

Remote Control of the Amateur Station

Making use of available software and systems to do the job.

Lou Fiore, W2LTF

I travel frequently and while away, I miss not having my Amateur Radio station nearby. Fortunately, I found a relatively simple way to check into my local 2 meter repeater, ragchew on HF, work DX or even do some shortwave listening from a location across the country or even across the globe, as long as a satisfactory broadband connection is available. It surely fills those lonely hours away from home. If you are in a similar situation, perhaps you will find this useful. While remote control can be expanded to change rigs, turn beams and do practically whatever else can be done in a radio shack, this approach is far less complicated and requires little investment.

So What's it Take?

In order to remotely access your Amateur Radio station in the way I do, you will need to have certain things:

- A modern PC at both the base or radio station end, and at the remote terminal location.

Typically, you will be using a laptop computer at the remote site. Although my slower computer at the ham shack did work, I found much improved performance and consistency after I upgraded the home station PC from an old 330 MHz unit to a 2 GHz Pentium. The radio station computer was the last refuge for my home computer before the junk pile. The slower machine was fine for logging and working with a DX *PacketCluster*, but really insufficient for the load of remotely controlling the station.

- Broadband is also nice.¹ It is not an absolute necessity, but it does greatly enhance audio quality and overall speed. While I know of at least one ham using dialup successfully, I would strongly recommend using broadband at both ends.
- For radio equipment at my base station, I am using an ICOM IC-746PRO because it gives me access to 160 through 2 meters plus the whole HF spectrum for listening.

I first used a VHF transceiver without the capability for computer control. I was limited to whatever frequency I had set before I left the home shack. The '746PRO now gives me total flexibility. Other radios such as the Kenwood TS-2000, ICOM IC-706MKIIG and similar class rigs should perform as well, some on even more bands. Any transceiver



The author operating remotely from his hotel room in Rome, Italy.

that includes computer interface capability should work fine within its capabilities.

To know whether you have a transceiver capable of being controlled remotely, you should know that all you need is a rig with means of connecting your computer to the microphone or phone patch input, audio output and push-to-talk line. The capability of being interfaced to the same computer through a *computer aided transceiver* (CAT) interface is useful but not absolutely required. Not having the interface capability will mean you will only be able to control your transceiver on the frequency you placed it on. If all you require is

the ability to check into your favorite net, that will be all you will require.

Setting Up the Computers

The first step is to know the Internet protocol (IP) address of the base station. This is easy if you have a fixed IP address, but most broadband companies will assign you an IP address temporarily or dynamically. To track the IP address of a base station, you can use a free service available from a Web site called www.no-ip.com. If you use that service you will select a name in the following format: `<yourselectedname>.no-ip.info` or suffixes other than "no-ip.info" that you can select from a list of suffixes available on their Web site. While your selected name can be your call letters, I would advise something less recognizable. This is to deter hackers from getting to your base station computer.

All you need to do is to use the www.No-IP entry level service. You can use `<yourselectedname>.no-ip.info` instead of a hard to remember IP address. No-IP's dynamic update client keeps track of your dynamic IP address.

Other services besides www.no-ip.com are available. I am certain you can find them

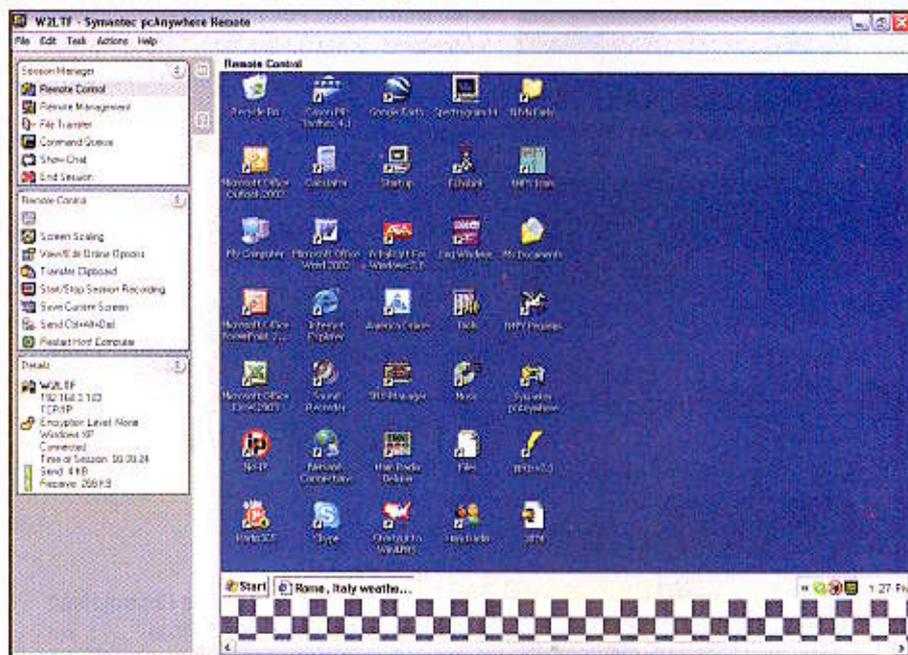


Figure 1 — Screen shot that shows a sample of what your base computer screen looks like as seen on the remote computer using *pcAnywhere*.

¹Notes appear on page 31.

by searching the Internet. But I am very satisfied with **www.No-IP**, and it's free.

The two next essential components are the ability to control the rig you want to use and the ability to pass two-way audio.

You will find *pcAnywhere*, a not too expensive product of the Symantec Corp, most useful to control the host computer remotely. It will allow you to start programs that you need and will give you the ability to control your rig remotely. *pcAnywhere* can be purchased directly from Symantec or through many other software outlets. Other software options for this function may include *Real VNC*, available at no cost at **www.VNC.com**. I have not used *Real VNC*, so I cannot comment on its performance.

These programs have other uses, such as transferring files between computers. It has helped me immensely in non-ham radio situations when I needed to remotely access a file that was loaded on another computer.

You will need to load *pcAnywhere* as a host on your base station computer and set up the program as instructed. You will then load *pcAnywhere* as a remote on your laptop computer or remote computer. I am currently using version 11.

You will begin a remote session by starting *pcAnywhere* in the remote control mode connecting to the selected no-IP address described above. At that point you will get an image of the screen of your base computer on your remote and you can click to bring up whatever programs you wish to use remotely. Figure 1 is a screen shot that shows a sample of what your base computer screen looks like as seen on the remote computer after you sign into *pcAnywhere*.

better audio quality and less latency.

To use *Skype* you will need to download *Skype* on both your home base computer and your remote computer. You will need to use a different name for each computer. You will set up two different addresses on the *Skype* network, one for your base station and another for your remote, traveling computer.

To use *Skype*, you effectively make a call to yourself. After logging into your host computer from your remote computer using *pcAnywhere*, you will see the desktop of your

home (host) computer on your remote screen. Click on the *Skype* icon on the host computer and place a call to your remote computer. If all is installed properly, within a few second your remote computer will ring, signaling that a call is coming to you over the Internet. You will then accept the call on your remote computer. You now have set up a two-way audio link between your home (host) computer and your remote computer.

Figure 2 shows the *Skype* dialogue box at the remote computer superimposed on the

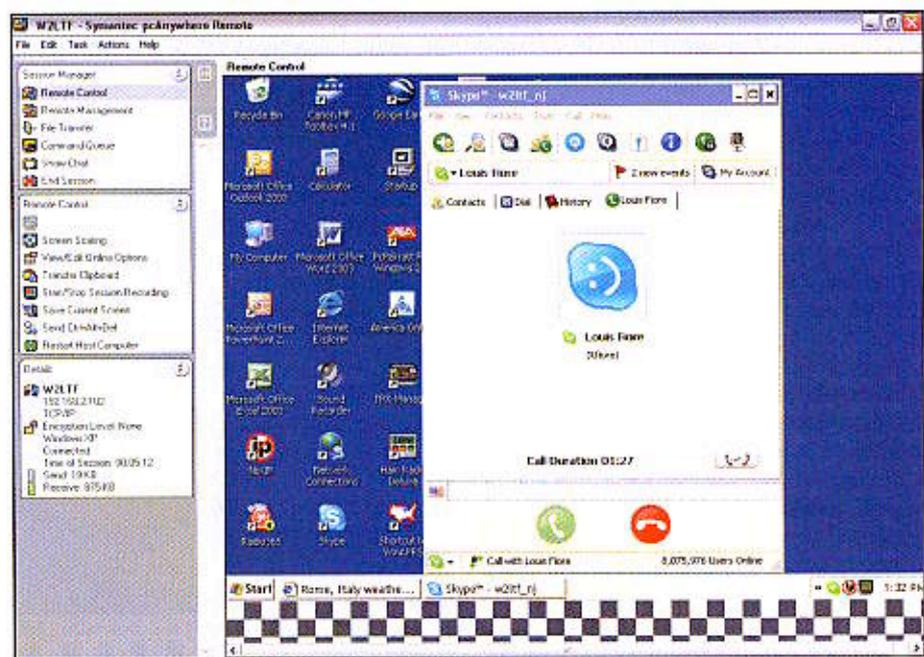


Figure 2 — *Skype* dialogue box at the remote computer superimposed on the base station computer's screen.

The Audio Connection

I am sure many programs are available that can enable two-way audio over the Internet. I have found two very useful: *NetMeeting* (a Microsoft product, buried in *Windows*) and *Skype*. In both cases you will be using the host computer's sound card by connecting the transceiver's audio output to the sound card's line input and the transceiver's audio input to the sound card's line output.

Software

If you are using *Windows 2000* or *Windows XP*, *NetMeeting* is in your operating system but needs to be activated at both your base and remote computers. To activate *NetMeeting*, click **START**, **RUN** and then enter **CONFEXE** in the command box. Then follow the setup instructions.

Skype (**www.skype.com**) is a free Internet voice over Internet protocol (VoIP) service that allows you to place free telephone calls to another *Skype* user worldwide. You can also place inexpensive calls to landline telephones. I find it useful while traveling abroad. While I have used *NetMeeting*, I find *Skype* to have

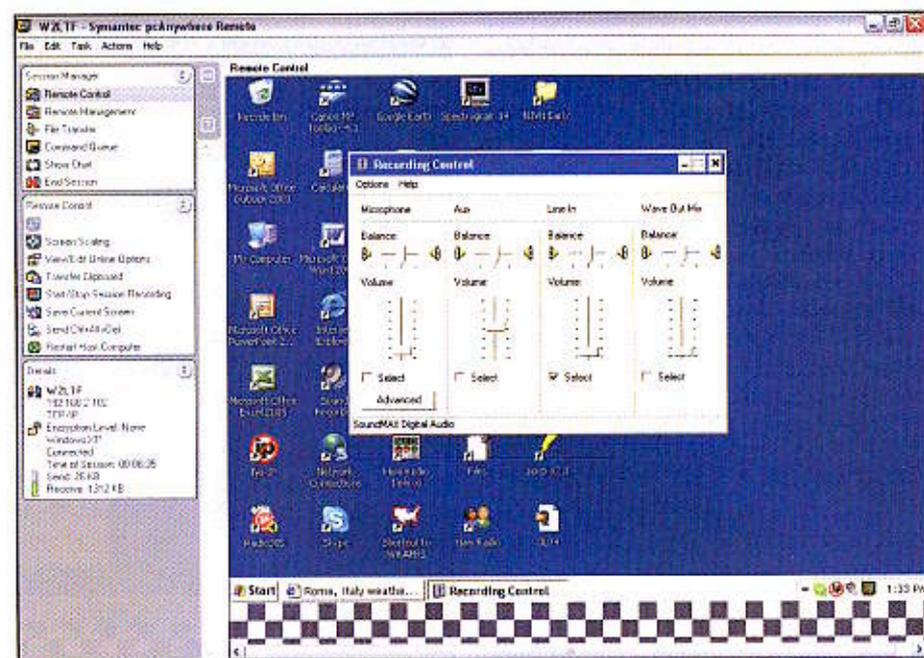


Figure 3 — Windows seen while changing from MICROPHONE INPUT (*Skype* default) to LINE INPUT.

base station computer's screen. These two boxes should be minimized to keep them active but not in the way of other program windows.

Audio Connections

Skype has one additional minor issue to deal with. Skype expects to use the microphone input and defaults to it. You can remotely change over to the line input by remotely bringing up the volume control window, clicking on OPTIONS, then RECORDING and then selecting LINE INPUT. Figure 3 shows this window.

If you decide to use the microphone input to begin with, this step is unnecessary. Alternately, you may want to use both inputs to listen to the output of two receivers. If you use the microphone input you may need to pad down the receiver's audio output to prevent overload.

The most difficult part of this project was to set the transmit audio. Most VHF/UHF rigs these days come with a microphone and the FM deviation preset. When I tried external audio with my VHF only radio, I received reports of too little audio, too much audio or distorted audio. To solve this I finally purchased a device to measure the radio's deviation and set it appropriately. I now employ external audio compression and limiting to fix my transmit audio level regardless of where I happen to be, in the shack or on the road. With carefully adjusted audio levels, the extra equipment should not be necessary. Some repeaters offer the ability to announce a station's FM deviation. If you are lucky enough to have one in range, you are home free.

Audio Hardware

A good quality microphone/headset combination at the remote computer is a good idea but not absolutely essential. Most laptops have a built-in microphone and speakers. I have used them successfully in a pinch. A microphone/headset that works very well can be purchased for \$20 at RadioShack. I would recommend a headset to avoid the possibility of setting up a feedback loop if you set levels inappropriately.

Be sure to separately terminate the Skype call when you finish your activity. You will note that you can continue to listen to your favorite repeater or shortwave frequency after you have terminated the *pcAnywhere* session, as long as Skype is still online.

Controlling the Radio Remotely

There are many options available for rig control. I have tried three: *TRX Manager* (www.trx-manager.com), *Ham Radio Deluxe* (hrd.hamradio.ch) and the Parallel Port Control Program (PPCP) I use for direct push-to-talk (www.geocities.com/micgm/; click on ELECTRONIC CIRCUITS).²

A review of *TRX Manager* in *QST* prompted

me to purchase it.³ *TRX Manager* can be set up to work in a host/remote mode. Alternately, one could simply work the screen of the host computer using *pcAnywhere*. Its graphics seem primitive to me, but it does seem to work well.

To my knowledge, *Ham Radio Deluxe* does not support host/remote operation. So to use *Ham Radio Deluxe* remotely, you must operate it via a program such as *pcAnywhere*.

I use *Ham Radio Deluxe* to set up my transceiver — band, mode, memory location or whatever parameter I need to change — and use *direct push-to-talk* software to initiate a transmission. I have also used *TRX*

Manager, but I prefer *Ham Radio Deluxe* and *direct push-to-talk*. Perhaps *click to talk* is more appropriate.

Figure 4 is a screen shot of *Ham Radio Deluxe* as seen on the remote computer. This program will give you virtually full control of the transceiver it is connected to, as if you were back in your shack. You'll find a "Short Takes" review of *Ham Radio Deluxe* elsewhere in this issue.

Controlling Push-to-Talk (PTT)

I have downloaded a piece of shareware software called *Parallel Port Control Program*

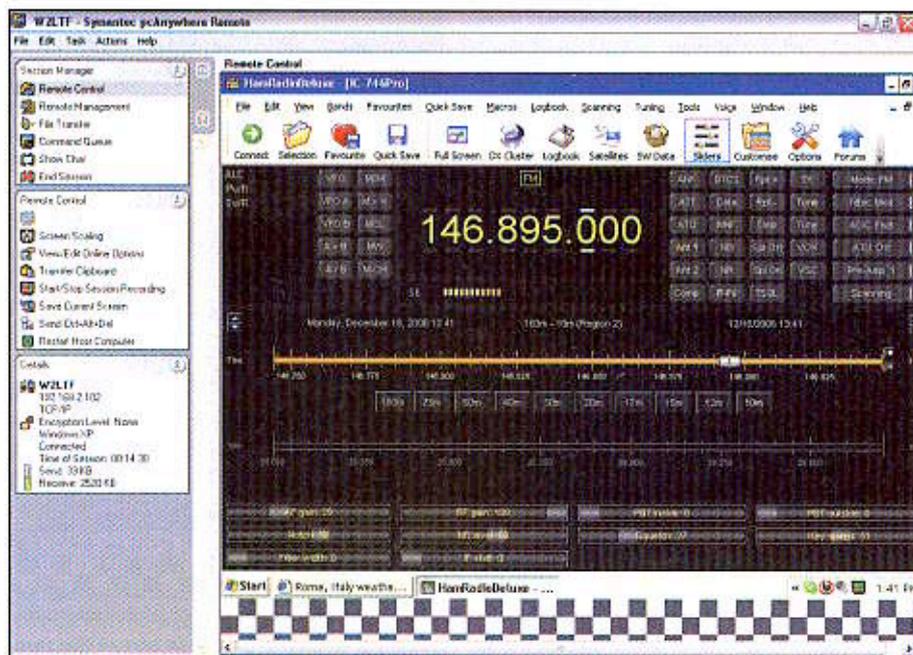


Figure 4 — Screen shot of *Ham Radio Deluxe* as seen on the remote computer.

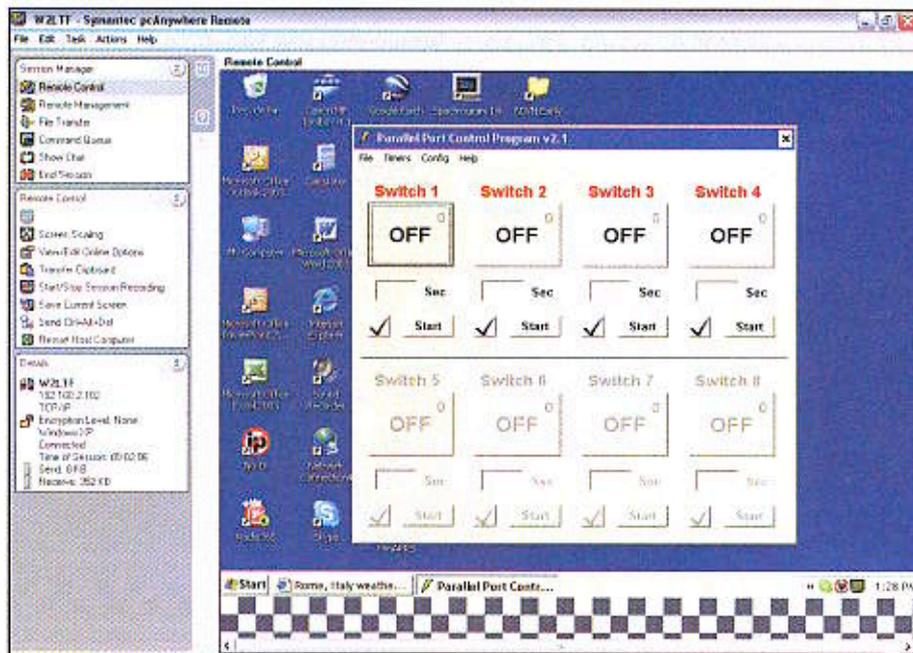


Figure 5 — Screen shot of the *Parallel Port Control Program*. Switch 1 is used as PTT.

which is found at www.geocities.com/micgm/. It can be configured to control either four or eight of the printer output lines. (It defaults to four outputs, but can be changed to eight outputs. Unfortunately, if you would like to use all eight outputs, you will need to select this mode every time you start the program.) A simple circuit shown on that or a similar version (I use my own), interfaces the parallel printer port with up to eight devices triggered by a voltage or relay closure.

Figure 5 is a screen shot of the *Parallel Port Control Program* window as seen on my remote computer. This is the screen you can use to signal to initiate a transmission. You will simply click the appropriate *switch box*, which in my case is SWITCH 1. The box will change to ON signifying that you are transmitting.

In the past I used an A/B switch to select a printer or the output control until I converted to a USB connected printer, freeing up the printer port for dedicated use in controlling the radio.

One problem is that my parallel printer port outputs and probably yours will "trash around" when the computer is turned on. To remedy this you should connect one of the outputs to inhibit the others through some gates. So when these outputs swing wildly, the inhibit output "kills" the swings. I can share this circuitry with anyone wishing to duplicate how I connect the parallel port outputs to the push to talk.

My next upgrade will be to use the additional outputs to switch an antenna, perhaps from a grounded, standby position, to turn the ac on to a radio and maybe even switch in a linear amplifier.

It helps to have desktop icon for each of the commonly used programs. I have placed shortcuts to *Skype*, the *Parallel Port Control Program* (shown as *ppcp v2.1*) and *Ham Radio Deluxe* on the desktop of the base computer.

Making it Play

To begin a remote operating session, first connect your remote computer to a broadband network and confirm it works. Next open *pcAnywhere* and connect to the host site. When the host screen appears on the remote computer, then bring up *Skype* at the host and place a call to the remote. If all is working, within seconds you should receive a *Skype* call at the remote from the host. Accept the call and minimize the *Skype* dialogue boxes at the remote and host. You will then access the soundcard interface of the host machine, click on the recording side and turn on the line input. You now have two way audio from the host to the remote.

Then bring up the *Parallel Port Control Program* window (or another software program) allowing you to control the transceiver. Most of the time you will use the *Parallel Port Control Program*, bringing up *Ham*

FCC Rules Relating to Remote Operation

FCC Section 97-109(c) allows for remote control. 97-213(a) and (b) further define how a station can be controlled remotely. The Internet is considered "wireline." As long as I make provisions to limit transmissions to no more than 3 minutes and obey all other rules, I should be fine. At present there seems to be no geographical limit to where the control point exists, but I am sure it is safe to assume my controlling my station from anywhere (inside the USA or from another country) still makes me, as the station's licensee and control operator, responsible to follow the FCC rules.

§97.109 Station control.

(a) Each amateur station must have at least one control point.

(b) When a station is being locally controlled, the control operator must be at the control point. Any station may be locally controlled.

(c) When a station is being remotely controlled, the control operator must be at the control point. Any station may be remotely controlled.

§97.213 Telecommand of an amateur station.

An amateur station on or within 50 km of the Earth's surface may be under telecommand where:

(a) There is a radio or wireline control link between the control point and the station sufficient for the control operator to perform his/her duties. If radio, the control link must use an auxiliary station. A control link using a fiber optic cable or another telecommunication service is considered wireline.

(b) Provisions are incorporated to limit transmission by the station to a period of no more than 3 minutes in the event of malfunction in the control link.

Radio Deluxe to change frequency using the memory function. If you are just listening, you can use *Ham Radio Deluxe* to tune around a particular band.

FCC Regulations Related to Remote Control

I was concerned at first about the legality of controlling my Amateur Radio station from a distant location over the Internet. The sidebar includes the results of my investigation.

One challenge was making sure that transmissions were limited to three minutes. I was worried about this aspect even before investigating remote access in Part 97. My fear was that a problem over the Internet or a failure at the base station computer might leave the transceiver in the key down position indefinitely, perhaps damaging the radio or, more importantly, causing unwanted interference or locking up a repeater. To prevent this you should take a step to ensure positive time out of the transceiver's transmitter. This is also an FCC requirement.

In my case I have routed the PTT control through a dedicated timer, set so that it will follow the input PTT activation up to one minute and then drop out, if the key down is longer than one minute. The timer resets instantly. This ensures transmissions are no longer than one minute. The function can be duplicated with a simple timer using available integrated logic or transistors. I leave it to the reader to design or find one

I have used this interface scheme on local FM repeaters, on HF SSB and AM. While you can listen to CW, delays across the Internet will make directly transmitting CW difficult, if not impossible. Some sort

of "character to code" program that can be remotely accessed may be required. I see no reason why other digital modes such as PSK31 could not be used, but at this point I have not attempted any other mode.

That's all there is to it. Have fun using your remote control system and let me know if I can help.

Notes

¹By broadband, I mean a computer to Internet connection running at a data rate of around 1 Mbps or greater. This could be provided by a telephone company over phone lines as a digital subscriber line (DSL), via a cable modem interface from a cable TV provider or in some areas as a wireless (Wi-Fi) access connection. The system described works best with such a connection at both ends.

²See "Short Takes" in this issue.

³S. Ford, "Short Takes — TRX Manager," *QST*, Jan 2003, p 55.

Lou Fiore, W2LTF, was first licensed as WN2QFN in 1958 then later as W2QFN. Lou currently holds an Amateur Extra class license and is active on 160 meters through 2 meters from his New Jersey home and worldwide over the Internet. He is a graduate engineer, with a BEE from Manhattan College, an MSEE from New York University and an MBA from Iona College. Lou's career began with CBS and then moved to the burglar alarm and fire alarm industry with ADT. For the last 11 years, Lou has been a consultant in the security industry. He has also served as president of the Central Station Alarm Association (CSAA) from 1997 to 1999 and is currently chairman of the Alarm Industry Communications Committee (AICC), a position he has held for the last 14 years. Lou recently received the K2SE Memorial Award for service on New Jersey VHF traffic nets. You can reach Lou at 64 Fox Hollow Rd, Sparta, NJ 07871-1118 or w2lft@arrl.net.

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