

RoachScope Building Instructions

Materials Needed

- [15x loupe](#) from Sparkfun
- [CR1620 batteries](#) [for replacing batteries when LED goes out on loupe]
- four 3/16 inch magnet cubes ([Amazon #B003VWST5C](#))
- 3D printed parts for scope (from the .stl on our website)
- two 2.5 inch ¼ inch diameter steel rods [[Grainger 2HJH5](#)]
- One ¼ inch-20 thread diameter threaded rod at 3 ¾ inches length ([Grainger 10P714](#))
- three ¼ inch - 20 thread nuts ([Grainger 2FE47](#))
- 1 M6 washer ([Grainger #6EY59](#))

Note: you can typically buy the Grainger parts at any decent hardware store

Tools Needed

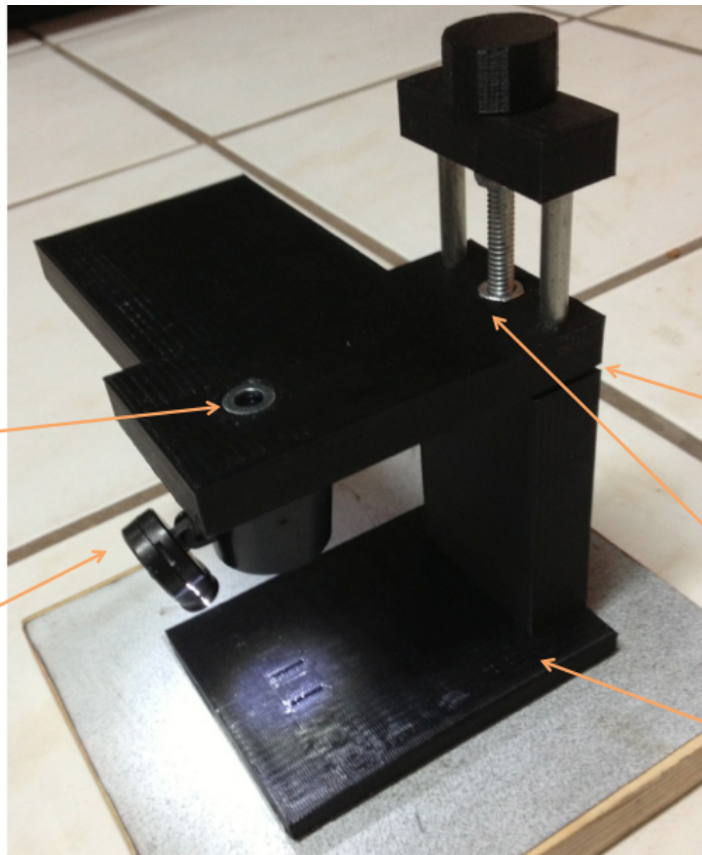
- Dremel for cutting rods
- [Superglue Gel](#) (cyanoacrylate)
- [3 in 1 machine oil](#)
- Pliers

January Update (Shipping Quality Build):

Jan 3
Update:

1. Place M6
Washer in hole.
You shouldn't need
glue (friction fit)

2. Place Lens so
that light is in front
(not in side as in
previous pictures)



3. When shipping,
Turn Knob and
adjust height so
that phone
platform is almost
touching
microscope base
piece. This is the
"Default"
configuration that
works for most
objects unless user
puts an object >2
inches under scope

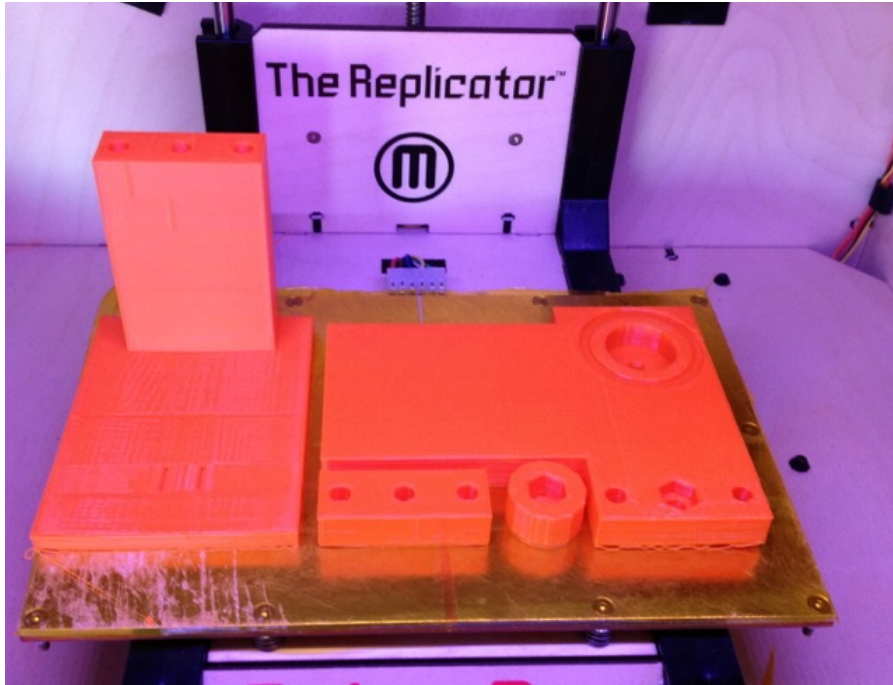
4. Note Nut is now
on top side of
phone platform

5. If possible
depending on
supplies, ship in all
black

March Update: Print Orange Parts; it's less reflective than black

Instructions (December):

1. Print Parts. This will take up the whole platform. Because the pieces are wide and flat, the acrylic slurry is absolutely necessary or you will get excessive curl



2. Because of acrylic slurry, you may notice a sheen on the underside of pieces. Using acetone and a rag, lightly rub residue off.



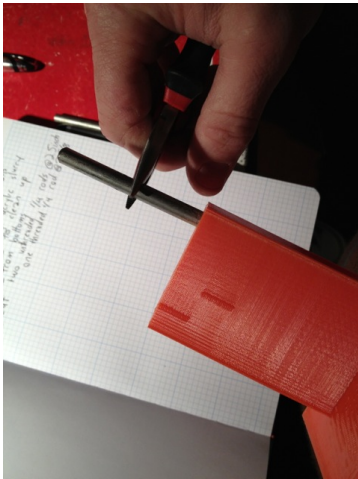
3. So that the pieces, look nicer, like this



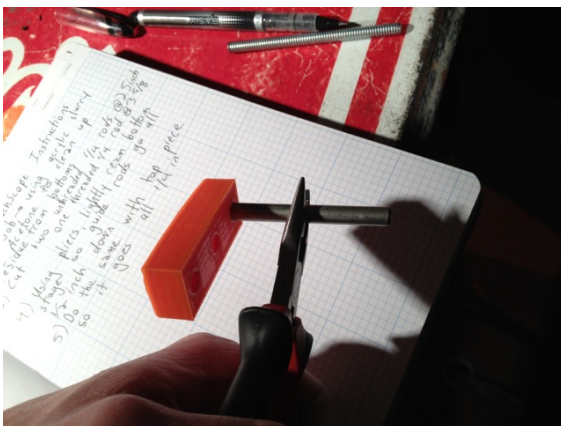
4. Cut Smooth Steel rod to two pieces at 2.5 inch long, cut threaded rod to one piece 3 $\frac{3}{8}$ inches long



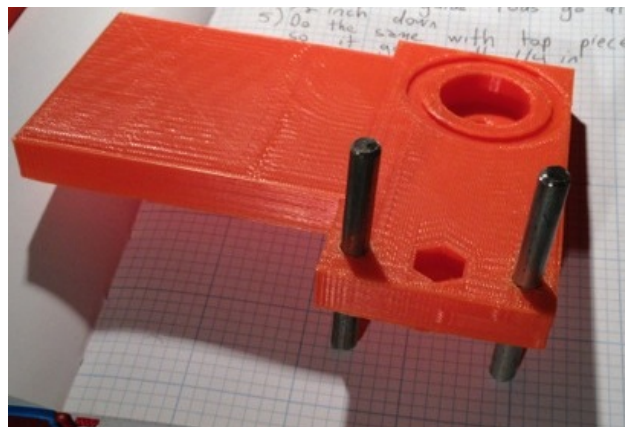
5. Lightly work smooth rods into side holes of bottom piece so that they slip in and out (going all $\frac{1}{2}$ inch down) with some elbow grease. Don't excessively ream. You might find pliers useful.



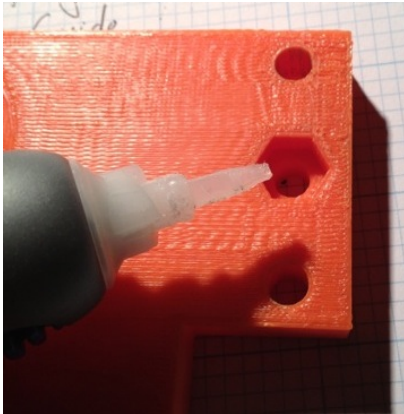
6. Repeat Reaming for top piece, ensuring rods go all $\frac{1}{4}$ inch in



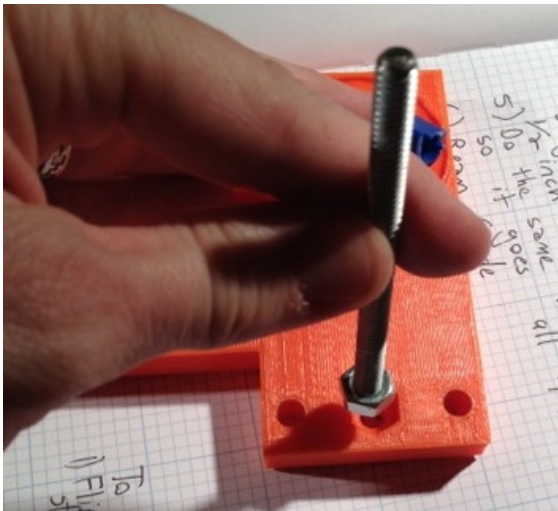
7. Insert Rods into side holes of middle stage. Ensure rods travel firmly but easily in holes. Too loose is not good. Oil may help. Using a table to push down is helpful.



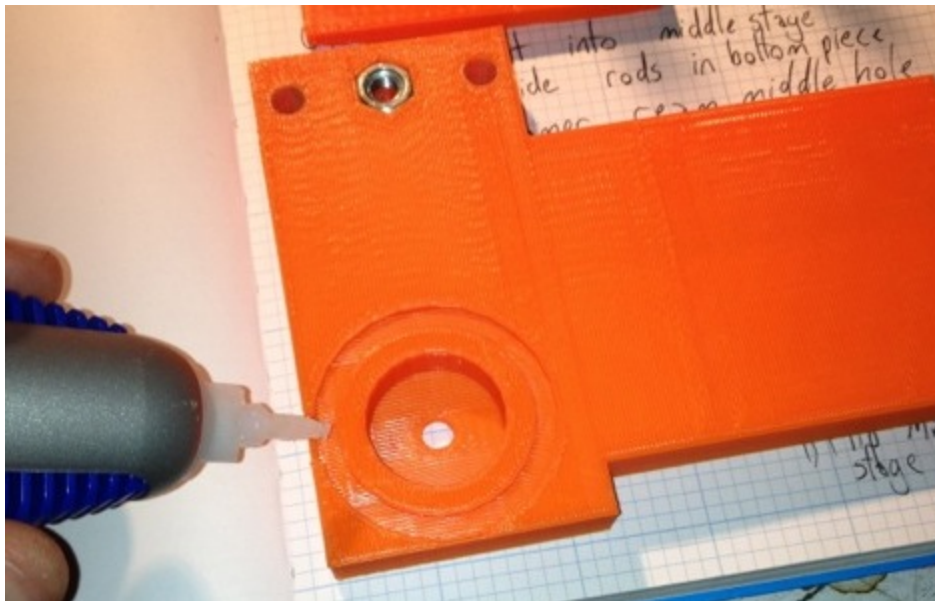
8. Apply some glue to walls of nut receptacle. You don't need much



9. Use the threaded rod to place the nut in the hole. This is a friction fit and may require some force to put in hole.



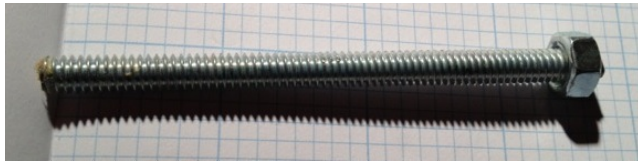
10. Apply Glue to four points along anulus. Not Much is need.



11. Install Lens. Much sure the light is facing towards short side and looks nice.



12. We have to ream middle hole of top piece so that the bolt turns easier without gripping the plastic and hurting user's hands. Built a reaming tool by super-gluing a nut on the top of a spare threaded rod.



13. using a ratchet, screw bolt through hole and keep turning to “strip” the hole. Repeat on other side. Eventually you should be able to push bolt freely into and out of hole, similar to the Manipulator steps.



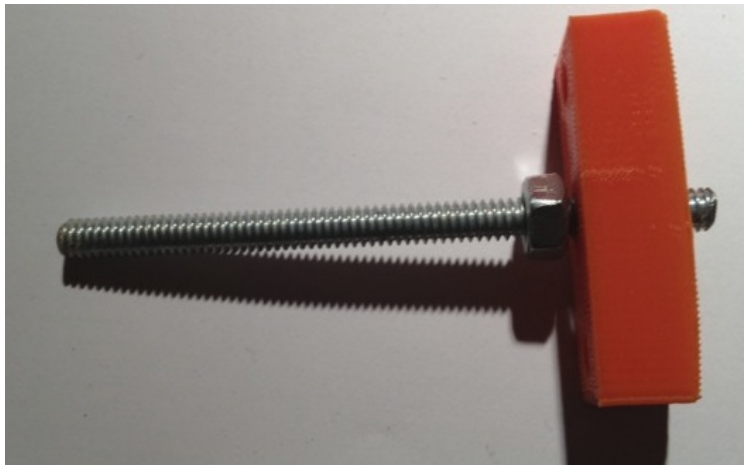
14. On the threaded rod, apply a bit of glue just before one inch mark....



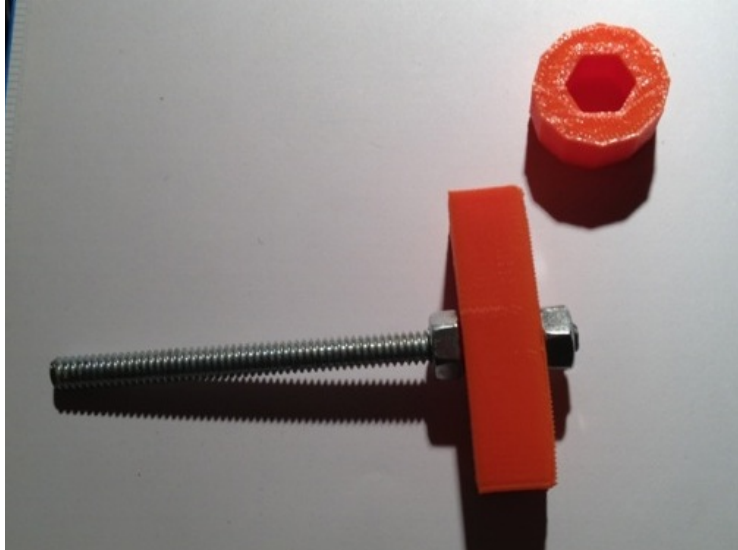
15. And Screw On Nut over glue so that nut ends at exactly one inch. Wait a couple minutes for glue to set.



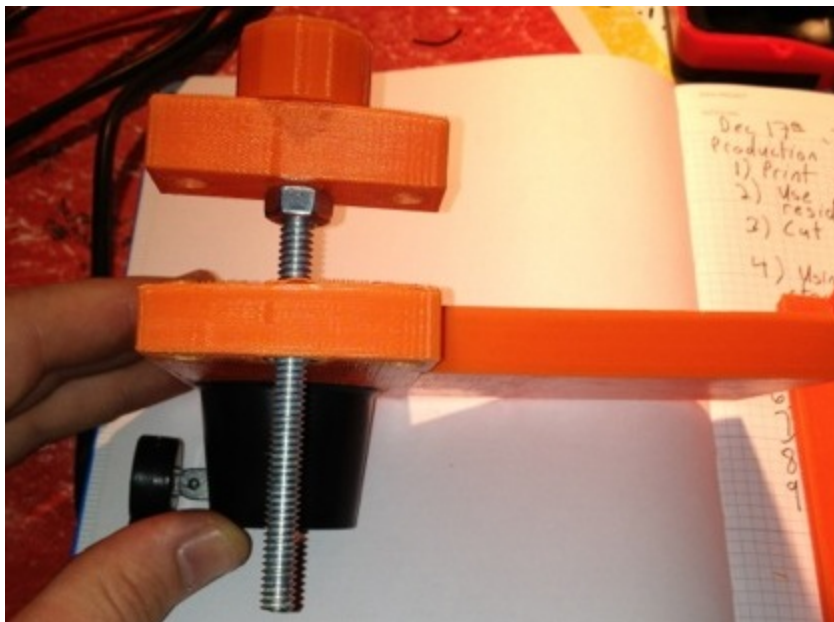
16. Slide faster through top piece. Again, should slide easily back and forth



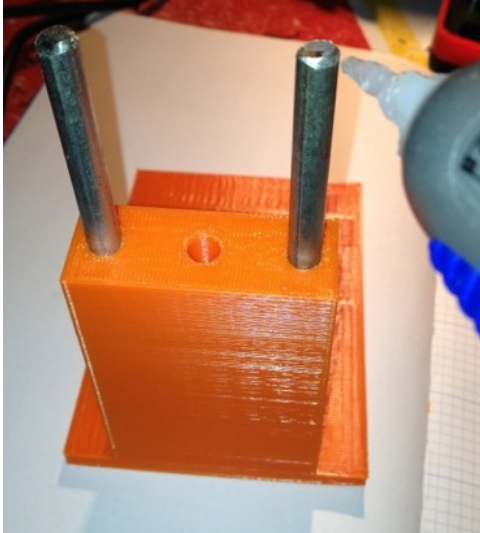
17. Apply a bit of glue to exposed top of bolt, and glue another nut. Make sure orange piece can turn freely between two nuts. Not too loose, not too tight. Then, slide knob on top of nut. Glue shouldn't be necessary as it's a friction fit. Use your discretion.



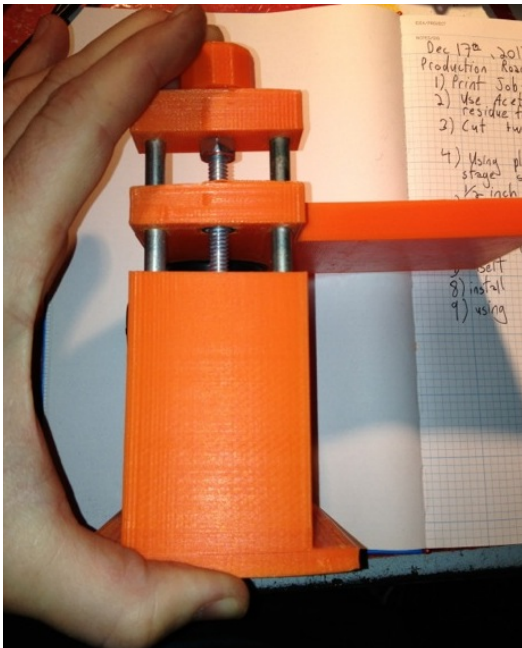
18. Screw Fastener through middle stage, leaving about a half-inch of clearance between sections.



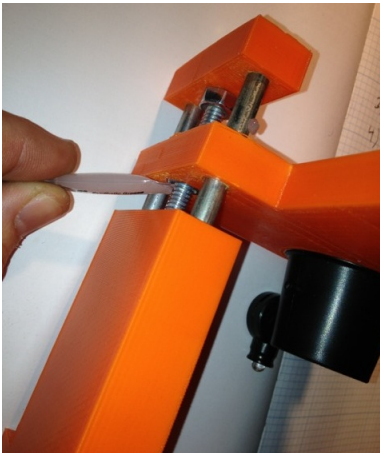
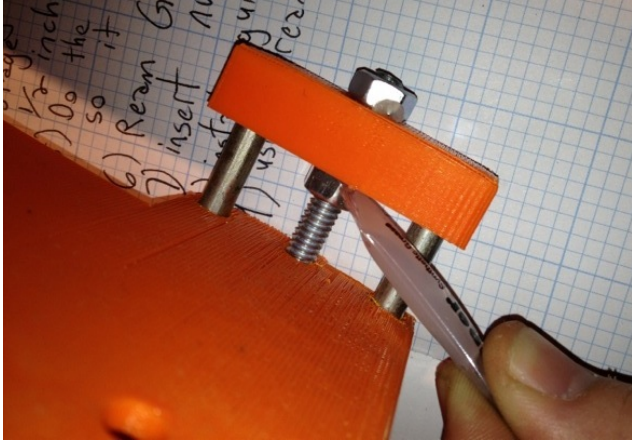
19. Put Guide Rods into bottom piece, again ensuring they go all $\frac{1}{2}$ inch down. use glue at bottoms. Definitely add glue to tops...



20. ...and slide everything together. Ensure guide rods on top go all $\frac{1}{4}$ inch into top piece. This may take some elbow grease to align everything.



21. Apply oil / grease at all moving parts, similar to manipulator



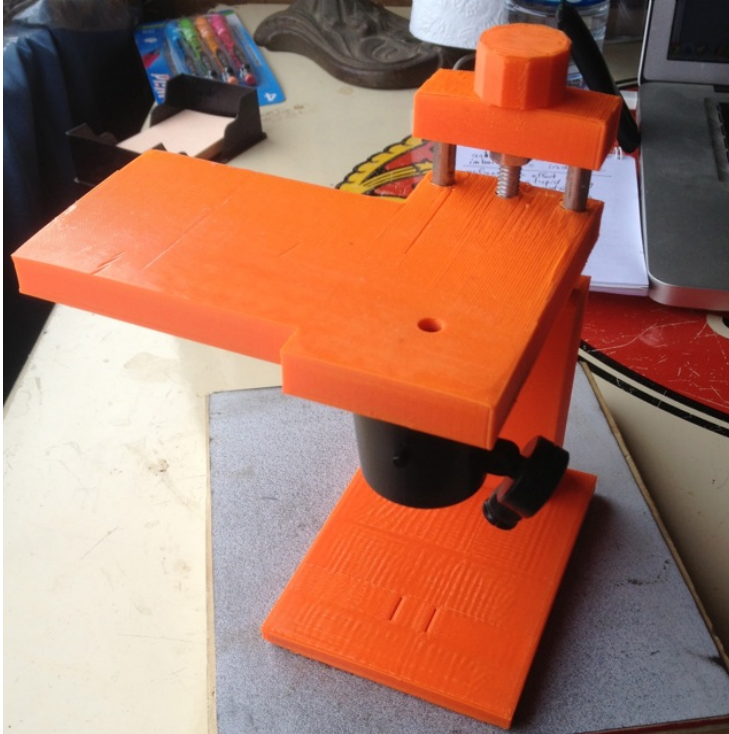
22. Apply Glue to inside of all Magnet Holes, and install Magnets.



23. Apply Magnets.



24. Let set for about an hour or so. Then ensures all moving parts move smoothly with turning of knob without excessive tightness or force.



25. Make sure light turns on and check image quality. If image is distorted it means lens is not installed flatly or 3D print was not level and is at angle. Imaged below is 1x through iPhone and unzoomed. There should not be any plastic “shadows” around the edge of image. Plastic shadows can be caused by bits of plastic strands hanging out inside hole.



26. Use your RoachScope and go make some discoveries