

FrSky Horus X12S System

**OpenTX Firmware and FrTX Flashing
with
Windows OpenTX Companion**

Production X12S Systems Only

October 23, 2016

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 draft is for use during the pre-release test phase of the OpenTX 2.2. **If you are just looking for the information on how to do a normal FrSky firmware update with firmware bin files go to page 17.**

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 by flashing the FrTX OS bootloader dfu and the FrTX firmware bin. The instructions assume the user is already an expert 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.

OpenTX 2.2.X is in its early development and only nightly builds are available. If you do not consider yourself an expert user of OpenTX Companion and have not used nightly builds before you may not want to flash your X12S with OpenTX and stay with FrTX until OpenTX is officially released.

Because 2.2.X is in development, models built in one nightly build 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 and a massstorage option to access the SD card via the USB connection. **There is no provision for reading or writing models to the X12S with Companion.** If you are not an expert user of OpenTX Companion you may have problems returning to your X12S to FrTX.

Preparing X12S For OpenTX Flashing

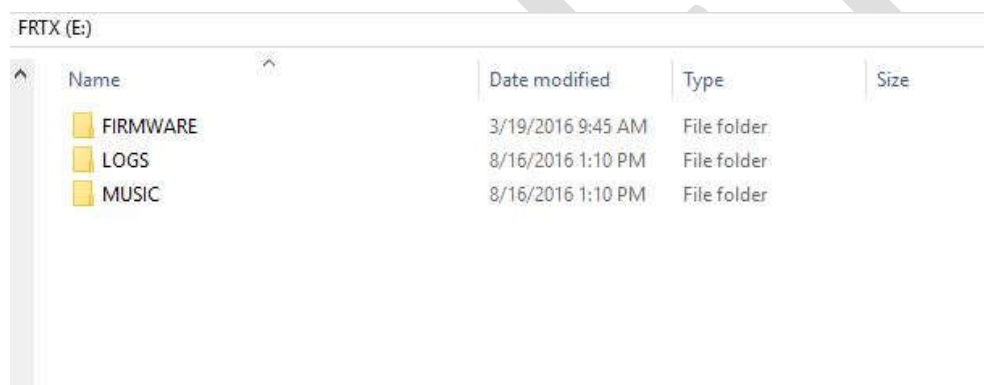
Warning: Before starting any flashing process make sure you have the correct X12S FrTX firmware files saved on your computer or follow the Companion backup process of the X12S system. These files are only available on the FrSky website here http://www.frsky-rc.com/download/index.php?sort=Firmware&cate_id=0&pro_id=0 Currently FrSky provides dfu files for a one step flashing process. There is a dfu file for each X12S mode (1 or 2) and for EU LBT FrTX and FrTX for US. 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 no longer 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.

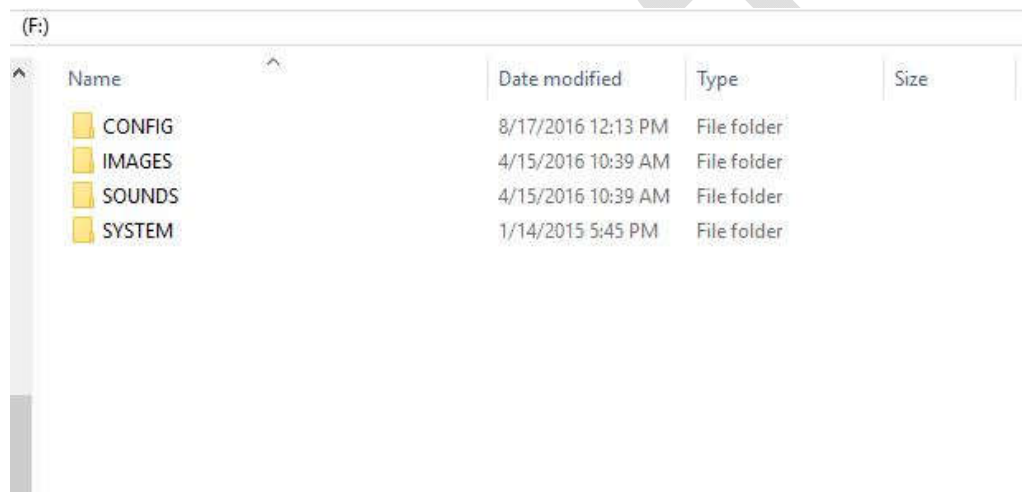


3. With the X12S system power off insert the card in the SD slot. The card contacts face up.
4. Start the system and the SD icon should be visible on the top right side of the display. Press SYS and select the MUSIC player and play the MP3. This is just a quick test to make sure the SD card access is working.
5. At this point the system is ready to use.

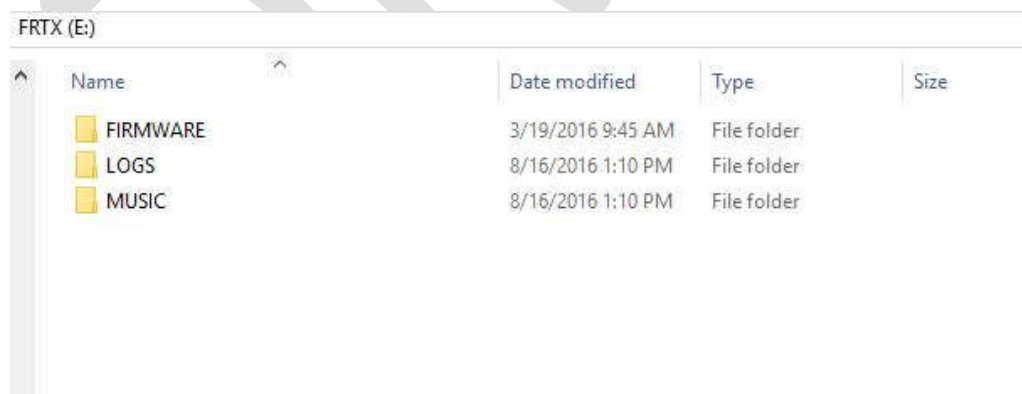
The next step is preparing the SD card so it can be used to restore the FrTX OS system after using OpenTX on the system. **This is a critical step. Without it you might not be able to easily return the system to FrTX. It is not known at this time what OpenTX might write into flash memory so the card will be configured and a backup made so the X12S can be recovered even if OpenTX starts using the flash memory drive at a later date. Or somehow someone makes a mistake and messes up the folders on the**

flash memory drive.

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.

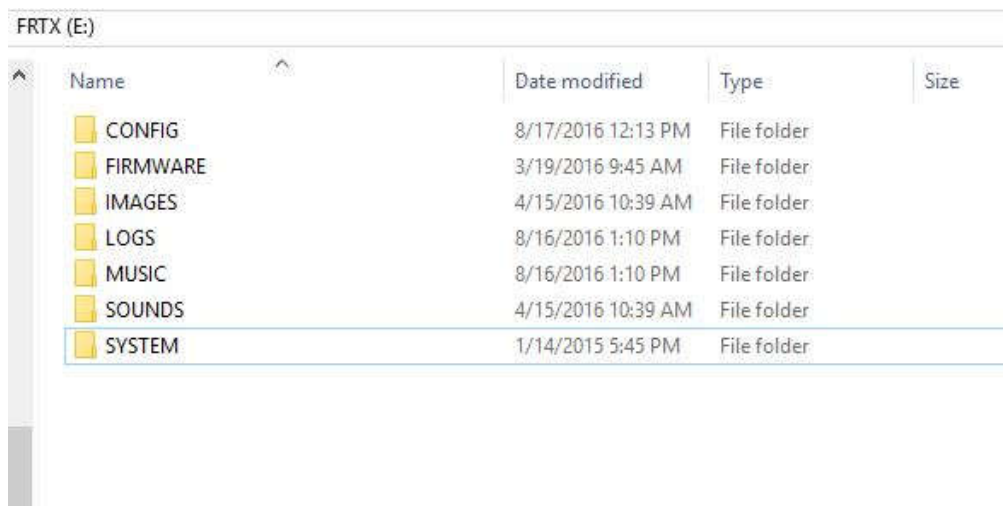


Flash memory drive folders.



SD card folders

3. Use the File Explore copy function to copy all the flash memory drive folders to the SD card. Or you can just copy the Fash memory drives to a folder on your computer for backup. **Caution do not delete the flash memory drive folders.**



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 OpenTX will eventually use the flash memory drive.**

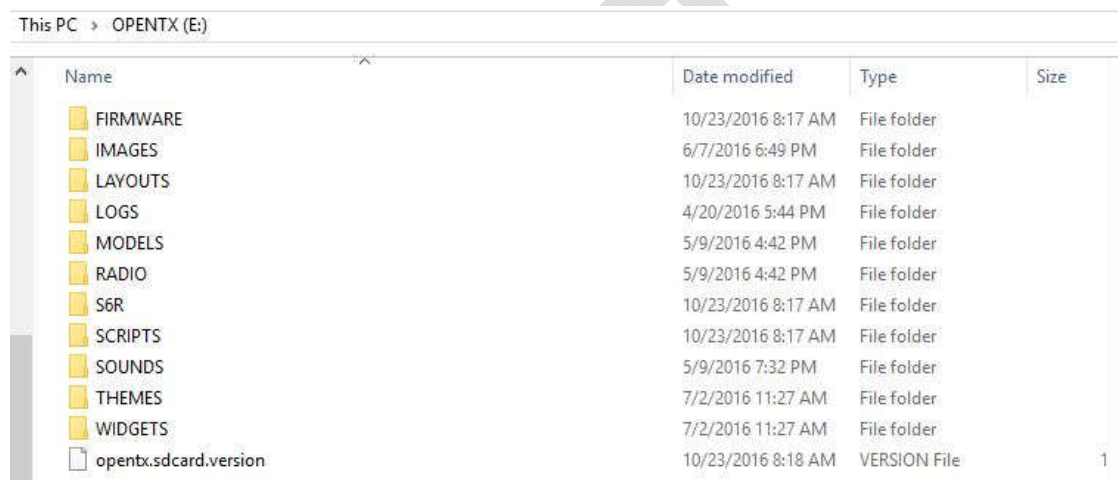
4. Copy all the SD folders to a folder on your computer for backup.
5. **Because OpenTX currently does not use the flash memory drive at this point in the development leave the FrTX folders on the flash memory drive.**
6. Using the Windows USB eject function eject both drives.
7. Disconnect the USB cable and the X12S will shut off.
8. With the system off remove the SD card. Store the SD card in a safe place and 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 here <http://downloads.open-tx.org/2.2/nightly/sdcard/> and included sounds.

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. The character length will most likely be longer in the final 2.2 build. Logs will hold log files when the data “logging” feature is used. Make sure the VERSION file is on the SD.



5. With the X12S with the power off install new OpenTX SD card.
6. Download OpenTX Companion 2.2.X from here <http://www.open-tx.org/downloads.html> and install. Until OpenX2.2.X is officially released use this link <http://www.open-tx.org/> and select the newest RC build. 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 STM Boot loader. You must use a compatible data cable or the X12S will not connect. .

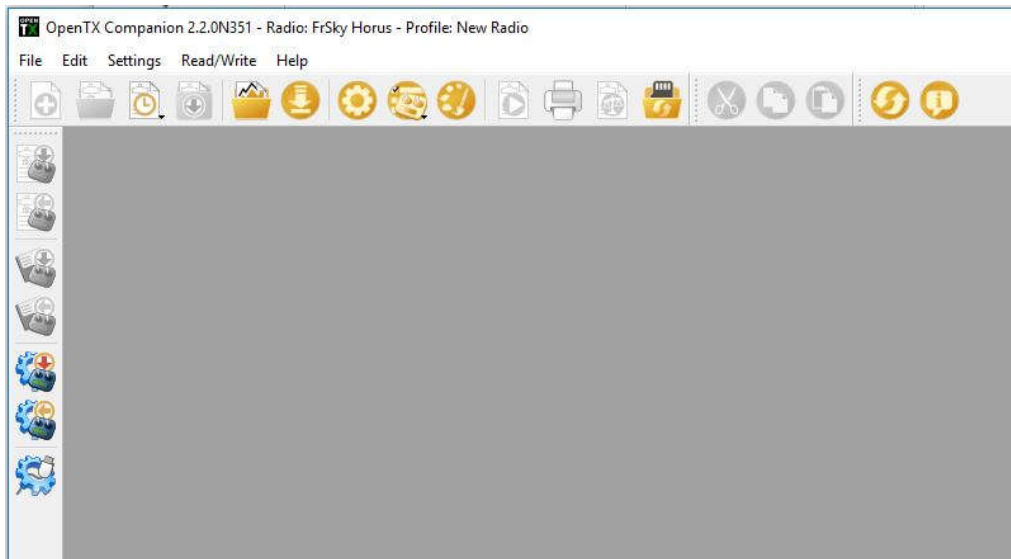
Zadig is an installer program to install the USB driver called STM32 Bootloader so that the USB power off connection can be made to the X12S. Zadig may replace the existing default USB driver. When installed the STM Bootloader should be visible in the USB section of the Windows Device Manager with the X12S connected.

Even if you think STM32 Bootloader 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/>

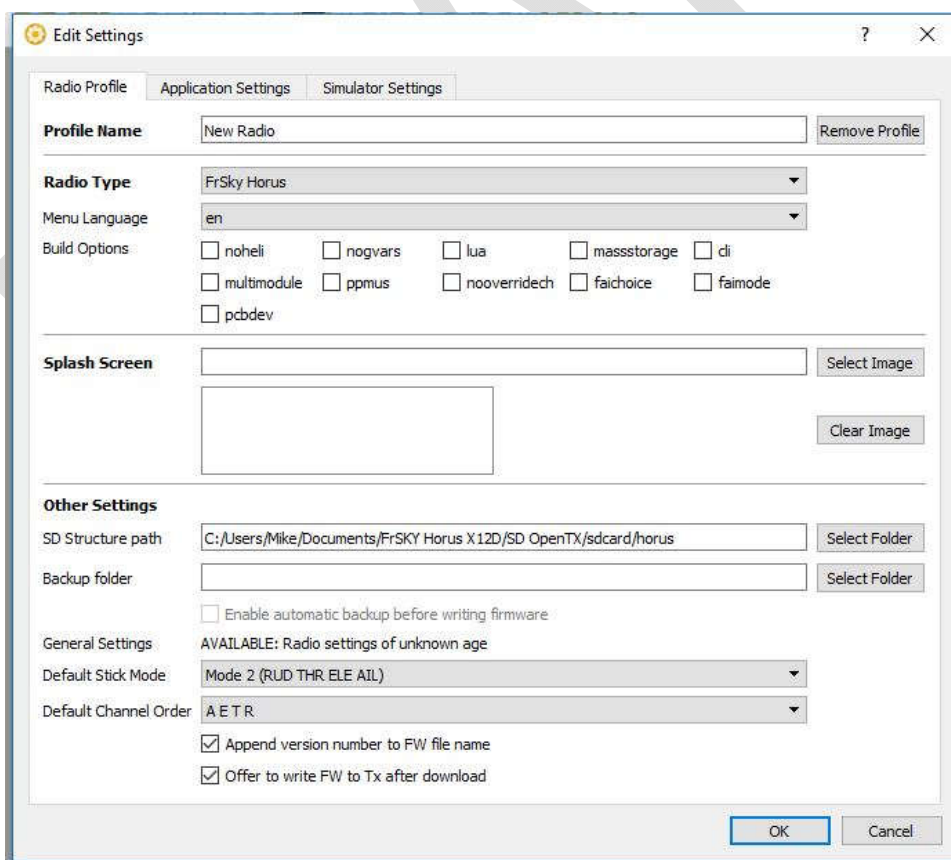
8. The X12S with power off should still be connected to the computer with a USB data cable. Start Companion and in settings, make sure the Radio Type is set to FrSky Horus. Click icon on the left side of Companion that has the left arrow on it. This process will make a valid backup of the FrTX firmware 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 be 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.

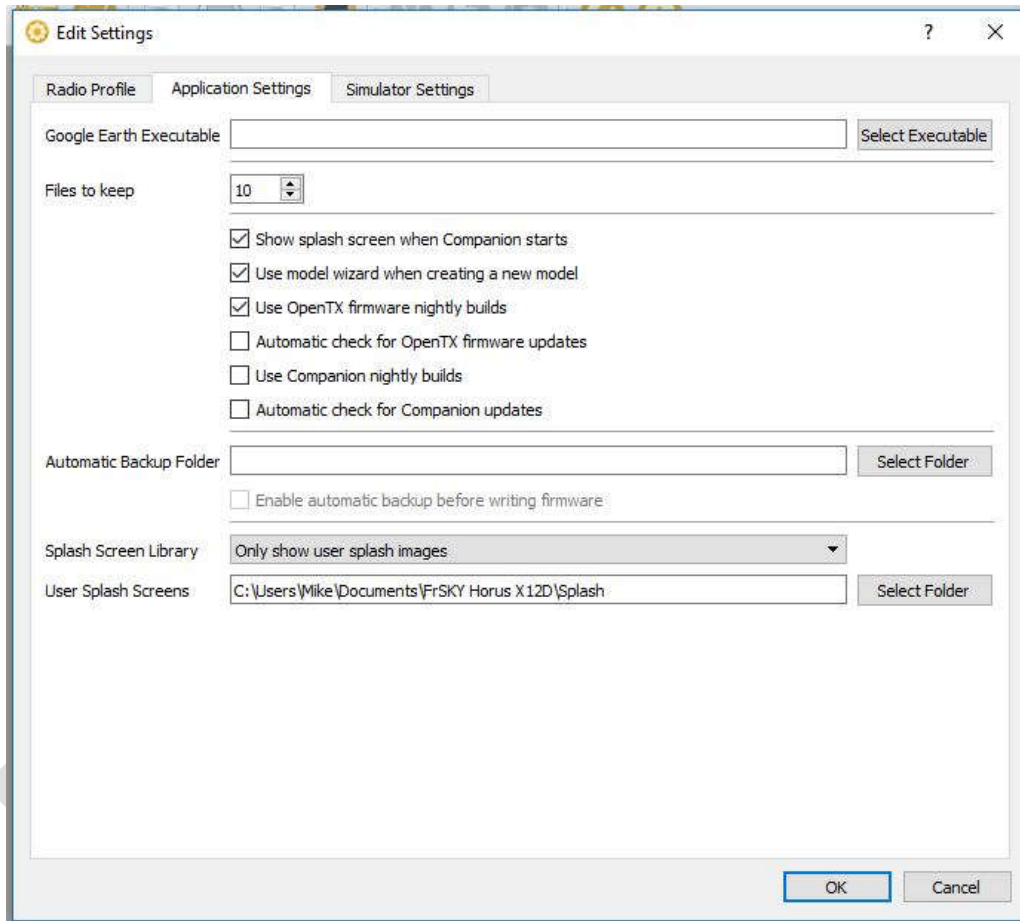
9. Click the settings "Gear" Icon on the top bar to open the settings window.



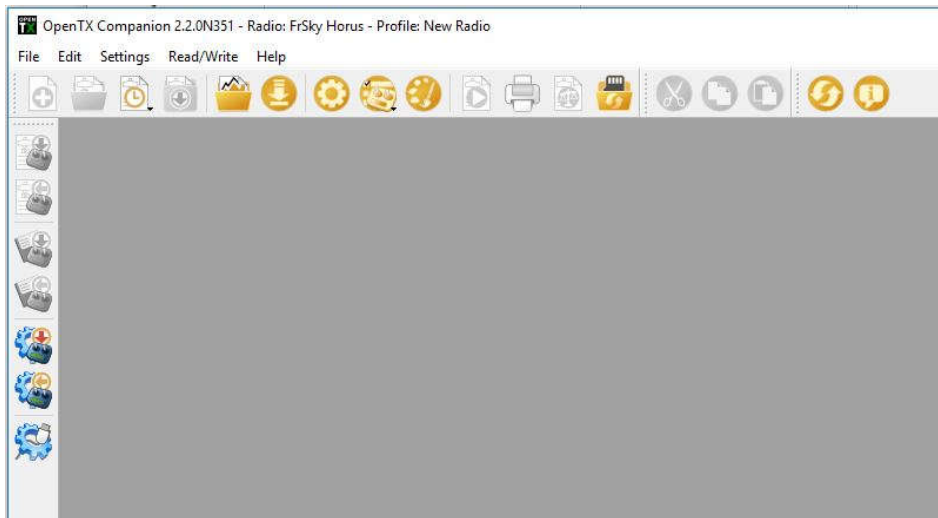
10. In settings, make sure the Radio Type is set to FrSky Horus. There is an option on this page called **pcbdev for downloading the firmware for the early beta X12S systems. DO NOT select this option.**



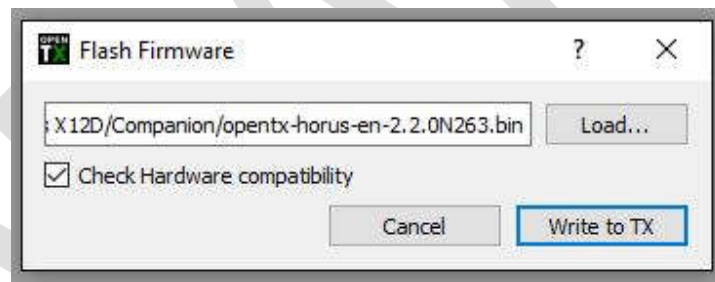
11. In Settings/Application Settings check "Use OpenTX firmware nightly builds".



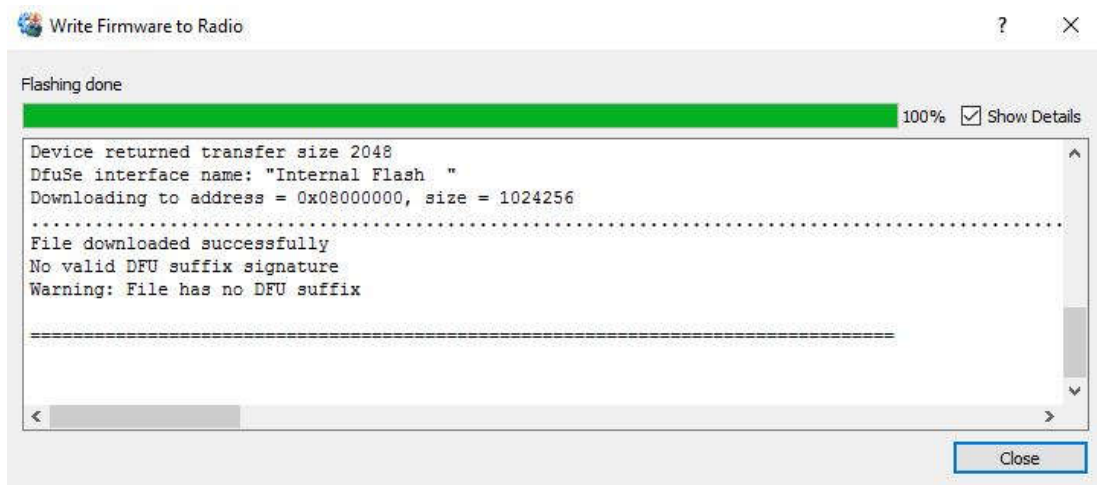
12. Start the download of the OpenTX Horus firmware by clicking down "arrow" icon on the top bar. A window opens and then Click the "Download FW" button and save the firmware.



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.



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



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

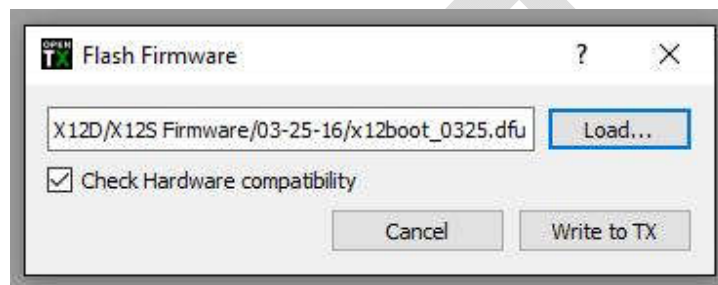
15. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
16. Disconnect the X12S from the USB
17. Turn on the X12S and test (if this is the first OpenTX flash for the system it will start on the calibrate screen) **Until the 2.2.X firmware is officially released, detailed testing of models must be done before flight and considerable caution must be used flying with the firmware because it is incomplete and may contain bugs resulting in loss of control. Always range check the system in range check mode before flight.**

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

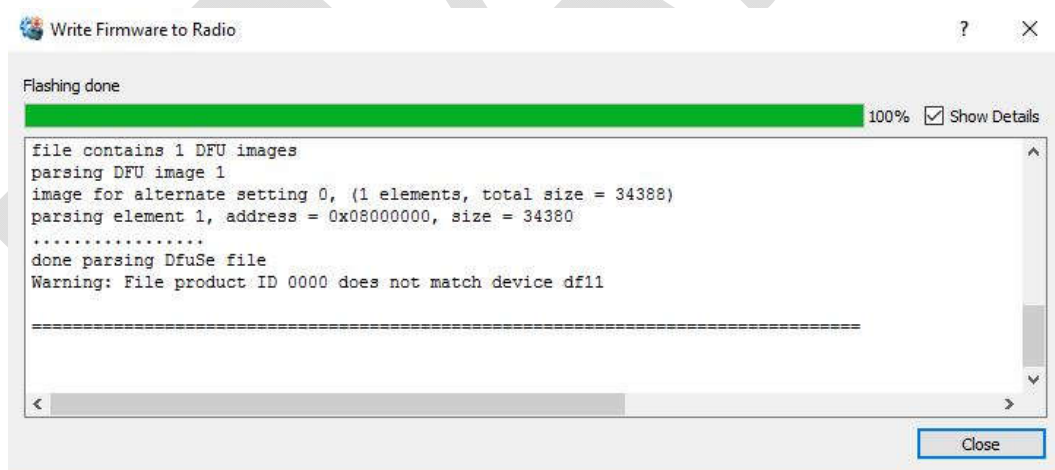
1. This process will remove OpenTX and install the FrTX bootloader and the FrTX firmware.
2. With the X12S power off remove the OpenTX SD card from the X12S **The OpenTX SD card contains all the X12S OpenTX configuration information including the model files created while using OpenTX and can be used 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.**



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 Hardwar” feature on your computer to close the USB port.

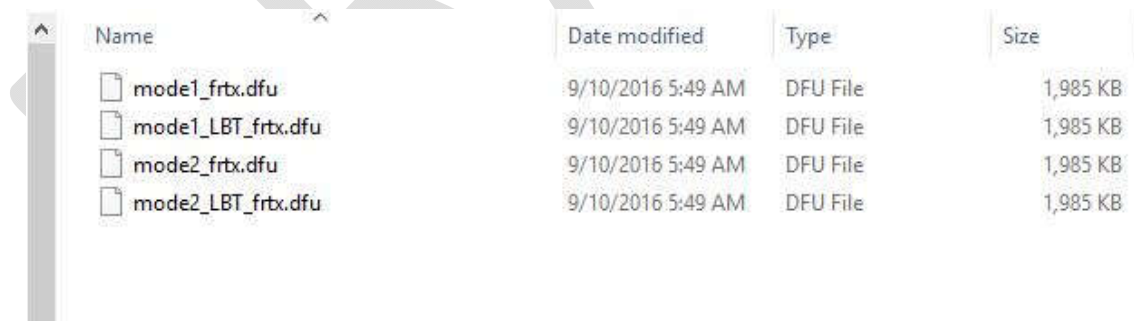
8. Disconnect the X12S from the USB

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. There are four different firmware bin files , Mode 1 EU LBT, Mode 2 EU LBT, Mode 1 FrTX US and Mode 2 FrTX US.



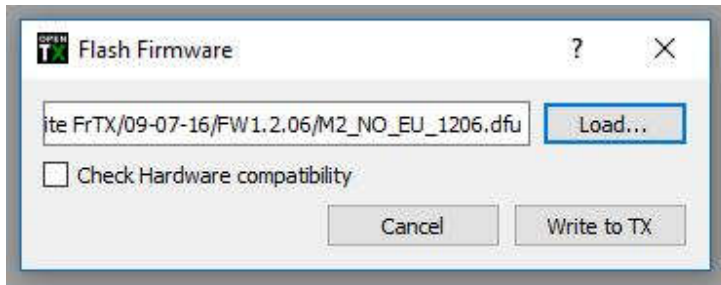
A screenshot of a file explorer window showing a list of four files. The files are arranged in a table with columns for Name, Date modified, Type, and Size. The files are mode1_frtrx.dfu, mode1_LBT_frtrx.dfu, mode2_frtrx.dfu, and mode2_LBT_frtrx.dfu. All files are DFU Files and are 1,985 KB in size. The date modified for all files is 9/10/2016 5:49 AM.

Name	Date modified	Type	Size
mode1_frtrx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode1_LBT_frtrx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode2_frtrx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB
mode2_LBT_frtrx.dfu	9/10/2016 5:49 AM	DFU File	1,985 KB

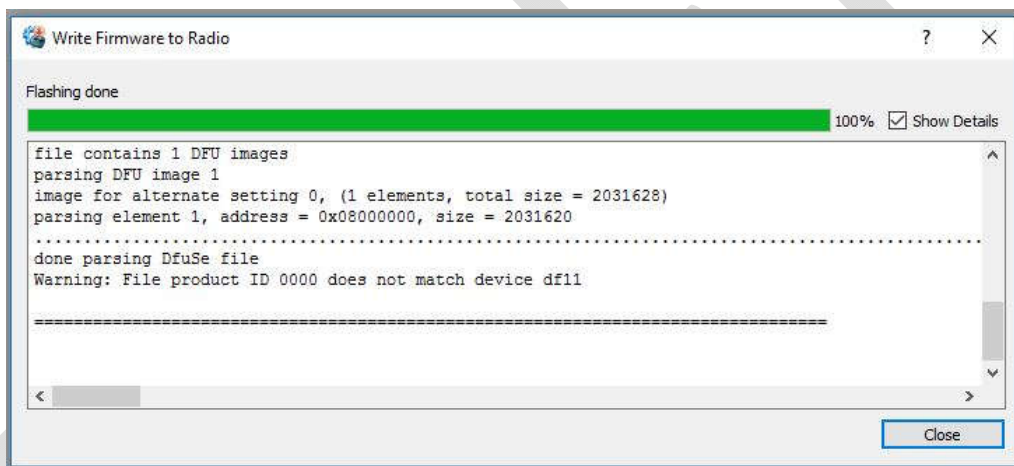
Dfu file list from FrSky website.

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, 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 Hardwar” 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.

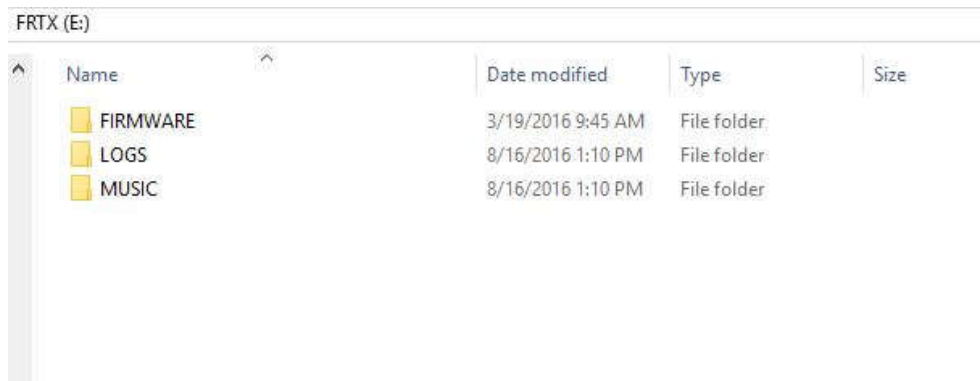


The update process runs and the system shuts off.

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.



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.

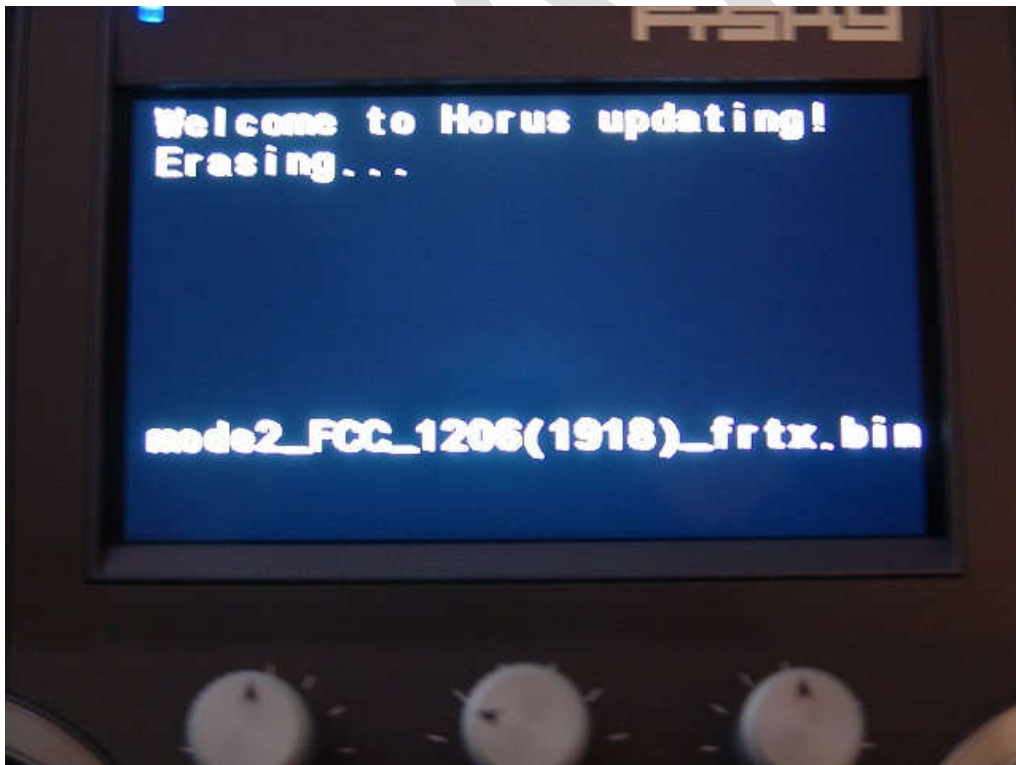
Normal FrTX OS Firmware Update – Using Firmware Bin Files

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 . Download the X12S firmware zip file and un-zip the file. There are four different firmware **bin** files , Mode 1 FrTX US, Mode 2 FrTX US, Mode 1 EU LBT and Mode 2 EU LBT. LBT (Listen Before Transmit) is used for EU countries and FrTX for the US and other countries that do not use LBT.
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. Holding the rotary encoder down (the enter knob) press and hold the power switch until text is displayed on the screen.

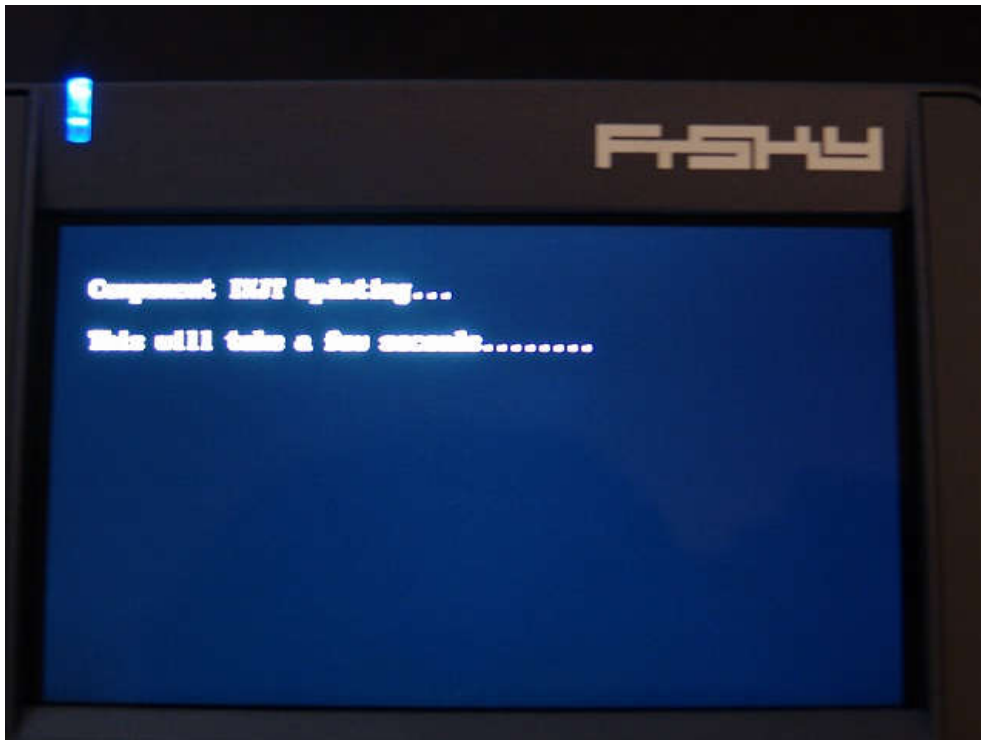
See below:



The flashing process will run and finish with a “Complete” 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 the system 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.

Happy Flying!