ADVANCED ELECTRONIC APPLICATIONS, INC.

PAKRATT™
Model PK-232
Multi-Mode Data Controller

OPERATING MANUAL

USER'S GUIDE

MODEL PK-232 DATA CONTROLLER

ADVANCED ELECTRONIC APPLICATIONS, INC

PREFACE TO THE PK-232 DATA CONTROLLER MANUAL

Please read this preface in its entirety. It contains information about how to receive warranty service from AEA, the current software installed in your PK-232, AEA's software update policy and how to get involved in the digital radio community.

RF Interference Information To User

This PK-232 has been certified under Subpart J of Part 15 of the FCC rules.

This equipment generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with AEA's instructions, it may cause interference to radio and TV reception. It has been type-tested and has been found to comply with the limits of a Class B computing device in accordance with the specifications in Subpart J of Part 15 of the FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or TV reception, which can be determined by turning the PK-232 on and off, the user is encouraged to try and correct the interference using one or more of the following measures:

o   Reorient the antenna of the device receiving interference.
o   Relocate the computer with respect to this device.
o   Plug the computer into a different outlet so the computer and the device are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/TV technician for additional suggestions. The user may find "How to Identify and Resolve Radio-TV Interference Problems," a booklet prepared by the FCC, helpful.

USE SHIELDED CABLE FOR ALL RS-232 CONNECTIONS

As part of its continuing program of product improvement, AEA reserves the right to make changes in this product's specifications. Changes will be made periodically to the information in this document. These changes will be incorporated in new issues of this manual.

There may be technical inaccuracies or typographical errors in this document. Please address comments and corrections to AEA Incorporated, PO Box C2160, Lynnwood, WA 98036-0918. AEA reserves the right to incorporate and issue any information thus supplied in whatever manner it deems suitable without incurring any obligations whatever.

SECOND ISSUE (SEPTEMBER 1986)

Welcome

Congratulations!! You've purchased another fine AEA product.

PLEASE, before we go any further, may we ask you to FILL OUT AND RETURN the
Warranty Registration Card , which has been packed with your PK-232 system.

WE WILL NOT BE ABLE TO FURNISH YOU WITH ANY UPDATES TO THE SOFTWARE IF YOU DO
NOT RETURN THE ABOVE DOCUMENT. AS NEW FEATURES ARE DEVELOPED, WE ARE SURE YOU
WILL WANT TO BE ABLE TO OBTAIN THEM.

If you call for any kind of customer assistance, we'll ask you for the serial
number on your warranty card. Because of the numerous situations in which our
product is used by an unauthorized third party, we MUST verify that you are
the licensed user. We may choose to call you at the phone number listed in
our records to verify your identity. THANK YOU for your patience.

Product Update Policy

From time to time AEA will make available updates to the design of its prod-
ucts. These sometimes are made available to the user who has previously pur-
chased its products. We can only tell you about these updates if we have your
warrant card. PLEASE SEND IT IN If you have not already done so. Future ver-
sions of software for the PK-232 will most likely become available. AEA will
make these updates available, if possible.

In Case of Trouble

Application and troubleshooting assistance may be had by calling AEA during
our 8-12, 1-4:30 working hours in Seattle WA. Ask for the Customer Service
Department. The phone number is (206) 775-7373. Please have your product
serial number, and version date of the software available. The version date
is on the first screen that comes up when you turn on the PK-232. We will
also need to know the nature of any other equipment connected to the PK-232.

Please attempt to solve problems locally, using other hams or an AEA dealer.
Substituting a PK-80 or other TNC that you know is working properly for your
questionable one is a diagnostic technique that will check out the rest of
your station. Also try running your PK-232 in another station.

Many of the AEA products that are sent to us for repair are in perfectly good
order when we receive them. Please perform whatever steps are applicable from
the information on installation and troubleshooting.

If you call for assistance, please have your PK-232 up and running beside the
phone. Our service technician will likely ask you to perform certain keyboard
routines to aid in diagnosis. If you have a voltmeter handy, you might have
the PK-232 open so you can report measurements to the service technician.

PLEASE DO NOT RETURN THE PK-232 TO US WITHOUT CONTACTING US FOR PERMISSION
FIRST. WE WOULD LIKE THE OPPORTUNITY TO TROUBLESHOOT THE PROBLEM OVER THE
PHONE FIRST, SAVING YOU BOTH TIME AND MONEY.

If you send us the PK-232 by UPS it must be sent to the street address - not the post office box number. The street address is:

> AEA. Inc.
> 2006 196ᵗʰ St. SW
> Lynnwood, WA 98036
> USA

We will need YOUR street address for UPS return - be sure and send it.

UPS Surface (Brown Label) takes 7-8 days, Blue takes 2-3 days and Red is presently available on the West Coast only. Red is an overnight service and it is expensive. Send the PK-232 in a way that it can be traced if we cannot verify receipt of shipment. We suggest UPS or insured postal shipment.

If the PK-232 is still under the original owners warranty, AEA will pay the cost of the return shipment. The current policy is that it will be returned Brown if received Brown or by US Mail; returned Blue if received Blue or by overnight service; or returned as the owner states in his letter if he furnishes the return cost for the method he selects.

If the PK-232 is out of warranty, it will be returned by UPS Brown COD unless: 1) It was received UPS Blue/Red in which case it will go back UPS Blue COD, or 2) If you designate billing to VISA or MASTERCARD, or 3) you enclose a BLANK personal check endorsed "not to exceed ...$", or 4) you specify some other method of return.

We will typically service the product in two or three days if we have all the facts. If we must call you, it may take longer. PLEASE, if you send it in, include a letter stating the problem and were you can be reached. If you can be reached by phone in the evening on the East Coast, let us know where. Our current rate for non-warranty service is $40/hour with a 3/4 hour minimum. Parts and shipping are extra. AEA is not responsible for damage such as caused by lightning, nonprofessional alterations, poor storage/handling, etc.

Should your warranty card not be on file at AEA, you need to send the proof of purchase date to receive warranty service. Typically a copy of your bill of sale from an AEA dealer will suffice.

The warranty is for the original owner only and is not transferable.

INTRODUCTION

Welcome to the exciting world of digital Amateur Radio! You've joined the ranks of the fastest growing modes in Amateur Radio since the FM repeater.

Your AEA PK-232 Data Controller is the connection between your computer and radios. The PK-232 performs all the "magic" of establishing data and text communications between your station and many other communication facilities equipped for digital communications.

With packet radio and AMTOR, you'll have a "private channel" while sharing a frequency with other packet and AMTOR stations; you'll be able to "read the mail" of other Morse, RTTY and AMTOR QSOs, log on to computer-based "bulletin board" or "mailbox" stations, handle message traffic - in short, you're now equipped to enjoy the advantages of digital communications and error-correct- ing radio techniques in your ham shack.

Your new AEA PK-232 is the heart of your digital radio station. The PK-232's packet system software is derived from the original TAPR TNC; it presents many of the advanced features of that design, coupled with significant enhancements based on the experience gained by thousands of TAPR-equipped amateur packet stations worldwide.

This manual is your guide into the realm of digital Amateur Radio.

Join a Packet Club - Subscribe To Newsletters - Join a Voice Net

Join a packet radio club - they exist in all states as of this writing. You might also subscribe to the ARRL publication "Gateway," which describes all the "goings on" in packet radio, and to the TAPR "Packet Status Register," which describes the technically interesting happenings in the movement. There are many voice nets on VHF and HF; they usually meet weekly. They are usually dedicated to making the newcomer feel at home.

Acknowledgement

AEA, Inc. gratefully acknowledges the Tucson Amateur Packet Radio Corporation, Tucson, AZ for permission to include excerpts from their TNC-2 documentation in this manual.

This User's Guide to the PK-232 was developed and written by Norm Sternberg, W2JUP and Barbara Argilo, on a Tandy 1000HD computer with IBM's DisplayWrite 3 program, and an IBM Displaywriter using TextPack 6. Our thanks also go to Alan Chandler, Steve Stuart and Joe Schimmel.

AEA, Inc. dedicates itself to the development of digital radio communications.

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15. With your radio in _receive_ mode, tune the receiver to a clear, unoccupied frequency.

16. Set the receiver's volume control so the DCD LED on your PK-232 is just lit by the output noise signals from your receiver.

     This is the approximate receiver audio output level for best receive performance from your PK-232's modem.

2.7.2.1 Connections for Direct FSK Operation on RTTY

Some HF SSB radios provide direct FSK (Frequency-Shift Keying) for RTTY operation. FSK operation sometimes offers advantages, especially with radios that automatically acquire a CW or narrow-band IF filter. This can sometimes provide better results at lower Baudot and ASCII RTTY speeds, although very narrow filters can limit your data rate. Direct FSK is not always recommended for Mode A (ARQ) AMTOR or data speeds in excess of 110 bauds (100 WPM in either Baudot or ASCII.)

To install and operate your PK-232 and radio in the FSK mode:

1. Connect a shielded cable from the PK-232's J7 (DIN) receptacle, pins 1 or 4, to the radio's FSK input.

    NOTE: Polarity of the FSK signals, which are DC rather than audio, is not standardized by the radio manufacturers. Consult the manufacturer's instruction manual for your radio to identify correct FSK polarity.

2. Connect the FSK lines from the PK-232 to your radio's FSK input in accordance with your radio's specific requirements.

    See Figure 2-3 below.
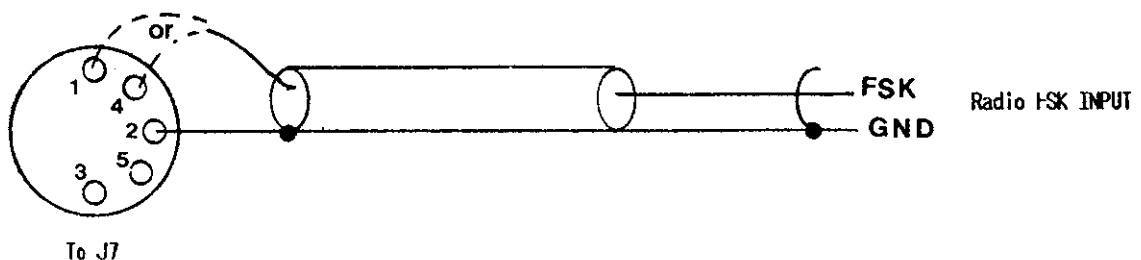
Figure 2-3   Connector J7 Pinout

NOTE: When using FSK for Baudot and ASCII RTTY, and AMTOR FEC
          (Mode B), the same power and duty-cycle restrictions apply
          as cited earlier for AFSK operation. Some radios provide
          lower output power when in FSK mode. Consult your radio's
          operating manual.

2.7.3   CW Installation and Adjustment

Your PK-232 permits CW operation in either of two ways:

o   Direct DC keying of your radio's CW KEY circuits.
o   Simulated CW keying using AFSK in upper or lower sideband.

2.7.3.1 DC Keying

If you choose the DC keying method, consult your radio's instruction
manual to determine if your radio uses negative or positive keying
polarity.

1.   Connect a two-wire shielded cable from the PK-232's positive (J9)
      or negative (J10) keying jacks to your radio's CW key input con-
      nector.

2.   Set your radio's Mode Selector switch to the "CW" position and
      operate the radio as though you were using a manual or hand key.
      Your PK-232 will key the radio in Morse without requiring any
      additional wiring.

2.7.3.2 AFSK CW Keying

If you choose the audio keying method, you'll use the same cables and
connections to the microphone input circuits previously described for
RTTY, AMTOR and Packet.

1.   Connect your radio to a dummy load.

2.   Set your radio's Mode Selector switch to the "USB" or "LSB" pos-
      ition. Your PK-232 will key the PTT line and send a keyed single
      audio tone to the radio's microphone input.

3.   While typing random letters at your keyboard, adjust the radio's
      microphone gain control until the radio's plate current or output
      power levels are correct according to the manufacturer's ratings
      for CW operation.

4.   All other radio and PK-232 adjustments are the same as in RTTY,
      AMTOR and Packet.

2.7.4   Oscilloscope Connections

You can connect an "X-Y display" tuning oscilloscope to Pins 3 (mark)
and 5 (space) on rear-panel connector J7. Connect the oscilloscope
ground return to Pin 2 of J7.

CHAPTER 3

BASIC OPERATION

3.1   Exploring the PK-232 Program

This chapter shows you how to use your PK-232 in each of its operating
modes, describes the keyboard commands you'll use to "talk" to your
PK-232, and the answers, prompts and error messages you'll receive
from your PK-232.

3.2   LED Status and Mode Indicators

Your PK-232's front-panel LEDs show you the operating mode and system
status at any moment. Each LED is marked with an abbreviated name.
Some LEDs have two name markings. All markings referring to packet
operation are below the LEDs. All other mode markings are above the
LEDs. Starting at the upper left corner, scan your PK-232's front
panel as we review the LEDs and their meanings.

3.2.1   Status Indicator LEDs

ERROR	ARQ Error	Lit when system receives errors from the distant station
IDLE	ARQ/FEC Idle	Lit when system sends synchronizing or idle characters
PHASE	ARQ Phasing	Lit when system sends SELCAL or phasing signals to distant station
STBY	ARQ Standby	Lit when system is available to answer ARQ SELCAL from distant station
RQ	ARQ Repeat Request	Lit when distant station requests repeat of previous information blocks
TFC	ARQ/FEC Traffic	Lit when system sends information
OVER	ARQ Changeover	Lit when system sends changeover command to distant station
MULT	Multiple	Lit when multiple connections exist
SEND	Send	Lit when PTT line is active
CONV	Converse	Lit when in Converse Mode
CMD	Command	Lit when in Command Mode
TRANS	Transparent	Lit when in Transparent Mode
PKT	Packet	Lit when in Packet Mode

3.2.2   Mode Indicator LEDs

STBY	ARQ/FEC Standby	Lit when in AMTOR ARQ or FEC Mode
MODE L	ARQ - Listen	Lit when system is in AMTOR Listen Mode
FEC	FEC - Mode B	Lit when system is in AMTOR FEC Mode
ASCII	ASCII Code	Lit when system is in ASCII RTTY Mode
BAUDOT	Baudot/CCITT Code	Lit when system is in Baudot RTTY Mode
ARQ	ARQ - Mode A	Lit when system is in AMTOR ARQ Mode
CHECK	Undefined	Reserved for possible future application
PKT	Packet	Lit when system is in Packet Mode
MORSE	Morse Code	Lit when system is in Morse Mode

3.2.2.1 The DCD LED - Data Carrier Detect

Use the DCD LED as an indication of channel activity. Your PK-232 detects activity on the channel (busy condition) by monitoring the demodulator's lock-detect signal and lighting the DCD LED when a valid signal exists. When the other station transmits, the DCD LED on your PK-232 should be lit for the duration of the received packet frame.

If the DCD LED is lit by random noises, rotate the THRESHOLD control counterclockwise until the DCD LED is extinguished. Valid received packets will almost always light the DCD LED, although your PK-232 may actually decode packets too weak to light the DCD LED.

3.2.3   LEDs at System Start

Your Pk-232 always starts in the Command Mode. At system start-up, or each time you type the RESTART command, your PK-232 shows its status on the front-panel LEDs:

STATUS: CMD lit

3.2.4   Tuning Indicator (See Figure 2-1)

Two center bars are lit when a tone is not present. When a "mark" tone is received, the bars at the left side of the display will be lit. Received "space" tones will light bars at the right side of the display. A properly-tuned signal is symmetrically divided, with the bright bars at the ends of the display. A properly-tuned CW signal shifts the lit bars from the center to the right side of the display in rhythm with the Morse keying.

In FM, tones are set by the sending station and can't be changed by the receiving station.

3.3   PK-232 Commands

The PK-232 Data Controller is a command driven system. All control
functions are performed by typing single- and multiple-character com-
mand from your computer's keyboard. Menus are not used.

Commands can specify the variable values of the parameters that affect
the PK-232's general operation and its performance during specific
actions.

3.3.1   Entering Commands

Commands are entered after the Command Mode prompt: "cmd:".

NOTE: Type <CTRL-C> if "cmd:" is not displayed.

You'll use English-like words or abbreviations to change the value of
parameters and issue instructions to the PK-232.

o   Commands are keywords or mnemonics (special abbreviations that
      trigger your memory) composed of strings of characters chosen by
      the user.

You'll probably never change the values of some parameters; however,
each user has maximum flexibility to adapt the PK-232 to the local en-
vironment and operating conditions.

o   Use either upper case (capital letters) or lower case (small let-
      ters) when entering commands.

o   End the command with a carriage return <CR>. Carriage returns
      are not shown in the examples below.

o   Correct your typing mistakes or cancel the line completely before
      you type the final <CR> of your command.

o   See Chapter 3 for a discussion of line editing.

We'll use UPPER CASE throughout this chapter to show you the commands,
and lower case to explain the text.

3.3.2   Command Responses

Whenever the PK-232 accepts a command that changes a value, the PK-232
responds with the previously stored value. For example, if you type

        XFLOW OFF

and "XFLOW" was "ON" you'll see the display

        XFLOW was ON

This message tells you that the value has been changed successfully.

3.3.3   <u>Error Messages</u>

If your PK-232 can't understand what you've typed, you'll get an error
message in English telling you the nature of the error.

o   If you type an unrecognized command:
            ?What?

o   If the command name is correct, but the arguments are wrong:
            ?bad

o   If you type a numerical value that is not within the proper range
        for that parameter:
            ?range

o   If you set the BEACON timing too often for busy channels:

            WARNING: BEACON too often

o   If you try to enter an improper SELCAL:
            ?call sign

Here are a few more examples:

        cmd:ASDFASDF   -   This isn't a command.
        ?What?

        cmd:BEACON E   -   A parameter was left out.
        ?bad

        cmd:PACLEN 265   -   Unacceptable numerical value.
        ?range

        cmd:DAY   -   You didn't set the PK-232's clock.
        ?clock not set

        cmd:x   -   Command is not valid for the mode in use
        ?not while in PACKET

        cmd:C N6IA   -   Command is not valid for the mode in use
        ?not while in MORSE

        cmd:C N6IA   -   Command is not valid for the mode in use
        ?not while in ASCII

        cmd:C N6IA   -   Command is not valid for the mode in use
        ?not while in BAUDOT

3.3.4   Command Names

The command name is the full word you can type to tell your PK-232 to execute this command. You can also give instructions to your PK-232 by typing a minimum abbreviation called a "mnemonic" instead of the full word. You may always type out the entire command word, or any abbreviation longer than the minimum abbreviation. For example:

o   The command MYCALL can be entered by simply typing "MY".
     (Note: DO NOT type the "quotation marks" - we show these for
     clarity in identifying the letters you'll type.)

The abbreviation "M" is not enough (and will be interpreted as another command), but "MY", "MYC", "MYCA", "MYCAL" or "MYCALL" are acceptable.

If a command requires parameters, the type of parameter is indicated after the command name as well as the default value. For example:

o   "n" means the command takes a numerical parameter value.

3.3.5   Default Values

Some commands have initial values that your PK-232 assumes as defaults or "used most often." These defaults are stored in EPROM and loaded into RAM when the system is first powered up - or when you give the RESET command.

3.3.6   Parameters, Arguments and Values:

Some commands need additional information before they can be executed. This type of command has "parameters" or requires "arguments."

For example, a command such as FULLDUP has a Boolean parameter;

o   The value that fill this parameter is either ON or OFF.

When you type FULLDUP ON, FULLDUP is the command, ON is its argument the value you want the PK-232 to use to execute the command FULLDUP.

o   Immediate commands such as ID have no parameters. Typing only
     "ID" causes the PK-232 to execute the command.

Some commands such as CONNECT have optional parameters.

o   If you enter CONNECT without an argument, the PK-232 displays the
     current status of the link.

However, if you enter CONNECT N7ML, the PK-232 issues the connect request and tries to establish the link to N7ML.

Some commands such as MFILTER can use several arguments at the same time. MFILTER accepts from 1 to 4 numerical arguments. You can type MFILTER 12 or MFILTER 12, 26. Both are legal commands.

Three different types of parameters are used: Boolean, numeric, and text or string.

o   Boolean Parameters

Boolean parameters have only two possible values, such as ON and OFF, YES or NO, or EVERY and AFTER. When a parameter is Boolean, its two possible choices are shown separated by a vertical bar.

o   Numeric Parameters

A parameter designated as "n" is a numeric value. Numeric values can be entered as the familiar decimal numbers, or optionally, as hexadecimal numbers. When using hexadecimal notation, you must prefix the number you type with a "$" character.

The PK-232 displays some of these numeric parameters (those which set special characters) in hexadecimal format. Here's a brief explanation of "hex" numbers:

The "digits" of a hex number represent powers of 16 in the same manner as the powers of 10 represented by a decimal number. The decimal numbers 10 through 15 are hexadecimal digits A through F. For example:

$$\$1B = (1 \times 16) + (11 \times 1) = 27 \text{ (decimal)}$$
$$\$120 = (1 \times 256) + (2 \times 16) + (0 \times 1) = 288 \text{ (decimal)}$$

You'll find a decimal-to-hexadecimal conversion table at the end of this manual in the Appendices.

o   Text or String Parameters

A parameter designated as text, such as the argument or "message" for BTEXT (your "beacon" message) or CTEXT ("connect" message), can be entered in upper or lower case.

A text parameter can include numbers, spaces, and punctuation. The text is accepted exactly as you type it.

Some commands require call signs as parameters. These parameters are usually amateur call signs, but may be any string of numbers and at least one letter up to six characters; the character strings identify stations sending and receiving packets.

A call sign can also include a sub-station identifier (SSID), a decimal number from 0 to 15 used to distinguish two or more stations on the air with the same amateur call (such as a base station and a digital repeater or "digipeater").

The call sign and SSID are entered and displayed as "call-n", e.g., "WX1AAA-3". If an SSID is not entered, the system sets it to 0 (zero); SSID "0" is not displayed by the PK-232.

Certain commands have parameters which are actually lists of call signs:

o   The CFROM and DFROM commands allow you to specify from one to eight call signs for selective monitoring.

o   You must separate multiple call sign lists with either blank spaces or commas.

Some examples will help you understand these explanations.

o   BEACON EVERYIAFTER "n"

     The BEACON command requires both Boolean and numeric arguments. You must specify either EVERY or AFTER (abbreviated to E or A), followed by an argument "n" chosen from some range of values.

     An appropriate entry would be BEACON EVERY 180 (this tells your PK-232 to send a beacon every 180 X 10 seconds, every 30 minutes), or BEACON EVERY 0 (tells your PK-232 to never send the beacon at all).

o   CONNECT call1 [VIA call2[,call3...,call9]]

     The CONNECT command requires a string argument "call1."

     You may optionally include the keyword VIA, followed by a list of from one to eight call signs, "call2" through "call9."

     Multiple call signs in the list must be separated by commas (as shown below) or by blank spaces.

     An acceptable entry would be: C WX1AAA V WX2BBB,WX3CCC.

3.3.7   Using Commands Without Arguments

If you type a command name without an argument, the current value of the command's arguments is displayed. For example:

```
cmd:MDIGI Y            Sets the value to YES (ON)
MDIGI was OFF          Displays the previous value

cmd:MDIGI              Command with no arguments
MDIGI ON               Displays the present value.
```

NOTE: The DISPLAY command shows you the values of all parameters or groups of related parameters.

3.3.8   <u>PK-232 Controller Messages</u>

Your PK-232 will frequently send you messages during normal operating
sessions. This section shows you typical messages and discusses the
circumstances under which they can appear.

3.3.8.1 <u>General Messages</u>

AEA PK-232 Data Controller
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Advanced Electronic Applications, Inc.
Release nn.mmm.yy
Checksum $aa
cmd:

This is the sign-on message that appears when you turn on your PK-232
or when you issue the RESET command. The release number will be up-
dated whenever the firmware is changed. The checksum is a hex number
which you can compare against the correct checksum given for the firm-
ware version you are using.

<u>PK-232 is using default values.</u>

This message appears along with the sign-on message above if the bbRAM
checksum verification fails at power-on time, causing the PK-232 to
load the default parameters from ROM. (This is the message you re-
ceive the first time you turn on your PK-232.) This message also ap-
pears if the PK-232 loads the defaults in response to the RESET com-
mand.

<u>cmd:</u>

This is the Command Mode prompt. When this prompt appears, the PK-232
is waiting for you to issue a command. Anything you type after this
prompt is read by the PK-232's command interpreter as a command to the
PK-232. If a monitored packet is being shown, the prompt may not be
visible, even though you are in Command Mode. If this happens, type
the redisplay-line character (set by the REDISPLA command) to retype
the prompt.

<u>?What?</u>

Your PK-232 didn't understand you at all! This will happen at any
time that you give your PK-232 an invalid command that is a complete
mystery to its command interpreter.

<u>was</u>

Whenever you change the value of one of the PK-232's parameters, the
previous value is displayed. This confirms that the PK-232 properly
interpreted your command, and reminds you of what you have done.

3.3.8.2 Command Mode Error Messages

An error message will be displayed if you make a mistake typing a command to the PK-232. Depending on the type of error you've made, you may see the following messages:

?bad

You typed a command correctly, but the parameters, arguments or values in the command line couldn't be interpreted.

?VIA

You tried to enter more than one call sign for the CONNECT or UNPROTO commands without the VIA keyword.

?callsign

You entered a call sign in a way that does not meet the PK-232's requirements for call signs. A call sign may be any string of numbers and letters, including at least one letter. Punctuation and spaces are not allowed. The sub-station ID, if given, must be a (decimal) number from 0 to 15, separated from the call by a hyphen.

?clock not set

You gave the command DAYTIME to display the date and time, but you haven't previously set the clock. DAYTIME sets the clock if it is given with the daytime parameters, and displays the date and time if it is given without parameters.

?not enough

You didn't give enough arguments for a command that expects several parameters.

?need ALL/NONE/YES/NO

You didn't give the arguments needed for CFROM, DFROM, MFROM and MTO.

?too many

You gave too many arguments for a command that expects several parameters. For example, MFILTER can have up to 4 arguments.

          cmd:MFILTER $1B,$0C,$1A,$03,$07
          ?too many

?too long

You typed a command line that is too long; the line was ignored. This might happen if you try to enter a BTEXT or CTEXT message using more than 120 characters. If you get this specific error message, the previous entry hasn't been changed and your new entry has been ignored.

<u>?not while connected</u>

You attempted to change MYCALL or AX25L2V2 while in a connected or
connecting state.

<u>?range</u>

You gave a numeric argument too large for that specific command.

<u>too many packets outstanding</u>

You'll get this message after a CONVERSE or TRANS command, if you've
already typed packet data and filled the outgoing buffer, and then
tried to return to the Command Mode. You'll be allowed to enter the
mode after some of the packets have been successfully transmitted.

3.3.8.3 <u>Link Status Messages</u>

Link status messages show you the status of packet AX.25 connections
in which your PK-232 may be involved. You can ask for link status at
any time from the Command Mode by typing the CONNECT command without
parameters.

If you type a CONNECT command while your PK-232 is in the connected
state, your monitor will display the link status but your PK-232 won't
take any other action.

The following messages appear in response to the CONNECT command.

o   Link state is: CONNECTED to call1
         [VIA call2[,call3...,call9]]

     Your station is connected to a distant station - you'll see the
     digipeater path in use, if any. The call sign sequence is the
     same sequence you would type to initiate the connection.

o   Link state is: DISCONNECTED

     No link or connection exists right now. You may type the CONNECT
     command to initiate a connection.

o   Link state is: CONNECT in progress

     You've already typed a connect request, but the acknowledgment
     from the other station has not been received. If you type the
     DISCONNE command, the connect process will be canceled.

o   Link state is: DISCONNECT in progress

     You've typed a disconnect request, but the acknowledgment from
     the other station has not been received. If you type a second
     DISCONNE command, the PK-232 immediately goes to the disconnected
     state.

o   Link state is: FRMR in progress

     Your PK-232 is connected to a distant station, but a protocol
     error has occurred. This should never happen when two AEA AX.25
     systems are connected. An improper implementation of the AX.25
     protocol could cause this condition. Your PK-232 will try to
     re-synchronize frame numbers with the PK-232 on the other end,
     although a disconnect may result. Connections are invalid in
     this state; a disconnect command starts the disconnect process.

     Your PK-232 will tell you whenever the link status changes. The
     link status may change in response to a command you've given the
     PK-232 (CONNECT or DISCONNE), a connect or disconnect request
     packet from a distant station, a disconnect due to the retry
     count being exceeded, an automatic time-out disconnect (CHECK),
     or a protocol error.

o   *** CONNECTED to: call1 [VIA call2[,call3...,call9]]

     This message appears when your PK-232 switches from the "discon-
     nected" or "connect in progress" state to the connected state.
     The connection may be a result of a CONNECT command typed by you,
     or a connect request packet received from a distant station.

o   *** Connect request: call1 [VIA call2[,call3...,call9]]

     Your PK-232 has received, but not accepted, a connect request
     from a distant station. This can happen if you have set CFROM to
     NONE, or if you are already connected to another station.

     When your PK-232 displays this message, it also sends a DM packet
     (busy signal) to the station that initiated the connect request.
     If your PK-232 rejects a connect request because you've set CFROM
     to NONE, you can issue your own connect request to the other sta-
     tion.

o   *** DISCONNECTED: (call sign)

     Your PK-232 has switched to the disconnected state from any other
     link state. This message may be preceded by a message explaining
     the reason for the disconnect, as shown below.

o   *** Retry count exceeded
     *** DISCONNECTED: (call sign)

     Your PK-232 has been disconnected because of a retry failure,
     rather than a disconnect request from one of the stations.

o   *** <call sign> busy
        *** DISCONNECTED: <call sign>

        Your connect request was rejected by a DM packet (busy signal)
        from the other station. Your PK-232 will reject a connect re-
        quest if CFROM is set to NONE, or if you are already connected to
        another station.

o   FRMR sent: xx xx xx

        Your PK-232 is connected but a protocol error has occurred. Your
        PK-232 has transmitted a special FRMR packet and is trying to
        re-synchronize frame numbers with the distant station's packet
        system. The string xxxxxx is replaced with the hex codes for the
        three bytes sent in the information part of the FRMR frame. This
        message will not appear if your PK-232 is in Transparent Mode.

o   FRMR rcvd: xx xx xx

        Your PK-232 has received an FRMR (protocol error as described
        above). This message will not appear if your PK-232 is in
        Transparent Mode.

3.3.9   Special Keyboard Control Codes

Except for packet operation, each operating mode assigns special uses
to certain keyboard characters. The assigned function depends on the
mode, and, except where noted, is typed from the Command Mode.

3.3.9.1 Morse Code

From Command Mode:

"L"   Locks to speed of the received signal.
"MO"   Unlocks from speed of received signal.
"R"   Switches the system to receive mode, unlocks received speed,
          forces receive speed to equal transmit speed.
"X"   Switches system to transmit mode.

3.3.9.2 Packet Mode

Characters "L", "R", and "X" do not have a special function in packet
operation.

3.3.9.3 **Baudot and ASCII RTTY**

In Baudot RTTY:

From Command Mode:

"L"   Forces LETTERS case.
"R"   Switches system to receive mode, forces LETTERS case.
"X"   Switches system to transmit mode.

Embedded in transmitted text:

<CTRL-O>   Sends LETTERS character.
<CTRL-N>   Sends FIGURES character.

In ASCII RTTY:

From Command Mode

"R"   Switches system to receive mode, forces LETTERS case.
"X"   Switches system to transmit mode.

3.3.9.4 **AMTOR Mode**

From Command Mode:

"L"   Forces LETTERS case.
"R"   Stops transmission in progress, forces AMTOR Standby.
"AM"   Stops transmission in progress, forces AMTOR Standby.
"AL"   In ALIST (AMTOR Mode A Listen), forces re-synchronization.
"X"   Unlike Baudot, ASCII and Morse, this has no effect.

Embedded in transmitted text:

<CTRL-O>   -   Sends LETTERS character.
<CTRL-N>   -   Sends FIGURES character.

3.3.9.5 **Clear String Commands**

While in Command Mode the following commands can be cleared by typing the command word followed by a single percent sign (%), an ampersand (&) or "N," "NO," "NONE", "OFF" as the command's argument.

BTEXT	CTEXT	MBX	MYALIAS	MHEARD
MFROM	MTO	CFROM	DFROM	

3.3.10 **Detailed Command Descriptions**

Chapter 5, "Command Summary," presents detailed descriptions of each command contained in the PK-232's operating system software. You'll find more information on the meaning, use and effects of each command, its parameters, default values and arguments. Examples of command usage are included.

3.4   General Operating Information

         Before we discuss the specifics of each your PK-232's five operating
         modes, we'll present some ideas and command concepts that apply to all
         of the operating modes.

3.4.1   Signal Function Commands

         These commands affect transmitted signals by allowing you to change
         data polarity and set automatic function commands.

3.4.1.1 Invert Received Data (RXREV)

         The "RXREV" command reverses the mark and space (stop and start) tones
         in Baudot and ASCII RTTY, and AMTOR reception. The polarity of the
         transmitted data is not affected. Use this option if you can't re-
         ceive with the opposite sideband to match a station that is sending
         inverted data.

3.4.1.2 Invert Transmitted Data (TXREV)

         The "TXREV" command reverses the mark and space (stop and start) tones
         in Baudot and ASCII RTTY and AMTOR transmission. The polarity of the
         received data is not affected. Use this option if you can't transmit
         with the opposite sideband to match a station that is receiving in-
         verted data.

3.4.1.3 Return to Receive Mode <CTRL-D>

         In the Baudot and ASCII RTTY modes, you can insert the RECEIVE command
         <CTRL-D> as you type "live" into the PK-232's transmit buffer, or you
         can write <CTRL-D> in a pre-typed message stored on disk or tape. As
         soon as your PK-232 reads this command, it immediately shuts off your
         rig and returns you to the Command Mode.

         o   Type "X" to start another transmission.

3.4.1.4 Send Time of Day <CTRL-T>

         In the Baudot/ASCII RTTY, AMTOR and Morse modes, use the character
         specified by the TIME command (default <CTRL-T>) to insert the time of
         day in the text you type into the transmit buffer, or into a text file
         stored on disk.

         The PK-232 reads the control code and sends the time to your radio in
         the data transmission code in use at that time, in format HH:MM, where
         "HH" is the hour in the 24-hour system and "MM" is the minute. The
         "colon" is transmitted in all codes, including Morse.

         If DAYSTAMP is ON the date is included with the time.

3.4.1.5 <u>CW Identifier <CTRL-F></u>

In the Baudot and ASCII RTTY modes, you can insert the character spec-
ified by the CWID command (default <CTRL-F>) as you type "live" into
the PK-232's transmit buffer, or you can write <CTRL-F> in a pre-typed
message stored on disk or tape. When your PK-232 reads <CTRL-F>, it
switches to the Morse Mode, sends your previously stored call sign in
Morse code prefixed by "DE," turns off your transmitter, and returns
to Command Mode.

<u>Note</u>:   In the U.S.A., the requirement for identifying your station
           in Morse code has been eliminated. U.S. amateurs may now
           identify in whatever mode they are operating. Check local
           government requirements.

3.4.1.6 <u>Wide Shift (WIDESHFT)</u>

Use the WIDESHFT command to select wide (1000 Hz) or narrow (200 Hz)
shifts. MARS stations will find WIDESHFT generally compatible with
standard MARS 850-Hz shift Baudot RTTY operations. Nearly all amateur
radio VHF and HF Baudot and ASCII RTTY operators use 170-shift. The
PK-232's 200-Hz shift is within the passband and filter tolerances of
any RTTY demodulator in general service.

Type "WIDESHFT ON <RETURN>" to select 1000-Hz shift. The PK-232 will
respond with:

        WIDESHFT   was OFF

3.4.1.7 <u>Answerback (AAB)</u>

The answerback and WRU? functions are widely used in low-speed Baudot
TTY, telex, ASCII and AMTOR/SITOR services to confirm that the traffic
is being received by the proper station and is probably being received
correctly.

You can store up to 17 characters in your answerback field. The text
string can be whatever suits your needs. For example, if you handle
traffic using Baudot RTTY or AMTOR, you can type in a "QSL" string:

o   Type "AAB QSL DE MYCALL<RETURN>"

If the station sending traffic to you starts and ends his transmission
with the WRU? character "FIGS D", "$" in Baudot and AMTOR, or <CTRL-E>
in ASCII, your PK-232 will turn on your transmitter, send the message
"<CR><LF>QSL DE MYCALL" stored in the Answerback field (AAB) and then
turn your transmitter off and return to the receive status. Note -
the <CR><LF> sequence is created by the PK-232 - don't type it as part
of your answerback text.

3.4.1.8 WRU? (Who Are You?)

Use the WRU? feature in Baudot and AMTOR to enable or disable your PK-232's automatic answerback feature. The default value is OFF.

If WRU? is set ON, your PK-232 send your answerback on receipt of a distant station's WRU? request character "FIGS D" or "$". Your PK-232 turns on your transmitter, sends the text string stored in the answerback field (AAB) and thens turn your transmitter off and returns to receive status.

These related features can be used in message handling in either direction to confirm that:

o   you are sending to the proper station;
o   the distant station is probably receiving your traffic successfully.

3.4.2   Formatting Commands

These commands affect transmitted or displayed signals, or both.

3.4.2.1 Screen Line Length (ACRDISP n)

The ACRDISP command (default 80) formats your computer's screen display. A <CR><LF> sequence is sent to your computer at the end of a line when "n" characters have been displayed. If your computer automatically formats output lines, set ACRDISP to zero (0) to disable this function.

3.4.2.2 Monitor Echo (ECHO)

The ECHO command controls local echo by your PK-232 in all modes except Packet radio's Transparent Mode. If the characters you type are correctly displayed, the ECHO function is set properly.

o   If you don't see your typing on your display, set ECHO to ON.
o   If you see each typed character doubled, set ECHO to OFF.

3.4.2.3 Automatic Word/Character Output (WORDOUT)

In Morse, Baudot and ASCII RTTY, and AMTOR, the WORDOUT command permits you to toggle between two different ways of outputting your hand-typed characters. If "WORDOUT" is set ON, you have a limited form of editing of your typing errors.

o   If "WORDOUT" is OFF: each character you type will be transmitted as soon as you type it as it enters the PK-232's transmit buffer.

o   If "WORDOUT" is ON: nothing will be sent until you type a "SPACE"
     character (space bar), a "RETURN", or any punctuation marks such
     as parentheses, plus sign, asterisk, etc. This gives you the
     opportunity to correct your spelling or even change words before
     the transmit buffer's contents are transmitted (even though the
     transmit buffer has been emptied).

3.4.2.4 Line Feed <CTRL-J>

<CTRL-J> is part of the standard terminal keyboard "RETURN" or "ENTER"
key operation and is normally sent with a carriage return.

You can insert "<CTRL-J>" in any text where you need an isolated line
feed function without an associated carriage return. This is known as
an "index" function in word processing, and can be useful when format-
ting text files in your buffers.

3.4.2.5 Carriage Return <CTRL-M>

<CTRL-M> is part of the standard terminal keyboard "RETURN" or "ENTER"
key operation and is normally transmitted together with a line feed.

You can insert "<CTRL-M>" in any text where you need an isolated car-
riage return function without an associated line feed. This is also
known as a "Zero-Index Carriage Return (ZICR)" function in word pro-
cessing, and can be useful when formatting text files in your message
buffers.

3.4.2.6 Automatic Carriage Return (ACRRTTY n)

If the ACRRTTY is set ON, when transmitting Baudot or ASCII RTTY, a
carriage return <CR> character is sent automatically at the first
space after "n" characters (default value is 71). After the carriage
return is sent, the character counter resets to zero (0).

Use this option when you are hand-typing text into the transmit buffer
and don't want the bother of watching the screen to see when you come
to the end of a line.

NOTE: There are several cases in which you should not use this option:

o   Don't use this option when retransmitting text, such as ARRL RTTY
     bulletins received from another station - the received text al-
     ready contains the carriage returns. Thus, enabling "Automatic
     CR" sends double or triple line feeds which look very strange to
     the distant station.

o   Many stations using electromechanical teleprinter and Teletype'•
    machines habitually send the traditional line-ending sequence of
    <CR><CR><LF><LTRS> needed to allow the slower machines to return
    to the left margin. The double <CR> will produce a double line
    feed if you set ACRRTTY at less than the number of columns or
    characters-per-line used by the originating station. The default
    value of 71 is acceptable for most received traffic. If you want
    to be certain that automatic carriage return is disabled, set
    ACRRTTY to 255.

o   When sending RTTY pictures; you want everything exactly as typed.

3.4.2.7 Automatic Line Feed (ALFRTTY)

If ALFRTTY is set ON, when transmitting Baudot or ASCII RTTY, a line
feed character is sent automatically after a <RETURN> is typed. Use
this option when you are hand-typing text into the transmit buffer and
don't want the bother of watching the screen to see when you come to
the end of a line. The same restrictions apply to this option as to
the automatic carriage return option described above.

3.4.2.8 Backspace and Delete <DEL>

Use your keyboard's <BACKSPACE> to backspace. Depending on how you've
set the "BKONDEL" and "DELETE" parameters, your BACKSPACE key may be a
"destructive" backspace key.

o   If "DELETE" is ON, typing <BACKSPACE> erases the characters from
    the screen and from the transmit buffer as well.

3.4.2.9 Escape Functions <ESC>

The echoed ESCAPE character can be either your keyboard's ESCAPE ($1B,
ASCII 27) key, or the "$" dollar sign character ($24, ASCII 36). The
default is the ESCAPE key.

This option is provided because some terminals and computer terminal
emulator programs may interpret the ESCAPE character as a special com-
mand prefix. These terminals change display functions depending on
the characters that follow the ESCAPE key.

o   If your computer presents this problem, set ESCAPE to ON.

o   See the MFILTER command which lets you strip or filter out any
    received characters and prevent them from reaching your computer
    or terminal.

3.4.2.10 <u>Echo As Sent (EAS)</u>

The Echo-As-Sent (EAS) command can be used in all modes but packet.
EAS permits you to choose the type of data displayed on your screen
or printer.

Set EAS ON when operating Morse, Baudot RTTY and AMTOR - these modes
don't use lower case characters. You can operate in a relaxed and
normal manner, typing entirely in lower case if that's easier for
you. With EAS ON, your PK-232 translates your lower case typing
into UPPER CASE Morse or Baudot/CCITT characters.

When EAS is on when operating Morse, Baudot and AMTOR, only UPPER
CASE characters appear on your screen, representing the data sent to
the distant station. Each character appears on the screen at the
time it is sent on the air.

Type "EAS OFF" to see your typing exactly as you type the characters
or send from a disk file. The PK-232 responds with:

        EAS   was ON

Type "EAS ON" to see the data as it appears on the air. The PK-232
responds with:

        EAS   was OFF

3.4.2.11 <u>Clear Transmit Buffer (TCLEAR)</u>

Use the TCLEAR command to clear your PK-232's transmit buffer and
cancel any further transmission of data.

Type "TCLEAR" or "TC" followed by a <RETURN>.

o   You <u>must</u> be in the Command Mode to use TCLEAR.

o   Use <CTRL-C> (default) command to return to Command Mode.

o   Type "TCLEAR <RETURN>" or "TC <RETURN>" to clear the transmit
       buffer.

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CHAPTER 4

OPERATING MODES

4.1   General Information

Five modes of operation are available with the PK-232.

o   Morse Code
o   Baudot RTTY
o   ASCII RTTY
o   AMTOR
o   Packet Radio

4.1.1   Morse Code

Morse continues to be the foundation of amateur radio operation. The
traditional Morse code QSO is greatly improved by computer-based Morse
operation. Messages formerly handled manually can now be sent at much
higher speeds, with greater ease of operation. Computer-based Morse
operation automatically creates and maintains a permanent record of
your Morse communications - a major advantage over manual operation.

4.1.2   Baudot RTTY

Computer-based Baudot operation is growing daily. The combination of
the economical personal computer and the amateur radio station opens
new vistas of enjoyment and provides better methods of handling mes-
sage traffic in the amateur radio service.

The Baudot/Murray code, also known as International Telegraph Alphabet
Number 2, is a five-bit asynchronous text transmission code used for
text or message transmission when you don't need the full character
set found in ASCII. The Baudot/Murray code is still the most widely
used RTTY in the amateur radio service in the world.

4.1.3   ASCII RTTY

The ASCII (American Standard Code for Information Interchange) code is
also known as International Alphabet Number 5. ASCII is a seven-bit
asynchronous transmission code used to send text or data traffic that
requires a more complete character set than that provided by older,
less sophisticated Baudot code. The ASCII code is generally suitable
for any form of data transfer, and is required for transmission of
computer program listings and executable or binary code files.

The PK-232 provides RTTY operation in the ASCII code at 110, 150, 200
and 300 bauds, corresponding to approximately 100, 150, 200 and 300
words per minute (WPM).

4.1.4   AMTOR

The PK-232 provides AMTOR operation in accordance with FCC Part 97.69
and CCIR Recommendations 476-2/476-3, Mode A (ARQ) and Mode B (FEC) in
normal, semiautomatic, and fully automatic modes.

AMTOR, an adaptation of the SITOR system used in high-seas ship telex,
uses a unique seven-bit synchronous code for error detection and error
correction.   AMTOR has been widely used overseas since 1977, and is
growing rapidly among U.S. amateurs who wish to obtain almost error-
free RTTY under the worst-case conditions found in HF radio.

AMTOR Mode A (ARQ) is the considered to be the most error-free method
of HF radiogram message and text transmission available in the amateur
radio service today.

o   Use AMTOR Mode A (ARQ - Automatic Request for Repetition) to an-
      swer another station's CQ call, or to set up a synchronous, in-
      teractive link with error detection and correction.

When used with EAS set ON, Mode A allows you to "see" the quality of
the path, the circuit link and band conditions, to watch the flow of
the data and accurately estimate the "throughput" rate.

o   Use AMTOR Mode B (FEC) to call CQ and to transmit information to
      more than one station at the same time ("round-table" mode).

We strongly urge that before operating AMTOR, you read APPENDIX E,
written by J. Peter Martinez, G3PLX, the "father" of AMTOR, and pub-
lished in this manual with his permission.

4.1.5   Packet Radio

Packet radio, one of the newest forms of communication, offers a major
improvement in the reliability of text and data transmission.   Your
PK-232 uses the AX.25 packet protocol.   AX.25 is based on the interna-
tional protocols standardized throughout the telephone networks.   It
has been modified within our fraternity for use in amateur radio.

We'll discuss each of the operating modes separately in the following
paragraphs.

For a more detailed discussion of appropriate amateur radio applica-
tions of ASCII, Baudot/Murray and AMTOR RTTY codes, see Appendix G.

²2   Morse Code Operation

        From the Command Mode, type "MORSE" or "MO" followed by a <RETURN> to
        enter the Morse mode. The PK-232 responds with the previous mode:

                OPMODE   was PACKET

        o   Type "X" to turn on your transmitter.
        o   Type "K" to enter the Converse Mode and begin the contact.
        o   Type <CTRL-D> to shut off your transmitter and return to Command
            Mode OR,
        o   Type <CTRL-C> to return to the Command Mode.
        o   Type "R" to shut down your transmitter and end the contact.

4.2.1   Transmit/Receive Function Keys

        From the Command Mode:

            "L"   Locks system to the speed of the incoming signal.
            "R"   Switches system to receive mode, unlocks receive speed,
                       forces receive speed to equal transmit speed
            "X"   Switches system to transmit mode.
            "MO"   Unlocks the Morse receive speed.

        Embedded in transmitted text:

            <CTRL-D>   Shut off transmitter immediately and go to Command
                       Mode.

        All amateurs are familiar with CW operation. However, there are some
        differences between manual and automatic Morse operation. As a rule,
        computer-based Morse needs stronger signals in order to achieve the
        lowest number of errors in automatic decoding of the received text.
        Computers are not forgiving or tolerant of a "bad fist!" Trying to
        decode poorly sent Morse Code with any computer system is like the
        "GIGO" rule - Garbage In, Garbage Out! The best computers will send
        garbled characters to the screen or printer when trying to decipher CW
        in which the dot-dash lengths, intervals and ratios, inter-character
        and inter-word spacing are really out of the normal specifications.

        Don't expect your PK-232 to do miracles and produce good copy from bad
        fists! Later in this manual you'll learn how to use the PK-232 pro-
        gram with your computer to improve your own CW fist.

4.2.2   Speed Change

        Use the MSPEED command to change Morse keying speed.

        Type "MSPEED (RETURN)" or "MSP (RETURN)", to read the present Morse
        speed. The PK-232 responds with:

                MSPEED   20

Type "MSPEED" followed by one or two digits from "5" to "99" and a <RETURN> The PK-232 responds with the previous Morse speed.

   MSPEED   was 20

The number you enter becomes the new _transmit_ speed and replaces the value previously stored in the program. The slowest available Morse speed is 5 words per minute. If you enter numbers lower than 5, the program uses 5 words per minute.

For speeds from 5 to 14 words per minute. the transmitted code is sent in Farnsworth spacing; the characters are sent at 15 words per minute while the spaces between characters are lengthened to yield an overall code transmission rate of 5 to 14 words per minute.

4.2.3   Speed Lock

The LOCK command locks the system to the speed of the received signal. Reception of Morse code in the presence of noise can be enhanced this way. To unlock the speed, type "R" or "MO", followed by a <RETURN>

4.2.4   Special Morse Characters

The PK-232's Morse program contains special keystrokes that you can use to make transmission easier, faster and more enjoyable. The most frequently used Morse "prosigns" are coded into the keyboard with keys that have no direct representation in standard Morse. These special "reserved" keys are listed below:

Keystroke	Abbreviation	Meaning
*	SK	End of QSO
&	AS	Wait
+	AR	End of message
(	KN	Go only
=	BT	Break or pause
>	AA	New line
!	SN	Understand
%	KA	Attention

4.2.5   Morse Code Practice

Use your computer and your PK-232 to develop and improve your manual CW sending and receiving skills.

Set your PK-232 for Morse receive operation and operate the hand key attached to your radio. In most typical installations, if your radio has an "input monitor" or "sidetone" output, your hand keying will be sent to the PK-232 and displayed on your monitor. Send test words for a few minutes to familiarize yourself with the relationship between your hand-keying and the Morse appearing on your screen. Practice keying at various speeds; observe how the system decodes your "fist." You may be a bit unhappy or surprised at the quality of your keying. After a few sessions, you'll notice an improvement in your keying.

4.3   Baudot RTTY Operation

       From the Command Mode, type "BAUDOT" or "BA" followed by a <RETURN> to
       enter the Baudot RTTY mode. The PK-232 will respond with the previous
       mode:

              OPMODE   was MORSE

       o   Type "X" to turn on your transmitter.
       o   Type "K" to enter the Converse Mode and begin the contact.
       o   Type <CTRL-D> to shut off your transmitter and return to the
              Command Mode OR,
       o   Type <CTRL-F> to send your call sign in Morse and shut off your
              transmitter and return to Command Mode, OR
       o   Type <CTRL-C> to return to the Command Mode.
       o   Type "R" to shut down your transmitter and end the contact.

4.3.1 Transmit/Receive Function Keys

       From the Command Mode:

              "L"   Forces LETTERS case.
              "R"   Switches system to receive mode, forces LETTERS case.
              "X"   Switched system to transmit mode.

       Embedded in transmitted text:

              <CTRL-O>   Sends LETTERS character.
              <CTRL-N>   Sends FIGURES character.
              <CTRL-D>   Shut off transmitter immediately.
              <CTRL-F>   Send call sign in Morse and shut off transmitter.

       The PK-232 provides RTTY operation in the Baudot/Murray code at 45,
       50, 57, 75 and 100 bauds, corresponding to approximately 60, 66, 75,
       100 and 132 words per minute (WPM).

4.3.2 Baud Rate (Speed) Change

       Use the RBAUD command to change the Baudot data rate.

       Type "RBAUD <RETURN>" or "RB <RETURN>" to read the present baud rate.
       The PK-232 responds with:

              RBAUD   45

       Type "RBAUD" followed two or three digits and a <RETURN>. The PK-232
       responds with the new baud rate:

              RBAUD   was 45

       The number you enter becomes the new data rate and replaces the value
       previously stored in the program:

You can also change the baud rate one step up or down one step at a
time by typing "RB U" or "RB D" respectively. The PK-232 returns the
previous data rate and adopts the new rate.

o   "RB n" can be any of the following speed options: 45, 50, 57, 75
      or 100 bauds.

NOTE: The expression "words per minute" (WPM) is no longer used in
          commercial telegraphy. Baudot speeds are now generally spe-
          cified by baud rates. The Baudot "WPM" speeds relate to
          modern terminology as follows:

            Words per Minute   Baud Rate
                 60   45 bauds
                 66   50 bauds
                 75   57 bauds
                100   75 bauds
                132   100 bauds

4.3.3   CCITT On/Off

Use the CCITT command when operating Baudot RTTY to select the correct
character translation between the standard "American keyboard" and the
internationally standardized keyboard used outside the U.S.A. The
CCITT option automatically translates your typing into International
Telegraph Alphabet Number 2 (ITA #2) to avoid character conflicts when
working stations overseas. (Part 97.69 of the FCC Rules calls for
this code when operating Baudot RTTY.)

If CCITT is set ON, characters typed on the keyboard or loaded from
disk files are translated into CCITT ITA #2 before being sent. If CCITT is
set
OFF, characters sent to the PK-232 are not translated into CCITT ITA
#2, but remain in the American standard Baudot format (typically West-
ern Union). For a description of the keyboard configurations, see the
CCITT command in Chapter 5, Command Summary.

4.3.4   Unshift-On-Space (USOS)

Unshift-On-Space automatically changes the program to the LETTERS or
lower case condition after the "space" character is received.

When operating Baudot RTTY under poor HF receiving conditions, a re-
ceived LETTERS-SHIFT character can be garbled, or another character
can be wrongly interpreted as a FIGURES-SHIFT character. Many other-
wise good characters received after this point would be interpreted as
"upper case," (numbers and punctuations) rather than the lower case
letters typed by the originating station.

USOS helps reduce reception errors under these conditions. However,
be aware that some commercial, weather and utility RTTY services send
consecutive groups of numbers separated by spaces. In these cases,
the use of USOS will produce unacceptable results by returning the
system to lower case characters when the originator may have intended
the data to be upper case characters.

4.4   ASCII RTTY Operation

From the Command Mode, type "ASCII" or "AS" followed by a <RETURN> to
enter the ASCII RTTY mode. The PK-232 will respond with the previous
mode:

        OPMODE   was BAUDOT
o   Type "X" to turn on your transmitter.
o   Type "K" to enter the Converse Mode and begin the contact.
o   Type <CTRL-D> to shut off your transmitter and return to Command
        Mode, OR
o   Type <CTRL-F> to send your call sign in Morse and shut off your
        transmitter and return to Command Mode, OR
o   Type <CTRL-C> to return to Command Mode.
o   Type "R" to shut down your transmitter and end the contact.

4.4.1   Transmit/Receive Function Keys

From the Command Mode:

        "R"   Switches system to receive mode.
        "X"   Switches system to transmit mode.

Embedded in transmitted text:

        <CTRL-D> Shut off transmitter immediately.
        <CTRL-F> Send call sign in Morse and shut off transmitter.

The PK-232 provides RTTY operation in ASCII code at 45, 50, 57, 75,
100, 110, 150, 200 and 300 bauds.

4.4.2   Baud Rate (Speed) Change

Use the ABAUD command to change the ASCII data rate.

Type "ABAUD <RETURN>" or "AB <RETURN>" to read the present baud rate.
The PK-232 responds with:

        ABAUD   110

Type "ABAUD" followed two or three digits and a <RETURN>. The PK-232
responds with the new baud rate:

        ABAUD   was 110

The number you enter becomes the new data rate and replaces the value
previously stored in the program.

You can also change the baud rate one step up or down one step at a
time by typing "AB U" or "AB D" respectively. The PK-232 returns the
previous data rate and adopts the new rate.

"AB n" can be any of the following speed options: 45, 50, 57, 75, 100,
110, 150, 200 or 300 bauds.

4.4.3 General Use of Control Key Functions

When planning text files and messages for later transmission in the ASCII RTTY mode, you can include any of the "<CTRL-CHAR>" commands just as you would use them in most word processors.

Dec	Hex	Control	Name	Function
0	$00	<CTRL-@>	NUL	Null or blank
1	$01	<CTRL-A>	SOH	Start of Heading
2	$02	<CTRL-B>	STX	Start of Text
3	$03	<CTRL-C>	ETX	End of Text
4	$04	<CTRL-D>	EOT	End of Transmission
5	$05	<CTRL-E>	ENQ	Enquiry
6	$06	<CTRL-F>	ACK	Acknowledge
7	$07	<CTRL-G>	BEL	Bell or Alarm
8	$08	<CTRL-H>	BS	Backspace
9	$09	<CTRL-I>	HT	Horizontal Tab
10	$0A	<CTRL-J>	LF	Line Feed
11	$0B	<CTRL-K>	VT	Vertical Tab
12	$0C	<CTRL-L>	FF	Form Feed
13	$0D	<CTRL-M>	CR	Carriage Return
14	$0E	<CTRL-N>	SO	Shift Out
15	$0F	<CTRL-O>	SI	Shift In
16	$10	<CTRL-P>	DLE	Data Link Escape
17	$11	<CTRL-Q>	DC1	Device Control 1
18	$12	<CTRL-R>	DC2	Device Control 2
19	$13	<CTRL-S>	DC3	Device Control 3
20	$14	<CTRL-T>	DC4	Device Control 4
21	$15	<CTRL-U>	NAK	Negative Acknowledge
22	$16	<CTRL-V>	SYN	Synchronous/Idle
23	$17	<CTRL-W>	ETB	End of Transmission Block
24	$18	<CTRL-X>	CAN	Cancel
25	$19	<CTRL-Y>	EM	End of Medium
26	$1A	<CTRL-Z>	SUB	Substitute Code
27	$1B	<CTRL-[>	ESC	Escape
28	$1C	<CTRL-\>	FS	File Separator
29	$1D	<CTRL-]>	GS	Group Separator
30	$1E	<CTRL-^>	RS	Record Separator
31	$1F	<CTRL-_>	US	United Separator
32	$20	<SPACE>	SP	Space
127	$7F	<DELETE>	DEL	Delete

Table 4-1 ASCII Codes for Control Characters

4.5   AMTOR Operation

From the Command Mode, type "AMTOR" or "AM" followed by <RETURN> to
enter the AMTOR mode. The PK-232 will respond with the previous mode:

        OPMODE   was ASCII

4.5.1   Transmit/Receive Function Keys

From the Command Mode:

"ARQ <SELCAL>"	Starts Mode A selective call
"FEC"	Starts Mode B transmission
"SELFEC <SELCAL>"	Starts Selective Mode B transmission
"R"	Stops transmission, forces AMTOR Standby
"AM"	Stops transmission, forces AMTOR Standby
"AL"	Forces re-synchronization in ALIST (AMTOR Mode A Listen)
"L"	Forces LETTERS case
"X"	Not used in AMTOR

Embedded in transmitted text:

<CTRL-O>	Sends LETTERS character
<CTRL-N>	Sends FIGURES character
<CTRL-F>	Sends call sign in Morse and shuts off transmitter
<CTRL-D>	Shuts off transmitter immediately

4.5.2   Speed Change Not Permitted

In accordance with FCC Part 97.69 and international regulations, AMTOR
is operated at one speed only - 100 bauds. The PK-232 does not permit
AMTOR operation at any other speed.

4.5.3   SELCAL (Selective Sequential Calling)

AMTOR operating modes require a SELCAL (Selective Sequential Calling)
code. This unique character sequence must contain four alphabetic
characters normally derived from your call sign.

The convention originated by the early European AMTOR pioneers, and
later adopted by amateurs around the world, was broadly based on the
then most common "one-by-three" call signs, and used the first and the
last three letters of the call sign. However, with the recent changes
and expansions of the call sign systems in many countries, some com-
ment and explanation may be in order here.

Some call sign groupings now in use are:

GROUP	CALL	SELCAL
1 by 2	W1XX	WWXX
1 by 3	W1XXX	WXXX
2 by 1	AA1X	AAAX
2 by 2	AA1XX	AAXX
2 by 3	KA1XXX	KXXX

For "1 by 2" call signs, the first letter is doubled, e.g., "N7ML" be-comes "NNML". This method is acceptable for most cases.

4.5.3.1 First SELCAL Installation

Type "MYSELCAL" or "MYS" to load your SELCAL into the PK-232:

    cmd:myselcal nnml

The PK-232 will respond with:

    MYSELCAL was

The "blank" response occurs the first time you use the PK-232. There is no default SELCAL.

Type "MYS" to confirm your SELCAL is properly loaded.:

    cmd:mys

The PK-232 will respond with:

    MYSELCAL NNML

4.5.3.2 Prevent Duplicate SELCALs

Because the same call sign sequences are assigned in ten districts, it is possible that your SELCAL could be the same as that used by another station. Using the standard convention, "N1ML", "N2ML", "N3ML", etc., would all derive the same SELCAL, "NNML". If you think a station in another call district or zone is also active on AMTOR and may be using the same SELCAL, you can derive your own unique SELCAL by substituting a letter for your call district number. Use the letter corresponding to the call district number as it appears on the keys of a standard typewriter or Baudot RTTY keyboard.

Let's assume that your call sign is N7ML. You discover that there is another station with the call sign N7ML. Change your SELCAL to NUML, according to the following table:

1 = Q	4 = R	7 = U	0 = P
2 = W	5 = T	8 = I	
3 = E	6 = Y	9 = O	

4.5.4   Mode A (ARQ) Call - Start the Contact (ARQ Command)

Type "ARQ (SELCAL)" to start the AMTOR selective calling sequence or
answer a Mode B (FEC) CQ call from a distant station.

Type <CR> after you've typed the fourth letter (a valid SELCAL must
have four characters) - your transmitter will be keyed on and off in
the typical ARQ three-character burst sequence.

After your PK-232 has locked or synchronized with the distant station,
type "K" to enter the Converse Mode and begin your conversation.

4.5.4.1 LED Status and Mode Indicators

After selecting AMTOR, the PK-232 displays system status on its LEDs:

       STATUS: STBY lit
       MODE: STBY lit

Type "ARQ (SELCAL of distant station)." The LEDs change to:

       STATUS: SEND lit, PHASE lit
       MODE: ARQ lit

These LEDs show that your transmitter is in the SEND condition, in the
"phasing" part of an ARQ selective call. Your transmitter will key on
and off sending the distant station's SELCAL. As soon as your PK-232
is synchronized with the distant station, the LEDs change:

       STATUS: SEND lit, TFC and IDLE lit alternately by data flow
       MODE: ARQ lit

Verify the link by typing a few <RETURNs>; watch the display. Your
traffic will now begin to flow as you type characters. If EAS is set
ON, your typed characters will be displayed as they are acknowledged
by the distant station. The IDLE and TFC LEDs will change back and
forth when you pause in your typing.

If EAS is ON, the delay between your typing and the appearance of your
characters on the screen indicates the quality of the radio link quite
accurately. The better the link between you and the distant station,
the faster your typed characters will scroll across your screen.

If your typing does not appear on your screen, the distant station is
not receiving valid data from you and the automatic error-detection
and error-correction features of the AMTOR ARQ mode begin to control
the link. Depending on how band conditions affect the link, the ERROR
and RQ LEDs may light occasionally. If errors occur on the link and
the distant station sends RQ (Request for Repeat), the LEDs show:

       STATUS   SEND lit, ERROR and/or RQ lit
       MODE   ARQ lit

ERROR lit: Your PK-232 has detected errors in the signals
                    received from the distant station

RQ lit: Your PK-232 has received a "request for repeat"
                    code from the distant station

If the link fails and you lose synchronization with the distant sta-
tion, your PK-232 automatically tries to reestablish synchronization
with the distant station. The LEDs change to show:

STATUS: SEND lit, PHASE lit, ERROR and RQ alternately lit
MODE: ARQ

4.5.4.2 Mode A (ARQ) Changeover (+? Command)

When you finish typing your comments or traffic to the other station
and wish the distant station to transmit to you:

o   Don't type "KKK" or anything like that!

o   Do type a plus sign immediately followed by a question mark (+?).

"+?" is a software changeover command that switches your system from
"Information Sending Station" (ISS) to "Information Receiving Station"
(IRS), and switches the distant system from "Information Receiving
Station" receive to "Information Sending Station". Your distant part-
ner will see the "+?" and begin typing comments or traffic.

NOTE: When discussing ARQ operation, we use the terms "Information
            Sending Station" and "Information Receiving Station" instead
            of "transmit" and "receive". In AMTOR ARQ operation both
            stations are rapidly switching between transmit and receive.
            When you send "information", the distant station is sends
            back "control" signals that tell your PK-232 how your sig-
            nals are being received, how the link is behaving.

o   Don't bother with multiple call signs and "over-to-you" routines
        used in Baudot and ASCII RTTY operation. Don't bother with "KKK"
        at the end of your turn - the system does it all for you when you
        type "+?."

The FCC requires station identification once every ten minutes. It's
sufficient to begin with "QRA (mycall)" or end your transmission with
"QRA (mycall)" before the "+?" changeover code.

4.5.4.3 Mode A (ARQ) Break-in (ACHG Command)

In Mode A (ARQ), when you're the "Information Receiving Station," you
can use the "ACHG" command to break or interrupt the distant station's
comments. ACHG is a software command that forces both systems to re-
verse the "Information Receiving" and "Information Sending" status at
both ends of the ARQ link. As the "Information Receiving Station,"
you normally rely on the distant station to send the "+?" command to
do the changeover at the end of his comments.

4.5.4.4 End the Mode A (ARQ) Contact, Return to AMTOR Standby

When you've finished your "final finals" to the distant station and both stations are ready to end the Mode A (ARQ) contact, you can end the contact and terminate the link in several different ways:

o   Type <CTRL-C> to return to Command Mode. Then type "R" to break the link.

The "R" command breaks the ARQ link and returns your system to AMTOR Standby - your station can be accessed by a distant station's transmission of your SELCAL. "R" can also be used to stop sending a SELCAL while trying to access a distant station.

o   Type <CTRL-F> to break the link and send your Morse ID.

Your PK-232 switches to the Morse Mode, sends your call sign at the speed set by MSPEED, and then shuts off your transmitter.

o   Type <CTRL-D> to stop transmission immediately.

The link is broken but the distant station's system keeps looking for your signals and continues sending control signals, trying to maintain the link until it times out. This method is considered poor operating practice.

<CTRL-D> and <CTRL-F> break the link and return your PK-232 to Command Mode.

4.5.5   ARQ Listen Mode - Start Monitoring (ALIST Command)

Use the "ALIST" command to monitor ARQ traffic flowing between two stations linked in an ARQ contact. Your PK-232 tries to synchronize with whichever of the two linked ARQ stations is the Information Sending Station at the moment.

Mode A Listen operation does not give you error detection or error correction; your PK-232 is not part of the synchronizing "handshake" between the other two stations locked to each other. If the other two stations are enjoying a good link, you will probably get good copy from that link.

If the stations you're monitoring are sending error codes and RQ codes and repeating blocks of characters across their link, you'll display the repeated character blocks. If they're having link problems, the data on your screen can look very strange indeed, although the two synchronized stations are getting error-free copy.

4.5.6   Mode B (FEC) Call - Starting the Contact

After selecting AMTOR from the Command Mode, type "FEC <RETURN>"
to enter the AMTOR FEC mode. You must be in the AMTOR Mode to start
an FEC transmission. If you type "FEC" from any other mode, your
PK-232 displays:

          ?type AMTOR first

o   Type "X" to turn on your transmitter.
o   Type "K" to enter the Converse Mode and begin the contact.
o   Type <CTRL-D> to shut off your transmitter, OR
o   Type <CTRL-F> to send your call sign in Morse and shut off your
     transmitter, OR
o   Type <CTRL-C> to return to the Command Mode.
o   Type "R" to shut down your transmitter and end the contact.

Type "FEC" to start the AMTOR Mode B call or transmission, or answer a
Mode B (FEC) CQ call from a distant station. Your transmitter will be
turned on and kept on continuously, sending synchronous idle control
characters.

Mode B (FEC) is recommended for calling CQ in AMTOR.

o   Sending CQ in Mode A (ARQ) gives the distant stations no clue as
     to who you are, or what your SELCAL might be. See APPENDIX E for
     more comments by G3PLX.

o   Don't send long CQ calls with many lines of repeated call signs.
     FEC eliminates the need for long CQ calls. A simple "3 by 3"
     sequence is all you need in FEC. Here's one example:

          CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
          CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
          CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
          QRR ARQ/FEC SELCAL WJUP +?

IMPORTANT NOTE

Wait several seconds before starting to type your CQ call or traffic!

o   The distant station must receive several seconds of synchronous
     idle control characters to synchronize with your system. The
     distant station cannot synchronize to your typed characters.

o   Do not start an FEC transmission with "RYs" as in conventional
     RTTY. The distant station cannot synchronize with RY characters.

The synchronous idle control signals are mark-to-space tone shifts and
can be used by the distant station for tuning.

4.5.6.1 LED Status and Mode Indicators

After typing FEC, your PK-232 displays system status on its LEDs:

    STATUS: SEND lit, IDLE lit, TFC lit only briefly
    MODE: FEC lit

Your transmitter is now keyed and sending the FEC "idle" signals. As
you type your comments or traffic, the IDLE LED is extinguished; the
TFC LED is lit during the moments when your PK-232 is sending your
data characters. Whenever you stop typing characters, the TFC LED is
extinguished and the IDLE LED is lit.

    STATUS: SEND lit, TFC and IDLE lit alternately by data flow
    MODE: FEC lit

4.5.6.2 Mode B (FEC) Changeover

FEC operation is very similar to conventional RTTY. You can tell your
partner at the distant station that you're ready for him to send by
typing the same "K", "KN" or "BTU" signals.

Except for the short delay in starting before sending your traffic,
you can operate FEC using the same typing and receiving techniques as
in CW or conventional Baudot and ASCII RTTY. The FEC mode does not
use interaction or "handshaking" between your station and the distant
station.

o   The "+?" changeover command has no effect in FEC operation.

4.5.6.3 End the Mode B (FEC) Contact, Return to ARQ Standby

You can end the FEC contact in several different ways:

o   Type <CTRL-C> to return to Command Mode. Then type "R" break the
     link.

     The "R" function stops the FEC transmission, turns off your
     transmitter and returns your PK-232 to AMTOR Standby. You can be
     accessed by any distant station's transmission of your SELCAL.

o   Without returning to Command Mode, type <CTRL-F> to send your
     Morse ID and shut off your transmitter.

     Your PK-232 switches to the Morse Mode, sends your call sign at
     the speed set by MSPEED, and then shuts off your transmitter.

o   Without returning to Command Mode, type CTRL-D to stop transmis-
     sion immediately.

Your PK-232 is now in AMTOR Standby, ready for SELCAL access by any
distant station. Your monitor is ready to display any FEC signals
received on the channel.

4.5.7   Echo as Sent (EAS)

EAS has special significance in AMTOR Mode A (ARQ). If EAS is on, no
matter how fast you type characters on your keyboard, you will see
them echoed on your screen only _after_ the distant station, partner in
the AMTOR link, has validated (Ack'd) your block of three characters.

With EAS ON, the characters will appear on your screen or printer _only_
as the distant station acknowledges them, three at a time.

o   If the data scrolls across your monitor at a nice even rate, in
     rhythm with your typing speed, you can assume that you have a
     good ARQ link.

o   If the data hesitates or scrolls in "jerky" intermittent fashion,
     that's generally a sign that the radio link is not too good.

o   If the characters stop appearing on your monitor, the link is
     failing or has failed.

NOTE: To prevent the PK-232's internal buffer from overflowing,
          use this mode if you transmitting long messages from a
          buffer or disk drive.

4.5.8   AMTOR Switching-Time Considerations

For operation in AMTOR Mode A (ARQ), your transceiver or transmitter-
receiver combination must be able to change between transmit and re-
ceive within 20 milliseconds. Most semiconductor-based radios can
easily meet this specification. Many older tube-type radios that use
electromechanical relays operate very well in AMTOR Mode A (ARQ).

IF the changeover from transmit to receive is too long, the minimum
working distance is extended; the signal to the distant station will
arrive before the station has switched back to receive. However, if
the transmitting station is further away, the transmission time over
the propagation path will delay the arrival of the signal until after
the station has switched to receive.

If the receiving station's changeover from transmit to receive is too
slow, the transmitting station delay between "PTT" and "data send" can
be extended. See the ADELAY command in the Command Summary for infor-
mation on adjusting the PK-232's AMTOR timing characteristics to com-
pensate for this effect.

4.5.9 Suggested AMTOR Trial Operating Techniques

If you have trouble synchronizing with another AMTOR ARQ station, try some of the following operating tips before calling AEA or deciding that your radio equipment needs modifications:

o   Try to work the distant station on Mode B (FEC) to establish that the other station's system is fully functional.

o   Don't use VOX control - use the PTT line from your interface.

o   Turn off the AGC circuit - use the RF gain control to prevent receiver blocking on stronger signals.

o   Turn off all compression or other audio processing.

o   Keep the AFSK audio input level to the microphone circuit as low as possible - avoid overdriving the audio input stages.

o   Disable the ALC circuit or reduce excessive ALC action; use more effective RF antenna loading to adjust output power levels.

APPENDIX E was written by Peter Martinez, G3PLX, "father" of AMTOR. Peter offers detailed operating hints for getting started on AMTOR. It's worth your reading time.

4.5.9.1 Possible Areas for AMTOR Performance Improvement

If switching-time problems persist, you may have to make changes in the radio to eliminate excessive time delays:

o   Remove large decoupling capacitors from the push-to-talk line to allow faster PTT (transmitter) activation;

o   Improve power supply decoupling, especially in audio stages.

o   Do not use squelch.

In case you can't solve your radio's switching-time problems, please call AEA Customer Service telephone (see front of this manual) for further helpful suggestions.

NOTE: AMTOR Mode B (FEC) operation is similar to conventional RTTY in its duty cycle; the transmitter operates continuously without the on/off switching characteristic of AMTOR Mode A (ARQ).

4.6   Packet Radio Operation

This section describes basic packet operation. You'll learn quite a
bit about your PK-232's packet features and control operation without
really sending anything over the air. For your first packet practice,
the PK-232 will be connected in a "loopback" circuit so that it will
"talk to itself". You'll have a chance become familiar with packet
operation before you actually go on the air.

We'll describe the commands you'll use for everyday packet operations.
These commands will get you ready for the section, "Your First Packet
QSO." The "Special Input Characters" section contains information on
editing from your keyboard and discusses other special characters used
by the PK-232.

If you intend to use your packet station for "advanced" applications,
such as a Bulletin Board System or binary file transfers, read the
chapter on "Advanced Packet Operation."

Most commands can be abbreviated by typing only the first two or three
characters. The "mnemonics" or minimum abbreviations for each command
are shown in the "Command Summary" chapter, along with a full descrip-
tion of each command.

Your PK-232 automatically enters the Packet Mode when you first turn
on the power or type the RESET command. If you've been in any other
mode, type "PACKET" or "PA" followed by a <RETURN>. The PK-232 answers
with:

        OPMODE   was (whatever mode you were in)

4.6.1   Change Radio Link Data Rate

Your PK-232 provides link rates of 45, 50, 57, 75, 100, 110, 150, 200,
300, 600, 1200, 2400, 4800 and 9600 BPS. The default data rate is
1200 BPS when you start your PK-232 for the first time.

Use the HBAUD command to read or change the packet link data rate.

To read the present baud rate, type "HBAUD <RETURN>" or "HB <RETURN>".
The PK-232 responds with:

        HBAUD   1200

To change the link rate, type "HBAUD" followed two or three digits and
a <RETURN>.

         HBAUD 300<RETURN>

The PK-232 accepts the new baud rate and responds with the old baud
rate:

        HBAUD   was 1200

The number you enter becomes the new data rate and replaces the value
previously stored in the program. You can also change the baud rate
one step up or down one step at a time by typing "HB U" or "HB D" re-
spectively. The PK-232 returns the previous data rate and adopts the
new rate.

4.6.2   Station Identification

You **must** use the MYCALL command to install your station identification
(call sign) in your PK-232's memory (see next section). If you intend
to operate more than one station with the same call sign, the stations
must use some means of telling the difference between two operations
under that same call sign - two stations _cannot_ have identical station
identifications. If they do, packet protocol will fail.

4.6.2.1 MYCALL Required at System Start-Up

When you start your PK-232 for the first time, the system is loaded
from ROM. All system parameters and values are those loaded at time
of manufacture. "MYCALL" is loaded with the default "PK232." You
must use the MYCALL command to install _your call sign_ in your PK-232.
You _cannot_ operate in packet mode until you've done this. If you try
to connect to a station _without_ installing your call sign, your PK-232
does not transmit, but instead sends you this error message:

        ?need MYCALL

4.6.2.2 Substation Identifiers (SSIDs)

You can identify additional stations with the "secondary station ID",
or SSID - a number from 0 to 15, appended to the call sign by a dash:

        cmd:MYCALL WX2BBB-1

If you don't specify the SSID extension, it will be "0" (zero), not
shown by your PK-232. To connect to a station with a SSID other than
0, or use such a station as a digipeater, you must specify the SSID:

        cmd:CONNECT WX3CCC-2
        or
        cmd:CONNECT WX1AAA VIA WB2BBB-2

4.6.2.3 Automatic Identification

Your PK-232 can send an automatic ID packet every 9-1/2 minutes when
your station is operating as a digipeater. You can turn this feature
on with the command HID ON. ID packets are displayed like this:

        WX2BBB-1>ID:WX2BBB digipeater
        or
        WX2BBB-1<ID:(MYALIAS) digipeater

When you shut down, you can command a final ID with the ID command.
The PK-232 sends these ID packets only if it has been digipeating.

4.6.3   Set Up Loopback Test Circuit

Do these steps in the exact order shown:

1.   Get the shielded radio cable you set aside in Chapter 2.
2.   Strip and tin the wires at the "radio" end of the cable.
3.   Join the green and white wires coming from Pins 1 and 2.
4.   Insert the plastic plug end of the cable into J6, the "RADIO 2"
     connector on the PK-232's rear panel. Be sure that the plug is
     inserted with the cable running downward.
5.   Set the front-panel "RADIO-1/RADIO-2" switch to "RADIO-2."

You've connected your PK-232's transmit audio output to its receive
audio input. Your PK-232 can now "talk to itself" in "loopback".

4.6.4   "Connect" and "Disconnect"

Packet radio contacts begin with a connect

time it is sent on the air.

Type "EAS OFF" to see your typing exactly as you type the characters
or send from a disk file. The PK-232 responds with:

    EAS   was ON

Type "EAS ON" to see the data as it appears on the air.   The PK-232
responds with:

    EAS   was OFF

3.4.2.11   Clear Transmit Buffer (TCLEAR)

Use the TCLEAR command to clear your PK-232's transmit buffer and
cancel any further transmission of data.

Type "TCLEAR" or "TC" followed by a <RETURN>.

o   You must be in the Command Mode to use TCLEAR.

o   Use <CTRL-C> (default) command to return to Command Mode.

o   Type "TCLEAR <RETURN>" or "TC <RETURN>" to clear the transmit
     buffer.

4.6.14.3 Select the CHSWITCH Character

The CHSWITCH command selects the character used to show that a new
multiple-connect channel is being addressed. The value "n" 0 to $FF
(0 to 255 decimal) specifies an ASCII character. CHSWITCH charac-
ters must not be one of the channel numbers (0 to 9). Your PK-232's
default value for CHSWITCH is $00, which disables the function. This
default was selected to prevent conflicts with the characters fre-
quently found in packet network maps. If you're using your PK-232
as the TNC for a Packet Bulletin Board System, (PBBS) the default
value of $00 is recommended.

A Suggestion: Set the CHSWITCH character to any hexadecimal value
from $80 to $FF, for any character that you won't normally use. You
can switch "logical channels" in a multiple-connect situation by
typing the CHSWITCH character even when in the Converse Mode.

The CHSWITCH character can be PASSed in CONVERS mode, and is always
ignored as a user-initiated channel switch in TRANSPARENT mode; it
just flows through as data. However, the outgoing channel cannot be
changed while active or "on-line" in TRANSPARENT mode.

4.6.14.4 Display Multiple-Connect Call Signs - The CHCALL Command

CHCALL displays the call sign of the "connected-to" station after
the channel identifier. CHCALL is especially useful when operating
with multiple connections. Using CHCALL is similar to using MRPT to
show digipeat paths when monitoring the channel.

Set CHCALL ON if you intend to operate multiple connections.

4.6.14.5 Display Doubled Characters - The CHDOUBLE Command

When CHDOUBLE is set ON, your monitor displays received characters
as doubled characters if are the same as your CHSWITCH character.

Set CHDOUBLE ON when operating with multiple connections to tell the
difference between CHSWITCH characters received from other stations
and CHSWITCH characters generated by your PK-232.

CHAPTER 5

ADVANCED PACKET OPERATION

5.1   Introduction

This chapter describes special aspects and advanced concepts not used
in everyday conversational operation. Read this chapter carefully if
you intend to use your PK-232 for:

o   A packet bulletin board system (PBBS)
o   Binary file transfers
o   A "host" program
o   HF or OSCAR operation
o   Special timing or other requirements needed by your radio

5.1.1   Using Hex Notation

If you reassign parameter values in hexadecimal numbers, observe some
simple rules. Begin the number with a "$". The "digits" of a hex
number represent multiples of powers of 16. The values 10 through 15
are represented by the letters A through F. The letters can be typed
in upper or lower case. For example:

$1B = (1 x 16) + (11 x 1) = 27 (decimal)

5.2   Operating Modes

Your PK-232 has three operating modes. We discussed the Command and
Converse Modes very briefly in Chapter 4. The third mode, Transparent
Mode, is a data mode like Converse Mode, but is intended primarily for
computer data interchange rather than human conversation.

5.2.1   Command Mode

Command Mode provides the communication or dialogue between your key-
board and your PK-232; nothing goes to the "outside world." You must
use Command Mode to enter commands which alter the PK-232's operating
parameters. When your PK-232 is in Command Mode, the Command Mode
prompt is shown at the beginning of each input line.

cmd:

(Note that the "cmd:" prompt may have scrolled off the screen if your
PK-232 has received and displayed packets.)

Your PK-232 always enters Command Mode after RESTART, RESET or a power
cycle. After a power-off/power-on sequence, resident software reini-
tializes the PK-232's operating parameters with values stored in RAM.

After the RESET command is issued all operating parameters are reset
to the default values stored in EPROM. The values of most parameters
are stored in RAM and can be easily changed.

5.2.1.1 Special Characters Used in Command Mode

The following commands set special characters which are active in the Command Mode. See the detailed descriptions of these commands in the "Command Summary" chapter.

COMMAND	DESCRIPTION
CANLINE	Cancel current line
CANPAC	Cancel packet output
DELETE	Delete character with destructive backspace
PASS	Insert after special character
REDISPLA	Re-display current typed line
START, STOP	Computer flow control characters (sent to PK-232)
XOFF, XON	PK-232 flow control characters (sent to computer)

5.2.1.2 Display Control in Command Mode

The following commands affect display features which are active in the Command Mode. See the detailed descriptions of these commands in the "Command Summary" chapter.

COMMAND	DESCRIPTION
ALFDISP	Add <LF> after <CR> in data sent to terminal
BKONDEL	Echo after character deletion
ECHO	Automatic echo of serial port input
FLOW	Type-in flow control
LCOK	Lower case translation
NUCR	Nulls after <CR>
NULF	Nulls after <LF>
NULLS	Null count
ACRDISP	Automatic <CR> insertion after n characters

5.3 Flow Control

Whenever data are transferred between computers or terminals the data may be received faster than the receiving system can handle it. Some programs try to deal with this by providing data buffers for storing incoming data until the program is ready for it. However, this merely postpones the problem; all buffers have size limitations.

To prevent loss of data, the computer controls data flow by telling the other device to stop sending data until the computer can empty its buffer. When the computer's buffer has been flushed and is available again, the computer tells the other device to resume sending data. If you use a personal computer you're probably already familiar with flow control that allows you to stop the output from the computer while you read the data, and restart the output when you are ready for more.

5.3.1   Type-in Flow Control

Type-in flow control (set by the FLOW command) is a display feature. When FLOW is set ON, your PK-232 cannot interrupt you with incoming packets while typing a command word or an outgoing packet.

As soon as you type the first character of a word (except for echoing your typing) your PK-232 "holds" output towards the computer. This "hold" remains in effect until you type <CR> to end the command, or a send-packet character to mark the end of a packet, or until you erase or re-display the line you've started.

Some computers have difficulty simultaneously sending and receiving characters over the serial port. This is most commonly the case for computers with "software UARTs." Type-in flow control improves the operation of such computers with your PK-232.

5.3.2   Data Flow Control

In Command Mode, your PK-232's input buffer may fill up if you try to type a command that is too long. In Converse Mode the buffer may fill up for any of several reasons: you may be using a faster serial port baud rate than the radio data rate; radio data transmission may have slowed down because of noise or other users on the channel; the other person or computer may have stopped output from that system.

Your PK-232 signals the computer to stop sending data when there is room remaining for about 80 characters in the buffer. When the buffer fills up entirely, data will be lost. When the buffer empties to the point where there is room for at least 270 characters, your PK-232 signals the computer to start sending data again.

A computer file transfer program may be unable to process data fast enough to keep up with output from your PK-232. A computer must respond to interrupts from its I/O devices in order to read every character. Some simple programs may poll the input register for new data. Data may be lost if the polling is not done often enough. Some computers disable interrupts during disk accesses. If the program enters a routine which doesn't allow it to check for data or respond to it, the computer should signal your PK-232 to stop sending data.

Your PK-232 provides two methods of flow control:

o   XON/XOFF flow control, sometimes called "software flow control," sends a special character (usually <CTRL-S>) to stop the output and another special character (usually <CTRL-Q>) to restart the output.

o   Hardware flow control requires that both computers use the CTS (Clear To Send) and RTS (Request To Send) lines of the RS-232C standard.

Some commonly used file transfer and terminal programs for home com-
puters do not provide flow control in software; many serial ports do
not support hardware flow control. Although the RTS and CTS lines
appear at the connector, they may not be used on some computers unless
the software reads the state of the CTS line. If your PK-232 seems to
lose data during file transfers, flow control is probably the problem.

5.3.2.1 XON/XOFF (Software) Flow Control

Set XFLOW ON to use XON/XOFF flow control if your terminal program
doesn't provide CTS/RTS (hardware) flow control.

The special flow control characters are set to <CTRL-S> and <CTRL-Q>
by default, but can be changed.

o   The XON and XOFF commands define the characters sent to the com-
     puter by your PK-232.

o   The START and STOP commands define the characters sent to your
     PK-232 by the computer.

After sending a STOP character, your computer may receive as many as
four characters from your PK-232; some characters may already be "en
route" through serial I/O chips.

A STOP/START character sent to your PK-232 will be ignored when the
PK-232 is already stopped/started. If the STOP and START characters
are identical, that character "toggles" the output, turning it off
when it is on, and on when it is off.

You can disable XON/XOFF flow control in one direction only by setting
the appropriate flow control characters to 0 (zero). Your PK-232
automatically uses CTS flow control to stop input from the computer.

XON/XOFF flow control is normally disabled in Transparent Mode; all
characters are treated as data. If DTR/RTS flow control is not avail-
able, set TXFLOW ON and XFLOW ON to activate the XON and XOFF charac-
ters (the commands from your PK-232 to the terminal).

Set TRFLOW ON to activate the START and STOP characters (the commands
to your PK-232 from the terminal) in Transparent Mode. Note that this
mode is no longer truly "transparent" when the flow-control feature is
enabled.

5.3.2.2 Hardware Flow Control

RS-232 RTS and CTS lines are normally used for flow control signals in
Transparent Mode. Hardware flow control is usually less dependent on
the way a given communication terminal program is written.

The XFLOW OFF command activates hardware flow control in Converse Mode
and Command Mode. Your computer may receive as many as two characters
after it signals your PK-232 to stop sending; some characters may be
"en route" already through serial I/O chips. Refer to AEA's PK-232
Technical Manual for hardware flow control interface requirements.

5.4   Data Transfer Modes

A data transfer mode can be entered several ways from Command Mode.

o   Type "CONVERS" (or just "K") to enter Converse Mode.

o   Type "TRANS" (or just "T") to enter Transparent Mode.

If you're in Command Mode when another station connects to your sta-
tion, your PK-232 automatically switches to a data transfer mode. Use
the CONMODE command to specify the data transfer mode to be used at
automatic entry.

o   CONMODE TRANS automatically selects Transparent Mode

o   CONMODE CONVERS returns to the default choice of Converse Mode

Timing of automatic entry into data transfer mode depends upon which
station in the link initiated the connection.

If your PK-232 receives and accepts a connect request, your system
always enters the data transfer mode at the moment your PK-232 sends
the connect acknowledgment (ACK) and displays the "*** CONNECTED to
<call sign>" message. Your PK-232 always switches to the data trans-
fer mode at the moment of connection unless NOMODE is set ON.

Any text sent to your PK-232 is queued into packets waiting for a suc-
cessful connection before being sent. If the connect attempt fails,
your system returns to Command Mode. The system also automatically
returns to Command Mode when either station disconnects and ends the
QSO.

5.4.1   Converse Mode

Converse Mode is the data transfer mode most often used for ordinary
conversations and message handling. Your PK-232 assembles your typed
data into packets and sends the data to the radio.

To return to Command Mode from Converse Mode type the Command Mode
entry character (default CTRL-C), or send a BREAK signal to the serial
port.

Although "BREAK" is not a regular ASCII character, it can frequently
be sent by typing a special key on the keyboard. A BREAK signal is a
continuous "mark" (or 1) signal on the serial port's Transmit Data
line lasting approximately 200 milliseconds. The timing of the BREAK
signal is not critical; most serial ports will recognize a BREAK if
the "mark" signal lasts significantly longer than the time required
for transmission of a character.

Because the BREAK signal is simple, it's easy to generate a BREAK with
circuitry outside the computer, thus guaranteeing return to Command
Mode in automatic station operation.

5.4.1.1 SENDPAC Character

The "send-packet" character packetizes the typed characters for transmission. If you type a full-length packet of characters (the default value is 128 characters) without typing the send-packet character, your input is packetized and sent after the 128th (PACLEN value) typed character.

Use the SENDPAC command to select a character for use as the "send-packet" command. "<CR>" is the default character. You can elect to include or not include the send-packet character in the transmitted packet.

If "<CR>" is the send-packet character, it's natural to include it in the packet as part of the text as well as interpreting <CR> as a command.

o   Set ACRPACK ON to send the <CR>

If you use some other character to force packet transmission, you may want to set ACRPACK OFF and inhibit transmission of the send-packet character.

5.4.1.2 CANPAC Character

If you set the send-packet character to something other than <CR>, use the "cancel-packet" character to cancel packets of more than one line.

Use the CANPAC command to select the cancel-packet character.

Single-line packets can be canceled with either the cancel-line character or the cancel-packet character.

5.4.1.3 Special Characters in Converse Mode

The following commands set special characters which are active in Converse Mode. See the detailed descriptions of these commands in the "Command Summary" chapter.

COMMAND	DESCRIPTION
CANLINE	Cancel current line
CANPAC	Cancel current packet
COMMAND	Command Mode entry
DELETE	Character deletion with destructive backspace
MFILTER	Characters to be filtered in monitored packets
PASS	Insert following special character
REDISPLA	Re-display current line
SENDPAC	Send current packet
START, STOP	Computer's flow control characters (sent to PK-232)
XOFF, XON	PK-232 flow control characters (sent to terminal)

5.4.1.4 <u>Display Features in Converse Mode</u>

The following commands activate the display features which are active
in Converse Mode. Refer to the discussions of these commands for de-
tails in the "Command Summary" chapter.

<u>COMMAND</u>	<u>DESCRIPTION</u>
8BITCONV	Retain high-order bit from serial port
ALFDISP	Add <LF> after <CR>
BKONDEL	Echo after character deletion
ECHO	Automatic echo of serial input
ESCAPE	<ESCAPE> translation
FLOW	Type-in flow control
LCOK	Lower case translation
NUCR	Null characters after <CR>
NULF	Null characters after <LF>
NULLS	Null count
ACRDISP	Automatic <CR> insertion after n characters

5.4.2   <u>Transparent Mode</u>

Packet radio is an ideal means of transferring data between computers.
Converse Mode works well for transferring ASCII text files. However,
some files use all eight bits of each byte, rather than the seven bits
used in ASCII code.

In addition, executable code files, such as CP/M ".CMD" or ".COM" and
PC/MS-DOS ".COM" or ".EXE" files, contain characters that conflict
with the control characters used in Converse Mode. Listings of BASIC
programs and documents written with word processors that don't create
ASCII files can also pose this problem.

Use the Transparent Mode to transfer these type of files.

Like Converse Mode, Transparent Mode is a data transfer mode. But,
in Transparent Mode <u>"special" characters do not exist</u> - everything you
type (or everything your computer sends to your PK-232) is transmitted
<u>exactly</u> as it is received by your PK-232.

5.4.2.1 <u>Input Editing and Packet Timing</u>

Transparent Mode does not permit input editing. The send-packet char-
acter does not exist. Packets are sent at specific regular intervals,
or when a full packet of information (PACLEN = 128 bytes) is ready.

Use the PACTIME command to set the time intervals at which the data is
packetized.

5.4.2.2 <u>Display Features in Transparent Mode</u>

Transparent Mode modifies your PK-232-monitor display characteristics. Data are sent to the computer exactly as received over the radio, with all eight bits of each byte received. Features such as auto-linefeed insertion and screen wrap are disabled, as is the echoing of input characters.

The parameters controlling these latter features in the Command and Converse Modes are not changed on entry into Transparent Mode; all display features are reestablished when your PK-232 is returned to Command Mode.

Transparent Mode also disables most of the link status messages that appear as your PK-232 cycles between the disconnected and connected states.

5.4.2.3 <u>Escape or Exit from Transparent Mode</u>

In order for the Command Mode entry character (default = <CTRL-C>) to be transmitted freely in Transparent Mode, escaping or exiting from Transparent Mode to Command Mode becomes a bit more complicated.

o   Use BREAK to return to Command mode, just as in Converse Mode.

o   Use the Command Mode entry character (<CTRL-C>) as follows:

1.   Wait a moment after typing the last character being sent. The minimum required wait is set by the CMDTIME command.

2.   Type three Command Mode entry characters (<CTRL-C>) within an interval CMDTIME of each other.

After a final CMDTIME interval during which no characters are typed, you'll see the command prompt. The default value of CMDTIME is one second. Note that you cannot escape from Transparent Mode using this second procedure if CMDTIME is set to <u>zero.</u>

If any characters are typed during this interval (even Command Mode entry characters), the escape will be aborted; all Command Mode entry characters you've typed are sent as packet data.

5.5   Commands That Affect Protocol

Certain commands affect the operation of the packet protocol. A full
copy of the AX.25 protocol appears in AEA's Technical Manual for your
PK-232.

5.5.1   AX25L2V2 - On or Off?

Your PK-232 uses the AX.25 Level 2 protocol, the rules by which your
PK-232 communicates with other packet systems.

o   Set AX25L2V2 ON to operate in Version 2.0

o   Set AX25L2V2 OFF to operate in Version 1.0

Digipeating may not work if a Version 2.0 packet is sent through a
digipeater using an older TNC.

The CHECK command controls a timing function that depends on the pro-
tocol version selected.

5.5.2   UNPROTO Who?

UNPROTO permits you to address "unconnected" packets, as well as route
your beacon and ID packets through digipeaters. The format is similar
to that of the CONNECT command:

        cmd:UNPROTO QST VIA NK6K

For example, if you set UNPROTO to "QST", other stations will see your
beacon like this:

        MYCALL>QST

The default address for unconnected packets is CQ.

5.5.3   PASSALL - The "Junque Mode"

PASSALL is sometimes known as the "garbage" mode. PASSALL is useful
in diagnosing connection failures and protocol problems. It's really
not very useful in ordinary packet operations.

If PASSALL is "ON", your PK-232 ignores error-checking. That function
of the protocol is disabled for all packets monitored. If you set
PASSALL ON, any "packet" is displayed that meets the following condi-
tions:

o   The packet must start with a flag field.

o   The packet must contain an integral number of 8-bit bytes, up to
      330 bytes.

5.5.4   Packet Timing Functions

Your PK-232 obeys a series of timing instructions built in to the pro-
tocol; timing is adjustable to compensate for variable conditions and
local circumstances.   The default values of these instructions can be
changed at any time for experimentation, and then returned to their
original values, if required.

Don't be afraid to try other values in these parameters.   You won't
hurt your PK-232 by changing timing values.   On the contrary, you may
improve your packet performance.

5.5.4.1 TXDELAY

Radios vary greatly in the time delays that occur when switching from
receive to transmit and from transmit to receive.   These switching-
time delays affect both ends of the packet link:

o   Time delay between the moment that your PK-232 keys your trans-
       mitter's PTT line and your transmitter delivers power to your
       antenna.

o   Time required for the distant station's receiver to recover full
       sensitivity and overcome squelch/AGC rise-time characteristics.

o   Transmitter and receiver phase-lock loop settling times at both
       ends of the link.

If your PK-232 starts sending data before your transmitter is up to
power, or before your receiver has recovered from transmitting and
locked up on the incoming signal, the packet will not be received pr-
operly at the distant end.

TXDELAY must be taken into account in cases where external amplifiers
use RF-driven switching.

TXDELAY controls the delay between your transmitter's key-up and the
moment when your PK-232 starts sending data.   During the period in
which your PK-232 is holding PTT active but not sending data, your
PK-232 transmits a series of contiguous synchronizing signals (flags).

5.5.4.2 AXDELAY and AXHANG

You may require a longer key-up delay when sending packets through an
audio repeater than normally needed for direct communications.   How-
ever, the extra key-up delay is not required if the repeater has not
had time to "drop" since the last transmission.

o   The AXDELAY command adds more key-up delay in your PK-232 so tha'
       the repeater receiver and transmitter have time to lock up.

o   The AXHANG command sets the time your PK-232 assumes is needed
       for the repeater to drop.

If your PK-232 has detected channel activity recently enough so that the repeater transmitter might still be on, it will wait only TXDELAY time before sending data, rather than adding AXDELAY time as well.

TXDELAY, AXDELAY and AXHANG set times in units of 10 milliseconds. If AXDELAY is in effect the total key-up delay is:

Key-up delay = (TXDELAY + AXDELAY) x 10 milliseconds.

If activity has been heard more recently than AXHANG x 10 milliseconds ago, the key-up delay will only be

Key-up delay = TXDELAY x 10 milliseconds.

5.5.4.3 FRACK and RETRY

The AX.25 protocol calls for retransmission of packets when an acknowledgment is not received from the distant end of the link within a specified period of time. A packet might not be acknowledged because of channel noise or "collision" with another packet transmission. If other stations are using the same channel, the receiving station may not be able to acknowledge the received packet immediately.

The FRACK command (FRame ACKnowledge time) sets the time lapse allowed before the originating station retransmits the packet.

The RETRY command sets the maximum number of retransmissions before the originating station abandons further retries and terminates the connection. The maximum number of packet transmissions is RETRY+1; the initial transmission does not count as a retransmission. Setting RETRY to 0 (zero) specifies an infinite number of retries.

FRACK is automatically corrected for the additional time required for digipeating. The time interval before your PK-232 retransmits an unacknowledged packet is

Retry interval = FRACK x (2 x n + 1) seconds

where "n" is the number of digipeaters used for this connection.

5.5.4.4 DWAIT

Digipeated packets require an end-to-end acknowledgment. Digipeaters don't acknowledge the packets they relay. If a link includes several digipeaters, the chances of loss of either the original packet or the acknowledgment increase drastically.

To help alleviate this problem, an automatic wait time can be imposed on any station not transmitting a digipeated packet. Stations waiting for a clear channel to transmit packets wait for this time interval after the channel clears before transmitting. This wait does not apply if the station is transmitting one or more digipeated packets. This usually gives the digipeater a clear chance at the channel.

The DWAIT command sets your PK-232's wait time in ten-millisecond intervals. If digipeating is not being done by anyone in your local area, this parameter can be set to 0 (zero). In any event it should be set to the same value by all members of a local area packet group.

To minimize unnecessary retries, the PK-232 applies a collision-avoidance strategy to all packets except those being digipeated. On the second and subsequent transmissions of a given packet, your PK-232 waits an _additional_ random time after detecting a clear channel _before_ transmitting. This prevents repeated collisions of transmissions by the same two stations. The random time is a multiple (0 to 15) of the TXDELAY time.

For the first transmission of a packet, the time between your PK-232's detection of loss of carrier and activation of the PTT line is:

Wait time = DWAIT x 10 milliseconds

For retries of the same packet, the interval is:

Wait time = (DWAIT + r x TXDELAY) x 100/16 milliseconds,

where "r" is a random number from 0 to 15. Therefore, the longest amount of time added randomly is 0.094 x TXDELAY seconds. For the default value of TXDELAY = 30, the longest time added is 2.8 seconds.

5.5.4.5 MAXFRAME

The AX.25 protocol permits the transmission of several packets without waiting for an acknowledgment. The number of packets that can be sent before acknowledgement is known as the "window." The window concept permits more efficient channel use if large amounts of data are being transferred.

The MAXFRAME command sets the maximum number of packets which your PK-232 will send before waiting for acknowledgment. (This doesn't mean that your PK-232 will wait until several packets have been typed before transmitting.)

MAXFRAME, in combination with the PACLEN command (which sets the maximum number of characters in a packet), determines how much information can be sent in a single burst transmission. The best combination for efficient data transfer depends upon channel quality and the rate at which the terminal can process data.

For a 1200-baud terminal data rate, begin with a combination that produces about 300 characters outstanding at one time.

5.5.4.6 CHECK

The CHECK command sets a connection timeout specified in multiples of ten-second intervals. This timeout function prevents your PK-232 from remaining connected to a distant station when the other station disappears for longer than the specified time. Your PK-232 uses this time somewhat differently, depending on the setting of AX25L2V2.

If AX25L2V2 is OFF (a pre-Version 2.0 connection), the link is preserved by initiating a reconnect call; the PK-232 returns to the "connect-in-progress" state and sends connect request (SABM) frames. In addition, the PK-232 adds a random time of up to 30 seconds each time CHECK occurs in a given connection.

5.5.4.7 RESPTIME

The RESPTIME command sets a delay between the receipt of a packet and the transmission of the acknowledgment packet. This delay is used to prevent collision between an acknowledgment and another packet from the sending station. RESPTIME is mainly necessary in file transfers. For normal service, RESPTIME is best set to 0 (zero) by the station sending the file.

The station receiving the file in a file transfer should set RESPTIME to 10 (default) or 12.

5.5.4.8 PACTIME

The PACTIME command sets packet transmission timing in the Transparent Mode. You can choose the way packet transmission is timed. It's best to send packets at regular intervals if you're typing manually to a remote computer.

If your computer is operating a remote-host or bulletin board program, send packets after an interval without further input from the host or computer.

Use the CPACTIME command to enable PACTIME in Converse Mode.

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CHAPTER 6

COMMAND SUMMARY

6.1   Introduction

Chapter 6 explains and illustrates all the PK-232's commands. You'll
use certain commands to affect the PK-232's performance under specific
conditions, and others to specify the values of parameters used during
the PK-232's general operation.

Your PK-232 is a "command-driven" system, that is, a system that does
not use "menus". You control the functions of the PK-232 by typing
single- or multiple-character commands at your computer's keyboard,

6.1.1   Entering Commands

Commands are entered after the Command Mode prompt:

        cmd:

You'll use English-like words or abbreviations to change the value of
parameters and issue instructions to the PK-232.

o   Commands are either keywords or mnemonics (special abbreviations
      that jog your memory) made up of strings of characters that you
      type.

You'll may not change the values of some parameters; however, you have
maximum flexibility to adapt the PK-232 to your local environment and
operating conditions.

o   Use either upper case (capital letters) or lower case (small let-
      ters) when entering commands.
o   End the command with a carriage return <CR>. Carriage returns
      are not shown in the examples below.
o   Correct your typing mistakes or cancel the line completely before
      you type the final <CR> of your command.
o   See Chapter 3 for a discussion of line editing.

We'll use UPPER CASE throughout this chapter to show you the commands,
and lower case to explain the text.

6.1.2   Command Responses

Whenever the PK-232 accepts a command that changes a value, the PK-232
responds with the previously stored value. For example, assume that
"XFLOW" is "ON" and you type "XFLOW OFF" - you'll see the display:

        XFLOW was ON

This message tells you that the value has been changed successfully.

6.1.3   Error Messages

If your PK-232 can't understand what you've typed, you'll get an error message in English reporting the nature of the error.

o   If you type a command your PK-232 can't understand - you'll see:

?What?

o   If you type a correct command word with a wrong argument:

?bad

o   If you type a numerical value outside a parameter's range:

?range

o   If you set the BEACON timing too short for busy channels:

WARNING: BEACON too often

o   If you type an improper SELCAL:

?call sign

Here are a few more examples:

cmd:ASDFASDF ?What?	-	This isn't a command.
cmd:BEACON E ?bad	-	A parameter was left out.
cmd:PACLEN 265 ?range	-	Unacceptable numerical value.
cmd:DAY ?clock not set	-	You didn't set the PK-232's clock
cmd:x	-	Command is invalid for the mode in use
cmd:C N6IA ?not while in PACKET	-	Command is invalid for the mode in use
cmd:C N6IA ?not while in MORSE	-	Command is invalid for the mode in use
cmd:C N6IA ?not while in ASCII	-	Command is invalid for the mode in use
cmd:C N6IA ?not while in BAUDOT	-	Command is invalid for the mode in use

6.2   Command List

Commands are listed alphabetically in the following command descriptions. Each command entry contains several sections:

o   Command name

o   Command abbreviation or mnemonic

o   Default value

o   Parameters

6.2.1   Command Names

The command name at the beginning of the description is the full word you can type in order to have your PK-232 execute this command. Next to the command you'll see the minimum abbreviation or the mnemonic that you can use instead of the full word. Of course, you can always type out the entire command word, or any abbreviation longer than the minimum abbreviation. For example:

o   You can enter the command MYCALL by simply typing "MY". (Note: DO NOT type the "quotation marks" - we show these for clarity in identifying the letters you'll type.)

The abbreviation "M" is not sufficient (and will be interpreted as a different command), but "MY", "MYC", "MYCA", "MYCAL" or "MYCALL" are all acceptable.

If a command requires parameters, the type of parameter is indicated after the command name as well as the default value. For example:

o   "n" means the command takes a numerical parameter value.

6.2.2   Default Values

Some commands have initial values that your PK-232 assumes as defaults or "used most often." These defaults are stored in EPROM and loaded into RAM when the PK-232 is first turned on - or when you type the RESET command.

6.3   Parameters, Arguments and Values:

Some commands need additional information before they can be executed. This type of command has "parameters" or requires "arguments." For example, a command such as FULLDUP has a Boolean parameter. When you type "FULLDUP ON", FULLDUP is the command, ON is its argument - the value you want the PK-232 to use to execute the command FULLDUP.

o   The values that fill this parameter are either ON or OFF.

o   Immediate commands such as "ID" have no parameters. Typing only "ID" causes the PK-232 to execute the command.

Some commands such as "CONNECT" have optional parameters.

o   If you type "CONNECT" without an argument, the PK-232 displays the current status of the link.

However, if you type "CONNECT N7ML", the PK-232 issues the connect request and tries to establish the link to N7ML.

Some commands such as MFILTER can use several arguments at the same time. MFILTER accepts from 1 to 4 numerical arguments. You can type MFILTER 12 or MFILTER 12, 26. Both are legal commands.

6.3.1   Parameters

Three different types of parameters are used: Boolean, numeric and text or string.

6.3.1.1 Boolean Parameters

Boolean parameters use one value out of a choice of only two possible values, such as ON or OFF, YES or NO, or EVERY or AFTER. Boolean parameters can also be toggled with an argument of "TOGGLE" or "T". This is useful, for example, in the case of RXREV and TXREV.

o   When a parameter is Boolean, its two possible choices are shown separated by a vertical bar.

6.3.1.2 Numeric Parameters

A parameter designated as "n" is a numeric value.

o   Numeric values can be entered by typing familiar decimal numbers, or optionally in hexadecimal numbers.

In using hexadecimal notation, you must prefix the number you type with a "$" character.

The PK-232 displays some of these numeric parameters (those which set special characters) in hexadecimal format. Here's a brief explanation of "hex" numbers:

o   The "digits" of a hex number represent powers of 16 in the same manner as the powers of 10 represented by a decimal number.
o   The numbers 10 through 15 are indicated by hexadecimal digits A through F. For example:

     $1B = (1 x 16) + (11 x 1) = 27 (decimal)
     $120 = (1 x 16 x 16) + (2 x 16) + (0 x 1) = 288 (decimal)

For numeric parameters in the range 0 to 255, arguments "ON" or "Y" set the value of the parameter to their ROM default values. Arguments "OFF" or "N" set the value to 0 (zero).

Baud-rate parameters can use arguments UP (U) or DOWN (D) to select the next higher or lower baud rate. This is useful with RBAUD and ABAUD in RTTY reception.

6.3.1.3 Text or String Parameters

A text parameter such as the argument or "message" for BTEXT (your "beacon" message) or CTEXT (your "connect" message), can be typed in upper or lower case.

o   A text parameter can include numbers, spaces, and punctuation.
o   The text is accepted exactly as you type it.

Some commands require call signs as parameters. These parameters are usually amateur call signs, but may be any string of numbers and at least one letter up to six characters; character strings are used to identify stations sending and receiving packets.

A call sign can also include a sub-station identifier (SSID), decimal numbers from 0 to 15 used to distinguish two or more stations on the air with the same call (such as a base station and a "digipeater").

The call sign and SSID are typed in and displayed as "call-n", e.g., "K0PFX-3." If an SSID is not entered, the system assumes 0 (zero); SSID "0" is not normally displayed by the PK-232.

Some commands have parameters which are actually lists of call signs:

o   The CFROM command allows you to specify from one to eight call signs for selective monitoring.
o   You must separate multiple call signs with either blank spaces or commas.

The following examples will help you understand these explanations.

o   BEACON EVERY|AFTER "n"

The BEACON command requires an argument;

-    You **must** specify either EVERY or AFTER (abbreviated to E or A), followed by an argument "n" which you may choose from a range of values.

A typical appropriate entry would be BEACON EVERY 180 (a beacon is sent every 180 times 10 seconds, every 30 minutes), or BEACON EVERY 0 (the beacon is **not** transmitted).

o   CONNECT call1 [VIA call2[,call3...,call9]]

The CONNECT command requires a call sign argument "call1."

-    You may optionally include the keyword VIA, followed by a list of one to eight call signs, "call2" through "call9."
-    Multiple call signs in the list **must** be separated by commas (as shown) or by blank spaces.

An acceptable entry would be: "C WX1AAA V WX2BBB,WX3CCC."

6.3.2   <u>Using Commands Without Arguments</u>

If you type the command name without its arguments, the current value of the command's arguments is displayed. For example:

cmd:VHF Y	-	Sets the value to YES (ON)
VHF was OFF	-	Displays the previous value
cmd:VHF	-	Command with no arguments
VHF ON	-	displays the present value.

NOTE: The DISPLAY command shows you the values of all parameters or groups of related parameters.

6.4   Controller Messages

This section describes your PK-232's messages and the circumstances
under which they can appear.

6.4.1   General

Sign-On Message

        Advanced Electronic Applications, Inc.
        AEA PK-232 Data Controller
        Release nn
        Checksum $xx
        cmd:

The sign-on message appears when you turn on your PK-232 or when you
type "RESET". The release number is updated whenever the firmware is
changed. The checksum is a hex number which you can compare against
the correct checksum given for the firmware version you're using.

PK232 is using default values

This message appears along with the sign-on message above if the bbRAM
checksum verification fails at power-on time, causing the PK-232 to
load the default parameters from ROM. (This happens the first time
you turn on your PK-232.)

This message also appears if the PK-232 loads the defaults in response
to the RESET command.

cmd:

This is the Command Mode prompt. When this prompt appears, the PK-232
is waiting for you to issue a command. Anything you type after this
prompt, up to and including the first <CR> is interpreted as a com-
mand to the PK-232. If a monitored packet has been displayed, the
prompt may not be visible, even though you are in Command Mode. You
can type the redisplay-line character (set by REDISPLA) to retype the
prompt.

was

Whenever you change one of the PK-232's parameters, the previous value
will be displayed. This confirms that the PK-232 properly interpreted
your command, and reminds you of what you have done.

too many packets outstanding

This message appears in response to a CONVERS or TRANS command, under
special circumstances. This message would appear if you've already
typed packet data and filled the outgoing buffer in the Converse Mode
or Transparent Mode and then tried to return to the Command Mode.
You'll be allowed to enter one of these modes when some of the packets
have been successfully transmitted.

6.4.2 Command Mode Error Messages

An error message is displayed if you make a mistake typing a command to the PK-232.

?bad

You typed a command correctly, but the remainder of the command line couldn't be interpreted.

?call sign

You typed a call sign that does not meet the PK-232's requirements for call signs. A call sign may be any string of numbers and letters. Punctuation and spaces are not allowed. The SSID, if given, must be a (decimal) number from 0 to 15, separated from the call by a hyphen.

?clock not set

You typed the command DAYTIME to display the date and time, but you haven't yet set the clock! DAYTIME sets the clock if it is given with the daytime parameters, and displays the date and time if it is given without parameters.

?What?

Your first entry is not a command or a command abbreviation - your PK-232 did not understand your instructions!

?not enough

You didn't type enough arguments for a command that expects several parameters. For example, "CONNECT W2JUP VIA."

?not while connected

You attempted to change MYCALL or AX25L2V2 while in a connected or connecting state.

?range

You typed a numeric argument too large or too small for that specific command.

?too long

You typed a command line that is too long, so the line is ignored. For example, if you try to type too long a BTEXT or CTEXT message, you'll receive this message. When you get this specific error mes- sage, the previous text entry is not changed.

?too many

You typed too many arguments for a command that expects several para-
meters. For example, MFILTER can have up to 4 arguments.

        cmd:MFILTER $1B,$0C,$1A,$03,$07
        ?too many

?VIA

You typed more than one call sign for the CONNECT or UNPROTO commands
without the VIA keyword.

?not while disconnected

You tried to set CONPERM while disconnected.

?channel must be 0-9

You typed an invalid channel character after the CHSWITCH character.

?already connected

You tried to CONNECT to a station to which you're already connected.

?different connectees

You tried to CONNECT to more than one station on the same logical
channel.

6.4.3   Link Status Messages

Link status messages show you the status of AX.25 connections in which
your PK-232 may be involved.

o   You can ask for link status at any time from the Command Mode by
     typing the CONNECT command without parameters.

     If you attempt a connection when your PK-232 is not in the dis-
     connected state, your monitor displays the link status but takes
     no other action.

The following messages appear in response to the CONNECT command.

o   Link state is: CONNECTED to call1
                   [VIA call2[,call3...,call9]]

     Your station is connected to a distant station - you'll see the
     digipeater path in use, if any. The call sign sequence is the
     same sequence you would type to initiate the connection.

o   Link state is: CONNECTED to call1;V2;2 unACKed
                   [VIA call2[,call3...,call9]]

     You are connected to a station using Version 2; two frames remain
     unacknowledged.

o   Link state is: DISCONNECTED

     No link or connection exists right now. You may type the CONNECT
     command to initiate a connection.

o   Link state is: CONNECT in progress

     You've already typed a connect request, but the acknowledgment
     from the other station has not been received. If you type the
     DISCONNE command, the connect process will be canceled.

o   Link state is: DISCONNECT in progress

     You've typed a disconnect request, but the acknowledgment from
     the other station has not been received. If you type a second
     DISCONNE command, the PK-232 will go immediately to the discon-
     nected state.

o   Link state is: FRMR in progress

     Your PK-232 is connected to a distant station, but a protocol
     error has occurred. This should never happen when two AEA AX.25
     systems are connected. An improper implementation of the AX.25
     protocol could cause this condition. Your PK-232 will try to
     re-synchronize frame numbers with the PK-232 on the other end,
     although a disconnect may result. Connections are not valid in
     this state; a disconnect will start the disconnect process.

     Your PK-232 will tell you whenever the link status changes. The
     link status may change in response to a command you've given the
     PK-232 (CONNECT or DISCONNE), a connect or a disconnect request
     packet from a distant station, a disconnect because of the retry
     count being exceeded, an automatic time-out disconnect (CHECK),
     or a protocol error.

o   *** CONNECTED to: call1 [via call2[,call3...,call9]]

     This message appears when your PK-232 switches from the "discon-
     nected" or "connect in progress" state to the connected state.
     The connection may be a result of a CONNECT command typed by you,
     or a connect request packet received from a distant station.

o   *** Connect request: call1 [via call2[,call3...,call9]]

        Your PK-232 has received but not accepted a connect request from
        a distant station.   This can happen if you've set CFROM to NONE,
        or if you are already connected to another station.

        When your PK-232 displays this message, it also sends a DM packet
        (busy signal) to the station that initiated the connect request.
        If your PK-232 rejects a connect request because you've set CFROM
        to NONE or OFF, you can issue your own connect request to the
        other station.

o   *** DISCONNECTED: (call sign)

        Your PK-232 has switched to the disconnected state from any other
        link state.   This message may be preceded by a message explaining
        the reason for the disconnect, as shown below.

o   *** Retry count exceeded
        *** DISCONNECTED: <call sign>

        Your PK-232 has been disconnected because of a retry failure,
        rather than a disconnect request from one of the stations.

o   *** <call sign> busy
        *** DISCONNECTED: <call sign>

        Your connect request was rejected by a DM packet (busy signal)
        from the other station.   Your PK-232 will reject a connect re-
        quest if CFROM is set to NONE, or if you are already connected to
        another station.

o   FRMR sent: xx xx xx

        Your PK-232 is connected but a protocol error has occurred.   Your
        PK-232 has transmitted a special FRMR packet and is trying to
        re-synchronize frame numbers with the distant station's packet
        system.   The string xxxxxx is replaced with the hex codes for the
        three bytes sent in the information part of the FRMR frame.   This
        message will not appear if your PK-232 is in Transparent Mode.

o   FRMR rcvd: xx xx xx

        Your PK-232 has received an FRMR (protocol error as described
        above) and shows this followed by a display of the FRMR packet in
        hexadecimal format.   This message will not appear if your PK-232
        is in Transparent Mode.

6.5   Special Keyboard Control Codes

Except for packet operation, each mode uses specific characters for
special functions. These functions vary with the mode, and unless
noted, are typed from the Command Mode.

6.5.1   Morse Code

From Command Mode:

"L"   Locks to speed of the received signal.
"MO"   Unlocks from speed of received signal.
"R"   Switches the system to receive mode, unlocks received speed,
           forces received speed to equal transmit speed.
"X"   Switches system to transmit mode.

6.5.2   Baudot and ASCII RTTY

From Command Mode:

"L"   Forces LETTERS case. (Baudot only)
"R"   Switches system to receive mode, forces LETTERS case.
"X"   Switched system to transmit mode.

Embedded in transmitted text in Baudot only:

<CTRL-O> Sends LETTERS character   <CTRL-N> Sends FIGURES character

6.5.3   AMTOR Mode

From Command Mode:

"L"   Forces LETTERS case.
"R"   Stops transmission in progress, forces AMTOR Standby.
"AM"   Stops transmission in progress, forces AMTOR Standby.
"AL"   In ALIST (AMTOR Mode A Listen), forces re-synchronization.

Embedded in transmitted text:

<CTRL-O> Sends LETTERS character   <CTRL-N> Sends FIGURES character

6.5.4   Clear String Commands

While in Command Mode, the following commands can be cleared by typing
the command word followed by a single percent sign (%), an ampersand
(&) or "N," "NO," "NONE", "OFF" as the command's argument.

     BTEXT CTEXT MBX MYALIAS MHEARD MFROM MTO CFROM DFROM

6.6   Specific Commands

The following section contains detailed descriptions of the meaning,
use and effects of each command, its parameters, default values and
arguments. Examples of command usage are included.

8BITCONV ON|OFF   Mnemonic: 8B   Default: OFF
MODE: Packet

Parameters:

ON -   The high-order bit IS NOT stripped in Converse Mode.

OFF -   The high-order bit IS stripped in Converse Mode.

8BITCONV permits packet transmission of eight-bit data in the Converse
Mode.

If 8BITCONV is OFF, the high-order bit (bit seven) of characters re-
ceived from the terminal is removed before the characters are trans-
mitted in a packet.

The standard ASCII character set requires only seven bits - the eighth
or final bit is used as a parity bit or ignored.

o   Setting bit seven in text characters transmitted over the air may
     cause confusion at the other end.

If you need to transmit eight-bit data but don't want all the features
of Transparent Mode, set 8BITCONV ON and AWLEN 8. This may be desir-
able if you're using a special non-ASCII character set.

Because commands require only the standard seven-bit ASCII character
set, bit seven is always removed in Command Mode.

| AAB text   Mnemonic: AA | Default: empty |
| MODE: Baudot/ASCII/AMTOR | |

Parameters:

text   any combination of characters and spaces up to a maximum of
        17 characters.

Use the AAB command to enter an acknowledgment text in the ANSWERBACK
section of the PK-232's memory. AAB sends automatic confirmation in
Baudot, ASCII and AMTOR operation in response to a distant station's
WRU? command,   AAB is not related to the CTEXT and BTEXT messages
used only in the packet mode. Set WRU ON to activate your answerback.

Type "AAB (17-character text)" to store your answerback in memory.

| ABAUD "n"   Mnemonic: AB | Default: 110 bauds |
| MODE: ASCII | |

Parameters:

"n" -   Specifies the rate or signaling speed in bauds from your
         PK-232 to your radio.

The available "n" ASCII data rates are:

   45, 50, 57, 75, 100, 110, 150, 200 and 300 bauds.

Example: ABAUD 300

ABAUD sets the radio ("on-air") baud rate only in the ASCII operating
mode. This value has no relationship to your computer or terminal
program's baud rate.

ASCII RTTY operation requires you to use the same data rate used by
the distant station.

In general, the higher the baud rate, the greater the probability of
data errors caused by interference and noise. Best results in the
worst-case conditions will usually be obtained at lower baud rates.

NOTE: Modern commercial and amateur radio operations no longer
         refer to the operating speeds or data rates in "WPM." The
         term "bauds" is now universally accepted for FSK and AFSK
         operations using monobit data. In these cases, the terms
         "bauds" and "bits per second" mean the same thing and may be
         used interchangeably.

ACHG	Mnemonic: AC	Immediate Command
MODE: AMTOR		

ACHG is an immediate command used in AMTOR by the <u>receiving</u> station to interrupt the the sending station's transmissions.

This software command forces a changeover from receive to transmit if needed to interrupt the sending station's transmission.

As the receiving station, you usually rely on the distant station, your partner in the ARQ "handshake", to send the "+?" command to do the changeover. However, in ARQ (Mode A), you can use the ACHG command to "break in" on the sending station's transmission.

o   Use the ACHG command with care, and only in situations where it is essential to do so.

There are inherent reasons why recovery from such an interruption can result in garbled copy at one end of the contact, in particular in "FIGS" garble. If possible, wait until the other station is <u>idling</u> before breaking in.

If the other station breaks in to your transmission, it will probably help to use the "TCLEAR" command to cancel subsequent transmission of any unsent text which would be inappropriate to the new context of the break-in.

ACRDISP "n"	Mnemonic: ACRD	Default: 80
MODE: All		

<u>Parameters:</u>

"n" -   0 to 255 specifies the screen or printer width, in number of columns or characters.

0 (zero) disables the function.

The numerical value sets the proper terminal output format for your specific needs. Your PK-232 sends a <CR><LF> sequence to your computer or terminal at the end of a line in the Command and Converse Modes when "n" characters have been printed.

o   If your computer or terminal automatically formats output lines, set ACRDISP to "0" (zero) to avoid conflict between the two formats.

ACRPACK ON|OFF MODE: Packet	Mnemonic: ACRP	Default: ON

Parameters:

ON -   The send-packet character, normally <CR>, IS added to all
          packets sent in Converse Mode.

OFF -   The send-packet character is NOT added to packets.

When ACRPACK is ON, all packets sent in Converse Mode include, as the
last character of the packet, the send-packet character which forces
the packet to be sent.

When ACRPACK is OFF, the send-packet character is interpreted only as
a command to your PK-232, not as data to be included in the packet;
the character is not echoed to the terminal.

o   Set ACRPACK ON and SENDPAC $0D to produce natural conversational
      mode.

Each line is sent when a <CR> is entered, and arrives at its destina-
tion with a <CR> at the end of the line.

o   If the distant station reports overprinting of lines on his dis-
      play, set ALFPACK ON, or the other station can set ALFDISP ON.

ACRRTTY "n"   Mnemonic: ACRR   Default: 71
MODE: Baudot/ASCII RTTY

Parameters:

"n" -   0 to 255 specifies the number of characters on a line after
         which a carriage return <CR> is automatically inserted in
         your transmitted text. This insertion occurs after the last
         space character before "n" columns across the screen or
         page.

0   -   Zero disables the function.

When sending Baudot or ASCII RTTY, the ACRRTTY feature automatically
inserts and sends a carriage return at the first space character fol-
lowing the "nth" character or column.

After the line ending sequence is sent, the character counter is reset
to zero (0) and the count starts again.

o   Use this option when you are hand-typing into the transmit buffer
     and don't want to be bothered by watching the screen or worrying
     about line length, or to see when you are coming to the end of a
     line.

There are several cases in which you should NOT use this option:

o   When retransmitting text received from another station; for ex-
     ample, ARRL RTTY Bulletins.

The received text already contains the necessary line-ending sequence
characters. If this option is enabled, your transmission will have
double, perhaps even triple line feeds and look very strange at the
distant station.

Many stations using the older electromechanical teleprinter and Tele-
type machines habitually send a traditional line-ending sequence con-
sisting of CR CR LF LTRS, which was needed to allow the older, slow
machines to return to the left margin. The double CR routine will
produce a double line if this option is selected ON by setting the
value of "n" greater than zero length.

ADELAY "n"   Mnemonic: AD   Default: 4
MODE: AMTOR

Parameters:

"n" -   1 to 9 specifies transmitter key-up delay in ten-millisecond
          intervals.

ADELAY is the length of time in milliseconds between the instant when
the PK-232 activates the transmitter's PTT line, and when the ARQ data
begins to flow to the transmitter. Some delay is necessary with any
radio transmitter.

o   All transmitters need some finite amount of time to switch from
      receive to transmit, and to develop their nominal power output

The ADELAY command allows you to adjust a variable delay, from 10 to
90 milliseconds, introduced by the PK-232 in handling the PTT (Push-
to-Talk) line activation and data flow in the AMTOR mode.

o   In most cases, the default value of 4 times 10 (40) milliseconds
      will be adequate for most of the popular HF transmitters.

o   If necessary, you can reset other values with the ADELAY command.

As an indication that adjustment is required, you may observe symptoms
of periodic errors caused by loss of phasing, shown by rephase cycles
in the middle of an ARQ contact. This will occur in spite of strong
signals and low QRM levels.

o   Be sure that errors and rephasing effects are not provoked by the
      distant station before changing your defaults.

o   If changing your ADELAY values does not improve link performance,
      reinstall your original or default values.

Because the ARQ mode allows 170 milliseconds for the signal to travel
to the distant station and then return, increasing ADELAY will reduce
the maximum working distance. At 300 kilometers per millisecond, the
maximum theoretical range of an ARQ contact is limited to about 25,500
kilometers. Using some of that time as transmit delay leaves less
time for signal propagation. Thus the maximum distance available is
restricted - the signal cannot cover as great a distance.

ALFDISP ON|OFF   Mnemonic: ALFD   Default: OFF
MODE: All

Parameters:

ON -   A line feed character <LF> IS sent to the terminal after
        each carriage return character <CR>.
OFF -   A <LF> is NOT sent to the terminal after each <CR>.

ALFDISP controls the display of carriage return characters received in
packets as well as echoing those that are typed in.

When ALFDISP is ON, your PK-232 adds a line feed <LF> to each carriage
return <CR> received __if needed__. If a line feed was received either
immediately before or after a carriage return, ALFDISP will __not__ add
another line feed. Use the PK-232's sign-on message to determine how
carriage returns are being displayed.

o   Set ALFDISP ON if the PK-232's sign-on message lines are typed
     over each other.
o   Set ALFDISP OFF if the PK-232's sign-on message is double spaced.

ALFDISP is set correctly if the PK-232's sign-on message is single
spaced. ALFDISP affects your local display. It does not affect the
data sent in any mode.

Use the ALFPACK command if you want to add line feed characters to
outgoing packets.

ALFPACK ON|OFF   Mnemonic: ALFP   Default: OFF
MODE: Packet

Parameters:

ON -   A <LF> character IS added to outgoing packets following each
        <CR> transmitted in the packet.
OFF -   A <LF> is NOT added to outgoing packets.

ALFPACK is similar to ALFDISP, except that the <LF> characters are
added to outgoing packets, rather than only to text displayed locally.

ALFPACK is included to maintain compatibility with other packet radio
controllers.

o   If the person you are talking to reports overprinting of packets
     from your station set ALFPACK ON. Character insertion is dis-
     abled in Transparent Mode.

ALFRTTY ON|OFF   Mnemonic: ALFR   Default: ON
MODE: Baudot/ASCII RTTY

Parameters:

ON -   A line feed character <LF> IS sent after each carriage re-
         turn character <CR>.

OFF -   A <LF> is NOT sent after each <CR>.

If ALFRTTY is set ON when transmitting Baudot or ASCII RTTY, a line
feed character is added and transmitted automatically after each <CR>
character you type.

o   Use this option when you are hand-typing into the transmit buffer
     and don't want to be bothered by watching the screen or worrying
     about line length, or to see when you are coming to the end of a
     line.

There are several cases in which you should NOT use this option:

o   When retransmitting text received from another station; for ex-
     ample, ARRL RTTY Bulletins.

The received text already contains the necessary line-ending sequence
characters. If this option is enabled, your transmission will have
double, perhaps even triple line feeds and look very strange at the
distant station.

Many stations using the older electromechanical teleprinter and Tele-
type'" machines habitually send a traditional line-ending sequence
consisting of CR CR LF LTRS, which was needed to allow the older, slow
machines to return to the left margin. The double CR routine will
produce a double line if this option is selected ON by setting the
value of "n" greater than zero length.

o   ALFRTTY has no effect in AMTOR; a line feed is automatically
     added after each carriage return.

ALIST   Mnemonic: AL   Immediate Command
MODE: AMTOR

ALIST is an immediate command that switches your PK-232 into the ARQ
Listen mode.

You can usually monitor a contact between two linked stations by using
the ARQ Listen mode (also called Mode L). This mode may need a few
seconds to phase or acquire synchronization with the other stations.
Your ability to synchronize successfully with the master station de-
pends on operating conditions such as noise and interference.

If the linked stations that you are monitoring are experiencing ARQ
errors and retries, your monitor will display all the retries.

Type ALIST (or AL) repeatedly if you lose synchronization.

AMTOR   Mnemonic: AM   Immediate Command
MODE: Command

AMTOR is an immediate command that switches your PK-232 into the AMTOR
mode. Your PK-232 is automatically placed in ARQ Standby condition.

Your station is then available for automatic access by and response to
any AMTOR station that sends your SELCAL.

Your monitor will now display any inbound FEC (Mode B) transmissions
on the received channel without any additional action on your part.

You **must** set MYSELCAL before you can use the AMTOR command.

ARQ aaaa   Mnemonic: AR   Immediate Command
MODE: AMTOR

Parameters:

aaaa   -   The distant station's SELective CALling code

ARQ is an immediate command that starts an AMTOR Mode A (ARQ) SELCAL
(SELective CALl) to a distant station.

    Example: ARQ NNML

The SELCAL started by the ARQ command is the proper method of respond-
ing to another station's Mode B (FEC) CQ call.

To begin the Mode A (ARQ) selective call:

o   Type "ARQ" followed by the other station's four-character SELCAL.

The distant station's SELCAL code is normally seen as part of the
his/her CQ call sequence.

As soon as a <CR> is typed, your PK-232 will begin keying your trans-
mitter in the three-character AMTOR ARQ burst sequence. If the dis-
tant station receives and decodes your selective call successfully,
the two AMTOR systems synchronize and begin the Mode A (ARQ) AMTOR
"handshaking" process.

o   See "SELCAL" for information on the derivation and structure of
      the selective calling code

You don't have to type the SELCAL a second time if you intend to call
the same station again right away.

ASCII   Mnemonic: AS   Immediate Command
MODE: Command

ASCII is an immediate command that switches your PK-232 into the ASCII
RTTY mode.

ASCII is the proper mode to use if you wish to use RTTY to transmit
text, data or other information containing the lower case and special
characters not present in the Baudot/Murray and ITA #2 telegraph al-
phabets or character sets.

Because the ASCII character set requires a minimum of seven bits to
define the identity of each transmitted or received character, under
worst-case conditions, ASCII is sometimes more subject to data errors
and garbled text than Baudot/ITA#2 at the same data rate.

AWLEN "n"   Mnemonic: AW   Default: 7
MODE: All

Parameters:

"n" -   7 or 8 specifies the number of data bits per word.

The parameter value defines the digital word length used by the serial
input/output (IO) terminal port and your computer or terminal program.

o   Set AWLEN to 7 for most packet operations, such as conversation,
     bulletin board operation and transmission of ASCII files.

If eight-bit words are sent to the PK-232 in the Command or Converse
Modes, the eighth bit is normally removed, leaving a standard ASCII
character, regardless of the setting of AWLEN.

All eight data bits of each character must be retained to send execut-
able files or other special data.

o   Set AWLEN to 8 and use the Transparent Mode.

You can also use Converse Mode and set AWLEN 8 and 8BITCONV ON. How-
ever, you must precede the Converse Mode special characters with the
PASS character in the data you send.

AX25L2V2 ON|OFF   Mnemonic: A   Default: OFF
MODE: Packet

Parameters:

ON -   The PK-232 uses AX.25 Level 2 Version 2.0 protocol.

OFF -   The PK-232 uses AX.25 Level 2 Version 1.0 protocol.

Some implementations of the earlier version of AX.25 protocol won't
properly digipeat Version 2.0 AX.25 packets. This command exists to
provide compatibility with these other TNCs until their software has
been updated.

For best results during this transition period set AX25L2V2 OFF.

After your local area TNCs have been updated to the newer protocol
version, set AX25L2V2 ON.

AXDELAY "n"   Mnemonic: AXD   Default: 0
MODE: Packet

Parameters:

"n" 0 to 180   specifies a key-up delay for voice repeater operation
               in ten-millisecond intervals.

AXDELAY specifies the period of time the PK-232 will wait - in addi-
tion to the normal delay set by TXDELAY - after keying the transmitter
and before data is sent.

Packet groups using a standard "voice" repeater to extend the range of
the local area network may need to use this feature.

Repeaters with slow electromechanical relays, split sites, auxiliary
links (or other circuits which delay transmission for some time after
the RF carrier is present) require some amount of time to get RF on
the air.

If you're using a repeater that hasn't been used for packet operations
before, try various values to find the best value for "n".

If other packet stations have been using the repeater, check with them
for the proper setting.

AXDELAY acts in conjunction with AXHANG.

AXHANG "n"   Mnemonic: AXH   Default: 0
MODE: Packet

Parameters:

"n" -   0 to 20 specifies voice repeater hang time in 100-milli-
          second intervals.

The numeric value can be used to increase channel efficiency when an
audio repeater has a hang time greater than 100 milliseconds. For a
repeater with a long hang time, it is not necessary to wait for the
repeater keyup delay after keying the transmitter if the repeater is
still transmitting.

When the PK-232 has heard a packet sent within the hang period, it
does not add the repeater keyup delay (AXDELAY) to the key-up time.

If you are using a repeater that hasn't been used for packet opera-
tions before, try various values to find the best value for "n".

If other packet stations have been using the repeater, check with them
for the proper setting.

BAUDOT   Mnemonic: BA   Immediate Command
MODE: Command

BAUDOT is an immediate command that switches your PK-232 into the
Baudot RTTY mode.

Baudot operation is still the most common form of RTTY operation in
use around the world, and is the basis of the worldwide telex network
and most radio press and weather services.

The Baudot/Murray and ITA#2 character sets do not contain lower case
and special punctuation characters found in the ASCII character set.

Because the Baudot/ITA#2 code requires only five information bits to
define the identity of each transmitted or received character, under
worst-case conditions, Baudot RTTY will generally suffer fewer errors
than ASCII code at the same data rate.

BEACON EVERYIAFTER "n"   Mnemonic: B   Default: EVERY 0
MODE: Packet

Parameters:

EVERY   -   Send the beacon at regular intervals.

AFTER   -   Send the beacon once after the specified time interval
              without packet activity.

"n"   -   0 to 250 specifies beacon timing in 10-second
              intervals.

0   -   Zero turns off the beacon.

The BEACON command sets the conditions under which your packet beacon
will be transmitted.

o   A beacon frame contains the text that you've typed into the BTEXT
     message in a packet addressed to "CQ" or other UNPROTO address.

o   A beacon frame may be sent directly, and also sent via the digi-
     peat addresses specified by the UNPROTO command.

When the keyword EVERY is specified, a beacon packet is sent every n
times 10 seconds. This mode can be used to transmit packets for test-
ing purposes.

When AFTER is specified, a beacon is sent after n times 10 seconds
have passed without packet activity.

o   The beacon is sent only once until further activity is detected.

This mode can be used to send announcements or test messages only when
packet stations are on the air.

o   Proper choice of "n" avoids cluttering a busy channel with lots
     of unnecessary transmissions.

Beacon frames from other packet stations can be monitored by setting
MONITOR in the range 1-6.

o   If you set the BEACON timing at less than "90", a value judged by
     most authoritative sources as too small for busy channels, you'll
     see the message:

          WARNING: BEACON too often

     The warning message appears in the Command Mode each time a new
     command is typed.

BKONDEL ON|OFF   Mnemonic: BK   Default: ON
MODE: All

Parameters:

ON -   The sequence <BACKSPACE><SPACE><BACKSPACE> is echoed when
         a character is deleted from the input line.

OFF -   The <BACKSLASH> character <\> is echoed when a character is
         deleted.

BKONDEL determines how character deletion is displayed in Command or
Converse Mode.

The <BACKSPACE><SPACE><BACKSPACE> sequence updates the video display
screen.

o   Set BKONDEL ON if you're using a video display terminal or com-
     puter.

On a printing terminal the <BACKSPACE><SPACE><BACKSPACE> sequence will
result in <u>overtyped</u> text.

o   Set BKONDEL OFF if you have a paper-output display, or if your
     terminal does not respond to the <BACKSPACE> character <CTRL-H>.

The PK-232 displays a <BACKSLASH> for each character you delete. You
can get a display of the corrected input by typing the redisplay-line
character set by the command REDISPLA.

BTEXT text	Mnemonic: BT	Default: Empty
MODE: Packet		(Null String)

Parameters:

text   Any combination of characters and spaces, up to a maximum
        length of 120 characters.

BTEXT is the content of the data portion of a beacon packet. The de-
fault text is an empty string (no message).

o   Beacon packets are discussed in more detail under the BEACON com-
    mand.

You can send multiple-line messages in your beacon by including <CR>
characters in the text. <CR> is inserted by typing the PASS character
before the <CR>

o   The PASS character is set by the PASS command.

If you enter a text string longer than 120 characters, the command is
ignored and the following error message appears:

    ?too long

A packet bulletin board (PBBS) program may set the beacon text to a
message like this, updating the text after each connection:

    MAIL for: WB9FLW AD7I K9NG N7ML W2JUP WB2MNF WA7MBL W0RLI

o   Use a "%," "&", "N," "NO," "NONE," or OFF as the first characters
    in the text to clear the BTEXT text without issuing the RESET
    command.

Although the beacon subject is controversial in packet circles, you
can use the feature intelligently and benefit the packet community.

o   Don't type your call sign in BTEXT - the normal packet header
    shows it for you.
o   Don't fill your BTEXT with screen graphics such as asterisks,
    parentheses, colons and semicolons, etc. Use BTEXT for some
    significant information.
o   Don't use BTEXT to tell the world that your "DIGIPEAT IS ON" and
    "BUFFER SAVE TO DISK IS ENABLED" - put this information in your
    CTEXT message so that it is seen by the station that connects to
    you - the only one who can make use of the information.
o   After you've beaconed for a week or two and the packet community
    has learned who and where you are, follow the practice used by
    more experienced packeteers: SET BEACON EVERY 0!

CALIBRATE   Mnemonic: CAL   Immediate Command
MODE: Command

CALIBRATE is an immediate command that starts the modem calibration
routine.

The PK-232 provides a continuous on-screen display of AFSK generator
tone frequencies in Hertz. The frequency is displayed in vertical
"scroll" fashion approximately twice per second, with the part number
of the potentiometer associated with that tone.

Calibration may be checked at any time without altering the state of
the existing link. However, the time-of-day clock (DAYTIME) will not
advance until you quit the calibration routine.

Commands available in the calibration routine are:

<SPACE>   Toggles the transmitted audio between "mark" (low) and
            "space" (high) tones.

D   Alternates the transmitted mark and space tones at a
            rate set by the radio baud (HB) rate.

K   Toggles the PTT line between ON and OFF.

Q   Quits the calibration routine.

H   Toggles the transmitted audio tones between wide shift
            (1200 Hz) and narrow shift (200 Hz).

Calibration of the modem tones and adjustment of the PK-232's tone
output levels for proper transmitter modulation are described in the
modem calibration section of AEA's Technical Manual for the PK-232.

NOTE: Set "D" OFF to transmit a continuous mark or space tone.

| CANLINE "n"
MODE: Packet | Mnemonic: CAN | Default: $18 <CTRL-X> |

Parameters:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

CANLINE changes the CANCEL-LINE input editing command character.

The parameter "n" is the ASCII code for the character you want to use to cancel an input line.

o   You can enter the code in either hex or decimal.

For example:

o   CANLINE $15 (hex)
o   CANLINE 21 (decimal)

Either sets the cancel-line character to <CTRL- U>.

When you use the CANLINE character to cancel an input line in Command Mode, the line is terminated with a <BACKSLASH> character and new prompt (cmd:) appears.

When you cancel a line in Converse Mode, only the <BACKSLASH> and a new line appear.

o   You can cancel only the line you are currently typing.

o   Once <CR> has been typed, you cannot cancel an input line using the cancel-line character.

o   Use the CANPAC character to cancel the entire packet.

NOTE: If your send-packet character is not <CR>, the cancel-line character cancels only the last line of a multi-line packet.

Like all other input editing features, line cancellation is disabled in Transparent Mode.

CANPAC "n"   Mnemonic: CANP   Default: $19 <CTRL-Y>
MODE: Packet

Parameters:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

CANPAC changes the CANCEL-PACKET input editing command character.

The parameter "n" is the ASCII code for the character you want to type
in order to cancel an input packet.

o   You can enter the code in either hex or decimal.

When you cancel a packet in Converse Mode, the line is terminated with
a <BACKSLASH> character and a new line.

o   You can only cancel the packet that is currently being entered.

Once you have typed the send-packet character, or waited PACTIME (if
CPACTIME is enabled), the packet cannot be canceled even if it has not
been transmitted.

Like other input editing features, packet cancellation is disabled in
Transparent Mode.

The CANCEL-PACKET character also cancels the display output in Command
Mode. If you are in Command Mode and type the CANCEL-PACKET charac-
ter, any characters that would be typed on the screen (except those
echoed) are "thrown away" by the PK-232.

o   Typing the cancel-output character a second time restores normal
     output.
o   To see how this works type DISPLAY, then type a <CTRL-Y>.

The command list display will stop. You won't see any response from
the PK-232 to commands.

To verify that the display is back to normal, type <CTRL-Y>, and then
type DISPLAY again.

Use the CANCEL-DISPLAY feature if you inadvertently do something that
causes the PK-232 to generate large amounts of output to the terminal,
such as giving the DISPLAY command or setting TRACE ON.

o   If you are in Converse or Transparent Mode and want to cancel
     display output, you must exit to Command Mode and then type the
     CANCEL-PACKET character.

CBELL   ON/OFF   Mnemonic: CB   Default: OFF
MODE: Packet

Parameters:

ON   -   Three BELL characters <CTRL-G> ($07) are sent to your ter-
          minal with the "*** CONNECTED to (call sign)" message.

OFF -   BELLS are NOT sent with the CONNECTED message.

---

o   Set CBELL ON if you want to be notified whenever someone connects
     to your station.

o   If CBELL is ON and MFILTER contains the character ($07), you can
     be sure that whenever your terminal beeps there is a connection
     for you. At no other time will you hear a beep while you are in
     packet mode.

CCITT ON|OFF	Mnemonic: CC	Default: ON
MODE: Baudot RTTY		

Parameters:

ON -   Characters typed on the keyboard or loaded from disk files
         are translated into CCITT International Telegraph Alphabet
         #2 before being sent.

OFF -   Characters sent to the PK-232 are not translated into CCITT
         ITA #2, but remain in the American standard Baudot format
         (typically Western Union).

Your computer or terminal will probably send a full ASCII character
set to the PK-232. Although there is no absolute standard, the fol-
lowing keyboard is typical of the IBM PC and compatibles.

```
        LOWER CASE SET                UPPER CASE SET

   1 2 3 4 5 6 7 8 9 0 - =      ! @ # $ % ^ & * ( ) _ +
   q w e r t y u i o p [ ]      Q W E R T Y U I O P { }
   a s d f g h j k l ; '        A S D F G H J K L : "
   z x c v b n m , . /          Z X C V B N M < > ?
```

If you set CCITT OFF, the PK-232 transmits the following character set
in the Baudot Mode (see NOTE below!):

```
        LOWER CASE SET                UPPER CASE SET

   1 2 3 4 5 6 7 8 9 0 -        !   # $     &   ( )
   Q W E R T Y U I O P          Q W E R T Y U I O P
   A S D F G H J K L ; '        A S D F G H J K L : "
   Z X C V B N M , . /          Z X C V B N M , . ?
```

If you set CCITT ON, the PK-232 sends International Telegraph Alphabet
#2 character set in the Baudot and AMTOR modes:

```
        LOWER CASE SET                UPPER CASE SET

   1 2 3 4 5 6 7 8 9 0 - =      ? ? ? ? ? ? ? ( ) ? +
   Q W E R T Y U I O P ? ?      Q W E R T Y U I O P ?
   A S D F G H J K L ? '        A S D F G H J K L : ?
   Z X C V B N M , . /          Z X C V B N M , . ?
```

NOTE: FCC Part 97.69(b)(1) calls for the use of International
         Telegraph Alphabet Number 2 (commonly known as Baudot); a
         single channel, five unit (start-stop) teleprinter code
         conforming to the International Telegraph Alphabet Number 2
         with respect to all letters and numerals (including the
         slant sign or fraction bar);" etc. The characters "$", "#"
         and "&" are NOT permitted in international Baudot RTTY.

CFROM all,none,yes/no call1[,call2..]   Mnemonic: CF   Default: all
MODE: Packet

<u>Parameters:</u>

call   -   all, none, YES list, NO list.
              list of up to eight call signs, separated by commas.

CFROM uses arguments to determine how your PK-232 responds to connect
requests - which calls are accepted and which calls are rejected.
CFROM is set to "all" when you start your PK-232 for the first time.

Type CFROM to display the ALL/NONE/YES list/NO list status of station
call signs to be rejected or accepted. You can use the abbreviated
command form or mnemonic:

            cmd:cfrom
            CFROM   all
            cmd:cf
            CFROM   yes WX1AAA,WX2BBB,WX3CCC,WX4DDD

To reject <u>all</u> call requests, type CFROM NONE. Your PK-232 sends the
calling station a DM packet, or "busy signal." The caller sees:

            *** MYCALL busy
            *** DISCONNECTED: (call sign)

Your PK-232 notifies you of these call requests:

            *** Connect request: WX1AAA

To <u>accept</u> calls from one or more specific stations, type CFROM (YES
followed by a list of calls signs). Connect requests will be <u>accepted</u>
from stations whose call signs are listed.

To <u>reject</u> calls from one or more specific stations, type CFROM (NO
followed by a list of call signs). Connect requests will be <u>rejected</u>
from stations whose call signs are listed.

You can include optional SSIDs specified as "-n" after the call sign.
If CFROM is set to "no W2JUP" or "yes W2JUP", any combination W2JUP,
W2JUP-1,...W2JUP-15 will be matched and processed. If CFROM is set to
"yes W2JUP-1" or "no W2JUP-1", then <u>only</u> W2JUP-1 will match and be
processed.

You can send your own connect command if you wish to chat with the
calling station even though his/her call request has been rejected.

Clear CFROM with "X," "&," or "OFF" as arguments.

CHCALL ON|OFF   Mnemonic: CHC   Default: OFF
MODE: Packet

Parameters:

ON -   Call sign of the distant station IS displayed in multiple
         connection operation.

OFF -   Call sign of the distant station is NOT displayed

CHCALL displays the call sign of the "connected-to" station after the
channel identifier.

Set CHCALL ON if you intend to operate multiple connections (as op-
posed to having your "host" computer operate multiple connections).

CHCALL is especially useful when operating with multiple connections.
Using CHCALL is similar to using MRPT to show digipeat paths when mon-
itoring the channel.

Examples:

o   CHCALL OFF - the monitored activity looks like this:

              :0hi howie
               hello ted how goes it?
              :1*** CONNECTED to WA7GXD
              :1must be a dx record. ge lyle
              :0lUNreal ted! fl-az no digis!
              :1big band opening...ge

o   CHCALL ON - the same activity looks like the following example.
     The additional information shown as a result of setting CHCALL ON
     is underlined.

              :0:K4NTA:hi howie
               hello ted how goes it?
              :1:WA7GXD:*** CONNECTED to WA7GXD
              :1must be a dx record. ge lyle
              :0lunreal ted! fl-az no digis!
              :1:WA7GXD:big band opening...ge

With CHCALL ON, ":1" becomes ":1:<call sign>:"

NOTE: To switch channels during your multi-connect conversations,
         type CHSWITCH characters ":0" and ":1" without a ":" after
         them.

CHDOUBLE ON I OFF   Mnemonic: CHD   Default: OFF
MODE: Packet

Parameters:

ON -   Received CHSWITCH characters appear twice (doubled).

OFF -   Received CHSWITCH characters appear once (not doubled).

CHDOUBLE displays received CHSWITCH characters as doubled characters.

In the following example CHDOUBLE is ON and CHSWITCH is set to "I":

        I I this is a test.

The sending station actually transmitted:

        I this is a test.

The same frame received with CHDOUBLE OFF would be displayed as:

        I this is a test.

o   Set CHDOUBLE ON When operating with multiple connections to tell
     the difference between CHSWITCH characters received from other
     stations and CHSWITCH characters generated by your PK-232.

NOTE: CHSWITCH characters must not be one of the channel numbers
         (0 to 9).

| CHECK "n"   Mnemonic: CH   Default: 30 |
| MODE: Packet |

Parameters:

"n" -   0 to 250 specifies the check time in ten-second intervals.

0 -   Zero disables this feature.

CHECK sets a timeout value for a packet connection, and depends on the setting of AX25L2V2.

Without the CHECK feature, if your PK-232 were linked or "connected" to another station and the other station seemed to "disappear", your PK-232 would remain in the connected state indefinitely, refusing connections from other stations.

This might happen if propagation changes unexpectedly or an intermediate digipeater station fails or is shut down while you and the distant station are connected "via" that digipeater.

Your PK-232 tries to prevent this sort of "lockup" from occurring by sending a new connect request packet when the specified time elapses without any packets being heard from the other TNC.

If a pre-Version 2 link is inactive for (CHECK times ten seconds), your PK-232 tries to save the link by starting a reconnect sequence. The PK-232 enters the "connect in progress" state and sends SABM (Connect Request) frames. In addition, the PK-232 adds a random time of up to 30 seconds each time CHECK is used.

o   If AX25L2V2 is ON and packets have not been heard from the distant end for "n" times 10 seconds, your PK-232 sends a "check packet" to test if the link still exists to the other station.

The "check" packet frame contains no information, but is interpreted by the distant station's TNC to see if it is still connected. If the distant station's TNC is still connected, the distant station sends an appropriate response packet.

If your PK-232 initiates the "check" and does not get an answer after RETRY+1 attempts, your PK-232 starts a reconnect sequence just as if you had typed the CONNECT command.

o   If AX25L2V2 is OFF and the other station has not been heard for "n" times 10 seconds, your PK-232 does not test the link to the distant station; your PK-232 sends a reconnect packet just as if you had typed the CONNECT command.

CHSWITCH "n"   Mnemonic: CHS   Default: $00
MODE: Packet

Parameters:

"n" - 0 to $FF (0 to 255 decimal) specifies an ASCII character code.

CHSWITCH selects the characters used by both the PK-232 and the user
to show that a new connection channel is being addressed.

The character can be PASSed in CONVERS mode. This character is _always_
ignored as a user-initiated channel switch in TRANSPARENT mode; it
just flows through as data.

o   The outgoing channel cannot be changed while active or "on-line"
     in TRANSPARENT mode.

o   To switch channels, ESCAPE to Command Mode, then enter Converse
     Mode to use the CHSWITCH command.

NOTE: If your PK-232 is being used as the TNC for a PBBS (Packet
         Bulletin Board System), change the CHSWITCH character to $00
         to avoid possible conflict or problems with the characters
         frequently found in packet network maps.

See CHDOUBLE and CHCALL for further use of CHSWITCH.

CMDTIME "n"   Mnemonic: CM   Default: 1
MODE: Packet

Parameters:

"n" -   0 to 250 specifies timeout value in one-second intervals
         while in Transparent Mode.

If "n" is 0 (zero), exit from Transparent Mode requires sending the
BREAK signal or interrupting power to the PK-232.

CMDTIME sets the timeout value in Transparent Mode. A guard time of
"n" seconds allows escape to Command Mode from Transparent Mode, while
permitting any character to be sent as data.

The same Command Mode entry character (default <CTRL-C>) used to exit
from the Converse Mode is used to exit Transparent Mode, although the
procedure is different.

o   The Command Mode entry character is set by COMMAND.

o   Three Command Mode entry characters must be entered less than "n"
     seconds apart, with no intervening characters, after a delay of
     "n" seconds following the last characters typed.

o   After a final delay of "n" seconds, the PK-232 exits Transparent
     Mode and enters Command Mode.

o   You will then see the normal Command Mode prompt:

          cmd:

The following diagram illustrates this timing:

```
last           first        second       third        PK-232
terminal       command      command      command      now in
input          mode         mode         mode         Command
|              entry        entry        entry        Mode
|              character    character    character    |
|              |            |            |            |
|              |            |            |            |
|<---longer--->|<-shorter->|<-shorter->|<-----n----->|
    than "n"       than "n"     than "n"
```
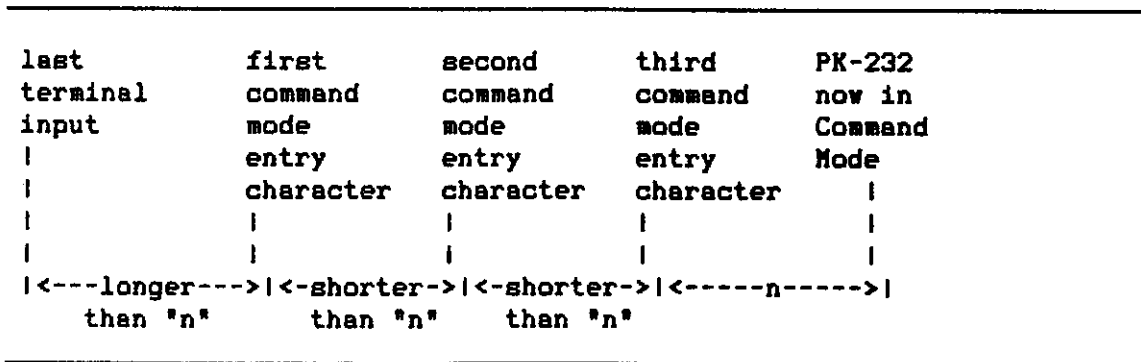
CMSG ON|OFF   Mnemonic: CMS   Default: OFF
MODE: Packet/AMTOR

Parameters:

ON -   The recorded CTEXT message is sent as the first packet after
         a connection is established by a connect request from a dis-
         tant station, or in response to a "WRU?" command in AMTOR.
OFF -   The text message is not sent at all.

CMSG enables or disables automatic transmission of the CTEXT message
when your PK-232 accepts a connect request from another station, or
when a distant AMTOR station transmits a "WRU?" character (FIGS D).

o   Set CMSG ON to tell callers that you're not available to answer
     calls manually when they connect to your PK-232.

o   Set CMSG OFF when available to operate or answer calls manually.

COMMAND "n"   Mnemonic: COM   Default: $03 <CTRL-C>
MODE: All

Parameters:

"n" -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

COMMAND is used to change the Command Mode entry character. You can
enter the code in either hex or decimal.

Type the COMMAND character to enter Command Mode from Converse Mode.
No response is seen if you type the Command Mode entry character while
you are already in Command Mode.

o   Enter Converse Mode by typing: CONVERSE

Now, all characters typed on the keyboard and characters send from a
disk or tape file are transmitted as packet data.

Type <CTRL-C>. The Command Mode prompt appears, indicating successful
exit to Command Mode. The display might look like this:

     cmd:CONVERSE
     Hello World! I'm on the air on packet radio! [type <CTRL-C>]
     cmd:

See CMDTIME or the discussion of Transparent Mode for instructions on
the Command Mode entry character to escape from Transparent Mode.

CONMODE CONVERS|TRANS   Mnemonic: CONM   Default: CONVERS
MODE: Packet

Parameters:

CONVERS   -   Your PK-232 automatically enters <u>Converse Mode</u> when a
                 connection is established.

TRANS   -   Your PK-232 automatically enters <u>Transparent Mode</u> when
                 a connection is established.

CONMODE selects the mode your PK-232 uses after entering the CONNECTED
state.

The connection may result either from a connect request received from
a distant station, or a connection initiated by a CONNECT command that
you've typed.

o   Set CONMODE to CONVERS for most packet operations.

o   Set CONMODE to TRANS if you are using Transparent Mode for a bul-
     letin board program, so that the correct mode will be entered
     when your bulletin board receives a connect request.

o   If the PK-232 is already in Converse or Transparent Mode when the
     connection is completed, the mode will not be changed.

CONNECT call1 [VIA call2[,call3...,call9]]   Immediate Command
MODE: Packet   Mnemonic: C

Parameters:

call1   -   Call sign of the distant station to which you wish to
              be connected.
call2   -   Optional call sign(s) of up to eight digipeaters via
              which you'll be repeated to reach the distant station.

CONNECT sends a connect request to station "call1," directly or via
one or more digipeaters. Each call sign can include an optional SSID
"n", immediately after the call sign.

The part of the command line shown in brackets below is optional. The
double-bracketed text ",call3...,call9" is also optional and is used
only when "VIA call2" is used, that is, when connecting through one or
more digipeaters. (The brackets and quotation marks are used in this
text only for clarity - please don't type them!)

        VIA call2[, call3...,call9]

o   Type the digipeater fields in the exact sequence you wish to use
     to route your packets to destination station "call1."

If you type CONNECT while your PK-232 is connected, or trying to con-
nect to or disconnect from a distant station, your monitor will show:

        Link state is: CONNECT in progress

If the distant station doesn't "ack" your connect request after the
number of tries specified by RETRY, the CONNECT command is canceled.
Your monitor displays:

        cmd:*** Retry count exceeded
        *** DISCONNECTED: (call sign)

To connect directly to WX1AAA, you would type:

        CONNECT WX1AAA (or C WX1AAA)

To connect to WX1AAA using WX2BBB (with whom you can easily connect)
and WX3CCC (who is near AAA) as digipeaters, you would type:

        CONNECT WX1AAA VIA WX2BBB,WX3CCC

Type CONNECT or "C" without arguments to see the link status and the
number of unacknowledged, outstanding packets.

CONPERM ON!OFF   Mnemonic: CONP   Default: OFF
MODE: Packet

Parameters:

ON -   The current connection on the current channel is not allowed
        to enter the disconnected state.

OFF -   The current channel can be connected to and disconnected
        from other stations.

When ON, CONPERM forces the PK-232 to maintain the current connection,
even when frames to the other station exceed RETRY attempts for an
acknowledgement. RESTART and power off/on cycling do not affect this
connected state.

CONPERM works only when a connection is established. It functions on
a channel-by-channel basis when multiple connections are allowed.

CONPERM allows connections on other channels to operate normally. For
example, automatic disconnect based on RETRY, when used under condi-
tions such as:

o   Certain networking applications

o   Meteor scatter

o   Other noisy, less reliable links

CONSTAMP ON|OFF   Mnemonic: CONS   Default: OFF
MODE: Packet

Parameters:

ON -   Connect status messages ARE time stamped.
OFF -   Connect status messages are NOT time stamped.

CONSTAMP activates time stamping of *** CONNECTED status messages.

If CONSTAMP is ON and DAYTIME (the PK-232's internal clock) is set,
date and time information generated in the PK-232 is available for
bulletin board programs or other host computer applications.

Date and time must be set initially by the DAYTIME command before time
stamping will occur. For example, if CONSTAMP is ON and the date and
time have been set in the PK-232, a connect and disconnect sequence
appears as follows:

            cmd:connect w2jup
            cmd:10:55:23 *** CONNECTED to W2JUP
            cmd:disconnect
            cmd:10:55:59 *** DISCONNECTED: W2JUP

The CONNECT and DISCONNECT command can be abbreviated as shown below.
The results are identical.

            cmd:c w2jup
            cmd:10:56:22 *** CONNECTED to W2JUP
            cmd:d
            cmd:10:56:32 *** DISCONNECTED: W2JUP

CONVERSE   Mnemonic: CONV or K   Immediate Command
MODE: All

CONVERSE is an immediate command that causes the PK-232 to switch from
the Command Mode into the Converse Mode.

o   Link connections in packet or AMTOR modes are not affected.

In packet mode and AMTOR, once the PK-232 is in the Converse Mode, all
characters typed from the keyboard or sent from a disk file are pro-
cessed and transmitted by your radio.

o   To return the PK-232 to the Command Mode from the Converse Mode,
     type the Command Mode entry character (default is <CTRL-C>).

CPACTIME ON:OFF   Mnemonic: CP   Default: OFF
MODE: Packet

Parameters:

ON -   Packet transmit timer IS used in Converse Mode.

OFF -   Packet transmit timer is NOT used in Converse Mode.

CPACTIME activates automatic, periodic transmission of packets while
in Converse Mode.

CPACTIME may be used for several types of computer communications such
as bulletin board or host computer operation when full Transparent
Mode features are not desired.

When CPACTIME is ON, characters are packetized and transmitted period-
ically as they are in Transparent Mode. Local keyboard editing and
display features of the Converse Mode are available; software flow
control can be used.

o   See the PACTIME command, (which controls the rate and mode of
     packet assembly) for a discussion of how periodic packetizing
     works.

o   Set ACRPACK OFF in this mode.

     When ACRPACK is ON, the send-packet character is inserted in the
     data being packetized even though it was not typed.

o   To include <CR> characters in transmitted packets, set SENDPAC to
     a character not normally used (e.g., <CTRL-P>); the PK-232 then
     treats a <CR> as an ordinary character.

o   Set CPACTIME ON for a mode of operation similar to full break-in
     CW.

Setting CPACTIME ON transmits your text soon after you type it, in
short bursts of a few characters. The other station may break in at
will. Some operators find it easier to chat in this mode; long delays
are eliminated while long packets are being typed.

CRADD ON!OFF   Mnemonic: CRA   Default: OFF
MODE: Baudot RTTY

Parameters:

ON -   Send <CR CR LF> in Baudot RTTY.
OFF -   Send <CR LF> in Baudot RTTY.

The CRADD command permits you to set the PK-232's "newline" sequence
so that an additional carriage return is automatically ADDed at the
end of each typed line. When CRADD is set ON, the line-end sequence
is <CR><CR><LF>. The double carriage return is required in some RTTY
services including MARS operation.

CRADD has no effect on received data.

CSTATUS   Mnemonic: CS   Immediate Command
MODE: Packet

CSTATUS is an immediate command used in multiple connections. When
CSTATUS is typed, your monitor displays:

   o   The number of each logical channel.
   o   The link state of all ten logical channels.
   o   The current input/output channel - the one you're using.
   o   Whether each channel connection is "permanent."
      (See CONPERM.)

Depending on your use of multiple connections and the USERS command,
CSTATUS will show you the following displays:

NOT CONNECTED TO ANY STATION	CONNECTED TO ONLY 1 STATION
cmd:cs	cmd:cs
Ch. 0 - IO DISCONNECTED	Ch. 0 - IO CONNECTED to WX1AAA
Ch. 1 - DISCONNECTED	Ch. 1 - DISCONNECTED
Ch. 2 - DISCONNECTED	Ch. 2 - DISCONNECTED
Ch. 3 - DISCONNECTED	Ch. 3 - DISCONNECTED
Ch. 4 - DISCONNECTED	Ch. 4 - DISCONNECTED
Ch. 5 - DISCONNECTED	Ch. 5 - DISCONNECTED
Ch. 6 - DISCONNECTED	Ch. 6 - DISCONNECTED
Ch. 7 - DISCONNECTED	Ch. 7 - DISCONNECTED
Ch. 8 - DISCONNECTED	Ch. 8 - DISCONNECTED
Ch. 9 - DISCONNECTED	Ch. 9 - DISCONNECTED

If you're connected to several stations, the CSTATUS command shows
your connect status as follows:

      CONNECTED TO SEVERAL STATIONS
      cmd:cs
      Ch. 0 - IO CONNECTED to WX1AAA
      Ch. 1 -   CONNECTED to WX2BBB P
      Ch. 2 -   CONNECTED to WX3CCC
      Ch. 3 -   CONNECTED to WX4DDD
      Ch. 4 -   CONNECT in progress
      Ch. 5 -   DISCONNECTED
      Ch. 6 -   DISCONNECTED
      Ch. 7 -   CONNECTED to WX5EEE via WX6FFF
      Ch. 8 -   DISCONNECTED
      Ch. 9 -   DISCONNECTED

This sample display shows that:
   o   CHANNEL 0 has the input and output channels - you're using it!
   o   CHANNEL 1 is connected to WX2BBB "permanently."
   o   All other channels' states are shown as they might appear with
      multiple connections.

CTEXT text   Mnemonic: CT   Default: See sample
MODE: Packet/AMTOR

Parameters:

text   Any combination of characters and spaces up to a maximum of
         120 characters.

CTEXT is the "automatic answer" text you type in to a special section
if the PK-232's memory.

The default text says, "Please leave a message, then disconnect."

If CMSG is set ON:

o   In packet operation, the CTEXT message is sent as soon as another
      station connects to your station.

o   In AMTOR, if the distant station sends the "WRU?" command (FIGS
      D), the PK-232 will respond with the CTEXT message unless CTEXT
      is empty.

To type multiple-line CTEXT messages and include a carriage return
(<CR>) character in your text, use the PASS character (<CTRL-V> is the
default value) immediately preceding the carriage return (see the PASS
command).

A typical CTEXT message might be:

      "I'm not available right now <CTRL-V> <CR>
      Please leave your message, then disconnect <CR>

o   If you enter a text string longer than 120 characters, an error
      message appears and the command is ignored.

             ?too long
             cmd:

o   Use a percent sign (%), an ampersand (&), "N," "NO","NONE," or
      "OFF" as the first characters in the CTEXT message to clear the
      previous message without having to type a RESET command.

CWID "n"   Mnemonic: CW   Default: $06 <CTRL-F>
MODE: Baudot/ASCII RTTY/AMTOR

The CWID command lets you change the "send CWID" control character
typed at the end of your Baudot and ASCII RTTY keyboard dialogue or
text file stored on disk.

When the PK-232 reads this specific character embedded at the end of
the text or keyboard input, it switches to the Morse Mode and sends
your call sign, in Morse code, at the keying speed set by the MSPEED
command.

As soon as your call sign has been sent in Morse, the PK-232 turns off
your transmitter and returns to Baudot or ASCII RTTY receive in the
Command Mode.

o   Type "CWID" (or just "CW") to display the current value of the
     CWID command:

          cmd:cwid   cmd:cw
          CWID $06 CTRL-F   CWID $06 CTRL-F
          cmd: cmd:

o   Type "CWID" followed by either the decimal or hexadecimal value
     of the new character you wish to use as the CWID trigger command.

          cmd:cwid 27
          CWID   was $06 CTRL-F
          cmd:

o   Type "CWID or "CW" again to verify the new command character:

          cmd:cwid
          CWID $1B CTRL-[

o   You can return to the original or default value at any time by
     typing the following:

          cmd:cwid $06
          CWID   was $1B CTRL-[

You can also use the command "CWID ON" or "CWID OFF" to activate or
deactivate the function. In either case, your PK-232 responds with
the previous state:

          cmd:cwid on
          CWID   was $00

DAYTIME date&time   Mnemonic: DA   Default: not set
MODE: All

Parameters:

date&time   -   Current DATE and TIME to set.

DAYTIME sets the PK-232's internal clock current date and time. The
date&time parameter is used in Packet Mode by the commands CONSTAMP
and MSTAMP to "time stamp" received and monitored messages.

Entries in the "heard" (displayed by MHEARD) are also time stamped if
date&time has been set. The PK-232's time is updated continuously, as
long as it is powered up.

The clock is not set when the PK-232 is turned on. The DAYTIME com-
mand displays the following error message:

             cmd:day
             ?clock not set

o   You must reset date and time each time you turn on the PK-232.
     Otherwise CONSTAMP and MSTAMP won't "stamp" the time.

If you type DAYTIME without a parameter, the PK-232 displays current
date and time information. The format of the display is:

                dd-mm-yy hh:mm:ss
             cmd:day
             DAYTIME 08-Jul-86 06:57:33

o   The format for entering the date&time is:

                   yymmddhhmm
             cmd:daytime 8607080659

     where:
             yy is the last two digits of the year
             mm is the two-digit month code (01-12)
             dd is date (01-31)
             hh is the hour (00-23)
             mm is the minutes after the hour (00-59)

o   Enter the numbers 0-9 with leading zeros; codes must be exactly
     two digits.

o   Be aware of the month when you set the date - the PK-232 does not
     check for the correct number of days in a month.

DAYSTAMP ON|OFF   Mnemonic: DAYS   Default: OFF
MODE: All

Parameters:

ON -   The DATE is included in CONSTAMP and MSTAMP.

OFF -   Only the TIME is included in CONSTAMP and MSTAMP.

DAYSTAMP activates the date in CONSTAMP and MSTAMP.

o   Set DAYSTAMP ON when you want a dated record of packet channel
     activity, or when you're unavailable for local packet operation.

DELETE ON|OFF   Mnemonic: DEL   Default: OFF
MODE: All

Parameters:

ON -   The <DELETE> ($7F) key is used for editing your typing.

OFF -   The <BACKSPACE> ($08) key is used for editing your typing.

Use the DELETE command to select the key to use for deleting while
editing.

o   Type the selected DEL key to delete the last character from the
     input line.

You cannot use the DEL key to delete text before the beginning of a
line. Use the PASS character to delete <CR> characters that have been
typed into the text.

o   The BKONDEL command controls how the PK-232 indicates deletion.

o   To see a corrected display of the current line after deleting
     characters, type the redisplay-line character, which is set by
     the REDISPLA command.

DFROM all,none,yes/no call1[,call2..] Mnemonic: DF   Default: all
MODE: Packet

Parameters:

call   - all, none, YES list, NO list.
             list of up to eight call signs, separated by commas.

DFROM uses arguments to determine how your PK-232 responds to stations
tyring to use your station as a digipeater - which stations will be
repeated and which stations will not be repeated. DFROM is set to
"all" when you start your PK-232 for the first time.

Type DFROM to display the ALL/NONE/YES list/NO list status of station
call signs whose packets will or will not be repeated. You can use
the abbreviated command form or mnemonic:

              cmd:dfrom
              DFROM   all
              cmd:df
              DFROM   yes WX1AAA,WX2BBB,WX3CCC,WX4DDD

To prevent all stations from using your station as a digipeater, type
DFROM NONE.

To permit one or more specific stations to digipeat through your
station, type DFROM (YES followed by a list of calls signs). Packets
will be digipeated only from stations whose call signs are listed.

To prevent one or more specific stations to digipeat through your sta-
tion, type DFROM (NO followed by a list of call signs). Packets will
not be digipeated only from stations whose call signs are listed.

You can include optional SSIDs specified as "-n" after the call sign.
If DFROM is set to "no NK6K" or "yes NK6K", any combination NK6K,
NK6K-1,...NK6K-15 will be matched and processed. If DFROM is set to
"yes NK6K-1" or "no NK6K-1", then only NK6K-1 will match and be pro-
cessed.

Clear DFROM with "X," "&," or "OFF" as arguments.

DISCONNE   Mnemonic: D   Immediate Command
MODE: Packet

DISCONNE is an immediate command that initiates a disconnect request
to the distant station to which you are connected.

If your disconnect command is successful, your monitor will display:

   *** DISCONNECTED: (call sign)

Other commands can be entered while a disconnect is in progress. New
connections are not allowed until the disconnect is completed.

o   If the retry count is exceeded while waiting for the distant sta-
     tion to acknowledge your disconnect command, your PK-232 switches
     to the disconnected state.

o   If another disconnect command is entered while your PK-232 is
     trying to disconnect, the retry count is immediately set to the
     maximum number. In either case, your monitor displays:

     *** Retry count exceeded
     *** DISCONNECTED: (call sign)

Disconnect messages are not displayed when your PK-232 is in the
Transparent Mode.

DISPLAY [class]   Mnemonic: DISP   Immediate Command
MODE: Command

Parameters:

class - Optional parameter identifier, one of the following:

(A)sync	display asynchronous port parameters
(C)haracter	display special characters
(I)d	display ID parameters
(L)ink	display link parameters
(M)onitor	display monitor parameters
(R)tty	display Baudot/ASCII RTTY, AMTOR and Morse parameters
(T)iming	display timing parameters
(Z)	display the entire command/parameter list

DISPLAY is an immediate command.

When DISPLAY is typed _without_ a parameter, the PK-232 responds with:

         DISPLAY A,C,I,L,M,R,T,Z
         cmd:

You can display subgroups of related system parameters by specifying
the optional class parameter:

              cmd:disp a
              8BITCONV OFF
              ACRDISP   80
              ALFDISP   OFF
              AWLEN   7
              ECHO   ON
              ESCAPE   OFF
              FLOW   ON
              LCOK   ON
              NUCR   OFF
              NULF   OFF
              NULLS   0
              PARITY   3
              TRFLOW   OFF
              TXFLOW   OFF
              XFLOW   ON
              cmd:

Individual system parameter values can be displayed by entering the
parameter name _without_ options.

         cmd: mycall   cmd:frack   cmd:dwait
         MYCALL WX1AAA   FRACK   3   DWAIT   16

> DWAIT "n"   Mnemonic: DW   Default: 16
> MODE: Packet

Parameters:

"n" -   0 to 250 specifies Default Wait time in ten-millisecond
         intervals.

DWAIT helps to avoid collisions with digipeated packets.

Unless the PK-232 is waiting to transmit digipeated packets, DWAIT
forces your PK-232 to pause after last hearing data on the channel,
for the duration of the DWAIT (Default Wait) time, before it begins
its transmitter keyup sequence.

Wherever possible, the value of DWAIT should be agreed on by all sta-
tions in a local area when digipeaters are used in the area. The best
value will be determined by experimenting.

DWAIT is a function of the keyup time (TXDELAY) of the digipeater sta-
tions and helps alleviate the drastic reduction of throughput that
occurs on a channel when digipeated packets suffer collisions.

DWAIT is necessary because digipeated packets are not retried by the
digipeater, but are always restarted by the originating station. When
all stations specify a Default Wait time, and the right value of "n"
is chosen, the digipeater captures the frequency every time it has
data to send - digipeated packets are sent without this delay.

Recommended settings of DWAIT for different types of packet station
operation are:

TYPE OF OPERATION	TIME (in ms)	DWAIT VALUE
Digipeaters	0	0
Local keyboards	160	16 (default)
PBBSs, Hosts	320	32
File transfers	480	48

EAS ON!OFF   Mnemonic: EAS   Default: OFF
MODE: Baudot/ASCII RTTY, AMTOR and Morse

Parameters:

ON -   Display characters as actually sent on the air by the PK-232

OFF -   Display characters as sent to the PK-232 by the computer

---

The ECHO-AS-SENT (EAS) command functions in all modes except packet. EAS permits you to choose the type of data displayed on your monitor screen or printer.

o   To display your typing exactly as you are typing the keyboard characters or sending from a disk file, set EAS "OFF."

o   To see the actual data being sent from your PK-232 to your radio and transmitted on the air, set EAS "ON."

EAS is convenient when operating Morse and Baudot RTTY - these modes don't use lower case characters. You can operate in a relaxed and normal manner, typing entirely in lower case if that's easier for you. Your PK-232 translates your lower case typing into upper case Morse or Baudot/CCITT characters.

When EAS is on, you'll see only UPPER CASE characters on your screen, representing the data actually transmitted to the distant station.

EAS has special significance in AMTOR Mode A (ARQ). If EAS is on - no matter how fast you type characters on your keyboard - you'll see them echoed on your screen only after the distant station (your partner in the AMTOR link) has validated (Ack'd) your block of three characters.

With EAS ON, the characters will appear on your screen or printer only as the distant station acknowledges them, three at a time.

o   If the data scrolls across your monitor at a nice even rate, in rhythm with your typing speed, you can assume that you have a good ARQ link.

o   If the data hesitates or scrolls in "jerky" intermittent fashion, that's generally a sign that the radio link is not too good.

o   If the characters stop appearing on your monitor, the link is failing or has failed.

ECHO ON|OFF   Mnemonic: E   Default: ON
MODE: All

Parameters:

ON -   Characters received from the computer or terminal ARE echoed
         by the PK-232.
OFF -   Characters are NOT echoed.

The ECHO command controls local echoing by the PK-232 when it is in
Command or Converse Mode. Local echoing is disabled in Transparent
Mode.

o   Set ECHO ON if you don't see your typing appear on your display.
o   Set ECHO OFF if you see each character you type doubled.

For example:

o   CANLINE $15 (hex)
o   CANLINE 21 (decimal)

Either sets the cancel-line character to <CTRL- U>.

When you use the CANLINE character to cancel an input line in Command
Mode, the line is terminated with a <BACKSLASH> character and new
prompt (cmd:) appears.

When you cancel a line in Converse Mode, only the <BACKSLASH> and a
new line appear.

PACKET   Mnemonic: PA   Immediate Command
MODE: Command

Use the PACKET command to switch your PK-232 into packet radio mode
from any other operating mode. Your PK-232 automatically enters the
Packet Mode at first power-up, or after a RESTART command.

PACLEN "n"   Mnemonic: PACL   Default: 128
MODE: Packet

Parameters:

"n" -   0 to 255 specifies the maximum length of the data portion of
        a packet.
0   -   Zero is equivalent to 256.

PACLEN sets the maximum number of user data bytes to be carried in
each packet's "information field." "User data" means the characters
you actually type at your keyboard (or send from a stored file).

Your PK-232 automatically transmits a packet when the number of char-
acters you type (or send from disk) for a packet equals "n." This
value is used in both Converse and Transparent Modes.

Most keyboard-to-keyboard operators use the default value of 128 bytes
for routine VHF/UHF packet services.

Experiment with different values for MAXFRAME and PACLEN to find the
combination best suited to your operating conditions - especially if
you are transferring files.

o   The lower the value of PACLEN, the greater the probability of
    getting packets though the link without "hits" or retries.
o   Increase PACLEN to 256 if transferring files to a nearby station
    over a high quality path.
o   Reduce PACLEN to 64, or even 32 when working "difficult" HF radio
    paths.
o   If the radio link is good, an optimal relationship will exist
    between the parameters set by these commands. Set PACLEN so that
    the maximum number of characters outstanding doesn't exceed the
    receive buffer space of the TNC receiving the data.

NOTE: It is not necessary that two TNCs be set to the same PACLEN
        value to exchange data; however, some TNCs may not be com-
        patible when frames contain more than 128 data characters.

PACTIME EVERYIAFTER "n"   Mnemonic: PACT   Default: AFTER 10
MODE: Packet

Parameters:

"n"   -   0 to 250 specifies 100-millisecond intervals.
EVERY   -   Packet timeout occurs every "n" times 100 milliseconds.
AFTER   -   Packet timeout occurs when "n" time 100 milliseconds
             elapse without input from the computer or terminal.

A PACTIME parameter is always used in Transparent Mode. PACTIME is
also used in Converse Mode if CPACTIME is ON.

o   When EVERY is specified, the characters you type or send from
     disk are packaged and queued for transmission every "n" times 100
     milliseconds.
o   When AFTER is specified, the characters you type or send from
     disk are packaged when input from the terminal stops for "n"
     times 100 milliseconds.

A zero-length packet will never be produced. The timer is not started
until the first character or byte is entered.

A value of 0 (zero) for "n" is allowed; zero means packets are sent
with no wait time.

PARITY "n"   Mnemonic: PAR   Default: 3 (even)
MODE: All

Parameters:

"n" -   0 to 3 selects a parity option from the table below.

PARITY sets the PK-232's data parity for terminal or computer data
transfer according to the following table:

            0 = no parity
            1 = odd parity
            2 = no parity
            3 = even parity

The parity bit, if present, is stripped automatically on input, and is
not checked in Command and Converse Modes.

In Transparent Mode all eight bits (including parity) are transmitted
in packets. When "no parity" is set and AWLEN is 7, the eighth bit is
set to 0 (zero).

PASS "n"   Mnemonic: PAS   Default: $16 <CTRL-V>
MODE: Packet

Parameter:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

PASS selects the ASCII character used for the "pass" input editing
command.

The parameter "n" is the numeric ASCII code for the character you'll
use to signal that the character immediately following it is to be
included in a packet or text string.

o   You can enter the code in either hex or decimal.

Use the PASS character (default- <CTRL-V>) to send characters that
usually have special functions.

A common use for the pass character is to allow <CR> to be included in
the BTEXT and CTEXT messages so that the transmitted information ap-
pears on several short lines rather than a single longer line.

Use the PASS character to insert <CRs> at the end of a short line:

BT Notice:<CTRL-V><CTRL-M>
    Meeting at the Firehouse tonight <CTRL-V><CTRL-M>
    at 8:00 PM. All welcome! <CR>

The distant station's monitor shows:

    Notice:
    Meeting at the Firehouse tonight
    at 8:00 PM. All welcome!

Without the PASS character, the message would probably look like this:

    Notice: Meeting at the Firehouse tonight at 8:00 PM. All welcome!

In like manner, you can include <CR> in text when you are in Converse
Mode, to send multi-line packets. (The default send-packet character
is <CR>.)

PASSALL ON|OFF   Mnemonic: PASSA   Default: OFF
MODE: Packet

Parameters:

ON -   Your PK-232 will accept packets with invalid CRCs.

OFF -   Your PK-232 will only accept packets with valid CRCs.

PASSALL permits the PK-232 to display packets received with invalid CRC fields; the error-detecting mechanism is turned off.

Packets are accepted for display despite CRC errors if they consist of an even multiple of eight bits and are up to 330 bytes. The PK-232 attempts to decode the address field and displays the call sign(s) in the standard monitor format, followed by the text of the packet.

PASSALL is normally turned off; therefore, the protocol ensures that received packet data is error-free by rejecting packets with invalid CRC fields.

PASSALL (sometimes called "Garbage Mode") may be useful for testing a marginal RF link or during operation under other unusual conditions or circumstances.

When you set PASSALL ON while monitoring a moderately noisy channel, "packets" are displayed periodically because there is no basis for distinguishing between actual packets and random noise.

o   When PASSALL is ON, logging of stations heard (for display by MHEARD) is disabled; the call signs detected may be incorrect.

RBAUD "n" Mnemonic: RB		Default: 45 bauds
MODE: Baudot RTTY		(60 WPM)

Parameters:

"n" -   Specifies the rate or signalling speed in bauds from the
         PK-232 to the radio.

RBAUD sets the radio baud ("on-air") rate only in the Baudot-CCITT
International Telegraph Alphabet #2 operating mode. This value has <u>no</u>
<u>relationship</u> to your computer or terminal program's baud rate.

Baudot RTTY operation requires you to use the same data rate used by
the distant station.

Available Baudot/CCITT ITA#2 data rates include:

     45, 50, 57, 75, and 100 bauds (60, 66, 75, 100 and 132 WPM)

o   Example: RBAUD 75

Use RBAUD UP (RB U) to go to the next highest Baudot speed or RBAUD
DOWN (RB D) to go to the next lowest Baudot speed. This is useful
when you are trying various combinations of RBAUD and RXREV to decode
an unknown Baudot signal.

<u>NOTE</u>:   Modern commercial and amateur radio operations no longer
           refer to the operating speeds or data rates in "WPM." The
           term "bauds" is now universally accepted for FSK and AFSK
           operations using monobit data. The terms "bauds" and "bits
           per second" mean the same thing and may be used interchange-
           ably.

RCVE   Mnemonic: R   Immediate Command
MODE: Command

RCVE is an immediate command, used in the Command Mode, to switch your
PK-232 from transmit to receive when operating Baudot and ASCII RTTY.

You must return to the Command Mode to use the RCVE command.

o   Type <CTRL-C> to enter the Command Mode.

RECEIVE "n"   Mnemonic: REC   Default: $04 <CTRL-D>
MODE: Baudot/ASCII/Morse/AMTOR

Parameter:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

The RECEIVE command allows you to insert a control character (default
<CTRL-D>) in your typed text or disk file; when read by your PK-232,
your system is switched from transmit to receive and returns to the
Command Mode.

o   Type the RECEIVE Command character at the end of your text or
     message while recording a disk file or on the air typing into the
     PK-232 transmit buffer.

REDISPLA "n"   Mnemonic: RED   Default: $12 <CTRL-R>
MODE: All

Parameters:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

REDISPLA changes the redisplay-line input editing character.

Parameter "n" is the numeric ASCII code for the character you'll use
when you want to re-display the current input line.

o   You can enter the code in either hex or decimal.

Type the REDISPLA character to re-display a line you've just typed.
The following things happen:

1)   Type-in flow control is temporarily turned off (if it had been
      active). Any incoming packets that are pending are displayed.

2)   A <BACKSLASH> is appended to the line you've just typed and the
      line is shown below it. Only the final form of the line is shown
      if you have deleted or or changed any characters.

3)   You can now continue typing where you left off.

o   Use the redisplay-line character to see a "clean" copy of your
      input if you are using a printing terminal and you have deleted
      characters.

If BKONDEL is set OFF, deletions are designated with <BACKSLASH> char-
acters, rather than by trying to correct the input line display. The
re-displayed line is the corrected text.

o   Use the REDISPLA character if a packet is received while you're
      typing a message in Converse Mode. You can see the incoming mes-
      sage before you send your packet without canceling your input.

RESET MODE: Command	Mnemonic: RESET	Immediate Command

RESET is an immediate command that resets all parameters to default settings and reinitializes the PK-232.

WARNING:

All parameter customizing and monitor lists are lost.

o To reinitialize the PK-232 using the parameter values in bbRAM, turn the PK-232 OFF then ON, or use the RESTART command.

RESPTIME "n" MODE: Packet	Mnemonic: RES	Default: 10

Parameters:

"n" -   0 to 250 specifies 100-millisecond intervals.

RESPTIME adds a minimum delay before your PK-232 sends acknowledgment packets. This delay may run concurrently with the default wait time set by DWAIT and any random wait in effect.

o Use RESPTIME delay to increase throughput during operations such as file transfer when the sending TNC usually sends the maximum number of full-length packets.

Occasionally, the sending TNC may not have a packet ready in time to prevent transmission from being stopped temporarily, with the result that the acknowledgment of earlier packets collides with the final packet of the series.

These collisions can be avoided if the receiving TNC sets RESPTIME to 10.

| RESTART | Mnemonic: RESTART | Immediate Command |
| MODE: Command | | |

RESTART is an immediate command that reinitializes the PK-232 using the defaults stored in the PK-232's bbRAM.

The effect of the RESTART command is the same as turning the PK-232 OFF, then ON again.

RESTART does not reset the parameter values in bbRAM.

o   See the RESET command.

| RETRY "n" | Mnemonic: RE | Default: 10 |
| MODE: Packet | | |

Parameter:

"n" -   0 to 15 specifies the maximum number of packet retries.

The AX.25 protocol uses retries - retransmission of frames that have not been acknowledged. Frames are retransmitted "n" times before the link is disconnected.

o   The time between retries is specified by the command FRACK. A value of 0 for "n" specifies an infinite number of retries. See the FRACK command.

The PK-232 enters the disconnected state if the number of retries is exceeded.

If you're not in Transparent Mode, the following message is displayed:

        *** Retry count exceeded
        *** DISCONNECTED: (call sign)

RXREV ON|OFF   Mnemonic: RXR   Default: OFF
MODE: Baudot and ASCII RTTY/AMTOR

Parameters:

ON -   Received data polarity is reversed (mark-space reversal).

OFF -   Received data polarity is normal.

Use the RXREV Command to invert the polarity of the data demodulated
from the received mark and space tones.

In some cases, you may be trying to copy a station that's transmitting
"upside down" but receiving your signals correctly.

Set RXREV ON to reverse the data sense of received signals.

Type RXREV TOG (RXR T) to "toggle" the polarity of received signals.
This is useful when trying various combinations of RBAUD and RXREV to
decode an unknown Baudot signal.

SELFEC aaaa   Mnemonic: SEL   Default: empty
MODE: AMTOR FEC

Parameters:

aaaa -   Specifies your SELective CALling code (SELCAL).

The SELFEC command starts a SELective FEC (Mode Bs) transmission to a
specific distant station when you enter that station's SELCAL (selec-
tive calling) code.

The SELFEC command must be a unique character sequence that contains
four alphabetic characters. It is normally derived from the call sign
of the distant station.

o   See MYSELCAL for further information on the derivation and use of
     SELCALs.
o   To end your SELFEC transmission, return to the Command Mode by
     typing <CTRL-C> (default value) and then typing "R" to switch
     back to receive mode.

You don't have to type the SELCAL a second time if you intend to call
the same station again right away.

SENDPAC "n"   Mnemonic: SE   Default: $0D <CTRL-M>
MODE: Packet

Parameters:

"n" -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the SENDPAC command to select the character used to force a packet
to be sent in Converse Mode. The parameter "n" is the numeric ASCII
code for the character you want to use to force your input to be pack-
etized and queued for transmission. You can enter the code in either
hexadecimal or decimal numbers.

Use default SENDPAC value $0D for ordinary conversation with CR ON to
send packets at natural intervals with <CRs> included in the packet.

When setting CPACTIME ON, set SENDPAC to some value not ordinarily
used (say, <CTRL-A>), with CR OFF). This setting forces packets to be
sent without extra <CR> characters being sent in the text.

SQUELCH ON|OFF   Mnemonic: SQ   Default: OFF
MODE: Packet

Parameters:

ON -   Your PK-232 responds to positive-going squelch voltage.

OFF -   Your PK-232 responds to negative-going squelch voltage.

Normally, to decide if the channel is clear so that it can transmit,
your PK-232 uses its CSMA (Carrier Sense Multiple Access) circuit by
sensing audio mark and space tones from your packet receiver.

If there are non-packet signals on the channel you're using (such as
voice operation), it's possible that your PK-232 might not be quite as
polite as it is normally and double with the other signals.

The PK-232 can use true RF-carrier CSMA by monitoring the squelch line
voltage from your radio. This line can be easily connected in many
radios to the "busy" light or indicator on the radio's front panel, or
to other circuit locations that indicate the presence or absence of
carrier or received signals. Because your carrier-sensing signal can
be active-low or active-high (depending on the individual radio manu-
facturer's design), you can set your PK-232 to sense either positive
or negative squelch voltages.

	SRXALL	Mnemonic: SRX	Immediate Command
	MODE: AMTOR		

Parameters:

ON -   Receive ALL selective (SELFEC) transmissions

OFF -   Receive only SELCAL-addressed SELFEC transmissions

SRXALL permits the reception of selectively-coded inverse FEC signals
normally not available for decoding.

Set SRXALL ON to activate this feature.

	START "n"	Mnemonic: STA	Default: $11 <CTRL-Q>
	MODE: All		

Parameters:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the START command to choose the User Start character you want to
use to restart output from the PK-232 to the terminal after it has
been halted by typing the User Stop character.

o   The User Stop character is set by the STOP command.

o   You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to $00, software
flow control to the PK-232 is disabled; the PK-232 will only respond
to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop
characters, the PK-232 alternately starts and stops transmission on
receipt of the character ("toggles").

STOP "n"   Mnemonic: STO   Default: $13 <CTRL-S>
MODE: All

Parameters:

"n" -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the STOP command to select the User Stop character you want to use
to stop output from the PK-232 to the terminal. Type this character
to halt the PK-232's output to your monitor so that you can read the
received text before it scrolls off your screen display.

Output is restarted with the User Start character.

o   The User Start character is set by the START command.
o   You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to $00, software
flow control to the PK-232 is disabled; the PK-232 will only respond
to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop
characters, the PK-232 alternately starts and stops transmission upon
receipt of the character ("toggles").

TBAUD "n"   Mnemonic: TB   Default: 1200 bauds
MODE: All

Parameters:

"n" -   Specifies the rate or signaling speed, in bauds, on the serial
        I/O terminal port.

TBAUD displays the baud rate set by the auto-baud routine when you
first apply power to the PK-232, or after typing "RESET".

Use TBAUD to set terminal rates not covered by the auto-baud routine,
such as 110 and 600 bauds.

Use TBAUD to specify a terminal baud rate that will become active at
the next power-on or RESTART. A warning message reminds you of this.

If you plan to change terminals, but want to retain all the RAM para-
meter values, set TBAUD, AWLEN and PARITY to the new terminal's char-
acteristics while you are still connected to the old terminal. Next,
turn off the PK-232, change the terminal and turn the PK-232 on again.

TCLEAR	Mnemonic: TC	Immediate Command
MODE: Command		

The TCLEAR command clears your PK-232's transmit buffer and cancels any further transmission of data when in the Baudot, ASCII, AMTOR or Morse operating modes. In Packet Mode, all data is cleared except for a few remaining packets.

o   You **must** be in the Command Mode to use TCLEAR.

o   Use the <CTRL-C> (default) command to return to Command Mode.

o   Type "TC" to clear the transmit buffer.

TIME	Mnemonic: TI	Default: $14 <CTRL-T>
MODE: Baudot/ASCII/AMTOR		

Parameters:

"n" -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

The TIME command specifies a control character in the text you type into the transmit buffer or into a text file stored on disk.

o   Type <CTRL-T> to embed the TIME command in your message text or file.

At transmit time, the PK-232 reads the embedded control code (default <CTRL-T>), reads the time-of-day from the PK-232's internal clock and then sends the time to the radio in the data transmission code in use at that time.

When DAYSTAMP is set ON, the date is transmitted with the time.

TRACE ON|OFF MODE: Packet	Mnemonic: TRAC	Default: OFF

Parameters:

ON -   Trace function is activated
OFF -   Trace function is disabled.

The TRACE command activates the AX.25 protocol display. If TRACE is
ON, all received frames are displayed in their entirety, including all
header information.

NOTE: Be careful using the mnemonic - don't use "TRA"! The PK-232
         will change to Transparent Mode!

The TRACE display is shown as it appears on an 80-column display. The
following monitored frame is a sample:

        W2JUP*>TESTER <UI>:
        This is a test message packet.

Byte	Hex	Shifted ASCII	ASCII
000:	A88AA6A8 8AA460AE 6494AAA0 406103F0	TESTER0W2JUP 0.x	......`.d...@a..
010:	54686973 20697320 61207465 7374206D	*449.49.0.:29:.6	This is a test m
020:	65737361 67652070 61636B65 742E0D	299032.80152:..	essage packet..

The byte column shows the offset into the packet of the beginning byte
of the line.

The hex display column shows the next 16 bytes of the packet, exactly
as received, in standard hex format. The shifted ASCII column decodes
the high-order seven bits of each byte as an ASCII character code.

The ASCII column decodes the low-order seven bits of each byte as an
ASCII character code.

In a standard AX.25 packet,

o   The call sign address field is displayed correctly in the shifted
     ASCII column.
o   A text message is displayed correctly in the ASCII column.
o   Non-printing characters and control characters are displayed in
     both ASCII fields as a period (".").

You can examine the hex display field to see the contents of the SSID
byte and the control bytes used by the protocol.
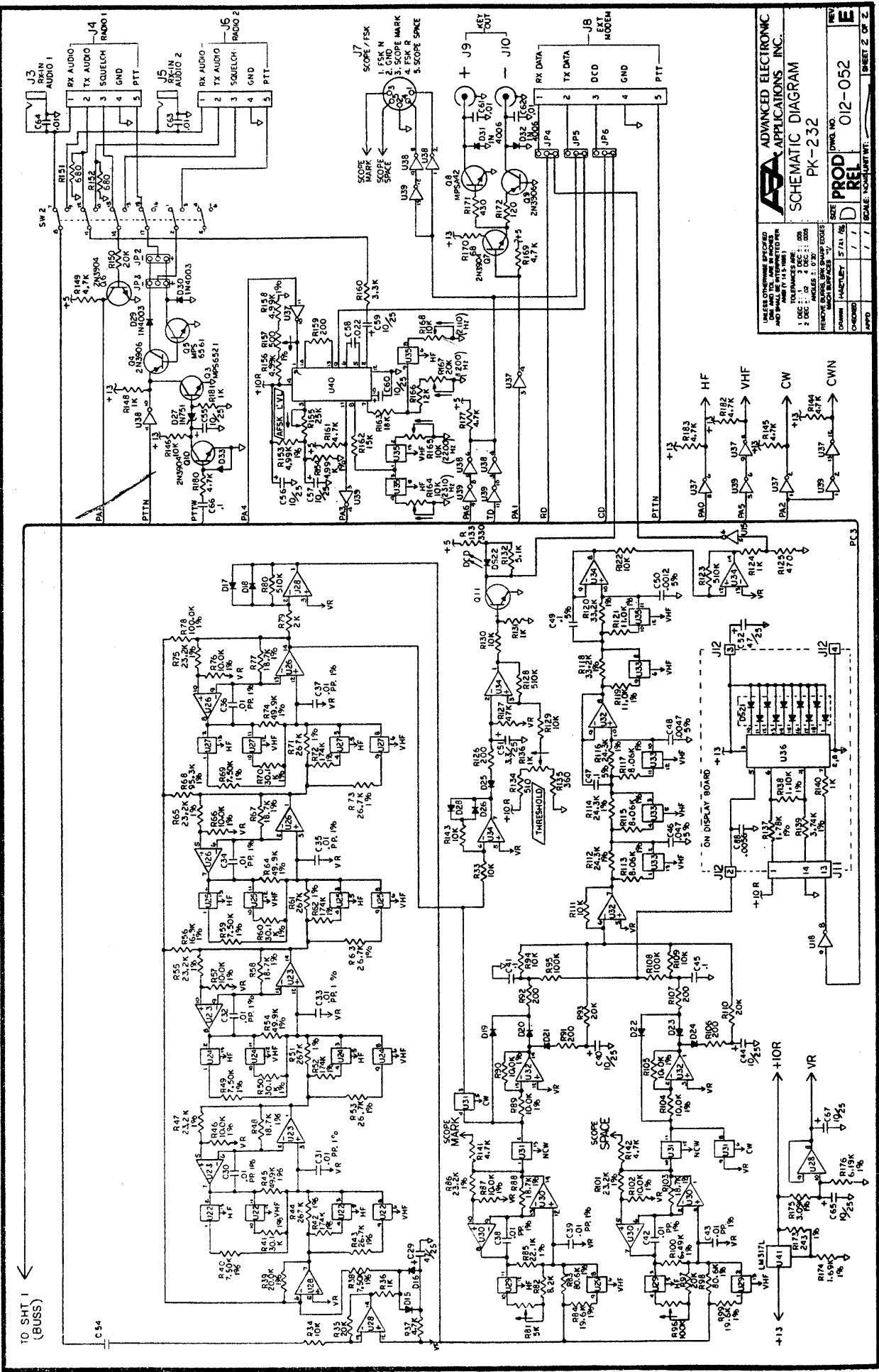
SCHEMATIC DIAGRAM
PK-232

ADVANCED ELECTRONIC
APPLICATIONS INC.

DWG NO. 012-052

REV E

SHEET 2 OF 2

H-2
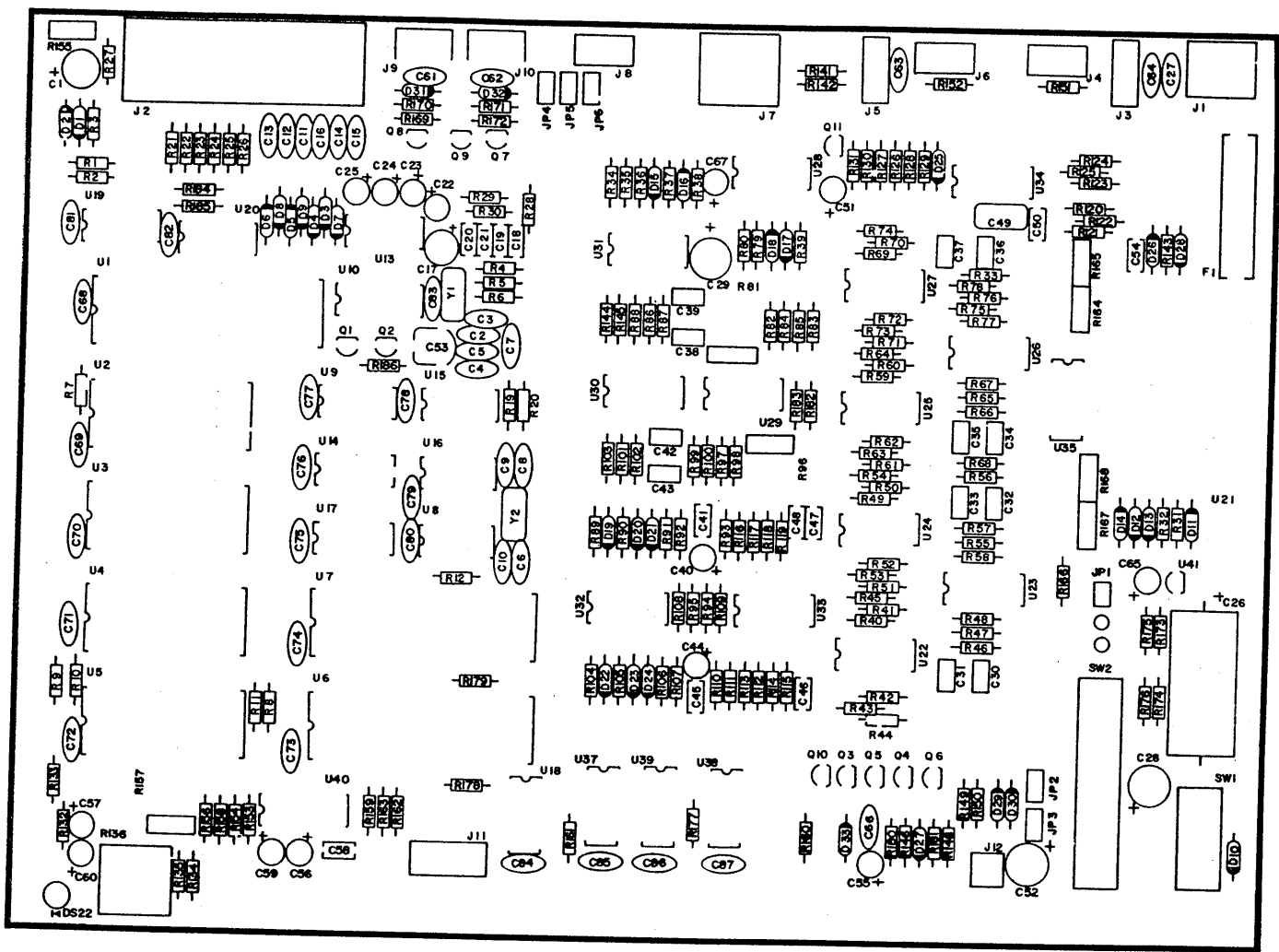
APPENDIX I

MAIN BOARD
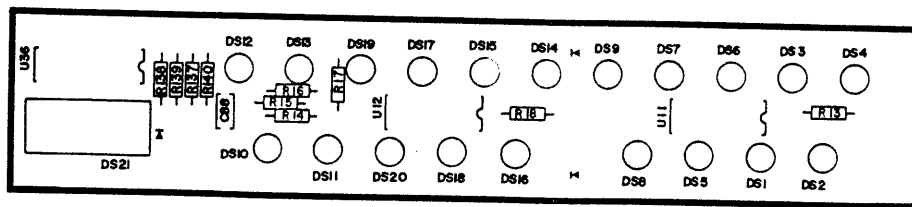
DISPLAY BOARD

| AEA PART NUMBER	DESCRIPTION	REF. DESIG.	AEA PART NUMBER	DESCRIPTION	REF. DESIG.
013-064	PCB PK-232		150-331	CAP SM 330P	C5
110-103	CAP MY 103P 10% 50V	C20,C21	150-681	CAP SM 680P	C10
110-104	CAP MY 104P 10% 50V	C18,C41,C45	150-821	CAP SM 820P	C9
110-562	CAP MY 562P 10% 50V	C88	210-100	RES 1/4W 5% 10.00	R28
111-104	CAP MY 104P 5% 50V	C47,C49	210-101	RES 1/4W 5% 100.00	R21-R24,R26,R27
112-122	CAP MY 122P 2% 50V	C50	210-102	RES 1/4W 5% 1.00K	R4,R5,R19,R20,R36, R131,R140,R148, R124,R181,R3
112-473	CAP MY 473P 2% 50V	C46			
111-103	CAP MY 103P 5%	C54	210-103	RES 1/4W 5% 10.00K	R7,R8,R11,R12,R94, R109,R111,R122, R129,R130,R146, R178,R179,R33, R34,R143,R184,R185
121-102	CAP CR 102P 50V	C11-C16,C19			
121-103	CAP CR 103P 50V	C3,C7,C61-C64,C8,C4			
121-104	CAP CR 104P 50V	C27,C66,C68-C87	210-104	RES 1/4W 5% 100.00K	R30,R108,R95
125-540	CAP VARIABLE 5-40	C53	210-121	RES 1/4W 5% 120.00	R172
130-106	CAP EL 106P RAD 25V	C22-C25,C40,C44, C55-C57,C59,C60, C65,C67	210-123	RES 1/4W 5% 12.00K	R166
			210-153	RES 1/4W 5% 15.00K	R162
130-107	CAP EL 107P RAD 25V	C28,C1	210-183	RES 1/4W 5% 18.00K	R163
130-335	CAP EL 335P RAD 100V	C51	210-201	RES 1/4W 5% 200.00	R106,R107,R126,R159, R91,R92
130-486	CAP EL 476P RAD 35V	C17,C29,C52,	210-202	RES 1/4W 5% 2.00K	R79
131-108	CAP EL 108P AX 35V	C26	210-203	RES 1/4W 5% 20.00K	R110,R150,R97,R93, R35
132-223	CAP PP 223P 2%	C58			
132-400	CAP PP 472P 2%	C48	210-331	RES 1/4W 5% 330.00	R6,R13-R18,R133,R186
			210-332	RES 1/4W 5% 3.30K	R160
135-103	CAP PP 103P 1%	C30-C39,C42,C43	210-361	RES 1/4W 5% 360.00	R135
150-201	CAP SM 220P	C2	210-431	RES 1/4W 5% 430.00	R171
150-330	CAP SM 33P	C6	210-471	RES 1/4W 5% 470.00	R125
			210-472	RES 1/4W 5% 4.70K	R1,R2,R25,R29,R37, R141,R142,R149,R161, R144,R145,R169, R177,R182,R183,R180
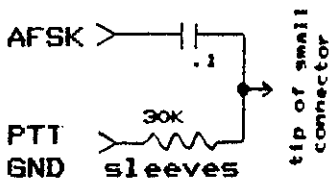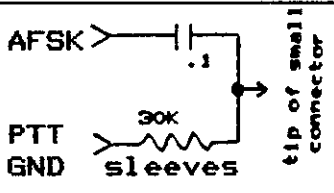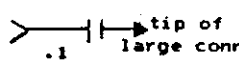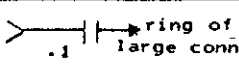
AEA PART NUMBER	DESCRIPTION	REF. DESIG.	AEA PART NUMBER	DESCRIPTION	REF. DESIG.
210-473	RES 1/4W 5% 47.00K	R127	211 333	RES 1/4W 1% 33.20K	R118,R120
210-511	RES 1/4W 5% 510.00	R134	211-374	RES 1/4W 1% 3.74K	R139
210-512	RES 1/4W 5% 5.10K	R9,R132,R10	211-492	RES 1/4W 1% 4.99K	R153,R154,R156, R158
210-514	RES 1/4W 5% 510.00K	R80,R128,R123	211-493	RES 1/4W 1% 49.90K	R45,R54,R64,R74
210-680	RES 1/4W 5% 68.00	R170	211-612	RES 1/4W 1% 6.19K	R176
210-681	RES 1/4W 5% 680.00	R151,R152	211-642	RES 1/4W 1% 6.49K	R100
210-822	RES 1/4W 5% 8.20K	R82	211-752	RES 1/4W 1% 7.50K	R40,R49,R59,R69,R38
211-103	RES 1/4W 1% 10.00K	R46,R57,R66,R76,R87, R89,R90,R102,R104, R105	211-802	RES 1/4W 1% 8.06K	R113,R115,R117
			211-803	RES 1/4W 1% 80.60K	R83,R98
211-104	RES 1/4W 1% 100.00K	R78	211-841	RES 1/4W 1% 845.00	R32
211-112	RES 1/4W 1% 1.10K	R138	211-953	RES 1/4W 1% 95.30K	R68
211-113	RES 1/4W 1% 11.00K	R119,R121	250-106	PNL POT .625 SQ 1K	R136
211-161	RES 1/4W 1% 1.69K	R174	251-103	POT TRM .15L/S 10K	R164,R165,R168
211 169	RES 1/4W 1% 16.90K	R56	251-104	POT TRM .15L/S 100K	R96
211 172	RES 1/4W 1% 1.78K	R137	251-203	POT TRM .15L/S 20K	R167
211-175	RES 1/4W 1% 174.00K	R42,R52,R62,R72	251-253	POT TRM .15L/S 25K	R155
211-183	RES 1/4W 1% 18.70K	R48,R58,R67,R77, R103,R88	251-501	POT TRM .15L/S 500	R157
211-193	RES 1/4W 1% 19.60K	R84,R99	251-502	POT TRM .15L/S 5K	R81
211-203	RES 1/4W 1% 20.00K	R39	310-001	DIODE SIG 1N4448	D1-D9,D13-26,D28,D33
211-223	RES 1/4W 1% 22.10K	R85	311-003	DIODE PWR 1N4003	D10-12,D29,D30
211-232	RES 1/4W 1% 23.20K	R47,R55,R65,R75,R86, R101	311-006	DIODE PWR 1N4006	D31,D32
			312-471	DIODE ZNR 1N751	D27
211-241	RES 1/4W 1% 243.00	R31,R173	314-001	LED RED MV5025	DS1,DS2,DS3,DS4,DS5, DS6,DS7,DS8,DS9, DS10,DS11,DS12,DS13, DS14,DS15,DS16,DS17, DS18,DS19,DS20,DS22
211-243	RES 1/4W 1% 24.30K	R112,R114,R116			
211-264	RES 1/4W 1% 267.00K	R44,R51,R61,R71			
211-269	RES 1/4W 1% 26.70K	R43,R53,R63,R73	314-010	LED 10 SEG BARGRAP	DS21
211-302	RES 1/4W 1% 3.09K	R175	320-001	XISTOR NPN 2N3904	Q6,Q7,Q10,Q11
211-303	RES 1/4W 1% 30.10K	R41,R50,R60,R70	320-010	XISTOR NPN MPSA42	Q8

AEA PART NUMBER	DESCRIPTION	REF. DESIG.	AEA PART NUMBER	DESCRIPTION	REF. DESIG.
320-011	XISTOR NPN MPS6521	Q3	400-020	DIP SOCK 20 PIN	DS21
320-012	XISTOR NPN MPS6561	Q5	400-028	DIP SOCK 28 PIN	U2,U3,U4,U5
320-202	XISTOR PFET VN10LM	Q1,Q2	400-040	DIP SOCK 40 PIN	U1,U6,U7
320-501	XISTOR PNP 2N3906	Q4,Q9	410-003	HDR R/AX2.1 3 POS	J12
330-008	IC LM317L	U41	410-005	HDR R/A.10 5 POS	J4,J6,J8
330-009	IC LM317T	U21	410-007	HDR R/AX2.10 7 POS	J11
330-011	IC NE556N	U13	410-102	HDR STR.10 2 POS	JP1
330-018	IC MC34074P	U23,U26,U28,U30,U32, U34	410-103	HDR STR .10 3 POS	JP2,JP3
330-034	IC XR2206	U40	412-125	HDR R/A 'D' 25 POS	J2
330-050	IC LM3914	U36	420-001	JACK PWR 2.1MM	J1
331-004-1	IC 74LS04	U15,U16,U39	420-002	JACK PHON 3.5MM	J3,J5
331-006	IC 7406	U18,U37,U38	420-008	JACK PHONO P.C.	J9,J10
331-011-1	IC 74LS11	U14	420-039	CONN R/A DIN 5 PIN	J7
331-032-1	IC 74LS32	U17	500-002	SW P-P 2P2T	SW1
331-045	I.C. 7445	U11,U12	500-006	SW P-P 6P2T	SW2
331-139	IC 74HCT139	U10	650-245	X-TAL 2.4576 MHZ	Y2
331-164-1	IC 74LS164	U9	650-405	X-TAL 4.000 MHZ	Y1
331-393	IC 74LS393	U8	750-019	HEATSINK THM 6019B	U21
332-128	IC 27128	U3	760-000	KNB SW GRY .4 X .2	SW1,SW2
332-256	IC 27256	U2	762-003	FUSE CLIP PCB	F1
332-264	IC 6264	U4,U5	763-001	FUSE 1 AMP	F1
333-015	IC Z80A CPU	U1	779-001	SHORT PLUG .10	JP1,JP2,JP3
333-018	IC Z8530	U7			
333-019	IC Z8536	U6			
334-066	IC 4066B	U22,U24,U25,U27,U29, U31,U33,U35			
350-488	I.C. MC1488	U20			
350-489	I.C. MC1489	U19			

APPENDIX K
SPECIFIC RADIO CONNECTIONS

MFG	RADIO	PIN OUT		NOTES
ICOM	4 pin	AFSK PTT GND	1 2 4	
	8 pin	AFSK PTT GND	1 5 6,7	RX audio available on pin 8 of some radios.
	HTs	AFSK PTT GND	(circuit diagram: .1 cap, 30K resistor, tip of small connector, sleeves)	RX audio available on tip of large conn.
YAESU	4 pin	AFSK PTT GND	2 3 1	
	8 pin	AFSK PTT GND	8 6 7	FT-270/2700 require mic DC block cap & series diode w/PTT
	FT-x03 x09 727	AFSK PTT GND	(circuit diagram: .1 cap, 30K resistor, tip of small connector, sleeves)	RX audio available on tip of large conn.
	FT-208	AFSK PTT GND	1 3 4	RX audio on pin 2.
KENWOOD	4 pin	AFSK PTT GND	1 2 3,4	
	5 pin	AFSK PTT GND	1 2 4,5	
	6 pin	AFSK PTT GND	1 2 6	
	8 pin	AFSK PTT GND	1 2 7,8	

MFG	RADIO	PIN OUT	NOTES
KENWOOD	TR-2500	AFSK >──┤├─▶tip of .1 large conn PTT lg sleeve GND sm sleeve	RX audio available on tip of small conn.
	TR-x600 TH-x1	AFSK >──┤├─▶ring of .1 large conn PTT lg sleeve GND sm sleeve	RX audio available on tip of small conn.
TEN-TEC	4 pin	AFSK 1 PTT 3 GND 2	
	1/4" stereo	AFSK ring PTT tip GND sleeve	
AZDEN	12 pin	AFSK 12 PTT 9 GND 2,11	
	8 pin	AFSK 1 PTT 7 GND 2	
DRAKE	4 pin	AFSK 1 PTT 2 GND 3	
	1/4" stereo	AFSK ring PTT tip GND sleeve	

This information has been obtained from various sources, and AEA assumes no responsibility for accuracy. Please consult your particular transceiver operator's manual for confirmation.

APPENDIX L

LIMITED WARRANTY

ADVANCED ELECTRONIC APPLICATONS, INC. warrants to the original purchaser that this product shall be free from defects in material or workmanship for ninety days from the date of original purchase. In order to obtain warranty service: (1) Complete and mail the warranty registration card within 10 days to Advanced Electronic Applications, Inc., and (2) Send written notification to the address below or telephone as soon as possible after discovering a possible defect:

Advanced Electronic Applications, Inc.
Attention: Service Department
2006 - 196th S.W.
Lynnwood, WA 98036

The written notification must include a copy of the invoice. Include a description of the defective part or condition, with details of the electrical connections to associated equipment and list such equipment. Please enclose your name, phone number, and address. Shipping charges for any parts or units submitted for replacement under this warranty must be paid by the purchaser.

Correct maintenance, repair and use are important to insure proper performance from this product. Carefully read the Instruction Manual. This warranty does not apply to any defect AEA determines is caused by (1) improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts; (2) misuse, abuse, neglect, or improper installation; (3) accidental or intentional damage. The field installation of circuits or batteries according to the instructions in the manual will not nullify this warranty.

All implied warranties, if any, terminate ninety days from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind whether based on contract, negligence, or strict liability. Maximum liability shall not, in any case, exceed the purchase price of the unit.

The foregoing constitutes AEA's entire obligation with respect to this product. The original purchaser and any user or owner shall have no other remedy and no claim for incidental or consequential damages. Some states do not allow limitations of how long an implied warranty lasts or do now allow the exclusion of incidental or consequential damages, therefore, the above limitations and exclusions may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.