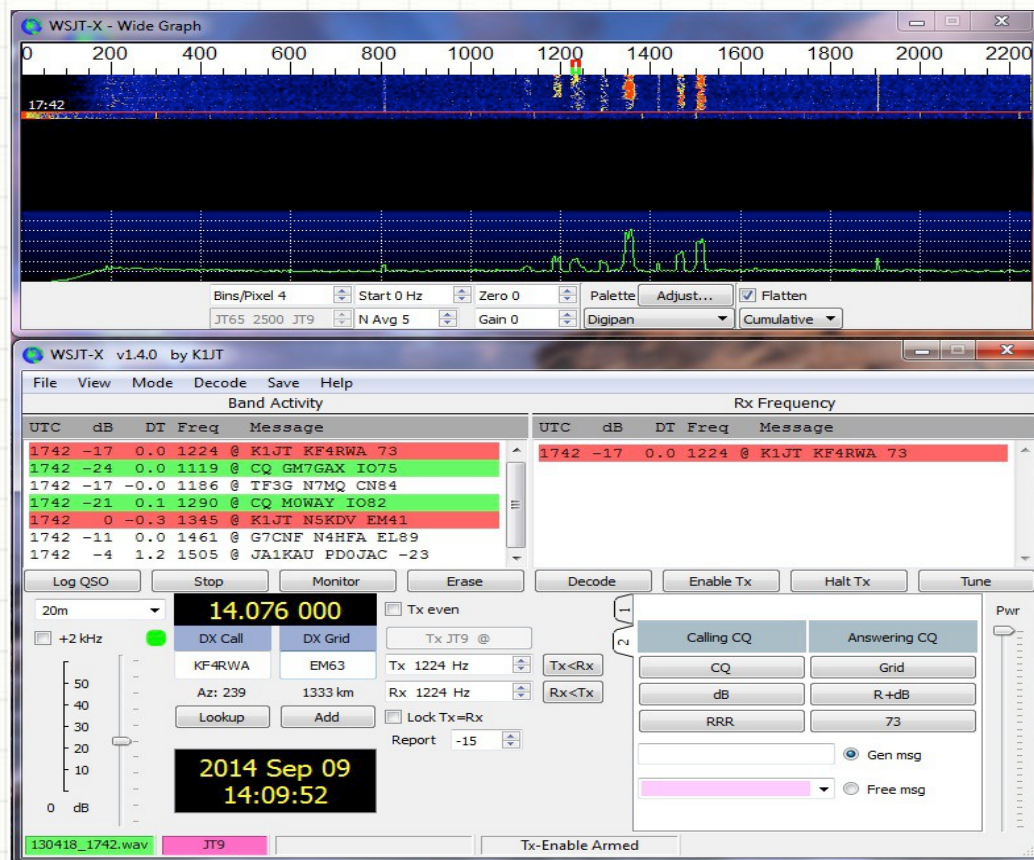


Note: We will be recording all Bootcamp Sessions. Anyone not wishing to be recorded should mute their video or disconnect.

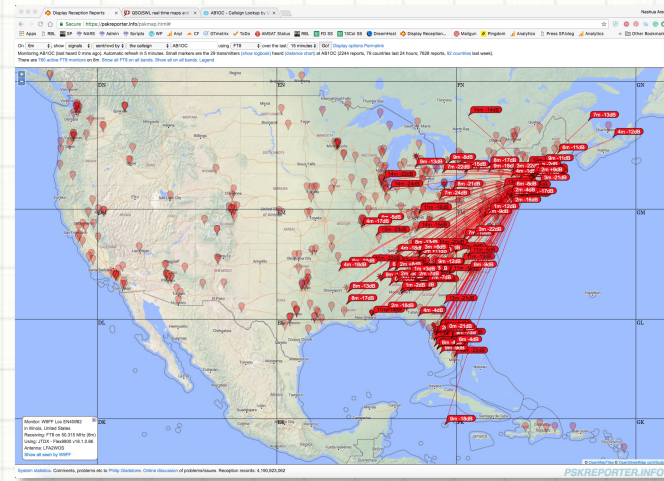


WSJT-X: FT8 AND MORE

Nashua Area Radio Society
Fall 2020

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Topics

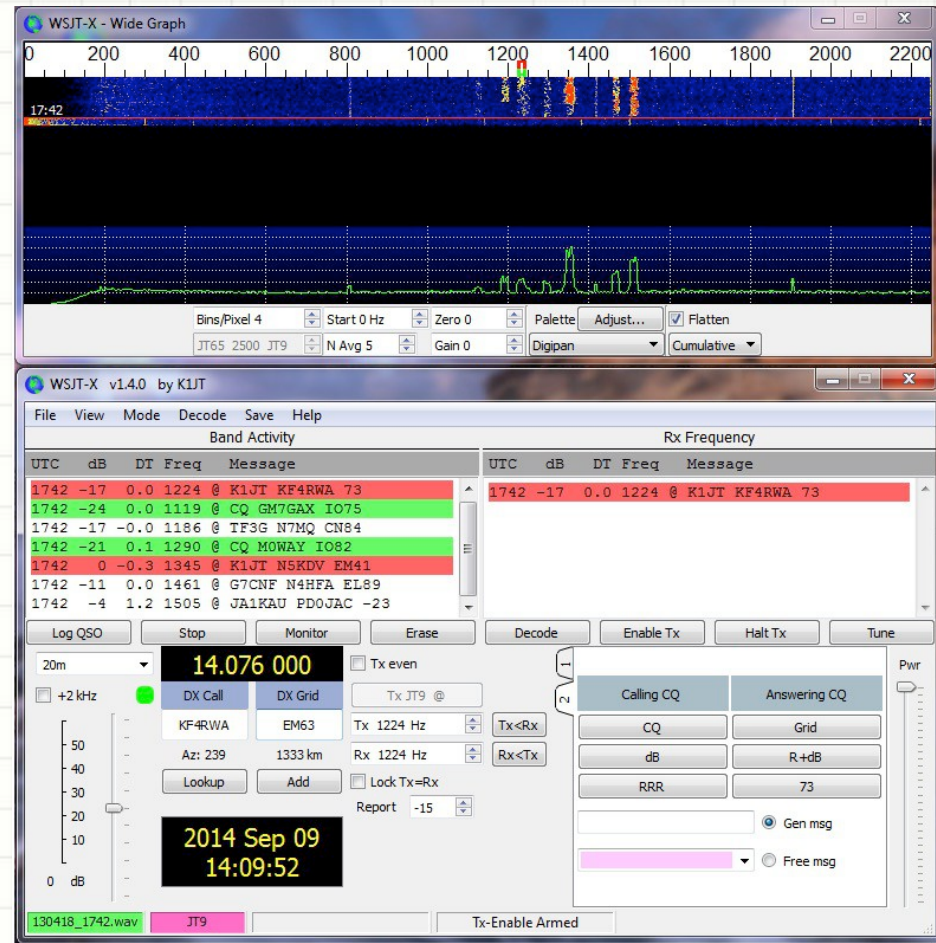


- What can you do with WSJT-X and FT8? How does it work?
- What kind of performance can you expect?
- What's required to get on the air?
- Setting up your Radio and Software
- Using FT8 to make contacts
- Evaluating the bands and your station with PSKReporter

WSJT-X Modes

What can I do?

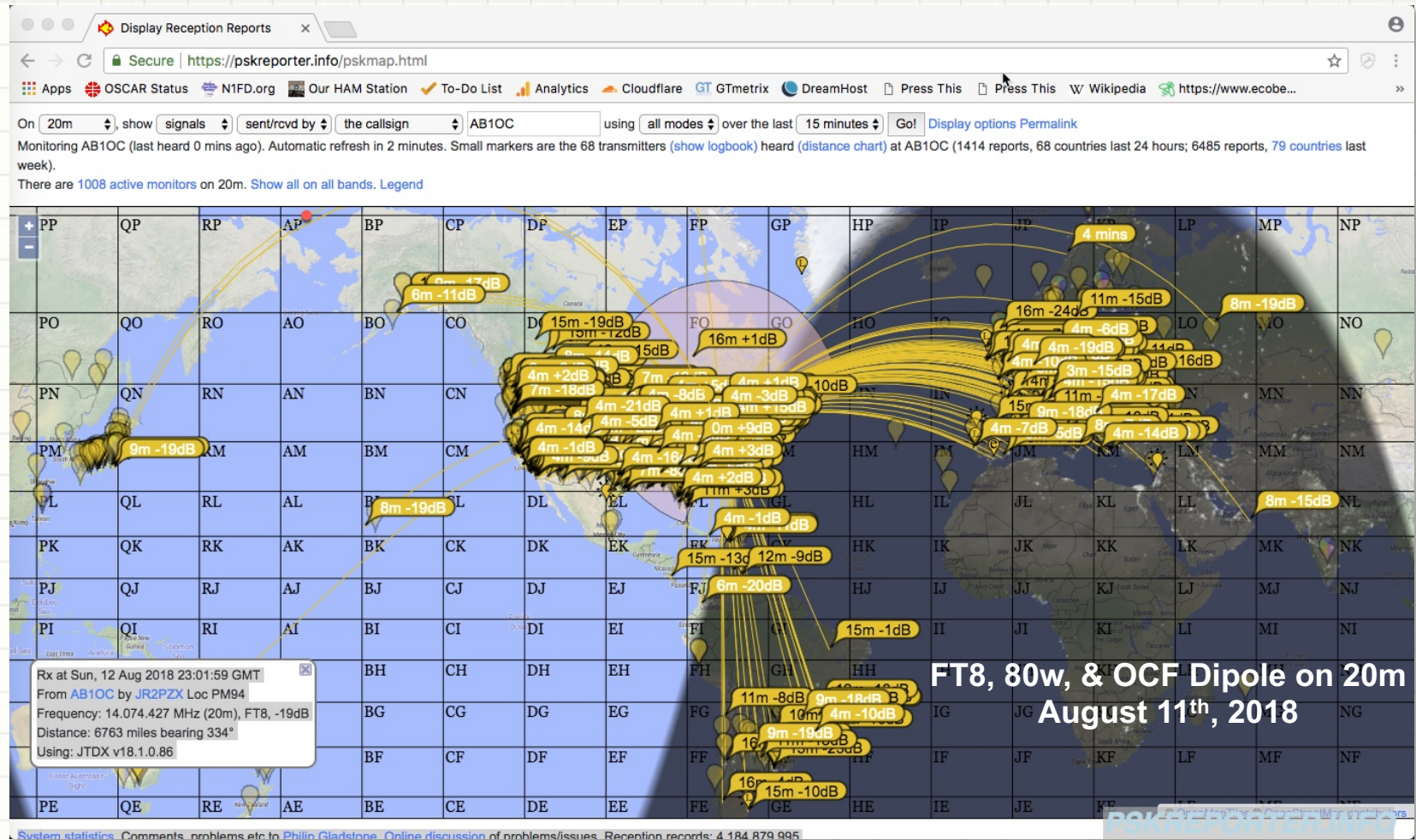
- Weak-signal Digital contacts on VLF, HF, VHF bands and above
- Great for basic stations (100W and a Wire or QRP)
- Exchange includes call signs, grids, and signal reports
- Work DX, make progress on operating awards
 - DXCC, WAS, VUCC, etc.
- Evaluate your station's performance & band conditions
- Make contacts using “exotic” modes
 - Meteor Scatter on 6m
 - Moon Bounce (EME)
 - Airplane & Rain Scatter
 - ...



Download The WSJT-X Program and Manual [here](#)

What Performance Can Be Expected?

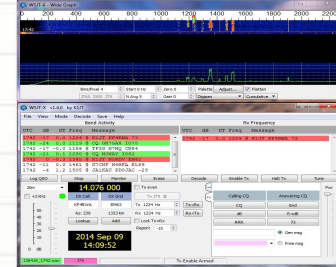
FT8 on the 20m Band: 80w and a Wire Antenna



- The [PSKReporter website](https://pskreporter.info/) is a **Reverse Beacon Network (RBN)** that supports WSJT-X modes (and other digital modes too)
- Display where your signal is being heard and how strong your signal is around the world in real-time. More to come on PSKReporter later...

WSJT-X Exchange

Typical Example



CQ K1ABC FN42

K1ABC G0XYZ I091

G0XYZ K1ABC -19

K1ABC G0XYZ R-22

G0XYZ K1ABC RRR

K1ABC G0XYZ 73

#K1ABC calls CQ

#G0XYZ answers

#K1ABC sends report

#G0XYZ sends R+report

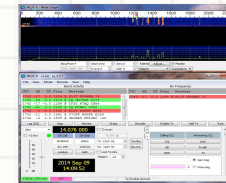
#K1ABC sends RRR

#G0XYZ sends 73

- Exchanges include Callsigns, Grid Squares, and Signal Reports
- **Auto Sequence** and **Answer 1st Caller** options for fast protocols (more coming in the demos)
- Software allows for custom messages which often include simple antenna information, power, etc.
- Special options exist for compound callsigns, contest exchanges, and other purposes (see WSJT-X manual for details)
- WSJT-X knows where “watering holes” for QSOs are on each band
 - They are usually just above the PSK sub-band

WSJT-X Exchange

Tx/Rx Sequences using FT8 (a "Fast Mode")



CQ K1ABC FN42	#K1ABC calls CQ	00:00 (Even)
K1ABC G0XYZ I091	#G0XYZ answers	00:15 (Odd)
G0XYZ K1ABC -19	#K1ABC sends report	00:30 (Even)
K1ABC G0XYZ R-22	#G0XYZ sends R+report	00:45 (Odd)
G0XYZ K1ABC RRR	#K1ABC sends RRR	01:00 (Even)
K1ABC G0XYZ 73	#G0XYZ sends 73	01:15 (Odd)

- In this example, **K1ABC** is using ***Tx Even***
 - **K1ABC** can only hear stations who are using ***Tx Odd***
- **G0XYZ** is using ***Tx Odd***
 - **G0XYZ** can only hear station who are using ***Tx Even***
- For weak signal modes on VHF and above (6m and higher), the convention is stations in US **should Tx Odd when DX open to EU**
 - *Especially important when a DX opening exists!!!*
 - *Ok to work single contacts in Tx Even BUT IT'S NOT APPROPRIATE TO CALL CQ! Watch power levels if doing this.*

WSJT-X

All Messages Decoded

Turn on Decoding

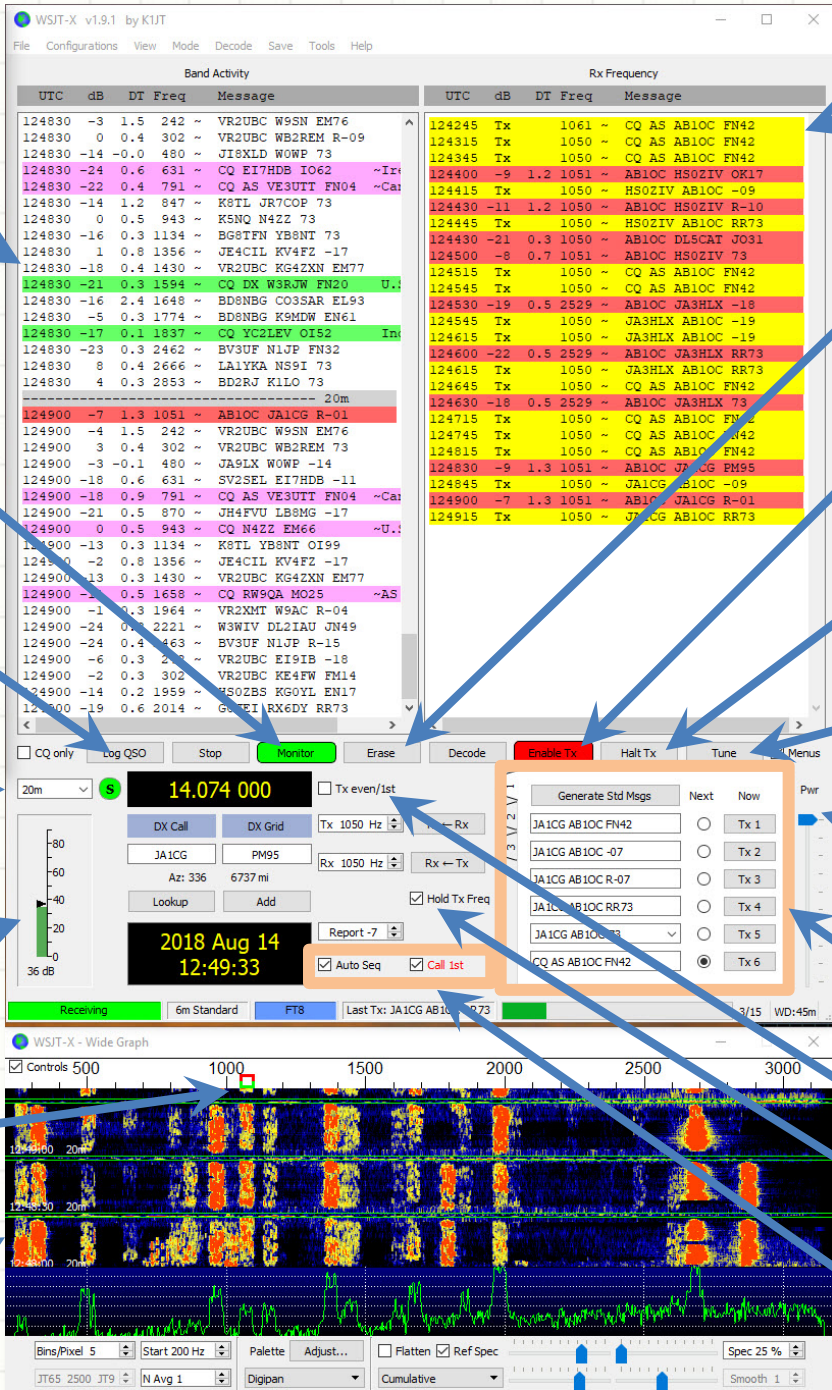
Log Completed QSO

Current Band & Sub-Band

WSJT-X "S Meter"

Tx (Red) & Rx (Green) Freqs.

Waterfall "Wide Graph"



Messages On Your Rx Freq.

Erase Messages

Enable Tx

Stop Tx

Tx Tone Only

Tx Power Control

Standard QSO Messages

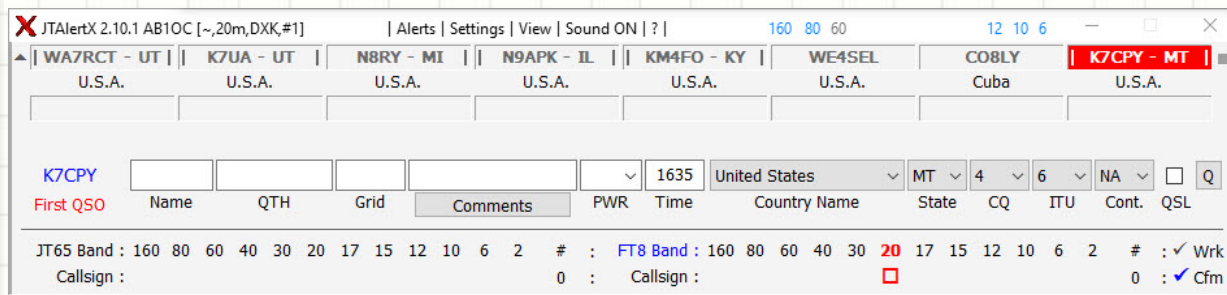
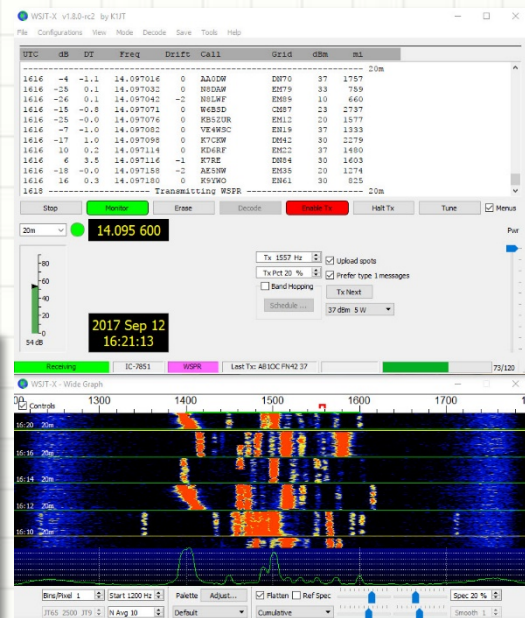
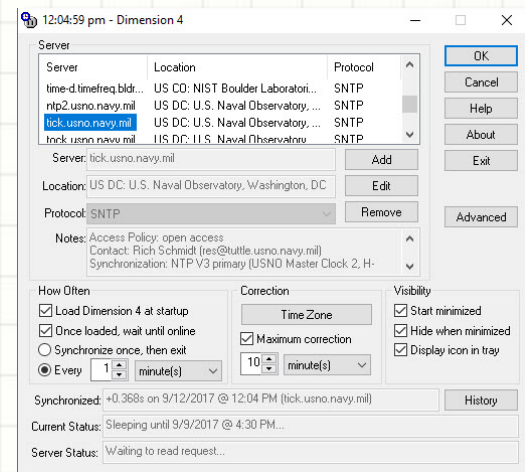
Even/Odd Tx Sequence and Hold Tx Freq.

QSO Step Automation

WSJT-X and Related Software

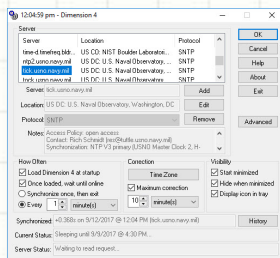
What's Needed?

- PC Clock Sync to ± 1 Second via NTP
 - Disable Windows/Mac time sync – they are not accurate enough!
 - Recommend **Dimension 4**
<http://www.thinkman.com/dimension4>
- WSJT-X 1.9.1, or latest version
 - <https://www.physics.princeton.edu/pulsar/K1JT/wshtx.html>
- Linkage to your logger is useful (Bridge App)
 - For DXLab, and HRD – recommend JTAAlert
<http://hamapps.com>
 - Use single control interface to radio (ex. **DXLab Commander** or equivalent)

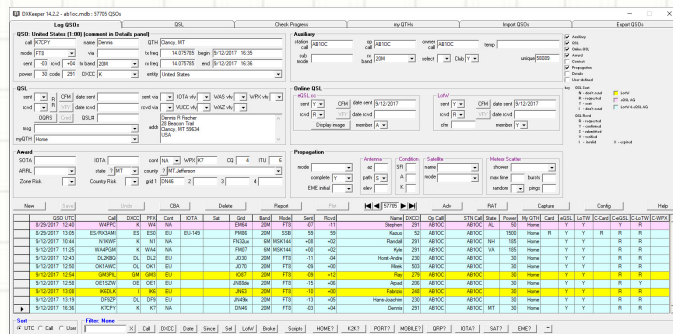


WSJT-X and Related Software

Components and Interfaces

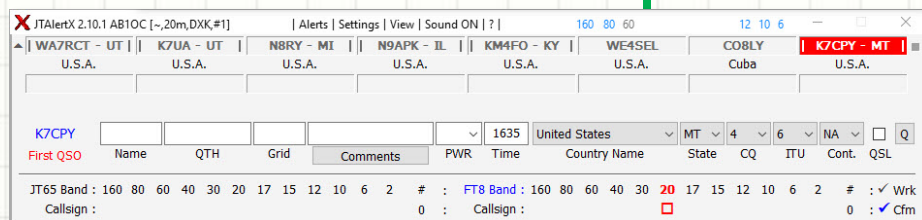


Dimension 4
(Sync's PC Clock)



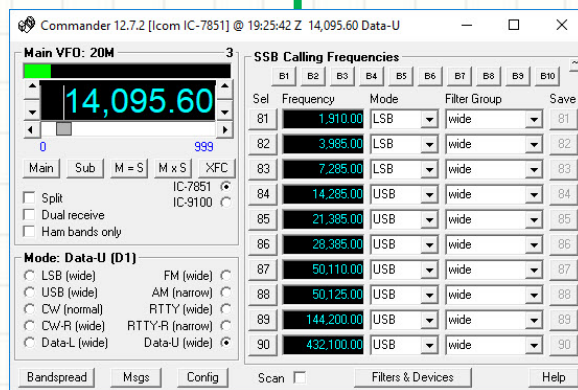
**IP/
DDE**

Your Log
(ex. DXKeeper)

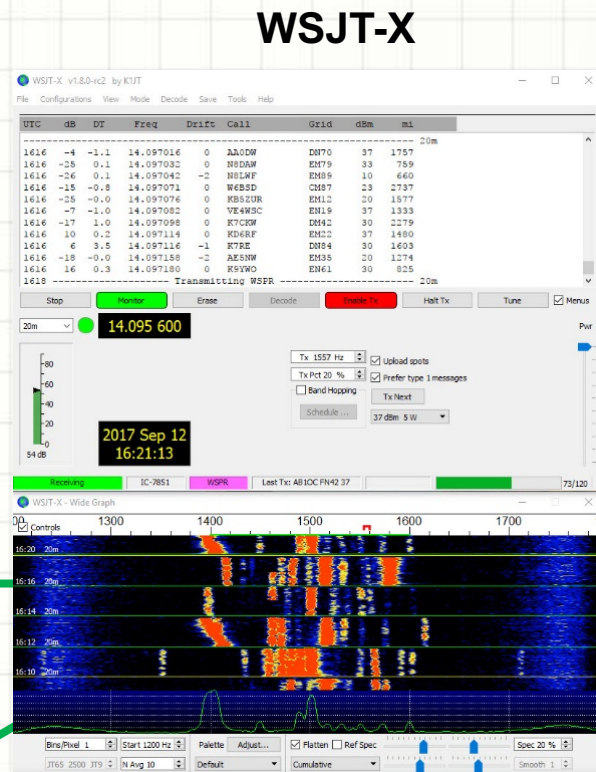


JTAAlert

- Configure IP/DDE Interfaces
 - WSJT-X
 - Radio Interface
 - JTAAlert
- Manuals cover the details



Radio Interface
(ex. DXLab Commander)



WSJT-X

IP

IP

**USB
CAT**

USB Audio
(Direct or Sound Card)



Your Radio

WSJT-X and Related Software

Basic Setup Steps

- ✓ **Install and configure Dimension 4** – use a single time server that's reliable
 - ☐ Run Dimension 4 as a service at windows startup
 - ☐ Turn OFF windows time updates
 - ☐ Automatically adjust your clock every 3 - 5 mins
- ✓ **Connect radio sound card and CAT control interfaces to your PC**
 - ☐ Details depend on radio and optional sound card
 - ☐ Always use **USB Mode: Digital Upper** option (**DIGU**) if your Transceiver has it
 - ☐ Set Radio Tx and Tx Bandwidth for 3 kHz (or max. if less)
 - ☐ Turn off Noise Reduction, Compression, Equalization and any audio processing (**DIGU mode usually** does much of this)
- ✓ **Install and Configure WSJT-X**
 - ☐ Set program options in the **General Tab**
 - ☐ Setup radio controls for PTT and CAT control in **Radio Tab**
 - ☐ Set "**Fake It**" option to optimize radio Tx
 - ☐ Configure Audio Tab for radio "sound card" devices on your PC
 - ☐ Configure Logging in the **Reporting Tab**
 - ☐ Turn on Two Pass Decoding in the **Advanced Tab**
- ✓ **Set your Audio Levels on you Radio, Sound Card, or windows**
 - ☐ **Radio is best approach, windows only as a last resort**
 - ☐ Adjust Tx levels for full output power with **NO ALC ACTION** (Power slider at Max, use the **Tune** Button)
 - ☐ Adjust Rx levels for ~30 dB when only band noise (no sigs) is present
- ✓ **Set WSJT-X to use default frequencies (Freqs. Tab, Right-Click, Reset)**

WSJT-X General Settings

Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Station Details

My Call: My Grid: ☐ AutoGrid IARU Region:

Message generation for type 2 compound callsign holders:

Display

☒ Blank line between decoding periods

☒ Display distance in miles

☒ Tx messages to Rx frequency window

☒ Show DXCC entity and worked before status

☐ Show principal prefix instead of country name

Behavior

☐ Monitor off at startup ☐ Enable VHF/UHF/Microwave features

☒ Monitor returns to last used frequency ☒ Allow Tx frequency changes while transmitting

☒ Double-click on call sets Tx enable ☐ Single decode

☐ Disable Tx after sending 73 ☐ Decode after EME delay

☐ CW ID after 73

Tx watchdog:

Periodic CW ID Interval:

OK Cancel

- ✓ Set your **Callsign** and **Grid Square**
- ✓ Set **IARU Region** to “2” (U.S. Stations)
- ✓ Other options as shown above or to your preferences...

WSJT-X Radio Settings

The screenshot shows the 'Settings' dialog box with the 'Radio' tab selected. The 'Rig' is set to 'Kenwood TS-2000' and the 'Poll Interval' is '1 s'. The 'CAT Control' section on the left includes a 'Serial Port' dropdown set to 'COM8', 'Serial Port Parameters' with 'Baud Rate' at '19200', 'Data Bits' set to 'Eight', 'Stop Bits' set to 'One', 'Handshake' set to 'None', and 'Force Control Lines' with 'DTR' and 'RTS' dropdowns. The 'PTT Method' section on the right has 'VOX', 'DTR', 'CAT' (selected), and 'RTS' radio buttons, with a 'Port' dropdown set to 'COM7'. Below this, 'Transmit Audio Source' has 'Rear/Data' and 'Front/Mic' (selected) radio buttons. 'Mode' has 'None', 'USB', and 'Data/Pkt' (selected) radio buttons. 'Split Operation' has 'None', 'Rig', and 'Fake It' (selected) radio buttons. At the bottom right are 'Test CAT' and 'Test PTT' buttons. The 'OK' and 'Cancel' buttons are at the bottom right of the dialog.

Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Rig: Kenwood TS-2000 Poll Interval: 1 s

CAT Control

Serial Port: COM8

Serial Port Parameters

Baud Rate: 19200

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: COM7

Transmit Audio Source

☐ Rear/Data ☒ Front/Mic

Mode

☐ None ☐ USB ☒ Data/Pkt

Split Operation

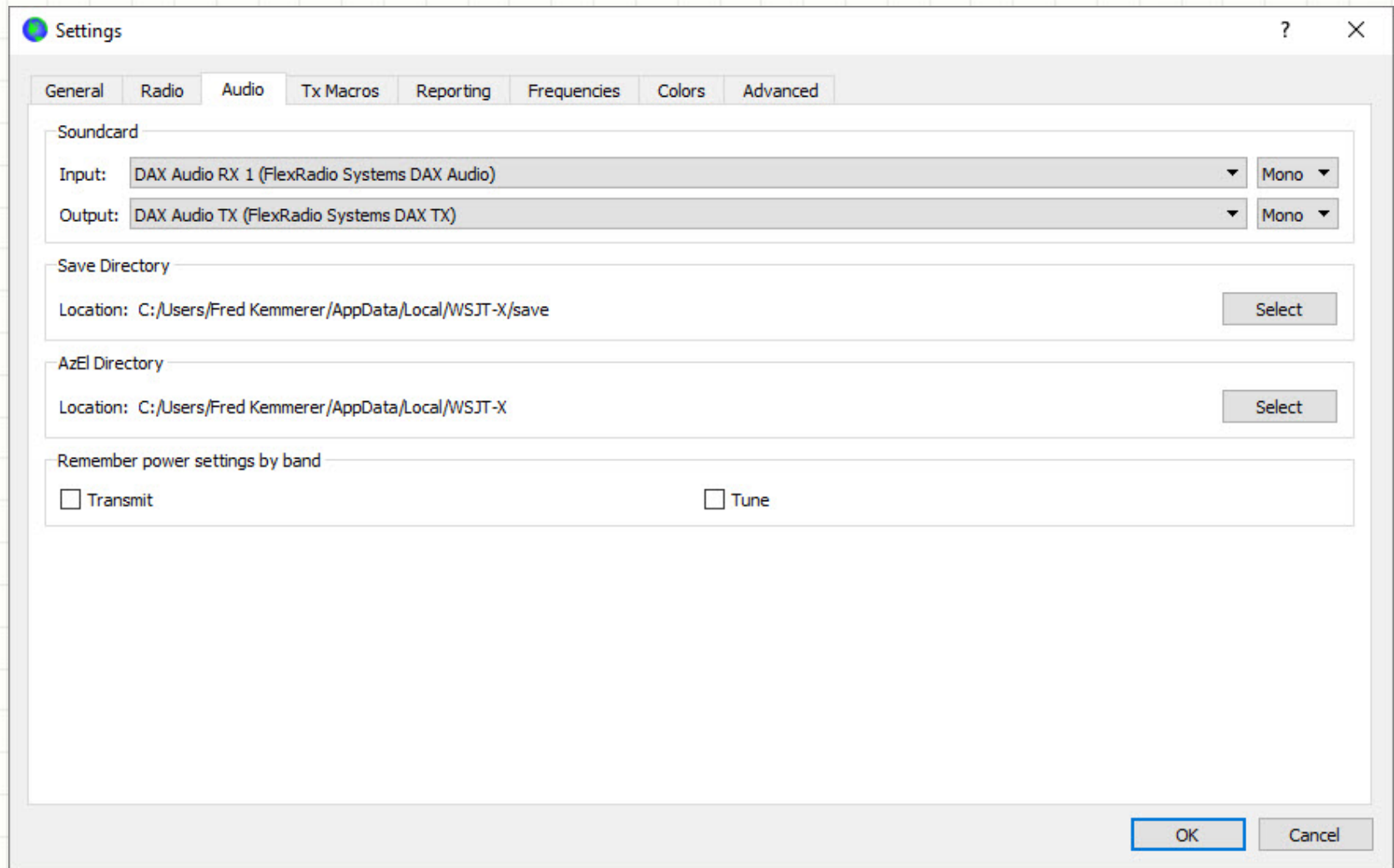
☐ None ☐ Rig ☒ Fake It

Test CAT Test PTT

OK Cancel

- ✓ Set **Serial Port** for CAT interface for your radio
- ✓ Set **PTT Method**
- ✓ Set **Mode** = Data/Pkt (if you have it) or USB
- ✓ Set **Split Operation** = "Fake It"

WSJT-X Audio Settings



The screenshot shows the 'Settings' window for WSJT-X, specifically the 'Audio' tab. The window has a title bar with a question mark and a close button. Below the title bar are several tabs: 'General', 'Radio', 'Audio' (selected), 'Tx Macros', 'Reporting', 'Frequencies', 'Colors', and 'Advanced'. The 'Audio' tab contains three main sections: 'Soundcard', 'Save Directory', and 'AzEl Directory'. The 'Soundcard' section has 'Input' and 'Output' dropdown menus, both set to 'DAX Audio RX 1 (FlexRadio Systems DAX Audio)' and 'DAX Audio TX (FlexRadio Systems DAX TX)' respectively, with 'Mono' selected for both. The 'Save Directory' section shows a 'Location' field with the path 'C:/Users/Fred Kemmerer/AppData/Local/WSJT-X/save' and a 'Select' button. The 'AzEl Directory' section shows a 'Location' field with the path 'C:/Users/Fred Kemmerer/AppData/Local/WSJT-X' and a 'Select' button. At the bottom of the 'Audio' tab, there is a section 'Remember power settings by band' with two checkboxes: 'Transmit' and 'Tune', both of which are unchecked. At the bottom right of the window are 'OK' and 'Cancel' buttons.

Settings

General Radio **Audio** Tx Macros Reporting Frequencies Colors Advanced

Soundcard

Input: DAX Audio RX 1 (FlexRadio Systems DAX Audio) Mono

Output: DAX Audio TX (FlexRadio Systems DAX TX) Mono

Save Directory

Location: C:/Users/Fred Kemmerer/AppData/Local/WSJT-X/save Select

AzEl Directory

Location: C:/Users/Fred Kemmerer/AppData/Local/WSJT-X Select

Remember power settings by band

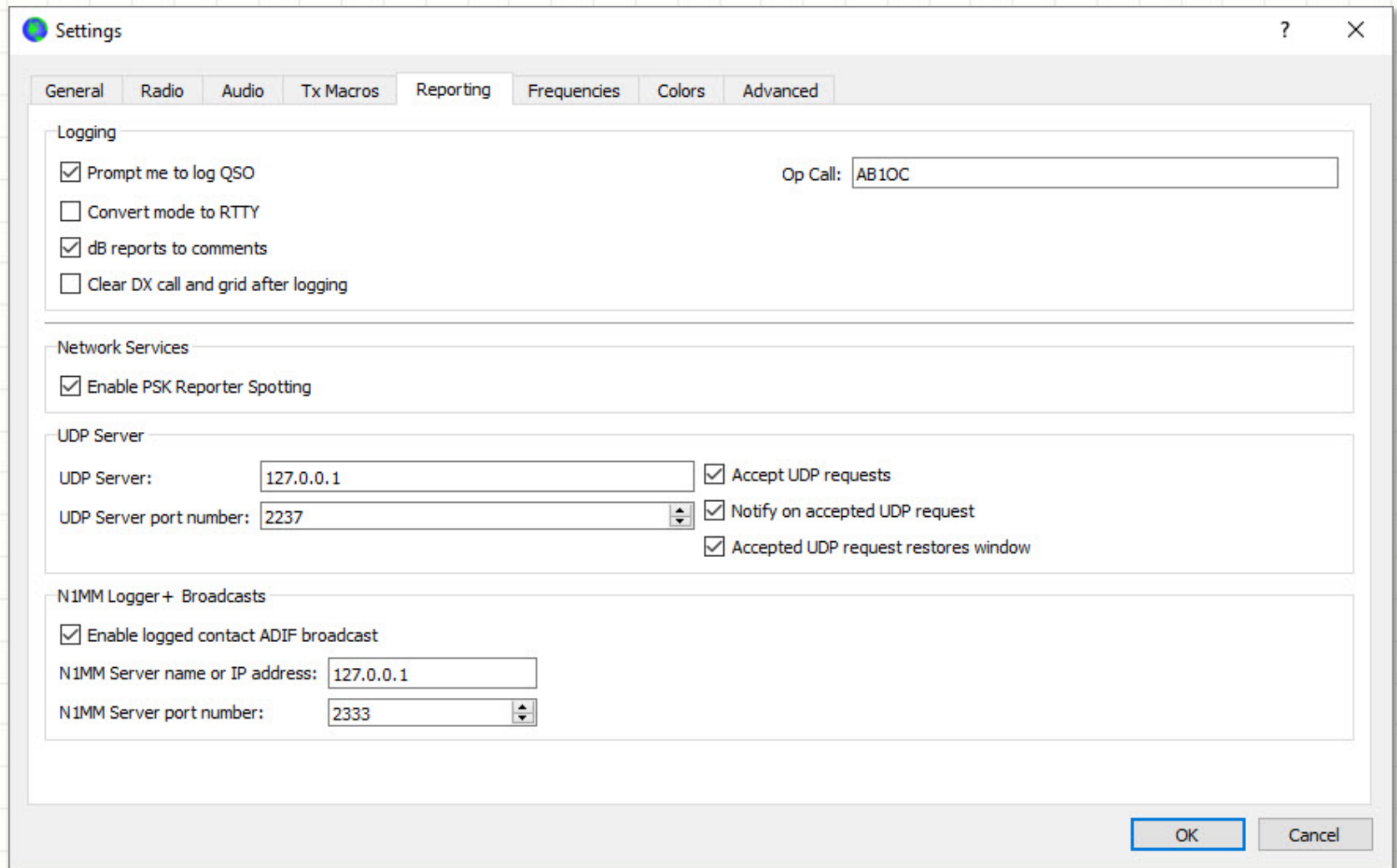
☐ Transmit ☐ Tune

OK Cancel

✓ Set **Input** to Sound Device from your Receiver

✓ Set **Output** to Sound Device going to you Transmitter

WSJT-X Advanced Settings



The screenshot shows the 'Settings' window for WSJT-X, specifically the 'Reporting' tab. The window has a title bar with a question mark and a close button. The tabs are: General, Radio, Audio, Tx Macros, Reporting (selected), Frequencies, Colors, and Advanced. The 'Reporting' tab contains three sections: 'Logging', 'Network Services', and 'UDP Server'. The 'Logging' section has four checkboxes: 'Prompt me to log QSO' (checked), 'Convert mode to RTTY' (unchecked), 'dB reports to comments' (checked), and 'Clear DX call and grid after logging' (unchecked). There is a text field for 'Op Call' with the value 'AB1OC'. The 'Network Services' section has one checkbox: 'Enable PSK Reporter Spotting' (checked). The 'UDP Server' section has two text fields: 'UDP Server' (127.0.0.1) and 'UDP Server port number' (2237). There are three checkboxes: 'Accept UDP requests' (checked), 'Notify on accepted UDP request' (checked), and 'Accepted UDP request restores window' (checked). The 'N1MM Logger+ Broadcasts' section has one checkbox: 'Enable logged contact ADIF broadcast' (checked). There are two text fields: 'N1MM Server name or IP address' (127.0.0.1) and 'N1MM Server port number' (2333). At the bottom right are 'OK' and 'Cancel' buttons.

Settings

General Radio Audio Tx Macros **Reporting** Frequencies Colors Advanced

Logging

☒ Prompt me to log QSO Op Call: AB1OC

☐ Convert mode to RTTY

☒ dB reports to comments

☐ Clear DX call and grid after logging

Network Services

☒ Enable PSK Reporter Spotting

UDP Server

UDP Server: 127.0.0.1 ☒ Accept UDP requests

UDP Server port number: 2237 ☒ Notify on accepted UDP request

☒ Accepted UDP request restores window

N1MM Logger+ Broadcasts

☒ Enable logged contact ADIF broadcast

N1MM Server name or IP address: 127.0.0.1

N1MM Server port number: 2333

OK Cancel

- ✓ Set **Prompt to log QSO**
- ✓ Check **Enable PSK Reporter Spotting**

- ✓ Set **Op Call** to your Callsign
- ✓ Other options depend upon logger/JTAlert & your preferences

WSJT-X Related Software

Additional Steps for Logger Integration via JTAAlert

JTAAlertX 2.10.1 AB1OC [~,20m,DXK,#1] | Alerts | Settings | View | Sound ON | ? | 160 80 60 | 12 10 6

WA7RCT - UT | K7UA - UT | N8RY - MI | N9APK - IL | KM4FO - KY | WE4SEL | CO8LY | K7CPY - MT

U.S.A. | U.S.A. | U.S.A. | U.S.A. | U.S.A. | U.S.A. | Cuba | U.S.A.

K7CPY | Name | QTH | Grid | Comments | PWR | Time | Country Name | State | CQ | ITU | Cont. | QSL

First QSO

JT65 Band : 160 80 60 40 30 20 17 15 12 10 6 2 # : FT8 Band : 160 80 60 40 30 20 17 15 12 10 6 2 # : ✓ Wrk

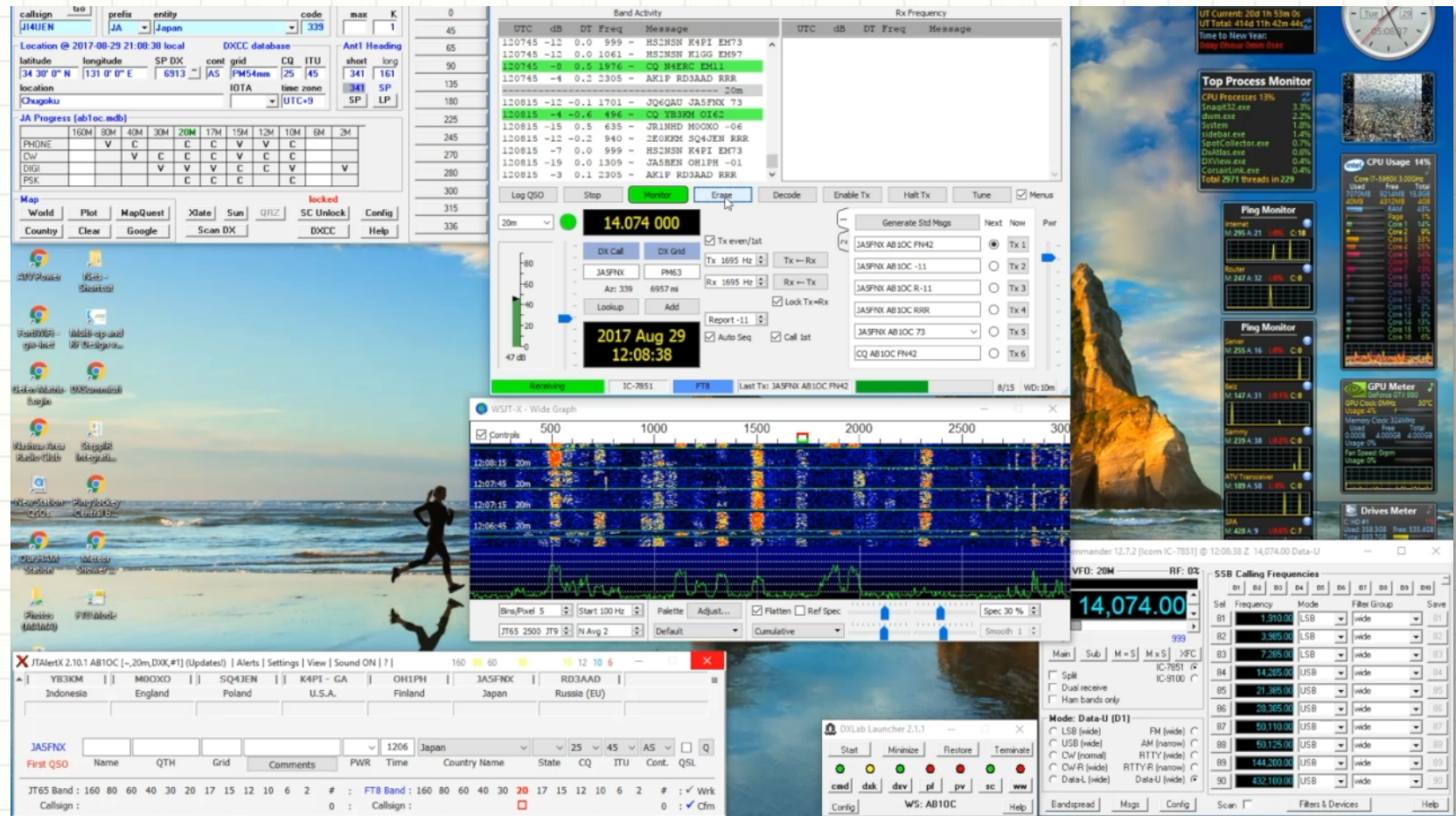
Callsign : 0 : Callsign : 0 : ✓ Cfm

- ✓ **Install and configure your logger** – DXLab Suite works well at AB1OC/AB1QB
- ✓ **Connect radio sound card and CAT control interfaces to your PC**
 - ☐ Must have a means to share CAT and PTT control for your radio between WSJT-X and your logger
 - ☐ Recommend using DXLab Commander as a CAT and PTT Gateway for both programs
 - ☐ Configure WSJT-X to use DXLab Commander in the **Radio Tab**
- ✓ **Install and configure JTAAlert** – be sure to install **Sounds** and **Callsign Database** add-ons
 - ☐ Integrates WSJT-X and DXLab Suite (other loggers supported as well)
 - ☐ Consult the JTAAlert help file to configure these integrations
 - ☐ Setup your alerts according to your preferences
 - ☐ Many other customizations possible – see the JTAAlert Manual for details
- ✓ **Periodically have JTAAlert scan your log and update its databases**

FT8 QSOs on 20m

Answer another station's CQ

[Link to Video](#)



- Answering a CQ from JA5FNX – Tx & Rx Locked (**Hold Tx Freq unchecked**)
- Call CQ and work RA3AL – Tx & Rx Unlocked (**Hold Tx Freq checked**)
- **Auto Seq** is *On* to keep our QSOs to moving along...

FT8 QSOs on 20m

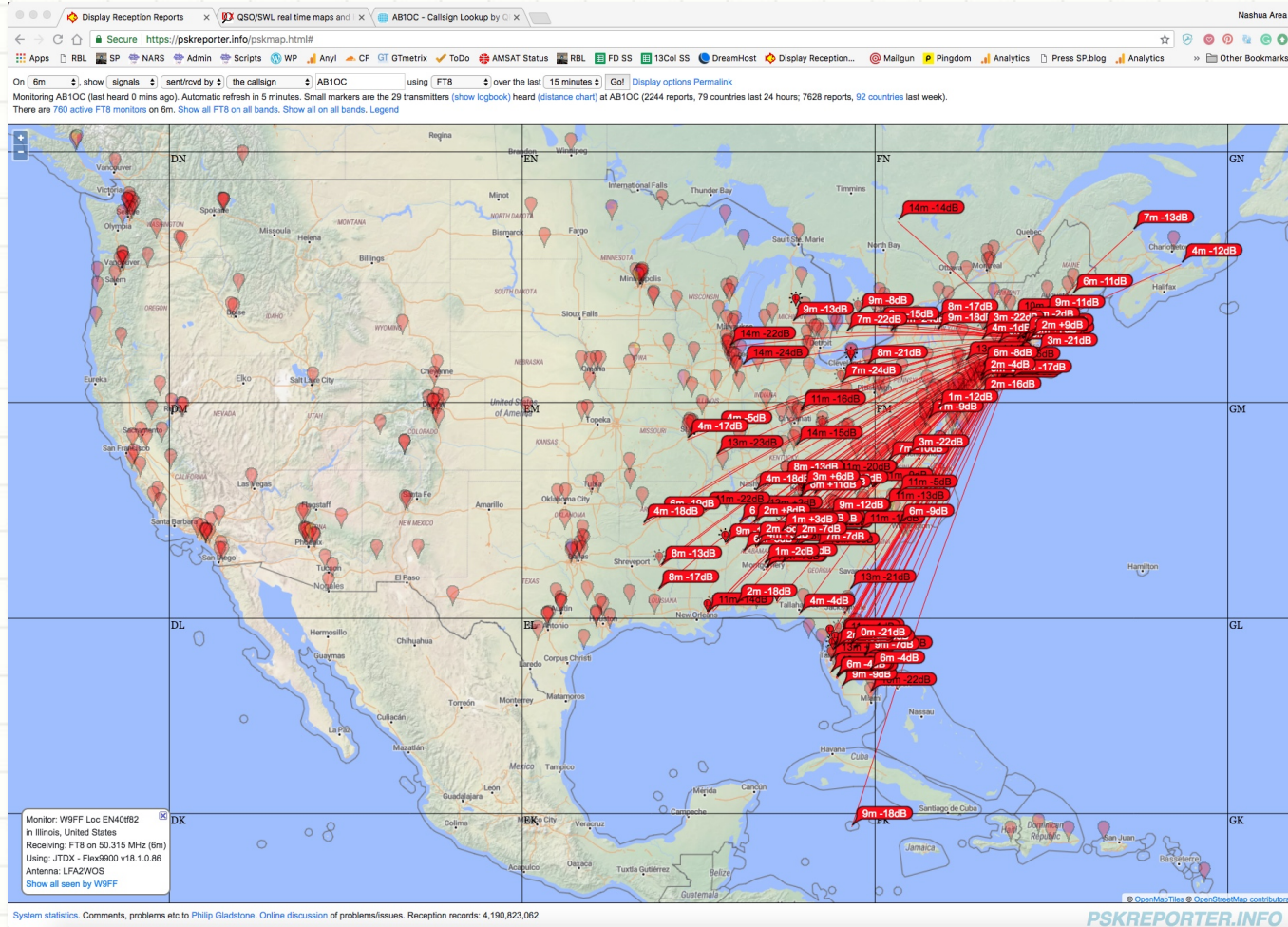
Calling CQ

[Link to Video](#)

The screenshot displays a desktop environment with several software applications open. The primary application is 'Log QSOs', which shows a list of QSOs with columns for Date, Time, Call, DXCC, PTT, Cont, IOTA, S, Q, Grid, Band, Mode, and others. A table of QSOs is visible, listing various stations and their details. Other windows include 'Band Activity' showing a list of active bands and frequencies, 'CPU Usage' showing system resource usage, 'Network Meter' showing network activity, and 'GPU Meter' showing GPU performance. The desktop background is a scenic image of a sunset over a body of water.

- We are **Tx Odd** to follow sequence conventions (not essential on HF)
- Calling CQ so Tx & Rx Unlocked (**Hold Tx Freq checked**)
- Auto Sequence is **On** to allow the QSO to move along...
- **Call 1st checked** – to automatically answer first station responding to our CQ

Evaluating Your Station and Band Conditions



- Use the [PSKReporter website](#) to evaluate your station, antennas, and band conditions in real-time – we always have it running along with WSJT-X
- WSJT-X reports all stations heard calling CQ to the [PSKReporter website](#)
- Use to evaluate and set Tx Power Levels (Reports in -15 to -5 dB range)

FT8 DXpedition Mode

How it works

[Video on YouTube](#)



- DXpedition can work up to 5 stations at the same time; 100+ Qs/hour!
- Consult the DXpedition website ([KH1 example](#)) to determine operating frequencies and add them to WSJT-X Frequencies in the **Frequencies Tab**
- Place WXJT-X in **Hound** mode in WSJT-X **Advanced Settings Tab**
- Set your ***Tx Frequency above 1000 Hz***
- Double click on one of the decoded DXpedition's CQ calls and work them!
- Fox Mode for ***DXpeditions ONLY*** - Not for Field Day, Contest Operation, Casual QSOs, or anything else!

WSJT-X Family of Protocols

Applications and Bands

Mode	Uses	Primary Bands	Tx Interval	Notes
FT8	LF-VHF Weak Signal Fast Mode	160m – 2m	15 sec.	Best mode for HF & 6m weak signal work
MSK144, ISCAT, JT9E-H	Brief Signal Enh. Mode; Meteor or Aircraft Scatter	6m and above	5 – 30 sec., 15 sec. typical	Power and antenna gain necessary for these modes
JT65	EME, Weak Signal MF-VHF	6m+ EME, 160m – 6m Weak Signal	1 min.	Several variations; can avg. multiple mins.
JT9	LF/MF/HF Weak Signal	160m and above	1 min.	2 dB better than JT65 , 10% of BW
QRA64 & JT4	EME	VHF – 24 GHz	1 min	Improved EME mode; Variable tone spacings for SHF+ bands
Echo	EME	6m+	CW, dits	To detect echoes off the moon
WSPR	Propagation and Antenna Evaluation	630m – 6m and above	2 mins.	Used with WSPRnet Reverse Beacon website

Questions?

To Learn More:

Check out the Nashua Area Radio Society's Tech Night Program at:

n1fd.org/tech-night

Become an Internet Subscriber (or members of NARS):

n1fd.org/join-us

Much more information, pictures and video are available on our Blog at:

stationproject.blog



“Over 60% of all QSOs uploaded to LoTW in June and July 2018 were FT8 Mode” – ARRL Podcast