

## Eclectic Technology

# Inexpensive Remote Operation with *NoMachine* and a Raspberry Pi

*Harry Bloomberg, W3YJ, has come up with an easy, affordable approach to remote operating that will allow you to operate your station from almost anywhere. You can contact Harry at [w3yj@arrl.net](mailto:w3yj@arrl.net). — Steve Ford, WB8IMY*

The first piece of my cost-effective remote solution is the Raspberry Pi. The Pi is a small single-board computer. It can run a popular distribution of the Linux operating system known as *Raspbian*. Raspberry Pis are inexpensive, starting at \$35. A Raspberry Pi 4 with 4 GB of RAM can be purchased as a complete package with accessories for \$99.

The next piece is *Fldigi* and *Flrig*, part of the Narrow Band Emergency Messaging Software (NBEMS) suite developed by Dave Freese, W1HKJ. Most hams associate NBEMS with emergency and public service operations. It is the standard communications package for many ARES groups. However, NBEMS also provides many features for recreational opera-

tion. *Fldigi* can function as a contest logger and CW keyer, for example. *Flrig* allows you to control a transceiver through a USB interface.

The final piece is *NoMachine* remote operating software. *NoMachine* is popular in the business world and uses the NX protocol to connect securely. *NoMachine* is free for personal use and will stream audio to and from the Raspberry Pi after running a few Linux commands. This gives you the ability to operate CW and SSB.

*NoMachine* makes clients for all major platforms including Windows, MacOS, iOS, and Android that can connect to the *NoMachine* server on the Raspberry Pi. *NoMachine* for all platforms along with installation instructions, documentation, and support is available from [www.nomachine.com](http://www.nomachine.com).

### Putting It All Together

You can use a Raspberry Pi 3 in your remote station, but experience has

shown that a Raspberry Pi 4 is more stable due to its improved CPU performance (see Figure 1).

Audio is processed on the Raspberry Pi by a package named *PulseAudio*, which acts as an audio server, sending and receiving streams of audio much as a web server sends and receives internet data. *NoMachine* interfaces to *PulseAudio*. A common commercial use for *NoMachine* is logging onto remote systems and streaming audio remotely to remote mics and speakers for Voice over Internet Protocol (VoIP) communications.

A detailed explanation of how to interface *NoMachine* with *PulseAudio* is beyond the scope of an article for *QST*. Please see the *NoMachine* remote operation overview and tech notes online at [www.w1hkj.com/W3YJ/Remote\\_Article.pdf](http://www.w1hkj.com/W3YJ/Remote_Article.pdf) and [www.w1hkj.com/W3YJ/Remote\\_Tech\\_Notes.pdf](http://www.w1hkj.com/W3YJ/Remote_Tech_Notes.pdf).

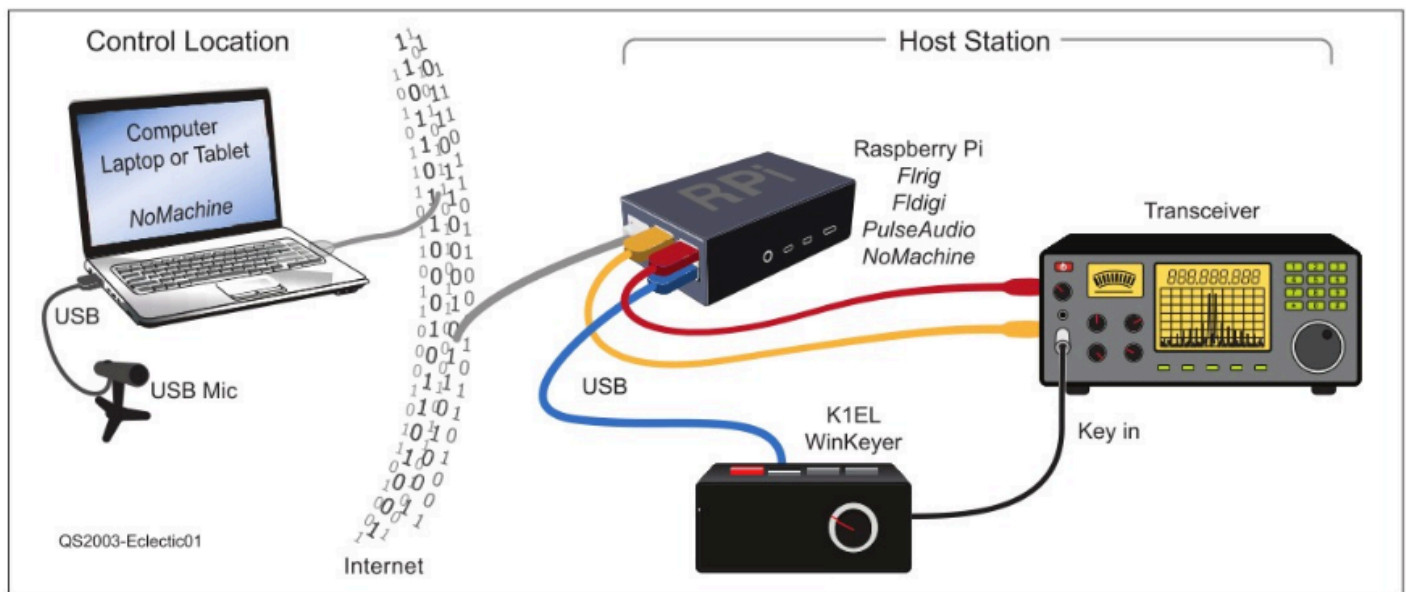


Figure 1 — A block diagram of Harry's remote station control system.