



3-Digit Combination Padlock Kit Card



LoboCNC

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updated 5. 8. 2023 | published 5. 8. 2023

Summary

A working padlock kit to challenge you and your printer.

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Tags: [padlock](#)

Update (7/14/2023) - no glue version! I've re-worked a few things so that everything presses or snaps together, making it a great project to put together with kids.

This (mostly-flat) kit card is a bit of a challenge to make but will produce a working 3-digit combination lock, just like the one you used to have on your high school locker. Well, sorta like that one. It requires an impeccably tuned printer (some of the parts are very tiny), a steady hand, tweezers, and maybe some magnifiers. It prints without supports and snaps together without any glue, fasteners, or other hardware.

I learned how a combination lock works from [this video](#), and based this design off of that. It consists of three dials which have release notches that all have to be lined up to open the lock. There are little pins on each dial that push on each other to align the notches, and you can set to location of the pins during assembly to create unique combinations.

About the dial: I didn't have enough room to put numbers, so like one of those annoying clock faces without numbers, you have to kind of intuit which number is which. On the face there are 10 long marks (0, 10, 20, 30... etc.) and short mark subdivisions in-between. And finally, one of the long marks is colored in to indicate the "zero" position of the dial. Each combination number is 2 digits (e.g.: 67 - 32 - 18) but this lock is forgiving enough that ± 3 on any number should be close enough.

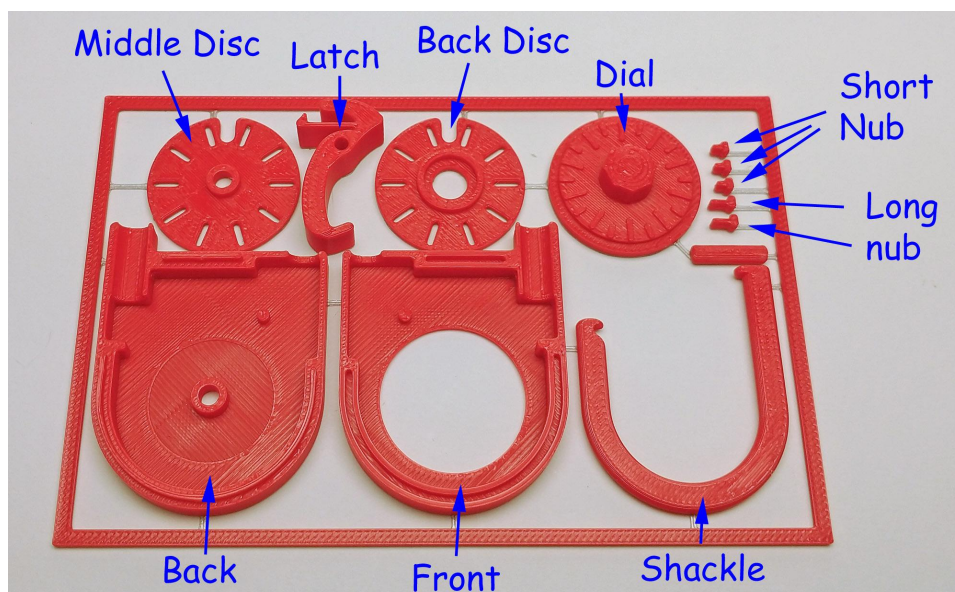
Printing

Print in PLA with exactly 0.2mm layers. Use a 0.4mm (or smaller) nozzle. Your bed levelling has to be near perfect, and you need to tune out any elephant's foot. You'll also want well tuned pressure advance to eliminate over-extrusion at the corners. Otherwise, the kit card prints easily as posted with no supports. For added contrast, you can print the first 2 layers in one color and then switch to a contrasting color, as shown in the second photo above.

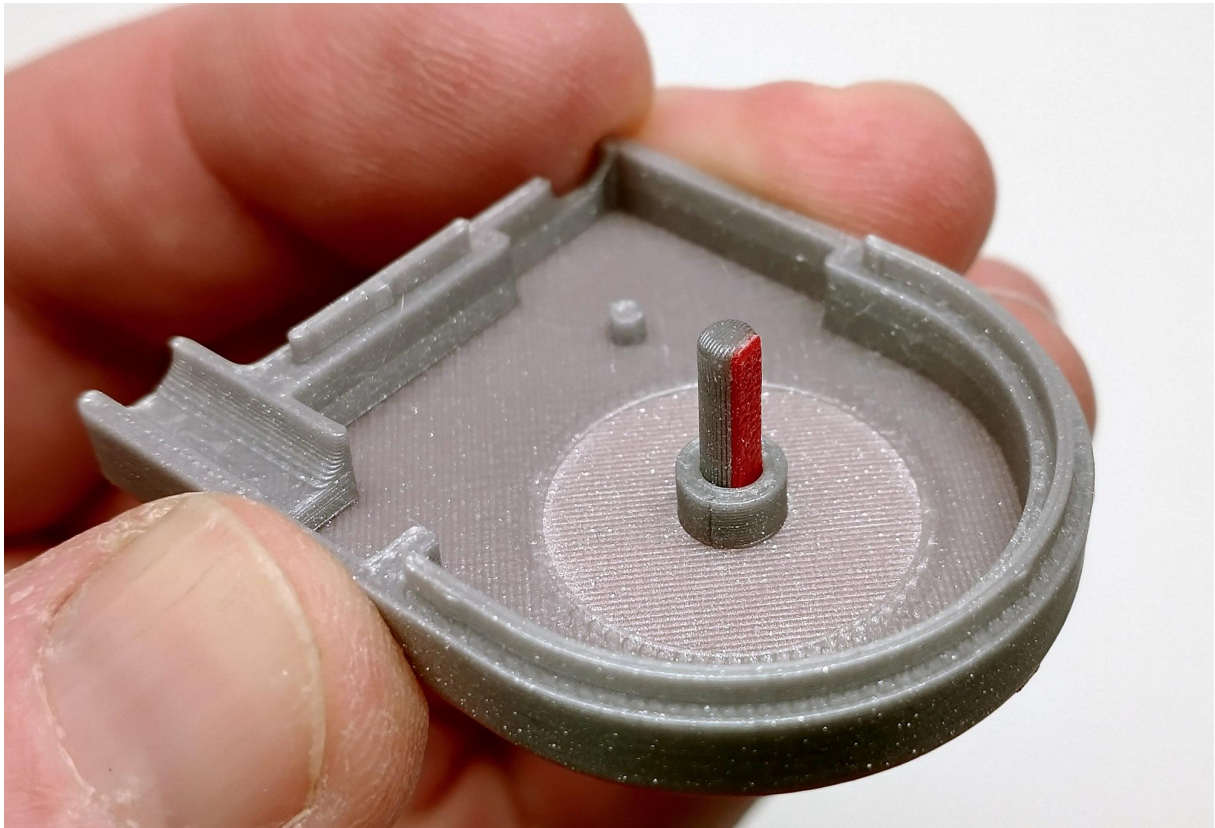
Assembly

Before getting started, read through the entire set of instructions and test-fit all the parts that mate together. Make sure that the three dial spin fairly easily on the pin and that the latch can pivot easily on the little posts on the inside of the covers.

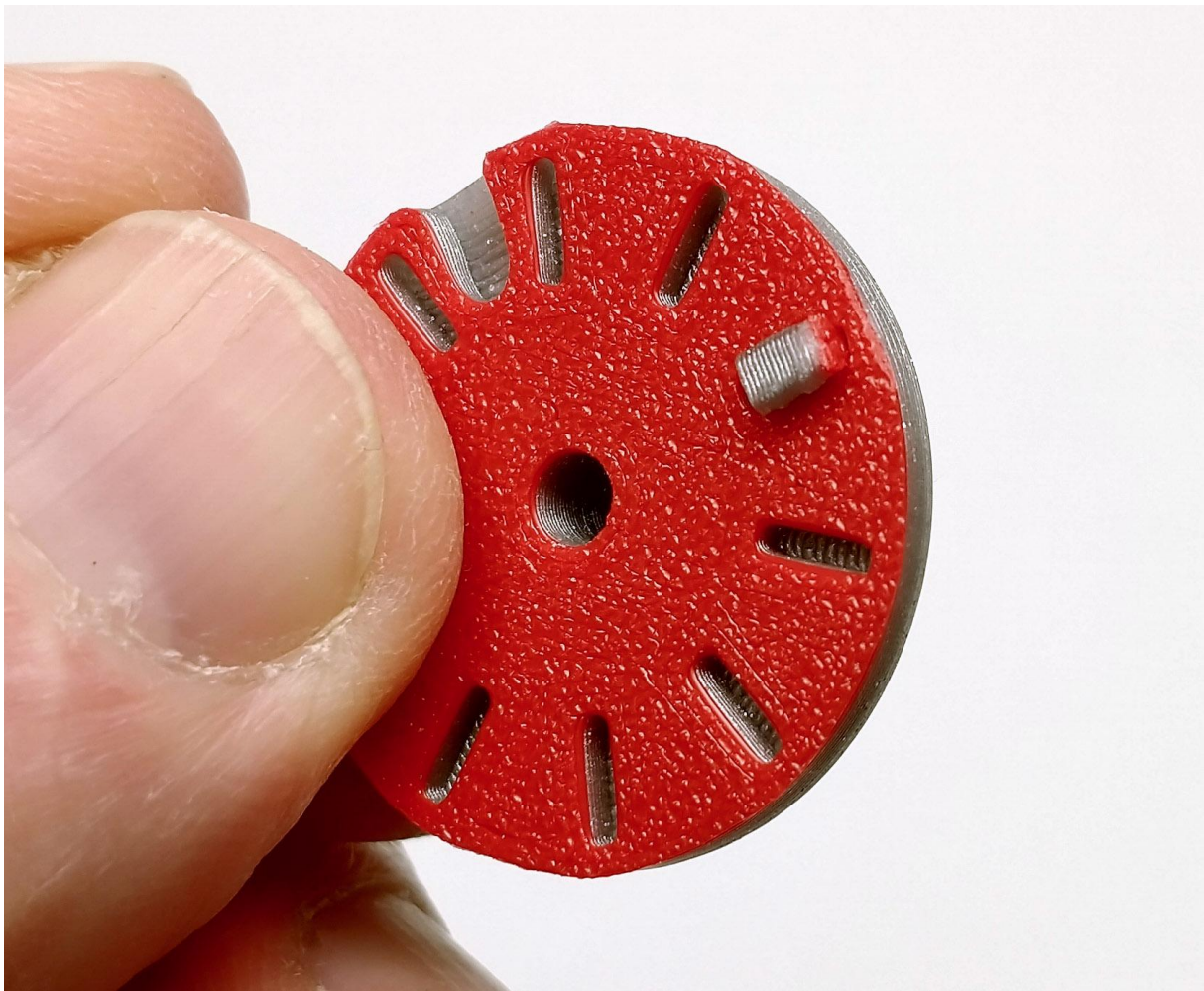
Here's the layout of all the parts:



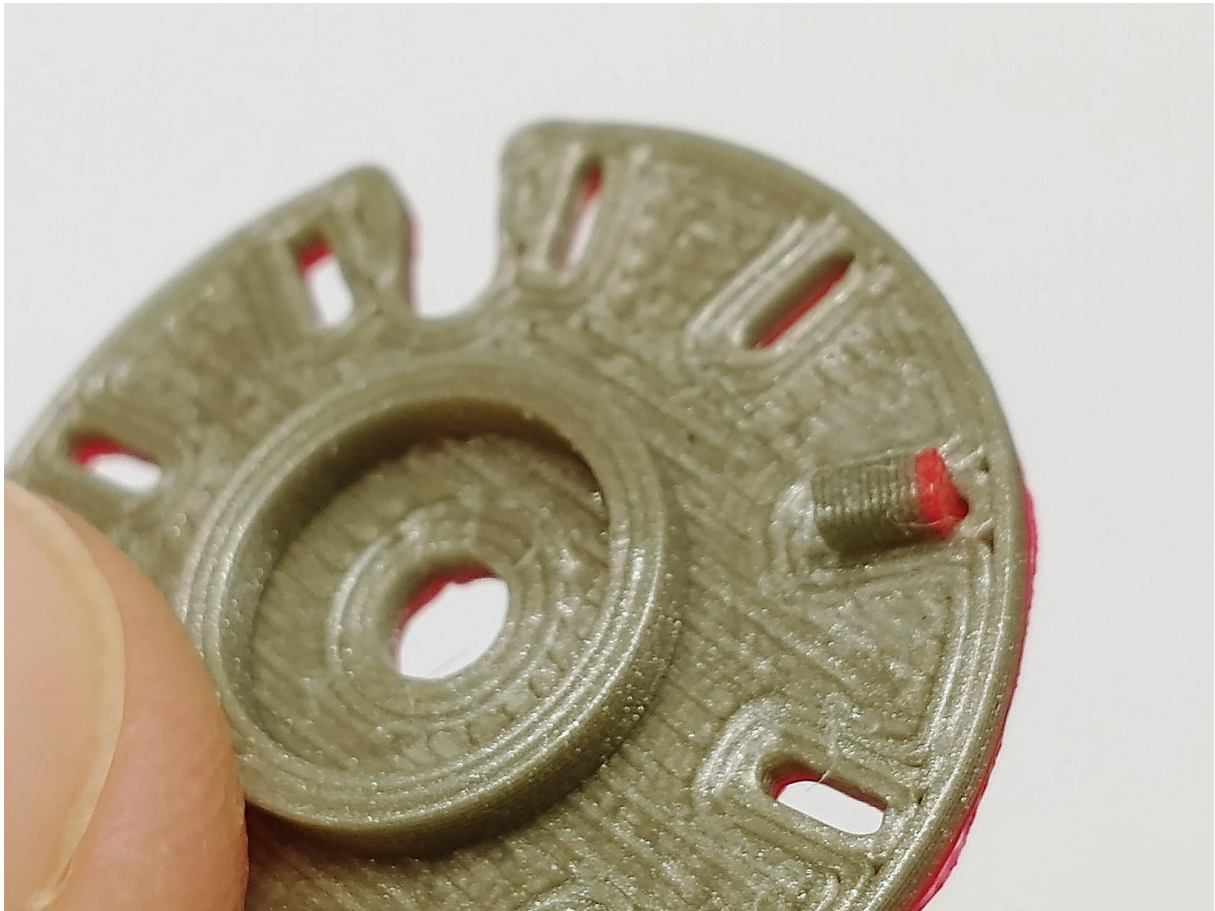
Note that the small pieces in the upper right corner are tricky to handle. When you cut them loose from the frame, cut them off at the frame, leaving the tabs as a small handles for maneuvering them into place.



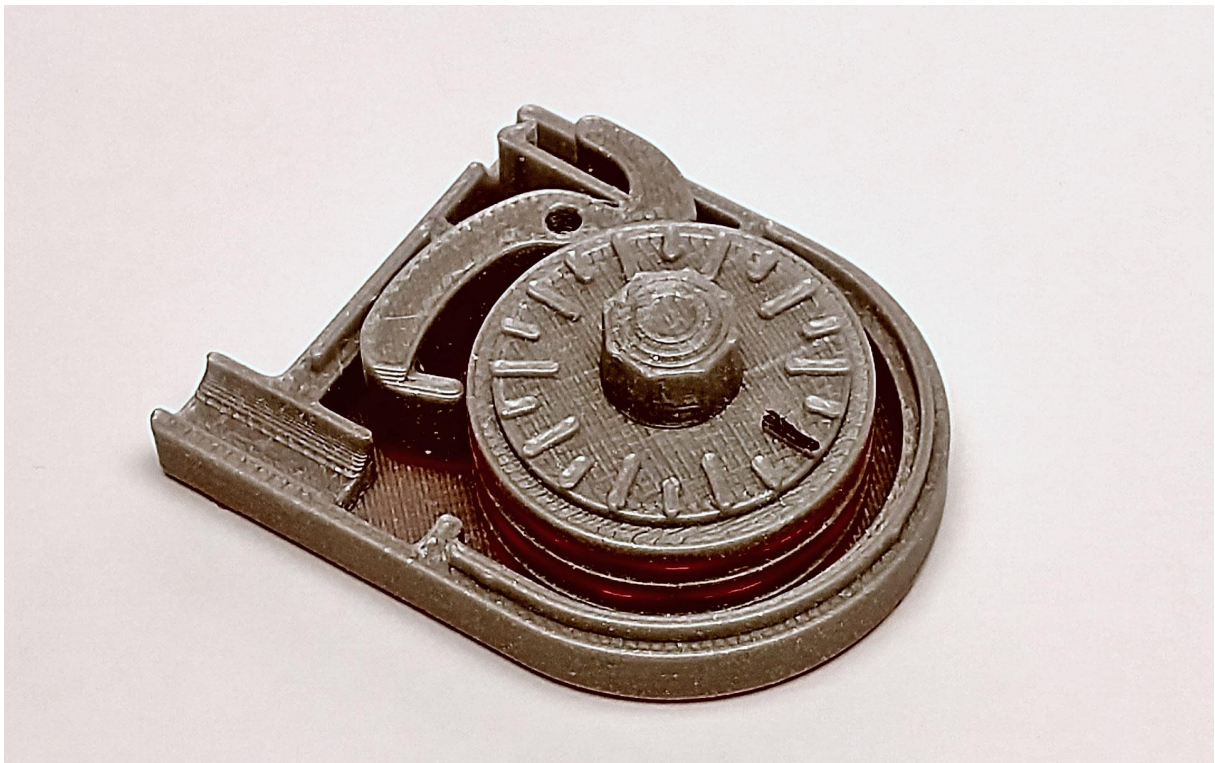
1. The center pin is slightly fatter at one end to create a friction fit. You can tell which end is fatter by trying to insert both ends into the hole in the back cover. Start by inserting the thin end through the back side of the cover and into the center of the lock. Press the pin all the way flush with the back cover by pressing the end of the pin against a hard, flat surface.



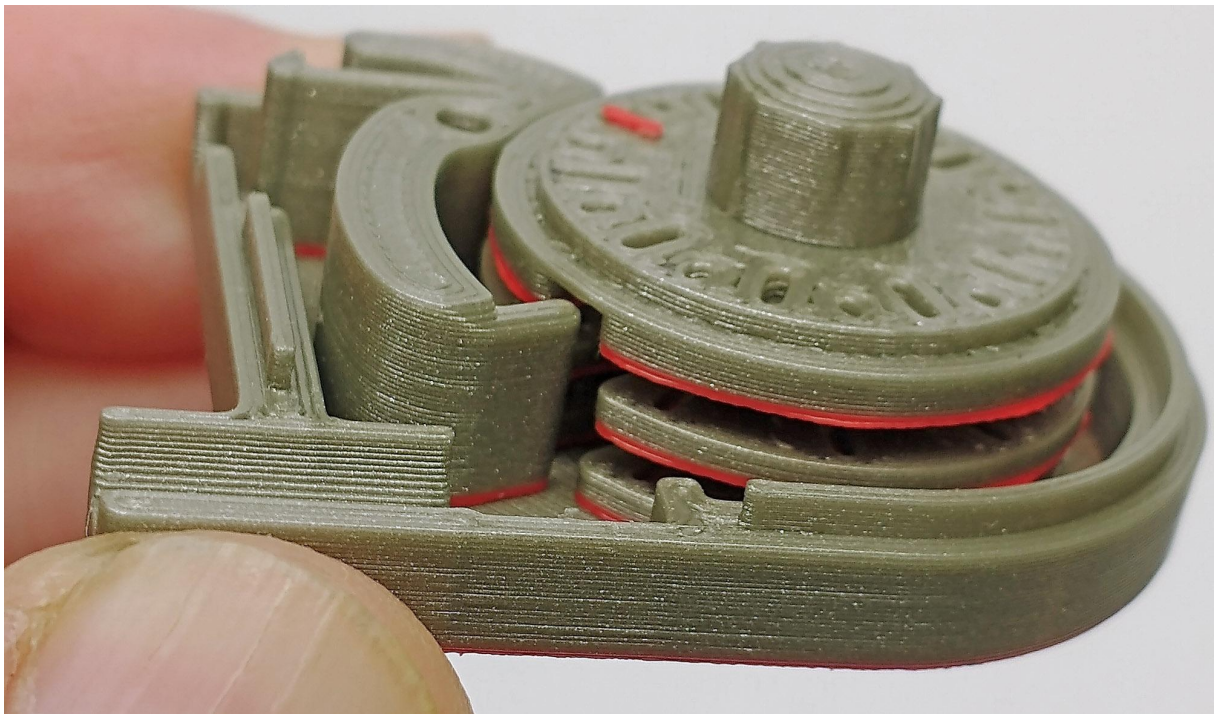
2. Insert one of the **short** nubs (I've given you two that you'll use, plus one spare) into one of the long slots (at random) in the back side of the dial. It doesn't matter which one - you'll be determining your combination later. Press the top of the short nub against a hard flat surface to fully seat the nub. On the front of the dial, use a sharpie or nail polish to color the top of one of the long marks to indicate the "zero" position. Again, it doesn't matter which one as we'll discover the combination later.



3. Insert the second **short** nub into one of the slots the top of the back disc, seating it firmly in place. Then insert the **long** nub into one of the slots in the middle disc and seat it firmly in place.



4. Stack up on the pin in the back: the back disc, the middle disc and then the dial. Place the latch over the little pivot nub on the back cover. As you rotate the dial, the nub on the back of the dial should hit the nub on the front of the middle disc and cause it to rotate, and eventually the protruding nub on the back side of the middle disc will hit the nub on the back disc, causing it to rotate as well. Note that none of the nubs should be rubbing against the face of the adjacent disc. If they do, file down the tops a little.



5. Now is when you determine what combination you have given yourself. Start by rotating the dial clockwise for at least 3 turns.

- Continue rotating the dial until the release notch on the back disc aligns with the pawl on the latch. Loosely place the front cover over the dial and record the dial position that aligns with the marker on the cover. This is the first digit of your combination.
- Remove the cover. Rotate the dial counter-clockwise one full revolution and then keep rotating until the release notch of the middle disc also lines up with the pawl on the latch. Again place the cover over the top and record the second number of the combination. (Note: as you rotate CCW, the back disc should not move. If it does, check for nubs rubbing on the face.)
- Remove the cover. Rotate the dial clockwise one last time until the release notch on the underside of the dial also lines up with the pawl. Record your third number.



6. Place the shackle in the assembly as shown. Now place the front cover over the top and press it into place. It should stay fairly well with just the press fit. Test your combination to make sure the lock works. If not, you'll need to use a knife blade to gently pry the cover off and see what's not working.

7. Working the combination:

- Rotate the dial at least 3 times clockwise, stopping at the first number of your combination.
- Rotate counterclockwise 1 full revolution back past the first number, and then stop at the second number of your combination.
- Rotate clockwise stopping at the first occurrence of your third number. (This will be less than 1 revolution.)
- Pull up on the shackle. If you've rotated the dial after opening the padlock, you can push it back closed with a little click. Make sure to give the dial a good spin after closing to make sure the combination has been cleared.

8. The cover press fit should be fairly tight, but if you want your padlock to be really secure (well, as secure as a tiny plastic padlock can be), add a few drops of superglue around the seam where the front joins the back.

And finally, a video posted by [Dr Operator](#) of the working padlock:

Model files



cardlayout-snap-fit.stl

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