

Remote station control using the Raspberry PI 3

My son and I have a combined hamshack at my Texas QTH, and we have several antennas located out in the pasture and fed with some CATV hard line and a remote antenna switch. Since I am located in an RV in Tucson AZ, I have long wondered if there was some way to make use of those antennas when my son is not using them. Since he is still working, I would have use of the station there at least during his working hours. He would switch my radio to a dummy load when he uses the antennas.

With the introduction of the Raspberry PI 3, I finally took the plunge and decided to try to get Fldigi and its associated programs installed on a PI and see how they worked. I had been running Fldigi and Flrig on a laptop located in my shop trailer and controlling it from another laptop in my motorhome and was surprised that I had some latency with this set-up even though I was on the same LAN with the two laptops.

I was amazed at the speed I got from the same laptop in my motorhome to the PI located in the shop. For all intents and purposes, the typing is real time, with no noticeable delay between pressing a key on my laptop to seeing the character on the screen coming back from the PI. After using this set-up for a while on the air, I started to think about the possibility of setting up the same kind of operation back at the Texas QTH to use while my son was not using the antennas. A ping on the LAN shows only 2 msec delay to the local PI. A ping to the Texas QTH from the AZ QTH shows about 62 msec delay. This is a noticeable latency for a touch typist, but is easily accommodated and I can backspace and correct if I get ahead of it.

I have a Ten Tec Pegasus which I had retired many years ago sitting unused at the Texas location, and I had used it with Flrig several times, so I decided to put a station together there using a PI3 and the Pegasus. Flrig provides complete control of the Pegasus, which is a radio with no front panel. It is strictly computer controlled and is an ideal radio for remote digital use.

I use a program called Remmina as the VNC control program on my Thinkpad T420 running Ubuntu 16.04, and a program called tightvnc on the PI. These two play very well together and Remmina provides a convenient way to store the parameters for a remote connect with just the click of a mouse.

The PI is configured to have tightvnc running at boot up, so complete control of the PI is available from the remote VNC coupled laptop. There is no monitor, mouse, or keyboard attached to the PI. Be aware that if you do have a monitor and keyboard on the PI, you will be using a separate desktop which is not the same as the one used by the VNC input. If you do use a monitor and keyboard, be sure to kill all programs started with the keyboard and then start them from the VNC control.

I normally have three programs running when using Fldigi on the PI – “pavucontrol” to set the audio levels and keep them from changing, “Frig” to control the radio, and “Fldigi”. On the later versions of Raspian I found that pulseaudio is not automatically started when the PI boots, so I manually start it from the terminal each time I reboot. Issuing a command “pulseaudio -D” gets the PI ready to start “pavucontrol”. This may be a problem common only to my implementation of Raspian.

I have a Belcan USB to RS-232 converter cable to interface the Pegasus radio and I use the supplied Elecraft USB cable to interface my KX3. I use a CM-108 type USB sound card dongle on both my remote stations and both calibrate with WWV nicely. A transformer coupled interface isolates the audio for both systems and prevents ground loop coupling of RFI into the audio circuits. CAT control of the PTT is used on both systems.

My Tucson station has no ambient temperature control and with outside temperatures up to 105 F and temperatures approaching 120 F in the closed shop trailer, the PI runs at around 55 C with a low speed 5 inch fan scrounged from an obsolete PC blowing directly on the fins of the added head sink on the processor. In a controlled environment in the hamshack in Texas the PI runs around 37 C with a small 40 mm fan. Another small fan blows air on the exposed fins of the Pegasus heat sink. Processor usage runs around 20% on both systems in the PSK mode with the browser and around 10% on Olivia, and only jumps to around 25% when compiling a new version of any of the FL programs on the PI. I regularly upgrade and update both the Raspian operating system and FL programs using the VNC remote.

Gary KT7AZ did the original set-up for Raspian on the PI for me, including the automatic start of tightvnc on a reboot, and has continued to help out when I encounter a problem with my two systems.

My son has a VNC program installed on a Windows computer and can access the PI at the same time I do in case I encounter a problem I can't handle from my location. He can watch my typing and mouse entries and I can see his from my remote QTH. Multiple VNC connections use the same desktop.

He has a static IP address on the WAN, and so far the only thing he had to worry about was settling down the IP address on the PI so his router could always get to it from the WAN. With my DSL Internet here in Tucson, I have to use the IP address EchoLink shows to follow the varying IP addresses my service provider assigns if I am away from this location. Using the LAN locally I have no problem finding the PI and am using its MAC address in my router to point to the PI.

I operate the Remmina program in full screen mode on one workspace in Ubuntu and use other workspaces for other operations on the Thinkpad. I also use the Remmina toggle scaled mode to force Fldigi to full screen on my laptop.

I have found that the Raspberry PI does not take too kindly to a sudden removal of power without first being shut down. As often as not, the microSD card will be corrupted and will have to be re-written. So a word to the wise is to make an .iso image of the SD card as soon as you have it working so if you get an unexpected shut down you can easily restore the software. I have both my systems on battery backed up supplies. The one in Texas is on a standard UPS using a 3 Amp switching supply supplied with the PI.

The PI here in Tucson is running on a Belcan 3 Amp battery backed 12 VDC supply with a switching regulator mounted with the PI to provide the 5 VDC. I had another configuration with a 7805 5 Amp TO3 regulator and decided that if an extended battery operation was possible, I needed to use a much more efficient switcher in place of the linear regulator. 12 VDC to 5 VDC switchers are available from China on eBay for less than \$2.00 including postage, so one can easily be mounted with the PI to allow powering from 12 VDC. I solder to the power terminals under the micro USB connector on the PI for a secure power input from the switcher, although a USB cable plugged into the PI could be cut and connected to the switcher.

Our family has maintained a club for many years to support our sponsored repeaters, and we decided that the club call could be used on the club remote HF station. This greatly simplifies QSL info from the two stations and an automatic upload to eQSL is utilized to provide QSL conformation to other stations.

The Remmina control icons appear when the mouse is positioned at the top center of the screen.

This is the Tucson remote screenshot for callsign W5ZIT:



This is the Texas remote screenshot for callsign N5SN:

