

Packet Radio Basics

Introduction to Packet Radio operation with emphasis on parameters and connecting with other stations, nodes, clusters, digis or BBS'.

3 parts to a Packet Radio Station

Radio – for class purpose, a VHF 2m mobile or HT.

Computer – A laptop or desktop unit with terminal software.

TNC – Terminal Node Controller – or Modem

Radio

For the purposes of this class, we will be using 2 meter rigs, both HT's and Mobiles. As is normal operating procedure, please reduce the power level of your rig to the absolute minimum necessary to achieve connectivity. 5 watts of power is all you would ever need for this type of exercise, and if possible, less in the case of HT's.

The Radio to TNC cable is probably the most crucial component, besides remembering to hook up the antenna and power to your rig. Sometimes the cables require two connections on a Radio – the Mic port and the speaker jack. If one becomes loose or disconnected, not much will happen except operator anxiety.

Some configurations between Radios and TNC's require the radio to be set up properly as well as tuned. Squelch may have some impact as to the ability of your station to make a successful connection. If set too high, it may not 'hear' the acknowledgment sent by the remote station.

A simple checklist of parameters, cabling and reminders would be a great help during times of emergency or stress. For best results, attach it to your rig or TNC.

Computer

Many computer operating systems come packaged with or have available simple terminal programs. These are the simplest of programs, provided primarily for troubleshooting connections. It is possible to use these simple terminal programs to operate packet, but by no means the easiest way.

There are many free or 'included' software programs that will provide an easier interface as well as tools to make the operator's job simpler. Not all programs will work with all TNC's, so try them out before you need them.

Some programs like AirMail have multiple programs within a suite, giving more options and enhanced capabilities like sending email messages with attachments between systems.

If you have a choice in the matter, find a computer that is low power, can be run from a 12v source and has an external serial port . Older laptops will have serial port connections while the newer ones may only have USB available. Not all USB to serial converters have been show to work properly, so ask for assistance and choose wisely.

TNC – Terminal Node Controller

The interface between the Radio and the Computer. This device translates the digital signal from the computer to an analog modulated signal that can be sent over RF, as well as back again. It is simply put, a Modem – Modulator and Demodulator.

Not all TNC's were created equal. There are different versions of hardware and firmware that can limit your ability to fully function in the modern packet environment. Some units available on the popular auction sites may not be able to perform all of the functions you would like them to... caveat emptor.

The TNC connects to the computer via a serial cable – please note that a Null Modem cable will not work. Verify that it is a straight through serial cable, not a Null Modem. When in doubt, have a spare cable to test with. Serial cables have rarely but sometimes been known to go bad. In most cases, the computer will have a 9 pin serial port, and the TNC will have a 25 pin port. Of course, not all pins are used in the cable, but are thankfully standard as far as the serial communication is concerned.

Connecting the TNC to the Radio is usually the trickiest part of packet radio operation. Ready made cables can be purchased to go between specific radios and TNC's, or they can be created. You can count on at least 4 separate connections with VHF/UHF Radio to TNC cables: TX, RX, Ground and PTT. If one is bad, two way communication will not occur.

Some example modern TNC's are Kantronics, HAL, RigBlaster, BayCom, MFJ, PK-232, Tasco. Ask other amateurs what they chose and why.

What's A Packet?

A packet is a group of bits (binary digits) structured and standardized that has contained within it the addressing information, message, error-checking and control information. The information is organized into a Frame. A Frame is a set sized template for sending information.

The Amateur X.25 protocol or AX.25 Protocol is the manner in which we send frames. Both the sending and receiving TNC is programmed to encode into frames to be sent, and decode received frames.

Three different types of Frames: Unnumbered, Supervisory, Information.

Unnumbered - begins connections, ends connections and allows for CQ.

Supervisory - maintains the connection, assures organization and readiness of sender and receiver.

Information – contains “from and to callsigns and path” as well as actual information to be transmitted.

What is an SSID?

(Secondary Station Identification) – callsign-1 through callsign-15.

Usually your callsign by itself is considered callsign-0. By some standards, using a ssid of 1 denotes your mailbox. You may have up to 16 of your callsign active at any one time, each with a unique number identifier (SSID). No duplicates are allowed at any one time.

The Packet Network

Many selfless amateurs have invested much time and money into setting up, configuring and maintaining routes around the world in which to pass traffic via packet and other modes. Digipeaters, Nodes, BBS's and Clusters are tools that can be used to communicate with packet over a wide area. Each of these network parts has an amateur callsign and SSID assigned to them. They may also have an Alias. Using an alias instead of a callsign and SSID can help amateurs remember nodes. Some examples of aliases used in our area are SPOKN, SPOKN1, SPOKN2, PULLMN, NUKE, ORFINO, ARESGW, ARESDX, SPODX. *When sending packet mail, use of the aliases will not work but the callsign –ssid will.* The network is very similar to a computing network as exists in businesses and schools. If you were to divide the Packet Network into two parts, it would be 'User Area' and 'Backbone'. User Areas are available to anyone, but Backbone areas and frequencies should be avoided. If someone tries to utilize the backbone for connecting to remote sites, they could very well bring a major part of the system down.

What is a Digipeater?

Digipeater is the term we use to describe a packet radio digital repeater. Unlike the FM voice repeaters, most digipeaters operate on simplex and do not receive and transmit simultaneously. They receive the digital information, temporarily store it and then turn around and retransmit it. Digipeaters are used primarily to assist low power stations to reach further. Sometimes your propagation path will not allow a direct connection to your intended recipient – a digipeater may be able to provide a solid connection.

Your TNC will allow you to enter up to eight digipeaters in your connect sequence, but using more than 3 usually means long waits, lots of repeated packets, and frequent disconnects, due to noise and other signals encountered on the frequency.

Please note: There cannot be spaces between the digipeaters names; they are separated only by commas.

Example: **C K7PKT VIA digip-1,digip-2,digip-3** (a v can be used in place of via)

Digipeaters are like springboard stepping-stones. A digipeater is a User Area.

You will need to know what digipeaters are out there before you begin randomly trying to connect to someone. Turn MONITOR ON and watch for the paths that other stations are using.

What's a Node?

Part of the packet network, it's a device that allows you to connect to other parts of the network - similar to a telephone switchboard. Nodes establish routes and remember where other nodes are. Properly configured nodes can have a very extensive list of routes to other nodes even in different states or countries. A node may have multiple ports as well as multiple operating frequencies. Nodes are more effective at "getting someplace" than digipeaters as they have established links and can provide the most direct route. A node is a tool to allow users to get to other places easier and faster. A node is a User Area. There are usually menu options available when you are connected to a node – simply type a question mark or help to get the list of commands available on that node.

What is a BBS?

A BBS or Bulletin Board System is a message center and information store. You are able to connect to the BBS, send messages, retrieve messages and read bulletins or announcements. Not only is a BBS a User Area, it's designed to be user friendly. One of the most common features of a BBS is an online extensive help file. Try typing help or simply typing a question mark to get this help file.

What's a Cluster?

It's a conference room, a Node, a BBS all rolled up into one. When you connect to a cluster you can retrieve messages, read news and bulletins, send messages as well as participate in conferences. Behind the scenes, the cluster is communicating on the Backbone and transferring messages, news and network updates to other parts of the packet network. It's a multiuser, multiconnect tool designed for a specific purpose or group use. A cluster is very effective for Emergency Communication use because of it's real-time functionality.

What is Keyboard to Keyboard?

Keyboard to Keyboard is simply a direct connection with another user, both of you able to send and receive each others messages. If both parties have CONOK set to ON, connecting will be easy.

What Packet Software Should I use?

There are many different terminal software packages out there that are available and free. One of the least complication and most available is the HyperTerm software that comes standard with Windows OS's. Others include WinPack, PacketWin, Yapp, Buxterm, PacTerm, Airmail (Packet Client) and Hostmaster just to name a few. Some of these programs are proprietary to specific TNC's so be aware of that possibility.

Undoubtedly, once you start with a specific program you'll have an affinity for that program as it was your first. It is recommended that you learn multiple packet programs so you'll be able to use what is available in the event of an emergency.

Common TNC Commands

The following list of commands are common to modern TNC's:

MYCALL or MY **callsign**

This is the callsign of the amateur station. Typing MY will give the current callsign.

ECHO **on or off**

if characters are repeated, or echoed on the screen, turning ECHO OFF should help.

CONOK **on or off**

On, users will be able to connect automatically to you. Off, all connect attempts are denied.

DWAIT **Range 16-30**

Number of time units the TNC will wait after last hearing data before it transmits.

FRACK or FRA **Range 7-11**

Determines how long your TNC will wait for an acknowledgment before resending a packet.

MAXFRAME or MAXF **Range 4-7**

the upper limit on the number of unacknowledged outstanding packets the TNC can have.

PACLEN or PACL **230**

Indicates the number of characters in the packets you transmit

RETRY **10**

The number of times the TNC will try to get the packet through before disconnecting.

TXDELAY **Range 25-35**

Tells the TNC how long to wait before sending data after it has keyed the transmitter.

MCON **on or off**

Monitor other frames while connected.

MALL **on or off**

Monitor connected and unconnected (unproto) frames.

MCOM **on or off**

Monitor only data or all frames.

CTRL-C

For command mode. Will return with the CMD: prompt

CONNECT **<station, node, digi, cluster, bbs>**

To connect to a station, type CONNECT or just C, then a space, then the destination.

DISCONNECT

To cancel or disconnect from another station or cease a connect attempt.

CONVERS Enter CONV mode from CMD: (Alt is "K")

This is an immediate command to enter the converse mode from Command Mode.

Simple Rules to keep in mind:

Keep power low. Remember it's simplex.

Learn to use the Question Mark "?" to find out what commands are available when connected to a node or cluster.

Make sure to properly exit a node - use the Bye – or B to exit the system, or Q for Quit.

Know your settings for FRACK, PACLEN and MAXFRAME

Sending Traffic via Packet

Packet is a very reliable method by which we can send traffic. It's been used for emergencies before, an example being during Ice Storm '96. It is precise as well as easy to copy. Once set up, it's reliable and bandwidth thrifty. Multiple stations can be utilizing the same frequency. A packet station normally has a lower duty cycle than a voice station.

How To Make a Packet Radiogram – Without using the NTS Form

Remember that you need a preamble, the address, the body of the message and the signature.

Number Precedence Handling Station of Origin Check Place of origin Time Filed Date

Example:

10 Routine HXB K7PKT 14 Spokane Valley, WA 1200Local January 17, 2009

**Scott Grimmett, AD7KV
509-993-9968**

**Scott x thanks for getting
us organized at the training
meeting x please confirm receipt**

Todd Cady, K7PKT

Note: You do not have to have the form to be able to send messages by packet.

Confirmation of Receipt

It is very good practice that we receive confirmation of receipt for all messages. This is much simpler when using voice, but not as guaranteed when using digital modes. Packet messages and Winlink email can be stored for later retrieval, not requiring that another station be present and active at the time of sending. Because of this convenience, the receiving station needs to send another message stating that they have received the message, thereby confirming with the originating station. It is preferred that the confirmation be sent within the hour.

<http://www.vhfclub.org/>

Packet Node Stack South Connect Procedure

145.010 - C WR7VHF-3 then C WR7VHF-2 then C WR7VHF or
C SPOKN1 then C #SLAN2 then C WR7VHF

You will need to send three separate B (Bye) commands to disconnect.

Packet Node Stack North Connect Procedure

145.090 - C WR7VHF-4 then C 2 WR7VHF or
C SPOKN2 then C 2 WR7VHF

Packet Node, Cluster, BBS, RMS Connect Procedure

144.93 – C K7PKT

144.93 – C KC7AAD-2 (up on Lookout Point), C K7PKT

Node

Cluster

BBS

RMS