

# Recommended Digital Skills for ECom

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The following are the recommended digital skills for ECom operators. If you do not have a General or higher license, please contact a general or higher licensee in your area for assistance with those for HF.

Please note, many of the operational details listed here will be greatly facilitated by using the WinPack software package. HOWEVER, if you have a terminal software package that you are more comfortable with AND it will perform the functions needed, use what you are most comfortable with.

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## HF Basic Operations

1. Given the "Mark" frequency, set-up your equipment and tune to copy RTTY, AMTOR, and PACTOR transmissions.
2. "Zero-beat" your station with an NCS station.
3. Distinguish RTTY, AMTOR and PACTOR by ear and adjust your TNC to handle the mode.
4. If your TNC requires multiple commands to change modes and you are using WinPack, build the WinPack scripts to handle rapid TNC mode changes. NOTE: Winpack scripts have a "HOTKEY" command that allow you to assign multiple commands to any one of 8 function keys and you can then press a single key to make the mode change.
5. Conduct keyboard to keyboard contact using RTTY, AMTOR and PACTOR modes.
  
6. Capture text from a contact and save it as a text file.
7. Learn how to update that text file if you do not already know how.
8. Send a text file to another station.
9. Learn the ["Q" codes](#) used most often in digital nets.

## V/UHF Basic Operations

1. Setup your station to operate on several of the standard VHF packet frequencies.
2. Make "keyboard to keyboard" contacts using [Packet](#).
3. Learn how to connect to a BBS and send/retrieve messages.
4. If your area uses a cluster, learn the unique cluster commands and any special cluster requirements.
5. Setup your station to operate RTTY, AMTOR and PACTOR on a VHF frequency.
  - a. "Zero-beat" your station with an NCS station.
  - b. Distinguish RTTY, AMTOR and PACTOR by ear and adjust your TNC to handle the mode.
  - c. If your TNC requires multiple commands to change modes and you are using WinPack, build the WinPack scripts to handle rapid TNC mode changes. NOTE: Winpack scripts have a "HOTKEY" command that allow you to assign multiple commands to any one of 8 function keys and you can then press a single key to make the mode change.
  - d. Conduct keyboard to keyboard contact using RTTY, AMTOR and PACTOR modes.
  
6. Capture text from a contact and save it as a text file.
7. Learn how to update that text file if you do not already know how.
8. Send a text file to another station.
9. Learn the ["Q" codes](#) used most often in digital nets.

## Mailbox/BBS/PBBS Operations

1. Set up your Maildrop/mail-box to accept messages.
2. Connect to another station's mailbox and use the L(ist), R(ead), and K(ill) commands.
3. Compose and send an [ICS213](#) formatted message to another station's mailbox.
4. Be able to put that message in your own mailbox.

## HF Gateway Operation

1. Connect to a VHF station through an HF Gateway station.
2. Conduct a keyboard to keyboard contact via a Gateway station
3. Place and retrieve messages in the VHF station's mailbox when you are on HF.

Reference [Gateway](#) operation for additional user details.

## VHF Gateway Operation

1. Connect to an HF station through an VHF Gateway station.
2. Conduct a keyboard to keyboard contact via a Gateway station
3. Place and retrieve messages in the HF station's mailbox when you are on VHF.

**Note:** This requires a General class or higher licensed operator to act as control operator if you are running VHF to HF or UHF to HF.

## Encoding/Decoding

1. Download and decode a UUE encoded Excel Worksheet (or equivalent) file.
2. Modify the above file, UUE encode it and upload it to a mailbox.

## Net Control Station

1. Serve as the Net Control Station and direct the passing of traffic between several digital stations.
2. As the Net Control Station, successfully direct moving the digital net to another band or frequency.
3. Optional: Design one or more interesting and challenging exercises of digital techniques.

## HF Airmail Operation

1. Set up your HF Digital station to use Airmail 2000.
2. Attach a formatted message to an Email and send via the internet (use the WinLink 2000 system).
3. Download an Email with an attached file from the WinLink 2000 system.
4. Send an NTS or ICS-213 formatted message to another Airmail Station.

## Exercise Participation

- Participate in a multiple district or state wide digital net during an event or incident.

## Deployed Operation

- Setup and operate multiple digital modes at a remote site during an event or incident.

## Hints and Kinks

- When composing a message with any of the text editors, be sure you end the message with a "/ex" (without quotes) on a line by itself. This will tell the receiving station (probably mail-box) that you have completed the message. This then saves you having to remember to send the CTRL+Z end-of-message indicator and speeds the data transfer.
- If you are running WinPack or similar software, think seriously about using scripts to quickly change modes. For example: AMTOR requires changing three parameters in the PK-900, so a script makes that a single key stroke.
- Exercise these skills at least once per month. The twice monthly HF digital net is an excellent way to keep your skills current.

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# Q Codes for Digital Operation

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The following are the recommended Q-Codes for Digital Operations.

While Q-Codes were developed to improve efficiency and reduce bandwidth for CW operations (the original digital mode), they have the same benefit for all digital communications. Below is an abbreviated list of Q-codes that can be useful for digital nets and operations. For a complete list of all Q-Codes see ARRL form FSD-218 on the ARRL website under "Forms."

QN == Q-Codes specifically for Net Operations    *Note: \* = NCS use only*

## **QN - Meaning**

- A\*** - Answer in prearranged order.
- C** - All net stations Copy.  
- I have a message for all net stations.
- D\*** - Net is Directed (controlled by net control station).
- F** - Net is Free (not controlled).
- H** - Your frequency is High.  
\* **Net stations report In.**
- I\*** - I am reporting into the net. (Follow with a list or traffic or QRU).
- L** - Your net frequency is Low.
- N\*** - \* **Net control station is \_\_\_\_\_**  
- What station has net control?
- S\*** - \* **Following Stations are in the net. (list)**  
- ? Request list of stations in the net.
- Z** - Zero beat your signal with mine.

A Q signal followed by a ? asks a question.

A Q signal without the ? answers the question affirmatively, unless otherwise indicated.

Two other "codes" will often be used. At the end of a transmission the operator will often use:

**KK** - - - "End of transmission" No specific reply anticipated.

**AR** - - - "Over to you." Indicating a reply is expected.

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# Packet

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## Disclaimer

This document is designed to provide the ARES operator with enough information to be able to function adequately as an emergency communicator. It is not intended to provide a technical foundation for this portion of the Amateur Radio hobby.

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## Why Packet Radio ?

Packet Radio provides a somewhat-secure method of transmitting/receiving data. Somewhat in that not just anyone with a scanner can listen to the information but NOT secure in that anyone with a receiver, TNC and computer can read the information being passed.

Packet increases the accuracy of the information by having it written rather than transmitted by voice and while the transmission time is a bit long (1200 baud is very common at VHF/UHF) the accuracy and increased confidentiality make it a good choice for ARES activities.

## How does it work ?

Packet radio consists of a computer, Terminal Node Controller (TNC), a radio and some cables connecting all of the parts. Some of the TNCs are happy with the full 25 pin cables and some are only happy with nine pin cables (see the TNC manufacturers instructions). The connection between TNC and radio will have ground, transmit audio, receive audio and push-to-talk (PTT) lines.

The computer will be loaded with one of many flavors or software that (depending on flavor) will operate as a subtask of the computer, to some that make the computer function as a dumb terminal. With the latter, if you try to make the computer do anything else it will lock up and do nothing. Ask a person with full packet training before you try to get the computer to multi-task.

The recommended software for ARES/RACES operation is [WinPack](#). This software allows you to compose a message without being connected. This is a **VERY** important function in that you are not clogging the frequency while you type.

The terms you will need to know **and** understand are:

1. Packet - the name of the piece of data sent from your computer to another. It has a header with the call of your station and the call of the station you are talking with (plus a little other information) followed by what you typed in.
2. TNC - Terminal Node Controller. The device that acts as an interface between the computer and the radio. It normally includes a MODEM (MODulator DEModulator) and will have a micro-processor included. Other things about the TNC are:
  - A. TNC state - Status of the TNC at that instant. Some of the status names are:
    1. Disconnected - Idle state where the TNC will monitor activity on the frequency and display that information on your computer.
    2. Connected - The state where the TNC has established contact with another station and is ready to exchange information. When you are connected, the channel activity will no longer be displayed on your computer (there are ways around this but don't worry about them).
    3. Converse Mode - once the TNC connects to another TNC it will normally enter converse mode so that anything you type in at your computer is transmitted to the other computer each time you press the Enter key.
  - B. Commands - Instructions to the TNC telling it what you wish it to do. A small subset of these commands are:

1. MYcall - Definition of the call to be used by the TNC.
2. Connect - Request to connect to another computer.
3. Disconnect - Request to sever connection with another computer
4. Send - Request to send a message to another user. This will be used when you have connected to a BBS (bulletin board) or cluster (interconnection between multiple users).
5. Read - Read a received message from the cluster/BBS.
6. CHeck - Normally set to zero for ARES work (keeps the TNC from automatically disconnecting if the activity is low).

C. Status Lights:

Status lights may vary by manufacturer. The most common are:

1. PWR - Power on indicator
2. CON - Connect indicator
3. STA - Data from the computer is ready to send but has **not** been sent yet.
4. PTT - On when PTT line is "down" (transmitting).
5. DCD - Incoming data indicator. The information available after this light goes out will only be displayed if the information was for your station.

3. Digi-Peater - a relay station between stations that cannot hear each other
4. Packet Bulletin Board Systems (BBS) - a local collection point for messages between users. Usually linked to other BBSs to exchange messages for additional users.
5. Cluster - Similar to a BBS but often without the links to other BBSs/Clusters.
6. Keyboard-to-Keyboard - Connection used to talk to other amateurs directly. Normally you will be talking with a single station or to a cluster.

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## What will I do ?

If you are part of the setup team, you will be asked to set up the station. Each of the districts with district-owned equipment will have a set of instructions for you to use. Most cables will be labeled with information telling you where each is to be connected.

You will setup the equipment per district instructions and:

1. Power up the computer
2. Load the communications program
3. Power up the TNC  
**Note:** The software used will determine if the TNC will need to be powered up before the communications program is loaded (read the setup instructions).
4. Power up the radio
5. Connect to the Cluster

This leaves only for you to operate, i.e. send and receive messages as required by your location. **Note:** Most districts will have a set format for their messages. Contact your team leader to get a copy of the format used by your district.

**Do not adjust, play with or fiddle with any piece of equipment in use for an event, during that event, unless it is malfunctioning.**

# Using a Gateway

[ [From Packet](#) | [From HF](#) | [SysOp](#) | ]

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## Overview

Colorado has an ever increasing population of multi-port, Gateway capable, Terminal Node Controllers (TNCs). These TNCs provide significant function for data support during emergencies. The most common versions of these controllers are the AEA PK-900 and the AEA DSP-2232 (not to be confused with the PK-232 which does not have gateway). From an end user standpoint these two controllers function in the same manner and thus the controllers will be referred to as the *GTNC* to differentiate them from the users TNC.

Most of our people that use packet have not been exposed to operation with this type of controller. This document is intended to supply the users with sufficient information that they will be functional with these TNCs in the minimum amount of time.

Because we also have many new owners (System Operators - SysOps) of these GTNCs there is also a section devoted to their needs.

If you have an experience with a Gateway TNC that does not fit within the parameters described here, PLEASE capture what you see and send me an E-mail with that information. Thanks! - ipl

## From Packet

The person coming from packet may connect to either an HF station or another VHF/UHF station via the GTNC. Which connection you will make must be agreed upon with the SysOp before you connect (because he/she will need to have the correct radio in place). For this discussion let us handle the VHF to HF connections to simplify the instructions. All other connections will only vary slightly from this example.

You will connect to the GTNC just as if it were any other packet TNC. That is to say enter "c their-call". The call of the GTNC may have an SSID in the same manner as any other packet station. The mode you will be running in *from* the GTNC may be packet, AMTOR or PACTOR. In each case that information will be sent to you in the "welcome" message from the GTNC. Each line of information from the GTNC will start with "+++" (without the quotes). For example, if you were to connect to N7ML-7 you would see:

```
cmd: c n7ml-7
*** CONNECTED to N7ML-7
+++ N7ML Gateway. Other port (1) is PACTOR. Type ? for help.
+++ You are on Port 2, 1200 bps Packet. Your ID is "yourcall-15".
de N7ML-7 (B, C, D, J, L, N, P, S, ?)
```

You will issue the command "p1" to get to port 1 and you would see:

```
p1
+++ Cross Access to port 1, PACTOR. Your ID is "yourcall".
de N7ML-7 (B, C, D, J, L, N, P, S, ?)
```

At this point you issue a connect request for the station you need to connect to. Once connected, you will end each of your exchanges with (CTRL-Z)+(RETURN) to tell the GTNC to turn over transmission to the other station. To end a contact either station may issue the (CTRL-D) to force the GTNC to disconnect the PACTOR link.

## From HF

The connection from HF to VHF is slightly simpler than from VHF to HF because the GTNC automatically provides access to port 2 (VHF) from port 1 (HF). To connect to VHF you will:

```
cmd: ptconn n7ml
+++ N7ML Gateway. Type ? for help.
+++ You are on Port 2, 1200 bps packet. Your ID is "yourcall-15".
"yourcall" de N7ML (B, C, D, J, N, S, ?)
```

At this point you simply connect to the station or BBS as if you were directly on VHF.

To disconnect you use the "B(ye)" command.

There is one other variation that you may see. If the SysOp has the GTNC Maildrop enabled you will receive the Maildrop welcome message. For example, if you were again connecting to N7ML and he had his maildrop enabled you would see:

```
cmd: ptconn n7ml
+++ (AEA PK-900) 17396 free (A, B, H, J, K, L, R, S, V, ?)
```

At this point you issue the gateway command "g" to get to the gateway and continue as above.  
Notice that 'G' is not shown in the options list above - from the GTNC.

## System Operator

SysOp considerations are fairly simple. You need to have established which bands are going to be used and which data modes you will be using. Port 2 defaults to packet and becomes difficult (at the minimum) to use any other mode there. Port 1 may be VHF/UHF or HF. As SysOp you will need to:

- Select the correct modem configuration to support the modes you have chosen. (Page 4-30 or A-67 in the manual)
- Enable both ports (Radio 1/2 - Page 4-36 and A-86 in the manual)
- Enable the Gateway (XGATEWAY ON and GUSERS 3 - See the Gateway Supplement documentation)
- Decide if you are going to have your Maildrop on (TMAIL ON or OFF) If you have TMAIL ON then your users will need to issue the gateway command "g" once they connect. If your maildrop is turned off they will be directly routed to the gateway.
- Enter a call for the mode you wish to use. (MYCALL for packet, MYPTCALL for PACTOR or MYSELCAL for AMTOR.
- You may have a separate call assigned to your gateway (MYGATE)  
**Please note: this MUST NOT be the same as MYCALL or MYMAIL.**

## Thought / Comments / Suggestions?

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