International DX Convention 2017
Remote Access to your Amateur Radio Station
Mark Aaker, K6UFO

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

Remote Access to your Amateur Radio Station
(Don't miss the Dxpedition when you're away from home.)

Our Topics:

- <u>How to</u> implement remote access.
- <u>Solutions</u> for audio, radio control, AC power, antenna switching …
- <u>How to</u> avoid the common problems.

- NOT to debate the ethics or morality of remote operating. All operating must follow your license rules and regulations (FCC, ITU, each country), and follow any applicable Award or Contest rules (DXCC, WAS, ARRL, CQ WW, IOTA,...)

- This is a rapidly changing area. There is no one perfect solution for everyone for all time. You will have to learn, adjust and experiment.

Three Basic Needs for Remote Operation

1. **Audio**: You need a radio with Audio IN and OUT connections, like MIC/SPKR, Line In/Line Out, or audio over USB. Just like when setting up for digital modes.

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

3. **Station Control**: To control the station's AC power outlets, antenna switching,, rotators, tuners, amplifiers, . (<u>this</u> is the difficult part, lots of "piecemeal" solutions.)

Four Proven Ways to Implement

1. Web Browser access

2. Software Programs

3. Remote Desktop

4. Remote Front Panels

Solutions vary from 100% Software to 100% Hardware.

Time spent from Minutes to Hundreds of Hours.

Money from $0 to $3,000 (or more!)

#2,#3 require a shack PC online. (otherwise shack PC optional.)

#2,#3,#4 might need changes to your internet router ports. (Messy.)

1. Web Browser access   RemoteHamRadio.com

Web Browser Access Pros/Cons

RemoteHamRadio.com Free 30 minute trial. $99/yr plus 9 to 49 cents/minute (or more!) Can be accessed with Chrome web browser, Android phone, Chromebook, iPhone App, PC with extra hardware "DXMate" USB device, or the RemoteRig hardware. (Full disclosure: I have a station on RHR.) Reviewed in QST Magazine, May 2013, p59.

Pros: Easy to sign up and get started. No equipment to buy. No software to maintain. Some very good stations.

Cons: Can be expensive if you "ragchew." No fun of "tinkering" with the equipment. Is not to your station.

Recommend: Good way to see what's possible. Good "backup" plan.

Many online RECEIVERs are available: websdr.org or globaltuners.com (Generally, their delay makes them unusable for making any QSOs.)

2. Software Programs

RemoteHams.com RemoteHams.com Free to sign up. Many sites free to use, some are "membership". Wide range of capability and reliability. You must use their RCForb Client software. You can also use their server software to set up your own station as a remote station. (QST Magazine April 2017, p30: "DIY Remote Radio Now")

ICOM's RS-BA-1 IP Remote Control software.
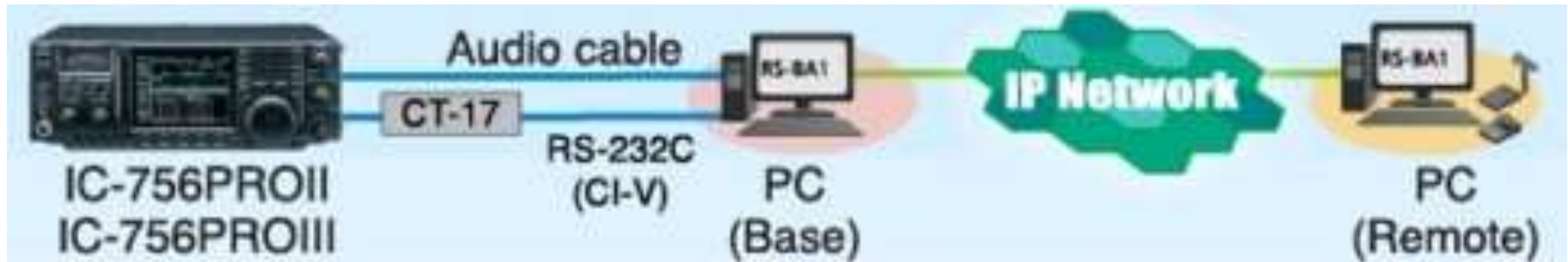
See also: Kenwood Radio Control Program ARCP-480, Ham Radio Deluxe, TRX-Manager, DF3CB software FT2000RC, N4PY Software, …

Example: Ham Radio Deluxe

Ham Radio Deluxe includes "HRD Remote Server" for remote operation over the internet. HRD versions 5.24(2012) and below were free. Current versions 6 and up are $100 (30 day free trial) but with support. Popular, lots of users. Many examples on the web of remote use. e.g., http://k1fs.org/wp-content/uploads/2012/01/hamradioremote.pdf

(Does not include audio - use Skype, RemAud, IP-Sound or Mumble.)
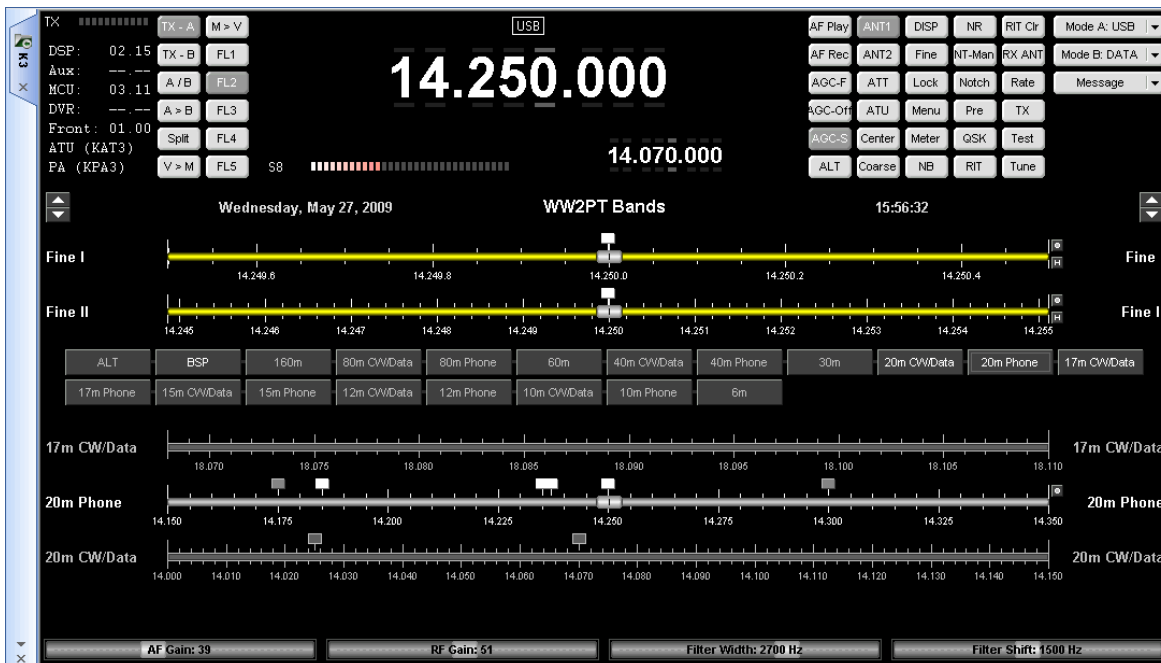
Software Programs Pros/Cons

Pros: Supported by a software vendor. You may already have a compatible radio. The software has <u>already solved many common problems</u>. You are in control of the station, software, access, settings…

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

Recommend: Good solutions if the program meets your needs, and you want vendor support and a user community (forums).
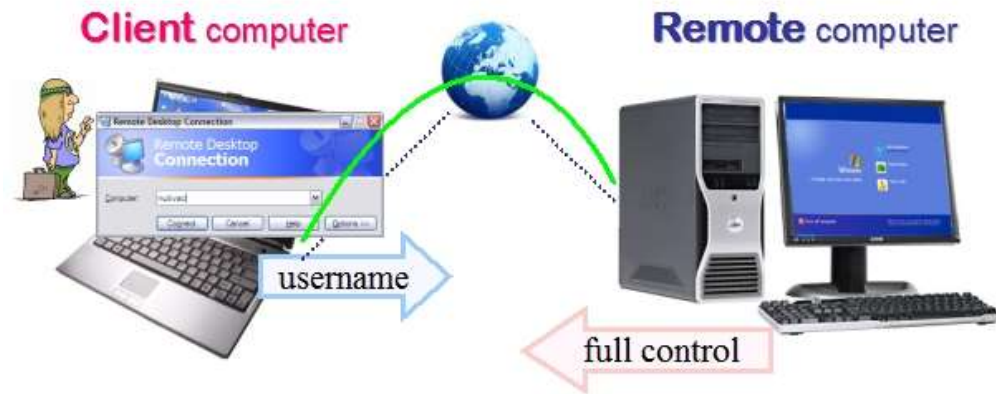
3. Remote Desktop

Set up your shack PC to control your station. You can 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 to your shack PC. On your laptop you "see" the shack computer, and can control the station.

There are many free "Remote desktop" programs (also called VNC):
- TeamViewer,
- Splashtop,
- Chrome Remote Desktop,
- Windows Remote Desktop,
- Mac OS Screen Sharing*,
- TightVNC*, …

* If yours doesn't include two-way audio - add Skype, Remaud by DF3CB, or VOIP "chat" software like Ventrilo, Mumble, or TeamSpeak.

Remote Desktop Pros/Cons

Pros: Use your station just like sitting at the shack PC. <u>Use any ham software</u> that runs on the shack PC. Works well with tablets and phones.

Cons: <u>Needs High Speed Internet</u>. <u>Delays</u> as it tries to duplicate the full desktop view. Requires a PC to be "on" and operating at shack. <u>Rest of shack needs to be computer-controlled or automatic.</u>

Recommend: Easy to use, provides familiar station operation.

4. Remote Front Panels - Microbit RemoteRig
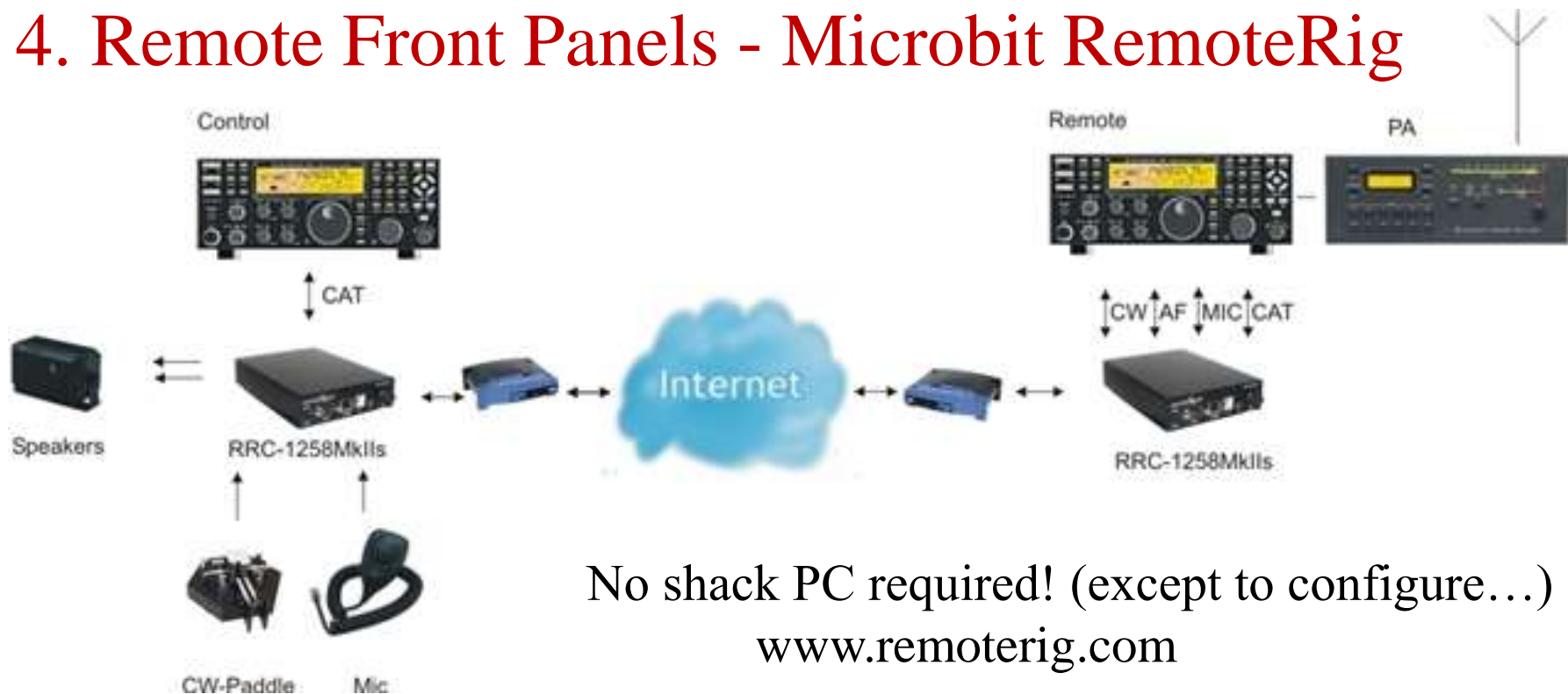
No shack PC required! (except to configure…)
www.remoterig.com

Uses a pair of Microbit RemoteRig "modems" to transfer audio, radio control and some station control. Can use with:

- radio with a detachable front panel (TS-480, IC-706), or

- Radio with a matching "control head" (Elecraft K3/0-Mini), or

- Two radios that support the "Twin" concept (Elecraft K3, Yaesu FT-2000, or

- Control with a PC program or Android App.

4. Remote Front Panels - FlexRadio Maestro

A FlexRadio Maestro plugs into the local network (or wireless) to control a FlexRadio elsewhere on the LAN. (Across internet soon, with SmartSDR v2.0)

FlexRadio Systems *MAESTRO* è la nuova console di controllo per i ricetrasmettitori della serie 6000 che permette l'uso immediato dell'apparato **senza bisogno del PC**, tramite connessione alla rete LAN anche WiFi, oppure direttamente all'apparato.

FlexRadio Systems *MAESTRO* è un moderno e funzionale pannello radio dotato di schermo touch, pulsanti e manopole, connessioni per microfono e tasto/paddle con il quale usare l'apparato senza rinuciare alla operatività tradizionale di una qualsiasi apparecchiatura radio, oltre che a permetterne la remotizzazione in qualsiasi punto coperto dalla vostra rete LAN.

Remote Front Panels Pros/Cons

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

Cons: <u>Expensive</u>. RemoteRig modems ($500 pair) plus a
  front panel ($300 - $1,200) or 2nd radio. ($900 - $2,400)
  Can be difficult in initial setup.
  <u>Rest of shack needs to be computer-controlled or automatic.</u>

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

All Methods Need "Good" Internet Service

- You need High Speed (but less than Netflix requires).   www.speedtest.net
  Minimum is "3G Wireless" at 144 kbps, above 400 kbps is better.
  Caution: Upload speed may be only 1/5 of the Download speed.
  Audio dropouts usually sound like repeated "clicks."
  If you can Skype to/from your station location, you're good-to-go.

- You need Low Delay (latency, ping time).   www.pingtest.net
  Below 200 millisecond is adequate, below 100 msec is better.
  Or tuning "lags" and poor button response. Also want low jitter (variation).

- GOOD: broadband, cable modem, WiFi, DSL, 4G, "MiFi" mobile hotspot.
- POOR: Dial-up modem (slow), Satellite internet (delay).
- WARNING: The station end needs a public-visible IP number. May require
  "business class" service, or not available on some mobile networks.

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, …...

Some functions can be made "automatic," some can be "computer-controlled."

Try to eliminate things that require you to <u>manually</u> switch or adjust them.

A "killer" problem when remote is when something needs to be reset or unplugged. There are more of these than you think.
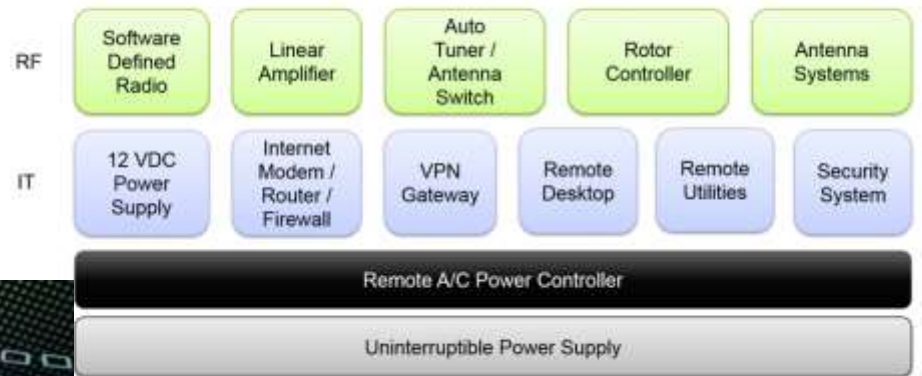

Two common approaches to station control:

(1) Incremental: Start with simple rig control and remote desktop, add functions as needed. Ant1/Ant2 button on rig, multiband antennas, auto-tuner, no amp.

(2) System Design: Plan for ultimate needs, identify solutions, then implement.

E.g.: W5FCX.net "A Software-Defined Radio Remote Station Design"

E.g.: AB1OC/AB1QB "Software Defined Radio/Remote Operating Gateway"
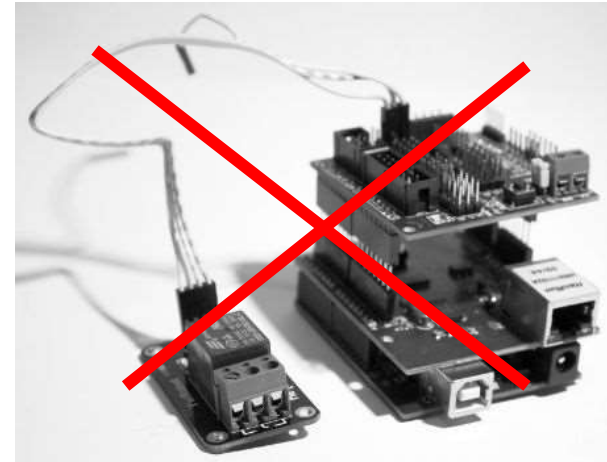
System Design Approach – W5FCX

W5FCX.net " A Software-Defined Radio Remote Station Design"
http://www.w5fcx.net/2016/12/23/a-software-defined-radio-remote-station-design/

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Internet control of AC Power Outlets

There are experimenter/homebrew solutions,
but for safety and reliability look for complete
UL-Listed and shielded/enclosed solutions.

DLI Web Power Switch $130   … or Belkin WeMo Switch $30

Hint: A "Webcam" in the shack can help see what's happening, but uses
lots of bandwidth.

Internet control of 12 Volt Power: West Mountain Radio RIGrunner 4005i $280
…or just control an AC socket to the DC power supply.

Antenna Switching can be "automatic."

- The radio or attached shack computer provides a "band data" output, or you can monitor the serial port for freq information.

- "Band Decoder" by Array Solutions, TopTen Devices, MicroHam, Hamation, …

- "Remote" antenna switch by same companies plus DX Engineering , Ameritron, …

- It is helpful to have a "dummy load" on one of the antenna ports.

Rotators can be "computer-controlled" (rarely automatic)

- Requires rotator control box with a serial port (RS-232 or USB.) Green Heron RT-21, Hy-Gain DCU-2, AlfaSpid, Prosistel, MDS-Ham RC1 …

- Or an "add-on" to control box: EASY-ROTOR-CONTROL(Vibroplex), EA4TX, …

- The serial port goes to the shack computer running "rotator control software" such as: many logging programs, Ham Radio Deluxe, LP-Rotor, or

  → PstRotatorAz software which includes a remote server. By YO3DMU $25 (and has SteppIR antenna control!)

- Or RemoteRig box includes a 2nd serial port that can be used for rotator control.
- Or RemoteRig RC-1216H plus 1216L gives web based control with no shack PC.

  (If that sounds complex, wait till you have two or three of them to control!)

Tuners (if used) can be "automatic"("auto-tune")

- Manual antenna tuners and manual tune amplifiers will be limited to one band, but can be switched in-line with the antenna switching.

- Automatic antenna tuners provide multi-band operation. LDG, Palstar HF-Auto, Elecraft KAT500, SGC, … Be careful the tuner doesn't require an actual "button push" to tune. Activated by radio, or tunes on "power up" or high SWR.

- 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.

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Amplifiers(if used) must be "automatic"(auto-tune) <u>and</u> "computer-controlled"(On/off and monitoring/reset)

- Solid state amplifiers are auto-tune and easy to use (can be left "On")
  Popular: Elecraft KPA-500 $2,300, SPE Expert Linears 1.3K-FA $6,000

- Some tube amplifiers are auto-tune and can be computer-controlled.
 Popular: Alpha 87A, Alpha 9500, Acom 2000A, OM Power…

Elecraft KPA500 Remote Software

Alpha 9500 Remote Software

Other devices or switching…

If you have devices controlled by a serial port, they can be extended over the internet by a hardware "serial server" or "serial port extender" from Lantronics, Digi, Moxa, … Or, an all-software solution: com0com and com2tcp. (requires a shack PC online.)
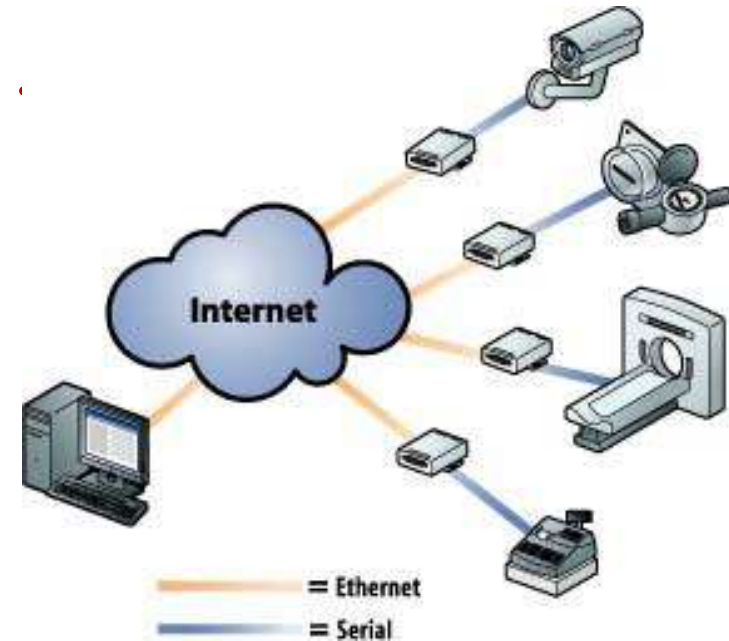
Other switching?

- Computer-controlled relays/switches:
  - ONTRAK Control Systems ADR2200
  - KMTronic
  - National Control Devices
- Internet-controlled relays/switches ready-to-go:
  - RemoteRig RC-1216H
  - Digital Loggers Inc DIN Relay III

You will be surprised to find out…

What about Monitoring your sending?

- Many configs do not "echo" your sending onto the receive audio line.
- If you try to "monitor" your own voice or CW sending coming back from the remote transmitter, the audio delay is confusing.

How to use a real CW Paddle?

- First, where to plug it in – to a laptop?!
- 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.

Examples: What you carry with you.

Essential: Smartphone, tablet or laptop, headphones.

Extras: Mouse, speaker, paddle and keyer, tablet for web access while the laptop is busy.

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.
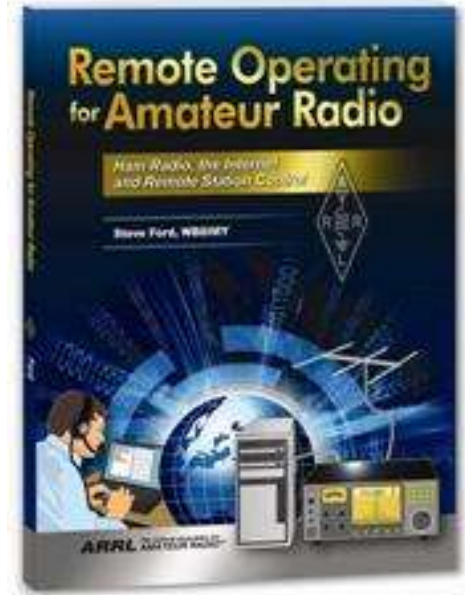4. Start external logging program if used.
5. Operate!

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!

Conclusion

- There is no single correct solution. You can vary the Software/Hardware, Laptop/Tablet/Smartphone..
- This is a fast changing and evolving area.
- Remote Operating is 90% the same as on-site Operating.

  9% different – additional HW or SW

  1% better – use it even when away from the station!

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

Thank You!