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:

- Reorient the antenna of the device receiving interference.
- Relocate the computer with respect to this device.
- 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 products. These sometimes are made available to the user who has previously purchased 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 versions 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-correcting 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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CHAPTER 1

INTRODUCTION

1.1 Introduction

The User's Guide to the PK-232 describes the general characteristics and operation of your AEA PK-232 Data Controller. Your User's Guide will help you to install, adjust and operate the system.

1.2 Scope

Your User's Guide provides general information on installation and operation of the PK-232. The Guide describes the PK-232's features, system components and basic operation in Morse, Baudot and ASCII RTTY, AMTOR and Packet Radio. Technical information on theory of operation, hardware and software descriptions, protocols and troubleshooting instructions are available in AEA's optional Technical Manual for the PK-232 System.

1.3 General

The PK-232 is designed and manufactured by AEA, Inc. for use with any standard communications terminal or computer equipped with an RS-232C serial data port and an appropriate communications program or terminal emulator. For information on operation with nonstandard interfaces or terminals, please contact AEA.

1.3.1 Application

Your PK-232 Data Controller is the connection between your radios and computer or terminal. The PK-232 provides all of the decoding, encoding and transmitter control routines needed to send and receive Morse code, Baudot and ASCII RTTY (RadioTeleTypewriter), AMTOR and packet radio. You can use your computer or data terminal with the same communications program or terminal emulator that you use with a telephone line modem.

1.3.2 Specifications

As part of its program of product improvement, AEA reserves the right to make changes in this product's specifications. Changes will be made to the information in this document and incorporated in revisions to this manual. Specifications are subject to change without notice.

1.3.2.1 Description

AEA's Model PK-232 is a five-mode protocol converter and data controller that includes built-in modems for all modes. The PK-232 converts Morse, Baudot/ASCII RTTY, AMTOR/SITOR and AX.25 packet to ASCII data via an EIA standard RS-232 serial port.

Operating Modes:	Morse, Baudot, ASCII, AMTOR/SITOR, and Packet Radio per AX.25, half- or full-duplex

1.3.2.2 Modem Characteristics

Demodulator:	Limiter-discriminator type, preceded by an eight-pole Chebyshev 0.5 dB-ripple bandpass filter
Receive Bandpass:	Automatically switched by operating mode
VHF packet:	Center frequency 1700 Hz, bandwidth 2600 Hz
HF (except CW)	Center frequency 2210 Hz, bandwidth 450 Hz
CW	Center frequency 800 Hz, bandwidth 200 Hz
Modulator:	Low-distortion AFSK sine wave function generator, phase-continuous AFSK
Output Level:	5 to 100 millivolts RMS, adjustable by rear-panel control

1.3.2.3 Processor System

Protocol conversion:	Zilog Z-80 microprocessor
RAM:	16 kilobytes
ROM:	Up to 48 kilobytes of ROM may be used
Hardware HDLC:	Zilog 8530 SCC

1.3.2.4 Input/Output Connections

Radio Interface:	Two five-pin TTL connectors, selectable on the front-panel
Input/Output Lines	Receive audio Transmit audio Push-To-Talk (PTT) External squelch input Ground
External modem connector	Five-pin TTL - TXD, RXD, DCD, PTT, Ground
Direct FSK Outputs	Normal and reverse
Oscilloscope Outputs	Mark (Stop) and space (Start)
CW keying Outputs	Positive: +100 VDC max, at up to 100 mA Negative: -30 VDC max, at up to 20 mA
Terminal Interface:	Standard RS-232C 25-pin DB25 connector
Input/Output	RS-232C with full handshake (hardware and software) Use only wires 1-8 and 20
Terminal Data Rates	Auto-baud selection of 300, 1200, 2400, 4800 and 9600 BPS. TBAUD adds 110, 150, 200 and 600 BPS.

1.3.2.5 Controls and Indicators

Front Panel Controls:	Power Switch Radio Selector Switch Threshold Adjust
Indicators:	Ten-segment discriminator-type bargraph indicator for HF tuning. DCD LED (Data Carrier Detect)

Status and Mode Indicators:

Mode Group	Status Group
BAUDOT	STBY
ASCII	PHASE
PKT	IDLE
MORSE	ERROR/CONV
CHECK	OVER
FEC	TFC/TRANS
ARQ	RQ/CMD
MODE L	CON
STBY	STA
	MULT
	SEND

1.3.2.6 General

Power Requirements:	+13 VDC (12 to 16 VDC) at 700 mA
Mechanical:	Overall, 11" x 8.25" x 2.5" (279.4 mm X 209.6 mm X 63.5 mm) Weight 3 pounds (1.36 kilograms)

1.3.3 Features

The PK-232 presents all of the features most frequently demanded by the modern amateur operator:

- Packet Radio using the AX.25 international packet protocol
- Host Mode, including raw HDLC mode
- Link and terminal data rates to 9600 bits per second
- AMTOR error-correcting operation using Mode A (ARQ), Mode B (FEC), Mode L (ARQ "Listen") and SELFEC (selective FEC)
- Baudot RTTY at standard speeds 45, 50, 57, 75 and 100 bauds (60, 66, 75, 100 and 132 WPM)
- Baudot RTTY Unshift-On-Space (USOS)
- Baudot/CCITT International Alphabet #2 keyboard conversion
- ASCII RTTY at 110, 150, 200 and 300 bauds
- WRU? Activation and Answerback Response
- Dual-polarity direct FSK outputs
- Dual-polarity CW keying outputs
- Monitor oscilloscope output
- Time-of-day clock
- Automatic Morse operation from 5 to 99 WPM (Words per Minute)
- Farnsworth Morse operation below 15 WPM
- Morse speed lock
- Selectable dual radio connector ports
- LED discriminator-type tuning display
- "Autobaud" selection: 300, 1200, 2400, 4800 and 9600 BPS

1.4 System Components

Your PK-232 Data Controller package contains the following items:

- o One PK-232 Data Controller
- o Cables to connect your PK-232 to two separate radios
- o User Guide to the PK-232

1.4.1 Input/Output Devices

Your PK-232 can be used with a standard ASCII communications terminal or computer equipped with an RS-232C serial data port and an ASCII communications program or terminal emulator. Data and control signals are exchanged between the PK-232 and the computer or terminal at standard RS-232C (CCITT V.24/V.28) levels.

Your computer and terminal program and their associated tape, disk and printer I/O devices provide the means to store messages received and retrieve messages for transmission. Although highly desirable, these peripheral or I/O devices are not needed for PK-232 operation.

Note In this User's Guide, the terms "computer" and "terminal" mean the same thing - the keyboard and monitor you use to communicate with your PK-232.

1.4.2 System Transmitter-Receiver Performance Requirements

Most modern radio transceivers are capable of excellent performance in Morse, Baudot and ASCII RTTY, AMTOR and packet radio. Although AMTOR Mode A (ARQ) operation imposes more demanding switching speed requirements than the other operating modes, most radios will operate in either AMTOR mode without any modifications. Radio switching times are less critical in packet radio operation. See the AMTOR operating section for further details on timing requirements.

Your PK-232 provides software-controlled timing variations that permits operation with nearly all the HF and VHF/UHF radios in general use.

CHAPTER 2

INSTALLATION

2.1 "Quick Start" Installation

You'll probably want to get your PK-232 connected and operating as soon as possible. This section contains instructions for a "generic" installation and system checkout to install and verify your PK-232's operation.

More detailed installation and system checkout instructions for specific computer applications are contained in AEA's Technical Manual for the PK-232.

2.1.1 Equipment Required

A complete PK-232 Data Controller system consists of the PK-232 and its power supply, your computer, your radio transceiver or receiver-transmitter combination and its power supply.

AEA supplies the cables for connecting the PK-232 Data Controller to your radio, and an external power supply. You must add the microphone connectors required by your radio, the power supply and the RS-232 cable that connects the PK-232 to your computer.

2.1.2 Precautions

AEA strongly recommends that all RS-232 cables and connectors be made with the best commercial-quality shielded materials, and that careful and correct grounding and bonding procedures be observed in the installation of the radio equipment being used with your PK-232.

2.1.3 Installation

The following sections describe the initial settings of the switches, connectors and their connections to your computer and your radio.

2.1.3.1 Initial Control Settings

For initial power-up of your PK-232, use the following front-panel control settings:

POWER SWITCH	OFF
RADIO 1/RADIO 2	Radio 2
THRESHOLD	Approximately "3-o'clock"

2.1.3.2 Power Connections

Power is connected to the PK-232's rear-panel coaxial power receptacle from any well regulated 12-volt DC power supply (12 to 16 VDC) capable of supplying 1 ampere. AEA's optional Model AC-4 wall-adapter power supply can be used.

- Be sure your power supply can furnish one (1) ampere with ripple voltage less than one volt peak-to-peak.
- Be sure you connect the positive voltage to the center pin of the coaxial power plug.

If you accidentally invert the power power cable, an internal fuse will open to protect the PK-232 from reverse-voltage damage. If this occurs, open the PK-232 and replace the internal fuse with an identical 1-ampere unit.

2.1.3.3 Radio Input and Output Connections (See Table 1-1)

AEA has supplied two shielded cables for connecting your PK-232 to one or two radios. One end is already pre-wired with a 5-pin Molex-type plug. You must supply and connect the plug for the end that connects to your radio's microphone receptacle or PTT and phone patch and tone inputs.

NOTE: Don't prepare both cables yet. Set one cable aside for use as a test cable during your first "loopback" experiments with packet operation.

The following signals at five-pin receptacles J4 and J5 pass between your PK-232 and radio. The pinout is shown in Table 2-1.

Pin	Signal Name	Description
1	Receive audio	AFSK from receiver to PK-232
2	Microphone audio	AFSK from PK-232 to transmitter
3	Squelch input	Allows PK-232 to detect activity on a shared-mode channel (optional)
4	Ground	Audio and PTT common return
5	Push-To-Talk	PK-232 keys transmitter

Table 2-1 J4 and J6 Radio Port Connectors

2.1.3.4 Computer Connections (See Table 1-2)

The PK-232's rear-panel serial-port connector carries data and control signals between your computer and the PK-232. The minimum number of pins that must be connected is shown in Table 1-2.

The PK-232 is connected to a computer just like you connect a RS-232C modem. If you now use your computer with a modem, connect the PK-232 the same way. Use any terminal program you now use with your modem.

IMPORTANT NOTE

If the full RS-232 cable set is used, DO NOT CONNECT any pins other than pins 1 through 8, and pin 20! The remaining pins, 17 through 19 and 21 through 25 have been reserved for future use. Connection of a full RS-232 wire set will cause improper operation of your PK-232. The minimum connections shown do not permit hardware flow control.

Pin	Signal Name	Description
2	Transmit Data	Serial data from computer to PK-232
3	Receive Data	Serial data from PK-232 to computer
7	Signal Ground	Common ground for both data lines

Table 2-2 Minimum Serial Port Connections Required by PK-232

2.1.4 Controls

Your PK-232's front panel has three controls:

- POWER ON/OFF push switch - turns off power from external supply
- RADIO-1/RADIO-2 push switch - selects between two available I/O jacks
- THRESHOLD control - squelch-like adjustment inhibits display of garbage characters produced by received noise.

2.1.5 Indicators

Your PK-232's front panel has three categories of LED (Light-Emitting Diode) indicators:

- Status
- Mode
- Tuning

2.1.5.1 Status LEDs

DCD	Data Carrier Detect
MULT	Multiple Connection
SEND	Transmitter PTT enabled
ERROR	In ARQ: Receiving errors from the distant station
/CONV	In Packet: System is in Converse Mode
IDLE	ARQ and FEC synchronous idle link, no traffic
PHASE	ARQ phasing is active
STBY	Ready to receive ARQ or FEC
STA	Packet frame(s) unacknowledged
CON	Packet link is in connected state
RQ	In ARQ: Requests for repetition from distant station
/CMD	In Packet: System is in Command Mode
TFC	In ARQ: System is sending/receiving traffic (data)
/TRANS	In Packet: System is in Transparent Mode
OVER	AMTOR changeover

2.1.5.2 Mode LEDs

STBY	ARQ Standby - ready to answer SELCAL or display FEC
MODE L	ARQ Listen - monitor two other stations linked in ARQ
FEC	Sending or receiving FEC (Mode B)
ASCII	Sending or receiving ASCII RTTY
BAUDOT	Sending or receiving Baudot RTTY
ARQ	Sending or receiving ARQ (Mode A)
CHECK	Sending or receiving SELFEC (Mode Bs)
PKT	Sending or receiving packets
MORSE	Sending or receiving Morse code

2.1.5.3 Tuning Indicator (See Figure 2-1)

This ten-segment bargraph LED display shows proper tuning of received mark and space tones in HF and VHF CW and SSB FSK or AFSK operations. In these modes, the correct tones are determined by how you tune your receiver.

In the absence of a received tone signal, the center LED elements are lit. When the received tone is at the "mark" frequency, the LED bars at the left side of the indicator will be lit. Received "space" tones will light the bars at the right side of the indicator. A properly-tuned RTTY, AMTOR or packet signal will be symmetrically divided, with the brightest bars at the ends of the indicator. A properly-tuned CW signal will shift the lit bars from the center to the extreme right-hand side of the display.

In FM operation, tone frequencies are set by the transmitting station and can't be changed by the receiving station.

Figure 2-1 Bar-graph Tuning Indicator Display

2.2 Serial Port Configuration

Let's verify that your PK-232's serial port and data words are set up properly for your computer. Should your monitor display garbled or incorrect characters or "funny" graphic symbols, you can change the PK-232's serial port parity and word length. The common parity and word length combinations are seven bits, even parity and one stop bit.

Your computer will probably accept the PK-232's default setting, even if it actually uses a different setting. If your computer requires eight data bits, you may have to set parity to "none"; otherwise text may be interpreted as graphics or other special characters.

To set eight bits, space parity, type:

AWLEN 8 (8-bit words) PARITY 0 (no parity bit)

To return to seven bits, even parity, type:

AWLEN 7 (7-bit words) PARITY 3 (even parity)

One of these combinations will satisfy most computers. You're more likely to require a different setting if you have a "dumb" terminal rather than a computer, or if you've configured your computer's serial port for some special application. If your computer needs odd parity, set PARITY to 1.

If your computer detects framing errors, try this for shorter characters:

AWLEN 7 (7-bit words) PARITY 0 (no parity bit)

For longer characters try:

AWLEN 8 (8-bit words) PARITY 1 or PARITY 3

2.3 Screen Displays

Some computers and terminal programs are configured to certain default characteristics that may, at first, seem incompatible with the PK-232. Follow these hints as you begin to "dialogue" with your new TNC.

2.3.1 Echoes

You may see two characters on your screen for every typed character.

cmd:RREESSEETT

Both your computer and your PK-232 are echoing your typed characters.

o Type: ECHO OFF to stop the PK-232's echoes.

If you later use your PK-232 with a different computer or terminal program, you may see nothing displayed when you type. In that case, set ECHO ON.

2.3.2 Line Feeds and Carriage Returns

If the lines displayed appear to be double spaced, your computer is adding an extra line feed <LF> when it displays a carriage return <CR>.

- Set ALFDISP OFF to stop your PK-232 from adding an <LF>.

If you change equipment you may have to set ALFDISP ON to restore the PK-232's automatic line feeds.

2.3.3 Screen Width

The screen width default value is 80, the width of many CRT displays. The PK-232 sends an extra <CR>, or <CR><LF> if ALFDISP is ON, when 80 characters have been displayed on a line.

If your computer does not automatically break long lines:

- Set ACRDISP (the screen width) to the width of your display.
- For a computer using a TV set for a display, set ACRDISP to 40.

If your computer does automatically break long lines:

- Set ACRDISP to 0 to disable this feature. Otherwise, you will get two <CR>s when the line wraps around.

2.3.4 Display Speeds

A few computers will lose the first characters of a line when several lines are displayed in rapid succession.

- Give the computer more time between lines by setting NUCR ON (delay after <CR>), or NULF ON (delay after <LF>).

The delay is adjusted by NULLS, which sets a number of character-times for the delay.

2.4 System Start-up and Quick-check

Do these steps before connecting any cables between your PK-232 and your radio.

1. Connect your PK-232 to your computer via the RS-232 cable. MAKE SURE THAT ONLY PINS 1 THROUGH 8, and PIN 20 are connected.

2. Connect your PK-232 to a regulated 12-volt DC power supply.

3. Set the RADIO-1/RADIO-2 switch to RADIO-1.

4. Connect a wire jumper between pins 1 and 2 on the PK-232's J4, or short the two appropriate loads on your TTL connector cables.

5. Press the PK-232's power switch to the ON position.

6. Turn on your computer. Load and run your communications program.

7. Set your computer's data rate to 1200 bauds, if available.

   If your serial port is operating at 1200 bauds, you'll see the the following message right away.

   Please type a star (*) for auto-baud routine.

   If this message appears, go to Step 9 now.

8. If you're using your computer or terminal at a different data rate, your screen may show meaningless "junque" characters. If true, go to Step 9 now.

   (Don't panic! - your PK-232 is doing its "auto-baud" routine with which it will measure your computer's data rate and set itself accordingly. (The PK-232 scans for baud rates of 300, 1200, 2400, 4800 and 9600 bauds.)

9. Type several asterisks (*) at one-second intervals.

   If the cable and connections between the PK-232 and your computer are correct, several of the PK-232's LEDs will begin cycling in order as the PK-232 runs its "auto-baud" routine. As soon as the PK-232 has recognized your data rate and set itself accordingly, your screen will display the sign-on message:

```
PK-232 is using default values.

AEA PK-232 Data Controller
Copyright (C) 1986 by
Advanced Electronic Applications, Inc.
Release nn.mmm.yy
Checksum $aa
cmd:
```

10. Don't turn on your radio yet!

11. Type "MY AAA" followed by a RETURN (or ENTER key). Your monitor should display:

    MYCALL was PK232

12. Type "C AAA" followed by a RETURN. After a few moments, your monitor should display:

    *** CONNECTED to AAA

13. Type a few characters, any characters, followed by a RETURN. After a few moments, your monitor should echo the same characters that you've just typed.

14. Type "(CONTROL-C)" (type "C" while pressing the CONTROL key down) Your monitor should respond with:

    cmd:

15. Type "VHF OFF" followed by a RETURN. Your monitor should respond with:

    VHF was ON

16. Type "HB 300" followed by a RETURN. Your monitor should respond with:

    HBAUD was 1200

17. Type "K" followed by a RETURN. Your monitor should echo the characters you've just typed.

18. Type "(CONTROL-C)". Your monitor should respond with:

    cmd:

19. Type "D" followed by a RETURN. Your monitor should respond with:

    *** DISCONNECTED: (AAA)

20. If you've done all the above steps successfully, you've completed the system quick-check - you're ready to begin operating.

21. If you have problems with the steps shown above, return to Step 1 AFTER checking all cables and connectors. Read each step again carefully. If you still have problems, shut down your PK-232 and contact AEA's Customer Service Department as suggested in the front of this User's Guide.

2.5 Command List Displays

Type the command word "display". Your screen will show:

DISPLAY A,C,I,L,M,R,T,Z

2.5.1 Display Complete Command List

At the "cmd:" prompt, type the command word "DISPLAY Z." The PK-232 displays the entire list as shown in APPENDIX A.

The "DISPLAY Z" command shows the complete command list and the ROM default values installed at time of manufacture, assigned to those parameters that take values. The defaults shown below are in effect when the PK-232 is turned on for the first time, and each time that you type the "RESET" command.

2.5.2 Display Partial Command Lists

The command list can be displayed in sections according to the class of parameter or function you wish to see. The DISPLAY function is divided into the following six classes:

A	Asynchronous port parameters
C	Special characters
I	Identification parameters
L	Link parameters
M	Monitor parameters
R	RTTY Parameters (includes Morse, Baudot, ASCII and AMTOR)
T	Timing parameters
Z	All parameters displayed

The following paragraphs list the commands by class with a brief explanation of each command's function.

2.5.3 Display Asynchronous Port Parameters

```
cmd:disp a
8BITCONV  OFF      Strip bit 7 in CONVERSE
ACRDISP   80       Screen width
ALFDISP   ON       Send <LF> after <CR> to terminal
AWLEN     7        Data bits per word, to terminal
ECHO      ON       Echo typed keyboard characters
ESCAPE    OFF      Send ESC character $1B as $24
FLOW      ON       Stop echo to screen while typing
LCOK      ON       Accept lower case to terminal
NUCR      OFF      Nulls to terminal after <CR>
NULF      OFF      Nulls to terminal after <LF>
NULLS     0        Number of nulls for NUCR & NULF
PARITY    3        Terminal program parity (0-3)
TBAUD     1200     Terminal baud rate
TRFLOW    OFF      Terminal flow control - Transparent
TXFLOW    OFF      PK232 flow control - Transparent
XFLOW     ON       Software flow control
```

2.5.4 Display Special Characters

```
cmd:disp c
BKONDEL    ON              Send <BS> <SP> <BS> for DELETE char.
CHSWITCH   $00             Channel-select (Link) character
CHCALL     OFF             Show call sign after channel ID
CHDOUBLE   OFF             Show CHSWITCH character twice
CANLINE    $18 CTRL-X      LINE DELETE character
COMMAND    $03 CTRL-C      Character escape to COMMAND Mode
CANPAC     $19 CTRL-Y      PACKET DELETE character
CWID       $06 CTRL-F      Command to send CWID (in text)
DELETE     OFF             Use <BS> ($08), not <DEL> ($7F)
PASS       $16 CTRL-V      Pass input editing character
RECEIVE    $04 CTRL-D      Receive mode character in text
REDISPLA   $12 CTRL-R      Re-display current input buffer
SENDPAC    $0D CTRL-M      Character that "sends" a packet
START      $11 CTRL-Q      Resume sending data to terminal
STOP       $13 CTRL-S      Stop sending data to terminal
TIME       $14 CTRL-T      Insert "sent time" in text
XOFF       $13 CTRL-S      Stop sending data to terminal
XON        $11 CTRL-Q      Resume sending data to terminal
```

2.5.5 Display Identification Parameters

```
cmd:disp i
UNPROTO    CQ                  Path/address to send UI frames
AAB        PK-232              0 - 17 character answerback (WRU?)
BEACON     EVERY 0             Set beacon timing (X10 seconds)
BTEXT      (empty)             120-byte BEACON message text
CBELL      OFF                 Connect bell
CMSG       OFF                 Send CTEXT message to caller
CTEXT      AEA PK-232 (etc)    120-byte CONNECT message text
HID        OFF                 Send ID UI packet every 9.5 mins
MYCALL     PK232               Your call sign for packet address
MYALIAS    none                Alternate MYCALL
MYSELCAL   (empty)             Your AMTOR SELCAL
MYALTCAL   (empty)             Alternate AMTOR SELCAL
WRU        OFF                 Turn on answerback
```

2.5.6 Display Link Parameters

```
cmd:disp l
CONNECT  Link state is: DISCONNECTED
ACRPACK  ON                    Add <CR> to packet
ALFPACK  OFF                   Send <LF> after <CR>, packet
AX25L2V2 OFF                   Operate as AX.25 Version 1.0
CONPERM  OFF                   Never disconnect this link
CFROM    all                   Connect requests from list
CONMODE  CONVERSE              Mode to enter when link starts
DFROM    all                   Digipeat these call signs only
FULLDUP  OFF                   Full-Duplex terminal operation
HBAUD    1200                  Packet link (radio) baud rate
MAXFRAME 4                     Maximum un-ACK'd frames allowed
NEWMODE  ON                    Return to Command Mode at DISC
NOMODE   OFF                   Never switch modes
PACLEN   128                   # of user-typed bytes in packet
PASSALL  OFF                   Ignore CRC in HDLC ("Junk Mode")
RETRY    10                    Maximum number of frame repeats
TRIES    0                     Show or force retry count
USERS    1                     # of multi-connections allowed
VHF      ON                    Packet - wide or narrow shift
XMITOK   ON                    PTT line can be keyed
```

2.5.7 Display Monitor Parameters

```
cmd:disp m
CONSTAMP OFF                   Mark connections with time/date
DAYSTAMP OFF                   Include DATE in time-stamp
HEADERLN ON                    Insert <CR> after headers
MBX      none                  Monitor channel without headers
MONITOR  4                     Monitor mode level select (0-6)
MCON     0                     Monitor while connected (0-6)
MDIGI    OFF                   Monitor digipeated frames
MFILTER  $07, $13              Filter received characters
MFROM    all                   Don't monitor MFROM call signs
MTO      none                  Don't monitor MTO call signs
MRPT     ON                    Show digipeaters in headers
MSTAMP   OFF                   Time-stamp monitored frames
TRACE    OFF                   Hex dump of packet frame
```

2.5.8 Display Morse/RTTY/AMTOR Parameters

```
cmd:disp r
ABAUD     110        ASCII baud rate
ACRRTTY   71         Auto <CR> column in RTTY
ADELAY    4          AMTOR transmit delay (X10 ms)
ALFRTTY   ON         Send LF after <CR>, RTTY
CCITT     ON         Select CCITT ITA #2 or US Baudot
CRADD     OFF        Allow <CR><CR><LF> in RTTY Modes
EAS       OFF        Echo as sent, non-packet modes
MSPEED    20         Set Morse speed in WPM (5-99)
RBAUD     45         Baudot RTTY baud rate
RXREV     OFF        Reverse received data sense
SQUELCH   OFF        Select receiver squelch polarity
TXREV     OFF        Reverse transmitted data sense
USOS      OFF        RTTY "Unshift On Space"
WIDESHFT  OFF        RTTY - wide or narrow shift
WORDOUT   OFF        RTTY - word or character output
```

2.5.9 Display Timing Parameters

```
cmd:disp t
AXDELAY   0          Repeater key-up delay (X10 ms)
AXHANG    0          Repeater hang time (X10 ms)
CHECK     30         Idle link timeout (X10 seconds)
CMDTIME   1          Transparent Mode escape timer
CPACTIME  OFF        Use packet timeout in Converse
DWAIT     16         Delay for digi repeat (X10 ms)
FRACK     3          Time (X1 sec) to wait for ACK
PACTIME   AFTER 10   Packet transmit timer (X100 ms)
RESPTIME  10         Minimum delay before sending ACK
TXDELAY   30         PTT key-to-data delay (X10 ms)
```

2.6 Immediate Commands

The "immediate" commands do not have default values.

These commands take effect as soon as you type them (and a <RETURN>), to start, stop or activate a specific PK-232 function.

NOTE: Like all other PK-232 commands, the immediate commands can be typed with a short mnemonic or abbreviated form. See the complete description of commands in the Command Summary.

ACHG	Force AMTOR ARQ Changeover (break-in)
AMTOR	Start AMTOR mode in ARQ standby
ARQ	Start AMTOR ARQ call (SELCAL)
ASCII	Start ASCII RTTY mode
BAUDOT	Start Baudot RTTY mode
CALIBRAT	Start calibrate mode
CONNECT	Send connect request to <call>
CONVERSE	Start Converse Mode from Command
CSTATUS	Show status of channels (links)
DISCONNE	Send DISC to distant station
DISPLAY	Show PK-232 parameters/classes
FEC	Start AMTOR FEC transmission
ID	Force ID packet via Unproto path
MHEARD	Display call signs heard
MORSE	Start Morse Mode
OPMODE	Display current operating mode
PACKET	Start Packet Mode
RCVE	Switch to receive, Morse/RTTY/AMTOR
RESET	RESET bbRAM to factory defaults
RESTART	Same as power-on/off reset
SELFEC	Start AMTOR Selective FEC call (SELCAL)
TCLEAR	Non-packet clear Transmit Buffer
TRANS	Start Transparent Data Mode
XMIT	Start transmission - key PTT

2.7 "Quick Start" Radio Connections and Set-Up

Let's go through a simple step-by-step routine in which you'll verify that all cables and connectors are properly installed, and that your PK-232 Data Controller is working correctly. The procedure will help you become familiar with the software commands and operations.

If you have a problem that seems unsolvable after reading this User's Guide thoroughly and checking all cables and connectors, please refer to the instructions for calling AEA in the front of this manual.

During these initial checkout procedures, do not connect the PK-232's PTT and AFSK lines to the transmitter until instructed to do so. Make all the other connections as described below.

After all the cables between the PK-232, your radios and your computer have been installed, apply power to your equipment in this order: radio, computer, PK-232.

"Quick Start" uses the simplest method of connecting your PK-232 to your radio - via the radio's microphone jack. However, unless you have an auxiliary speaker-mike jack, you may not be able to monitor the channel or conveniently use the rig on voice. This type of connection may also be susceptible to RFI from nearby amateur or commercial transmitters. After your first trials with the "Quick Start" routines in an initial test phase, you can consider alternate methods shown later in this User's Guide for your permanent station installation.

Shielded wire is recommended in all cases for your microphone audio circuit. If you notice significant hum in the monitored audio during modulation adjustments or in the Calibrate mode, verify the ground and shield connections in the cable between the radio and the PK-232. The cables supplied with your PK-232 are shielded for these applications.

Your PK-232 provides two separate radio input/output cable receptacles and a front-panel radio selector switch. If you plan on using both HF and VHF radios, prepare the two cables with suitable microphone plugs.

"Quick Start" requires that you have a second receiver in your shack so that you can listen to your own signal. Read the remainder of this chapter carefully before connecting your PK-232 to your radio.

In this method, the PK-232 is connected directly to the radio; initial tests are performed without making any adjustments in the radio or adding any signal-level balancing devices in the cables.

IMPORTANT NOTE

MAKE SURE THAT THE RADIO CABLES EXIT "DOWNWARD" FROM THE TWO RADIO JACKS ON THE REAR PANEL. ALTHOUGH NO DAMAGE WILL OCCUR FROM REVERSE CONNECTION, YOUR PK-232 AND RADIO WILL NOT OPERATE CORRECTLY!

This procedure is is divided into separate sections for FM and SSB radios. Follow these steps exactly in order to:

- o Verify that your radio and PK-232 are connected as shown in Table 1-1 earlier in this manual, and Figure 2-2 below.
- o Feed the PK-232's AFSK audio output to your radio's microphone receptacle or similarly connected auxiliary jack.
- o Adjust the PK-232's rear-panel output-level control to give proper modulation.
- o Take the receiver's audio output from an earphone plug or speaker jack and feed the audio directly to the PK-232.

If your transmitter has an easily accessible microphone gain control, try reducing the sensitivity of the transmitter microphone circuit and increasing the signal level from your PK-232 to minimize hum or other noise problems.

2.7.1 FM Installation and Adjustment

NOTE: Turn power off before making any connections.

1. Connect your PK-232 and FM radio as shown in Figure 2-2. BE SURE THAT THE FIVE-PIN CONNECTORS EXIT DOWNWARD FROM J4 and J6.

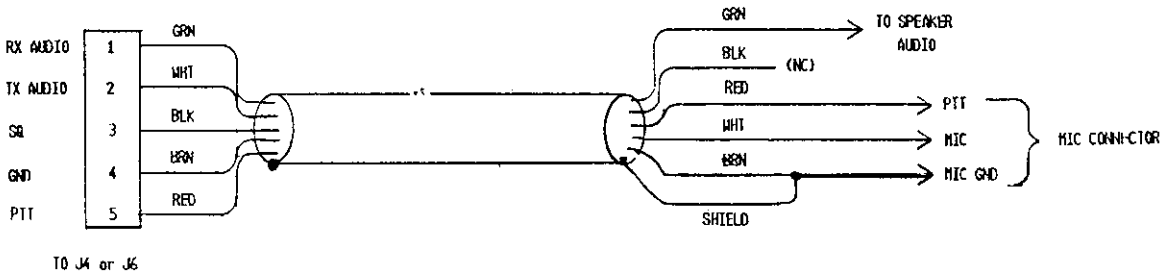

Figure 2-2 Radio-to-PK-232 Connections

2. Turn on your computer and PK-232 and start your terminal program.
3. Connect the radio to a dummy load; be prepared to monitor your transmissions with another nearby radio.

NOTE: In the Calibrate mode only, the "K" key toggles the transmitter PTT line on and off. The "SPACE BAR" toggles the PK-232's AFSK tone generator from "Mark" (the lower pitched tone) to "Space" (the higher pitched tone). The PK-232 has a transmit watch-dog timer circuit that unkeys your transmitter automatically after sixty (60) seconds. As you perform the following adjustments, unkey periodically, then rekey the transmitter by typing "K."

4. Enter the Calibrate mode by typing: "CAL <RETURN>."

5. Press the "K" key on the keyboard to key the transmitter. You should hear a continuous tone in the monitor receiver.

6. Tap the space bar several times until the higher pitched of the two tones ("space") is heard.

7. Press "K" again to unkey the transmitter.

8. With the PK-232 keying the transmitter and transmitting the higher of the two tones, adjust the transmit audio level as follows:

   - Listen to the monitor receiver; turn the PK-232's rear-panel AFSK Output Level adjustment screw clockwise (CW) until you hear no increase in output level in the monitoring receiver.

   - Rotate the AFSK Output Level adjustment screw counterclockwise until the audio signal on the monitoring receiver is slightly but noticeably reduced from the maximum level.

9. Type "K" to return to receive mode.

10. Type "Q" to "Quit" (exit) the calibration routine.

    You've now set your FM transmitter's deviation to an approximate level which will be adequate for initial operation.

11. With your radio in the receive mode, open the squelch control so that a steady hiss or noise is heard on a speaker.

12. Set the PK-232's THRESHOLD control to the "12-o'clock" position.

13. Set the receiver's volume control so the DCD LED on your PK-232 just lights with the receiver unsquelched.

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

14. Reset your receiver's squelch control for normal operation.

2.7.2 SSB Installation and Adjustment

Installation and adjustment of your PK-232 with SSB radios is usually simpler and more direct than with FM equipment. You'll use the same kind of cables and connectors that you use with your FM gear.

Digital modes with an SSB radio require some different settings of the radio's operating controls for proper AMTOR and packet operation. Be sure to observe the following precautions:

- Set VOX to OFF.
- Set speech compression to OFF.
- Set AGC to FAST (if available).
- Disconnect the ALC cables between your SSB radio and any external RF amplifier you wish to use in AMTOR or packet radio service.

Remember - Baudot and ASCII RTTY and Mode B (FEC) AMTOR are continuous key-down conditions - your radio's duty cycle is 100% for the duration of each transmission. If your SSB radio isn't designed for continuous full-power operation, you must operate your radio at reduced output power. Consult the manufacturer's specifications for details on the operating duty cycle.

NOTE: Make all connections with all power off. If your SSB radio has a phone patch input and external PTT connections, the PK-232's AFSK output can be connected to those input jacks, leaving the microphone jack for normal service. However, some microphones are connected at all times (regardless of the PTT line's state. In this case, remove the microphone from the input to prevent inadvertent loading of the audio input circuit. If the phone patch jack has a series isolating resistor, your microphone can remain connected.

1. Connect your PK-232 and SSB radio as shown in Figure 2-2.

2. Turn on your PK-232 and your computer and start your terminal program.

3. Connect your SSB radio to a dummy load.

4. If your SSB radio has a "monitor" facility, i.e., an audio output that lets you listen to the audio signals entering the microphone or phone patch jacks, turn that monitor circuit on.

5. Set the radio's MODE selector to LSB (lower sideband).

6. Set the radio's meter switch to the "ALC" position. If the radio doesn't have an "ALC" indication, set the meter switch to "Ip" to read plate current. If a plate current reading isn't available, set the meter to indicate power output.

NOTE: In the Calibrate mode only, the "K" key toggles the transmitter PTT line on and off. The "SPACE BAR" toggles the PK-232's AFSK tone generator from "Mark" (the lower pitched tone) to "Space" (the higher pitched tone). The PK-232 has a transmit watch-dog timer circuit that unkeys your transmitter automatically after sixty (60) seconds. As you perform the following adjustments, unkey periodically, then rekey the transmitter by typing "K."

7. Enter the Calibrate mode by typing: "CAL <RETURN>."

8. Press the "K" key on the keyboard to key the transmitter. You should hear a continuous tone in the radio's monitor output.

9. Tap the space bar several times until you hear the lower pitched of the two tones ("mark").

10. Press "K" again to unkey the transmitter.

11. With the PK-232 keying the transmitter and transmitting the lower of the two tones, adjust the transmit audio level as follows:

    - Rotate the microphone gain control clockwise to about one-quarter open.

    - Turn the PK-232's rear-panel AFSK Output Level adjustment screw clockwise (CW) until until the ALC meter shows a small deflection from the unmodulated reading. Check the radio's plate current or output power indicators.

    - Adjust the AFSK Output Level control until the radio's indicators show approximately thirty percent (30%) of the manufacturer's rated full-power reading.

    EXAMPLE: If the manufacturer's plate current specification for CW operation is 200 mA, set the AFSK Output Level control and your microphone gain control so that the plate current indicates approximately 75 mA.

12. Type "K" to return to receive mode.

13. Type "Q" to "Quit" (exit) the calibration routine.

    You have now set the PK-232's transmit audio output level and your SSB radio's microphone gain control to an approximate correct level for all operating modes.

    NOTE: For CW, Mode A (ARQ) AMTOR and packet radio operation, the radio's microphone gain control can be adjusted to produce the full-power output plate current recommended by the radio manufacturer. These modes are "bursty" modes; the transmitter is keyed on and off automatically by the PK-232. The resulting duty cycle is much less than 100% and full-power operation is generally acceptable.

14. Set the PK-232's front-panel THRESHOLD control at approximately the two-o'clock position.

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.

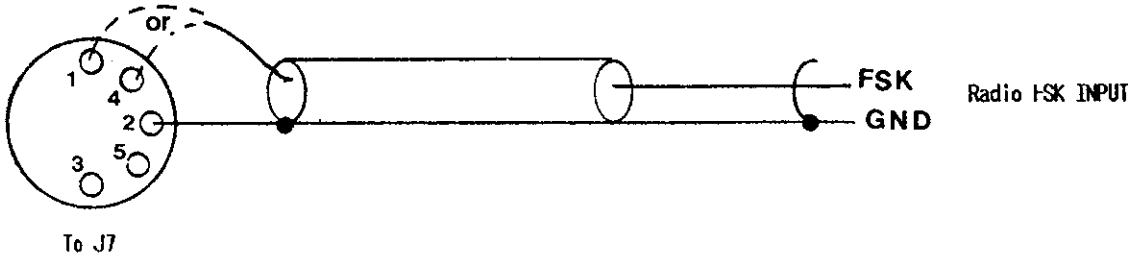

Figure 2-3 Connector J7 Pinout

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 connector.

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" position. 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 command 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.

- 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 environment and operating conditions.

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

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.

- If you type an unrecognized command:
  ?What?

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

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

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

  WARNING: BEACON too often

- 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:

- 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:

- "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;

- 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.

- 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.

- 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.

- 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.

- 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 x 16) + (11 x 1) = 27 (decimal)
  $120 = (1 x 256) + (2 x 16) + (0 x 1) = 288 (decimal)

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

- 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:

- The CFROM and DFROM commands allow you to specify from one to eight call signs for selective monitoring.
- You must separate multiple call sign lists with either blank spaces or commas.

Some examples will help you understand these explanations.

- BEACON EVERY|AFTER "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).

- 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 PK-232 Controller Messages

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 General Messages

```
AEA PK-232 Data Controller
Copyright (C) 1986 by
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 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 are using.

PK-232 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 is the message you receive 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 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.

?What?

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.

was

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.

?not while connected

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

?range

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

too many packets outstanding

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 Link Status Messages

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.

- 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.

- Link state is: DISCONNECTED

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

- 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.

- 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.

- 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.

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

  This message appears when your PK-232 switches from the "disconnected" 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.

- *** 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 station.

- *** 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.

- *** 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.

- *** <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 request if CFROM is set to NONE, or if you are already connected to another station.

- 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.

- 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 receive 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 inverted 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.

- 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 CW Identifier <CTRL-F>

In the Baudot and ASCII RTTY modes, you can insert the character specified 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.

Note: 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 Wide Shift (WIDESHFT)

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 Answerback (AAB)

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:

- you are sending to the proper station;
- 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.

- If you don't see your typing on your display, set ECHO to ON.
- 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.

- 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.

- 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 formatting 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 carriage return function without an associated line feed. This is also known as a "Zero-Index Carriage Return (ZICR)" function in word processing, 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:

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

- 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.

- 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.

- 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 command prefix. These terminals change display functions depending on the characters that follow the ESCAPE key.

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

- 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 Echo As Sent (EAS)

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 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>.

- You must be in the Command Mode to use TCLEAR.
- Use <CTRL-C> (default) command to return to Command Mode.
- 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.

- Morse Code
- Baudot RTTY
- ASCII RTTY
- AMTOR
- 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 message 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.

- Use AMTOR Mode A (ARQ - Automatic Request for Repetition) to answer another station's CQ call, or to set up a synchronous, interactive 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.

- 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 published 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 international 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 applications of ASCII, Baudot/Murray and AMTOR RTTY codes, see Appendix G.

2 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
```

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

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

- "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 specified 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 Western 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 received LETTERS-SHIFT character can be garbled, or another character can be wrongly interpreted as a FIGURES-SHIFT character. Many otherwise 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
```

- Type "X" to turn on your transmitter.
- Type "K" to enter the Converse Mode and begin the contact.
- Type <CTRL-D> to shut off your transmitter and return to Command Mode, OR
- Type <CTRL-F> to send your call sign in Morse and shut off your transmitter and return to Command Mode, OR
- Type <CTRL-C> to return to Command Mode.
- 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 comment 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" becomes "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 N?ML. 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 station, 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:

- Don't type "KKK" or anything like that!
- 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 partner 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 signals are being received, how the link is behaving.

- 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 reverse 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:

- 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.

- 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.

- 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
```

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

- 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.

- 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!

- 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.

- 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.

- 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:

- 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.

- 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.

- Without returning to Command Mode, type CTRL-D to stop transmission 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 receive 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 information on adjusting the PK-232's AMTOR timing characteristics to compensate 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:

- Try to work the distant station on Mode B (FEC) to establish that the other station's system is fully functional.
- Don't use VOX control - use the PTT line from your interface.
- Turn off the AGC circuit - use the RF gain control to prevent receiver blocking on stronger signals.
- Turn off all compression or other audio processing.
- Keep the AFSK audio input level to the microphone circuit as low as possible - avoid overdriving the audio input stages.
- 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:

- Remove large decoupling capacitors from the push-to-talk line to allow faster PTT (transmitter) activation;
- Improve power supply decoupling, especially in audio stages.
- 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 description 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" respectively. 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 process that sets up the "handshaking" between the two stations to insure error-free communications. Contacts or "connections" are ended by a disconnect process that leaves both stations free to start new contacts.

Packet connections can also use digipeaters - other packet stations that relay packets automatically from one station to another over a specified route. We're going to "connect" your PK-232 to itself to see how this works. You've already set the PK-232 up in loopback; therefore, your PK-232 will receive all the packets that it sends.

4.6.5 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.

MULT	Multiple	Lit when multiple connections exist
SEND	Send	Lit when PTT line is active
CONV	Converse	Lit when in the Converse Mode
CMD	Command	Lit when in the Command Mode
TRANS	Transparent	Lit when in the Transparent Mode
PKT	Packet	Lit when in the Packet Radio Mode
DCD	Data Carrier Detect	Lit when valid data signals received

4.6.5.1 LEDs at System Start or RESET

At system start-up or after selecting packet, your PK-232 shows its status on the front-panel LEDs:

STATUS: CMD lit
MODE: PKT lit

4.6.6 System Quick-Check - Loopback Test Connection

Try this using your own call sign. Type "CONNECT (MYCALL)"

```
cmd:CONNECT (MYCALL)
*** CONNECTED to (MYCALL)
```

The LEDs change to show your PK-232 in Packet Mode, in CONNECTED state and in CONVERSE Mode.

STATUS: CONV lit, CON lit
MODE: PKT lit

Your PK-232 sends special packets to set up a connection. These packets are now leaving your PK-232 on J7's Pin 1 and returning on Pin 2 without being transmitted over your radio.

4.6.6.1 Connect Message

"*** CONNECTED to MYCALL" shows that the connection is established. The CON LED is now lit; the "cmd:" prompt doesn't appear on the next line. You're connected to yourself in Converse Mode, ready to start talking. Try it. Type your message, ending the line with a <CR>:

```
Hello, there.
Hello, there.  (Underscore here indicates received data)
```

4.6.6.2 Send Packet Character

<CR> tells your PK-232 to form your typed characters in a packet and transmit them. (We'll explain in the "Command Summary" chapter how you can use a different character to send packets.) In the Converse Mode, everything you type is assembled into a packet addressed and sent to the station to which you're connected. If no connection (QSO) exists, the packet is addressed to "CQ", or whatever address you've typed into the "UNPROTO" field.

Your PK-232 entered Converse Mode automatically when the connection was established. You can also command the PK-232 to move back and forth between Command Mode and Converse Mode.

4.6.6.3 Return to Command Mode

Type <CTRL-C> (or whatever character you've previously set ($00-$7F)) to return to Command Mode. The PK-232 doesn't echo the <CTRL-C>, but you should immediately see a Command Mode prompt.

You can return to Command Mode with the <BREAK> key. BREAK is a break in transmission (not an ASCII character) - your keyboard may have it.

If <CTRL-C> interferes with or stops your terminal program and you can't send the BREAK signal, change the character that returns you to Command Mode. See "COMMAND" in the "Command Summary" chapter.

4.6.6.4 Return to Converse Mode

Type "CONVERSE" to return to Converse Mode.

```
<CTRL-C>
cmd:CONVERSE
Whatever I type in Converse Mode is transmitted.
Whatever I type in Converse Mode is transmitted.
<CTRL-C>
cmd:
```

4.6.6.5 Terminate the Link - Disconnect

Type "DISCONNE" (or "D") to terminate the link or connection. Your PK-232 transmits a special packet that ends the contact and notifies you when the link is disconnected:

```
cmd:DISCONNE
*** DISCONNECTED: (call sign)
```

An actual QSO may be terminated by the other station. In that case, you'll see the *** DISCONNECTED (call sign) message without having typed the command at your station.

You've now run through the basic operations of a packet QSO:

- o You connected to the desired station to begin the QSO.
- o You sent and received messages.
- o You disconnected from that station at the end of the QSO.

4.6.7 Your First Packet QSO!

There are more features you should be familiar with for comfortable packet operation - but you're probably eager to get on the air and try your PK-232, so here goes!

Try to arrange with an experienced packet operator to help you get started. Be sure that your partner is close enough to ensure solid noise-free copy for your first "on-the-air" QSO.

4.6.7.1 System Cable and Switch Check

Before actually trying your first connection (QSO), take one more minute to verify your system setup:

1. Remove the loopback test cable from the "RADIO-2" connector.
2. Set the front-panel "RADIO-1/RADIO-2" switch to "RADIO-1."
3. Connect your radio to your PK-232 using the "RADIO-1" jack.
4. Be sure you've adjusted your PK-232 and your radio using the "Quick Start" procedure described earlier in this manual.

4.6.7.2 Starting the QSO

You're ready to try connecting! We'll use WX2BBB in place of your call sign, and WX6FFF for your partner's call sign. Type <CTRL-C> to verify that you're in Command Mode. Now type "CONNECT WX6FFF" after the CMD: prompt. After a moment you should see:

*** CONNECTED to WX6FFF

You've begun your first QSO! Both you and your partner will be automatically switched to Converse Mode. Your partner will see:

*** CONNECTED to WX2BBB

Exchange several messages to get the feel of packet radio. Watch your radio's transmit indicators and if possible, listen to the audio from both radios; you'll get a better idea of what's happening. Your radio is inactive most of the time, even while you're actually typing.

When you get to the end of a line and type <CR>, your radio is keyed briefly. Your partner hears "brrrraaaap" on his speaker. As your message is displayed on his computer, his radio will be keyed for an even shorter burst; you'll hear "brraap" on your speaker. This is ACK, the packet acknowledgment coming back.

Your PK-232 notes that the packet was received correctly, but displays nothing on your screen. This is normal operation. If your system still had any unacknowledged packets outstanding, your PK-232's "STA" (Status) LED would be lit - but it's not. (Unless you set MONITOR to a value higher than "4", you won't display the "ACK" frames.)

4.6.7.3 What If....?

If you have trouble connecting, take a few minutes to check each of the following items. Verify that:

- Your PK-232's AFSK Output Level control, your microphone gain and deviation are set properly as shown and discussed in Section 2.5.
- All cables and connectors are properly installed.
- The RADIO-1/RADIO-2 switch is set for your cable-to-radio setup.
- Your radio's volume and squelch are set for local conditions.
- You're in Command Mode. (Type "<CTRL-C>" to confirm this. You must see the "cmd:" prompt.)
- If the "cmd:" prompt doesn't appear, press the PK-232's POWER switch off and then on again. You should get the normal sign-on message.
- Your PK-232 is in Packet Mode. Type "OP" to confirm this.
- "HB" is "1200" if on VHF, "300" if on HF.
- "VHF" is "ON" if on VHF, "OFF" if on HF.
- "CFROM" is set to ALL.
- Move to an unused channel for "on-the-air" testing (simplex FM!).

Ask one of your area's more experienced packet operators to listen to your transmissions and monitor with his TNC. Both you and your partner should set MONITOR and MCON to "5", enter Converse Mode and send some packets. Each station should display packets sent by the other.

- o If only one station is "hearing" properly, concentrate on the modulator and transmitter of that station and the demodulator and receiver of the other station.
- o Experiment with the TXDELAY timing parameter for the sending TNC. Set TXDELAY 64 for a long delay. If this solves the problem, decrease TXDELAY to the smallest value that works all the time.

4.6.8 Automatic Operation

Your PK-232 offers a variety of automatic operating features including beacon operation, digipeater function and auto-answer messages.

Your packet station can be a digipeater for relaying packets to a more remote destination. Functions like the "connect message" take care of situations not readily solved in modes other than packet. See the "Command Summary" chapter for full details on your PK-232's commands.

4.6.8.1 Beacon Operation

Your PK-232 can send an automatic "Beacon" message at specified time intervals. A beacon can send special announcements, or send the "mail for" list in a bulletin board operation. The values "0" to "250" set the beacon timing in 10-second intervals. "0" turns off the beacon.

- o Set your beacon text using the BTEXT command.
- o Set the beacon timing interval using the BEACON EVERY or BEACON AFTER command.

For example, to transmit your beacon at 15-minute (15 X 60 seconds) intervals, type:

```
cmd:BEACON EVERY 90 (Beacon is sent every 900 seconds)
cmd:BEACON EVERY 0  (Beacon is disabled)
```

"EVERY" sends your beacon text at regular intervals. "AFTER" sends your beacon once after the specified time interval without any packet activity on the channel.

A beacon frame may be sent directly, and also sent via the digipeat addresses specified by the UNPROTO command.

Proper beacon timing avoids cluttering a busy channel with unnecessary transmissions. In the early days of packet radio, the beacon was very useful to show your presence on the empty packet channels. With the growth of packet radio, many users feel that beacons have outlived their usefulness and may be a source of interference to good traffic flow. Use your beacon with consideration for others on the channel.

If you set the BEACON timing at a value considered too small for busy channels (less than "50"), you'll see:

WARNING: BEACON too often

This warning appears in the Command Mode each time you type a command to remind you that your beacon interval is too short; your beacon may be bothering other channel users, and it needs your attention.

4.6.8.2 Will You Accept Connections?

CFROM determines if call requests are accepted or rejected, which are accepted and which are rejected. CFROM works with four arguments: "all", "none", "yes" and "no".

"ALL" and "NONE" are used alone and work this way:

- ALL - your PK-232 accepts connect requests from all callers;
- NONE - your PK-232 rejects connect requests from all callers.

"YES" and "NO" work with a list of call signs:

- YES (list) - up to eight call signs whose call requests will be accepted;
- NO (list) - up to eight call signs whose call requests will be rejected.

CFROM's default argument is "all". This means that your PK-232 will normally accept connect requests from any station that sends you a connect request.

Type "CFROM NONE" to reject connect requests from all stations. If your PK-232 receives a connect request when CFROM is set to NONE, your monitor displays:

*** Connect request: <call sign>

Your PK-232 sends the calling station a DM packet, or "busy signal." The caller sees:

*** MYCALL busy
*** DISCONNECTED: (call sign)

You can set the CFROM field to accept or reject call requests from specific stations.

To accept calls from one or more specific stations:

- type CFROM YES (plus a list of calls signs). Connect requests will be accepted only from listed callers.

To reject calls from one or more specific stations:

- o type CFROM NO (plus a list of call signs). Connect requests will be rejected only from stations whose call signs are listed.

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
```

You can include SSIDs 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 only 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 "%," "&," or "OFF" as arguments.

Error messages will result from invalid commands. Here are some examples:

```
cmd:cfrom all w2jup
?too many                (calls not allowed with ALL or NONE)

cmd:cfrom no
?not enough              (NO and YES require call sign list)

cmd:cfrom w2jup
?need ALL/NONE/YES/NO    (Calls must follow YES or NO)
```

4.6.8.3 Are You Available to Chat?

Set CMSG ON (default is OFF) and use the CTEXT command to enter the sort of a message you might put in a telephone answering-machine. If you're not available to answer connect requests, your PK-232 automatically sends the CTEXT message to each station that connects to your system.

The CTEXT message can be any text string up to 120 characters. You can include <CR>s by prefixing them with the pass character (CTRL-V is the default):

```
cmd:CTEXT Sorry, I can't talk right now.<CTRL-V><CR>
I'll be on the air again after 8 PM.<CTRL-V><CR>
Joe
```

CFROM must be set to ALL (default) so that the connection takes place in order that this message be sent to stations connecting to you.

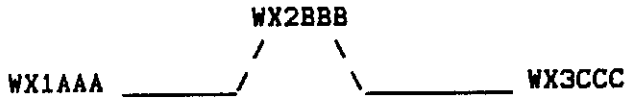
4.6.8.4 Do You Want to Transmit?

If you want to leave your station on to monitor and perhaps record the activity on the channel, but prevent your station from transmitting, set XMITOK OFF. In this case, you would probably want to set CFROM to NONE as well.

Type "XMITOK OFF"
Type "CFROM NONE"

4.6.9 Digipeater Details

You may wish to connect to a packet station that is beyond your direct radio range. If a third packet station is on the air and both you and the station you want to talk to are in range of that third station, the third station can relay or "digipeat" your packets. You set up the "digipeater" routing when you request the connection. Your PK-232 automatically includes the necessary routing information in the transmitted packets. Here's a sketch that shows how digipeating can solve problems:



You are station WX1AAA - you want to have a packet QSO with WX3CCC. But there's a mountain between you and WX3CCC; you're out of simplex range of each other. However, you know that there's a packet station located on the ridge - WX2BBB - which is in range of you and WX3CCC.

Instruct your PK-232 to set up a connection to WX3CCC using WX2BBB as an intermediate digipeater. After the "cmd:" prompt, type: "CONNECT WX3CCC VIA WX2BBB."

You can specify a routing list of up to eight intermediate stations. For example, consider a modification of the example above:

WX2BBB has turned off his station, but you can still contact WX3CCC by going around the mountain through WX4DDD and WX5EEE. This time, type the connect command like this:

cmd:CONNECT WX3CCC VIA WX4DDD,WX5EEE

Type the digipeaters' call signs in the exact order of the intended path from your station to the station with which you wish to connect.

4.6.9.1 Are You a Digipeater?

Your packet station can be a digipeater for other stations. You don't have to "do" anything - your PK-232 digipeats other stations - unless you tell it not to! (See the DFROM command in the Command Summary.)

The default argument of DFROM is "all". If your transmitter is keyed when you're not using it, or during lulls in your own conversations, you're being used as a digipeater by some other stations. This won't bother your chat with your partner.

Set MDIGI to ON (default is OFF). The packet headers on your monitor will show the call signs of the stations using you as a digipeater, and the data being transmitted.

If MRPT is ON (default), you'll also see your call sign in the packet header, showing the exact digipeater path in which you're included. The call sign of the station whose packet is being decoded is flagged with as asterisk. Here's a sample taken with Monitor 4 (default), MDIGI ON and MRPT ON:

```
W2HPM*>W2JUP-2>W2PEE:
What time is the meeting?
W2PEE*>W2JUP-2>W2HPM <RR>
```

4.6.9.2 Do You Want to be a Digipeater?

Many packeteers allow (and even encourge) the use of their stations as digipeaters to provide a simple form of "networking" for the area's packet community. If local circumstances prevent you from being a digipeater, you can disable the digipeat function.

DFROM's default argument is "all". This means that your PK-232 will normally repeat packets from any station that includes your station's call sign in their digipeat path.

Type "DFROM NONE" if you don't want to be used as a digipeater.

DFROM determines if your station will digipeat other stations, and which stations packets will be digipeated.

DFROM works with four arguments: "all", "none", "yes" and "no".

"ALL" and "NONE" are used alone and work this way:

- ALL - your PK-232 will repeat packets from any station;
- NONE - your PK-232 will not repeat packets from any station.

"YES" and "NO" work with a list of call signs:

- YES (list) - call signs of up to eight stations whose packets will be repeated;
- NO (list) - call signs of up to eight stations whose packets will be not be repeated.

To repeat packets from one or more specific stations:

- o type DFROM YES (plus a list of calls signs). Packets will be repeated only from listed callers.

To block packets from one or more specific stations:

- o type DFROM NO (plus a list of call signs). Packets will not be repeated only from stations whose call signs are listed.

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
```

You can add SSIDs as "-n" after the call sign. If DFROM is set to "no N7ML" or "yes N7ML", any combination of N7ML, N7ML-1,...N7ML-15 will be matched and processed. If DFROM is set to "yes N7ML-1" or "no N7ML-1", then only N7ML-1 will match and be processed.

Clear DFROM with "%," "&," or "OFF" as arguments.

Error messages will result from invalid commands. Here are some examples:

```
cmd:dfrom all w2jup
?too many                (calls not allowed with ALL or NONE)

cmd:dfrom no
?not enough              (NO and YES require call sign list)

cmd:dfrom w2jup
?need ALL/NONE/YES/NO    (Calls must follow YES or NO)
```

4.6.10 Unsuccessful Connections and Retries

Sometimes your connect request can't be completed; the desired station may not be on the air, it might be out of range, or you could have mis-typed the other station's call sign. If your PK-232 does not get a response to its first connect request packet, it will try again.

Use the RETRY command to control the number of times your PK-232 will repeat the connect request. The default value is 10. If your PK-232 doesn't get an ACK after that number of repeats, it quits and shows:

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

4.6.10.1 Retries While Connected

The same retry mechanism and count continues after the connection is established, you're in Converse Mode and the QSO has started. Each packet frame sent by your PK-232 must be "acknowledged," or ACKed by the other station, and vice versa. "ACK" means that the packet was received correctly at the distant station; the error-detection protocol indicated it was received without errors. (This is how packet radio provides error-free communication.)

Sometimes a packet won't be received correctly by the other station, because of collisions with packet signals from other stations, or because of channel noise. If your PK-232 doesn't get an ACK within a specific time, it sends the same packet again and increments the retry count. If the count set by RETRY is exceeded, your PK-232 disconnects and displays:

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

The automatic disconnect feature avoids excessive retransmission of useless packets. If, for example, the other operator turns off his station without disconnecting, or your path is through a digipeater that is shut down, or the RF channel deteriorates to the point of being unusable, the disconnect prevents a "hopeless" condition from tying up the channel.

If you are operating under special conditions such as a marginal HF channel, you can set RETRY to 0 (zero) to disable all automatic disconnects - the retry attempt is not limited.

4.6.11 Monitoring Activity on the Channel

In addition to displaying data from the station to which you're connected, you can monitor all packet activity on the channel, "read the mail," display packets "flying" between other stations. Your PK-232 will also keep track of stations heard on the channel. This section describes the monitor functions.

4.6.11.1 Monitoring Other Stations

Use the MONITOR parameter to determine how monitoring is to be done; what stations will or will not be monitored and the type and amount of information shown by the monitor.

"MONITOR" takes a numerical value between "0" (zero) and "6." Each higher number adds more detail to your monitoring. As the value of MONITOR settings is increased, additional functions are included in the monitoring sequences.

The meanings of the MONITOR numbers are:

0 Monitoring is disabled.

1 Only unnumbered, "unconnected" frames are displayed. Use this for an "unproto", round-table type QSO. Other connected stations using the frequency are not displayed. This setting will also display beacons.

2 Numbered (I) frames are also displayed. I-frames are numbered in order of generation and appear in a connected transmission. Use this to monitor connected conversations in progress.

3 Connect request ("C") frames and disconnect ("D") frames are also displayed with the headers.

4 This is your PK-232's default value. Unnumbered acknowledgement (UA) of connect and disconnect frames are also displayed with either the characters "UA" or "DM" and a header.

5 Receive Ready (RR), Receive Not Ready (RN), Reject (RJ), Frame Reject (FR) and I-Frames (I) are also displayed.

6 Poll/Final bit and sequence numbers are also displayed.

Before this next step, verify that your loopback test cable is still connected to the PK-232's "RADIO-2" rear-panel receptacle, and that the front-panel RADIO-1/RADIO-2 switch is still set to "RADIO-2."

Type: "<CTRL-C> D <RETURN>" to make sure you're DISCONNECTED.

Type "MONITOR 4". Your PK-232 responds with: MONITOR was 4.

Type "CONVERSE", then type: "This is a test packet."

Your monitor now shows:

MYCALL>CQ:This is a test packet.

Because the "UNPROTO" parameter is defaulted to the address "CQ", your packets are sent to "CQ," - you're not connected to any other station. Your packet was "heard" by your PK-232 and displayed with the packet header containing the sending station's call sign and the destination.

4.6.11.2 Monitoring Digipeaters - The MRPT Command

Set MRPT ON to see any digipeater stations being used. This feature is useful if you want to connect to a station you're monitoring and need to know a digipeater route in order to reach it. For example, you might see the following:

```
WX1AAA*>WX2BBB>WX3CCC:Hello, Bill!
```

This packet went from WX1AAA via WX2BBB to WX3CCC. The "*" shows you which station you actually heard. If your PK-232 had decoded the packet from WX2BBB, the display would have shown:

```
WX1AAA>WX2BBB*>WX3CCC:Hello, Bill!
```

If several digipeaters are active, or if the message lines are long, the display may be difficult to read. You can put the header on a separate line from the text by setting HEADERLN ON:

```
WX1AAA*>WX2BBB>WX3CCC:
Hello, Bill!
```

4.6.11.3 Monitoring Other Stations While Connected

Use the MCON command for selective monitoring of other traffic on the channel while connected to a distant station. MCON works like MONITOR, but affects your display while in the connected state. As the value of MCON is increased, additional functions are included in the monitoring sequences.

Your PK-232's default (MCON 0) tells your system not to show packets from other stations while you are connected to any station. This lets you converse without interruption and confusion caused by the mixture of everyone else's packets and those of your partner.

You might use MCON set to 1 to monitor the "mail list" beacons from a PBBS while holding connected conversations with your partners on the channel. Whenever a beacon is sent, that message is displayed while you're connected to another station. (See previous sections.)

4.6.12 Selective Monitoring

The MFROM, MTO and MONITOR commands provide monitor features not previously available. You can use these commands in combination to display or mask traffic to and from any stations or combination of stations as required. One example would be to inhibit display of a busy PBBS while you're monitoring other conversations.

4.6.12.1 The MFROM Command

MFROM uses arguments to determine how your PK-232 monitors packet channels and displays information - which stations' packets will be displayed and which stations' packets will be masked or hidden.

MFROM is set to "all" when you start your PK-232 for the first time.

Type MFROM to display the ALL/NONE/YES list/NO list status of call signs of stations from whom packets will or will not be displayed. You can use the abbreviated command form or mnemonic:

```
cmd:mfrom
MFROM    all

cmd:mf
MFROM    yes WX1AAA,WX2BBB,WX3CCC,WX4DDD
```

To stop any packets from being displayed, type MFROM NONE. This has the same effect as setting MONITOR to 0 (zero).

To display packets only from one or more specific stations, type MFROM (YES followed by a list of calls signs). Only packets from stations whose call signs are listed after YES will be displayed.

To hide or mask packets only from one or more specific stations, type MFROM (NO followed by a list of call signs). Only packets from stations whose call signs are listed after NO will not be displayed.

You can add optional SSIDs specified as "-n" after the call sign. If MFROM is set to "no N6IA" or "yes N6IA", any combination of N6IA, N6IA-1,...N6IA-15 will be matched and processed. If MFROM is set to "yes N6IA-1" or "no N6IA-1", then only N6IA-1 will match and be processed.

When MFROM and MTO contain different types of arguments, to avoid any possible conflict, the arguments take the following priority:

ALL, NO list, YES list, NONE

Clear the MFROM field by typing "%," "&," or "OFF" as arguments.

Error messages will result from invalid commands. Here are some examples:

```
cmd:mfrom all w2jup
?too many                (calls not allowed with ALL or NONE)

cmd:mfrom no
?not enough              (NO and YES require call sign list)

cmd:mfrom w2jup
?need ALL/NONE/YES/NO    (Calls must follow YES or NO)
```

4.6.12.2 The MTO Command

MTO uses arguments to determine how your PK-232 monitors the packet channels and displays information - which stations' packets will be displayed and which stations' packets will be masked or hidden. MTO is set to "none" when you start your PK-232 for the first time.

Type MTO to display the ALL/NONE/YES list/NO list status of call signs of stations to whom addressed packets will or will not be displayed. You can use the abbreviated command form or mnemonic:

```
cmd:mto
MTO     all

cmd:mt
MTO     yes WX1AAA,WX2BBB,WX3CCC,WX4DDD
```

To stop packets addressed to all stations from being displayed, type MTO ALL.

To display only packets addressed to one or more specific stations, type MTO (YES followed by a list of calls signs). Only packets addressed to stations whose call signs are listed after YES will be displayed.

To hide or mask packets addressed to one or more specific stations, type MTO (NO followed by a list of call signs). Only packets addressed to stations whose call signs are listed after NO will be hidden or masked.

You can add optional SSIDs specified as "-n" after the call sign. If MTO is set to "no WB9FLW" or "yes WB9FLW", any combination of WB9FLW, WB9FLW-1,...WB9FLW-15 will be matched and processed. If MTO is set to "yes WB9FLW-1" or "no WB9FLW-1", then only WB9FLW-1 will match and be processed.

When MFROM and MTO contain different types of arguments, to avoid any possible conflict, the arguments take the following priority:

ALL, NO list, YES list, NONE

Clear MTO with "%," "&," or "OFF" as arguments.

Error messages will result from invalid commands. Here are some examples:

```
cmd:mto all w2jup
?too many                 (calls not allowed with ALL or NONE)

cmd:mto no
?not enough               (NO and YES require call sign list)

cmd:mto w2jup
?need ALL/NONE/YES/NO     (Calls must follow YES or NO)
```

4.6.12.3 The MCON Command

Use the MCON command for selective monitoring of other traffic on the channel while connected to a distant station. Use this feature to have your PK-232 "listen" for a specific station while you are connected to and conversing with someone else.

Set MCON to "0" or "OFF" to monitor packet activity when your station is not connected, but have all monitoring automatically cease when you are connected to someone.

MCON works like MONITOR but affects your display while connected. As MCON settings are increased, more functions are added in monitoring sequences. The meanings of the parameter values are identical to those shown under the MONITOR command.

4.6.12.4 The MFILTER Command

Use the MFILTER command to "filter" selected characters from packets received. For example, you can command your PK-232 system to filter out form feeds, bell characters, or extra <LFs> that may be sent by the station with which you're connected, but which may interfere with your display or otherwise disturb your operations. You can specify up to four characters by giving the ASCII character codes in hex or decimal. Some examples follow:

- To prevent a <CTRL-L> character from clearing your screen, set MFILTER to 12.
- To eliminate <CTRL-Z> characters, which some computers interpret as end-of-file markers, set MFILTER to 26.
- To prevent <CTRL-G> characters from "beeping" your computer or terminal, set MFILTER to 7.

Enter the ASCII or hexadecimal values of the selected characters separating each value with a comma:

```
cmd:MFILTER $07, $13
```

4.6.12.5 The MHEARD Monitor Buffer

Use the MHEARD command to display a list of stations heard since the last time your PK-232 was powered up, or since the last time the MHEARD buffer was cleared.

Clear the MHEARD buffer by typing either a "percent sign" (%), an ampersand (&), "N", "NO", "NONE", or "OFF" after the command word.

- Stations that are heard directly are marked with a "*".
- Stations heard through a digipeater are not marked.

Entries in the "heard" report are also time stamped if the date and time has been set. The PK-232's time is updated continuously as long as it is powered.

4.6.12.6 MSTAMP - The Monitor Time-Stamp Command

Monitored packets can be time-stamped if DAYTIME has been set. To enable this function, set MSTAMP ON. You can also time-stamp connect and disconnect messages with the command CONSTAMP ON.

- If DAYSTAMP is OFF, CONSTAMP and MSTAMP show only TIME.
- If DAYSTAMP is ON, the DATE is included in CONSTAMP and MSTAMP.

Set DAYSTAMP ON when you want a dated record of packet channel activity, or when you're unavailable for local packet operation.

4.6.12.7 DAYTIME - Set the Real-Time Clock

You can activate the PK-232's real-time clock by setting the date and time with the command DAYTIME. Once you have set the clock, you can request the time by entering DAYTIME with no parameters. If you have turned off your PK-232 since the last time you entered DAYTIME, DAYTIME will have to be reset.

The clock is not set when the PK-232 is turned on. The DAYTIME command will display the following error message:

```
?clock not set
```

You must reset the 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.

```
DAYTIME  08-Jul-86  06:57:33
```

The format for entering the date and time is "yymmddhhmm", 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)
cmd:daytime 8607080659
```

4.6.13 Packet Formatting

The PK-232 uses some special characters to control its operations. Many of these special characters can be used to "edit" commands and text as you type. You can "personalize" these features to suit you and your computer. Most of the special input characters are active in both Command and Converse modes; any exceptions will be noted.

Some of your PK-232's command parameters affect how your packets are formatted - how your typing appears to the rest of the world. Other commands let you correct typing errors before your packet is sent, cancel lines, cancel entire packets if necessary.

If the default command character is unsuitable for your computer's terminal program, you can redefine each function using any ASCII character appropriate to your needs.

See the "Command Summary" chapter for full details on how to define these formatting and control features and commands.

4.6.13.1 PACLEN - Long or Short?

PACLEN sets the maximum length of your packet - the largest number of typed characters that can fit in one packet. If you type more than the maximum number of characters (default 128) without typing a "send-packet" character (default <CR>), your PK-232 will send a maximum-length packet.

In Transparent Mode, a packet is sent if the maximum number of characters is typed before the delay set by PACTIME forces a packet to be sent.

NOTE: Some other packet systems may not be able to accept packets longer than 128 characters.

4.6.13.2 Backspace and Delete

You can erase typing errors with your <BACKSPACE> key. If your terminal lacks <BACKSPACE>, set DELETE ON to erase characters with the <DELETE> key; set DELETE OFF to use the <BACKSPACE> key.

You'll probably want to use the same key your computer normally uses to "rub out" typing. <BACKSPACE> is more common than <DELETE> on personal computers. If you aren't sure what your rub-out key does, try both settings of the DELETE command and see which works.

When you rub out typing errors, your PK-232 tries to correct the screen display. This works with most computers and display-type terminals. It won't work for hardcopy-type terminals. If your display doesn't look right after you rub out a character, try setting BKONDEL OFF. Your PK-232 won't correct the display but will show the rub-out with a "\" character (<BACKSLASH>). Restore the display correction by setting BKONDEL ON.

4.6.13.3 Cancel Line

If you make several mistakes in a line, or if you change your mind, you can cancel the whole line rather than rubbing out the characters one at a time. Your monitor displays a <BACKSLASH> and a <CR>.

Type <CTRL-X> to cancel the line. If you're in Command Mode, a new prompt appears:

```
cmd:Hi, John, how are you?<CTRL-X>\
[You started typing text while in Command Mode.]
cmd:CONVERSE
Hi, John, how are you?
```

4.6.13.4 Redisplay

If you've erased and retyped lots of characters, you may want to see "fresh" input, especially if BKONDEL is OFF. Your PK-232 shows the line you're entering when you type <CTRL-R>:

```
cmd:CONNECT KB7\\\WA7<CTRL-R>\
[You mis-typed the call sign.]
cmd:CONNECT WA7GXD
```

Here you mis-typed the first letters of the call and rubbed them out. The PK-232 displayed "\" for each letter erased. You then retyped the call and re-displayed the characters on the new line.

4.6.13.5 XON/XOFF, START/STOP - Display Flow Control

Type <CTRL-S> to stop the display if your monitor scrolls the data faster than you can read it. Type <CTRL-Q> to resume output from the PK-232 to your computer.

4.6.13.6 The PASS Character

You may want to include a special input character in a packet. For example, to send several lines in the same packet, you must include <CR> at the end of each line, bypassing its "send-packet" function except at the intended end of the packet. You can include any character in a packet (including all special characters) by prefixing that character with the pass character, <CTRL-V>:

```
I wasn't at the meeting.<CTRL-V><CR>
What happened?
```

Without the PASS character, this message would go as two packets. By prefixing the first <CR> with <CTRL-V>, you send it all at once, but maintain the <CR> in the text.

4.6.13.7 More Carriage Returns and Line Feeds

If you've set the "send-packet" character to <CR>, you'll probably want the <CR> to be included in the packet for display at the other end.

If you set the send-packet character to a non-printing character, you'll probably want that character to be treated only as a command. The ACRPACK command determines whether the "send-packet" character is echoed and included in the packet.

You can add a <LF> after the <CR> in your packets by setting ALFPACK ON. If the other station reports that lines are overprinted on his display and he can't change it at his end, set ALFPACK to ON.

These formatting features and commands are described in full detail in the "Command Summary" chapter.

4.6.14 Multiple Connections

Multiple-connection capability is a very powerful addition to your PK-232's "bag of tricks" that can be very useful for traffic net operation, multi-user bulletin board and host computer systems, path checking and just plain "round-table" ragchews.

A multiple connection isn't the same as a "multi-way" contact. In a multiple connection, you can establish separate "point-to-point" links with several different stations. In a multi-way contact (this feature isn't available yet), several stations are simultaneously connected to each other, a network in which each station sees all of the data passed from any station in the group, with full error correction in effect.

4.6.14.1 Default Multiple-Connect Conditions

At start-up time and until changed by the user, your PK-232 defaults to the following multiple-connect conditions:

CONPERM	OFF
CHCALL	OFF
CHDOUBLE	OFF
CHSWITCH	$00
USERS	1

These defaults set your PK-232 to operate exactly as would a TNC without the multiple-connect feature. The key to setting "normal" operation is the value USERS = 1.

4.6.14.2 Multiple-Connect Active - The USERS Command

The USERS command affects only the manner in which incoming connect requests are handled, and has no effect on the number of connections you initiate with your PK-232.

A numerical value"n" from 0 to 10 specifies the number of active simultaneous connections that can be established with your PK-232. For example:

USERS 0	allows incoming connections on any free logical channel
USERS 1	allows incoming connections on logical channel 0 only
USERS 2	allows incoming connections on logical channels 0 and 1
USERS 3	allows incoming connections on logical channels 0, 1 and 2

and so on, through USERS 10.

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 characters 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 frequently 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 keyboard 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 reinitializes 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:

- 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.

- 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 computers 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.

- The XON and XOFF commands define the characters sent to the computer by your PK-232.
- 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 available, set TXFLOW ON and XFLOW ON to activate the XON and XOFF characters (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.

- Type "CONVERS" (or just "K") to enter Converse Mode.
- Type "TRANS" (or just "T") to enter Transparent Mode.

If you're in Command Mode when another station connects to your station, 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.

- CONMODE TRANS automatically selects Transparent Mode
- 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 transfer 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 successful 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.

- 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 Display Features in Converse Mode

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

COMMAND	DESCRIPTION
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 Transparent Mode

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 "special" characters do not exist - everything you type (or everything your computer sends to your PK-232) is transmitted exactly as it is received by your PK-232.

5.4.2.1 Input Editing and Packet Timing

Transparent Mode does not permit input editing. The send-packet character 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 Display Features in Transparent Mode

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 Escape or Exit from Transparent Mode

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.

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

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.

- Set AX25L2V2 ON to operate in Version 2.0
- 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 protocol 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 conditions:

- The packet must start with a flag field.
- 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 protocol; 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:

- Time delay between the moment that your PK-232 keys your transmitter's PTT line and your transmitter delivers power to your antenna.
- Time required for the distant station's receiver to recover full sensitivity and overcome squelch/AGC rise-time characteristics.
- 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 properly 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. However, the extra key-up delay is not required if the repeater has not had time to "drop" since the last transmission.

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

- 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.

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

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

  ?What?

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

  ?bad

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

  ?range

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

  WARNING: BEACON too often

- 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:

- Command name
- Command abbreviation or mnemonic
- Default value
- 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:

- 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:

- "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.

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

- 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.

- 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.

- 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.

- 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:

- 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 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.

- 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; 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:

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

The following examples will help you understand these explanations.

- 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).

- 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 Using Commands Without Arguments

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 command 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.

vas

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 message, the previous text entry is not changed.

?too many

You typed 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
```

?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.

- 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 disconnected state, your monitor displays the link status but takes no other action.

The following messages appear in response to the CONNECT command.

- 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.

- 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.

- Link state is: DISCONNECTED

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

- 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.

- 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 disconnected state.

- 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.

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

  This message appears when your PK-232 switches from the "disconnected" 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.

- *** 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.

- *** 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.

- *** 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.

- *** <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 request if CFROM is set to NONE, or if you are already connected to another station.

- 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.

- 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.
"NO"	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 received from the terminal is removed before the characters are transmitted 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.

- 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 desirable 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 receiving 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.

- 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 idling 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

Parameters:

"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.

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

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

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.

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

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

- If the distant station reports overprinting of lines on his display, 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 following 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.

- 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:

- When retransmitting text received from another station; for example, 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 Teletype 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.

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.

- 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.

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

- 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.

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

- 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.

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

- If the person you are talking to reports overprinting of packets from your station set ALFPACK ON. Character insertion is disabled 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 return 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.

- 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:

- When retransmitting text received from another station; for example, 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 Teletype® 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.

- 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 depends 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 responding 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 transmitter in the three-character AMTOR ARQ burst sequence. If the distant 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 alphabets 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.

- 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 executable files or other special data.

- Set AWLEN to 8 and use the Transparent Mode.

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

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

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" MODE: Packet	Mnemonic: AXD	Default: 0

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 addition 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-millisecond 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 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.

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 EVERY|AFTER "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.

- A beacon frame contains the text that you've typed into the BTEXT message in a packet addressed to "CQ" or other UNPROTO address.
- A beacon frame may be sent directly, and also sent via the digipeat addressees 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 testing purposes.

When AFTER is specified, a beacon is sent after n times 10 seconds have passed without packet activity.

- 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.

- 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.

- 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.

- Set BKONDEL ON if you're using a video display terminal or computer.

On a printing terminal the <BACKSPACE><SPACE><BACKSPACE> sequence will result in overtyped text.

- 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 MODE: Packet	Mnemonic: BT	Default: Empty (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 default text is an empty string (no message).

- Beacon packets are discussed in more detail under the BEACON command.

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>

- 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
```

- 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.

- Don't type your call sign in BTEXT - the normal packet header shows it for you.
- Don't fill your BTEXT with screen graphics such as asterisks, parentheses, colons and semicolons, etc. Use BTEXT for some significant information.
- 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.
- 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" Mnemonic: CAN Default: $18 <CTRL-X>
MODE: Packet

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.

- You can enter the code in either hex or decimal.

For example:

- CANLINE $15 (hex)
- 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.

- You can cancel only the line you are currently typing.
- Once <CR> has been typed, you cannot cancel an input line using the cancel-line character.
- 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.

- 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.

- 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 character, any characters that would be typed on the screen (except those echoed) are "thrown away" by the PK-232.

- Typing the cancel-output character a second time restores normal output.
- 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.

- 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 terminal with the "*** CONNECTED to (call sign)" message.

OFF - BELLS are NOT sent with the CONNECTED message.

- Set CBELL ON if you want to be notified whenever someone connects to your station.
- 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 following 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

Parameters:

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 all 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 accept calls from one or more specific stations, type CFROM (YES followed by a list of calls signs). Connect requests will be accepted from stations whose call signs are listed.

To reject calls from one or more specific stations, type CFROM (NO followed by a list of call signs). Connect requests will be rejected 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 only 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 "%," "&," 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 opposed 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 monitoring 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
:01UNreal 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
:01unreal 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|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 "|":

|| this is a test.

The sending station actually transmitted:

| this is a test.

The same frame received with CHDOUBLE OFF would be displayed as:

| 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.

- 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.

- 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.

- The outgoing channel cannot be changed while active or "on-line" in TRANSPARENT mode.
- 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.

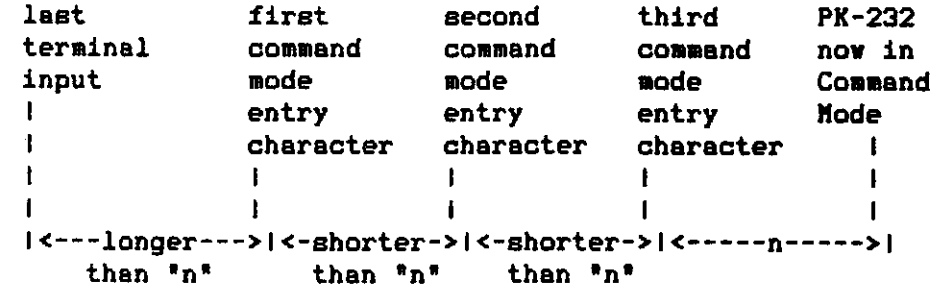
CMDTIME sets the timeout value in Transparent Mode. A guard time of "n" seconds allows escape to Command Mode from Transparent Mode, while permitting any character to be sent as data.

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.

- The Command Mode entry character is set by COMMAND.
- 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.
- After a final delay of "n" seconds, the PK-232 exits Transparent Mode and enters Command Mode.
- You will then see the normal Command Mode prompt:

  cmd:

The following diagram illustrates this timing:



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 distant 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).

- Set CMSG ON to tell callers that you're not available to answer calls manually when they connect to your PK-232.

- 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.

- 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 Converse Mode when a connection is established.

TRANS - Your PK-232 automatically enters Transparent Mode 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.

- Set CONMODE to CONVERS for most packet operations.
- Set CONMODE to TRANS if you are using Transparent Mode for a bulletin board program, so that the correct mode will be entered when your bulletin board receives a connect request.
- 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 connect 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 conditions such as:

- Certain networking applications
- Meteor scatter
- 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.

- 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 processed and transmitted by your radio.

- 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 periodically as they are in Transparent Mode. Local keyboard editing and display features of the Converse Mode are available; software flow control can be used.

- See the PACTIME command, (which controls the rate and mode of packet assembly) for a discussion of how periodic packetizing works.
- 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.
- 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.
- 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

```
cmd:cs
Ch. 0 - IO DISCONNECTED
Ch. 1 -    DISCONNECTED
Ch. 2 -    DISCONNECTED
Ch. 3 -    DISCONNECTED
Ch. 4 -    DISCONNECTED
Ch. 5 -    DISCONNECTED
Ch. 6 -    DISCONNECTED
Ch. 7 -    DISCONNECTED
Ch. 8 -    DISCONNECTED
Ch. 9 -    DISCONNECTED
```

CONNECTED TO ONLY 1 STATION

```
cmd:cs
Ch. 0 - IO CONNECTED to WX1AAA
Ch. 1 -    DISCONNECTED
Ch. 2 -    DISCONNECTED
Ch. 3 -    DISCONNECTED
Ch. 4 -    DISCONNECTED
Ch. 5 -    DISCONNECTED
Ch. 6 -    DISCONNECTED
Ch. 7 -    DISCONNECTED
Ch. 8 -    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:

- In packet operation, the CTEXT message is sent as soon as another station connects to your station.
- 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>
```

- If you enter a text string longer than 120 characters, an error message appears and the command is ignored.

```
?too long
cmd:
```

- 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.

- 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:
```

- 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:
```

- Type "CWID or "CW" again to verify the new command character:

```
cmd:cwid
CWID     $1B CTRL-[
```

- 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 command displays the following error message:

```
cmd:day
?clock not set
```

- 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
```

- 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)

- Enter the numbers 0-9 with leading zeros; codes must be exactly two digits.

- 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.

- 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.

- 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.

- The BKONDEL command controls how the PK-232 indicates deletion.
- 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 digpeated only from stations whose call signs are listed.

To prevent one or more specific stations to digipeat through your station, 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 processed.

Clear DFROM with "%," "&," 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.

- If the retry count is exceeded while waiting for the distant station to acknowledge your disconnect command, your PK-232 switches to the disconnected state.

- 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 stations 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 stations 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.

- To display your typing exactly as you are typing the keyboard characters or sending from a disk file, set EAS "OFF."
- 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.

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

- Set ECHO ON if you don't see your typing appear on your display.
- Set ECHO OFF if you see each character you type doubled.

ECHO is set correctly when you see the characters you type displayed correctly.

ESCAPE ON!OFF Mnemonic: ES Default: OFF
MODE: All

Parameters:

ON - The <ESCAPE> character ($1B) is output as "$" ($24).
OFF - The <ESCAPE> character is output as <ESCAPE> ($1B).

The ESCAPE command selects the character to be output when an <ESCAPE> character is to be sent to the terminal. The <ESCAPE> translation is disabled in Transparent Mode.

The ESCAPE character selection is provided because some computers and terminal emulators interpret the <ESCAPE> character as a special command prefix. Such terminals may alter their displays depending on the characters following the <ESCAPE>.

- Set ESCAPE ON if you have such terminal to avoid unexpected text strings from other packeteers.
- See the MFILTER command for information on character stripping (rather than character translation) in monitored packets.

FEC Mnemonic: FE Immediate Command
MODE: AMTOR Mode B

FEC is an immediate command that starts an AMTOR FEC (Mode B) transmission.

- Use FEC for all round-table contacts.
- Use FEC for CQ calls. Distant stations cannot identify you in an ARQ CQ call.
- Use FEC if the desired range is longer than 22,000 miles, such as in "long path" contacts or high-orbit satellite contacts.
- Include your SELCAL code in your CQ message so that the distant station can call you back in ARQ with your SELCAL. If you want replies only on FEC, (for example, for contacts via a long path), include that information in your CQ call (see sample below).
- Don't start typing right away! Let your PK-232 begin each transmission with three to five seconds of idling. Under poor conditions, this may help the distant station to tune your signal.
- Avoid the RTTY practice of transmitting a line of RYRYRY to allow the distant station to tune in - this is wrong on FEC. Distant stations cannot synchronize until the end of the RYRY sequence. The normal FEC idle-signal can be used for tuning.
- To aid formatting of distant screen and printer copy, start an FEC transmission with a new line sequence by sending a <CR>.
- You can signify the end of your FEC transmission by typing the ARQ changeover sign "+?", internationally recognized as the RTTY equivalent of "KKK". However, in FEC, "+?" is not a software command. You still have to un-key your transmitter manually as you would in conventional RTTY.

You can terminate your FEC transmission several ways:

- Type the RCVE (R) command;
- Type the AMTOR (AM) command;
- Insert the RECEIVE command (default <CTRL-D>) character in your typing or disk file.

FLOW ON!OFF Mnemonic: F Default: ON
MODE: All

Parameters:

ON - Type-in flow control IS active.

OFF - Type-in flow control is NOT active.

When FLOW is ON, type-in flow control is active. Any character typed on your keyboard causes output from the PK-232 to the terminal to stop until any of the following conditions exist:

- A packet is forced (in Converse Mode)
- A line is completed (in Command Mode)
- The packet length (See PACLEN) is exceeded
- The terminal output buffer fills up

Cancelling the current command or packet or typing the redisplay-line character also causes output to resume. Type-in flow control is not used in Transparent Mode.

Setting FLOW ON prevents inbound or received data from interfering with your keyboard data entry. If you (and the person you are talking to) normally wait for a packet from the other end before starting to respond, you can set FLOW OFF.

- Some packet bulletin board programs (PBBS) may work best with FLOW set to OFF.
- Some computers with "software UARTs" may be unable to send and receive data at the same time. If you're using that type of computer, set FLOW to ON.

FRACK "n" Mnemonic: FR Default: 3
MODE: Packet

Parameters:

"n" - 1 to 15, specifying frame acknowledgment time-out in one-second intervals.

FRACK is the FRame ACKnowledgement time in seconds that your PK-232 will wait for acknowledgement of the last-sent protocol frame before resending or "retrying" that frame.

After sending a packet requiring acknowledgment, the PK-232 waits for FRACK seconds timeout before incrementing the retry counter and sending the frame again. If the packet address includes digipeat instructions, the time between retries is adjusted to:

Retry interval = "n" x (2 x m + 1)
where m is the number of intermediate relay stations.

When a packet is retried, a random wait time is added to any other wait times in use. This avoids lockups in which two packet stations repeatedly send packets which collide with each other.

FULLDUP ON|OFF Mnemonic: FU Default: OFF
MODE: All

Parameters:

ON - Full duplex mode is ENABLED.
OFF - Full duplex mode is DISABLED.

When full-duplex mode is disabled, the PK-232 makes use of the DCD (Data Carrier Detect) signal from its modem to avoid collisions; the PK-232 acknowledges multiple packets in a single transmission with a single acknowledgment.

When full-duplex mode is enabled, the PK-232 ignores the DCD signal and acknowledges packets individually.

Full-duplex operation is useful for full-duplex radio operation, such as through OSCAR 10. It should not be used unless both your station and the distant station can operate in full-duplex.

You may also find full-duplex mode useful for some testing operations, such as analog- or digital-loopback tests.

HBAUD "n" Mnemonic: HB Default: 1200 bauds
MODE: Packet

Parameters:

"n" values specifying the rate or signalling speed in bauds from the PK-232 to the radio.

Available HDLC packet data rates "n" include 45, 50, 57, 75, 100, 110, 150, 200, 300, 600, 1200, 2400, 4800 and 9600 bits per second.

o Example: HBAUD 300

HBAUD sets the radio ("on-air") baud rate only in the packet operating mode. HBAUD has no relationship to your computer terminal program's baud rate.

You must use the same radio data rate as the distant station.

NOTE: Modern commercial and amateur terminology no longer refers to the 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. Either term may be used.

HEADERLN ON|OFF Mnemonic: HE Default: OFF
MODE: Packet

Parameters:

ON - The header for a monitored packet is printed on a separate line from the packet text.
OFF - The header and packet text of monitored packets are printed on the same line.

HEADERLN affects the display of monitored packets. When HEADERLN is OFF, the address information is shown on the same line as the packet text:

```
WX1AAA>WX2BBB: Go ahead and transfer the file.
```

When HEADERLN is ON, the address is shown, followed by a <CR><LF> that puts the packet text on a separate line:

```
WX1AAA>WX2BBB:
Go ahead and transfer the file.
```

If MRPT or MSTAMP are ON, set HEADERLN ON; long headers may extend across your screen or page when these functions are active.

HELP Mnemonic: H Immediate Command
MODE: Command

While in Command Mode, type the command "H" to read the abbreviated on-line HELP file.

Your monitor displays the following brief list:

```
cmd:help
HELP:
AMTOR     PACKET      ASCII
  ARQ       CONNECT   BAUDOT
  ALIST     DISCONNE  MORSE
  FEC       CONVERSE  DISPLAY
  ACHG      TRANS     CALIBRAT
XMIT      RCVE
cmd:
```

You can exit from your present operating mode and enter Command Mode at any time to list the HELP text. This won't affect AMTOR or Packet operation.

HID ON!OFF Mnemonic: HI Default: OFF
MODE: Packet

Parameters:

ON - Your PK-232 sends HDLC identification as a digipeater.
OFF - Your PK-232 does not send HDLC identification.

The HID command activates or disables your PK-232's automatic periodic transmission of identification packets when operating as a digipeater. This identification consists of an unsequenced I-Frame with your station identification (MYCALL) and MYALIAS in the data field.

- Set HID ON to force your PK-232 to send an ID packet every 9.5 minutes when it's being used as a digipeater.
- Set HID OFF to stop your PK-232 from sending any ID packets.
- The HID identification packet is addressed to the "CQ" address set by the UNPROTO command.
- Your station identification is the call sign you've set with the MYCALL command, with "digipeater" appended.

NOTE: You cannot change the 9.5-minute automatic interval timing.

HOST Mnemonic: HOST Default: OFF
MODE: Packet

Parameters:

ON - The PK-232 operates with a host computer or other special application program.
OFF - The PK-232 operates as a normal TNC.

The HOST command permits the PK-232 to operate in the Host Mode, a "computer-friendly" communications mode, over the RS-232 link between the PK-232 and a host computer.

In the Host Mode, the PK-232 sends data to the computer only when the computer requests data. The data are prefaced with a special header that identifies the type of information being sent.

To cancel HOST mode, send a Break or type <CTRL-A>O H O N<CTRL-W>.

See AEA's PK-232 Technical Manual for full information on Host Mode.

ID Mnemonic: I Immediate Command
MODE: Packet

ID is an immediate command that sends a special identification packet. The ID command allows you to send a final identification packet when you're taking your station off the air. Note that HID must be set ON.

ID forces a final identification packet to be sent when a digipeater station is being taken off the air. The identification consists of an unnumbered I-Frame, with its data field containing your MYALIAS (if any) and your MYCALL station identification and the word "digipeater".

- The ID identification packet is sent only if the digipeater has transmitted since the last automatic identification.
- The ID identification packet is addressed to "ID."
- Your station identification is the call sign you've set with the MYCALL command, with your MYALIAS, your main call sign and the word "digipeater" appended. The following example is shown as seen with and without a MYALIAS, with MONITOR set to 6.

```
W2JUP-9*>ID <UI>          W2JUP-9*>ID <UI>
W2JUP digipeater          BHTC, W2JUP digipeater
```

LCOK ON!OFF Mnemonic: LC Default: ON
MODE: All

Parameters:

ON - The PK-232 sends lower case characters to your computer or terminal.

OFF - The PK-232 translates lower case characters to upper case before sending characters to your computer or terminal.

When LCOK is OFF, lower case characters in received data are changed to upper case before being sent to your terminal. The characters you type into the keyboard and their echoes are not changed.

If your computer or terminal cannot not display lower case characters, it may react badly if the PK-232 sends lower case characters to it. LCOK OFF forces your PK-232 to translate all lower case characters received in packets, as well as the PK-232's own internal messages, to upper case.

Echoes of your typed characters are not translated to upper case.

- Use this command to make your display easier to read when you are conversing in connected mode. If you and the other station's operator set LCOK OFF, you can each type your own messages in lower case and see incoming packets displayed in upper case. It will then be easy to distinguish incoming and outgoing lines.

- Case translation is disabled in Transparent Mode.

LOCK Mnemonic: L Immediate Command
MODE: Morse/Baudot/AMTOR

LOCK is an immediate command that instructs the PK-232 to measure the speed of received Morse code signals and lock its timing to the speed of the incoming signals. LOCK also forces LETTERS shift in Baudot and AMTOR modes.

The LOCK command may improve the PK-232's ability to decode CW signals in the presence of high noise levels.

MAXFRAME "n" Mnemonic: MAX Default: 4
MODE:Packet

Parameters:

"n" - 1 to 7 signifies a number of packet frames.

MAXFRAME sets an upper limit on the unacknowledged packets your PK-232 permits on the radio link at any one time. MAXFRAME also sets the maximum number of contiguous packets your PK-232 will send during any given transmission.

If some, but not all, of the outstanding packets are acknowledged, a smaller number may be transmitted the next time, or new frames may be included in the retransmission, so that the total number of unacknowledged packet frames does not exceed "n."

The "best" value of MAXFRAME depends on your local channel conditions. In most cases of keyboard-to-keyboard direct or local operation (links that don't require going through digipeaters), you can use the default value MAXFRAME 4.

When the amount of packet traffic, the path in use, the digipeaters involved - or other variables not under your control - make packet operation difficult (as shown by lots of retries!), you can actually improve your throughput by reducing MAXFRAME.

- If packet traffic is heavy or the path is poor, reduce MAXFRAME to 3 or 2.
- If you're sharing the channel with several PBBSs and digipeaters, or when working a PBBSs or other types of host computers, reduce MAXFRAME to 1.
- If the radio link is good, an optimal relationship exists between the parameters set by these commands, so that the maximum number of characters outstanding doesn't exceed the receive buffer space of the TNC receiving the data.

MBX call1[,call2][-"n"] Mnemonic: MB Default: empty
MODE: Packet

Parameters:

call	-	The call signs of one or two stations to be monitored.
"n"	-	0 to 15, indicating an optional SSID.

The MBX command permits you to read or record useful or needed data without having to connect or log on to the source station(s). Channel occupancy and bandwidth are conserved on busy channels.

MBX filters the received packet data stream so that only packets from the selected station(s) are shown, without headers, codes or repeated frames.

The MBX command overrides normal monitor functions and can show one or both sides of a conversation. You can enter a single call sign, or two call signs, separated by a comma:

```
cmd:MBX W1AW-4
 or
cmd:MBX W2JUP-4,W2HPM-4
```

Use the MBX feature to:

- Read or record transmissions from any packet station, without any extraneous material;
- Read or record transmissions from a PBBS (Packet Bulletin Board System) while another station is downloading files or messages;
- Read or record dialog between two connected packet stations or two PBBSs during mail forwarding operations.

The resulting information is free of all headers, frame identifier codes, repeats and improperly-sequenced lines. You won't need to edit or manually purge the recorded information.

NOTE: When using the MBX feature, your station is not part of the protocol handshake between the originating and receiving stations. If your local conditions (such as noise bursts or interfering packets) collide with the data being transferred between the two distant stations, you may miss one or more packets and lose one or more lines of text.

Use the MBX feature when channel conditions are at their best and the source station originating the transmissions is strong.

MCON "n" Mnemonic: MC Default: 0 (zero)
MODE: Packet

Parameters:

"n" - 0 to 6 signifies various levels of monitor indications

Use MCON for selective monitoring of other traffic while connected to a distant station.

MCON works in similar fashion to MONITOR, but affects your display while in the connected state.

As the value of MCON settings is increased, additional functions are included in the monitoring sequences.

If MCON is set to a value between "1" and "5," frames meant for you are displayed as though monitoring was OFF. You'll see only the data. If MCON is set to "6", frames meant for you are displayed as any other monitored frame. The headers appear together with the data.

The meanings of the parameter values are:

0 Monitoring while connected is disabled.

1 Only unnumbered (UI) frames resulting from an unconnected transmission are displayed. Use this for an "unproto", round-table type QSO. Other mutually connected stations using the frequency are also displayed. This setting also display beacons.

2 Numbered (I) frames are also displayed. I-frames are numbered in order of generation and result from a connected transmission. Use this to monitor connected conversations in progress.

3 Connect request (SABM or "C") frames and disconnect (DISC or "D") frames are also displayed with the headers.

4 Unnumbered acknowledgement (UA) of connect- and disconnect-state frames are also displayed with either the characters "UA" or "DM" and a header.

5 Receive Ready (RR), Receive Not Ready (RNR), Reject (RJ), Frame Reject (FRMR) and (I)-Frames are also displayed.

6 Poll/Final bit and sequence numbers are also displayed.

MDIGI ON!OFF Mnemonic: MD Default: OFF
MODE: Packet

Parameters:

ON - I and UI frames having your call sign (MYCALL or MYALIAS) as the next digipeater in the digipeater field are displayed, whether you are connected or disconnected.

OFF - Normal monitoring as determined by the monitoring mode commands

---

MDIGI permits you to display packet frames that your monitor would normally not show when another station uses your station as a digipeater. MDIGI helps you to better understand the digipeating paths that may involve your station, even when you've been unaware of what's happening on the channel.

Use MDIGI to see why your transmitter is being keyed when you're not actively involved in a communication session, or when your system is more active than you would expect.

When MDIGI is OFF you'll see those frames that include your station as one of the digipeaters, if your monitor modes have been set this way. If your monitor modes have not been set so you can see these frames, set MDIGI ON to display them.

MFILTER n1[,n2[,n3[,n4]]] Mnemonic: MFI Default: $07, $13
MODE: Packet

Parameters:

"n" - 0 to $7F (0 to 127 decimal) specifies an ASCII character code. Up to four characters may be specified.

Use MFILTER to select characters to be "filtered," or excluded from monitored packets. Parameters "n1", "n2", etc., are the ASCII codes for the characters you want to filter. You can enter up to four characters in either hex or decimal.

- To prevent a <CTRL-L> character from clearing your screen, set MFILTER 12.
- To eliminate <CTRL-Z> characters, which some computers interpret as end-of-file markers, set MFILTER 26.
- To eliminate <CTRL-G> characters, which beep your computer or terminal, set MFILTER 7.

MFROM all,none,yes/no call1[,call2..] Mnemonic: MF Default: all
MODE: Packet

Parameters:

call - all, none, YES list, NO list.
list of up to eight call signs, separated by commas.

MFROM uses arguments to determine how your PK-232 monitors the packet channels and displays information - which stations' packets will be displayed and which stations' packets will be masked or hidden. MFROM is set to "all" when you start your PK-232 for the first time.

Type MFROM to display the ALL/NONE/YES list/NO list status of station call signs whose packets will or will not be displayed. You can use the abbreviated command form or mnemonic:

```
cmd:mfrom
MFROM    all
cmd:mf
MFROM    yes WX1AAA,WX2BBB,WX3CCC,WX4DDD
```

To stop any packets from being displayed, type MFROM NONE.

To display packets from one or more specific stations type MFROM (YES followed by a list of calls signs). Packets will be displayed only from stations whose call signs are listed after YES.

To hide or mask packets from one or more specific stations, type MFROM (NO followed by a list of call signs). Packets from stations whose call signs are listed after NO will not be displayed.

You can include optional SSIDs specified as "-n" after the call sign. If MFROM is set to "no N6IA" or "yes N6IA", any combination N6IA, N6IA-1,...N6IA-15 will be matched and processed. If MFROM is set to "yes N6IA-1" or "no N6IA-1", then only N6IA-1 will match and be processed.

When MFROM and MTO contain different types of arguments, to avoid any possible conflict, the arguments take the following priority:

1. ALL
2. NO list
3. YES list
4. NONE

Clear MFROM with "%," "&," or "OFF" as arguments.

MHEARD Mnemonic: MH Immediate Command
MODE: Packet

MHEARD is an immediate command that displays a list of stations heard since the last time the MHEARD buffer was cleared.

Use a percent sign (%), an ampersand (&), "N," "NO","NONE," or "OFF" after the command word to clear the MHEARD buffer.

The maximum number of heard stations that can be logged is 18. If more stations are heard, earlier entries are discarded.

- o Stations that are heard directly are marked with a * in the heard log.
- o Stations that have been repeated by a digipeater are not marked.
- o If you clear the list of stations heard at the beginning of a session, you can use this command to keep track of the stations that are active during that period.
- o Logging of stations heard is disabled when PASSALL is ON.

When DAYTIME has been used to set the date and time, entries in the heard log are time stamped. When DAYSTAMP is ON, the date is shown before the time. Here is an actual sample of the MHEARD function with the clock set:

DAYSTAMP ON

```
cmd:mh
05-Jul-86  21:42:27  WA1FJW
05-Jul-86  21:42:24  WA1IXU*
05-Jul-86  21:32:18  K2AAA-5
05-Jul-86  21:27:57  W2HPM-4*
05-Jul-86  21:26:41  K2AAA-4
05-Jul-86  21:26:38  W2JUP-9
05-Jul-86  21:21:24  KA1EOU*
05-Jul-86  21:21:23  W2JUP-4*
05-Jul-86  21:05:07  KB1H
05-Jul-86  20:56:40  WA1LGQ
05-Jul-86  14:45:57  WA2SNA-1
05-Jul-86  14:45:53  KV1P
05-Jul-86  14:45:47  W6AXM
05-Jul-86  14:28:16  KB2ANH
05-Jul-86  14:23:32  WB2NYC
05-Jul-86  14:23:19  WB2EUL
05-Jul-86  13:55:26  N2FWE
05-Jul-86  13:50:28  W1GB-1*
cmd:
```

DAYSTAMP OFF

```
cmd:mh
21:42:27  WA1FJW
21:42:24  WA1IXU*
21:32:18  K2AAA-5
21:27:57  W2HPM-4*
21:26:41  K2AAA-4
21:26:38  W2JUP-9
21:21:24  KA1EOU*
21:21:23  W2JUP-4*
21:05:07  KB1H
20:56:40  WA1LGQ
14:45:57  WA2SNA-1
14:45:53  KV1P
14:45:47  W6AXM
14:28:16  KB2ANH
14:23:32  WB2NYC
14:23:19  WB2EUL
13:55:26  N2FWE
13:50:28  W1GB-1*
cmd:
```

MONITOR "n" Mnemonic: M Default: 4
MODE: Packet

Parameters:

"n" - 0 to 6 signifies various levels on monitor indications

As the value of MONITOR settings is increased, additional functions are included in the monitoring sequences.

The meanings of the parameter values are:

0 All packet monitoring functions are disabled.

1 Only unnumbered (UI) frames resulting from an unconnected transmission are displayed. Use this for an "unproto," round-table type QSO. Other mutually connected stations using the frequency are not displayed. This setting also displays beacons.

2 Numbered (I) frames are also displayed. I-frames are numbered in order of generation and result from a connected transmission. Use this to monitor connected conversations in progress.

3 Connect request (SABM or "C") frames and disconnect (DISC or "D") frames are also displayed with the headers.

4 Unnumbered acknowledgement (UA) of connect- and disconnect-state frames are also displayed with either the characters "UA" or "DM" and a header.

5 Receive Ready (RR), Receive Not Ready (RNR), Reject (RJ), Frame Reject (FRMR) and (I)-Frames are also displayed.

6 Poll/Final bit and sequence numbers are also displayed.

MORSE Mnemonic: MO Immediate Command
MODE: Command

MORSE is an immediate command that switches your PK-232 into the Morse code mode.

Unless you change MSPEED, your PK-232 uses the default Morse transmit speed value of 20 WPM.

o When receiving clear text only, use the LOCK command to lock the PK-232's Morse receiving speed to the the incoming signals.

MRPT ON|OFF Mnemonic: MR Default: ON
MODE: Packet

Parameters:

ON - Show digipeaters in the header; stations heard directly are marked with asterisk.

OFF - Show packets only from originating and destination stations.

MRPT affects the way monitored packets are displayed.

When MRPT is OFF, only packets from the originating station and the destination are displayed:

W2JUP-4*>W1AW-4 <I;0,3>:

When MRPT is ON, the call signs of all stations in the entire digipeat path are displayed. The call sign of the stations heard directly are flagged with an asterisk (*):

W2JUP-4*>WA1IXU>W1AW-5>W1AW-4 <I;0,3>:

NOTE: These actual samples were taken with MONITOR set to 6.

MSPEED "n" Mnemonic: MSP Default: 20 WPM
MODE: Morse

Parameters:

"n" - 5 to 99 signifies your PK-232's Morse transmit speed.

The MSPEED command sets the Morse code keying speed for your PK-232. The slowest available Morse code speed is 5 words per minute. (Setting MSPEED lower than 5 means your PK-232 still transmits Morse at 5 WPM.)

When using Morse speeds between 5 and 14 WPM, the transmitted code is sent with Farnsworth spacing - the characters are actually sent at 15 words per minute. The spacing between characters is lengthened to produce an overall code transmission rate of 5 to 14 WPM.

MSTAMP ON|OFF Mnemonic: MS Default: OFF
MODE: Packet

Parameters:

ON - Monitored frames ARE time stamped.

OFF - Monitored frames ARE NOT time stamped.

The MSTAMP command activates or disables time stamping of monitored packets. When your PK-232's internal software clock is set, date and time information is available for automatic logging of packet activity or other applications.

When MSTAMP is OFF, the packet header display looks like this:

W2JUP-4*>KA2EYW-1>AI2Q <I;2,2>:

When MSTAMP is ON and DAYSTAMP is OFF, the display looks like this:

22:51:33 W2JUP-4*>KA2EYW-1>AI2Q <I;1,7>:

When both MSTAMP and DAYSTAMP are ON, the display looks like this:

10-Jul-86 22:54:25 W2JUP-4*>KA2EYW-1>AI2Q <I;2,2>:

o Set the date and time with the DAYTIME command.

Setting MSTAMP ON increases the length of the address display.

o Set HEADERLN ON to display this information on a separate line.

MTO all,none,yes/no call1[,call2..] Mnemonic: MT Default: none
MODE: Packet

Parameters:

call - all, none, YES list, NO list.
list of up to eight call signs, separated by commas.

MTO uses arguments to determine how your PK-232 monitors the packet channels and displays information - which stations' packets will be displayed and which stations' packets will be masked or hidden. MTO is set to "none" when you start your PK-232 for the first time.

Type MTO to display the ALL/NONE/YES list/NO list status of call signs of stations to which addressed packets will or will not be displayed. You can use the abbreviated command form or mnemonic:

```
cmd:mto
MTO    all
cmd:mt
MTO    yes WX1AAA,WX2BBB,WX3CCC,WX4DDD
```

To stop packets addressed to all stations from being displayed, type MTO ALL.

To display only packets addressed TO one or more specific stations, type MTO (YES followed by a list of calls signs). Packets will be displayed only if addressed to stations whose call signs are listed after YES.

To hide or mask packets addressed to one or more specific stations, type MTO (NO followed by a list of call signs). Packets addressed to stations whose call signs are listed after NO will not be displayed.

You can include optional SSIDs specified as "-n" after the call sign. If MTO is set to "no WB9FLW" or "yes WB9FLW", any combination WB9FLW, WB9FLW-1,...WB9FLW-15 will be matched and processed. If MTO is set to "yes WB9FLW-1" or "no WB9FLW-1", then only WB9FLW-1 will match and be processed.

When MFROM and MTO contain different types of arguments, to avoid any possible conflict, the arguments take the following priority:

1. ALL
2. NO list
3. YES list
4. NONE

Clear MTO with "%," "&," or "OFF" as arguments.

MYALIAS call[-n] Mnemonic: MYA Default: empty
MODE: Packet

Parameters:

call Alternate identity of your PK-232.

"n" 0 to 15, an optional substation ID (SSID).

MYALIAS specifies an alternate call sign (in addition to the call sign specified in MYCALL) for use as a digipeater only.

MYALIAS permits both normal HID identification and an alias alternate, repeater-only "call sign."

Wide-coverage digipeater operators in some areas change their call sign to a shorter and (usually) easier to remember identifier.

Identifiers used include International Civil Aviation Organization (ICAO) airport IDs, sometimes combined with telephone area codes.

MYALTCAL aaaa Mnemonic: MYALT Default: empty
MODE: AMTOR

Parameters:

aaaa - Your alternate SELective CALling code (SELCAL)

Use the MYALTCAL command to specify an your alternate SELCAL which, under certain conditions, may be convenient or necessary.

You can enter an additional SELCAL code not related to your call sign. The alternate SELCAL can be any four alphabetical characters, or can be numeric strings of either four or five characters. Your PK-232 automatically translates your numeric MYALTCAL input according to CCIR Recommendation 491, Direct-Printing Telegraph in the Maritime Mobile Service.

MYALTCAL is generally used for special applications such as receiving network or group broadcasts in AMTOR Mode B Selective (Bs or SELFEC). The sending station must address all stations by one common SELCAL. Any other type of "all ships and stations" operation using special or group SELCALs can be handled with MYALTCAL.

MYCALL call[-"n"] Mnemonic: MY Default: PK232
MODE: Packet

Parameters:

call - Your call sign.

"n" - 0 to 15, indicating an optional substation ID (SSID).

Use the MYCALL command to load your call sign into your PK-232's RAM. Your call sign is inserted automatically in the FROM address field for all packets originated by your PK-232. MYCALL is also used for identification packets (see HID and ID).

Your PK-232 accepts connect request frames with your MYCALL in the TO field and repeats frames with this call sign in the digipeat field.

The "PK232" default call sign is present in your PK-232's RAM when the system is manufactured. This "artificial call" must be changed for proper operation of the packet and AMTOR protocols.

Two or more stations cannot use the same call sign (including SSID) on the air at the same time.

- Use the SSID to distinguish two stations with the same amateur call.
- The SSID will be zero (0) unless explicitly set to another value.

Although there is no standardization of SSIDs at present, most packet operators use SSID 0 (zero) for manual or local keyboard operation of their main station, and an SSID of (-1) or (-2) for a secondary station or dedicated digipeater under their responsibility.

Local area networks operated or maintained by a packet group or club may use the same call sign for several stations in their network, each node or unit being identified with a different SSID.

As packet networks grow and become more complex, with multi-port and gateway systems and frequency translation between bands, SSIDs become especially significant. For example look at the hypothetical case:

```
W2HPM-4>K2AAA-5>W2JUP-1>W2JUP-2>W2JUP-4
145.07  145.07  221.11  221.11  145.07
```

In this example, PBBS (Packet Bulletin Board System) W2HPM-4 is linked to PBBS W2JUP-4 via three digipeaters, each having a distinctive SSID.

NOTE: Your PK-232 will not operate in the Packet Mode until you have installed your own call sign in place of "PK232."

MYSELCAL aaaa Mnemonic: MYS Default: empty
MODE: AMTOR

Parameters:

aaaa - specifies your SELective CALling code (SELCAL)

Use the MYSELCAL command to enter the SELCAL (selective calling) code required in AMTOR ARQ (Mode A) and SELFEC operating modes. MYSELCAL is a unique character string which must contain four alphabetic characters and is normally derived from your call sign. You can't operate AMTOR unless your SELCAL is installed. The error message reminds you:

?need MYSELCAL

Some of the call sign groupings now in use:

GROUP	CALL	SELCAL
1 by 2	W1XX	WWXX
1 by 3	W1XXX	WXXX
2 by 1	AB1X	AABX
2 by 2	AB1XX	ABXX
2 by 3	KA1XXX	KXXX

For "1 by 2" call signs, the first letter is doubled, e.g., W1AW becomes WWAW. For most cases this is acceptable.

However, if you become aware that 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 N?ML. 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	

Although the convention is to form the SELCAL from the call sign, your PK-232 is capable of including any AMTOR character in the SELCAL, including digits 0 through 9. In accordance with CCIR Recommendation 491, four- or five-digit numbers may be entered; the PK-232 will automatically translate the numeric entry to your four-letter alphabetic SELCAL.

NEWMODE ON|OFF Mnemonic: NE Default: OFF
MODE: Packet

Parameters:

ON - The PK-232 automatically returns to the Command Mode at disconnect.
OFF - The PK-232 does not return to Command Mode at disconnect.

NEWMODE determines how your PK-232 behaves when the link is broken.

Your PK-232 always switches to a data transfer mode at the time of connection, unless NOMODE is ON.

Set NEWMODE for the type of operation most suitable to your needs.

If NEWMODE is OFF and the link is disconnected, your PK-232 remains in Converse or Transparent Mode unless you have forced it to return to Command Mode.

When NEWMODE is ON and the link is disconnected, or if the connect attempt fails, your PK-232 returns to Command Mode.

Bulletin Board or other host computer programs designed to operate with earlier TNC systems may require NEWMODE to be set OFF.

NOMODE ON|OFF Mnemonic: NO Default: OFF
MODE: Packet

Parameters:

ON - The PK-232 switch modes (Command, Converse, Transparent) only upon explicit command. NEWMODE function is ignored.
OFF - The PK-232 changes modes according to NEWMODE.

When NOMODE is ON, your PK-232 never switches from Converse or Transparent Mode to Command Mode (or vice versa) by itself. Only specific commands (CONVERSE, TRANS, or <CTRL-C>) typed by you can change the operating mode.

When NOMODE is OFF, your PK-232 switches modes automatically according to the way NEWMODE is set.

NUCR ON|OFF Mnemonic: NU Default: OFF
MODE: All

Parameters:

ON - <NULL> characters ARE sent to the terminal following <CR> characters.
OFF - <NULL> characters ARE NOT sent to the terminal following <CR> characters.

Some of the older electromechanical terminals (Teletype℠ machines) and printer-terminals require some extra time for the printing head to do a line feed and return to the left margin. NUCR ON solves this problem by making your PK-232 send <NULL> characters (ASCII code $00) to your computer or terminal. This introduces any necessary delay after any <CR> sent to the terminal.

The NULLS command sets the number of individual <NULL> characters that are to be sent when NUCR is ON.

o Set NUCR ON if your terminal or printer misses one or more characters after responding to a <CR>. If this is the case, you will sometimes see overtyped lines.

NULF ON|OFF Mnemonic: NUL Default: OFF
MODE: All

Parameters:

ON - <NULL> characters are sent to the terminal following <LF> characters.
OFF - <NULL> characters are not sent to the terminal following <LF> characters.

Some of the older electromechanical terminals (Teletype℠ machines) and printer-terminals require some extra time for the printing head to do a line feed and return to the left margin. NULF ON solves this problem my making your PK-232 send <NULL> characters (ASCII code $00) to your computer or terminal. This introduces any necessary delay after any <LF> sent to the terminal.

The NULLS command sets the number of individual <NULL> characters that are to be sent when NULF is ON.

Set NULF ON if your terminal or printer misses one or more characters at the beginning of a new line after responding to a <LF>.

NULLS "n" Mnemonic: NULL Default: 0 (zero)
MODE: All

Parameters:

"n" - 0 to 30 specifies the number of <NULL> characters to be sent to your computer or terminal after <CR> or <LF> when NUCR or NULF are set ON.

NULLS specifies the number of <NULL> characters (ASCII code $00) to be sent to the terminal after a <CR> or <LF> is sent.

o NUCR and/or NULF must be set to indicate whether nulls are to be sent after <CR>, <LF> or both.

Devices requiring nulls after <CR> are typically hard-copy devices requiring time for carriage movement. Devices requiring nulls after <LF> are typically CRTs that scroll slowly.

The null characters are sent from your PK-232 to your computer only in Converse and Command Modes.

OPMODE Mnemonic: O Immediate Command
MODE: Command

OPMODE is an immediate command that shows the PK-232's current mode of operation and system status.

Use the OPMODE command ("O") at any time when your PK-232 is in the Command Mode to display the present operating mode. Here are some typical indications:

```
cmd:o
OPMODE   ASCII      RCVE

cmd:op
OPMODE   PACKET

cmd:OP
OPMODE   BAUDOT     SEND
  :        :
OPMODE   MORSE      RCVE 20
OPMODE   ALIST      PHAS RCVE
OPMODE   FEC        IDLE SEND
OPMODE   AMTOR      STBY RCVE
OPMODE   ARQ        TFC  SEND
```

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 characters 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.

- The lower the value of PACLEN, the greater the probability of getting packets though the link without "hits" or retries.
- Increase PACLEN to 256 if transferring files to a nearby station over a high quality path.
- Reduce PACLEN to 64, or even 32 when working "difficult" HF radio paths.
- 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 compatible when frames contain more than 128 data characters.

PACTIME EVERY|AFTER "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.

- When EVERY is specified, the characters you type or send from disk are packaged and queued for transmission every "n" times 100 milliseconds.
- 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 appears 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.

- 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 no relationship 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.

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. The terms "bauds" and "bits per second" mean the same thing and may be used interchangeably.

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.

- 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.

- 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> characters, rather than by trying to correct the input line display. The re-displayed line is the corrected text.

- Use the REDISPLA character if a packet is received while you're typing a message in Converse Mode. You can see the incoming message 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.

- 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.

- 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 (selective 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 packetized 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 manufacturer'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.

- The User Stop character is set by the STOP command.
- 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.

- The User Start character is set by the START command.
- 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 parameter values, set TBAUD, AWLEN and PARITY to the new terminal's characteristics 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.

- You must be in the Command Mode to use TCLEAR.
- Use the <CTRL-C> (default) command to return to Command Mode.
- 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.

- 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 Mnemonic: TRAC Default: OFF
MODE: Packet

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.

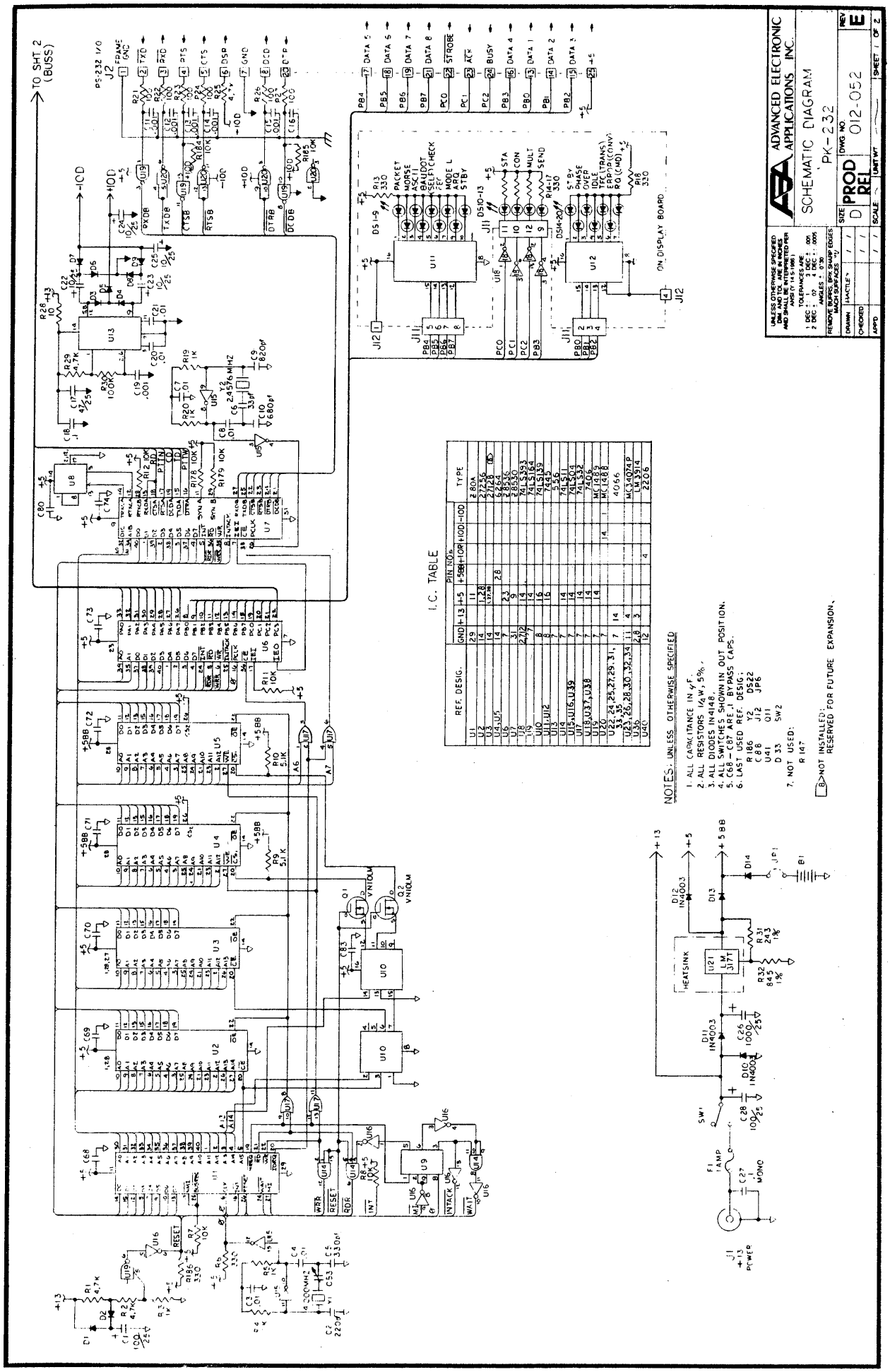
The hex display column shows the next 16 bytes of the packet, exactly as received, in standard hex format. The shifted ASCII column decodes the high-order seven bits of each byte as an ASCII character code.

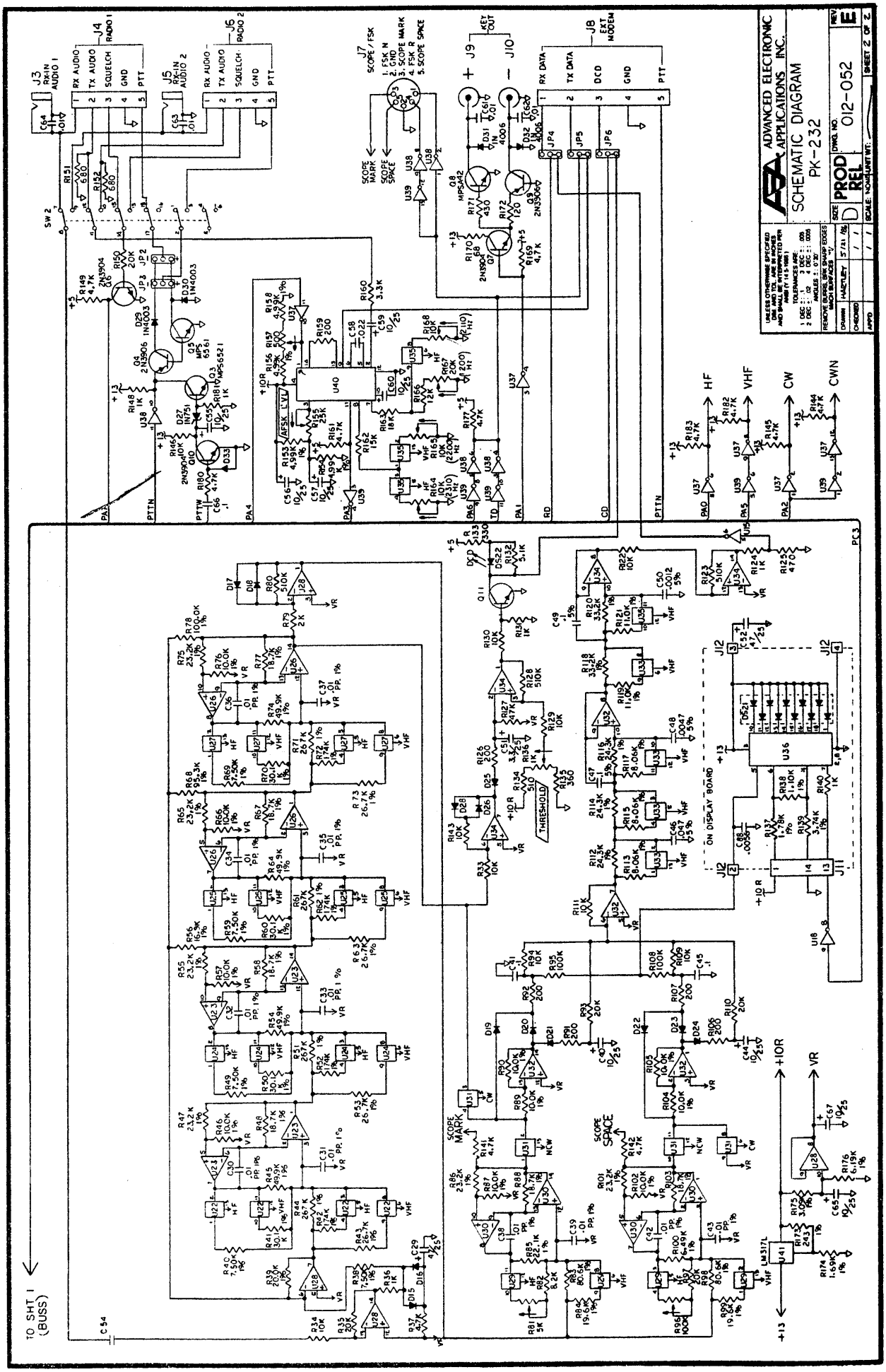
The ASCII column decodes the low-order seven bits of each byte as an ASCII character code.

In a standard AX.25 packet,

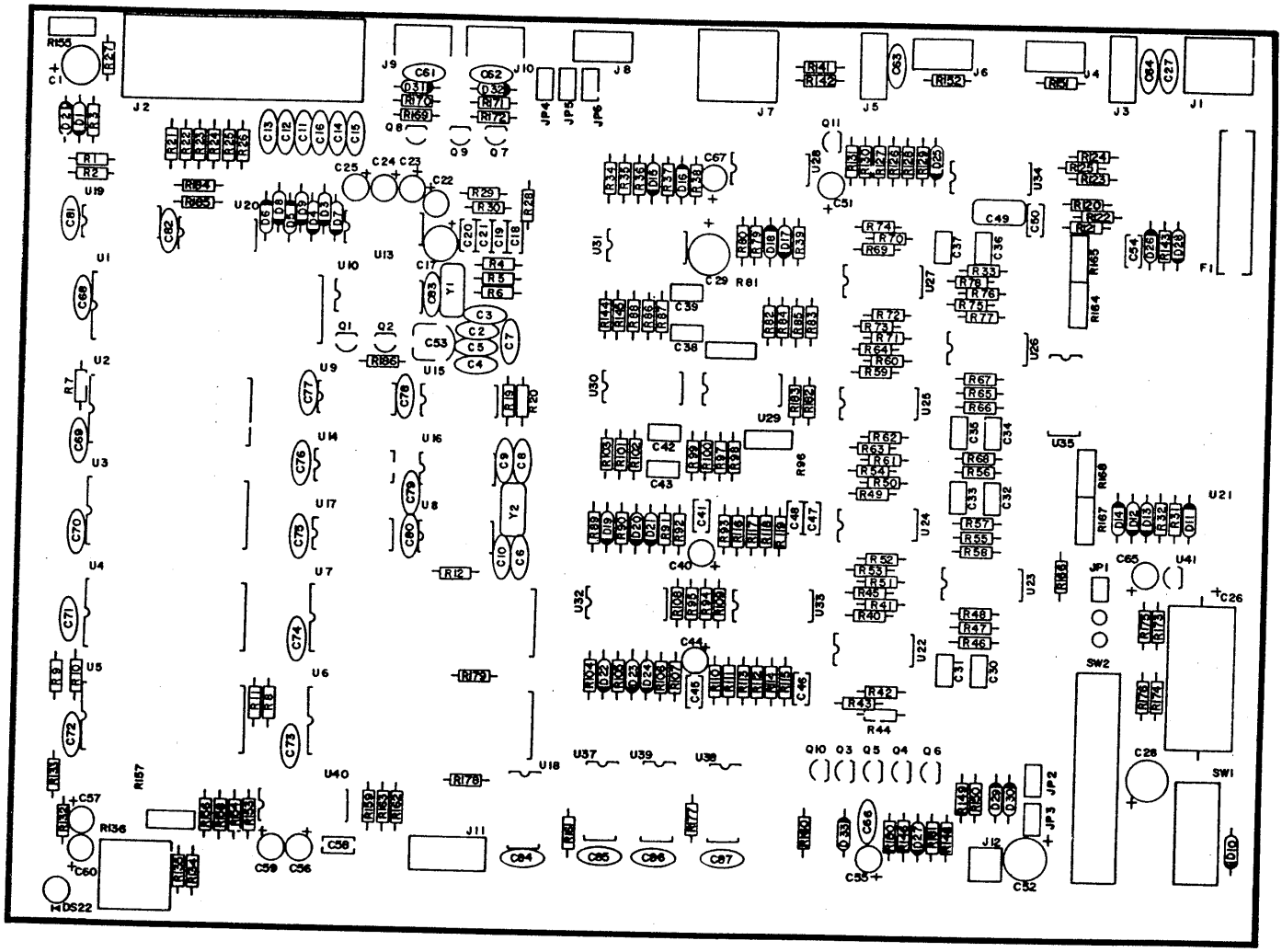
- The call sign address field is displayed correctly in the shifted ASCII column.
- A text message is displayed correctly in the ASCII column.
- Non-printing characters and control characters are displayed in both ASCII fields as a period (".").

You can examine the hex display field to see the contents of the SSID byte and the control bytes used by the protocol.

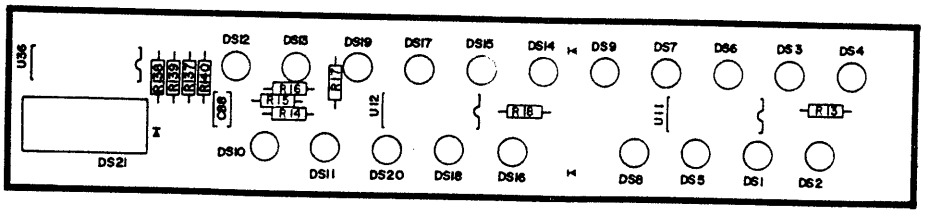

ADVANCED ELECTRONIC APPLICATIONS INC.
SCHEMATIC DIAGRAM
PK-232
DWG NO 012-052
REV E
SIZE D
PROD REL
SHEET 1 OF 2
TO SHT 2 (BUSS)
RS-232 I/O
J2
ON DISPLAY BOARD
J12
I.C. TABLE
REF. DESIG.
GND
+13
+5
+5B
+10R
+10I
-10D
TYPE
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL CAPACITANCE IN µF.
2. ALL RESISTORS 1/4 W, 5%.
3. ALL DIODES IN4148.
4. ALL SWITCHES SHOWN IN OUT POSITION.
5. C68 - C87 ARE .1 BYPASS CAPS.
6. LAST USED REF. DESIG:
R 186
C 88
U41
D 33
7. NOT USED:
R 147
8 NOT INSTALLED;
RESERVED FOR FUTURE EXPANSION.


ADVANCED ELECTRONIC APPLICATIONS INC.
SCHEMATIC DIAGRAM
PK-232
012-052
PROD REL
SHEET 2 OF 2
J3 RX-IN AUDIO 1
J4 RADIO 1
J5 RX-IN AUDIO 2
J6 RADIO 2
J7 SCOPE / FSK
J8 EXT MODEM
J9 KEY OUT
RX AUDIO
TX AUDIO
SQUELCH
GND
PTT
RX DATA
TX DATA
DCD
SCOPE MARK
SCOPE SPACE
HF
VHF
CW
CWN
ON DISPLAY BOARD
THRESHOLD
TO SHT 1 (BUSS)

APPENDIX I



MAIN BOARD



DISPLAY BOARD

APPENDIX J
PARTS LIST
PK-232 PCB

AEA PART NUMBER	DESCRIPTION	REF. DESIG.
013-064	PCB PK-232	
110-103	CAP MY 103P 10% 50V	C20,C21
110-104	CAP MY 104P 10% 50V	C18,C41,C45
110-562	CAP MY 562P 10% 50V	C88
111-104	CAP MY 104P 5% 50V	C47,C49
112-122	CAP MY 122P 2% 50V	C50
112-473	CAP MY 473P 2% 50V	C46
111-103	CAP MY 103P 5%	C54
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
125-540	CAP VARIABLE 5-40	C53
130-106	CAP EL 106P RAD 25V	C22-C25,C40,C44, C55-C57,C59,C60, C65,C67
130-107	CAP EL 107P RAD 25V	C28,C1
130-335	CAP EL 335P RAD 100V	C51
130-486	CAP EL 476P RAD 35V	C17,C29,C52,
131-108	CAP EL 108P AX 35V	C26
132-223	CAP PP 223P 2%	C58
132-400	CAP PP 472P 2%	C48
135-103	CAP PP 103P 1%	C30-C39,C42,C43
150-201	CAP SM 220P	C2
150-330	CAP SM 33P	C6

AEA PART NUMBER	DESCRIPTION	REF. DESIG.
150-331	CAP SM 330P	C5
150-681	CAP SM 680P	C10
150-821	CAP SM 820P	C9
210-100	RES 1/4W 5% 10.00	R28
210-101	RES 1/4W 5% 100.00	R21-R24,R26,R27
210-102	RES 1/4W 5% 1.00K	R4,R5,R19,R20,R36, R131,R140,R148, R124,R181,R3
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
210-104	RES 1/4W 5% 100.00K	R30,R108,R95
210-121	RES 1/4W 5% 120.00	R172
210-123	RES 1/4W 5% 12.00K	R166
210-153	RES 1/4W 5% 15.00K	R162
210-183	RES 1/4W 5% 18.00K	R163
210-201	RES 1/4W 5% 200.00	R106,R107,R126,R159, R91,R92
210-202	RES 1/4W 5% 2.00K	R79
210-203	RES 1/4W 5% 20.00K	R110,R150,R97,R93, R35
210-331	RES 1/4W 5% 330.00	R6,R13-R18,R133,R186
210-332	RES 1/4W 5% 3.30K	R160
210-361	RES 1/4W 5% 360.00	R135
210-431	RES 1/4W 5% 430.00	R171
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

PARTS LIST (cont.)

AEA PART NUMBER	DESCRIPTION	REF. DESIG.
210-473	RES 1/4W 5% 47.00K	R127
210-511	RES 1/4W 5% 510.00	R134
210-512	RES 1/4W 5% 5.10K	R9,R132,R10
210-514	RES 1/4W 5% 510.00K	R80,R128,R123
210-680	RES 1/4W 5% 68.00	R170
210-681	RES 1/4W 5% 680.00	R151,R152
210-822	RES 1/4W 5% 8.20K	R82
211-103	RES 1/4W 1% 10.00K	R46,R57,R66,R76,R87, R89,R90,R102,R104, R105
211-104	RES 1/4W 1% 100.00K	R78
211-112	RES 1/4W 1% 1.10K	R138
211-113	RES 1/4W 1% 11.00K	R119,R121
211-161	RES 1/4W 1% 1.69K	R174
211-169	RES 1/4W 1% 16.90K	R56
211-172	RES 1/4W 1% 1.78K	R137
211-175	RES 1/4W 1% 174.00K	R42,R52,R62,R72
211-183	RES 1/4W 1% 18.70K	R48,R58,R67,R77, R103,R88
211-193	RES 1/4W 1% 19.60K	R84,R99
211-203	RES 1/4W 1% 20.00K	R39
211-223	RES 1/4W 1% 22.10K	R85
211-232	RES 1/4W 1% 23.20K	R47,R55,R65,R75,R86, R101
211-241	RES 1/4W 1% 243.00	R31,R173
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
211-302	RES 1/4W 1% 3.09K	R175
211-303	RES 1/4W 1% 30.10K	R41,R50,R60,R70
211-333	RES 1/4W 1% 33.20K	R118,R120
211-374	RES 1/4W 1% 3.74K	R139
211-492	RES 1/4W 1% 4.99K	R153,R154,R156, R158
211-493	RES 1/4W 1% 49.90K	R45,R54,R64,R74
211-612	RES 1/4W 1% . 6.19K	R176
211-642	RES 1/4W 1% 6.49K	R100
211-752	RES 1/4W 1% 7.50K	R40,R49,R59,R69,R38
211-802	RES 1/4W 1% 8.06K	R113,R115,R117
211-803	RES 1/4W 1% 80.60K	R83,R98
211-841	RES 1/4W 1% 845.00	R32
211-953	RES 1/4W 1% 95.30K	R68
250-106	PNL POT .625 SQ 1K	R136
251-103	POT TRM .15L/S 10K	R164,R165,R168
251-104	POT TRM .15L/S 100K	R96
251-203	POT TRM .15L/S 20K	R167
251-253	POT TRM .15L/S 25K	R155
251-501	POT TRM .15L/S 500	R157
251-502	POT TRM .15L/S 5K	R81
310-001	DIODE SIG 1N4448	D1-D9,D13-26,D28,D33
311-003	DIODE PWR 1N4003	D10-12,D29,D30
311-006	DIODE PWR 1N4006	D31,D32
312-471	DIODE ZNR 1N751	D27
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
314-010	LED 10 SEG BARGRAP	DS21
320-001	XISTOR NPN 2N3904	Q6,Q7,Q10,Q11
320-010	XISTOR NPN MPSA42	Q8

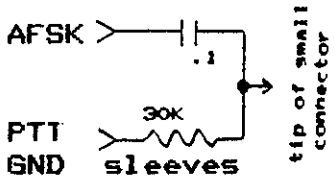
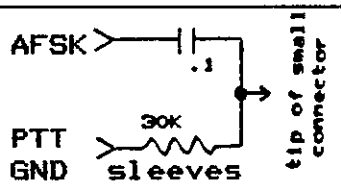
PARTS LIST (cont.)

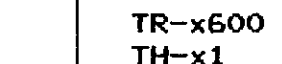
AEA PART NUMBER	DESCRIPTION	REF. DESIG.
320-011	XISTOR NPN MPS6521	Q3
320-012	XISTOR NPN MPS6561	Q5
320-202	XISTOR PFET VN10LM	Q1,Q2
320-501	XISTOR PNP 2N3906	Q4,Q9
330-008	IC LM317L	U41
330-009	IC LM317T	U21
330-011	IC NE556N	U13
330-018	IC MC34074P	U23,U26,U28,U30,U32, U34
330-034	IC XR2206	U40
330-050	IC LM3914	U36
331-004-1	IC 74LS04	U15,U16,U39
331-006	IC 7406	U18,U37,U38
331-011-1	IC 74LS11	U14
331-032-1	IC 74LS32	U17
331-045	I.C. 7445	U11,U12
331-139	IC 74HCT139	U10
331-164-1	IC 74LS164	U9
331-393	IC 74LS393	U8
332-128	IC 27128	U3
332-256	IC 27256	U2
332-264	IC 6264	U4,U5
333-015	IC Z80A CPU	U1
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

AEA PART NUMBER	DESCRIPTION	REF. DESIG.
400-020	DIP SOCK 20 PIN	DS21
400-028	DIP SOCK 28 PIN	U2,U3,U4,U5
400-040	DIP SOCK 40 PIN	U1,U6,U7
410-003	HDR R/AX2.1 3 POS	J12
410-005	HDR R/A.10 5 POS	J4,J6,J8
410-007	HDR R/AX2.10 7 POS	J11
410-102	HDR STR.10 2 POS	JP1
410-103	HDR STR .10 3 POS	JP2,JP3
412-125	HDR R/A 'D' 25 POS	J2
420-001	JACK PWR 2.1MM	J1
420-002	JACK PHON 3.5MM	J3,J5
420-008	JACK PHONO P.C.	J9,J10
420-039	CONN R/A DIN 5 PIN	J7
500-002	SW P-P 2P2T	SW1
500-006	SW P-P 6P2T	SW2
650-245	X-TAL 2.4576 MHZ	Y2
650-405	X-TAL 4.000 MHZ	Y1
750-019	HEATSINK THM 6019B	U21
760-000	KNB SW GRY .4 X .2	SW1,SW2
762-003	FUSE CLIP PCB	F1
763-001	FUSE 1 AMP	F1
779-001	SHORT PLUG .10	JP1,JP2,JP3

APPENDIX K

SPECIFIC RADIO CONNECTIONS

MFG	RADIO	PIN OUT	NOTES
ICOM	4 pin	AFSK 1 PTT 2 GND 4	
	8 pin	AFSK 1 PTT 5 GND 6,7	RX audio available on pin 8 of some radios.
	HTs		RX audio available on tip of large conn.
YAESU	4 pin	AFSK 2 PTT 3 GND 1	
	8 pin	AFSK 8 PTT 6 GND 7	FT-270/2700 require mic DC block cap & series diode w/PTT
	FT-x03 x09 727		RX audio available on tip of large conn.
	FT-208	AFSK 1 PTT 3 GND 4	RX audio on pin 2.
KENWOOD	4 pin	AFSK 1 PTT 2 GND 3,4	
	5 pin	AFSK 1 PTT 2 GND 4,5	
	6 pin	AFSK 1 PTT 2 GND 6	
	8 pin	AFSK 1 PTT 2 GND 7,8	

MFG	RADIO	PIN OUT	NOTES
KENWOOD	TR-2500	AFSK  PTT lg sleeve GND sm sleeve	RX audio available on tip of small conn.
	TR-x600 TH-x1	AFSK  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.