FT8 Best Practices, Tips, and Tricks

Hamfesters Radio Club
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Topics We will Cover

- The importance of digital modes
- Software considerations
- Hardware considerations
- Sharing a virtual serial port
- Using a logging server
- FT8 Operating best practices
- FT8 Tips and Tricks

The Importance of Digital Modes

- Why should you care about digital modes.
  - **Fun and technically challenging to learn.**
  - **Often can overcome poor propagation.**
  - **Often can cut through the noise.**
  - **Most are open source and open hardware.**
  - **Significant opportunities for experimentation.**
  - **Many say that CW was the first digital mode.**
  - **They are vital for passing emergency traffic.**

The Environment for Our Discussion

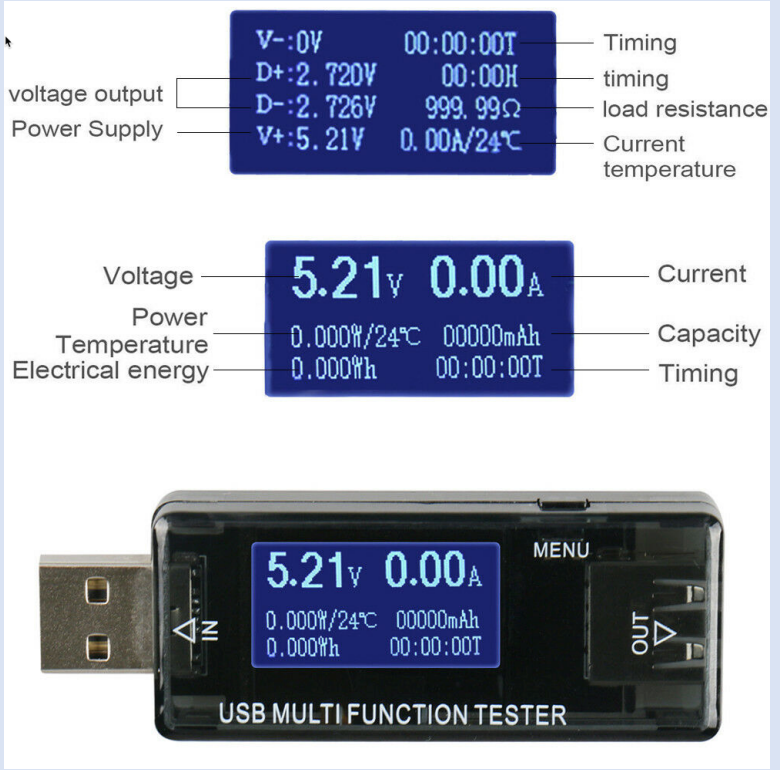
- **Hardware**
  - Any computer (x86, x64, ARM, ...).
  - ICOM IC-7300, SDR, or a radio w/ a stable oscillator.
  - 2X USB A Male to B Male (host) Cable.
  - A powered USB hub.
- **Software**
  - **Windows**, **Mac OS**, or **Linux** operating system.
  - A USB device driver. Other radios may or may not require a driver.
  - **ICOM Rig Control and Remote.** Build in feature w/ Flex and …
  - Virtual Serial Port Sharing. Not required, but nice to have.
  - **N3FJP Amateur Communications Log** (or your favorite).
  - **WSJT-X 2.2.2+** and **JTAlert-X 2.16.8+**

Hardware Considerations (1)

- Not all USB Hubs and Ports are equal.
  - Each USB Hub has a maximum voltage and current rating.
  - Each USB Hub has a device driver.
  - As does each Port on the USB Hub.
  - Each USB Port has a device driver.
  - The device drivers defines the current and voltage constraints for the given USB profile (protocol and port architecture).

Hardware Considerations (2)

- **Although you can directly connect your radio to the computer, you shouldn't.**
- **Powered USB Hubs protect both**
  - Against over current or voltage when multiple devices are plugged into a single USB HUB.
  - They electrically or optically isolate the radio and computer.
- **You can measure the current and voltage loads.**

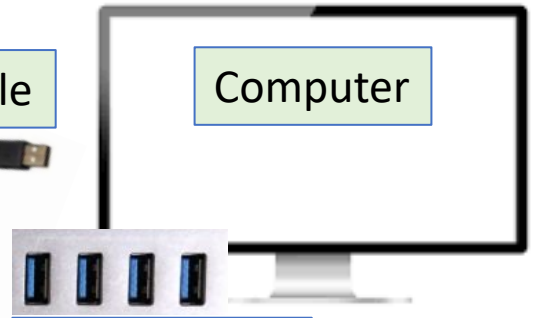


Using a Powered USB Hub

USB B Female

USB B to A Male

Computer



USB 3.x Ports

COMv1

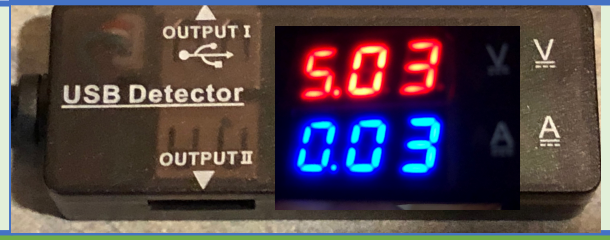
USB A to B Male

Powered USB Hub

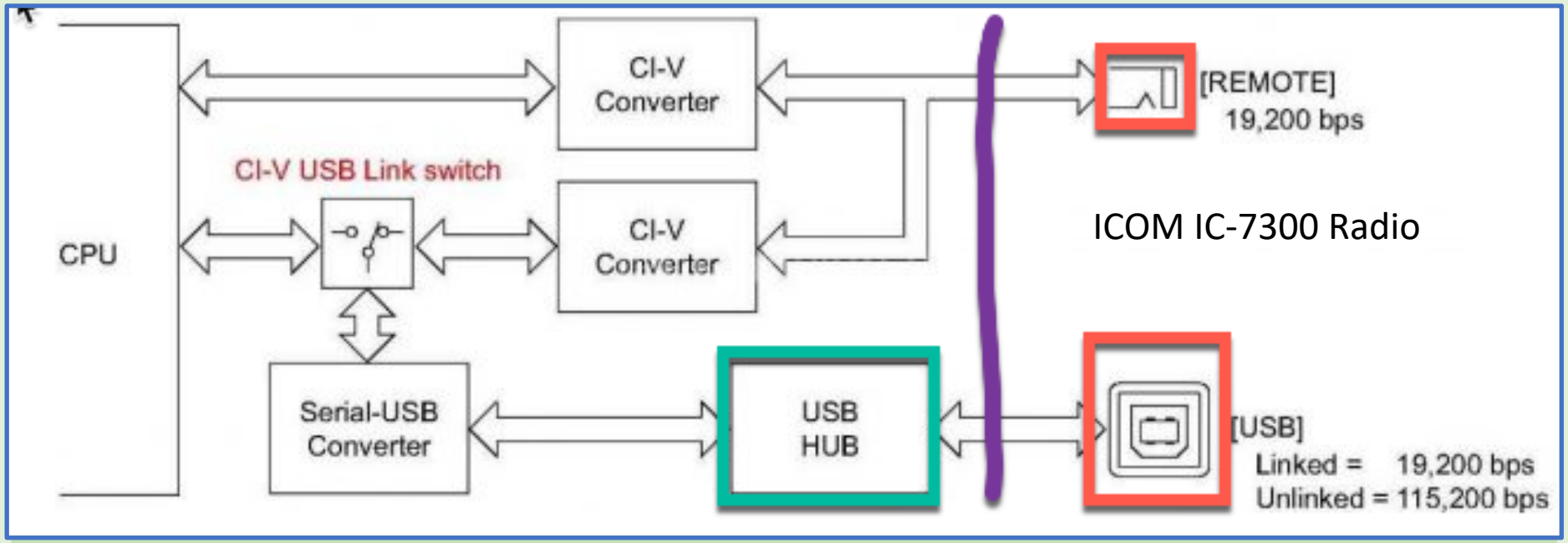
Power Supply

You can attach the Powered USB HUB to your bench or computer case using commercial grade Velcro.

Hardware Considerations (3)

Computer Maximum Voltage	**For USB 2.x** 5.0V (+0.25V | -0.60V) 5.0V (+0.25V | -0.55V)	**For USB 3.x** 5.0V (+0.25V | -0.60V) 5.0V (+0.25V | -0.55V) 20.0V (PD)
Computer Maximum Current	0.5A **It is important to test all communications modes over your USB connection. As the current drain will very.**	For USB 3.0 0.9A For USB 3.0 Battery Charging (BC 1.2) 1.5A For USB C 3.1 or 3.2 3A For Power Delivery (PD) up to 5A
Radio Maximum Current		The ICOM IC-7300 Only draws between 0.03A to 0.07A at 5V.

The CI-V Protocol

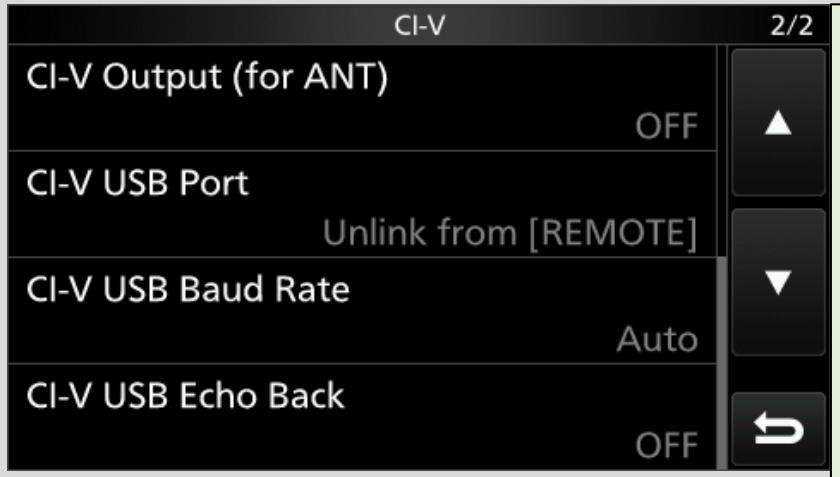


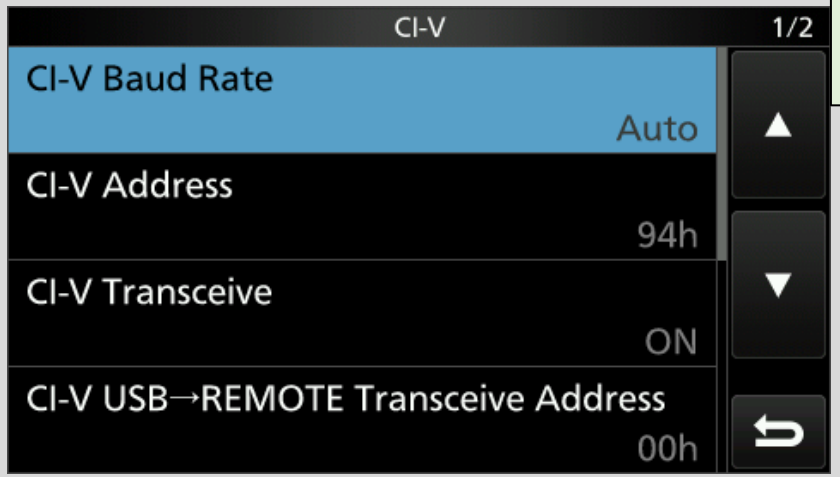
The above drawing shows the computer on the left and the connections to the radio on the right. Typically 19.200 bps is the default baud rate. Especially if the radio's link is enabled. There is one catch; however, if you want a virtual Panadapter you must use the radio's unlinked mode and operate the radio at 115.200 bps.

Configuring the ICOM IC-7300 (1)

Configuring the ICOM IC-7300 (2)

Set AGC Fast (default) or off.
Set Notch to Automatic Notch (AN).
Enable Noise Reduction as needed.
On 80 you may need to use a Pre-Amp





CI-V USB Port - Unlink from [Remote].

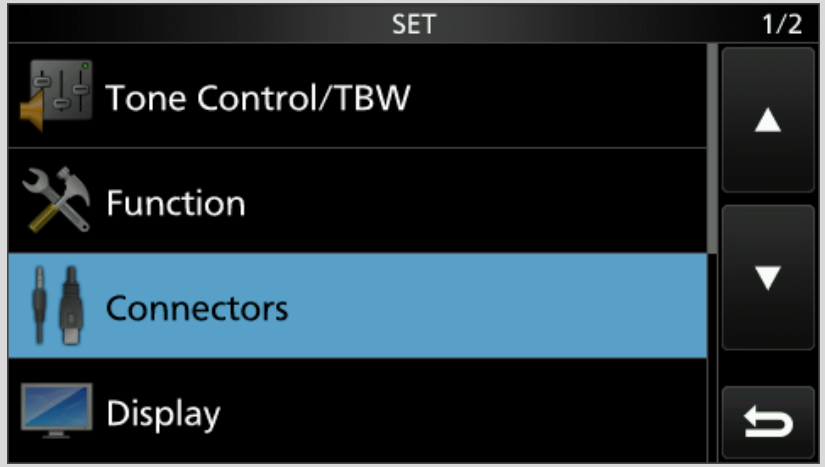
CI-V USB Baud Rate – Auto

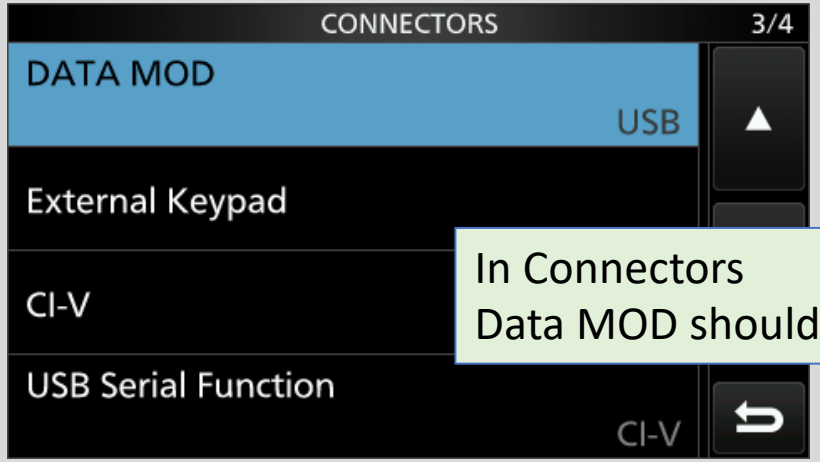
CI-V USB Echo Back – Off

CI-V Baud Rate – Auto

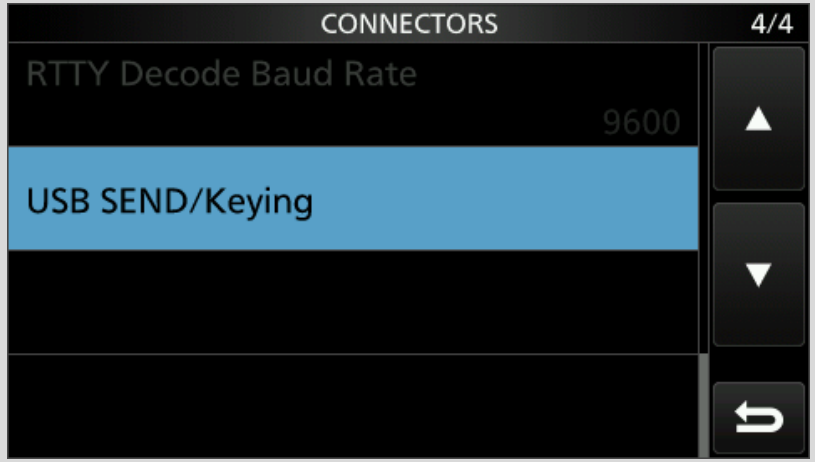
CI-V Address – 0x94

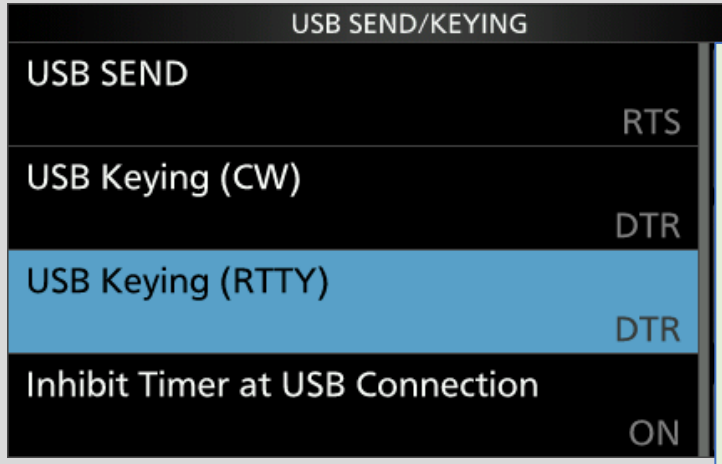
Configuring the ICOM IC-7300 (3)





In Connectors
Data MOD should be set to - USB



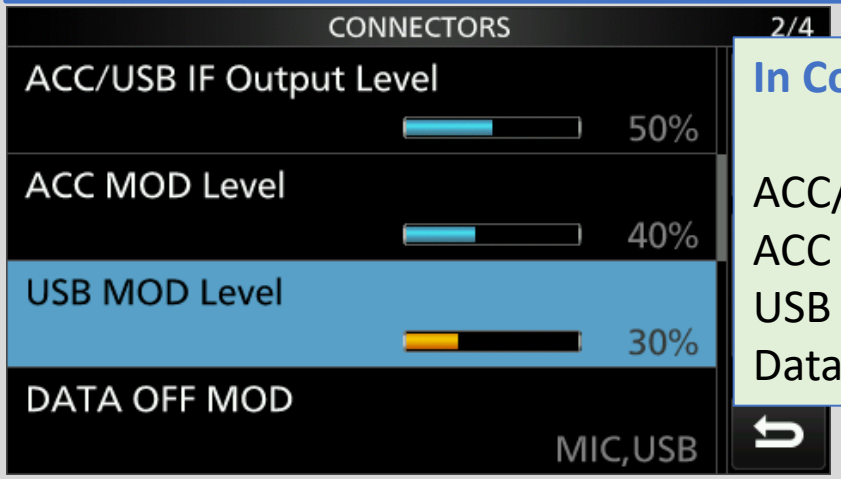


In USB Send/Keying

USB Send – RTS
USB Keying (CW) – DTR
USB Keying (RTTY) – DTR

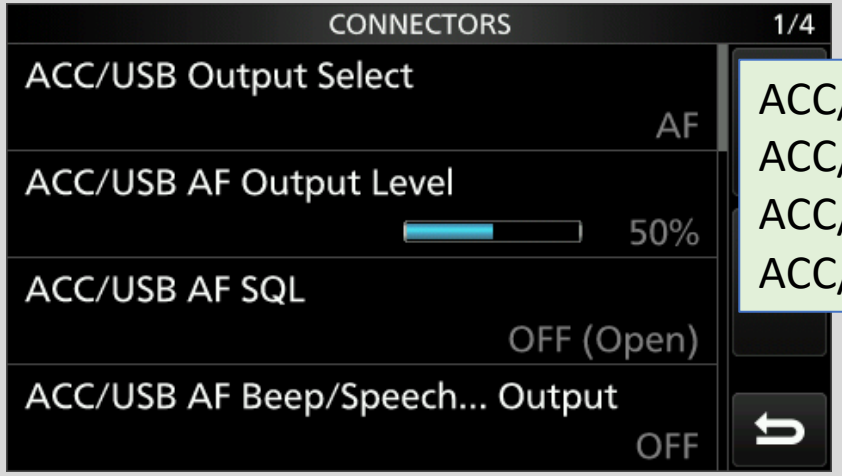
Inhibit Timer at USB Connection - On

Configuring the ICOM IC-7300 (4)



In Connectors

ACC/USB IF Output Level **50%**
ACC MOD Level **40%**
USB MOD Level **30%**
Data off MOD **MIC/USB**

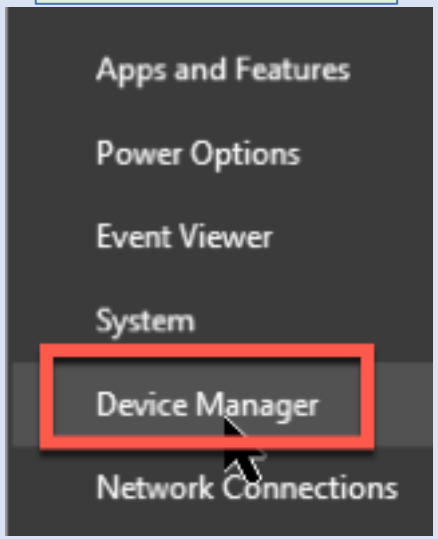


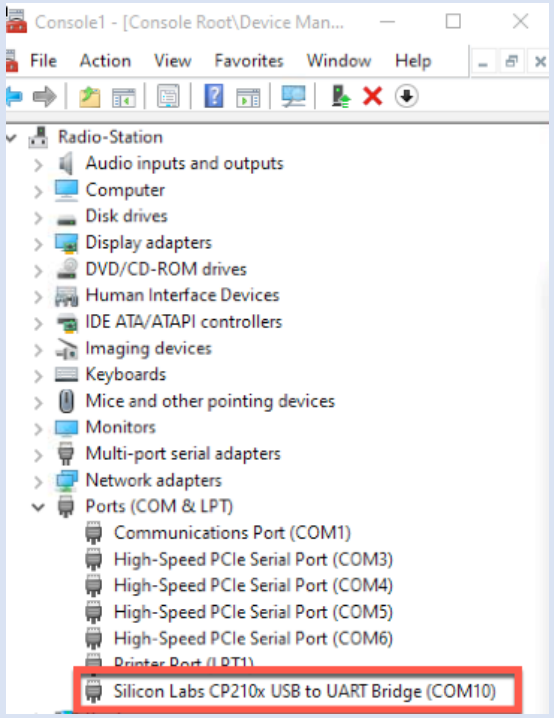
ACC/USB Output Select – **AF**
ACC/USB AF Output Level – **50%**
ACC/USB AF SQL – **Off (Open)**
ACC/USB AF Beep/Speech Oytput - **Off**

Configuring Your Computer

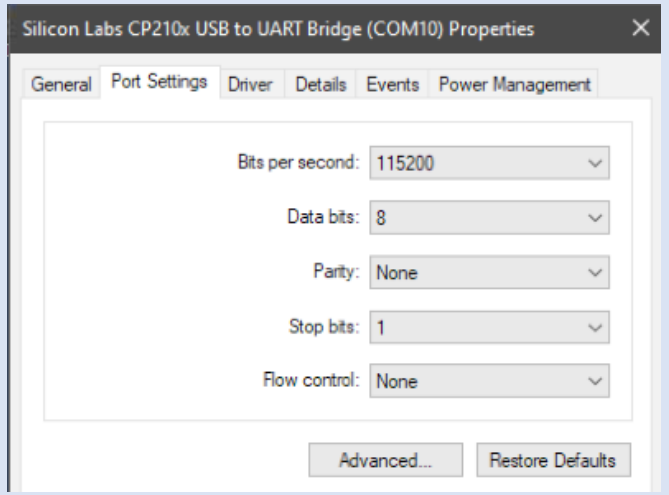
Windows 10

Right mouse the [**Start**] button.





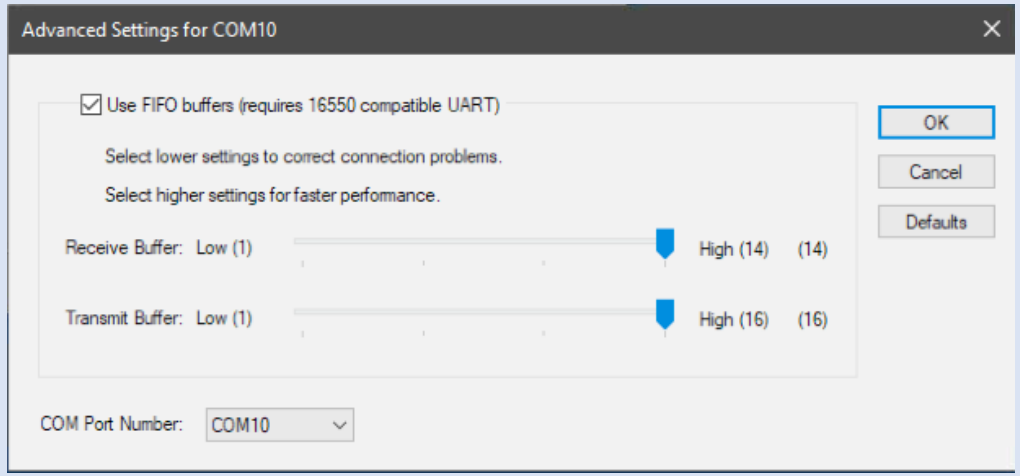
The Silicon Labs CP210x is what our physical COM port is.



Use a baud rate of 115,200 bps

8 None 1

No flow control

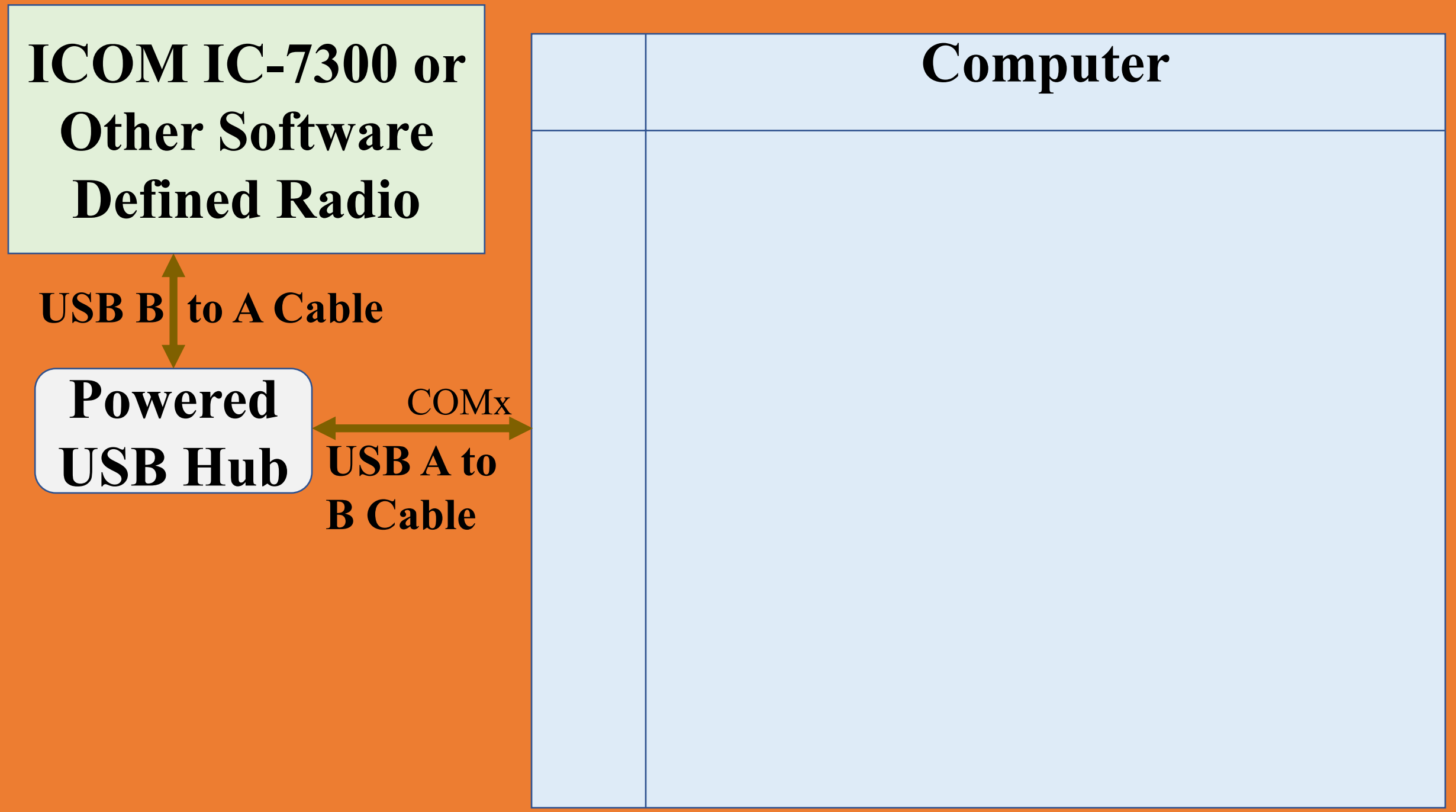


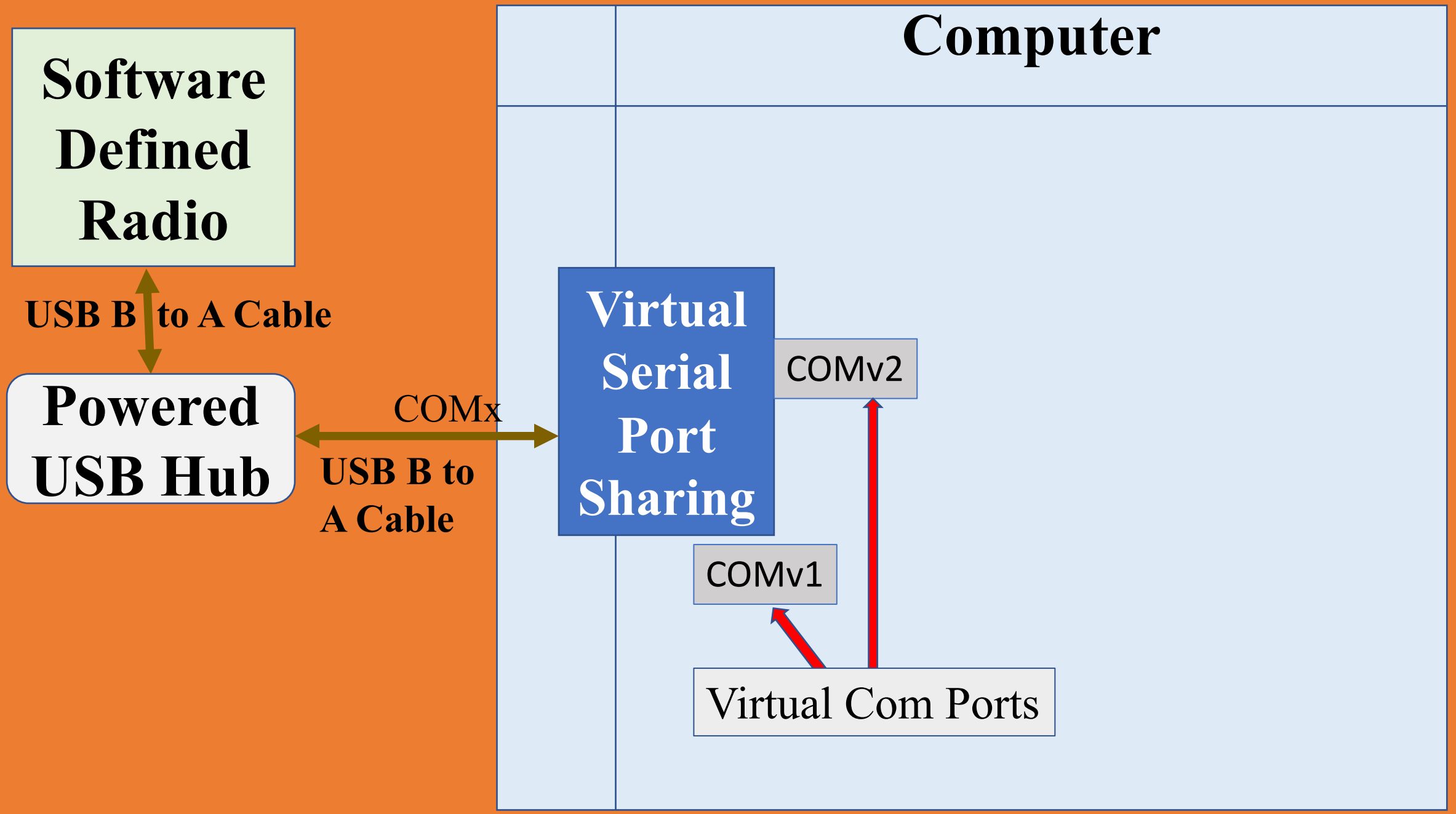
Virtual Serial Interfaces

- Allow two or more software packages to share one physical USB / serial interface.
- Each physical USB / Serial port will have an associated COMx.
- Each virtual USB / Serial Port will have an associated virtual COMv port (i.e. COMv1).

Virtual Network Interfaces

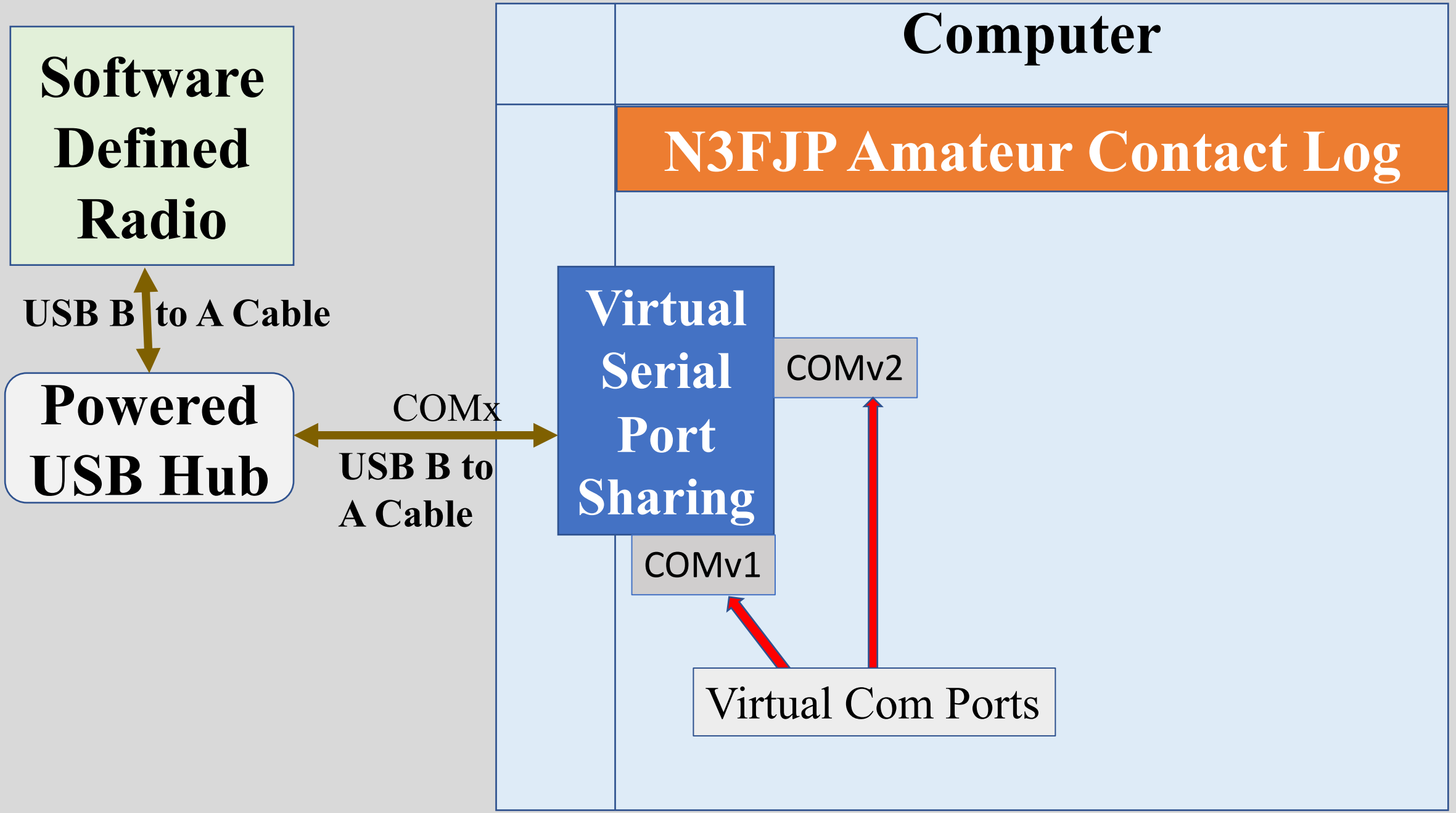
- **Allow 2 or more software packages to communicate with each other.**
  - **On the same computer**
  - **Or over a network.**
- Use standardized Internet Protocols (IP).
- They Communicate over ports using either:
  - TCP provides error detection & correction.
  - UDP provides no guaranty, but is fast.

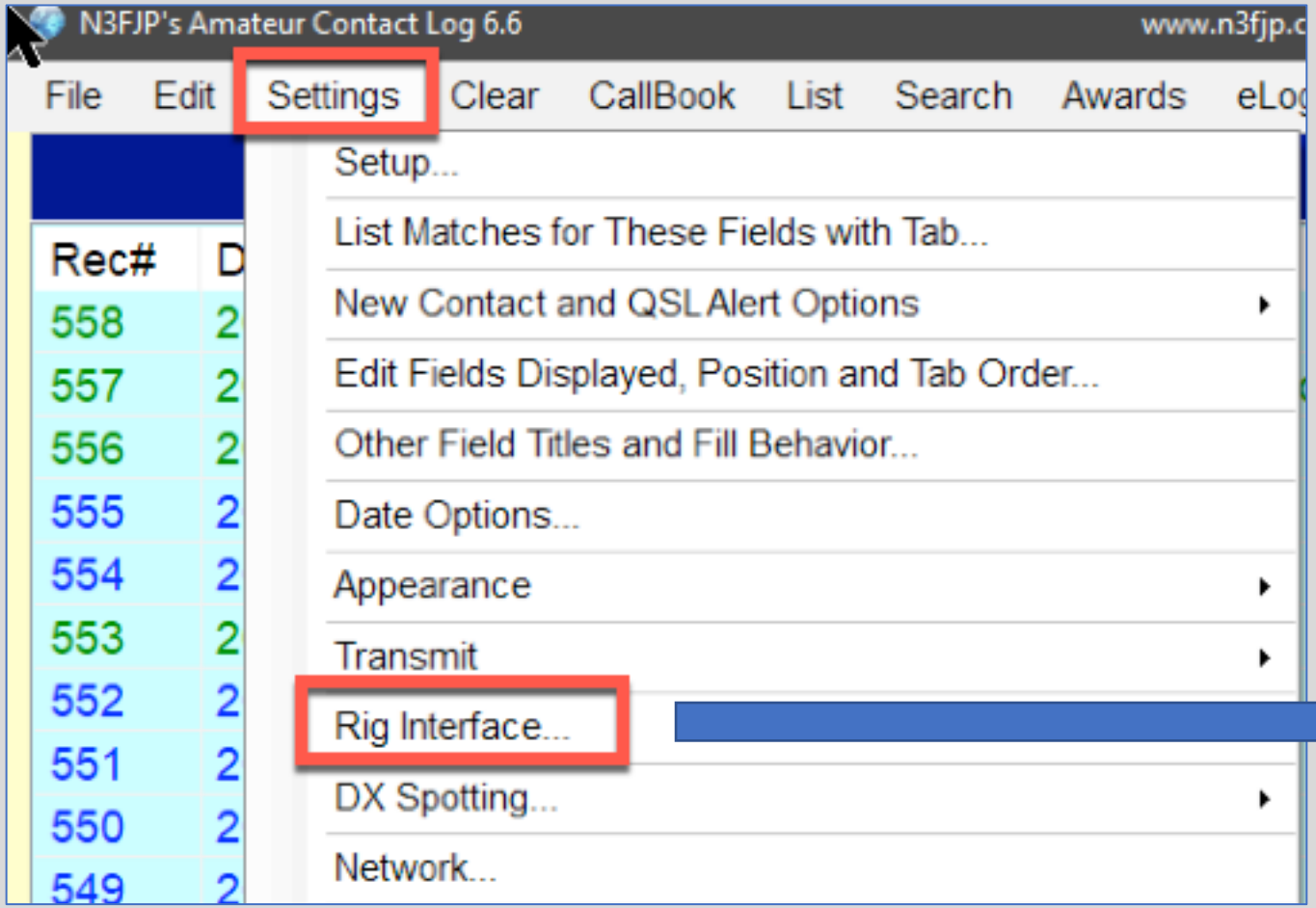

ICOM IC-7300 or Other Software Defined Radio
USB B to A Cable
Powered USB Hub
COMx
USB A to B Cable
Computer


Software Defined Radio
USB B to A Cable
Powered USB Hub
COMx
USB B to A Cable
Computer
Virtual Serial Port Sharing
COMv2
COMv1
Virtual Com Ports

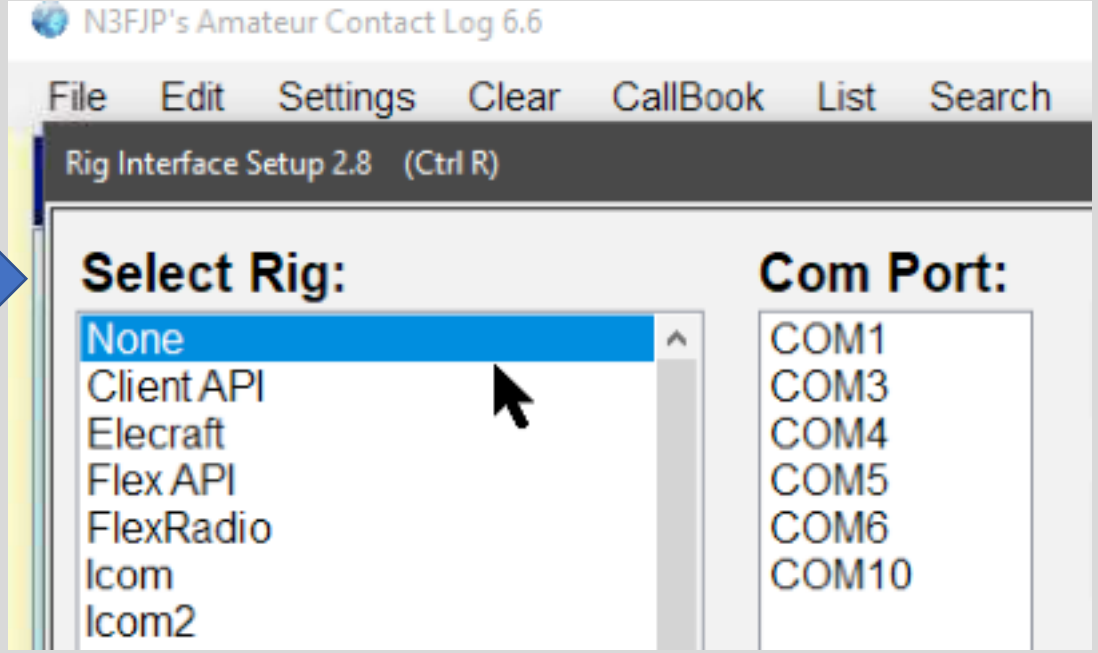
N3FJP AC Logging Server

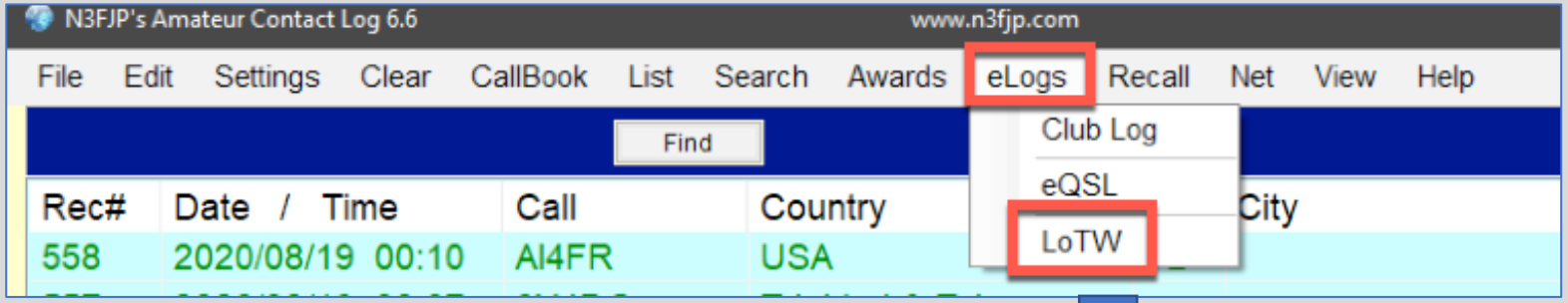
- N3FJP Amateur Contact Logging Server
  - Allows connections from multiple clients
  - Listens on UDP port 1100
  - Can automatically upload contacts to:
    - LotW
    - Club Log
    - QSL.CC
  - Can proxy queries for amateur radio callsign DBs.


Computer
N3FJP Amateur Contact Log
Software Defined Radio
USB B to A Cable
Powered USB Hub
COMx
USB B to A Cable
Virtual Serial Port Sharing
COMv2
COMv1
Virtual Com Ports



We don't want N3FJP's AC Log software to control our rig.



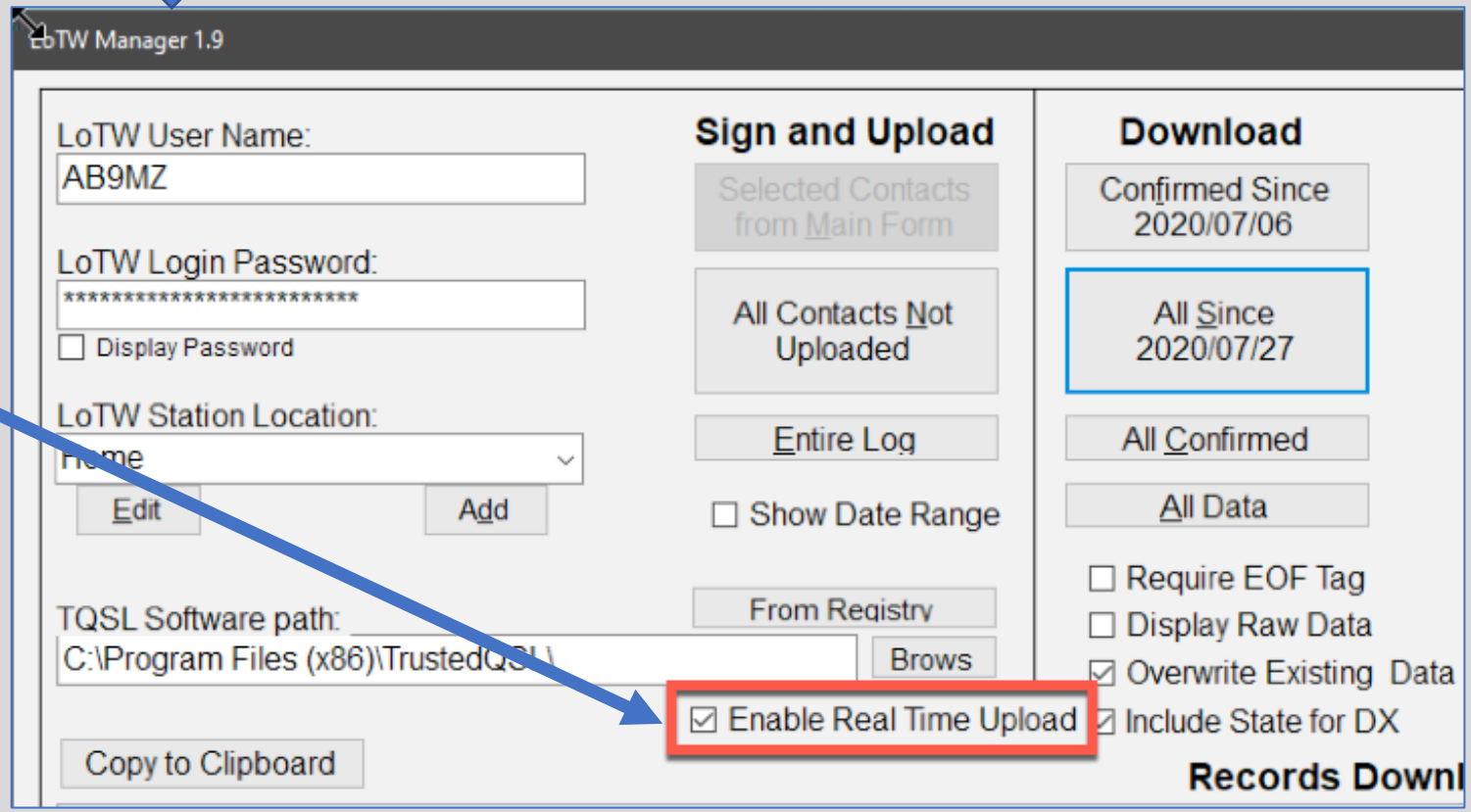


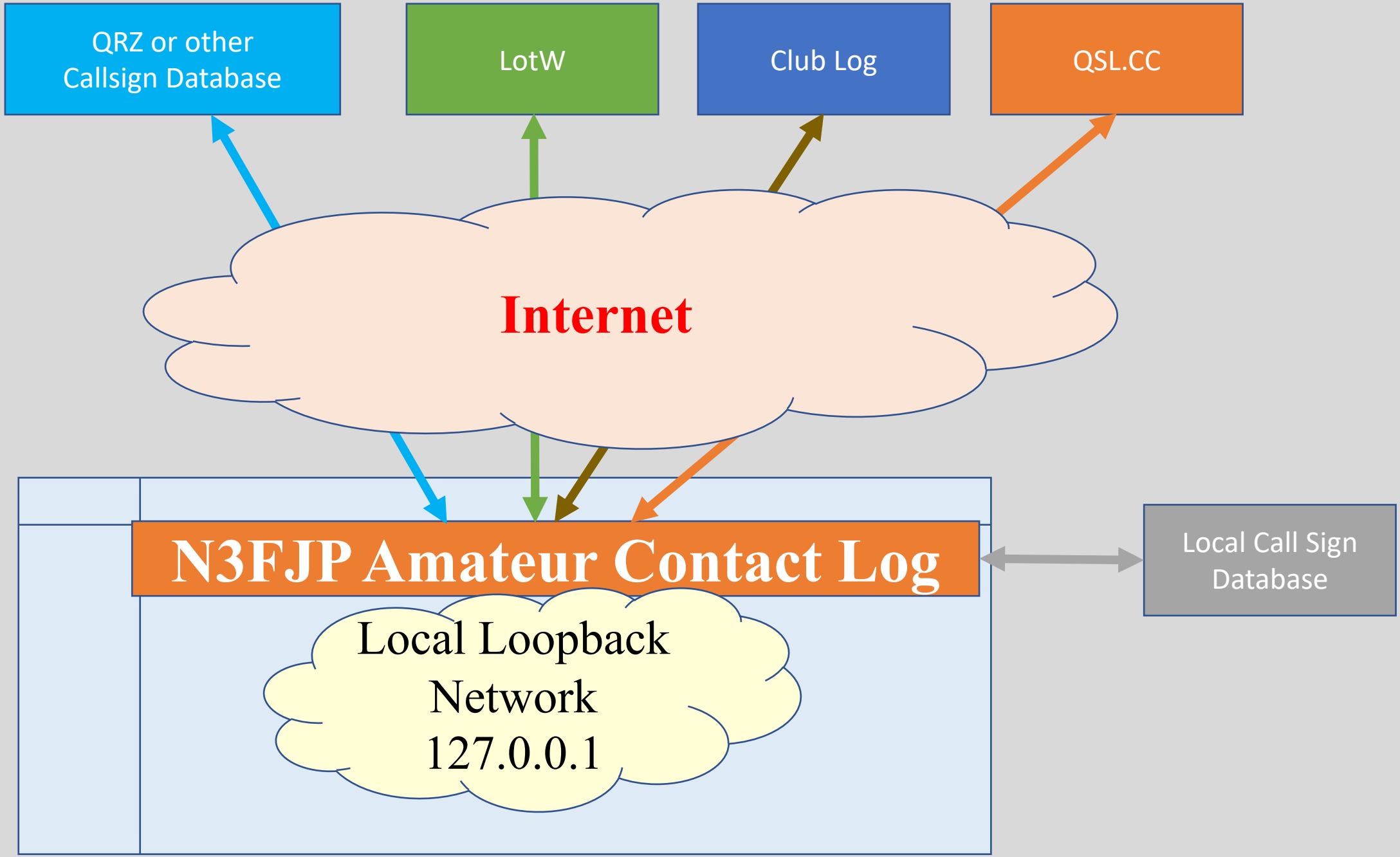
Setting up Club Log or eQSL.cc is about the same effort as LotW.

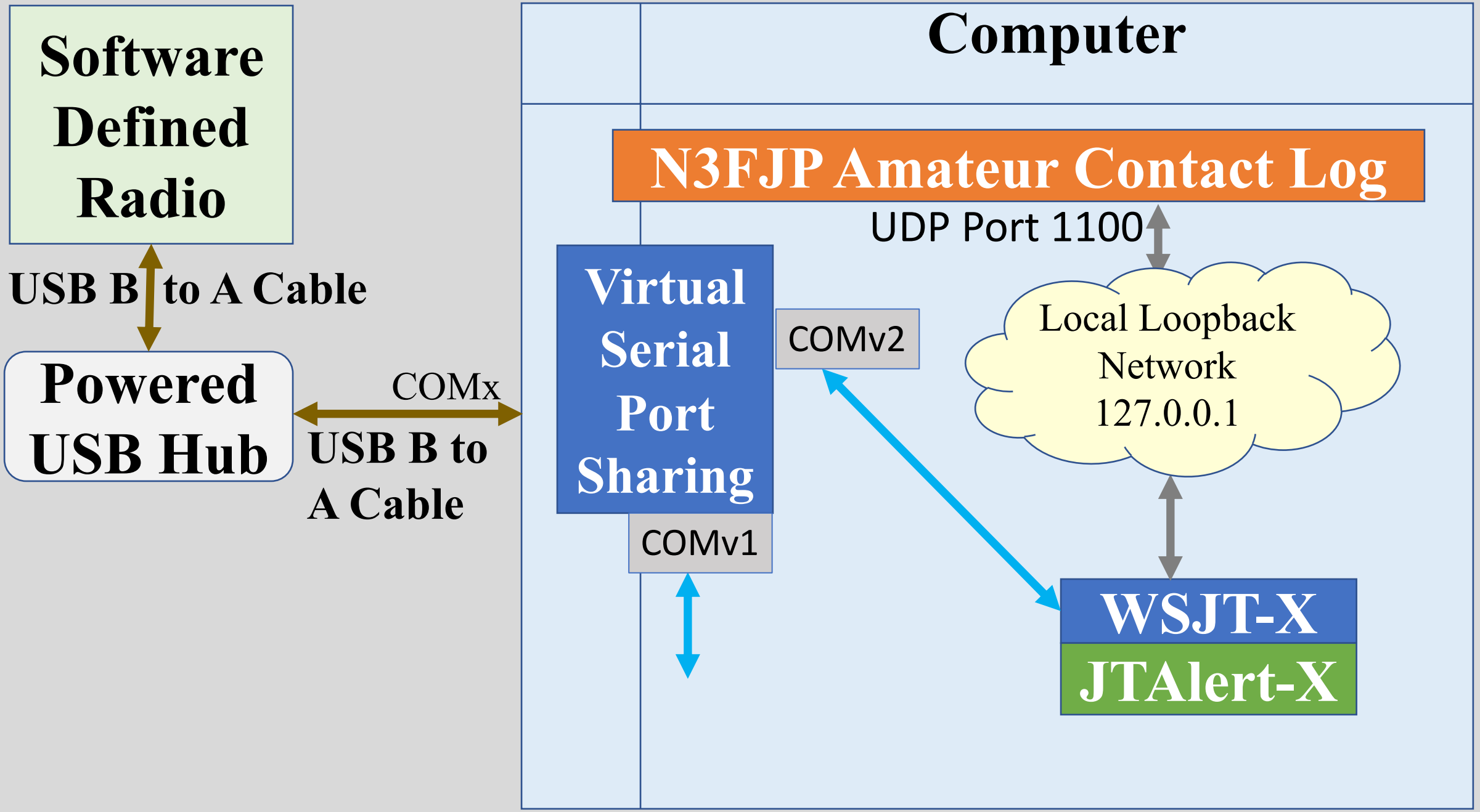
You need to have installed tqsl from the ARRL's Logbook of the World website and successfully uploaded at least one QSO before checking the "Enabling Real Time Upload" checkbox.

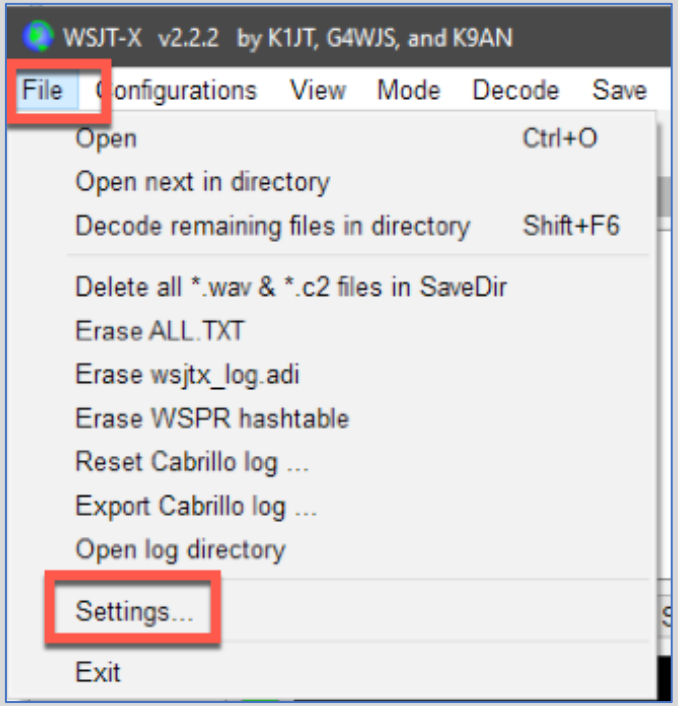
I wrote an article for Hamgab years ago on setting up LotW. I am updating that article to appear in the October 2020 Hamgab.

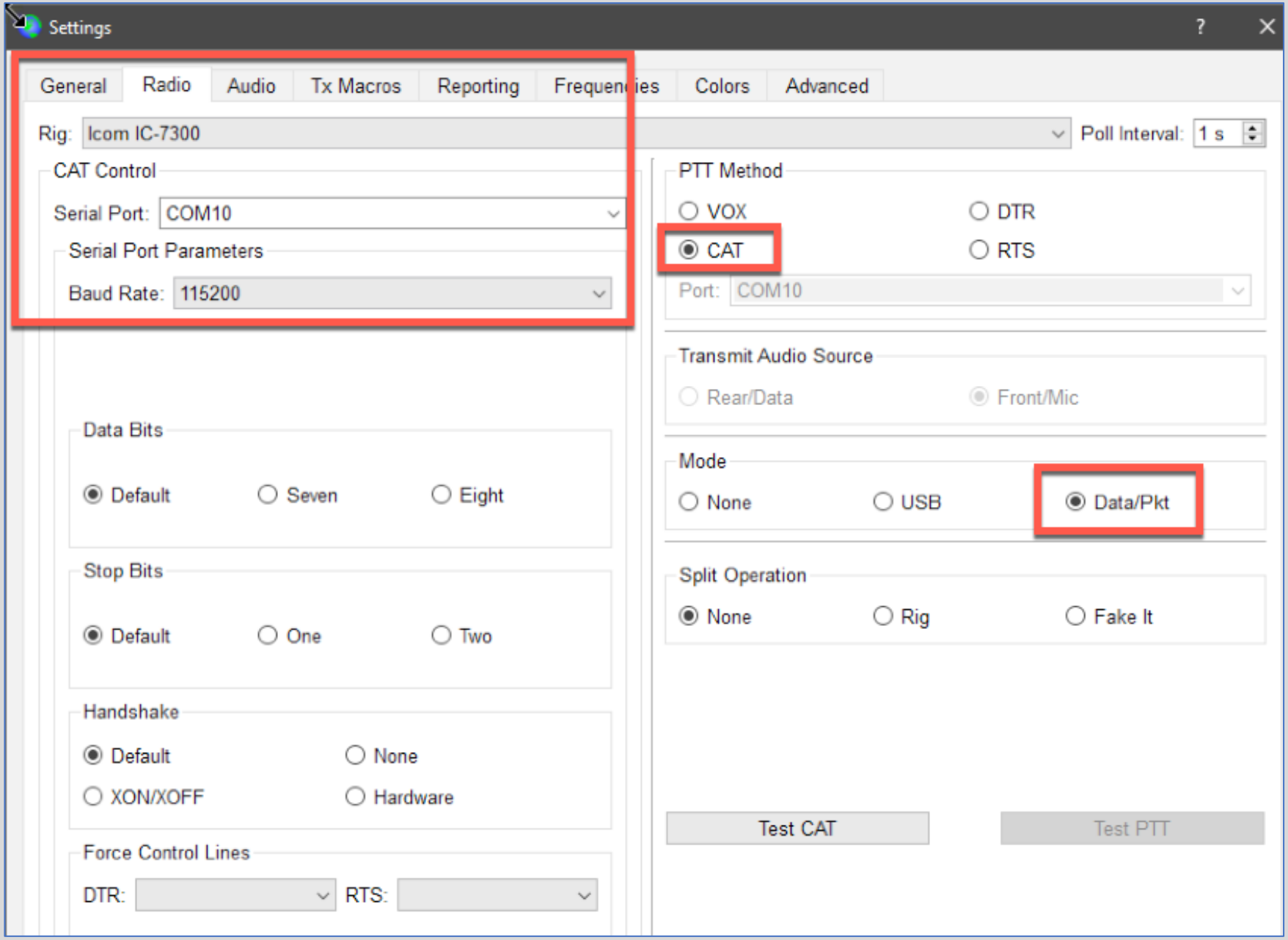
I am willing to help If anyone needs help setting up LotW.

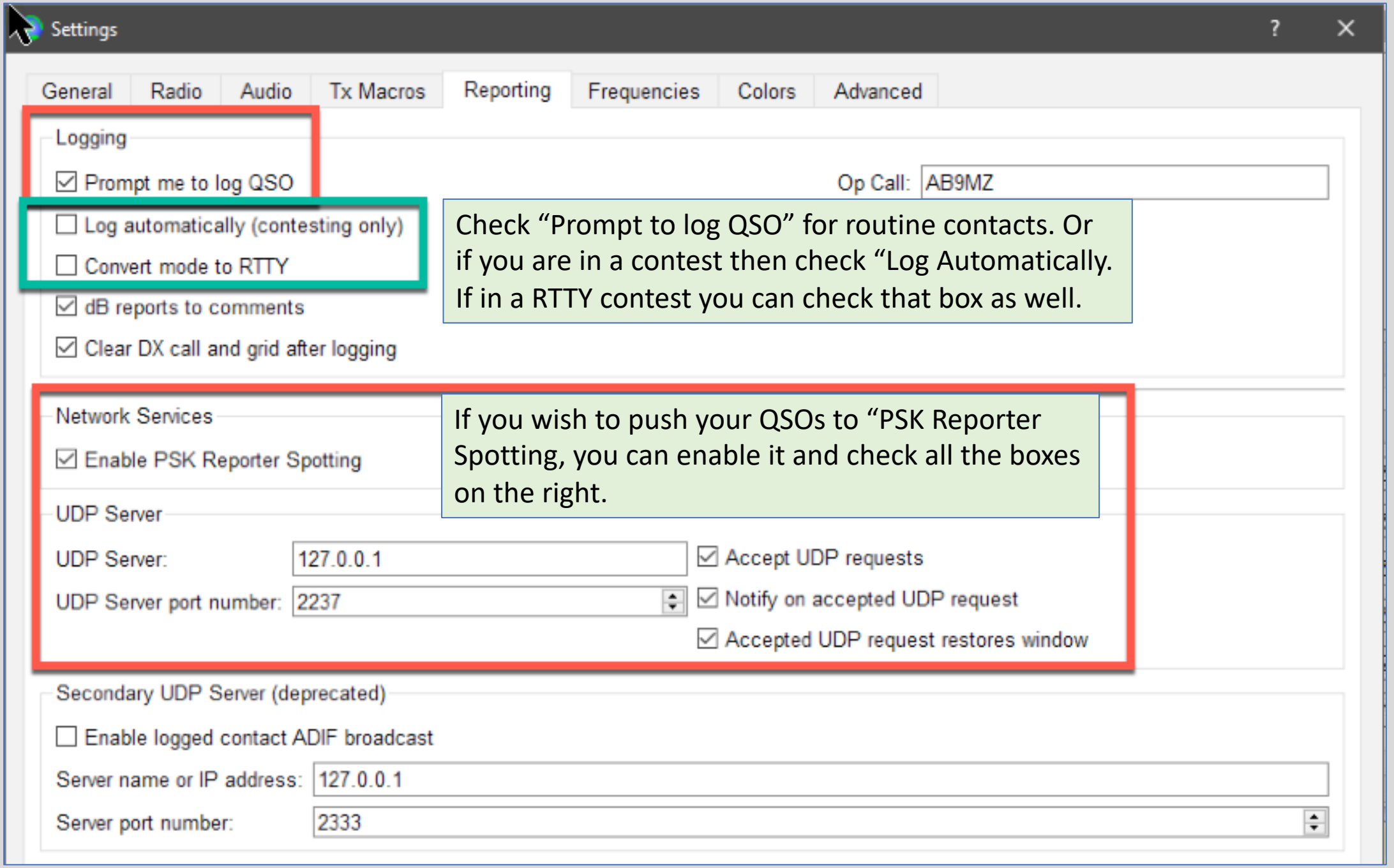


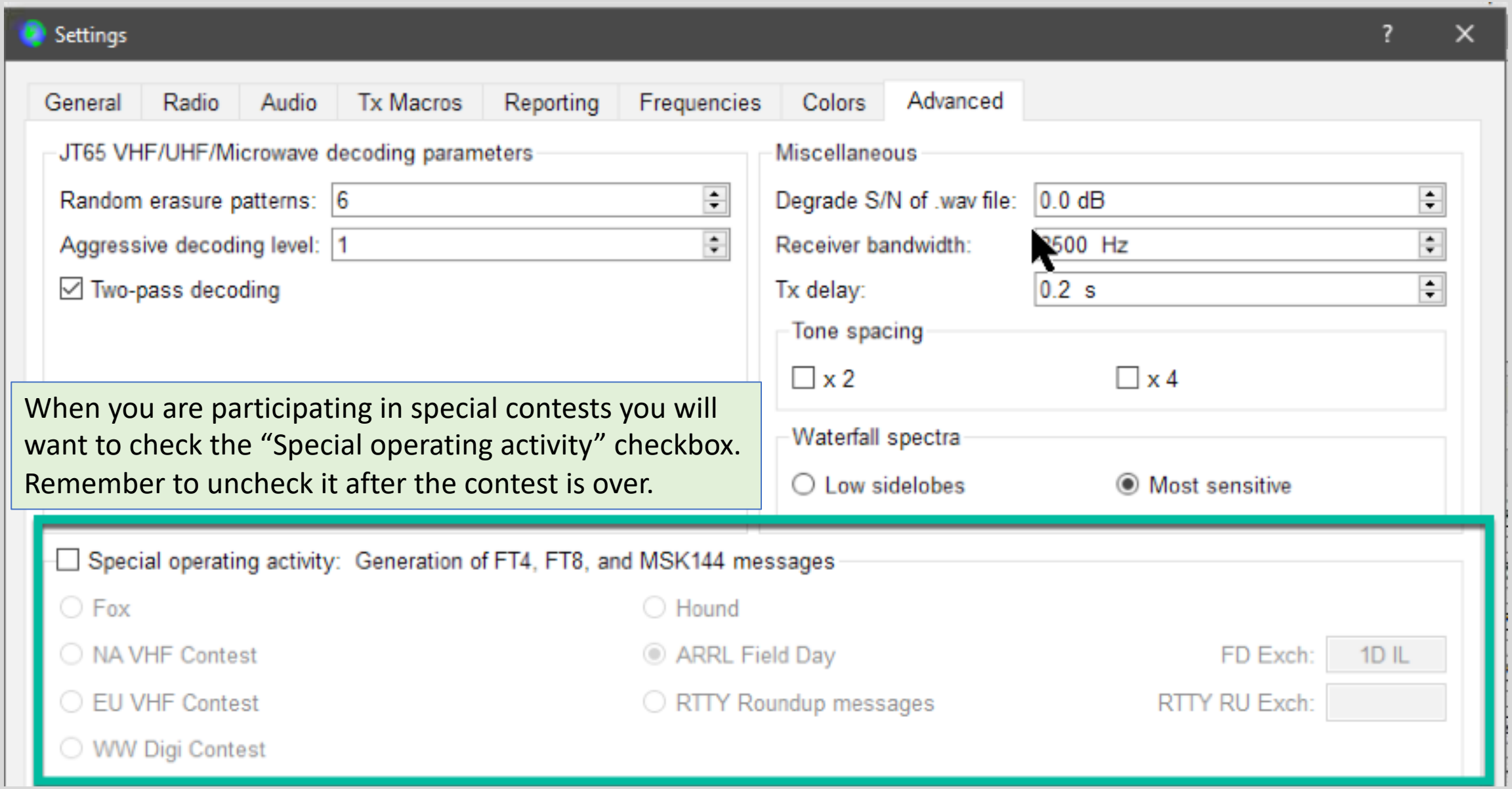

QRZ or other
Callsign Database
LotW
Club Log
QSL.CC
Internet
N3FJP Amateur Contact Log
Local Loopback
Network
127.0.0.1
Local Call Sign
Database

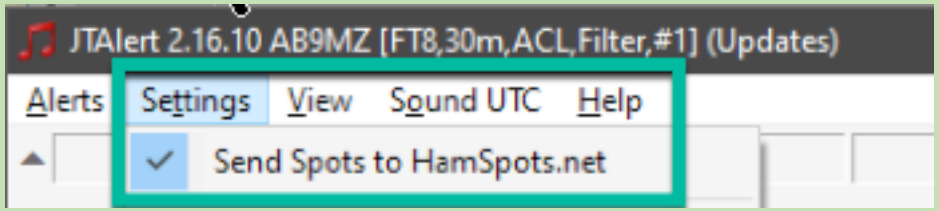

Software Defined Radio
USB B to A Cable
Powered USB Hub
COMx
USB B to A Cable
Computer
N3FJP Amateur Contact Log
UDP Port 1100
Virtual Serial Port Sharing
COMv2
COMv1
Local Loopback Network 127.0.0.1
WSJT-X
JTAlert-X


WSJT-X v2.2.2 by K1JT, G4WJS, and K9AN
File
Configurations
View
Mode
Decode
Save
Open Ctrl+O
Open next in directory
Decode remaining files in directory Shift+F6
Delete all *.wav & *.c2 files in SaveDir
Erase ALL.TXT
Erase wsjtx_log.adi
Erase WSPR hashtable
Reset Cabrillo log ...
Export Cabrillo log ...
Open log directory
Settings...
Exit

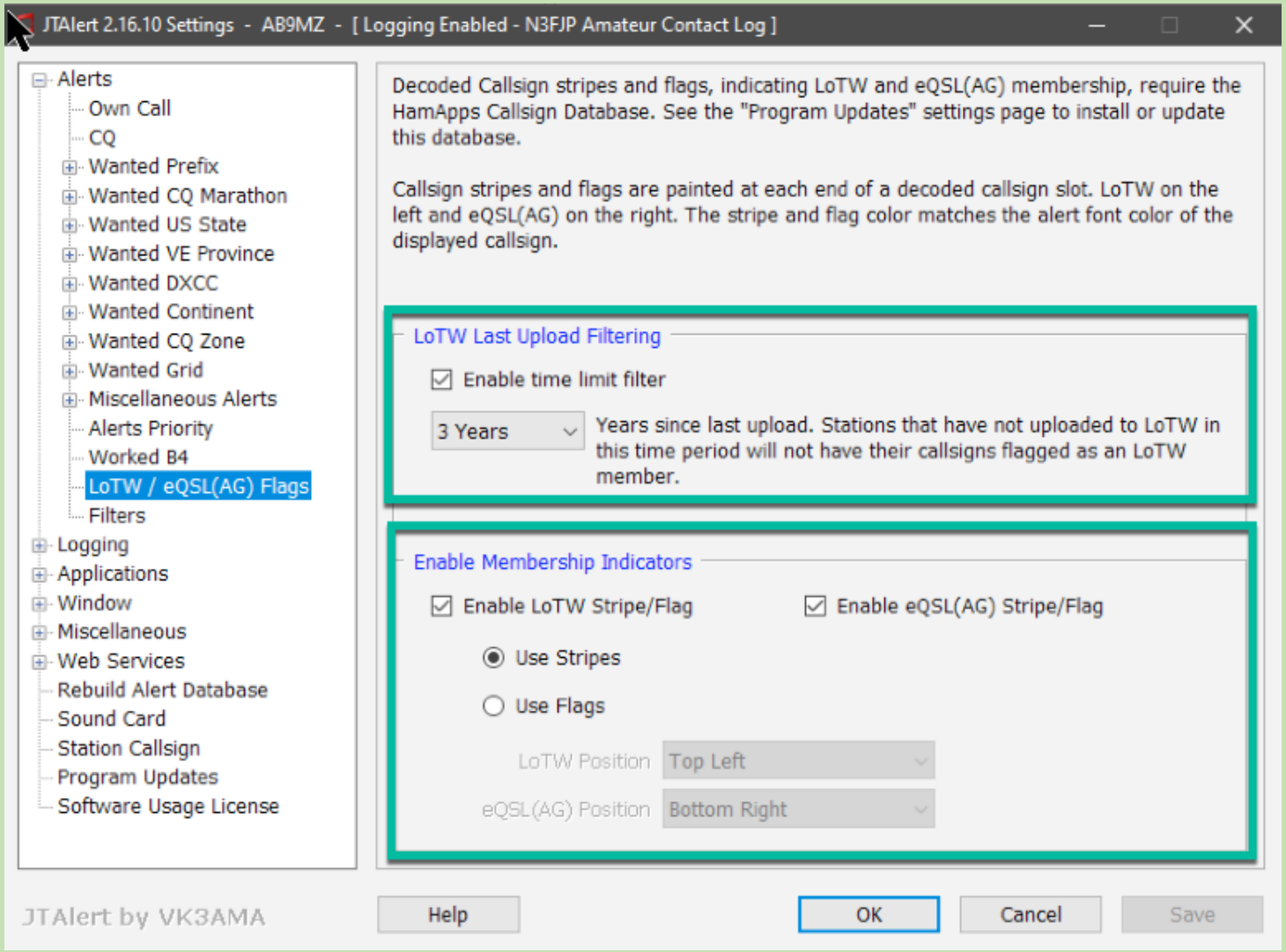

Settings
General
Radio
Audio
Tx Macros
Reporting
Colors
Advanced
Rig: Icom IC-7300
Poll Interval: 1 s
CAT Control
Serial Port: COM10
Serial Port Parameters
Baud Rate: 115200
Data Bits
Default
Seven
Eight
Stop Bits
Default
One
Two
Handshake
Default
None
XON/XOFF
Hardware
Force Control Lines
DTR:
RTS:
PTT Method
VOX
DTR
CAT
RTS
Port: COM10
Transmit Audio Source
Rear/Data
Front/Mic
Mode
None
USB
Data/Pkt
Split Operation
None
Rig
Fake It
Test CAT
Test PTT

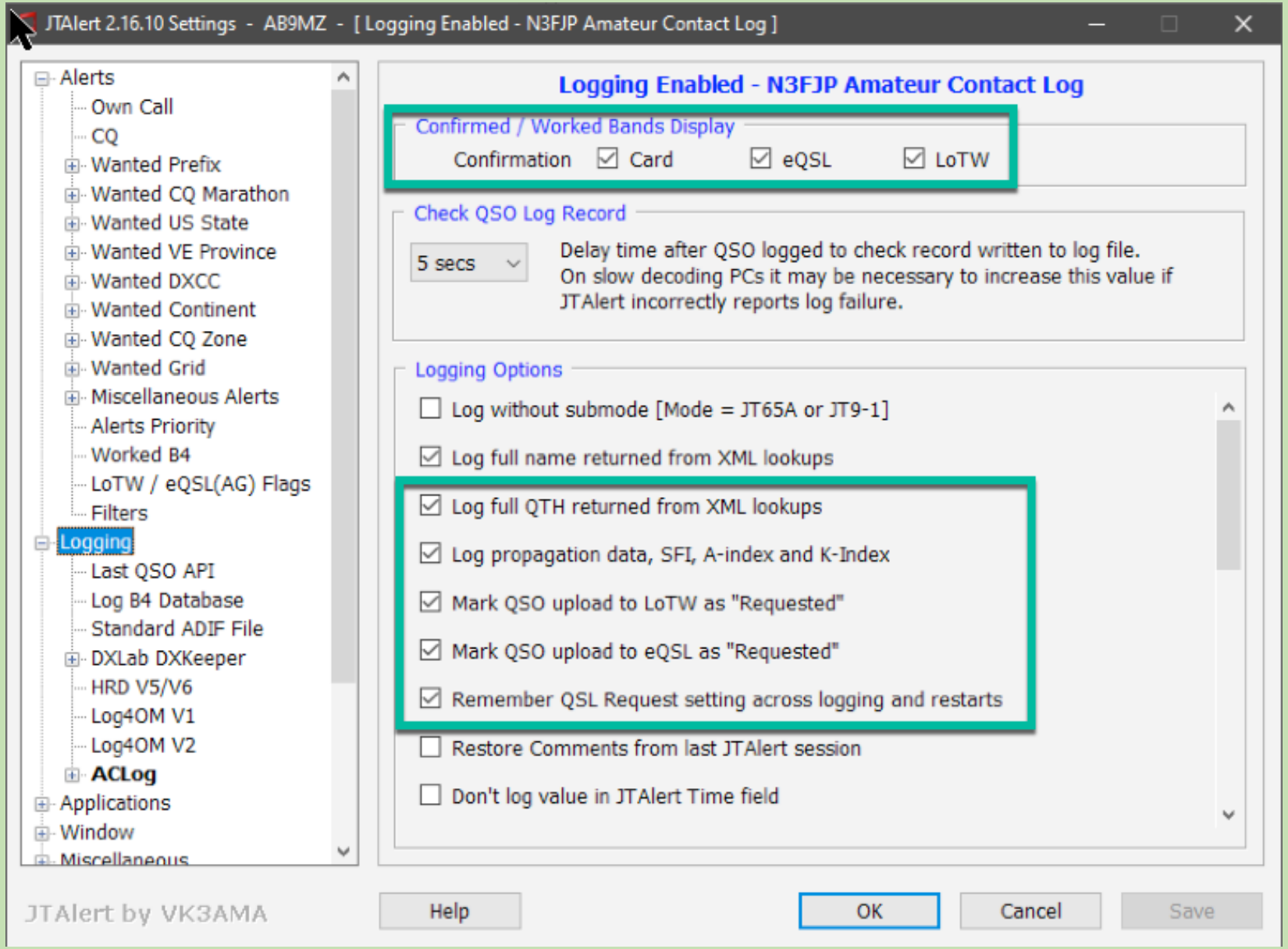

Settings
General
Radio
Audio
Tx Macros
Reporting
Frequencies
Colors
Advanced
Logging
Prompt me to log QSO
Log automatically (contesting only)
Convert mode to RTTY
dB reports to comments
Clear DX call and grid after logging
Op Call: AB9MZ
Check “Prompt to log QSO” for routine contacts. Or if you are in a contest then check “Log Automatically. If in a RTTY contest you can check that box as well.
Network Services
Enable PSK Reporter Spotting
If you wish to push your QSOs to “PSK Reporter Spotting, you can enable it and check all the boxes on the right.
UDP Server
UDP Server: 127.0.0.1
UDP Server port number: 2237
Accept UDP requests
Notify on accepted UDP request
Accepted UDP request restores window
Secondary UDP Server (deprecated)
Enable logged contact ADIF broadcast
Server name or IP address: 127.0.0.1
Server port number: 2333

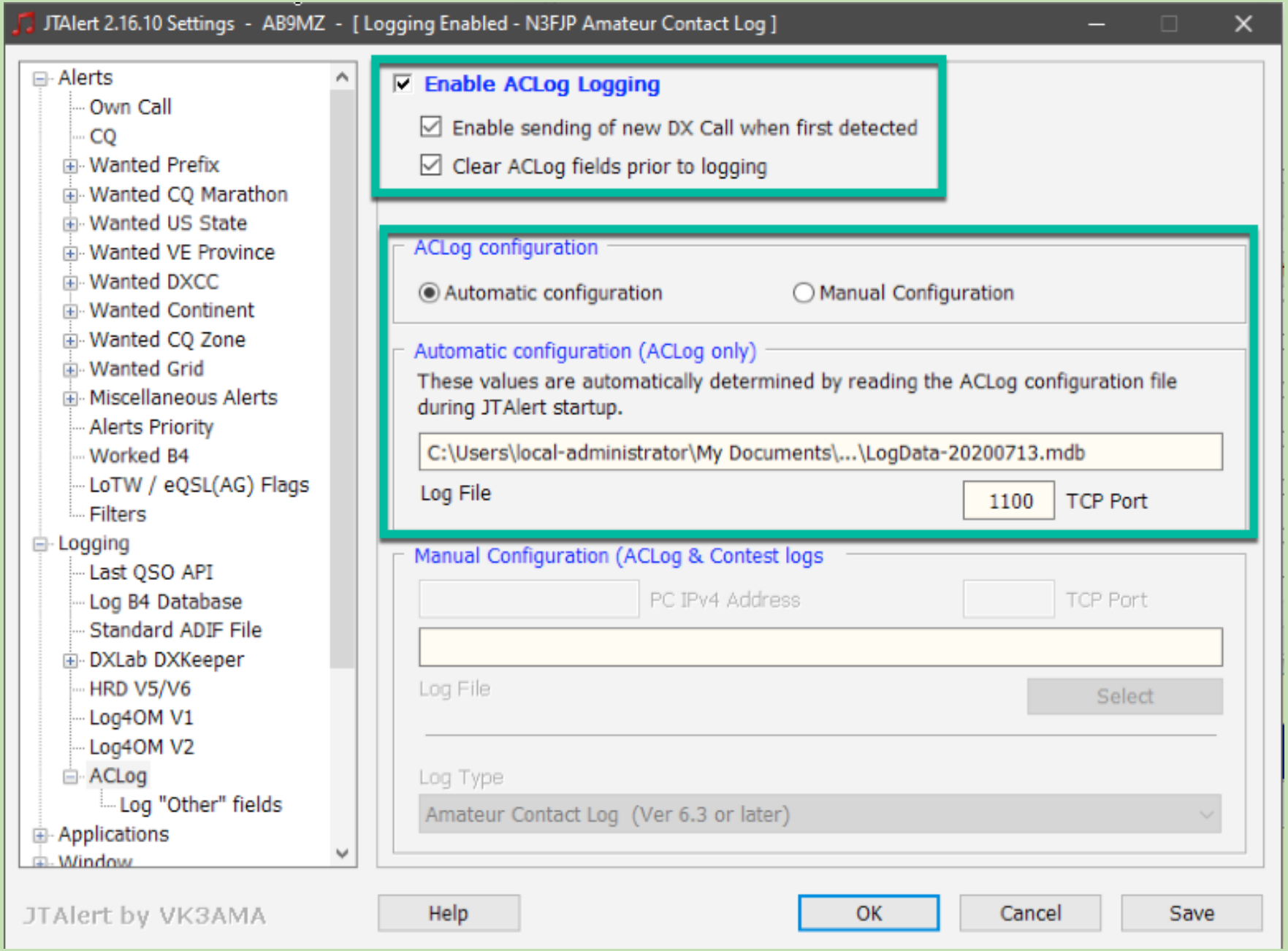

Settings
General
Radio
Audio
Tx Macros
Reporting
Frequencies
Colors
Advanced
JT65 VHF/UHF/Microwave decoding parameters
Random erasure patterns: 6
Aggressive decoding level: 1
Two-pass decoding
Miscellaneous
Degrade S/N of .wav file: 0.0 dB
Receiver bandwidth: 2500 Hz
Tx delay: 0.2 s
Tone spacing
x 2
x 4
Waterfall spectra
Low sidelobes
Most sensitive
When you are participating in special contests you will want to check the “Special operating activity” checkbox. Remember to uncheck it after the contest is over.
Special operating activity: Generation of FT4, FT8, and MSK144 messages
Fox
Hound
NA VHF Contest
ARRL Field Day
FD Exch: 1D IL
EU VHF Contest
RTTY Roundup messages
RTTY RU Exch:
WW Digi Contest


JTAlert 2.16.10 AB9MZ [FT8,30m,ACL,Filter,#1] (Updates)
Alerts
Settings
View
Sound UTC
Help
Send Spots to HamSpots.net

JTAlert-X


JTAlert 2.16.10 Settings - AB9MZ - [Logging Enabled - N3FJP Amateur Contact Log]
Alerts
Own Call
CQ
Wanted Prefix
Wanted CQ Marathon
Wanted US State
Wanted VE Province
Wanted DXCC
Wanted Continent
Wanted CQ Zone
Wanted Grid
Miscellaneous Alerts
Alerts Priority
Worked B4
LoTW / eQSL(AG) Flags
Filters
Logging
Applications
Window
Miscellaneous
Web Services
Rebuild Alert Database
Sound Card
Station Callsign
Program Updates
Software Usage License
Decoded Callsign stripes and flags, indicating LoTW and eQSL(AG) membership, require the HamApps Callsign Database. See the "Program Updates" settings page to install or update this database.
Callsign stripes and flags are painted at each end of a decoded callsign slot. LoTW on the left and eQSL(AG) on the right. The stripe and flag color matches the alert font color of the displayed callsign.
LoTW Last Upload Filtering
Enable time limit filter
3 Years
Years since last upload. Stations that have not uploaded to LoTW in this time period will not have their callsigns flagged as an LoTW member.
Enable Membership Indicators
Enable LoTW Stripe/Flag
Enable eQSL(AG) Stripe/Flag
Use Stripes
Use Flags
LoTW Position
Top Left
eQSL(AG) Position
Bottom Right
JTAlert by VK3AMA
Help
OK
Cancel
Save


JTAlert 2.16.10 Settings - AB9MZ - [Logging Enabled - N3FJP Amateur Contact Log]
Alerts
Own Call
CQ
Wanted Prefix
Wanted CQ Marathon
Wanted US State
Wanted VE Province
Wanted DXCC
Wanted Continent
Wanted CQ Zone
Wanted Grid
Miscellaneous Alerts
Alerts Priority
Worked B4
LoTW / eQSL(AG) Flags
Filters
Logging
Last QSO API
Log B4 Database
Standard ADIF File
DXLab DXKeeper
HRD V5/V6
Log4OM V1
Log4OM V2
ACLog
Applications
Window
Miscellaneous
Logging Enabled - N3FJP Amateur Contact Log
Confirmed / Worked Bands Display
Confirmation
Card
eQSL
LoTW
Check QSO Log Record
5 secs
Delay time after QSO logged to check record written to log file.
On slow decoding PCs it may be necessary to increase this value if
JTAlert incorrectly reports log failure.
Logging Options
Log without submode [Mode = JT65A or JT9-1]
Log full name returned from XML lookups
Log full QTH returned from XML lookups
Log propagation data, SFI, A-index and K-Index
Mark QSO upload to LoTW as "Requested"
Mark QSO upload to eQSL as "Requested"
Remember QSL Request setting across logging and restarts
Restore Comments from last JTAlert session
Don't log value in JTAlert Time field
JTAlert by VK3AMA
Help
OK
Cancel
Save


JTAlert 2.16.10 Settings - AB9MZ - [Logging Enabled - N3FJP Amateur Contact Log]
Alerts
Own Call
CQ
Wanted Prefix
Wanted CQ Marathon
Wanted US State
Wanted VE Province
Wanted DXCC
Wanted Continent
Wanted CQ Zone
Wanted Grid
Miscellaneous Alerts
Alerts Priority
Worked B4
LoTW / eQSL(AG) Flags
Filters
Logging
Last QSO API
Log B4 Database
Standard ADIF File
DXLab DXKeeper
HRD V5/V6
Log4OM V1
Log4OM V2
ACLog
Log "Other" fields
Applications
Window
Enable ACLog Logging
Enable sending of new DX Call when first detected
Clear ACLog fields prior to logging
ACLog configuration
Automatic configuration
Manual Configuration
Automatic configuration (ACLog only)
These values are automatically determined by reading the ACLog configuration file during JTAlert startup.
C:\Users\local-administrator\My Documents\...\LogData-20200713.mdb
Log File
1100
TCP Port
Manual Configuration (ACLog & Contest logs
PC IPv4 Address
TCP Port
Log File
Select
Log Type
Amateur Contact Log (Ver 6.3 or later)
JTAlert by VK3AMA
Help
OK
Cancel
Save

JTAlert 2.16.10 Settings - AB9MZ - [Logging Enabled - N3FJP Amateur Contact Log]

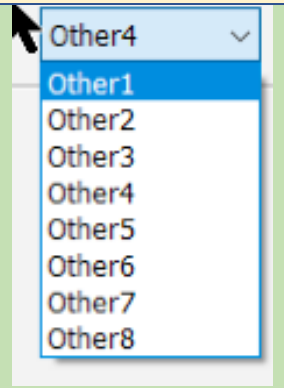
- Wanted Continent
- Wanted CQ Zone
- Wanted Grid
- Miscellaneous Alerts
- Alerts Priority
- Worked B4
- LoTW / eQSL(AG) Flags
- Filters
- Logging
  - Last QSO API
  - Log B4 Database
  - Standard ADIF File
  - DXLab DXKeeper
  - HRD V5/V6
  - Log4OM V1
  - Log4OM V2
  - ACLog
    - Log "Other" fields
- Applications
- Window
- Miscellaneous
- Web Services
- Rebuild Alert Database
- Sound Card
- Station Callsign
- Program Updates
- Software Usage License

Additional Log Fields (Other Fields)

Other8	Enable logging QTH to this field
Other7	Enable logging QSLMSG to this field
Other6	Enable logging WSJT-X gridsquare to this fie
Other5	Enable logging WSJT-X contest exch rcvd to this fie
Other4	Enable logging WSJT-X contest exch sent to this field

These settings are subjective. If you like more details in your logs then consider leveraging this additional logging into AC Log.

You can change the Otherx field. Field you wish to use.



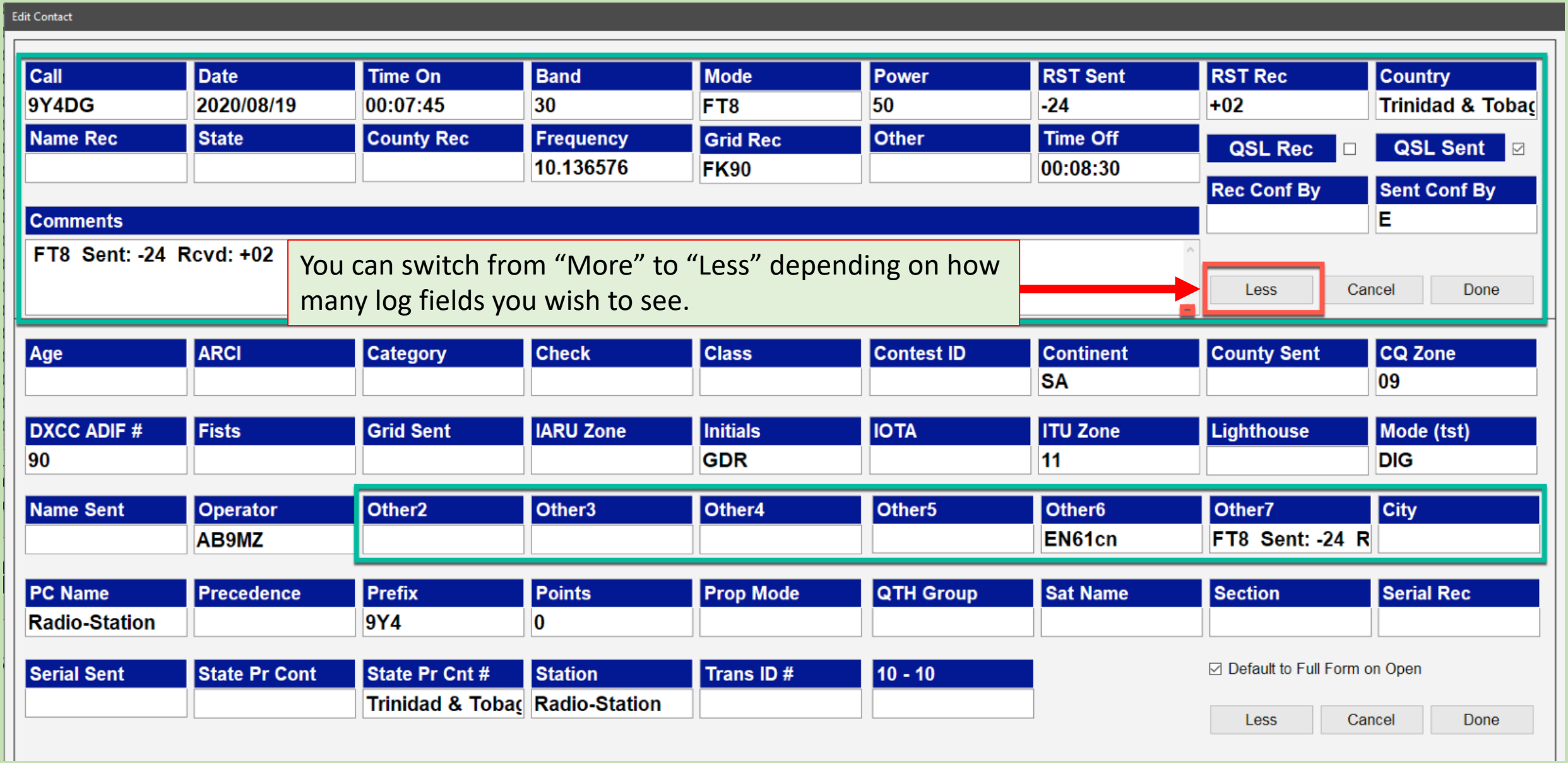
You can rename any fields in AC log. Notice I renamed “Other8” to “City”.

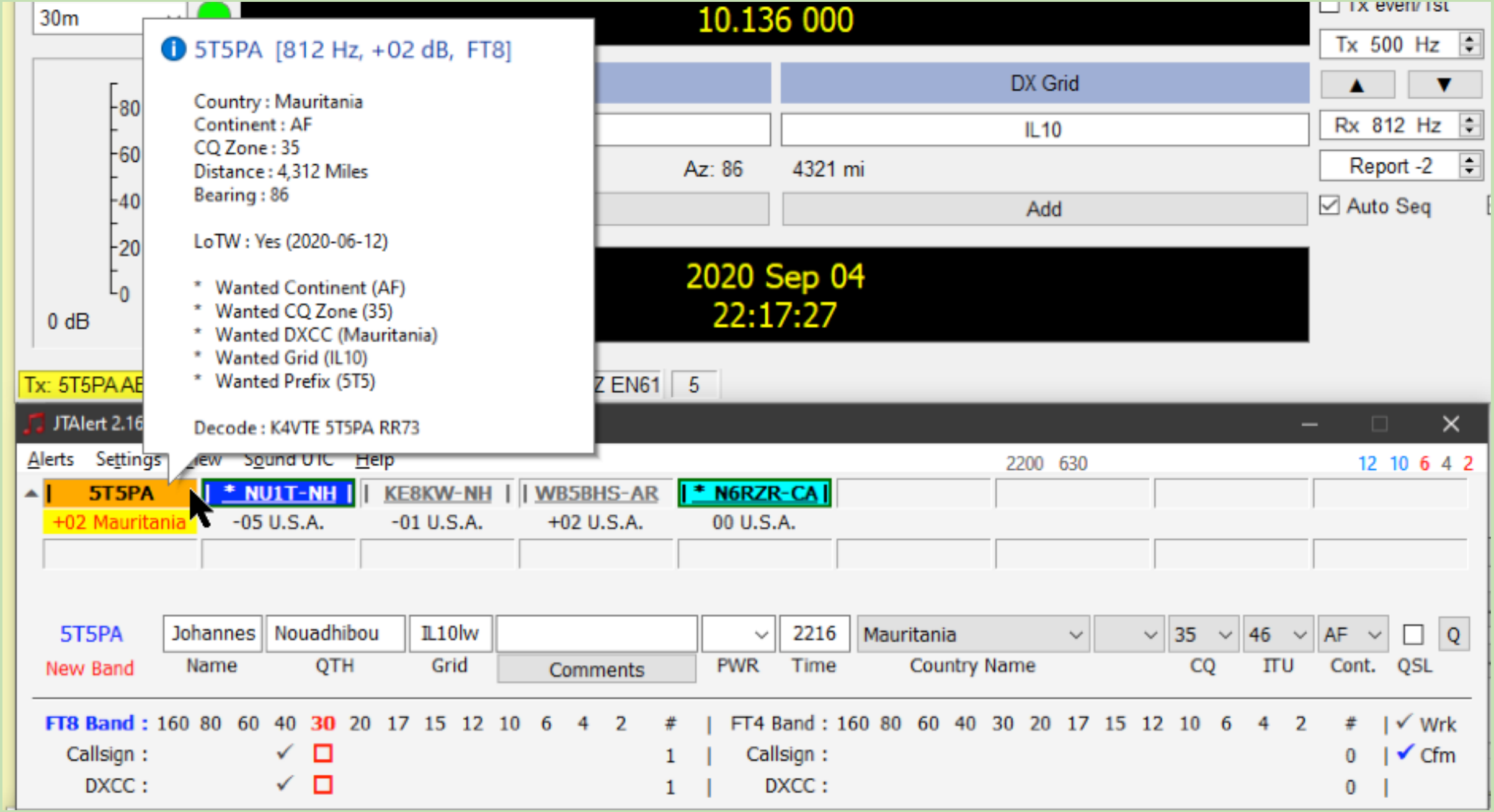
Initials	IOTA	ITU Zone	Lighthouse	Mode (tst)
GDR		11		DIG

Other4	Other5	Other6	Other7	City
		EN61cn	FT8 Sent: -24 R	

JTAlert by VK3AMA

Help | OK | Cancel | Save


Edit Contact
Call
9Y4DG
Date
2020/08/19
Time On
00:07:45
Band
30
Mode
FT8
Power
50
RST Sent
-24
RST Rec
+02
Country
Trinidad & Tobag
Name Rec
State
County Rec
Frequency
10.136576
Grid Rec
FK90
Other
Time Off
00:08:30
QSL Rec
QSL Sent
Rec Conf By
Sent Conf By
E
Comments
FT8 Sent: -24 Rcvd: +02
You can switch from “More” to “Less” depending on how many log fields you wish to see.
Less
Cancel
Done
Age
ARCI
Category
Check
Class
Contest ID
Continent
SA
County Sent
CQ Zone
09
DXCC ADIF #
90
Fists
Grid Sent
IARU Zone
Initials
GDR
IOTA
ITU Zone
11
Lighthouse
Mode (tst)
DIG
Name Sent
Operator
AB9MZ
Other2
Other3
Other4
Other5
Other6
EN61cn
Other7
FT8 Sent: -24 R
City
PC Name
Radio-Station
Precedence
Prefix
9Y4
Points
0
Prop Mode
QTH Group
Sat Name
Section
Serial Rec
Serial Sent
State Pr Cont
State Pr Cnt #
Trinidad & Tobag
Station
Radio-Station
Trans ID #
10 - 10
Default to Full Form on Open
Less
Cancel
Done


30m
10.136 000
5T5PA [812 Hz, +02 dB, FT8]
Country : Mauritania
Continent : AF
CQ Zone : 35
Distance : 4,312 Miles
Bearing : 86
LoTW : Yes (2020-06-12)
* Wanted Continent (AF)
* Wanted CQ Zone (35)
* Wanted DXCC (Mauritania)
* Wanted Grid (IL10)
* Wanted Prefix (5T5)
Decode : K4VTE 5T5PA RR73
DX Grid
IL10
Az: 86
4321 mi
Add
Tx 500 Hz
Rx 812 Hz
Report -2
Auto Seq
2020 Sep 04
22:17:27
0 dB
Tx: 5T5PA AE
EN61
5
JTAlert 2.16
Alerts
Settings
Sound
UTC
Help
5T5PA
+02 Mauritania
* NU1T-NH
-05 U.S.A.
KE8KW-NH
-01 U.S.A.
WB5BHS-AR
+02 U.S.A.
* N6RZR-CA
00 U.S.A.
5T5PA
New Band
Johannes
Name
Nouadhibou
QTH
IL10lw
Grid
Comments
PWR
2216
Time
Mauritania
Country Name
35
CQ
46
ITU
AF
Cont.
QSL
Q
FT8 Band : 160 80 60 40 30 20 17 15 12 10 6 4 2 #
Callsign : ✓ 1
DXCC : ✓ 1
FT4 Band : 160 80 60 40 30 20 17 15 12 10 6 4 2 #
Callsign : 0
DXCC : 0
✓ Wrk
✓ Cfm

WSJT-X Modes

Modes in *WSJT-X*

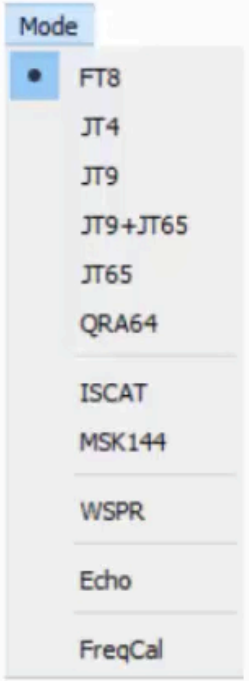
Scatter → "Fast"

- MSK144
- JT9 E-H
- ISCAT

QRP, EME, … → "Slow"

- FT8
- JT4
- JT9
- JT65
- QRA64
- WSPR

Echo



Why multiple modes?

Different propagation modes require different protocols.

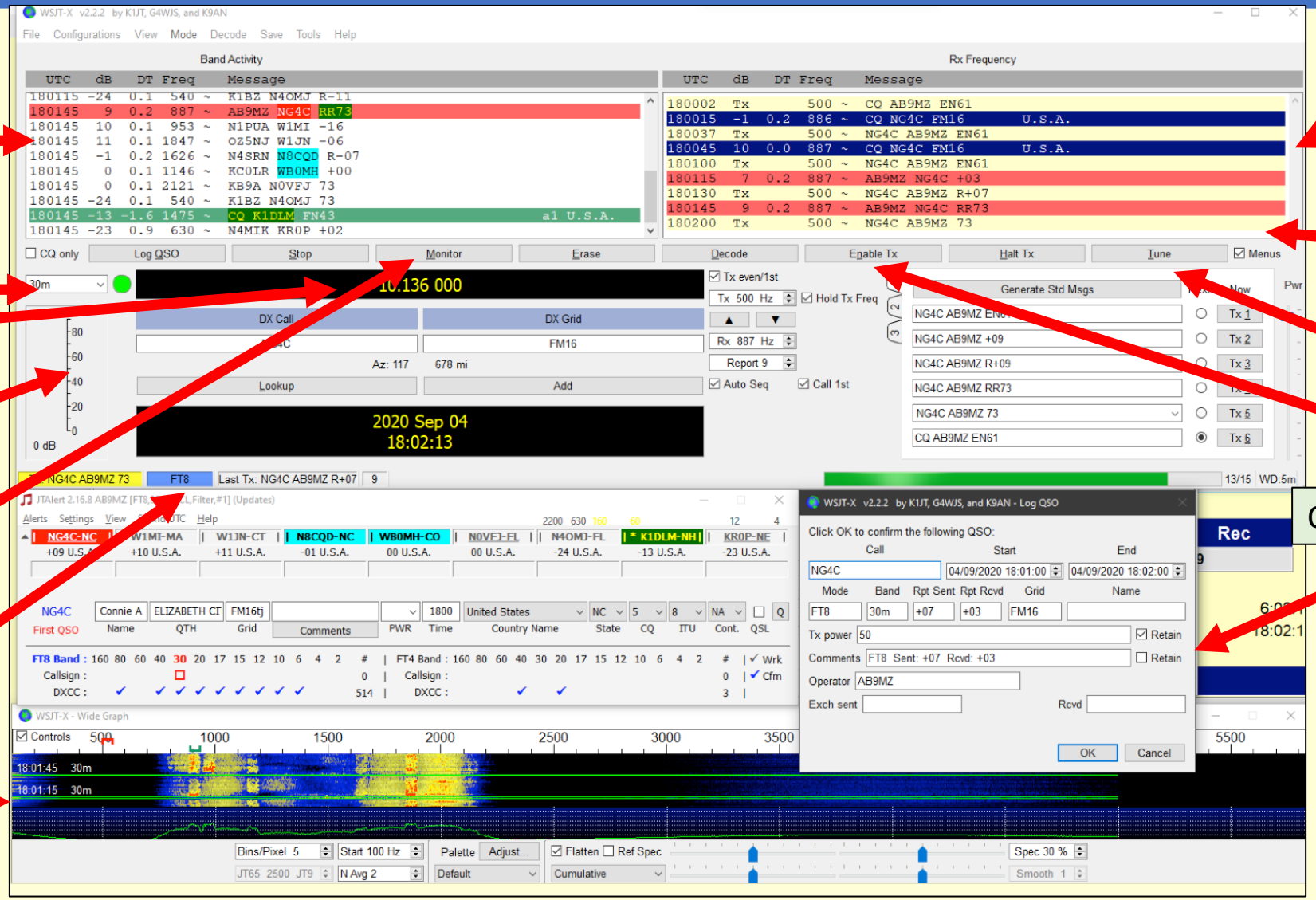
…and many different applications.

QRP Dxing
Certificate Hunting
- ARRL International Grid Chase

VHF Contesting
Meteor Scatter
Moon bounce
Asteroid bounce
Airplane bounce

All modes use a fixed length block.

WSJT-X FT8 Operating Screen



Band Activity

Operating Band &Frequency

Operating Band

Monitor Button

Mode

Waterfall and Spectrum

Received Window

FT8 Dialogue

Tune

Enable Tx

QSO Confirmation Box

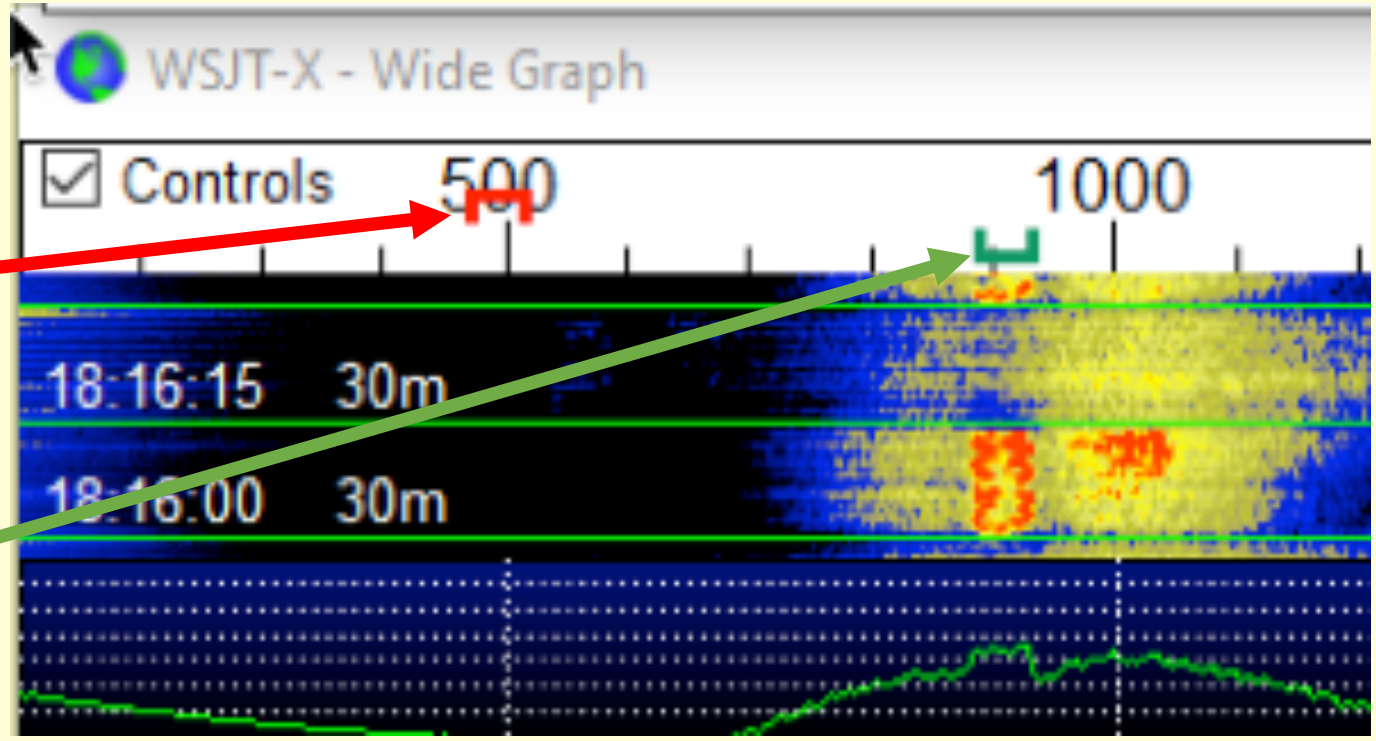
FT8 Xmit and Recv Cursors

Transmit Cursor

Set using
<Shift><Left Mouse Click>

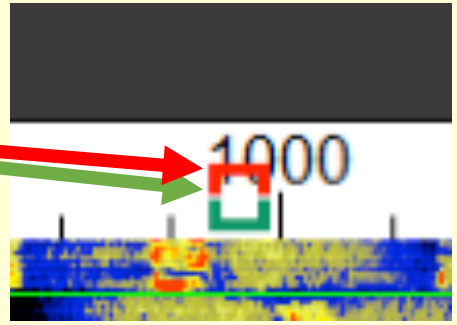
Receive Cursor

Set using
<Left Mouse Click>



Both Cursors

Set using
<Ctrl><Right Mouse Click>



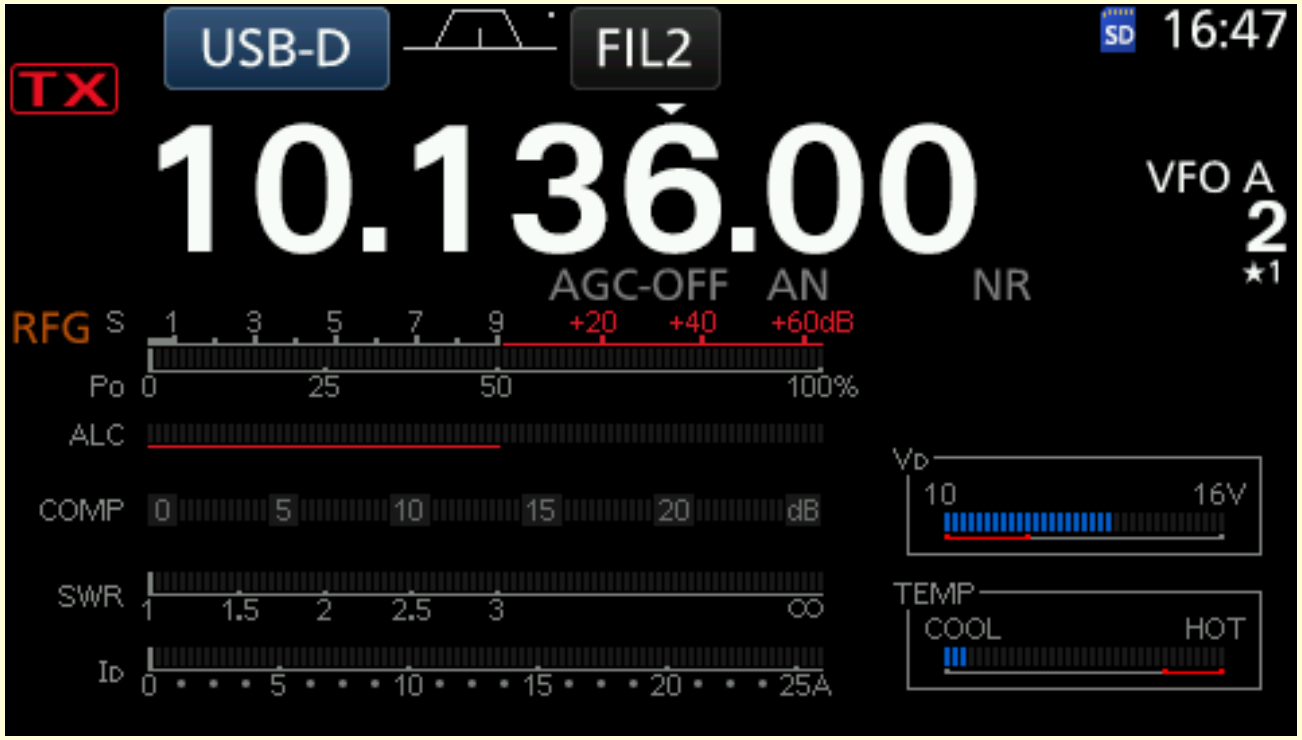
Low Signal Mode Best Practices (1)

- Study your propagation reports.
- The exception is when they are in fox / hound mode.
- Or if DX target is using the special DeXpedition mode.
- Learn to use <F5>, the chat mode in JTAlert-X to request a do over if something went awry.
- You may here them, but they may not hear you.

Low Signal Mode Best Practices (2)

- ALC **Minimum** / maybe one-bar.
- AGC **Off** or **Fast.**
- ACC/USB AF Output Level **40%.**
- Set RF Gain should be set relatively low.
- Squelch must be **wide open**.
- Set Power at **30 Watts** to start
- Increase RF Xmit power as needed.

Low Signal Mode Best Practices (2)



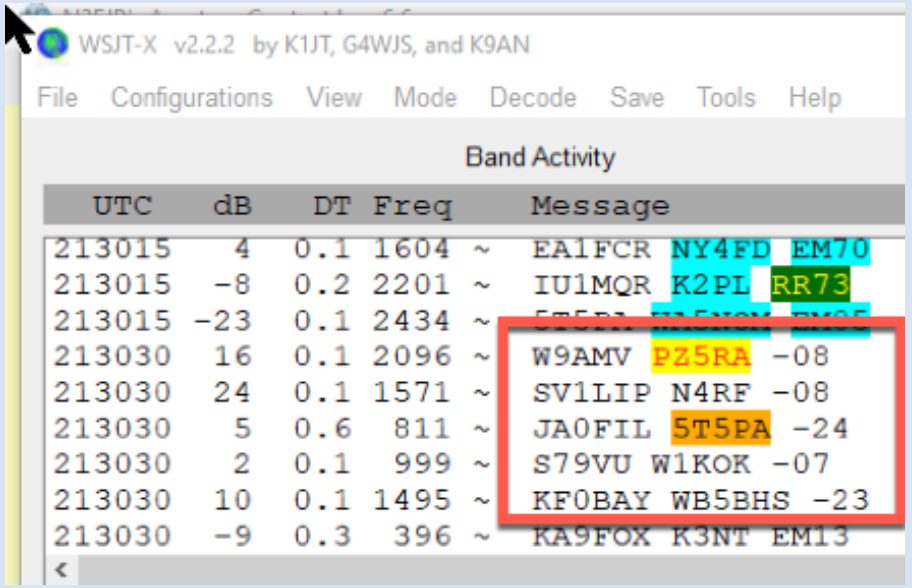
On the IC-7300 you click Functions, Then press and hold AGC. Then rotate the VFO counter-clockwise to make the "Off" option visible.

FT8 Tips and Tricks (1)

- Avoid calling a person already in a QSO.
- If you see someone calling a station you want, look it up & generate the exchange sequence.

J68ml ab9mz -10

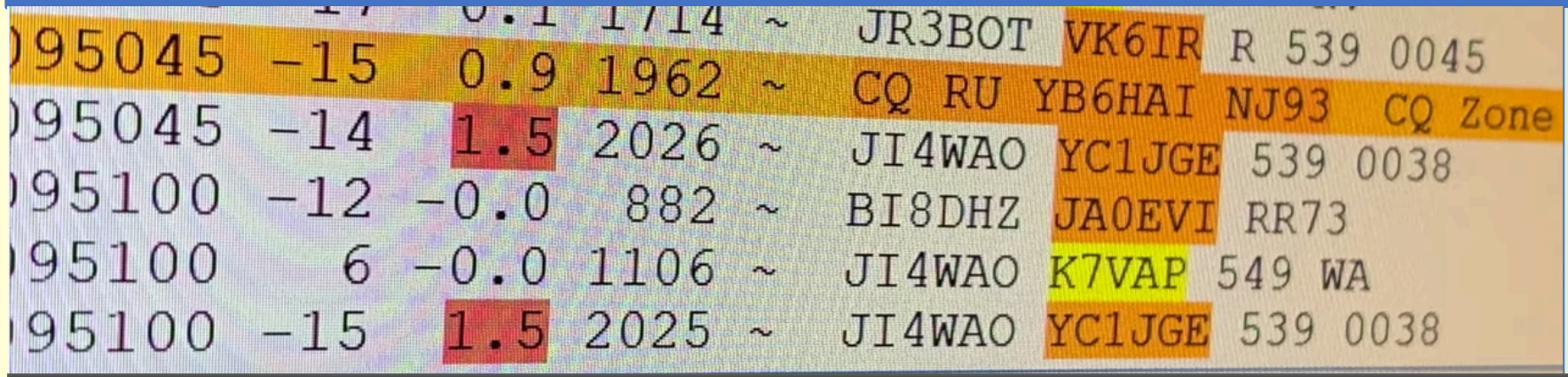
- Pounce when QSO ends.



FT8 Tips and Tricks (2)

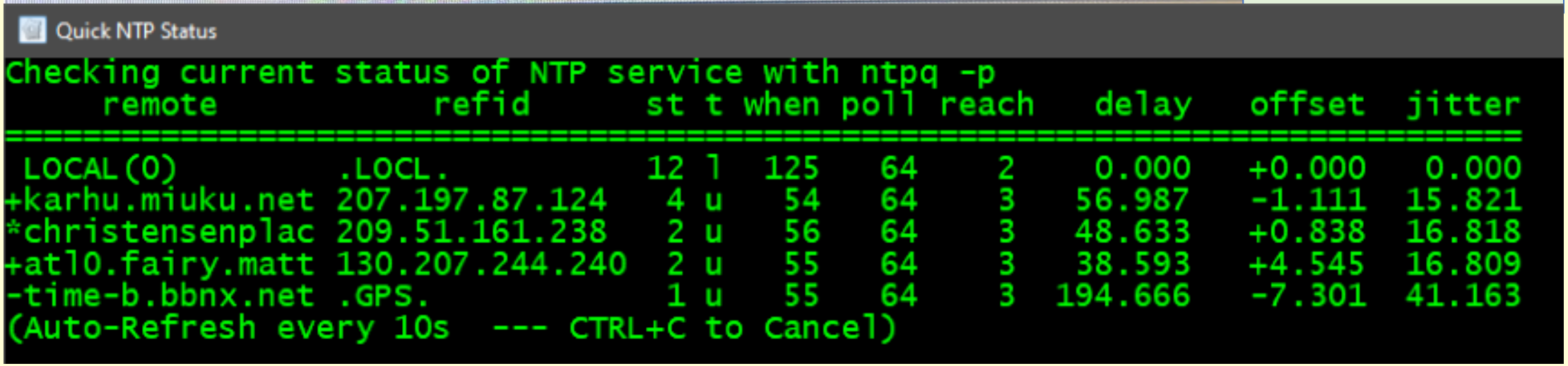
- Contest stations often filter above the1st KHz.
- Transmit in the 1st KHz, that is where they listen.
- Place your transmit cursor in the 1st KHz.
- The “receive cursor” will move to where they Xmit.
- Often moving your Xmit cursor over the Recv cursor can snag a tough contact.

Time is critical for Weak Signal Modes



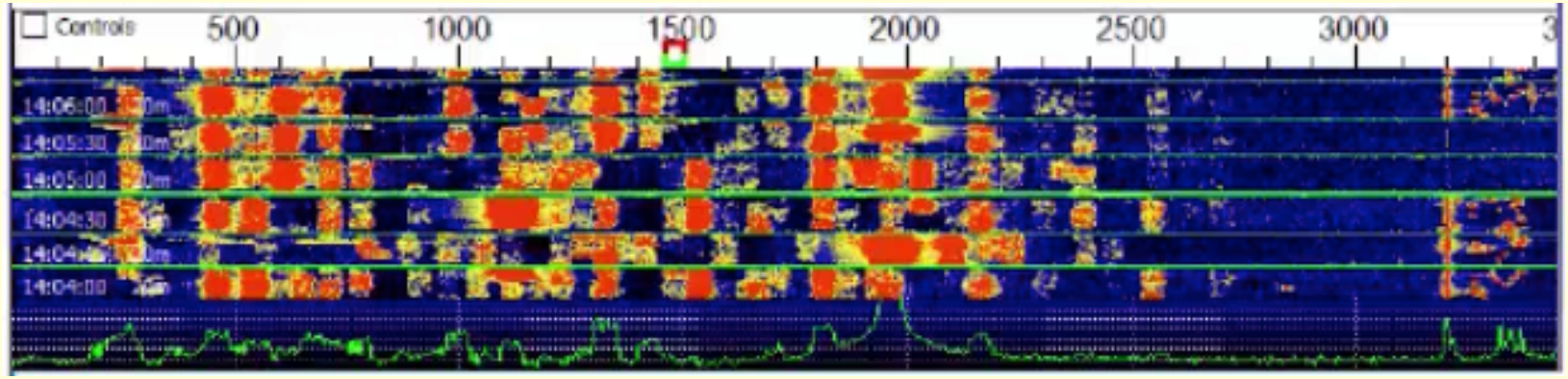
Run a time server on your radio shack's computer

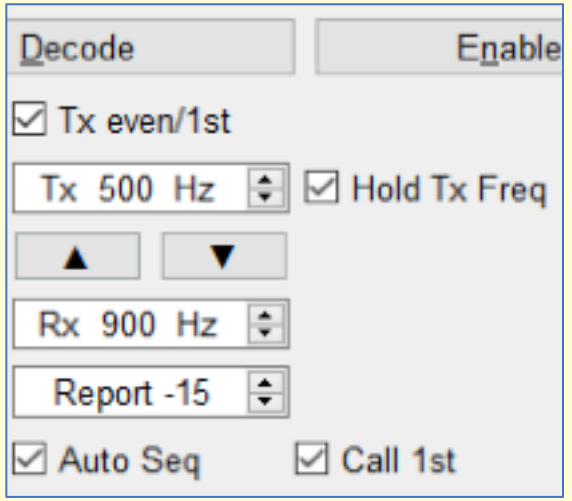
See August Hamgab for my article on time.



Find a space and stay there to Xmit

FT8 uses 50Hz bandwidth.
FT8 is a low signal not a low power mode.
It can decode signals as low as -28db.

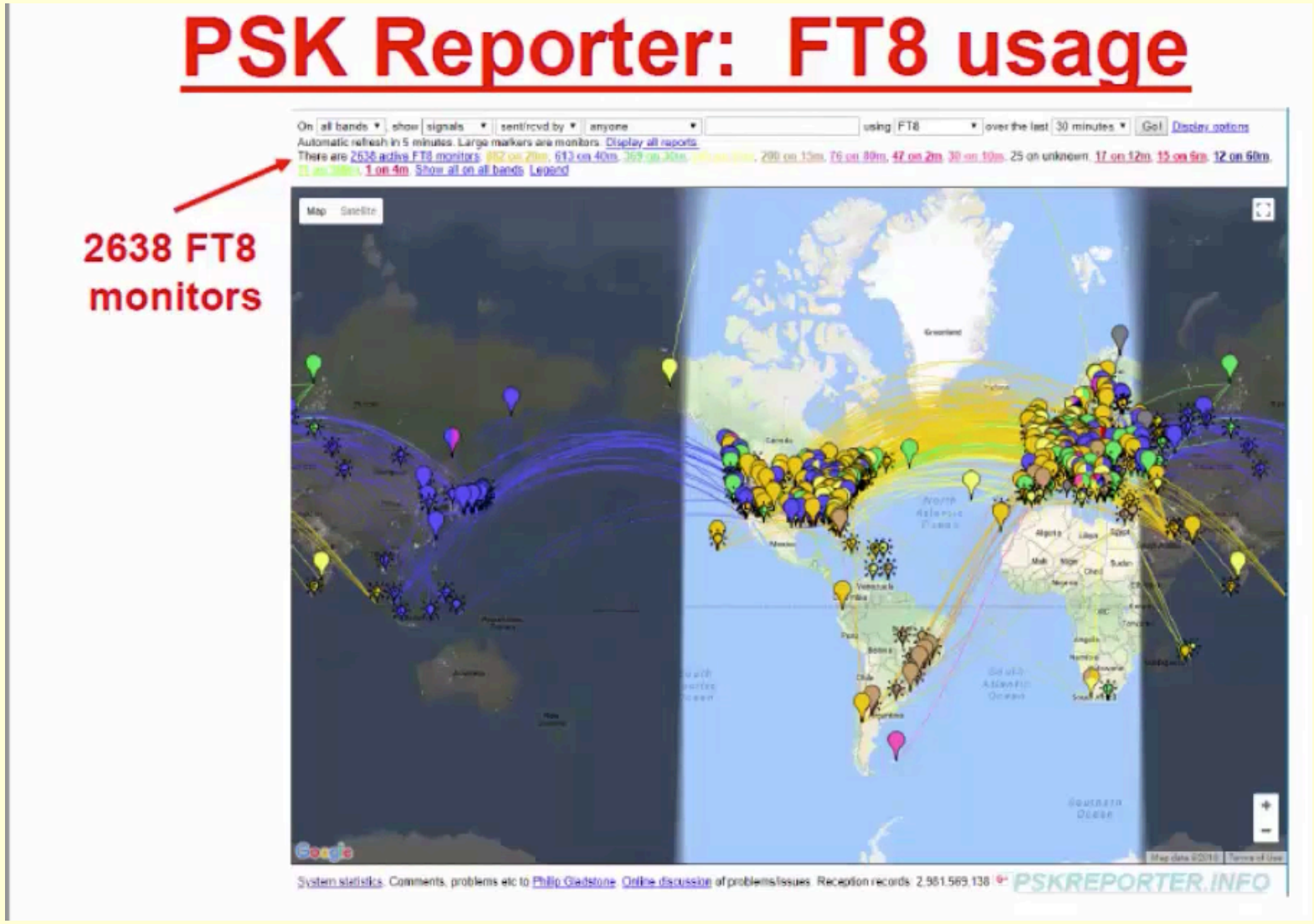




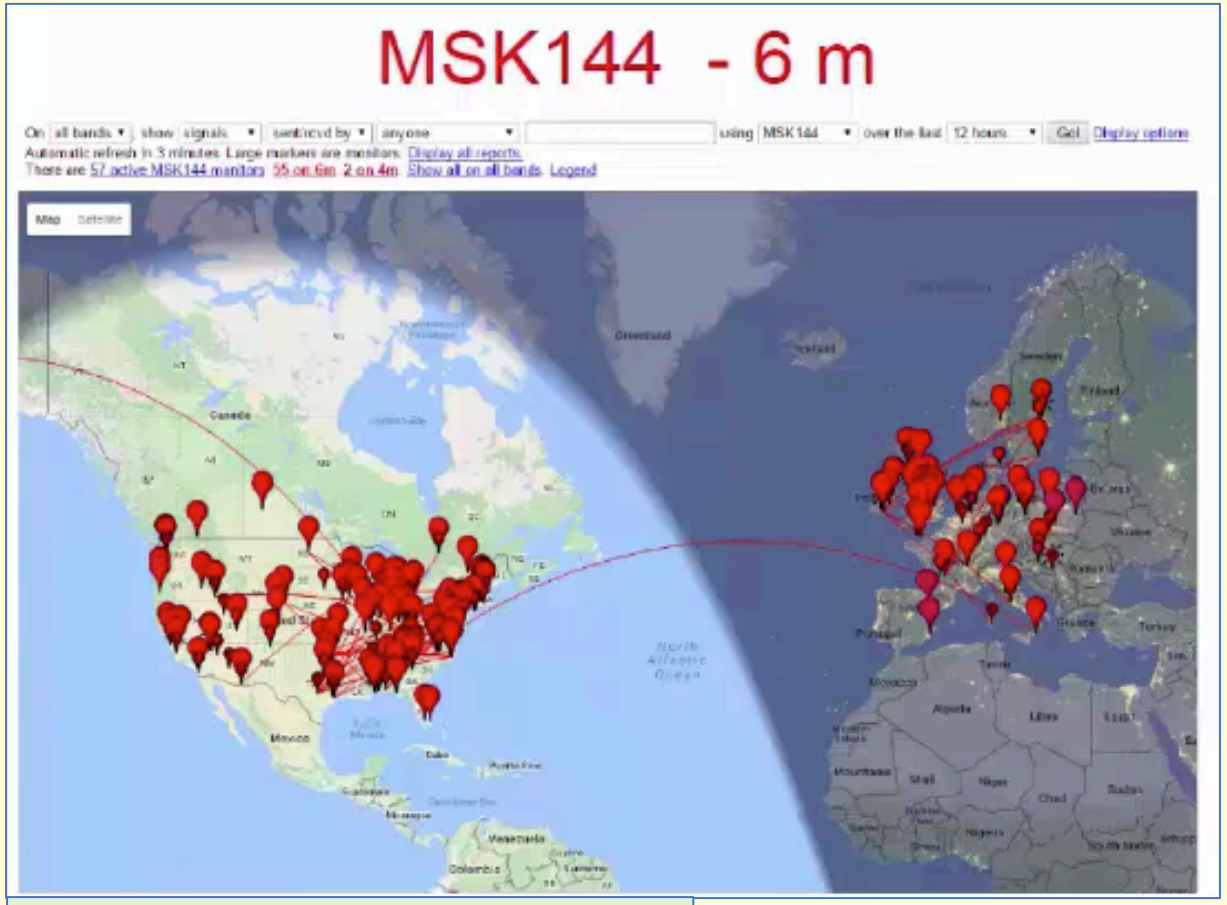
15 Seconds	15 Seconds	15 Seconds	15 Seconds

FT8 Uses Time-Division Multiplexing

PSK Reporter: FT8 Usage



Map Showing MSK144 on 6m



MSK144 is primary useful on 6m

Weak Signal Minimal QSO

Weak-signal minimal QSO,
with structured messages

CQ K1ABC FN42

K1ABC W9XYZ EN37

W9XYZ K1ABC -22

K1ABC W9XYZ R-19

W9XYZ K1ABC RRR

K1ABC W9XYZ 73

Find a space and stay there to Xmit

Calls and locator:

KA1ABC WB9XYZ EN37

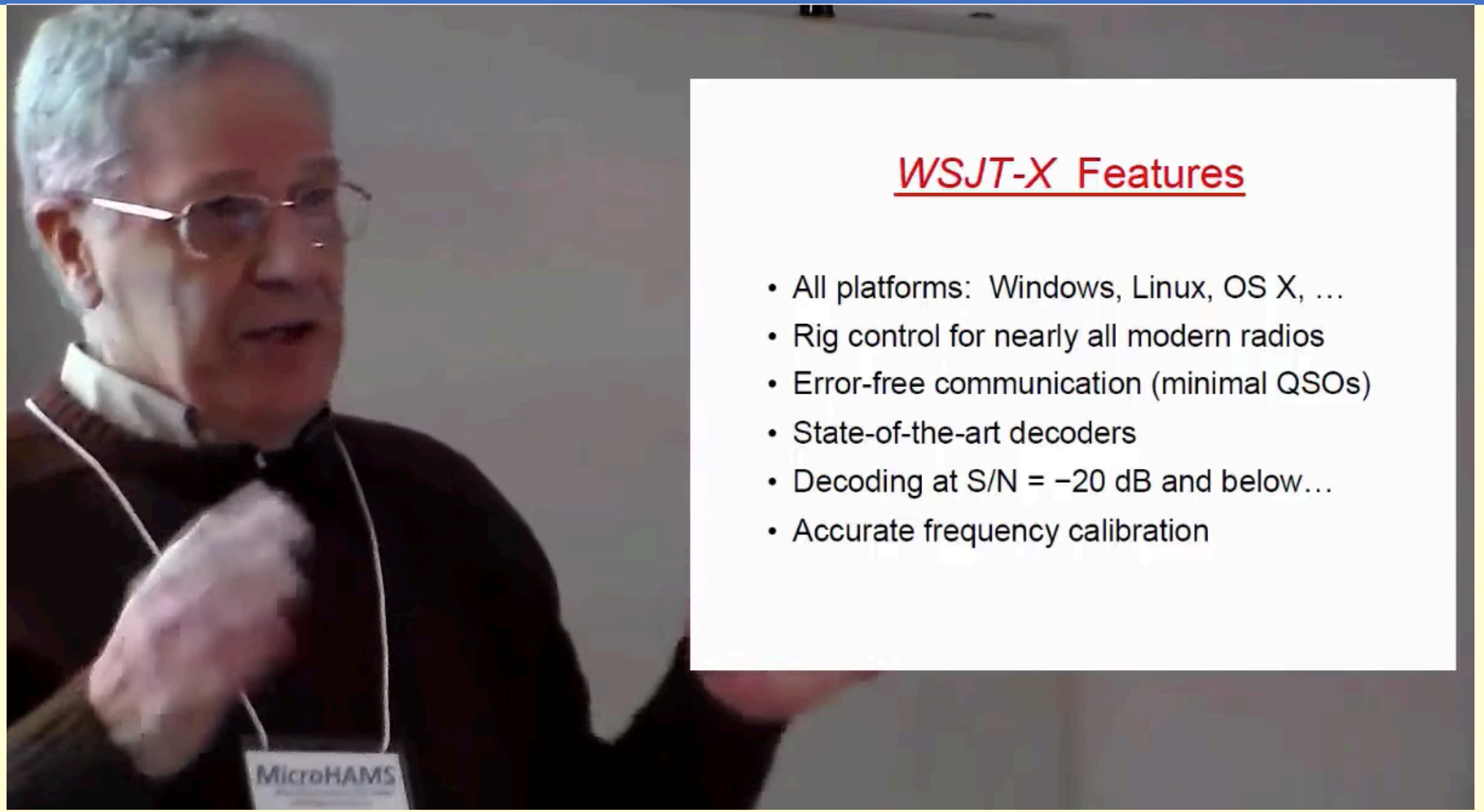
28 + 28 + 15 + 1 = 72

Free text:

TNX BOB 73 GL

71 + 1 = 72

WSJT-X Features

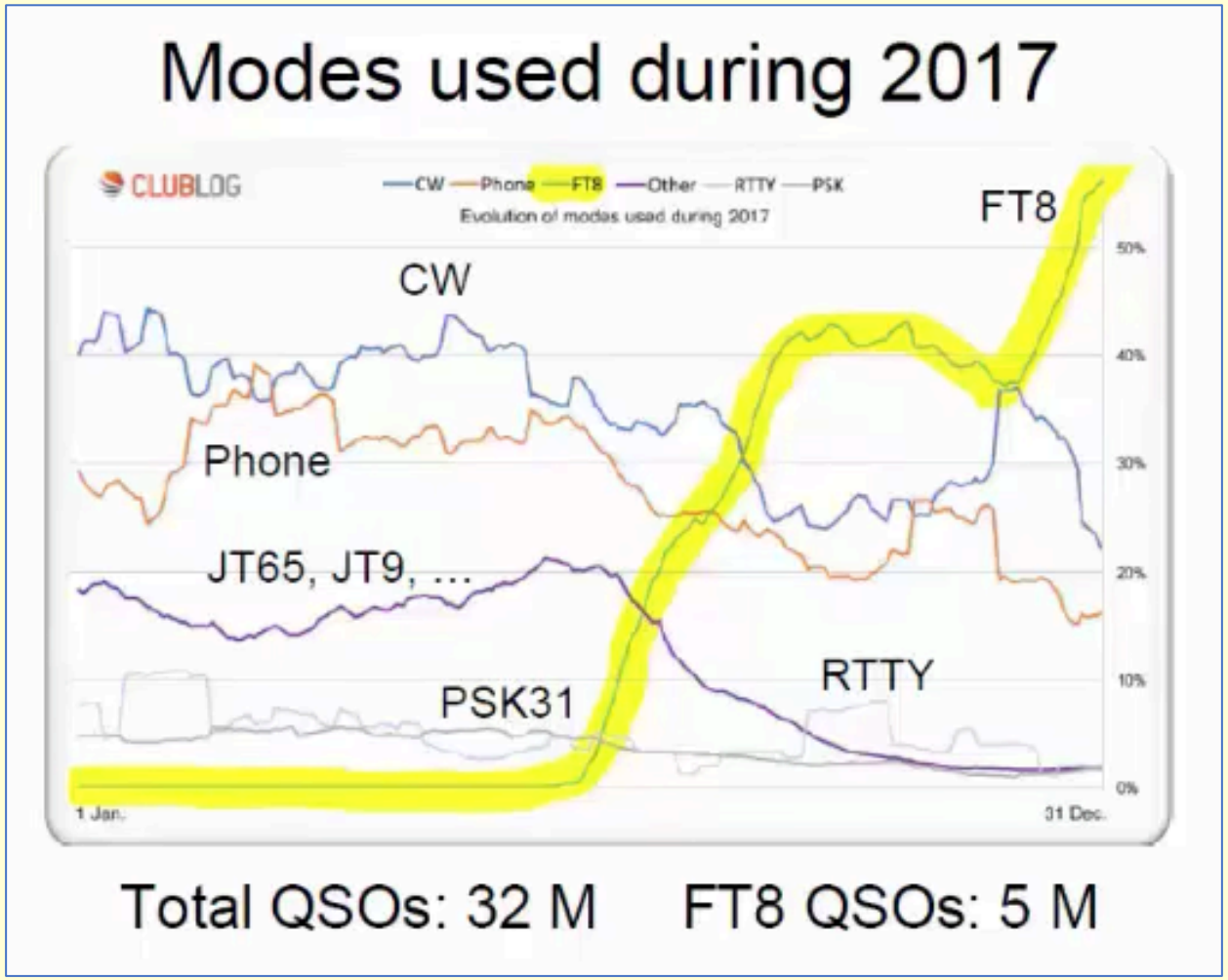


Weak-Signal S/N Limits

Mode	(B = 2500 Hz)
SSB	~+10 dB
MSK144	- 8
CW, “ear-and-brain”	-15
FT8	-21
JT4	-23
JT65	-25
JT9	-27
QRA64	-27
WSPR	-31

From the MicroHam Conference in May 2018

Data from ClubLog



Recent FT8 Usage Stats from 2018

Recent FT8 Usage Statistics

- Spots per hour: 200,000 – 650,000
- Active monitors in any hour
  - Midweek: ~ 2500
  - Weekend: ~ 3700
- Active transmitters in any hour
  - Midweek: 2000 – 5000
  - Weekend: 3500 – 7500
- Top number of DXCCs reported
  - 24 hours: 164
  - 7 days: 221

WSPR – Weak Signal Propagation Reporter

Typically 1mW to 5W

Run WSPR for a week before a contest To get a good idea of the propigation.

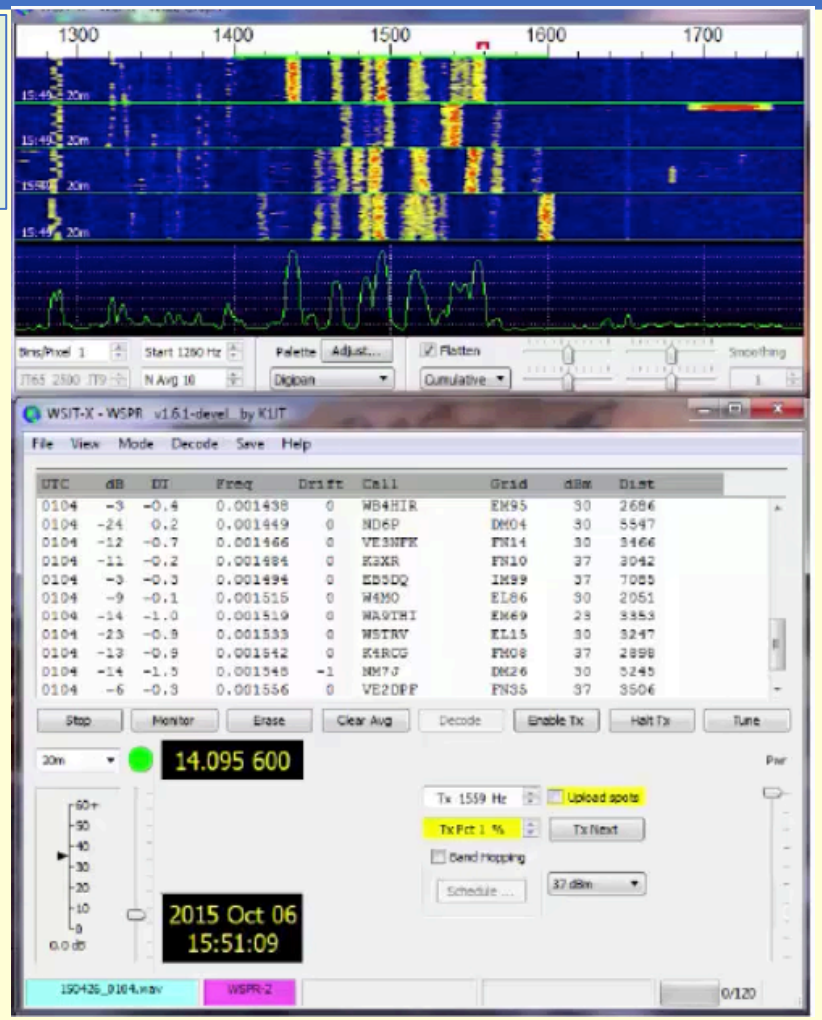
WSPR

"Weak Signal Propagation Reporter"

- Pronounced "whisper"
- Low-power, one-way mode
- 2-minute Tx, randomized T/R cycle
- Example message: **K1JT FN20 37**
- 4-FSK modulation: BW = 6 Hz
- Spots optionally sent to wsprnet.org
- ~ 1500 stations participating, avg day
- 965 million spots archived, since 2008 !

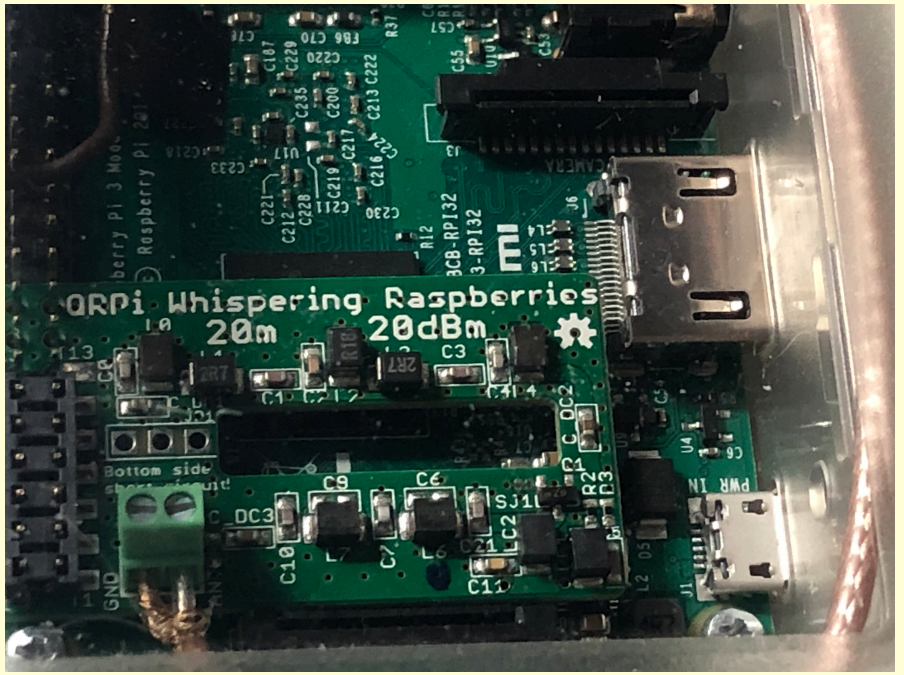
WSPR Operation Screen

WSPR are two minutes long. Transmits for 25% of the time and receive the rest of the time.

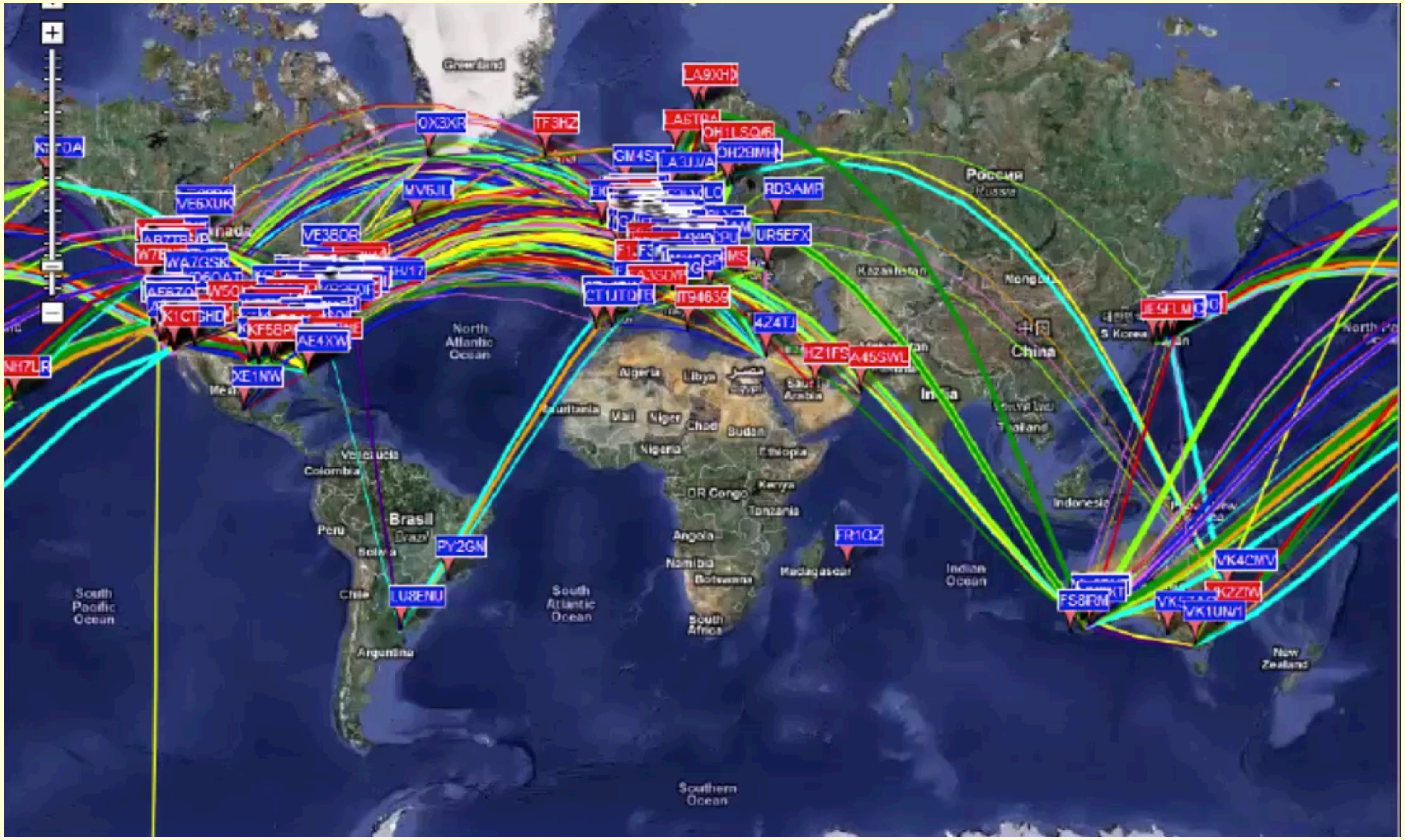


My Raspberry Pi WSPR 20m Transmitter

Left is my Raspberry Pi WSPR 20m Transceiver.
Right is a close up of the transceiver module.

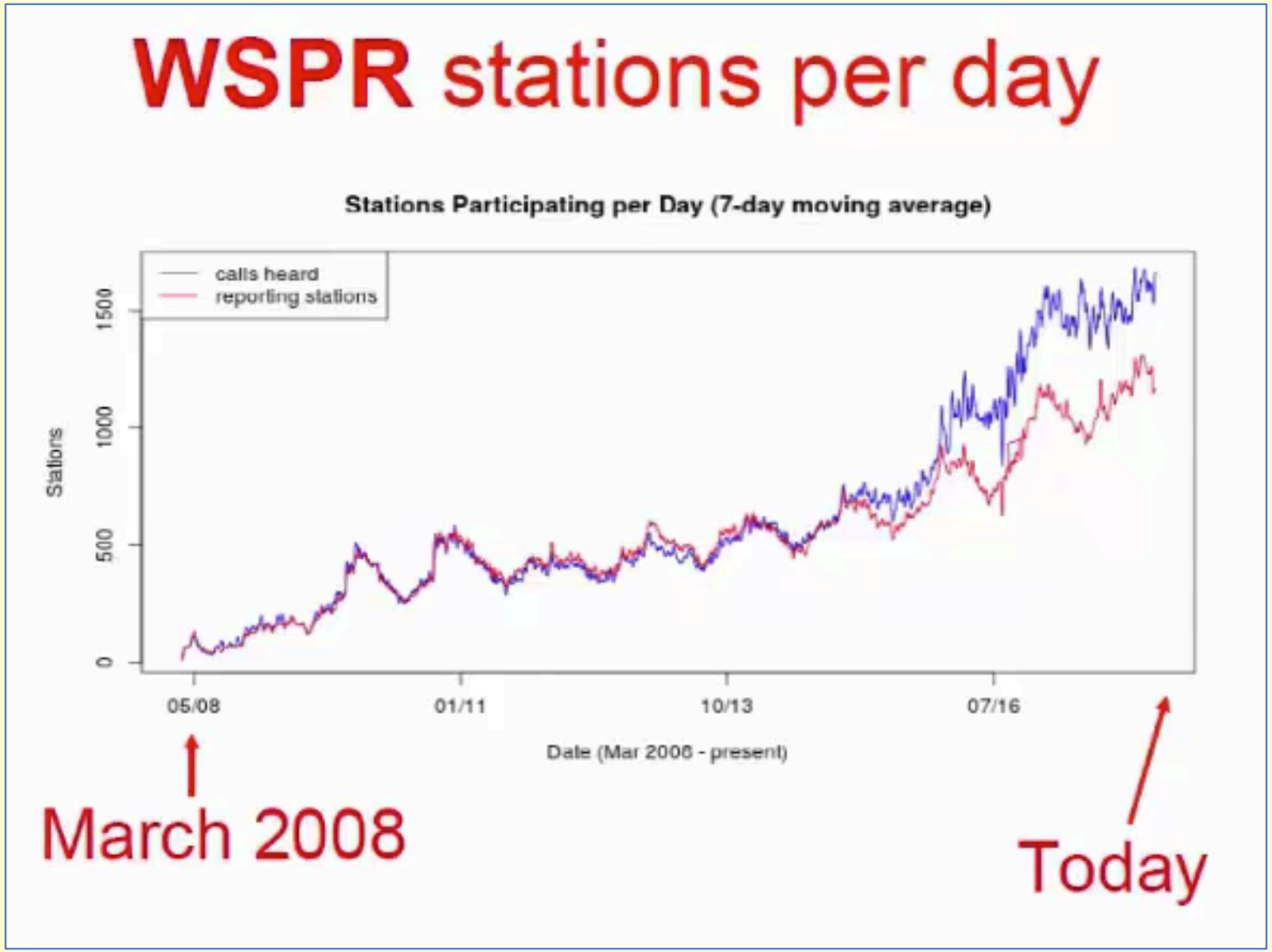


WSPR Map

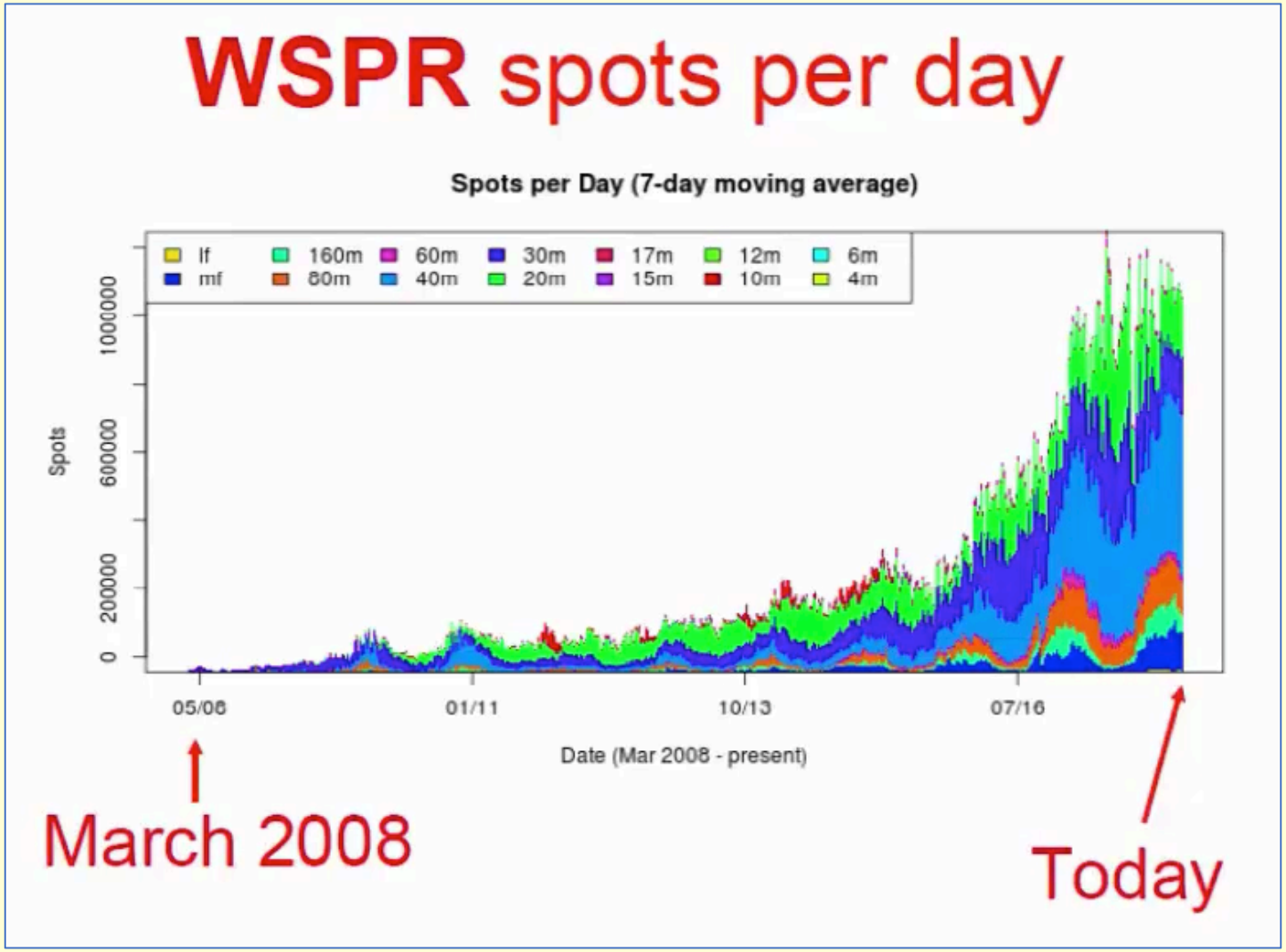


Greenland
OX3XR
TF3HZ
VE6XUK
RD3AMP
UR5EFX
Россия
Russia
Kazakhstan
China
India
North Atlantic Ocean
XE1NW
AE4XW
HZ1FS
Algeria
Libya
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
Tanzania
DR Congo
Angola
Namibia
Botswana
Madagascar
South Africa
FR1OZ
Colombia
Brasil
Peru
Chile
Argentina
PY2GN
LU8ENU
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
Indonesia
VK4CMV
VK1UN/1
New Zealand
Southern Ocean

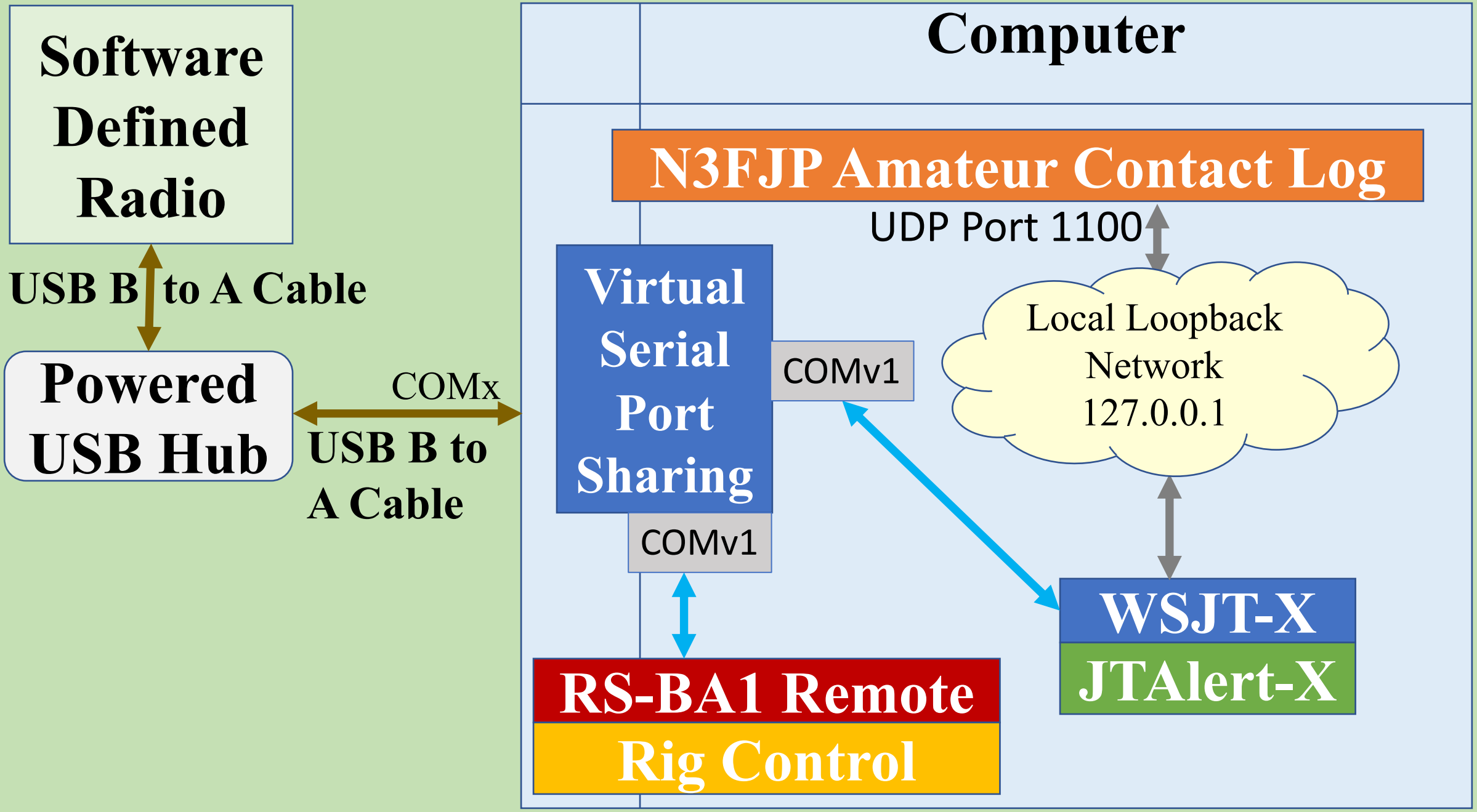
WSPR Statistics Per Day from March 2008



WSPR Spots Per Day from March 2008



WSPRnet Map Selected by Callsign


Software Defined Radio
USB B to A Cable
Powered USB Hub
COMx
USB B to A Cable
Computer
N3FJP Amateur Contact Log
UDP Port 1100
Virtual Serial Port Sharing
COMv1
COMv1
Local Loopback Network 127.0.0.1
WSJT-X
JTAlert-X
RS-BA1 Remote
Rig Control

N3FJP AC Log Resources

- Youtube videos
  - A whirlwind tour of ACLog. https://www.youtube.com/watch?v=mHqJWAm0-ZI
- Web resources
  - http://n3fjp.com/
  - https://www.n3fjp.com/aclog.html
  - https://www.n3fjp.com/guide.html
- PDFs
  - http://www.n3fjp.com/KD5KC-ACL.pdf

ICOM IC-7300 Resources (1)

- ICOM IC-7300 Manuals
  - http://www.ogdenarc.org/downloads/IC-7300%20Quick%20Start%20Guide.pdf
  - http://logqslbyc.com/qsl/icom/IC-7300_Servicio.pdf
  - https://wa7ewc.files.wordpress.com/2016/04/icom-ic-7300-presentation.pdf
  - https://www.icom.co.jp/world/support/download/manual/pdf/IC-7300_ENG_Full_6a.pdf
- ICOM IC-7300 Drivers and Firmware
  - http://www.g3nrw.net/ic-7300-files/IC-7300%20TechNote%20-%20CI-V%20Controls%20Big%20Picture%20v1.0.pdf
  - https://www.icomjapan.com/support/firmware_driver/2417/

ICOM IC-7300 Resources (2)

- ICOM RS-BA1 Remote / Rig Control SW
  - https://www.icomeurope.com/wp-content/uploads/2019/07/RS-BA1_Ver2_ENG_IM_2.pdf
  - https://www.manualslib.com/manual/1312523/Icom-Rs-Ba1.html
  - https://www.classicinternational.eu/_clientfiles/info_extra/icom_rsba_quickguide.pdf
  - https://www.icomamerica.com/en/products/amateur/hf/rsba1/default.aspx
- ICOM VC-28 Remote Encoder
  - https://www.icomjapan.com/support/manual/1483/
  - https://www.youtube.com/watch?v=UOlhznMaPlo

JTAlert-X Resources

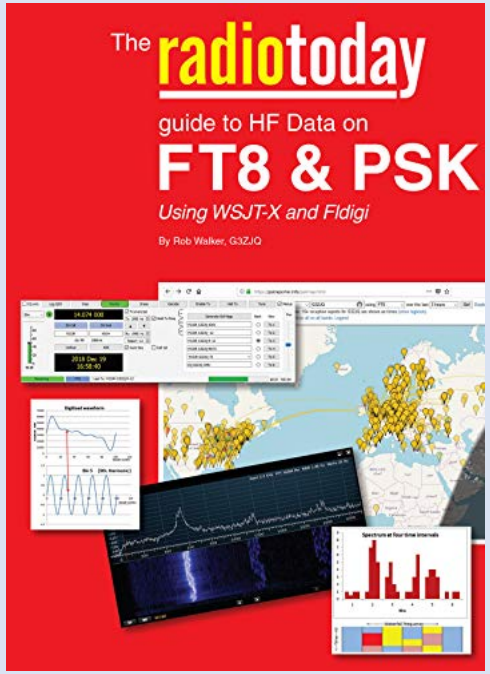
- Youtube videos
  - https://www.youtube.com/watch?v=QTWlFsxdEVU
  - https://www.youtube.com/watch?v=P5pcUNII68o
  - http://radio.pk2.se/JTAlertXsettings/jtalertxsettingsloggingaclog.html
- Web resources
  - https://hamapps.com/
  - http://www.dxlabsuite.com/dxlabwiki/GettingStartedwithK1JTModesWithJTAlert
- PDFs
  - https://www.radioclub-carc.com/wp-content/uploads/2019/03/JTalert.pdf

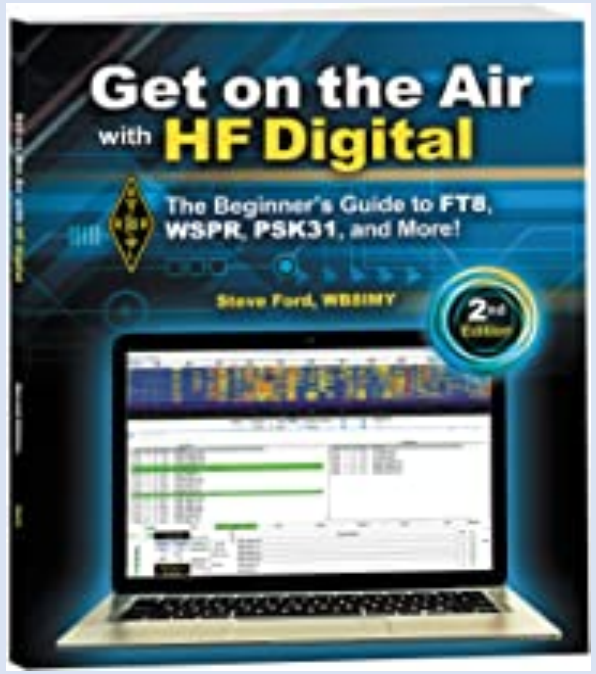
WSJT-X Resources

- Youtube videos
  - https://www.youtube.com/watch?v=233HQs_8JGQ
  - https://www.youtube.com/watch?v=DkqaCGIe9P0
- Web resources
  - https://physics.princeton.edu/pulsar/k1jt/wsjtx.html
  - https://physics.princeton.edu/pulsar/K1JT/wsjtx-doc/wsjtx-main-2.2.2.html
  - https://sourceforge.net/projects/wsjt/
  - https://www.g3lrs.org.uk/training/guide-to-wsjt-x.html

Digital Mode Books

- https://www.amazon.com/radiotoday-guide-data-FT8-PSK-ebook/dp/B07NNZ49MF/ref=sr_1_1?dchild=1&keywords=ft8&qid=1599246297&sr=8-1





Time Management Resources

- See my article in the August 2020 Hamgab.

More Digital Resources

- Joe Taylors talk at MicroHam Conference
  https://www.youtube.com/watch?v=233HQs_8JGQ
- Digital Modes History Part 1 and Introduction
  https://www.youtube.com/watch?v=MAUhl9BjDIo&t=927s
- Digital Modes History Part 2
  https://www.youtube.com/watch?v=TdJFWG3Ek4M&t=28s
- General Lesson 6.1, Basics of Digital Modes (G22)
  https://www.youtube.com/watch?v=qA2ULCtHLxQ&t=559s
- General Lesson 6.2, Character-based Modes (G23)
  https://www.youtube.com/watch?v=tCS1R6lk2cg&t=1104s
- General Lesson 6.3, Packet-Based Modes and Systems (G24)
  https://www.youtube.com/watch?v=TOYidPOjSPE&t=58s
- General Lesson 6.4, Receiving and Transmitting Digital Modes (G25)
  https://www.youtube.com/watch?v=5Sv6wLOErEQ&t=38s
- General Lesson 6.5, Digital Operating Procedures (G26)
  https://www.youtube.com/watch?v=aa6XcKjRaho&t=174s
- Digital Modes Identifier
  https://www.youtube.com/watch?v=nwkz0GNpA0I&t=122s
- Icom 7300 N3FJP ACLog WSJT X JTAlert Rig Control And Logging
  https://www.youtube.com/watch?v=cn9m-6J9EG0

?s