Raspberry Pi 2 and 3 Software Installation

Download latest Raspian image from https://www.raspberrypi.org/downloads/raspbian/

Unzip image

Copy image to memory card

Boot the Rpi with it attached to your network, it will use DHCP to get an IP address.

Note that the display will work but may not be the correct size and the touch screen may not be working.

Connect to the RPi using ssh from another system. You can do all this on the RPi with a keyboard and mouse attached, but I find it is easier to ssh. (ssh pi@<IP address>).

The following instructions to expand the file suystem may not be required with the latest raspbian as it will automatically do this when first booted.

Expand the root file system by running the command and selecting the option to expand the root-fs:

```
sudo raspi-config
```

select option to reboot the system and when rebooted connect using ssh again.

Update the system (warning this may take some time to complete):

```
sudo apt-get update && sudo apt-get dist-upgrade && sudo apt-get install -f
```

If you are using the Raspberry Pi 7 inch LCD touch screen, it should be fully working at this point.

Run the following commands to install FFTW3:

```
sudo apt-get install libfftw3-dev
```

Run the following commands to download and install the GPIO package:

```
wget abyz.co.uk/rpi/pigpio/pigpio.zip
unzip pigpio.zip
cd PIGPIO
make
sudo make install
cd
```

To disable screen blanking

sudo apt-get install xscreensaver

Using a mouse or the touchscreen:
Select **Menu**->**Preferences**->**Screensaver**
On the **Display Modes** tab set the **Mode** to **Disable Screen Saver**

save the file and reboot the Rpi.

To over clock the processor on the RPi 2 (not needed on Rpi 3) :

as root, edit the file /boot/config.txt:

sudo nano /boot/config.txt

find the lines that define the clock speeds and change them to:

```
arm_freq=1000
core_freq=500
sdram_freq=500
over_voltage=2
```

save the file (Ctrl-X and then Y).

reboot the Rpi:

sudo reboot now

The system is now ready to install wdsp and pihpsdr.

Now ssh into the Rpi again, or open a terminal window on the RPi.

In the home directory (/home/pi) download the binary package:

wget https://github.com/g0orx/pihpsdr/raw/master/release/pihpsdr.tar

The /home/pi directory should now contain the pihpsdr.tar file.

Extract the files (will create directory pihpsdr):

tar xvf pihpsdr.tar

Copy shared libraries to /usr/local/lib:

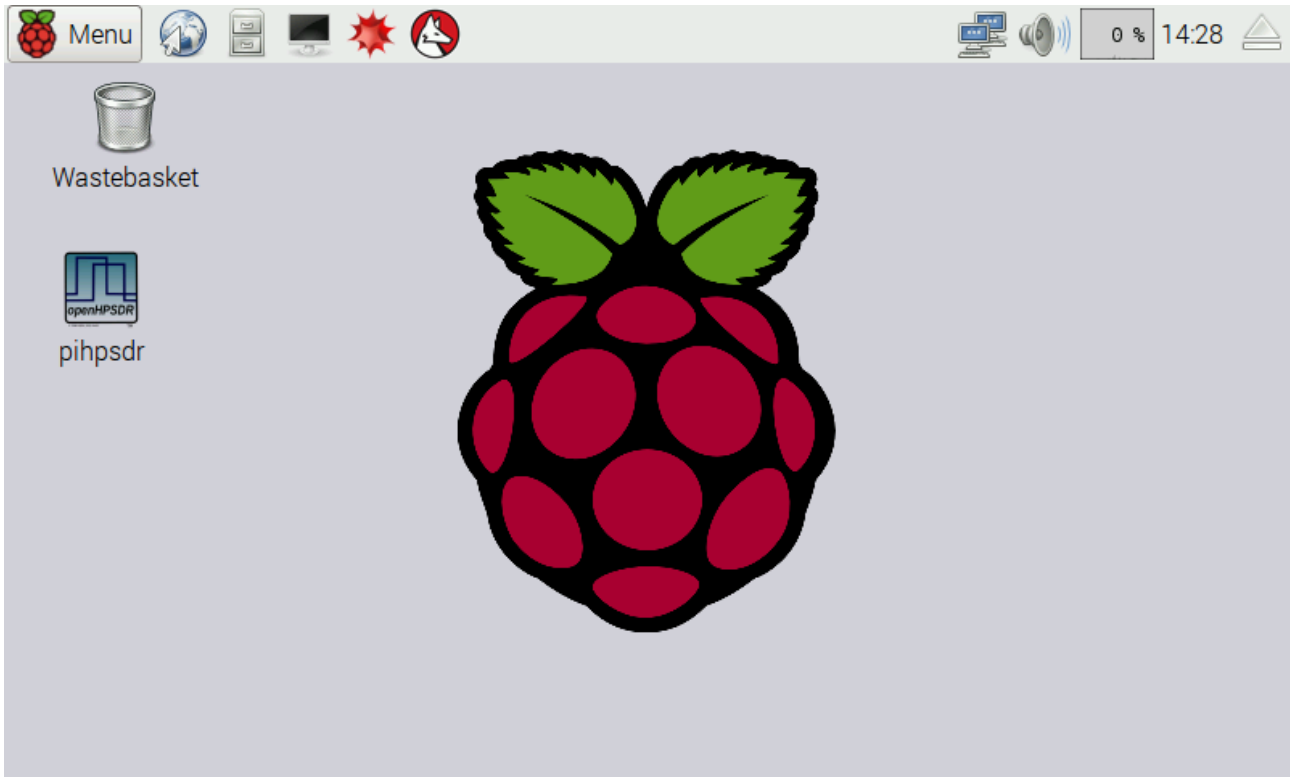
```
cd pihpsdr
sudo ./install.sh
```

Rebuild the library cache:

```
sudo ldconfig
```

Copy desktop shortcut:

```
cp pihpsdr.desktop /home/pi/Desktop
```



You are now ready to run the application by double tapping (clicking) on the desktop icon.

To be able to hear the audio locally on the Raspberry Pi you need to configure portaudio.

Note: there are bugs in the driver for the Raspberry Pi built in analog audio output that causes pulse audio to hang up. I have used a small USB audio adapter like the following with no problems plus this has microphone input for future use.

From a terminal window or ssh:

```
cd pihpsdr
./portaudio.sh
```

Install Pulse Audio Preferences:

```
sudo apt-get install paprefs
```

Using the touch screen or a mouse:

select **Menu → Preferences → PulseAudio Preferences**
tap on the **Network Server** tab
tap on the check box **Enable network access to local sound devices**
tap on the check box **Don't require authentication**

To be able to use the USB Audio card you have to select it as the default device:

tap **Menu → Preferences → Audio Device Settings**
tap the **Sound card** drop down box and select the sound card (mine is identified as a C-Media USB Headphone Set)
tap on **Make Default**
close thedialog

Reboot the Rpi:

```
sudo reboot now
```

If you want to set up the system so that pihpsdr starts automatically when the system is booted do the following:

```
nano ~/.config/lxsession/LXDE-pi/autostart
```

add the following line to the end of the file:

```
@/home/pi/pihpsdr/start_pihpsdr.sh
```

and save the file.

Next time you boot the system it will start pihpsdr.

Waveshare LCD

If you are using the 5 inch Waveshare LCD touch screen the following instructions will install the required software otherwise skip to “To disable screen blanking”.

```
wget www.waveshare.com/w/upload/9/9d/LCD-show-151020.tar.gz
tar xvf LCD-show-151020.tar.gz
cd LCD-show
sudo dpkg -i xinput-calibrator_0.7.5-1_armhf.deb
sudo ./LCD5-show
```

For Development:

```
sudo apt-get install libgtk-3-dev
```

Raspberry Pi 2 Rotary Encoders

Currently pihpsdr supports a high resolution optical rotary encoder for tuning and 2 low resolution encoders with a built in push switch for AF Gain/AGC Gain and RF Drive/RF Tune Drive.

The high resolution encoder is a 600 ppr optical encoder, and the low resolution encoders are 24 ppr (KY-040) with built in push switch.

Connection to the Raspberry Pi 2:

VFO: 600 ppr optical encoder.

Green – GPIO-17 (pin 11)
White – GPIO-18 (pin 12)
Black - Ground
Red - +3.3v

AF Gain/Mic Gain: 24 ppr encoder (KY-040):

CLK – GPIO-20 (pin 38)
DAT – GPIO-26 (pin 37)
SW – GPIO-25 (pin 22) (LOCK)
+ - +3.3v
GND - Ground

RF Drive/Tune Drive: 24 ppr encoder (KY-040):

CLK – GPIO-16 (pin 36)
DAT – GPIO-19 (pin 35)
SW – GPIO-08 (pin 24)
+ - +3.3v
GND - Ground

AGC: 24 ppr encoder (KY-040):

CLK – GPIO-04 (pin 7)
DAT – GPIO-21 (pin 40)
SW – GPIO-07 (pin 26)
+ - +3.3v
GND - Ground

All the following SPST momentary push to make buttons have one side connected to ground:

Band Up/Down - GPIO-13 (pin 33)
Band Stack Up/Down - GPIO-12 (pin 32)
Mode Up/Down - GPIO-06 (pin 31)
Filter Up/Down - GPIO-05 (pin 29)
Noise Up/Down - GPIO-24 (pin 18)
AGC Up/Down - GPIO-23 (pin 16)

MOX/Tune	- GPIO-27 (pin 13)
Function	- GPIO-22 (pin 15)