



MFJ TNC

RIGblaster Sound Card Interface

What is the Difference Between a TNC and a Sound Card Interface for Digital Amateur Radio Communications?

Starting in the November MARC Newsletter we have started a feature we call Phrase-of-the-Month. We will take a item of question or interest and try to expand upon it. This may just be a few words, or in the case of this one, it becomes the intro article. If you have a item of Amateur radio that you would like further information let a MARC Board Member know, we will try to fit it into an upcoming newsletter.

Protocols and Data Transmissions

Before comparing a TNC and a Sound Card Interface, an understanding of few protocols and methods of modulation used by digital signals in amateur radio helps; Protocols are the set of rules that the digital software uses to encode, package, exchange, a decode digital data. Some popular protocols you hear about are Packet, PSK31, PACTOR, and grouping of protocols used in weak signal processing such as JT65, JT9, FT8, and WSPR. Both PSK31 and PACTOR both use a form of Phase Shift Keying (PSK) for modulation of the data signal. Packet, and the WSJT-X protocols all use a form of Frequency Shift Keying (FSK) for their modulation of the data signal. The more typical modulation of data signals used in Ham Radio most people think of is the human voice. This is a set of continuously variable frequencies of tones, and these days often called analog sound. Digital uses a discrete set of audio signals defined by the protocol. PSK uses an amplitude- and phase-modulated waveform that is converted to an audio frequency analog signal by a sound card, resulting in a set of pulses of sound that form the 0 and 1's used by the software on the computer. The various forms of PSK use a specific set of angular degree phase shifts. Standard PSK uses two phases 180 degrees apart, which is why you may also see it called binary phase shift keying (BPSK). Another popular mode is QPSK where the Q is for Quaderature, and it uses 4 phases 90 degrees apart. PACTOR uses a form of PSK called DPSK or DQPSK where the D stands for differential, and rather than look at absolute phase angles, it looks at the relative phase, which makes it more robust with the changing propagation impacts in HF.

FSK and its nearly identical twin audio frequency shift keying (AFSK) in which digital information is transmitted through discrete frequency changes in the modulation. One frequency represents one binary

state (the 0), another frequency represents the other binary state (the 1). With FSK the frequency shift is performed by shifting the transmitters oscillator's frequency with a digital signal. AFSK modulation is performed by changes in the pitch of an audio tone where the discrete tones represent the different binary states.

Packet radio relies upon the AX.25 protocol which is a data link layer protocol X.25 developed by the communications industry (A for Amateur). The data is exchanged in packets called frames, these frames have a set of fields that follow a set of rules that define the packaging of the data. As mentioned earlier, Packet uses frequency shift keying, usually AFSK in VHF/UHF, and FSK in HF. The WSJT-X suite use AFKS in all its protocols on all Upper Side Band frequencies.

Terminal Node Controller

In amateur radio a TNC (terminal node controller) is a device generally for use with VHF/UHF Packet. This device consists of a microprocessor, a modem, and embedded software that implements the AX.25 protocol, telnet command line interface, and push-to-talk control of the transceiver. The telnet command line interface allows the user to interact with the TNC. Because the TNC contains all the intelligence needed to communicate over an AX.25 network, no external computer is required. All of the network's resources can be accessed using a dumb terminal. When configuring a TNC on a PC, a dumb terminal emulator is often used to validate connectivity. When sending email via Packet with software like WinLink Express, it interfaces through this telnet interface to send the commands to the TNC to inform it of the email to send, and it is the TNC which handles all the Packet protocols, and triggers the PTT on transmit requests.

Notice that the TNC also has a modem. This modem is nothing more than a sound card that is provides the Digital to Analog Conversions of the signal to send to the radio on transmit, and Analog to Digital Conversions on receive. For transceiver connectivity, the "speaker" of the sound card is connected to the microphone of the transceiver's data port and the "microphone" of the sound card is connected to speaker of the transceiver's data port. PTT control is either handled via a USB serial connection or a true RS232 serial connection.

Sound Card Interface

This is basically just the modem part of the TNC. Though these often have a better digital signal processing hardware, possibly up to 24 bits and 96000 Hz sampling rates. There is no embedded processor and usually simple circuitry for triggering the push-to-talk. So if you want to do Packet with a Sound Card Interface, you will need a piece of software on your computer that provides the functionality of software embedded in the TNC, including the telnet interface. The most well known software for performing this is called AGWPE and many MARC members are using this for their APRS systems. Another is SoundModem that I use to run Winlink Packet with my FT857 at UHF/VHF frequencies via a Signalink sound card interface. The sound card built into you PC can do most of these same functions, though most external interfaces have AC coupled sound cards, isolating the PC, and removing frequencies below 20 Hz. The advantage of a Sound Card interface is they have built in PTT circuitry and work with your transceiver. Most vendors also provide the cabling to fit you transceiver.+ If using a PC's internal sound card, you must devise your own transceiver interface for PTT.

As mentioned earlier, a TNC is generally used for VHF/UHF packet. But a Sound Card Interface can be used in its place with additional software. A TNC is rarely used for HF if not at all, nearly all software HF digital expects a Sound Card Interface, with the HF software providing all that is necessary for the protocol selected. All my WSPR related articles in previous MARC newsletters have been written with Sound Card Modem as the interface of the radio and computer.