How To Use Fox-in-a-Box SD Card Image
V3.1, 28-Oct-2021

This file documents the use of the prebuilt SD Card from store.amsat.org and the online image, both for Fox-in-a-Box running on a Raspberry Pi 3B+ or 4B with or without touchscreen. This document has been updated to refer to the new V3 FIAB which includes support for the CubeSat Sim as well as many additional programs. Please also look at the readme.txt file pointed to below for more information. Especially look at the readme before you download a large file from this directory! The store's SD card may be newer just because I test it in that form, and it takes a while to upload a new image. The store SD card is also pre-tested.

Readme file: http://burnsfisher.com/AMSAT/FoxInABox/readme.txt

The AMSAT Store SD card can be plugged into a Pi and booted immediately. The online image needs to be downloaded from burnsfisher.com. The current image name will be found in the readme.txt file. Do not use a file that is not explicitly mentioned in readme.txt since other files might be for internal testing.

If you download the file from a browser, you must first unzip it before writing the image file to an SD card. The easiest way to do this is to use Balena Etcher (on Windows, Mac or Linux) which will unzip the file and write it to an SD card. It can work by giving it the URL, but we have found that method unreliable on burnsfisher.com. You can get it here: https://www.balena.io/etcher/ If you know other ways to unzip and burn the image file, that is fine too.

Now you have an SD card that you just created or that you bought from the AMSAT store. Plug the card into your Raspberry Pi and power on. Bingo! You have a Fox-in-a-Box, although it really requires a bit of customization. As the "Building a Fox-in-a-Box" document suggests, connect the FIAB to an HDMI monitor, and to a USB keyboard and mouse without the touchscreen. You should not need to login, but if you do, use the default Raspberry Pi username (pi) and password (raspberry).

If you have no HDMI monitor, you must have a network connection either via direct LAN connector or Wi-Fi (see the last section for setting up Wi-Fi without a monitor and keyboard for your Pi). You can use the VNC viewer locally, as described below, by connecting to Fox-in-box-v3.local (if your infrastructure supports local names).

CUSTOMIZING THE RASPBERRY PI
First set some basic characteristics on your FIAB:

Use the mouse to click on the 'raspberry' icon in the upper left and chose preferences and Raspberry Pi Configuration.

Under the System tab, change the hostname from Fox-in-Box-Distro to something of your choice. If you are not planning to use a touch screen, you likely want to go to "Set Resolution" and chose a larger screen than "Default 720x480". Don't forget also to change your password on that same screen. And finally, if you are not in the Eastern US time zone and/or not an English-speaker, go to the "Localization" tab and set the time zone, country, etc. (The Pi4 seems to work a bit differently. Use raspi-config for the resolution as shown in the readme.txt file)

Next enable Wi-Fi by clicking on the up/down blue arrows near top right side of the screen. Select your Wi-Fi ID and enter the password when asked. (You can also choose not to setup Wi-Fi and use a direct network connection.)

Now you should be able to access your FIAB locally over VNC by using VNC Viewer on another computer and connecting to Fox-in-box-v3.local (or a different name if you changed it). If you want to connect remotely, you will need to get a free account from RealVNC (http://realvnc.com). Once you have that all set up, log into the RealVNC account from the FIAB as follows: Click on the VNC logo in the upper right of the FIAB screen, then look on the left under "Connectivity". Click on the highlighted words "Sign In" and use your RealVNC account credentials to sign in. Be sure it all works. If you can login from a remote location (the library, Starbucks, whatever) that proves it.

CUSTOMIZING FOXTELEM
The FoxTelem program is automatically started on boot. The first time you boot up, you will need to run FoxTelem manually by clicking on the desktop icon or raspberry pi menu item. Then you will be prompted to set the profile. Specifically, you will be prompted for your location, altitude, and a name for your ground station. From then on, FoxTelem will automatically run when you start the pi. You can also manually customize FoxTelem by going to the File/Settings tab and entering the name you want to call your ground station, as well as your geographical location (either LatLong or grid

square as well as altitude). Checking "FoxTelem Calculates Position" and "Auto Start Decoder" will reduce the amount of heat generated by your Pi. See the FoxTelem documentation for many more details. If you click on “Upload to server” the data you collect will be sent to AMSAT’s server (with no other info other than the name of your station and the time). This is helpful to AMSAT engineering and Ops to keep track of the health of the satellites, as well as to experiment providers who get data from their instruments.

There are videos to help you with the the setup process as well as using the other programs on the SD card at this URL: https://burnsfisher.com/AMSAT/FoxInABox/Videos

FINAL STEPS
At this point, you can shut down and power off your FIAB. Now that you have customized it, you might wish to backup the SD card. There is also a script on the Pi called “rpi-clone/rpi-clone” in the pi home directory that can backup the Pi “system disk” to an SD card plugged into the USB port (see below). Also, this would be the time to (re-) connect the touchscreen if you are going to use one and install everything neatly in a case.

BACKUP USING RPI-CLONE
You will need an SD card (any size the same or greater than the SD card you are using) and an SD-card/USB adapter. Plug the SD card and adapter into a Raspberry Pi USB port. Dismiss the dialog box asking what to do, if it should appear. Create a terminal and type “cd rpi-clone” followed by “sudo rpi-clone sda”. You will be asked some questions about dismounting, are you ready. Answer yes. You may be asked if you want to name the SD card. You can do so if you wish. Twenty minutes later you have a cloned SD card that you can store away with your backups. You can repeat the process anytime with the same SD card if you wish to update it to include any changes you have made.

UPDATE ON PROBLEMS
With recent FoxTelem updates, the data corruption problems should be fixed, but it is still possible it will occur if you turn off the power at the wrong moment. With the current version, though, you should be able to access the File/Delete Payload Files menu on FoxTelem to fix this problem.

Occasionally you may get a USB error when starting up (manually or automatically). The developer has added some code to automatically retry, but using a small USB extension cord to isolate your SDR mechanically from the Pi will help keep the connection tight.

NOTE ABOUT NEW SATELLITES
Fox-in-a-box is set up to use the latest known orbital elements for satellites that are in orbit as of the build date of the SD card. Elements are not 100% certain before and for a while after launch, so after Golf-TEE launches they will probably have a generic name (for example 2022-005J). FoxTelem downloads orbital elements regularly from amsat.org. At some point after launch, maybe several times, the names will change around and you will have to tell FoxTelem to use a different name. You can do this by pulling down the "Spacecraft" menu and under the new satellite name (Fox-1e for example), change "Name (for Keps)" to the new name. Keep an eye on the AMSAT BB, Twitter, or Facebook group to know the initial name and later names as they change. Note that RadFxSat-2/Fox-1E is now AO-109, and that change is reflected in the FIAB starting with serial number 167, although due to the low power in AO-109 you will require a large antenna to receive it.

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