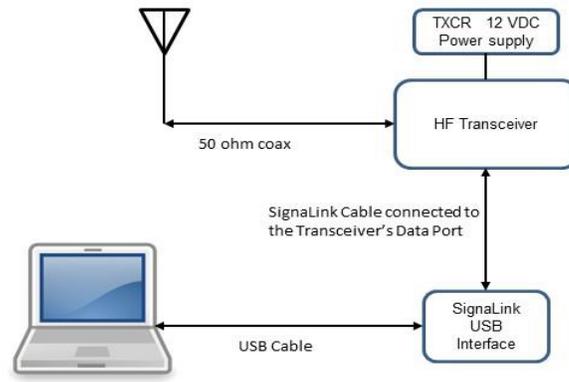


# How to get on the air with FT8

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## KC5RUO Hardware Configuration



- The SignalLink USB interface device on message transmission converts the encoded message symbols into Frequency Shift Key (FSK) audible tones. The SignalLink contains a sound card which produces the FSK tones
- The transceiver modulates the FSK audible tones onto the transmit IF, the IF carrier is upconverted to the desired transmit carrier frequency, amplified, and sent to the antenna.
- Upon receive of an FT8 signal the transceiver amplifies the received signal, downconverts it to the receive IF, demodulates the IF signal to the baseband FSK audible tones and sends them to the SignalLink USB.
- The SignalLink performs an Analog/Digital conversion of the tone and sends the Real (I channel) and Quadrature (Q channel) sampled data to the PC hosted FT8 software.
- The FT8 software derives the audible frequencies and amplitudes for panoramic waterfall display and spectrum display, and demodulates /decodes the FSK tones to derive the encoded data symbol.

### SignalLink USB Device Particulars

- There are several PC -to- transceiver interface devices you can purchase, SignalLink is just one. Some modern transceivers have this functionality build into the unit such that an interface device is not needed.

- If you go with the Signalink USB it is critical you order the correct Signalink Cable that connects to your transceiver's data port. The Signalink USB web site will help you through that selection process. In my case I have two different cables to interface to two different transceiver manufacturers. For my ICOM 718 I use the SLCAB13I cable. For the Yaesu FTdx3000D and the Yaesu FT-891 transceivers I use the SLCAB6PM cable.
- To configure the Signalink for your specific cable and transceiver data port you'll remove the cover from the Signalink device and connect 4 or 5 jumper wires per the provided instructions.
- I have used the Signalink for BPSK31, and now FT8, JT65, and JT9, since Jan 2010 and it has never failed me. It is a good unit and has allowed me to work HF digital communications for a number of years.
- The Signalink installation instructions are very clear and helpful.
- If you procure this unit I will be able to share with you my Signalink configuration.

### **FT8 operations with Signalink USB Interface Device**

- The transceiver is set to Upper Side Band and 100 watt transmit carrier power level.
- The Signalink TX knob sets the actual transmit power level. The FSK audible tones modulates the carrier just as a voice signal modulates the carrier. The greater the FSK tone amplitude, the higher the transmit carrier power.
- The Signalink device also performs the PTT operation.
- Receive level is set using the Signalink RX knob. I usually have it set at the 10 O'Clock position. Usually never less than 9 O'Clock and rarely above 12 O'Clock.
- To set the right receive chain levels, i.e., transceiver front end amplification (with or without preamp), RF Gain level, transceiver set Data receive level, digital noise reduction, and the Signalink receive level will take a little tweeking. I set my levels to minimize the noise seen on the waterfall and to be able to see each received FT8 received signal discretely, if you will. A demo is worth a 1000 words.

### **Transmit Signal Characteristics**

- These are USB 100% duty factor carriers
  - Unlike a voice (phone) USB signal, when the FT8 message is transmitted out over a 12 second period, you are transmitting at full carrier power for that entire 12 seconds. This is a continuous (100% duty cycle) waveform. Hence, it may have some hardware implications on your amateur radio station.
  - For example, if you decide to use an RF tube power amplifier the tubes may not be able to handle a 100% duty factor of a FT8, JT65, or JT9 carrier. They were made for short duration dit/dash CW and phone communications. I eventually blew out my AL-811 RF Power amplifier tubes. Now when I use my RF power amplifier, which by the way is very rare with FT8, JT65 and JT9 weak signal communications modes, I never exceed 100 watts (33 watts power output per tube).
  - Second example, your antenna may have transmit power level limitations unless you use a full legal power capable antenna. I use a Comet CHA-250B raised vertical antenna which contains a ferrite core loading coils antenna matching

unit. Hence, it has transmit power limitations, 250 watts SSB phone and 120 watts CW (includes BPSK31, FT8, JT65, JT9). I usually never exceed 100 watts transmit power otherwise the loading coils heat up and the VSWR goes CRAZY HIGH. Similarly, I use Buddipole raised vertical antennas and they too have a 250 watt maximum requirement. Fortunately, FT8, JT65, and JT9 are weak signal HF digital communication modes and usually anything over 100 watts (depending upon your antenna system of course) is over kill. With the no sun spot propagation conditions we are experiencing now, QSOs can still be made with 50 to 90 watts. If you use a narrow beam antenna system you can get away with much less power.

- So what is the actual transmit frequency?
  - Answer: If you are operating 40 meters, the FT8 carrier frequency is 7.074 MHz. But the actual frequencies you are transmitting = 7.074 MHz + FSK audible tone frequency. Hence, if you select 1500 Hz as your FT8 message transmission frequency, the FT8 FSK tones (there are 8 of them) have a transmission bandwidth of approximately 50 Hz. Therefore, the actual carrier frequency will be anywhere from 7.075500 – to – 7.075550 Hz. More on this in a later email if you are interested.