

OPERATING MANUAL

MODEL PK-232 DATA CONTROLLER

ADVANCED ELECTRONIC APPLICATIONS, INC.

PROPRIETARY INFORMATION

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## 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 and AEA's software update policy. This information is important; if you do not read it, you may damage your unit. The preface also tells you how you can get involved in the digital radio community.

RF Interference Information To User

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

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

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

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

## USE SHIELDED CABLE FOR ALL RS-232 CONNECTIONS

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

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

Software Release 25.JUN.87 Checksum \$E3  
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FIFTH ISSUE (JUNE 1987)

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### 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 may 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 warranty 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 8:00-12:00, 1:00-4:30 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 the unit must be sent in, we will give you a Return to Manufacturer Authorization (RMA) number over the telephone. This number allows us to better track your unit with our computer, so we can tell you its' exact status over the telephone.

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.

NOTE

IF YOU DECIDE TO RETURN YOUR PK-232 TO THE FACTORY FOR SERVICE, PLEASE REMOVE THE BATTERIES BEFORE SHIPMENT.

UPS Surface (Brown Label) takes 7-8 days, Blue takes 2-3 days. Red is an overnight service and 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 owner's 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.

Typically, we will 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 where 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 one 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, as well as 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.

### Acknowledgments

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.

Norm Sternberg (W2JUP) and Barbara Argilo developed, wrote and edited this User's Guide to the PK-232 on an IBM Displaywriter using TextPack 6, and on Tandy 1000HD and 1000SX computers using IBM's Display-Write 3 V1.1 program. Our special gratitude also to Dr. Alan Chandler (K6RFK), Steve Stuart (N6IA), Joe Schimmel (W2HPM), Paul Newland (AD7I), Jeff Jacobsen (WA7MBL) and Steve Zopfi (KZ7G), for their invaluable help.

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

BATTERY BACK-UP

NOTE: Your PK-232 uses batteries to back up the user-programmable values in the system. If you don't install batteries, you'll have to re-enter all of your personal system settings each time you turn on the PK-232. Your PK-232 will operate normally in all modes but will not retain your personalized parameters such as your call sign, until you install three AA-size batteries in the battery holder inside the chassis cover. We recommend that you choose alkaline batteries for this application.

- o Remove the four screws from the sides and the two screws from the rear of the chassis. Then lift off the PK-232's cover. Take care not to disturb the black or red wires that attach the battery holder to the printed circuit board.
- o Find the positive and negative symbols embossed on the inside of the battery holder. Insert each battery, carefully matching the positive symbols on the battery with the positive symbols on the holder.
- o Replace the cover and the six screws.

The battery back-up retains all the parameters except the time-of-day clock and the MHEARD (Monitor Heard) list. These two functions are controlled by the microprocessor.

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## CHAPTER 1

## INTRODUCTION

1.1 Introduction

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

1.2 Scope

Your Operating Manual provides general information on installation and operation of the PK-232. The manual 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-232-C serial data port and an appropriate communications program or terminal emulator. Please contact AEA for information on operating with non-standard interfaces or terminals.

1.3.1 Application

Your PK-232 Data Controller is the connection between your radios and computer or terminal. The PK-232 provides all 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 multi-mode protocol converter and data controller that includes built-in modems for all modes. Your PK-232 converts Morse, Baudot and ASCII RTTY, AMTOR/SITOR and AX.25 Packet Radio to ASCII data and communicates with your terminal or computer via an EIA standard RS-232-C serial port.

Operating Modes: Morse, Baudot, ASCII, AMTOR/SITOR and half- or full-duplex Packet Radio in accordance with the AX.25 protocols.

#### 1.3.2.2 Modem Characteristics

Demodulator:	Limiter-discriminator type, preceded by an eight-pole Chebyshev 0.5-dB ripple bandpass filter
Receive Band-pass:	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:	RS-232-C 25-pin DB25 connector
Input/Output	RS-232-C with full handshake (hardware and software) USE WIRES 1 THROUGH 8 AND 20 ONLY.
Terminal Data Rates	Autobaud 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:	<table border="0"> <thead> <tr> <th><u>Mode Group</u></th> <th><u>Status Group</u></th> </tr> </thead> <tbody> <tr> <td>BAUDOT</td> <td>STBY</td> </tr> <tr> <td>ASCII</td> <td>PHASE</td> </tr> <tr> <td>PKT</td> <td>IDLE</td> </tr> <tr> <td>MORSE</td> <td>ERROR/CONV</td> </tr> <tr> <td>CHECK</td> <td>OVER</td> </tr> <tr> <td>FEC</td> <td>TFC/TRANS</td> </tr> <tr> <td>ARQ</td> <td>RQ/CMD</td> </tr> <tr> <td>MODE L</td> <td>CON</td> </tr> <tr> <td>STBY</td> <td>STA</td> </tr> <tr> <td></td> <td>MULT</td> </tr> <tr> <td></td> <td>SEND</td> </tr> </tbody> </table>	<u>Mode Group</u>	<u>Status Group</u>	BAUDOT	STBY	ASCII	PHASE	PKT	IDLE	MORSE	ERROR/CONV	CHECK	OVER	FEC	TFC/TRANS	ARQ	RQ/CMD	MODE L	CON	STBY	STA		MULT		SEND
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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:

- o Packet Radio using the AX.25 international packet protocol
- o Host Mode, including raw HDLC mode
- o KISS TNC Mode for TCP/IP protocol packet service
- o Link and terminal data rates to 9600 bits per second
- o AMTOR error-correcting RTTY operation in Mode A (ARQ), Mode B (FEC), Mode L (ARQ 'Listen') and SELFEC (selective FEC)
- o Baudot RTTY at standard speeds 45, 50, 57, 75 and 100 bauds (60, 66, 75, 100 and 132 WPM)
- o Baudot RTTY Unshift-On-Space (USOS)
- o CCITT International Telegraph Alphabet #2 keyboard conversion
- o ASCII RTTY at 45, 50, 57, 75, 100, 110, 150, 200 and 300 bauds
- o WRU? activation and Answerback (AAB) response
- o Dual-polarity direct FSK outputs
- o Dual-polarity CW keying outputs
- o Monitor oscilloscope output
- o Time-of-day clock
- o Automatic Morse operation from 5 to 99 WPM
- o Farnsworth Morse operation below 15 WPM
- o Morse speed lock
- o Front-panel selectable dual radio connector ports
- o LED discriminator-type tuning display
- o '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 PK-232 Operating Manual

NOTE: A special "Y" Facsimile cable is supplied for connecting the PK-232 to a computer or Terminal, and optionally to a graphics printer.

#### 1.4.1 Input/Output Devices

Your PK-232 can be used with a standard ASCII communications terminal or computer equipped with an RS-232-C serial data port and any ASCII communications program or terminal emulator. Data and control signals are exchanged between the PK-232 and the computer or terminal at standard RS-232-C (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 Operating Manual, we'll use the terms 'computer' and 'terminal' to 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 both AMTOR modes 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 today.

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## 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. Information on specific computer interfaces is presented in section 2.9 at the end of this chapter. More detailed installation and system checkout instructions follow later in this chapter.

2.1.1 Equipment Required

You need the following:

- o your PK-232 Data Controller;
- o three type AA 1.5-volt alkaline batteries for RAM battery backup.
- o two AEA-supplied shielded cables for connecting your PK-232 to your radio;
- o an AEA-supplied cable to connect your PK-232 to an external power supply.
- o a 13.6-volt, 1-ampere regulated DC power supply;
- o your computer;
- o a terminal emulator or communication program for your computer;
- o your radio and its power supply;
- o the microphone connectors required by your radios;
- o the supplied "Y" Facsimile cable, or a shielded RS-232-C cable to connect the PK-232 to your computer.

2.1.2 Battery Installation for RAM Backup

- o Remove the six screws that hold the gray PK-232 top-chassis in place, and carefully separate it from the PK-232.
- o Install the batteries in the holder located inside the PK-232's top cover. Make sure the RED wire goes to the POSITIVE battery terminal, and the BLACK wire to the NEGATIVE terminal.
- o Carefully re-assemble the PK-232 being careful not to bind the battery wires between the chassis and the top-cover.

A more detailed description is available on Page 'v' in the Preface.

2.1.3 Radio and Power Connections

- o Connect the positive voltage to the center pin of the coaxial power plug.
- o Wire your microphone plug to the end of the cable that has the five-pin plastic connectors; see the connection drawings in Appendix K at the end of this manual. The pinout is shown below.

Pin	Signal Name	Wire Color	Description
1	Receive audio	Green	AFSK <u>from</u> receiver to PK-232
2	Microphone audio	White	AFSK from PK-232 <u>to</u> transmitter
3	Squelch input	Black	Optional squelch input from radio
4	Ground	Brown	Audio and PTT common return
5	Push-To-Talk	Red	PK-232 keys transmitter

Table 2-1 J4 and J6 Radio Port Connectors

2.2 Computer Connections (See Table 2-2)

IMPORTANT NOTE

Do NOT use an RS-232-C cable with all 25 wires in it, DO NOT CONNECT any pins other than pins 1 through 8, and pin 20! Connection of all 25 wires will cause improper operation of, and may damage your PK-232.

Connect your PK-232's 'RS-232 I/O' receptacle to your computer using the "Y" Facsimile cable, or a shielded RS-232 cable just like you would connect a standard telephone modem. The "end" of the cable with 2 wires coming out of it connects to the PK-232, and the other 25-pin connector connects to your computer or terminal. The 36-pin connector plugs into a parallel graphics printer for Facsimile operation as described in Appendix M of this manual.

If you make your own cable, You must connect at least the three wires shown in Table 2-2.

NOTE: These minimum connections don't permit hardware flow control.

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

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



Please refer to section 2.9 for more information on connections to specific computers, and APPENDIX K for connections to specific radios.

The following two figures (Figures 2-1 and 2-2) show the front and rear panel controls, connectors and indicators. Please take a moment to familiarize yourself with them, as we will be referring to them throughout this manual.

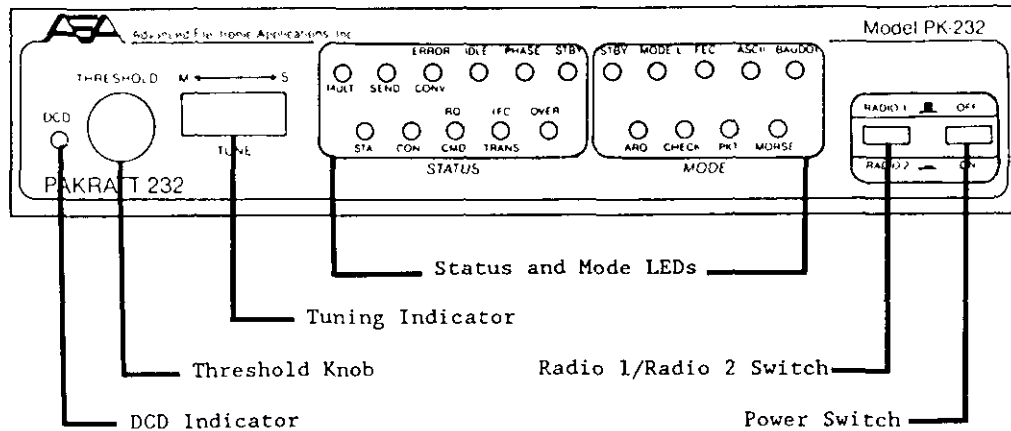


Figure 2-1 PK-232 Front Panel Controls and Indicators

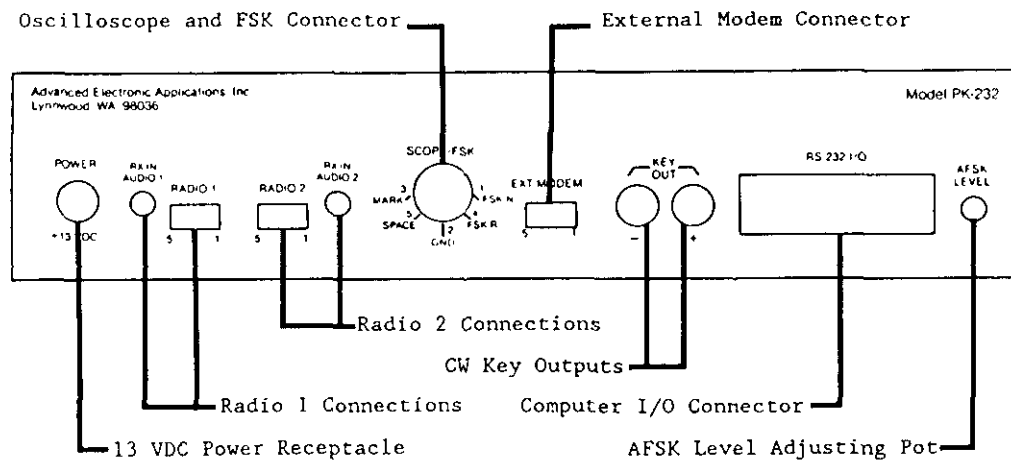


Figure 2-2 PK-232 Rear Panel Connections and controls

### 2.3 System Quick-Check

Verify that you've done these initial steps before going any further:

- o the ROM backup batteries are installed in the PK-232;
- o your PK-232 is connected to your computer via the RS-232-C cable;
- o ONLY PINS 1 THROUGH 8, and PIN 20 are connected;
- o your PK-232 is connected to a regulated 13.6-volt DC supply;

2.3.1 System Startup and Loopback Test

1. Don't connect any cables to your radio yet!
2. Set the RADIO-1/RADIO-2 switch to RADIO-1.
3. Connect a wire jumper between pins 1 and 2 on the PK-232's RADIO1 (J4) receptacle, or plug your PK-232-to-microphone jack cable into the RADIO1 socket on the PK-232's rear panel, strip and short the green and white wires on the radio cable. Set this cable aside for another loopback test in Chapter 4.
4. Turn on your computer. Load and run your communications program.
5. Set your computer's terminal program to:
  - o 1200 bauds (if available);
  - o even parity;
  - o seven-bit word;
6. Press the PK-232's power switch to the ON position.

The four LEDs clustered at the left side of the panel will be lit briefly and then the BAUDOT LED will be lit. If your serial port is operating at 1200 bauds, you'll see the the following message:

Please type a star ( \* ) for autobaud routine.

If this message appears, go to Step 8 now.

7. If your screen shows only 'junque' characters, go to Step 8 now.
8. Type several asterisks (\*) at one-second intervals. When the PK-232 has "recognized" your computer's data rate and set itself accordingly, the CMD and PKT LEDs will be lit. Your screen will then display the following sign-on message:

PK-232 is using default values.

AEA PK-232 Data Controller  
 Copyright (C) 1986, 1987 by  
 Advanced Electronic Applications, Inc.  
 Release DD.MMM.YY  
 Checksum \$nn  
 cmd:

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

MYCALL was PK232  
 MYCALL now AAA

10. Adjust the THRESHOLD control until the DCD LED just goes out. This should occur between the 2-O'clock and 4-O'clock position.
11. Type 'C AAA' followed by a RETURN. After a few moments, your monitor should display:

\*\*\* CONNECTED to AAA

12. 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.
13. Type '(CONTROL-C).' (Type 'C' while pressing the CONTROL key down.) Your monitor should respond with:

cmd:

14. Type 'VHF OFF' followed by a RETURN. Your monitor should respond with:

VHF was ON  
VHF now OFF

15. Type 'HB 300' followed by a RETURN. Your monitor should respond with:

HBAUD was 1200  
HBAUD now 300

16. Type 'K' followed by a RETURN. Type any characters. Your monitor should echo the characters you've just typed.
17. Type '(CONTROL-C).' Your monitor should respond with:

cmd:

18. Type 'D' followed by a RETURN. Your monitor should respond with:

\*\*\* DISCONNECTED: AAA

If you've done all the above steps successfully, you've completed the system quick-check and are ready to connect your radio and operate.

If you have problems with the steps shown above, go back to Step 1 AFTER checking all cables and connectors. Read each step again carefully. The most common problems are in trying to connect to a call different from MYCALL, leaving the DCD LED on which inhibits transmit, or not having the loopback installed correctly.

If you still have problems, shut down your PK-232 and contact AEA's Customer Service Department as suggested in the front of this operating manual.

## 2.4 Radio Connection

TURN OFF ALL POWER BEFORE MAKING ANY CONNECTIONS. Refer to Appendix K at the rear of this operating manual for hints on connections for YOUR specific radio.

This section is split into separate procedures for FM and SSB radios. In the following steps, you're going to:

- o verify that your radio and PK-232 are connected as shown in Table 2-1 earlier in this manual, and Figure 2-3 below;
- o feed the PK-232's AFSK audio output to your radio's microphone receptacle;
- o adjust the PK-232's rear-panel output-level control for proper modulation;
- o take the receiver's audio output from a speaker jack and feed the audio directly to the PK-232.

Insert the five-pin plastic connector in RADIO 1 socket and connect the microphone plug to your radio's microphone jack.

### 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!

### 2.4.1 PTT (Push-to-Talk) Configuration

The PK-232 is configured for positive PTT at the factory. This seems to work with most modern radios. However, if necessary, you can change the polarity of the PTT configuration on either or both RADIO1 and RADIO2 ports. Follow these steps:

- o Remove four screws from the sides and two screws from the rear of the chassis cover and lift off the cover. Be careful not to disturb the black and red wires that connect the battery holder to the printed circuit board.
- o Jumper posts JMP2 and JMP3 are located next to the RADIO1/RADIO2 switch SW2. JMP2 and JMP3 are 3-pin jumper posts on which you install a slip-on jumper to connect the center pin to one of the outside pins.
- o Use JMP2 to configure RADIO1 port; use JMP3 to configure RADIO2 port.

NOTE: This is especially useful if you want to configure one radio port for positive PTT and the other for negative PTT.

2.4.1.1 Positive PTT

Place the slip-on jumper across the center pin and the pin nearest the front of the unit. Replace the cover and six screws.

2.4.1.2 Negative PTT

Place the slip-on jumper across the center pin and the pin nearest the rear of the unit. Replace the cover and six screws.

2.4.2 FM Installation and Adjustment

1. Turn on your computer and PK-232 and start your terminal program.
2. Connect the radio to a dummy load; be prepared to monitor your transmissions with another nearby radio.
3. Verify that your PK-232 and FM radio are connected as shown in Figure 2-3 below.

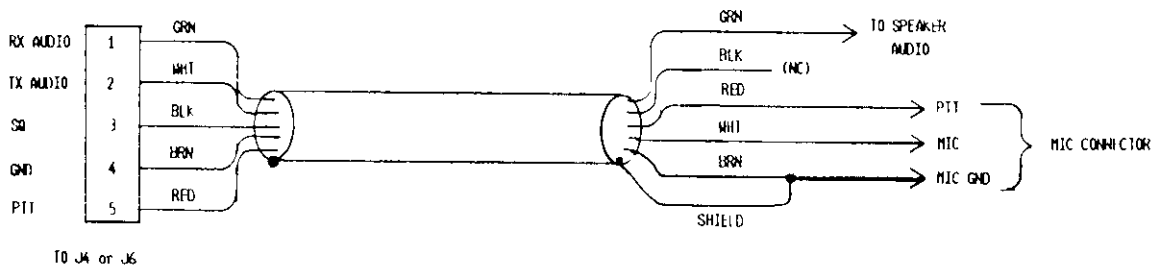


Figure 2-3 Radio-to-PK-232 Connections

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

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 watchdog 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.'

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:
  - o 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.
  - o 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.

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.

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.

#### 2.4.3 SSB Installation and Adjustment

Installation and adjustment of your PK-232 with SSB radios is simpler 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:

- o Set VOX to OFF.
- o Set speech compression to OFF.
- o Set AGC to FAST (if available).
- o 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.

1. Connect your PK-232 and SSB radio as shown in Figure 2-3.
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:
  - o Rotate the microphone gain control clockwise to about one-quarter open.
  - o 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.
  - o 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. With your radio in receive mode, tune the receiver to a clear, unoccupied frequency.
15. Set the receiver's audio volume control (AF GAIN) to the position you would normally use for CW reception. This is the approximate receiver audio output level for best receive performance from your PK-232's modem.
16. Turn the PK-232's front-panel THRESHOLD control clockwise until the DCD LED is lit by the noise output from your receiver, then slowly counterclockwise until the DCD LED is no longer lit.



#### 2.4.4 Connections for Direct FSK Operation on RTTY, AMTOR and Packet

Some HF SSB radios provide direct FSK (Frequency-Shift Keying) for RTTY operation. The PK-232's FSK driver circuits are active in Baudot and ASCII RTTY, AMTOR and packet operation. FSK operation can be used on AMTOR and packet, and may be an advantage 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 data speeds, although very narrow filters can limit your data rate. Direct FSK is not always recommended for data speeds in excess of 110 bauds. Results will vary depending on the switching and recovery characteristics of your radio. Some HF transceivers are known to work well in FSK even on packet at 300 bauds.

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. We have observed that Icom radios most often use FSK, while Kenwood radios most often use FSKR. Consult the manufacturer's instruction manual for your radio to identify the 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 2-4 below.

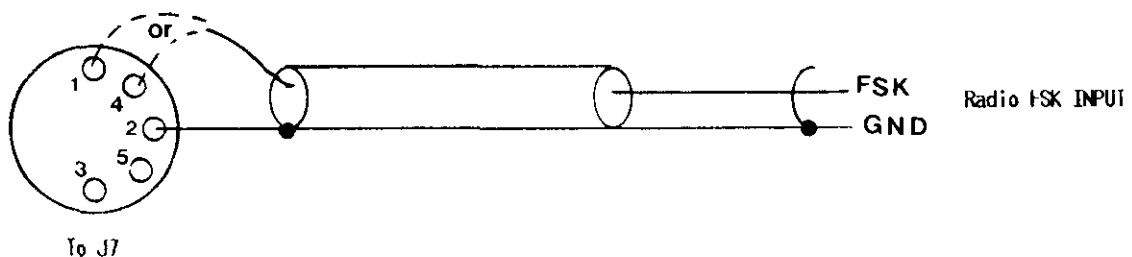


Figure 2-4 Connector J7 FSK Connections

**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.

#### 2.4.5 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.

##### 2.4.5.1 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.

- o 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.
- o 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 keys the radio in Morse without requiring any additional wiring.

##### 2.4.5.2 AFSK CW Keying

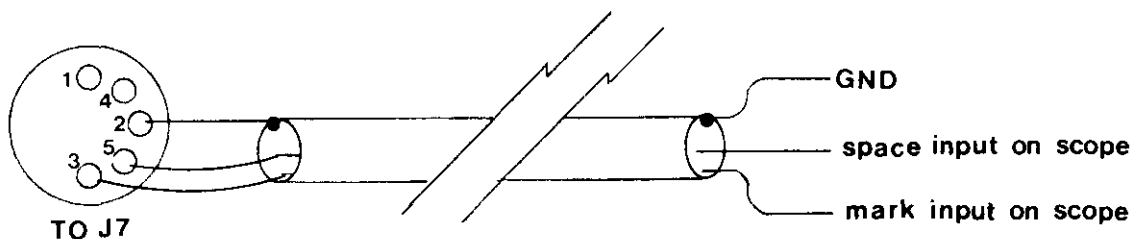
If you choose the audio keying method, you'll use the same cables and connections to the microphone input circuits described earlier for RTTY, AMTOR and Packet.

- o Connect your radio to a dummy load.
- o Set your radio's Mode Selector switch to the 'USB' or 'LSB' position. Your PK-232 then keys the PTT line and sends a keyed single audio tone to the radio's microphone input.
- o Type random letters at your keyboard and 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.
- o All other radio and PK-232 adjustments are the same as in RTTY, AMTOR and Packet.

### 2.4.6 Oscilloscope Connections

You can use an ordinary oscilloscope as a tuning indicator to obtain an accurate 'X-Y tuning display'. The 'scope need not be expensive or sophisticated. Any low-cost or surplus 'scope capable of displaying audio signals can be used.

- o Connect the oscilloscope to Pins 3 (mark) and 5 (space) on rear-panel connector J7.
- o Connect the oscilloscope ground return to Pin 2 of J7.
- o See figure 2-5 below for connections to J7.



**Set scope to AC coupled.**

Figure 2-5 Connector J7 Tuning Scope Connections

**NOTE:** If your Oscilloscope cannot be AC coupled, you must place a 0.1 uf disc capacitor in-series with your connections to both pin-3 and pin-5 of J7

### 2.5 Set Your Identifiers

Packet radio and AMTOR require that your PK-232 know exactly WHO you are in order to operate properly.

Your PK-232 will not allow you to try a packet radio connection or try a contact in AMTOR until you have done the following steps:

#### 2.5.1 Packet Call Sign

Type <CTRL-C> to verify that your PK-232 is in Command mode. Your PK-232 will respond with:

```
cmd:
```

Type MYCALL (or just MY) followed by your call sign and then press the ENTER or RETURN key on your keyboard. You can type in either upper or lower case - it doesn't matter here. For example:

```
cmd:my w2jup
MYCALL was AAA
MYCALL now W2JUP
```

### 2.5.2 AMTOR SELCAL (Selective Call)

Type MYSELCAL (or just MYS) followed by your selective calling code.  
(See the MYSELCAL command in Chapter 6 for details on how to chose  
your SELCAL.)

```
cmd:mys wjup
MYSELCAL was
MYSELCAL now WJUP
```

Actually, at this point, you're ready (electrically speaking) to begin  
operating your PK-232 in all of its operating modes.

We suggest you read through the following information on Commands and  
Displays, and then proceed to Chapter 3, Basic Operation.

## 2.6 Commands and Displays

Type the command word 'display.' Your screen shows:

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

### 2.6.1 Display Complete Command List

At the 'cmd:' prompt, type the command word 'DISPLAY Z.' The PK-232 displays the command list 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.

### 2.6.2 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 seven classes:

A	Asynchronous port parameters
C	Special characters
F	Facsimile parameters
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.

2.6.3 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
CASEDISP  0 (as is) Display case (as is/lower/upper)
DCDCONN   OFF      RS-232 pin 8 follows CON LED (connected)
ECHO      ON       Echo typed keyboard characters
ESCAPE    OFF      Send ESC character $1B as $24
FLOW      ON       Stop echo to screen while typing
ILFPACK   ON       Ignore line feeds in packet transmit
NUCR      OFF      Nulls to terminal after <CR>
NULF      OFF      Nulls to terminal after <LF>
NULLS     0        Number of nulls for NUCR & NULF
PARITY    3 (even) 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

```

2.6.4 Display Special Characters

```

cmd:disp c
BKONDEL   ON       Send <BS> <SP> <BS> for DELETE char.
CANLINE   $18 (CTRL-X) LINE DELETE character
CANPAC    $19 (CTRL-Y) PACKET DELETE character
CHCALL    OFF      Show call sign after channel ID
CHDOUBLE  OFF      Show CHSWITCH character twice
CHSWITCH  $00      Channel-select (Link) character
COMMAND   $03 (CTRL-C) Character escape to COMMAND Mode
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

```

2.6.5 Display Facsimile Parameters

cmd:disp f		
ASPECT	2 (576)	Facsimile Aspect Ratio
FAXNEG	OFF	Invert facsimile printing
FSPEED	2 (120)	Facsimile scan speed
GRAPHICS	1 (120)	Printer Dot Density setting
LEFTRITE	ON	Left-to-Right or Right-to-Left printing
PRCON	OFF	Parallel printer connected to the PK-232
PROUT	OFF	All characters echoed to the printer
PRTYPE	2	Type of Graphics printer connected

NOTE: All Facsimile commands are described in detail in Appendix M, in the back of this manual.

2.6.6 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 (00 sec.)	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 Auto Answer --	
Please leave message, then disconnect (120-byte CONNECT message)		
HID	OFF	Send ID UI packet every 9.5 mins
MYALIAS	none	Alternate MYCALL
MYCALL	PK232	Your call sign for packet address
MYALTCAL	(empty)	Alternate AMTOR SELCAL
MYSELCAL	(empty)	Your AMTOR SELCAL
WRU	OFF	Turn on answerback

2.6.7 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 ON Operate as AX.25 Version 1.0
CFROM all Connect requests from list
CONMODE CONVERSE Mode to enter when link starts
CONPERM OFF Never disconnect this link
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 unless ordered
PACLEN 128 # of user-typed bytes in packet
PASSALL OFF Ignore CRC in HDLC ('Junque Mode')
RELINK OFF Try to reconnect after timeout
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

```

2.6.8 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
MBELL OFF Rings bell when station is heard
MBX none Monitor channel without headers
MCON 0 (none) Monitor while connected (0-6)
MDIGI OFF Monitor digipeated frames
MFILTER $80 Filter received characters
MFROM all Don't monitor MFROM call signs
MONITOR 4 (UA DM C D I UI) Monitor mode level select (0-6)
MPROTO OFF Only monitor all PID packets
MRPT ON Show digipeaters in headers
MSTAMP OFF Time-stamp monitored frames
MTO none Don't monitor MTO call signs
TRACE OFF Hex dump of packet frame

```



2.6.9 Display Morse/RTTY/AMTOR Parameters

cmd:disp r		
ABAUD	110	ASCII baud rate
ACRRTTY	71	Auto <CR> column in RTTY
ADELAY	4 (40 msec.)	AMTOR transmit delay (X10 ms)
ALFRTTY	ON	Send LF after <CR>, RTTY
ARQTIMO	90 (90 sec.)	AMTOR ARQ SELCAL timeout in secs.
BITINV	\$00	Baudot Bit inversion mask (SIAM)
CCITT	ON	Select CCITT ITA #2 or US Baudot
CODE	0 (International)	Recognised character set (SIAM)
CRADD	OFF	Allow <CR><CR><LF> in RTTY Modes
EAS	OFF	Echo as sent, non-packet modes
MARSDISP	OFF	Translate received LTRS and FIGS
MSPEED	20	Set Morse speed in WPM (5-99)
RBAUD	45	Baudot RTTY baud rate
RFEC	ON	Receive FEC in AMTOR Standby
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

2.6.10 Display Timing Parameters

cmd:disp t		
AXDELAY	0 (00 msec.)	Repeater key-up delay (X10 ms)
AXHANG	0 (00 msec.)	Repeater hang time (X10 ms)
CHECK	30 (300 msec.)	Idle link timeout (X10 seconds)
CMDTIME	10 (1000 msec.)	Transparent Mode escape timer
CPACTIME	OFF	Use packet timeout in Converse
DWAIT	16 (160 msec.)	Delay for digi repeat (X10 ms)
FRACK	3 (3 sec.)	Time (X1 sec) to wait for ACK
PACTIME	AFTER 10 (1000 msec.)	Packet transmit timer (X100 ms)
PERSIST	127	Persistent random number threshold
PPERSIST	OFF	Persistence CSMA
RESPTIME	10 (1000 msec.)	Minimum delay before sending ACK
SLOTTIME	10 (100 msec.)	Persistent time interval setting
TXDELAY	30 (300 msec.)	PTT key-to-data delay (X10 ms)

2.7 Immediate Commands

'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 PK-232 commands, immediate commands can be typed using a short mnemonic or abbreviated form. See the complete description of commands in the Command Summary.

ACHG	Force AMTOR ARQ Changeover (break-in)
ALIST	Start AMTOR Listen mode
AMTOR	Start AMTOR mode in AMTOR standby
ARQ	Start AMTOR ARQ selective call (type "his" 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)
DISCONN	Send DISC to distant station
DISPLAY	Show PK-232 parameters/classes
FAX	Start Facsimile mode in FAX Standby
FEC	Start AMTOR FEC transmission
HELP	Show brief HELP menu
ID	Force ID packet via Unproto path
K	Start Converse Mode (same as CONVERSE)
LOCK	Morse receive speed lock
MHEARD	Display call signs heard
MORSE	Start Morse Mode, unlock morse receive speed
OPMODE	Display current operating mode
PACKET	Start Packet Mode
RCVE	Switch to receive, Morse/RTTY/AMTOR, sync
RESET	Flush everything, RESET bBRAM to factory defaults
RESTART	Same as power-on/off reset, saves parameters
SELFEC	Start AMTOR Selective FEC call (type "his" SELCAL)
TCLEAR	Clear the Transmit Buffer
TRANS	Start Transparent Data Mode
XMIT	Start transmission - key PTT

2.8 Detailed Connections for Specific Computers

Many computers require a serial port adapter card that incorporates the necessary interface circuitry. Some popular computers in this category are the Apple // series, the IBM PC (and many compatibles), the Tandy 1000, 1200 and 3000-series computers and the Sanyo MBC-55X series. If you're using one of these computers refer to the section, 'Other Computers with Nonstandard Serial Ports.'

Computers that do not have a serial port and do not permit use of a suitable adapter or level converter cannot be used with the PK-232.

2.8.1 Available Serial Interfaces

Most manufacturers of personal and desktop computers can provide optional serial interface boards that can be installed by the user. Here is a partial list of these makes and models.

<u>MANUFACTURER</u>	<u>MODEL</u>
Apple	Macintosh tm Apple II, II+, II-E and II-GS
Commodore	Vic 20 tm 64 tm 64/C tm 128 tm
IBM	PCjr tm PC-XT PC-AT
Tandy	Most compatibles and clones Color Computer tm 1000, 1000HD, 1000EX and 1000SX 1200, 2000, 3000HL, 3000 Model 100 tm Model 102 tm
NEC	8201

2.8.2 Computers with Specific Serial Interfaces

Apple Macintosh

The Macintosh serial port is compatible with the RS-422 standard, but can be used with the RS-232-C port on your PK-232.

Wire a cable as shown below:

MACINTOSH (DB9P)	PK-232 (DB25P)
1 .....	1
5 .....	2
9 .....	3
3 .....	7
7 .....	8
6 .....	20

Note that pin 1 is not connected inside the Macintosh. Use a shielded serial cable and connect both pins numbered "1" to the shield. Connect pin 1 at the Macintosh end to the main ground on the computer.

2.8.3 Commodore 64, 64C, 128, Vic 20

Although you can use almost any terminal program with your computer, AEA now sells the Com Pakratt tm program cartridge and Level Converter for the Commodore 64, 64C and 128 computers. Com Pakratt provides a split-screen display as well as on-screen status indication. See your AEA dealer if you are interested in this program.

Commodore and other manufacturers sell a signal level converter that is installed in the User Port Connector on the rear of the computer. The converter changes the computer's internal TTL voltage levels to the proper RS-232-C voltage levels and polarities. Unless you are very familiar with the inner workings of your computer, you should purchase a level converter rather than trying to 'do it yourself.'

2.8.4 IBM PCjr

The PCjr uses standard RS-232-C voltage levels; however, the connector is not standard and is sometimes hard to find. Pin-out information can be found in the IBM PCjr Technical Reference Manual.

Some computer dealers sell a 'IBM PCjr Adapter Cable for Serial Devices' that converts the connector on the PCjr to standard RS-232-C. The cable is attached directly between the PCjr and the PK-232. The cable is only about three inches long; you may want to get a male-to-female RS-232-C extension cable.

2.8.5 Tandy Color Computer

The CoCo series (except for the Micro Color Computer) uses a four-pin DIN connector for its serial interface. Wire a cable as shown below. All necessary parts should be available from your Radio Shack dealer.

CoCo	PK-232 (DB25P)
4 .....	2
2 .....	3
3 .....	7

2.8.6 Tandy Model 100/102 and NEC 8201

The Model 100/102 and NEC 8201 have built-in standard RS-232-C serial ports which are compatible with the PK-232. You'll need a standard male-to-male RS-232-C extension cable to connect the computer and the PK-232.

2.8.7 Other Computers with 25-Pin RS-232-C Ports

If your computer has a 25-pin RS-232-C port, consult your computer or accessory manual to see which pins are used for Send and Receive data, as well as which pin is used for signal common. Read the manufacturer's recommendations for connecting the serial port to a modem and connect your PK-232 in the same way.

Your PK-232 is configured as Data Communications Equipment (DCE), the technical term for an RS-232-C modem. Most computers and terminals are configured as Data Terminal Equipment (DTE).

- o If your computer is configured as DTE:

Wire pin 2 of the PK-232 connector to pin 2 of the computer's RS-232-C port, pin 3 to pin 3 and pin 7 to pin 7. Use a standard 3-wire male-to-female or male-to-male (depending on whether your computer has a DB25S or DB25P connector) RS-232-C extension cable.

- o If your computer is configured as DCE:

Wire pin 2 of the PK-232 to pin 3 of the computer connector.  
Wire pin 2 of the computer connector to pin 3 of the PK-232.  
Wire pin 7 to pin 7.

Some computers require pin 5 of the computer's serial port connector to be connected to an appropriate signal. Others may require connections for pin 8 and pin 20. You can use the computer's output signals on pins 4 and 6 as indicated below:

PK-232	COMPUTER
2 .....	2
3 .....	3
7 .....	7
	:..... 4
	:..... 5
	:..... 6
	:..... 8
	:..... 20

### 2.8.8 Other Computers with Non-Standard Serial Ports

Computers with non-standard serial ports must meet the following conditions:

- o The signal levels must be compatible with RS-232-C. The PK-232 requires the voltage levels from the computer be greater than about +3 volts in one state and less than 0 volts in the other state.
- o The signal polarity must conform to the RS-232-C standard. The low-voltage state must correspond to logical '1' and the high-voltage state to logical '0.'
- o The computer must be able to correctly receive a signal that meets RS-232-C specifications. The PK-232 supplies signals that meet this specification.

Make or buy a cable that provides the following connections:

- o The computer's serial port common pin must be connected to the PK-232's serial port connector pin 7.
- o The pin on which the computer SENDS data must be connected to the PK-232's connector pin 2.
- o The pin on which the computer RECEIVES data must be connected to the PK-232's connector pin 3.

If your computer requires any other signals, you must arrange to provide them. The documentation provided with your computer or serial card should clarify any special requirements.

### 2.9 Terminal (Modem) Software for Specific Computers

Any communications program that enables your computer to emulate or act as an ASCII terminal with a telephone modem should work with your PK-232. If you have a familiar program you have used successfully, use it to communicate with your PK-232.

#### 2.9.1 Apple Macintosh

Apple dealers sell a communications program called 'MacTerminal' that will work well with the PK-232. Set the program options as listed below:

COMPATIBILITY:

1200 bauds, 7 bits/character, even parity, Handshake XON/XOFF, Modem connection, 'telephone' port.

TERMINAL:

VT100, ANSI, UNDERLINE, US, 80 columns, ON LINE, AUTOREPEAT.

### 2.9.2 Apple II, II+, IIE and IIC

The PK-232 operates well with the Apple II family of computers using both Apple-supplied and third-party serial interface cards. Terminal programs used successfully include ASCII EXPRESS PRO, Hayes SMARTCOMM IIE, and DataCapture 4.0

### 2.9.3 Commodore 64, 64C, 128, Vic 20

A BASIC communications program is printed in the Programmer's Reference Guide published by Commodore. Use the program listing for 'True ASCII'; Commodore computers internally use a modified ASCII format. We suggest you operate your PK-232 at 300 bauds with these computers to avoid possible data speed difficulties.

### 2.9.4 IBM PCjr

The PCjr's BASIC cartridge contains a terminal program. Start the program by typing 'TERM.' Refer to the PCjr's BASIC manual for details on the program. For best results with the PCjr do not run the PK-232's serial port baud rate faster than 1200 bauds.

### 2.9.5 Tandy Color Computer

Several terminal programs are available for the CoCo. We suggest that you use a commercial program rather than writing your own. The CoCo's 'software UART' may be difficult to program in BASIC.

### 2.9.6 Tandy Model 100/102 and NEC 8201

The Model 100, 102 and NEC 8201 have built-in terminal programs in ROM. Consult the computer documentation for instructions in their use.

### 2.9.7 IBM PCs, 'Clones' and True Compatibles

Although you can use almost any terminal program with your IBM PC or close compatible, AEA sells the PC-PAKRATT tm program which provides many features not available in "telephone modem" programs. See your AEA dealer for the most current information on PC-PAKRATT.

There are many commercial, 'shareware' and public-domain communications and terminal programs available for the IBM PC family and compatible MS-DOS computers. Almost any of these programs can be used successfully with your PK-232. In addition, specialized terminal programs for packet-radio and packet bulletin board service can be found throughout the amateur radio community and can be downloaded from CompuServe, GENie and from many telephone bulletin boards.

A partial list of PC programs tested successfully with the PK-232 includes:

CROSSTALK-XVI, SMARTCOM, RELAY, PROCMM, BITCOM, QMODEM, PC-TALK, CTERM, HAMCOM, PACKCOMM, PACKTALK, HAMPAC, and YAPP.

2.10 Packet Bulletin Board Program Compatibility

The PK-232 is used successfully with PBBS (Packet Bulletin Board) programs written for the PC/MS-DOS computers by WORLI and VE3GYQ, WA7MBL and KA2BQE.

Please consult the authors directly for information on operating your PK-232 with their PBBS programs. AEA's Customer Service Department cannot provide information on these applications.

The following default parameters are recommended for PBBS operation:

```

8BITCONV  ON
ACRDISP   0
ALFDISP   OFF
AWLEN     8
AX25L2V2  ON
CHSWITCH  $00
DCDCONN   ON *
DELETE    OFF
ECHO      OFF
FLOW      OFF
NEWMODE   OFF
NOMODE    ON
PARITY    0
RELINK    OFF
START     $00
STOP      $00
TXFLOW    OFF
XFLOW     OFF
XOFF      $00
XON       $00

```

\* WA7MBL's Version 3.12 PBBS code requires that Pin 8, 'DCD' (Data Carrier Detect) must be wired between the computer and the PK-232. 'DCDCONN' must be ON to force Pin 8 to follow the PK-232's connect status. NOMODE must be ON.



## 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. It describes both 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. AMTOR only.
IDLE	ARQ/FEC Idle	Lit when system sends synchronizing or idle characters. AMTOR only.
PHASE	ARQ Phasing	Lit when system sends SELCAL or phasing signals to distant station. AMTOR only.
STBY	ARQ Standby	Lit when system is available to answer ARQ SELCAL from distant station. AMTOR only.
RQ	ARQ Repeat Request	Lit when distant station requests repeat of previous information blocks. AMTOR only.
TFC	ARQ/FEC Traffic	Lit when system sends information. AMTOR only.
OVER	ARQ Changeover	Lit when system sends changeover command to distant station. AMTOR only.
MULT	Multiple	Lit when multiple connections exist. Packet only.
SEND	Send	Lit when PTT line is active. All modes.
CONV	Converse	Lit when in Converse Mode. All modes except AMTOR.

CMD	Command	Lit when in Command Mode. All modes except AMTOR.
TRANS	Transparent	Lit when in Transparent Mode. All modes except AMTOR.
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, or each time you type the RESTART command, your PK-232 shows its status on the front-panel LEDs:

STATUS: CMD lit

MODE: PKT lit

### 3.2.4 Tuning Indicator (See Figure 3-1)

One or 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 are lit. Received 'space' tones light the 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 left 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.



Figure 3-1 Bar-graph Tuning Indicator Display

## 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.

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

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

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

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 value previously stored, and the new value assigned. For example, if you type

```
XFLOW OFF
```

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

```
XFLOW    was ON
XFLOW    now OFF
```

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.

- o If you type an unrecognized command:  
?What?
- o If the command name is correct, but the arguments are wrong:  
?bad
- o If you type a numerical value that is not within the proper range for that parameter:  
?range
- o If you set the BEACON timing too often for busy channels:  
  
WARNING: BEACON too often
- o If you try to enter an improper SELCAL:  
?callsign

Here are a few more examples:

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

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

cmd:PACLEN 265    - Unacceptable numerical value.
?range

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

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

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

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

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

#### 3.3.4 Command Names

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

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

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

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

- o 'n' means the command takes a numerical parameter value.

#### 3.3.5 Default Values

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

#### 3.3.6 Parameters, Arguments and Values:

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

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

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

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

- o Immediate commands such as ID have no parameters. Typing only 'ID' causes the PK-232 to execute the command (when HID is ON).

Some commands such as CONNECT have optional parameters.

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

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

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

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

- o Boolean Parameters

Boolean parameters have only two possible values, such as ON and OFF, YES or NO, or EVERY and AFTER. When a parameter is Boolean, its two possible choices are shown separated by a vertical bar. Boolean parameters may be set by entering the command followed by either the desired value (ON and OFF, YES or NO, or EVERY and AFTER) or they may be Toggled by simply entering the command followed by a T.

- o Numeric Parameters

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

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

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

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

- o Text or String Parameters

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

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

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

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

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

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

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

Some examples will help you understand these explanations.

- o BEACON 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).

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

The CONNECT command requires a string argument 'call1.'

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

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

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

### 3.3.7 Using Commands Without Arguments

When 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
MDIGI   now ON       Displays the newly-assigned 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 DD.MMM.YY
Checksum $nn
cmd:
```

This is the sign-on message that appears when you turn on your PK-232 with batteries installed, or when you type the RESTART command after having done the autobaud routine. The release number will be updated whenever the firmware is changed by AEA. The checksum is a hex number which you can compare against the correct checksum given for the firmware version you are using. Checksum information for each specific firmware release can be obtained from AEA.

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 happens any time you give your PK-232 an invalid command which 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 is displayed if you make a mistake typing a command to the PK-232.

?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 that does not meet the PK-232's requirements. A call sign may be any string of numbers and letters. The maximum length of the string is six characters or a maximum of six characters followed by a hyphen and a decimal number from 0 to 15 as an SSID. Punctuation and spaces are not allowed.

?clock not set

You gave the command DAYTIME to display the date and time, but you hadn't set the clock previously. If you type DAYTIME with the daytime parameters, you'll set the clock. Then if you type DAYTIME without parameters, you'll see the date and time.

?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 the 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 transmitted successfully.

### 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 displays the link status. If you've set AX25L2V2 to ON, you'll also see the number of unacknowledged packets for which your PK-232 is awaiting acknowledgment.

The following messages appear in response to the CONNECT command.

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

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

- o Link state is: DISCONNECTED

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

- o Link state is: CONNECT in progress

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

- o Link state is: DISCONNECT in progress

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

- o Link state is: FRMR in progress

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

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

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

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

- o \*\*\* Connect request: call1 [VIA call2[,call3...,call9]]  
  
Your PK-232 has received, but not accepted, a connect request from a distant station. This can happen if you have set CFROM to NONE or if you are already connected to another station.  
  
When your PK-232 displays this message, it also sends a DM packet (busy signal) to the station that initiated the connect request. If your PK-232 rejects a connect request because you've set CFROM to NONE, you can issue your own connect request to the other station.
- o \*\*\* DISCONNECTED: (call sign)  
  
Your PK-232 has switched to the disconnected state from any other link state. This message may be preceded by a message explaining the reason for the disconnect, as shown below.
- o \*\*\* Retry count exceeded  
\*\*\* DISCONNECTED: (call sign)  
  
Your PK-232 has been disconnected because of a retry failure, rather than a disconnect request from one of the stations.
- o \*\*\* <call sign> busy  
\*\*\* DISCONNECTED: <call sign>  
  
Your connect request was rejected by a DM packet (busy signal) from the other station. Your PK-232 will reject a connect request if CFROM is set to NONE or if you are already connected to another station.
- o FRMR sent: xx xx xx  
  
Your PK-232 is connected but a protocol error has occurred. Your PK-232 has transmitted a special FRMR packet and is trying to re-synchronize frame numbers with the distant station's packet system. The string xxxxxx is replaced with the hex codes for the three bytes sent in the information part of the FRMR frame. This message will not appear if your PK-232 is in Transparent Mode.
- o FRMR rcvd: xx xx xx  
  
Your PK-232 has received an FRMR (protocol error as described above). This message won't 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 and forces immediate entry into Converse 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 and forces immediate entry into Converse mode.  
 'K' Enters Converse mode to preload Transmit buffer (Type Ahead).

##### Embedded in transmitted text:

<CTRL-O> Sends LETTERS shift character.  
 <CTRL-N> Sends FIGURES shift character.  
 <CTRL-D> End transmission (Go back to receive)  
 <CTRL-F> End transmission then send CW ID

##### In ASCII RTTY:

##### From Command Mode

'R' Switches system to receive mode, forces LETTERS case.  
 'X' Switches system to transmit mode and forces immediate entry into Converse mode.

3.3.9.4 AMTOR ModeFrom 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.  
 'ARQ' The 'ARQ (SELCAL)' and 'FEC' commands force immediate entry into Converse mode on completion of the link setup in ARQ and end of phasing at the start of an FEC transmission.  
 'K' Enter Converse mode to preload Transmit buffer (Type Ahead)

Embedded in transmitted text:

<CTRL-O> - Sends LETTERS shift character.  
 <CTRL-N> - Sends FIGURES shift 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 6, '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 along with 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.

- o Type 'X' to start another transmission.

##### 3.4.1.4 Send Time of Day <CTRL-T>

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 the 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.

In packet mode, the <CTRL-T> command can be embedded in message text sent or typed while connected in Converse Mode, but will have no effect in Transparent Mode.

The PK-232's DAYTIME value will be sent as part of the packet data.

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

- o Note: the TIME command cannot be embedded in the CTEXT message.

#### 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, then 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-Hz shift. The PK-232's 200-Hz shift is within the passband and filter tolerances of any RTTY demodulator in general service.

NOTE: The use of shifts up to 1000 Hz on HF radio is authorized in FCC Part 97.69.

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

```
WIDESHFT    was OFF
WIDESHFT    now ON
```

#### 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), 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 '\$' in Baudot and AMTOR, or <CTRL-E> in ASCII.

Your PK-232 turns on your transmitter, sends the text string stored in the answerback field (AAB) and then turn your transmitter off and returns to receive status.

These related features can be used to handle messages in either direction to confirm that:

- o You are sending to the proper station.
- o The distant station is probably receiving your traffic successfully.

#### 3.4.2 Formatting Commands

These commands affect transmitted or displayed signals, or both.

##### 3.4.2.1 Screen Line Length (ACRDISP n)

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

##### 3.4.2.2 Monitor Echo (ECHO)

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

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

### 3.4.2.3 Automatic Word/Character Output (WORDOUT)

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

- o When 'WORDOUT' is OFF: Each character you type is transmitted as soon as you type it as it enters the PK-232's transmit buffer.
- o When 'WORDOUT' is ON: Nothing is 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 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:

- o 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' transmits double or triple line feeds, which looks very strange to the distant station.
- o Many stations using electromechanical teleprinter and Teletype tm 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> produces 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 0 (zero).
- o When sending RTTY pictures - you want everything exactly as typed.

#### 3.4.2.7 Automatic Line Feed (ALFRTTY)

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

#### 3.4.2.8 Backspace and Delete <DEL>

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

- o If 'DELETE' is ON, typing <BACKSPACE> erases the characters from the screen and the transmit buffer.

#### 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.

- o If your computer presents this problem, set ESCAPE to ON.
- o See the MFILTER command which lets you strip or filter out any received characters and prevent them from reaching your computer or terminal.

#### 3.4.2.10 Echo As Sent (EAS)

The Echo-As-Sent (EAS) command can be used in all modes except 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>.

- o You must be in the Command Mode to use TCLEAR.
- o Use <CTRL-C> (default) command to return to Command Mode.
- o Type 'TCLEAR <RETURN>' or 'TC <RETURN>' to clear the transmit buffer.

### 3.4.3 Summary of Automatic Carriage Return and Line Feed Commands

The PK-232's text and display formatting commands provide great flexibility in text and message handling. The following paragraphs summarize the various combinations of format commands available and describe their effects on typed text and messages.

#### 3.4.3.1 Automatic Carriage Returns - ACRDISP, ACRRTTY, ACRPACK and CRADD

ACRDISP affects the data flowing from the radio or the TNC to the user's terminal. The argument is a number 0-255, signifying the screen width of the terminal. The default 80 means that an automatic CR is inserted after the 80th consecutive non-CR character. An argument of 0 means the feature is disabled.

ACRRTTY affects the data flowing from the terminal to the radio in Baudot, ASCII and AMTOR modes. The argument is a number 0-255, signifying the assumed screen width of the distant station. The default of 71 means that a CR is substituted for the first space after 66 consecutive non-CR characters, or is inserted after the 71st consecutive non-CR character, whichever comes first. An argument of 0 means the feature is disabled.

ACRPACK affects the data flowing from the terminal to the radio in packet mode.

- o ACRPACK OFF - the SENDPAC character is not added to outgoing packets.
- o ACRPACK ON (default) - the SENDPACK character itself is added to the end of the packet.

CRADD affects the data flowing from the terminal to the radio in Baudot.

- o CRADD OFF (default) - the data is not modified.
- o CRADD ON - each CR from the terminal is transmitted followed by a second inserted CR.

With CRADD ON and ALFRTTY ON, a CR typed at the terminal yields the CR-CR-LF sequence favored by MARS operators.

#### 3.4.3.2 Automatic Linefeeds - ALFDISP, ALFPACK, ILFPACK and ALFRTTY

ALFDISP affects the data flowing from the radio or the TNC to the user's terminal. ALFDISP OFF means that this command does not modify the data.

- o ALFDISP ON (default) - in packet mode, all received LFs are ignored, and every received CR is passed to the terminal followed by an inserted LF. In Baudot, ASCII and AMTOR, all received CRs are ignored, and each received LF is passed to the terminal preceded by an inserted CR.

ALFDISP ON inserts LF after every automatic CR caused by ACRDISP.

ALFPACK affects the data flowing from the terminal to the radio in packet mode.

- o ALFPACK OFF (default) - the data is not modified.
- o ALFPACK ON - LFs from the terminal are ignored, and each CR from the terminal is transmitted followed by an inserted LF.

ILFPACK affects the data flowing from the terminal to the radio in packet mode.

- o ILFPACK OFF (default) - all LFs are passed without modification.
- o ILFPACK ON - all LFs from the terminal are ignored; this would be useful for sending computer files that contain LFs.

ALFPACK ON overrides ILFPACK:

ALFPACK	ILFPACK	Action:	CR	LF
OFF	OFF		CR	LF
OFF	ON		CR	-
ON	OFF		CRLF	-
ON	ON		CRLF	-

ALFRTTY affects the data flowing from the terminal to the radio in Baudot, ASCII and AMTOR.

- o ALFRTTY OFF - the data is not modified.
- o ALFRTTY ON (default) - all LFs from the terminal are ignored, and each CR from the terminal is transmitted followed by an inserted LF.

ALFRTTY ON inserts LF after every automatic CR caused by ACRRTY.

Command	Direction	Action:	CR	LF
ALFDISP ON (packet)	Terminal <- Radio		CRLF	-
ALFDISP ON (RTTY)	Terminal <- Radio		-	CRLF
ALFPACK ON	Terminal -> Radio		CRLF	-
ILFPACK ON	Terminal -> Radio		CR	-
ALFRTTY ON	Terminal -> Radio		CRLF	-

3.4.4 PK-232-to-TNC-2 Command Cross-Reference

The following table of equivalent commands will help those operators who are familiar with formatting commands used in the TAPR TNC-2 Packet TNC and its commercial clones to gain a clearer view of the differences in command words and their equivalent functions.

PK-232	TNC-2
ACRDISP	SCREENLN
ACRPACK	CR
ACRRTTY	-
CRADD	-
ALFDISP	AUTOLF
ALFPACK	LFADD
ALFRTTY	-
ILFPACK	LFIGNORE

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## CHAPTER 4

## OPERATING MODES

4.1 General Information

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

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

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

4.1.1 Morse Code

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

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 to achieve the lowest number of errors when automatically decoding 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! Even 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 or 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!

4.1.2 Baudot RTTY

Computer-based Baudot operation is growing daily. The economical personal computer and the amateur radio station open new vistas of enjoyment and provide 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 ASCII character set. The Baudot/Murray code is still the most widely used RTTY code format in the amateur radio service in the world. Your PK-232 provides Baudot RTTY at all standard speeds in use today, including all commercial Baudot speeds up to 300 bauds.

#### 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 which requires a more complete character set than that provided by older, less sophisticated Baudot code. The ASCII code is generally suitable for any form of data transfer, and is required for transmission of computer program listings and executable or binary code files.

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

#### 4.1.4 AMTOR

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

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

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

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

With EAS set ON in Mode A you can 'see' the quality of the path and the circuit link and band conditions, watch the flow of the data, and accurately estimate the 'throughput' rate.

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

We strongly urge that, before operating AMTOR, you read APPENDIX D, 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 CCITT X.25 protocols standardized throughout the telephone networks, as modified within our fraternity for use in amateur radio.

#### 4.2 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
OPMODE    now MORSE
```

Type WIDESHFT OFF followed by a <RETURN>. The PK-232 responds with the previous mode:

```
WIDESHFT  was OFF (or ON, if you had previously set it on).
WIDESHFT  now OFF
```

Your PK-232's front panel will show the CMD and MORSE LEDs lit.

- o Type 'X' to turn on your transmitter and enter Converse mode. (The 'K' command is not needed.)
- o Type <CTRL-D> to shut off your transmitter and return to Command Mode OR,
- o Type <CTRL-C> to return to the Command Mode.
- o Type 'R' to shut down your transmitter and end the contact.

You can use either the CW or LSB mode for Morse operation. The PK-232 provides both direct keying and tone modulation keying at the same time. The PK-232's CW filters are tuned to 800 Hz. When using your transceiver's CW mode, you can usually switch in additional filtering to improve selectivity.

For tone-modulated CW, place your transceiver in the LSB mode. Your PK-232 simulates CW by turning a 1200-hertz tone on and off.

If you use LSB, remember that you are transmitting a 1200-Hz tone and receiving an 800-Hz tone. Therefore, you need to use the RIT control because of the offset between transmit and receive tones.

The PK-232's automatic speed-tracking feature monitors the speed of the received signal.

- o Use the 'L' command from Command Mode to LOCK the receive speed after getting good copy from a CW station.

This minimizes the effects of static crashes and interference from other stations causing speed tracking to lock to a different speed. This is particularly helpful when the band is noisy or cluttered with many stations.

- o Use the 'MO' command from Command Mode to unlock the LOCK command.

This places the PK-232 back into its 'free running' mode in which it tracks CW speed automatically.

- o To start a CW transmission, type 'X' and a carriage return from the Command Mode.

The PK-232 keys your radio's the PTT circuit; the SEND, CONV and MORSE LEDs are lit.

- o To end a CW transmission and return to the receive mode, type <CTRL-D>.

The setting of WORDOUT determines the way your typed characters will be grouped and sent.

- o Set WORDOUT OFF to send your typed characters as you enter them.
- o Set WORDOUT to ON characters to allow you to edit typing errors. No characters are sent until you press either the space bar, type a carriage return, or type any standard keyboard punctuation.

You may wish to copy the signal in your head and use the PK-232 as a CW keyboard. This procedure works only when using CW keying via the KEY OUT jacks on the rear of the PK-232.

- o Disconnect your microphone cable from the PK-232 to the radio so that the radio does not hang in transmit.
- o Place your transceiver in VOX or QSK mode.
- o Set WORDOUT to OFF.
- o Start a CW transmission by typing 'X' as above.

The PK-232 is now in MORSE SEND mode.

#### 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 and forces immediate entry into Converse mode.                      |
| 'K'  | Loads the Transmit type ahead buffer   |
| 'MO' | Unlocks the Morse receive speed.   |

Characters embedded in transmitted text:

- |          |   |
|----------|---|
| <CTRL-D> | Shuts off transmitter immediately and returns PK-232 to the Command Mode. |
|----------|---|

#### 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
MSPEED now xx (whatever new speed digits you typed)
```

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. A number lower than 5 is ignored and the program then 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 by unlocking 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 which 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 with 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 installations your hand keying will be sent to the PK-232 and displayed on your monitor if your radio has an audio 'input monitor' or 'sidetone' output and you've turned on those monitor functions.

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 but 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 responds by displaying the previous mode:

```
OPMODE  was MORSE
OPMODE  now BAUDOT
```

Set the following commands and typical values for Baudot operation:

```
RBAUD   45 (or whatever speed you wish)
RXREV   OFF
TXREV   OFF
WIDESH  OFF
```

Your PK-232's front panel will show the CMD and BAUDOT LEDs lit.

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

#### 4.3.1 Baudot RTTY Operating Tips

Operate your radio in LSB mode. If your radio has IF shift or pass-band tuning, center both controls. Tune the transceiver so that no signals are heard. Set the AF GAIN control to a normal listening level. Turn the THRESHOLD control fully clockwise, then counterclockwise until the DCD LED is extinguished.

Tune your radio a Baudot signal. Try to get a tuning indication as shown in Figure 2-1.

The DCD LED should now be on and your screen or printer should show readable text. If you're getting 'garbage' or the text isn't readable, the sending station may be using a different speed than the speed you've selected, or it may be sending on the opposite sideband.

The PK-232 cannot automatically determine the speed of the received signals. However, you can step the system through all the available receiving speeds. Assume you've been receiving at 45 bauds and wish to increase the baud rate in steps. From the Command mode, type RB U followed by a <RETURN>. The PK-232 responds with:

```
RBAUD   was 45
RBAUD   now 50
```

'RB U' increases the RBAUD value one step each time you type it. For example, if RBAUD was 45, 'RB U' increases it to 50. Increase RBAUD one step at a time until you can copy the desired station.

If you suspect that the distant station is using the other sideband, type RXREV T, followed by a <RETURN>. The PK-232 will respond with:

```
RXREV  was OFF
RXREV  now ON
```

RXREV T toggles the RXREV parameter from OFF to ON or ON to OFF. You can now use the RBAUD D command to decrease RBAUD one notch at a time until you can copy the station.

Many amateur RTTY stations operate at 45 bauds (RBAUD), although the number of stations using higher speeds is increasing rapidly. Many RTTY mail box stations and MSOs operate at 75 bauds. You'll find lots of Baudot signals in the RTTY portions of each amateur band.

#### 4.3.2 A Typical Baudot RTTY Contact

Let's assume you hear KZ7G calling CQ. Wait until he completes his CQ and turns his transmitter off before doing the following:

- o Type 'X' to key your transmitter and start the PK-232 sending.
- o Call the other station by giving his call followed by your call, (KZ7G DE N7BTT). You can start the transmission with a line of RYs as a tuning signal for the distant station. Here's a typical callup sequence:

```
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYR
KZ7G KZ7G KZ7G DE N7BTT N7BTT N7BTT
KZ7G KZ7G KZ7G DE N7BTT N7BTT N7BTT
KZ7G KZ7G KZ7G DE N7BTT N7BTT N7BTT
<CTRL-D><RETURN>
```

(If the other station can't copy these four lines of text, the chances are he won't copy any more than that. No need to waste time and bandwidth by typing 15 or 20 lines of the same thing.)

- o Type <CTRL-D><RETURN> at the end of your call. The <CTRL-D> puts both your radio and the PK-232 into the receive mode.

Always end every transmission with a carriage return to force the distant station's screen cursor or teleprinter back to the left margin on a new line. It's a good operating habit that keeps things neat.

- o Wait a bit to see if you get a response. If not, you can repeat the above procedure.

<CTRL-D> makes the PK-232 turn off the transmitter. Otherwise, you'd have to wait until you 'thought' the PK-232 was finished transmitting. You'd have to return the PK-232 to Command Mode manually by typing <CTRL-C>. Then you'd have to type 'R' to force the PK-232 into the Receive Mode regardless of any other text to be transmitted.



4.3.3 Transmit/Receive Function Keys

From the Command Mode:

'L' Forces LETTERS case.  
 'R' Switches system to receive mode, forces LETTERS case.  
 'X' Switches system to transmit mode and forces immediate entry into Converse mode.  
 'K' Load Transmit type ahead buffer

Characters embedded in transmitted text:

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

The PK-232 provides Baudot/Murray RTTY operation at 45, 50, 57, 75, 100, 110, 150, 200 and 300 bauds, corresponding to approximately 60, 66, 75, 100, 132, 145, 198, 264 and 396 words per minute (WPM).

## 4.3.4 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 previous and the new baud rate:

```
RBAUD    was 45
RBAUD    now 75 (or whatever new speed you've selected)
```

The number you enter becomes the new data rate, replacing the value previously stored in the program.

- o 'RB n' can be any of the following speeds: 45, 50, 57, 75, 100, 110, 150, 200 or 300 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 generally used in amateur radio relate to baud rates as follows:

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

#### 4.3.5 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.

CCITT ON translates your typing into International Telegraph Alphabet Number 2 (ITA #2) to avoid character conflicts when working stations overseas. (Incidentally, Part 97.69 of the FCC Rules specifies ITA #2 code when operating Baudot RTTY.)

- o With CCITT ON, characters typed on the keyboard or loaded from disk files are translated into CCITT ITA #2 before being sent.
- o With CCITT 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.'

#### 4.3.6 Unshift-On-Space (USOS)

Unshift-On-Space automatically changes the received Baudot/Murray code characters to the LETTERS or lower case condition after any '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, some commercial, weather and utility RTTY services send consecutive groups of numbers separated by spaces.

When receiving such non-amateur signals, USOS set to ON may produce bad results by displaying 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 mode. The PK-232 responds with the previous mode:

```
OPMODE   was BAUDOT
OPMODE   now ASCII
```

Set the following commands and typical values for ASCII operation:

```
ABAUD    110 (or whatever speed you wish)
RXREV    OFF
TXREV    OFF
WIDESH   OFF
```

Your PK-232's front panel will show the CMD and ASCII LEDs lit.

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

##### 4.4.1 ASCII Operating Tips

ASCII RTTY operation is generally similar to Baudot RTTY except for a greater tendency to receive errors under conditions of noise or interference. Because the ASCII code uses seven bits to define a character (instead of the five bits used in the Baudot/Murray code), the mathematical probability of receiving errors is somewhat higher. For these reasons, ASCII is not used widely on the HF amateur bands. However, some commercial and military HF stations do use ASCII.

Some VHF Bulletin Boards and MSOs use ASCII at 110 and 300 bauds, most commonly on two meters.

Follow the general operating procedures shown in section 4.3.1 for Baudot RTTY. As in Baudot operation, you can step the system through all the available receiving speeds.

Assume you've been receiving at 110 bauds and wish to increase the baud rate in steps. From the Command mode, type AB U followed by a <RETURN>. The PK-232 responds with:

```
ABAUD    was 110
ABAUD    now 150
```

'AB U' increases the ABAUD value one step each time you type it. For example, if ABAUD was 110, AB U increases it to 150. Increase ABAUD one step at a time until you can copy the desired station.

See section 4.3.2 for additional general operating tips.

#### 4.4.2 A Typical ASCII RTTY Contact

There is no major difference between Baudot and ASCII RTTY operation other than the ability to type both upper and lower case characters in the ASCII code. You can also send certain control codes and special characters that don't exist in Baudot/Murray code. See section 4.3.2 for typical operating suggestions.

#### 4.4.3 Transmit/Receive Function Keys

From the Command Mode:

'R'            Switches system to receive mode.  
'X'            Switches system to transmit mode and forces immediate entry into Converse mode.

Characters embedded in transmitted text:

<CTRL-D>    Shuts off the transmitter immediately.  
<CTRL-F>    Sends call sign in Morse and shuts off the transmitter.

The PK-232 provides RTTY operation in ASCII code at 45, 50, 57, 75, 100, 110, 150, 200 and 300 bauds. The concept of 'WPM' is generally not used in reference to the ASCII code.

#### 4.4.4 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
ABAUD        now 150 (or whatever new speed you've selected)
```

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' (up) or 'AB D' (down). The PK-232 returns the previous data rate and adopts the new rate.

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

4.4.5 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 with 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 responds by displaying the previous mode:

```
OPMODE   was ASCII
OPMODE   now AMTOR
```

Your PK-232's front panel will show both STBY LEDs lit.

##### 4.5.1 Transmit/Receive Function Keys

From the Command Mode:

'ARQ <SELCAL>'	Starts Mode A selective call and forces Converse
'FEC'	Starts Mode B transmission and forces Converse
'SELFEC <SELCAL>'	Starts Selective Mode B transmission
'R'	Stops sending immediately, forces AMTOR Standby, clears the transmit buffer of all remaining data
'AM'	Stops transmission, forces AMTOR Standby, clears the transmit buffer of all remaining data
'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>	Stops sending when the transmit buffer is empty

##### 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 operating AMTOR at any other speed.

##### 4.5.3 SELCAL (Selective Call)

AMTOR operating modes require a SELCAL (Selective Call) 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	WLAB	WWAB
1 by 3	WIABC	WABC
2 by 1	AB1Z	AABZ
2 by 2	AB1YZ	ABYZ
2 by 3	KA1XYZ	KXYZ

For '1 by 2' call signs, the first letter is doubled. For example, 'N7ML' becomes 'NNML'. In most cases this method is acceptable.

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

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

Type 'ARQ (SELCAL)' to start an AMTOR Mode A (ARQ) contact. The SELCAL should be four letters. In certain special applications, four or five-digit SELCALs may be used if necessary.

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, you may 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 are displayed as they are acknowledged by the distant station. The IDLE and TFC LEDs change back and forth whenever your typing pauses.

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 re-establish synchronization with the distant station. The LEDs change to show:

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

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

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

- o    Don't type 'KKK' or anything like that!
- o    Do type a plus sign immediately followed by a question mark (+?).

'+?' is a software changeover command that switches your system from 'Information Sending Station' (ISS) to 'Information Receiving Station' (IRS), and switches the distant system from 'Information Receiving Station' receive to 'Information Sending Station.' When your distant partner sees the '+?' he knows he can 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 sending back 'control' signals that tell your PK-232 how your signals are being received and how the link is behaving.

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

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

#### 4.5.4.3 Mode A (ARQ) Break-In (ACHG Command)

In Mode A (ARQ), when you're the 'Information Receiving Station,' you can use the 'ACHG' command to break or interrupt the distant station's comments.

ACHG is a software command that forces both systems to 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 change-over at the end of his comments.

The use of this command can be rather disconcerting to the operator at the other end of the link.

- o Use the ACHG command only when really needed to interrupt the distant station.

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

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

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

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

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

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

- o Type <CTRL-D> to stop sending when the transmit buffer is empty.

<CTRL-F> breaks the link and returns your PK-232 to Command Mode.

- o Type <CTRL-C> and then the letter 'R' if you need an 'emergency shutdown', or in any case when you want to take your transmitter off the air immediately.

#### 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'll probably get good copy from that link.

If the stations you're monitoring are sending error and RQ codes and repeating blocks of characters across their link, you may see some repeated character blocks. Your PK-232 will not print a block of data if that block contains the same information as the previous block. If the 'ISS' (Information Sending Station) is repeating the same block, you won't print it twice, unless you receive an error. 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 (FEC Command)

After selecting AMTOR from the Command Mode, type 'FEC <RETURN>' to enter the AMTOR FEC mode. (You can start an FEC transmission from any other mode simply by typing 'FE'.)

- o Type 'FE' to turn on your transmitter.
- o Type <CTRL-F> to send your call sign in Morse and shut off your transmitter, OR
- o Type <CTRL-C> to return to the Command Mode.
- o Type 'R' to shut down your transmitter and end the contact.

Type 'FEC' to start the AMTOR Mode B call or transmission, or answer a Mode B (FEC) CQ call from a distant station. You don't have to type a SELCAL. Your transmitter will be turned on and kept on continuously, sending synchronous idle control characters.

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

- o Sending CQ in Mode A (ARQ) gives the distant stations no clue as to who you are, or what your SELCAL might be. See APPENDIX D for more comments by G3PLX.
- o Don't send long CQ calls with many lines of repeated call signs. FEC eliminates the need for long CQ calls. A simple '3 by 3' sequence is all you need in FEC. Here's one example:

```

CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
CQ CQ CQ DE W2JUP W2JUP W2JUP (WJUP)
QRR ARQ/FEC SELCAL WJUP KKK

```

IMPORTANT NOTE

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

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

Your PK-232 waits several seconds before sending your traffic! You don't need to 'wait' for the PK-232; it will send the necessary idle characters the distant station needs for acquiring synchronization.

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

4.5.6.1 LED Status and Mode Indicators

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

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

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

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

4.5.6.2 Mode B (FEC) Changeover

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

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

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

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

You can end the FEC contact in several different ways:

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

The 'R' function stops the FEC transmission when the transmit buffer is empty, turns off your rig and returns your PK-232 to AMTOR Standby. You can then be accessed by any distant station's transmission of your SELCAL.

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

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

- o Without returning to Command Mode, type CTRL-D to stop transmission immediately. Your transmitter will shut down but the PK-232 transmit buffer is not cleared.

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 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: Use this mode to prevent the PK-232's internal buffer from overflowing when you are 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 Chapter 6, 'Command Summary' for information on adjusting the PK-232's AMTOR timing characteristics to compensate for this effect.

See the March 1987 issue of "QEX" for an article by Paul Newland, AD7I, for a test procedure for measuring HF transceiver switching times.

#### 4.5.9 Suggested AMTOR Trial Operating Techniques

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

- o Try to work the distant station on Mode B (FEC) to establish that the other station's system is fully functional.
- o Don't use VOX control - use the PTT line from your interface.
- o Turn off the AGC circuit - use the RF gain control to prevent receiver blocking on stronger signals.
- o Turn off all compression or other audio processing.
- o Keep the AFSK audio input level to the microphone circuit as low as possible - avoid overdriving the audio input stages.
- o Disable the ALC circuit or reduce excessive ALC action; use more effective RF antenna loading to adjust output power levels.

APPENDIX D 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.

#### 4.5.10 Possible Areas for AMTOR Performance Improvement

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

- o Remove large decoupling capacitors from the push-to-talk line to allow faster PTT (transmitter) activation;
- o Improve power supply decoupling, especially in audio stages.
- o Do not use squelch.

In case you can't solve your radio's switching-time problems, please call AEA Customer Service Department (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 to 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 enters 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)
OPMODE   now PACKET
```

##### 4.6.1 Change Radio Link Data Rate

Your PK-232 provides radio link data 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
HBAUD    now 300
```



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' (up) or 'HB D' (down). The PK-232 responds with the previous data rate, adopts and displays 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 will not transmit, but sends you the following error message instead:

```
?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, the PK-232 retains its default value of '0' (zero) and the SSID is not displayed. You must specify the SSID to connect to a station with a SSID other than 0 or to use such a station as a digipeater:

```
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), WX2BBB 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 'RADIO2' 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 ensure 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 automatically relay packets 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 Blinks when receive buffer is full
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 RESTART

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 create a packet from your typed characters and then transmit it. (We'll explain in the 'Command Summary' chapter how you can use a different character to send packets.) In Converse Mode everything you type is assembled into a packet that is addressed and sent to the station you're connected to. If no connection (QS0) exists, the packet is addressed to 'CQ' or whatever address you've typed into the 'UNPROTO' field.

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

##### 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 'DISCONN' (or 'D') to terminate the link or connection. The PK-232 transmits a special packet that ends the contact and notifies you when the link is disconnected:

```
cmd:DISCONN
*** 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 our 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 are automatically switched to Converse Mode and your partner sees:

```
*** 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:

- o Your PK-232's AFSK Output Level control, your microphone gain, and deviation are set properly as shown and discussed in Section 2.5.
- o All cables and connectors are properly installed.
- o The RADIO-1/RADIO-2 switch is set for your cable-to-radio setup.
- o Your radio's volume and squelch are set for local conditions.
- o You're in Command Mode. (Type '<CTRL-C>' to confirm this. You must see the 'cmd:' prompt.)
- o 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.
- o Your PK-232 is in Packet Mode. Type 'OP' to confirm this.
- o 'HB' is '1200' if on VHF, '300' if on HF.
- o 'VHF' is 'ON' if on VHF, 'OFF' if on HF.
- o 'CFROM' is set to ALL.
- o 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 '90'), 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 needs your attention.

#### 4.6.8.2 Will You Accept Connections?

CFROM determines:

- o if any call requests are to be accepted or rejected at all
- o or specifies whose call requests are to be accepted or rejected.

CFROM works with four arguments: ALL/NONE or YES(list)/NO(list).

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

- o ALL - your PK-232 accepts connect requests from any caller.
- o NONE - your PK-232 rejects connect requests from all callers.

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

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

CFROM's default argument is 'all.' When CFROM is set to ALL your PK-232 accepts 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:

- o Type CFROM YES (plus a list of calls signs). Connect re-quests are accepted from listed callers only.

To reject calls from one or more specific stations:

- o Type CFROM NO (plus a list of call signs). Connect requests are rejected from the listed stations.

Type CFROM to display the ALL/NONE/YES\_list/NO\_list status of 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 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 <CRs> 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 and the message sent to stations connecting to you.



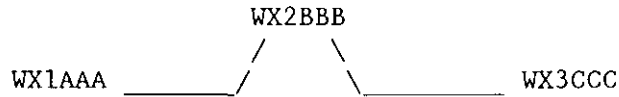
4.6.8.4 Do You Want to Transmit?

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

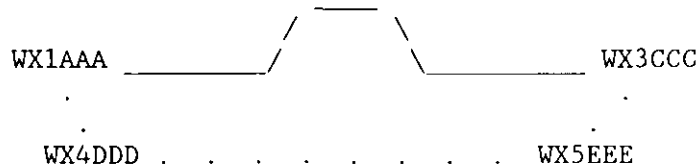
You may wish to connect to a packet station that is beyond your direct radio range. If a third packet station is on the air and both you and the station you want to talk to are in range of that third station, the third station can relay or 'digipeat' your packets. You set up the 'digipeater' routing 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 display 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 an 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 encourage) 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 of 'all' means your PK-232 repeats packets from any station that includes your station's call sign in its 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. If you choose to digipeat other stations, use DFROM to select which stations packets are to be digipeated.

DFROM works with four arguments: ALL/NONE or YES(list)/NO(list)

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

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

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

- o YES (list) - calls of up to eight stations that will be repeated.
- o NO (list) - calls of up to eight stations that will 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 from listed callers only.

To block packets from one or more specific stations:

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

Type DFROM to display the status of ALL/NONE/YES\_list/NO\_list. 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 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 displays:

```
*** 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 and you're in Converse Mode and the QSO has started. Each packet frame sent by your PK-232 must be 'acknowledged,' or ACK'd 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 retransmitting useless packets excessively. 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 also keeps track of stations heard on the channel. This section describes the PK-232's monitoring 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 also displays 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!
```

- o Note: When MRPT is OFF, digipeater paths will not appear in connect requests or connect and disconnect monitor functions.

#### 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. For example, you could inhibit the display of a busy PBBS while you're monitoring other conversations.

4.6.12.1 The MFROM Command

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

To hide or mask packets from one or more specific stations only, 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 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 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 determines 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 call 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 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.

Setting MCON to '0' or 'OFF' monitors packet activity when your station is not connected, but all monitoring automatically ceases 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 received packets. 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. A special value of 128 (\$80) is included which filters all control characters except for carriage return and linefeed, as well as the characters above 127 (\$7F).

Some examples follow:

- o To prevent a <CTRL-L> character from clearing your screen, set MFILTER to 12.
- o To eliminate annoying control characters and characters above 127 (\$7F), set MFILTER to 128.
- o 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.

- o Stations that are heard directly are marked with a '\*.'
- o 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.

- o If DAYSTAMP is OFF, CONSTAMP and MSTAMP show only TIME.
- o 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

Use the DAYTIME command to set the PK-232's real-time clock. After the clock has been set, you can show the time by typing 'DAYTIME'.

When the PK-232 is turned on, the DAYTIME command displays the following error message:

```
?clock not set
```

You must reset DAYTIME 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-87 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)
```

Example: cmd:daytime 86 07 08 06 59

Use either SPACE, '/', ':' or ';' as a separator or delimiter. The PK-232 confirms the date and time entry by echoing the new setting.

#### 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 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 sends 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, while maintaining the <CR> as part of 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 Connects

Multiple-connect capability is a powerful addition to your PK-232's 'bag of tricks'. You can use multiple connect for traffic net operation, multi-user bulletin board and host computer systems, path checking and just plain 'round table ragchews.'

- o Multiple connects work with 'logical channels', channels that are created or simulated by computer logic and don't really exist in the same way that a 'radio channel' exists.
- o Multiple connects don't affect your radio's performance. Use your radio equipment normally on only one radio channel.

A multiple connect isn't the same as a 'multi-way' contact.

- o Multiple connect sets up separate 'point-to-point' links with several different stations.
- o Multi-way contact (not yet available) connects several stations to each other simultaneously as 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 unless you change the values, your PK-232 defaults to the following multiple-connect conditions and does not allow any multiple-connects.

```

CONPERM  OFF
CHCALL   OFF
CHDOUBLE OFF
CHSWITCH $00
USERS    1

```

##### 4.6.14.2 Multiple Connects Yes - the USERS Parameter

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

- o USERS 1 is 'normal' operation without multiple connect.

When USERS is set to '1' and you already have a connect on another channel, the PK-232 sends a packet to the calling station indicating that you are busy.

A numerical value from 0 to 10 specifies the number of multiple connects 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

Use the CHSWITCH command to select the character that shows that a new multiple-connect channel is being addressed.

- o Use a value 'n' between 0 and \$FF (0 to 255 decimal) to specify an ASCII character.
- o 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.

- o Suggestion: set the CHSWITCH character to a 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 online 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 they are the same as your CHSWITCH character.

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

4.6.15 Tips on Channel Switching and Multiple Connects

The PK-232 offers ten logical channels on which you can hold more than one conversation at a time. In effect, multiple connect operation is much like a 'ten-button' telephone with a 'hold' button.

Depending upon the status of USERS, you can be linked to one station on logical channel 1, connect to another on logical channel 2 and accept a connect request on logical channel 3.

- o Use the CHSWITCH character to change logical channels.

Make sure that the CHSWITCH character you select is not one you use in everyday conversation. The next number you type after entering the CHSWITCH character is interpreted as the channel number to which you want to switch.

For example, if you've selected 'A' as your CHSWITCH character, and type 'Mike is an AI class operator' the PK-232 thinks you have given the command 'to switch to channel 1.'

- o The CHSWITCH character is active in both Converse and Command Modes. You don't have to return to the Command Mode to change channels.

Let's choose the CHSWITCH character '@' by typing the ASCII value, decimal or hex, of '@' to define CHSWITCH.

```
CHSWITCH $40 (hex) or
CHSWITCH 64 (decimal)
```

After you have defined CHSWITCH, the PK-232 changes logical channels whenever you type '@' followed by a number (0-9).

- o Choose the 'equals' sign (=) as your switch character.

Type 'CHSWITCH \$3D' to select the 'equals' sign. Your monitor displays:

```
CHSWITCH was $00
CHSWITCH now $3D (=)
```

- o To see the call signs of the stations with whom you're connected, type 'CHCALL ON'.
- o To accept the maximum number of permissible multi-connects, type 'USERS 10'.

- o Assume you want to connect to WX1AAA and WX2BBB. From Command mode, type:
  - =0 CONNECT WX1AAA
  - and
  - =1 CONNECT WX2BBB
- o After you're connected, you can tell who's talking to you:
  - =0:WX1AAA: Hi Ralph.
  - =1:WX2BBB: Long time no see!
- o To chat with WX1AAA in Converse mode, type:
  - =0 Hi Chuck!
- o To chat with WX2BBB, do the same thing for his channel:
  - =1 Hello Bert.
- o To disconnect from WX1AAA, type:
  - <CTRL-C>=ODISCONNECT

#### 4.6.15.1 The CSTATUS Command

CSTATUS is an immediate command that shows you the status of all 9 channels.

- o Use the CSTATUS command to find out what logical channel you're using.

For example, assume you're connected to KZ7G on channel 0, trying to connect to N7BTI on channel 1, and have issued a disconnect request for N7ML on channel 3 which also happens to be the channel you are using.

The CSTATUS command shows:

```

CH 0-    CONNECTED TO KZ7G; V2; 3 UN ACKED
CH 1-    CONNECT IN PROGRESS
CH 2-    DISCONNECTED
CH 3- I/O DISCONNECT IN PROGRESS
CH 4-    DISCONNECTED
CH 5-    DISCONNECTED
CH 6-    DISCONNECTED
CH 7-    DISCONNECTED
CH 8-    DISCONNECTED
CH 9-    DISCONNECTED

```



You now know that:

- o your PK-232 is connected to KZ7G on logical channel 0 using Version 2 protocol and there are three unacknowledged packets outstanding
- o a connect is in progress on logical channel 1
- o a disconnect is in progress on logical channel 3, which is also the channel to which you're actually connected and where the Input/Output activity is now occurring.

Don't select a CHSWITCH character that can be usually found in text. If by chance you receive the selected CHSWITCH character in text, the PK-232 interprets the next character received as the logical channel to which it should switch activity. If that character is a number, the PK-232 will change logical channels. The chances are that the next received character will be a letter rather than a number. Your system will display the error message ?CHANNEL MUST BE 0-9.

#### 4.6.15.2 The MULT LED

The MULT LED is lit when you have established a multiple connect.

- o If USERS is set to a value greater than '1', more than one connect is permitted.
- o The MULT LED is lit when you establish a second connect or when another station connects to you after you have a connect on another channel.

NOTE: The MULT LED will blink if the PK-232's receive buffer is filled. This can happen if your computer is not connected to the PK-232, or if for some reason, your communications program no longer can accept any further inbound data. The blinking effect is not related to multiple-connect operation.

#### 4.6.16 Understanding Monitor Level 6

When MONITOR is set to '6', your PK-232 displays all packet frames received on the channel to which you're tuned. 'Monitor 6' provides information that can frequently be used to identify the exact nature of the packet communication in progress and diagnose link problems. Packet frame identifiers are displayed at the end of each packet header received and decoded by the PK-232. The identifier letters are enclosed in either < > or [ ] brackets.

<C> indicates a Connect Command received with AX25L2V2 set OFF  
 [C] indicates a Connect Command received with AX25L2V2 set ON.

In all cases, the < > or [ ] indicates the version of the protocol in use by the station sending the packets.

Monitor '6' sets your PK-232 to display and identify ten different types of packet frames:

C	Connect Command (also known as a 'SABM' frame)
D	Disconnect Command
I	Information Command and Response
UA	Unnumbered Acknowledgment Response
UI	Unnumbered Information Frame
RR	Receive Ready Command and Response
RJ	Reject Command and Response
RNR	Receive Not Ready Command and Response
FRMR	Frame Reject Response
DM	Disconnected Mode Response

In these next paragraphs, we'll show some examples of these frame identifiers and how they appear in various packet link situations. We'll assume that stations KZ7G and N7BTI are working these links.

#### 4.6.16.1 The <C> Connect Command <SABM Frame>

Let's assume that KZ7G is using AX25L2V2 set to OFF, and has typed the 'C N7BTI' command. His PK-232 sends a Connect Command frame to N7BTI, the station to whom he wants to connect. The header will look like this:

```
KZ7G>N7BTI <C,P>
```

- o The '<>' indicates that V2 is OFF;
- o The 'C' indicates a Connect Command (SABM Frame);
- o The 'P' indicates that the 'Poll' bit is set and that a 'Final' bit is expected in response.

#### 4.6.16.2 The <UA> Unnumbered Acknowledgment Frame

Assuming that N7BTI's system is available and responds with the normal acknowledgment, the next header will look like this:

```
N7BTI>KZ7G <UA,F>
```

- o The 'UA' indicates an Unnumbered Acknowledgment Frame that says that N7BTI's system is alive and well and accepts the Connect Command from KZ7G;
- o The 'F' indicates that the 'Final' bit is set, the proper response to the 'P' bit received;
- o On receipt of this 'UA' frame, KZ7G's screen will show the usual '\*\*\* CONNECTED TO N7BTI' message.

The two systems are now connected and ready to exchange information.

4.6.16.3 The <I> Information Frame

Let's assume that KZ7G types 'Hi John!'. If HEADERLN set ON, the frame for that line of information looks like this:

```
KZ7G>N7BTI <I;0,0>:
Hi John!
```

- o The 'I' indicates an Information Frame containing KZ7G's typed data;
- o The first number is the number of the frame that KZ7G's system expects to receive next from N7BTI's system;
- o The second number is the number of this specific frame that KZ7G is now sending to N7BTI.

The next frame typed by KZ7G would look like:

```
KZ7G>N7BTI <I;0,1>:
'TEXT OR INFORMATION'
```

When N7BTI types information on his keyboard, his system sends an information frame to KZ7G, which looks like:

```
N7BTI>KZ7G <I;2,0>:
'TEXT OR INFORMATION'
```

N7BTI's system has sent an information frame to KZ7G. The numbers in the information frame indicate that:

- o N7BTI's system expects KZ7G's next information frame to be number 2
- o This frame from N7BTI is number 0

N7BTI's next information frame would look like:

```
N7BTI>KZ7G <I;2,1>:
'TEXT OR INFORMATION'
```

4.6.16.4 The <RR> Receive Ready (Acknowledgment) Frame

The <RR> Receive Ready frame acknowledges that a frame has been received correctly. If the frame is not correctly received, the receiving system does nothing. The sending system waits for a set time interval until it decides that the last frame wasn't received and sends it again, until either the frame is acknowledged or until the sending system 'times out' on excessive retries.

To acknowledge a frame, the receiving system sends an 'RR' frame including the number of the next frame it expects to receive. Using the example above:

```
N7BTI>KZ7G <I;2,1>:
'TEXT OR INFORMATION'
```

KZ7G's system would send the following to acknowledge this frame:

```
KZ7G>N7BTI <RR;2>
```

KZ7G's system acknowledges information frame number 1 from N7BTI by telling N7BTI's system that it's 'READY TO RECEIVE' his next frame number 2. This would cause N7BTI's system to send it's next frame number 2. KZ7G's system would acknowledge this by sending:

```
KZ7G>N7BTI <RR;3>
```

#### 4.6.16.5 The <RJ> Reject Command Frame

Let's assume that some other station sends a packet that collides with KZ7G's acknowledge packet and N7BTI misses the acknowledgment. N7BTI's system would send the packet again because it has not heard an acknowledgment packet:

```
N7BTI>KZ7G <I;2,2>:
'TEXT OR INFORMATION'
```

KZ7G's system has already seen and acknowledged this specific frame. To indicate that it doesn't want the same frame again, KZ7G's system sends a Reject Frame with a number that tells N7BTI's system exactly what frame it expects to see next. KZ7G's system would send:

```
KZ7G>N7BTI <RJ,3>
```

This tells N7BTI's system to send frame number 3.

#### 4.6.16.6 The <DM> Disconnected Mode Frame

Let's assume that, in the above example, N7BTI's system receives a connection request from N7ML but N7BTI has USERS set to 1. N7BTI's system will not accept any more connections and therefore will send a Disconnected Mode frame (Busy Packet) to N7ML:

```
N7BTI>N7ML <DM>
```

This tells N7ML that N7BTI's system is busy and should cause N7ML to disconnect.

#### 4.6.16.7 The <D> Disconnect Command Frame

When KZ7G and N7BTI have finished their conversation they must disconnect and break the link. If KZ7G issues the disconnect packet it will look like:

```
N7BTI>N7ML <D,P>
```

Again we see the poll bit with the disconnect frame. N7BTI's screen would display '\*\*\* DISCONNECTED: KZ7G', and at the same time send an unnumbered acknowledgment response frame:

```
N7BTI>KZ7G <UA,F>
```

The <UA> frame tells KZ7G's system to disconnect and again we see the FINAL bit. When KZ7G's system receives the <UA>frame, his screen will display '\*\*\* DISCONNECTED: N7BTI'.

#### 4.6.16.8 The <UI> Unnumbered Information Frame

The <UI> frame is unique to amateur radio. It provides the means by which we can send beacons and other information without protocol.

If N7BTI wanted to call CQ after the previous contact, he'd first have to enter Converse mode by typing 'CONVERSE' or 'K'.

N7BTI could then type a short CQ message such as 'CQ de John'. Assuming N7BTI's UNPROTO address had the default setting 'CQ', the resulting <UI> frame would look like:

```
N7BTI>CQ <UI>  
CQ de John
```

The 'UI' in the above packet indicates this is an unnumbered information frame. This type of frame does include a packet number.

#### 4.7 Reception of Non-Amateur RTTY Signals

One of the most interesting uses for your PK-232 is looking for and monitoring stations outside the amateur bands. A general coverage receiver is helpful, but it is possible to find quite a few stations within the out-of-band tuning range of many amateur-band only radios.

As a general rule, you must identify five variables before you can make sense out of many non-amateur stations:

- o the data code in use;
- o the baud rate;
- o the frequency shift;
- o the sideband (upper or lower);
- o possible signal encryption .

You must 'guess' the first three values and set them into your PK-232. You can determine the values by trial and error or by following the procedure below. You can also consult one of the many press teletype listings available from your amateur radio dealer. The listings contain the time, frequency, baud rate, frequency shift, and whether a station is using upper or lower sideband. The books save a lot of time; however, some of the stations listed are using signal encryption and bit inversion. In such cases, it's not possible to decode the received signals.

##### 4.7.1 Frequency Shift and Tuning

Set WIDESHFT to ON as a first step.

- o Set WIDESHFT to OFF to copy a station using 170-Hz shift.
- o Set WIDESHFT to ON to copy a station using at 850-Hz shift.

With WIDESHFT OFF, the PK-232 uses filter tone settings at 2110 Hz and 2310 Hz to demodulate 200 Hz frequency shift.

With WIDESHFT ON, the PK-232 uses filter tone settings at 1200 Hz and 2200 Hz to demodulate a 1000-Hz frequency shift.

Many press and weather stations using 425-Hz shift can be copied with WIDESHFT set at either ON or OFF. The bandwidth of the WIDESHFT OFF filter is 450 Hz. Therefore the filter begins to attenuate shifts greater than 450 Hz. 425-Hz shift is within the filter roll-off frequencies and should work well here.

You can also copy 425-Hz shift signals in the WIDESHFT ON position because of the bandwidth characteristics. Usually 425-Hz shift signals are copied better using WIDESHFT OFF to reduce the effects of noise and QRM.

- o When you toggle between WIDESHFT ON and WIDESHFT OFF, you are changing the resonant frequency of the filters in the PK-232; therefore, retune the VFO on your radio after toggling between WIDESHFT.
- o If the sending station's shift is unknown, start with WIDESHFT OFF and try to tune the station to the display similar to Figure 2-1.
- o If you can't get that display, the station is probably using a wider shift than the WIDESHFT OFF position can handle. If so, set WIDESHFT to ON and retune the radio again.
- o If neither method works, the station may not be sending the usual telegraphy codes. It could be facsimile or some form of multiplex code.

After you've got the station tuned in, you need to know its baud rate. Assuming the station is sending in Baudot/Murray code, set RBAUD to its lowest setting of 45.

- o Use the RB U command to increase RBAUD one step at a time. RBAUD U increases RBAUD to its next highest value, up to 300 bauds.

If you can't copy after stepping through all the speeds, the station may be using the opposite sideband.

- o Use the RXREV T command to reverse the polarity of the received signals. After toggling, decrease RBAUD to its next lowest value by using RBAUD D.
- o If you cannot copy after stepping through all possible settings of RBAUD and RXREV, you can assume the station is using encryption and cannot be copied.

You can try the same general sequence of operation using ASCII and AMTOR. A large number of coastal stations use SITOR (sometimes known and identified in Morse as 'RADIO TELEX' or 'RTTY TELEX'). See the sections on ASCII and AMTOR for general operating methods.

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## 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

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

$$\$1B = (1 \times 16) + (11 \times 1) = 27 \text{ (decimal)}$$

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 primarily intended 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 the commands that 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 to 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.

<u>COMMAND</u>	<u>DESCRIPTION</u>
CANLINE	Cancel current line
CANPAC	Cancel packet output
DELETE	Delete character with destructive backspace
PASS	Insert after special character
REDISPLA	Redisplay 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.

<u>COMMAND</u>	<u>DESCRIPTION</u>
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 which allows you to stop the output from the computer while you read the data, then restart the output when you're 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 you are 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 either <CR> to end the command or a send-packet character to mark the end of a packet, or until you erase or redisplay the line you've started.

Some computers find it difficult to send and receive characters over the serial port simultaneously. 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 can be lost if the polling is not done often enough. Some computers disable interrupts during disk accesses. If the program enters a routine which doesn't allow it to check for data or respond to it, the computer should signal your PK-232 to stop sending data.

Your PK-232 provides two methods of flow control:

- o XON/XOFF flow control, sometimes called 'software flow control,' sends a special character (usually <CTRL-S>) to stop the output and another special character (usually <CTRL-Q>) to restart the output.
- o Hardware flow control requires that both computers use the CTS (Clear To Send) and RTS (Request To Send) lines of the RS-232C standard.

Some commonly used file transfer and terminal programs for home 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

If your terminal program doesn't provide CTS/RTS (hardware) flow control, set XFLOW ON to use XON/XOFF flow control

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

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

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

A STOP/START character sent to your PK-232 is ignored when the PK-232 has 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.

- o Type 'CONVERS' (or just 'K') to enter Converse Mode.
- o Type 'TRANS' (or just 'T') to enter Transparent Mode.

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

- o CONMODE TRANS automatically selects Transparent Mode
- o CONMODE CONVERS returns to the default choice of Converse Mode

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

If your PK-232 receives and accepts a connect request, your system always enters the data transfer mode at the moment your PK-232 sends the connect acknowledgment (ACK) and displays the '\*\*\* CONNECTED to <call sign>' message. Your PK-232 always switches to the data 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 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 as part of the text in the packet, in addition to interpreting <CR> as a command.

- o Set ACRPACK ON to send the <CR>

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

#### 5.4.1.2 CANPAC Character

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

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

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

#### 5.4.1.3 Special Characters in Converse Mode

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

<u>COMMAND</u>	<u>DESCRIPTION</u>
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	Redisplay 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.

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

#### 5.4.2 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 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 automatic 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.

- o Use BREAK to return to Command mode, just as in Converse Mode.
- o Use the Command Mode entry character (<CTRL-C>) as follows:
  - Wait a moment after typing the last character being sent. The minimum required wait is set by the CMDTIME command.
  - 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 PK-232 Technical Manual.

### 5.5.1 AX25L2V2 - On or Off?

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

- o Set AX25L2V2 ON to operate in Version 2.0
- o Set AX25L2V2 OFF to operate in Version 1.0

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

The CHECK command controls a timing function that depends on the 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 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.

When 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:

- o The packet must start with a flag field.
- o The packet must contain an integral number of 8-bit bytes, up to 330 bytes.

#### 5.5.4 Packet Timing Functions

Your PK-232 obeys a series of timing instructions built into 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:

- o Time delay between the moment that your PK-232 keys your transmitter's PTT line and your transmitter delivers power to your antenna.
- o Time required for the distant station's receiver to recover full sensitivity and overcome squelch/AGC risetime characteristics.
- o Transmitter and receiver phase-lock loop settling times at both ends of the link.

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

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).

You may need to increase TXDELAY several points when using external amplifiers using RF-driven switching circuits.

##### 5.5.4.2 AXDELAY and AXHANG

When sending packets through an audio repeater you may require a longer key-up delay than is 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.

- o The AXDELAY command adds more key-up delay in your PK-232 so that the repeater receiver and transmitter have time to lock up.
- o The AXHANG command sets the time your PK-232 assumes is needed for the repeater to drop.

If your PK-232 has detected channel activity recently enough so that the repeater transmitter might still be on, it waits 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:

$$\text{Key-up delay} = (\text{TXDELAY} + \text{AXDELAY}) \times 10 \text{ milliseconds.}$$

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

$$\text{Key-up delay} = \text{TXDELAY} \times 10 \text{ milliseconds.}$$

#### 5.5.4.3 FRACK and RETRY

The AX.25 protocol calls for retransmitting 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.

You may want to increase FRACK several seconds when using HF. Bear in mind that the FRACK time is really counted from the instant when your PK-232 begins sending a frame, and that your data rate is four times slower when using HF at 300 bauds.

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:

$$\text{retry interval} = \text{FRACK} \times (2 \times n + 1) \text{ seconds}$$

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 losing 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 your local area has no digipeater DWAIT can be set to 0 (zero). DWAIT 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:

$$\text{Wait time} = \text{DWAIT} \times 10 \text{ milliseconds}$$

For retries of the same packet, the interval is:

$$\text{Wait time} = (\text{DWAIT} + r \times \text{TXDELAY}) \times 100/16 \text{ milliseconds,}$$

where 'r' is a random number from 0 to 15. Therefore, the longest amount of time added randomly is  $0.094 \times \text{TXDELAY}$  seconds. If TXDELAY has the default value of 30 the longest time added is 2.8 seconds.

#### 5.5.4.5 MAXFRAME

The AX.25 protocol permits transmitting several packets without waiting for an acknowledgment. The number of packets that can be sent before acknowledgment 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 your PK-232 will send before waiting for acknowledgment. (This doesn't mean that your PK-232 waits 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.

When using 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 can be preserved by initiating a reconnect call if the command RELINK is ON. 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. If RELINK is OFF, the PK-232 will simply go to a "disconnected" state without trying to reconnect if the link has timed out.

#### 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. If you're typing manually to a remote computer it's best to send packets at regular intervals

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

Use the CPACTIME command to enable PACTIME in Converse Mode.

## 5.6 Packet Bulletin Board Operation

Your PK-232 can be used as the TNC or Data Controller with several of the PBBS (Packet Bulletin Board System) programs presently available in the Amateur Radio community. Your PK-232's system compatibility has been field-proven with the following programs:

- o WORLI's Version 11.6 CP/M-based PBBS for the Xerox 820 Systems
- o WA7MBL's Version 2.04 PBBS for the IBM PCs and compatibles
- o WA7MBL's Version 3.12 PBBS for the IBM PCs and compatibles
- o WORLI/VE3GYQ Version 2.0 CBBS for the IBM PCs and compatibles
- o KA2BQE's Version .90 CBBS for the IBM PCs and compatibles

NOTE: These programs are available from the authors. AEA does not currently distribute any PBBS code or operating programs.

### 5.6.1 Special Default Considerations

The following default parameters are recommended for PBBS operation:

```

8BITCONV  ON
ACRDISP   0
ALFDISP   OFF
AWLEN     8
AX25L2V2  ON
CHSWITCH  $00
DCDCONN   ON *
DELETE    OFF
ECHO      OFF
FLOW      OFF
NEWMODE   OFF
NOMODE    ON
PARITY    0
RELINK    OFF
START     $00
STOP      $00
TXFLOW    OFF
XFLOW     OFF
XOFF      $00
XON       $00

```

- \* WA7MBL's Version 3.12 PBBS code requires that Pin 8, 'DCD' (Data Carrier Detect) must be wired between the computer and the PK-232. 'DCDCONN' must be ON to force Pin 8 to follow the PK-232's connect status.

Please consult the authors directly for additional information on operating your PK-232 with their PBBS programs. AEA's Customer Service Department cannot provide information on

## CHAPTER 6

## COMMAND SUMMARY

6.1 Introduction

Chapter 6 explains and illustrates all PK-232 commands. You'll use certain commands to control 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, it does not use 'menus.' Instead, you control the functions of the PK-232 by typing single- or multiple-character commands from your computer's keyboard.

6.1.1 Entering Commands

Commands are entered after the Command Mode prompt:

cmd:

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

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

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

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

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

6.1.2 Command Responses

Whenever the PK-232 accepts a command that changes a value it responds by displaying both the previously stored value and the newly-assigned value. For example, assume that 'XFLOW' is 'ON' and you type 'XFLOW OFF' - you'll see the display:

```
XFLOW  was ON
XFLOW  now OFF
```

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

### 6.1.3 Error Messages

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

- o If you type a command your PK-232 can't understand - you'll see:  
    ?What?
- o If you type a correct command word with a wrong argument:  
    ?bad
- o If you type a numerical value outside a parameter's range:  
    ?range
- o If you set the BEACON timing too short for busy channels:  
    WARNING: BEACON too often
- o If you type an improper SELCAL:  
    ?call sign

Here are a few more examples:

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



## 6.2 Command List

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

- o Command name
- o Command abbreviation or mnemonic
- o Default value
- o Parameters

### 6.2.1 Command Names

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

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

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

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

- o 'n' means the command takes a numerical parameter value.

### 6.2.2 Default Values

Almost all commands and parameters have initial values that are stored in EPROM and loaded into RAM when the PK-232 is first turned on - or when you type the RESET command. The PK-232 assumes these defaults or values 'used most often' to be best suited for the 'average' amateur station's operation.

There is no hard and fast rule that says 'you must use the defaults'. You can (and should) change the default values as required for your individual operating and equipment conditions.

### 6.3 Parameters, Arguments and Values:

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

- o The values that can fill this parameter are either ON or OFF.
- o Immediate commands such as 'ID' have no parameters. Typing only 'ID' causes the PK-232 to execute the command.

Some commands such as 'CONNECT' have optional parameters.

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

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

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

#### 6.3.1 Parameters

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

##### 6.3.1.1 Boolean Parameters

Boolean parameters use one value out of a choice of only two possible values, such as ON or OFF, YES or NO, or EVERY or AFTER. Boolean parameters can also be toggled with an argument of 'TOGGLE' or 'T.' This is useful, for example, in the case of RXREV and TXREV.

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

##### 6.3.1.2 Numeric Parameters

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

- o Numeric values can be entered by typing them in familiar decimal numbers, or optionally, in 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:

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

$$\text{\$1B} = (1 \times 16) + (11 \times 1) = 27 \text{ (decimal)}$$

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

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

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

#### 6.3.1.3 Text or String Parameters

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

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

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

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

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

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

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

The following examples will help you understand these explanations.

o BEACON EVERY|AFTER 'n'

The BEACON command requires an argument;

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

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

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

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

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

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

### 6.3.2 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 GeneralSign-On Message

AEA PK-232 Data Controller  
 Copyright (C) 1986, 1987 by  
 Advanced Electronics Applications, Inc.  
 Release DD-MMM-YY  
 Checksum \$nn  
 cmd:

The sign-on message appears when you turn on your PK-232 or when you type 'RESTART', and after system 'RESET' and autobaud routine. The release number is updated whenever the firmware is changed. The checksum is a hex number which you can compare against the correct checksum available from AEA 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.

wasnow

Whenever you change one of the PK-232's parameters, both the previous value and the new value are displayed. This confirms that the PK-232 has 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. The message would appear if you've already typed packet data and filled the outgoing buffer in either 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 name correctly, but the remainder of the command line couldn't be interpreted.

##### ?callsign

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 type a BTEXT or CTEXT message that is too long 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.

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

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

The following messages appear in response to the CONNECT command.

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

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

- o Link state is: CONNECTED to call1; v2; 2 unACKed  
[VIA call2[,call3...,call9]]

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

- o Link state is: DISCONNECTED

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

- o Link state is: CONNECT in progress

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

- o Link state is: DISCONNECT in progress

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

- o Link state is: FRMR in progress

Your PK-232 is connected to a distant station, but a protocol error has occurred. This should never happen when two AEA AX.25 systems are connected. An improper implementation of the AX.25 protocol could cause this condition. Your PK-232 will try to re-synchronize frame numbers with the PK-232 on the other end, although a disconnect may result. Connections are 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 DISCONN), a connect or a disconnect request packet from a distant station, a disconnect because of the retry count being exceeded, an automatic time-out disconnect (CHECK), or a protocol error.

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

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



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

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

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

- o \*\*\* DISCONNECTED: (call sign)

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

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

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

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

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

- o FRMR sent: xx xx xx

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

- o FRMR rcvd: xx xx xx

Your PK-232 has received an FRMR (protocol error as described above) and shows this followed by a display of the FRMR packet in hexadecimal format. This message does not appear if the 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 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 and forces immediate entry into Converse mode.  
 'MO' Unlocks the Morse receive speed.

Characters embedded in transmitted text:

<CTRL-D> Shuts off transmitter immediately and returns PK-232 to the Command Mode.

### 6.5.2 Baudot and ASCII RTTY

#### From Command Mode:

'L' Forces LETTERS case (if Baudot)  
 'R' Switches system to receive mode, forces LETTERS (if Baudot) case.  
 'X' Switches system to transmit mode and forces immediate entry into Converse mode.  
 'K' Enters Converse Mode for entering data into Transmit buffer.

Characters embedded in transmitted text:

<CTRL-O> Sends LETTERS shift character (if Baudot).  
 <CTRL-N> Sends FIGURES shift character (if Baudot).  
 <CTRL-D> Shuts off transmitter immediately.  
 <CTRL-F> Sends call sign in Morse and shuts off transmitter.

### 6.5.3 AMTOR Mode

#### From Command Mode:

'ARQ <SELCAL>' Starts Mode A selective call and forces Converse  
 'FEC' Starts Mode B transmission and forces Converse  
 'SELFEC <SELCAL>' Starts Selective Mode B transmission  
 'R' Stops sending immediately, forces AMTOR Standby, clears the transmit buffer of all remaining data  
 'AM' Stops transmission, forces AMTOR Standby, clears the transmit buffer of all remaining data  
 'AL' Forces re-synchronization in ALIST (AMTOR Mode A Listen)  
 'L' Forces LETTERS case  
 'X' Not used in AMTOR

Characters 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>	Stops sending when the transmit buffer is empty

#### 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.

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

---

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 Converse Mode.

When 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.

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

If you need to transmit eight-bit data but don't want all the features of Transparent Mode, set 8BITCONV ON and AWLEN 8. This may be 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: PK-232
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 data 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, 300, 600, 1200, 2400  
4800, and 9600 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 that both you and the distant station operate at the same speed or data rate.

As a general rule, 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. The modem in the PK-232 cannot handle data rates faster than 1200 bauds.

NOTE:      The term 'WPM' is generally considered obsolete. Signalling speeds are now universally referred to as 'bauds' in FSK and AFSK operations using monobit data. In these cases, 'bauds' and 'bits per second' may be used interchangeably.

---

ACHG MODE: AMTOR	Mnemonic: AC	Immediate Command
---------------------	--------------	-------------------

---

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

ACHG forces a changeover from receive to transmit if it is necessary to interrupt the sending station's transmission.

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

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

Recovery from this kind of interruption can result in garbled copy at one end of the contact, especially 'FIGS' garble. If possible, wait until the other station is idling before breaking in.

If the other station breaks in to your transmission, you can use the 'TCLEAR' command to cancel transmission of any unsent text that might not 'fit' the meaning of the break-in text.

---

ACRDISP 'n' MODE: All	Mnemonic: ACRD	Default: 80
--------------------------	----------------	-------------

---

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.

- o If your computer or terminal automatically formats output lines, set ACRDISP to '0' to avoid conflict between the two formats.

---

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

---

Parameters:

- ON - The send-packet character, normally <CR>, IS added to all packets sent in Converse Mode.
- OFF - The send-packet character is NOT added to packets.
- 

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

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

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

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

- o If the distant station reports overprinting of lines on his display, set ALFPACK ON, or suggest that the other station set his ALFDISP ON.

---

ACRRTTY 'n'	Mnemonic: ACRR	Default: 71
MODE: Baudot/ASCII RTTY		(69 in AMTOR)

---

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. The 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.

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

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

- o When retransmitting text received from another station; for 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.

The same ACRRTTY function is used in AMTOR, except that AMTOR, like SITOR, is limited by international telex practices to a maximum of 69 characters per line. (If ACRRTTY is set to 71, in AMTOR the automatic carriage return function operates after 69 characters.)



---

ADELAY 'n' MODE: AMTOR	Mnemonic: AD	Default: 4
---------------------------	--------------	------------

---

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 the ARQ data begins to flow to the transmitter. Some delay is necessary with any radio transmitter.

- o All transmitters need some finite amount of time to switch from receive to transmit, settle on to the operating frequency and develop their nominal power output.

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

- o In most cases, the default value of 4 times 10 (40) milliseconds will be adequate for the majority of the popular HF transmitters.
- o If necessary, you can reset other values with the ADELAY command.

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

- o Be sure that errors and rephasing effects are not provoked by the distant station before changing your defaults.
- o If changing your ADELAY values does not improve link performance, reinstall your original or default values.

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

Note that even the shortest possible ADELAY may not allow ARQ (Mode A) AMTOR to work very well over very short distances, e.g., one or two miles. In very short distance work, ARQ should not be necessary to achieve error-free copy.

---

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

---

Parameters:

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

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

When ALFDISP is ON, your PK-232 adds a line feed <LF> to each carriage return <CR> received, if needed. If a line feed was received either immediately before or after a carriage return, ALFDISP will not add another line feed. Use the PK-232's sign-on message to determine how carriage returns are being displayed.

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

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

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

---

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

---

Parameters:

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

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

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

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

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

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

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

The received text already contains the necessary line-ending sequence characters. If this option is enabled, your transmission will have 'funny' word wrap, 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.

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

---

ALIST	Mnemonic: AL	Immediate Command
MODE: AMTOR		

---

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

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

Your monitor displays all the retries if the linked stations that you are monitoring are experiencing ARQ errors and 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 MODE: AMTOR	Mnemonic: AR	Immediate Command
-------------------------	--------------	-------------------

---

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.

---

ARQ TMO "n" MODE: AMTOR	Mnemonic: ARQT	Default: 90
----------------------------	----------------	-------------

---

Parameters:

"n" - 0 to 250 specifies the number of seconds to send an ARQ SELCAL before automatic transmitter shutdown.

---

ARQ TMO sets the length of time during which your ARQ SELCAL call will be sent, e.g., how long your system will call a distant station before shutting down automatically. As a general rule, if you can't activate another AMTOR station in the default time of 90 seconds, you can probably assume that the other station can't hear your transmission.

---

ASCII MODE: Command	Mnemonic: AS	Immediate 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' MODE: All	Mnemonic: AW	Default: 7
------------------------	--------------	------------

---

Parameters:

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

---

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

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

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

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

- o Set AWLEN to 8 and use the Transparent Mode.

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

The RESTART command must be issued before a change in word length will take effect.

---

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

---

Parameters:

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

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

---

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

For best results during this transition period set AX25L2V2 OFF.

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

---

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

---

Parameters:

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

---

AXDELAY specifies the period of time the PK-232 will wait - in 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 finite amount of time to get RF on the air.

Try various values to find the best value for 'n' if you're using a repeater that hasn't been used for packet operations before

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

AXDELAY acts together with AXHANG.

---

AXHANG 'n' MODE: Packet	Mnemonic: AXH	Default: 0
----------------------------	---------------	------------

---

Parameters:

'n' - 0 to 20 specifies voice repeater 'hang time' in 100-millisecond intervals.

---

AXHANG greater than 0 allows you to increase channel efficiency when sending packets through an audio repeater that has a hang time greater than 100 milliseconds. With a longer hang time, you can eliminate 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.

Try various values to find the best value for 'n' if you are using a repeater that hasn't been used for packet operations before.

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

---

BAUDOT MODE: Command	Mnemonic: BA	Immediate 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, weather and point-to-point message services.

The Baudot/Murray and ITA#2 character sets do not contain lower case or the special punctuation, formatting and control 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 sets beacon timing in ten-second intervals.
'0'	-	Zero turns off the beacon.

---

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

- o A beacon frame contains the text that you've typed into the BTEXT message in a packet addressed to 'CQ' or other UNPROTO address.
- o A beacon frame may be sent directly, and also sent via the digipeat addresses specified by the UNPROTO command.

When the keyword EVERY is specified a beacon packet is sent every 'n' times ten seconds. This mode can be used to transmit packets for testing purposes.

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

- o The beacon is sent only once until further activity is detected.

This mode can be used to send announcements or test messages only when packet stations are on the air.

- o Proper choice of 'n' avoids cluttering a busy channel with lots of unnecessary transmissions.

Beacon frames from other packet stations can be monitored by setting MONITOR in the range 1-6.

- o If you set the BEACON timing at less than '90' - a value judged by most authoritative sources as too short for busy channels - you'll see the message:

WARNING: BEACON too often

The warning message appears in the Command Mode each time a new command is typed.

---

BKONDEL ON OFF	Mnemonic: BK	Default: ON
MODE: All		

---

Parameters:

- ON - The sequence <BACKSPACE><SPACE><BACKSPACE> is echoed when a character is deleted from the input line.
- OFF - The <BACKSLASH> character <\> is echoed when a character is deleted.
- 

BKONDEL determines how character deletion is displayed in Command or Converse Mode.

The <BACKSPACE><SPACE><BACKSPACE> sequence updates the video display screen.

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

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

- o Set BKONDEL OFF if you have a paper-output display, or if your terminal does not respond to the <BACKSPACE> character <CTRL-H>.

The PK-232 displays a <BACKSLASH> for each character you delete. You can get a display of the corrected input by typing the redisplay-line character set by the REDISPLAY command.

---

BTEXT text	Mnemonic: BT	Default: Empty
MODE: Packet		(Null String)

---

Parameters:

text Any combination of characters and spaces, up to a maximum length of 120 characters.

---

BTEXT is the content of the data portion of a beacon packet. The default text is an empty string (no message). Beacon packets are discussed in more detail under the BEACON command.

Although the beacon subject is controversial in packet circles, you can use beacon texts intelligently and benefit the packet community.

- o Don't type your call sign in BTEXT - the normal packet header shows it for you.
- o Don't fill BTEXT with screen graphics such as asterisks, colons and semicolons, parentheses, etc. Use BTEXT for meaningful data such as meeting announcements, weather warnings, etc.
- o Don't use BTEXT to tell the world that your 'DIGIPEAT IS ON' and 'BUFFER SAVE TO DISK IS ENABLED' - put this information in your CTEXT message so that it is seen by the station that connects to you - the only station that really can use that information.
- o After you've beaconsed 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!

You can send multiple-line messages in your beacon by including <CR> characters in the text. <CR> is inserted by typing the PASS character before the <CR>

- o The PASS character is set by the PASS command.

If you enter a text string longer than 120 characters, the command is ignored and the following error message appears:

?too long

A packet bulletin board (PBBS) program may set the beacon text to a message like this, updating the text after each connection:

MAIL for: WB9FLW AD7I K9NG N7ML W2JUP WB2MNF WA7MBL WORLI WA7GXD

- o Use a '%', '&', 'N', 'NO', 'NONE', or OFF as the first characters in the text to clear the BTEXT text.

---

CALIBRATE MODE: Command	Mnemonic: CAL	Immediate 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:

- K           Toggles your transmitter's PTT line between ON and OFF.
- Q           Quits the calibration routine.
- H           Toggles the transmitted audio tones between wide shift (1000 Hz) and narrow shift (200 Hz).
- <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.

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: All		

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

CANLINE changes the CANCEL-LINE input editing command character.

The parameter 'n' is the ASCII code for the character you want to use to cancel an input line.

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

For example:

- o CANLINE \$15 (hex)
- o CANLINE 21 (decimal)

Either sets the cancel-line character to <CTRL- U>.

When you use the CANLINE character to cancel an input line in Command Mode, the line is terminated with a <BACKSLASH> character and a new prompt (cmd:) appears.

When you cancel a line in Converse Mode, only the <BACKSLASH> and a new line appear.

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

NOTE: If your send-packet character is not <CR>, the cancel-line character cancels only the last line of a multi-line packet.

Like all other input editing features, line cancellation is disabled in Transparent Mode.

---

CANPAC 'n'	Mnemonic: CANP	Default: \$19 <CTRL-Y>
MODE: Packet		

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

CANPAC changes the CANCEL-PACKET input editing command character.

The parameter 'n' is the ASCII code for the character you want to type in order to cancel an input packet.

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

When you cancel a packet in Converse Mode, the line is terminated with a <BACKSLASH> character and a new line.

- o You can only cancel the packet that is currently being entered.

Once you have typed the send-packet character, or waited PACTIME (if CPACTIME is enabled), the packet cannot be canceled even if it has not been transmitted.

Like other input editing features, packet cancellation is disabled in Transparent Mode.

The CANCEL-PACKET character also cancels the display output in Command Mode. If you are in Command Mode and type the CANCEL-PACKET character, any characters that would be typed on the screen (except those echoed) are 'thrown away' by the PK-232.

- o Typing the cancel-output character a second time restores normal output.
- o To see how this works type DISPLAY, then type a <CTRL-Y>.

The command list display will stop. You won't see any response from the PK-232 to your commands.

To verify that the display is back to normal, type <CTRL-Y>, and then type DISPLAY again.

Use the CANCEL-DISPLAY feature if you inadvertently do something that causes the PK-232 to generate large amounts of output to the terminal, such as giving the DISPLAY command or setting TRACE ON.

- o If you are in Converse or Transparent Mode and want to cancel display output, you must exit to Command Mode and then type the CANCEL-PACKET character.

---

CASEDISP 'n' MODE: Packet	Mnemonic: CAS	Default: 0 (as is)
------------------------------	---------------	--------------------

---

Parameters:

'n' - 0 to 2 specifies how your PK-232 sends characters to your terminal.

---

CASEDISP allows you to set the case of the characters your PK-232 sends to your terminal. This may be helpful with certain terminal programs.

CASEDISP offers three possible modes:

CASEDISP 0	'As is' - characters are not changed.
CASEDISP 1	'lower' - characters are displayed in lower case only.
CASEDISP 2	'UPPER' - characters are displayed in upper case only.

CASEDISP has no effect on your transmitted data.

---

CBELL ON/OFF MODE: Packet	Mnemonic: CB	Default: OFF
------------------------------	--------------	--------------

---

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.

---

- o Set CBELL ON if you want to be notified whenever someone connects to your station.
- o If CBELL is ON and MFILTER contains the character (\$07), you can be sure that whenever your terminal beeps there is a connection for you. At no other time will you hear a beep while you are in packet mode.

CCITT ON|OFF                      Mnemonic: CC                      Default: ON  
 MODE: Baudot RTTY

Parameters:

- ON - Characters typed on the keyboard or loaded from disk files are translated into CCITT International Telegraph Alphabet #2 before being sent.
- OFF - Characters sent to the PK-232 are not translated into CCITT ITA #2, but remain in the American standard Baudot format (typically Western Union).

Your computer or terminal will probably send a full ASCII character set to the PK-232. Although there is no absolute standard, the following keyboard is typical of the IBM PC and compatibles.

<u>LOWER CASE SET</u>	<u>UPPER CASE SET</u>
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!):

<u>LOWER CASE SET</u>	<u>UPPER CASE SET</u>
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:

<u>LOWER CASE SET</u>	<u>UPPER CASE SET</u>
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 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 generally used 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). Connects will be accepted from stations whose call signs are listed after CFROM YES.

To reject calls from one or more specific stations, type CFROM NO (followed by a list of call signs). Connects will be rejected from stations whose call signs are listed after CFROM NO.

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 MODE: Packet	Mnemonic: CHC	Default: OFF
-------------------------------	---------------	--------------

---

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
:lmust be a dx record. ge lyle
:lUNreal ted! fl-az no digis!
:lbig 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
:lmust be a dx record. ge lyle
:lunreal 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 MODE: Packet	Mnemonic: CHD	Default: OFF
---------------------------------	---------------	--------------

---

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.

- o If AX25L2V2 is ON and packets have not been heard from the distant end for 'n' times 10 seconds, your PK-232 sends a 'check packet' to test if the link still exists to the other station.

The 'check' packet frame contains no information, but is interpreted by the distant station's TNC to see if it is still connected. If the distant station's TNC is still connected, the distant station sends an appropriate response packet.

If your PK-232 initiates the 'check' and does not get an answer after RETRY+1 attempts, your PK-232 starts a reconnect sequence just as if you had typed the CONNECT command.

- o If AX25L2V2 is OFF and the other station has not been heard for 'n' times 10 seconds, your PK-232 does not test the link to the distant station; your PK-232 sends a reconnect packet just as if you had typed the CONNECT command if RELINK is ON. If RELINK is OFF, the PK-232 will immediately go to the "disconnected" state.

---

CHSWITCH 'n'	Mnemonic: CHS	Default: \$00
MODE: Packet		

---

Parameters:

'n' - 0 to \$FF (0 to 255 decimal) specifies an ASCII character code.

---

CHSWITCH selects the characters used by both the PK-232 and the user to show that a new connection channel is being addressed.

The character can be PASSED in CONVERS mode. This character is always ignored as a user-initiated channel switch in TRANSPARENT mode; it just flows through as data.

- o The outgoing channel cannot be changed while active or 'on-line' in TRANSPARENT mode.
- o To switch channels, ESCAPE to Command Mode, then enter Converse Mode to use the CHSWITCH command.

NOTE: If your PK-232 is being used as the TNC for a PBBS (Packet Bulletin Board System), change the CHSWITCH character to \$00 to avoid possible conflict or problems with the characters frequently found in packet network maps.

See CHDOUBLE and CHCALL for further use of CHSWITCH.

CMDTIME 'n'                      Mnemonic: CM                      Default: 10 (1000 msec.)  
 MODE: Packet

Parameters:

'n' -     0 to 250 specifies timeout value in 100-millisecond intervals while in Transparent Mode.

If 'n' is 0 (zero), exit from Transparent Mode requires sending the BREAK signal or interruption of power to the PK-232.

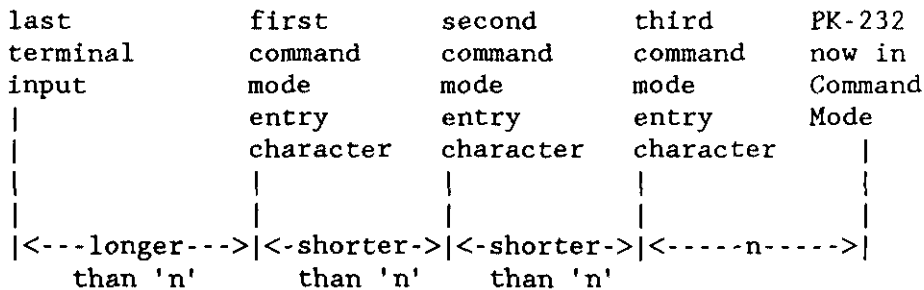
CMDTIME sets the timeout value in Transparent Mode. A guard time of 'n' seconds allows escape to Command Mode from Transparent Mode, while permitting any character to be sent as data.

The same Command Mode entry character (default <CTRL-C>) used to exit from the Converse Mode is used to exit Transparent Mode, although the procedure is different.

- o The Command Mode entry character is set by COMMAND.
- o Three Command Mode entry characters must be entered less than 'n' seconds apart, with no intervening characters, after a delay of 'n' seconds following the last characters typed.
- o After a final delay of 'n' seconds, the PK-232 exits Transparent Mode and enters Command Mode.
- o You will then see the normal Command Mode prompt:

cmd:

The following diagram illustrates this timing:



---

MSG ON OFF MODE: Packet	Mnemonic: CMS	Default: OFF
----------------------------	---------------	--------------

---

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.
  - 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.

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

COMMAND 'n' MODE: All	Mnemonic: COM	Default: \$03 <CTRL-C>
--------------------------	---------------	------------------------

---

Parameters:

- 'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.
- 

COMMAND is used to change the Command Mode entry character. You can enter the code in either hex or decimal.

Type the COMMAND character to enter Command Mode from Converse Mode. No response is seen if you type the Command Mode entry character while you are already in Command Mode.

- o Enter Converse Mode by typing: CONVERSE

Now all characters typed on the keyboard and characters send from a disk or tape file are transmitted as packet data.

Type <CTRL-C>. The Command Mode prompt appears, indicating successful exit to Command Mode. The display might look like this:

```
cmd:CONVERSE
Hello World! I'm on the air on packet radio! [type <CTRL-C>]
cmd:
```

See CMDTIME or the discussion of Transparent Mode for instructions on the Command Mode entry character to escape from Transparent Mode.

---

CONMODE CONVERS TRANS MODE: Packet	Mnemonic: CONM	Default: CONVERS
---------------------------------------	----------------	------------------

---

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.

- o Set CONMODE to CONVERS for most packet operations.
- o 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.
- o If the PK-232 is already in Converse or Transparent Mode when the connection is completed, the mode will not be changed.



---

```
CONNECT call1 [VIA call2[,call3...,call9]] Immediate Command
MODE: Packet           Mnemonic: C
```

---

Parameters:

- call1 - Call sign of the distant station to which you wish to be connected.
  - call2 - Optional call sign(s) of up to eight digipeaters via which you'll be repeated to reach the distant station.
- 

CONNECT sends a connect request to station 'call1,' directly or via one or more digipeaters. Each call sign can include an optional SSID 'n' immediately after the call sign.

The part of the command line shown in brackets below is optional. The double-bracketed text ',call3...,call9' is also optional and is used only when 'VIA call2' is used, that is, when connecting through one or more digipeaters. (The brackets and quotation marks are used in this text only for clarity - please don't type them!)

```
VIA call2[, call3...,call9]
```

- o Type the digipeater fields in the exact sequence you wish to use to route your packets to destination station 'call1.'

If you type CONNECT while your PK-232 is connected, or trying to connect to or disconnect from a distant station, your monitor displays:

```
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.

---

CONOK ON OFF	Mnemonic: CONO	Default: ON
Mode: Packet		

---

Parameters:

- ON - Connect requests from other stations will be accepted if CFROM is set to ALL.
- OFF - Connect requests from other stations will not be accepted if CFROM is set to ALL or NONE.
- 

CONOK is included only to maintain upward compatibility with the TAPR TNCs and some BBS software that depends on this command being there. The command CFROM is much more versatile, and should be used instead of CONOK.

Make sure that CFROM is set to ALL if your software needs CONOK.

---

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 logical channels to work normally. For example, automatic disconnect based on RETRY, when used under conditions such as:

- o Certain networking applications
- o Meteor scatter
- o Other noisy, less reliable links

CONPERM ON may be advantageous when using full-duplex continuous mail forwarding or traffic links.

---

CONSTAMP ON OFF MODE: Packet	Mnemonic: CONS	Default: OFF
---------------------------------	----------------	--------------

---

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 MODE: All	Mnemonic: CONV or K	Immediate Command
-----------------------	---------------------	-------------------

---

CONVERSE is an immediate command that causes the PK-232 to switch from the Command Mode into the Converse Mode.

- o Link connections in packet or AMTOR modes are not affected.

In packet mode and AMTOR, once the PK-232 is in the Converse Mode, all characters typed from the keyboard or sent from a disk file are processed and transmitted by your radio.

- o To return the PK-232 to the Command Mode from the Converse Mode, type the Command Mode entry character (default is <CTRL-C>).

---

CPACTIME ON OFF MODE: Packet	Mnemonic: CP	Default: OFF
---------------------------------	--------------	--------------

---

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.

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

When ACRPACK is ON, the send-packet character is inserted in the data being packetized even though it was not typed.

- o To include <CR> characters in transmitted packets, set SENDPAC to a character not normally used (e.g., <CTRL-P>); the PK-232 then treats a <CR> as an ordinary character.
- o Set CPACTIME ON for a mode of operation similar to full break-in CW.

Setting CPACTIME ON transmits your text soon after you type it, in short bursts of a few characters. The other station may break in at will. Some operators find it easier to chat in this mode; long delays are eliminated while long packets are being typed.

---

CRADD ON OFF	Mnemonic: CRA	Default: OFF
MODE: Baudot RTTY		

---

Parameters:

ON - Send <CR CR LF> in Baudot RTTY.  
OFF - Send <CR LF> in Baudot RTTY.

---

The CRADD command permits you to set the PK-232's 'newline' sequence so that an additional carriage return is ADDED automatically at the end of each typed line.

When CRADD is set ON the line-end sequence is <CR<del>CR<del>LF>.

When CRADD is set OFF the line-end sequence is <CR<del>LF>.

- o The double carriage return is required in some RTTY services such as 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		

---

Parameters:

text Any combination of characters and spaces up to a maximum of 120 characters.

---

CTEXT is the 'automatic answer' text you type in to a special section if the PK-232's memory.

The default text says, 'Please leave a message, then disconnect.'

If CMSG is set ON:

- o The CTEXT message is sent as soon as another station connects to your station.

To type multiple-line CTEXT messages and include a carriage return (<CR>) character in your text, use the PASS character (<CTRL-V> is the default value) immediately preceding the carriage return (see the PASS command).

A typical CTEXT message might be:

```
'I'm not available right now <CTRL-V> <CR>
Please leave your message, then disconnect <CR>
```

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

```
?too long
cmd:
```

- o Use a percent sign (\*), an ampersand (&), 'N,' 'NO,' 'NONE' or 'OFF' as the first characters in the CTEXT message to clear the previous message without having to type a RESET command.

---

CWID 'n'	Mnemonic: CW	Default: \$06 <CTRL-F>
MODE: Baudot/ASCII RTTY/AMTOR		

---

The CWID command lets you change the 'send CWID' control character typed at the end of your Baudot and ASCII RTTY keyboard dialogue or text file stored on disk.

When the PK-232 reads this specific character embedded at the end of the text or keyboard input, it switches to the Morse Mode and sends your call sign, in Morse code, at the keying speed set by the MSPEED command.

As soon as your call sign has been sent in Morse, the PK-232 turns off your transmitter and returns to Baudot or ASCII RTTY receive in the Command Mode.

- o Type 'CWID' (or just 'CW') to display the current value of the CWID command:

```
cmd:cwid          cmd:cw
CWID      $06 CTRL-F    CWID      $06 CTRL-F
cmd:              cmd:
```

- o Type 'CWID' followed by either the decimal or hexadecimal value of the new character you wish to use as the CWID trigger command:

```
cmd:cwid 27
CWID      was $06 CTRL-F
cmd:
```

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

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

- o You can return to the original or default value at any time by typing the following:

```
cmd:cwid $06
CWID      was $1B CTRL-[
```

You can also use the command 'CWID ON' or 'CWID OFF' to activate or deactivate the function. In either case, your PK-232 responds with the previous state:

```
cmd:cwid on
CWID      was $00
```



---

```

DAYTIME date&time Mnemonic: DA Default: not set
MODE: All

```

---

Parameters:

```

date&time - Current DATE and TIME to set.

```

---

DAYTIME sets the PK-232's internal clock current date and time. The date&time parameter is used in Packet Mode by the commands CONSTAMP and MSTAMP to 'time stamp' received and monitored messages.

Entries in the 'heard' (displayed by MHEARD) are also time stamped if date&time has been set. The PK-232's time is updated continuously, as long as it is powered up.

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

```

cmd:day
?clock not set

```

- o You must reset date and time each time you turn on the PK-232. Otherwise CONSTAMP and MSTAMP won't 'stamp' the time.

If you type DAYTIME without a parameter the PK-232 displays current date and time information. The format of the display is:

```

          dd-mm-yy  hh:mm:ss
DAYTIME 09-Mar-87 06:57:33

```

- o The format for entering the date & time is:

```

          yymmddhhmm
cmd:daytime 8703090659

```

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)

```

Example: cmd:daytime 87 03 08 06 59

You can insert separators or delimiters such as SPACE, '/', ':' or ';'. Successful date and time entry is confirmed when the PK-232 echoes the new setting.

- o Enter the numbers 0-9 with leading zeros; codes must be exactly two digits.
- o Be aware of the month when you set the date - the PK-232 does not check for the correct number of days in a month.

---

DAYSTAMP ON OFF	Mnemonic: DAYS	Default: OFF
MODE: All		

---

Parameters:

- ON - The DATE is included in CONSTAMP and MSTAMP.
  - OFF - Only the TIME is included in CONSTAMP and MSTAMP.
- 

DAYSTAMP activates the date in CONSTAMP and MSTAMP.

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

---

DCDCONN ON OFF	Mnemonic: DC	Default: OFF
MODE: Packet/AMTOR		

---

Parameters:

- ON - RS-232 cable Pin 8 follows the state of the CON LED.
  - OFF - RS-232 cable Pin 8 is permanently set high (active).
- 

DCDCONN defines how the DCD (Data Carrier Detect) signal affects pin 8 in the RS-232 interface to your computer or terminal.

Set DCDCONN ON to emulate the DCD interface found in the TAPR TNC-2, AEA PK-80 and equivalent TNC/DCE systems.

Some applications programs require that the DCD signal on pin 8 follow the PK-232's connect status.

For example, WA7MBL's Version 3.12 PBBS program will not work properly with your PK-232 unless DCDCONN is set ON.

---

DELETE ON OFF MODE: All	Mnemonic: DEL	Default: OFF
----------------------------	---------------	--------------

---

Parameters:

- ON - The <DELETE> (\$7F) key is used for editing your typing.
  - OFF - The <BACKSPACE> (\$08) key is used for editing your typing.
- 

Use the DELETE command to select the key to use for deleting while editing.

- o Type the selected DEL key to delete the last character from the input line.

You cannot use the DEL key to delete text before the beginning of a line. Use the PASS character to delete <CR> characters that have been typed into the text.

- o The BKONDEL command controls how the PK-232 indicates deletion.
- o To see a corrected display of the current line after deleting characters, type the redisplay-line character, which is set by the REDISPLAY 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 trying 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's call signs whose packets will or will not be repeated. You can use the abbreviated command form or mnemonic:

```
cmd:dfrom
DFROM all
cmd:df
DFROM yes WX1AAA,WX2BBB,WX3CCC,WX4DDD
```

To prevent all stations from using your station as a digipeater, type DFROM NONE.

To permit one or more specific stations to digipeat through your station, type DFROM YES (followed by a list of calls signs). Packets will be digipeated only from and to 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 and to 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.

---

DIGIPEAT ON OFF Mode: Packet	Mnemonic: DIG	Default: ON
---------------------------------	---------------	-------------

---

Parameters:

- ON - The PK-232 will Digipeat packets from all other stations if DFROM is set to ALL.
- OFF - The PK-232 will not Digipeat packets from other stations if DFROM is set to ALL or NONE.
- 

DIGIPEAT is included only to maintain upward compatibility with the TAPR TNCs and some BBS software that depends on this command being there. The command DFROM is much more versatile, and should be used instead of DIGIPEAT.

Make sure that DFROM is set to ALL if your software needs DIGIPEAT.

---

DISCONNE MODE: Packet	Mnemonic: D	Immediate Command
--------------------------	-------------	-------------------

---

DISCONNE is an immediate command that initiates a disconnect command to the distant station to which you are connected.

If your disconnect command is successful, your monitor will display:

\*\*\* DISCONNECTED: (call sign)

Other commands can be entered while a disconnect is in progress. New connections are not allowed until the disconnect is completed.

- o If the retry count is exceeded while waiting for the distant station to acknowledge your disconnect command, your PK-232 switches to the disconnected state.
- o If another disconnect command is entered while your PK-232 is trying to disconnect, the retry count is immediately set to the maximum number. In either case, your monitor displays:

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

Disconnect messages are not displayed when your PK-232 is in the Transparent Mode.

---

DISPLAY [class]	Mnemonic: DISP	Immediate Command
MODE: Command		

---

Parameters:

class - Optional parameter identifier, one of the following:

- (A)sync           display asynchronous port parameters
  - (C)haracter       display special characters
  - (F)ax             display Facsimile parameters
  - (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,F,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. Command mnemonics can be used.

```

cmd: my                   cmd:fr                   cmd:dw                   cmd: mys
MYCALL WX1AAA           FRACK 3                 DWAIT 16               MYSELCAL WJUP
    
```

DWAIT 'n'                      Mnemonic: DW                      Default: 16 (160 msec.)  
 MODE: Packet

Parameters:

'n' -     0 to 250 specifies 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:

<u>TYPE OF OPERATION</u>	<u>TIME (in msec.)</u>	<u>DWAIT VALUE</u>
Digipeaters	0	0
Local keyboards	160	16 (default)
PBBSSs, Hosts	320	32
File transfers	480	48

---

EAS ON OFF	Mnemonic: EAS	Default: OFF
MODE: Baudot/ASCII RTTY, AMTOR and Morse		

---

Parameters:

- ON - Display characters as actually sent on the air by the PK-232.
- OFF - Display characters as sent to the PK-232 by the computer.
- 

The ECHO-AS-SENT (EAS) command functions in all modes except packet. EAS permits you to choose the type of data displayed on your monitor screen or printer.

- o To display your typing exactly as you are typing the keyboard characters or sending from a disk file, set EAS 'OFF.'
- o To see the actual data being sent from your PK-232 to your radio and transmitted on the air, set EAS 'ON.'

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

When EAS is on you'll see only UPPER CASE characters on your screen, representing the data actually transmitted to the distant station.

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

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

- o If the data scrolls across your monitor at a nice even rate, in rhythm with your typing speed, you can assume that you have a good ARQ link.
- o If the data hesitates or scrolls in 'jerky' intermittent fashion, that's generally a sign that the radio link is not too good.
- o If the characters stop appearing on your monitor, the link is failing or has failed.



---

ECHO ON OFF MODE: All	Mnemonic: E	Default: ON
--------------------------	-------------	-------------

---

Parameters:

- ON - Characters received from the computer or terminal ARE echoed by the PK-232.
  - OFF - Characters are NOT echoed.
- 

The ECHO command controls local echoing by the PK-232 when it is in Command or Converse Mode. Local echoing is disabled in Transparent Mode.

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

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

---

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

---

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>.

- o Set ESCAPE ON if you have such terminal to avoid unexpected text strings from other packeteers.
- o 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.

- o Use FEC for CQ calls. Distant stations cannot identify you in an ARQ CQ call.
- o 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).
- o Use FEC if the desired range is longer than 22,000 miles, such as in 'long path' contacts or high-orbit satellite contacts.
- o Use FEC for all round table contacts.
- o 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.
- o 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 must receive the automatically-sent idle sync characters from your PK-232. The distant station cannot sync to RYs. The normal FEC idle-signal can be used for tuning.
- o To aid formatting the distant station's screen and printer copy, always start FEC transmission with a new line sequence by sending a <CR>.
- o 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 as you would in conventional RTTY.

You can terminate your FEC transmission several ways:

- o Type the RCVE (R) command.
- o Type the AMTOR (AM) command.
- o Embed 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:

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

Canceling 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.

- o Some packet bulletin board programs (PBBS) may work best with FLOW set to OFF.
- o 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.

NOTE: When FLOW is ON, text will no longer be released to the terminal if the channel is changed when multi-connected.

---

FRACK 'n'	Mnemonic: FR	Default: 3 (3 sec.)
MODE: Packet		

---

Parameters:

'n' - 1 to 15, specifying frame acknowledgment timeout 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: HEA	Default: ON
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   MHEARD   DISPLAY
  ACHG  CSTATUS   CALIBRAT
CONVERSE TRANS
XMIT    RCVE
RESTART RESET
TCLEAR
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.

- o 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.
- o Set HID OFF to stop your PK-232 from sending any ID packets.
- o The HID identification packet is addressed to 'ID'.
- o 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 ON OFF	Mnemonic: HOST	Default: OFF
MODE: All		

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 3-<CTRL-C> characters as for exiting the Transparent mode, or type <CTRL-A> O H O N <CTRL-W>.

With the 25.JUN.87 Firmware release, Sending a Break signal will no longer exit the PK-232 from HOST mode.

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.'

- o The ID identification packet is sent only if the digipeater has transmitted since the last automatic identification.
- o The ID identification packet is addressed to 'ID.'
- o Your station identification is the call sign you've set with the MYCALL command. It includes 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

---

ILFPACK ON OFF MODE: Packet	Mnemonic: IL	Default: ON
--------------------------------	--------------	-------------

---

Parameters:

- ON - The PK-232 ignores all line-feed characters received from the computer or terminal.
- OFF - The PK-232 transmits all line-feed characters received from the computer or terminal
- 

The ILFPACK command permits you to control the way the PK-232 handles line-feed characters received from your computer.

This feature is especially useful when sending certain types of computer programs in text form.

---

KISS ON OFF MODE: Packet	Mnemonic: KI	Default: OFF
-----------------------------	--------------	--------------

---

Parameters:

- ON - The PK-232 operates as a KISS TNC.
- OFF - The PK-232 operates as a normal AX.25 Level 2 TNC
- 

KISS TNC protocol permits more efficient use of your PK-232 with host computers. The PK-232 converts synchronous HDLC used on the half-duplex radio channel to and from a special asynchronous, full-duplex frame format spoken on the host/PK-232 link. Each frame received on the HDLC link is passed intact to the host after translation to the asynchronous format; likewise, asynchronous frames from the host are transmitted on the radio channel after conversion to HDLC format.

Normal PK-232 software was written for human users and is inefficient for host computer use, especially multi-user servers such as bulletin boards. Experimentation with new link-level protocols is greatly hampered; there may be no way to send or receive frames in the desired format without reprogramming the PK-232.

The KISS function solves the problems of software written for human users by eliminating much of the PK-232 software, giving the host complete control of the contents of the HDLC frames sent and received over the air.

The bulk of AX.25 (or other protocol) must be executed in the host. Complete details on the use of KISS TNC protocol are contained in AEA's Technical Manual for the PK-232.



---

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

---

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.

---

MARSDISP ON OFF	Mnemonic: MAR	Default: OFF
MODE: Baudot and AMTOR, RTTY		

---

Parameters:

ON - The PK-232 will translate a received LTRS character to a <CTRL-O>, and a received FIGS character to a <CTRL-N> and send these to the terminal.

OFF - The PK-232 operates as before in Baudot and AMTOR.

---

The MARSDISP command permits the Baudot and AMTOR operator to detect and display every character including LTRS and FIGS sent by the other station. The ACRDISP and ALFDISP may be turned off to prevent extraneous carriage-returns and Linefeeds from being sent to the RS-232 serial port.

If the user retransmits this data, ACRTTY should be set to 0, and ALFRTTY should be OFF.

---

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.

- o If packet traffic is heavy or the path is poor, reduce MAXFRAME to 3 or 2.
- o 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.
- o 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.
- o Use MAXFRAME 1 for best results on HF packet.

---

MBELL ON OFF Mode: Packet	Mnemonic: MBE	Default: OFF
------------------------------	---------------	--------------

---

Parameters:

- ON - Will send 3 BELL characters to the terminal when the call sign(s) of the station(s) monitored match the MFROM and MTO lists.
- OFF - As is, that is the PK-232 will not send any BELL characters to the terminal due to MONITORED packets.
- 

MBELL can be used to alert the user to the presence of particular station(s) on the packet frequency. For example if you want to be alerted when N7ML comes on frequency you would set the following:

```
MBELL ON
MONITOR 4
MFROM yes N7ML
MTO NONE
```

Now that MBELL is ON, any packet that matches MFROM or MTO will cause the BELL character to be output to the terminal. Since MTO is NONE, and MFROM is set to YES N7ML, only the presence of N7ML on frequency will cause the BELL character to be sent.

When MBELL is ON, packets from and to all stations are displayed, but only those packets matching the MFROM and MTO lists cause the bell to ring.

As another example, if you wish to detect the presence of packets addressed to CQ or BEACON, simply enter the following commands:

```
MBELL ON
MONITOR 4
MFROM NONE
MTO yes CQ, BEACON
```

Now, only packets addressed to CQ and BEACON will cause the BELL character to be output to the terminal. To return to normal operation simply turn MBELL OFF, and return the MFROM, MTO and MONITOR commands to your preferred settings.

---

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

---

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. MBX 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
```

(NOTE: These stations must be connected to each other for this feature to work. Use two call signs if you suspect that your target station may be in a multiple connection.)

Use the MBX feature to:

- o Read or record transmissions from any packet station, without any extraneous material.
- o Read or record transmissions from a PBBS (Packet Bulletin Board System) while another station is downloading files or messages.
- o 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.

Clear MBX with '% '&' 'N' 'NO' 'NONE' or 'OFF' as arguments.

---

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: \$80
MODE: Packet		

---

Parameters:

- 'n' - 0 to \$80 (0 to 128 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.

The special (default) value of \$80 (128) filters all control-characters except for carriage-return (\$0D) and linefeed (\$0A), as well as the characters \$80 (128) and above.  
received.

- o To prevent a <CTRL-L> character from clearing your screen, set MFILTER 12.
- o To eliminate <CTRL-G> characters, which beep your computer or terminal, set MFILTER 7.

---

MFROM ALL/NONE or YES/NO call1[,call2...] Mnemonic: MF Default: ALL  
MODE: Packet

---

Parameters:

call - ALL/NONE or 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 KA1EQU*
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 KA1EQU*
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 (UA DM C D I UI)
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.

---

MPROTO ON OFF Mode: Packet	Mnemonic: MP	Default: OFF
-------------------------------	--------------	--------------

---

Parameters:

ON - Monitors all I and UI frames as before.

OFF - Monitors only those I and UI frames with a PID byte of \$F0.

---

This is in response to NET/ROM, which sends frames that have a PID of \$CF, and that contain Control characters. If you want to monitor every frame including those used by NET/ROM, you must turn MPROTO ON.

---

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

---

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*>W1IXU>W1AW-5>W1AW-4 <I;0,3>:
```

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

- o Note: When MRPT is OFF, digipeater paths will not appear in connect requests or connect and disconnect monitor functions.

---

MSPEED 'n' MODE: Morse	Mnemonic: MSP	Default: 20 WPM
---------------------------	---------------	-----------------

---

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 MODE: Packet	Mnemonic: MS	Default: OFF
-------------------------------	--------------	--------------

---

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 or YES/NO call1[,call2...] Mnemonic: MT Default: NONE  
MODE: Packet

---

Parameters:

call - ALL/NONE or 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.'

In some areas wide-coverage digipeater operators 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).

---

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

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 packet and AMTOR protocols.

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

- o Use the SSID to distinguish two stations with the same amateur call.
- o 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.

MYSELCAL aaaa            Mnemonic: MYS            Default: empty  
 MODE: AMTOR

Parameters:

aaaa -        specifies your SElective CALLing code (SELCAL)

NOTE:        You can't operate AMTOR unless your SELCAL is installed.  
               The error message reminds you:

              ?need MYSELCAL

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. Some of the call sign groupings now in use:

	<u>GROUP</u>	<u>CALL</u>	<u>SELCAL</u>
	1 by 2	W1XX	WWXX
	1 by 3	W1XXX	WXXX
	2 by 1	AB1X	AABX
	2 by 2	AB1XX	ABXX
	2 by 3	KAlXXX	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	2 - W	3 - E	4 - R	5 - T
6 - Y	7 - U	8 - I	9 - O	0 - P

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 automatically translates the numeric entry to your four-letter alpha SELCAL.

---

NEWMODE ON OFF	Mnemonic: NE	Default: ON
MODE: All		

---

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: All		

---

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.

Some applications programs may require NOMODE set ON. WA7MBL's PBBS Version 3.12 program is one such example.



---

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

---

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 (Teletypem 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 MODE: All	Mnemonic: NUL	Default: OFF
--------------------------	---------------	--------------

---

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 (Teletypem 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 by 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 MODE: Command	Mnemonic: PA	Immediate 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 or RESET command.

---

PACLEN 'n' MODE: Packet	Mnemonic: PACL	Default: 128
----------------------------	----------------	--------------

---

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.

- o The lower the value of PACLEN, the greater the probability of getting packets though the link without 'hits' or retries.
- o Increase PACLEN to 256 if transferring files to a nearby station over a high quality path.
- o Reduce PACLEN to 64, or even 32 when working 'difficult' HF radio paths.
- o If the radio link is good, an optimal relationship will exist between the parameters set by these commands. Set PACLEN so that the maximum number of characters outstanding doesn't exceed the receive buffer space of the TNC receiving the data.

NOTE: It is not necessary that two TNCs be set to the same PACLEN value to exchange data; however, some TNCs may not be compatible when frames contain more than 128 data characters.

---

PACTIME EVERY AFTER 'n'	Mnemonic: PACT	Default: AFTER 10
MODE: Packet		(1000 msec.)

---

Parameters:

'n' - 0 to 250 specifies 100-millisecond intervals.  
 EVERY - Packet timeout occurs every 'n' times 100 milliseconds.  
 AFTER - Packet timeout occurs when 'n' time 100 milliseconds elapse without input from the computer or terminal.

---

A PACTIME parameter is always used in Transparent Mode. PACTIME is also used in Converse Mode if CPACTIME is ON.

- o When EVERY is specified, the characters you type or send from disk are 'packetized' and queued for transmission every 'n' times 100 milliseconds.
- o When AFTER is specified, the characters you type or send from disk are 'packetized' 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 <CRs> 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 the same way, you can include <CRs> in text when you are in Converse Mode, to send multi-line packets. (The default send-packet character is <CR>.)

---

PASSALL ON/OFF MODE: Packet	Mnemonic: PASSA	Default: OFF
--------------------------------	-----------------	--------------

---

Parameters:

- ON - Your PK-232 will accept packets with invalid CRCs.
  - OFF - Your PK-232 will accept packets with valid CRCs only.
- 

PASSALL permits the PK-232 to display packets received with invalid CRC fields; the error-detecting mechanism is turned off.

Packets are accepted for display, despite CRC errors, if they consist of an even multiple of eight bits and are up to 330 bytes. The PK-232 attempts to decode the address field and displays the call sign(s) in the standard monitor format, followed by the text of the packet.

PASSALL is normally turned off; therefore, the protocol ensures that received packet data is error-free by rejecting packets with invalid CRC fields.

PASSALL (sometimes called 'Garbage Mode') may be useful for testing a marginal RF link or during operation under other unusual conditions or circumstances.

When you set PASSALL ON while monitoring a moderately noisy channel, 'packets' are displayed periodically because there is no basis for distinguishing between actual packets and random noise.

- o When PASSALL is ON, logging of stations heard (for display by MHEARD) is disabled; the call signs detected may be incorrect.

---

PERSIST 'n'	Mnemonic: PE	Default: 127
MODE: Packet		

---

Parameters:

- 'n' - 0 to 255 specifies the threshold value for a random-number attempt to transmit.
  - '0' - Signifies a 1/256th chance of transmitting every SLOTTIME.
  - '255' - Signifies 'transmit right away without delay'.
- 

The PERSIST parameter works with the PERSIST and SLOTTIME parameter to achieve true p-persistent CSMA (Carrier-Sense Multiple Access) in KISS TNC mode and in normal AX.25 operation. However, no real advantage will be obtained in AX.25 operation unless the other stations on the channel are also using PERSIST and SLOTTIME.

When the host (your computer) has queued data for transmission, the PK-232 monitors the DCD (Data Carrier Detect) signal from its internal modem. The PK-232 waits indefinitely for DCD to go inactive.

When the channel is clear, the PK-232 generates a random number between 0 and 255. If this number is less-than or equal to 'P', the PK-232 keys the radio's PTT line, waits  $.01 * TXDELAY$  seconds, and then transmits all frames in its queue. The PK-232 then unkeys the PTT line and returns to the idle state.

If the random number is greater than 'P', the PK-232 waits  $.01 * SLOTTIME$  seconds and repeats the procedure. If the DCD signal has gone active in the meantime, the PK-232 again waits for DCD to clear before continuing.

The PK-232 waits an exponentially-distributed random interval after sensing that the channel is clear before trying to transmit. With proper 'tuning' of the PERSIST and SLOTTIME parameters, several stations sending traffic are much less likely to collide with each other when they simultaneously see that the channel is clear.

Note that P=255 means 'always transmit as soon as possible, regardless of the random number'.

Additional information on p-persistent operation can be found in AEA's Technical Manual for the PK-232.

---

PPERSIST ON OFF MODE: Packet	Mnemonic: PP	Default: OFF
---------------------------------	--------------	--------------

---

Parameters:

- ON - The PK-232 uses PERSIST and SLOTTIME parameters in executing p-persistent CSMA (Carrier Sense Multiple Access).
- OFF - The PK-232 uses DWAIT for TAPR-type 1-persistent CSMA.
- 

When PPERSIST is set ON, the PK-232 uses the PERSIST and SLOTTIME parameters for p-persistent CSMA instead of the normal TAPR-type DWAIT procedure to achieve CSMA operation. PPERSIST can be used in both KISS TNC and normal AX.25 operation. See PERSIST and SLOTTIME.

---

RBAUD 'n' MODE: Baudot RTTY	Mnemonic: RB	Default: 45 bauds (60 WPM)
--------------------------------	--------------	-------------------------------

---

Parameters:

- 'n' - Specifies the rate or signalling speed in bauds from the PK-232 to the radio.
- 

RBAUD sets the radio ('on-air') baud 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, 100, 110, 150, 200 and 300 bauds (60, 66, 75, 100, 132, 145, 198, 264 and 396 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' may be used interchangeably in such cases.



---

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' MODE: All	Mnemonic: RED	Default: \$12 <CTRL-R>
---------------------------	---------------	------------------------

---

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:

- o Type-in flow control is temporarily turned off (if it had been active). Any incoming packets that are pending are displayed.
- o 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.

You can now continue typing where you left off.

Use the REDISPLA command 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 command 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.

---

RELINK ON OFF , MODE: Packet	Mnemonic: REL	Default: OFF
---------------------------------	---------------	--------------

---

Parameters:

- ON - The PK-232 will try to automatically reconnect the distant station after the link has timed out on retries.
  - OFF - The PK-232 will not attempt to reestablish the failed link.
- 

Set RELINK to OFF when using the PK-232 with host computer applications, computer-based message systems and programs such as WA7MBL's Version 3.12 Packet Bulletin Board (PBBS) software.

---

RESET	Mnemonic: RESET	Immediate Command
MODE: Command		

---

RESET is an immediate command that resets all parameters to PK-232's PROM default settings and reinitializes the PK-232. Everything in the PK-232 goes back to 'square one'.

NOTE:

All personalized parameters and monitor lists are lost.

- o To reinitialize the PK-232 using the parameter values in bBRAM, without starting from 'square one', turn the PK-232 OFF then ON, or use the RESTART command.

---

RESPTIME 'n'	Mnemonic: RES	Default: 10
MODE: Packet		(1000 msec.)

---

Parameters:

'n' - 0 to 250 specifies 100-millisecond intervals.

---

RESPTIME adds a minimum delay before your PK-232 sends acknowledgment packets. This delay may run concurrently with the default wait time set by DWAIT and any random wait in effect.

- o Use RESPTIME delay to increase throughput during operations such as file transfer when the sending TNC usually sends the maximum number of full-length packets.

Occasionally, the sending TNC may not have a packet ready in time to prevent transmission from being stopped temporarily; therefore, 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 values in bbRAM. 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. A value of 0 for 'n' specifies an infinite number of retries.

- o The time between retries is specified by the command FRACK. See the FRACK command.

If the number of retries is exceeded, the PK-232 enters either the "connect in progress" or "disconnected" state depending on the setting of RELINK.

If you're not in Transparent Mode, the following message is displayed:

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

---

RFEC ON OFF	Mnemonic: RF	Default: ON
MODE: AMTOR		

---

Parameters:

ON - Mode B (FEC) signals are displayed in AMTOR Standby.  
 OFF - Mode B (FEC) signals are not displayed in AMTOR Standby.

---

Use the RFEC command to prevent the reception and display of all FEC signals received while in AMTOR Standby.

---

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' although it is 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 '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' MODE: Packet	Mnemonic: SE	Default: \$0D <CTRL-M>
-----------------------------	--------------	------------------------

---

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 a value not ordinarily used (for example, <CTRL-A>) with CR OFF). This setting forces packets to be sent without extra <CR> characters in the text.

---

SLOTTIME 'n' MODE: Packet	Mnemonic: SL	Default: 10 (100 sec.)
------------------------------	--------------	---------------------------

---

Parameters:

'n' - 0 to 250 specifies the time interval during which the PK-232 waits between generating random numbers to see if it can transmit.

---

The SLOTTIME parameter works with the PPERSIST and PERSIST parameters to achieve true p-persistent CSMA (Carrier-Sense Multiple Access) in KISS TNC mode and in normal AX.25 operation. However, no real advantage will be obtained in AX.25 operation unless the other stations on the channel are also using PERSIST and SLOTTIME.

---

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	Default: OFF
MODE: AMTOR		

---

Parameters:

- ON - Receive ALL selective (SELFEC) transmissions.
- OFF - Receive only SELCAL-addressed SELFEC transmissions.
- 

SRXALL permits the reception of selectively coded inverse FEC signals normally not available for decoding.

Set SRXALL ON to activate this feature.

---

START 'n'	Mnemonic: STA	Default: \$11 <CTRL-Q>
MODE: All		

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

Use the START command to choose the User Start character you want to use to restart output from the PK-232 to the terminal after it has been halted by typing the User Stop character.

- o The User Stop character is set by the STOP command.
- o You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to \$00, software flow control to the PK-232 is disabled; the PK-232 will only respond to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop characters, the PK-232 alternately starts and stops transmission on receipt of the character ('toggles').

---

STOP 'n'	Mnemonic: STO	Default: \$13 <CTRL-S>
MODE: All		

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

Use the STOP command to select the User Stop character you want to use to stop output from the PK-232 to the terminal. Type this character to halt the PK-232's output to your monitor so that you can read the received text before it scrolls off your screen display.

Output is restarted with the User Start character.

- o The User Start character is set by the START command.
- o You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to \$00, software flow control to the PK-232 is disabled; the PK-232 will only respond to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop characters, the PK-232 alternately starts and stops transmission upon receipt of the character ('toggles').



---

TBAUD 'n' MODE: All	Mnemonic: TB	Default: 1200 bauds
------------------------	--------------	---------------------

---

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 autobaud routine when you first apply power to the PK-232, or after typing 'RESET.'

Use TBAUD to set terminal rates not covered by the autobaud routine, such as 110 and 600 bauds.

Use TBAUD to specify the terminal baud rate to be activated 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, then turn the PK-232 on again.

---

TCLEAR MODE: Command	Mnemonic: TC	Immediate Command
-------------------------	--------------	-------------------

---

The TCLEAR command clears your PK-232's transmit buffer and cancels any further transmission of data when in the Baudot, ASCII, AMTOR or Morse operating modes. In Packet Mode, all data is cleared except for a few remaining packets.

- o You must be in the Command Mode to use TCLEAR.
- o Use the <CTRL-C> (default) command to return to Command Mode.
- o Type 'TC' to clear the transmit buffer.

---

TIME	Mnemonic: TI	Default: \$14 <CTRL-T>
MODE: All		

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

The TIME command specifies which control character to use 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.

NOTE: The TIME command cannot be embedded in CTEXT, BTEXT or AAB.

TRACE ON|OFF                    Mnemonic: TRAC                    Default: OFF  
 MODE: Packet, FAX

Parameters:

ON - Trace function is activated  
 OFF - Trace function is disabled.

The TRACE command activates the AX.25 protocol display. When 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'! If you do, 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.
```

<u>Byte</u>	<u>Hex</u>	<u>Shifted ASCII</u>	<u>ASCII</u>
000: A88AA6A8 8AA460AE 6494AAA0 406103F0	TESTEROW2JUP 0.x	.....'.d...@a..	
010: 54686973 20697320 61207465 7374206D	*449.49.0.:29:.6	This is a test m	
020: 65737361 67652070 61636B65 742E0D	299032.80152:..	essage packet..	

The byte column shows the offset into the packet of the beginning byte of the line.

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

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

In a standard AX.25 packet,

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

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

---

TRANS	Mnemonic: T	Immediate Command
MODE: Packet		

---

TRANS is an immediate command that switches the PK-232 switch from the Command Mode to Transparent Mode. The current state of the radio link is not affected.

Transparent Mode is primarily useful for computer communications. In Transparent Mode 'human interface' features such as input editing, echoing of input characters, and type-in flow control are disabled.

- o Use Transparent Mode for transferring binary or other non-text files.

---

TRFLOW ON OFF	Mnemonic: TRF	Default: OFF
MODE: All		

---

Parameters:

- ON - Software flow control for the computer or terminal can be activated in Transparent Mode.
- OFF - Software flow control for the computer or terminal is disabled in Transparent Mode.

---

When TRFLOW is ON, the type of flow control used in Transparent Mode is determined by how START and STOP are set.

When TRFLOW is OFF, only 'hardware' flow control (CTS, RTS) is available to the computer and all characters received by the PK-232 are transmitted as data.

If START and STOP are set to \$00 the User Stop and User Start characters are disabled - hardware flow control must be used by the computer.

If TRFLOW is ON, and START and STOP are set to values other than zero, software flow control is enabled for the user's computer or terminal. The PK-232 responds to the User Start and User Stop characters (set by START and STOP) while remaining transparent to all other characters from the terminal.

Unless TXFLOW is also ON, only hardware flow control is available to the PK-232 to control output from the terminal.

---

TRIES 'n'	Mnemonic: TRI	Default: 0
MODE: Packet		

---

Parameters:

'n' - 0 to 15 specifies the current RETRY level on the selected input channel.

---

TRIES retrieves (or forces) the count of 'tries' on the data channel presently selected.

If you type TRIES without an argument, the PK-232 returns the current number of tries if an outstanding unacknowledged frame exists. If no outstanding unacknowledged frame exists, the PK-232 returns the number of tries required to get an ACK for the previous frame.

If RETRY is set to zero (0), the TRIES command always returns zero (0).

Use TRIES for gathering statistics on a given path or channel. TRIES is especially useful for computer-operated stations (such as automatic message-forwarding stations) using less-than-optimal, noisy HF or satellite channels or paths.

Using TRIES under these conditions automatically optimizes the PACLEN and MAXFRAME parameters.

If you type TRIES with an argument the 'tries' counter is forced to the entered value. Using this command to force a new count of tries is not recommended.

---

TXDELAY 'n'	Mnemonic: TXD	Default: 30
MODE: Packet		(300 msec.)

---

Parameters:

'n' - 0 to 120 specifies ten-millisecond intervals.

---

The TXDELAY command tells your PK-232 how long to wait before sending packet frame data after keying your transmitter's PTT line.

All transmitters need some amount of start-up time to put a signal on the air; some need more, some need less.

Some general rules apply to these radios:

- o Crystal-controlled radios with diode antenna-switching don't need much time.
- o Synthesized radios need time for their phase-lock-loops (PLLs) to lock up and settle on to the operating frequency.
- o Radios with mechanical transmit/receive relays need time for the physical movement of the relays.
- o External amplifiers using RF-driven relay switching frequently require that you increase TXDELAY to allow for the additional delays.

Experiment to determine the best TXDELAY value for a specific radio.

TXDELAY can also compensate for certain characteristics of the radio used by the station with whom you're communicating.

- o If the distant station's radio has slow AGC recovery or squelch release times when switching from transmit to receive, increasing your TXDELAY may reduce retries and actually improve throughput by retarding the start of your data until the distant station's receiver has reached full sensitivity.

---

TXFLOW ON OFF MODE: Packet	Mnemonic: TXF	Default: OFF
-------------------------------	---------------	--------------

---

Parameters:

- ON - Software flow control for the PK-232 can be activated in Transparent Mode.
- OFF - Software flow control for the PK-232 is disabled in Transparent Mode.
- 

When TXFLOW is ON, the setting of XFLOW determines the type of flow control used in Transparent Mode.

When TXFLOW is OFF, the PK-232 uses only hardware flow control; all data sent to the terminal remains fully transparent.

When TXFLOW and XFLOW are ON, the PK-232 uses the Start and Stop characters (set by XON and XOFF) to control the input from the terminal.

Unless TRFLOW is also ON, only hardware flow control is available to the computer or terminal to control output from the PK-232.

If the PK-232 Start and Stop characters are set to \$00, hardware flow control is always selected, regardless of the setting of TXFLOW.

---

TXREV ON OFF MODE: Baudot/ASCII/AMTOR	Mnemonic: TXR	Default: OFF
--	---------------	--------------

---

Parameters:

- ON - Transmit data polarity is reversed (mark-space reversal).
- OFF - Transmit data polarity is normal.
- 

Use the TXREV Command to invert the polarity of the data sent to the PK-232's AFSK tone generator, thus reversing mark and space in the transmitted AFSK and FSK signals.

In some cases, the station you're working may be receiving inverted data although it is transmitting in correct polarity.

- o Set TXREV ON to reverse the sense of your transmitted signals.

---

UNPROTO call1 [VIA call2[,call3...,call9]] Mnemonic: U Default: CQ  
 MODE: Packet

---

Parameters:

call1 - Call sign to be placed in the TO address field.  
 call2-9 - Optional digipeater call list, up to eight calls.

---

UNPROTO sets the digipeat and destination address fields of packets sent in the unconnected (unprotocol) mode.

Unconnected packets are sent as unsequenced I-frames with the destination and digipeat fields taken from 'call1' through 'call9' options. When a destination is not specified, unconnected packets are sent to 'CQ.'

Unconnected packets sent from other packet stations can be monitored by setting MONITOR to a value greater than '1' and setting MFROM to ALL.

The digipeater list can also be used for beacon packets.

To send your beacon message through one or more digipeaters, type the following:

```
UNPROTO BEACON VIA WX1AAA,WX2BBB,WX3CCC
```

Your beacon is routed to and repeated by each of the digipeaters in the order listed.

Some PBBSs and other types of host computer systems may use this form of UNPROTO addressing to disseminate their traffic or mail lists over the channel to a wider audience.

To address a PBBS mail list through one or more digipeaters, type the following:

```
UNPROTO MAIL VIA WX1AAA,WX2BBB,WX3CCC
```

The resulting 'unproto' beacon may look like this:

```
W2JUP-4>MAIL:  

QTC (List of callsigns with mail waiting in the PBBS)
```



---

USERS 'n'	Mnemonic: US	Default: 1
MODE: Packet		

---

Parameters:

'n' - 0 to 10 specifies the number of active simultaneous connections that can be established with your PK-232.

---

USERS only affects the way that incoming connect requests are handled. It does not affect the number of connections you initiate 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.

---

USOS ON OFF	Mnemonic: USO	Default: OFF
MODE: Baudot RTTY		

---

Parameters:

ON - Letters (LTRS) case IS forced after a space character.  
 OFF - Letters (LTRS) is NOT forced after a space character.

---

Use the USOS Command when you want your PK-232 to automatically change from figures to letters after receiving a space character.

When using Baudot RTTY in poor HF receiving conditions, a received character can be incorrectly interpreted as a FIGURES-SHIFT character, forcing the received data into the wrong case. Many otherwise good characters received after this will be interpreted as figures (numbers and punctuation), not as the letters sent by the distant station.

USOS ON helps reduce these receiving errors.

NOTE: Some weather, commercial, point-to-point and utility stations use Baudot RTTY to send consecutive groups of numbers separated by spaces. USOS ON produces unacceptable results by forcing the system into letters case when the originator may have intended the information to be in figures case.

---

VHF ON OFF MODE: Packet	Mnemonic: V	Default: ON
----------------------------	-------------	-------------

---

Parameters:

- ON - Packet tones are shifted 1000 Hz.
  - OFF - Packet tone are shifted 200 Hz.
- 

Use the VHF Command for immediate software control of the PK-232's modem tones. Changing components or switch settings is not required.

- o Set VHF OFF for HF packet operation.
- o Set VHF ON for VHF operation.

NOTE: Be sure to change HB to 300 bauds when operating below 28 MHz.

---

WIDESHFT ON OFF MODE: Baudot/ASCII RTTY	Mnemonic: WI	Default: OFF
--	--------------	--------------

---

Parameters:

- ON - RTTY tones are shifted 1000 Hz.
  - OFF - RTTY tones are shifted 200 Hz (emulates 170-Hz shift).
- 

The WIDESHFT command permits you to use the PK-232 on VHF or HF with either wide (1000 Hz) or narrow (200 Hz) shifts.

Nearly all amateur radio VHF and HF Baudot and ASCII RTTY operators use 170-shift. The PK-232's 200-Hz shift is well within the passband and filter tolerances of any RTTY demodulator in general service.

MARS stations will find WIDESHFT generally compatible with standard MARS 850-Hz shift Baudot RTTY operations.

The WIDESHFT command has no effect in AMTOR operation.

---

WORDOUT ON OFF	Mnemonic: WO	Default: OFF
MODE: Baudot/ASCII RTTY, AMTOR, Morse		

---

Parameters:

- ON - Typed characters are held in the transmit buffer until a space character or punctuation is typed.
- OFF - Typed characters are sent directly to the transmitter.
- 

Use the WORDOUT Command (in all modes except packet) to choose whether or not you can edit while entering text for transmission.

When WORDOUT is ON, each character you type is held in a buffer until you type a space, a carriage return, a line feed, or any punctuation mark - including parentheses, plus signs, asterisks, etc. You can correct spelling or change words before the transmit buffer's contents are sent to the radio.

When WORDOUT is OFF, each character you type is sent to the radio just as you typed it, without any delay.

Set WORDOUT ON to permit limited on-screen editing before each word is sent to the transmitter. Set WORDOUT OFF to transmit each character immediately as it is typed.

---

WRU ON OFF	Mnemonic: WR	Default: OFF
MODE: Baudot/ASCII/AMTOR ARQ		

---

Parameters:

- ON - Your answerback is sent after a distant station's WRU?
- OFF - Your answerback is NOT sent after a distant station's WRU?
- 

Use the WRU command in Baudot, ASCII and AMTOR to enable or disable your PK-232's automatic answerback feature.

When WRU is ON, your PK-232 sends the answerback on receipt of a distant station's WRU? request ('FIGS D' or '\$' in Baudot and AMTOR, or <CTRL-E> in ASCII). Your PK-232 keys your transmitter, sends the text stored in the answerback field (AAB), then unkeys your transmitter and returns to receive status.

In AMTOR ARQ operation, your answerback will automatically send the +? changeover command to the distant station and maintain the link.

These related features can be used in message handling in either direction, to confirm that you are sending to the proper station and the distant station is probably receiving your traffic successfully..

---

XFLOW ON OFF	Mnemonic: XF	Default: ON
MODE: All		

---

Parameters:

ON - XON/XOFF (software) flow control is activated.  
 OFF - XON/XOFF flow control is disabled - hardware flow control is enabled.

---

When XFLOW is ON, software flow control is in effect - it's assumed that the computer or terminal will respond to the PK-232's Start and Stop characters defined by the XON and XOFF commands.

When XFLOW is OFF, the PK-232 send hardware flow control commands via the RTS line.

For full hardware control in both directions, set START, STOP, XON and XOFF all to \$00.

---

XMIT	Mnemonic: X	Immediate Command
MODE: Command Mode in Baudot/ASCII/Morse		

---

XMIT is an immediate command that keys your radio's PTT line and prepares the radio to receive outbound data and Morse characters from the PK-232.

The XMIT Command can only be used from the Command Mode.

Type <CTRL-C> (default) to enter Command Mode before typing the 'X.'

XMIT switches your PK-232 to either Converse Mode or Transparent Mode, depending on the setting of CONMODE.

---

XMITOK ON OFF MODE: Packet	Mnemonic: XMITO	Default: ON
-------------------------------	-----------------	-------------

---

Parameters:

ON - Transmit functions (PTT line) are active.  
 OFF - Transmit functions (PTT line) are disabled.

---

When XMITOK is OFF, the PTT line to your transmitter is disabled - the transmit function is inhibited. All other PK-232 functions remain the same. Your PK-232 generates and sends packets as requested, but does not key the radio's PTT line.

Use the XMITOK command at any time to ensure that your PK-232 does not transmit.

Set XMITOK OFF if you're absent and wish to leave your PK-232 on as a channel activity monitor.

Set XMITOK OFF for testing in loopback or direct wire connections when PTT operation is not required.

---

XOFF 'n' MODE: All	Mnemonic: XO	Default: \$13 <CTRL-S>
-----------------------	--------------	------------------------

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

Use XOFF to select the Stop character to be used to stop input from the computer or terminal.

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

The Stop character default value is <CTRL-S> for computer data transfers.

If you're operating in Converse Mode, and there is a chance that activity might fill the PK-232's buffers, you can define the Stop character as <CTRL-G> (\$07), the 'beep' character on many terminals.

---

XON 'n' MODE: All	Mnemonic: XON	Default: \$11 <CTRL-Q>
----------------------	---------------	------------------------

---

Parameters:

'n' - 0 to \$7F (0 to 127 decimal) specifies an ASCII character code.

---

XON selects the PK-232 Start character that is sent to the computer or terminal to restart input from that device.

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

The Start character default value is <CTRL-Q> for computer data transfers.

If you're operating in Converse Mode, and there is a chance that activity might fill the PK-232's buffers, you can define the Stop character as <CTRL-G> (\$07), the 'beep' on many terminals.

## APPENDIX A - PK-232 COMMAND LIST

<u>COMMAND</u>	<u>MNEMONIC</u>	<u>DEFAULT</u>	<u>FUNCTION</u>
8BITCONV	8B	OFF	Strip bit 7 in CONVERSE
AAB	AA	PK-232	0-17 character answerback (WRU?)
ABAUD	AB	110 bauds	ASCII baud rate
ACHG	AC	Immediate Command	Force AMTOR ARQ Changeover
ACRDISP	ACRD	80	Screen width
ACRPACK	ACRP	ON	Add <CR> to packet
ACRRTTY	ACRR	71	Auto <CR> column in RTTY
ADELAY	AD	4	AMTOR transmit delay, 10 ms.
ALFDISP	ALFD	OFF	Send LF after <CR> to terminal
ALFPACK	ALFP	OFF	Send LF after <CR>, packet
ALFRTTY	ALFR	ON	Send LF after <CR>, RTTY
ALIST	AL	Immediate Command	Start AMTOR ARQ 'Listen' mode
AMTOR	AM	Immediate Command	Start AMTOR mode in ARQ standby
ARQ	AR	Empty; enter SELCAL	Start AMTOR ARQ call with SELCAL
ARQTMO	ARQT	90	AMTOR ARQ call timeout, seconds
ASCII	AS	Immediate Command	Start ASCII RTTY mode
AWLEN	AW	7	Data bits per word, to terminal
AX25L2V2	A	ON	Operate as AX.25 Version 1.0
AXDELAY	AXD	0 (zero)	Repeater key-up delay (X10 ms)
AXHANG	AXH	0 (zero)	Repeater hang time (X10 ms)
BAUDOT	BA	Immediate Command	Start Baudot RTTY mode
BEACON	B	EVERY 0	Set beacon timing (X10 seconds)
BKONDEL	BK	ON	Send BS SP BS for DELETE char.
BTEXT	BT	(Empty)	120-byte BEACON message text
CALIBRAT	CAL	Immediate Command	Start calibrate mode
CANLINE	CAN	\$18 <CTRL-X>	LINE DELETE character
CANPAC	CANP	\$19 <CTRL-Y>	PACKET DELETE character
CASEDISP	CAS	0 (as is)	Display case (as is/lower/UPPER)
CBELL	CB	OFF	Enable 'Connect' bell
CCITT	CC	ON	Select CCITT ITA#2 or US Baudot
CFROM	CF	Empty; enter calls	Connect request/accept list
CHCALL	CHC	OFF	Show call sign after channel ID
CHDOUBLE	CHD	OFF	Show CHSWITCH character twice
CHECK	CH	30	Idle link timeout (X10 seconds)
CHSWITCH	CHS	\$00	Channel-select (Link) character
CMDTIME	CM	1	Transparent Mode escape timer
CMSG	CMS	OFF	Send CTEXT message to caller
COMMAND	COM	\$03 <CTRL-C>	Character escape to COMMAND Mode
CONMODE	CONM	CONVERSE	Mode to enter when link starts
CONNECT	C	Immediate Command	Send connect request to <call>
CONOK	CONO	ON	Allow others to connect (TAPR)
CONPERM	CONP	OFF	Never disconnect this link
CONSTAMP	CONS	OFF	Mark connections with time/date
CONVERSE	CONV or K	Immediate Command	Start Converse Mode from Command
CPACTIME	CP	OFF	Use packet timeout in Converse
CRADD	CRA	OFF	Send <CR><CR><LF> in RTTY Modes
GSTATUS	GS	Immediate Command	Show status of channels (links)
CTEXT	CT	(Sample Text)	120-byte CONNECT message text
CWID	CW	\$06 <CTRL-F>	Command to send CWID (in text)
DAYSTAMP	DAYS	OFF	Include DATE in time-stamp
DAYTIME	DA	None	Set/read PK-232 internal clock

## PK-232 COMMAND LIST (Continued)

<u>COMMAND</u>	<u>MNEMONIC</u>	<u>DEFAULT</u>	<u>FUNCTION</u>
DCDCONN	DC	OFF	RS-232 Pin 8 follows DCD/CON
LED DELETE	DEL	OFF	Use BS (\$08), not DEL (\$7F)
DFROM	DF	Empty; enter calls	Digipeat call sign list
DIGIPEAT	DIG	ON	Allow digipeating (TAPR)
DISCONNE	D	Immediate Command	Send DISC to distant station
DISPLAY	DISP	Immediate Command	Show PK-232 parameters/classes
DWAIT	DW	16	Delay for digi repeat (X10 ms)
EAS	EAS	OFF	Echo as sent, non-packet modes
ECHO	E	ON	Echo typed keyboard characters
ESCAPE	ES	OFF	Send ESC character \$1B as \$24
FEC	FE	Immediate Command	Start AMTOR FEC transmission
FLOW	F	ON	Stop echo to screen while typing
FRACK	FR	3	Time (X1 sec) to wait for ACK
FULLDUP	FU	OFF	Full-Duplex terminal operation
HBAUD	HB	1200 bauds	Packet link (radio) baud rate
HEADERLN	HEA	ON	Insert <CR> after headers
HELP	H	None	Show brief HELP text on screen
HID	HI	OFF	Send ID UI packet every 9.5 mins
HOST	HOST	OFF	Host/terminal interface
HP	HPOLL	ON	Host poll, packet mode
ID	I	Immediate Command	Force ID packet via Unproto path
ILFPACK	IL	OFF	Ignore line feeds in packet xmit
IO	IO	Enter hex addresses	Read/write IO register
K	K	Immediate Command	Same as CONVERSE
KISS	KI	OFF	Use KISS TNC host protocol
LOCK	L	ON	Morse receive speed lock
MARSDISP	MAR	OFF	Translate LTRS & FIGS characters
MAXFRAME	MAX	4	Maximum un-ACK'd frames allowed
MBELL	MBE	OFF	Rings bell when station heard
MBX	MB	none, (enter calls)	Monitor channel without headers
MCON	MC	0 (zero)	Monitor while connected (0-6)
MDIGI	MD	OFF	Monitor digipeated frames
MFILTER	MF1	\$07, \$13	Filter received characters
MFROM	MF	Empty; enter calls	Monitor MFROM call signs
MHEARD	MH	Immediate Command	Display call signs heard
MONITOR	M	4 (UA DM C D I UI)	Monitor mode level select (0-6)
MORSE	MO	Immediate Command	Start Morse mode, unlock speed
MPROTO	MP	OFF	Monitor all packet protocols
MRPT	MR	ON	Show digipeaters in headers
MSPEED	MSP	20	Set Morse speed in WPM (5-99)
MSTAMP	MS	OFF	Time-stamp monitored frames
MTO	MT	Empty; enter calls	Monitor MTO call signs
MYALIAS	MYA	none; enter yours	Alternate MYCALL
MYALTCAL	MYALT	Empty; enter yours	Alternate AMTOR SELCAL
MYCALL	MY	PK232; enter yours	Your call sign for packet address
MYSELCAL	MYS	Empty; enter yours	Your AMTOR SELCAL, 4 letters
NEWMODE	NE	ON	Return to Command mode at DISC
NOMODE	NO	OFF	Never switch modes
NUCR	NU	OFF	Nulls to terminal after <CR>
NULF	NUL	OFF	Nulls to terminal after <LF>
NULLS	NULL	0 (zero)	Number of nulls for NUCR & NULF



## PK-232 COMMAND LIST (Continued)

<u>COMMAND</u>	<u>MNEMONIC</u>	<u>DEFAULT</u>	<u>FUNCTION</u>
OPMODE	O	Immediate Command	Display current operating mode
PACKET	PA	Immediate Command	Start Packet Mode
PACLEN	PACL	128	# of user-typed bytes in packet
PACTIME	PACT	AFTER 10	Packet transmit timer (X100 ms)
PARITY	PAR	3 (even)	Terminal program parity (0-3)
PASS	PAS	\$16 <CTRL-V>	Pass input editing character
PASSALL	PASSA	OFF	Ignore CRC in HDLC ('Junk Mode')
PERSIST	PE	127	P-persistent CSMA threshold
PPERSIST	PP	OFF	P-persistent/1-persistent CSMA
RAWHDL	RAW	OFF	Raw HDLC mode
RBAUD	RB	45 bauds (60 WPM)	Baudot RTTY baud rate
RCVE	R	Immediate Command	Go to receive, Morse/RTTY/AMTOR
RECEIVE	REC	\$04 <CTRL-D>	Receive Mode character in text
REDISPLA	RED	\$12 <CTRL-R>	Re-display current input buffer
RELINK	REL	OFF	Re-connect after retrying out
RESET	RESET	Immediate Command	RESET bbRAM to factory defaults
RESPTIME	RES	10	Minimum delay before sending ACK
RESTART	RESTART	Immediate Command	Same as power-on/off reset
RETRY	RE	10	Maximum number of frame repeats
RFEC	RF	ON	Receive FEC in AMTOR Standby
RXREV	RXR	OFF	Reverse received data sense
SELFEC	SEL	Empty; enter SELCAL	Start Selective FEC with SELCAL
SENDPAC	SE	\$0D <CTRL-M>	Character that 'sends' a packet
SLOTTIME	SL	10	P-persistent CSMA slot time, ms
SQUELCH	SQ	OFF	Select receiver squelch polarity
SRXALL	SRX	OFF	SELFEC Receive SELECTIVE or ALL
START	STA	\$11 <CTRL-Q>	Resume sending data to terminal
STOP	STO	\$13 <CTRL-S>	Stop sending data to terminal
TBAUD	TB	1200 bauds	Set terminal data rate
TCLEAR	TC	Immediate Command	Non-packet clear Transmit Buffer
TIME	TI	\$14 <CTRL-T>	Insert 'send time' in text
TRACE	TRAC	OFF	Hex dump of packet frame
TRANS	T	Immediate Command	Start Transparent Data Mode
TRFLOW	TRF	OFF	Terminal flow ctrl - Transparent
TRIES	TRI	0 (zero)	Show or force retry count
TXDELAY	TXD	30	PTT key-to-data delay (X10 ms)
TXFLOW	TXF	OFF	PK232 flow control - Transparent
TXREV	TXR	OFF	Reverse transmitted data sense
UNPROTO	U	CQ	Path/address to send UI frames
USERS	US	1	# of multi-connections allowed
USOS	USO	OFF	RTTY 'unshift on space'
VHF	V	ON	Packet - wide or narrow shift
WIDESHFT	WI	OFF	RTTY - wide or narrow shift
WORDOUT	WO	OFF	RTTY - word or character output
WRU	WR	OFF	Turn on auto-answerback (AAB)
XFLOW	XF	ON	Software flow control
XMIT	X	Immediate Command	Start transmission - key PTT
XMITOK	XMITO	ON	PTT line can be keyed
XOFF	XO	\$13 <CTRL-S>	Stop sending data to terminal
XON	XON	\$11 <CTRL-Q>	Resume sending data to terminal

## APPENDIX B

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## APPENDIX C

## INTERNATIONAL HF AMTOR CALLING FREQUENCIES

Since the earliest days of AMTOR (around 1977), AMTOR operators around the world have agreed on the use of certain informal, internationally recognized calling channels. This is similar to the conventional operating methods of the commercial stations using SITOR the ancestor of AMTOR.

The Concept and the Need

The 'calling channel' concept is just that - worldwide recognition of channels reserved for stations to make their initial calls. Stations transmit their CQ or other general broadcast calls on a frequency established as the frequency to which all hands will remain tuned and monitoring.

In this way, any operator can know in advance that the station with which contact is desired can be readily accessed - you can't raise another station by sending the SELCAL on a channel that the distant station may not be actively monitoring.

The Discipline

After initial contact is made, both stations involved in the contact quickly move off to another channel to continue their communication.

The calling channel should not be used as a working channel. Calling channels should not be used for testing or lengthy conversations. Automatic beacon transmissions should not be used on the calling channel.

Stations wishing to operate computer-based message storage or mailbox systems on these calling channels should provide automatic means of causing the system to change frequency and relocate both the calling station and the mailbox to another channel, thus leaving the calling channel free for other stations.

The Channels

80 METERS:	3588	3637.5	
40 METERS:	7045	7075	
30 METERS:	10143		
20 METERS:	14075		
15 METERS:	21075	21100	21115
10 METERS:	28075		

## APPENDIX D

## AMTOR OPERATING SUGGESTIONS FROM G3PLX

Introduction

The following text is reproduced verbatim from a letter from Peter Martinez, G3PLX, dated 9/24/84, on the subject of good AMTOR operating practices. This paper is reproduced here by express permission of the author and is offered as a guide to AMTOR operation from the one man most responsible for bringing AMTOR into the amateur radio fraternity. Newcomers to AMTOR are invited to give serious consideration to the ideas presented here.

Preface by Peter Martinez, G3PLX

Here are some thoughts on the subject of operating rules, etc., for AMTOR. They are in no particular order and are written down exactly as they occurred to me as I sat in front of my typewriter. They represent aspects of AMTOR operating that have given rise to problems so far over here and some (the hot QSY technique) which have been invented to complement the advantages of AMTOR.

AMTOR OPERATING NOTES  
G3PLX September 19831. Legalities

Establish before operating whether you are authorised to do so. Most countries where there is currently AMTOR activity are permitted by general license regulations. Some countries require the licensee to apply for a special permit. Some countries do not permit AMTOR. In others, stations are active!

2. Getting started on AMTOR for the first time

The most popular AMTOR mode is ARQ, since it is the most effective. However, do not attempt to make the first QSOs on ARQ until FEC has been tested and is known to be working. If there is a fault in part of the system, no contact will result on ARQ at all, whereas at least in one direction (transmit or receive) is working, faults can be identified and cured with contact in FEC. The following step-by-step procedure will assist in finding faults during commissioning a new AMTOR station.

- 2.1 Check FEC receive first, with a known distant station sending in the correct shift-polarity. This will confirm the station receiver is working, and in the correct shift-polarity.
- 2.2 Check FEC transmit next, asking a distant receiving station to confirm that the transmit shift-polarity is correct.
- 2.3 Make a short transmission with an ARQ call, asking the distant station to use 'listen' or 'monitor' mode to check that the transmitter keying is functioning correctly. The most common fault at this stage is a too-slow changeover from receive to transmit, resulting in missing transmitted data at the start of the burst.

Some AMTOR units have a delay adjustment which may allow slow transmitters to be used successfully except for very long distance contacts. Some remedial work may be required on the radio if this test fails.

- 2.4 If 2.3 is successful, ask the distant station to make an ARQ call to your Selcal. Your station should respond and an ARQ contact should result.
- 2.5 Finally, make an ARQ call to the distant station and attempt an ARQ contact with your station as master rather than, as in 2.4, as a slave. If no contact results, yet the distant station indicates that he was replying to the call, then the problem is that the radio is too slow to change from transmit to receive. Remedial work may be required to correct this. No adjustment to the 'delay' preset in the AMTOR unit, if fitted, will cure this problem. Consult the supplier of your radio if remedial work is needed.

It is important to follow these steps in order. Unnecessary confusion, frustration, and interference can result from a premature attempt to start an ARQ contact where the complete contact cannot be made until all the component parts are working correctly.

### 3. AMTOR operating techniques

AMTOR is sufficiently different from other modes that some of the operating practices traditionally used on the air, are no longer appropriate, and some new techniques peculiar to AMTOR need explaining.

#### 3.1 FEC and ARQ. When to use them.

ARQ is well-known to be the better of the two, but there are several situations where FEC has its advantages, and some where its use is essential.

- 3.1.1 Use ARQ for all two-way contacts.
- 3.1.2 Use FEC for all multi-way contacts.
- 3.1.3 Do not use ARQ for CQ calls. There are several reasons for this:
  - 3.1.3.1 Listeners cannot identify the calling station in an ARQ CQ call. Thus they either must risk replying to a station with whom contact was not desirable, or suffer the embarrassment of having to terminate a contact if, for example, it turns out to be the station you have just worked.
  - 3.1.3.2 If a contact which resulted from a CQ call on ARQ subsequently runs into a re-phasing attempt, the resultant CQ call from the master station may attract a completely new reply from a third station, thus resulting in this new station 'stealing' the contact.

3.1.4 FEC will have to be used if the distance between the two stations is longer than about 22,000 miles, such as in 'long path' contacts which travel more than halfway round the globe, or some high orbit satellite contacts. Make sure you know in advance if the path you are attempting is in this category, and do not attempt ARQ under these conditions; it is very frustrating to be called on ARQ when it is known that the path is too long, and very difficult to attract the attention of the caller to the problem.

### 3.2 Starting an AMTOR QSO

There is no need to explain how to start an FEC QSO, since the technique is identical to that on other modes. However, since in ARQ mode it is necessary to know the other station's Selcal code before calling him, a new technique must sometimes be required.

3.2.1 If the other station's Selcal code is already known, as in the case of a 'sked', then there is no problem. Simply enter the required Selcal code to the AMTOR unit, and if/when the desired station is on frequency, he will reply and the contact can proceed.

3.2.2 If tail-ending on a previous contact, and the intention is to call one station on ARQ and his Selcal code is not known, then there are two ways to proceed.

3.2.2.1 There is a convention in operation amongst AMTOR operators in respect of the way to choose the station Selcal code from the station call sign. This is to choose the firm letter of the call sign, followed by This is to choose the first letter of the call sign, followed by the last three letters, ignoring completely any figures. In the case of call signs with only three letters altogether, the first letter is repeated twice. This ruse breaks down for call signs in which the prefix contains figures. However, if the call sign of the desired station can be translated into a Selcal code in this way, then use that Selcal code to call him after he signs off with the station he is working.

3.2.2.2 If his call sign cannot be encoded in the above way, or his call sign is not known, or he does not respond to the expected Selcal code, then call him in FEC mode, giving him the choice of calling you back on your Selcal code, or asking him to tell you what Selcal code he is using. Note that some stations who may be using commercial SITOR-type units, may not always be able to make ARQ calls to all possible combinations of letters in a Selcal, and thus may require that you call them, often with a Selcal code that bears no relationship to their call sign, being in fact a translation from a telex number associated with the commercial equipment.

3.2.3 To make a CQ call to start an AMTOR QSO, do so on FEC mode, mentioning your own Selcal code so that, at the end of your call, a prospective QSO partner can call you back directly with your Selcal. If you are expecting replies only on FEC, for example for contacts via a long path, mention this fact in the CQ call.

### 3.3 Operating techniques whilst in contact in FEC

Whilst operation in FEC is very similar indeed to that of conventional RTTY, there are two points to note, both related to the method by which the FEC receiver synchronises to the distant transmitter.

- 3.3.1 Since the receiver can only synchronise to the transmitter when it is not sending traffic (that is, idling) each transmission must start with a period of idling. Most AMTOR units will ensure that a short period of idle precedes the typed message, but under poor conditions, or where it may help the distant receiving station to tune in, extra periods of idle will help, both at the beginning of the transmission, and also at periods during the transmission, in case interference may have resulted in the distant receiver losing synchronisation.

Note that the practice common on conventional RTTY of transmitting a line of test message of RYRYRY to allow the distant station to tune in, is actually counterproductive on FEC, since the distant receiver will not synchronise until the end of this test sequence, and the idle-signal itself is quite suitable itself for tuning purposes.

- 3.3.2 Some commercial SITOR-type units require a received FEC transmission to start with a carriage return and/or a line feed signal. For this reason, and also to aid the formatting of any distant printer copy, always start an FEC transmission on a new line.

### 3.4 Operating techniques on ARQ mode.

- 3.4.1 Transmitter and receiver tuning.

An ARQ contact always starts with the master station making the initial call, and the slave replying. Thus the frequency will have been chosen by the master station, and the slave station will have 'netted' onto that. It often happens that an offset at either station will then result in the signal from the slave received at the master being a bit off tune. If the master station then readjusts his transceiver main tuning dial to remedy this error, he will also offset his transmitter, probably putting his signal off tune in the distant slave's receiver. A never ending series of readjustments can then take place. The equivalent problem on other modes rarely causes trouble since the retune operations only take place each time the transmission is passed from one station to the other. However, with the 'quick-break' operation of ARQ, such offsets can cause trouble. Thus a convention has been adopted among AMTOR operators to prevent this situation arising.

This convention is that the master station must at all times keep his transmitter frequency constant. Thus if the master finds that the slave signal is not correctly tuned, he must adjust only his receiver frequency to remove the error, leaving his transmitter frequency untouched, by the use of the RIT control on the transceiver. The slave station, on the other hand, may, if he finds his receiver off tune, make a correction by adjusting both receiver and transmitter frequencies together, by means of the main tuning dial.



This convention prevents any offset from accumulating, and is the frequency-domain analogue to the time-domain synchronisation in which the master station clock determines the phasing for the contact.

### 3.4.2 Changing frequency during an ARQ QSO.

Since both stations are 'listening-through,' if there is some interference on the frequency, or if a change of frequency is desirable for some other reason, for example, to clear a calling frequency, then both stations may wish to move together to another frequency. Whilst at first there may seem to be no reason to discuss such a simple operation, which is very common and easy to perform on any other mode, there are problems if a QSY is made in some ways in ARQ, and there are advantages in adopting a specific technique.

3.4.2.1 The easiest way of QSY-ing an ARQ QSO is to close it down, and restart it again on a new frequency, with the master station choosing the new frequency. This is referred to in AMTOR circles as a 'cold' QSY. This technique is the preferred one when moving off a calling frequency, and in other conditions where there is good copy between both stations, so that an orderly close-down and start-up is anticipated.

3.4.2.2 If, however, the QSY is desired because of interference, then another technique is possible, and if carried out in the right way, can have decided advantages, but if carried out wrongly, can cause problems and offence to other band users. This is referred to as the 'HOT' QSY technique.

In this, the master station, while in the re-phasing mode, moves off the old frequency to the new one, and the slave then follows. It is important, while the master station is doing this, for him to prevent his transmitter from radiating, in order to prevent unintentional interference to other band users, and also to disable the connection between the receiver and the AMTOR, in order to prevent unintentional 'phantom sync.' to any other ARQ signals which may be audible during the search for a new frequency. Such phantom sync will result in spillage of traffic from the QSO in progress, or from the other QSO, or both. It can only be the master station that leads in a 'hot' QSY. If the slave station were to attempt to lead a QSY, then, in the event that it was not successfully completed before the contact timed-out into a re-phase operation, the slave would no longer be transmitting, and there would be no way for the slave to establish a new frequency without restarting as a master and thus lose some traffic.

### 3.4.3 Fixed-channel working

Since it is possible to leave an AMTOR station in 'standby' mode on a channel, and for any other station to make a specific call to that station, a common practice in AMTOR is to monitor such a specific frequency. The question arises as to what exactly is the 'frequency' of an AMTOR emission. There are, unfortunately, two different conventions in use, one more commonly used in amateur circles, and the other used universally by all non-amateur users.

- 3.4.3.1 The 'amateur' convention says that an AMTOR signal (and indeed any FSK signal) is specified with reference to the frequency of the higher-frequency tone in the pair. Thus, if a sked, for example, is pre-arranged to occur on 14075 kHz, this is taken to mean that the two transmitted tones are on 14075.00 and 14074.83 kHz.
- 3.4.3.2 The 'commercial' convention, also increasingly by amateurs, says that the signal is specified with respect to the frequency of the imaginary centre-channel. This a signal said to be on 21100 kHz will have one tone on 21099.915 kHz and the other on 21100.085 kHz, that is, 85 Hz either side of the nominal, rather than with one tone on, and the other tone 170 Hz below, the nominal. Note that it is assumed that the frequency-shift is universally accepted to be 170 Hz.

Thus, in any specification of a 'frequency' in connection with AMTOR working, due regard must be taken of the convention intended, at least until such time as one of these conventions is dropped in favour of the other.

Another factor is significant in respect of setting frequencies on the dials of SSB transceivers used on AMTOR with audio-frequency-shift tones used. Since the tones will result in transmissions offset from the suppressed carrier frequency, the dial, which normally indicates the suppressed carrier frequency, will not read correct. It will be necessary to add or subtract a fixed amount to the dial frequency in order to establish the actual frequency in use. For example, if the transceiver is in use on lower sideband, with audio tone frequencies of 2125 and 2295 Hz, then, to operate on an 'amateur' frequency of 14075, the transceiver dial must be set to 14077.125, that is, 2.125 kHz higher than the desired frequency. The two radiated tones will then be on 14077.125-2.125 (14075) and 14077.125-2.295 (14074.83). Other offsets must be used if a 'commercial' channel is to be set up (2.210 Hz), and the offset will be in the other direction if upper sideband is to be used in the transceiver. The offset must be recalculated if the tone frequencies are different from those quoted.

Users of transceivers with an FSK connection, must consult the transceiver handbook or supplier to establish if an offset has to be applied to the dial frequency. Even if the transceiver supplier indicates that no offset is needed, it will be necessary to establish if the 'amateur' or 'commercial' convention is implied, or some other convention.

#### 3.4.4 Use of the 'over' or 'break-in' facility

In ARQ mode, it is possible, by use of the 'over' or 'break-in' facility, to interrupt the sending of the other station. This facility should be used with care, and only in situations where it is essential to do so. The reason is that 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, and if the other station breaks in to your transmission, it will probably help to use the 'clear buffer' facility if such exists to abort the later transmission of any unsent text which would be inappropriate to the new context of the break-in.

- 3.4.5 The AMTOR alphabet, like the RTTY alphabet, consists of two sets of 30 characters, with a switch made between them by two 'shift' or 'case' codes. On inherent result of this technique is that it is often not known which shift the distant receiving station is in at the commencement of the contact. For this reason it is always good practice to send the appropriate shift code at the start of each contact, and indeed, at the start of each message, and perhaps at more frequent intervals. With terminals encoded in teleprinter code, there are always two keys labelled 'letters' and 'figures,' and so it is simply necessary to hit the appropriate one of these keys as required. However, on more modern terminals, these two keys may not exist, and the sending of the shift code may be 'hidden' from the user.

However, since the distant terminal could still nevertheless be in the wrong shift, there will always be the requirement to send the shift code at the start, to prevent the distant receiver copying the first part of the text in the wrong shift. Consult the documentation with your AMTOR unit or terminal in order to establish how to do this if there is no 'letters' or 'figures' key.

#### 4.0 Format of the Selcal Code

Although the convention is to form the Selcal from the call sign, some AMTOR units have the possibility to include any AMTOR character in the Selcal. It is strongly recommended, however, that only the 26 letters A-Z are used in Selcal codes.

## APPENDIX E

## AMTOR THEORY

1.1 Definition and Standards References

AMTOR (Amateur Teleprinting Over Radio) is a microprocessor-controlled, error-correcting data communications system.

AMTOR is derived directly from the commercial practice known as SITOR (Simplex Telex Over Radio), as described in Recommendations 476-2 and 476-3 of the CCIR (International Consultative Committee on Radio, an agency of the International Telecommunications Union, and in turn, of the United Nations. These international commercial standards were adapted for amateur use in 1977 by J. Peter Martinez, G3PLX.

AMTOR is now permitted in many countries, including the United States of America, as specifically defined in Part 97.69 of the Rules of the Federal Communications Commission.

1.2 Application

Like SITOR, AMTOR uses synchronous transmission of a seven-bit information code to achieve essentially error-free message and text communications. The transmit function encodes all characters with a mark-to-space polarity ratio, always as four ones and three zeros, thus allowing the receiving station's processor to check for that ratio.

There are two basic AMTOR modes. In the ARQ mode (also called Mode A), Station A sends a block of three characters during an interval of 210 milliseconds. The sending system then pauses for 240 milliseconds, during which Station B transmits a single acceptance code.

1.3 Mode A - ARQ

In the interactive ARQ mode, all transmitted characters are sent in blocks or groups, each containing three characters. This mode operates between two synchronized or phased stations.

If the receiving system's processor detects an incorrect mark-to-space (ones-to-zeros) polarity ratio, the receiving station's processor or computer sends a command back to the sending station's processor or computer to retransmit the invalid group of characters.

No data are displayed on the screen at the receiving site until it has passed this test, been validated and is essentially error-free.

Data transmission is at 100 bauds, corresponding to a character length of 70 milliseconds. The overall cycle time for a three-character block and the control signal reply is 450 milliseconds.

### 1.3 Mode A - ARQ (Continued)

If the information has been received incorrectly, Station B issues a 'request for repetition' (RQ) code. Receiving the RQ code, Station A repeats the three-character block. This process repeats until Station B transmits a second control code, an acceptance code, after which the next three characters are sent as a block.

Station A displays the transmitted text on its display device only after receiving the acceptance code from Station B. This is called 'echoing.'

A third control code is used to command the direction of sending to be reversed, allowing the receiving station to reply. If there is no data waiting to be sent, Station A fills the three-character blocks with Idle characters.

Station A can send special blocks to indicate the following:

- o The Selcal of the station being called.
- o A QRT request to put Station B back into the standby mode.
- o Acknowledgement of Station B's request to transmit.
- o A request to repeat a badly received control code.

The receiving station controls the changeover in communication direction. Station A uses a software command, '+?', to indicate the end of his transmission. Station B recognizes the command and initiates the turn-around routine. Station B can also interrupt Station A's transmission with a break-in control code.

The 'chirp-chirp' you hear on the air is the characteristic frequency-shift keying in bursts. One of the stations is transmitting a longer burst, allowing a time gap between transmissions during which the other station sends its reply. If both stations have equally loud signals at your location, the 'chirp' will sound more or less continuous. If one station appears weaker than the other, your receiver AGC may not be fast enough to copy both sides. Try turning the AGC off.

In the ARQ mode, signal fading simply slows the text received on your screen as the stations transmit a higher proportion of retries. The overall accuracy of the data is maintained.

In the ARQ mode, your station must know the identity of the other station. Therefore, FEC (see APPENDIX D) is normally used to call CQ and start a contact. Then stations switch to ARQ. The ARQ mode also allows you to access and activate selectively any other stations monitoring on the frequency.

Your station 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 moments to phase or sync with the other stations. When the linked stations you are monitoring are experiencing ARQ retries your screen displays all the retries.

#### 1.4 Mode B - FEC

The second AMTOR mode is called FEC (Forward Error Correction), or Mode B. FEC provides the means of transmitting to several stations simultaneously. This is the proper mode to use for sending QST or CQ.

FEC is a synchronous system that transmits an uninterrupted stream of characters. FEC does not operate with a 'handshake' as does ARQ.

In FEC, the sending station transmits each character twice. The first transmission of a specific character is followed by the transmission of four other characters, after which the first character is retransmitted. This allows for time diversity reception at 280 milliseconds time space.

The receiving station's computer searches the inbound data characters to verify and validate characters having the required 4:3 mark-to-space tone polarity ratio.

If both appearances of the same character are mutilated and fail the polarity-ratio test, no data are printed or displayed. Because the second appearance of the character occurs 280 milliseconds after the first appearance, the mathematical probabilities are that noise bursts will not destroy both appearances of the character.

At the beginning of an FEC transmission, the message is preceded by ten Idle characters. After 28 characters of the message, a sequence of five Idle characters is inserted in each message space, giving the receiving stations a reference timing interval to which they can lock again if necessary.

The code sequence for the repeated idle string is different from the first idle string so that they are identified correctly. The sequence looks like this:

Idle1 - Idle2 - Idle1 - Idle2 - Idle 1, etc.

for ten occurrences. Then each character is transmitted interleaved with four sequential characters and its own repetition.

Unlike ARQ (Mode A), in FEC (Mode B), the transmitter operates at 100% duty cycle. Consult the operating manual and duty-cycle specifications of your radio equipment for the correct operating conditions suitable for RTTY and FEC operation. As a general rule, many recent transmitters must be operated at significantly reduced power levels to prevent excessive dissipation in the amplifier stages. A 50% reduction in operating power is frequently required.

In FEC and ARQ, accurate synchronization or phasing is necessary. Each station sends phasing bursts at the beginning of each contact, with a crystal clock maintaining the timing relationship during the contact. If the stations lose synchronization lock during the contact, the program provides automatic re-phase procedures.

## APPENDIX F

## ASYNCHRONOUS VERSUS SYNCHRONOUS TRANSMISSION

Since the beginning of electromechanical telegraphy and teleprinting, the problem of maintaining the proper timing relationship between the sender and the receiver has been resolved by mechanical synchronization methods. These were based on the basic ideas of 'start-stop' telegraphy.

The original Baudot rotary distributor permitted the sending distributor to tell the receiving distributor when the rotary contact was at a reference point in the rotation of the motor shaft. The distributor created a start and stop pulse at the beginning and end of each character. In teleprinter operation, each character has carried its own sync information in the form of the traditional 'start' element at the beginning of each character, and the 'stop' bit at the end of the character.

In some systems, the 'stop' element is one, one-and-one-half, or two bits. The result is reduced efficiency - each character has a fixed amount of 'overhead.' These housekeeping bits carry no user information. They exist only to keep the sending and receiving machines in sync. This reduced efficiency has kept a lid on higher data rates and has been a block in the constant search for faster ways of sending more information for more people.

As data processing requirements became more demanding newer forms of synchronization evolved. A method was developed which applied a single synchronizing string to an entire string of characters, rather than include sync information in each character. The 'overhead,' or housekeeping bits previously inserted into each character for sync purposes were eliminated; higher data rates became practical without sacrificing data integrity. This newer method, called 'synchronous' transmission, is used in higher speed and specialized forms of transmission.

Unlike conventional Baudot and ASCII RTTY operation, both AMTOR modes, ARQ and FEC, use synchronous, rather than asynchronous transmission.

Your computer keyboard sends asynchronous data to your PK-232 with start and stop bits in each character.

When you enter the AMTOR operating modes, the PK-232 program routines strip the start and stop bits from the characters and establish the synchronous transmission required in AMTOR.

The PK-232 has a versatile software program for digital communications techniques that gives you computer-based Morse code, and the choice of four different data transmission codes: Baudot, ASCII, AMTOR, and Packet Radio.

The question of transmission speed is discussed separately. It should be understood that the speed at which a digital code is used has no real relationship to the choice of the code itself. As a general rule, any code can be used at any speed within the capacity of the system software.

## APPENDIX G

## DATA TRANSMISSION CODES

## MYTHS AND MISUNDERSTANDINGS

1. 'RTTY' Means 'Baudot' - Not True!

'RTTY' does not mean 'Baudot.' 'RTTY' is a simple abbreviation for 'RadioTeleTypewriter.' Baudot, ASCII, AMTOR and packet radio are not exactly different modes. They are different languages and methods within the same mode - RTTY. Think of them this way:

MODE:	<u>Human Speech</u>	<u>RTTY</u>
CODES:	English	Baudot
	French	ASCII
	Spanish	AMTOR
	Italian	Packet

2. 'Baudot Code is Obsolete' - Not True!

The largest record communications network in the world today (record communications systems leave a permanent record of the traffic passed) is the International Telex Network. Worldwide, there are over one-and-one-half million regular telex subscribers connected to their domestic networks, and, in turn, to the International Telex Network through gateway switching systems in each country.

Telex is, by definition, a Baudot code system, operating at 50 bauds (66 WPM) in CCITT International Alphabet Number 2, the same code specified for the amateur radio service in Part 97.69 of the Commission's rules.

Although telex was invented in 1932 and the first automatic telex network established in 1933, until the recent advent of packet network transmission and switching standards, the telex networks of the world had been growing world-wide at an annual rate of about 22% per year. This does not indicate obsolescence.

Here in the U.S.A. many of the commercial carriers are still enlarging their networks. Instead of abandoning the Baudot code in favor of anything else, they are changing from the traditional 50-baud operating speed to 200- and 300-baud telex, still using Baudot, and generally working into stored program control computer-based telex switching exchanges. In many of these cases, the Baudot code is being retained in those applications where line and circuit noise is greater than the optimal design goals, and not easily improved.

Many manufacturers are still producing Baudot telex and teleprinter systems. What has disappeared is the electromechanical teleprinter. The older teleprinters are being replaced with all-electronic systems using microprocessor-based terminals with video displays and various types of disk and tape storage. Internally, many of these terminals work with the ASCII and EBCDIC codes.



By means of code- and speed-conversion firmware, these terminals send the Baudot code to the telex and telephone lines for integration into the telex and gentex networks and leased-line services.

At times, the Baudot code has certain advantages over other standardized codes. These advantages are discussed in detail later in these Appendices.

Some newcomers to digital radio are unsure which digital code is best to use on a given band under given conditions. This brief tutorial outlines some differences between Baudot and ASCII and explains some of the advantages and disadvantages of both codes.

## BAUDOT CODE

### History

The Baudot/Murray code dates from about 1874, when Emile Baudot, a Lieutenant in the French Telegraph Service, developed the Baudot distributor for telegraphy. This code uses a 'start' bit and a 'stop' bit to mark the beginning and end of each character, and five information or data bits to identify each character.

With only five information bits, the total number of possible combinations equals 25 or 32. But our English language has 26 letters (counting upper case only!), 10 numerical digits and 9 common punctuation characters. That adds up to 45 alphanumeric characters. How can we transmit at least 45 different characters if the available code only permits 32 code combinations?

The Baudot/Murray codes resolve this seeming paradox by the same stunt used on your old electromechanical typewriter - you shift to FIGS or UPPER CASE. Now you have the numerical digits, the punctuations and other useful things like parentheses, cent sign, dollar sign, number sign, 'at' sign, asterisk, percent sign, ampersand, underscore, etc. You can handle 64 possibilities. That's fine -- if you never need to handle anything but text message traffic or connect to computers!

### Code Variations

Over the years, different versions of the same code have evolved, creating some confusion in both domestic and international traffic. Western Union, the Bell System, the Weather Bureau, the F.A.A., the Armed Forces and the Associated Press all developed their own versions of the same code. Some users couldn't get together on the same keyboard configurations.

When the International Telex Network was formed before World War II telex users had yet another version of the Baudot/Murray code - the International Telegraph Alphabet Number 2.

### Limitations

Although it is the most widely used data transmission code in the world (the International Telex Network is still the largest of all record communications networks) the Baudot/Murray code has two serious drawbacks:

1. The code makes no provision for parity or any other built-in method of detecting transmission or reception errors. This means the receiving system has no way of telling if an error has occurred;
2. The code is sequential -- a specific control character defines the identity of the following series of characters for a period of time until a new control character is recognized. FIGURES SHIFT is an example.

The two control characters which identify the shift, or 'case' are 'LETTERS' and 'FIGURES.' Those who operated in the days of electromechanical teleprinters and Teletype machines know what happened when the data was kicked into upper case by a noise hit, and how frustrating it was to have lines of unintelligible stuff.

### Applications

Baudot/Murray code is still the most widely used RTTY code in amateur radio, and this will probably continue for some years to come. Even with its limitations, Baudot still has some advantages for the amateur operator.

### ASCII - AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE

ASCII is an extension of the eight-bit code developed decades ago and used for years in the Bell System TWX network. ASCII was published as a standard by ANSI, the American National Standards Institute around 1963, in order to achieve some degree of compatibility for the newborn data communications field. ASCII is also known as International Alphabet Number 5, and is standardized for international traffic at various data rates.

ASCII uses seven bits to define each character. That give us a maximum of 27, or 128 possible combinations. We now have the ability to transmit upper case and lower case letters, all punctuations, ten digits and control codes such as 'start of text,' 'end of text,' 'horizontal tab,' 'vertical tab,' 'form feed,' 'backspace,' and many other control functions unavailable in Baudot.

ASCII is not an eight-bit code; the eighth bit is reserved for calculating parity - a form of error detection. However, many ASCII systems do not require the eighth bit for parity and operate well without it.

### OTHER DATA CODES

Baudot code was fine in the days when all communication was between humans. But as technology developed machines started to communicate with other machines without involving humans. Better and more efficient codes had to be developed for transmitting information so that the machines themselves could evaluate the received information and request repeats if errors were received.

As data processing first evolved and data communication codes were developed, the data processing systems used their own codes. One of the first of these was 'BCD,' Binary Coded Decimal. BCD was used for internal calculations inside a data processing device. BCD has no alpha characters, only numbers, and thus was unsuitable as a communications code for use by humans.

### BCDIC

Binary Coded Decimal Interchange Code was developed when the data processing systems had to communicate with humans using printed characters on a printing device. This code was fine for communication with humans, but was unsuitable for machine-to-machine communications because it lacked any form of parity or error-checking capabilities.

BCDIC had the same problem as Baudot - a machine couldn't tell when an error occurred in transmission.

### EBCD

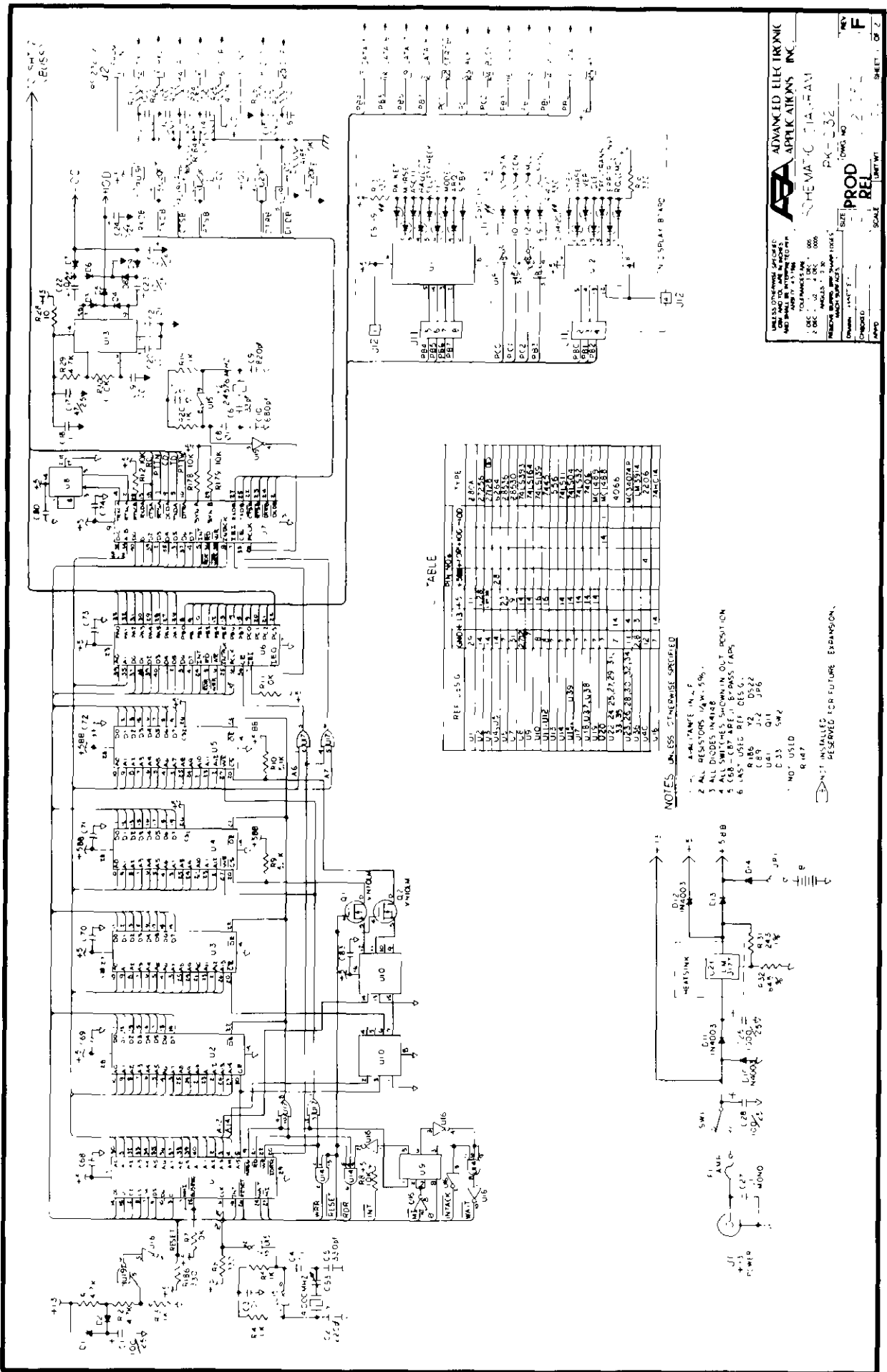
Extended Binary-Coded Decimal, developed for the IBM Selectric typewriter, solved the parity problem. The Selectric principle allowed typing and printing of hard copy, while it could also generate a unique code suitable for transmitting over a communications facility. Also known in the field as PTTC (Paper Tape Transmission Code), EBCD uses six information bits and a parity bit so the receiving system can determine if an error has occurred in a specific character. But EBCD is a sequential code with upper and lower case characters. So, while parity could detect errors and provoke repeats, the sequential nature of the code made its efficiency rate less than desirable.

### EBCDIC

Extended Binary-Coded Decimal Interchange Code was developed in 1962. It uses 8 bits which makes it capable of transmitting 256 characters. But for communications EBCDIC might be deemed a backward step because it has no parity capability. Users who don't need all 256 characters have redefined the code, using EBCDIC as a base and identifying particular characters with odd or even parity bits. Although there are occasional compatibility problems because of parity definitions varying between users, EBCDIC is still widely used in data processing communications systems.

### Still Other Codes

Several other data codes are in use today, some of them dating back decades. Hollerith Code, developed more than 80 years ago, is still used commercially and is generally associated with punch card systems. There are others such as Jaquard Code, Moore ARQ code, Syntoc code, AP code and others too numerous to list here.

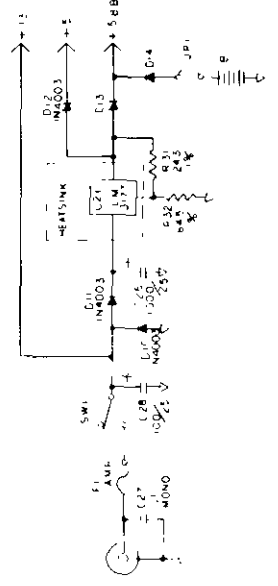


TABLE

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U2	1	74182	74182
U3	1	74183	74183
U4	1	74184	74184
U5	1	74185	74185
U6	1	74186	74186
U7	1	74187	74187
U8	1	74188	74188
U9	1	74189	74189
U10	1	74190	74190
U11	1	74191	74191
U12	1	74192	74192
U13	1	74193	74193
U14	1	74194	74194
U15	1	74195	74195
U16	1	74196	74196
U17	1	74197	74197
U18	1	74198	74198
U19	1	74199	74199
U20	1	74200	74200
U21	1	74201	74201
U22	1	74202	74202
U23	1	74203	74203
U24	1	74204	74204
U25	1	74205	74205
U26	1	74206	74206
U27	1	74207	74207
U28	1	74208	74208
U29	1	74209	74209
U30	1	74210	74210
U31	1	74211	74211
U32	1	74212	74212
U33	1	74213	74213
U34	1	74214	74214
U35	1	74215	74215
U36	1	74216	74216
U37	1	74217	74217
U38	1	74218	74218
U39	1	74219	74219
U40	1	74220	74220
U41	1	74221	74221
U42	1	74222	74222
U43	1	74223	74223
U44	1	74224	74224
U45	1	74225	74225
U46	1	74226	74226
U47	1	74227	74227
U48	1	74228	74228
U49	1	74229	74229
U50	1	74230	74230
U51	1	74231	74231
U52	1	74232	74232
U53	1	74233	74233
U54	1	74234	74234
U55	1	74235	74235
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U57	1	74237	74237
U58	1	74238	74238
U59	1	74239	74239
U60	1	74240	74240
U61	1	74241	74241
U62	1	74242	74242
U63	1	74243	74243
U64	1	74244	74244
U65	1	74245	74245
U66	1	74246	74246
U67	1	74247	74247
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U70	1	74250	74250
U71	1	74251	74251
U72	1	74252	74252
U73	1	74253	74253
U74	1	74254	74254
U75	1	74255	74255
U76	1	74256	74256
U77	1	74257	74257
U78	1	74258	74258
U79	1	74259	74259
U80	1	74260	74260
U81	1	74261	74261
U82	1	74262	74262
U83	1	74263	74263
U84	1	74264	74264
U85	1	74265	74265
U86	1	74266	74266
U87	1	74267	74267
U88	1	74268	74268
U89	1	74269	74269
U90	1	74270	74270
U91	1	74271	74271
U92	1	74272	74272
U93	1	74273	74273
U94	1	74274	74274
U95	1	74275	74275
U96	1	74276	74276
U97	1	74277	74277
U98	1	74278	74278
U99	1	74279	74279
U100	1	74280	74280

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL PARTS IN 4.0
  2. ALL RESISTORS 1/4 W. 5%
  3. ALL CAPACITORS 50V
  4. ALL SWITCHES SHOWN IN OUT POSITION
  5. C88 - CRT ARE "BYPASS TAPS"
  6. LAST USC REF DES G.
- R1B5 Y2 D522  
 U64 Y1 Q11 J16  
 D-33 5M2  
 R-447  
 3- NOT INSTALLED FOR FUTURE EXPANSION.



**AAA** ADVANCED ELECTRONIC APPLICATIONS, INC.

SCHEMATIC DRAWING

PK-232

PROD REL

SCALE 1:1

SHEET 2 OF 2

DATE 11/1/77

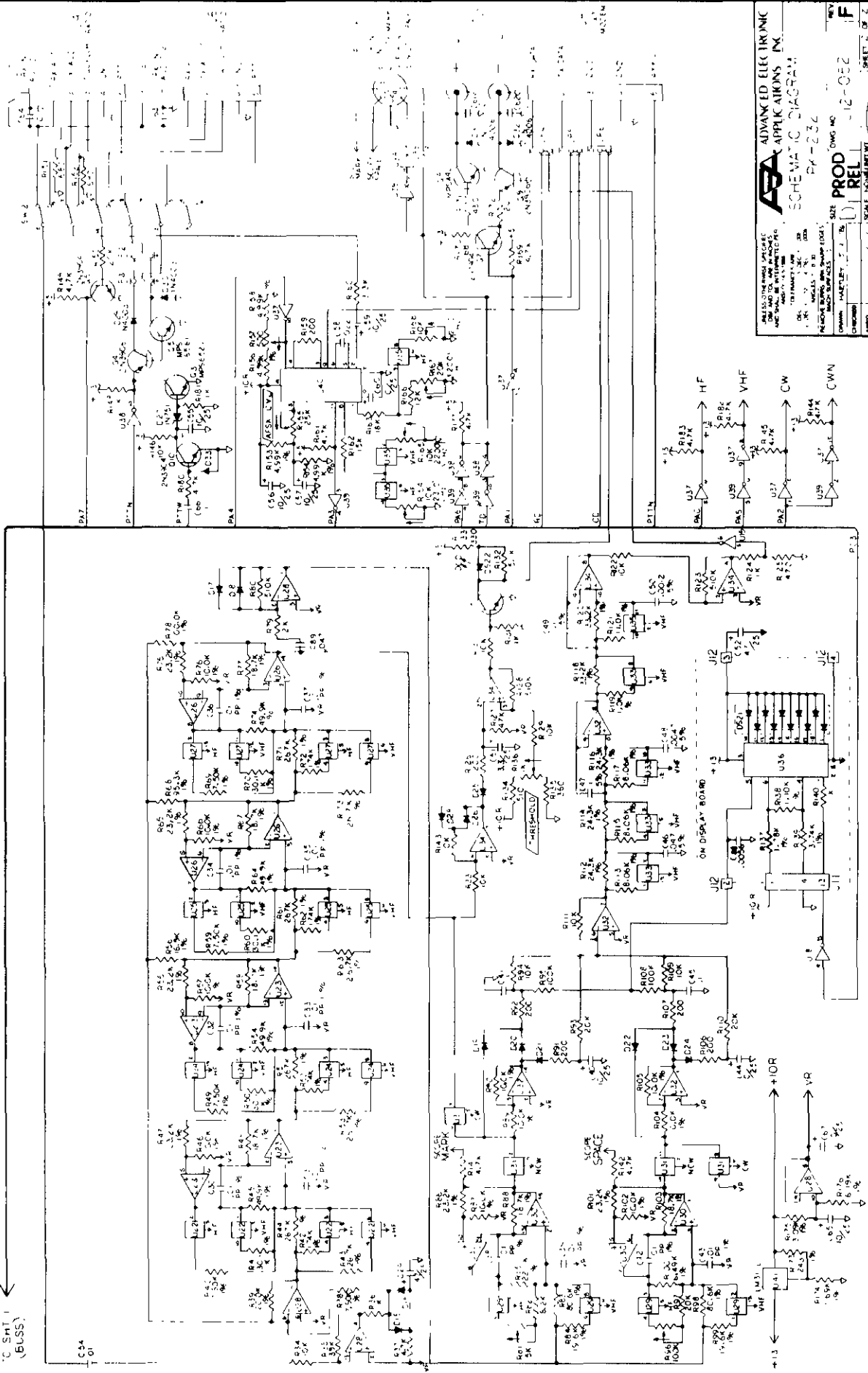
DESIGNED BY: [Name]

CHECKED BY: [Name]

APPROVED BY: [Name]

UNLESS OTHERWISE SPECIFIED:  
 ALL PARTS IN 4.0  
 ALL RESISTORS 1/4 W. 5%  
 ALL CAPACITORS 50V

C SMT 1  
(BUSS)

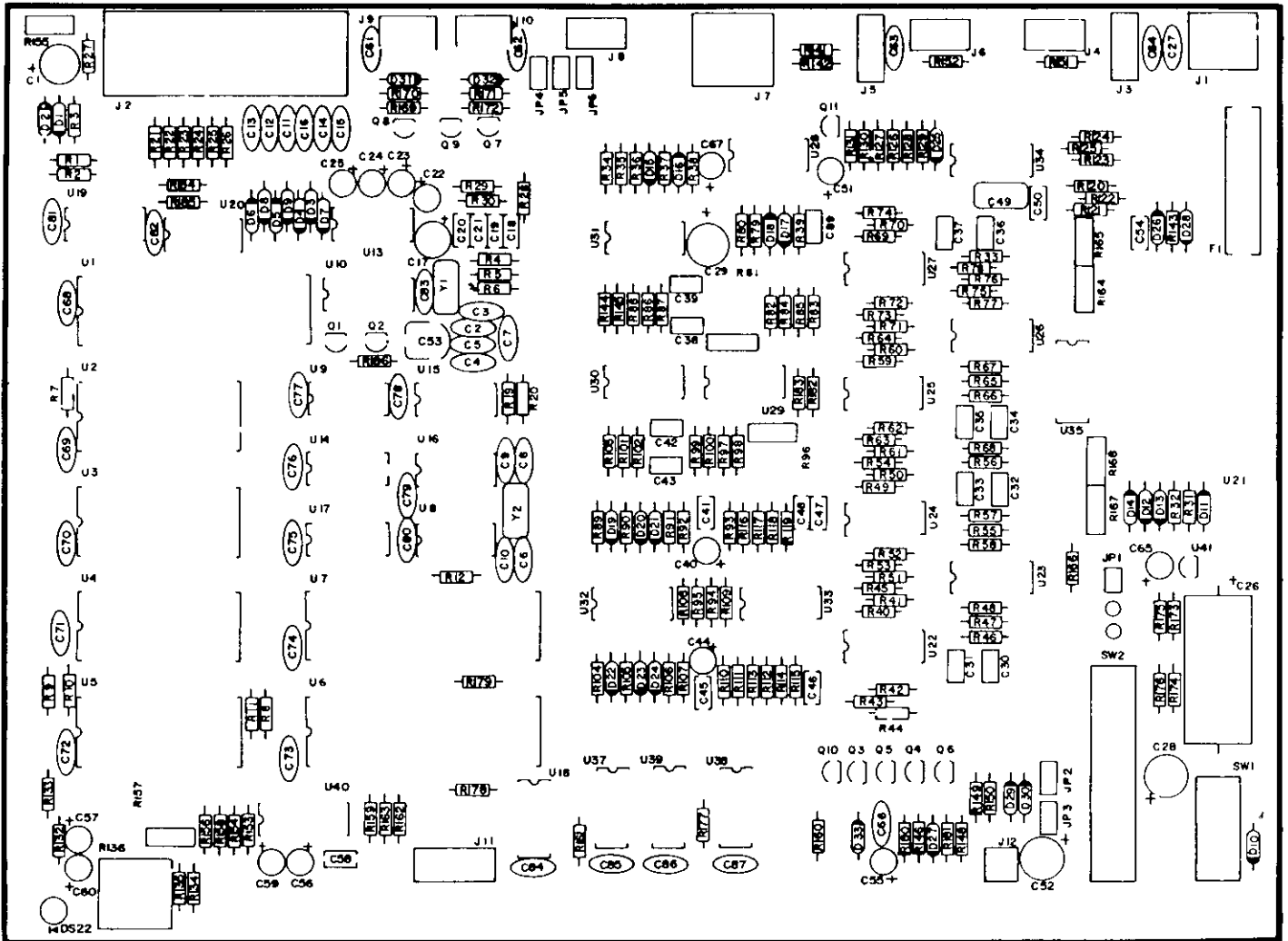


ADVANCED ELECTRONIC APPLICATIONS, INC.  
SCHEMATIC DIAGRAM  
PX-234  
SIZE 12-052  
REL 1  
SCALE 1:1  
SHEET 2 OF 2

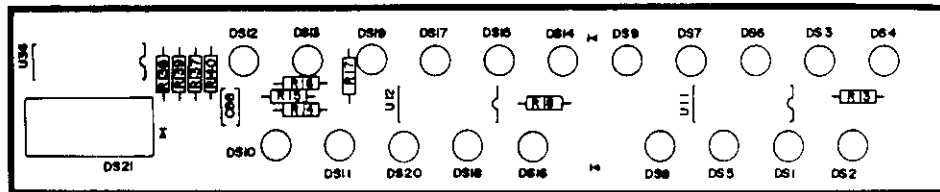
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DESIGNED BY: J. L. BROWN  
CHECKED BY: J. L. BROWN  
DATE: 12-052

APPENDIX I  
PARTS PICTORIAL



MAIN BOARD



DISPLAY BOARD

PARTS LIST

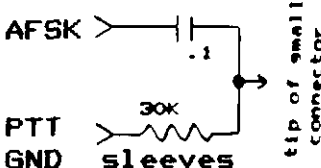
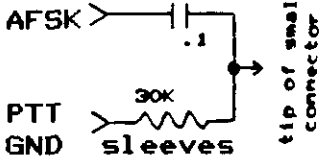
AEA P/N	DESCRIPTION	REF. DESIG.	AEA P/N	DESCRIPTION	REF. DESIG.
013-064	PCB PK-232		210-431	RES 1/4W 5% 430.00	R171
110-103	CAP MY 103P 10% 50V	C20,C21	210-471	RES 1/4W 5% 470.00	R125
110-104	CAP MY 104P 10% 50V	C18,C41,C45	210-472	RES 1/4W 5% 4.70K	R1,R2,R25,R29,R37, R141,R142,R149,R161, R144,R145,R169, R177,R182,R183,R180
110-473	CAP MY 473P 10% 50V	C89			
110-562	CAP MY 562P 10% 50V	C88	210-473	RES 1/4W 5% 47.00K	R127
111-103	CAP MY 103P 5%	C54	210-511	RES 1/4W 5% 510.00	R134
111-104	CAP MY 104P 5% 50V	C47,C49	210-512	RES 1/4W 5% 5.10K	R9,R132,R10
112-122	CAP MY 122P 2% 50V	C50	210-514	RES 1/4W 5% 510.00K	R80,R128,R123
112-473	CAP MY 473P 2% 50V	C46	210-680	RES 1/4W 5% 68.00	R170
120-223	CAP CR 223P NPO	C58	210-681	RES 1/4W 5% 680.00	R151,R152
121-102	CAP CR 102P 50V	C11-C16,C19	210-822	RES 1/4W 5% 8.20K	R82
121-103	CAP CR 103P 50V	C3,C7,C61-C64,C8,C4	211-103	RES 1/4W 1% 10.00K	R46,R57,R66,R76,R87, R89,R90,R102,R104, R105
121-104	CAP CR 104P 50V	C27,C66,C68-C87	211-104	RES 1/4W 1% 100.00K	R78
125-540	CAP VARIABLE 5-40	C53	211-112	RES 1/4W 1% 1.10K	R138
130-106	CAP EL 106P RAD 25V	C22-C25,C40,C44, C55-C57,C59,C60, C65,C67	211-113	RES 1/4W 1% 11.00K	R119,R121
130-107	CAP EL 107P RAD 25V	C28,C1	211-161	RES 1/4W 1% 1.69K	R174
130-335	CAP EL 335P RAD 100V	C51	211-169	RES 1/4W 1% 16.90K	R56
130-486	CAP EL 476P RAD 35V	C17,C29,C52	211-172	RES 1/4W 1% 1.78K	R137
131-108	CAP EL 108P AX 35V	C26	211-175	RES 1/4W 1% 174.00K	R42,R52,R62,R72
132-400	CAP PP 472P 2%	C48	211-183	RES 1/4W 1% 18.70K	R48,R58,R67,R77, R103,R88
135-103	CAP PP 103P 1%	C30-C39,C42,C43	211-193	RES 1/4W 1% 19.60K	R84,R99
150-201	CAP SM 220P	C2	211-203	RES 1/4W 1% 20.00K	R39
150-330	CAP SM 33P	C6	211-223	RES 1/4W 1% 22.10K	R85
150-331	CAP SM 330P	C5	211-232	RES 1/4W 1% 23.20K	R47,R55,R65,R75,R86, R101
150-681	CAP SM 680P	C10	211-241	RES 1/4W 1% 243.00	R31,R173
150-821	CAP SM 820P	C9	211-243	RES 1/4W 1% 24.30K	R112,R114,R116
210-100	RES 1/4W 5% 10.00	R28	211-264	RES 1/4W 1% 267.00K	R44,R51,R61,R71
210-101	RES 1/4W 5% 100.00	R21-R24,R26,R27	211-269	RES 1/4W 1% 26.70K	R43,R53,R63,R73
210-102	RES 1/4W 5% 1.00K	R4,R5,R19,R20,R36, R131,R140,R148, R124,R181,R3	211-302	RES 1/4W 1% 3.09K	R175
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	211-303	RES 1/4W 1% 30.10K	R41,R50,R60,R70
210-104	RES 1/4W 5% 100.00K	R30,R108,R95	211-333	RES 1/4W 1% 33.20K	R118,R120
210-121	RES 1/4W 5% 120.00	R172	211-374	RES 1/4W 1% 3.74K	R139
210-123	RES 1/4W 5% 12.00K	R166	211-492	RES 1/4W 1% 4.99K	R153,R154,R156, R158
210-153	RES 1/4W 5% 15.00K	R162	211-493	RES 1/4W 1% 49.90K	R45,R54,R64,R74
210-183	RES 1/4W 5% 18.00K	R163	211-612	RES 1/4W 1% 6.19K	R176
210-201	RES 1/4W 5% 200.00	R106,R107,R126,R159, R91,R92	211-642	RES 1/4W 1% 6.49K	R100
210-202	RES 1/4W 5% 2.00K	R79	211-752	RES 1/4W 1% 7.50K	R40,R49,R59,R69,R38
210-203	RES 1/4W 5% 20.00K	R110,R150,R97,R93	211-802	RES 1/4W 1% 8.06K	R113,R115,R117
210-331	RES 1/4W 5% 330.00	R6,R13-R18,R133,R186	211-803	RES 1/4W 1% 80.60K	R83,R98
210-332	RES 1/4W 5% 3.30K	R160	211-841	RES 1/4W 1% 845.00	R32
210-361	RES 1/4W 5% 360.00	R135	211-953	RES 1/4W 1% 95.30K	R68
210-393	RES 1/4W 5% 39.00K	R35	250-106	PNL POT .625 SQ 1K	R136

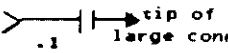
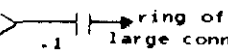
PARTS LIST (cont.)

AEA P/N	DESCRIPTION	REF. DESIG.	AEA P/N	DESCRIPTION	REF. DESIG.
251-103	POT TRM .15L/S 10K	R164.R165.R168	350-488	IC MC1488	U20
251-104	POT TRM .15L/S 100K	R96	350-489	IC MC1489	U19
251-203	POT TRM .15L/S 20K	R167	400-028	DIP SOCK 28 PIN	U2.U3.U4.U5
251-253	POT TRM .15L/S 25K	R155	400-040	DIP SOCK 40 PIN	U1.U6.U7
251-501	POT TRM .15L/S 500	R157	410-003	HDR R/AX2.1 3 POS	J12
251-502	POT TRM .15L/S 5K	R81	410-005	HDR R/A.10 5 POS	J4.J6.J8
310-001	DIODE SIG 1N4448	D1-D9.D13-26.D28.D33	410-007	HDR R/AX2.10 7 POS	J11
311-003	DIODE PWR 1N4003	D10-12.D29.D30	410-102	HDR STR.10 2 POS	JP1
311-006	DIODE PWR 1N4006	D31.D32	410-103	HDR STR .10 3 POS	JP2.JP3
312-471	DIODE ZNR 1N751	D27	412-125	HDR R/A 'D' 25 POS	J2
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	420-001	JACK PWR 2.1MM	J1
			420-002	JACK PHON 3.5MM	J3.J5
			420-008	JACK PHONO P.C.	J9.J10
314-010	LED 10 SEG BARGRAP	DS21	420-039	CONN R/A DIN 5 PIN	J7
320-001	XISTOR NPN 2N3904	Q6.Q7.Q*0.Q*1	500-002	SW P-P 2P2T	SW1
320-010	XISTOR NPN MPSA42	Q8	500-006	SW P-P 6P2T	SW2
320-011	XISTOR NPN MPS6521	Q3	650-245	X-TAL 2.4576 MHZ	Y2
320-012	XISTOR NPN MPS6561	Q5	650-405	X-TAL 4.000 MHZ	Y1
320-202	XISTOR PFET VN10LM	Q1.Q2	750-019	HEATSINK THM 6019B	U21
320-501	XISTOR PNP 2N3906	Q4.Q9	760-000	KNB SW GRY .4 X .2	SW1.SW2
330-008	IC LM317L	U41	762-003	FUSE CLIP PCB	F1
330-009	IC LM317T	U21	763-001	FUSE 1 AMP	F1
330-011	IC NE556N	U13	779-001	SHORT PLUG .10	JP1.JP2.JP3
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.U39			
331-006	IC 7406	U18.U37.U38			
331-011-1	IC 74LS11	U14			
331-014-1	IC 74HC14	U16			
331-032-1	IC 74LS32	U17			
331-045	IC 7445	U11.U12			
331-139	IC 74HCT139	U10			
331-164-1	IC 74LS164	U9			
331-393	IC 74LS393	U8			
332-264	IC 6264	U4.U5			
332-805	27256 PRG PK-232	U2			
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			



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	 <p>AFSK &gt; .1 PTT &gt; 30k GND sleeves</p> <p>tip of small connector tip of large conn.</p>	RX audio available on tip of large conn.
YAESU	4 pin	AFSK 2 PTT 3 GND 1	
	8 pin	AFSK 8 <i>white</i> PTT 6 <i>red</i> GND 7 <i>black = shield</i>	FT-270/2700 require mic DC block cap & series diode w/PTT
	FT-x03 x09 727	 <p>AFSK &gt; .1 PTT &gt; 30k GND sleeves</p> <p>tip of small connector tip of large conn.</p>	RX audio available on tip of large conn.
	FT-20B	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 APPLICATIONS, 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 not 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.

# Advanced Electronic Applications, Inc.

## Fax Manual appendix

### Overview

Weather Facsimile (WEFAX) is transmitted throughout the short-wave radio spectrum, primarily to provide weather information to ships at sea and to weather forecasters. Typical stations you may find broadcast weather maps showing current as well as predicted weather conditions, and satellite photographs showing the cloud cover over a large area.

Not only weather information is transmitted, but also news photographs from the wire services (see the frequency list below). Many of the photographs you see in your local newspaper every night are distributed via facsimile and some can be copied on your printer. Although a dot matrix printer does not have the resolution of an expensive facsimile receiver, it can display a reasonable amount of definition.

The facsimile mode, or simply FAX, is fairly straight-forward, and a little background on its format may be helpful. A facsimile picture is usually sent by placing the original picture on the slowly-rotating drum of a facsimile transmitter where it is scanned horizontally at a pre-set rate. The information from each horizontal scan is converted into an audio frequency between 1,500 Hz and 2,300 Hz, as shown below in Figure 1. 1,500 Hz represents pure black, and 2,300 Hz represents pure white. In between these two frequencies lie varying shades of gray; the "gray scale" as it is often called. Figure 1 shows a facsimile signal as it lies within the typical audio passband of a SSB receiver.

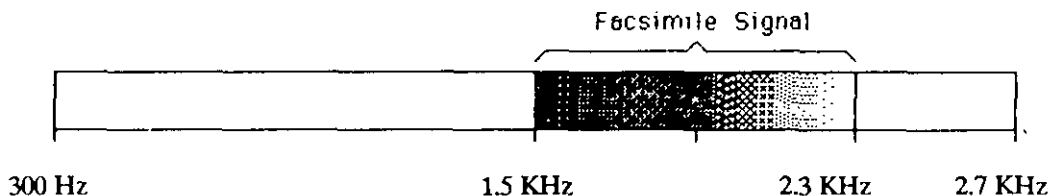


Figure 1: Facsimile signal inside the audio passband of a typical SSB receiver

Dot-matrix printers and the PK-232 unfortunately cannot resolve shades of gray, and so cannot print with photographic quality. The PK-232 uses its 1,000 Hz wideband filters which have a center frequency of 1,700 Hz to copy facsimile transmissions. Since facsimile is transmitted using a maximum of only 800 Hz shift, a FAX signal is tuned-in by "straddling" the 1,700 Hz center frequency of the PK-232's filters.

This means that when a facsimile signal is tuned-in, anything below 1,700 Hz will produce a black dot on the page, and anything above 1,700 Hz will print nothing thus leaving a white area as diagrammed in Figure 2 below. In this way the PK-232 decodes the gray-scale of a transmitted facsimile picture allowing reasonably good resolution from a dot-matrix printer. WEFAX maps however only contain black and white, so excellent reproduction of weather charts is obtained using a dot-matrix printer.

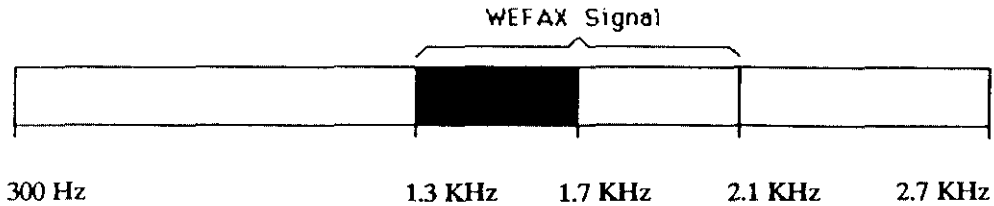


Figure 2: How the PK-232 receives and digitizes facsimile signals

### Finding Fax Frequencies

The following is a list of frequencies that seem to broadcast on a regular schedule. A few of these stations transmit 24-hours/day. We suggest you try the weather FAX frequencies listed below while you are becoming familiar with the commands. After you print a few pages, and have become accustomed to the sound of facsimile you will be able to tune the bands in search of other frequencies where perhaps different kinds of pictures may be found.

#### Weather: USB

3,357.0 KHz 4,268.0 KHz 4,975.0 KHz 6,946.0 KHz

10,865.0 KHz 12,125.0 KHz 20,015 KHz

#### Photographs: LSB

10,680.7 KHz 17,673.9 KHz 18,434.9 KHz

The following frequencies were obtained from Popular Communications Magazine:

#### USB

4,271.0 KHz	9,890.0 KHz	13,510.0 KHz	Halifax, Canada	
8,502.0 KHz	12,750.0 KHz		Boston, Mass	
9,389.5 KHz	11,035.0 KHz		Brentwood, NY	
4,793.5 KHz	10,185.0 KHz	12,201.0 KHz	14,671.5 KHz	Washington, DC
9,157.5 KHz	17,447.5 KHz			Mobile, Al
8,080.0 KHz	10,854.0 KHz	16,410.0 KHz		Norfolk, VA
4,802.5 KHz	9,440.0 KHz	13,862.5 KHz		Hawaii
7,770.0 KHz	11,090.0 KHz	13,627.5 KHz		Hawaii
8,459.0 KHz				Alaska
4,346.0 KHz	8,682.0 KHz	12,730.0 KHz	17,151.2 KHz	San Francisco
8,646.0 KHz	17,410.5 KHz			San Diego

Table 1: Facsimile Frequencies

## System Setup

To hook-up the PK-232 for facsimile operation the radio must be connected to either radio port 1 or 2. If all you want is to receive FAX, you only need to connect the audio from your receiver. If you wish to transmit as well, follow the instructions in chapter 2 of the PK-232 manual for Radio Connections. Note that for transmitting facsimile with the correct 800 Hz shift, you will need to recalibrate the VHF transmit tones as described below.

To allow the PK-232 to talk to your terminal or computer and the parallel printer, the special "Y" cable must be attached. The DB-25, 25-pin connector with the two cables coming out of it plugs in to the PK-232's RS-232 I/O connector. The DB-25 25-pin connector with only one cable coming out of it connects to your RS-232 terminal or computer. The third connector with 36-pins connects to a 36 pin Centronics Parallel printer that supports one of the standard graphics formats. Check the PRINTER section and the PRTYPE command to find the correct settings for your printer.

Now you are ready to read the Tuning in FAX and the Getting Started With FAX sections of this appendix.

### Facsimile transmit tone calibration:

The Wideshift (1000 Hz shift) tones are used for VHF-Packet, and so adjusting them for an 800 Hz shift should only be done if VHF-Packet operation is not anticipated. This adjustment does not require any component changes, but it does require that you remove the cover of the PK-232.

After the cover of the PK-232 is removed, reconnect the power connector and the RS-232 cable to your computer and turn the PK-232 on. When you see the Cmd: prompt, type CAL to enter the AFSK-tone calibration mode. The screen should now be continuously displaying the VHF Mark-tone (approximately 1200 Hz) followed by R167 which indicates the variable resistor that adjusts the tone frequency. If your display is substantially different, see the CALIBRATE description in the PK-232 manual. Locate the variable resistor R167 on the right side of the PK-232 circuit board near the internal heat-sink. With a small screwdriver begin adjusting R167 until the display reads nearly 1300.

Hit the < space bar > and observe that your display is now continuously reading somewhere near 2200 followed by R165. This is the VHF Space-tone frequency, and R165 is the variable resistor that controls it. Locate and adjust R165 until the display reads nearly 2100. Type a Q to exit the calibration routine.

The Wideshift transmit tones have now been adjusted to an 800 Hz shift for facsimile transmit operation. If it is desired to reset the tones to 1200 and 2200 Hz (1000 Hz shift) all that is necessary is to repeat the above procedure adjusting R167 for 1200 Hz, and R165 for 2200 Hz.

### Tuning in FAX

Facsimile is most often found on Upper Sideband and sounds similar to monitoring an ARQ AMTOR QSO with both stations being of equal signal strength. Since the most common facsimile signals are WEFAX, we have set the PK-232 FAX default parameters to copy the weather charts and many satellite photographs. We recommend that you start with one of the listed weather frequencies, or frequencies from Popular Communications in Table 1 when first beginning to copy facsimile.

Upon tuning into a WEFAX signal, you will notice that the facsimile sound seems to repeat at the rate of twice a second. This is the same as the horizontal scan frequency mentioned earlier, and allows you to distinguish different facsimile services by speed. Common horizontal scan rates are 2 lines per Second, which is typically used in weather facsimile broadcasts, 1-line per Second for

photographs, and 4-lines per second, for some foreign facsimile stations. Remember these repetition rates and listen for them as you tune across the bands in search of new pictures to print.

The PK-232 uses the 1,000 Hz wideband filters which have a center frequency of 1.7 KHz for copying facsimile transmissions. As a result, you must tune 1.7 KHz lower than the frequencies listed in Table 1 when using Upper Sideband. Similarly, in Lower Sideband, one must tune 1.7 KHz higher than the frequencies listed in Table 1.

Since facsimile is transmitted using a maximum of only 800 Hz shift, a FAX signal is tuned-in by "straddling" the 1.7 KHz center frequency of the PK-232's filters. The PK-232 LED bar-graph should be tuned so that the facsimile signal is roughly centered in the display as shown in the middle of Figure 3 below. If the audio frequency is too low, the bar-graph will look something like the left-most display. If the audio frequency is too high, it will look something like the right-most display. Facsimile tuning is not especially critical when copying WEFAX, but a properly tuned signal is necessary to produce an evenly distributed gray-scale when printing facsimile photographs.

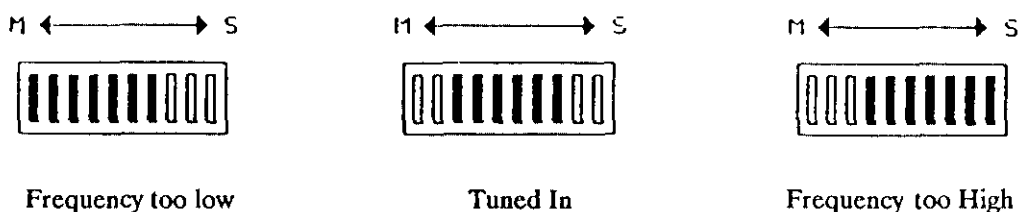


Figure 3: Facsimile tuning indicator conditions for proper and improper FAX tuning

### Compatible Printers

In the latest release of the PK-232 firmware we have tried to include most of the common graphics formats supported by printer manufacturers. Supported in this release are Epson, IBM, Tandy/Radio Shack, Okidata, and Apple, as well as a few others.

Before you can continue, you must set the PRTYPE command for your make and model of printer. In essence, this command tells the PK-232 what kind of printer is attached to the FAX cable. The PRTYPE command section in this appendix lists the different settings available and their printer compatibilities. See the Operating Manual Addendum for a list of printers, listed in order of printer manufacturer, and the proper PRTYPE setting. If your exact printer is not listed you should check the PRTYPE command section of this appendix for instruction concerning the graphics formats supported. Please note that not all the printers listed have been tested with the PK-232. According to the information provided by the printer manufacturer the PRTYPE setting given should work properly.

### Getting Started With FAX

To start receiving WEFAX broadcasts on the PK-232 and your graphics compatible printer, you first must tell the PK-232 that there is a parallel printer connected to it by going to the command mode and issuing the command PRCON ON. (Don't forget to set the PRTYPE command for your printer.) The PK-232 will respond with:

PRCON was OFF

PRCON now ON

At this point you will observe that the STA, CON, STBY, and PKT LEDs are on. The MULT LED may also be on if the printer is "Off Line" or is not connected to the PK-232. This is normal whenever the printer command PRCON is ON and is nothing to worry about. Remember to turn PRCON off when you are through printing facsimile to return the status LEDs to their normal function.

Now all that is necessary is to put the PK-232 into FAX mode by typing FAX.

The PK-232 will respond with:

**OPMODE was XXXXX**

**OPMODE now FAX**

The PK-232 is now in the Facsimile Standby-Receive mode which means it is waiting for a synchronization signal from a facsimile transmitter to begin a new picture. Verify this by entering the OPMODE command. The PK-232 should respond with:

**OPMODE FAX STBY RCVE**

At this point make sure the THRESHOLD control is fully clockwise otherwise the printer will not print. If you do not want to wait for the beginning of a new picture, you may type LOCK

This forces a synchronization-lock, and starts the printer printing regardless of what kind of signal is being monitored. Since this synchronization lock was not sent by the transmitting station, the picture will probably not be correctly positioned on the page. Rather, it will likely appear to be split in half with the left half of the picture on the right half of the page, and the right half of the picture on the left half of the page.

To correct for this, a justification command has been included that allows the user to shift the entire image to the left in 1/2 inch increments. For example if the left-edge of the picture appears roughly 4-1/2 inches away from the left edge of the paper, issuing the command JUSTIFY 9 will shift the left edge of the picture to the left 4-1/2 inches (9 X 0.5 inch) correcting its justification.

The PK-232 will respond with:

**JUSTIFY was 0**

**JUSTIFY now 9**

This procedure will not be necessary if the PK-232 synchronizes from the transmitted facsimile signal. The PK-232 will always respond with JUSTIFY was 0 when a new justification parameter is entered. In this way, the PK-232 always assumes that the left-hand margin of the picture has been set to 0 inches.

To stop the printer, you may either exit the facsimile mode by changing to another mode or enter the RCVE command, which puts the PK-232 back into facsimile standby receive. Standby receive is the same as if you have just entered the FAX mode from another mode. The PK-232 will wait until it receives the synchronization signal from a facsimile station before beginning to print again.

Weather FAX as well as most other facsimile prints from left to right, but occasionally you may find a station that is reversed. If you come across such a transmission, you may simply issue the command LEFTRITE OFF to correct this.



The PK-232 will respond with:

**LEFTRITE was ON**

**LEFTRITE now OFF**

Similarly, you may come across a station that appears to be inverted; that is printing black where you expect white, and leaving white where you expect black. In this case you may issue the command FAXNEG ON.

The PK-232 will respond with:

**FAXNEG was OFF**

**FAXNEG now ON**

What was before printing black will now be white, and vice versa.

How the graphics will look on your printer depends on the setting of the GRAPHICS command. There are 7 graphics commands providing horizontal dot densities from 480 dots to 1,920 dots horizontally across a page. The default setting of GRAPHICS 1 should work with most printers except some OKIDATA models. See the GRAPHICS and PRTYPE commands section of this appendix for more information.

## **Printing Other Services**

Most of the weather services at least in the US use a facsimile scan speed of 2-lines per Second, which corresponds to an FSPEED of 2 (Default). Facsimile photographs often use 1-line per Second, which is an FSPEED of 1. Some foreign services use speeds of 4-lines per Second, which is an FSPEED of 4. Speeds of 1.5 and 3-lines per Second are also supported. See the Command Summary in the back of this appendix for more information on FSPEED.

When different horizontal scan speeds are used, the number of lines per vertical inch can also vary. If nothing is done to change the number of lines printed by the printer, the pictures may appear squashed or elongated. The ASPECT command resolves this by allowing from one to six lines to be printed out for every six lines received. The default setting is ASPECT 2 which means that 2 out of 6, or 1 out of every 3 horizontal lines is printed. This is the most common setting you will use for WEFAX, but other services may require using other values to print pictures without aspect ratio distortions.

If your terminal program allows you to save non-ASCII files to disk for later transmission or printing, you can route the Facsimile data to the RS-232 port instead of the parallel printer by using the command PRFAX. Turning PRFAX OFF tells the PK-232 to send the graphics codes to the RS-232 port, and not to the parallel printer port. The PK-232 will respond with:

**PRFAX was ON**

**PRFAX now OFF**

When you are routing a facsimile signal to the RS-232 port you must be sure to have AWLEN set to 8, 8BITCONV ON, PARITY 0, and ACRDISP 0 before you turn on the file capture of your terminal program. Entering the TRANSPARENT mode before you turn the file-capture of your terminal program on will eliminate the need for setting the above except for AWLEN which must be set

to 8. If the TRANSPARENT mode is used, make sure TRFLOW and TXFLOW are both OFF. Hardware flow-control is a must when transferring 8-bit files.

Not all terminal programs allow the user to capture 8-bit ASCII-files. You must make certain your program will allow this if you are to successfully save the facsimile file. You must also make sure your terminal program does not add Carriage returns or Linefeeds to the captured file. After the file has been saved to disk, it should be able to be printed or retransmitted.

## **Transmitting FAX**

Typing an X while in command mode puts the PK-232 into facsimile transmit. To correctly transfer the saved facsimile file on disk, AWLEN must be 8, PARITY must be 0, PRFAX must be OFF, and the PK-232 must be in Transparent mode. TRFLOW should be off.

The PK-232 is set-up for 1,000 Hz shift transmit and receive, but commercial facsimile is sent using 800 Hz shift as described earlier. The VHF transmit tones should be recalibrated for 800 Hz shift (1,300 Hz and 2,100 Hz) as described in the Setup section before you transmit facsimile.

When you type an X and begin to transmit, the PK-232 first sends a black tone for 5 Seconds, and then a 300 Hz alteration of black and white tones for another 5 Seconds, during which time the OPMODE will read:

### **OPMODE FAX STBY SEND**

After the 10 Seconds have passed the PK-232 OPMODE will go from STBY SEND to SYNC SEND. At this time the PK-232 will transmit 30 seconds of synchronization pulses at the proper rate determined by the FSPEED command. As soon as the sync pulses start, the PK-232 can accept dot graphics from the computer. You must remember to wait until the OPMODE changes to SYNC SEND before entering the TRANSPARENT mode and sending the facsimile graphics file to the PK-232.

You should be able to watch the progress of the facsimile data file you are sending to the PK-232 from your terminal program. When the file has been completely sent to the PK-232 you have 3 options to return to receive:

First; you may type a < Ctrl D > which will cause the PK-232 to send 5 Seconds of alteration between black and white at a 450 Hz rate which signifies the end of the picture to the receiving station, and then return to receive.

Second; typing a < Ctrl F > will do the same as a < Ctrl D >, only adding a CW ID before returning to receive.

Third; typing an "R" while in command mode will force an immediate receive, sending neither an end of picture signal, nor a CW ID.

Remember you must identify every 10 minutes regardless of the length of the picture you are sending. Using a higher FSPEED setting will help speed transmission of facsimile pictures.

See the GRAPHICS and PRTYPE section of this appendix for descriptions of the codes the PK-232 will acknowledge.

## In Case of FAX Difficulty

### **Problem:**

Printer appears to be printing two pictures side by side

### **Solution:**

Reduce the FSPEED setting. Chances are you are trying to print a facsimile transmission that is being sent at 240 lines per Minute with the FSPEED set at 120 Lines per Minute. Similarly the transmission may be at 120 lines per Minute with the FSPEED set at 60 lines per Minute.

### **Problem:**

Printer never prints

### **Solution:**

Make sure the command PRCON is on, the THRESHOLD knob is fully clockwise and the DCD Light Emitting Diode is on.

Make sure the OPMODE is FAX SYNC RECEIVE, and if not place the PK-232 into FAX mode by typing FAX and then force a synchronization-lock by typing LOCK. If the printer does not begin to print within a minute or so, do the following.

Issue the command PROUT ON which will cause all characters sent by the PK-232 to be echoed to the printer. If you now see the correct characters printing on the printer, but still cannot get facsimile to print, you need to check your PRTYPE setting and make sure your printer supports graphics.

### **Problem:**

Facsimile does not print straight down the page, but rather veers consistently to the left or to the right.

### **Solution:**

If you observe this, it indicates the 4.0000 MHz master oscillator has drifted off frequency and will have to be recalibrated. This is relatively simple and can be done with or without a frequency counter as described below.

### **Without a frequency counter:**

#### **Step 1:**

Open the PK-232 by removing the six screws that hold the gray top-chassis in place and carefully separate it from the bottom chassis. Be careful that you do not strain of the wires to the battery holder

#### **Step 2:**

Reconnect the PK-232 to your radio, computer, printer and to +13 VDC, then turn it on and allow it to warm-up for 30 minutes.

**Step 3:**

Locate and tune-in a strong facsimile signal.

**Step 4:**

With the help of Figure 4 below, locate the variable capacitor C53 in the left-rear quadrant of the PK-232 circuit board. It is the only variable capacitor on the circuit board and is immediately to the right of Q1 and Q2.

**Step 5:**

Tune-in and start printing a strong facsimile signal. Let it print a few lines to observe the angle at which the facsimile picture deviates from vertical.

**Step 6:**

With a small screwdriver adjust C53 no more than 1/8 of a turn and then let the printer print a few more lines of the picture. Observe the printout to see if the adjustment has made things better or worse.

**Step 7:**

Repeat Steps 5 and 6 making smaller and smaller adjustments of C53 until you observe the facsimile is printing vertically. Note that this may require quite a few adjustments before the oscillator is back on frequency.

**If you have a frequency counter with a high-impedance input, you may do the following:**

**Step 1:**

Open the PK-232 by removing the six screws that hold the gray top-chassis in place and carefully separate it from the bottom chassis. Be careful that you do not strain the wires to the battery holder.

**Step 2:**

Reconnect the PK-232 to +13 VDC, then turn it on, and allow it to warm up for 30 minutes.

**Step 3:**

With the help of Figure 4 below, locate the variable capacitor C53 in the left-rear quadrant of the PK-232 circuit board. It is the only variable capacitor on the circuit board and is immediately to the right of Q1 and Q2.

**Step 4:**

Place the high-impedance probe of the frequency counter on pin-6 of the Z80 microprocessor which will provide a strong square-wave clock signal.

**Step 5:**

Adjust C53 until the frequency counter reads 4.00000 MHz +/- 10 Hz.

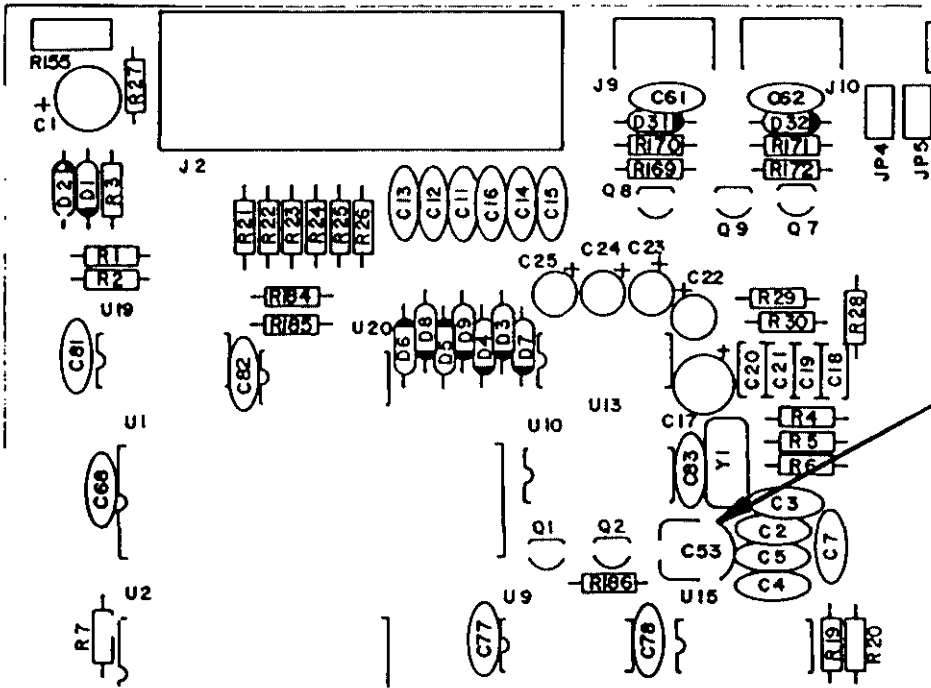


Figure 4: PK-232 circuit board layout showing the location of capacitor C53

## Command Summary

The following commands have been added to the PK-232 firmware for use in the facsimile mode. Some existing commands that function in the facsimile mode are also listed here.

---

**ASPECT n**          Mnemonic: ASP          Default: 2

Mode: FAX

---

### Parameters:

"n" - 1 to 6, specifying the number of FAX scan lines the PK-232 prints out of every 6 lines received.

---

*ASPECT controls the aspect ratio of the length to the width of a FAX image. On most weather charts, the default of ASPECT 2 keeps the shapes received in the right proportion. On some other transmissions, you may want more vertical resolution. To stretch the image down the page, use a higher setting of ASPECT, such as 4.*

The Index Of Cooperation, or IOC is an international measure of the aspect ratio. The formula for the CCITT IOC is:

$$(\text{vertical scan line density}) \times (\text{horizontal width})$$

$$3.14159$$

The IEEE Index Of Cooperation is simply the numerator of the CCITT IOC or:

$$(\text{vertical scan line density}) \times (\text{horizontal width})$$

Both the CCITT and the IEEE IOCs are given for each ASPECT setting below.

The figures given are for narrow and wide carriage printers.

<u>ASPECT</u>	<u>CCITT IOC (Narrow)</u>	<u>CCITT IOC (Wide)</u>
1	1100	1788
2	550 (Weather Charts 576)	894
3	367 (Wirephotos 352)	596 (Weather Charts 576)
4	275 (WEFAX Satellite 288)	447
5	220	358 (Wirephotos 352)
6	183	298 (WEFAX Satellite)

Weather charts are transmitted at a nominal CCITT IOC of 576. ASPECT 2 is so close to this that the charts print with no noticeable distortion.

In receive, ASPECT 2 causes the PK-232 to sample 2 out of every six lines received. ASPECT 4 makes it sample four of every six lines. In transmit, ASPECT 2 causes the PK-232 to send every line three times. ASPECT 4 causes it to send even lines twice, and odd lines once. When sending an image from one PK-232 to another, we recommend that aspect be set to the same number for both units, and that ASPECT be set to 1, 2, 3, or 6 which provide symmetrical repetition patterns. Otherwise it is possible that the receiving unit will miss lines, and double the lines it does receive.

Please note that high settings of ASPECT such as 6 may generate data so often that your printer can not handle the high data rate.

---

**DISPLAY** (Class)      Mnemonic: DISP      Immediate Command

Mode: Command

---

Parameters:

Class - A new parameter identifier has been added:

(F)ax displays the FAX related parameters

---

DISPLAY is an immediate command.

When DISPLAY is typed without a parameter, the PK-232 responds with:

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

cmd:

---

**FAX**                      Mnemonic: FA                      Immediate Command

Mode: Command

---

FAX is an immediate command that switches your PK-232 into the facsimile mode.

The unit starts out in FAX standby, waiting to detect sync pulses that start a frame.

---

**FAXNEG ON|OFF**                      Mnemonic: FAXN                      Default: OFF

Mode: FAX

---

Parameters:

ON - The white and black senses are reversed

OFF - The white and black senses are normal

---

One might use FAXNEG ON when receiving an image consisting mostly of black, as in a satellite photo. In this case it might help to save your printer ribbon, as well as accentuating features such as cloud cover.

Note: FAXNEG ON is NOT the same as RXREV ON. RXREV reverses the entire signal, including the sync pulses. FAXNEG keeps the sync pulses so that they can be recognized, but reverses the image data. When copying a reversed signal, you should switch sidebands or use RXREV ON rather than using FAXNEG ON. This way, the PK-232 can still receive the sync pulses properly. Switching sidebands may be easier since in this case, white will still be the higher pitch frequency and appear on the right (Space) side of the bar-graph indicator.

---

**FSPEED "n"**                      Mnemonic: FS                      Default: 2 (2 lines/Sec)

Mode: FAX

---

Parameters:

"n" - 0 to 4 selects the FAX horizontal scan rate in lines per minute from the table below

---

FSPEED (Highest Print Density Usable)		narrow carriage	wide carriage
1:	1 line/Second	60 lines/Minute	275 dpi      169 dpi
2:	2 lines/Second	120 lines/Minute	138 dpi      85 dpi
3:	3 lines/Second	180 lines/Minute	92 dpi      56 dpi
4:	4 lines/Second	240 lines/Minute	69 dpi      42 dpi
0:	1.5 lines/Second	90 lines/Minute	183 dpi      113 dpi



You can tell the scan rate by listening to the signal. Most weather charts are transmitted at 2 lines/Second (default), or 120 lines/Minute. Some facsimile photographs and Japanese news is sent at 60 lines/minute. You may also find satellite photos being sent at 240 lines/Minute.

---

**GRAPHICS "n"**                      Mnemonic: GR                      Default: 1 (960 dots)

Mode: FAX

---

Parameters:

"n" - 0 to 6 selects the FAX horizontal graphics dot density printed on the printer from the table below

---

Density in dots/inch as a function of GRAPHICS and PRTYPE

		<b>GRAPHICS</b>						
<b>PRTYPE</b>		<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
0- 3		60	120	120	240	80	72	90
4- 7		60	120	120	240	80	72	90
8- 9		60	120	144	200	80	72	100
12-19		136	120	144	160	80	72	96
20-21		60	60	60	60	60	72	100
24-27		60	120	144	240	60	72	.
28-29		60	120	.	.	.	.	.
32-35		60	120	120	240	80	72	90
36		60	60	60	60	60	60	60
40-43		60	120	120	120	60	72	144
44-47		72	144	144	72	72	72	72
48-51		80	160	80	80	80	80	80

In reading and using the various GRAPHICS densities above, the user should be aware that not all combinations of parameters work, especially with slower printers (100 CPS or less). For example, a combination of PRTYPE 2, FSPEED 4, GRAPHICS 1 and ASPECT 4, would require the printer to print a pattern of dots 8 by 960 every 3 seconds, which would mean trouble for a 100 CPS printer. On the other hand, a combination of PRTYPE 2, FSPEED 1, GRAPHICS 0 and ASPECT 2 would always work, as it results in a pattern of dots 8 by 480 every 24 seconds. We know the following combinations of dot densities and FSPEED cause trouble.

(s = sluggish response to commands)

(x = can't work; disabled)

Dot Density	FSPEED, 8" width					FSPEED, 13" width				
	0	1	2	3	4	0	1	2	3	4
60 dpi										
72 dpi										s
80 dpi										x
90 dpi										x
96 dpi									s	x
100 dpi									s	x
120 dpi				s					x	x
136 dpi				x					x	x
144 dpi				x				s	x	x
160 dpi			s	x		x	x	x	x	x
200 dpi			x	x		x	x	x	x	x
240 dpi		s	x	x		x	x	x	x	x

GRAPHICS determines the horizontal print density of the parallel printer. Changing the GRAPHICS setting in the middle of an image causes the unit to print a few lines of garbage while it adjusts to the new setting.

---

**JUSTIFY "n"**      Mnemonic: JU      Immediate Command

Mode: FAX

---

Parameters:

"n" - 0 to 25 specifies the number of half-inches the facsimile image will be moved closer to the edge of the paper.

---

The number 0-25 is in units of half-inches, or 1/16 of standard paper width. In most cases LEFTRITE will be ON, so entering JUSTIFY 1 will move the image one half-inch to the left. If LEFTRITE is OFF, then the JUSTIFY will move the image to the right n half-inches.

You may want to first try entering a number one less than the number of half-inches the image is away from the edge of the paper. For example if you measure that the left-hand edge of the image is 4-1/2 inches away from the edge of the paper, first try the entering JUSTIFY 8 This will move the image 4 inches to the left. If this is found to be not enough, you can always enter JUSTIFY 1, which will move the image the additional half-inch to the left.

JUSTIFY should only be needed after a manual start has been issued by using the Lock command. If the PK-232 is allowed to synchronize by itself, JUSTIFY should not be needed.

---

**LEFTRITE ON|OFF**                      Mnemonic: LE                      Default: ON

Mode: FAX

---

Parameters:

ON - The signal is scanned from left to right

OFF - The signal is scanned from right to left

---

Occasionally you may come across images that are obviously backwards. Turning LEFTRITE OFF or toggling it by issuing the command LEFTRITE TOG will reverse the scanning direction. This command is useful for printing wirephotos.

---

**LOCK**                                      Mnemonic: L                                      Immediate Command

Mode: FAX

---

LOCK is an immediate command that tells the PK-232 to start printing regardless of whether or not the facsimile sync pulses have been detected.

This is a manual start command for FAX. Normally the transmitting station starts out a FAX image with sync pulses so that the receiver can line-up the image with the edge of the paper. The sync pulses consist of lines of 5% white, and 95% black with the beginning of the white pulse signifying the left edge of the following image. The PK-232 detects the sync pulses on a good signal and lines-up the image accordingly. If you tune-in on a signal too late, or there is so much noise that the sync pulses are not detected, you can start the printer manually with the LOCK command. If you issue a LOCK to the PK-232, you will probably need to use the JUSTIFY command to properly align the image.

---

**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. The four following indications have been added to the OPMODE command to display facsimile related status:

OPMODE FAX STBY RCVE

OPMODE FAX SYNC RCVE

OPMODE FAX STBY SEND

OPMODE FAX SYNC SEND

In receive, STBY means the PK-232 is searching for sync pulses to start printing the next image. SYNC means the PK-232 has detected the sync pulses, or that synchronization has been forced with the LOCK command, and the PK-232 should be starting to print the next image.

In transmit, STBY means that the PK-232 is idling or sending the 300 Hz motor start tone before it sends the sync pulses, or that it is sending the 450 Hz stop tone. SYNC means that the unit is sending either sync pulses, or image dots. If the computer has not yet sent image data to the PK-232, the unit will transmit the white tone continuously, and the status will show SYNC SEND.

---

**PRCON ON|OFF**                      Mnemonic: PRC                      Default: OFF

Mode: FAX

---

Parameters:

ON - A parallel printer is connected to the PK-232 via the special cable. The mode LED's are disabled and may stay lit or flash randomly.

OFF - There is no parallel printer connected, or it is not currently in use. The mode LED's are enabled and correctly show operating mode and status.

---

PRCON tells the PK-232 whether or not a parallel printer is connected to it via the special "Y" facsimile cable. When PRCON is ON, the mode and status LED's are disabled, and do not perform their proper function. Some LED's may remain lit, and others may flash randomly from time to time.

This is normal, and should be no cause for alarm. When you are through printing facsimile pictures, remember to turn PRCON OFF and the status LED's will return to normal operation.

---

**PRFAX ON|OFF**                      Mnemonic: PRF                      Default: ON

Mode: FAX

---

**Parameters:**

ON - FAX bit-graphics are sent to the parallel printer for immediate printing if PRCON is also on.

OFF - FAX bit-graphics are sent to the terminal via the serial port using the printer escape codes, as set by PRTYPE and GRAPHICS.

---

PRFAX should be set to ON if a parallel printer is connected to the PK-232 and in use for printing facsimile pictures. If you wish to save the facsimile graphic data to disk for later retrieval, simply turn PRFAX OFF and make sure AWLEN is set to 8 to allow 8-bit data to be sent to the serial port.

Some terminal programs act upon escape codes instead of receiving the data, so be careful when using this command when in the FAX mode.

---

**PROUT ON|OFF**                      Mnemonic: PRO                      Default: OFF

Mode: All

---

**Parameters:**

ON - All text characters including terminal echoes are sent to the parallel printer if PRCON is also ON. Keyboard input is still accepted.

OFF - All text and data is sent to the terminal through the serial port.

---

This command is useful for any text mode where the user wants to get a printed copy of what is being received by the PK-232. It is especially desirable for those using a dumb terminal with the PK-232 who otherwise can not get hard copy of received text. It is also handy if you wish to use your computer for another purpose, and still be aware of, and display channel activity.

---

**PRTYPE "n"**                      Mnemonic: PRT                      Default: 2 (Epson)

Mode: FAX

---

Parameters:

"n"    0-255, specifying a code for the type of dot graphics sequences used by your printer.

At this time, these codes are supported:

---

If you are having trouble deciding on your printers graphics format, you may wish to consult the list of printers in the back of the addendum. This list is sorted by brand, and is correct to the best of our knowledge.

<b>PRTYPE</b>	<b>Printer</b>	<b>"Enter graphics" sequence</b>
0	Epson	CHR\$(27) K n1 n2
4	IBM	CHR\$(27) K n1 n2
8	Radio Shack (Tandy)	CHR\$(18)
12	Apple (G)	CHR\$(27) G n n n n
16	Apple (S)	CHR\$(27) S n n n n
20	old Okidata	CHR\$(3)
24	Okidata	CHR\$(3)
28	Gemini 10, 15	CHR\$(27) K n1 n2
32	Star Micronics	CHR\$(27) K n1 n2
36	GX-100, Gorilla	CHR\$(8)
40	Texas Instruments	CHR\$(27) K n1 n2
44	Genicom	CHR\$(27) K n1 n2
48	Miscellaneous	CHR\$(27) K n1 n2

Unsupported PRTYPE settings are treated as PRTYPE 0.

Notice that the printers above are assigned PRTYPE settings in groups of four. Within each block of 4 PRTYPE settings, add the following to customize for a particular type of printer:

- + 0: 7-bit data, standard printer carriage.
- + 1: 7-bit data, wide printer carriage.
- + 2: 8-bit data, standard printer carriage.
- + 3: 8-bit data, wide printer carriage.

As an example, the PRTYPE setting of 0 + 2 = PRTYPE sets the PK-232 for an Epson standard carriage printer capable of handling 8 bit data. Even-numbered PRTYPE codes are for standard

printer carriage width (8-inch wide image). To get a 13-inch wide image for wider carriages, use the odd-numbered PRTYPE code (e.g., an Epson FX-100 would use PRTYPE 3).

**PRTYPE 0-3, Epson:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'A' 7 LF

New-line code (8 bits): <ESC> 'A' 8 LF

Printer reset code: <ESC> '@' CR LF

(Note: Epson MX-80 with Grafrax-80 uses PRTYPE 40 or 42).

**--- Dot density ---**

<b>GRAPHICS</b>	<b>PRTYPE 0,2</b>	<b>PRTYPE 1,3</b>	<b>Code</b>
0	60 dpi	60 dpi	ESC 'K'
1	120 dpi	120 dpi	ESC 'L'
2	fast 120 dpi	fast 120 dpi	ESC 'Y'
3	240 dpi		ESC 'Z'
4	80 dpi	80 dpi	ESC '*' 4
5	72 dpi	72 dpi	ESC '*' 5
6	90 dpi	90 dpi	ESC '*' 6

For Epson printers, not all GRAPHICS settings are implemented on each model:

<b>GRAPHICS:</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>dots/inch:</b>	<b>60</b>	<b>120</b>	<b>120</b>	<b>240</b>	<b>80</b>	<b>72</b>	<b>90</b>
FX-80:	yes	yes	yes	yes	yes	yes	yes
RX-80:	yes	yes	yes	yes	yes	.	yes

**PRTYPE 4-7, IBM:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'A' 7 <ESC> '2' LF

New-line code (8 bits): <ESC> 'A' 8 <ESC> '2' LF

Printer reset code: CR LF

- - - Dot density - - -

<b>GRAPHICS</b>	<b>PRTYPE 4,6</b>	<b>PRTYPE 5,7</b>	<b>Code</b>
0	60 dpi	60 dpi	ESC 'K'
1	120 dpi	120 dpi	ESC 'L'
2	fast 120 dpi	fast 120 dpi	ESC 'Y'
3	240 dpi		ESC 'Z'
4	80 dpi	80 dpi	ESC '*' 4
5	72 dpi	72 dpi	ESC '*' 5
6	90 dpi	90 dpi	ESC '*' 6

**PRTYPE 8-9, Radio Shack (Tandy):**

Typical graphics code: <ESC> 19 18

New-line code: CR 30

Printer reset code: <ESC> 19 CR LF

Note that the Radio Shack DMP-130 printer may be used with PRTYPE 4 (IBM) if these DIP switches are ON: 1-1, 1-3, and 1-6. To use PRTYPE 8, set all DIP switches OFF.

The Radio Shack DMP-400, -420 and -500 should have the DIP switch for DMP-series emulation, not LP-series.

- - - Dot density - - -

<b>GRAPHICS</b>	<b>PRTYPE 8</b>	<b>PRTYPE 9</b>	<b>Code</b>
0	60 dpi	60 dpi	ESC 19
1	120 dpi	120 dpi	ESC 23
2	144 dpi	144 dpi	ESC 19
3	200 dpi		ESC 20
4	80 dpi	80 dpi	ESC 19
5	72 dpi	72 dpi	ESC 23
6	100 dpi	100 dpi	ESC 20



Not all densities apply to each Radio Shack printer:

GRAPHICS:	0	1	2	3	4	5	6
dots/inch:	60	120	144	200	80	72	100
LP VII:	yes						
LP VIII:	yes						
DMP-100:	yes						
DMP-105:	yes					yes	
DMP-110:		yes					
DMP-120:		yes		yes			
DMP-130:	yes						
DMP-200:		yes	yes	yes			
DMP-400:	yes					yes	yes
DMP-420:	yes					yes	yes
DMP-500:	yes					yes	yes
DMP-2100:	yes						
CGP-220:					yes		

**PRTYPE 12-15, Apple (G):**

Typical graphics code: <ESC> 'N' <ESC> 'G0640'

New-line code (7 bits): <ESC> 'T14' LF CR

New-line code (8 bits): <ESC> 'T16' LF CR

Printer reset code: <ESC> 'N' CR LF

The "G" refers to the graphics escape code used. Most Apple printers respond to both the Escape-G and Escape-S codes in exactly the same way. For those printers that use only the Escape-S command, use PRTYPE 16-19.

(Note: We don't know of any Apple printer that has a parallel interface. Either connect the PK-232's serial port directly to the Apple printer and turn PRFAX OFF, or use a parallel-to-serial converter.)

- - - - Dot density - - - -

GRAPHICS	PRTYPE 12,14	PRTYPE 13,15	Code
0	136 dpi	136 dpi	ESC 'Q'
1	120 dpi	120 dpi	ESC 'q'
2	144 dpi	144 dpi	ESC 'p'
3	160 dpi		ESC 'P'
4	80 dpi	80 dpi	ESC 'N'
5	72 dpi	72 dpi	ESC 'n'
6	96 dpi	96 dpi	ESC 'E'

**PRTYPE 16-19, Apple (S):**

Typical graphics code: <ESC> 'N' <ESC> 'S0640'

New-line code (7 bits): <ESC> 'T14' LF CR

New-line code (8 bits): <ESC> 'T16' LF CR

Printer reset code: <ESC> 'N' CR LF

The "S" refers to the graphics escape code used. Some printers are mostly compatible with Apple graphics escape codes, except they use the Escape-S sequence but not the Escape-G sequence. The C. Itoh 1550 and 8510 printers are in this category. Except for the graphics escape sequence, PRTYPE 16-19 works exactly the same as PRTYPE 12-15 (Apple G). Refer to your printer manual for the graphics escape code used.

**PRTYPE 20-21, Old Okidata:**

Typical graphics code: 30 3

New-line code: 3 14 3 2

Printer reset code: 24 CR LF

Okidata 82A and 83A: Okigraph I EPROMs must be installed.

GRAPHICS:	0	5	6
Code:	30	28	29
Density, dpi:	60	72	100
Okidata ML 82A:	yes	.	yes
Okidata ML 83A:	yes	.	yes
Okidata ML 92:	yes	yes	
Okidata ML 93:	yes	yes	.

**PRTYPE 24-27, Okidata:**

Typical graphics code: 30 <ESC> 'P' 3

New-line code: 3 14 3 2

Printer reset code: <ESC> 24 CR LF

PRTYPE 26 and 27 are for the Okidata 192 and 193 with 8-bit APA graphics selected. In 7-bit mode, these printers also accept PRTYPE 20, 21, 24 and 25.

PRTYPE 24 and 25 are similar to PRTYPE 20 and 21, except that 24 and 25 use the ESC-P and ESC-R codes.

Okidata 192, 193: In the printer's Menu Select Mode, select "CH SET NORM". For 7-bit data (PRTYPE 24 and 25), select "7/8 BIT" 7 and "APA-7/8" 7. For 8-bit data (PRTYPE 26 and 27), select "7/8 BIT" 8 and "APA-7/8" 8. Also, "APA-UNI" Y gives better print quality.

**---- Dot density ----**

<b>GRAPHICS</b>	<b>PRTYPE 26,28</b>	<b>PRTYPE 25,27</b>	<b>Code</b>
0	60 dpi	60 dpi	30 ESC 'P'
1	120 dpi	120 dpi	30 ESC 'R'
2	144 dpi	144 dpi	28 ESC 'R'
3	240 dpi		ESC '*' \$71 \$58
5	72 dpi	72 dpi	28 ESC 'P'

Note: When switching from GRAPHICS 3 to some other GRAPHICS setting, type R to stop the image and reset the printer, change GRAPHICS, and then type L to start the image again. Or, if you do not want to lose sync, change the GRAPHICS setting, turn the printer off and then turn it on again.

Not all Okidata printers respond to all the available GRAPHICS settings. The table below shows which settings are supported.

<b>GRAPHICS:</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>dots/inch:</b>	<b>60</b>	<b>120</b>	<b>144</b>	<b>240</b>	<b>60</b>	<b>72</b>	<b>100</b>
Okidata 82A:	yes	.	.	.	yes	.	yes
Okidata 83A:	yes	.	.	.	yes	.	yes
Okidata 92:	yes	.	.	.	yes	yes	.
Okidata 93:	yes	.	.	.	yes	yes	.
Okidata 192:	yes	yes	yes	yes	yes	yes	.
Okidata 193:	yes	yes	yes	yes	yes	yes	.

**PRTYPE 28-29, Star Gemini:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code: <ESC> 'I'

Printer reset code: <ESC> '@' CR LF

PRTYPE 28 and 29 are for the older Star Gemini 10 and 15. The Gemini 10X and 15X use PRTYPE 32 and 33. The Star Micronics SG-10 and SG-15 use PRTYPE 4-7 (IBM) or 32-33 (Star).

<u>GRAPHICS</u>	<u>Dot density</u>	<u>Code</u>
0	60 dpi	ESC 'K'
1	120 dpi	ESC 'L'

**PRTYPE 32-35, Star Micronics:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'J' 14 CR

New-line code (8 bits): <ESC> 'J' 16 CR

Printer reset code: <ESC> '@' CR LF

This set of PRTYPE codes would be used for various printers manufactured by Star Micronics, including these:

Delta 10, 15  
Radix 10, 15  
Gemini 10X, 15X  
SD-10, SD-15 in Star Mode  
SG-10, SG-15 in Star Mode  
SR-10, SR-15 in Star Mode

These Star printers use other PRTYPE settings:

Gemini 10, 15	PRTYPE 28-29
SB-10	PRTYPE 0-3?
SD-10, SD-15 in IBM Mode	PRTYPE 4-7
SG-10, SG-15 in IBM Mode	PRTYPE 4-7
SR-10, SR-15 in IBM Mode	PRTYPE 4-7
NB-15 in 9-wire emulation mode	PRTYPE 4-7
Gemini 10XPC, 15XPC	PRTYPE 4-7
Delta 10PC, 15PC	PRTYPE 4-7
Radix 10PC, 15PC	PRTYPE 4-7
Gemini 10X Plus, 15X Plus	PRTYPE 0-3
Delta 10 Plus, 15 Plus	PRTYPE 0-3
Radix 10 Plus, 15 Plus	PRTYPE 0-3
NL-10, NL-15 w/ std. cartridge	PRTYPE 0-3
NL-10, NL-15 w/ IBM cartridge	PRTYPE 4-7

- - - - Dot density - - - -

<u>GRAPHICS</u>	<u>PRTYPE 32,34</u>	<u>PRTYPE 33,35</u>	<u>Code</u>
0	60 dpi	60 dpi	ESC 'K'
1	120 dpi	120 dpi	ESC 'L'
2	fast 120 dpi	fast 120 dpi	ESC 'y'
3	240 dpi		ESC 'z'
4	80 dpi	80 dpi	ESC 'g' 4
5	72 dpi	72 dpi	ESC 'g' 5
6	90 dpi	90 dpi	ESC 'g' 6

**PRTYPE 36, GX-100/Gorilla:**

Typical graphics code: 8 <ESC> 16 0 0

New-line code: LF 15

Printer reset code: 16 '00' LF

PRTYPE 36 covers the Commodore 1525, Leading Edge Gorilla Banana, Seikosha GX-100, and C. Itoh GX-100.

<u>GRAPHICS</u>	<u>Dot density</u>	<u>Code</u>
0	60 dpi	8 ESC 16 0 0

These printers have a vertical dot density of 63 dpi, which changes the aspect ratio as follows:

<u>ASPECT</u>	<u>CCITT IOC</u>	<u>IEE IOC</u>
1	963	3025
2	481	1511
3	321	1008
4	241	757
5	193	606
6	160	503

**PRTYPE 40-43, Texas Instruments:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'A' 7 LF

New-line code (8 bits): <ESC> 'A' 8 LF

Printer reset code: <ESC> '@' CR LF

Texas Instruments 850 and 855 in DP Mode.  
Epson MX-80 with Grafrax-80 (GRAPHICS 0-2 only).

<b>GRAPHICS</b>	<b>Dot density</b>	<b>Code</b>
0	60 dpi	ESC 'K'
1	120 dpi	ESC 'L'
2	fast 120 dpi	ESC 'J'
5	72 dpi	ESC 'N'
6	144 dpi	ESC 'O'

**PRTYPE 44-47, Genicom:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'A' 7 <ESC> '2' LF

New-line code (8 bits): <ESC> 'A' 8 <ESC> '2' LF

Printer reset code: CR LF

Genicom 3310 and 3320 in IBM-GP Mode.

<b>GRAPHICS</b>	<b>Dot density</b>	<b>Code</b>
0	72 dpi	ESC 'K'
1	144 dpi	ESC 'L'
2	fast 144 dpi	ESC 'Y'

**PRTYPE 48-51, Miscellaneous:**

Typical graphics code: <ESC> 'K' n1 n2

New-line code (7 bits): <ESC> 'A' 7 LF

New-line code (8 bits): <ESC> 'A' 8 LF

Printer reset code: <ESC> '@' CR LF

BMC BX-80, Blue Chip 120/10, Mannesmann Tally Spirit 80

---- Dot density ----

<b>GRAPHICS</b>	<b>PRTYPE 48,50</b>	<b>PRTYPE 49,51</b>	<b>Code</b>
0	80 dpi	80 dpi	ESC 'K'
1	160 dpi		ESC 'L'

---

**RCVE**                      Mnemonic: R                      Immediate Command

Mode: Command

---

RCVE is an immediate command that places the PK-232 in receive when issued from the command mode. <Ctrl-D> will also return the PK-232 to receive without first having to enter the command mode. <Ctrl-D> sends the stop signal before returning to receive which will stop the receiving stations printer. <Ctrl-F> is the same as <Ctrl-D> only in addition performs a CW ID for you before going back to receive.

---

**TRACE ON|OFF**

**Mnemonic: TRAC**

**Default: OFF**

**Mode: Packet and FAX**

---

The TRACE command has been enhanced to include Facsimile mode. When the Opmode is FAX, TRACE is ON, and PRFAX is OFF, the graphics escape sequences and dot data are sent to the terminal with each byte expanded to two Hexadecimal characters. This will help get around the limitations of many terminal programs that do not allow 8-bit data to be saved to disk as an ASCII file.

Interspersed command prompts and even the L and R commands would have no effect on the final data, because you would re-translate the hex back to a binary file with a program like this one for the IBM-PC:

```
10 INPUT "FILENAME OF HEX INPUT?", FH$
15 INPUT "FILENAME OF BINARY OUTPUT?", FB$
20 OPEN FH$ FOR INPUT AS #1
30 OPEN FB$ FOR OUTPUT AS #2
40 LINE INPUT #1, C$: CL=LEN(C$)
50 GOSUB 300: I=A*16
60 GOSUB 300: PRINT #2, CHR$(I+A); : GOTO 50
300 IF CL=1 THEN A$=C$: CL=0: GOTO 330
310 IF CL=0 THEN IF EOF(1) THEN 999: ELSE LINE INPUT #1, C$: CL=LEN(C$)
320 A$=LEFT$(C$, 1): CL=CL-1: C$=RIGHT$(C$, CL)
330 A=ASC(A$)-48: IF A < 0 GOTO 300
335 IF A < 10 THEN RETURN
340 A=A-7: IF A < 10 GOTO 300
350 IF A > 15 GOTO 300
360 RETURN
999 CLOSE #1: CLOSE #2: END
```

---

**XMIT**

**Mnemonic: X**

**Immediate Command**

**Mode: Command**

---

XMIT is an immediate command that keys your radio's PTT line and prepares the radio to receive outbound data.

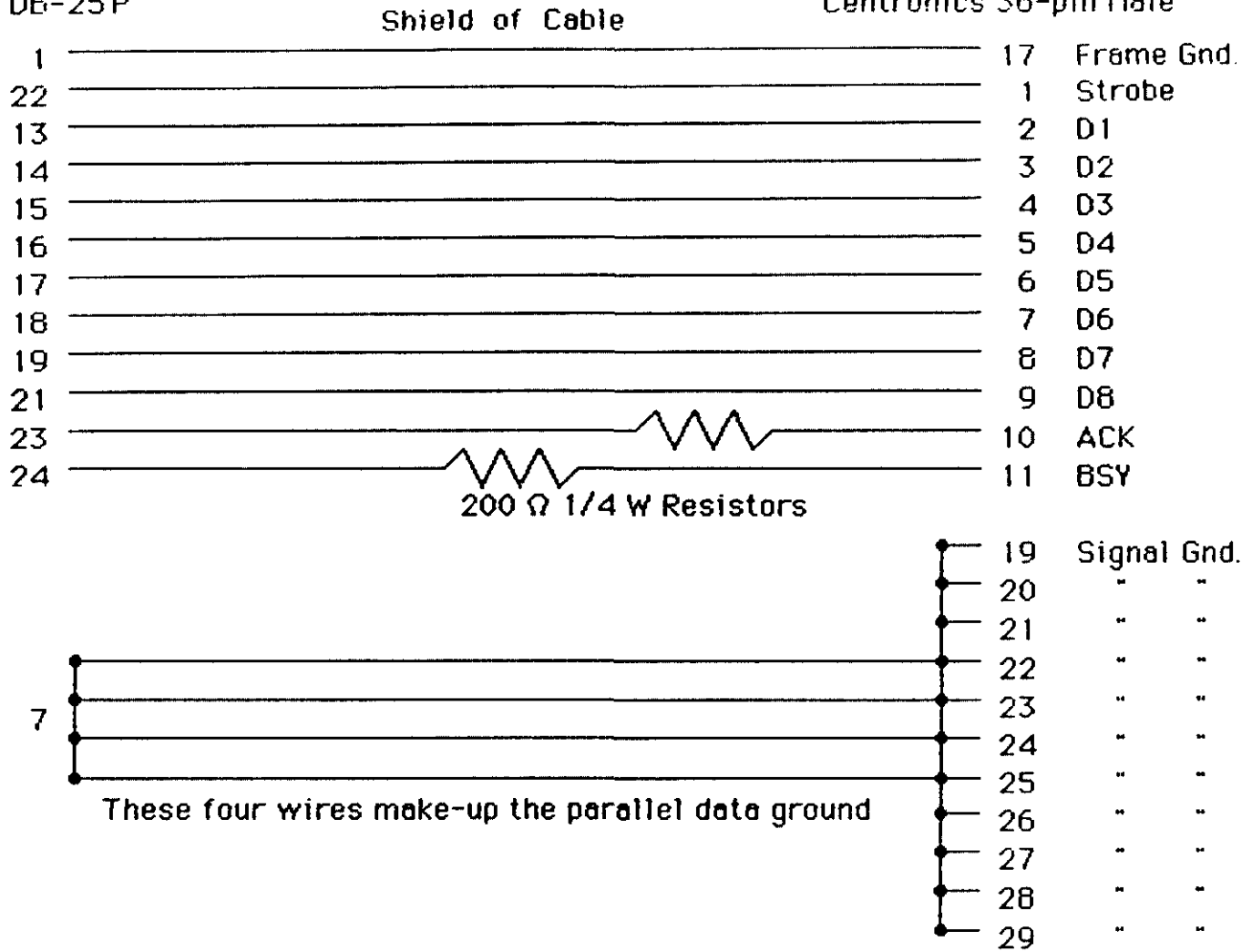
Before transmitting, PRFAX must be turned OFF, AWLEN must be set to 8, and PARITY should be 0. Read the Facsimile transmit section before you begin to transmit so that you set the proper commands, and send data at the appropriate time.



# FAX Cable Wiring Diagram

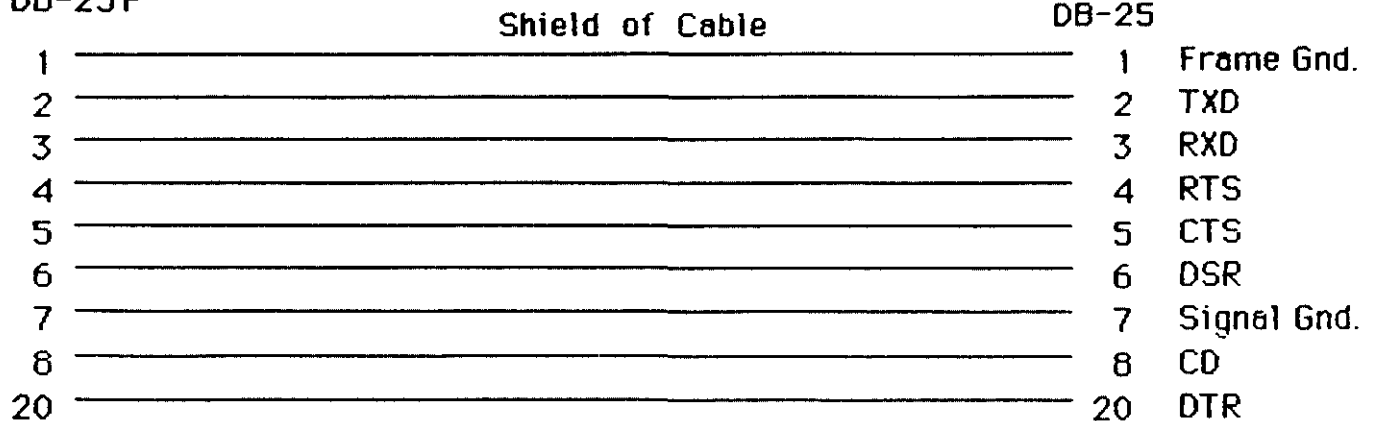
PK-232 Connector  
DB-25P

Printer Connector  
Centronics 36-pin Male



PK-232 Connector  
DB-25P

Serial Connector  
DB-25



# Advanced Electronic Applications Inc.

---

## SIAM<sup>™</sup> Appendix

### Overview

As you tune across the High-Frequency bands these days you find an ever increasing number of digital signals. These signals range from the simple Murray Baudot code, to ASCII and even packetized data communication. With the large number of speeds, formats and shifts now in use, it is difficult to say the least, to determine what kind of signal you are listening to. Even with a good knowledge of digital communications, it is still time consuming to set the communication parameters correctly.

SIAM stands for Signal Identification and Acquisition Mode, and allows a wide variety of digital signals to be automatically analyzed so they can be easily copied with the PK-232. SIAM will "listen" to a signal for a few seconds and then display the type of signal and its speed to the user. The user can then decide whether or not to copy the signal, or simply go on to the next.

SIAM makes the PK-232 more useful to the Amateur Radio Operator and the Short-Wave Listener alike. Whether tuning across 20 meters, or searching the Short-Wave bands, when you find a signal SIAM will help you decide what it is, and tune it in without time consuming trial and error.

### SIAM Operation

When preparing to tune-in a digital signal, the only decision the operator needs to make before entering the Signal analysis mode is whether the signal is narrow or wide shift. The command WIDESHFT determines whether or not the filters in the PK-232 are set for copying signals with a frequency-shift greater than 200 Hz (WIDESHFT ON) or a shift of 200 Hz or less (WIDESHFT OFF). Inside the Amateur bands most signals will be using 170 or 200 Hz shift and so WIDESHFT should be OFF. Outside the Amateur bands most stations will be using a frequency shift of more than 200 Hz and so WIDESHFT should be set ON.

After correctly tuning in a signal as described in chapters 2 and 3 of the manual, you are ready to enter the SIGNAL command. The PK-232 will respond with:

```
OPMODE was XXXXX
```

```
OPMODE now SIGNAL
```

Make sure the THRESHOLD is adjusted so that the DCD LED is illuminated, then after about 10 seconds the PK-232 should respond with a baud rate indication and confidence factor similar to the one shown below.

```
0.47: 50 Baud,
```

After another 15 seconds or so, the PK-232 should respond with one of the following signal classes and tell whether or not the signal is reversed by giving the status of the command RXREV:

**ASCII, AMTOR, ALIST, Baudot, synchronous, noise, 6-bit**

The complete information from the PK-232 signal analysis will look something like the following:

0.47: 50 Baud, Baudot, RXREV OFF

This means that the PK-232 has determined the signal to be a 50 -Baud Baudot signal that is not inverted since RXREV is OFF. The 0.47 means that the PK-232 is only 47% sure that this analysis is correct.

SIAM can identify and copy ASCII, ARQ and FEC AMTOR, and Baudot signals. To begin printing one of these signals, all that must be done is to type the command **OK** after the analysis has been completed. You should immediately begin to see text appear on your screen.

If the PK-232 determined the signal to be **synchronous, 6-bit** or **noise** which it cannot decode, typing **OK** will cause the PK-232 to respond with:

?bad

The **SIGNAL** routine will run repeatedly until the operating mode is changed either by typing **OK**, or forcing a change to another mode. If you tune to a different signal during an analysis, simply type **SIGNAL** again to restart the analysis routine.

If the text is not plain, but appears to be encoded, you can try different settings of the **BITINV** command. **BITINV** will Exclusive-OR a number from \$00 to \$1F with the received character of a Baudot signal thus inverting specific bits. By varying **BITINV** from 0 through 31, you will be testing all the different bit-inversion possibilities that may be used to encode a Baudot signal. If only simple bit-inversion is being used, one of the settings of **BITINV** should cause the transmission to print in plain text. If however, none of the 32 possibilities reveal plain text, then the transmitting station is likely using a more sophisticated encryption technique.

## SIAM Commands

The following commands have been added to the PK-232 firmware for use in the SIAM mode. A few of these commands have different functions in other modes.

---

**BITINV n**                      Mnemonic: BI                      Default: \$00

Mode: RTTY

---

Parameters:

"n" - 0 to \$1F, (0 to 31 decimal) specifies a number to be exclusive-ORed with every received Baudot character.

---

Bit inversion has been used to prevent the casual listener from reading the content of some Baudot transmissions. Usually either two or three bits of each Baudot character are inverted to give the appearance of an encrypted transmission. Try different settings of BITINV on an unknown signal after the baud rate and signal class have been determined. BITINV also accepts the commands UP and DOWN to increase and decrease its value.

Under the default setting of BITINV 0 no inversion takes place, which prints plain text.

---

**CCITT ON|OFF**                      Mnemonic: CC                      Default: ON

Mode: Baudot RTTY

---

Parameters:

ON - If Code is 0, the PK-232 uses the CCITT ITA #2 code in Baudot.

OFF - If Code is 0, the PK-232 uses the U.S. teleprinter code in Baudot..

---

The command CCITT has been retained for compatibility reasons, although with the new CODE command, CCITT has become redundant. CCITT is used only in Baudot, and has meaning only if CODE is 0 as shown below:

<u>CODE</u>	<u>CCITT</u>	<u>Meaning</u>
0	ON	ITA #2
0	OFF	US teleprinter
1	X	US teleprinter
2	X	Cyrillic
3	X	Transliterated Cyrillic

**CODE n**                      Mnemonic: COD                      Default: 0

Mode: Baudot, AMTOR, Morse

**Parameters:**

"n" - 0 to 5 specifies a code from the list below.

<u>CODE</u>	<u>Meaning</u>	<u>Morse</u>	<u>Baudot</u>	<u>AMTOR</u>
0	International	RX/TX	RX/TX	RX/TX
1	US teleprinter	-	RX/TX	-
2	Cyrillic	RX	RX	RX
3	Transliterated Cyrillic	RX	RX	RX
4	Katakana	RX/TX	-	-
5	Transliterated Katakana	RX	-	-

Note that not all the codes in the list above can be transmitted. In the Morse, Baudot and AMTOR columns, RX means receive only, and RX/TX means both transmit and receive are enabled.

**CODE 0: International**

In Morse, this means the International or Continental Morse Code. For Baudot and AMTOR, this means the ITA #2 teleprinter code, which is internationally recommended for Baudot and TOR communications.

**CODE 1: US Teleprinter**

In Morse, this has no effect. The unit will use the International Morse Code and NOT the American Morse code. In AMTOR, CODE 1 has no effect; the code used in AMTOR will still be ITA #2. In

Baudot, the US teleprinter code is used. The differences between ITA #2 and US teleprinter codes are listed below:

<u>Character</u>	<u>ITA #2</u>	<u>U.S.</u>
FIGS-D	WRU	\$
FIGS-H		#
FIGS-J	BELL	'
FIGS-S	'	BELL
FIGS-V	=	;
FIGS-Z	+	"

**CODE 2: Cyrillic**

This code causes a translation to an artificially extended version of ASCII, so that all received characters are converted to single ASCII characters. The extended characters are:

<u>ASCII</u>	<u>English pronunciation</u>	
\$40 @	E	(RTTY only)
\$5B [	YA	
\$5C \	CH	(Morse only)
\$5D }	YU	
\$5E ^	SH	

In Morse, the four characters that are displayed as double characters in International are shown as single ASCII in Cyrillic:

<u>Character</u>	<u>CODE 0</u>	<u>CODE 2</u>
. . . .	aa	\$5B [
. . . .	oe	\$5C \
. . . .	ue	\$5D ]
. . . .	ch	\$5E ^

In Baudot and AMTOR, Russian transmitters use a third register to transmit Cyrillic characters in addition to the LTRS and FIGS. They use LTRS to transmit the Roman alphabet. As LTRS and FIGS

characters are used to access the first and second registers, they use the BLK or NUL character (00) to access the third register. The PK-232 displays the third-register characters as if they were in the LTRS case, and all FIGS characters as in CODE 0 with the following exceptions:

<u>Character</u>	<u>CODE 2</u>	<u>English pronunciation</u>
FIGS-G	\$5E ^	SH
FIGS-H	\$5I Q	SHCH
FIGS-F	\$40 @	E
FIGS-J	\$5D ]	YU
3rd-Q	\$5B [	YA

You can tell if a transmission is in Russian if several words end in "OJ", "OW" or "OGO". There is no separate Baudot combination for the CH character. the Russians use a "4" because the Cyrillic character for CH resembles a "4". The actual character intended must be gathered from the context. It is safe to leave CODE set to 2 if you are not sure which alphabet the transmitting station is using. You will be able to see the message in either alphabet with minimal garbling, and can then set CODE to either 0 or 3.

#### **CODE 3: Transliterated Cyrillic**

This code is similar to CODE 2, except that some characters are transliterated into English phonetic equivalents for easier reading.

<u>CODE 2</u>	<u>CODE 3</u>
W	V
V	ZH
H	KH
C	TS
\	CH (Morse only)
^	SH
Q	SHCH
X	,
@	E (RTTY only)
[	YA
]	YU

**CODE 4: Katakana**

Katakana is the phonetic character set used in Japan for spelling out words of foreign (to Japan) origin. The Japanese also use Katakana for Morse and some computer communication. There are about 50 Katakana characters. CODE 4 translates the Katakana Morse code into an 8-bit extended version of ASCII. The characters displayed are generally in the range from \$A0 to \$DF, except for numerals and punctuation.

If you are using CODE 4, remember to set up the PK-232 for AWLEN 8, PARITY 0 and 8BIT-CONV ON.

**CODE 5: Transliterated Katakana**

This is similar to CODE 4, except that the extended ASCII is transliterated into English equivalents for easier reading. The Morse characters are translated into 2- and 3-letter syllables.

---

**OK**                      Mnemonic: OK                      Immediate Command

Mode: SIGNAL

---

This command normally follows the SIGNAL command after it has determined the class and speed of the station being monitored. Typing OK will change the commands RXREV, RBAUD or ABAUD and OPMODE to their proper value.

For example if the SIGNAL command has determined that the station being monitored is transmitting Baudot, typing OK should display the following:

**OPMODE was SIGNAL**

**OPMODE now BAUDOT**

If the SIGNAL command did not reveal any useful information, typing OK will produce the response:

**?bad**

---

**SIGNAL**                      Mnemonic: SI                      Immediate Command

Mode: ASCII, AMTOR, Baudot

---

SIGNAL is an immediate command that causes the PK-232 to enter the SIAM Signal Analysis mode. The PK-232 will respond with:

**OPMODE was BAUDOT**

**OPMODE now SIGNAL**



About 10 seconds after the user types the SIGNAL command, the screen will display the predicted signal and a confidence factor. The confidence factor is a number between 0.10 and 0.99, where 0.99 means the PK-232 is 99% sure the signal is of the type indicated. The signal type may be one of the following:

**ASCII, AMTOR, ALIST, Baudot, synchronous, noise, 6-bit**

After about 25 seconds the state of signal inversion is determined. As an example, if you tune into 50 baud Baudot signal that is not reversed, the SIGNAL command should reveal something like the following:

0.47: 50 baud, Baudot, RXREV OFF

The confidence level will probably be different, but the idea is the same.

The SIGNAL routine will run repeatedly until the operating mode is changed either by typing OK, or by forcing a change to another mode. If you tune to a different signal during an analysis, simply type SIGNAL again to restart the analysis routine.

Advanced Electronic Applications, Inc.  
PK-232 Firmware Revision Supplement  
23-FEB-88

To keep the PK-232 the best multimode data controller available, A.E.A. constantly works on the software to add the features you the users request the most. The following pages describe changes and enhancements we have made in the 23-FEB-88 firmware release for the PK-232.

These enhancements have been made to the PK-232 Firmware since the 25-JUN-87 release described in Revision-E of the PK-232 operating manual. Since these enhancements are for the most part additions to the Revision-E Operating Manual, they appear as the following supplement.

The following is an outline of the features and enhancements in the PK-232 23-FEB-88 firmware that are covered in this supplement. Look up the capitalized command in the COMMAND SUMMARY section for more information about a particular feature.

**NAVTEX Mode:** NAVTEX is a relatively new marine weather broadcast service that is rapidly being installed in coastal areas around the world. Operating on a standard frequency of 518 KHz, NAVTEX broadcasts navigation and weather information to ships.

**AFILTER Command:** AFILTER is an ASCII Filter that works the way MFILTER does, only in all modes to prevent unwanted ASCII characters from ever being sent to the terminal or computer.

**BBSMSGs Command:** BBSMSGs strips some of the unwanted "friendliness" from the command responses generated by the PK-232, making it compatible with older versions bulletin board software such as that from WORLI and WA7MBL.

**CBELL** now sends three BELL characters on DISCONNECT as well as CONNECT.

**MFILTER \$80** no longer filters the TAB character (ASCII \$09)

**PRTYPE** has been expanded to support more printers including the Anadex, Citizen, NEC and the HP-Thinkjet.

Five Morse Code Characters that are useful for Swedish and German Morse have been added to the National Morse alphabets CODE Command.

In the KISS and Raw HDLC modes, activity on the RS-232 link is now shown via the STA and CON LEDs.

In Morse, Baudot and ASCII, the delay at the end of a transmission before going back to receive has been shortened from 1 sec to 0.2 sec.

The TAB character (ASCII \$09, CTRL-I) is now accepted as a delimiter in command strings, same as space and comma always have been.

**Defaults Changed:** The parameters MPROTO, RESPTIME, PERSIST and PPERSIST have had their default settings changed.

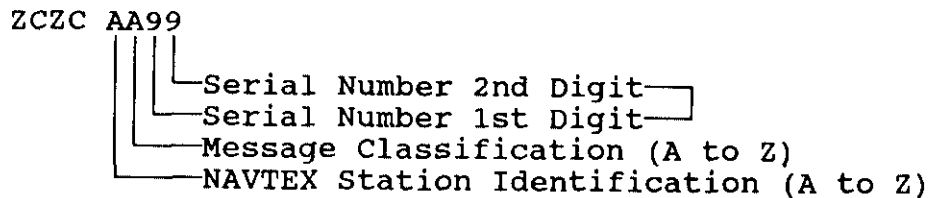
The NAVTEX Mode:

NAVTEX is an international system which stands for NAVIGATIONAL TELEX. It is a direct printing service designed to distribute navigational and meteorological warnings and other urgent information to ships.

Since NAVTEX is a relatively new service, it not fully operational in all areas of the world at this time. Currently, NAVTEX covers most of Europe, and the east coast of the United States. Stations to cover the west coast of the U.S. are under construction and scheduled to be operational in 1988.

NAVTEX is broadcast in Mode-B AMTOR (SITOR) on a frequency of 518 KHz. This frequency has been agreed upon as the world wide standard. NAVTEX may be selectively monitored, so the vessel would see only the information of interest as well as never seeing the same message twice. It is this unique feature of NAVTEX that the PK-232 uses along with the NAVSTN and NAVMSG commands to allow the user to monitor only those messages of importance.

All NAVTEX messages are prefaced by the four characters "ZCZC" and then a four character Preamble as diagrammed below.



The first character of the Preamble is a letter that identifies the NAVTEX transmitter. Transmitter Identification letters can be any of the characters A through Z. This limits the number of NAVTEX stations in an area to 26. The NAVSTN Command can be used to selectively monitor or reject certain NAVTEX transmitters.

The second character of the Preamble is the NAVTEX Message Classification. Currently the letters A through J define a message class, while the letters K through Z are reserved for future use. The NAVMSG command may be used to selectively monitor or reject certain NAVTEX message classes.

The last two numbers form a serial number from 00 through 99 that is different for each NAVTEX message. The PK-232 remembers the Preamble of the 200 most recent messages and will not re-print a message that has the same preamble if it has already been received without many errors.

Currently Europe has a lead on the United States in the number of NAVTEX stations. There are however active NAVTEX stations on the east-coast and stations under construction in other parts of the U.S.

In the U.S. and Canada there are currently stations in:

Sydney, Nova Scotia	Boston Massachusetts
Portsmouth, Virginia	Miami, Florida
New Orleans, Louisiana	

Some of the planned stations are:

San Francisco, California	Long Beach, California
Astoria, Oregon	Kodiak, Alaska
Adak, Alaska	Honolulu, Hawaii

PK-232 COMMAND SUMMARY ADDENDUM

The following is the list of commands that are either new or have changed in the 23-FEB-88 release of PK-232 firmware.

---

AFILTER ON OFF Mode: ALL	Mnemonic: AF	Default: OFF Host: AZ
-----------------------------	--------------	--------------------------

---

Parameters:

- ON - The ASCII characters specified in the MFILTER are filtered out and never sent to the terminal or computer.
- OFF - Characters in MFILTER list are only filtered from monitored packets.
- 

Some terminals and computers use special characters to clear the screen or perform other "special" functions. Placing these characters in the MFILTER list, and turning AFILTER ON will keep them from being sent by the PK-232.

Exception: When ECHO is ON, and the terminal or computer sends a filtered character, the PK-232 will echo it back to the terminal or computer.

AFILTER works regardless of mode, or CONNECT/CONVERSE/TRANSPARENT status. One must be careful to leave AFILTER OFF during Binary file transfers.

---

BBSMSGs ON OFF Mode: Packet	Mnemonic: BBS	Default: OFF Host: BB
--------------------------------	---------------	--------------------------

---

Parameters:

- ON - Makes the PK-232 status messages look like the TAPR-style output.
- OFF - The PK-232 status messages work as before.
- 

When BBSMSGs is ON, some of the status messages change or are suppressed which may improve operation of the PK-232 with some BBS software. The following AEA status messages from the PK-232 are suppressed if BBSMSGs is ON:

No "(parm) now (value)"  
Connect messages: No "; v2; 1 unACKed"  
No "xxx in progress: (dest) via (digis)"  
No space after comma in digipeater lists  
"VIA" in upper case  
If MRPT is ON, digi paths are displayed in TAPR format

When BBSMSGs is ON, the following status messages are deleted or changed:

No "\*\*\* connect request:"  
No "\*\*\* retry count exceeded"  
Sends carriage return before all other "\*\*\*"  
No "(parm) was (value)"  
No "(callsign) busy" message

---

CBELL ON OFF Mode: Packet	Mnemonic: CB	Default: OFF Host: CU
------------------------------	--------------	--------------------------

---

Parameters:

- ON - Three BELL characters <CTRL-G> (\$07) are sent to your terminal with the '\*\*\* CONNECTED to or DISCONNECTED from (call sign)' message.
- OFF - BELLS are NOT sent with the CONNECTED or DISCONNECTED message.
- 

CBELL now sends BELL characters on DISCONNECT as well as CONNECT. In the 25-JUN-87 release of firmware the BELLS were only sent upon a CONNECT.

All other aspects of the CBELL command are described in Revision-E of the PK-232 Operating Manual.

---

CODE 'n' Mode: Baudot, AMTOR, Morse	Mnemonic: COD	Default: 0 HOST: C1
--	---------------	------------------------

---

Parameters:

- 'n' - 0 to 5 specifies a code from the list in the SIAM chapter of the Revision-E of the PK-232 Operating manual.
- 

For the International Morse alphabet (CODE 0), the following characters have been added since 25-JUN-87 for receiving and transmitting:

\$40	@	..-..	
\$5B	[	..-.	Formerly received as aa
\$5C	\	---.	Formerly received as oe
\$5D	]	..-.-	
\$5E	^	..-.	Formerly received as ue

These are for the Swedish alphabet, but have applications for German also.

Chapter 4 and the SIAM appendix of the PK-232 manual further describe Morse.

---

HOST ON OFF Mode: All	Mnemonic: HO	Default: OFF HOST: HO
--------------------------	--------------	--------------------------

---

Parameters:

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

Turning the PK-232 on or doing a RESTART command while in the HOST Mode (HOST ON) causes the TNC to issue a RESTART response (\$01 \$4F R T \$00 \$17).

All other aspects of the HOST command are described in the PK-232 Operating and Technical Manuals.

---

KISS ON|OFF  
Mode: Packet

Mnemonic: KI

Default: OFF  
HOST: KI

---

Parameters:

ON - The PK-232 operates as a KISS TNC.  
OFF - The PK-232 operates as a normal AX.25 Level 2 TNC.

---

In KISS and Raw HDLC modes, communication activity on the RS-232 link is shown by illumination the STA and CON LEDs as follows:

Host to TNC Communication: STA LED illuminated.  
TNC to host Communication: CON LED illuminated.

The most popular use of the KISS mode is running Phil Karn's TCP/IP. Turning KISS ON is not the only command that must be set to enable TCP/IP operation.

The following 3 commands must be entered only if the terminal word length and parity is something other than 8-bits and No parity.

AWLEN 8  
PARITY 0  
RESTART

The next 4 commands must be entered if they have been changed from default.

TRACE OFF  
HID OFF  
BEACON EVERY 0  
PACKET

The next 6 commands must be entered with the HOST ON command entered last.

CONMODE TRANS  
PPERSIST ON  
RAW ON  
HPOLL OFF  
KISS ON  
HOST ON

Other aspects of KISS operation are described in the PK-232 Technical Manual.

---

MFILTER n1[,n2[,n3[,n4]]]  
Mode: Morse, Baudot ASCII, AMTOR and Packet

Mnemonic: MFI

Default: \$80  
HOST: MI

---

Parameters:

'n' - 0 to \$80 (0 to 128 decimal) specifies an ASCII character code.  
Up to four characters may be specified.

---

With the special value of \$80, all characters in the range of \$80 to \$FF as well as the Control characters, except for Carriage-return (\$0D), Linefeed (\$0A), and TAB (\$09) are filtered out.

It is the subtraction of the TAB character from the characters that MFILTER \$80 filters out that has changed from the 25-JUN-87 firmware release.

All other aspects of the MFILTER command are described in Revision-E of the PK-232 Operating Manual.

---

NAVMSG all, none, Yes\No (letters) Mode: NAVTEX	Mnemonic: NAVM	Default: All HOST: NM
--	----------------	--------------------------

---

Parameters:

letters - all, none, YES List, NO List. List of up to 13 letters which may or may not be separated by spaces, commas or TABS.

---

NAVMSG uses Letter arguments to determine which type of NAVTEX messages your PK-232 will print.

NAVTEX messages are grouped into into classes by the second letter in the Preamble. The classifications currently defined are as follows:

- A. Navigational Warnings
- B. Meteorological Warnings (Storm Warnings)
- C. Ice Reports
- D. Search and Rescue Information
- E. Weather Forecasts
- F. Pilot Service Messages
- G. DECCA System Information
- H. LORAN-C System Information
- I. Omega Systems Messages
- J. SATNAV System Messages
- K-Z. Reserved for future use

The NAVMSG Command allows ALL, NONE or a list of up to 13 letters representing message types to be Monitored or Rejected.

The exception to this is that message classes A, B and D CANNOT be excluded and will always be copied if the transmitting station is enabled by NAVSTN.

As an example, let's say that you are not interested in SATNAV or Omega System messages (message classes I and J), you should enter the following command:

NAVMSG NO IJ

This will cause the PK-232 to ignore message classes I and J from all NAVTEX transmitting stations while copying all others.

The letters in the list (I and J in the above example) may be separated by spaces, commas or TABS, although they may be typed in with no spaces as well.

NAVMSG may be cleared with '%' '&' or 'OFF' as arguments.

NAVSTN all, none, Yes\No (letters) Mode: NAVTEX	Mnemonic: NAVS	Default: All HOST: NS
--	----------------	--------------------------

Parameters:

letters - all, none, YES List, NO List. List of up to 13 letters which may or may not be separated by spaces, commas or TABS.

NAVTEX stations are identified by the first letter in the Preamble.

The NAVSTN Command allows ALL, NONE or a list of up to 13 letters representing NAVTEX transmitting stations to be Monitored or Rejected.

As an example, let's say that you are only interested in NAVTEX stations E, G, and C, because they are near you. You should enter the following command:

NAVSTN YES EGC

This will cause the PK-232 to monitor only messages from NAVTEX transmitters C, E, and G and ignore messages from all others.

The letters in the list (E, G, and C in the above example) may be separated by spaces, commas or TABS or typed in with no spaces if desired.

NAVSTN may be cleared with '\*' '&' or 'OFF' as arguments.

NAVTEX Mode: Command	Mnemonic: NA	Immediate Command HOST: NA
-------------------------	--------------	-------------------------------

NAVTEX is an immediate command that switches your PK-232 into the NAVTEX receive mode. Currently, NAVTEX stations are found on 518 KHz.

NAVTEX is a special form of Mode B (FEC) SITOR that does not output data to the computer or printer until "ZCZC" and a preamble are received intact. The preamble consists of 2 letters and 2 numerals. The PK-232 will print until the end of message indicator "NNNN" is received.

The first two letters of the preamble define the transmitting station and the message class respectively. The following two numerals form a serial number that is remembered by the PK-232 when a message is copied intact. The PK-232 remembers the preambles of the last 200 printed messages and will not re-print a message with the same preamble with the following exceptions:

Any preamble with a serial number of 00 is considered an Emergency message and will always be printed. Also, any message with more than 1/8 of its characters received in error, will not be saved so that it may be re-printed. To clear the preamble memory, simply exit and then re-enter NAVTEX mode.

The PK-232 can accept only, or lock-out certain message classes and transmitting stations with the NAVMSG and NAVSTN commands described above.

For logging purposes, NAVTEX mode uses the setting of DAYTIME to print the date and/or time in front of the preamble if MSTAMP and/or DAYSTAMP are ON.



---

PRTYPE "n" Mode: FAX	Mnemonic: PRT	Default: 2 (Epson) HOST: PY
-------------------------	---------------	--------------------------------

---

Parameters:

"n" 0-255, specifying a code for the type of dot graphics sequences used by your printer. At this time, the codes shown below are supported.

---

New values of PRTYPE from 52 to 61 have been added to support additional printers since the 25-JUN-87 version of PK-232 firmware.

PRTYPE 48-51 (Miscellaneous): Supports the HP ThinkJet printer as well.

PRTYPE	Printer	"Enter graphics" sequence
-----	-----	-----
52	Citizen	CHR\$(27) K n1 n2
56	NEC	CHR\$(27) > CHR\$(27) M CHR\$(27) S0960
60	Anadex	CHR\$(28)

The new values of PRTYPE that have been added are as follows:

PRTYPE 52-55: Citizen

Same as PRTYPE 0-3 (Epson), except:

New-line code (7 bits): <ESC> 'A' 7 (no LF)  
New-line code (8 bits): <ESC> 'A' 8 (no LF)

PRTYPE 56-59: NEC

Typical graphics code: <ESC> '>' <ESC> 'M' <ESC> 'S0960'  
New-line code (7 bits): <CR> <ESC> 'T11' <LF>  
New-line code (8 bits): <CR> <ESC> 'T13' <LF>  
Printer reset code: <ESC> 'A' <ESC> ']' <CR> <LF>

GRAPHICS	PRT 56, 58	PRT 57, 59	Code
1	120 dpi	120 dpi	ESC '>' ESC 'M'
3	160 dpi		ESC '>' ESC 'M'
4	80 dpi	80 dpi	ESC '>' ESC 'D'

PRTYPE 60-61: Anadex

Typical graphics code: 28  
New-line code (6 bits): '6'  
Printer reset code: 29 <CR> <LF>

GRAPHICS	PRTYPE 60	PRTYPE 61	Printers
0	60 dpi	60 dpi	DP-9000, DP-9500
5	75 dpi	75 dpi	DP-9001, DP-9501

---

The following Parameter Default Settings have been changed since 25-JUN-87

MPROTO	now ON	was OFF
PERSIST	now 63 (25%)	was 127 (50%)
PPERSIST	now ON	was OFF
RESPTIME	now 5	was 10