WinterHill - 4 Channel DATV Receiver

Raspberry Pi Installation Manual – 3v20a Rev1

Overview

- WinterHill is a 4 channel DVB-S/S2 receiver based on the BATC Advanced Receiver PCB
- The main components are a Raspberry Pi 4 (RPi4), 2 PICs and 2 FTS433x NIMs
- The PICs are programmed in-circuit
- The RPi4 software is based on LongMynd by M0HMO
- New RPi4 software, PIC software and PC software designed by G4EWJ
- PCB designed by G0MJW
- Installation software designed by G8GKQ
- The RPi4 interfaces to each NIM using a PIC, rather than an FT2232H USB module
- The 4 received transport streams (TS) can be sent to any location using UDP protocol
- Transport streams are displayed either locally or remotely using VLC
- Receive commands can come from various sources, including QO-100 LiveTune designed by M0DTS
- The highest symbol rate is limited by the speed of the serial connections between devices and is about 10M bit/s per NIM. E.g. the QO-100 beacon at SR1500 FEC4/5 (2.4Mbps) and a terrestrial repeater at SR4000 FEC7/8 (7Mbps) should be OK.
- Currently, the lowest symbol rate that can be received is 66kS.
- WinterHill is named in memory of Brian G3SMU, who was a huge presence on ATV and microwaves from his Winter Hill QTH in Lancashire, North-West England.

RPi4 SD Card

- On a Windows PC, go to https://www.raspberrypi.org/software/operating-systems/
- Download the image for **Raspberry Pi OS with desktop**
- Write the image to an SD card win32diskimager. A 16GB Sandisk SD card is recommended.
- win32diskimager can be found here: https://sourceforge.net/projects/win32diskimager/
- Before you remove the card from your Windows PC, look at the card with windows explorer; the volume should be labelled "boot".
- Create a new empty file called ssh in the top-level (root) directory by right-clicking, selecting **New**, **Text Document**, and then change the name to ssh (not ssh.txt).
- You should get a window warning about changing the filename extension. Click **OK**. If you do not get this warning, you have created a file called ssh.txt and you need to rename it ssh.
- IMPORTANT NOTE: by default, Windows (all versions) hides the .txt extension on the **ssh** file. To change this, in Windows Explorer, select **File**, **Options**, click the **View** tab, and then untick **Hide extensions for known file type**". Then click **OK**.

RPi4 Configuration

An RPi4 with 2GB ram is sufficient.

There are several items to configure manually and then the RPi will update itself over the internet, which may take some time.

- Insert the SD card into the RPi4 on an assembled WinterHill (it will work with just NIM_A)
- Connect USB keyboard, USB mouse, wired network and HDMI display to the RPi4.
- Power on, and allow to boot. Use the Keyboard Mouse and Display connected to the RPi4.
- Once the Raspberry Pi desktop is displayed, click **OK** on **ssh warning**. Do not change your password.
- You may get an audio message about the “text screen reader”. Click the **Loudspeaker** at the right of the task bar at the top of the screen and select **Mute** for now. This message will stop after the next reboot.
- Make a note of the IP address at the bottom right of the welcome window. Then click **Next**.
- Confirm the settings on the **Set Country** screen. If you have selected **British English**, do not tick **Use English Language**. Click **Next**.
- Leave both **Password** boxes blank (unless your receiver is going to be directly connected to the internet (i.e. not behind a domestic router) or at a remote site (i.e. a repeater). If so, change the password. Click **Next**.
- If you have a black border around the screen edge, set the screen to expand by ticking the box. Click **Next**.
- The next screen allows you to set up a wireless network. Only do so if you have no wired network. Wireless is not recommended. Normally, click **Skip**.
- On the **Update Software** screen, update the RPI4 software by clicking **Next**. The updates can take between 5 minutes and an hour to complete.
- If a box with “**Error comparing versions”** appears, click **OK**, click **BACK**, click **NEXT** and it will try again.
- When “System is up to date” is displayed, click **OK** and then click **Restart**. When the system restarts, click **OK** on the **ssh warning**.

RPi4 Settings for WinterHill

- Right click on the Desktop, select **Desktop Preferences**, click the **Defaults** tab, click **Set Defaults for large screens**, click **OK**.
- Right click on the Desktop, select **Desktop Preferences**, untick **Wastebasket,** click **OK.**
- Click the **Raspberry** in the taskbar, click **Preferences,** click **Raspberry Pi Configuration**.
- Click the **Display** tab, click **Screen Blanking "Disabled".** Click **OK**. Click **No** in response to "**Would you like to reboot now**".
- Click the **Raspberry** in the taskbar, then **Preferences**, then **Raspberry Pi Configuration**.
- Click the **Interfaces** tab, click **Enabled** against **I2C**, the fifth line down. Click **OK**.
- Click the **Raspberry** in the taskbar, click **Sound & Video**, click **VLC Media Player**.
- Make sure that **Allow metadata network access** is ticked. Click **Continue**, then close VLC.

Downloading and Installing the WinterHill RPi4 software

- Use your Windows PC on the same network as the Raspberry PI (so move your Raspberry Pi keyboard out of the ways so you do not get confused).
- Connect to your Raspberry Pi by **SSH** on the IP address you noted earlier using KiTTY or PuTTY. Log in (username **pi**, password **raspberry**)
- PuTTY can be downloaded from here:

  https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html MSI ('Windows Installer')
- You may receive a security alert. Click **YES**.
- Download and execute the WinterHill installer by pasting in these lines:

  ```
  wget https://raw.githubusercontent.com/BritishAmateurTelevisionClub/winterhill/main/install_winterhill.sh
  chmod +x install_winterhill.sh
  ./install_winterhill.sh
  ```

  The installer will add some additional programs and copy all the required files to your system.

  At the end of the install, the Raspberry Pi will reboot.

  After the reboot, WinterHill should start in **Local** mode.
- Un-mute the audio on the taskbar.
- If you are not using WiFi, turn it off via the WiFi icon at the bottom right of the taskbar
- If you have no need to use Bluetooth, turn it off via the Bluetooth icon on the bottom right of the taskbar

Troubleshooting

- If there is no audio:

  Make sure that the audio is not muted.

  Right-click the **Loudspeaker** icon at the right of the task bar - HDMI should be ticked.

- If VLC windows 3 and 4 are running off the bottom of the screen:

  Log in with ssh, or open a terminal screen (the dark >_ icon to the left of the task bar).

  Edit the Raspberry Pi config file with **sudo nano /boot/config.txt**

  Find the lines:

  #framebuffer_width=1280
  #framebuffer_height=720

  Change them to:

  framebuffer_width=1920
  framebuffer_height=1080

  Save the file with **CTRL-X** then **Y** then **ENTER**

  Type **sudo reboot** to restart.

WinterHill Log File

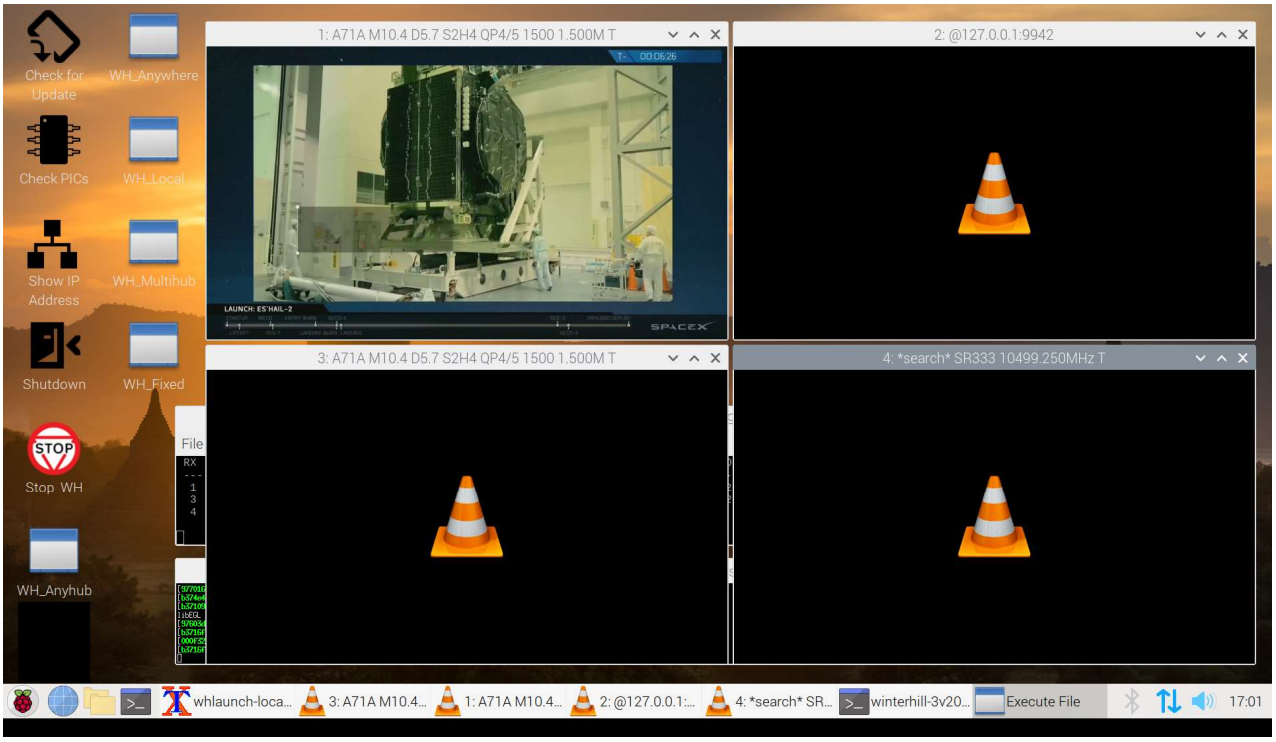
When any problems occur, always look at the file **/home/pi/winterhill/whlog.txt**

RPi4 Default Startup

See the Operations Manual for details on how to change the startup mode.

After re-booting, WinterHill will start in the default **Local** mode. The RPi4 screen will look like this, with the **whlaunch** window and the **winterhill** window behind the VLC windows.

The screen icons may have slightly different names from the ones shown.



It may be displaying the beacon on RX1, if the default WinterHill initialisation file **/home/pi/winterhill/winterhill.ini** is compatible with your antenna setup.

Below is an extract from winterhill.ini:

```
COMMAND = [to@wh],rcv=1,freq=10491500,offset=9750000,srate=1500,fplug=A
COMMAND = [to@wh],rcv=3,freq=10491500,offset=9750000,srate=1500,fplug=A
COMMAND = 3       # a single digit causes a delay of that many seconds
COMMAND = [to@wh],rcv=2,freq=10499250,offset=9750000,srate=333,fplug=A
COMMAND = [to@wh],rcv=4,freq=10498750,offset=9750000,srate=333,fplug=A
```

If required, edit **/home/pi/winterhill/winterhill.ini** for your antenna local oscillator offsets. If you have LNB PSU boards fitted, comment out the 4 lines above with **#** and uncomment the 4 lines below and edit them for your local oscillator offsets and voltage requirements. Voltage settings are (**off, hi, lo, hit, lot**). **Hit** and **lot** also turn on the 22kHz tone. Case is not important.

```
#COMMAND = [to@wh],rcv=1,freq=10491500,offset=9750000,srate=1500,fplug=A,vgx=hi
#COMMAND = [to@wh],rcv=3,freq=10491500,offset=9750000,srate=1500,fplug=A,vgx=hi
#COMMAND = 2     # a single digit causes a delay of that many seconds
#COMMAND = [to@wh],rcv=2,freq=10499250,offset=9750000,srate=333,fplug=A,vgx=hi
#COMMAND = [to@wh],rcv=4,freq=10498750,offset=9750000,srate=333,fplug=A,vgx=hi
```

See the Operations Manual for more details about the initialisation file.

The beacon will not display on RX3, which uses the hardware codec, because of a known problem, but there may be sound, giving an echo effect.

If the beacon is displaying, but there is no sound, see the troubleshooting section above.
If the screen does not look like this, maximise the **winterhill** window, if present and look for error messages. Also look at the **file /home/pi/winterhill/whlog.txt**

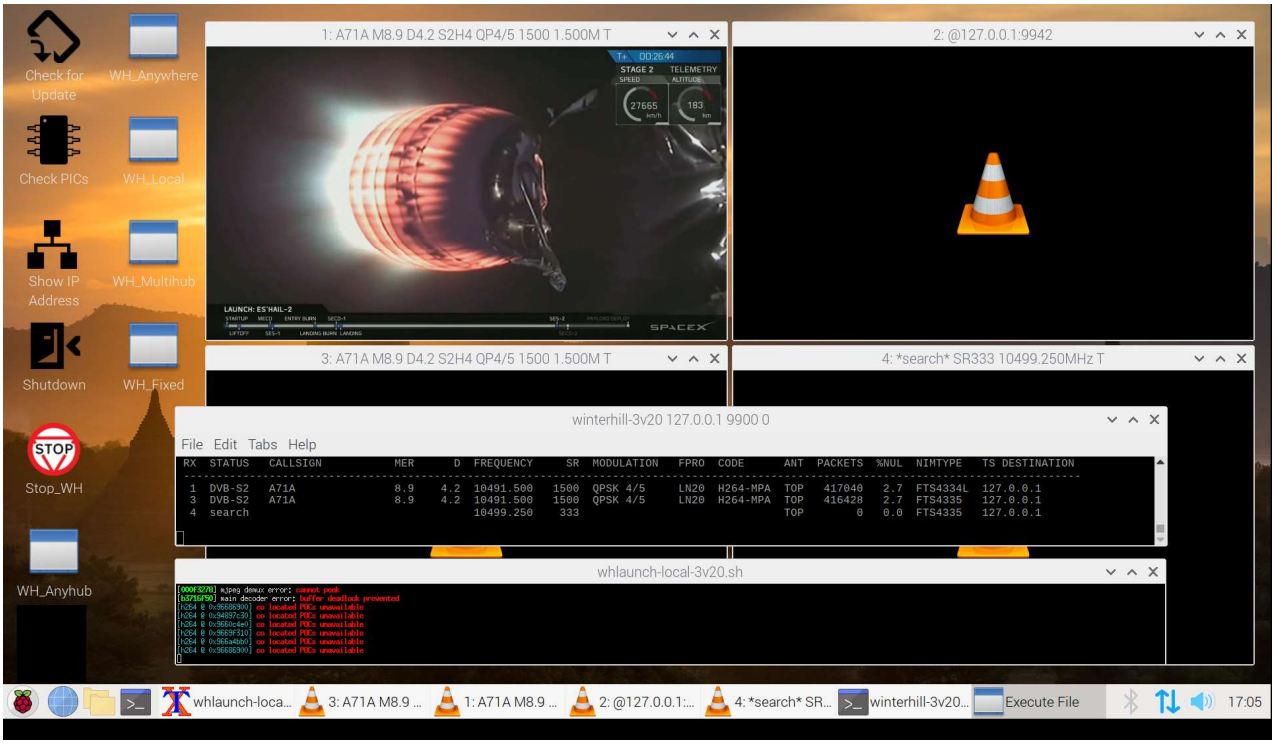
Ignore any error messages on the **whlaunch** window.

The 4 VLC windows are looking for transport streams sent to IP address 127.0.0.1 and on IP ports 9941-9944.

127.0.0.1 is a special IP address known as LOCALHOST, which means ‘this computer’.

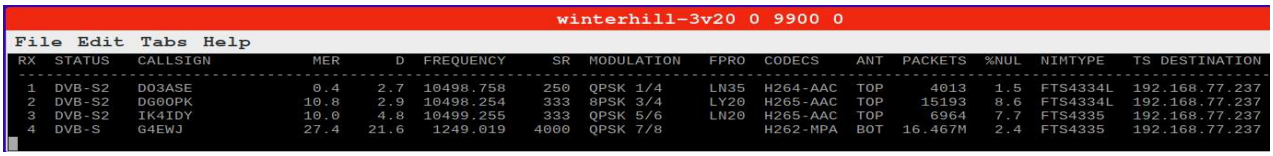
See the Operations manual for details on how to send receive commands.

Click on the two windows behind the VLC windows to bring them forward temporarily.



- If a hub mode is used in the future, only the two smaller windows are displayed.
- The **whlaunch** window will show any messages from VLC. It is not particularly significant, but may be useful for debugging. There can sometimes be lots of errors, even if video is still displayed.
- The **winterhill** window will show a status line for each of the 4 receivers. It will also show information briefly as receive commands arrive. It can be enlarged for debugging purposes.

In normal operation, the **winterhill** window will display something similar to:



It may be necessary to change the **winterhill** window text size parameters to get the display exactly as above. Use **Edit** / **Preferences.**

- Click VLC windows 3 and 4 to bring them to the front again.

*** Now see the WinterHill Operations Manual ***

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G4EWJ, G8GKQ, 2021-03-23
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