

FT8 in the ARRL RTTY Roundup

The popular digital mode makes its HF contest debut January 5 – 6. Follow these instructions and give it a try!

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The annual ARRL RTTY Roundup (www.arrl.org/rtty-roundup) has always been a multimode contest; its rules permit digital modes, such as ASCII, AMTOR, PSK31, and packet, in addition to Baudot RTTY. However, only RTTY has been widely used until now. In the Roundup, to be held on January 5 – 6, 2019, users of the free software package *WSJT-X 2.0* have been encouraged to try contesting with FT8. This article is a brief tutorial on how to do that, using new features built into *WSJT-X 2.0*.

Initial caveat: The ARRL RTTY Roundup is 30 years old and has a wide and enthusiastic following. FT8 users might therefore consider themselves guests of a sort, in this event. Inevitably, there will be some cross-mode interference as the available subbands are not very wide. All participants, using whatever mode, should try to accommodate one another. The RTTY Roundup may help to determine whether an HF contest with significant participation in more than one digital mode is a good idea.

Differences Between FT8 and RTTY Signals

Standard amateur radioteletype signals with Baudot encoding, keying rates of 45.45 baud, and 170 Hz shifts occupy bandwidths of about 250 Hz. Information is transmitted on a character-by-character basis at about 5.7 characters per second and start times and durations of transmis-

sions are determined by the operators. Decoding with low error rates requires signal-to-noise ratios greater than about –5 dB, measured in a reference bandwidth of 2,500 Hz.

In sharp contrast, FT8 transmissions have fixed 12.6-second lengths, always start at 0, 15, 30, or 45 seconds into a UTC minute, occupy 50 Hz bandwidths, and are reliably decodable with signal-to-noise ratios as low as –20 dB. The FT8 protocol includes strong forward error correction, so decoding is an all-or-nothing process. At the receiving end, you see exactly the message transmitted, or nothing at all. After a message is decoded, the software reconstructs its audio waveform, scales it to the received signal strength, and subtracts it from the received audio data. In this way, signals can be “peeled away,” so that several may be decoded at the same (or nearly the

same) frequency. FT8 is optimized for the exchange of call signs, signal reports, and a few additional bits of information, so it is potentially very well suited to contesting. In *WSJT-X 2.0* the FT8 protocol has been enhanced to support exchanges for the RTTY Roundup and several other popular contests.

Setup and Operation

The following instructions assume familiarity with everyday FT8 operating procedures; you should consider such experience a prerequisite for using FT8 in the RTTY Roundup. A full *WSJT-X 2.0* User Guide may not be available at the time you are reading this, but most program features are thoroughly covered in the guide for version 1.9.1, which you will find at www.physics.princeton.edu/pulsar/K1JT/wsjt-x-doc/wsjt-x-main-1.9.1.html. Details about the

Table 1
Common RTTY Contest Frequencies and Suggested FT8 Contest Frequencies

Set the *WSJT-X* dial frequency to a multiple of 2 kHz, for example 7.082 MHz. The RTTY contest frequencies shown for 80 and 40 meters also reflect band plans for operations outside the Western Hemisphere.

Band (Meters)	RTTY Contest Frequencies (MHz)	Suggested FT8 Frequencies (MHz)
80	3.570 – 3.600	3.590 – 3.600
40	7.025 – 7.100	7.080 – 7.100
20	14.080 – 14.150	14.130 – 14.150
15	21.0805 – 21.150	21.130 – 21.150
10	28.0805 – 28.200	28.160 – 28.200

program's contesting features are described in the *Quick Start Guide to WSJT-X 2.0* at https://physics.princeton.edu/pulsar/k1jt/Quick_Start_WSJT-X_2.0.pdf. Be sure to read the latter document thoroughly.

FT8 and other *WSJT-X* modes require a reliable means of keeping your computer's clock synchronized with UTC. Follow instructions for your operating system found in the *WSJT-X User Guide*. Computer aided transceiver (CAT) control of your radio is highly recommended, and this is fully supported by *WSJT-X*.

Starting with a normal FT8 setup, configure the program for the RTTY Roundup by navigating to **FILE > SETTINGS > ADVANCED**. Check the box labeled **SPECIAL OPERATING ACTIVITY**, select **ARRL RTTY ROUNDUP**, and enter the two- or three-letter abbreviation for your state or province, or DX if you are located outside the United States and Canada. You may want to select the **COLORS** tab and check only the color-highlighting boxes for **CQ IN MESSAGE**, **MY CALL-IN MESSAGE**, **TRANSMITTED MESSAGE**, **NEW CALL**, and **NEW CALL ON BAND**. Click **OK** to return to the main window, and be sure the box **AUTO SEQ** is checked.

To keep track of stations already worked in the contest, it's best to start the contest with an empty *wsjtx_log.adi* file. Select **FILE > OPEN LOG DIRECTORY**, then right-click on the file *wsjtx_log.adi* and rename it to something else, for example *wsjtx_log.bak*. After the contest, be sure to reverse this procedure to restore your normal ADIF log. Before the contest starts, execute the command **FILE > ERASE CABRILLO.LOG**.

FT8 contacts in the RTTY Roundup will typically proceed as in the following example, where KF1ABC is the "Run" station calling CQ. The numbered items represent successive transmission intervals.

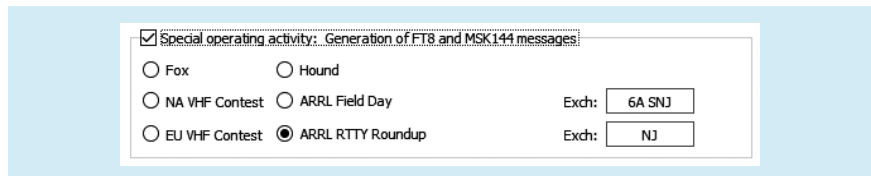


Figure 1 — Be sure to select the RTTY Roundup and enter your exchange information.

- 1) CQ RU KF1ABC FN42
- 2) KF1ABC WA9XYZ 579 WI
- 3) WA9XYZ KF1ABC R 589 MA
- 4) KF1ABC WA9XYZ RR73
KF1ABC GM1AAA 559 0013
- 5) WA9XYZ KF1ABC 73
- 6) KF1ABC GM1AAA 559 0013
- 7) GM1AAA KA1ABC R 569 MA
- 8) KF1ABC GM1AAA RR73
- 9) GM1AAA KA1ABC 73

Note that GM1AAA has called as a tailender in intervals 4 and 6. KF1ABC works WA9XYZ and GM1AAA in quick succession, using just two transmissions to each caller. In this fashion, and with a continuous string of callers, a practiced operator can make QSOs at maximum rate 60 per hour.

Frequencies to Use

Many FT8 exchanges can fit in a single 2 to 3 kHz window, but during a popular contest, it will be necessary to spread out. The first two columns of Table 1 list conventional frequency ranges used on each HF band for RTTY contesting, taken from the website www.aa5au.com/rtty/rtty-sub-bands/. The third column suggests ranges near the upper ends of these subbands where FT8 contest activity might best be concentrated.

Operating procedures for FT8 in contests will surely evolve over time, as users gain experience. Initially, the *WSJT-X* development team proposes that run stations should select integral multiples of 200 Hz as their audio transmit frequencies and check the **TX EVEN/1ST** box. Search-and-pounce (S+P) stations should call at frequencies 0, 60, or 120 Hz above the run frequency. The

WSJT-X user interface has tools to make these settings easy. Tap your F3 or F5 keyboard keys to see concise lists of relevant keyboard and mouse shortcuts.

Experienced contesters may choose to configure *WSJT-X* so that it forwards contact information to the *N1MM+* contest logging program. Setup instructions for the *N1MM+* side can be found at n1mm.hamdocs.com/tiki-index.php?page=UDP+Broadcasts, and for the *WSJT-X* side, it can be found in Section 4.5 of the *WSJT-X User Guide*. For log submission, you can use the Cabrillo log produced by *N1MM+*, which will include proper computation of your claimed score. Alternatively, you can invoke the *WSJT-X* command **FILE > EXPORT CABRILLO LOG** to create a valid log for submission. Note, however, that at present, *WSJT-X* has no concept of contest multipliers, does not account for dupes, and does not compute a claimed score. We plan to add these features in a later program release.

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