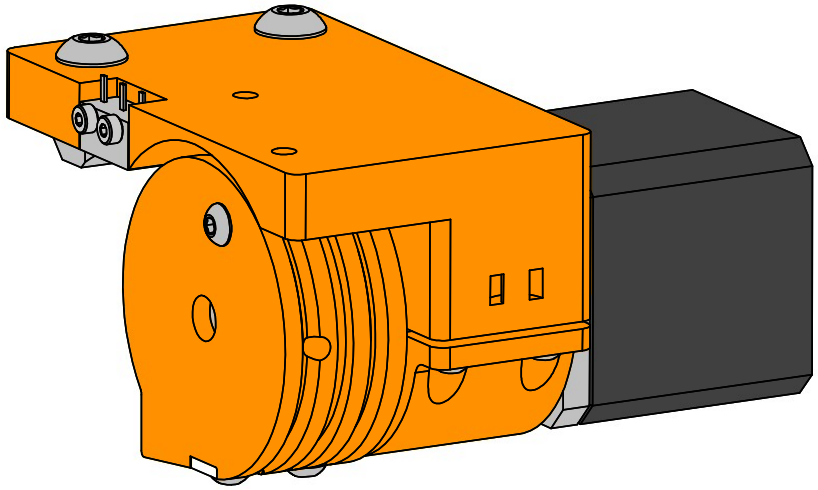


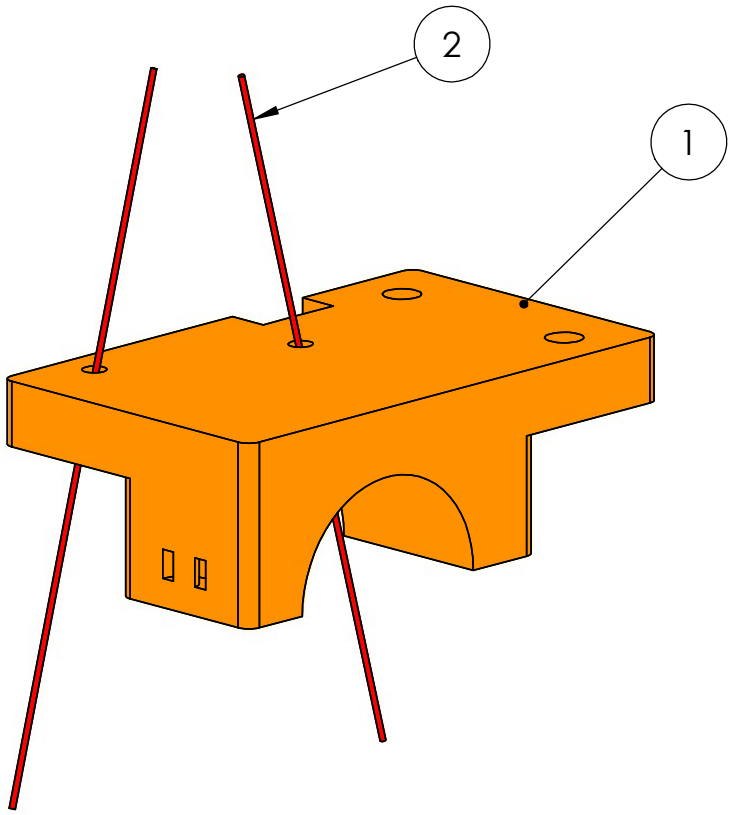
Toolchanger Lock Actuator Assembly

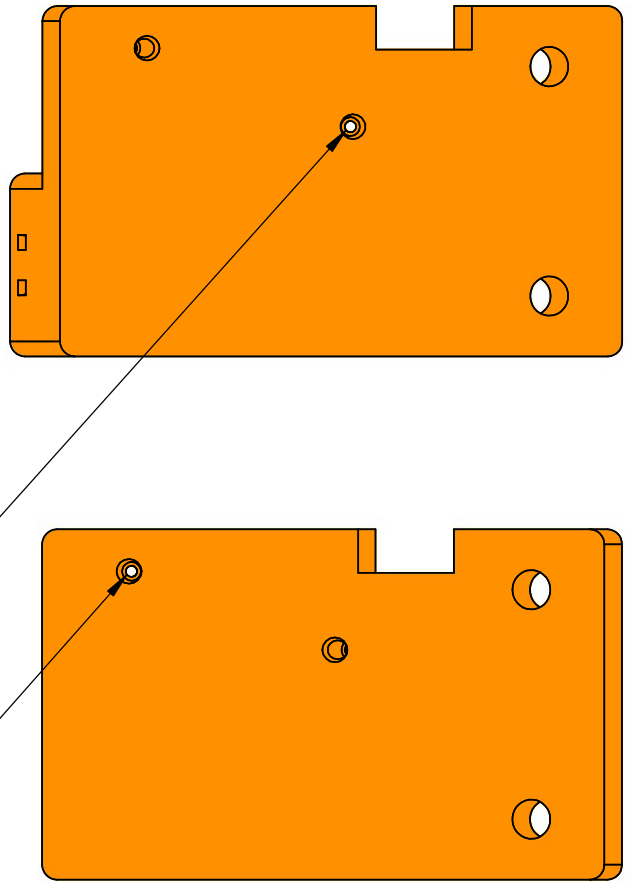
Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1

SHEET 1 OF 17





Poke a loose end of wire rope through both holes shown above to ensure that they were printed correctly. If they don't fit, gently twist a Phillips screwdriver back-and-forth into the hole to widen it. Remove the wire rope when finished.

ITEM NO.	DESCRIPTION	QTY.
1	Top Lock Actuator Plate	1
2	full length of wire rope	1

Part Inspection

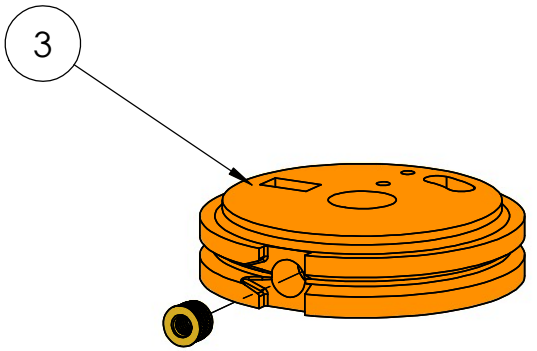
Created by: Joshua Vasquez

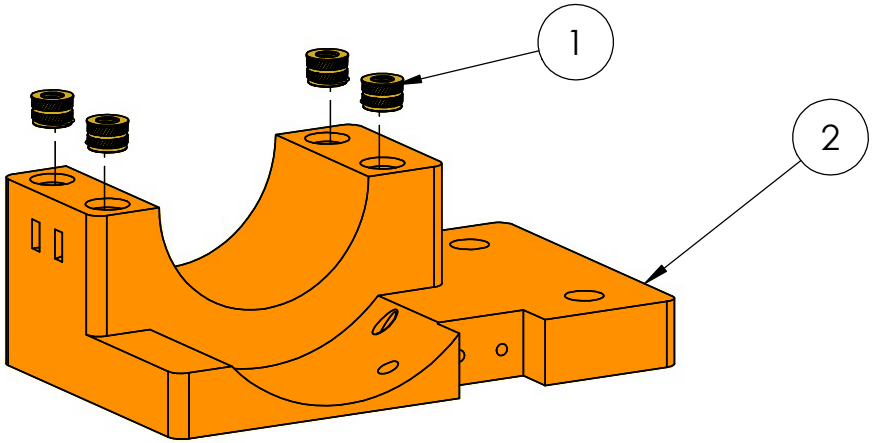
last edited: 1/1/2020

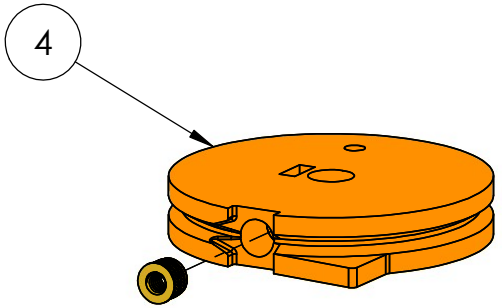
SCALE: 1:1

SHEET 2 OF 17

Install the following heat-set inserts using the *plate press technique*.
More information on the plate-press technique can be found here:
https://hackaday.com/2019/02/28/threading-3d-printed-parts-how-to-use-heat-set-inserts/







ITEM NO.	DESCRIPTION	QTY.
1	M3 Tapered Heat Set Insert	6
2	Lock Actuator Base Plate	1
3	Floating Half-Pulley	1
4	Fixed Half-Pulley	1

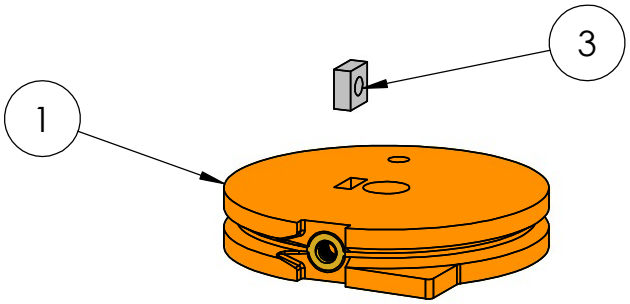
Heat Set Insert Callout

Created by: Joshua Vasquez

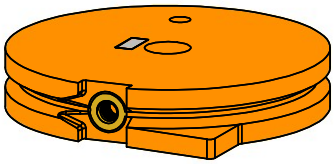
last edited: 1/1/2020

SCALE: 1:1

SHEET 3 OF 17



Press Fit the square nut such that it is flush with the top surface of the fixed half pulley.



Result

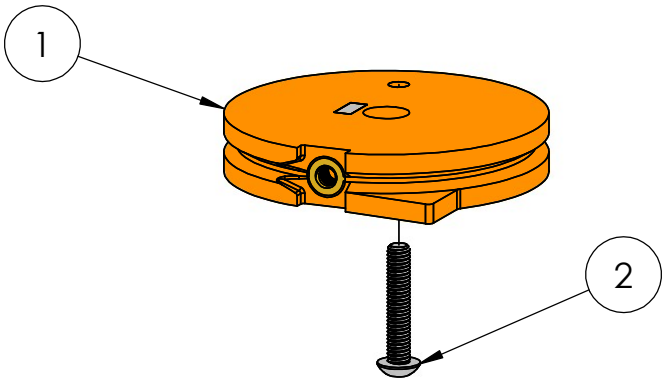
ITEM NO.	DESCRIPTION	
1	Fixed Half-Pulley with Insert	1
3	M3 Square Nut	1

Fixed Half Pulley with Press Fits

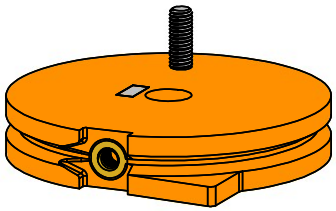
Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1



Fully screw in the butthonhead screw such that it pokes out from the top.



Result

ITEM NO.	DESCRIPTION	
2	M3 Buttonhead Screw, 16mm long	1

Fixed Half Pulley with Inserts

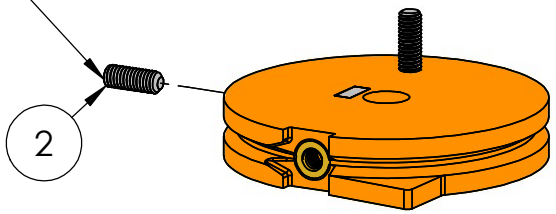
Created by: Joshua Vasquez

last edited: 1/1/2020

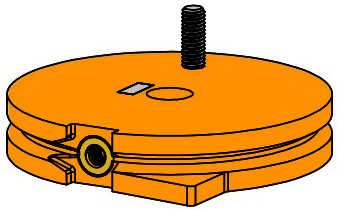
SCALE: 1:1

SHEET 5 OF 17

Install this set screw such that it engages the square nut but does not protrude into the center hole. We will fully tighten it onto the shaft later.



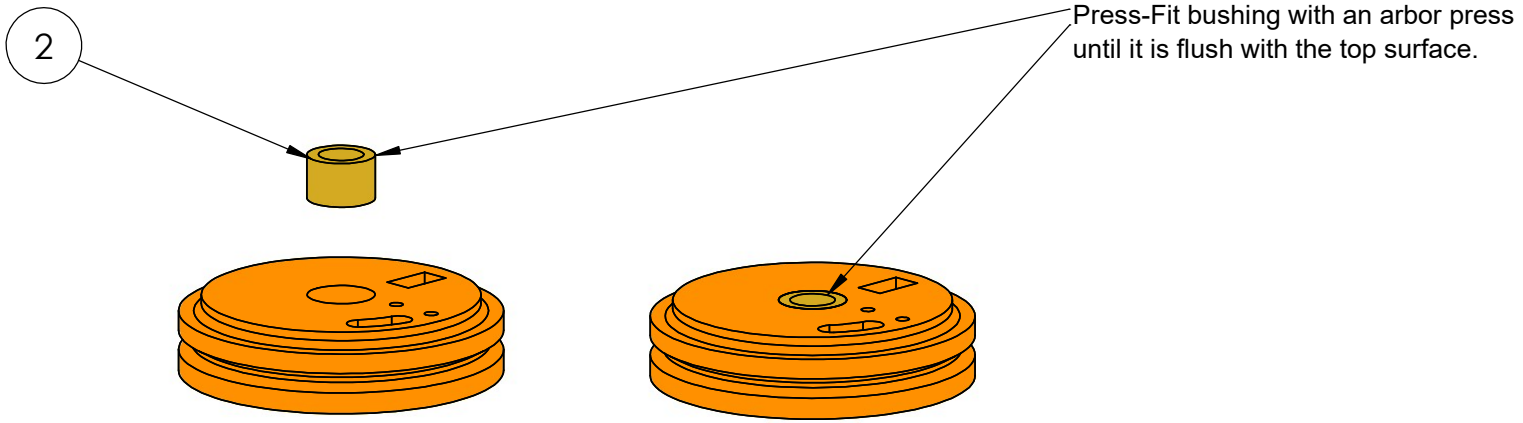
Exploded View



Assembled View

ITEM NO.	DESCRIPTION	QTY.
2	M3 Set Screw, 8mm long	1

Fixed Half Pulley Assembly		
	Created by: Joshua Vasquez	last edited: 1/1/2020
	SCALE: 1:1	SHEET 6 OF 17



ITEM NO.	DESCRIPTION	QTY.
1	Floating Half Pulley with insert	1
2	Sleeve Bearing, 6mm ID, 8mm OD, 6mm tall	1

Floating Half Pulley with Inserts and Press Fits

Created by: Joshua Vasquez

last edited: 1/1/2020

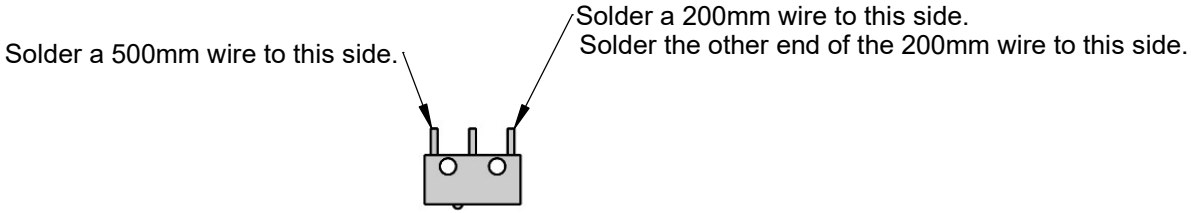
SCALE: 1:1

SHEET 7 OF 17

The lock actuator assembly requires two limit switches wired in series.

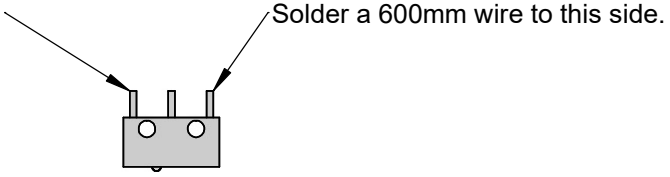
External Limit Switch

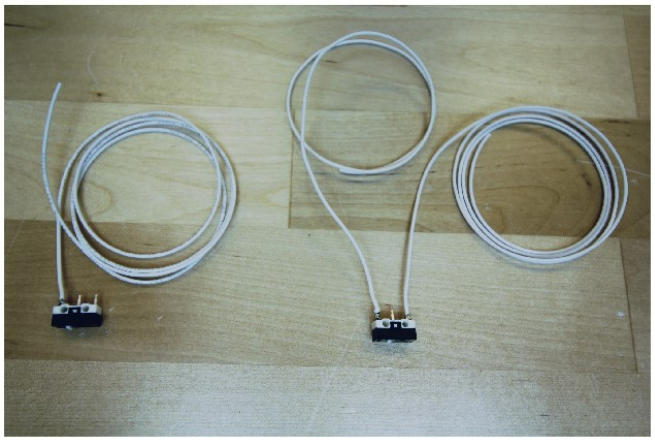
This switch will be installed on the mounting plate.



Internal Limit Switch

This switch will be installed inside the pulley assembly.





Result. TODO: retake this picture with the completely soldered wire harness.

ITEM NO.	DESCRIPTION	QTY.
1	Mechanical Limit Switch	2
2	26AWG stranded wire, 500mm long	1
3	26 AWG stranded wire, 200mm long	1
4	26 AWG stranded wire, 600mm long	1

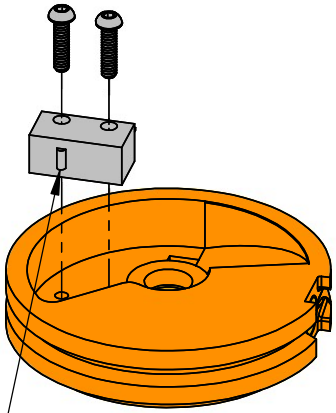
Internal Switch Wiring

Created by: Joshua Vasquez

last edited: 1/1/2020

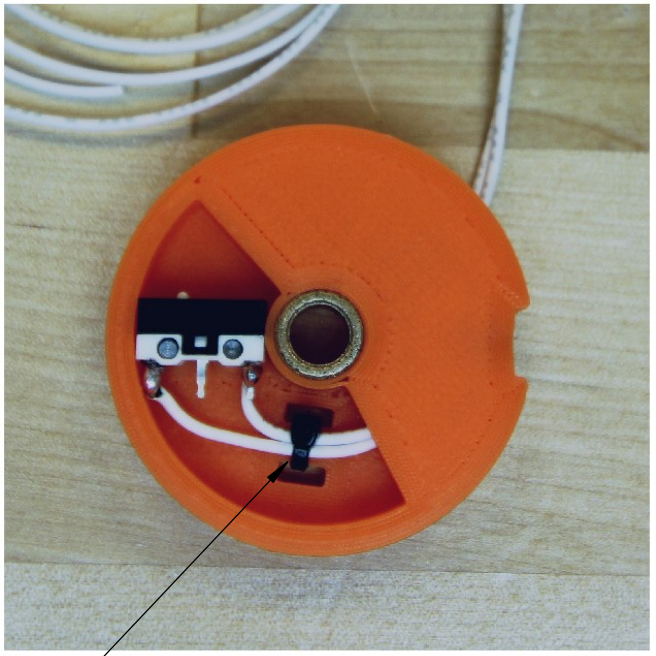
SCALE: 1:1

SHEET 8 OF 17



Exploded View

TODO: retake both pictures



Zip-tie the wires down such that the head of the zip tie is inside the cavity and does not protrude out the bottom of the printed part.

The limit switch button should be closer to the outside.

ITEM NO.	DESCRIPTION	QTY.
1	Mechanical Limit Switch	1
2	Floating Half-Pulley Assembly	1
3	Small Zip Tie	1
4	M2 Buttonhead Screw, 8mm long	2

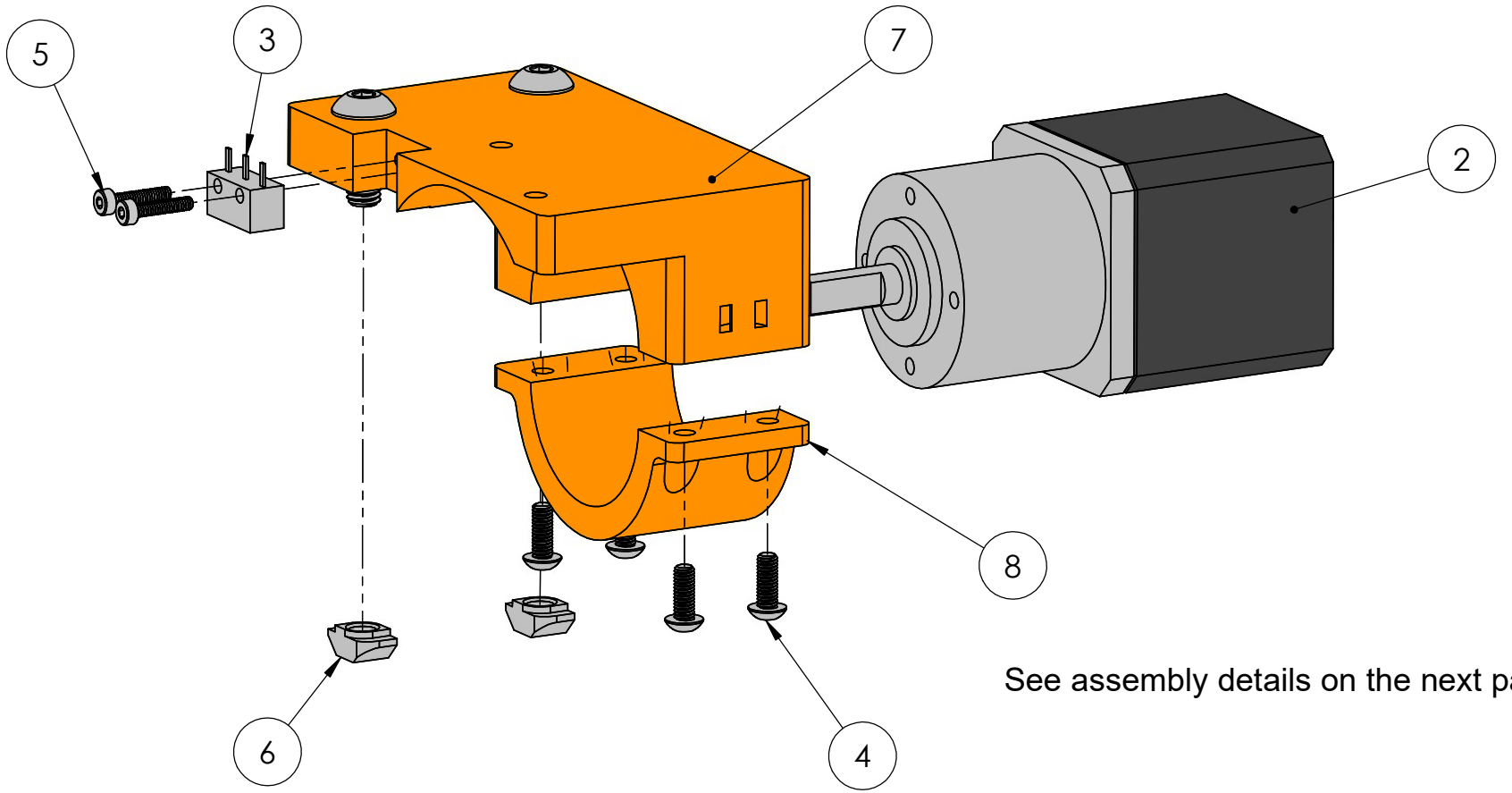
Internal Switch Installation

Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1

SHEET 9 OF 17



See assembly details on the next page.

ITEM NO.	DESCRIPTION	QTY.
2	Planetary Stepper Motor	1
3	Mechanical Limit Switch	1
4	M3 Buttonhead Screw, 8mm long	4
5	M2 Screw, 10mm long	2
6	M5 Drop-In T-Nut for 20x20 Extrusion	2
7	Lock Actuator Base Plate with Inserts	1
8	Lock Actuator Motor Clip	1
9	M5 Buttonhead Screw, 14mm long	2

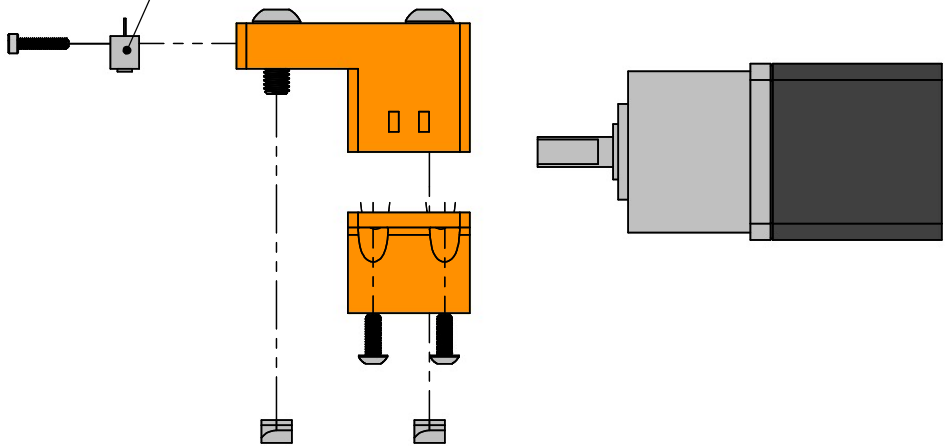
Plate Assembly Overview

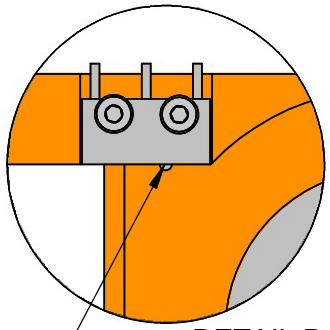
Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1

Install the dangling switch in the wire harness from the prior step first; then install the screws.

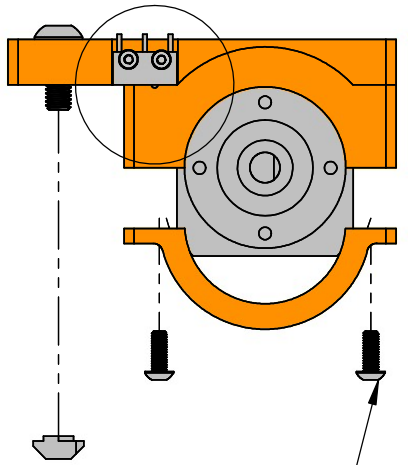




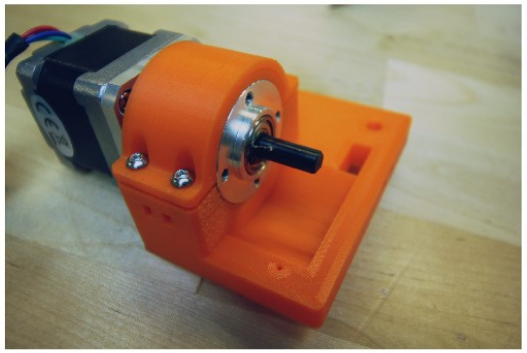
Note the orientation of the switch from this view.

DETAIL D

D



Tighten the four M3 screws until you can no longer twist the stepper motor by hand relative to the plate.

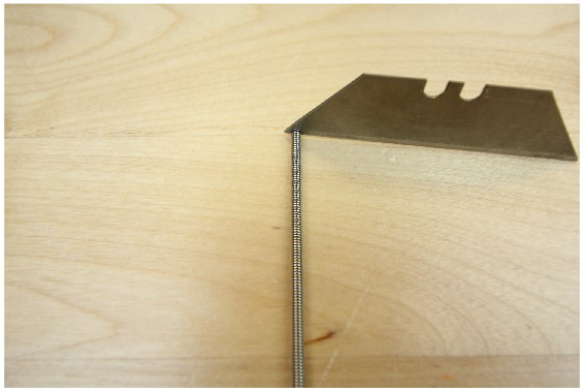


Note: the face of planetary stepper should be flush with the face of the locking plates. The limit switch wire should curl out of this gap.

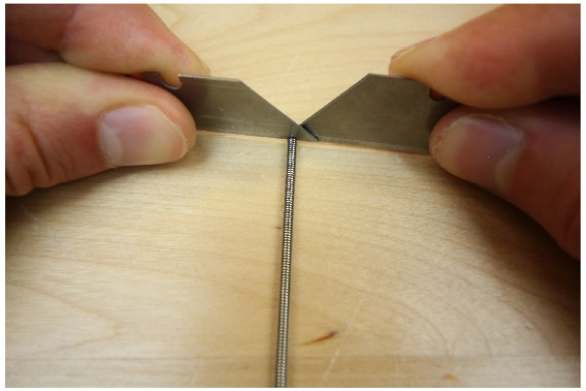
Plate Assembly Details		
CC BY	Created by: Joshua Vasquez	last edited: 1/1/2020
	SCALE: 1:1.5	SHEET 11 OF 17

With calipers and hard wire cutters, measure and cut a length of Spring Guide to 106.5mm.

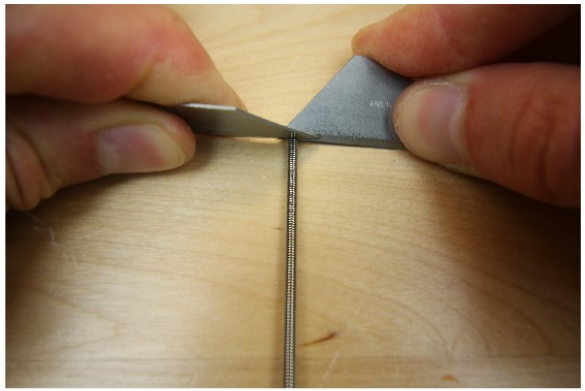
Follow the remaining instructions to create loops in both ends of the cut spring guide.



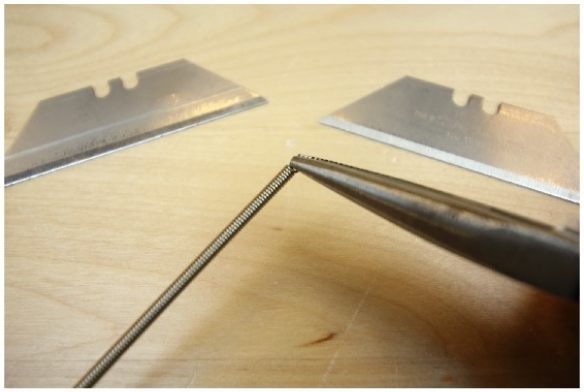
Wedge a knife blade into the last full loop on the spring guide.



Wedge a second knife blade into the same location as the prior knife blade.



With the blade that is farthest towards the end of the spring guide, bend it outwards to bend the last loop away from the spring guide.



Use pliers to open the loop.

Create a loop like this one on both ends of the spring. It need not be aesthetically perfect as we will crush it into another piece in the next step.

ITEM NO.	DESCRIPTION	QTY.
1	106.5mm Spring Guide (0.088-in outer diameter)	1

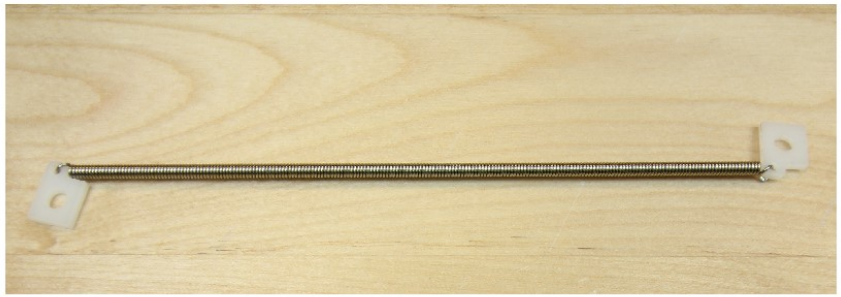
Locking Spring Fabrication

Created by: Joshua Vasquez

last edited: 1/1/2020

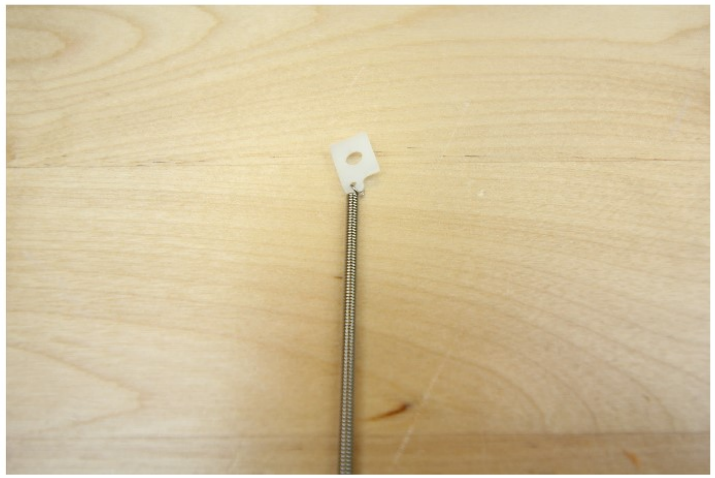
SCALE: 1:1

SHEET 12 OF 17



Note the orientations of both cinch plates on the ends of the spring guide.

Loop a cinch plate into each loop and use pliers to squeeze the loop such that the cinch plate can freely rotate but cannot fall off.



ITEM NO.	DESCRIPTION	QTY.
1	Spring Guide with formed loops	1
2	cinch plate	2

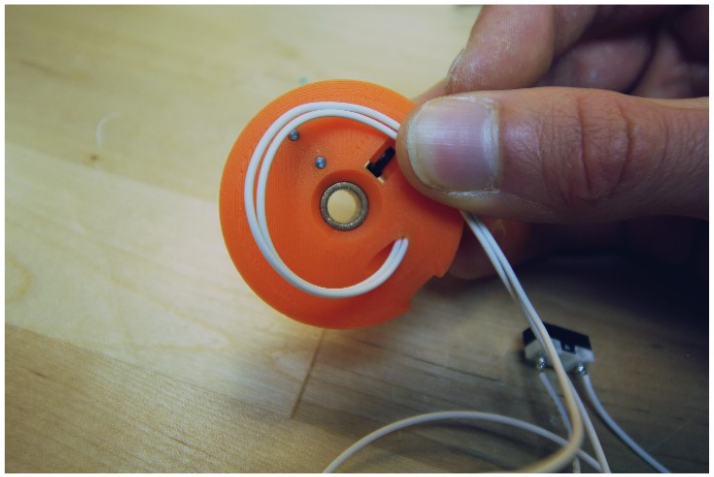
Locking Spring Assembly

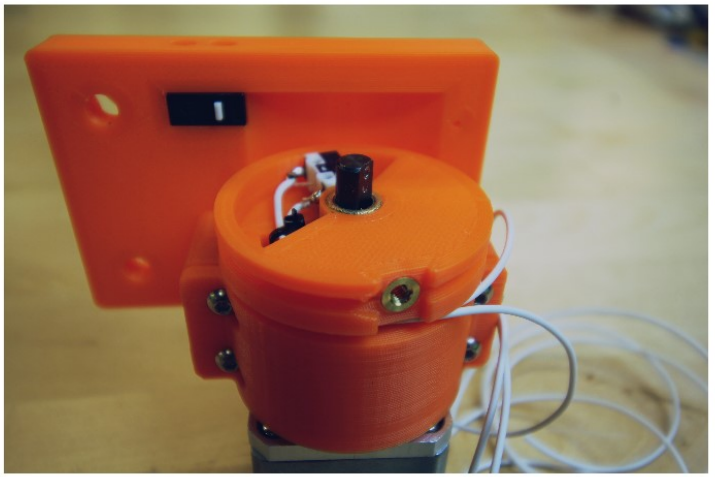
Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1.5

SHEET 13 OF 17

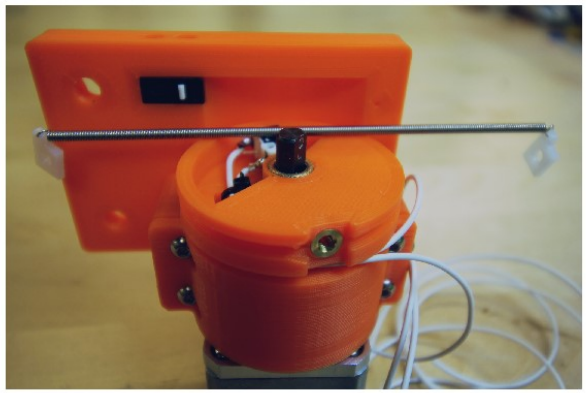




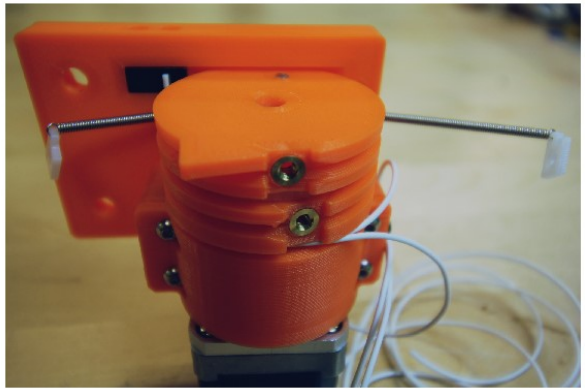
Install the floating pulley assembly onto the motor shaft with a single loop of slack tucked under the pulley.

TODO: retake these pictures.

Spring Pulley Installation 1		
	Created by: Joshua Vasquez	last edited: 1/1/2020
	SCALE: 1:1.5	SHEET 14 OF 17



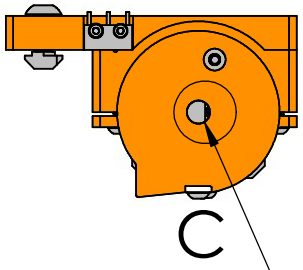
Install the Locking Spring and the Fixed Half-Pulley Assembly.

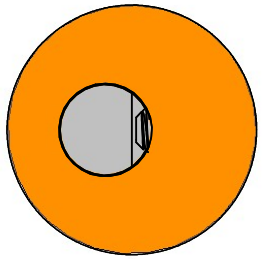


Install the Fixed Half Pulley assembly by pushing it down firmly and tightening the setscrew onto the flat part of the shaft. Note that

1. the Locking Spring will ride in the groove formed by the Delrin Slide Face

2. the Fixed Half-Pulley has a dowel pin that should extend into the Floating Half-Pulley. Wiggling it by hand should make an audible clicking noise from the limit switch.



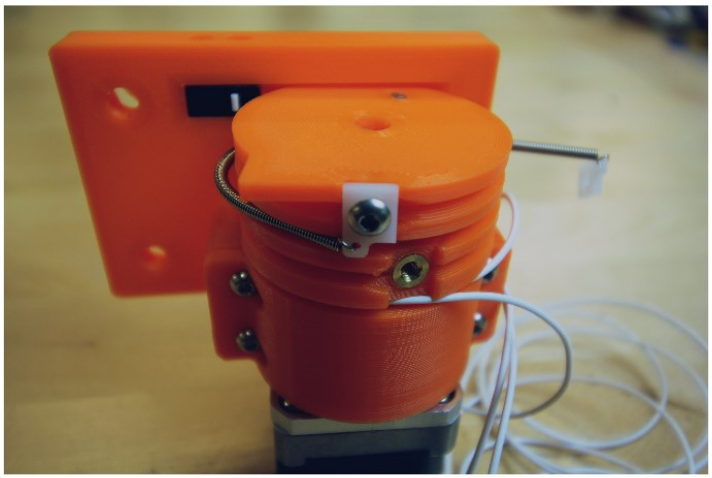


DETAIL C
SCALE 2 : 1

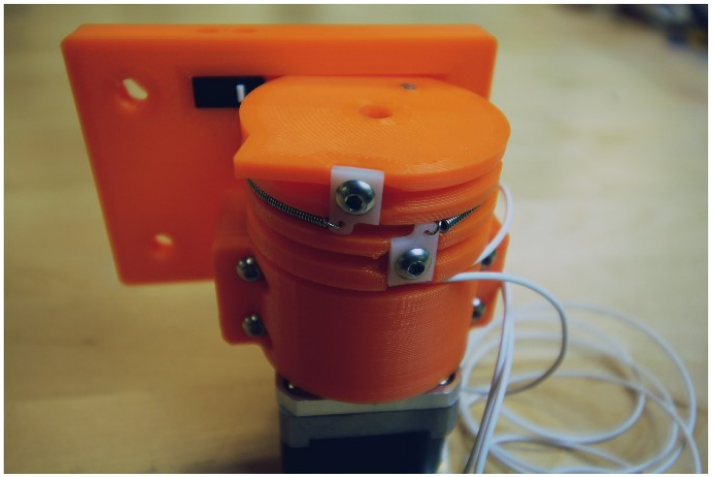
Note how the set screw must line up with the flat part of the shaft in the final assembly.Before installing the fixed pulley assembly, twist the motor shaft by hand such that the flat section properly engages the set screw.

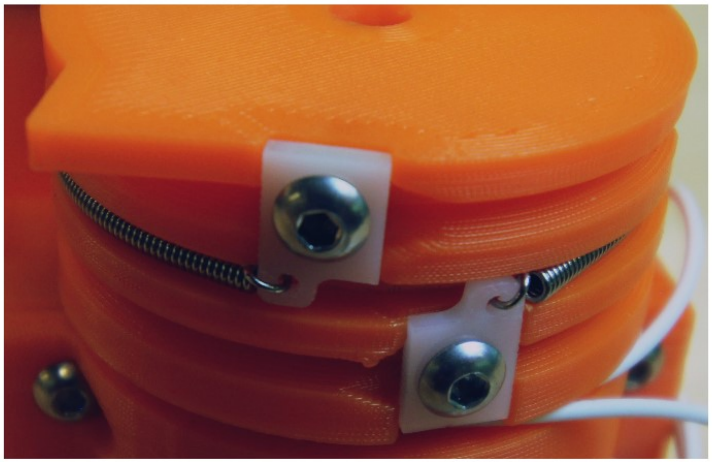
Apply threadlock to this setscrew. Then fully-tighten it.

Spring Pulley Installation 2		
	Created by: Joshua Vasquez	last edited: 1/1/2020
	SCALE: 1:1	SHEET 15 OF 17



Loosely fasten down both cinch plates in the orientations shown. They do not need to be tight as we will tighten them later.





Ensure tha tthe orientations match the image above.

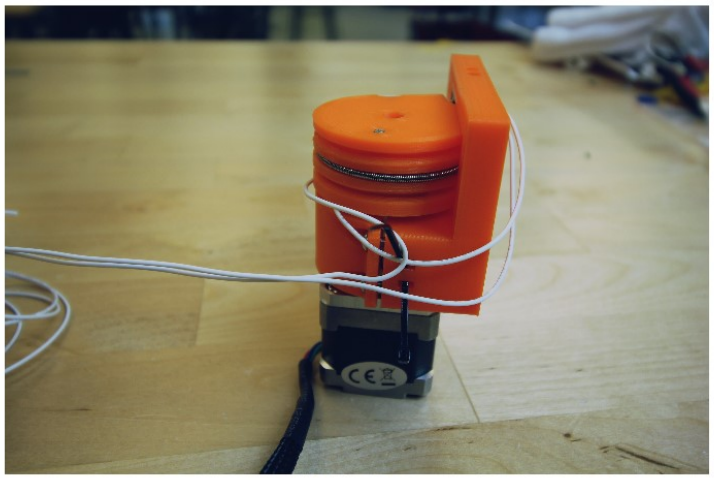
Spring Pulley Installation 3

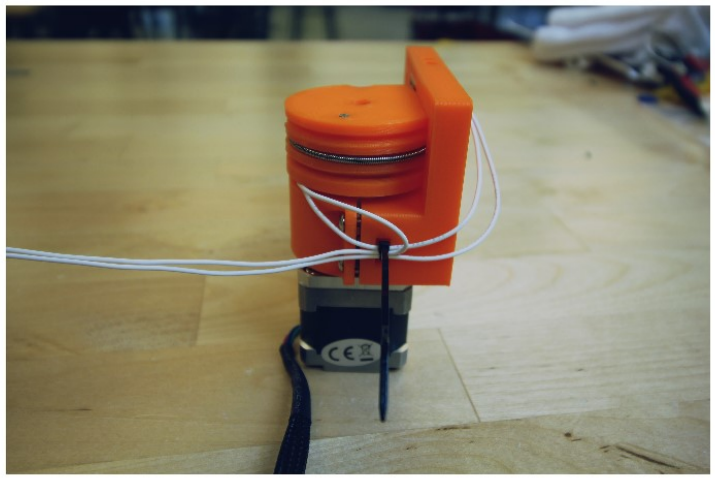
Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1.5

SHEET 16 OF 17





Gather the loose wires and zip tie them such that the long leads extent as show in the picture. Ensure that the pulley can freely rotate to the limit without being snagged. If it does snag, tighten up slack on the two wires that extend from the pulley and re-zip-tie.

Optional: sleeve the two loose wires for easy management.

From the connector bag that came with the Duet, install the 3-wire connector as shown. Polarity does not matter, but the wires must be installed on the outermost connector sockets.

Lock Detect Wiring

Created by: Joshua Vasquez

last edited: 1/1/2020

SCALE: 1:1.5

SHEET 17 OF 17