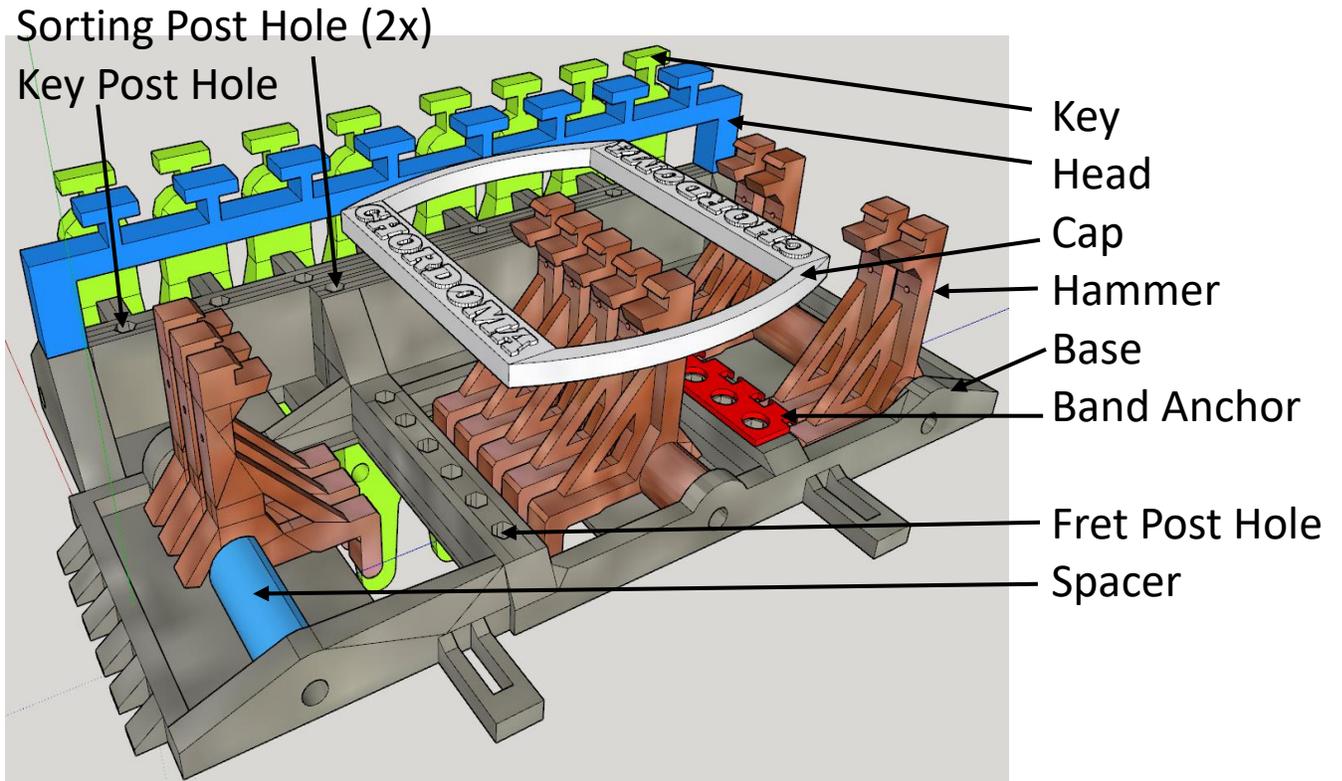


# Chordoma

## Single Finger Guitar Chord Machine

Assembly Instructions



1. Print out all the parts except for the Fret Board. That's only there for viewing in CAD
2. Mark up the hammers with a sharpie as I have in my pictures. The code I've used is String (EADGBE) and number (1 for first fret).
3. Find some thin rubber gasket material (ACE Hardware) and cut some little strips and fold over the end of the hammer, to cushion the blows against the strings. I found that they'd vibrate horribly if left as bare plastic. I used CA glue with accelerant, but maybe you have a better solution.
4. The perfect size rubber bands come by the hundred in a packet intended for little kids to make things from. They are called "loom bands" and young children make bracelets from them, but they're the perfect size.
5. The rods are 3mm diameter stainless rounds bar, intended for RC model aircraft. I got 5x 350mm length from Amazon for about \$5. Five lengths was plenty.
6. You need to cut several lengths of rod, but check dimensions from CAD. You need 150mm for the key's axle. 12x 30mm for the 'fret posts', and about 15mm for the sorting posts and key posts near the keys (sandwiched between the head and block). Double check that last one as

the holes in the head are missing in my CAD. You'll need to cut an additional three lengths of rod for the hammers to pivot, each about 54mm long.

7. I got the small socket screws and nuts from Mr. Metric online. I got 100 of each and the bill came to \$5 plus shipping. I have quite a lot left ;-)
  - a. M4X.7 Hex Nut Steel Class 8 Yellow Zinc Cr3 Trivalent DIN934
  - b. M4X12 Button Head Socket Cap Screw Steel 10.9 ISO7380
8. The four screws and nuts to secure the machine to the neck of the guitar came from ACE Hardware – just a case of raiding the bins until you find what you're looking for. Take your printed parts with you, that's what I always do.
9. The string is some fishing line from Meijer's (or lots of places). Not the mono-filament stuff, this is braided which makes it slippery. I think it was called SpiderWire. It was fairly cheap and advertised as having very low stretch. Get low breaking strain (lightweight stuff). Seems perfect for this job.
10. You may need to gently drill out the holes using a 3mm drill bit. Test each one with the rod to make sure it turns freely.
11. Mount the hammers to the base. Three for first fret, five on second fret and four on third fret.
12. Test fit the base to the fret board of your chosen guitar. The hammers line up fine on my 'silent' guitar, but you may need to adjust it slightly. The base has slots to allow you to move the base around until you have a good contact with each string. The neck clips were sized for my guitar neck – you may need to adjust. In the photo's you can see rubber wadding to prevent it from sliding, and protecting the back of the neck.
13. Cut 12 pieces of the string, each about 10" long. You won't need that long, but it's surprising how much length is used in snaking around the posts.
14. Put a thick knot in the end of each, pass through the small hole in the hammer, then put a blob of thick CA over the knot, with some accelerant. Nice and secure.
15. Put the fret posts in the twelve holes between the frets. Before you put the cap on (which has Chordoma written on it) put the band anchor over the posts between second and third fret, and glue down.
16. Now you can put bands on each hammer, back to either the base (for fret one and three) or the anchor (fret two). Again test to see that each hammer contacts the string.
17. Put the ten short rods (key posts and sorting posts) into the base, then glue the head on.
18. The keys have plastic bushings that I got from ACE Hardware. Dirt cheap, and questionable whether you need them. You could print with high quality and not use a bushing. You can just see them in my pictures.
19. Put cap screws and nuts lightly into the keys, then push the long rod through all the keys, to make a kind of piano keyboard. You might like to decide which order of keys you'd like at this point. You can adjust, but I went for "deadCAGE" because I liked the word – in other words, minor chords d,e,a and d, then major chords C,A,G and E. Note that this design is limited to chords with two or three strings, but I suspect you could redesign for the occasional four string chord (looking at you F Major).
20. Now you might like to print a chord diagram and work through this carefully. As an example, the C-Major chord is made up of three strings –
  - a. B1

- b. D2
- c. A3

You did mark the hammers with a sharpie right... So gather the strings for those three hammers, and pass them around the posts to get to the key. The string has to pull the hammer 'squarely', so first go from the hammer through the long 'fret posts', then turn 90deg and go to one of the two 'sorting posts', then along the row to the appropriate 'key post', then through the hole in the key, and secure around the screw, then gently tighten. I went once completely round the screw to make sure it's secure.

21. Repeat for each of the chords. The next chord is A-Major, which is broken down into B2, G2, D2 (nice easy one). The strings will look like a cat's cradle when you're finished, but all the strings will slide easily over each other so you don't have false activations.
22. ...And I think that's everything. I have built one of these and got it working. It's not perfect by any stretch (no pun intended) and I hope that by putting it in the public domain you can iterate the design.
23. Problems I've found:
  - a. There is no method of force balancing between the three strings for each chord. So, taking the example of C-Major above, if B1 has more force, then it will reduce the force for the other strings. Hence tuning is harder. I tried different methods of attaching the strings to the keys (so, many, attempts), but did not find a way to force balance. What ideas have you?
  - b. The base could use being a bit stronger. There is a thinner section between the head / block and the fret posts. You could consider beefing that up a bit. Any elasticity there reduces the force you're putting on the strings.
  - c. Once the machine is on the guitar, you really can't access the fret board – in other words there's no way to partly use the machine, and partly use fingers.
  - d. You could just learn to play the guitar in the usual way, but this would be ideal for somebody no longer having the manual dexterity to make the finger shapes for the chords, or somebody like me who's just an engineer and wants to see if it's possible to fund another way.
24. Good luck – let me know how you get on!!! /Andy 3/31/19