

Decode Telemetry and Packets


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Introduction

There are several tools available to decode telemetry and packets. SatNOGS provides some built-in demodulators for various data formats. There are also additional tools that allow you the decoding of telemetry.

Built-in Demodulators

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Observation #150869

🕒 Timeframes are in UTC

Satellite

40967 - FOX-1A

Waterfall

Audio

Data 1

(/File:SatNOGS-Observation-Data.png)

Although the SatNOGS servers support many satellites with many modes, only the following modes are supported with built-in demodulators:

- APT (/APT) (Automatic Picture Transmission)
- AFSK (/AFSK) 1k2 (Audio Frequency Shift Keying)
- AX.25 (Amateur Radio adaptation of X.25 packet protocol)
- CW (/CW) (Continuous Wave, Morse Code)
- DUV (/DUV) (Data Under Voice)
- GFSK (/GFSK) 9k6 (Gaussian Frequency Shift Keying)
- FSK (/FSK) 9k6 (Frequency Shift Keying)
- LRPT (/LRPT) (Low Resolution Picture Transmission)

External Demodulator/Decoders

If for some reason, the above built-in decoders are not doing enough, there are many Satellite specific telemetry decoders (/Satellite_specific_telemetry_decoders). Also, there are more generic decoders listed below.

SoX - Sound eXchange

SoX is the Swiss Army knife of sound processing programs. SoX is cross-platform and is available for many operating systems (Windows, Linux, MacOS X, etc.).

SoX supports demodulating the following modes:

- CW (/SoX_CW) (Continuous Wave, Morse Code)

References

- Chris Bagwell SoX – Sound eXchange <http://sox.sourceforge.net/sox.html>
(<http://sox.sourceforge.net/sox.html>)

Fldigi in audio playback mode

Fldigi can be used to decode a variety of data modes.

- CW (/Fldigi_CW) (Continuous Wave, Morse Code)

FoxTelem for FOX1 series satellites

FoxTelem (/FoxTelem) currently supports decoding DUV telemetry the following satellites:

- AO-85 (Fox-1A)
- AO-91 (Radfxsat / Fox1-B)
- AO-92 (Fox1-D)
- Fox-1Cliff, and
- Fox-1E.

References

- AC2CZ FoxTelem - AMSAT Ground Station Software <http://www.g0kla.com/foxtelem/> (<http://www.g0kla.com/foxtelem/>)

multimon-ng

Multimon-ng is a general purpose decoder. It can take wav or raw files and decode a variety of modes among which: CW, AFSK, FSK...

How to CW

First you have to use sox to convert ogg files from SatNOGS download to 22050Hz raw file:

```
sox file.ogg -r 22050 file.raw gain 6
```

The gain is in dB and has a considerable impact on the decoding in the special case of CW. You have to adjust gain to get proper decoding.

Then you must apply on the raw file the proper decoder:

```
multimon-ng -a MORSE_CW -t raw file.raw
```

How to AFSK

First convert to raw sound file (sampling frequency 22050Hz) using sox

```
sox -t ogg $file -r 22050 -t raw file.raw $soxopts
```

Then use multimon-ng with AFSK1200 decoder

```
multimon-ng -t raw -a AFSK1200 $file.raw
```

You can add more decoders if needed with additionnal "-a" options

References

- Elia Oenal Multimon-ng <https://github.com/EliasOenal/multimon-ng> (<https://github.com/EliasOenal/multimon-ng>)

Direwolf

Direwolf is a software encoder/decoder for APRS (AX.25). It can take raw files and decode APRS.

How to

First you have to use sox to convert ogg files from SatNOGS download to 22050Hz raw file
 sox file.ogg -signed-integer -b 16 -r 48000 file.raw

then launch direwolf

```
direwolf -B 1200 -b 16 -n 1 -r 48000 -q hd -t 0 -q h -q d -d p -d t -a 0 - < file.raw
```

Both commands can be combined with a pipe:

```
sox -t ogg satnogs_386252_2018-12-29T02-54-45.ogg -signed-integer -b 16 -r 48000 -t raw - | direwolf -B 1200 -b 16 -n 1 -r 48000 -q hd -t 0 -q h -q d -d p -d t -a 0 -
```

(source (<https://community.libre.space/t/observation-386252-x-cubesat-42707/3093/2>))

QSSTV

QSSTV (<http://users.telenet.be/on4qz/qsstv/index.html>) is a modem software to send and receive SSTV (Slow Scan Television (https://en.wikipedia.org/wiki/Slow-scan_television)).

Usage

- Download the ogg file and convert it to wav with:
 sox satnogs_154162_2018-06-06T12-46-40.ogg output154162.wav rate 48000
- Open QSSTV and specify "Sound>Sound Input: from file"
- Press the play button and you will be asked to select the previously generated wav file. The decoding should start now.

References

Direwolf WB2OSZ <https://github.com/wb2osz/direwolf> (<https://github.com/wb2osz/direwolf>)

WXtoImg

WXtoimg is a program used to produce neat weather pictures from APT format receptions of NOAA satellites.

SatNOGS client produces automatically such weather map. However, if you want to add overlays or test some part of the processing, you can do it manually.

It uses a .wav file and produces weather picture with possible nice overlays (frontiers, colors...).

Usage

- Download for example the ogg file from observation #1193773 and convert it to wav with:

```
sox satnogs/satnogs_1193773_2019-11-12T07-13-50.ogg -r 11025 satnogs/satnogs_1193773_2019-11-12T07-13-50.wav
```

- Then invoke command line interface of WXtoIMG with:

```
wxtoimg -t n -e HVC -N satnogs/satnogs_1193773_2019-11-12T07-13-50.wav > satnogs/satnogs_1193773_2019-11-12T07-13-50.png
```

References

WXtoimg restored: <https://wxtoimgrestored.xyz/> (<https://wxtoimgrestored.xyz/>)

See also

- Software (/Software)
- Satellite specific telemetry decoders (<http://www.dk3wn.info/software.shtml>) (German)
- gr-satnogs Adding a New Satellite (<https://gitlab.com/librespacefoundation/satnogs/gr-satnogs#adding-a-new-satellite-demodulator>)

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