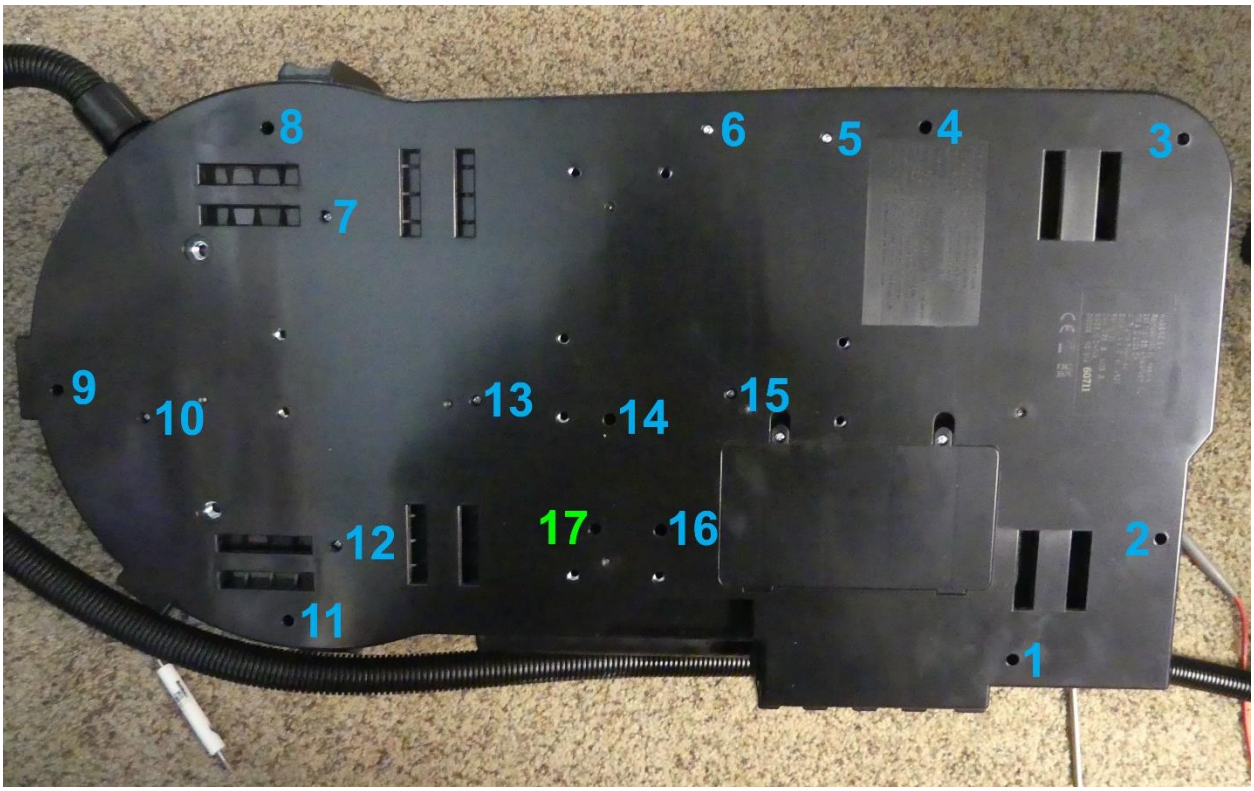
Legris Replica elbows and replica straight installation instructions for the Hasbro 1984 proton pack (and HasLab Spengler Afterlife Pack).

Open up the pack

First remove the Shock mount, Bumper, Cyclotron cover and the “cake” from the center of the cyclotron base. Also the ion arm top with rod since you will be flipping the pack over for the next steps.

Next get a longer Philips head screwdriver and remove 17(!) screws from the back of the pack. Screw #17 holds a tube in place so that will fall off when this last screw is removed. On my pack all of the screws were the same length, some have reported screws being different lengths. Just make a note of any unique screw lengths and where they came from so you can put it back together after you finish with this modification.

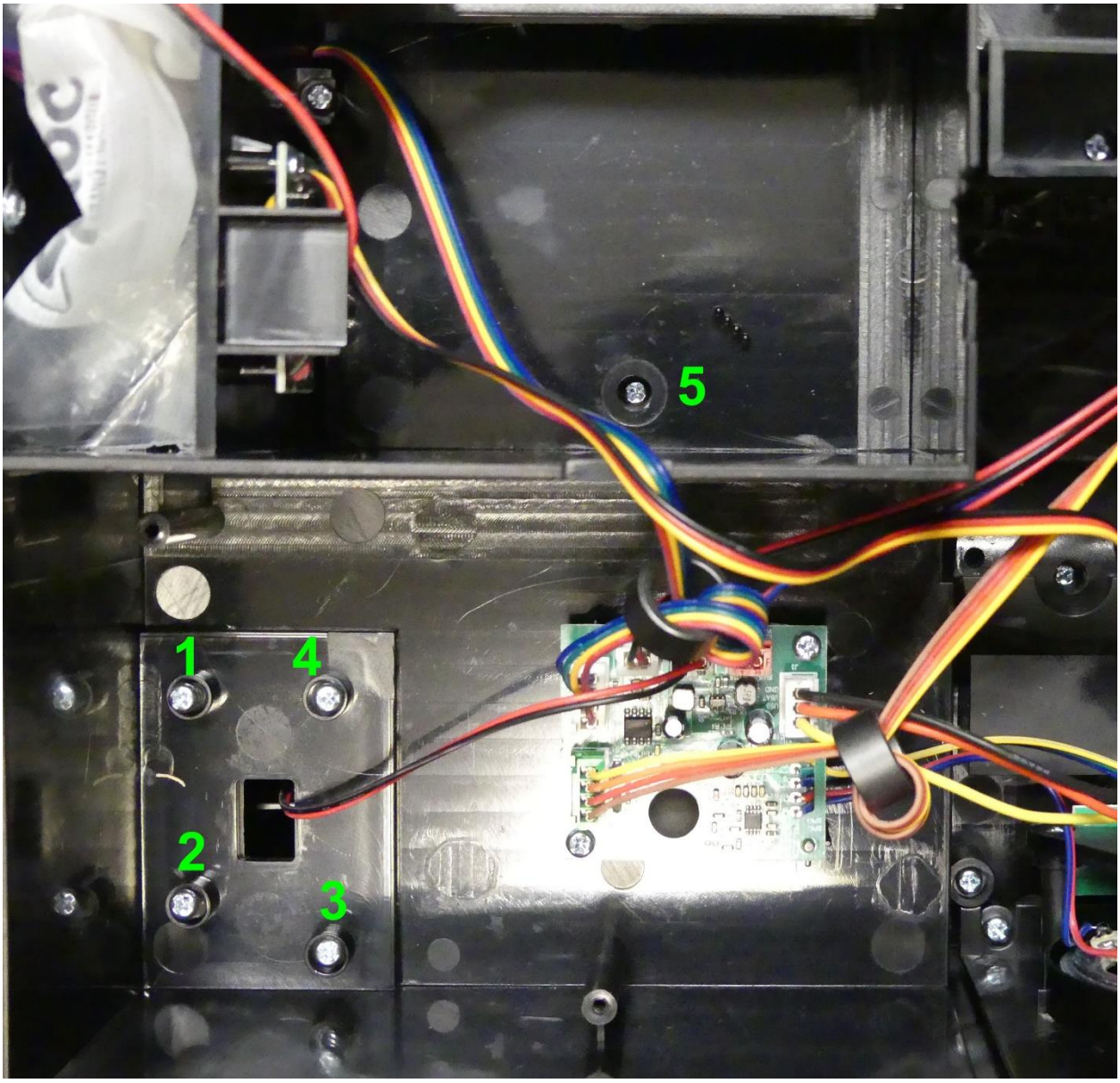


This should free the back to be popped off. Lift the back off a little bit at a time so you do not make a large angle between the back and the main pack body. There are some longer supports and you do not want to bend/break those. Best to lift the back straight up off of the pack.

Ion Arm Assembly modification

First, unplug the 2-wire cable coming from the power switch on the ion arm assembly from the main circuit board (Red and Black wires).

There are 4 screws directly holding the ion arm in place, but there is a part that is also somewhat attached to the booster tube. Screw #5 holding the top of the booster tube in place and with this remove you can lift the tube up slightly – just enough to get the ion arm assembly out from the pack. Some have mentioned the removal of the booster tube and that is a couple more screws, but I did not find that necessary on either 1984 or the Spengler Afterlife pack.



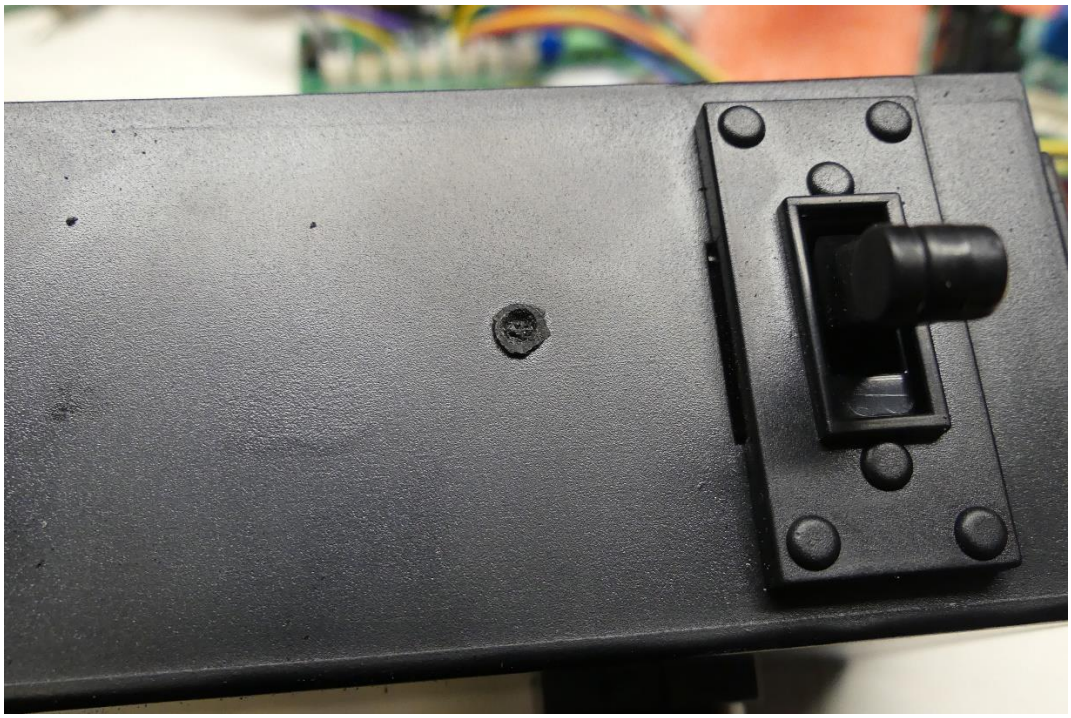
Remove six more screws to remove to gain access to the inside of the ion arm assembly:



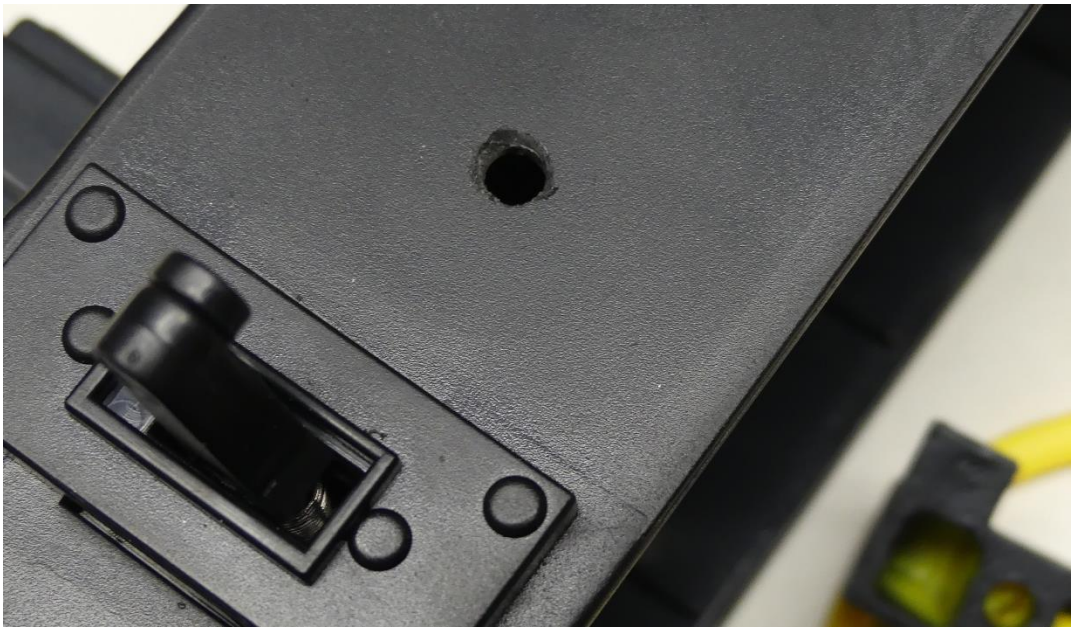
When you pop off the existing elbow, a post will be exposed. We need this removed!
I use a roto grinder (Dremel) tool with a grinding wheel. Just remove a bit at a time and keep checking to make sure you ONLY remove the post and do not mar up the surface around it.



We need a hole to be placed where the post once was. I use a cone shaped grinder bit or a very small drill bit to mark the center of the where the post used to be after it was ground down:

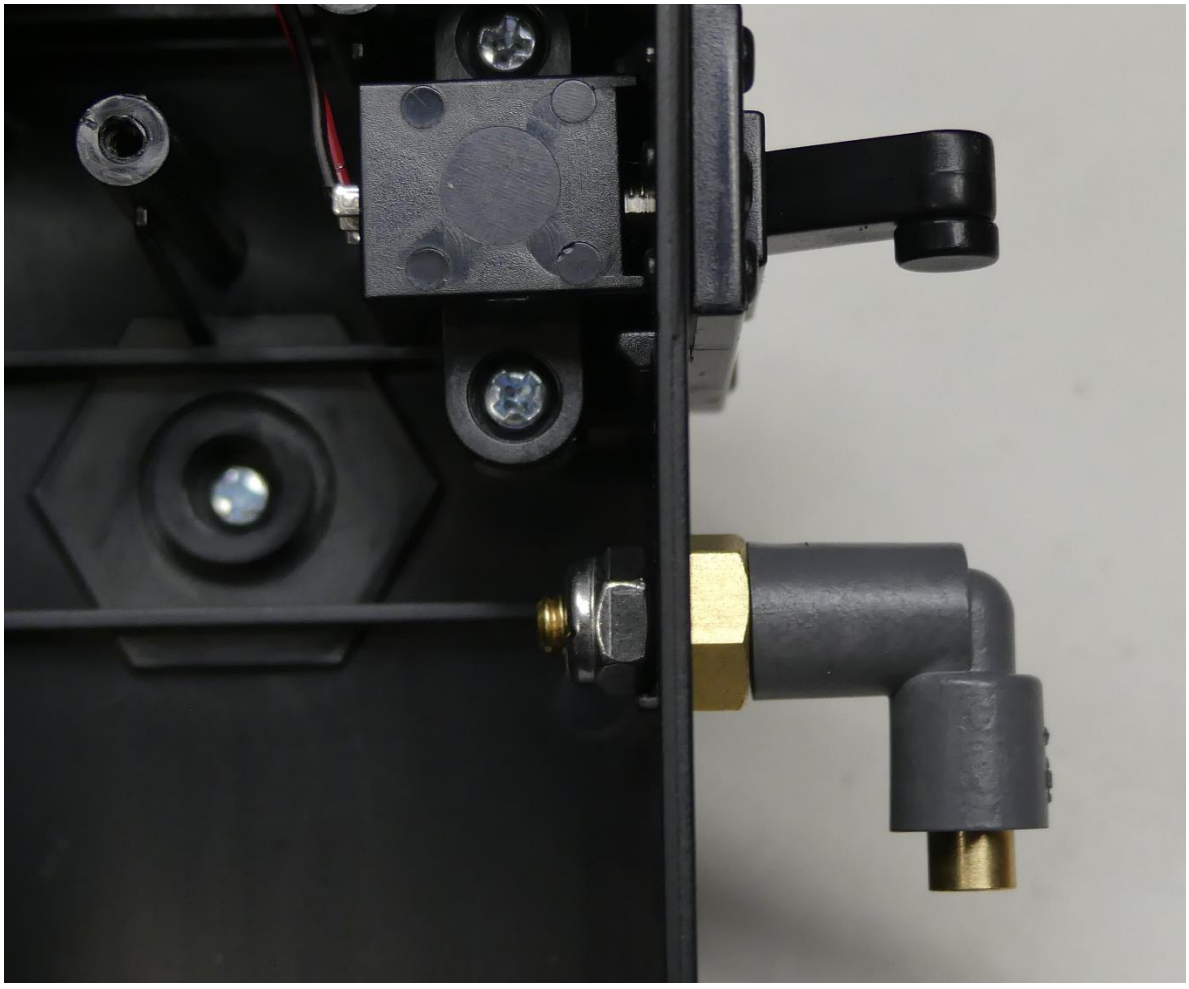


Then use a 11/64” bit to drill a hole. This hole can be small enough to require threading the replica Legris elbow in place. Which _could_ be good practice for the cyclotron mounting. If you want an easier install here, use a 3/16” bit and the threaded post should drop right in to the hole.



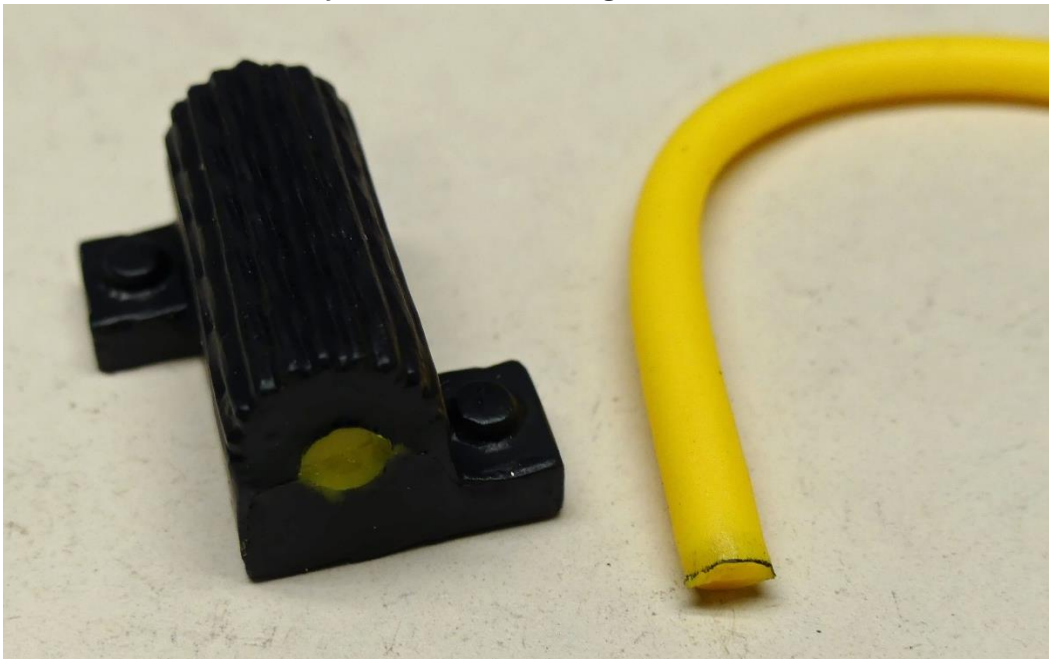
Install the replica Legris elbow and use one of the 10-24 lock nuts on the inside to secure it in place (even if not needed because you drilled the smaller diameter hole.

I use a socket on the inside and a crescent wrench on the outside. You may want to use some masking/painter's tap on the outside surface to help prevent scratches on the surface from the crescent wrench. This is even more important if you are tightening the elbow only from the outside so you will be repeatedly moving the crescent wrench.

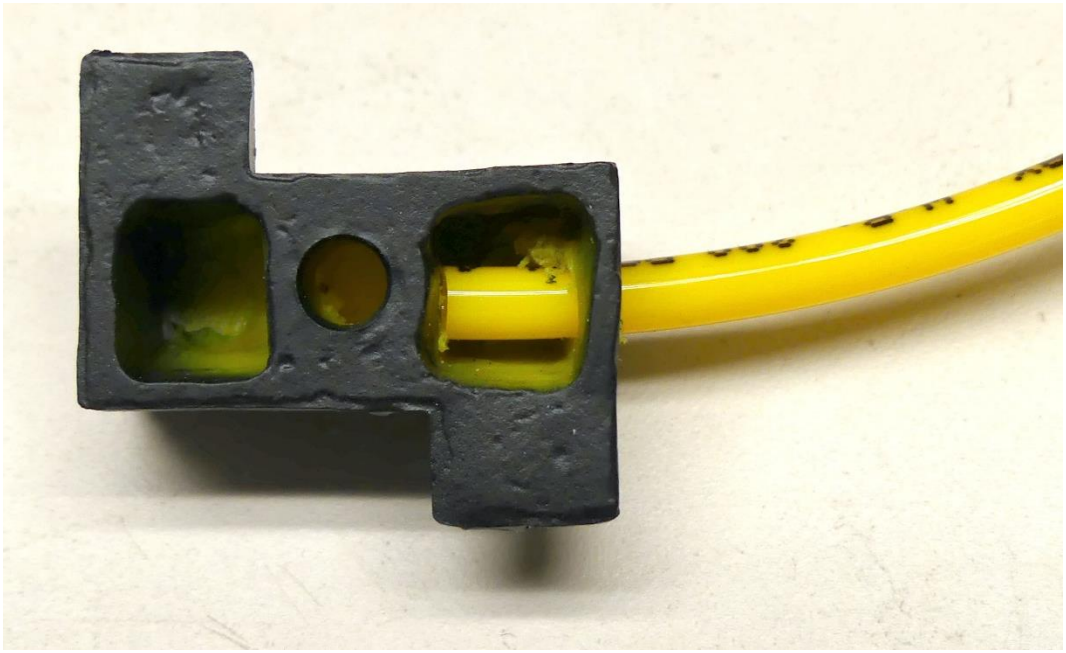


Next you need to modify the side resistor to accept the new yellow hose.

First cut off the molded rubber yellow hose with diagonal cutters:



Then we need to drill a hole for the new yellow tube to go into this molded rubber part. My drill bits were apparently not sharp enough to easily puncture the surface, so I started with my smallest bit for a starter hole. Then I drilled the actual hole with a 5/32” bit. Make sure the hole does not go halfway into the resistor since that is where the mounting post hole lives. Then you can insert the new yellow tubing.

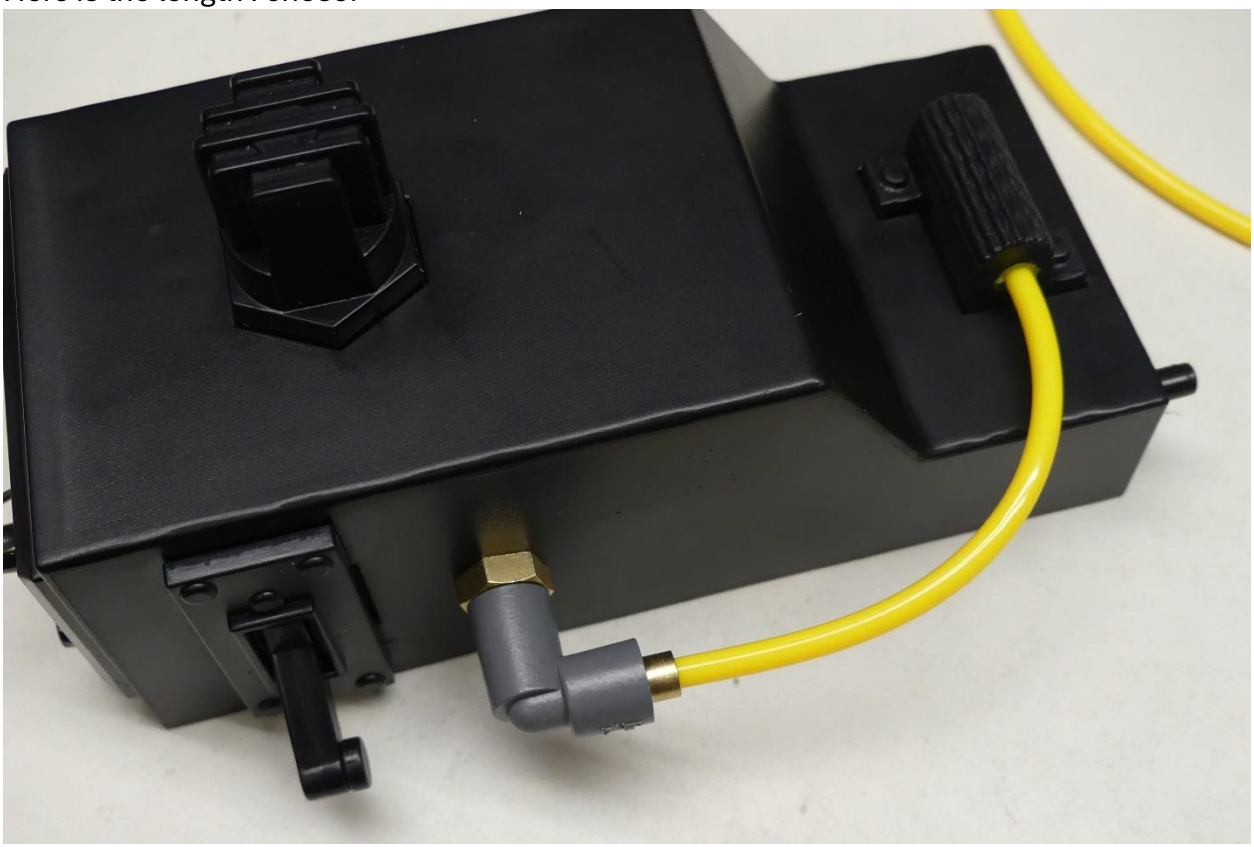


You can add some glue if you want the tubing more securely attached, but the fit was fairly snug on my part. And I wanted to be able to adjust the angle after the length has been tested with the installed replica Legris elbow.

Now attach the resistor and tubing to the ion assembly and see how much yellow tubing needs to be trimmed. About 0.4” of the tube will go into the elbow so DO NOT TRIM THE LENGTH of the yellow tubing to only reach the top of the elbow!

It is best to dress the tubing how you like and then trim it to something 1/2” or more longer than you think you need and then test fit and trim a bit more off. Keep doing this until you get the tubing the right length.

Here is the length I chose:

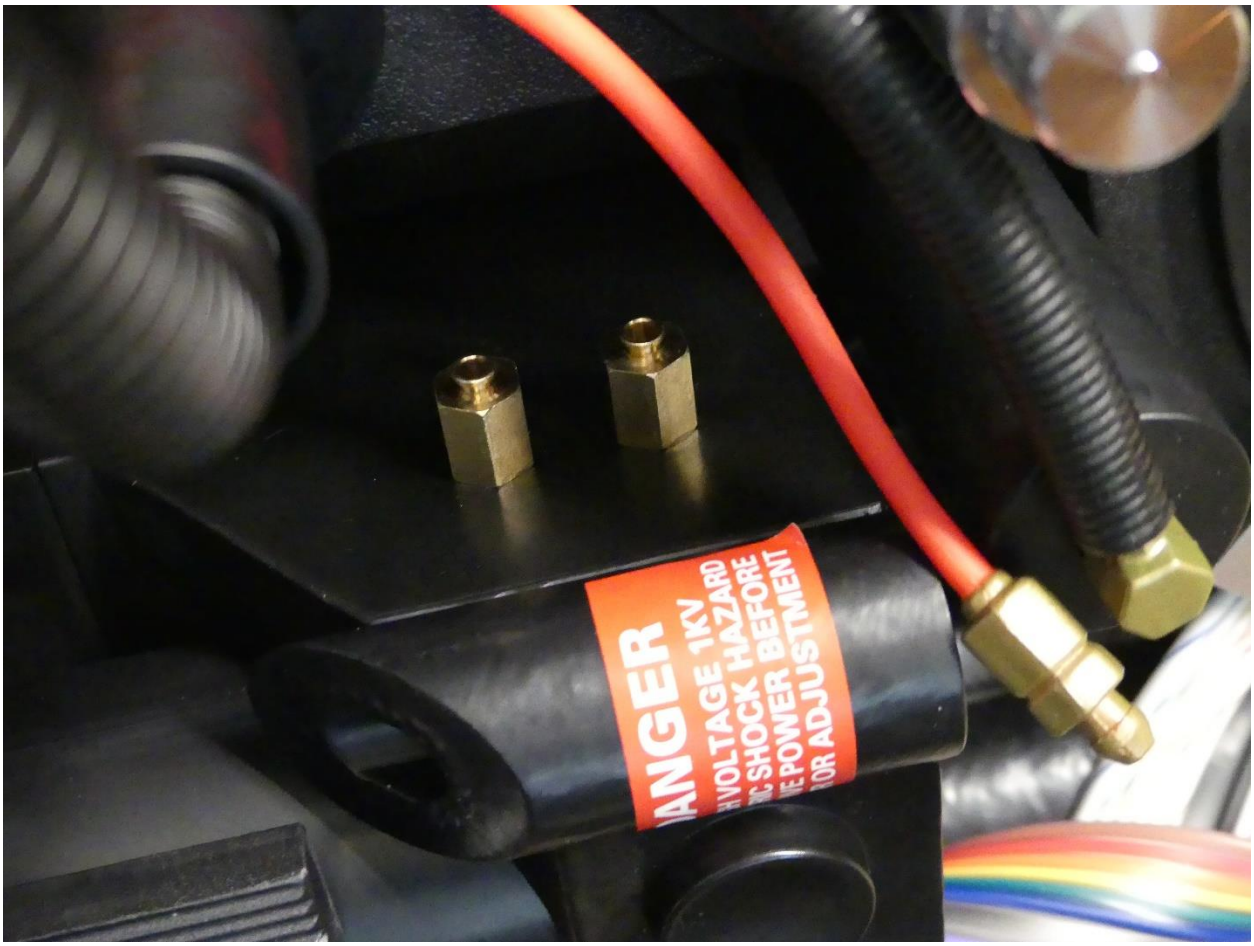


You can see the excess tubing that was cut off in the background.

Replica Straight Connector Installation

These are easy to install and do not even require any grinding or drilling!

First pop out the existing straight connectors to reveal the holes that are larger than needed for the straits. Remove the locknut from the straights and the install the straights one at a time into the holes by placing the lock nut on the back of the straight and tightening the lock nut. I used a crescent wrench to hold the straight in place on the outside of the pack and an open wrench (spanner?) to tighten the 10-24 lock nut that is on the inside of the pack.

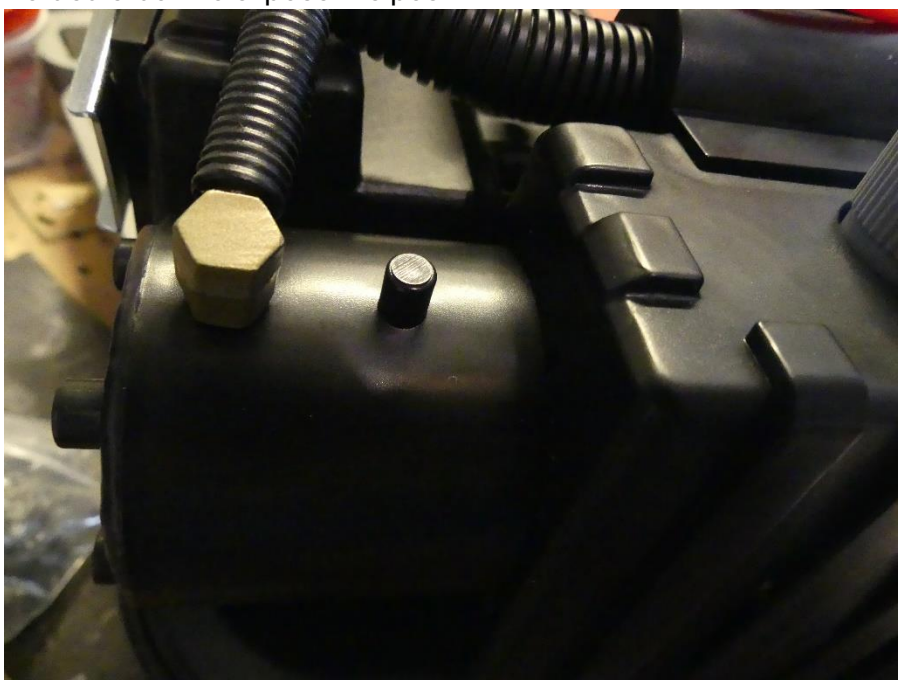


I missed getting a picture of the lock nuts from the inside of the pack, but probably not needed.

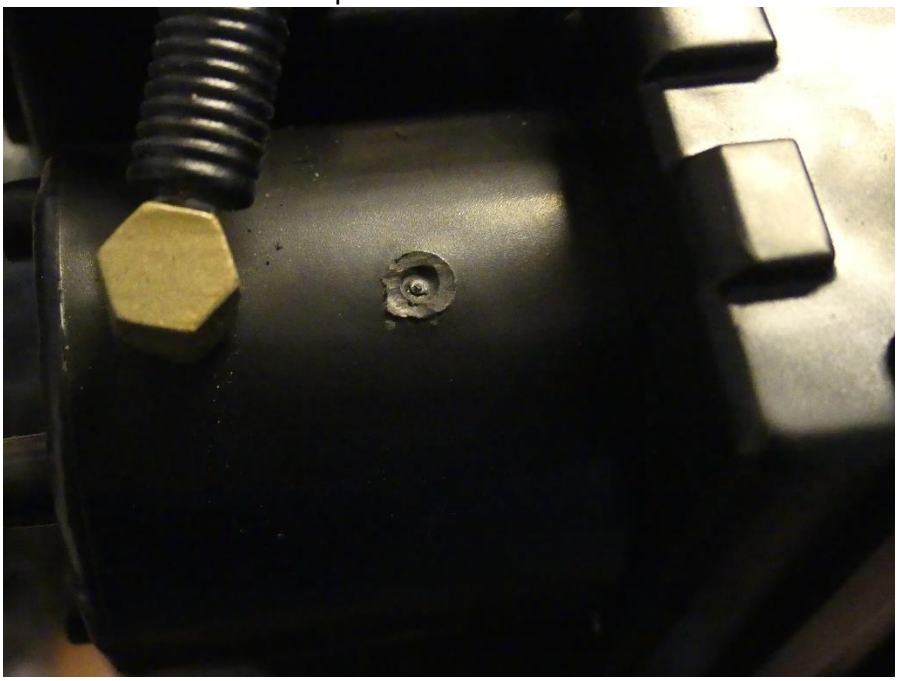
HGA Connector Installation

This will be similar to the ion arm elbow installation: remove the molded elbow, grind down the post, drill a hole and then put the elbow in place and optionally add a lock nut to hold it very securely.

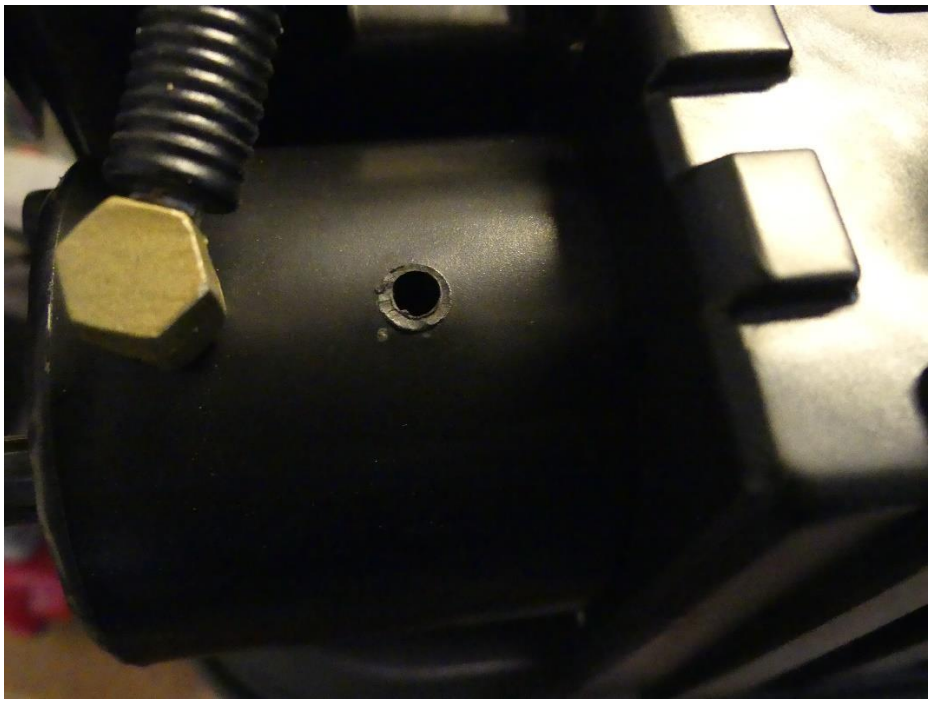
Remove the molded elbow to expose the post:



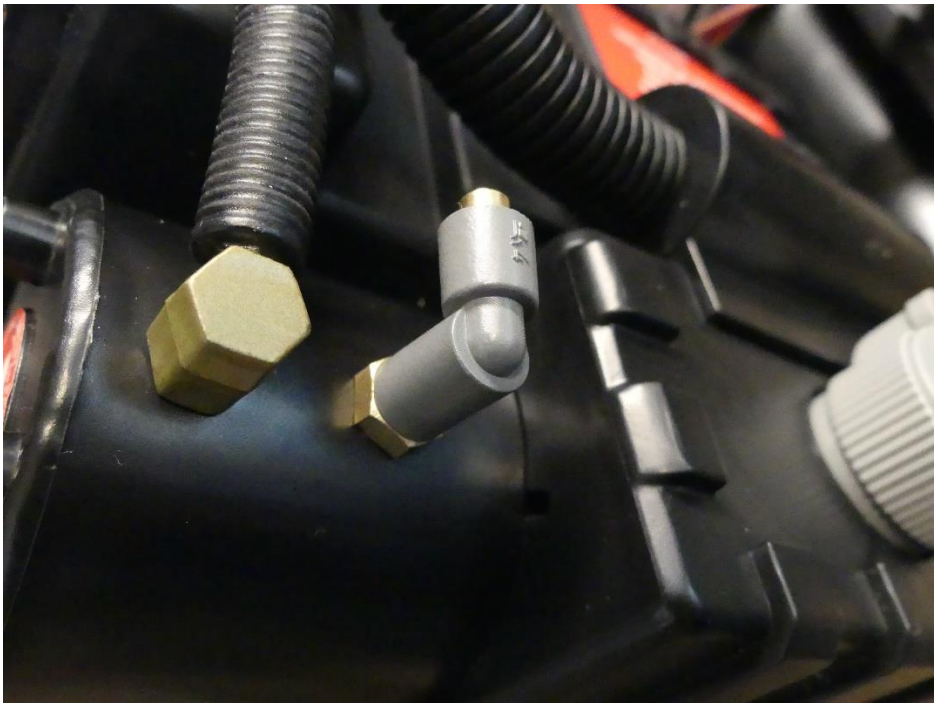
Grind it down and make a mark to help the drill bit find the center:



Then use a 11/64” bit to drill a hole. This hole can be small enough to require threading the replica Legris elbow in place. Which _could_ be more practice for the cyclotron mounting. If you want an easier install here, use a 3/16” bit and the threaded post should drop right in to the hole, but this will require adding the lock nut inside the HGA.



Install the hex nut inside the HGA if needed or you want a more secure attachment



Cyclotron Connector Installation

This one is a bit tricky… The cyclotron lid is two separate pieces glued together, and we do not want to _have_ to separate those two pieces to place a lock nut on the elbow's threaded post!

This means drilling the smaller hole and then threading the elbow into the hole so that the plastic will hold the elbow in place and we do not need to access the end of the threading to place a lock nut on it.

One other thing is we do not want to have the elbow's threaded post rub against or penetrate the inner lid, or it will make it more difficult to separate those two lid pieces for future mods (hint hint).

Like the other elbow installs, we need to pop off the existing molded elbow, grind down the retaining feature and then drill a hole. Just a bit more constraints on the grinding and drilling steps.

Pop of the molded rubber elbow and expose the support structure:



This needs to be ground down, BUT NOT COMPLETELY REMOVED!

If it is completely removed, the replica Legris elbow's threaded post will "interfere" with the inner lid piece, and we do not want that. We want to leave about an 1/16"or so left of the structure and we want it to have a flat surface, not the curved shape of the surface that it is protruding from.

I grind a lot at first and then much smaller amounts of grinding as I get closer to the desired height.

Then using the 11/64" drill bit drill a hole in the center of the now very short structure. DO NOT REAM OUT THE HOLE. We want this to be a tight fit so the coarse 10-24 threading of the replica Legris elbow's post can me firmly attached to the cyclotron housing without requiring a lock nut! DO NOT DRILL TOO DEEPLY! We do not want to drill through the inner plastic lid. This would only be a cosmetic issue, so if you do it is not really that bad – just a hole you may want to patch and paint if it bothers you.

Here is a picture of the shortened structure and the drilled hole. I wanted to see the hole more easily and I am doing other modes so can now easily separate the two cyclotron lids, so I am just showing off here:



I did not install the locknut since I am making sure you don't have to separate the two haves and would not have access to the threaded post to install a locknut.

Then carefully and as straight as possible, screw in the replica Legris elbow:



No need to install the Red Nycoil tubing until the pack is all back together.

Reassemble the Pack

Reattach the ion arm assembly (4 screws) and then the 5th screw to secure the booster tube. Make sure the wires from the switch go inside the pack.
Reattach the other resistor

Plug in the wire from the switch on the ion arm assembly back into the main circuit board.

Re-attach the back panel – align and then carefully press down the back of the pack until it sets against the main pack body. Then I put the screws back in reverse order – I start with getting the tube aligned and screw #17 installed. But order does not really matter… I did that since the one screw with the tube can hold the hole thing together and I can now make a test of the pack to make sure it still powers up – before the other 16 screws are installed!

Reinstall the parts that were removed: "cake", cake nut, cyclotron lid, bumper and shock mount and ion arm end cap with rod.

Install the red Nycoil tubing

Similar to the yellow tubing you added on the ion arm assembly, there is enough red tubing to connect the two straights and the two elbows that you installed.

Start with longer than needed length and then dress the tubing as desired and cut down closer to the needed length. Remember that the tubing will be inserted inside the elbow by about 0.4" in length.

The tubing may not be a tight fit so you may want to have a more secure connection between the tubing and the brass parts. You can wrap a small bit of tape to the tubing end, or some glue for a more permanent connection.
*** Note *** you probably want to be able to remove the tubing from the Cyclotron lid's elbow since the cyclotron is removable, so you may not want to permanently glue that connection!

All done! Now get out there keep on bustin'!