

VHF+ Contesting and the Digital Modes

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This article explains why and how to configure your *WSJT* digital mode software for successful and effective VHF+ contesting. The intent is to be informative and educational. I hope that it is a little of both. If as VHF+ ops, we all “get on the same page,” everyone will make more contacts and have more fun. *Good Luck and 73 — Marshall K5QE*

As in any contest, the idea is to make a good score according to the rules. ARRL VHF+ contests on the VHF, UHF, and microwave bands are scored by multiplying the total QSO points by the sum of the number of unique grid squares worked per band. The most successful strategy is to assess conditions to use the bands and modes that give you the best score overall.

For a valid contact to occur, each station must send and receive both call signs, a report in a mutually agreed format, and an acknowledgement (roger). VHF+ contests exchange *grid square* (“Grid”) instead of a numeric signal report. The only exceptions are EME contests in which the signal reports ‘OOO’ (capital O) or ‘RO’ are exchanged.

The WSJT Suite

The *WSJT* (Weak Signal Joe Taylor) suite is a package of software designed for working very weak signals using digital signal processing. The signals are generated and decoded by computers and sound cards. Dr. Joe Taylor, K1JT, is a Professor of Physics (retired) at Princeton. Joe has been a serious VHF operator for many years. His suite of programs has revolutionized weak-signal VHF+ operating and the importance of Joe’s work cannot be overstated. It is a tour de force.

WSJT-X includes software that implements several different types of communication, but the two most important to VHF+ contesting are intended for meteor scatter and EME. (The User’s Manual is available for downloading at [physics.princeton.edu/pulsar/k1jt/wsjt-doc/wsjt-main-1.7.1-devel.html](http://physics.princeton.edu/pulsar/k1jt/wsjt/doc/wsjt-main-1.7.1-devel.html).)

The first meteor scatter mode, FSK441, was optimized for very short “bursty” signals, which is typical of a signal reflected from an ionized meteor trail. FSK441, now obsolete, revolutionized meteor scatter operations and has been replaced by MSK144 which is the current standard. For EME, JT65 had a similar and dramatic effect, enabling many modest stations to communicate “off the Moon.”

This article discusses specifics of using these modes during VHF+ contests. Why is this software so important to VHF+ contesting? Because with this software and these modes, you can work stations that you could not ordinarily work using CW or SSB. This boosts your grid count and your score.

WSJT Background

The HF community discovered JT65 and began using it on the various HF bands because you could make contacts that otherwise were not possible on traditional modes due to noise and low signal levels. JT65 QSOs on the HF bands have always used numerical signal reports like “-12” or “R-06,” rather than the terse “OOO” or “RO” often used in EME contacts. Like its predecessors, the currently

supported software package *WSJT-X* supports both styles of signal reports. It also offers the relatively new modes MSK144, for meteor scatter, and FT8, described further below. (While signal reports are not required for a VHF+ contest exchange which consists of grid squares, the reports convey useful information and come "for free" as an integral part of the structured message sequences of all *WSJT(-X)* modes.)

I know that those who came to VHF+ *WSJT* modes with HF customs are more familiar with numeric signal reports when using FT8 and JT65. However, in a VHF+ contest, *WSJT-X* Auto-Sequencing will fail to exchange the required information for a complete QSO if one station is configured to use Contest Mode and the other is not. Be sure to configure your software properly as described below.

When to Use and *NOT* Use WSJT Modes

Remember that the *WJST* suite is intended for low signal-strength work. Some of the very best VHF+ contest operators have commented they are seeing two stations work on FT8 with S9+ signals on both sides. If signals are loud, you should be using SSB or CW rather than FT8. Why? Because you can easily work a loud SSB station in less than 10 seconds. It takes a full minute to work someone on FT8, even if everything is perfect. Why waste a minute when 10 seconds will do? I realize that new FT8 operators are not yet experienced with making QSOs during VHF+ contests. Give SSB and CW a try and you may find you can make contacts quite easily and quickly. As we all get more experience with the new digital modes a balance between SSB, CW, FT8, MSK144, and JT65 will be reached. The important thing is to get on the air and learn how to use as many of these modes as you can – they are just tools and appropriate in different circumstances.

Using MSK144, FT8, and JT65

The current revision of *WSJT-X* is Version 1.8.0-rc2 (as of 21 Sep 2017). Among its modes, the most important for VHF+ contesting are MSK144, FT8, and JT65. Each mode requires careful setup:

JT65: 2M EME operation occurs from 144.100MHz to 144.150MHz. If you have a 2M EME setup, you can work a lot of stations that you could not work any other way on 2M. It does not take a huge station: One long Yagi or two medium-length Yagis and high power will do the job.

JT65 comes in three flavors; JT65A for 6M; JT65B for 2M, 222, and 432; and JT65C useful for bands above 432MHz. A typical JT65 VHF+ QSO consists of messages exchanged like this:

Message 1—K5QE W8XYZ EM89
Message 2—W8XYZ K5QE EM31 OOO
Message 3—RO
Message 4—RRR
Message 5—73

Note the use of grids in messages 1 and 2 — required for JT65 contacts to count in VHF+ contests.

Interestingly, almost every JT65 EME QSO will be with a new grid. You can work 60+ contacts in Europe and almost never dupe a grid. The NØUK EME-1 reflector is where the EME stations mostly hang out (www.chris.org/cgi-bin/jt65emeA). The EME-1 page is a "sister page" to the PingJockey page used by meteor scatter ops (see next paragraph). There are other reflectors in Europe that are popular with some ops.

MSK144: MSK is used for digital meteor scatter (MS). Distances typically are from 500 miles out to 1200 miles. The technical details of MSK144 are described in the Sep/Oct 2017 *QEX* article by K9AN and K1JT: www.arri.org/files/file/QEX_Next_Issue/SeptOct2017/FrankeTaylor.

The “North American calling frequency” for MSK is 50.260MHz on 6M. During non-contest periods, you can go there and call CQ. You will often make a random contact that way. The PingJockey reflector (www.pingjockey.net/cgi-bin/pingtalk) is where meteor scatter ops hang out. You can chat with other MS ops, make schedules, and then run them. Many run their scheduled contacts right on 50.260MHz, but others move off the calling frequency just to avoid QRM. During contest times, if everyone tries to run their scheduled contacts on 50.260MHz bedlam is almost guaranteed, so moving off .260 is wise.

A “calling frequency” for 2M is not yet firmly established. Some are using the old meteor scatter frequency of 144.140MHz, while others are using 144.150MHz. Of those two, I tend to support 144.150MHz as frequencies below that are in the middle of the EME band on 2M. I don't believe that there are any agreements for the other bands, but this is not a problem....just use the PingJockey reflector and make a schedule with the other station. You can put a LOT of grids in the log using MSK144 meteor scatter. You would be wise to practice using this mode.

SHAMELESS PLUG: MSK144 has made meteor scatter on 222 relatively easy. Many will tell you that “you can't do MS on 222”, but they are wrong. We (K5QE) worked every station that ran 222 in the last contest. If everyone would make an effort on 222, there would be a lot more points in the logs.

FT8: FT8 was designed for weak and multi-hop E-skip and is also useful for tropo propagation. Depending on the strength of the tropo path, distances out to 600+ miles are possible and if you are very lucky, more. The calling frequency for FT8 on 6M is 50.313MHz. Right now, everyone seems to want to run all FT8 contacts on 50.313MHz. During a contest, this is obviously going to be a mess. Some mechanism is going to have to be worked out so that contesters can “spread out”.

Setting up WSJT-X

Here is how to set up *WSJT-X* to get messages that work well for VHF+ contesting. (These instructions assume version 1.8.0 RC2.)

MSK144: Getting the setup right is very important with this software.

- On the main page, click the “TX even/first” box if you are intending to transmit on the first sequence, then click “Auto Seq”.
- By agreement, ShortHand messages are *not* used on 6M but *are* used on the other bands, so set “SH” appropriately for the band you are going to use.
- Click on File/Settings and fill in your call and grid square.
- Click the “Enable VHF/UHF/microwave features” box.
- Click on the Radio tab and chose your PTT method and COM port.
- Click on the Advanced tab and click the “FT8 and MSK144 Contest Mode” box.
- Click OK to return to the main page. Messages should now be correct for VHF+ contesting, including grid squares.

It is important that both stations use “Contest Mode”. If one station is sending numeric signal reports (what I call the “funny little numbers”) and the other is in Contest Mode, the message decodes won't work right, even if both stations are using *WSJT-X*. If both stations are not in Contest Mode, the Auto-Sequencing process will fail to complete the contact.

A final issue is the “F Tol” parameter (frequency tolerance). Ideally, it should be set for 200 Hz, however this requires a LOT of computing horsepower. If you set it smaller, say 50 Hz, and the station on the other end is off by 60 Hz, you will never get a successful decode. You will have to experiment to see how wide you can set this parameter and still have acceptable computer performance.

FT8: click “Auto Seq” on the main page and use the same settings as above. Select “Enable VHF/UHF/microwave features”, select the correct PTT method and port on the Radio tab, and select the “FT8 and MSK144 Contest Mode” box on the Advanced tab. Click OK. Messages should now be correct for VHF+ contesting, including grid squares

JT65: You can use JT65 for long-haul tropo contacts but it is most useful for EME. On the front page of *WSJT-X*, provided that the “Enable VHF/UHF/microwave features” is checked, you will see a new box that says “Submode A” with up/down arrows. If you wanted JT65A for 6M, leave this menu set to Submode A. If you wanted JT65B for 2M, you would change to Submode B. (Note that if the other station is using JT65B and you are using JT65A (Submode A), decodes will fail.) Click the “SH” box and you will see the correct messages, including grids.