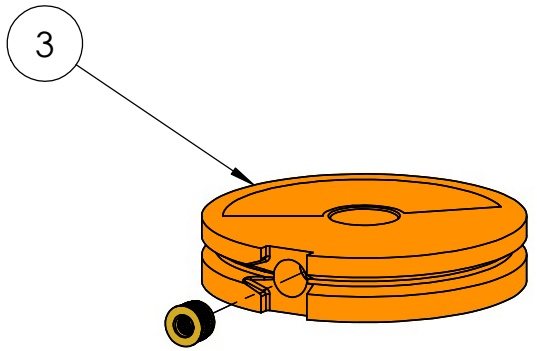
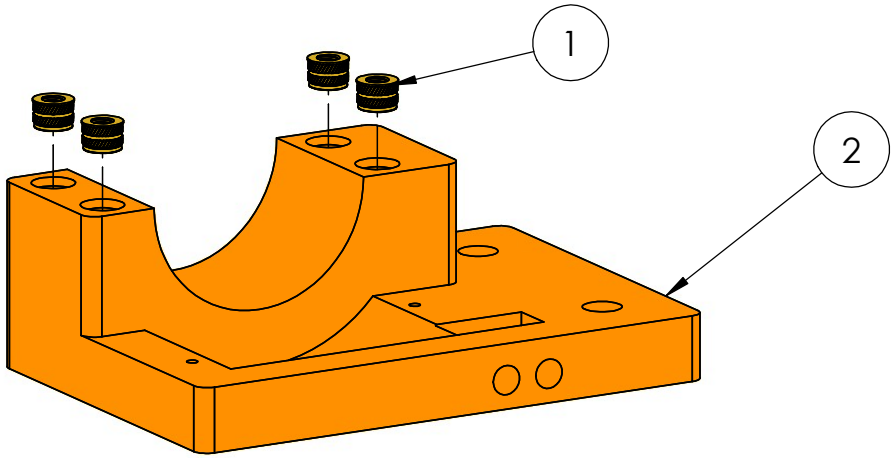
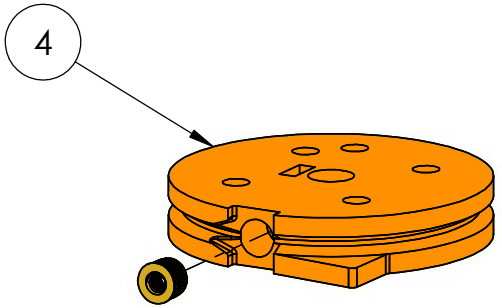
Install the following heat-set inserts using the *plate press technique*.
More information on the plate-press technique can be found here:
https://hackaday.com/2019/02/28/threading-3d-printed-parts-how-to-use-heat-set-inserts/







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

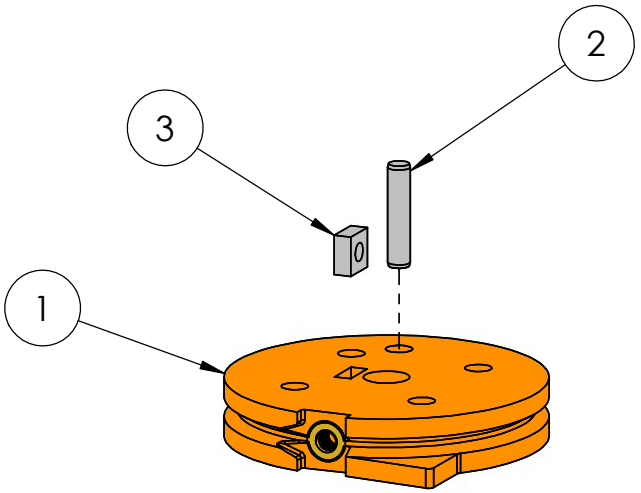
Heat Set Insert Callout

Created by: Joshua Vasquez

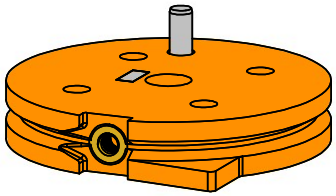
last edited: 10/8/2019

SCALE: 1:1

SHEET 1 OF 16



Press-fit both parts with an arbor press. Press-fit the dowel pin such that it is flush with the bottom surface. Press-fit the square nut such that it is flush with the top surface.



Result

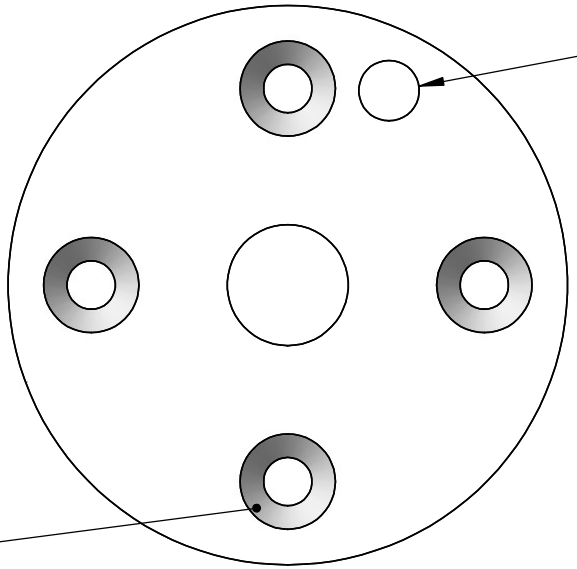
ITEM NO.	DESCRIPTION	QTY.
1	Fixed Half-Pulley with Insert	1
2	M3 Dowel Pin, 14mm len	1
3	M3 Square Nut	1

Fixed Half Pulley with Inserts and Press Fits

Created by: Joshua Vasquez

last edited: 10/8/2019

SCALE: 1:1



Befour countersinking, note the orientation of the plate by using this hole as a reference

With a countersink cage or similar, apply a 90-degree countersink for the M3 screw holes such that the flatehead screws sit flush (or deeper) than the top face of the part.

ITEM NO.	DESCRIPTION	QTY.
1	Spring Slide Face	1

Slip Face Countersink Callout

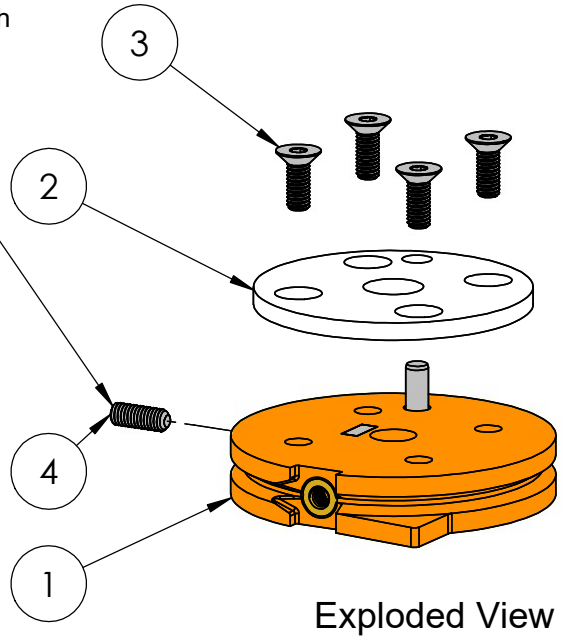
Created by: Joshua Vasquez

last edited: 10/8/2019

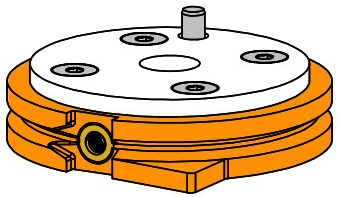
SCALE: 2:1

SHEET 3 OF 16

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.



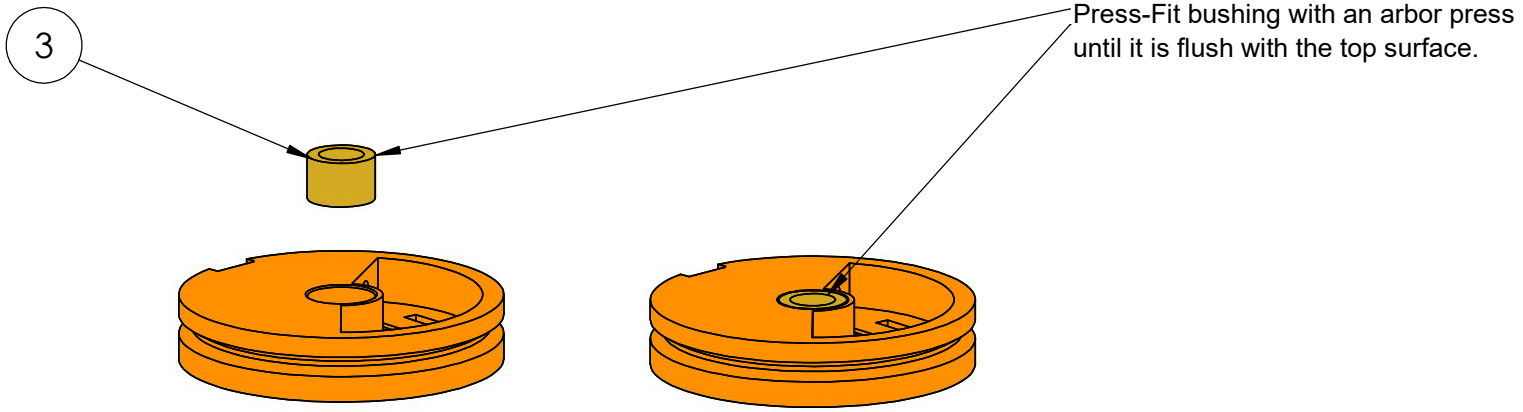
Exploded View



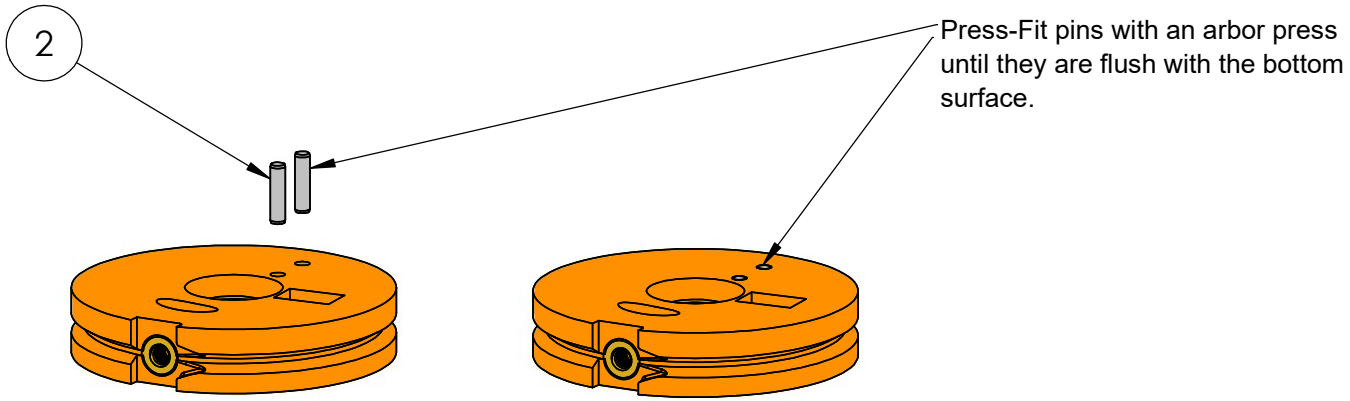
Assembled View

ITEM NO.	DESCRIPTION	QTY.
1	Fixed Half Pulley with press-fit parts	1
2	spring slide face	1
3	M3 Flathead Screw, 8mm long	4
4	M3 Set Screw, 8mm long	1

Fixed Half Pulley Assembly		
CC BY	Created by: Joshua Vasquez	last edited: 10/8/2019
	SCALE: 1:1	SHEET 4 OF 16



Top Side Views



Upside-Down Views

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

Floating Half Pulley with Inserts and Press Fits

Created by: Joshua Vasquez

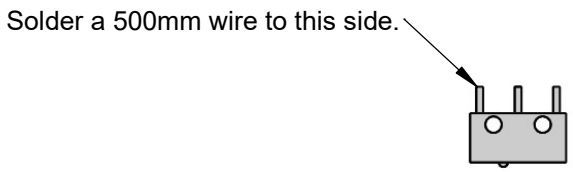
last edited: 10/8/2019

SCALE: 1:1

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

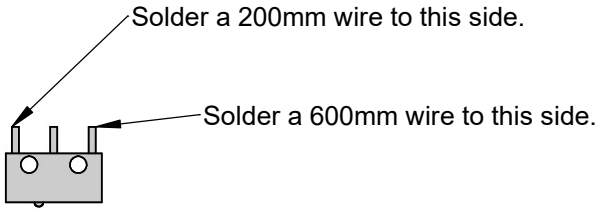
External Limit Switch

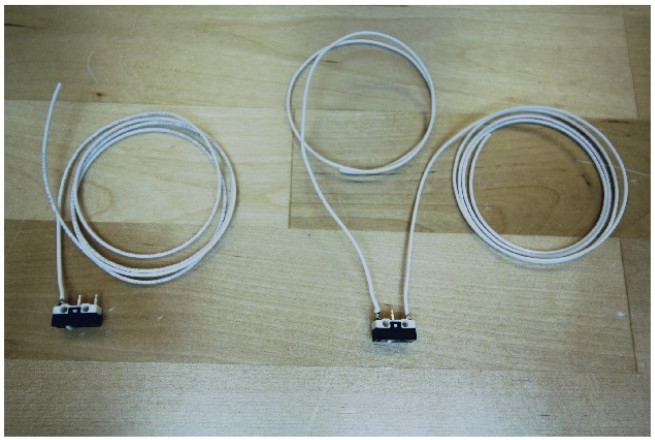
This switch will be installed on the mounting plate.



Internal Limit Switch

This switch will be installed inside the pulley assembly.





Result

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

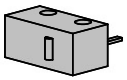
Internal Switch Wiring

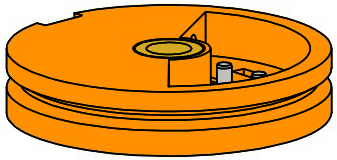
Created by: Joshua Vasquez

last edited: 10/8/2019

SCALE: 1:1

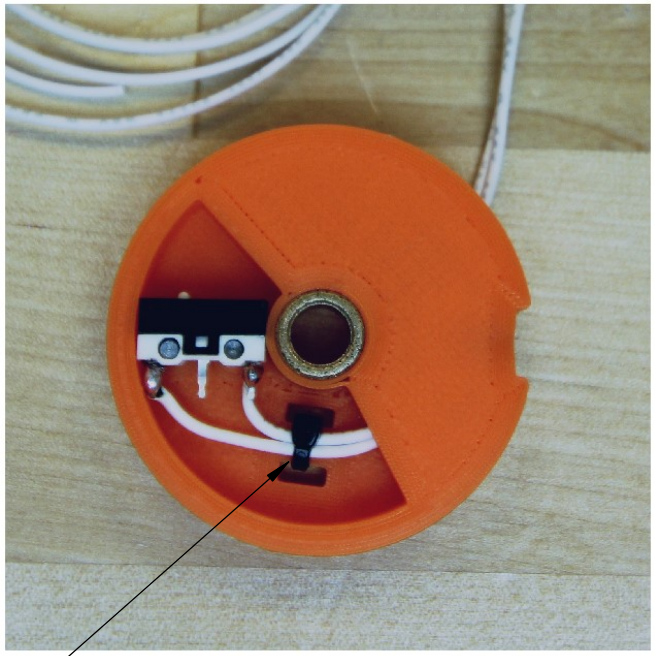
SHEET 6 OF 16





Exploded View

Tuck the two wires through the hole and out the other end through the bottom. Then slide the limit switch onto the two posts, noting the orientation.



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.

ITEM NO.	DESCRIPTION	QTY.
1	Mechanical Limit Switch	1
2	Floating Half-Pulley Assembly	1
3	Small Zip Tie	1

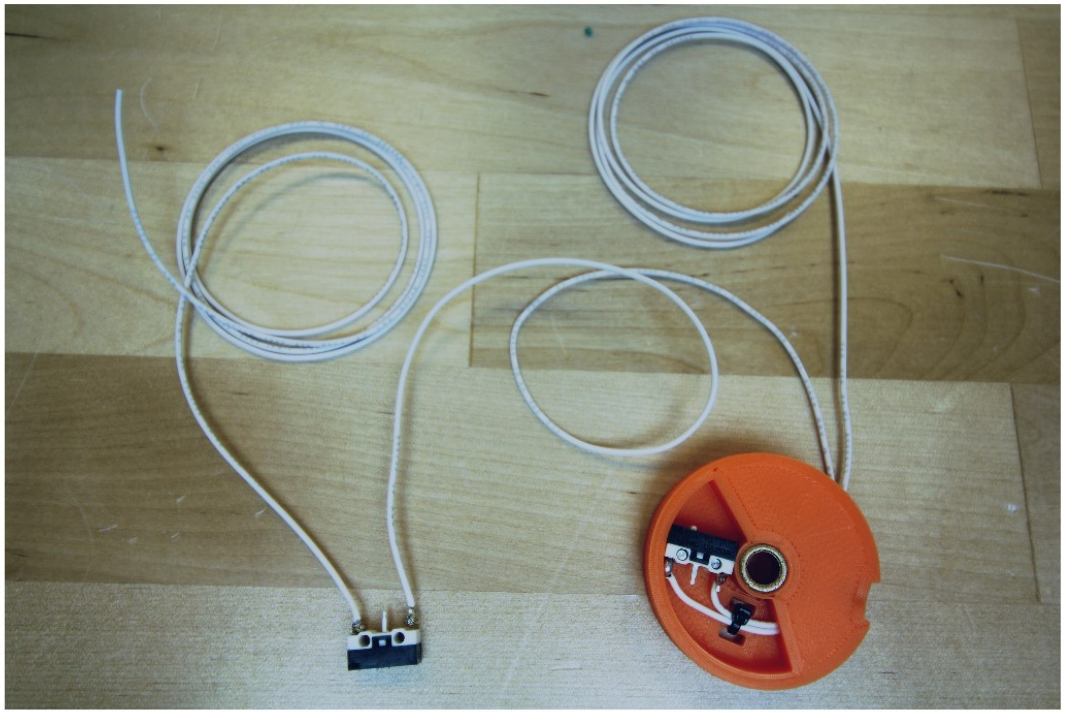
Internal Switch Installation

Created by: Joshua Vasquez

last edited: 10/8/2019

SCALE: 1:1

SHEET 7 OF 16



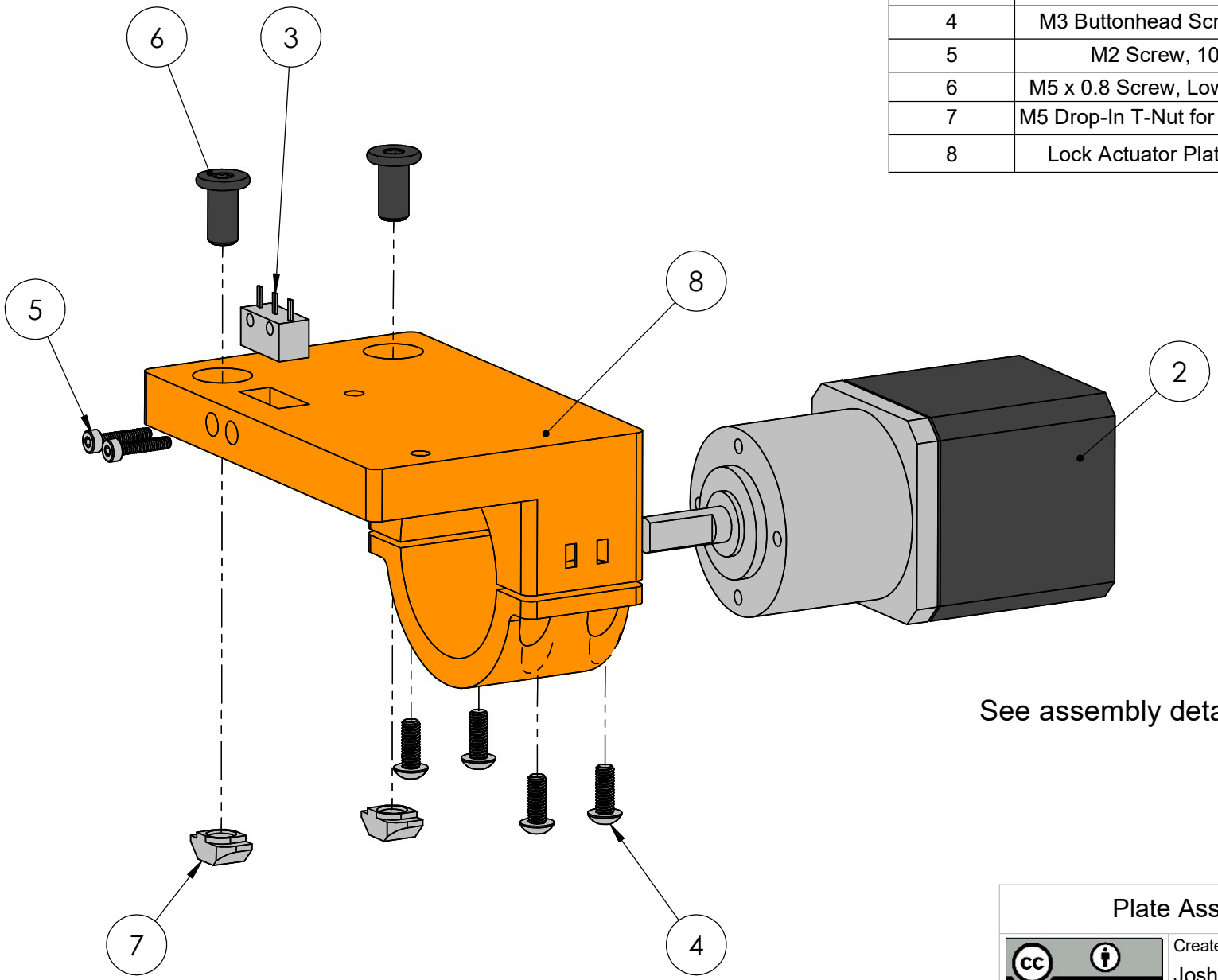
With the first limit switch installed inside the printed part, solder the shorter wire to the remaining outermost lead of the second switch. The result should look like the image above.

(Optional: slip on some heat-shrink onto the wires before soldering.)

Note: the dangling switch will be installed into the main plate.

Final Switch Soldering		
	Created by: Joshua Vasquez	last edited: 10/8/2019
	SCALE: 1:1	SHEET 8 OF 16

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 x 0.8 Screw, Low Profile, 10mm	2
7	M5 Drop-In T-Nut for 20x20 Extrusion	2
8	Lock Actuator Plate with Inserts	1



See assembly details on the next page.

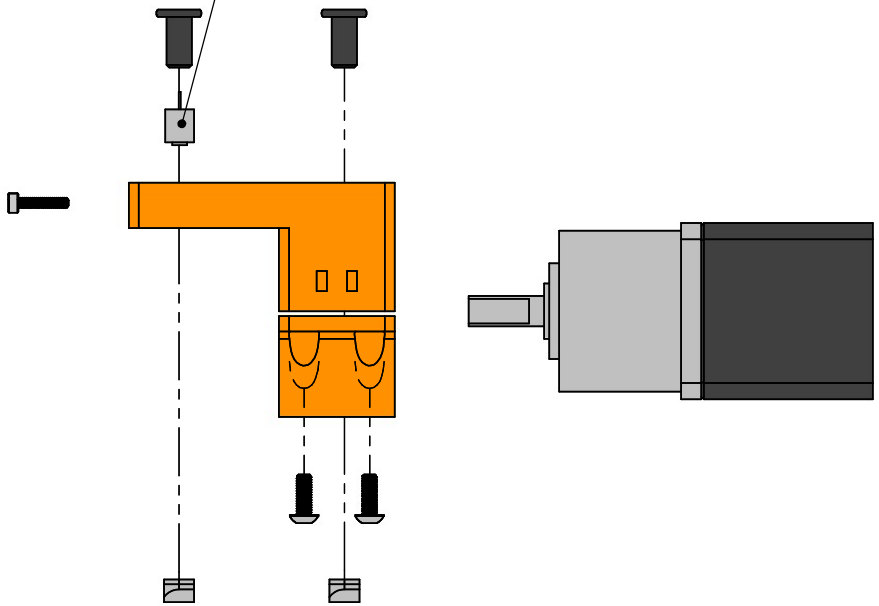
Plate Assembly Overview

Created by: Joshua Vasquez

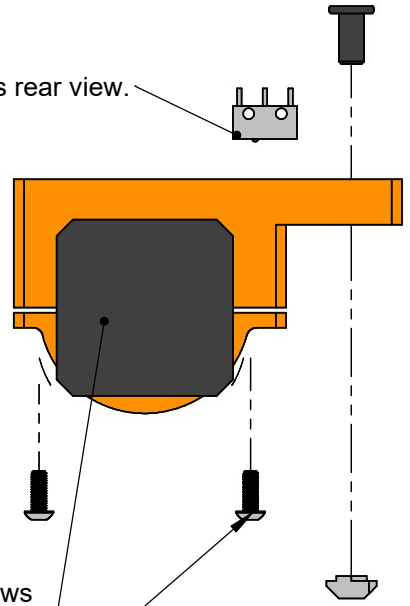
last edited: 10/8/2019

SCALE: 1:1

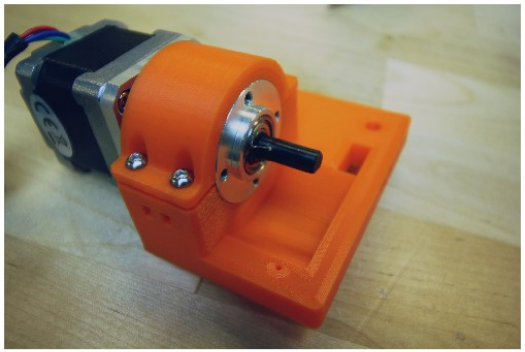
Install the dangling switch in the wire harness from the prior step first; then install the screws.



Note the orientation of the switch from this rear view.



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

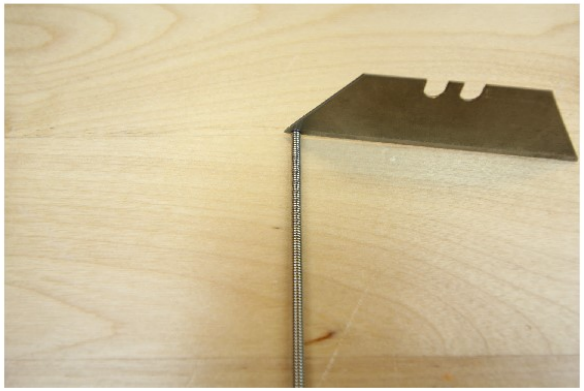


Note: the face of planetary stepper should be flush with the face of the locking plates. The limit switch wire should curl out of this gap.

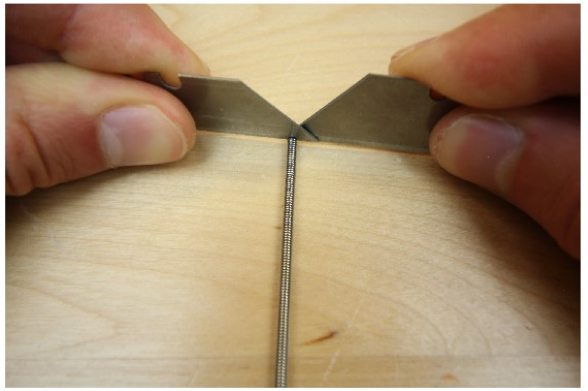
Plate Assembly Details		
	Created by: Joshua Vasquez	last edited: 10/8/2019
	SCALE: 1:1.5	SHEET 10 OF 16

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

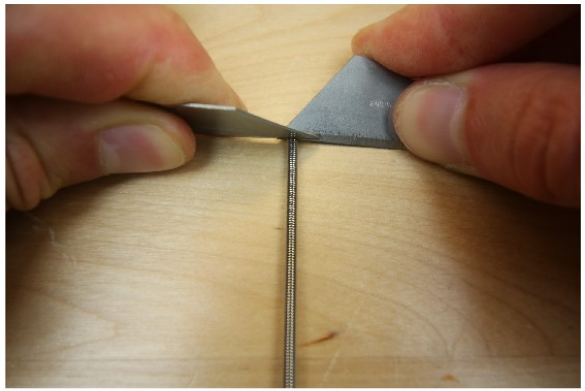
Follow the remaining instructions to create loops in both ends of the cut spring guide.



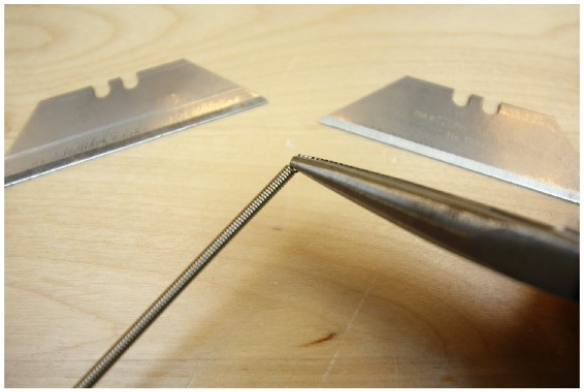
Wedge a knife blade into the last full loop on the spring guide.



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.

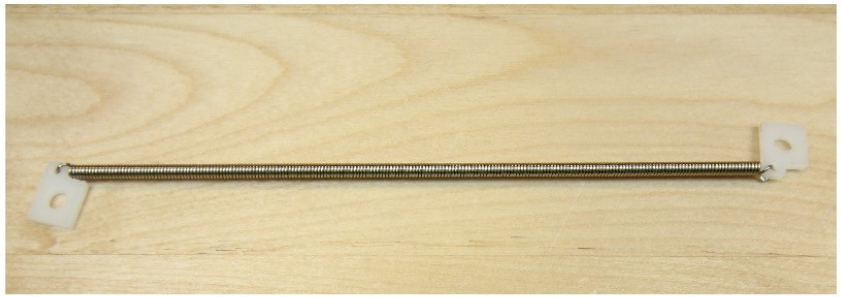
ITEM NO.	DESCRIPTION	QTY.
1	106.5mm Spring Guide	1

Locking Spring Fabrication

Created by: Joshua Vasquez

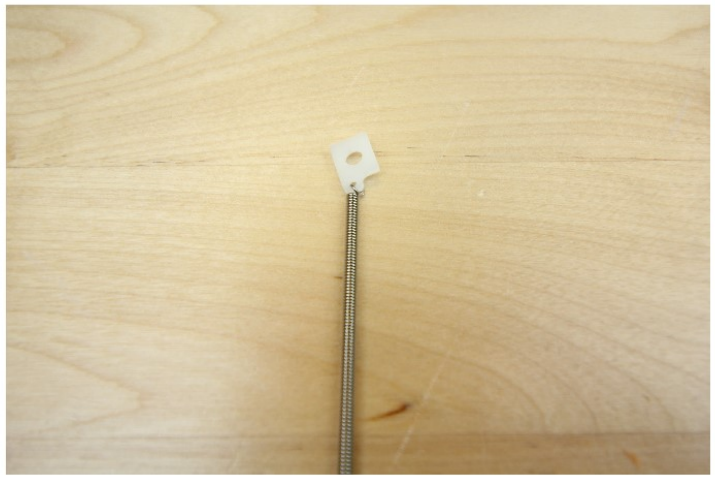
last edited: 10/8/2019

SCALE: 1:1



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

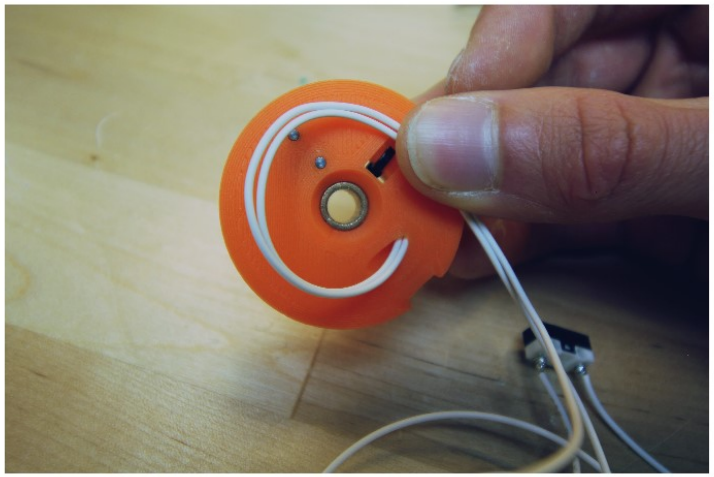
Locking Spring Assembly

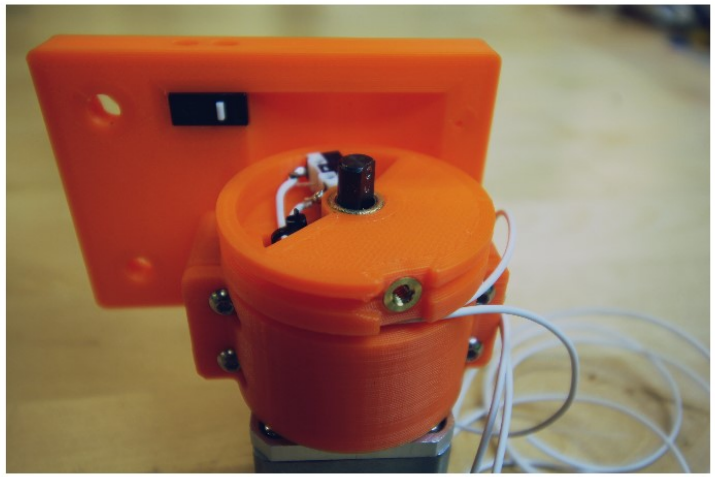
Created by: Joshua Vasquez

last edited: 10/8/2019

SCALE: 1:1.5

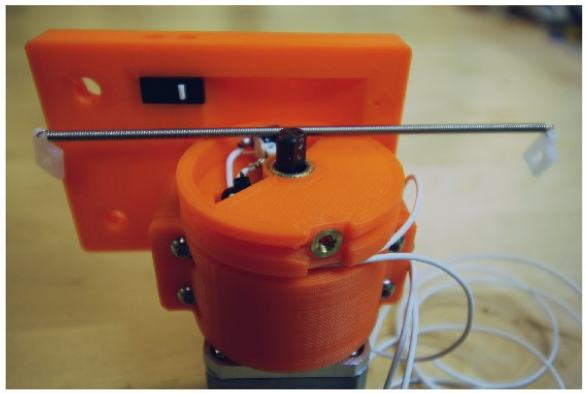
SHEET 12 OF 16



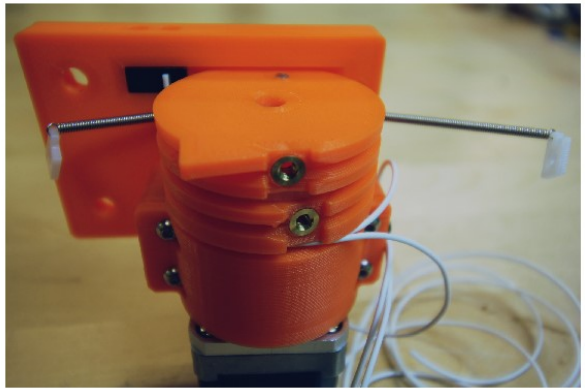


Install the floating pulley assembly onto the motor shaft with a single loop of slack tucked under the pulley.

Spring Pulley Installation 1		
	Created by: Joshua Vasquez	last edited: 10/8/2019
	SCALE: 1:1.5	SHEET 13 OF 16



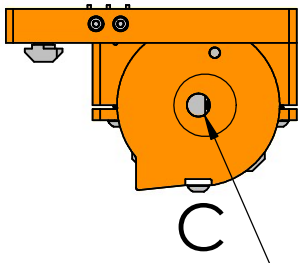
Install the Locking Spring and the Fixed Half-Pulley Assembly.

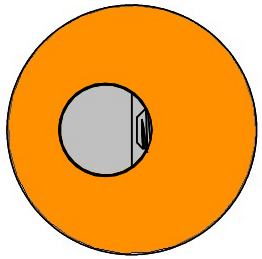


Install the Fixed Half Pulley assembly by pushing it down firmly and tightening the setscrew onto the flat part of the shaft. Note that

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.



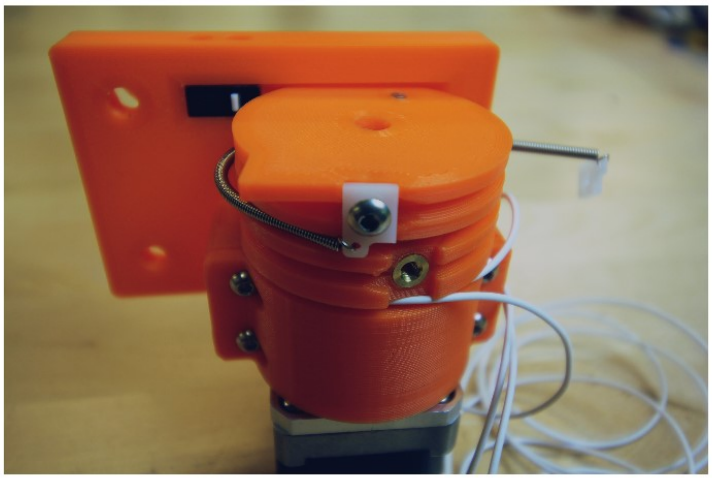


DETAIL C
SCALE 2 : 1

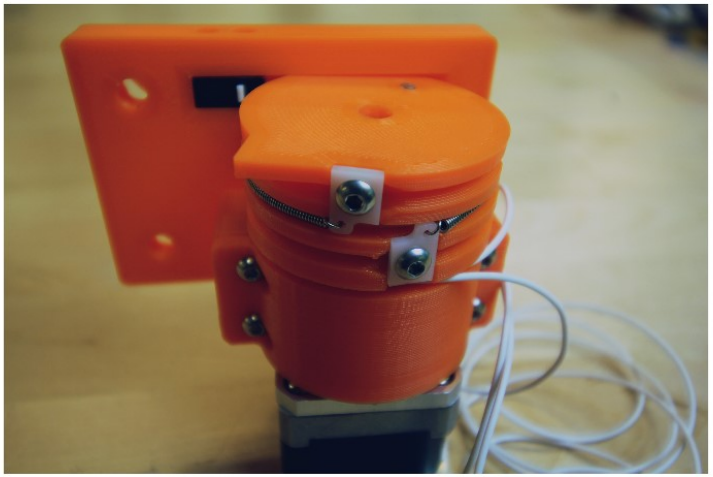
Note how the set screw must line up with the flat part of the shaft in the final assembly.Before installing the fixed pulley assembly, twist the motor shaft by hand such that the flat section properly engages the set screw.

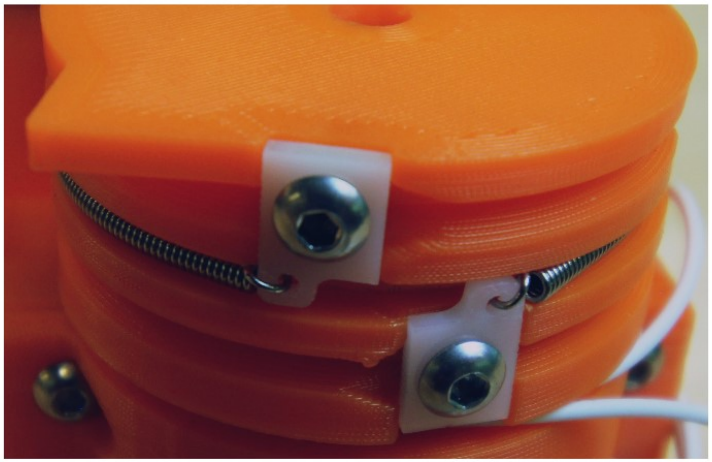
Apply threadlock to this setscrew. Then fully-tighten it.

Spring Pulley Installation 2		
	Created by: Joshua Vasquez	last edited: 10/8/2019
	SCALE: 1:1	SHEET 14 OF 16



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.

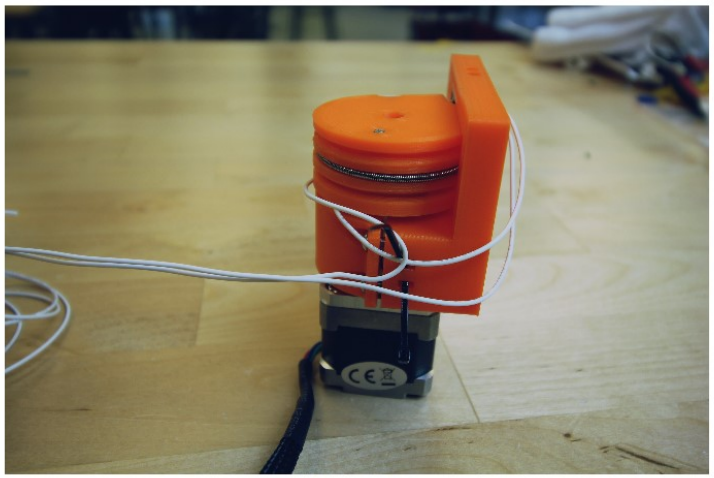
Spring Pulley Installation 3

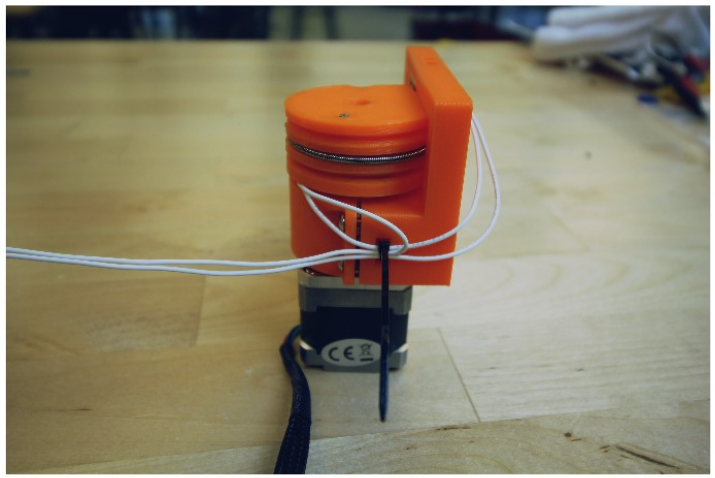
Created by: Joshua Vasquez

last edited: 10/8/2019

SCALE: 1:1.5

SHEET 15 OF 16





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: 10/8/2019
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