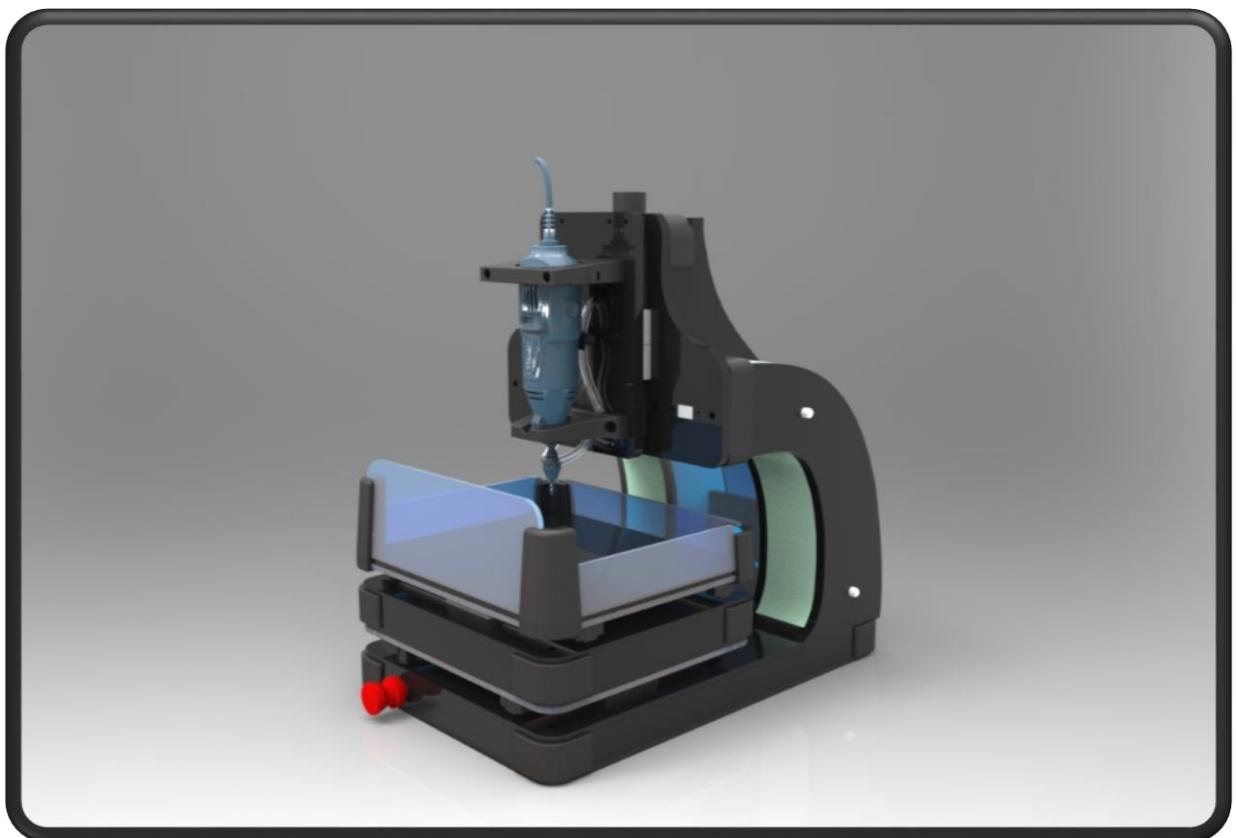


2016

# DS1 CNC

Assembly instructions

DS



*Assembly instructions*

**'C' PANEL SECTION**

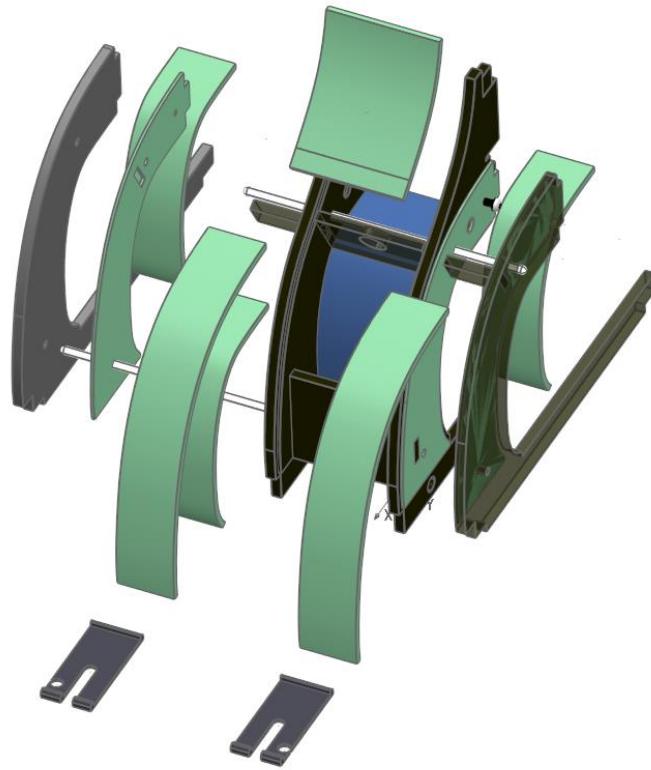
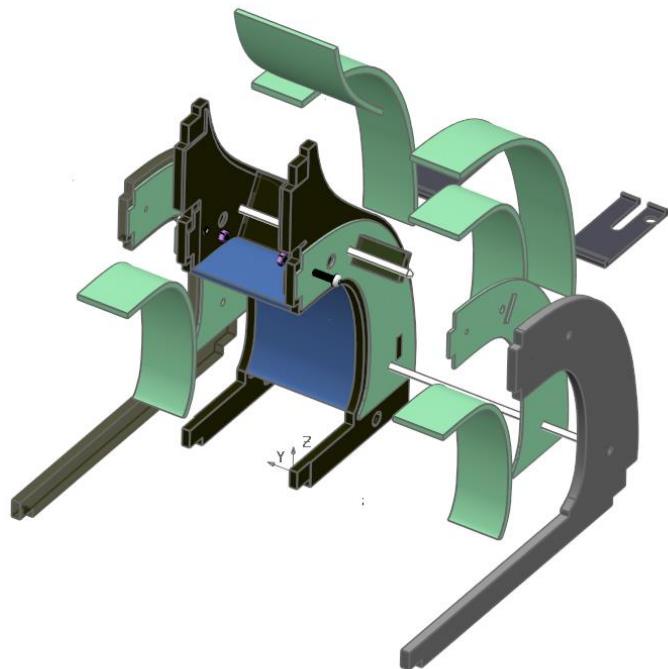
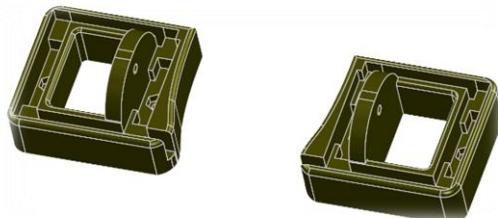


Fig1



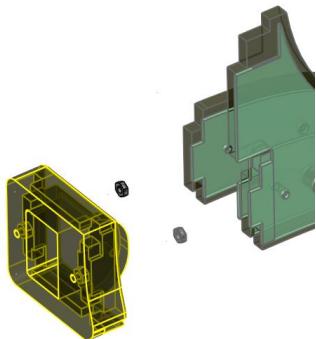
Select ZASL and ZASR z axis supports

Fig 2



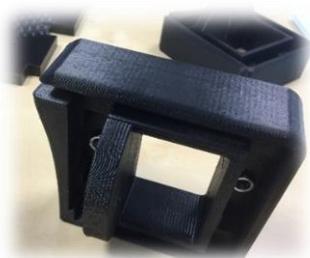
Select OP and CP panels

Fig 3



Insert M6 hexagonal nuts into left and right Z axis supports

Fig 4



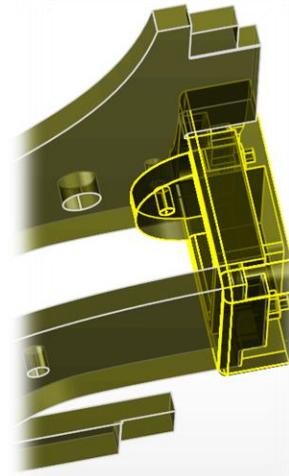
Insert the nuts until they are flush with the inside surface.

Fig 5



Using an M6 70mm bolt slightly engage the thread and between vice jaws or using a mallet apply some pressure to secure the nuts into position.

Fig 6



Push 10mm OP and CP panels into slots in ZASL and ZASR Z axis supports.

Fig7



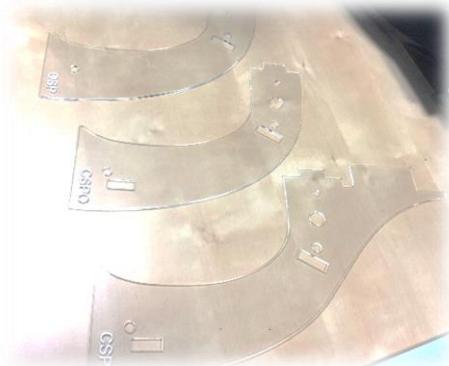
Position the support on a desk and push the panels into the 10mm slots within the fixture

Fig 8



Repeat the process for the other 'C' side section.

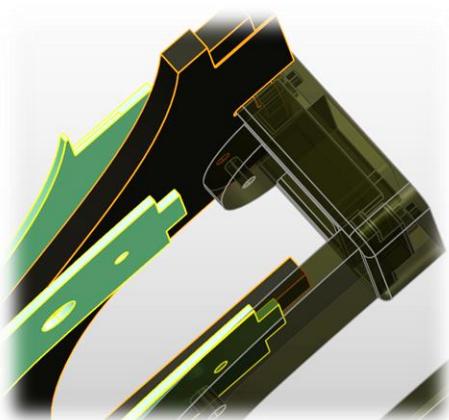
Fig 9



Select 3mm inner 'C' panels (CSPI, CSPO and OSP)

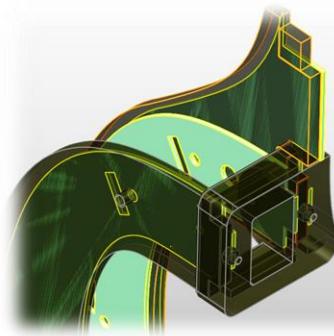
*Note: CSPI and CSPO panels slot either side of main CP panel.*

Fig 10



Push panels into place as image

Fig 11



Align all holes in panels as Fig 12,13

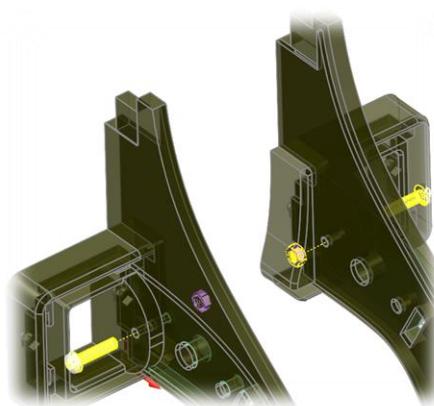
Fig 12



Fig 13



Fig 13a



Insert the 2xM6x30mm bolts and nuts.

*Note: do not fully tighten nuts. It is easier to push the bolts through at this stage and tighten later.*

Fig 14



Image of 'C' panels, left and right assemblies

Fig 15



Select C section back panels (BT and BB)

Fig 16



Insert both panels through the 'C' panels.

*Note: this will be a tight fit so all holes must be inline through all 'C' panels*

*Assembly instructions*

'Y' AXIS SECTION

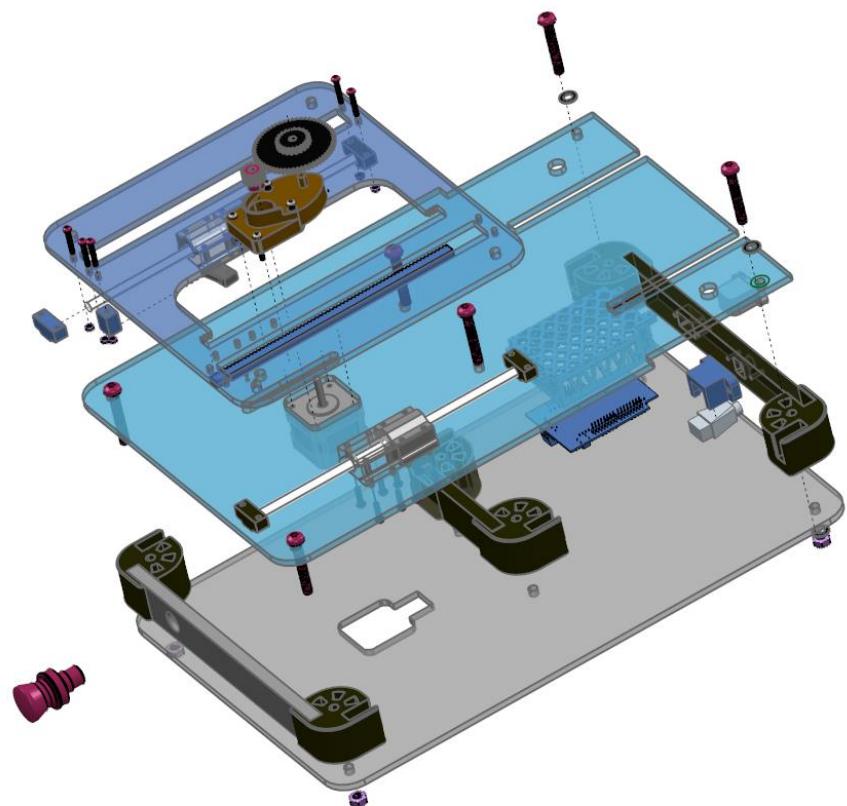
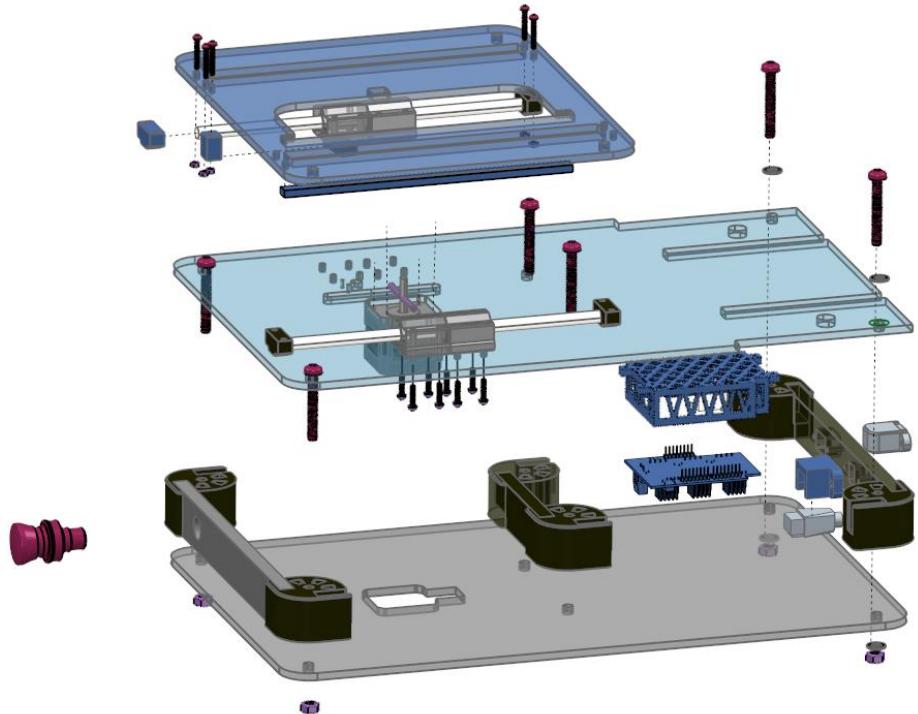


Fig 17



Select Panel (YB, YBP, YF, YM) 6 CS corner supports, USB fixture, Power socket and PS holder 4xM3x20mm bolts/nuts and the Stop button

Fig 17a

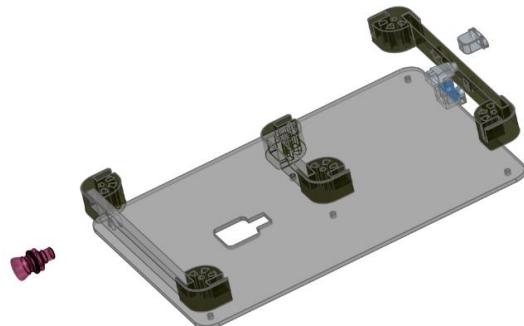


Note: This is (PS) power socket holder for clip terminal block option, see image.



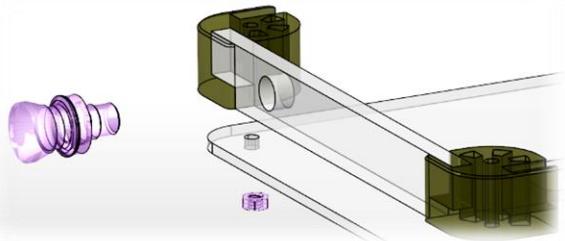
Note: This is an alternative power socket holder (PS2) for screw terminal block option, see image.

Fig 18



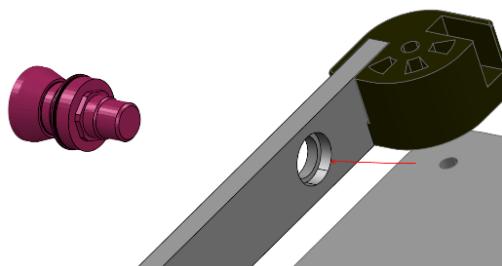
'Y' axis assembly

Fig 19



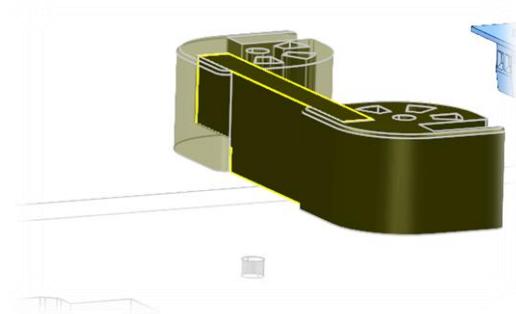
Push fit 'YF' panel into 2 corner supports

Fig 20



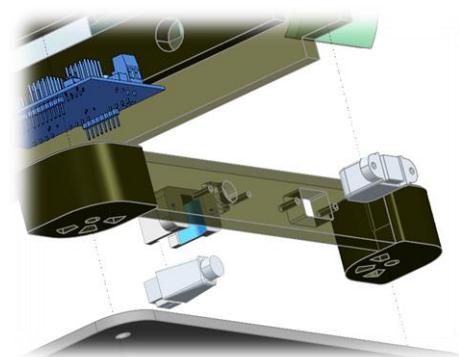
Note: The stop button requires a 5mm recess in either the inner or outer surface of the YF panel. This can be chamfered during assembly with a drill bit or etched in during the laser profiling phase.

Fig21



Insert YM panel into 2 corner supports.

Fig 22

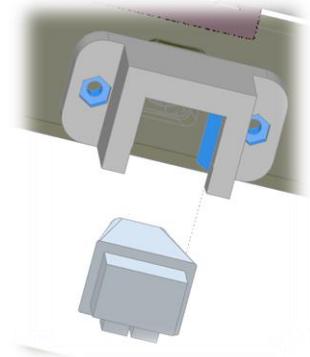


Insert YBP panel into 2 corner supports. Fit power socket into holder and with USB attach to YBP panel

*Note: there is an alternative power socket holder that can be used... see Fig 18a*

*Note: the power socket should be mounted with the terminal blocks facing down. This will aid assembly during the electronics stage.*

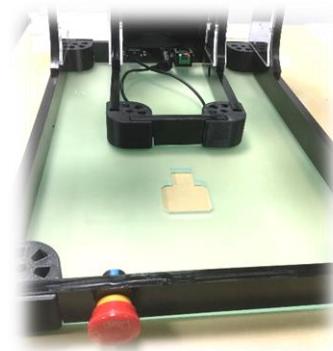
Fig23



Push fit securing nuts into power socket holder.

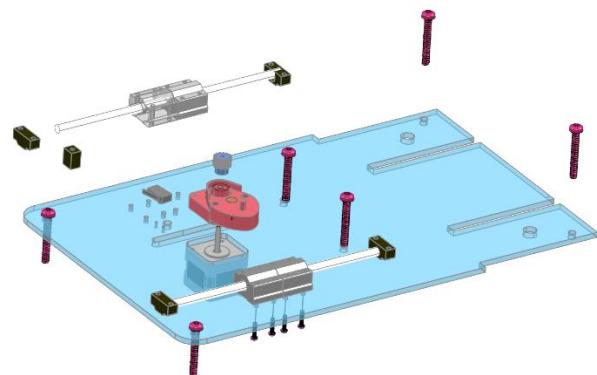
*Note 2xM3x20mm are used for power socket and 2xM3x15mm bolts for the USB socket fixture. If longer trim as required.*

Fig 24



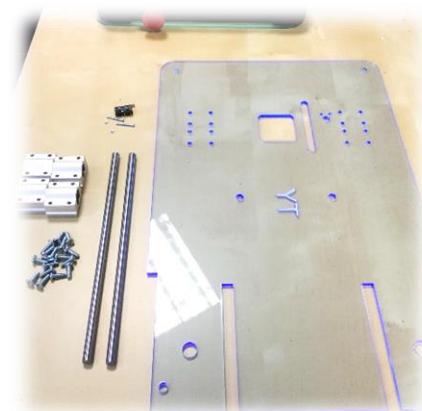
Assemble all sections as image.

Fig 25



Assemble Y axis top section with limit switch and bearing blocks.

Fig26

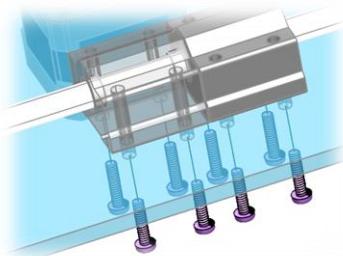


Select YT panel, 4xbearing blocks, 2x230x8mm steel rails, 4xBSC rail supports, 1x 14 tooth pinion gear, 1xGH gear housing, 1x limit switch and 4x bearing blocks.

Bolts and washers = 6xM6x50mm, 16xM4x12mm, 2xM2x19mm, 4xM3x15mm.

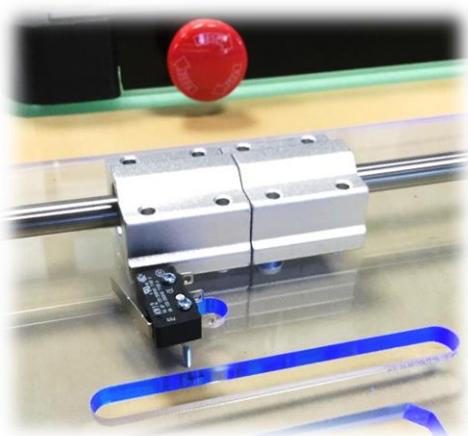
*Note: 230mm rails can be cut to size from 500mm bar using Dremel grinding tool. The remaining 270mm of bar is used for the X Axis bearing rail.*

Fig 27



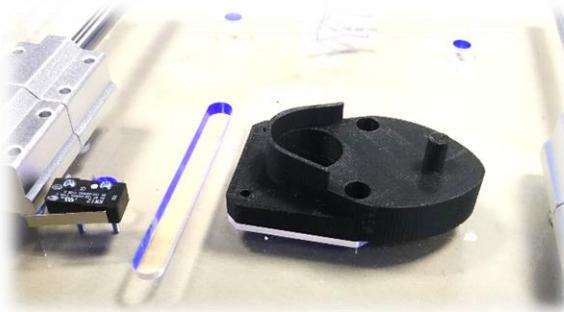
**Note:** The bearing blocks should be secured only with the 8mm steel rail in situ. This will ensure correct alignment of the bearing blocks.

Fig 28



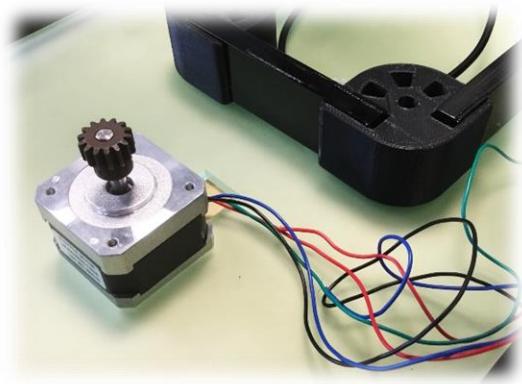
Secure blocks both sides and the limit switch using 16xM4x12mm and the 2xM2x19mm.

Fig 29



Push fit the YAR gear housing into YT panel ensuring a tight fit.

Fig 30



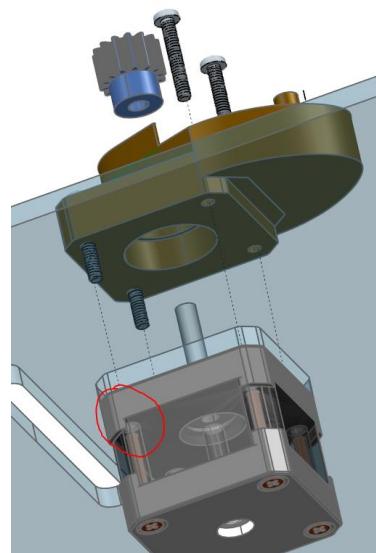
Attach pinion gear to stepper motor and push fit into YB panel ensuring cables are aligned to the back of the machine and the motor sits inside hole. **Note: Adjust if needed.**

Fig 31



Remove motor from bottom YB panel and fit into the YT panel secure motor using 4xM3x15 securing bolts

Fig 32



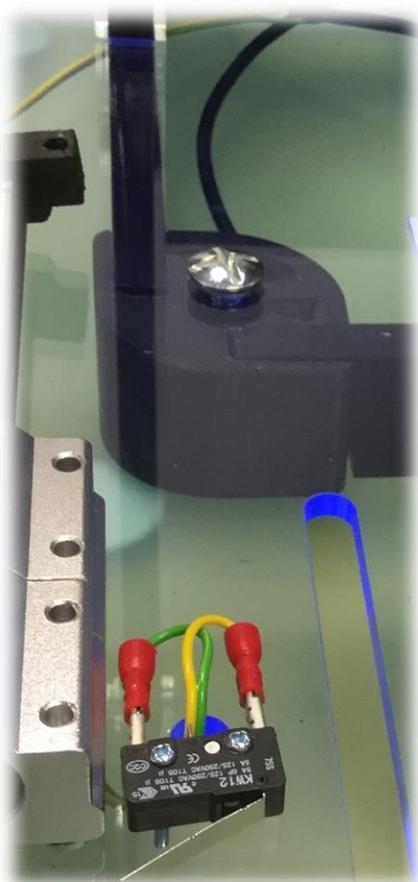
**Note:** ensure that the fixing bolts are no longer than 15mm as any longer will either push out original motor bolts or damage thread. (where indicated)

Fig 33



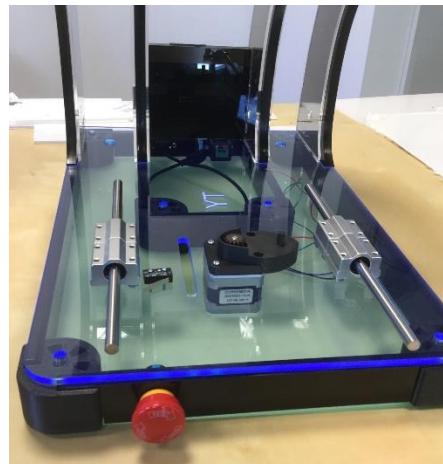
Split the 4 core ribbon cable into 2 core and cut length of 600mm , attach 2 spade connectors

Fig34



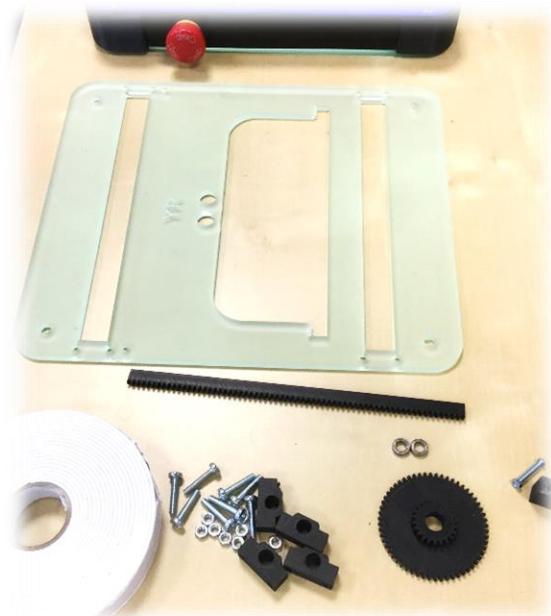
Attach a spade connector to 'C' (common) and the other connector to 'NO' (normally open) on the limit switch and feed cable through the holes to the electronics area in the centre rear of the machine.

Fig 35



Position 'YT' panel top ensuring the base of motor clips into YB panel and align bolt holes.

Fig36



Select YR panel, DG drive gear, YAR rack, 4xBSC bearing support caps, LST limit switch toggle, mounting tape and 2x10mm small bearings. Bolts and nuts = 8xM4x25mm and 1xM3x20mm

Fig 37



Cut a 5mm strip of the mounting tape and attach to YAR rack.

*Note: this tape acts as a compression spring for the gears removing backlash.*

Fig38



Insert YAR rack into YR panel and remove protective layer... press rack into recess to achieve good bond.

Fig 39



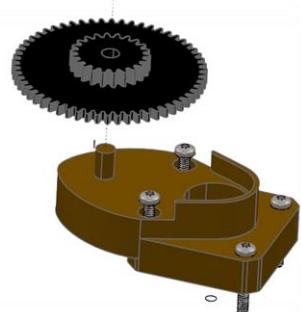
Select DG gear and 2x 10mm bearings

Fig 40



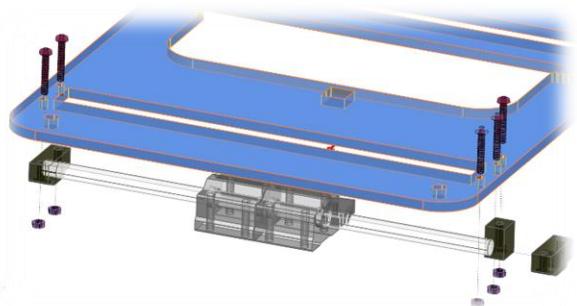
Push fit bearings into DG gear back and front.

Fig 41



Assemble gear, offer up to the GH housing and check that it is rotating correctly.

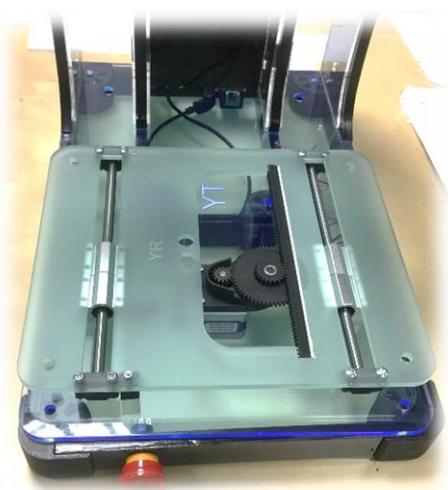
Fig 42



Push fit BSC bearing support caps onto rails after inserting through bearing blocks. Offer up the YR panel to machine, engage gears and align all fixing holes and finally 8xM4x25 insert bolts.

*Note: push fit the BSC supports onto the 8mm rails before assembly as these will be a very tight fit.  
Engage gears first, align supports and fit the bolts.*

Fig 43



check operation of gear (moving the YR panel forward and backward) and finally tighten all bolts.

Fit LST toggle.

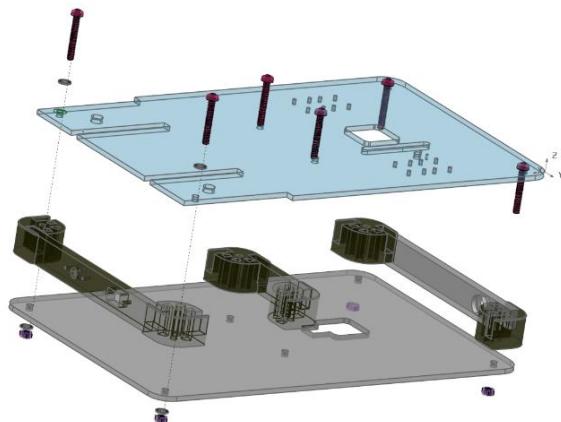
Fig 44



Select 6xM6x50mm bolts nuts and 6x small and large washers, 6xPTFE feet for machine base.

*Note: this should avoid scratching work surface.*

Fig 45



Fit 6xM6x50mm bolts and nuts through YB and YT.  
Use a washer top and bottom of machine and  
assemble finger tight for now.

*Note: the 50mm bolts may protrude through the bottom of the machine further than the PTFE feet. Either reduce the length of the bolt or simply add an extra washer on the top of the assembly.*

Fig 46



Attach PTFE self adhesive feet to the base of machine.

*Assembly instructions*

'X' AXIS SECTION

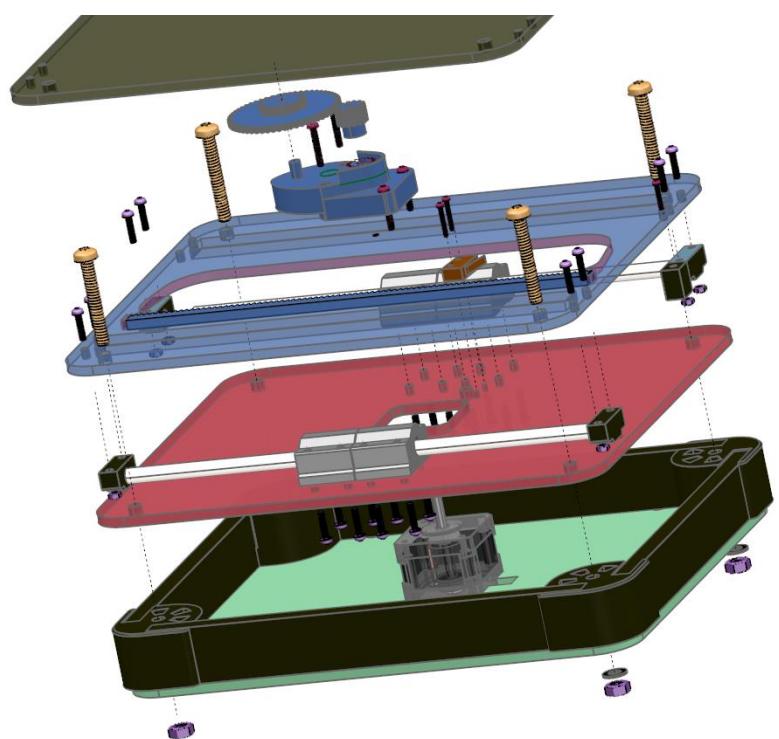
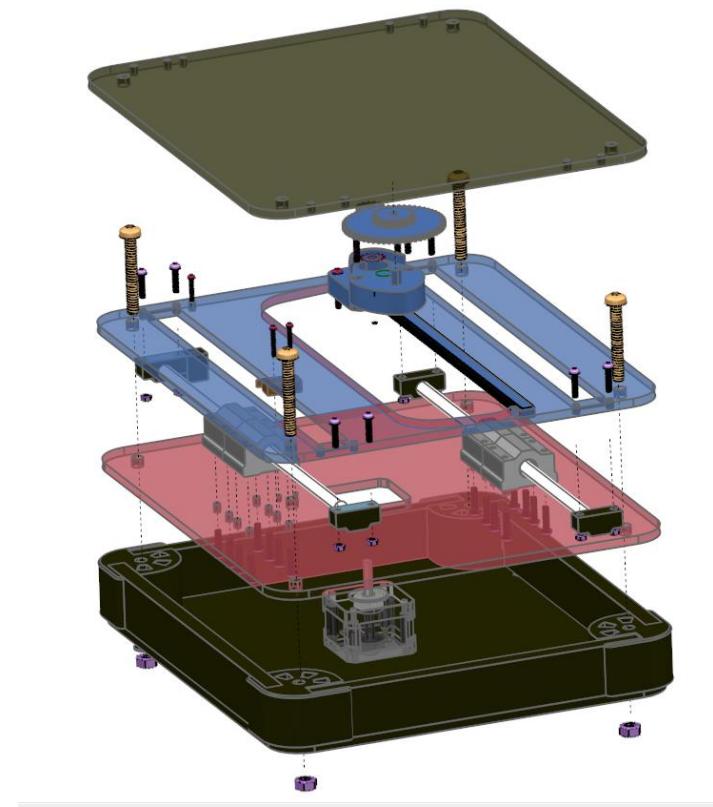
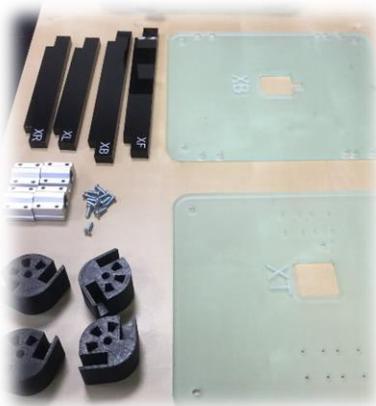


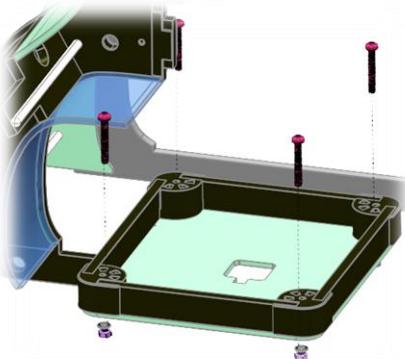
Fig 47



Select XB, XT, XF, XBP, XR, XL panel's.

4xCS corner supports 4X bearing blocks,  
16xM4X12mm bolts and 4xM6x50mm bolts.

Fig 48



Push fit CS supports and the side panels.

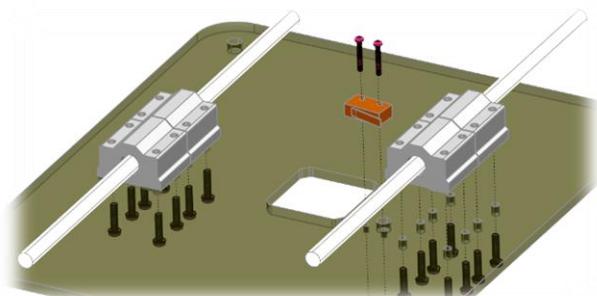
*Note: when assembling the X axis ensure that the motor location (XB panel) is situated toward the front of the machine and the cable clearance section is facing left ...Do not insert bolts at this stage.*

Fig 49



Check the motor fits correctly into XB panel.

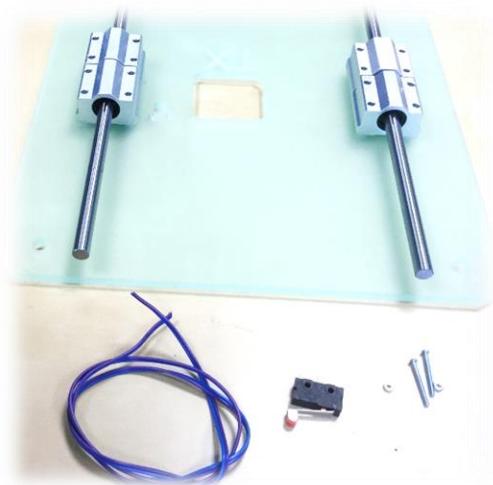
Fig 50



Attach the bearing blocks and the limit switch.

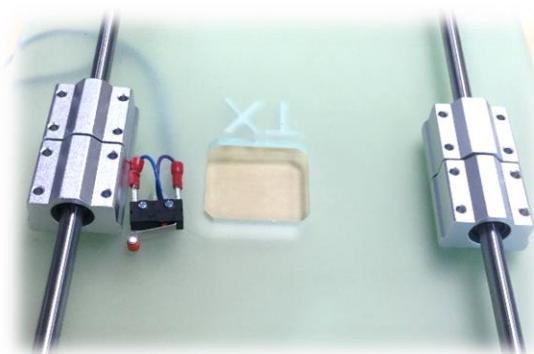
*Note: insert the 8mm rails when tightening the bearing blocks to ensure smooth operation of bearings.*

Fig 51



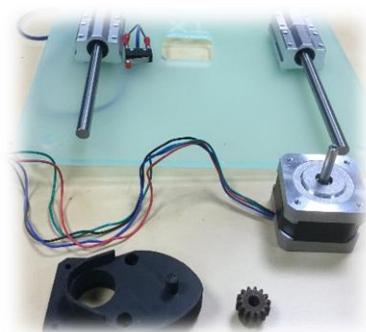
Select the limit switch, 2xM2x19mm bolts and nuts. Split the 4 core ribbon cable into 2 core and cut length of 600mm.

Fig 52



Attach 2 spade connectors to the limit switch and fit onto the XT panel. Thread the cable through the cable hole.

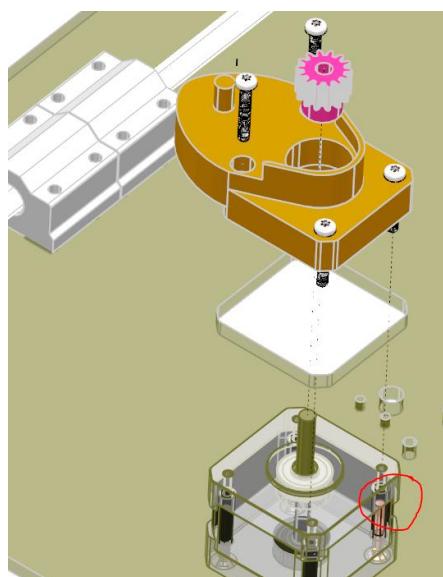
Fig 53



Select GH gear housing, 4xM3m15mm bolts, metal 14 tooth pinion and stepper motor.

*Note: before attachment of the motor to XT panel, check the stepper wires are facing left*

Fig 54



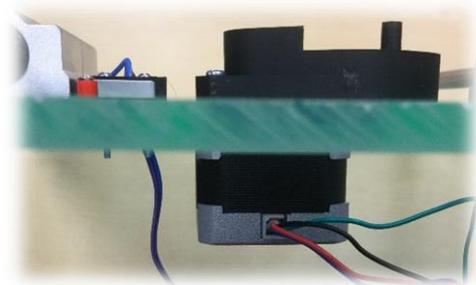
*Note: ensure that the fixing bolts are no longer than 15mm as this will either push out original motor bolts or damage thread. (where indicated)*

Fig55



Push fit the GH gear holder into XT panel.

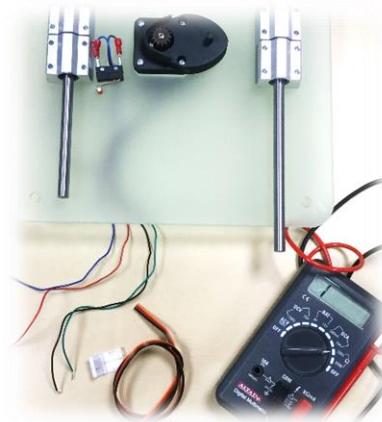
Fig56



Attach the motor with the 4 bolts.

*Note: attach the pinion gear to the motor before assembly*

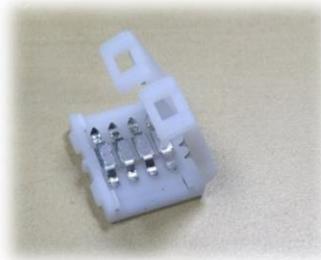
Fig 57



Select 4 core ribbon cable, 4 pin solderless connector and digital multimeter.

*Note: the wires from the motor need to be in pairs for the stepper motor to perform correctly. Identify the pairs with the multimeter or another device. Fig57 it is (blue/red and Green/Black) in this example that are paired. There will be an identifiable resistance when the correct cables are selected. Alternatively, holding the cable ends together and turning the motor by hand will indicate which cables are paired as it is possible to feel the resistance from the motor.*

Fig58



Select solderless clip to attach the stepper motors to the ribbon cable.

*Note: other types of electrical connector can be used to connect the motor to the ribbon cable...see Fig 58a*

Fig58a

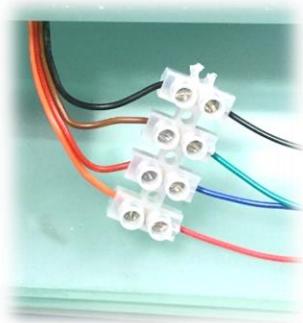


Fig 59



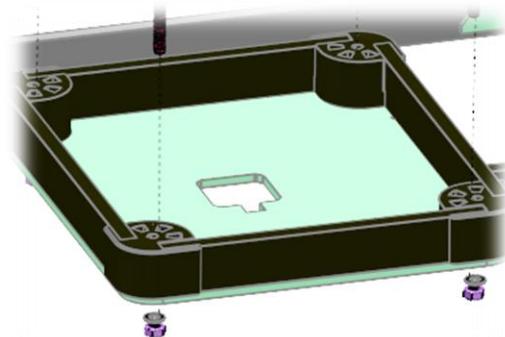
*Note: if using the clip type of connector (as in Fig 58), only remove a small section of the insulation to expose the electrical cable. This enables the cables to be clipped under the electrode. Ensure the plastic retaining clip is firmly clamped together so the cables can't escape. Check again with the multimeter after assembly ensuring correct connection.*

Fig 60



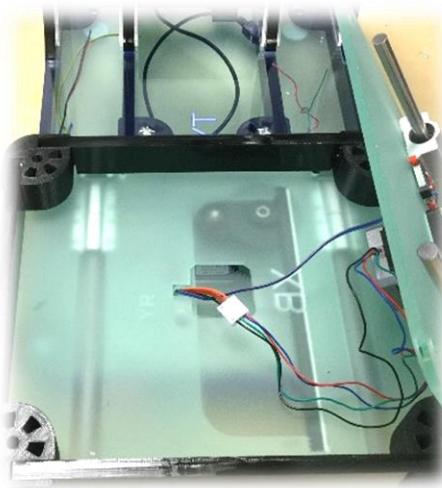
Place the XB panel on the machine ensuring the motor location hole is nearest the machine.

Fig 60a



Fit the side panels and corner supports

Fig 61



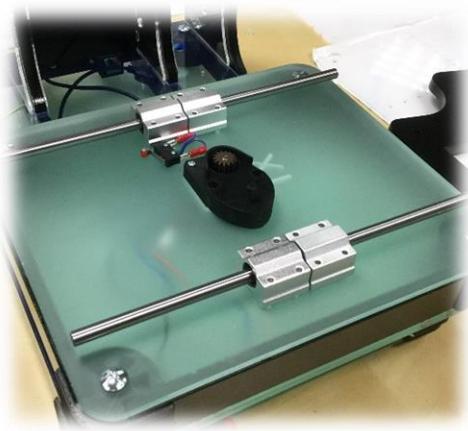
Position the XT panel to the side of the X axis and thread all cables through and into the 'Y axis' enclosure.

Fig 62



Select 4 bolts 4xM6x50mm and nuts.

Fig 63



locate the stepper motor into the XB panel and bolt the XT, XB panels together. Using the bolts

Fig 64



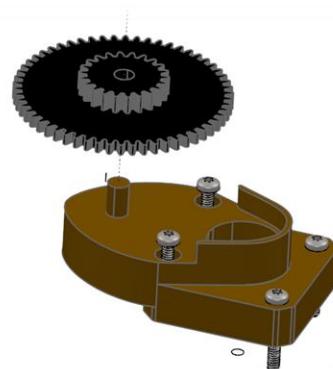
Select DG gear and 2x10mm bearings

Fig 65



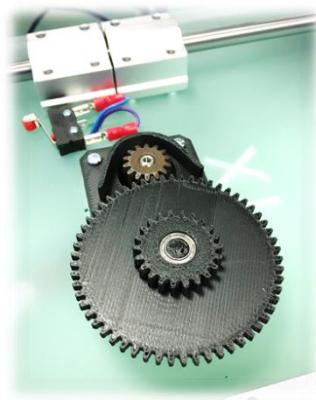
Push fit bearings into DG gear back and front.

Fig 66



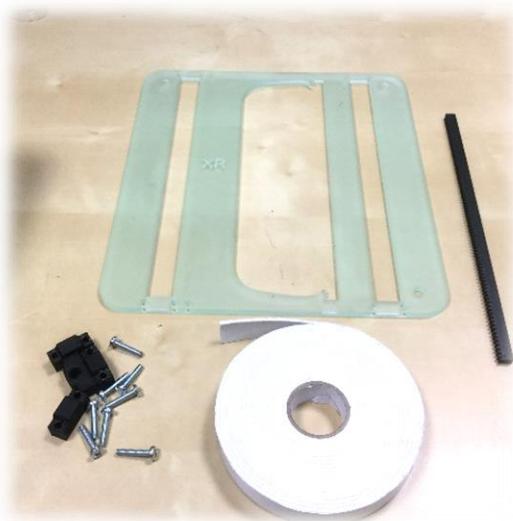
Assemble gear and check operation on the machine.

Fig 67



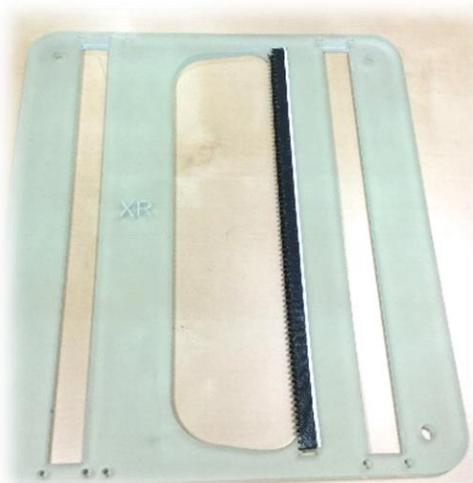
Check gear is rotating correctly with the motor

Fig 68



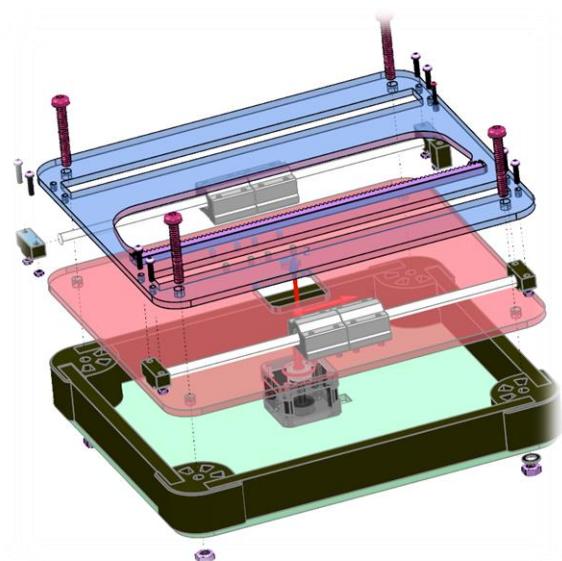
Select XR panel, double sided mounting tape, YAR 'Y' axis rack, 4 BSC bearing support caps and 8xM4x25mm bolts and nuts.

Fig 69



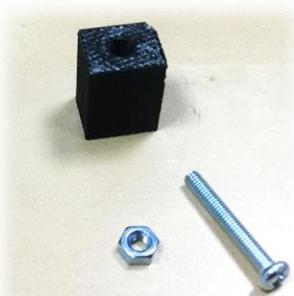
Cut a 5mm strip of the mounting tape and stick to the edge of the rack. Insert the rack and remove the protective film. Firmly push the rack into place.

Fig 70



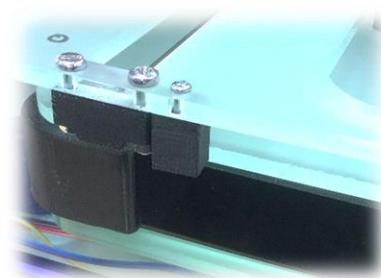
Push fit BSC bearing support caps onto rails after inserting through bearing blocks. Offer up the XR panel to machine, engage gears first and align all fixing holes: insert bolts.

Fig 71



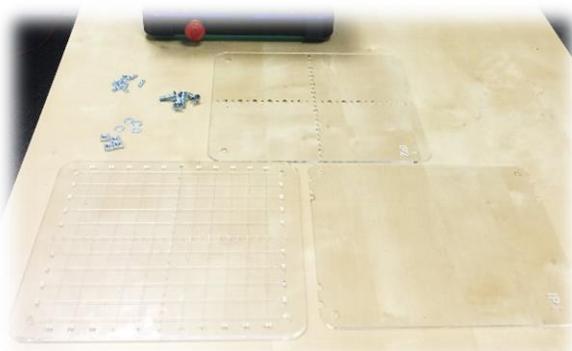
Select LST Limit switch toggle and 1xM3x19 ro 20mm bolt and nut.

Fig 72



Fit LST limit switch toggle.

Fig73



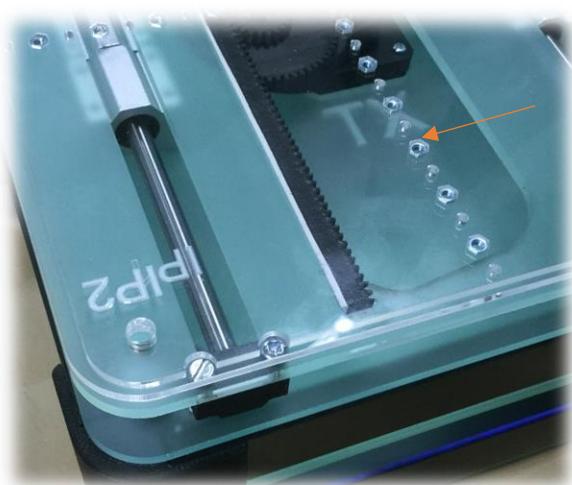
Select IP1, IP2 and index table panels and 4xM6x20mm bolts washers and nuts, 22xM3 nuts only.

Fig 74



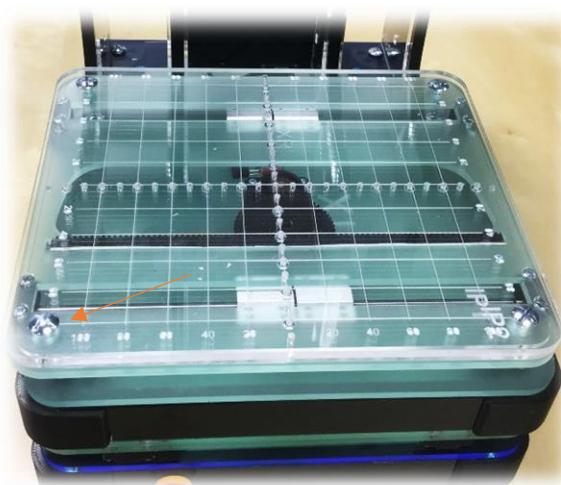
Align the IP1 panel on top of XR panel, ensure that it is seated correctly.

Fig 75



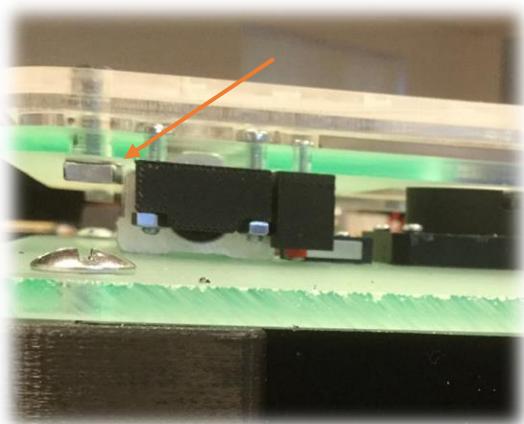
Align IP2 panel ontop of IP1 panel. Insert 22xM3 nuts into the corresponding hexagonal holes.

Fig76



Align index plate and secure with the 4xM6x 20mm.

Fig 77



*Note: When all panels of the index panles are secured with the M6 bolts ensure the nuts are aligned parallel to the edge of machine table to avoid collision with bearing blocks. If the nuts make contact with bearing blocks before the limit switch toggle the limit switch will not operate.*

#### ***Assembly instructions***

**'Z' AXIS SECTION**

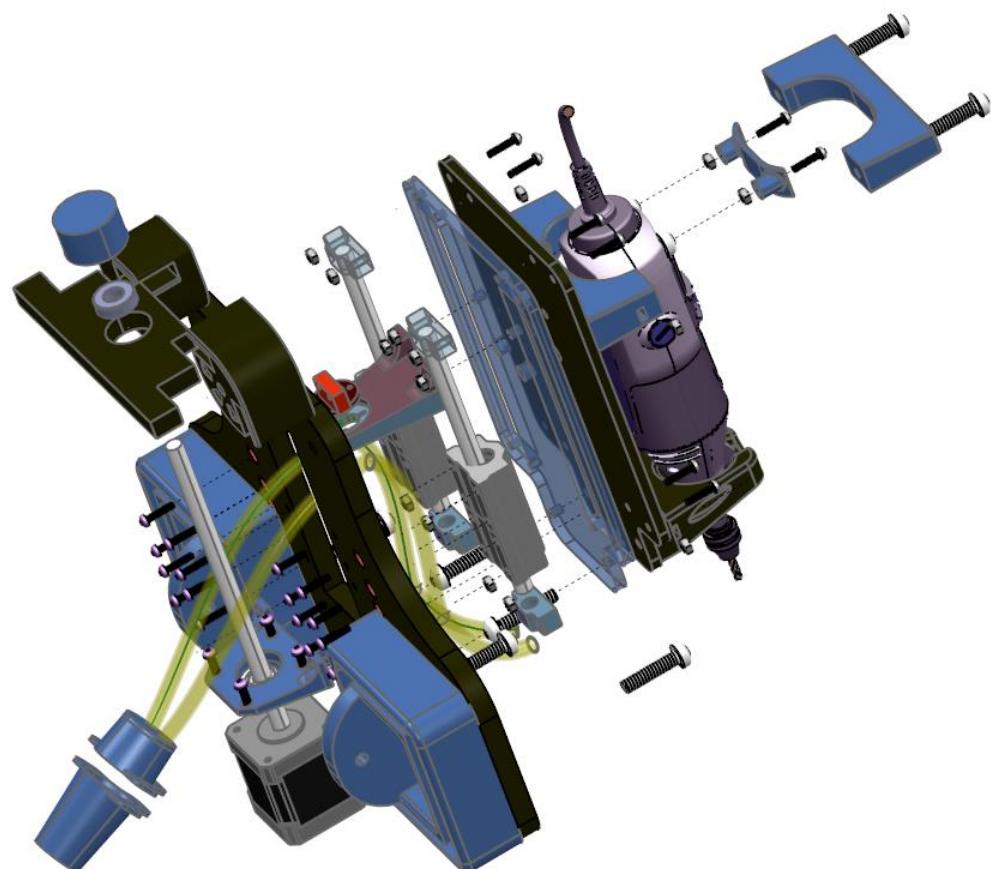
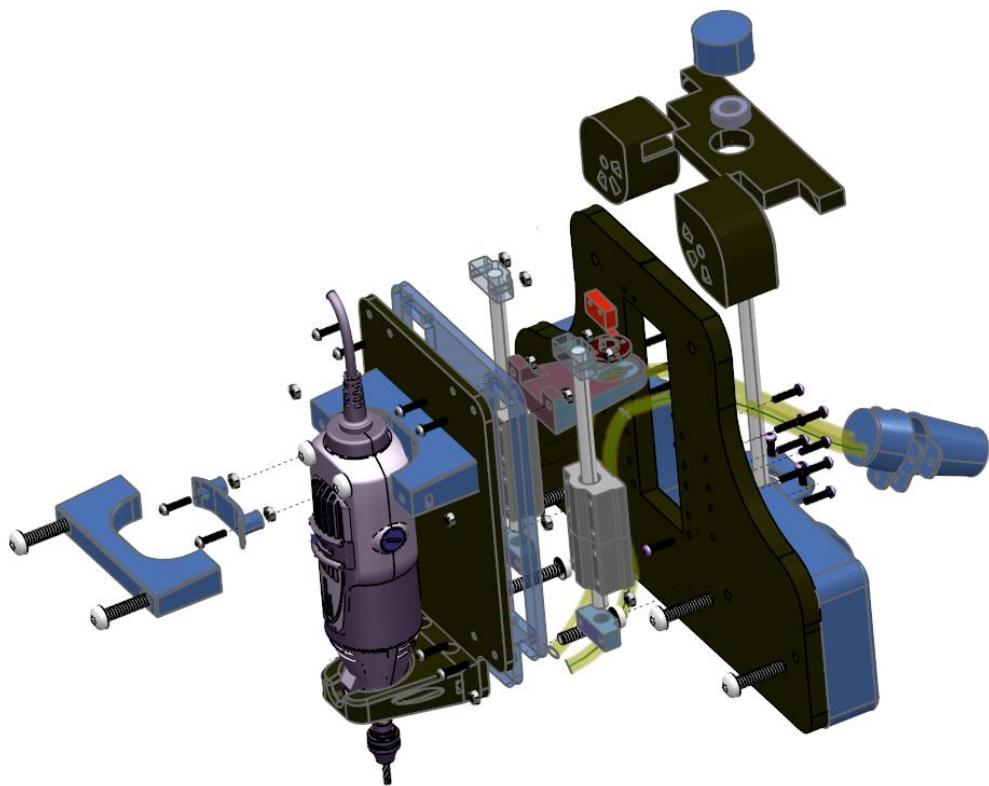
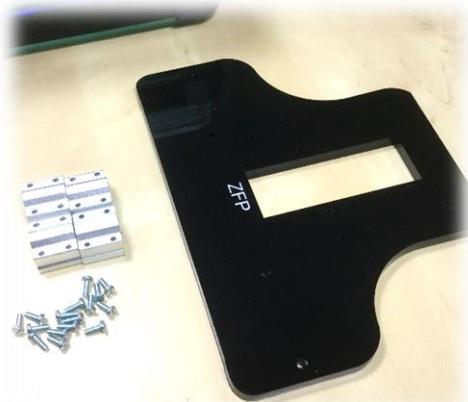
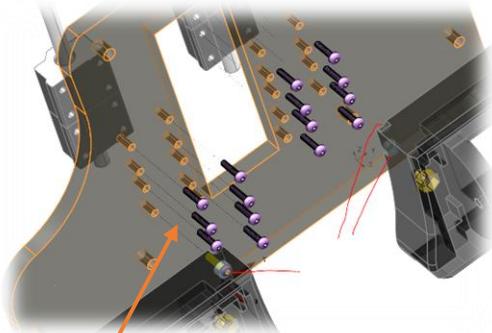


Fig78



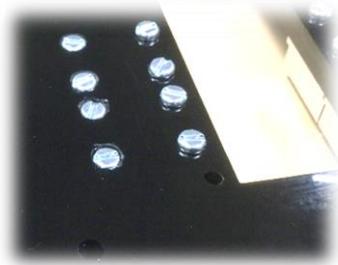
Select ZFP front panel, 4x bearing blocks,  
16xM4x15x20mm bolts

Fig 79



*Note: There are recesses built into the back of ZASL and ZASR to allow for the head of the bearing block fixing bolts.*

Fig80



Attach the bearing blocks.

*Note: insert 8mm rail whilst tightening bolts.*

Fig 81



Select ZBSH ball screw bearing holder, 2x ball screw nuts, 4xM3x19mm bolts and 8 nuts.

*Note the second brass nut is to remove back lach that may occur in the z axis.*

Fig 82



Attach the ball screw nut to ZBSH and then add 4 nuts.

*Note: the original ball screw nut (that comes with the ball screw), usually have 4xM3 tapped holes for securing. If not, 4 extra nuts will be required to secure the brass nut first.*

Fig83



Drop the second brass nut onto the upstanding bolts. Offer the whole unit to the Ballscrew thread and check the the brass nuts and assembly move freely up and down the ball screw shaft. Unscrew the M3 nuts (between the brass nuts) until backlash is removed. Finally tighten the top M3 nuts to secure the position. Check again that the unit moves freely on the ball screw.

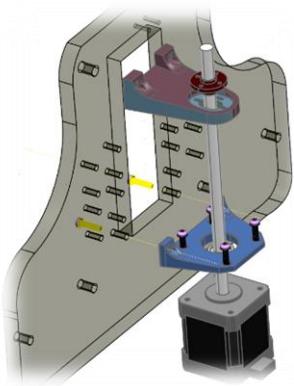
Fig84



Select stepper motor (total lead screw length required=175mm) M&BS motor support, 4xM3x10mm bolts with washers and 2xM4x25mm bolts and nuts.

*See Fig83>Fig85 before fitting whole unit to ZFP panel*

Fig 85



Fix motor to M&BS support using 4xM3x10mm bolts and the whole assembly to ZFP panel using 2xM4x25mm bolts and nuts.

*Note: do not use bolts longer than 10mm when securing motor support to motor. Bolts should be trimmed in length if depth of motor securing thread is in question. Longer bolts could either push out original motor bolts or damage thread.*

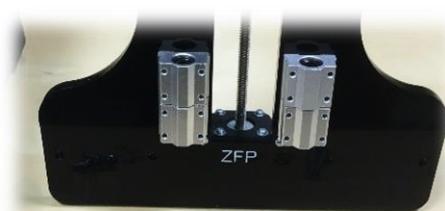
Fig86



Fix motor assembly securely to ZFP panel.

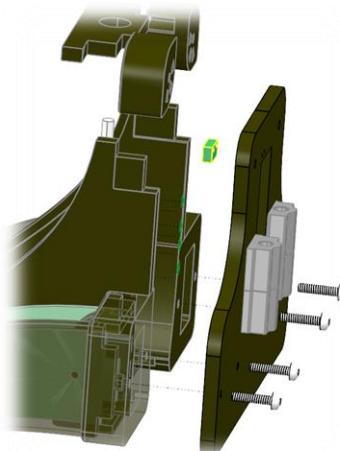
*Note: ensure that BZSH, ball screw holder, is already threaded on the ballscrew rod before securing the z axis stepper motor.*

Fig87



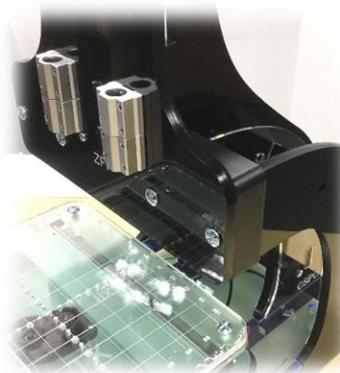
Select ZFP panel, 4xM6x20mm bolts 4 small washers and 2xM6x70mm bolt, nuts and large washers.

Fig 88



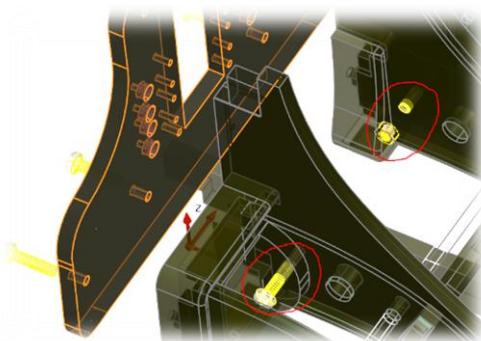
Using the 4xM620 bolts and washers attach ZFP panel to the ZASL and ZASR supports.

Fig 89



Tighten 4 bolts fixing ZFP panel in situ.

Fig 90



Also when fixing front bolts tighten the 2 inner side bolts where indicated

Fig91



Select the limit switch, 2xM2x19mm bolts and nuts. Split the 4 core ribbon cable into 2 core and cut length of 900mm.

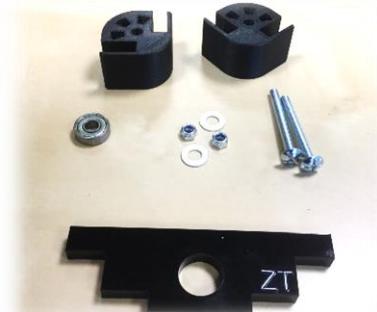
Fig 92



Fit spade connections to limit switch, attach the limit switch to ZFP panel and thread cable through cable holes to the YB panel at the base of the machine.

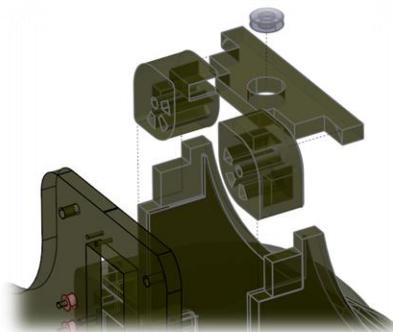
*Note: it is adviseable to thread the limit switch cabling through one side of the machine and the stepper motor cabling through the other side. This should mitigate electronic interference between motors and switches.*

Fig93



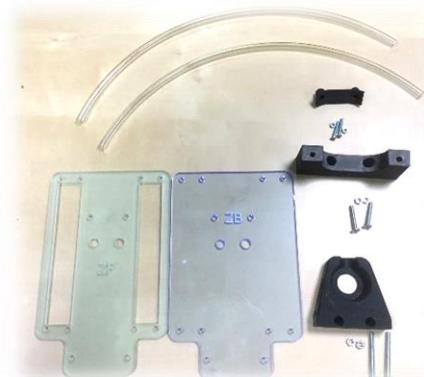
Select 2xCS supports 1xbearing 22x8x7mm, ZT panel, 2xM6x70mm bolts,nuts and large washers.

Fig 94



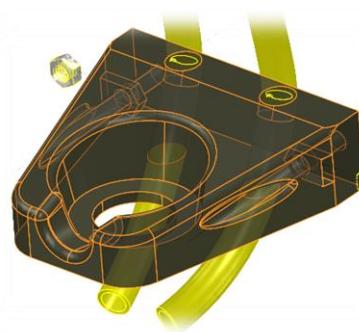
Push fit bearing into ZT panel, push ZT panel into CS supports and assemble all onto the CP panel.

Fig 95



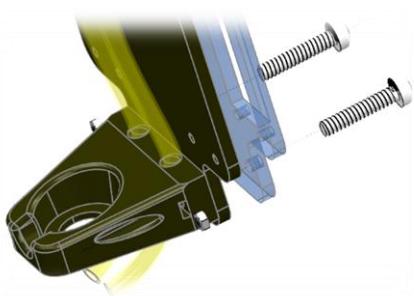
Select ZF, ZB panels, DBB bottom bracket, DTBB top bracket back, 2x8mmx400mm vacuum tubing. Bolts and nuts = 2xM4x40mm,2xM4x25mm and 2xM3x19mm

Fig 96



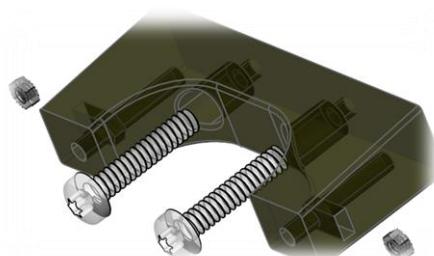
Push fit 2 nuts into DBB fixture and push fit the vacuum tube.

Fig 97



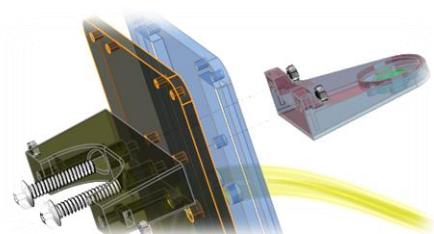
Using the M4x40mm bolts assemble ZF, ZB and the DBB housing.

Fig 98



Push fit the nuts into the DTBB

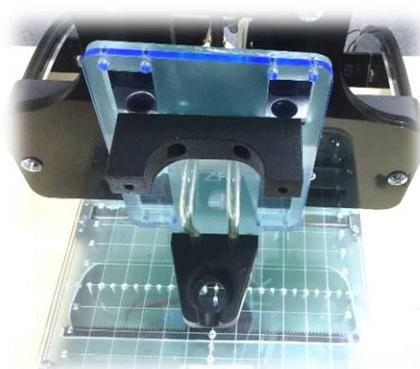
Fig 99



Offer up the ZB, ZT assembly and secure to the ZBSH ball screw bearing holder using 2xM4x25mm bolts

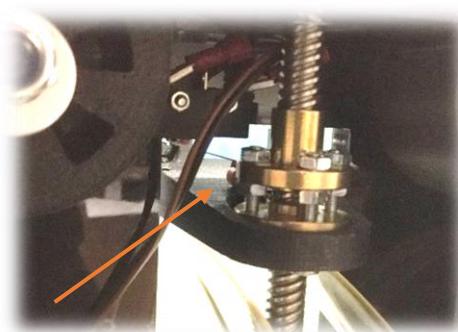
*Note: this should be assembled with all parts in situ.*

Fig 100



Tighten bolts and check operation of the ballscrew on the Z axis by hand turning the ball screw.

Fig101



From the back of the machine ensure that the limit switch clicks when the machine is in the full home position in Z.

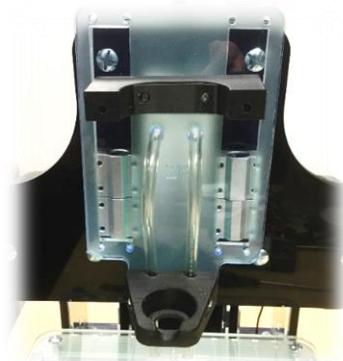
Fig 102



Push fit the M3 nuts into the back of the DTBA fixture, screw in the M3 bolts and push adjuster into the DTBB fixture.

*Note: this will allow fine adjustment of the Dremel when mounted so that it can be aligned vertical to the machining plane.*

Fig 103



View of assembled Z axis

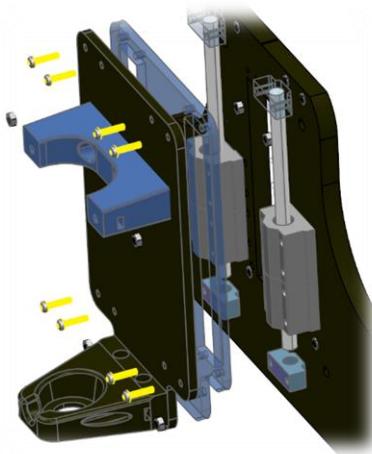
Fig 104



Select 2x8x150mm rails, 4xBSC supports and 8xM4x25mm bolts and nuts.

*Note: the rails are to be cut using the Dremel grinder to 150mm from a 500mm rail.*

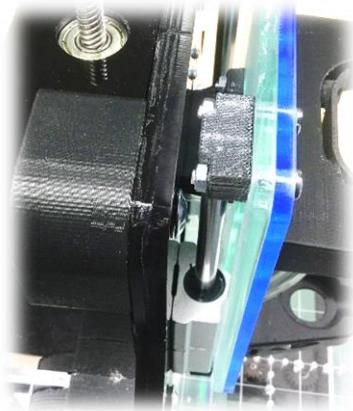
Fig 105



Push fit the BSC supports onto rails after inserting the rails through the bearings. Align the BSC's and secure with the bolts.

*Note: push fit the BSC supports onto the 8mm rails before assembly as these will be a very tight fit. Align supports and fit the bolts.*

Fig 106



*Note: check there is free movement of the rails and only tighten top caps when 'Z' travel is fully down, and bottom caps when 'Z' travel is fully up.*

Fig 107



Select Vi, VO vacuum fixtures, 3xM3x19mm bolts and nuts with 6 small washers.

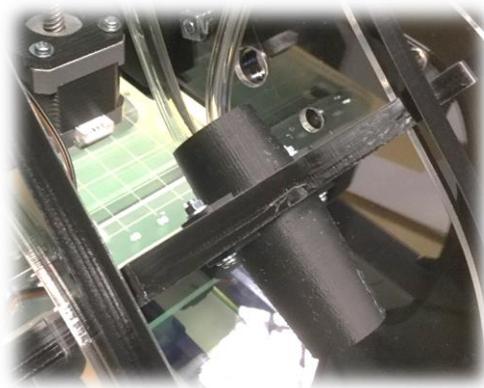
Fig 108



Insert the 2 vacuum tubes and secure Vi and VO to the central panel of the machine.

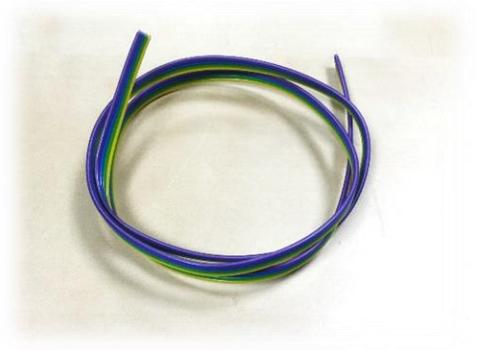
*Note: vacuum tube may need to be trimmed in length at a later stage.*

Fig 109



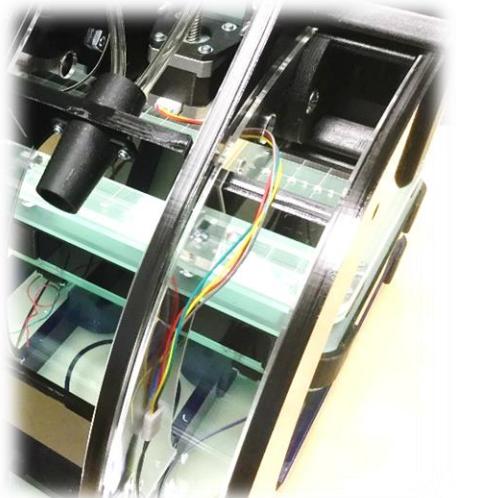
*Note: Insert the vacuum fixture first and then attach the 3 bolts.*

Fig 110



Select 4 core cable 600mm and attach to Z axis stepper motor.

Fig 111



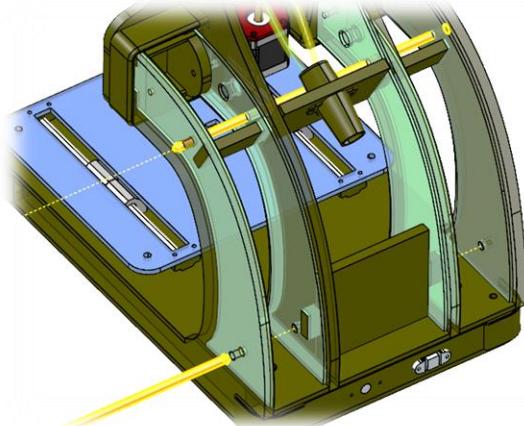
*Note: if the motor already comes with a plugin cable then just connect to the motor and pass the cable through the machine to the base YB panel. Otherwise connect the cable with the relevant connectors.*

Fig 112



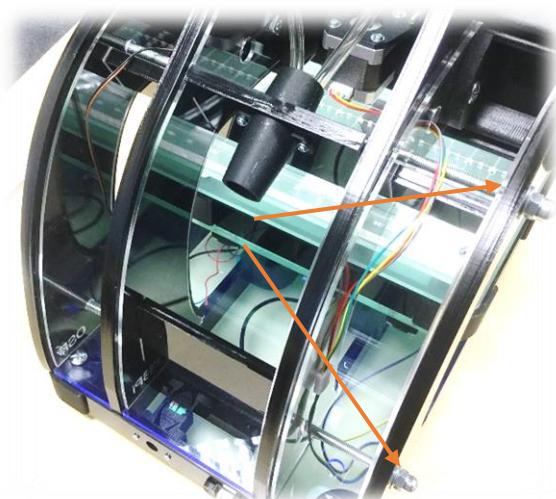
Select 2x290x8mm threaded rod, 4 large washers, and 4xM8 domed nuts.

Fig 113



Insert the threaded bar through the machine, fit the washers and bolts and tighten.

Fig 114



*Note: only finger tight for the time being.*

*Assembly instructions*

ELECTRONICS ASSEMBLY

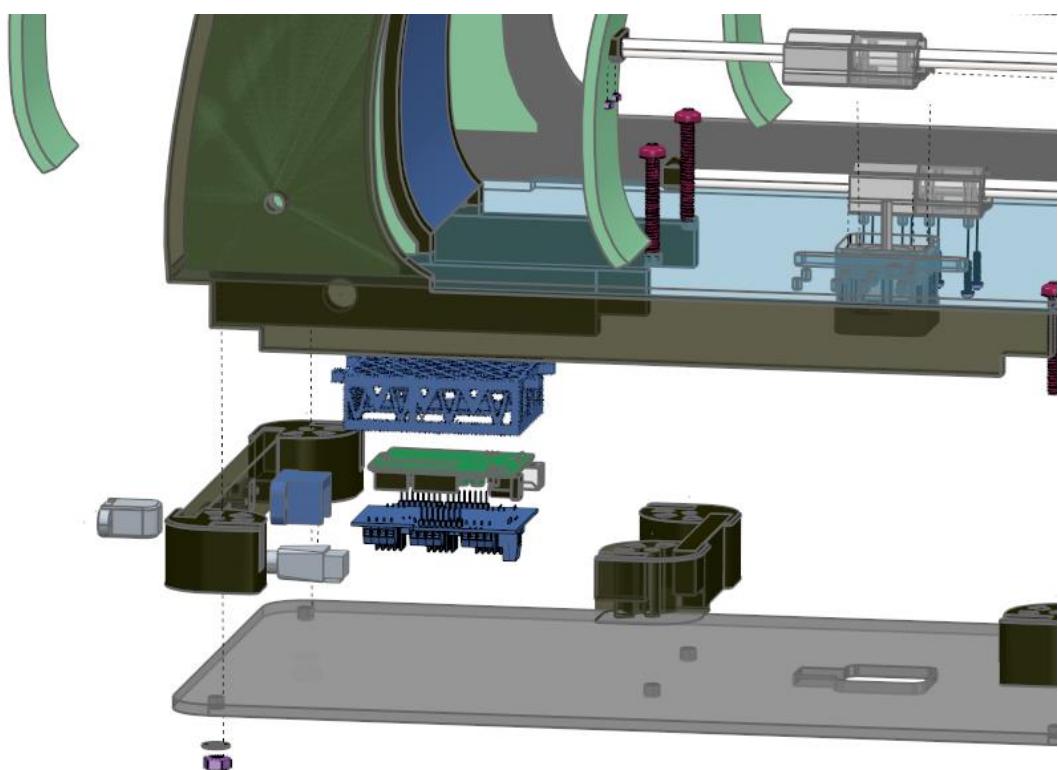
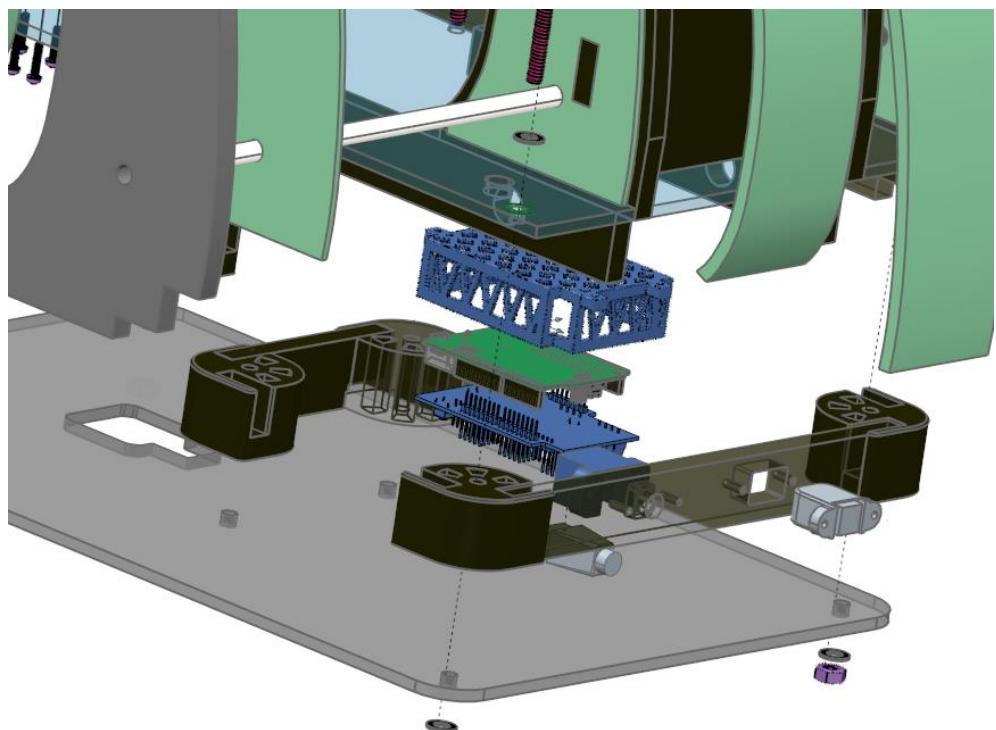
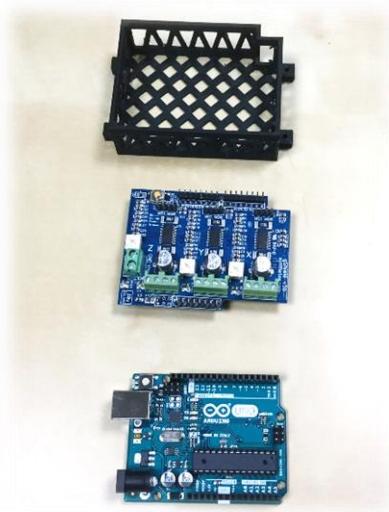
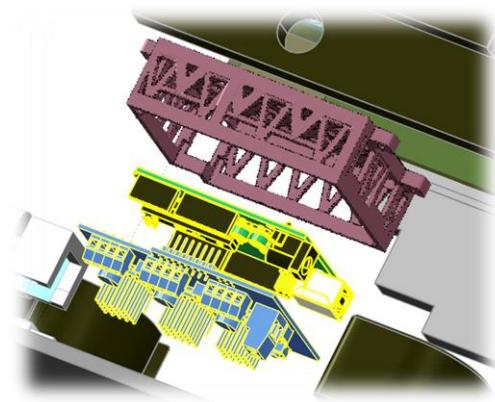


Fig 115



Select Arduino board, G'shield board and the CB circuit board holder.

Fig 116



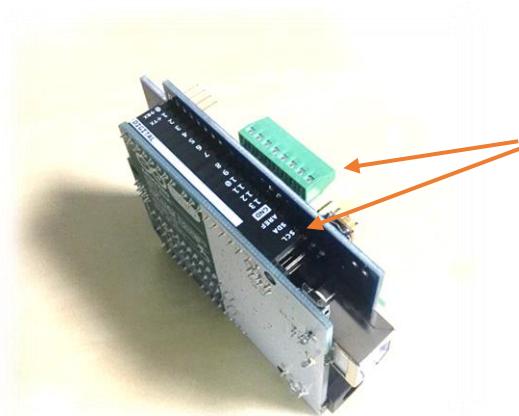
The assembled unit will be fitted into the machine from the base YB panel axis.

Fig 117



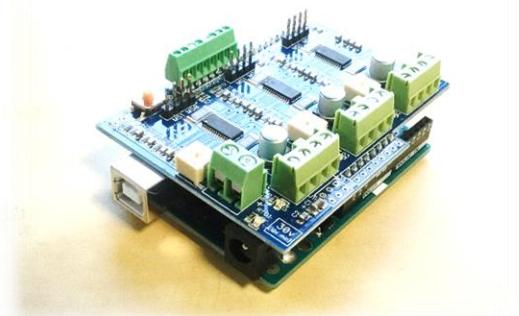
Assemble the circuit boards, plug them together as image and Fig 117 and 118

Fig 118



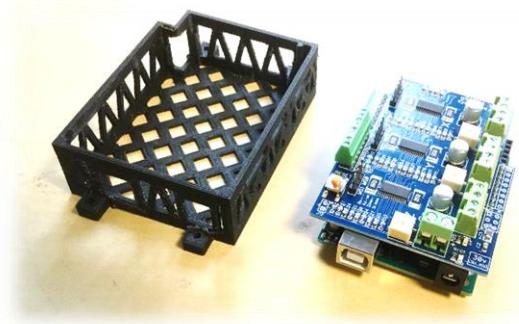
*Note: please ensure that the GND from Arduino plugs into the GND from the G shield board*

Fig 119



Insert the power and USB connections (at one end of the board) into the CB housing first and then manoeuvre the boards carefully into position as F

Fig 120



Insert the USB and Power end into the CB housing assembly and slightly pull the outer casing until the boards click into position at the back

Fig121

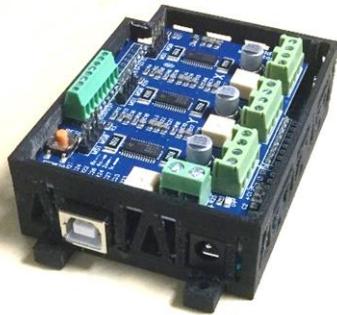
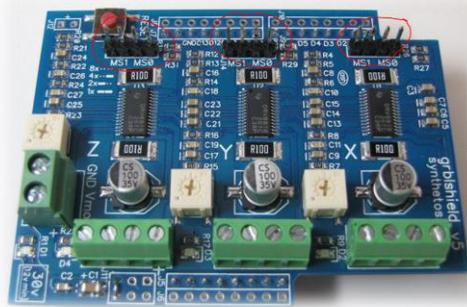


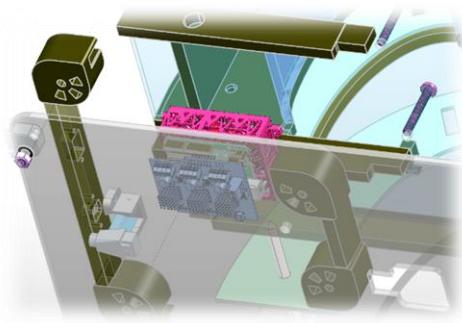
Fig121a

*Note: All Jumpers should be removed to achieve 8 micro steps. See image*



The assembled boards should look like this.

Fig122



Carefully turn the machine on its side and remove the 6xM6 bolts from the bottom panel. The Assembled control unit will sit inside the machine at the back.

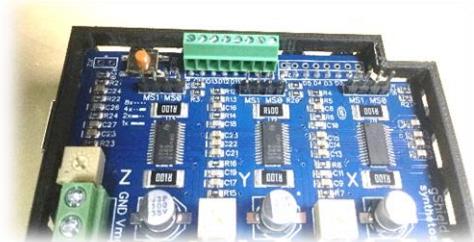
Fig 123

**Note:** Make and fit PCB board.

For construction details, please see appendix A.



Fig 124



Ensure the 8pin terminals are facing inwards.

Fig 125



Connect the terminals from left to right as picture  
Connect all common cables from XYZ switches into the right-hand (GND) terminal and ZYX control switches as image.

*Note: Connections as follows: 0 is no connection and 1 is a connection from left to right. [01010110](#)*

Fig 126



Take 2 core cable and trim to 600mm and a single core cable trimmed to 250mm and 2x spade connectors

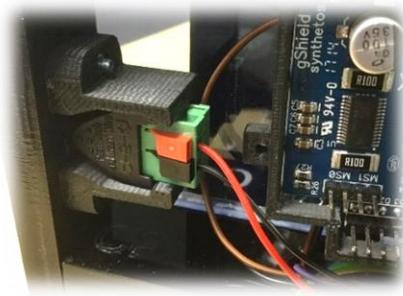
Fig 127



Fit spade connections and connect to the emergency stop button.

*Note: Connect Red cable to common (C) terminal and orange to NC terminal.*

Fig 128



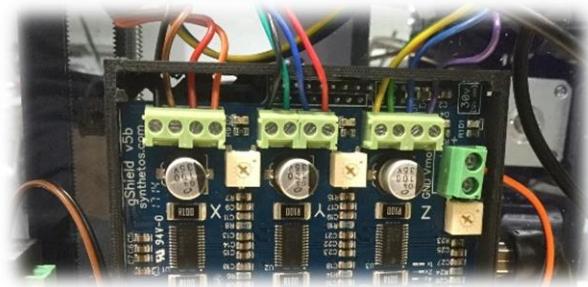
Connect red cable to the + red power socket connector and the black cable to the negative black terminal connector.

Fig 129



On the G shield board now connect the orange return from the stop button to the positive connection and the black cable from the power socket to the GND connection.

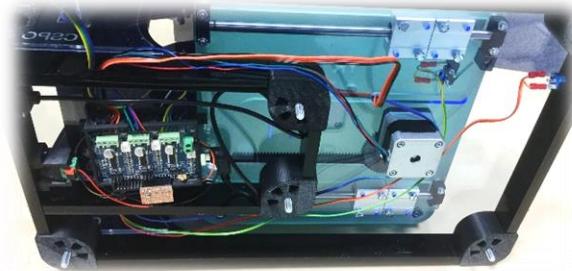
Fig130



Connect the X,Y,Z stepper motors as image and indicated on the G shield board.

*Note: Ensure the cables are paired so that the motors operate correctly and as previously discussed... see fig 57*

Fig131



Ensure that all cabling is correctly wired and cables will not get pinched during the reassembly of the bottom YB panel.

Fig 132



Reassemble bottom panel and finger tighten nuts.

*Note: Either at this point or prior It is important to flash the Arduino with the Grbl controller and test the machine operation.*

*See Appendix B*

Fig 133



Install the control software and adjust the machine control files as indicated in appendix 'C'.

See appendix C

#### Assembly instructions

##### **COVERS AND DREMEL FIXTURE ASSEMBLY**

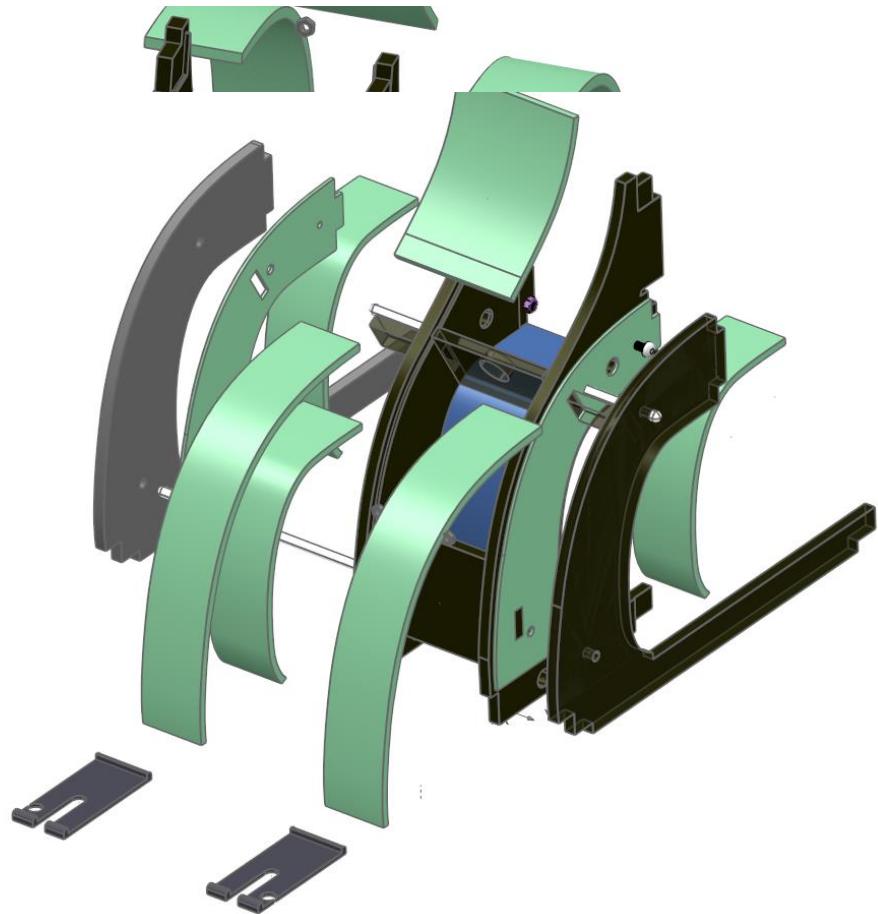
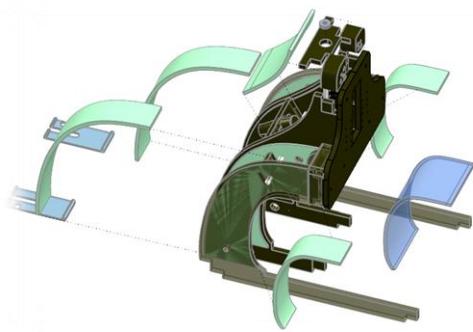
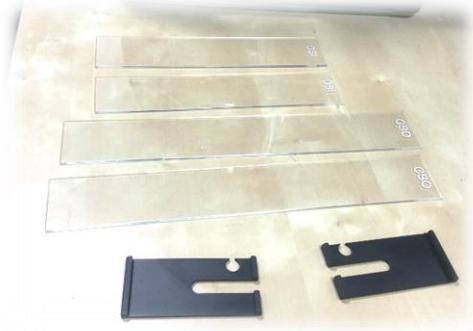


Fig 134



After checking the operation of the machine proceed to add the front and back covers

Fig 135



Select 2xCSO, 2xCSI panels and PCL, PCR panel clips left and right.

*Note: The holes in the clips rest onto the bolts in the back of the machine and the slit in the centre is to accommodate the cables.*

Fig 136



*Note: in this section a heat gun and gloves will be required to manipulate the Perspex material. It is also possible to make the covers out of thin MDF or hardboard and can be shaped using steam if preferred*

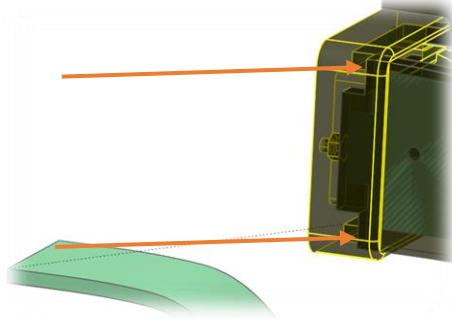
Fig137



Apply the heat to the CSi panel. The Perspex needs to be heated until the material takes on a toffee type consistency as this will help when positioning the material.

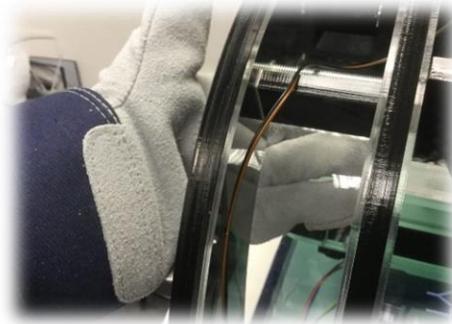
*Note: Important when heating the material that this is done in a well-ventilated area with extraction.*

Fig 138



There are recesses top and bottom of ZASR and ZASL supports to accommodate the CSO and CSI covers to slot into.

Fig 139



Manipulate the material into the recess at the top of the ZASL/R 'Z' axis supports first and then hold the Perspex inside the recess of the side panels too until the material starts to cool and take on shape.

*Note: Gloves will be required to position the material due to the absorbed heat.*

Fig 140



Insert PCL clip while the Perspex is hot as this should help to hold the material in position while cooling.

*Note: it will be necessary to hold the PCR or PCL clip in position from the back of the machine while the Perspex is cooling.*

Fig141



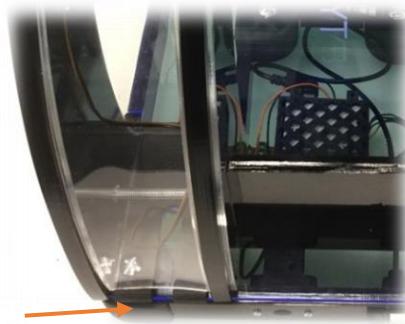
Heat the CSO outer panel to the same consistency.

Fig 142



Fit the outer panel and hold in position while Perspex is cooling.

Fig 143



Attach the clip so that it is engaged on the inner and outer covers as this will help shape of the covers while cooling.

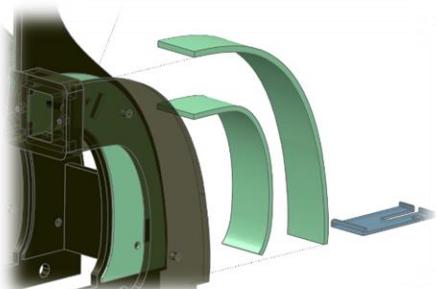
Fig 144



Remove panel again from the machine, after it has acquired the general shape, and re heat the centre section of panel. As the panel profile lowers due to the heat, remove from the heat and place on flat surface to cool.

*Note: When cooled, this will allow a small spring/tension to the material that will help hold covers in situ when assembled using the cover clips.*

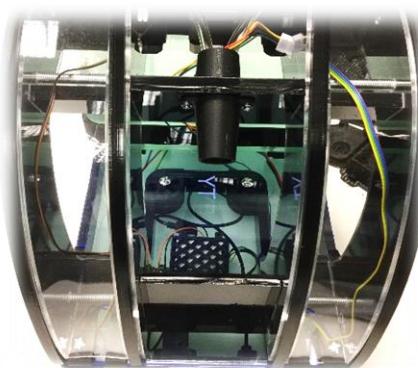
Fig 145



Insert PCR clip after positioning the covers into ZASL recess.

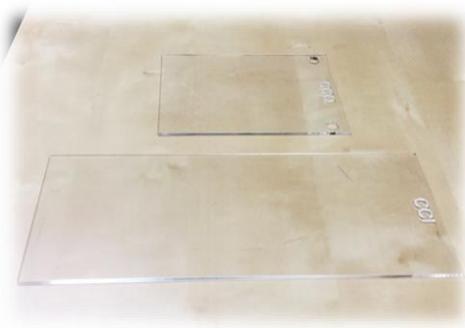
*Note: the clip should be inserted from the front of the machine so as not to damage cabling.*

Fig146



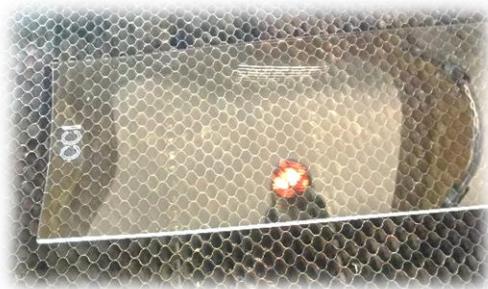
Repeat the process for both sides.

Fig147



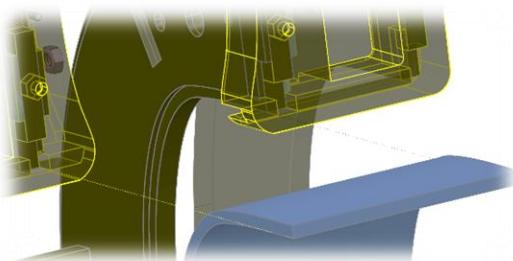
Select CCO, CCi panels.

Fig148



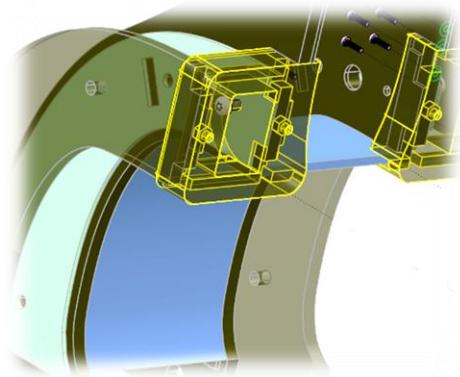
Heat the inner panel to the same consistency as previously discussed. See Fig 140

Fig149



Insert centre CCi panel into recesses in ZASL & ZASR supports

Fig 150



Hold the material in situ while cooling and ensure a good fit ZASL & ZASR support recesses and around the side panel recesses. This is important as there isn't a clip to keep this panel in position after the construction phase.

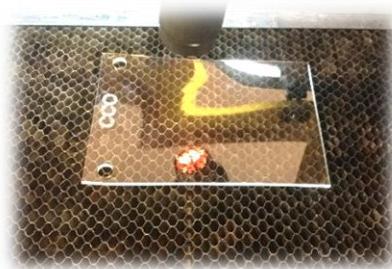
Fig 151



Remove panel from the machine, after it has acquired the correct shape, and re heat the centre section. As the panel profile lowers due to the heat, remove from the heat and place on flat surface to cool.

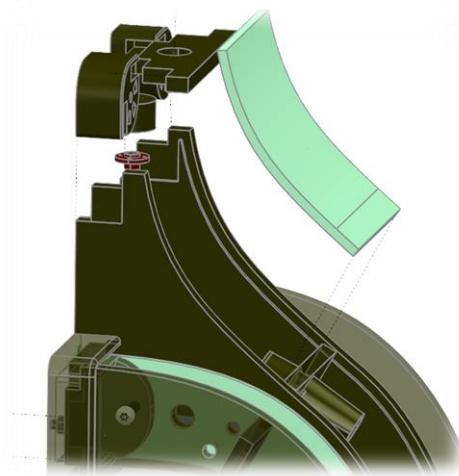
*Note: When cooled, this will allow a small spring/tension to the material that will hold cover in situ when reassembled. It is important for the centre section to spring into position especially as there are no cover clips to hold this panel in place.*

Fig 152



Heat CCO inner panel to the same consistency.

Fig153



After heating the panel to the required consistency, push the CCO panel into position. Hold while cooling.

Fig 154



#

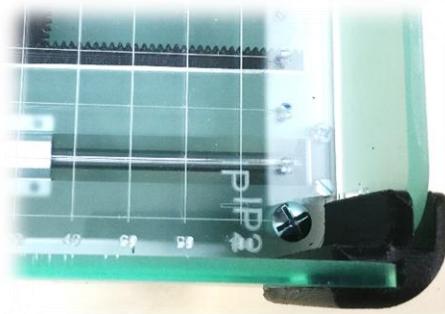
Fit the panel and push through the 2xM6x70mm bolts, add 2x large washers and tighten the nuts. Finger tight only for now.

Fig155



Select SPF, SPB and 2x SPS panels and 2xSGS, SGSR and SGSL corner supports.

Fig 156



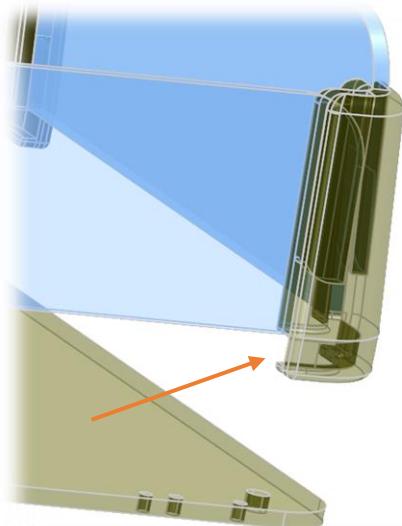
Slightly slacken the 4xM6X20mm bolts on the index table.

Fig 157



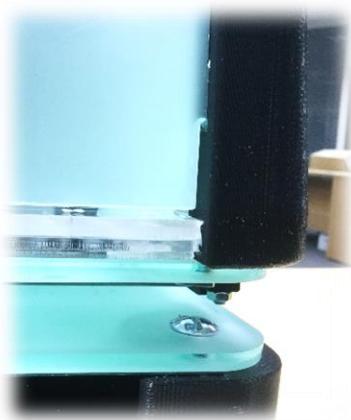
Clip the SPF panel to the front, the SPB panel to the back and the two side panels to the corner supports. This is to test the fit of the panels before assembly.

Fig 158



Clip the corner supports to the machine using the small recess in the base of the support.

Fig 159



Push fit supports and attach the panels.

Fig160



Push fit the 2xSGS supports to the front of the table and SGSR and SGSL to the rear of the table (left and right).

Fig 161



Select 4xM3x12mm bolts

*Note: The 4 small bolts should alight the index plate correctly. This will align the top panel holes with the inlaid nuts layer ensuring future location fixing points are in position.*

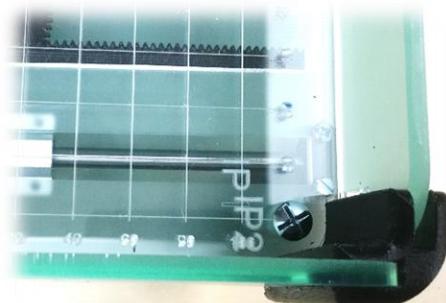
Fig 162



Insert the 4 bolts into the last nut fixing on the index table machine bed: north, south, east and west.

*Note: Only 7mm depth is available for the bolt so do not fully tighten otherwise this will distort the index table.*

Fig163



With the small bolts in position and the safety panels and supports clipped in, re-tighten the 4xM6 bolts on the index table.

*Also, when tightening the 4xM6 bolts. See Fig 77 for alignment information.*

Fig164



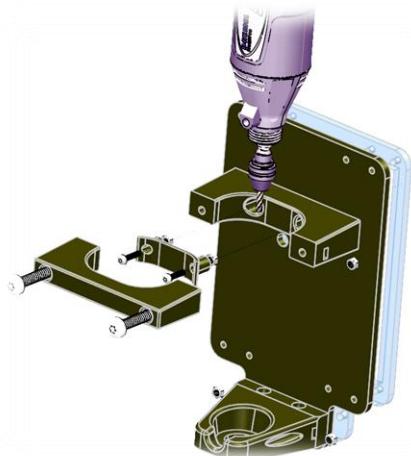
Select the Dremel tool, DTBF bracket and 2xM4x40mm bolts.

Fig165



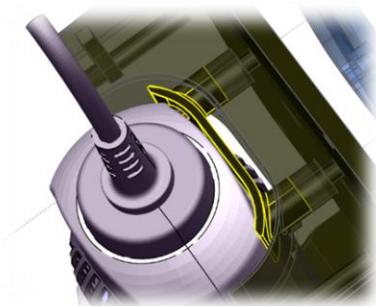
Unscrew the plastic nut from the bottom of the Dremel. Insert the Dremel into DBB bracket and re-attach the plastic nut.

Fig 166



Check the position of the DTBA top bracket adjuster. Remove the Dremel again and adjust the small bolts

Fig 167



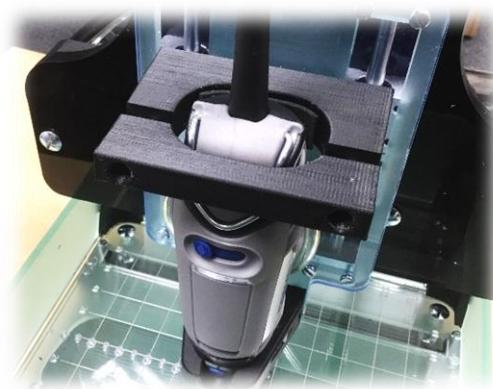
Adjust until the fixture until it is in the correct position to support the top of the Dremel.

Fig168



Re-fit the Dremel and re-attach the plastic nut again checking the plastic nut is secure.

Fig169



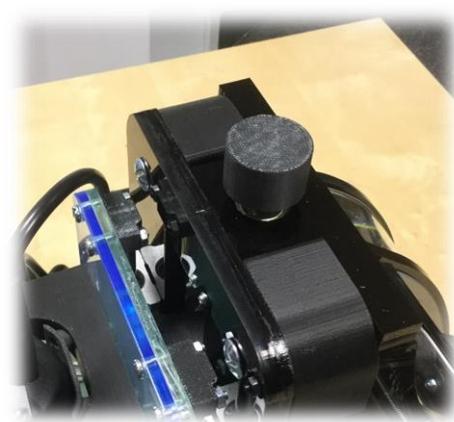
Finally attach DTBF clamp using the 2xM4x40mm bolts, to secure the Dremel.

Fig170



Select the ZK Z axis knob and attach to the top of the ball screw.

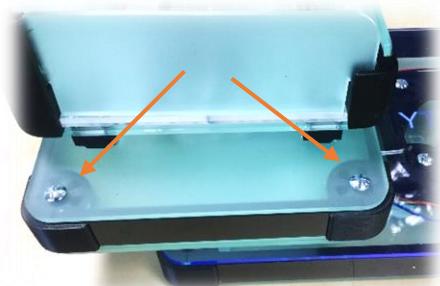
Fig171



Apply gorilla glue to the ZB knob and leave for the required time to ensure good adhesion.

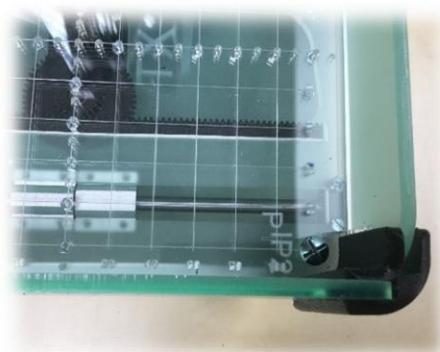
Tighten the 4x side nuts of the threaded bar and the 2x top bolts of the Z axis.

Fig 174



Tighten the 4 'Y' axis bolts.

Fig 175



Tighten the 4 bolts on the X axis index table.

Fig 172



Tighten the 6 base bolts.

*Note: do not overtighten*

Fig 173

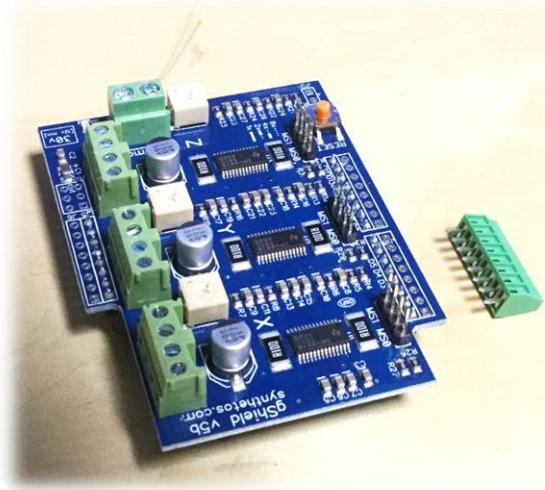


## Assembly instructions

### Appendix A

#### G Shield PCB and 8pin connector instructions

Fig A1



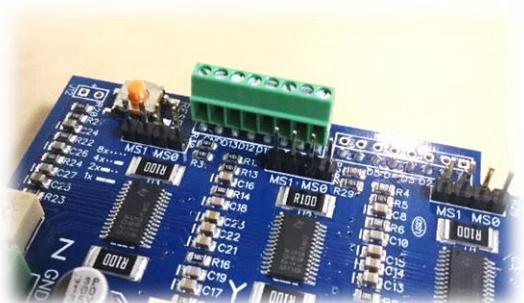
Select the 8 pin 0.1 connector and the Grbl G shield PCB.

Fig A2



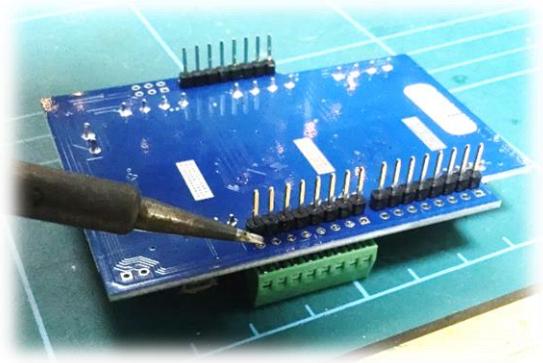
Push fit the 8-pin terminal connector into the PCB as the photo.

Fig A3



*Note: Ensure the terminal connections for the cable are facing inwards*

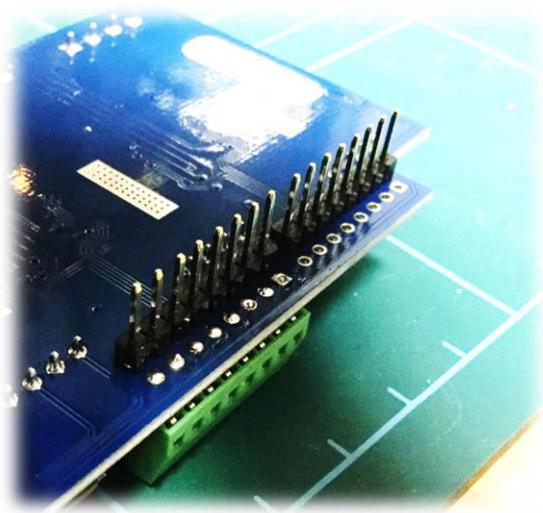
Fig A4



Using a soldering iron solder the connections to the PCB board.

*Note: ensure that the solder does not spill onto neighbouring contact points as this will damage the PCB and it will not operate correctly.*

Fig A5



Check solder joints are good and that there are no dry joints, as these could impede the correct workings of the PCB.

Now refer back to Fig 124 in the electrical assembly instructions

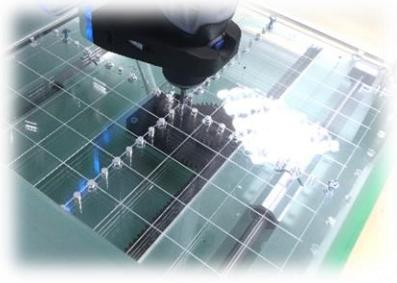
## Assembly instructions

### Appendix D

#### INDEX TABLE ALIGNMENT.

*Note: Before starting this section refer to fig 161 to 163 in the main assembly instructions and then continue with this section.*

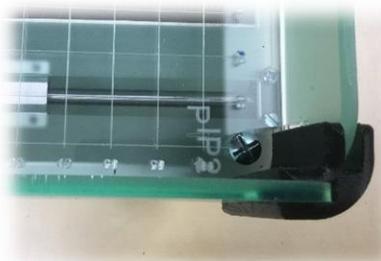
Fig D1



Fit a 3mm mill tool (upside down) into the Dremel chuck. Run a homing sequence for the machine to find the limit switches. Using V Transfer, jog the machine to the centre position stepping 10mm initially and followed by finer adjustments until the 3mm tool passes into the centre hole of the index plate.

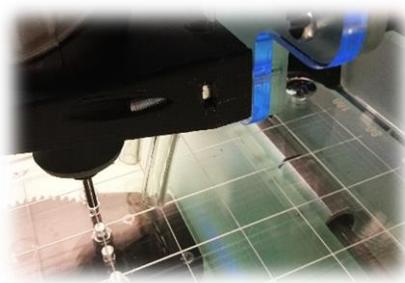
*Note: refer to 'V Transfer' Appendix B for set up of the home position.*

Fig D2



Loosen the 4 bolts on the index table.

Fig D3

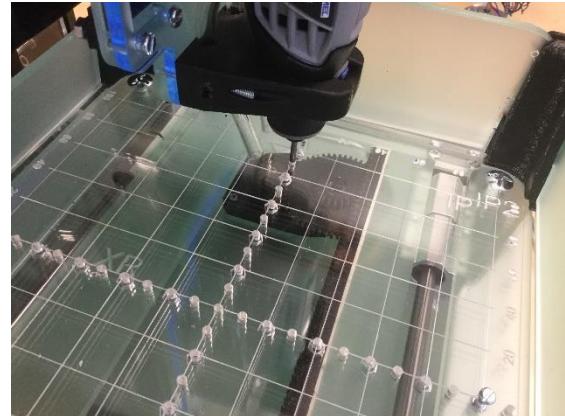


Jog the tool up in Z and out of the centre hole. Jog the machine left, to the 80mm hole on the index

plate. Now jog the Z axis down until the tool passes into the hole.

*Note: the table will need to be gently manoeuvred into position for this to happen.*

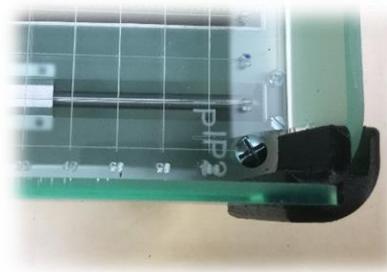
Fig D4



Jog the Z axis up and out of the hole and jog the machine along the X axis to the right until the 80mm mark on the index plate. Jog the Z axis down until it passes into the hole.

*Note: the table will need to be gently manoeuvred into position for this to happen. This process should be repeated until the tool passes into each 80mm location without the need to alter the index table.*

Fig D5



Carefully tighten the 4 bolts on the index table.

*Note: ensure the nut does not impede the bearing blocks see Fig 77*

The finished machine.

