Hamvention Forums: Remote Operating

Moderator: Mark Aaker, K6UFO

Speakers: Brian Moran, N9ADG

Dennis Egan, W1UE

These slides available on k6ufo.com or via my QRZ.com page.

Hamvention Forums: Remote Operating

9:15 – 9:40 AM Mark, K6UFO

Why Remote. Basic FCC Rules, Award Rules.

Basic Remote Needs, Basic Remote Approaches.

9:40 – 10:00 AM Brian, N9ADG

Some specific cases: VO1HP, NK7U, NK7U SO2R.

Ideas about the future.

10:00 – 10:20 AM Dennis, W1UE

Some specific cases: W1A, VY1AAA

ARRL Expo "Discover the HF Experience“

10:20 – 10:45 AM Questions & Answers

Why Remote Operating?

Hams are often away from their home station, or have limits on their home station:

- Home Owners Association
- rental apartment or house
- no antennas allowed
- no space for antennas
- RF Noise or Interference

With remote access, they can still be "on-the-air" from:
- their home station
- friend's station
- club station
- online or rental station

N6V Special Event station
International DX Convention 2015

New hams can try HF operating before they invest and build a station.
Club members can have a useful project setting up a club station.
Serious DXers can operate from work - never miss a DXpedition again!

Basic FCC Rules

US Station:

FCC Rules: Part 97.109 Station control

…“Any station may be remotely controlled.”

FCC Rules Part 97.213 Telecommand of an amateur station:

…has some simple requirements, including a 3 minute time-out on the transmitter in the event of malfunction.

US Station, with Operator outside of US:

Operator must be “licensed” by a US License, bilateral, reciprocal, IARP agreement or CEPT T/R 61-01. The call sign used must always indicate the location of the transmitter. "W3 / G1ABC“

Station outside of US:

Each country has different regulations, whether remote is legal, whether CEPT T/R 61-01 is accepted, … In general, both the station and the operator must be “licensed” for that country.

Award Rules

ARRL DXCC Rules: Rule 9. Station Location and Boundary:

a) All stations used to make contacts for a specific DXCC award must be located within the same DXCC entity.

(no using stations in multiple countries for one DXCC award)

b) All transmitters and receivers comprising a station used for a specific contact must be located within a 500-meter diameter circle.

(no receivers remote from the transmitter)

c) QSOs made with legally licensed, remotely controlled stations are allowed to be used for DXCC credit.

Contest Rules

The 2015 CQ World-Wide DX Contest Rule IX.5.

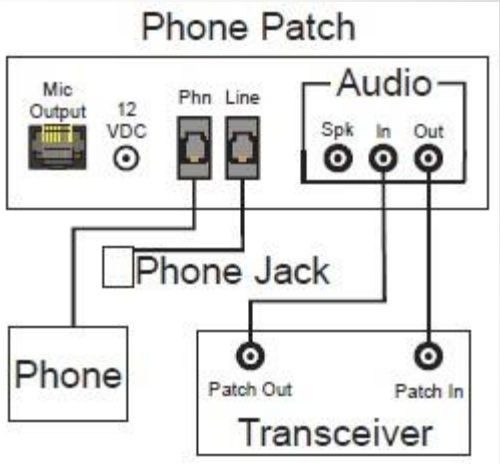
Remote operation is permitted if the physical location of all transmitters, receivers, and antennas are at one station location.

A remotely operated station must obey all station license, operator license, and category limitations.

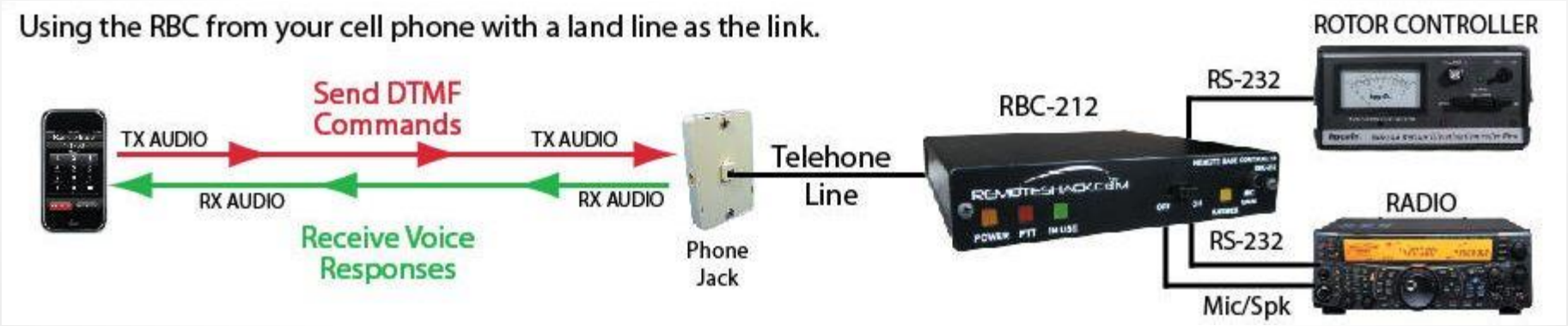
The call sign used must be one issued or permitted by the Regulatory Authority of the station location.

A little history…

Remote operation over telephone lines is ancient. You can still use an old "phone patch" for about $50 or an MFJ-642E new for $160.



As “good as it gets” is DTMF tone control of additional functions, like a repeater controller or the Remoteshack.com RBC-212 $550.



Pros: Simple. Need only an audio line (telephone, UHF link, Skype)

Cons: Limited. Slow and difficult to tune or change bands. Voice only.

Recommend: You can do better. Use an Internet control system.

How much internet do I need?

You need High Speed, (bandwidth) same as a streaming music service. "3G Wireless" is the minimum at 144 kbps, above 400 kbps is better. Otherwise, audio “dropouts.” Speed is advertised by “download speed”, and upload speed may be only 1/4 of the download speed, but is important for getting your audio and control to the transmitter. If you can Skype across country, you’re good-to-go. www.speedtest.net

You need Low delay (latency or ping), same as an online game player. Below 200 millisecond is adequate, below 100 msec is better. Otherwise, tuning “lags” and poor PTT timing. Voice and Digital operating are more tolerant of delay than CW operating. www.pingtest.net

GOOD: broadband, cable modem, WiFi, DSL, 4G,…

POOR: Dial-up modem (slow), Satellite (delay).

Basic Remote Acess Needs

There are many remote access methods, but all involve:

1. **Audio:** Download from the receiver to you, and Upload from you to the transmitter for voice or digital modes. Your radio or computer will need Audio IN and OUT connections, like MIC and SPKR, or Line In/Line Out. Just like when setting up for digital modes with a soundcard interface like a RigBlaster, SignaLink, …

2. **Radio Control:** To read and set the radio's frequency, mode, filters, PTT, CW keying… Needs a radio with a serial port, USB, CAT or CI-V control.

3. **Station Control:** To control the station's AC power outlets, antenna switching, rotators, tuners, amplifiers, ...

Setting up **your** station to "provide" these can be a big project!
Lets look at several "popular" solutions:

Remote Access - Basic Ways to Implement

Web Browser

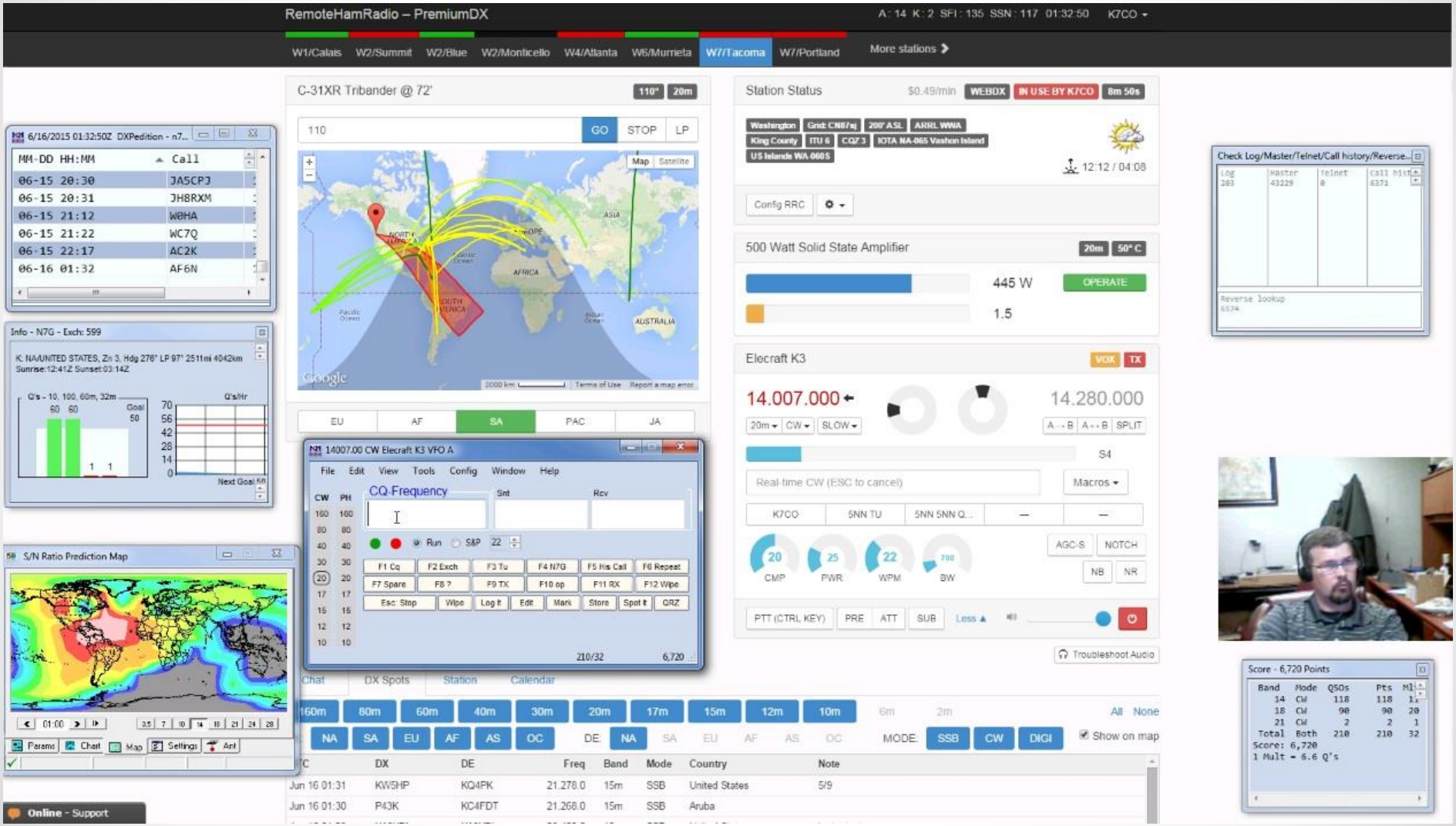
Software Programs

Remote Desktop

Remote Front Panel

Solutions vary from 100% Software to 100% Hardware.
Money from $0 to $2,000.
Time from Minutes to Thousands of Hours.

Web Browser



RemoteHamRadio.com WebDX

Web Browser Pros/Cons

RemoteHamRadio.com $99/yr plus $6 to $36/hr. Can be accessed with a web browser, with extra hardware, or RemoteRig hardware.

(Full disclosure: K6UFO has a station on RHR.)

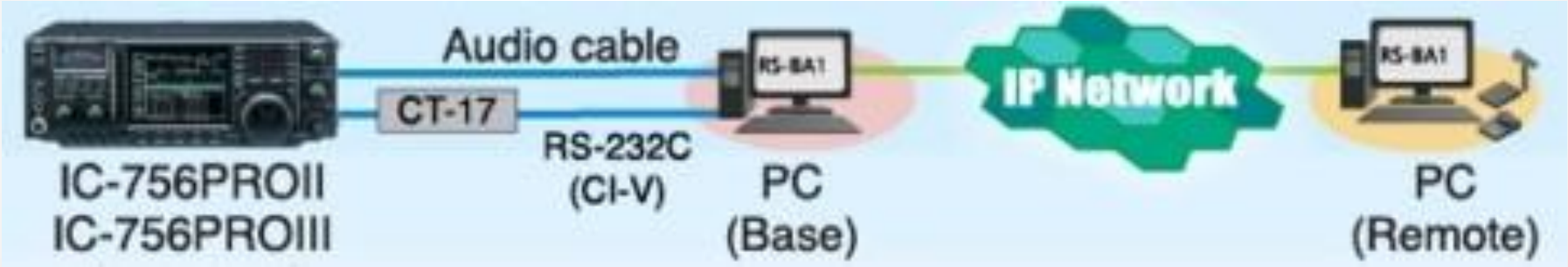
Pros: Easy to sign up and get started. No equipment to buy.
Cons: Can be expensive. No “tinkering” with the equipment.
Recommend: Good way to see what’s possible.

P.S. Many online receivers are freely available: websdr.org or globaltuners.com

Software Programs

See RemoteHams.com Free to sign up. You must use their RCForb Client software. You can also use their server software to set up your own station as a remote.

ICOM's RS-BA-1 software.



See also: Ham Radio Deluxe "Remote Server," Kenwood ARCP-480, TRX-Manager, DF3CB software, N4PY Software, W4MQ, Win4K3Suite, …

Software Programs Pros/Cons

Pros: Built-in remote functions are supported by the software vendor. You may already have a compatible radio.

Cons: Limited to the configurations and abilities of the chosen software. Rest of shack needs to be computer-controlled or automatic. Requires a shack PC and a remote PC (laptop). Limited control of antennas (Ant1/Ant2) or other station accessories (rotator, amp).

Recommend: Good solutions if you want some vendor support.

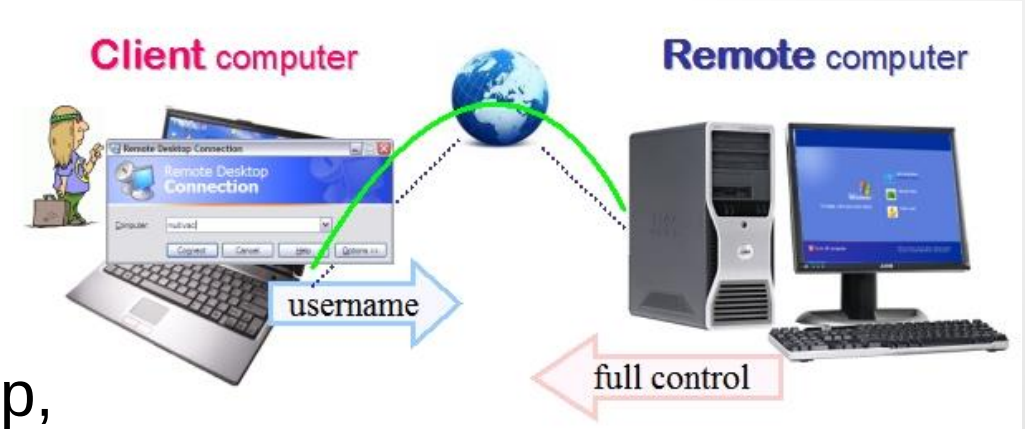
Remote Desktop

Set up the shack PC to control the station. Use your favorite logging programs or rig control programs - even if they don't have any "remote" ability: N1MM+, Wintest, Logger32, DXLab,...

Then use a "remote desktop" program to connect-in from your laptop to the shack PC.

There are many "Remote desktop" programs (also called VNC):

- TeamViewer,
- TightVNC,
- Splashtop,
- Chrome Remote Desktop,
- Microsoft Remote Desktop,
- Apple Remote Desktop …



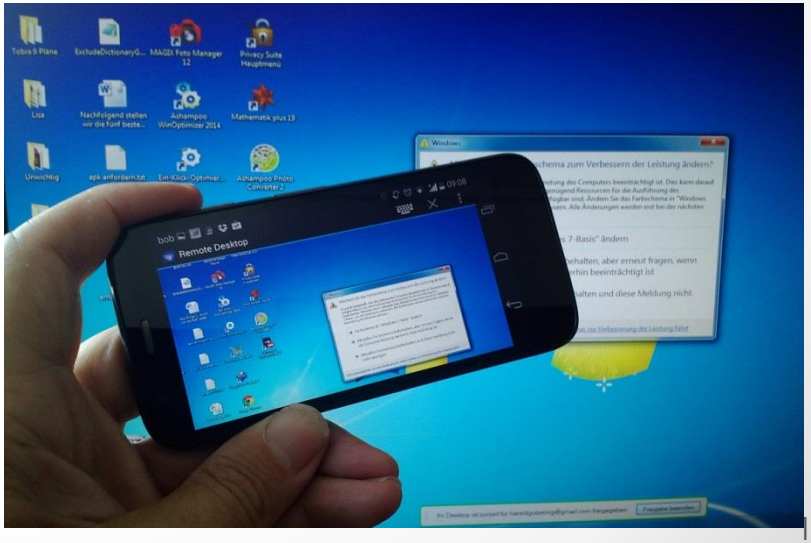
If yours doesn't include two-way audio, add Skype, IP-sound, RemAud, or VOIP "chat" software like Ventrilo, Mumble, or TeamSpeak.

Remote Desktop Pros/Cons

Pros: Use your station remotely just like sitting at the shack PC. Use any ham software that runs on the shack PC. Can work well with tablets and smartphones.

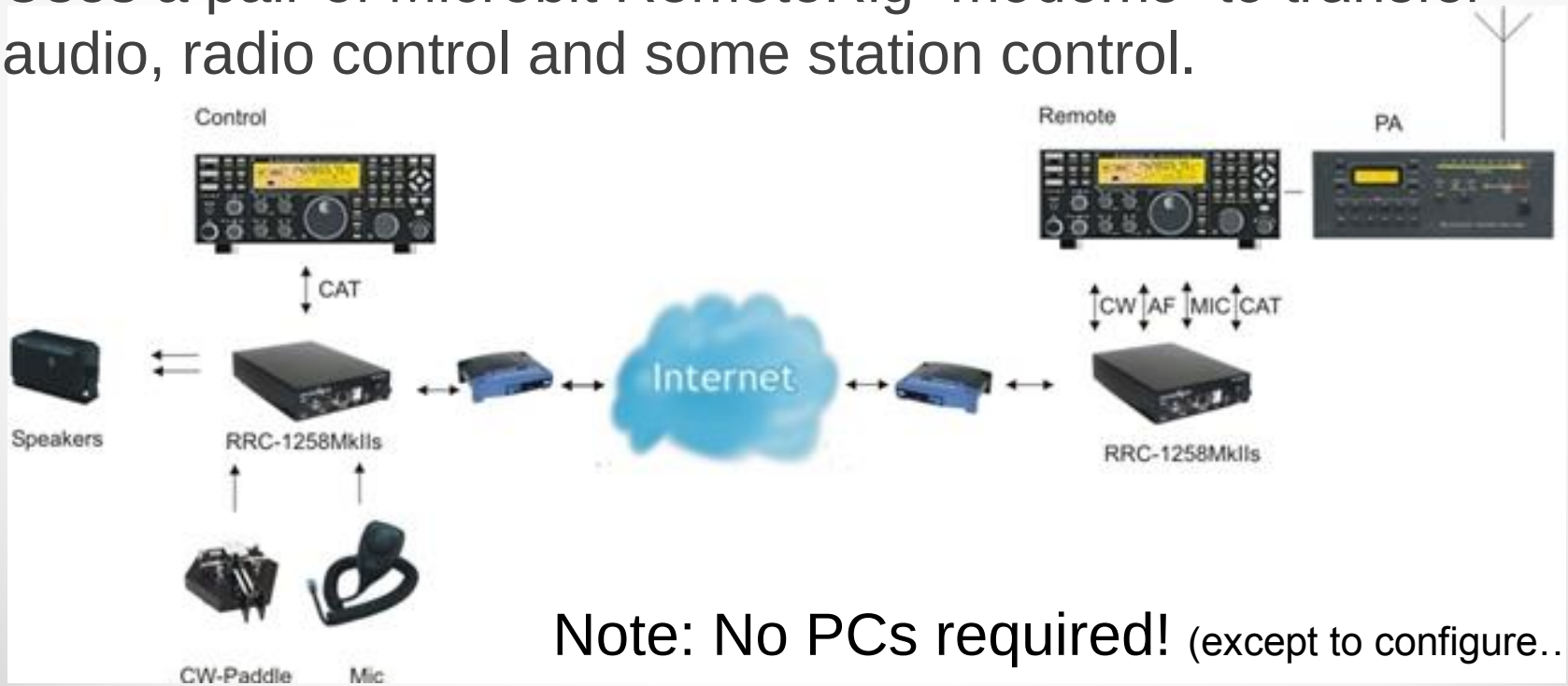
Cons: Can have delay as it tries to duplicate the full desktop view. Rest of shack needs to be computer-controlled or automatic. There can be network “firewall” issues to solve. Requires a PC to be “on” and operating at shack.

Recommend: Excellent remote access setup, just like working from home.



Remote Front Panel: Microbit RemoteRig

- Radio with a detachable front panel (TS-480, IC-7100), or
- Radio with a matching "control head" (Elecraft K3/0-Mini), or
- Two radios that support the "Twin" concept where one local radio is used to control the remote radio (Elecraft K3, Yaesu FT-200, Kenwood TS-590,…)
- Uses a pair of Microbit RemoteRig “modems” to transfer audio, radio control and some station control.



Note: No PCs required! (except to configure…)

Remote Front Panel: FlexRadio Maestro

FlexRadio method: A FlexRadio Maestro front panel wirelessly connects to a local network to control a FlexRadio. (Connecting across the internet coming soon.)

Remote Front Panel Pros/Cons

Pros: Provides knobs & buttons, just like a real radio.
Very reliable once configured.
Support by vendors Microbit / Elecraft , or FlexRadio.

Cons: Expensive. Costs of front panel or 2nd radio.
Can be difficult to setup.
Rest of shack needs to be computer-controlled or automatic.

Recommend: This is current "Top of the Line“ for a real radio “feel.”

Audio Quality and Decoding Quality

You might think that compressing and transferring the audio to the remote location would lead to poor quality and poor decoding. But as millions of "streaming music" listeners (Pandora, Spotify, YouTube, SoundCloud ...) can attest, the streaming audio sounds just fine and sounds the same as a "local" audio stream.

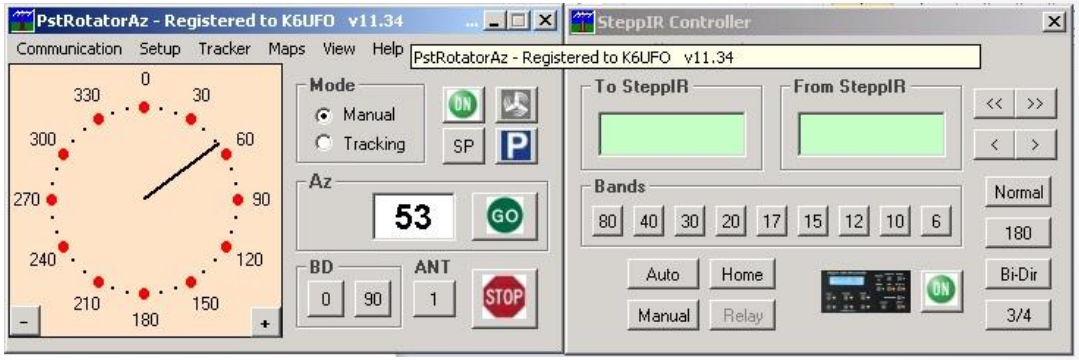
Streaming music, typical:
128 kbps, 16-bit, 44.1k

RemoteRig (quality 2):
120 kbps, 16-bit, 16k

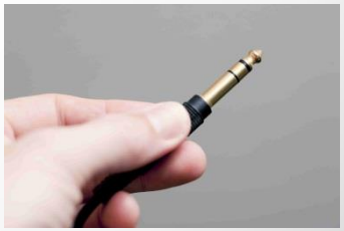
Experience by remote operators in many RTTY contests with thousands of operating hours and contacts rarely list "poor audio quality" as a problem. Far more decoding problems are due to the usual problems of radio noise, interference, QRM, doubling, flutter, crowded band ...

What are the REAL problems?

Control of "everything else": rotators, amplifiers, tuners, multiple antennas per band, RX only antennas, watt meters, ... Some functions are automatic, some require you to manually adjust, some have special software controls, …



A "killer" problem when operating remote is when something needs to be reset or changed, and there is no "remote" way to fix it. There are more of these problems than you anticipate. ☺



“Rest of shack needs to be computer-controlled or automatic.”

- Remote AC Power switch: You’ll need to control AC power at the station.
  DLI Web Power Switch $130 … or Belkin WeMo Switch $40

- Be able to remotely “Reboot” the station computer: Enable Wake-On-LAN, or set the BIOS to boot when AC power is applied (and use your remote power switch).
- Your Internet connection: Learn how to remotely restart the router and determine the current IP address, and how to use DNS to map to “yourcall.net” (DynDNS or no-IP) You’ll learn to configure and “open ports” on a router ☺.
- Hint: A “Webcam” pointed at the radio and shack PC display can help in troubleshooting.

Antenna switching needs to be computer-controlled or automatic.

- Radio's "band data" output (Elecraft, Yaesu), or the computer "band data" output on LPT, or Icom Band Voltage output, or monitor the serial port (Icom CI-V, CAT, Kenwood serial port).
- "Band Decoder" by Array Solutions, TopTen Devices, MicroHam, Hamation, …
- "Remote" antenna switch by Array Solutions, TopTen Devices, MicroHam, Hamation, …
- It is helpful to have a "dummy load" on one of the antenna ports for testing.

Rotator control needs to be computer-controlled or automatic.

- Automatic control from many logging programs to a rotator control box with a serial port or USB. Most common protocol is Hy-Gain DCU-1.
- Rotator can be software controlled with PstRotatorAZ $25.

  PstRotatorAZ can also control a SteppIR antenna.

- Green Heron Engineering also offers software for rotator control and antenna switch control.

Tuners (if used) need to be computer-controlled or automatic.

- Manual antenna tuners and manual tune amplifiers will be limited to one band. But can be switched in-line with antenna switch.

- Automatic antenna tuners provide multi-band operation. LDG, Palstar HF-Auto, Elecraft KAT500, SGC, MFJ-998, …

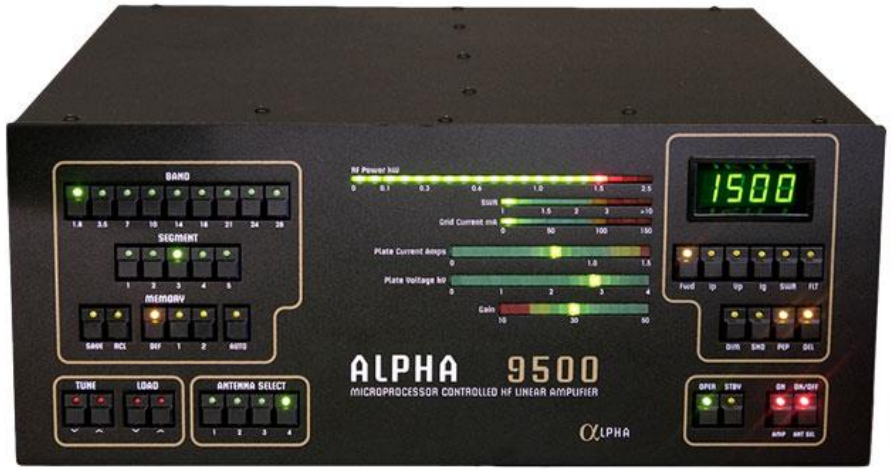
- Some tuners and amplifiers include a wattmeter that can be read by the serial port. If you want an independent external wattmeter: Elecraft W2 $250, Array Solutions PowerMaster III $525.

Amplifiers(if used) need to be computer-controlled or automatic.

- Auto-tune amplifiers provide multi-band operation. Solid state amplifers are naturally “automatic”: Elecraft KPA-500 $2,300, Acom 600s $2,800, SPE Expert Linears 1.3K-FA $4,600.
- Some “tube” amplifiers are “automatic” and can be “computer controlled”: Alpha 87A, Alpha 9500 $6,995, Acom 2000A $6,490, OM Power 2500A $6,700.

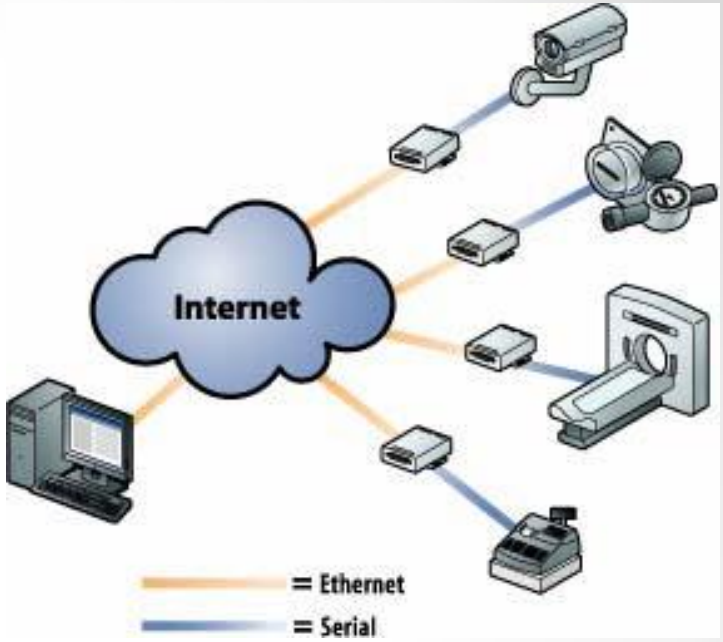
+ Elecraft KPA500 Utility software

+ Alpha 9500 Remote Software



A few “extras”

If you have other devices controlled by a serial port, they can also be extended over the Internet by a hardware “serial server” from Lantronics, Digi, Moxa, … Or a software solution: com0com and com2tcp.



What about audio delay?

- You cannot “monitor” your own voice audio coming back from the transmitter, the delay is confusing.
- If the operator wants to use a paddle to send CW, you need to generate a local sidetone. e.g., RemoteRig, a pair of linked K1EL Winkeyers (Wkremote), RemoteHams.com ORB Control Device, or Begali CW Machine. Memory and keyboard CW are fine.

Operating Position: Fixed

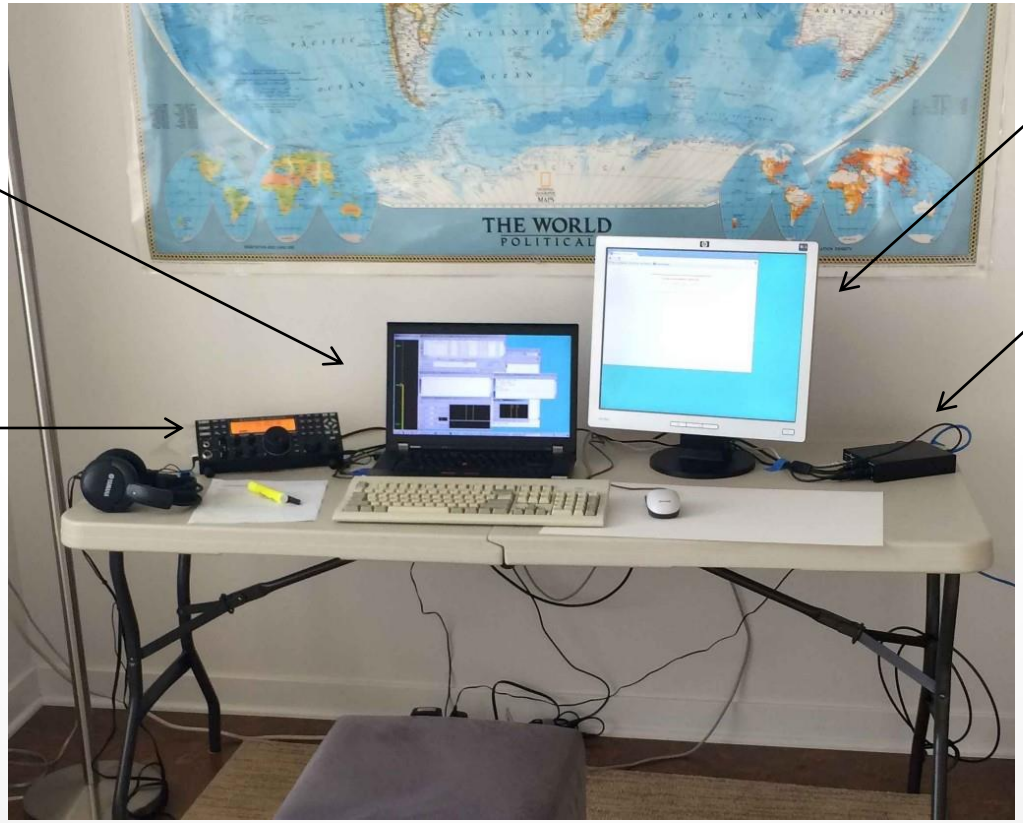
Remote Operating is 95% the same as on-site Operating.

4 percent different – additional software or hardware for the connection.

1 percent better - because you can do it even when away from the station!

Laptop with RTTY and logging software, web browser

Elecraft Front Panel



Extra screen space

RemoteRig "modem"

Internet to station 600 miles away

Operating Position: Portable

Essential: Laptop and mouse.

Extras: WinKeyer and paddle, speaker, and tablet for web access while the laptop is busy running HamRadioDeluxe.

Examples: How to Connect

RemoteHamRadio.com

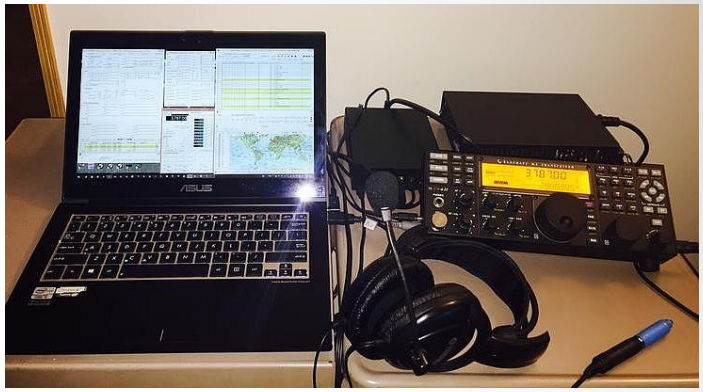
1. Start laptop, open webpage to RHR, login.
2. Select a station, click Power On button.
3. Adjust radio to band and mode, turn rotator as needed.
4. Start external logging program if used.
5. Operate!

Remote Desktop

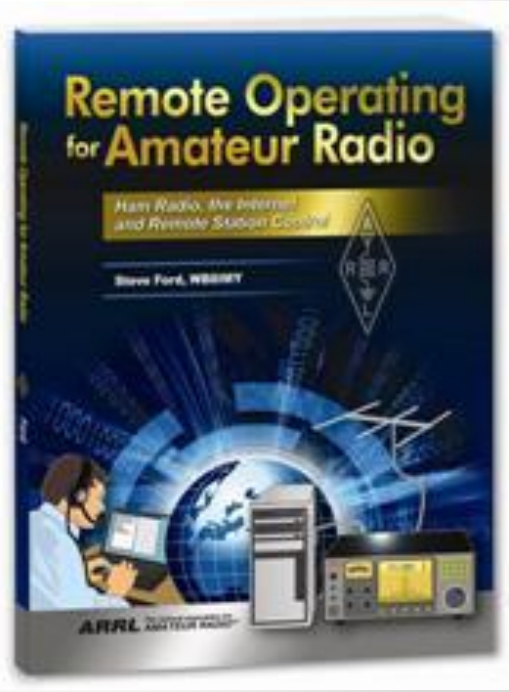
1. Start laptop, open webpage to web power switch, login and turn on shack PC and equipment.
2. Start VNC program, connect laptop to shack PC, login and start audio programs, control or logging programs as needed.
3. Set radio, antenna, amp as needed.
4. Operate!

Yes, once all the setup problems are solved, its easy!

There is no single correct solution.



- Software/Hardware
- Simple / Complex
- PC/ Laptop / Tablet / Smartphone
- One radio/ multiple radios (HF, VHF & UHF)
- This is real ham radio experimentation, you can try out new ideas and technology as you wish and experiment.
- This is a fast growing and fast changing topic, and there is far more information we haven't touched on. There are books, web pages, Youtube videos, blogs, …and it will change a lot by next year.



In closing…

- Remote operators just want to be on the air, and enjoy radio operating.

- Remote access may allow you to operate more and increase your enjoyment of Amateur Radio.

Fred, K6DGW: "I was worried that operating remote and not making RF at home would not provide the fun level that I've enjoyed for so long, but that turns out not to be the case at all."

Thank You!