

# **FrSky Horus X12S System**

**OpenTX Firmware and FrTX Flashing  
with  
Windows OpenTX Companion  
and  
Smart Port Flashing with X12S**

**Production X12S Systems Only**

**May 31, 2017**

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## Document Credits

This document was created by Mike Dailey and Jan Urbanek with support from the OpenTX team members Bertrand Songis and Andre Bernet.

## About This Document

This document is in draft form and is for use with OpenTX 2.2.0 or later **If you are just looking for the information on how to do a normal FrSky FrTX OS firmware update with firmware bin files go to page 19.**

## Overview

The FrSky Horus X12S has the ability to operate with the factory installed FrSky FrTX OS firmware or OpenTX 2.2.X. The FrTX OS is FrSky's in-house developed powerful menu driven OS and OpenTX is a highly flexible and powerful open source OS developed by the OpenTX Development Team for the X12S.

This document, explains how to switch the X12S system to the OpenTX OS and how to remove OpenTX from the system and return to FrTX OS. The instructions assume the user is already an experienced user of OpenTX Companion. If you have not used OpenTX Companion before read the "Downloading and flashing the firmware" section at the bottom of this page <https://opentx.gitbooks.io/opentx-taranis-manual/content/companion-introduction.html>

Two separate SD cards will be used to make the process easier and keep the FrTX and OpenTX files separate to avoid conflicts. One card will be used for FrTX and the other card will be configured for OpenTX.

It is recommended that the user read through the instructions first and then start at the beginning and follow them step-by-step. It is easier to get the process done correctly the first time rather than needing to troubleshoot a problem later.

These instructions are written for users of Windows computers.

## General Warnings

These instructions are for use with **ONLY** the FrSky X12S **production system**. When running the FrTX OS the X12S it is flash memory centric and only uses the SD card for Music, Logs and firmware updates.

The FrSky X12S production systems were provided with factory installed FrTX firmware. There is no FrSky support planned for users that flash their X12S with OpenTX and have problems with OpenTX or have problems flashing the system back to FrTX. Considering the risk if there are problems you may not want to flash your system with OpenTX. If you do change the OS system you do so at your own risk.

If you do not consider yourself an experienced user of OpenTX Companion and have not used Companion before you may not want to flash your X12S with OpenTX and stay with FrTX OS.

Even though 2.2.X is in ongoing development, there is little chance that models built in one release might not be compatible with a future build. After building a model the programming needs to be checked very carefully with the aircraft to make sure it works as expected.

The current version of OpenTX Companion only supports an USB connection to the X12S for flashing of firmware (power off) and a massstorage option to access the SD card via the USB connection (power on). The massstorage option is used for reading or writing models to the X12S with Companion.

If you are not an experienced user of OpenTX Companion you might have problems returning to your X12S to FrTX.

## Preparing X12S For OpenTX Flashing

Warning: Before starting any flashing process make sure you have the correct X12S FrTX OS firmware files saved on your computer or follow the Companion backup process of the X12S system. These files are only available on the FrSky website [here](#)

[http://www.frsky-rc.com/download/index.php?sort=Firmware&cate\\_id=0&pro\\_id=0](http://www.frsky-rc.com/download/index.php?sort=Firmware&cate_id=0&pro_id=0) As

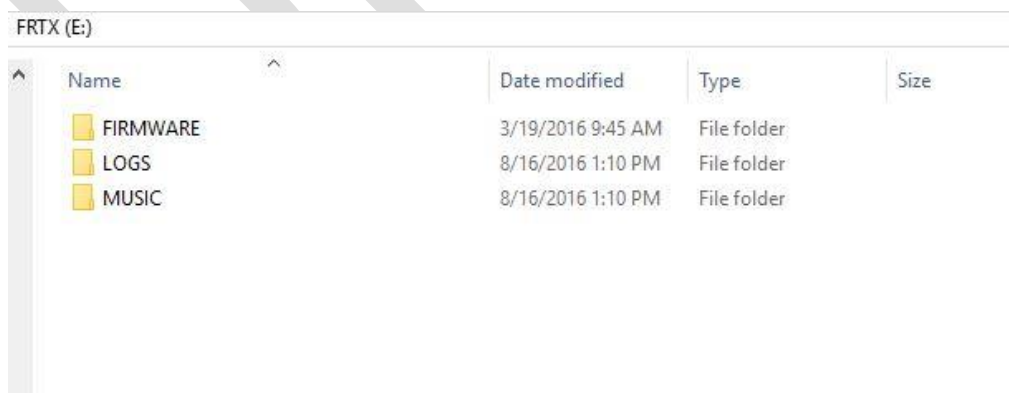
the builds have been released the folder structure and file naming has been changed a number of times. The most recent firmware builds have three folders, Normal (English), L - Localization (localized languages) and C - Simplified Chinese. In most cases FrSky provides dfu files for a one step flashing process, but can be missing in some builds. If a given build is missing the dfu files it can be found in older builds. In the early firmware build there is a dfu file for each X12S mode (1 or 2) and for EU LBT FrTX and FrTX for US. In the later firmware there is no separate file for modes. FrSky has also posted bin for simple firmware updates using the firmware folder.

**We will make a virtual backup of the X12S FrTX bootloader and firmware that can be used to restore that part of the system in the future.**

The SD card eject spring tension has the ability to launch the SD card a significant distance, so caution should be used when removing or inserting the card.

The X12S is not shipped with a micro SD card because the production system keeps its operating folders in an internal flash memory drive. The first step will be setting up the SD card. A class 10 card works the best and 16gig is about the smallest you can buy nowadays. 16gig should be way more storage than needed.

1. Format the card using Fat 32 using a Window computer. Mark the card FrTX.
2. Create FIRMWARE, MUSIC and LOGS folders on the card. A MP3 music file can be added as a way to test the card after it is installed.



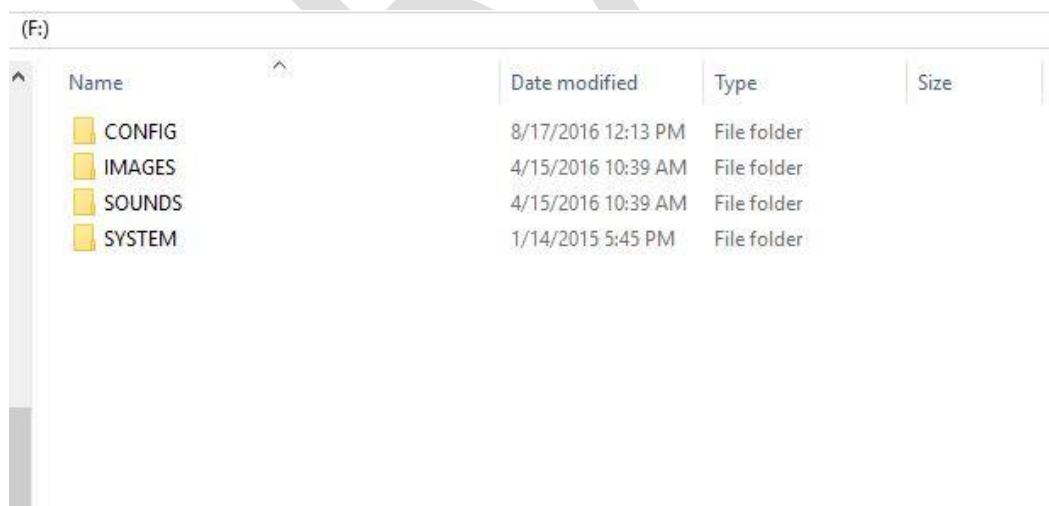
FRTX (E:)				
	Name	Date modified	Type	Size
	FIRMWARE	3/19/2016 9:45 AM	File folder	
	LOGS	8/16/2016 1:10 PM	File folder	
	MUSIC	8/16/2016 1:10 PM	File folder	

3. With the X12S system power off insert the card in the SD slot. The card contacts face up.

4. Start the system and the SD icon should be visible on the top right side of the display. Press SYS and select the MUSIC player and play the MP3. This is just a quick test to make sure the SD card access is working.
5. At this point the system is ready to use.

The next step is preparing the SD card so it can be used to restore the FrTX OS system after using OpenTX on the system. **This is a critical step. Without it you might not be able to easily return the system to FrTX and maintain your system settings and models. OpenTX should never write into flash memory area, but just for best practices the SD card will be configured and a backup made so the X12S can be recovered even something happens to the flash memory drive at a later date. The factory default contents of the flash memory drive are available on the FrSky download website.**

1. With the X12S system power on connect a USB data cable to the USB port on the back of the X12S (do not lay the X12S on its back with the USB cable attached it could damage the USB connector) and connect the USB data cable to a USB port on a Windows computer. The display of the X12S will display a large USB symbol on the screen.
2. After a few seconds two Windows File Explore windows should open.



Flash memory drive folders.

FRTX (E:)				
Name	Date modified	Type	Size	
FIRMWARE	3/19/2016 9:45 AM	File folder		
LOGS	8/16/2016 1:10 PM	File folder		
MUSIC	8/16/2016 1:10 PM	File folder		

### SD card folders

- Use the File Explore copy function to copy all the flash memory drive folders to the SD card. Or you can just copy the Flash memory drives to a folder on your computer for backup. **Caution: DO NOT delete the flash memory drive folders.**

FRTX (E:)				
Name	Date modified	Type	Size	
CONFIG	8/17/2016 12:13 PM	File folder		
FIRMWARE	3/19/2016 9:45 AM	File folder		
IMAGES	4/15/2016 10:39 AM	File folder		
LOGS	8/16/2016 1:10 PM	File folder		
MUSIC	8/16/2016 1:10 PM	File folder		
SOUNDS	4/15/2016 10:39 AM	File folder		
SYSTEM	1/14/2015 5:45 PM	File folder		

Flash memory files copied to the SD card. **The card is being configuring with the assumption that something might happen to the flash memory drive files.**

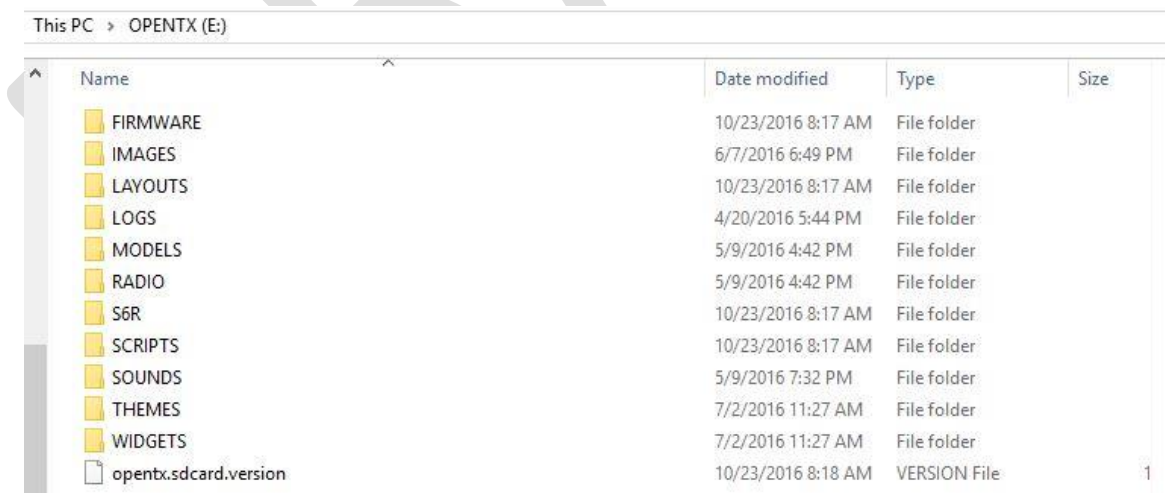
- Copy all the SD folders to a folder on your computer for backup.
- Because OpenTX does not use the flash memory drive leave the FrTX folders on the flash memory drive.**
- Using the Windows USB **eject function eject both drives.**
- Disconnect the USB cable and the X12S will shut off.

8. With the system off remove the SD card. Store the SD card in a safe place and or note where you made the SD backup on your computer.

## Flashing Firmware

### Flashing OpenTX Firmware

1. A SD card of about 4 gigabytes or more is required and formatted as Fat32
2. Down load the Horus OpenTX SD card files from the link on this page here <http://www.open-tx.org/2017/05/30/opentx-2.2.0> and included sounds. Download the newest files.
3. Un-zip the download and copy the files to the SD card.
4. The folders on the SD card will look like the image below. The Models and Radio and folders must be manually created and will be empty until the system is flashed. **Be sure to copy the Version file.** IMAGES is used for 192X114 JPG and PNG color model images with a file name length limit of 6 characters. Sound files have a file name length limit of 6 characters. Logs will hold log files when the data "logging" feature is used. **Make sure the VERSION file is on the SD.**



Name	Date modified	Type	Size
FIRMWARE	10/23/2016 8:17 AM	File folder	
IMAGES	6/7/2016 6:49 PM	File folder	
LAYOUTS	10/23/2016 8:17 AM	File folder	
LOGS	4/20/2016 5:44 PM	File folder	
MODELS	5/9/2016 4:42 PM	File folder	
RADIO	5/9/2016 4:42 PM	File folder	
S6R	10/23/2016 8:17 AM	File folder	
SCRIPTS	10/23/2016 8:17 AM	File folder	
SOUNDS	5/9/2016 7:32 PM	File folder	
THEMES	7/2/2016 11:27 AM	File folder	
WIDGETS	7/2/2016 11:27 AM	File folder	
opentx.sdcard.version	10/23/2016 8:18 AM	VERSION File	1

5. With the X12S with the power off install new OpenTX SD card.
6. Download OpenTX Companion 2.2.X from the OpenTX 2.2 branch link here <http://www.open-tx.org/downloads.html> and install. After selecting, review the

instructions on the 2.2.X page before downloading the Companion build.

7. With the X12S **power off** connect it to a Windows computer using a USB data cable. Download Zadig from here <http://zadig.akeo.ie/> and install. Not all USB cables are actually “data” cables; some are just a charging cable. Even data cables are not all created equal and one that you have used for other data applications may not work with STM32bootloader. You must use a compatible data cable or the X12S will not connect. .

Zaddig is an installer program to install the USB driver called STM32bootloader so that the USB power off connection can be made to the X12S. Zaddig may replace the existing default USB driver. When installed the STM32bootloader should be visible in the USB section of the Window Device Manager with the X12S connected.

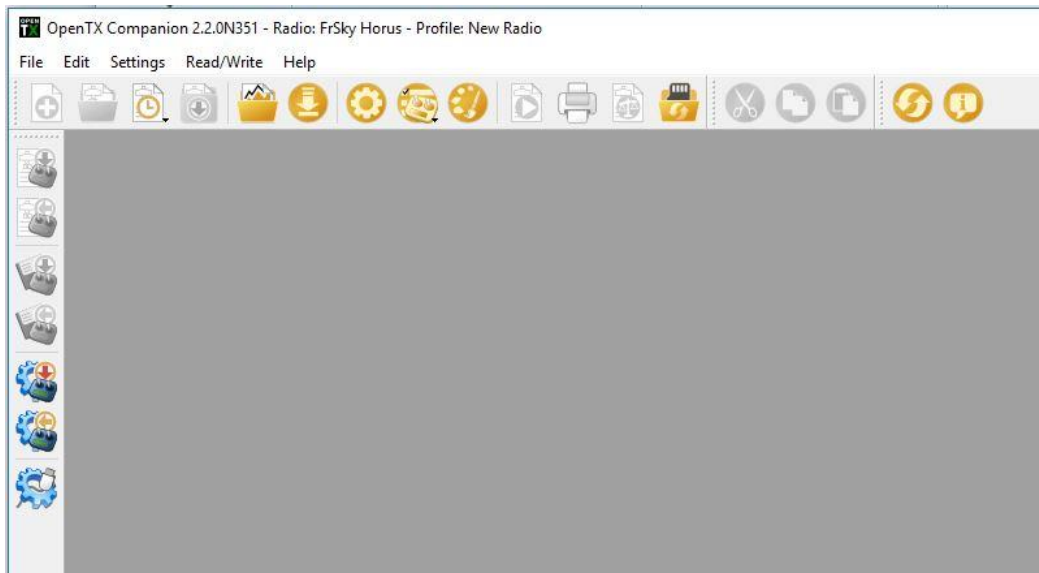
Even if you think STM32bootloader was installed for a Taranis you may need to do the installation again. Also some Windows updates like Windows 10 Anniversary update may remove STM32 Bootloader. If you need help on installing go here <http://open-txu.org/home/undergraduate-courses/fund-of-opentx/using-zadig/>

8. The X12S with power off should still be connected to the computer with a USB data cable. Start Companion and in settings, make sure the Radio Type is set to FrSky Horus. Click the lower icon on the left side of Companion that has the left arrow on it (read firmware from radio). This process will make a valid backup of the FrTX firmware and bootloader. This backup creates an image that can be flashed back to the X12S to restore the FrTX boot loader and firmware.

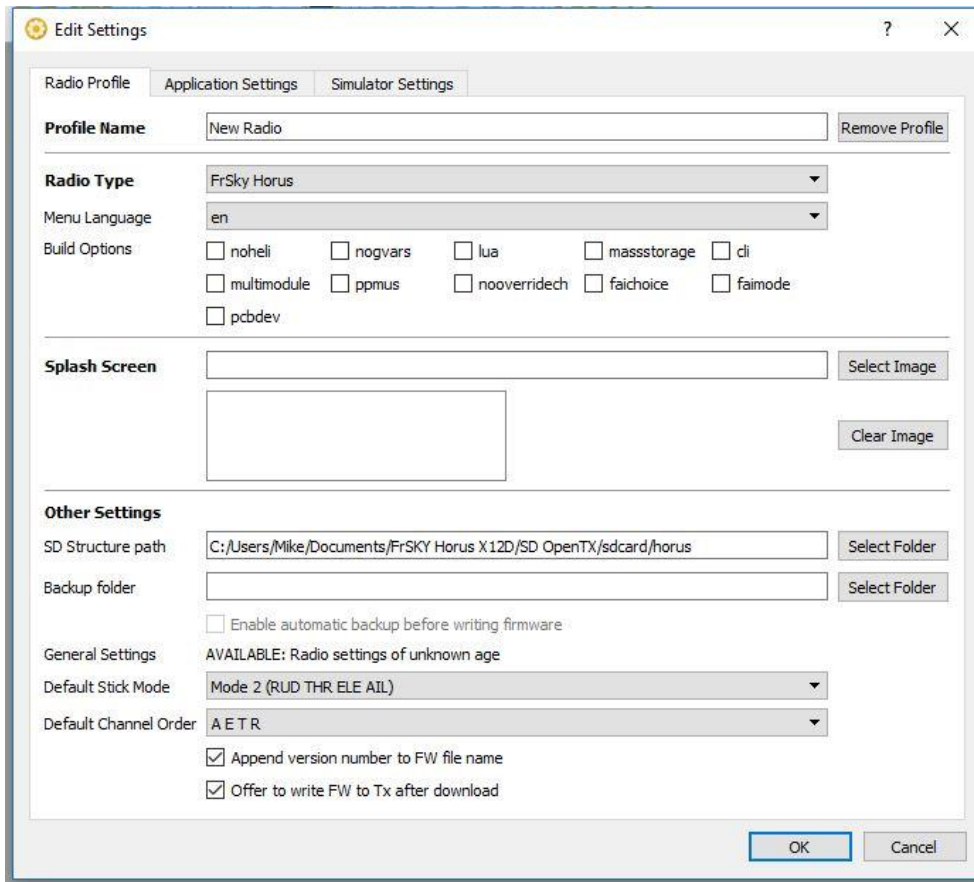
Save the file to a folder on your computer. It would a good idea to use a file name with FrTX included and the firmware release as a reminder that it is the FrTX backup file. Make sure that the backup process actually saved the backup file. The extension should be bin and around 2000KB in size. If there is no file saved check the STM32 Bootloader installation.



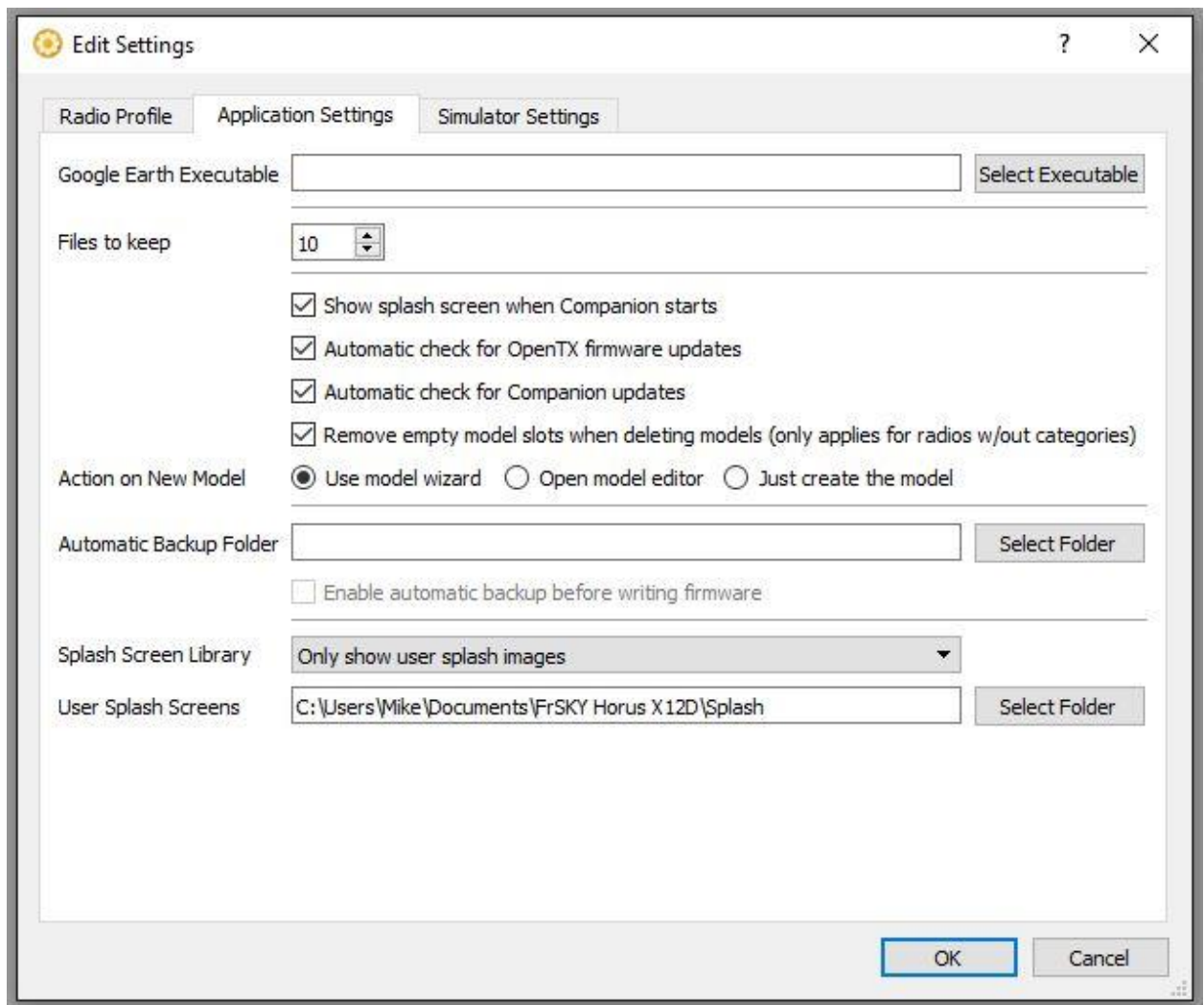
9. Click the settings “Gear” Icon on the top bar to open the settings window.



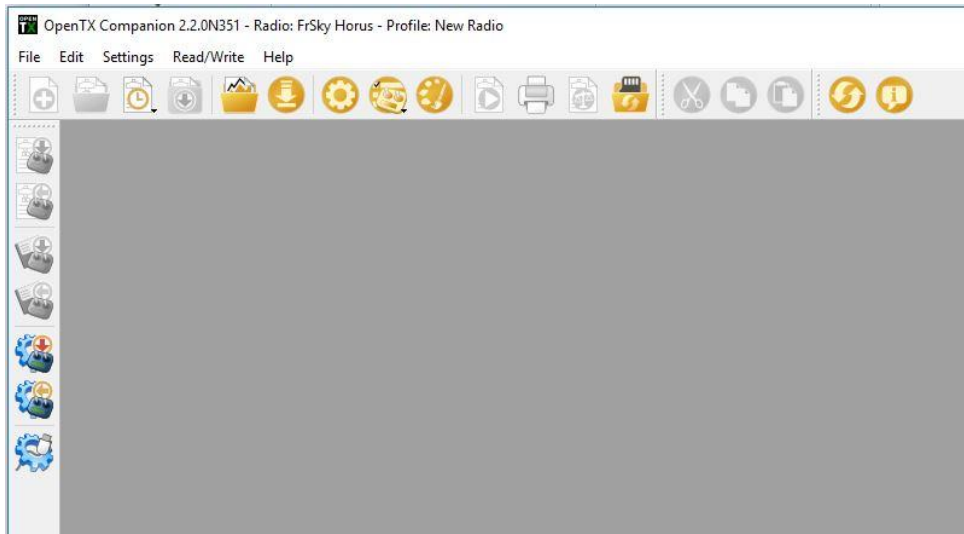
10. In settings, make sure the Radio Type is set to FrSky Horus. There is an option on this page called **pcbdev for downloading the firmware for the early beta X12S systems. DO NOT select this option. Do select the massstorage option** so that models can be read and written to the X12S .



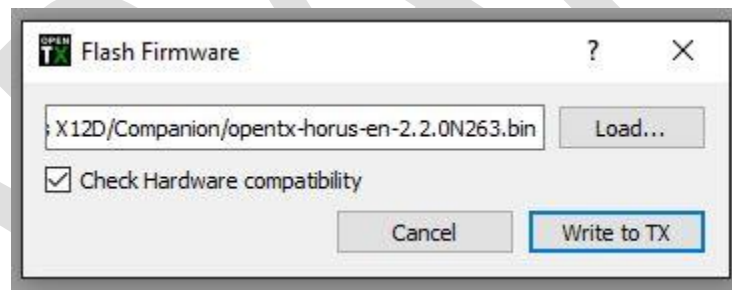
11. In Settings/Application Settings check that the following boxes are checked.



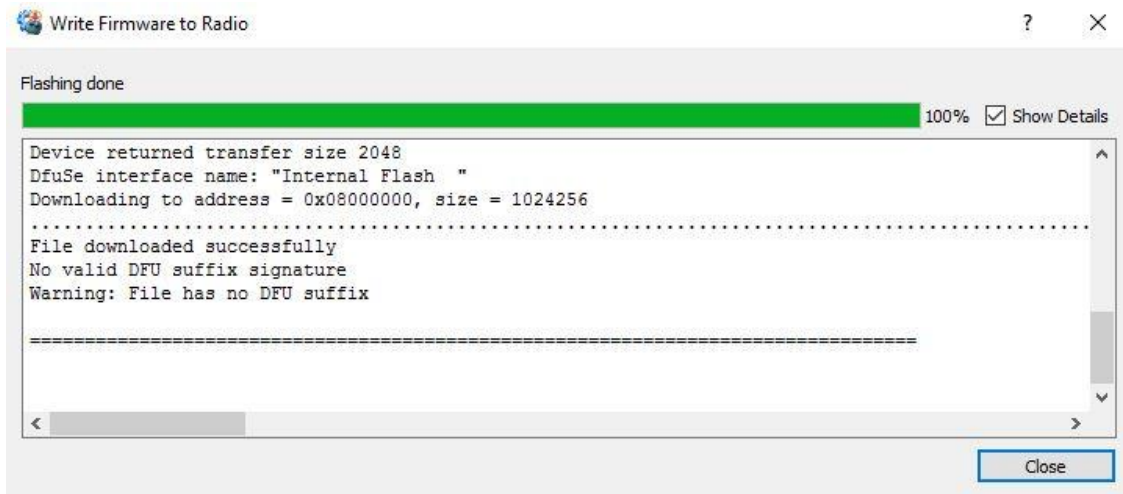
12. Start the download of the OpenTX Horus firmware by clicking down “arrow” icon on the top bar. A window opens and then Click the “Download FW” button and save the firmware.



13. In Companion select “write firmware to radio” icon. It is the “radio” icon with the down arrow on the left of the screen. The window below opens. Check that the firmware that was just downloaded is displayed. If not click “Load” and select the OpenTX Hours firmware bin file. Check Hardware compatibility box may need to be unchecked.



14. Click “Write to TX” and flash the X12S.



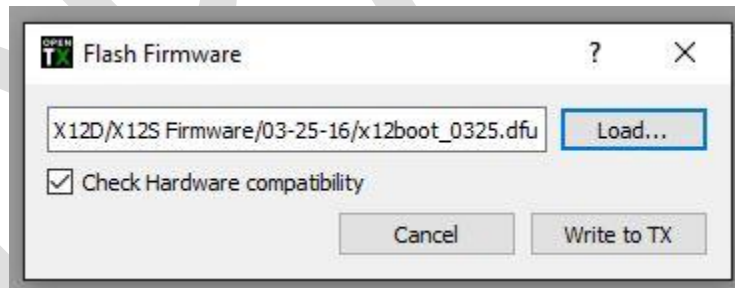
After the flashing is complete the OpenTX Companion screen looks like the above image.

15. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
16. Disconnect the X12S from the USB
17. Turn on the X12S and test (if this is the first OpenTX flash for the system it will start on the calibrate screen) **Detailed testing of models should be done before flight to make sure the programming works as expected. Always range check the system in range check mode before flight.**

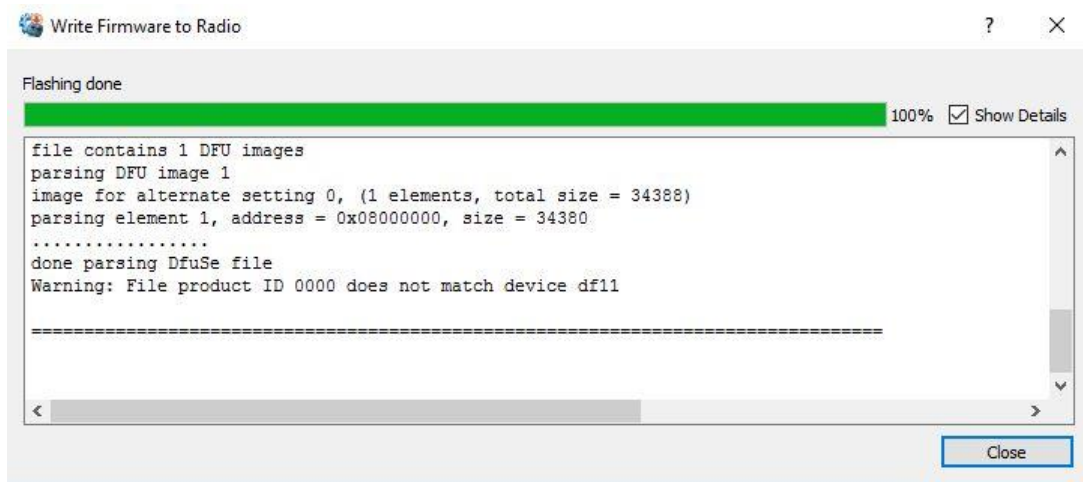
**In the rare case that the X12S will not start after flashing, reconnect the X12S to the PC and re-flash the system. If the X12S system is not recognized by the PC then there is a possibility that a bad flash process has hung the system and the battery needs to be disconnected for a few minutes to fully shut down the system and then re-flash. In some cases the battery may need to be disconnected until the flashing process is complete. See page 27 for how to open case and disconnect the battery.**

## Removing OpenTX Option 1 - Flashing the FrTX Bootloader and Firmware – Using the FrTX Companion Backup

1. This process will remove OpenTX and install the FrTX bootloader and the FrTX firmware.
2. With the X12S power off remove the OpenTX SD card from the X12S. **The OpenTX SD card contains all the X12S OpenTX configuration information including the model files created while using OpenTX and can be used again starting with step #5 of the OpenTX flashing instructions, but not before the FrTX folders are backed up. See the Preparing X12S For OpnTX Flashing section on page 3.**
3. Insert the FrTX SD card in the X12S
4. With the X12S power off connect it to the computer with a USB data cable.
5. Start Companion, select “write firmware to radio” icon, in the window that opens click “Load” and select the FrTX backup file that was made before OpenTX was flashed. **Caution make sure the FxTX file is selected and not the OpenTX file.** Check Hardware compatibility box may need to be unchecked.



6. Click “Write to TX” to flash the X12S



After the flashing is complete the OpenTX Companion screen looks like the above image.

7. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
8. Disconnect the X12S from the USB

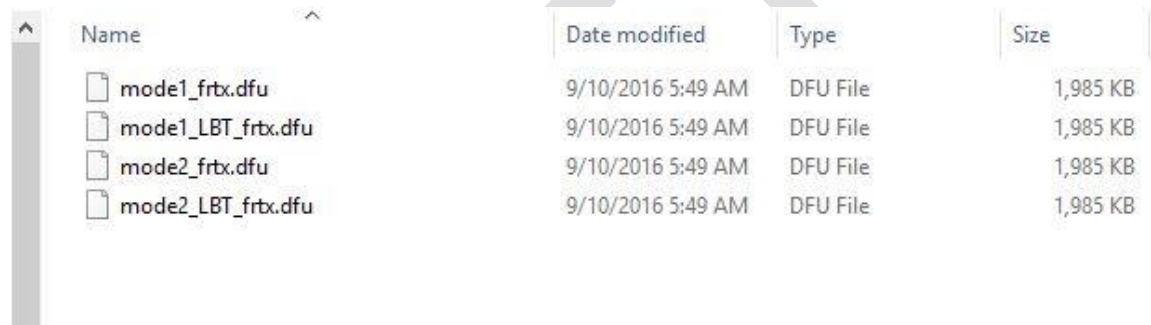
At this point the system has OpenTX removed. Power on the system and it should be restored to FrTX. **Go to page 20 step15 to remove the backup files that were added to the SD card.**

### Removing OpenTX Option 2 - Flashing the FrTX dfu – One Step Using FrTX Files

1. This process will remove OpenTX and install the FrTX bootloader and FrTX firmware.
2. With the X12S power off remove the OpenTX SD card from the X12S **The OpenTX SD card contains all the X12S OpenTX configuration information including the model files created while using OpenTX and can be used again starting with step #5 of the OpenTX flashing instructions, but not before the FrTX folders are backed up. See the Preparing X12S For OpnTX Flashing section on page3**

This process assumes you have the FrTX **dfu** files from the FrSky Website. **As the**

builds have been released the folder structure and file naming has been changed a number of times and is not consistent. The most recent firmware builds have three folders, Normal (English), L - Localization (localized languages) and C - Simplified Chinese. In most cases FrSky provides **dfu** files for a one step flashing process, but can be missing in some builds. If a given build is missing the **dfu** files it can be found in older builds. In the early firmware build there is a **dfu** file for each X12S mode (1 or 2) and for EU LBT FrTX and FrTX for US. In the later firmware there is no separate file for modes and are not necessary because mode is selected when building a model. The most recent builds are just EU\_XXXX\_frtx, NEU\_XXXX\_frtx (N=NOT EU).

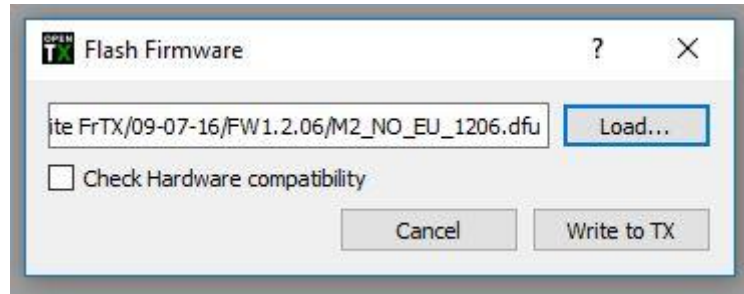


Name	Date modified	Type	Size
mode1_frtx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode1_LBT_frtx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode2_frtx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode2_LBT_frtx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB

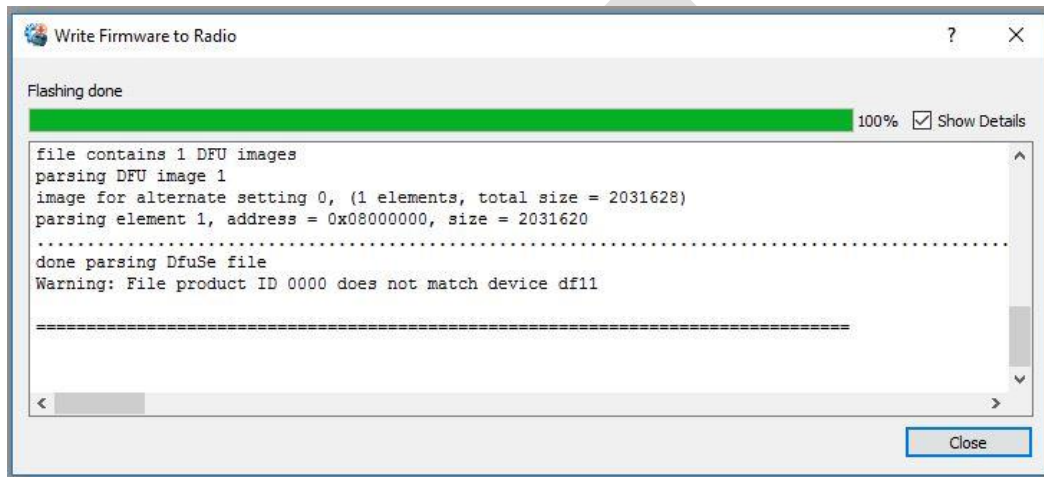
**Dfu** file list from FrSky website.

3. Insert the FrTX SD card in the X12S
4. With the X12S power off connect it to the computer with a USB data cable.
5. Start Companion, In settings, make sure the Radio Type is set to FrSky Horus, then select “write firmware to radio” icon, in the window that opens click “Load” and select the **dfu** file. **Caution make sure the FxTX file is selected and not the OpenTX file.**





Click “Write to TX” to flash the X12S.



After the flashing is complete the OpenTX Companion screen looks like the above image.

6. Use “Safely Remove USB Hardware” feature on your computer to close the USB port.
7. Disconnect the X12S from the USB
8. Hold the power button down on the X12S until you see text below.



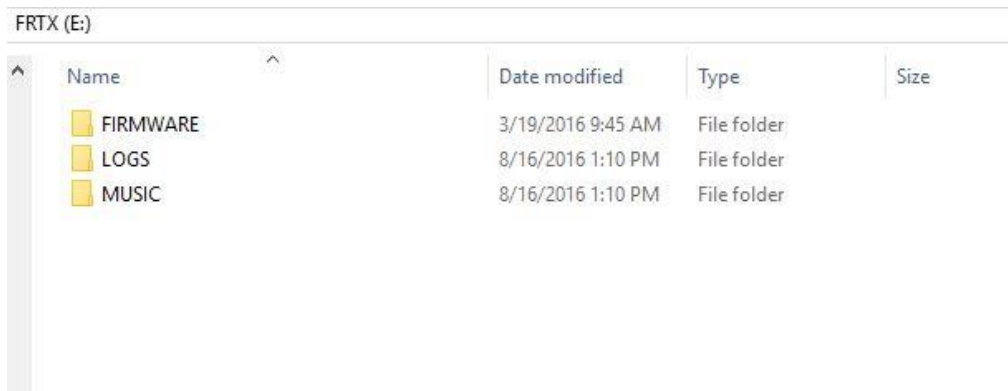
The update process runs with an ending message to “restart system please” and shuts off automatically.

9. Power on the system and test.
10. At this point the flashing is done unless you did all the folder backups to the SD card starting on page 3.
11. To remove SD backup files. With the power on connect the X12S to a Windows computer with a USB data cable. **This step and the following steps will be modified if and when OpenTX starts using the flash memory drive. It is not known at this time how OpenTX may use the flash memory and the impact it might have on starting the system with FrTX. The X12S FrTX can run in the flash memory drive mode and also run in a SD card only mode. If and when OpenTX starts using the flash memory drive the FrTX SD card run mode can be used to remove the OpenTX folders and restore the FrTX folders to the flash memory**

drive.

12. Two File Explore windows will open.

13. Select the SD card drive and delete the system folders from the SD card CONFIG, IMAGES, SOUNDS and SYSTEM.



Name	Date modified	Type	Size
FIRMWARE	3/19/2016 9:45 AM	File folder	
LOGS	8/16/2016 1:10 PM	File folder	
MUSIC	8/16/2016 1:10 PM	File folder	

Remaining SD card folders

14. Using the Window USB eject feature, eject both drives and disconnect USB. The X12S shuts off.

15. Power on the X12S and test.

### Normal FrTX OS Firmware Update – Using Firmware Bin Files

This process is for performing a normal FrTX OS **bin** file update on systems that are currently operating with the FrTX OS.

1. From the FrSky Firmware Download Website [http://www.frsky-rc.com/download/index.php?sort=Firmware&cate\\_id=0&pro\\_id=0](http://www.frsky-rc.com/download/index.php?sort=Firmware&cate_id=0&pro_id=0) . Download the X12S firmware zip file and un-zip the file. This process assumes you have the FrTX **bin** files from the FrSky Website. The most recent firmware builds have three folders, Normal (English), L - Localization (localized languages) and C - Simplified Chinese. In the early firmware build there is a **bin** file for each X12S mode (1 or 2) and for EU LBT FrTX and FrTX for US. In the later firmware there is no separate file for modes and are not necessary. Depending on the build there could be LBT (Listen Before Transmit) is used for EU countries and FrTX for the

US and other countries that do not use LBT. The most recent builds have EU\_XXXX\_frtx and NEU\_XXXX\_frtx (N=NOT EU).

2. The firmware **bin** file copy function can be done by connecting the powered on X12S to your Windows computer with a data USB cable or removing the SD card and writing directly to the SD card.
3. When the powered on X12S is connected with the data USB cable two Windows File Explores will appear within a minute, one for the SD card and one for the Flash Memory Drive.
4. Copy the correct FrTX firmware **bin** file for your system to the SD FIRMWARE folder. Only **ONE** file can be in this folder.
5. Use “Safely Remove USB Hardwar” feature on your computer to close the USB port.
6. Disconnect the X12S from the USB
7. Press and **hold** the rotary encoder down (the enter knob) and **at the same time press and hold** the power switch until text is displayed on the screen.

See below:



The flashing process will run and finish with a "Successful" press the power off button briefly and the system shuts off.

8. Next. Press hold the power switch until text is displayed on the screen.

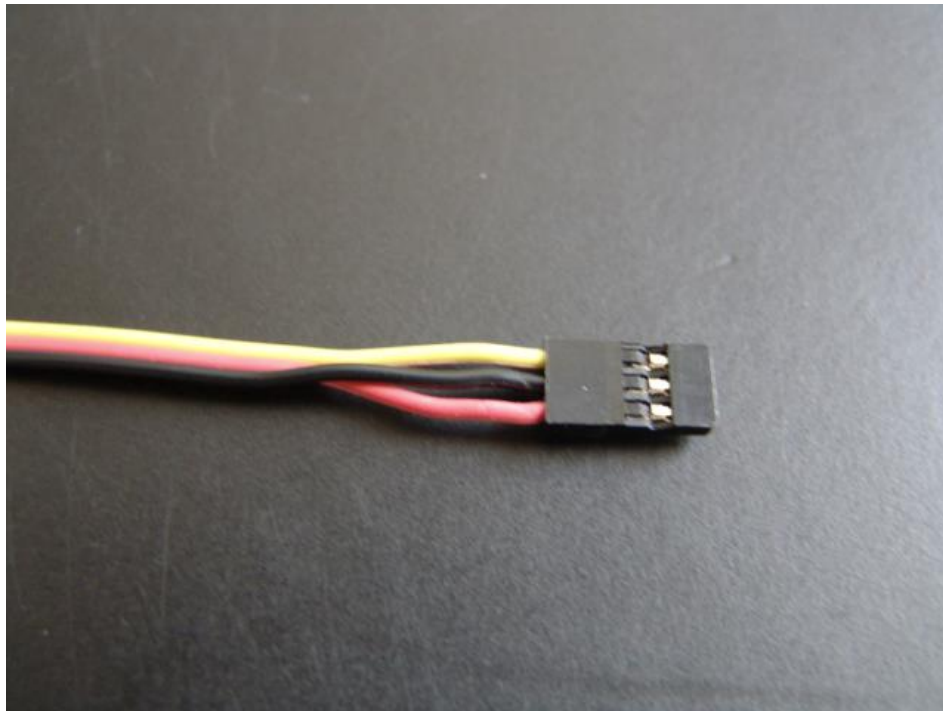
See below:



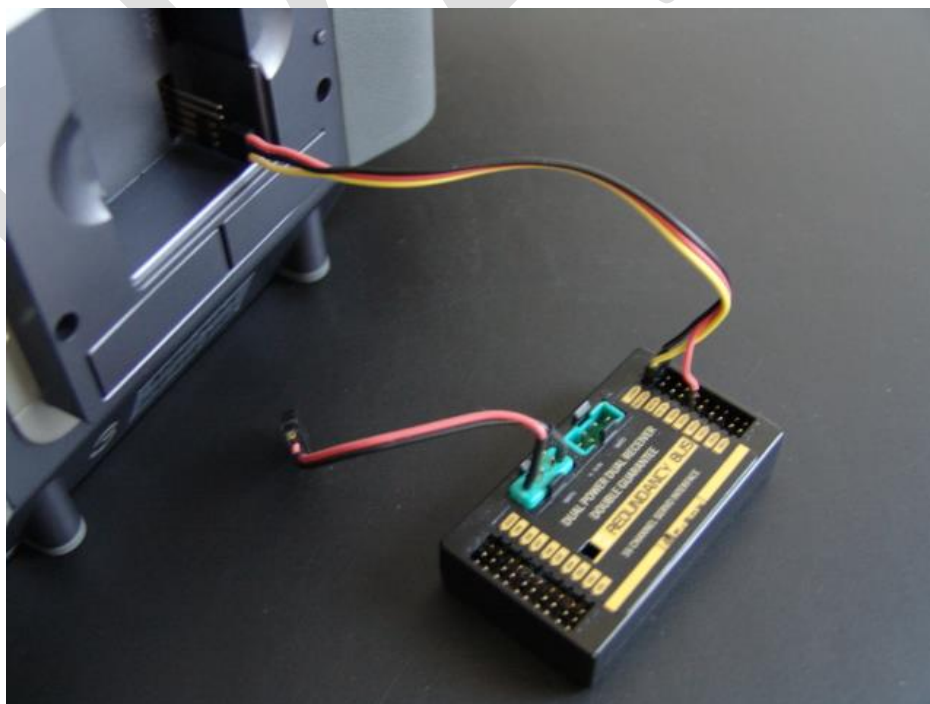
9. The flashing process runs with an ending message to “restart system please” and shuts off automatically.
10. Press the power switch to start the system. The system should have the normal FrTX screen with all models, etc.

### Smart Port Flashing of Devices with X12S FrTX OS

1. For this flashing example we will update the FrSky Redundancy Bus, but the process can be used for the XJT module, receivers, etc. **Caution: Because the TX voltage is used for power when you flash devices make sure there is nothing connected to the device, servos, etc.**
2. Copy the file to be flashed to the X12S SD card FIRMWARE folder. If the file name is too long it may need to be renamed shorter to appear in the X12S update selection window.
3. Change the order of the connector wires in a Smart Port cable for the X12S connection by reversing the black and red wire.

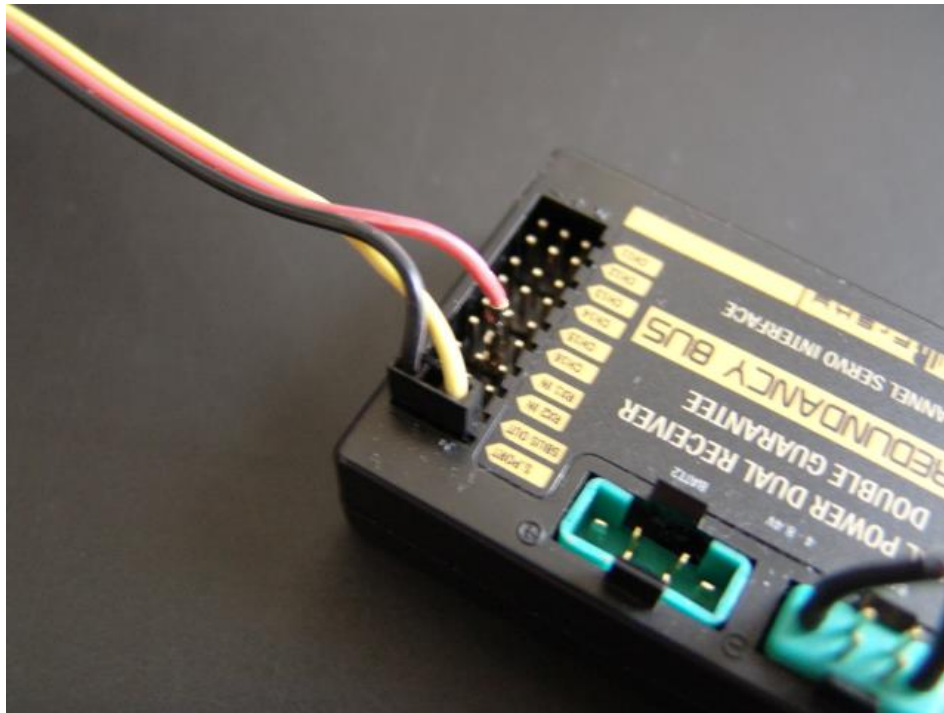


4. With the X12S powered off connect the cable to the lower three pins of the module bay connector (yellow on the lowest pin) and to the Redundancy Bus.





5. The connection on the Redundancy Bus is on the Smart Port with the red wire on Channel 18 + connection.

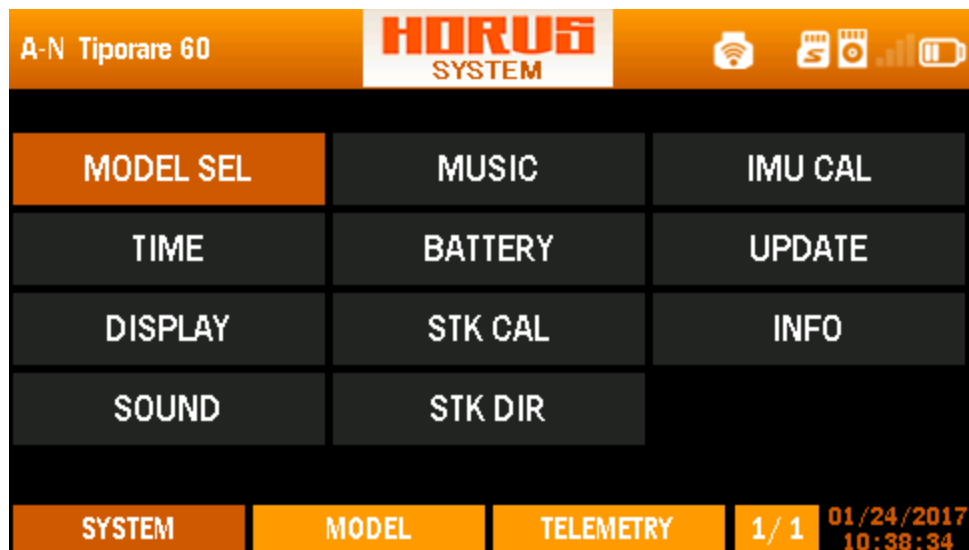


6. Power on the X12S. At the main screen press SYS.



7. At the SYSTEM screen select UPDATE

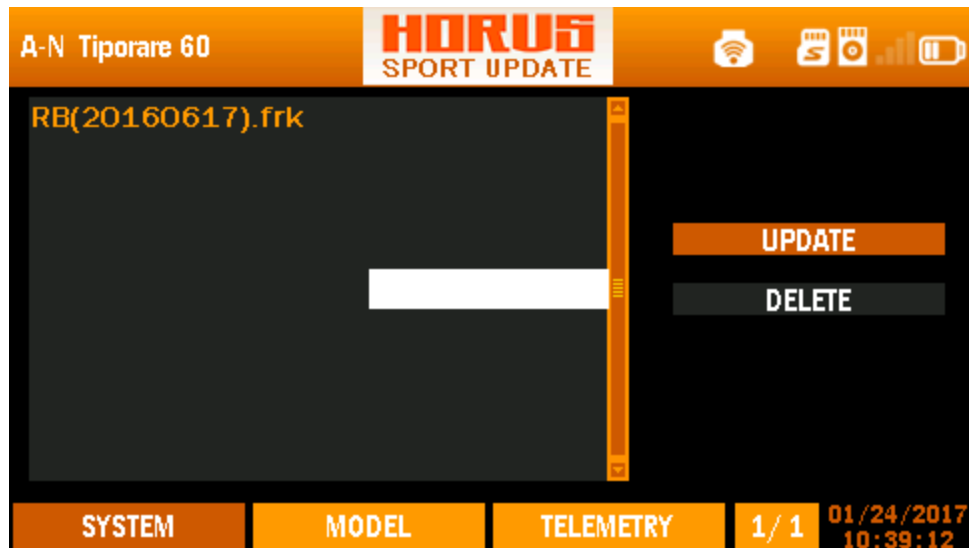




8. At the SPORT UPDATE Screen select the file to be flashed and select UPDATE



9. When UPDATE is selected a flash progress bar pops up.

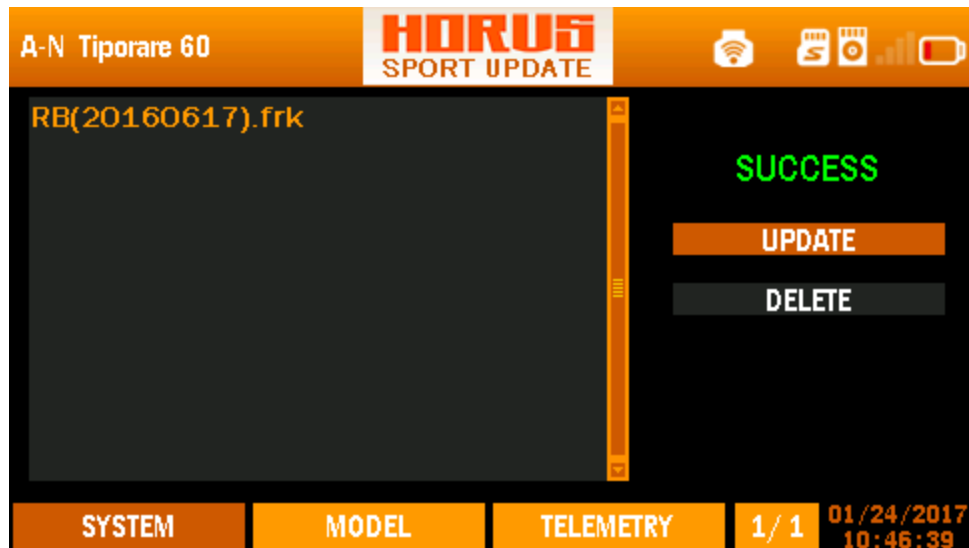


10. The progress bar during flashing.



11. When the flashing is complete the progress bar closes and SUCCESS is displayed.

Use the **DELETE** function to delete the file. Test

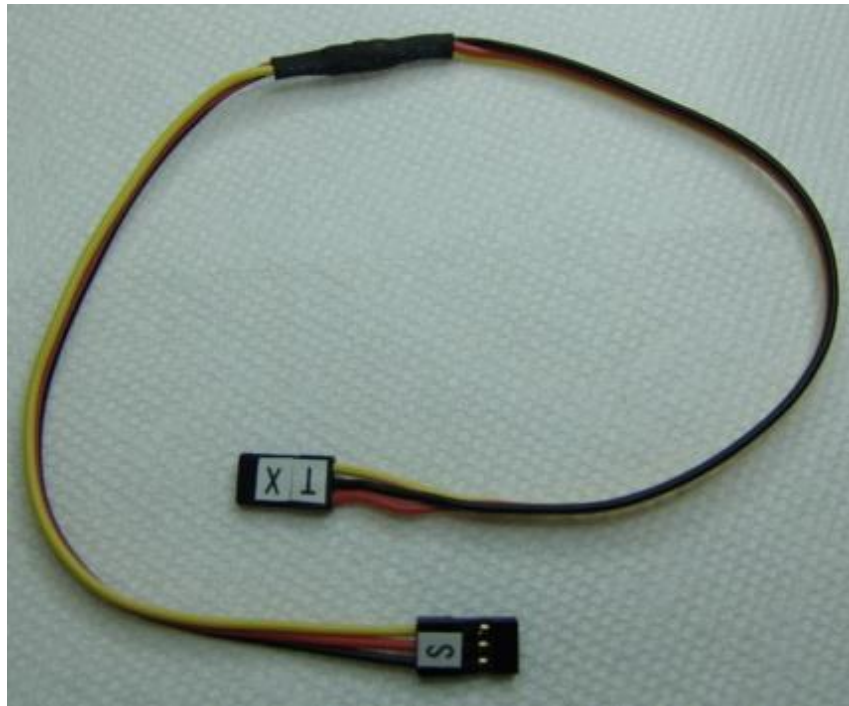


12. Power the X12 off and disconnect the Smart Port cable. As always carefully test any device flashed to make sure it functions correctly. OpenTX RC11 and above also has a Sport flashing feature.

13. Flashing Cables.



RBUS Cable



Receiver Cable X6R and X8R



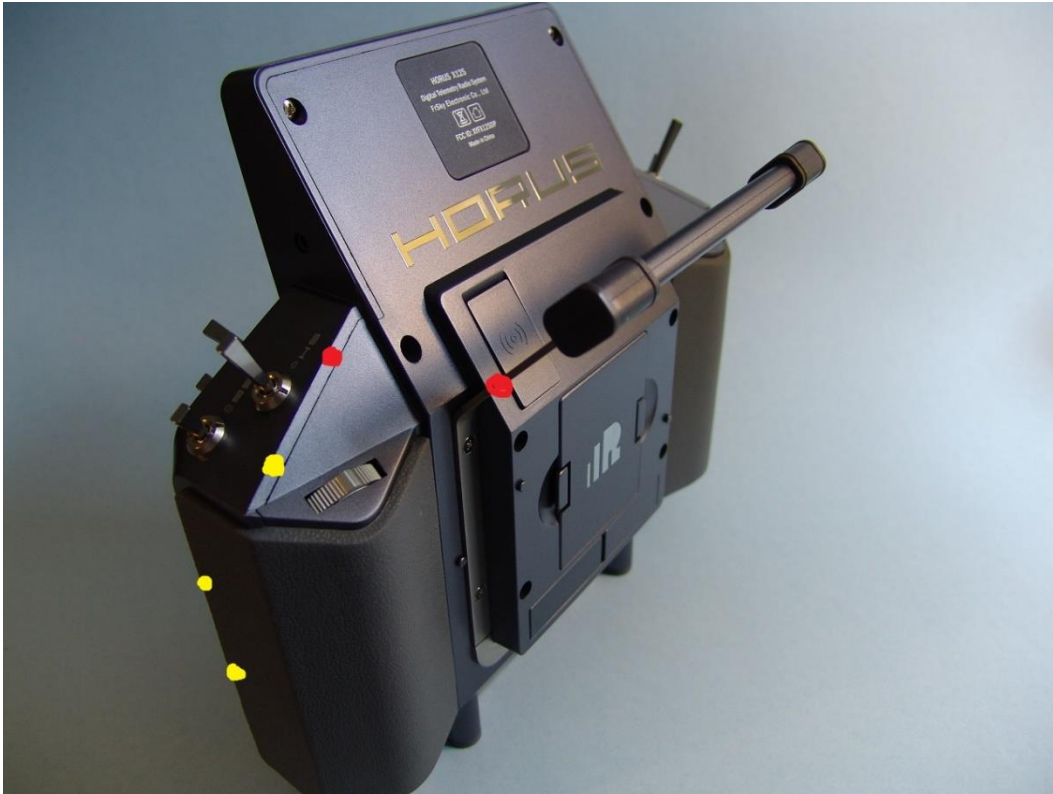
Receiver Cable X4R

## How to Open X12S Case – Battery Disconnect

1. If the flashing of OpenTX or the FrTX dfu does not complete properly there possibility that the X12S will not start and also a possibility that it will not be recognized again when reconnect to the PC. If the X12S system will start and is not recognized by the PC it is most likely in a hung condition and will need to be reset by disconnecting the system battery. In some cases the battery will need to be left disconnected during the flash and then reconnected when the flash process is complete.
2. The case will be opened for access to the battery.
3. After removing the case screws (6 round head chrome) and bolts (4 black, not used in the later cases) place the X12S on a table face down and padded with a thick folded towel. Do not remove the rubber side grips. Stand so your leg is against the edge of the table. Pull the X12S to the edge of the table so the bottom/base is against your leg to brace the X12S.
4. With your right hand wrap your fingers around the base of the handle (red dot) and put your right thumb on the front of the case edge (red dot). With your left hand grip the front edge of the rubber grip with your fingers and place your thumb on the front edge of the case (yellow dot). Using your leg to brace the X12S, grip the case back with your fingers as described above and press on the front edge of the case with both thumbs until that side of the case pops lose.
5. Be careful that you just pop the case open ¼" or less and then release the other side. There are connections to the case back for the GPS antenna, external antenna, haptic motor and the two back sliders. Just open the case far enough to reach between the front and back case to reach the battery connector from the bottom of the case.

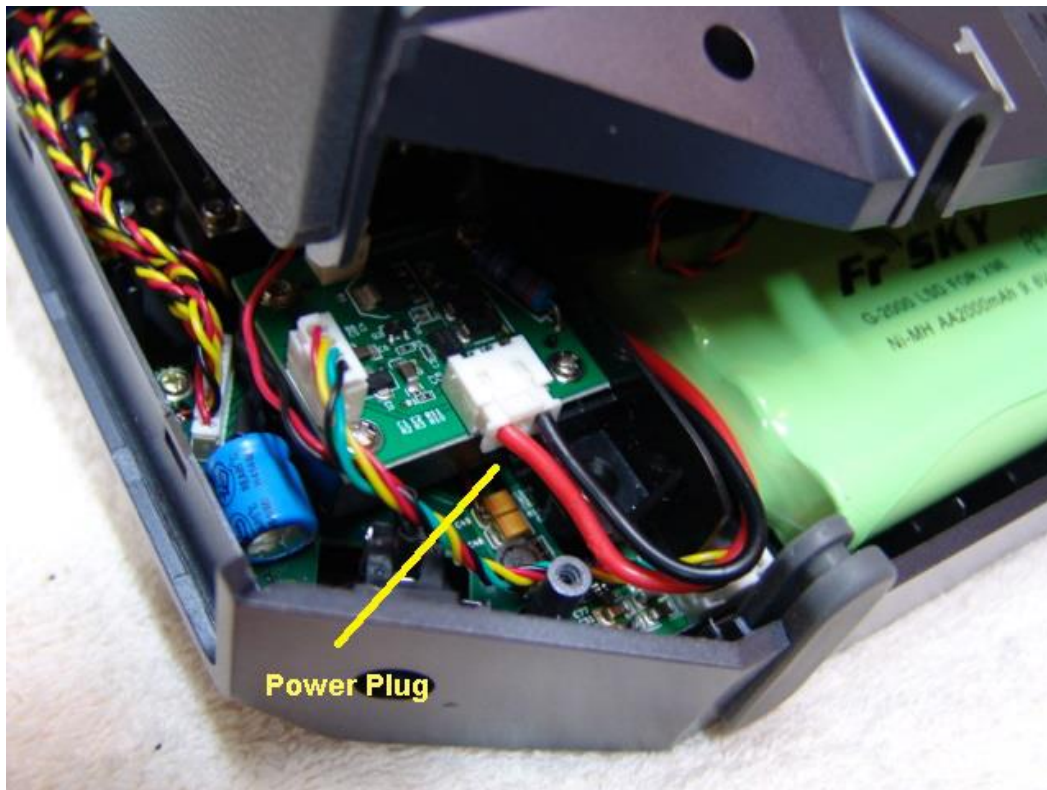
See images below....





X12S case back

Looking from the back of the X12S the battery connector plug is in the lower left corner of the front case and has heavy red and black wires,



The battery connector plug. **Be careful when reconnecting the battery connector that the power wires are clear of the front case mounting stud near the wire.**

**Happy Flying!**