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Emergency Management Office, Fulton, NY 13069



Packet Radio Suggested Operating Guidelines

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INTRODUCTION TO PACKET RADIO - PART 1

by Larry Kenney, WB9LOZ (Parts are reproduced here from the original published in 1986. For a complete version go to www.choisser.com/hamradio/packet.html.)

WHAT IS PACKET RADIO?

A SHORT HISTORY - HOW IT ALL BEGAN

It was in March, 1980, that the Federal Communications Commission approved the transmission of ASCII for Amateur Radio in the United States. That was a year and a half after Canadian hams had been authorized to transmit digital “packet radio”, and the Canadians had already been working on a protocol for it. Doug Lockhart, VE7APU, of Vancouver, British Columbia, had developed a device that he called a terminal node controller (TNC). It worked with a modem to convert ASCII to modulated tones and convert the demodulated tones back to ASCII. Doug had also formed the Vancouver Amateur Digital Communications Group (VADCG) and named his TNC the “VADCG board”.

Hams here in the U.S. started experimenting with the VADCG board, but in December, 1980, a ham from the San Francisco Bay Area, Hank Magnuski, KA6M, put a digital repeater on 2 meters using a TNC that he had developed. A group of hams interested in Hank’s TNC started working together on further developments in packet radio and formed the Pacific Packet Radio Society (PPRS). AMRAD, the Amateur Radio Research and Development Corporation, in Washington, DC became the center for packet work on the east coast, and in 1981 a group of hams in Tucson, Arizona, founded the Tucson Amateur Packet Radio Corporation (TAPR).

Working together these groups developed a modified version of the commercial X.25 protocol called Amateur X.25 (AX.25) and in November, 1983, TAPR released the first TNC in kit form, the TAPR TNC1. In 1984, a great deal of packet experimentation was done, software for packet bulletin board systems was developed, and packet radio started becoming more and more popular all across the U.S. and Canada.

Packet Radio was one of the major developments to hit the world of Amateur Radio and thousands of hams soon caught the “packet bug”. If you’re wondering what it’s all about and why so many people got so excited about it, continue reading. You’re about to find out.

PACKET RADIO - WHAT IT’S ALL ABOUT

Packet seems to offer something different from other facets of Amateur Radio, yet it can be used for everything from a local QSO to a DX contact thousands of miles away, for electronic mail, message transmission, emergency communications, or just plain tinkering in the world of digital communications. It presents a new challenge for those tired of the QRM on the low bands, a new mode for those already on FM, and a better, faster means of message handling for those on RTTY. Packet is for the rag chewer, the traffic handler, the experimenter, and the casual operator.



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A ham can get involved very easily with relatively small out-of-pocket expenses. All you need is a transceiver, a computer, and a TNC or special packet modem and software. A two-meter rig is preferred, since that's where most of the packet activity is located. You probably already have the rig and the computer, so all you need to buy is the TNC, which costs just over \$100, or the special modem and software, which sell together for about \$50.

The **TNC**, the Terminal Node Controller, is a "little black box" that's wired between the computer and the radio. It contains software for controlling the outgoing and incoming transmissions for your station and a modem that converts the data from the computer into AFSK tones for transmission and changes the tones that are received by the radio into data for the computer. The TNC modem works much like a modem that's used to connect your computer to the telephone lines. It's a simple matter of wiring up a plug and a couple of jacks to become fully operational on packet. If you prefer to use the small modem instead of a TNC, you'll need special software for your computer to replace the software in the TNC. Either method works equally well.

Packet is communications between people either direct or indirect. You can work "keyboard to keyboard" or use electronic mailboxes or bulletin board systems to leave messages. Due to the error checking by the TNC, all of it is error free, too. (That is, as error free as the person at the keyboard types it!) As the data is received it's continuously checked for errors, and it isn't accepted unless it's correct. You don't miss the information if it has errors, however, because the information is resent until it is correctly received.

The data that is to be transmitted is collected in the TNC and sent as bursts, or packets, of information, hence the name. Each packet has the callsign or address of who it's going to, who it's coming from and the route between the two stations included, along with the data and error checking. Since up to 256 characters can be included in each packet, more than three lines of text can be sent in a matter of a couple of seconds. There is also plenty of time between packets for several stations to be using the same frequency at the same time.

If all of this sounds confusing, don't let it bother you, because the TNC or special packet software does everything for you automatically. Packet radio might seem very confusing at first, but in a day or two you'll be in there with the best of them. In this series I'll be telling you all about packet radio - how you get on the air and how to use it. We'll talk about the little black box, the TNC, and tell you about all its inner-most secrets. We'll discuss mailboxes, bulletin board systems, and the packet networks that allow you to work stations hundreds, even thousands, of miles away using just a low powered rig on 2 meters, 220 or 450. The world of packet radio awaits you!

INTRODUCTION TO PACKET RADIO - PART 2

In the first part of this series I told you, in general terms, what packet radio was all about. Now I'm going to tell you how to get on the air, make a QSO, and become familiar with your packet station. Whether you're new to packet, have been involved for just a short time, or are one of the "old timers", this series should help all of you. Even if you don't yet have equipment to get on the air, you should keep this series of articles handy for future use. I'll bet you'll be joining us soon!

The equipment that's needed to get on the air with packet is a transceiver, a computer or terminal, and a TNC - a terminal node controller - the little black box I talked about in part 1. Or, if you're using a computer, not just a terminal, you can use special software and a small packet modem instead of a TNC. You need a special modem, though, not one that's used to connect your computer to the telephone line. The tones used for packet are different than those used on the phone.



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I highly recommend that you start with a 2 meter transceiver. There is packet activity on 220, 440 and HF, but 2 meters is where most of the action is and that's the best place to start.

When you buy a TNC or packet modem and take it out of the box, you'll find a cable supplied for connecting it to the radio, but you'll have to attach the appropriate mic and speaker jack connectors for the radio you're going to use. You'll have to furnish the cable that connects the TNC to your computer or terminal. In most cases, the TNC or modem is connected to the standard RS-232 communications port of the computer. On a PC this port is called a serial or COM port. On other systems it may be referred to as a telecommunications port or telephone port. You can make up the cable that goes between the TNC and computer yourself, or you can purchase it at a local computer store. As an option, you may be able to purchase one or both of the needed cables from the manufacturer of your TNC with the appropriate connector's factory installed for your particular radio and computer. The operating manuals that are supplied with TNCs and modems have a good description of the cabling needed for the various computers. Please read the introduction and set up procedures for your particular TNC or packet modem very carefully. Most companies have supplied excellent manuals, and you shouldn't have any trouble figuring out your particular set up from the information supplied in the manual.

Once you have everything connected as described above, you've completed the hardware phase of the installation. Now you need to turn your attention to software. If you're using a TNC, you'll need a terminal or communications program for your computer. Any software used for a telephone modem, such as Procomm or the Windows Terminal program, will work well for packet. There are also many special programs that have been developed specifically for packet radio use, such as PC PACRATT, MFJCOM, PAKET, PacketGold, TPK, etc. If you're using the small modem instead of a TNC, you'll need to use the special packet software written for the modem, such as Baycom. Read the instructions carefully for setting up the program on your computer.

No matter what software you use, you'll have to specify the communications port you'll be using and set the baud rate (data rate) and data parameters for that port. (Note: There are two baud rates associated with your packet station: 1-the baud rate between your computer and TNC and 2-the baud rate of the packets on the air. Here I am discussing the first of these baud rates. The second will be discussed in part 3 of this series.) Refer to the manual or help information for the specific program you've chosen, to set the baud rate and data parameters. The baud rate of your computer must match the baud rate of your TNC. Some TNCs will automatically set their baud rate to match the computer. Other TNCs have software commands or switches for setting the baud rate. Again, you'll need to refer to your manual for specific instructions. When setting the data parameters, 8-N-1 is normally used: 8 data bits, no parity, 1 stop bit. But like the baud rate, the computer and TNC parameters must match.

Now I need to point out the various levels of communicating you can do from the keyboard. First, you can communicate with your computer for setting up your software program; second, you can communicate with the TNC or packet software; and third, you can send data over the radio. It's very important that you know which level you're in when working packet. You need to know where your keystrokes are going! If you're not using a TNC, you will have to figure out the difference between software set up and software usage. This is explained in the program instructions.

Once you have your communications program or packet software up and running, you can move on to the next step. If you're using a TNC, you now need to set it up. First, turn it on. You should get a "greeting" or sign on message from the TNC on your screen showing the manufacturer's name, the software version, a date, etc. If you see a bunch of gibberish, such as &tf\$d.h#sxn, it means that the parameters of the TNC and computer don't agree and you'll have to make adjustments. If you don't see a "greeting" or the gibberish, check your cables and connections. Make sure that you have everything connected properly, that the right wires are on the right pins, and so on.

Next, do a "control C" (press the CNTL and the letter C simultaneously); this puts the TNC in COMMAND mode, the level where you communicate directly with the TNC from the keyboard. You should see "cmd:" on your screen. Enter: MYCALL - - - - with your call sign in place of the dashed lines (such as: MYCALL WB9LOZ) followed by



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a carriage return <CR>. (The carriage return key is labeled “Enter” or “Return” on most keyboards.) All commands must be followed by a <CR>. This sets into the TNC memory the call that you’re going to use on the air. Now if you type MYCALL <CR>, it should respond with your callsign. If it does, you’ve proven that the computer to TNC link is working fine. If you do not see anything on the screen when you type, blindly enter the following: ECHO ON <CR>. If you see two of everything that you type, such as MMYCCAALLLL, enter ECHO OFF <CR>.

Now enter the following commands: MONITOR ON <CR> MRPT ON <CR>

For those using packet software and a modem instead of a TNC, you should have already entered your callsign in the configuration file during the set up procedure. If you have not, refer to the software instructions for preparing the configuration file for your station. Also note that with this software, you don’t enter Control C to go into command mode. You simply use the ESC (Escape) key prior to entering each command.

You’re now ready to go on the air! Turn on your radio, make sure the volume is turned up about a third of a turn (about the “10 or 11 o’clock” position) and make sure the squelch is set. It should be at the point where the background noise disappears, just as it would be set for a voice QSO. Tune the receiver to any odd numbered frequency between 144.91 and 145.09 or 145.61 and 145.79 MHz and set the rig for simplex operation. You might have to tune around for a frequency with activity in your area. Watch your screen. You should soon be seeing the packets that are being sent over the air by other stations.

Let’s look at what you might see. You should see something similar to this:

WB9LOZ > W6PW-3: The meeting will be held at 8:00 pm. This shows a packet being sent by WB9LOZ to W6PW-3. Watch for callsigns with asterisks next to them in packets that look like this:

WB9LOZ > W6PW-3,W6PW-1*: The meeting will be held at 8:00 pm. The asterisk indicates that you’re receiving the packet from W6PW-1, not the originating station, WB9LOZ. The packets are being digitally repeated, or digipeated, by W6PW-1. The station that’s doing the digipeating is called a digipeater. You’ll also note that some stations are using names or a series of letters rather than callsigns. You might see something like SFW, BERKLY, or BLUE. These are packet stations set up to operate as nodes. The stations are usually located in higher locations, and they’re installed to make connections to other stations easier. They often use a name or letters, called an alias, that identify their location. They send both their alias and callsign at 10 minute intervals to identify themselves and to be legal. (Both digipeaters and nodes will be discussed in detail in a later part of this series.)

You’ll also notice that some callsigns have a trailing number attached to them. On packet you can have up to 16 different stations on the air at the same time using the same callsign. That’s where the numbers at the end of the callsign come into play. The calls W6PW, W6PW-1, W6PW-2, W6PW-3, W6PW-4 and W6PW-5 are all individual stations operating under the same station license. A callsign without a number is the same as -0. These numbers are called Secondary Station IDs or SSIDs, and are used to differentiate between the various stations. There should never be more than one station using the same callsign and SSID on the air at the same time.

Now that you’re familiar with what you might see on packet, you’re ready to make your first packet QSO! If you’re using a TNC, make sure it’s still in command mode. (Remember, it’s Control-C.) Watch for a familiar call on the screen or note calls you see frequently. Be sure to note whether or not a digipeater is being used. When the station you want to contact is finished with his QSO, enter the command: C ---- or C ---- V ---- (depending on whether or not a digipeater is needed) followed by <CR>. Replace the dashed lines after the “C” with the call of the station you want to contact and the dashed lines after the “V” with the digipeater call, if needed. Don’t forget the SSID if the call has one. The C means CONNECT and the V means VIA. C WB9LOZ V W6PW-1 means connect to WB9LOZ via W6PW-1. If you’re successful, you should soon see “**** CONNECTED TO (callsign)” on your screen and your first packet QSO is underway!



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You have now entered the third level of communications, called CONVERSE mode, and this is where you communicate from the keyboard to the radio. Anything you type on the keyboard will be transmitted over the air as a packet every time you hit a <CR> and it will appear on the other station's screen. Anything sent by the other station will be transmitted to you and will appear on your screen.

When you're finished with your QSO, be sure to do a CONTROL C to get back into command mode on your TNC, or hit the ESC key if using the packet software, then enter D to disconnect from the other station. You'll see "DISCONNECTED" on the screen. If you get connected to a station but you don't receive a response, you might have reached an unattended station or a node. Don't despair, disconnect and try someone else.

You're on the way now to lots of packet fun and adventure! If you are still having problems at this point, contact a friend that has some experience on packet and ask for help. The initial set up of the computer, TNC, software and radio is probably the biggest stumbling block in packet. Any experienced packet operator will be happy to help you get through this process to get you on the air.

INTRODUCTION TO PACKET RADIO - PART 3

In Part 2 I talked about how to get on the air and make your first QSO. Now let's take a look at some of the commands that are available in your TNC or packet software to help improve your station operation.

The TNC (Terminal Node Controller) has more than 100 different commands available for you to use. You're able to customize your packet operating with these commands and turn on and off various features as you wish. Not all TNCs are exactly alike, but all have pretty much the same set of commands. I'll be using the command set in the TNC2 and clones in my examples. You might want to check the command list in your TNC operating manual to see if your TNC uses the commands as I indicate here.

For those of you who are using the packet software and modem instead of a TNC, you'll find a list of the commands in your help documentation. You will find that some of the commands cannot be modified while the software is running. Some have to be changed with the program's configuration file. Check the help document for instructions on how to change these commands in your particular software.

We covered a few of the commands previously: CONTROL C for entering command mode, MYCALL, MONITOR, ECHO, CONNECT, and DISCONNECT. (Refer to Part 2 if you need information on these commands.) Now let's discuss a few that will affect the way your station functions on the air.

CONV (converse mode): Your TNC will automatically switch to this mode when you connect with someone, but you can also switch to this mode by entering CONV <CR> at the Cmd: prompt. When you're in converse mode and are NOT connected to another station, anything you type will be transmitted via the path you set with the UNPROTO command. (See the next paragraph for UNPROTO.) Packets sent via UNPROTO are sent only once and are not acknowledge-edged, so there is no guarantee that they'll get through. This mode is used frequently for sending CQ's.

UNPROTO: Designates the path used when you send BEACONS or when you're in converse mode and NOT connected to another station. The default is CQ, but you can enter a series of digipeaters if you wish, or a specific group or club name. Some examples:



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CQ v WB6SDS-2,W6SG-1,AJ7L SFARC v W6PW-1,W6PW-4 If you include digipeaters in your UNPROTO path, you will have to change the information for each frequency you use. (BEACONS will be discussed in a later part of this series.)

FRACK: Determines how long your TNC will wait for an acknowledgement before resending a packet. It shouldn't be set too low, or you'll simply clutter up the frequency, yet it shouldn't be too high, or you'll spend too much time waiting. I use FRACK set to 7, and have found that to be a good overall value.

DWAIT: Used to avoid collisions, DWAIT is the number of time units the TNC will wait after last hearing data on the channel before it transmits. I have DWAIT set to 16, and have found that to work well.

PACLEN: Indicates the number of characters in the packets you transmit, ranging from 0 to 255. (A value of 0 equals 256.) The more characters you send per packet, the longer it takes to transmit the information and the greater your chances are of noise, interference or another station wiping it out. I've found a PACLEN of 80, which is the length of one line, to be a good value. When working a station nearby, PACLEN can be increased. When working a distant station, it should be decreased.

RETRY: Your TNC will retransmit a packet if it doesn't receive an acknowledgement from the station you're working. RETRY indicates the number of times the TNC will try to get the packet through before giving up and disconnecting. This can be set from 0 to 15, but I've found 8 to 10 to work well. Less than that causes an unnecessary disconnect if the channel happens to be busy, but more than that clutters up the channel. Do NOT set RETRY to 0. That means infinite retries, and serves no useful purpose. It simply clutters up the frequency needlessly.

The following commands affect "monitoring", which is what you see on your screen from stations you're NOT connected to.

MONITOR: This must be ON for you to monitor anything. When ON, you see packets from other stations on the frequency you're tuned to. What packets you see is determined by other commands from the list below. If MONITOR is OFF, you only see the packets that are sent to you while you're connected to another station.

Note: On some TNCs, such as the AEA PK-232, monitoring functions are selected by a number after the MONITOR command, such as MONITOR 3 or M 3. Refer to your TNC operating manual for details.

MALL: If MALL is ON, you receive packets from stations that are connected to other stations, as well as packets sent in unproto (unconnected) mode. This should be ON for "reading the mail". If MALL is OFF, you receive only packets sent in unproto mode by other stations.

MCOM: If ON, you see connect <C or SABM>, disconnect <D>, acknowledge <UA> and busy <DM> frames in addition to information packets. If OFF, only information packets are seen.

MCON: If ON, you see packets from other stations while you're connected to someone else. This can get very confusing, but is useful when your path is bad and you want to see if your packets are being digipeated okay. If OFF, the monitoring of other stations is stopped when you're connected to another station.

MRPT: If ON, you see a display of all the stations used as digipeaters along with the station originating the packet and the destination station. If OFF, you see only the originating and destination stations. For example, if you have MRPT ON, you might see a transmission such as this:

K9AT>WB6QVU,W6PW-5*: I'll be leaving for the meeting at about 7:30.



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If MRPT was OFF, the same transmission would look like this:

K9AT>WB6QVU: I'll be leaving for the meeting at about 7:30.

In the first case, you can see that the W6PW-5 digipeater was being used. The asterisk indicates which station you were hearing the packet from. In the second case you have no idea if digipeaters are being used or what station you were receiving.

HEADERLN: If you have this turned ON, the header of each packet is printed on a separate line from the text. If OFF, both the header and packet text are printed on the same line.

MSTAMP: The date and the time the monitored packets are received is indicated if the MSTAMP command is ON. If it's OFF, the date/time stamp is not shown. NOTE: The date and time must be entered into your TNC memory using the DAYTIME command before the MSTAMP command will function.

I run my station with all of these commands, except MCON, turned ON so that I can really see what's happening on the frequency I'm monitoring. Try various combinations of these commands and then decide on the combination you like best for your station.

INTRODUCTION TO PACKET RADIO - PART 4

USING DIGIPEATERS AND NODES

DIGIPEATERS:

Digipeater is the term used 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. Your TNC can be used by others as a digipeater if you have the command DIGIPEAT turned ON.

You use a digipeater by entering its callsign after a V or VIA in your connect sequence. Here are some examples of proper connect sequences:

C W6PW-3 V WB9LOZ-2

C N6ZYX V WA6FSP-1,WD6EOB-3

C W6ABY-4 V K6MYX,N2WLP-2,AB6XO

In the first example, the sequence shown means: Connect to W6PW-3 via the WB9LOZ-2 digipeater.

Your TNC will allow you to enter up to eight digipeaters in your connect sequence or in your UNPROTO path, 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.

When entering the list of digipeaters in your connect sequence, you must make sure that you enter them in the exact order that your signal will use them. You must separate the calls by commas, without any spaces, and the EXACT callsigns must be used, including the SSID, if any. That means you need to know what digipeaters are out there



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before you begin randomly trying to connect to someone. Turn MONITOR ON and watch for the paths that other stations are using.

Something to remember when using digipeaters is the difference between making a connection and sending information packets. If the path isn't all that good, you might be able to get a connect request through, but will have a difficult time with packets after that. The connect request is short so it has much less of a chance of being destroyed by noise or collisions than a packet containing information. Keeping information packets short (PACLEN set to 40 or less) can help keep retries down when the path is less than ideal.

NODES:

Net/Rom, TheNet, G8BPQ packet switch and KA-Node are names that refer to a device called a packet node. This is another means of connecting to other packet stations. Later on in this series you'll find a complete review of node operation, but for now we'll cover the basics so that you can begin to use the node network. The difference between a digipeater and a node that you should note here is that you connect to a node rather than using it in a connect path as you do with a digipeater. Some packet stations are set up so that they can be used as a digipeater and as a node.

First, you need to determine what nodes are located close to you. You can do this by monitoring and watching for an ID, or by watching to see what other stations in your area are using. It is most common for a node to have an alias ID in addition to its callsign. Once you determine the call-sign or alias of a local node, you connect to it the same way as you connect to any other packet station. You may use either the callsign or the alias to make the connection. For example, the node I operate has the alias ID of BERKLY and the callsign of WB9LOZ-2, so you could connect to it using C BERKLY or C WB9LOZ-2. Either one will work.

When you connect to a node, your TNC automatically switches to converse mode, just like when you connect to any packet station. Anything you now type is sent to the node as a packet, and the node acknowledges each packet back to your TNC. For the remainder of your connection your TNC works only with this one node.

To use the node network to connect to another local station, you simply connect to the node and then enter a connect request to the other station. Say you wanted to connect to K9AT using the WB9LOZ-2 node. You first connect to WB9LOZ-2 (C WB9LOZ-2) and then, while you ARE STILL CONNECTED TO THE NODE, you enter the connect request to K9AT (C K9AT). The node will then retransmit your connect request and you'll receive one of two responses: "Connected to K9AT" or "Failure with K9AT". Once you are connected you hold your QSO just as if you had connected direct or via a digipeater. When your QSO is finished, go to command mode on your TNC (Control C) and enter "D" (CR) and you will be disconnected from the node and the station you were working.

Some nodes have a BYE command available for disconnecting. You can get a list of available commands from any node by sending a question mark. All of the node commands will be covered in detail later in this series.

NODE NETWORK:

The packet nodes work together to form a packet node network. Once an hour each node transmits a list of other nodes that it knows about. The neighboring nodes use this information to keep track of the other nodes in the network. We will discuss how all of this works later on the series.

When you're connected to a node you can enter: NODES (or N) <CR> and you'll receive a list of other nodes that you can reach on the network from the node you're using. You'll note that the node list will vary in length and in the calls listed as you move from frequency to frequency, since all frequencies are not linked together. The list gives both an alias ID and a callsign for each node. The alias ID often gives you a hint as to where the node is located, but not always. To find out for sure where a node is located you'll need to get a copy of the descriptive



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node listings that are available on most packet bulletin board systems. These complete lists give the alias, callsign, location, frequency and other information on each node in the network.

To connect to a station in another area using the node network you first must determine which node is closest to the station you want to work. For demonstration purposes, let's say we want to connect to N6XYZ. He's told you he uses the W6ABC-3 node, so you check the node list and see that GOLD:W6ABC-3 is listed. WHILE YOU ARE STILL CONNECTED TO YOUR LOCAL NODE you connect to the distant node by sending a normal connect request, in this case C GOLD or C W6ABC-3. Your TNC will send this as a packet to your local node and your local node will acknowledge it. The network will then go to work for you and find the best path between your local node and the one you're trying to reach. Remember, with digipeaters you needed to know the exact sequence of stations. With nodes you don't. The network does that for you.

You might have to be a little patient here, since it sometimes takes a few minutes for the connection to be completed. Don't type anything while you're waiting for a response because any new information received by your local node will override any previously entered information. When the network has completed its work you'll receive one of two responses:

"Connected to W6ABC-3" OR "Failure with W6ABC-3". If it can't connect for some reason, try again later. It could be that W6ABC-3 is temporarily off the air or the path has decayed and is no longer available. We're going to be positive here and say we received the first option.

Once you're connected to W6ABC-3, enter "C N6XYZ". Again, your TNC will send this as a packet to your local node and the local node will acknowledge-edge it and send it down the path to W6ABC-3. W6ABC-3 will then attempt to connect to N6XYZ. Here again you'll get one of the two responses:

"Connected to N6XYZ" OR "Failure with N6XYZ". If you get connected, you hold your QSO just as you normally would, but there's one BIG difference—your TNC is receiving acknowledgements from your local node, and N6XYZ is receiving acknowledgements from W6ABC-3. The acknowledgements do not have to travel the entire distance between the two end stations. Each node in the path handles the acknowledgement with the next node in line. Because of this, retries are greatly reduced, and your packets get through much faster than when using a similar number of digipeaters.

When you're finished with the QSO, you disconnect in the normal manner. Use the BYE command, if available, or go to Command Mode on your TNC and enter "D" <CR>. The entire path will disconnect for you automatically.

Nodes offer a variety of other features besides allowing you to connect to other stations. We'll look at those and go into much more detail on the packet network in parts 10 and 11 of this series.

INTRODUCTION TO PACKET RADIO - PART 5

USING A PACKET BULLETIN BOARD SYSTEM

In this part of the series I will introduce you to the basics of bulletin board system (BBS) use; in part 6 I will discuss BBS commands in detail. There are now dozens of different packet radio bulletin board system programs available to the packet community. You might find a few minor differences in the commands used, but for the most part they are the same. If you find that a command does not function as I describe here, use the ? or H - HELP command to get more specific details for the BBS program you're using.



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You connect to a BBS exactly the same way as you connect any other station. Don't forget the SSID for the BBS callsign if one is required. Once you're connected, you will receive a welcoming message, information for that particular BBS and some basic instructions. Read the information and the instructions carefully. The first or second time you connect you might receive a request to enter your name, QTH, zip code and home BBS for the system's user file. Some systems will simply ask you for the information, while others will ask you to "register". On some systems, the software will not allow you to use any of the commands except HELP until you have entered this information.

After you receive the welcoming message and information from the BBS, you should note that the last line ends with a >. This is known as the PROMPT. When the BBS sends the prompt it is telling you that it has finished sending you information, and it is waiting for you to tell it what to do next. You do this by sending it a command. You must follow each command by a carriage return <CR>, just like on your TNC, which you send by hitting the "Enter" or "Return" key.

When checking in to a BBS for the first time, you should become familiar with the commands available to you. Enter a ? or H and read the general instructions for the BBS you're using. It should tell you how to get a list of the commands that are available. Review the command list to see what features the BBS offers.

When entering a BBS command, you must be careful to enter it exactly as the program requires. Some commands are just a single letter, while other commands require added information. Computers are not very forgiving and expect things to be entered in proper form. Enter only one command at a time, and be sure to read the information that is sent to you by the BBS.

Take your time, check out the various features that the BBS offers and enjoy yourself. There's no need to feel rushed or intimidated. If you get to a point where you don't know what to do next, don't give up and disconnect. Enter a ? or H again for further assistance. That's what the help information is there for! Remember this important point: whenever you're using a BBS and you don't know what to do next, enter a ? or H for the HELP instructions. I suggest that you make a printed copy of the complete help document so that you have the information available as a reference when using the BBS.

Now let's go through the basic procedures you should follow when checking into a BBS. After you connect and receive the welcome message, you will receive a list of your mail if there are any personal messages addressed to your callsign. Enter the command RN to read your mail. (If that command isn't available, note the message numbers and then enter: R followed by the message numbers, separating each by a space. Example: R 24112 24174)

If there were messages addressed to you, you should erase or "kill" them once you've read them. You can do this with the "KM" command, which means "Kill Mine". This command will erase all messages that are addressed to you that have been read. You can also kill each message individually by entering K XXXX, where the X's are the message number.

After reading your mail, the next thing I recommend that you do is list the new messages, by entering L. The BBS program updates the user file each time you check in, logging the latest message number. The next time you check in, only the new messages that have been received by the system are included in your list. The first time you check in, you might want to avoid using L by itself. Many systems have more than 1000 active messages available, and since you haven't seen any of them, the L will list all of them for you. As an alternative, I suggest that you use the LL (LIST LAST) command. You enter LL followed by a space and then the number of messages you'd like to see, such as LL 30 to list the last 30 messages that were received by the BBS. When you receive the list, you'll note that each message has a number, and that the size of the message, the topic, the originating station, a date and time, the subject, and other information are given. I will discuss each of these parts later in the series. For now, note the numbers of the messages you're interested in reading - that's the number to the far left of the screen.



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Some BBS programs have a paging feature that will send just enough information to fill your screen and then stop. You simply enter a CR by hitting the “Enter” or “Return” key to tell the BBS to continue. When listing the new messages, you might have the option of reading the ones you’re interested in before continuing with another page from the message list. As mentioned earlier, be sure to read the information that is sent to you by the BBS program before you proceed with your next operation.

To read the messages you’re interested in, you enter R XXXX, where the Xs represent the message number(s), such as R 14521 14528. Note that there is a space between the command and the number. If the paging feature is not available or not turned on, it’s best to “capture” your messages or have your printer turned on when reading messages. They’re apt to come in faster than you’re able to read them. (By “capture” I mean using your communications program to save incoming data to a file. You can read it later after you’ve disconnected from the BBS.)

Once you’ve read all the messages you’re interested in, you have several options. You can look back at old messages, send messages to other stations, see what’s available in the file directories - the BBS library, download a file, upload a file, check the list of stations that have recently checked in to the BBS or stations that have been heard on the BBS frequency, check the status of the BBS to find out what other stations are connected and who has mail waiting for them, or a variety of other things. We look at the BBS commands in detail in part 6 and explain how to do all of these things and more.

Oh, so that we don’t leave you connected forever, when you’re ready to leave the BBS, enter a B. You should always use the B command rather than just disconnecting so that the system updates your user file.

INTRODUCTION TO PACKET RADIO - PART 6

In part 5, we discussed the basics of using a packet bulletin board system. Now let’s look at the commands you use on a BBS. As previously mentioned, some of the commands on your BBS might vary slightly from the information I’ll be presenting to you here. Remember, all of the commands you enter must be followed by a carriage return <CR>.

? or H (Help) - Every BBS has help available for the user. When you don’t understand how to use a command, the help documentation will give you the details. For help on a specific command enter: ? or H followed by the letter of the command you’d like more information about. Either ? or H will work on some BBSs. On others, only one of them will work.

Example: ?L or HL will give you details on how to use the LIST command and its many variations.

A ? or an H, by itself, will give you general help information and specific instructions on how to use the help documentation on your BBS.

MESSAGE COMMANDS:

LIST: One of the commands you will want to use when connecting to a BBS is the LIST command. There are many variations available, but L, by itself, is the one used most often:



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L (List) - Lists all new messages that have been received by the BBS since you last logged in, except for other users' personal messages. This command will show you all of the bulletins and NTS messages on the BBS that you haven't seen, plus any personal messages that are to or from you.

If you want to list specific messages, you may use one of the following variations of the L command:

LM - (List Mine) - Lists all messages addressed to you.

LL # - Lists the last # messages. Example: LL 30 will list the last 30 messages received at the BBS, excluding others' personal messages.

L> callsign or category - Lists all messages TO the callsign or the category indicated. Examples: L> N6XYZ L> SALE
L< callsign - Lists all messages FROM the callsign indicated.

Example: L< N6XYZ

L@ designator - Lists all messages that have that "designator" in the @ BBS column of the message header.
Example: L@ NCA will list all messages with NCA in the @ BBS column.

There are several other variations depending on the type of BBS you're using. Enter: ?L for a complete list.

READ:

To READ a message, you enter an **R** followed by a space then the message number. Examples: If you wanted to read message 25723, you would enter: R 25723. To read several messages, such as numbers 25723, 25726 and 25730, you'd enter: R 25723 25726 25730. Note that you separate the numbers with a space, not commas.

You may also read messages in a way that will give you all of the forwarding headers in detail, rather than giving you just the callsigns. The forwarding headers show the list of BBSs that handled the message to get it from the originating BBS to the one you're using, along with the date and time it was received, the BBS address and other information. Depending on the BBS software being used, either the RH or V command replaces the R. Examples: To read message 25723 with the full headers, you'd enter either RH 25723 or V 25723.

There is another variation of the READ command that you'll find very useful, and that's RM. Entering RM by itself will give you all of the messages addressed to you that have not yet been read.

ERASING MESSAGES:

Once you have read a personal message, please erase it.

The sysop will appreciate your help in clearing out the "dead" messages. You use the K - KILL command to do this. You can enter K #, such as K 25723, which will erase that particular message, or you can enter KM, which will erase all of the personal messages you have read. If you use the KM command, the BBS will list the message numbers for you as they're killed.

THE "S" COMMAND(S):



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SENDING A MESSAGE:

The “S” command is mainly used for sending a message, but it should always be used with another letter specifying the type of message you’re sending. There are three types of messages found on packet bulletin board systems: Personal, Bulletin, and Traffic.

“SP” is used for sending a personal message to one other station,

“SB” for sending a bulletin (a message available to all), and

“ST” for sending a message that’s going to be handled by the National Traffic System.

You’re able to send a message to one particular person, to everyone on the local BBS, to everyone at every BBS in your area, in the entire state, all across the country or around the world. It all depends on how you address the message.

Each message has three parts to it: The ADDRESS, the SUBJECT and the TEXT.

I’ll discuss each part separately.

THE MESSAGE ADDRESS:

Personal messages: To send a personal message you enter SP followed by a space and then the callsign of the person you want to receive the message. Normally, that’s all that’s needed. A database of user information called the White Pages will fill in the address if it’s known. (I’ll discuss the White Pages later on in this series.) If the callsign is not known, you must then enter the full packet address, known as the hierarchical address. This address consists of the callsign of the BBS where you want the message to be delivered, the local area, state or province, country and continent. The local area is usually preceded by the # sign, and is optional in some areas. However, it helps deliver the message to its final destination more directly, so use it if you know what it is. The state or province is the two-letter abbreviation used by the post office; the country is the three-letter country code and the continent is the four-letter continent code. You should find a list of these codes on your BBS either in the help file or in the files section.

Here are some examples of some correctly entered addresses for a personal message:

SP WB9LOZ @ W6PW.#NCA.CA.USA.NOAM -- That’s how you would address a message to me in San Francisco.

SP WM2D @ WA2NDV.#NLI.NY.USA.NOAM -- WM2D uses the WA2NDV BBS located in the Northern Long Island (#NLI) area of New York state.

SP G8BPQ @ G3DAD.#32.GBR.EURO—Note that BBSs in Great Britain, Japan

and some other countries use numbers for the local area and do not use the state part of the address.

The hierarchical address will be discussed in detail in part 7 of this series.

Bulletins: A bulletin is addressed to a CATEGORY. The category is limited to six characters and should indicate the nature of the message, such as PACKET, INFO, SALE, WANTED, DEBATE, ARES, etc. To send a bulletin to more than just the local BBS, you must add a forwarding designator that will specify the area where you want the



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message distributed. This can be the local area, the entire state, a region, all of the US or the world. Each state uses different designators, so you'll need to check your local BBS for this information. Try entering ?S or ?SB for a list.

These are some examples of how you would address a bulletin:

SB INFO -- This bulletin is offering "information" (on a topic that would be given in the "subject") and it would be available only to users of the BBS where it was entered since no distribution is specified.

SB SALE @ CA—This bulletin lists an item that's for sale and it will be sent to all BBSs in the state of California. (Note: CA is used in CA, but the designator used in your state might use a different format.)

National Traffic System (NTS) messages: NTS messages require special addressing and a prescribed format. They're entered as ST ZIPCODE @ NTSXX where the zip code is that of the person the message is going to, and the XX is the two-letter state abbreviation. NTS messages can be sent to the US and possessions and Canada only.

Examples: ST 03452 @ NTSNH ST 60626 @ NTSIL ST V7L1J3 @ NTSBC

THE MESSAGE SUBJECT:

When you have the address line of your message complete, you enter a carriage return <CR>. You'll then receive a prompt asking for the SUBJECT or TITLE of the message. For a personal message you may enter anything you wish, but you're limited to a maximum of 30 characters. I usually indicate what I will be discussing in the message.

For a bulletin, you should enter a brief description (again, 30 characters or less) describing what the message will be about. Lots of bulletins are received everyday, so your SUBJECT should help the one listing messages to determine whether or not your message is to be read. You should attempt to describe the contents of your bulletin briefly but with detail. For SALE or WANTED messages, be specific about the equipment and include the brand and model. If you used INFO as a category, indicate what the information is about. For a personal message, the subject entered is really not important, since people will read any message directed to them. For a bulletin, though, the subject is critical. It is in these thirty characters that you must "sell" your message to potential readers.

An NTS message requires a specific format for the subject:

City, State, Telephone Area Code and Prefix

Example: Boston, MA 617-267

MESSAGE TEXT:

Next, you'll be asked to enter the TEXT of the message. This is where you enter the actual message information. When entering the text, you should insert carriage returns at the end of each line, as if you were typing a letter. A normal line has a maximum of 80 characters, so when you have 70 to 75 characters typed, enter a carriage return and continue on the next line. This will prevent words from wrapping around to the next line and the program inserting an unnecessary blank line in the text. Some programs require the carriage return or anything after the first 80 characters will not be able to be read.



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An NTS message requires you to use the ARRL message format for the text. I will tell you more about the National Traffic System and NTS messages in part 12 of this series.

When you have completed the text, you end the message with a CONTROL Z (you send a CONTROL Z by holding down the CONTROL key and hitting the Z key) or with /EX at the beginning of a new line. You must follow the CONTROL Z or the /EX with a carriage return <CR>.

Many BBSs will send you information about your message once it has been received completely: the message identification, the size, and the fact that it has been saved, etc. Some systems do not, so you have to make sure you receive the BBS prompt. Only when you receive the prompt are you sure that the message has been accepted by the BBS.

FILE DIRECTORY COMMANDS:

The files on a BBS offer you a variety of information on a wide range of subjects. The file section is often referred to as the BBS library. Each BBS has its own unique set of files as determined by the sysop (the system operator), yet the libraries of many BBS's contain a lot of the same information. The files are stored in directories according to subject and are listed by file name.

To determine what directories and files are available on your BBS you use the W (WHAT) command. Entering W, by itself, gives you a list of the directories available on the BBS along with an associated letter or topic name and a general description of the subject for each directory. To list the files stored in a specific directory you enter W followed the directory letter or topic name that you received with the directory list.

Example: WA or W ARRL depending on the software used at your BBS.

Enter: ?W to find out which form is used on your system.

If you want to read a file you use the D (Download) command. You enter D followed by the letter or topic name for the directory where it's stored and then the exact file name. Here are some examples:

DF FCCEXAM.LST or D FCC FCCEXAM.LST

DM TS440S.MOD or D MODS TS440S.MOD

You can enter ?D to find out which form is used on your BBS.

To send a file to the BBS you use the U (Upload) command. The command must be used with the letter or topic name for the directory you want to store the file in, followed by the filename you're assigning to the file. The filename can have up to 8 characters preceding the period and 3 characters following the period. (Normal DOS format.) Some examples:

UG FLEAMKT.INF or U GENERAL FLEAMKT.INF would upload a file named FLEAMKT.INF into the G or GENERAL directory.

UP BBSTIPS.01 or U PACKET BBSTIPS.01 would upload the file BBSTIPS.01 into the P or PACKET directory. The BBS program will not allow you to upload a file with a filename that already exists. Some directories are set by your local sysop for downloading only, so they won't permit you to upload files to them. Enter ?U for more information on uploading to your local BBS.



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OTHER COMMANDS:

You'll find a variety of other commands available on your BBS, but which ones you find depends on the software being used. Here is an explanation of some of the ones you might find.

A - ABORT - Many systems offer the A (Abort) command, allowing you to stop the BBS from sending you further information. If you want to stop receiving a message list, a message, a file, or whatever is being sent to you, enter an A followed by a <CR>. When the TNC buffer is emptied, the flow of data will stop.

COPY - The COPY command is a C on some systems and SC (SEND COPY) on some others. The command is used to make a copy of an existing message and send it to another station. Enter ?C or ?SC for information.

C - CONFERENCE - Some BBS software offers a conference mode. This lets BBS users engage in a round-table QSO. Enter ?C on systems where this feature is available to get specific information.

D - DOS - The FBB BBS offers FBBDOS for listing, downloading, uploading and copying files, along with some other features. If you're using an FBB system, enter ?D for specific information.

E - EDIT - If you enter a message and then notice that you made an error entering the addressee's callsign, home BBS or address or decide you want to change the Subject of the message, some BBSs offer the EDIT command to make the desired changes. You can only change the message type, TO, BBS, address and subject. You cannot edit the message text. Enter ?E for details.

F - SERVERS - The FBB software offers several servers which you access by entering F, by itself. Enter ?F on an FBB BBS for an explanation of the servers available.

G - GATEWAY - A gateway feature is available on some BBSs, allowing you to connect to stations on a different BBS port than the one you're using. Enter ?G for details on how to use the gateway.

I - INFO - This command can give you details on the location of the BBS, the hardware, software and RF facilities of the system you're using, or on some systems, a page of upcoming events, helpful hints, or other useful information.

On WORLI and F6FBB type BBSs, there are several other variations of the I command:

I callsign - gives you the name, QTH, zip code and home BBS of the person with that callsign, if they're listed in the local "White Pages" database. Example: I K1TGZ IZ zip code - gives you a list of all active packet stations in the specified zip code that are stored in the local "White Pages". An asterisk may be used in place of the end numbers to give you a wider area. Examples: IZ 94114 would give you stations listed in the 94114 zip code only. IZ 941* would give you the stations in all zip codes that begin with 941. I@ BBS - lists all callsigns in the "White Pages" having the specified BBS as their home BBS. Example: I@ W6PW

IH location - lists all callsigns in the "White Pages" having the specified location. Examples: IH CA IH GBR
Enter: ?I for more detailed information on using this command.

J - Displays a listing of stations that were heard by the BBS or that connected to the BBS. The command must be used with a port identifier, such as JA, JB, etc. J, by itself, will list the ports for you or give you an error message. You'll find several variations of the J command depending on the type of software being used. Enter: ?J for details.

M - On MSYS BBSs M, by itself, will give you the message of the day.



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N - The N command has several variations that are used for entering your name, QTH, zip code and home BBS. To enter your name you type the letter N followed by a space and then your first name, such as: N Larry. Your QTH is entered using NQ followed by a space then your full city name and two letter state abbreviation, such as: NQ San Francisco, CA. You enter your zip code with NZ followed by a space and your five-digit zip. NH is the command for entering your "home BBS". This is the system that you plan to use regularly and want all of your personal messages delivered to. Make sure that it's a full service BBS, not a personal mailbox, since only full service systems are included in the message forwarding network. You enter your home BBS by typing NH followed by a space and then the callsign of the BBS, such as NH W6PW. (Note: SSIDs are not used with BBS operation except for when making the initial connection. Most BBS software ignores all SSIDs.)

REBBS type systems will ask you to register and you'll then be prompted for your name and other information. **FBB** type systems will automatically ask for your name and other information the second time you connect. On both of these BBSs, you will only need to use the N commands to change your user information.

This user information is stored at the local BBS and is also sent to a central database known as the "National White Pages Directory". The information can be accessed by anyone. You can use it to find the name, QTH and home BBS of your friends. How to use the "National White Pages" will be discussed in part 9 of this series.

O - **OPTIONS** - FBB systems offer several user selectable options - the language used by the BBS, paging, mail listing and base message number. Enter ?O for an explanation of how to use these options if you're using an FBB BBS.

P - **PATH** - On MSYS BBSs, P followed by a callsign will give you the path last used by that station to connect to the BBS. Example: P W6PW

B - **BYE** - When you're finished using the BBS, enter a B to disconnect. You should always use the B instead of disconnecting with the TNC DISCONNECT command. On most BBSs, your user file is updated only when you leave the BBS using the B. If you don't use the B, the update doesn't occur, so the L command will not have the correct information for the next time you use the BBS.

Remember, you won't find all of these commands on the BBS you're using, but you might find others available that aren't listed here. Check your local BBS help document for a complete list of the commands available to you.

INTRODUCTION TO PACKET RADIO - PART 8

This part of the series discusses the various parts of the packet message.

The following is an example of what you see when listing messages on a BBS. On some systems the information is displayed in a different order, but the same information is given.

MSG #	STAT	SIZE	TO	FROM	@BBS	DATE/TIME	SUBJECT
14823	PN	1084	WD5TLQ	WA6XYZ	N5SLE	0604/1240	Software working great
14721	PS	441	PACKET	WB9LOZ	WUSA	0604/1154	INTRO TO PACKET PART 7 OF 20
14717	BF	1387	EXAMS	W6NLG	NCA	0603/1020	FCC EXAMS: MARCH - JUNE
14715	TN	275	94114	W1AAR		0604/0959	SAN FRANCISCO 415-821
14714	BF	1663	DEBATE	N3DEQ	WW	0602/2314	CW REALLY NEEDED?
14712	TN	918	INFO	N6ZYX	NCA	0603/1854	9600 BAUD DEMONSTRATION



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The MESSAGE NUMBER is assigned by the BBS program when the message is received and it cannot be changed. The numbers are assigned sequentially.

The STATUS of the message includes several different bits of information. The first letter of the STATUS indicates the TYPE of message: B for Bulletin, P for Personal, or T for Traffic for the National Traffic System. Bulletins are messages of general interest to all users, and they can be read by everyone using the system. Personal messages are listed only for the sender, the addressee and the sysop, and they're the only ones who can read them. The list above would have to have been requested by WD5TLQ, WA6XYZ or a sysop. Can you see why? It lists an outgoing personal message. (NOTE: Although personal messages can't be read by everyone using the BBS, anyone in monitor mode can see a personal message as it's being sent over the air, of course.) Traffic messages, type T, are listed for everyone and can be read by anyone. In fact, all users are encouraged to participate in the delivery of NTS messages addressed to your area. (Refer to part 12 of this series for information on NTS messages.)

STATUS also shows whether or not the message has been read, has already been forwarded to all designated stations, or has not been forwarded. You might see one of these letters: N - no, it hasn't been read, Y - yes, it has been read, F - it has been forwarded, \$ - it has not been forwarded, I - it's in the process of being forwarded right now.

The SIZE indicates the combined total of characters, including punctuation, in the message text. The forwarding headers (explained below) are considered to be part of the text and are included in the size. What starts out as a short message can grow in size as it's forwarded from BBS to BBS.

TO is the callsign of the addressee for personal messages, the category or interest group for bulletins and the zip code of the addressee for NTS messages. While you might find bulletins addressed TO AMSAT, TO PACKET or TO SALE, they're actually messages about AMSAT, about PACKET or about equipment for SALE. You're apt to see anything in the TO column: ALL, USERS, EXAMS, CODE, SALE, WANTED, DEBATE, SAT, PACKET, etc.

FROM shows the callsign of the station originating the message.

@ BBS is used for forwarding a personal message to someone at another BBS, for forwarding NTS messages and for general distribution of a bulletin using a forwarding designator. In the list shown above, the personal message would automatically be forwarded to WD5TLQ at the N5SLE BBS. By entering a special designator, such as NCA, in the "@ BBS" column a bulletin may be forwarded to specific areas. (See Parts 6 and 7 of this series for details on the addressing of personal messages and bulletins and on using the forwarding designators. Addressing of NTS messages is discussed in Part 12.)

Next is the DATE and TIME showing when the message was received at the BBS you're using, or when the message was written. (This varies depending on the type of software being used at the BBS.) If the message originated at another BBS, the date and time when the message was originally entered will be shown in the forwarding headers, as explained below, and at the top of the message when you read it. The date and time indicated can be either local time or GMT (Zulu time) depending on the time used by the BBS.

The SUBJECT (or TITLE) is a short description of the message content. For bulletins, this is the information that determines whether or not someone is going to read your message when he sees it in the message list. It should be brief, but it also should be informative. You need to tell the other users what the message is about as clearly and concisely as you can with just 30 characters.

The parts of the message mentioned so far are all seen when you ask for a message list using the L (LIST) command. On some systems, entering a semicolon after the list command (Example: LL 35 ;) will give you more information about the message, such as the message ID, the full hierarchical address, the number of times the message has been read, etc.



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If a message has been forwarded from another BBS, forwarding headers are added at the top of the actual message TEXT. This information is added by each BBS that is used to get the message from its origination point to the destination. Each BBS adds one line showing the time the message was received by that particular BBS, its callsign and address, and possibly the QTH, zip code, message number and other information. If you use the RH or V command (depending on your software), rather than just R, when reading a message, you'll receive complete headers. With just the R, headers are reduced to a list of the BBS callsigns. The complete headers are useful if you want details on the path a message took to reach you or how long it took to be forwarded from system to system from the source to destination.

The TEXT of the message contains the information you want to convey to the reader. It can be of any length. However, if the message will be going to a distant BBS and will most likely be forwarded on the HF network, there is a 2.5K size limit. This limit has been set by the HF gateway sysops to keep traffic moving smoothly despite poor conditions and QRM. Extremely long messages can tie up the forwarding system unnecessarily, so users are advised to break up long messages into parts.

As mentioned in part 6, when entering a message into a BBS, use carriage returns at the ends of your lines, as if you were using a typewriter. The normal screen width is 80 characters, so you should enter a carriage return prior to the 80th character on each line. A message entered without the carriage returns can be very difficult to read as words are cut at improper points, lines vary drastically in length, and blank lines are often inserted. On some terminal programs and printers, any line exceeding 80 characters without a carriage return inserted will not be seen or printed past the 80th character.

You should include your name, call and packet address at the end of the text so that the person reading your message will be able to send a return message to you if he or she wishes to do so. You end your message with a control-Z or a /ex at the beginning of a new line. This will tell the BBS to save the message. Don't disconnect until you receive the prompt back from the BBS. Otherwise you won't know whether or not your message was saved.

INTRODUCTION TO PACKET RADIO - PART 10

In this and the next part of the series we're going to take an in depth look at the packet node network. In part 4 I explained how to use the network for connecting to another station. Now we'll look at the other features a node offers.

Using the packet node network can make your operating time on packet more enjoyable and it can greatly expand the area that you can reach. The network of NET/ROM, TheNet, G8BPQ and KAM nodes is expanding very quickly and now covers most of the country. New nodes are showing up almost daily. Thanks to all of these stations and the interconnecting links, you can now connect to stations in many distant places using a low powered 2 meter rig. Some nodes are set up for cross-banding, and with the introduction of nodes on 10 meter FM, there's the possibility of working a station just about anywhere.

A packet node, in most cases, is still set up for digipeater operation, so you can still use it as a regular digipeater, but for most of your connections you'll want to use the node features. Why? When using a string of digipeaters your packets have to reach their destination parity correct and the receiving TNC has to return an acknowledgement (ack) to your TNC for each packet to be accepted. As you add more digipeaters to the path the chances of each packet being accepted becomes less and less. Other stations on the frequencies being used and noise along the route can be the cause of many retries. When using a node, however, your packets no longer have to reach their destination before the acknowledgements are returned to your TNC. Each node acknowledges your packet as it's sent along the way toward its destination.



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If you've been monitoring lately, you might have seen the nodes in action. You might have wondered why they were sending all of those weird symbols like @fx/<~|. What you're seeing is the nodes communicating with each other and updating their node lists. You also might have noted callsigns with high numbered SSIDs, such as WB9LOZ-14, WA6DDM-15, W6PW-12, etc. The nodes change the SSIDs of all stations that originate packets so that the callsigns sent via the network are not the same as those sent directly. If you were to use a node to connect to another station in the local area, there's the possibility of your packets being received by this station both from you directly and from the node. If the callsign through the node wasn't changed, the TNCs involved would be totally confused as it would appear that two stations were connecting using the same callsign. The node automatically changes the SSID using the formula 15-N, where N is your usual SSID. A call with -0 becomes -15, a -1 becomes -14, -2 becomes -13, etc.

The node network is very simple to use. As explained in part 4, to use the node network you first connect to a local node. It should be one where you can connect to it direct with good signal strength. Once you've connected, you then have several options—connect to another station within range of the node, connect to another node, connect to an associated BBS, obtain a list of the nodes that are available, or check route and user status. On NET/ROM and TheNet nodes you can also answer or call CQ.

There are several commands available on your local node. All have CONNECT, NODES, ROUTES and USERS, and depending on the type of node you're using, you might also find the BBS, BYE, CQ, INFO, MHEARD, PARSMS or PORTS commands available.

PACKET NODE COMMANDS

CONNECT: The CONNECT command (which can be abbreviated as C) is used just like you use the CONNECT command with your TNC. To convert to another local station using a node, first connect to the node and then enter C followed by the callsign of the station you want to reach. To connect to another node you can use either the callsign of the alias. For example, to connect to the Berkly: WB9LOZ-2 node you can use C WB(LOZZ or you can use the alias, C BERKLY. Either one will work. Review part 4 of this series form more information on making connections via the node network.

There's a special consideration when making connections from a node using the G8BPQ Packet Switch software. Since these nodes are capable of having several different frequencies operating from the one node, you have to indicate which frequency port you want to make your connection on. The PORTS command, abbreviated P, will give you a list of the ports available, such as this:

SF:WB9LOZ-1 } Ports:

1 144.99 MHz

2 223.56 MHz

3 441.50 MHz

You then insert the port number between the C and the callsign, such as C 1 WB6QVU, to indicate which frequency you want to use, in this case the port 1 frequency of 144.99 MHz.

NODES COMMAND: The nodes command can be abbreviated as N and when entered without any other information will give you a listing of other nodes that can be worked from the node you're using. The list contains both the alias and the callsign of each node. The alias might give you a hint of a node's location, but you'll need a list of the local nodes to be able to tell for sure where each node is located. (You'll probably find node lists in the



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file section of your local BBS.) As you move from node to node, the list of nodes you find will vary in length and will contain different callsigns since all of the frequencies are not linked.

The NODES command has a feature that gives you a simple way to find out how easy it will be to connect to another node in the list. All you need to do is enter N followed by either the alias or callsign of the node that you want to reach, such as:

N FRESNO or N W6ZFN-2

You'll receive a report showing up to three routes to the node you asked about, how good these routes are and how up to date the information is. If there is no information available, you will receive either "Not found" or the complete node list, depending on the type of node or switch you're using.

Let's take a look at a typical report you would receive after entering N FRESNO. If you were connected to a NET/ROM or TheNet node the report would look like this:

SFW:W6PW-1} Routes to: FRESNO:W6ZFN-2

105 6 0 WB9LOZ-1

78 6 0 W6PW-6

61 5 0 WA8DRZ-7

If you were connected to a G8BPQ packet switch you would see one less column in the report and it would look like this:

SF:WB9LOZ-1} Routes to: FRESNO:W6ZFN-2

126 6 W6PW-10

78 6 W6PW-6

60 4 W6PW-1

Each line is a route to the node you asked about. The symbol > indicates a route that's in use. The first number is the quality of the route. 255 is the best possible quality and means a direct connect via hard wire to a coexisting node at the same site; zero is the worst, and means that the route is locked out. 192 is about the best over the air quality you'll find, and it usually means that the node is only one hop away. If you see a quality of less than 80, you'll probably have a difficult time getting any information through via that route. The second number is the one that tells you how up to date the information is; it's called the obsolescence count. This number is a 6 when the information for the route is less than an hour old. For each hour that an update on the route is not received, this number is decreased by one. A 5 means the information is an hour old, a 4 means that it's two hours old, and so on. The next number, shown only on NET/ROM and TheNet nodes, indicates the type of port. A 0 is an HDLC port; a 1 is an RS-232 port. You don't need to pay any attention to this figure. The callsign is that of the neighboring node that's next in line on the route.

This quick check on a node that you want to reach can save you a lot of time. You'll know immediately whether or not the node is available, and if it is, how good the available routes are to it. You then won't have to spend time trying to connect to a node that isn't available or is of poor quality.



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If you find that there's a decent route to the node or switch you want to reach, it's normally best to let the network make the connection for you. Simply enter a connect to the alias or callsign you want rather than connecting to each individual node along the route yourself.

If a route exists but the quality is not very good, you might want to connect to the neighboring node shown for the best route, then do another quality check, repeating this procedure until you find a route with decent quality. You can actually get through to some distant nodes using this method if you have the time and patience to work on it.

Preceding was from WB9LOZ.

FLEXNET

The preceding has primarily focused on TheNet packet architecture where a node consists of TNC's and radios. Now we are seeing a greater acceptance of newer concepts in packet operating software such as FlexNet. FlexNet uses the same TNC's and radios but adds a computer to perform critical functions that used to have to be done manually by the operator. The following pages will guide you through the use of packet in a FlexNet environment.

FlexNet is a packet radio networking system, like TheNet, etc., but the software has addressed many of the problems that have frustrated packet operators and networks for some time. One of the biggest frustrations was finding the best way across town to route packets so that they would arrive as quick as possible. FlexNet takes those questions away from the operator and uses the computer software to find and maintain a "road map" of the best way between here and there. FlexNet periodically polls the various connected Flex Nodes or FlexDigi's and checks the time that it takes to send and receive information so that when you want to connect to that far away station, the computer will select the best and quickest path to get there. If a link deteriorates, Flex will back off that links parameters to avoid excessive resends and retries. It will also search for a better path to the end node and automatically reroute your traffic that way, all happening without you having to do anything.

BASIC FLEXDIGI COMMANDS

FlexDigi is being used to differentiate the two popular software node sites. When accessing either one you will need to follow that sites software protocol.

The following are the commands that are most used when connecting to a FlexDigi. (A carriage return [enter], <cr>, after the command is used to execute the request.)

- A** Shows new information about the node
- B** Shows beacon text (a text message sent out by the digi on a periodic basis)
- C xyz** The connect command. Connect to station xyz
- C** Converse mode.

If no callsign is given, the CONNECT command puts you in converse mode. By this mode, a great number of stations can have a round table conversation. There are 255 different converse channels available. After entering the C-Command, you get a list of all stations connected to the node and, if they are in converse mode, too, the channel on which they are. Now the node prompts for a number, which selects the channel you want to join.

Example:

C <CR>



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users:

```
0: W2OSC 0:KC2JNI ---: KA2AON 73: WB2TQG 73: N2MKH channel ? 73 <CR>
```

```
*** starting converse, exit: /q
```

In this example, W2OSC and KC2JNI are on channel no. 0 and WB2TQG AND N2MKH on channel 73. KA2AON is connected to the node without being in converse mode. Those that are connected to the same channel can now talk to each other separately from the other conversations going on on the other channels.

When another station joins a channel, the following message is displayed.

```
"<K1YHR>: *** Logon"
```

While being in converse mode you have the following commands at your disposal:

```
"/w" shows all stations connected to the node (with converse channel number if available)
```

```
"/c" shows the actual channel number
```

```
"/c n" switches to channel n
```

```
"/s <call> <msg>" sends private msg to <call> only
```

```
"/m <call> <msg>" sends private msg to <call> only
```

```
"/q" quits converse mode
```

If a station disconnects while being in converse mode or quits converse mode, all other users of the channel get the message:

```
"<W2OSC>: *** Logoff".
```

If a user changes to another channel, the users that are left on the channel get the message:

```
"<N2MKH>: *** switched to channel n"
```

If there is no channel number entered on converse start-up, converse mode is ended immediately. You are then prompted for a new command. (Above converse description from the FlexSysOp manual by Gunther Jost, DK7WJ)

D Shows the destination table, list of reachable nodes, with the SSID range and the RTT (round trip time) in tenths of a second.

H Show the help text

L Shows link information

M Connects you to the local mailbox, if defined

MH Show the Mheard list: list of stations with times since last activity

MY Shows the call of the digi with its SSID range

Q Disconnect from the digi

T <call> Enters talk mode with another station that is connected to a digi.

OPERATIONS

PACKET NET

Packet net operation is one of the main functions that we do here in Oswego County. The net is formed around a net control operator and the stations check in by signing on to a converse channel. The default channel is 10, so a station wishing to join the net would meet at the advertised digi, in this case usually the K2QQY digi in Fulton, and enter a c for converse and then a number 10. This will connect the operator into the net. All keyboard strokes now will be seen by all the stations at the same time.



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Checking into the packet net does not require a formal procedure other than just doing it. As soon as you are connected into the channel, your call will be seen by everyone.

NET ETIQUETTE

Follow the directions of net control.

Wait for a "k" at the end of the transmission before typing your message. Example: *the quick brown fox jumped over the lazy red dog* **k**

If you need the attention of net control, send your complete callsign or your complete tactical callsign and wait to be recognized.

Net control will direct which station to transmit next.

The main goal is to allow each station to complete their message before another begins. Even though many stations can transmit at the same time, the displayed packets will not be only from the one station, but will display in order of receipt. This might lead to confusion when printing a message for another agency or even when translating to a standard message form.

MESSAGE FORMATS

There are three basic formal message formats that we may see during an event. The first, of course is the Oswego County Standard format, the ARRL format for messages originated by a State RACES operator and the FEMA format 213 that may be used by other counties or states. When sending or receiving these formats on packet it may become important to define some of the information such as to and from. Otherwise, it is suggested that each block of information is entered on a separate line with the text being entered in 5 word group sequence. Examples:



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OSWEGO COUNTY STANDARD MESSAGE FORMAT

8 (*agency message number, not a radio operator's number*)

2/24/04 (*date, may be in any of the various forms, with or without a year*)

2237 (*time in twenty four hour format, local*)

To eoc fulton

From highway parish

urgent (*message priority, deliver immediately*)

26 (*number of word groups in the message*)

confirming receipt of 47.3gal

sea water from iowa where

are we to ship the

20gal without salt is pepper

to be shipped without the

salt

k haul (*author of the message*) capt c anchor (*authority, is the person responsible for the action*)



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ARRL FORMAT

8 *(this is the number of the message originating at an amateur station)*

priority *(message priority, deliver immediately)*

kc2ftd *amateur station originating the message)*

26 *(number of word groups in the message)*

from: parish highway

2237 *(time in twenty four hour format, local)*

2/24/04 *(date, may be in any of the various forms, with or without a year)*

to: eoc fulton

confirming receipt of 47.3gal

sea water from iowa where

are we to ship the

20gal without salt is pepper

to be shipped without the

salt

k haul *(author of the message)* capt c anchor *authority, is the person responsible for the action)*



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FEMA FORM 213

To eoc fulton *(this form also allows for the message to be sent to an individual. A notation of the persons position is required if this is done)*

From highway parish *(this form also allows for the message to come from ad individual. A notation of the persons position is required if this is done)*

Subject salt water

Feb 24, 04

2237

confirming receipt of 47.3gal of sea water from iowa. where
are we to ship the 20gal without salt? is pepper to be shipped without the
salt?

k haul *(the signature requires that a position also be stated that gives this person authority to initiate this action)*

Note: This message was sent in a non word grouped form. Typical for agencies.

All received formal messages must be copied to the standard Oswego County form..

PACKET USER PORT FREQUENCIES

Oswego County Emergency Management Office **K2QQY 145.090 MHz**

Hannibal FlexDigi **K1YHR 145.770 MHz**

Scriba FlexDigi **KA2AON 145.690**

Clay FlexDigi **K2JFK 144.970 MHz**

Syracuse FlexDigi **N2MKH 144.91**



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Cortland FlexDigi KB2FAF 145.730 MHz

Auburn FlexDigi W2QYT 145.07 MHz

These FlexDigi's are interlinking to each other. Connecting into one allows you to connect to any other one by just entering the callsign (SSID) of that destination.

CONSOLE OPERATON AT EOC

The packet station at the EOC provides access to both the BBS and the normal packet operating mode. The station monitor is generally turned off.

STATION OPERATION

When getting ready to activate the packet station, first turn on the monitor.

Hit any key to turn off the screen saver. Now you see a screen without much on it.

Press F9.

When asked for a port number, type 1 and hit enter.

Type "c k2qqy" to enter the local packet station. Follow regular packet commends such as c for connect, b to disconnect form non Flex stations and q to disconnect from other Flex stations.

To return to the "console" in preparation for connecting to the BBS or to shut down the station, type "Q".

Turn off the monitor when leaving.

CHECKING THE BBS

After turning the monitor on, hit any key to turn off the screen saver.

Press F2. This connects you to the BBS.

Type LL (space) and a number such as a 5 or 10 to list the last 5 or 10 messages posted.

To read a message type "r" and the message number.

To post a message, type send and the call of the person you want to send a message to. Follow instructions on the screen.

To exit the BBS, type "B".



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CONNECTING TO NY SEMO RACES KC2FTD

At the present time there is no path to SEMO RACES.

ACTIVATING THE E.O.F. PACKET STATION

1. Push power button on computer.
2. Turn on monitor, if it is off.
3. Turn on printer. .
4. The computer will boot up in WinPack.
5. Turn on power to the radio and the TNC (terminal node controller) by pushing the power button on the Astron power supply under the Icom IC-27A.
6. Use the packet terminal program to set MYcall. MYcall establishes the call sign that the packet rig will display. Use the keyboard command <control C> <enter> to put the TNC into Command Mode. Type: my <enter>. The program will respond: MYCALL:K1YHR (for example). That call sign belongs to the previous operator of the equipment. Record that call in your notes and then enter your call sign by typing: my<space> [your call sign] <enter>. The TNC will respond: MYCALL: [your call sign].
7. In most cases, you will communicate with other packet stations during a drill or activation by connecting with the Converse function at the K2QQY digipeater. Do this by typing: c k2qqy <enter>. When you receive a connect acknowledgement from K2QQY, type: c <enter>. The digipeater will respond: users: [your call and the calls of any other stations on channel 10]. It will then ask: channel? Our convention is to use channel 10. Simply type: 10 <enter>.
8. You can determine the calls of any stations connected with Converse with the command: /w <enter>. The “w” stands for “who.” When you wish to leave Converse, simply type: /q <enter>.
9. Shut down of the packet station is accomplished by repeating, in reverse order, the start-up sequence described above.