

DIGITAL COMMUNICATIONS

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Disclaimer:

These are my comments on digital communications and are not necessarily all there is to know on the subject. As with everything computer related – there are at least six ways to do the same thing. Given this caveat, let me say this is opinion and not the complete story. I only relate to you my experience of 5 or more years using digital modes to give you the benefit of my experience. I will leave the rest for you to research as you see fit.

Radio Interface Techniques - Fundamentals

For any soundcard software to work properly, there must be an audio source, an audio output, and a PTT keying arrangement. In its' simplest form, this type of interface only involves your computer, and your radio. The audio source is the speaker of the radio, the audio output is the speakers of your computer, and the PTT arrangement is the PTT button on your rig microphone. Sound acoustically coupled to the computer microphone provides the audio input and the microphone of your rig provides the audio for transmit. Manual keying works for all the keyboard to keyboard modes. This acoustical arrangement is not possible with synchronous modes like PACTOR I or AMTOR. Keying must be under software control at a time decided by the digital software.

While the acoustical setup is exquisitely simple, it is also the least reliable of all the interface choices. Because of the mechanical nature of the interface, external noise in the proximity of the operator may interfere with operation of digital communications on send or receive. Despite the fragile nature of acoustical coupling, it points out how easily the digital ham can set up a digital data point for simple keyboard to keyboard communication, even some image and file transfer modes.

Radio Interface Techniques – Partial Hardwiring

To eliminate the acoustical drawbacks, the radio may be partially hardwired. This means that direct connections may be made from the radio external speaker or headphone output to the soundcard line input or microphone input. The speaker output of the soundcard may be directly wired to the microphone input of the radio. This will work for most modern ham radio models. However, it is highly susceptible to AC hum and RF interference. This should be attempted only when no other method is available.

Radio Interface Techniques – Buffered Hardwiring

Eliminating the AC hum interference is easily accomplished by buffering the input and output with an audio transformer. These devices are small and readily available from a local electronics parts supplier or over the Internet from at least a half dozen sources (Digi-Key, All-Electronics, Newark, etc.). Homebrew computer interfaces may be devised and built for for under \$30 buying everything brand new. One transformer for receive audio and one for transmit audio is all that is necessary. Appropriate connections for the computer soundcard and the rig can be devised to provide the necessary hardwiring through the interface.

Radio Interface Techniques – Buffered Hardwiring with PTT

The majority of soundcard software available to hams use the serial port for keying PTT. By default COM1 is used on Windows computers and TTY1 or SS1 on Linux computers. Some programs may rely on external software interface programs like Ham Radio Deluxe, HamLib, or RigCat for serial port control of the radio. The connection for PTT is the same. The caveat to interfacing the radio is that most modern radios do not use the CCITT RS232 signaling method (+ / - 12 to 23v) for PTT. They use what is known as TTL Logic (+ / - 5v) keying. Older radios may even use a more arcane method dubbed “direct” keying. The point to remember here is that PTT must be interfaced using a level converter of some sort if under computer control. Some manufacturers like ICOM or Kenwood supply external devices that do this conversion for you and provide safe levels to the radio for external serial connections. The homebrew ham can easily provide this interface using a variety of switching techniques. Among the more popular are transistor switching, opto-isolator switching, and MOSFET switching. Any of these methods provide the necessary change of switching levels between the computer and your radio. If purchasing a manufactured interface, there must be adequate information available to determine whether the interface will provide the PTT switching required by your rig.

Radio Interface Techniques – Hardwiring Drawbacks

When making or choosing an interface for digital communication, there are drawbacks to consider. The most annoying is that the soundcard output to the computer speakers is abducted by the radio interface. It is fed directly to the rig microphone input. When choosing an interface for use with your radio and your desire is to hear what is being transmitted and received, the choice of rig interface is dramatically reduced to only a handful of commercial units. Perhaps in an effort to make the interface more affordable, most manufactured units do not have separate switched speaker output to allow for use of the computer speakers in a normal manner. The entire transmit and receive process is conducted in silence (with the possible exception of the rig monitor output if available). For some, the difference in cost (\$50-\$250) is worth it. After working with digital communication for a while or if it is your primary operating mode, you may find the convenience of hearing the nuances of received and transmitted audio, a blessing well worth the extra expense.

Newer rigs have the convenience of Computer Aided Transmission (CAT) or Computer Interface Control (CI-T/V). The availability of which is employed by your rig (if at all) varies widely by manufacturer, model, and year of issue. This highly convenient interface allows the use of the computer to obtain pertinent information from the rig (like operating frequency) automatically. Programs like MixW, MultiPSK, and Ham Radio Deluxe, all incorporate this feature to make control of the radio and logging from the radio a computer-based operation. Having the ability to control the radio and obtain information from the radio through the serial or USB port of the computer is a feature some commercial products incorporate in their feature list. If not, the user must provide such hardware connections separately from the sound card interface.

Not all interface manufacturers provide the appropriate connections for both your computer and your radio. In fact, if you switch radios, there is a very high likelihood that you will need to re-purchase an appropriate interface cable for your new rig for units that service many models. The rig interface cables come in basically two types – accessory port connection and microphone input connection.

The accessory port connection is extremely model and manufacturer specific. Think carefully before spending the \$5-\$15 more for this type cable. The advantage is that these accessory ports contain multiple functions and usually can be adapted so that all transmit, receive, PTT, and CAT functions are provided in a single cable from the rig. The disadvantage is the considerable added expense and the possible loss of multiple functions in the event of electronic failure of the accessory port or cable.

The microphone input cable is much more versatile in that it can easily be replaced by a desk or hand microphone with no change in the radio operation or settings. The disadvantage in using this type of cable for interface is that the level coming from the computer must be considerably lower than would be used for an accessory port. All audio signals must be at the very low microphone levels expected when the desk or hand mic are used. Operationally, care must be taken to keep the levels at a state that does not overdrive the microphone input. When operating PSK for instance, the ALC function should be switched off. If this is not possible, an input level that does not cause the ALC to activate should be used. The other disadvantage is that there is usually a separate connection for Ext. Spkr. Or Headphone output as connection to the soundcard audio input.

The matrix that follows lists features available for commercial computer-rig interfaces and can be used to make a purchase decision.

Feature Decision Matrix

Feature	Price (MSRP)	Isolated Audio	Isolated PTT	Isolated CAT / CI-V	Serial / USB Input	Adaptable Input Cables	Adaptable Output Cables	Level Controls	PTT / Level indicator	Ext Spkr. / Headphone
Model							Mic/Assy			
Rascal GLX	\$79.95	X	X		SU		M	X++		
RIGblaster Nomic	\$59.95	X	X		SU		M	X++		
RIGblaster Plus II	\$159.95	X	X	X	SU	X	M/A	X++	P	X
RIGblaster Pro	\$349.95	X	X	X	SU	X	M/A	X++	PL	X
SignalLink SL-1	\$74.95	X	X		S	X	M/A	X#	P	X
SignalLink Ser	\$99.95	X+	X	X	S	X	M/A	X#	PL	X
SignalLink USB	\$104.95	X+	X	X	U	X	M/A	X#	PL	X
RigExpert Plus	\$315.00	X	X	X	X	X	M/A	X#	PL	X
RigExpert Std	\$215.00	X	X	X	X	X	M	X#	P	
RigExpert Tiny	\$120.00	X	X				M	X++	P	

MFJ 1273	\$59.95	X	X		X		M	X++	P	
MFJ 1275	\$109.95	X	X		X	X	M/A	X++	PL	
MFJ 1279	\$139.95	X	X	X	X	X	M/A	X++	PL	X
US Interface Navigator	#369.99	X	X	X	SU	X	M/A	X+	PL	X

+ This unit has an external sound card built in

++ This unit has output level adjust only

This unit has separate receive and transmit level controls