

The Horus Transmitters

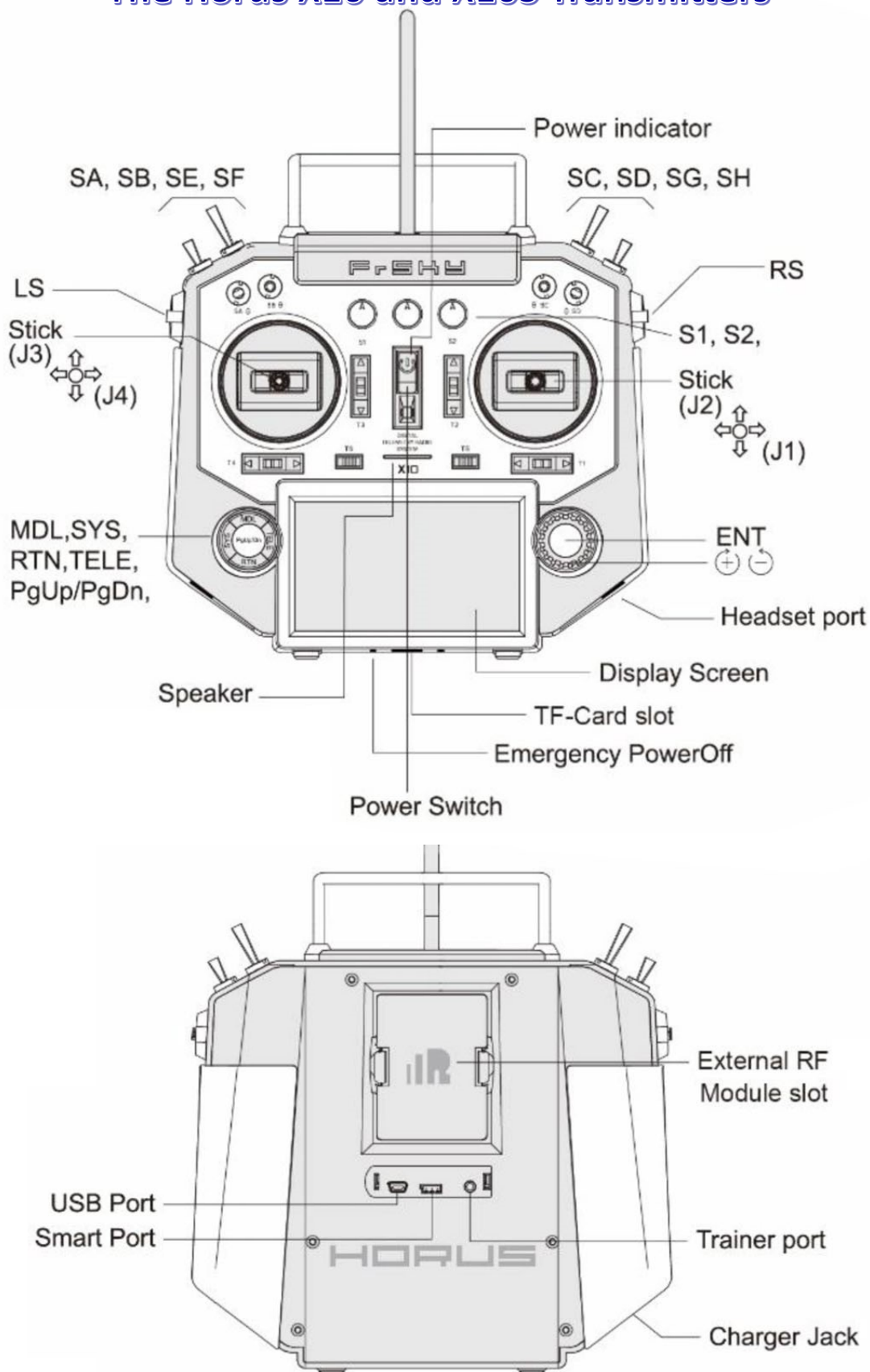
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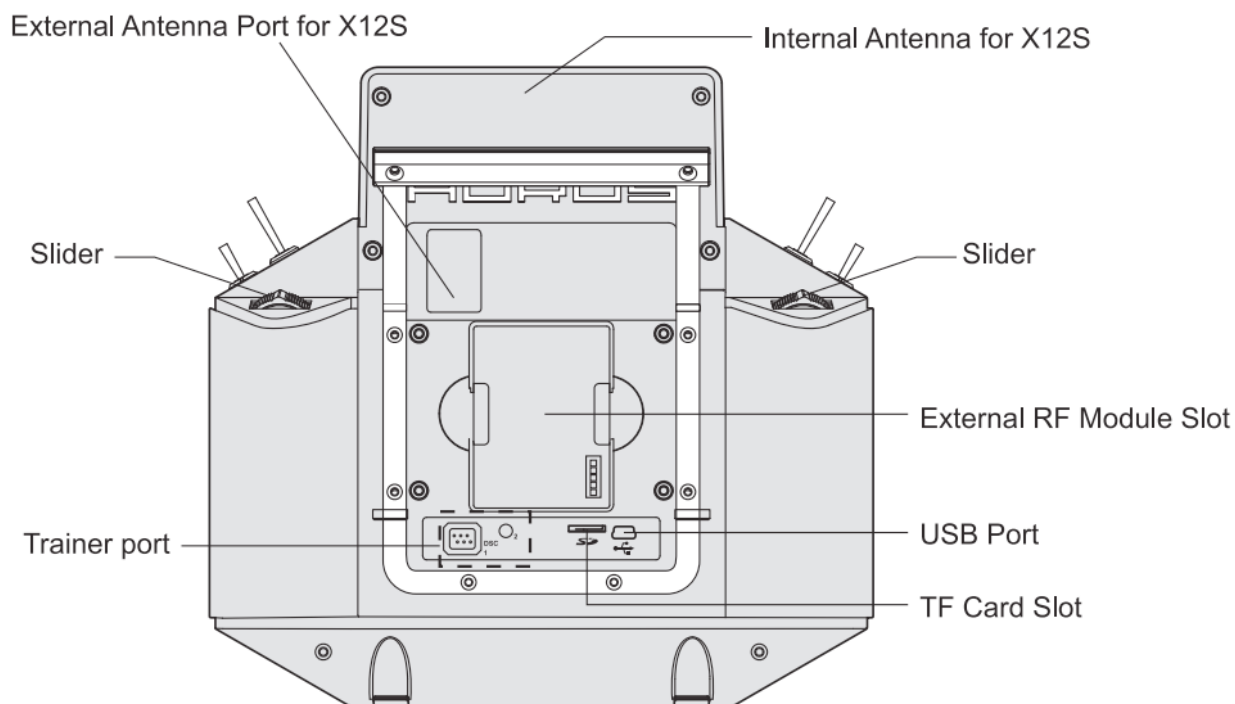
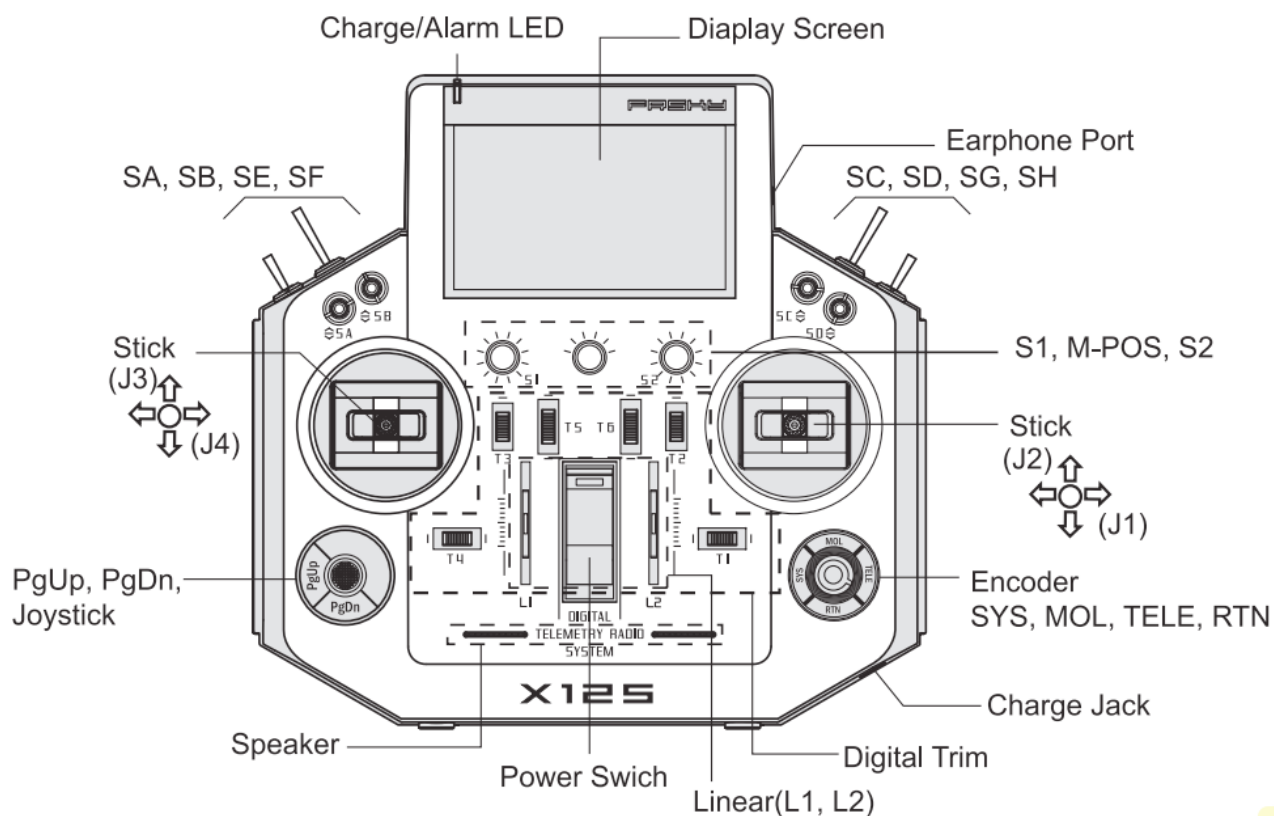
It is the sole responsibility of the user to ensure that the setting up of their transmitter functions as expected on the model.

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The Horus X10 and X10S Transmitters



The Horus X12S Transmitter



Sources for Inputs and Mixes

As you work through this guide you will have come across various source functions. There are some specialist ones in the **Special Functions** screen. The ones available in **Inputs** and **Mixes** are shown here:

Source	X10 Horus	X12S Horus	Available in Inputs	Available in Mixes	
Rud	✓	✓	✓	✓	Rudder
Ele	✓	✓	✓	✓	Elevator
Thr	✓	✓	✓	✓	Throttle
Ail	✓	✓	✓	✓	Aileron
S1	✓	✓	✓	✓	Slider 1
6P	✓	✓	✓	✓	6 pole switch
S2	✓	✓	✓	✓	Slider 2
L1		✓	✓	✓	Linear 1
L2		✓	✓	✓	Linear 2
LS	✓	✓	✓	✓	Left Slider
RS	✓	✓	✓	✓	Right Slider
JSx		✓	✓	✓	Joystick x
JSy		✓	✓	✓	Joystick y
TrmR	✓	✓	✓	✓	Rudder Trim
TrmE	✓	✓	✓	✓	Elevator Trim
TrmT	✓	✓	✓	✓	Throttle Trim
TrmA	✓	✓	✓	✓	Aileron Trim
Trm5		✓	✓	✓	Trim 5
Trm6		✓	✓	✓	Trim 6

Source	X10 Horus	X12S Horus	Available in Inputs	Available in Mixes	
MAX	✓	✓	✓	✓	Sets source = +100
SA to SH	✓	✓	✓	✓	Switches A to H
L1 to L64	✓	✓	✓	✓	Logical switches 1 to 32
CR1 to 3	✓	✓	✓	✓	Cyclic 1 to 3
TR1 to TR16	✓	✓	✓	✓	Trainer inputs 1 to 16
CH1 to 32	✓	✓	✓	✓	Channels 1 to 32
Batt	✓	✓	✓		The transmitter battery
Time	✓	✓	✓		Current time
Timer 1 to 3	✓	✓	✓		The three timers
TELE 01 to ?	✓	✓	✓		Telemetry values
LUA	✓	✓		✓	LUA script
I[]	✓	✓		✓	Input []

Screen Symbols

A number of special symbols appear on the Horus screen:



Switch Default Settings

Switch Default Settings		
SA	3 Position	Short lever
SB	3 Position	Long lever
SC	3 Position	Long lever
SD	3 Position	Short lever
SE	3 Position	Short lever
SF	2 Position	Long lever
SG	3 Position	Short lever
SH	2 Position	Long lever, momentary

One of the very useful features of the **OpenTX** system is its flexibility. These are the switch types provided with the standard Horus. If one would rather have different switch types rather the standard ones fitted, **OpenTX** allows these switch types to be redefined to match. This can be done from the **Radio Settings** menu. (See later in this reference section.) The only limitation in both the hardware and firmware is that switches **SF** and **SH** cannot be altered to 3 position switches.

Why would one want to do this? As can be seen in the various **How To's** later on, many clever routines require just a momentary switch. For instance, with the trainer function, one can have take back from the student by simply moving one of the joysticks. Thus all that is required is a momentary switch to hand over control to the student. Thus the instructor does not have to keep a finger on the button all the time. However, one might also need a momentary switch to read out the telemetry values, or for an almost foolproof engine arm/disarm function at the same time.

External/Internal Aerials

The X12 Horus has one internal antenna, and one external aerial. If the user selects external aerial in the model setup, then both aerials will be enabled.

The X10 Horus has two internal aerials, and one external aerial. If the user selects external aerial in the model setup, then only the external aerial will be enabled.











At the time of writing, the **Companion** does not display this correctly for the X10.

Memory Storage

The Horus has two user accessible storage mediums, 16MB of internal memory drive and an external micro SD drive. With **FrOS**, (the FrSky operating system that comes installed on the radio.) the internal memory stores the system configuration files, system sound files, model files, model images, model sounds, and user defined custom sounds. The SD card stores the **FrOS** firmware when doing system firmware updates, data logs, screen prints, extra model images and extra user defined custom sounds. **OpenTX** stores everything on the SD card.

The X10 has a micro SD slot in the bottom of the case, the X12 has the micro SD slot behind a removeable cover at the back, and the card is inserted upside down. A 16GB card is more than adequate and it is better to use a class 10 card. The micro SD card must be no larger than 32GB and needs formatting to FAT32. From the initial **FrOS**, it is possible to flash with **OpenTX** and then go back to the **FrOS**. While devout **OpenTX** users may wonder about ever going back, at the time of writing this is the only way to update the XJT module, the internal module which handles the actual radio transmissions and telemetry. Therefore it is important to retain the ability to do this for the time being at least.

The SD-HD Card

Name	Date modified	Type	Size
 CROSSFIRE	05/02/2018 12:34	File folder	
 FIRMWARE	05/02/2018 12:34	File folder	
 IMAGES	05/02/2018 12:34	File folder	
 LOGS	05/02/2018 12:34	File folder	
 SCRIPTS	05/02/2018 12:34	File folder	
 SOUNDS	05/02/2018 12:35	File folder	
 SxR	05/02/2018 12:35	File folder	
 THEMES	05/02/2018 12:35	File folder	
 WIDGETS	05/02/2018 12:35	File folder	
 opentx.sdcard.version	05/02/2018 12:35	VERSION File	1 KB

The SD card should contain the following folders when downloaded:

CROSSFIRE

Routines to support Crossfire are stored here.

FIRMWARE

This folder is empty when downloaded, but is intended for the user to store copies of the firmware for the transmitter and any receiver. It is possible to update any receiver using just the transmitter and a modified servo extension lead through the Smart Port.

IMAGES




Use this folder for storing images of each of your models. It is already populated with a number of models though more can be added by downloading from websites or by creating ones own. See the **How To ... Part 2** section.

LOGS

If telemetry logging is enabled, the logging files are stored here. One for each model flown each day.

SCRIPTS

This folder contains 3 sub-folders, each containing LUA scripts. The Wizard folder already contains the LUA script for the new model wizard.

Name	Date modified	Type	Size
 FUNCTIONS	05/02/2018 12:34	File folder	
 MIXES	05/02/2018 12:34	File folder	
 WIZARD	05/02/2018 12:34	File folder	

SOUNDS

This folder contains all the “wav” files for sounds and music. There is first a sub folder for each language supported. In that folder are all the user available sounds. A further sub-folder contains all the system files. In the **SYSTEM** sub-folder is also an Excel file detailing what each file is. One important file in this folder is the “hello.wav” file which is the “Welcome to OpenTX message”. This file can be deleted to keep the start-up silent, or can be changed to have your own personal message. See the **How To ... Part 1** for creating one’s own sound files.

SxR

This folder contains the LUA files for setting up the S6R and S8R receivers. There are two files, one for the configuration and one for changing the receiver options and parameters. See **How To Part 2** for more information.

THEMES

This folder contains the three themes currently available on the Horus screen. At the time of writing there is no way to add more themes or edit these themes except to change the background. In the **default** folder will be found the file **background.png**. This can be changed to give a different background. The image should be 480 by 272 pixels. A useful collection of ready made backgrounds can be found here:

<https://skyraccoon.com/>

WIDGETS

This is the place to store LUA widgets.

opentx.sdcard.version

This contains a single text file containing the version number. This version number must match the **OpenTX** version otherwise an error will be reported.

Updating the SD Card

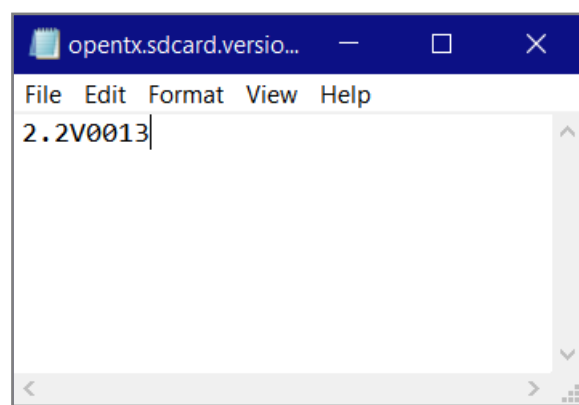
When a new version of **OpenTX** is downloaded, the SD card contents can change too. Do be very careful when doing this as some of your own information can be changed too.

1. Read the release notes, any important changes to the SD card will be notified here. Often it is only major upgrades where any significant changes are made.
2. If there are no important changes, consider NOT altering the SD card contents. However, this will then bring up an SD card error when the transmitter is started.
3. This is easily overcome in one of two ways:



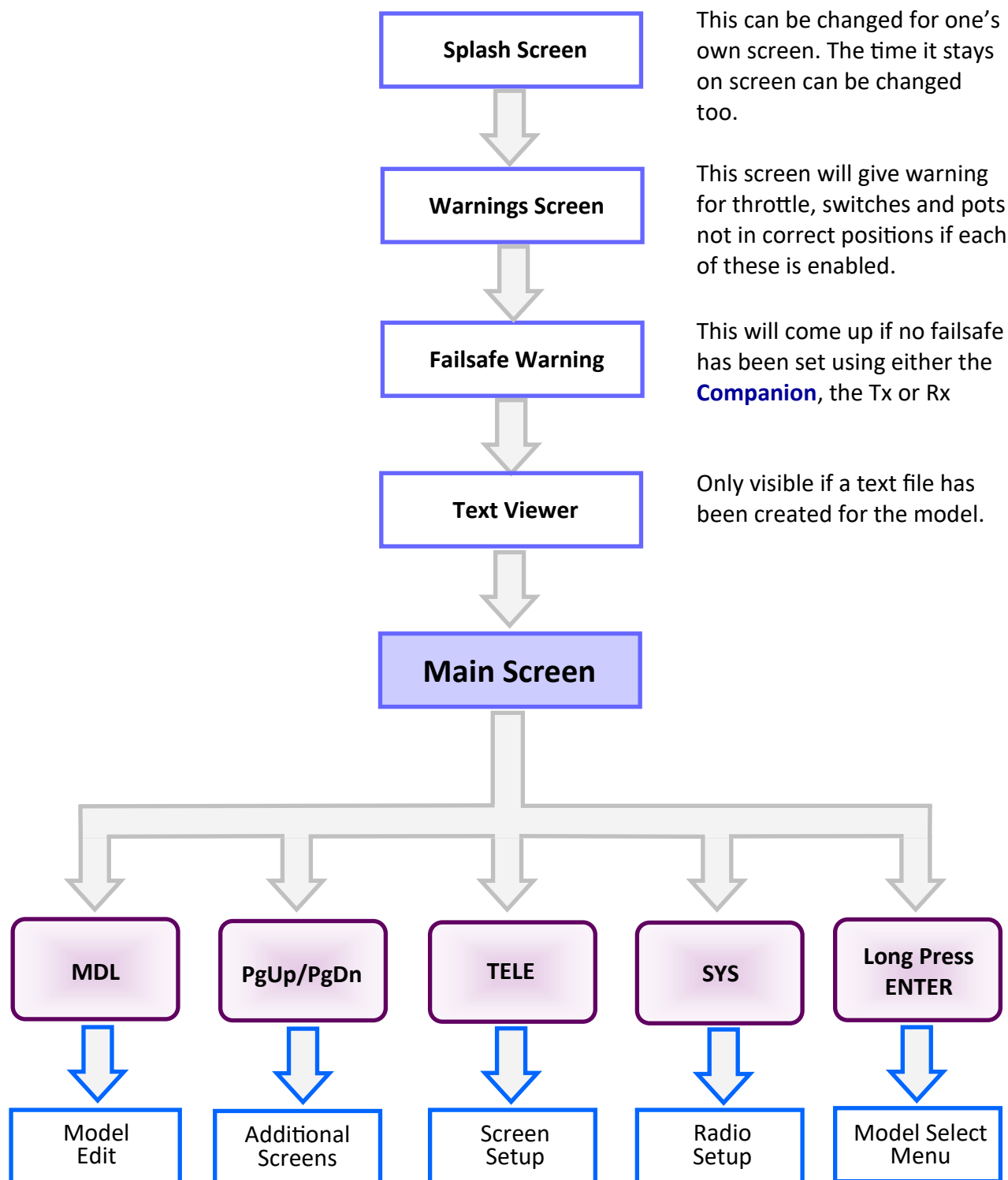
- ✳ Simply copy the newer version of **opentx.sdcard.version** from the new SD card download in place of the old one, or:

- ✳ To save having to download the new SD card contents, load the **opentx.sdcard.version** file into something like **Notepad** and just change the version number to the one shown in the error message above and resave.



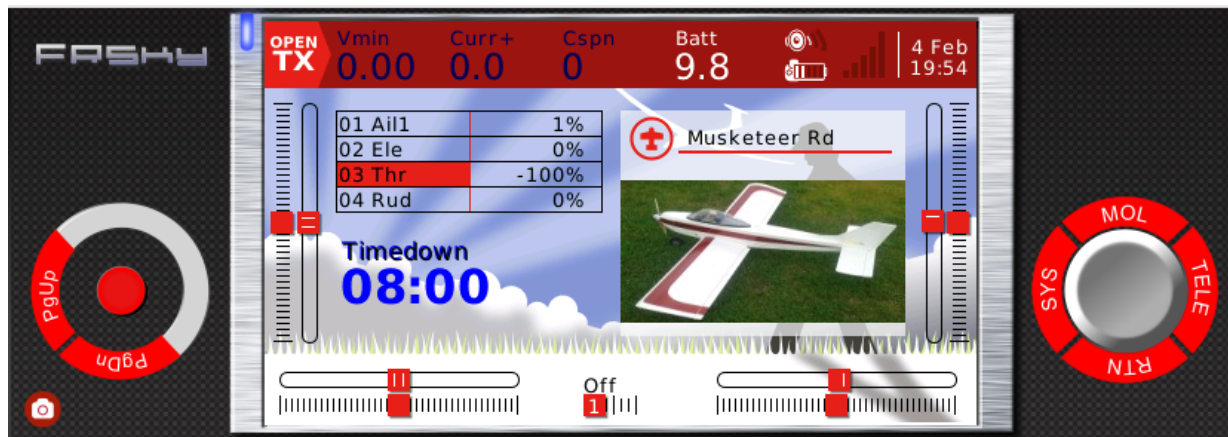
4. If there are major changes to the SD card, first backup the existing card to your computer, then copy each directory from the downloaded new version to your SD card. Avoid replacing the **MODELS**, and **RADIO** directories as these contain the setup for your radio and models. Also avoid replacing the **SOUNDS** and **IMAGES** directories as these may contain extra sound or model image files you have added yourself, unless absolutely necessary. If these do need updating, then copy any of your own extra images and sounds from your backup copy.

The Horus Transmitter Menu System



The Horus Screen

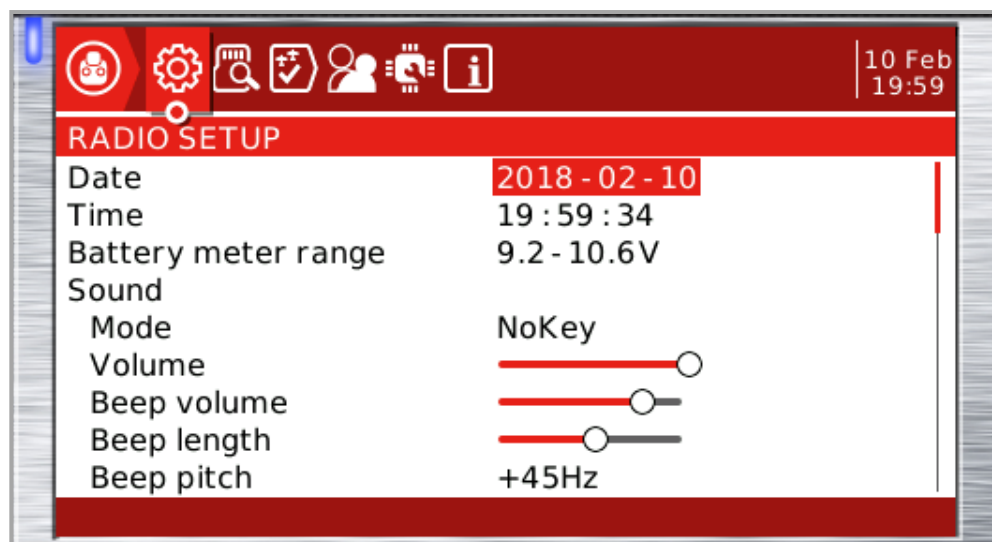
The Horus has a large industrial high resolution colour TFT screen 480 x 272 pixels, readable outdoors. It is fully customisable to provide a range of different information.



As can be seen, the screens on the X12 and the X10 are the same, however button placement and the rotary encoder are different. Also there are two separate buttons for **PgUp** and **PgDn** on the X12 but only one on the X10. A short press of the **PgUp/Dn** button on the X10 is equivalent to page down, whereas a long press is equivalent to page up.

The System Menu

There are 6 pages in the **System Menu** options. A short press of **PgDn/PgUp** is used to move through them. The various functions of most of the screens will be discussed later in **Section 3** of the **Reference Section**, and contain the same settings as the **Companion** screens. The **SD-HC card**, and the **Version** pages are unique to the radio and are not displayed on the **Companion**. The **Hardware** page also includes the **Calibration** function which is obviously not available on the **Companion**.



Radio Setup



Trainer



SD-HC Card



Hardware



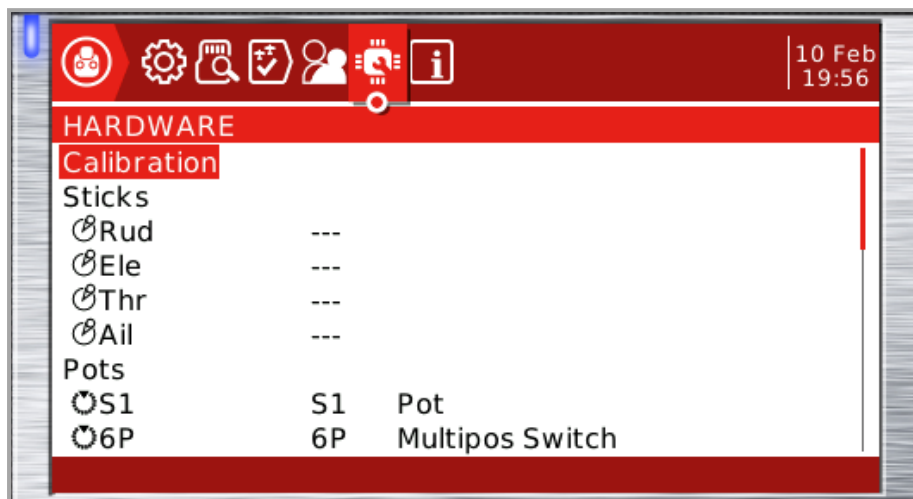
Global
Functions



Versions

To move through items on the screen, the rotary encoder is used and to highlight a particular element to edit the **Enter** button is pressed. To exit from an edited element the **RTN** button is pressed. Sometimes a long press of the **Enter** button will bring up a different feature, where possible they will be highlighted in the text, however there are probably many more yet to be discovered. One simple example is when entering text, a long press of the **Enter** button will change from lower case to upper case and back again.

Most of the features in the **System Menu** pages are duplicated in the **Companion**, and have been discussed in more detail in that section. There are a few features available on the transmitter screens that do not appear in the **Companion**. One of these, and an important task when setting up a new transmitter is to calibrate the various sticks, pots and sliders. Go to the **Hardware** page and select Calibration.



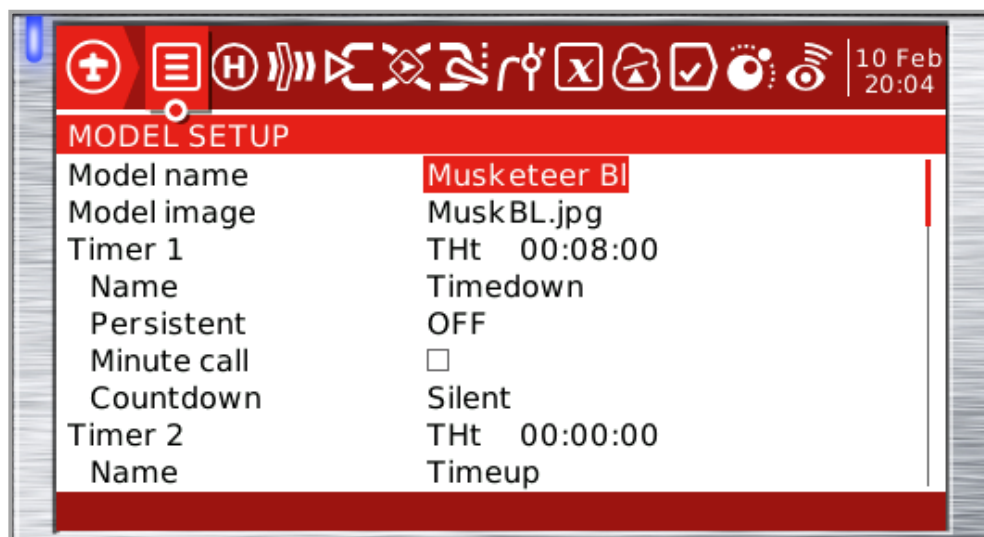
The **Calibration** page will now appear. Follow the instructions on the screen carefully to calibrate each function.



- ★ Sometimes the 6 position knob does not calibrate correctly. It is best to start the calibration with this in position 3, and then move slowly to each extreme.
- ★ Do be careful not to force any of the controls to the extreme, a light touch is needed! A heavy hand can cause a problem with the throttle such that in use there is a throttle warning every time the transmitter is switched on, even though the throttle is at the minimum. If this occurs, recalibrate.

The Model Setup Menu

The **Model Edit** menu has 12 screens. Most of these screens are replicated on the **Companion**, though the **Flight Mode** screen and the **Global Variables** screens are combined, and the **Custom Scripts** is only found on the transmitter screen.



Model Setup



Curves



Heli Setup



Global Variables



Flight Modes



Logical Switches



Inputs



Special Functions



Mixer



Custom Scripts

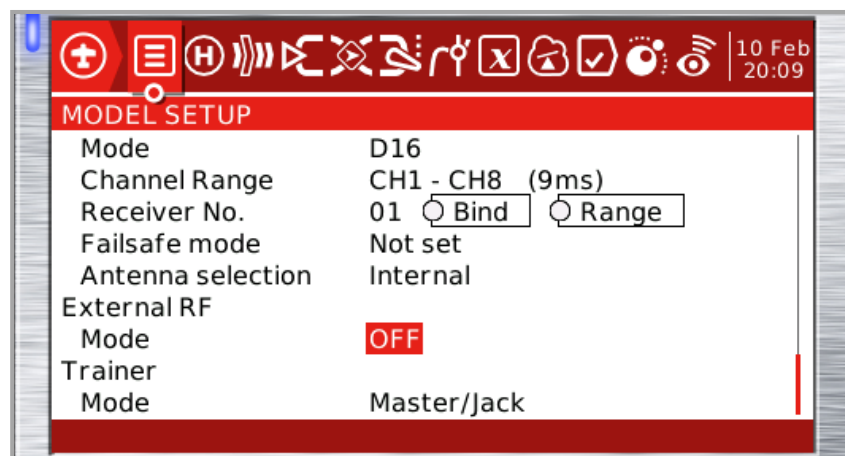


Outputs



Telemetry

Bind and Range Check

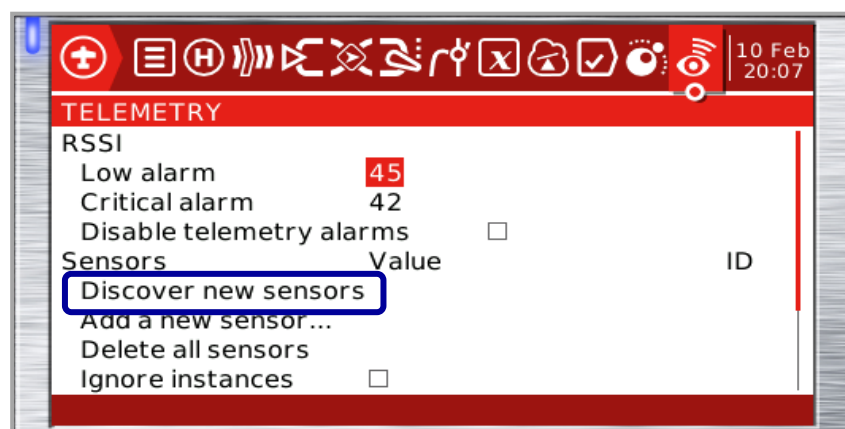


At the bottom of the **Model Setup** page there are the **Bind** and **Range** check options. These are obviously not available on the equivalent **Companion** page. Binding is quite straightforward:

- ★ Set up the model using the **Companion** preferably, and ensure that failsafes are set.
- ★ If the model is electric powered, do remove all propellers first before binding, or better still bind the receiver before installing it in a model.
- ★ Set the transmitter to **Bind**, when a regular beep will be heard. Power up the receiver with the failsafe button pressed. A green light should come on once binding is complete. The receiver needs to be at least a metre away from the transmitter to work.
- ★ Power off the receiver and power up again, and come out of **Bind** mode on the transmitter.

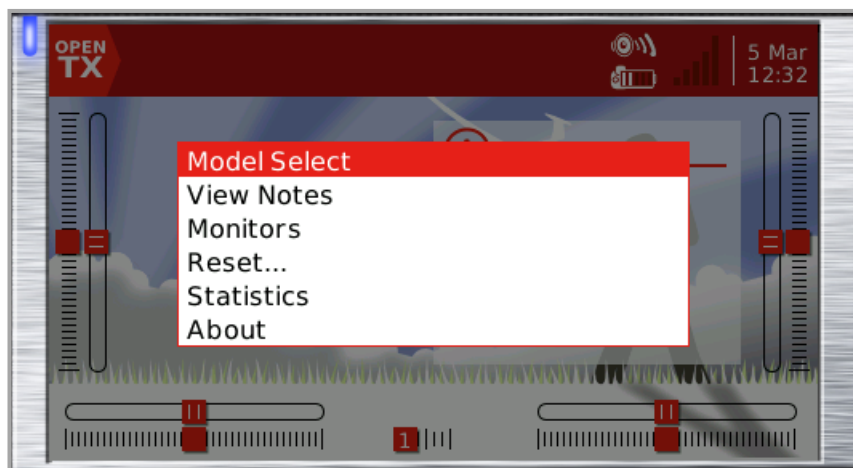
Detecting Telemetry Sensors

This is another operation that needs to be undertaken with the transmitter. Connect all the sensors in the model and power up. Then click **Discover new sensors** to allow **OpenTX** to find them. Stop discovery once all the sensors have been found.



The Model Select Menu

The **Model Select Menu** is obtained from the main transmitter screen by a long press of the **Enter** button and has 6 screens.



Model Select

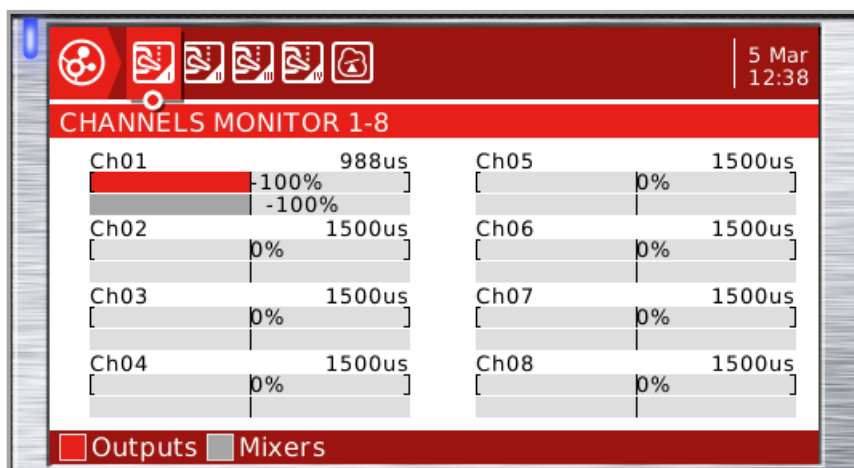
Takes the user to the model select screen.

View Notes

This allows a text file created for the model to be viewed again.

Monitors

This brings up a channel monitor screen. All 32 channels and the Logical Switches can be monitored by cycling up or down through the pages using **PgUp** and **PgDn**.



Reset

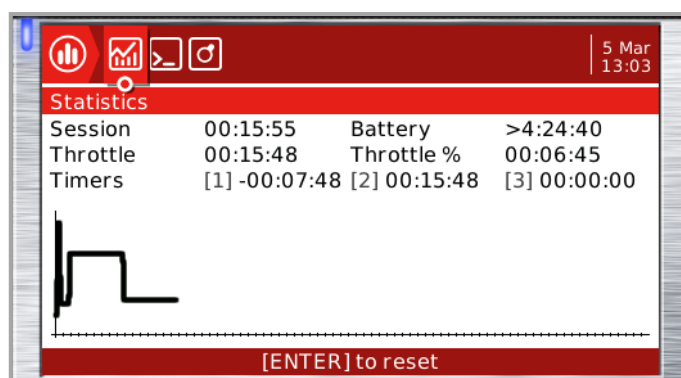
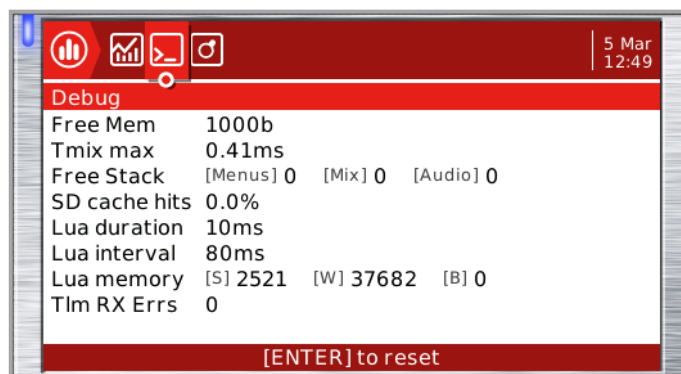
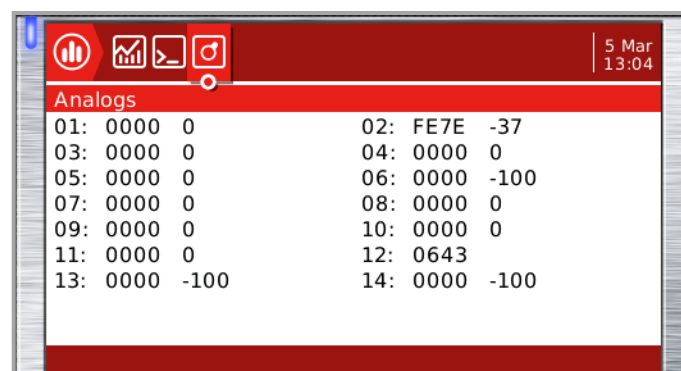
Allows the flight, the timers, or the telemetry to be reset. Resetting the flight is equivalent to opening up a new model, and all the warnings and any text file will be displayed, as well as resetting everything. Each timer can be reset individually. However, it is not possible to reset individual telemetry parameters.

Statistics

This brings up three screens of statistics. The first screen gives some basic data plus shows a graph of the throttle usage. Screen 2 is a debug screen, and screen three shows the analogue values of the joysticks, sliders and pots.

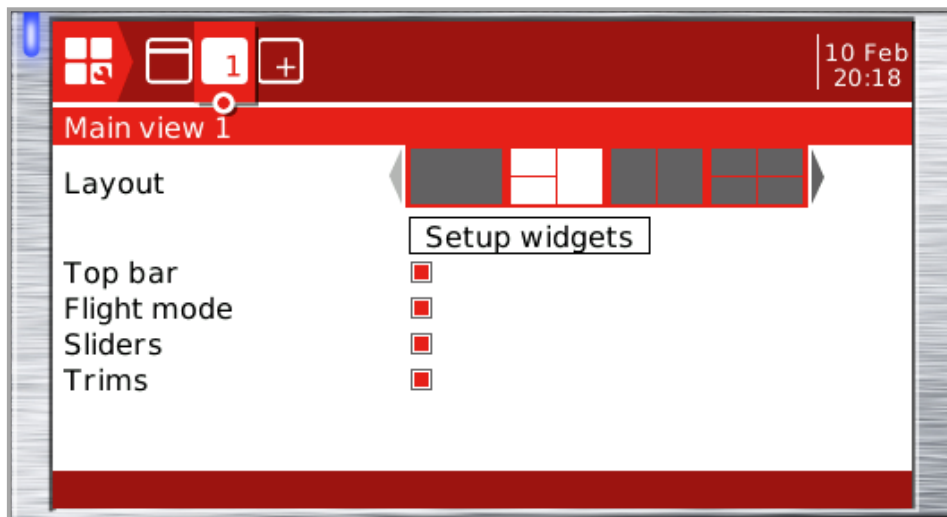
About

Brings up a message about **OpenTX**.

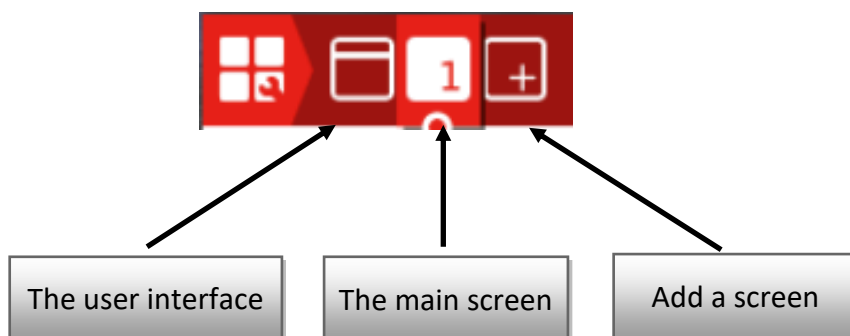
Statistics screen 1**Statistics screen 2****Statistics screen 3**

Widget Editing

To edit the screen widgets and add more screens, press the **TELE** button. A new screen will be presented:



Along the top bar three screens are shown:

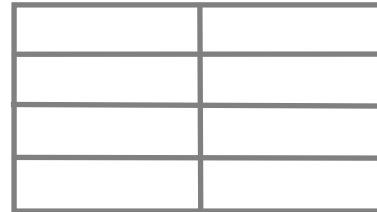
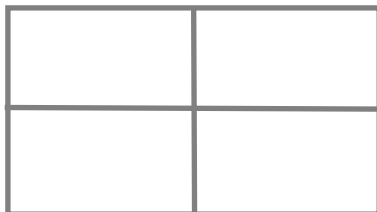
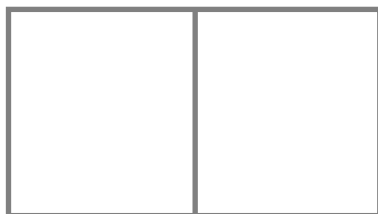


To scroll between these three buttons, use the **PgUp** and **PgDn** keys. The rotary encoder is used to scroll down the options and **Enter** pressed to select the option. It is possible to add up to five screens.

Layout

There are 5 possible screen layouts:

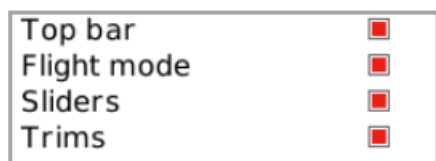
- ✧ Full window
- ✧ Two half windows
- ✧ Four quarter windows
- ✧ Two quarter windows plus a half window
- ✧ Eight small windows:



Screen options

The four options here allow the display of:

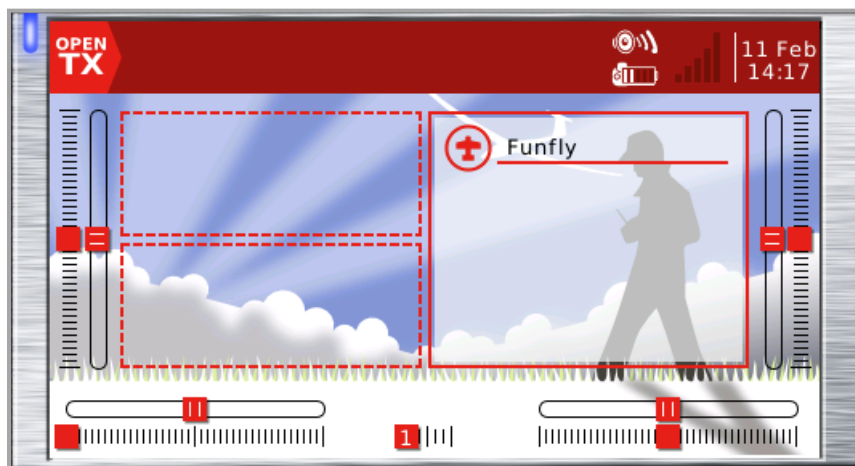
- ✧ the top bar
- ✧ flight mode name
- ✧ slider values
- ✧ trim values.



The box to the right shows all four options selected.

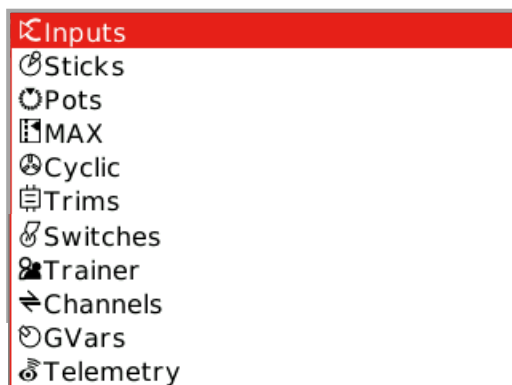
Set Up Widgets

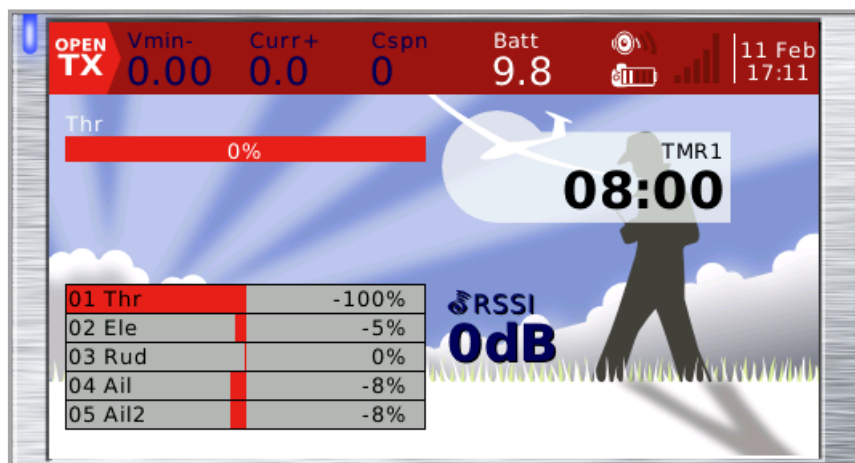
Selecting this option allows a range of pre-defined widgets to be placed in each of the windows on the screen. Using the encoder, move through each of the windows before selecting that one. The highlighted window is the one with the solid line round it.



Then the option will come up to either select or remove the widget. On selecting the widget a choice is given of:

- ✧ Gauge (only available for quarter display)
- ✧ Display a picture, usually the model, but actually one could have any picture.
- ✧ Outputs, displayed as a chart with either 4, 12 or 20 channels depending on widget size.
- ✧ Text. This has to be typed in whilst setting up. It does not allow saved text files to be loaded. Different font sizes can be used.
- ✧ Timer
- ✧ Value. A whole range of values can be selected. A long press of the **Enter** key will bring up a short-cut list of options:
- ✧ Battery check
- ✧ Counter

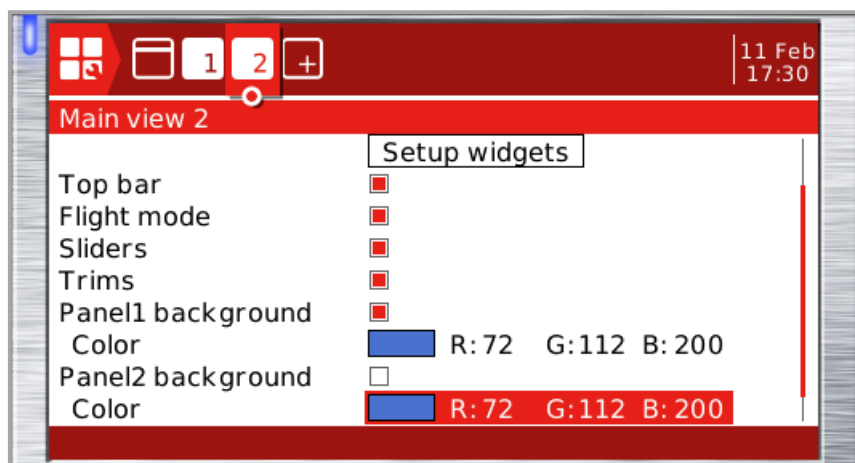




This shows an example window. The window is divided up into 4 widgets.

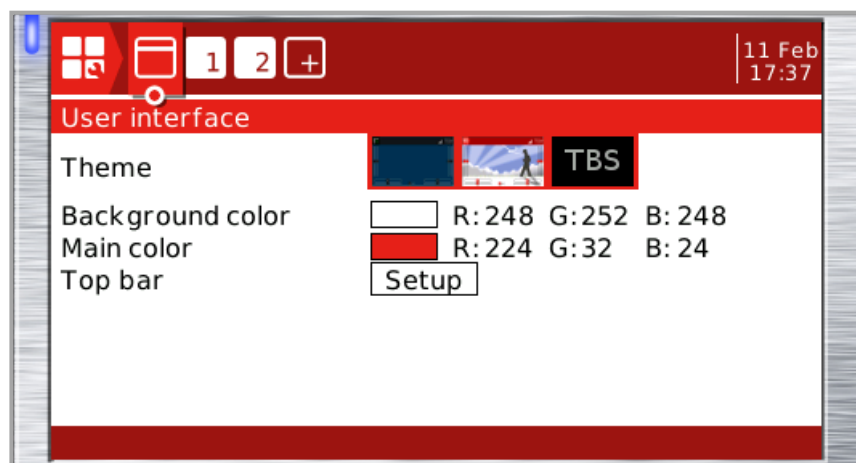
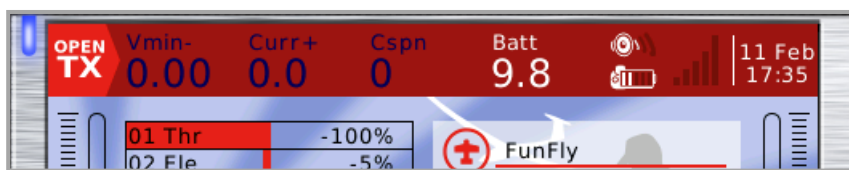
The gauge. The bar colour only can be changed.	The timer widget. Any of the three timers can be selected.
The outputs. The background has been changed to grey.	The value. The text colour can be changed.

When setting up the main view, the background panel colours can be set up.



The Widget User Interface

This screen allows the theme to be changed, and the main and background colours to be altered. It is also the place to set up the top bar of the main screen.

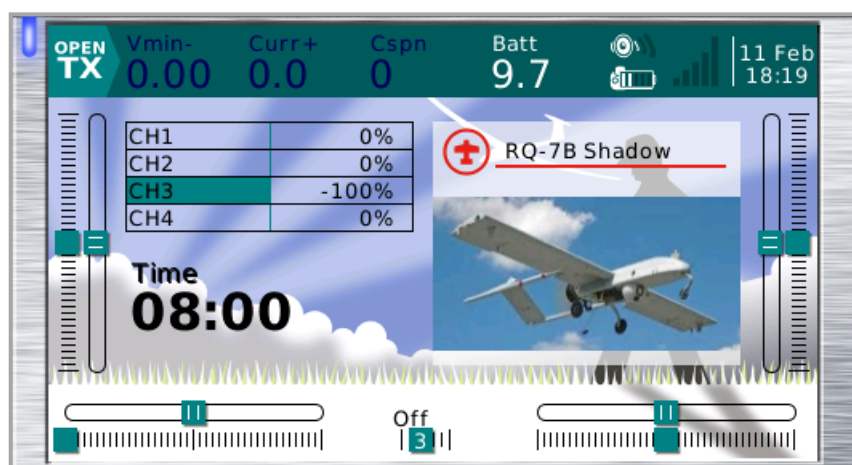
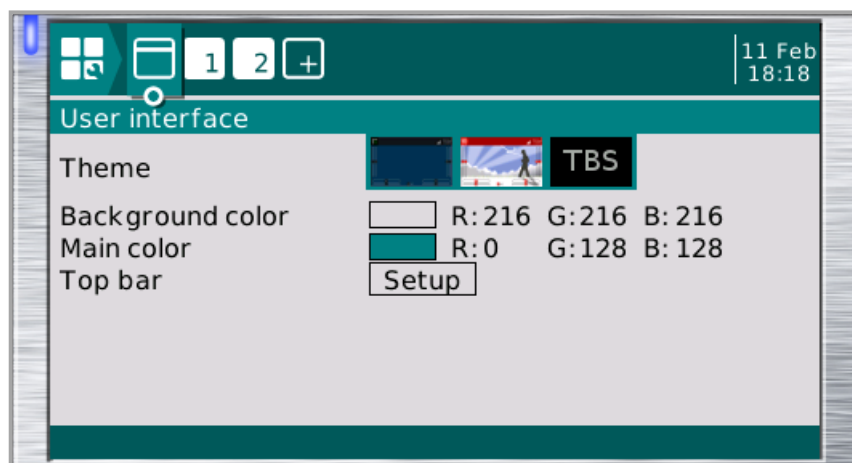


At present there are only three themes. The top bar widgets are set up in exactly the same way as the main widgets.

Colour Chart			
Colour	Red	Green	Blue
Mid green	0	128	0
Pale green	52	204	52
Brown	104	52	0
Orange	248	128	0
Yellow	248	252	0
Purple	104	0	104
Pale purple	176	0	176
White	248	252	248

Colour Chart			
Colour	Red	Green	Blue
Dark blue	0	0	128
Mid blue	0	0	248
Pastel blue	56	104	208
Teal	0	128	128
Pink	248	0	248
Default red	224	32	24
White	248	252	248
Grey	216	216	216

The effect of changing the background colour and the main colour can be quite dramatic, and is an interesting way of personalising the Horus. Here the display has been set to teal and grey. Grey is quite an easy colour to lighten or darken. Keeping all three colours the same, with the values at 0, you get black. As the colours are increased, you go through various shades of grey until you reach a value of 248, when you have white. The printed colours here cannot exactly represent the on-screen colours.



Notes on Widgets

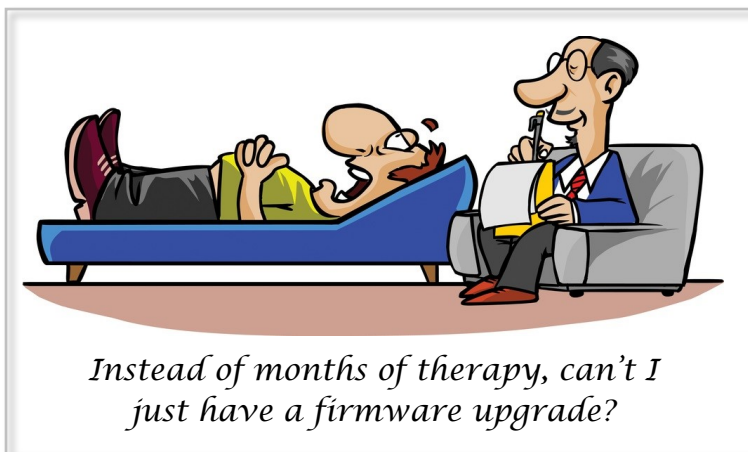
1. When model files are copied from the radio to the **Companion**, the widget settings are also copied.
2. It is possible to alter the widgets on the simulator. However, do remember that there is no way of saving these settings back to the radio at the time of writing, so all widget editing must be done on the radio.
3. At the moment there is no way of copying the widget settings from one model to another. It would seem that the best way to ensure this when adding a new model is to start off copying an existing model with the widget settings already in.
4. For anyone converting models from a Taranis to a Horus, setting up the screens can be a very tedious process. One way to simplify this is to use the simulator and a model with a finished set of widgets and take a snapshot of each screen which can then be copied to a word processor or graphics program and printed out to have as a reference.
5. It is also possible to use LUA scripts to create more widgets. No doubt in time there will be a good selection of ready made LUA scripts to add when required.
6. At the moment there is very little support for themes, indeed **OpenTX 2.2** is not really designed to be able to add more themes simply. However, in time this will probably come along as with so many other things.

Firmwares

What is firmware?

In electronic systems and computing, firmware is a type of software that provides control, monitoring and data manipulation of engineered products and systems. Typical examples of devices containing firmware are embedded systems, such as traffic lights, consumer appliances, remote controls and digital watches, computers, computer peripherals, mobile phones, and digital cameras. The firmware contained in these devices provides the low-level control program for the device.

On the Horus transmitter there are three different firmwares when running under **OpenTX**. The first and most obvious is **OpenTX** itself. However this does not do everything. There is one circuit board in the back of the Horus with its own firmware. This is the internal XJT module. This firmware takes all the control signals from **OpenTX**, encodes them and transmits them to the receiver. It also looks for telemetry data from the receiver and makes this available back to **OpenTX**. This firmware has been designed and is maintained by FrSky, **NOT** the **OpenTX** team. The third firmware is actually the bootloader. This is a piece of software that allows the transmitter to communicate with a computer. It is also part of the **OpenTX** software, available from release 2.2.2.



As well as these three pieces of firmware, there is also all the data created by **OpenTX** and you, the user, which contains all the settings for each of the models programmed. When stored on a computer this data file has the file extension: **.otx** This is kept on the SD card in the transmitter and not on the transmitter in the built in memory. The original FrOS software is held in transmitter memory and is not disturbed when downloading **OpenTX**. It can also be saved to the computer, and saved to the SD card in the transmitter. Clearly it is advisable to save copies to either the computer or the SD card, or both. Even better is to save fresh copies every time a new model is added or one is edited.

The Bootloader and **OpenTX** firmwares are maintained by the **OpenTX** team, FrSky maintain the transmitting firmware. Updates of each can be found on the appropriate websites. The **OpenTX** team have been very clever, by including routines in their firmware which will allow the FrSky firmware in both the transmitter and any receivers to be easily upgraded too.

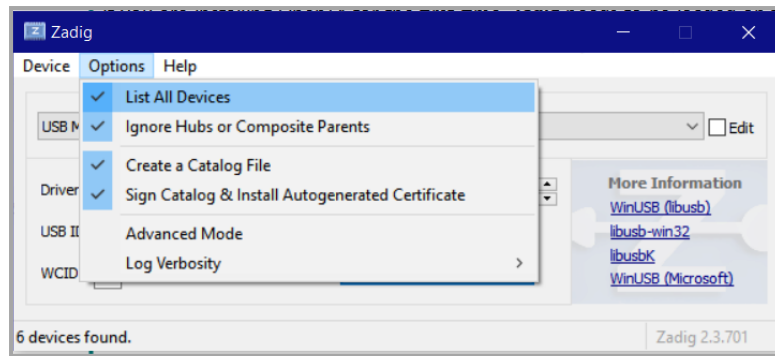
Finally of course there is the **OpenTX Companion**, a separate piece of software which is stored on, and used by, the computer.

Installing OpenTX

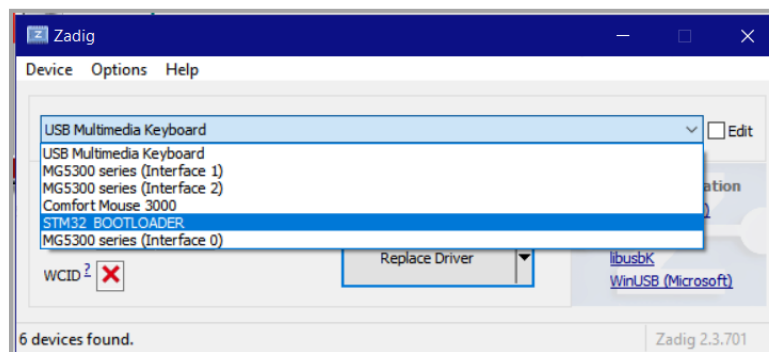
Installing Zadig for PC

If you are installing **OpenTX** for the first time, **Zadig** needs to be loaded on the computer first. This little program will allow the radio to connect to the computer through the USB lead while the radio is turned off.

1. Search for **Zadig** in your browser and download and install it.
2. Connect the Horus to your computer via a mini USB lead, with the Horus switched off.
3. Run **Zadig**. Go to **Options** and select **List all devices**.



4. Scroll down to select **STM32 BOOTLOADER** and then install it. If the **STM32 BOOTLOADER** does not appear in the list see below.



Zadig Won't Install/Run

There could be a number of reasons **Zadig** will not install, or will refuse to run properly once installed:

1. Try changing the USB cable. Not all USB cables have all the pins wired up.
2. Try changing the USB port. Often it does not like going through a hub, or the front USB sockets. Try plugging into one of the computer's rear USB sockets if it is a desktop.
3. Even with **Zadig** loaded it sometimes will not work. Once **Zadig** is installed, when you plug the USB in, you should hear the USB connection sound. If it still won't work, try disconnecting other USB peripherals. In my case, my Canon inkjet stopped **Zadig** working!

Installing OpenTX

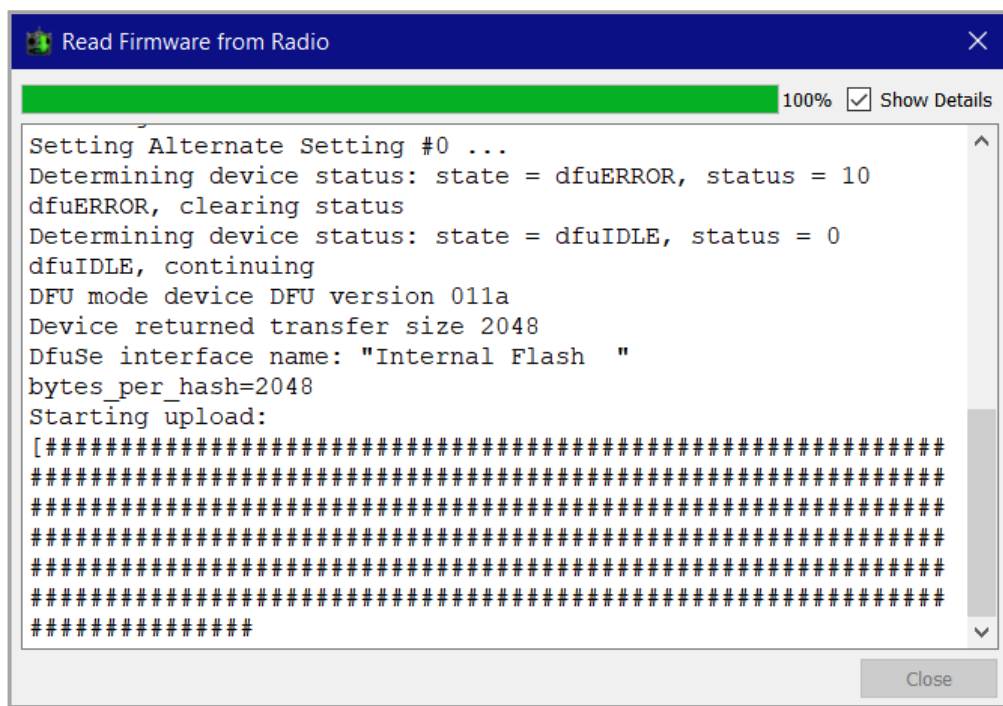
Installing OpenTX Companion

1. Go to the [OpenTX](#) website, click on the download tab and select the latest 2.2 version.
2. At the bottom of the screen download the appropriate version for your computer.
3. Also download the SD Card contents.
4. Both these downloads will need unzipping and placed in appropriate folder on your computer.
5. Then run the [Companion](#).
6. Open the **Edit Settings** menu by clicking on the icon:




7. The correct radio MUST be selected in the **Radio Type**. The build options were discussed earlier, select the ones appropriate for your needs. The folders need to be selected too.
8. Click on the **Read Firmware from Radio** and give it a meaningful name so that you can find it again if needed.

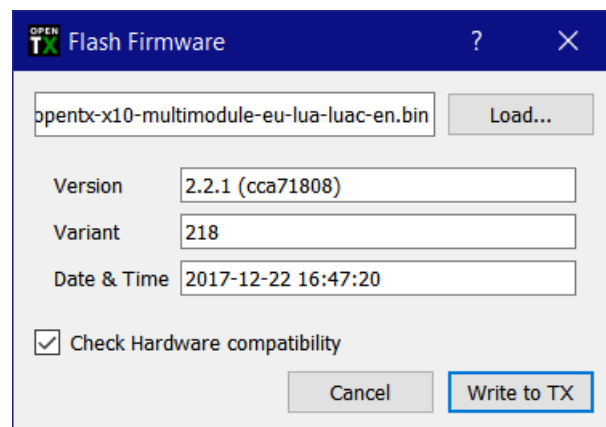


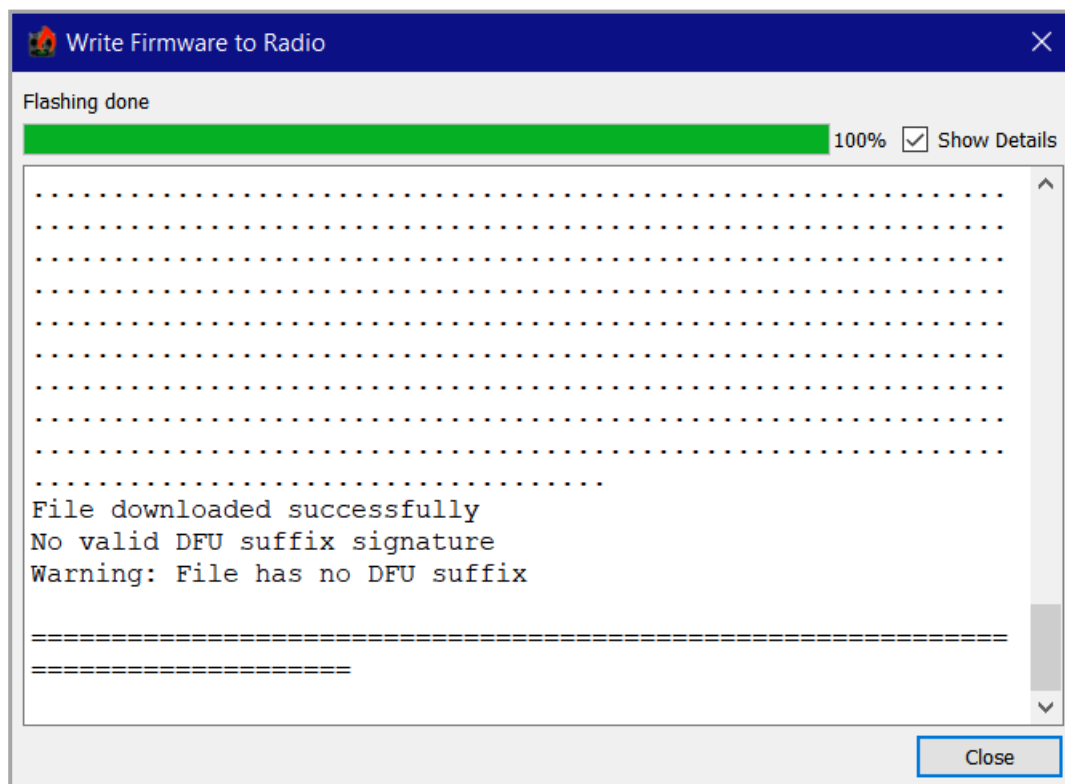


9. Once complete it should look as above. Then check the file has been properly saved. It should be a .bin file about 2048KB long.
10. Disconnect the USB lead, switch on the radio and reconnect the USB.
11. You should now be able to see the radio files using File Explorer or similar. Copy these also to a backup folder for your **FrOS** files. Make sure these files and the .bin file created above are securely stored so they cannot be accidentally wiped.

Installing OpenTX on the Radio

1. You will need a micro SD cards. SD cards are not supplied with the system. A 16GB class 10 card is more than adequate. The card must be no larger than 32GB. Prepare the card by formatting it as FAT32 on the computer. Give it a sensible label, e.g. **HORUS SD**
2. Copy the SD card files you downloaded earlier onto the SD card. These were discussed earlier in this section.
3. Insert the SD card into the Horus.
4. Now connect the USB lead again, with the radio switched off.
5. From the Companion, Write Firmware to Radio.
6. Load the appropriate **OpenTX** firmware downloaded earlier.





7. When complete it should look as above.
8. Switch on and you should be rewarded with [OpenTX](#).

Re-installing FrOS

As the **FrOS** firmware contains the transmitting module firmware, if this ever needs updating, it is necessary to return to **FrOS**, upload the latest version then reinstall [OpenTX](#).

1. Remove the SD card from the radio.
2. Open [OpenTX Companion](#). Connect the radio with the radio off.
3. Go to [Write Firmware to Radio](#). Now select the **.bin** file that was saved earlier (see P27), and simply rewrite the **FrOS** file.