

**STERN**  
**Ghostbusters (GB) 2016**

***“Proton Gun” Mod (2021/2022) Servo Setting***

The Ghostbuster “Proton Gun” mod is hand crafted in Australia by a GB owner for all the other GB owners around the world that love their game and want to finally complete the game. Stern made allowance for Proton Guns but never implemented them into the game. Now you can add ball interactive mechs to your GB Pro / Premium / LE.

But some people are experiencing servo issues and this is a manual on how to Set the new Servos.



Thank you for your support and I hope you will enjoy this mod for many years to come

Proudly Designed and Manufactured by



**[www.swinks.com.au](http://www.swinks.com.au)**

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## **1. IMPORTANT NOTES**

1. This document is specific for the 2021 released Proton Gun v2 Mod manufactured and delivered at the end of 2021 through to early 2022.
2. This manual covers any possible problems (also repeated in the Installation Manual) as well as mainly setting up your new servo's.
3. The installation manual can be found here: <https://swinks.com.au/manuals>
4. Contact us via:
  - Pinside PM - Swinks
  - email - [swinks.pinball@gmail.com](mailto:swinks.pinball@gmail.com)

## **1. Trouble Shooting Possible Issues**

These are a few scenarios that people have experienced - therefore use the following as a guide but feel free to contact us for help.

### **Scenario 1 - The Proton Gun lighting falls out**

The lighting is probably the weakest design component of the whole mod as I am trying to ensure parts are removable for servicing / adjusting and not glued in place. The bulb is inserted into a holder and the LED holder inserts into the back of the gun and held in place with just pressure. If it is a little loose - cut a small piece of masking tape and wrap around the black bulb adaptor and re-insert until the friction increases to lock the bulb holder into place into the gun. Or you can add a drop of glue but may make things difficult in the future.

### **Scenario 2 - When one or both Proton Gun stops working**

It could also be possible that when you were in at the coin door to remove the lockdown bar or glass that one or both Proton Guns do not work anymore. It could be that a wire has come loose or pulled from it's connection, so check all plugs are seated properly and on the correct pins.

Sometimes when you have lifted the playfield you could of forgot to disconnect the wires so if when lifting the playfield on to the service brackets it may disconnect a cable with force.

### **Scenario 3 - The guns are not aligned perfectly from Swinks Pinball**

It is highly un-likely that perfect alignment will occur from us as perfect alignment depends on perfect installation as any slight angles when installing and fastening the mechs to the game will contribute to slight angle variance. The process of alignment is part of the installation process - refer to section **21. Hook Up / Power Up and Tune Up Process**

### **Scenario 4 - The Servo's have a slight buzzing sound**

The buzzing sounds means that the guns in their non-used state are being restricted and not allowed to totally rest in their home position and are under a small load. This means the proton gun at rest has the proton stream section hard up against the stainless ball guides, therefore make a small adjustment to your proton gun - refer to section **21. Hook Up / Power Up and Tune Up Process**. Occasionally there is a slight buzz when activated and this is hard to avoid and is just part of the servo.



### Scenario 5 - The Proton Streams are bending in at the home position

This is basically the proton guns at rest are too far adjusted to the Stainless Steel rails - you need to fine tune your Proton Guns - refer to section 21. **Hook Up / Power Up and Tune Up Process**

It could also mean that the lock screw for the proton gun to the pivot shaft is loose or in the fastening process you did not align the end of the bolt square to the flat of the pivot shaft.

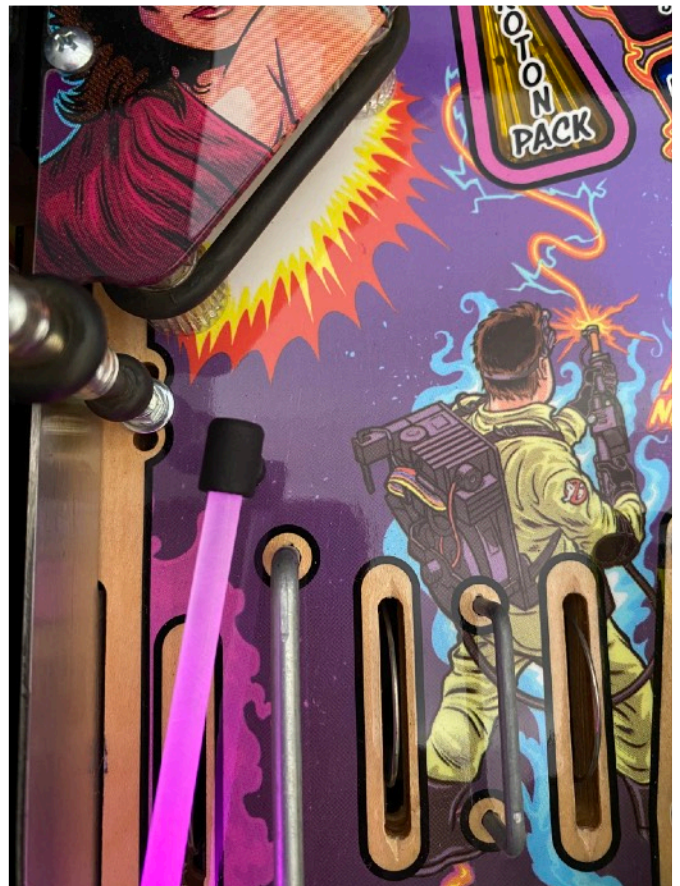
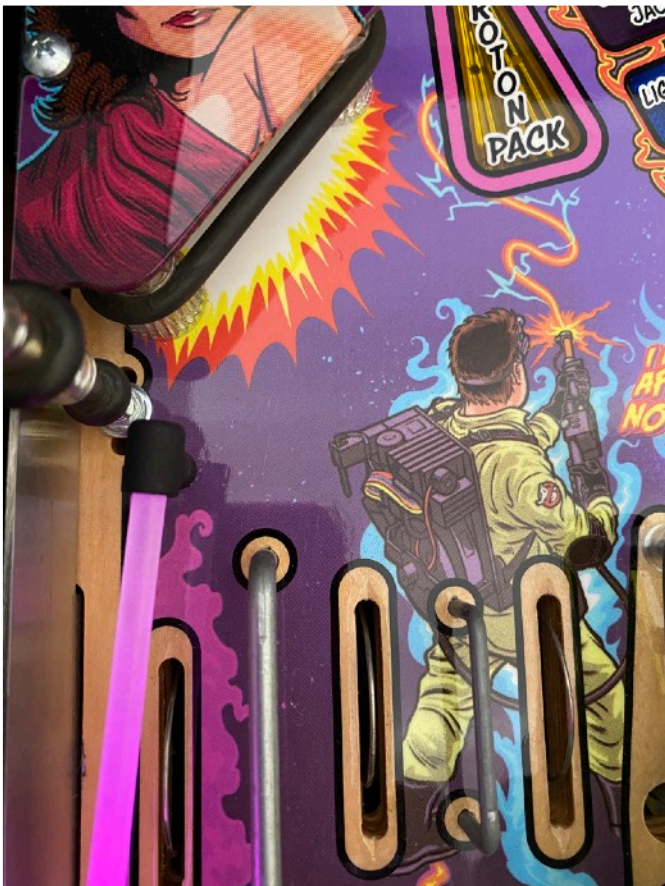
And sometimes it only happens on the initial power up and the RHS stream goes against the rail on power up but on first use of the foot pedal the stream settles back to it's proper home point after it's first use - it is a servo thing that we have to accept - though I try to set so any homing issues are minimal.

### Scenario 6 - When one of the Proton Guns stops after a few pushes

The Servo driver board sometimes does not like it when the travel from rest position to block position is a very small movement. Simply push your foot on the pedal and then adjust the B screw so it moves the Proton Gun out just a little more to block the lane. Just don't go too far out so the ball can't get stuck behind the proton gun.

Original Setting

Adjusted Out a Little More

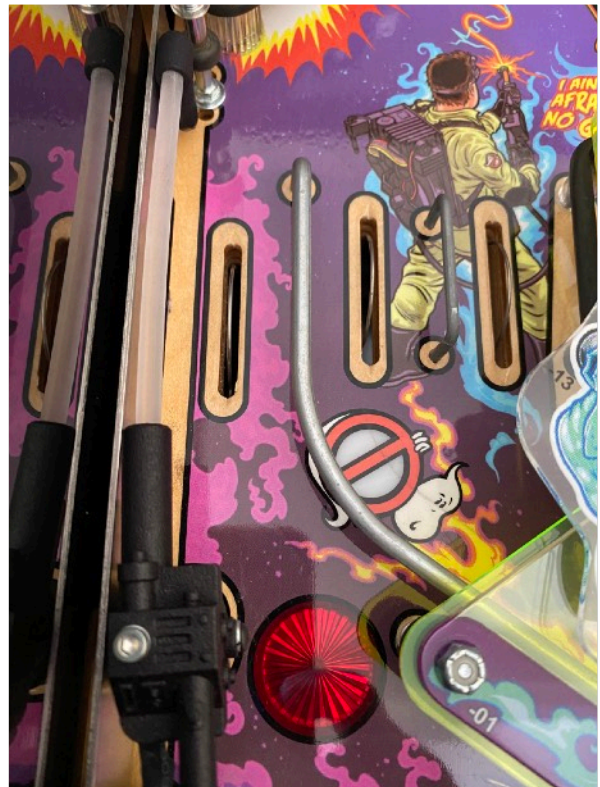




**Scenario 7 - When one of the Proton Guns is not aligned and you have adjusted all the screws in an attempt to reset one side of the Proton Guns.**

The Proton Guns are all set before sending to you the customer, but sometimes if the mech is not installed dead straight to the playfield it will transfer to the the Proton Gun tilted either into the lane or into the side of the playfield beyond it's rest position. Most people think it is straight away the gun and not consider the mech install has possibly contributed to mis-aligned Proton Guns. Some people adjust the A and B screws without any issues and others actually mess up the settings - but it is all fixable. In the example we are working on the LHS Proton Gun and LHS Servo Trigger Board.

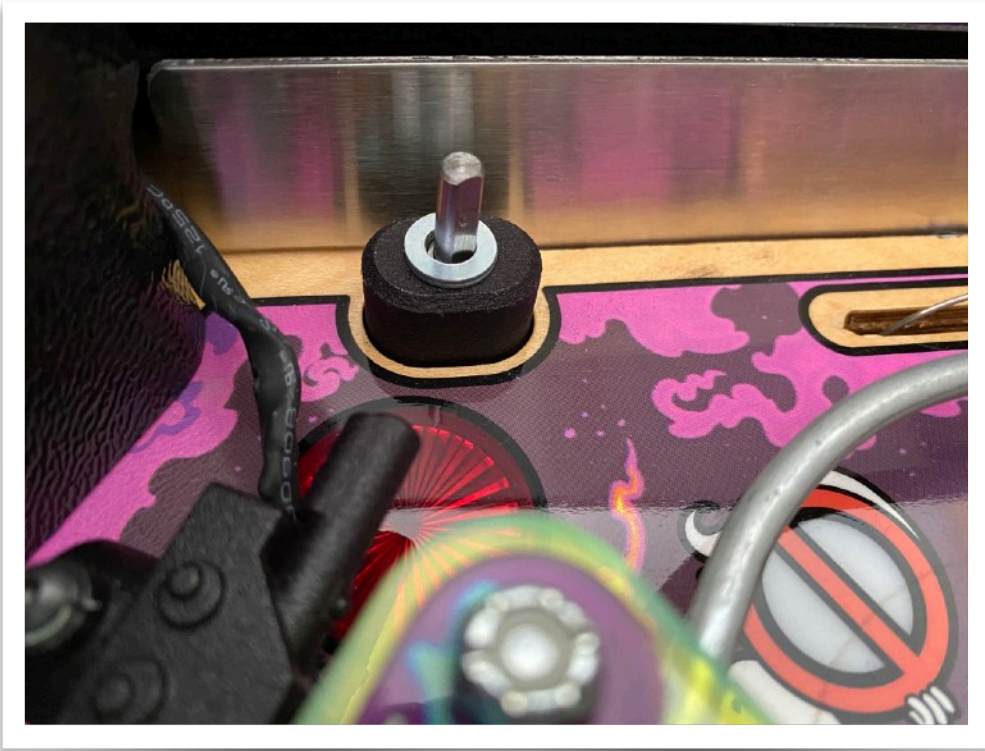
This is what it looks like (beam has a decent bend in it) and you may have a mild panic, the Proton Gun heavily turned into the side and when you push the pedal it wants to go further into the playfield side - **turn the mod off immediately:**



Loosen the screw on the side of the Proton Gun (inlane side) and lift the gun off the shaft:

Take note of the flat on the shaft as per this picture, the goal is to adjust the A screw on the LHS Servo Driver Board so the flat is parallel to the cabinet side - BUT do not touch the Pedal during this adjustment. **BUT first adjust the T screw incase you played with it as this is the speed of the shaft rotation - turn it full anti-clockwise (for fastest movement) because if you adjust A & B screws and this is set to the slowest (full clockwise) you might make adjustments that are mid movement. So adjust T screw first and then go back to setting the A screw:**

*Flat of shaft incorrect*



*Flat of Shaft now correct*





Now push the pedal as we will correct the Ball Block Adjustment of the Proton Gun - depending on what you adjusted earlier on it might be messed up - so it may not move or only move a little or a lot. Push the pedal and also adjust the B Screw as you only want about 10 degrees of movement.

*When the pedal is pushed the Ball Block position should be roughly this*



Now reinstall the gun back on to the shaft and nip the screw onto the flat of the shaft. Now check that the Proton Gun is parallel with the cabinet side and make a slight adjustment to the A screw to get it right if required:





Then activate the pedal and the gun should rotate into the lane to block a ball - it might be adjusted to far but that is ok but this is an example of where the ball could travel behind the Proton Gun and then it could not return when not using.



Now adjust the B screw to get Proton Gun to your liking but not too far over so the ball can get trapped behind the Proton Gun Beam.





## Scenario 8 - When the guns are activated they both rotate in the same direction

When each mod is assembled the servos and boards are set in a jig so the servos and servo boards rotate the blue servo horns in the correct direction and to the correct angle as a preset. They sit in a close to straight home position with an approximate 15 degree of turning when activated. Then the servos and boards are numbered and transferred straight to their corresponding brackets to ensure they are not mis-matched with other servo parts of other Proton mods. Mixing set servos and board could lead to tuning issues if not performed this way. Then on final assembly each kit is tested a 2nd time and a sticker is installed on the back of the coin door plate stating it is SET & TESTED. When you first power up the mod both proton guns will rotate in a clockwise direction and I try to set so they only travel 5-10 degrees using my custom test rig.

Please observe the problem as sometimes it isn't really a problem and more a case of the servo natural behaviour.

Ensure not to play with the Servo Pots (screws) A, B and T until you have read this manual and understand the setting of the guns.

When powering up the mod each time the servos want to rotate a little to go to their set HOME position. The servos and servo boards are able to be used so they can rotate clockwise or anti-clockwise but when initially powered up they typically rotate in a clockwise rotation from 5 up to approx 45 degrees. Swinks Pinball uses a jig and sets the home rotate as tight as possible with 10 degrees being the maximum. **The rotating clockwise for both guns on power is standard.** Then when you push the foot pedal the guns rotate correctly then everything should be fine. Also a contributing factor to the rotate and gun alignment is when the mechs are screwed to the playfield you are governed by the bung holes but if the mechs are not exactly parallel with the playfield sides you may have introduced a few degrees in rotation which could contribute to setting concerns.

But if you have powered up the mod and the RHS rotates clockwise and it is concerning - check to see what happens when you push the foot switch. If the right gun rotates even further in the clockwise direction you will need to stop activating the guns immediately, power off and check wiring connections are seated properly and in the correct positions and in their correct locations - not a rhs cable plugged into a lhs board for example. Refer to [Section 6 pg 12](#) for the correct wire locations.

If everything seems right and the problem persists remove the problem gun from the pivot shaft and put a little bit of tape onto the shaft to watch the pivoting motion instead of potentially watching the perspex rod break. If the rotation is still incorrect it is time for testing a little more. Remove both guns off their shafts and add tape and now power off the mod and swap the servo wires at the servo board to see if the problem flips or rotation is still the same. If the problem persists return the cabling back to original RHS to RHS etc and leave the guns off / with tape on and do a test to see if the rotation corrected itself - if it has then it means the cabling was not seated properly or not correctly aligned up. If the problem persists it is time to perform Scenario 7 first and worst case reset the shaft in the mech which while not overly difficult means a full disassembly and should not be required.

To reset the shaft in the mech contact Swinks Pinball first as this next step is a little complex for the non-technically minded person. The mech has to be removed from the playfield and you will need to download the assembly drawing from the website for reference of how everything is assembled. Once the mech in question is removed reconnect the servo cabling and connect directly to the servo board as a final check to see if the problem still exists as this takes the long extension cable out of the equation.

If the problem still persists it is time to disassemble the mech in question. Why do we need to do this ? - it is because the servo coupled with the servo board halves the servo range but allows the

servo to be activated clockwise or anti-clockwise and the mid point of both keeps the homing range small, but can also have a negative effect because when preset and if you need to adjust A it can occasionally fall into a dead-space adjustment.

- 1.** While connected and the gun removed inspect where the pivot shaft flat is - it should be parallel with the playfield side. Activate the foot switch / mod / mech and watch the direction of the shaft flat when activated as this is your 15 degrees of pivot range - take a picture, video - what ever helps to remember where it needs to be.
- 2.** If nothing has changed now adjust A so the flat sits parallel to the mech via your corresponding servo board. Refer 20. Understanding the Proton Gun Servo's.
- 3.** Now turn the red switch off, wait 10 seconds and turn back on and check the shaft flat placement and determine the homing angle range.
- 4.** Now activate the foot switch and see what it does. Sometimes to get the correct range the servo A and B have to be adjusted so the homing pivot angle is minimal which means forgetting about the pivot shaft flat but it must rotate the correct direction.
- 5.** Once the servo is re-adjusted you will notice the flat is not parallel with the mech anymore. It is now time to disassemble the mech so locate the drawing relating to your mech so you understand the assembly and can ensure re-assembly will be performed correctly. The goal is have the shaft flat facing 90 degrees to the inside of the playfield. The shaft flat represents the plan of your gun.
- 6.** Loosen off the pivot horn screw to the shaft.
- 7.** Remove the servo from the mech.
- 8.** Remove the pivot horn from the servo horn.
- 9.** Loosen the 2 small screws on the side of the servo horn - do not lose these.
- 10.** Remove the black screw that holds down the pivot horn to the servo.
- 11.** Lift off the pivot horn and power up the servo as this locks in the home position and then re-install the servo horn so it 90 degrees to the servo. The grooves in the servo horn are not as fine so some minor Servo Board adjustment maybe needed, Power off and on to check the home position and repeat until correct.
- 12.** Now reconnect the pivot horn, then assemble the servo to the mech, lock the pivot horn to the shaft.
- 13.** Now do a test - on, off and gun use and check that it is in an acceptable range and then re-assembly into your playfield and you alignment should be now better.



## Scenario 9 - Will there be spares available in the future ?

Basically - YES - this will NOT be a mod that in a years time you can not get parts for. Keeping in mind I design these mods to last and not fail easily or early as I only want happy customers and reliable products. **BUT** I have no control over the servo's and servo driver boards as they are Spark Fun products and they do retire products from time to time. I would recommend getting 1-2 Driver Boards just in case though the specific Servo's are not a Sparkfun product so should be readily available elsewhere.

Most part details can be identified in the drawings as well as below:

- **Servo** - from Sparkfun DGServo S05NF STD  
<https://www.sparkfun.com/products/14760>
- **Servo Driver PCB Boards** - from Sparkfun WIG-13118 ROHS  
<https://www.sparkfun.com/products/13118>
- **3D Printed Parts** - they were available through Shapeways but they went bankrupt so reach out to Swinks Pinball as can arrange some spare if needed
- **5mm Acrylic Rod** - Acrylic supplies - must be 5mm Dia. and solid. The RHS is 140mm long and LHS is 135mm long and the rod is scuffed to make it translucent to aid in showing the colour better. I insert the rod into a cordless drill and then I hold sand paper around the rod and then activate the drill, spinning the rod to scuff up consistently.
- **LED's** - Pink 3mm Super Bright LED (3.2v) with a resistor to allow to run with 5-5.5vdc
- **Bolts, Washers, Nuts** - are all metric and are as detailed in the drawings
- **100R Ohm Resistor** - for 5v supply to 3.2v Pink LEDS
- **150R Ohm Resistor** - for 5v supply to 2v Green Bezelled LED

Note: The **On/Off Switch** and **Green Bezelled LED** are unique to a locally electronics store but there will be similar products out there if I can't help you out with sourcing.

## **2. Make the Servo Setting Jig**

In the event that a wire to a servo board was crossed when re-pinning or if someone stomped on the foot pedal for too long either or possibly both the servo trigger board and servo could of blown and your mod is no longer working properly.

This is a rough guide on setting up your new servos and servo trigger boards using a jig I created to set up all the mods before they went to my customers.

**IMPORTANT NOTE:** while you could just re-install a new servo into the left or right mech - it will cause you a large headache as the servo trigger board and servo need to be paired and set prior to being installed into the mech and installed into the game.

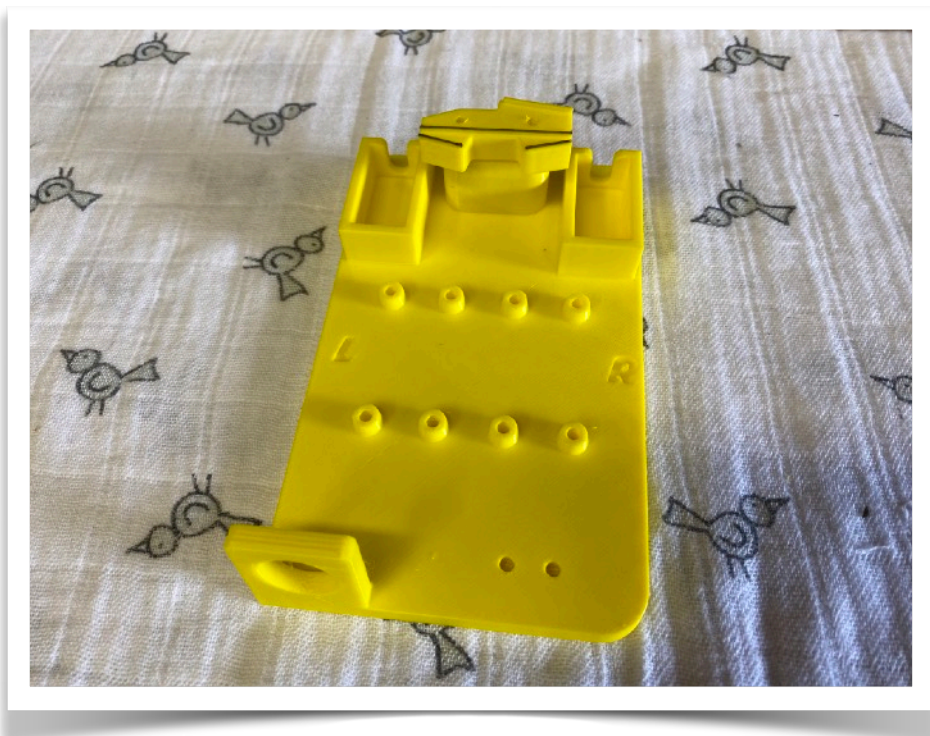
Please keep in mind this was a jig I used for many mods and not ideal for the one off use but it gives you a guide of what I did and how to set the servos.

After purchasing your new servo trigger boards and servos (links available in main manual). You will need to follow these instructions:

**Step 1** - 3d print the servo setting jig made available here:

<https://makerworld.com/en/models/1300317-gb-proton-gun-mod-servo-setting-jig#profileId-1332528>

**Step 2** - run a black texture over the lines on the small part as this is what servo horns will be aligned with. Enhancing the lines helps to see and align things better. Then tap a 3mm thread through the 2 small holes. Or if you do not have taps - simply find a similar gauge bolt or rivet to secure. Then fasten to the jig as per below:

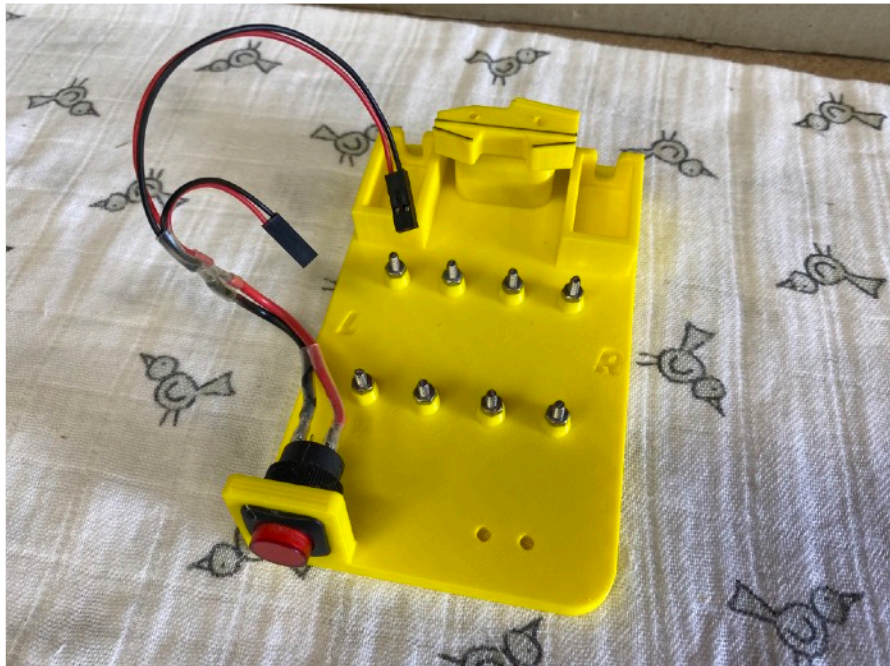




**Step 3** - install 8 of 3mm bolts into the 8 raised posts and then a nut on top to secure, ensuring about 6mm / 1/4" of thread is hanging out. This is to place the servo trigger boards on but you could just push in a rivet / pin / nail.

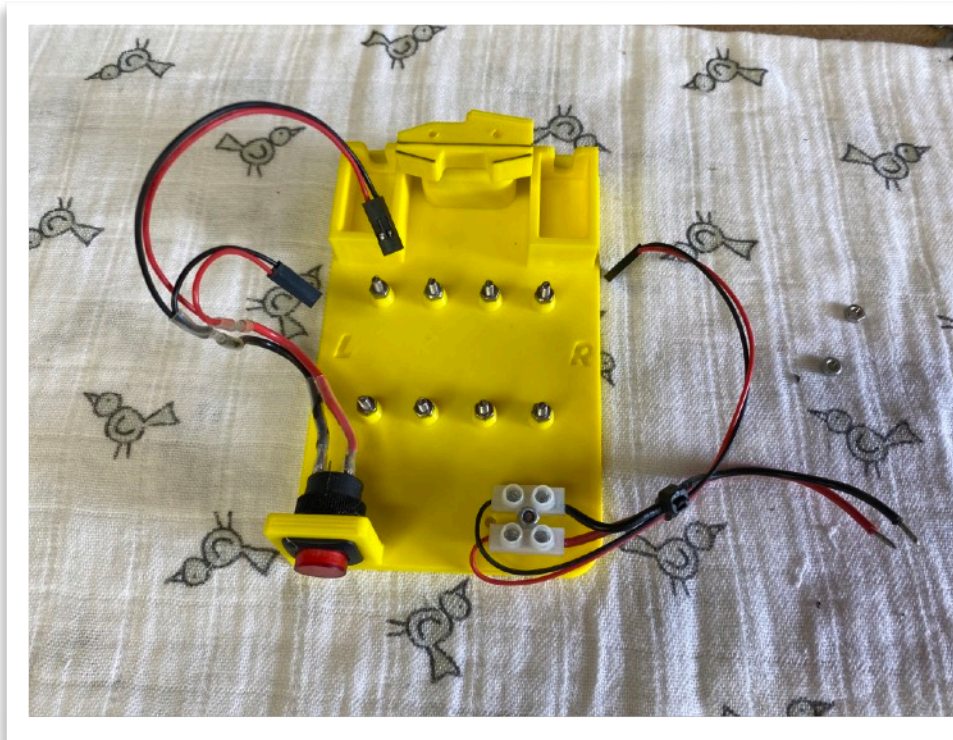


**Step 4** - locate a switch in the front hole though it isn't really required, you can just use any switch hanging loose or even bridge to wires on pins to activate.

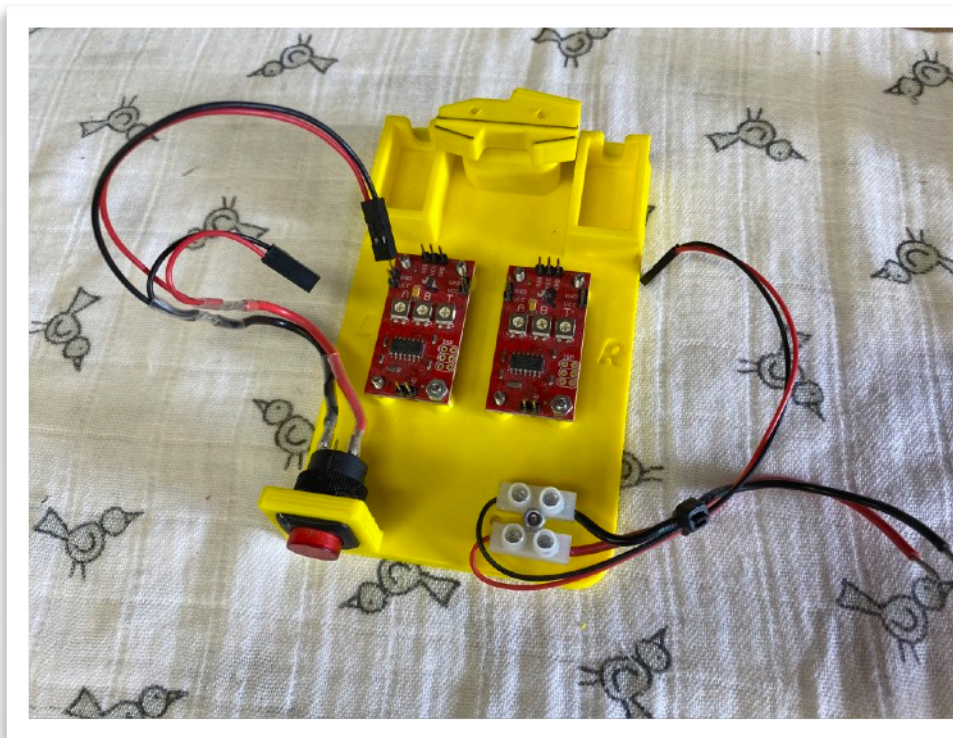




**Step 5** - install a terminal strip if desired but not necessary for a one off setting and just run 2 wires to the power of the Servo Trigger Board.

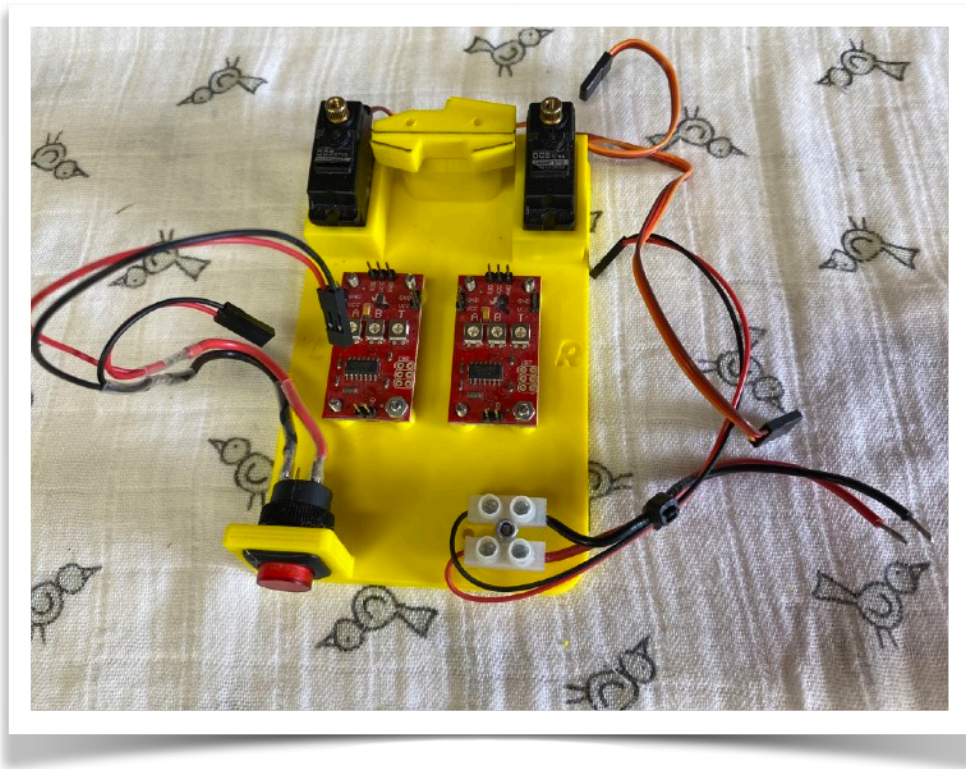


**Step 6** - install your new servo trigger boards onto the posts.





**Step 7** - install your new servos into the 2 holders as shown and your jig should look something like this.

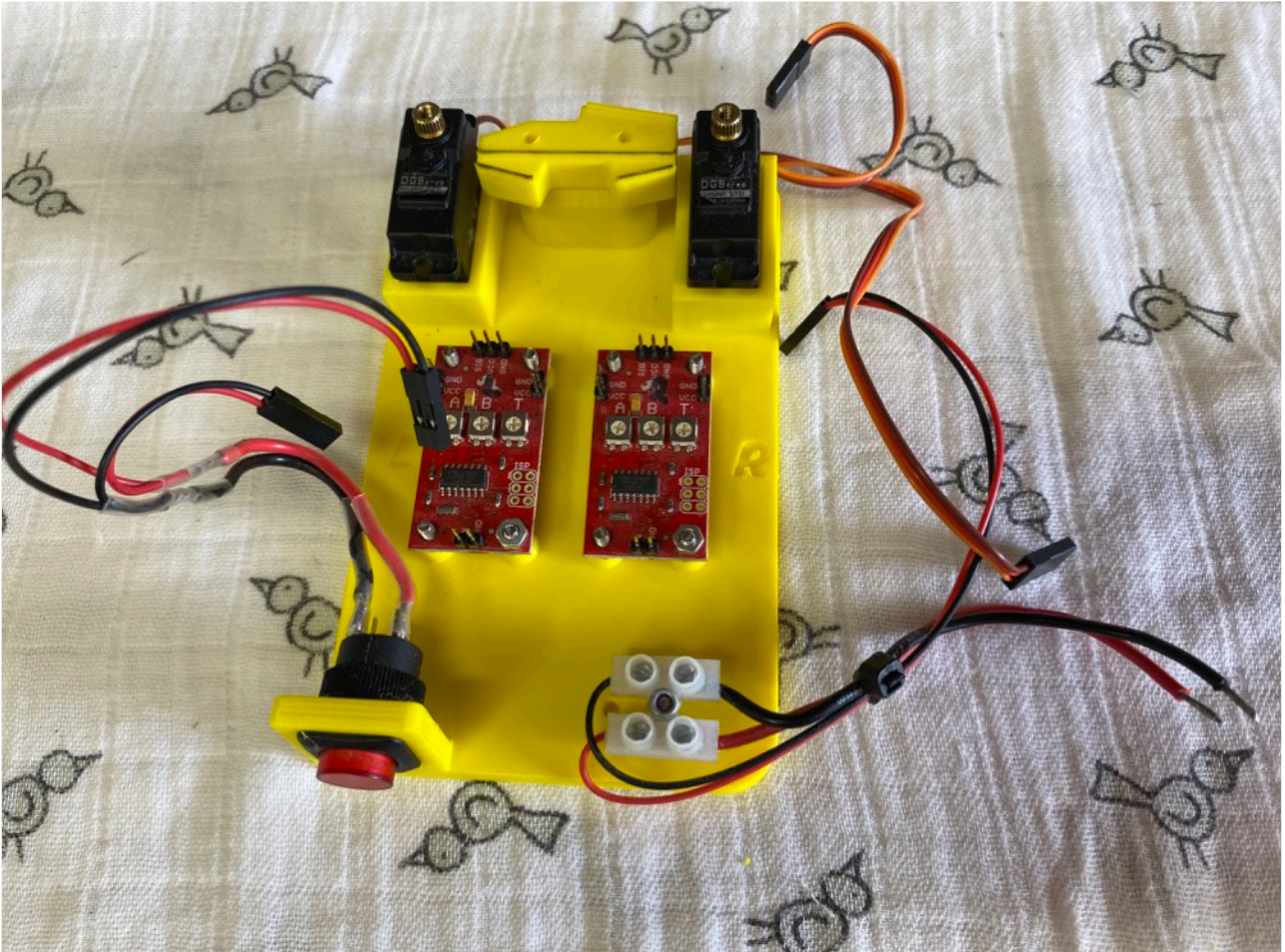


**Important Note:** while some of this is not required for just using the jib once this shows what the various features / parts are for. BUT it is critical to be able to drop the servos in and the alignment jig.

### 3. Setting the Servo

Follow these instructions:

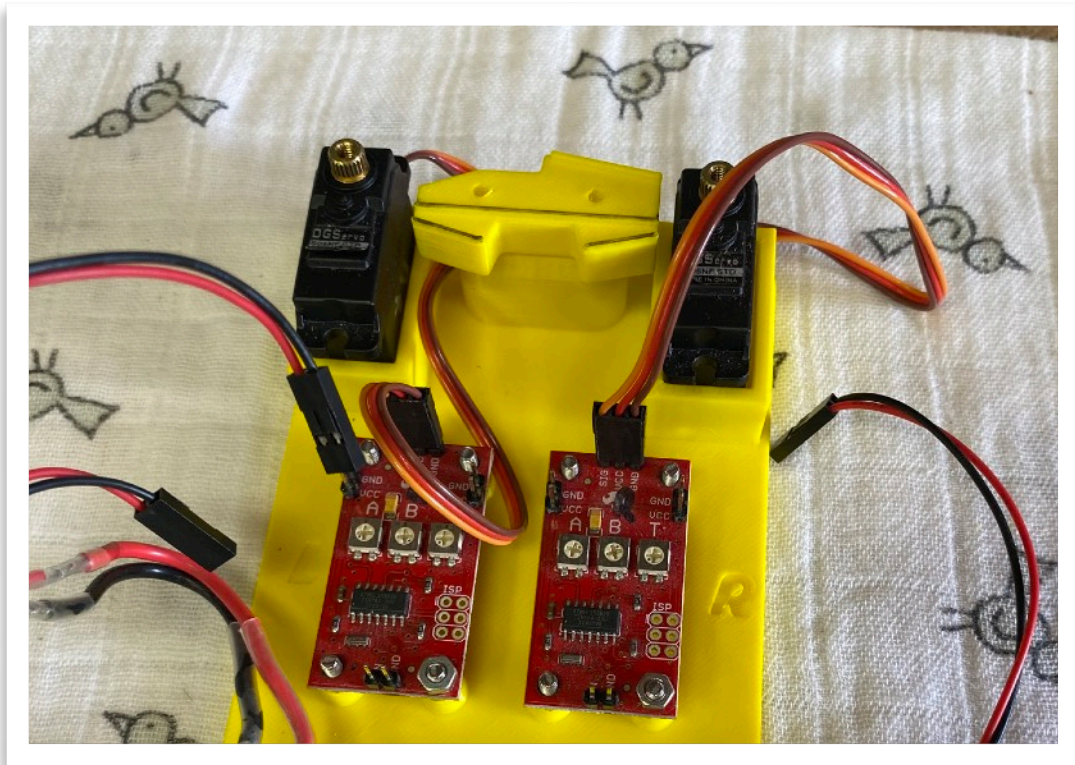
**Step 1:** Do not install the servo horns just yet, have it like this



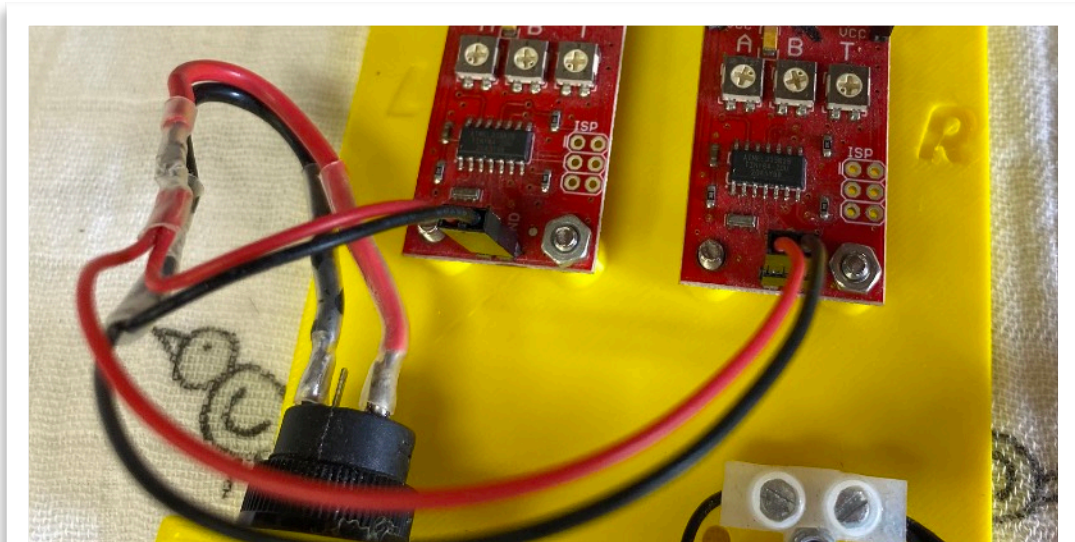
**Important Note:** Understanding the Servo and Servo Trigger Board. Most servo's will have a 180 degree range BUT when connecting the servos to Servo Trigger Board it divides the range in 2 with 90 degree ability clock wise and 90 degree ability anti-clockwise. BUT in-between these 2 points is a few degrees of dead zone so we want to avoid this when setting the servo.



**Step 2** - connect the left servo to the left board - refer to wiring detailing into the installation manual and then also do the right servo to the right board

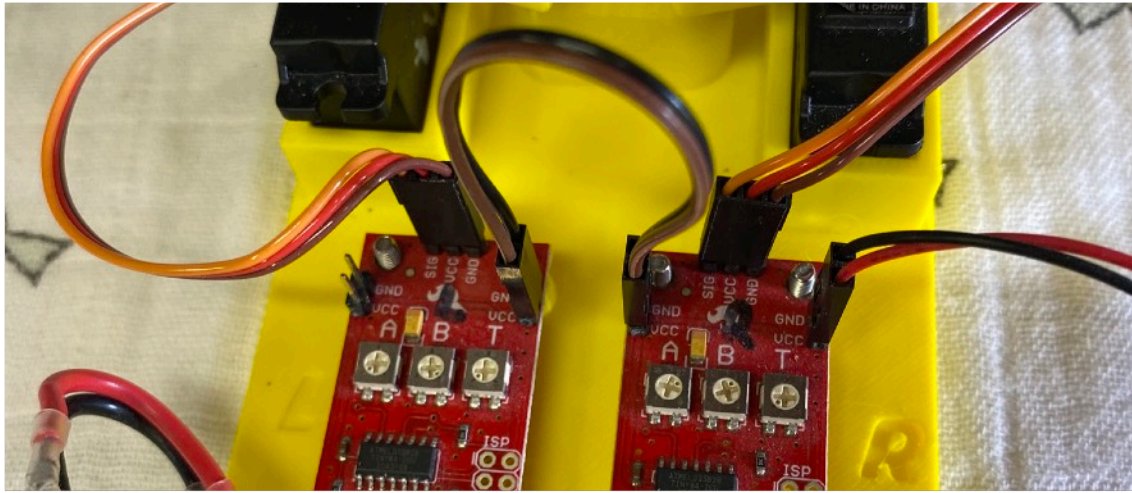


**Step 3** - borrow your power wire from your mod or bring the jig close to your coin door to simply move the power lead to you mod control board / bracket or create a switch and dual switch wires to both activation points. Do **NOT** power up yet.

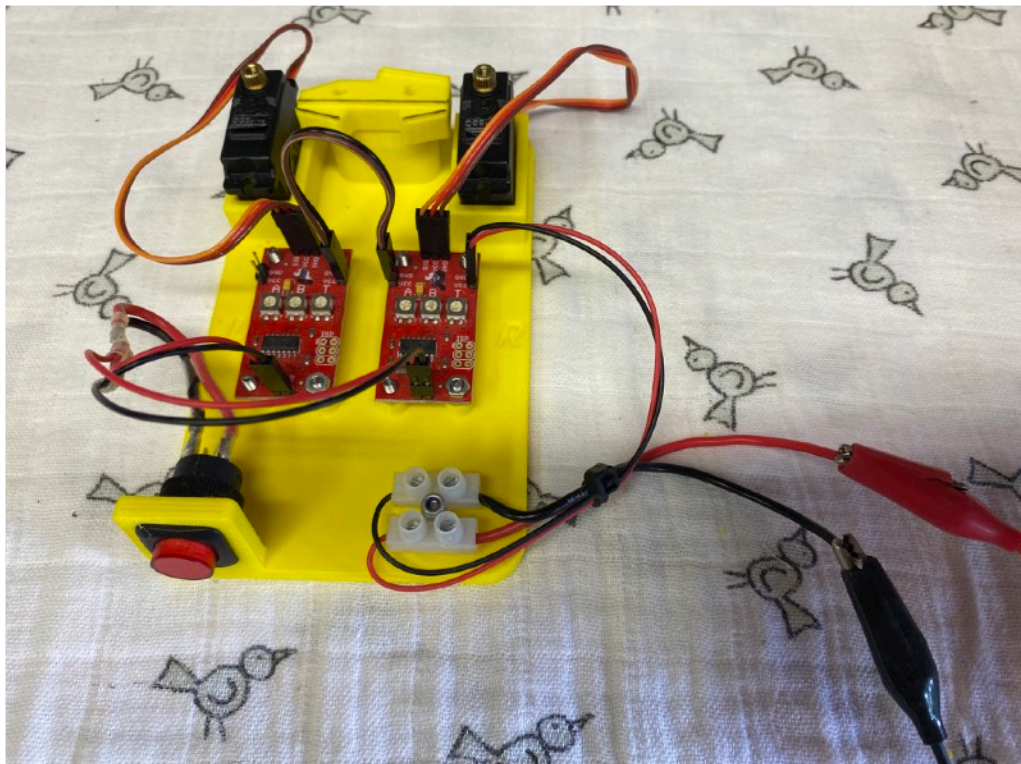




**Step 4** - Connect either custom power wire or bring the jig closer to the original mod board / bracket and connect. Also install the bridging power wire from your mod set. Do **NOT** power up yet.



**Step 5** - Connect 5VDC and power up as shown above and you should hear the servo motors activate

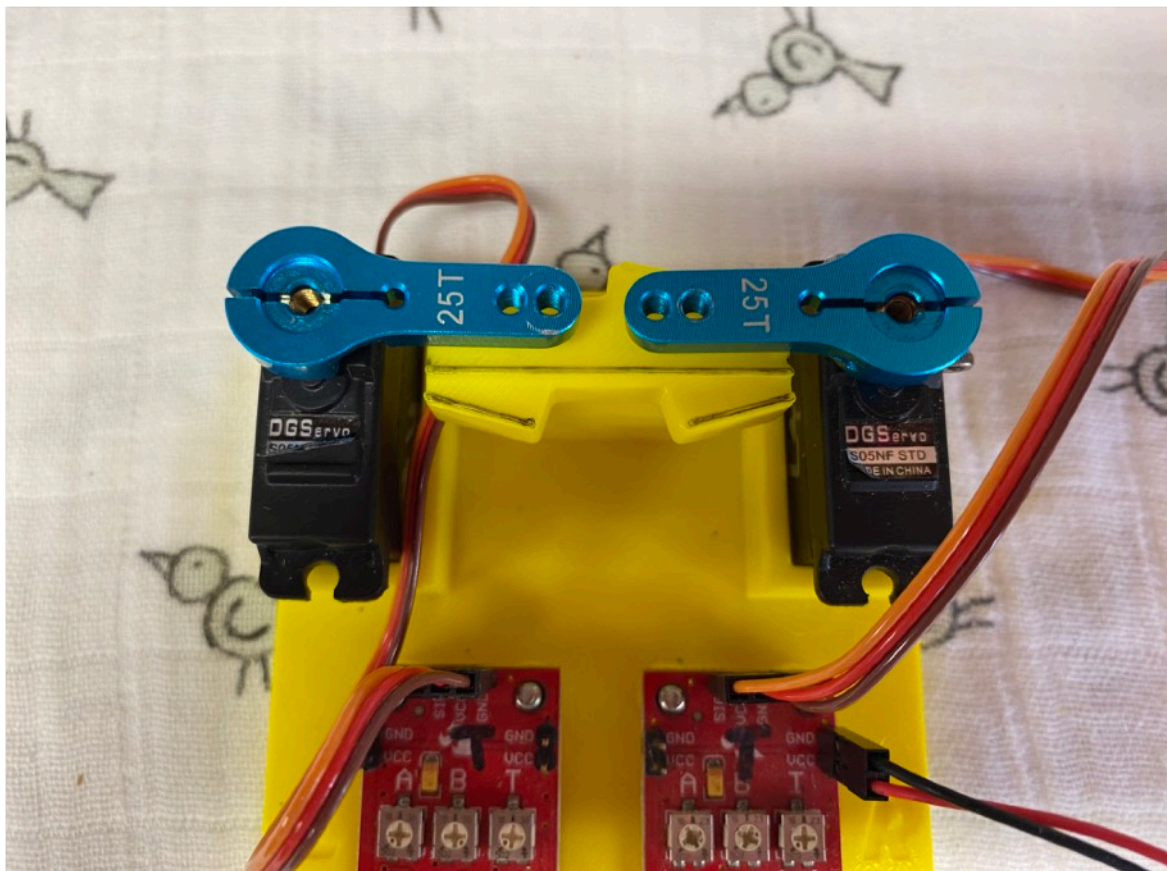


**Step 6** - Now rotate the T pot anti-clockwise on both Servo Trigger Board as this is your gear speed and needs to be set at it's fastest..

**Do not be forceful.**

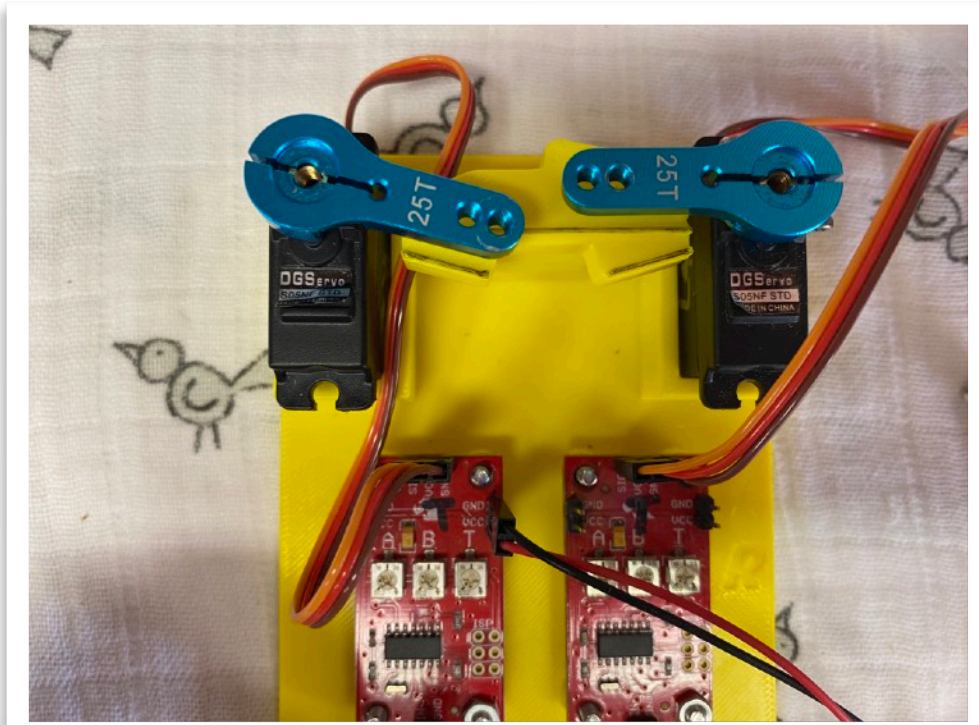
**Step 7** - drop on the servo horn either new or from your disassembled mod to the servo shaft so the setting procedure can be performed - do not secure down as it will need to be adjusted. For the moment align the servo horn with the long line.

**Note:** if using the servo horn from your mod - you do not have to remove the whole mech just the 2 screws holding the servo to the mech and disconnect the wiring.





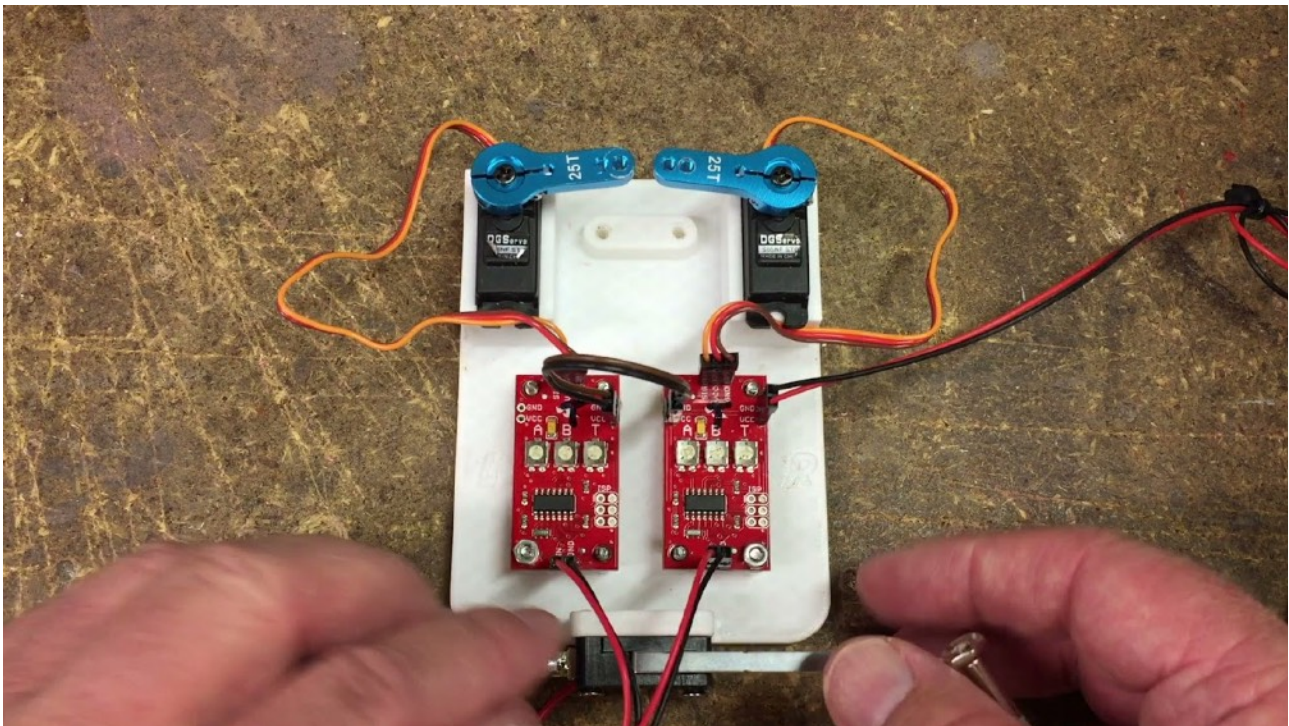
**Step 9** - Start with the left side activate a switch and watch what it does. The servo horn must rotate down clockwise. If it doesn't then the A pot needs to be adjusted a bit in one direction or the other until it is rotating clockwise and going anticlockwise on switch release. Once the rotation direction is correct lift the servo horn off and re-align with the top jig. Now push the switch again and hold it and now adjust the B pot until the servo horn is in line with the lower shorter mark on the alignment jig. Sometimes in adjusting it puts the servo into a dead zone so simply adjust the rest placement with Pot A and then re-align the Servo Horn and test a few times to get it right.





A video of the process can be found here (though uses my version 1 jig):

<https://youtu.be/Xvnxf634zTA?si=i7Bl6BbyDLnZQTqv>



**Step 10** - Once the left servo and servo trigger board are set, tested and you are happy - install the screw into the top so the Servo horn can not be adjusted. Next tighten up the shaft of the servo iron so the servo horn is nice and firmly installed. Lastly Texta mark or put a masking tape note on to the servo and servo trigger board with a LHS and this is now ready for installation into the mech.

**Step 11** - Repeat Steps 9 and 10 for the right Servo and Right Servo Trigger Board but this time the servo horn pivots the opposite.

**Step 12** - Now simply re-assemble the servos into your mechs with the same 2 screws and align the servo horn into the servo horn coupler and do not remove the servo horns at all otherwise your settings will be mucked up. The assembly drawings can be found here:

<https://swinks.com.au/manuals>

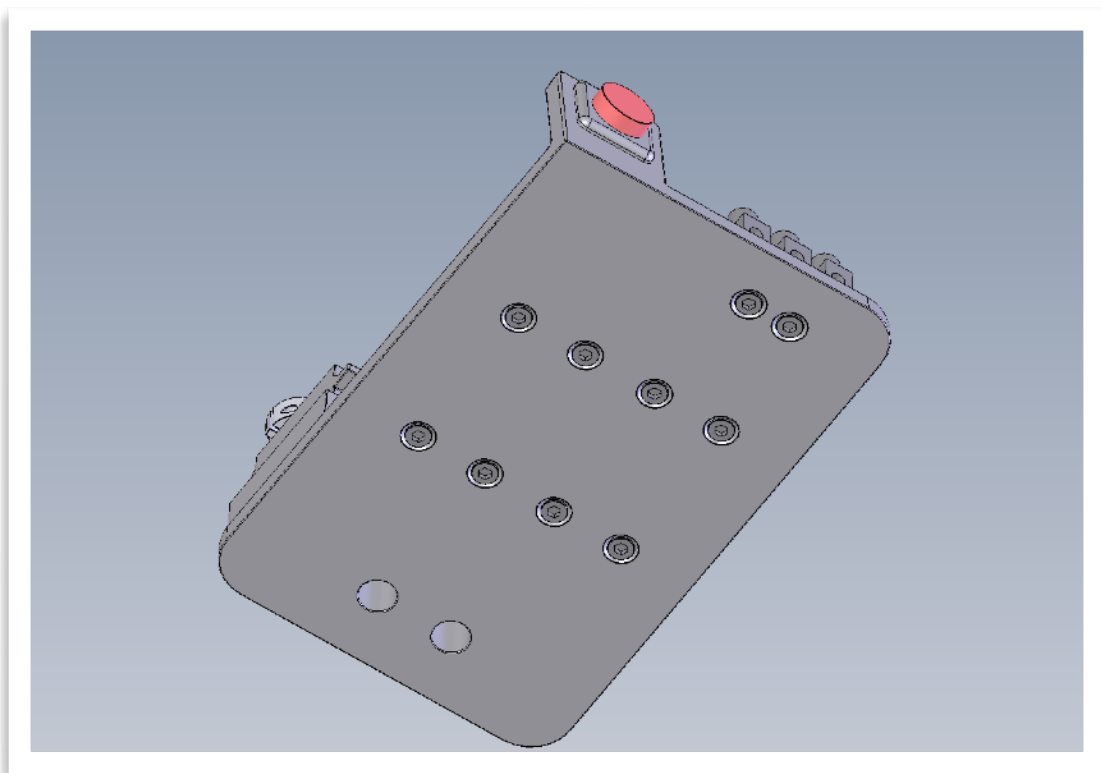
#### **4. Testing the Mod**

Refer back to the installation manual as it shows that procedure of the initial testing of the mod and fine tune adjustment as does the video link above.

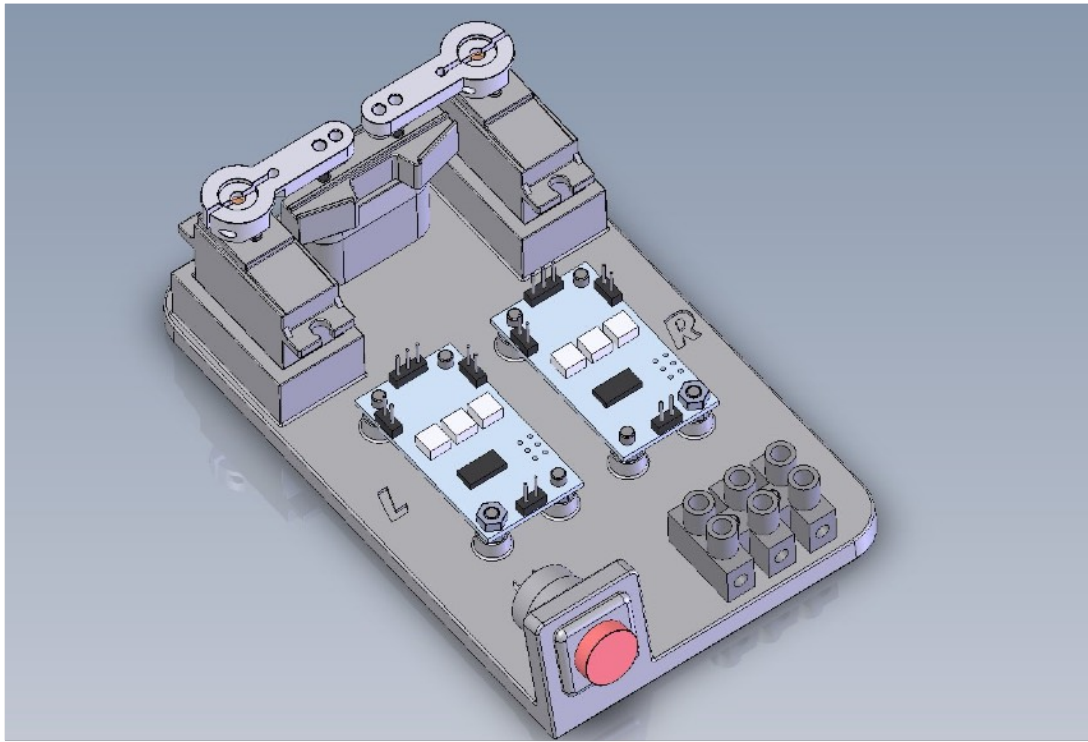
#### **5. Reference Images**

Just some images from my CAD if it helps in any way.

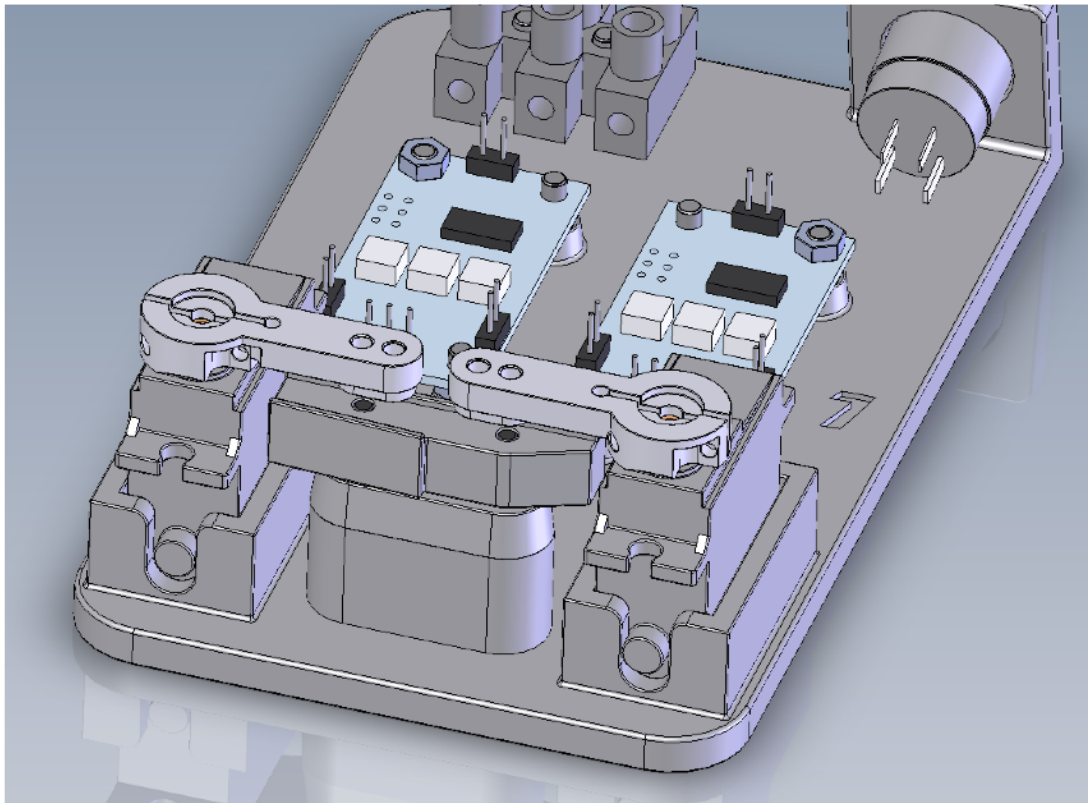
Countersunk M3 bolts installed from the underside:



Assembled kit ready for setting the servos and servo trigger boards.

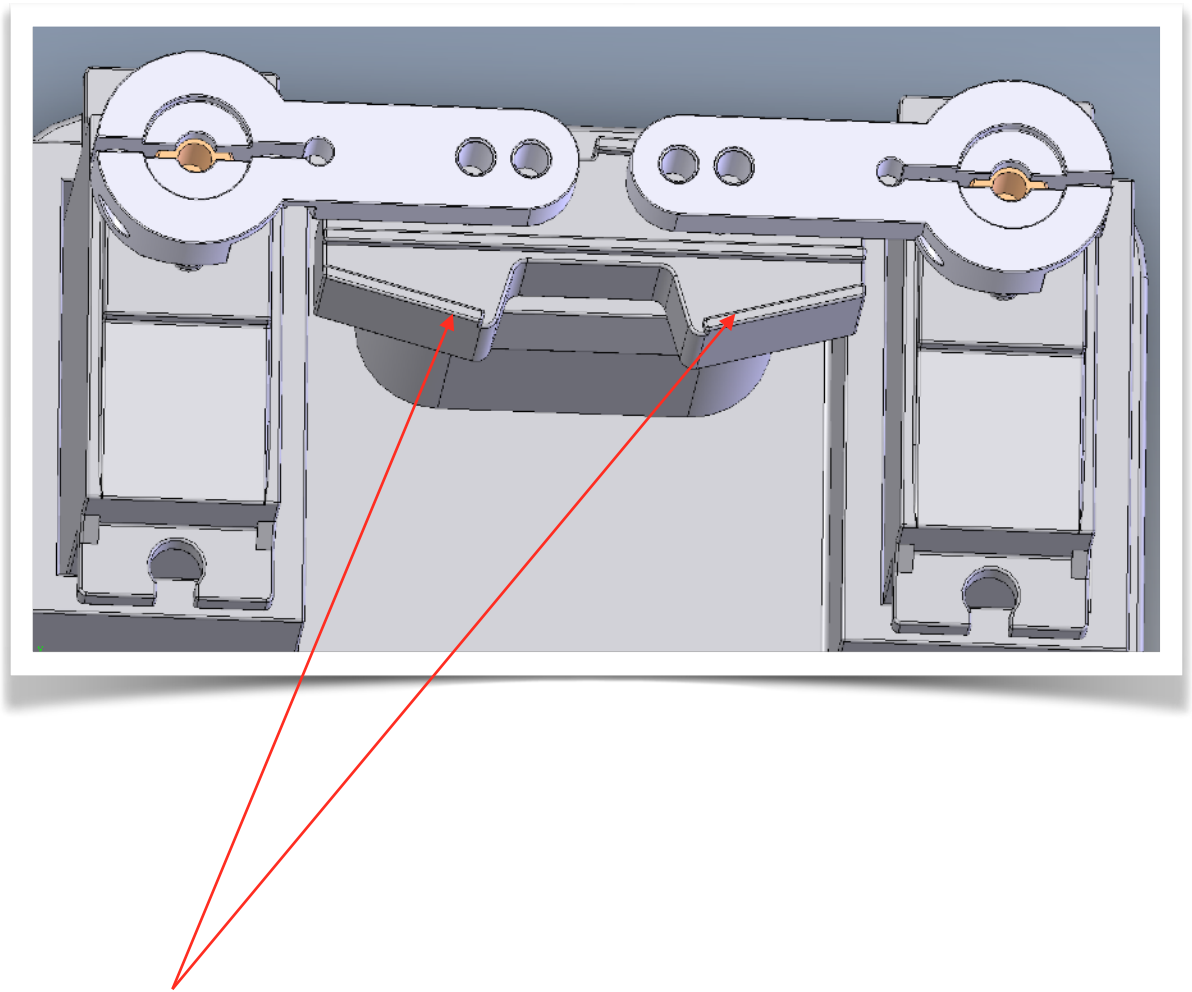


Another view of the at rest setup:





Servo horns in their at rest setup - which equals the proton guns at rest to the cabinet sides:



These are reference points for maximum stroke of the servo = the activate stroke of your proton gun mod.

#### **RETURN POLICY:**

*There is no return policy as this is a help guide on a no longer available mod that has expired it's warranty period but as seen in this document is a help guide to get your mod back up and running.*

#### **PRODUCT DISCLAIMER:**

*Please remember that this is for a "MOD." We took great effort in designing and testing our system in order to produce a high quality product, but it is not a factory original nor an approved part for your pinball machine. There is the risk of unwanted side effects with any modification to a factory game and there are many factors that can cause undesirable side effects after installation of such a modification. As such, we cannot assume responsibility for game malfunction, damage to the game or surroundings, unwanted electrical emissions, personal injury, or other adverse effects caused by the installation of our MOD. This mod was designed to run via an external power supply and run independent of Stern's system therefore if you opt to run via an after market power supply that plugs into the Stern boards or other aftermarket power boards say from a Pinball Parts Provider - this mod will then not be covered electrically by Swinks Pinball.*

#### **PRODUCT QUALITY DISCLAIMER:**

*All parts are made to the highest quality possible. Most parts are professionally 3D printed by Shapeways, iMaterialise or Zelta3D using SLS nylon / MJF nylon process with some minor print lines which is part of the process but treated to the best of our ability to make the parts look the part / professional. You may notice some minor print lines when handling but once the mod is installed they will not be clearly visible from the players perspective and give your machine that cool Ghostbuster look. Professionally printed parts are solid and stable nylon plastic prints and very strong and not hollow weak home printed parts.*