

## Cougar Throttle "Anti-Static Friction" Fix Installation Instructions

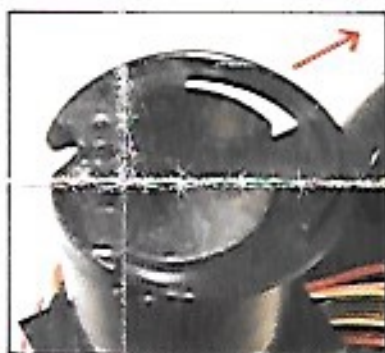
Throttle "Stiction" is a problem for the HOTAS Cougar. My definition of "stiction", or more properly called "**Excess Static Friction**", manifests itself as a sticking of the throttle when you first start to move it. The force required to break this excess static friction makes it impossible to make small throttle adjustments of any accuracy, you almost always over shoot the throttle setting that you want.

Some static friction is good, it keeps the throttle where you want it. However, any friction larger than the **Non-Static Friction** is undesirable and is therefore "**Excess Static Friction**", the cause of the problem. (**Non-Static Friction** = the friction present while the throttle is in motion, **EXCLUDING** the added static friction of the beginning movements of the throttle).

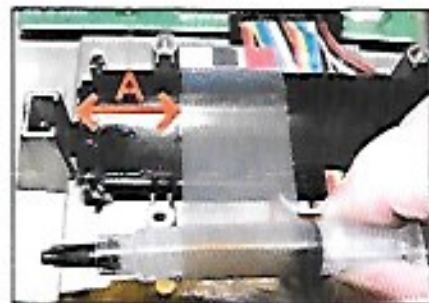
**This fix eliminates 99.5% to 100% of the excess static friction!** Tests show that small, 1% throttle changes, can now be made at **ANY** throttle drag adjustment setting, from minimum to maximum settings on the first try!!!

With increased throttle drag settings all that is felt is the added friction from the drag adjustment without the excess static friction, just as it should be. The throttle now has the smooth feel of a volume control knob on a high end Stereo Receiver. **This is an install and forget fix, no periodic maintenance is required and it has proved itself to be very durable!** **Compatible with Ian's UTM bushings.**

- 1) Take the throttle base apart ( 8 screws). Unplug the ribbon cable and remove the screw holding the yellow grounding wire at the throttle PCB (if you have a grounding wire, earlier Cougars didn't have this GND wire).
- 2) If you have an original throttle pot lift the end of the throttle shaft and pull it out of the end of the throttle shaft. If you have a hall sensor kit, disconnect the small aluminum hall sensor arm from the end of the throttle shaft.
- 3) Take the throttle shaft / handle out of the throttle base. Take the screw out of the "pot" end of the throttle shaft and slide the thrust washer off the throttle shaft, use care that you don't break the thrust washer, see photos below. Rotating the thrust washer slightly while removing or installing it will be of great help.



- 4) Remove the pot end throttle shaft bearing and set it aside. Use **Isopropyl Alcohol** (get it at any Drug Store) to clean all traces of the grease off of the pot end of the throttle shaft and the bearing you just removed. Clean the other bearing nearest the throttle handle to remove the original "red goop". Move the bearing from side to side along the length of the throttle shaft and rotate it on the throttle shaft, then wipe the throttle shaft. Do this several times to clean the bearing and throttle shaft the best that you can.
- 5) **Installing the tape.** Make sure the throttle shaft is clean, dry, and free of grease so the tape will stick properly to the shaft. The tape should be positioned 1 inch (25.4 mm) (A) from the end of the throttle shaft as shown in the picture to the right. The edge of the tape should be installed parallel to the end of the throttle shaft. The tape will wrap around the throttle shaft. You want to start this so the end of the tape is as shown in the photo to the right. **The goal is to have both ends of the tape away from the friction adjustment pad so they DO NOT travel over the friction pad when moving the throttle.**



**Tip:** Leave the tape attached to the syringe & hold the syringe to help keep the tape taught to help eliminate bubbles and wrinkles in the tape when installing it on the throttle shaft.

**Note:** The throttle doesn't need to be installed as shown above to install the tape. Take note of the area that the throttle adjustment friction pad touches on the throttle shaft when in use. Avoid placing the tape ends in this area.

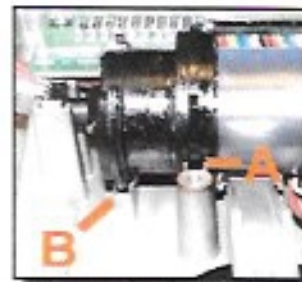
Take your time, make sure there are no air bubbles under the tape or wrinkled or folded over tape, etc. The idea is to put it on smoothly so that the outside edges of the tape meet each other at each end of the tape, **within reason, it doesn't need to match up perfectly.** If you do begin to get air bubbles under the tape or a wrinkle just lift the tape off the throttle shaft a bit and try again.


- 6) After wrapping the tape around the throttle shaft trim the end of the tape where it meets itself so that the tape does not overlap itself. If you have a bit of a gap between the ends of the tape, as shown in the photo to the right, that is OK, as long as the tape ends are not in the area of the throttle shaft that the drag adjustment pad uses.
- 7) Slip the thrust washer off the throttle shaft and put the bearing on the "pot" end of the throttle shaft. Use some of the grease supplied on this bearing and the bearing nearest the throttle handle. Reinstall the thrust washer and screw. Clean the throttle detent pad of the old "red goop" and apply some of the grease supplied with this kit.



**I DO NOT RECOMMEND using any grease on the drag adjustment friction pad. Grease on the drag adjustment friction pad may actually cause "Static Friction". The tape is self-lubricating in theory and in use has shown no need to be greased.**

- 8) Check that your drag adjustment pad and arm is in its proper position in the base, (C) as shown in the picture below in step 9. Put some of the grease included with the kit into the thrust washer pocket (B) as shown in the picture to the right. If you are still using the original pot, install it into the end of the throttle shaft as you install the throttle shaft into the base. Re-install the throttle shaft / handle into the base, locating both throttle bearings so they go into their respective bearing mounts in the base (A). Be sure the thrust washer is in its pocket (B) in the base.



- 9)  Reconnect your throttle handle ribbon cable to the PCB. Please note that two end terminals of the ribbon cable are not used and do not connect to any pins on the PCB as shown in the picture to the left. (D) points to the two unused terminals on the ribbon cable connector. Re-attach your yellow GND wire from the throttle handle and screw to the PCB (E), if your Cougar has a GND wire.

**If your throttle buttons do not work properly after throttle re-assembly the first thing to check is the ribbon cable connection.**

- 10) Install the 8 screws in the throttle base. The 4 outer screws can be tightened up as tight as they will go. Do not tighten up the 4 inner screws yet, they will be part of your basic throttle drag adjustment as described below (these 4 inner screws may apply a clamping force on the throttle bearings and throttle shaft and the friction pad).

I have found that there are large variations in the throttle base and its parts. I have one throttle that has the four inner screws very slightly tightened and another that has the same screws tightened up as tight as you can get them. Both throttles feel the same with respect to the minimum / maximum drag feel.

The four inner screws on the throttle base should be adjusted as follows :

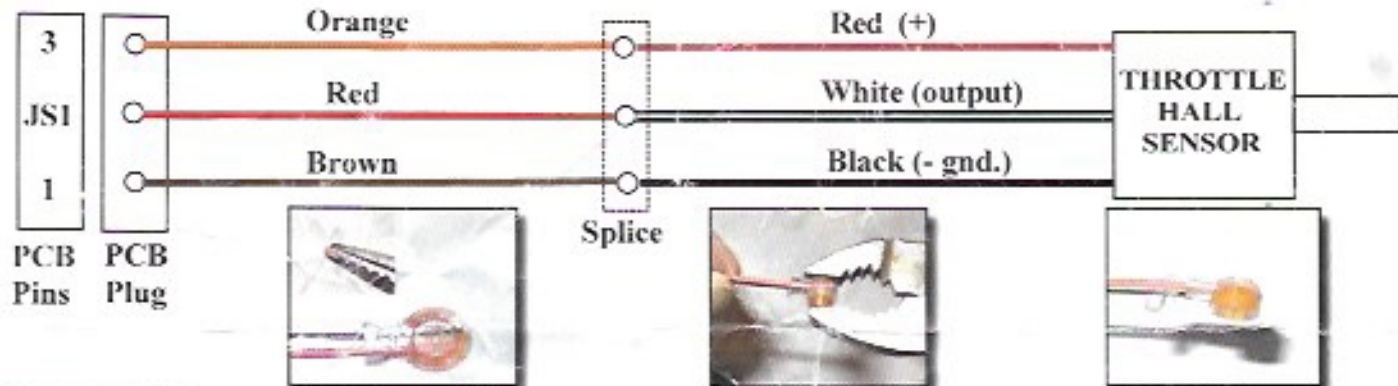
- A) Set your throttle drag adjuster to its minimum setting. Turn the drag adjuster thumb screw fully to the right (counter clockwise) as viewed with the throttle right side up as you would be using it.
- B) NOTE: If you have Ian's UTM throttle bushings installed this adjustment has to be done by shimming the friction pad as described below. Tightening the four inner screws will not work. Tighten the four inner throttle base screws only enough so your throttle handle will not fall by its own weight when pushed slightly forward of center and you let go of it (center = handle is straight up). You will need to keep tweaking the screws until they are just a bit tighter than the setting that allows the handle to fall forward. **This will become your minimum drag adjustment setting.** If you tighten the screws as tight as you can and the throttle still falls at the minimum drag adjustment setting (or you have UTM throttle bushings installed) then you should put a shim(s) between the black throttle friction pad and the metal friction adjustment arm it rests on. You could use tape, writing paper, or aluminum foil to do this as long as your shim is the same thickness all around. A square hole will work for the friction pad locating pin, it doesn't have to be round. **It is important that the friction pad stays parallel with the throttle shaft after shims are installed.** If you tighten the four inner screws too much (or too thick of a shim) you may not have any variable drag adjustment at all because the screws are squeezing too hard on the bearings and / or the drag adjustment pad of the throttle shaft. Avoid this as it defeats the option of having an adjustable throttle drag adjustment.

Enjoy your new, smoooooth, "I wonder where the excess static friction went?". Cougar throttle.



## + HS1™ THROTTLE KIT

### WIRING DIAGRAM IF THE HALL SENSOR HAS RED, WHITE, AND BLACK WIRES



#### Splice Connector Instructions

1. Trim off bare wire back to insulation. Insert wires into Splice Connector. Be sure both wires go fully into connector.
2. Use pliers to push the orange button into the connector. Check that both wires are all the way in first.
3. Squeeze until the orange button is flush with the clear body of the connector. Wipe off excess sealing goop.

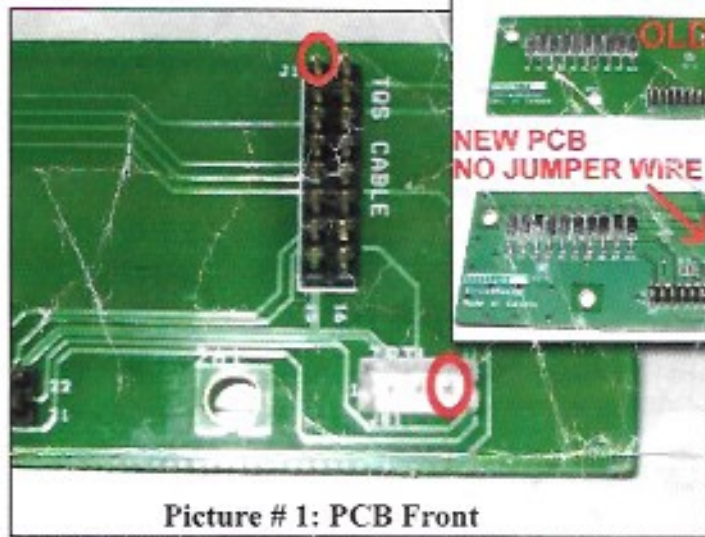
Be sure to go to my Web Page to see the installation instructions before you attempt to install these sensors.

## READ THIS !!!

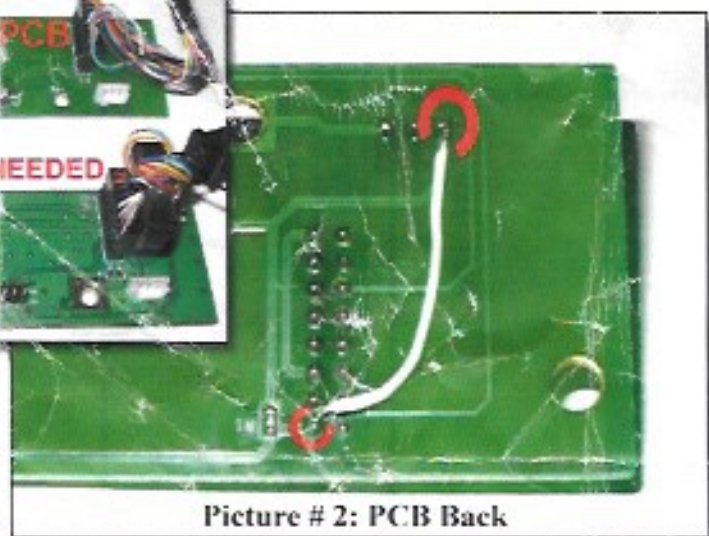
The wiring diagram for any version of the + HS2™ Joystick Kit is NOT the same as this wiring diagram for the + HS1™ Throttle Kit.

If you use this wiring diagram for the Joystick Kit the hall sensors will be damaged.

(over)



Picture # 1: PCB Front



Picture # 2: PCB Back

A jumper wire needs to be soldered to the Throttle PCB between the terminals circled in red in picture # 1. **If you have the new PCB the jumper wire is not required.** Twist the wire strands of the jumper wire together so that no strands stick out. Then “tin” the ends of the jumper wire (apply a small amount of solder to the wire). Heat the wire so the solder flows into the wire strands. Turn the PCB over and solder the jumper wire to the connector solder lugs as shown in picture # 2. When doing this apply heat to the PCB soldered lug connection until the solder melts, then push the end of the jumper wire into the molten solder. Remove the heat and hold the wire still until the solder solidifies. You shouldn't need to add more solder. Be careful when soldering not burn your fingers or create a “solder bridge” to a terminal next to where you are soldering.