
Outernet L-band for Linux Documentation

Release 1.0a2

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This guide demonstrates the process of installing and running the Outernet SDR demodulator and decoder software on a desktop Linux operating system. As of this writing, only 64-bit versions of Linux are supported. 32-bit version are in the works.

Note: In theory, this guide should work in a virtual machine with slight modifications, but virtual machines are outside the scope of this guide.

Warning: This guide is a work in progress and may contain wrong and/or incomplete information. Please use the [issue tracker](#) or [our forums](#) to discuss any problems you encounter.

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Licenses

The binary files closed-source are released under the proprietary freeware licenses:

- `sdr100*` - see [SDR100_LICENSE.txt](#)
- `ondd*` - see [ONDD_LICENSE.txt](#)

The scripts in the repository including any example scripts found in the documentation folder are released under GNU GPL version 3 or any later version. See [COPYING](#) for more information, or visit the [GPL homepage](#).

The documentation, except example scripts found in the docs directory, is released under GNU FDL version 1.3 or any later version. See [COPYING.docs](#) for more information, or visit the [FDL homepage](#).

Guide contents

2.1 Requirements

In order to follow this guide, you will need:

- A Linux operating system
- RTL-SDR USB dongle
- LNA
- patch antenna
- Internet connection
- Basic familiarity with the Linux command line shell

The RTL-SDR radio dongle, LNA, and antenna, can be purchased [through Outernet](#) either individually or as a kit.

Note: The author of this guide uses Arch Linux, in case you are wondering.

2.2 Introduction

The files that are datacast by Outernet are encoded, modulated, and sent to several Inmarsat satellites. These satellites transmit the radio waves in the [L band frequency range](#). The waves are received by a radio on your receiver and then passed on to the software demodulator. The demodulator turns the analog signal into bits and then passes them onto the decoder, which extracts the file information from the data and reconstructs the files on local storage.

The software components involved in this process are the software demodulator (sdr100) and the decoder (ondd).

Despite this software coming from a single vendor, they don't come as a single package for the reasons of flexibility and so that various components can be replaced by others with same or similar functionality in future. Because of this, much of this guide is going to be about ensuring that these pieces of software work together.

Note: Although these pieces of software are all part of the Outernet software eco-system, which is predominantly open-source, the demodulator and decoder are closed-source freeware.

The relevant license files are installed in `/usr/local/share/outernet` folder by the installer.

The software involved in this set-up is meant to be used as long-running background processes (a.k.a. daemons). Some of the programs already provide features that let them run as proper well-behaved daemons, while others do not. We will not discuss daemonizing any of the programs in this guide. Documentation about command line options will be provided as appropriate, but daemonization (or conversion into proper system services) is going to be left to you as an exercise.

In a proper Outernet receiver, there are usually a few more components, like the web-based user interface software. Since the purpose of such software is to provide access to files from outside the receiver, they will not be covered in this guide. It is assumed that, on a regular desktop Linux, user will have enough options for getting access to files locally.

2.3 Software installation

In this section, we will install all the necessary software and ensure the system is prepared to run it. The next section will discuss the programs' usage.

2.3.1 Installing the software

Download the [Outernet demodulator/decoder kit](https://github.com/Outernet-Project/outernet-linux-lband/archive/master.tar.gz) and untar it:

```
$ wget https://github.com/Outernet-Project/outernet-linux-lband/archive/master.tar.gz -O outernet.tar.gz
$ tar xvf outernet.tar.gz
```

To install:

```
$ cd outernet-linux-lband-master
$ sudo ./installer.sh
```

During installation, you will be asked to decide whether you wish to configure udev. By default, access to the SDR dongles is restricted to root. The udev rules relax these rules so that any user can access them.

You will also be asked to create the temporary download folder as well as the download folder. The temporary download folder is used to store incomplete downloads, while the download folder is the final destination for the downloaded files. You can chose to create these folders later by yourself, or have the installer create them (default).

Warning: If the installer is asked to create the download folders, the created folders will be world-writable (any user will have read-write access to them).

2.4 Running the programs

We are now ready to run the demodulator and the decoder. Before we do that, though, we need to connect the radio and the antenna.

Connect the antenna's connector to the LNA. Next, connect the LNA to the RTL-SDR dongle. Finally, plug the dongle into your computer's USB port.

2.4.1 Running the demodulator

The demodulator needs a few parameters so it knows how to set up the tuner. The `demod-presets` command makes this easier by providing presets for the known frequencies. If you run this command without any arguments, you will get a list of presets (among other things):

```
$ demod-presets
Usage:
  /usr/local/bin/demod-presets PROFILE
  /usr/local/bin/demod-presets update

parameters:

  PROFILE    name of the tuner profile
  update     fetch the latest profiles

supported profiles:

  americas   North and South Americas
  euraf      Europe, Africa, Middle East
  apac       Asia, Pacific
```

Pick a preset for your region and run `demod-presets` again. For example, let's run it with `euraf` preset:

```
$ demod-presets euraf

Outernet SDR Satellite Demodulator
Batch: 164          AFEDrops: 0          Freq: NORMAL      Version: 1.0.4
PhzIntg: -55       ClkIntg: 8           Rs: NORMAL        Offset: 9.24 Hz
RSSI: -99.55 dBm   AFE Gain: 43.90 dB  AGC mult: 2700    Offset: -0.38 Hz
                                                           SNR: 0.34 dB

DPDrops: -1
CRC Ok: 0          CRC Errs: 0          SER: 0
                                                           PER: -nan         Invert: 0

aFreq: 2984.6930   aPkmn: 12.063          SigDet: 0         State: SEARCH

  X      X      X
    X  X      X
  X      XX
  X      XXX
X      X  X  X  X
    X      X  X  X
      X      X
      X
```

2.4.2 Running the decoder

With the demodulator running, open up a new terminal window to start the decoder.

```
$ decoder
```

Output from the decoder will be logged in the terminal where you started it.

To run the decoder with paths different from the ones in this guide:

```
$ decoder -c /path/to/cache -o /path/to/downloads
```

2.4.3 Updating demodulator presets

The L-band presets used by `demod-presets` command may change from time to time. The program has an update feature which you can use to fetch the updated presets. To use this feature, run:

```
$ sudo demod-presets update
```

2.4.4 What next?

It will take a while for the files to arrive, so please be patient. You may also need to adjust the antenna so it's pointed correctly. Antenna pointing is outside the scope of this guide, though. The best place to ask for help regarding this is [our forum](#).

When successfully downloaded, files should appear in the output directory. If you used the values from this guide, that's `/srv/downloads`.

2.5 Troubleshooting

This section contains some common issues and known ways to fix them. Note that no two machines are exactly the same, and therefore some problems may have more than one root cause. If a fix listed here does not work for you, please ask for help in the [Outernet forum](#) or, if you've found a fix, please [file a bug report](#).

2.5.1 Unable to load config: `/etc/ondd.conf`

This is normal, and you shouldn't worry about it. If you still see issues, they are most likely not related to this message.

2.5.2 error while loading shared libraries: `libncurses.so.5`

If you see this, your distro probably has a newer version of `libncurses` installed. First find out what version of `libncurses` your distro has:

```
$ ls -l /usr/lib/libncurses*
/usr/lib/libncurses.so
/usr/lib/libncurses++.so
/usr/lib/libncurses++w.so
/usr/lib/libncursesw.so
/usr/lib/libncurses++w.so.6
/usr/lib/libncursesw.so.6
/usr/lib/libncurses++w.so.6.0
/usr/lib/libncursesw.so.6.0
```

In this case, we are dealing with version 6, so we make two symlinks:

```
$ sudo ln -s /usr/lib/libncursesw.so.6.0 /usr/lib/libncurses.so.5
$ sudo ln -s /usr/lib/libncursesw.so.6.0 /usr/lib/libtinfo.so.5
```

After this, the program should run normally.

2.5.3 `/usr/lib/....: no version information available`

This is normal for some Linux distros, and should not cause any issues. If you are still having some problem, it is more likely *not* because of this warning message.

2.5.4 Kernel driver is active, or device is claimed...

You probably need to blacklist the `dvb_usb_rtl28xxu` driver. Please search online for instructions on how to blacklist modules on your distro.

2.5.5 No sdr devices found

You should plug in your RTL-SDR dongle. If it is already plugged in, it may not be working correctly or may not have enough power.