PACIFICON℠ 2023

ARRL Pacific Division Ham Radio Convention

Produced by the Mount Diablo Amateur Radio Club

Remote Operation of Your Ham Radio Station

Mark Aaker, K6UFO

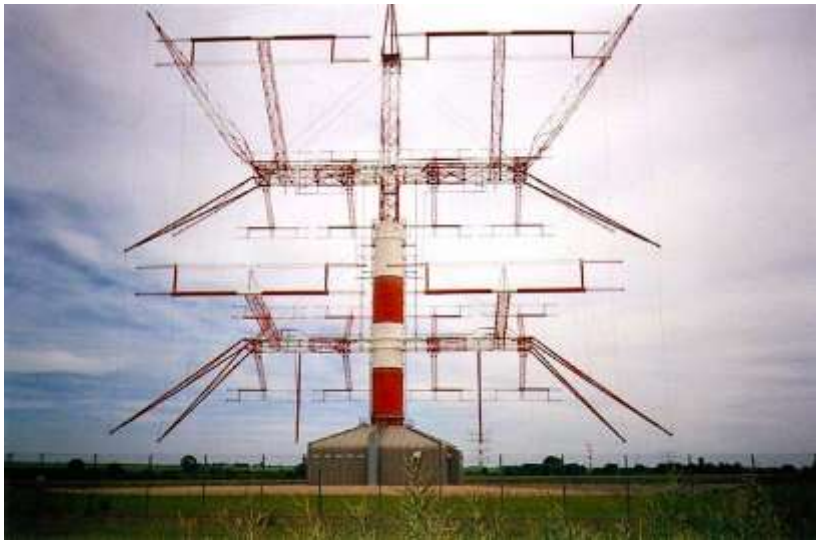
These slides, and more, are at my website k6ufo.com

Reasons to want a remote station:

Operate when away from home, antenna restrictions, moving into assisted-living, no longer able to do antenna work, share a station with others, multi-op contesting, use a good hill-top location, use a low-noise location, operate from the office, hotel, living room...

...but how to build a remote station?

?



Using other people's stations is available, a good learning experience, and a backup solution.

Receive-only sites on the internet: websdr.org kiwisdr.com/public rx.linkfanel.net and others.... Good for SWL, signal monitoring, …

Receive AND Transmit: you may need to register, provide a copy of your license, join a club, pay dues or dollars. Look for:

- A friend or club station already setup for remote access, especially FlexRadio-based station. Many contest stations have remote operators.

  In the Feb 2023 ARRL DX CW contest, 15% of Multi-op entries checked "Remote."

- RemoteHams.com has many shared stations and club stations globally.
- RemoteHamRadio.com $20/month or $99/year, plus airtime billed at $0.05 to $1.25 per minute. Very capable stations in USA, Puerto Rico, Haiti and Croatia. Free stations for licensed youth age 25 and younger.

Remote operators need to be properly licensed for the location of the transmitter. Always follow the rules of the regulatory authority. Must use callsign correct for the transmitter location. Transmitter location is the location for purposes of LoTW, contest operation, and award chasing.

But how to setup your own station for remote use?

There is no One Perfect Solution. It depends on what you want to do:

Modes: Voice, Digital, CW? CW by keyboard only, or key and paddle?

How much equipment will you haul around with you? Just a smartphone or tablet? Or extra control head? extra displays?

Fast connect? On in seconds from a phone? Or longer for extras…

Dual use? Station to be used at home AND remotely, or dedicated to remote? Do you need a human operator position at station?

How much re-configuration to go from local to remote use? Will you re-configure every day before leaving to work?

Is the station easily accessible (in the garage), or is it a trip to the hills?

Will you keep a PC on-line at the remote station (useful), or does everything have to be extended across the internet (harder)?

How much remote "reset" ability do you need? Is anyone on-site?

Recommendation: Start simple, gain experience, then expand or change. Different solutions have different advantages/problems.

VE3VEE

Four Basic Needs for Remote Operation

1. Audio In/Out to radio: e.g., **<u>audio over USB.</u>** Just like being set up for digital modes (FT8).

2. Radio Control: Radio with a **serial port, CAT, CI-V, <u>USB control</u>,** or Ethernet. Just like using a contest logging program with your radio.

3. Station Control: AC power outlets, antenna switch, rotators, tuners, amplifiers, ... Equipment must be highly **<u>automatic</u>**, or have PC control, or over-the-web control. **<u>Automate and Simplify</u>** your station where possible.

4. "Good" Internet service: …

4. “Good” Internet service to the location of your transmitter equipment.

(Do not select a remote site without Low Delay and Reliable internet service!)

Speed: Download and Upload speeds over 1 Mbps for audio and radio control. (more for waterfalls, and even more for webcams). This is low speed in today’s streaming world.

Low Delay/Low Latency/Low Ping Time: High delay is difficult for tuning and PTT timing.
+ Under 50ms is good,
- 100ms **okay** (USA W6 to W1),
- over 150ms **difficult** (USA W6 to Europe).

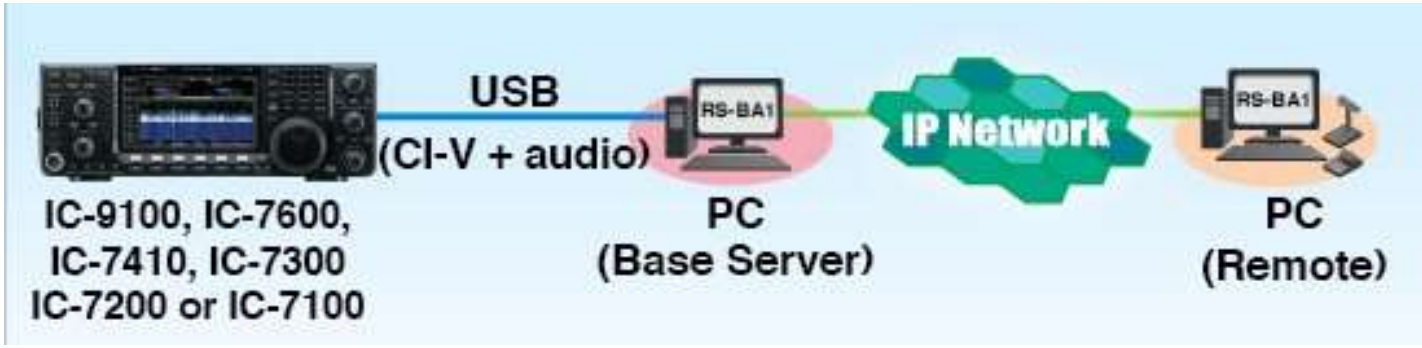
Low packet loss, low jitter, low variation: causes audio and control dropout.
+ “Wired” internet like DSL/cable/fiber = good
- Wireless internet provider, 5G Home Internet, or WiFi service can be good or bad.
- Starlink has frequent dropouts, but getting better as more satellites launched. Was used by recent expeditions to Pacific islands VP6A Ducie and E51D North Cook Is.
- Satellite internet (Geosync) = bad HughesNet or ViaSat has delay too long.

There are issues whether your service provides Port Forwarding, not CGNAT, Fixed IP addresses,… Most can be overcome with VPN, if the service is Low Delay, and Reliable.

1. Software Programs designed to control remote radios.

RemoteHams.com is both a free software Program (RCForb) and a community of users & stations. You can use the server software to offer up your own station for remote use. See, QST Magazine, April 2017, p30: "DIY Remote Radio Now" by K5PA, and k5pa.com

ICOM's RS-BA-1 IP Remote Control software. $160.



For ICOM radios, see also: Win4Icom Suite (VA2FSQ), or wfview.org

See also: RemoteTX.net, N4PY Software, Win4K3Suite Server, Ham Radio Deluxe, Kenwood ARCP-590, TRX-Manager, DF3CB software, RigPi (MFJ-1234B)…

Warning: You can spend a lot of time on this path, that may not meet your goals.

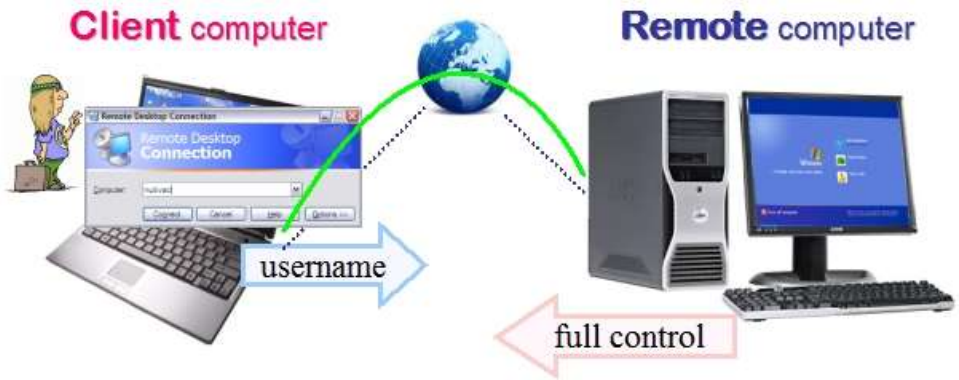
Warning: Can be hard to also connect to your logging program since "serial port is already in use." You may have to log manual/un-connected.

2. Remote Desktop Software designed to control a remote computer.

Set up the shack PC to control the station. Use any software - it doesn't have to have "remote" knowledge: WSJT-X, N1MM+, DXLab, N3FJP, ...

Then, use remote desktop software to "connect-in" to the shack PC. You "see" the shack desktop, and control the station, just like being at the shack PC. (with delay).

There are many good free "remote desktop" programs (also called VNC):
Chrome Remote Desktop,
AnyDesk,
Windows Remote Desktop,
TeamViewer (will nag you for license),
Splashtop,, …



+ Use any ham software on the shack PC.
+ Audio decoding for FT8 is best at the station.
+ CW generation is best at the station.
- Audio transfer may need special attention.
- Needs higher internet speed to duplicate the display.

*make sure your VNC includes two-way audio, or you'll have to add SW like Skype, Mumble, RemAud, … which adds complexity.

Similar to Remote Desktop, is to install a

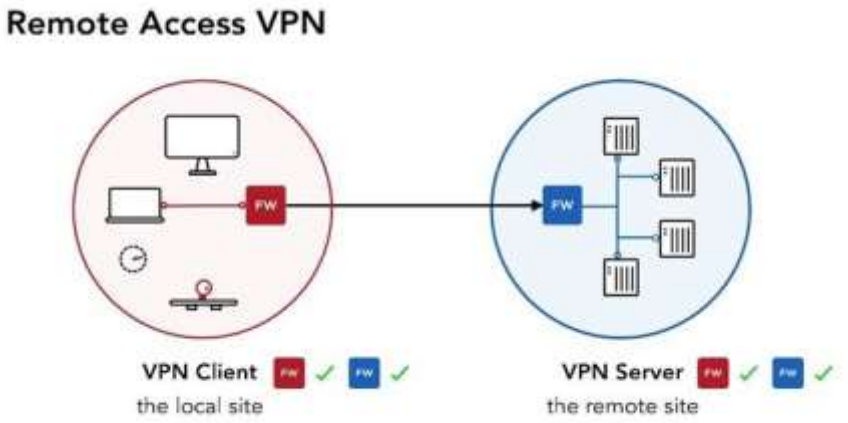
VPN (Virtual Private Network)

between the operator and the station.

VPN makes it look like the operator's computer and station's computer are on the same LAN.
Setup a VPN server on the station computer. Then use a VPN client to "connect in" to your station and use the radio and devices on the LAN or connected to the station computer.

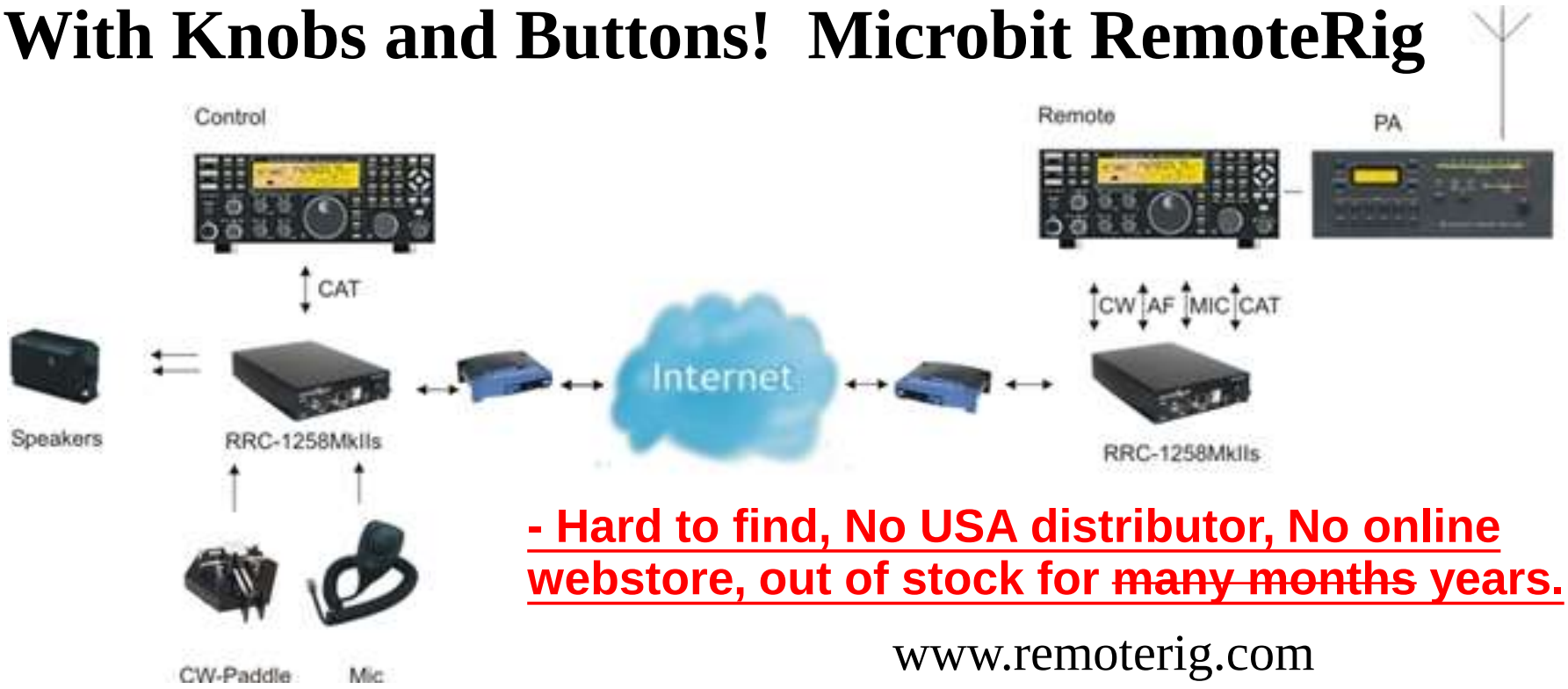
You can use Windows "built-in" VPN, or install SoftEther software on both operator computer and station computer. (SoftEther recommended, it passes UDP broadcast packets. Hams also like OpenVPN, Tailscale and ZeroTier.)

Many VPNs focus on privacy and encryption – but our use is for "remote access".



+ Operator can use any logging software.
- Audio transfer may need special attention.
- Needs higher internet speed to handle all LAN traffic.
- Can lead down complex IT/network rabbit holes.

With Knobs and Buttons! Microbit RemoteRig



- Hard to find, No USA distributor, No online webstore, out of stock for ~~many months~~ years.

www.remoterig.com

Use a pair of RemoteRig "modems" to send audio and control signals across internet. These have been a "gold standard" for years with Elecraft K3 radios. Hard to find.

+ No shack or remote PC needed (but useful). Very reliable once working. Real knobs.
+ Good CW keying from computer or paddle or straight key. Widely used for good CW.
+ Good PTT support, including hand switch or foot switch. (Switch is far better than VOX)
- Expensive? ($500 a pair, plus a $700 control head or a 2nd radio)
- May be hard to configure the first time. Get help from a current user/expert.

With Knobs and Buttons! FlexRadio and a Maestro

All FlexRadios are controlled from a software program (SmartSDR) locally or remotely. A “Maestro” control panel can also be used locally or remotely. (WiFi or wired) There are also tablet and smartphone Apps.

+ Support from one vendor.
+ No shack PC required (but useful).
+ Real Knobs.
+ CW keying from computer or paddle or key. Some latency issues.
+ Widely used.
+ Nice Spectrum Display.
- Expensive? $2k radio and $1k Maestro
- **Maestro out of stock until Q4…**
- **Some SW Updates have problems.**

Operating CW to a remote transmitter has some unique issues.

+ Generating CW at the transmitter generates good CW.
    1. Use the transmitter's internal keyer.
    2. Use a shack PC at the transmitter to generate keying.
    3. Use a Winkeyer at the transmitter to generate keying.

- Sending "keyboard CW" as text to the transmitter is usually okay.
- Sending CW paddle keying across the internet can have problems. (Microbit RemoteRig and Flexradio are designed to address this.)

- A **Local sidetone** is needed to allow straight key or paddle keying by an operator. A remote sidetone returned from a remote transmitter is okay for TX monitoring, but is too delayed for an operator to perform paddle keying.

You can use "linked winkeyers" called Wkremote, one at operator and one at transmitter.

RemoteKeyerInterface@groups.io also offers a solution for getting an operator paddle signal safely across the internet to a Flexradio.

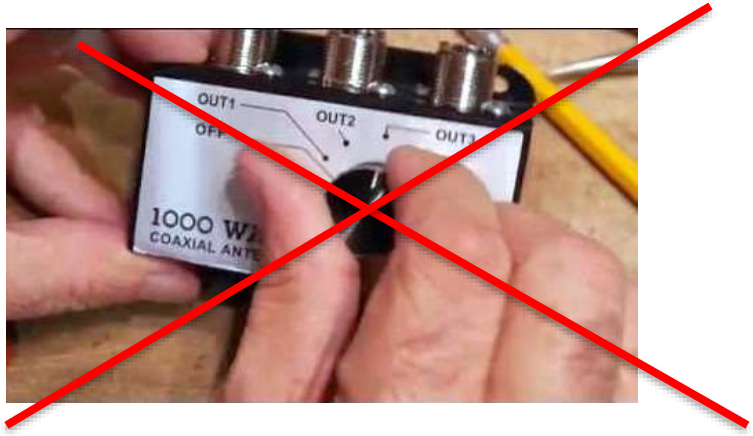
What are the REAL problems?

Station Control: **The control of "everything else"**: AC power outlets, antenna switching, rotators, tuners, amplifiers, RX-only antennas, watt meters, …

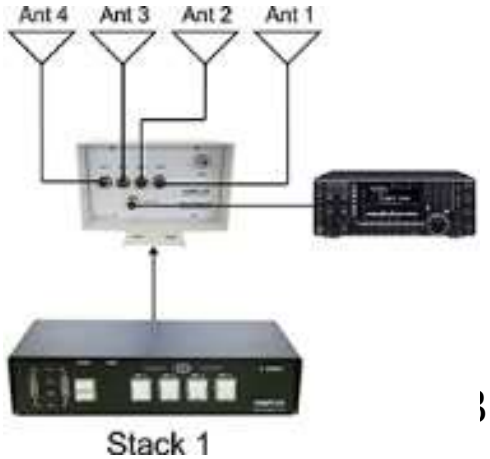
Simplify your station, make your station as **automatic** as possible, then solve remaining issues. Look for devices that are "**automatic**" or "**computer-controlled**"(needs a PC in shack). (Trust, but verify…)

Eliminate things that require you to manually switch, plug, adjust or reset.

No!



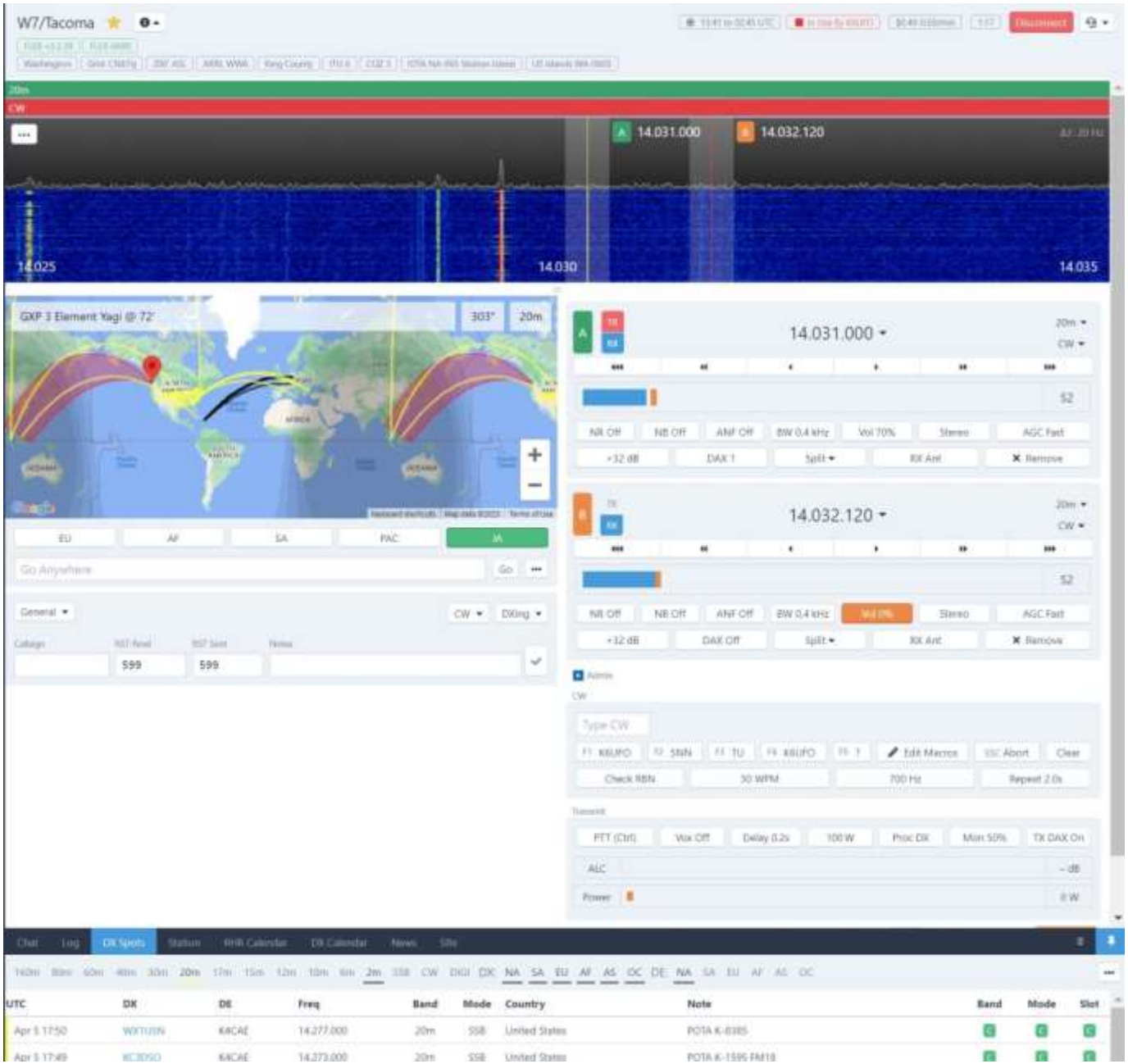
Yes!



Example: Operator Screen for a Remote Station, using separate programs on a remote desktop.

Example 2: Operator Screen for a Remote Station, using Node Red software to provide a consistent look.

Example 3: Operator Screen for a Remote Station, on RHR using web browser



Summary: … ***how to build a remote station:***

Use other people's stations as a learning experience.

Recommendation: Start simple, gain experience, then expand or change.

Different solutions have different advantages/problems.

Do not select a remote site without Low Delay and Reliable internet service!

Consider a remote desktop or VPN to use your home station from elsewhere.

The real problems are control of "everything else": AC power outlets, antenna switching, rotators, tuners, …

Remember the goal: get a transmitter on the air, for more hours of operating.
Not… learn to program or solve network problems…

Other resources: Excellent YouTube videos by:
VE6WZ - e.g.,"The control setup at VE6WZ"
FlexRadioSystems VA3MW - e.g.,"Setting up my First HF Remote Station"
- "How To Build A HF Remote Station with Mike VA3MW"