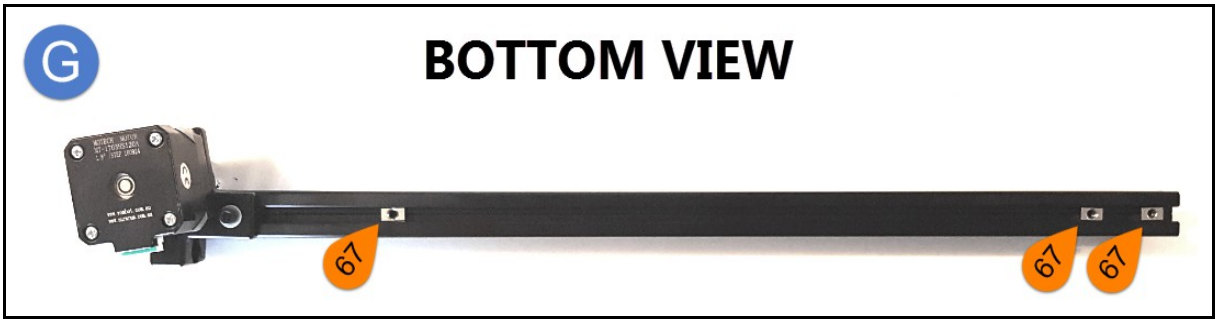




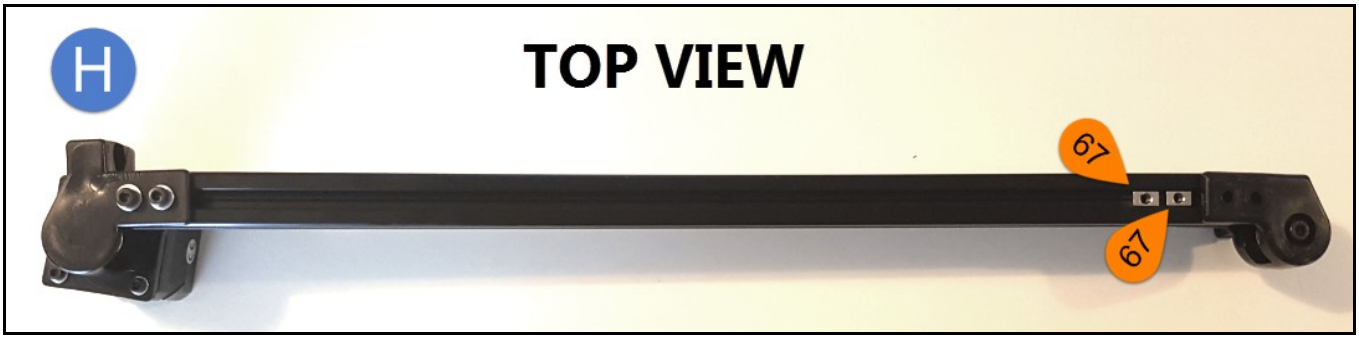


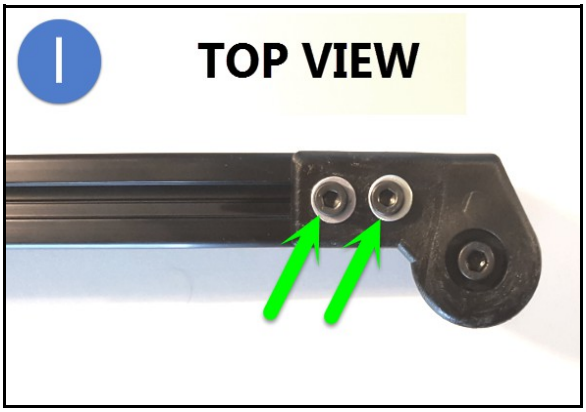


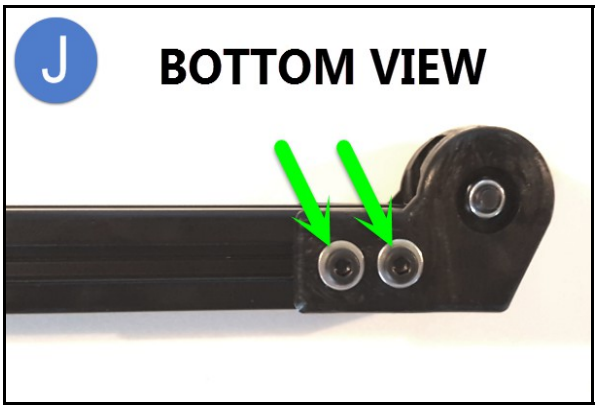
With respect to the orientation of the X Motor Module, please load the rest of the M4 Sliding nuts as per the below images. Please note that there are no sliding nuts on the FRONT of the X rail, only TOP, REAR and BOTTOM:



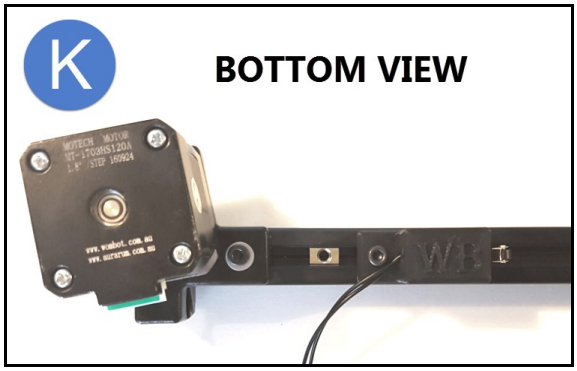
Once all sliding nuts are in place and are captive in the extrusion slots, fasten the X Idler Module to the other end of the rail using the 10mm long M4 cap head bolts with flat washers. Please observe the orientation of the X Idler Module in relation to the X Motor Module:

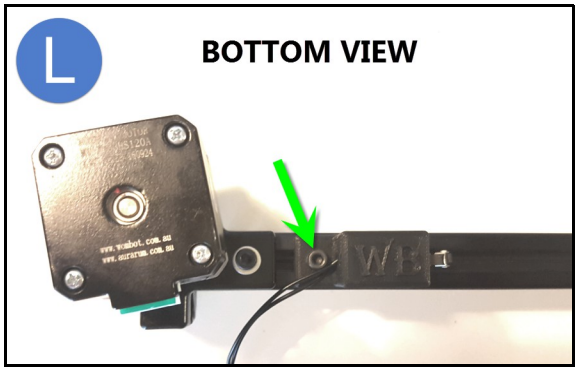




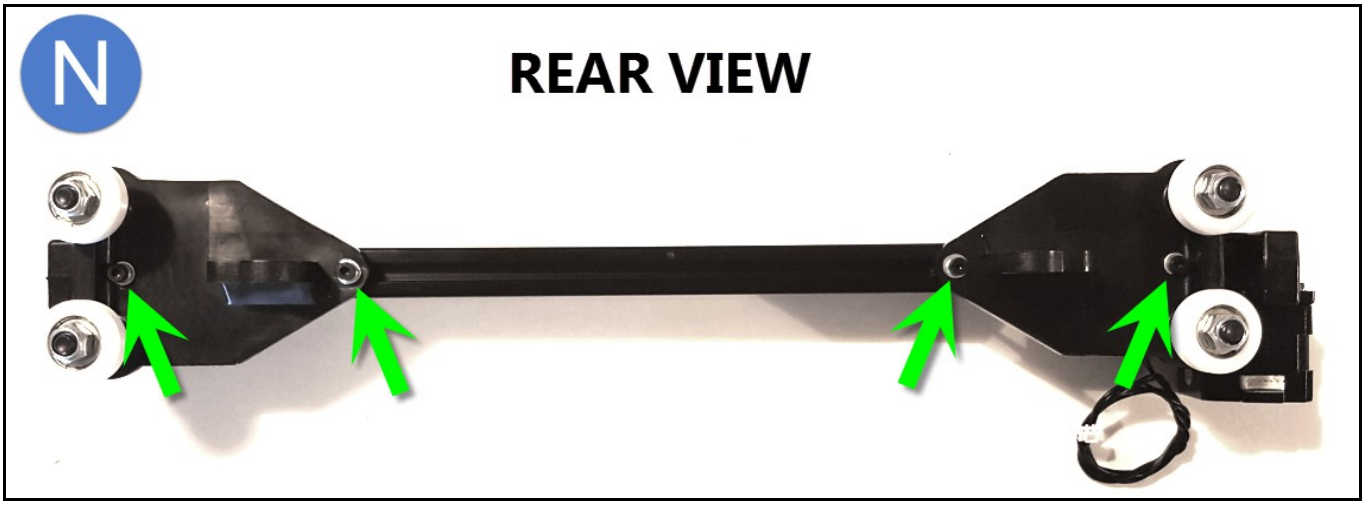


Using an M4 x 10mm Bolt with Flat Washer fitted, secure the X End Stop Module to the BOTTOM of the frame. Note the orientation of the end stop to the X Motor Module. Do not be concerned with the final position of the End Stop module – it will be adjusted later, just allow some spare cable for movement into it's final position.

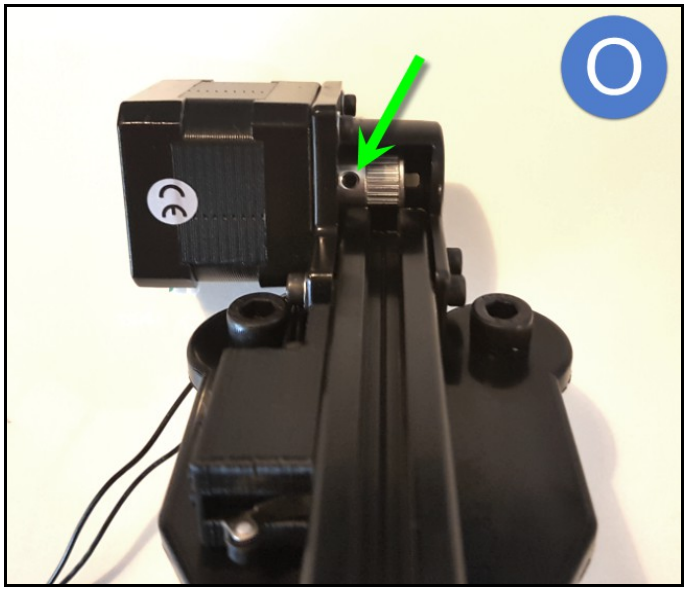




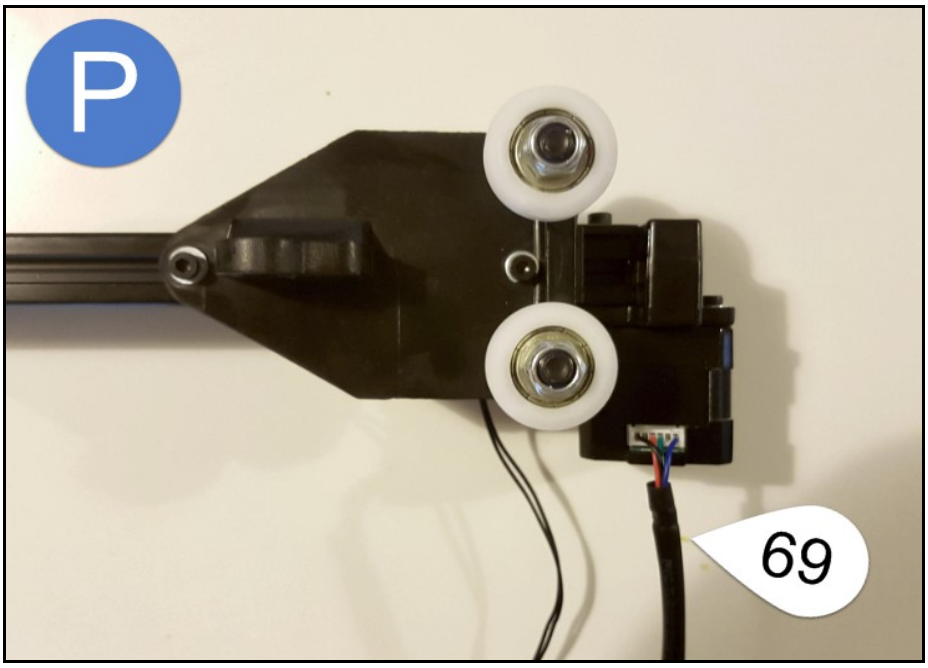
Place the X Rail Assembly on your work table, rear side upwards. Utilising the last 4 x M4 Sliding nuts and the M4 x 12mm Cap Heat Bolts with Spring and Flat Washers already fitted, secure the X Rail Brackets as per the following images. Please note that the bracket closest to the X Motor Module can be fitted loosely, it will need to be adjusted and tightened later to provide tension to the vertical rails at a later stage.



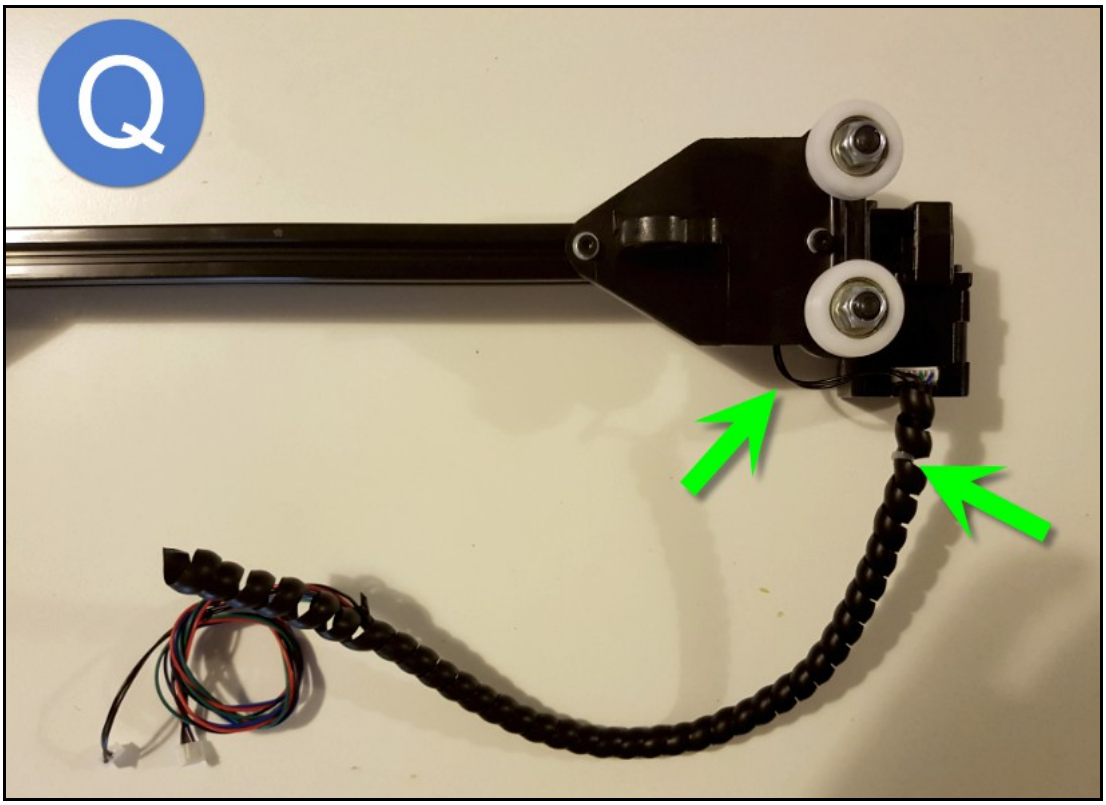
Now is a good time to align and secure the Pulley on the X Motor Module. Using an Allen Key of appropriate size, align the pulley tooth surfaces with the centre of the slot in the X rail. The Pulley needs to be aligned perfectly with the slot in the extrusion because half of the belt length will travel inside the extrusion during X Axis motion.
Important: The pulley has 2 grub screws with which it can be secured to the Stepper Motor Shaft. One of the grub screws *must* be secured in line with the flat on the stepper motor shaft.



Connect the 900mm Stepper Motor Loom to the X Axis Motor Module as per the following image:



Join the X Stepper Motor Module Loom to the X Axis End Stop Module loom using Black Spiral Wrap. Please remember to allow some extra cable in a small loop for the End Stop Module Loom to allow for final adjustment of the End Stop Position. You can cut off any excess Spiral Wrap during final wiring of your Exilis. Secure the Spiral Wrap to the looms inside it with a Cable Tie as per the following image:

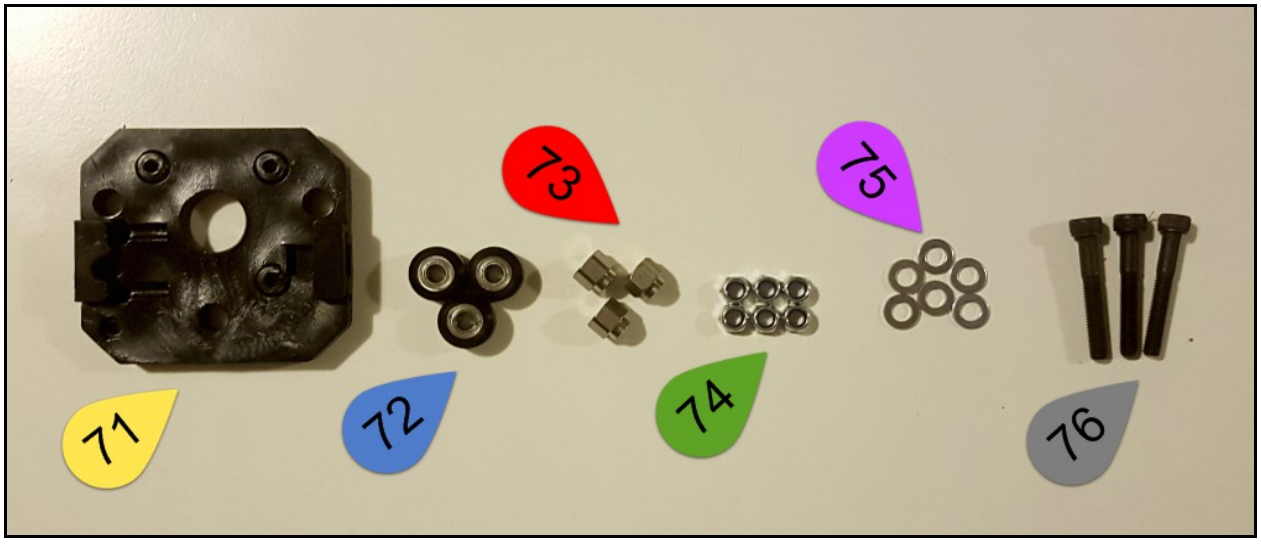


You can set aside your X Axis Rail assembly for now while you assemble the Extruder Carriage in the next step.

Step 8 – Extruder Carriage Assembly.

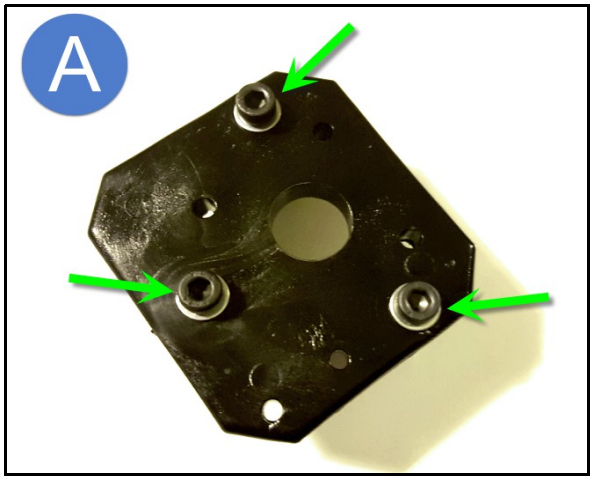
In your kit of parts, locate the following items:

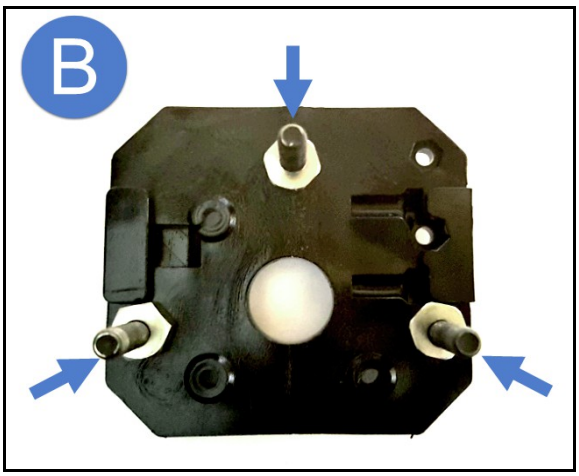
ITEM	DESCRIPTION	QTY
71	EXTRUDER CARRIAGE PLATE	1
72	DELRIN WHEEL BLACK	3
73	ECCENTRIC NUT M5	3
74	NUT M5 NYLOC	6
75	WASHER M5 FLAT	6
76	BOLT M5 x 35mm CAP HEAD	3

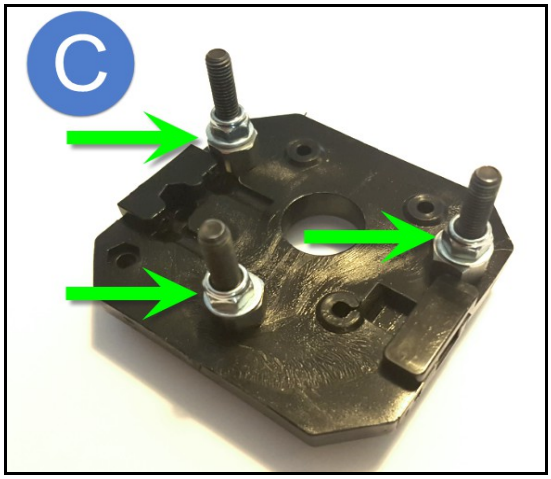


Begin by loading each M5 x 35mm Bolt with a Flat Washer. Pass these bolts through the Extruder Carriage Plate from the Flat Side. Turn over the Extruder Carriage plate and place the Eccentric Nuts on the bolts and fasten them down with the M5 Flat Washers and M5 Nyloc Nuts as per the below images. Please secure the eccentric nuts firmly but do not over-tighten, they must be able to turn under pressure later to provide adjustment to the extruder carriage so that it will run smoothly on the X rail.

Please Note: the eccentric nuts must be orientated correctly to achieve adequate and reliable fitting and adjustment of the Extruder Carriage during assembly and final adjustment. Please note the position of the groove on the eccentric nuts per the below images – indicated by the small blue arrows.

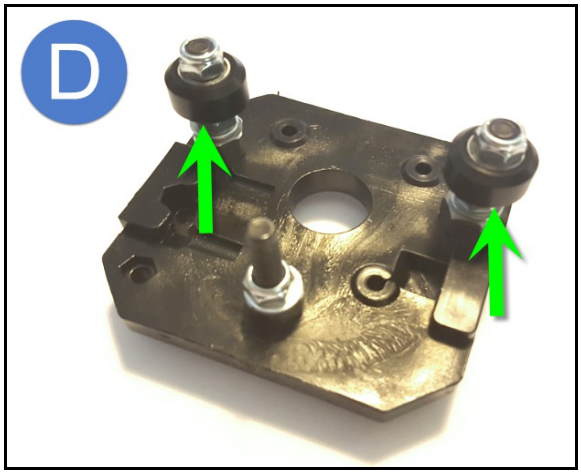






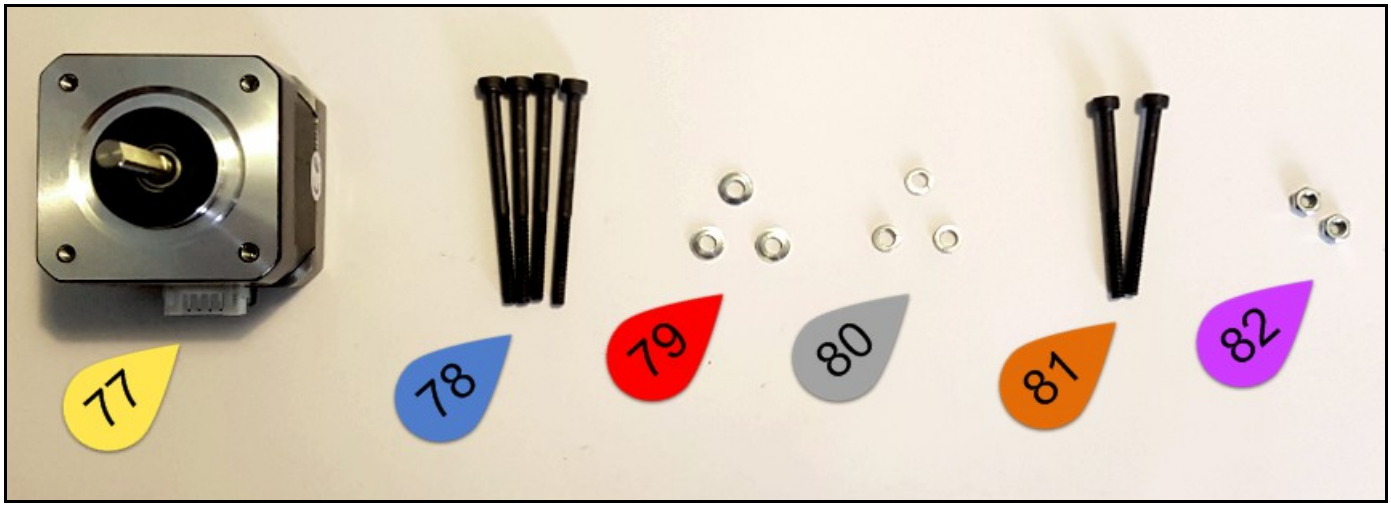
Place two of the three black delrin bearings over the bolts as per the below image and fasten them down with two of the three remaining M5 Nyloc Nuts. Set aside the remaining Black Delrin Wheel and M5 Nyloc Nut for a later step – Fitting the Extruder.

Important Note on tensioning down the Black Delrin Bearings: This must be done very gently and with great care. Only tighten down the Nyloc Nuts onto the Bearing as much as is needed to stop any play between the inner bearing hubs and the faces of the two Nyloc Nuts. They must be free spinning, but not allowed to move up and down the bolt shaft. Over-tightening these bearings will result in too much friction, restricted rotation and permanent damage to the internal ball bearings which you will then be required to purchase separately as replacements as they are not covered under warranty as a result of over-tightening.

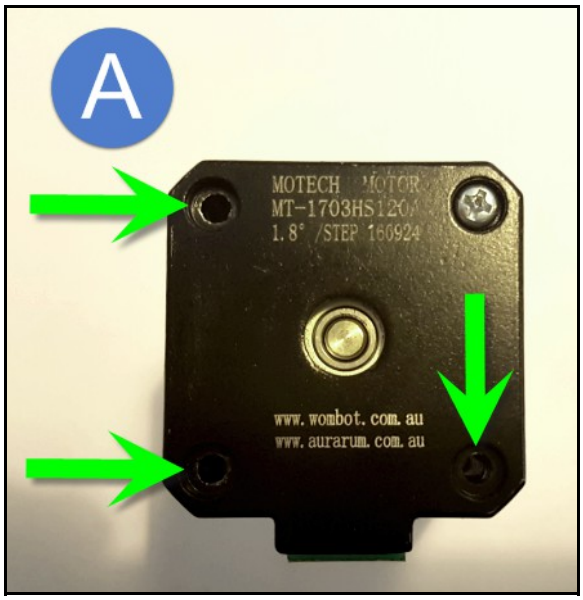


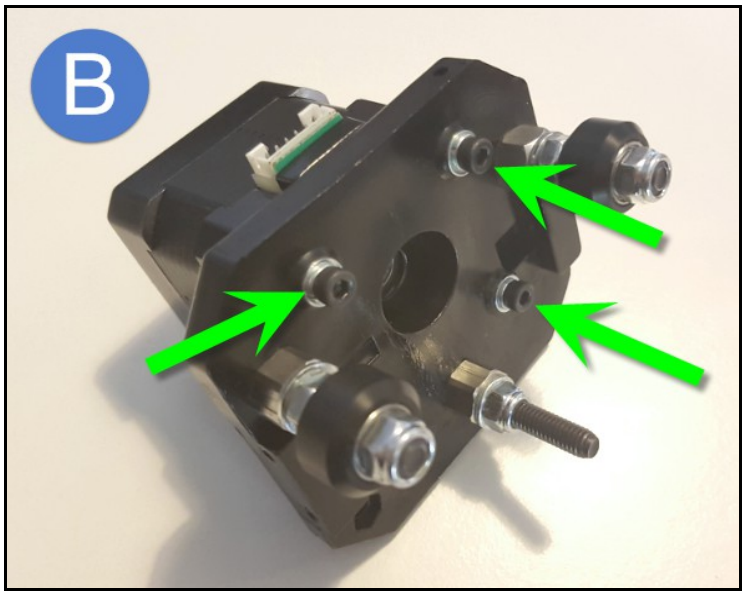
Please locate the following items in your kit of parts for the next step:

ITEM	DESCRIPTION	QTY
77	STEPPER MOTOR NEMA 17	1
78	BOLT M3 x 45mm CAP HEAD	4
79	WASHER M3 SPRING	3
80	WASHER M3 FLAT	3
81	BOLT M3 x 40mm CAP HEAD	2
82	NUT M3 STANDARD HEX	2

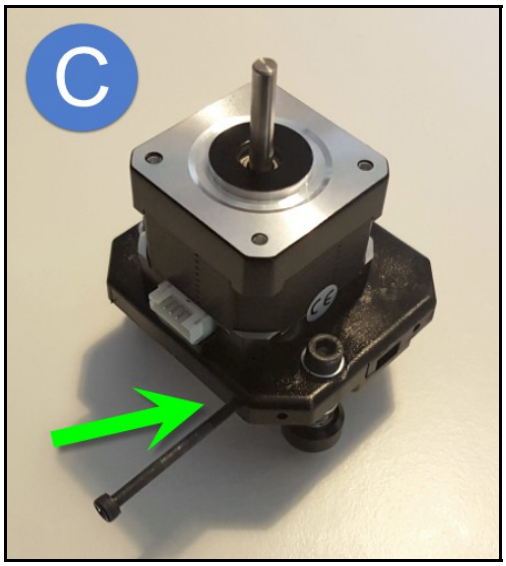


Remove 3 screws from the rear of the Stepper Motor as per the below image. Fit the motor to the Extruder Carriage using 3 x 45mm M3 Cap Head Screws, each with Spring and Flat Washers fitted.

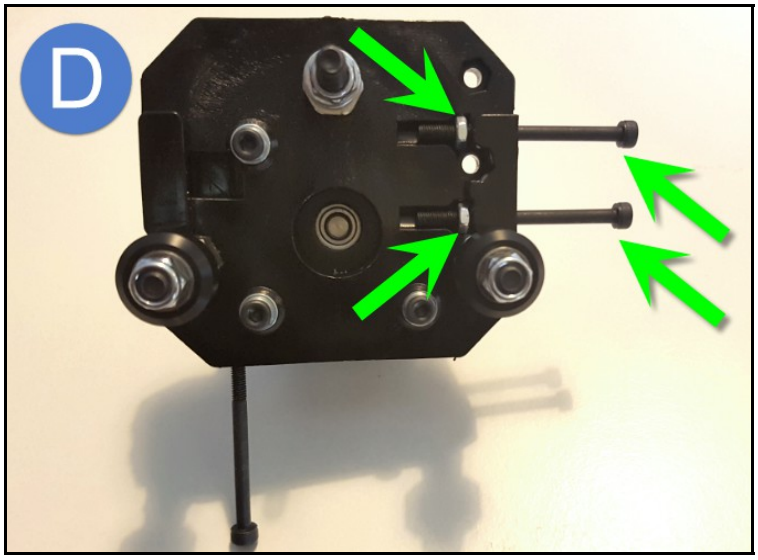




Fit the remaining M3 x 45mm Cap Head Bolt into the pre-drilled hole on the top of the extruder carriage bracket as per the following image. Please note: this is going to serve as a mechanical post for the wiring loom coming from the extruder system back to the Motherboard Enclosure. It is a tight fit and will cut it's own thread as you screw it in. Please screw it in at least 7mm to provide sufficient mechanical strength to support and anchor the wiring loom.

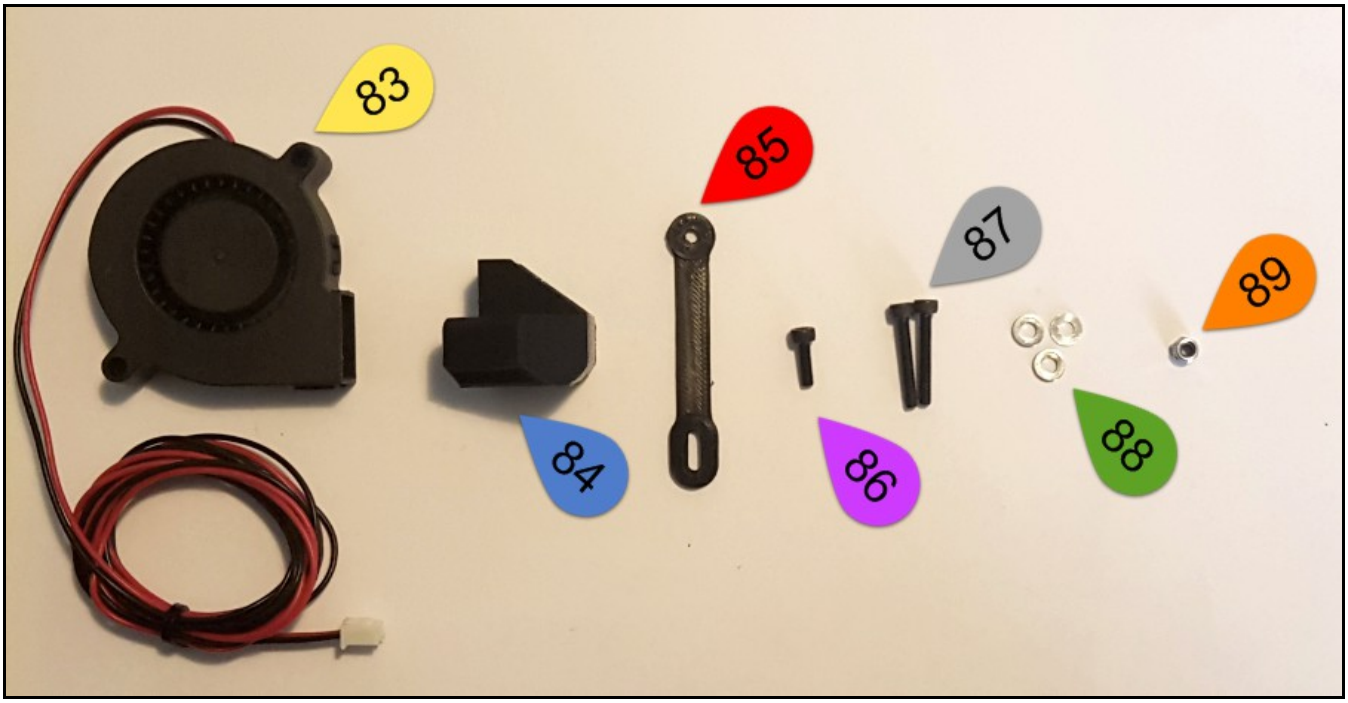


Secure the two M3 x 40mm Cap Head Bolts into the side of the extruder carriage plate utilising the two pre-drilled holes and 2 x M3 Standard Hex Nuts as per the following image. There is already a cavity in the rear of the extruder carriage to house and retain the two nuts to prevent them from turning during tightening. Please make sure that both screws extend from the body of the extruder carriage to the same distance. This will be the mounting point for the X Belt System later in the build. This is also where the X Belt is adjusted for tension.

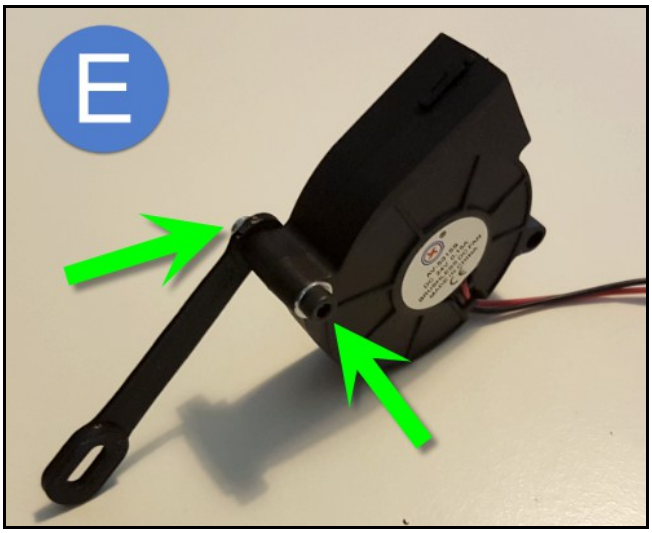


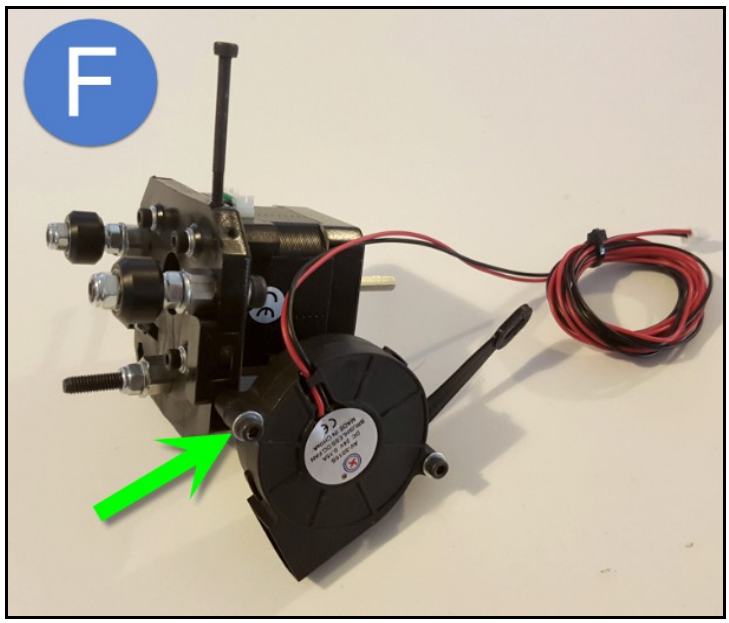
In your kit of parts, please locate the following items:

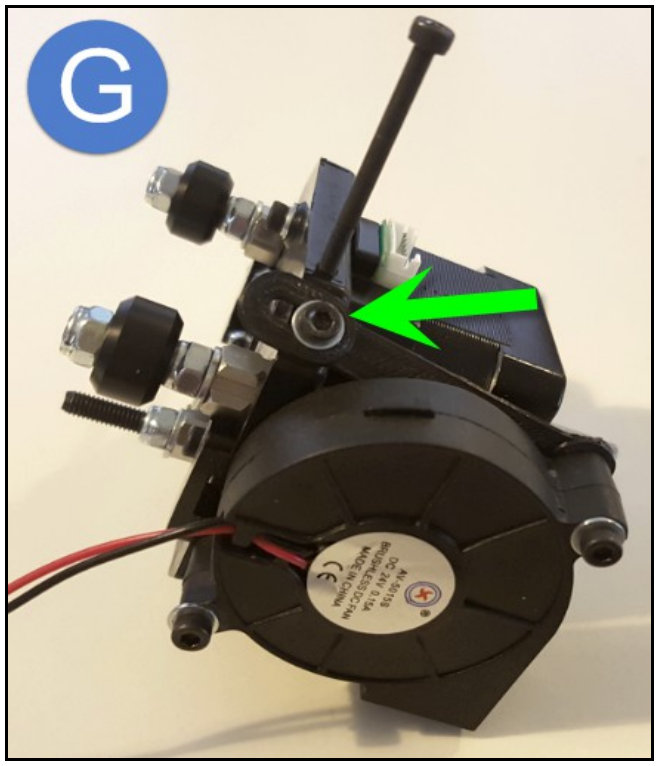
ITEM	DESCRIPTION	QTY
83	FAN 40mm RADIAL 24V DC - PART COOLING FAN	1
84	PART COOLING FAN NOZZLE	1
85	PART COOLING FAN BRACE	1
86	BOLT M3 x 10mm CAP HEAD	1
87	BOLT M3 X 20mm CAP HEAD	2
88	WASHER M3 FLAT	3
89	NUT M3 NYLOC	1



Begin by securing the Part Cooling Fan Brace to the Part Cooling Fan loosely using one of the 20mm M3 Cap Head Bolts, one Flat Washer under the head of the bolt and one Nyloc Nut as per the image below. Next, using the other mounting hole in the Fan, fit it to the Extruder Carriage Plate loosely with the other 20mm M3 Bolt with one Flat Washer under the head of the bolt. Please note that this bolt will cut it's own thread in the Plate while being installed and may give resistance at first. Next, swing the Brace around so that it can be secured to the Extruder Carriage using the M3 x 10mm Cap Head Bolt. Once in place, gently tighten all bolts/nuts to make the Part Cooling Fan Assembly rigid and strong. The Part Cooling Fan final position can be adjusted by loosening the screw between the brace and the carriage. The Fan will then swivel on the lower screw, because the hole in the brace at the carriage end is a slot. Simply re-tighten once you are happy with the final position.





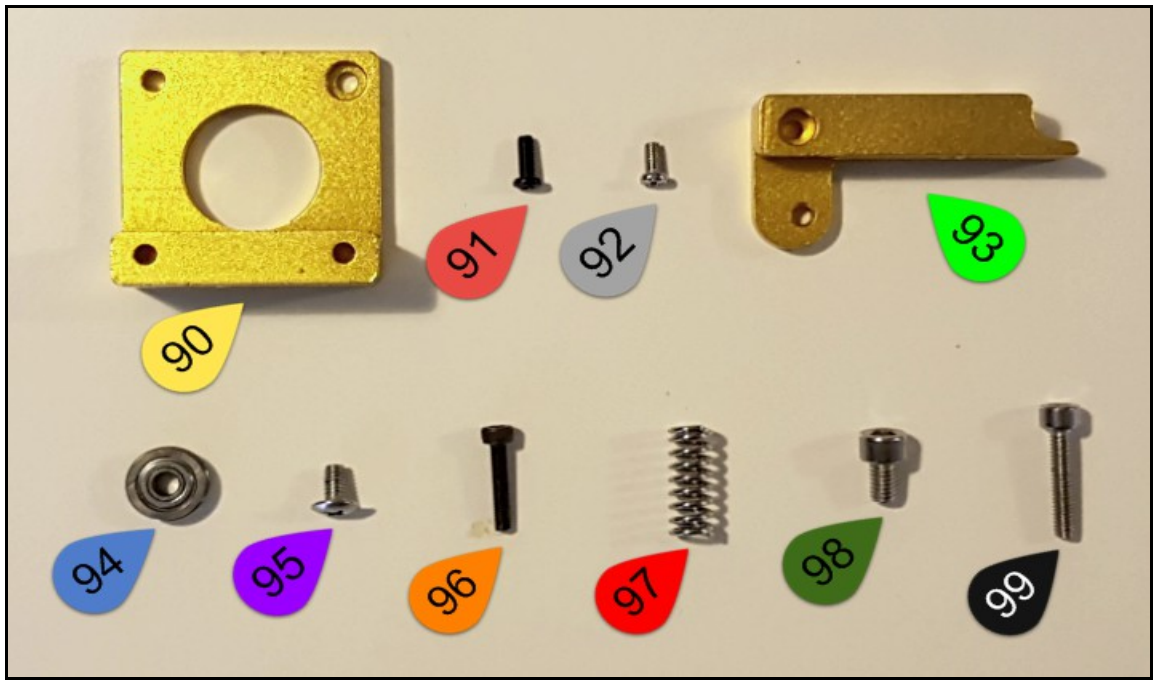


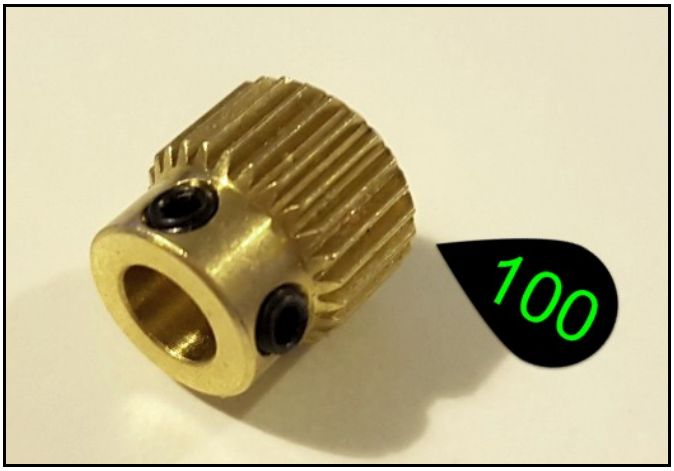
Set aside the Cooling Fan Nozzle (also called a Fan Boot) for now. It is a thin walled 3D Printed Component and may be damaged if fitted at this stage and exposed to rough handling.

Step 9 – MK8 Extruder Module Assembly.

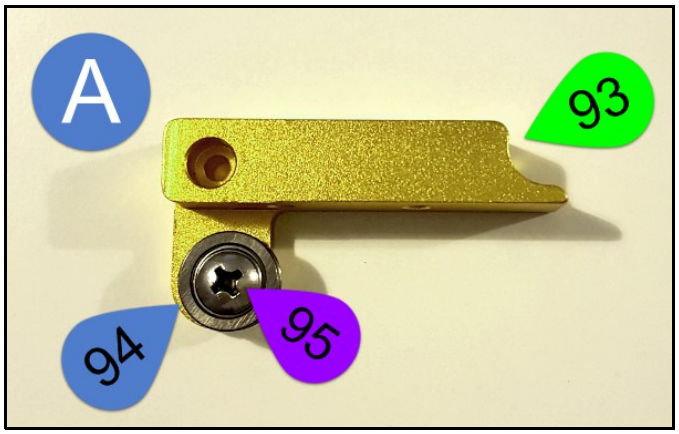
In your kit of parts, please locate the following items:

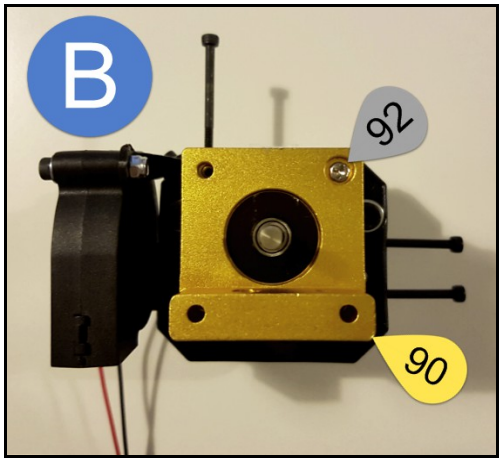
ITEM	DESCRIPTION	QTY
90	MK8 EXTRUDER MOUNTING PLATE	1
91	BOLT M3 x 8mm PAN HEAD PHILLIPS #1	1
92	BOLT M3 x 5mm PAN HEAD PHILLIPS #1	1
93	MK8 EXTRUDER IDLER TENSION ARM	1
94	MK8 EXTRUDER FILAMENT TENSION BEARING	1
95	BOLT M4 x 7mm BROAD PAN HEAD PHILLIPS #2	1
96	BOLT M3 x 16mm CAP HEAD	1
97	MK8 EXTRUDER FILAMENT TENSION SPRING	1
98	BOLT M5 x 8mm CAP HEAD	1
99	BOLT M4 X 20mm CAP HEAD – FILAMENT TENSION ADJUSTMENT BOLT	1
100	MK8 EXTRUDER COG	1



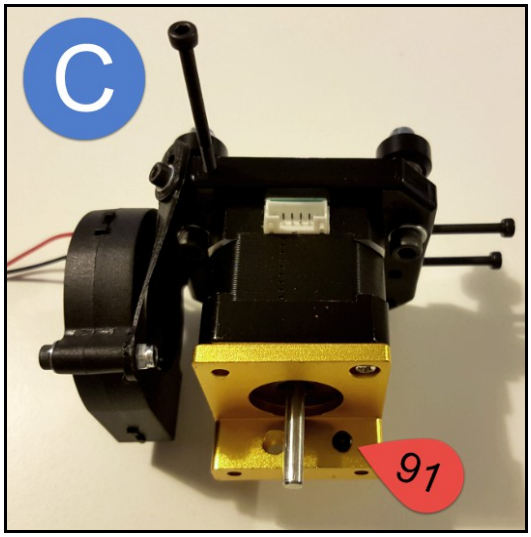


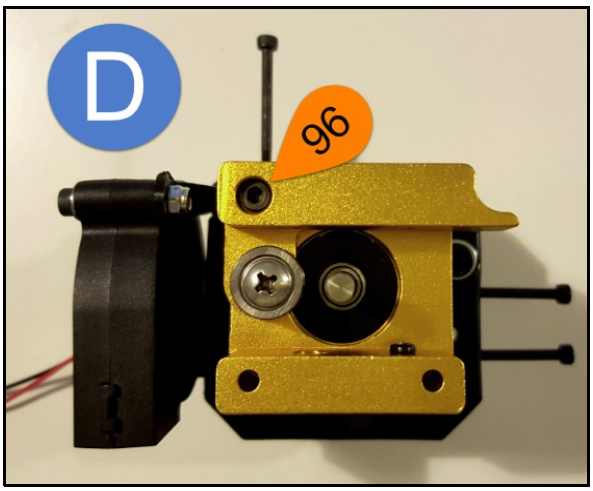
Secure the Filament Tension Bearing to the Tension Arm tightly using the M4 x 7mm Broad Head Phillips Bolt. Set it aside for the moment. Place your Extruder Carriage on your workspace, motor face up and secure the Extruder Mounting Plate to the face of the Motor using the M3 x 5mm Philips Bolt as per the below images:



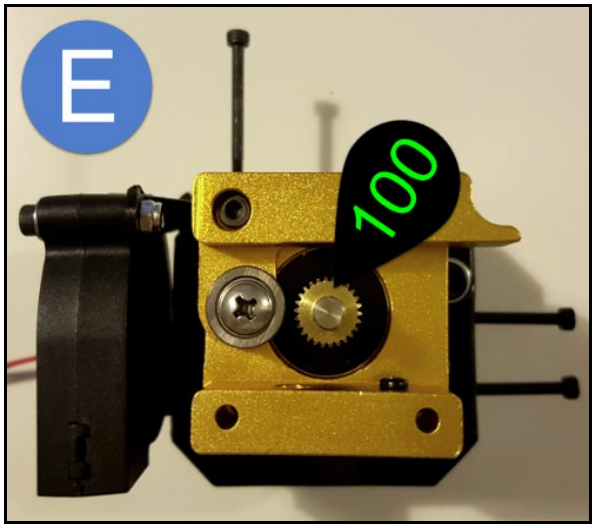


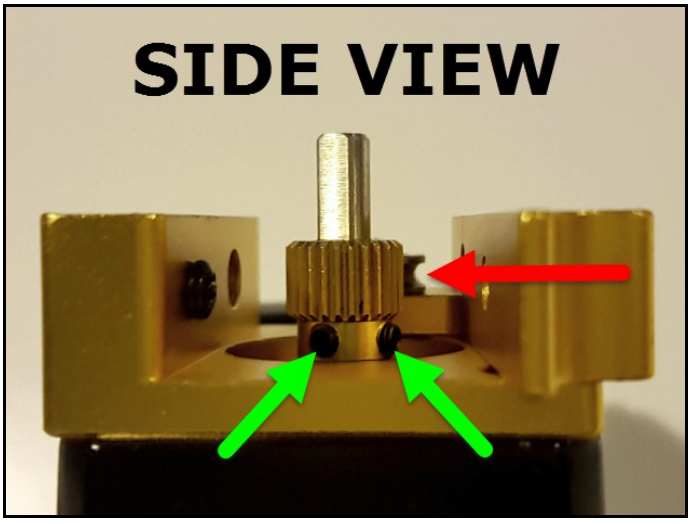
Tightly secure the M3 x 8mm Pan Head Bolt into the bottom of the Extruder Mounting Plate as per the below image. This will serve as a locating boss for the Tension Spring you will install later. Secure the Tension Arm to the Extruder plate and Motor using the M3 x 16mm Cap Head Screw. This must be tight enough to hold the Tension arm down, but not so tight that it locks the arm in place, preventing it from swivelling on the Bolt.



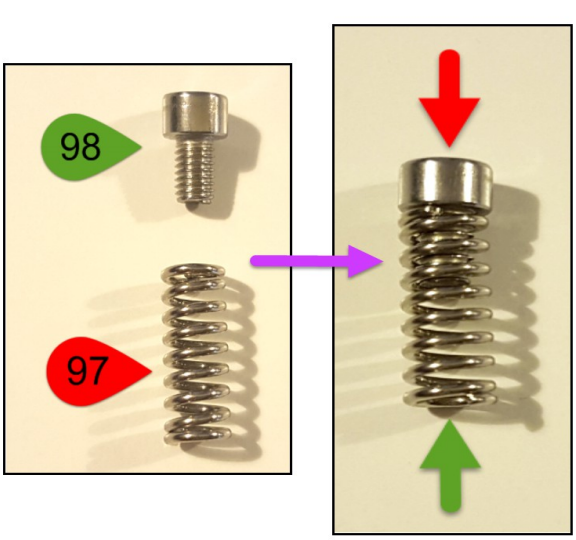


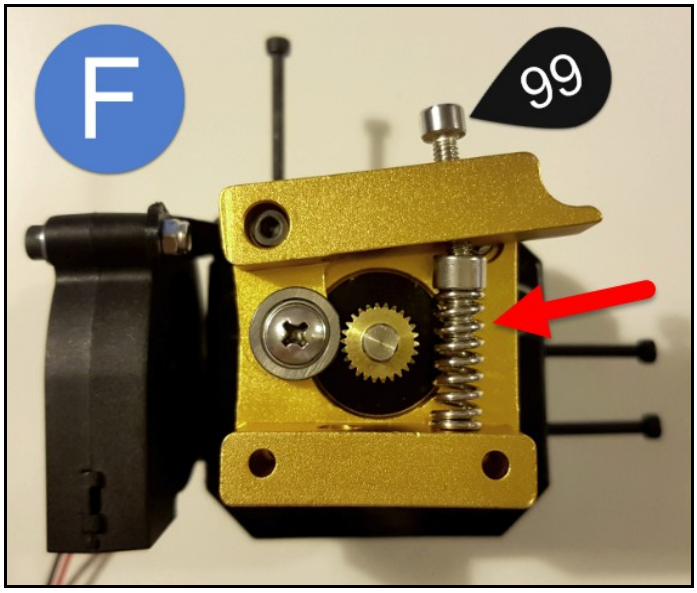
Fit the Extruder Cog to the Motor Shaft so that the cog teeth are central to the Filament Tension Bearing as per the below image. Tighten the two grub screws on the Extruder Cog making sure that one of the grub screws is located in line with the flat section on the shaft of the motor.





Assemble the Filament Tension Spring to the M5 x 8mm Cap Head Bolt. This bolt serves as a locator and anchor for the filament tension adjustment bolt. Insert the assembled spring into the extruder module. Install the M4 x 40 Cap Head Bolt in the top of the Tension Arm so that it passes through the arm and locates itself in the head of the bolt on the spring assembly. Tension this bolt until the spring is captive in the module.





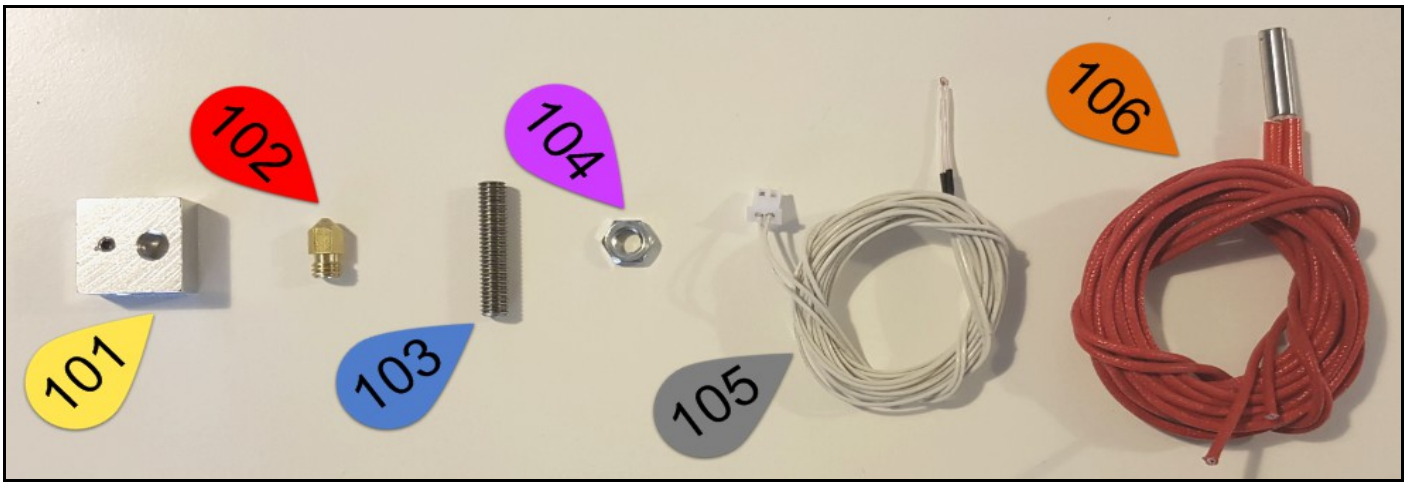
This is the heart of the filament tensioning system for the MK8 Extruder. When assembled correctly, the spring provides tension to the pivoting arm. As a result, the filament bearing is moved closer to the extruder cog. With filament loaded, this system provides pressure to the filament which pushes it against the Extruder Cog. When under pressure, the sharp teeth on the Extruder Cog are intended to have sufficient mechanical grip on the filament so as to "Push" it downwards into the Hot End in a very reliable and controlled fashion.

For more detailed information on correct filament tension, please complete the assembly of your Exilis then consult the Exilis Operation Manual prior to printing.

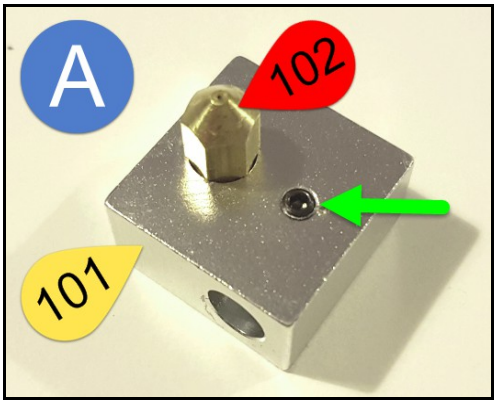
Step 10 – Assembling the Hot End

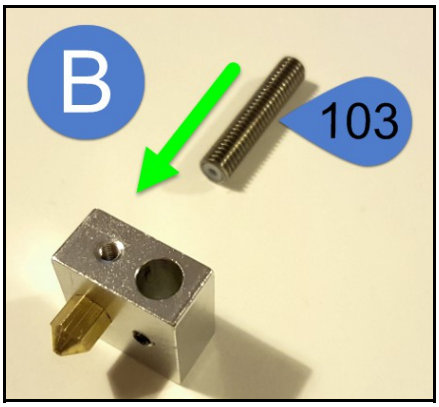
In your kit of parts, please locate the following items:

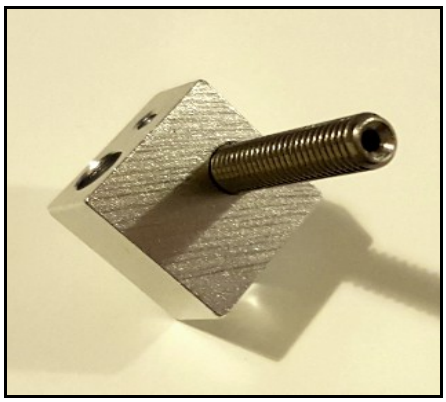
ITEM	DESCRIPTION	QTY
101	MK7 / MK8 THERMAL BLOCK ALUMINIUM ANODIZED	1
102	MK7 / MK8 NOZZLE BRASS 0.4mm	1
103	THERMAL BREAK PTFE LINED 6mm	1
104	LOCKING NUT 6mm	1
105	THERMISTOR 100K NTC	1
106	HEATER CARTRIDGE 40 Watt	1
107	KAPTON TAPE 8mm WIDE	1



Begin assembling the Hot End by screwing the Nozzle all the way into the Thermal Block until it stops. Please note orientation of Nozzle to Thermal Block with respect to the position of the Grub Screw. Only tighten the nozzle finger tight, it will need to be unscrewed slightly later in order to secure the Thermal Break. Screw in the Thermal Break from the other side of the Thermal Block finger tight with the PTFE Liner towards the nozzle, until it stops at the back end of the nozzle thread, inside the Thermal block.



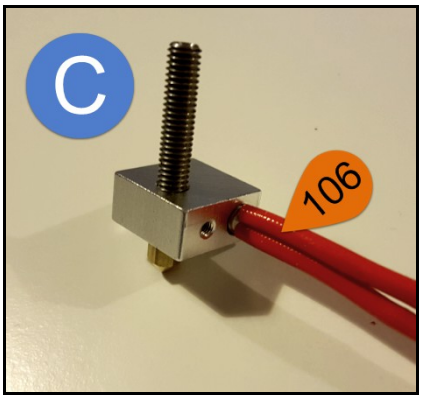


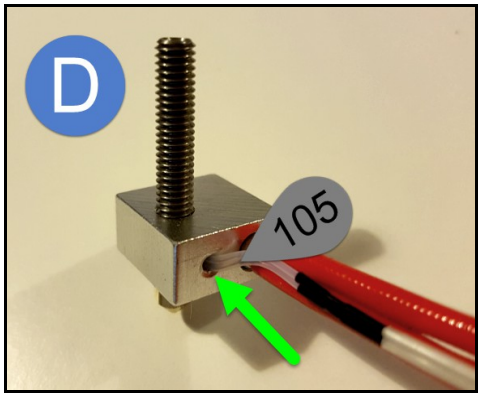


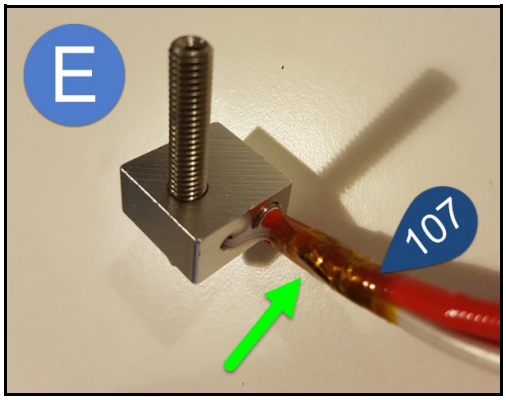
While holding the thermal break in place (not allowing it to rotate at all), Unscrew the nozzle 1/8th of a turn. Hold the nozzle in this position while screwing in the thermal break the same 1/8th of a turn until it again reaches the rear end of the nozzle. Now, while holding the thermal break in place, re-tighten the nozzle into the thermal break tightly using a ring spanner or adjustable wrench. The Nozzle is now locked in place, as is the Thermal Break under compression, inside the Thermal Block. This is the preferred method of securing the Nozzle and Thermal Break to a heater block because it ensures that the nozzle is as far as possible inside the thermal block (maximum exposure to the thermal energy generated by the thermal block/heater cartridge assembly) and because it allows tightening of the Thermal Break without damaging it. The Thermal Break is named this because it is the point at which the thermal transition occurs to the plastic material being printed – from filament to liquid plastic. This kind of thermal break has very thin wall section behind the visible threads on the outside of it – this is so that the thermal energy from the heater block has minimal material with which to conduct heat to the "cold side" of the extruder – where it must remain as solid filament in order for the extruder cog to maintain optimal traction on the filament during extrusion.

Unfortunately, this also makes them susceptible to breaking if handled roughly, over-tightened or mechanically twisted or bent. Please exercise care and a gentle hand when handling thermal breaks of all types as they are low cost consumable items that are not covered under warranty, should you break it during assembly of your kit.

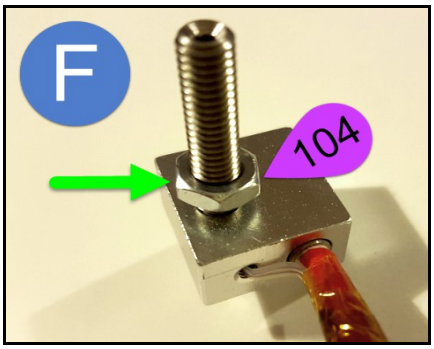
Fit the Heater Cartridge into the thermal block and secure it gently with the grub screw on the nozzle side of the block. Once the heater cartridge is secured in the block, insert the Thermistor all the way into the threaded hole next to the heater cartridge and bend the wires so that they run along the heater block then follow the heater cartridge wires. Using the supplied Kapton Tape, tightly wrap the heater cartridge wires and thermistor wires together in such a way that the thermistor wires are under tension to remain in the heater block, as per the following images:





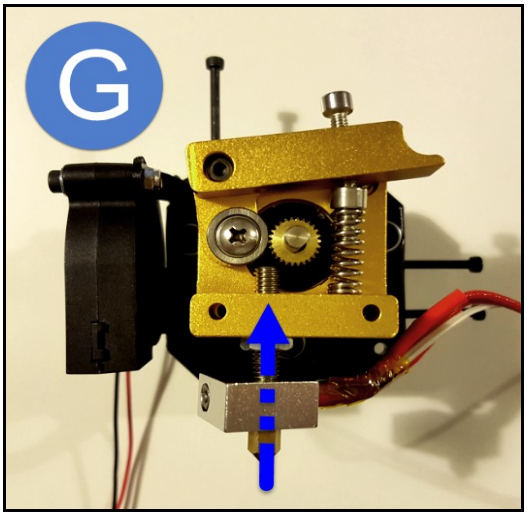


Screw the M6 Locking Nut over the thermal break loosely and leave it close to the thermal block.



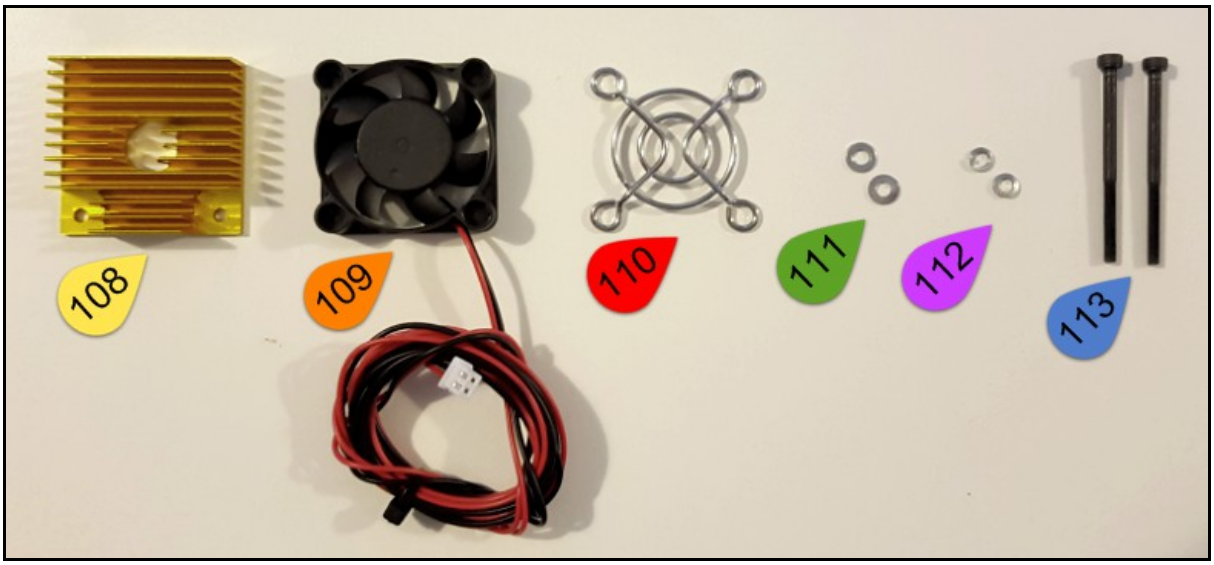
Screw the completed Hot End Assembly into the Extruder Assembly as per the following images.

<u>Important Notes:</u> The Hot End Assembly should be screwed into the Extruder Module so that there is approximately 1.5mm of clearance between the Extruder Cog and the Thermal Break and the Idler Bearing and the Thermal Break. It should be close so that there is a minimal distance of unsupported filament through the extruder, but far enough away so that there is clearance between the thermal break and extruder cog/idler bearing. The thermal break cannot be allowed to touch either the cog or bearing during normal operation. Contact between the Thermal Break and either the Cog or Bearing will result in damage to the components and unreliable operation of the extruder module.

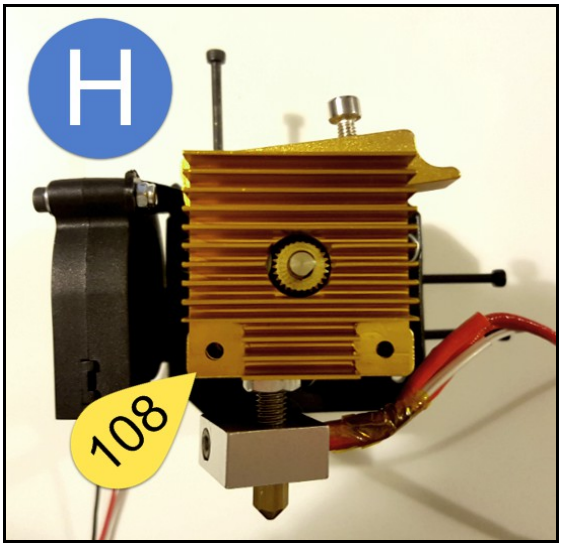


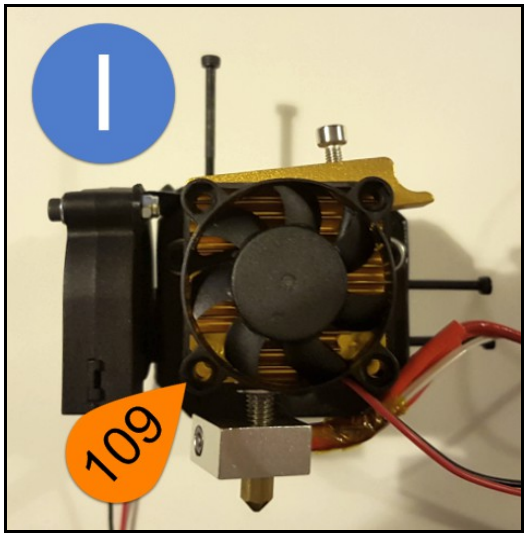
Next, in your kit of parts, please locate the following items:

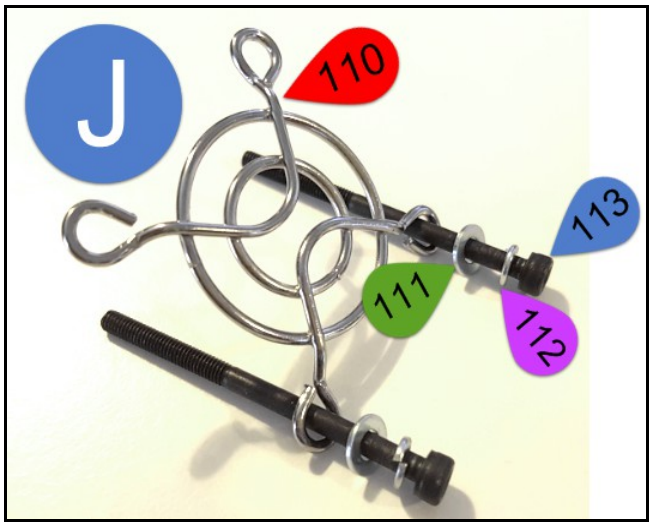
ITEM	DESCRIPTION	QTY
108	MK8 EXTRUDER HEATSINK	1
109	FAN 40mm AXIAL 24V DC	1
110	FAN GUARD 40mm	1
111	WASHER M3 FLAT	2
112	WASHER M3 SPRING	2
113	BOLT M3 x 45mm CAP HEAD	2

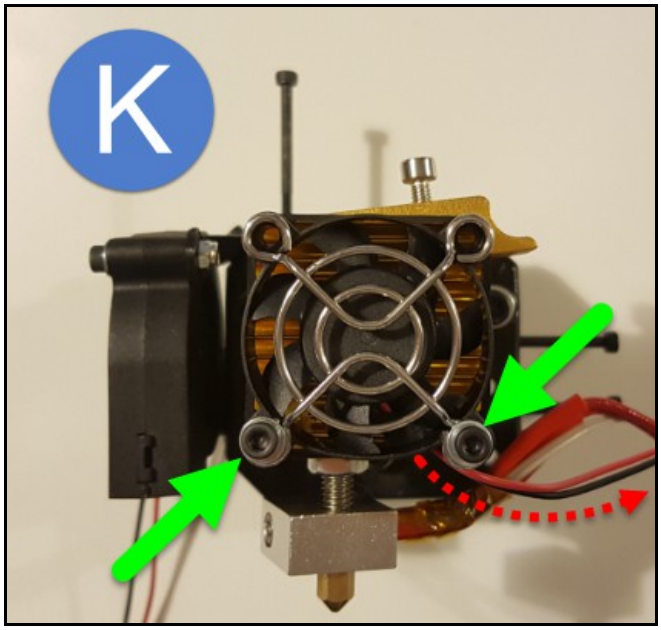


Place the MK8 Heatsink on top of the Extruder as per the following image. Place the 40mm Fan on top of the heatsink. Load one M3 Spring Washer and one M3 Flat Washer to each of the M3 x 45mm Bolts. Insert these through two of the holes on the Fan Guard on one side as per the following image. Assemble the Fan Guard with Bolts onto the bottom face of the already installed Heatsink and Fan. Secure these two bolts to the Extruder Module. Please note the orientation of the Fan with respect to the wires and airflow direction.
Cool air should be blown *TOWARDS* the heatsink.





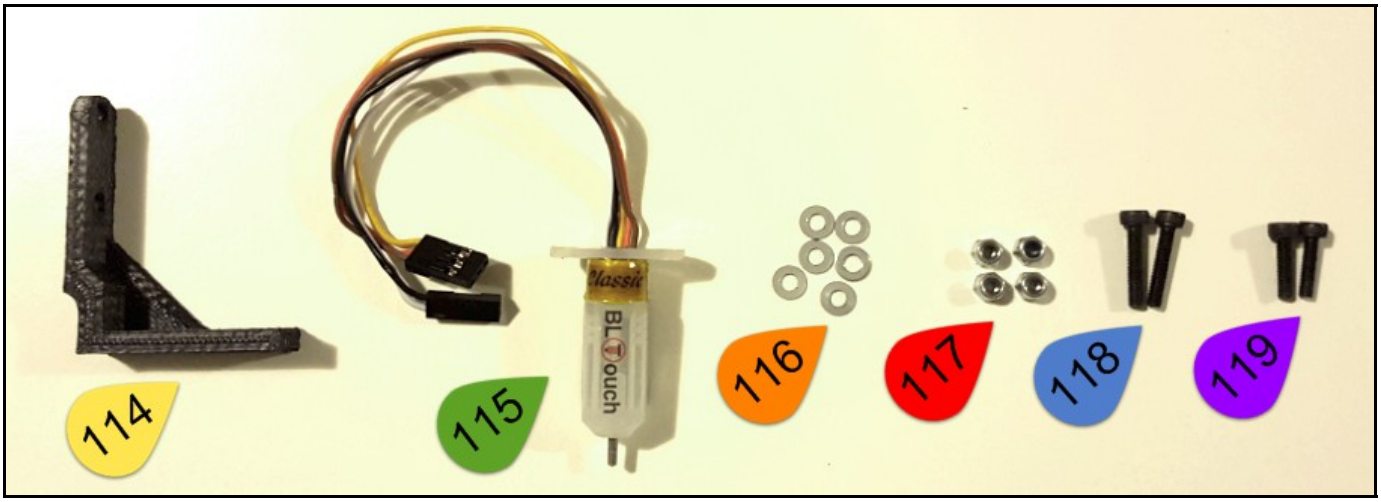


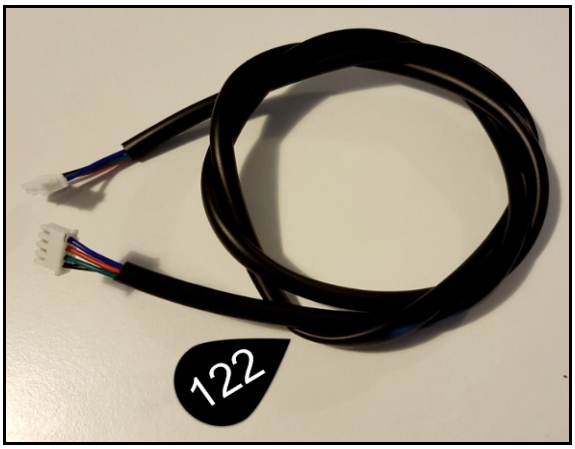


Please note: these two Bolts extend into the bottom two tapped (threaded) holes on the Extruder Stepper Motor. These Bolts are intended to hold the Heatsink, Fan, Fan Guard

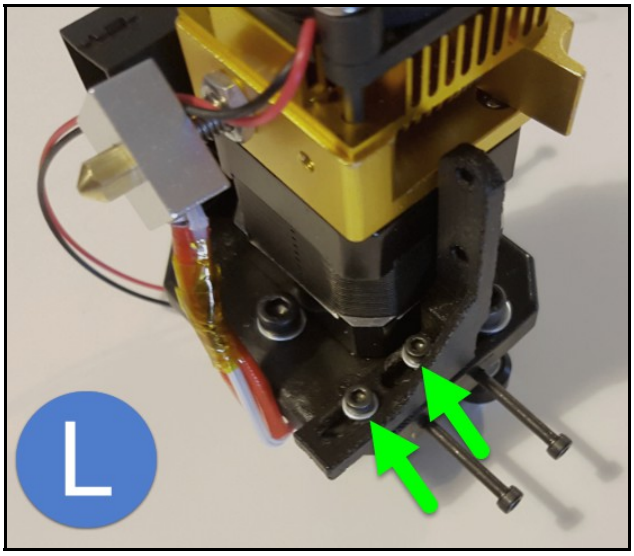
In your kit of parts, please locate the following items:

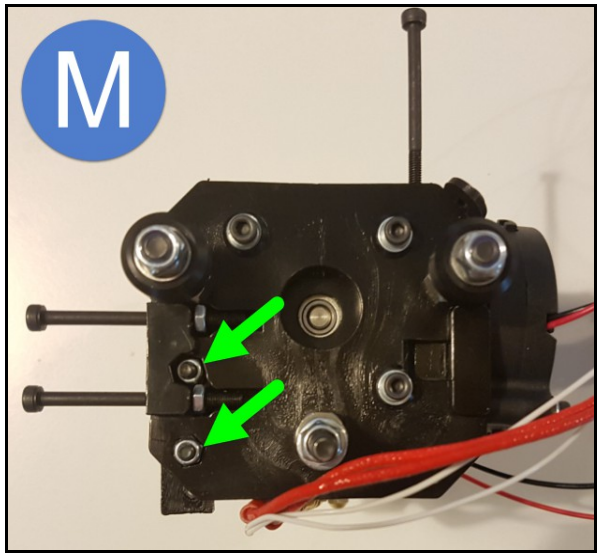
ITEM	DESCRIPTION	QTY
114	BL-TOUCH BRACKET RIGHT ANGLE	1
115	BL-TOUCH MODULE	1
116	WASHER M3 FLAT	6
117	NUT M3 NYLOC	4
118	BOLT M3 x 16mm CAP HEAD	2
119	BOLT M3 x 10mm CAP HEAD	2
120	3 PIN DUPONT EXTENSION CABLE	1
121	2 PIN DUPONT EXTENSION CABLE	1
122	STEPPER MOTOR CABLE 900mm	1
123	SPIRAL WRAP BLACK NYLON	1



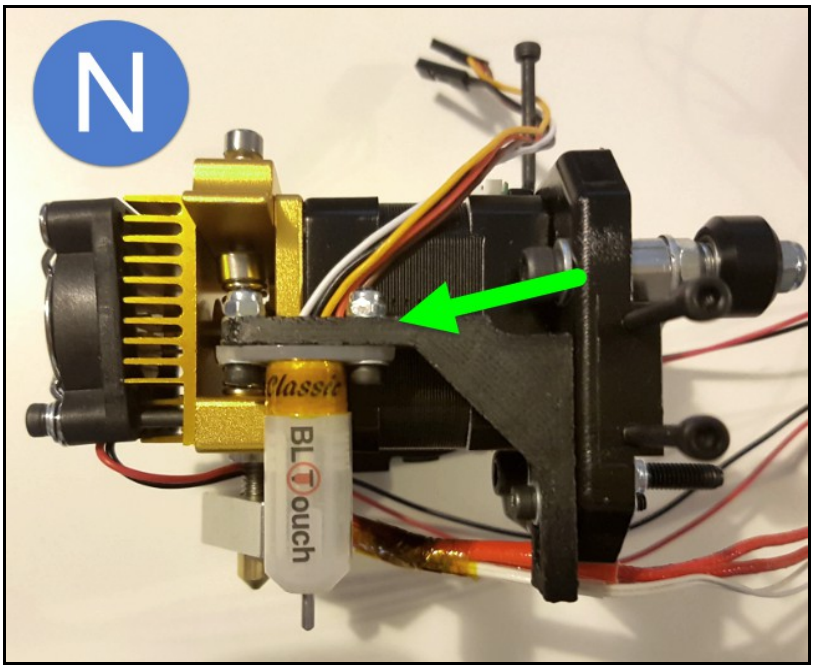


Using the two M3 x 16mm Cap Head Screws, two M3 Flat Washers and two M3 Nyloc Nuts, fit the BLTouch Bracket to the Extruder Carriage Module. There are recesses in the rear of the Extruder Plate to house and lock the Nyloc Nuts in place. Do not fully tighten this bracket to the carriage, it will need to move up or down for final calibration of the BLTouch Sensor at the end of the build.



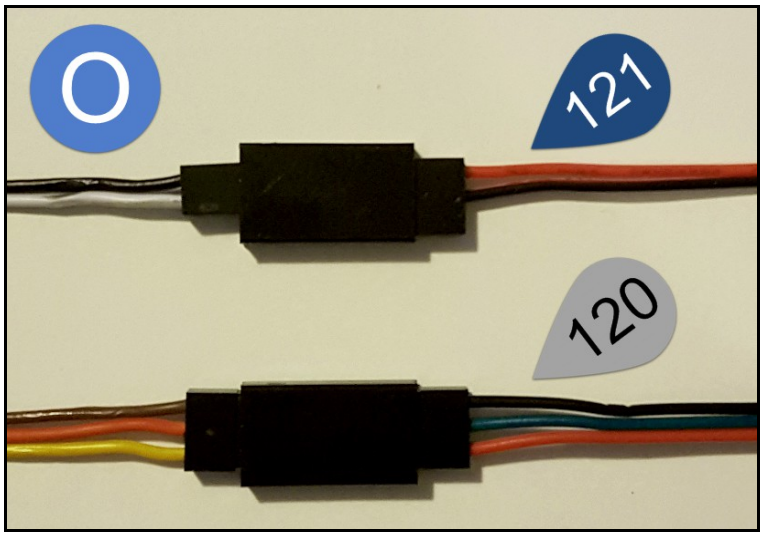


Using the two M3 x 10mm Cap Head Bolts, four M3 Flat Washers and two M3 Nyloc Nuts, fasten the BLTouch Sensor to the bracket as per the following image. Please note that the green PCB on the BLTouch should face the Extruder Motor so that it is protected and so that the wires coming from the sensor travel in the correct direction to be formed into a loom.



With the BLTouch Sensor installed, connect the two DuPont Extension cables into the connectors on the end of the wires coming from the BLTouch sensor **EXACTLY** the same as the following image.
Make sure that on the 2 pin connectors you join BLTouch BLACK to Extension RED and that you join BLTouch WHITE to Extension BLACK. Make sure that on the 3 pin connectors you join the BLTouch BROWN to Extension BLACK and BLTouch ORANGE to Extension GREEN and BLTouch YELLOW to Extension RED

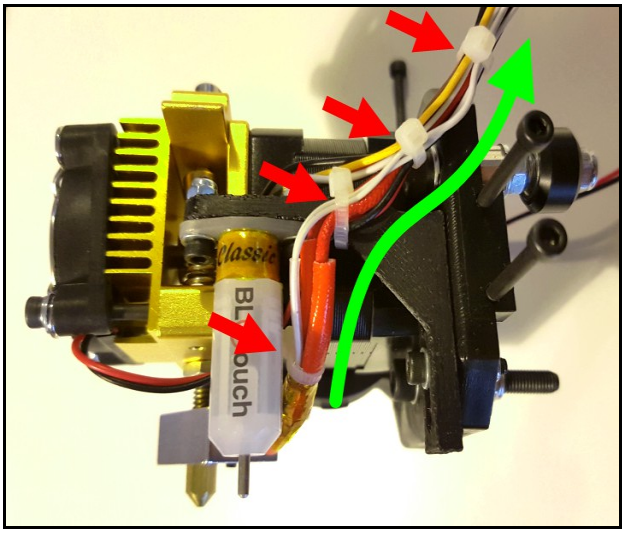
Reversing the polarity of these connectors will result in damage to the BLTouch Sensor or the Motherboard or both.

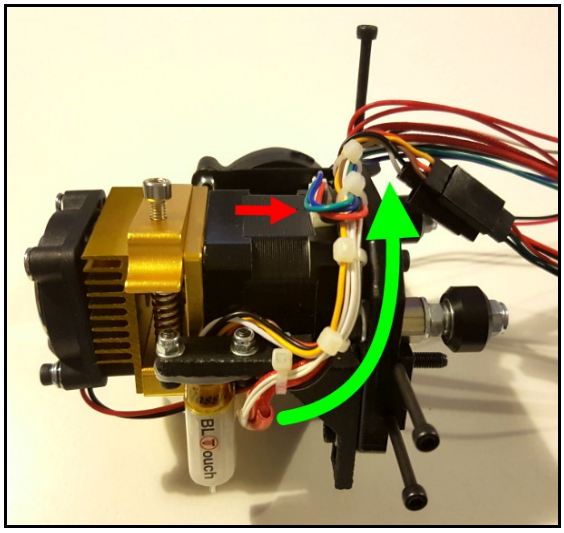


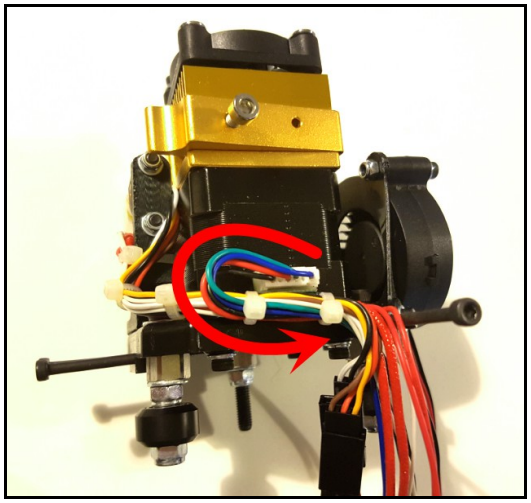
Remove the Black PVC Sheath from the Stepper motor loom by cutting one end lengthways (being careful not to cut or damage any of the 4 wires inside) and pulling it along the loom to tear it away. Discard the split protective sheath, it is not required for the Extruder Carriage Loom – it will be protected by the Black Spiral Wrap. Plug the Stepper Motor Loom into the socket on the top of the Stepper Motor – the connector is keyed so it will only insert if orientated the correct way. The Stepper Motor Loom will join with the other wires coming from the extruder into a single bundle of wires.

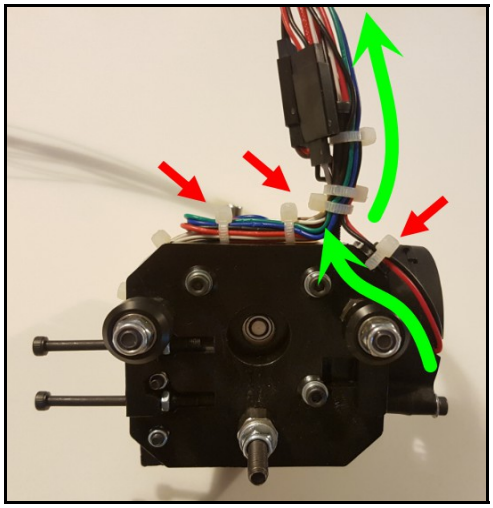
Now is also a good time to label the various wires coming from the Extruder Module. This will make final wiring much simpler. Don't forget to differentiate between the Part Cooling Turbo Fan (which is controllable by the printer and has it's own terminals on the motherboard) and the 40mm Fan on the front of the extruder, which is wired to 24V because it is always on.
It is now time to shape the wires on the Extruder Module into one tidy loom wrapped in spiral wrap, which will travel to the motherboard enclosure and connect the various Extruder Module components to the MKS Gen 1.4 Motherboard.

Please study the following images for guidance on how to shape and secure the wires to the extruder carriage, BLTouch Bracket and the M3 Bolt Turret on the top of the Extruder Carriage using cable ties and Spiral Wrap. Please remember to allow a little extra cable for each component, but not so much that the excess cable will interfere with operation or get in the way. Cable looms which are pulled tight can cause excessive tension to components and pull them out of place and do not allow for adjustment or repair at a later stage.



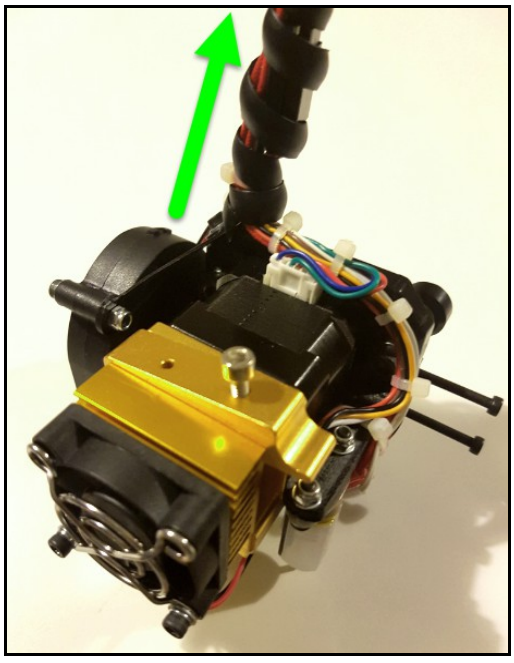


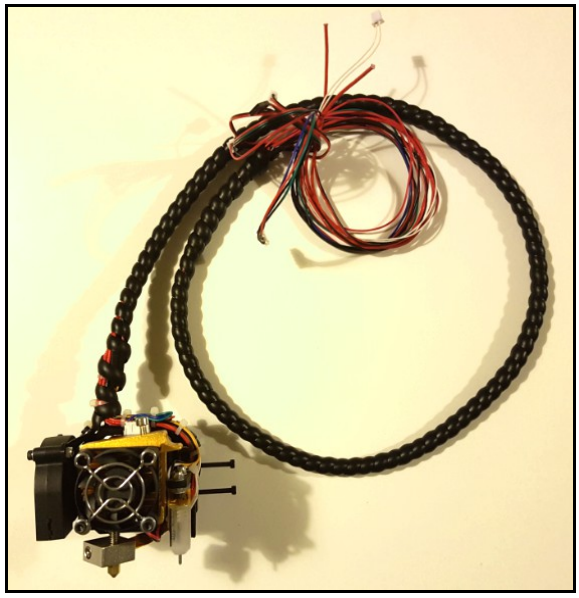




Set aside your assembled extruder module for the moment – it will be fitted at a later stage.

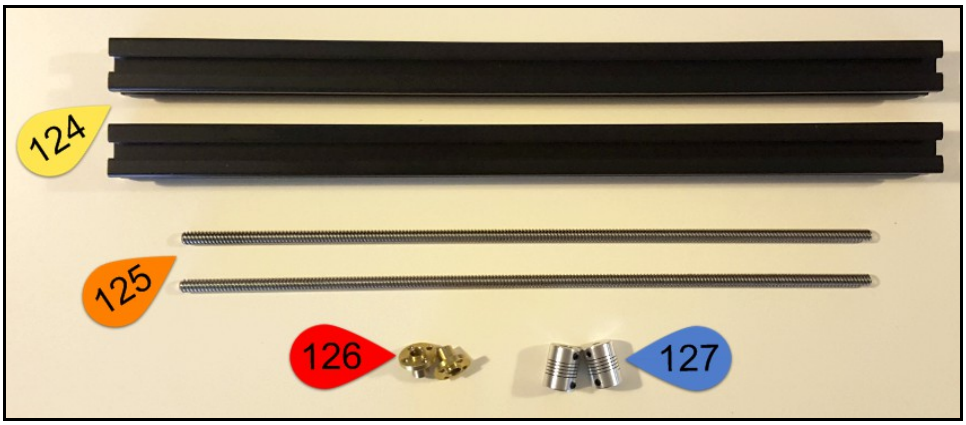
Step 11 – Vertical Rails and Lead Screws



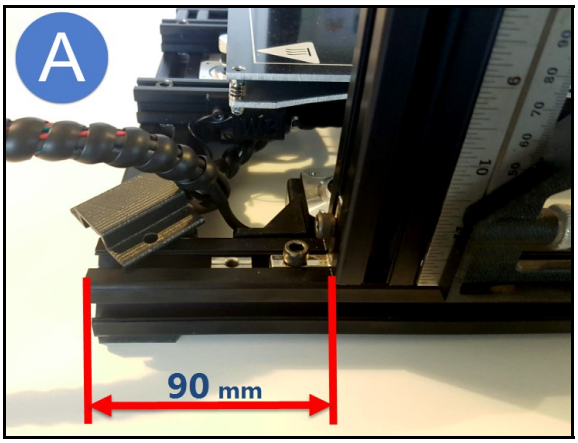


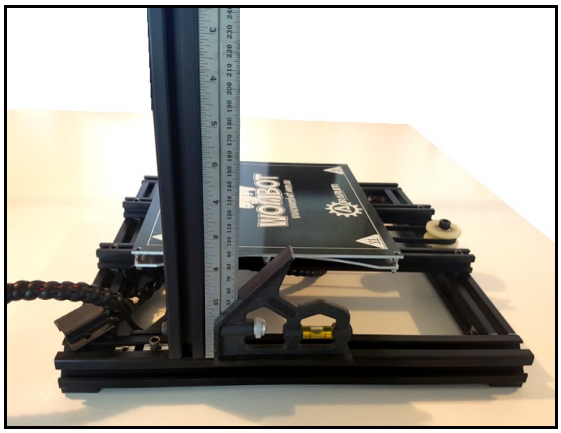
In your kit of parts, please locate the following items:

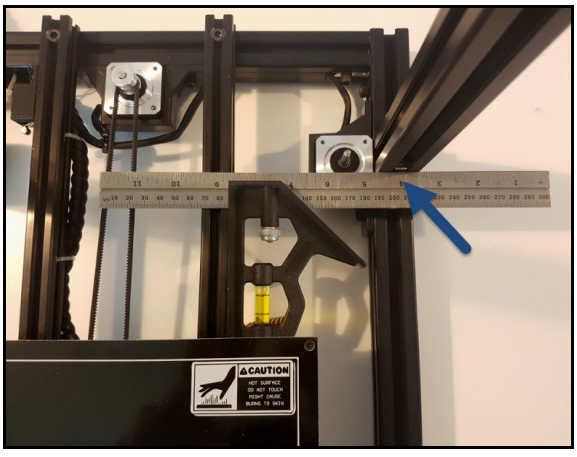
ITEM	DESCRIPTION	QTY
124	3030 EXTRUSION 465mm LENGTH - VERTICAL RAIL	2
125	TRAPEZOIDAL LEAD SCREW 4-START 8mm DIAMETER 8mm PITCH	2
126	T-NUT BRASS 4-START 8mm PITCH	2
127	COUPLER FLEXIBLE 5mm TO 8mm ALUMINIUM	2

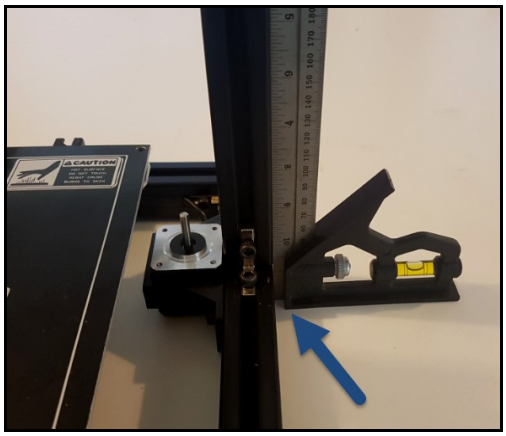


Place your Base Frame on a clean flat surface. Loosen the four right angle brackets on the top side of the Base Frame so that the Vertical Rails can be slotted into them easily and shifted into their final locations. Place the Vertical Rails over these right angle brackets. Gently tighten the four screws finger tight, alternating between the two screws so that the bracket comes up to the internal grooves of the extrusion evenly and in a reasonably square fashion. Slide the two rails into position as per the following image (note that you can temporarily remove the power connector to get an accurate measurement between the vertical rail and the rear of the base frame) and gently tighten while paying attention to the squareness of each Vertical Rail in respect to the rest of the frame components:



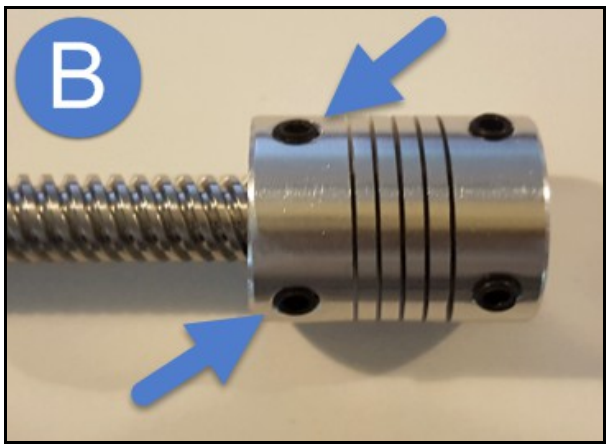


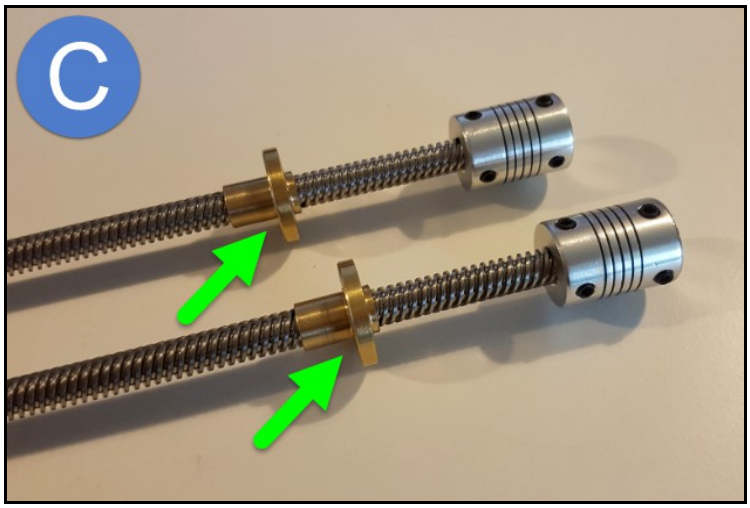




If the verticals are not square to the frame following tightening, loosen one bracket, re-check and re-tighten.

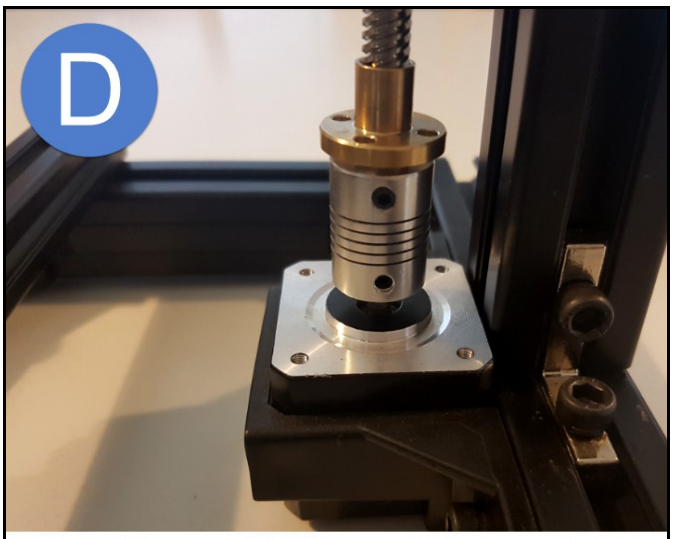
Take your Trapezoidal Lead Screws and Couplers. Lay them out on your table. Loosen the grub screws so that they are clear of the internal bore of the coupler. Insert 8mm of Lead Screw into the end of each coupler and tighten the grub screws so that the Lead Screw is secure in the Coupler as per the following image. Repeat for the second Lead Screw. Screw the Brass T Nuts over the Lead screws in preparation for fitting to the motors:



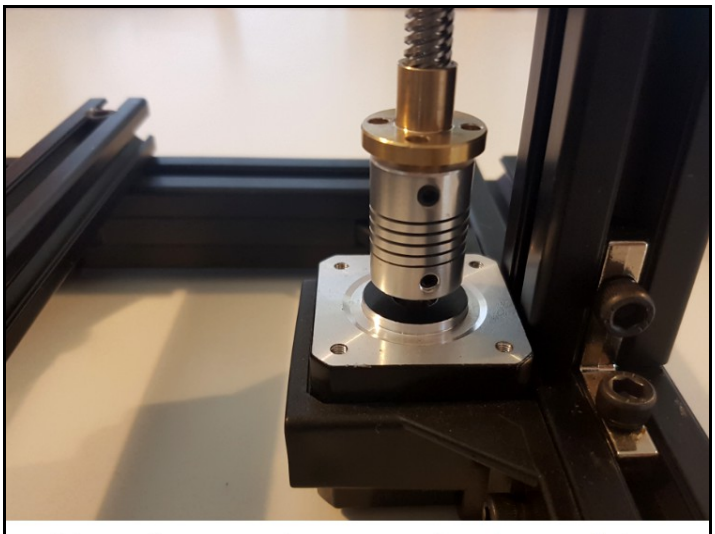


Place the Couplers (with Lead Screws Fitted) onto the Z Motor Shafts making sure that one of the grub screws is aligned with the flat on the shaft of the Motor.

Important note about tightening the Couplers to the Z Motors:
When tightening the grub screws in the coupler to fasten them to the Z Motors, it is important that you fasten the coupler while under downward tension, hence stretching slightly the "spring" portion of the coupler. Do this by inserting your Hex Key into the grub screw then apply gentle pressure downward on the hex key. The coupler will stretch – the gaps between the rings will increase slightly. Tighten while under pressure. This forces the Motor Shaft into contact with the face of the Lead screw so that a solid mechanical interface is achieved between Motor and Lead Screw.



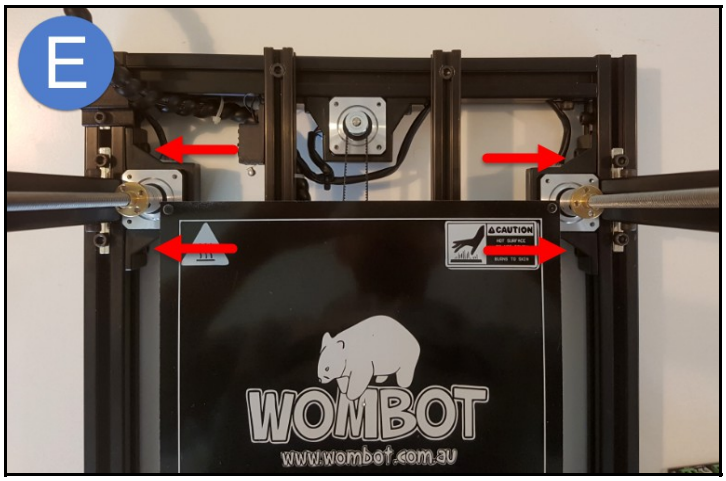
Note the gaps between the rings of the coupler. This is how it looks when grub screw is loose.



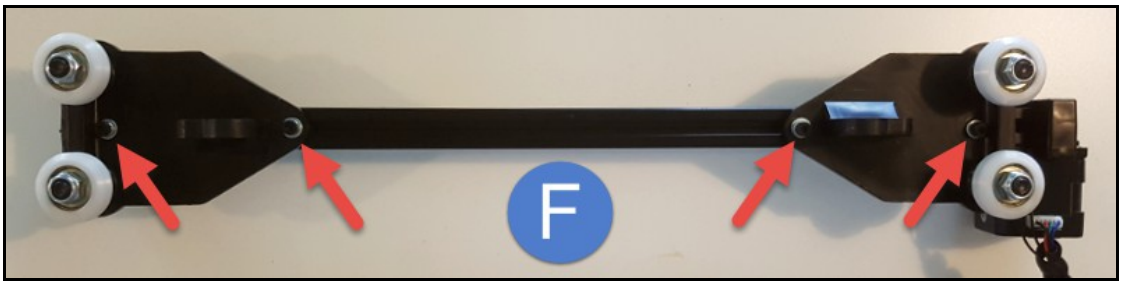
Note the gaps between the rings of the coupler. This is how it looks when tightened under tension.

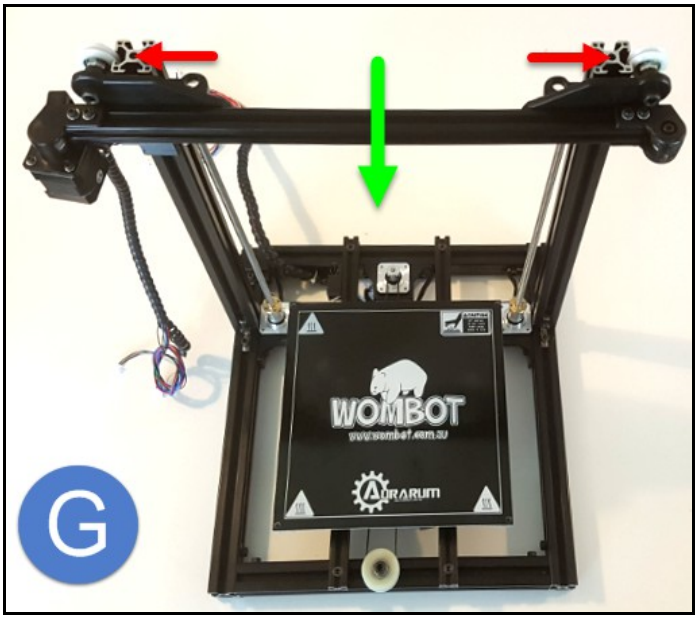
The difference is subtle, but important. If after tightening the grub screws on the Motor Shaft, when you push the lead screw downward, the spring portion of the coupler compresses, then you have not applied sufficient tension to the coupler during tightening. Please loosen grub screws and apply greater downward force while tightening the grub screws.

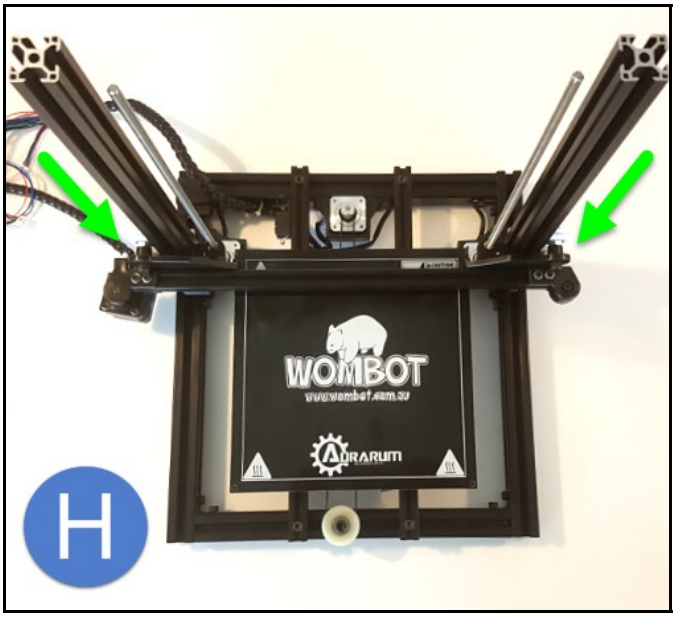
Loosen the four screws holding the Z motor brackets in place so that they can shift into their final positions.



Loosen the four screws on the X Rail as per the following image:



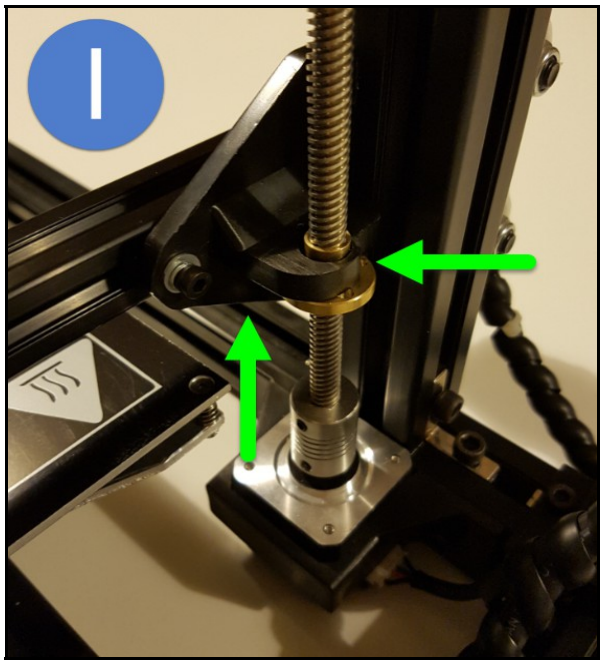


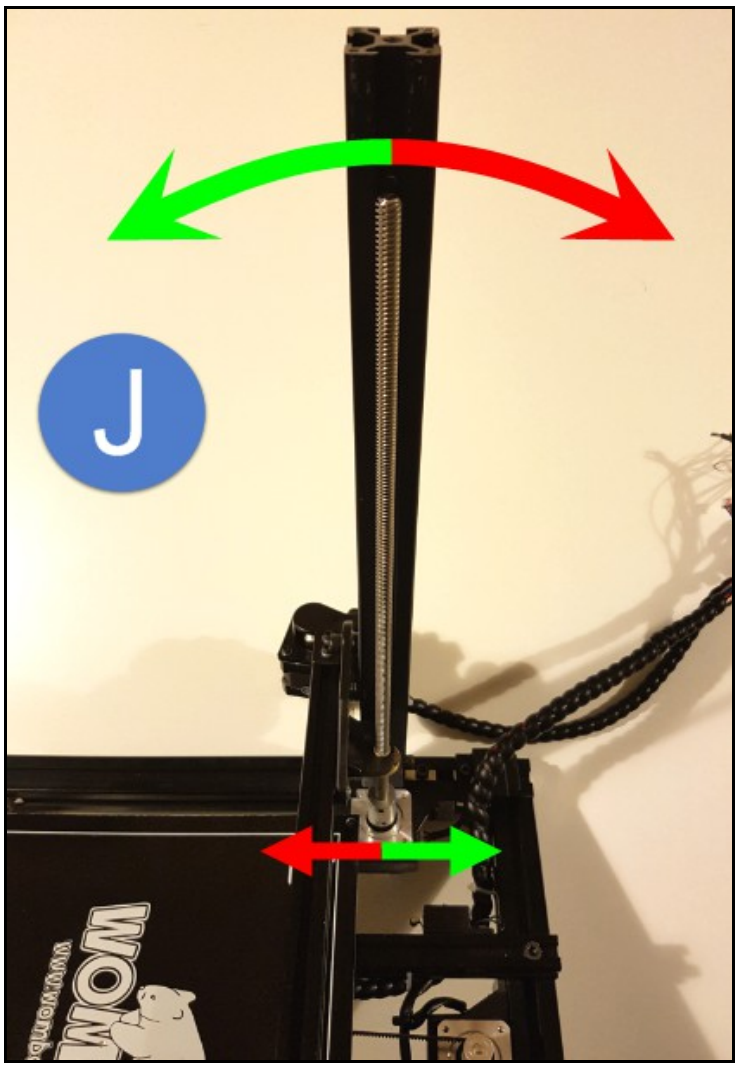


Gently align the X Rail with the top of the vertical rails making sure the Large White Bearings align with the grooves on the outside of the Vertical Rails and that the Lead Screws pass through the holes in the X Rail Brackets. Lower the X Rail down gently and slowly. Rest it on the heated bed assembly.

Once you are confident that the X Rail will move smoothly and without obstruction along the Vertical Rails, Lift the X Rail by approximately 150mm vertically and spin the Brass T Nuts upward along the Lead Screws to support the X rail – make sure that each boss on the top of the Brass T Nut is located in the holes in the X Rail Brackets as per the following images and that the X Rail is approximately parallel to the Base Frame. Inspect the angle of the lead screws in relation to the Vertical Rails running along side them. They should be perfectly in line with the central slot in the Vertical Rails. If they are not, simply shift the Z Motor Brackets forward or rearward to align the Lead Screws with the Vertical Rails.

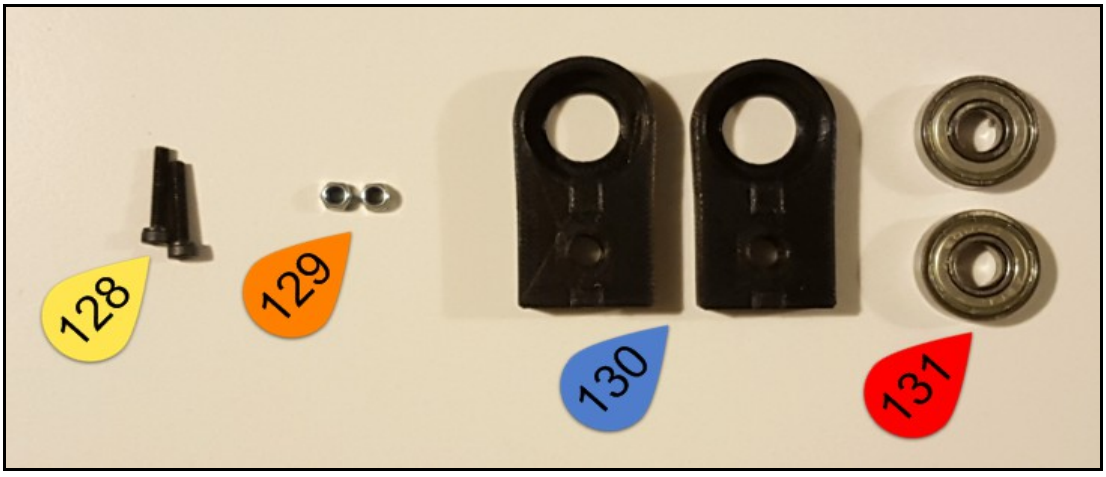
Once you are happy that the Trapezoidal Lead Screws are perfectly in line with the Vertical Rails, Securely fasten the Z Motor Brackets in place.



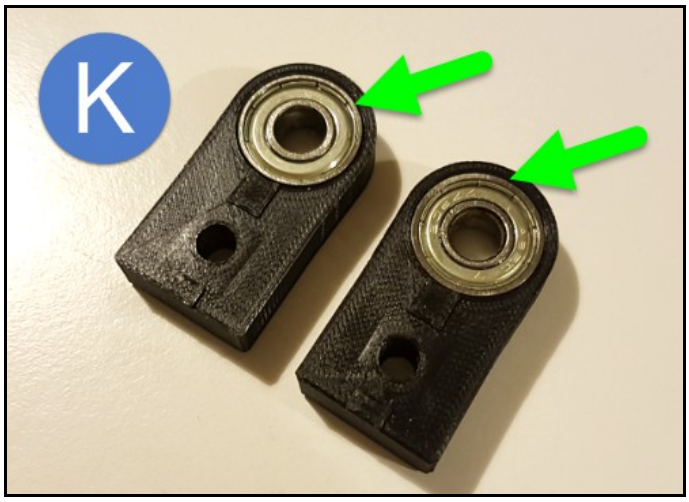


Next, please locate the following items in your kit of parts:

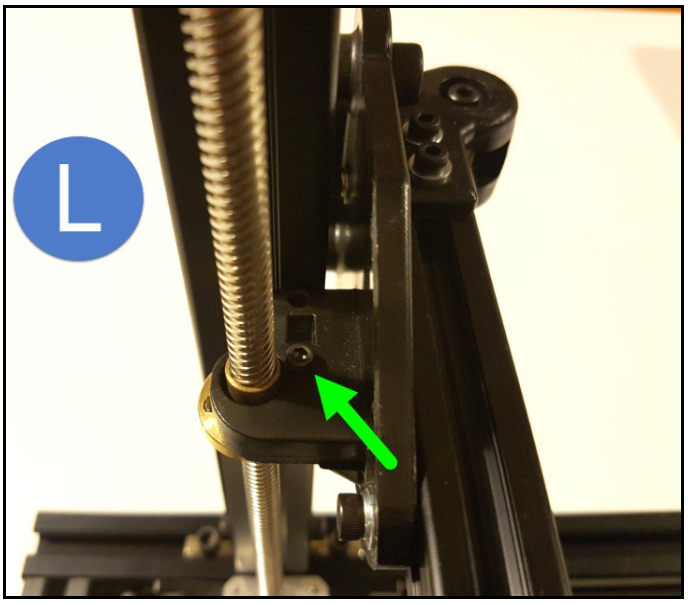
ITEM	DESCRIPTION	QTY
128	BOLT M3 x 15mm CAP HEAD	2
129	NUT M3 NYLOC	2
130	TR8 STABILISER BRACKET- 3D PRINTED	2
131	RADIAL BEARING 608Z	2

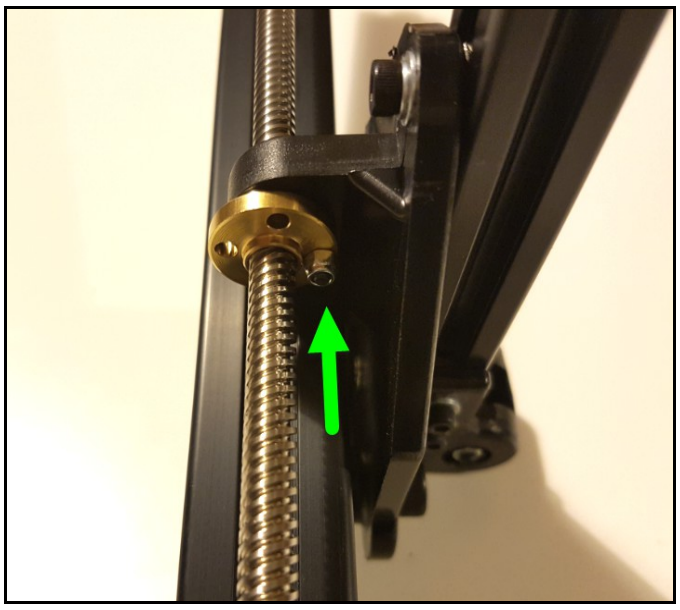


Press the 608Z Bearings into the TR8 Stabiliser Brackets. Set them aside for the moment.

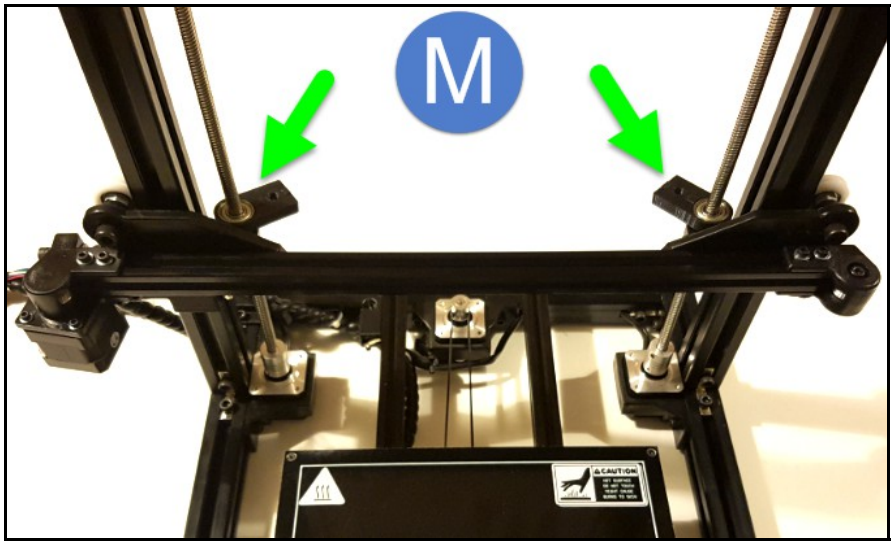


With the X Axis Rail still at a height that will allow you to access the underside of the Brass T Nuts on both sides, rotate each T Nut slightly until one of the mounting holes in the flange of the T Nut aligns with the hole in the X Axis Bracket. Using the M3 x 15 Cap Head Bolts and M3 Nyloc Nuts, Secure the X Axis Brackets to the Brass T Nuts as per the following images. Please note: do not tighten the nuts on these fasteners so that the Brass T Nut cannot rotate within the X Axis Bracket. The Bolts and nuts are intended only to hold the T Nut from moving up or down.





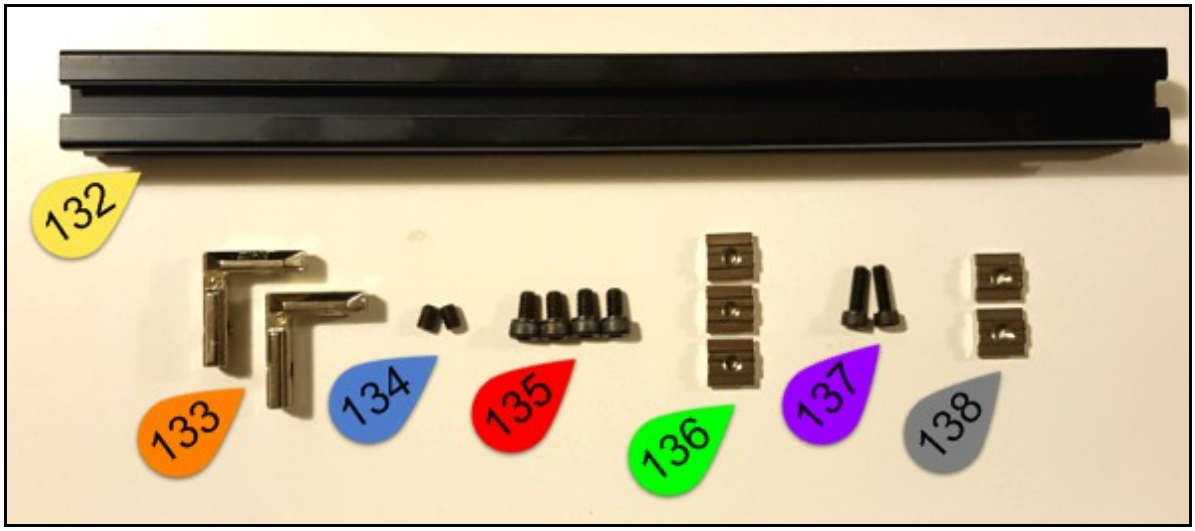
Next, drop the TR8 Stabiliser Brackets onto the Lead Screws. They will be secured in the next step:



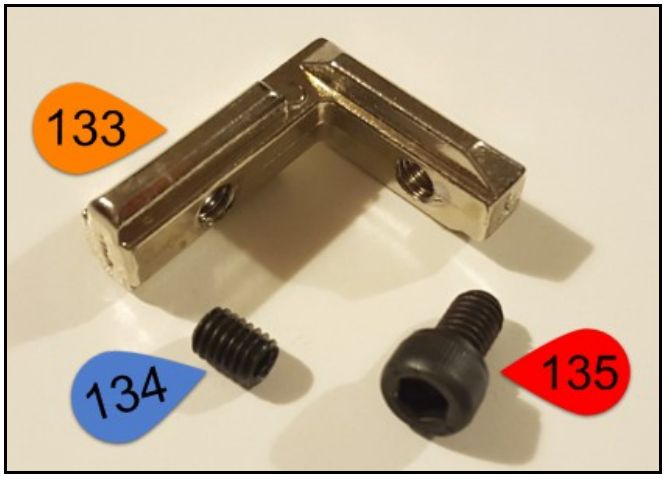
Step 12 – Top Gantry

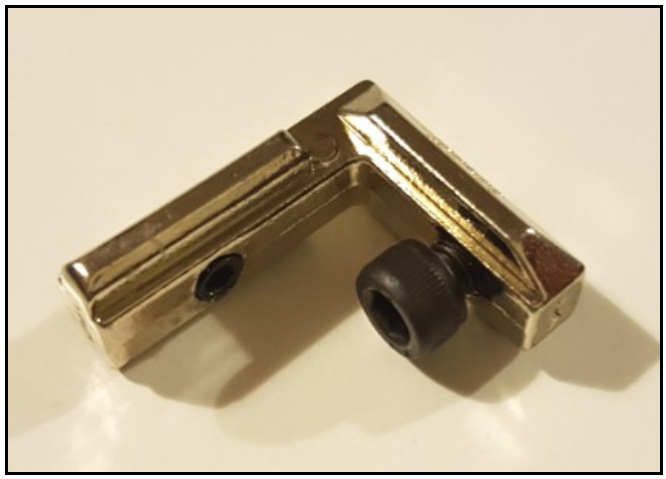
In your kit of parts, please locate the following items:

ITEM	DESCRIPTION	QTY
132	3030 EXTRUSION 340mm LENGTH	1
133	3030 INTERNAL R/ANGLE BRACKET	2
134	GRUB SCREW M6	2
135	BOLT M6 x 10mm CAP HEAD	4
136	3030 SLIDING NUT M5	3
137	BOLT M5 x 16mm CAP HEAD	2
138	3030 SLIDING NUT M6	2



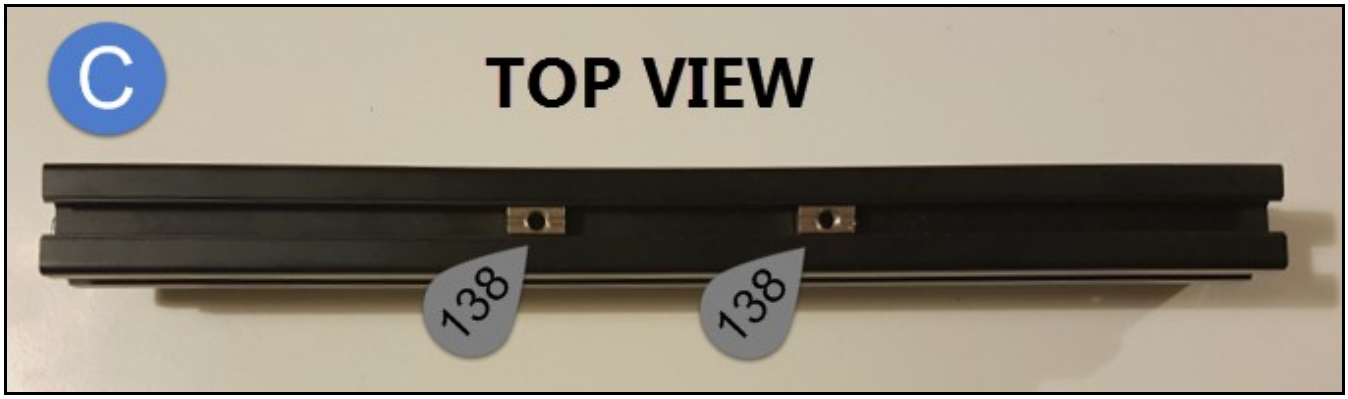
Using the M5 Grub Screws and two of the M6 x 10mm Bolts, prepare the R/Angle Brackets as per the following images:



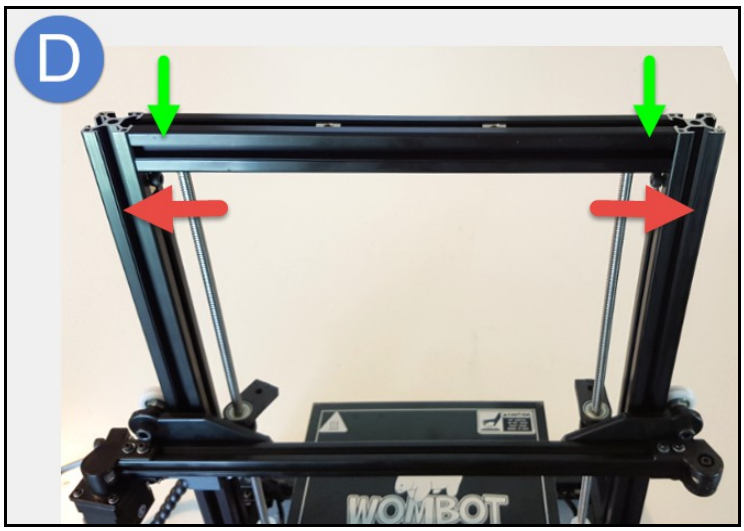


Set aside the Right angle brackets for the moment and lay your piece of 3030 extrusion out on the table.

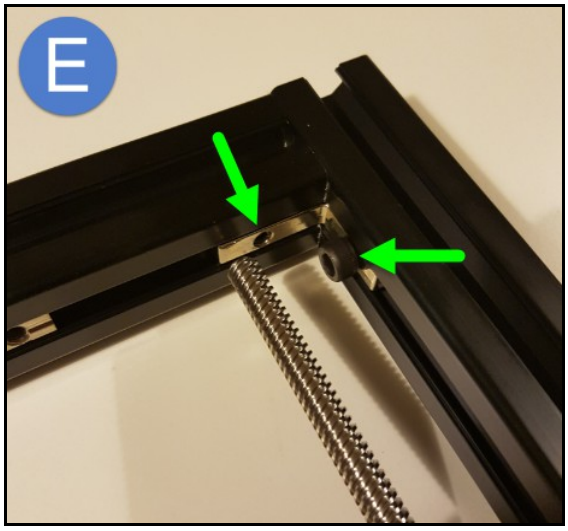
Load the sliding nuts and right angle brackets into the extrusion as per the following images:

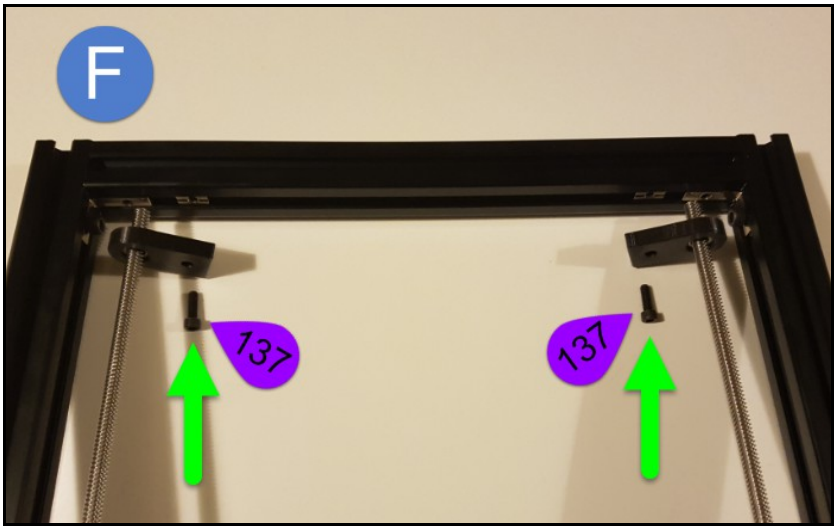


Insert the Top Gantry complete with Sliding Nuts and R/Angle Brackets into the Vertical Rails as per the following images. Make sure that the Gantry Rail is pushed flush with the Vertical Rails on the top and sides before tightening in place. It may be necessary to push the vertical rails outward slightly in order to fit the Top Gantry. Please also check that the two rails, once fitted, are perfectly parallel to one another. This can be done by measuring the Vertical Rails near the Base, then near the Top and making sure these two dimensions are the same.

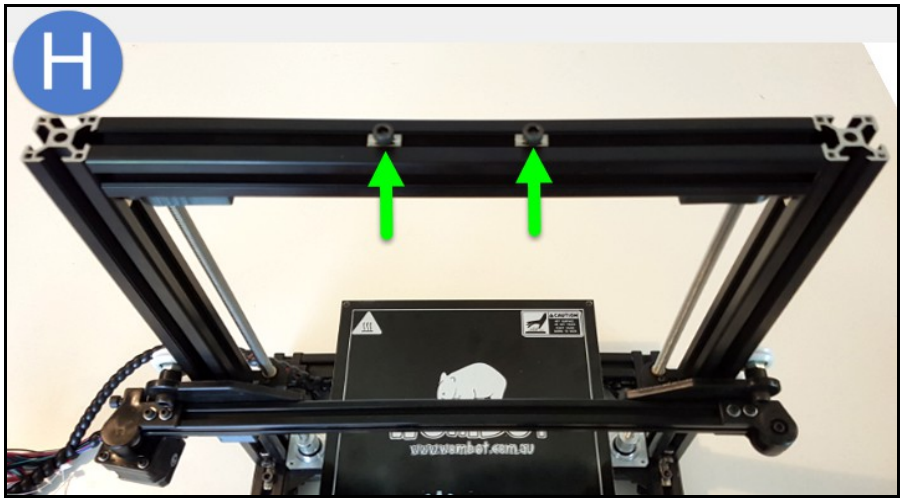


Once you are satisfied that the Top Gantry is flush on all corners with the Vertical Rails, fasten the Grub Screws and CapHead Screws in the R/Angle Bracket to secure the Gantry in place, alternating between Grub Screw and Cap Head Bolt to make sure the R/Angle Bracket centralises correctly between the two parts. Slide the TR8 Stabiliser Brackets up the Lead Screws and fasten them to the Gantry using the M5 Sliding nuts you installed in the Gantry earlier, and the M5 x 16 Cap Head Bolts. Please make sure that the lead screw is parallel to the Vertical Rails and perfectly in line with the slots in the Vertical Rails prior to fastening the TR8 Stabiliser.





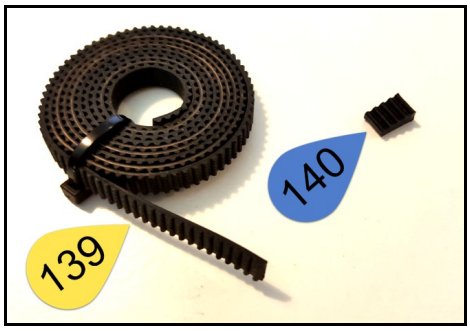
Take the remaining two M6 x 10mm Bolts and secure them in the two Sliding Nuts on the top of the Gantry. These will be utilised later for the Spool Holder Brackets.

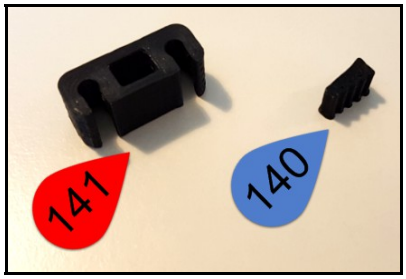


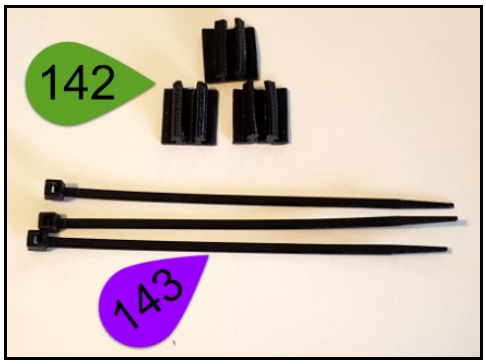
Step 13 – Fitting the Extruder Module to the X Rail

It is now time to fit the Extruder Module to the X rail. Please locate the following in your kit of parts:

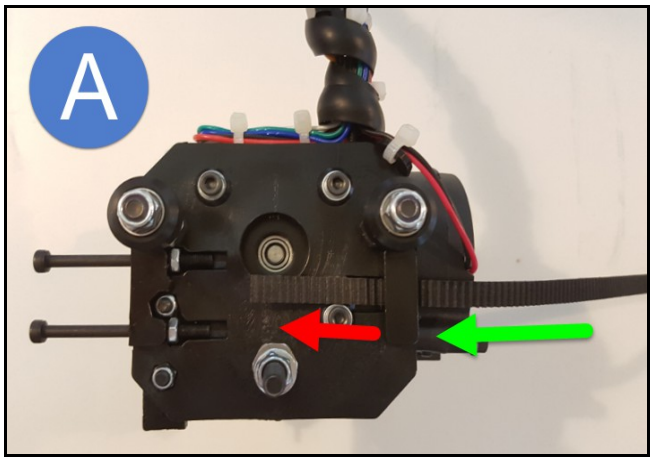
ITEM	DESCRIPTION	QTY
139	GT2 BELT 6mm WIDTH	1 MT
140	GT2 BELT WEDGE	2
141	GT2 X BUCKLE	1
142	3D PRINTED EXTRUSION CLIP	3
143	CABLE TIE 2.5mm x 100mm	3

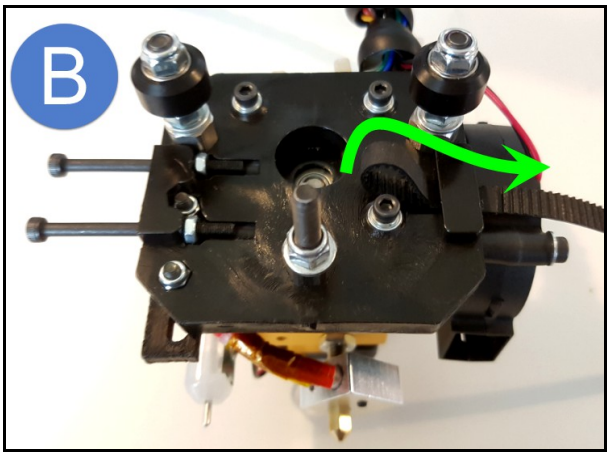


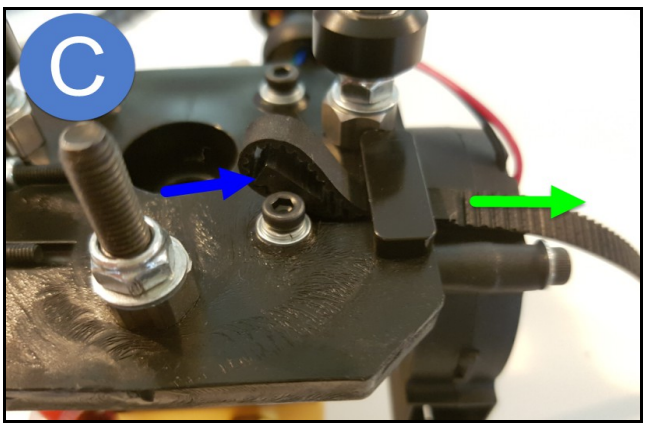


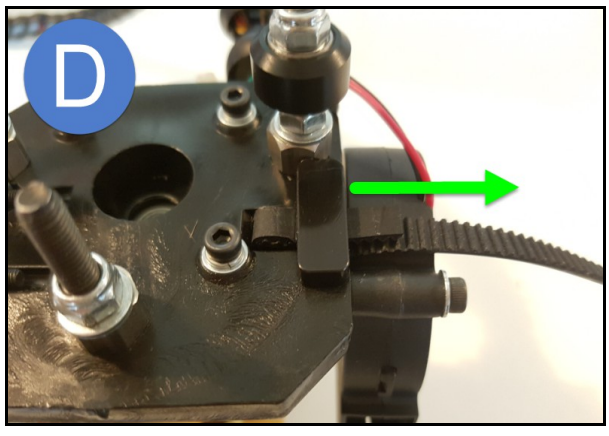


Feed the GT2 belt into the Extruder Carriage (smooth side towards the carriage) as per the below image. Make a loop with the belt and pass it back through the opening, allowing enough room in the loop to slide the GT2 Wedge into place while giving 5mm of spare belt on the outside of the carriage. Remove the slack from the loop and push the belt-wrapped wedge into the cavity of the extruder carriage plate. Pull firmly on the belt on the outside of the carriage to self-tighten the wedge/belt clamping arrangement.

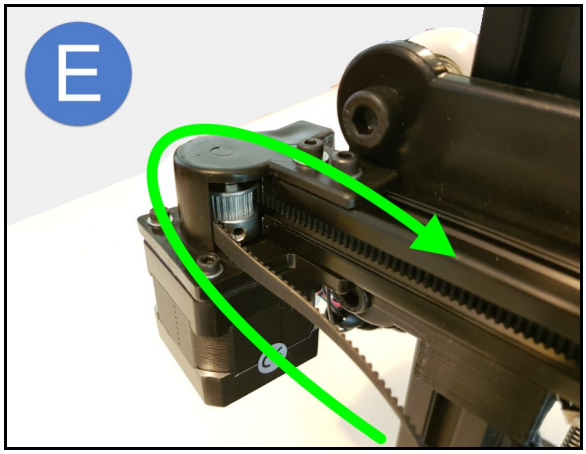


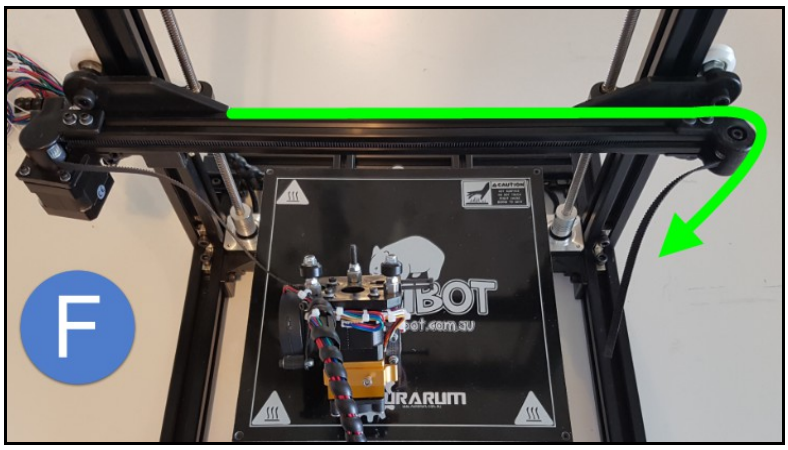




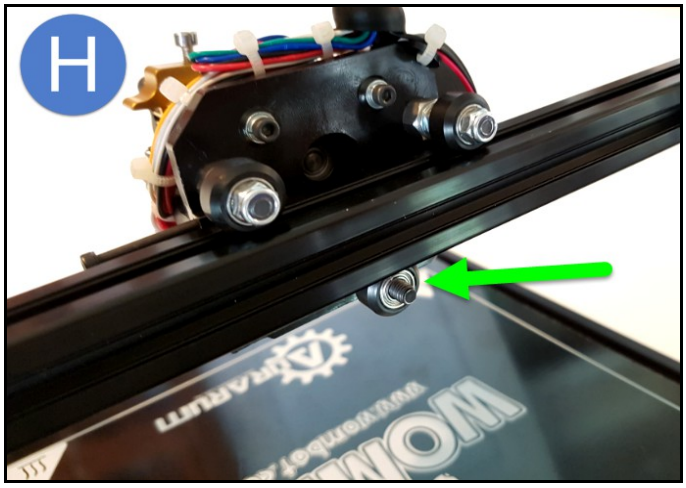


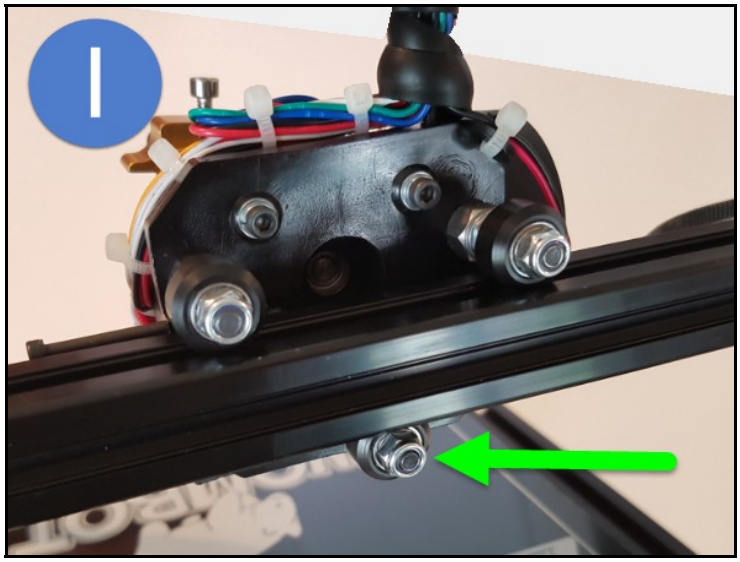
Place the Extruder Module on the Heated Bed. Feed the GT2 Belt through the front of the cavity in the X Axis Motor Mount on the left hand side of the printer and around the pulley. Pass the pulley through the rear of the X Axis Idler Bracket and around the Idler Pulley.





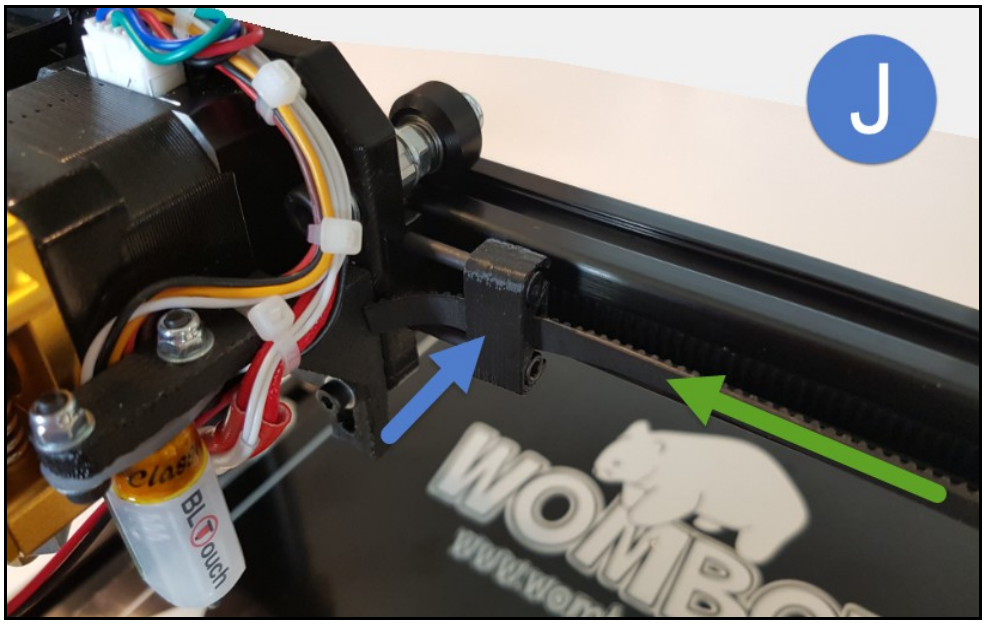
Next, we need to fit the Extruder Module to the X Axis Rail. Locate the 3rd Black Delrin Bearing from the section of this manual where we asked you to set it aside. Keeping the belt reasonably taught, bring the extruder module up to the rail and gently rest the two top delrin bearings on the top of the rail. Bring the third bearing up to the bottom bolt shaft on the bottom of the Extruder Module and by tilting the module, you should be able to slip the wheel onto the shaft while locating it in the bottom groove of the X Rail as per the following images. Once in place, fit the M5 Nyloc Nut to the shaft – the same rule applies to this bearing – do not overtighten, only tension the nut against the bearing sufficient to the task of arresting movement of the bearing centre along the bolt.



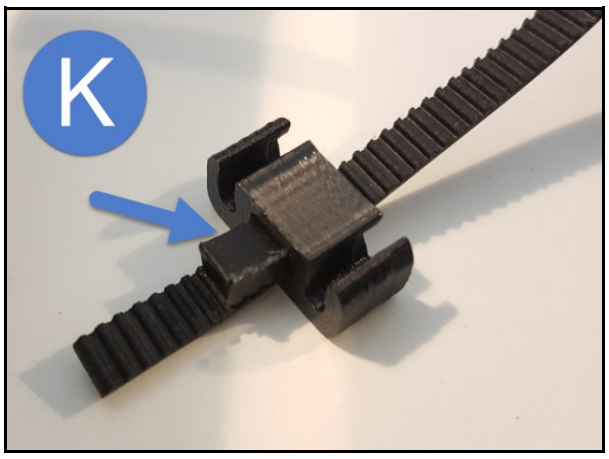


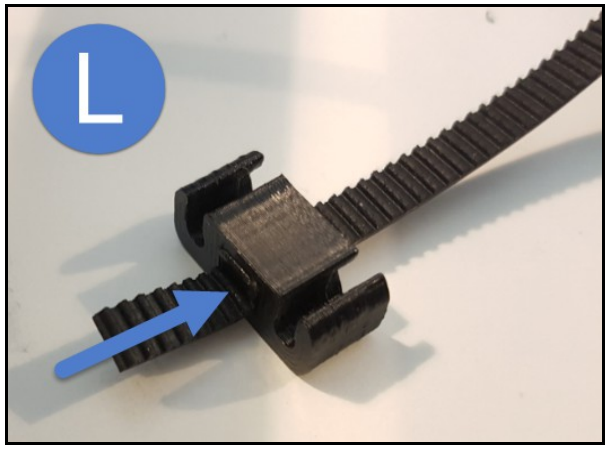
With the Nyloc Nut in place, gently turn the eccentric nut on the bottom of the extruder to increase the tension of the bottom delrin wheel to the X Rail. Do not over-tighten, only turn the eccentric enough to arrest any wobble in the extruder carrige.

With the Extruder Module now fitted to the X Rail, bring the GT2 Belt up to the right hand side of the extruder. Pass it through the GT2 X Buckle and snap the GT2 Buckle into place over the two long bolts on the side of the extruder module.

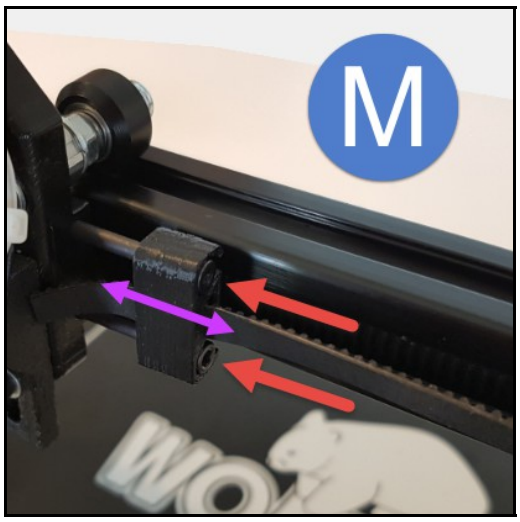


Take note of the position of the belt in regard to the left hand side of the buckle – you can mark it with a pencil if this will help or you can hold it between your thumb and index finger while removing the buckle. Place the GT2 Wedge on the belt and re-insert it into the broad end of the buckle. Clamp the wedge and belt into the buckle using a pair of pliers being careful not to crush the buckle.





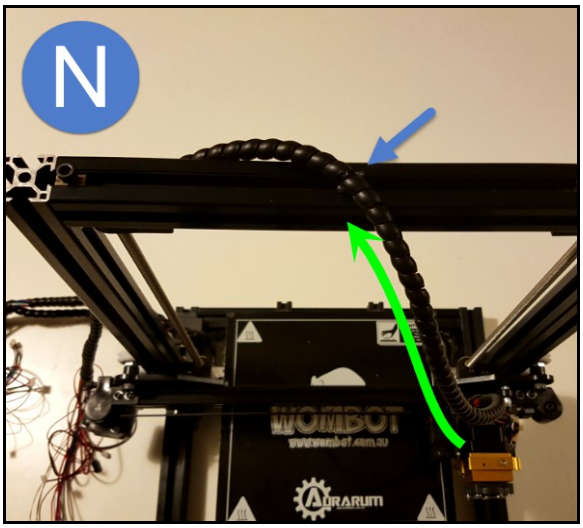
With the belt now fixed to the buckle with the wedge, clip the buckle back onto the two bolts on the extruder module. This system is how you will adjust the X Axis Belt to achieve the correct tension. Turn the two bolts clockwise to increase the tension on the belt system.

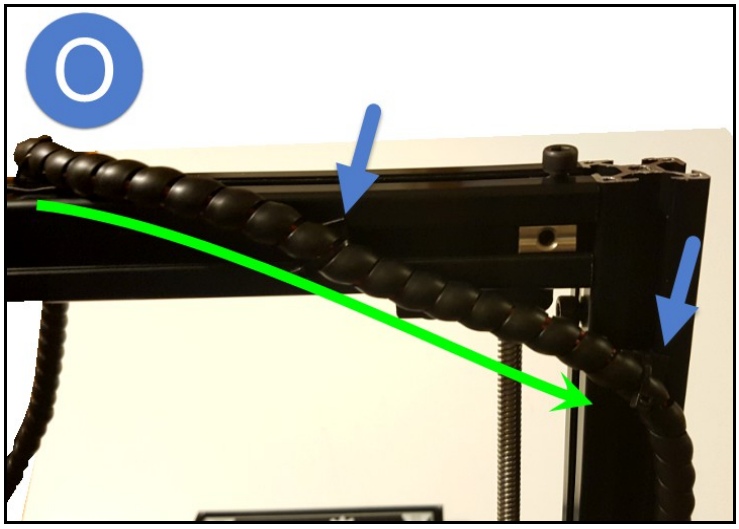


You may need to make several attempts to get the distance of the buckle correct so that it clicks onto the bolts and slides back onto the heads of the bolts (there are two recesses inside the buckle inside which the bolt heads are retained). If you find it too tight and difficult to place on the bolts, remove the buckle, use a pair of pliers to gently pull on the belt to remove the wedge and belt out and move the wedge a few teeth further out on the belt and try again. Similarly, keep in mind that there is only so much adjustment available on the bolts so if you allow too much slack when positioning the buckle, you will run out of adjustment distance on the bolts before the belt is correctly tensioned.

This completes the Extruder Module installation, it is now time to tidy the wiring, clip it to the gantry and run it to the area where the motherboard enclosure is going to be fitted. Lower the X Rail all the way to the bottom and push the extruder module all the way to the right hand side of the heated bed. This is the furthest position from where the wiring loom will be anchored and will tell you how much cable you need to allow:

Using the Extrusion Clips and Cable Ties, Anchor the Extruder Module wiring loom as per the following images making sure to allow enough extra cable so that at full travel, in either direction, the cable loom is not under tension:





Step 14 – Wiring Up Your MKS Gen 1.4 Motherboard

The MKS Gen 1.4 – 3D Printer Motherboard is an all in one solution for 3D Printers. It is manufactured to a high standard using quality components and circuit board design to minimise the requirements for external hardware. It comes delivered to you already pre-loaded with a modified version of Marlin Firmware for your Wombot Exilis as well as all required stepper motor drivers (already pre-tuned to the correct current settings) so that you don't have to worry about loading firmware, modifying code or measuring stepper drivers to get your machine up and running in the quickest possible time frame.

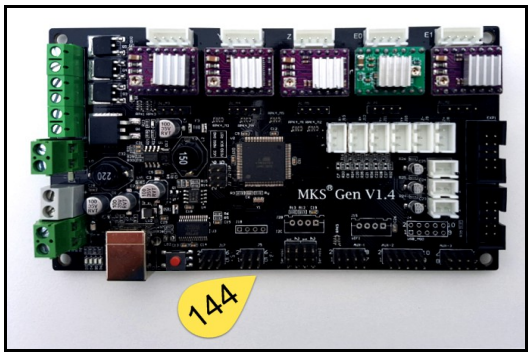
An important note on Polarity:

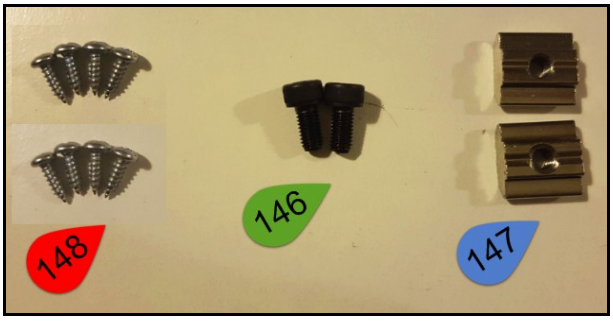
Some of the components on your Wombot Exilis ***must*** be wired with the correct polarity – In other words, **POSITIVE** must be wired to **POSITIVE** and **NEGATIVE** must be wired to **NEGATIVE**. If there is a requirement for a particular wire to go to a particular point (with regard to polarity), it will be detailed in the following instructions and will be identified by wire colour (subject to change based on wire availability at the time of kit preparation).

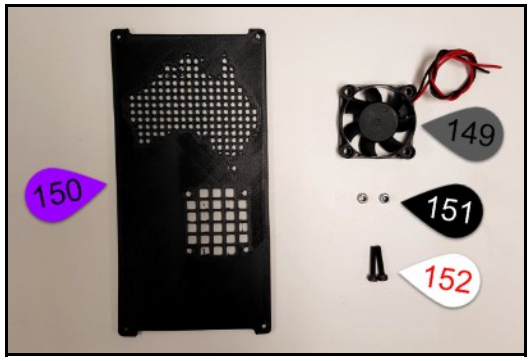
Some examples of components which are required to be connected with "Correct Polarity" are Main Power Supply Cable, Fans, End Stop Switches and BLTouch Sensor (for automatic bed level compensation functionality).

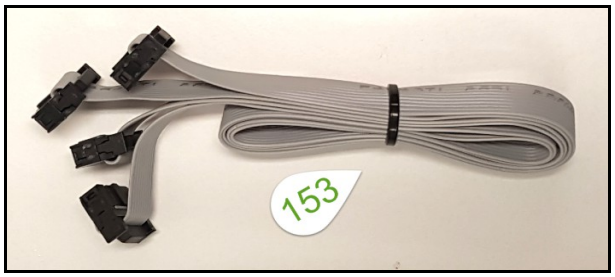
In your kit of parts, please locate the following items:

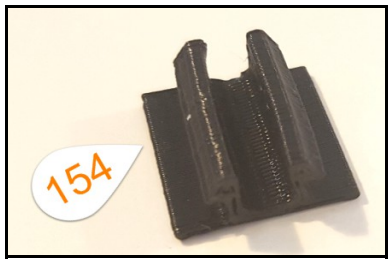
ITEM	DESCRIPTION	QTY
144	MOTHERBOARD - MKS GEN 1.4	1
145	MOTHERBOARD ENCLOSURE	1
146	BOLT M5 x 10mm CAP HEAD	2
147	3030 SLIDING NUT M5	2
148	SELF TAPPING SCREW SILVER	8
149	FAN 40MM AXIAL 24VDC	1
150	MOTHERBOARD ENCLOSURE COVER	1
151	BOLT M3 x 15mm CAP HEAD	2
152	NUT M3 NYLOC	2
153	RIBBON CABLE SET - 10WAY IDC - LCD	2
154	3D PRINTED EXTRUSION CLIP	1



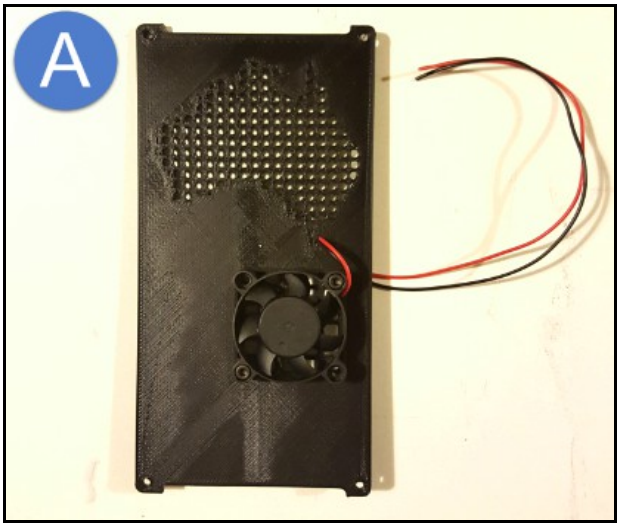




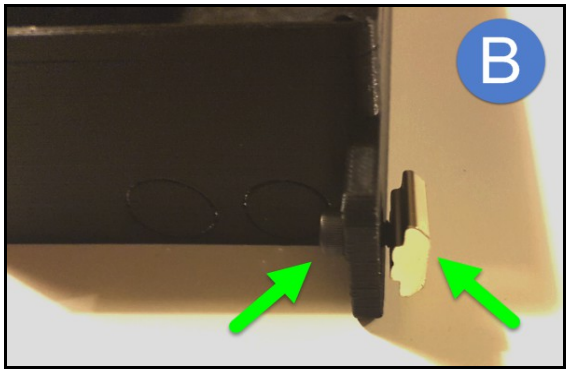




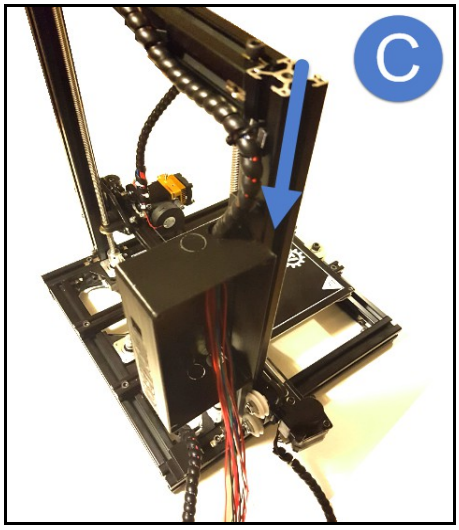
Please begin by preparing the Motherboard Enclosure Cover. Fit the 40mm Fan to the outside of the Cover taking note of the airflow direction – the fan should blow air IN to the enclosure. Using the M3 x 15mm Bolts and M3 Nyloc Nuts, secure the fan to the cover plate. Pass the wires from the fan through the nearest hole (Tasmania on the Australian map air vent) as per the following image. Leave the cables long – they can be trimmed later to the correct length.



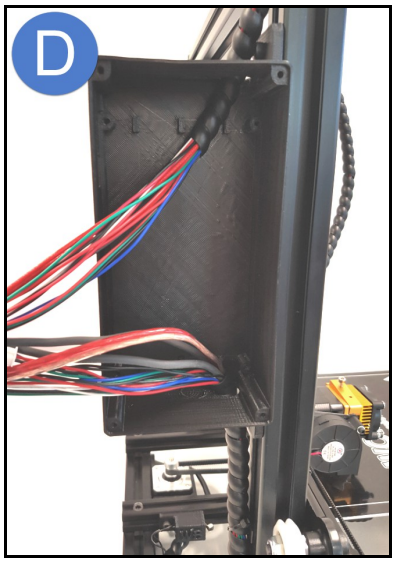
Set aside the cover for now and fit the M5 x 10mm bolts and M5 3030 Sliding Nuts to the Motherboard Enclosure as per the following image (it is easier at this point of assembly with the machine frame built and the vertical rails in place to fit the sliding nuts to the case and slide it on than it is to slide the nuts into the frame while trying to hold the nuts in place).



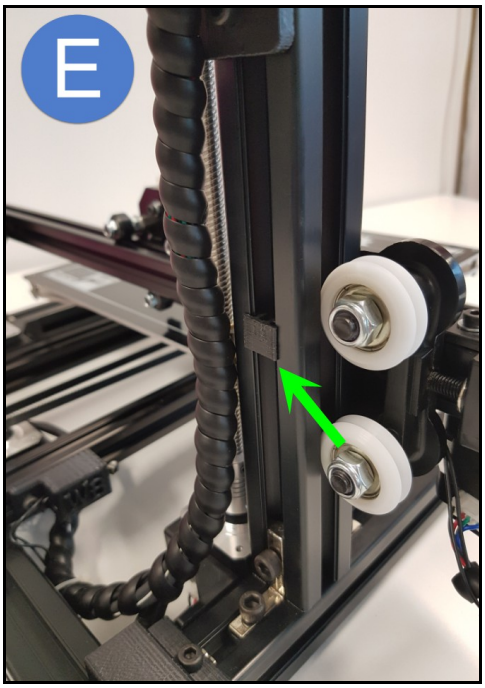
Slide the Motherboard Enclosure onto the rear of the left hand side vertical rail as per the following image. Secure it by fastening the two M5 x 10 Cap Head screws with the top mounting point on the enclosure approximately 80mm from the top rail – this can be adjusted later for the correct position if required. Remove the entry hole plugs so that the cable looms from the top and bottom can be fed into the enclosure for termination to the motherboard later. You may need to temporarily remove the cable clip for the Extruder Module Loom to get the enclosure to slide down.

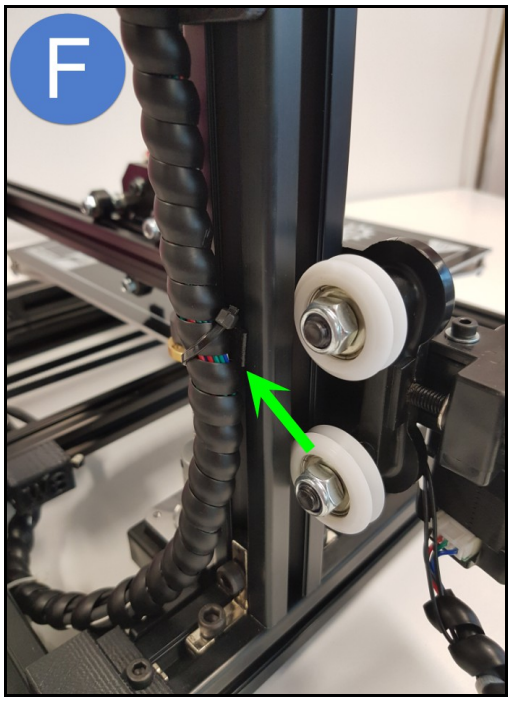


Make sure that the wires from the top loom (extruder module loom) have been passed through the hole in the top of the enclosure and that the loom coming from the bottom of the machine (heated bed, main power and base frame stepper motor looms) pass through the hole in the bottom of the enclosure as per the following image.



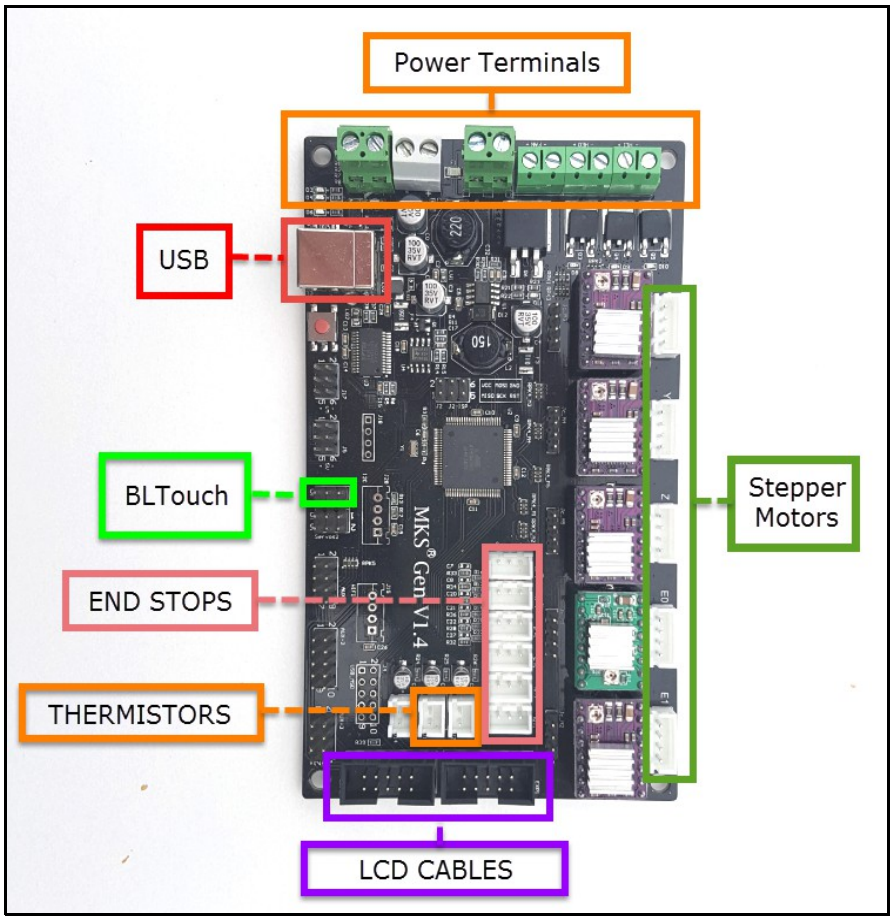
Secure the bottom loom you have just fed into the enclosure to the vertical rail using an extrusion clip and a cable tie as per the following images:





Your Main Board must be wired in two stages – firstly the wires that need to be cut to length, stripped and screwed into the terminals along the top of the board and run behind the board prior to securing it within the enclosure and second, the wires that only need to be plugged in to sockets and the excess cable lengths cable tied together at the end.

Before beginning to wire your Exilis, please study the following board layout summary for the MKS Gen 1.4 Motherboard. Each group of wires are explained in further detail under their respective headings in the sequence in which they need to be wired

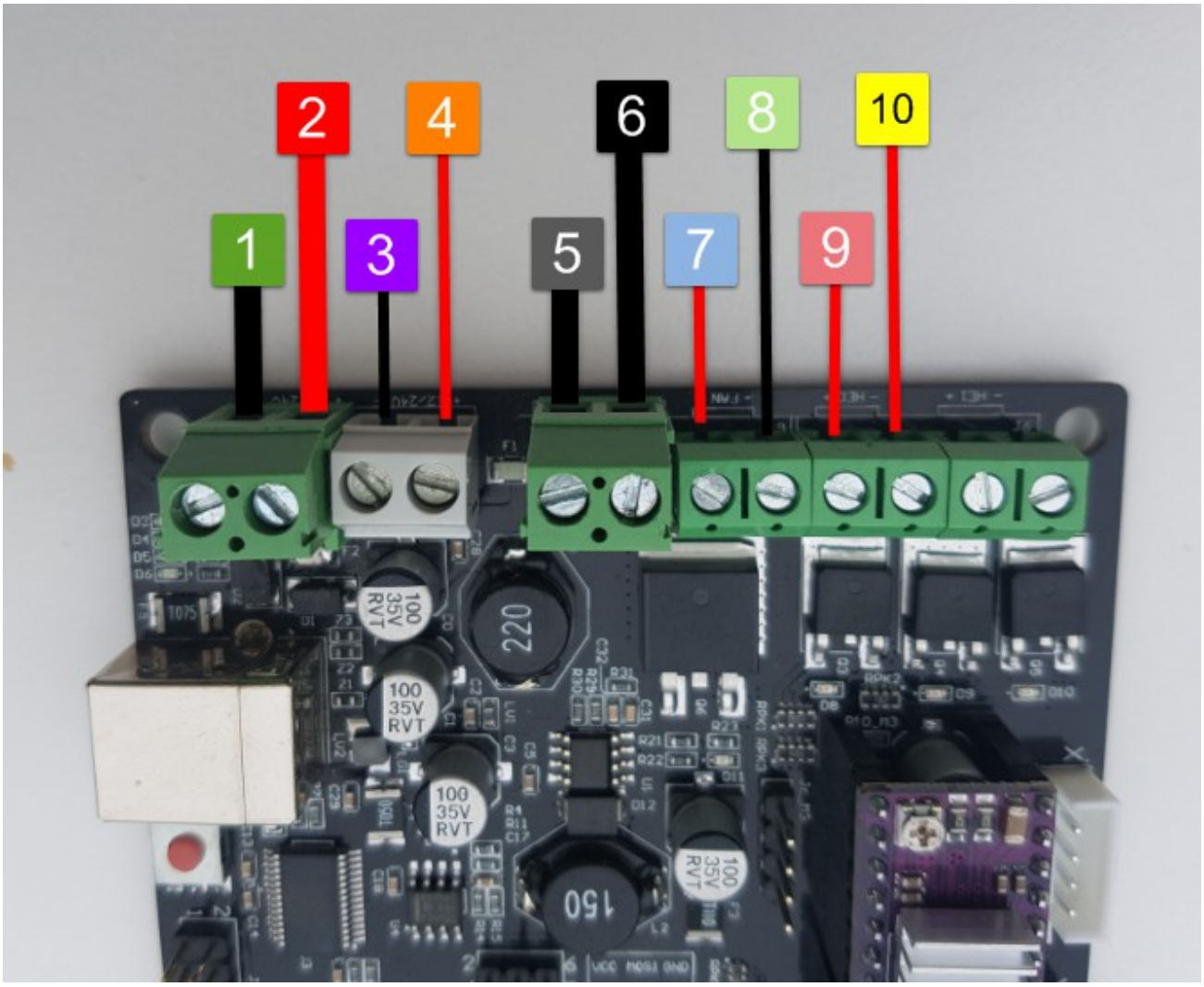


Power Terminals

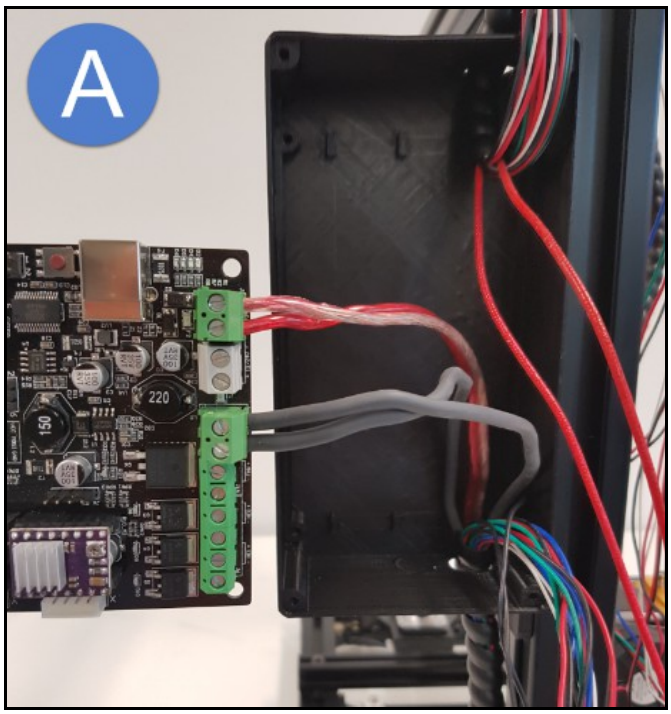
Please see the below table and image for the correct termination point for each set of power related cables on your Wombot Exilis. Familiarise yourself with where each component needs to be wired to then follow the steps below in sequence. We have provided a Termination Table for this section of the wiring only because the writing on the Motherboard is quite small and there are a number of cable sets which must be wired with the correct polarity.

TERMINATION TABLE:

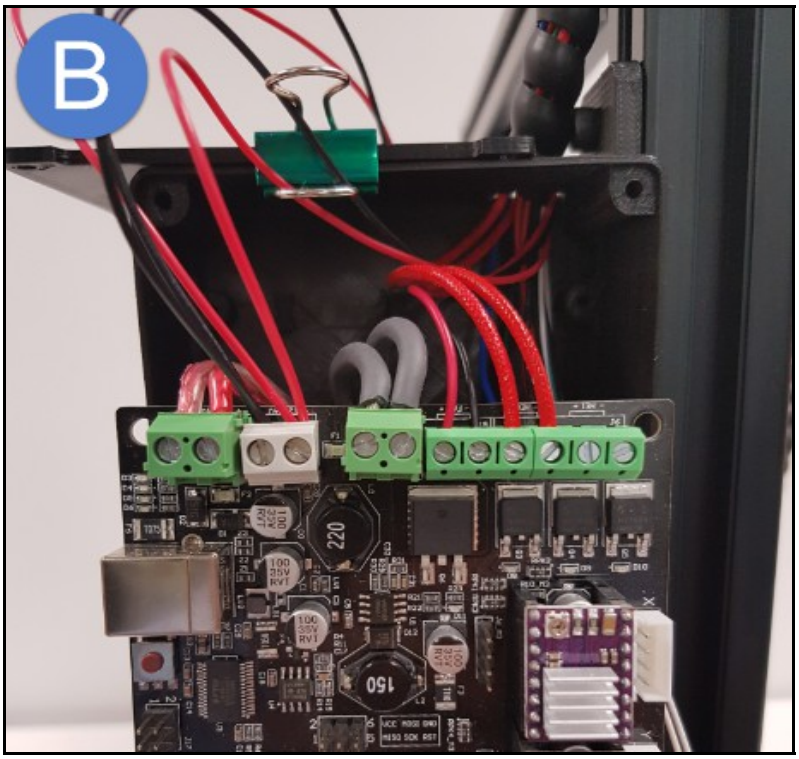
ID#	DESCRIPTION
1	MAIN POWER INPUT NEGATIVE - GOES TO ANDERSON POWER SOCKET
2	MAIN POWER INPUT POSITIVE - GOES TO ANDERSON POWER SOCKET
3	ALWAYS-ON FAN OUTPUT NEGATIVE - CONNECTS TO MKS FAN AND EXTRUDER COOLING FAN
4	ALWAYS-ON FAN OUTPUT POSITIVE - CONNECTS TO MKS FAN AND EXTRUDER COOLING FAN
5	HEATED BED OUTPUT - POLARITY NOT IMPORTANT
6	HEATED BED OUTPUT - POLARITY NOT IMPORTANT
7	TURBO FAN OUTPUT POSITIVE - GOES TO THE TURBO PART COOLING FAN ON SIDE OF EXTRUDER
8	TURBO FAN OUTPUT NEGATIVE - GOES TO THE TURBO PART COOLING FAN ON SIDE OF EXTRUDER
9	EXTRUDER HEATING ELEMENT - POLARITY NOT IMPORTANT - GOES TO THERMAL BLOCK ON EXTRUDER
10	EXTRUDER HEATING ELEMENT - POLARITY NOT IMPORTANT - GOES TO THERMAL BLOCK ON EXTRUDER



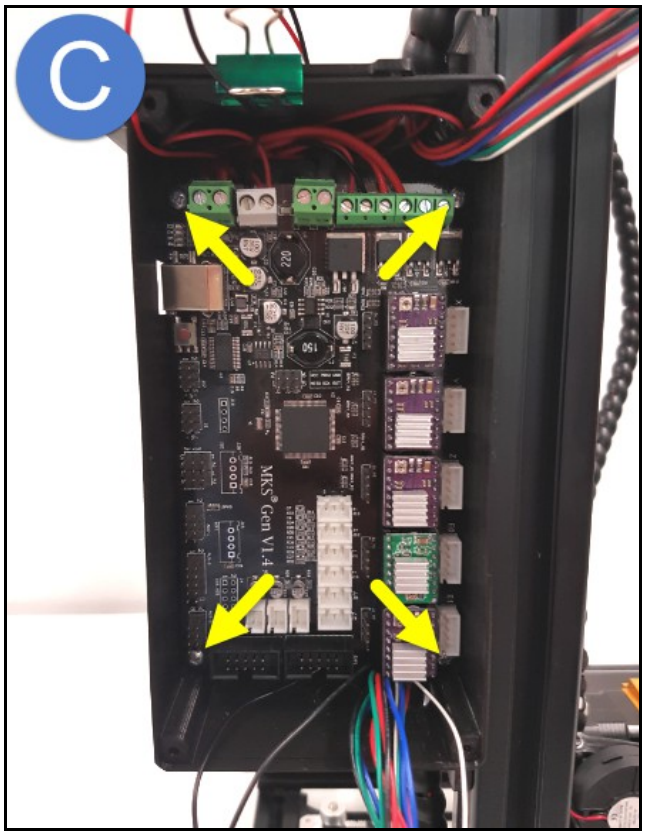
Start wiring your Motherboard by loosening all of the screw terminals on the board so that they can accept wires. Bring the Motherboard up to the enclosure and first of all, secure the Main Power Input cables and the Heated bed cables. These will sit behind the board when you secure the Motherboard to the enclosure floor. Please note the polarity of the Main Power Cables. You can use a multimeter to make sure that Positive and Negative are identified and fitted to the correct terminals.



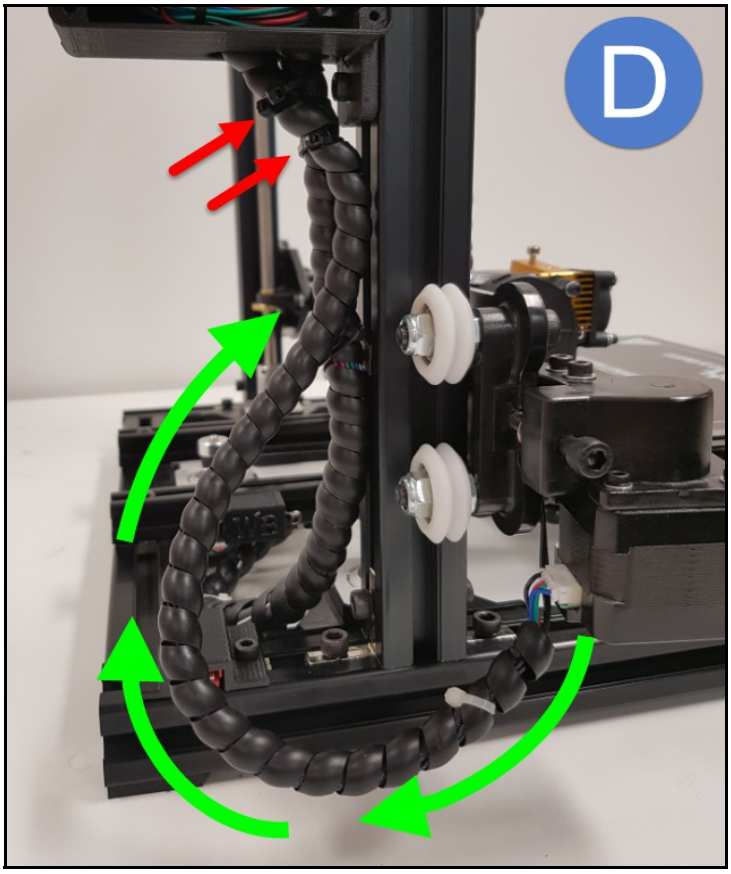
With these two sets of cables terminated, bring the Motherboard up to the enclosure with the screw terminals towards the top, making sure that the Main Power and Heated Bed cables are routed BEHIND the board and flat against the rear of the Motherboard Enclosure. Proceed to wire in the other cables to the screw terminals according to the termination table. You can cut the various wires to a shorter length but remember that you will need some spare cable available in order to manoeuvre the Motherboard into it's final position and to allow for some strain relief inside the enclosure. Important note: you will need to strip and twist together the MKS Enclosure Cover Fan and Extruder Head Fan wires before securing them. To make this easier, clip the Enclosure Cover to the top of the Motherboard Enclosure using one of your small bulldog clips (which will be used later to hold your glass build platform to the heated bed).



With the wiring to all of the screw terminals complete, you can proceed to fit the motherboard to the rear of the enclosure using four of the self tapping screws as highlighted in the following image.



Next, bring the second loom from the X Axis Rail up to the bottom of the Motherboard Enclosure so that it forms a "U" shape . This extra loom material will provide plenty of spare cable for the X Axis to move up and down in the Z direction during printing. Secure the loom to the existing lower loom at the bottom of the enclosure and feed the wires into the enclosure.

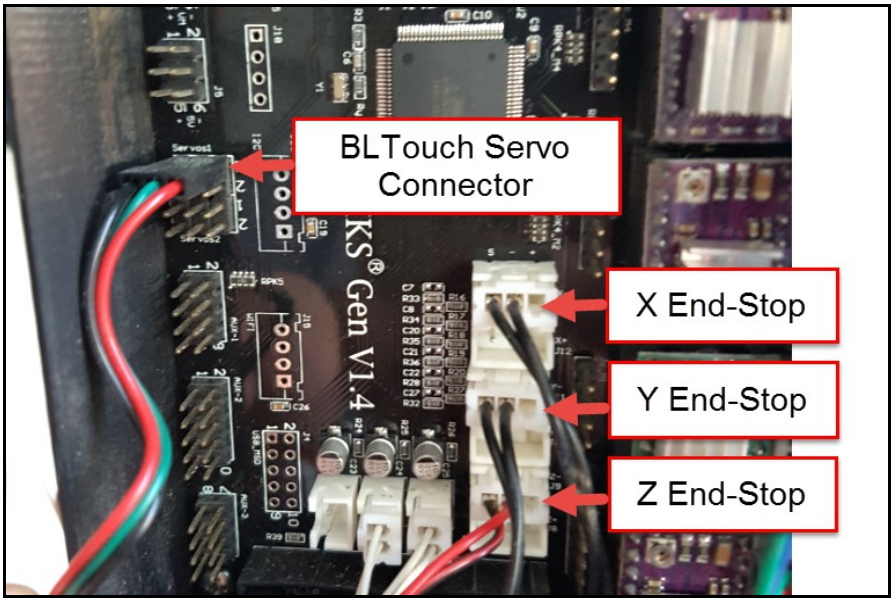


Now that all wiring looms are routed to the enclosure and the Power Terminals are wired in, you can proceed to connect all other cables and wires to the Motherboard in the following sequence:

BLTouch & End Stops

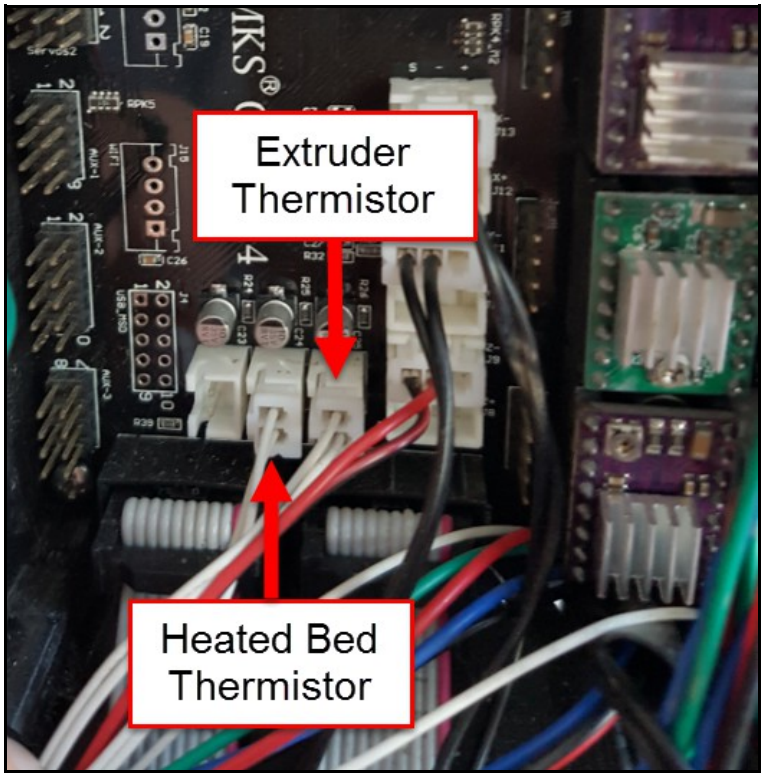
Next, in your wiring looms, locate the 3 pin Servo connector and Z Endstop coming from your BLTouch Bed Level Sensor. Also locate the X Endstop and Y Endstop connectors. Plug them in to your motherboard as per the following image.

Important Note: The BLTouch Servo Connector must be plugged in with the RED wire towards the centre of the board and the BLACK wire towards the outside of the board. Incorrect connection will result in damage to the Motherboard.



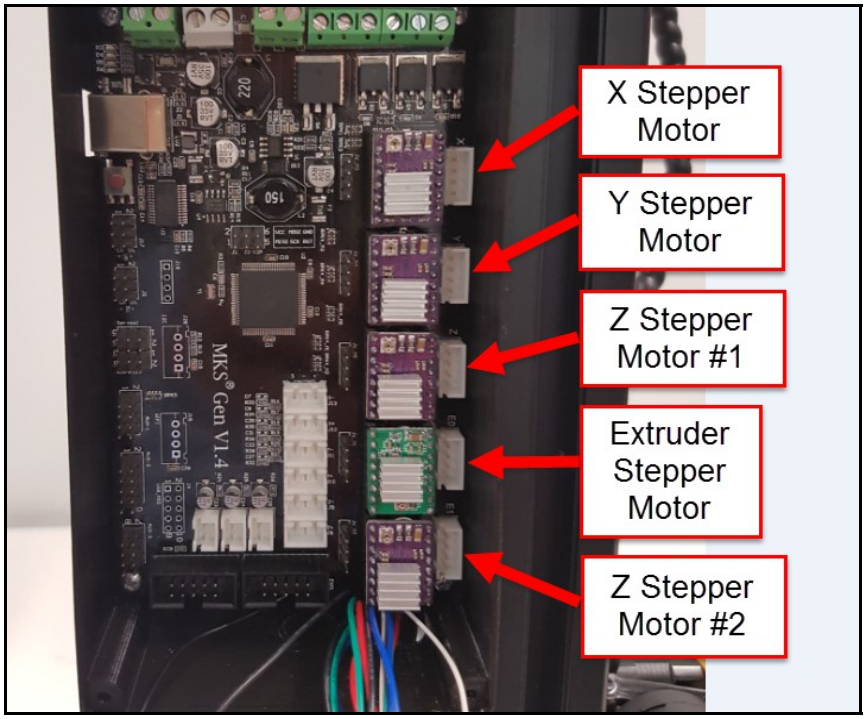
Thermistors

In your wiring looms, locate the Heated Bed and Extruder Thermistor cables. Connect them to the motherboard as per the following image:



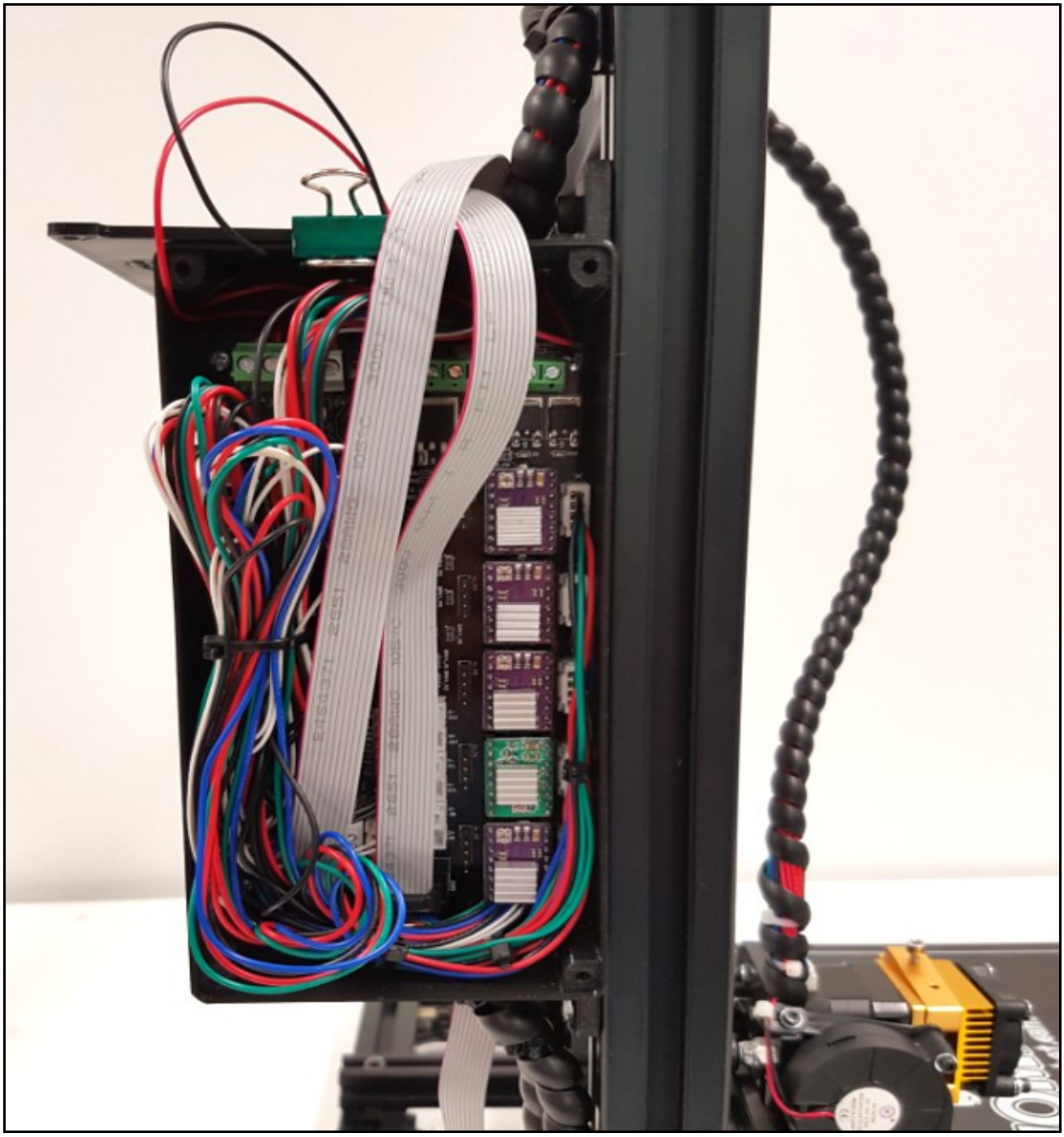
Stepper Motors

Locate the Stepper Motor Looms for each stepper motor on your Exilis. Plug them in to the corresponding ports on the Motherboard. Please note – there are two independent Z Axis Motors, each has their own driver port on the motherboard. It does not matter which port you plug either Z motor into, as long as both Z motors are connected.



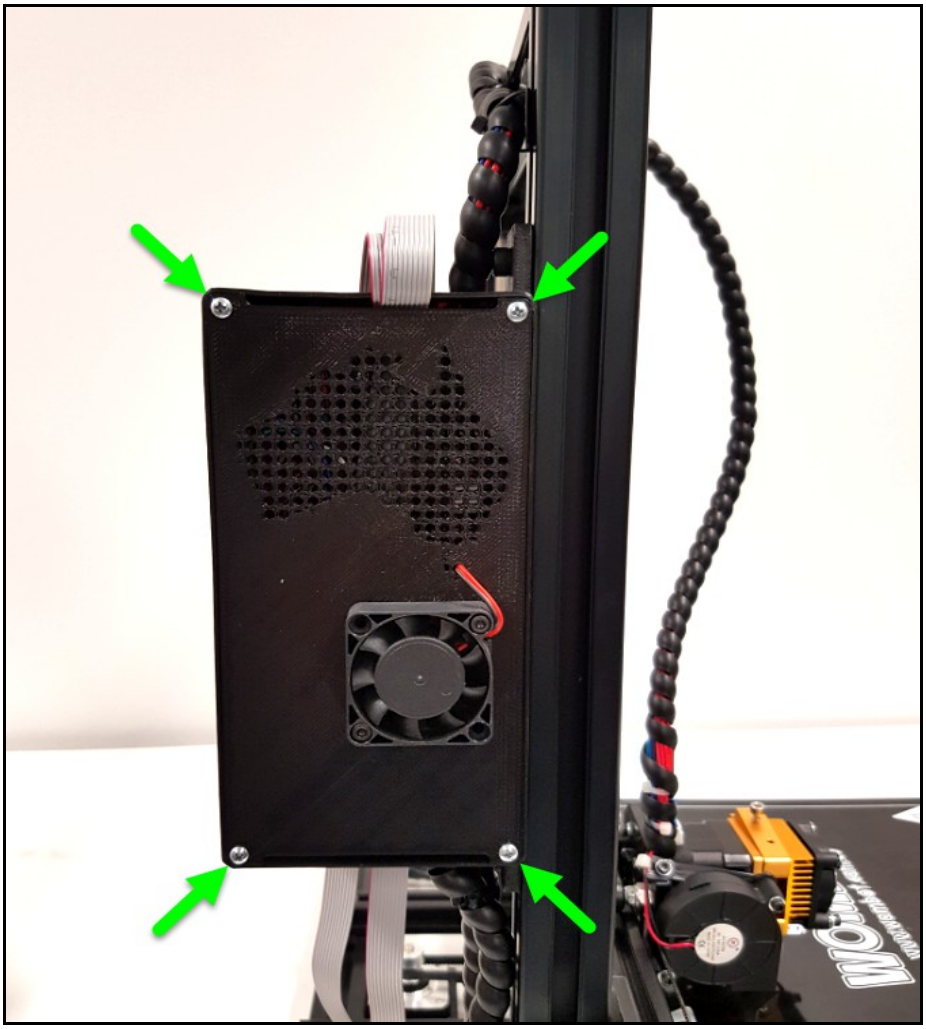
LCD Cables

Plug in the two Ribbon Cables to the Motherboard – they are located at the bottom of the motherboard below the thermistor connectors. Take note of which cable is connected to the ***EXP 1*** port and which is connected to the ***EXP 2*** port. Mark them as 1 and 2. Run the cables to the top of the Motherboard Enclosure making sure they remain flat and are not twisted. These two Ribbon Cables will travel out of the top of the Motherboard Enclosure and connect to the LCD Module in a later step. With the Ribbon Cables fitted, proceed to tidy up your wiring with cable ties so that everything flows into a single bundle on the left hand side of the enclosure. This needs to be done so that there are no cable bundles sitting on top of the Stepper Motor Drivers which would lead to reduced airflow from the fan on the Enclosure Cover. Stepper Motor Drivers require constant airflow to keep them cool and operating correctly. Your wiring does not need to be perfectly tidy or organised, just out of the way and kept to the left hand side of the enclosure. Aim to achieve something like this once all wiring is completed:



Closing Up the Motherboard Enclosure

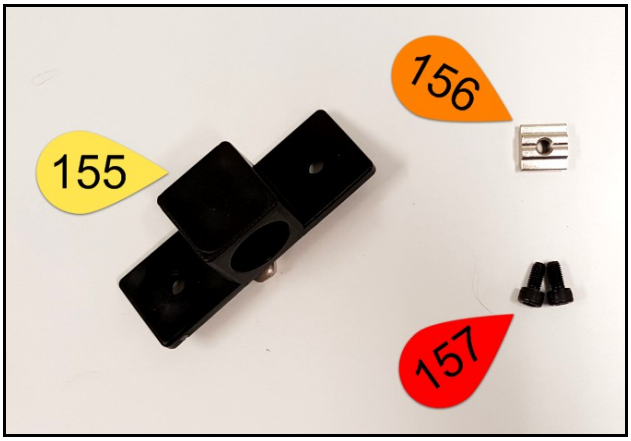
Once you are happy that all wires have been terminated in their correct positions on the Motherboard (please double check them to make sure) and that there is no strain present on any of them (not tightly pulled against anything and properly seated to the Motherboard) you can gently push the wiring into position within the confines of the enclosure and fit the Motherboard Enclosure Cover. Secure the cover with the remaining 4 self tapping screws so that once done, it looks like this:

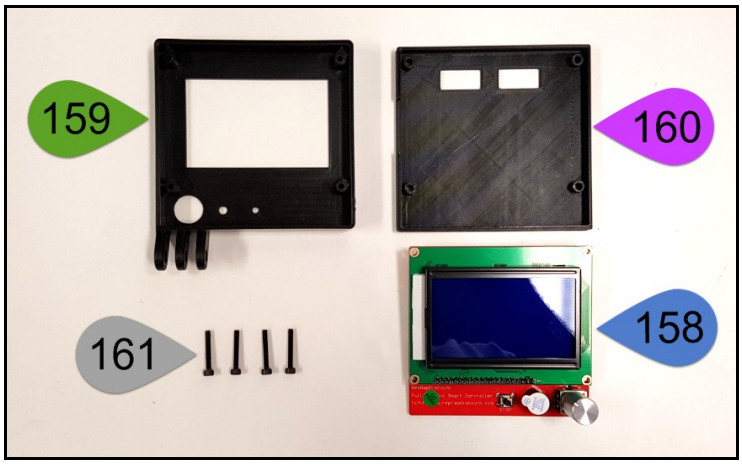


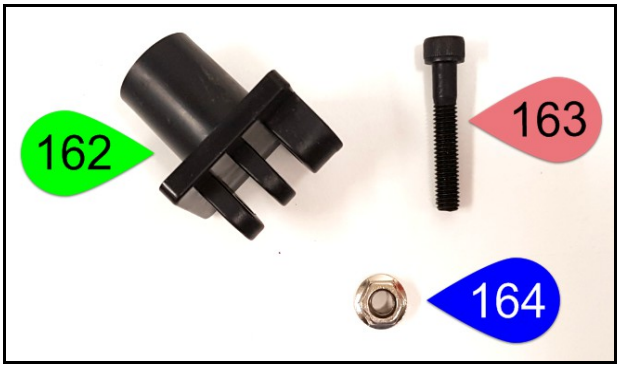
Step 15 – Fitting the LCD Module

Please locate the following items in your kit of parts:

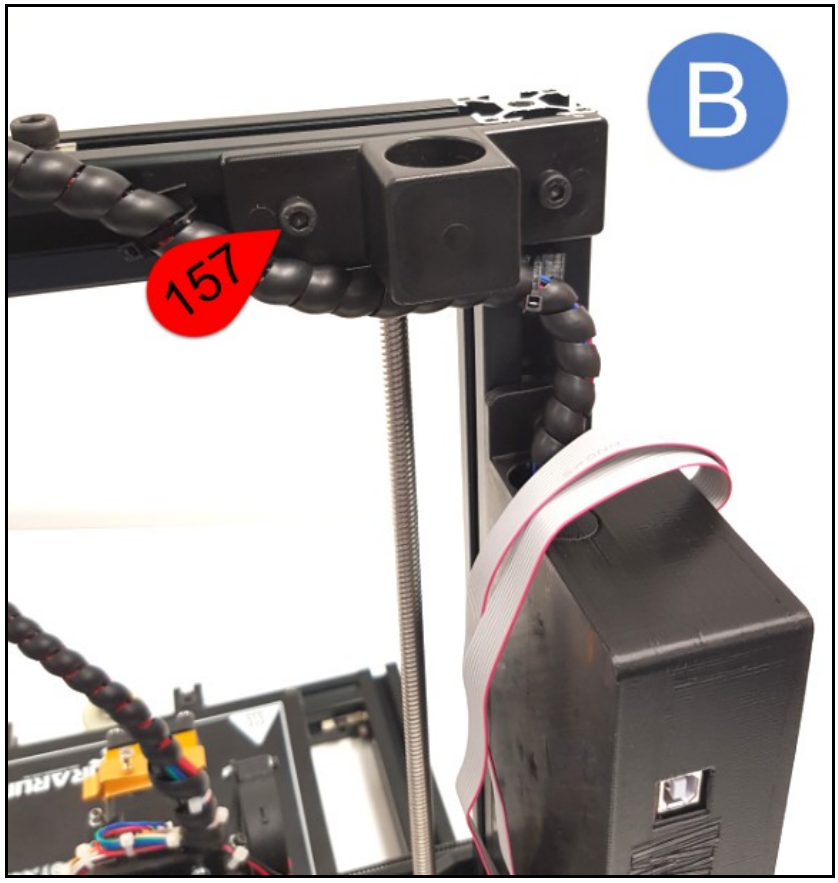
ITEM	DESCRIPTION	QTY
155	LCD MOUNTING BRACKET	1
156	3030 SLIDING NUT M5	1
157	BOLT M5 X 10mm CAP HEAD	2
158	DISPLAY MODULE WITH ROTARY CONTROL DIAL	1
159	LCD FRONT FASCIA	1
160	LCD REAR COVER	1
161	BOLT M3 X 20mm CAP HEAD	4
162	LCD SWIVEL MOUNT POST	1
163	BOLT M5 X 35mm CAP HEAD	1
164	NUT FLANGE M5	1



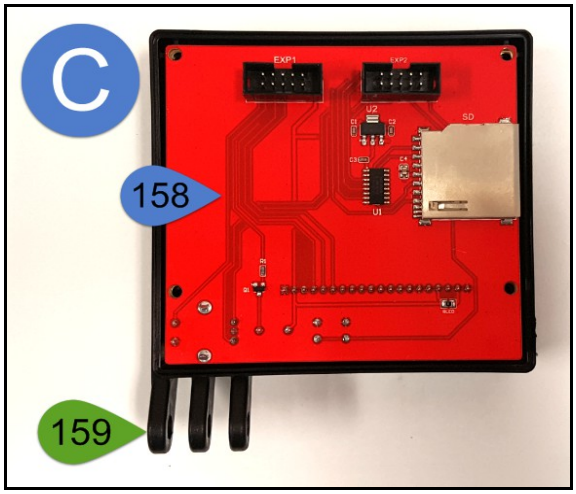


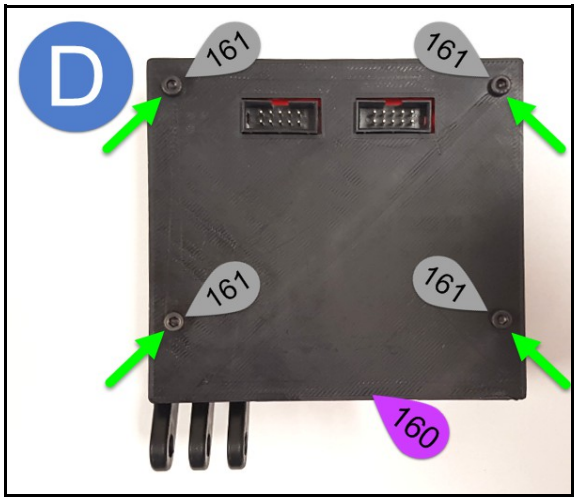


First, fit the LCD Mounting Bracket to the rear of the Gantry Frame. You will need to load one M5 x 10mm Bolt and one 3030 M5 Sliding nut to the bracket first so that it can slide vertically into the rear of the left hand vertical rail. Please note that the bracket has a tapered opening – that is, the hole is larger on one side than the other – the wider opening needs to be fitted upward so that the LCD Swivel Mounting Post can drop into the hole once fitted to the module. The second M5 x 10mm Cap Head Screw is used to secure the other end of the LCD Mounting Bracket to the rear of the Gantry – utilising the one remaining 3030 M5 Sliding Nut left on the Gantry.

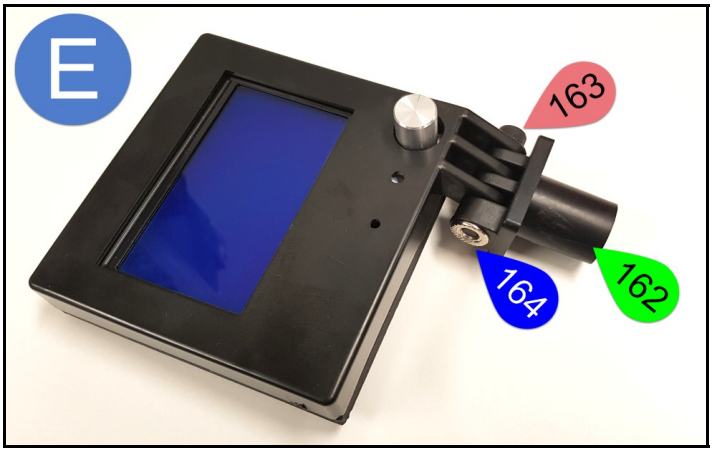


Next, assemble the LCD into the housing by placing the LCD face down into the Fascia, placing the Rear Cover over the LCD rear panel and securing it with the four M3 x 20mm bolts. Important note: do not over-tighten these 4 Bolts to the point where it distorts the housing – they only need to be tight enough to hold the rear cover to the edges of the front fascia:

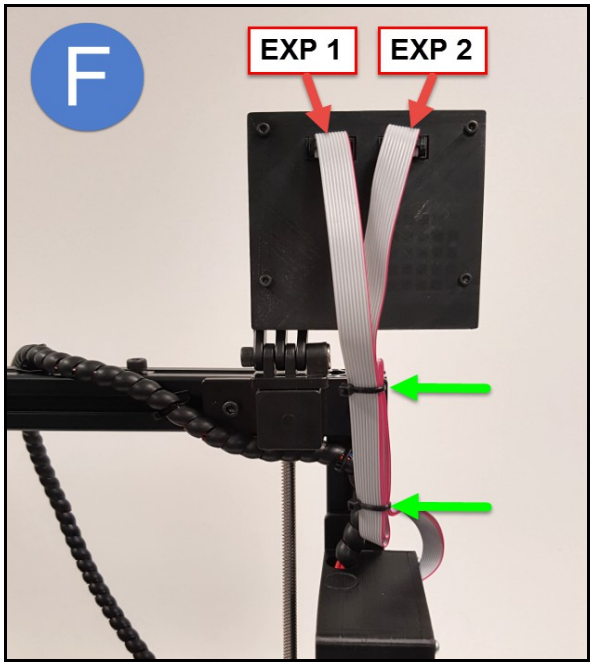




Next, fit the LCD Swivel Mount Post to the completed LCD Module Housing using the M5 x 35mm Cap Head Bolt and M5 Flange Nut. Note that the LCD Swivel Mount Post has a cutout in which to place the Flange Nut.



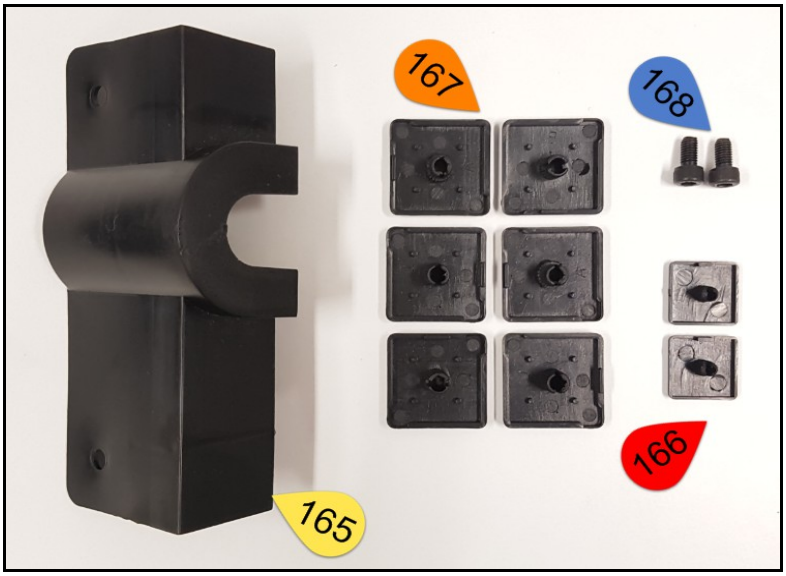
To finish the LCD Module Assembly, simply place the completed module into the Mounting Bracket on the Exilis top gantry and fit the ribbon cables coming from the Motherboard Enclosure. You can cable tie the ribbon cables together to tidy them up and keep the excess cable from dropping down:

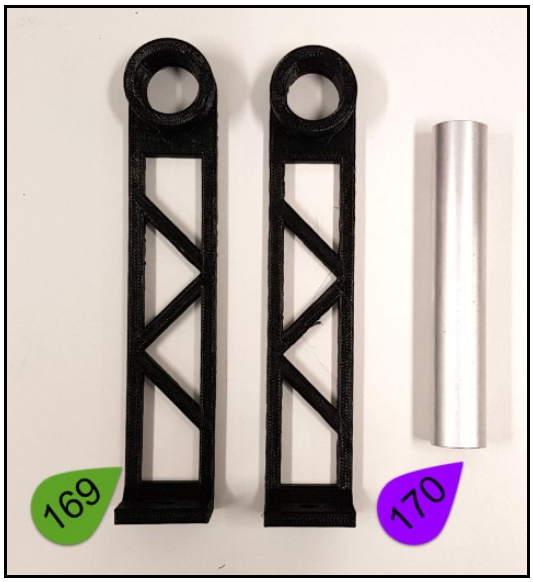


Step 16 – End Caps, Idler Wheel Cover Plate and Spool Holder

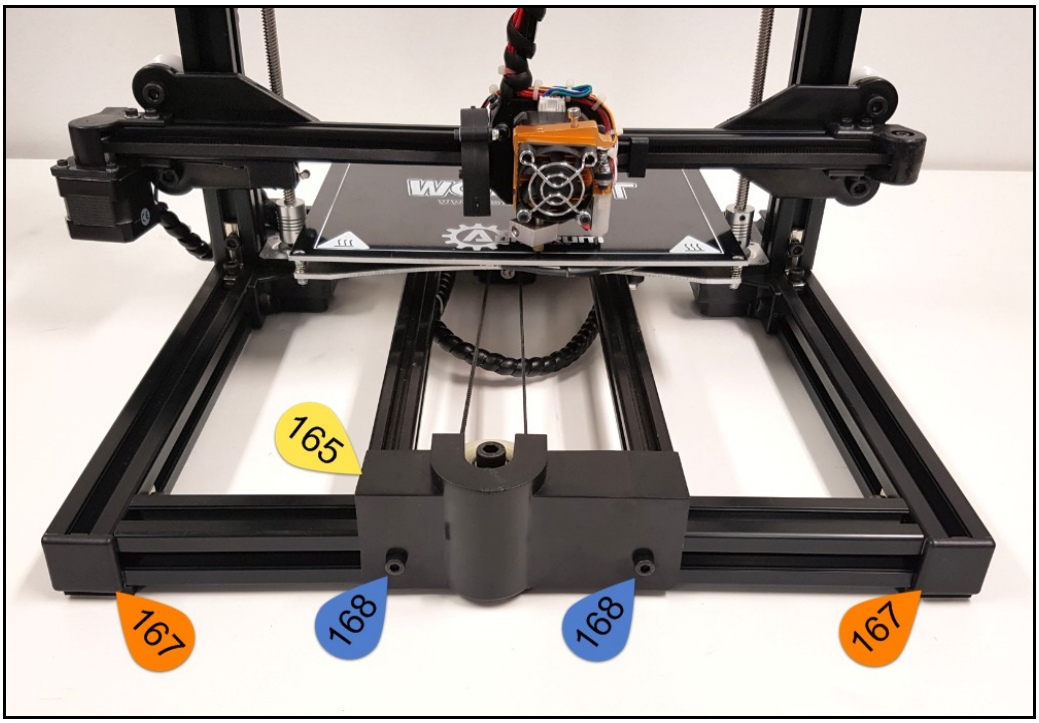
In your kit of parts, locate the following items:

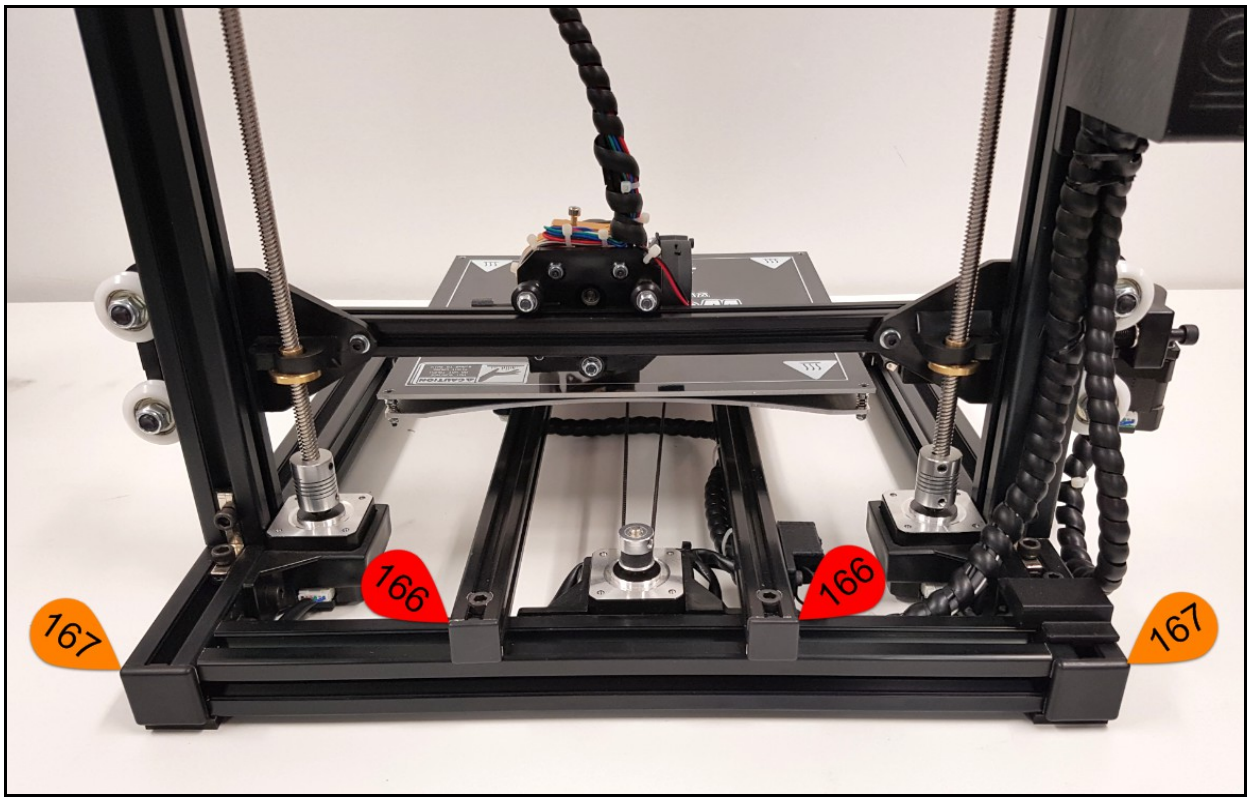
ITEM	DESCRIPTION	QTY
165	Y IDLER COVER PLATE	1
166	2020 END CAP COVER	2
167	3030 END CAP COVER	6
168	BOLT M5 X 10mm CAP HEAD	2
169	SPOOL HOLDER BRACKET	2
170	SPOOL TUBE	1

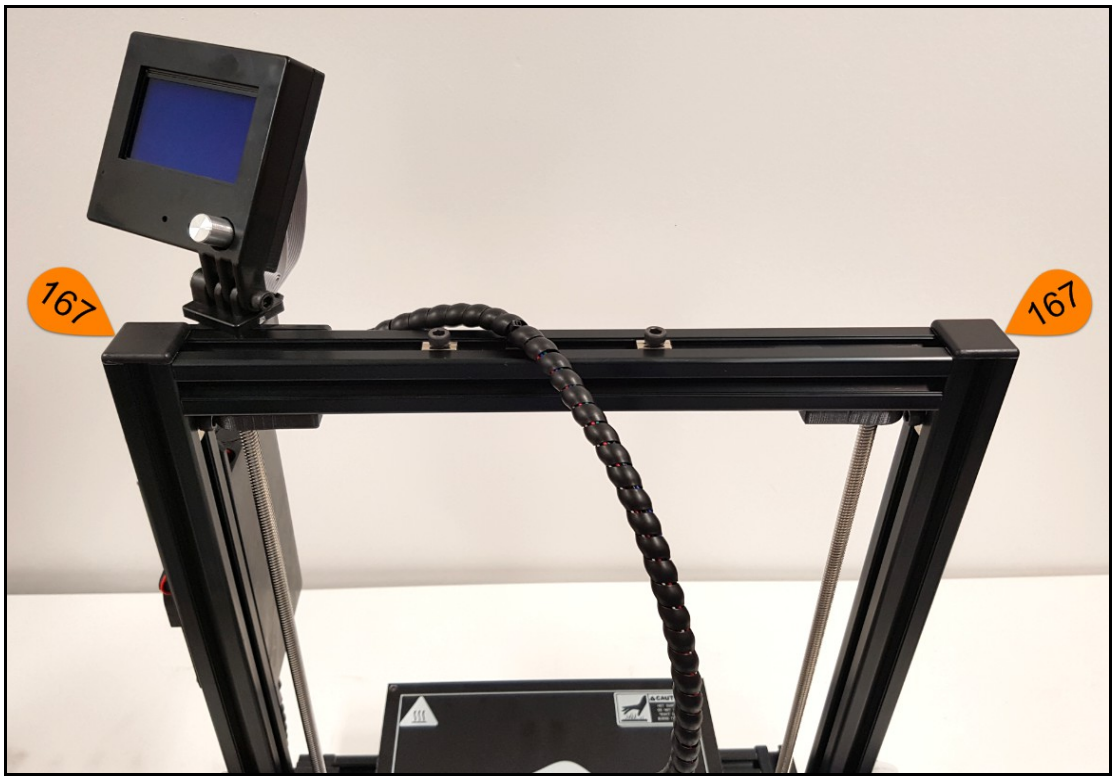




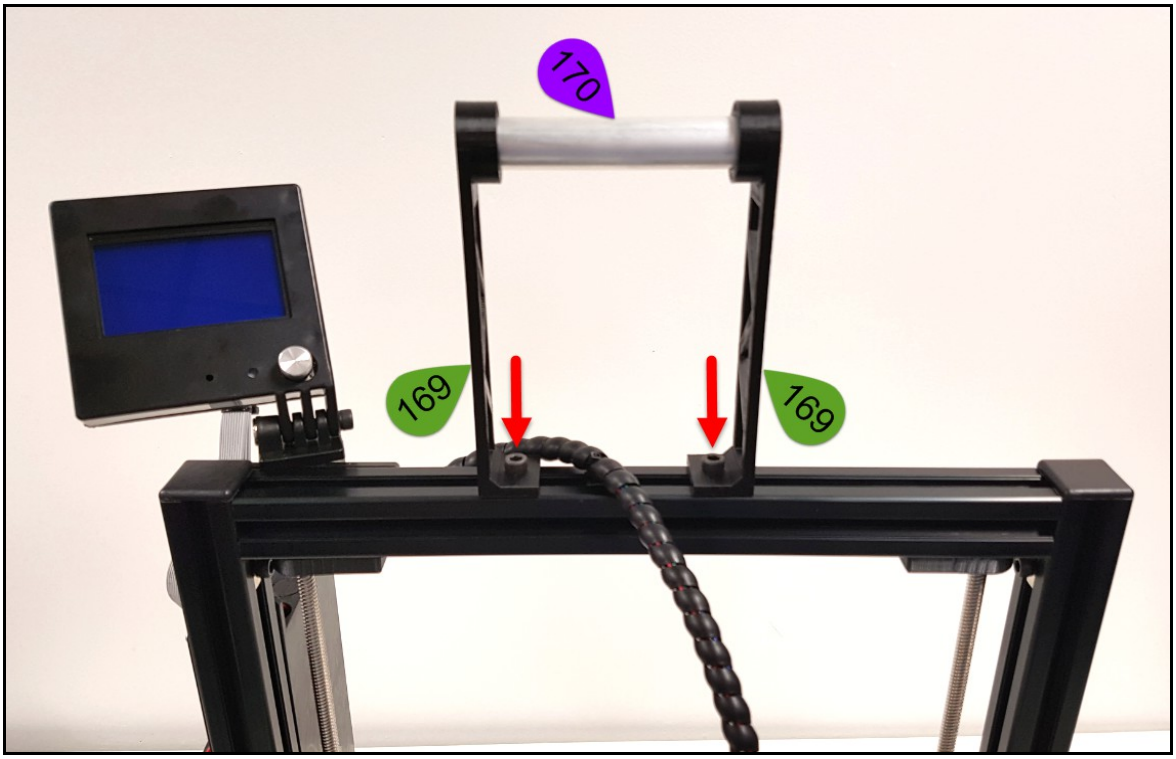
Place the Y Idler Cover Plate over the front bottom rail of the Exilis. Secure it with the two M5 x 10mm Bolts. Gently tap into place the remaining End Caps as per the following images:







Fit the two Spool Brackets to the Top Gantry using the two Bolts you loaded previously, as per the following image. The Spool tube can be fitted between the two collets at the top of the spool holders to support the roll of filament.

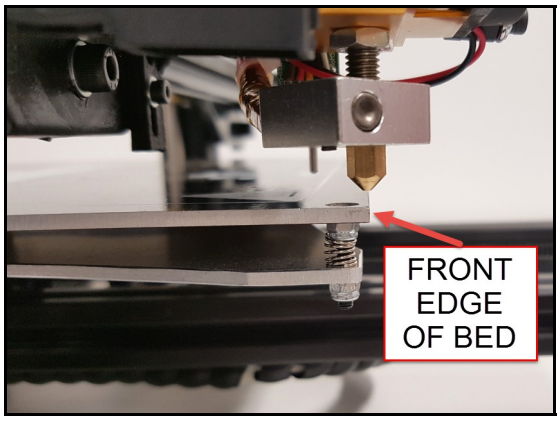


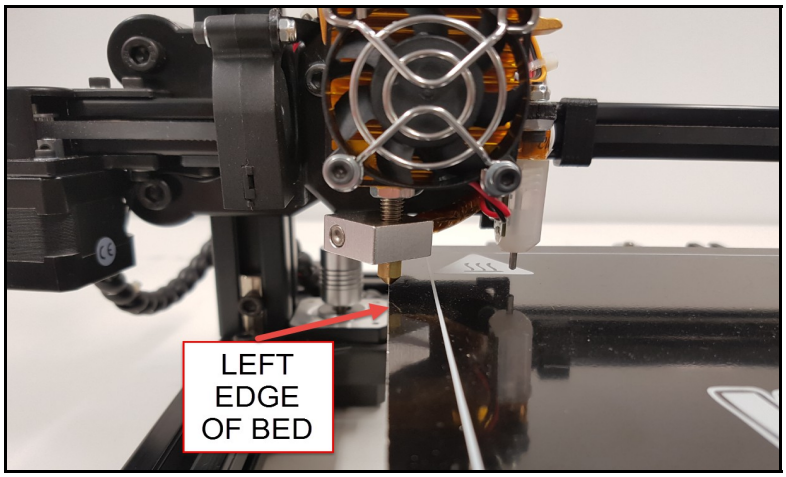
Congratulations, If you have followed each assembly process carefully and completed each step, then you have completed the assembly of your Wombot Exilis 3D Printer. All that's left now is to check a few things, calibrate your end stops and you will then be ready to power up your printer.

Step 18 – Adjustment and Calibration Checklist

Once you have completed assembly, before powering on for the first time, it is advised that you do a check over of all joints, bolts and modules on your printer including the following:

Endstops – Please move your heated bed towards the rear of the machine. When the End-Stop triggers, you will hear a "CLICK". When this "CLICK" is heard, the nozzle should be at the leading edge of the bed as per the following image. Similarly, when you move the extruder carriage to the left side of the X Rail, the Nozzle should be in line with the left most edge of the heated bed when the "CLICK" is heard. Simply loosen the end stop switch screws and slide them to adjust the position where they are activated to be in line with the limits of the heated bed.





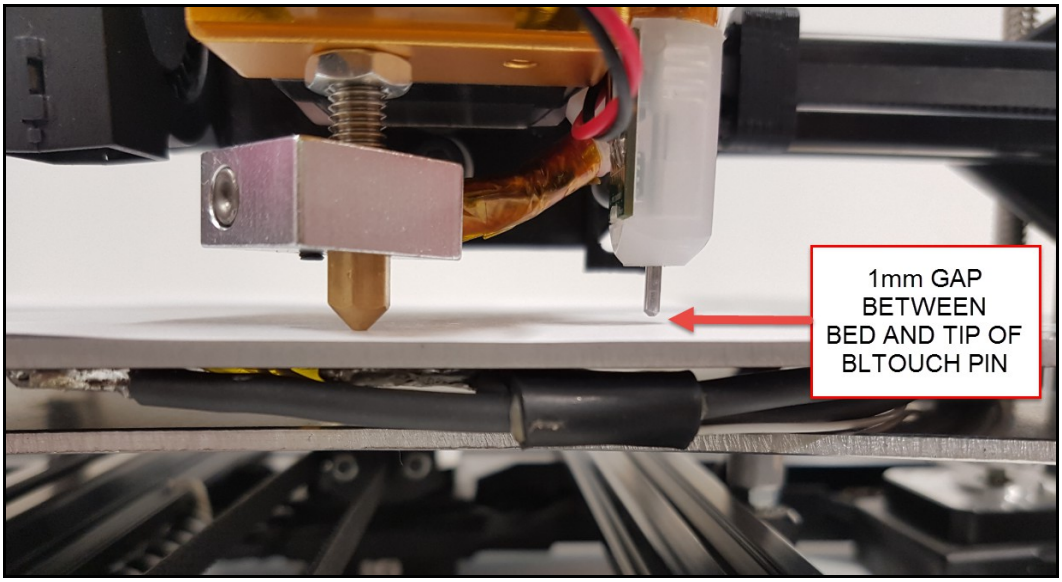
Belts – Please ensure that the X axis belt and Y axis belt are taught but not over-tight. There needs to be sufficient tension on them so that there is no slack present on the pulleys or idlers when moved, but not so tight that they cause resistance to the smooth movement of the axis that they are attached to.

Eccentric Nuts – Please re-check the eccentric nuts on the extruder carriage and bed trolley to make sure that they are the correct tension and that there is no excessive slop throughout their entire range of movement.

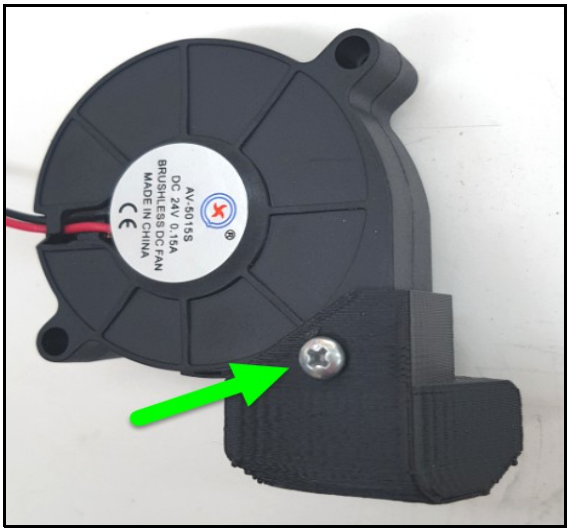
Hot End – Check that your thermal break, heater block and nozzle are tight and do not rotate when turned by hand.

Bed Level – With the X Axis Rail ends equidistant from the base frame, lower the gantry down so that the nozzle is approximately 1mm from the heated bed. Re-check the distance between the X Rail and the base frame. Gently slide the Extruder from left to right and check that the distance between nozzle and heated bed remains constant. Do the same from front to back. Minor adjustment may be required to the spring loaded screws between the heated bed and bed trolley to achieve a reasonably uniform distance between the nozzle and the bed, across the entire area of the heated bed.

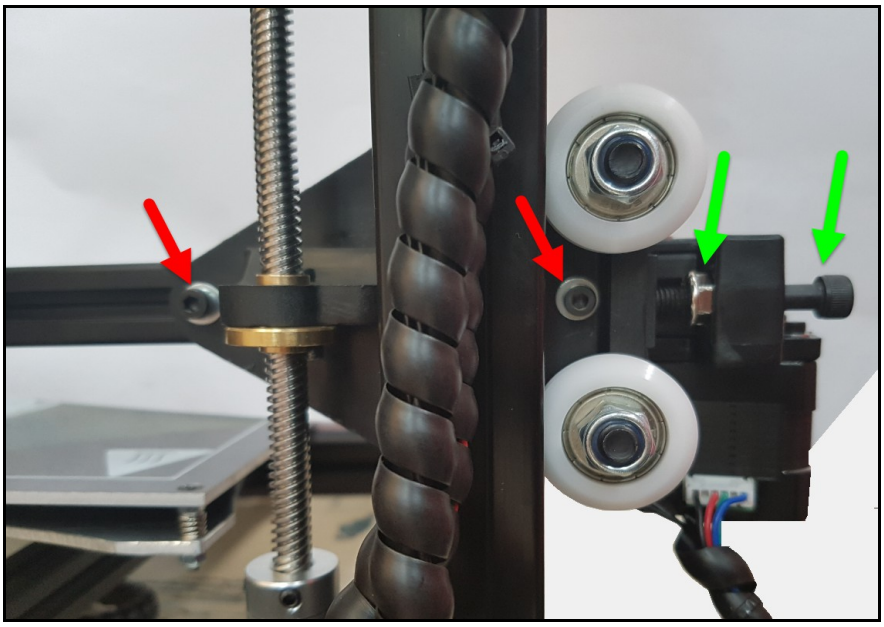
BLTouch Sensor Height – It is important to set the height of the bracket for the BLTouch sensor before powering on your printer for the first time. The best way to do this is to loosen the two bolts holding the bracket to the extruder carriage and shift the bracket upwards. Then gently lower the extruder until the nozzle is just barely touching a piece of paper on the heated bed. Push the silver pin on the BLTouch upwards until the internal magnet keeps the pin retracted. Lower the BLTouch Bracket until there is approximately 1mm of distance between the tip of the pin and the piece of paper – this means that the nozzle is 1mm lower than the BLTouch pin. Tighten the two screws holding the BLTouch bracket to the extruder carriage. The following image should help to demonstrate this principal:



Part Cooling Fan Nozzle – Fit the 3D Printed Part Cooling Fan Nozzle (that we asked you to set aside in Step 8 – Extruder Carriage Assembly) to the Part Cooling Fan on the Left hand side of the Extruder carriage. You can do this by placing a small amount of adhesive from a hot glue gun, or alternatively you can fit the Fan Nozzle to the fan and drill a small hole from the outside of the nozzle on the left hand side and use one of the spare self tapping screws in your kit of parts to secure it.



X Axis Bracket Tensioning – In order to get the correct tension on the X Rail between the two brackets that travel up and down the Vertical Rails on either side of the printer, so that there is minimal movement during printing, temporarily remove the M5 x 35mm Bolt and M5 Flange Nut from the LCD Module (Items 163 and 164). Fit the nut and bolt to the X Motor Bracket. Loosen the two bolts holding the X Rail Bracket to the Rail. Turn the large M5 Bolt to bring the X Brackets closer, the bolt end thread pushes against the X Rail Bracket, hence shortening the distance between the two X rails and increasing tension of the large white bearings on the outside of the Vertical Rails. Please see following images for a visual representation of how this works::



Don't forget to re-tighten the two rail bolts once you are happy with the tension of the rail brackets. Your X Rail should be able to move upwards and downwards on the two vertical rails without difficulty. There should be very little play if any in the X Rail Brackets when tilted. Gently turn both Trapezoidal Lead Screws simultaneously in the same direction to make sure that there is no binding. Remove the M5 Bolt and Nut and replace them in the LCD Module to secure the LCD.

You can now proceed to powering up your Wombot Exilis and familiarising yourself with the display, menu structure and features. We recommend that you read the User Manual before you power up your Exilis as it has some useful information about preparing for your first print, setting your Z offset (for automatic bed level compensation) For further information on the operation of your Exilis, please read the user manual available online at www.wombot.com.au

Need Assistance?

Every care has been taken to ensure that your kit has been prepared with all components required to complete the build, however if you find a part missing or damaged, please let us know by sending an email outlining the problem to support@wombot.com.au

We value your feedback. If you would like to make a comment about our products or this manual, please feel free to email us with your thoughts to support@wombot.com.au

END OF DOCUMENT