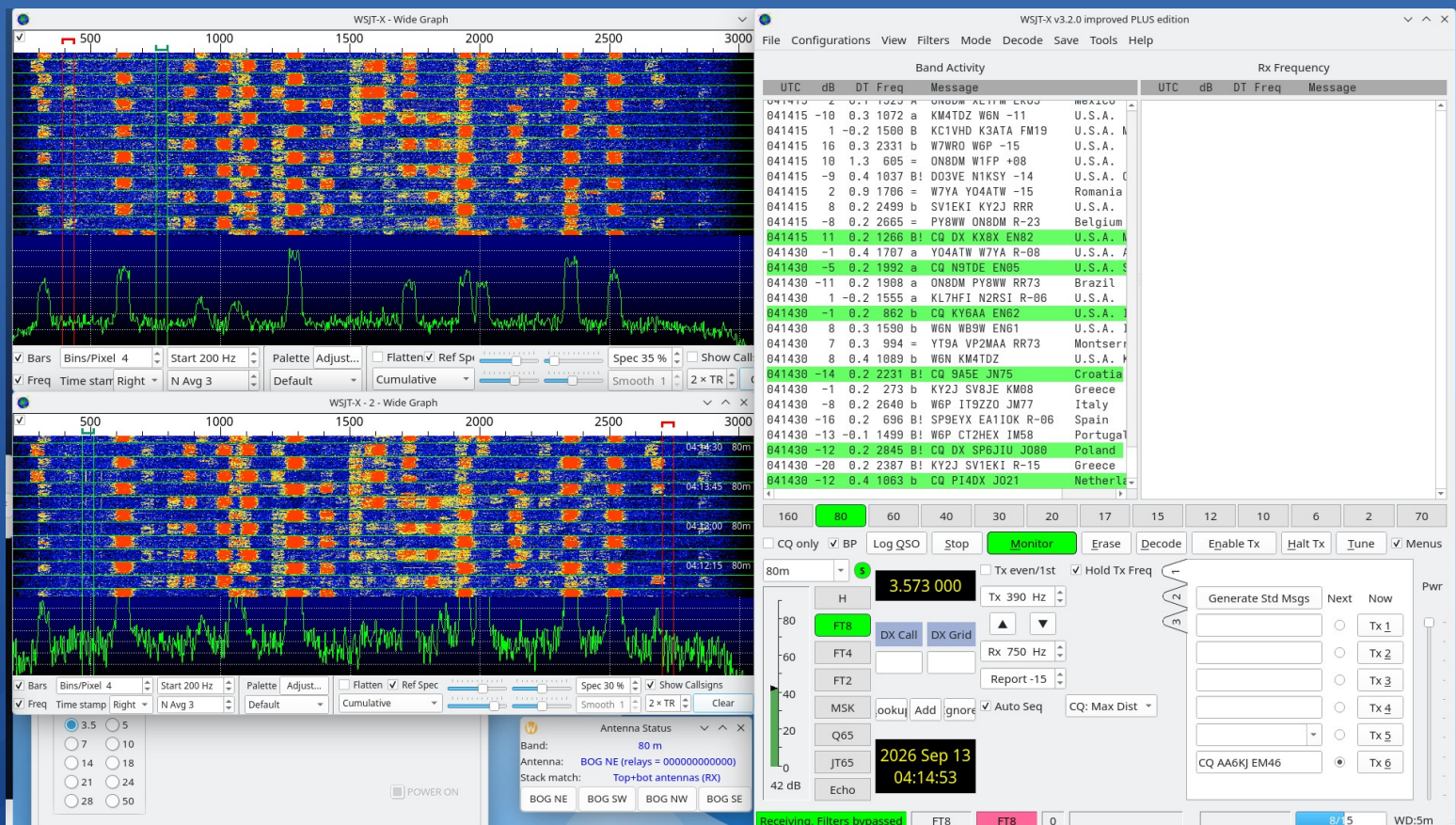


Introduction to FT8



What is FT8?

- Digital mode developed by K9AN (Franke) and K1JT (Taylor)
- “Modern day RTTY” – cannot be decoded by ear
- Needs a computer with sound card (or one built into radio)
- Time synchronized RX/TX periods with 15 second length
- Occupies only 50 Hz bandwidth and can copy below noise
- Weak signal mode (not necessarily low power mode)
- Common FT8 frequencies per band (MHz):

1.840, 3.573, 5.357, 7.074, 10.136, 14.074, 18.100, 21.074, 24.915, 28.074

What is it **NOT** good for?

- Rag chewing – very limited messaging
Typically only call signs, location, signal report exchanged
- Operation without computer (often in portable operation)
- Emergency communication – very limited messaging
- Cannot be used if time is not known with better than 2.5 sec accuracy. Best to have correct time within 0.2 sec
- Traditional ham radio – requires a new mindset...

What is it good for then?

- Very efficient to work stations: DX collecting, activities like Route 66, 13 colonies; Awards: DXCC, WAS, WAZ, etc.
- Fast to locate stations – instant RX of all stations on band
- Making contacts with a small station. Even antennas inside the house would work
- Working weak stations – especially on the low bands (160 m & 80 m)
- Special additional digi modes for ultra weak signals: jt65, q65, etc. For moon bounce work (EME), meteor scatter, ...
- Antenna testing & propagation (pskreporter)

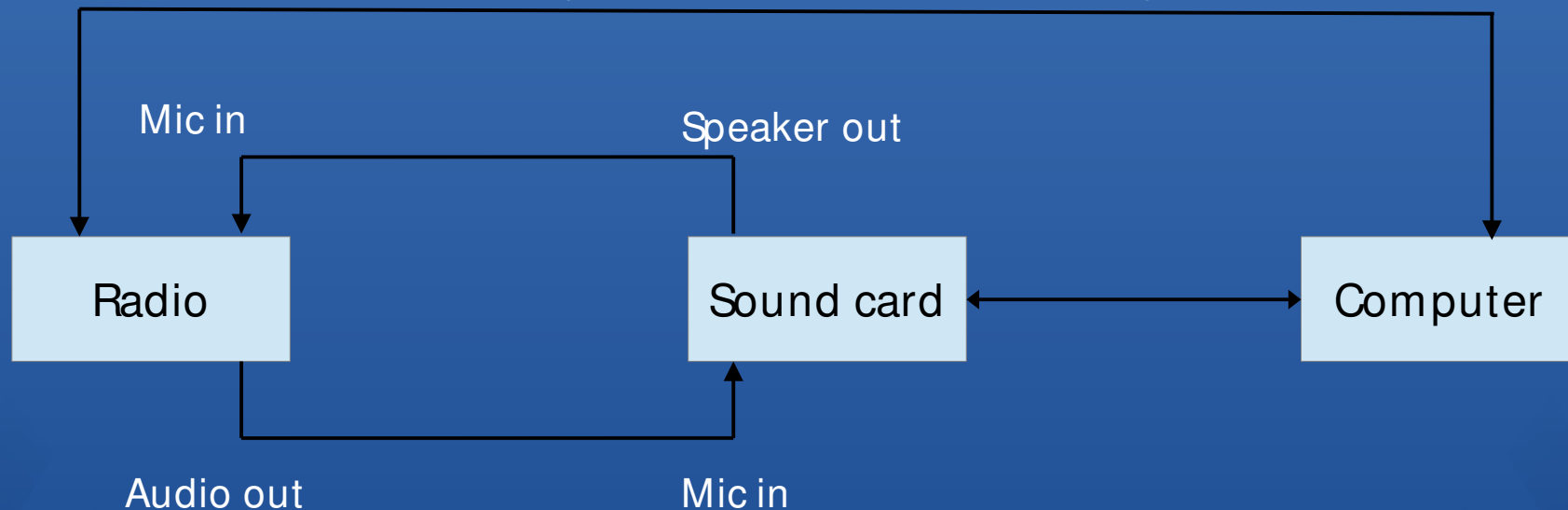
WARNING !!!

- Because of the long TX periods, digital modes can be quite harsh on your radio, amplifier and antenna system
- Often radio gear is rated for full 1500W but only for SSB or CW, which have shorter TX periods
- Especially susceptible: amplifier, coax, baluns/ununs, traps, ...
- Do not overdrive your radio audio, splatter causes lot of problems!



How does it work?

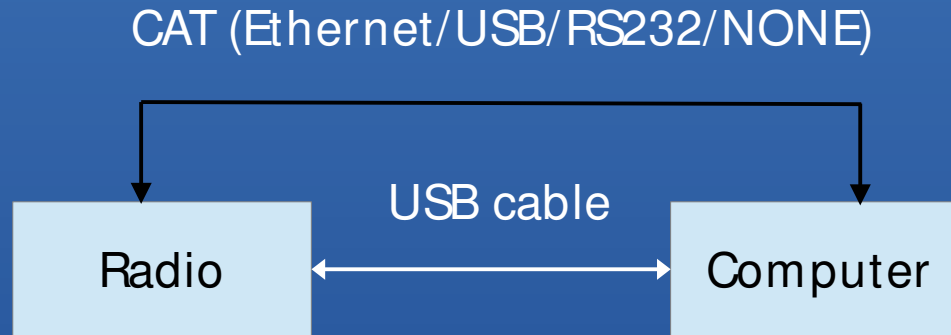
CAT (Ethernet/USB/RS232/NONE)



Radio without internal sound card

CAT = Computer Aided Transceiver (= computer can control the radio)

How does it work?

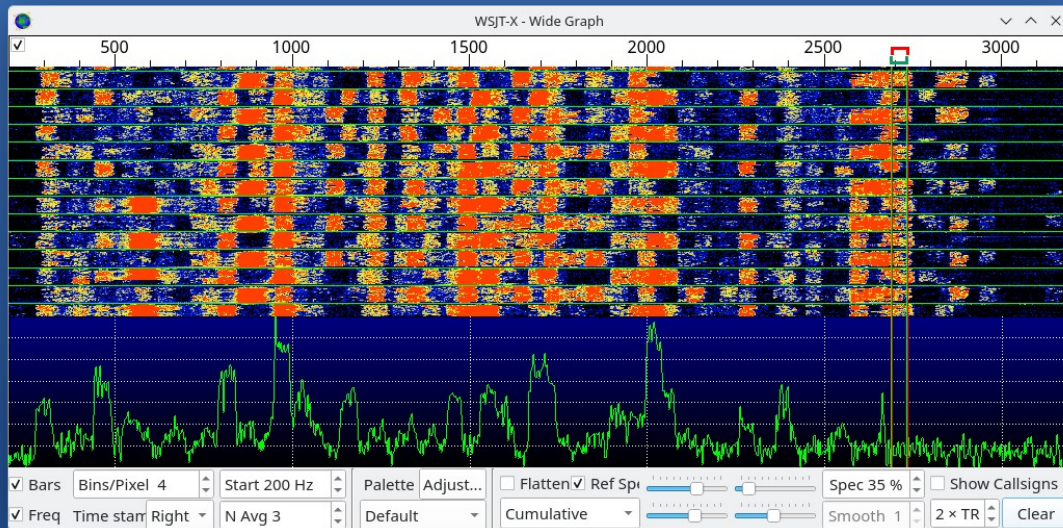


Radio with internal sound card

On the computer the radio appears as a sound card.
Most modern radios have this feature.

Note: This uses only RF for communication – no data sent over internet!

WSJT-X software

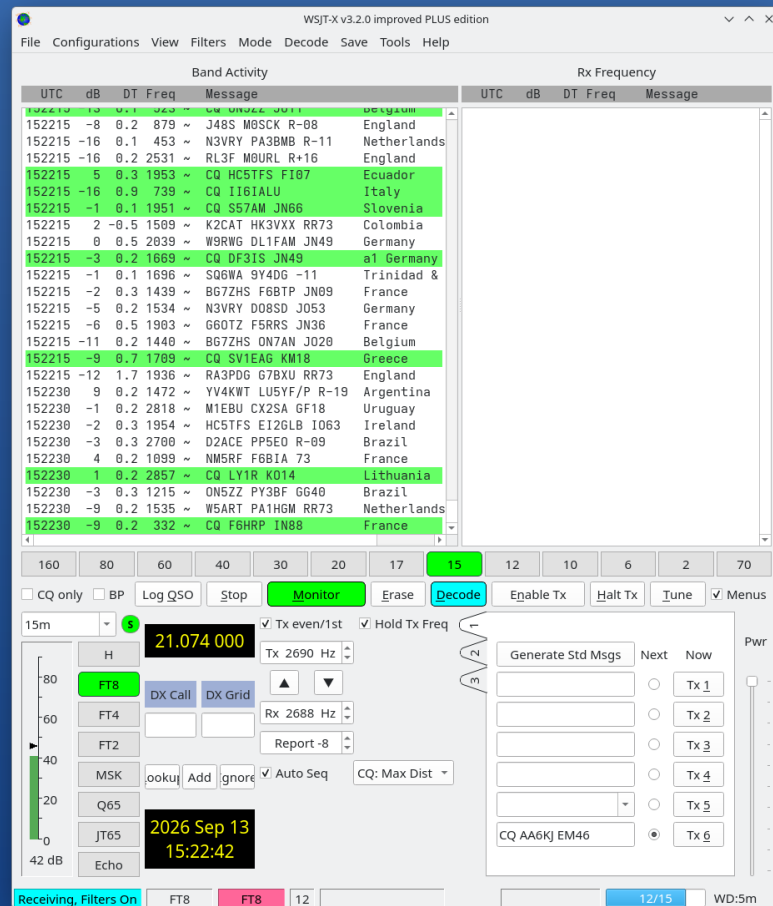


“FT8 panadapter”

Download:

<https://wsjt.sourceforge.io/downloads.html>

Works on Windows, Linux, Mac, Android, ...



Other software

- JTDX alternative to WSJT-X:
<https://sourceforge.net/projects/jtdx/>
- MSHV for running pileups:
<http://lz2hv.org/mshv>
- Improved versions for WSJT-X and JTDX:
<https://wsjt-x-improved.sourceforge.io/>
<https://jtdx-improved.sourceforge.io/>

Running QSOs

- When I call another station (red = me, yellow = OH2AA):

CQ OH2AA KP20

OH2AA calling CQ at KP20 grid

OH2AA AA6KJ EM46

I am responding to his CQ

AA6KJ OH2AA -01

OH2AA gives me -01 dB report

OH2AA AA6KJ R+01

I send roger and give him 1 dB

AA6KJ OH2AA RR73

He confirms and sends 73

OH2AA AA6KJ 73

End of QSO

Each message takes 15 seconds to send / receive.

Running QSOs

- When another station calls me (yellow = me, red = OH2AA):

CQ AA6KJ EM46

I am calling CQ (my grid EM46)

AA6KJ OH2AA KP20

OH2AA responding to my CQ

OH2AA AA6KJ -01

I give him -01 dB report

AA6KJ OH2AA R+01

He sends R and gives me 1 dB

OH2AA AA6KJ RR73

I confirm and send 73

AA6KJ OH2AA 73

End of QSO

Note: This information will show up in both general and RX windows.

QSO exchange

The following information must be exchanged in a QSO:

- Locators for both stations (4 letters; QTH)
- Signal report both ways. Typically between +25 and -25 dB with +25 the strongest and -25 weakest
- All information must be confirmed with R both ways
- WSJT-X can interact with most common logging programs so it can make the right log entry for you
- To view how your signal is heard:
<https://pskreporter.info/pskmap.html>

Signal report scale

-25 dB

The lowest FT8 can copy

....

-15 dB

The weakest CW signal that can be copied by ear

....

0 to +10 dB

Weakest SSB signal that can be copied by ear

.....

> 20 dB

Very strong – upper limit for FT8.
Attenuate signal

Signal report scale

The difference between FT8 and CW is 10 dB!

This corresponds to the difference between dipole and 6 element yagi antennas!

Just like with antennas, this advantage works for both RX and TX (unlike, e.g., amplifier). Even small antennas can work DX stations!

The report scale can be used for comparing antennas and studying propagation

Setup overview

- Connect radio (data or USB mode) and computer (sound card or USB connection)
- Install and set up WSJT-X software on the computer

File → Settings:

- General: Enter your call sign, grid square and IARU region (2)
- Radio: Set your radio type for CAT control
- Audio: Select input and output sound sources
- Computer audio settings: Set empty band RX level to 30 dB on WSJT-X bar (left bottom) and TX to level that does NOT overdrive (radio dependent; on Elecraft K4 ALC just below 5)

Be careful NOT to overdrive your audio (splatter!)

Operating with WSJT-X

- Three important windows:
 - Band activity: all traffic within the 3 kHz FT8 frequency (Hz)
 - RX Frequency: all traffic within the RX frequency (Hz)
 - Wide graph: Panadapter -like view of the FT8 frequency slice (waterfall shows signal history)
- To call station: choose a **free** frequency for your TX and double click on message originating from that station (Hold TX Freq enabled).
- Pay attention to “Enable TX” **yellow/red** button. It tells you whether your radio will **transmit**. Click to toggle
- When TX active, WSJT-X will automatically run the right exchange in QSO sequence (Auto Seq enabled)

Operating with WSJT-X

- RX and TX frequencies are usually different. They can be modified by entering numerical values in the boxes or using left (RX) and right (TX) mouse clicks on the waterfall display
- Follow the band activity before TXing so that you won't end up transmitting on top of someone else
- DX & rare stations operate usually below 1000 Hz (fox-hound)
- Double check the period: even/1st (00/30) vs. odd/2nd (15/45)
- Your computer must synchronize the clock & use right period
- TX timeout setting (6 min) to prevent runaway transmitter

WSJT-X demo



We will now connect to my station over the internet to demonstrate FT8