

FT8 Mode

How, Why
and Tips and tricks
Fox/Hound vs. MSHV

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FT8 (short for **Franke-Taylor 8-FSK modulation**) is a digital mode of radio communication used by amateur radio operators worldwide. It was jointly developed by Joe Taylor, K1JT, and Steve Franke, K9AN, and released back in 2017. The mode is designed to allow for reliable communication over long distances, even in poor conditions.

Here are some key points about FT8:

1.Purpose: FT8 was specifically designed for making **reliable QSOs (contacts)** under **extreme weak-signal conditions**.

2.Transmission Cycles: FT8 uses **short transmission and reception cycles**, with T/R cycles only **7.5 seconds** long.

3.Message Structure: It employs a structured message format that allows for efficient communication.

4.Sensitivity: FT8 is highly sensitive and can detect signals even when they are very weak.

5.Bandwidth: It uses minimal bandwidth, making it suitable for crowded frequency bands.

6.Global Communication: Hams use FT8 to communicate globally using **low-power transmissions**.

In summary, FT8 is a powerful digital mode that enables ham radio operators to establish reliable contacts even when traditional voice or other digital modes might fail due to weak signal conditions. It has revolutionized long-distance communication within the amateur radio community.

Resources

- WSJT-X program and manuals (<https://wsjt.sourceforge.io/wsjtx.html>)
- Paper on RCARC.ORG by Bob WB2NFL
- ZL Paper on FT8
(https://www.g4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf)
- JT alert (<https://hamapps.com/JTAlert/>)
- PSK reporter (<https://pskreporter.info/pskmap.html>)
- Fox/Hound Manual (<https://wsjt.sourceforge.io/wsjtx.html>)
- DX Watch.com /VE7CC (<http://www.bcdxc.org/ve7cc/>)
- QRZ.COM
- Time Sync: <https://www.meinberg-usa.com/support/downloads/ntp-software-download.htm>

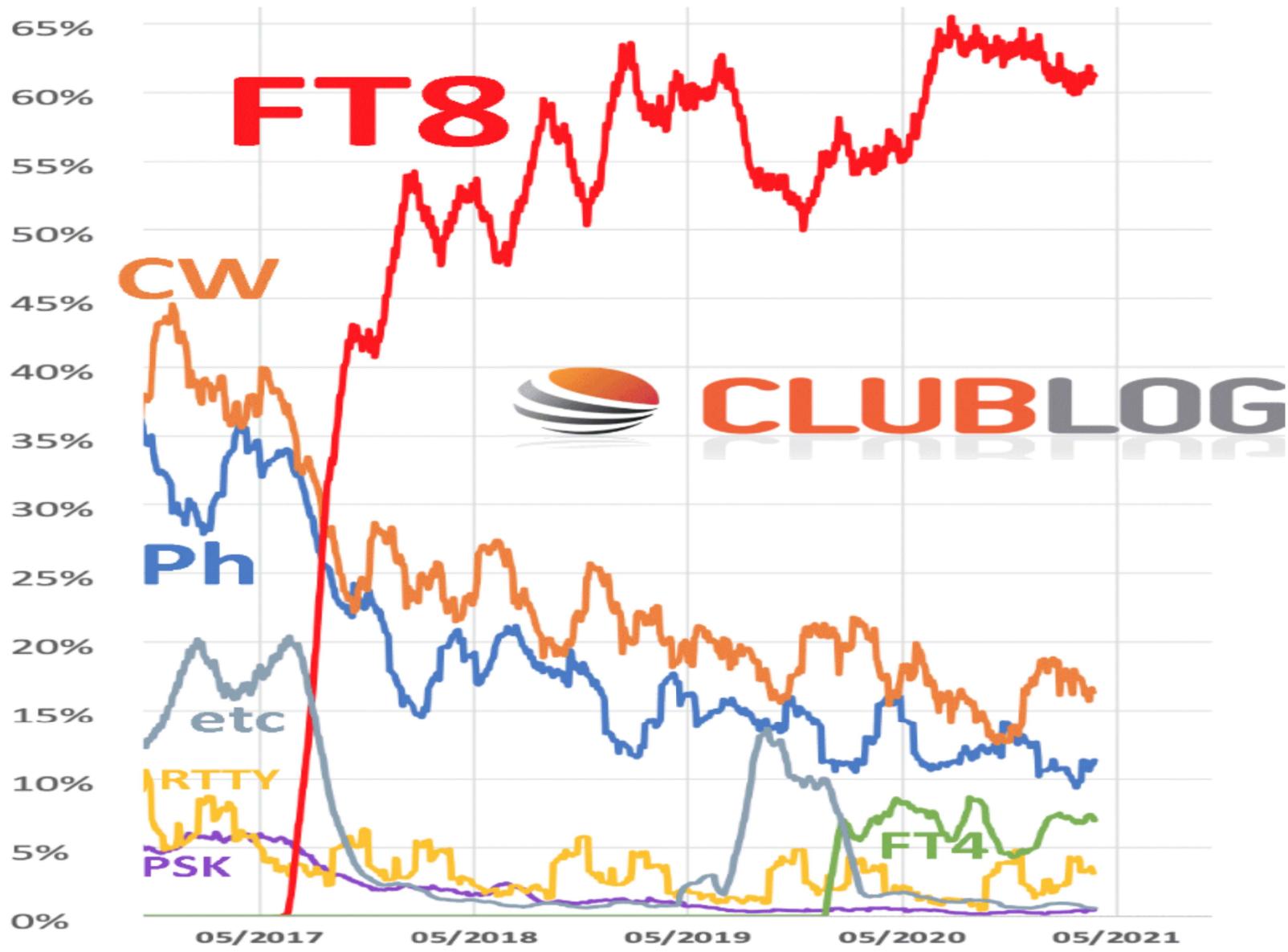
Advantages of FT8

- Pipsqueaks can do serious DX
- No need for big antenna systems
 - Wires/Indoor antennas
 - Vertical Antennas/Flagpoles
- Everyone gets a free Bandscope
- No need for amplifiers
 - 100 Watts or less
- Easy semi-automatic logging for uploading to LOTW

FT8 Weak Signal comparisons

Weak-Signal S/N Limits

<u>Mode</u>	<u>(B = 2500 Hz)</u>
SSB	~+10 dB
MSK144	- 8
CW, "ear-and-brain"	-15
FT8	-21
JT4	-23
JT65	-25
JT9	-27
QRA64	-27
WSPR	-31



Equipment (in addition to your Transceiver)

- 1) PC running Windows, Linux or Mac
 - Installed WSJT-X (ver 2.6 or above recommended)
 - Time Sync Software (Meinberg or others)
 - Reset audio output for Transceiver interface or Rig with USB input
 - Reset audio input for Transceiver interface or Mic or Rig with USB input
 - Optional: Two Monitors very helpful
- 2) Rig interface or Rig with USB input
- 3) Optional tuner for multiple bands (but be careful about power rating)
- 4) Just about any antenna

FT8 Screens

The screenshot displays the FT8 software interface. At the top is a waterfall plot showing signal activity across a frequency range from 500 to 2500 kHz. Below the plot is a log window with two columns: 'Band Activity' and 'Rx Frequency'. The log contains various entries with columns for UTC, dB, DT, Freq, and Message. A control panel at the bottom includes a frequency display (24.915 000), mode selection (FT8), and a list of messages to be transmitted.

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
212515	-15	0.1	2093	3D2CCC KM3V FM19	211800	-14	0.1	2461	CQ 5Z4VJ KI88 Kenya
212515	-18	0.5	731	HI8MLV HI3K -15	211830	-17	0.1	2461	JABRKC 5Z4VJ -10
212515	-13	0.1	1487	N2JF AALEF FN43	211900	-18	0.1	2461	JABRKC 5Z4VJ RR73 Kenya
212515	-15	-0.2	1502	7Q6M HK3J FU24	212030	-1	0.2	2471	CQ CS2GPDX Portugal
212515	-19	0.4	2185	K6SRB CB8EIO RR73 Chile	212100	1	0.2	2471	KC2YIL <CS2GPDX> -03
212515	-19	0.7	1233	ZL4KYH KC2YIL 73 U.S.A.	212130	2	0.2	2472	<KC2YIL> CS2GPDX RR73 Portugal
212545	9	1.2	1331	CQ CO3LY EL82 Cuba	212200	-2	0.2	2471	CQ CS2GPDX Portugal
212545	2	-0.2	1019	CQ EA9DS IL28 Canary Is.	212230	-2	0.2	2471	CQ CS2GPDX Portugal
212545	3	1.4	1600	N2WPT PY2DPM GG66	212300	3	0.2	2471	KM3V <CS2GPDX> -01
212545	2	0.6	1646	<CS2GPDX> HI3CH FK49	212330	5	0.2	2472	<KM3V> CS2GPDX RR73 Portugal
212545	3	0.5	1501	CQ KP4MAQ FK78 Puerto Rico	212400	-1	0.2	2471	CQ CS2GPDX Portugal
212545	4	0.1	1107	3D2CCC WA9IVH EN62	212415	12	1.2	1331	CQ CO3LY EL82 Cuba
212545	-2	0.1	2471	CS2GPDX <HI8RMQ> RR73 Dominican Rep.	212436	Tx		2211	CO3LY N2WPT FN30
212545	-11	0.2	1835	<CS2GPDX> CT3IQ IM12	212445	9	1.2	1331	N2WPT CO3LY -01
212545	-13	-0.1	826	CQ HI3K FK49 Dominican Rep.	212500	Tx		1600	CO3LY N2WPT R+09
212545	-10	0.1	2049	3D2CCC KM3V FM19	212515	12	1.2	1331	N2WPT CO3LY RR73 Cuba
212545	-13	0.2	1487	N2JF AALEF FN43	212530	Tx		1600	CO3LY N2WPT 73
212545	-22	0.4	730	HI8MLV HI3K RR73 a7 Dominican Rep.	212545	9	1.2	1331	CQ CO3LY EL82 Cuba
212545	-21	-0.2	1500	7Q6M HK3J FU24 a7	212545	3	1.4	1600	N2WPT PY2DPM GG66

Control Panel:

- Mode: FT8
- Frequency: 24.915 000
- Power: 65 dB
- Message List:
 - CO3LY N2WPT FN30
 - CO3LY N2WPT +09
 - CO3LY N2WPT R+09
 - CO3LY N2WPT RR73
 - CO3LY N2WPT 73
 - CQ N2WPT FN30

FT4

The screenshot displays the WSJT-X software interface. At the top, a wide graph shows signal activity across a frequency range from 500 to 2500 kHz. Below the graph, a window titled 'JTAlert 2.60.10 N2WPT [17m, FT4, *** NO LOG *** ,#1]...' is visible. The main window, 'WSJT-X v2.7.0-rc4 by KI1J et al.', shows a 'Band Activity' window with two columns of received messages. The left column lists messages received between 1443 and 2452 kHz, and the right column lists messages received between 1571 and 1731 kHz. The interface also includes a control panel at the bottom with various settings and a 'Generate Std Msgs' section.

Band Activity					Rx Frequency				
UTC	dB	DI	Freq	Message	UTC	dB	DI	Freq	Message
203145	9	0.0	1443	+ JA5MHD ON6LEO 73 Belgium	202830	Tx		1571	+ JE1SYN N2WPT FN30
203145	10	0.2	1657	+ 8P2K DK2CX +06	202837	-3	0.2	1730	+ CQ JE1SYN PM96 Japan
203145	2	0.1	2078	+ CQ PE0TS JO32 Netherlands	202845	Tx		1571	+ JE1SYN N2WPT FN30
203145	-9	-0.0	734	+ JH6EFI ON2VG +03	202852	-1	0.2	1729	+ SP6JIU JE1SYN -03
203145	-6	0.3	1481	+ 8P2K SP6JIU JO80	202900	Tx		1571	+ JE1SYN N2WPT FN30
203152	8	0.2	1036	+ IZ7XNB JRLAIB -13	202907	-3	0.2	1730	+ SP6JIU JE1SYN RR73 Japan
203152	-4	0.1	1170	+ T77C LA2IR JP77	202915	Tx		1571	+ JE1SYN N2WPT FN30
203152	-1	-0.0	1484	+ CQ 9P2K GK03 Barbados	202930	Tx		1571	+ JE1SYN N2WPT FN30
203152	2	0.2	1777	+ CS2GPD <CT1EQQ> RR73 Portugal	202945	Tx		1571	+ JE1SYN N2WPT FN30
203152	-14	-0.1	2310	+ <CS2GPD> SV3AUW KM17	203000	Tx		1571	+ JE1SYN N2WPT FN30
203200	-2	0.2	1731	+ JG3LGD OT8P JO21	203015	Tx		1571	+ JE1SYN N2WPT FN30
203200	0	0.0	642	+ JRLAIB IZ7XNB R-09	203030	Tx		1571	+ JE1SYN N2WPT FN30
203200	-2	-0.0	734	+ JH6EFI ON2VG RR73 Belgium	203045	Tx		1571	+ JE1SYN N2WPT FN30
203200	-15	0.0	836	+ JF2JRD T77C -05	203100	Tx		1571	+ JE1SYN N2WPT FN30
203200	-8	-0.0	1070	+ 8P2K ON6ME JO10	203115	-4	0.2	1732	+ JRLAIB OT8P -05
203200	-14	0.0	1161	+ CT1EQQ <CS2GPD> R-06	203122	-3	0.2	1730	+ <CS2GPD> JE1SYN PM96
203200	-9	0.3	1338	+ JRLAIB UF5F RO85	203130	-6	0.2	1732	+ JRLAIB OT8P RR73 Belgium
203200	11	0.2	1482	+ 8P2K DK2CX +03	203137	-3	0.2	1728	+ <CS2GPD> JE1SYN PM96
203200	-15	0.2	2454	+ JF2JRD R2ASY +02	203200	-2	0.2	1731	+ JG3LGD OT8P JO21

Control Screen

WSJT-X v2.7.0-rc4 by K1JT et al.

File Configurations View Mode Decode Save Tools Help

Band Activity

UTC	dB	DT	Freq	Message
203145	9	0.0	1443	+ JA5MHD ON6LEO 73 Belgium
203145	10	0.2	1657	+ 8P2K DK2CX +06
203145	2	0.1	2078	+ CQ PE0TS JO32 Netherlands
203145	-9	-0.0	734	+ JH6EFI ON2VG +03
203145	-6	0.3	1481	+ 8P2K SP6JIU JO80
203152	8	0.2	1036	+ IZ7XNB JR1AIB -13
203152	-4	0.1	1170	+ T77C LA2IR JP77
203152	-1	-0.0	1484	+ CQ 8P2K GK03 Barbados
203152	2	0.2	1777	+ CS2GPDX <CT1EQQ> RR73 Portugal
203152	-14	-0.1	2310	+ <CS2GPDX> SV3AUW KM17
203200	-2	0.2	1731	+ JG3LGD OT8P JO21
203200	0	0.0	642	+ JR1AIB IZ7XNB R-09
203200	-2	-0.0	734	+ JH6EFI ON2VG RR73 Belgium
203200	-15	0.0	836	+ JF2JRD T77C -05
203200	-8	-0.0	1070	+ 8P2K ON6ME JO10
203200	-14	0.0	1161	+ CT1EQQ <CS2GPDX> R-06
203200	-9	0.3	1338	+ JR1AIB UF5F KO85
203200	11	0.2	1482	+ 8P2K DK2CX +03
203200	-15	0.2	2454	+ JF2JRD R2ASY +02

Rx Frequency

UTC	dB	DT	Freq	Message
202830	Tx		1571	+ JE1SYN N2WPT FN30
202837	-3	0.2	1730	+ CQ JE1SYN PM96 Japan
202845	Tx		1571	+ JE1SYN N2WPT FN30
202852	-1	0.2	1729	+ SP6JIU JE1SYN -03
202900	Tx		1571	+ JE1SYN N2WPT FN30
202907	-3	0.2	1730	+ SP6JIU JE1SYN RR73 Japan
202915	Tx		1571	+ JE1SYN N2WPT FN30
202930	Tx		1571	+ JE1SYN N2WPT FN30
202945	Tx		1571	+ JE1SYN N2WPT FN30
203000	Tx		1571	+ JE1SYN N2WPT FN30
203015	Tx		1571	+ JE1SYN N2WPT FN30
203030	Tx		1571	+ JE1SYN N2WPT FN30
203045	Tx		1571	+ JE1SYN N2WPT FN30
203100	Tx		1571	+ JE1SYN N2WPT FN30
203115	-4	0.2	1732	+ JR1AIB OT8P -05
203122	-3	0.2	1730	+ <CS2GPDX> JE1SYN PM96
203130	-6	0.2	1732	+ JR1AIB OT8P RR73 Belgium
203137	-3	0.2	1728	+ <CS2GPDX> JE1SYN PM96
203200	-2	0.2	1731	+ JG3LGD OT8P JO21

CQ only

 Menus

17m
 S
18.104 000
 Tx even/1st
 Hold Tx Freq

Tx 1571 Hz
 Rx 1728 Hz
 Report -3
 Auto Seq
 CQ: None

H DX Call DX Grid

FT8 JE1SYN PM96

FT4 Az: 335 6755 mi

MSK

Q65 2024 May 09

JT65 20:32:08

Next	Now
JE1SYN N2WPT FN30	<input checked="" type="radio"/> Tx 1
JE1SYN N2WPT -03	<input type="radio"/> Tx 2
JE1SYN N2WPT R-03	<input type="radio"/> Tx 3
JE1SYN N2WPT RR73	<input type="radio"/> Tx 4
JE1SYN N2WPT 73	<input type="radio"/> Tx 5
CQ N2WPT FN30	<input type="radio"/> Tx 6

Pwr

Log Screen

WSJT-X v2.7.0-rc4 by K1JT et al. - Log QSO

Click OK to confirm the following QSO:

Call	Start	End
FM4LV	5/21/2024 17:16:30	5/21/2024 17:17:45

Mode	Band	Rpt Sent	Rpt Rcvd	Grid	Name
FT8	10m	-12	-08		

Tx power Retain

Comments Retain

Operator

Exch sent Rcvd

Prop Mode Retain

JT Alert

The screenshot displays a software interface for monitoring callsigns and activity. The main window is titled "Callsigns #1" and contains several sections:

- All decodes:** A list of callsigns with their respective countries and status indicators.

-13 AA1EF ME U.S.A.	+09 CO3LY B4 CQ Cuba	-11 CT3IQ Madeira Is.	+02 EA8DS CQ Canary Is.	+02 HI3CH Dominican Rep.	-22 HI3K Dominican Rep.	-13 HI3K CQ Dominican Rep.	-02 HI8RMQ B4 CQ Dominican Rep.	-21 HK3J Colombia	-10 KM3V MD U.S.A.
+03 KP4MAQ CQ Puerto Rico	+03 PY2DPM B4 Brazil	+04 WA9IVH IL U.S.A.							
- Callers : Alert:** A list of callers with alerts, showing call times and durations.

+12 CO3LY CQ Cuba	+03 PY2DPM B4 Brazil
39s	2 8s
- Alerts Only:** A list of alerts, showing call times and durations.

+03 PY2DPM B4 Brazil
1
- Activity:** A table showing activity statistics for various callsigns at 21:25 utc.

	tx	JT65	rx	tx	FT4	rx	tx	FT8	rx
160m							2	2	
80m				7	27		193	213	
60m				1	1		24	91	
40m				49	68		278	487	
30m	1	1		13	35		263	480	
20m				181	252		625	+1K	
17m				18	46		343	658	
15m				32	77		263	769	
12m				1	2		103	330	
10m				24	27		291	625	
Total	2	2		286	387		+2K	+4K	

PSK Reporter

The screenshot displays the PSK Reporter website interface. At the top, there is a navigation bar with a "Sign in" button and several browser tabs. The main content area features a search and filter section with dropdown menus for "On all bands", "show signals", "sent/rcvd by", "the callsign", and "n2wpt", along with a "Go!" button and a "Display options Permalink" link. Below this, a status message reads: "Monitoring N2WPT (last heard 1 mins ago). Automatic refresh in 5 minutes. Small markers are the 237 transmitters (show logbook) heard (distance chart) at N2WPT (262 reports, 43 countries last 24 hours; 5488 reports, 43 countries last week). There are 4558 active monitors: 1401 on 20m, 1099 on 40m, 692 on 30m, 528 on 10m, 477 on 15m, 383 on 80m, 381 on 17m, 298 on 6m, 210 on 60m, 193 on 160m, 65 on 2m, 50 on 12m, 26 on unknown, 25 on 11m, 16 on 600m, 9 on 70cm, 7 on invalid, 5 on 23cm, 5 on 2200m, 3 on 10Ghz, 1 on 8m, 1 on 2.4Ghz, 1 on 1.25m, 1 on 24Ghz. Legend".

The central part of the page is a world map with numerous colored markers (pins) indicating signal reception locations. Many markers are labeled with time intervals such as "8 mins", "1 mins", "5 mins", "9 hrs", and "2 mins". A large, semi-transparent purple arc is drawn across the map, centered on the Atlantic Ocean. In the bottom-left corner, a pop-up window provides details for a specific monitor: "Monitor: KC3YYZ Loc FP61 in ??Nunavut??, United States Receiving: JS8 on 14.080 MHz (20m) Using: JS8Call v2.2.0 Show all seen by KC3YYZ".

At the bottom of the page, there is a footer with the text "Statistics — Comments to Philip Gladstone — Online discussions — Reception records: 45,918,323,882 — Hosting by Fast Serv Networks, LLC" and the logo "PSKREPORTER.INFO".

Fox/Hound Mode

- A sub mode within FT8 for use by DX expeditions(which is the fox) you are the hound. Watch for spots to see who is using it.
- It is done outside of usual FT8 bands, watch for spots to see where they are.
- Enter by clicking the H box on main screen
- It has its own protocols
 - Fox transmits below 1000Hz on band screen
 - Fox can transmit on *multiple frequencies simultaneously*
 - Hounds must transmit above 1000Hz on band screen
 - Your transmissions limited to 2 minutes on each click

Fox/Hound 2

- Spooky action at a distance (per A. Einstein):
 - after Fox acknowledges you, you will be magically (automatically) moved to one of the transmit frequencies to complete the QSO, logging screen will popup.
 - If your 2 minutes transmission has timed out, the fox can re- enable your transmitter if you are in his receive queue (but you won't know if you are in the queue, so you may want to manually re-enable transmit).
- Note well- If you can't hear (decode) them, you can't work them!!

F/H Screenshot

The screenshot displays the WSJT-X software interface. At the top, a wide graph shows signal activity across a frequency range from 500 to 2500 kHz. A call sign '1103' is visible in the graph area. Below the graph, there are two message log windows. The left window shows a list of received messages with columns for UTC, dB, DI, Freq, and Message. The right window shows a list of transmitted messages with columns for UTC, dB, DI, Freq, and Message. The bottom section of the interface contains various controls, including a frequency display showing 10.131 020, a DX Call field with '3GOYA', and a date/time display showing '2024 Apr 22 03:06:59'. There are also buttons for 'Log QSO', 'Stop', 'Monitor', 'Erase', 'Decode', 'Enable Tx', 'Halt Tx', and 'Tune'. A 'Generate Std Msgs' window is open on the right, showing a list of messages to be transmitted, including '3GOYA N2WPT FN30', '3GOYA N2WPT -02', '3GOYA N2WPT R-02', '3GOYA N2WPT RR73', '3GOYA N2WPT 73', and 'CQ N2WPT FN30'. The interface is set to 'Receiving' mode, and the last transmitted message is '3GOYA N2WPT R-02'.

UTC	dB	DI	Freq	Message
030545	-4	0.1	2495	3GOYA IZ7NLJ JN80
030545	-3	0.2	1312	3GOYA W9CSX EM69
030545	4	0.2	1558	3GOYA KC9IVQ EN62
030545	-5	0.2	1900	3GOYA NZ1I R+00
030600	1	0.2	516	S57AT 3GOYA -13
030600	0	0.2	576	W9CSX 3GOYA +07
030600	1	0.2	455	NZ1I 3GOYA RR73
030600	-1	0.2	635	KB8UIP 3GOYA -20
030600	1	0.2	395	KC9IVQ 3GOYA -09
030615	2	0.2	576	3GOYA W9CSX R-12
030615	-7	0.2	1901	3GOYA NZ1I 73
030615	-5	0.1	2494	3GOYA IZ7NLJ JN80
030615	2	0.2	1558	3GOYA KC9IVQ EN62
030630	5	0.2	516	KB8UIP 3GOYA RR73
030630	5	0.2	456	W9CSX 3GOYA RR73
030630	5	0.2	396	KC9IVQ 3GOYA -12
030645	7	0.2	1558	3GOYA KC9IVQ EN62
030645	-2	0.1	2495	3GOYA IZ7NLJ JN80
030645	-5	0.2	1554	3GOYA NM9P EN60

UTC	dB	DI	Freq	Message
043945	-20	0.0	2119	PAST DJ4WM 73 a7
044030	Tx	1994	~	YV5BRB N2WPT FN30
044100	Tx	1994	~	YV5BRB N2WPT FN30
044130	Tx	1994	~	YV5BRB N2WPT FN30
044200	Tx	1994	~	YV5BRB N2WPT FN30
044230	Tx	1994	~	YV5BRB N2WPT FN30
044300	Tx	1994	~	YV5BRB N2WPT FN30
044330	Tx	1994	~	YV5BRB N2WPT FN30
044400	Tx	1994	~	YV5BRB N2WPT FN30
030100	4	0.3	452	N9GB 3GOYA +06
030119	Tx	1994	~	3GOYA N2WPT FN30
030130	-2	0.2	632	N2WPT 3GOYA -07
030145	Tx	632	~	3GOYA N2WPT R-02
030200	-2	0.2	514	N2WPT 3GOYA RR73
030215	-5	0.2	1749	3GOYA R1AP R-17
030315	Tx	332	~	3GOYA N2WPT R-02
030322	Tx	1228	~	3GOYA N2WPT R-02
030345	Tx	332	~	3GOYA N2WPT R-02
030400	-3	0.2	634	N2WPT 3GOYA RR73

MSHV

- MSHV is similar to F/H (but different)-
 - Usually on non standard frequencies
 - Multiple streams
 - You should transmit above 1000Hz on band screen (but not required), the target transmits below
 - No 2 minute timeout
 - No Moving to one of the transmit frequencies
 - When in doubt use F/H mode

Coming soon to a transceiver near you:



Joe Taylor's team will soon offer a "SuperFox" mode of WSJT-X for making rapid FT8 QSOs. Hounds chasing the SuperFox DX station will transmit normal FT8 signals, as in the already familiar Fox/Hound mode.

But rather than sending concurrent streams of up to five FT8 signals, the SuperFox station will transmit a single constant envelope, using a 1.5 KHz-wide waveform, that conveys signal reports or "RR73" acknowledgments to as many as ***nine different Hounds simultaneously***. Most importantly, there will be no signal-strength penalty for simultaneously transmitting to all those Hounds.

Another very significant improvement will be a digital signature contained in the SuperFox message that will allow the receiving software to verify the legitimate origin of the signal from a validated DXpedition.

The SuperFox development team will be beta testing the software in coming weeks with the goal to have it rolled out in time to debut during the [N5J Jarvis Island DXpedition](#) a few months from now (August 2024).

You may need an upcoming version of FT8 to use all the features of this mode.

Summing up

- If can't hear (decode) them, you can't work them
- Hit them where they ain't/ Go for the gaps
- JT Alert is a great add on
- Don't forget FT4
- A wire antenna and a good tuner will allow you to work more bands, but watch out for full power rating
- Two monitors are helpful
- The WARC bands are perfect for FT8
- Use at least the 2.6 version of WSJT-X
- F/H is a very powerful DX tool
- Thank you for listening!

