MARCH 2020   Volume 9   Issue 3
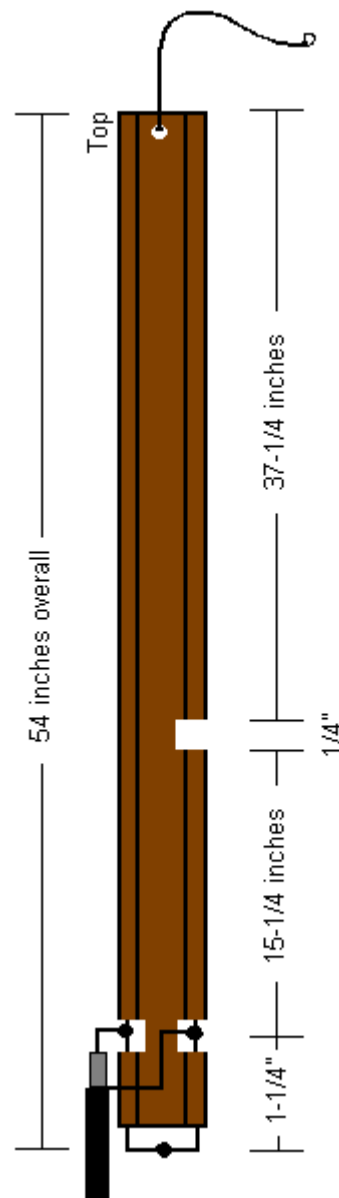
VE3ERC-LUB

ERC   REPEATERS

UHF 444.700   TONE: 131.8
UHF 444.700   TONE: 123.0
VHF 147.390 + TONE: 123.0
EMERGENCY SIMPLEX: 147.51
UHF– IRLP node 2404
VHF– IRLP node 2403, ECHOLINK node
VE3ERC-R

In an emergency, tune Into our repeaters,
UHF 444.700 or
VHF 147.390 or
HF 3.755 LSB or
Simplex 147.510
For coordination and assignments.

Easy to build j-pole using 300 ohm ladder line for portable or emergency communication. More on Emergency Preparedness on page 3—6.

THE PREZ SEZ!

This club is Radio-ACTIVE

President's Update for March 2020

Hello All,

Please be advised of some important information regarding our **Elmira Radio Club** in relation to Public Events and the COVID-19 Global Pandemic. Following the guidelines of our local, provincial, and national Public Health officials and agencies will help ensure everyone's safety in the coming weeks and months. Accordingly:

● For the immediate and indefinite future, and in accordance with social distancing protocol, **all club activities involving gatherings of members** are cancelled due to the global pandemic. This includes activities such as Wednesday morning coffee, April-May-June ERC meetings (in-person), Central Ontario Hamfest, June ERC Field Day, etc. This will ensure we as a club do our part to minimize close contact with others during the outbreak.
Officials say we are in this for at least several months as the pandemic plays out over an as yet unknown timeline. We will adjust and revise our club activities in response to official guidelines/recommendations.

Coronavirus disease (COVID-19): Being prepared

Coronavirus disease (COVID-19): Prevention and risks

● I encourage you all to get some ERC 'social interaction' by making a coffee and joining the morning ERC Net! No masks, just microphones needed, hi, hi.

● ERC Club dues are due this month: $40 RAC members, $50 all others. You can mail a cheque or e-transfer the amount to our club treasurer Paul VA3PDC. Please call his cell to get it to him that way, and for security reasons don't send the security word in the same message.

A thank you to Ted, who literally in the eleventh hour, set up a virtual video meeting for our club members on Wednesday night. For those who may not have seen Ted's e-mail in time, see the next page for the e-mail with appropriate instructions how to access it for our next meeting on April 22. We now know that it works well.

Sincerely,

Brian VA3DXK
President, Elmira Radio Club

ERC Meeting Information

TED RYPMA—VE3TRQ via groups.io   March 25, 2020 7:15PM
to ve3erc@groups.io

Everyone,

Here's the info you need to join the Elmira Radio Club on-line meeting. Just click on the link, and it should bring up your browser or Hangouts Meet app (on iOS or Android):

To join the video meeting, click this link: https://meet.google.com/pzm-rqrz-egt

Otherwise, to join by phone, dial +1 678-631-8954 and enter this PIN: 409 601 197#

"pzm-rqrz-egt" is the meeting code, in case you need it. I plan to be near the radio, so will also have RF access. Connect any time you want.

Try VE3TRQ

Paul VA3PDC added the following instructions:
Hello Again,

I have copied the link from Ted for tonight's meeting. After you access it, type your name in the space provided and click ask to join.
If it doesn't see your camera or audio, settings are the three vertical dots in the bottom right hand corner of the screen. From there you can set your desired camera and sound card.

_____

Correspondence- Emergency Preparedness
Frank Monozlai VA3FLN sent me

Preparedness Foundations
Course Workbook
by Clayton Whitson & Jonathan Coussens

It is a very thorough 79 page free to copy book on Emergency Preparedness in pdf format. If anyone wishes a copy, send me an e-mail at
bobve3ixx@gmail.com
and I will be happy to forward you a copy. Frank wrote the following e-mail:

Hello,

I dug up a copy of lesson plans for teaching emergency preparedness to church and community groups and thought it would be a handy resource under the current circumstances.

For Your Consideration,

Frank VA3FLN

Personal Emergency Preparedness

Who would have thought a few weeks ago that today, we, as a community, as a country, as the entire world, would all be self-isolating due to a deadly virus?

Over the years the Elmira Radio Club has been involved with Emergency Planning for our local township. We have talked a lot about Emergency Preparedness as a club, but how much have we pondered Emergency Preparedness for ourselves and our families?

At the moment we still have the main necessities to sustain us. We have a roof over our heads, hydro to supply our energy needs, retail outlets for food, maintenance and repairs and internet and telephone to keep us connected and entertained. But as we have seen how easily any of these systems can deteriorate in the "twinkling of an eye," it is a good thing to reflect on our personal Emergency Preparedness.

For an intensive plan check out the material listed by Frank VA3FLN on the previous page. However, The Region of Waterloo Emergency Measures Office has put out a very basic Emergency Survival Checklist. Keep in mind that you maintain a three-day supply for every person.

- Flashlight and spare batteries.
- Radio and batteries or crank radio.
- More spare batteries in all the needed sizes.
- First-aid Kit.
- Candles and matches or lighter.
- Extra car keys and cash money.
- Important papers (identification)
- Food and bottled water.
- Clothing and footwear.
- Blankets or sleeping bags.
- Toilet paper and other personal items.
- Medication.
- Backpack/duffel bag (to hold all of the emergency survival kit items)
- Whistle (to attract attention, if needed)
- Playing cards, games.
- And finally as hams, handheld or mobile radios for communication if cell phones fail.
- Extra batteries for your radios and charging systems whether through your car battery or small solar chargers.
- See the easy portable antenna on front page of the newsletter.
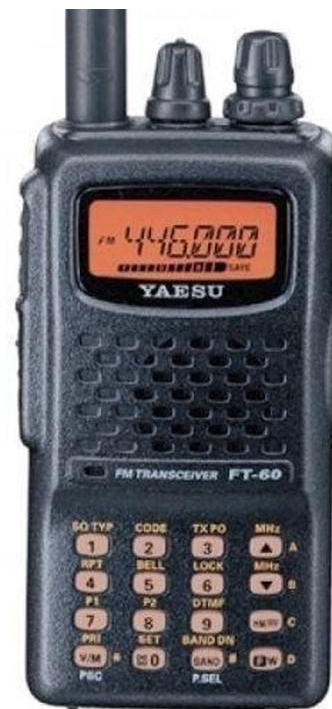
For immediate release:

Message from the RAC President
Glenn MacDonell, VE3XRA

The Covid-19 pandemic has been a part of our daily lives for several weeks now and will most likely continue to be for some time. The pandemic is of particular concern for Radio Amateurs because ours is a hobby that can be practised by people of all ages from elementary schoolchildren to senior citizens.

In fact, it is frequently one of the activities that many take up as they near or begin retirement and finally have the time and resources available to participate. Consequently, we have a high proportion of seniors among our members and indeed some of the Amateur Radio clubs affiliated with RAC are senior citizen organizations.

Canadians are being directed to stay home in order to limit their contact with other people and to "flatten" or "plank" the coronavirus curve. As result, Amateur Radio club meetings and public events have been cancelled and clubs are investigating ways to keep in touch with their members – who are being encouraged to limit direct personal contacts through social/physical distancing and self-isolation – by using existing or new Amateur Radio nets (see below) and/or internet-based communication tools such as Zoom, GoToMeeting, WebEx and many others.

Isolation can have its own potential problems for people who live alone. Amateur Radio is all about communicating and we have the necessary hardware and expertise to enable individuals to stay in touch with their families, friends and colleagues.

The Canadian Red Cross has prepared a "Psychological First Aid Pocket Guide" (PDF file, 631 kB) which "provides emotional and practical support to individuals, families and communities who are having difficulty coping. It is about establishing a connection with people in a compassionate non-judgmental manner to bring calm and comfort."

The Amateur Radio Emergency Service (ARES) is assisting the effort at every level. Some regions have already activated their Emergency Operations Centres to help coordinate agencies working the frontline and because of the current state of emergency declared by provinces, territories and municipalities. This does not mean that Amateur Radio Emergency Services are active or will be activated for this event. We provide communications services to mitigate potential failures and currently, despite the reports of concerns, there have been no reported issues.

Amateur Radio nets regularly connect individuals on a scheduled basis, but perhaps they can play additional roles during these difficult times such as helping isolated seniors keep contact with one another and allowing their colleagues and club members to help out when needed. We do not have a complete list of all Amateur Radio nets in Canada but the links at the end of this Message will provide a good start.

The impact and duration of the unprecedented global pandemic we now face has yet to be determined and it is difficult to plan in an uncertain future. However, although the RAC Head Office in Ottawa has been closed indefinitely, the majority of activities and responsibilities of the RAC administration are now being performed remotely. In addition, the RAC Board and Executive and all RAC committees and volunteers continue to work on behalf of all RAC members and for Amateur Radio in Canada and internationally.

The Amateur Radio Service consists of a diverse population, both in age and abilities, and Amateurs and Amateur Radio organizations are adapting to the current crisis and using their skills and knowledge to help in any way they can. RAC is also rising to the challenge and is now looking at ways to do things differently and to take advantage of our technical skills and recent technological advances. For example, we are now in the final stages of organizing both a Basic and an Advanced online Amateur Radio course. More information about this new initiative will be posted on the RAC website in the coming days.

It is interesting that we are discussing this new need for Amateur Radio to provide assistance as we approach World Amateur Radio Day which is held every April 18. It was on that day in 1925 that the International Amateur Radio Union (IARU) was formed in Paris and Radio Amateurs worldwide now take to the airwaves each year in celebration.

Appropriately, the theme of World Amateur Radio Day is "Celebrating Amateur Radio's contribution to Society" and Amateur Radio will play its part as the current global crisis unfolds. RAC is planning to celebrate World Amateur Radio Day this year on the air by inviting Amateurs in Canada and around the world to contact RAC official stations (VA2RAC, VA3RAC etc). The details are still being worked out and we will provide more information about this event in the near future.

Thank you for your continued support and understanding during this time of crisis. Please take care of yourself and your loved ones. Stay safe and, wherever possible, let us help one another during this extraordinary time.

Amateur Radio nets:
Radio Amateurs of Canada:

https://www.rac.ca/nets/

The Battleford's Amateur Radio Association:

http://ve5brc.amateur-radio.ca/net.htm

The North Okanagan Radio Amateur Club:

http://norac.bc.ca/index.php/nets

Glenn MacDonell, VE3XRA
President, Radio Amateurs of Canada

www.rac.ca

720 Belfast Road, #217
Ottawa, ON K1G 0Z5
613-244-4367, 1- 877-273-8304

raccomms@gmail.com

VE3ERC Elmira Radio Club Inc.

Minutes from March 25, 2020

1. **Call to Order & Welcome**

The meeting was open at 7:30 pm by our virtual meeting host Ted VE3TRQ. The meeting was held on line due to covid 19 concerns.

2. Roll Call: Ted VE3TRQ, Bill VA3QB,Brian VA3DXK, Brian VE3YBM, BruceVE3QB, Dan VA3SQD, Frank VA3FJM, Kirk VA3KSX, Judd VE3WXU, Ken VE3KCY, Roger VE3RKS, Tony VE3DWI, Paul VA3PDC, Tom VE3DXQ, VE3DCC Rich, Wes VE3ML, VE3CD Harold, Bob VE3IXX.

3. Adopt Agenda : Brian VA3DXK used Feb agenda as one was not made up for the March meeting as we were not sure if we would have a meeting due to Covid 19

4. Secretary's Report: Tom VE3DXQ – January minutes were accepted

5. Treasurer's Report: Paul VA3PDC made a motion to pay for the following items: coffee card for our guest speaker, office supplies, and RAC insurance. Seconded by VA3QB. Paul reminded everyone dues are due and you can pay via email transfer or drop off a check at his place. $40.00 per RAC member and $50,00 for non RAC members.

6. President's Report: Brian VA3DXK reminded us that the AGM meeting is in May and we should keep that in mind. He said he is not sure how this will turn out due to the situation (covid 19). It may turn out existing Executive may be back in by acclamation.

 7. Committee Reports: Brian VA3DXK reminded those present we still need to strike up a nominations committee. Brian asked for volunteers for the nominations committee and none were forthcoming.

8. Unfinished Business: Elmira Maple Syrup Festival is cancelled due to Covid-19.

Ham Tech Committee: Ted VE3TRQ said we need to come up with new speakers as not to have a repeat of last years, Speakers. Tom VE3DXQ said we may not have the event this year as it will be hard for Frank to get around to the various clubs to promote the event and also line up speakers in time. Rich VE3DCC said we may have to run this on a restricted scale, but time is running short. Brian VA3DXK said that he has relatives in the medical profession and they are saying this covid thing could last 4 to 6 months. Brian said he will get a hold of Frank to check progress on Ham Tech, and decide a go or no go on the event. Roger VE3RKS said on the Ham side did an online conference with speakers which was successful. They used ZOOM. Brian VA3DXK said that so far Bob VE3IXX and Reg VE3RVH have signed up to help Frank with Ham Tech and he is looking for more volunteers to sign up to help. You can let Brian know if you wish to sign up by sending him a personal email. Frank VA3FJM did show up late in the meeting and advised that the Legion Hall is not able even to talk with him at this time, and so he can not even set the date for the Hall. Frank said there maybe a speaker available in California by video link, but the situation out there is making it very difficult to get a hold of people. So things are on Hold for now.

9. New Business: - Tom VE3DXQ asked about ERC on eQSL whether we should keep the lighthouse eQSl card up there. The Club decided that due to the fact that there is no maple Syrup Festival this year we will leave the Point Clark Lighthouse eQSL card on the ERC eQSL sight.

10. Presentations/Speakers/Workshop: none.

1**1.ANNOUNCEMENTS**:Next Meeting: Wed April 22, 2020

12. Adjournment – meeting adjourned at 8:40 pm.

CONTRIBUTIONS TO VE3ERC-CLUB NEWSLETTER

Do you have an article you'd like to submit? Or photos? Do you have any comments you'd like to make?

Perhaps you'd like to share a photo of your shack, a   special project you are working on or a special interest!

SEND THEM TO:

Bob bobve3ixx@gmail.com

(519-787-2279)

HOW GUY WIRES ARE MADE

WEDNESDAY NITE NET CONTROLLERS

FEBRUARY 12 - TED VE3TRQ

FEBRUARY 19 - AL VA3TET

FEBRUARY 26 - M E E T I N G

MARCH 4 - REG VE3RVH

MARCH 11 - FRANK VA3FJM

MARCH 18 - TOM VE3DXQ

MARCH 25 - M E E T I N G

APRIL 1 - BILL VA3QB

APRIL 8 - WES VE3ML

APRIL 15 - PAUL VE3PVB

APRIL 22 - M E E T I N G

APRIL 29 - AL VE3DZZ

MAY 6 - BRIAN VA3DXK

MAY 13 - BOB VE3IXX

How the National Bureau of Standards helped make "radio"

This was originally published as "NIST's Role in the Early Decades of Radio (1911-1933)" on the National Institute of Science and Technology's blog, *Taking Measure…….*Dan KB6NU

Even if you weren't able to watch the recent Super Bowl on TV, you could still listen to the play-by-play commentary on the radio. But radio does more than just broadcasting sporting events or playing music. It plays a major role in emergency response, navigation and science.

The word "radio," however, didn't become part of our regular vocabulary until 1911, and it happened thanks in part to J. Howard Dellinger, a radio scientist at the National Bureau of Standards (NBS), the agency that became the National Institute of Standards and Technology (NIST). This came about when the second International Radiotelegraph Conference was being planned in London, and a professor sent Dellinger a paper that he was going to present to the conference for review.

At the time, "wireless" was used as the term for radio communication, especially by the British. However, NIST was charged with revising standards in preparation for the conference, and Dellinger suggested that the professor use "radio," which was already becoming a popular word in the U.S., instead of "wireless." The professor agreed, and the word "radio" went on to become the universally accepted term.

Dellinger not only played a role in popularizing the word "radio," but he also played a role in the first radio work done at NIST. A commercial company asked NIST to calibrate a wavemeter, a device developed by one of its engineers that measures electromagnetic waves like those of radio. Dellinger was known as the wireless expert and took on the project of calibrating the first radio instrument at NIST.

A New Type of Radio Receiver

But for radio to become mainstream, it first had to be commercialized, which began with its introduction into households. However, the challenge was building a radio set that used the electrical current, called alternating current (AC), which powered lights, fans and kitchen appliances when plugged into wall sockets. The predecessor to this technology was developed and patented by two researchers, Percival D. Lowell and Francis W. Dunmore, at NBS in 1922. They called their invention the "mousetrap."
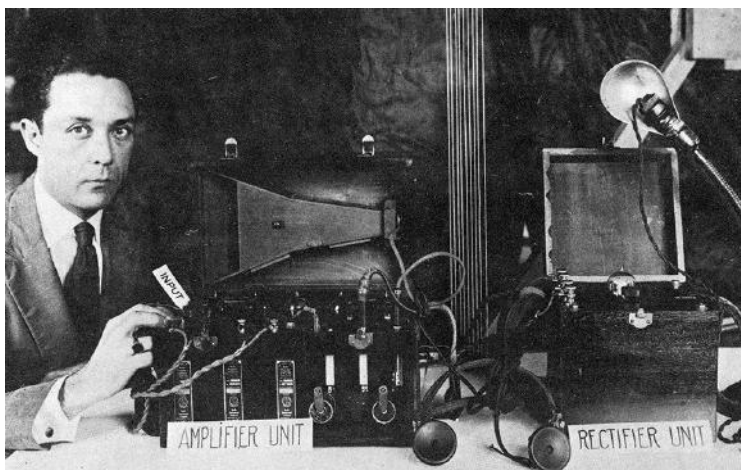
The "mousetrap" was a receiver for a radio amplifier that could run on AC. This was considered a breakthrough because at that time radios were only able to be powered by direct current (DC) provided by batteries. These batteries were bulky and heavy, had to be charged from time to time and were considered dangerous because of the acid used in them. The researchers' prototype meant the radio could be used in homes without causing damage and with the same performance quality.

Lowell and Dunmore filed two more patents together for other innovations, and for the "mousetrap" they sold the rights to the Dubilier Condenser Corporation. Little did they know that, because there was no uniform policy on patents issued to government employees, their actions would result in more than a decade of litigation over who legally had the rights to the patent.

While they were tied up in court, the Radio Corporation of America (RCA) developed its own model of the AC radio in 1926. Its model later became the first AC-powered radio sold to consumers.

Flying by Radio

During the early years of flight navigation, NIST was doing research to assist pilots while they were flying and landing. Pilots needed three things to get their bearings when flying "blind," meaning it's foggy, too dark or too cloudy to see. They needed to know the longitudinal position, altitude and speed of the aircraft, which were all achieved by various beacons installed in the plane. The remaining issue was that there were two frequencies the pilot constantly had to switch between the frequency that the Department of Commerce used to send weather information to planes and ships, which sometimes caused interference for pilots, and the frequency the radio beacon operated on, which gave altitude and other information.

Dunmore created a prototype, but Harry Diamond, a radio engineer who joined NIST in 1927, completed the device, called the radio guidance system. Diamond solved the problem by developing a separate device that allowed for voice communication to the pilot without receiving any outside interference from ships' radios.

A Curtiss Fledgling, a trainer aircraft developed for the U.S. Navy, was equipped with the device, and flight tests were performed between NIST's experimental air station at College Park, Maryland, and Newark Airport in New Jersey in foggy weather. After a series of successful tests were performed, the device was turned over to be used by the Department of Commerce in 1933.

Praise From a Famous Inventor

While mostly intended for serious users, some of NIST's journals and publications were popular with the public. One such book, titled The Principles Underlying Radio Communication, covered topics such as elementary electricity, radio circuits and electromagnetic waves and was also published as a textbook for soldiers in the U.S. Army. The famous inventor Thomas Edison received a copy from NIST and wrote a letter thanking the first director, Samuel W. Stratton, for publishing it, saying it was "the greatest book on this subject that I have ever read."

As these and other examples show, NIST had a significant influence on radio research between 1911 and 1933. However, NIST's radio work didn't end with the first blind landing. NIST would continue to contribute to the field leading up to and during World War II, and research continues to this day in areas such as 5G, public safety communications and spectrum sharing.

ABOUT THE AUTHOR

Alex Boss is a general assignment writer in the NIST Public Affairs Office and covers standard reference materials (SRM). She has a B.S. in biology from Rhodes College and an M.A. in health and...
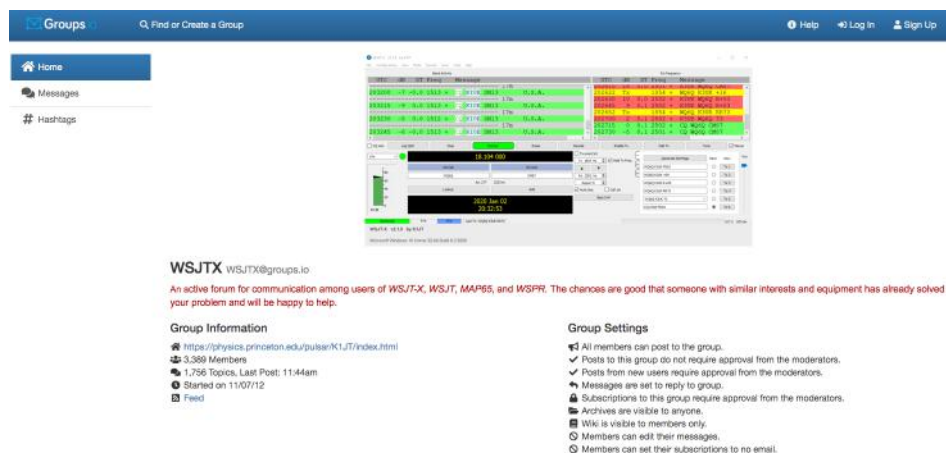
Digital Radio Today

By Ted VE3TRQ

Digital Radio Bits – The 800 Pound Gorilla – WSJT-X and FT8

We can't talk about digital radio today without mentioning Joe Taylor. He is responsible, together with a few other folks, for JT4, JT9, JT65, FT8, FT4, MSK144, WSPR, and a few other digital modes. One computer program, WSJT-X, implements them all.

The "JT" in JT9, JT65, etc., stands for **J**oe **T**aylor, PhD (K1JT), a Princeton professor of astrophysics (and Nobel laureate). The "FT" in FT8 and FT4 stands for **F**ranke and **T**aylor, where Taylor is the aforementioned Joe Taylor, and Franke is Stan Franke (K9AN). Together with Bill Somerville (G4WJS) who did much of the software build and distribution, they are responsible for the FT8 and FT4 modes in WSJT-X. Bill Somerville is quite active on the groups.io WSJTX group, and answers many questions there. This is a great place to find out what is going on, what problems hams are seeing, and finding tips and techniques for using the modes and the program.


A review of what WSJT-X does

The "WS" in WSJT-X is for "Weak Signal" digital modes. That's _weak_ signal, not QRP or low power! Use as much power as you need to complete a QSO - a kilowatt may be needed to get to the moon and back (EME). Just don't overdrive the audio input of the transceiver, which is the cause of most of the "crud" and splatter on the FT8 bands. That said, most people are careful to use no more power than necessary, often less than 30 watts. The forward error correction (_FEC_) used in the encoding scheme allows for information to be reliably recovered from weak signals.

The first modes made popular by WSJT-X were JT65 and JT9. Although JT65 and QRA64 were designed for EME on VHF/UHF, they work just fine on terrestrial HF with low power or weak signal levels. JT9 was actually designed for HF weak signal use. JT65 is 178 Hz, QRA64 is 111 Hz, and JT9 is 16 Hz wide. Many simultaneous signals of each will fit in a single 3 KHz SSB signal bandwidth, allowing most transceivers to pass many to the decoding program.

These modes (QRA64 / JT65 / JT9) are the "slow" modes, taking 60 seconds for each transmission, which includes decode time for the receiver (approx. 10 seconds). A complete QSO, with CQ, response, signal report, and acknowledgement, in these modes lasts for 4 to 6 minutes.

The JT65 and JT9 modes are seldom seen these days, although they were extremely popular before the advent of FT8. It's a pity they have fallen out of favor, as the *SNR threshold* for JT65 is -25 dB, and for JT9 is -27 dB! These modes can really be dug out of the noise.

Next for WSJT-X came FT8 mode, which dropped the transmission and decode time to 15 seconds, with a total QSO time of 1.5 minutes. FT4 followed shortly thereafter, with a transmission and decode time of 7.5 seconds, and a QSO completion time of less than a minute. Speed counts out there! Unfortunately, sensitivity was sacrificed for the increase in speed. The *SNR threshold* for FT4 is -17 dB, and for FT8 -21 dB. FT4 is a full 10 dB **less** sensitive than JT9.
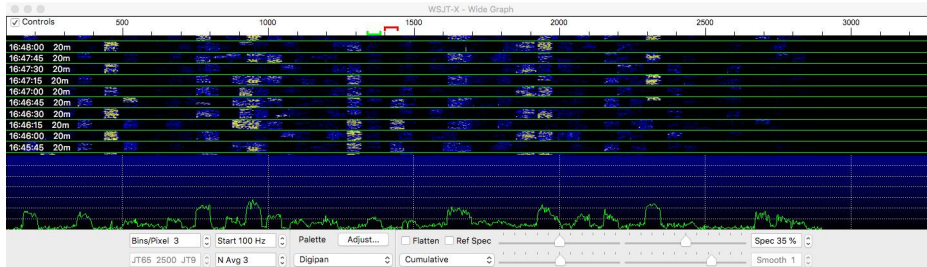
The only other mode implemented by WSJT-X that I will mention (and which I use often) is WSPR - **W**eak **S**ignal **P**ropagation **R**eporter. This mode is only 6 Hz wide, and is usually used at less than 5 watts (I usually run 500 mw to 1 W). The transmit and decode cycle is 2 minutes long. This is not a QSO mode, and is designed strictly to test and monitor propagation. The *SNR threshold* for this mode is an astounding -31 dB! I have been heard on 20m and 40m, with my compromise attic antenna, at 250 mw around the world, including in Antarctica. This mode is monitored using a website, *wsprnet.org*, at which one can visualize on a map of the world the location where receivers have monitored your signal, and the location where transmitters are that you have received. This information is absolutely invaluable in evaluating antenna systems and propagation conditions.
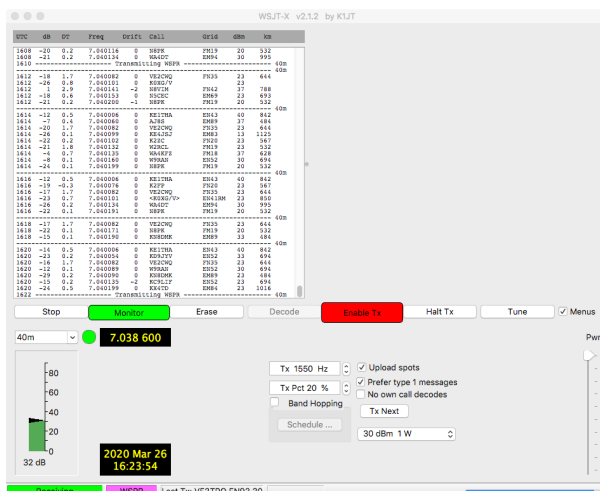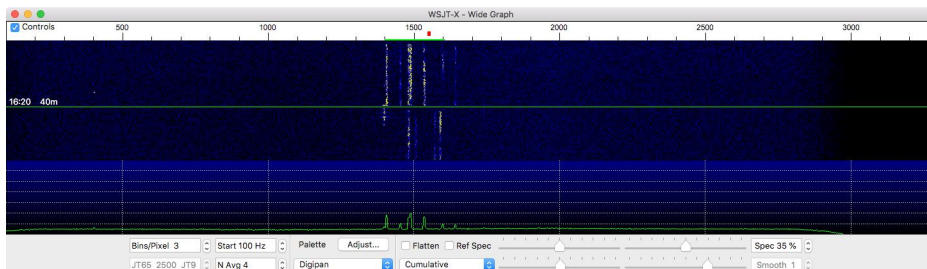
Setting up to use WSJT-X

You will need both a CAT (Computer Aided Transceiver) and an audio interface to your radio from your computer (for ease of use, CAT is needed, although it is possible to operate without it). I will not go into details of interfacing radios to computers – the topic is too broad to cover in one short article. There are many support groups and web page devoted to solving radio interfacing issues, among them *groups.io/g/WSJTX* and *physics.princeton.edu/pulsar/k1jt*. You will definitely benefit from installing an NTP (*Network Time Protocol*) client on your computer to keep time (I prefer Meinberg NTP software for Windows). If you see band activity, but no decodes, check your clock (visit *time.is*). You will need to configure station information, radio information, and audio interface information in the WSJT-X Settings / Preferences.

General Settings: Enter your callsign and location information (Maidenhead grid square), plus configure double-click on callsign behavior (for auto tx-enable) and configure the watchdog transmit timer (6 minutes is good for slow modes, 2 minutes for fast modes).
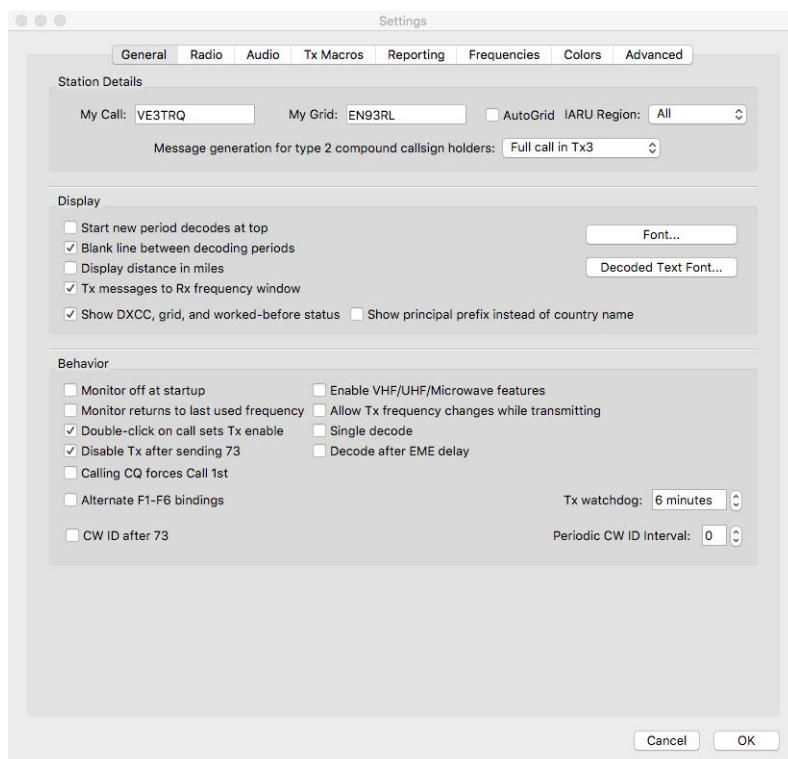
Radio Settings: If using CAT control, choose your rig from the dropdown list, or choose the program you are using to interface with your radio (i.e. *HRD, HamLib*, etc.), or choose *None*. The interface available will depend on the *Rig* setting chosen above (Serial, USB Serial, Network, etc.). If the method is Serial, you will need to match the serial parameters such as *baud rate*, *stop bits*, and flow control that the radio is set for. You will need to choose a *PTT Method*, which should be CAT if you have set up CAT. You can use hardware control lines DTR / RTS, or VOX if CAT is not set up. *SPLIT Operation* helps keep the audio in the *sweet spot* of the bandpass by optionally changing the tx dial frequency (*Fake It*) in conjunction with audio frequency, or actually using the radio's VFO B to transmit on (*SPLIT*), or by doing nothing and assuming the radio has the capability to transmit cleanly anywhere in the passband (*None*). Your radio's capabilities will determine which is best.
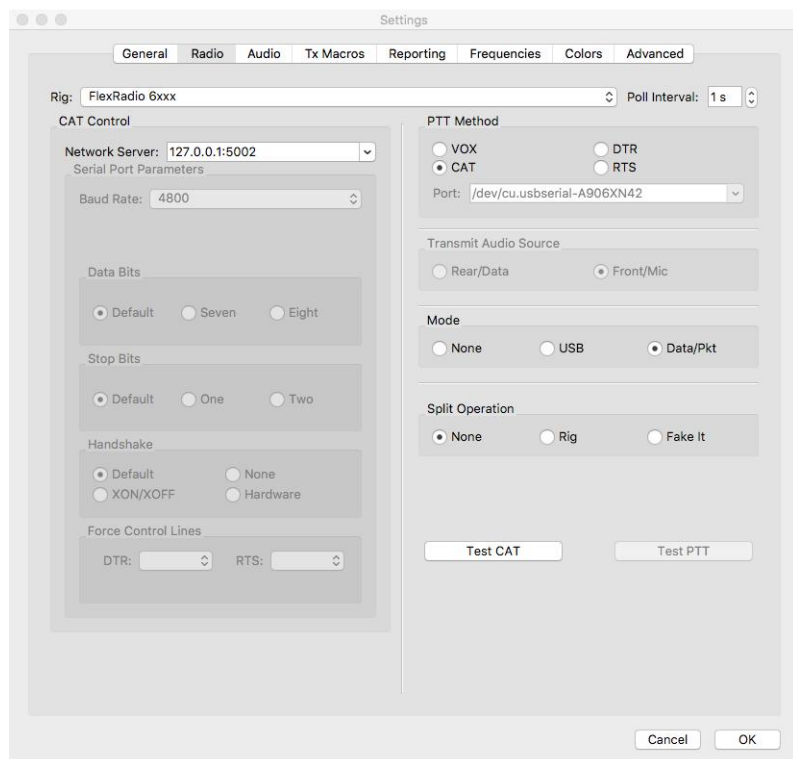
Audio Settings: You may have a sound card in your computer, in an external device, or in your radio – they will all work fine. In my case, the digital audio stream from the WSJT-X program is sent directly via network to my radio. The sound card must support the 48K rate, 16-bit samples sent by WSJT-X, preferably in *mono*, although stereo can work. If the sound card has a *line in* and a *mic* in, be sure to use the *line in*. If ther is only a *mic* input, be sure to set it to 0 dB.
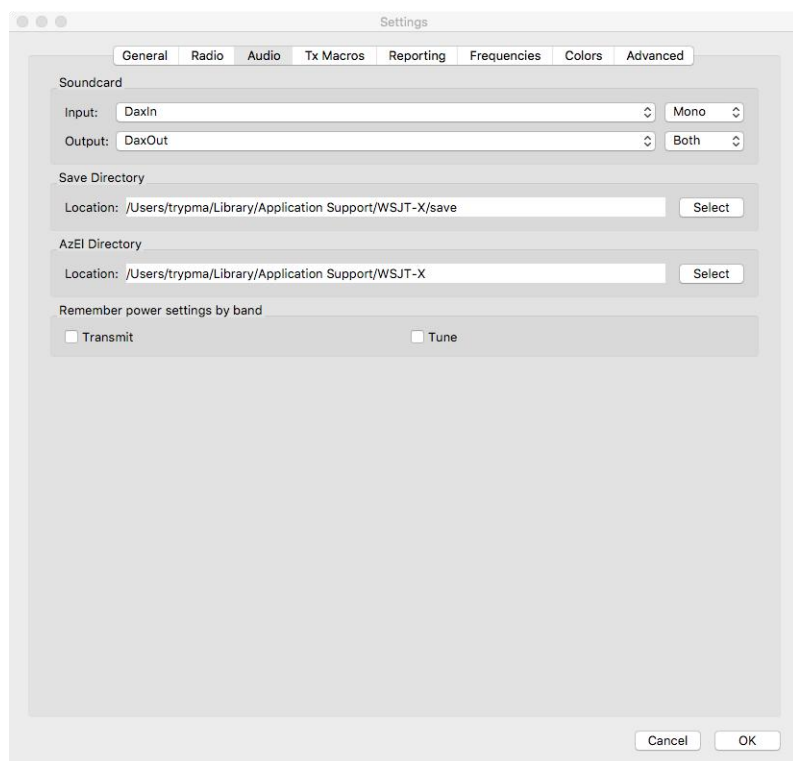
Other WSJT-X settings can be left alone, unless you want to make changes, for instance to the colour scheme for displayed stations. Also, the default frequencies for the various modes may

be reset to default by *right-clicking* on the frequency tab and choosing *Reset*. The *Reporting* panel allows setting up sending to *PSKreporter*, and to local logging programs.

Before using WSJT-X, the input and output levels need to be set. For input (*Rx*), the PC audio card settings and/or the radio audio output needs to be adjusted so that the audio *level* indicator on the left hand side reads approximately 30 dB on a quiet band with only background noise. For output level (*Tx*), the audio card output level would normally be set mid-range, then the radio microphone or line input level adjusted for appropriate ALC action on the rig while WSJT-X outputs a *Tune* tone. At this point, you may also reduce the *PWR slider* on the right until the transmitter output just drops a small amount. I always run mine at 100% and adjust with the radio or sound card output.

The spectrum / graph display has a number of settings that affect how the incoming signals appear. The *Bins/Pixel* value should be set to show the entire bandwidth in the spectrum display (I use 3). I set the start of the spectrum to 100 Hz so I don't try to decode too low a frequency. I set *N Avg* to 3 for a slow waterfall scroll. I prefer the *Digipan* colour scheme, and do *not* check *Flatten* because my radio has a nice flat response across the bandwidth - you may need to turn it on if your baseline is not horizontal most of the way. Choose *Cumulative* for spectral display. Waterfall and spectrum gain should be chosen for signal colour, width, and contrast. Both waterfall and spectrum zero points should be chosen so you can see the signals of interest - start at the mid-point and adjust as needed. These last four adjustments are sliders.

Using WSPR

To use WSPR to test propagation with your antenna system, choose a band, go to *Mode*, and choose *WSPR*. If Monitor is enabled, you should see narrow WSPR signals and after a couple of minutes, some decodes in the *Band Activity* window. Adjust the *Tx Hz* value so that the red bar is at least 5 Hz away from any received signals you have seen. Set your *Tx power* in the WSJT-X dropdown to less than 5 watts, and set your transceiver power the same. Set the *Tx Pct* to 20% or so - i.e. *Tx* approximately 1 in 5 intervals. Now *Enable Tx* and start watching the *wsprnet.org* website for your signal. Enter the band and your callsign, and the spots will be filtered for your station, receive and transmit. Make sure you have enabled *Upload Spots*! At this time, *wsprnet* still has an issue with Google maps, and the display is compromised (Google wants money!)

Using FT8 / FT4 / JT9 / JT65

All these modes use a common procedure for making QSOs. To start, just choose your band, and the CAT control will set the transceiver frequency for you. Make sure *Monitor* is selected and wait for signals to appear and decode in the *Band Activity* window. To start, choose *Msg Type 2* from the choices next to *Calling CQ* and *Answering CQ*. There are three different message displays - I happen to prefer *Type 2*. Before answering any CQs or calling CQ, be sure to

click the *Hold TX Freq* checkbox*,* find a clear spot on the spectrum, and *ctl-click* on that frequency to move and keep red transmit marker there. A simple *left-click* will move the green receive marker, and cause traffic there to appear in the *Rx Frequency* window. If the option is chosen, your transmissions will appear here too. Occasionally check to see that your Tx frequency is still clear.

Once you see a CQ of interest in the *Band Activity* window, *double-click* on it to start the process. If you have the *Double-click on call sets Tx Enable* setting chosen, you should see *Enable Tx* turned on immediately. WSJT-X will do the rest for you until the *Ack/73* step for FT4 and FT8. For JT9 and JT65, you will need to click on the type of message you want to send next (just pick the next one down, under *Answering CQ*), otherwise the same message will be sent over and over (until watchdog timer expiration). Once the *73 message* has been sent, *Enable Tx* will be turned off and you will be prompted to log the CQ (if you have chosen those settings). WSJT-X can also send a network message to your logging program, so it will also record the QSO.

In order to call CQ, click the first message under *Calling CQ*, choose *Tx even/1st* if you want to wait to transmit on an even time boundary, and *Enable Tx*. By default, your callsign as a destination from a caller will appear in red in the *Band Activity* window. Once you see a response to your CQ to which you wish to reply, double click it and WSJT-X will do the rest. FT4 / FT8 will handle all the sequencing until the *73 message*, but again for JT9 / JT65, you will need to sequence through the messages under *Calling CQ*. Once the *73* messages have been exchanged, the QSO will be automatically logged and Tx terminated, if those options are chosen in settings. QSO logging happens as in answering a CQ. If you ever need to just **QUIT NOW**, just click on the *Halt Tx* button and everything goes back to *Monitor*. All colours in the decode windows can be customized using the *Colors tab* in the Preferences / Settings.
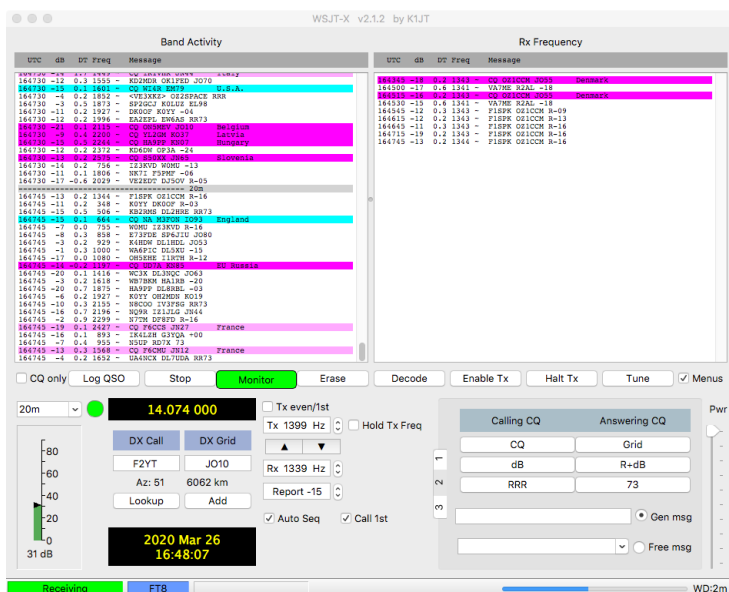
There's a lot more to WSJT-X - try it out, play with it. Also, visit the WSJT-X website at https://physics.princeton.edu/pulsar/k1jt/wsjtx.html, or the Groups.io site for WSJT-X at https://groups.io/g/WSJTX. You will find lots of discussion on the group website, including from the principal developers, and all manuals and software are available on the Princeton website.

Ted VE3TRQ