



Tiger TPR FFB

Assembly Instructions

Overview

I wanted to create a Force Feedback modification for the ThrustMaster Pendular Rudders that anyone with a 3-D printer could build. There is no soldering required and all parts and hardware are available on Amazon. When completed, if you do not like the result you can easily revert to the original TPR.

The Tiger TPF FFB is inspired by the work of Smitty and Arno and in the style of the Rhino FFB Joystick. With the help of Winger we have created a Bill of Materials for both the US and EU community.

I offer no support for the build, no guarantees in any way, no promises of safety, or in any other way represent this build as meeting any regulatory requirements anywhere in the world. The build and use is at your risk entirely.

Printing Instructions

I used PLA Carbon fiber for key parts because it is very easy to print, strong, and has a good finish. For the PLA CF components I used 4 walls with 75% infill. For the other parts I used standard PLA with 2 walls and 15 % infill. Very few parts required support on my Bambu Labs X1-Carbon printer, but, when necessary, I like Tree support because it is much easier to remove and requires almost no post processing. I suspect that PET-G or ABS would work as well, along with PET-G GF, or ABS-CF, depending on your printer's capabilities.

Below is a list of STL files with associated print materials and quantities required:



Name	Material	Quantity
TPR FFB Mount Plate	PLA-CF	2
TPR FFB Swing Arm	PLA-CF	1
Tension Slider	PLA-CF	1
Tension Insert	PLA-CF	2
Swing Arm Spacer	PLA-CF	2
Motor Spacer	PLA-CF	4
Pulley Spacer	PLA-CF	4
86BLF04 Spacer	PLA	1
USB-Controller Board Bracket	PLA	1
Motor Shaft Drill Guide	PLA	1
Swing Nut Retainer	PLA	1
Main Board Bracket	PLA	1

Once again, other materials and print setting may work just as well. Adjust according to your comfort level and printer capabilities.

Bill of Materials – USA

Hardware

I will not provide links for the standard washers, nuts, and bolts. They are readily available on Amazon, locally, or if you are like me, in your workshop.



Item	Quantity	Link
M3 X6 Self Tapping Screw	4	
M4 X 60 Bolt	1	
M4 Lock Bolt	1	
M5 X 60 Bolt	4	
M5 Flat Washer	8	
M5 Lock Washer	4	
M6 x 60 Bolt	4	
M6 Flat Washer	8	
M6 Nut	4	
M8 X 70 Bolt	1	
M8 Locknut	1	
Skate Bearings 8mmx22mmx7mm	2	

https://www.amazon.com/gp/product/B0B4FKDY3K/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

5M20T Smooth Idler Pulley – 15mm	2
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https://www.amazon.com/5M20T-Smooth-Idler-Pulley-Timing/dp/B07R8GYYJV/ref=sr_1_3?crid=3D506ELUAKAHP&dib=eyJ2ljojMSJ9.sBRQLBXXA6MOL_U7IE3pkOmUobp_r7eQP6u86gFT38UWo2eaYU7-Wu0DkMloX185QdqREkXPSNK5kYf5lfjQa5GOoSVhCOFUbW0QW33SgShKY2fhVPf1_4_b5PcUpmM5qQtNNyu0VvGAmz3CR3O1xSvzE8s7M8p68qb_i6QDDC2fXtE0NuDrxP3sSX_Zpddkqyd5-Z0SaOpuf4fQMoA3WzP7CUt4uTZN8fM3E4wZU.aSeGX-fU0R9WReYFvWddoy3ShjELbtmKsQD8K6AC3c&dib_tag=se&keywords=5m20t+idler+pulley+5mm+bore&qid=1718478409&sprefix=5m20t+idler+pully+5mm+bore%2Caps%2C153&sr=8-3



Timer Belt – Cut to 600mm Length

1

https://www.amazon.com/gp/product/B00ISC68DU/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

5.5 x 2.5 MM 5A DC Power Jack Socket

1

https://www.amazon.com/dp/B07QLZ9VWL/?coliid=I32H4T4LKB3U44&colid=IMBHOZAVFXJ7&ref=list_c_wl_gv_ov_lig_pi_dp&th=1

Adafruit 4115 Zero4U - 4 Port USB Hub

1

https://www.amazon.com/dp/B07PP91HWD/?coliid=I17DWENKYTQZF1&colid=IMBHOZAVFXJ7&psc=1&ref=list_c_wl_gv_ov_lig_pi_dp

USB Panel Mount Jack

1

https://www.amazon.com/gp/product/B0BDWV1BCV/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&th=1

90 Degree USB A to B Cable

1

https://www.amazon.com/gp/product/B0C39TLMQ7/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&th=1

USB A to B Adapter

1

https://www.amazon.com/gp/product/B01LWVRQQI/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

Mini USB to USB A Adapter

https://www.amazon.com/dp/B0C9LLHWVK/ref=ppx_yo2ov_dt_b_product_detail_s&th=1



Power Supply

1

https://www.amazon.com/dp/B0CQ81CFV1?psc=1&ref=ppx_yo2ov_dt_b_product_details

You have a choice of motors. Always ask for a motor that has firmware that assigns it to the X axis, as this is the default rudder axis. You may have to drop a note to them to insure this. They are available at: <https://vpforcecontrols.com>

Choice 1 – A less expensive option with a weaker motor, but one that has been used without complaint so far:

DIY FFB kit: 57BLF03 x1 + USB

With this motor use this Timing 5M 12 teeth timing pulley with an 8mm bore:

https://www.amazon.com/gp/product/B07RR7K2TG/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&th=1

Choice 2 – A slightly more expensive option with a motor that is certainly strong enough for the application:

DIY FFB kit: 86BLF04 x1 + USB

With this motor use this 5M 15 Teeth timing pulley with a ½ inch bore:

5M 15 Teeth Timing Pulley

1

https://www.amazon.com/gp/product/B09TCZ59TX/ref=ppx_yo_dt_b_asin_title_00_s00?ie=UTF8&psc=1



Assembly Instructions

1. Remove both ball links from the swing arm and retain the hardware.



2. Remove the rounded cover. Be careful to support the remaining structure after removal as it will tend to bend easily. Retain all hardware.

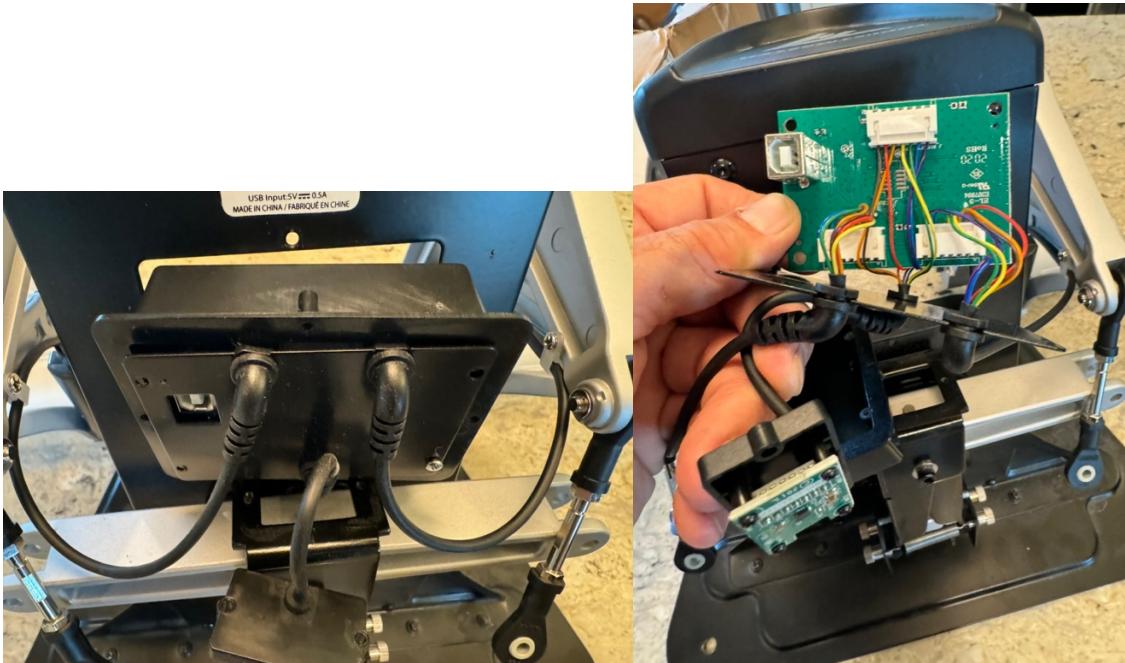




3. Remove the hall sensor that is just above the swing arm. Retain the screws.



4. Remove the electronics bay, remove the main board from the bay, and retain the screws.



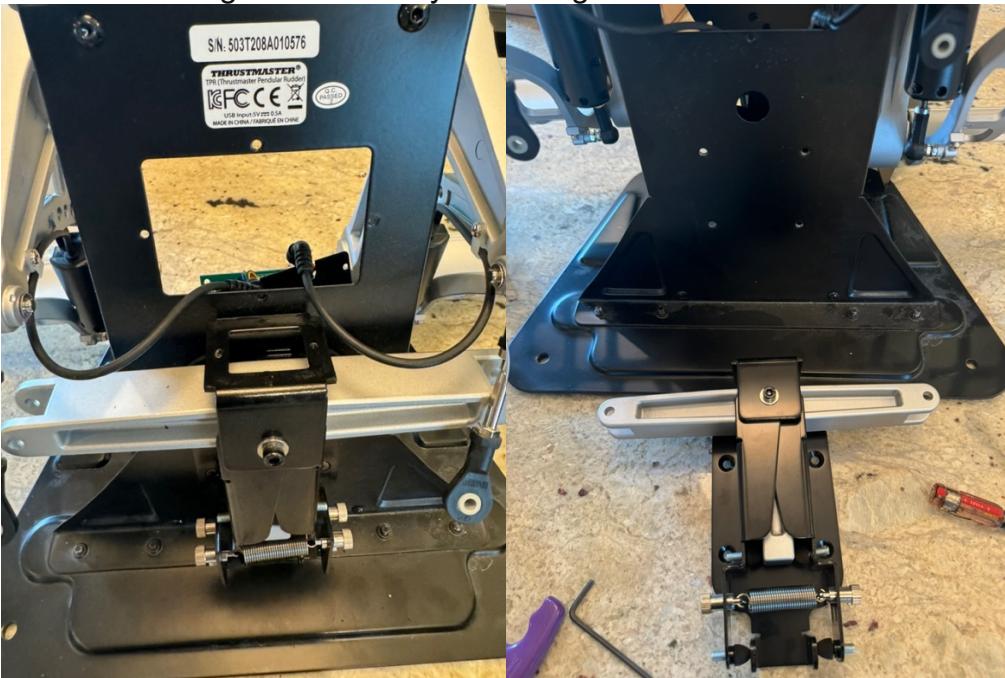


5. Unplug the hall sensor and retain it separately for storage. Mark the two remaining plugs and jacks with separate colors and unplug them. Retain main board.



6. Remove the entire swing arm assembly. Retain the screws for use in the mod.

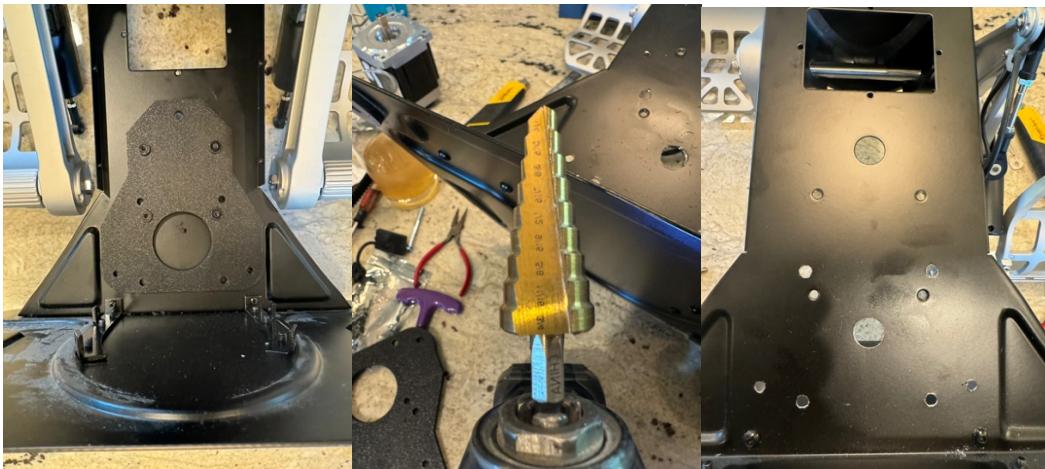
Retain the swing arm assembly for storage





7. Using the four screws from the swing arm assembly, attach one of the TPR FFB Mount Plates to the back of the TPR. Insert the Motor Shaft Drill Guide into the large hole. This will serve as a template for marking your drill holes. Note that there are 4-6mm holes that will mount the motor, 2-5 mm holes for the pulley shafts, and a final 5 mm hole that will serve as the center guide for the motor shaft hole. Be certain to use the correct drill for the hole of regard. Carefully using your drill make a small divot in the back plate for each hole. DO NOT attempt to drill through. The divot will serve as your drill guide. After making the divots, remove the TPR FFB Mount Plate. Being careful to drill the correct diameter holes, drill through the 4-6 mm motor mount holes, the two 5 mm pulley shaft holes and the center motor shaft hole. Then widen the motor shaft hole to $\frac{3}{4}$ of an inch with a sheet metal step bit.

(https://www.amazon.com/Step-Drill-Bit-Set-Titanium/dp/B08Y96Z669/ref=sr_1_9?dib=eyJ2ljoMSJ9.rIDd59csIRMsep12fT2pPThHkz7ubn40eZEV2L_vDKVJyuPgeQnT0Gj8Ngc-cCAmnKKNr6bfl_KcSnNfFzf9GNTyflhfJmEp7XmfDSoM2t59JRtCFD_q_ofA5Zkw2UA7Y4ls_s1-PHMhLL4PlsHNdhhnNfkyZlhfRKN0vnrb1UUGWh_tWfC8DiKs_aDFNXFXgrcmYfei_5Xu6q_by-nxa0JFrJW4b0xPcS0qRHfN24.ZbZdp00m0vMhrKxT8PIX3Xz1ZXsZYo7jxlDtFlhdtsk&dib_tag=se&keywords=sheet+metal+step+bit&qid=1718483176&sr=8-9)





8. Attach the USB Hub to the bottom of the USB-Controller Board Bracket using 4 of the retained screws from the electronics bay removal. Place two of the screws from the removal of the swing arm assembly in their respective holes in the USB-Controller Board Bracket. Trapping them there, attach the Controller board using for M3 X 6 flat head self-tapping screws.

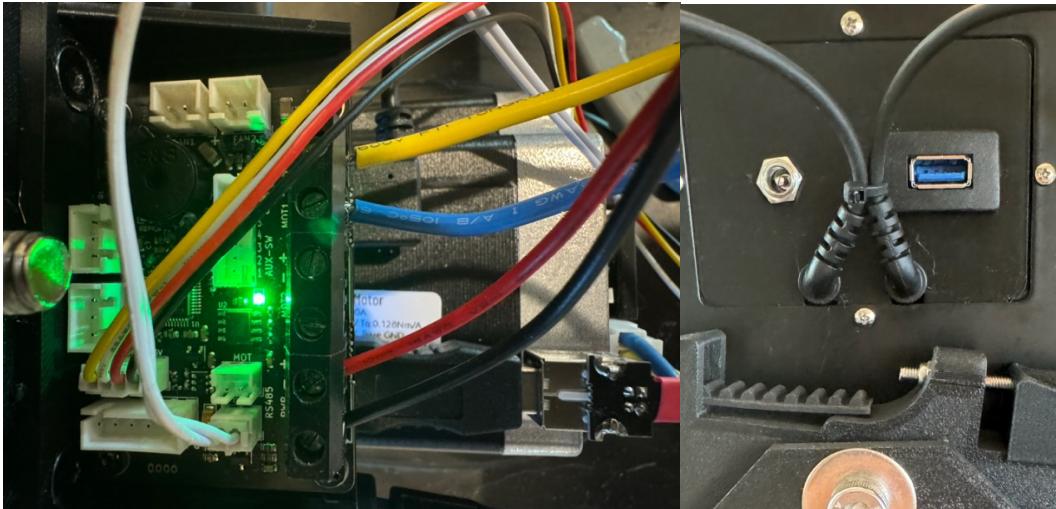


9. Place one of the TPR FFB Mount Plates on the inside wall of the TPR with the chamfered holes down. Align the USB-Controller Board Bracket with the two original upper threaded TPR holes. Using the two retained screws from the swing arm assembly attach the USB-Controller Board Bracket through the TPR FFB Mount Plate to the TPR Back plate.





10. Trapping the two brake sensor cords in their respective slots, attach the Main Board Bracket using four of the retained screws from the electronics bay removal. Attach the plugs into their selected sockets being sure to match the colors. From the back insert the USB Panel Mount Jack cable, pull it though, and secure the USB Panel Mount Jack. Insert 5.5 x 2.5 MM 5A DC Power Jack Socket in its associated hole and secure it with the supplied nut. Then secure the Rudder brake cables with a cable tie as pictured.



11. Insert 4 M X 60 Bolts through their washers and through the motor mount holes in the second TPR FFB Mount Plate. Then slip the motor spacers over each bolt.

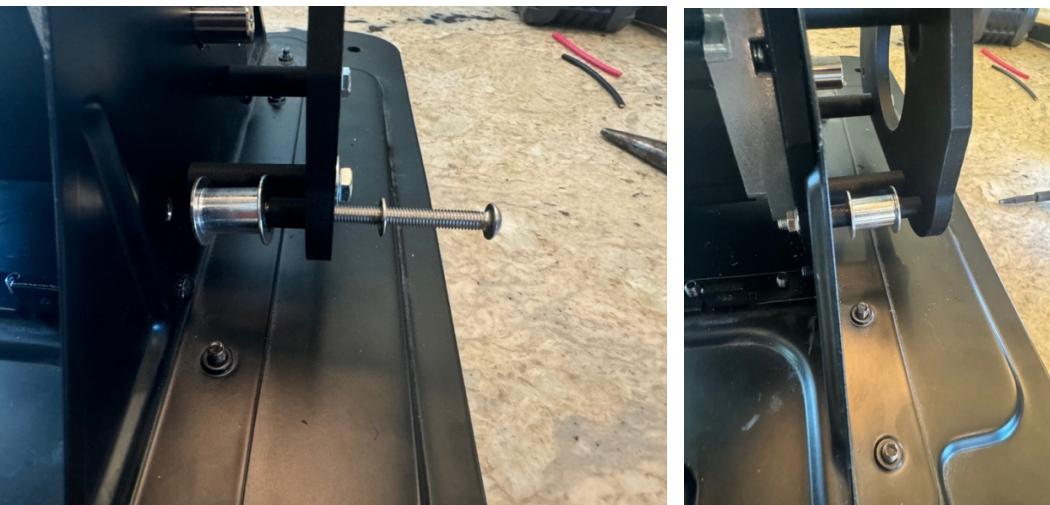




12. Slip the four M6 bolts through their holes from the outside of the TPR Backplate through both the backplate and the TPR FFB Mount Plate. Place the 86BLF04 Spacer over the bolt ends. Attach the motor with the four bolts, insuring the electronic jacks are facing up.



13. Place 2-M5 flat washers over 2- M5 X 60 bolts. Slip the bolts through the pulley holes in the TPR FFB Mount Plate trapping a pulley spacer, a Smooth Idler Pulley, and another spacer before inserting through the TPR Backplate and the TPR FFB Mounting Plate. Secure with a washer, lock-washer, and nut or alternatively a washer and locknut. Do not over tighten. Adjust just tight enough to secure the pulley. Overtightening will bind the pulley.

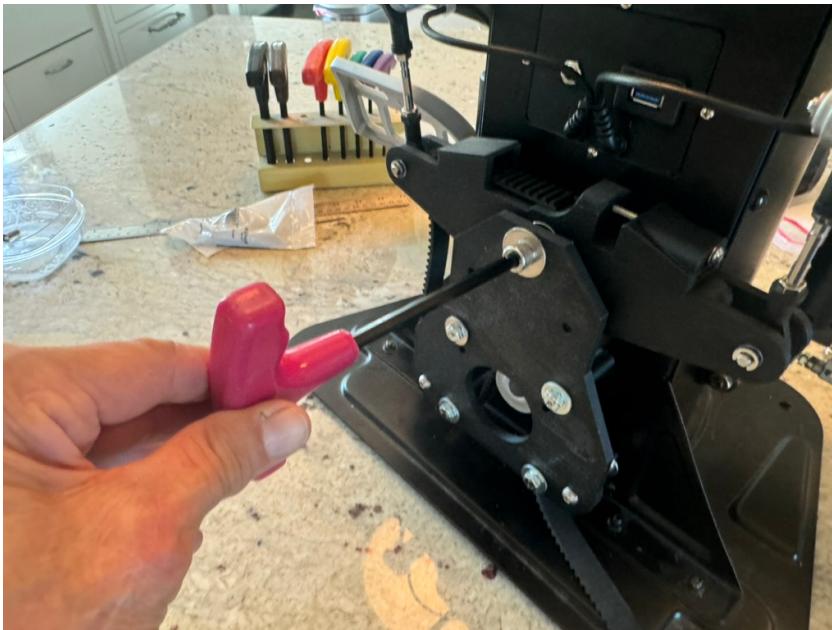




14. Insert the Skate Bearings into the TPR FFB Swing Arm. A rubber mallet or gentle use of hammer may be necessary.

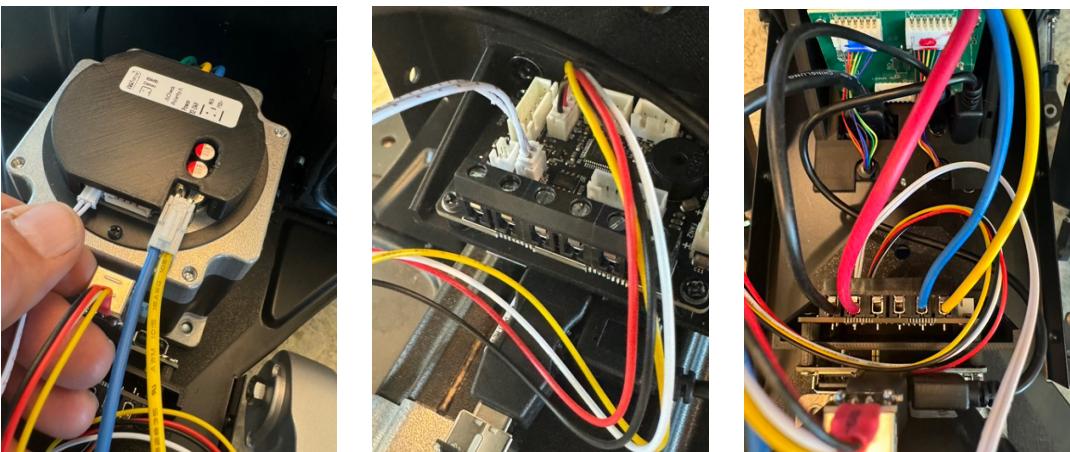


15. Insert the M8 Locknut into the Swing Nut Retainer. Slip a washer over the M8 x 70 bolt. Slip it through the TPR FFB Mount Plate hole, trap a Swing Arm Spacer, the Swing Arm, another Swing Arm Spacer through both the TPR backplate and the TPR FFB Mount Plate. Place the retainer and thread the M8 locknut, insuring the retainer is properly seated. DO NOT OVERTIGHTEN. Adjust the tension such that the swing arm does not wobble, but the bearings do not bind. This can be repeated after full assembly as required. Re-attach the ball links after inserting their bushings into the swing arm. Hand drilling the ball link rod holes in the Swing Arm can help if the bushings are too tight.

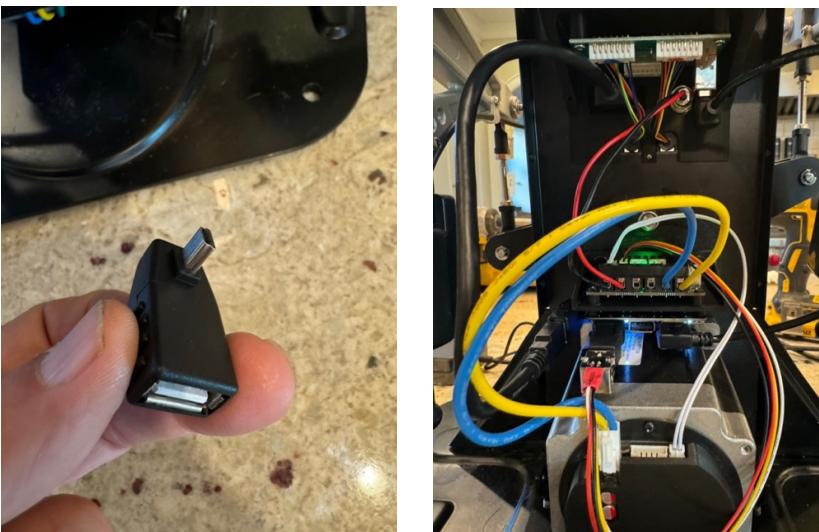




16. Time to wire up! Please connect the wires per the images below.



17. Plug in the USB's and their adapters. Note the Mini USB jack on the side of the USB Hub. Plug the USB cable from the USB Panel Mount Jack into the Mini USB to USB A adapter and then plug the adapter into the jack on the side of the hub. Plug the USB A to USB B Adapter into the USB B Jack from the controller board. Then Plug the adapter into the middle jack on the front of the USB Hub. (In the picture below, it is in the left most hub jack, but could interfere with the blue and yellow cables.) Finally, connect the 90 Degree USB A to B Cable from the TPR Main Board to the Hub. After testing you may want to add silicone glue to the joints.





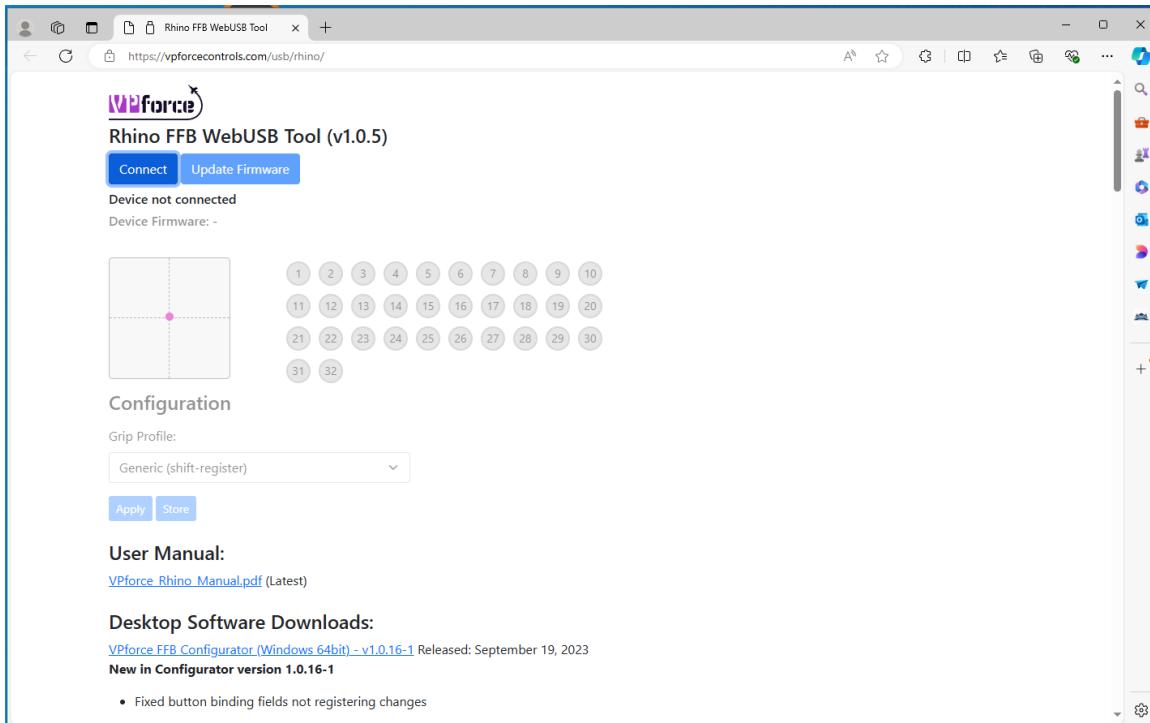
18. Secure the appropriate Timing Pulley with Teeth on the motor shaft. Note that the socket set screws should just cover the end of the shaft. DO NOT ATTACH THE BELT YET.



19. If you have the actual Rhino FFB Joystick, temporarily disconnect it to avoid confusion. Connect the USB Cable from the Tiger TPR FFB to your computer. Connect the power supply to the Tiger TPR FFB and then to the wall outlet. You should hear some beeps during this process.



20. Navigate your browser to <https://vpforcecontrols.com/usb/rhino>. Press the connect button, select the VPforce Rhino FFB, and connect it.

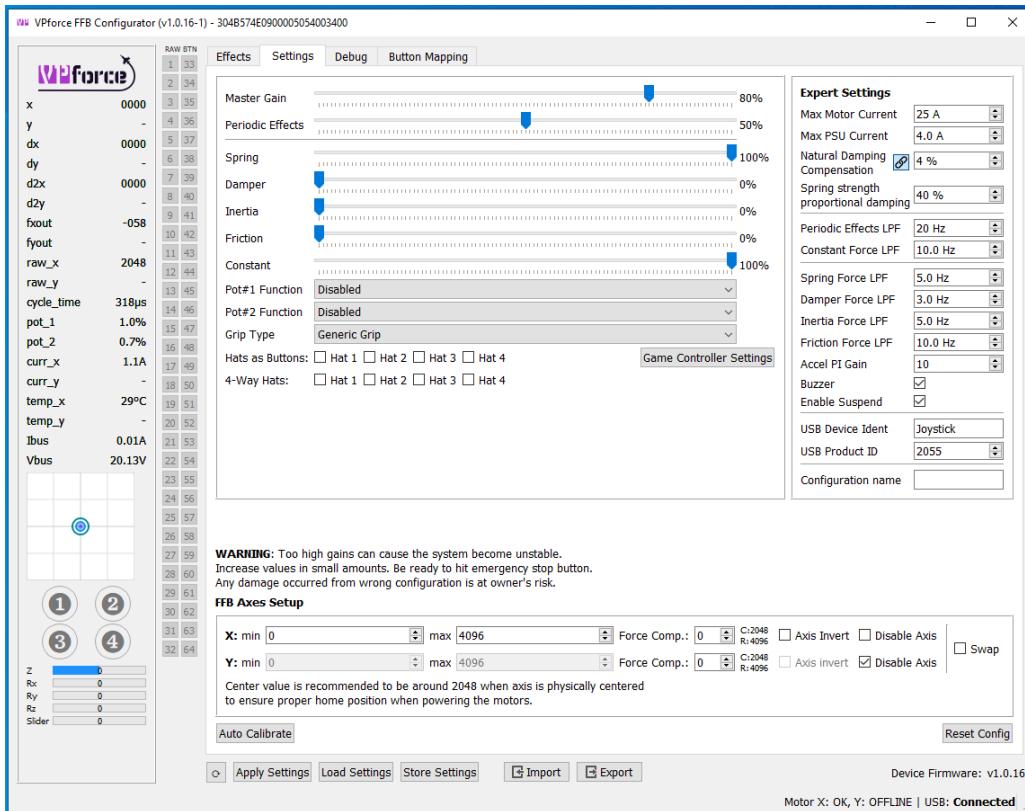


21. Download the VPforce Rhino Manual. Download the VPforce FFB Configurator App, unzip it, and run VPforce_FFB_Configurator.exe. You will get a warning from Windows, run it anyway. The first thing you should do is to note the serial number at the top right of the screen. Write down the last 5 digits. If you are also using a Rhino FFB Joystick in addition to the rudders you will need these later.



22. Look at the lower right of the screen and select the Disable Axis on the Y Axis.

To start, just set the Master Gain slider to 90, the Periodic Effects to 50, and the Spring to 100. (You will fine tune this later.). Press “Apply Settings” and then press “Store Settings.” After this you should see raw x data start to display on the left hand window of the screen. (If not now is the time to troubleshoot, check wiring, etc.). At the top go to the “Effects” tab. In the top left box, check “Spring.” In the strength box, temporarily set it to 75%. Press “Apply Settings” and then press “Store settings.”



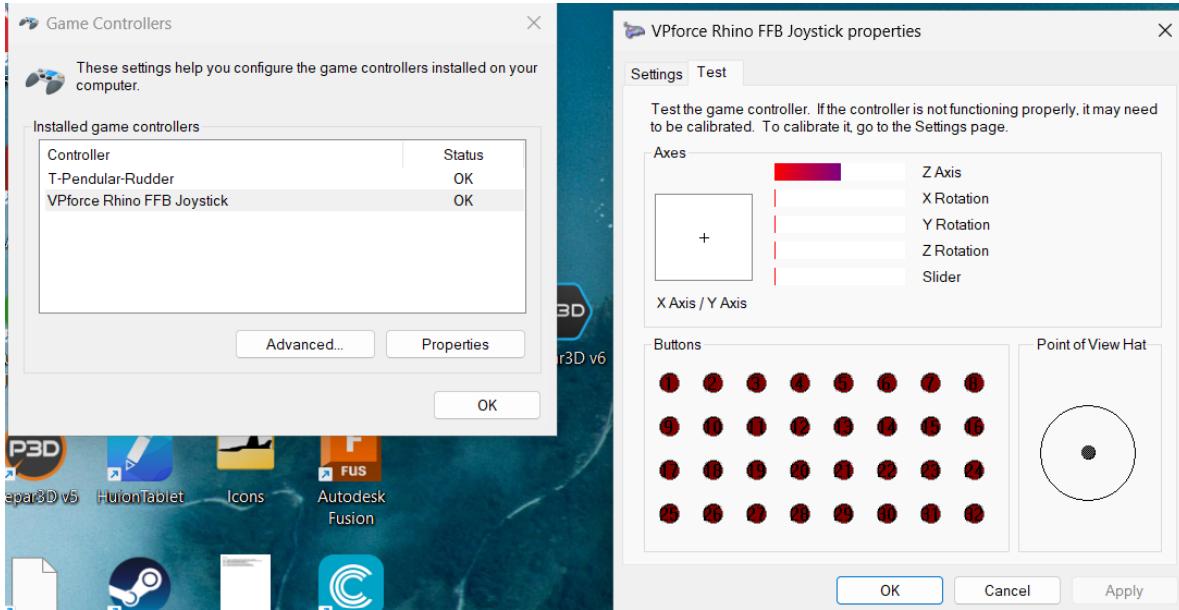


23. Check to see that the X axis circles are centered in the left side box. Unplug the Tiger. Rotate the Timing Pulley a full turn, it will click with resistance. Plug the Tiger back in. The Timing Pulley should rotate back to center. Then take a felt tip pen and mark the 6 o'clock position on the motor shaft and the Timing Pulley.

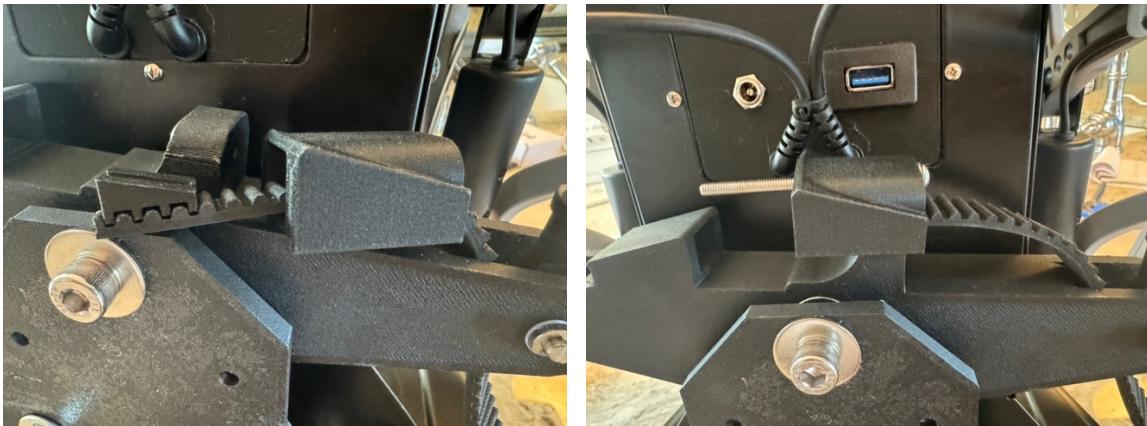




24. As a quick check, search for and run the USB Game Controllers App that is part of Windows. If things are connected properly you should see the VPForce Rhino FFB Joystick in the Game Controller App. If you see two of them, you likely have another FFB device connected. Again, unplug it to avoid confusion.

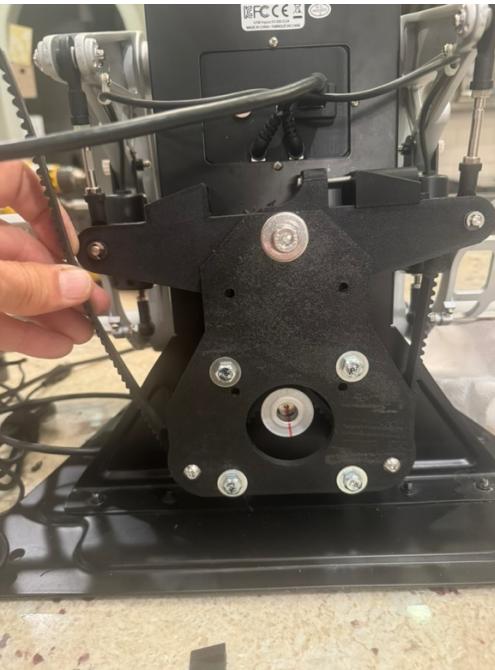


25. Unplug the Tiger TPR FFB. Insert the belt, teeth up, into the Tension Slider. Place the Tension Insert at the end of the belt, engaging the teeth of both. Then, using the belt, firmly pull the Tension Insert into the Tension Slider. Pull the Tension Slider close to the slot in the swing arm. Do not connect yet.





26. Loop the belt down through the swing arm, around the Smooth Idler Pulley, and over the Timing Gear. Making sure the mark is at the 6 o'clock position, adjust the belt so that the arm is horizontal or slight down on the right side as you are viewing it. Then slip the belt around the other Smooth Idler Pulley, up through the Swing Arm and through the slot of the Tension Insert housing. A pair of long nose pliers helps as pictured. Using the pliers to hold the belt tight against the swing arm, place the Tension Insert on the belt as far in as possible. Then using a small screwdriver push it deeply into the slot and engage the teeth.





27. Place the M4 X 60 washer and bolt through the Tension Slider. Place the M4 Locking nut in the retainer hole in the swing arm. Insert the bolt into the corresponding hole in the swing arm, engage the lock nut, and tighten such that the belt is tight, the teeth in the timing pulley are engaged, but the swing arm still moves well. Because the motor is not yet connected to power it will be a jerky movement.



28. If you are only using the Tiger Pedals without the Rhino FFB Joystick you can reconnect the Tiger TPR FFB, power up, and re-open the VPforce Configurator. Press the auto-calibrate button in the lower left side and follow directions.
29. Navigate your browser to <https://vpforcecontrols.com/TelemFFB> . Download, unzip, and run the VPforce-TelemFFB application. Follow the supplied instructions for use with your applications.
30. Telem FFB, which you will be using to communicate between the Application (DCS, MSFS, etc.) and the output to the rudders can only work with one device at a time. If you are only running the Tiger Pedals, simply follow the documentation supplied with the software.
31. If you already have a Rhino FFB Joystick, and you want to add the Tiger Pedals to the system, you will need to do a few more steps. First, make sure the devices are connected. Then run the VPforce Configurator software. You will be prompted to choose between two instances of The Rhino FFB Joystick. In fact, one of these is your joystick and the other is the Tiger Pedals. They will have two different serial numbers. Select the serial number that you noted before.
32. Now refer to section 4.2.9 of the VPforce Rhino manual. You will note that you need to assign a new VID:PID address to the Tiger rudders. In the Configurator software be sure the settings tab is selected at the top of the page. Note the



Expert Settings column on the right-hand side. Near the bottom you will see the USB Product ID, which should read 2055. Change it to another number, I used 2054. Now press “Apply Settings” and then press “Store settings.”

33. Open the Telem FFB Software. Continue following the directions in Section 4.2.9. Note that you should first select Enable Auto-Launch, and make sure the Joystick box is selected. Then check the Auto-Launch box next to Pedals.
34. Shut down, and restart Telm FFB. You will now see two of Telem FFB instances running: One for the joystick and one for the rudders. Set up Telem FFB according to your preferences as outlined in the manual.
35. Check on Discord or Forums for your application for advice on settings and configuration values. Then you can tune them to your liking.
36. Before opening any applications like DCS, be sure to make a copy of your input device settings and save it. I found that I had to reconfigure the Rhino FFB after adding the new ID for the Tiger Pedals. If you have a backup this is easy to do.

Enjoy Your Build!

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