VPforce RHINO FFB

User Manual

Version 0.6 (WIP)

2024-03-31

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1. Welcome

Whether you just opened a box of Rhinos, are waiting for yours to arrive or just want to know more about the beast, you have come to the right place. This manual is intended to provide you with all the relevant information on what the Rhino is, what it is capable of and how you can get the most out of one.

First of all, the Rhino is huge. When it comes to sheer size and weight, most other stick bases aren't even close. The dimensions are available in this manual, so that you can prepare beforehand - and it is highly recommended that you do so. The shape is simple enough so that you can even build a cardboard model to assist in figuring out a suitable mounting for your setup. Also note that due to the long distance from the gimbals to the stick mounting point, the Rhino basically comes with a built-in extension and at a maximum of 22 degrees each way, the stick throw is significant out of the box.

Mounting is not critical just because of the weight of the Rhino, but also its strength. At a maximum of 9 Nm of Torque the Rhino can provide about 3+kg of pull with typical stick setups. Compared to most springs & cams -controllers, this is about the maximum they can do with the heaviest springs, but they really only give you that much resistance at the very edges of avia-style cams, whereas the Rhino can be more linear. In practice, the Rhino is probably the strongest controller you have used, even if it's not exactly in a class of its own.

Another key characteristic of the Rhino is its flexibility. Whereas with many other controllers adjusting the basic qualities such as the amount of resistance or the shape it comes in can make your fingers bleed, with the Rhino you can simply adjust a few sliders in the software. You can also mount pretty much any grip you wish to use - Thrustmaster and Virpil directly, VKB and Winwing with an adapter.

All the flexibility comes with a price, however. The Rhino does anti-cogging, natural damping compensation and a number of other forms of black magic to make the operation smooth and seamless. On simpler, closed systems such as the venerable Microsoft Force Feedback 2, everything is optimized for the one, simple configuration

they come with, ensuring smooth operation straight out of the box. When you can mount for example either a Virpil MongoosT-50 grip or an extended Warthog with five times the weight and maybe twice the height, there is no one size fits all -settings to ensure perfect operation for both. Although the Rhino should be fine with default settings, some amount of adjustments will be required to get the most out of any specific setup. No need to worry about it, though, that's exactly what this manual and the accompanying video guides are for.

With a tool as powerful as the Rhino, the results of less than optimal settings or a misbehaving game can be somewhat spectacular, which is why the system comes with a big red button that makes everything instantly safe again. One more reason to pay attention to the mounting arrangement, make sure you have easy access to all the controls. Despite its strength, encounters with an angry Rhino usually don't end up with lethal consequences and sometimes even catastrophic injuries can be avoided. Mostly the Rhino just wants to slap your fingers a bit or play a friendly little game of WF[1], so no need to worry too much.

Last but not least, different games and simulators offer a whole new level of complexity. Some, such as Il-2 Great Battles and DCS support DirectInput FFB right out of the box, others (MSFS, XP) need external software. There is also an ongoing telemetry project for richer FFB in DCS. Luckily and as usual, this manual contains a lot of the info you need to get well on your way with at least the most popular simulators out there - and towards what for many of you out there will be a paradigm shift in controlling virtual planes, spaceships or whatever floats your boat.

[1] https://www.youtube.com/shorts/2XXK-gT5Sko

2. Getting Started

Force feedback in general is a somewhat complicated topic, largely thanks to all the possibilities the technology provides. Getting the most out of your VPforce Rhino will require some setup and adjustment, but thankfully you can eat Rhinos just like you eat elephants: one bite at a time.

This section of the manual includes all the relevant information to get the Rhino running in a basic configuration, both the physical configuration and the very basics of the software. Once you are done with this section you should have a functional game controller you can start using right away, while you dive deeper into the technology in the following sections.

2.1. Technical Specifications

Weight: 5.2 kg

Size: 205mm x 180mm base,
height to the top of the grip connector 290mm

Motors:

- Two type 57BLF03 NEMA servo motors
- Max 30A drive current per motor
- Resolution: 12 bit / Rev, 11bit effective stick resolution

Typical power: 150W

Maximum torque: 9 Nm

Gimbal: 3D Printed PETG / Aluminum / Bearings

Transmission: 1:6.2 ratio belt drive

Maximum throw: 22 degrees each direction

Built-in functions: 1 bindable rotary axis (defaults to spring force strength)
1 emergency button that cuts off all power to the motors

Cooling: Two fans kick in when the motors reach 50°C

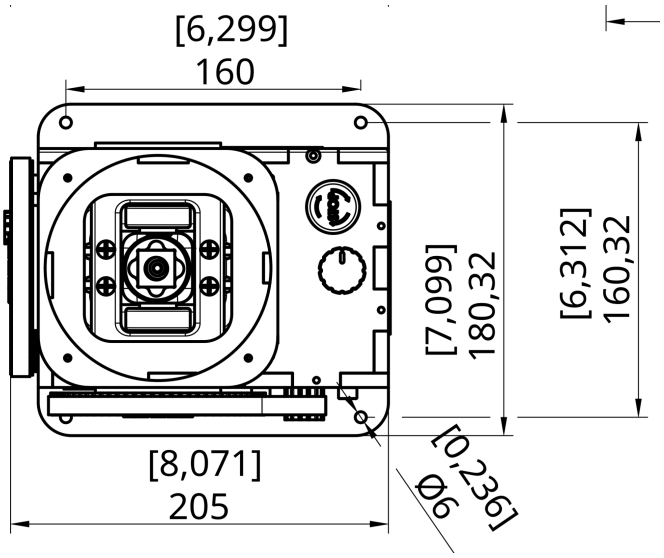
Power source: 180W, 20V

Grip Compatibility:

- Thrustmaster directly
- Virpil directly (T-50CM2, WarBRD, Constellation Alpha, V.F.X)
- VKB with an adapter and a black box
- WinWing with an adapter

2.2. Physical Setup

The VPforce Rhino can be attached to any suitably durable and rigid mounting with four 6mm bolts (see schematic).



Due to the weight and strength of the hardware, the mounting structure needs to be designed accordingly. Also note that the gear and belt drives are on the outside of the base structure and it is important to make sure that they do not make any contact with other parts of the mounting system or the person in the pilot's seat.

Attach the power cable and the included USB cable to the Rhino base and then connect them to the power socket and computer respectively.

The big red button is an important safety feature, make sure that you have unrestricted access to it at all times. To facilitate this you can rotate the Rhino and reverse the axis in software (see 2.4 for details).

To cut off all power to the motors, simply push down on the big red button until it locks.

To reset, rotate clockwise and let the button pop up.

The rotating knob can be used to control different features of the Rhino (see software sections for details), by default it controls the spring force.

The Rhino supports Thrustmaster (Cougar, Warthog, F/A-18C) and Virpil grips directly.

Note that rotating Thrustmaster grips requires the use of an extension. For VKB and Winwing see below.

2.2.1. The VKB Adapter

The VKB Adapter allows for the mounting of any socket rev. B - style VKB grips. In addition to the Adapter, you will need a VKB main controller (black box) to operate VKB grips with the Rhino. Note that the adapter has an external cable that attaches to the black box (see picture).

To connect the adapter to your VKB grip, push the connector into the grip until it makes contact and secure with the little screw thing - basically exactly as with a normal VKB base.

Important: if the connector is tight and doesn't want to go in easily, DO NOT apply force to the rotating lower part. This can pinch and mangle the wire coming out of the adapter. Sitting on the adapter is also highly not recommended.

There is no electrical connection between the adapter and the Rhino, so you can simply place the adapter on the Rhino connector, rotate the grip freely into a suitably ergonomic position and screw the adapter's lower part in until the connection is secure enough to hold the grip without rotating under stress. Re-tighten if necessary.

Note: The black box will blink a red light, because it doesn't see any axis (only the grip connects to the black box). This is normal and will not hamper the operation of the device.

To use a VKB grip's buttons for force trim or other functions in the Rhino software, you need to use the included RhinoLoopback app. See details in the relevant section.

2.2.2. The WinWing Adapter

The WinWing adapter adapts the WinWing grips to the Rhino interface both mechanically and electrically. Tested and correctly working correctly with the WinWing F-16EX and F-18 grips.

It converts the proprietary WinWing protocol to a TM standard 5-pin interface and also passes analog axis data such as brake lever and thumbsticks. It should be compatible with TM/Virpil bases, but without the analog axis functionality and possibly limited to 24 buttons.

In some rare cases a WinWing grip will not report analog axis data, in that case a calibration of the grip analog functions needs to be performed via WinWing software on a WinWing base.

To use the full grip functionality on the Rhino base the “WinWing adapter” grip type needs to be selected in the drop down menu.

On newer revisions of the WinWing adapter firmware, button number 32 will illuminate if the Grip connection with the WinWing grip is not functioning/disconnected.

2.2.3. The RHINO Throw Limiter Adapters

The RHINO has a significant amount of throw - 22 degrees - and a long shaft compared to most comparable controllers. The long throw does help with accuracy, but especially with extensions the wide movement range can become excessive. It is possible to set limiters in software, but depending on how much force you are using in general, the software limiter may not feel strong enough. The physical throw limiter adapters offer a simple to install alternative solution that sets hard physical limits to the stick’s movement.

The adapters come in two pieces - front and back. They can be ordered in different configurations and may have different movement ranges in different directions. To install the adapter plates,

1) Unscrew the four Torx T5 screws that connect the dust cover at the base of the stick shaft to the RHINO base and lift the cover slightly - you don’t need to remove it completely. With the cover out of the way, you should now be able to

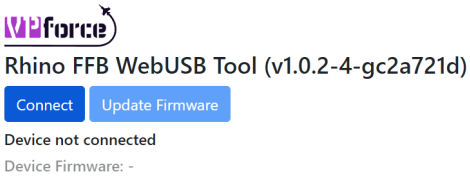
see the opening the stick shaft goes through and the top of the gimbal assembly inside the base.

2) Insert the two limiter plates in the stick shaft opening. **Text side is up** and **FWD is forwards**. When installed correctly, the plates should fit snugly in the opening and stay firmly in place.
3) Place the dust cover plate on top of the limiter plates so that the screw holes align and reattach the screws so that they hold the whole shebang in place. There is no need to go full gorilla on the screws, but do note that they are now holding in place not just the dust cover, but also the limiters that make physical and sometimes somewhat forcible contact with the stick shaft.
4) Recalibrate the controller for the new throw ranges.

2.3. Initial Connection and Updating the Firmware

As you connect the Rhino to the computer for the first time, it should give you a popup with a link to the VPforce WebUSB tool website. If it doesn't or you miss the popup, the site is https://vpforcecontrols.com/usb/rhino/

Clicking "Connect" on the website to gain access to Firmware update and some basic configuration utilities. Click "Connect", choose the correct stick (for most it's the only Rhino on the list) and "Connect".



If the system detects that a newer firmware is available, it will offer you the choice of updating it - unsurprisingly known as "Update Firmware".

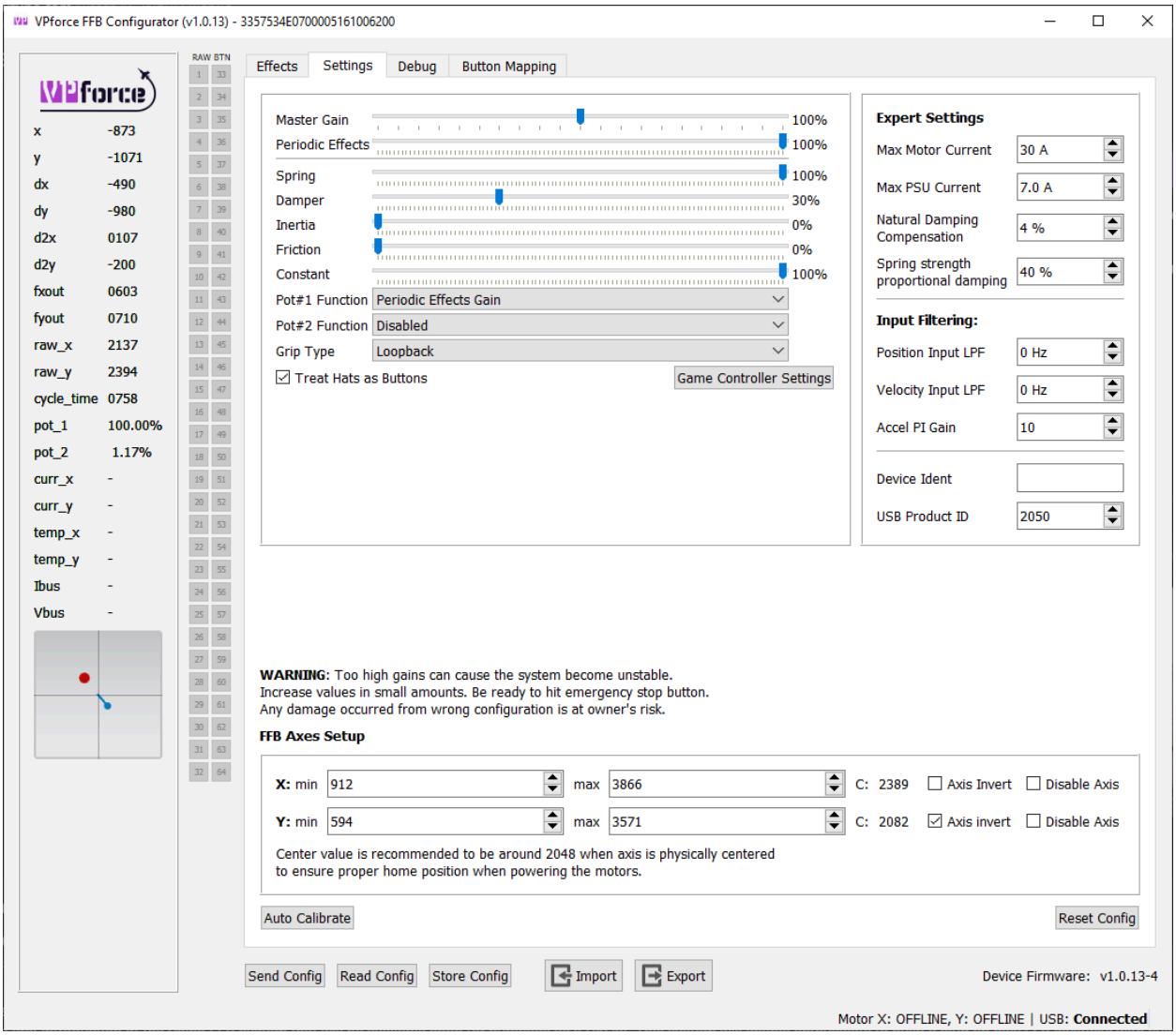
On the same website you can also download the Rhino Desktop Software package.

Note: You must be running a chromium based browser in order for the WebUSB functionality to work (Google Chrome, Brave, Microsoft Edge, Opera, etc..). Firefox does not support WebUSB

2.4. Installing the Software and Basic Operation

First go to the https://vpforcecontrols.com/usb/rhino/ website and download the software package. The latest one is recommended, although older ones are also available. The software comes in a simple zip package, unpack it to a location of your choice. To start the configuration software, double click “VPforce_FFB_Configurator.exe” located in the folder you just created.

You should now be greeted by something that looks a bit like this:



You should be able to see raw_x, raw_y values react to the stick position and also curr_x, curr_y along with some other values. If you don’t (like the picture above), check

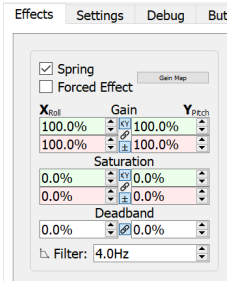
that the power supply and USB cable are connected and the big red button is not pushed in (rotate clockwise and let it pop up if it is). More troubleshooting help is available in the relevant sections.

The first thing you need to do is to calibrate the sensors. Click “Auto Calibrate” in the Settings tab and move the stick to all the extremes. Next turn off “Auto Calibrate” and click “Send Config” below. If you want to save the calibration more permanently, click “Store Config”.

- **Send Config** makes the current configuration active, but does not store it to the device, so it gets lost during restarts.
- **Store Config** stores the configuration permanently to the device’s flash memory.
- **Read Config** reads the configuration stored in the device and adjusts the software setting accordingly.

Tip: If the maximum movement range feels excessive, see “Endstops” in the main software section.

Once the calibration is complete, you are almost ready to go and understanding just a couple of the settings should get you on your way. First of all, “Master Gain” in the “Settings” tab is basically your main power setting. Set it to 100% to find out what the RHINO is capable of or use more modest settings to suit your specific setup. “Periodic effects” (below Master Gain) are basically stall shake, gun fire and other effects produced by equivalent events in games.



If you want to get a feel for the controller right away, go to the “Effects”-tab and make sure “Spring” is selected and gains are at 100%. Also make sure that the “Spring” slider in the “Settings”-tab is not in the zero position. Due to how force feedback works, the stick will be basically limp unless there is input from a game or other software. The “Spring” option in the FFB Configurator will provide basic centering so that you can get a feel for the RHINO and play with the other settings. Choosing “Forced Effect” is not recommended at this point, because it will keep the

Configurator spring force always active and prevent other software (like your favorite simulator) from taking over properly when it needs to.

For more details see the main sections on the configurator software and game specific settings, but you should now be ready to start your adventures in learning the way of the force feedback.

3. Using the RHINO

The VPforce RHINO is a powerful tool and power usually comes with an inevitable degree of complexity. RHINO is not an exception and combined with the plethora of existing force feedback implementations in different simulators as well as the 3rd party software required for some of them - not to dismiss the enhanced DCS exports project by VPforce itself - the situation can be quite complicated, indeed. Fortunately the amount of complexity is perfectly manageable with a little bit of help and this document is specifically designed to provide that help.

First of all, the RHINO should work pretty well right out of the box. Of course it's tempting to immediately dive into all the options that can make the RHINO experience just a little bit better, but my advice is to actually try your favorite sim and get some actual stick time before tinkering with every setting. Especially if you aren't used to Force Feedback - like many probably aren't nowadays - the experience will help understand what all the adjustments actually do. It will also help to have some fun in between settings diving sessions so that you don't drown in the ocean of options.

This document provides instructions for the main FFB Configurator software, the RHINO Loopback app, basics of *TelemFFB* - which is intended to provide more advanced FFB effects for DCS World - as well as instructions on how to best utilize force feedback and the RHINO in different simulators. Also included is a basic description of what force feedback is, how it works and what is the functionality behind the terminology.

3.1. Overview and Force Feedback Terminology

3.1.1. FFB Overview

Force Feedback (Control loading) is a technology used to provide users with a more realistic and immersive experience in virtual environments. It involves the application of physical resistance to input devices, such as joysticks, pedals, or steering wheels, to simulate the feeling of controlling a real-world device.

Force Feedback can be used to simulate the resistance of mechanical systems, such as the control surfaces of an aircraft, the suspension of a car, or the movements of a robot arm.

By providing users with tactile feedback that corresponds to their actions in a virtual environment, Force Feedback enhances the realism and engagement of their interactions, making it easier to learn and practice complex tasks.

Force Feedback can be combined with other technologies, such as motion tracking, to create a more convincing and effective virtual experience for users in a wide range of applications, from aviation and automotive training to entertainment and gaming.

3.1.2. FFB Effect types

Periodic Effects: These effects generate a repeating waveform, which is modulated in amplitude, frequency, or phase. The waveform can be sinusoidal, triangular, or square, and the modulation parameters determine the specific sensations felt by the user. Periodic effects are used to simulate sensations such as vibrations, oscillations, and pulses.

Spring: This effect provides a linear restoring force that is proportional to the displacement of the input device. The spring constant determines the strength of the force, and the effect can be used to simulate the feeling of a mechanical spring, such as the resistance felt when pushing down on a button or pulling on a joystick.

Damper: This effect provides a damping force that is proportional to the velocity of the input device. The damping coefficient determines the strength of the force, and the effect can be used to simulate the feeling of a viscous fluid.

Inertia: This effect provides an inertial force that is proportional to the acceleration of the input device. The mass parameter determines the strength of the force, and the effect can be used to simulate the feeling of a heavy object moving or the sensation of acceleration.

Friction: This effect provides a static or dynamic frictional force that is proportional to the displacement or velocity of the input device. The friction coefficient determines the strength of the force, and the effect can be used to simulate the feeling of different surfaces, such as a slippery road or a sticky track.

Constant: This effect generates a constant force in any direction. But it can also be modulated, i.e. updated by software dynamically thus achieving any desirable effect from host software.

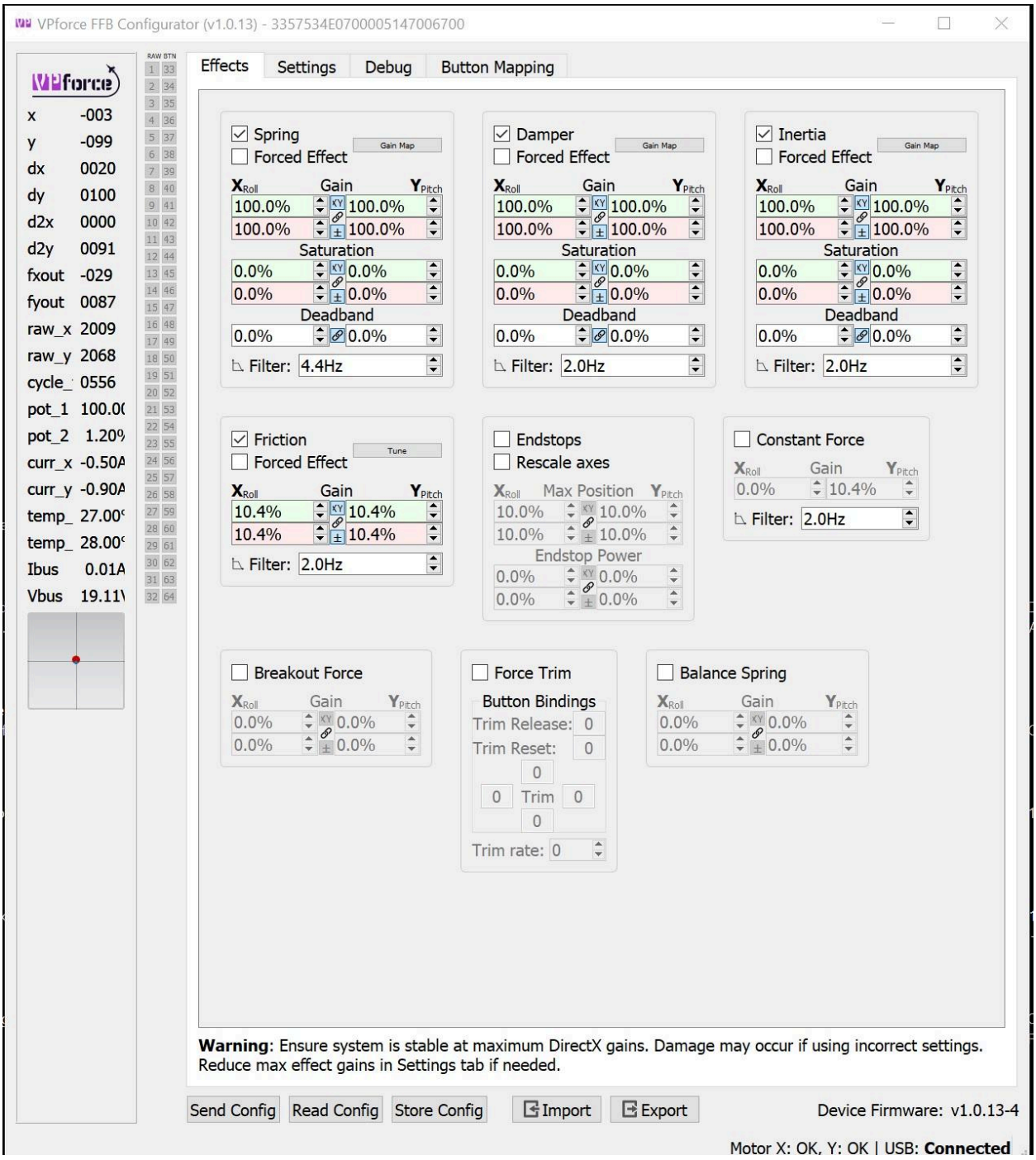
3.2. The FFB Configurator Software

VP Configurator

The left pane is a list of variables affecting the behavior of the Rhino. It is a real time display of the values sent from the joystick.

The right pane consists of 4 tabs where the behavior of the joystick can be modified.

3.2.1. Effects tab



If a checkbox is checked, then that function is active.

Functions definitions:

Spring effect

a force is generated by the motors in the control unit that feels like spring which return the joystick to center.

Forced effect:

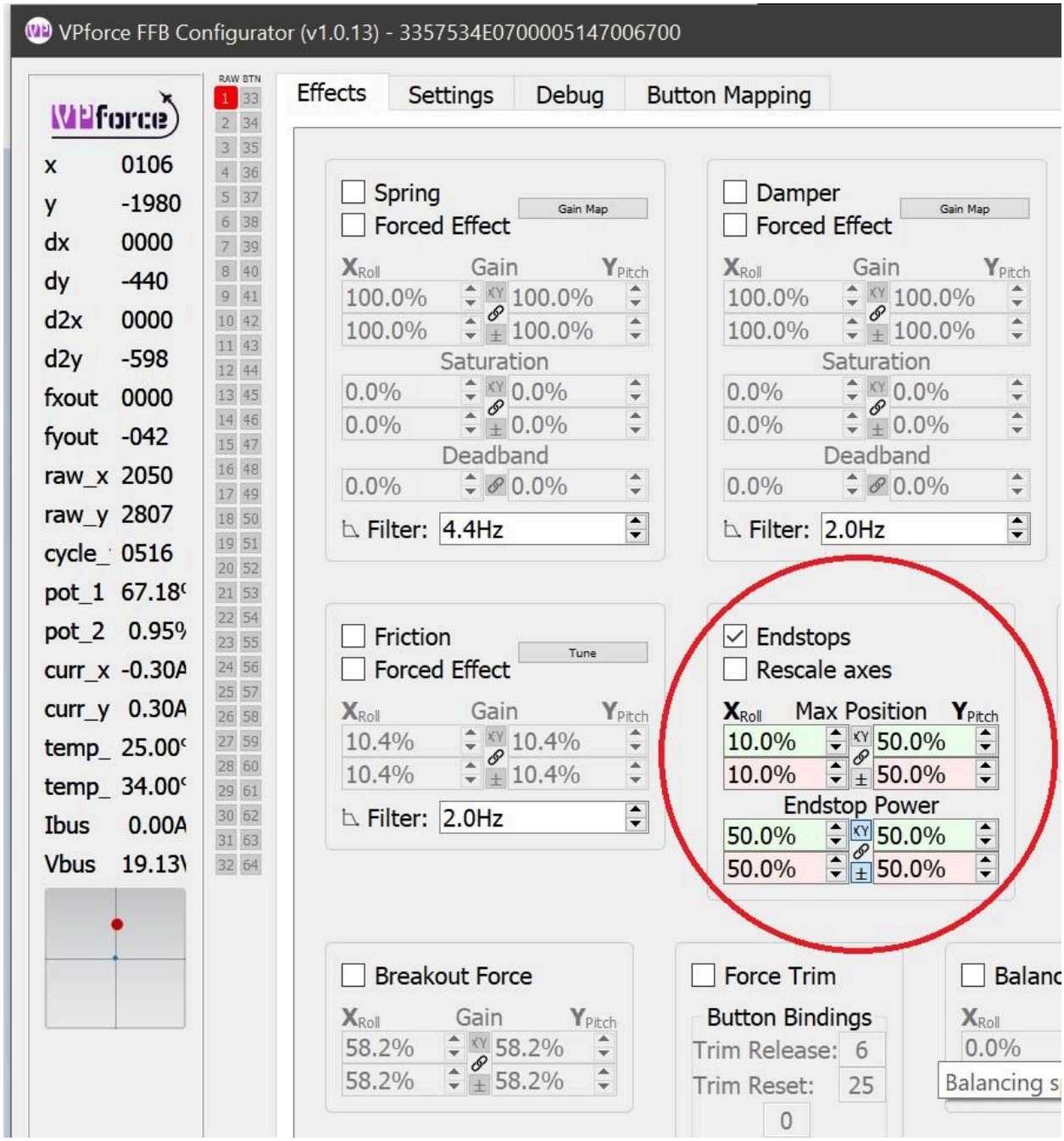
Gain:

Saturation: the percent of the maximum force

Deadband: the region near the center where no force is active

Filter:

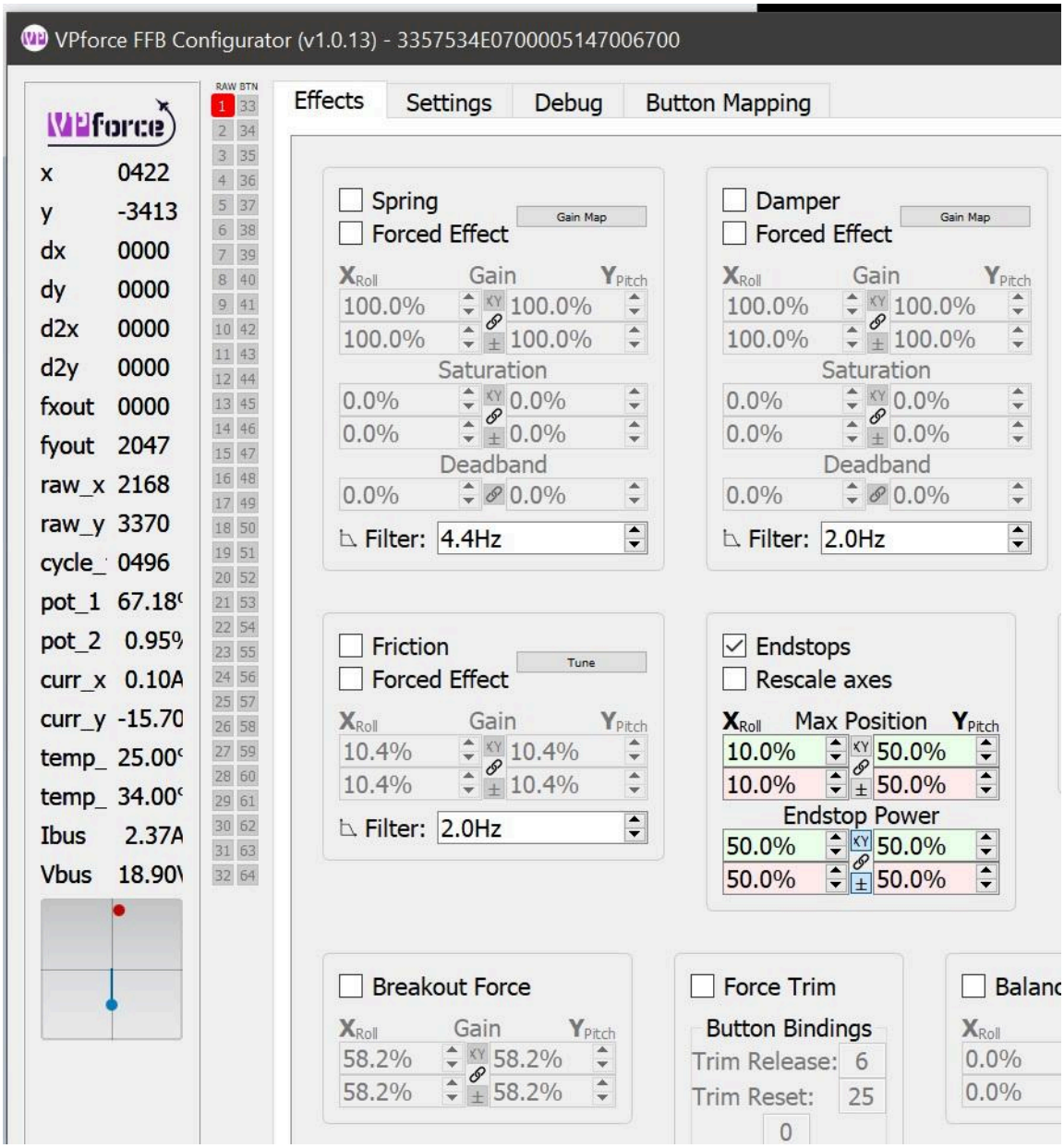
- **Damper effect**
  A force is generated by the motors in the control unit that feels like the joystick is moved through a viscous fluid. The resistance increases the faster the joystick is moved.
- **Inertia effect**
  A force is generated by the motors in the control unit that feels like the joystick has momentum and tends to continue moving in the direction it was moved.
- **Friction effect**
  A force is generated by the motors in the control unit that feels like the joystick is moved through a fixed resistance.
- **Endstops**
  A force is generated by the motors in the control unit when the stick reaches a certain point. These parameters are set in the green and red colored boxes in the region of the page titled ‘End Stops’.



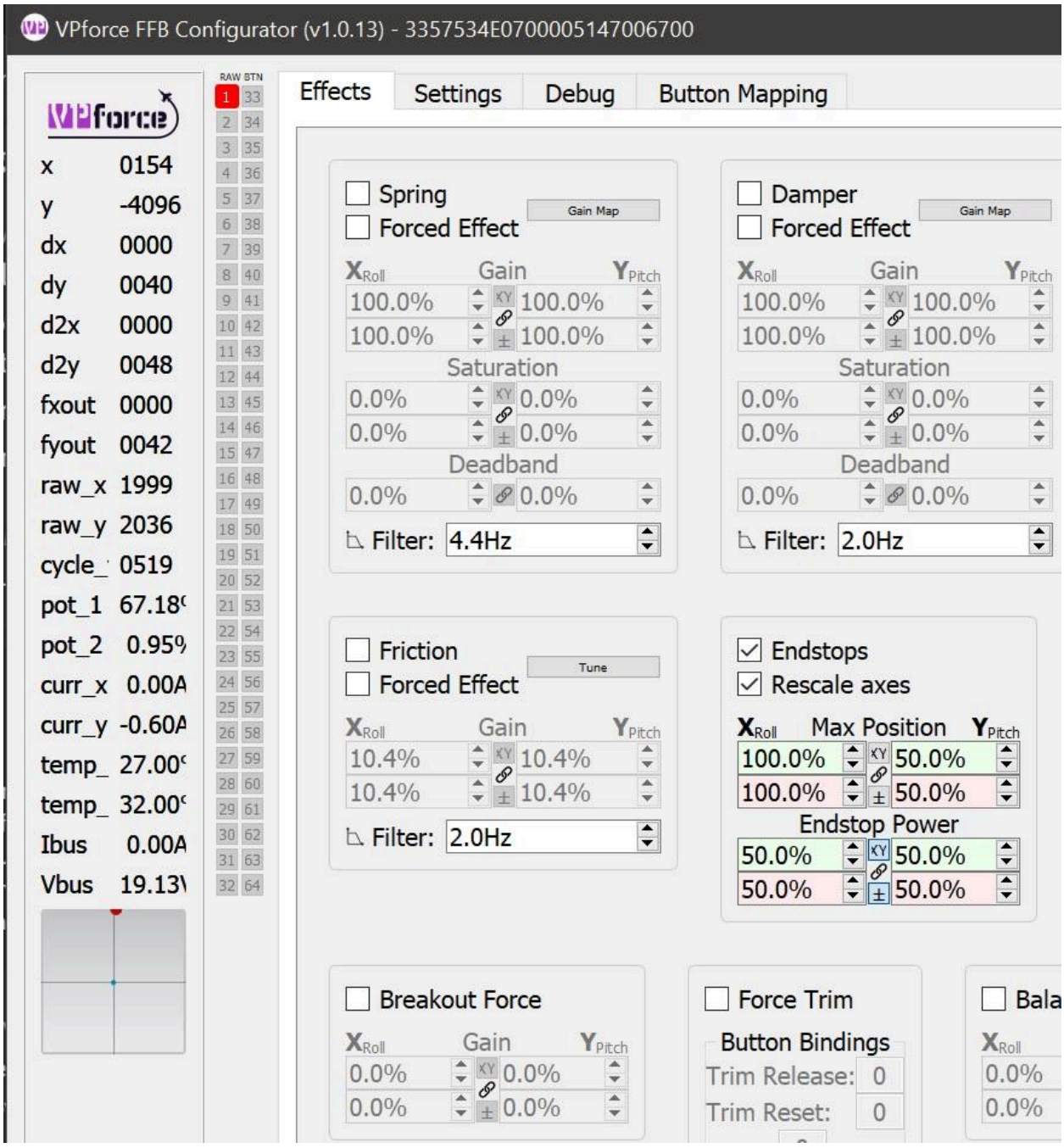
In the picture above, endstops have been set at 50% Y travel in both directions with 50% maximal force to be generated at each endstop. Each direction is contained in a different colored box.

For Y, green is the direction of pushing the stick away from you. Red is the direction of pulling the stick toward you. This configuration results in the stick moving freely fore and aft about halfway in each direction without resistance. It is entirely limp.

However, at the halfway excursion, stiff resistance is encountered. If you look at the little graph in the bottom left of the picture, you'll see the red dot is halfway forward and the blue dot is still at center. The red dot indicates stick displacement. The blue dot is the vector of the force applied by the motors. If the stick is pushed further through the resistance, the red dot is seen to advance to the limit and the motors are pushing against you with half of their maximal force. This is depicted below.



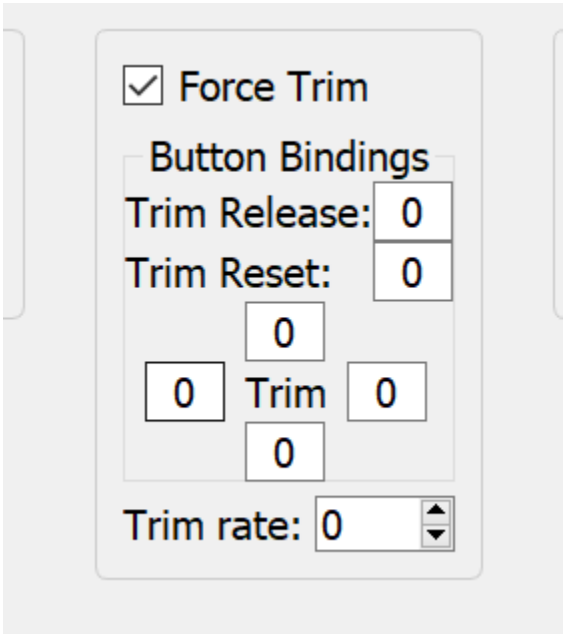
If the rescale axes box is checked, then the joystick will tell the computer it has reached full excursion when it reaches an endstop. Below you can see this as the red dot has moved to the limit of the little box. However, the blue dot is still centered because the motors are not doing anything.



Constant Force

Breakout force

Force trim

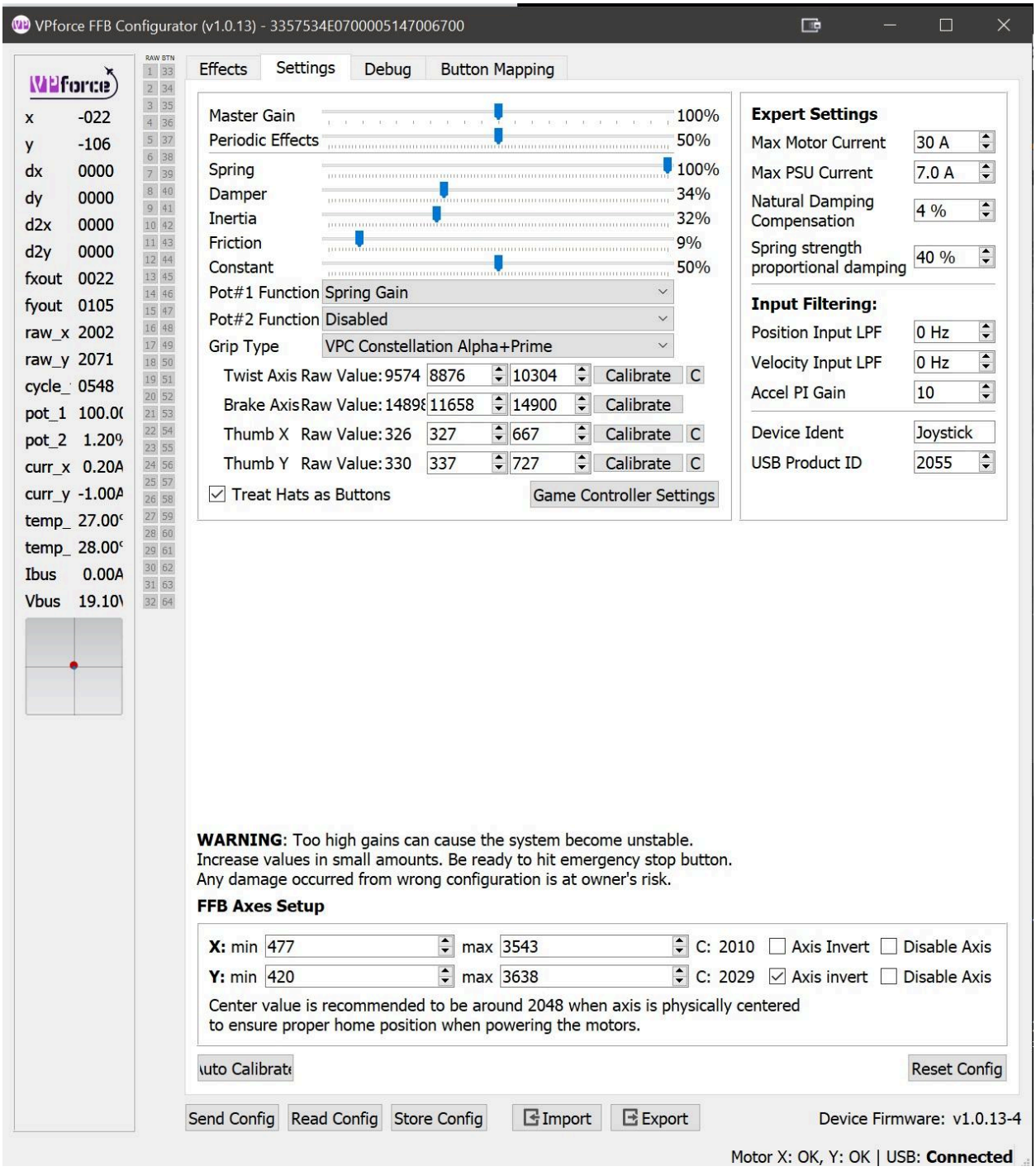


This setting allows a trim button and a trim release for helicopters

The four fields surrounding the word ‘Trim’ are button assignments for pitch and roll trim.

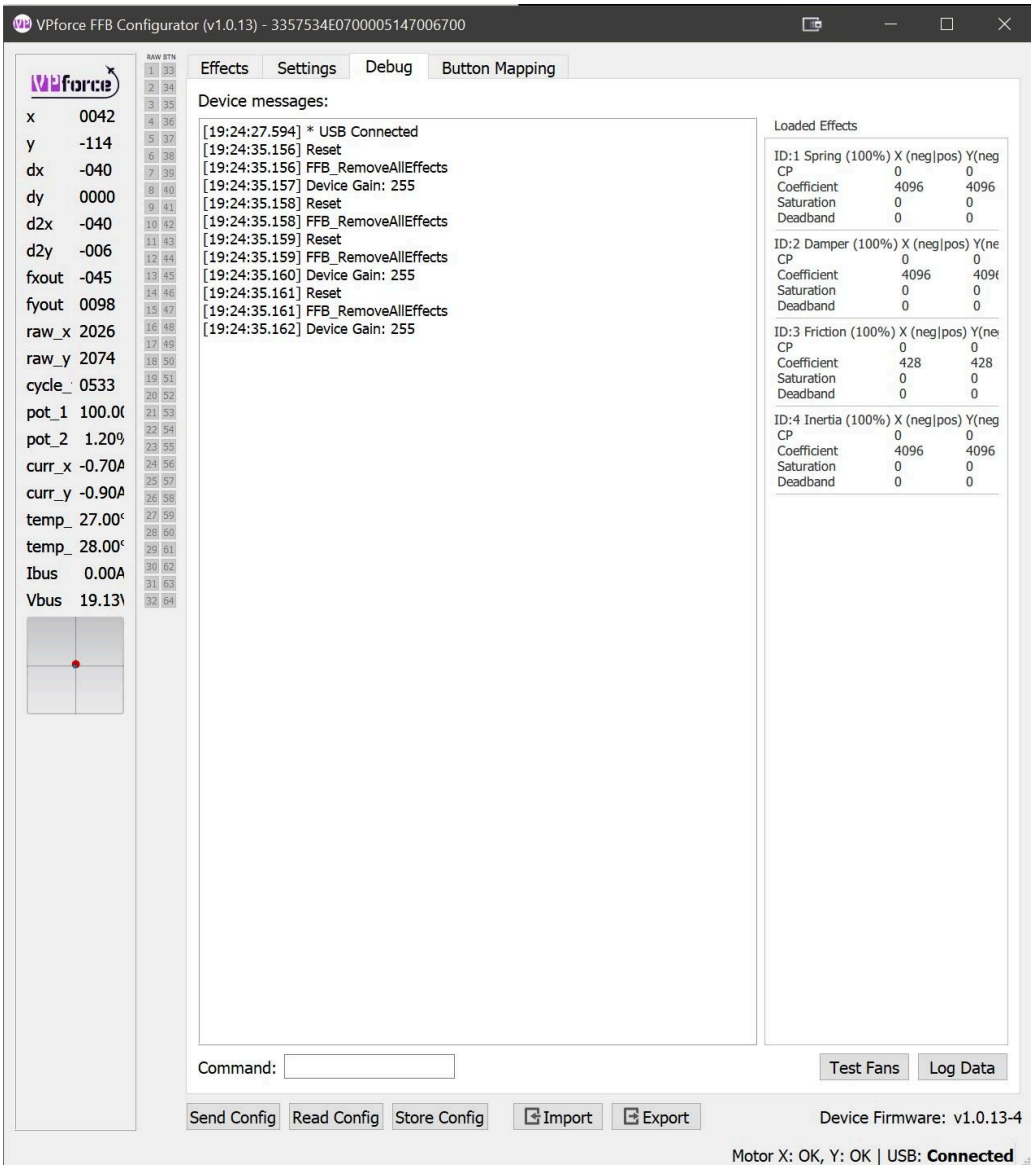
Balance spring

3.2.2. Settings tab

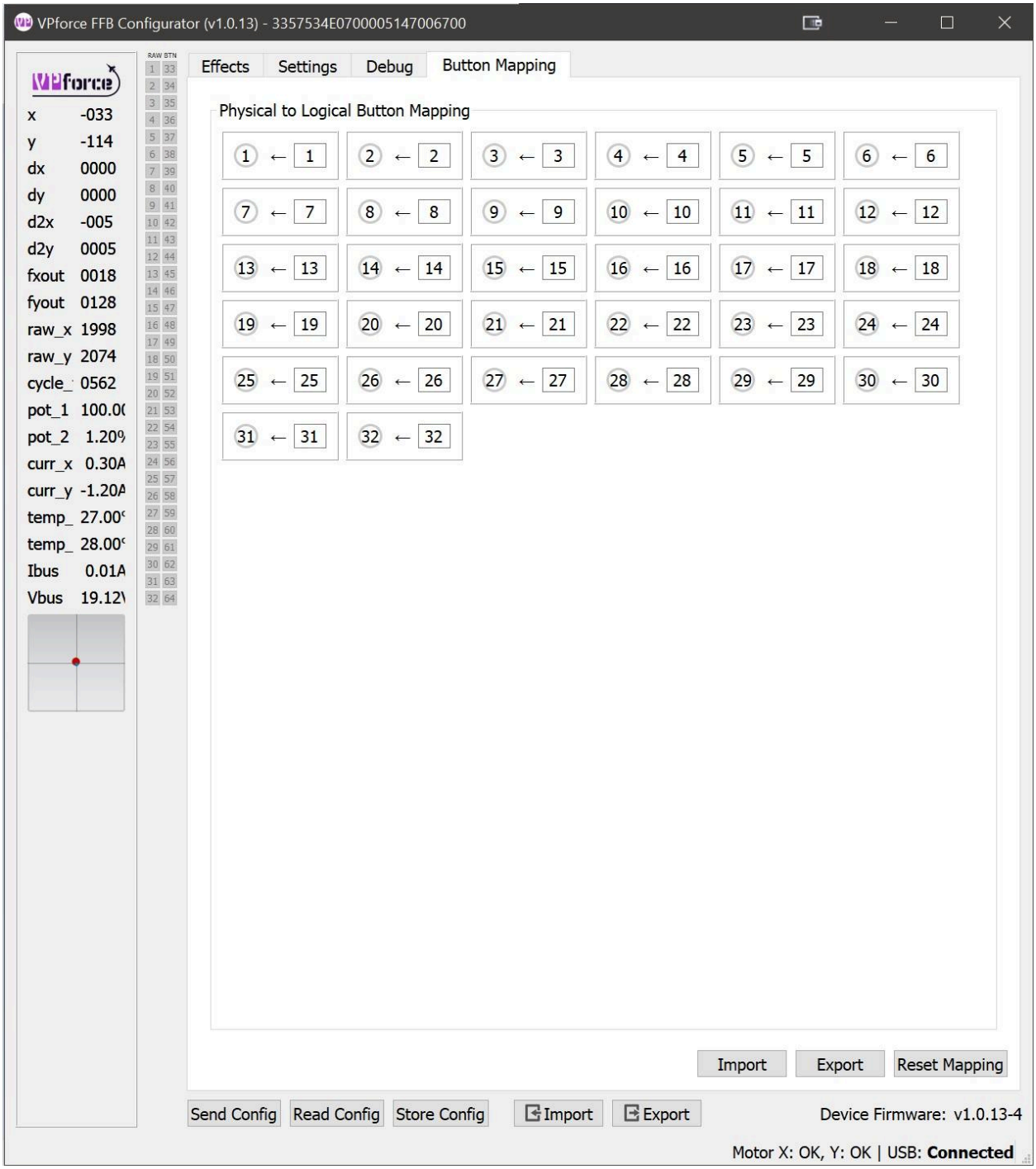


Each slider allows amplification or reduction of the effect set in the previous Effects tab. The total effect felt by the user will be the product of these two numbers. So for example if the spring effect is set to 50% in the effects tab, and the slider on the settings tab for spring is set to 50%, then the user will feel 25% of the maximal force. There is a reason for providing these two controls separately. (I dont know what the reason is but Walmis certainly does)

3.2.3. Debug tab



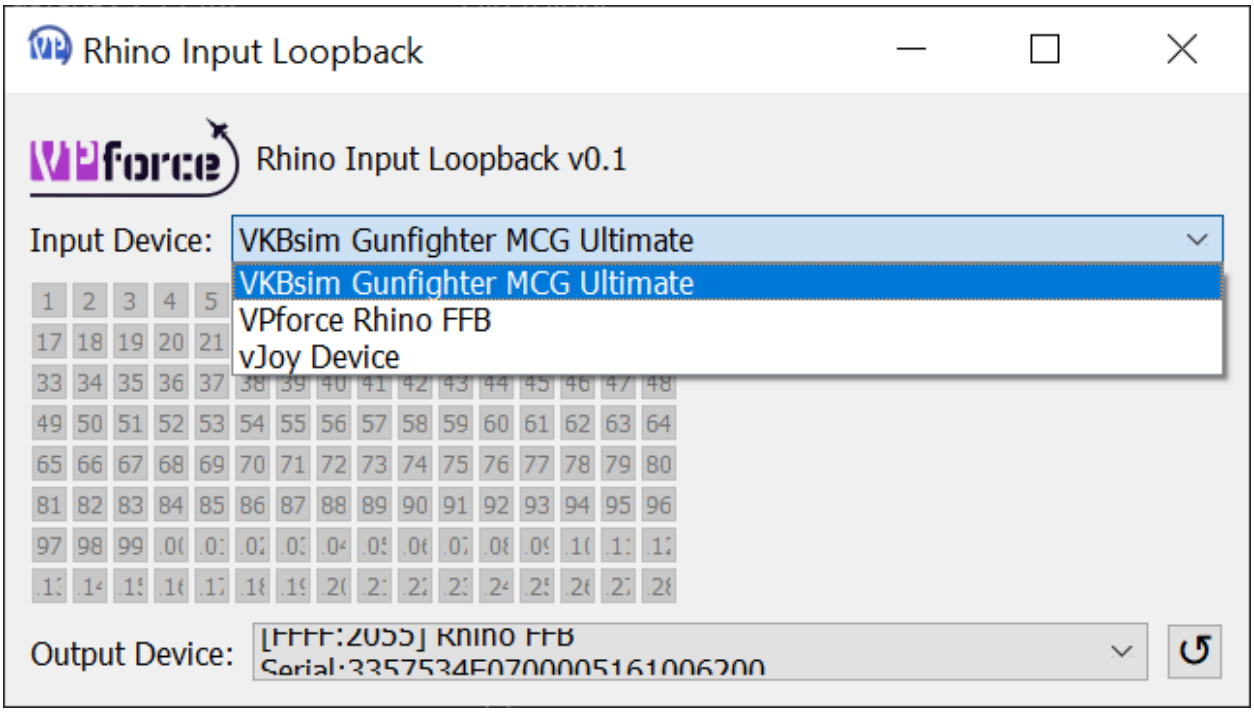
Button mapping tab



3.3. The RhinoLoopback Application

The purpose of the RhinoLoopback app is simply to allow for using any controller - including VKB installed on a Rhino - to control VPforce FFB Configurator features, such as for example the Force Trim (see relevant section in 3.2.).

To start the application, navigate to the directory you unzipped the software package (VPforce_FFB_Configurator_vx.x.xx.zip), locate Rhinoloopback.exe and start it. You should see something like this



Choose the input device you want to use from the list (in this case the VKBsim Gunfighter MCG Ultimate), Output Device will in most cases be the only Rhino on the list. Note that the **RhinoLoopback app needs to be running for the loopback to work**. To finalize the operation, go to the FFB Configurator software settings tab and set Loopback as the Grip Type.

Configuring the RhinoLoopback app in this way will now allow the main FFB Configurator to see, map and utilize the buttons of the selected device.

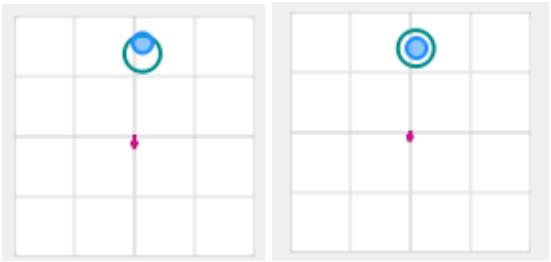
3.4. Balancing the Grip

3.4.1. Balance Spring

The "Balance Spring" feature, found within the VP Configurator, allows users to achieve optimal trim performance, particularly when using heavier grips or extensions. This manual entry provides instructions on how to tune the "*Balance Spring*" settings effectively.

The usual problem with a heavy grip and/or a long extension, is that it will sag or drift when trimmed at an angle as indicated in the picture. This occurs because additional torque is required to hold the stick in place at an angle. The spring force is proportional to the stick distance from the center point, therefore the stick falls a bit until countering torque is achieved, which is undesirable for force trim applications. This effect is most noticeable with a weak spring setting.

Before balance: After balance:

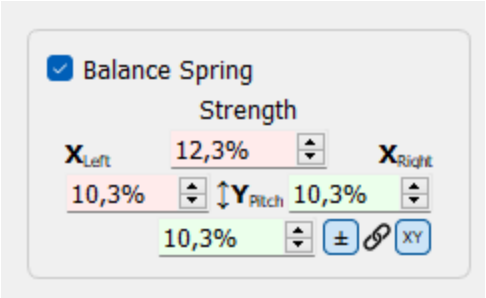


***Note:** Before adjusting the *"Balance Spring"* settings, it's crucial to disable Spring/Damper/Friction/Inertia effects. This ensures that adjustments made to the balance spring force settings are accurately reflected without interference from the other effects.

Adjusting "Balance Spring" Settings

Once the effects are disabled, you can proceed to adjust the "Balance Spring" settings. Follow these steps to fine-tune the spring force in different directions:

Within the VP Configurator, locate the effect box labeled ”Balance Spring”.



You'll find settings for adjusting the strength of the spring force in four directions: left, right, forward, and backward. Here's how to adjust each direction:

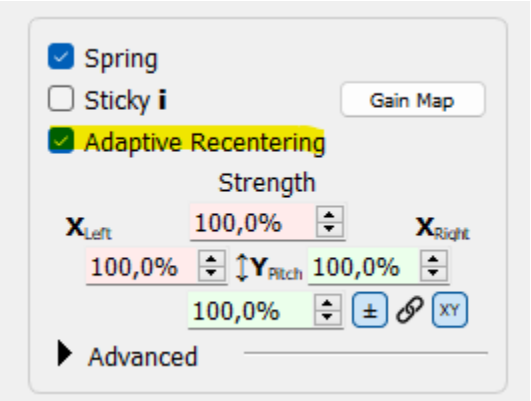
Left/Right: Increase or decrease the strength of the spring force to counteract imbalance caused by uneven weight distribution or grip extensions on the respective sides.

Forward: Adjust the spring force forward to counteract any tendency of the device to tilt forward, especially if the front end is heavier.

Backward: Similarly, adjust the spring force backward to counteract any tendency of the device to tilt backward, particularly if the rear end is heavier.

Experiment with different *Strength* settings and observe how the stick responds in various scenarios, such as holding and releasing it at different angles. Fine-tune the settings as necessary until you achieve the optimal values indicated by the stick staying in place after moving it to various angles.

3.4.1.1. Adaptive Recentering

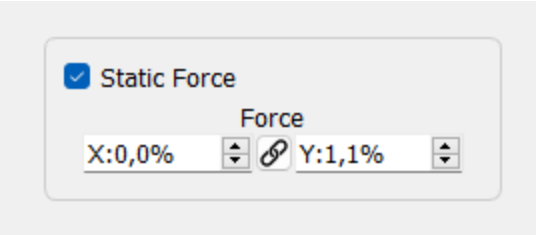


In addition to “Balance Spring” there is an additional facility to aid in reducing the error of the trimmed position - **Adaptive Recentering**.

Adaptive recentering aims to reduce the error between the trimmed position and the actual stick position by slowly adjusting the force to minimize the error. It works for any *Spring* class effects created by *directX* game or *telemFFB*.

The Adaptive recentering has limited authority based on spring strength, so on lower spring settings it might not have enough authority to bring the stick into position. It’s required to adjust the “Balance Spring” in that case.

3.4.1.2. Static Force



Static force setting is useful if the stick is very front or rear heavy. Increasing this setting is akin to adding a rubber band that adds a constant torque/force in a particular direction (can be positive or negative).

This effect is also very useful to simulate a counterbalance when building an FFB collective for example.

4. The VPforce TelemFFB Application

TelemFFB is a (work in progress) open source python based application which intakes telemetry from a simulator and uses that telemetry to produce various effects.

Supported simulators:

- DCS World
- Microsoft Flight Simulator
- IL-2 Sturmovik
- X-Plane 11/12 (WiP version only)

The repository is located on GitHub here: VPforce-TelemFFB

For DCS and IL-2, which support native FFB, the TelemFFB app is primarily leveraged to implement certain effects like gunfire, engine rumble and helicopter ETL shaking (among many others). However, there are some additional 'FFB type' effects which are implemented such as deceleration force and g-loading effect.

For MSFS, which ***does not*** have native FFB support, TelemFFB is also implementing basic axis FFB in addition to some of the effects previously mentioned for DCS.

As of February, 2024, the WIP branch now supports X-Plane 11/12 as well with the same capabilities as MSFS.

There are two main branches of TelemFFB, master and wip

- Master
    - The master branch is considered the 'stable' implementation of TelemFFB and is rarely updated. As of January, 2024 the ongoing 'wip' updates have been promoted into the master branch (commit id: `cfeff461`). The current stable release is v1.0.0

- WIP
    - The WIP (or, ‘work in progress’) branch is much more fluid and is updated regularly as new effects and functionality are implemented by the community.

The rest of this section is split into Stable Version and WiP/Development Version.

4.1. Stable Version Documentation

4.1.1. Installing the TelemFFB executable version

TelemFFB is a python application, however it is also released as a packaged executable that can be run without installing any additional software on your computer.

Downloading the Main Branch release:

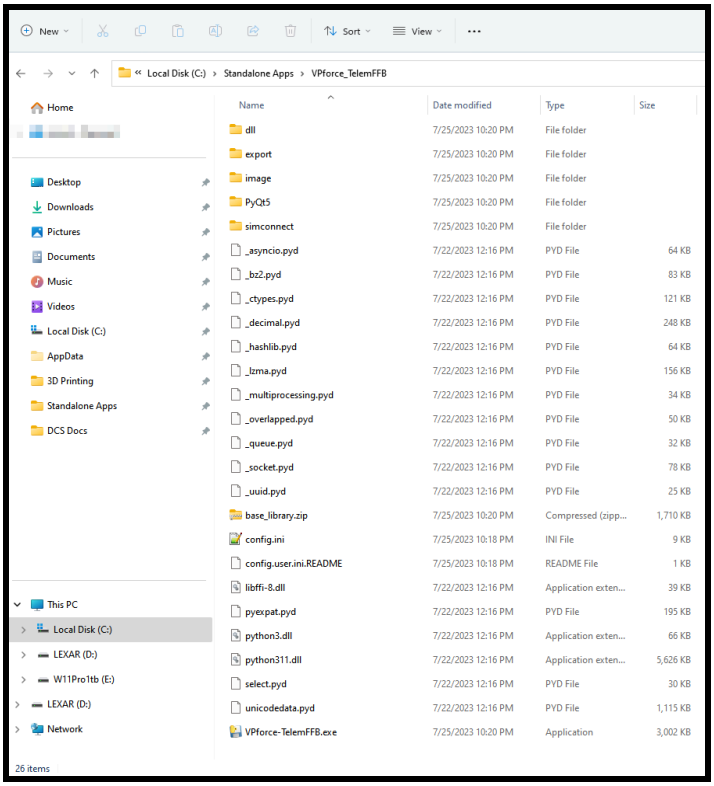
The latest main branch executable release can be found on the releases page on GitHub.

Downloading the WIP Branch release:

The WIP branch undergoes an auto-build process after each commit of updated code to the repository. The latest WIP executable builds can be found on the VPforce Controls website.

Installation:

Once you have downloaded the release zip file, simply extract the archive on your computer. The location itself does not matter.


New
Sort
View
Local Disk (C:) › Standalone Apps › VPforce_TelemFFB
Home
Desktop
Downloads
Pictures
Documents
Music
Videos
Local Disk (C:)
AppData
3D Printing
Standalone Apps
DCS Docs
This PC
Local Disk (C:)
LEXAR (D:)
W11Pro1tb (E:)
LEXAR (D:)
Network
26 items
Name
Date modified
Type
Size
dll 7/25/2023 10:20 PM File folder
export 7/25/2023 10:20 PM File folder
image 7/25/2023 10:20 PM File folder
PyQt5 7/25/2023 10:20 PM File folder
simconnect 7/25/2023 10:20 PM File folder
_asyncio.pyd 7/22/2023 12:16 PM PYD File 64 KB
_bz2.pyd 7/22/2023 12:16 PM PYD File 83 KB
_ctypes.pyd 7/22/2023 12:16 PM PYD File 121 KB
_decimal.pyd 7/22/2023 12:16 PM PYD File 248 KB
_hashlib.pyd 7/22/2023 12:16 PM PYD File 64 KB
_lzma.pyd 7/22/2023 12:16 PM PYD File 156 KB
_multiprocessing.pyd 7/22/2023 12:16 PM PYD File 34 KB
_overlapped.pyd 7/22/2023 12:16 PM PYD File 50 KB
_queue.pyd 7/22/2023 12:16 PM PYD File 32 KB
_socket.pyd 7/22/2023 12:16 PM PYD File 78 KB
_uuid.pyd 7/22/2023 12:16 PM PYD File 25 KB
base_library.zip 7/25/2023 10:20 PM Compressed (zipp... 1,710 KB
config.ini 7/25/2023 10:18 PM INI File 9 KB
config.user.ini.README 7/25/2023 10:18 PM README File 1 KB
libffi-8.dll 7/22/2023 12:16 PM Application exten... 39 KB
pyexpat.pyd 7/22/2023 12:16 PM PYD File 195 KB
python3.dll 7/22/2023 12:16 PM Application exten... 66 KB
python311.dll 7/22/2023 12:16 PM Application exten... 5,626 KB
select.pyd 7/22/2023 12:16 PM PYD File 30 KB
unicodedata.pyd 7/22/2023 12:16 PM PYD File 1,115 KB
VPforce-TelemFFB.exe 7/25/2023 10:20 PM Application 3,002 KB

4.1.2. Running the TelemFFB Application

To start the application, double-click “VPforce-TelemFFB.exe”

If you are using the python source code, start the application by running “python main.py”

4.1.2.1. Application Overrides

There are a variety of command line arguments that can be used at runtime:

- `-D | --device <vid:pid>`
  - Specify the VID:PID of the VPforce device. Default FFFF:2055
- `-r | --reset`
  - Reset the VPforce device and clean up any lingering effects. Note: Is destructive to any active effects being generated by a simulator.
- `-c | --configfile`
  - Override the primary configuration file that is loaded. Default: ‘config.ini’
  - **Supported, but recommended to use override option below**
- `-o | --overridefile`
  - Override the user override file to be loaded. Default: ‘config.user.ini’
- `-s | --sim <DCS|MSFS|IL-2>`
  - Enable the defined simulator, regardless of setting in config file. Default ‘DCS’
- `-t | --type <joystick|pedals>`
  - Tell TelemFFB that the device being connected to is a joystick base or rudder pedals (certain effects only apply to one or the other, or behave differently). Default ‘joystick’

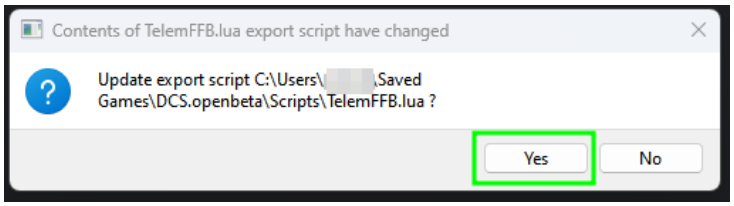
You can permanently enable or disable a given simulator inside of your primary or user override configuration file. Keep in mind that an overlapping setting in the override file will supersede the setting in the primary config file.

```
[system]
logging_level = INFO                    # DEBUG | INFO | WARNING | ERROR | CRITICAL
telemetry_timeout = 200ms     #ms - increase only if low frame-rate resulting in lost effects/control forces due to timeout
msfs_enabled = no                        # yes/no 0/1 | can also run app with '-s MSFS' argument
dcs_enabled = yes                        # yes/no 0/1 | can also run app with '-s DCS' argument
il2_enabled = no                        # yes/no 0/1 | can also run app with '-s IL2' argument
il2_telem_port = 34385                                          # port number for Il-2 telemetry senders
il2_path = 'C:\Program Files\IL-2 Sturmovik Great Battles'          # Path to IL2 root directory
```

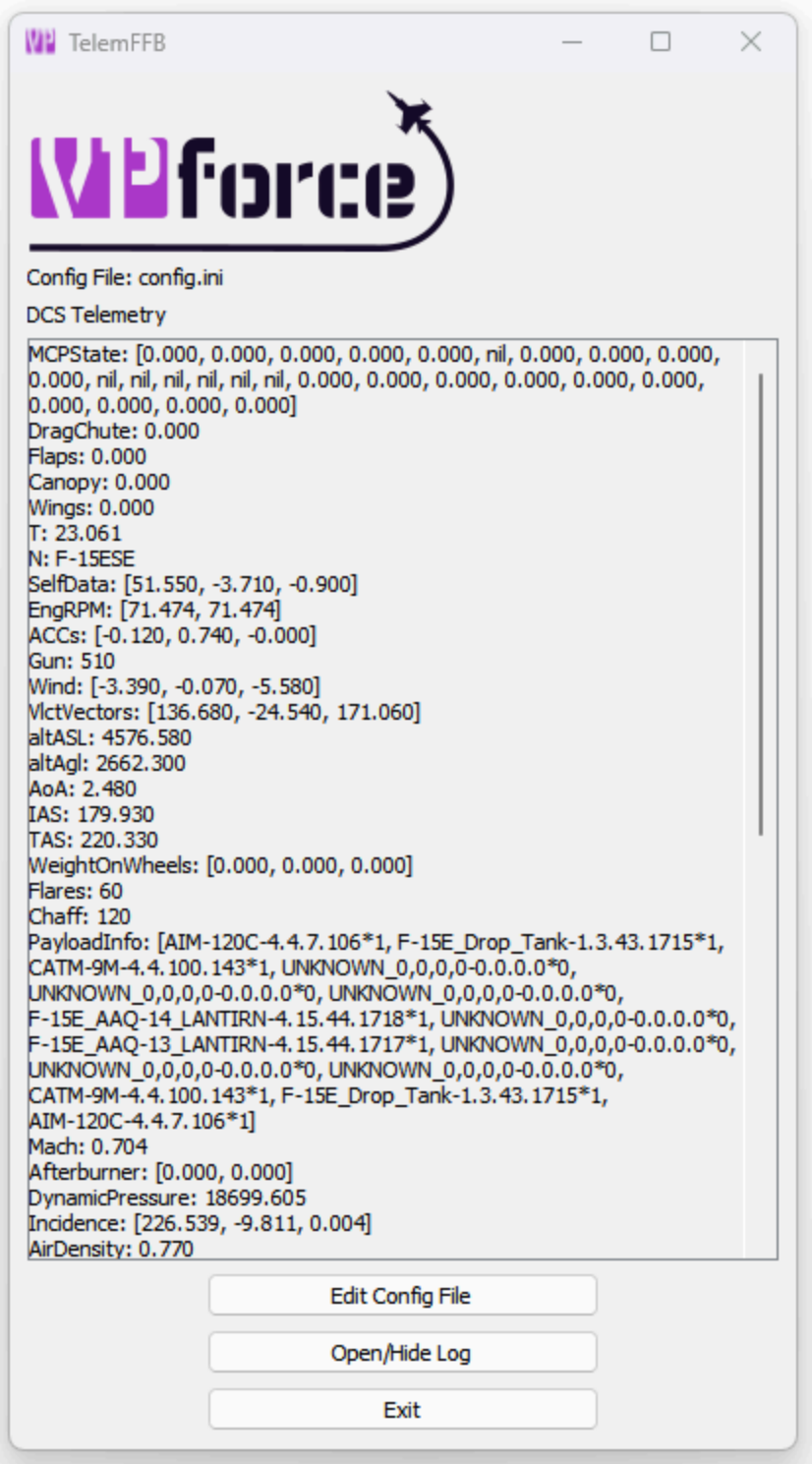
4.1.3. Setting up TelemFFB for DCS

DCS uses a telemetry export LUA file to define the data and parameters that need to be sent to TelemFFB. The setup of this file and the modification of the export.lua file in your DCS 'saved games' folder is handled automatically by TelemFFB.

The first time you launch the application, or if a new version of TelemFFB needs to update the DCS export file, you will receive a popup notification asking if you want to update. Selecting 'Yes' will update/install the necessary export script file in your DCS saved games folder. The application will then start and wait to receive telemetry from DCS.



Once a DCS module is loaded , the TelemFFB window will update with real-time telemetry statistics. This is your indication that everything is working properly.


TelemFFB
Config File: config.ini
DCS Telemetry
MCPState: [0.000, 0.000, 0.000, 0.000, 0.000, nil, 0.000, 0.000, 0.000, 0.000, nil, nil, nil, nil, nil, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000]
DragChute: 0.000
Flaps: 0.000
Canopy: 0.000
Wings: 0.000
T: 23.061
N: F-15ESE
SelfData: [51.550, -3.710, -0.900]
EngRPM: [71.474, 71.474]
ACCs: [-0.120, 0.740, -0.000]
Gun: 510
Wind: [-3.390, -0.070, -5.580]
VlctVectors: [136.680, -24.540, 171.060]
altASL: 4576.580
altAgl: 2662.300
AoA: 2.480
IAS: 179.930
TAS: 220.330
WeightOnWheels: [0.000, 0.000, 0.000]
Flares: 60
Chaff: 120
PayloadInfo: [AIM-120C-4.4.7.106*1, F-15E_Drop_Tank-1.3.43.1715*1, CATM-9M-4.4.100.143*1, UNKNOWN_0,0,0,0-0.0.0.0*0, UNKNOWN_0,0,0,0-0.0.0.0*0, UNKNOWN_0,0,0,0-0.0.0.0*0, F-15E_AAQ-14_LANTIRN-4.15.44.1718*1, UNKNOWN_0,0,0,0-0.0.0.0*0, F-15E_AAQ-13_LANTIRN-4.15.44.1717*1, UNKNOWN_0,0,0,0-0.0.0.0*0, UNKNOWN_0,0,0,0-0.0.0.0*0, UNKNOWN_0,0,0,0-0.0.0.0*0, CATM-9M-4.4.100.143*1, F-15E_Drop_Tank-1.3.43.1715*1, AIM-120C-4.4.7.106*1]
Mach: 0.704
Afterburner: [0.000, 0.000]
DynamicPressure: 18699.605
Incidence: [226.539, -9.811, 0.004]
AirDensity: 0.770
Edit Config File
Open/Hide Log
Exit

4.1.3.1. Notable DCS Specific Settings

The following sections document some of the 'non haptic effect' features of TelemFFB for DCS.

4.1.3.1.1. Trimming for VPforce powered DIY FFB Pedals

As described in 5.1.1 - Setup tips for DIY FFB Pedals and/or Collective devices, DCS does not properly support FFB pedals. As such, the following implementation has been added to TelemFFB to enable both correctly behaving spring forces as well as trimming for fixed wing aircraft that have rudder trimmers.

Helicopter trimming is not currently supported as there are currently no viable methods to deal with the "double input" effect that is generated by the "instant trim" option for those helicopters which support pedal trimming. Additionally, helicopters like the Mi-24 implement an approximation of the real helicopter's "foot microswitch" logic which detects when the pilot's feet are on the pedals. None of the modes for this simulation of that switch logic are conducive to integrating with FFB trim following.
The shining light is that with the auto-switching to springless mode for helicopters, pedal trimming is not really necessary.

The following settings make up the feature in the TelemFFB configuration:

- `pedal_trimming_enabled - (True/False, default=True)`
    - Enabled by default for both JetAircraft and PropellerAircraft types

4.1.3.1.2. Auto pedal spring mode switching duplicated

In addition to pedal trimming, TelemFFB now implements dynamic switching between 3 different modes for Helicopters (mode 1), Jets (mode 2) and Prop aircraft (mode 3). The modes may be overridden on a per aircraft basis by adding the applicable mode setting to that aircraft section in the configuration.

All of the DCS warbirds have default values built into the application for the V speeds. It is possible to override the default internal V_S and V_{NE} speeds as well as the spring gains.

The settings which make up this feature are as follows

- `pedal_spring_gain (0-100%)`
    - Percent of max value set in VPforce configurator
- `pedal_spring_mode`
    - 0=DCS Default
    - 1=spring disabled
    - 2=static spring enabled using "pedal_spring_gain" spring setting
    - 3=dynamic spring enabled. Based on "pedal_spring_gain", dynamic force between 0 and Vs speed (%25 of force) and Vs and Vne speeds (remaining %75)
- `pedal_dampening_gain (0-100%)`
    - Percent of max value set in VPforce Configurator

To change the V speeds or add V speeds to a non-warbird type aircraft, or adjust the gain values, you can add the following settings to your aircrafts configuration

- `pedal_spring_mode = 3` (to enable dynamic mode)
- `aircraft_vs_speed` - Stall speed in m/s
- `aircraft_vs_gain` - Spring gain when aircraft at Vs (0-100%)
- `aircraft_vne_speed` - Never Exceed speed in m/s
- `aircraft_vne_gain` – Spring gain when aircraft is at Vne (0-100%)

4.1.4. Setting up TelemFFB for MSFS 2020

Microsoft Flight Simulator does not require any special configuration on the simulator side. All subscriptions to telemetry data are done via the SimConnect API.

Inside of the 'config.ini' configuration file, near the top inside the **`[system]`** section is a **`msfs_enabled`** flag. Setting this flag to 'yes' or '1' will enable the code which attempts to connect to, and listens for, simconnect events from MSFS.

You may also enable MSFS communication when starting TelemFFB from the command line using the '-s' parameter (i.e., `-s MSFS`)

You will know you have successfully enabled support for MSFS when you see the corresponding indication in the TelemFFB window:

As with DCS, when you load into a flight (or when MSFS first enters the hangar/menu) you will see the telemetry window populate with values.

It bears repeating here that MSFS does not have native support for FFB devices. Therefore, external software must take in telemetry from the simulator in order to create those basic dynamic spring forces impacted by prop wash and airspeed as well as other common FFB type effects like ground-roll/touchdown and stall buffeting.

For DCS (actually it is implemented per aircraft module by the individual developers) the game itself supplies these basic effects to FFB Joysticks.

4.1.4.1. Notable MSFS Specific Settings

The following sections document some of the 'non haptic effect' features of TelemFFB for MSFS.

4.1.4.1.1. Axis Position Sending via SimConnect (duplicated in settings section

The trim/ap following feature requires that TelemFFB be the source of the axis position for MSFS. As such, the following settings will enable and configure the sending of the axis positions via simconnect.

****Note** - You must un-bind your axes in MSFS for this feature to work**

- `telemffb_controls_axes`
  - Master control for the feature (enable/disable, true/false, on/off)
- `joystick_x_axis_scale`
  - Scaling of the joystick X axis (0-100%)
- `joystick_y_axis_scale`
  - Scaling of the joystick Y axis (0-100%)
- `rudder_x_axis_scale`
  - Scaling of the rudder X axis (0-100%)

The input range used by MSFS is -16383 to +16384. Axis curves are not supported in this implementation, however you can utilize the scaling settings to adjust the sensitivity of the physical axis. A (unreasonable) scale value of %50 would send a range of -/+8192 over the full range of the physical axis, resulting in less sensitive control inputs at the expense of range of movement.

The following simconnect events are used to send the axis position data:

Fixed Wing:

- `AXIS_AILERONS_SET`
- `AXIS_ELEVATOR_SET`

- AXIS_RUDDER_SET

Helicopter:

- AXIS_CYCLIC_LATERAL_SET
- AXIS_CYCLIC_LONGITUDINAL_SET
- ROTOR_AXIS_TAIL_ROTOR_SET

4.1.4.1.2. Trim and Autopilot Following

The most common feature request for MSFS is trim and/or AP following. Given the lack of key FFB concepts inside MSFS, such as axis offset, this presents several challenges with such an implementation.

For this reason, this feature as implemented requires TelemFFB to be the source of the axis position data for MSFS (see **Axis Position Sending via SimConnect** above).

See “Tips on configuring the trim settings” at the bottom of this section for guidance on customizing these options per aircraft

**** Hat based trim following is now supported for Generic helicopter types ****

****Autopilot following is only available for fixed-wing aircraft at this time****

**** Autopilot following is part of the trim following feature ****

- trim_following
  - Master control for the feature (enable/disable, true/false, on/off)
- ap_following (fixed wing only)
  - Enable or disable AP following (only disables the aileron/rudder axis). To disable elevator following, you must disable the trim following feature. (enable/disable, true/false, on/off)
- invert_ap_x_axis (fixed wing only)
  - Some aircraft, like the default C172, have a strange behavior where axis inputs, when the AP is active, act in the opposite direction. Note that while this setting allows the aircraft to fly normally, the stick following in the x axis will be incorrect (reversed)

- `joystick_trim_follow_gain_physical_x`
    - Physical stick x axis movement as a percentage of the trim value (0-100%)
- `joystick_trim_follow_gain_physical_y`
    - Physical stick y axis movement as a percentage of the trim value (0-100%)
- `joystick_trim_follow_gain_virtual_x`
    - Virtual stick x axis movement as a percentage of the physical stick movement (0-100%)
- `joystick_trim_follow_gain_virtual_y`
    - Virtual stick y axis movement as a percentage of the physical stick movement (0-100%)
- `rudder_trim_follow_gain_physical_x (fixed wing only)`
    - Physical pedal x axis movement as a percentage of the trim value (0-100%)
- `rudder_trim_follow_gain_virtual_x (fixed wing only)`
    - Virtual pedal x axis movement as a percentage of the physical pedal movement (0-100%)

How it works at a high level:

- Trim Following
    - Trim position is read from the sim
    - Physical stick center point is calculated using the ‘physical’ position gain
    - Physical stick center is sent to the joystick/pedals
    - Virtual stick position is calculated using the ‘virtual’ position gain
    - Virtual stick position is sent to MSFS
- AP Following
    - Elevator AP following is reliant on the trim value, as APs use the elevator trim
    - Aileron/Rudder
        - Control surface deflection is read from the sim (as induced by AP control)

- Control surface deflection is used to calculate physical axis position
- Physical position is sent to joystick/rudder

- The AP induced physical control inputs are dampened to prevent out of control oscillations in turbulence or in aircraft with extra sensitive controls.

Tips on configuring the trim settings

Physical & Virtual configuration should be done for each plane.

Suggested starting points:

```
joystick_trim_follow_gain_physical_x = 50%
joystick_trim_follow_gain_virtual_x = 20%

joystick_trim_follow_gain_physical_y = 100%
joystick_trim_follow_gain_virtual_y = 20%

rudder_trim_follow_gain_physical_x = 50%
rudder_trim_follow_gain_virtual_x = 20%
```

Joystick..X and Rudder..X can typically be left as default, since many planes do not even have in-cockpit trims on those axes, and if they do they are set and forget. The elevator trim however is interacted with a great deal and joystick..Y must be tuned per plane for realistic results.

Create a custom plane entry in the config.user.ini. There are some default aircraft included as examples in config.ini. Save and restart TelemFFB.

Adjust joystick_trim_follow_gain_physical_y % to the amount that trim can move the surface vs the full travel of the elevator. If it's possible for full trim to fully deflect the elevator, this will be 100%.

Then, fly the plane, and trim for level flight at cruise speed.

In VPForce configurator, temporarily set spring to 0% and friction to 100%. Apply (do not store) the setting.

Without moving the Rhino joystick, use your trim buttons/keys/axis to nose down the plane.

If the nose goes up, adjust joystick_trim_follow_gain_virtual_y 10% higher.

If the nose goes down, adjust joystick_trim_follow_gain_virtual_y 10% lower. It may be negative.

Save the config.user.ini and the effects will be immediate.

Adjust the trim and observe the reaction again. It will take a few iterations. The goal is to have the trim adjustment have no effect with the stick not moving. You can adjust by 5%, 1% when you are close.

When finished, go back to VPForce configurator and click Load Settings, your Friction and Spring will return to your stored settings. Enjoy your new realistic trim!

4.1.4.1.3. Helicopter Force Trim

TelemFFB implements a hardware based force trim feature for MSFS helicopters. The implementation is identical to how hardware trim works when configured inside VPforce Configurator, however the benefit of doing it inside TelemFFB is that it is dynamically enabled when loading a helicopter. Enabling this in VPforce Configurator requires enabling/disabling 'sticky spring' and force trim when switching between helicopter and fixed wing types.

- `force_trim_enabled`
  - Master control (enable/disable, on/off, true/false)
- `cyclic_spring_gain`
  - Percent of VPforce Configurator spring value (0-100%)
- `force_trim_button`
  - joystick button to use for force trim (button number as seen by vpforce configurator)
- `force_trim_reset_button`
  - joystick button to use for trim reset (button number as seen by vpforce configurator)

4.1.4.1.4. Glider Force Trim

Many gliders have a lever actuated trim positioning system that recenters the elevator trim to hold the control stick where the lever is released. This is modeled in TelemFFB per the below settings

- `force_trim_enabled`
  - Master control (enable/disable, on/off, true/false)
- `elevator_force_trim`
  - Enable/disable force trim functionality on the elevator axis (true/false, on/off, enable/disable)
- `elevator_force_trim`

    - Enable/disable force trim functionality on the elevator axis (true/false, on/off, enable/disable)
- `force_trim_button`
    - joystick button to use for force trim (button number as seen by vpforce configurator)
- `force_trim_reset_button`
    - joystick button to use for trim reset (button number as seen by vpforce configurator)

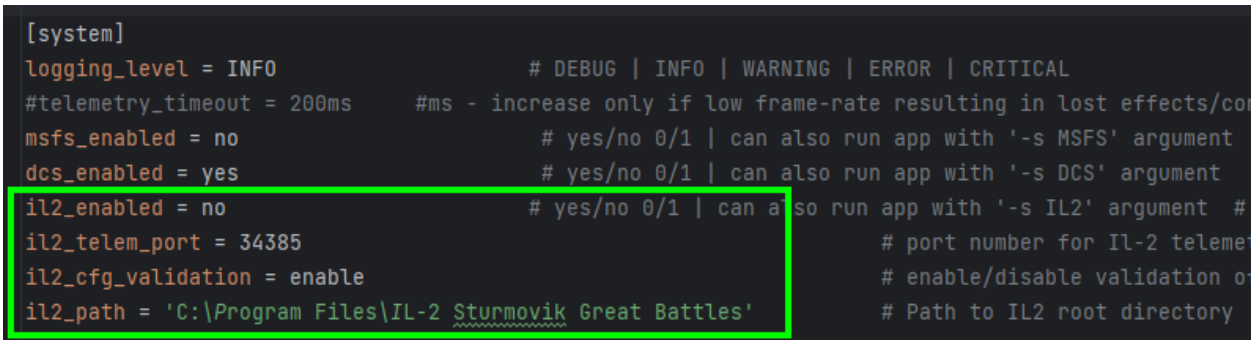
4.1.5. Setting up TelemFFB for IL-2 Great Battles

Inside of the 'config.ini' configuration file, near the top inside the `[system]` section is an `il2_enabled` flag. Setting this flag to 'yes' or '1' will enable the code which listens for telemetry from IL-2.

You may also enable IL-2 communication when starting TelemFFB from the command line using the '-s' parameter (i.e., `-s IL2`)

IL-2 Great Battles requires that the receiver address and port values be configured inside of the `'/data/startup.cfg'` file in the simulator installation directory.

TelemFFB can automatically add the required entries to the file provided the following information is supplied in the TelemFFB configuration file.

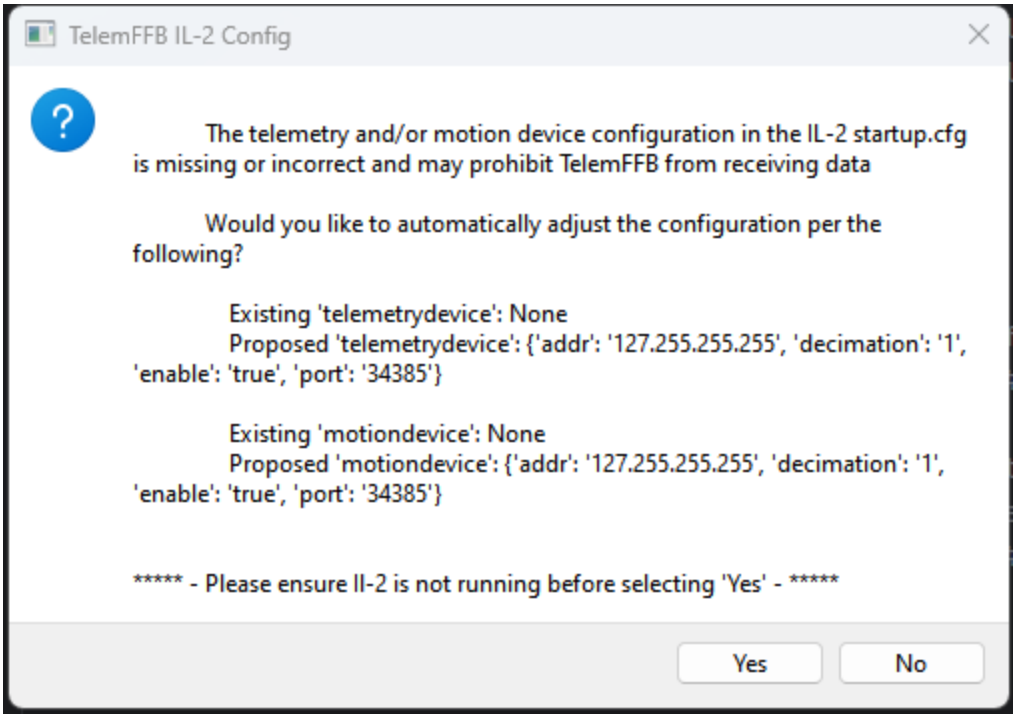


`il2_telem_port` - This is the port number that will be configured for the telemetry receiver in the IL-2 config file

`il2_cfg_validation` - If you want to manually configure your IL-2 telemetry settings, set this to 'disable'

`il2_path` - This is the root directory of your IL-2 installation.

The first time you launch TelemFFB with IL2 enabled, **if you do not already have any telemetry receivers defined**, you will see the following notification.



These are the entries that will be placed in startup.cfg which will enable telemetry to be sent to TelemFFB. **Do be certain that IL-2 is not running when you select Yes**. Otherwise, IL-2 will delete the entries from the config when you restart it.

4.1.5.1. Notable IL-2 specific settings duplicated

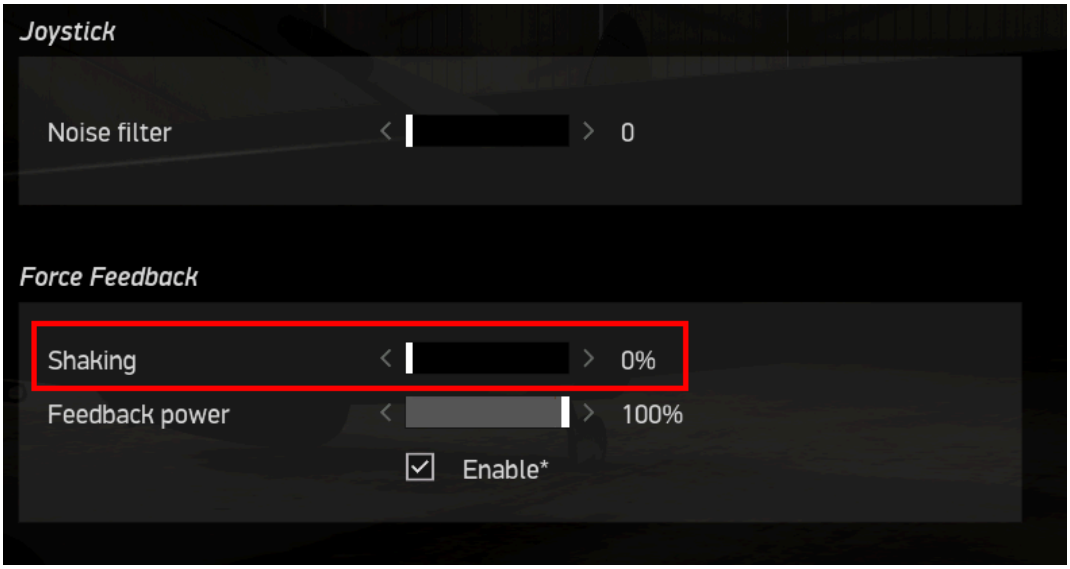
While the majority of the settings for use in IL-2 are similar or identical to those that are used in DCS and MSFS, there are several that differ.

IL-2 has several native FFB effects that can overlap with what TelemFFB is capable of generating. Specifically weapons release, runway rumble and buffeting. The benefit of implementing these in TelemFFB is that each effect is individually configurable both from an enable/disable perspective as well as the intensity.

In the configuration, there is a section that is controlled by a master on/off variable:

```
il2_shake_master = off   ## master control for effects which
    il2_enable_weapons = yes
        weapon_release_intensity = %20
    il2_enable_runway_rumble = yes
        runway_rumble_intensity = 10%
    il2_enable_buffet = yes
        il2_buffeting_factor = 1.0
```

These three effects are generated by IL-2 by default. If you wish to use the effects generated by TelemFFB in lieu of those generated by IL-2, you can enable the master setting in the TelemFFB config and then disable the 'shaking' effects in the IL-2 FFB settings as follows. Navigate to Settings->Input Devices and move the 'Shaking' slider to 0.



4.1.5.2. Coexistence with other telemetry receivers (Base shaker, motion platforms, etc)

IL-2 only supports a single TelemetryDevice and a single MotionDevice configuration. However, the configuration can make use of multiple receiver addresses, provided the additional receivers are configured correctly.

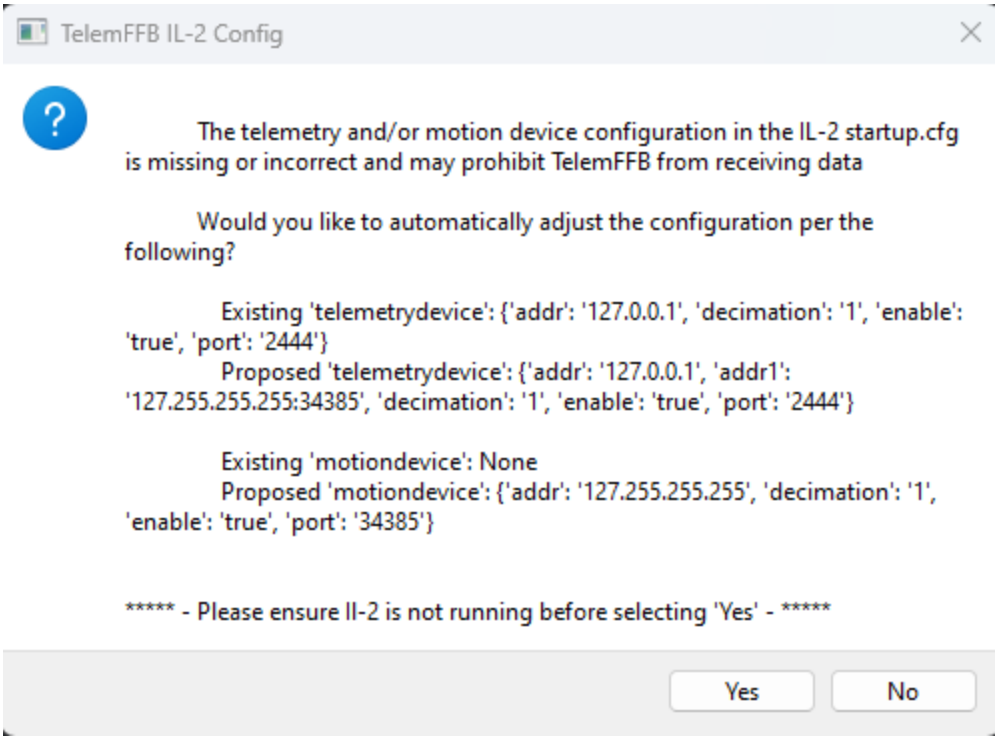
TelemFFB uses the link local broadcast address (127.255.255.255) because if multiple VPforce devices (joystick, pedals, etc) are in use, multiple instances of TelemFFB need to be able to receive the data. Rather than configuring a unique IP or port per instance, telling IL-2 to send to the broadcast address will allow any host listening to that port with a 127.0.0.0/8 address to receive the data.

In the event that a previous configuration exists for either telemetry or motion, TelemFFB will attempt to insert its own entry as an additional receiver within the config.

Note that TelemFFB will attempt to enforce a **decimation** value of 1. This value affects the frequency of the telemetry data. Some apps (like SRS for IL-2) call for a value of 2. This works fine if you are only concerned with server information, but for a real-time telemetry application such as TelemFFB, decimation values higher than 1 may produce unexpected results in the generated effects.

Other applications that may call for a decimation value of 2 should work with a decimation value of 1, even if they don't need the extra data fidelity.

If this is the case, you will see a notification from TelemFFB when starting as follows:



If you select ‘Yes’, the configuration will be overwritten with the proposed values.

4.1.5.3. Manually configuring the telemetry export for IL-2

While TelemFFB can automatically configure the required entries in the IL-2 startup file, the exact entries that are required are given below in the event you want to manually edit the IL-2 configuration.

Inside of the IL-2 installation folder, navigate to the ‘/data’ directory and edit ‘startup.cfg’.

No existing config:

Insert the following entries (the port numbers may be modified to match what is in the TelemFFB config file (assuming the TelemFFB configuration is specifying port 34385):

```
[KEY = telemetrydevice]
 addr = “127.255.255.255”
 decimation = 1
```

```
 enable = true
 port = 34385
[END]

[KEY = motiondevice]
 addr = "127.255.255.255"
 decimation = 1
 enable = true
 port = 34385
[END]
```

Inserting into existing config:

If there are existing configurations, you need to insert the ‘addr1’ TelemFFB item(s) as follows.

```
[KEY = telemetrydevice]
 addr = "127.0.0.1"
 addr1 = "127.255.255.255:34385"
 decimation = 1
 enable = true
 port = 4222
[END]


[KEY = motiondevice]
 addr = "127.0.0.1"
 addr1 = "127.255.255.255:34385"
 decimation = 1
 enable = true
 port = 4222
[END]
```

4.1.6. Customizing the TelemFFB configuration

TelemFFB uses a hierarchical configuration model. Within the configuration there are various sections. System settings, Simulator default settings, aircraft type default settings and finally, per-aircraft settings. As the configuration section gets more specific, settings in that section will override the same setting in a higher level section.

Essentially, the “sim default” settings will apply to all aircraft unless they are overridden in an aircraft type or aircraft specific section. The basic layout is as follows:

```
[SIM]
     setting1=value1
[SIM.AircraftCategory1]
     setting1=value2
[SIM.AircraftCategory2]
     setting1=value2
[AircraftName1]
     type=AircraftCategory1
[AircraftName2]
     type=AircraftCategory2
     setting1=value3
```

In the example above, both `[SIM.AircraftCategory1]` and `[SIM.AircraftCategory2]` override the value of `setting1` that is configured at the `[SIM]` level.

The `[AircraftName1]` aircraft will inherit the value of `setting1` from `[SIM.AircraftCategory1]` as it does not further define its own value.

The `[AircraftName2]` aircraft further overrides the value of `setting1` within its own configuration section.

4.1.6.1. Creating a custom user override file

TelemFFB also uses a config-override model. Inside the main folder structure is a template named 'config.user.ini.README'. If you re-name that file to 'config.user.ini' (remove the '.README'), then any entries in that file will further override the settings which are in the default 'config.ini' file.

This allows users to create and keep their own custom configurations that will not be overwritten when a new version of TelemFFB is installed. In most cases, the user.ini file from one version of TelemFFB will work with a newer version.

While the default config file is 'config.ini', it is possible to use a different config file. While the default config file is generally all that is required for most users, it is useful to use multiple config files if you have multiple VPforce FFB devices (i.e., Rhino and DIY pedals).

Note that any configuration in the user override file must match the hierarchy of the primary configuration file exactly.

TelemFFB will automatically try to load config.user.ini if it exists, however, You can create a user override file with any name you want and pass the file name as an argument to TelemFFB using the "-o <filename>" runtime flag.

4.1.6.2. Understanding the structure of the config file

The config.ini file is a flat configuration file which consists of multiple sections. At the top are the **system** variables that control certain aspects of the application such as logging level and the flags to enable support for MSFS and/or DCS.

```
[system]
logging_level = INFO                    # DEBUG | INFO | WARNING | ERROR | CRITICAL #MSFS
msfs_enabled = 1                        # 0=disable, 1=enable
dcs_enabled = 0                         # not plumbed - for future use      # DCS
```

System Settings

Below the system settings are the **'default'** category settings. These settings will modify the behavior of their corresponding effects globally for all aircraft unless they are overridden in a specific aircraft block further down in the config (more on that shortly).

Not all settings apply to both DCS and MSFS. Each setting has a comment in-line which indicates the applicable simulators.

```
[default]
type=Aircraft                       # Valid Types 'Aircraft' | 'PropellerAircraft' | 'JetAircraft' | 'Helicopter'
## Default Settings below
## Effects will use default settings below unless un-commented and edited
## Un-comment line to edit, or add to aircraft specific settings below

buffeting_intensity = 0.2           # peak AoA buffeting intensity  0 to disable (default 0.2)                    # DCS/MSFS
buffet_aoa          = 10            # AoA when buffeting starts (default 10)                                     # DCS Only
stall_aoa           = 15            # Stall AoA (default 15)                                                     # DCS Only
runway_rumble_intensity = 0.5       # peak runway intensity, 0 to disable (default 1.0)                          # DCS/MSFS
gun_vibration_intensity = 20%       # peak intenstiy for gunfire effect, 0 to disable (default 0.12)             # DCS Only
cm_vibration_intensity = 20%        # peak intensity for countermeasure release effect, 0 to disable (default 0.12) # DCS Only
weapon_release_intensity = 20%      # peak intensity for weapons release effect, 0 to disable (default 0.12)     # DCS Only

......... more settings below ........
```

Default Settings

The final section of the config are the unique aircraft definitions. While the actual order of the aircraft are not important, the default ones included in the config are arranged thusly:

- DCS Aircraft
  - DCS Props
  - DCS Jets
  - DCS Helicopters
- MSFS Aircraft
  - MSFS Props
  - MSFS Turboprops
  - MSFS Jets
  - MSFS Helicopters
  - MSFS Gliders

```
################################################
################################################
########   Aircraft Definitions Below   ##########
################################################
################################################

#########################
#####       DCS     ######
#########################
####################
###  DCS Props   ####
####################
[TF-51D]
type=PropellerAircraft
buffeting_intensity = 0.0 # implemented by DCS
runway_rumble_intensity = 1.0
engine_rumble = 0 # rumble based on RPM
gear_buffet_intensity = 0.15
rpm_scale = 31.5 # RPM% to actual RPM scale

[P-51D]
type=PropellerAircraft
buffeting_intensity = 0.0 # implemented by DCS
```

4.1.6.3. Customizing per-aircraft settings

Customizing per aircraft settings is fairly straightforward once you understand the basic hierarchy of the config file.

As an example, look at the configuration for the Supermarine Spitfire in DCS:

The most important setting here is the aircraft name "**SpitfireLFMkIX**". This is the unique name in DCS for that aircraft. The next most important field is '**type**'. By setting the type to PropellerAircraft, we are telling TelemFFB that this aircraft is a propeller aircraft and that it should treat it as such and play the effects for that aircraft type based on the values configured in the global settings and/or the individual values in the aircraft config section.

```
[SpitfireLFMkIX]
type=PropellerAircraft
engine_rumble = 1
engine_rumble_lowrpm = 650
engine_rumble_lowrpm_intensity = 0.06
engine_rumble_highrpm = 2800
engine_rumble_highrpm_intensity = 0.03
gear_buffet_intensity = 0.15
buffeting_intensity = 20%
buffet_aoa = 12
stall_aoa = 16
```

If we inspect the config further, we are enabling the engine rumble effect and defining the characteristics of the effect. The 2 RPM and 2 intensity settings work together to define how the effect behaves. At the 'lowrpm' value, the rumble effect will be played at an intensity of %6. As the RPM increases, the intensity will decrease proportionally all the way up to the 'highrpm' value, where the intensity will reach just %3 intensity. Note that these are not floor values. If the RPM drops below 650, the intensity

will increase above %6. Similarly, if the RPM goes above 2800, the intensity will continue to decrease below %3.

Next, we have set the gear buffet effect to %15 intensity. This effect will be played when the gear are extended (proportionally increasing as the gear extend further from stowed to full).

We are also setting the buffeting intensity to %20. Note that you can give the intensity values as either a decimal value 0.00-1.00 or as a percentage 0%-100%.

Lastly we define the buffeting characteristics of the aircraft. The buffeting will begin to occur when the AngleOfAttack reaches 12 degrees. The intensity of the buffetting will start very low and will continue to increase up to %20 at an AoA of 16 degrees. Note that in the case of this particular effect, the intensity value is a ceiling. The intensity will not increase beyond 20%.

All remaining effects that apply the generic and propeller aircraft types will use the default values at the top of the config file

4.1.6.4. Config files other than 'config.ini'

While the default 'config.ini' will be loaded on startup, it is possible to use a different config file. This can be useful if you are using additional VPforce enabled devices and want or need to have different effects settings for the different devices.

Simply pass the config file name with the '-c' argument. For example:

```
VPforce-TelemFFB.exe -c pedals.ini
```

4.1.6.5. Auto-loading custom VPForce FFB Configurator profiles

Sometimes it is desirable to have different settings in your VPForce FFB Configurator for different types of aircraft or a specific aircraft. This can be accomplished in TelemFFB dynamically when the aircraft loads. In your TelemFFB user config file, you can add a

“vpconf=” to any sim, aircraft type or specific aircraft section. Normal configuration hierarchy applies.

For example, in the following config excerpt, there are unique vpconf profiles defined at the sim level, the Helicopter category level and a specific aircraft level.

- If the DA-62 is loaded, TelemFFB will call the configurator CLI tool and load the ***da62.vpconf*** profile.
- If any MSFS aircraft that is identified as a helicopter is loaded, it will load ***helicopter.vpconf***
- If any other MSFS aircraft that does not match the two above cases is loaded, it will load the ***default.vpconf*** profile.

Upon successful loading of the profile, you will hear your Rhino beep (as long as the buzzer is not disabled

***** Note that the path is relative to the installation folder where the VPforce_FFB_Configurator executable is.***

```
[MSFS2020]
      type=Aircraft
      vpconf='./configs/default.vpconf'
[MSFS2020.Helicopter]
      vpconf='./configs/helicopter.vpconf'
[DA62.*]
      type=PropellerAircraft
      vpconf='./configs/da62.vpconf'
```

4.1.7. Effects Documentation (Stable)

This section attempts to document and explain each of the effects and their settings. It is a work in progress.

A majority of the effects will apply to both DCS and MSFS. Where applicable, each effect setting has a comment in-line with the default setting to indicate which simulator(s) it applies to.

4.1.7.1. Generic Aircraft Effects (applies to all (or multiple) aircraft types)

4.1.7.1.1. G-Force Loading Effect

Only applies to fixed-wing aircraft

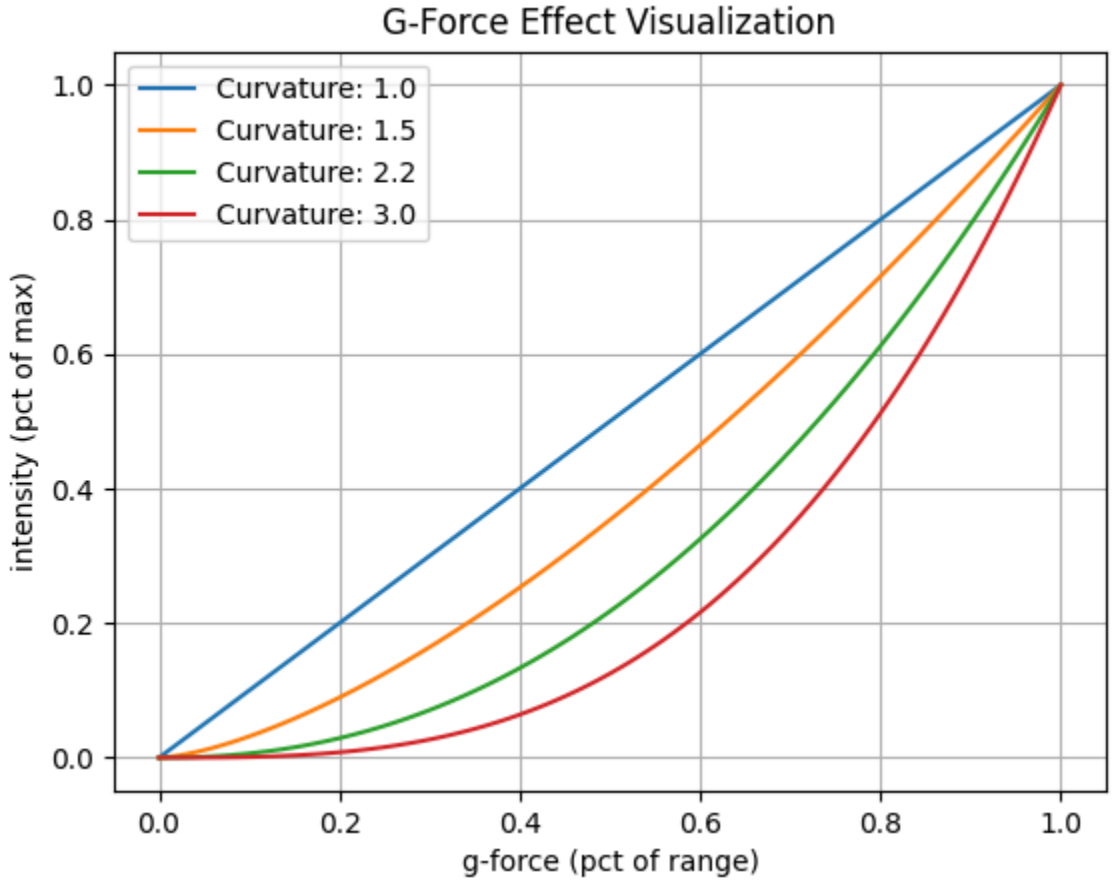
DCS Only (MSFS has built in G forces in the TelemFFB stick force implementation)

The G-Force loading effect simulates the increasing force that is required to pull back on the stick as the g forces increase during a dive pull-out or hard turn.

```
## G force effect will increase the spring force against movement as the G-loading on the aircraft increases
## Keep a firm grip on stick while enabled.  Do not be surprised if the temperature of your y-axis motor skyrockets when
## using this effect
gforce_effect_enable = yes                                                                          # DCS
gforce_effect_curvature = 2.2          #adjust the onset characteristics of the effect              # DCS
gforce_effect_max_intensity = 100%                                                                  # DCS
gforce_min_gs = 1.5                    # G's where the effect starts playing                        # DCS
gforce_max_gs = 6.5                    # G limit where the effect maxes out
```

- `gforce_effect_enable` (yes/no)
  - enable or disable the effect
- `gforce_min_gs` (1.0 or greater)
  - the g loading where the effect will start playing
- `gforce_max_gs` (greater than gforce_min_gs)
  - g loading where the strength will reach ‘gforce_effect_max_intensity’
- `gforce_effect_max_intensity` (0.0-1.0 or 0%-100%)

- the maximum force applied in relationship to the constant force slider in VPforce configurator

- `gforce_effect_curvature` (1.0 or greater)
  - affects the onset characteristics of the force effect. A value of 1.0 is a linear increase in force across the defined g range. Increasing the curvature value will result in a flatter increase at the beginning of the range followed by an ever increasing force as the effect approaches the top of the range.
  - Example values (default is 2.2)
  - 

4.1.7.1.2. Deceleration Effect

Monitors the deceleration g-forces on the aircraft and, if the aircraft is on the ground will apply a forward force (away from pilot) equal to the deceleration G force up to, but not exceeding 'deceleration_max_force'.

- deceleration_effect_enabled (yes/no, on/off, 1/0)
  - Enable/disable the effect
- deceleration_max_force (0.0-1.0)
  - Controls the maximum force that can be applied

4.1.7.1.3. Damage Effect (DCS)

Plays a short random direction, random intensity bump each time damage is detected on the aircraft.

**** Can potentially cause performance impact due to large number of calculations required in export script for some aircraft **** Written in a way that will only execute the code in the export script if the feature is enabled in TelemFFB.

- `damage_effect_enabled` (yes/no, 1/0)
  - Controls whether the effect is enabled (both in TelemFFB and the calculations in TelemFFB.lua export script)
- `damage_effect_intensity` (0.0-1.0, %0-%100)
  - Controls the intensity of the generated effects. Note that with the randomized nature of the intensity, some hits will be lower and some higher than the defined value

4.1.7.1.4. Damage Effect (IL-2)

Plays a short random direction, random intensity bump each time damage is detected on the aircraft.

- `damage_effect_intensity` (0.0-1.0, %0-%100)

- Controls the intensity of the generated effects. Note that with the randomized nature of the intensity, some hits will be lower and some higher than the defined value

4.1.7.1.5. AoA Buffeting

4.1.7.1.6. Runway Rumble/Touchdown

4.1.7.1.7. Weapons and Countermeasure deployment

4.1.7.1.8. Speedbrake Motion and Buffeting

4.1.7.1.9. Gear Motion and Buffeting

4.1.7.1.10. Flaps Motion

4.1.7.1.11. Canopy Motion

4.1.7.1.12. Spoiler Motion and Buffeting

4.1.7.2. Propeller Aircraft Specific Effects

4.1.7.2.1. Engine Rumble

4.1.7.3. Jet Aircraft Specific Effects

4.1.7.3.1. After Burner Rumble

4.1.7.3.2. Jet Engine Rumble

4.1.7.3.3. AoA Reduction Effect

Simulates the increased forward stick pressure that is applied on some fighter aircraft when a critical angle of attack is exceeded. The effect will monitor the AoA and apply a linear force, up to the maximum defined value starting at the ‘start’ AoA and maxing out at the ‘max’ AoA.

- `aoa_reduction_effect_enabled` (yes/no, 1/0)
- `aoa_reduction_max_force` (0.0-1.0, %0-%100)
- `critical_aoa_start` (AoA in degrees)
- `critical_aoa_max` (AoA in degrees)

4.1.7.4. Helicopter Specific Effects

4.1.7.4.1. ETL Transition and Overspeed Shake

4.1.7.4.2. Helicopter Rotor/Engine Rumble

4.1.7.5. Turboprop Specific Effects (MSFS)

None as of yet

4.1.7.6. Glider Specific Effects (MSFS)

4.2. WiP/Development Version

As of January 2024, a new UI with many enhanced capabilities has been implemented. The new UI supports dynamic configuration changes using simple checkboxes, gain slider and options pull-down boxes.

4.2.0.1. Important differences from previous WiP (now stable) Release

Previous versions of TelemFFB used a flat '.ini' style configuration model. Each setting was manually configured with an enable/disable flag and associated strength value.

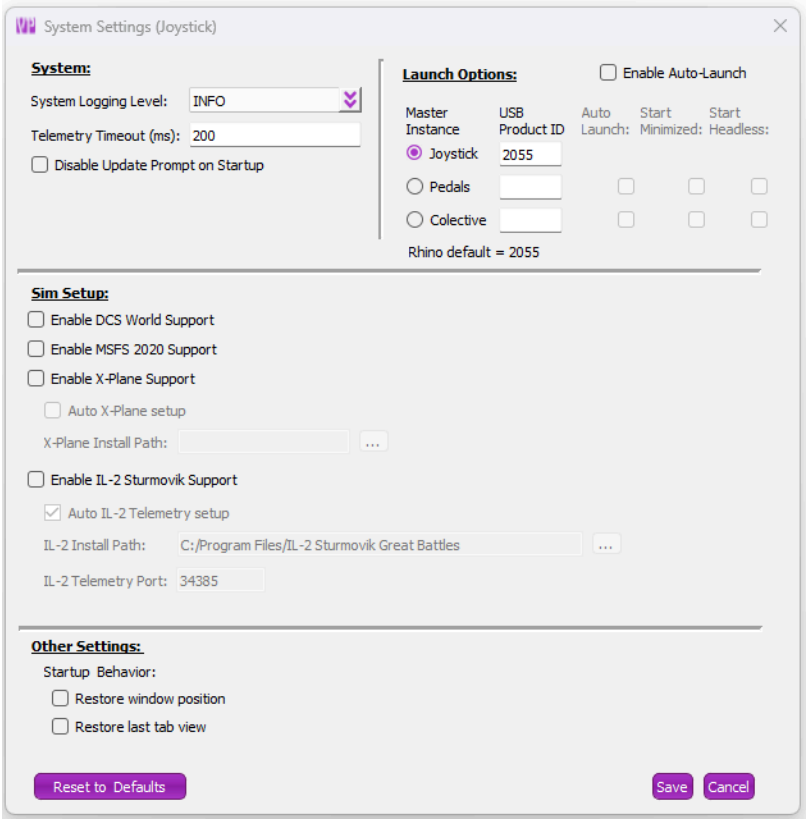
- Versions of TelemFFB from the development branch after January, 2024 make use of a UI based configuration model which abstracts the complexity of the configuration from the user. Enabling/Disabling and adjusting effects is a simple matter of interacting with the UI.
    - If you were previously using a 'user config override file', Telem FFB will detect this and you will be prompted on whether you want to convert your previous settings to the new settings model. See the Migration section for details.
- TelemFFB system settings are now stored in the system registry at the following key location:
  `Computer\HKEY_CURRENT_USER\Software\VPforce\TelemFFB`
- The user configuration file and log files will be auto-generated and are located in:
  `%LOCALAPPDATA%\VPForce-TelemFFB`
    - It is no longer necessary to use the '-c' or '-o' options to specify an override file. The user override file is automatically managed by TelemFFB.
    - You can access the config/log folder from the **System** menu in TelemFFB
- While the legacy '-D' and '-t' runtime flags are still supported, they are generally no longer required. You can use the options to start an instance of TelemFFB for a

specific physical device and/or device type, however it will be far more common to use the auto-launch setup if you have multiple FFB devices.

4.2.1. First-Time Setup

4.2.1.1. New Installations:

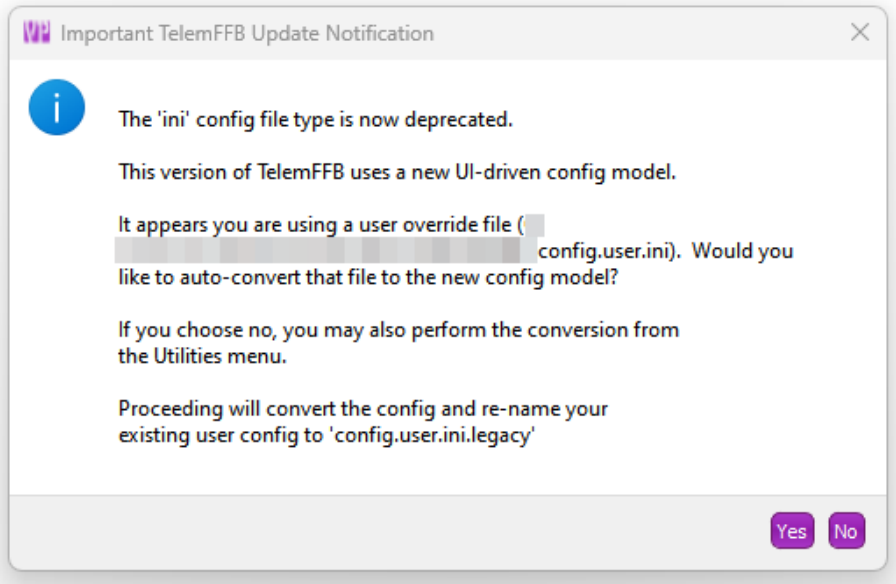
The very first time you install and launch TelemFFB, you will be greeted by the system settings window. Follow the guidelines in the systems setting section for setting up TelemFFB.



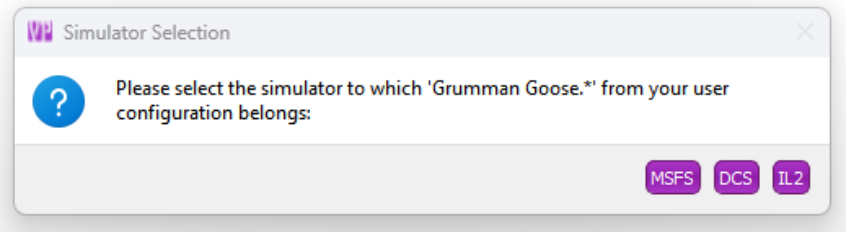
4.2.1.2. Migration from Previous WiP/Development Versions

If you were previously using a user config override file, whether it be the default “config.user.ini” or if you were passing another file using the ‘-o’ runtime flag, TelemFFB

will detect this and offer to convert your previous settings into the new settings framework. If you have multiple devices, you will have to perform this on each one. It all gets saved into the single userconfig.xml file. If there are existing settings saved already, this will append to them. If an existing setting is for the same sim, setting name, and device then the existing value will be overwritten.



During the conversion, you will be prompted to identify the applicable simulator for any non-default aircraft that the conversion script finds.

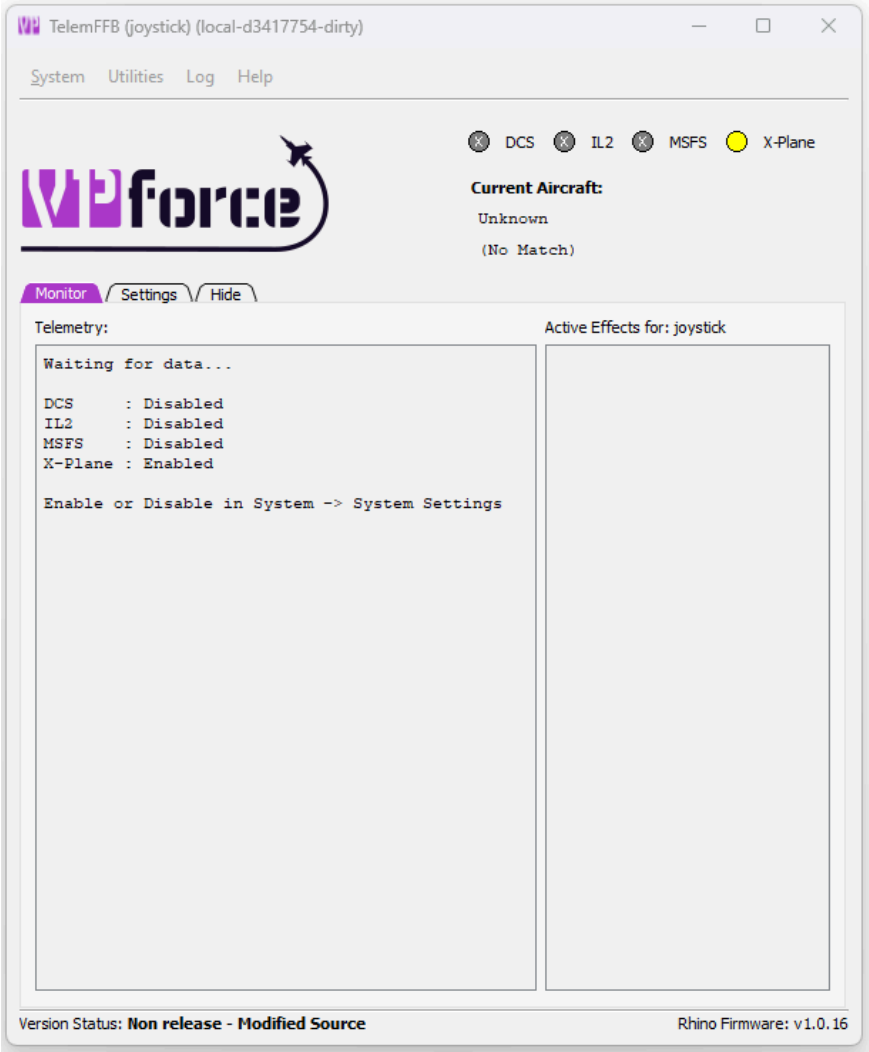


After all of your configuration has been converted, you will see the following dialog.

Following the conversion process, if this is the first time you are starting the new version of TelemFFB, you will be greeted by the system settings dialog for initial setup. Follow the guidelines in the systems setting section for setting up TelemFFB.

4.2.2. General Application Overview

TelemFFB is laid out with a menu bar, a simulation status area and the view tabs at the bottom. Refer to the sections below for details on each.



4.2.2.1. Sim Status Area

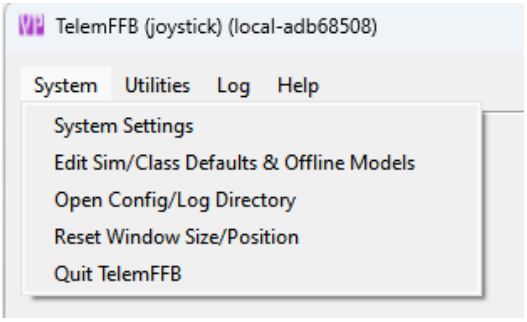
The colored circle icons show the status of receiving telemetry from those sims:

Sim Disabled	Sim Enabled, Waiting for Data
Receiving Telemetry from Sim	Receiving Telemetry, Sim Paused
Error condition exists (check log)	

You can also view the currently loaded aircraft as well as the ‘match string’ for the settings that were loaded.

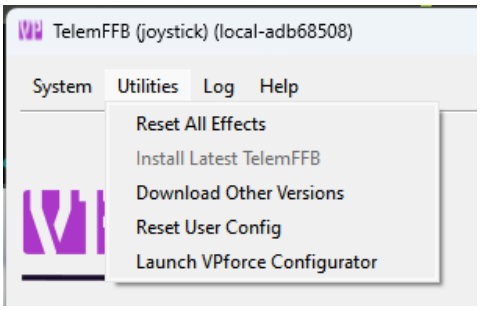
4.2.2.2. The Menus

4.2.2.2.1. System Menu



- **System Settings** - covered here
- **Edit Sim/Class Defaults & Offline Models** - While the Settings tab of the main window allows you to edit the current aircraft, this settings editor allows you to see model settings for any aircraft, without the sim needing to be active, and also enables changing default settings that apply to an entire sim or class of aircraft. More detail is in a section below.
- **Open Config/Log directory** - opens the folder in your user local appdata where logs and settings are stored
- **Reset Window Size/Position** - resets to default
- **Quit TelemFFB** - closes the application and stops all effects.

4.2.2.2.2. Utilities Menu

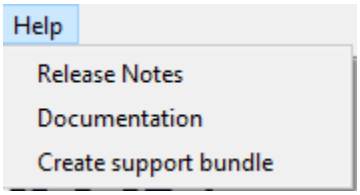


- **Reset all Effects** - Reset the VPforce device and clean up any lingering effects. **Note: Is destructive to any active effects being generated by a simulator.**
- **Install Latest TelemFFB** - Start the auto-update process. Only active if an update is available and the update prompt is disabled or was dismissed on startup.
- **Download Other Versions** - opens a webpage where you can select legacy versions to download.
- **Reset User Config** - Removes all user configured settings from TelemFFB and reverts to 'factory defaults' for all effects settings. Note that when this is executed, a date-time stamped backup of the existing user configuration is saved in the TelemFFB folder in AppData/Local
- **Launch VPForce Configurator** - Cross launches the VPforce configurator app to set up your device

4.2.2.2.3. Log Menu

- Open Console Log - Open the log window

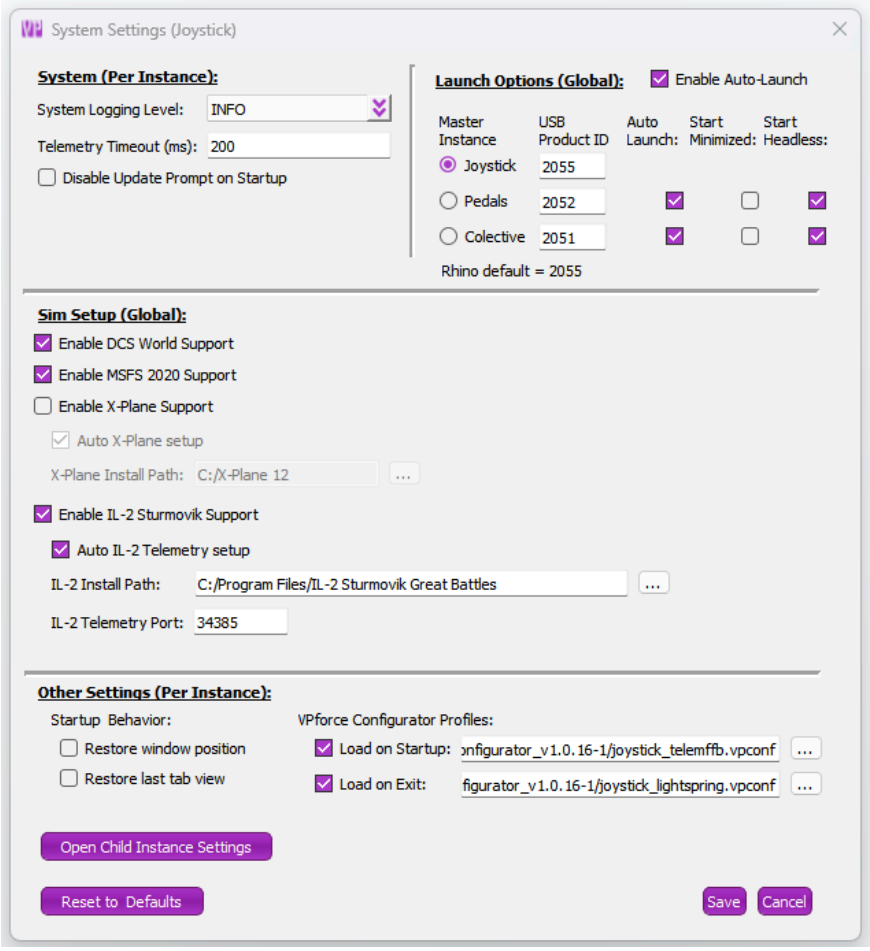
4.2.2.2.4. Help Menu



- **Release Notes** - shows any release notes for this version of TelemFFB
- **Documentation** - opens this manual
- **Create Support Bundle** - Opens a file dialog and creates a zip file containing your TelemFFB system settings, any user settings you have stored, and your Log folder..

4.2.3. System Settings

In the System Menu, choose System Settings:



4.2.3.0.1. System Options

These settings are unique per device instance of TelemFFB

- **System Logging Level**

- Control the logging level for an instance of TelemFFB

- **Telemetry Timeout**
  - Control the telemetry timeout value for an instance of TelemFFB
- **Update Prompt Control**
  - Enable/Disable the new-update prompt for an instance of TelemFFB when starting up.

4.2.3.0.2. Sim Setup Options

These settings are global for any instance of TelemFFB.

To enable a given simulator, simply tick the checkbox. The applicable telemetry engine will start automatically when the settings are saved. There is no need to restart TelemFFB.

For X-Plane and IL-2, TelemFFB needs to be told where the installation folder is so that it can perform the necessary plugin install (x-plane) or telemetry setup (IL-2). For X-Plane this is also important so that the plugin will stay up to date as needed if the plugin is updated between versions

4.2.3.0.3. Other Settings

These settings are unique per instance of TelemFFB

- **Restore Window Position**
  - When enabled, TelemFFB will remember where the window was positioned the last time it was run and restore the window to that same position
- **Restore Last Tab View**
  - When enabled, TelemFFB will remember the window size for each tab the last time it was run. It will also restore these sizes and remember the last tab that was viewed the last time it was run.
- **VPForce Configurator Profiles**
  - Define a profile to load on TelemFFB startup and/or exit

4.2.3.0.4. Launch Options

These settings are global for any instance of TelemFFB and affect how the application starts up and communicates with one or more FFB devices.

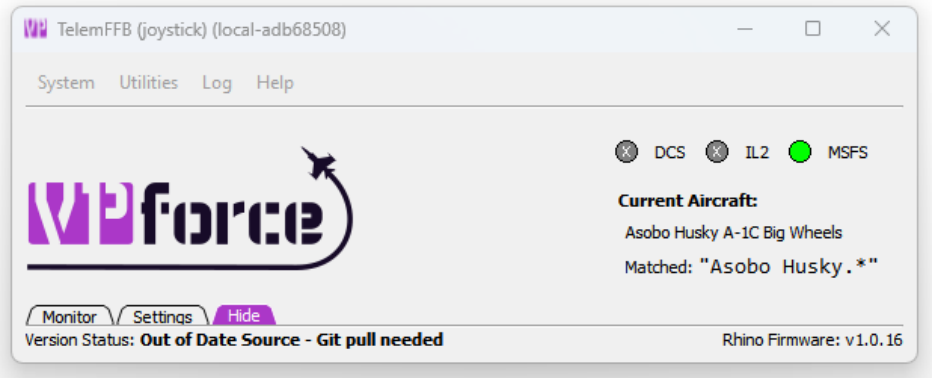
- Enable Auto-Launch
  - Tick this checkbox to enable the auto-launch feature which will start multiple instances of TelemFFB to communicate with multiple FFB devices. See the section on running with multiple FFB devices for details.
- Master Instance Radio Buttons
  - Independently of the auto-launch feature, the selected radio button defines the device that TelemFFB will connect to when it is launched with no device or type command line arguments.
  - When combined with the auto-launch feature, the selected device will act as the master instance for any additional spawned instances of TelemFFB.
- USB Product ID
  - Enter the USB Product ID that is configured for a given device (as configured in VPforce FFB Configurator)
- Instance Auto Launch Options
  - Auto Launch
    - Enable or disable auto-launching of an instance when the master instance loads.
  - Start Minimized
    - Start the selected instance with its window minimized
  - Start Headless
    - Start the selected instance with its window hidden (can be revealed from the master instance **window** menu)

4.2.4. Application Tabs

The main window has tabs to show different views or perform different tasks: Monitor, Settings & Hide.

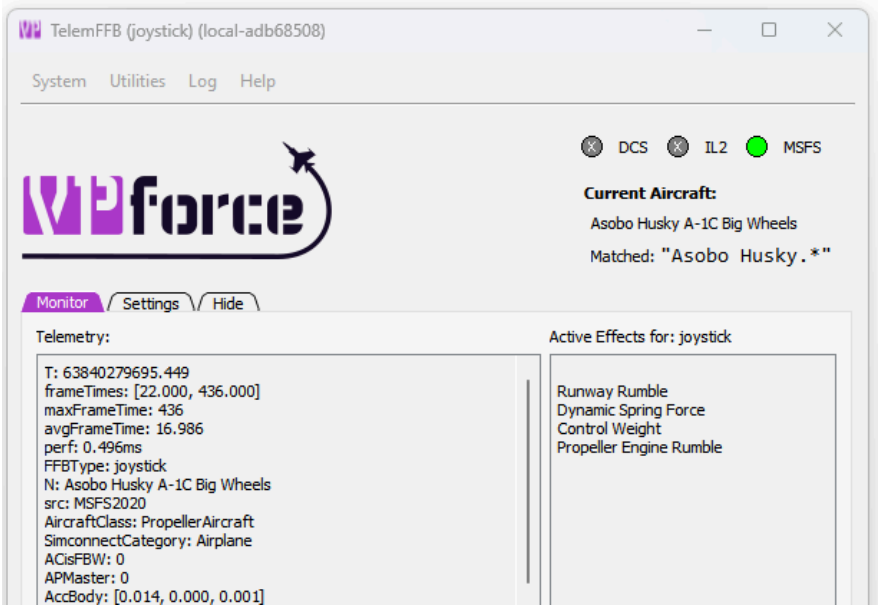
4.2.4.0.1. Hide Tab

The Hide tab is the simplest and reduces information shown to the bare minimum:



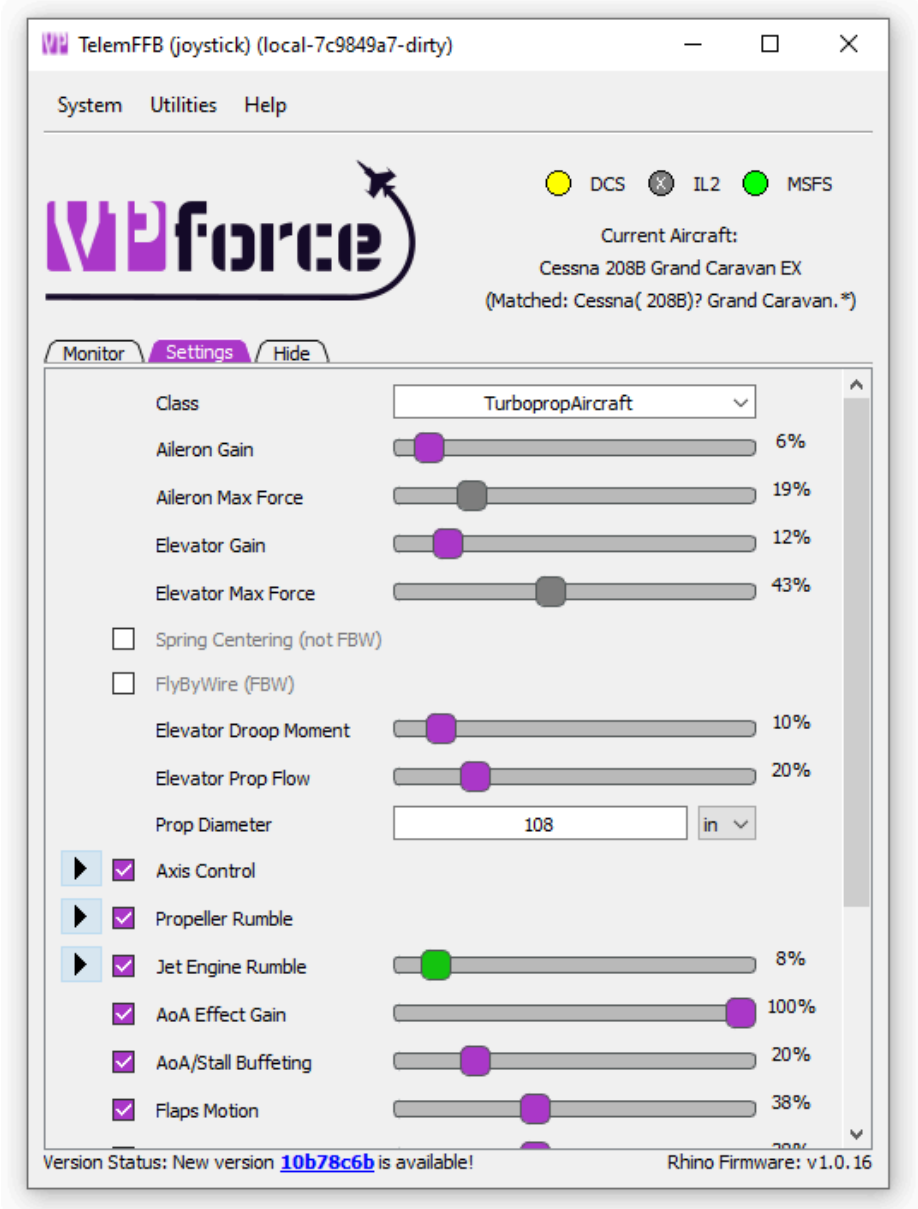
4.2.4.0.2. Monitor Tab

The Monitor tab shows received telemetry data and effects that are currently active:



4.2.4.0.3. Settings Tab

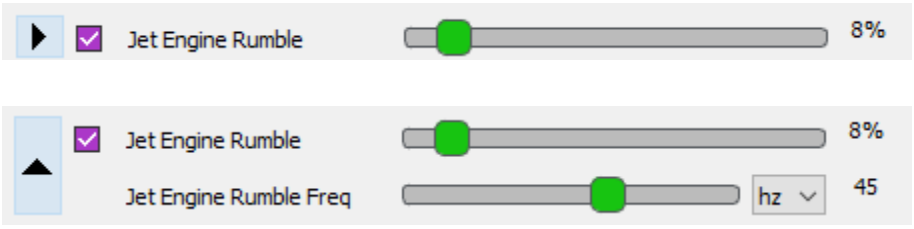
The Settings tab allows you to edit all possible forces and effects for the current aircraft loaded in the simulator. This section describes the interface, details about each setting are in other parts of the manual. Changing any setting has an immediate effect. To edit the global settings for a simulator, aircraft category or an aircraft which is not currently loaded in the simulator, you can use the Sim/Class & Offline editor



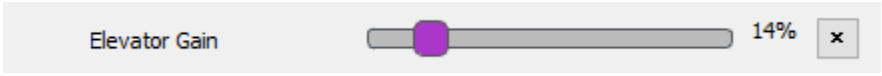
Sliders with no checkbox on the left are always active. Change the setting by dragging the handle to a new position, or **hold shift and use the mouse wheel**.

Effect sliders have a checkbox to enable or disable that effect. You can quickly toggle on/off an effect. When the setting is off, your intensity setting is retained. **The handle will also turn green when that effect is active**.

Some settings have additional parameters. You will see an expander button next to them. **Click the expander** to see additional settings, and again to collapse:



Any setting you have modified will show a 'x' icon on the right side. You can **click this icon** to return the setting to the default:



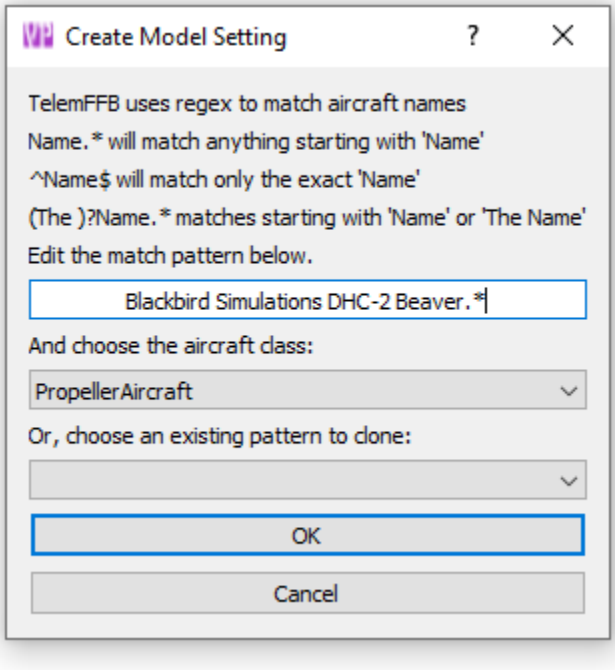
For settings where a unit is used, there is a dropdown of acceptable units:

Some settings require a grip button assignment before use. **Click the button** on the screen and then press the desired grip button before the timer expires:

4.2.5. Create new aircraft dialog

If you use a aircraft that has no default profile, you will see a reduced set of effects and the main window will appear like this:

Click on Create/clone config for new aircraft.



In this dialog, edit the name into a match pattern so that other liveries or variants of the same aircraft use these settings, select the type of aircraft it is, and click OK. Some guesses at a match pattern are provided in the dropdown box. You can also clone an existing profile if the aircraft is very similar. Then, adjust settings to suit.

4.2.6. Notable Sim Specific Info

4.2.6.1. MSFS and X-Plane

4.2.6.1.1. Trim and Autopilot Following

TelemFFB supports trim and autopilot following in MSFS and X-planes, with special caveats for MSFS.

In order for TelemFFB to emulate movement of the joystick/pedals in response to trim or autopilot inputs, it needs to be able to control the axis position that MSFS is seeing from the joystick device. This is required since these simulators have no concept of FFB or axis offsets and will interpret any intentional deflection of an axis as ***deflection of the control surface*** and not just a response to the trim input. This is counteracted in software by limiting the amount of physical movement of the joystick that is actually communicated to MSFS.

For MSFS:

Since MSFS does not have a specific override toggle for external axis control, this means that in order to use this feature of TelemFFB, ***you must unbind your joystick or pedal axes inside of MSFS***. Otherwise, the internal joystick position will conflict with what is being sent by TelemFFB.

For X-Plane:

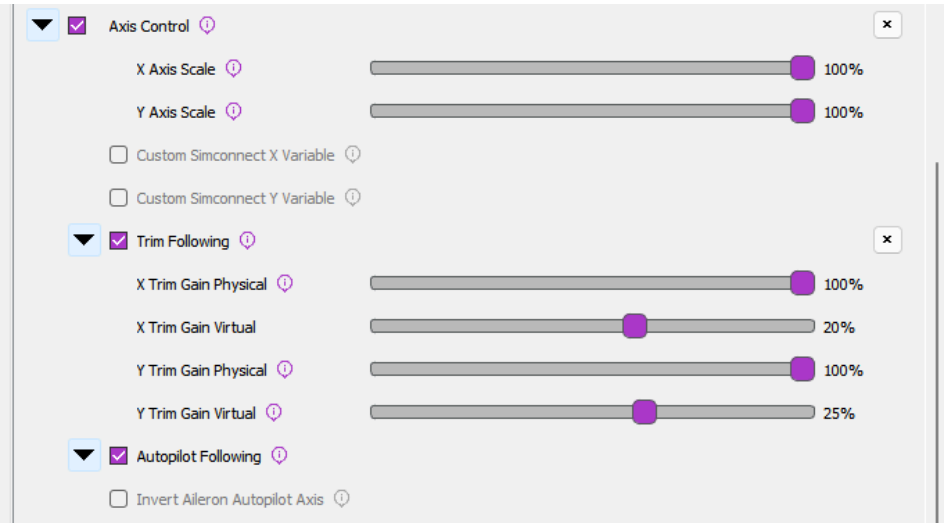
It is **not required to unbind your axes for X-Plane** since there are override toggles as part of the SDK. When the feature is enabled in TelemFFB, the axis is overridden.

To enable Trim and/or Autopilot following, simply enable the “Axis Control” feature and then in the sub-settings, enable Trim or Autopilot following accordingly.

Axis Scale: These sliders can be used to adjust the scale of the axis as sent to MSFS. A value of %50 will result in %50 control deflection in the sim with %100 physical deflection

Custom Axis Variables: Some aircraft do not use the standard simconnect events for their axes, or use custom LVAR variables. You can use these checkboxes to override the default variable that is sent or input a custom LVAR. Use "VARNAME" for simvars or "L:VARNAME" for LVARS

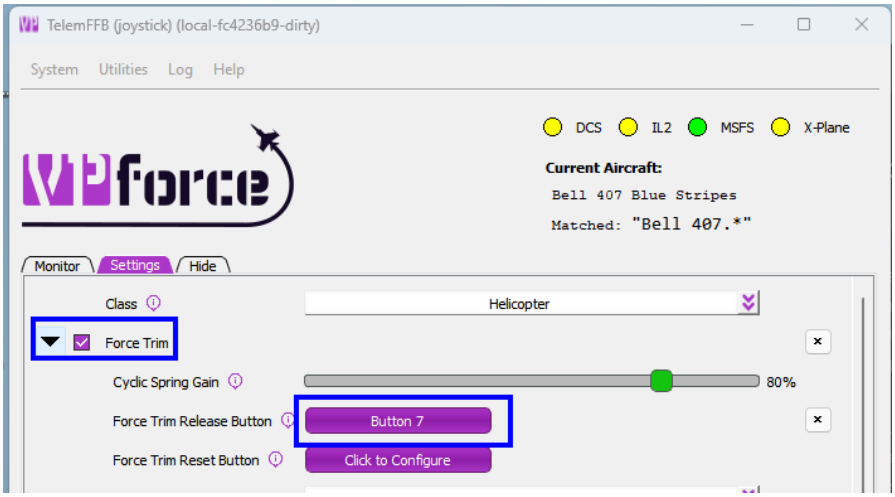
Trim Following Gains: For details on the X/Y Physical/Virtual trim settings, review the Trim and Autopilot Following legacy version documentation



4.2.6.1.2. Helicopter Force Trim

Helicopter force trim emulation is supported for both MSFS and X-Plane. To enable this feature of TelemFFB, enable the Force Trim checkbox and then in the sub-settings, configure a button on your joystick to serve as the trim release button.

Note: If you enable force trim, but do not set a button, you will see a  indiction for the simulator. The Trim Release button is mandatory, the Trim Reset button is optional.



4.2.6.1.3. (MSFS Only) - Special FFB Implementation for Hype Performance Group Airbus Helicopters

In collaboration with HPG, this implementation in TelemFFB was developed as a true-to-life representation of piloting the Airbus H145 and H160 aircraft.

The VPforce Rhino will work with the AFCS and act as the auto trim motor does, slowly moving the joystick as required to keep the SEMAs within their range of travel. The Rhino is also integrated with the force trim release system and the “hands on” spring override detection system. Force trim for hand-flying is also supported.

Both the Cyclic and Collective axes (if you have a VPforce powered collective) are integrated with the AFCS. The Tail Rotor axis is planned.

Excerpt from the HPG H145 user guide:

AFCS (Autoflight System)

The H145 autopilot is a comprehensive autoflight system, capable of both basic stabilization and also fully-hands-off upper modes. The system combines redundant Stability Augmentation Systems with redundant aircraft management computers, which take data from aircraft sensors and send commands to the actuators. The systems are monitored by and interacted with through the MFDs, Autopilot control panel (APCP) and controls on the cyclic and collective.

Background

The H145 flight controls are augmented by parallel actuators, called SEMAs (smart electro-mechanical actuator). These parallel actuators are invisible to the pilot (not felt in the controls) and are controlled by aircraft computers directly. The SEMA are quick and powerful but limited in travel. The total SEMA travel will be only 10% of the pitch axis and 20% of the roll and yaw axis. For this reason, the AFCS also needs the ability to re-center the SEMA. The A.TRIM (auto trim) system is able to receive commands from the AFCS computers and then slowly drive the trim motor in the requested direction. As the trims move, the pilot sees and feels their cyclic moving. It is for this reason that the A.TRIM system must be engaged to use UPPER MODES, as otherwise the saturation of the SEMA could not be automatically resolved by the computers.

As part of this implementation, there are certain requirements and recommended settings in the MSFS control bindings, the HPG Helicopter settings (iPad) and in TelemFFB.

VPForce Configurator Settings:

- You must ensure that there is enough spring force enabled in the profile to properly center the joystick
- If the joystick sags away from center due to grip weight or low spring force:
    - use the ‘balance springs’ feature to counteract the grip weight
    - use the ‘adaptive centering’ feature to assist bringing the stick to center position when you are not holding it.

TelemFFB Settings:

- **Axis Control** must be enabled.
    - This is required for both the Cyclic axes and the Collective axis (if you are using a VPforce powered Collective)
    - You must UNBIND the axes in MSFS
- **Force Trim** must be enabled
    - you must also set your force trim binding in the force trim sub-configuration in TelemFFB
- **Cyclic**
    - **Hands-On Deadzone**
    - **Hands-Off Deadzone**
- **Collective**
    - **Collective AP Spring Gain**
    - **Collective Dampening Gain**

MSFS Settings:

- You must **UNBIND** your Cyclic axes in MSFS to prevent conflicts with TelemFFB sending the axis position
- If using a VPforce powered Collective,
    - You must **UNBIND** your Collective axis in MSFS to prevent conflicts with TelemFFB sending the axis position
    - You must **BIND** a button on your collective to act as collective trim release. Pressing the trim release is required to manipulate the real helicopters collective and that is modeled in TelemFFB. The binding in MSFS is **`AUTOTHROTTLE DISCONNECT`**

HPG H160/H145 Settings:

Depending on the version of the helicopter you have installed, the tablet options may differ. Use the tablet settings below depending on what your tablet options look like.

Older Versions:

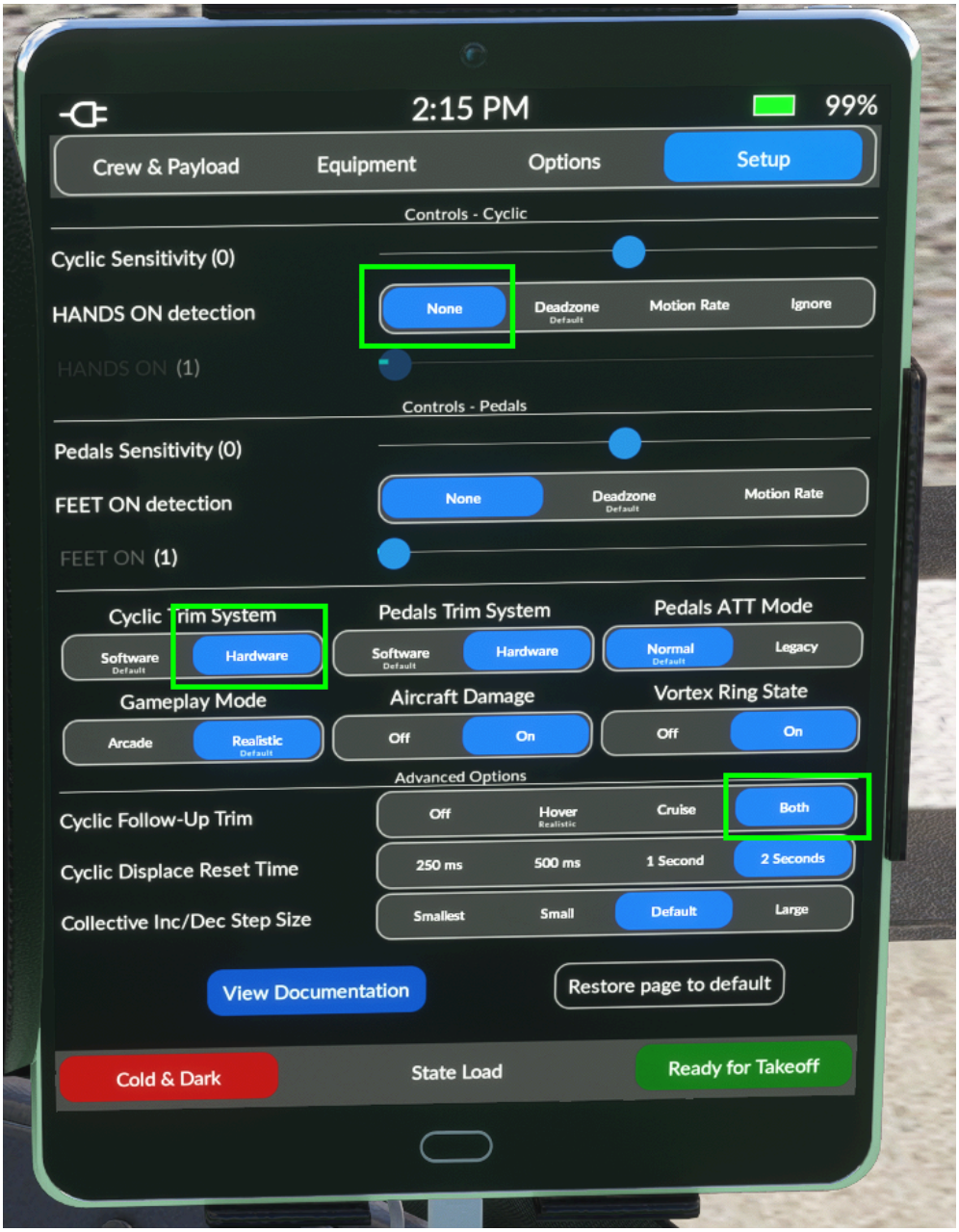
In the tablet settings inside the aircraft, the following must be configured for proper behavior:

- Cyclic:
  - Cyclic Control set to **'No Springs'**
  - Follow-Up trim set to **'OFF'** (you may need to temporarily enable Centering Springs to set this)
  - SAS Stability level
    - For the **H160**: between -80 and -60
    - For the **H145**: between -50 and -20
- Collective
  - SAS Stability level -100

Newer Versions:

Newer versions of the HPG helicopters have more options that assist with FFB implementations. You will want to set:

- Hands on Detection: **'None'**
- Cyclic Trim System: **'Hardware'**
- Cyclic Followup Trim: **'Both'**


2:15 PM
99%
Crew & Payload
Equipment
Options
Setup
Controls - Cyclic
Cyclic Sensitivity (0)
HANDS ON detection
None
Deadzone
Default
Motion Rate
Ignore
HANDS ON (1)
Controls - Pedals
Pedals Sensitivity (0)
FEET ON detection
None
Deadzone
Default
Motion Rate
FEET ON (1)
Cyclic Trim System
Software
Default
Hardware
Pedals Trim System
Software
Default
Hardware
Pedals ATT Mode
Normal
Default
Legacy
Gameplay Mode
Arcade
Realistic
Default
Aircraft Damage
Off
On
Vortex Ring State
Off
On
Advanced Options
Cyclic Follow-Up Trim
Off
Hover
Realistic
Cruise
Both
Cyclic Displace Reset Time
250 ms
500 ms
1 Second
2 Seconds
Collective Inc/Dec Step Size
Smallest
Small
Default
Large
View Documentation
Restore page to default
Cold & Dark
State Load
Ready for Takeoff

4.2.6.1.4. Low Hydraulic Pressure Effect

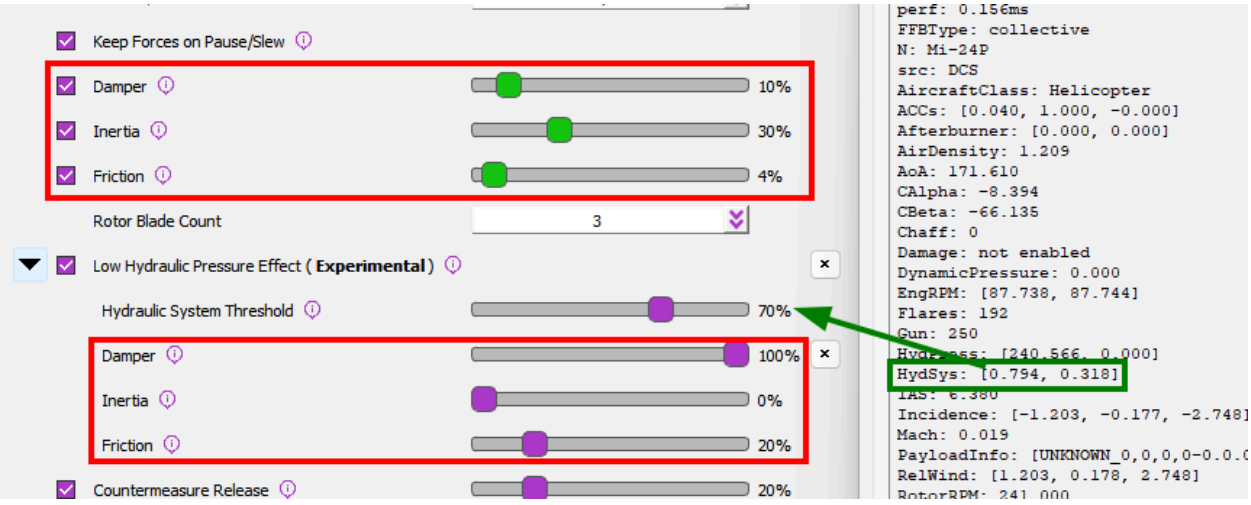
This effect allows the configuration of damper, inertia, and friction forces above and beyond those which are set by the base damper/inertia/friction settings in TelemFFB.

Note *In order for this effect to work, the Damper/Inertia/Friction effects must also be enabled.*

Note *Care must be taken when increasing these forces. Particularly with Inertia and Friction. Adding too much of these forces can quickly lead to motor instability issues, resulting in motor fault protection shutdown.*

***** Note**** *It is important to understand that all of these slider settings are limited by what is configured in the active VPForce Configurator profile. If your basic damper/inertia/friction forces are enabled at %100 in TelemFFB, there will be no room for the low pressure effect to increase them further.*

TelemFFB monitors the data in the "**HydSys**" telemetry and will linearly apply these effect values in place of the standard values between the threshold setting value and a 'HydSys" value of 0. If the HydSys value is a list, the effect uses the max value to determine whether or not the pressure is below the threshold.



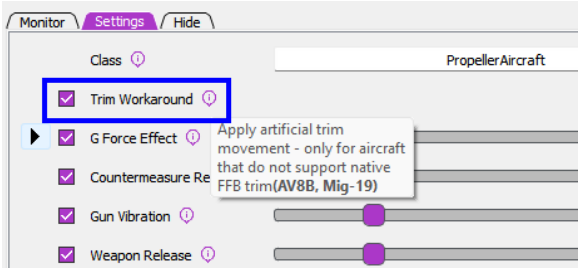
When setting the Hydraulic System Threshold setting for a new aircraft, you must first determine what "normal" is, by inspecting the **HydSys** telemetry value under normal

conditions. Then set the Hydraulic System Threshold slider to a value *less than* the normal operational value. If the HydSys value drops below the threshold, the effects force settings will begin taking effect.

4.2.6.2. DCS

4.2.6.2.1. Joystick Trim Workaround

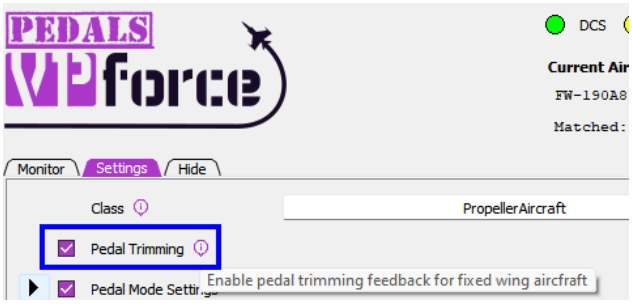
Some DCS modules do not properly implement joystick following for trim inputs. This feature mimics the trim movement by moving the physical joystick with the trim.
Note: When this setting is enabled, TelemFFB is overriding the axis position and sending it to DCS. As such, **the axis scaling, curve and inversion settings in DCS are overridden**



4.2.6.2.2. Pedal Trim Following

This setting will enable trim following for DIY Rudder pedals.

Note: When this setting is enabled, TelemFFB is overriding the axis position and sending it to DCS. As such, **the axis scaling, curve and inversion settings in DCS are overridden**

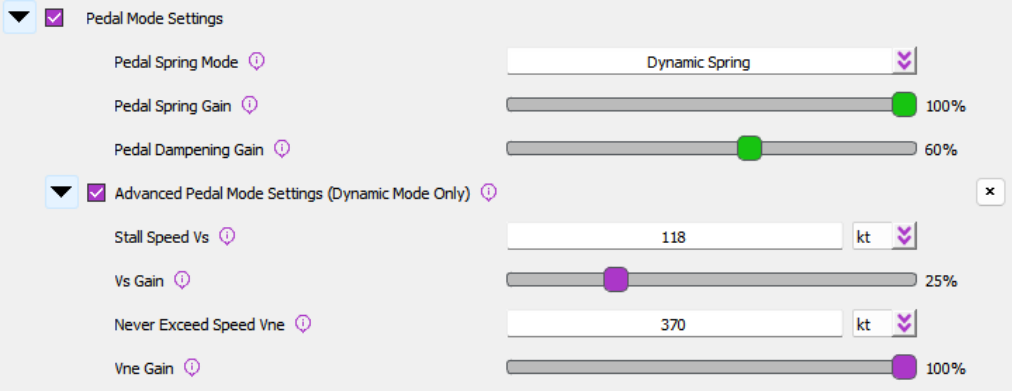


4.2.6.2.3. Pedal Mode

DCS does not natively support FFB pedals. TelemFFB has implemented basic FFB capabilities.

There are 3 pedal modes supported. Dynamic (default for warbirds), Static (default for jets) and No Spring (default for helicopters).

For Dynamic mode, there are advanced settings that are available for adjusting how the spring force is applied across the speed envelope of the aircraft.



4.2.6.2.4. Low Hydraulic Pressure Effect

See the documentation for this effect in the MSFS Low Hydraulic Pressure Effect Section above. The effect works largely the same way for DCS.

Support is currently limited to:

- UH-1, SA342, Mi-8, Mi-24, KA-50
- A-10C, AV-8B, F-14, F15ESE

The primary difference is that for each DCS aircraft, the telemetry must be individually sourced in a unique way per aircraft. As such, the supported aircraft are limited at this time. See the TelemFFB release notes for the supported aircraft.

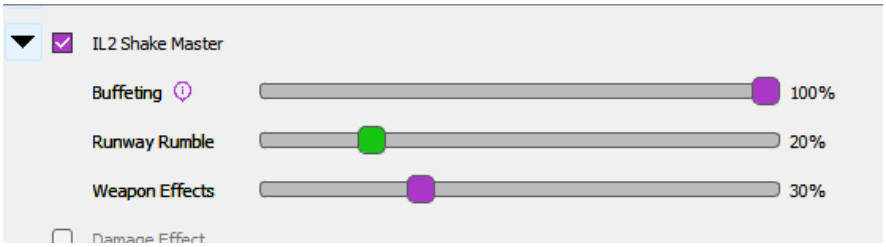
For DCS Aircraft, the Hydraulic System Threshold setting has already been coarsely configured for each of the supported aircraft, depending on how the data is being read and what the normal values are.

4.2.6.3. IL-2

4.2.6.3.1. Duplicate 'Shake' effects

IL2 implements FFB for dynamic stick forces and some very basic shake effects. TelemFFB implements duplicate (but far more configurable) effects which overlap with those that are implemented by IL2. To enable these specific settings, enable the "IL-2 Shake Master" setting in TelemFFB.

Note: It is recommended to set the "shake" intensity in the IL-2 FFB control settings to 0 if you enable these settings in TelemFFB.

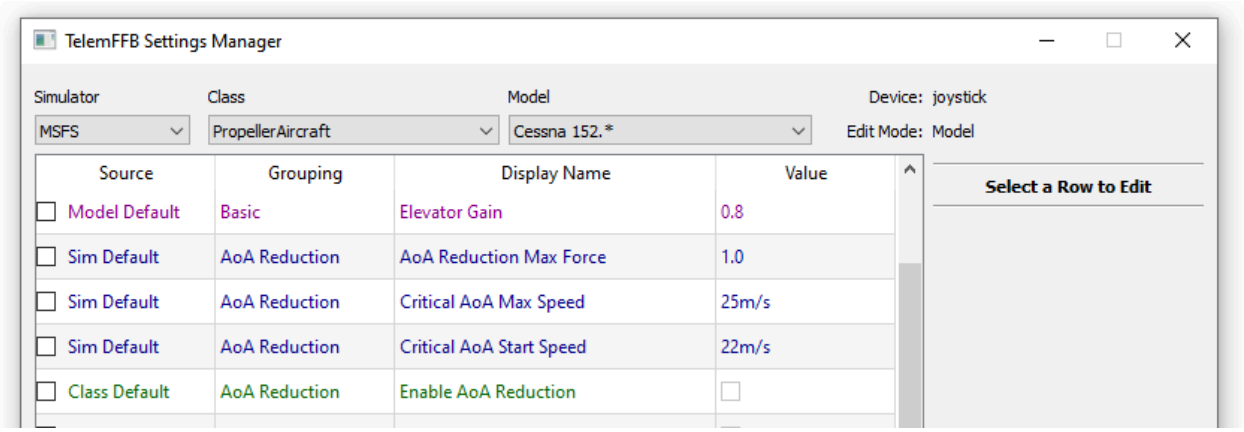


4.2.7. Offline/Global Sim/Class Configuration

While the main screen settings sliders are used for the currently loaded aircraft, you can change any of the default settings to apply to anything in that sim, any aircraft of that class, or previously stored individual model settings to your liking. From the **System** Menu, choose **Edt Sim/Class Defaults & Offline Models**.

TelemFFB settings are applied in a hierarchy: Simulator -> Aircraft Class -> Aircraft Model. A setting in a higher level will apply to the aircraft unless a lower level setting exists. Setting hierarchy is shown in the Source column, and by color- Sim settings are blue, Class settings are green and Model settings are magenta. The Source column shows where the current setting was read from in the hierarchy. It also shows whether it came from a default setting, or was changed by the user.

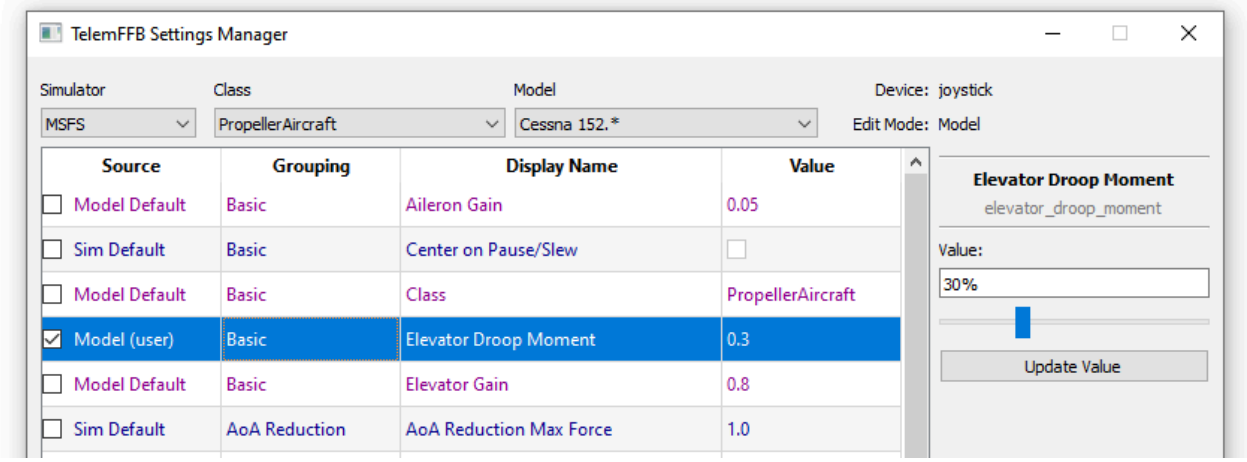
Interface



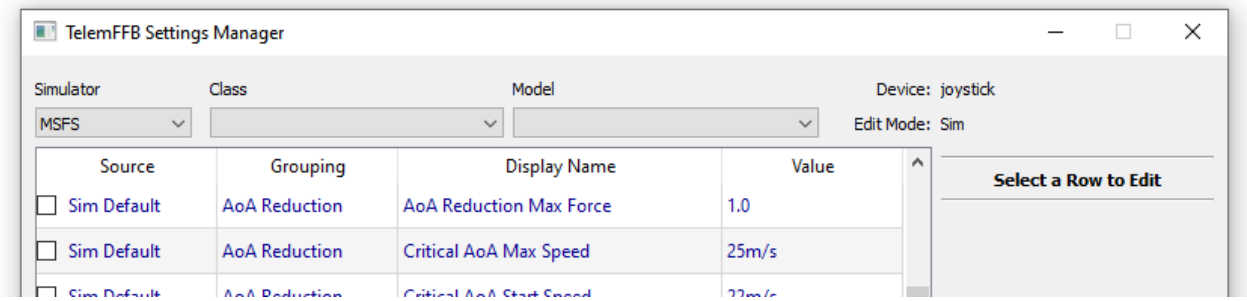
Across the top row are the dropdowns for Simulator, Class, and Model. You can change the dropdowns to edit other Simulator, Class or Model settings. In the property manager on the right side, you can drag the slider or type a new value in the box and click Update Value. The setting will apply immediately. The property manager interface will be slightly different for other datatypes such as a checkbox for enable/disable or dropdowns for valid values. Many options have some information to explain their usage.

Note the **Edit Mode**, shown in the upper right of the window. These modes allow you to edit the settings at that hierarchy level. You can change the Edit Mode by selecting another, or blanking out, the dropdown menus. When you change a setting in Sim mode, it will apply to all aircraft in that simulator. In Class mode, such as 'Helicopter', you are changing settings for all helicopters. In Model mode, you can override something that was set for Sim or Class, and is the mode that the main window works in.

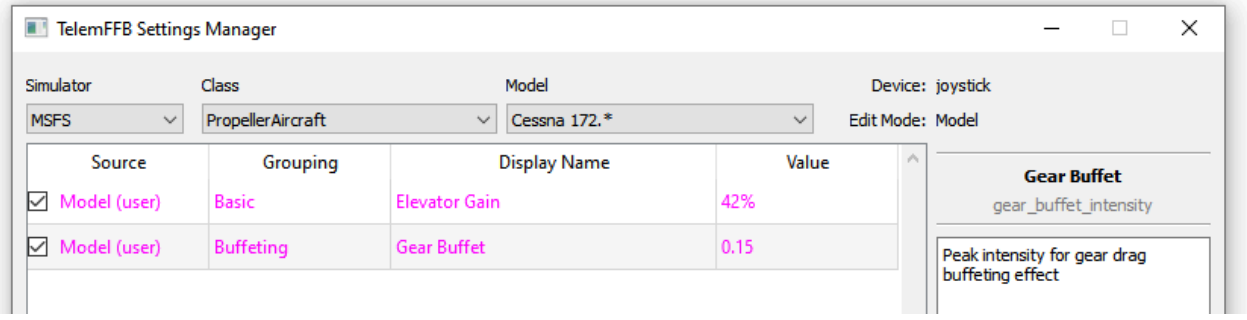
To change a default setting, it first must become a *user* setting (vs. a default setting). If you click on rows of default settings, you'll find that it has no effect. Click on the checkbox to turn any default setting into a user setting in that mode, and then it will be selectable.



Selecting a blank entry in class or model will show the defaults for the next higher category. Here, both class and model are blank, so we are editing **Sim** defaults:



The Show Defaults toggle on the bottom left will show/hide settings that are not user customized.



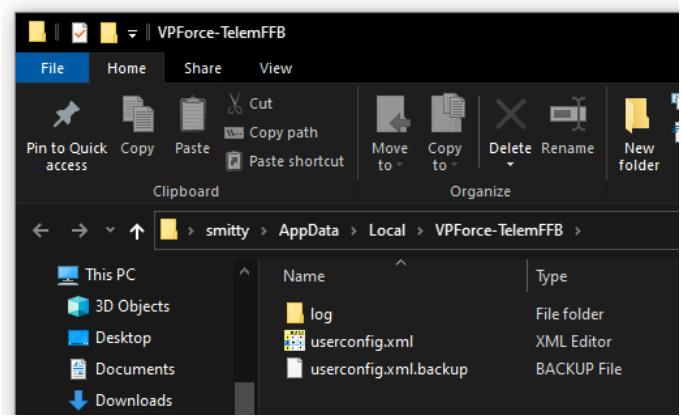
Also in the bottom left corner is a **Revert** button, which will restore any changed settings back to the moment that the Settings Window was opened. On the bottom row is a direct link to this section of this manual.

4.2.8. The userconfig.xml File

All user settings for all simulators (and all devices, if applicable) are stored in:

`C:\Users\{username}\Appdata\Local\VPForce-TelemFFB\userconfig.xml`

You can select the menu System..open Config/Log Folder in the main window to quickly open the folder. The xml file will be helpful to troubleshoot any issues. If you are getting support, it may be useful instead to create a support bundle using the option in the Utilities menu, and send that instead, as it will contain a complete package of your settings.



4.2.9. Running TelemFFB with multiple VPforce FFB devices

With the availability of the VPforce DIY kits, people are developing their own FFB devices such as rudder pedals, and even collectives. While DCS does not support FFB on the rudder or collective axes (nor MSFS or IL2), it is still possible to play all of the effects that TelemFFB offers through any VPforce device.

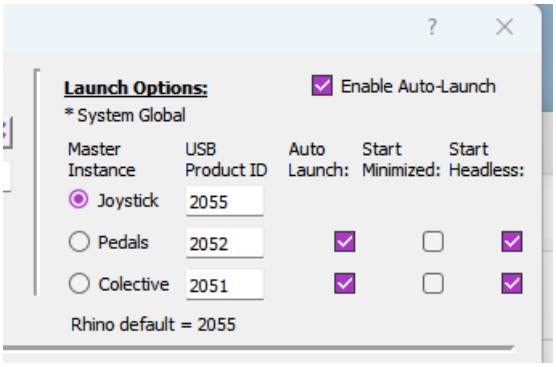
By default, TelemFFB attempts to connect to the VID:PID address that is specific to the Rhino Joystick Base. The VID for all VPforce control boards is 'FFFF'. The default PID

for the Rhino Joystick Base is ‘2055’. The PID can be viewed (and modified) in the VPforce FFB Configurator utility:

With previous versions of TelemFFB, it was necessary to start multiple instances of TelemFFB using ‘-D’ to specify the VID:PID and ‘-t’ to specify the device type (joystick/collective/pedals) and each configuration had to be maintained separately.

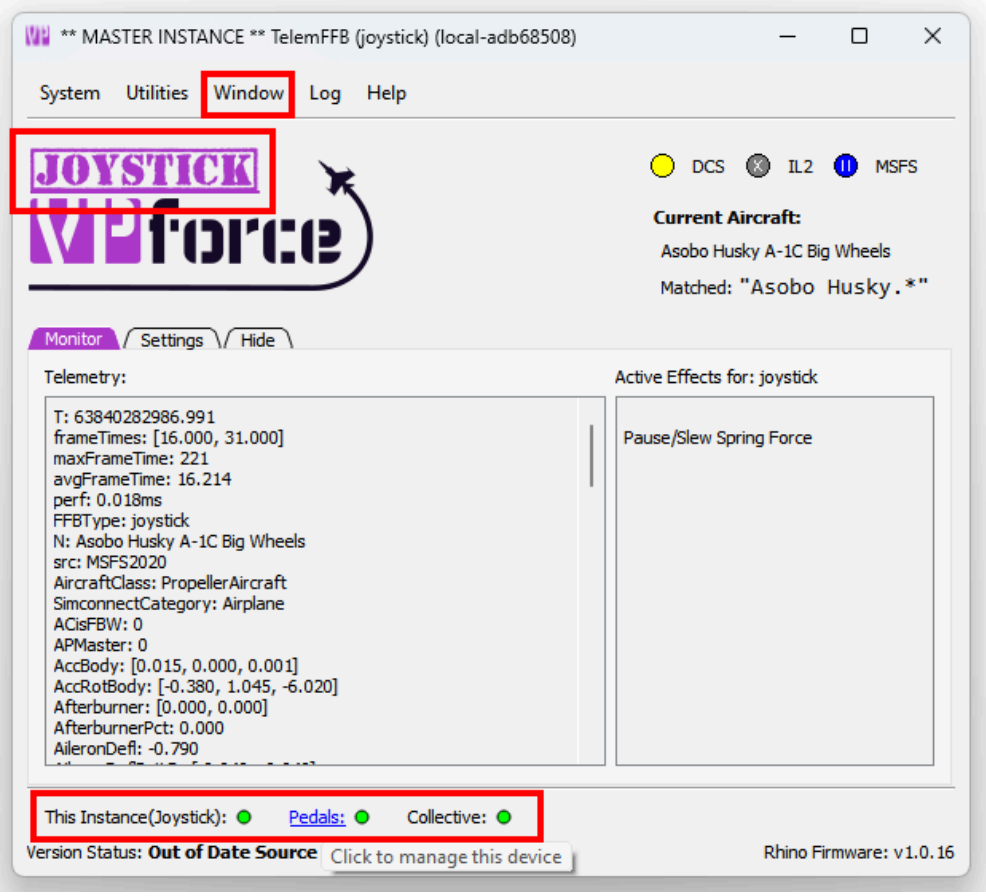
The whole process of running with multiple devices has been largely automated.

In the system settings Launch Options section, you can configure the PID values for each of your FFB devices.

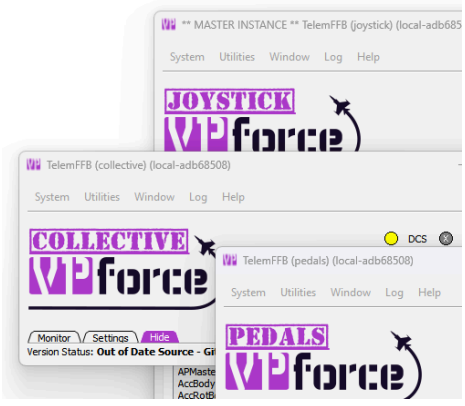


You can also choose which additional devices you would like to automatically launch when the master instance of TelemFFB is started. These additional child instances can be started in normal, minimized or headless modes.

After starting TelemFFB using the auto-launch mode, you will see a slightly different interface.



The first thing you will notice is the large device label. If you chose to launch the child instances with their windows shown, this is an easy indicator as to which instance you are currently looking at.



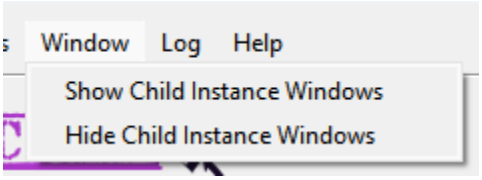
From the master instance, you can also use this label as a button to switch between the different child instance settings personas. Clicking on the label will switch the master

instance of TelemFFB between devices and allow you to adjust settings for that device. It will also update the active effects window to reflect the currently playing effects for that device.

The second difference is the instance status icons at the bottom of the window. These serve two purposes. The color of the dot (green or red) indicates the status of the inter-process communications between the master and child instances. If the icon turns red, that is an indication that there is a problem with the communication and that instance may have crashed.

You can also click on the device name to switch configuration modes for the master instance.

Lastly, there is an additional 'Window' menu that will allow you to show and/or hide the child instance windows.



5. Game Specific FFB Settings, Tips and Tricks

This section consists basically of a massive amount of collective knowledge in the community, from years of getting or trying to get force feedback to work in a variety of simulators. A lot of it concerns generic force feedback devices, but Rhino specific instructions are included where applicable.

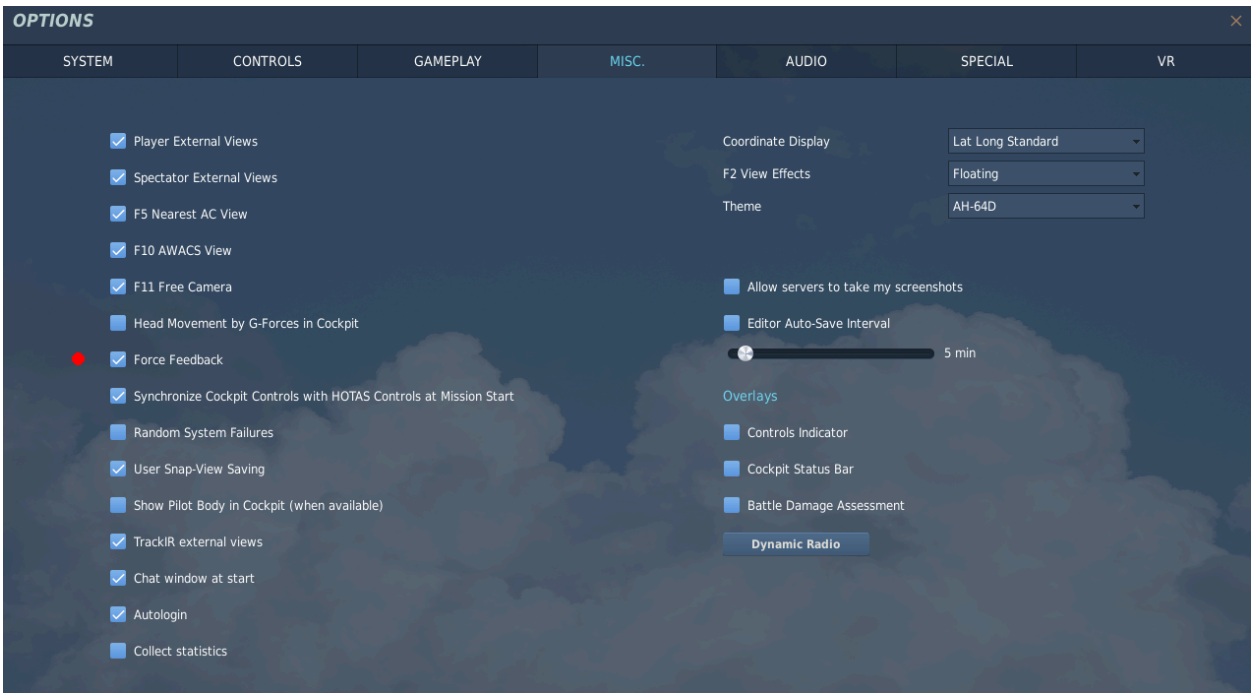
This section is expected to be updated somewhat regularly when it inevitably becomes necessary.

5.1. DCS World

DCS World is easy to get started with, because it offers native force feedback support through DirectInput. It's impossible to define a general level of force feedback support, though, because it varies so much based on the module. Generally the helicopters have force trim, warbirds model control stiffness from airflow (try getting one of your elevators shot off and enjoy the pleasantly light control feel), high AoA shake and weapons effects and the modern stuff varies from basically nothing at all to pretty good effects.

DCS offers fairly good data export, enabling projects like the TelemFFB to tap into the simulator and enhance the FFB experience - see the relevant section in this manual for more information.

The basic setup for Force Feedback is simple. Go to Options - Misc and enable Force Feedback as in the image below:



And that's pretty much it. The real work is in the modules, though, so it's not quite that simple.

DCS has some occasional glitches, such as force reversal, which seems to happen when the axis in question is reversed in DCS (can anyone confirm if this is systematically the case?). The nuclear option that is almost guaranteed to work is to set up the axis directions in the FFB Configurator software so that reversing them in DCS is not necessary. Note that this can create conflicts with other simulators, since reversing axis in the FFB Configurator reverses them everywhere.

DCS FFB Support varies based on aircraft types:

- **Warbirds**
  - Flight surface pressure depending on speed (stick is limp on ground, pressure builds up during takeoff)
  - Stall effect (buffeting)
- **Cold War Era**
  - Stick center offset (F-5E, A10C, F-14 ...)
  - Stick offset through trimming
  - Autopilot features take full control over the stick (Mig21 ...)
- **Helicopters**
  - Full force trim (stick offsets and hold in position)
  - Trim button released means forces are applied
  - Trim button depressed means forces are off (for maneuvering)
- **Modern Jets:**
  - standard stick functionality (spring effect)

5.1.1. General note on DCS Helicopter Force Trim settings

All of the DCS helicopter modules support force trim in one fashion or another. For *all* helicopters "Special" settings menu, you will want to choose the "**Instant**" or "**Default**" trimming option for the cyclic.

The settings names are somewhat confusing however and prior experience with the "instant" trimmer and non-ffb joysticks often leads new FFB users down the wrong path.

Without FFB enabled in DCS and with no FFB joystick, the "instant" trim mode results in an immediate doubling of the input when the trim button is released. This behavior changes when FFB is enabled.

On many helicopters there is also a setting that is usually called "**Joystick with no springs and FFB**". The actual intent of this setting seems to vary from helicopter to helicopter. For most helicopters it does not result in the desired behavior and the developers seem to have interpreted the meaning as "with no springs and with no ffb". In only one case (the KA-50) does it seem to behave the same as the "instant" mode.

However, in all cases, the "instant" or "default" trimmer modes will work with FFB.

Note that DCS does not support FFB pedals, even if many of the helicopter modules have pedal trimmer settings in the special menu. None of the pedal modes for any of the helicopters has been found to be of any use for FFB.

5.1.2. Setup tips for DIY FFB Pedals and/or Collective devices

DCS does not natively support any FFB devices other than joysticks. While you can connect and use other FFB devices (like pedals), DCS does not understand what these devices are and does not differentiate them from the X/Y axes that are part of the

joystick. DCS will broadcast all “FFB events” to all connected FFB devices with the assumption that they all behave like joysticks with x/y axes tied to the control surfaces.

What this means is that if your pedals (or collective) are connected to DCS and you adjust the aileron trim in an aircraft, the spring offset that is generated for your joystick will *also* be sent to your pedals X axis. Similarly for a collective type device, the Y axis conflicts with the Y (pitch) axis when it comes to receiving FFB events from DCS.

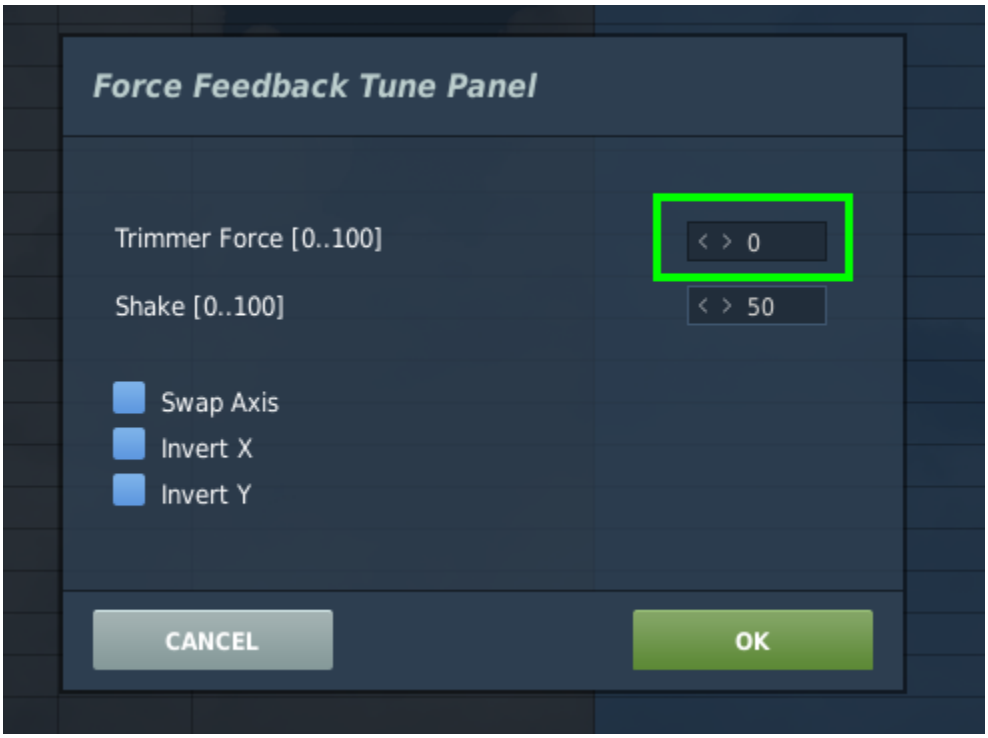
The VPforce TelemFFB application adds some basic pedal support for DCS (see section on TelemFFB).

The solution to this is to disable FFB trim forces for those devices in the DCS **“FF Tune”** menu. Many people don’t know these settings exist in DCS.

You can disable the FFB spring force per device, per aircraft in DCS. To do so:

- Enter the controls configuration for the aircraft and ensure that “**Foldable view**” is **unselected**.
- Select the column header for your pedals/collective
- Then select the ‘**FF Tune**’ button.
- In the resulting window, change the “Trimmer Force” value to 0 and apply
- Repeat for additional FFB devices and aircraft configurations.

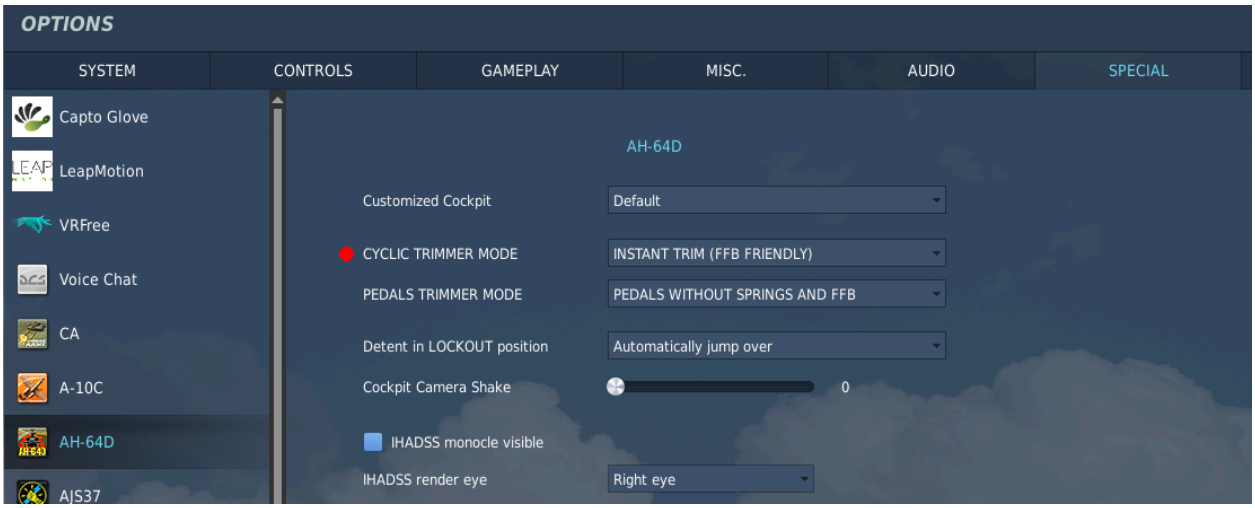

OPTIONS
SYSTEM
CONTROLS
GAMEPLAY
MISC.
AUDIO
SPECIAL
VR
F/A-18C
All But Axis Commands
Foldable view
Reset category to default
Clear category
Clear all
Load profile
Save profile as
Action
VPC Panel #2 {96E73C50-...
VP...
VPforce Rhino FFB Joystick...
VPforce Rhino FFB Pedals {433E17B0-0EE...
vJoy Device {2D2EA160-D...
LEFT VPC Throttle MT-50C...
Button Box interface {6E8
A/A refueling - "Ready for precontact" radio call
AAU-52 Altimeter Pressure Setting Knob - CCW/Decrease
AAU-52 Altimeter Pressure Setting Knob - CW/Increase
Aircraft Bank Left
Aircraft Bank Right
Aircraft carrier catapult camera
Aircraft carrier catapult crew camera
Aircraft Labels
Aircraft Pitch Down
Aircraft Pitch Up
Aircraft Rudder Left
Aircraft Rudder Right
ALQ-165 ECM Mode Switch - BIT
ALQ-165 ECM Mode Switch - CCW
ALQ-165 ECM Mode Switch - CW
ALQ-165 ECM Mode Switch - OFF
ALQ-165 ECM Mode Switch - REC
ALQ-165 ECM Mode Switch - STBY
ALQ-165 ECM Mode Switch - XMIT
ALR-67 BIT Pushbutton
ALR-67 DIS TYPE Switch - A
ALR-67 DIS TYPE Switch - CCW
ALR-67 DIS TYPE Switch - CW
ALR-67 DIS TYPE Switch - F
ALR-67 DIS TYPE Switch - I
ALR-67 DIS TYPE Switch - N
ALR-67 DIS TYPE Switch - U
ALR-67 DISPLAY Pushbutton
ALR-67 DMR Control Knob - CCW/Decrease
ALR-67 DMR Control Knob - CW/Increase
ALR-67 OFFSET Pushbutton
ALR-67 POWER Pushbutton - OFF
ALR-67 POWER Pushbutton - ON
ALR-67 POWER Pushbutton - ON/OFF
ALR-67 POWER Pushbutton: ON<>OFF
ALR-67 SPECIAL Pushbutton
All Labels
All missiles padlock
Altitude 2-pos Switch: BARO<>RDR
Altitude Switch - BARO
Altitude Switch - BARO/RDR
Altitude Switch - RDR
AMPCD Contrast Control Switch - DOWN
AMPCD Contrast Control Switch - UP
AMPCD Gain Control Switch - DOWN
JOY_BTN12
JOY_BTN11
JOY_BTN23
JOY_BTN25
JOY_BTN37
JOY_BTN69
Modifiers
Add
Clear
Default
Axis Assign
Axis Tune
FF Tune
Make HTML
Disable hot plug
Rescan devices
CANCEL
OK


Force Feedback Tune Panel
Trimmer Force [0..100]
< > 0
Shake [0..100]
< > 50
Swap Axis
Invert X
Invert Y
CANCEL
OK

5.1.3. AH-64D Apache

The AH-64D Apache by Eagle Dynamics basically only offers support for force trim - but it is a very nice feature indeed and one of the best uses for force feedback in simulators so it's well worth having and the implementation in the AH-64D is good.

To enable FFB trim for the RHINO, go to Options - Special - AH-64 and set CYCLIC TRIMMER MODE to INSTANT TRIM (FFB FRIENDLY). For once, a feature is basically what it claims to be.



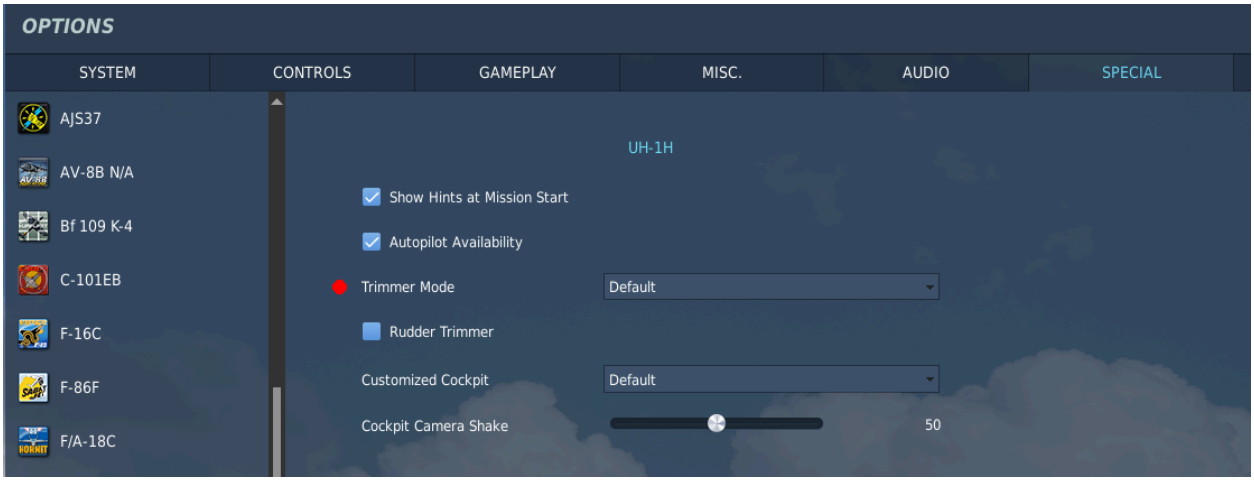
The PEDALS TRIMMER MODE option should be whatever best suits your hardware, it will have no effect on the RHINO.

Note that as in many other helicopters in DCS World, anything that affects the in-game cyclic will affect the RHINO. It is highly recommended to do the initial testing and any troubleshooting in a scenario where the aircraft is guaranteed to be intact, properly configured and ready to go.

5.1.4. UH-1H Huey

The UH-1H Huey offers the always useful force trim feature, like most other DCS helicopters. The implementation is good and well worth the effort.

To enable FFB trim for the RHINO, go to Options - Special - UH-1H and set Trimmer Mode to Default as in the picture below. The other modes are designed for non-FFB controllers.

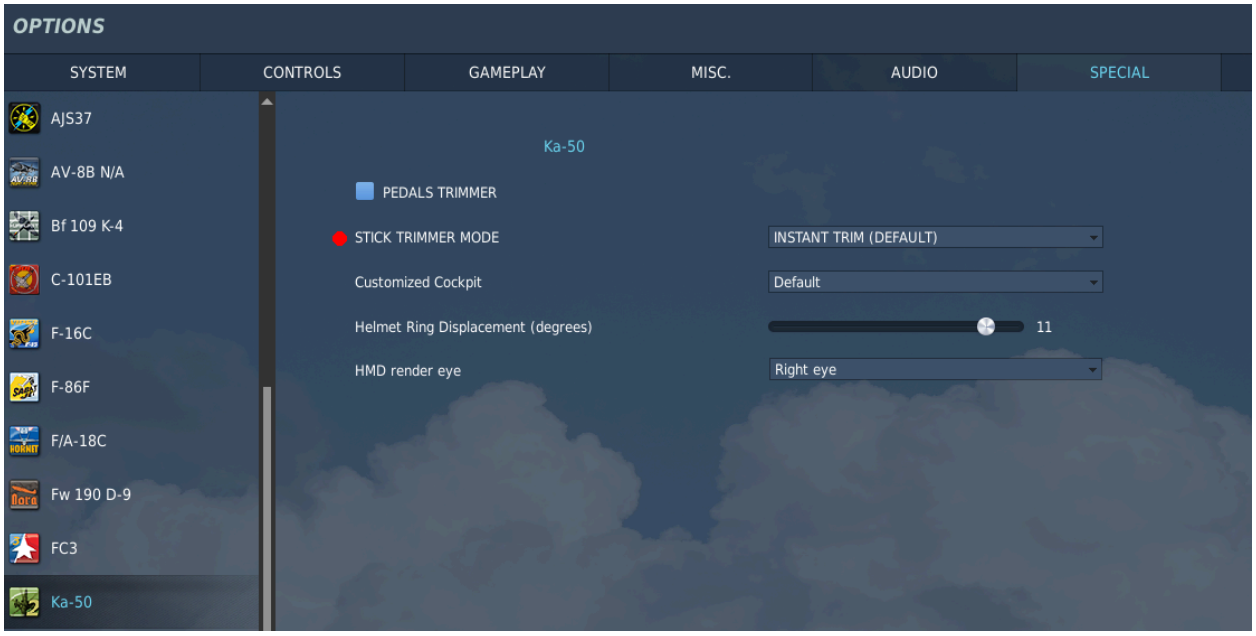


As with many other DCS helicopters, RHINO functionality is tied to the in-game cyclic functionality and if the aircraft is without power, configured incorrectly or broken, force trim won't work. Don't forget to turn on the force trim switch shown below:

It is highly recommended to do the initial setup or any troubleshooting in a scenario where the aircraft is guaranteed to be intact, correctly configured and ready to go.

5.1.5. Ka-50 Black Shark

As is typical to DCS helicopters, The Ka-50 offers force trim functionality, but no other effects. To enable force feedback for the Ka-50, go to Options - Special - Ka-50 and choose INSTANT TRIMM (DEFAULT) in the STICK TRIMMER MODE:

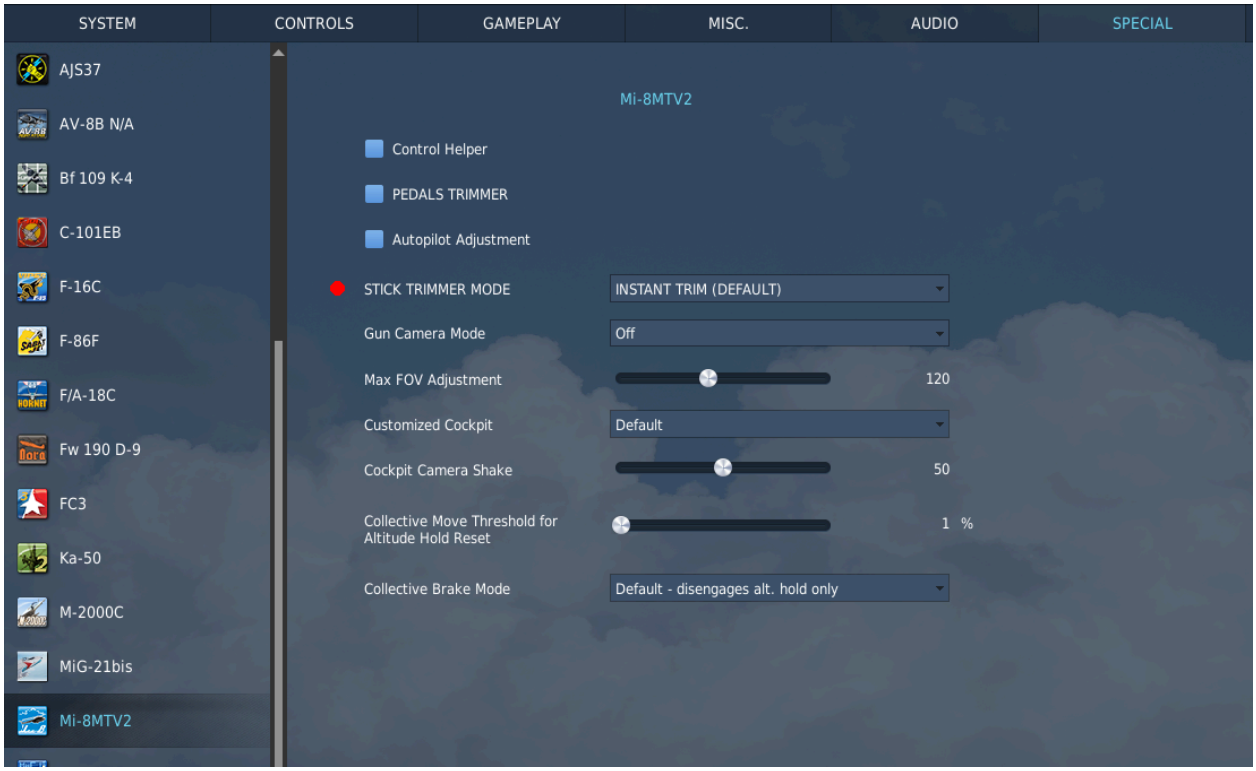


PEDALS TRIMMER has no effect on the Rhino. It seems that generally DCS helicopter trims default to correct force trim functionality and the extra options are different workarounds for non-FFB controllers.

Also typically, the Ka-50 force trim on the Rhino is dependent on what happens in the virtual cockpit, so make sure the aircraft is intact, powered up and ready to go before initial setup and testing.

5.1.6. Mi-8MTV2

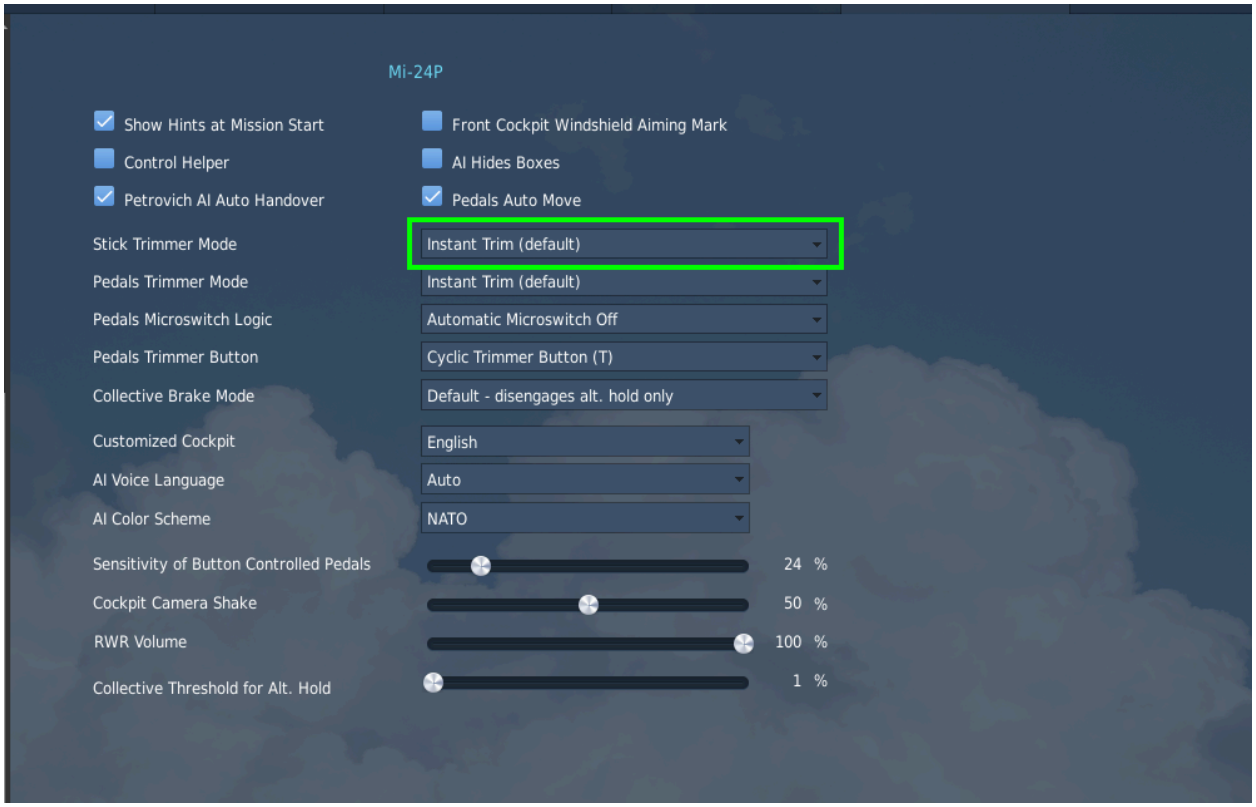
Just like the other helicopters so far, The Mi-8MTV2 offers a well working force trim option, but no other effects. To enable force trim, choose INSTANT TRIM (DEFAULT) as the STICK TRIMMER MODE as in the image below:



As usual, during the initial setup and for troubleshooting, make sure the aircraft is intact, powered up and ready to go. The Rhino force trim will mirror the in-cockpit one and won't work if the aircraft is not set up correctly

5.1.7. Mi-24P Hind

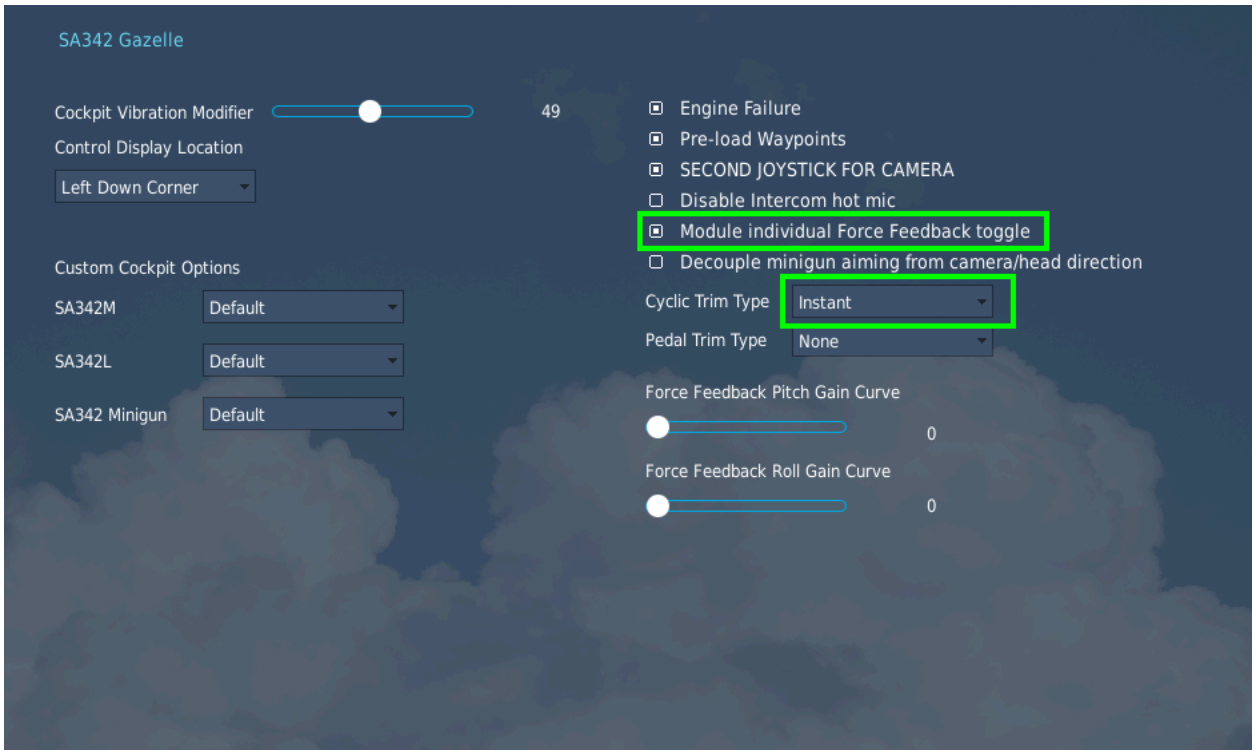
The Hind follows the same configuration logic as most of the other helicopters. In the special settings menu, be sure that the Stick Trimmer Mode is set to “Instant Trimmer (default)”



5.1.8. SA342 Gazelle

The Gazelle is the only helicopter which has its own FFB toggle in the special settings menu.

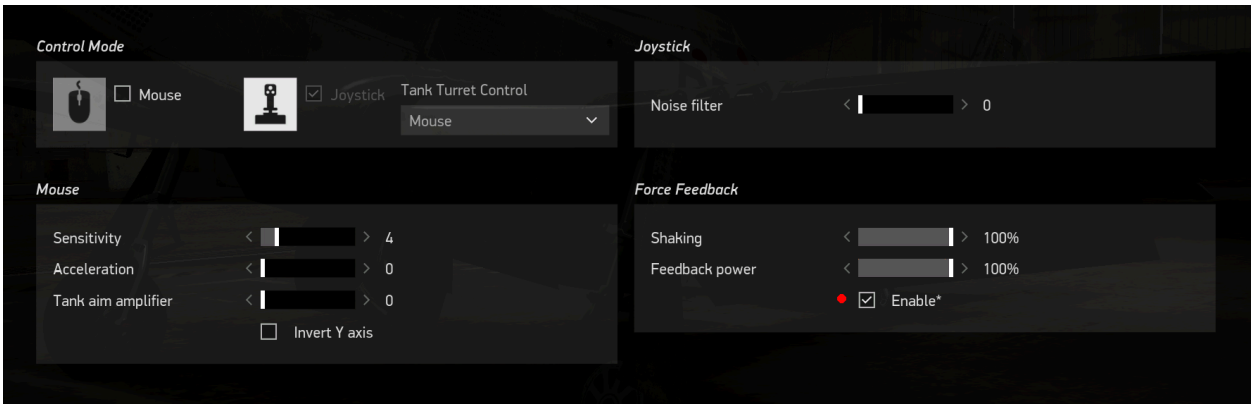
Enable the “Module individual Force Feedback toggle” setting and ensure the Cyclic Trim Type is set to “Instant”



5.2. Il-2 Sturmovik: Great Battles

The latest iteration of Il-2 supports force feedback directly through DirectInput, which makes it very simple to get working. Supported effects include control stiffening with air pressure, stall shake, ground bouncing and gun recoil. Note that the effect of trimming will be different depending on the plane. The level of support is fairly consistent throughout, although thus far only WW1 planes seem to model elevator droop on the ground.

To enable force feedback, simply go to Settings - Input devices and enable Force Feedback as in the image below:



The feedback power setting will adjust the overall spring forces applied by any given aircraft. The ‘shaking’ setting will affect the haptic feedback effects like gunfire and stall buffeting.

Some glitches such as force reversion can occur. Sometimes the simulator rights itself simply after a restart. If reversion occurs after reversing axis in game, the nuclear option is to do the reversal in FFB Configurator software. This will of course affect every other software that has something to do with the RHINO.

Other glitches may occur when changing windows focus to another window and then back to IL-2. Depending on the aircraft, you may notice loss of spring forces in one or both axes, or a large shift in the center point of the spring forces.

5.3. Microsoft Flight Simulator

The latest iteration in the MSFS franchise does not offer native support for force feedback. It does offer a multitude of exports, though, which enables external software such as XPForce to approximate force feedback effects from the telemetry.

The TelemFFB application implements full support for FFB with MSFS 2020.

5.4. X-Plane

The X-Plane franchise does not offer native support for force feedback. It does however have a full SDK that can be used to access the necessary telemetry data to implement FFB externally. The TelemFFB application enables full support for FFB with X-Plane 11/12 by implementing its own plugin which is installed into X-Plane that enables exporting telemetry data.

5.5. Prepar3D

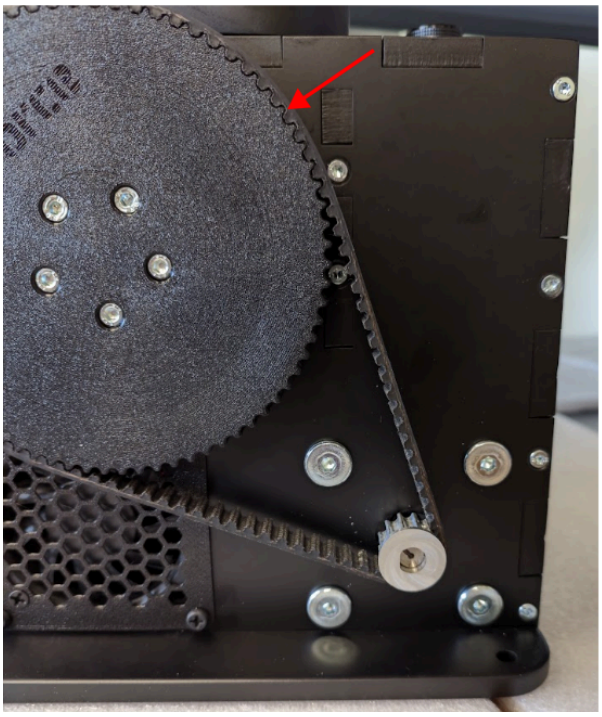
6. Troubleshooting & Maintenance

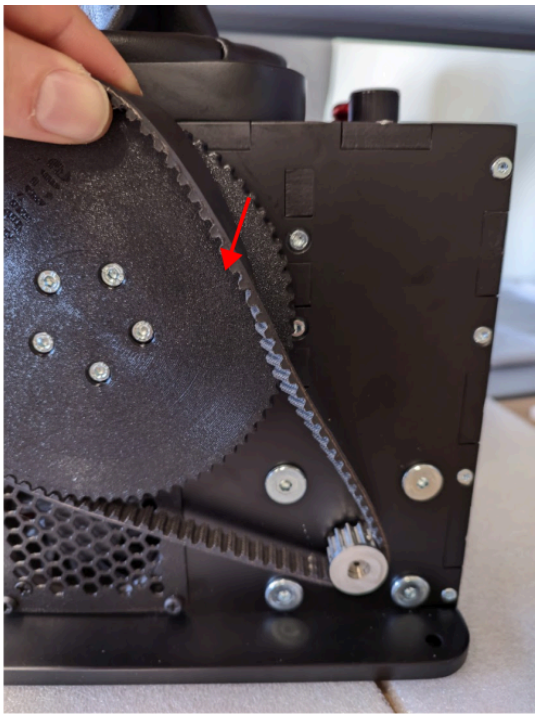
6.1. Re-tightening the belts

The belts might need re-tightening during the device's lifetime. The tightening procedure is quite straightforward. The holes that motor bolts are held are slotted so the procedure is done by pushing the motor back slightly with the belt slipped off.

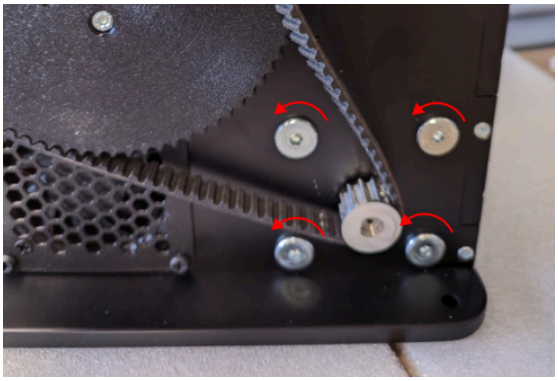
Note: the roll (X axis) motor on the *Rhino* is slotted vertically so it will need to be pushed down.

Step 1: Slide off the belt like shown in the image, but to maintain the existing calibration, do not completely remove it.

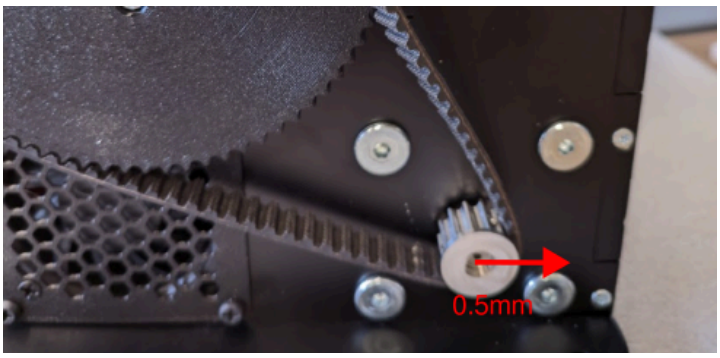




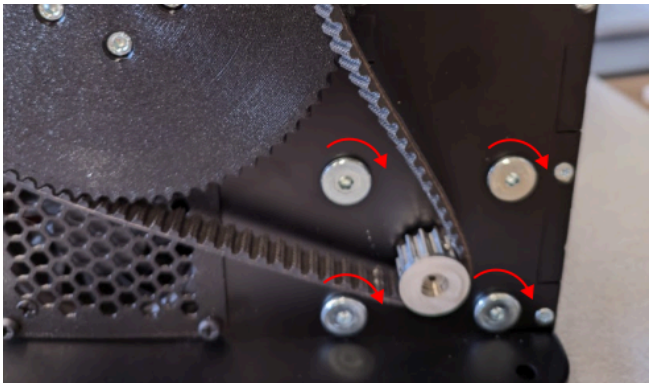
Step 2: Loosen the motor screws. This will allow the motor to slide in the slots.



Step 3: Push the motor back ~0.5mm



Step 4: Re-Tighten the bolts (or a single bolt to test the tension)

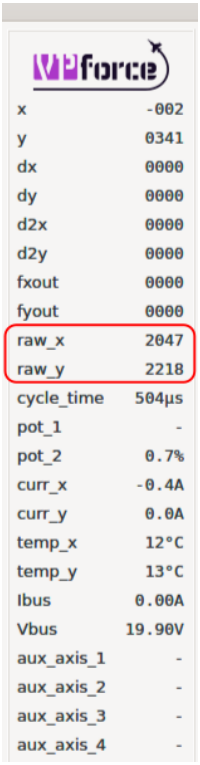


Once the motor bolts are tightened, you can slide the belt back on. If the tension is too high, indicated by the inability to slip the belt back on the large gear, you can loosen the bolts again and slide the motor slightly towards the large gear and repeat **step 4**.

Note: If the belt slipped, the motor pulley / stick pulley relationship needs to be realigned before reattaching the belt.

To do this, turn on the Rhino and turn the motor pulley so that *raw_x* or *raw_y* value, depending on the axis in question, is close to 2100. Then while the stick is roughly centered, reattach the belt.

After the procedure the Auto Calibration will need to be performed again, ideally the calibrated values will stay in the 0 .. 4096 range.



6.2. Stick drifts when trimming off center

See section 3.4 Balancing the Grip

Appendix A: Record of DCS bugs that affect the Rhino

1. curves applied to the cyclic of the Huey results in stick recentering all by itself when trim button is released
2. curves applied to pitch in the F5E results in the center point being off