

# Getting Started with JT65 on the HF Bands

By Steve Ford, WB8IMY  
QST Editor

# What is JT65?

- A form of digital communications originally developed by Joe Taylor, K1JT, for Moonbounce applications where signals are extremely weak.
- Uses sophisticated digital signal processing
- Also relies on redundancy – it sends the information over and over

# 65 Different Tones

- A 1270.5 Hz synchronizing tone
- 64 additional tones to carry the information
- On the air it sounds like someone playing music



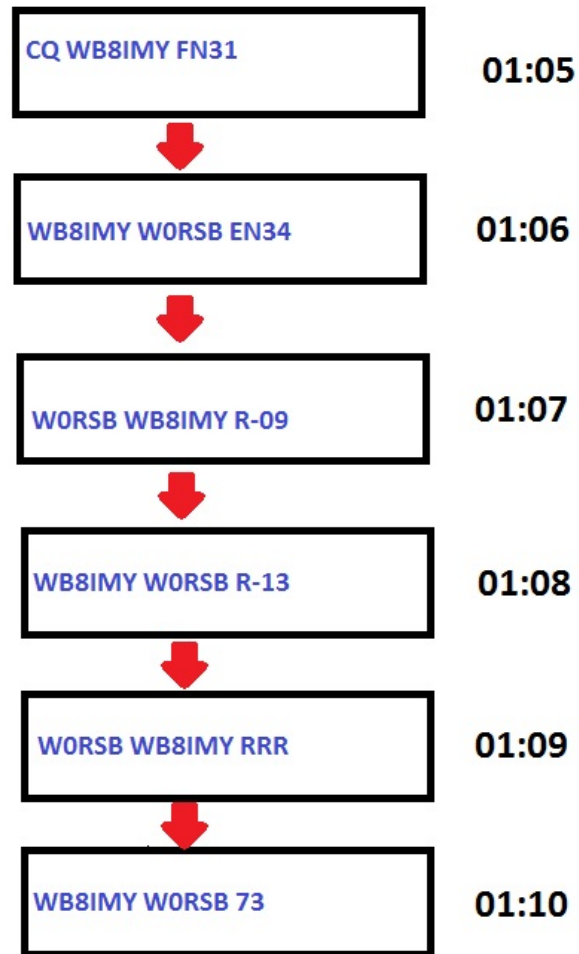
# Timing is Everything

- Each JT65 transmission lasts precisely 46.8 seconds.
- During transmission only a small amount of information is sent – about 13 characters
- Station clocks must agree within about 2 seconds
- As much as 80% of the transmission can be lost and still be decoded

# Taking Turns

- Stations take turns transmitting
- Stations transmit on even or odd minutes, and then listen on the following minutes

# Transmitting and Receiving by Turns



# Just the Facts!

- A JT65 contact is designed to exchange the bare minimum information needed to qualify as a “QSO”
  - Call signs
  - Signal Reports
  - Grid Squares

# JT65 on HF

- The JT65 “revolution” on the HF bands is primarily due to Joe Large, W6CQZ.
- Joe wrote a piece of software called *JT65-HF* that makes it much easier to operate JT65 and make successful contacts.
- *JT65-HF* is currently available for *Windows* only.
- Excellent mode for low power or antenna restricted stations.



# Contacts by the “Colors”

- *JT65-HF* uses color highlighting to indicate which stations are **calling CQ**, which stations **are in contact with each other**, and which stations **are transmitting to you**.
- The program also has preformatted responses that you can send by simply double clicking on the appropriate line.

Audio Input Levels

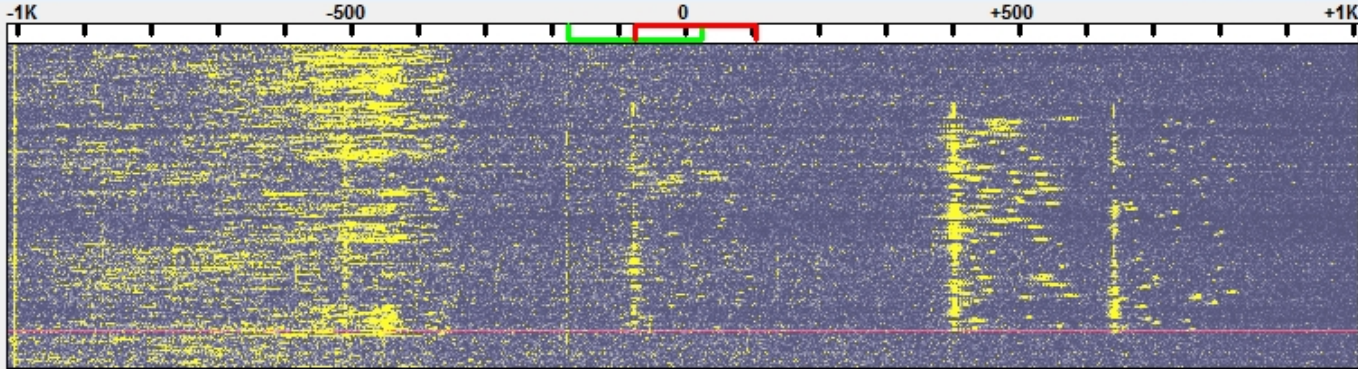
L 5  
 R 5

Optimum input level is 0 with only background noise present.

Digital Audio Gain

L: 0   
 R: 0

2011-Feb-01  
01:53:12



Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map  Brightness  Contrast  Speed  Gain   Smooth  
 Blue

Transmitting: UX3IV WB8IMY R-11

TX Text (13 Characters) **TX IN PROGRESS**

TX Generated

TX Even  TX Odd

Use buttons below to call CQ and answer callers.

Use buttons below when answering CQ.

TX DF  RX DF   TX DF = RX DF TX to Call Sign  Rpt (-#)   
 -75 -75 UX3IV -11

Single Decoder BW  AFC   
 100 Noise Blank

Multi Decoder Spacing   Enable Multi  
 100

Dial QRG KHz

Enable RB  Enable PSKR **0** Right Click for Menu

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
01:52	6	-11	-1.8	-75	B WB8IMY UX3IV -20
01:48	8	-10	-1.0	829	B K0RCJ WA4RG -05
01:48	9	-10	9.5	285	B CQ KB0NAZ EN41
01:48	5	-9	-1.8	54	B CQ YV6EJI FJ79
01:48	4	-13	-1.7	-73	B CQ UX3IV KN98
01:47	3	-16	-1.1	70	B YV6EJI WB2LMV 73
01:47	7	-7	-1.5	-864	B KB8RTB W7DRO 73
01:46	12	-9	-1.2	829	B K0RCJ WA4RG -05
01:46	6	-10	-1.8	264	B KF5JJH N7MQ CN84
01:46	9	-6	-1.9	46	B TNXQSLOTW.73

# Let's Follow an Actual Contact, Step by Step

- I made this contact while running just 5W on 20 meters using two Hamstick mobile antennas connected together as a dipole



# I'm Calling CQ...

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels  
 L 7  
 R -20  
 Optimum input level is 0 with only background noise present.  
 Digital Audio Gain  
 L: -2  
 R: -6

2011-Jul-23  
 22:42:07

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map Brightness Contrast Speed Gain  
 Blue    5  0  Smooth

Transmitting: CQ WB8IMY FN31  
 TX Text (13 Characters) **TX IN PROGRESS**  
    
 TX Generated  
  TX Even  TX Odd

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:41	4	-22	-0.8	740	K G6XDI VK7XX RRR
22:41	6	-4	1.0	269	B WA1QIK KW7E -08
22:41	7	-7	-0.8	-323	B CQ UT3UA K050
22:41	7	-13	-1.9	-668	B CQ WB0ZPW EM28
22:41	2	-16	-0.9	-826	B WB9OTX SV7LWV RRR
22:41	11	-8	-0.6	-999	B SP3IY K4JJQ 73
22:40	6	-7	-1.2	740	B VK7XX G6XDI R-19
22:40	6	-13	-1.2	563	B KE1F ON4CDJ RRR
22:40	4	-23	-1.0	269	B KW7E WA1QIK FN44
22:40	8	-10	-1.4	-334	B IK2EKO NK9B EN70
22:40	7	-8	-0.9	-826	B SV7LWV WB9OTX R-07
22:39	12	-8	-0.8	563	B ON4CDJ KE1F R-18

Use buttons below to call CQ and answer callers.

Use buttons below when answering CQ.

TX DF 830 RX DF 830  TX DF = RX DF TX to Call Sign M6AVL Rpt (-#) -10

Single Decoder BW 100  AFC  Noise Blank

Enable Multi-decoder Reports Sent  
 Enable RB 53   
 Enable PSKR 38 Right Click for Menu

# W0RSB Has Answered. I'm Replying with a Signal Report

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels  
 L 1  
 R -20  
 Optimum input level is 0 with only background noise present.  
 Digital Audio Gain  
 L: -2  
 R: -6

2011-Jul-23  
22:44:07

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Transmitting: W0RSB WB8IMY -04

Color-map Brightness Contrast Speed Gain  
 Blue 5 0 Smooth

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:43	5	-4	-1.1	842	B WB8IMY W0RSB EN34
22:43	5	-8	-0.5	269	B WA1QIK KW7E RRR
22:43	2	-17	-1.4	-339	B NK9B IK2EKO RRR
22:43	3	-11	-1.2	-598	K CQ ON5UN JO11
22:43	5	-13	-1.4	-668	B CQ K9JKM EN52
22:43	12	-10	-1.0	-999	B CQ K4JJQ FM18
22:41	4	-22	-0.8	740	K G6XDI VK7XX RRR
22:41	6	-4	1.0	269	B WA1QIK KW7E -08
22:41	7	-7	-0.8	-323	B CQ UT3UA KO50
22:41	7	-13	-1.9	-668	B CQ WB0ZPW EM28
22:41	2	-16	-0.9	-826	B WB9OTX SV7LWV RRR
22:41	11	-8	-0.6	-999	B SP3IY K4JJQ 73

TX Text (13 Characters) **TX IN PROGRESS**  
 TNX 5W MOBILE Enable TX Halt TX

TX Generated  
 W0RSB WB8IMY -04  TX Even  TX Odd

Use buttons below to call CQ and answer callers.  
 Call CQ Answer Caller Send RRR

Use buttons below when answering CQ.  
 Answer CQ Send Report Send 73

TX DF 842 RX DF 842  TX DF = RX DF TX to Call Sign W0RSB Rpt (-#) -04  
 Zero Zero Log QSO

Single Decoder BW 100  AFC  Noise Blank Restore Defaults

Enable Multi-decoder Dial QRG KHz 14076  
 Enable RB Reports Sent 59  
 Enable PSKR 38 Right Click for Menu

Clear Decodes Decode Again

# W0RSB Confirms My Report and Gives Me a Report of -13 dB. I Reply "RRR"

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels  
 L -2  
 R -20  
 Optimum input level is 0 with only background noise present.  
 Digital Audio Gain  
 L: -2  
 R: -6

2011-Jul-23  
 22:46:04

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map Brightness Contrast Speed Gain  
 Blue  Smooth

Transmitting: W0RSB WB8IMY RRR  
 TX Text (13 Characters) **TX IN PROGRESS**  
 TNX 5W MOBILE    
 TX Generated  
 W0RSB WB8IMY RRR  TX Even  TX Odd

Use buttons below to call CQ and answer callers.  
    
 Use buttons below when answering CQ.

TX DF RX DF TX to Call Sign Rpt (-#)  
 842 842  TX DF = RX DF W0RSB -09  
 Zero Zero

Single Decoder BW  AFC   
 100  Noise Blank

Enable Multi-decoder  
 Enable RB 67 Reports Sent  
 Enable PSKR 46  
 Dial QRG KHz **14076**  
 Right Click for Menu

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43
22:45	6	-12	-0.3	269	B TU 4EQSLS 73
22:45	5	-8	-0.3	191	B RW0SR M6AVL RRR
22:45	3	-22	-0.8	-229	K ND4X HB9JNM JN47
22:45	5	-14	-1.2	-342	B NK9B IK2EKO 73
22:45	2	-10	-0.9	-641	B CQ KF6H CM87
22:45	5	-13	-1.0	-826	B CQ SV7LWV KN20
22:45	9	-9	-1.0	-1001	B WB0ZPW K4JJQ -12
22:43	5	-4	-1.1	842	B WB8IMY W0RSB EN34
22:43	5	-8	-0.5	269	B WA1QIK KW7E RRR
22:43	2	-17	-1.4	-339	B NK9B IK2EKO RRR

# W0RSB Sends 73 and I do the Same

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels  
 L 7  
 R -20  
 Optimum input level is 0 with only background noise present.  
 Digital Audio Gain  
 L: -2  
 R: -6

2011-Jul-23  
**22:48:03**

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map Brightness Contrast Speed Gain  
 Blue 5 0 Smooth

Transmitting: W0RSB WB8IMY 73  
 TX Text (13 Characters) **TX IN PROGRESS**  
 TNX 5W MOBILE Enable TX Halt TX  
 TX Generated  
 W0RSB WB8IMY 73  TX Even  TX Odd

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:47	5	-7	-1.0	842	B WB8IMY W0RSB 73
22:47	6	-11	-1.6	396	B CQ KF7QGD DM43
22:47	7	-12	-0.3	188	B RW0SR M6AVL 73
22:47	7	-18	-0.8	-229	B ND4X HB9JNM JN47
22:47	3	-12	6.2	-651	B UT3UA WB9OTX EM79
22:47	4	-11	-0.8	-821	B NK9B SV7LWV -12
22:47	5	-9	-0.8	-1001	B WB0ZPW K4JJQ -12
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43
22:45	6	-12	-0.3	269	B TU 4EQSLS 73
22:45	5	-8	-0.3	191	B RW0SR M6AVL RRR
22:45	3	-22	-0.8	-229	K ND4X HB9JNM JN47

Use buttons below to call CQ and answer callers.  
 Call CQ Answer Caller Send RRR  
 Use buttons below when answering CQ.  
 Answer CQ Send Report Send 73

TX DF 842 RX DF 842  TX DF = RX DF TX to Call Sign W0RSB Rpt (-#) .07  
 Zero Zero Log QSO

Single Decoder BW 100  AFC  Noise Blank Restore Defaults  
 Enable Multi-decoder

Reports Sent  
 Enable RB 74  
 Enable PSKR 46  
 Dial QRG KHz **14076**  
 Right Click for Menu

Clear Decodes Decode Again

# You Can Also Send Short Text Messages. The White Text is UR3CTB Telling Me that he is Running 30W to a Dipole Antenna

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels  
 L -3  
 R -20  
 Optimum input level is 0 with only background noise present.  
 Digital Audio Gain  
 L: -2  
 R: -6

2011-Jul-23  
 22:56:27

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map Brightness Contrast Speed Gain  
 Blue    5  0  Smooth

Transmitting: UR3CTB WB8IMY RRR  
 TX Text (13 Characters) **TX IN PROGRESS**  
 TX Generated  
 UR3CTB WB8IMY RRR  TX Even  TX Odd

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:55	4	-17	-1.8	840	B 30W DIP 73GL
22:55	14	-6	-0.6	-54	B CQ DX KE1F
22:55	3	-20	-0.8	-229	K ND4X HB9JNM R-18
22:55	12	-14	-1.4	-307	B KD8EZS M6KLO 73
22:55	5	-9	-1.1	-595	B CQ ON5UN JO11
22:55	6	-8	-0.9	-851	B KG4Q SV7LWV -14
22:53	2	-15	-1.8	840	B WB8IMY UR3CTB R-18
22:53	5	-7	0.8	563	B CQ LU8EX GF05
22:53	5	-19	5.4	215	B CQ KF7JGF CN84
22:53	8	-6	-0.6	-156	B CQ DX KE1F
22:53	7	-17	-1.4	-307	K KD8EZS M6KLO -12
22:53	8	-11	-1.6	-544	B VE3DV KF7QGD -17

TX Text (13 Characters) **TX IN PROGRESS**  
 TNX 5W MOBILE

Use buttons below to call CQ and answer callers.

Use buttons below when answering CQ.

TX DF RX DF TX to Call Sign Rpt (-#)  
 840 840  TX DF = RX DF UR3CTB -15

Single Decoder BW  AFC   
 100  Noise Blank

Enable Multi-decoder Reports Sent 101   
 Enable RB 101 Right Click for Menu  
 Enable PSKR 51



# Understanding the *JT65-HF* Decoding Screen

UTC	Sync	dB	DT	DF	Exchange
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43

- **UTC** – When the signal was received.
- **Sync** – A measure of how well the synchronizing tone is being received. Higher is better.
- **dB** - The strength of the received signal in dB. Higher is better. 0 is the upper limit.
- **DT** – The calculated offset of the received signal from your local clock. Values of .3 to 1.9 are typical.
- **DF** – Offset in Hz from the center point (0).

# JT65 Contacts Are Valid For Most Awards

- DXCC
- Worked All States
- Worked All Continents
- Also supported by ARRL's Logbook of The World

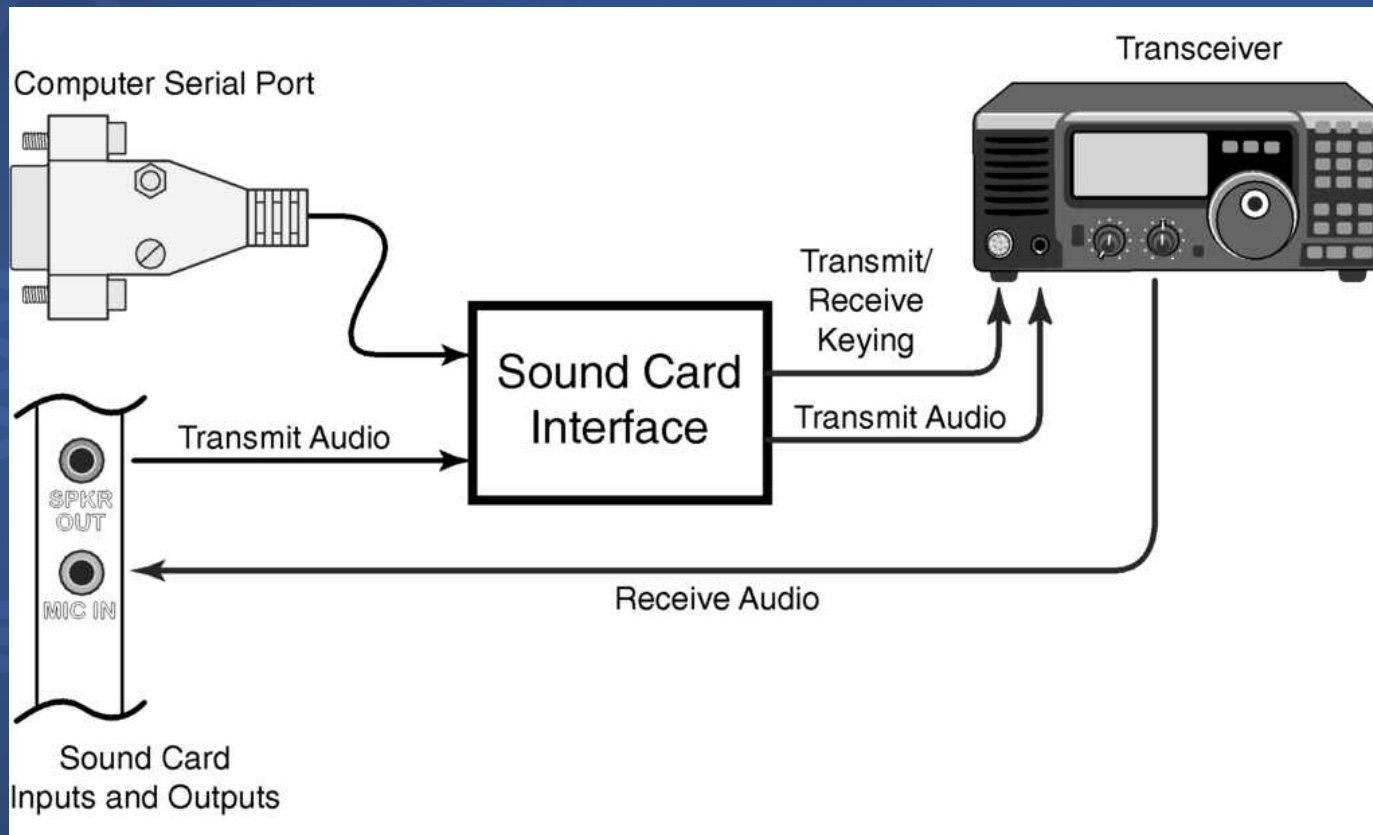
# What Do You Need to Try JT65 on HF?

- SSB Transceiver
- Computer with sound device
- Interface



# Typical Installation

- This installation will work for other sound-card based digital modes



# Download and Install the Free *JT65-HF* Software

- <http://sourceforge.net/projects/jt65-hf/files/>
- <http://iz4czl.ucoz.com/index/0-28>

# The PC should have at Least a 1.5 GHz Processor



- When operating outdoors, I run *JT65-HF* with a 1.5 GHz *Windows Vista* laptop.
- In the station setup screen, you can configure the program to turn off “multi-decoding” when you’re in a QSO. This is helpful when using slower computers.

# Configure the Software First

**Configuration**

Station Setup | Rig Control/PTT | Heard List/PSKR Setup/RB Setup | Macros | Si570 USB Control | Colors | Diagnostics

**Callsign**  **Prefix**  **Suffix**

**Grid (4 or 6 Characters). Required value.**

**Note: Suffix/Prefix is suggested to only be used in situations where you have a legal requirement to do so. You may define a suffix OR a prefix but not both. Suffix/prefix support in the JT65 protocol is a (very) complex issue. My suggestion is to avoid its use if at all possible. Suffix/prefix support in JT65-HF is, at best, incomplete.**

**Sound Input Device**  **Sound Output Device**

**RX Sample Rate**  **TX Sample Rate**   **Enable Automatic RX/TX Sample Rate Correction.**

Automatic adjustment may cause some initial skewing of spectrum display until SR settles. This is harmless. In most cases it is suggested that Automatic sample rate correction be enabled.

- Disable TX after sending same message 15 times. (Runaway TX watchdog)
- Disable Multidecoder while in QSO. Suggested unless you have a fast CPU (>1.5GHz).
- Enable Multidecoder after 2 minutes of no TX (If disabled by option above).
- Restore defaults sets Multidecoder On
- Send CW ID With 73 or Free Text Message
- Save text of decodes and transmissions to file.

**Location of RX/TX history file (JT65hf-log.csv)**

**Save Settings and Close Window**

# “Tell” *JT65-HF* Which COM Port is Used for T/R Switching

**Configuration**

Station Setup | Rig Control/PTT | Heard List/PSKR Setup/RB Setup | Macros | Si570 USB Control | Colors | Diagnostics

**Enter your PTT port into the input box below in the format COM###, for example, COM11**

PTT Port      Test PTT will Key/Unkey your Transceiver. No audio will be sent during test.

            Use Alternate PTT Method. Only enable this if you have problems with PTT.

Ham Radio Deluxe      OmniRig      Commander

Enable       Version 4       Version 5       Enable       Radio 1       Radio 2       Enable



# Accurate Time is Important

- If you have an Internet connection, update your time in *Windows* Control Panel before you start operating. Some say the *Windows* time synchronization isn't adequate for *JT65-HF*, but that hasn't been my experience.
- If you are running *Windows XP*, try *Dimension4*. This program will sync your clock automatically.
- <http://www.thinkman.com/dimension4/>

# What's Your Grid Square?

- Use K2DSL's Web page to determine your grid square from your street address.
- [http://www.levinecentral.com/ham/grid\\_square.php](http://www.levinecentral.com/ham/grid_square.php)

Amateur Radio Ham Radio Maidenhead Grid Square Locator Map

Enter any address, city & state or zip:    
or Enter any call sign:  Data provided by [QRZ.com](http://QRZ.com)   
or Enter any a 4 or 6 character grid square:



Map Satellite Hybrid

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[Delta® - Official Site](#)  
Book Direct and Save on Domestic & International Flights at Delta.com  
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Download Form 171

# JT65 HF Frequencies (All USB)

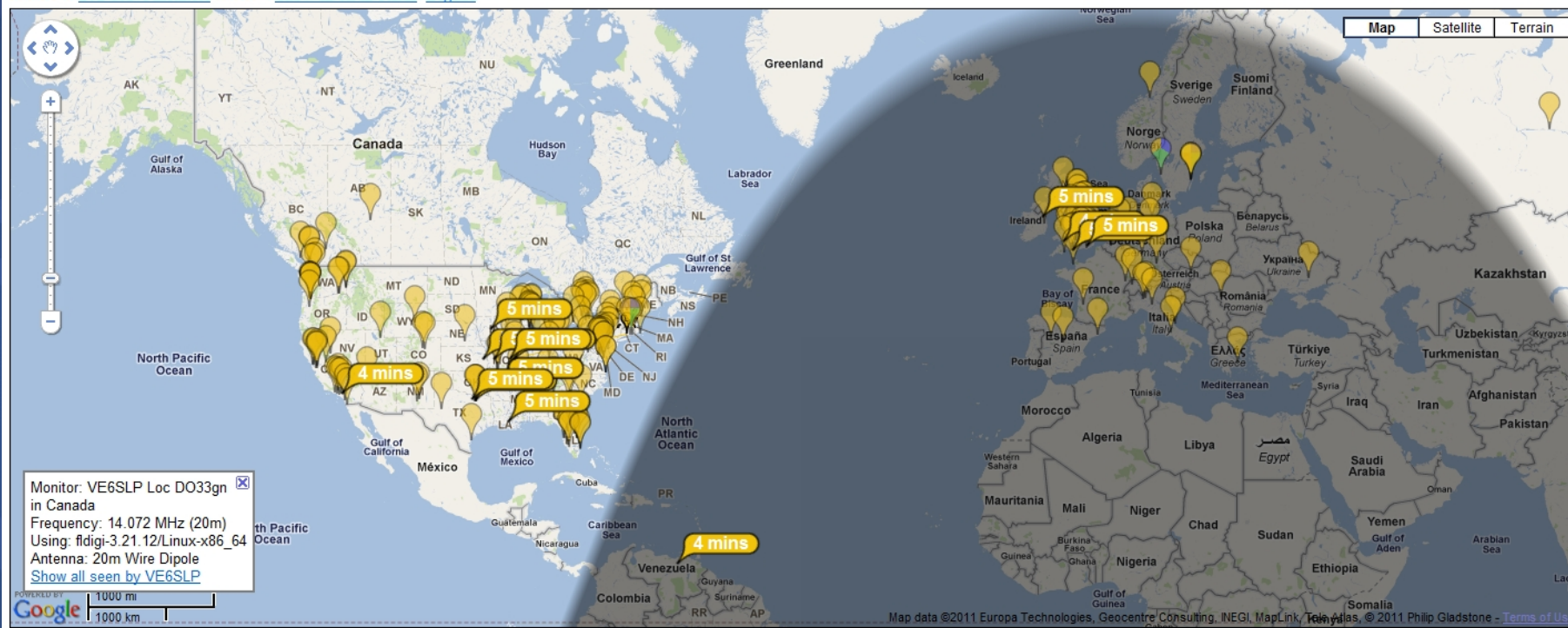
- 1838 kHz
- 3576 kHz
- 7076 kHz (European stations often use 7039 kHz)
- 14076 kHz
- 10139 kHz
- 18102 kHz
- 21076 kHz
- 24920 kHz
- 28076 kHz

# If you have an Internet Connection, You can Participate in the Reporting Network

On  show  sent by   using  over the last  Go! [Display options](#) [Permalink](#)

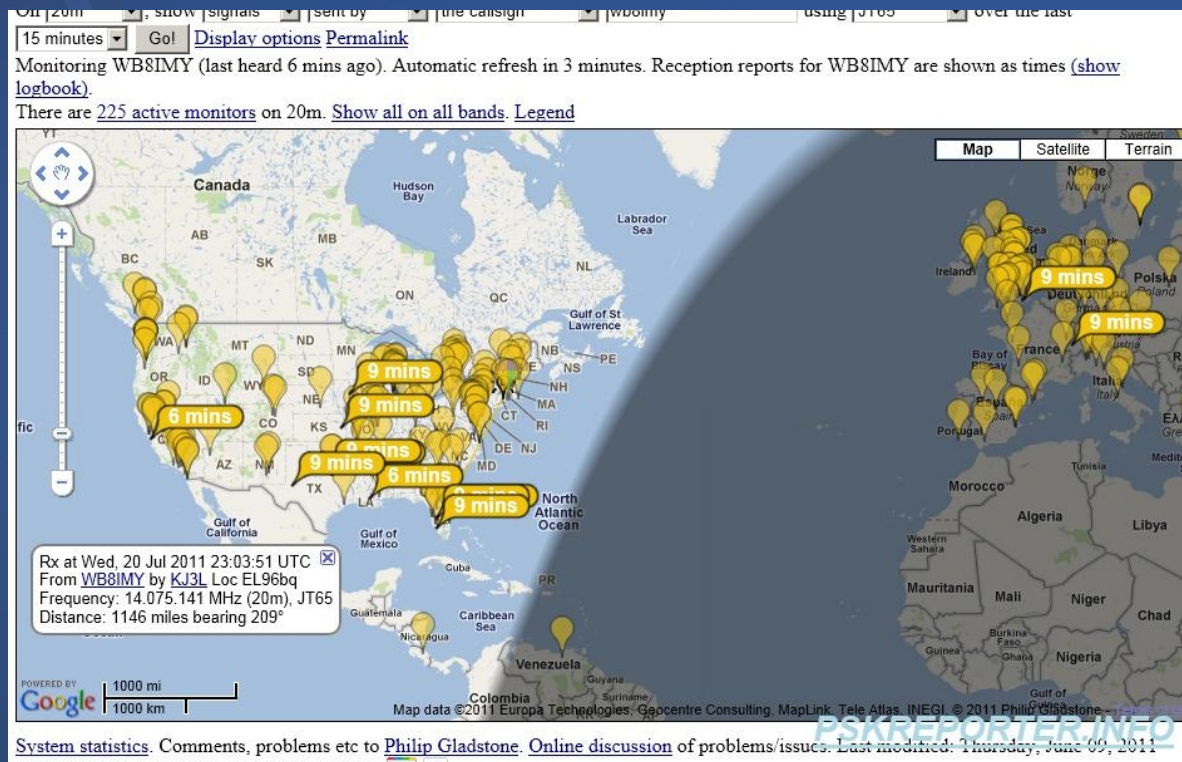
Monitoring WB8IMY (last heard 2 mins ago). Automatic refresh in 5 minutes. Reception reports for WB8IMY are shown as times ([show logbook](#)).

There are [202 active monitors](#) on 20m. [Show all on all bands](#). [Legend](#)



# I Monitored Reception of my 5W Signal on PSKReporter

- <http://pskreporter.info/pskmap.html>



See You on JT65!

