

# **FrSky Horus X10S/X10 System**

**FrOS Firmware Updating and OpenTX  
Flashing Using Windows**

**Smart Port Flashing with X10S/X10**

**January 30, 2018**

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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 FrOS and OpenTX 2.2.1 or later. **If you are just looking for the information on how to do a normal FrSky FrOS OS firmware update with firmware bin files go to page 17.**

## Overview

The FrSky Horus X10S/X10 has the ability to operate with the factory installed FrSky FrOS OS firmware or OpenTX 2.2.1. The FrOS 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 X10S/X10.

This document, explains how to switch the X10S/X10 system to the OpenTX OS and how to remove OpenTX from the system and return to FrOS 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 FrOS and OpenTX files separate to avoid conflicts. One card will be used for FrOS 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 X10S/X10 system**. When running FrOS OS the X10S/X10 it is flash memory centric and only uses the SD card for, Logs, extra sounds, extra model images, screen prints and firmware updates.

The FrSky X10S/X10 systems were provided with factory installed FrOS firmware. There is no FrSky support planned for users that flash their X10S/X10 with OpenTX and have problems with OpenTX or have problems flashing the system back to FrOS. 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 X10S/X10 with OpenTX and stay with FrOS OS.

Even though OpenTX 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 X10S/X10 for flashing of firmware (power off) and the massstorage option to access the SD card via the USB connection (power on) is no longer needed. The massstorage or Joystick option is now selected when the system is connected to the PC.

If you are not an experienced user of OpenTX Companion you might have problems returning to your X10S/X10 to FrOS.

### **Warning**

These instructions assume the user has knowledge and experience with copying files with their Windows computer. Significant caution must be used with connecting and disconnecting the X10S and X10 from the windows computer and the file copy process. Accidentally copying the wrong file or deleting system files from the internal X10S and X10 USB Flash Memory drive can cause the system to be inoperable. Recovering an inoperable system can be difficult because the system must be operable to access the USB Flash Memory drive.

## **X10S and X10 Storage**

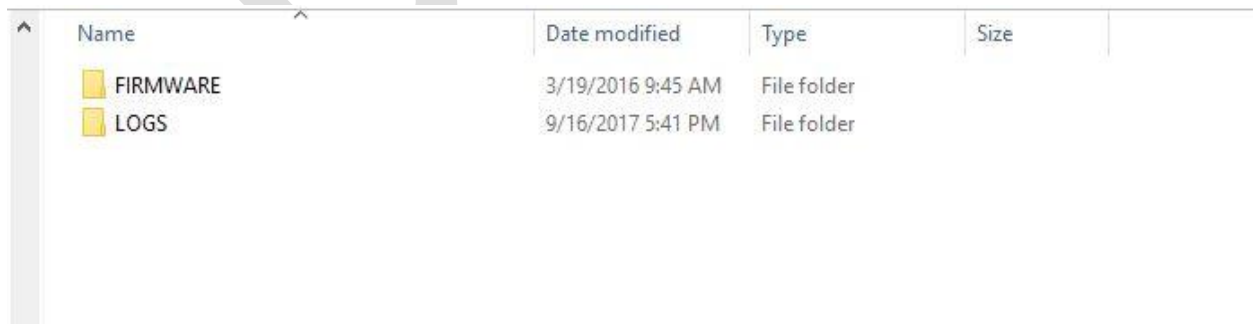
The X10S and X10 have two user accessible storage mediums, a 16 meg internal USB Flash Memory drive and an external micro SD drive.

The Flash Memory drive 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.

## **Using The SD Card**

The X10S and X10 have a SD slot in the bottom of the case. The SD card is used for FrOS firmware updates, data logs, screen prints and extra storage space for extra model images and sound files. SD card is not supplied with the system. A 16 gig card is more than adequate and I prefer to use a class 10 card. The micro SD card must be no larger than 32 gig.

Prepare the card by formatting it as fat 32. Then create the following directories.



Name	Date modified	Type	Size
FIRMWARE	3/19/2016 9:45 AM	File folder	
LOGS	9/16/2017 5:41 PM	File folder	

The SD card is inserted into the slot in the bottom of the system with the card contacts facing up. Use caution because the SD card mechanism is spring loaded and can launch

the card a significant distance. When the card latches it will be below the surface of the case.



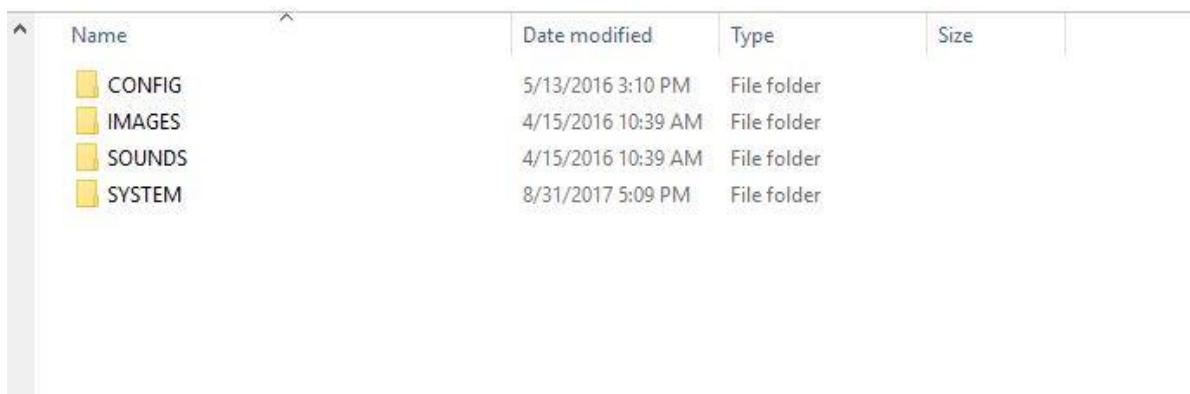
If more than a few custom sounds are planned rather than using up space on the internal USB Flash Memory drive the least used sound files can be stored on the SD card. The files need to be in a path on the SD card that is the same path that is used on the Flash Memory drive. The path on the SD would be SOUNDS\en\Track. When programming a sound in Special Functions the system looks for the sound on the Flash Memory drive first and then the SD card. The same applies to model images on the SD card IMAGES/modelimages. See the FrOS Sound and Image Files section for file specifications.

### **Backing Up - USB Flash Memory Drive**

Before copying files to the Flash Memory drive it is best practice to make a backup.

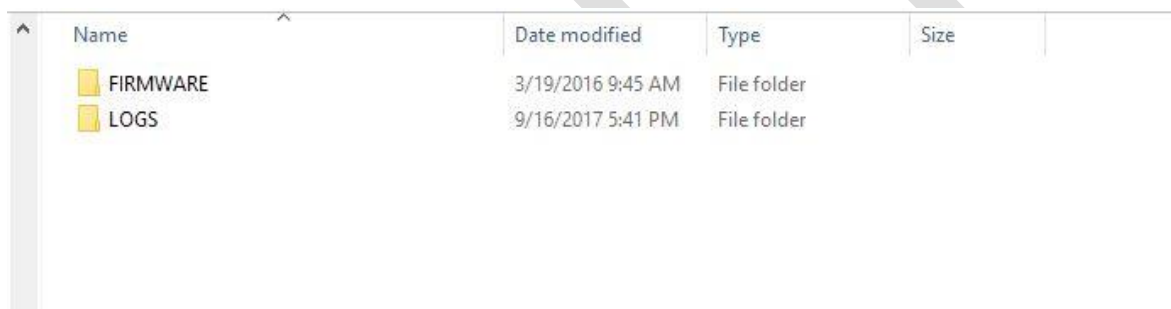
With the system powered on plug a USB mini data cable into the USB connector on the back of the system. The connector is under the rubber cover. Plug the other end of the

USB data cable into the USB connector on a Windows computer. The Windows computer will automatically detect the Horus and two File Explore screens will appear.



Name	Date modified	Type	Size
CONFIG	5/13/2016 3:10 PM	File folder	
IMAGES	4/15/2016 10:39 AM	File folder	
SOUNDS	4/15/2016 10:39 AM	File folder	
SYSTEM	8/31/2017 5:09 PM	File folder	

One for the Flash Memory drive.



Name	Date modified	Type	Size
FIRMWARE	3/19/2016 9:45 AM	File folder	
LOGS	9/16/2017 5:41 PM	File folder	

And one for the SD card.

Copy the Flash Memory folders to a folder on your Windows computer. After models are built, sound files and model images are added it is best practice to make more backups to protect your data. **Be careful not to delete the Flash Memory files, just copy them.**

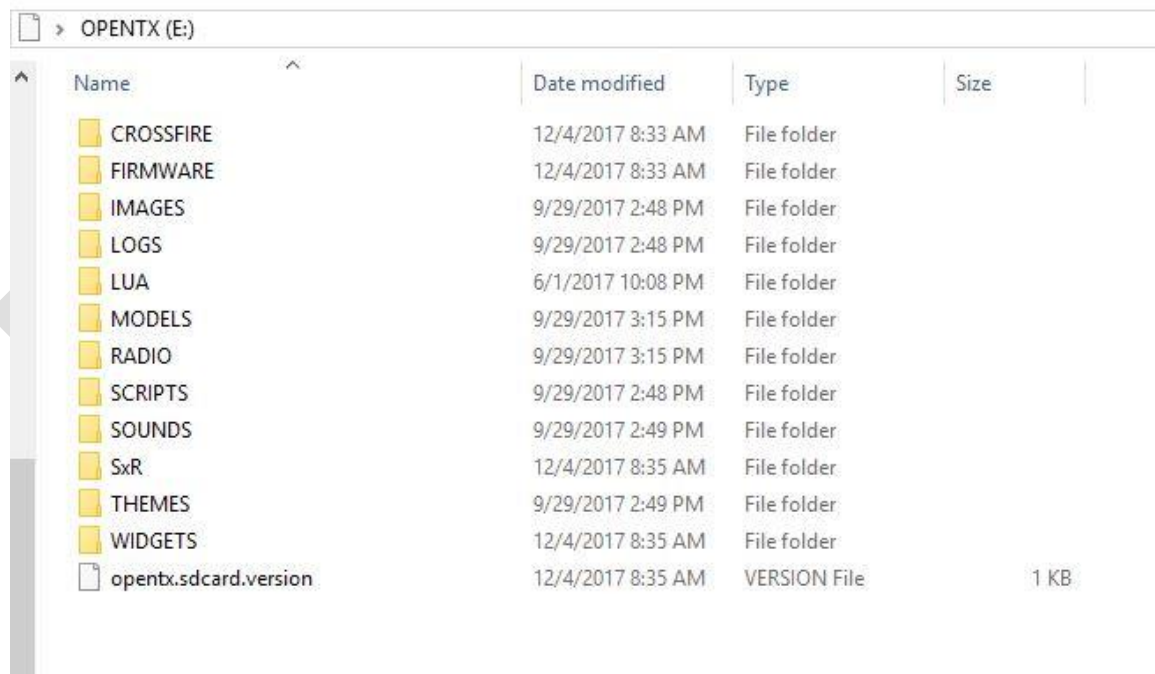
**Caution.** Always use the “Safely Remove USB Hardware” eject feature on your computer to close each of the USB ports.

## Flashing Firmware

### Flashing OpenTX Firmware

1. A micro SD card of about 4 gigabytes or more is required and formatted as Fat32. The maxim SD card size is 32 gig.

2. Download the Horus OpenTX SD card files from the 2.2.1 link on this page here <http://www.open-tx.org/downloads.html> and included sounds. As of this date OpenTX 2.2.1 will be listed as a RCX build until the production release. The link takes you to a second page where there is a link to the SD card files. Download the newest files from the link X12 or X10.
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. The LUA folder is something special I'm doing. **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 that matches the OpenTX build.**



5. With the X10S/X10 power off install new OpenTX SD card.

6. Download OpenTX Companion 2.2.1 from the OpenTX 2.2 branch link here <http://www.open-tx.org/downloads.html> and install. Currently the link on the page will be OpenTX 2.21RCX until the production version is released. After selecting, review the instructions on the 2.2.1 page before downloading the Companion build.
7. With the X10S/X10 **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 X10S/X10 will not connect. .

Zadig is an installer program to install the USB driver called STM32bootloader so that the USB power off connection can be made to the X10S/X10. Zadig 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 X10S/X10 connected.

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

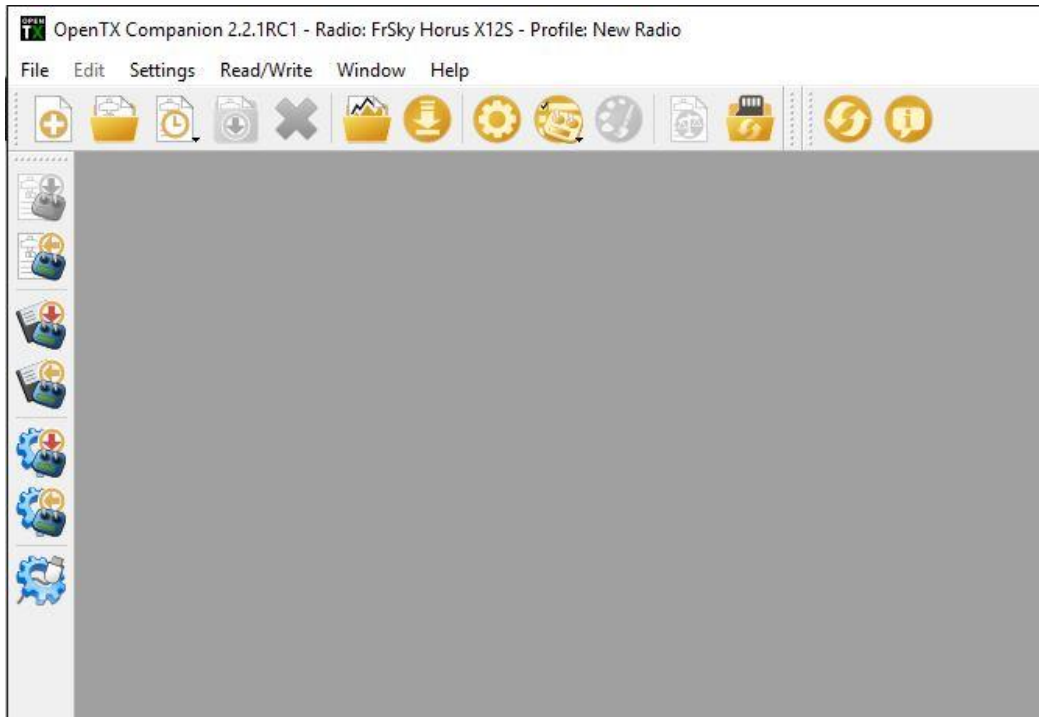
8. The X10S/X10 with **power off** should still be connected to the computer with a USB data cable. Start Companion and in settings, **make sure the Radio Type is set to FrSky Horus X10 / X10S**. Click the lower icon on the left side of Companion that has the left arrow on it (read firmware from radio). This process will make a valid backup of the FrOS firmware and bootloader. This backup creates an image that can be flashed back to the X10S/X10 to restore the FrOS boot loader and firmware.

Save the file to a folder on your computer. It would a good idea to use a file name with FrOS included and the firmware release as a reminder that it is the FrOS

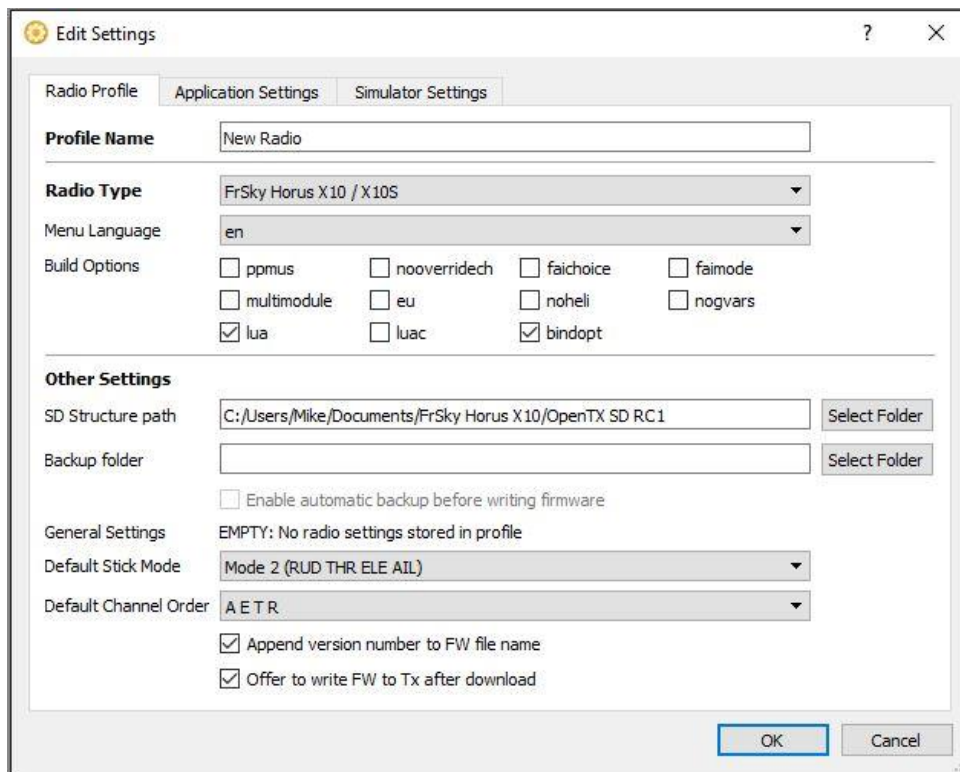


backup file. Make sure that the backup process actually saved the backup file. The extension should be bin and around 2000KB in size. If there is no file saved check the STM32 Bootloader installation.

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

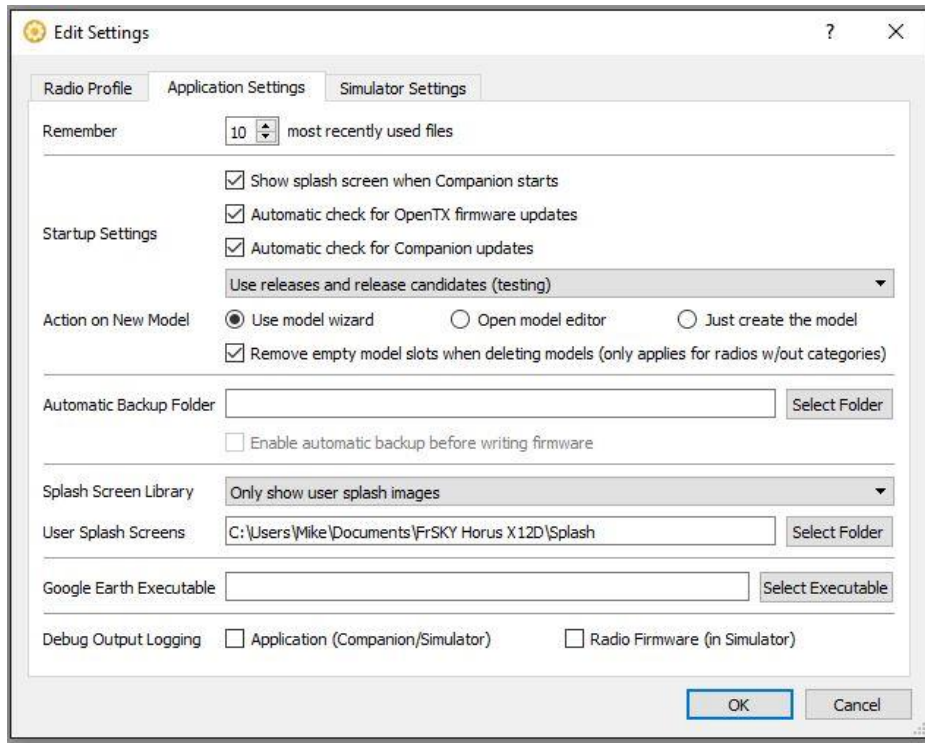


10. In settings, make sure the Radio Type is set to FrSky Hours X10 / X10S.



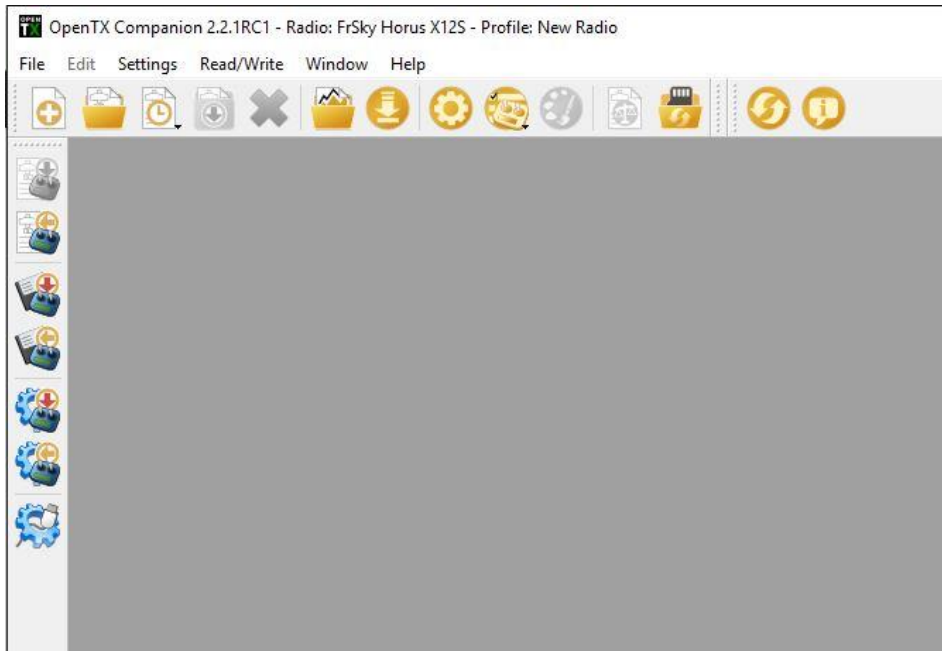
I'm using the optional Lua and bindop

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

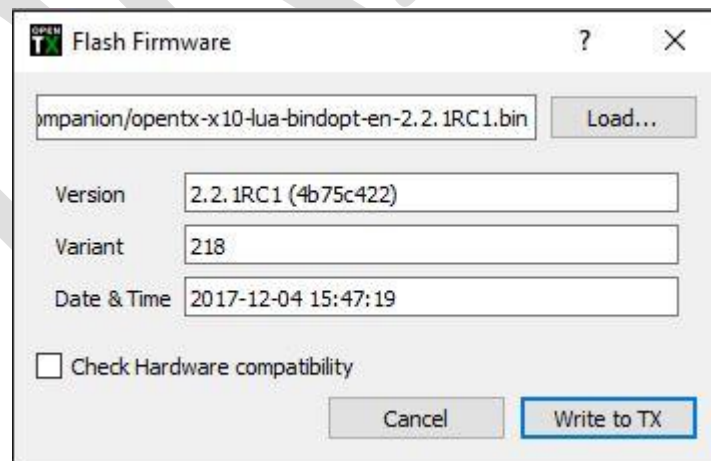


**Note: Select use release candidates until the production version is released.**

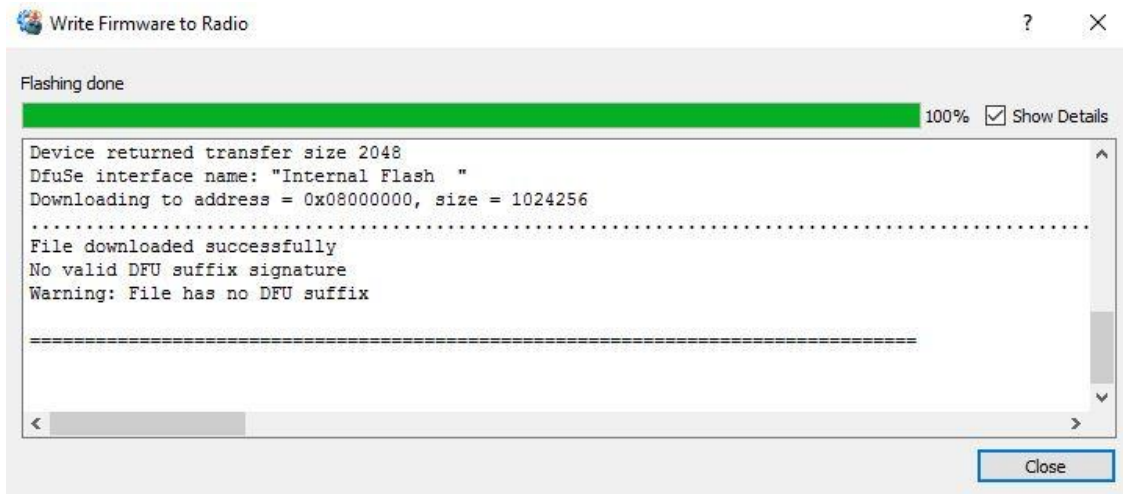
12. Start the download of the OpenTX Horus firmware by clicking down “arrow” icon on the top bar. A window opens and then Click the “Download FW” button and save the firmware.



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 X10S/X10.



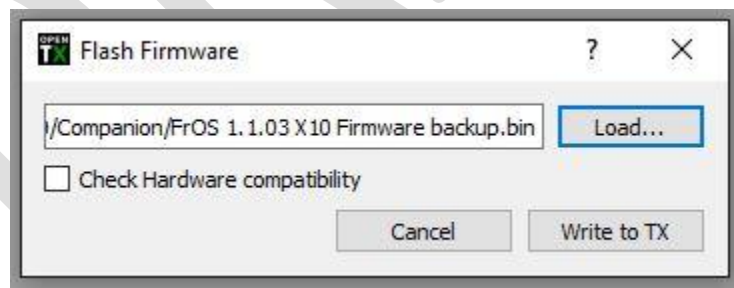
After the flashing is complete the OpenTX Companion screen looks like the above image.

15. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
16. Disconnect the X10S/X10 from the USB
17. Turn on the X10S/X10 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.**

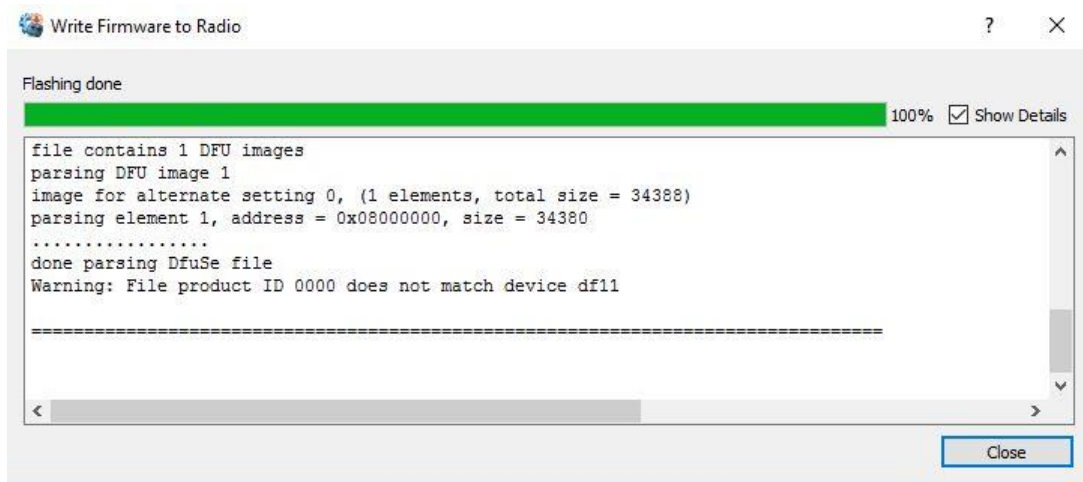
**In the rare case that the X10S/X10 will not start after flashing, reconnect the X10S/X10 to the PC and re-flash the system. If the X10S/X10 system is not recognized by the PC then there is a possibility that a bad flash process has hung the system to be reset of the battery needs to be disconnected 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. There is also a reset button behind the hole to the right of the SD card (looking with X10S/X10 face down)**

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

1. This process will remove OpenTX and install the FrOS bootloader and the FrOS firmware.
2. With the X10S/X10 power off remove the OpenTX SD card from the X10S/X10  
The OpenTX SD card contains all the X10S/X10 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 FrOS folders are backed up**. See the Preparing X10S/X10 For OpenTX Flashing section on page 4.
3. Insert the FrOS SD card in the X10S/X10
4. With the X10S/X10 power off connect it to the computer with a USB data cable.
5. Start Companion. Make sure FrSky X10 radio is set and then select “write firmware to radio” icon, in the window that opens click “Load” and select the FrOS 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 X10S/X10



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

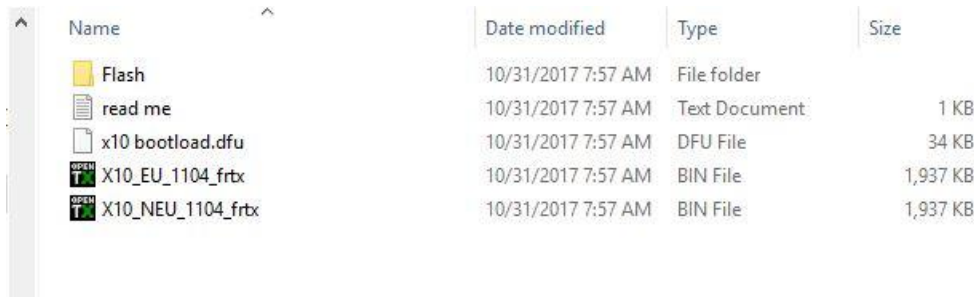
7. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
8. Disconnect the X10S/X10 from the USB

At this point the system has OpenTX removed. Power on the system and it should be restored to FrOS.

### Removing OpenTX Option 2 - Flashing the FrOS boot dfu – Two Steps Using FrOS Files

1. This process will remove OpenTX and install the FrOS bootloader, but no FrOS firmware. The firmware is installed in a second step.
2. With the X10S/X10 power off remove the OpenTX SD card from the X10S/X10  
The OpenTX SD card contains all the X10S/X10 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 FrOS folders are backed up**. See the Preparing X10S/X10 For OpnTX Flashing section on page 4.

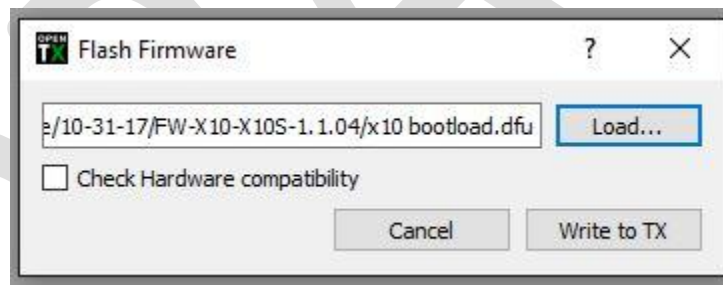
This process assumes you have the FrOS bootloader **dfu** file from the X10S/X10 download on the FrSky Website saved on your computer.



Name	Date modified	Type	Size
Flash	10/31/2017 7:57 AM	File folder	
read me	10/31/2017 7:57 AM	Text Document	1 KB
x10 bootloader.dfu	10/31/2017 7:57 AM	DFU File	34 KB
X10_EU_1104_frtrx	10/31/2017 7:57 AM	BIN File	1,937 KB
X10_NEU_1104_frtrx	10/31/2017 7:57 AM	BIN File	1,937 KB

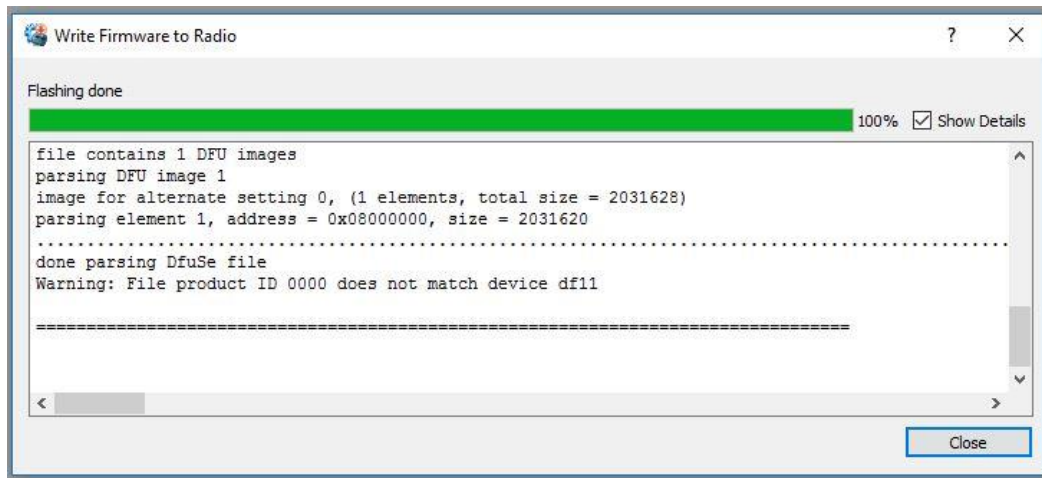
Example file list from the FrSky website showing **Dfu** Bootload file.

3. With the X10S/X10 power off connect it to the computer with a USB data cable.
4. 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 FxOS file is selected and not the OpenTX file.**



Click “Write to TX” to flash the X10S/X10.





After the flashing is complete the OpenTX Companion screen similar text but not the same to the above image.

5. Use "Safely Remove USB Hardware" feature on your computer to close the USB port.
6. Disconnect the X10S/X10 from the USB. At this point the system is ready for the actual firmware installation using the "Normal FrOS OS Firmware Update – Using Firmware Bin File" listed below. **Please note that the system only has the bootload file installed, cannot start and the FrOS firmware bin file will need to be copied to the SD card using a Windows computer.**

### Normal FrOS Firmware Update – Using Firmware Bin Files

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

#### Warning

These instructions assume the user has knowledge and experience with copying files with their Windows computer. Significant caution must be used with connecting and disconnecting the X10S and X10 from the windows computer and the file copy process. Accidentally copying the wrong file or deleting system files from the internal X10S and

X10 USB Flash Memory drive can cause the system to be inoperable. Recovering an inoperable system can be difficult because the system must be operable to access the USB Flash Memory drive. See Backing Up - USB Flash Memory Drive on page 5 before starting the update process.

1. From the FrSky Firmware Download Website, X10S <https://www.frsky-rc.com/x10s/> and X10 <https://www.frsky-rc.com/x10/> . Download the X10S/X10 firmware zip file and un-zip the file. Usually the builds are named X10\_EU\_XXXX\_frtx for EU systems and X10\_NEU\_XXXX\_Frtx (N=NOT EU).
2. Be sure to read the firmware “read me” document for information on the update changes, fixes and new features. There can be new files that need to be added to the flash memory drive, or new features that need folders to be created, etc.
3. The firmware **bin** file copy function can be done by connecting the powered on X10X to your Windows computer with a data USB cable or removing the SD card and writing directly to the SD card.
4. When the powered on X10X 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.
5. Copy the correct FrOS firmware **bin** file for your system to the SD FIRMWARE folder. Caution. Only **ONE** file can be in this folder. If computers other than Windows computers are used trash files might be copied with the firmware folder and the update will not work
6. Caution. Always use the “Safely Remove USB Hardwar” eject feature on your computer to close the USB ports.
7. Disconnect the X10X from the USB
8. Press and **hold** the rotary encoder down (the enter knob) and **at the same time press and hold** the power switch until the first text is displayed on the screen.

See below:



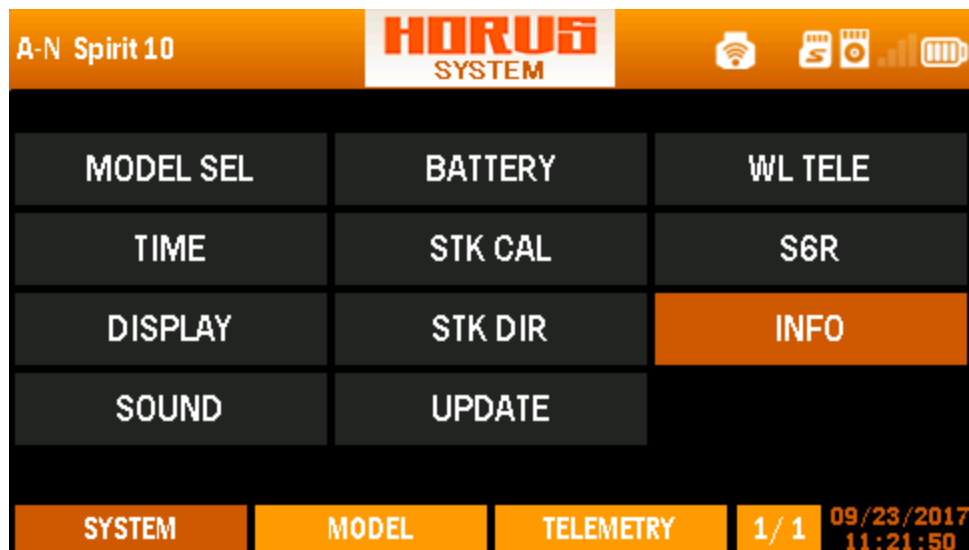
The firmware flashing process will run and finish with a “Successful” press the power off button briefly and the system shuts off.

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

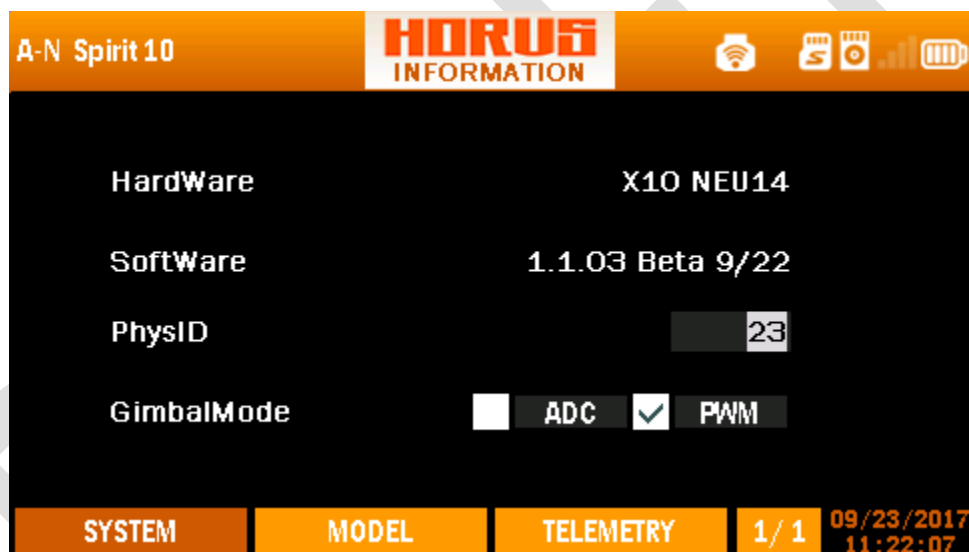
See below:



10. The IXXT firmware flashing process runs with an ending message to “restart system please” and shuts off automatically.
11. Press the power switch to start the system. The system should have the normal FrOS screen with all models, etc.
12. The version number of the firmware is displayed on the info screen. Press SYS to select the System screen.



At the System screen select INFO.



INFO screen.

## FrOS Sound and Image Files

### Audio Files

WAV -TRACK FOLDER - Flash Memory Drive. Size < 100K; Number <100; name length <10 chars (.wav not included); format should be .wav. Track wav files are the user created files that are used with Special Functions.

If more than a few custom sounds are planned rather than using up space on the

internal USB Flash Memory drive the least used sound files can be stored on the SD card. The files need to be in a path on the SD card that is the same path that is used on the Flash Memory drive. The path on the SD would be SOUNDS\en\Track. When programming a sound in Special Function the system looks for the sound on the Flash Memory drive first and then the SD card.

Model Sounds - Size < 50k ,format should be .wav,, name length < 30. path: SOUNDS/en/model. Model sounds are the user created files that speak the model name when models are selected.

OpenTX Speaker is an easy way to create WAV files <http://www.opentx.org/2014/03/15/opentx-speaker>

### **Image Files**

Size 50K or less, max number <100, name length up to 30 chars (.jpg extensions not included), format jpg 155x100 (larger or smaller size will not display as well, cut off, etc..

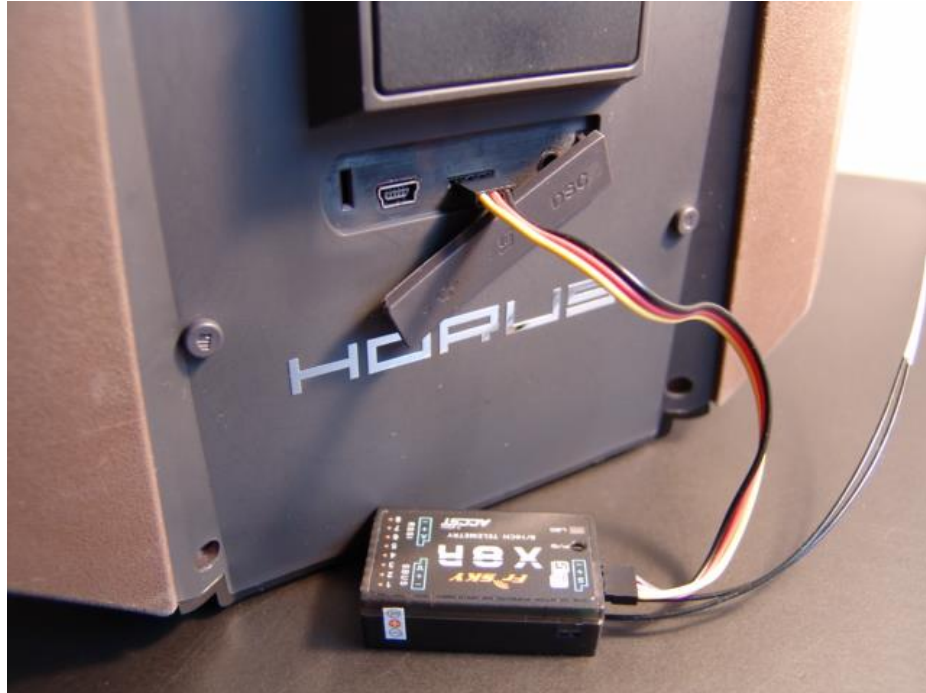
The Model images go in the folder IMAGES/modelimages on the Flash Memory drive.

Starting with FrOS 1.1.04 and later model images can also be stored on the SD card by creating a SD folder IMAGES/modelimages and placing the image files in the folder.

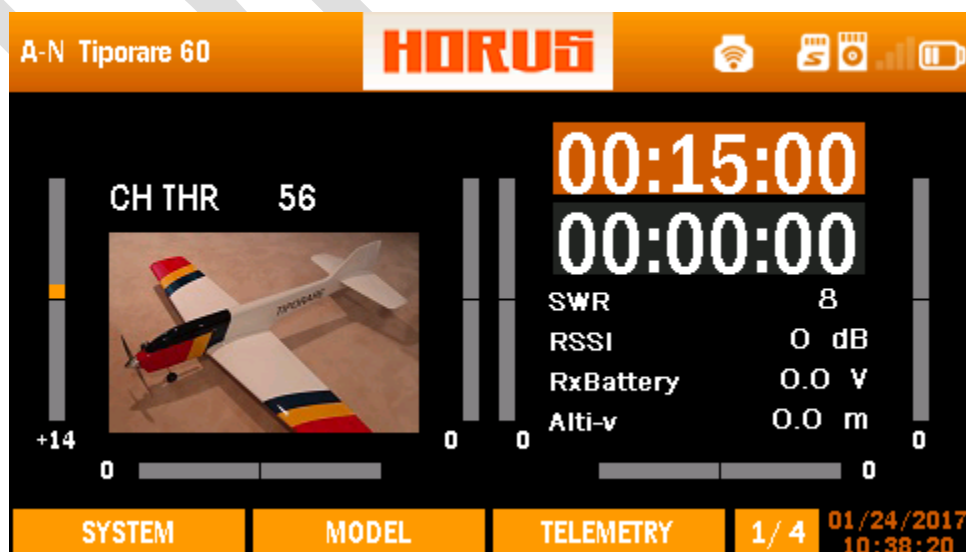
### **Smart Port Flashing of Devices with X10S/X10 FrOS OS**

1. The smart port flashing feature can be used to flash FrSky products that have Sports (smart ports) like X receivers, Redundancy Bus, XJT module, R9M module, etc. Note: The IXJT internal RF module can only be flashed as part of the normal FrOS firmware update.
2. Copy the file to be flashed to the X10S/X10 SD card FIRMWARE folder. If the file name is too long it may need to be renamed shorter to appear in the X10S/X10 update selection window.

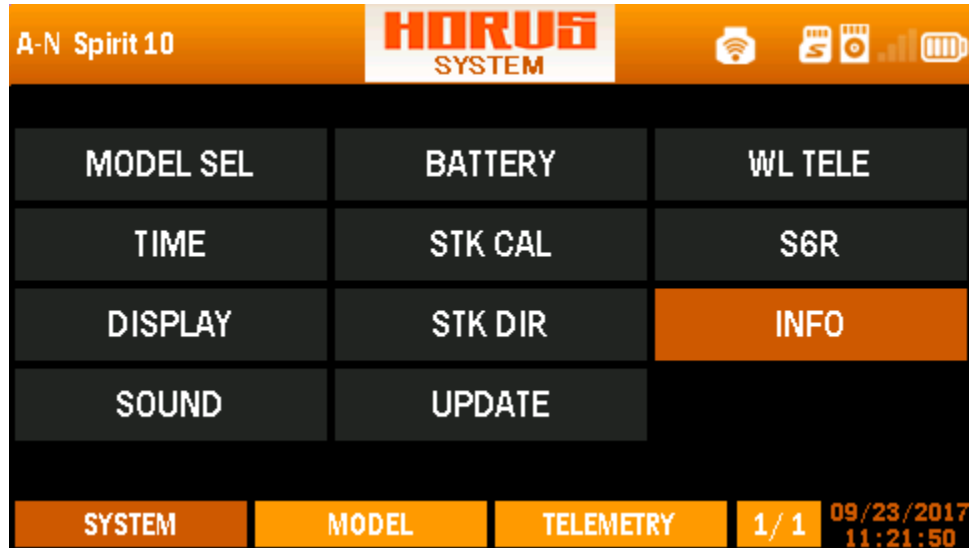
3. With the X10S/X10 powered off connect the cable to the Sport connector. In this case the cable (yellow signal on the left) and to the Sport on the device (yellow on signal).



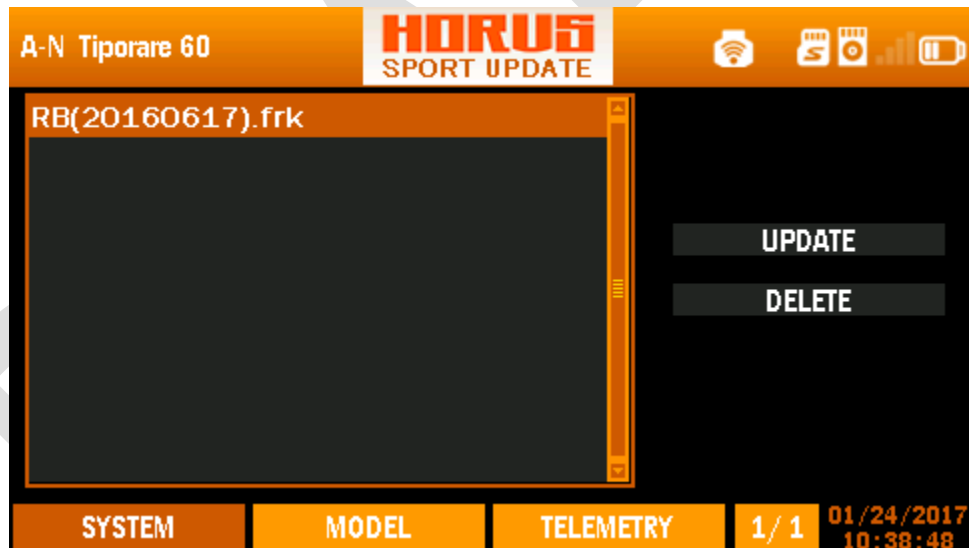
4. The connection of a X8R to the X10S/X10 Smart Port. Note the yellow wire is the signal wire. To flash the XJT or R9M modules insert them into the module bay.
5. Power on the X10S/X10. At the main screen press SYS.



6. At the SYSTEM screen select UPDATE

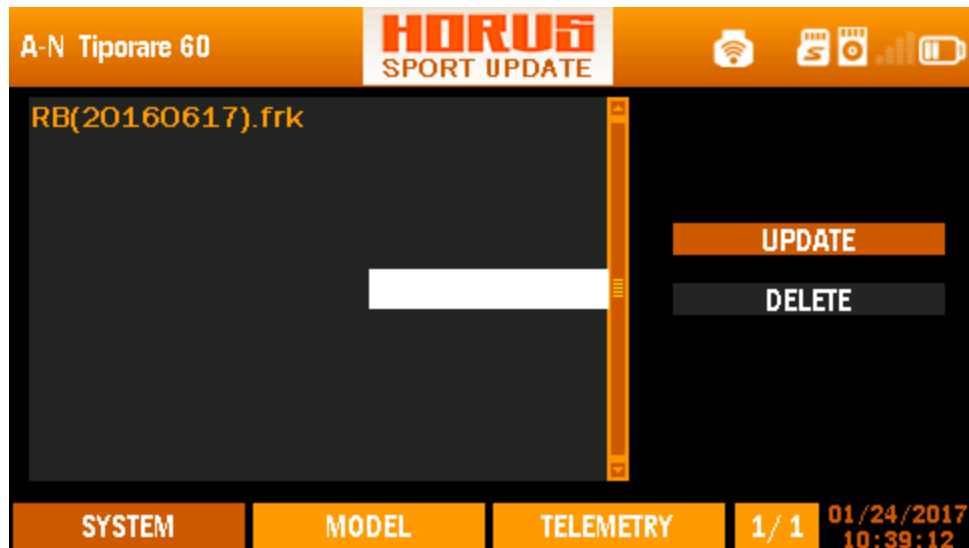


7. At the SPORT UPDATE Screen select the file to be flashed and select UPDATE



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

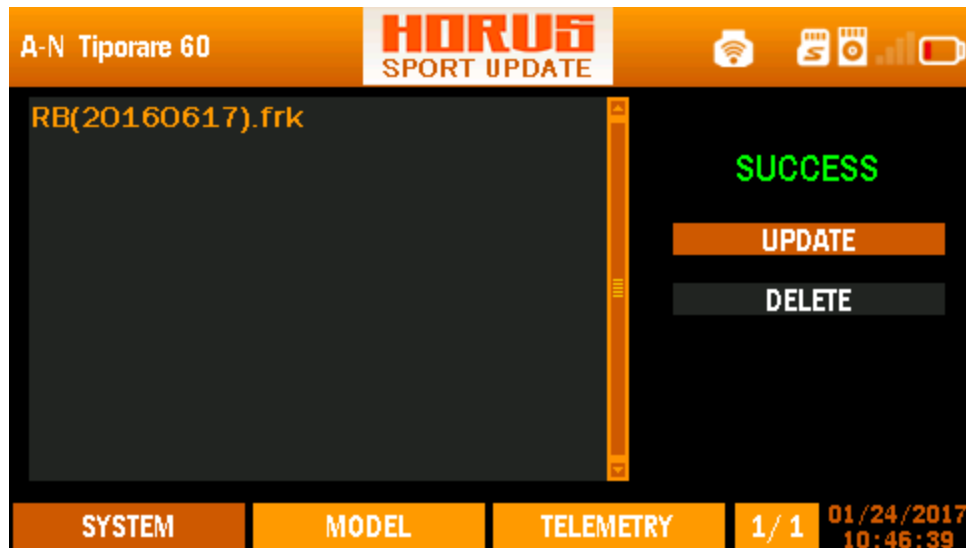




9. The progress bar during flashing.



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



11. SUCCESS is displayed. The delete function can be used to delete the file.
12. Power the X12 off and disconnect the Smart Port cable. **As always carefully test any device flashed to make sure it functions correctly.**

## FrOS Firmware File Compatibility

### Warning

Always make a backup of the system flash memory drive and copy it to your computer before starting a firmware update. The firmware update process requires that the user be proficient with the use of Microsoft File Explorer and a Windows computer. Use only a Windows computer for the file copy process.

### Firmware Release Numbers

How the FrOS firmware release numbers impact the file compatibility between releases as the release numbers change.

Release Number	X	. X	.XX
Table Legend	A	B	C

### Legend

- A. Major firmware changes, no model or configuration file compatibility available between previous firmware and new firmware.
- B. Model file changes, but a compatibility method is added to the update when going to a higher “B” number build. Update may require new configuration files or other files specified in the release notes and provide in the FLASH folder included with the update zip to be copied to the flash memory drive of the system. Only the files specified with the release notes are needed not all the folders in the FLASH folder. Be sure to use only the FLASH folder provided with the current update zip that is being used for the update.

Because of the compatibility methods added to files on this type of update it is not a good idea to attempt to go back to an earlier build once the update has been started. For an example the model files modified by the update will not be able to be read by the previous build and the system may not be able to start.

- C. No difference in model or configuration files. Usually just a simple update with just the firmware bin file used for updating.

### **Returning System To An Older “B” build Number**

It is not recommended to return a system to an older “B” build number because if you make a mistake in the file copy process you could create a situation where the system will not start. If the system will not start then you cannot access the Flash Memory Drive to recover. But there are some situations where returning to an older build is desirable and being very careful with file changes it can be done.

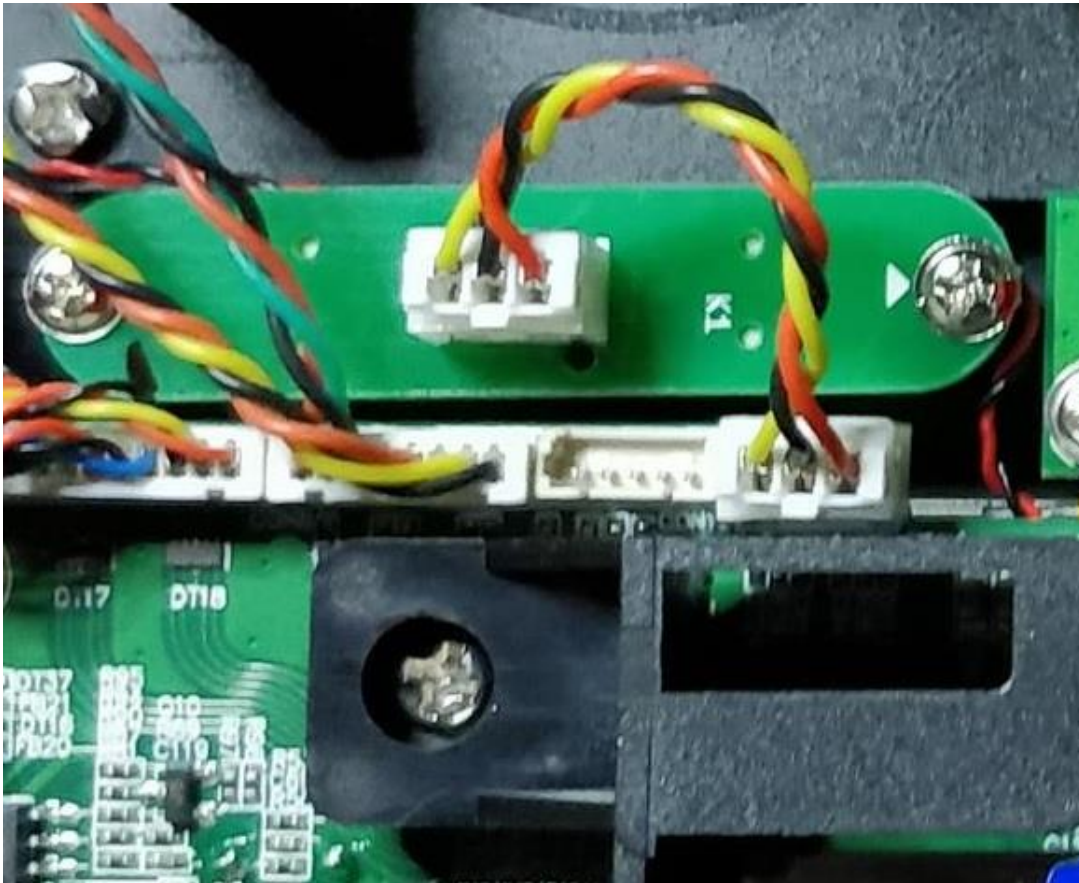
Depending on the older model file backups available and changes made in the current model files not all of the old model files may have current data. Because the “B” number model files are not compatible between builds when going to a lower “B” number the following is the best solution available.

1. Determine the “B” number build you want to use and have those update files available and your model file backups that match that build.
2. Connect the system power on to a Windows computer using a data USB cable. After connection two File Explorer windows will open.

3. Make a copy of the Flash Memory Drive folders and save them to your computer. The Flash Memory Drive has the Config, Images, Sounds, System, etc. folders on it.
4. From the “B” number build you want to use copy the Config files from the FLASH Config folder provided with the build to the Config folder on the system Flash Memory Drive and overwrite the files.
5. Delete the current model files from the system Flash Memory Drive. The model files are in sub folders in the System folder. Delete only the model files not the folders. It is important to delete the files because incompatible files will result in the system not starting and displaying “HORUS\_SD\_STATUS\_MODEL\_VERSION\_”. The model files will be added later process after the system has been flashed and working.
6. Copy the “B” number firmware bin file for the build you want to use to the firmware folder on the SD drive. Only one file can be in the firmware folder.
7. Using the Windows Eject feature Eject the Flash Memory Drive and the SD drive then disconnect the USB cable.
8. At this point follow the normal firmware update listed in the system flashing document, i.e. start the system while holding the enter key down and follow the process.
9. When the flashing process is complete and the system is started it will power up to a screen asking to create a model. Follow the screen prompts and create a new model and load it. Test the system to make sure the model is working. At this point the system is ready to use. If you have backup model files that match the “B” build number, proceed to the next steps.
10. After the system has been tested as working OK, connect the system power on to a Windows computer using a data USB cable. After connection two File Explorer windows will open.
11. Copy the model files from you model file backup that match the “B” number build to the model folders in the System folder.
12. Using the Windows Eject feature Eject the Flash Memory Drive and the SD drive then disconnect the USB cable.
13. Start the system and test it by selecting the model files that were restored. If the correct model files are in place the system will select the files without error and they should work correctly.
14. Test everything very carefully including a range test in range test mode before flying.

## Stick End Connections

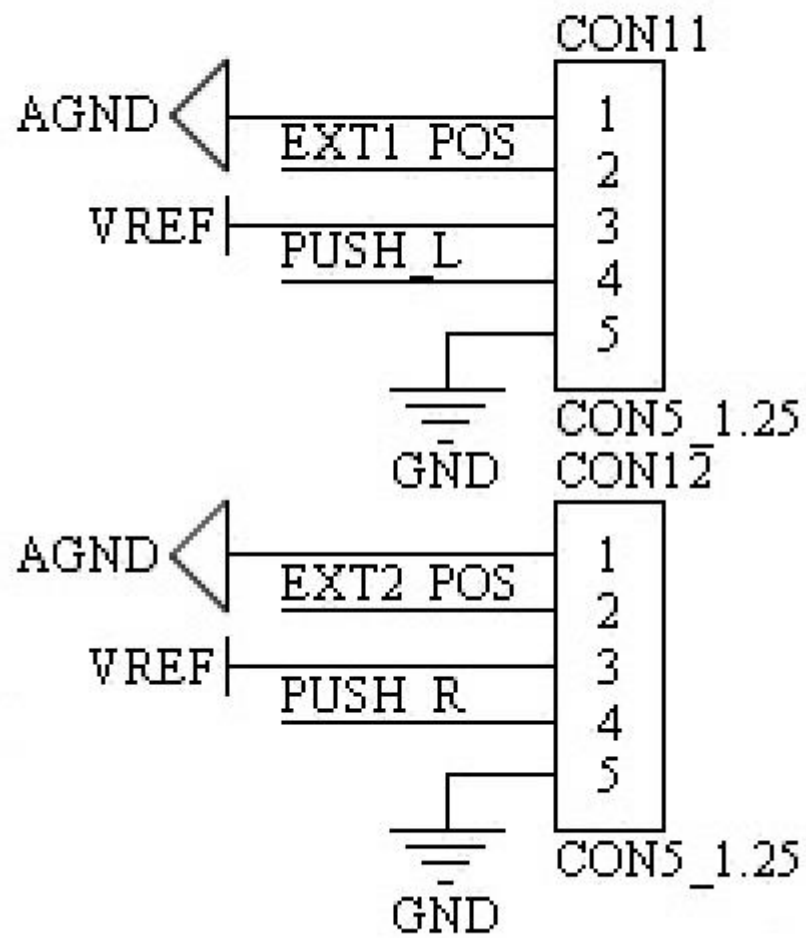
The X10S supports stick end connections.



Right side stick end connector (aileron/elevator)



Left side stick end connector (rudder/throttle)



Connector pins

Happy Flying