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Abstract—This module explains how to interface RTL-SDR dongle with Raspberry Pi and Demodulate FM Signal.

1 SOFTWARE INSTALLATION

1.1 Preliminary Tools

If you do not have GIT, cmake & unzip installed them using following commands.

```
sudo apt-get update
sudo apt-get install git-core
sudo apt-get install cmake
sudo apt-get install unzip
```

1.2 Update & Install Dependencies

Update the internal repository of Pi

```
sudo apt-get update
```

Download or clone dependencies.html file from the github to know list of dependencies required to interface RTL-SDR dongle.

```
git clone https://github.com/
PrasannaIITH/UHD-dependencies.
git
cd UHD-dependencies
unzip dependencies.zip
```

Open the .html page in the directory using browser

```
ls
chromium-browser ./Dependencies.
html
```

Open a new terminal and install the dependencies which are present in the page as per instructions.

1.3 Download & Build RTL-SDR software

Download or clone from github:

```
git clone git://git.osmocom.org/
rtl-sdr.git
(or)
git clone https://github.com/
PrasannaIITH/rtl-sdr.git
```

Build with cmake :

```
cd rtl-sdr
mkdir build
cd build
cmake ../
make
sudo make install
sudo ldconfig
```

In order to be able to use the dongle as a non-root user, you may install the appropriate udev rules file by calling cmake with the following command in build directory.

```
cmake ../ -DINSTALL_UDEV_RULES=ON
```

Building with auto tools:

```
cd
cd rtl-sdr/
autoreconf -i
./configure
make
sudo make install
sudo ldconfig
```

In order to be able to use the dongle as a non-root user, you may install the appropriate udev rules file by calling

```
cd
cd rtl-sdr/
sudo make install-udev-rules
```

we can see `rtl_tcp`, `rtl_test` & `rtl_sdr` in `rtl-sdr/src` directory. By this we can say the software is successfully.

2 HARDWARE INSTALLATION

We use DVB-T RTL-SDR R820TU dongle with antenna as RF front-end.



Fig. 1: DVB -T RTL-SDR Dongle

2.1 Interior Components

2.2 Working Process

RTL-SDR Dongle consists of two important blocks **Radio tuner** & **Demodulator with ADC**.

- 1) **Antenna:** Antenna converts the electromagnetic signal to electrical analog signal.
- 2) **Radio Tuner:** R820T2 chip is an radio tuner here, it converts high frequency signal to a lower intermediate frequency.

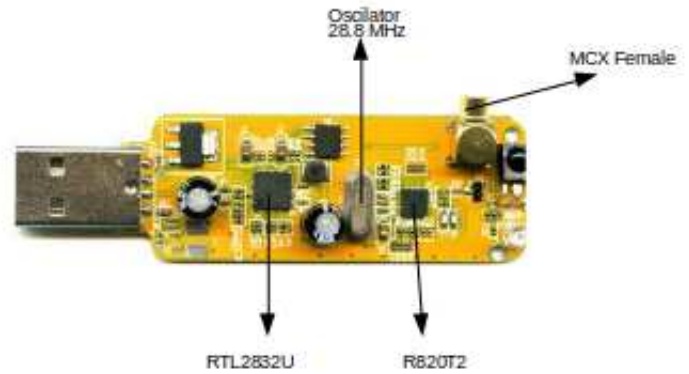


Fig. 2: Components of RTL-SDR Dongle

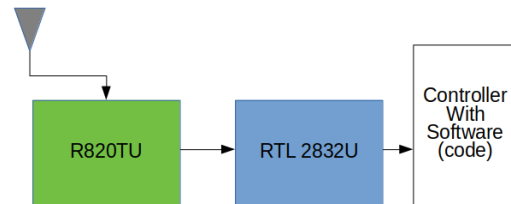


Fig. 3: Block Diagram

- 3) **Demodulator:** RTL2832U helps to demodulate the signal and convert the analog signal to digital.
- 4) The digital signal with help of USB fed to the computer.

2.3 Test Connection

Connect the dongle to Pi, connect the antenna to the dongle with help of MCX Male & Female. Now run the following command in the terminal to see device details.

```
rtl_tcp
```

3 OPERATION

Run the following commands to receive & play audio single from the FM transmitter

```
cd rtl-sdr
cd src
sudo ./rtl_fm -f 89.9e6 -M wbfm -s
200000 -r 48000 - | aplay -r 48
k -f S16_LE
```

REFERENCES

- [1] Open Source Mobile Communications, <https://osmocom.org/>.
- [2] RTL-SDR Dongle and GQRX on Mac <https://www.youtube.com/watch?v=bSAa2aOXpCc>.
- [3] Official Osmocom mirror, Mirror of the git.osmocom.org repositories <https://github.com/osmocom>.