

The background is a dark blue gradient with technical diagrams. On the left, there is a large circular scale with markings from 150 to 260. To the right, there are several circular diagrams with arrows indicating clockwise rotation. The overall aesthetic is technical and professional.

# JT65

WHAT IS IT  
AND  
WHY SHOULD I CARE?

James Wolf, KR9U

# JT65 – WHAT IS IT?

- WSJT is the Base Program
- JT65 is one of many operating modes of WSJT
- Originally Designed for Moon Bounce (EME) and Meteor Scatter Communications where every dB counts.
- Uses State-of-the-Art Encoding, Decoding and Error-Correcting Algorithms
- Constant Envelope Waveform with 65 tone FSK Modulation.
- Capable of 10-15 dB better S/N than Human Ear/Brain CW recognition
- Arbitrary Text Messages are Limited to 13 characters per Transmission

# JT65 – HOW IT WORKS

- Compresses Messages into a Minimum Fixed Number of Bits
- Two Callsigns and a Grid Locator or 71 bits
- Message is not Sent Character by Character
- The 72-Bit message is augmented with 306 Error-Correction Bits using the Reed Solomon Code converting the message into Sequences of 63 six-bit Channel Symbols.
- Every Sequence used in the Code differs from every other by at least 52 of the 63 Symbols
- Message will either print error free or not at all
- Message Throughput is One Character every Three Seconds.

# JT65 - HOW IT WORKS - CONT

- The Forward Error Correction (FEC) Makes it highly probable that either the Message is Received in its Entirety or not at All.
- Report messages are predefined. For Instance, an “RO” is sent by alternating two tones of Specific Frequencies and Switching Rates.
- The synchronizing signal is so important that half of every transmission is devoted to it.

# JT65 - TIMING

- JT65 uses one-minute T/R sequences and requires tight synchronization of time and frequency between transmitter and receiver.
- A transmission nominally begins at  $t = 1$  s after the start of a UTC minute and finishes at  $t = 47.8$  s.
- Utilizes calibration of relative time and frequency errors with accuracies of about 0.03 s and 1.5 Hz

# METEOR SCATTER

ANOTHER WSJT MODE



- Mode FSK441 is used for Meteor Scatter and Transmits at a high Rate of 147 Characters Per Second to take Advantage of Fraction-Of-A-Second Reflections from the Ionized Trails of Meteors.
- Meteor scatter QSOs in the 500 – 1400 Mile Range can made be on the VHF Bands at any time, using FSK441.

# JT-65 SOFTWARE

JT65-HF HB9HQX-Edition Version 0.9.86.9 < HB9HQX JN36XH >

File Configure Settings JT65-Log Names Show About

Audio Input Level 15 %  
0 % 100 %

2014-09-04  
09:32:56

Dial QRG kHz USB Band  
14076 20 m

Insert QRG OmniRig Radio 1  
Delete QRG PTT CAT Command  
VOX

Adjust DT On WF: Left click sets Tx DF - Right click sets Rx DF  
0.0  Rx DF = Tx DF Rx DF Tx DF  Fix Tx DF  
DT = 0.0  Auto Adjust DT 0 -332

Insert Free Text Current operation Idle  
Delete Free Text

Free Text  
Generated Text Clear Text  
EW8FN HB9HQX R-06  
CQ -dB RRR  
CQ DX QSO B4 RR 73  
GRID R-dB 73

Singledecoder in QSO  
 Multidecoder Clear  
 Alert  SNTP Time updated  
20 PSKR spots 0 RB spots 2696 JT65 QSOs

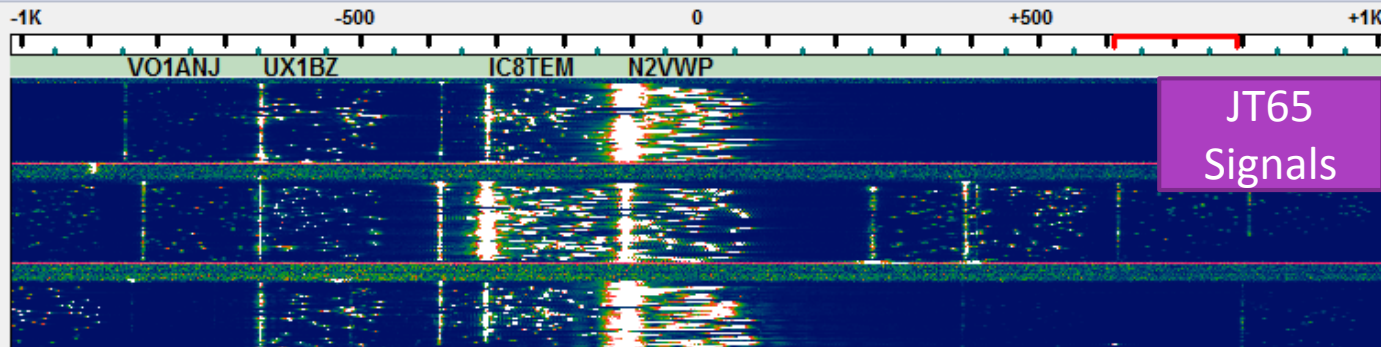
TX ENABLED  
Tx Enable Tx Halt  
Tx Start Minute  
 Even  Odd  
58° 1670 km  
Station Grid  
EW8FN KO42  
dB sent dB rcvd  
-06 -07  
Log QSO

UTC Band D dB DT DF Exchange  
09:32 20 -20 1.4 557 CQ R6DH KN96 QSO B4  
09:32 20 -8 0.3 -331 HB9HQX EW8FN -07  
09:31 20 -332 EW8FN HB9HQX JN36  
09:30 20 -19 1.4 560 CQ R6DH KN96 QSO B4  
09:30 20 -14 0.3 318 CT1BNW YO5PHL KN16 QSO B4  
09:30 20 -6 0.3 -318 CQ EW8FN KO42  
09:29 20 -100 CQ HB9HQX JN36  
09:28 20 -17 1.3 560 CQ R6DH KN96 QSO B4  
09:28 20 -7 0.3 -318 HB9DQV EW8FN RRR

On Rx List: Left click sets fields and starts a QSO. Right click sets fields (Station, Grid, dB sent, Adjust DT & Tx DF)

JT65-HF Station Infos

Station	Band	Grid
EW8FN	20 m	KO42
Country		
Belarus		
DXCC		
EU	CQ 16	ITU 29
Cont		
Eu		
Statistic		
EW8FN	KO42	EU
160 m		
80 m		1
40 m		1
30 m		
x 20 m	2	6
17 m		
15 m		3
12 m		
10 m		
6 m		
2 m		
Total:	2	11



audio input level  
 L O R  
 gain  
 kHz  
 22:12:51

UTC	Svnc	dB	DT	DF	wkd
22:12	16	-8	-0.7	-105	B F6ARS N2VWP 73
22:12	6	-8	-1.2	-310	B K4VRI IC8TEM -07
22:12	10	-5	-1.0	-643	B KK4JTW UX1BZ -05
22:12	9	-8	-0.4	-842	B CQ VO1ANJ GN37
-----					
22:11	5	-6	-1.0	616	B JR1EMO IT9PQJ -22
22:11	9	-9	-1.4	-108	B N2VWP F6ARS 73
22:11	8	-7	-0.4	-643	B UX1BZ KK4JTW EL96
22:11	3	-7	-0.6	-816	B VO2NS VK7XX QE38
22:09	6	-7	-1.0	611	B CQ IT9PQJ JM76
22:09	3	-7	-0.3	390	B WA9CGZ EA1IEU RRR
22:09	7	-11	-0.4	-86	B CQ K4VRI FM16
22:09	7	-10	-1.4	-108	B N2VWP F6ARS -09
22:09	6	-8	-0.6	-388	B CQ ON4VT DX
22:09	5	-10	-0.1	-829	B VO2NS PA2GP JO33
22:08	1	-8	-1.1	797	B CQ UT9LI KO80
22:08	4	-9	-1.1	581	B TU NEW WAS
22:08	2	-14	-0.4	385	B EA1IEU WA9CGZ R-04
22:08	17	-5	-0.6	-110	B F6ARS N2VWP FN20
22:07	5	-8	-1.0	608	B CQ IT9PQJ JM76
22:07	4	-6	-0.4	388	B WA9CGZ EA1IEU -08
22:07	14	-8	-1.4	-110	B CQ F6ARS JN18
22:07	1	-4	-0.6	-390	B 20WHEX 73DALE

TX generated  TX free text

IT9PQJ KR9U EN71  
 >> IT9PQJ KR9U EN71

**TX OFF** enable halt  even  odd

Initiate QSO CQ KR9U EN71 {him} KR9U {rprrt} RRR 73

Reply to CQ {him} KR9U EN71 R{rprrt}

call sign rprrt/dB grid  
 IT9PQJ -07 JM76 log QSO 8173 km (56°)

TX Δf = RX Δf  NB  
 AFC  RB (0) defaults  
 multi-decode  PSKR

Δf TX Δf RX single BW multi BW Δt  
 611 X 611 X 100 100 0



# WSJT-X

- WSJT-X is a recent update that implements JT9 mode specifically designed for LF, MF and HF bands as well as JT65.
- JT9 is about 2 dB more sensitive than JT65 while using less than 10% of the bandwidth. JT9 has a total bandwidth of 15.6 Hz.
- A 2 kHz slice of spectrum is essentially full when occupied by ten JT65 signals. As many as 100 JT9 signals can fit into the same space, without overlap.

# JT9

The screenshot displays the WSJT-X software interface. The main window is titled "Wide Graph" and shows a waterfall plot of frequency (0 to 1400 Hz) over time (20:27 to 20:30). A purple box highlights a signal at approximately 1100 Hz, labeled "JT9 Signal". The signal is a narrowband transmission with a distinct tone and data stream. The interface also shows a "Band Activity" table with the following data:

UTC	dB	DI	Freq	Message
2021	-13	0.1	711	@ CQ DJ5JD J033
2027	5	0.1	1070	@ CQ W2BT FN20
2029	4	0.2	1070	@ CQ W2BT FN20
2030	-6	-0.5	1070	@ W2BT HB9YC JN46

The interface also shows a "Log QSO" section with a frequency of 14.078 000 MHz and a date/time of 2014 Sep 23 20:30:59. The "Tx" section is set to JT9 @ 1500 Hz, and the "Rx" section is set to 1069 Hz. The "Report" section is set to -15 dB. The "Wide Graph" window has settings for Bins/Pixel 2, Start 0 Hz, Zero 0, Palette, Flatten, JT65 2500 JT9, N Avg 5, Gain 0, Default, and Current.

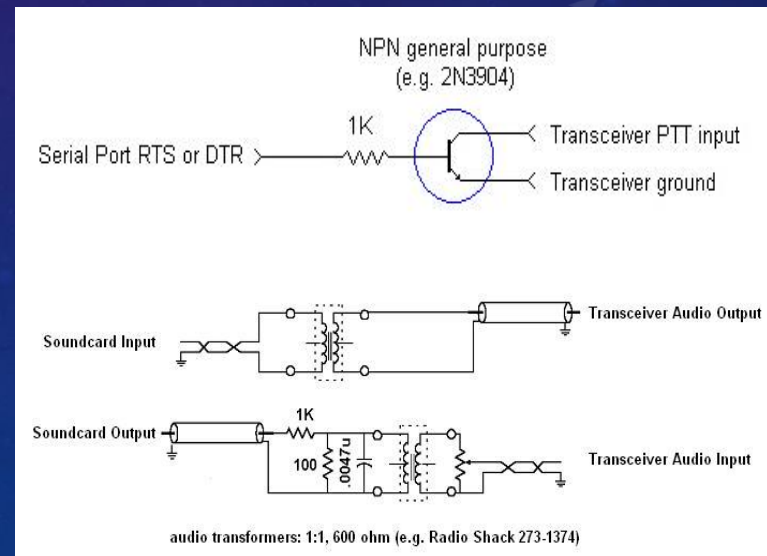
# OPERATING JT65

- JT65 uses only USB mode
- Use barefoot power – mostly less
- Use an accurate computer timing sync program
- A quality sound card may work better than your internal card. Reports are Signal Link has a poor sound card and can affect signal reception by as much as 20dB over a quality card.
- If you are seeing signal reports of -25 or lower – that’s pretty good. Best sound cards are ~ -30
- HF Frequencies (kHz)

• 28,076	14,076	1,838
• 24,917	10,139	501/505
• 21,076	7,039/36	136.13
• 18,102	3,576	

# HOOKING IT ALL UP

- Connections to the computer are the same as RTTY and other digital modes
  - Transceiver-to-Soundcard Audio connection – Receive Audio
  - Soundcard-to-Transceiver Audio connection – Transmit Audio
  - PTT Mechanism
- Good information on interfacing is found at <http://aa5au.com/rtty.html>



# WHY SHOULD I CARE?

- JT65 will work when nothing else works
- JT65 offers another level of weak signal operation
- Great for stations with limited antennas
- Easy portable use – vacations etc.
- It's fun