The FT8 Assistant

By Eugene Morgan (WB7RLX)

The FT8 Assistant utility was born after months of using JT-65. The problem I was trying to solve was to know where a given station was that was calling CQ. I also wanted to know where a station was that was answering my CQ, especially in the case where there were several stations responding to my CQ. For DX countries WSJT-X does provide some help but for the Worked-All-States (WAS) chaser it's no help at all other than a grid square. What often happens is you waste time working stations you didn't need and miss stations that you are looking for to complete your DXCC or WAS quest. Or you turn your attention away from WSJT-X to look up a station. For DX stations you waste time working stations you don't need because you can't remember what countries you have already confirmed and you risk missing countries that you do need. This is especially true as your country count starts to climb above 50 or so.

What I needed was a program that could see all the stations calling CQ and look them up in real time without me ever having to touch a keyboard or mouse. I wanted a SIMPLE utility that would do the lookups for me in real time without any intervention on my part. Manually looking up calls simply was not a good solution.

In the normal scenario you load up WSJT-X and start watching the screen, you're looking for stations calling CQ. If you're a state hunter then you're usually looking for calls with a particular prefix, a 1 for example for stations located in New England. The problem these days is you really don't know where the station is located. The W1XYZ you just worked turned out to actually live in Las Vegas. Of course you can look at the grid square, which is just a series of cryptic letters and numbers but without decoding it you really don't know where a given grid square is at.

Or consider the case of the DX chaser. You see a prefix pop-up in WSJT-X and you have no idea if you have confirmed that country or not. So you work him only to find out that you have already confirmed that country. It's still fun but you realize you missed a country you needed.

The bottom line is that when using WSJT-X it can be important knowing where a station is and if you have confirmed them. Now let's be clear, WSJT-X will show you what stations you have worked but it will not show you what countries you have confirmed. Working them is one step, confirming them is another. The official way of confirming a QSO is by using Log Book of the World (LoTW) if you're chasing ARRL awards. If you're chasing QRZ awards then a QRZ confirmation is all that is needed. Note however that QRZ considers a QSO that has been confirmed by either LoTW or QRZ as confirmed. Unfortunately and perhaps unfairly the reverse is not true because the requirements for confirmation is the same for both QRZ and the ARRL. The key difference is the ARRL uses what in my opinion is a totally unnecessary and a little over top Public Key/Private Key encryption that is complicated to setup and keeps a lot of hams from applying for an LoTW account or installing the necessary SSL certificates. I find the QRZ certificates just as satisfying and just as rewarding as any ARRL certificate and just as hard to get. And I can display my QRZ certificates on my QRZ bio page. However, if you're a contester the ARRL LoTW is your only option.

In case you are wondering what constitutes a confirmed QSO? For a confirmation to take place, both parties to the QSO (you and the worked party) must each independently enter a record of the QSO in

their QRZ logbook. QRZ then automatically tests to determine whether or not the following data fields in each record match the other with regard to: **call signs, band, mode, and UTC date/time within a 30-minute window.** If so, a confirmation is indicated; if not, none is indicated.

WSJT-X has no way of knowing what countries you have actually confirmed, it knows what stations you have worked but NOT what countries you have confirmed. So rather than working toward DXCC strategically you are kind of shooting blind most of the time and wasting hours staring endlessly at your computer, listening, watching and calling CQ from time to time when band conditions seem favorable. Of course as ham radio operators that's part of the fun of what we do, stare endlessly at our radios or computers, listening, calling CQ, listening some more and waiting for that chance moment when that elusive DX station or state calls CQ or answers your CQ. And of course we can also spend our time rag chewing on SSB or CW. That's the fun and the magic of ham radio. There's something there for everyone. But we are focused on FT-8 for the moment.

Consider the following scenarios. There you are sitting in front of your computer, running WSJT-X and you're closing in on WAS and you only have one state to go, Delaware. So you watch and wait and you call CQ DE WB7RLX DN41, 42 times. Unknown to you there is a W5XYZ calling CQ from Delaware but you have no way of knowing the station is located in Delaware. All we know is the station is in the 5th call area, so we assume the station most likely is in Texas. And without taking the time to decode the grid square or actually looking up the call up you don't bother to work him. So you miss an opportunity and you spend another 3 weeks trying to work and confirm that elusive Delaware station.   Of course we all know there are only 3 ham operators in all of Delaware and only one of them uses FT-8 …. .. …. ..

Now let's walk through that same scenario but using the FT8 Assistant. There you sit in front of your computer watching call signs and grids scroll across the screen. But this time you have the Assistant running as well and it's telling you the location of every station calling CQ. You see W5XYZ call CQ and you look over at the Assistant and see that his name is Fred Brown and he is located in Easton Delaware. To find that out you never had to press a single key or move your mouse an inch. You even know how far away he is and in what direction his station is from your QTH.   You answer his CQ and he comes back with a signal report and you are able to complete the QSO with a 73. You have just worked Delaware. How cool is that! Now let's hope he uploads his logs to QRZ or LoTW so you can get that confirmation.

But wait there's more. As you are looking up the station you just worked on QRZ because you are wondering about his station you hear the sound of a phone ringing coming from your computer. You turn your attention back to WSJT-X and realize there's a DX Station calling you, using what we call a "tailgating" strategy. He was watching your QSO with the Delaware station and as you were finishing up with the Delaware station the DX station started sending you his grid data for his station in Coventry England. Had you not been using the FT8 Assistant you might have missed his call. This is a true story by the way, only the names were changed to protect the innocent.

With DX the situation is just as simple. There you sit on a Friday night tuned into 40 meters and the DX is rolling in from the Pacific rim along with a smattering of Russians, VK's, ZL's and of course a mighty horde of JA's. All of a sudden the Assistant alerts you by playing a Fog horn through the computer speakers letting you know that a station in a country you have never confirmed has just called CQ. You look over the Assistant and highlighted in red and yellow you see the call sign of the station with his city and country. You quickly turn your attention back to WSJT-X and double click on his CQ and you work him. You have now added Mongolia to your list of countries worked. And sure enough a few hours later

he confirms the QSO in QRZ. And as luck would have it he had never worked Utah and was very happy to finally confirm a Utah station. Life is good and your DXCC county count just went up another notch.

These are hypothetical scenarios but for me they are real experiences and examples of what I have been able to do with WSJT-X and the Assistant. And to do all this all you need is a $30 yearly subscription to QRZ and my program that can be downloaded from the Club's web site for free. You don't even have to be a member.

I'm not sure how interesting it would be to explain how the program actually works but I will give you a high level description. The program monitors the data stream coming out of WSJT-X, picks out the stations calling CQ and extracts the call signs. It then checks its memory cache to see if it's already looked up the station. If it hasn't it does a QRZ query, adds the information to the cache and then displays the information for that station on the screen. If it can access a local copy of your QRZ log it will also check to see if you have confirmed the country the station is in. If it's a DX station you have not confirmed it will alert you by playing a fog horn sound and highlighting the station on the display by displaying the information in a yellow on red format. The program can also spot when a station is calling you and tell you where they are and alert you by playing the sound of a phone ringing. That's the basic theory of operation. There is of course a bit more to it, but that's the simple description. Below is a list of the features.

 FT8 Assistant Feature Set:

- Displays the name, location (city, State, Country, and DXCC entity number)
- Caches station information for the stations that it looks up to minimize QRZ lookup's
- Display the Bearing and Distance of the station calling CQ
- Displays the number of times the station has called CQ during the programs run time
- Provides an audio alert when it hears a CQ from an unconfirmed DX country. The program assumes any QSO not confirmed via QRZ as an unconfirmed country.
- Provides an audio alert when it hears a station calling you.
- Color codes stations calling you, DX stations and unconfirmed DX stations and stations you have worked in the past. Yes WSJT-X also does some of the same color coding but it does not distinguish between confirmed and unconfirmed DX.
- Tells you how many CQ's have been decoded while you have been running the Assistant, how many have been look up via QRZ and how many it was able to lookup in cache.
- It gives you the average number of decoded CQ's over the last five minute period. This is handy for comparing notes with your friends and is also an indicator of band activity and conditions.

Program Requirements:

Required: A computer running Windows. This program was developed using Windows 10 but there's no reason it shouldn't run under Windows 7 or even Windows XP.

Required: Disc space and memory requirements are minimal. If you have enough to run Windows and WSJT-8 you should have enough to run the Assistant.

Required: XML Enabled QRZ account or higher, I think the cost is about $30 a year. If you are unsure if you have the correct type of QRZ account go to the following link and test your account: QRZ XML Account Checker You can also go to the following URL to find out more about an XML QRZ account: https://www.qrz.com/page/xml_data.html

Optional: A local copy of your QRZ log. If you keep your QRZ log in sync with LoTW then those confirmations will also be included. Please note that LoTW is only required if you are going to apply for awards through the ARRL, it is NOT required in order to run the FT8 Assistant. If the QRZ log file is not available then the DX alert feature will not work.

Installation Instructions:

When I initially wrote this program I never intended it to be used by anyone but me so I never bothered to write an installation utility. Given the simplicity of the installation I decided that a good set of written instructions would suffice. But if you find you need some help give me a call: (801) 540-4907.   I'll be glad to walk you through it and help you with downloading your QRZ log file.

- ✓ Download the program from the OARC web site. It should be located in the down load area on the OARC web site see: http://ogdenarc.org/downloads.html. Look for *Member downloads by Eugene Morgan*.

- ✓ **IMPORTANT: Before beginning the installation you need to have your Grid, your Latitude and Longitude and an XML Logbook or above subscription to QRZ. You will also need your QRZ password and QRZ account name which as far as I know is your call sign.**

- ✓ After you have downloaded the setup utility run it. By default the program will install the program into your Documents folder.

- ✓ During the setup a program will pop up asking you for the information specified above. Fill that out. The program will automatically update the Config.ini file. You can run the Configuration Editor any time you have changed your QRZ password or want to change your latitude and longitude.
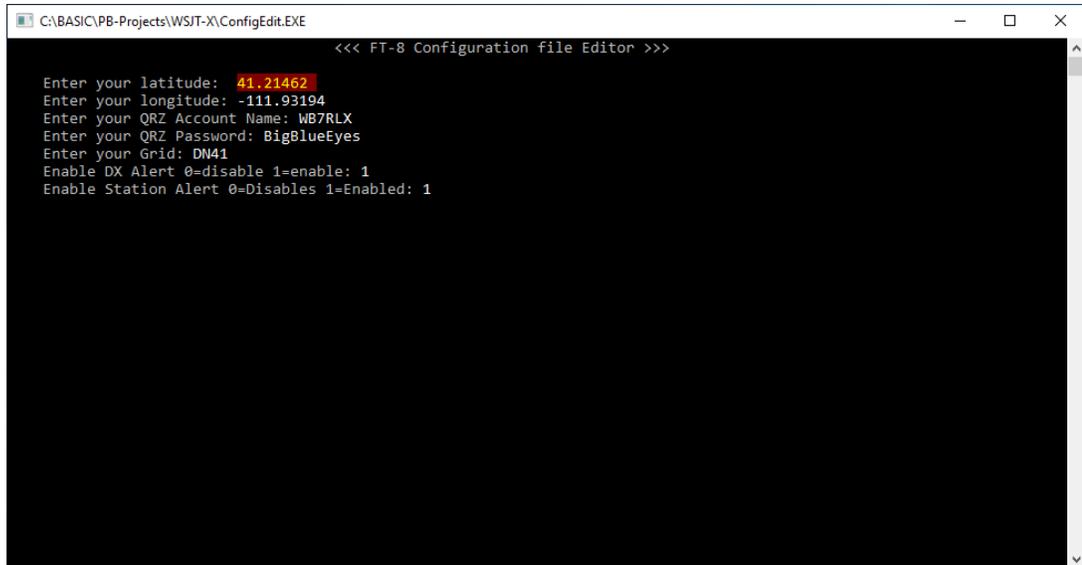
Figure 1: Configuration Editor

✓ The last step will require that we configure the FT8 Assistant's window size. On your desktop you will find the *FT8 Assistant* icon. *Right Click* on it and select **Properties**.   In the properties window you will see a bunch of tabs, click on the *Layout* tab. In the middle of the Layout Tab windows you will see a box labeled **Windows Size**. Set the *Width:* to **140** and the *Height:* to **43**. Then click on the "*Ok*" button. At this point you can run the program but there is one more optional step that I recommend if you are to take full advantage of the Assistant. Download your QRZ log file.
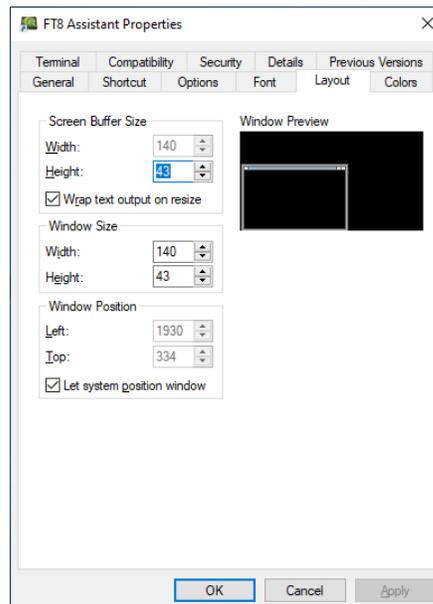
Figure 2: Setting the FT8 Assistant Windows Size

✓ This last step is optional. Download your QRZ logbook to the folder where you installed the Assistant. Give it the following name: [*your QRZ account name*].*adi.txt* Example:

wb7rlx.adi.txt There may already be a file by that name in the program folder, just overwrite it. This will allow the Confirmed DX feature to operate normally alerting you when an unconfirmed DX station is calling CQ. This is a pretty handy feature if you're a DX chaser.

Just In Case You See A Warning From Windows Defender or other Anti-Virus program: When executing the program for the first time you may experience a warning from Microsoft Defender or your anti-virus software warning you about this program. Don't worry. In the case of Microsoft Defender just click on the "***More info***" link then click on the "***Run anyway***" link. This only occurs the very first time the program is launched and only on some computers. I do take extreme precautions to make sure that none of my programs are infected.

Running the Program: Now that you have the program running let's describe what you are seeing. Refer to Figure 3 . Starting at the top of the screen you see my Information and a version number. On the next line you will see the column headings. I'll explain each.

Call: This is the stations call sign. ONLY stations calling CQ will be displayed or a station calling you. We will get to that in a minute.

Name: This is the person's full name as it appears in QRZ.

City/Country: This is the stations city and country separated by a "/". On rare occasions this information will not be complete. I only had so much room to display this information so at times the information will appear to have been truncated, it has. Regardless it should provide you with enough information to know where the station is.

DXCC: This is the stations DXCC country code

State: This is the two digit state abbreviation. This will appears for stations based in the US and Canada. I have noticed that from time to time some other countries also have states. It's all based on what information QRZ has for each station.

Bearing: This is the bearing (short path) to the station. In short this is the direction you should aim your beam to maximize the possibility of working the station.

Distance: This is the great circle short path distance to the station in miles.

CQ's: This is the number of times the station has called CQ since you started the Assistant. Why is this important you might wonder? If there is a station that has been calling CQ and it just happens to be a station that you really want to work and you missed him. What generally happens the station has been calling CQ a lot the odds are good the station will be calling CQ again and you just need to be on the alert for his call. If he has only called CQ a small number of times then your chances of him calling CQ again may not be as great.

Figure 3: WSJTX-Assistant Screen

Frame Separator: FT-8 protocol uses a 15 second frame structure. The WSJT-8 transmits for 15 seconds and then listens for 15 seconds. Each frame is given a time stamp. The time stamp format is: yyyymmdd_hhmmss, example: 210121_003545. Also note that the time stamp is in GMT, not local time. In WSJT-X Assistant each frame is separated by a dash line with the time stamp of the frame in the middle of the line enclosed in brackets. On occasion you will see frames with no time stamp, these are frames where you were transmitting or the program only received a partial frame. I made a last minute change to the program that is not shown in the above figure. The time frame also includes the band. Note that if you change bands while running the Assistant it will clear the screen and show only CQ's for the current operating band.

The Colors: In the lower right corner of the screen you will see the legend explaining what each color signifies.

> **White on Black:** This is a US based station. Although Alaska and Hawaii have different DXCC entity numbers the Assistant identifies them as US based stations.

> **Black on Green:** This is a station you have worked before.

> **Red on White:** This is a DX station that is located in a country that you have confirmed via LoTW or QRZ. There are four ways that a station can be confirmed in QRZ: eQSL, Paper QSL, LoTW, and QRZ. QRZ only recognizes QRZ and LoTW confirmations. If the DXCC country has been confirmed then it will be displayed using red on white.

Red on Yellow: This is a DX station calling CQ from a DXCC country that you have not confirmed via LoTW or QRZ. In addition to being displayed as yellow on red a fog horn sound will play giving you an audio alert that there is an unconfirmed DX station calling CQ.

Black on Grey: This is a station that was not found in the QRZ call book. No other information will be displayed for the station.

Black on Red: This is a station calling you. The program looks for your call sign in each line it decodes. If it sees your call it will display the information for the station calling you. At the same time the computer will play the sound of a phone ringing. This is really helpful if you're not paying attention to WSJT-X as often happens. I find that after a QSO I will look up the station on QRZ just to see if the operator has posted any information about their station. Or I may go get myself a beverage or turn my attention back to the book I was reading while waiting for the DX station on Desecheo Island to come on the air.

The Bottom of the Screen: Now let's turn our attention to the bottom two lines of the screen. There is some fairly useful information here.

Run Time: This is how long you have been running the Assistant. We use this information in the running 5 minute average calculation. It tells you how long you have been running the Assistant.   It's funny how fast time passes when you're having fun.

Total CQ's: This is the total number of CQ's WSJT-X has decoded during run time period.

QRZ Lookups: The Assistant looks up the call sign of every CQ it hears during the programs run time. However before going to QRZ it checks its memory cache to see if the call has been looked up during the session. When it does do a QRZ lookup it caches the stations information in case we need to look the station up again as often happens. This number indicates how many times the Assistant has had to go to QRZ. Over time what you will see is that the Assistant goes less and less to QRZ and more and more to cache. The Assistant uses a circular cache algorithm. It caches up to 256 calls signs and once the cache is full it will overwrite the oldest calls with the newer calls.

Cache Lookups: This is the number of times the Assistant has been able to use its cache to get a stations information rather than going to QRZ. Over a long session you will see this number grow much faster than the QRZ lookup's.

Running 5 Minute avg CQ's per/min: This is the average number of CQ's per minute over the last 5 minute period. Note that this number will not be accurate if the Assistant has been running for less than 5 minutes. This information is useful in determining if the band is fading or building. It's also fun to compare numbers with other hams who are running the Assistant on the same band. It can sometimes be a measure of how well your antenna is hearing versus another station. It's also a great indication of just how busy the FT-8 frequency is. It's kind of a fun number to watch as the band builds and fads. Some of the heaviest traffic I've observed has been on Sunday mornings on 40 meters where I've seen this number go as high as 25 CQ's a minute. At around 16 or 17 CQ's a minute the band will start looking pretty full. Of course you don't need this number to know what's going on, but it does quantify things, which makes it easier to draw conclusions and do comparisons regarding band conditions.

Periodic Maintenance: There are two tasks that you will want to perform on a regular basis. The first is to upload your WSJT-X adi log to QRZ or at a minimum the new calls that have been added since your last upload. I may do this several times during an operating session but at a minimum I do it at the end of each operating session. The second task is to download your QRZ log file to the FT8 Assistant folder. The reason for this is the Assistant can alert you when an unconfirmed DX station is calling CQ. It does this by scanning a local copy of your QRZ log file, without that even Canada will look like an unconfirmed DX station.

At a minimum you should download your QRZ log file after you have confirmed a new country. If you monitor your DXCC-100 Award Status on QRZ you will see when your country count has gone up. QRZ provides documentation on how to upload and download your log file. What will be helpful to know is where your FT8 ADI file is located:

<div align="center">**C:\users\[your windows login name]\AppData\Local\WSJT-X\wsjtx_log.adi**</div>

In Windows the *AppData* folder is a hidden folder so in order to find it using *File Explore* you will need to make sure you have the "*Hidden Items*" feature turned on. In *File Explorer* click on the **View** Tab then click the box next to the "*Hidden Items*" option. That should cause a check to appear in the box next to the "*Hidden Items*" option.

LoTW: If you are a LoTW user you will also want to keep your LoTW log synchronized with your QRZ log book. Here again this is something I do several times during an operating session. There are a lot of folks that are counting on that LoTW confirmation so if you use LoTW keep it updated and in sync with your QRZ log book. Please consult QRZ for information on the process for uploading and synchronizing with LoTW.

Possible Feature Updates: As with nearly all programs they are never truly done. I have been considering some possible features:

> **County Hunters:** If there are any county hunters out there let me know. I have been toying with the idea of adding county information as part of the data displayed for a station.

> **JT-DX:** Currently the Assistant does not run with JT-DX. I have looked into the changes that would be necessary. It is doable but would require that I rewrite some key areas of the code. Just now I don't know what the demand is. If you're running JT-DX and would like to be able to run the Assistant let me know.

> **Raspberry Pie:** Although I'd not be able to migrate the Assistant code to the Raspberry Pie platform it would be possible to access the WSJT-X folder across a network thus making it possible to run the Assistant on a Windows computer while accessing the WSJT-X files across a network. This would be a fairly easy modification but again I'm not sure of the demand. If you run WSJT-X on a Raspberry Pie and have it connected to the same network as your Windows computer and would like to be able to take advantage of the benefits of the FT8 Assistant let me know.

Acknowledgements: I would be remise if I didn't call out two of our peers that helped me during beta testing. Peter Heisig (WB6WGS) and Rick Morrison (W7RIK). I can't express my thanks and appreciation enough. Their testing and their input really help in getting the Assistant to its final state. It's a better program because of them. A heartfelt thanks Guys!

I also need to extend an acknowledgement and thanks to the folks at QRZ, Fred Lloyd (AA7BQ) the founder and head of QRZ and his partner Stephen McLaughlin (VA7STV) who provided me with information about how QRZ flags confirmed QSO's.

In Closing: I hope you find the Assistant as useful as I have. If you have any questions or if you have some ideas about additional features or improvements give me a call. If you find any bugs please do contact me with the specifics. If you are interested in seeing the source code or doing a deep dive into the code drop by, I love talking about this stuff. Above all and most importantly to me, I hope you enjoy using my program.

73,

Gene

(WB7RLX)