

# The Ashcroftmakers 3D CSM Kit



## **Disclaimer ~**

Any errors are mine and mine alone.

Names of products are copyright of their respective owners.

## **Target audience:**

Self Builders of the Ashcroftmakers 3D CSM Kit.

## **Getting Help:**

To reach the builder of Ashcroftmakers 3D CSM kits and maker of retail machines, email [csmkit.support@ashcroftmakers.com](mailto:csmkit.support@ashcroftmakers.com) ~ emails are answered in UK business hours and we will try to resolve any problems you may have in making, assembling and getting the machine working.

## **Update History:**

Second Issue February 2022, v2.03

If you spot any errors or omissions please let us know at [csmkit.support@ashcroftmakers.com](mailto:csmkit.support@ashcroftmakers.com)

# Introduction

## Introduction Building the Ashcroftmakers 3D CSM Kit

Thank you for purchasing the Ashcroftmakers CSM kit, which is based upon the designs and models we manufacture, assemble and test for customers.

The memory stick contains all the source STL's you will need, and 3MF files suitable for direct import into Cura, generating gcode which is optimised for each component - critical settings such as layer height, infill, support and wall thickness.

## General Notes

This machine requires 1.2 to 1.8 KG of PLA or PLA+ filament, you can use whatever colour you prefer but beware some PLAs contain significant amounts of filler which makes the printed part 'soft'.

Transparent or semi transparent PLA's tend to be 'hard' when files or sanding materials are used to finish or smooth components - this makes finishing take longer and even metal cutting files will wear out. If you have used your files previously on steel they will not be suitable for filing any 3D prints - new files cut, not rub.

Print the parts using the 3MF files to create gcode suitable for your 3D printer(s), the settings in the 3MF files have been optimised to print the parts with an optimum finish. Orientation of some components is also critical to minimise the amount of finishing required to complete the machine.

The best print sequence, unless you are printing parts in random colours, which will give you a machine from about 1.3kg of PLA. You don't need to use ABS or PETG to get a working machine.

Print the components in the suggested sequence below - this optimises use of your material by making all the large components first.

Photographs of the components and assembly stages are included on the memory stick.

Printing Instructions are in Chapter 1.

Build the sub-assemblies in sequence as described in Chapter 2.

Complete Assembly of the machine using the sequence described in Chapter 3.

Testing is described in Chapter 4.

Assembly of the machine uses components from multiple print steps, otherwise you will find that you will be dismantling the machine more than once to fit components that you haven't prepared.

There is a list of:

- The Base Kit Contents in Appendix 1
- The Fixings Kit in Appendix 2

How to modify your own needles and tension unit is covered in Appendix 3, with additional photos in the 'CSM Kit' PDF which you will find in the DOC folder.

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### Finishing Components

Most components can be used directly off the printer, with the exception of removing sharp edges - the designs do have chamfers on components to remove the effect of elephants foot, but it is unavoidable on some parts, in particular part 10A and 10B that they are printed on a flat surface and have no chamfer, as a result, the cams have very sharp ends - be careful when finishing the cam edges.

If your printers are well tuned, there should be few surface artefacts on the prints, however mating surfaces will need to be finished to a high standard so that the machine fits together properly, the instructions note which parts where fit/finish is critical.

Ashcroft Makers has had considerable success with

- Silicon carbide 'wet or dry sheets'

- Silicon carbide 'sanding sticks', often used in pen making 200 / 400 grit

- Micro mesh sanding materials - also used in penmaking 1500 grit / 1800 grit

- Silica sanding sheets 180 grit, 240 grit, 320 grit

Metal cutting files in second cut in flat / half round, and 'Swiss' needle files for finishing cylinder slots.

As PLA and PLA+ have low transition temperatures and soften easily, don't file or sand in the same place constantly as the material heats up and softens, keep moving and make sure the file or sanding sheet is cutting, not rubbing.

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### Abrasives - for finishing

We use 240 and 500 grit sheet in full size for flattening component bases if required.

We use 25mm wide abrasive tape in 180, 240 and 320 grits specifically for cam edges - if the needles jam in the machine for whatever reason, you may need to refinish the edges

We use specialist abrasive sheets from Micro Mesh for getting an ultra smooth finish - especially on cam edges, starting at 1500 grit and progressing to 3600 grit, the main components that require this treatment are the cams, the base ring in the casing and the bottom of the cylinder(s).

<https://www.axminstertools.com/micro-mesh-flexi-file-2-way-100-150mx-502797>

<https://gcabrasives.co.uk/product/micro-mesh-mx-buffer-handi-file/>

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## Adhesives

Unfortunately it is not possible to ship the kit with an appropriate solvent adhesive - the postal services don't like handling solvents based on Methyl Ethyl Ketone.

Suggested brands in the UK are EMA Supplies Plastic Weld and in the USA - Plastruct plastic weld cement.

If you cannot find an MEK based solvent you can use plastic kit adhesive from a tube, applied as they state 'sparingly'.

Or at a push, Superglue. The solvent based adhesives are much better in our opinion as they actually join the parts together, permanently.

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## Tools

We provide screwdrivers, allen keys and a spanner to suit the fixing kit which is sold as an optional extra.

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## Fixings

The easiest way to obtain the fixings is to buy the optional Fixings Kit - it contains all the parts you require to build your machine, in the correct quantities, packed separately according to the components the fixings are used for. Much easier than buying very small quantities of nuts, bolts that may not be easily obtainable - this is a kit which is completely metric, using M5 and M3 fixings and a small number of self tapping screws.

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## Row Counter

Available as an optional extra

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## Weight

Available as an optional extra, if you can find a Brother Flat Bed knitting machine weight, that is the correct weight and has a hook on top which works with the Sock Grip or the Caston Bonnet.

## Needles

Ashcroftmakers needles are supplied cut, cleaned, polished, degreased and tested ready for use. They are modified standard Brother Flat Bed Knitting machine needles which are available from a number of suppliers.

## ADDENDUM TO MAKE / BUILD INSTRUCTIONS:

Read also the CHANGELOG.txt file in the root folder of this memory stick, which may contain more recent changes than contained in this document – thanks!

The Ribber has its own assembly instructions and photographs which you will find on the memory stick in separate folders.

Revised June 2022 - Improved casing markings for cam positions, improved edge finish on numerous components, revised print settings

on 60T gear - changed layer height to 0.2, and selection of adaptive layers, changed infill to Gyroid.

Reduced print speeds on Cylinder outer walls to minimise corner rounding.

Revised April 2023 - Merged first ribber models and 3MF files

Revised June 2023 - Final ribber models and 3MF files, include CSM and Ribber User Guides, added new Ribber Kit Assembly instructions

Replaced cylinder models with latest versions, including version label, thinned top dividing 'vanes' on 68 and 72 slot count cylinders

Revised Ribber mounting brackets to replace CSM cam clips

Revised 30T pinion, tidied up and improved

Changed all dates on new and updated components

Changed mounting bracket - shortening the central pillar in the socket, add a tapered washer which fits TIGHTLY into the socket on the Housing, uses the same screw, but eliminates clearance in the assembly, reducing movement.

Print Part 2A - a tapered circular wedge, during final assembly of the bracket and housing, use the countersunk screw which in the instructions

passes through the peg in the bracket. Put the screw through the wedge and put the screw into the shortened peg and tighten after putting the housing block into the socket on the top of the bracket.

The wedge should pass into the socket in the housing and pull the assembly together, eliminating movement resulting from the clearance between peg and socket.

Realigned the switch recess in the bracket to improve switch sensitivity and prevent 'double counting'

Modified the 60T gear, replacing the magnet recess with a groove to indicate magnet position, to prevent 'double counting'

Revised July 2023

Alternative pigtail [tapered arm for tensioner, part 8\_C], separated from rest of Part 8 and moved to separate file

- reason is layer height reduced to 0.12mm - printing the taper horizontally with a large layer height creates steps, end changed from round to rounded corner hexagon.

Some of these modifications derived from the changes needed to make a similar bracket work with the Ashcroftmakers Circular HAT knitting machine, so have been backported to the CSM bracket.

## Chapter 1 - CSM Print Instructions

## Print Instructions

This machine requires 1.2 to 1.8 KG of PLA or PLA+ filament, you can use whatever colour you prefer but beware some PLAs contain significant amounts of filler which makes the printed part 'soft'.

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## Finishing Components

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Metal cutting files in second cut in flat / half round, and 'Swiss' needle files for finishing cylinder slots.

As PLA and PLA+ have low transition temperatures and soften easily, don't file or sand in the same place constantly as the material heats up and softens, keep moving and make sure the file or sanding sheet is cutting, not rubbing.

## Recommended sequence

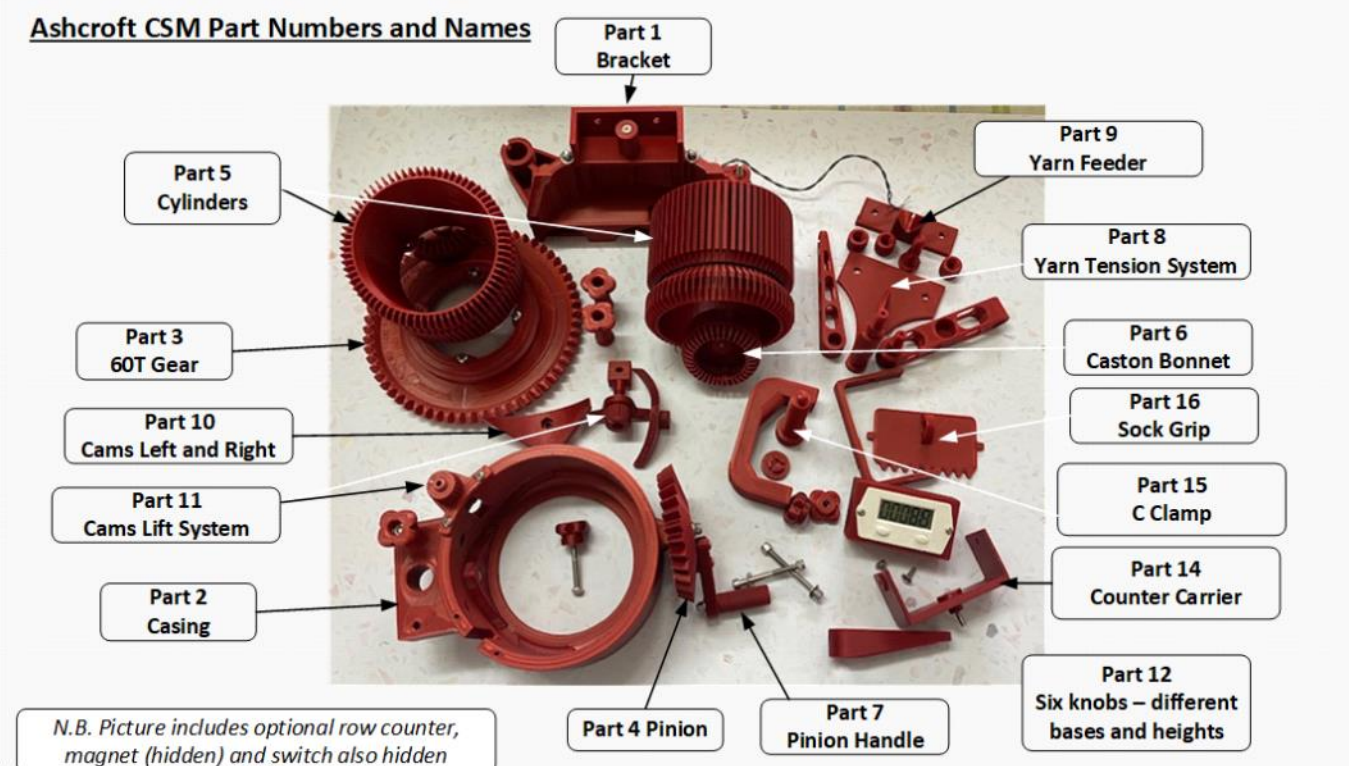
Print the knobs, part 12 first, to check that the slicer settings work with your chosen material.

Part 1	Bracket	print time 14 hours	weight 220g
Part 2	Housing	print time 23 hours	weight 255g
Part 3	60T gear	print time 14 hours	weight 126g
Part 4	30T gear	print time 7hrs 15 minutes	weight 46g
Part 5	Cylinder - various slot counts	print time 24-25 hours	weight 220g
Part 6	Caston bonnet	print time 5.5 hours	weight 32g
Part 7	30T gear handle	print time 4.5 hours	weight 17g
Part 8	Yarn Tension System	print time 12 hours	weight 75g
Part 9	Yarn Feeder	print time 2hrs 30mins	weight 20g
Part 10	Cams - Left Right and Centre	print time 7hrs 45 mins	weight 30g
Part 11	Cam lift system - print two sets	print time 2hrs 45 mins each	weight 25g
Part 12	Knobs	print time 5 hours	weight 26g
Part 14	Counter Arm and Swivel	print time 5 hours	weight 60g
Part 15	C Clamp	print time 7 hours	weight 65g
Part 16	Sock Grip	print time 3 hours	weight 30g

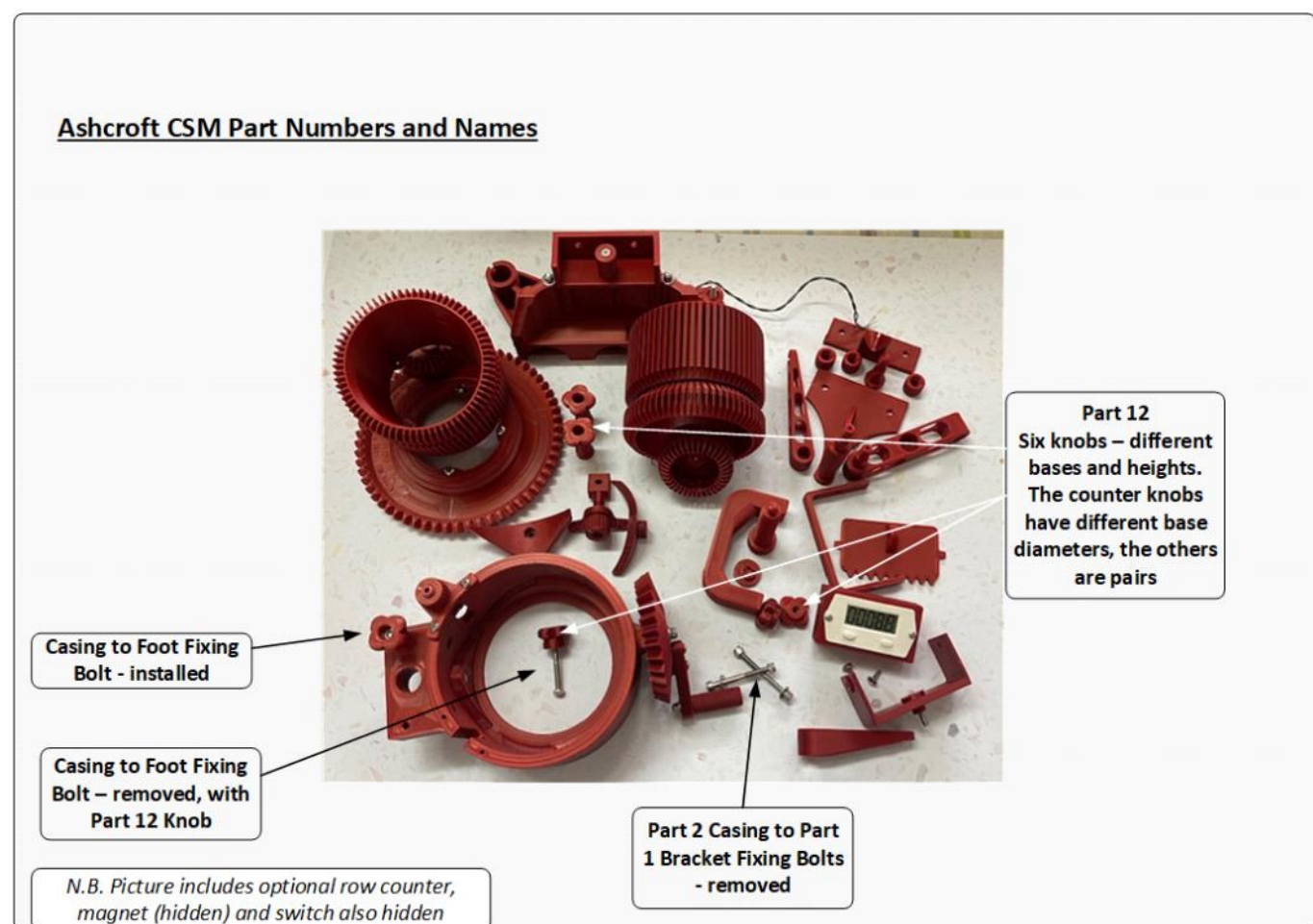


# Ashcroft CSM Part Numbers and Names

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## CHAPTER 2 - Build

## Section 2.1

### Building the subassemblies.

#### Section 2.1.1

##### *The knobs - Part 12 A through D*

The Foot Knobs, part 12B are used in the preparation of the housing, part 2, once finished you can set the knobs aside until they are required in the later stages of assembly.

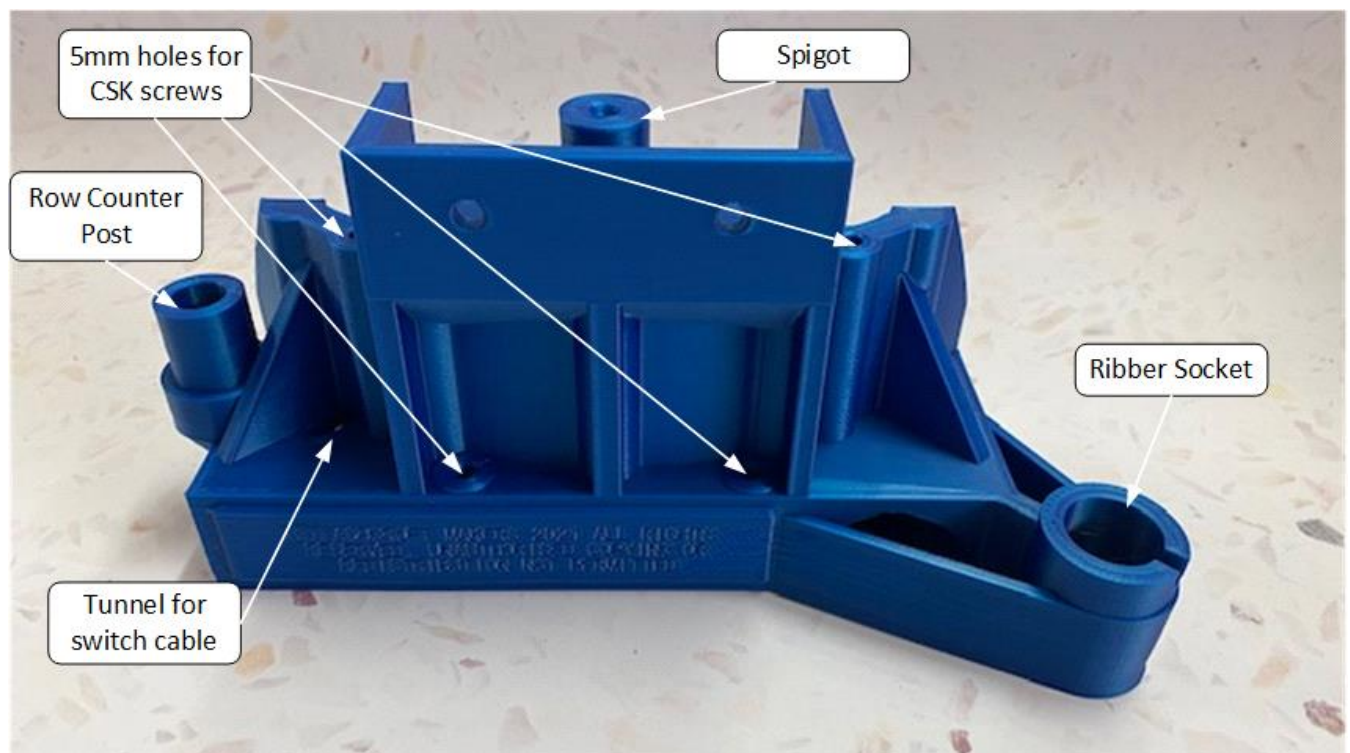
Start by fitting the M5 nuts to the four lobe knobs, parts 12A, 12B, 12C and 12D, put the nut onto a screw long enough to reach to the bottom of the knob and fit the nut into the hexagonal socket, depending upon your printer and material, you may need to use a small drop of superglue to retain the nut, especially in the deep Cam Knobs, part 12A. The nuts should be a light press fit if you have aligned the flats properly.

Please also refer to the CSM parts PDF and the photographs.

#### Section 2.1.2

##### *Bracket - Part 1*

The front side of the bracket has the ribber socket at the back left and the counter hole on the right hand side.



The bracket as printed should require only that the through holes are clear [5.2mm drill suggested] and any sharp edges on the base removed.

## Section 2.1.2

### Bracket continued

Use two M5 x 35 CSK screws inserted from beneath in the holes closest to the back, put a large M5 washer over the top of each screw and fit an M5 nyloc nut and tighten fully.

Use two M5 x 70 CSK screws inserted from beneath into the holes that pass up the columns, put a large M5 washer over the top of each screw and fit an M5 nyloc nut and tighten fully.

Put an M5x40 hex bolt into the deep peg, part 17A and put the peg/bolt assembly into the socket on the right hand side of the bracket with the head of the bolt down, solvent weld the peg into the hole, with a generous amount of adhesive, leave to set.

Clean up the countersink in the top of the spigot and put the 30mm x 4mm dia. countersunk screw in fully.

If you are using a counter, before fitting the switch permanently, twist the wires together and pass through the tunnel to the rear of the bracket, then screw the magnetically operated switch into the hole in the bracket and use two 2.9mm x 9.5 mm blunt point screws from the fitting kit to hold the switch.

The Ashcroftmakers kit includes a switch, a magnet and a counter that are all proven to work.

## Section 2.1.3

### *Casing / Housing - Part 2*

To assemble the Casing you will need:

Part 2 - the casing, a pair of M5x40 hex bolts

Part 10C - the riser Cam and the fixings from the list - M5x12 socket cap screw and M5 half nut.

Part 12B - a pair of Foot Knobs with M5 nuts fitted

The main elements of finishing the casing are:

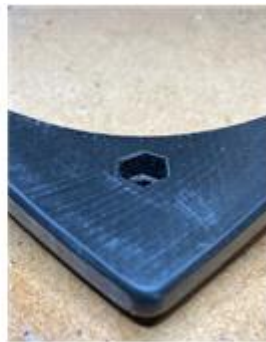
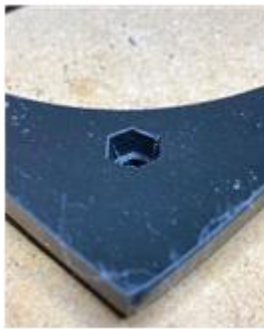
Removal of print supports from the block on the rear and the pinion cone on the front, make sure the hexagonal sockets in the bottom of the rear block are clear - these are used to prevent the M5x40 bolts rotating - the bolts become the captive studs for the tension system. See photo below for the best way to remove the support block at the rear - by placing and pushing in a sharpened spatula between the support block and the casing block.



## Section 2.1.3 Housing continued

Polishing of the cylinder track and riser wedges that the butt of the needle slides up -  
The circular track requires a denib and light polish - the fixed ramps at each side require the layer steps to be sanded smooth so that the butt of the needle slides up the ramp.

Finish part 10C - it is printed right way up, so both slopes on left and right need to have the layer steps removed so that the top faces are completely smooth - finish the edges to a rounded shape to a smooth finish.



Sand the top of the riser cam so that it is a rounded shape which aligns with the left and right edges and polish like the edges.



## Section 2.1.3 Housing continued

Bolt part 10C to the casing with the nut in the hex socket and the cap screw coming from the outside, the nut should be below the face of the cam when tightened up.



Half Nut on 12mm long M5 cap screw

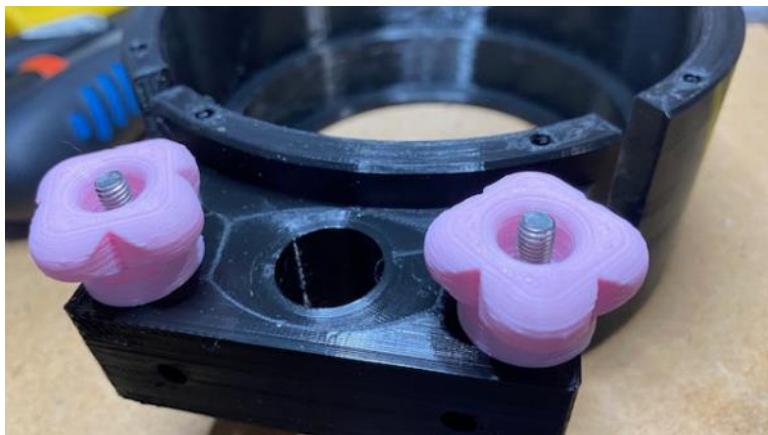
Riser Cam fastened to the inside of the casing



Push M5x40 hexagonal bolts up from beneath and retain the bolt in place with a foot knob - this must be done BEFORE fitting the casing to the machine bracket (Part 1) this part of the construction is in Chapter 3 section 3.1

### Section 2.1.3 Housing continued

Push M5x40 hexagonal bolts up from beneath and retain the bolt in place with a foot knob - this must be done BEFORE fitting the casing to the machine bracket (Part 1) this part of the construction is in Chapter 3 section 3.1



## Section 2.1.4

### *Part 3 - 60T Gear*

The 60T gear requires little finishing apart from removal of the printed support which fills the magnet position.

Remove the support if you are using a row counter and stick a 10x1mm magnet into the position, note that the gear has a radial line on the top indicating the position of the magnet.



This helps you to align the machine during final assembly by putting the cylinder '0' marker over the magnet. You can optionally fill the radial line with paint to make it more visible, Ashcroftmakers uses Acrylic Artist's paint for this purpose.

The magnet included in the Ashcroftmakers kit uses double sided tape, remove the non stick brown paper and place the magnet into the socket. If you are using your own magnet, use a contact adhesive; Ashcroftmakers experience with superglue has shown it to be ineffective when used on magnets owing to the smoothness of the magnets' surface.



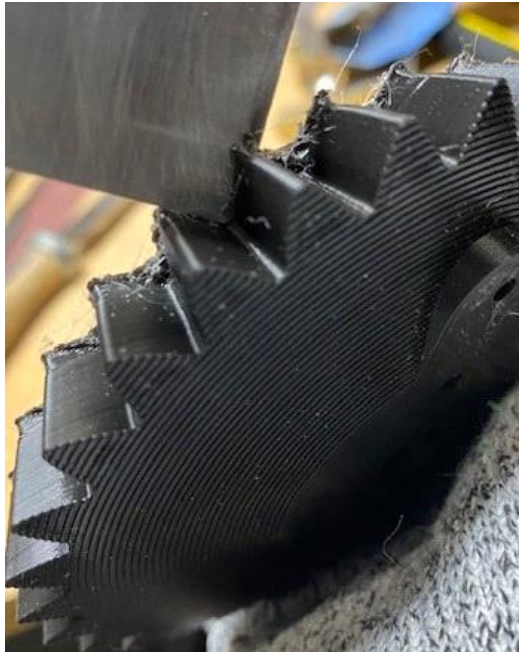


### Section 2.1.5

#### Part 4 - 30T pinion

The 30T pinion is printed outside face up, with a low layer height, resulting in a support structure beneath.

Remove the support structure WITH CARE, Ashcroftmakers use the spatula supplied with 3D printers, but with a sharpened edge, lever off the support and clear any remaining material.



You may need to finish the lower edge of the teeth and tooth corners to remove any print artefacts. Ashcroftmakers uses a combination of 180 and 240 grit tape to clean up the corners.



If the machine intermittently transmits vibration through the handle after assembly, one possible cause is the mating teeth of the pinion and gear, smooth edges to the gear teeth will help to prevent that problem arising.

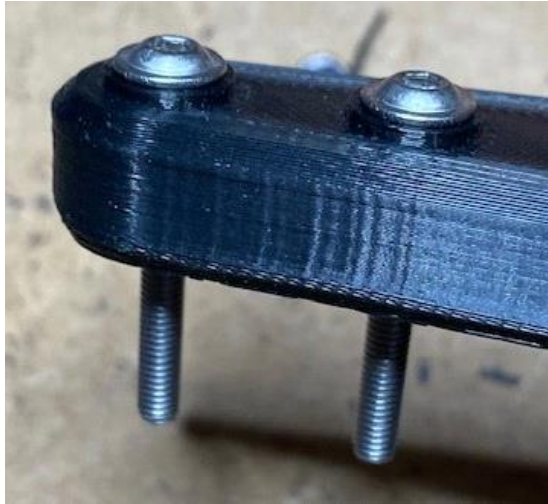
### *Assembling the handle - Part 7*

Put a small M5 washer under the head of an M5x50 socket cap bolt, push the bolt through the knurled sleeve and through the spindle hole in the handle, put a large M5 washer over the end of the bolt and tighten up an M5 Nyloc nut on the end of the bolt, the sleeve should rotate on the spindle. See photographs below.



#### *Fitting the handle to the pinion Part 4 to part 7*

Make sure the holes in each component are clear with a 3mm / or 1/8" drill, put an M3x25 flanged button screw through each hole in the handle and put the screws through the holes in the pinion, put an M3 nyloc nut over the end of the screw and tighten the nuts.



### *Fitting the bearings*

Clear the centre holes, which may need a little relief with a file before push fitting the bearings.

Set aside the completed pinion assembly for later. See photograph below.



### Section 2.1.6

#### *Part 5 - Cylinders*

Require only finishing of the slots so needles slide smoothly up and down and polishing of the base of the cylinder to a good finish.

If the machine drops stitches or fails to knit cleanly, make sure the top rim of the cylinder is smooth, and the top of each slot is smooth.

There are two 'vanes' on the cylinder at 180 degrees to each other, which are different to all the others, mark one of the extended vanes with paint or a pen in a contrasting colour - treat this slot as 'slot 0' when you assemble the 60T gear to the cylinder.

[Ashcroftmakers uses Acrylic Artist's paint for this purpose.]

### Section 2.1.7

#### *Part 6 - Cast on bonnets*

These are not essential to the knitting process and are offered as an option to a knitted cast-on bonnet.

Printed in two halves, top and bottom, assembly consists of removing the support from the top and fixing the two halves together using solvent weld adhesive, apply adhesive from the inside and around the outside.

Taking the 40mm screw eye from the fixings kit, remove the point and about 6mm of thread, and screw the eye into the flat base, try not to put the screw all the way through into the bonnet so you don't catch your fingertips on it. See photographs below.



## Section 2.1.8

### *Part 8 - Yarn Tension System*

The Yarn Tension System comprises a foot, a parallel arm and a tapered 'pigtail', each is held to the other with a printed screw and thumbnut. It is not necessary to overtighten the thumbnuts when building or using the machine, there is no significant load on any part of the tension system.

The top post for the Tension Arm has a captive M5 x 40 bolt with an M5 nut set into the thumb knob, put one of the sleeves with a hexagonal socket over the bolt and place the thumb nut on top and tighten - this pulls the bolt into the socket. Then solvent weld the top post into the foot with a generous amount of solvent. Set aside to dry overnight.

Put the Tension Unit into the socket on the parallel arm whilst aligning the scoop in the pinch screw with the socket, set the spring tensioner horizontal facing back towards the threaded peg and fit the thumb nut. The Ashcroftmakers provided tension unit has a modified spring, if you are using your own tensioner, you will need to remove the very strong conical spring and replace with a three turn compression spring with an extended length of about 10mm, Ashcroftmakers uses springs with 0.8mm diameter wire.

When replacing the tension knob do not turn the knob and compress the spring, the purpose is to apply a very light friction to the yarn as it passes through the discs, this is very different from the tension units' original purpose with a cotton thread. - See the Appendix

Place the tapered pigtail arm with the slot facing towards the parallel arm and put a thumbnut over the thread. See photographs below.

## Section 2.1.9

### *Part 9 - Yarn Feeder*

No finishing required - ready to use



### Section 2.1.10

#### *Part 10A 10B Left and Right Cams*

Finish the cam leading and trailing edges as the Riser Cam by filing at 45 degrees and then sanding to a rounded corner finishing with 3200 grit.

File off the sharp corners and smooth to reduce the possibility of injury during assembly, the corners of printed PLA can be very sharp.

File a flat of about 4mm across the bottom corner of each cam and sand / finish to a smooth curve joining the two cam faces. See photographs.



### Section 2.1.11

#### Part 11 - Cam Lift System

The Cam Lift system comprises four parts, one set for each Cam:

A knob, a washer, a clip and a lift screw. The clip is trapped between the washer, placed into the recess of the clip, and the knob which has a mating hexagonal socket for the hexagon on the top of the washer, if the knob is a loose fit, use a small amount of solvent weld adhesive placed into the hexagonal socket [keep the solvent away from the threaded portion] and push fit the washer/clip assembly into the knob, keeping the knob inverted until assembled.

The washer/knob assembly must rotate in the clip after assembly.

The lift screws [and knobs] have a LEFT HANDED thread. The lift screws have a curved face, when you assemble the machine, the curved face must be next to the outer face of the casing. See photographs below.



The knob has a radial line on the top to assist when adjusting the cams, you can optionally fill the line with a contrasting colour paint, if you overfill the line, allow the paint to dry then clean off the top surface.

[Ashcroftmakers uses Acrylic Artist's paint for this purpose.]



## Section 2.1.12

### Part 14 - Counter Carrier

The Counter Carrier comprises four parts:

An arm which fits over the post on the right of the bracket, a carrier for the counter [which is an optional component from Ashcroftmakers or other suppliers] and a swivel base. Additionally the flanged peg [

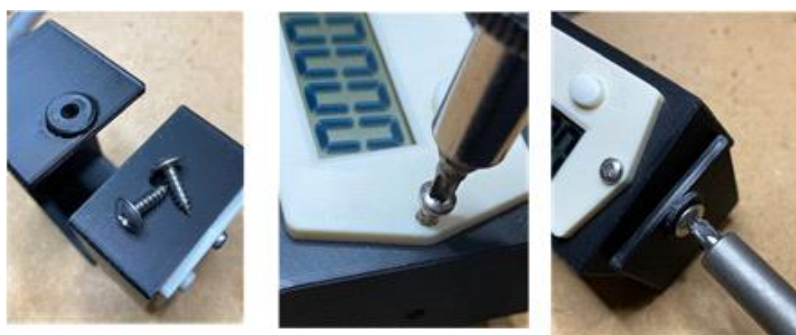
Solvent weld the flanged peg with the hexagonal socket into the swivel base from above, so that the hexagonal socket is on the same side as the vertical arms. Set aside to dry.



Remove the metal clamp plate and small self tapping screws from the counter and discard for recycling, remove the battery compartment cover and pull off the foam, an AA battery is a very tight fit even with the foam removed. Regrettably, the postal services discourage inclusion of a battery with the kit.



Loosen the marked 'COUNT' screws in the counter before fitting the counter to the carrier, the counter is retained in the carrier with two blunt point 2.9mm dia x 9.5mm long self tapping screws - provided in the Ashcroftmakers fixings kit. See photographs.



### Section 2.1.13

#### *Part 15 - 'C' Clamp*

Print two sets of frames and screws. The screw may be a tight fit when first turned into the C frame, if it sticks, withdraw the screw and turn it back in until the screw passes through the frame, then fit the press end.

Used with the sponge non-slip mat there is absolutely no need to tighten the clamps - Ashcroftmakers has used previous variants of this clamp for many months as an alternative to the metal clamps without issues - the clamps are used during assembly as well as during machine operation. The current C frame design when printed with the default settings is quite strong enough to hold the machine in place on a table or desk.



## Section 2.1.14

### *Part 16 - Sock Grip*

The Sock Grip is printed in two parts, an arm and a swivel grip, the arm has a single layer brim at each which need to be removed before springing the arms open and fitting swivel - the hole in the swivel is for the knitting weight, if you have purchased the Ashcroftmakers weight, the hook has the necessary clearance to pass around the loop.



## CHAPTER 3 - Assembly of your CSM

### Section 3.1 Bracket and Casing

Clamp the bracket, part 1, to your bench using the printed C clamps and/ or metal flat C clamps, placing the sponge mat under the base with the open arches facing the table edge.

Put the M5 type P nyloc nuts into the hexagonal sockets on the inside of the casing. The type P Nyloc has a much deeper hexagonal section than the standard nyloc nut, this helps to prevent the nut spinning inside the hexagonal socket.

The turning torque required to put the bolt through the nut for the first time is such that we ship our kit with the nut assembled to the M5x50 bolt, this means that subsequent dismantling and reassembly doesn't require the same amount of torque - DO NOT try to use standard Nyloc nuts in the casing sockets. If the nut decides to turn in the socket, the only solution is to cut the head off the bolt and put the bolt through the casing from the inside and you'll need a new bolt [or bolts]. See photographs.

Remove the nuts from the M5x50 socket cap bolts and put the M5 type P nyloc nuts into the hexagonal sockets on the inside of the casing.

Place the casing block over the spigot - having checked that the block slides into the socket and over the spigot - whether its tight depends upon how well setup your printer is. Chamfers on the block corners help to minimise the effect of ringing.

With the block positioned in the socket on the bracket and the nuts in the sockets, push the M5x50 bolt, with the big M5 washer in from the rear of the bracket and through into the block, then gently tighten the bolt up, you might have to push the nut in slightly to engage the thread on the bolt.

Repeat with the second bolt. This now makes the bracket and casing one component - which you can dismantle if you have forgotten to put the magnetic switch in - or fit the M5x40 hex head bolts. See photographs in the Kit Pictures folder on the memory stick.

### Section 3.2 Fitting the Cam Assembly

Slide the block at the back of the cam into the slot in the casing, note that the cams are handed, left and right, this is marked on the top of the cam, making sure the block has the rounded face closest to the casing, place the block on the back of the cam into the slot and position the assembly onto the top of the casing.

Using a pair of 3.5x19 self tapping screws, attach each cam clip to the top of the casing. See photographs in the Kit Photos folder.

Turn the knob left and right to ensure the cam rises and falls as you turn [making sure the long cam knob is loose enough to permit this], set each cam with the screw protruding about 5mm above the knob, lightly clamp the cams using the long cam knob - when you try to knit, the cams will need to be adjusted according to your yarn and the cylinder slot count - a 48 slot cylinder isn't always the same setting as a 72 slot.

### Section 3.3 Fitting the Pinion axle and Pinion

Using an M5 x 35 countersunk [flat head] socket cap screw, insert the screw from inside the casing into the hole so that the screw passes through the conical pinion mount on the front of the casing.

Fit an M5 standard nut over the screw and thread all the way along the screw until the nut flats align with the printed socket, keeping the nut still, turn the screw until the nut is recessed and the screw is fully tight.

The washers in the kit are provided in the sequence required, slip an M5 standard washer over the screw, followed by the Pinion assembly completed in section 1.1.5.

Put another washer over the screw and then put a standard M5 Nyloc nut over the end of the screw, do not overtighten, the pinion should rotate smoothly without sticking at any position.

### Section 3.4 Fitting the Row Counter Assembly

Put the large diameter end of the Row Counter Arm over the mounting point on the bracket, then place the Knob, part 12C with the wide base over the captive bolt and tighten up the nut - it doesn't need to be overtight as you may wish to reposition the Row Counter for better visibility.

Put the counter carrier over the small hole in the opposite end of the Row Counter Arm, using the narrow base knob, part 12D, clamp the assembly together.

Swivel the counter over so that you can access the screws and then feed the cable from the magnetic switch through the arm and attach each cable in turn to the COUNT screws. The cable from the switch in the AshcroftMakers optional kit is crimped using terminals that provide a degree of strain relief.

### Section 3.5 Foot and Feeder Assembly

Remove the Foot Knobs from the two screws on the Casing Block [the knobs perform two functions, retaining the screws and protecting your hands during assembly], align the holes in the Foot over the screws, then place the Feeder on top of the Foot and replace the knobs.

### Section 3.6 Cylinder and 60T gear assembly

Place the finished and polished cylinder inside the casing and place the 60T gear underneath the casing, align the registration marks on cylinder and gear so that the row counter increments when the 'Zero' needle passes the counter, which is beneath the right hand cam - so the counter increments at the end of each row of stitches.

### Section 3.7 Attaching the Needle Retainer and inserting needles

Slip the needle retainer spring over the cylinder into its groove.

Starting at about four o'clock, treating the feeder position as 12, take each finished needle in turn and holding by the hook/latch end with the butt of the needle facing down, slide the butt between the spring and the cylinder, making the needle vertical as it goes into the slot.

Repeat with each available slot which is not obscured by the cams, turn the cylinder as necessary to fill the slots.

Now you are ready for initial testing.

## CHAPTER 4 Testing and Fault Finding

The purpose of testing without trying to knit is to ensure that the machine operates without yarn. All CSM's, whether metal or 3D printed are intricate machines that always require some degree of testing to assure they knit properly.

All Ashcroftmakers machines are tested before despatch, including knitting of the sock bonnet which accompanies the machine.

Turn the handle and test the rotation of the CSM in each direction.

If your machine rotates smoothly with no needle jams and the cylinder slides easily when you are fitting needles, then you are ready to try casting on and knitting for the first time.

During testing, a machine rotates several hundred times, as some needle/slot related problems take between 50 and 100 revolutions to find.

Casting On, Knitting and Cylinder size selection is all covered in the Ashcroftmakers CSM User Guide, a copy of which you will find in the Documents folder of the memory stick.



# Appendices

12 November 2021 21:49

1. Base Kit and Optional Components
2. Fixings Part List
3. Needle Cutting and Tension Unit

# Appendix 1 - Base Kit + Optional Components

18 November 2021 12:42

Base Kit and Optional components		Qty
<b>3D CSM Base kit</b>		
<b>Comprises:</b>	Memory Stick	1
3D CSM files on memory stick	No1 Pozidrive	1
Essential tools to assemble machine	No2 Pozidrive	1
	2mm allen key	1
	3mm allen key	1
	4mm allen key	1
	Multi size spanner	1
<b>Fixing kit</b>		
	Pinion Flanged bearings	2
	Tension Unit with modified spring	1
	Yarn Take Up Spring	1
	Sponge non slip mat	1

<b>Row Counter Option kit</b>		
<b>Comprises:</b>	Row counter	1
Counter, operating detection switch, magnet	Row counter microswitch	1
Direct fit to 3D CSM kit – can be retrofitted by partially dismantling the machine	Row counter magnet, 10mm dia x 1mm thick	1

<b>Accessories kit</b>		
<b>Comprises:</b>		
Three heel forks		
with weight kit – washers and nut/bolt assembly for heel forks only	Heel Forks	3
Weight kit for heel forks	Mushroom Head M10x25 socket cap screw	3
	M10 half nut	3
	M10x40 repair washers	24

Metal clamp	Metal clamps [50mm]	2
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<b>Weight Kit</b>		
Weight with hook	500g Knitting Weight	1

## Appendix 2 - Fixings Part List

18 November 2021 12:23

### Fixings Part List

Type	Length	Diameter	Qty	Used On
socket cap bolt	50	M5	3	Bracket to casing; Pinion handle rotating sleeve
hex head bolt	40	M5	6	Casing to foot [captive] x 2; Cam locking screw x 2; Row counter to bracket [captive] x 1, Top tension unit post x 1
hex head screw	20	M5	1	Row counter carrier to arm
csk socket cap screw	70	M5	2	bracket reinforcement
csk socket cap screw	35	M5	3	bracket reinforcement; pinion spindle
nyloc nut	n/a	M5	6	bracket reinforcement; pinion spindle; pinion handle rotating sleeve
standard nut	n/a	M5	8	press fit into foot knobs, cam locking knobs, top foot thumb nut, counter bracket knobs; pinion spindle lock nut [captive in casing]
Type P nyloc	n/a	M5	2	captive inside casing sockets to M5x50 socket cap screws - do NOT use standard nyloc
half nut	n/a	M5	1	riser cam fixing
socket cap screw	12	M5	1	riser cam fixing
standard washer [ISO form A]	n/a	M5	3	pinion to spindle [2]; pinion handle rotating sleeve [beneath head]
standard washer [ISO form C]	n/a	M5	7	bracket reinforcement [4]; pinion handle rotating sleeve [1]; socket cap screw [bracket to casing, 2]
flanged button head socket cap screw	25	M3	2	pinion handle to pinion
nyloc nut	n/a	M3	2	pinion handle to pinion
flanged self tapping screw	13 [1/4"]	4.2 [No 8]	3	Rotating counter carrier horizontal pivot, yarn take-up spring
self tapping screw blunt point	9.5 [3/8"]	2.9 [No 4]	4	Fix row counter to counter carrier; Fix magnetic switch to Bracket [Part 1]
self tapping screw blunt point	16 [5/8"]	3.5 [No 6]	4	Fix cam clip to casing
self tapping screw blunt point	16 [5/8"]	4.2 [No 8]	4	Fix cylinder to 60T gear
self tapping screw	30	4	1	bracket reinforcement, for spigot
Screw Ring	40	4.2 [No 8]	1	Loop for cast on bonnet
Bearings MF115 ZZ 5 X 11 X 4MM , flanged			2	pinion spindle bearings

## Appendix 3 - Needle Cutting + Tension Unit

18 November 2021

12:35

### Needle Cutting.

If you are purchasing your own Brother Flat Bed needles, make sure they are main bed needles with a total length of 120mm, and a butt length of 17mm. If you find ribber needles, the butt is lower and doesn't work well with the AshcroftMakers CSM.

Remove the entire tail of the needle as shown by the photo below, the needles are hardened steel and are best cut with a grinding disc in a bench grinder.

Finish the cut end and ensure the cut is entirely smooth without burrs - the needles will snag in the cylinders if they are not smooth, this will prevent the needle rising and falling with the cams and a jam caused by a needle will probably result in a damaged cam which you will need to correct by removing and repolishing the cam edge.

There are detailed annotated pictures in the CSM Parts and Assembly PDF which identify the needle elements and the cutting and cleaning processes required to prepare needles for use in the machine.



### Modifying a Sewing Machine tension Unit

Remove the adjusting knob and friction disc and then the conical spring which you can discard and the single large conical washer.

Obtain a spring with an 8mm internal diameter made from 0.8mm spring steel - doesn't matter whether it's a compression or tension spring. Stretch a compression spring so that four coils are about 10-12mm long and cut the four coils off. Straighten one end about 6mm long and then bend

the straight portion at 90 degrees into the centre. Slip the spring over the divided shaft with the bent end and replace the conical washer and the friction disc and then replace the adjusting knob.