

AMSAT AMATEUR RADIO IN SPACE Ground Station Quick Start Guide

This guide provides a short description of how to use the CubeSatSim Ground Station. The Ground Station is an SDR (Software Defined Radio) receiver that has the capability of receiving and decoding signals from the CubeSatSim. For details of assembly of the Ground Station, please see: https://www.youtube.com/watch?v=l1o9LD_2hIU For details of assembly of the CubeSatSim please see: <https://github.com/alanjohnston/CubeSatSim/wiki>

Before you begin, please make sure that you have the following ready:

- [Raspberry Pi version 3B or later \(Pi 4 or 5 is fine\)](#)
- [RTL-SDR Receiver](#) with an antenna
- [AMSAT ARISS Pi image](#) loaded on a Micro SD card and inserted into the Raspberry Pi
- [Power Adapter for the Raspberry Pi](#)
- Keyboard and mouse connected (you can use a [mini keyboard/mouse](#) device)
- HDMI Monitor



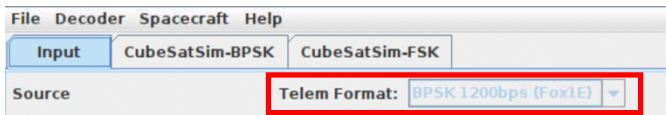
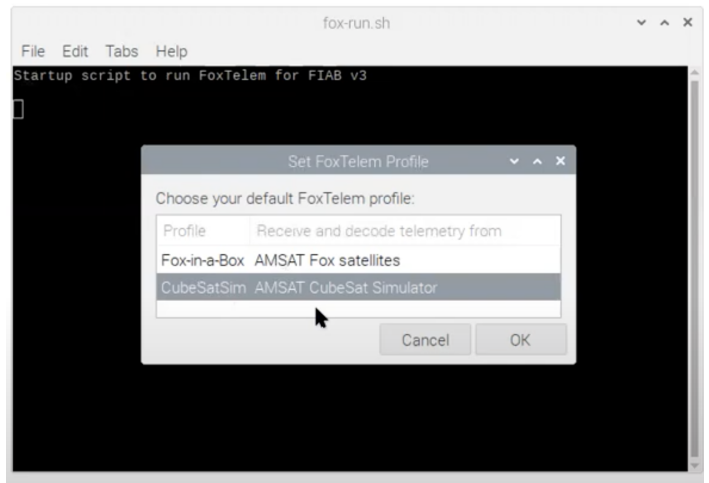
Steps:

1. Turn on your CubeSatSim. see <https://cubesatsim.org/download/cubesatsim-qsg.pdf> (make sure you are in BPSK mode)
2. Make sure your RTL-SDR, keyboard/mouse, and monitor are inserted in Raspberry Pi and then apply the power. It will take about 10 seconds for the operating system to load and then FoxTelem will automatically load (wait for it to load completely).
3. When you run it the first time, FoxTelem will ask you which satellite profile you want to use - choose "CubeSatSim AMSAT CubeSat Simulator"

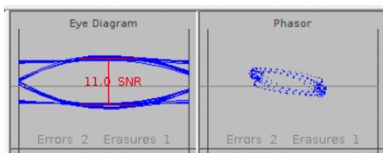
To Decode BPSK:

The CubeSatSim will initially start in BPSK Mode, or you can change to mode 3 using the pushbutton (three blinks of the Green LED).

FoxTelem will start listening in BPSK Mode (Mode 3) and automatically tuned to around 434.9 MHz. The "Telem Format" will be "BPSK 1200bps (Fox1E)"



If you have a handheld VHF FM radio, you can listen on that frequency for the sound. FoxTelem will then open to the "Input" tab that shows the waveforms of the signal.



If the "Eye Diagram" looks like an eye, you will start to see an increasing count of frames of data being decoded in the lower left corner of the window.

Now select the **CubeSatSim-BPSK** tab and you should be able to see that you are receiving data and decoding. Make sure that “Telemetry Payloads Decoded” in the upper right corner keeps increasing.

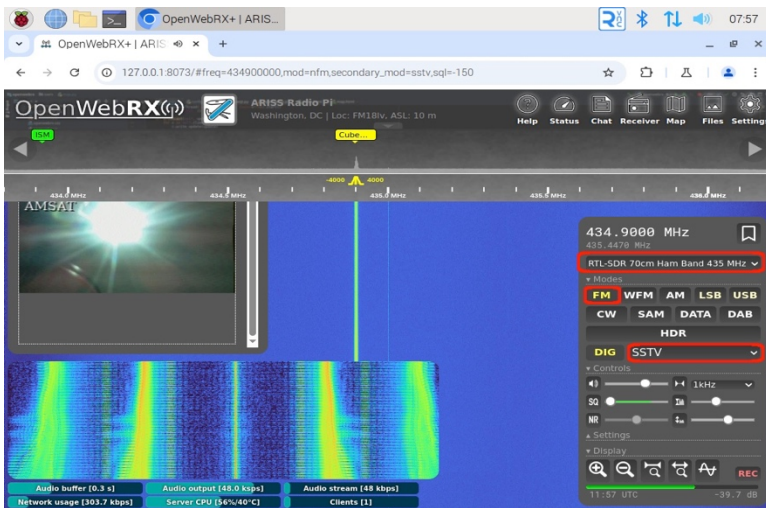
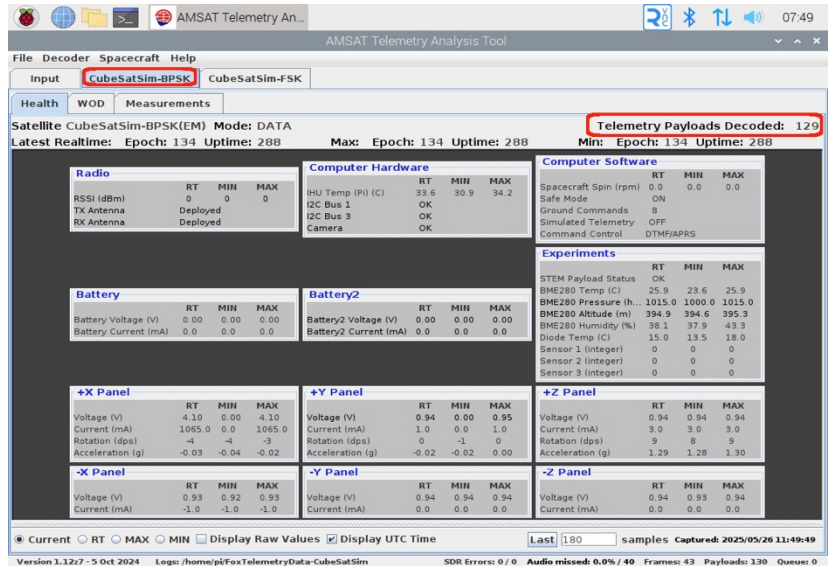
To Decode FSK:

Change the CubeSatSim to FSK mode (Mode 2 – two blinks of the Green LED).

Run FoxTelem and in the Input tab, set the “Telem Format” to be “FSK 200bps (Fox1)”. You might need to click on Stop before you can change it.

To see data, select the **CubeSatSim-FSK** tab.

You can delete the payload files from previous sessions by clicking on Stop in the Input tab, then going under the File menu then Delete Payload Files. All the counts will go to zero and you will only see fresh data.



To Decode SSTV:

Change the CubeSatSim to SSTV mode (Mode 4 – four blinks of the Green LED).

You can use QSTTV or you can open the WebSDR app on the Raspberry Pi.

For the frequency, select CubeSatSim (yellow button) which will set the decoding the “DIG” and “SSTV”. Decoding will start when a new image transmission begins, and the CubeSat image will appear first in the image window on the left side. If you have a camera on the CubeSatSim, the second image and all of the following images will show what the camera is viewing.

To Decode APRS:

Change the CubeSatSim to APRS (Mode 1). You can run Direwolf or open the WebSDR on the desktop. WebSDR is already set up for receiving the CubeSatSim on 434.9 MHz. Make sure you select “Packet” next to “DIG” in yellow. You will see the APRS data and the signal in the waterfall display.

To Decode CW:

Open OpenWebRX and select “CW Decoder” next to “DIG”. You might need to offset the frequency from the center to get it to decode.

To Receive Cross Band Repeater:

Change the CubeSatSim to Cross Band Repeater Mode (Mode 6). Run OpenWebRX. For the band, select “RTL-SDR 2m Ham Band 145 MHz (CubeSatSim Cross Band Repeater)” and tune to 144.9 MHz FM and you should hear anything transmitted on 435 MHz (assuming default frequencies are used). See the Cross Band Repeater Quick Start Guide for more information.

