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1. Introduction

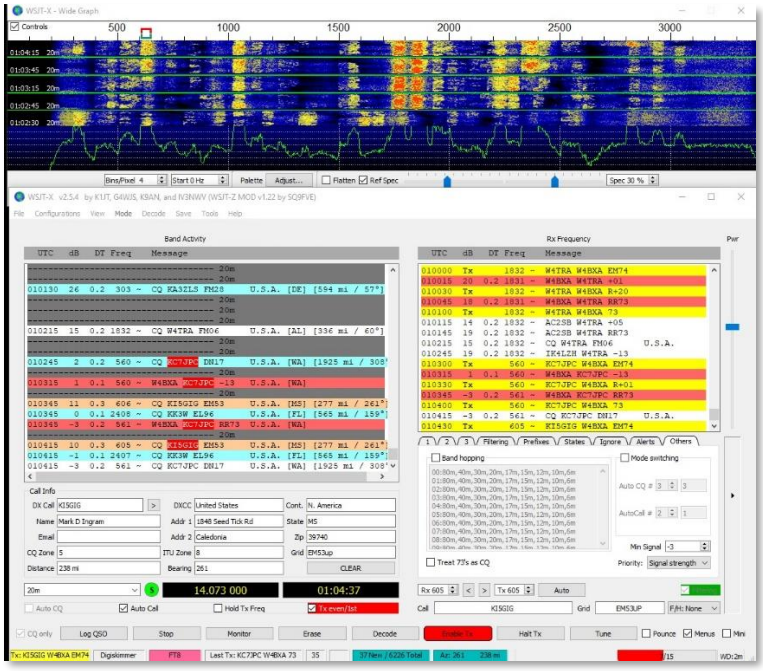


Figure 1- Sample WSJT-Z main window and waterfall display

WSJT-Z is a clone and modification to the original WSJT-X program, which was designed to facilitate ham radio communications with very weak signals. WSJT-X was based on an earlier program, WSJT, released in 2001 by Joe Taylor, K1JT. WSJT-Z was previously known as WSJT-X SQ9FVE Full-Auto Mod, and was written by Tom Rudzinski, SQ9FVE.

WSJT-Z includes the open source WSJT-X software and extends it with these additional features:

- Modified user interface, including a larger Band Activity pane
- Extended filtering features
- Auto CQ and auto responding
- Automatic selection of a free TX frequency
- QRZ.COM integration
- Audio alerts
- Execute user specified commands based on a custom alert
- DXCC / Continent Filtering
- US state filtering
- Additional views of the decoded messages and additional callsign information
- Integration with PSKReporter.

WSJT-Z supports ONLY FT4, FT8, JT*, and WSPR.

⚠	While WSJT-Z does provide a great deal of automation, users should always attend to their transceiver unless automated operation is legal in your location. While the software can automate transmissions, it is not aware of the presence of other signals on a frequency and may cause interference to other stations, and/or generate unnecessary transmissions. Damage to the operator's equipment is also possible due to extended transmissions causing overheating and/or by operation into an improperly tuned antenna.

In a default installation, WSJT-Z replaces WSJT-X, meaning users may not switch between the two packages. However, users may install them in separate directories if they desire to be able to switch between them.

A description of WSJT-X and a complete user manual are available at the WSJT Home Page.

This user manual for WSJT-Z does NOT replicate the full WSJT-X user manual and focuses solely on the enhancements and differences between the two packages. Users will find it helpful to at least read the WSJT-X User Manual, and perhaps even install WSJT-X before attempting to use WSJT-Z.

Many fields within the program, especially those that are unique to WSJT-Z, include pop-up help text which appears when the user hovers the mouse pointer over that field. Users should also be aware that there are right-click context menus available at many points within the program that expose additional options, or additional ways to access some features.

Some amateurs have produced guides or videos for operating FT4 and FT8, including many useful tips and techniques. For example, you might like this one by Gary Hinson, ZL2IFB - *FT8 Operating Guide, Weak signal HF DXing for technophiles*. While it doesn't specifically address WSJT-Z, the general radio

and computer setup is the same, and many of the techniques also apply. At 85 pages, it is still a lot to read, but shorter than the WSJT-X user manual at over 100 pages and is more focused on actual operation.

1.1 New Features in this Release of WSJT-Z

A complete list of changes is included in the changelog on this page - https://sourceforge.net/p/wsjt-z/wiki/Changelog/.

This user guide has been updated to include new features in v1.22 and to incorporate additional explanations in response to questions and comments from the WSJT-Z groups.io forum.

A version of this user guide is also available in Spanish.

1.2 Documentation Conventions

This document frequently refers to both the original WSJT-X and to this cloned and enhanced version. To help avoid confusion, when referring to the original WSJT-X, normal case and font is used. The enhanced software WSJT-Z will always be referred to in this different font and color.

The following icons call attention to particular types of information:

	Notes containing information that may be of interest to some users.

	Tips on program features or capabilities that might otherwise be overlooked.

	Warnings about usage that could lead to undesired consequences.

1.3 User Interface in Other Languages

At this time, fields specific to the WSJT-Z interface are only available in English.

1.4 Enhancement Requests

Suggestions for enhancements to the software may be submitted by posting a message in Groups.io at WSJT-Z@groups.io | Topics.

1.5 Bug Reports

Reporting of software bugs is encouraged, and these may be reported by submitting a ticket at WSJT-Z / Tickets (sourceforge.net) or posting a message in Groups.io at WSJT-Z@groups.io | Topics.

1.6 Documentation Errors

If you find errors in this document, or have suggestions for additions or changes, please email them to w4bxa@arrl.net

1.7 Help

To post questions and get help with using the software, try posting a message on WSJT-Z@groups.io. You should try searching the messages prior to posting to see if someone else has already gotten the same question answered. To subscribe to follow messages, visit WSJT-Z+subscribe@groups.io.

1.8 How You Can Contribute

After releasing over a hundred versions of WSJT-Z, spending many hundreds of hours coding and supporting users, Tom, SQ9FVE, decided to start a small charity campaign. WSJT-Z is, and will always be free, but if you're enjoying the software, please show your appreciation for his work, and for the work of everyone who spends time testing and reporting issues, by supporting the WSJT-Z charity campaign. All the funds go directly to a large organization that helps children with cancer. For more information visit Saving Kids With Cancer Foundation | Na Ratunek. To contribute, visit Skarbonka Pomagacza Tomek SQ9FVE - WSJT-Z Users - Radio operators vs cancer! | Siepomaga.pl.

1.9 License

WSJT-Z is licensed under the terms of Version 3 of the GNU General Public License (GPL). Most of the code was created and is copyrighted by the WSJT-X team led by Joe Taylor K1JT.

2. System Requirements

WSJT-Z installation packages are available for both 32 bit and 64 bit Windows 7, 8, 10 and 11. See the detailed system requirements in the WSJT-X User Guide.

3. Installation

Software installation packages are available on WSJT-Z download | SourceForge.net under WSJT-Z - Browse /Packages.

3.1 Windows

Download the appropriate package and run the executable file. Note that your antivirus software may detect the file as being malicious, simply because it is not commonly downloaded. You may have to override any such detections. Reporting of these files to your antivirus vendor as being safe would be appreciated.

In general, follow the installation instructions for WSJT-Z the same as you would for WSJT-X as described in the WSJT-X User Guide. These include information about directories where the software is loaded, information about setting your system clock accurately, and setting the sampling rate on your sound card. Accurate time and correct sound card settings are essential to ensure proper program operation.

	You may want to specify a different directory for WSJT-Z and WSJT-X so that can run each of them independently. If you already have WSJT-X installed, it will be overlayed by WSJT-Z. If you don't already have WSJT-X installed, you will only be able to run WSJT-Z. If you load them into separate directories, you can run either one, or even both at once, as long as you use different radios for each.

	For example, you might install WSJT-X in C:\WSJT\WSJTX (and the setup program creates \bin, \plugins and \share subdirectories). Then you might install WSJT-Z in C:\WSJT\wsjtz (and the setup program creates a \wsjtx subdirectory with the above sub-subdirectories)

3.2 Linux

This user guide does not include specific installations for Linux, however, you might find this guide produced by Al Rovner, K7AR, to be useful.

Packages for various versions of Linux, as well as macOS are available on SourceForge at WSJT-Z - Files at SourceForge.net.

3.3 OS X and macOS

This user guide does not include specific installation instructions for OS X or MacOS, however a MacOS port provided by Dillon Angle is available on the WSJT-Z SourceForge page.

4. Menu Bar Changes

The description and configuration of the options under the menu bar are the same as in the WSJT-X User Manual, except for the differences described below.

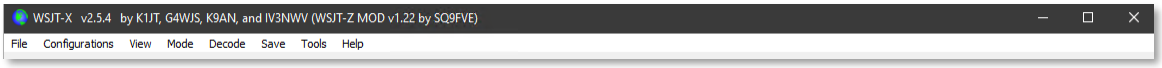


Figure 2- Sample Menu Bar

A. File
There are no WSJT-Z specific options here except under Settings, which are discussed in the section 5 of this document.

B. Configuration
There are no WSJT-Z specific options here.

C. View Menu
WSJT-Z includes these new options which are not present in WSJT-X. View options which are unchanged are not addressed here.

I. Dock Windows – allows "gluing" the various WSJT-Z windows together in their current position so that they can then be moved around the screen as one unit. A check mark indicates it has been enabled.

II. Call Info – If enabled, replaces the bottom portion of the Band Activity information on the main screen with information about a contact. A check mark indicates this has been enabled.

III. Dark Mode – If enabled, shows the WSJT-Z windows as white letters on a dark background instead of black letters on a white background. A check mark indicates this has been enabled. Note that in dark view, check marks are replaced by a filled in box.

IV. Raw View – If selected, a new window opens which displays all decoded messages without regard to filters. This is useful to see all activity on the band, especially in cases where filters don't allow any messages to display in the Band Activity pane. There is no color coding in this window. The window may be resized and moved on the screen as desired.

V. PSK Reporter - If selected, a new window opens which displays tabular results from PSK Reporter showing stations that reported our signal within the last 60 minutes. This information is refreshed every 5 minutes. This window may be resized and moved on the screen as desired.



When enabled, there is a delay of a few seconds when WSJT-Z starts due to loading of SSL libraries. If you get a message saying "Network Error – SSL/TLS support not installed", you need to install suitable OpenSSL libraries. How to do this is described in the documentation for WSJT-X.

D. Mode

Selects the operation mode. There are no WSJT-Z specific options here, but be aware that WSJT-Z supports ONLY FT4, FT8, JT*, and WSPR.

E. Decode

WSJT-Z supports only Fast, Normal and Deep decoding, and these function the same as in WSJT-X.

F. Save

There are no WSJT-Z specific options here.

G. Tools

The only WSJT-Z specific option here is to enable debugging data collection, which displays in the Rx Frequency pane or may be directed to a file for forwarding to the developer. This information may be of use in resolving configuration or programming problems. When enabled, by default debugging information appears in red in the RX Frequency pane. You can select all (CTL-A) in that pane, then CTL-C to copy the information, and paste it into a notepad or other document.

Alternately, you can choose to have debugging information sent directly to a file under the File tab, Settings, WSJT-Z, Debug.

Debug should normally not be enabled unless you are trying to collect information on a specific behavior or problem.

H. Help
The only WSJT-Z specific option here is to display the About information for WSJT-Z, which includes links to the WSJT-Z documentation and the forum. The other documentation links here are to the WSJT-X version of the software.

5. Settings Changes

For the most part, configuration of WSJT-Z is the same as for WSJT-X. Configuration of the radio and audio interface, for example, are the same. If WSJT-Z is installed over WSJT-X, the existing configuration, including any user customization, will remain. However, there are additional items on tabs that require configuration and are specific to WSJT-Z. These are documented below and are found under the menu option File, Settings. Suggested values are shown in parenthesis but may be determined by the user.

	Note that if the settings window is not wide enough, you may need to use the right and left pointing arrows in the Settings tab list to be able to access the WSJT-Z tab or to return to the General tab.

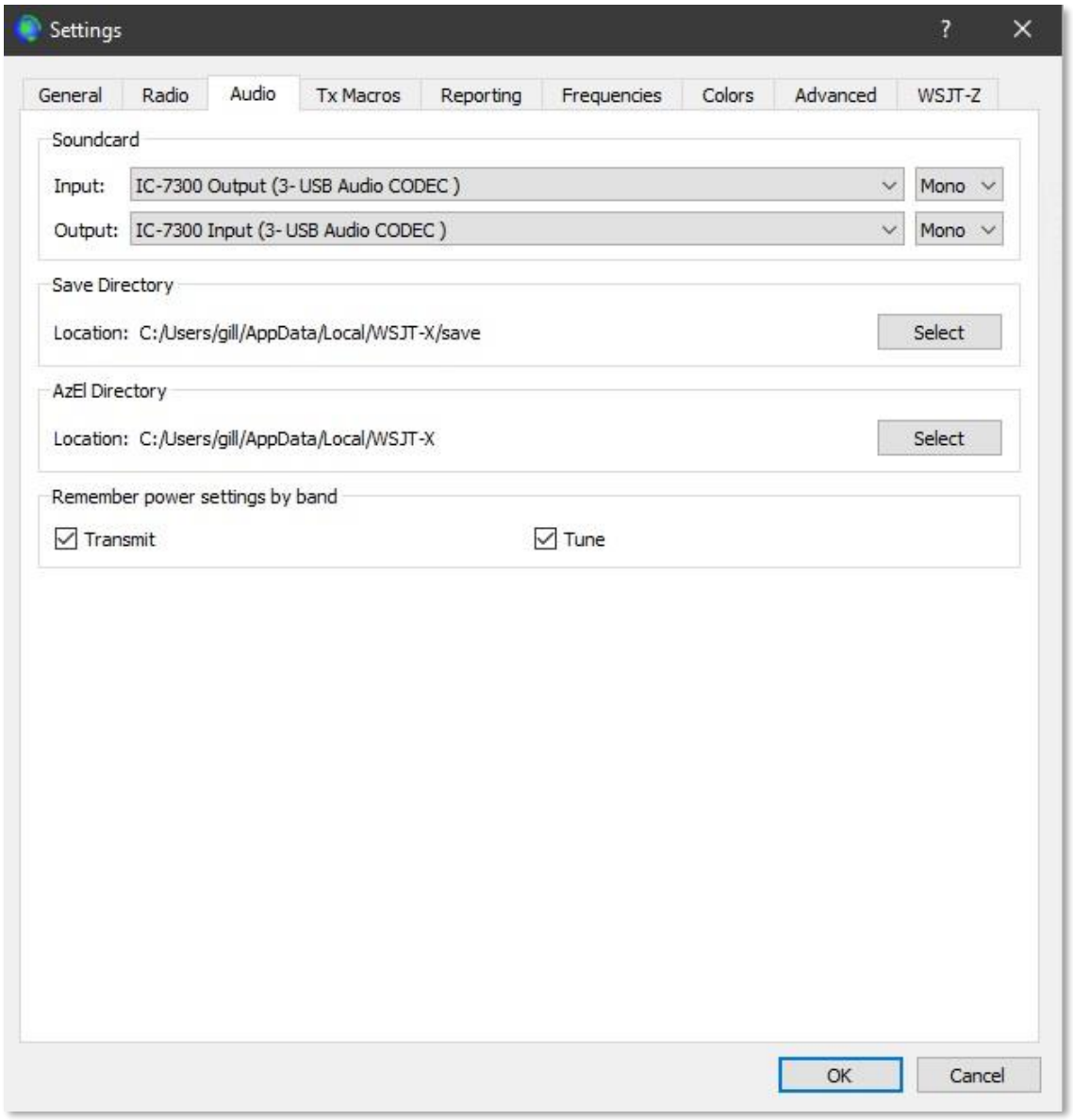


Figure 3- Sample Settings Window

5.1 General Tab

There are no WSJT-Z specific settings required here, however this tab must be configured before using WSJT-Z for the first time.

5.2 Radio Tab

There are no WSJT-Z specific settings required here, however this tab must be configured before using WSJT-Z for the first time.

5.3 Audio Tab

There are no WSJT-Z specific settings required here, however this tab must be configured before using WSJT-Z for the first time.

5.4 Tx Macros Tab

There are no WSJT-Z specific settings required here.

5.5 Reporting Tab

There are no WSJT-Z specific settings required here.

5.6 Frequencies Tab

There are no WSJT-Z specific settings required here.

5.7 Colors Tab

There are no WSJT-Z specific settings required here.

5.8 Advanced Tab

There are no WSJT-Z specific settings required here.

5.9 WSJT-Z Tab

This tab is new and must be configured before using WSJT-Z for the first time. Each of the settings is described below. Values in parenthesis are the recommended values.

Note that there are two sub-tabs under the WSJT-Z tab, RX Windows and Misc.

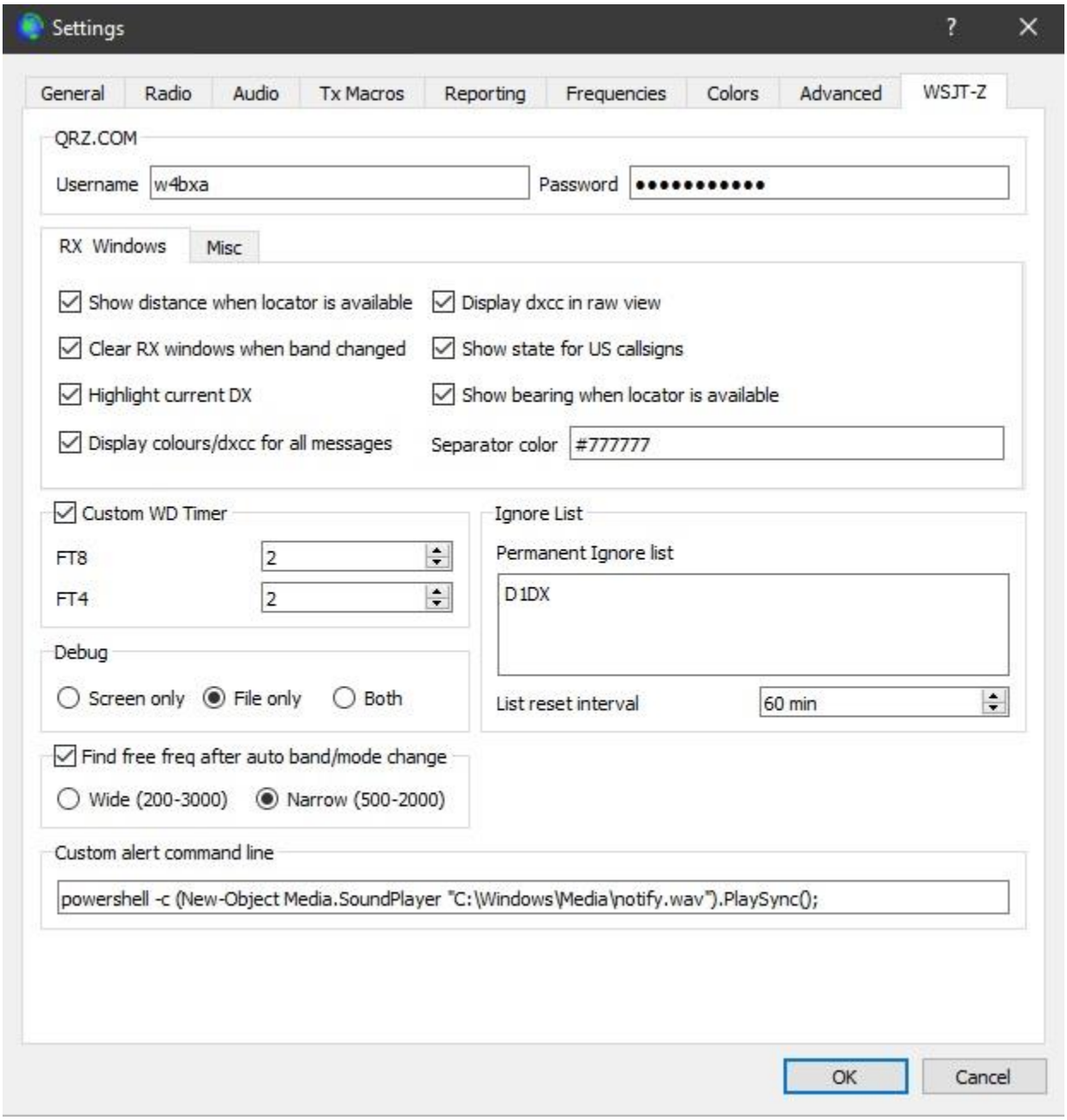


Figure 4 - WSJT-Z tab with RX Windows Sub-tab

RX Windows Sub-Tab

A. QRZ.COM – Enter your userid and password to enable QRZ.COM integration. Note that you will need to have at least an XML subscription to QRZ.COM in order to access all of the data on contacts. Without a subscription, you will only get the name, callsign, DXCC, continent, CQ Zone, and ITU Zone.

B. Show distance when locator is available – shows the distance to the station if the grid square was provided in the message. (checked)

C. Clear RX windows when band changed – clears the RX windows when the band is changed. (checked)

D. Highlight current DX – highlights the callsign of our QSO partner in the band activity pane. (checked)

E. Display colors/DXCC for all messages – colors and shows DXCC for all messages, not just CQ. (checked)

F. Display DXCC in raw view – displays the DXCC in the raw mode view. (checked)

G. Show state for US callsigns – shows the state for US callsigns. (checked)

H. Show bearing when locator is available – shows bearing to the station when the grid square is available. (checked)

I. Separator color – allows specifying the hexadecimal color code for the separator. (#7777777)

J. Custom WD Timer – allows setting custom values for the watchdog timer for FT4 and FT8. This allows you to change the amount of time before WSJT-Z "gives up" on a station and stops calling. You might start with a value of 2 for both FT4 and FT8. Make the number larger if you feel like the software "gives up" too quickly. Don't set this to too large a number or the software will keep on calling, and calling, and calling. (checked)

K. Permanent ignore list – to list callsigns of stations that you don't ever want to see traffic from, of for stations you don't want WSJT-Z to ever call. Insert one callsign per line. You might use this to ignore unlicensed or pirate stations, for example. D1DX could be a callsign to put here as it and other D1 prefix calls have been reported to be illegal calls originating from Eastern Ukraine. This is the only place you can remove a station from the permanent ignore list. (blank)

L. List reset interval – to specify how often you want callsigns to be automatically removed from the temporary ignore list on the ignore tab. Callsigns on the permanent ignore list above are never removed automatically. (60 min.)

M. Debug – determines whether debug information is sent to the screen or to a file, or to both. (screen only)

N. Find free freq after auto band/mode change – Determines whether the software will automatically select a new transmit frequency following an auto band or auto mode change. There are two options, wide or narrow. This determines how much of the available bandwidth is used to search for a free frequency. (Narrow)

O. Custom alert command line – Use to specify a custom command to be executed whenever an alert is triggered. (blank)

Examples:

To add an entry to a file when an alert is triggered:

```
cmd.exe /c echo %band% %call% %dxcc% %datetime% >> C:\log.txt
```

To play a default windows notification sound:

```
powershell -c (New-Object Media.SoundPlayerC:\Windows\Media\notify.wav").PlaySync();
```

If there are multiple alerts in a single cycle, the command will only be executed for the first alert.

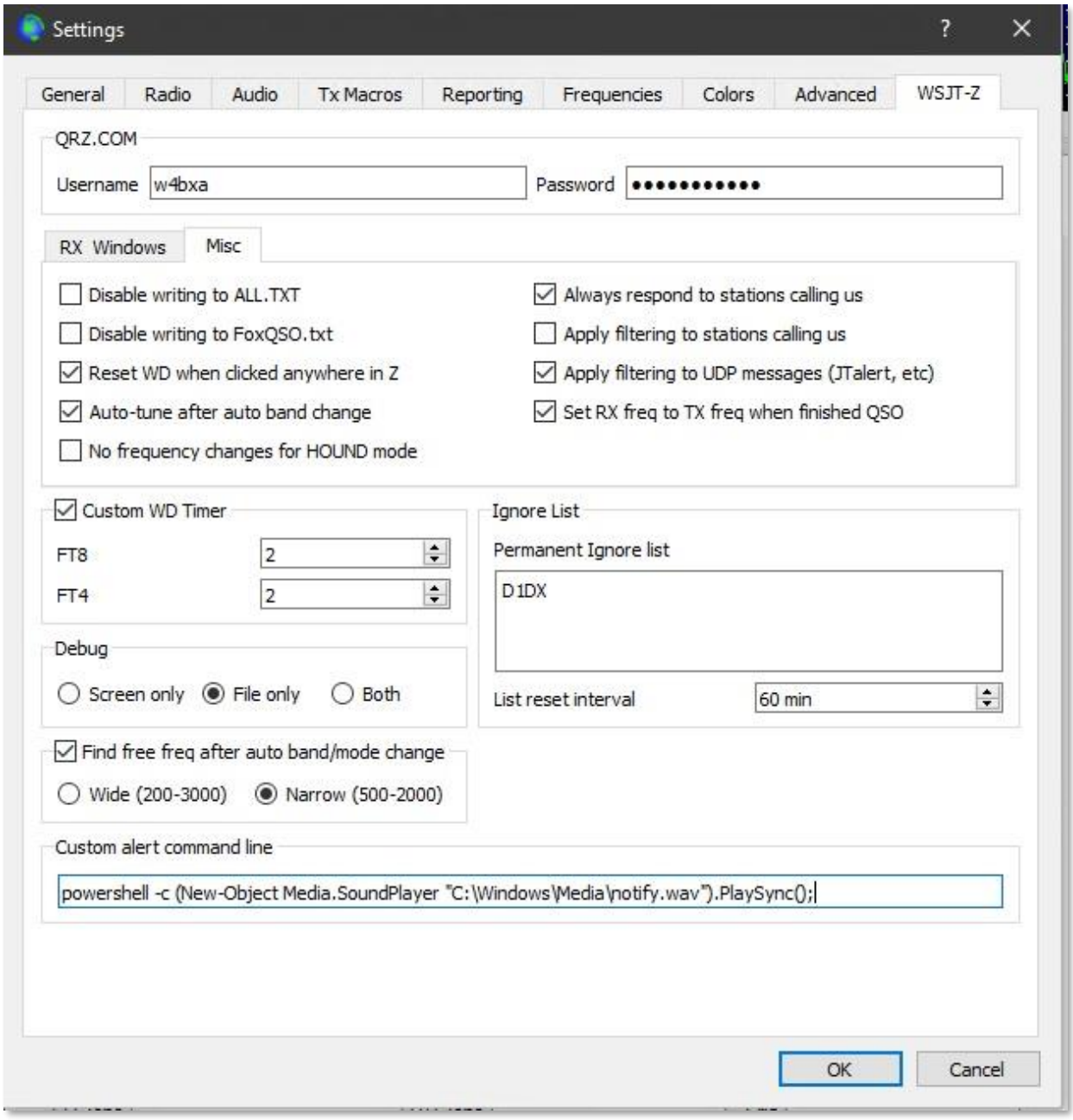


Figure 5- Sample Settings, WSJT-Z screen, Misc. Sub-tab

Misc. Sub-Tab

P. Disable writing to ALL.TXT – if you wish to avoid constantly writing to this file. However, this file is useful when you suspect a contact may not have been logged correctly. Searching in this file will give you all the data about the contact. (unchecked)

Q. Disable writing to FoxQSO.txt – if you wish to avoid writing to this file if Fox and Hound mode. (unchecked)

R. Reset WD when clicked anywhere in WSJT-Z – will cause the watchdog timer to be reset anytime you click anywhere within the window. Useful to manually override timing out and having the calling sequence aborted. (checked)

S. Auto-tune after auto band change - enables automatic tuning whenever the band is changed using Band Hopping. (user preference and depends on your tuner)

T. No frequency changes for HOUND mode – prevents frequency changes when operating in hound mode. (unchecked)

U. Always respond to stations calling us – to have WSJT-Z automatically respond to stations that are specifically calling you. (checked)

V. Apply filtering to stations calling us – to filter stations that are calling us according to the filter setting. Note that if this is checked, a station calling us may appear in the message list, but the software will not automatically call them. (unchecked)

W. Apply filtering to UDP messages (GridTracker, etc.) – to filter data sent in UDP messages. (User preference)

X. Set RX freq to TX freq when finished QSO– to set the RX frequency to the TX frequency when the QSO is completed. (checked)

The remainder of the values are the same as for the RX Window sub-tab described previously.

6. Main Window Changes

This section of the documentation focuses on changes in the appearance or setting on the main WSJT-Z window, an example of which is shown below.

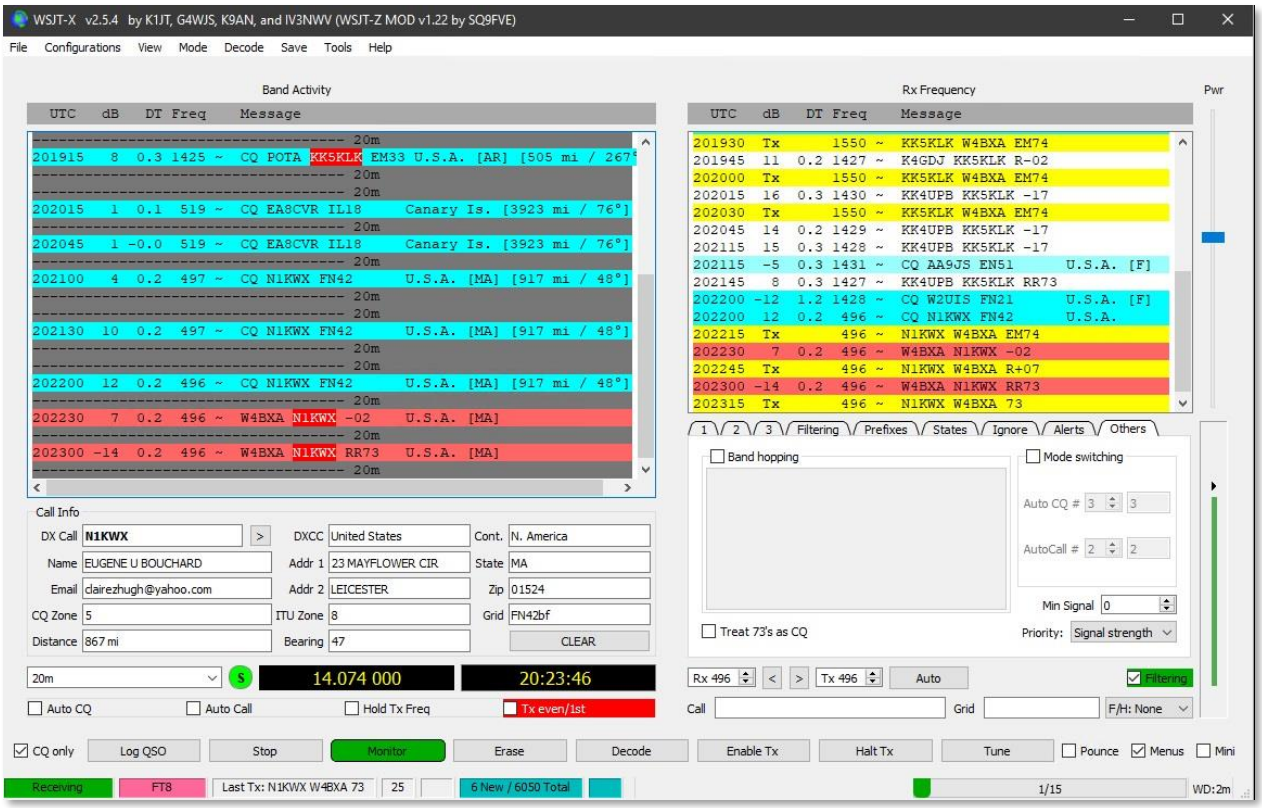


Figure 6- Sample main window display

The main window is broken into five areas:

- Band Activity Pane
- RX Frequency Pane
- Call Info
- Tabs
- Other Controls

6.1 Band Activity Pane

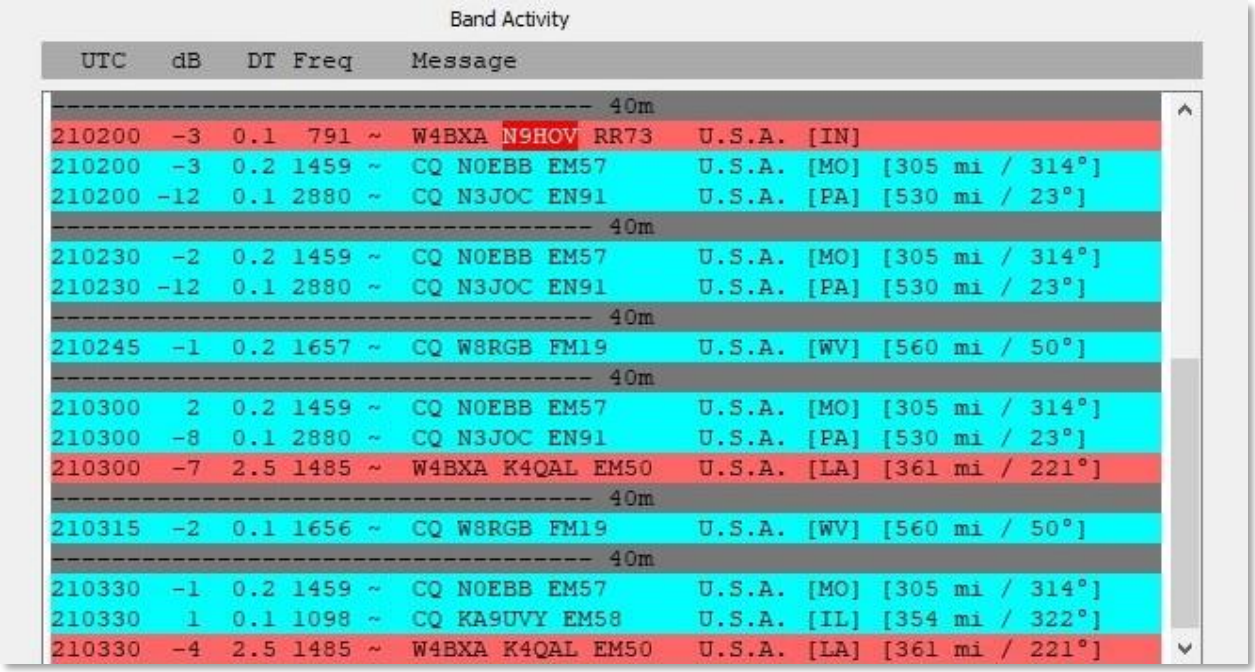


Figure 7- Sample Band Activity Pane

Band activity is shown in the upper left-hand portion of the main window. This displays decoded messages received by the radio. Messages can be color coded as they are in the original WSJT-X, but also can have information about the station added (country, US State, distance, and bearing) if desired. Messages can also be filtered so that they are not so overwhelming in each transmission cycle. If the “Filtering” box is checked, messages can be filtered out based on several criteria which will be discussed later. If the “CQ only” box is checked, only messages that represent a station calling CQ will be shown. It is also possible to consider stations that are ending their QSO with 73 or RR73 as calling CQ, which allows for “tail ending” a QSO, making the exchange quicker. These settings will be discussed later.

6.2 RX Frequency Pane

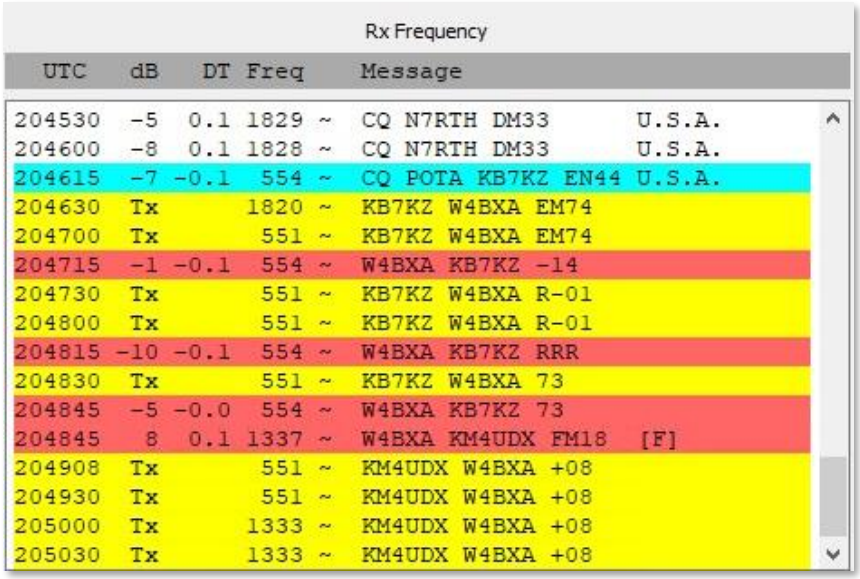


Figure 8- Sample Rx Frequency Pane

The only WSJT-Z change here is that in some cases, an [F] will appear to the right of a received transmission. This indicates that this line would have been filtered based on the user settings for Filtering, Prefixes, States, and the Others tabs. In the example above, the station KM4UDX called me, and would normally have been suppressed due to my filter. Since he called me, and I am configured to respond to all calls, this was marked with the [F].

6.3 Call Info

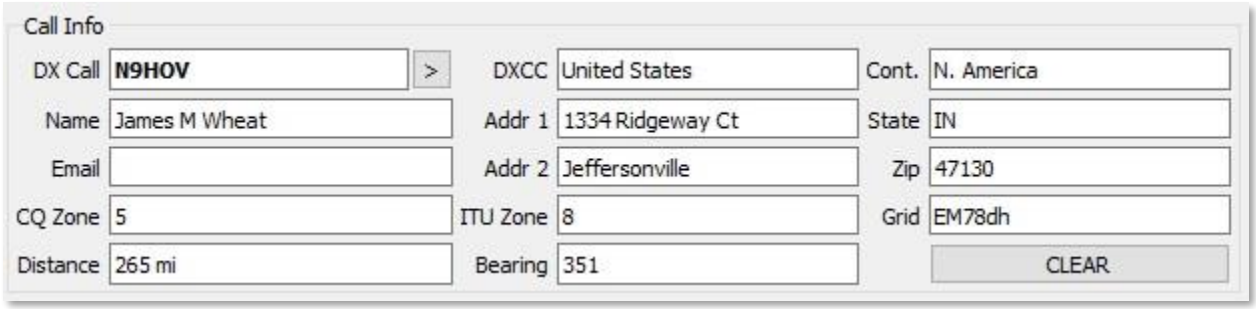


Figure 9- Sample Call Info pane

This section is only displayed if enabled under the View – Call Info option discussed earlier. Information is displayed about the current contact you are in QSO with. In addition, you can CTRL+Click on a callsign in the RX pane, or enter a callsign in the DX Call field (DX is perhaps a bit of a misnomer here) and click the > to the right of callsign. This will display information for the callsign you entered.

	This information is pulled from QRZ.COM, if an internet connection is available. In addition, you must have at least an XML subscription to pull data for all fields. Without a subscription, you will only get the name, callsign, DXCC, continent, CQ Zone, and ITU Zone.

6.4 Tabs

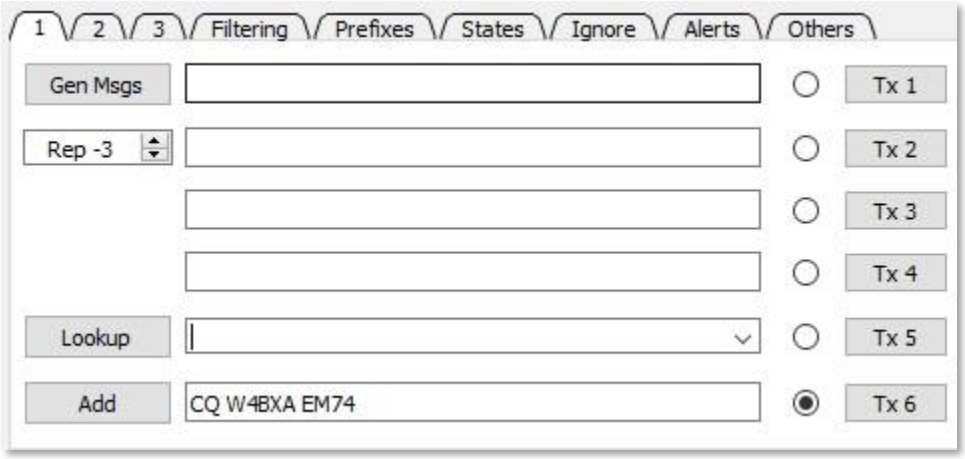


Figure 10- Sample Tab 1 pane

The Tabs are largely the same as from WSJT-X, with the addition of the new tabs described below. Note that functions aren't necessarily grouped together because an effort was made to minimize the changes to the layout of the original WSJT-X, and in some cases, new fields would not fit on the existing tabs.

A. Tab 1
No change from WSJT-X.

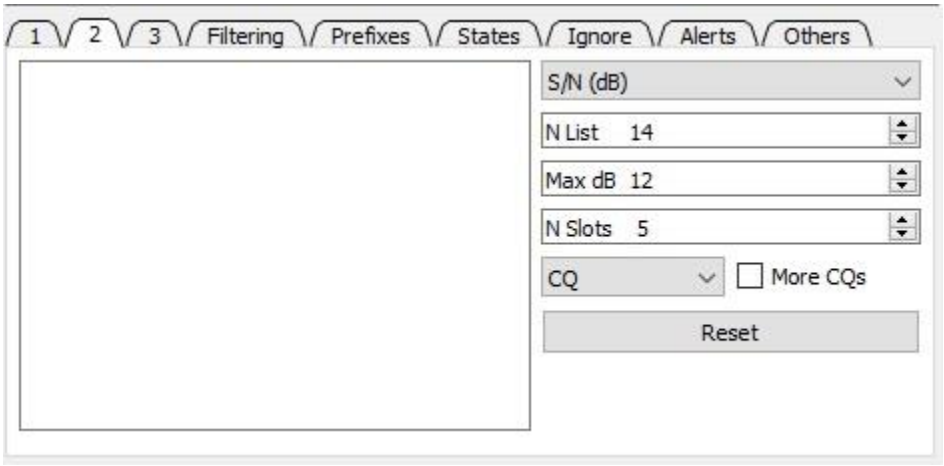


Figure 11 - Sample Tab 2 Pane

B. Tab 2

No change from WSJT-X. Note that this is used only for DX operations operating as Fox. See WSJT-X documentation for more information.

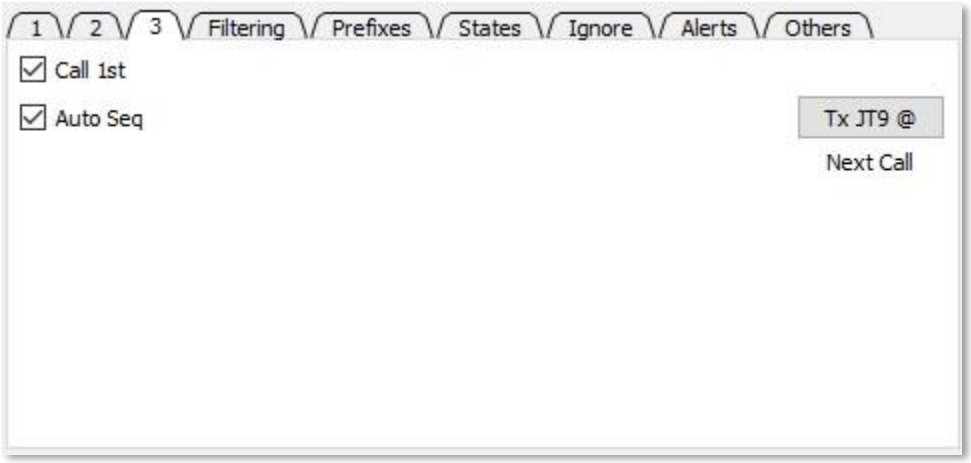


Figure 12 - Sample Tab 3 Pane

C. Tab 3
No change from WSJT-X.

D. Filtering Tab

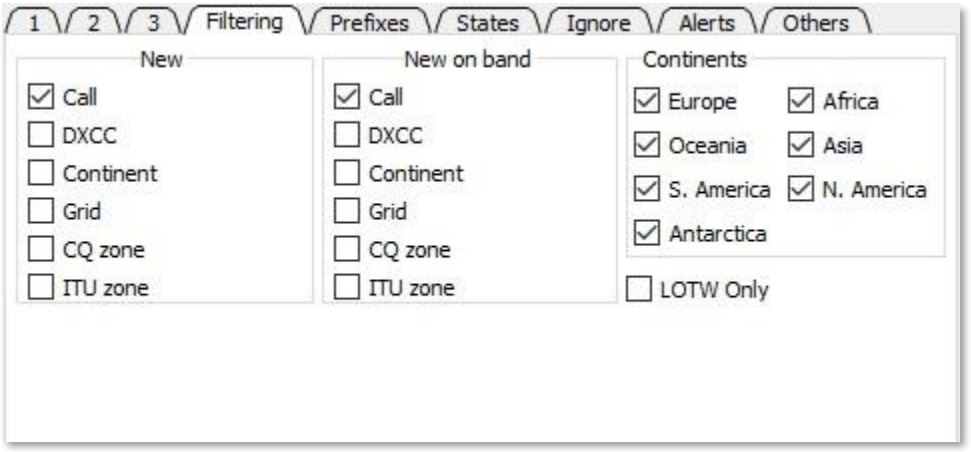


Figure 13- Sample Filtering Tab

Permits filtering of band activity. Check the boxes in each column according to your needs. For example, to see all new calls, check "Call" under the "New" column. To See only New DXCC calls, check "DXCC" under the "New" column. To see only New DXCC calls on new bands, check "DXCC" under the "New on band" column. To see only calls from specific continents, check the continents you want to see. To only see messages from stations that are Logbook of the world users, check the "LOTW Only" box. This may be helpful by limiting your contacts to stations that are more likely to confirm your

contact through LOTW.

Note that even though this is labelled the Filtering tab, the Prefixes, States, Ignore, and Others tabs make up the complete filter specification. When filtering is turned on or off, all these tabs are affected. Remember, you can use the Raw View to see all stations received to help you figure out why a station may not be making it through your specified filters.

The filtering capability is extremely powerful and helps you focus on just the subset of stations you want to work.

E. Prefixes Tab



Figure 14- Sample Prefixes tab using callsign filtering

Permits additional filtering of stations. Specify "Exclude" and enter the callsign prefixes or DXCC names in the box below to specifically exclude calls from those stations. Specify "Include" and the values to specifically include calls from those stations. Specify "Off" to disable this filter.

When entering the prefixes to be filtered, enter each band separately. If a band is not specified, no filtering occurs for that band.

Be sure to enter all stations for a band on a single line, separated by comas. Do not put a line feed in the middle. Values are NOT case sensitive.

Blank lines to separate bands are permitted and may help enhance readability.

In the example above, I have filtered callsigns beginning with K, W, N, and A, trying to include US stations only. This filter would also pick up some non-US stations that begin with A, such as those beginning with A2 from Botswana, but I can block those on the filtering tab by specifying only North America.

Notice that I have a typo for 15 and 17 meters, which are missing the "m". There is no error message to indicate this. Incorrectly formatted lines are generally ignored.

Here is another example of filtering using DXCC zone names.

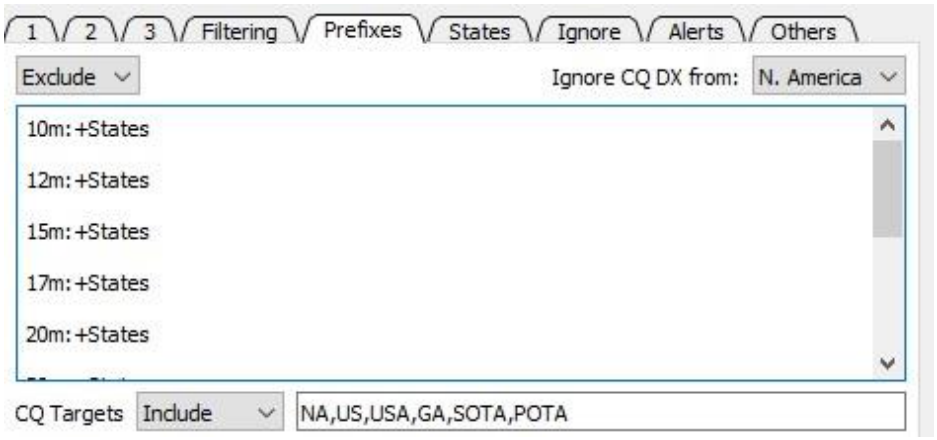


Figure 15 - Sample Prefixes tab filtering by DXCC name

In this case, I have specified the DXCC name, or actually a partial name – States for United States. The software will match on a DXCC entity beginning, ending, or containing the specified value.

I have specified the exclude option, so any callsigns from the US will be excluded. Multiple DXCC names can be entered here. The names are not case sensitive. Remember to add a plus sign in front of each DXCC name, separate them with commas, and don't include any line feeds, i.e., enter everything for a band on a single continuous line. Blank lines between bands are permitted and may improve readability.

Due to the political situation in Europe, there is some interest in blocking contacts with Russia and Belarus. To exclude them, you would enter this as follows:

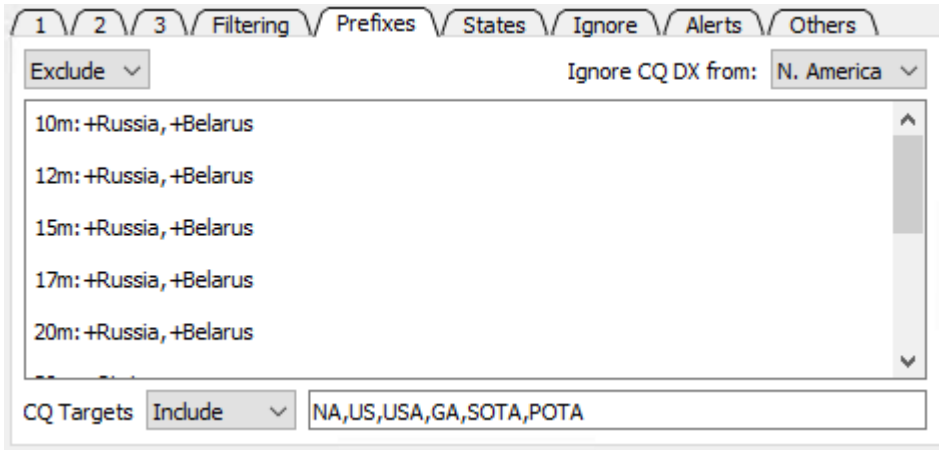


Figure 16 - Sample Prefixes tab filtering by DXCC name

The term “Russia” will cover both Russia and Asiatic Russia due to the partial matching capability.

Note that there are no error messages if you get the syntax or DXCC names wrong. The filter just won’t work properly. Remember, you can use the Raw view to help debug this if you aren’t getting the filtering you expected.

Where can I find a list of DXCC zones? ARRL publishes one, but they charge for it. A quick Internet search will probably find such a list. For example, maybe this one – All Entities Sorted by Name (ng3k.com).

To ignore stations making CQ DX calls for your location, specify your region. For example, US stations should specify “N. America”.

The “CQ Targets” section allows you to ignore stations calling CQ criteria that would not fit your situation. For example, US stations might specify “CQ Targets” with an “Include” value of “NA, US, USA, SOTA, POTA”, and their own state. (Don’t use quotes when adding these values.) Include other values here as desired. You can also use the exclude option here, but you will quickly find yourself with a very long exclusion list. The include method seems to work better.

F. States Tab

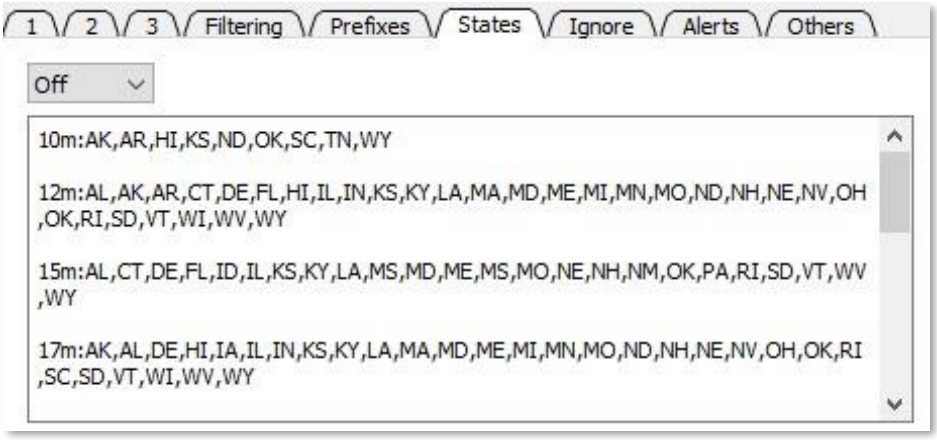


Figure 17- Sample States tab

The states tab works similarly to the Prefixes tab, allowing you to include or exclude calls from a specific US state or states. This is useful when you are only looking for contacts with the remaining states you need for WAS. Use the official, two character postal abbreviations. This filter can be set to include or exclude the specified states, or just turned off.

Multiple states should be separated by comas and specified for each band desired. These do not have to be in alphabetical order, but it is helpful when you start removing states you have confirmed. Don't include a line feed within a band entry. Blank lines between bands are permitted.

The State tab does not filter out non-US states, so if you only want US states, combine the state filter with the prefix filter as described previously.

You can find a complete list of US state abbreviations at USPS.COM.

If you would like to copy/paste the entire list of all 50 states (and Puerto Rico), you can use the following:

AL,AK,AZ,AR,CA,CO,CT,DE,DC,FL,GA,HI,ID,IL,IN,IA,KS,KY,LA,ME,MD,MA,MI,MN,MS,MO,
MT,NE,NV,NH,NJ,NM,NY,NC,ND,OH,OK,OR,PA,PR,RI,SC,SD,TN,TX,UT,VT,VA,WA,WV,WI,
WY

Paste these into an include list, then delete states as you get them confirmed.

G. Ignore Tab

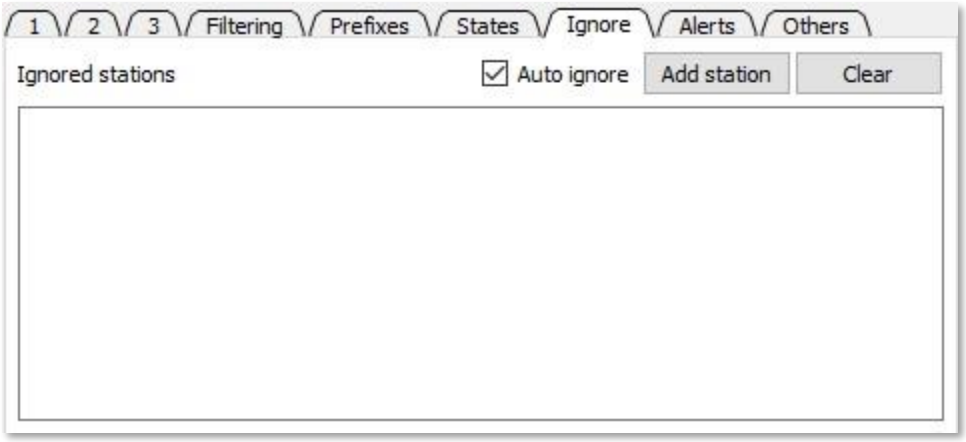


Figure 18- Sample Ignore tab

This tab is used to specify stations that will not be called or answered. Stations can have their callsigns manually typed into the box here (one callsign per line) or can be added by right clicking on a call in either of the message panes and selecting "Ignore Station". Clicking the "Add station" button will add the station currently selected. Stations will be automatically added by the software if the station was being called and the TX watchdog expired. (In other words, the station never responded.) This only occurs if the Auto Ignore checkbox is selected. Stations added to this list will remain blocked until they are cleared from the list. Stations can be removed by individually erasing them, or by using the "Clear" button to remove all of them. Stations can be automatically removed after a time period set on the Settings, WSJT-Z tab, down at the bottom – List reset interval. This is useful if propagation has changed and will allow for trying the contact again after this time period.

While you can ignore a station while you are in QSO with them, this will not abort the current QSO if you are already calling them.

	The ignored stations list will be automatically cleared when changing bands.

Any stations you included in the permanent ignore list will appear in the top of this box and cannot be edited or deleted here. See File, Settings, WSJT-Z for this purpose.

H. Alerts Tab

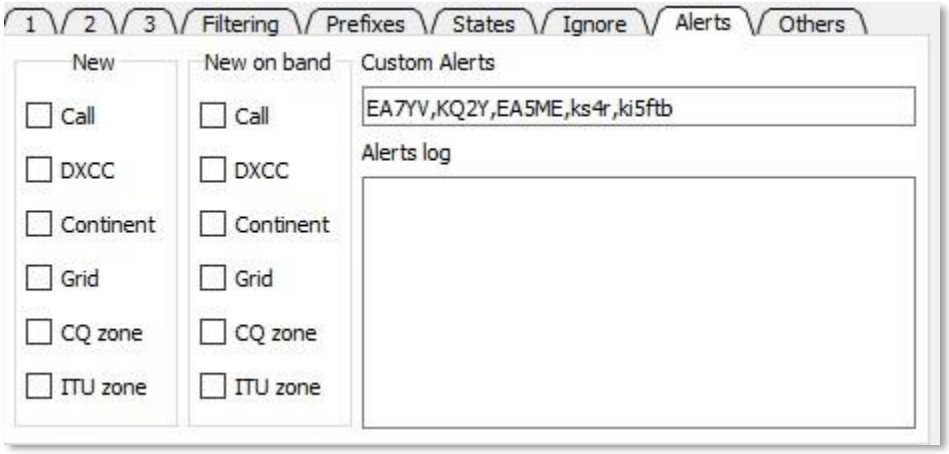


Figure 19- Sample Alerts tab

Similar to the Filtering tab, the Alerts tab allows configuring situations which will trigger an audible alarm and be added to the alerts log. You can specify new, or new on band criteria. You can also specify a list of callsigns, separated by commas (no spaces), in the Custom Alerts field. These can be prefixes, suffixes, or entire callsigns. For example, "SQ,SQ9FVE,FVE". (Don't use quotes when adding these values.) You can only alert on callsigns, not things like "POTA" or "QRP".

As discussed earlier on the File, Settings, WSJT-Z tab, you can specify a custom action to be taken when an alert is triggered.

I. Others Tab

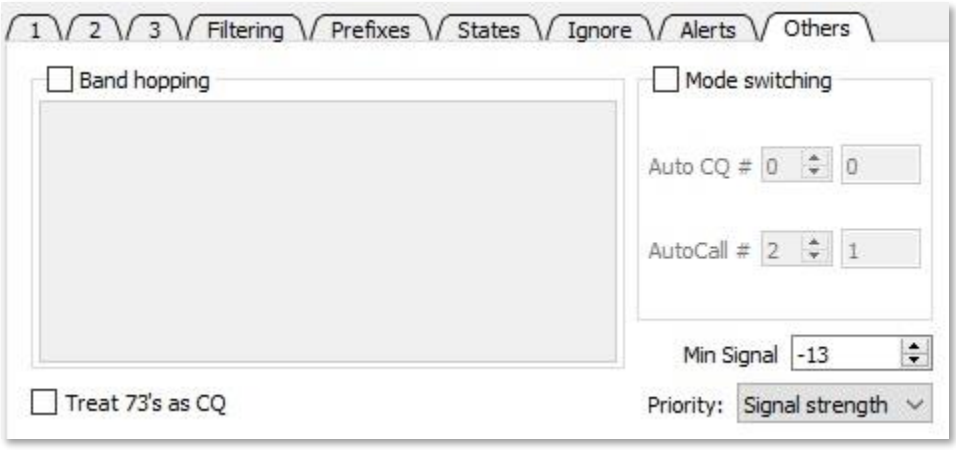


Figure 20- Sample Others tab

This tab is a place for several unrelated, but important settings used by WSJT-Z.

Band hopping – This feature allows you to set up automatic band changes based on the time of day. To enable this, check "Band hopping" and specify the bands and times for hopping to take place in the field below using this format (HOUR:BAND1,BAND2,BAND3...)

Example:
12:20m,40m
18:80m,40m,15m
22:160m

Remember to include the colon between the hour and the band. If you specify multiple bands, separate them with commas. Each hour entry must be on a single line. Don't insert a line return within a single band. Inserting blank lines between hour entries is allowed.

The time is specified in Zulu time, or GMT.

This feature cannot be used to start/stop automation, only to modify the band(s) being used. Use the two check boxes described below to activate these modes.

If auto frequency is enabled, the software will automatically select a relatively clear frequency before starting to transmit after the band or mode change.

⚠	When using this function, make sure you are using a multi-band antenna that can handle all the scheduled bands. If you are using an automatic tuner on this antenna, you may need to enable automatic tuning following a band change under the Settings, WSJT-Z tab.

Mode switching – This feature allows switching between Auto CQ mode and Auto Call mode based on the number of calls made. To enable this, check "Mode switching". There are two options for which values can be set – Auto CQ # and Auto Cal #. In the first field for each of these, enter how many iterations you want in each cycle. The second field counts down the number of iterations in each cycle. When the counter reaches zero, the software switches from Auto CQ to Auto Call, or vice versa.

One good use for this is if you are trying to scare up activity on a seemingly dead band by calling CQ, but don't want to just call continuously. You can use mode

switching to call CQ a couple of times, then stand by for some period of time before calling CQ again. Much easier on the finals and the power bill, and less QRM generated.



Mode switching should not be confused with the WSJT mode, such as FT4 or FT8. Here, mode refers to whether to use Auto Call vs. Auto CQ.

Treat 73's as CQ – Enabling this setting causes the software to support "tail ending" when a QSO is wrapping up. This affects both the CQ only filter and the Auto Call function. When the CQ Only filter is enabled, it will also include stations signing 73. When the Auto Call function is enabled, stations that are signing 73 are eligible to be called, just as if they were calling CQ. In this mode, the TX frequency is locked to make sure the user doesn't transmit over the final 73. Enabling this option will generate more calls, however, you may find that your success with calling stations who are actually calling CQ is higher than your success tail-ending. Many operators don't seem to have learned how to reply to direct calls. Or perhaps they just don't want to respond to these. If they don't reply, your station wastes time until the WD timer expires. Tail ending does seem to be more successful during contests.

Min Signal – Perhaps the most useful setting in WSJT-Z, this value specifies the minimum signal strength which will be displayed, and is applied whenever the Filtering box is checked. Messages below this threshold will not be displayed or called. On a busy band, it is useful to set this to a value at which you are reasonably confident you can complete a QSO. On a sparsely populated band, you can generally set this lower. A station in an HOA neighborhood with a compromise antenna and high noise level may want to set this to something like -10 on crowded bands, and -17 on sparsely populated ones. Setting this value too low will result in Auto Call and Auto CQ failing to complete QSOs, resulting in extended repeated calls before the watchdog times shuts down the QSO. This just creates QRM for others and ties up the radio from working stations with which it can successfully complete a QSO.

Priority – When Auto Call is enabled, this setting determines which station from the decoded list is called next. There are three options – Last Decoded, Signal Strength, and Distance. The decoder places messages in the Band Activity display in the order that it decodes them. Some decodes take longer than others. The list as it is displayed is not sorted in any way, however, this option allows for you to tell the software how to choose which station to call next. If you just want to make contacts, choosing "Signal Strength" is a good choice, as it will call the strongest station first. If you are trying to work DX stations, and not closer stations, you might try using "Distance". If you want to work the weakest stations, you might try "Last Decoded". In practice, selecting "Distance"

is often the best choice, and use the other filtering options, like setting a minimum signal strength, to further define what station is selected next.

6.5 Other Controls



Figure 21- Sample Other Controls pane

The remainder of the main window includes a collection of various buttons, fields, and status displays. Controls have been changed and/or relocated somewhat from WSJT-X and are as follows:

A. Frequency
Select the desired operating band using the drop down box, or enter the desired frequency in MHz, or frequency in KHz followed by “k”.

B. Split
Green indicates that split operation in use. Red or orange indicates that there has been a rig control error. This is often cause by a configuration issue or RF getting into the USB cable for rig control. Click to reset and re-read the dial frequency of the radio.

C. Operating Frequency
Displays the actual frequency in use. During transmit, shows the actual transmit frequency of the transmission, which will differ from the receive frequency when working split.

D. Time
Indicates the current time based on UTC. The time is derived from the computer system clock. Remember that it is important that your computer clock be accurate and correct.

E. Rx frequency
Allows adjusting the receive frequency using the up/down arrows or by manually typing the desired frequency offset.

F. Tx frequency
Allows adjusting the transmit frequency using the up/down arrows or by manually typing the desired frequency offset.

G. Auto
Click to automatically select a relatively clear transmit frequency based on the previous

two receive cycles. You can keep clicking until you find one you are happy with.

H. Filtering
Check the box to enable filtering as specified by the Filtering, Prefixes, States, Ignore, and Others tabs. Turns green when enabled.

I. Auto CQ
Enables automatic calling of CQ. The program will call CQ and respond to anyone who answers the call, then resume calling CQ after the QSO is complete. The contact is logged automatically. The WD timer will not stop calling CQ, though it will abort QSO's that are not progressing and return to calling CQ.

J. Auto Call
Enables automatic calling of other operators who are calling CQ. (Optionally, operators that are sending 73 or RR73 will be treated as if they are calling CQ.) No transmissions are initiated except in response to a CQ.

Selecting this option enables the CQ only button and the Filtering button.

K. Hold Tx Freq
No change from WSJT-X.

L. Tx even/1st
No change from WSJT-X, however, note that you can lock or unlock the setting by double clicking on the label. This can be locked either on or off. The text appears in red if the option is locked. This is especially useful if you are using two radios and want them to transmit in the same, or in opposite time slots.

M. Call
Displays the callsign of the station currently being worked.

N. Grid
Displays the grid square of the station currently being worked.

O. F/H
Indicates Fox and Hound mode, and whether to act as a fox or as a hound.

P. CQ Only
No change from WSJT-X.

Q. Log QSO
No change from WSJT-X.

R. Stop

No change from WSJT-X.

S. Monitor
No change from WSJT-X.

T. Erase
No change from WSJT-X.

U. Best S&P (FT4 only)
No change from WSJT-X.

V. Decode
No change from WSJT-X.

W. Enable Tx
No change from WSJT-X.

X. Halt Tx
No change from WSJT-X.

Y. Tune
No change from WSJT-X.

Z. Pounce
Sets the software to automatically call the operator specified in the Call field above, if/when their call is seen and they are available for a call. Useful if you are watching for a rare DX station or POTA station to come up on frequency. Note that you can set the station to be pounced upon by right clicking on a station in the Band Activity window and selecting Pounce.

When Pounce is enabled, no other automatic calling will occur.

Once a Pounce is initiated, the Pounce check box is cleared and this becomes a normal call to the station. If the WD timer kicks in, no further calling takes place. Basically, you only get one pounce at a station.

AA. Menus
No change from WSJT-X.

BB. Mini
Unique to WSJT-Z, provides for a smaller window for use on computers with small screens by reducing the amount of data displayed.

Several unlabeled status indicators are shown at the bottom of the screen as follows:

I. Transmit/receive status – shows either Transmitting or Receiving status, according to the current operation. When transmitting, shows TX: and the text of the message currently being sent. In Receive, shows Receiving. This is the also the place you will get a message in red when the watchdog timer times out – Runaway Tx watchdog.

II. Profile Name – shows the name of the profile in use. If you are using the default profile, this field is blank.

III. Mode – Shows FT4, FT8, etc., to indicate the operation mode.

IV. Last Tx message– Shows the text of the last message transmitted

V. Decode Count – Shows the number of stations decoded during that sequence, before filtering.

VI. QSO count – Shows the number of completed QSO's in this session, followed by a slash, then the total number of completed QSO's in the log file.

VII. Bearing and distance to station in QSO – shows azimuth in degrees and distance to the station with which you are in contact.

VIII. Timer – A moving green or red bar showing where we are in the transmit/receive cycle. A number indicates how many seconds we are into the sequence, e.g., 8/15 means we are eight seconds into the 15 second FT8 sequence.

IX. WD – indicates the time remaining on the watchdog timer, which will shut down transmission and reset at zero. Displayed in minutes.

Not shown in the screenshot above, a slider bar is located on the right side of the main pane, and allows for adjusting the power output of the transmitter. The top of the bar indicates 100% and the bottom of the bar indicates 0%. There are no numerical labels for these bars to save screen space. When you click on the bar and move the slider for TX Pwr, the current value is show in a floating box. Below the TX Pwr is a bar showing the receive audio level. This cannot be adjusted here.

7. Making QSOs

While this document is focused on WSJT-Z, in this section we will discuss things you need to know about making QSO's, starting with prerequisites before you begin operations, then moving ahead to tips and techniques for different types of operating. These will focus on using the features unique to WSJT-Z. Remember, the WSJT-X User Guide is a great source for documentation on native WSJT-X features and functions.

7.1 Pre-QSO Checklist

Use this checklist to make sure you are ready to start your first WSJT-Z QSO:

- ☐ Be sure you have installed WSJT-Z. If you have previously installed WSJT-X, you can simply install WSJT-Z into the same directory. This will carry forward all your WSJT-X configuration and settings. If you installed into a separate directory, you would need to make these same configuration changes here.

- ☐ Test and confirm that your audio settings are correct and working with your radio.

- ☐ Test and confirm that your serial port settings are correct and working with your radio.

- ☐ Confirm that your audio levels are set correctly both for audio input to the computer, and audio output to the radio. Watch your ALC level. Be sure not to overdrive your radio, or you will generate splatter across the band from your transmissions.

- ☐ Confirm that you have Windows sound options configured correctly and are not sending all the various computer system sounds or application sounds to the radio. When you hear "New grid" or "New DCXX" over the air in the FT4/8 portion of the band, it's because someone has failed to do this correctly. These folks are unintentionally operating voice mode in the CW part of the band. Oops! You won't be able to hear when YOU mess up, but everyone else will hear you! One way to monitor what your output looks and sounds like is to use a nearby WebSDR receiver to listen.

- ☐ Make the required settings for WSJT-Z in the configuration section of the program, as well as on the main screen. We will touch on the important ones in here. Remember that there is complete information on all WSJT-Z options in sections 4 and 5 above. In general, be sure to set/configure the following:

  - File, Settings, WSJT-Z – Configure these settings as described in paragraph 4 above, which includes recommendations for these options.

  - Enable any additional windows you prefer using the View tab. The Waterfall tab seems almost required, but you may also find the Call info, Raw View, and PSK Reporter views useful as well. Resize and arrange these on your screen as desired. You probably cannot fit all of these on one screen, so pick and choose as you see fit. Select the Min option if you need to reduce the size of the main window. Select View Dock Windows to lock all the windows in place once you get them the desired size and location.

    - Call info shows you details about the person you are in QSO with, such as their exact location and contact information. As mentioned previously, you must have at least a QRZ.COM XML subscription to populate all these fields.

- Raw view is useful because it shows a few of all messages being decoded, including the ones excluded by your filters. This will help when your Band Activity pane shows few decodes, but you are seeing lots of activity on the waterfall.

- The PSK Reporter view may be improved in future versions. For now, you may find it preferable to just open pskreport.com/map in a browser window.

- Start with Auto CQ and Auto Call unchecked. The program will not make calls automatically.

- Hold Tx Freq is a bit controversial. Many hams tell you to use the waterfall to find a quiet spot and lock it in place for all transmissions by enabling this setting. DX stations in particular don't like you calling them on "their" frequency and causing QRM. They generally much prefer you to work split, and they are more likely to hear you if you do so. This works fine until someone else starts transmitting on "your" frequency. When that happens, MOVE! If this option is not enabled, your transmissions will occur on (or very close to) the frequency you are responding to.

  When calling CQ, enabling this option, as well as "Tx even/1st" is recommended. If you are not calling CQ, and are not working DX, you will probably find that you have better results with this not enabled. WSJT-X applies special treatment to messages received within 50hz of where you are transmitting. If it sees that the station you are calling starts calling someone else, the QSO is aborted, saving time and avoiding interfering with the station you were calling.

- CQ only – It is recommended that you enable this. This limits the messages displayed in the Band Activity pane to only those stations calling CQ. This makes it much easier to decide who you are going to call since the list is much shorter.

- Filtering – It is recommended that you enable this. This also limits the messages displayed in the Band Activity pane and makes it easier to decide who you are going to call, or who will be automatically called.

- Tab 3 – Call 1st --It is recommended that you enable this. This will cause the software to call the first message that responds to a CQ you send.

- Filtering Tab – This is where you specify what filtering of incoming messages you want. You enabled this earlier with the Filtering checkbox. A good place to start here is to enable New Call, New on Band, and all continents.

- Prefixes – Configure as described in paragraph 6.4 above. Note the recommended values as these will further filter extraneous message from the Band Activity pane. For example, maybe you are working on WAS and only want to see US stations, or perhaps you are working on DXCC and you don't want to see US stations.

- Others – Min. Signal – set this to a value representing the signal strength above which you want messages to be displayed. For example, if you set this to 5, you will only display very strong signals. For manual operation you could set this to some low value like -24 db, since you will be deciding which stations to call manually anyway. You might find it more reasonable to specify some reasonable value such as -10 or -13. This will avoid displaying stations that you probably cannot work anyway.

- Determine the appropriate power level to be used with your radio. These digital modes were designed for low power work, but full power from most radios can be used, if they can tolerate extended periods of operation with a 50% transmit/receive duty cycle. In general, in keeping with good amateur practice, use only the power level that you need to complete the contact.

- Ensure that your power supply is adequate to handle the 50% transmit/receive duty cycle of the digital modes, especially for long operating sessions.

7.2 Standard Exchange

If you have completed all the prerequisites described above, you are ready to make a contact. Calling CQ or responding to a CQ works the same as in WSJT-X. Double click on a message from someone calling CQ to start a QSO, or tap the Tx 6 button on tab 1 to kick off calling CQ. Have fun!

Assuming you configured WSJT-Z as recommended, your QSO will be automatically logged when completed.

Remember, we have mostly focused on WSJT-Z in this user guide, but there is a great document about how to use WSJT-X, including lots of hints and tips, in *FT8 Operating Guide, Weak signal HF DXing for technophiles* by Gary Hinson, ZL2IFB, which can be found here. This information is applicable to WSJT-Z as well.

Many hams like to use companion programs such as Grid Tracker or JTAlert. Some users of JTAlert have reported problems with the UDP communication between WSJT-Z and JTAlert. Some versions of JTAlert have included code specifically to prevent it from working with WSJT-Z, so use is not recommended. There are other add on programs available, and most that work with WSJT-X should also work with WSJT-Z.

7.3 Auto Call

In this section, we will talk about additional configuration changes required to have WSJT-Z automatically respond to operators calling CQ. We remind you again that you should always attend to your radio while using Auto Call, unless automated operation is legal in your location.

Auto Call is relatively innocuous in that all it does is to automatically respond to users that are calling CQ. However, keep in mind that WSJT-Z is a relatively simple-minded bot. It does not monitor a frequency before transmitting, which can cause interference to other stations. For this reason, we recommend selecting a clear frequency to transmit, and selecting the Hold Tx option. (You may choose to use the Auto button to help automate the process of finding a clear frequency.) Also consider that while the software sends responses to messages in the standard TX sequence, if the station on the other end doesn't respond, WSJT-Z will repeat the transmission, and will repeat it again, and repeat it again, until the watchdog timer expires.

So let's talk about the watchdog timer (WD). In classical computer science, a watchdog timer was an independent timer that was set to monitor if a computer or system crashed, and would either halt or reset the computer or system. The watchdog timer here is used not to monitor for the software crashing, but to detect and halt endless re-transmissions. It is basically a QSO timeout timer. So if you tell the software to respond to a station calling CQ, it will reset the QSO after a set amount of time. We don't want this to be too long, because we don't want to create QRM, but we don't want it to be too short because often the other station may be busy working someone else and not respond for several cycles. You will likely find it necessary to modify the timeout depending on band conditions and whether you are operating FT4 or FT8.

In WSJT-X, the watchdog timer is configured in File Settings, under Tx watchdog. The default time is set to 6 minutes. This value seems to be a bit long, and you may want to use something like 4 minutes, or even 2 minutes.

In WSJT-Z, on the File, Settings, WSJT-Z tab, you can set custom individual settings for FT8 and FT4 under the Custom WD Timer fields. These override the WSJT-X TX watchdog setting. This is useful because FT4 exchanges take half the time of an FT8 exchange. Recommended values here are 2 minutes for FT4 and 2 minutes for FT8. Be aware that if you enabled it in the WSJT-Z settings, clicking anywhere on the program window, the timer will reset.

When using Auto Call, consider carefully the value you specify for Min. Signal on the Others tab. Choose a high enough value that the software won't waste time (and generate QRM) by trying to call stations that can't hear you and won't respond. You might want to start with a value of zero or -10 db, then decrease if appropriate. Keep in mind that the db values returned by the software (1) are not always accurate, (2) change due to propagation shifts, and (3) don't indicate that propagation both directions is equivalent.

To enable Auto Call, click the Auto Call box. The Filtering box and the CQ only box will be enabled automatically, and the software will begin responding to CQ's.

You may also want to enable the Treat 73's as CQ button on the Others tab. As the name implies, this will cause the software to respond to messages containing 73, which indicate the QSO is wrapping up. In this way, you can respond to someone calling CQ before the message is even sent! Amazing!

To halt automatic calling, uncheck the Auto Call box or tap to turn off the Enable Tx button. If a transmission is in progress, tab on the Halt Tx button.

A quick way to abandon a QSO in progress and have the software start a new sequence is to hit the Auto Call button twice.

7.4 Auto CQ

In this section, we will talk about additional configuration changes required to have WSJT-Z continuously call CQ and complete a QSO with operators who reply. Once completed, calling CQ repeats.

We remind you again here that you should always attend to your radio while using Auto CQ, unless automated operation is legal in your location.

Auto CQ is more "aggressive" than Auto Call in that it continuously calls CQ. If nobody responds, it keeps calling. If someone responds but doesn't complete the QSO, the software will keep trying to complete the call until the watchdog timer expires, then start calling CQ again. In this case, the operator's callsign will be added to the temporary ignore list to avoid starting another QSO sequence with them.

Again, keep in mind that WSJT-Z is a relatively simple-minded bot. It does not monitor a frequency before transmitting, which can cause interference to other stations. And while the software sends responses to messages in the standard TX sequence. If the station on the other end doesn't respond, it will repeat the transmission, and will repeat it again, and repeat it again, until the watchdog timer expires.

Unlike Auto Call, the Min. Signal setting is not really important in this mode, as the onus is on the other operator to initiate a QSO.

Auto CQ mode and Auto Call mode are mutually exclusive. In other words, while you are in Auto CQ mode, the software will not call another station calling CQ. While in Auto Call mode, you can however hit the TX 6 button to initiate a CQ.

7.5 Automatic Mode Switching

Automatic mode switching is enabled by selecting Mode Switching on the Others tab. In this mode, the software will alternate between Auto CQ mode and Auto Call mode based on the number of CQ's sent, or the number of cycles listening for a call.

There are two options for which values can be set – Auto CQ # and Auto Cal #. In the first field for each of these, enter how many iterations you want in each cycle. The second field counts down the number of iterations in each cycle. When the counter reaches zero, the software switches from Auto CQ to Auto Call, or visa vera. The Auto Call and Auto CQ boxes are automatically enabled and disabled to show which mode is currently active.

7.6 Automatic Band Hopping

Automatic band hopping is enabled by selecting Band Hopping on the Others tab. In this mode, the software will change bands at the times indicated in the box below. The format is "hour:band1,band2,band3…". Enter one hour per line. Hopping between multiple bands per hour is supported.

Example:
12:20m,40m
18:80m,40m,15m
22:160m

If in auto call mode, the Auto Call # is decremented, then the band is cycled when it reaches zero. If in auto CQ mode, the Auto CQ # is decremented, then the band is cycled when the counter reaches zero. If Auto mode and Auto CQ are both enabled, the software will cycle through Auto Call #, then Auto CQ #, then switch the band.

⚠	When using this function, make sure you are using a multi-band antenna that can handle all the scheduled bands. If you are using an automatic tuner on this antenna, you may want to enable automatic tuning following a band change under the Settings, WSJT-Z tab.

Note that automatic Mode switching, and automatic band hopping can be used together by enabling both options.

8.0 A Band Hopping FT8 Monitor Using WSJT-Z

Some hams may be interested in using WSJT-Z to monitor multiple HF bands for FT8 activity using a CAT controlled transceiver and upload the results to PSKReporter by using this setup. The transmitter is never triggered, so there are no concerns about illegal automatic transmissions. This idea was proposed by Hasan Schiers, N0AN.

On the WSJT-Z tab, unselect Autotune after auto band change. This prevents the transmitter from being triggered to tune the antenna. Also unselect Always respond to stations calling us, to keep us from ever answering anyone who calls us.

On the Filtering tab, uncheck all continents. This will filter out all stations, so we don't try to call them. Filtered calls won't appear in the Band Activity window but will be seen in the Raw View and reported to PSKReporter.

Enable Band Hopping and set up a hopping schedule on the Other tab.

Check the Autocall box in the main window.

The radio will begin listening on each band for the specified number of cycles, then go to the next band. The bands will change at the top of the hour in accordance with the hopping schedule. You may need to restart WSJT-Z when you make changes to the hopping schedule.

To change the number of cycles that will be monitored before a band hop occurs, use the Mode Switching portion on the Others tab. You will have to temporarily enable Mode Switching in order to update the value for Autocall. The number you want to change is the first one next to AutoCall #. You might want to set this to a value of 2, or a multiple of 2. The second field will decrement as the cycles progress. Uncheck Mode Switching once you have set this value.

You can combine both band hopping and mode switching, for example to switch between FT4 and FT8, however, mode switching would apply to all bands that you hop. Since FT4 is mostly confined to 20 meters, this is probably not a good idea.

You may find it useful to create a separate profile for this configuration, different from the one you use for normal digital communications. Refer to the WSJT-X manual for information on using profiles.
