

Quick-Start Guide to *WSJT-X 2.0*

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Overview: This Guide is written for experienced users of *WSJT-X* v1.9, and especially for beta-testers of *WSJT-X* v2.0. It will be superseded by the *WSJT-X 2.0 User Guide*, when that becomes available. Be sure to read this entire document before using *WSJT-X 2.0*. Changes made between release candidates RC2 and RC3 are described in a new section starting on page 7.

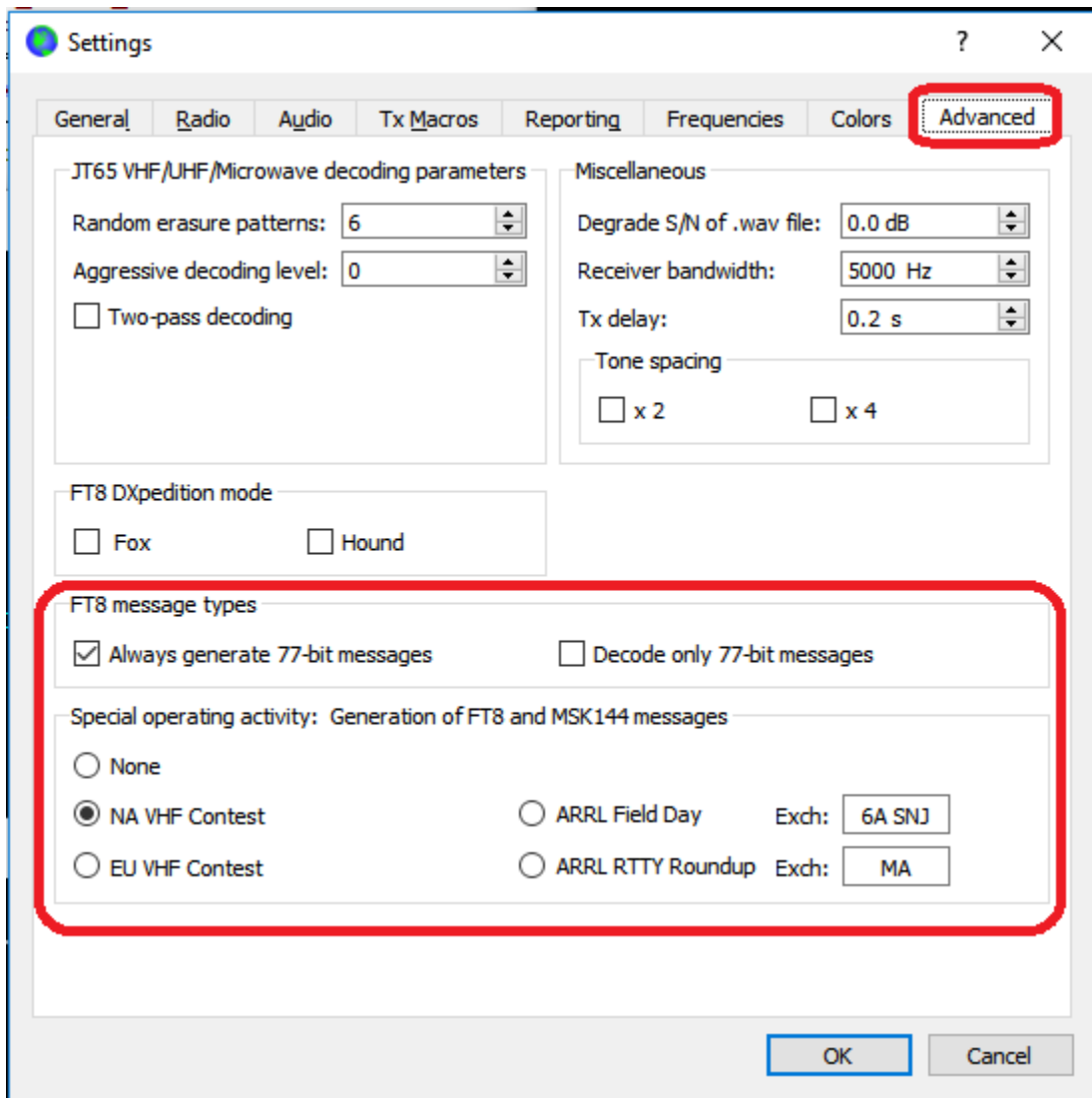
The most important new program features apply to operating modes FT8 and MSK144. These protocols now convey 77-bit information payloads, compared with the previous 75-bit (FT8) and 72-bit (MSK144) messages. Cyclic redundancy checks (CRCs) have been extended from 12 to 14 bits (FT8) and from 8 to 13 bits (MSK144). These changes enable new message formats for efficient, robust QSOs in North American VHF contests, European VHF contests, ARRL Field Day, and the ARRL RTTY Roundup. They also provide user-friendly support for nonstandard callsigns, smaller false decode rates, and many other benefits.

Transition period: To help ease a transition from the v1.x to v2.0 protocols, the first beta-test versions will support the original FT8 format as well as the new one. Releases made after RC3 (October 15, 2018) will discontinue support for the old-style FT8 protocol. In contrast, all release candidates and the final *WSJT-X 2.0* will support *only* the new protocol for MSK144. (The community of MSK144 users is much smaller than that of FT8, and we are confident that this group can be persuaded to upgrade quickly.) During the beta-testing period from September 15 through November 12 the v2.0 protocols should be used on different operating frequencies from FT8 and MSK144 usage in v1.x. For FT8 v2.0 we recommend using the 40- and 20-meter bands, dial frequencies 7.078 and 14.078 MHz. This concentration should aid testing activity and make many random QSOs possible. For MSK144 during the transition period we recommend the frequencies 50.380 MHz rather than 50.360 (IARU Region 1) and 50.280 rather than 50.260 (Regions 2 and 3). As soon as most regular users have upgraded to a v2.0 release, MSK144 activity can be moved back to 50.360 or 50.260 MHz.

Operating with *WSJT-X 2.0*: Most of the new program features are invoked automatically, as needed. The generation of default messages for special operating activities is controlled through user options on the **Settings | Advanced** tab. By default, release candidates up to and including RC3 will transmit FT8 messages using the original protocol whenever possible, *i.e.*, for the standard structured messages and free text messages used in old-style FT8 QSOs. Thus, with the early candidate releases you can operate as usual in the standard FT8 sub-bands.

The new v2.0 message formats are recognized automatically and transmitted using the new protocol. You can check **Always generate 77-bit messages** to force *all* transmissions to use the new protocol, and we recommend doing this during the

transition period when operating on 7.078 or 14.078 MHz. In releases up to and including RC3 the FT8 decoder will respond to received signals using either old-style or v2.0 protocols. Check **Decode only 77-bit messages** if you wish to use only the v2.0 decoder. Doing so will make decoding somewhat faster, but you will no longer be able to copy v1.x FT8 messages. Users of *WSJT-X* v1.x will not be able to decode v2.0 transmissions that use the new FT8 protocol.



FT8 DXpedition Mode: Starting with release candidate RC3 the “Fox and Hound” operating mode will always transmit and receive using only the new 77-bit messages. We recommend that any serious use of DXpedition mode should use *WSJT-X* v1.9.1 until December 10, 2018, and *WSJT-X* 2.0 thereafter.

Keep in mind that *WSJT-X 2.0* will *always* use the new protocol for transmitting and receiving MSK144. For this mode there is no backward compatibility with v1.x.

To make FT8 QSOs with other stations using version 1.x software:

- Operate in the standard FT8 sub-bands
- Be sure to uncheck **Always generate 77-bit messages** and **Decode only 77-bit messages**
- Do not invoke any of the special contest-like operating activities
- Do not operate with a compound or nonstandard callsign, or try to work a station using such a callsign

To test and use the new *WSJT-X 2.0* message types for FT8:

- Operate at dial frequencies 7.078 or 14.078, or elsewhere by special arrangement
- Check the boxes **Always generate 77-bit messages** and **Decode only 77-bit messages**
- Optionally, you may test any of the special contest-like operating activities. You may find it most convenient to do this by special arrangement with other stations, or during a scheduled “mock contest” period.
- To make QSOs using compound or nonstandard callsigns, both stations must use *WSJT-X 2.0* with both 77-bit message options checked.

To make MSK144 QSOs:

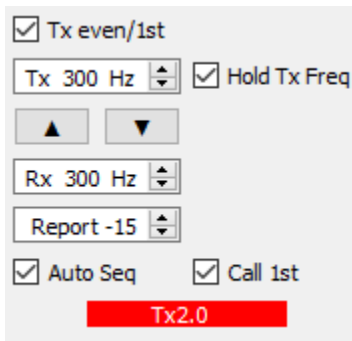
- Remember that *WSJT-X 2.0* cannot communicate with older software versions using the original MSK144 protocol.
- With early candidate releases of *WSJT-X 2.0* (or until most of the MSK144 activity has converted to the v2.0 protocol), operate at dial frequency 50.380 (IARU Region 1) or 50.280 (Regions 2 and 3), or elsewhere by special arrangement.
- Starting no later than November 12, 2018, revert to the conventional MSK144 operating frequencies, 50.360 (Region 1) and 50.260 (Regions 2 and 3).

Contest-style messages: When testing or participating in one of the special operating activities supported by *WSJT-X 2.0*, be sure to check the appropriate box: **NA VHF contest**, **EU VHF contest**, **ARRL Field Day**, or **ARRL RTTY Roundup**. For Field Day enter your exchange information (operating Class and ARRL/RAC section). For the RTTY Roundup (and similar RTTY contests) the required exchange is signal report and State or Province (US/Canadian stations), or signal report and QSO serial number (DX stations). Enter your fixed exchange information on the **Settings | Advanced** tab,

using “DX” for section or state/province if you are not in the US or Canada. If your entered information is displayed it red, it has not been accepted as a valid exchange.

Early candidate releases of *WSJT-X 2.0* lack a number of features found in mature contesting software: dupe checking, display of QSO rate, multipliers, cumulative score, etc. Such features will be added in due course, some of them based on using *WSJT-X 2.0* together with contesting software *N1MM+*.

When **Always generate 77-bit messages** or a **Special operating activity** has been selected, a suitable color-highlighted message appears on the *WSJT-X* main window:



WSJT-X 2.0 supports a number of new formats for structured messages. Some examples of valid FT8 and MSK144 exchanges follow, grouped according to standard usage in minimal QSOs for the special operating activities:

NA VHF Contest

```
CQ TEST K1ABC/R FN42
    K1ABC/R W9XYZ EN37
W9XYZ K1ABC/R R FN42
    K1ABC/R W9XYZ RR73
```

EU VHF Contest

```
CQ TEST G4ABC/P
    G4ABC/P PA9XYZ JO22
PA9XYZ 570123 IO91NP
    G4ABC/P R 580071 JO22DB
PA9XYZ G4ABC/P RR73
```

ARRL Field Day

```
CQ FD K1ABC FN42
    K1ABC W9XYZ 6A WI
W9XYZ K1ABC R 2B EMA
    K1ABC W9XYZ RR73
```

ARRL RTTY Roundup

```
CQ RU K1ABC FN42
    K1ABC W9XYZ 579 WI
W9XYZ K1ABC R 589 MA
    K1ABC W9XYZ RR73
    K1ABC G3AAA 559 0013
TU; G3AAA K1ABC R 569 MA
    K1ABC G3AAA RR73
```

Compound or Nonstandard Callsigns

```
CQ PJ4/K1ABC
    <PJ4/K1ABC> W9XYZ
W9XYZ <PJ4/K1ABC> +03
    <PJ4/K1ABC> W9XYZ R-08
<W9XYZ> PJ4/K1ABC RRR
    PJ4/K1ABC <W9XYZ> 73
```

Details of the New Message Formats

1. CQ messages may contain an optional second word with up to four letters — “CQ TEST”, “CQ FD”, etc. — followed by a standard callsign and 4-character grid locator, or a nonstandard callsign and no locator. In MSK144 mode a second word with three decimal digits, as in “CQ 285 K1ABC FN42”, is permissible and has the automatic-QSY implication described in the present (v1.9.1) *WSJT-X User Guide*.
2. As in *WSJT-X* v1.x and in modes other than FT8 and MSK144, the most common standard messages contain two callsigns and a grid locator, signal report, RRR, RR73, or 73. An optional “R” (for acknowledgment) may appear before the locator or signal report. In *WSJT-X 2.0* either or both of the callsigns may be appended by /R (indicating Rover status) or /P (portable).
3. The third message shown above in the **EU VHF Contest** group includes a 6-digit integer and a 6-character grid locator. The example number conveys a signal report “57” and a QSO serial number “0123”. Signal reports range from 52 to 59; they are generated automatically based on received signal-to-noise ratio using, a 6 dB per S-unit scale starting at –24 dB. Serial numbers may range from 0001 to 4095.

S/N (dB)	RST
≤ –19	529
–18 to –13	539
–12 to –7	549
–6 to –1	559
0 to 5	569
6 to 11	579
12 to 17	589
≥ 18	599

4. The **ARRL Field Day** exchange includes number of transmitters (1-32), operating class (A-F), and ARRL/RAC Section. DX stations send “DX” for section.
5. The RTTY Roundup exchange includes a 3-digit signal report in RST format (529 through 599) followed by US state, Canadian province, or QSO serial number for non-US/Canadian stations. Serial numbers may range from 0001 to 7999. As illustrated in one example shown above, for the **ARRL RTTY Roundup** messages in this format may be preceded by “TU;” — thereby thanking a previous QSO partner while simultaneously responding to another caller.
6. Compound and nonstandard callsigns such as PJ4/K1ABC or YW18FIFA are automatically recognized and handled using special message formats. One such callsign and one standard callsign may appear in most messages, provided that one of them is enclosed in <...> angle brackets. If the message includes a grid locator or numerical signal report, the brackets must enclose the compound or nonstandard callsign; otherwise the brackets may be around either call. Angle brackets imply that the enclosed callsign is not transmitted in full, but rather as a

hash code with a smaller number of bits. Receiving stations will display the full nonstandard callsign provided that it has been received in full in the recent past. These restrictions are honored automatically by the algorithm that generates default messages for minimal QSOs. For FT8 and MSK144 there is no longer a distinction between “Type 1” and “Type 2” compound callsigns; all nonstandard calls are treated identically. Except for the special cases involving /P or /R, *WSJT-X 2.0* offers no support for two nonstandard callsigns to work each other.

7. Standard messages in the **NA VHF Contest** format are the same as those required for the Makrothen RTTY Contest. Thus, if the Makrothen sponsors decide to offer an FT8 contest the necessary support is already provided.

Comparison with *WSJT-X v1.9.1*: Earlier versions of *WSJT-X* could lead to confusion when one station enabled **NA VHF Contest** mode and the QSO partner did not. Grid locators might then be displayed as that of the antipode location on Earth and signal reports might be received when not expected, confusing the auto-sequencing logic. Other problems existed for those using /R (rover) callsigns. None of these problems is present in *WSJT-X 2.0*. When a casual operator happens upon a station transmitting messages in **NA VHF Contest** format, the QSO will proceed without complication: all messages will be decoded and sequenced correctly with no special user action. You will no longer see odd grid locators from the antipodes, and you may append the /R suffix to any standard callsign.

When a casual operator receives a message addressed to him/herself in the special **EU VHF Contest** format, *WSJT-X 2.0* recognizes the need to enable these messages and makes the necessary change automatically. Casual operators who decode a contest-type message formatted for **ARRL Field Day** or **ARRL RTTY Roundup** will be prompted to check the relevant box so that they can transmit the required exchanges.

Other program enhancements: *WSJT-X 2.0* has several other new features and capabilities. The WSPR decoder has better sensitivity by about 1 dB. Color highlighting of decoded messages provides worked-before status for callsigns, grid locators, and DXCC entities on a “by band” basis. Color highlighting can also identify stations that have uploaded their logs to Logbook of the World (LoTW) within the past year. The necessary information from LoTW is automatically downloaded from the ARRL web site.

Release schedule: Staged transition to the new FT8 and MSK144 protocols makes it particularly important for users to be aware of our target schedule for releases. Note that each release candidate will have a built-in expiration date, after which it will no longer function.

- September 17: -rc1 (expires October 31)
- September 25: -rc2 (expires October 31)

- October 15: -rc3 (expires November 30)
- November 12: -rc# (expires December 31)
- December 10: GA (full release of *WSJT-X 2.0*)

Additional bug-fix releases might occur between these stated intervals. The candidate targeted for release on November 12 will therefore bear the tag RC4, or possibly a higher number.

Instructions for Beta-testers: If you are an experienced user of *WSJT-X* v1.9.1 and choose to download a release candidate for *WSJT-X 2.0*, please help us by reporting relevant experiences to the WSJT Developers email list, wsjt-devel@lists.sourceforge.net. You must be a subscriber to post messages there; to register go to <https://sourceforge.net/projects/wsjt/lists/wsjt-devel>. With release candidates up to and including RC3, FT8 QSOs with users of *WSJT-X* v1.9.1 or earlier (as well as the derivative programs *JTDX* and *MSHV*) can be made in the usual way, in the conventional FT8 sub-bands. Tests of the new FT8 features should be on 40 or 20 meters, dial frequencies 7.078 or 14.078 MHz, or somewhere else by specific arrangement. For such tests you will probably want to check the boxes **Always generate 77-bit messages** and **Decode only 77-bit messages** on the **Settings | Advanced** tab.

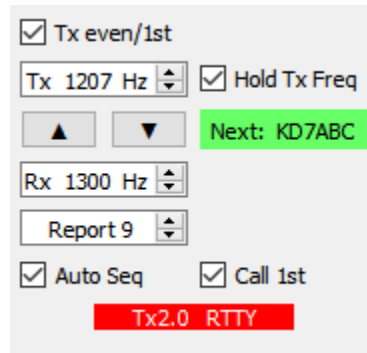
Users with particular interest in one or more of the contest-like activities should check the appropriate box under **Special operating activity** and arrange with others to try it out. We will help to schedule and publicize “mock contests” in one or more of these formats, if there is sufficient interest.

If you find program bugs or unexpected behavior, or have specific suggestions for program improvement, please report them to the wsjt-devel email list. Remember that the most useful bug reports include a concise description of the problem, an exact sequence of steps that will reproduce the problem, and any relevant *.wav files or screen shots. We recommend checking **Save all** when using a release candidate. (You can easily delete any unwanted *.wav files later, if no problems are found.)

Release candidate RC3: A number of new or recently completed features appear in release candidate 3. Some are readily visible during normal operation, others are active behind the scenes. Most (but not all) of the new features help to support contesting activities. Among the more important changes since RC2:

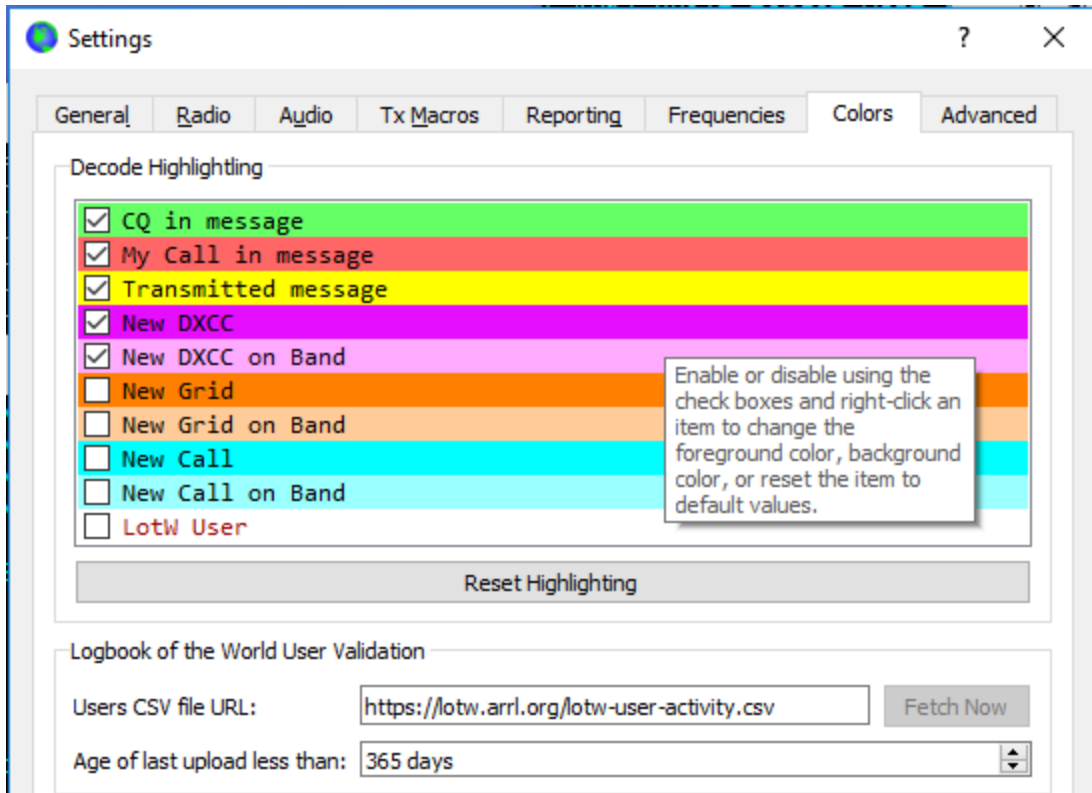
- Messages are now correctly auto-generated for callsigns that include /R or /P.
- Auto-sequencing works correctly with CQ messages with a 2, 3, or 4-letter modifier, for example “CQ TEST K1ABC FN42”.
- Field Day and RTTY Roundup exchanges are checked for validity when they are entered on the **Settings | Advanced** tab. If your entry for an activated contest is colored red, it is invalid.
- During a RTTY contest QSO you can double-click on a second caller. The second callsign is automatically queued up to be worked next, using the “TU; ...”

message format described earlier. The queued callsign will be displayed below the Hold Tx Freq control and highlighted in green, as shown here:



- An **Auto Log** option is available as an alternative to **Prompt me to log QSO**. When **Auto Log** is checked, a QSO will be logged when complete, without user interaction.
- Select **Fox or contest log** on the **View** menu to display the contest log as it accumulates, in real time.
- A priori (AP) decoding is now available for contest messages and for Hound in **FT8 DXpedition Mode**.
- **FT8 DXpedition mode** now uses the 77-bit message protocol. Note that this will not be backward compatible with those using 1.9.1 or earlier software.
- Contest exchanges are sent to the ADIF log and also to the N1MM+ logger, if that is connected and properly configured.
- A new function **Export Cabrillo log** is available on the **File** menu.
- **Ctrl+Shift+F12** moves dial frequency up 2 kHz, **Ctrl+Shift+F11** down 2 kHz.
- MSK144 encoding and decoding of shorthand (“Sh”) messages and messages using nonstandard callsigns is now fully implemented, to the extent possible.
- The status file for Logbook of The World (LoTW) is downloaded from the ARRL web site automatically, as needed.
- A better algorithm is now used to calculate S/N in FT8 mode.
- Program startup is much faster.
- A number of relatively minor bugs have been fixed.

Color highlighting of decoded transmissions according to new call, new grid, and new DXCC can be activated on an overall or band-by band basis. The user interface is on the **Settings | Colors** tab. Right-click on any item to set its foreground or background colors. Plans call for the next revision after RC3 to let you set relative priorities by dragging an item up or down in the list.



RTTY contest mode operating: The following screen shot shows a sequence of three QSOs using the RTTY Roundup messages. K1JT calls CQ and is called simultaneously by W9XYZ, KD7ABC, and G4AAA. The three stations are worked in series, using just one 15-second transmission per QSO.

		Rx Frequency			
UTC	dB	DT	Freq	Message	
152400	Tx		1207 ~	CQ RU K1JT FN20	
152415	9	0.2	1300 ~	K1JT W9XYZ 589 WI	
152415	17	0.1	1800 ~	K1JT KD7ABC 589 WA	
152415	9	0.1	2300 ~	K1JT G4AAA 589 0001	
152430	Tx		1207 ~	W9XYZ K1JT R 579 NJ	
152445	8	0.1	1300 ~	K1JT W9XYZ RR73	
152445	17	0.1	1800 ~	K1JT KD7ABC 589 WA	
152445	9	0.2	2300 ~	K1JT G4AAA 589 0001	
152500	Tx		1207 ~	TU; KD7ABC K1JT R 589 NJ	
152515	18	0.2	1800 ~	K1JT KD7ABC RR73	
152515	9	0.2	2300 ~	K1JT G4AAA 589 0001	
152530	Tx		1207 ~	TU; G4AAA K1JT R 579 NJ	
152545	15	0.2	2300 ~	K1JT G4AAA RR73	
152600	Tx		1207 ~	G4AAA K1JT 73	

Nonstandard callsigns and mode restrictions: In general, the special message formats that support nonstandard calls cannot be combined with the special formats for contest exchanges or the MSK144 shorthand messages. Exceptions to this rule are the

/R (rover) indicator for **NA VHF Contest** and /P (portable) indicator for **EU VHF Contest**; these are always acceptable in those events. MSK144 cannot be used with the **ARRL Field Day** or **ARRL RTTY Roundup** message formats.

Future releases: As described earlier, RC3 will be the last release candidate to support transmitting or receiving the old FT8 protocol. All subsequent releases will support only 77-bit protocols for both FT8 and MSK144.

Status, recommended testing, and reporting: Many of the new features and capabilities of *WSJT-X 2.0* have been exercised extensively in candidate releases RC1 and RC2. Nearly all bugs identified in those tests have been fixed, and a number of previously missing or incomplete features have been implemented. With RC3 we recommend thorough testing of MSK144 and further tests of the **NA VHF Contest**, **EU VHF Contest**, **ARRL Field Day**, and **ARRL RTTY Roundup** message formats. Please help us test these features! In addition to identifying remaining bugs, we are particularly interested in feedback that might help us to improve the *WSJT-X 2.0* user experience in contest-like situations.

If you find program bugs or unexpected behavior, or have specific suggestions for program improvement, please document them carefully and report to the wsjt-devel email list. You must be subscribed to that list in order to post there. Remember that the most useful bug reports include a concise description of the problem, an exact sequence of steps that will reproduce the problem, and any relevant screen shots, *.wav files, etc., that could help us to reproduce and diagnose the problem.

Known limitations

1. For correct transfer of contest exchange information from *WSJT-X 2.0* to the N1MM+ logger, be sure to upgrade your N1MM+ to a version released on October 16, 2018 or later.
2. The program currently has no concept of contest dupes or multipliers, so it does not compute or display a contest score. If you are sending contest QSO information to N1MM+, that program will provide these features.