Tips for FT8 DXers

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1. The digital modes are being actively developed and the protocols/operating conventions are still evolving. Use the latest available software: currently for FT8 that means the RC2 beta release or later development versions of WSJT-X.

2. With the program running, press F1 and **read the help file/manual.** It's quite well written, if I say so myself. You'll discover, for instance, that the weirdly confusing combinations of shift/alt/control keys and clicks are handily explained on the screen by pressing F5 to "Display special mouse commands" (commands for *special* mice):

Click on	Action
Waterfall:	**Click** to set the Rx frequency. **Shift-click** to set Tx frequency. **Ctrl-click** to set Rx and Tx frequencies. **Double-click** to decode at resulting Rx frequency. If **Lock Tx=Rx** is checked all actions set Tx/Rx.
Decoded text:	**Double-click** to copy second callsign to Dx Call, locator to Dx Grid; change Rx and Tx frequencies to decoded signal's frequency; generate standard messages. If first callsign is your own, Tx frequency is not changed unless **Ctrl** is held down when double-clicking. **Alt-Double-click** to move only Rx frequency when replying to a CQ or QRZ caller.
Erase button:	**Click** to erase QSO window. **Double-click** to erase QSO and Band Activity windows.

3. By far the most useful weirdness is to **shift-click** on the waterfall to put your TX signal there (think of it as 'shift my TX'). See tip 5 and others. If nothing else, remember to **shift-click** .

4. **Unselect** the "Lock Tx=Rx" function and don't *ever* click it again. Never, not ever, never. Even the software developers acknowledge it was a mistake to include it. With it selected, your TX frequency gets pulled to wherever the RX frequency goes so, for instance, if you are CQing on 666 Hz when someone calls you at 660 Hz, as you respond to them, your TX will move down to 660 ... and so on with each caller pulling you around. If someone calls you split on 800 Hz, you will be dragged to 800 if you respond to them. See tip 5.

5. Select *Auto Seq* most of the time. It works pretty well in RC2 and cuts down on newbie operating errors (*e.g.* not selecting the next message, not the correct one anyway). You can always override the auto-selected message by quickly clicking the Tx message button for your choice of message during the first couple of seconds of your transmission (the synchronization period): this may be needed if you are contacting someone still using RC1, or a newbie, or to recover from a sequence error. Alternatively, there's still the manual option.

"The auto sequencer is doing the equivalent of double-clicking each response from your QSO partner ... A QSO will be "correctly" sequenced by double-clicking each of your QSO partner's responses as they arrive. This is how you would normally use the application in modes without auto-sequencing like JT9 and JT65 although, of course, you can click through the next message manually as well, automation is an aid not a necessity." [Bill G4WJS]

6. When the band is humming and the DX is busy, **spread out!** As in any pileup, if several people call on the same frequency, there's a fair chance they will QRM each other and few if any of them will be decoded. Unlike more conventional modes, *split operation is preferred on FT8*: don't zero-beat to call someone on their frequency but **shift-click** to put your transmitted signal (the red goalpost above the waterfall) elsewhere on the waterfall, somewhere quiet (see tip 9). To respond to a CQ call, **ALT-double-click** the decode line, leaving your TX frequency unchanged. Any decode, anywhere within the subband, containing the DX call will be highlighted on his screen so there's no need to zero-beat with the DX.
As Hasan N0AN put it: **"Don't call me on my tx freq, as it is full of callers."**

7. Set up your transceiver, sound system and software, preferably off-air into a dummy load using a scope to check your signal, otherwise work it out on-air (on a quiet frequency) with a competent helper giving you honest feedback as you adjust the settings. Although FT8 is a constant level FSK mode (unlike PSK, CQ and SSB), it is still important to **avoid overdriving your rig** . Set things up so the entire chain (from sound generation to transmission) is**operating linearly** . This is more complicated than it sounds: it varies between rigs and setups . On my K3, 4 or 5 blobs on the ALC meter is correct. On rigs that use ALC to reduce output (Icoms?), ALC indication is normal at QRP levels. On some rigs, the ALC meter is, in effect, a distortion meter! Sorry I can't be more specific here.

8. If you are injecting transmit audio into the microphone input on the rig, be sure to turn off your speech processor and any audio shaping/profiling when using digimodes. It is probably distorting your signal. Radios with a line-level input especially for digimodes, or a special 'data' mode that automatically disables the processing (such as the K3), tend not to have this issue ... but still it helps to keep your audio within the normal frequency range of SSB speech as both low and high frequencies tend to be attenuated, often nonlinearly (at least with analog rigs). *[Thanks for the tip Joe W4TV]*

9. Similar considerations apply to received audio: generally it's best to turn off the rig's noise blanker, narrow filtering and fancy DSP - let the sound card and computer software do its thing, extracting signals from noises ... but under some circumstances you may like to experiment with different settings (*e.g.* IF shift, high- or low-cut or your notch filter may reduce overloading from strong signals such as W1AW news broadcasts or over-the-horizon radar).

10. Check your computer's clock. **Timing is important for FT8:** if your PC clock is a second or more wrong, you will have transmission and reception problems (*i.e.* signals won't decode reliably, if at all). Provided you have Internet access, the free Meinberg NTP softwaremaintains millisecond accuracy by synchronising to atomic clocks on the Internet. Install, configure, check, forget. It's that easy. Some prefer Dimension 4 or TimeSynchTool, or GPS receivers and caesium or rubidium references, even WWV or the other radio clocks. The crude time synchroniser built-in to Windows is poor, a last resort. If you see plenty of FT8 signals on the waterfall but few
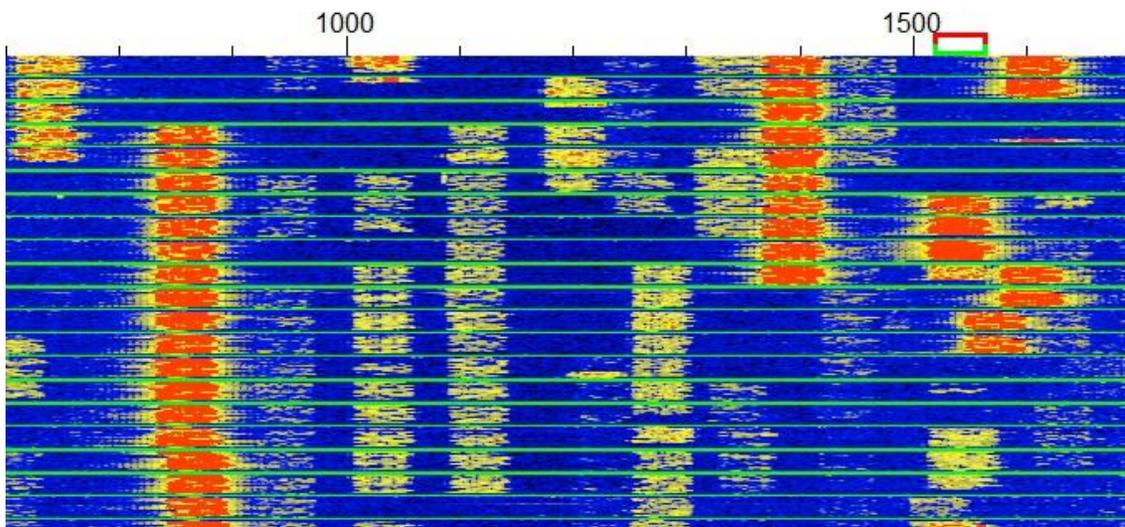
decodes, or a distinct bias in the DT values on the decode screen (*e.g.* mostly negative values), those are strong clues that your clock may be wrong. A quick and easy way to check is to visit the Time.is website: if your PC clock is correct, you should see something like this at the top left of the page:

Your time is exact!

The difference from Time.is was -0.001 seconds (±0.014 seconds).

11. Keep your transmit power down. Generally, if a path is open, just a few watts will do. Put your amplifier on standby. Turn down the wick to QRP levels. Try it! If you don't get any responses at all, try 10 watts, maybe 20. Aside from QRO being antisocial and usually unnecessary, if your signal is too strong, it will overload receivers and audio cards at the DX end, preventing your signal from decoding. Take your cue from the received signal reports: **if you are getting positive reports, you can probably do just as well (maybe even better) with a fraction of the power.** The sweet spot is when you are receiving mostly negative or zero reports.

12. Especially when the band is busy, monitor for a couple of minutes before selecting your transmit frequency. Look for a continuous blank column on the waterfall, and **shift-click** to move the red goalpost there. If there are very strong signals from your neighbours, give them a little space and aim to transmit on the same time slots as them so you are all receiving at the same time, causing less mutual QRM. Here's part of the waterfall around 18100kHz one lazy Sunday lunchtime, beaming at NA:

Not bad for low power DX on a seemingly deserted band! If I was planning to transmit, I'd probably

choose 1140, 1490 or 1650 Hz, or hold back in the hope of seeing other free columns open up. Another possibility is 760, but notice the strong signal at 830 with distinct sidebands due to overload in his transmitter and/or my receiver - hard to know which. The sidebands might mask any weak callers who zero beat with me, unless I transmit at the same time as him.

13. **NEW** If you CQ, try to use the same time slots as any neighbours with strong signals to minimize mutual interference (transmit when they transmit, receive when they receive). If there are no strong signals on your waterfall, a simple way to choose slots slots is by the **first character of your callsign** : if it is an **even** number (2, 4, 6 or 8), or an **even-numbered** letter of the English alphabet (e.g. B, D, F, H ... Z), tick the box to transmit on the **even** slots. Otherwise, if you are odd, leave it unticked.

14. Be kind to other digi-users. Try to keep within the FT8 sub-band: the weak signal DXers using Olivia, JT65 and other digimodes, mostly above 2000 Hz or so on the waterfall, will not appreciate you stomping all over them. You may not even see them on the waterfall: that's why it's called *weak-signal* DXing!

15. With *Auto Seq* selected, to respond to someone's CQ, **ALT-double-click** their CQ call on the Band Activity pane. Provided they are using the standard CQ message, that does the following:

    o   Puts their callsign into the DX callsign box and their grid in DX Grid

    o   Calculates the azimuth (short path beam heading) and distance to them

    o   Generates the standard messages using their callsign

    o   Puts your Rx frequency (the dead green goalposts) on them ... but ...

    o   **Leaves your TX frequency (the red goalpost) unmoved** (handy that! If you forget the ALT, double-clicking will zero-beat you with the other station, not a good idea if others are calling him at the same time)

    o   Enables TX and starts calling them in the correct time slot, when they are listening

    o   Continues calling them even if they respond to and start working someone else (not ideal but at least you won't be QRMing them since you chose a clear TX frequency, remember? See next tip ...)

16. Keep an eye on what's going on, especially when you are new to the game. It's tempting to set the *Auto Seq* and *Call 1st* options, then start CQing or calling someone and wander off ... but the sequencing function is not exactly clever and is easily confused by custom messages, or by messages received sequence out of. See also the last point in the previous tip. As with all DXing, the key is to listen more than you transmit. Two ears, one mouth, remember.

17. If you are CQing, making a run of QSOs or calling and working several people, take a break every so often to check that your TX frequency and slot remains clear. The easy way is *not* to re-Enable TX immediately after you log a completed QSO - skip a slot. Another option is to wait for the watchdog timer to kick in (try reducing it from the default to just 3 or 4 minutes under *F2 Settings - General*). By taking a break, you may see other stations transmitting on 'your'

frequency and time slot, or encroaching on it ... so **shift-click** yourself somewhere else on the waterfall. If you don't take a break, you might think 'your' TX frequency is clear whereas someone else is sharing 'your' slot.

18. Don't worry too much about your receive frequency: you can safely ignore the dead green goalpost above the waterfall, leaving WSJT-X to move it around for you. The software is decoding the entire waterfall, all at once, right? Well, yes and no: it focuses on the current receive frequency, decoding first and more deeply there. So you might want to set the receive frequency manually if you are monitoring some juicy DX, waiting for him to complete QSOs so you know when to call. On a busy band, the band activity screen scrolls too fast to 'read the mail', whereas the Rx Frequency pane scrolls at a far more sedate pace. Very weak traces may be decoded better if you click them on the waterfall to move the green bar there.

19. Stop calling the DX if he is calling or working someone else. Be nice: wait your turn! If you are too impatient and don't care about being thought rude, at the very least **shift-click** your TX to a different frequency (go back and read tip 5 again). It's more polite to wait until someone sends 73, or the DX starts CQing, before calling. [RC2 automatically stops calling someone if they respond to someone else, but you should be keeping an eye on things anyway - see tip 12.]

20. In a DX pileup, a shortened *Auto Seq* helps maximise the QSO rate. To set things up for this, double-click message Tx1 to skip it (it will be greyed out). Now when you call someone, you will send Tx2 instead *i.e.* both callsigns plus their report, rather than both calls plus your grid. Next, double click Tx4 to change from the conventional RRR message to R73, short for 'Got it , thanks, let's end the QSO right here: there is no need for us to swap 73's as well. Good luck with the rest of the pile, CUL, please QSL ...'.

21. The stock DX advice to LISTEN, *LISTEN*, **LISTEN** applies equally to FT8 and other digimodes, well almost: I normally have the receiver audio turned right down, headphones off. So the advice becomes WATCH, *WATCH,* **WATCH.**   Learn to interpret the waterfall and decodes to figure out what's happening. Are the DX stations CQing, searching-and-pouncing, or just quietly monitoring the band (in which case they may appear on [PSKreporter](#), and if you call them speculatively they may just respond!).

22. Call patiently. If 'some idiot' is QRMing you, you may struggle to make or complete a QSO until the idiot stops. After 2 or 3 failed calls, try **shift-clicking** your TX to a different clear frequency and continue calling. If that still doesn't work, maybe your signal is just a little too weak, so try again later. That's DXing.

23. Use your [favorite screen capture tool](#) to record your QSOs, especially those with rare DX. Aside from the ADIF log and ALL.TXT file containing all your decodes and transmissions, screen -grabs taken at the time are good evidence that you did or did not complete a QSO with someone *[thanks [David WA9ONY](#) for the tip].*

24. If a stalker is hounding you for a QSO, constantly calling you (regardless of what you send) but never sending you a report, or repeatedly sending the same message over and over and over like a stuck record, here are a few things you can do:

o Be patient. Most of us struggle to master the weirdness of the WSJT-X interface, so the caller may have foolishly or accidentally unselected *Auto Seq* and neglected to select the next message manually. Hopefully he will eventually notice the error of his ways and do something. Perhaps he is distracted by reading the help file. Well, we live in hope.

o Double-check that *your* computer clock is set accurately, especially if this is a frequent occurrence. Is your NTP software running? Using Meinberg, under the Windows Start menu, select Meinberg then Network Time Protocol, then click the "Quick NTP status" to display a simple text window listing the time servers it is using. Are there any error messages, or is it all normal? The *offset* is typically in the low single digits (*i.e.* within a few milliseconds):

```
hecking current status of NTP service with ntpq -p
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
tur-dm21.massey 132.181.2.72     2 u  433 1024  377   25.804   -1.283   9.704
msltime.irl.cri .MSL.            1 u  403 1024  377   27.880    2.459   3.042
msltime2.irl.cr .ATOM.           1 u  484 1024  377   23.788   -1.892   3.565
122.252.184.186 202.46.179.18    2 u  243 1024  377   51.562   -3.953   7.331
Auto-Refresh every 10s   --- CTRL+C to Cancel)
```

o Take a break: maybe someone is transmitting over you. Skip a transmit slot to check whether your TX frequency and time slot is quiet without you.

o Try **shift-clicking** to move your TX frequency. If all that achieves is to drag the stalker to your new frequency and he's still not responding, QSY further and toggle the *Tx even/1st* option to swap time-slots, transmitting your CQs at the same time as the stalker is plaintively calling you. Maybe then he'll get the hint.

o Check your beam heading and power: perhaps your signal is just too weak for the stalker to decode? Try beaming directly at him (SP or LP) and give it just a few more watts.

o Conversely, deliberately beam *away* from the stalker and turn your power down, in the hope that having noticed you disappear from his waterfall, he'll crawl away to his cave.

o Last resort: give up. Change mode or band. QRT. Make a cup of tea. Walk the dog. Poke the fire. Hug a stranger. Tidy the cave. Email Gary with more tips.

25. Don't get too fancy with the custom messages and shortcuts. There is clever programming under the hood to optimize communications with the standard messages in FT8, which means some compromises. On top of that, you normally only have 13 places to fill in each message from a *very* limited character set (I think just numerals, capitals, hyphen, plus, slash and space ... and the slash is not recommended to avoid it being interpreted as a callsign separator). In particular, you will soon discover that most users are reliant on *Auto Seq*, which is easily confused by anything out of the ordinary. A common example on the air right now is if you select the R73 message instead of RRR to confirm receipt of your report and skip forward a message. That evidently triggers RC1's *Auto Seq* to send you a report without the R - a bizarre response that takes the sequence backwards, the very opposite of what you probably intended! Custom final messages are less of an issue though, so it's worth composing and storing a few in your quick-select list (under *F2 Settings - Tx Macros*) especially if you are not so good at typing

fast under pressure *e.g.* NO DECODE SRI, QRZ CALL AGN, SRI TOO WEAK, CALL LATER, 5W G5RV 73, FB LP QSO 73, CHECK UR CLK, SPREAD OUT, WAIT UR TURN ... and perhaps even TNX TIPS GARY!

26. It's only a hobby. Most of the issues with FT8 operating are not due to malice but ordinary hams like you and me, exploring the new mode and picking up new tricks as we go. We make mistakes. We get things wrong. We experiment. We try. We learn. We enjoy ourselves and help each other out.