

Clock 13 FDM - Hints and Tips -1

1 Silver steel is common tool steel that is supplied as a centerless ground round bar (with tolerances similar to that of drill rod). The name comes from the highly polished appearance of the rods. The American equivalent is tools steel or Drill Rod. Typical American supplier is www.speedymetals.com/ps-3356-17-2532-rd-o-1-drill-rod.aspx. The nearest equivalent to the Ø2 mm used for this project is Ø 5/64".

2 The bearings used for this project are Ø2 mm x Ø 6mm O/Dia x 3 mm. The spec used is 692ZZ 2X6X3, again the American equivalent is Ø 5/64" bore x Ø1/4"O/D x 9/64" wide.

3 The screws, nuts and washers used are M2 for the two positions on the escapement and M4 for the Pendulum Bob. For American equivalent see this table <http://www.trfastenings.com/pages/Thread+Conversion+Tables>

4 To enable you to modify the models I have supplied IGS files for all of the parts which should be easier to modify than the original STL. See this web page for a list of suitable CAD programs, several of which are free <http://alternativeto.net/software/freecad/>

5 The Cross section drawing in the instructions shows the types of fit needed for all the moving parts in the clock, it is recommended that these fits be achieved by drilling the holes formed in the printed parts using drill sizes given in the chart below. For the metric build use Ø1.9mm for tight fit and Ø2.1 for a loose fit .

Drill size	Diameter (in)	Diameter (mm)
#49	0.0730	1.8542
1.9 mm	0.0748	1.9000
#48	0.0760	1.9304
5/64 in	0.0781	1.9844
#47	0.0785	1.9939
2 mm	0.0787	2.0000
#46	0.0810	2.0574
#45	0.0820	2.0828
2.1 mm	0.0827	2.1000
#44	0.0860	2.1844

6 The escapement is fitted to the Pendulum head with two Ø3mm pins on its rear face, these fit into two Ø3mm holes in the Pendulum head. These should be a reasonable tight fit so that there is no relative movement between the the Escapement and the pendulum. However try to make them so that you can get them apart if you need to dis-assemble the clock.

7 I used Ø8 mm steel balls (Catapult Ammo) for the Main weight 300gms and the Counter weight 30gms, but you can of course use any heavy metal to serve this purpose. The main weight container is a little large deliberately so as the running weight was unknown at the time it was modeled so you may want to make it a little smaller. An alternative would be to use a brass rod Ø25 diameter by 80mm long, wit a counter weight in proportion. The pendulum Bob is filled either with smaller balls or nails so that the weight is around 30gms (1 oz)

8 I used ABS throughout for this model and it has worked well, I won't try to advice on the settings for your printers as this is my first use of the process and I am sure you are more experienced at this than I am.

9 The cord tying the two weights together is 1700mm long, I used 1.3mm white Polyester cord, the advantage of this cord is that it doesn't twist when loaded.

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10 To bond together the plastic parts together such as the Pendulum head and rod use a liquid solvent adhesive applied with a syringe like applicator or if necessary a small brush, this latter can be a bit messy..

11 When the clock is first assembled, the pendulum bob is fixed at a point on the rod that is approximately 250 mm from the pendulums pivot point. This is roughly the right position for the clock to run at the correct rate . It will not be the exact position for your clocks because of all the small differences in your build of the clock, so to get it to run correctly you need to adjust the pendulums position on the rod, either move it closer to the pivot point or further away to slow it down. It will take several attempts but it should be possible to get the clock running within a minute in 24 hours.
The length of time your clock will run for will depend on how high you hang the clock on the wall, but if you position it so the centre of the dial is at eye level then it should run for about 10hours.

12 To wind the clock I follow this routine, with the counter weight to the left looking at the front of the clock, I hold that cord in my left hand, and the main weight cord in my right hand both near the top. Slightly lift both cords and slide cords up and down a bit to unlock them from the drum, then with the left hand pushed to the back and the right hand pulled to the front, gradually pull down on the counter weight whilst slightly supporting the main weight, shuffle hands up and down to repeat this until you complete the wind.

This seems to work for me, I only have the cords wrapped around 1.5 turns, and the weights used for this clock are 300grams main weight and 30 grams counterweight.