

STERN
Ghostbusters (GB) 2016

“Proton Gun” Mod (2021/2022)

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.



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

Manual Rev-5 (8-10-23)

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1. IMPORTANT NOTES

1. These instructions are specific for the 2021 released Proton Gun v2 Mod manufactured and delivered at the end of 2021 through to early 2022.
2. There is no soldering or crimping required by you the customer - Swinks Pinball will provide all the cables ready for screw down / plug and play. No Alligator Clips are used as well.
3. PLEASE READ this manual before installing to get a good overview and then use it as your installation guide, as a number of enquiries have come from people that did not follow the manual. Swinks Pinball is very happy to help and will answer questions as promptly as we can - please understand we might be asleep as we are in Australia when you want help but we will check and reply back asap.
4. If after installing your GB Proton Gun Mod and you have followed all the steps in this installation guide, there is a Trouble Shooting section - Section 24 to further aid you. But if you are still having problems refer to the next point.
5. Contact us via:
 - Pinside PM - Swinks
 - email - swinks.pinball@gmail.com

2. Tools and Safety Notes

Tools necessary to install this mod

1 x jeweller Phillips screwdriver (is not provided)

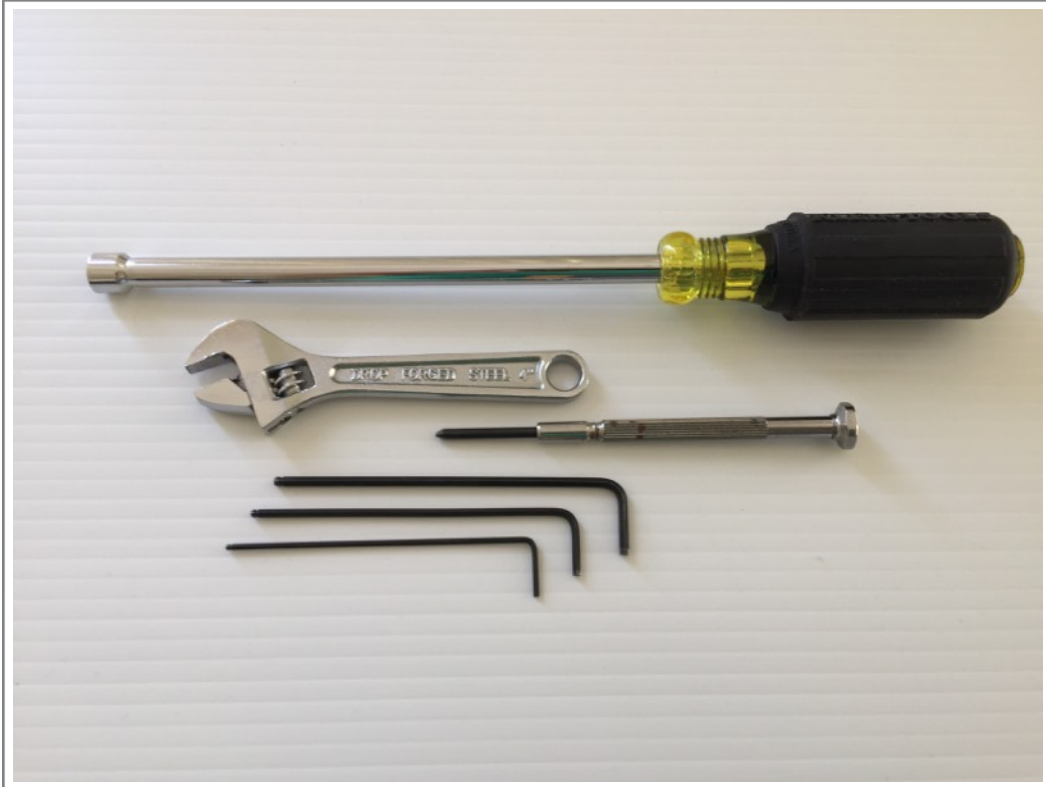
1 x 5/16" socket driver (is not provided)

1 x adjustable wrench / spanner / shifter (called different things in different countries - is not provided)

1 x 2.5mm metric allen key (provided in the kit)

1 x 2.0mm metric allen key (provided in the kit)

1 x 1.5mm metric allen key (provided in the kit)



SAFETY NOTES:

Make sure that your machine is powered off and the power cord running from your machine to the wall outlet has been turned off / disconnected to remove all risk of electrocution.

Read through these instructions carefully & completely before attempting the installation of this pinball mod enhancement. Although you may know your machine inside and out, there are a few things to consider before proceeding blindly.

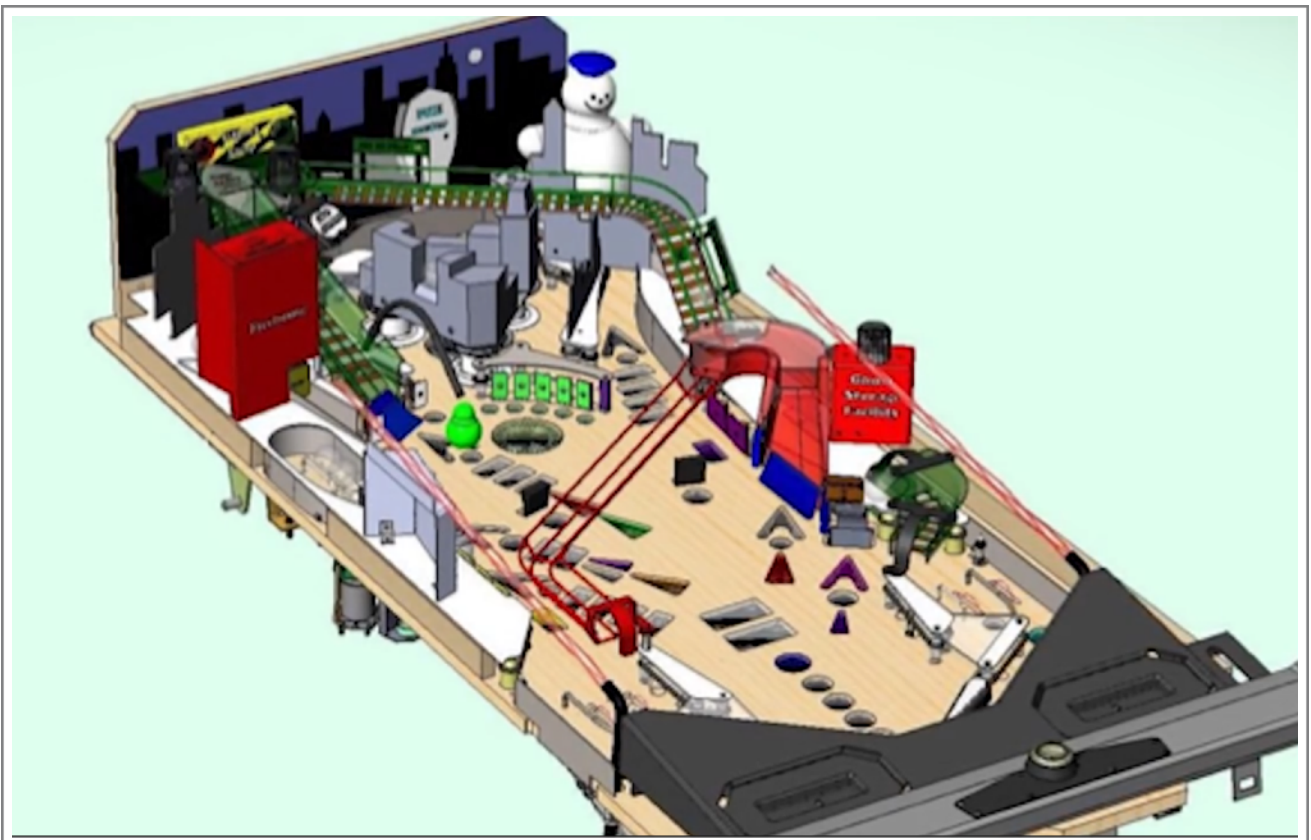
3. The Myth

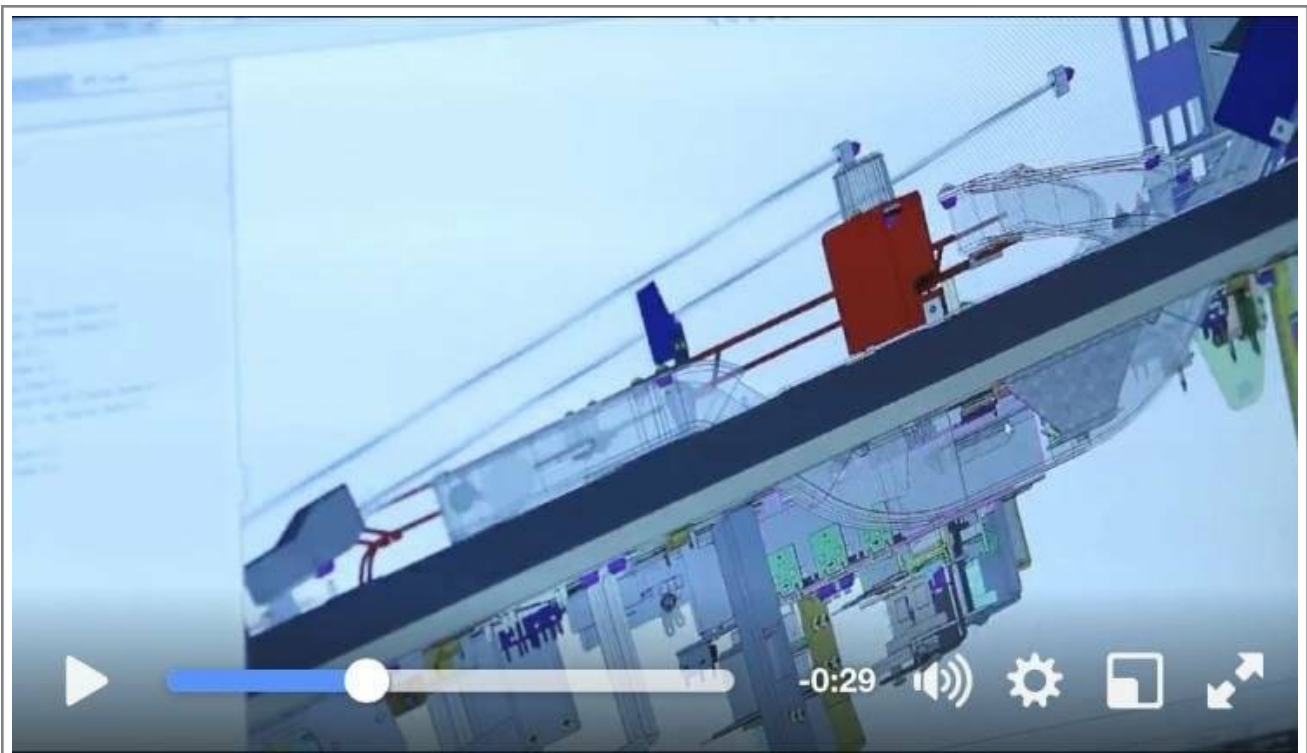
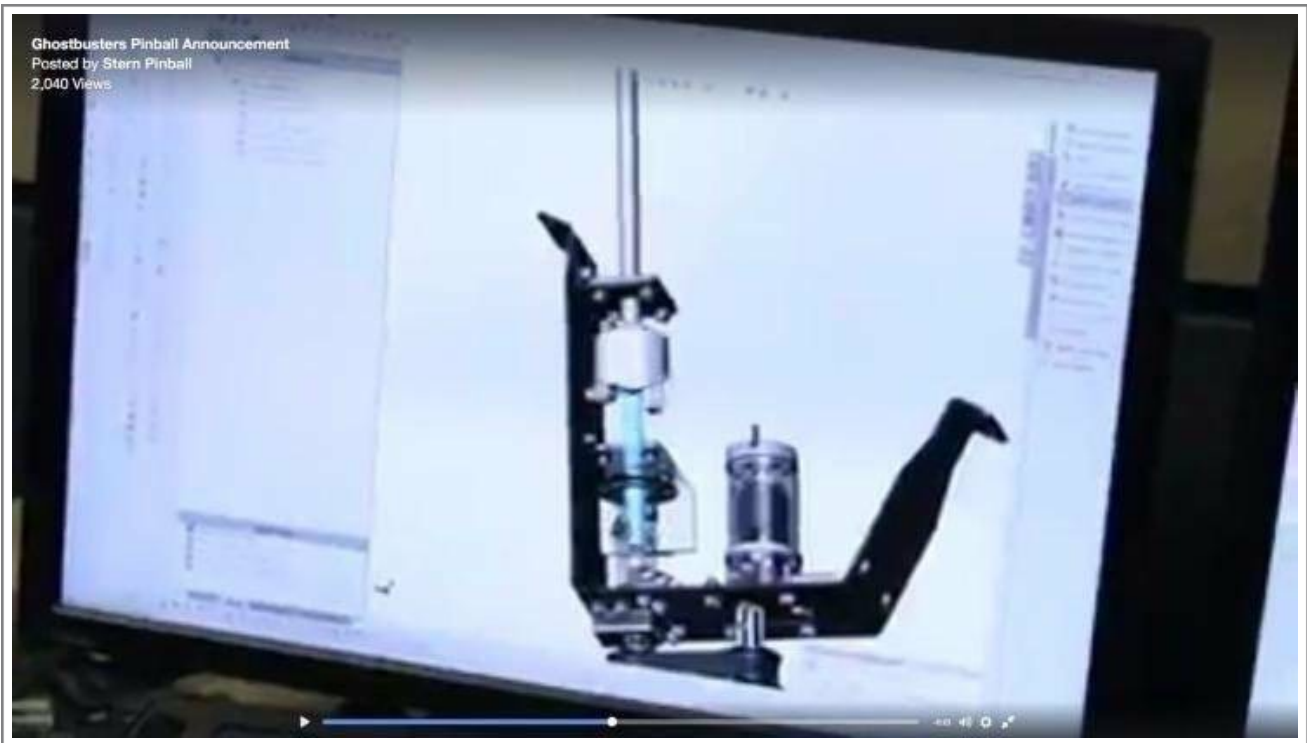
Firstly before going into installing this mod we wanted to share where the inspiration came from.

Stern were going to supply games - probably just Premiums and LE's with Proton Guns / Streams but pulled due to cost and probably replaced with the video mode.

This is one of these mods where some people have sold el-wire kits and stated that is what Stern had intended to supply - this is a myth and is not true. This is one of the rare games in which Stern were going to supply the game with a unique feature but then never did due to cost but placed the obvious holes for the feature in to all models - Pro / Premium / LE.

The details are vague but based on sneak release images / videos and a brief chat with the designer Trudeau back in 2016 the original mechs were largish and had large lit up proton beams that moved in to the centre of the playfield and you had to avoid crossing the streams. Here are a few concept images that leaked out of what was originally planned for the game. Notice the red beams coming from the apron area. Also notice the difference in the playfield design with the targets near slimer.

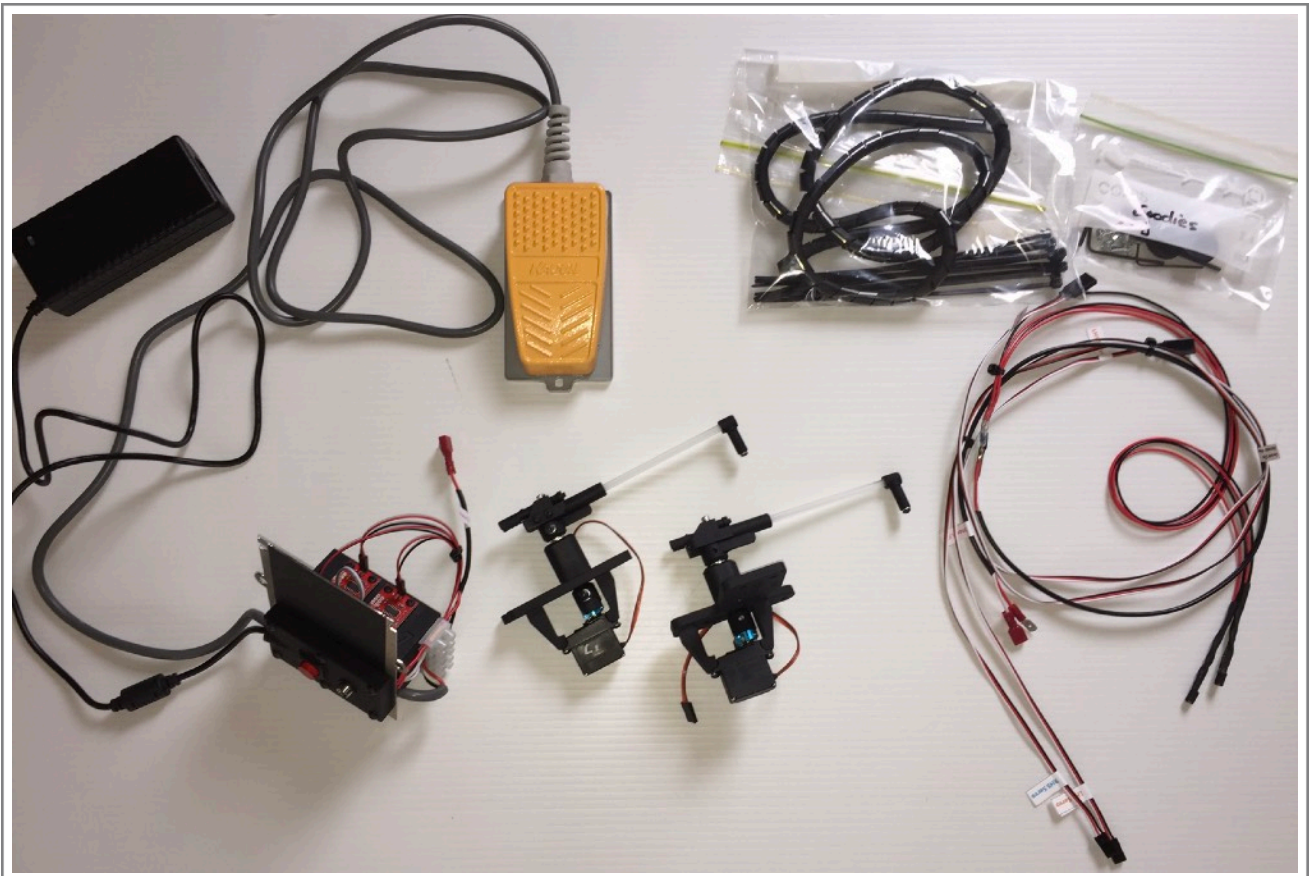




4. The “Proton Gun” Kit

This what the mod (v2a) looks like in it's non installed state.

- 1 x LHS Playfield Mech and Gun
- 1 x RHS Playfield Mech and Gun
- 1 x Coin Door Assembly
- 1 x Wiring Kit (servo and lighting) between Mechs / Gun to the Coin Door Assembly
- 1 x Foot Switch (connected to door panel)
- 1 x 5vdc Power Brick (connect to door panel) **excluding wall power lead**
- 1 x Plastic Lifter / set of Allen keys / Screws to fasten mechs to playfield
- 10 x cable ties and 1metre of cable spiral wrap



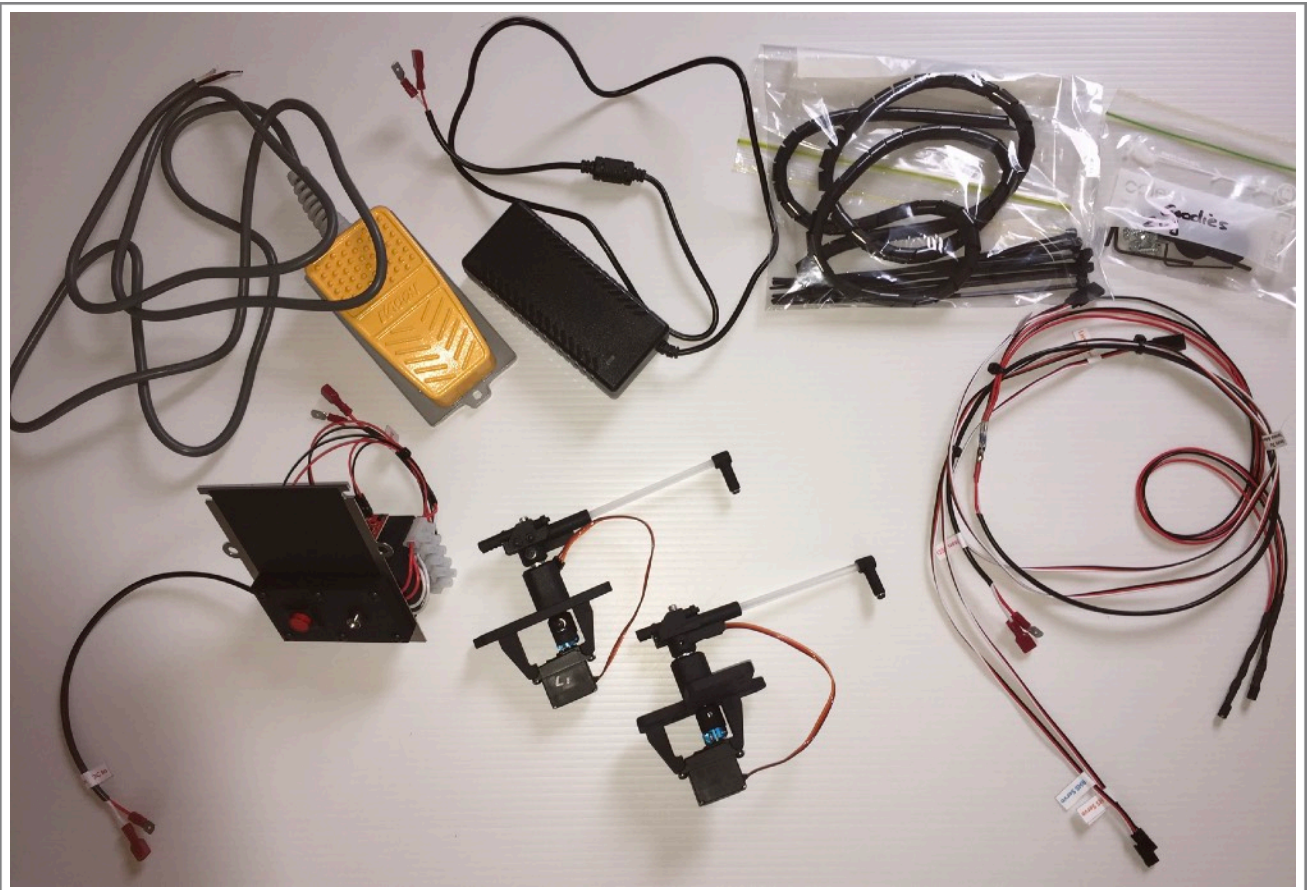
Note 1: The Pedal Colour will vary - Orange or Grey depending on what you ordered.

Note 2: The power and foot switch cable will not be connected to the plate but shows where they go.

Note 3: The lead from the power brick to the wall is not shown but if you are outside of Australia you will need to be sourced by the customer - my apologies. For me to buy a US Wall Lead and additional weight to the post to you you will save \$20-30 through purchasing yourself. See page 9 of the part you need to buy at an electronics shop / bay or Amazon. Should be around the \$7-10 cost.

This what the mod (**v2b**) looks like in it's non installed but connected state though will be packaged into smaller kits.

- 1 x LHS Playfield Mech and Gun
- 1 x RHS Playfield Mech and Gun
- 1 x Coin Door Assembly
- 1 x Wiring Kit (servo and lighting) between Mechs / Gun to the Coin Door Assembly
- 1 x Foot Switch
- 1 x 5vdc Power Brick **excluding wall power lead**
- 1 x Plastic Lifter / set of Allen keys / Screws to fasten mechs to playfield / 2 x through cabinet bushes
- 10 x cable ties and 1metre of cable spiral wrap



Note 1: The Pedal Colour will vary - Orange or Grey depending on what you ordered.

Note 2: The power and foot switch cable will not be connected to the plate but shows where they go.

Note 3: The lead from the power brick to the wall is not shown but if you are outside of Australia you will need to be sourced by the customer - my apologies. For me to buy a US Wall Lead and additional weight to the post to you you will save \$20-30 through purchasing yourself. See page 9 of the part you need to buy at an electronics shop / bay or Amazon. Should be around the \$7-10 cost.

If you are outside of Australia you will need to purchase this lead for the supplied power brick. For example in the US these can be found at Walmart starting from \$6.95.



5. What Mod Options Are There

There are 2 elements to the mod that you need to decide which way you want to go when you place your order. There is no cost variances with which ever option you choose, it just comes down to what you feel is right for you.

a) Foot Switch Colour

One option is the foot switch to activate the Proton Guns available in a Yellow (I refer to it as Orange) or Grey. These are hard to get at a good price so I keep minimal stock so you need to let me know when you place your order to get your preference as currently takes approximately 6 weeks for a batch of 10 to arrive.



b) Coin Door Panel

This component determines which way 2 of the cables (power and foot switch cable) come into the cabinet.

Refer to the following page for more info.

V2a - Cabling passing through the plate / coin door

Pro's - no permanent alterations to your cabinet.

Con's - the cabling over time could possibly damage / mark your cabinet decal.



V2b - Cabling passing through the pinball cabinet base

Pro's - cables are not seen as they can be tucked in the inside edge of the pinball leg and also restrained on the inside of the front left pinball leg with cable anchors.

Con's - permanent alteration to the cabinet (requiring a hole drilled through the cabinet base) - on the positive side I will provide a STL file for a 3D printed part to plug up the hole if you remove the mod from your game but will come with a 2 part cable bung to install the cables.



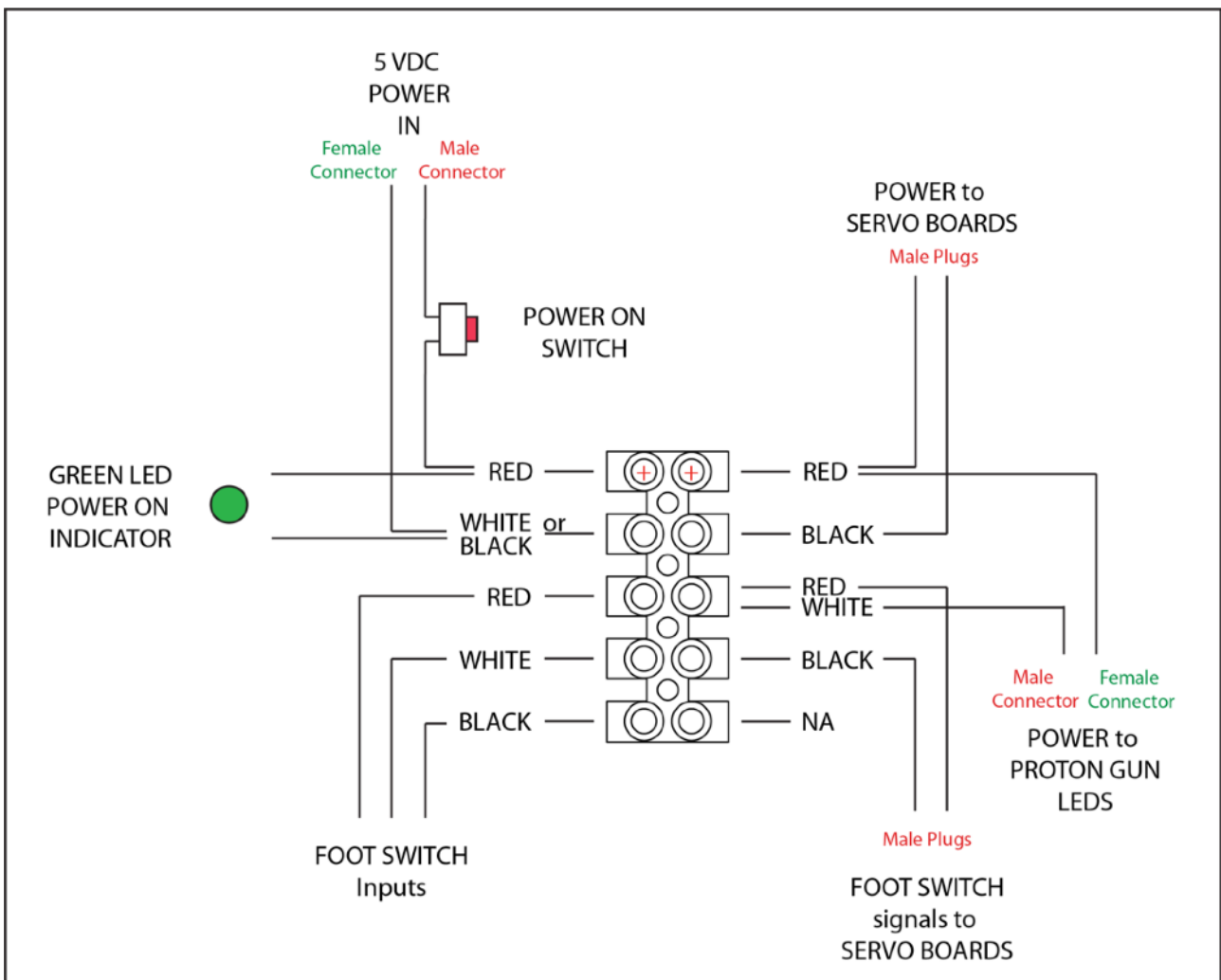
6. Assembly and Fitting Resources

Apart from this manual, Service Bulletins and Assembly Drawings can be found on my website here:

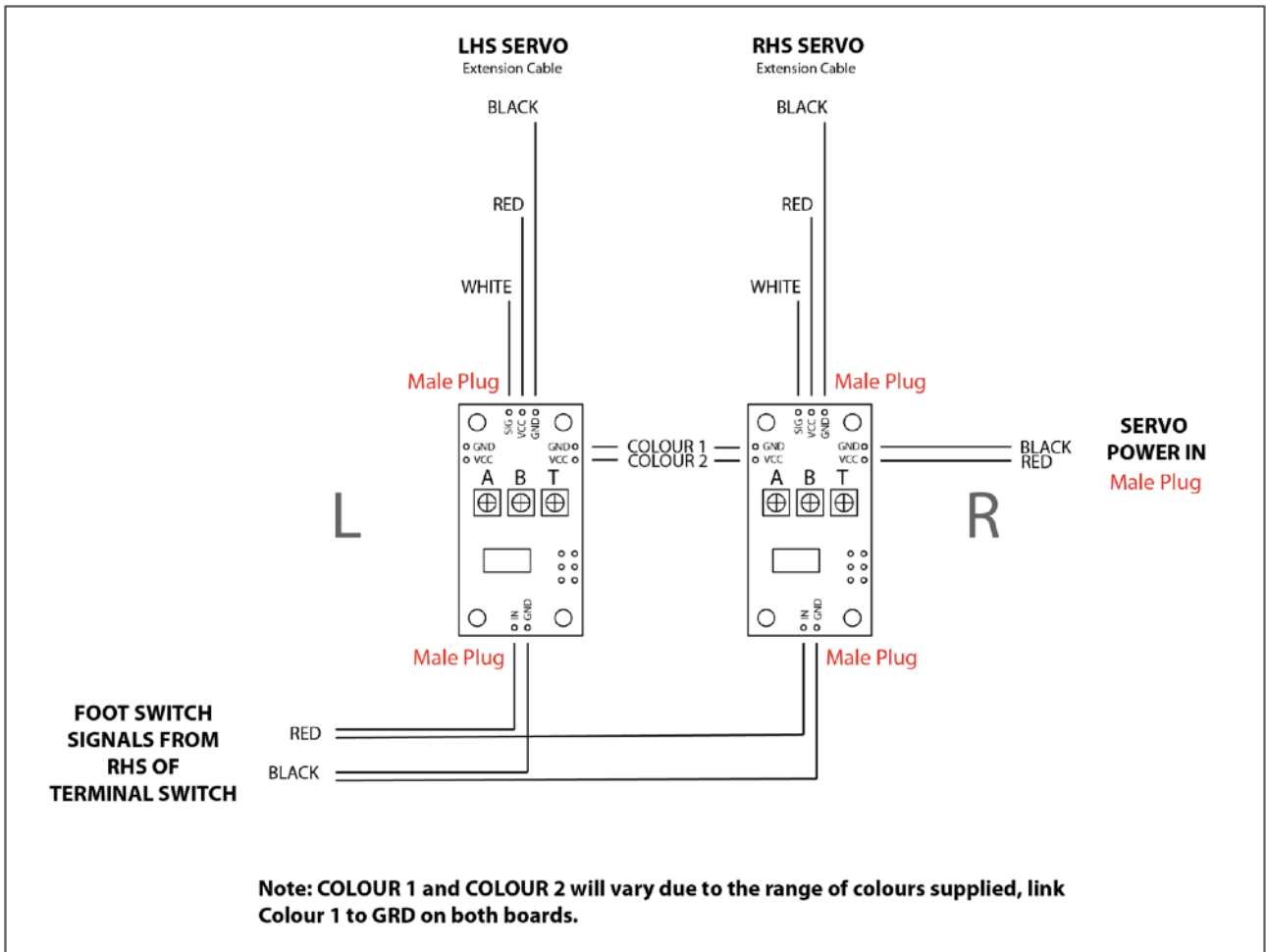
<https://swinks.com.au/manuals>

The various wiring diagrams are all moved from various locations in the manual (rev1-3) to this section for you go to location. Through the manual you will be referred to **Section 6 pg 12** a number of times throughout the installation process.

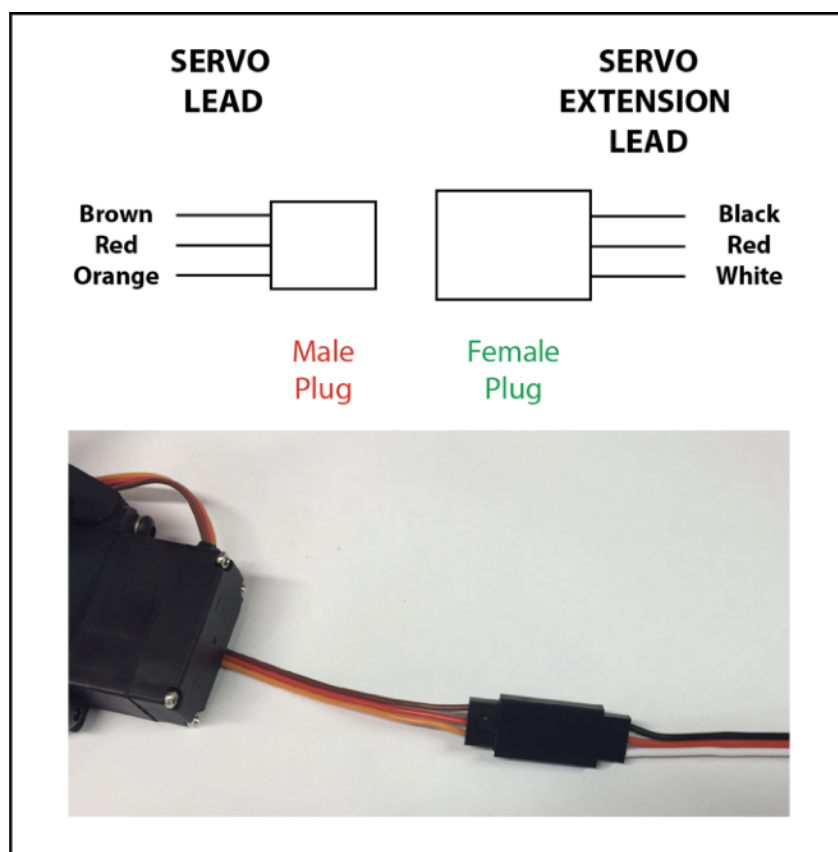
a) Terminal Strip Wiring



b) Sparkfun Servo Driver Board Wiring



c) Sparkfun Servo connection to the Extension Cables



There are currently a number of assembly drawings to aid you in part identification or service / maintenance which can be found here:

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

for the following:

- LHS Gun Assembly
- RHS Gun Assembly
- LHS Mech Assembly
- RHS Mech Assembly

There will soon be drawings for the following assembly:

- v2a Coin Door Plate Assembly
- v2b Coin Door Plate Assembly

7. Coin Door Differences

There are 2 versions of Front Coin Door Panel:

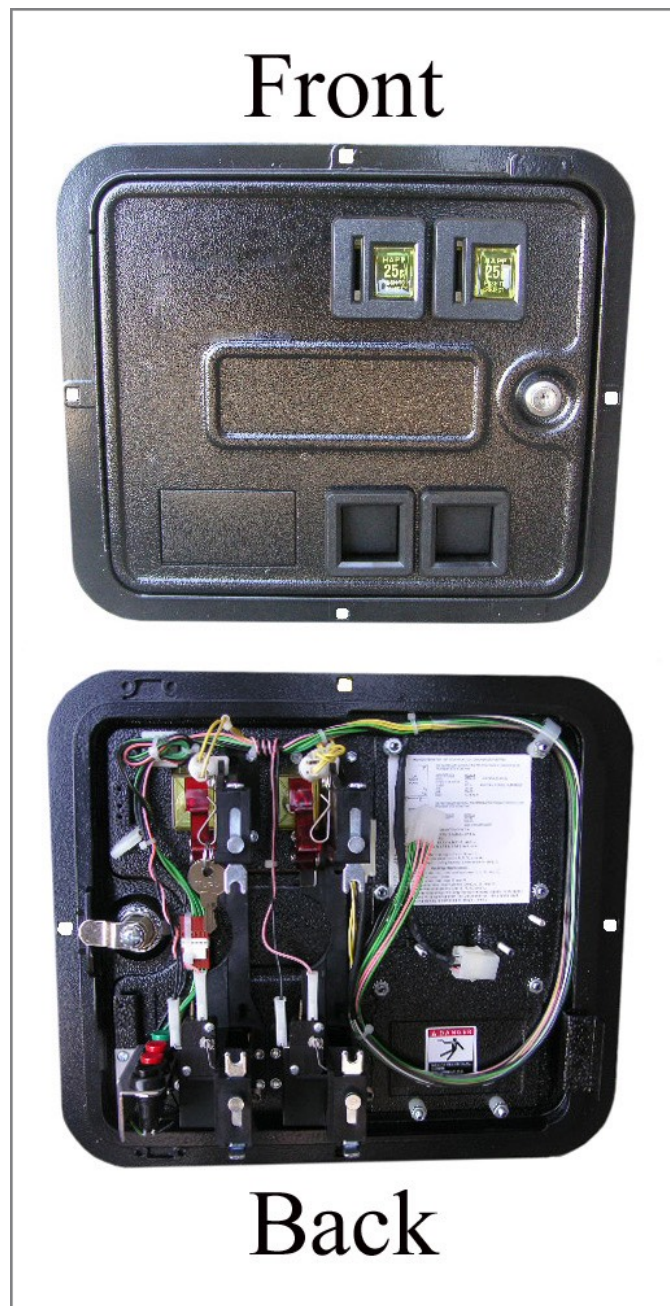
V2a - cables pass through the front of the coin door.

V2b - cables pass through the cabinet base - you need to drill a hole.

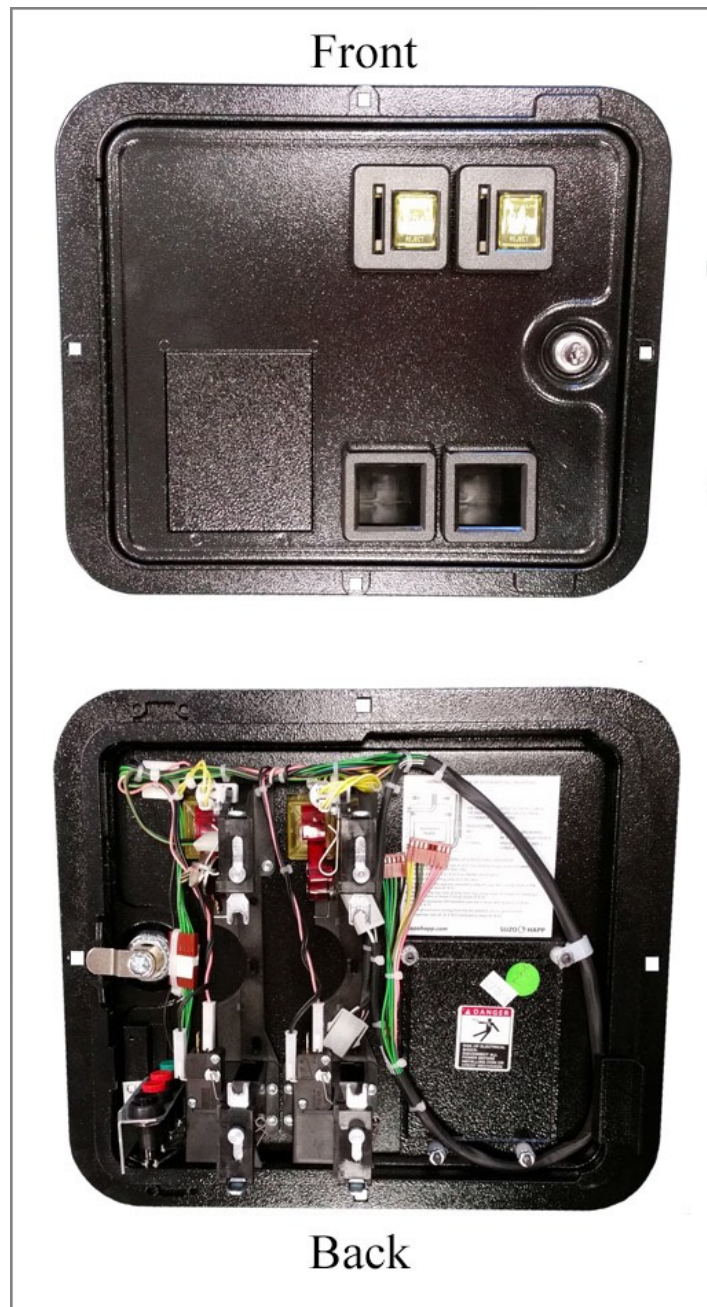
Stern sends games all over the world including Ghostbusters but strangely does not supply the game with a standardised door all over the world.

Australia and New Zealand gets a Coin Door like the one below, which Pinball Life sells called a SAM / Whitestar Door which has a small knock out panel on the left hand side:

Swinks has designed a stainless steel plate and face plate that works for both the Australian and US / Canadian and Italian Coin Doors.



USA / Canada and parts of Italy gets a Coin Door like this, which Pinball Life sells called a US Spike 2 Door which has a large knock panel on the left hand side:



Sadly parts of Europe get a very different door again that does not have a knockout panel so this mod will not just bolt in though we have a Coin Box mount that allows for the mod to be installed but you need to turn on and leave on and then close the coin door or open and close each time to turn on and off. For people interested in this mod who are in Europe they can contact us for more information on the Coin Box Mount. Refer to the Service Bulletin 3 for more information.

8. Installing the v2a Kit to the Coin Door

You will need to locate your Coin Door Assembly (though the power and foot switch cable is no longer connected up to the coin door plate for ease in packing / sending and assembly to the coin door). The kit is made up of the power brick, foot pedal and the coin door plate assembly:



The Swinks replacement plate is universal and suits games with either a large or small knockout panel. The following photos refer to my Australian version.

Coin door viewed from the outside:



Coin door viewed from the inside:

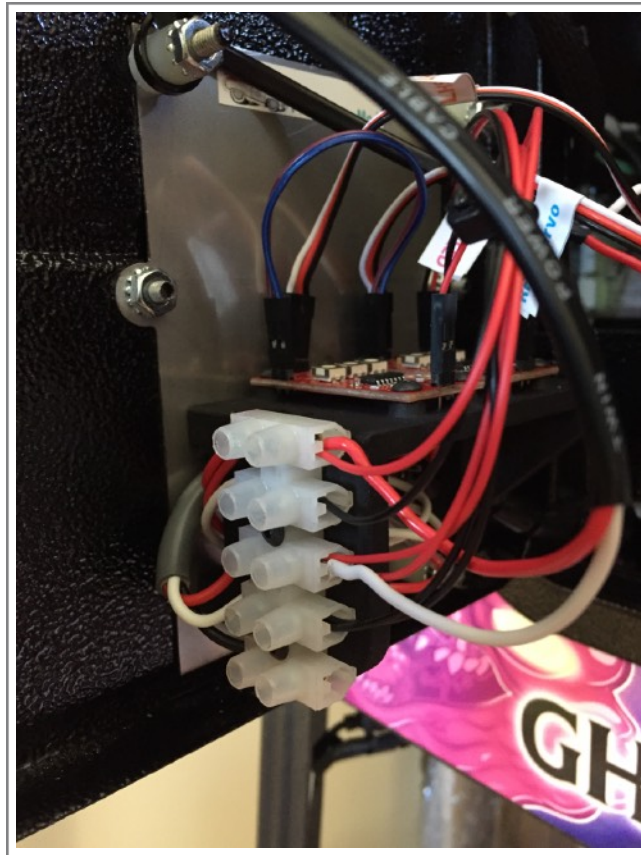


Remove the 6 x spacers / washers and nuts and original plate to expose the hole in the coin door.

Then you will need to remove the front cover from the mount plate as you will not be able to install the plate with the cables installed - this is because of the exiting cables make it difficult to place the plate through the hole and over the existing coin door bolts. You will need to remove all 6 bolts with the supplied Allen key from the face plate so it separates from the plate like shown below.



Now install the stainless steel plate to the coin door and lock into place. Then it gets a little fiddly as you need to pass the power cable and foot switch cable through the coin door from the front and to the inside of the coin and fasten the power cable to the already fitted short power cable and then the door switch cable and wire up to the terminal strip. Refer to [Section 6 pg 12](#) for the correct wire locations.

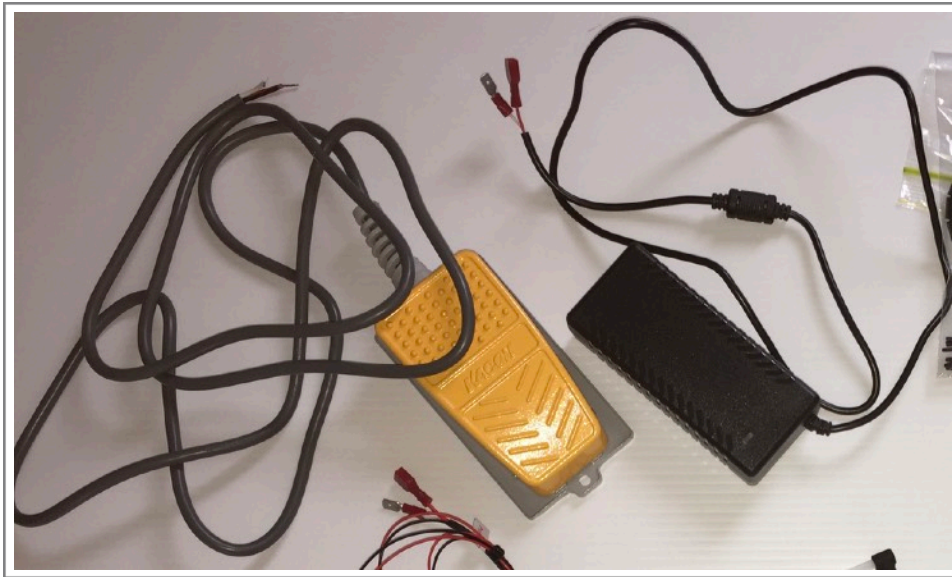


Once done you now need to fasten the face plate to the stainless steel plate to the mod backing bracket (one with the terminal strip - like how it was before you dis-assembled it with just enough cable passing to the inside and as much as possible on the outside the coin door and tighten up all 6 bolts and it should look like this.



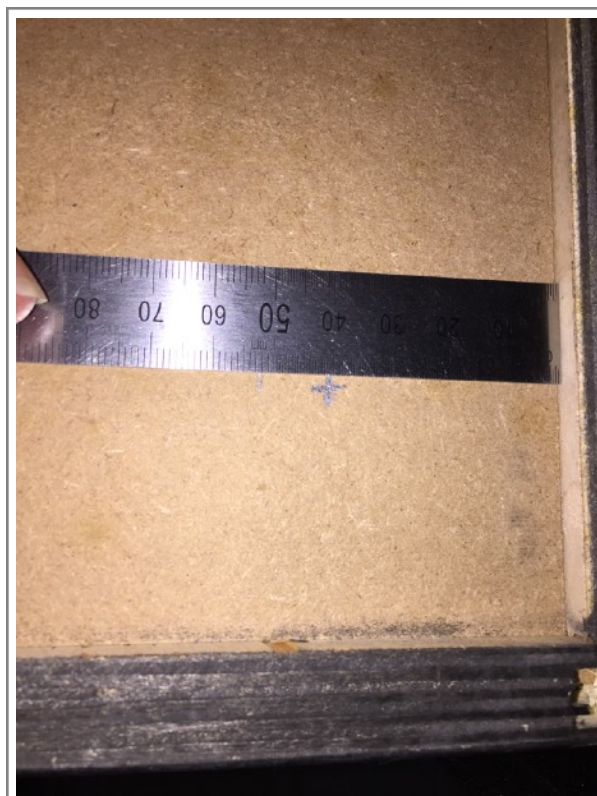
9. Installing the v2a Kit to the Coin Door

You will need to locate your Coin Door Assembly and Foot Switch / Power Brick Assembly - which are 2 different separate components which will look like these from you mod kit:

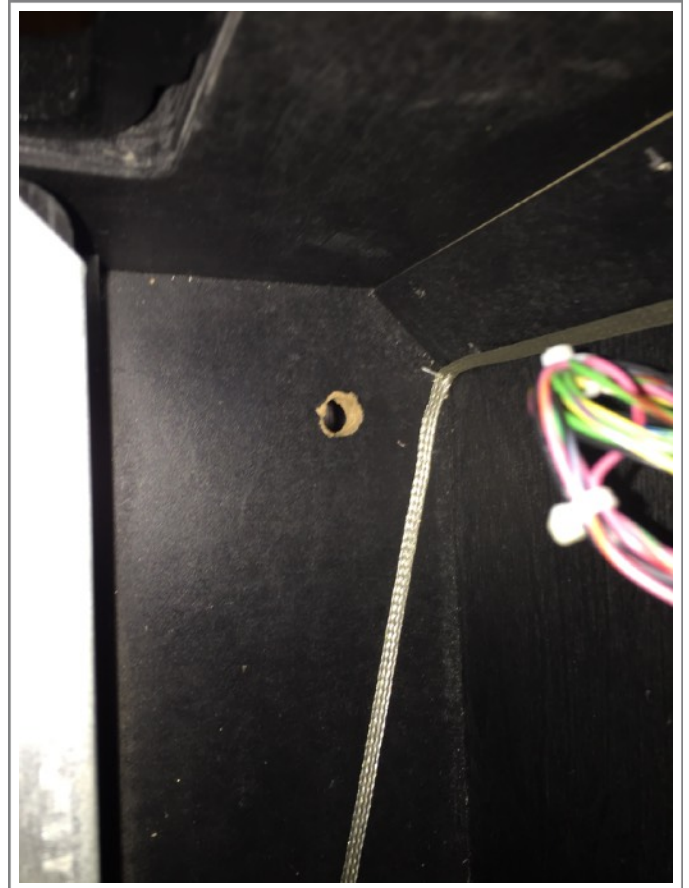


Then you will need to drill a 1/2" / 12.7mm or 13mm hole into your cabinet near the front left corner from underneath going upwards. But start slowly with a small drill - approximately 3mm and then step up to about a 6mm and lastly the final size detailed above. Also find some scrap timber and place inside the cabinet and either weigh it down or have a friend / partner apply pressure so when the drill runs through the base it will continue a little into the scrap timber - giving you a nice clean hole - **BIG NOTE** - make sure that the friend / partner does not put their hand in the range of the drill coming up - don't want 2 holes eeeekkk.

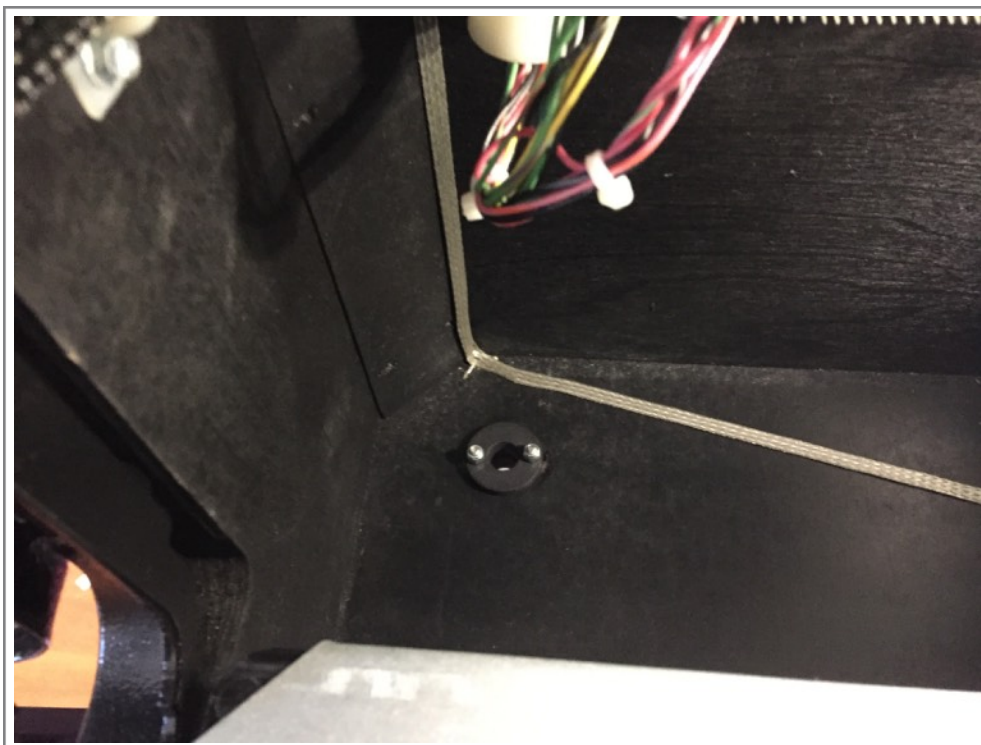
The hole is 40mm in from both edges as per below:



The drilled hole will look like this - underside & top side (though I forgot the scrap timber):



Then with the **v2b** you will get 2 bushes which fit in from the top and bottom and you can screw down with a bolt right through or with small screws from each side - it is your choice. The bushes look like this in the installed state - if you are using bolts use approx M3 x 25mm or 1 inch with some nuts. This will make the cabinet look finished and professional and not a hack.



Now you need to install the power brick cable and foot switch cable. The hole size in the bushes is neat on purpose, so follow this procedure otherwise you will curse me and say it isn't possible.

- insert the female terminal from under the cabinet through to the inside of the cabinet then the male terminal.
- Now insert the foot switch wires and cable through the bush - it will be neat but this is a good thing as then nothing falls out too easily.
- The power cable can only go up to the point of the bulky component on the lead limiting the distance it can pass into the cabinet.

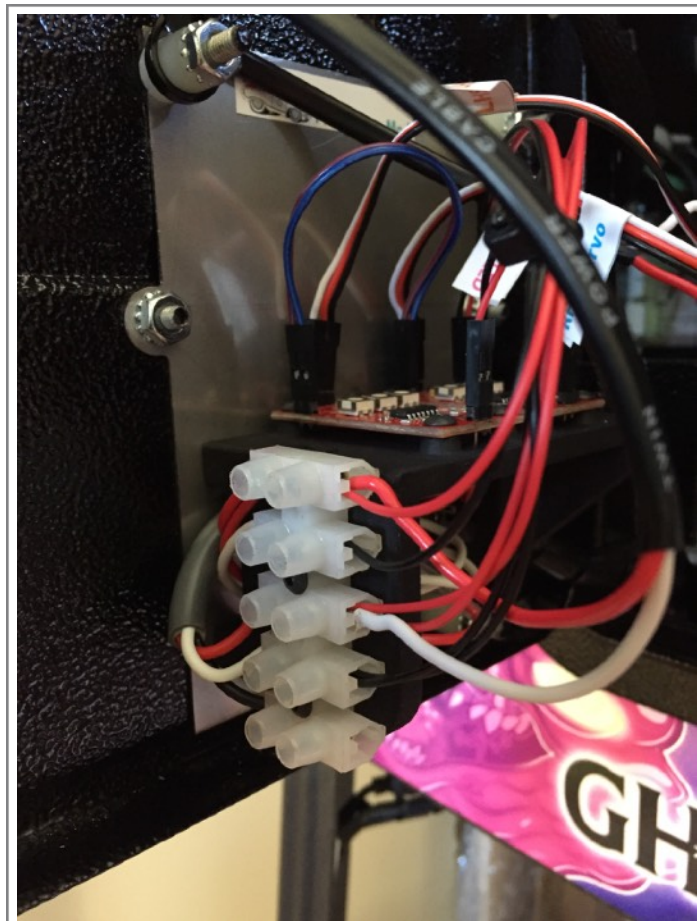


Allow a little bit of play in the cables between the bushes and coin door knockout panel making sure you can fully open the door. Then feed excess cable back through the bush outside the cabinet base - do a rough check to make sure the foot switch is in the desired location between the legs as well. Secure the cables with a cable tie on the inside cabinet just above the bush to limit the amount it can drop out.

Coin door viewed from the inside:



Now locate your V2b Coin Door Kit and fasten the foot switch cable to the terminal strip as per diagram before installing the plate to the coin door. Refer to [Section 6 pg 12](#) for the correct wire locations. Then fasten the coin door panel to the coin door with the existing coin door bolts - the V2b kit assembles easier as it just slides through the coin door opening.



10. Securing the Power Supply and Foot Switch Cables

Regardless of the cables dropping from the coin door or from the cabinet base I recommend securing the 2 supplied cable anchor squares to the inside of the left leg and then securing the cabling also to the leg levelling bolt. This will protect the cables fitted to the door or under the cabinet.



Install the 2 x cable anchor squares to the inside of the pinball leg and now with the supplied spiral wrap start at the coin door or under the cabinet secure the 2 x cables together and fasten to the 2 x fitted cable anchor squares and then a 3rd cable tie to the levelling bolt.



11. Removing the Playfield Plugs

Time to install the playfield mechanisms. Remove the glass and playfield balls from the game now. Lift the playfield and locate on to it's service brackets / posts as you will need to access the plugs from both sides of the playfield.

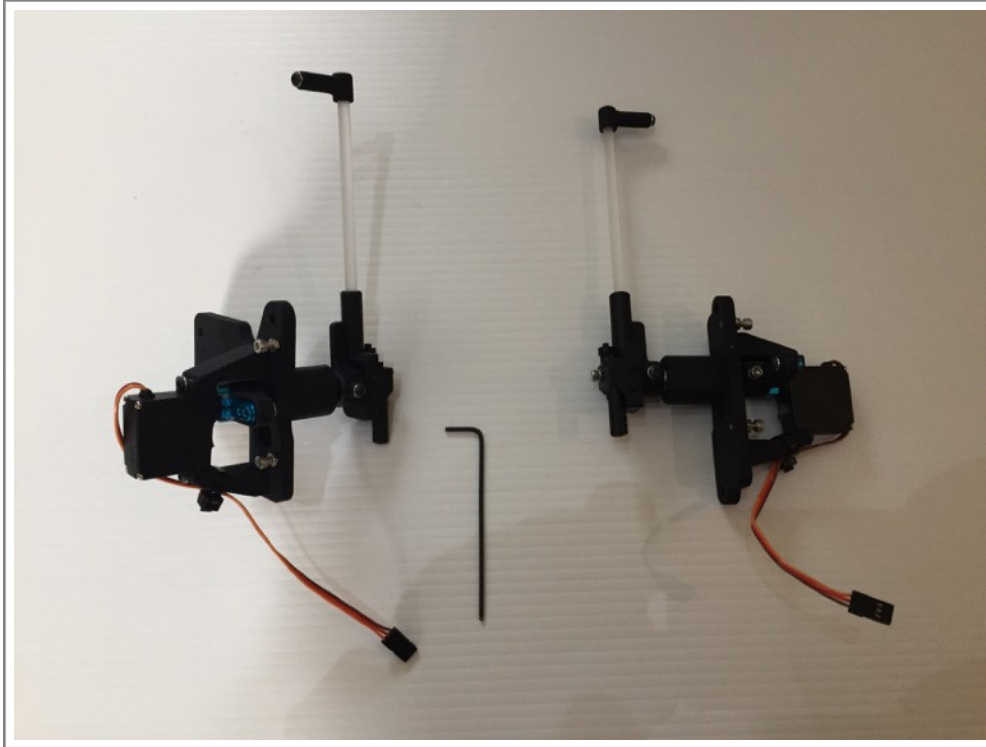
This is the left hand plug and the right side is the same setup.



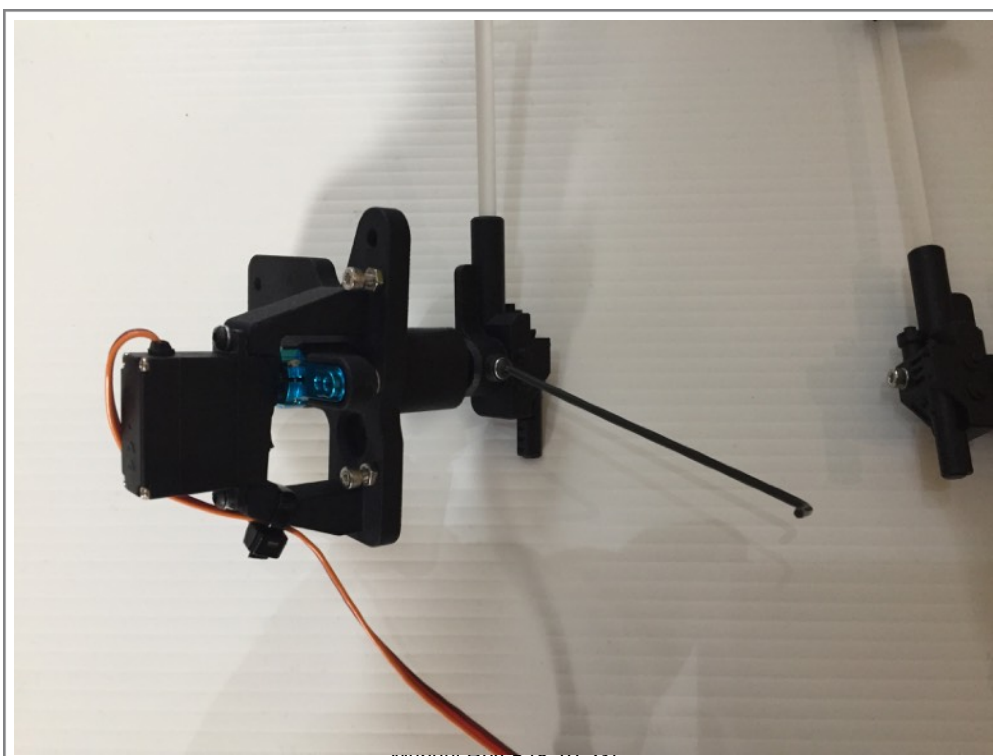
Put a spanner onto the nut underneath and unscrew from the top and remove the bung and small plastic first and then remove the plate from the playfield and reassemble as a kit and store in your games goodie bag. The hex screw that fastens the plate to the playfield can be reused for the new mechs but the mod was designed so it is not required - so store in the goodie bag as well.

12. Dismantling Proton Guns for Assembly

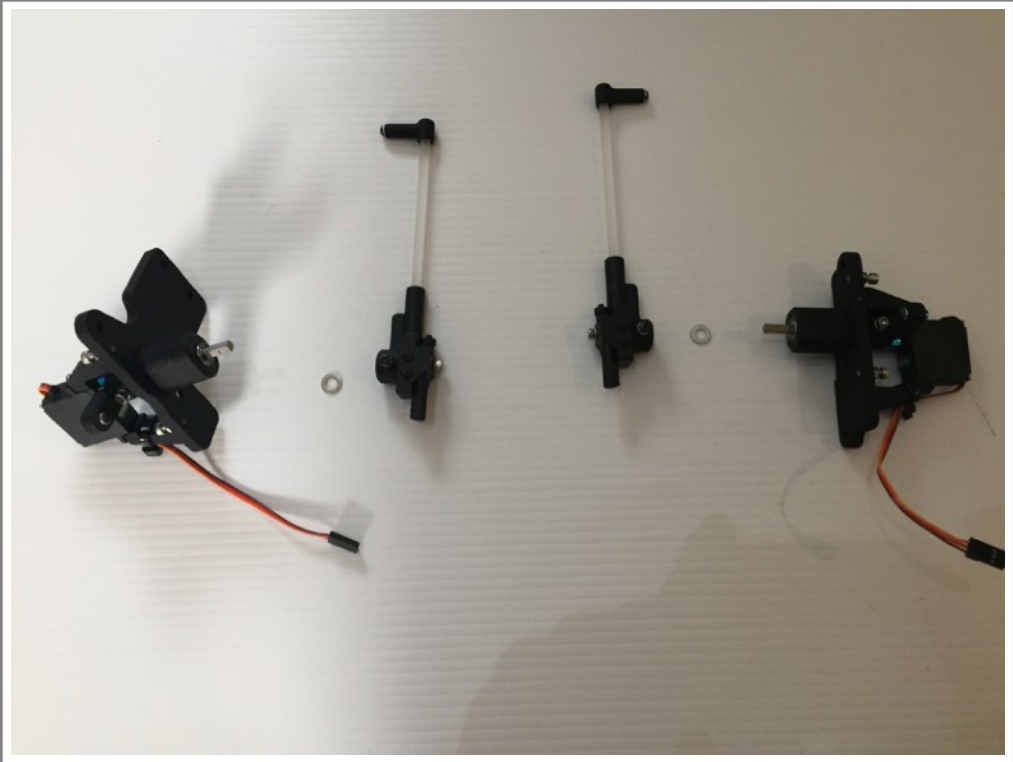
Before installing the LHS & RHS mechs you will have to remove the guns. Your sub-assemblies will look like this. The narrow mech is the LHS and RHS has the large wing on it with the Swinks logo and v2 engraved in it.



Using the supplied Allen Key locate the black bolt and loosen a couple of turns and then the gun will lift off the shaft. The gun is specific to the side as when installed the stream needs to tuck against the playfield side otherwise the ball can not pass by.

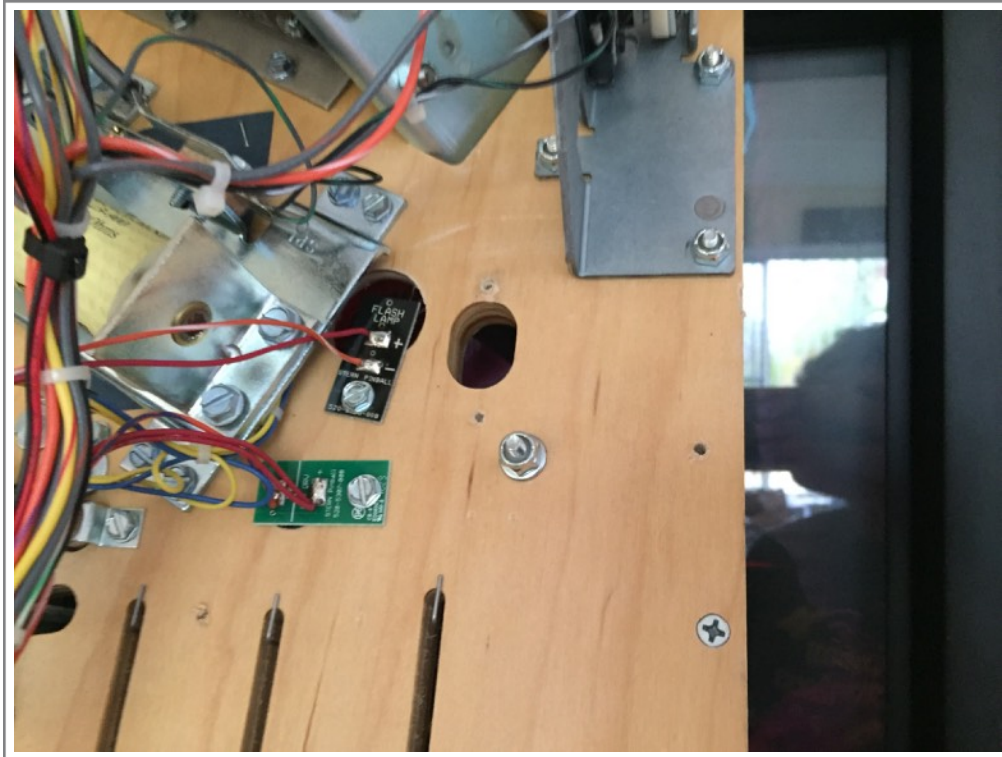


Perform this to both mechs and ensure not to discard the washers (*there is actually 2 per side*) as they are important for reassembly. Also take note of the roller bearings as they might be a neat to slightly loose fit so you don't want to lose them.

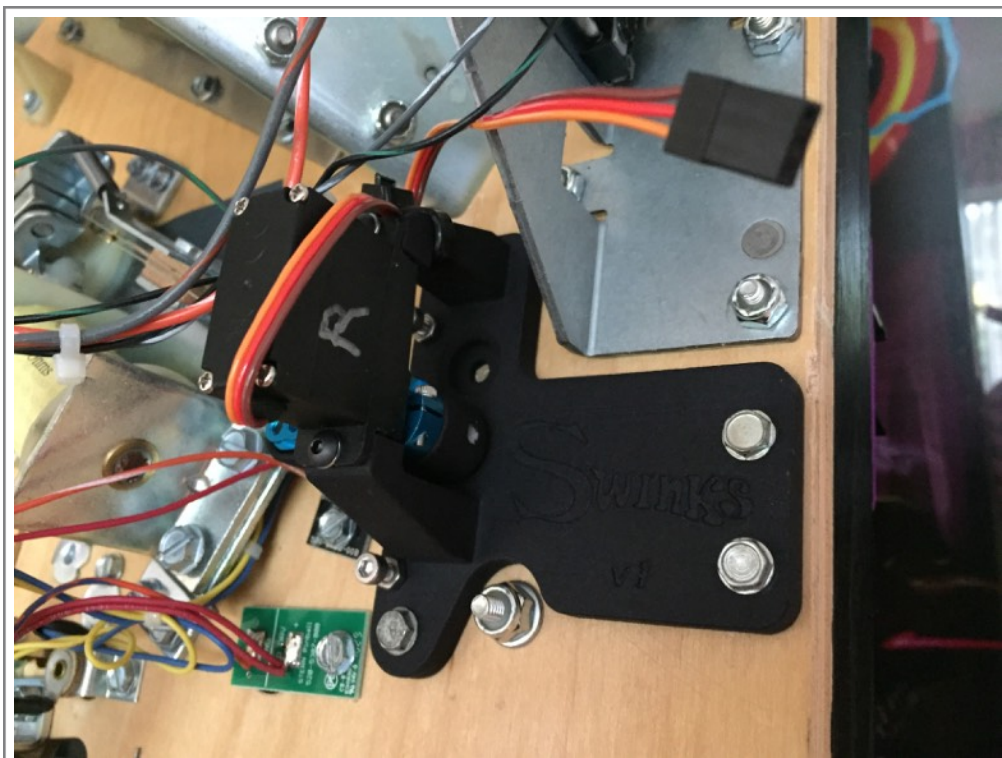


13. Fitting the RHS Proton Mech

Once the bungs and plates are removed it will look like this. Note: mine has 2 extra screw holes in the playfield from already installing the mech.



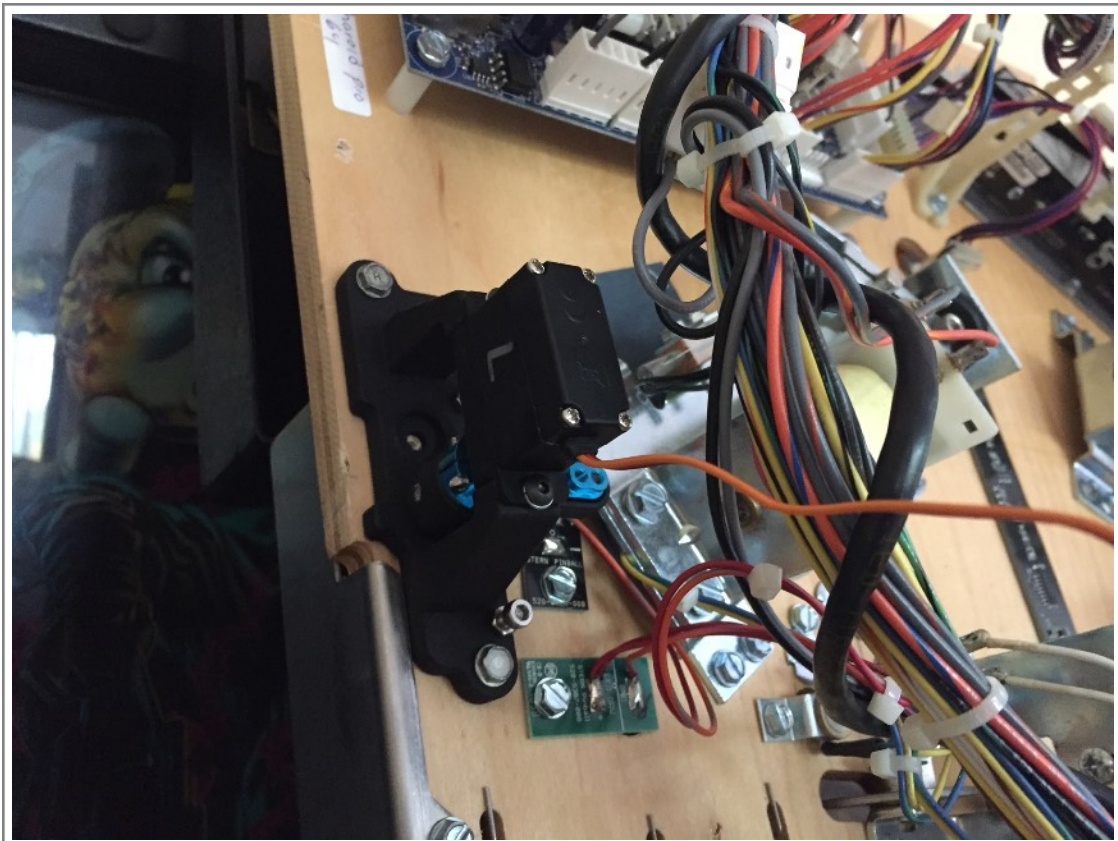
The RHS mech has the Swinks Logo and version number engraved into it. Pass the mech into the playfield hole and then hand drive the 3 supplied playfield hex screws through the mech holes. Some people use a spring loaded centre punch to aid in making a start. Make sure to keep the bolt being screwed in square. There is an extra hole which picks up the original plate mount screw / hole, but to use this you need to dismantle the servo and mech and re-assembly would not be the easiest while fitted to the playfield so only use if you want that extra piece of mind. If you do use make sure to use the original shorter original screw. I do not use the original mount / screw.



14. Fitting the LHS Proton Mech

Repeat the process for the LHS and apologies I do not have a before mech install photo but very similar to the RHS but there is less space and more of a slimmer / narrower space to work with.

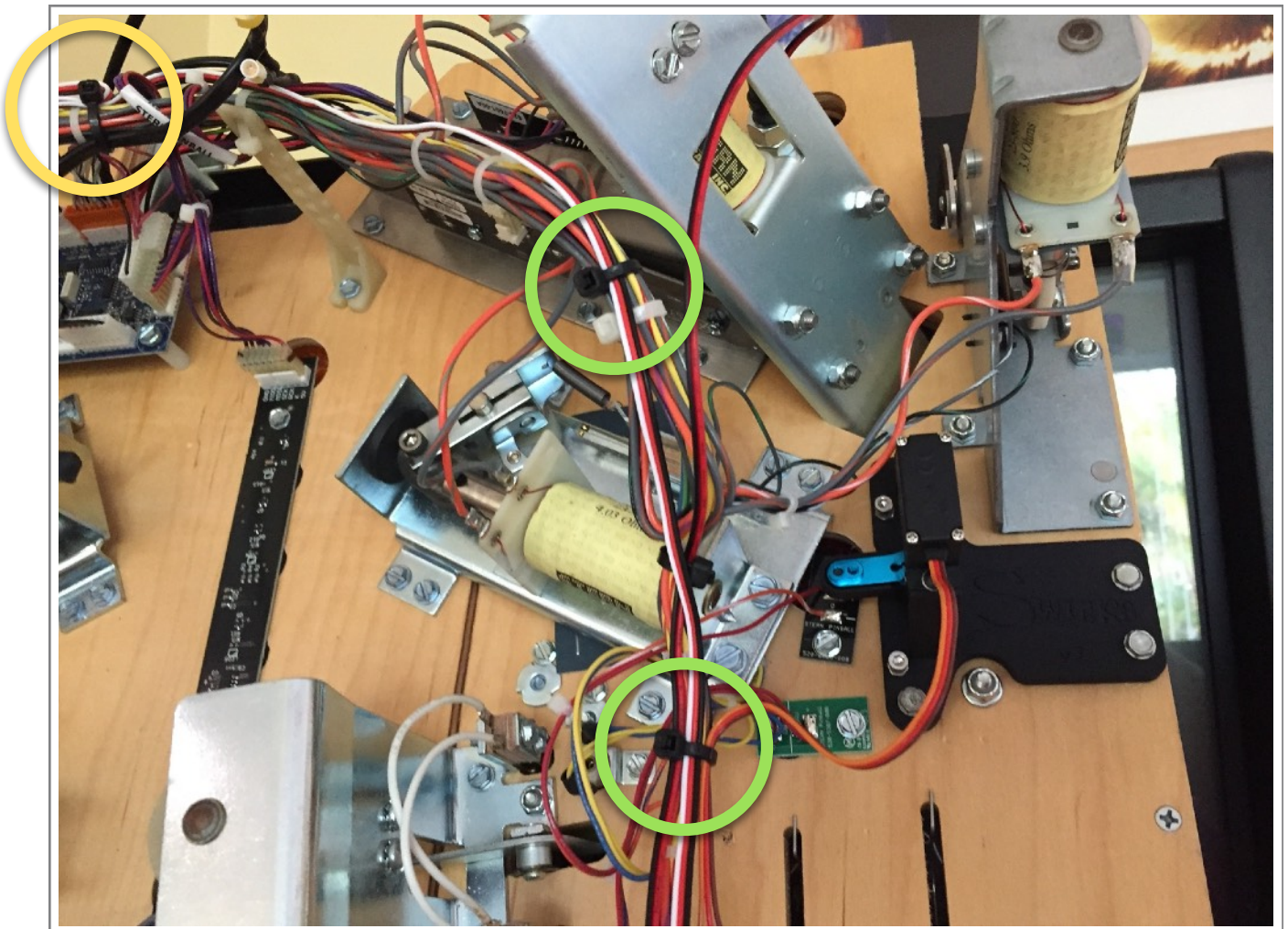
Pass the mech into the playfield hole and then hand drive the 2 supplied playfield hex screws through the mech holes. Some people use a spring loaded centre punch to aid in making a start. Make sure to keep the bolt being screwed in square. There is an extra hole which picks up the original plate mount screw / hole, but to use this you need to dismantle the servo and mech and re-assembly would not be the easiest while fitted to the playfield so only use if you want that extra piece of mind. If you do use make sure to use the original shorter original screw. I do not use the original mount / screw.



15. Securing Cabling to Playfield Underside

The cable starts off as brown / red / orange from the servo and converts to black / red / white. Refer to **Section 6 pg 12** for the correct wire locations.

Once the mechs are installed you will need to secure the 2 extension servo wires on both sides routing to the top / front of the playfield as shown. Securing and fastening put a small loop in the cable (50mm / 2 Inch) in near the mech to the main cable bundle on either side to allow a little bit of slack incase you need to service the mech. Secure in 2 spots (green circle) up to the centre of the playfield front near the big cut out for both sides - 2 sides combine to one - shown as the yellow circle. This will be the point in which both black / red / white and the proton led lighting cables meet in the centre of the playfield. There is a sticker on the cable to show where to fasten at this point.

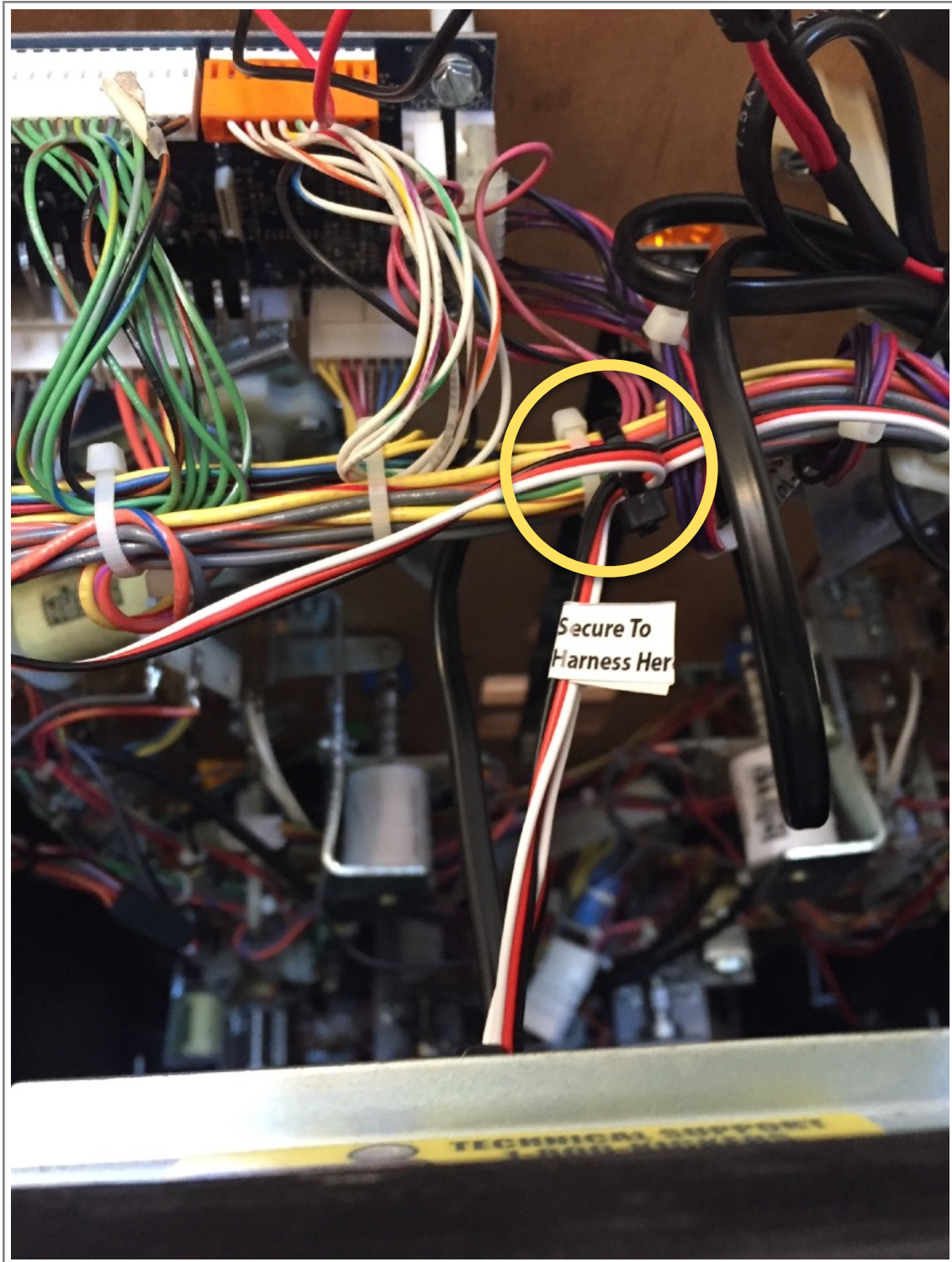


RHS Cable Routing

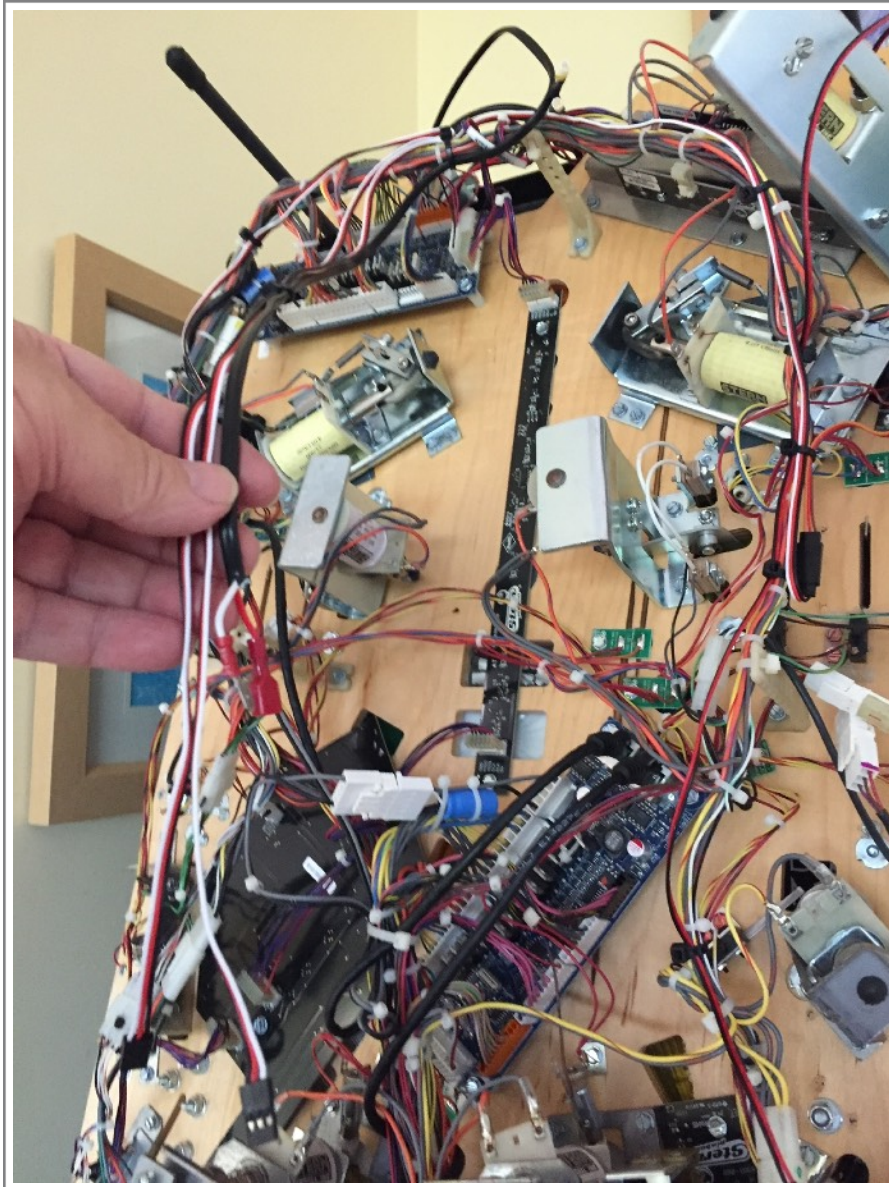


LHS Cable Routing

The cable bundle is already bundled and it will have a label - **Secure To Harness Here** - this is your indicator of where to mount to the playfield harness in the middle front of the playfield wiring - secure just above the notification sticker.



Then drop the 3 x cables down which will already be bundled together ready for when the playfield is lowered. Now the playfield can be lowered on to it's pegs / service brackets - ensure the 3 cables do not get caught up with anything and at risk of being pinched. The wiring will be continued soon.



16. Fitting The Plastic Lifter

The RHS Proton Gun rubs and can get jammed on the stainless steel bracket / plastic near the RHS out lane so this is a simple slide on part that slides on to the stainless steel rail with the bevelled edge facing the top of the playfield. Slightly lift the plastic and push the spacer up until it rests against the plastic matching bevelled edge and now you have clearance and no rubbing / jamming issues.

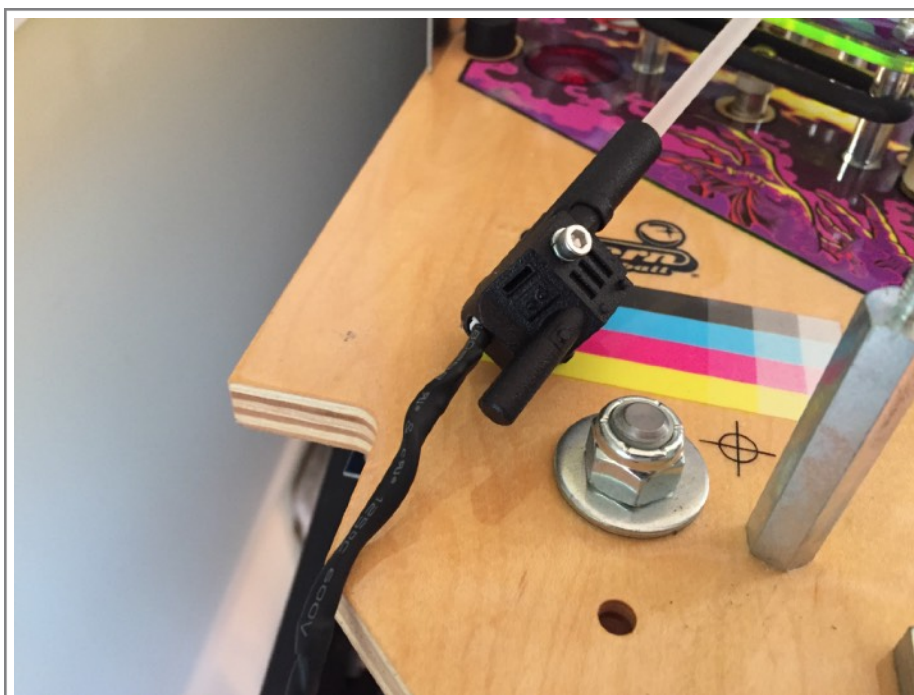


17. Fitting Proton Gun Lights & Cabling

To fit the lighting to the proton guns the apron has to be removed. For the Pro it is a plastic apron and to remove is very easy. Simply remove the game cards and underneath are 2 nylon nuts - remove these and then lift the apron off. For the LE you will have a steel folded apron which will have different mounting which I believe is 2 screws at the very front near the playfield hangers.



Once your apron has been removed, then route the 2 x lighting lead each with a LED via the large cut way at the front of the playfield. The LED's are already fitted to a bulb gun adaptor and the LED's simply push in and held with friction. Note: If they are a fraction loose cut a small piece of masking tape (colour black if desired but it should be small enough that it can't be seen once installed) and wrap around the bulb adaptor and insert into each gun. Refer to the next step for gun assembly.



18. Fitting Proton Guns to Mechs

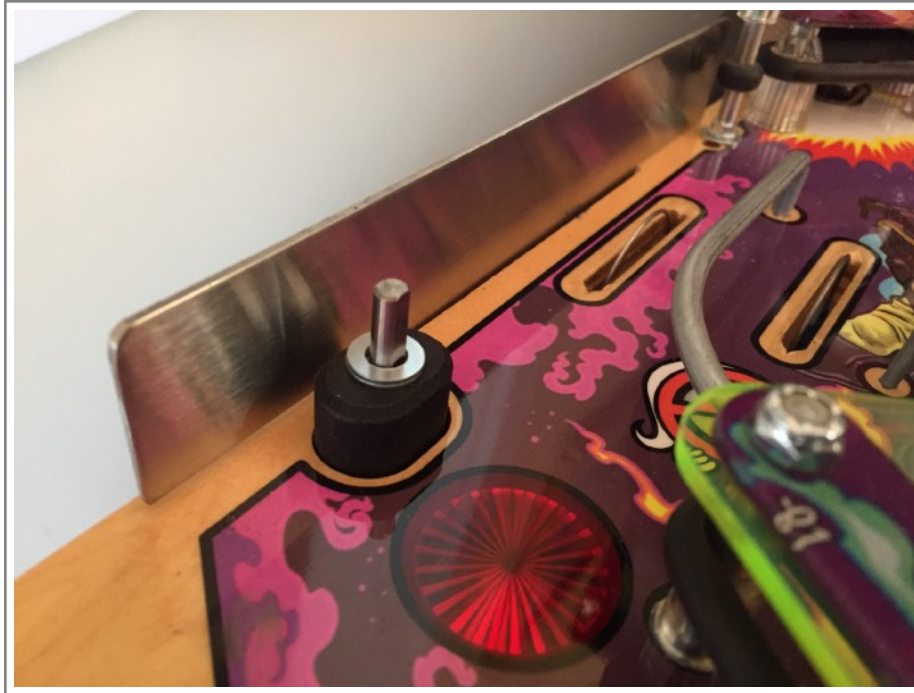
While the apron is off you now need to fit the proton guns to each side before securing the lighting cabling in place. Firstly the Proton Gun Streams are adjustable to extend out but are set to suit the posts in the middle position as shown. If you want to set the post in the lowest position you will need to cut the proton streams down or remove and forego the lighting feature at the back of the gun.



Next you will have some washers that sat between the mech and the proton gun, retrieve these from when you dismantled the guns from the mechs at an earlier step and place over the pivot shaft on top of the 5mm bearing.



Have the washer with smooth and rolled edges face each other in the centre for best slide effect.



Now slide the LHS gun over the pivot shaft and have it go as low as possible and have the bolt face the flat on the drive shaft and nip up - do not tighten this super tight as you risk stripping the nylon thread. Check that the proton gun stream nozzle black component underside clears the playfield - you do not want to scratch the playfield. You should have a couple of millimetres clearance.



When you go to the RHS side, slide the RHS gun over the pivot shaft and before tightening up twist the gun across the out going lane and see if the gun hits the stainless steel rail - on our machine this rail was leaning into the RHS outlane a little. If it hits, remove the gun and use both hands to hold on to the stainless steel rail and bend the rail towards the shooter lane just a little to bring it more to a vertical position.



Now re-install the gun and do a twist check and then have it go as low as possible and have the bolt face the flat on the drive shaft and nip up - do not tighten this super tight as you risk stripping the nylon thread in the gun housing.



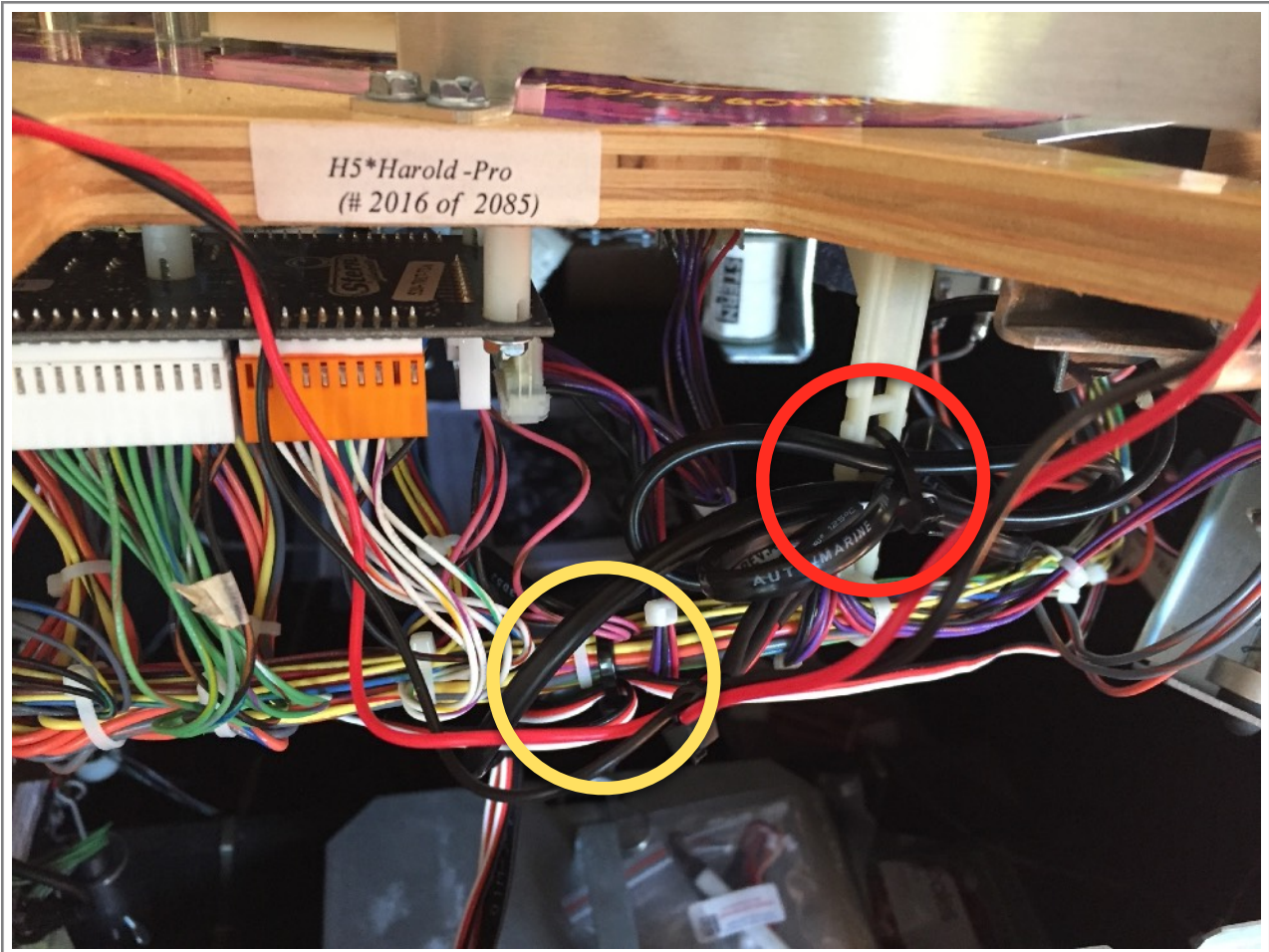
Now for the Pro route the cable around the posts and secure with a cable tie. For a game with a steel apron it won't have these posts so install a square cable tie anchor and cable tie the lighting cable and allow a little bit of movement. Perform this for both sides.



Don't be confused for the extra cable that I have there for cabin lighting for the car which passes through the ball storage mech hole.



I dropped the cable through this gap and then restrained to the existing cable standard-off as per the red circle though mine being a porto-type had some extra cable, production versions won't be as long. The yellow circle is where the bundle of wires were fastened as per before.



19. Connecting Cabling to Coin Door Assembly

Now we are up to connecting the Servo and Lighting cables from the guns / mechs BUT do not re-install the apron just yet.

You can now lower your playfield into it's play position and ensure no cables are at risk of being pinched.

The cabling that dropped down from Section 15 will now be in front of the coin door space.

IMPORTANT NOTE: the cabling from the playfield to the coin door assembly DOES have to be disconnected each time you lift the playfield unfortunately.

The reason being is that currently the servo cabling is approx 1200mm / 4 foot long and to make the cable another 1800mm / approx 6ft longer to avoid cable disconnection while doable but starts to introduces time delays / lag in proton gun use taking away from that instant use function. The cabling will have name decals on them so you know where to fasten them plus wiring details as follows:

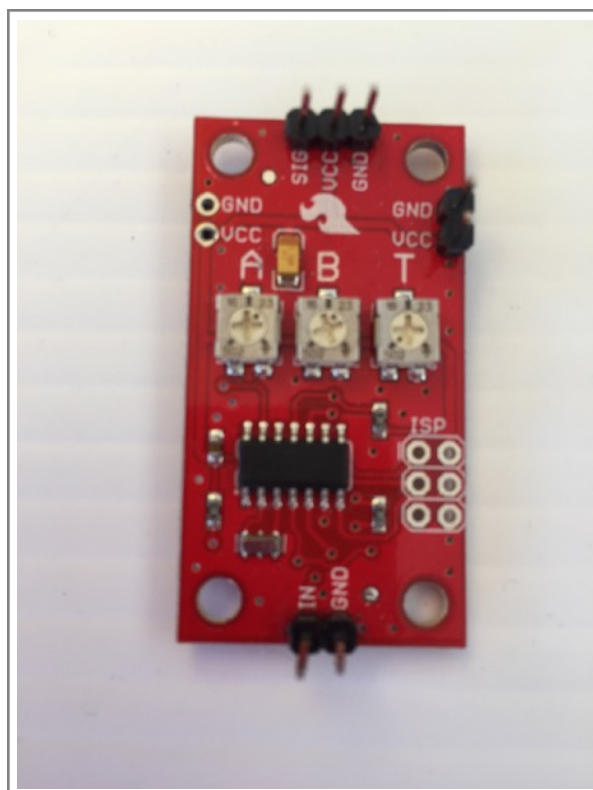
Make sure LHS Servo Cable goes into the LHS Servo Driver Board and the RHS Servo Cable into the RHS Driver Board. Refer to [Section 6 pg 12](#) for the correct wire locations.

IMPORTANT NOTE: connecting to the wrong board will rotate the proton gun the wrong way on power up and could flex the acrylic stream rod to the point of breaking if you are not careful.

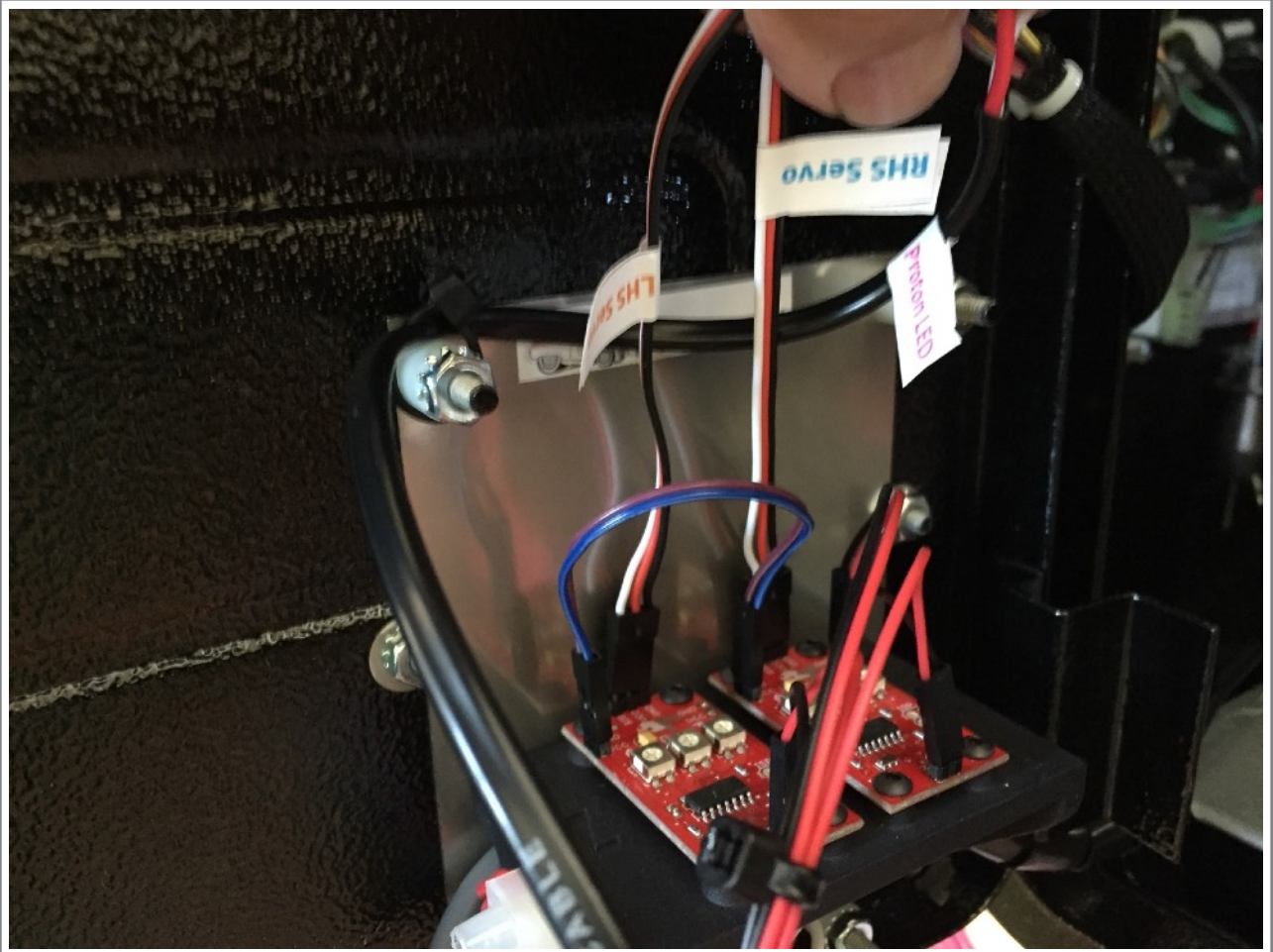
Line up the colour of the cable to the top 3 pins in the following order:

Brown or Black = GRD
Red or Red = VCC
Orange or White = SIG

Refer to [Section 6 pg 12](#) for the correct wire locations.



The 2 servo extension cables and proton gun led cable are bundled together and plug into the provided spots and cable. Make sure the Black wire marries up with the GRD marking on the boards. There is a large L = Left and R = Right engraved into the coin door bracket ensuring you connect to the correct side. The cables are labeled to aid in correct installation. Then also connect up the Proton LED cable with the corresponding Proton LED cable via the male to female fittings. Refer to [Section 6 pg 12](#) for the correct wire locations.



20. Understanding the Proton Gun Servo's

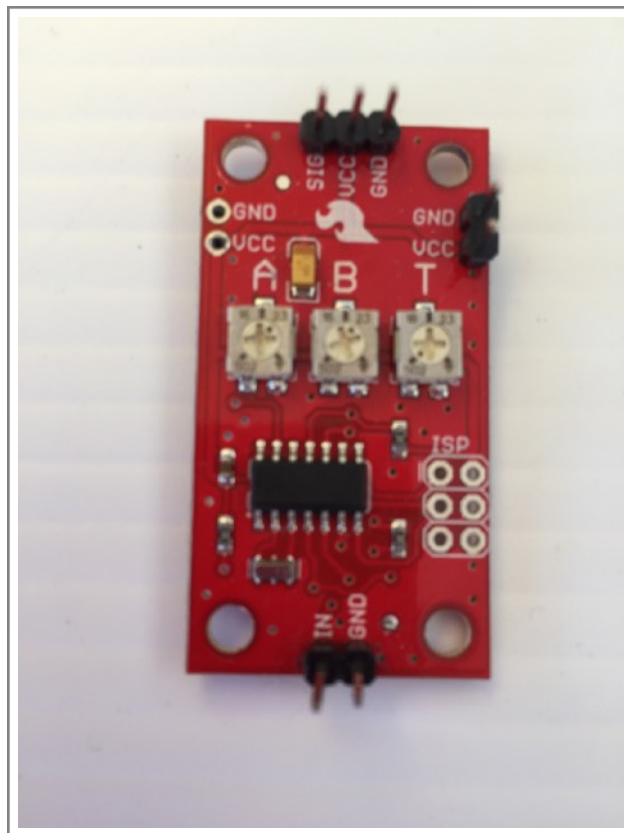
When I assemble the mechs here for you I attempt to get the proton gun close to it's home / rest position and also it's open / lane blocking position but you will need to fine tune your proton gun / streams as the mech installation angle can affect the angles a fraction. You will just need a Philips Screwdriver (jeweller type) and locate 3 x screw adjustable pots name **A** / **B** / **T** on the Sparkfun Servo Board.

IMPORTANT NOTE: do not adjust these until the process is explained.

A = Home / Rest Position

B = Open / Lane Blocking Position

T = Servo Travel Speed (which is already set to max)



21. Hook Up / Power Up and Tune Up Process

- Now connect your power box lead that you purchased and plug into the power board and plug into the wall and turn on.
- You will notice a light on the power box go on.



- Then go to your coin door and locate the red power button and watch your proton guns when you push the red button. Inspect your protons as they will home once powered, and be ready to turn off quickly if Proton Gun / Streams are bending to much or travelling in the wrong direction - though the RHS will home clockwise briefly. The green light will light up showing your mod is now powered and you might hear the proton gun servos move.



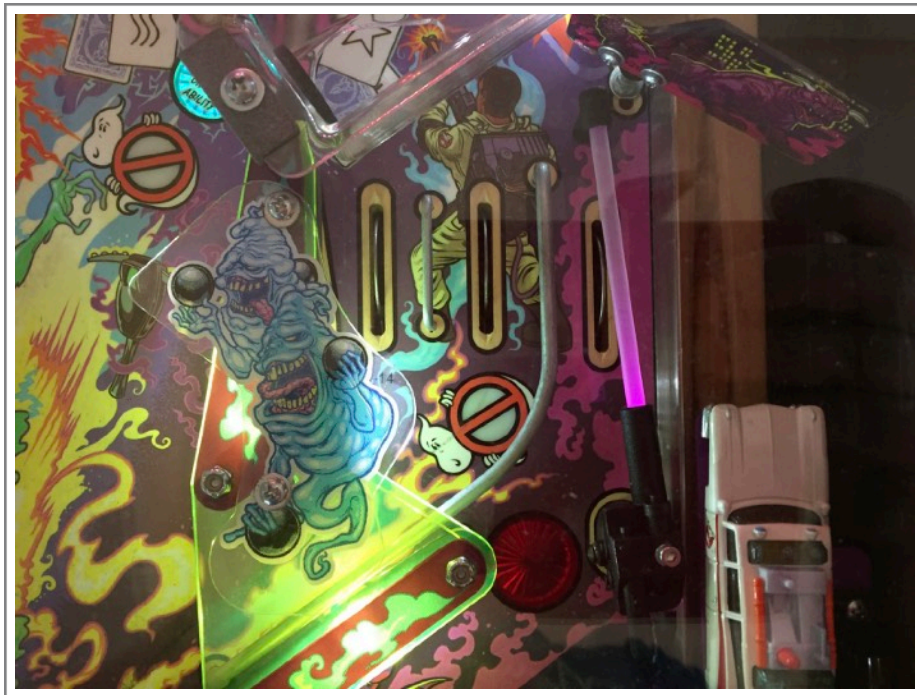
- Inspect your proton guns (but do not push the foot pedal just yet) and both guns should be fairly parallel to the stainless steel rails. Now you need to fine tune the LHS and RHS proton guns. So locate your LHS board and ever so slightly turn the “A” screw a little so the proton gun nozzle (ball stop) is about 1mm / 1/16” off the stainless steel rail and repeat for the RHS - effectively taking the proton a little beyond the vertical / parallel position so they tuck away nicely when not activated.



- Once you set the home / rest point you are ready to set your activated proton guns to your liking. The idea is to set mid way between rest and the in-lane ball guide so if the ball goes to the top but not too much ensuring the ball can NOT slip down the back (this would be a glass off situation) and out enough to stop a ball from going down the out-lane. Use the following photos as a guide. See next page for a closer view.



- This is a closer view of the recommended left and right gun activated position but you can adjust to your liking though remember don't allow it to move too far to the slingshot mechs as if the ball can get past the proton gun stream tip on the outside it will get jammed and you will need to take the glass off. I recommend getting a ball out and just do a little test as a check.



- The screw on top of the proton gun locks in the acrylic rod, if you want to adjust - loosen a little, twist and then pull the stream rod, which you will have about 10mm of adjustment up only. Unfortunately while you can push the rod in it will hit the stream LED lighting so if you really want to push in and keep the light you need to cut the rod down.
- The guns are slightly different on each side as are the stream rod length. The visible length of the acrylic rod is:
 - LHS - 85mm
 - RHS - 80mm
- Lastly the nozzles, the part that the ball impacts is fastened to the stream acrylic rod from the underside close to the playfield (don't worry these are not that close to the playfield that it will cause damage). If these are kicked out, just loosen the bolt on top of the proton gun and twist the stream rod a fraction to get your preferred position - recommended to be vertically down.

22. Using the Proton Gun Mod

The Proton Gun Mod is very simple to use.

1. Simply push the red button on the front of the coin door and a green light will light to show you that the mod is now powered up and ready for use.
2. Push the foot switch to activate the Proton Guns. Currently in the supplied mode the Proton Guns activate and swing out when the foot switch is pushed and they will light up when activated. When you release the foot switch the Proton Guns swing back in against the stainless steel rails to allow a ball to pass. You can do quick taps or long depressions of the foot switch and in turn activates the Proton Guns the same.
3. This mod is not an earned feature / mod as runs totally separate to the Stern System and so runs all of the time which will not be too everyone's liking though read point 5.
4. There is another option to modify the 2 servo PCB's by putting a solder dab in-between 2 x tabs on the underside of the board. This changes the mode so when you push the foot switch the protons activate to their full out set position and return immediately to their home set position after going to their maximum swing out position. Timing becomes much more important as you no longer can keep the proton guns out blocking the lane for as long as the foot switch is pressed. Refer to the next section for how to perform this change. **I do recommend NOT using this feature as it is harder to return back to original and at this point you are modifying the mod.**

23. Modifying the Proton Gun Mod

As noted in Section 12 this section explains how to modify the Servo PCB's to suit the Item No:4 game play mode if you want to mix it up a little.

Here is the back of the Servo PCB and here are the 2 tabs = SJ1 - Mode - simply add a solder blob across these 2 small solder tabs to change the function of the Servo Driver Board.



This is what is an example of what it looks like to change the function of the mod. Only do the SJ1-Mode - do not modify SJ2 as this will add weird effects. I did add a solder blob to SJ1 to trial which worked but not consistently as it had a random weird effect so it really is your choice to try and then return to standard if you do not like it.



24. 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.

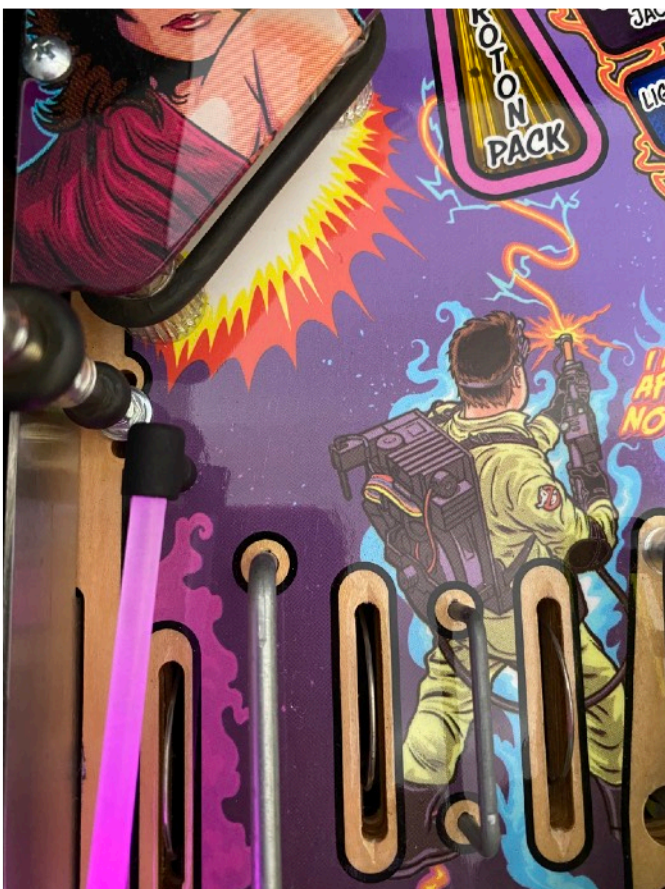
And sometimes it only happens on the initial power up and the RHS stream goes against the rail on power up but on first use of the foot pedal the stream settles back to it's proper home point after it's first use - it is a servo thing that we have to accept - though I try to set so any homing issues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

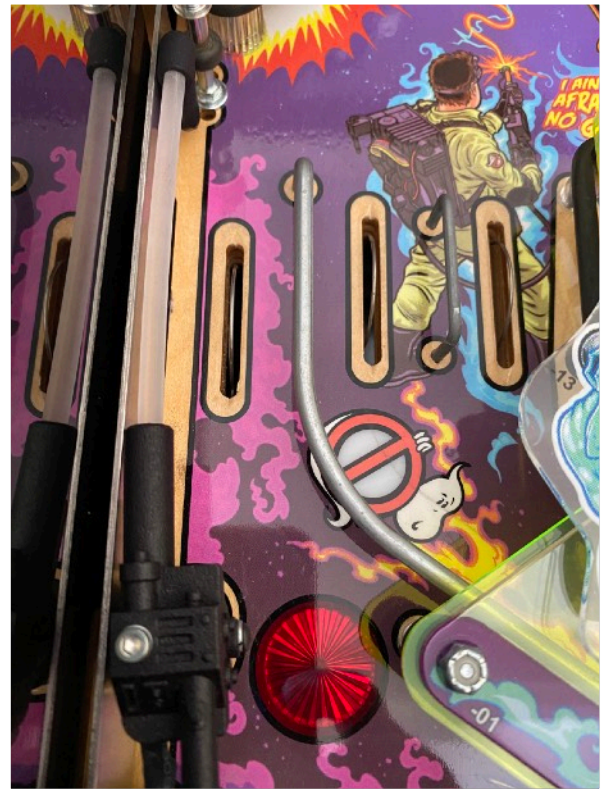
Adjusted Out a Little More



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.

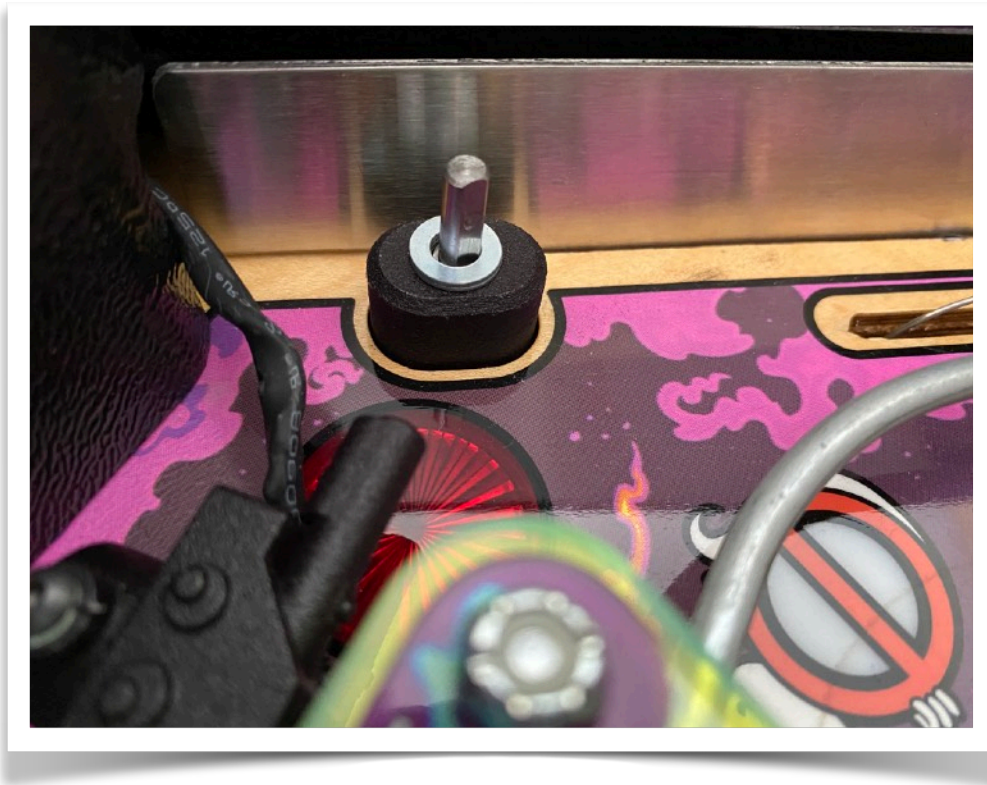
This is what it looks like (beam has a decent bend in it) and you may have a mild panic, the Proton Gun heavily turned into the side and when you push the pedal it wants to go further into the playfield side - **turn the mod off immediately:**



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

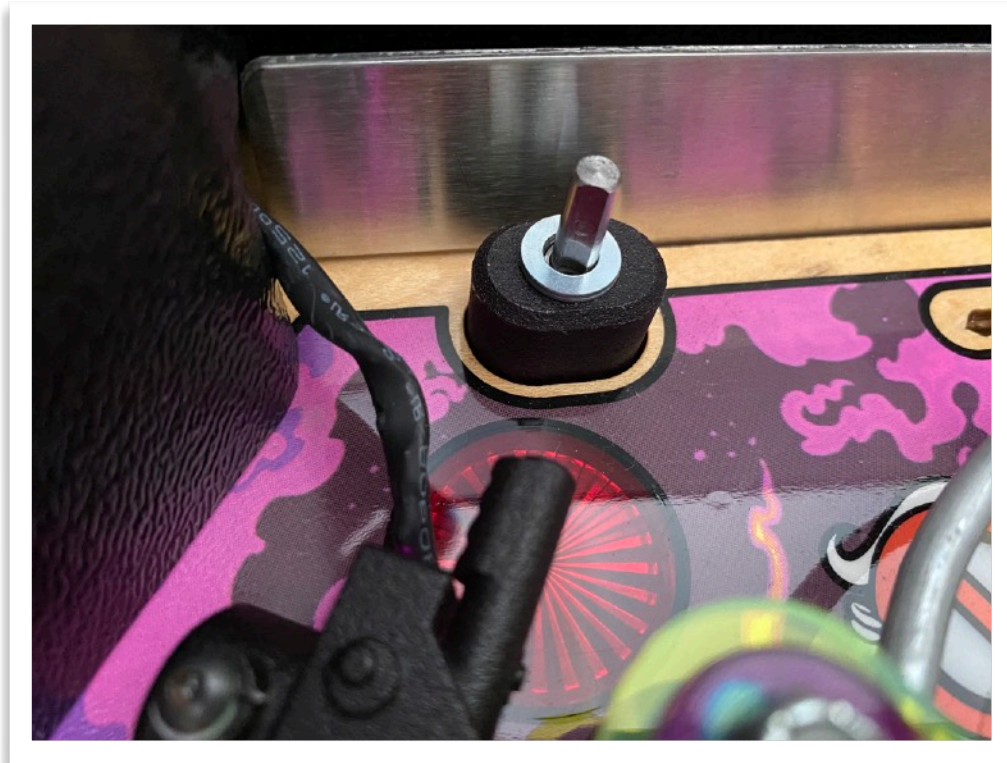


Flat of Shaft now correct

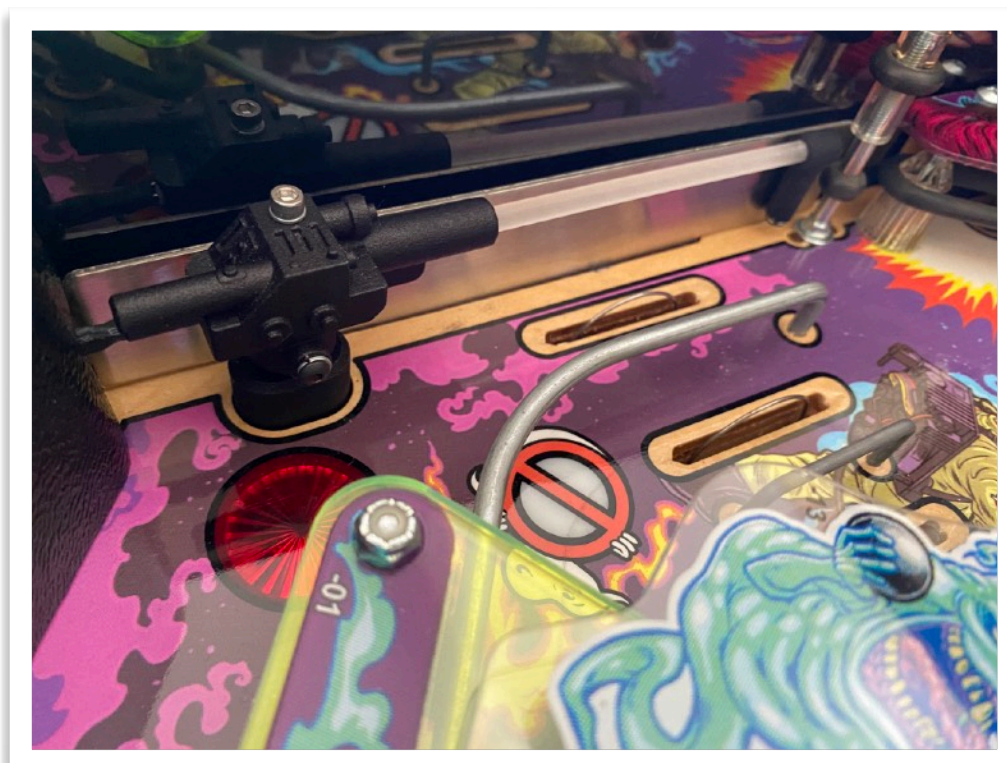


Now push the pedal as we will correct the Ball Block Adjustment of the Proton Gun - depending on what you adjusted earlier on it might be messed up - so it may not move or only move a little or a lot. Push the pedal and also adjust the B Screw as you only want about 10 degrees of movement.

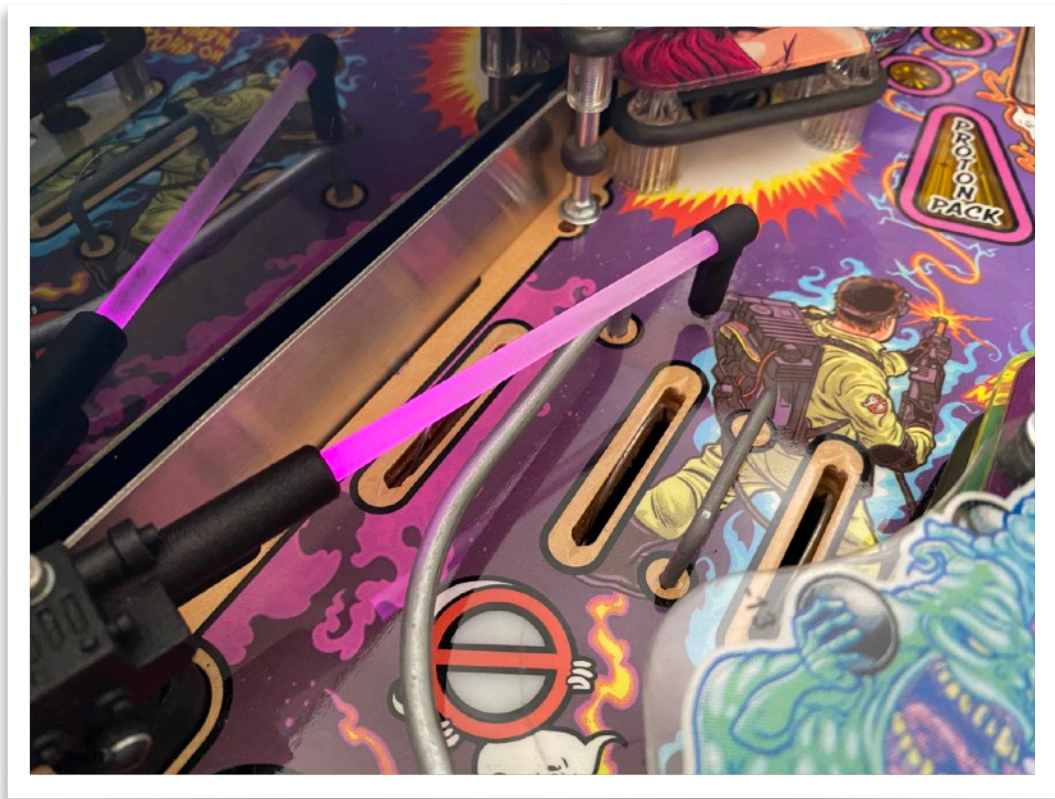
When the pedal is pushed the Ball Block position should be roughly this



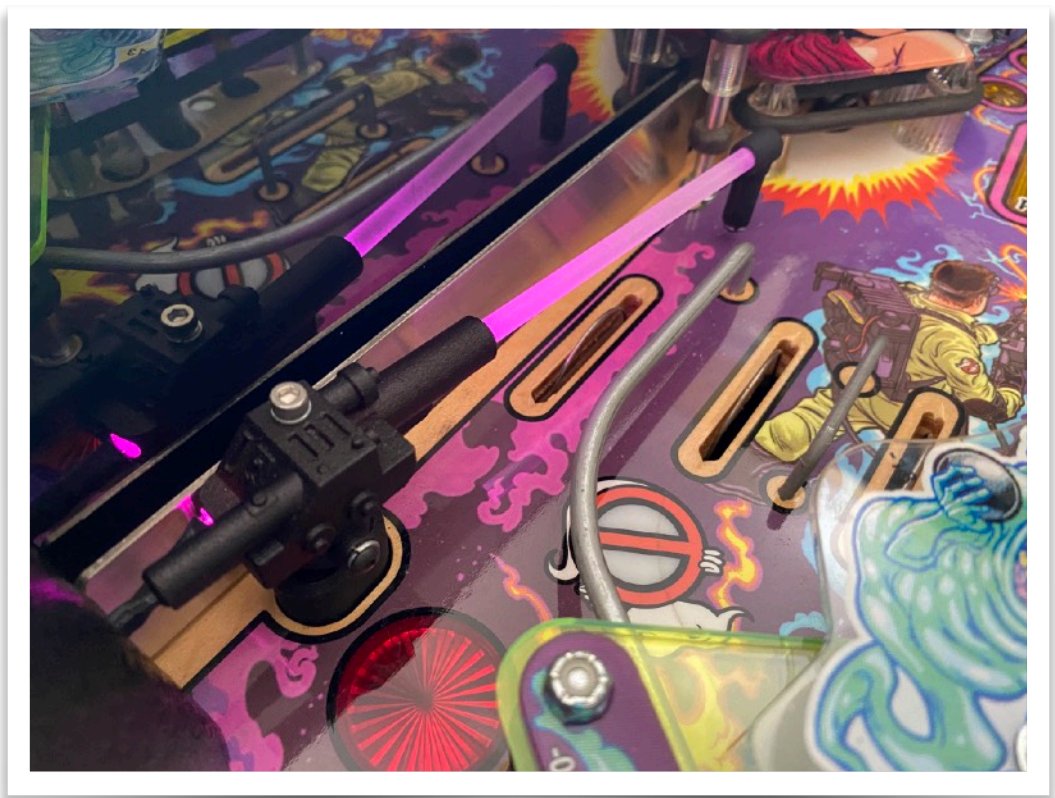
Now reinstall the gun back on to the shaft and nip the screw onto the flat of the shaft. Now check that the Proton Gun is parallel with the cabinet side and make a slight adjustment to the A screw to get it right if required:



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** - Shapeways
<https://www.shapeways.com/marketplace?type=product&q=swinksgbproton>
- **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

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

25. Historical Data - Proton Gun Revisions

Swinks like statistics, as I think it is interesting to look back on & know where things are in years to come. It also may help people determine what they have once a mod is on-sold or someone buys a game with a Proton Gun Mod in it. These are the following versions:

1 x Proto-Type Proton Gun Rev 4 - white home printed version with linkages and went through a number of revisions (4 in total) to get it to work well. This has been parted out and home printed parts destroyed.

1 x Proto-Production V1 - RHS mech has "Swinks V1" engraved in the bracket - all black parts - direct drive and linkages no longer required. The coin door backing bracket was congested and difficult to see the boards and terminal strip - design was revised for v2 release. I have used some of these v1 parts and v2 parts for my machine.

No: 1-36 x Production V2 - RHS mech has "Swinks V2" engraved in the bracket - all black parts - direct drive. Flipped the design of the coin door backing bracket compared to v1 for easier access to boards and wiring and minor tolerance changes across a number of parts.
When made in batches of 12 this mod was **\$795 AUD** + PayPal Fee if you paid a Merchandise Payment + postage + postal insurance.

RETURN POLICY:

*Please contact us as we will be proactive to try and quickly resolve any problems from abroad reducing the need to send your purchased parts. Approval from Swinks Pinball must be granted before any items can be returned for repair or replacement. All materials, boards, cables, etc. must be included when the product is returned. We will repair or replace/exchange faulty components based on our analysis of the problem. Swinks Pinball reserves the right to deny any return or exchange. Refunds are not given. Freight Costs will **ONLY** be covered by Swinks Pinball on the return trip back to you and you cover sending it to Australia. Though in saying that we have never needed to have anything returned and very rarely experience any problems. Swinks does not issue refunds for a change of mind purchase or viewed too difficult to install. This manual was available before purchasing so you could review and aid you in feeling comfortable to purchase.*

PRODUCT DISCLAIMER:

Please remember that this is 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.