3-in-1 Dock - A Microsoft Garage Project for Surface Pro 3

Version: 0.97
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Introduction

This intermediate-level maker project guide will help convert a Microsoft Surface Pro 3 Docking Station into a portrait VESA-mounted dock so you can use your tablet at eye-level next to regular desktop monitors. Turn your 2-in-1 mobile into a 3-in-1 ergonomic workstation!

Safety

Opening your Microsoft Surface Pro 3 Docking Station will void your warranty. You should take every precaution when opening any consumer electronics device. Though the main circuit board operates at 12 volts, you should be careful to keep metal bits and tools away to not short out anything. If you are not familiar with the safety aspects of working with electronics, do not attempt this maker project. Websites such as Ifixit have good safety guides for electronic teardowns and repairs. We recommend experienced makers refresh their knowledge with the latest safety guidelines before proceeding.

Table of Contents

Tools

- pliers
- end-cutters
- slot screwdriver
- #0 Philips screwdriver
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- 3mm hex wrench
- 2.5mm hex wrench
- Pentalobe screwdriver (optional)
- Dremel or similar rotary tool for trimming plastic
- 3D printer with at least 8”x6” bed and 3” z-height build volume
- CNC laser cutter (OR drill press and band saw similar tool for cutting acrylic sheets)
- utility knife
- sandpaper

Parts and Materials

Material	Quantity	Notes	Cost ($USD as of 06/2015)
Microsoft Surface Pro 3 Docking Station purchased from an Authorized Reseller	1	Prices vary, but the dock is currently available for $149.99 at Amazon.com	$150-$200
6mm (1/4”) acrylic board	8”x14”	Prices vary	$11
3mm (1/8”) acrylic board	8”x11”	Prices vary	$10
3D printing filament	as needed	Prices vary	$2
100mm x 100mm VESA mount	1	MonoPrice #5401 works great	$18+
¾” cabinet/mailbox cam lock	1	• 19mm (0.75”) x 16mm (0.625”) double-D hole • 38mm (1.5”) cam length • 16mm (0.625”) body length • Ace Hardware #55311 • Similar mul-t-lock part	$5-9
1/32” OD spring steel wire	2 25mm pieces	Available at various hobby stores	$1
epoxy adhesive	as needed		$2
M4 nuts	6	Use ISO - JIS nuts won’t work	$1.5
M4x12mm socket head cap screw	2	For VESA mount	$0.5
M4x16mm socket head cap screw	2	For VESA mount	$0.5
M4x30mm socket head cap screw	2	For attaching back plate to cradle	$1
M3x8mm socket head cap screw	5	For bottom plate	$1
M3x12mm socket head cap screw	19	Used in various locations	$4
M3x20mm socket head cap screw	2	For fastening the locking mechanism	$0.5
Total			**$208-$262**

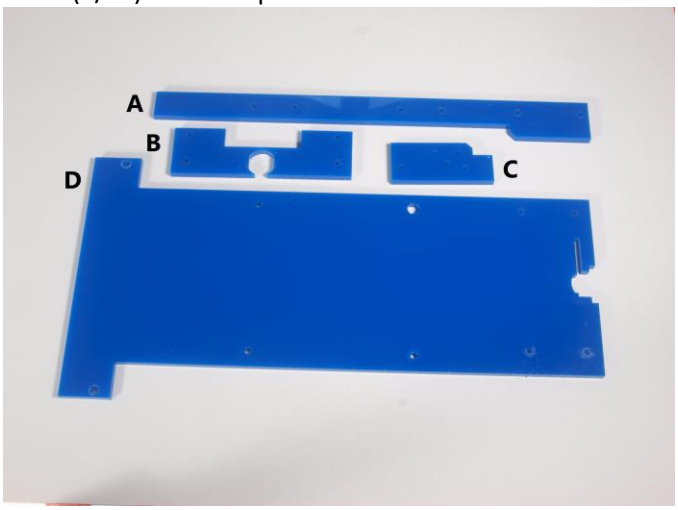
Build Guide

Laser Cutting

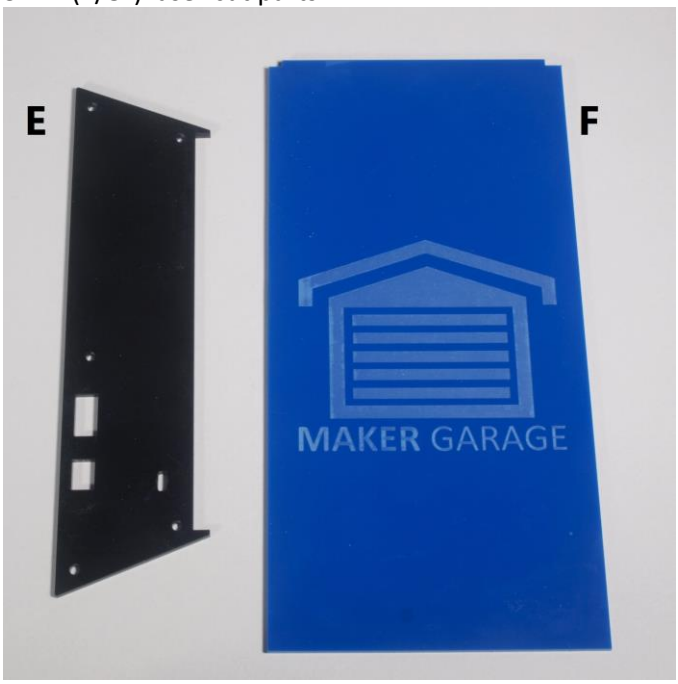
Laser cut the 6 parts according to the CAD files. A drill press and band saw or similar tool can be used as an alternative. We've included .dxf, .vsd, and .pdf versions of the cut files.

Part #	Cut Filename	Quantity	Part Description	Material
A	3-in-1-Dock_1-4 Inch-lasercut.dxf	1	Left plate	6mm (1/4") acrylic
B	3-in-1-Dock_1-4 Inch-lasercut.dxf	1	Lock plate	6mm (1/4") acrylic
C	3-in-1-Dock_1-4 Inch-lasercut.dxf	1	Right-upper plate	6mm (1/4") acrylic
D	3-in-1-Dock_1-4 Inch-lasercut.dxf	1	Back plate	6mm (1/4") acrylic
E	3-in-1-Dock_1-8 Inch-lasercut.dxf	1	Bottom Plate	3mm (1/8") acrylic
F	3-in-1-Dock_1-8 Inch-lasercut.dxf	1	Front Plate	3mm (1/8") acrylic

6mm (1/4") laser cut parts



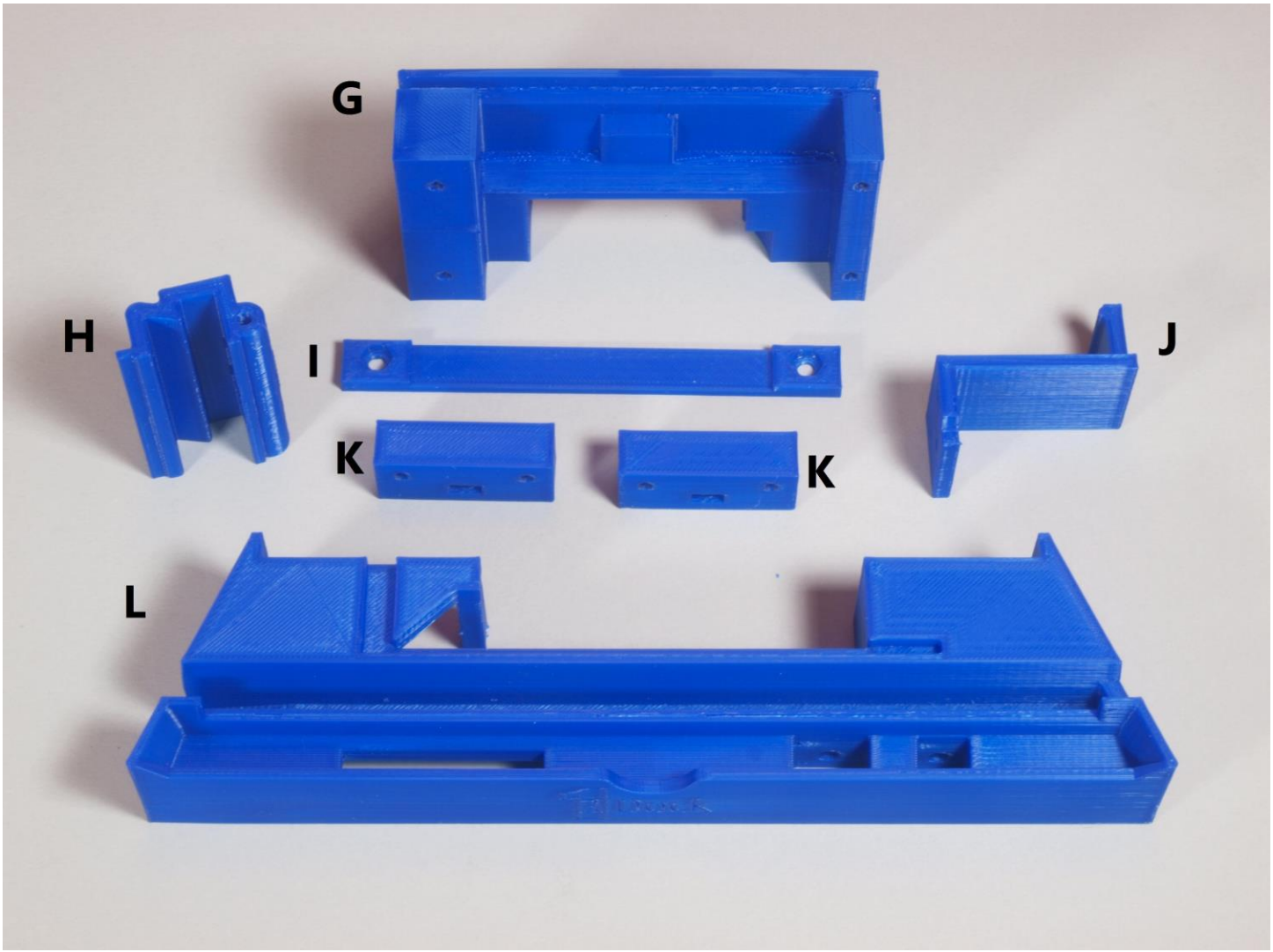
3mm (1/8") laser cut parts



3D Printing

Print the 7 parts according to the CAD files. Depending on the type of printer used a few edges may need to be cleaned up with a knife, sandpaper, or Dremel tool. Print time depends on the printer and infill options. We recommend 25%+ infill for durability. Printer should be well-tuned and used with 200 micron layer height or smaller for best results.

Part #	Print Filename	Quantity	Part Description
G	Cap.STL	1	Top cap holds locking mechanism
H	Flip_Lock.STL	1	Retainer flips down to lock tablet in place
I	Nut_Plate.STL	1	Holds captured nuts
J	Support Arm.STL	1	Support tablet in landscape orientation (optional)
K	Nut Block.STL	2	Holds captured nuts
L	Cradle.STL	1	Cradles the tablet and holds 40-pin connector



Landscape Dock disassembly

Test your Microsoft Surface Pro 3 Docking Station to make sure it works.

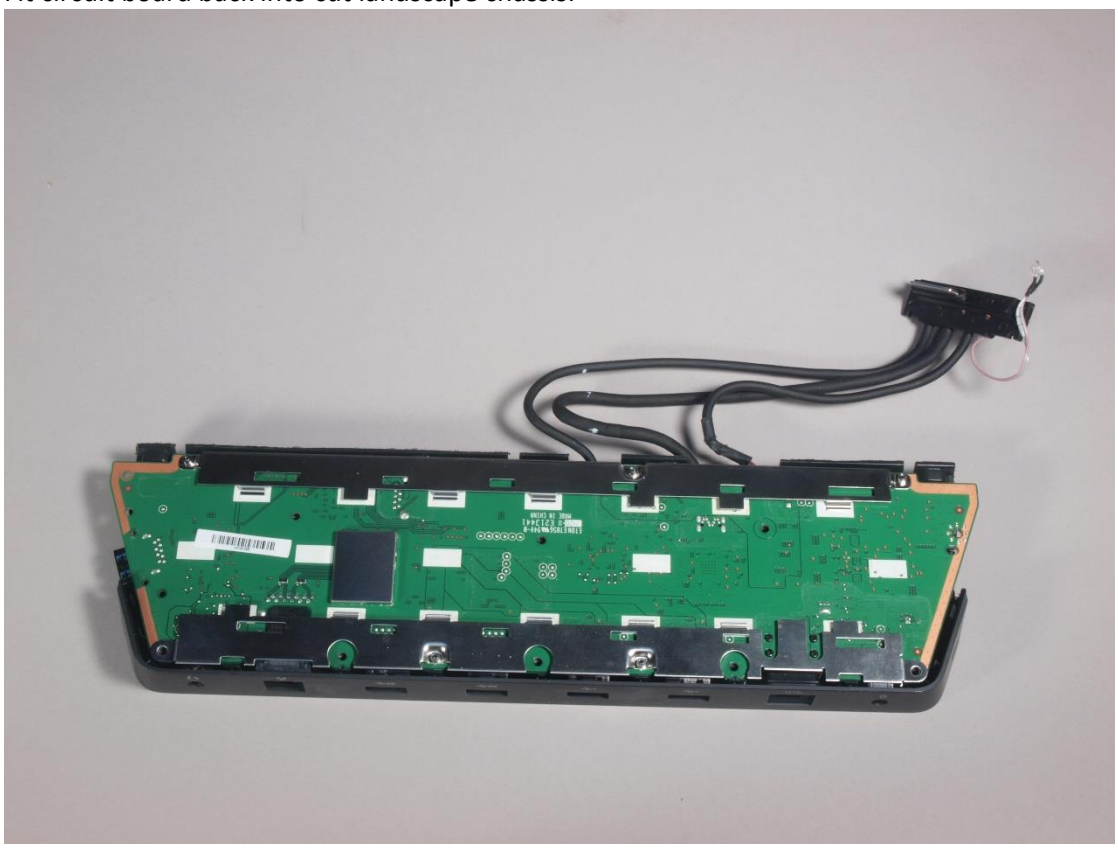
Disassemble docking station according to the guide. **Reminder: disassembly will void your warranty.**

Remove circuit board and trim chassis along the red lines with a Dremel or similar tool. **Do not use the Dremel tool on the chassis with the circuit board inside as you could slip and damage the board.**

It may be easier to cut from the other side.

Ensure 40-pin connector harness is plugged into the circuit board at all locations:USB, DispayPort, power.

Fit circuit board back into cut landscape chassis.

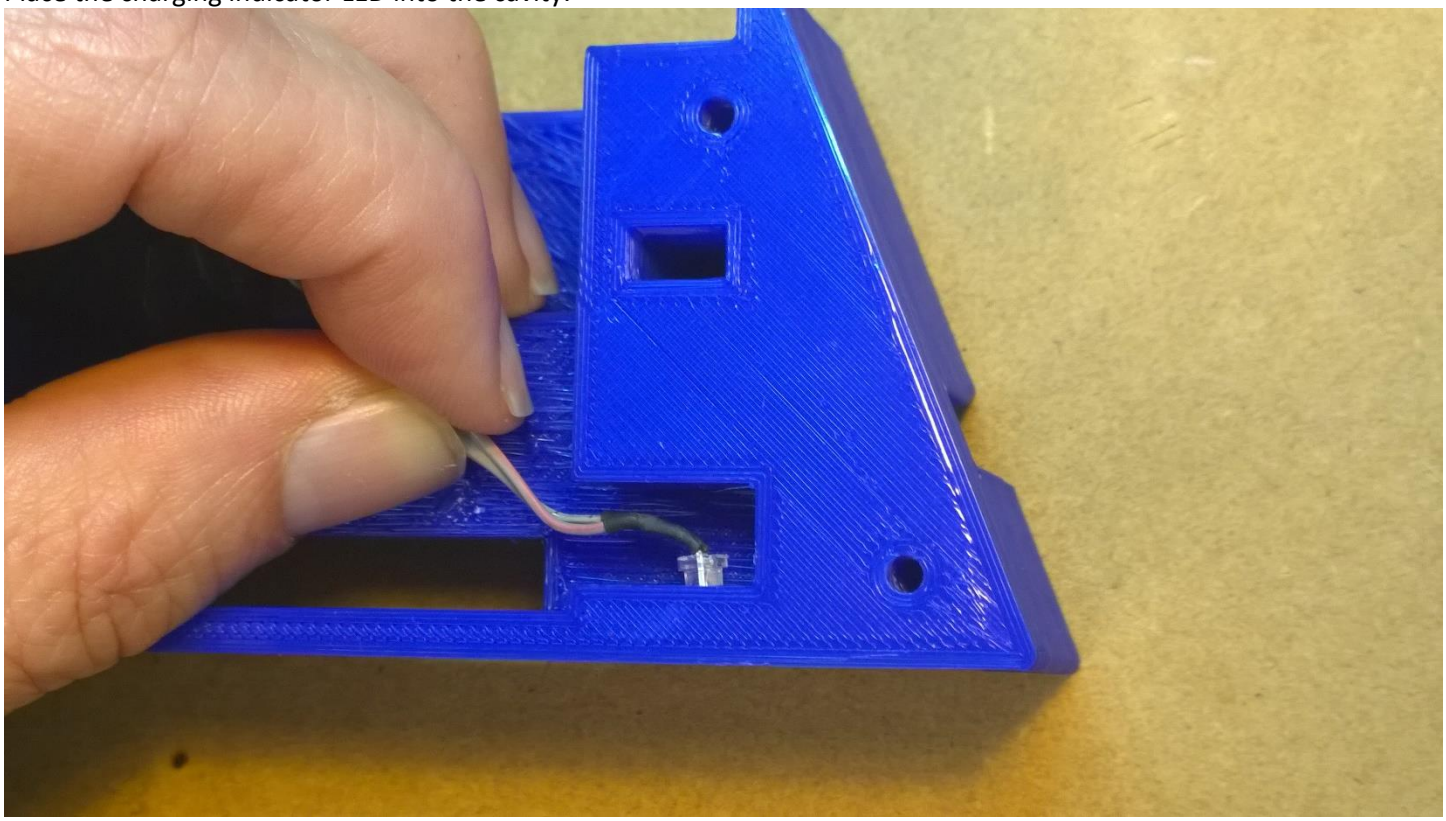


Fasten circuit board to chassis with original screws - refer to landscape dock teardown guide.

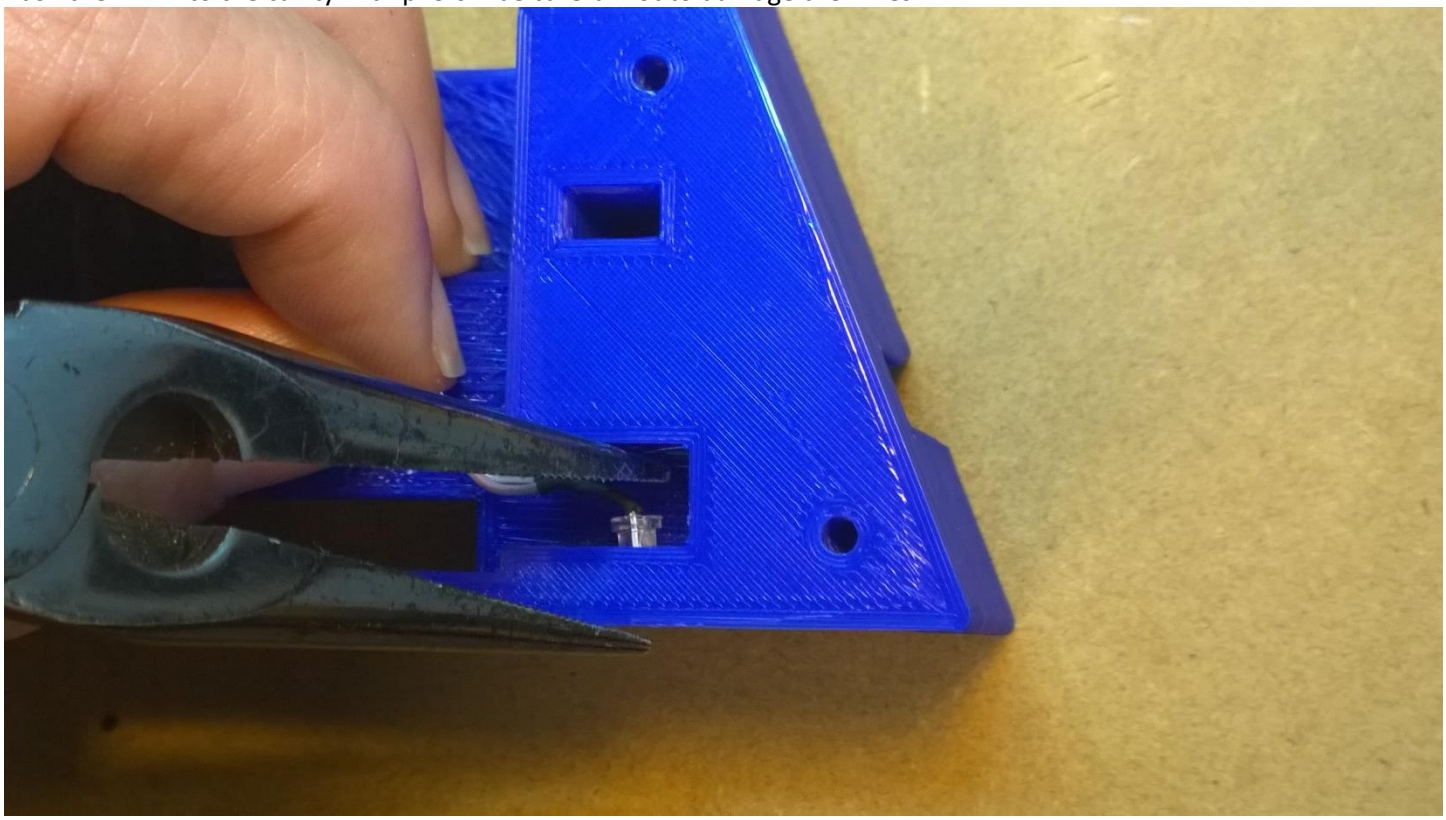
Assembly

Seat 40-pin connector and charging indicator LED

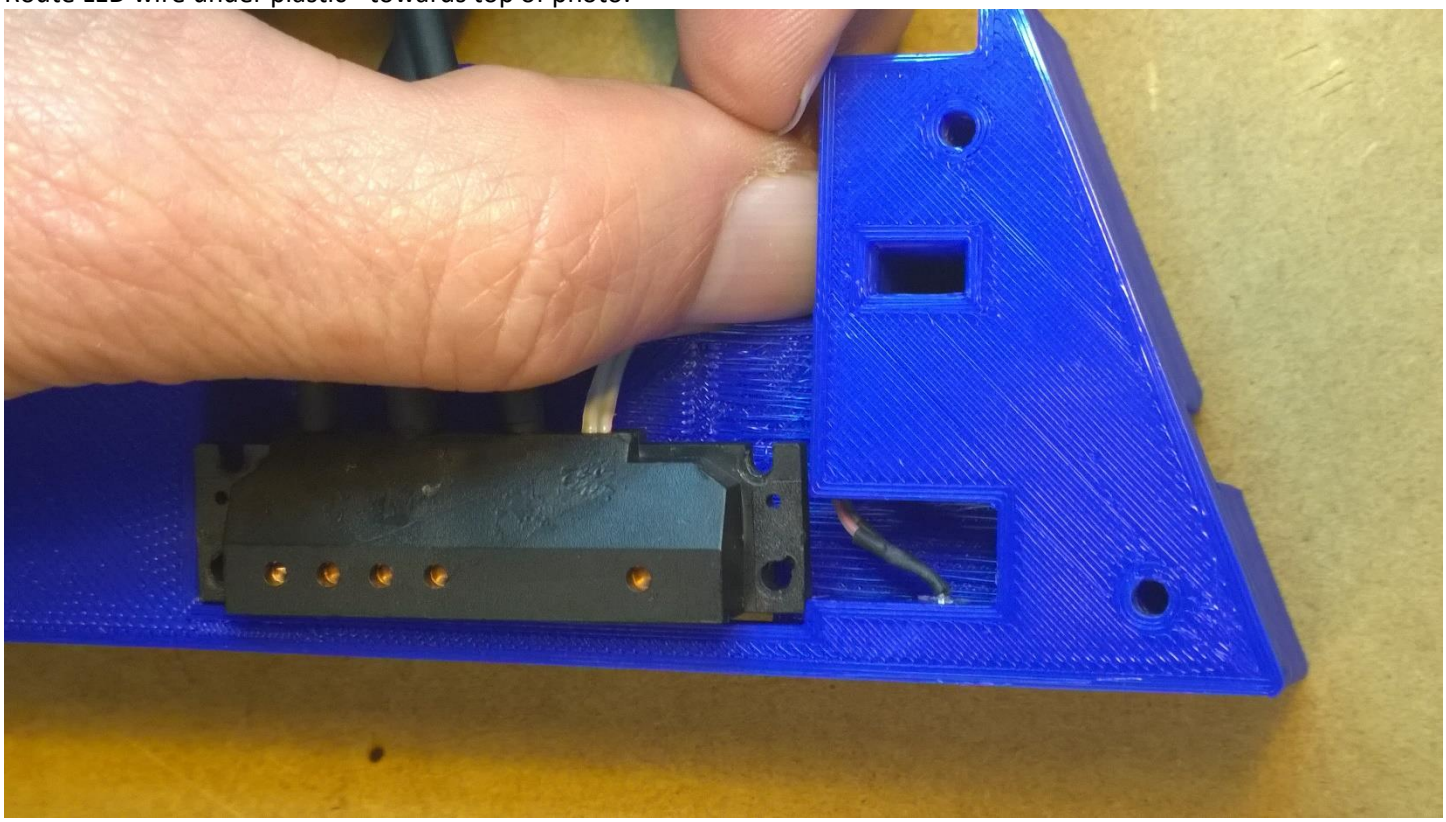
Place the charging indicator LED into the cavity.



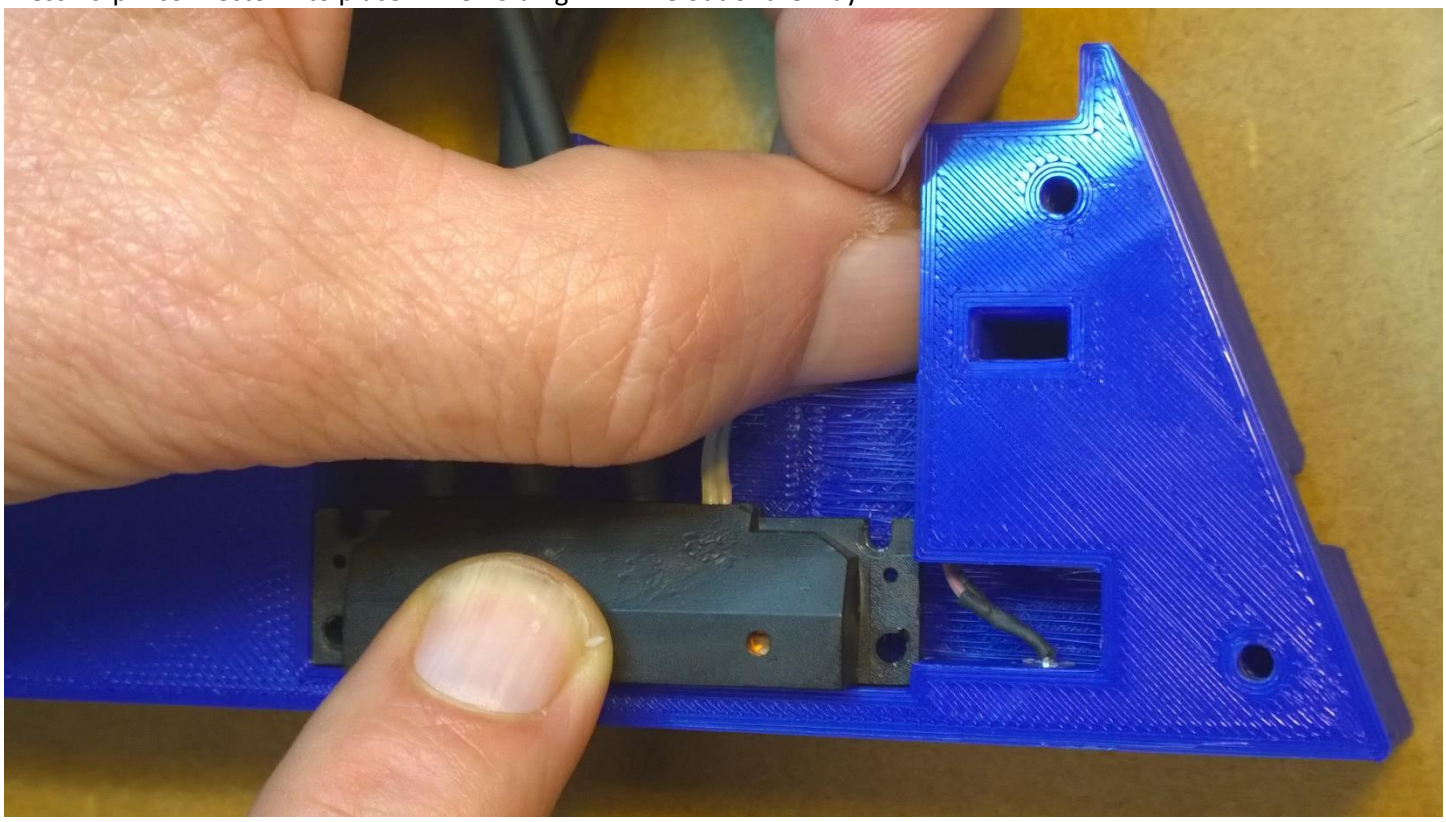
Push the LED into the cavity with pliers – be careful not to damage the wires.



Route LED wire under plastic - towards top of photo.

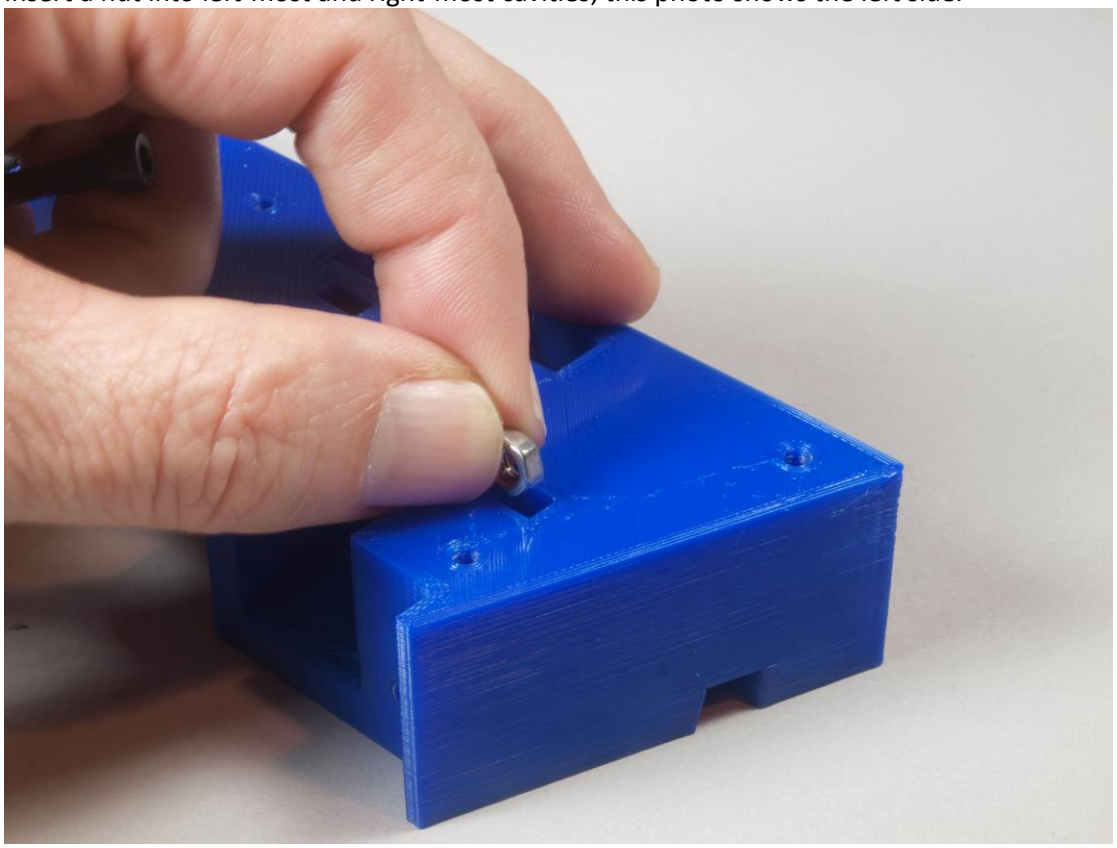


Press 40-pin connector into place while holding LED wire out of the way.

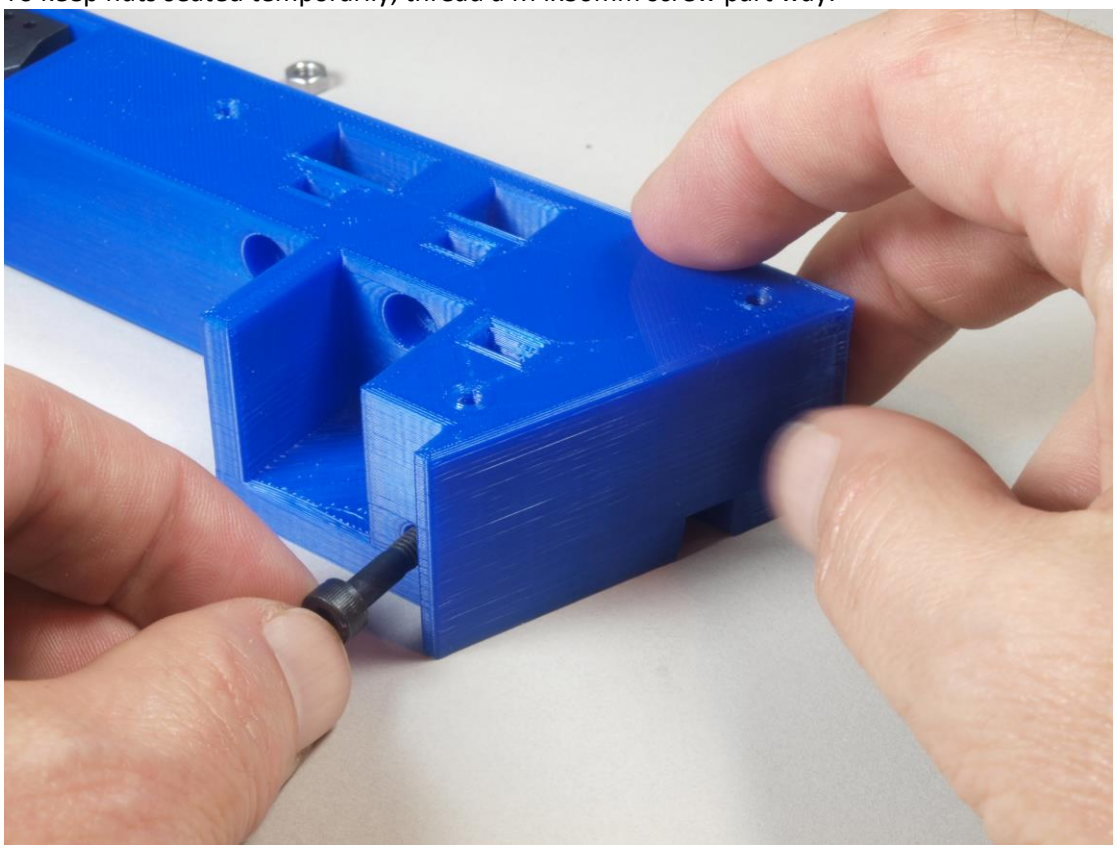


Assemble Cradle

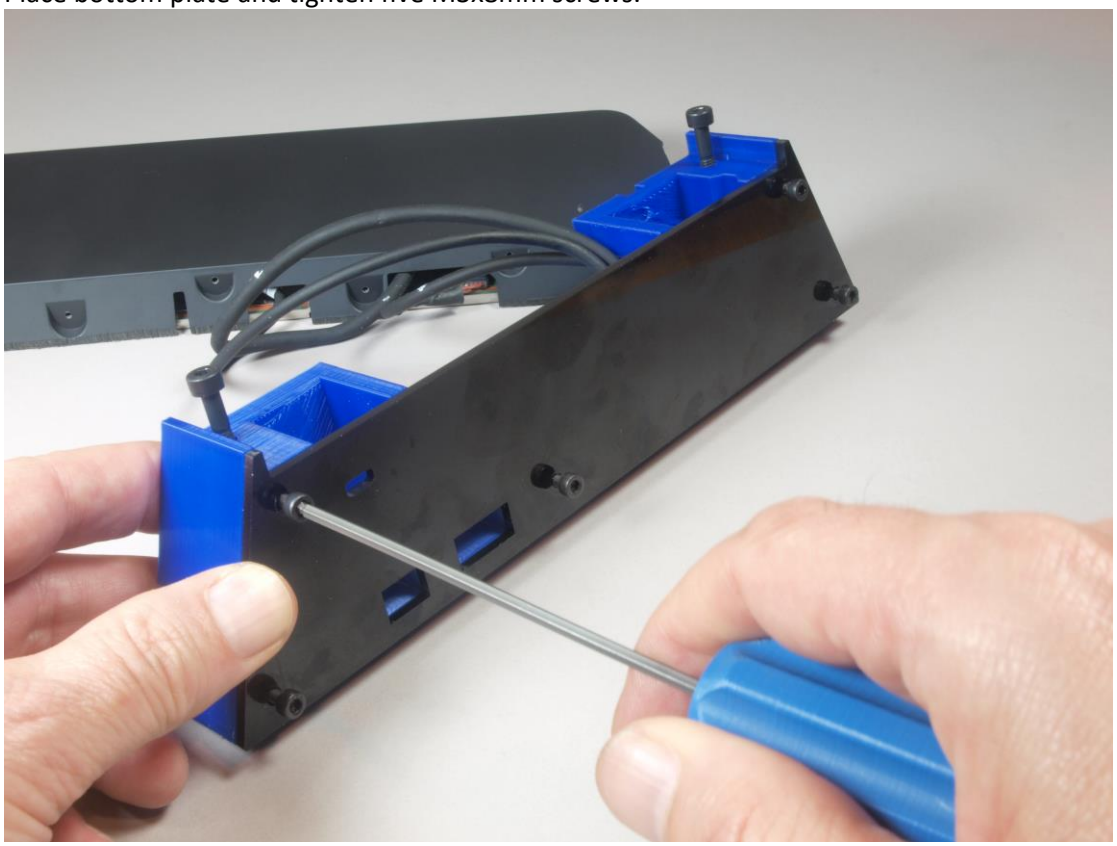
Insert a nut into left-most and right-most cavities; this photo shows the left side.



To keep nuts seated temporarily, thread a M4x30mm screw part way.



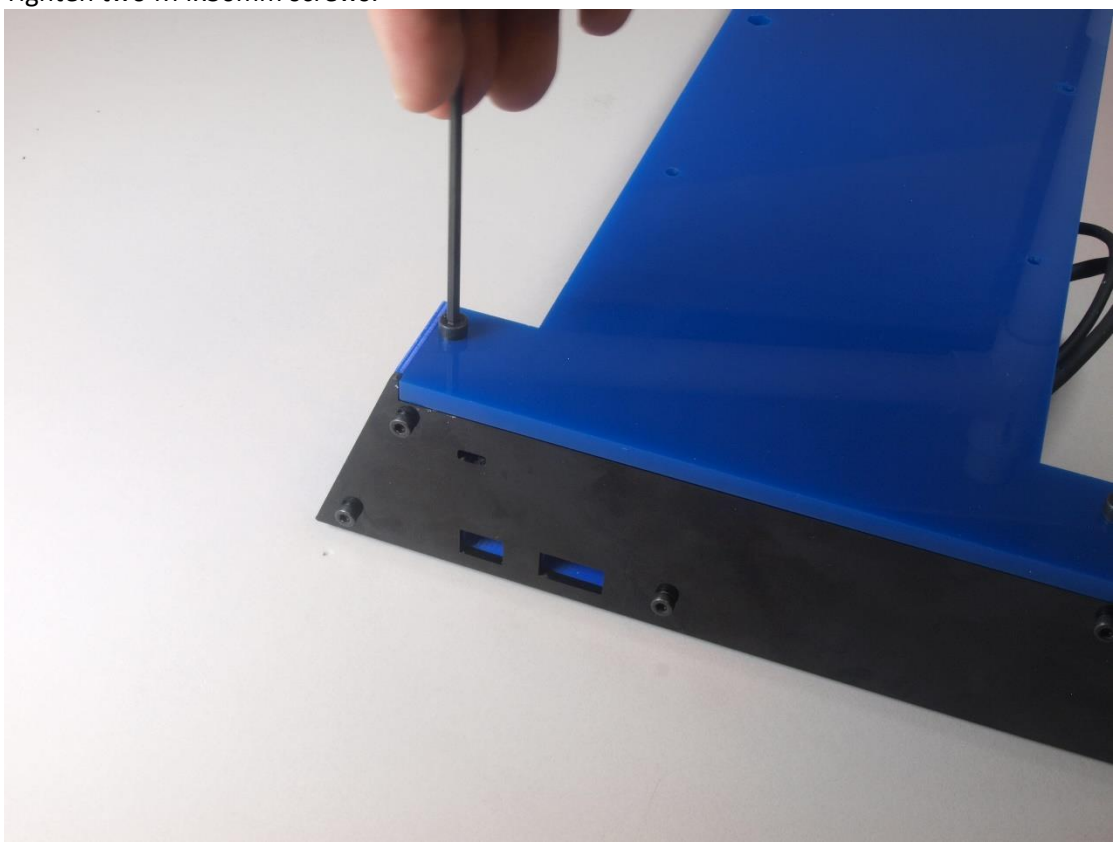
Place bottom plate and tighten five M3x8mm screws.



Wedge the circuit board in place, remove the two M4x30mm screws that were temporarily holding the captured nuts and slide back plate into place.

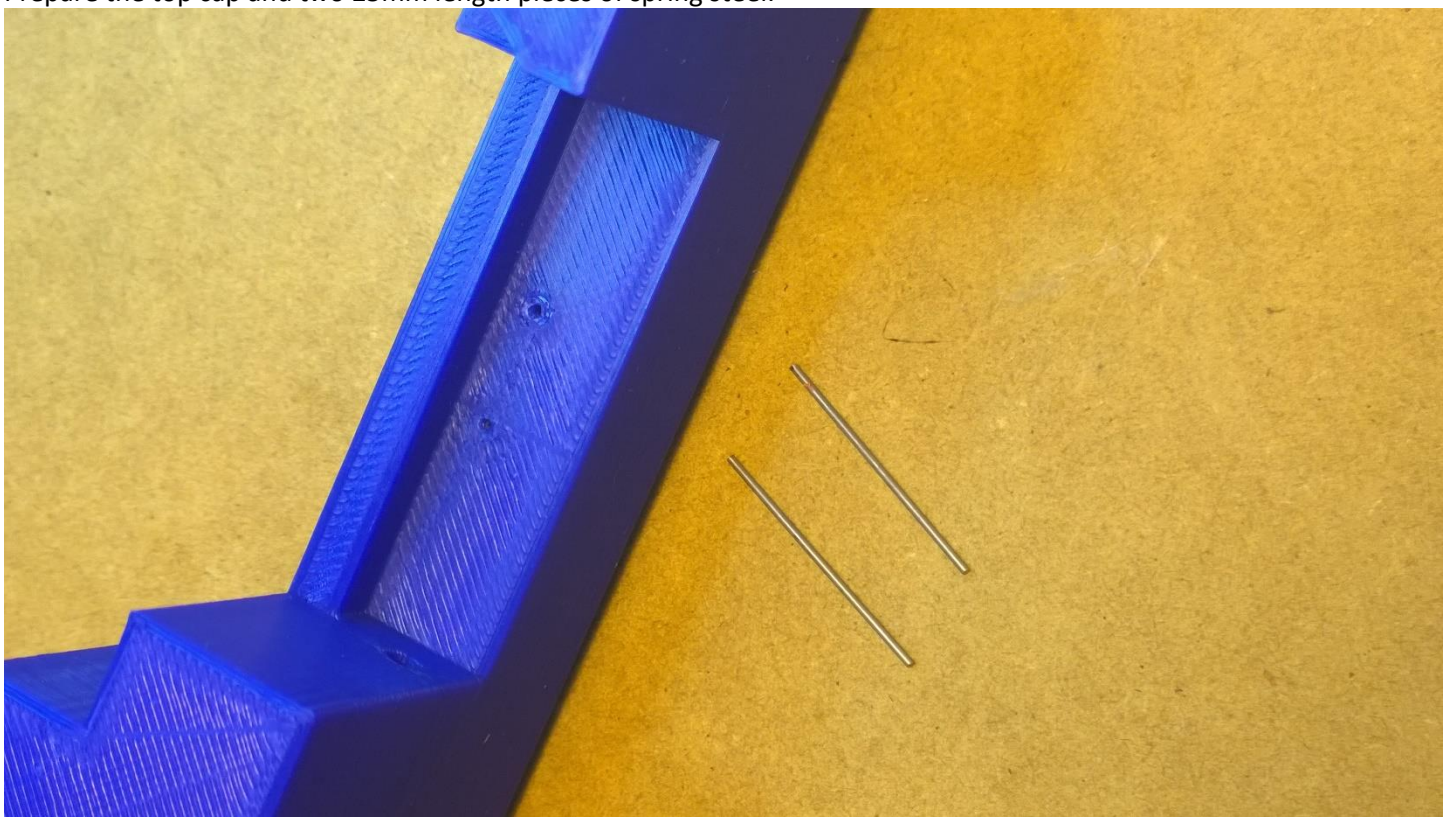
Replace two M4x30mm screws.

Tighten two M4x30mm screws.

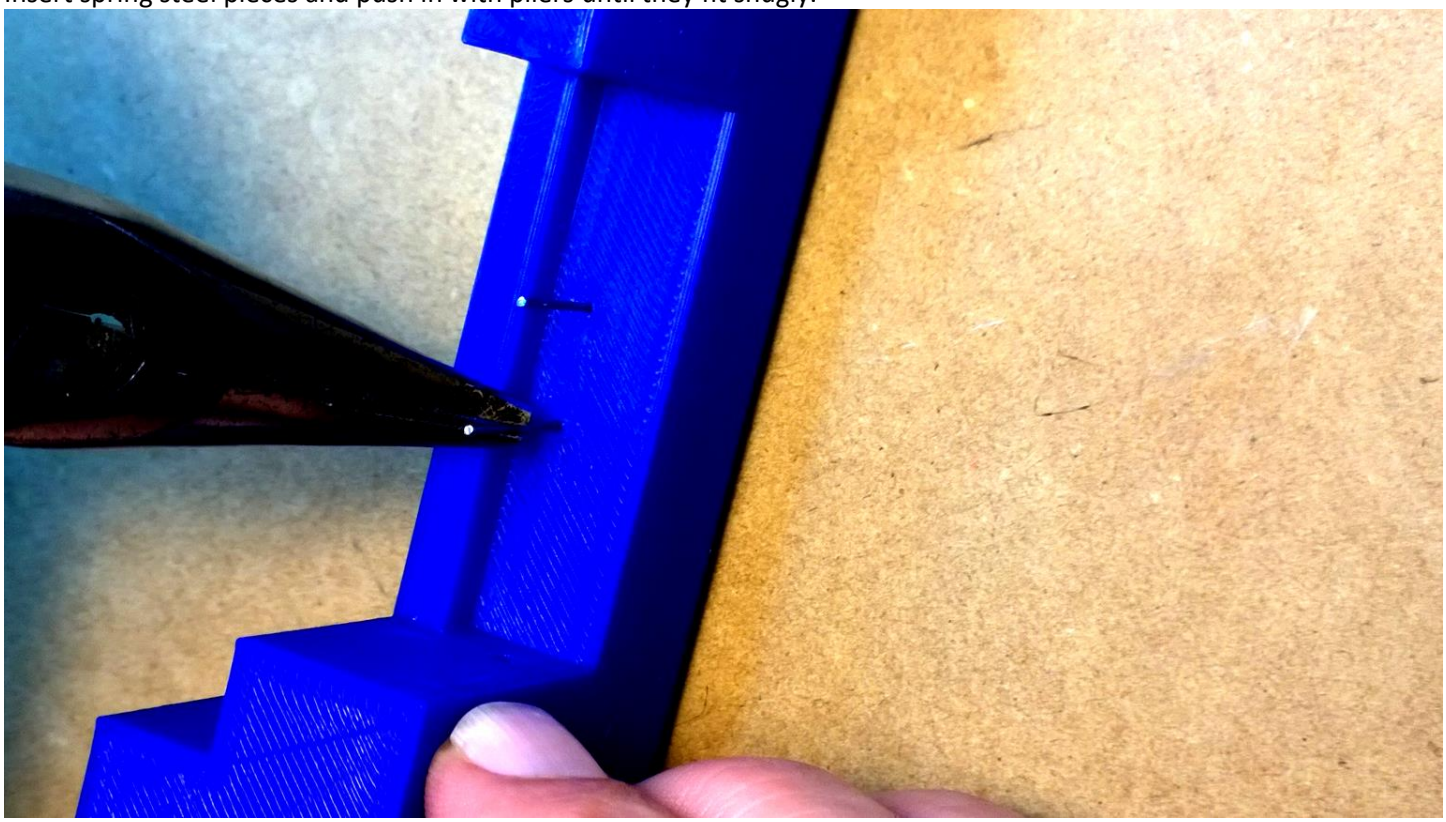


Assemble Cap and Flip Lock

Prepare the top cap and two 25mm length pieces of spring steel.

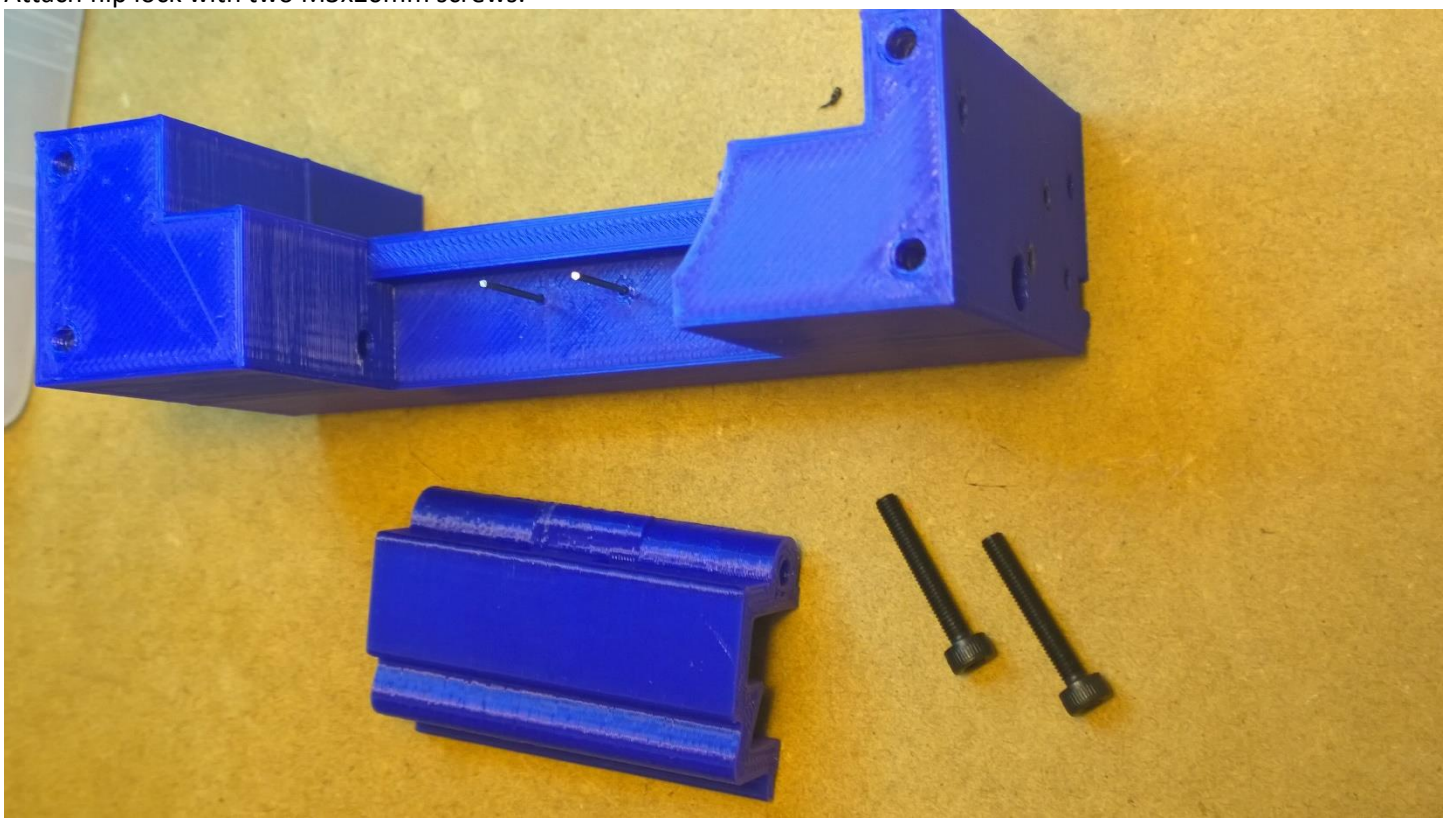


Insert spring steel pieces and push in with pliers until they fit snugly.

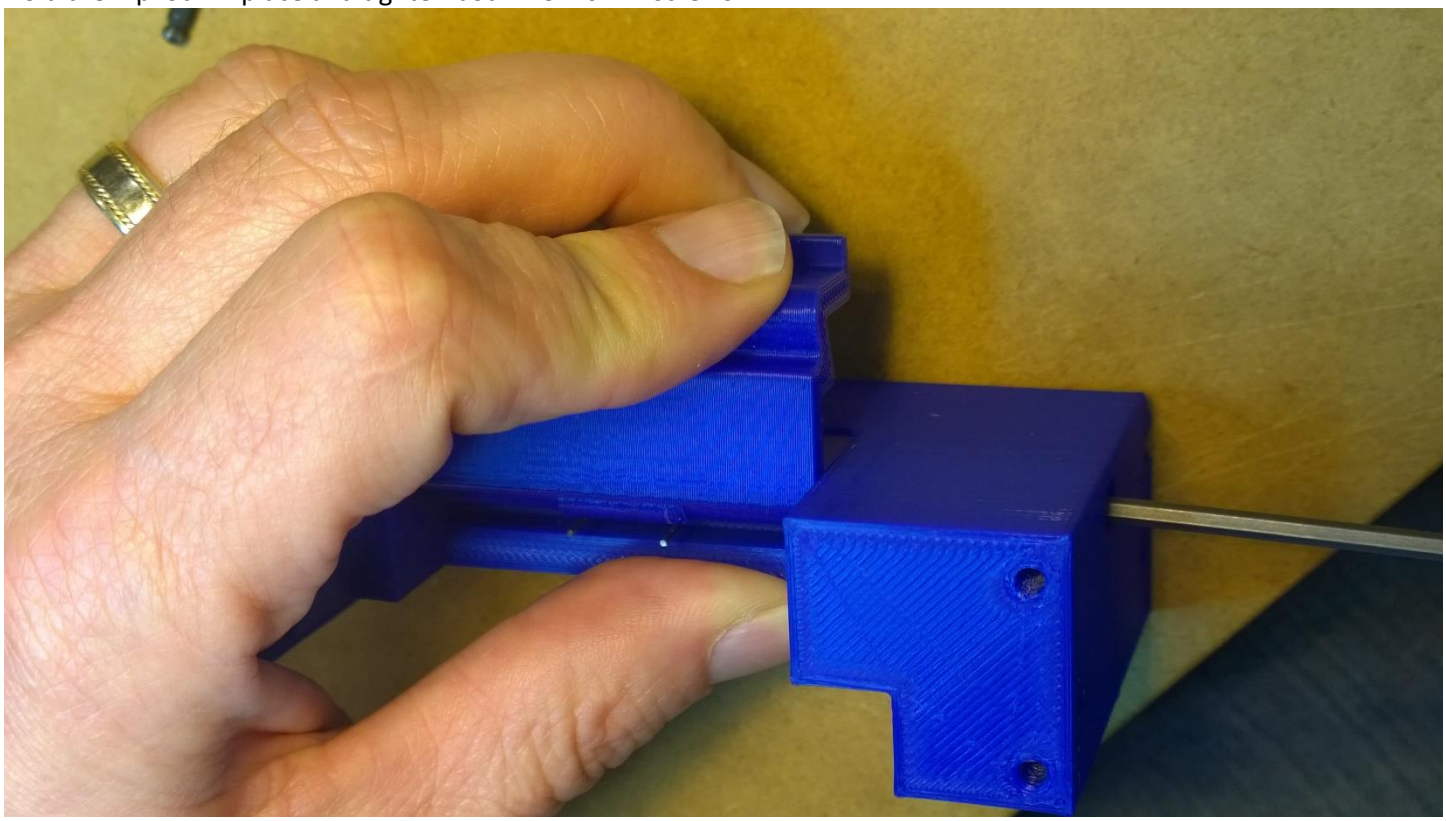


If the spring steel pieces do not fit snugly, remove and apply a dab of epoxy or other adhesive to the end and push them in with pliers again.

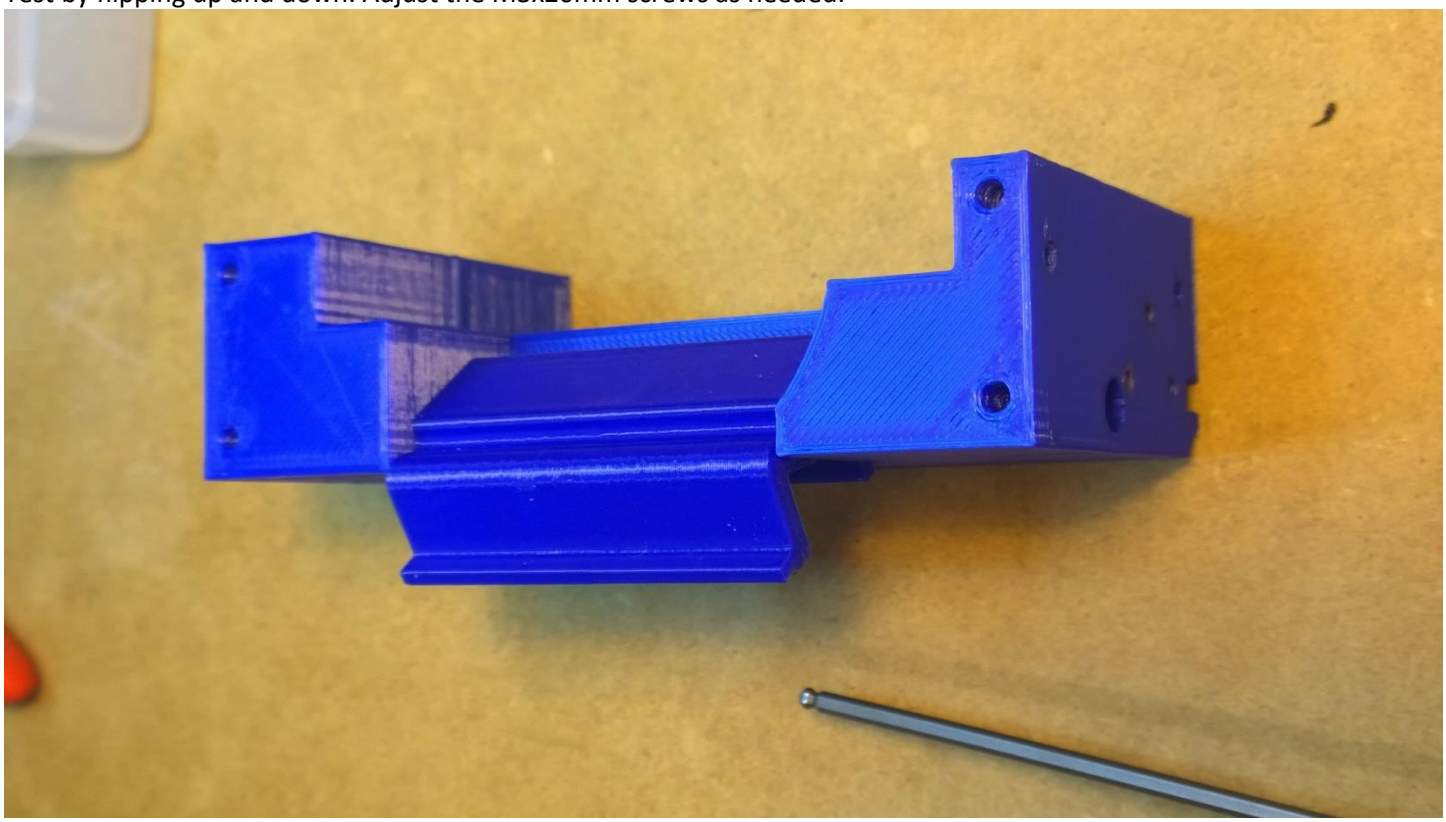
Attach flip lock with two M3x20mm screws.



Hold the flip lock in place and tighten both M3x20mm screws.

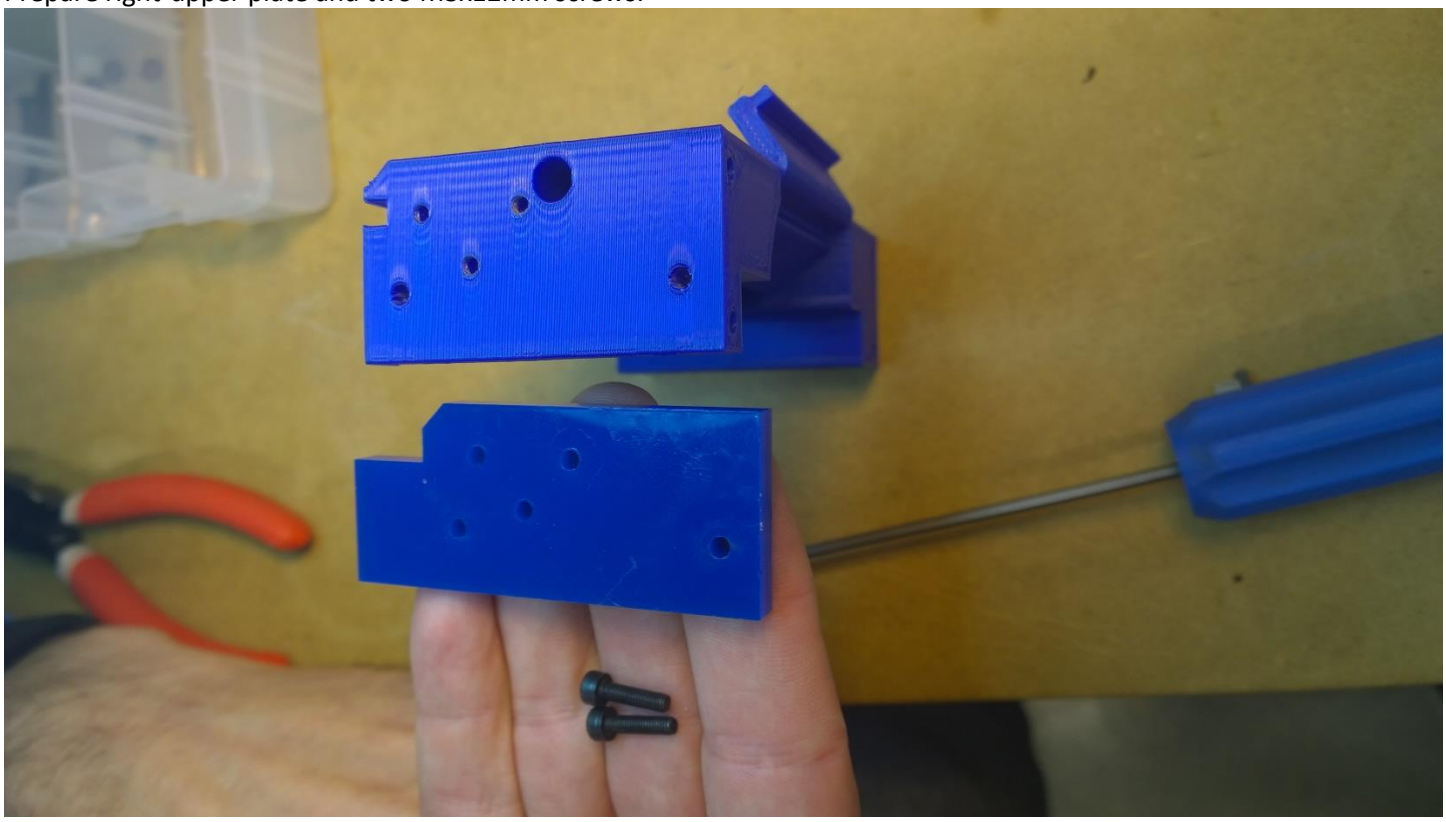


Test by flipping up and down. Adjust the M3x20mm screws as needed.

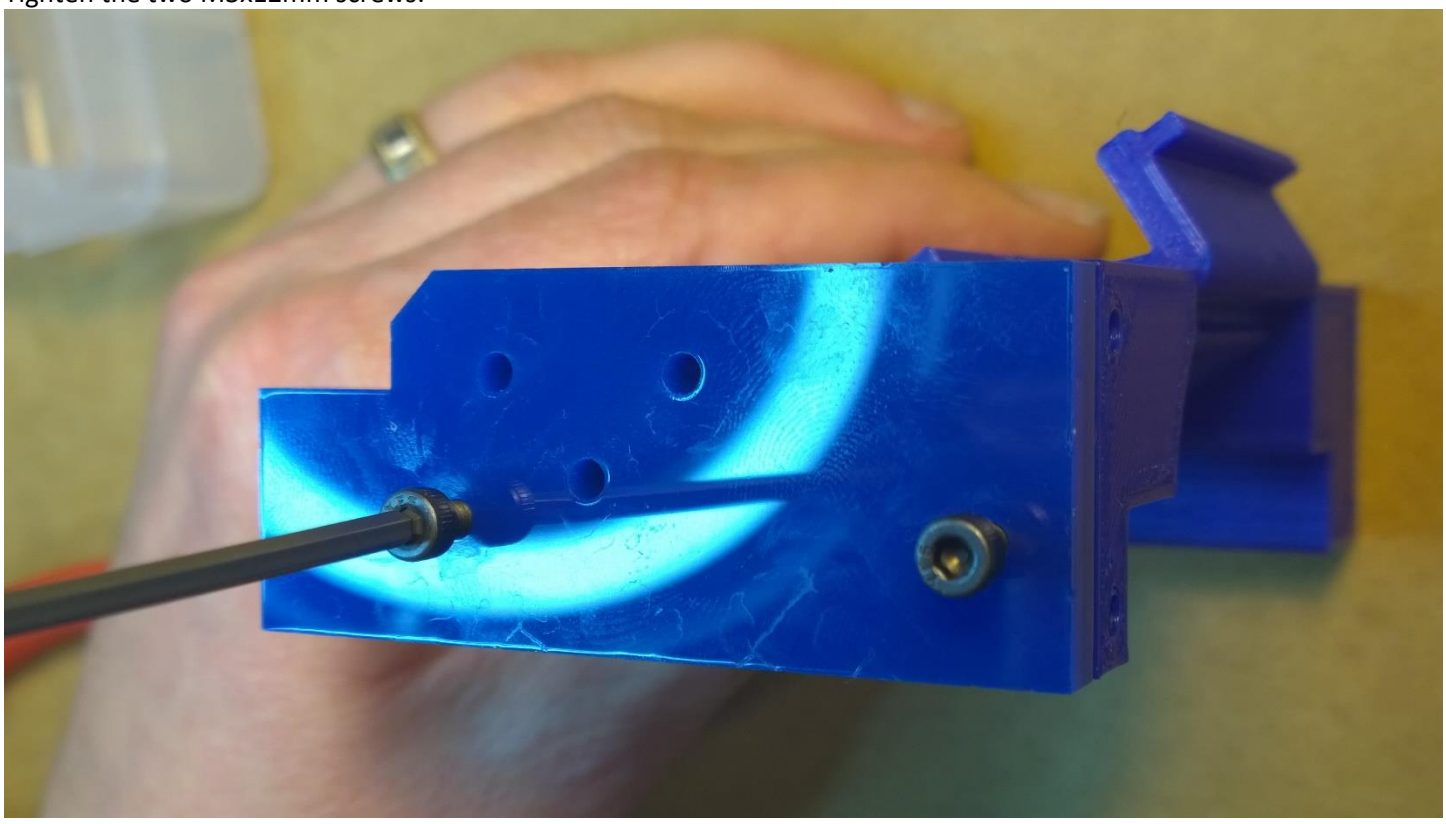


Attach Right-upper Plate

Prepare right-upper plate and two M3x12mm screws.

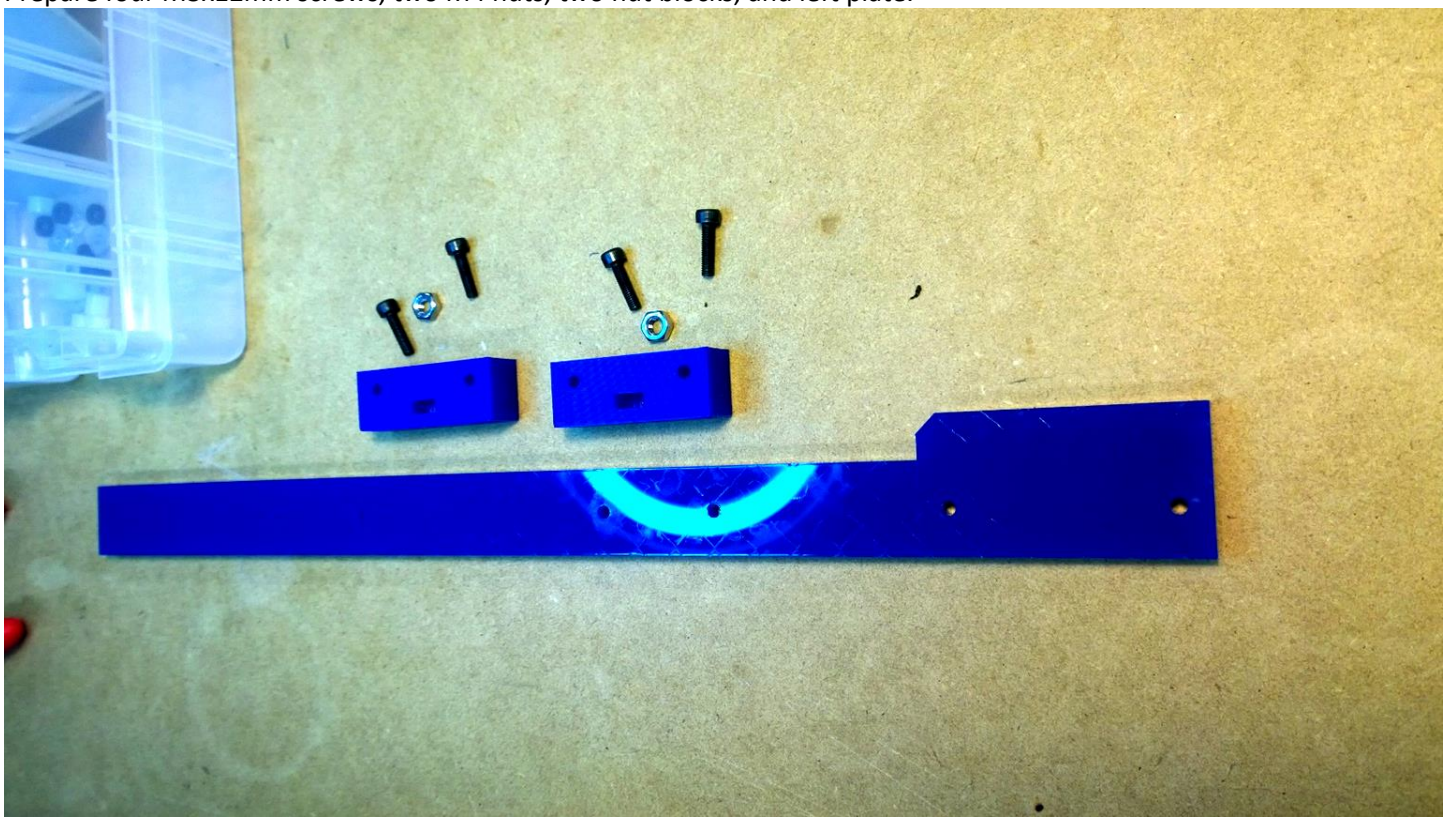


Tighten the two M3x12mm screws.

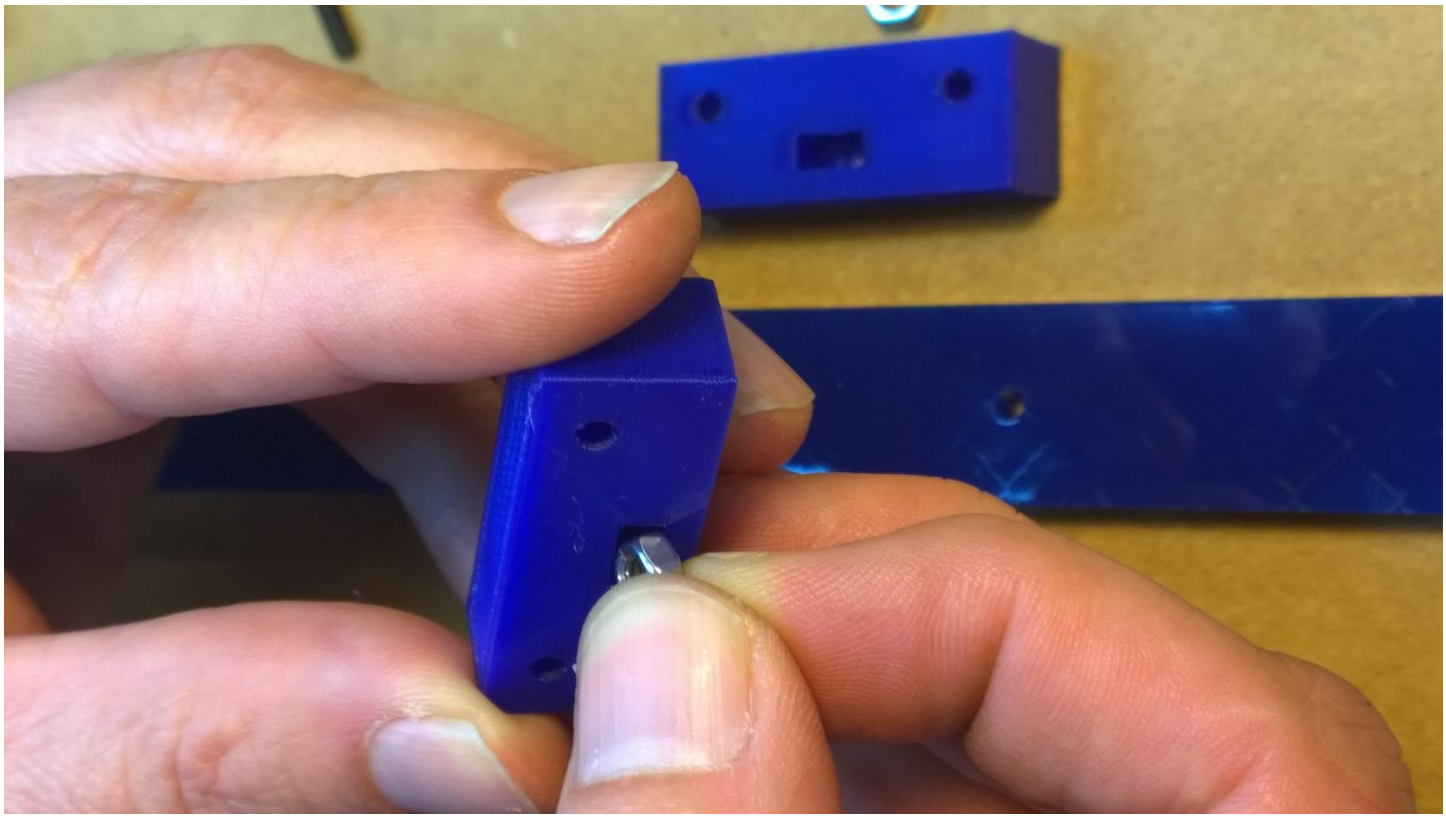


Attach Nut Blocks to Left Plate

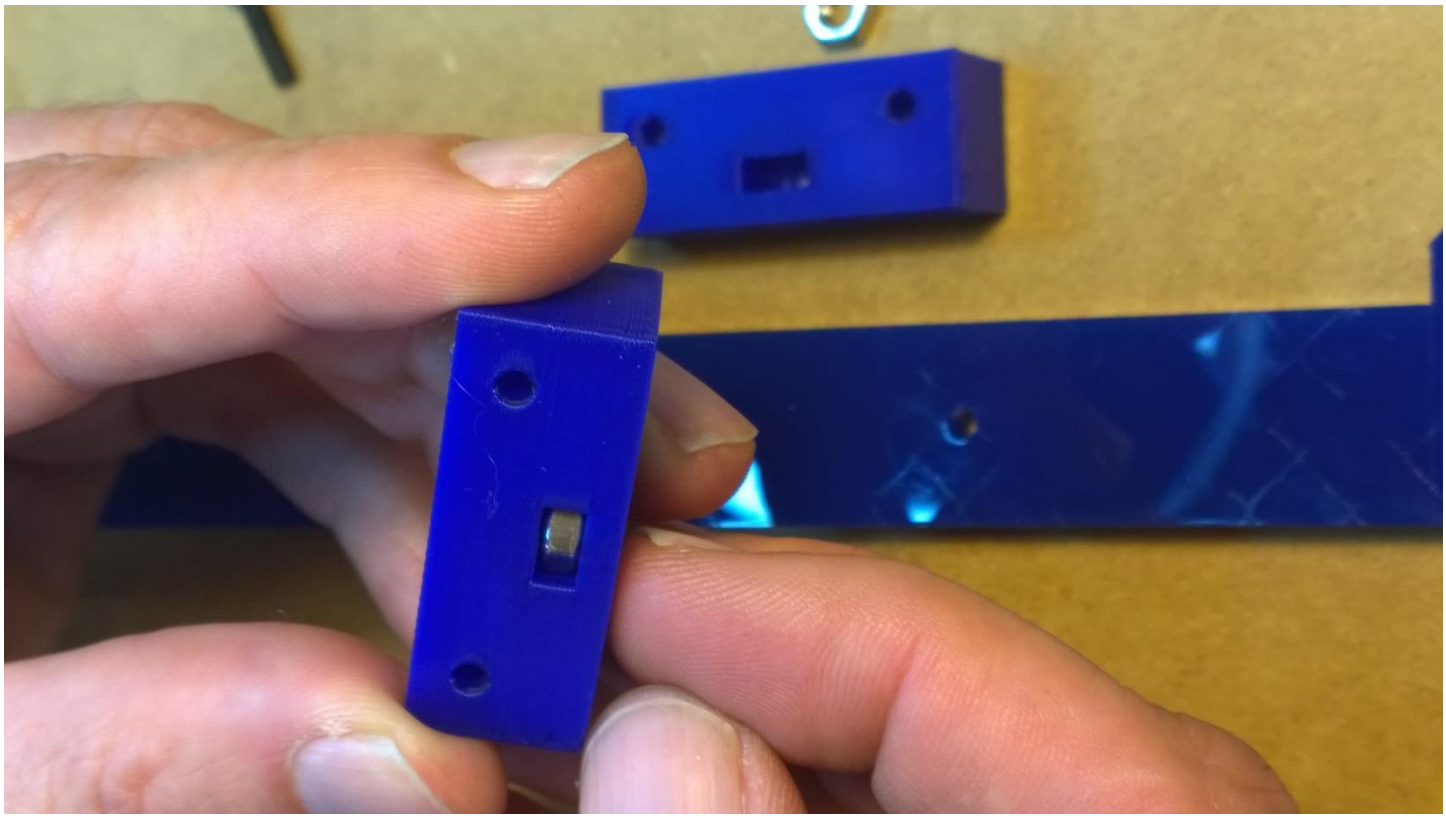
Prepare four M3x12mm screws, two M4 nuts, two nut blocks, and left plate.



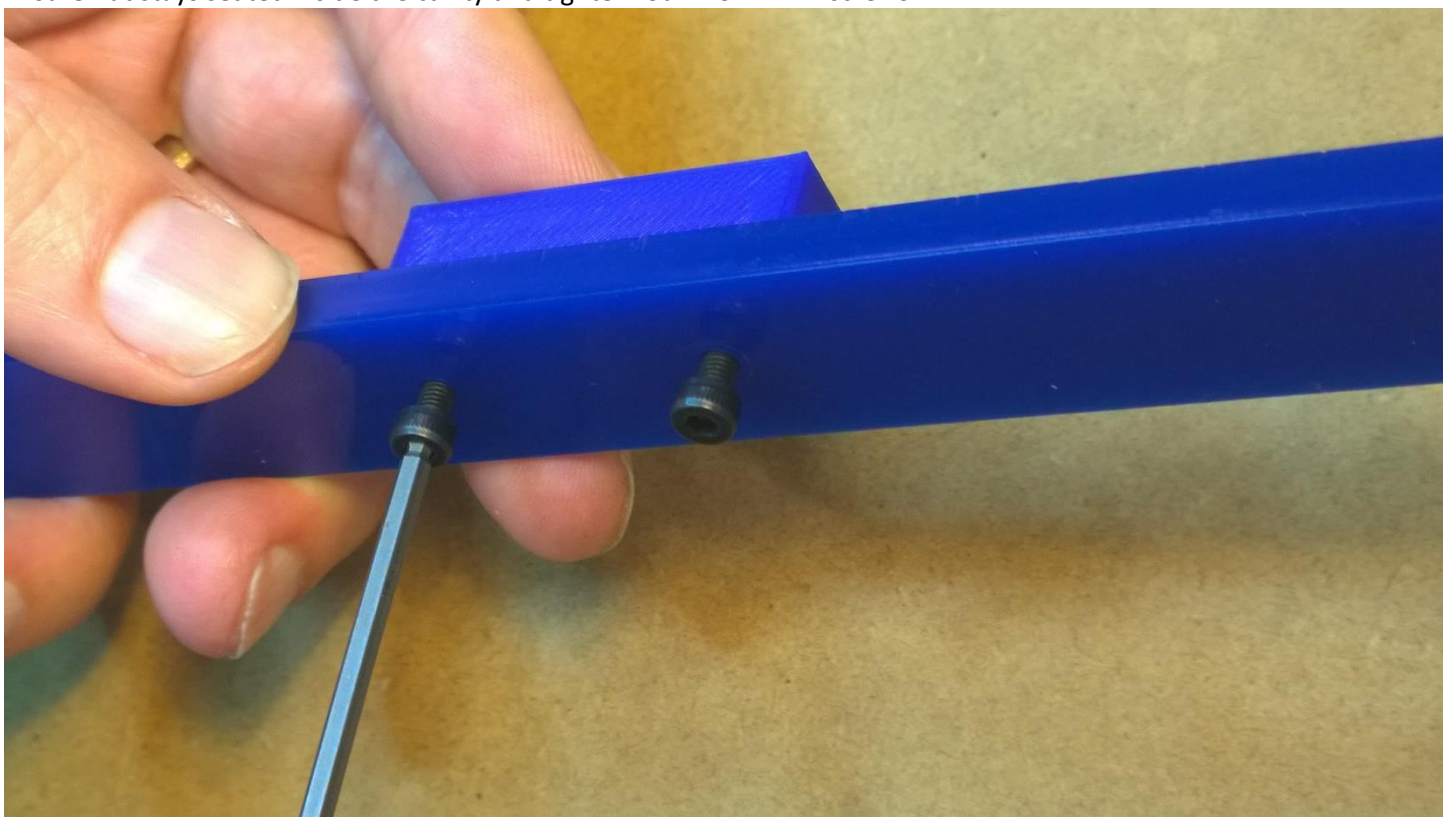
Insert M4 nuts into cavities.



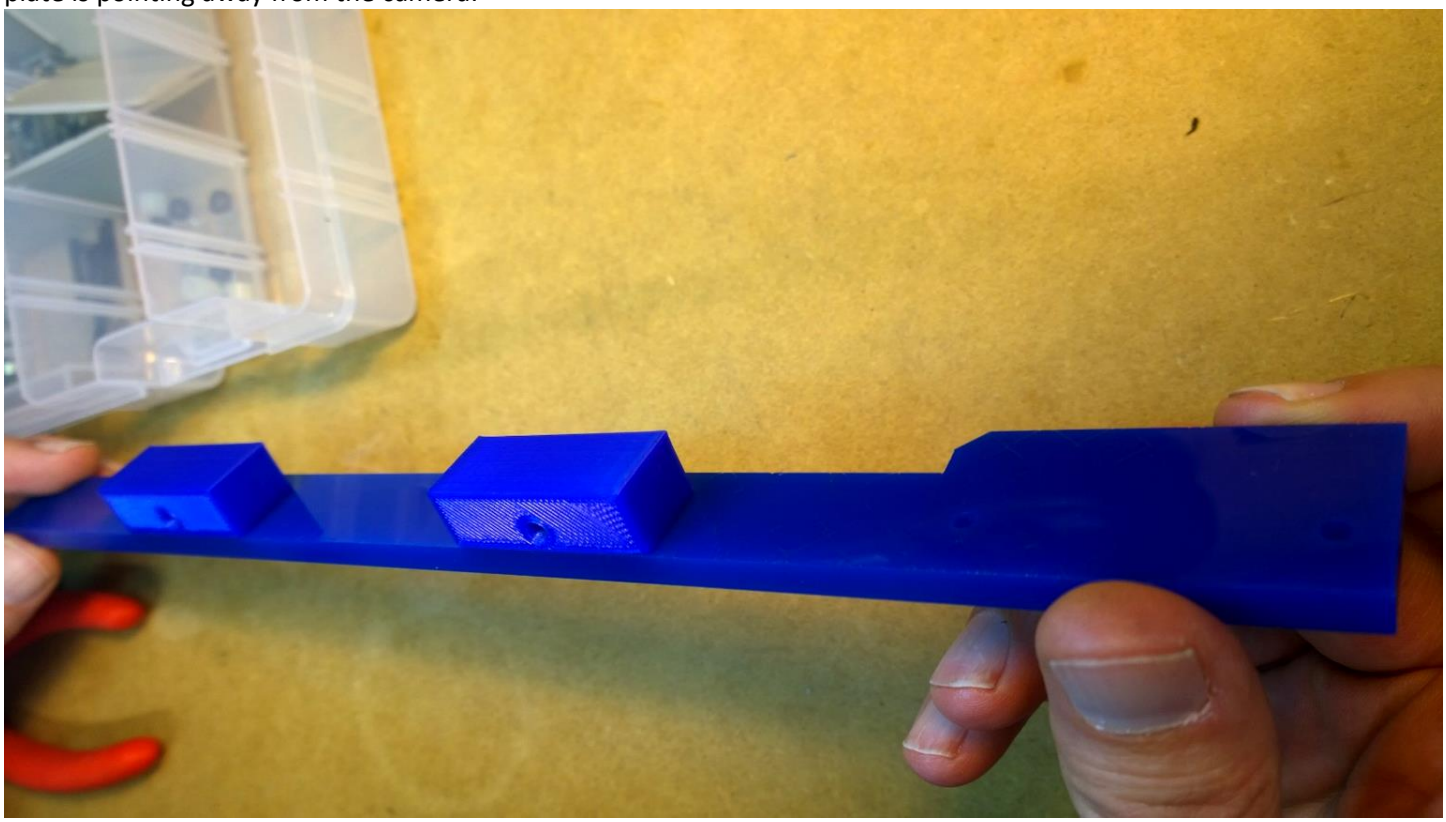
Nut seated.



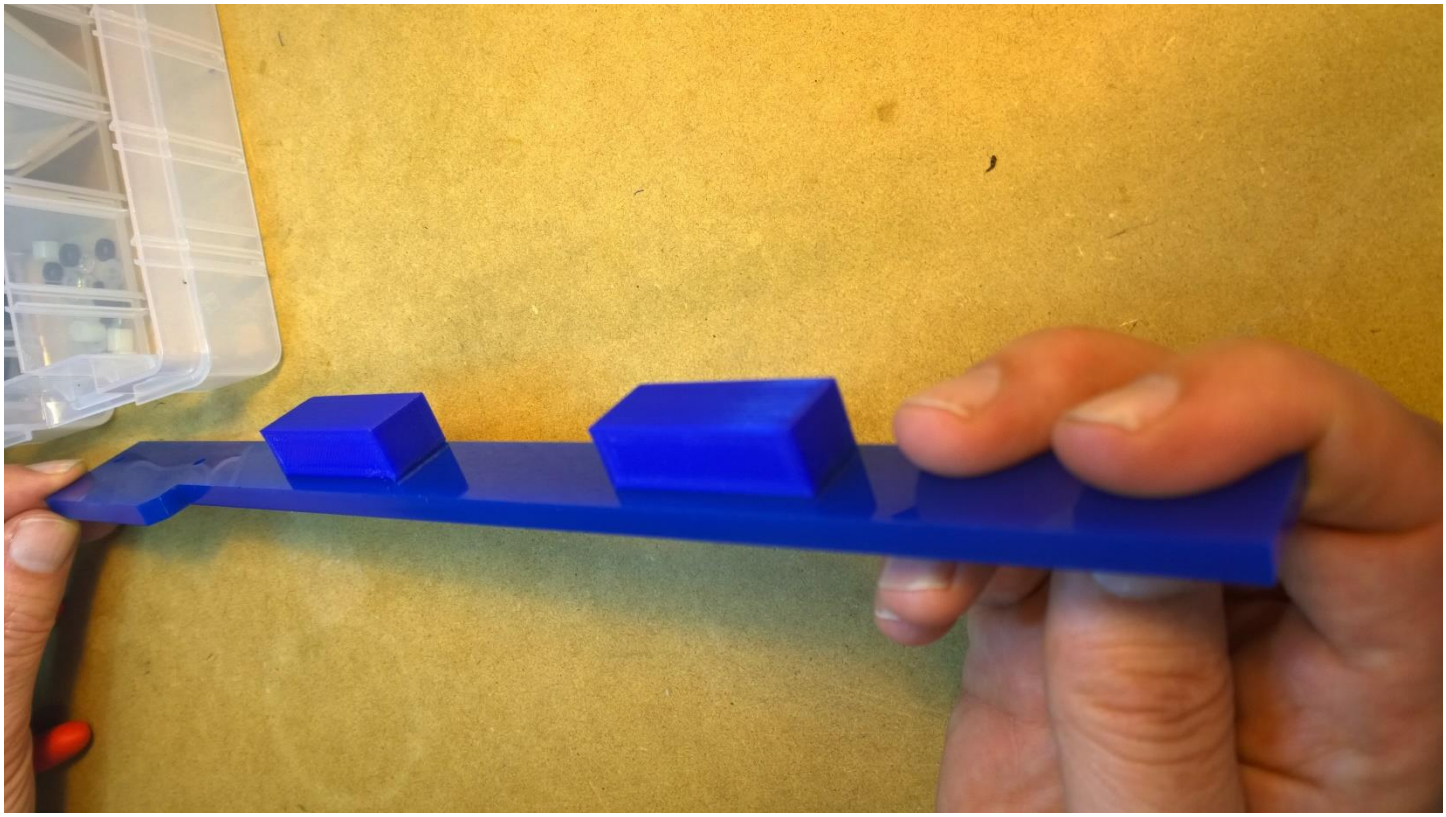
Ensure nut stays seated inside the cavity and tighten four M3x12mm screws.



Mind the orientation of the nut blocks - note the holes are pointing toward the camera and the wider part of the left plate is pointing away from the camera.



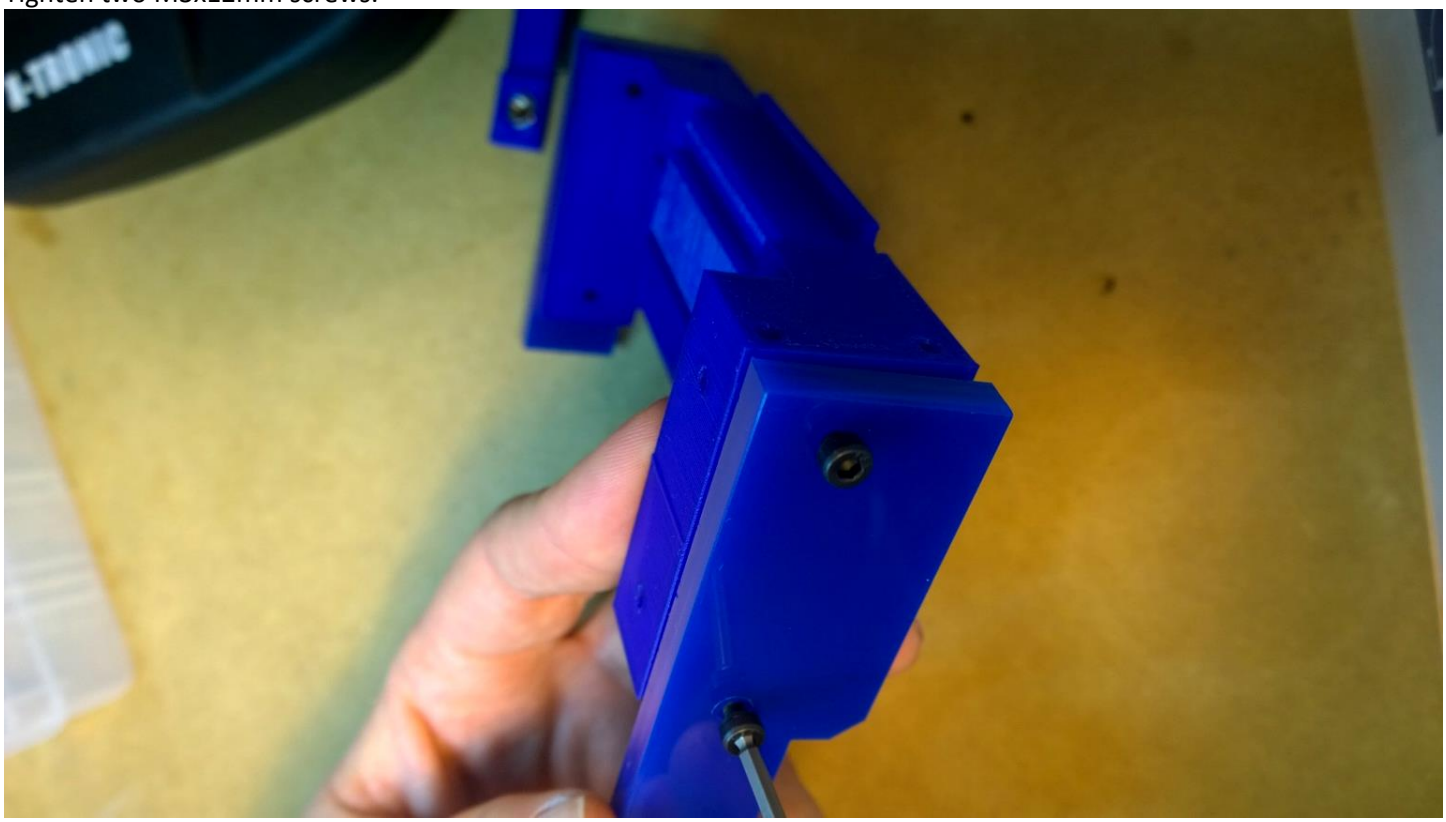
Reverse view – note the nut block holes are not visible.



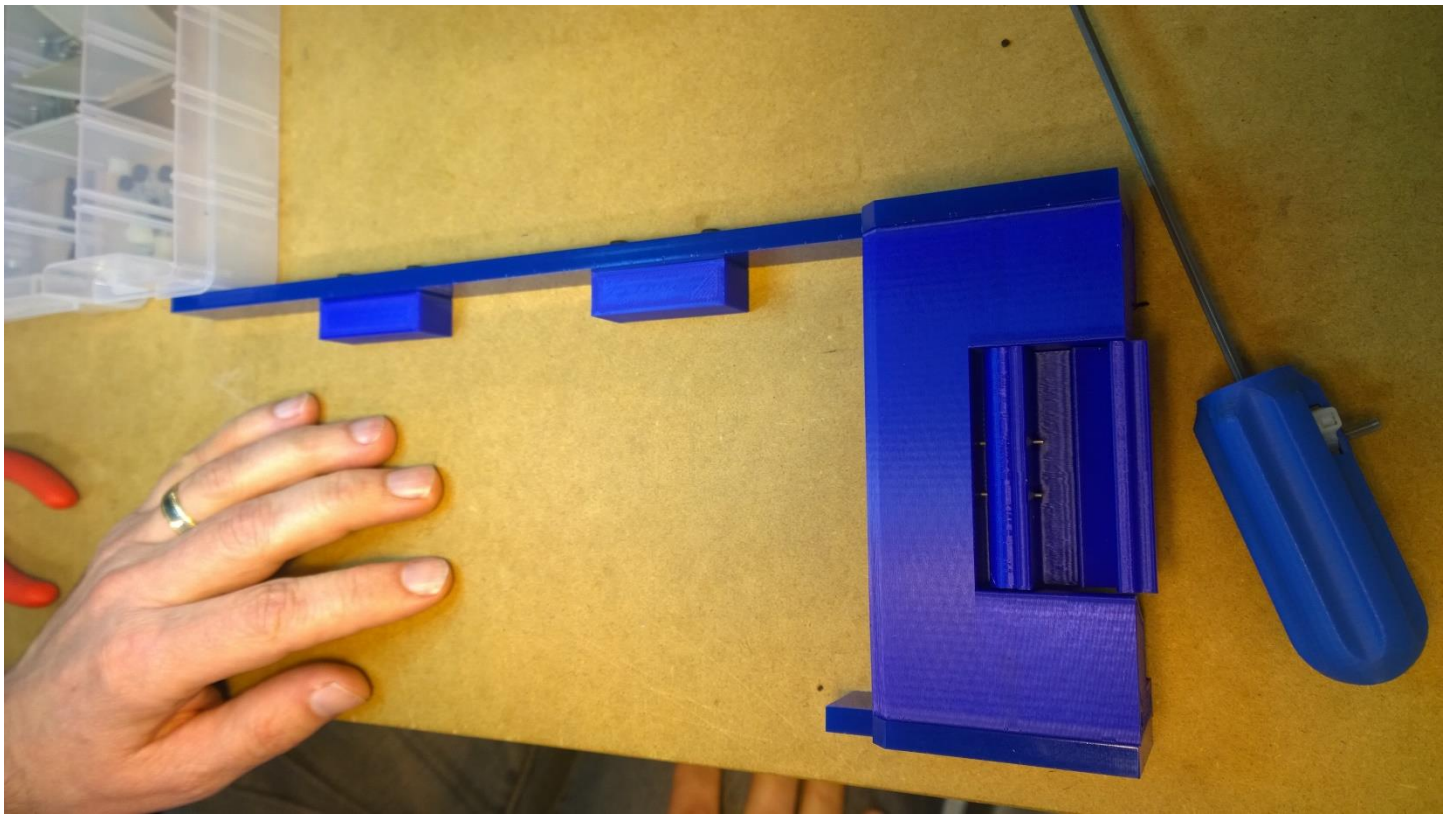
Attach assembled Left Plate to Cap

Prepare top cap, left plate, and two M3x12mm screws.

Tighten two M3x12mm screws.

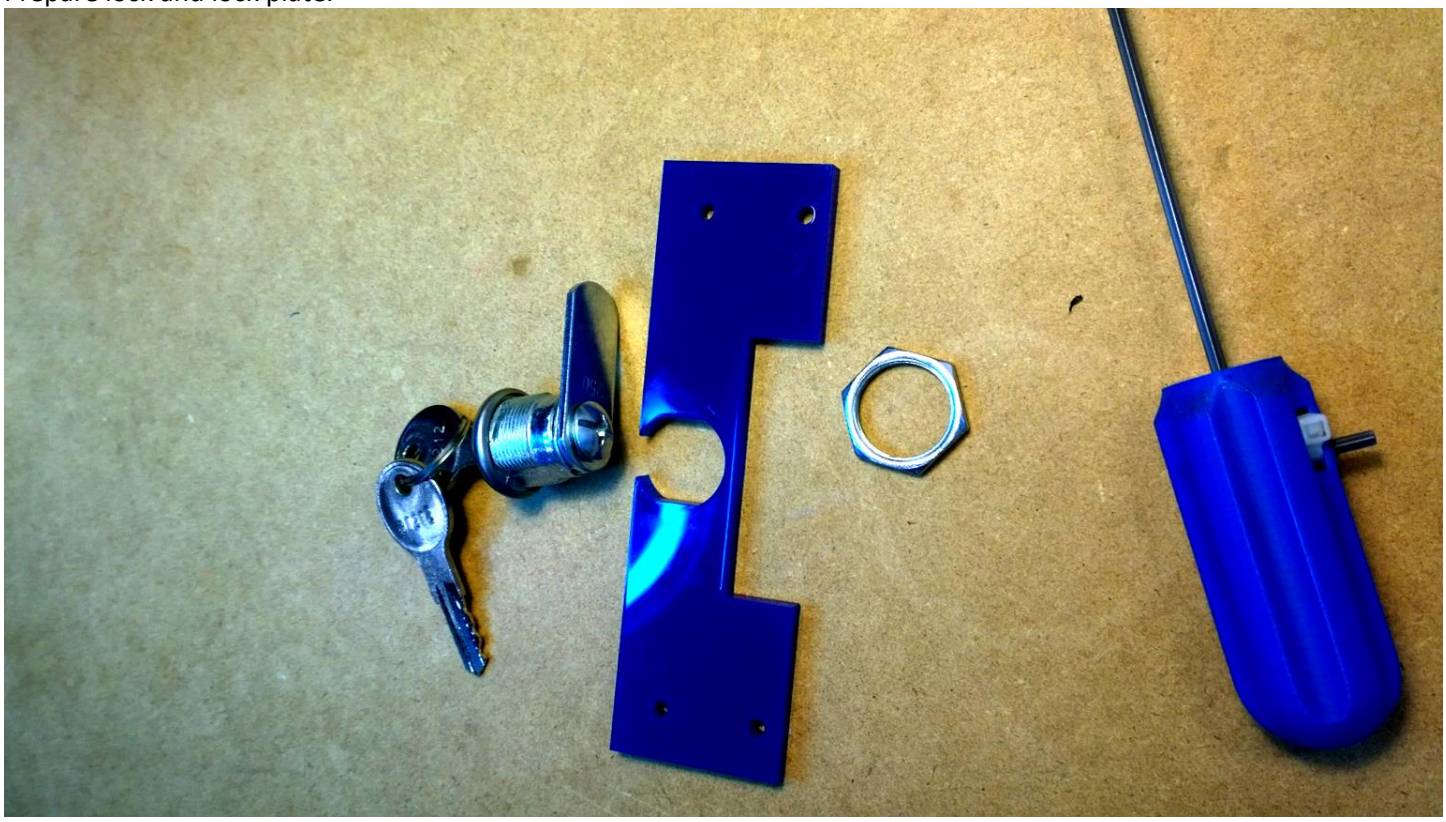


Assembled.



Attach lock hardware

Prepare lock and lock plate.

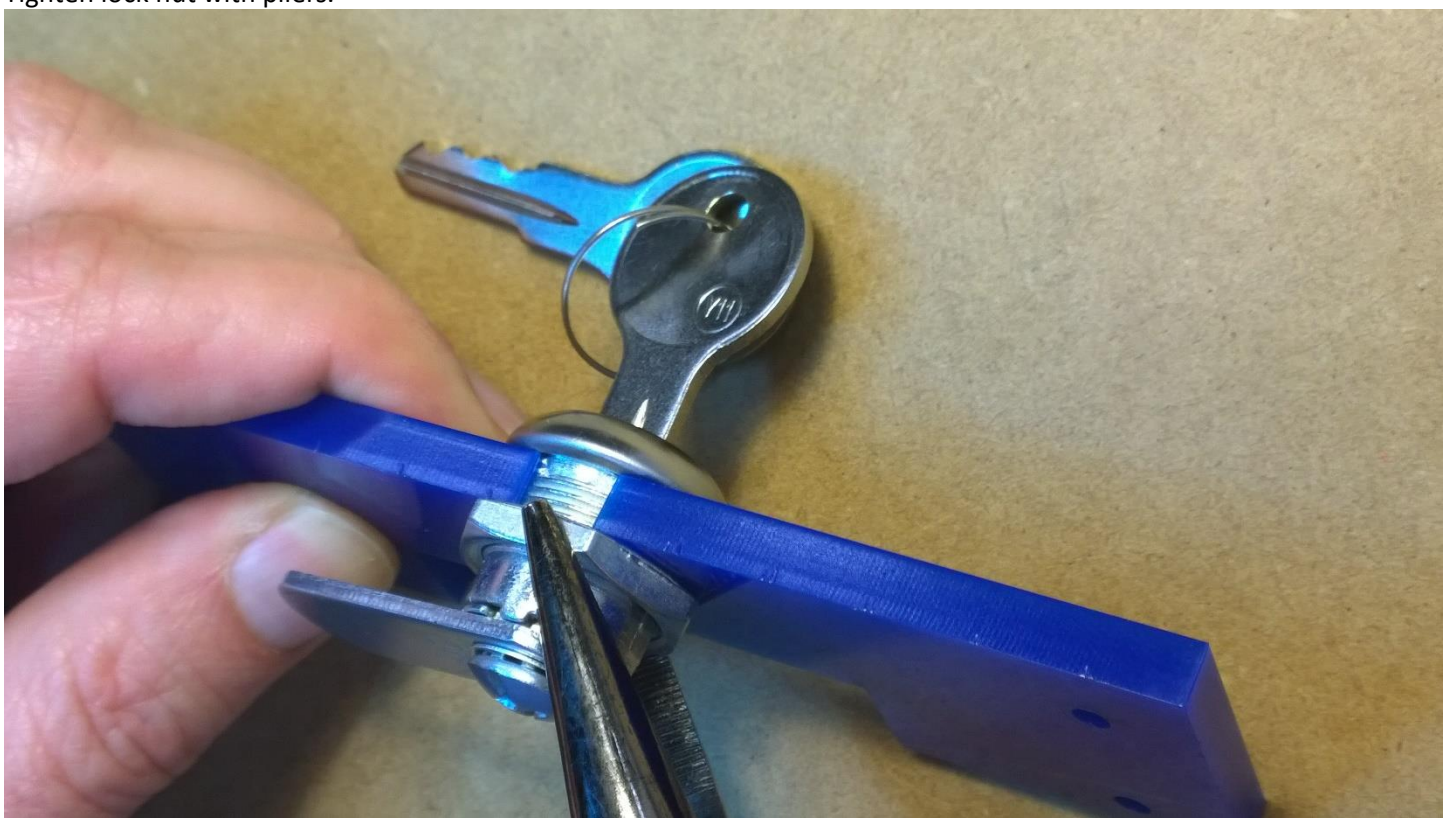


Place lock in lock plate.

Place lock nut.

Hand-tighten lock nut.

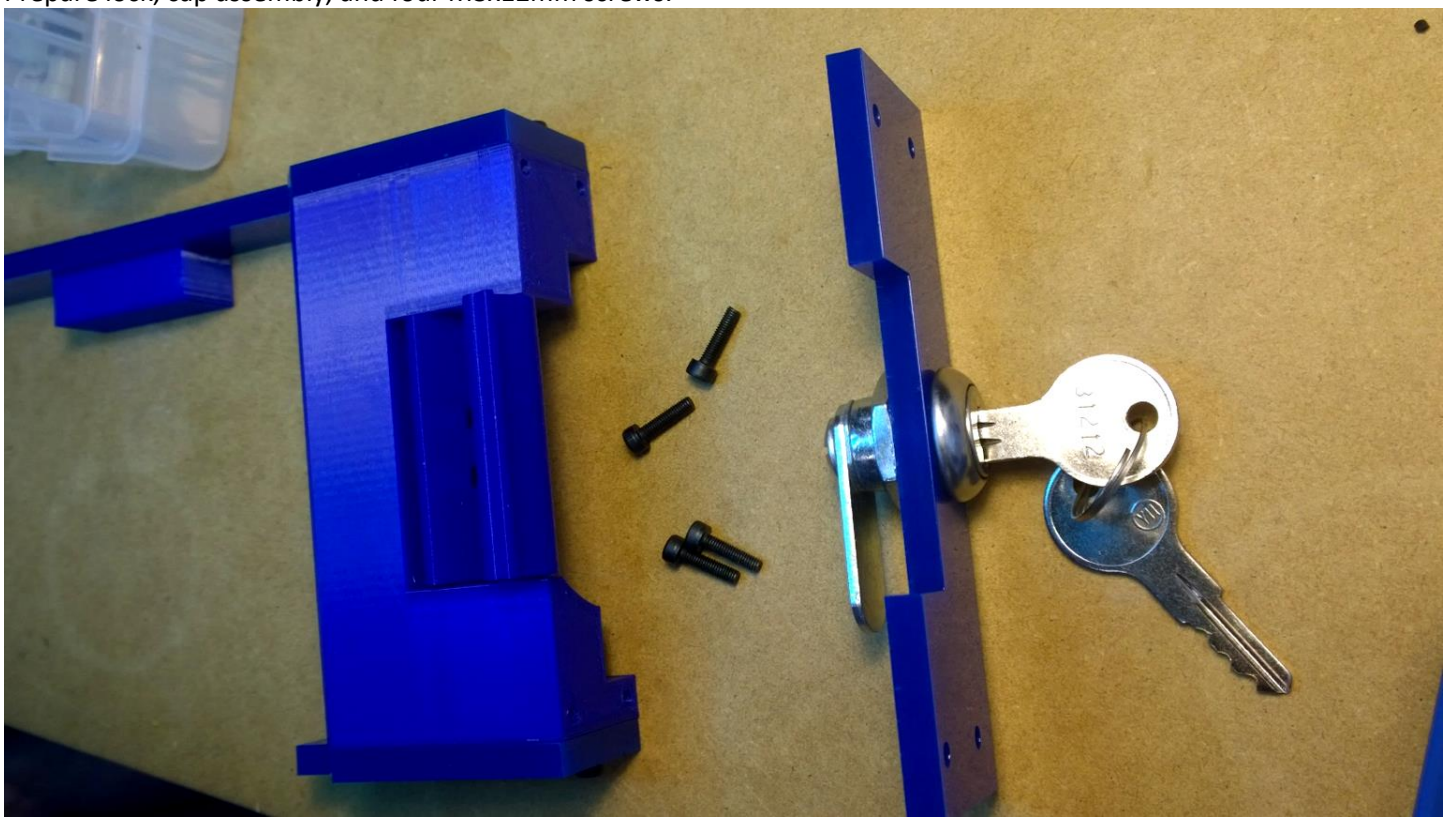
Tighten lock nut with pliers.



Note the orientation of the assembled lock – this is the unlocked position.

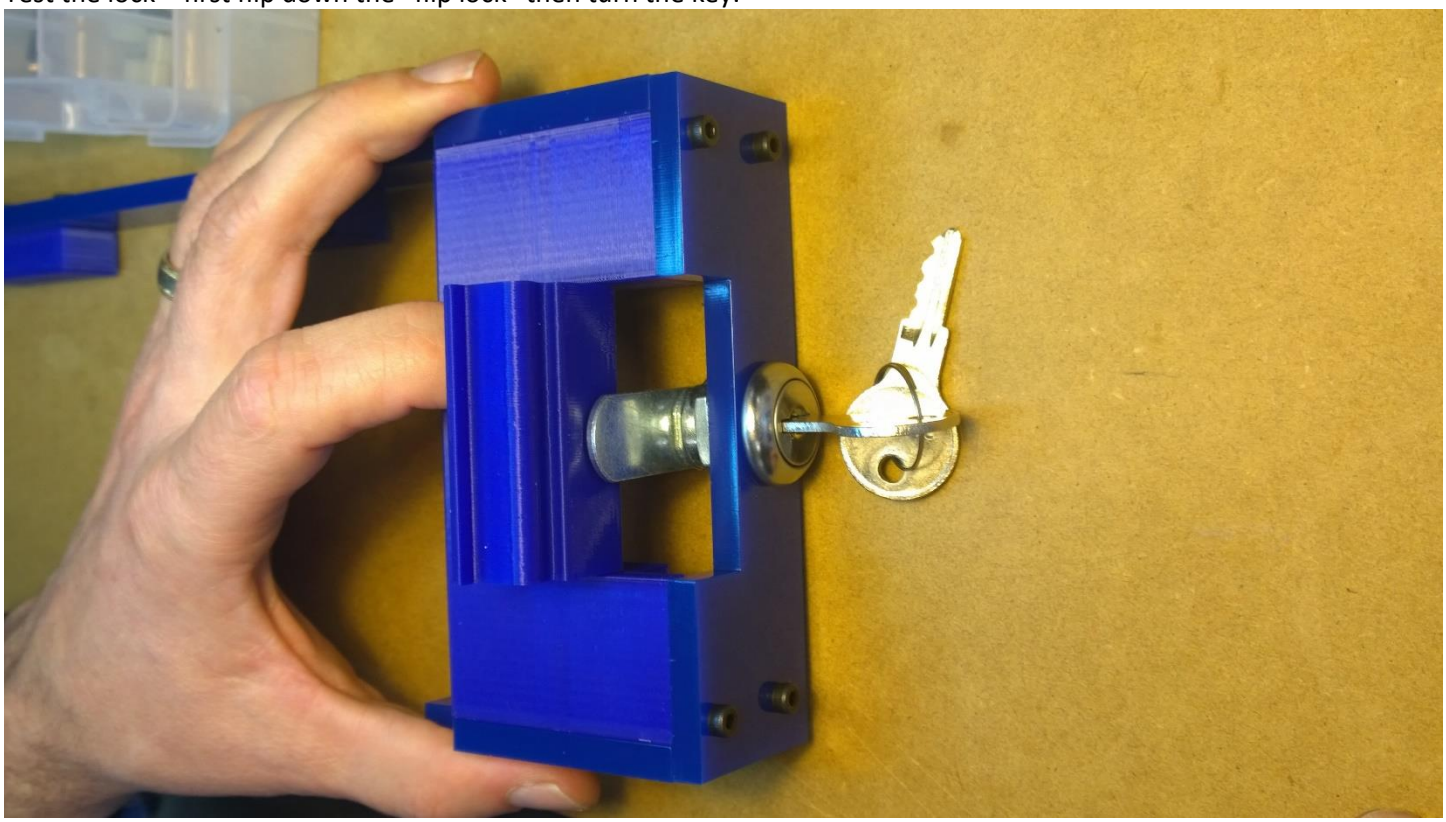
Attach assembled Lock Plate to Cap

Prepare lock, cap assembly, and four M3x12mm screws.



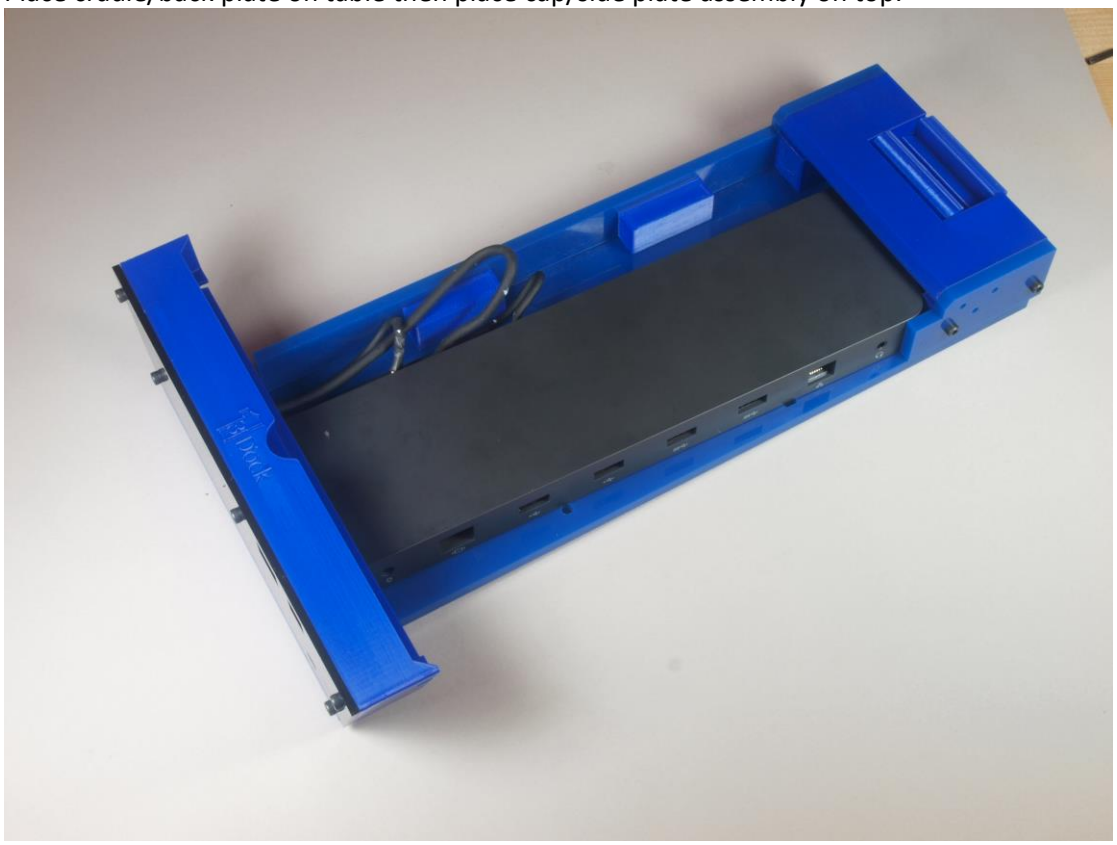
Tighten the 4 screws.

Test the lock – first flip down the “flip lock” then turn the key.

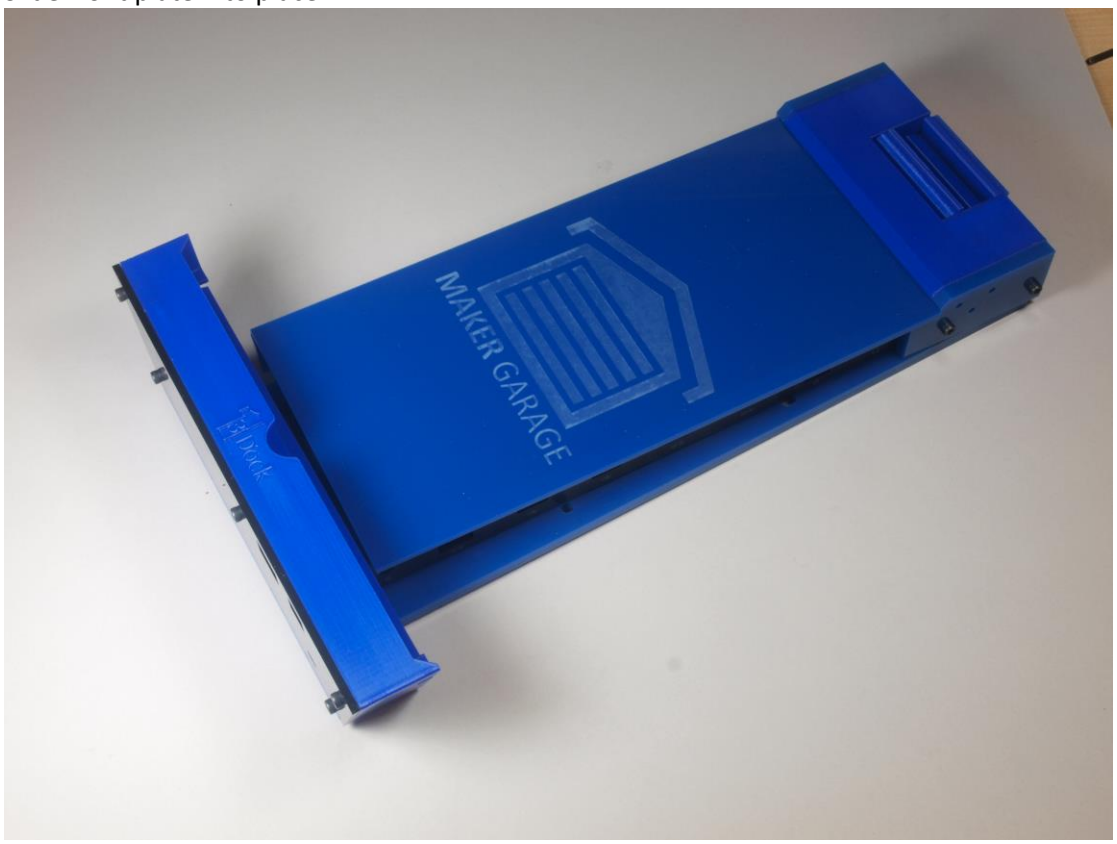


Attach all sub-assemblies

Place cradle/back plate on table then place cap/side plate assembly on top.

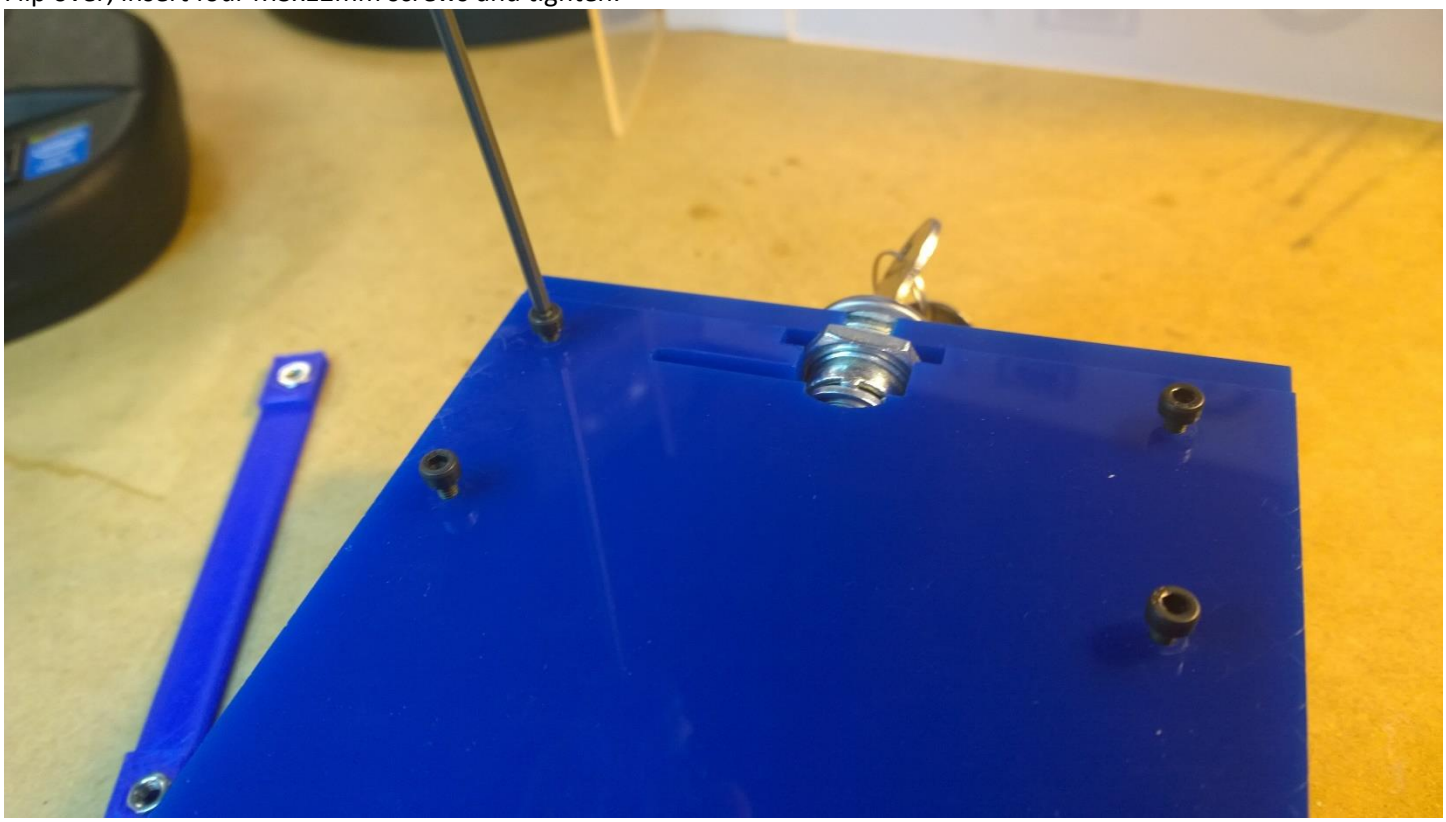


Slide front plate into place.



Ensure front plate is firmly in place.

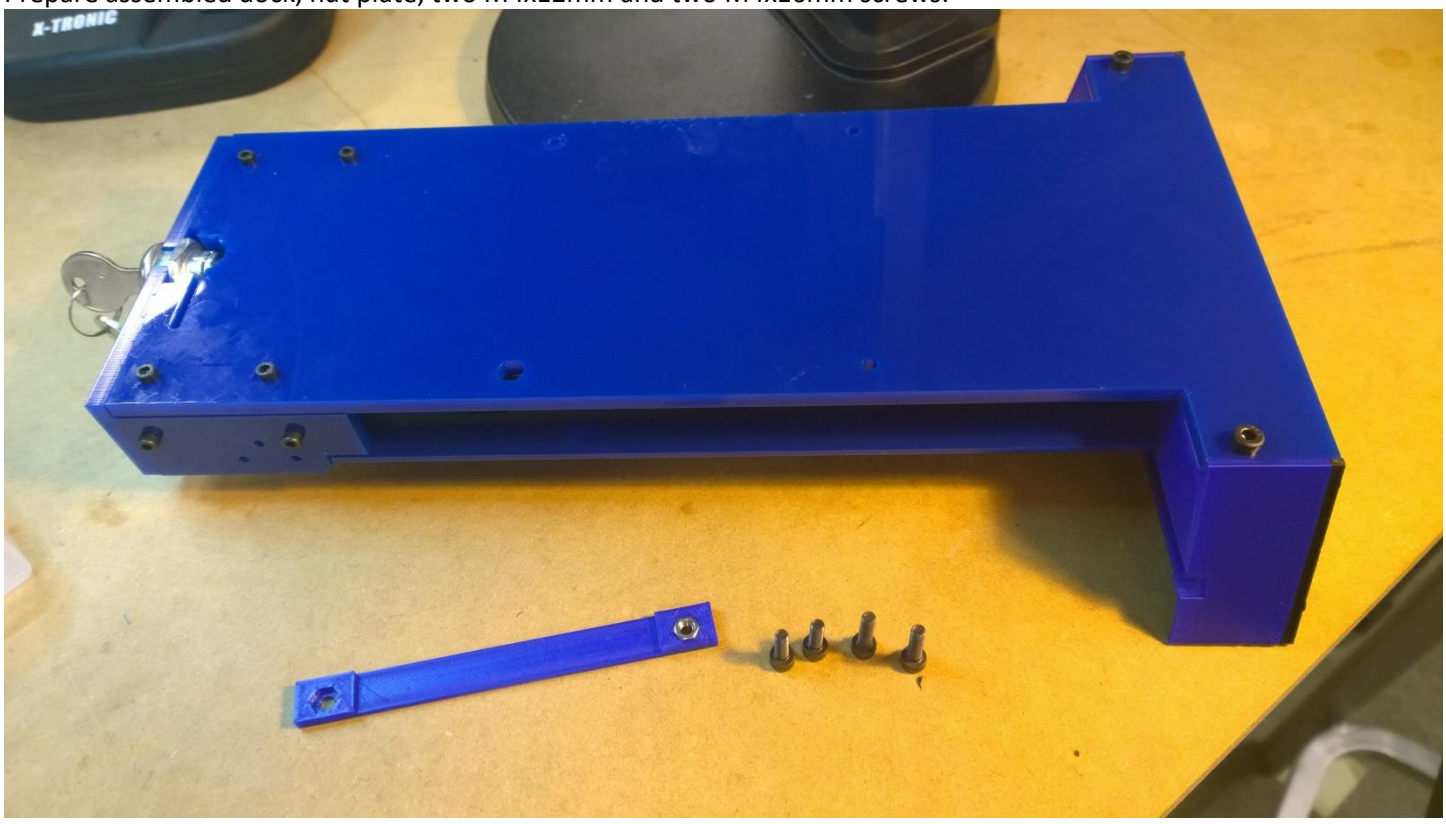
Flip over, insert four M3x12mm screws and tighten.



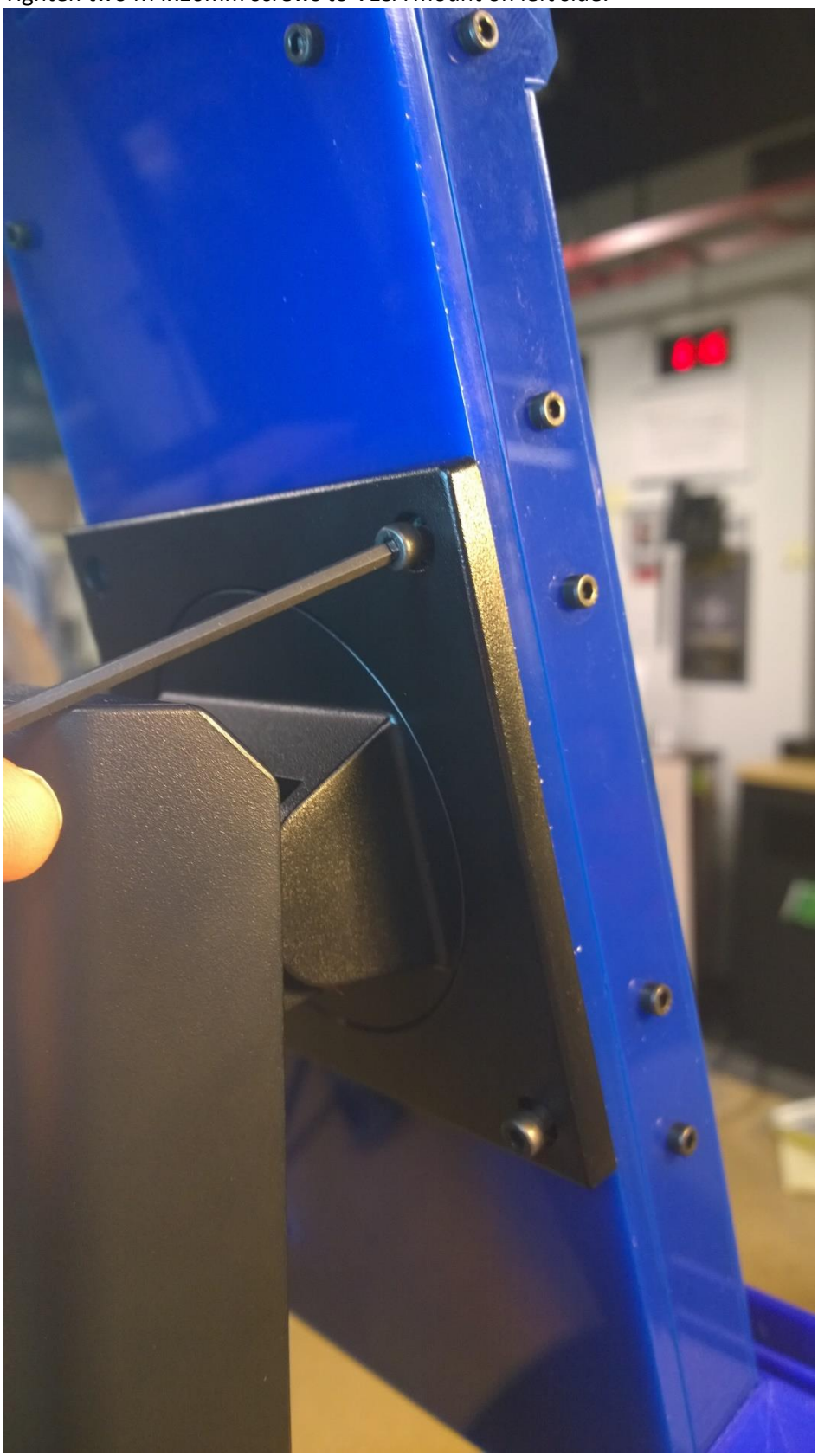
Attach to VESA mount

Place two M4 nuts in the nut plate cavities.

Prepare assembled dock, nut plate, two M4x12mm and two M4x16mm screws.



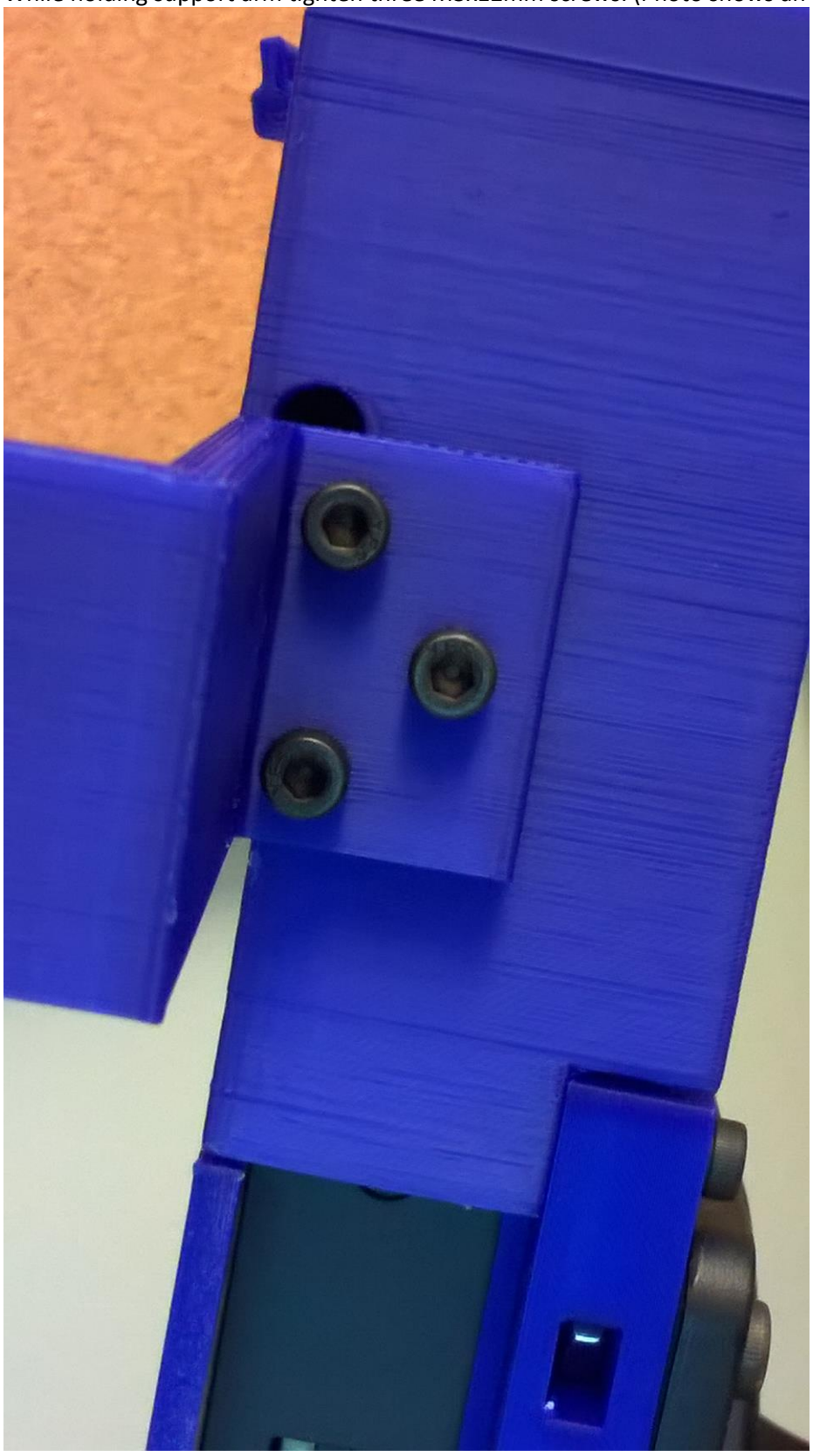
Tighten two M4x16mm screws to VESA mount on left side.



While holding nut plate, tighten two M4x12mm screws – you may need to re-position the circuit board slightly.

Attach Support Arm (optional for landscape/kiosk use)

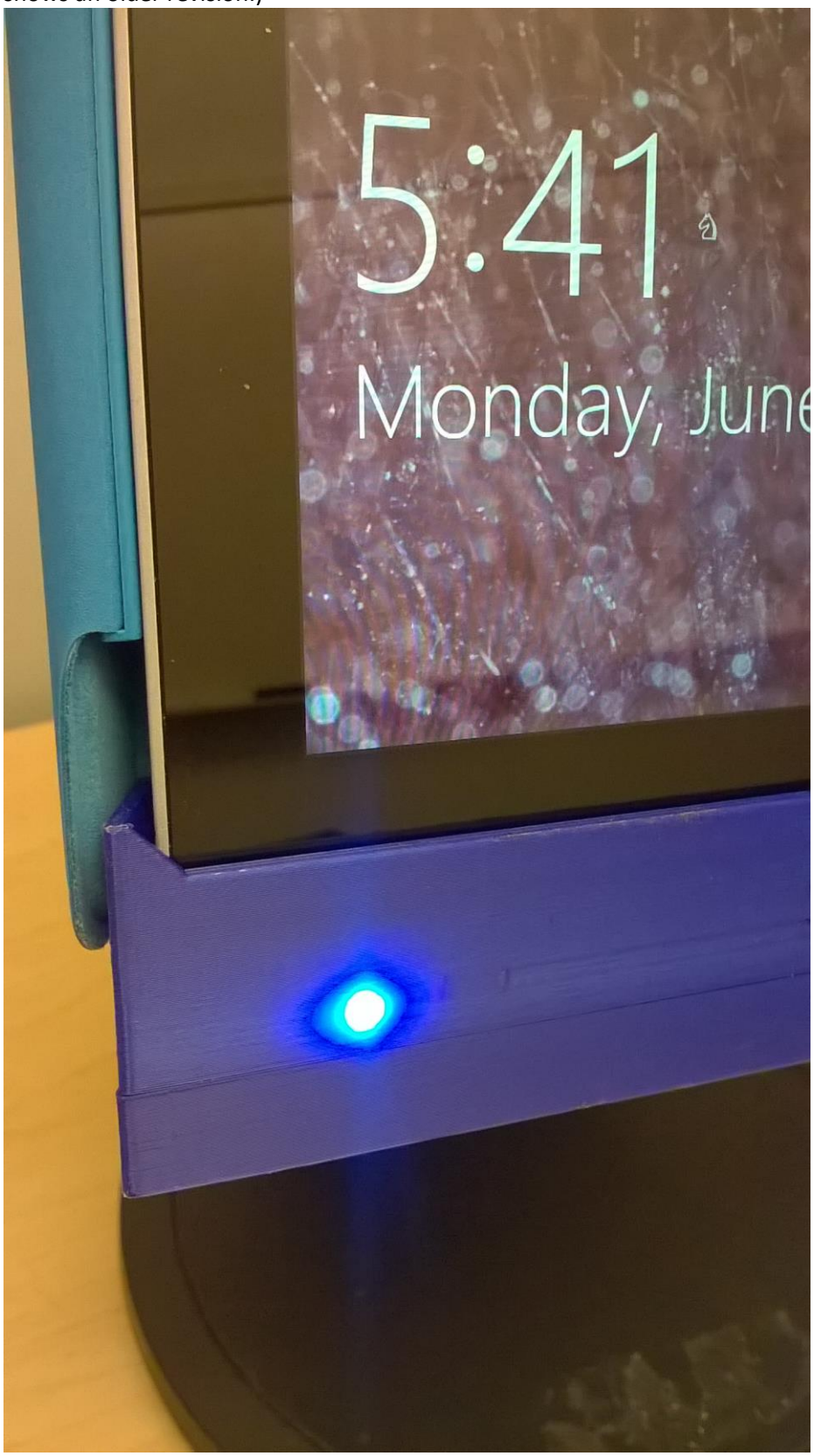
While holding support arm tighten three M3x12mm screws. (Photo shows an older revision.)



Testing

Plug in the landscape dock power supply. (Photo shows an older revision.)

Flip type cover around back and dock the tablet. You should see the LED shine through the 3D-printed plastic. (Photo shows an older revision.)



If the LED doesn’t shine, check the power connection and the fitment of the 40-pin connector.
Connect your USB accessories, monitors and test each connection.

Software setup (optional)

Learn about optimizing your desktop with our high-dpi multi-monitor guide.