Curta Type 3DP Build Manual

Contents

1 Introduction

This build manual is an attempt to describe the detailed and extensively manual process by which I build my 3D printed Curta Calculators.

2 Change Log

3 Safety Warning

4 Tools and Parts

5 A Note About Fitting Parts

6 Preparing and Painting External Facing Parts

7 Preparing Main Casting and Bearing Plate

7.1 Parts Required

7.2 Tools Required

7.3 Process

7.3.1 Bearing Plate Diagram (from the bottom side)

8 Step Drum and Bearing Plate

8.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
13	Step Drum Lower or Step Drum (with main axle)	
45	Step Drum Upper Or Main Axle Bottom	
78	Step Drum Pins	3
49	Anti-Rotation plate (called Anti-Reversal in BoM)	
33	Tens Bell	

8.2 Tools Required

- Hex driver or screwdriver (depending on the type of bolts you have)
- PTFE spray lubricant
- Files
- Sandpaper
- Superglue (cyanoacrylic)

8.3 Process

If you opted for printing the step drum as one piece, fit the main axle bottom into the base of the step drum. This should be a snug fit with the keys matching up inside the step drum preventing any rotation of the bottom of the axle relative to the step drum.

If you opted for printing the step drum in two pieces, fit the three pins into the lower piece of the step drum and super them into place. Once that has dried, add super glue to the pins of the lower step drum and pres the upper half of the step drum onto the pins to combine the upper and lower portions of the step drum into one piece.

The flat portion of the anti-rotation collar on the base of the axle needs to align with the right side of the step drum when the toothed face of the step drum is facing you. This ensures that the Curta will not switch between addition and subtraction when it is mid-rotation.

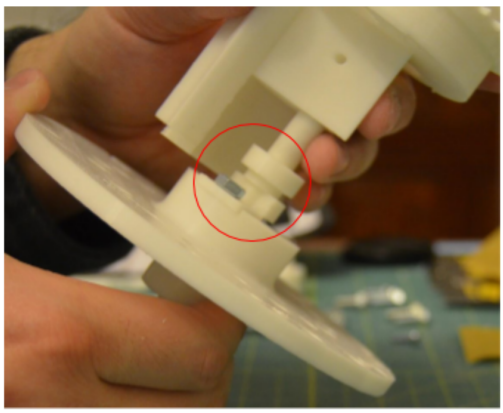

Figure 1: Alignment of the anti-rotation collar to the step drum

Now slide the step drum into the center of the bearing plate. The step drum should spin smoothly. If it does not, file and sand it down until it does. Use some PTFE spray lubricant on the shaft and the bearing plate. Do not allow the lubricant to reach the teeth of the step drum, but do allow it to cover the anti-rotation collar. The fit should allow the step drum to spin freely. If you have to sand further after spraying the lubricant, you will need to respray the parts that have already been sanded.

Place the anti-rotation plate on the recessed portion of the bearing plate near the center. Turn the step drum until the anti-rotation plate aligns with the collar and then slide the anti-rotation plate to meet the flat portion of the anti-rotation collar. Test this fit to check that the plate fits in the slots in the collar and that the step drum still moves freely. Sand and file as necessary to make that happen. The step drum may need to slide up or down to align the plate with the middle section of the collar to get it in the correct position.

Now use a 10mm M5 bolt to secure the anti-rotation plate ensuring that it stays press against the ant-rotation collar. If you need to, you can put a driver through the hole at the top of the step drum to reach the bolt. I used plier for this since I had a hex bolt. **Do not over tighten any of the screws or nuts in this build. If you strip the plastic the part will need to be reprinted**. Fasteners should be tight, but don't crank down too much. If it will not stay as secure as you need, use removeable threadlock.

Finally, double-check that you can still rotate the step drum smoothly and that the step drum can switch between the raised (subtraction) position and the lowered (addition) position easily. If not, you may need to file the anti-rotation plate or the collar some more and re-lubricate.

9 Tens Bell and Main Casting

9.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
33	Tens Bell	
39	Tens Bell c-clip	
40	Tens Bell spring	
48	Retaining fing for Tens Bell	
56	Main Casting (main body in BoM)	
26	Support Columns (Frame Support in BoM)	3

9.2 Tools Required

9.3 Process

10 Springs for Zero Positioning Lever and Anti-Reversal Pawl

10.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
-	0.6mm Music Wire (0.024in)	
-	1.1mm Music Wire (0.043in)	

10.2 Tools Required

10.3 Process

11 Zero Positioning Disk

11.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
27	Zero Positioning Disc	
67	Zero Positioning Disc Lever	
25	Zero Positioning Disc Roller	
66	Anti Reversal Pawl (Reverse Rotation Prevention Pawl)	
77	Anti-Reversal Pawl Bolt Sleeve	
76	Zero Positioning Lever Bolt Sleeve	
74	Zero Positioning Disc Clip (Zero Positioning Plate Securing Spring)	
71	Main Axle Pin for Zero Positioning Disc	
-	Anti-Reversal Pawl Spring	
-	Zero Positioning Lever Spring	
-	M5 hex head 10mm	1
-	M5 hex head 20mm	1
-	M5 hex head 30mm	1
-	M5 nut	2

11.2 Tools Required

11.3 Process

12 Main Casting and Bearing Plate

12.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
-	Assembled Main Casting and Tens Bell with Support Columns	
-	Assembled Bearing Plate, Main Axle, and Step Drum	
-	M4 nuts	3

12.2 Tools Required

12.3 Process

13 Transmission Shafts

13.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
6	Double Transmission Gear	
7	Standard Transmission Gear	15
8	Lockout	
9	Triple Transmission Gear	
10	Tall Lockout	
11	Lockout with Transmission Gear	15
28	Ones Results Transmission Shaft	
29	Ones Turns Transmission Shaft	
30	Transmission Shaft	12
31	9, 10, 11 Digits Transmission Shaft	3
59	Transmission Lock Ring (Cover Ring)	
-	M3 10mm Screws	3

13.2 Tools Required

13.3 Process

14 Reversing Lever

14.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
20	Upper Reversing Lever Spacer	
21	Lower Reversing Lever Spacer	
22	Reversing Lever	
23	Reversing Lever Shaft	
-	M4 Nut	1

14.2 Tools Required

14.3 Process

15 Carry Levers

15.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
37	Results Carry Levers (Tens Slider for Results)	10
38	Turns Counter Carry Lever (Tens Slider for Turns Counter)	5
68	Carry Lever Bearings (Tens Slide Bearing)	15
-	0.6mm Music Wire	
-	16mm M4 Screws	25

15.2 Tools Required

15.3 Process

16 Selector Shafts

16.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
1	Selector Shaft (Selector Shaft Bottom)	8
2	Selector Shaft Top	8
4	Selector Shaft Bearing	8
65	Selector Knob	8
63	Selector Shaft Guide Screw (Digit Selector Screw)	8
19	Selector Shaft Bearing Cover Plates (Setting Axle Holding Plate)	2
-	Cheap Ball Point Pen Springs	8
-	5mm Ball Bearings	8
-	M4 10 mm Screws	4

16.2 Tools Required

16.3 Process

17 Collar and Lower Housing

17.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
64	Curta Collar (Upper Outer Sleeve)	
52	Lower Housing	
69	Position Markers	5
13	Position Marker Spring ($0.4 \times 3 \times 5$mm spring)	5
14	3mm Position Marker Ball Bearings	5
11	M3 10mm Screws	3

17.2 Tools Required

17.3 Process

18 Carriage Casting Preparation

18.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
14	Carriage Casting (Counter Body)	
15	Counter Body Stop Pin	
16	Counter Body Spider Spring Pin	2
53	Clearing Stop Pin Sleeve	
70	Digits Axle	17
12	6mm Ball Bearing	1

18.2 Tools Required

18.3 Process

19 Results Dials

19.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
43	Results Dial Type 2	13
44	Results Dial Type 1	4
60	Half Carry Pins (Number roll carry pin half)	8
61	Full Carry Pins (Number roll carry pin full)	7

19.2 Tools Required

19.3 Process

20 Carriage Cage and Upper Housing

20.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
-	Carriage with Dial Axles and Dials	
55	Carriage Cage (Digits Cover)	
36	Upper Housing	
73	Upper Housing Pin (Carriage Pin)	

20.2 Tools Required

20.3 Process

21 Bearings and Spider Spring

21.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
17	Spider Spring	
12	6m Ball Bearing	17

21.2 Tools Required

21.3 Process

22 Clearing Cap

22.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
24	Clearing Ring Handle (Clearing Ring)	
41	Clearing Cap Teeth Spacer (Clearing Cap Tooth Segment Spacer)	
42	Clearing Cap Teeth	2
47	Clearing Cap (Clearing Cover)	
58	Clearing Cap Rivet (Clearing Ring Rivet)	2
69	Position Marker	5
75	Clearing Cap Stop Pin (Crank Pin)	
14	3mm Ball Bearing	5
13	Position Marker Spring ($0.4 \times 3 \times 5$mm spring)	5
15	Clearing Cap Stop Spring ($0.6 \times 5 \times 20$mm)	

22.2 Tools Required

22.3 Process

23 Crank Collar

23.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
12	Crank Collar Nut (Counter Sleeve Nut)	
18	Crank Collar	
34	Crank Collar Spacer Ring	

23.2 Tools Required

23.3 Process

24 Carriage and Main Body

24.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
-	Completed Carriage	
-	Completed Curta Body	
35	Main Crank Spring Sleeve	
51	Spring Sleeve Clip	
19	Upper Carriage Spring ($1.8 \times 28 \times 40$mm)	
12	6mm Ball Bearing	

24.2 Tools Required

24.3 Process

25 Crank Handle

25.1 Parts Required

Part Number	Part Name	Quantity (if > 1)
-	Mostly Completed Curta	
3	Crank Handle Pin Screw	
5	Crank Handle	
62	Main Crank	
72	Main Axle Pin for Crank Handle	

25.2 Tools Required

25.3 Process