ADVANCED ELECTRONIC APPLICATIONS, INC.

PAKRATT ™
MODEL PK-232
Multi-Mode Data Controller

Operating Manual

REVISION G 7/89

PREFACE TO THE PK-232 DATA CONTROLLER

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

RF interference Information To User

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

This equipment generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with AEA's instructions, it may cause interference to radio and TV reception. It has been type-tested and has been found to comply with the limits of a Class B computing device in accordance with the specifications in Subpart J of Part 15 of the FCC rules, which are designed to provide reasonable protection against such interference will not occur in a particular installation. If this equipment does cause interference to radio or TV reception, which can be determined by turning the PK-232 on and off, the user is encouraged to try and correct the interference using one or more of the following measures:

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

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.

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FIFTH ISSUE (JUNE 1987)

Welcome

Congratulations! You've purchased another fine AEA product.

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

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

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

Product Update Policy

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

In Case of Trouble

Application and troubleshooting assistance may be had by calling AEA during our 8:00–12:00, 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 an 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.
> 206 196th St. SW
> Lynnwood, WA 98036
> USA

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

<u>NOTE</u>

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

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

If the PK-232 is still under the original owners warranty, AEA will pay the cost of the return shipment. The current policy is that it will be returned Brown if received Brown or by US Mail; returned Blue if received Blue or by overnight service; or returned as the owner sates 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 typically service the product in two or three days if we have all the facts. If we must call you, it may take longer. PLEASE, if you send it in, include a letter stating the problem and were you can be reached. If you can be reached by phone in the evening on the east coast, let us know where. Our current rate for non-warranty service is $40/hour with a 3/4 hour minimum. Parts and shipping are extra. AEA is not responsible for damage such as caused by lightning, non professional 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 original owner only and is not transferable.

INTRODUCTION

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

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

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

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

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

Join a Packet Club - Sbscribe 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 'going on' in Packet-Radio, and to the TAPR 'Packet Status Register', which describes the technically interesting happenings in the movement. There are many voice nets on VHF and HF; they usually meet weekly. They are usually dedicated to making the newcomer feel at home.

Acknowledgement

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

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. Text and pictures where edited in February 2016 by DC7XJ.

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

BATTERY BACK-UP

NOTE: Your PK-232 uses to 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.

- 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.

- 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 symbol on the holder.

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

1.2   **Scope**

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

1.3   **General**

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

1.3.1   **Application**

Your PK-232 Data Controller is the connection between your radios and computer or terminal. The PK-232 provides all of the decoding, encoding and transmitter control routines needed to send and receive Morse code, Baudot and ASCII RTTY (**R**adio**T**ele**Ty**pewriter), 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 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 Bandpass:	Automatically switched by operating mode.
VHF Packet:	Center frequency 1700 Hz, Bandwidth 2600 Hz
HF (except CW):	Center frequency 2210 Hz, Bandwidth 450 Hz
CW:	Center frequency 800 Hz, bandwidth 200 Hz
Modulator:	Low-distortion AFSK sine wave function generator, phase-continuous AFSK.
Output Level:	5 to 100 millivolts RMS, adjustable by rear-panel control.

1.3.2.3   Processor System

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

1.3.2.4   Input/Output Connections

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

1.3.2.5   Controls and Indicators

Front Panel Controls: Power Switch
                         Radio Selector Switch
                         Threshold Adjust
Indicators: Ten-segment discriminator-type bargraph indicator for HF
                         tuning.
                         DCD LED (**D**ata **C**arrier **D**etect)

Status and Mode Indicators:

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

1.3.2.6   General

Power Requirements: +13 VDC (12 to 16 VDC) at 700 mA
Mechanical: Overall 11" × 8.25" × 2.5" (279.4 × 209.6 × 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 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 (Words per Minute)
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 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-232C (CCITT V.24/V.28) levels.

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

NOTE: In this 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 operation modes, most radios will operate in either AMTOR mode without any modifications. Radio switching times are less critical in Packet-Radio operation. See the AMTOR operating section for further details on timing requirements.

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

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 in-structions 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 back-up;
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 Connection

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 from receiver to PK-232
2	Microphone audio	White	AFSK from PK-232 to 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.

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

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

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.
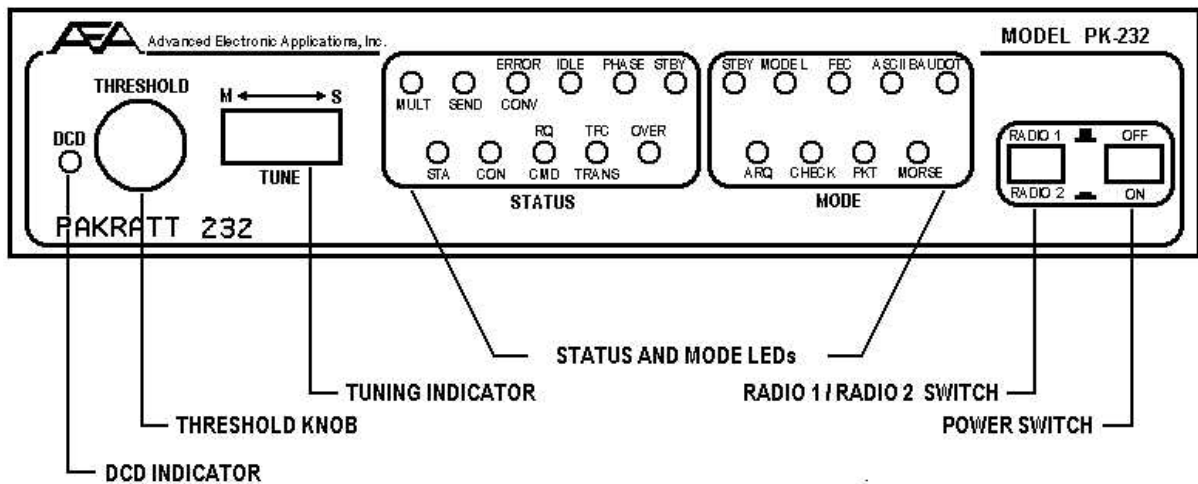
Figure 2-1   PK-232 Front Panel Controls and Indicators
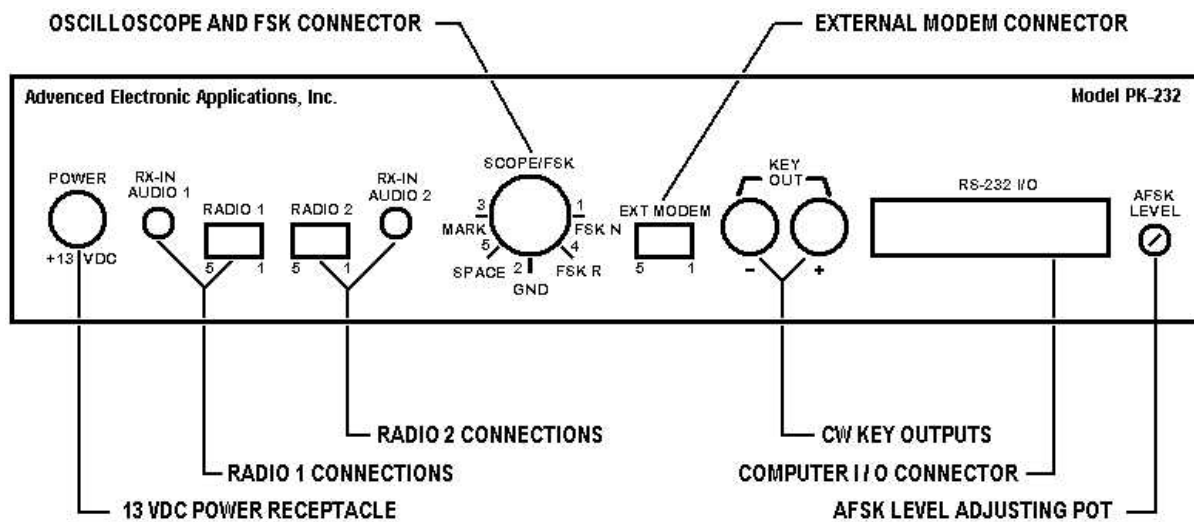
Figure 2-2   PK-232 Rear Panel Connections and Controls

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 RADIO 1 (J4) recepta-
    cle or plug your PK-232-to-microphone jack cable into the RADIO 1 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
    following message:

                Please type a star (*) for auto-baud 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 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 character, followed by a <RETURN>. After a few moments, your monitor should echo the same characters that you've just typed.

13. Type <CTRL-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 <CTRL-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 begin operating.

If you have problems with the steps shown above, return 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.

2.2   **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!

2.2.1   **PTT (Push-to-talk) Configuration**

The PK-232 is configured for positive PTT at the factory so it will operate with most equipment without changes. However, if necessary, you can change the polarity of the PTT configuration on either or both RADIO 1 and RADIO 2 ports. Follow these steps:

o   Remove four screws from the sides and two screws from the rear of the PK-232 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 RADIO 1/RADIO 2 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 this outside pins.
o   Use JMP2 to configure `RADIO 1` port; use JMP3 to configures `RADIO 2` port.

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

2.2.1.1   Positive PTT

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

2.2.1.2   Negative PTT

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

2.2.2   **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.
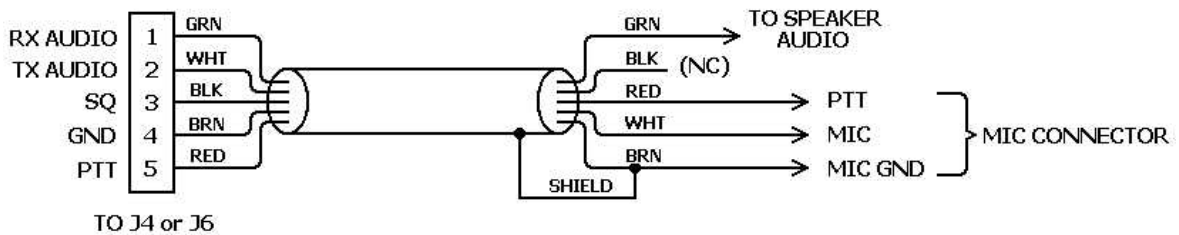
Figure 2-3   Radio-to-PK-232 Connection

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

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 tone generator from 'Mark' (the <u>lower pitched</u> tone) to 'Space' (the <u>higher pitched</u> 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 sending 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 (CCW) 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 OFF, turn the `THRESHOLD` control fully clockwise. Note, that the `DCD` LED is now on.

12.   Slowly turn the `THRESHOLD` control counter-clockwise just until the `DCD` LED goes out.

13.   Turn on the radio and set to the receive mode.

14.   Turn the volume and squelch fully counter-clockwise. Make sure that turning the volume counter clockwise just enough to turn the `DCD` LED OFF.

15.   Look again at the `DCD` LED. If turning on the radio caused the `DCD` LED to light, then turn the threshold counter-clockwise just enough to turn the `DCD` LED OFF.

16.   Slowly turn the volume clockwise until the `DCD` LED lights.

17.   Slowly turn the squelch clockwise until the `DCD` LED just goes out.

(Correction by AEA Service Bulletin July 1989)

2.2.3   **SSB Installation and Adjustment**

Installation and adjustment of your PK-232 with SSB radios is usually 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 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, ASCII RTTY and Node 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 <u>lower pitched</u> tone) to 'SPACE' (the <u>higher pitched</u> tone). The PK-232 has a transmit watch dog timer circuit that unkeys your transmitter automatically after 60 (sixty) 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 the ALC meter shows a small deflection from the unmodulated reading. Check the radio's plate current or output power indicators.

    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 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.

2.2.4   Connections for Direct FSK Operation on RTTY

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. 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 your transceiver's manual to identify the proper polarity.

2.   Connect the FSK lines from the PK-232 to your radio's FSK input in accordance with your radio's requirements. See Figure 2-4 below.
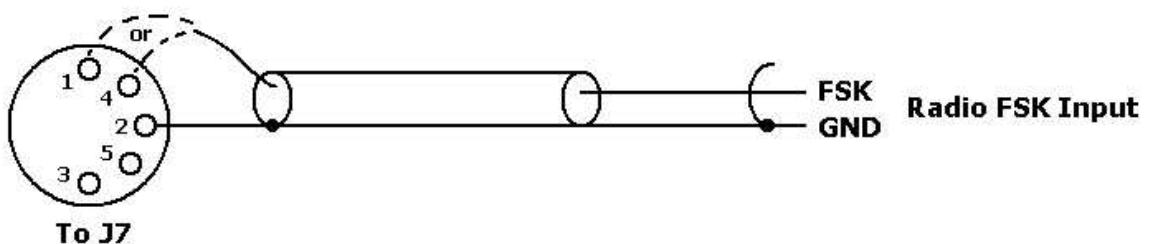
Figure 2-4   Connector J7 FSK Connections

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 opera-tion. Some radios provide lower output power when in FSK mode. Consult your radio's operating manual.

2.2.5   **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.

2.2.5.1   DC Keying

If you choose the DC keying method, consult your radio's instruction manual to deter-mine 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 will key the radio in Morse without requiring any additional wiring.

2.2.5.2   AFSK CW Keying

If you choose the audio keying method, you'll use the same cables and connections to the microphone input circuits previously described 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 will key the PTT line and send a keyed single audio tone to the radio's microphone input.

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

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

2.2.6   **Oscilloscope Connections**

You can use an ordinary oscilloscope as a tuning indicator to obtain an accurate 'X-Y tun-ing 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 `SCOPE/FSK` connector.

o   Connect the oscilloscope ground to Pin 2 of `SCOPE/FSK` .
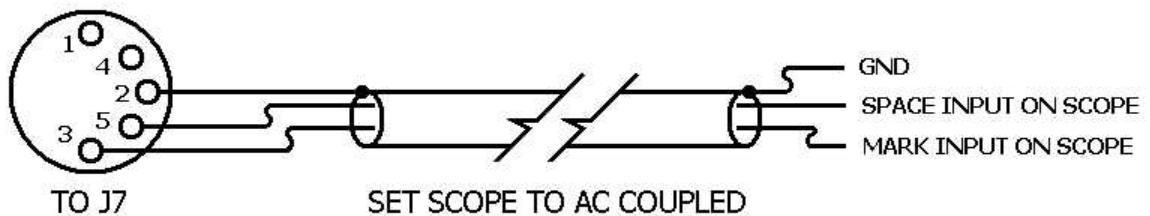
Figure 2-5   Connector J7 Tuning Scope Connections

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

2.3   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:

2.3.1   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 RE-
TURN key on your keyboard. You can type in either upper or lower case - it doesn't mat-
ter here. For example:

    cmd:my dc7xj
    MYCALL   was AAA
    MYCALL   now DC7XJ

2.3.2   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 dcxj
    MYSELCAL   was
    MYSELCAL   now DCXJ

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.

2.4   **Commands and Displays**

Type the command word display. Your screen will show:

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

2.4.1   **Display Complete Command List**

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

The *DISPLAY Z* command shows the complete command list and the ROM default values installed at time of manufacture, assigned to those parameters that take values. The default 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.

2.4.2   **Display Partial Command Lists**

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

        A   Asynchronous port parameters
        C   Special characters
        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.

2.4.3   **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**	PK-232 flow control - Transparent
XFLOW	**ON**	Software flow control

2.4.4 Display Special Characters

cmd: disp c

BKONDEL	**ON**	Send <BS> <SP> <BS> for DELETE character
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 'send time' in text
XOFF	**$13 CTRL-S**	Stop sending data to terminal
XON	**$11 CTRL-Q**	Resume sending data to terminal

2.4.5 Display Facsimile Parameters

cmd: dips 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

2.4.6 Display Identification Parameters

cmd: disp i

UNPROTO	**CQ**	Path/adress to send UI frames
AAB	**PK-232**	0 - 17 character answerback (WRU?)
BEACON	**EVERY 0**	Set beacon timing (×10 seconds)
BTEXT	**(empty)**	120-byte BEACON message text
CBELL	**OFF**	Connect bell
CMSG	**OFF**	Send CTEXT message to caller
CTEXT	**AEA PK-232**	120-byte CONNECT message text
HID	**OFF**	Send ID UI packet every 9.5 mins
MYALIAS	**none**	Alternate MYCALL

MYCALL	**PK232**	Your call sign for packet address
MYSELCAL	**(empty)**	Your AMTOR SELCAL
MYALTCAL	**(empty)**	Alternate AMTOR SELCAL
WRU	**OFF**	Turn on answerback

2.4.7 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	**OFF**	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
PACLEN	**128**	# of user-typed bytes in Packet
PASSALL	**OFF**	Ignore CRC in HDLC ('Junk 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

2.4.8 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**	Monitor while connect (0-6)
MDIGI	**OFF**	Monitor digipeated frame
MFILTER	**$07, $13**	Filter received characters
MFROM	**all**	Don't monitor MFROM call signs
MONITOR	**4**	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

2.4.9   Display Morse/RTTY/AMTOR Parameters

cmd:disp r

ABAUD	110	ASCII baud rate
ACRRTTY	71	Auto <CR> column in RTTY
ADELAY	4	AMTOR transmit delay (×10 ms)
ALFRTTY	ON	Send <LF> after <CR>, RTTY
ARQTMO	90	AMTOR ARQ SELCAL timeout in secs.
BITINV	$00	Baudot Bit inversion mask (SIAM)
CCITT	ON	Select CCITT ITA #2 or US Baudot
CODE	0	Recognized 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 transmitter data sense
USOS	OFF	RTTY 'Unshift On Space'
WIDESHIFT	OFF	RTTY - wide or narrow shift
WORDOUT	OFF	RTTY - word or character output

2.4.10   Display Timing Parameters

cmd:disp t

AXDELAY	0	Repeater key-up delay (×10 ms)
AXHANG	0	Repeater hang time (×10 ms)
CHECK	30	Idle link timeout (×10 seconds)
CMDTIME	1	Transparent Mode escape timer
CPACTIME	OFF	Use Packet timeout in Converse
DWAIT	16	Delay for digi repeat (× 10 ms)
FRACK	3	Time (×1 sec) to wait for ACK
PACTIME	AFTER 10	Packet transmit timer (×100 ms)
PERSIST	127	Ppersistance random number threshold
PPERSIST	OFF	Ppersistance CSMA
RESPTIME	10 (1000 msec.)	Minimum delay before sending ACK
SLOTTIME	10 (100 msec.)	Ppersistant time interval setting
TXDELAY	30 (300 msec.)	PTT key-to-data delay (×10 ms)

2.5   **Immediate Commands**

The 'immediate' commands do not have default values.

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

NOTE: Like all other PK-232 commands, the immediate commands can be typed 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 ARQ standby
ARQ	Start AMTOR ARQ call (SELCAL)
ASCII	Start ASCII RTTY mode
BAUDOT	Start Baudot RTTY mode
CALIBRAT	Start calibrate mode
CONNECT	Send connect request to <call>
CONVERSE	Start Converse Mode from Command
CSTATUS	Show status of channels (links)
DISCONNE	Send DISC to distant station
DISPLAY	Show PK-232 parameters/classes
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)
MHEARD	Display call signs heard
LOCK	Morse receive speed lock
MHEARD	Display call signs heard
MORSE	Start Morse Mode
OPMODE	Display current operating mode
PACKET	Start Packet Mode
RCVE	Switch to receive, Morse/RTTY/AMTOR
RESET	RESET bbRAM to factory defaults
RESTART	Same as power-on/off reset
SELFEC	Start AMTOR Selective FEC call (SELCAL)
TCLEAR	Non-Packet clear Transmit Buffer
TRANS	Start Transparent Data Mode
XMIT	Start transmission - key PTT

2.6   **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 II series, the IBM PC (and many compatibles), the Tandy 1000, 1200 and 3000-series computers and the Sanyo MBC-55X series. If you are 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.

2.6.1   **Available Serial Interfaces**

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

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

2.6.2   **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.

2.6.3   **Commodore 64, 64C, 128, Vic 20**

Although you can use almost any terminal program with your computer. AEA now sells the *Com Pakratt* ™ 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 states indication. See your AEA dealer if you are interested in this program.

Commodore and either 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 working of your computer, you should purchase a level converter rather than trying to 'do it yourself'.

2.6.4 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 "IBMjr 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.

2.6.5 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
```

2.6.6 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.

2.6.7 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 you computer is configured as DCE:
       Wire pin 2 of the PK-232 to pin 3 of the computer connector. Wire pin 3 of the PK-232 to pin 2 of the computer and 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 pin 4 and 6 as indicated below:

```
PK-232          COMPUTER

    2 ....................... 2
    3 ....................... 3
    7 ....................... 7

              : ....... 4
              : ....... 5

              : ....... 6
              : ....... 8
              : ....... 20
```

2.6.8   Other Computers with Non-Standard Serial Ports

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

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 V in one state and less than 0 V 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 specifications.

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 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.

2.7   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.

2.7.1   **Apple Macintosh**

Apple dealers sell a communication 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.

2.7.2   **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*.

2.7.3   **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.

2.7.4   **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.

2.7.5   **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.

2.7.6   **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.

2.7.7   **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* ™ 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 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, PROCOMM, BITCOM, QMODEM, PC-TALK, CTERM, HAMCOM, PACKCOM, PACKTALK, HAMPAC and YAPP.

2.8   Packet Bulletin Board Program Compatibility

The PK-232 is used successfully with PBBS (Packet Bulletin Board) program written for the PC/MS-DOS computers by W0RLI and VE3GYQ, WA7MBL and KA2BQE.

Please contact 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 <u>connect status</u>. *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, describes the keyboard commands you'll use to 'talk' to your PK-232, and the answers, prompts and error messages you'll receive from your PK-232.

3.2   LED STATUS and Mode Indicators

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

3.2.1   Status Indicator LEDs

ERROR	ARQ Error	Lit when system receives errors from the distant station. 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 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 noise, 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   **LED at System Start**

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

STATUS: `CMD` lit

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

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

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

Noise or no signal   FSK or Packet during keying

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 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.

o   See Chapter 4 for a discussion of line editing.

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

3.3.2   **Command Responses**

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

XFLOW OFF

and XFLOW was ON you'll see the display

> **XFLOW was ON**

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

3.3.3   Error Messages

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

o   If you type an unrecognized command:
> **?What?**

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

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

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

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

Here are a few more examples:

cmd: ASDFASDF
?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 not valid for the mode in use.

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

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

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

3.3.4   **Command Names**

The command name is the full word you can type to tell your PK-232 to execute this com-
mand. 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 com-
mand word, or any abbreviation longer than the minimum abbreviation. For example:

o   The command *MYCALL* can be entered by simply typing MY.

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

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

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

3.3.5   **Default Values**

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

3.3.6   **Parameters, Arguments and Values**

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

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

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

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

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

Some commands such as CONNECT have optional parameters.

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

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

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

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

o   **Boolean Parameters**

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

o   **Numeric Parameters**

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

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

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

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

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

o   **Text or String Parameters**

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

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

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

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

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

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

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

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

Some examples will help you understand these explanations.

o   BEACON 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 × 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

3.3.7   Using Commands Without Arguments

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

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

        cmd:MDIGI   Command with no argument
        MDIGI ON   Displays the present value

NOTE: The *DISPLAY* command shows you the values of all parameters or groups a 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 the 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 *RE-SET* 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 trough you are in Command Mode. If this happens, type the redisplay-line character (set by the *REDISPLA* command) to retype the prompt.

?What?

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

was

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

3.3.8.2   Command Mode Error Messages

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

?bad

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

?VIA

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

?callsign

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

?clock not set

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

?not enough

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

?need ALL/NONE/YES/NO

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

?too many

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

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

?too long

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

?not while connected

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

?range

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

too many packets outstanding

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

3.3.8.3   **Link Status Messages**

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

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

The following messages appear in response to the *CONNECT* command.

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

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

o **Link state is: DISCONNECTED**

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

o **Link state is: DISCONNECT in progress**

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

o **Link state: 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.

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. You 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 xx xx xx is replaced with the hex codes for the three bytes sent in the information part of the FRMR frame. This message will not appear if your PK-232 is in Transparent Mode.

o **FRMR rcvd: xx xx xx**

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

3.3.9   Special Keyboard Control Codes

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

3.3.9.1   Morse Code

From Command Mode:

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

3.3.9.2   Packet Mode

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

3.3.9.3   **Baudot and ASCII RTTY**

In Baudot RTTY:
From Command Mode:

L	Forces LETTERS case
R	Switches system to receive mode, forces LETTERS case.
X	Switches system to transmit mode.
K	Enters Converse mode to preload Transmit buffer (Type Ahead)

Embedded in transmitted text:

\<CTRL-O\>	Sends LETTERS character.
\<CTRL-N\>	Sends FIGURES 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 Mode**

From Command Mode:

L	Forces LETTERS case.
R	Stops transmission in progress, forces AMTOR Standby.
AM	Stops transmission in progress, forces AMTOR Standby.
AL	In ALIST (AMTOR mode A Listen), forces re-synchronization.
ARQ	The 'ARQ /SELCAL)' and 'FEC' commands force immediate entry and end of phasing at the start of an FEC transmission.
K	Enter Converse Mode to preload Transmit buffer.

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, 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 <u>not</u> 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 and 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 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 and returns to Command Mode.

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

3.4.1.6   Wide Shift (*WIDESHFT*)

Use the *WIDESHFT* command to select wide (1000 Hz) or narrow (200 Hz) shifts. MARS Stations will find *WIDESHFT* generally compatible with 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<CR> to select 1000-Hz shift. The PK-232 will respond with:

```
Wideshft    was OFF
Wideshift   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) and then turn your transmitter off and return to the receive status.

Note: The <CR><LF> sequence is created by the PK-232 – don't type it as part of your answerback text.

3.4.1.8   WRU? (Who Are You)

Use the WRU? feature in Baudot and AMTOR to enable or disable your PK-232's auto-

matic 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 turns your transmitter off and returns to receive status.

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

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

3.4.2   **Formatting Commands**

These commands affect transmitted or displayed signals, or both.

3.4.2.1   Screen Line Length (*ACRDISP n*)

The *ACRDISP* command (default 80) formats your computer's screen display. A <CR> <LF> sequence is sent to your computer at the end of a line when *n* characters have been displayed. If your computer automatically formats output lines, set *ACRDISP* to 0 (zero) 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, ASCII RTTY and AMTOR, the *WORDOUT* command permits you to toggle between two different ways of outputting your hand-typed characters. If *WORDOUT* is set ON, you have a limited form of editing of your typing errors.

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

o   If *WORDOUT* is ON: nothing will be sent until you type a <SPACE> character (space bar), a <RETURN> or any punctuation mark 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 send with a carriage return.

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

3.4.2.5   Carriage Return <CTRL-M>

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

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

3.4.2.6   Automatic Carriage Return (*ACRRTTY n*)

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

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' sends double or triple line feeds which look very strange to the distant station.

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

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

3.4.2.7   Automatic Line Feed (*ALFRTTY*)

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

3.4.2.8   Backspace and Delete <DEL>

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

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

3.4.2.9   Escape Functions <ESC>

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

This option is provided because some terminals and computer terminal emulator programs may interpret the ESCAPE character as a special 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 but Packet. *EAS* permits you to choose the type of data displayed on your screen or printer.

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

When *EAS* is ON when operating Morse, Baudot and AMTOR, only UPPER CASE characters appear on your screen, representing the data sent to the distant station. Each character appaers 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 <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 Return – *ACRDSIP, 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 insert 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 CR 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 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 on Baudot, ASCII and AMTOR.

o   *ALFRATTY* 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 *ACRRTTY*.

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-TNC2 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

CHAPTER 4 – OPERATING MODES

4.1   General Information

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

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

4.1.1   Morse Code

Morse 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 operation 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 are 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 opens 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 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 that requires a more complete character set than that provided by older, less sophisticated Baudot code. The ASCII code is generally suitable for any form of data transfer and is <u>required</u> 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, 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 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 WIDESHIFT OFF followed by a <RETURN>. The PK-232 responds with the previous mode:

        WIDESHIFT was OFF   (or ON, if you had previously set it on)
        WIDESHIFT now OFF

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

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

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-Hz 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 features monitors and speed of the received signal.

o   Use the *L* command from the 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 the 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<RETURN> from the Command Mode.

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

o   To end a CW transmission and return to the receiving 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 your 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 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 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>   Shut off transmitter immediately and go to 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 <u>transmit</u> speed and replaces the value previously stored in the program. The slowest available Morse speed is 5 words per minute. A numbers 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 this way. To unlock the speed, type R or MO, followed by a <RETURN>.

4.2.4 **Special Morse Characters**

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

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

4.2.5 **Morse Code Practice**

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

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

4.3 **Baudot RTTY Operation**

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

```
OPMODE     was MORSE
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.

o   Type K to enter the Converse Mode and begin the contact.

o   Type <CTRL-D> to shut off your transmitter and return to the Command Mode, or

o   type <CTRL-F> to send your callsign 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 passband 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.

Turn your radio to 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 toggels 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 N7BIT). You can start the transmission with a line of RYs as a tuning signal for the distant station. Here's a typical callup sequence:

RYRYRYRYRYRYRYRYRYRYRYRYRYR
KZ7G KZ7G KZ7G DE N7BIT N7BIT N7BIT
KZ7G KZ7G KZ7G DE N7BIT N7BIT N7BIT
KZ7G KZ7G KZ7G DE N7BIT N7BIT N7BIT
<CTRL-D><RETURN>

(If the other station can't copy these four lines of text, the chances are he won't copy any more of 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 of 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 turns 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.

Embedded in transmitted text:

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

The PK-232 provides RTTY operation in the Baudot/Murray code at 45, 50, 57, 75, 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 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 and replaces the value previously stored in the program.

o   RB *n* can be any of the following speed options: 45, 50, 57, 75, 100, 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 <u>baud rates</u>. 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 the 'space' character is received.

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

USOS helps reduce reception errors under these conditions. However, be aware that some commercial, weather and utility RTTY services send consecutive groups of numbers separated by spaces.

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 RTTY mode. The PK-232 will respond 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 the Command Mode, or
o   type <CTRL-F> to send your callsign 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.

4.4.1 **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 procedure 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>   Shut off transmitter immediately.
<CTRL-F>   Send 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.

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.

o   AB *n* can be any of the following speed options: 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 in most word processors.

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

Table 4-1   ASCII Codes for Control Characters

4.5   **AMTOR Operation**

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

```
OPMODE    was ASCII
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 transmission 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 transmission 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 AMTOR operation at any other speed.

4.5.3   **SELCAL (Selective Sequential Calling)**

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

The convention originated by the early European AMTOR pioneers, and later adopted by amateurs around the world, was broadly based on the 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	GROUP	CALL	SELCAL
1 by 2	W1AB	WWAB	2 by 1	AB1Z	AABZ
1 by 3	W1ABC	WABC	2 by 2	AB1YZ	ABYZ
			2 by 3	KA1XYZ	KXYZ

For '1 by 2' call signs, the first letter is doubled, e.g., '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 will respond with:

        MYSELCAL was

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

Type MYS to confirm your SELCAL is properly loaded:

        cmd: mys

The PK-232 will respond with:

        MYSELCAL NNML

4.5.3.2   Prevent Duplicate SELCALs

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

Let's assume that your call sign is N7ML. You discover that there is another station with the call 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 the AMTOR selective calling sequence or answer a Mode B (FEC) CQ call from a distant station.

Type <CR> after you've typed the fourth letter (a valid SELCAL must have <u>four</u> characters) – your transmitter will be keyed on and off in the typical ARQ three-character burst sequence. After your PK-232 has locked or synchronized with the distant station, type K to enter the Converse Mode and begin your conversation.

4.5.4.1   LED Status and Mode Indicators

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

STATUS: `STBY` lit
MODE: `STBY` lit

Type ARQ {SELCAL of distant station}. The LEDs change to:

STATUS: `SEND` lit, PHASE lit
MODE: `ARQ` lit

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

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

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

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

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

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

`ERROR` lit: Your PK-232 has detected errors in the signals received from the distant station
`RQ` lit: Your PK-232 has received a 'request for repeat' code from the distant station

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

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

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 <u>immediately followed</u> by a question mark (+?)

+? is a software changeover command that switches <u>your</u> system from 'Information Sending Station' (ISS) to 'Information Receiving Station' (IRS) and switches the <u>distant</u> system from 'Information Receiving Station' receive to 'Information Sending Station'. Your distant partner will see the *+?* and begin typing comments or traffic.

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

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

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

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

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

ACHG is a software command that forces both systems to reverse the 'Information Receiving' and 'Information Sending' status at both ends of the ARQ link. As the 'Information Receiving Station', you normally rely on the distant station to send the *+?* command to do the changeover at the end of his comments.

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) Connect, Return to AMTOR Standby

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

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

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

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

Your PK-232 switches in 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.

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 <u>immediately</u>.

4.5.5   ARQ Listen Mode – Start Monitoring (*ALIST* Command)

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

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

If the stations you're monitoring are sending error codes and RQ codes and repeating blocks of characters across their link, you 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 <u>you</u> receive an error. If they're having link problems, the data on <u>your</u> 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 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 <u>no</u> effect in FEC operation.

4.5.6.3   <u>End the Mode B (FEC) Contact, Return to ARQ Standby</u>

You can end the FEC contact in several different ways:

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

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

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

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

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

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 our keyboard, you will see them echoed on your screen only <u>after</u> the distant station, partner in the AMTOR link, has validated (Ack'd) your block of three characters.

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

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

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

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

NOTE: 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 the 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.

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   <u>Don't use VOX control</u> – 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 telephone (see front of this manual) for further helpful suggestions.

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

4.6   **Packet-Radio Operation**

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

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

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

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

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

>   **OPMODE   was** (whatever mode you were in)
>   **OPMODE   now PACKET**

4.6.1   **Change Radio Link Data Rate**

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

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

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

>   **HBAUD   1200**

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

>   HBAUD 300<RETURN>

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

```
HBAUD    was 1200
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 or HB D respectively. The PK-232 returns the previous data rate and adopts the new rate.

4.6.2 **Station Identification**

You must use the *MYCALL* command to install your 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 'PK-232'. 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 automatic ID packet every 9½ minutes when your station is operating as a digipeater. You can tune this feature on with the command *HID ON*. ID packets are displayed like this:

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

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

4.6.3   Set Up Loopback Test Circuit

Do these steps in the exact order shown:

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

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

4.6.4   'Connect' and 'Disconnect'

Packet-Radio contacts begin with a connect process that sets up the 'handshaking' between the two stations to insure error-free communications. Contacts or 'connections' are ended by a disconnect process that leaves both stations free to start new contacts.

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

4.6.5   LED Status and Mode Indicators

Your PK-232's front-panel LEDs show you the operating mode and system status at any moment. Each LED is marked with an abbreviated name. Some LEDs have two name markings. All markings referring to Packet Operation are below the LEDs.

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

4.6.5.1   LEDs at System Start or RESET

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

STATUS: CMD lit
MODE: PKT lit

4.6.6   System Quick-Check – Loopback Test Connection

Try this using your own call sign. Type CONNECT {MYCALL}.

> **cmd:** CONNECT {MYCALL}
> ***** CONNECTED to {MYCALL}**

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

4.6.6.2   Send Packet Character

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

Your PK-232 automatically entered Converse Mode when the connection was established. You can also command the PK-232 to move back and forth between Command Mode 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 DISCONNE (or D) to terminate the link or connection. Your PK-232 transmits a special packet that ends the contact and notifies you when the link is disconnected:

cmd:DISCONNE
*** DISCONNECTED: {call sign}

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

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

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

4.6.7   **Your First Packet QSO**

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

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

4.6.7.1   System Cable and Switch Check

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

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

4.6.7.2   Starting the QSO

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

*** CONNECTED to WX6FFF

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

*** CONNECTED to WX2BBB

Exchange several messages to get the feel of Packet-Radio. Watch your radio's transmit indicators and if possible, listen to the audio from both radios; you'll get a better idea of what's happening. Your radio is inactive the 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 'brrrrraaaap' on this 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 then '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, you 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 <u>must</u> see the **cmd:** prompt.)
o   If the **cmd:** prompt doesn't appear, press the PK-232's POWER switch off and 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   *CFROM* is set to *ALL*.
o   Move to an <u>unused</u> channel for 'on-the-air' testing (simplex FM!).

Ask one of your area's more experienced Packet operators to listen 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 longer 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* commend.
o   Set the beacon timing interval using the *BEACON EVERY* or *BEACON AFTER* command.

For example, to transmit your beacon at 15-minute (15 × 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 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 the beacons have outlived their usefulness and may be a source of interference to good traffic flow. Use your beacon with consideration for other on the channel.

If you set the BEACON timing at a value considered to small for busy channels (less then '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 it 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 <u>accepts</u> connect requests from <u>any</u> callers;
o   NONE – your PK-232 <u>rejects</u> connect requests from <u>all</u> callers.

'ALL' and 'NONE' work with a list of call signs:

o   ALL – your PK-232 <u>accept</u> connect requests from <u>any</u> caller.
o   NONE – your PK-232 <u>rejects</u> connect requests from <u>all</u> callers.

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

o   YES (list) – up to eight call signs whose call requests are to be <u>accepted</u>;
o   NO (list) – up to eight call signs whose call requests are to be <u>rejected</u>.

CFROM's default argument is 'all'. When *CFROM* is set to ALL your PK-232 will normally <u>accept</u> 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 <u>accept</u> or <u>reject</u> call requests from specific stations.

To <u>accept</u> calls from one or more specific stations:

o   Type CFROM YES (plus a list of call signs). Connect requests are <u>accepted</u> 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 <u>rejected</u> from the listed stations.

Type CFROM to display 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
or
   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

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 message you might put in a telephone answering-machine. If you're not available to answer connect requests, your PK-232 automatically sends the *CTEXT* message to each station that connects to your system.

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

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

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

4.6.8.4   Do You Want to Transmit?

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

   Type XMITOK OFF
   Type CFROM NONE

4.6.9   **Digipeater Details**

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

```
                    WX2BBB
                    /    \
        WX1AAA____ /      \____WX3CCC
```
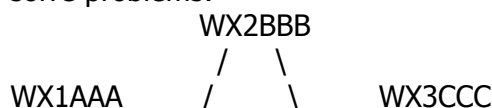
You are station WX1AAA – you want to have a Packet QSO with WX3CCC. But there's a mountain between you and WX3CCC; you're out of simplex range each other. However, you know that there's a Packet station located on the ridge – WX2BBB – which is in range of you and W3CCC.

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:

```
                    ___
                   /   \
    WX1AAA_____/     \_____WX3CCC
          .                        .
          .                        .
    WX4DDD . . . . . . . . . . . WX5EEE
```
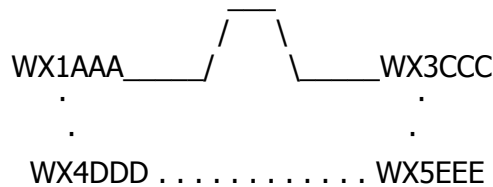
WX2BBB has turned off his station, but you can still contact WX3CCC by going around the mountain through WX4DDD and WX5EEE. This time, type the connect command like this:

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 anything – your PK-232 digipeats other stations – <u>unless you tell it not to do!</u> (See the *DFROM* command in the Command Summary.)

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

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

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

```
W2HPM*>W2JUP-2>W2PEE: What time is the meeting?
W2PEE*>W2JUP-2>w2HPM <RR>
```

4.6.9.2   Do You want to be a Digipeater?

Many packeteers allow (and even 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 is ALL. this means that your PK-232 will normally repeat packets from any station that includes your station's call sign in their digipeat path.

Type DFROM NONE if you <u>don't</u> want to be used as a digipeater.

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

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

ALL and NONE are used alone and work this way:

o   ALL   – your PK-232 <u>will</u> repeat packets from any station;
o   NONE – your PK-232 <u>will not</u> repeat packets from any station.

YES and NO work with a list of call signs:

o   YES (list) – call signs of up to eight stations whose packets <u>will be repeated</u>;
o   NO (list) – call signs of up to eight stations whose packets <u>will be not repeated</u>.

To repeat packets from one or more specific stations:

o   type DFROM YES (plus a list of call 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 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,W3CCC,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

4.6.10   Unsuccessful Connections and Retries

Sometimes your connect request can't be completed; the desired station may not be an 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 show:

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

4.6.10.1   Retries While Connect

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

Sometimes a packet won't be received correctly by the other station, because of collisions with Packet signals from other stations, or because of channel noise. If your PK-

232 doesn't get an ACK within a specific time, it sends the same packet again and increments the retry count. If the count set by *RETRY* is exceeded, your PK-232 disconnects and displays:

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

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

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

4.6.11 Monitoring Activity on the Channel

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

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 includes in the monitoring sequences.

The meaning of the *MONITOR* numbers are:

0   Monitor is disabled.

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

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

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

4   <u>This is your PK-232's default value</u>. 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 are also displayed.

6   Poll/Final bit and sequence number 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 rout 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 sending HEADERLN ON:

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

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.
You 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 interrupt-

ing and confusion caused by the mixture of everyone else's packets and those of your partner.

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

4.6.12 Selective Monitoring

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

4.6.12.1   The *MFROM* Command

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

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

Type MFROM to display the ALL/NONE/YES_list/NO_list status of call signs of stations <u>from</u> 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 <u>from</u> one or more specific stations <u>only</u>, type MFROM YES (followed by a list of call signs). Only packets from stations whose call signs are listed after *YES* <u>will be displayed</u>.

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 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

*M*TO determine how your PK-232 monitors the Packet channels and displays informa-
tion – 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 packets will or will not be displayed. You can use the abbreviated command form
or mnemonic:

cmd: mto
MFROM   all

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

To stop packets addressed to all stations from being displayed, type MTO NONE.

To display only packets addressed to one or more specific stations, type MTO YES (fol-
lowed by a list of call signs). Only packets addresses 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 (fol-
lowed 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 <u>while connected</u> to a distant station. Use this feature to have your PK-232 'listen' for a specific station while you are connected to and conversing with someone else.

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

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

4.6.12.4   The *MFILTER* Command

Use the *MFILTER* command to 'filter' selected characters from packets received. For example, you can command your PK-232 system to filter out form feeds, bell characters or extra <LF> 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 code in hex or decimal. Some examples follow:

o   To prevent a <CTRL-L> character from clearing your screen, set *MFILTER* to *12*.
o   To eliminate <CTRL-Z> characters, which some computer interpret as end-of-file markers, set *MFILTER* to *26*.
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 to 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* an *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–86 06:57:33

The format for entering the date and time is 'yymmddhhmm', where:

>   yy is the last two digits of the year (00-99)
>   mm is the two-digit month code (01-12)
>   dd is the date (01-31)
>   hh is the hour (00-23)
>   mm is the minutes after the hour (00-59)

Example: **cmd:** daytime 8607080657

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 these formatting and control features and commands.

4.6.13.1   *PACLEN* – Long or Short?

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

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

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

4.6.13.2   Backspace and Delete

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

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

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

4.6.13.3   Cancel Line

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

Type <CTRL-X> to cancel the line. If you're in Command Mode, a new prompt appears:
    cmd:Hi, John, how are you?<CTRL-X>\
            [You started typing text while in Command Mode.]

cmd:CONVERSE
Hi, John, how are you?

4.6.13.4   Redisplay

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

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

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

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

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

4.6.13.6   The PASS Character

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

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

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

4.6.13.7   More Carriage Returns an 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 the lines are overprinted on his display and he can't change it at his end, set *ALFPACK* to *ON*.

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

4.6.14   **Multiple Connections**

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

o   Multiple connects work with 'logical 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 <u>don't</u> affect your radio's performance. Use your radio equipment normally on only <u>one</u> radio channel.

A multiple connection 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 <u>you change the values</u>, 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-Connect Active – The USERS Command

The *USERS* command affects only incoming connect requests and has no effect on the number of connections you <u>initiate</u> 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 connections that can be established with you 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 specifies an ASCII character.

o   *CHSWITCH* characters <u>must not</u> 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 any hexadecimal value from $80 to $FF, for any character that you won't normally use. You can switch 'logical channels' in a multiple-connect situation by typing the *CHSWITCH* character even when in Converse Mode.

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

4.6.14.4   Display Multiple-Connect Call Signs – The CHCALL Command

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

Set *CHCALL* ON if you intend to operate multiple connections.

4.6.14.5   Display Doubled Characters – The CHDOUBLE Command

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

Set *CHDOUBLE ON* when operating with multi connections to tell the difference 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 the 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 A1 class operator, the PK-232 thinks you have given the command 'to switch to channel 1'.

o   The CHSWITH 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 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 USER 10.

o   Assume you want to connect to WX1AAA and WX2BBB. From Command Mode type:

         =0 CONNECT WX1AAA
                and
         =1 CONNECT WX2BB

o   After you're are 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 WZ2BBB, do the same thing for <u>his</u> channel:

         =1 Hello Bert.

o   To disconnect from WX1AAA, type:

         <CZTL-C>=0**D**ISCONNECT

4.6.15.1   The CSTATUS Command

CSTATUS is an immediate command that shows you the status of all 10 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:

    `KZ7ON7BTI <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 <u>his</u> 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 <u>nothing</u>. 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 <u>receiving</u> 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 acknowl-
edge 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 num-
ber that teils N7BTI's system exactly what frame it expects to see next. KZ7G's system
would send:

    KZ7G>N7BT1 <RJ, 3>

This teils 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 teils 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:

    KZ7G>N7BTI <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 acknowl-
edgment 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 ***** DISCON-
NECTED: 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 *UN-
PROTO* 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.

CHAPTER 5 – ADVANCED PACKET OPERATION

5.1. **Introduction**

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

o   A Packet bulletin board system (PBBS)
o   Binary file transfer
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 value 10 trough 15 are represented by the letters A trough F. The let-
ters can be typed in upper or lower case. For example:

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

5.2. **Operation Modes**

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

5.2.1. **Command Mode**

Command Mode provides the communication or dialogue between your keyboard and
your PK-232; nothing goes to the 'outside world'. You must use Command Mode to enter
commands which alter the PK-232's operating parameters. When your PK-232 is in Com-
mand 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 pa-
rameters with values stored in RAM.

After the *RESET* command is issued all operating parameters are reset to the default val-
ues 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 Command Mode. See
the detailed descriptions of these commands "Command Summary" Chapter.

COMMAND   DESCRIPTION

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

5.2.1.2.   Display Control in Command Mode

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

COMMAND   DESCRIPTION

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

5.3.   **Flow Control**

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

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

5.3.1.   **Type-in Flow Control**

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

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

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

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

Your PK-232 provides two methods of flow control:

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

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

Some commonly used file transfer and terminal programs for home 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 to 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. <u>XON/XOFF (Software) Flow Control</u>

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

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

XON/XOFF flow control is normally disabled in Transparent Mode; all characters are treated as data. If DTR/RTS flow control is not available, set TXFLOW ON and XFLOW ON to activate the XON and XOFF characters (the command 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 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 acknowledgement (ACK) and displays the ***** CONNECT to {call sign}** message. Your PK-232 always switches to the data transfer mode at the moment of connection unless *NOMODE* is set ON.

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

5.4.1. **Converse Mode**

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

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

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

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

5.4.1.1. _SENDPAC_ Character

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

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

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

o   Set _ACRPACK_ ON to send the <CR>.

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

5.4.1.2. _CANPAC_ Character

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

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

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

5.4.1.3.   Special Characters in Converse Mode

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

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

5.4.1.4.   Display Features in Converse Mode

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

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

5.4.2.   **Transparent Mode**

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

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

Use the Transparent Mode to transfer these type of files.

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

5.4.2.1.   Input Editing and Packet Timing

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

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

5.4.2.2.   Display Features in Transparent Mode

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

The parameter controlling these latter features in the Command and Converse Mode are not changed on entry into Transparent Mode; all display features are re-established 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 the AEA's Technical Manual for your PK-232.

5.5.1. ***AX25L2V2* – ON or OFF?**

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

o   Set *AX25L2V2 ON* to operate in Version 2.0.
o   Set *AX25L2V2 OFF* to operate in Version 1.0.

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

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

5.5.2.   *UNPROTO* Who?

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

> **cmd:** UNPROTO QST VIA NK6K

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

> **{MYCALL}>QST**

The default address for unconnected packets is CQ.

5.5.3.   *PASSALL* – The 'Junque Mode'

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

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

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

5.5.4.   Packet Timing Functions

Your PK-232 obeys a series of timing instructions built in to the 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 <u>both</u> 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 over-come squelch/AGC rise-time characteristics.
o   Transmitter and receiver phase-lock loop settling times at both ends of the link.

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

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

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

5.5.4.2.   *AXDELAY* and *AXHANG*

When sending packets through an audio repeater you may require a longer key-up de-lay 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 repea-ter receiver and transmitter have time to lock up.
o   The *AXHANG* command sets the time your PK-232 assumes is needed for the re-peater to drop.

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

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

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

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

Key-up delay = *TXDELAY* × 10 milliseconds.

5.5.4.3.   *FRACK* and *RETRY*

The AX.25 protocol calls for retransmission of packets when an acknowledgement 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 re-transmissions 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 re-transmission. 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

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

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 loss of either the original packet or the acknowledgment increase drastically.

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

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

To minimize unnecessary retries, the PK-232 applies a collision-avoidance strategy to all packets except those being digipeated. On the second and subsequent transmissions of a given packet, your PK-232 waits an <u>additional</u> random time after detecting a clear channel <u>before</u> transmitting. This prevents repeated collisions of transmissions by the same two stations. The random time in 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:

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

For retries of the same packet, the interval is:

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

where **r** is a random number from 1 to 15. Therefore, the longest amount of time added randomly is $0.094 \times \textit{TXDELAY}$ seconds. For the default value of *TXDELAY* = 30, the longest time added is 2.8 seconds.

5.5.4.5.   *MAXFRAME*

The AX.25 protocol permits the transmission of several packets without waiting for an acknowledgment. The number of packets that can be sent before 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 which your PK-232 will send before waiting for acknowledgment. (This doesn't mean that your PK-232 will wait until several packets have been typed before transmitting.)

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

When use 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 the 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 packets 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 *PCTIME* 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   W0RLI'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   W0RLI/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	NEWMODE	OFF
ACRDISP	0	NOMODE	ON
ALFDISP	OFF	PARITY	0
AWLEN	8	RELINK	OFF
AX25L2V2	ON	START $00	
CHSWITCH	$00	STOP	$00
DCDCONN	ON *	TXFLOW	OFF
DELETE	OFF	XFLOW	OFF
ECHO	OFF	XOFF	$00
FLOW	OFF	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 the PK-232's commands. You'll use certain commands to affect the PK-232's performance under specific conditions, and other s to specify the values of parameters used during the PK-232's general operation.

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

6.1.1.   **Entering Commands**

Commands are entered after the Command Mode prompt:

cmd:

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

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

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

o   Use either UPPER CASE (capital letters) or lower case (small 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 4 for a discussion of line editing.

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

6.1.2.   **Command Responses**

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

XFLOW   was ON
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 with a wrong argument:

        ?bad

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

        ?range

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

        WARNING: BEACON too often

o   If you type an improper SELCAL:

        ?call sign

Here are a few more examples:

    cmd: ASDFASDF
    ?What?   –   This isn't a command

    cmd: BEACON E
    ?bad   –   A parameter was left out

    cmd: PACLEN 265
    ?range   –   Unacceptable numerical value

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

    cmd: X   –   Command is invalid for the mode in use

    cmd: C N6IA
    ?not while in PACKET   –   Command is invalid for the mode in use

    cmd: C N6IA
    ?not while in MORSE   –   Command is invalid for the mode in use

    cmd: C N6IA
    ?not while in ASCII   –   Command is invalid for the mode in use

    cmd: C N6IA
    ?not while in BAUDOT   –   Command is invalid for the mode in use

6.2.   **Command List**

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

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

6.2.1.   **Command Names**

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

o   You can enter the command *MYCALL* by simply typing MY.

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 the 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 *FULL-DUP*.

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

Some commands such as *CONNECT* have optional parameters.

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

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

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

6.3.1. Parameters

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

6.3.1.1. Boolean Parameters

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

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

6.3.1.2. Numeric Parameters

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

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

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 power of 10 represented by a decimal number.
    o   The numbers 10 through 15 are indicated by hexadecimal digits A through F. For example:

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

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

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

6.3.1.3.   Text or String Parameters

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

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

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

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

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

Some commands have parameters which are actually <u>lists</u> 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 <u>or</u> commas.

The following examples will help you understand these explanations.

o   BEACON EVERY|AFTER **n**

The *BEACON* command requires an argument;

o   You <u>must</u> 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 ever 180 times 10 seconds, every 30 minutes), or BEACON EVERY 0 (the beacon is <u>not</u> transmitted).

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

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

o   You may optionally include the keyword VIA, followed by a list of one to eight call signs, 'call2' trough 'call9'.
o   Multiple call signs in the list must be separated by commas (as shown) <u>or</u> 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 commands shows you the values of all parameters or groups of related parameters.

6.4.   **Controller Messages**

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

6.4.1.   **General**

Sign-On Message

```
AEA PK-232 Data Controller
Copyright (C) 1986, 1987 by
Advanced Electronic Applications, Inc.
Release DD-MM-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 given for the firmware version you're using.

```
PK-232 is using default values
```

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

```
was
now
```

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

too many packets outstanding

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

6.4.2. Command Mode Error Messages

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

?bad

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

?call sign

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

?clock not set

You typed the command DAYTIME to display the date and time, but you haven't yet set the clock! DAYTIME <u>sets</u> the clock if it is given with the daytime parameter 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 the specific command.

?too long

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

?too many

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

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

?VIA

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

?not while disconnected

You tried to set *CONPERM* while disconnected.

?channel must be 0-9

You typed an invalid channel character after the *CHSWITCH* character.

?already connected

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

?different connectees

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

?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:

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

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

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

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

```
Link state is: DISCONNECTED
```

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

```
Link state is: CONNECT in progress
```

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

```
Link state is: DISCONNECT in progress
```

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

```
Link state is: FRMR in progress
```

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

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

```
*** CONNECTED to: call1 (via call2[,call3...,call9])
```

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

```
*** Connect request: call1 (via call2[,call3...,call9])
```

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

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

*** DISCONNECTED: {call sign}

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

*** Retry count exceeded
*** DISCONNECTED: {call sign}

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

*** {call sign} busy
*** DISCONNECTED: {call sign}

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

FRMR sent: xx xx xx

Your 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 xx xx xx is replaced with the hex codes for the three bytes sent in the information part of the FRMR frame. This message will not appear if your PK-232 is in Transparent Mode.

FRMR rcvd: xx xx xx

Your PK-232 has received an FRMR (protocol error as described above) and shows this followed by a display of the FRMR packet in hexadecimal format. This message 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 to speed of the incoming signal.
R	Switches the system to receive mode, unlocks received speed, forces received speed to equal transmit speed.
X	Switches system to transmit mode and forces immediate entry into Converse Mode.
MO	Unlocks the Morse received speed.

6.5.2.   **Baudot and ASCII RTTY**

From Command Mode:

L	Forces LETTERS case (Baudot only).
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 character (if Baudot)
<CTRL-D>	Shuts off transmitter immediately
<CTRL-F>	Sends callsign 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

Characters embedded in transmitted text:

<CTRL-O>	Sends LETTERS character
<CTRL-N>	Sends FIGURES character
<CTRL-F>	Sends callsign in Morse and shuts off transmitter
<CTRL-D>	Stops sending when the transmitter 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 re-turn to Command Mode, or
o   type <CTRL-C> to return to the Command Mode.
o   Typr 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 8-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.

• 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 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 ASCII 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 to use 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. Signaling speed are now universally referred to as 'bauds' in FSK and AFSK operations using monobit data. In these cases, the terms 'bauds' and 'bits per second' may be used interchangeably.

| **ACHG**   Mnemonic: **AC**   Immediate Command |
| Mode: AMTOR |

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

• Use the *ACHG* command with care and only in situations where it 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***   Mnemonic: **ACRD**   Default: 0 |
| Mode: ALL |

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

0 (zero) disables this function.

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

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

ACRPACK ON|OFF   Mnemonic: **ACRP**   Default: ON
Mode: Packet

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

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

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

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

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

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

ACRRTTY _n_   Mnemonic: **ACRR**   Default: 71 (69 in AMTOR)
Mode: Baudot/ASCII RTTY

Parameters: **_n_** -   0 – 255 specifies the number of characters on a line after which a carriage return <CR> is automatically inserted in your transmitted text. This insertion occurs after the last space character before **_n_** columns across the screen or page.
0 (Zero) disables the function.

When sending Baudot or ASCII RTTY, the *ACRRTTY* feature automatically inserts and sends a carriage return at the first space character following the **_n_**th character or column.

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

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

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

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

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

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

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 carrage return function operates after 69 characters.)

ADELAY *n*	Mnemonic: **AD**	Default: 4
Mode: AMTOR		

Parameters: ***n*** -   1 to 9 specifies transmitter key-up delay in 10-millisecond intervals.

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

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

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

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

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

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

Because the ARQ mode allows 170 milliseconds for the signal to travel to the distant station and than 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 the 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> <u>is</u> sent to the terminal after each <CR>.
               OFF - A <LF> is <u>not</u> 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 <u>if needed</u>. If a line feed was received either immediately before or after a carriage return, *ALFDISP* will <u>not</u> add another line feed. Use the PK-232's sign-on message to determine how carriage returns are being displayed.

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

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

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

ALFPACK ON|OFF   Mnemonic: **ALFP**   Default: OFF
Mode: Packet

Parameters: ON -   A <LF> character <u>is</u> added to outgoing packets following each <CR> trans-
                      mitted in the packets.
               OFF - A <LF> is <u>not</u> added to outgoing packets.

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

ALFPACK is included to maintain compatibility with other Packet-Radio Controllers.

- If the person you are talking to reports overprinting of packets from your station, set *ALFPACK* ON. *ALFPACK* is disabled in Transparent Mode.

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

Parameters: ON -   A line feed character <LF> <u>is</u> sent after each carriage return <CR>.
               OFF - A <LF> is <u>not</u> sent after each <CR>.

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

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

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

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

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

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

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

ALIST Mnemonic: **AL** Immediate Command		
Mode: AMTOR		

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

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

Your monitor display all the retries if the link 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 SELCALL.

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

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

ARQ *aaaa* Mnemonic: **AR** Immediate Command		
Mode: AMTOR		

Parameters: *aaaa* - The distant station's SELective CALling code.

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

        Example: ARQ DCXJ

The SELCALL 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:

- 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.

- 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.

ARQTMO *n*	Mnemonic **ARQT**	Default: 90
Mode: AMTOR		

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

ARQTMO 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	Mnemonic: **AS**	Immediate Command
Mode:		

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

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

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

AWLEN *n*	Mnemonic: **AW**	Default: 7
Mode: All		

Parameters: *n* -   7 or 8 specifies the number of data bits per word.

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

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

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

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

- Set *AWLEN* to 8 and use 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.

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-milli-second intervals.

AXDELAY specifies the period of time the PK-232 will wait – in addition to the 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 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 in conjunction with *AXHANG*.

AXHANG *n*   Mnemonic: **AXH**   Default: 0
Mode: Packet

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

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

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

If you are using a repeater that hasn't been used for packet operations before, try various values to find the best value for ***n***. If other packet stations have been using the repeater, check with them for the proper setting.

BAUDOT   Mnemonic: **BA**   Immediate Command
Mode: Command

BAUDOT is an immediate command that switches the 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 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 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 (default).

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

- A beacon frame contains the text that you've typed into the *BTEXT* message in a packet addressed to 'CQ' or other *UNPROTO* address.
- A beacon frame may be sent directly, and also sent via the digipeat 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 <u>without</u> packet activity.

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

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

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

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

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

> **WARNING: BEACON too often**

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

BKONDEL ON|OFF   Mnemonic: **BK**   Default: ON
Mode: All

Parameters: ON -   The sequence <BACKSPACE><SPACE><BACKSPACE> is echoed when a character is deleted from the input line.
OFF -   The <BACKSLASH> character <\> is echoed when a character is deleted.

BKONDEL determines how character deletion is displayed in Command or Converse Mode.

The <BACKSPACE><SPACE><BACKSPACE> sequence updates the video display screen.

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

On a printing terminal the <BACKSPACE><SPACE><BACKSPACE> sequence will result in <u>over-typed</u> text.

- Set *BKONDEL* OFF if you have a paper-output display, or if your terminal does not respond to the <BACKSPACE> character <CTRL-H>.

The PK-232 displays a <BACKSLASH> for each character you delete. You can get a display of the corrected input by typing the *REDISPLAY*-line character set by the command *REDISPLA*.

BTEXT *text*   Mnemonic: **BT**   Default: Empty (Null string)
Mode: Packet

Parameters: *text* -   Any combination of characters 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.

- <u>Don't</u> type your call sign in *BTEXT* - the normal packet header show it for you.

- <u>Don't</u> 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.

- 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.
- After you've beaconed for a week or two and the Packet community has learned who and where you are, follow the practice used by more experienced packeteers: SET BEACON EVERY 0!

You can send multiple-line messages in your beacon by including <CR> characters in the text. <CR> is inserted by typing the PASS character before the <CR>.

- The PASS character is set in 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 WB2NNF WA7MBL W0RLI

- Use a %, &, N, NO, NONE, or OFF as the first characters in the text to clear the *BTEXT* text without issuing the *RESET*.

Although the beacon subject is controversial in Packet circles, you can use beacon texts intelligently and benefit the Packet community.

CALIBRATE	Mnemonic: **CAL**	Immediate Command
Mode: Command		

CALIBRATE is an immediate command that starts the modem calibration routine.

The PK-232 provides a continuous on-screen display of AFSK generator tone frequencies in Hertz. The frequency is displayed in vertical 'scroll' fashion approximately twice per second, with the part number of the potentiometer associated with that tone.

Calibration may be checked at any time without altering the state of the existing link. However, the time-of day clock (DAYTIME) will not advance until you quit the calibration routine.

Commands available in the calibration routine are:

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) shift.
<SPACE>	Toggles the audio tone 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.

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

For example:

>   CANLINE $15 (hex)
>   CANLINE 21   (decimal)

Either sets the cancel-line character to <CTRL-U>.

When you use the *CANLINE* character to cancel an input line in Command Mode, the line is terminated with a **** character and a new prompt (**cmd:**) appears.

When you cancel a line in Converse Mode, only a **** and a new line appear.

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

NOTE: If your send-packet character is not <CR>, the cancel-line character cancels only the last line of a multi-line packet.

Like all other input editing features, line cancellation is disabled in Transparent Mode.

CANPAC *n*   Mnemonic: **CANP**   Default: $19 <CTRL-Y>
Mode: Packet

Parameters: *n* -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

CANPAC changes the CANCEL-PACKET input editing command character.

The parameter *n* is the ASCII code for the character you want to type in order to cancel an input packet.

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

When you cancel a packet in Converse Mode, the line is terminated with a <BACKSLASH> character and a new line.

• You can only cancel the packet that is currently being entered.

Once you have typed the send-packet character, or waited *PACTIME* (if *CPACTIME* is enabled), the packet cannot be canceled even if it has not been transmitted.

Like other input editing features, packet cancellation is disabled in Transparent Mode.

The CANCEL-PACKET character also cancels the display output in Command Mode. If you are in Command Mode and type the CANCEL-PACKET character, any characters that would be typed on the screen (except those echoed) are 'thrown away' by the PK-232.

- Typing the cancel-output character a second time restores normal output.
- To see how this works, type DISPLAY, then type a <CTRL-Y>.

The command list display will stop. You won't see any response from the PK-232 to commands.

To verify that the display is back to normal, type <CTRL-Y> and then type DISPLAY again.

Use the CANCL-DISPLAY feature if you inadvertently do something that causes the PK-232 to generate large amounts of output to the terminal, such as giving the *DISPLAY* command or setting *TRACE* ON.

- If you are in Converse or Transparent Mode and want to cancel display output, you must exit to Command Mode and then type the CANCEL-PACKET character.

CASEDISP *n*   Mnemonic: **CAS**   Default: 0 (as is)
Mode: Packet

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   Mnemonic: **CB**   Default: OFF
Mode: Packet

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.

- Set *CBELL* ON if you want to be notified when someone connects to your station.

- IF *CBELL* is ON and *MFILTER* contains the character ($07), you can be sure that whenever your terminal beeps there is a connection for you. At no other time will you hear a beep while you are in Packet Mode.

CCITT ON|OFF   Mnemonic: **CC**   Default: ON
Mode: Baudot RTTY

Parameters: ON -   Characters typed on the keyboard or loaded from disk files are translated in-
                      to CCITT International Telegraph Alphabet #2 before being sent.
               OFF - Characters sent to the PK-232 are not translated into CCITT ITA #2, but re-
                      main 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 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 <u>CCITT OFF</u>, 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 <u>CCITT ON</u>, the PK-232 sends International Telegraph Alphabet #2 character set in Bau-
dot 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(b)(1) calls for the use of International Telegraph Alphabet Number 2
               (commonly known as Baudot); a single channel, five unit (start-stop) teleprinter
               code conforming to the International Telegraph Alphabet Number 2 with respect to
               all letters and numerals (including the slant sign or fraction bar);;" etc. The charac-
               ters '$', '#' and '&' are **not** permitted in <u>international</u> 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 determines 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 sign to be rejected or accepted. You can use the abbreviated command form or mnemonic:

       cmd:cfrom
       CFROM all

or

       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: {MYCALL}

Your PK-232 notifies you of these call requests:

       *** Connect request: WX1AAA

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

To reject calls from one or more specific stations, type CFROM NO (followed by a list of call signs). Connect requests will be rejected from stations whose call signs are listed 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 W2JUO, W2JUO-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 thought his/her call request has been rejected.

Clear CFROM with %, & or OFF as arguments.

CHCALL ON|OFF   Mnemonic: **CHC**   Default: OFF
Mode: Packet

Parameters: ON -   Call sign of the distant station IS displayed in multiple connection Packet operation.
              OFF - Call sign of the distant station is NOT displayed (default).

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:

- *CHCALL* is OFF – the monitored activity looks like this:

        :0hi howie
         hello ted how goes it?
        :1*** CONNECTED to WA7GXD
        :1must be a dx record. ge lyle
        :01UNreal ted! fl-az no digis!
        :1big band opening...ge

- *CHCALL* ON, the same activity looks like the following example. The additional information shown as a result of setting *CHCALL* ON is underlined

        :0:K4NTA:hi howie
         hello ted how goes it?
        :1:WA7GXD:*** CONNECTED to WA7GXD
        :1must be a dx record. ge lyle
        :01UNreal ted! fl-az no digis!
        :1:WA7GDX:big band opening...ge

With *CHCALL* ON, ':1' becomes ':1:<call sign>:'

NOTE: To switch channels during your multi-connect conversations, type *CHSWITCH* characters ':0' and ':1' without a ':' after them.

CHDOUBLE ON|OFF   Mnemonic: **CHD**   Default: OFF
Mode: Packet

Parameters: ON -   Received CHSWITCH characters appear twice (doubled).
               OFF -   Received CHSWITCH characters appear once (not doubled).

CHDOUBLE ON displays received CHSWITCH characters as doubled characters.

In the following example *CHDOUBLE* is ON and *CHSWITCH* is set to '|' ($7C):

> **|| 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.**

- 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 <u>must not</u> be one of the channel numbers (0 to 9).

CHECK *n*   Mnemonic: **CH**   Default: 30 (300 sec.)
Mode: Packet

Parameters: *n* -   0 to 250 specifies the check time in ten-second intervals.
                        0 (Zero) disables this feature.

CHECK sets a time-out 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 connected 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 10 seconds), your PK-232 tries to save the link by starting a reconnect sequence. The PK-232 enters the 'connect in progress' state and sends SABM (Connect Request) frames. In addition, the PK-232 adds a random time of up to 30 seconds each time CHECK is used.

- If AX25L2V2 is ON and packets have not been heard from the distant end for *n* times 10 seconds, your PK-232 sends a 'check packet' to test if the link still exists to the other station.

The 'check' packet frame contains no information, but is interpreted by the distant station's TNC to see if it is still connected. If the distant station's TNC is still connected, the distant station sends an appropriate response packet.

If your PK-232 initiates the 'check' and does not get an answer after RETRY+1 attempts, your PK-232 starts a reconnect sequence just as if you had typed the *CONNECT* command.

* If *AX25L2V2* is OFF and the other station has nit 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 *REKINK* is ON. If *RELINK* is OFF, the PK-232 will immiately 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 character 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 Converse Mode. The character is always ignored as a user-initiated channel switch in Transparent Mode; it just flows through as data.

* The outgoing channel cannot be changed while active or 'on-line' in Transparent Mode.
* To switch channels, *ESCAPE* to Command Mode, then enter Converse Mode to use the *CHSWITCH* command.

NOTE: If your PK-232 is being used as the TNC for a PBBS (Packet Bulletin Board System), change the *CHSWITCH* character to $00 to avoid possible conflict or problems with the characters frequently found in Packet network maps.

See *CHDOUBLE* and *CHCALL* for further information on the use of *CHSWITCH*.

CMDTIME *n*	Mnemonic: **CM**	Default: 1
Mode: Packet		

Parameters: *n* -   0 to 250 specifies timeout value in one-second intervals while in TRANSPA-RENT 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 time-out 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 *COMMAND* (default <CTRL-C>) is used to exit from the Converse Mode is used to exit Transparent Mode, although the procedure is different.

- The Command Mode entry characters is set by *COMMAND*.
- Three Command Mode entry characters must be entered less than *n* seconds apart, with no in-tervening characters, after a delay of *n* seconds following the last characters typed.
- After a final delay of *n* seconds, the PK-232 exits Transparent Mode and enters Command Mode.
- You will then see the normal Command Mode prompt: `cmd:`

The following diagram illustrates this timing:
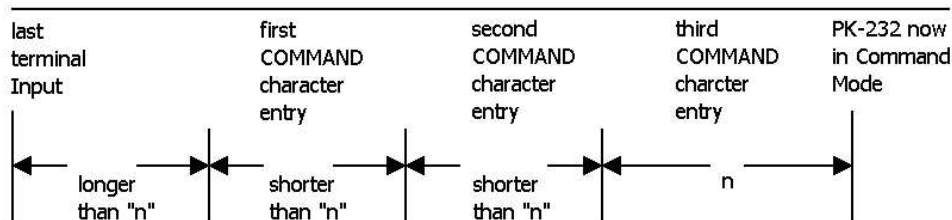
CMSG ON|OFF	Mnemonic: **CMS**	Default: OFF
Mode: Packet/AMTOR		

Parameters: ON -   The recorded *CTEXT* message is sent as the first packet after a connection is established by a connect request from a distant station or in response to a 'WRU?' command in AMTOR.

              OFF - The text message is not sent at all

CMSG enables or disables automatic transmission of the *CTEXT* message when your PK-232 ac-cepts a connect request from another station, or when a distant AMTOR station transmits a 'WRU?' character (FIGS D).

- Set *CMSG* ON to tell callers that you're not available to answer calls manually when they con-nect to your PK-232.
- Set *CMSG* OFF when available to operate or answer calls manually.

COMMAND *n*	Mnemonic: **COM**	Default: 03 <CTRL-C>
Mode: All		

Parameters: *n* -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

COMMAND is used to change the Command Mode entry character. You can enter the code either hex or decimal.

Type the *COMMAND* character to enter Command Mode from the Converse Mode. No response is seen if you type the Command Mode entry character while you are already in Command Mode.

- Enter Converse Mode by typing: CONVERSE

Now, all characters typed on the keyboard and characters send from a disk or tape file are trans-mitted 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 CONVERSE|TRANS   Mnemonic: **CONM**   Default: CONVERS
Mode: Packet

Parameters: CONVERSE -   Your PK-232 enters Converse Mode when a connection in established.
              TRANS -   Your PK-232 enters Transparent Mode when a connection is established.

CONMODE selects the mode your PK-232 uses after entering the CONNECTED state.

The connection may result either from a connect request received from a distant station, or a connection initiated by a *CONNECT* command that you've typed.

- Set *CONMODE* to CONVERS for most Packet operations.
- Set *CONMODE* to TRANS if you are using Transparent Mode for a bulletin board program, so that the correct mode will be entered when your bulletin board receives a connect request.
- If the PK-232 is already in Converse or Transparent Mode when the connection is completed, the mode will not be changed.

CONNECT call1 (VIA call2(,call3 .... call9) Mnemonic: **C** Immediate Command
Mode: Packet

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 breaks and quotation marks are used in this text only for clarity – please don't type them!)

> VIA call2[, call3 .... ,call9]

- 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 and disconnected from the 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 acknowledgment. *RESTART* and power off/on cycling do not affect this connected state.

CONPERM works only when a connection is established. It functions on a channel-by-channel basis when multiple connections are allowed.

CONPERM allows connections on other channels to operate normally. For example, automatic disconnect based on *RETRY*, when used under conditions such as:

- Certain networking applications
- Meteor scatter
- Other noisy, less reliable links

CONPERM ON may be advantageous when using full-duplex continuous mail forwarding or traffic links.

CONSTAMP ON|OFF Mnemonic: **CONS** Default: OFF	
Mode: Packet	

Parameters: ON -   Connect status messages <u>are</u> time stamped.
              OFF - Connect status messages are <u>not</u> 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 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:10:55:23  *** CONNECTED to W2JUP
cmd:d
cmd:10:55:59  *** DISCONNECTED: W2JUP
```

CONVERSE Mnemonic: **CONV** or **K** Immediate Command	
Mode: All	

CONVERSE is an immediate command that causes the PK-232 to switch from the Command Mode into the Converse Mode.

- Link connections in Packet or AMTOR modes are not affected.

In Packet mode and AMTOR, once the PK-232 is in Converse Mode, all characters typed from the keyboard or send from a disk file are processed and transmitted by your radio.

- To return the PK-232 to the Command Mode from the Converse Mode, type the Command Mode entry character (default is <CTRL-C>).

CPACTIME ON|OFF   Mnemonic: **CP**   Default: OFF
Mode: Packet

Parameters: ON -   Packet transmit timer IS used in Converse Mode.
               OFF -   Packet transmit timer is NOT used in Converse Mode.

CPACTIME activates automatic, periodic transmission of packets while in the Converse Mode.

CPACTIME may be used for several types of computer communications such as bulletin board or host computer operation when full Transparent Mode features are not desired.

When *CPACTIME* is ON, characters are packetized and transmitted periodically as they are in Transparent Mode. Local keyboard editing and display features of the Converse Mode are available; software flow control can be used.

- See the *PACTIME* command (which controls the rate and mode of packet assembly) for a discussion of how periodic packetizing works.
- Set *ACRPACK* OFF in this mode. When *ACRPACK* is ON, the send-packet character is inserted in the data being packetized even though it was not typed.
- To include <CR> characters in transmitted packets, set SENDPAC to a character not normally used (e.g., <CTRL-P>); the PK-232 then treats a <CR> as an ordinary character.
- Set *CPACTIME* ON for a mode of operation similar to full break-in CW.

Setting *CPACTIME* ON transmits your text soon after you type it, in short bursts of a few characters. The other station may break in at will. Some operators find it easier to chat in this mode; long delays are eliminated while long packets are being typed.

CRADD ON|OFF   Mnemonic: **CRA**   Default: OFF
Mode: Baudot RTTY

Parameters: ON -   Send <CR><CR><LF> in Baudot RTTY.
               OFF -   Send <CR><LF> in Baudot RTTY (default).

The *CRADD* command permits you to set the PK-232's 'newline' sequence so that an additional carriage return is automatically ADDed at the end of each typed line.

When *CRADD* is ON the line-end sequence is <CR><CR><LF>.

When CRADD is OFF the line-end sequence is <CR><LF>.

- 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:

- The number of each logical channel.
- The link state of all ten logical channels.
- The current input/output channel – the one you're using.
- 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:

<u>NOT CONNECTED TO ANY STATION</u>   <u>CONNECTED TO ONLY 1 STATIONS</u>

```
cmd:CS                              cmd:CS
Ch. 0 - IO DISCONNECTED             Ch. 0 - IO CONNECTED to WX1AAA
Ch. 1 -    DISCONNECTED             Ch. 1 -    DISCONNECTED
Ch. 2 -    DISCONNECTED             Ch. 2 -    DISCONNECTED
Ch. 3 -    DISCONNECTED             Ch. 3 -    DISCONNECTED
Ch. 4 -    DISCONNECTED             Ch. 4 -    DISCONNECTED
Ch. 5 -    DISCONNECTED             Ch. 5 -    DISCONNECTED
Ch. 6 -    DISCONNECTED             Ch. 6 -    DISCONNECTED
Ch. 7 -    DISCONNECTED             Ch. 7 -    DISCONNECTED
Ch. 8 -    DISCONNECTED             Ch. 8 -    DISCONNECTED
Ch. 9 -    DISCONNECTED             Ch. 9 -    DISCONNECTED
```

If you're connected to several stations, the *CSTATUS* command shows your connect status as follows:

<u>CONNECTED TO SEVERAL STATIONS</u>

```
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:

- CHANNEL 0 has the input and output channels – you're using it!
- CHANNEL 1 is connected to WX2BBB 'permanently'.
- 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 up to a maximum of 120 characters.

CTEXT is the 'automatic answer' text you type into a special section of the PK-232's memory.

The default text says 'Please leave a message, then disconnect.'

If *CMSG* is set ON:

• 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 a message, then disconnect.<CR>"

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

```
?too long
cmd:
```

• Use a percent sign (%), an ampersand (&), N, NO, NONE or OFF as the first sign in the *CTEXT* message to clear the previous message without having to type a *RESET* command.

CWID *n*   Mnemonic: **CW**   Default: $06 <CTRL-F>
Mode: Baudot/ASCII RTTY/AMTOR

The *CWID* command lets you change the 'send CWID' control character typed at the end of your Baudot and ASCII RTTY keyboard dialogue or text file stored on disk.

When the PK-232 reads this specific character embedded at the end of the text or keyboard input, it switches to the Morse Mode and sends your call sign, in Morse code, at the keying speed set by the *MSPEED* command.

As soon as your call sign has been sent in Morse, the PK-232 turns off your transmitter and returns to Baudot or ASCII RTTY receive in the Command Mode.

• Type CWID (or just CW) to display the current value of the CWID command:

```
cmd:cwid            cmd:cw
CWID  $06 CTRL-F    CWID  $06 CTRL-F
cmd:                cmd:
```

- Type CWID followed by either the decimal or hexadecimal value of the new character you wish to use the CWID trigger command.

        cmd:cwid 27
        CWID was $06 CTRL-F
        cmd:

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

        cmd:cwid
        CWID $1B CTRL-[

- You can return to the original or default value at any time by typing the following:

        cmd:cwid $06
        CWID was $1B CTRL-[

You can also use the command *CWID* ON or *CWID* OFF to activate or deactivate the function. In either case, your PK-232 responds with the previous state:

        cmd:cwid on
        CWID was $00

DAYTIME *date & time*	Mnemonic: **DA**	Default: none
Mode: All		

Parameters: *date & time* - Current DATE and TIME to set.

DAYTIME sets the PK-232's internal clock current date and time. The *date & time* parameter is used in Packet Mode by the commands *CONSTAMP* and *MSTAMP* to 'time stamp' received and monitored messages.

Entries in the 'heard' (displayed by *MHEARD*) are also time stamped if date & time has been set. The PK-232's time is updated continuously, as long as it is powered up.

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

        cmd:day
        ?clock not set

- You must reset date and time each time you turn on the PK-232. Otherwise *CONSTAMP* and *MSTAMP* won't 'stamp' the time.

If you type *DAYTIME* without a parameter, the PK-232 displays current date and time information. The format of the display is:

        dd-mm-yy hh:mm:ss

        cmd:day
        DAYTIME 08-Jul-86 06:57:33

- The format for entering the day&time is:

yymmddhhmm
cmd:daytime 8607080659

where:
yy is the last two digits of the year
mm is the two-digit month code (01-12)
dd is date (01-31)
hh is the hour (00-23)
mm is the minutes after the hour (00-59)

Example: cmd:daytime 19 05 11 18 36

You can insert separators or delimiters such as <SPACE>, /, : or ;. Successful data and time entry is confirmed when the PK-232 echoes the new setting.

- Enter the number 0-9 with leading zeros; codes must be exactly two digits.
- Be aware of the month when you set the date – the PK-232 does not check for the correct number of days in a month.

DAYSTAMP ON|OFF	Mnemonic: **DAYS**	Default: OFF
Mode: All		

Parameters: ON -   The DATE is included in *CONSTAMP* and *MSTAMP*.
              OFF - Only the TIME is included in *CONSTAMP* and *MSTAMP*.

DAYSTAMP activates the date in *CONSTAMP* and *MSTAMP*.

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

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 - The 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   Mnemonic: **DEL**   Default: OFF
Mode: All

Parameters: ON -   The <DELETE> ($7F) key is used for editing your typing.
              OFF - The <BACKSPACE> ($08) key is used for editing your typing.

Use the *DELETE* command to select the key to use for deleting while editing.

• Type the selected DEL key to delete the last character from the input line.

You cannot use the DEL key to delete text before the beginning of a line. Use the PASS character to delete <CR> characters that have been typed into the text.

• The *BKONDEL* command controls how the PK-232 indicates deletion.
• To see a correct display of the current line after deleting characters, type the redisplay-line character, which is set by the *REDISPLA* command.

DFROM all,none,yes/no call1[,call2..]   Mnemonic: **DF**   Default: all
Mode: Packet

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

DFROM uses arguments to determines 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   **cmd:**df
          DFROM all   DFROM   yes WX1AAA,WX2BBB,WX3CCC

To prevent all stations from digipeating through your station, type DFROM NONE.

To permit one or more specific stations to digipeat through your station, type DFROM YES (followed by a list of calls signs). Packets will be digipeated only from stations whose call signs are listed.

To prevent one or more specific stations to digipeat through your station, type DFROM NO (followed by a list of call signs). Packets will not be digipeated from stations whose call signs are listed.

You can include optional SSIDs specified as *-n* after the call sign. If *DFROM* is set to 'no NK6K' or 'yes NK6K', any combination NK6K, NK6K-1,...NK6K-15 will be matched and processed. If *DFROM* is set to 'yes NK6K-1' or 'no NK6-1', then only NK6K-1 will match and processed.

Clear DFROM with %, & or OFF as arguments.

DIGIPEAT ON|OFF   Mnemonic: **DIG**   Default: ON
Mode: Packet

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   Mnemonic: **D**   Immediate Command
Mode: Packet

DISCONNE is an immediate command that initiates a disconnect request to the distant station to
which you are connected.

If your disconnect command is successful, your monitor will display:

> ***** DISCONNECTED: {call sign}**

Other commands can be entered while a disconnect is in progress. New connections are not allowed until the disconnect is completed.

- If the retry count is exceeded while waiting for the distant station to acknowledge your disconnect command, your PK-232 switches to the disconnected state.
- If another disconnect command is entered while your PK-232 is trying to disconnect, the retry count is immediately set to the maximum number. In either case, your monitor displays:

> ***** Retry count exceeded**
> ***** DISCONNECTED: {call sign}**

Disconnect messages are not displayed when your PK-232 is in the Transparent Mode.

DISPLAY [class]   Mnemonic: **DISP**   Immediate Command
Mode: Command

Parameters: class - Optional parameter identifier, one of the following:

(A)sync	display asynchronous port parameters
(C)haracter	display special characters
(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.

```
cmd:mycall      cmd:fr           cmd:dw          cmd:mys
MYCALL DC7XJ    FRACK    3        DWAIT    16     MYSELCAL DCXJ
```

DWAIT *n*	Mnemonic: **DW**	Default: 16
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.

Where ever 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 help alleviate the drastic reduction of throughput that occurs on a channel when digipeating packets suffer collision.

DWAIT is necessary because digipeated packets are not retried by the digipeater, but are always restarted by the originating station. When all stations specify a Default Wait time and the right value of *n* is chosen, the digipeater captures the frequency every time it has data to send – digipeated packets are sent without this delay.

Recommended settings of *DWAIT* for different types of Packet station operation are:

TYPE OF OPERATION	TIME (in ms)	DWAIT VALUE
Digipeaters	0	0
Local keyboards	160	16 (default)
PBBSe, 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 <u>except</u> Packet. EAS permits you to choose the type of data displayed on your monitor screen or printer.

- To display your typing exactly as you are typing the keyboard characters or sending from a disk file, set *EAS* OFF.
- To see the actual data being sent from your PK-232 to your radio and transmitted on the air, set *EAS* ON.

EAS is convenient when operating Morse and Baudot RTTY – these modes don't use lower case characters. You can operate in a relaxed and normal manner, typing entirely in lower case if that's easier for you. Your PK-232 translates your lower case typing into upper case Morse or Baudot/CCITT characters.

When *EAS* is ON, you'll see only UPPER CASE characters on your screen, representing the data actually transmitted to the distant station.

EAS has special significance in AMTOR Mode A (ARQ). If *EAS* is ON – no matter how fast you type characters on your keyboard – you'll see them echoed on your screen only <u>after</u> the distant station (your partner in the AMTOR link) has validates (ack'd) your block of three characters.

With *EAS* ON, the characters will appear on your screen or printer <u>only</u> as the distant station acknowledges them, three at a time.

- If the data scrolls across your monitor at a nice even rate, in rhythm with your typing speed, you can assume that you have a good ARQ link.
- If the data hesitates or scrolls in 'jerky' intermittent fashion, that's generally a sign that the radio link is not too good.
- If the characters stop appearing on your monitor, the link is failing or has failed.

ECHO ON|OFF   Mnemonic: **E**   Default: ON
Mode: All

Parameters: ON -   Characters received from the terminal ARE echoed by the PK-232.
              OFF - Characters are NOT echoed.

The *ECHO* command controls local echoing by the PK-232 when it is in Command or Converse Mode. Local echoing is disabled in Transparent Mode.

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

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

ESCAPE ON|OFF   Mnemonic: **ES**   Default: OFF
Mode: All

Parameters: ON -   The <ESCAPE> character ($1B) is output as '$' ($24).
              OFF - The <ESCAPE> character is output as <ESCAPE> ($1B) (default).

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 terminals interpret the <ESCAPE> character as a special command prefix. Such terminals may alter their displays depending on the characters following the <ESCAPE>.

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

FEC   Mnemonic: **FE**   Immediate Command
Mode: AMTOR Mode B

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

• Use *FEC* for CQ calls. Distant stations cannot identify you in an ARQ CQ call.
• 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).
• Use FEC if the desired range is longer than 22,000 miles, such as in 'long path' contacts or high-orbit satellite contacts.
• Use FEC for all round table contacts.
• Don't start typing right away! Let your PK-232 begin each transmission with three to five sec-onds of idling. Under poor conditions, this may help the distant station to tune your signal.
• Avoid the RTTY practice of transmitting a line of RYRYRY to allow the distant station to tune in – this is wrong on FEC. Distant stations cannot synchronize until the end of the RYRYRY se-quence. The normal FEC idle-signal can be used for tuning.
• To aid formatting the distant station's screen and printer copy, always start *FEC* transmission with a new line sequence by sending a <CR>.
• You can signify the end of your FEC transmission by typing the ARQ changeover sign +?, inter-nationally recognized as the RTTY equivalent of KKK. However, in FEC, +? is not a software

command. You still have to un-key your transmitter manually as you would in conventional RTTY.

You can terminate your FEC transmission several ways:

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

FLOW ON|OFF	Mnemonic: **F**	Default: ON
Mode: All		

Parameters: ON -   Type-in flow control IS active.
              OFF - Type-in flow control is NOT active.

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

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

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're talking to) normally wait for a packet from the other end before starting to respond, you can set *FLOW* OFF.

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

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
Mode: Packet		

Parameters: ***n*** -   1 to 15, specifying FRame ACKnowledgment time-out in 1 second intervals.

FRACK is the FRame ACKnowledgment time in seconds that your PK-232 will wait for acknowledgment 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 before incrementing the retry counter and sending another frame. If the packet address includes digipeat instructions, the time between retries is adjusted to:

Retry interval (in seconds) = $n \times (2 \times m + 1)$
(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 which two Packet stations repeatedly collide with each other.

FULLDUP ON|OFF   Mnemonic: **FU**   Default: OFF
Mode: Packet

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 signaling 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.

• 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 operating using monobit data. In these cases, the terms 'bauds' and 'bits per second' mean the same thing. Either term may be used.

HEADERLN ON|OFF   Mnemonic: **HE**   Default: ON
Mode: Packet

Parameters: ON -   The header in a monitored packet is printed on a separate line from the text.
               OFF -   The header and 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 (default), 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
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.

- Set *HID* ON to force your PK-232 to send an ID packet every 9.5 minutes when it's being used as a digipeater.
- Set *HID* OFF to stop your PK-232 from sending any ID packets.
- The HID identification packet is addressed to *ID*.
- 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: Packet		

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

The *HOST* command permits the PK-232 to operate in the Host Mode, a 'computer-friendly' communication 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 a unnumbered I-frame, with its data field containing your *MYALIAS* (if any) and your *MYCALL* station identification and the word 'digipeater'.

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

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

ILFPACK ON|OFF	Mnemonic: **IL**	Default: ON
Mode: Packet		

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   Mnemonic: **KI**   Default: OFF
Mode: Packet

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

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 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 key-board-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 traffic, the path in use, the digipeaters involved – or other variables not under your control – make Packet operation difficult (as shown by lots of retries!), you can actually improve your throughput by reducing _MAXFRAME_.

*   If Packet traffic is heavy or the path is poor, reduce _MAXFRAME_ to 3 or 2.
*   If you're sharing the channel with several PBBSs and digipeaters or when working a PBBSs or other types of host computers, reduce _MAXFRAME_ to 1.
*   If the radio link is good, an optimal relationship exists between the parameter 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.
*   Use _MAXFRAME_ 1 for best results on HF Packet.

MBELL ON|OFF   Mnemonic: **MBE**   Default: OFF
Mode: Packet

Parameters: ON-   Will send 3 _BELL_ characters to the terminal when the callsign(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*]   Mnemonic: **MB**   Default: empty
Mode: Packet

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

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

MBX filters the received packet data 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 multiple connection.)

Use the *MBX* feature to:

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

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

NOTE: When using the MBX feature, your station is not part of the protocol handshake between the originating and receiving stations. If your local conditions (such as noise busts 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 transmission is strong. Clear MBX with %, &, N, NO, NONE or OFF as argument.

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 packet traffic <u>while connected</u> to a distant station.

MCON works in similar fashion to *MONITOR*, but affects your display only 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,' roundtable 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 acknowledgment (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, PID 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 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 com-munication 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 *n*1[,*n*2[,*n*3[,*n*4]]]   Mnemonic: **MFI**   Default: $07,$13
Mode: Packet

Parameters: ***n*** -   0 to $80 (0 to 128 decimal) specifies an ASCII character code. Up to four characters may be specified separated by commas.

Use *MFILTER* to select characters to be 'filtered' or excluded from monitored packets. Parameters '*n*1,', '*n*2', 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 character $80 (128) and above.

- To prevent a <CTRL-L> character from clearing your screen, set *MFILTER* 12.
- To eliminate <CTRL-G> characters, which beep your computer or terminal, set *MFILTER* 7.

MFROM ALL/NONE, YES/NO call1[,call2..] Mnemonic **MF**   Default: ALL
Mode: Packet

Parameters: call -   ALL/NONE, YES list/NO list
                       (list of up to eight call signs, separated by commas).

MFROM uses arguments to determine how your PK-232 monitors the Packet channels and display information – which stations' packet will be displayed and which stations' packet 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 sign whose packets will or will not be displayed. You can use the abbreviated command form or mnemonic:

```
    cmd:mfrom
```
or
```
    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 call signs. Packets <u>will be displayed</u> 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 <u>will not be displayed</u>.

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 *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.

- Stations that are heard directly are marked with a * in the heard log.
- Stations that have been repeated by a digipeater are not marked.
- If you clear the list of stations heard at the beginning of a session, you can use this command to keep track of stations that are active during that period.
- 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 also shown before the time. Here is an actual sample of the *MHEARD* function with the clock set:

DAYSTAMP ON	DAYSTAMP OFF
`cmd:mh`	`cmd:mh`
`05-Jul-86 21:42:27 WA1FJW`	`21:42:27 WA1FJW`
`05-Jul-86 21:42:24 WA1IXU*`	`21:42:24 WA1IXU*`
`05-Jul-86 21:32:18 K2AAA-5`	`21:32:18 K2AAA-5`
`05-Jul-86 21:27:57 W2HPM-4*`	`21:27:57 W2HPM-4*`
`05-Jul-86 21:26:41 K2AAA-4`	`21:26:41 K2AAA-4`
`05-Jul-86 21:26:38 W2JUP-9`	`21:26:38 W2JUP-9`
`05-Jul-86 21:21:24 KA1EOU*`	`21:21:24 KA1EOU*`
`05-Jul-86 21:21:23 W2JUP-4*`	`21:21:23 W2JUP-4*`
`05-Jul-86 20:56:40 KB1H`	`20:56:40 KB1H`
`05-Jul-86 14:45:57 WA2SNA-1`	`14:45:57 WA2SNA-1`
`05-Jul-86 14:45:53 KY1P`	`14:45:53 KY1P`
`05-Jul-86 14:45:47 W6AXM`	`14:45:47 W6AXM`
`05-Jul-86 14:28:16 KB2ANH`	`14:28:16 KB2ANH`
`05-Jul-86 14:23:32 WB2NYC`	`14:23:32 WB2NYC`
`05-Jul-86 14:23:19 WB2EUL`	`14:23:19 WB2EUL`
`05-Jul-86 13:55:26 N2FWE`	`13:55:26 N2FWE`
`05-Jul-86 13:50:28 W1GB-1*`	`13:50:28 W1GB-1*`
`cmd:`	`cmd:`

MONITOR *n*	Mnemonic: **M**	Default: 4
Mode: Packet		

Parameters: *n* -   0 to 6 signifies various levels on monitor indications.

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

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 acknowledgment (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, PID 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 Mode.

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

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

MPROTO ON|OFF	Mnemonic: **MP**	Default OFF
Mode: Packet		

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   Mnemonic: **MR**   Default: ON
Mode: Packet

Parameters: ON -   Show digipeater in the header.; stations heard directly are marked with aste-
                    risk.
             OFF - Show packets only 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 stations are dis-
played 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
signs of the stations heard directly are flagged with an asterisk (*):

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

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

- When *MRPT* is OFF, digipeater paths will not appear in connect requests or connect and discon-
  nectet monitor function.

MSPEED *n*   Mnemonic: **MSP**   Default: 20 WPM
Mode: Morse

Parameters: ***n*** -   5 to 99 signifies your PK-232's Morse transmit speed.

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

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

MSTAMP ON|OFF   Mnemonic: **MS**   Default: OFF
Mode: Packet

Parameters: ON -   Monitored frames ARE time stamped.
             OFF - Monitored frames ARE NOT time stamped.

The *MSTAMP* command activates or disables time stamping of monitored packets. When your PK-
232's internal software clock is set, date and time information is available for automatic logging of
packet activity and 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;2,2>:`

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>:`

• Set the date and time with the *DAYTIME* command.

Set *MSTAMP* ON increase the length of the address display.

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

MTO ALL/NONE,YES/NO call1[,call2..]   Mnemonic: **MT**   Default: none
Mode: Packet

Parameters: call -   ALL/NONE, YES list/NO list
                        (list of up to eight call signs, separated by commas).

MTO uses arguments to determine how your PK-232 monitors the Packet channels and displays in-formation – 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 the stations to which ad-dressed packets will or will not be displayed. You can use the abbreviated command form or mnemonic.

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

To stop packets addressed <u>to</u> 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. Packets <u>will be displayed</u> only if addressed <u>to</u> stations whose call signs are listed after YES.

To hide or mask packets addressed <u>to</u> one or more specific stations, type MTO NO followed by a list of call signs. Packets addressed <u>to</u> stations whose call signs are listed after NO <u>will not be dis-played</u>.

You can include optional SSIDs specified as '-***n***' after the call sign. If *MTO* is set to 'NO N6IA,' or 'YES N6IA' any combination N6IA, N6IA-1,...N6IA-15 will be matched and processed. If *MTO* 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 *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 (SELCALL)

Use the *MYALTCAL* command to specify an your <u>alternate</u> *SELCALL* which, under certain conditions, may be convenient or necessary.

You can enter an additional *SELCALL* code not related to your call sign. The alternate *SELCALL* can be any <u>four</u> 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 - 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 'PK-232'.

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 digipeated field.

The 'PK232' default call sign is present in your PK-232's ROM when the system is manufactured. This 'artificial call' <u>must be changed</u> for proper operation of the Packet and AMTOR protocols.

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

- Use the SSID to distinguish two stations with the same amateur call.
- The SSID will be 0 (zero) 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 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 (SELCALL)

NOTE: You can't operate AMTOR unless your SELCALL is installed. The error message reminds you:

> **?need MYSELCAL**

Use the *MYSELCAL* command to enter the *SELCALL* (SELective CALLing) code required in AMTOR ARQ (Mode A) and SELFEC operating modes. *MYSELCAL* is a unique character string which <u>must</u> contain four alphabetic characters and is normally derived from your call sign. Some of the call signs groupings now in use:

GROUP	CALL	SELCALL
1 by 2	W1XY	WWXY
1 by 3	W1XYZ	WXYZ
2 by 1	AB1X	AABX
2 by 2	AB1XY	ABXY
2 by 3	KA1XYZ	KXYZ

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 N?ML. Change your SELCAL to NUML, according to the following table:

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

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

NEWMODE ON|OFF   Mnemonic: **NE**   Default: ON
Mode: Packet

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

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

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

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

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

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

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

NOMODE ON|OFF   Mnemonic: **NO**   Default: OFF
Mode: Packet

Parameters: ON -   The PK-232 switches 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 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   Mnemonic: **NU**   Default: OFF
Mode: All

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

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

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

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

NULF ON|OFF   Mnemonic: **NUL**   Default: OFF
Mode: All

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

Some of the older electromechanical terminals (Teletype™ machines) and printer-terminals require some extra time for the printing head to do a line feed and return to the left margin. *NULF* ON solves this problem 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 com-
                      puter or terminal after <CR> or <LF> when NUCR or NULF are set ON.

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

• *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 is a typical indications:

```
cmd:o
OPMODE  ASCII        RCVE

cmd:op
OPMODE  PACKET

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

PACKET   Mnemonic: **PA**   Immediate Command
Mode: Command

Use the *PACKET* command to switch your PK-232 into Packet-Radio mode from any other operating mode. Your PK-232 automatically enters the Packet Mode at first power-up, or after a *RESTART* command.

PACLEN *n*   Mnemonic: **PACL**   Default: 128
Mode: Packet

Parameters: ***n*** -   0 to 255 specifies the maximum length of the data portion of a packet.
               0 -   Zero is equivalent to 256.

PACLEN sets the maximum number of 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 sends a packet when the number of characters you type for a packet equals ***n***. This value is used in both Converse and Transparent Modes.

Most keyboard-to-keyboard operators use the default value of 128 bytes for routine VHF/UHF packet services.

Experiment with different values for *MAXFRAME* and *PACLEN* to find the combination best suited to your operating conditions – especially if you are transferring files.

- The lower the value of *PACLEN*, the greater the probability of getting packets though the link without 'hits' or retries.
- Increase *PACLEN* to 256 if transferring files to a nearby station over a high quality path.
- Reduce *PACLEN* to 64, or even 32 when working 'difficult' HF radio paths.
- If the radio link is good and optimal relationship will exist between the parameter 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 <u>not</u> necessary that two TNCs be set to the same *PACLEN* value to exchange data; however, some TNCs may not be compatible when frames contain more than 128 data characters.

PACTIME EVERY/AFTER *n*   Mnemonic: PACT   Default: AFTER 10
Mode: Packet

Parameters: *n* -   0 to 250 specifies 100-millisecond intervals.
                EVERY -   Packet time-out occurs every *n* times 100 milliseconds.
                AFTER -   Packet time-out-occurs when *n* times 100 milliseconds elapse without input from the computer or terminal.

A *PACTIME* parameter is always used in Transparent Mode. *PACTIME* is also used in Converse Mode if *CPACTIME* is ON.

- When EVERY is specified, the characters you type or send from disk are packaged and queued for transmission every *n* times 100 milliseconds.
- When AFTER is specified, the characters you type or send from disk are packaged when input from the terminal stops for *n* times 100 milliseconds.

A zero-length packet will <u>never</u> 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 table below:

        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

Parameters: ***n*** -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

PASS selects the ASCII character used for the 'pass' input editing commands.

The parameter ***n*** is the numeric ASCII code for the character you'll used to signal that the character immediately following it is to be included in a packet or text string.

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

Use the *PASS* character (default <CTRL-V>) to send characters that usually have special functions.

A common use for the PASS character is to allow <CR> to be included in the *BTEXT* and *CTEXT* messages so that the transmitted information appears on several short lines rather than a single longer line.

Use the *PASS* character to insert <CR> 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 <CR> in text when you are in Converse Mode, to send multi-line packets. (The default send-packet character is <CR>.)

PASSALL ON|OFF   Mnemonic: **PASSA**   Default: OFF
Mode: Packet

Parameters: ON -   Your PK-232 will accept packets with <u>invalid</u> CRCS.
               OFF -   Your PK-232 will only accept packets with <u>valid</u> CRCs.

PASSALL permits the PK-232 to display packets received with invalid CRC fields; the error-detecting mechanism is turned off.

Packets are accepted for display despite CRC errors if they consist of an even multiple of eight bits and are up to 330 bytes. The PK-232 attempts to decode the address field and displays the call sign(s) in the standard monitor format, followed by the text of the packet.

PASSALL is normally turned off; therefore, the protocol ensures that received packets data is error-free by rejecting packets with invalid CRC fields.

PASSALL (sometimes called 'Garbage Mode') may be useful for testing a marginal RF link or during operation under other unusual conditions or circumstances.

When you set *PASSALL* ON while monitoring a moderately noisy channel, 'packets' are displayed periodically because there is no basis for distinguishing between actual packets and random noise.

- When *PASSALL* is ON, logging of stations heard (for display by *MHEARD*) is disabled; the call signs detected may be incorrect.

PERSIST *n* Mode: Packet	Mnemonic: **PE**	Default: 127

Parameters: ***n*** -   0 to 255 specifies the threshhold value for a random-number attempt to transmit.

   0 -   Signifies a $1/256^{th}$ chance of transmitting every SLOTTIME.

   255 -   Signifies 'transmit right away without delay'.

The *PERSIST* parameter works with the *PPERSIST* 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 $.01 \times$ *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 $.01 \times$ *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 <u>Technical Manual for the PK-232</u>.

PPERSIST ON|OFF   Mnemonic: **PP**   Default: OFF
Mode: Packet

Parameters: ON -   The PK-232 uses *PERSIST* and *SLOTTIME* parameters in executing p-persis-
                       tent 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-persis-
tent CSMA instead of the normal TAPR-type DWAIT procedure to achieve CSMA operation. *PPER-SIST* can be used in both KISS TNC and normal AX.25 operation. See *PERSIST* and *SLOTTIME*.

RBAUD *n*   Mnemonic: **RB**   Default: 45 bauds (60 WPM)
Mode: Baudot RTTY

Parameters: ***n*** -   Specifies the rate or signaling 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 Alpha-
bet #2 operating mode. This value has <u>no relationship</u> to your computer or terminal program's
baud rate.

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).

•   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 term '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 Command Mode, to switch your PK-232 from transmit to
receive when operating Baudot and ASCII RTTY.

You <u>must</u> return to the Command Mode to use the *RCVE* command.

•   Type <CTRL-C> to enter the Command Mode.

RECEIVE *n*   Mnemonic: **REC**   Default: $04 <CTRL-D>
Mode: Baudot/ASCII/Morse/AMTOR

Parameters: ***n*** -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

The *RECEIVE* command allows you to insert a 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.

• Type the *RECEIVE* Command character at the end of your text or message while recording a disk file or on the air typing into the PK-232 transmit buffer.

REDISPLA *n*   Mnemonic: **RED**   Default: $12 <CTRL-R>
Mode: All

Parameters: ***n*** -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

REDISPLA changes the redisplay-line input editing character.

Parameter ***n*** is the numeric ASCII code for the character you'll use when you want to re-display the current input line. You can enter the code in either hex or decimal.

Type the *REDISPLA* character to re-display a line you've just typed. The following things happen:

• Type-in flow control is temporarily turned off (if it had been active). Any incoming packets that are pending are displayed.
• 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 changed any characters.

You can now continue typing where you left off.

Use the redisplay-Line character to see a 'clean' copy of your input if you are using a printing ter-minal and you have deleted characters.

If *BKONDEL* is set OFF, deletions are designated with <BACKSLASH> characters, rather than by trying to correct the input line display. The re-displayed line is the corrected text.

Use the *REDISPLA* character if a packet is received while you're typing a message in Converse Mode. You can see the incoming message before you send your packet without canceling your in-put.

RELINK ON|OFF   Mnemonic: **REL**   Default: OFF
Mode: Packet

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 re-establish the failed link.

Set RELINK to OFF when using the PK-232 with host computer applications, computer-based mes-sage systems and programs such as WA7MBL's Version 3.12 Packet Bulletin Board (PBBS) soft-ware.

RESET   Mnemonic: **RESET**   Immediate Command
Mode: Command

RESET is an immediate command that resets all parameters to default settings and reinitializes the PK-232.

WARNING:
All parameters customizing and monitor lists are lost.

• To reinitialize the PK-232 using the parameter values in bbRAM, turn the PK-232 OFF then ON, or use the *RESTART* command.

RESPTIME *n*   Mnemonic: **RES**   Default: 10
Mode: Packet

Parameters: *n* -   0 to 250 specifies 100-millisecond intervals.

RESPTIME <u>adds</u> a minimum delay before your PK-232 sends acknowledgment packets. This delay may run concurrently with the default wait time set by *DWAIT* and any random wait in effect.

• Use *RESPTIME* delay to increase throughput during operations such as file transfer when sending TNC usually sends the maximum number of full-length packets.

Occasionally, the sending TNC may not have a packet ready in time to prevent transmission from being stopped temporarily, with the result that the acknowledgement 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 <u>does not</u> reset the parameter values in bbRAM. See the *RESET* command.

RETRY *n*   Mnemonic: **RE**   Default: 10
Mode: Packet

Parameters: *n* -   0 to 15 specifies the maximum number of packet retries.

The AX.25 protocol uses retries – the retransmission of frames that have not been acknowledged. Frames are retransmitted *n* times before the link is disconnected. A value of 0 for <u>n</u> specifies an infinite number of retries.

• 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 are 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' but receiving your signals correctly.

Set *RXREV* ON to reverse the data sense of received signals.

Type RXREV TOG (RXR T) to 'toggle' the polarity of received signals. This is useful when trying various combinations of *RBAUD* and *RXREV* to decode an unknown Baudot signal.

SELFEC *aaaa*	Mnemonic: **SEL**	Default: empty
Mode: AMTOR FEC		

Parameters: *aaaa* - Specifies your SELective CALling code (SELCALL).

The *SELFEC* command starts a SELective FEC (Mode Bs) transmission to a specific distant station when you enter that station's SELCALL (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.

- See *MYSELCAL* for further information on the derivation and use of SELCALs.
- To end your *SELFEC* transmission, return to the Command Mode by typing <CTRL-C> (default value) and then typing R to switch back to receive mode.

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

SENDPAC *n*   Mnemonic: **SE**   Default: $0D <CTRL-M>
Mode: Packet

Parameters: ***n*** -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the *SENDPAC* command to select the character used to force a packet to be sent in Converse Mode. The parameter ***n*** is the numeric ASCII code for the character you want to use to force your input to be packetized and queued for transmission. You can enter the code in either hexadecimal or decimal numbers.

Use default *SENDPAC* value $0D for ordinary conversation with CR ON to send packets at natural intervals with <CR> 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*   Mnemonic: **SL**   Default: 10 (100 sec.)
Mode: Packet

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 ON|OFF   Mnemonic: **SRX**   Default: OFF
Mode: AMTOR

Parameters: ON -   Receive ALL selective (SELFEC) transmissions.
              OFF - Receive only SELCALL-addressed SELFEC transmissions.

SRXALL permits the reception of selectively-coded inverse FEC signals normally not available for decoding.

Set *SRXALL* ON to activate this feature.

START *n*   Mnemonic: **STA**   Default: $11 <CTRL-Q>
Mode: All

Parameters: *n* -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the *START* command to choose the user START character you want to use to restart output from the PK-232 to the terminal after it has been halted by typing the user STOP character.

• The User Stop character is set by the *STOP* command.
• You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to $00, software flow control to the PK-232 is disabled; the PK-232 will only respond to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop character, the PK-232 alternately starts and stops transmission on receipt of the character ('toggels').

STOP *n*   Mnemonic: **STO**   Default: $13 <CTRL-S>
Mode: All

Parameters: *n* -   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the *STOP* command to select the user *STOP* character you want to use to stop output from the PK-232 to the terminal. Type this character to halt the PK-232's output to your monitor so that you can read the received text before it scrolls off your screen display.

Output is restarted with the User Start character.

• The User Start character is set by the *START* command.
• You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to $00, software flow control to the PK-232 is disabled; the PK-232 will only respond to hardware flow control (CTS).

If the same character is used for both the User Start and User Stop character, the PK-232 alternately starts and stops transmission on receipt of the character ('toggels').

TBAUD *n*   Mnemonic: **TB**   Default: 1200 bauds
Mode: All

Parameters: ***n*** -   Specifies the rate or signaling speed, in bauds, on the serial I/O port.

TBAUD displays the baud rate set by the auto-baud routine when you first apply power to the PK-232, or after typing RESET.

Use *TBAUD* to set terminal rates not covered by the auto-baud routine, such as 110 and 600 bauds.

Use *TBAUD* to specify a terminal baud rate that will become active at the next power-on or *RESTART*. A warning message reminds you of this.

If you plan to change terminals, but want to retain all the RAM parameters values, set *TBAUD*, *AWLEN* and *PARITY* to the new terminals's characteristics while you are still connected to the old terminal. Next, turn off the PK-232, change the terminal and turn the PK-232 on again.

TCLEAR   Mnemonic: **TC**   Immediate Command
Mode: Command

The *TCLEAR* command clears your PK-232's transmit buffer and cancels any further transmission of data when in the Baudot, ASCII, AMTOR or Morse operating modes. In Packet Mode, all data is cleared except for a few remaining packets.

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

TIME *n*   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 a control character in the text you type into the transmit buffer or into a text file stored on disk.

• Type <CTRL-T> to embed the *TIME* command in your message text or file.

At transmit time, the PK-232 reads the embedded control code (default <CTRL-T>), reads the time-of-day from the PK-232's internal clock and then sends the time to the radio in the data transmission code in use at that time. When *DAYSTAMP* is set ON, the date is transmitted with the time.

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. If *TRACE* is ON all received frames are displayed in their entirety, including all header information.

NOTE: Be careful using the mnemonic – don't use *TRA* ! The PK-232 will change to Transparent Mode!

The *TRACE* display is shown as it appears on an 80-column display. The following monitored frame is a sample:

```
W2JUP*>TESTER <UI>:
This is a test message packet.

Byte              Hex                    Shifted ASCII      ASCII
000: A88AA6A8 8AA460AE 6494AAA0 406103F0   TESTER0W2JUP 0.x   ......`.d...@a..
010: 54686973 20697320 61207465 7374206D   *449.49.0.:29:.6   This is a test m
020: 65737361 67652070 61636B65 742E0D     299032.80152:..    essage packet...
```

The byte column shows the offset into the packet of the first byte of the line.

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

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

In a standard AX.25 packet,

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

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

TRANS   Mnemonic: **T**   Imediate 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.

• 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 Trans-
                        parent 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 out-standing 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 0 (zero), the *TRIES* command always returns 0 (zero).

Use *TRIES* for gathering statistics on a given path or channel. *TRIES* is especially useful for compute operating 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 (300 msec.) |
| Mode: Packet |

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:

• Crystal-controlled radios with diode antenna-switching don't need much time.
• Synthesized radios need time for their phase-lock-loops (PLLs) to lock up and settle on to the operating frequency.
• Radios with mechanical transmit/receive relays need time for the physical movement of the re-lays.
• External amplifiers using RF-driven relay switching frequently require that you increase *TXDE-LAY* 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.

• 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   Mnemonic: **TXF**   Default: OFF |
| Mode: Packet |

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   Mnemonic: **TXR**   Default: OFF
Mode: Baudot/ASCII/AMTOR

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 genera-tor, 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 transmit-ting in correct polarity.

• 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 (un-protocol) 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 <u>not</u> 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* address-ing 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 let-
ters 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 punctua-
tion), 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 unac-
                ceptable results by forcing the system into letters case when the originator may
                have intended the information to be in figures case.

VHF ON|OFF   Mnemonic: **V**   Default: ON
Mode: Packet

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.

- Set *VHF OFF* for HF packet operation.
- Set *VHF ON* for VHF operation.

NOTE: Be sure to change *HB* to 300 bauds when operating below 28 MHz.

WIDESHFT ON|OFF   Mnemonic: **WI**   Default: OFF
Mode: Baudot/ASCII RTTY

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	Mnemonic: **XMITO**	Default: ON
Mode: Packet		

Parameters: ON -   Transmit functions (PIT 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*   Mnemonic: **XO**   Default: $13 <CTRL-S>
Mode: All

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.

- 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*   Mnemonic: **XON**   Default: $11 <CTRL-Q>
Mode: All

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.

- 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

COMMAND	MNEMONIC	DEFAULT	FUNCTION
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 (×10 ms)
AXHANG	AXH	0 (zero)	Repeater hang time (×10 ms)
BAUDOT	BA	Immediate Command	Start Baudot RTTY mode
BEACON	B	EVERY 0	Set beacon timing (×10 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 (XlO 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
CSTATUS	CS	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

COMMAND	MNEMONIC	DEFAULT	FUNCTION
DAYTIME	DA	None	Set/read PK-232 internal clock
DCDCONN	DC	OFF	RS-232 Pin 8 follows DCD/CON
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 (×10 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 (×1 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
HPOLL	HP	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	MFI	$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

COMMAND	MNEMONIC	DEFAULT	FUNCTION
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 (×100 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 threshhold
PPERSIST	PP	OFF	P-persistent/1-persistent CSMA
RAWHDLC	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 (×10 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 – BIBLIOGRAPHY

B-1

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 <u>calling</u> 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 <u>initial</u> calls. Stations transmit their CQ or other general broadcast calls on a frequency established as <u>the</u> 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 <u>can</u> 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 <u>quickly move off to another channel</u> to continue their communication.

The calling channel should not be used as a <u>working</u> 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.

<div align="center">

AMTOR OPERATING NOTES
G3PLX September 1983

</div>

1. Legalities

    Establish before operating whether you are authorized 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 SEL-CAL 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 synchronizes to the distant transmitter.

3.3.1.   Since the receiver can only synchronize 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 synchronization.

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 synchronize 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

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 analog to the time-domain synchronizations 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 prearranged 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 center-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 favor 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 or 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 labeled '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.   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 en-codes all characters with a mark-to-space polarity ratio, always as four ones and three ze-ros, 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 sta-tions.

If the receiving system's processor detects an incorrect mark-to-space (ones-to-zeros) polar-ity ratio, the receiving station's processor or computer sends a command back to the send-ing 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 millisec-onds.

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 accep-tance 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 turnaround 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:

Idle 1 - Idle 2 - Idle 1 - Idle 2 - 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.   <u>'RTTY' Means 'Baudot' – Not True!</u>

'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:	Human Speech	RTTY
CODES:	English	Baudot
	French	ASCII
	Spanish	AMTOR
	Italian	Packet

2.   <u>'Baudot Code is Obsolete' – Not True!</u>

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 se-

quential 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 that 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.

APPENDIX I – PARTS PICTORIAL
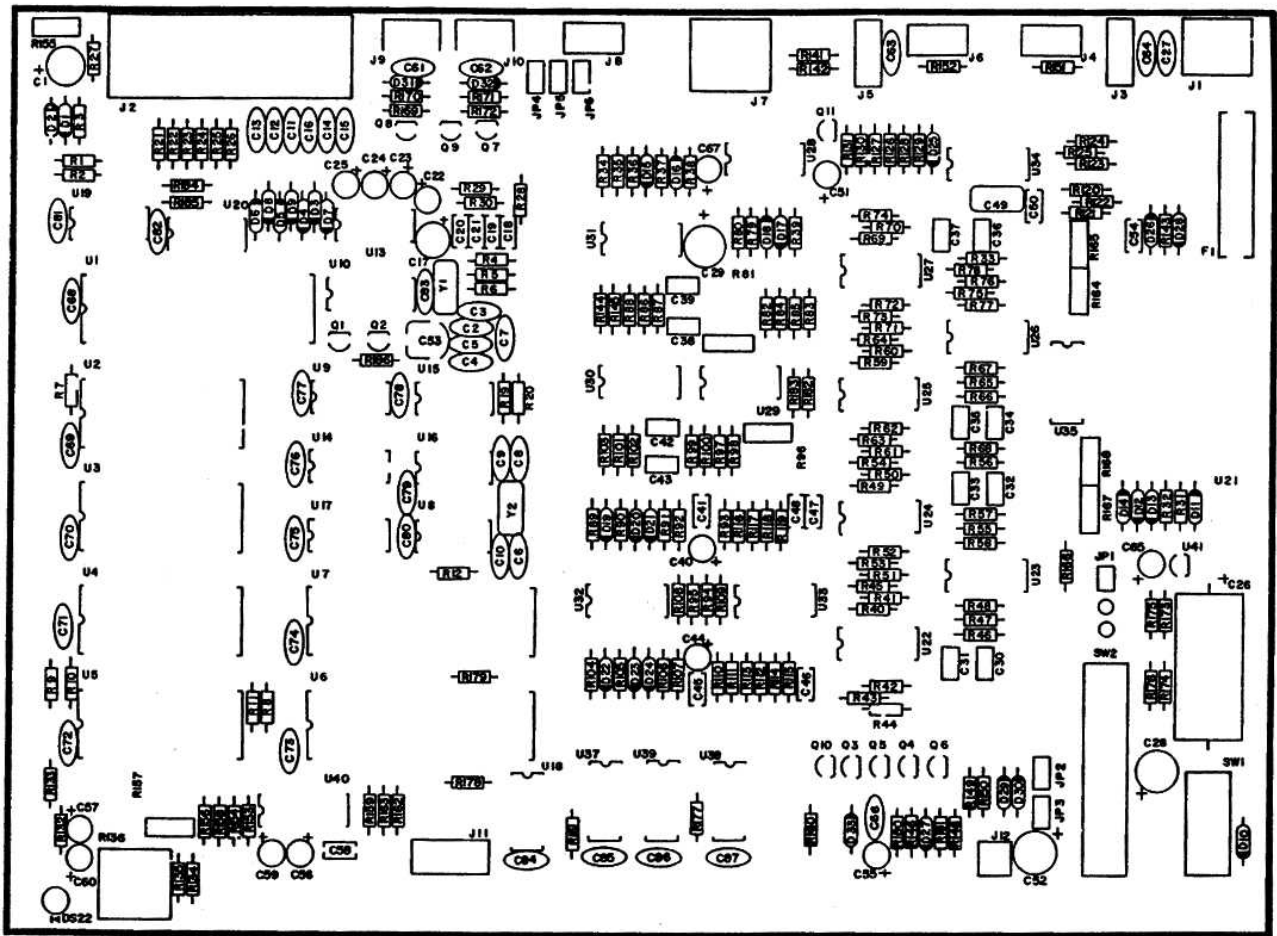
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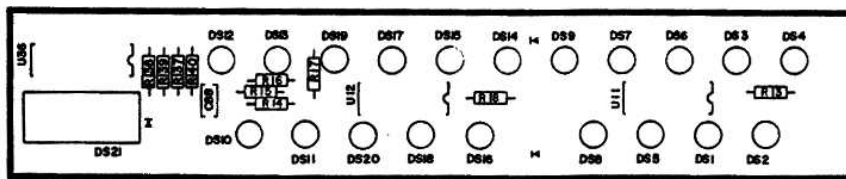
DISPLAY BOARD

APPENDIX J – PARTS LIST PK-232 PCB
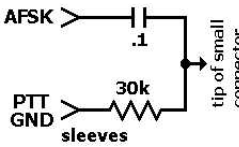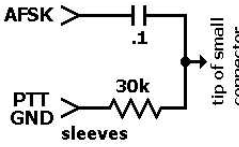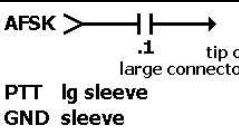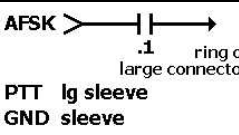
DESCRIPTION	REF. DESIG.	DESCRIPTION	REF. DESIG.
CAP MY 103P, 10%, 50V	C20, C21	RES ¼W 5% 680.00	R151, R152
CAP MY 104P, 10%, 50V	C18, C41, C45	RES ¼W 5% 8.20K	R82
CAP MY 562P, 10%, 50V	C88	RES ¼W 5% 10.00K	R46, R57, R66, R76, R87,
CAP MY 104P, 5%, 50V	C47, C49		R89, R90, R102, R104,
CAP MY 122P, 2%, 50V	C50		R105
CAP MY 473P, 2%, 50V	C46	RES ¼W 5% 100.00K	R78
CAP MY 103P, 5%	C54	RES ¼W 1% 1.10K	R138
CAP CR 102P, 50V	C11-C16, C19	RES ¼W 1% 11.00K	R119, R121
CAP CR 103P, 50V	C3, C4, C7, C8, C61-C64	RES ¼W 1% 1.69K	R174
CAP CR 104P, 50V	C27, C66, C68-87	RES ¼W 1% 16.90K	R56
CAP VARIABLE, 5-40P	C53	RES ¼W 1% 1.78K	R137
CAP EL 106P RAD, 25V	C22-25, C40, C44, C55-C57, C59, C60, C65, C67	RES ¼W 1% 174.00K	R42, R52, R62, R72
		RES ¼W 1% 18.70K	R48, R58, R67, R77, R88,
CAP EL 107P RAD, 25V	C1, C28		R103,
CAP EL 335P RAD, 100V	C51	RES ¼W 1% 19.60K	R84, R99
CAP EL 476P RAD, 35V	C17, C29, C52	RES ¼W 1% 20.00K	R39
CAP EL 108P AX, 35V	C26	RES ¼W 1% 22.10K	R85
CAP PP 223P, 2%	C58	RES ¼W 1% 23.20K	R47, R55, R65, R75, R86,
CAP PP 472P, 2%	C48		R101
CAP PP 103P, 1%	C30-C39, C42, C43	RES ¼W 1% 243.00	R31, R173
CAP SM 220P	C2	RES ¼W 1% 24.30K	R112, R114, R116
CAP SM 33P	C6	RES ¼W 1% 267.00K	R44, R51, R61, R71
CAP SM 330P	C5	RES ¼W 1% 26.70K	R43, R53, R63, R73
CAP SM 680P	C10	RES ¼W 1% 3.09K	R175
CAP SM 820P	C9	RES ¼W 1% 30.10K	R41, R50, R60, R70
		RES ¼W 1% 33.20K	R118, R120
		RES ¼W 1% 3.74K	R139
RES ¼W 5% 10.00	R28	RES ¼W 1% 4.99K	R153, R154, R156, R158
RES ¼W 5% 100.00	R21-R24, R26, R27	RES ¼W 1% 49.90K	R45, R54, R64, R74
RES ¼W 5% 1.00K	R3, R4, R5, R19, R20, R36, R124, R131, R140, R148, R181	RES ¼W 1% 6.19K	R176
		RES ¼W 1% 6.49K	R100
		RES ¼W 1% 7.50K	R38, R40, R49, R59, R69
RES ¼W 5% 100.00K	R30, R95, R108	RES ¼W 1% 8.06K	R113, R115, R117
RES ¼W 5% 120.00	R172	RES ¼W 1% 80.60K	R83, R98
RES ¼W 5% 12.00K	R166	RES ¼W 1% 845.00	R32
RES ¼W 5% 15.00K	R162	RES ¼W 1% 95.30K	R68
RES ¼W 5% 18.00K	R163		
RES ¼W 5% 200.00	R91, R92, R106, R107, R126, R159	PNL POT .625 SQ 1K	R136
RES ¼W 5% 2.00K	R79		
RES ¼W 5% 20.00K	R35, R93, R97, R110, R150	POT TRM. .15L/S 10K	R164, R165, R168
RES ¼W 5% 330.00	R6, R13-R18, R133, R186 R160	POT TRM. .15L/S 100K	R96
		POT TRM. .15L/S 20K	R167
RES ¼W 5% 3.30K	R135	POT TRM. .15L/S 25K	R155
RES ¼W 5% 360.00	R171	POT TRM. .15L/S 500	R157
RES ¼W 5% 430.00	R125	POT TRM. .15L/S 5K	R81
RES ¼W 5% 470.00	R1, R2, R25, R29, R37,		
RES ¼W 5% 4.70K	R141, R142, R144, R145, R149, R161, R169, R177, R180, R182, R183	DIODE SIG 1N448	D1-D9, D13-D26, D28, D33
		DIODE PWR 1N4003	D10-D12, D29, D30
RES ¼W 5% 47.00K	R127	DIODE PWR 1N4006	D31, D32
RES ¼W 5% 510.00	R134	DIODE ZNR 1N751	D27
RES ¼W 5% 5.10K	R9, R10, R132		
RES ¼W 5% 510.00K	R80, R123, R128		
RES ¼W 5% 68.00	R170		

DESCRIPTION	REF. DESIG.	DESCRIPTION	REF. DESIG.
LED RED MV5025	DS1-DS20, DS22	DIP SOCK 20 PIN	DS21
LED 10 SEG BARGRAPH	DS21	DIP SOCK 28 PIN	U2, U3, U4, U5
		DIP SOCK 40 PIN	U1, U6, U7
XISTOR NPN 2N39114	Q6, Q7, Q10, Q11		
XISTOR NPN MPSA42	Q8	HDR R/AX2.1 3 POS	J12
XISTOR NPN MPS6521	Q3	HDR R/A.10 5 POS	J4, J6, J8
XISTOR NPN MPS6561	Q5	HDR R/AX2.10 7 POS	J11
XISTOR PFET VN10LM	Q1, Q2	HDR STR.10 2 POS	JP1
XISTOR PNP 2N3906	Q4, Q9	HDR STR .10 3 POS	JP2, JP3
		HDR R/A 'D' 25 POS	J2
IC LM317L	U41	JACK PWR 2.1MM	J1
IC LM317T	U21	JACK PHON 3.5MM	J3, J5
IC NE556N	U13	JACK PHONO P.C.	J9, J10
IC MC34074P	U23, U26, U28, U30,	CONN R/A DIN 5 PIN	J7
	U32, U34		
IC XR2206	U40	SW P-P 2P2T	SW1
IC LM3914	U36	SW P-P 6P2T	SW2
IC 74LS04	U15, U16, U39		
IC 7406	U18, U37, U38		
IC 74LS11	U14	X-TAL 2.4576 MHZ	Y2
IC 74LS32	U17	X-TAL 4.000 MHZ	Y1
IC 7445	U11, U12		
IC 74HCT139	U10		
IC 74LS164	U9	HEATSIN THM 60198	U21
IC 74LS393	U8	KNB SW GRY .4 X .2	SW1, SW2
IC 27128	U3	FUSE CLIP PCB	F1
IC 27256	U2	FUSE 1 AMP	F1
IC 6264	U4, U5	SHORT PLUG .10	JP1, JP2, JP3
IC Z80A CPU	U1		
IC Z8530	U7		
IC Z8536	U6		
IC 40668	U22, U24, U25, U27, U29,		
	U31, U33, U35		
IC MC1488	U20		
IC MC1489	U19		

APPENDIX K – SPECIFIC RADIO CONNECTIONS

MFG	RADIO	PIN OUT	NOTES
ICOM	4 pin	AFSK 1 PTT 2 GND 4	
	8 pin	AFSK 1 PTT 5 GND 6, 7	RX audio available on pin 8 of some radios.
	HTs		RX audio available on tip of large conn.
YAESU	4 pin	AFSK 2 PTT 3 GND 1	
	8 pin	AFSK 8 PTT 6 GND 7	FT-270/2700 require mic DC block cap & series diode w/PTT
	FT-x03 FT-x09 FT-727		RX audio available on tip of large conn.
	FT-208	AFSK 1 PTT 3 GND 4	RX audio on pin 2.
KENWOOD	4 pin	AFSK 1 PTT 2 GND 3, 4	
	5 pin	AFSK 1 PTT 2 GND 4, 5	
	6 pin	AFSK 1 PTT 2 GND 6	
	8 pin	AFSK 1 PTT 2 GND 7, 8	
	TR-2500		RX audio available on tip of small conn.
	TR-x600 TH-x1		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	
ALINCO	ALR 206T		Brown and Shield to Pin 7. External Speaker for Audio.
RADIO SHACK	HTX 100	WHITE 1 RED 2 GREEN 6 SHIELD 7 BROWN 8	

NOTE: On all radios, the shield should go to the same place as the brown wire, unless oth-
erwise noted.

ICOM IC-751

Pin 1   Output from the discriminator circuit
Pin 2   13,8 VDC, switched with the front panel power
Pin 3   RED, PTT when grounded
Pin 4   GREEN, Fixed level audio out
Pin 5   WHITE, Input for mic gain control
Pin 6   8 VDC when transmitting, max. 5 mA
Pin 7   Input for external AGC
Pin 8   BROWN & SHIELD, Ground
Pin 9   FSK N. Input for RTTY, Mark High - Space Low
Pin 10 NC
Pin 11 Input for transverter control
Pin 12 Output reference voltage for band switching
Pin 13 Output for external band switching

This information has been obtained from various sources and AEA assumes no responsibility for ac-
curacy. Please consult your particular transceiver operator's manual for confirmation.

FACSIMILE OPERATION

Overview

Weather Facsimile (WEFAX) is transmitted throughout the Short-Wave radio spectrum, primarily to provide information to ships at sea. 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 reasonable 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.
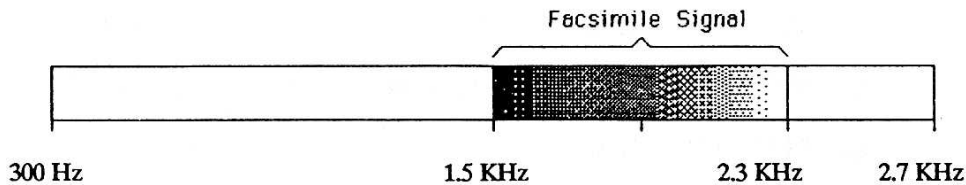
Figure 1: Facsimile signal inside the audio passband of a typical SSB receiver

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 wideshift 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 diagramed 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.
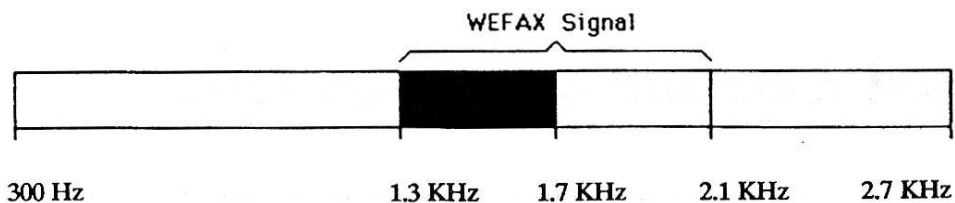
Figure 2: How the PK-232 receives and digitizes facsimile signals Finding Fax Frequencies

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 · 20,015.0 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 re-calibrate 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 wideshift 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.

Frequency too low   Tuned In   Frequency too High
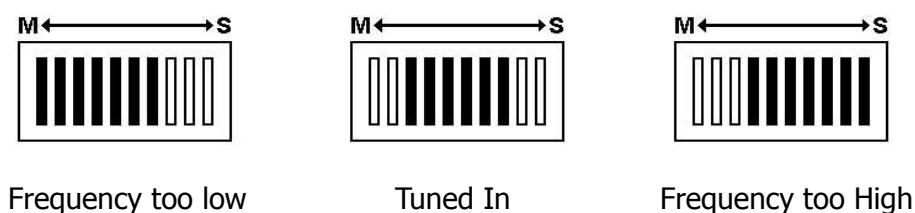
Figure 3: Facsimile tuning indicator conditions for proper and improper FAX tuning

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 compatibility. 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 ½ inch increments. For example if the left-edge of the picture appears roughly 4-½ 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 4-½ inches (9 × 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 OP-MODE 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 return-ing 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 be-ing sent at 240 lines per Minute with the *FSPEED* set at 120 Lines per Minute. Similarly the trans-mission 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 typ-ing 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 fac-simile to print, you need to check your *PRTYPE* setting and make sure your printer supports graph-ics.

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:
1. Open the PK-232 by removing the six screws that hold the gray top-chassis in place and care-fully separate it from the bottom chassis. Be careful that you do not strain of the wires to the battery holder.
2. Reconnect the PK-232 to your radio, computer, printer and to +13 VDC, then turn it on and al-low it to warm-up for 30 minutes.
3. Locate and tune-in a strong facsimile signal.
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 immedi-ately to the right of Q1 and Q2.

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.
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.
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:

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.
2. Reconnect the PK-232 to +13 VDC, then turn it on, and allow it to warm up for 30 minutes.
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.
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.
5. Adjust C53 until the frequency counter reads 4.00000 MHz ±10 Hz.
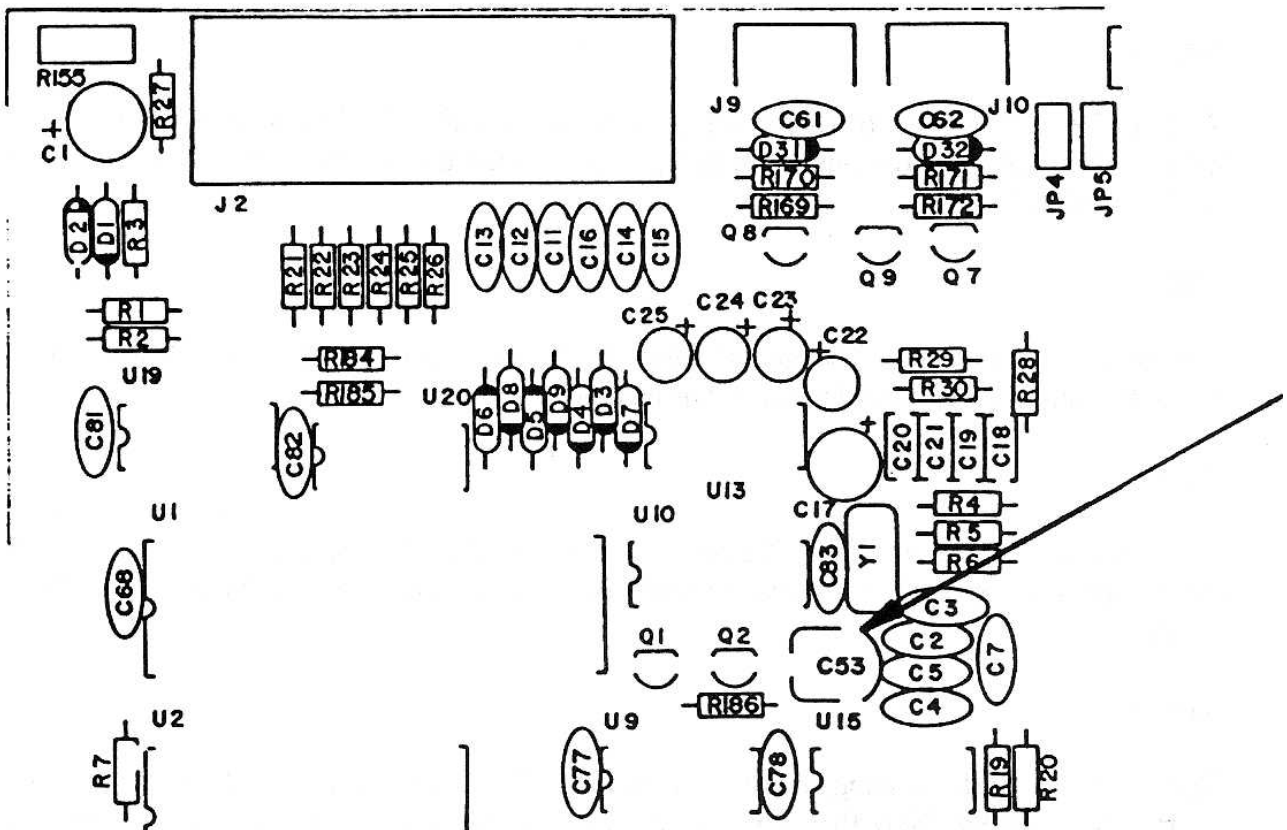
Figure 4:   PK-232 circuit board layout showing the location of capacitor C53

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 hi 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:

$$\frac{(\text{vertical scan line density}) \times (\text{horizontal width})}{3.14159}$$

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.

ASPECT	CCITT IOC (Narrow)	CCITT IOC (Wide)
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*.

GRAPHICS

PRTYPE	0	1	2	3	4	5	6
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 bots 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)

```
                    FSPEED, 8" width     FSPEED, 13" width

        Dot Density   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 _LEFT-RITE_ 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 4-½ 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 LEDs 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 LEDs 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 LEDs are disabled, and do not perform their proper function. Some LEDs 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 LEDs 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 backs of the addendum. This list is sorted by brand, and is correct to the best
of aour knowledge.

PRTYPE	Printer	"Enter graphics" sequence
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 car-
riage 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 Graftrax-80 uses *PRTYPE 40* or *42*).

Dot density

GRAPHICS	PRTYPE 0, 2	PRTYPE 1, 3	Code
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:

GRAPHICS dots/inch:	0 60	1 120	2 120	3 240	4 80	5 72	6 90
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

GRAPHICS	PRTYPE 4, 6	PRTYPE 5, 7	Code
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

GRAPHICS	PRTYPE 8	PRTYPE 9	Code
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 dots/inch:	0 60	1 120	2 144	3 200	4 80	5 72	6 100
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.)

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-UNT Y gives better print quality.

Dot density

GRAPHICS	PRTYPE 26, 28	PRTYPE 25, 27	Code
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
6	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.

GRAPHICS dots/inch:	0 60	1 120	2 144	3 240	4 60	5 72	6 100
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> '1'
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).

GRAPHICS	Dot density	Code
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

GRAPHICS	PRTYPE 32, 34	PRTYPE 33, 35	Code
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. Hoh GX-100.

GRAPHICS	Dot density	Code
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:

ASPECT	CCITT IOC	IEE IOC
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 Graftrax-80 (GRAPHICS 0-2 only).

GRAPHICS	Dot density	Code
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.

GRAPHICS	Dot density	Code
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

GRAPHICS	PRTYPE 48, 50	PRTYPE 49, 51	Code
0	60 dpi	60 dpi	ESC 'K'
1	120 dpi	120 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$(I+A);:GOTO 50
300 IF CIXL THEN A$=C$:CL=0:GOTO 330
310 IF CL=0 THEN IF EOF(l) THEN 999:ELSE LINE INPUT #1,C$: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   Printer Connector
DB-25P   Centronics 36-pin Male
              Shield of Cable

PK-232		Printer
1	—	17 Frame Gnd.
22	—	1 Strobe
13	—	2 D1
14	—	3 D2
15	—	4 D3
16	—	5 D4
17	—	6 D5
18	—	7 D6
19	—	8 D7
21	—	9 D8
23	—WWW—	10 ACK
24	—WWW—	11 BSY

200 Ω 1/4 W Resistors

	Printer
	19 Signal Gnd.
	20 " "
	21 " "
7	22 " "
	23 " "
	24 " "
	25 " "
	26 " "
	27 " "
	28 " "
	29 " "

These four wires make-up the parallel data ground

PK-232 Connector   Serial Connector
DB-25P   DB-25
              Shield of Cable

PK-232		Serial
1	—	1 Frame Gnd.
2	—	2 TXD
3	—	3 RXD
4	—	4 RTS
5	—	5 CTS
6	—	6 DSR
7	—	7 Signal Gnd.
8	—	8 CD
20	—	20 DTR

SIAM ™ 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 packe-tized 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 parame-ters correctly.

SIAM stands for Signal Identification and Acquisition Mode, and allows a wide variety of digital sig-nals 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 sig-nal 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:

CODE	CCITT	Meaning
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.

CODE	Meaning	Morse	Baudot	AMTOR
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:

Character	ITA #2	U.S.
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:

ASCII	English pronunciation	
$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:

Character	CODE 0	CODE 2
•-•-	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:

Character	CODE 2	English pronunciation
FIGS-G	$5E ^	SH
FIGS-H	$51 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.

CODE 2	CODE 3
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.

> ## 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 W0RLI 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.
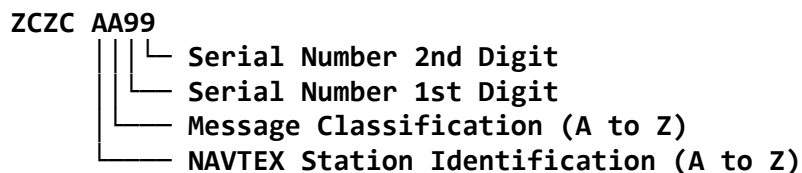
The NAVTEX Mode:

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.

```
ZCZC AA99
        │││└── Serial Number 2nd Digit
        ││└─── Serial Number 1st Digit
        │└──── Message Classification (A to Z)
        └───── NAVTEX Station Identification (A to Z)
```

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 reprint 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   Mnemonic: **AF**   Default: OFF
Mode: ALL   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   Mnemonic: **BBS**   Default: OFF
Mode: Packet   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	Mnemonic: **CB**	Default: OFF
Mode: Packet		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*	Mnemonic: **COD**	Default: 0
Mode: Baudot, AMTOR, Morse		HOST: Cl

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	Mnemonic: **HO**	Default: OFF
Mode: All		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	Mnemonic: **KI**	Default: OFF
Mode: Packet		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 three 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 four commands must be entered if they have been changed from default:

        TRACE OFF
        HID OFF
        BEACON EVERY 0
        PACKET

The next six 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*]]]	Mnemonic: **MFI**	Default: $80
Mode: Morse, Baudot ASCII, AMTOR and Packet		HOST: MI

Parameters: *n1* -   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) | Mnemonic: **NAVM** | Default: All |
| Mode: NAVTEX | | 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) | Mnemonic: **NAVS** | Default: All |
| Mode: NAVTEX | | 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	Mnemonic: **NA**	Immediate Command
Mode: 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 reprint 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 DAYSTAHP are ON.

PRTYPE *n*	Mnemonic: **PRT**	Default: 2 (Epson)
Mode: FAX		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> 'A1 8 (no LF)

PRTYPE 56-59: NEC

Typical graphics code: <ESC> '>' <ESC> 'M' <ESC> 'S0960'
New-line code (7 bits):   <CR> <ESC> 'Til1 <LF>
New-line code (8 bits):   <CR> <ESC> 'T131 <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	PRT 60	PRT 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

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PK-232 Firmware Revision Supplement
30-DEC-88

</div>

The following briefly describes the changes that we have made in the PK-232 firmware since the 23-FEB-88 release. A more detailed description follows in the Command Summary.

Added the command *WHYNOT*. Sometimes packet data will be received by the PK-232 but not displayed to the screen. Turning *WHYNOT* on causes the PK-232 to generate a message explaining why the data was not displayed.

Added the command *CUSTOM*. This command allows some customizing of the PK-232.

Turning KISS ON now sets all packet parameters for TCP/IP operation.

Added *AUDELAY* to allow for a delay from PTT to applied AFSK audio. An appropriate setting of *AUDELAY* will help prevent spurious emissions and arcing of amplifier relay contacts.

Added the command *DIDDLE*. When in transmit, the PK-232 sends the LTRS character in Baudot and the NULL character in ACSII, during idling when DIDDLE is on.

Added the command *MWEIGHT*. This will allow the user to vary the Morse dot to space ratio from the default of 1:1.

If the *MYCALL* parameter is left at the default value of PK-232 then no Packet transmissions will be allowed.

If *DAYTIME* has not been set pressing a <CTRL-T> will cause an asterisk (**) to be sent.

Added the command *NUMS*. This will force the PK-232 into the figures case in AMTOR and Baudot receive.

WRU is now always ON in AMTOR, however in Baudot and ASCII, *WRU* is on|off selectable.

The *ABB* default has been changed to none.

When in a Packet link all left over data will not be transmitted as UI frames should a disconnect occur.

MBX has been enhanced to accept the argument of ALL.

The *MPROTO* default is now off.

Added a Morse ID in the Packet Mode (required in England). This is NOT required in the United States, and it is advised to leave this set to zero.

In Morse, received data is broken up on word boundaries depending on the setting of *ACRDISP*, similar to word wrap.

PK-232 COMMAND SUMMARY ADDENDUM

The following is the list of commands that are either new or have changed in the 30-DEC-88 release of the PK-232 firmware.

AAB *text*	Mnemonic: **A**	Default: none
Mode: Baudot, ASCII, AMTOR		Host: AU

Parameters: *text* -   Any combination of characters and spaces up to a maximum of 17 characters.

The default is now empty with this release. All other aspects of *AAB* remain unchanged as described in the PK-232 Operating Manual Rev E.

ACRDISP *n*	Mnemonic: **ACRD**	Default: 80
Mode: ALL		Host: AA

Parameters: **n** -   0 to 255 specifies the screen or printer width, in number of columns or characters. 0 (zero) disables this function.

When the PK-232 is in the Morse mode received data will be broken up into word boundaries if possible. At some column X, the PK-232 will start looking for spaces in the received data. The first space that is received after column X will force the PK-232 to generate a carriage return. If *ALFDISP* is also ON then a line feed will also be generated.

Column X is 12 less than the *ACRDISP* value. If *ACRDISP* is set to 0, then column X equals 60. If there are no spaces at or after column X then a carriage return occurs at ACRDISP as before.

All other aspects of the *ACRDISP* command are described in Revision E of the PK-232 operating manual.

AUDELAY *n*	Mnemonic: **AUD**	Default: 0
Mode: Packet		Host: AQ

Parameters: **n** -   0 - 120 specifies in units of 10 msec, intervals, the delay between PTT going active and the start of the transmit AFSK audio tones.

In some applications it may be desirable to create a delay from the time that the radio PTT line is keyed and the time that audio is produced from the PK-232.

Most notably, on HF when a high power amplifier is used, arcing of the amplifier relay contacts may occur if drive to the amplifier is applied before the contacts have closed. If arcing occurs, increase *AUDELAY* slowly until the arcing stops.

In VHF or UHF FM operation, some synthesized transceivers may produce undesirable spurious emissions (referred to as being dirty), if audio is applied at the same time as PTT. These spurious emissions may be reduced by setting *AUDELAY* to roughly one half of *TXDELAY*.

Please note that *AUDELAY* must always be less than *TXDELAY*. It is advisable that *AUDELAY* be set lower than *TXDELAY* by a setting of 10. For example, you have determined that a *TXDELAY* of 20 works well for your transceiver. Subtracting 10 from 20 yields 10, which is the recommended setting for *AUDELAY*. If a setting of *AUDELAY* of 10 is too short, then set both *TXDELAY* and *AUDELAY* higher.

CUSTOM *nnnn*   Mnemonic: **CU**   Default: $0015
Mode: Packet   Host: Cu

Parameters: *n* -   0 to $40 (0 to 64 decimal) specifies a four digit hex value, where each bit controls a different function.

Bit 0, position $0001: If bit 0 is set to 1 (default setting), then the PK-232 will discard a received packet if the signal is too weak to cause the DCD LED to light. If set to 0, packets will be received regardless of the setting of the THRESHOLD control.

Bit 1, position $0002: If bit 1 is set to 0 (default setting), then setting the *MONITOR* command to either ON or YES will result in a *MONITOR* value of 4. If bit 1 is set to I, then setting *MONITOR* to ON or YES will force the *MONITOR* value to 6. PBBS SysOps may want to set *CUSTOM* to $0017 (23 decimal).

Bit 2, position $0004: If bit 2 is set to 1 (default setting), a break on the RS-232 line will put the PK-232 into the Command Mode (except from Host Mode). If set to 0, a break on the RS-232 line will not affect the PK-232.

Bit 3, position $0008: If bit 3 is set to 0 (default setting), Packet channel numbers will be numbered from 0-9. If bit 3 is set to one, then Packet channel numbers are labeled A-J. Lower case a-j are also accepted.

Bit 4, position $0010: This function affects only Baudot transmit. If bit 4 is set to 1 (default setting), then the PK-232 will insert the figures shift character after a space, just prior to sending any figures, <space><FIGS><number>. This is to compensate for the use of *USOS* at the receiving end. This in turn will permit the receiving station to correctly decode several groups of figures separated by spaces. If bit 4 is set to 0, then the PK-232 will not insert the FIGS character after each space, <space><number>. MARS operators may want to set this bit to 0 for literal operation.

Bit 5, position $0020: If bit 5 is set to one, then the PK-232 when powered on, will stay in the last mode it was in, i.e., converse, command, or transparent. If bit 5 is set to 0, (default mode) the PK-232 will always power up in the Command Mode.

Bit 6, position $0040: If bit 6 is set to 1, then monitoring is active in the transparent mode. The *MFROM*, *MTO*, *MRPT*, *MONITOR*, *MCON*, *MPROTO*, *MSTAMP*, *CONSTAMP*, and *MBX* are all active. If bit 6 is set to 0, (default setting), then monitoring is disabled in the Transparent Mode.

Bits 7-15 are all unused at the present time. To return the *CUSTOM* command to the default setting, type CU Y or CU ON at the command prompt.

A discussion here describing the default settings and how the $0015 setting was derived may assist you with understanding the *CUSTOM* parameter.

The default setting for Bits 0-6 is noted below:
Bit 0 is set to 1, Bit 1 is set to 0, Bit 2 is set to 1, Bit 3 is set to 0, Bit 4 is set to 1, Bit 5 is set to 0, and Bit 6 is set to 0. The following chart indicates the same information.

          Bit Position   7 6 5 4 3 2 1 0
          Setting   0 0 0 1 0 1 0 1

Looking at just the setting row in the chart, the binary number 00010101 becomes evident. The binary number 00010101 equals the decimal number 21, and the hexadecimal equivalent is $0015 hence the reason the default setting for *CUSTOM* is $0015.

Let us say, for example, that you have decided that as a MARS operator you want to change bit 4 from the default of 1 to a setting of 0. The chart below reflects this change.

```
Bit  Position    7 6 5 4 3 2 1 0
Setting          0 0 0 0 0 1 0 1
```

This results in a binary number of 00000101 which is a decimal number 5. The hex equivalent is $0005, therefore, to change bit Position 4 to a setting of zero, leaving the others unchanged, will require a *CUSTOM* setting of $0005.

The *CUSTOM* command will accept arguments in decimal format. For example, the default is $0015, however if you enter decimal 21, the PK-232 will accept this. The PK-232 will display on the screen the hexadecimal equivalent.

A brief discussion of Hexadecimal notation can be found in the PK-232 Operating Manual, Section 5.1.1.

DAYTIME *date & time*	Mnemonic: **DA**	Default: none
Mode: All		Host: DA

Parameters: *date & time* - Current DATE and TIME to set.

All *DAYTIME* functions remain the same as described in the PK-232 users guide. Rev E, EXCEPT for the following. If the *DAYTIME* has not been set, and a <CTRL-T> is pressed, the PK-232 will send an asterisk (*).

DIDDLE: ON|OFF	Mnemonic: **DID**	Default: OFF
Mode: Baudot, ASCII		Host: DD

Parameters: ON -   In Baudot, the PK-232 will send the LTRS character when idling. In ASCII the PK-232 sends the NULL (00) character.
OFF -   No characters are sent when idling in transmit.

In the RTTY modes, it may be desirable to continue sending some sort of data while paused at the keyboard. With *DIDDLE* on, the PK-232 will send idle characters when waiting for keyboard entry.

KISS ON|OFF	Mnemonic: **KI**	Default: OFF
Mode: Packet		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.

Turning *KISS* ON now has a temporary effect on several other parameters. KISS ON temporarily forces *HPOLL* OFF, *PPERSIST* ON, *RAWHDLC* ON, and *HOST* ON. *RAWHDLC* ON temporarily forces *CONMODE* TRANS, *TRACE* OFF, *HID* OFF, and no *BEACON*. *HOST* ON temporarily forces *8BITCONV* ON, *AWLEN* 8, *PARITY* 0, and no software flow control.

This change makes going into the KISS much easier!

To exit KISS, you must type three <CTRL-C> all within one second. Also, no data can be received by the PK-232 during this operation or it will not work, and you will remain in KISS Mode.

HOST OFF (3× <CTRL-C>) will force KISS OFF. The PK-232's `CMD` and `PKT` LEDs will be lit, confirming exit from KISS Mode.

"Temporarily forcing" a function means that the PK-232 will behave as if the function is set that way, although the function setting does not actually change.

MBX call1, call2, -*n*	Mnemonic: **MB**	Default: none
Mode: Packet		Host: MB

Parameters: call -   The call sign of one or two stations to be monitored
                   -*n* -   0-15, indicating an optional SSID.

The *MBX* command will now accept the argument of ALL. There are no changes in the functions of the arguments that have been permitted previously. The operation of *MBX* command is as follows.

MBX NONE   (Default setting) All monitored frames are shown with their packet headers. See *MFROM*, *MTO*, *MONITOR*, *CONSTAMP*, *MSTAMP*, and *MPROTO*.

MBX ALL   Only the data fields in the I-frames and UI frames are shown; no headers or other types of frames are shown. Data from retried frames will be shown each time such a frame is monitored. The *MFROM* and *MTO* commands are active.

MBX CALL 1   Only the data fields in the I and UI frames to or from CALL 1 are shown. CALL 1 can be in either the source or destination address field of the frame. Retried frames are not shown. The *MFROM* and *MTO* commands are ignored.

MBX CALL 1 CALL 2   Only the data fields in the I and UI frames are shown when

                   CALL 1 is the source and CALL 2 is the destination, or

                   CALL 1 is destination and CALL 2 is the source.

                   Retried frames are not shown. The *MFROM* and *MTO* commands are ignored.

A Packet connection on any channel inhibits monitoring, if *MBX* is not set to "none". *MCON* will only work if *MBX* is set to "none".

MID *n*	Mnemonic: **MI**	Default: 0
Mode: Packet		Host: Mi

Parameters: *n* -   0 - 250 specifies the Morse ID timing in units of 10 second intervals.
                   0 -   (zero) disables this function.

A setting of 0 (default) disables this function. If **n** is set to some value between 1 and 250, then the Packet Mode, the PK-232 will periodically issue a 20 WPM Morse ID. A Morse ID consists of 0.5 seconds of idle, the call sign in *MYCALL*, without the SSID, followed by 0.5 seconds of idle. For example, an MID of 177 seconds would cause a Morse ID every 1,77 seconds, or every 29.5 minutes. The Morse ID will only be issued if a packet was sent since the last Morse ID. The Morse ID uses *TXDELAY*, *PPERSIST*, and *DCD*.

The *ID* command has now changed. If *HID* is ON, ID will cause the *HDLC* ID to be transmitted immediately, which is the same as before. If *MID* is set to a value other than 0, *ID* will force a Morse ID immediately. If both *HID* and *MID* are both active, the Morse ID will be sent first.

The PK-232 generates Morse code by switching from the mark tone to the space tone. This prevents other TNCs from accidentally transmitting and colliding with a CW ID.

MWEIGHT *n*	Mnemonic: **MW**	Default: 10
Mode: All except Packet		Host: Mw

Parameters: *n* -   5 to 15 specifies roughly 10 times the ratio of one dot length to one inter-element space length.

A value of 10 (default) results in a 1:1 dot-space ratio. A setting of 5 (minimum) results in a 0.5:1 ratio, while a setting of 15 (maximum) results in a 1.5:1 ratio.

Changing the *MWEIGHT* may be desirable to counteract the switching delays of SOME transmitters when operating at high speeds. *MWEIGHT* applies only to the Morse mode and the CW ID in all modes except packet. *MWEIGHT* does not affect the code output by the *MID* command.

MYCALL *call -n*	Mnemonic: **MY**	Default: PK-232
Mode: Packet		Host: ML

Parameters: *call* -   Your call sign.
              -n -   0 - 15, indicating an optional substation ID, (SSID)

If *MYCALL* has not been changed from the default value of PK-232, the TNC will not transmit or acknowledge any packets. This will prevent the call sign "PK-232" from being transmitted. A warning message, **?need MYCALL** is issued for attempts to use the *CONNECT*, *CONVERSE*, *K*, *TRANS* and *ID* commands. No warning will be given for attempts to use *HID* or *BEACON*.

All other aspects of *MYCALL* remain unchanged as described in the PK-232 Users Guide, Rev E.

NUMS	Mnemonic: **N**	Immediate Command
Mode: Baudot, AMTOR		Host: NX

In Baudot and AMTOR receive, this command will force the PK-232 into the FIGS case.

WHYNOT ON|OFF	Mnemonic: **WHY**	Default: OFF
Mode: Packet		Host: WN

Parameters: ON -   PK-232 will generate a reason why a received packet was not displayed to the screen.
              OFF - This function is disabled.

During Packet operation, the PK-232 may receive many packets that are not displayed to the screen. Turning *WHYNOT* on will cause the PK-232 to display a message explaining the reason the received packet was not displayed to the screen.

The messages and their meanings are shown below:

Bit residue: The frame ended in the middle of a byte. A weak packet signal might cause this, or, more likely, random noise that triggered the start of packet reception. Also, this may occur after a genuine frame has been received.

PASSALL: The received packet frame had errors, and *PASSALL* was off, thereby preventing the packet from being displayed to the screen.

DCD Threshold: The ` THRESHOLD ` control was set to far counter clockwise. The ` DCD ` LED was off when the packet was received.

MONITOR: The *MONITOR* value was set to low to receive this type of frame.

MCON: *MCON* was set too low to receive this type of frame.

MPROTO: *MPROTO* was set to off, and the received packet was probably a NET/ROM or TCP/IP frame.

MFROM/MTO: The frame was blocked by the setting of either the *MFROM* or *MTO* command.

MBX: The call sign of the sending station does not match the call sign setting in the *MBX* command.

MBX Sequence: The packet frame has been received out of sequence, probably a retry.

WRU ON|OFF	Mnemonic: **WR**	Default: OFF
Mode: Baudot, ASCII, AMTOR ARQ		Host: WR

Parameters: ON -   Your answerback is sent after a distant station's WRU?
              OFF - Your answerback is NOT sent after a distant station's WRU?

When in AMTOR, WRU is no longer ON|OFF selectable, WRU is now always ON in AMTOR. All other aspects of WRU remain unchanged as described in the PK-232 Operating Manual, Rev E.

The following Parameter Default Setting has been changed since 23-FEB-88.

The *MPROTO* command default is set to OFF.

The *AAB* text string default is now empty.

PK-232 *PRTYPE* Settings for Facsimile Printing with Various Printers

The following is a list of printers by brand, with the corresponding *PRTYPE*(s) we have determined should print Facsimile with the PK-232. Please note that not all these printers have actually been tested, but according to the best available data, the indicated setting(s) of *PRTYPE* should work.

We do not guarantee that all graphics modes that a particular printer is capable of are supported. All graphics modes that we support are listed in the Facsimile Appendix to the PK-232 manual, so it should be possible to determine if a particular printer will work without actually trying it.

If you try a particular *PRTYPE* and it does not work, you may try other values of *PRTYPE* that are used by that same manufacturer on a different model. If you still cannot get Facsimile to print properly, check your printer manual to see if there is another graphics mode you can select.

We recommend that you use an Epson graphics mode or an IBM graphics mode if you have that option available on your particular printer.

If all else fails, then call or write AEA and give us a complete description of your printer and its problem. If possible have the manual for your printer available when you call. This will allow us to more quickly get your PK-232 and printer set up for Facsimile operation.

From time to time, printer manufacturers change their own firmware which may create problems for Facsimile printing with the PK-232. So again, we cannot guarantee that a particular printer listed will work with the PK-232 using the listed *PRTYPE*. We are however interested in any incompatibilities that are found. The easiest way for us to solve a compatibility problem is to get a copy of the printer manual that describes the graphics commands the printer will accept. Only then can we possibly affect changes in a future release of PK-232 firmware.

K-PAX and COM-FAX users:

Both of these programs will print directly to a printer that is attached to the computer. When using these programs, the printer port on the 'Y' cable is not used. These programs will only work if the *PRTYPE* has been set to a DEFAULT VALUE OF TWO.

Anadex DP-9500	PRTYPE 60
Antex ADS-2000	PRTYPE 0, 2
Apple Dot Matrix	PRTYPE 12, 14
Apple Imagewriter I	PRTYPE 12, 14
Apple Imagewriter II	PRTYPE 12, 14
Apple Prowriter	PRTYPE 12, 14

Apple printers are serial devices which require a Parallel to Serial Converter.

BMC BX-80	PRTYPE 48, 50
BMC BX-100	PRTYPE 48-51?
Blue Chip M120/10	PRTYPE 48, 50
Blue Chip M120/15	PRTYPE 48-51
Brother M-1009	PRTYPE 4, 6
Brother M-1109 (Mode I)	PRTYPE 0, 2
Brother M-1109 (Mode II)	PRTYPE 4, 6
Brother M-1509	PRTYPE 0, 2

Brother M-1709	PRTYPE 0, 2
Brother Twinwriter 5	PRTYPE 0, 2
Cal-Abco Legend 800	PRTYPE 0, 2
Canon A1200	PRTYPE 12, 14
Canon PW-1156A	PRTYPE 0-3
Centronics GLP	PRTYPE 0, 2
Centronics H-80	PRTYPE 0, 2
Centronics H136A	PRTYPE 0, 2
Centronics 351	PRTYPE 0-3
Centronics 352	PRTYPE 0-3
Centronics 353	PRTYPE 0-3
Citizen MSP-10 (IBM mode)	PRTYPE 4, 6, or 52, 54
Citizen MSP-15 (IBM mode)	PRTYPE 4-7 or 52-55
Citizen MSP-20 (IBM mode)	PRTYPE 4, 6, or 52, 54
Citizen MSP-25 (IBM mode)	PRTYPE 4-7 or 52-55
Commodore 1525	PRTYPE 36
Requires a Parallel to Serial Converter	
Copal SC-1200	PRTYPE 0, 2
Copal SC-1500	PRTYPE 0, 2
Copal SC-5500	PRTYPE 0, 2
Dataproducts Prism 8050	PRTYPE 20?
Dataproducts 8070	PRTYPE 20?
Datasouth Personal Printer I	PRTYPE 0, 2
Datasouth Personal Printer II	PRTYPE 0, 2
DECwriter LA35 (Graphics II)	
DECwriter LA36 (Graphics II)	
DECwriter LA120	PRTYPE 4-7
Diablo 34LQ	PRTYPE 4, 6
Epson EX-800	PRTYPE 0, 2
Epson EX-1000	PRTYPE 0-3
Epson FX-70	PRTYPE 0, 2
Epson FX-80	PRTYPE 0, 2
Epson FX-85	PRTYPE 0, 2
Epson FX-100	PRTYPE 0-3
Epson FX-185	PRTYPE 0-3
Epson FX-286	PRTYPE 0-3
Epson JX-80	PRTYPE 0, 2
Epson LQ-800	PRTYPE 0, 2
Epson LQ-1500	PRTYPE 0, 2
Epson LX-80 (Homewriter 10)	PRTYPE 0, 2
Epson LX-86	PRTYPE 0, 2
Epson MX-70	PRTYPE 0, 2
Epson MX-80 III	PRTYPE 0, 2

Epson MX-80 with Graftrax 80	PRTYPE 40, 42
Epson MX-85	PRTYPE 0, 2
Epson MX-100	PRTYPE 0-3
Epson MX-185	PRTYPE 0, 2
Epson P-80	PRTYPE 0, 2
Epson RX-70	PRTYPE 0, 2
Epson RX-80	PRTYPE 0, 2
Epson RX-85	PRTYPE 0, 2
Epson RX-100	PRTYPE 0-3
Epson RX-185	PRTYPE 0, 2
Genicom 3014	PRTYPE 0, 2
Genicom 3024	PRTYPE 0, 2
Genicom 3310 (IBM-GP mode)	PRTYPE 44-47
Genicom 3320 (IBM-GP mode)	PRTYPE 44-47
Hewlett Packard ThinkJet	PRTYPE 48-51
IBM Color	PRTYPE 4, 6
IBM Graphics	PRTYPE 4, 6
IBM Proprinter	PRTYPE 4, 6
IDS Prism 80	PRTYPE 8?
IDS Prism 132	PRTYPE 8?
Inforunner Riteman	PRTYPE 0, 2
C. Itoh Gorilla GX-100	PRTYPE 36
C. Itoh Riteman II	PRTYPE 0, 2
C. Itoh Prowriter 1550	PRTYPE 16-19
C. Itoh 7500	PRTYPE 12-15
C. Itoh Prowriter 8510 A	PRTYPE 16-19
C. Itoh Prowriter 8510 B	PRTYPE 16, 18
C. Itdh Prowriter 8510 S	PRTYPE 16, 18
C. Itoh Prowriter 8510 SC	PRTYPE 16, 18
C. Itoh Prowriter 8510 SEP	PRTYPE 4, 6
Leading Edge Gorilla Banana	PRTYPE 36
Legend 880	PRTYPE 0, 2?
Legend 1000	PRTYPE 0, 2?
Legend 1080	PRTYPE 0, 2?
Legend 1081	PRTYPE 0, 2?
Legend 1200	PRTYPE 0, 2?
Legend 1500	PRTYPE 0. 2?
Legend 1380	PRTYPE 0, 2?
Legend 1385	PRTYPE 0. 2?
Mannesmann Tally 85 (Epson mode)	PRTYPE 0. 2
Mannesmann Tally 85 (IBM mode)	PRTYPE 4, 6
Mannesmann Tally 86 (Epson mode)	PRTYPE 0, 2
Mannesmann Tally 86 (IBM mode)	PRTYPE 4, 6
Mannesmann Tally 160L	PRTYPE 0, 2
Mannesmann Tally 180L	PRTYPE 0, 2?

Mannesmann Tally MT-290 (Epson)	PRTYPE 0. 2
Mannesmann Tally MT-290 (IBM)	PRTYPE 4, 6
Mannesmann Tally MT-490	PRTYPE 0, 1, 4, 5
Mannesmann Tally Spirit 80	PRTYPE 48, 50
Mannesmann Tally 1602	PRTYPE 0, 2?
Mannesmann Tally 1605	PRTYPE 0. 2?
Mannesmann Tally 1800	PRTYPE 0, 2?
Matra SCANSET	PRTYPE 4-7
NEC Pinwriter P6	PRTYPE 0, 2
NEC Pinwriter P7	PRTYPE 0-3
NEC 8023	PRTYPE 12, 14
Okidata Okimate 20 (IBM mode)	PRTYPE 4-7
Okidata ML82A with Okigraph I	PRTYPE 20
Okidata ML83A with Okigraph I	PRTYPE 20-21
Okidata ML84 (IBM mode)	PRTYPE 4-7
Okidata ML92 (IBM mode)	PRTYPE 4
Okidata ML92 (Oki mode)	PRTYPE 20
Okidata ML93 (IBM mode)	PRTYPE 4-7
Okidata ML93 (Oki mode)	PRTYPE 20, 21
Okidata ML182 (IBM mode)	PRTYPE 4, 6
Okidata ML183 (IBM mode)	PRTYPE 4-7
Okidata 192	PRTYPE 24, 26
Okidata 193	PRTYPE 24-27
Olivetti DM-280	PRTYPE 0, 2
Olivetti DM-290	PRTYPE 0-3
Panasonic KX-P10801	PRTYPE 0, 2
Panasonic KX-P1090	PRTYPE 0, 2
Panasonic KX-P1091	PRTYPE 0, 2
Panasonic KX-P1092	PRTYPE 0, 2
Panasonic KX-P1592	PRTYPE 0-3
Personal Micro DMP-85	PRTYPE 12, 14
Printers Plus NLQ	PRTYPE 0, 2
Radio Shack Lineprinter VII	PRTYPE 8
Radio Shack Lineprinter VIII	PRTYPE 8
Radio Shack DMP-100	PRTYPE 8
Radio Shack DMP-105	PRTYPE 8
Radio Shack DMP-110	PRTYPE 8
Radio Shack DMP-120	PRTYPE 8
Radio Shack DMP-130	PRTYPE 8, 4, 6
Radio Shack DMP-200	PRTYPE 8
Radio Shack DMP-400 (DMP emul.)	PRTYPE 8
Radio Shack DMP-420 (DMP emul.)	PRTYPE 8
Radio Shack DMP-430	PRTYPE 4, 6
Radio Shack DMP-500 (DMP emul.)	PRTYPE 8
Radio Shack DMP-2100	PRTYPE 4, 6
Radio Shack DMP-2110	PRTYPE 8
Radio Shack DMP-2200	PRTYPE 4-9

Radio Shack CGP-220	PRTYPE 8
Sakata SP-1000	PRTYPE 0, 2
Sakata SP-1500	PRTYPE 0, 2
Seikosha GP-100	PRTYPE 36
Seikosha GX-100	PRTYPE 36
Seikosha SP-1000 A	PRTYPE 0, 2
Seikosha SP-1000 VC (E-64)	PRTYPE 36
Seikosha SP-1000 IBM	PRTYPE 4, 6
Seikosha SP-1000 AS	PRTYPE 0, 2
Smith Corona D-100	PRTYPE 0, 2
Smith Corona D-200 (Standard)	PRTYPE 0, 2
Smith Corona D-200 (IBM)	PRTYPE 4, 6
Smith Corona D-300 (Standard)	PRTYPE 0, 2
Smith Corona D-300 (IBM)	PRTYPE 4, 6
Smith Corona Fastext 80	PRTYPE 0, 2
Smith Corona TP-1000	PRTYPE 0, 2, 4, 6
Star Delta 10	PRTYPE 32, 34
Star Delta 15	PRTYPE 32-35
Star Delta 10 PC	PRTYPE 4, 6
Star Delta 15 PC	PRTYPE 4-7
Star Delta 10 Plus	PRTYPE 0, 2
Star Delta 15 Plus	PRTYPE 0-3
Star Geinini 10	PRTYPE 28
Star Gemini 15	PRTYPE 28-29
Star Gemini 10X	PRTYPE 32, 34
Star Gemini 15X	PRTYPE 32-35
Star Gemini 10XPC	PRTYPE 4, 6
Star Gemini 15XPC	PRTYPE 4-7
Star Gemini 10X Plus	PRTYPE 0, 2
Star Gemini 15X Plus	PRTYPE 0-3
Star Micronics SG-10 (Star mode)	PRTYPE 32, 34
Star Micronics SG-15 (Star mode)	PRTYPE 32-35
Star Micronics SG-10 (IBM mode)	PRTYPE 4, 6
Star Micronics SG-15 (IBM mode)	PRTYPE 4-7
Star Micronics SD-10 (Star mode)	PRTYPE 32, 34
Star Micronics SD-15 (Star mode)	PRTYPE 32-35
Star Micronics SD-10 (IBM mode)	PRTYPE 4, 6
Star Micronics SD-15 (IBM mode)	PRTYPE 4-7
Star Micronics SR-10 (Star mode)	PRTYPE 32, 34
Star Micronics SR-15 (Star mode)	PRTYPE 32-35
Star Micronics SR-10 (IBM mode)	PRTYPE 4, 6
Star Micronics SR-15 (IBM mode)	PRTYPE 4-7
Star Micronics NB-15 (9-wire emulation)	PRTYPE 4-7
Star Micronics NL-10 (std. cartridge)	PRTYPE 0, 2
Star Micronics NL-10 (IBM cartridge)	PRTYPE 4, 6
Star Micronics NL-15 (std. cartridge)	PRTYPE 0-3
Star Micronics NL-15 (IBM cartridge)	PRTYPE 4-7
Star Radix 10	PRTYPE 32, 34
Star Radix 15	PRTYPE 32-35
Star Radix 10 PC	PRTYPE 4, 6

Star Radix 15 PC   PRTYPE 4-7
Star Radix 10 Plus   PRTYPE 0, 2
Star Radix 15 Plus   PRTYPE 0-3

Texas Instruments 850 (DP mode)   PRTYPE 40-43
Texas Instruments 855 (DP mode)   PRTYPE 40-43

Transtar T315   PRTYPE 12, 14

APPENDIX Q
ANSWERS TO COMMONLY ASKED QUESTIONS AND
SPECIAL NOTES TO PC-PAKRATT AND COM PAKRATT USERS

The PK-232 can be used with a multitude of computers, and computer programs. This can lead to some confusion as to how to properly connect, access certain features and configure the PK-232. The following questions and answers may help you without having to make a long-distance phone call to AEA's Technical Support,

QUESTION: How do I use the "Y" cable that came with my PK-232, and how is it connected?
ANSWER: The "Y" cable has three connectors attached to it: Two 25-pin connectors, and one 36-pin connector. The male 25-pin connector should be attached directly to the PK-232, and the female end should be connected to the serial port of the computer. The 36-pin end is generally hooked up only if you are using a dumb terminal or a dumb terminal program. It is hooked directly to a Centronics-type parallel printer. It is intended primarily for printing received facsimile signals directly to the printer in the dumb terminal mode.

Dumb terminal mode is defined by working from a command prompt (`cmd:`). You cannot print files from your computer through the "Y" cable; you can only print received information "off-the-air" by turning the parameters *PRCON* and *PROUT* to ON. If you wish to print received FAX pictures, first you must enter the proper *PRTYPE* for your printer, turn *PRCON* to ON, *PROUT* to OFF, *PRFAX* to ON and type in FAX from a command prompt. Please refer to Appendix M for complete details.

PC-PAKRATT, PK-FAX, COM PAKRATT, COMFAX, and MACRATT with FAX all support the use of the printer port on the computer. When using one of these programs, you do not need to connect the 36-pin end of the "Y" cable to your printer. Similarly, if you are using another program that supports the printer port, you do not need to connect the 36-pin end of the "Y" cable. Connect the computer's printer port to your printer. The "Y" cable is constructed with pins 1-8 and 20 hooked up between the male and female 25-pin connectors for connection between a PK-232 and a computer's serial port This is referred to on page 2-2 of this manual. You can hook the female end directly to a computer's serial port, or to a gender changer, 25 to 9-pin, 25 to 8-pin etc. adaptor with no worries. Just make sure you are connecting it to an RS-232 serial port.

QUESTION: How do I connect my PK-232 to my radio?
ANSWER: The radio cable supplied with the unit is described in Table 2-1 on page 2-2 of the manual and in figure 2-3 on page 2-7 of the manual. For specific radio connections, refer to Appendix K of the manual. Always connect the shield wire (non-insulated bare wire) to the ground wire (brown) on the radio end, unless otherwise instructed in Appendix K. If you are unsure about your radio connections, refer to the section in the manual for your radio describing the microphone and its connections.

You may have received one 10-foot long cable with a 5-pin connector on each end with your PK-232. Simply cut this cable in half for your two radio cables. AEA has started manufacturing the radio cable this way so we can test the cable prior to shipment. The radio cable(s) you have received with your PK-232 may or may not be cut. In either case, you can be assured that the cable was tested.

QUESTION: Do I connect the green wire AND the Rx-IN audio input to my radio?

ANSWER: No! The green wire, and the Rx-IN jack are the same thing. They are directly wired together inside the PK-232. You use one OR the other. A cable is supplied with the PK-232 that allows you to connect the Rx-IN jack easily. The best place to get the audio from the radio is from the EXTERNAL SPEAKER OUT jack, especially if you plan to decode MORSE or FAX. Many transceivers have other places you can get receiver audio from, but sometimes they are simply not strong enough signals to drive the PK-232 in these modes. See Chapter 2 and Appendix K for more information about radio connections.

QUESTION: Do I install batteries in my PK-232, or do I leave them out?

ANSWER: This depends mainly on what computer program you are going to use. The best thing to do regardless of what program you are using is to leave them out until you get comfortable with the unit. The batteries are used if you wish to save your call sign and parameters you might change after power to the PK-232 has been turned off. If you are using a program that saves parameters to disk, such as PC-PAKRATT or PK-FAX, generally it is best to leave the batteries out. This is because if the parameters conflict, the program may appear not to work. If you are using COM PAKRATT, COM FAX, MACRATT with FAX or any terminal program that does not support automatically saving parameters to disk, you will probably want to install batteries so the PK-232 can store parameters. This allows parameters such as your call sign (MYCALL) to be stored in its internal RAM even with the power OFF. The only way to change all of your parameters back to default is to issue a RESET command from a command prompt (`cmd:`), or to remove the battery power by lifting JP-1, or removing the batteries from their holder.

Some customers have expressed a desire to use several different programs, but do not wish to change their parameters every time they switch. This can be done by installing batteries. One word of caution is that TERMINAL BAUD RATE of all programs must match to do this. PK-FAX uses a terminal baud rate of 4800 baud to work properly. This cannot be changed, and it is suggested that you use this baud rate with all other programs if you wish to have batteries installed, and switch between programs. For example, if you are using PC-PAKRATT at a terminal baud rate of 4800 baud (selectable from the "Welcome To" opening screen) and wish to go to a program such as PROCOMM[1], first exit PC-PAKRATT, and then bring up PROCOMM. Turn off your PK-232, and set PROCOMM to 4800 N, 8, 1. Then turn on your PK-232. You may see the message ORT which is explained next. Send the PK-232 three <CTRL-C> within one second, and a command prompt will be displayed. PROCOMM must be in the terminal mode for this to work. You can now access all the commands of the PK-232, but the parameters should be the same as used by PC-PAKRATT.

QUESTION: Sometimes I get the message ORT on my screen. What does this mean?

ANSWER: This is the PK-232 sign-on message in Host Mode language. It means that when you turned off your PK-232, you were in the host mode, and now you are trying to communicate with it in the terminal mode. This is common if you are using the COM PAKRATT program, and you have the batteries installed. You can send three <CTRL-C> within one second, get a command prompt, and take it from there. Or, if you are using COM PAKRATT, you can turn the computer off and then back on to get to the opening screen again. Then, instead of striking T for terminal mode, strike the RETURN key to immediately bring up the split screen operation. Remember, if you have batteries installed, the PK-232 "remembers" the parameters when you last

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[1] PROCOMM is a registered trademark of DATASTORM TECHNOLOGIES, INC.

turned it off. See Question 2 in "SPECIAL NOTES FOR COM PAKRATT WITH FAX USERS."

QUESTION: How do I find the DATECODE and CHECKSUM Of my PK-232 firmware?
ANSWER: You must always be in the terminal mode to find this. First, whatever program you are using, escape to the terminal mode so you are displaying a command prompt (`cmd:`). Now type in the command RESTART. The PK-232 will now display the sign-on message which includes the DATECODE and CHECKSUM of your firmware. This is important information and should be written down on the first page of your manual in case you should have to call for technical assistance. We will want to know what the DATECODE and CHECKSUM of your firmware is, as well as the type of computer and the radio being used.

QUESTION: How can I use my PK-232 in the unattended mode, where people can connect to me, leave messages and also digipeat through me?
ANSWER: In order to accomplish this, the first step is to set the *MONITOR* parameter to 0, set *CMSG ON*, and put a message in your *CTEXT* buffer indicating you are not there, but to leave a message and disconnect. It is important to set *MONITOR* to 0, as otherwise you will store all packet activity on the channel. The receive buffer is 2.3 k in size, and this can easily be exceeded if you are monitoring all activity. If the buffer size is exceeded, the front panel MULT LED will start blinking, and you will not be able to store any more incoming data. If you are handling quite a few connects, and overrunning your buffer, you may wish to turn *DAYSTAMP* and *CONSTAMP* off so just the message is stored. You may also wish to turn the parameter *MDIGI* to OFF, and *MCON* to 0, to save buffer space.

MONITOR set to 0 will disable the monitor function of the unit. Since monitor does not affect the "connectibility" of the PK-232, you will still be able to accept connect requests from any station, unless you have that station listed in the CFROM parameter.

Lastly, send a <CTRL-S> to the PK-232 if you are using a dumb terminal program. If you are using PC-PAKRATT, or COM PAKRATT in the split screen mode, this is not necessary. You just simply exit the program using X for PC-PAKRATT or C= Q for COM PAKRATT.

At this time, power down the computer. In most cases, the serial cable may be left connected to the computer and the PK-232 permanently. We have had a few customers indicate that they must disconnect the cable from the PK-232 at this point to prevent noise and/or characters from being sent to the PK-232 when they power up their computer. This is only necessary if you find yourself losing the data that has been left for you when you turn on your computer. We have been unable to duplicate this so far. If this is done, first turn on the computer and then connect the serial cable you are using to the 25-pin connector on the PK-232. Again, in most instances, disconnecting the serial cable is unnecessary.

When you return to the computer, bring up the Terminal Program you were last using and send a <CTRL-Q> to the PK-232. Again, this is not necessary with PC-PAKRATT or COM PAKRATT in the split screen mode. With these programs, you simply bring up the program, and the stored data is displayed.

With a dumb terminal program, this data is displayed once, and is non-retrievable. In this case, you will need to enable your computer's capture buffer, or printer, BEFORE you enter the <CTRL-Q> if you want to save the data.

Even though the computer is turned off, the PK-232 will still perform as a digipeater. This is especially nice because you do not have to leave the entire system on to function as a packet station.

* NOTE * Unattended operation is presently restricted below 50 MHz. While it is allowed above 50 MHz, third party traffic is not allowed on any frequency without the station operator present to control the system. Please keep this in mind regarding the above information.

QUESTION: My PK-232 is not working – HELP!
ANSWER: The best thing to do if your PK-232 does not seem to be working is to start at the beginning. If you have the batteries in, take them out, or if you are using a terminal program, make a new working copy from the original disk. If the problem is serious, such as the four LEDs on the left of the PK-232 stay on, or no LEDs are lit, it is best to take the cover off and inspect your PK-232. Remove all cables and connectors, and remove the six Phillips head screws that hold the chassis down. Carefully remove the top chassis from the bottom.

If no LEDs are lit, check the fuse. Take the fuse out of its holder and check with an Ohmmeter. This is preferable to a visual inspection. It should measure as a short (zero Ohms). If the fuse is bad, replace it with a one amp fuse. NEVER REPLACE THE FUSE WITH ONE THAT IS RATED ABOVE ONE AMP! If the fuses continue to blow, check the power cable. The tip of the power connector should go to the positive side of the power supply. Also check the power cable for shorts. ALWAYS DISCONNECT THE POWER CABLE FROM THE POWER SOURCE WHEN TESTING WITH AN OHMETER.

If power is getting to the board and you have a good indication that the power is satisfactory (such as LEDs being lit), a good place to start is with the five Volt regulator, U21, on the right hand side of the board. It is located inside the heatsink. There are two screws that hold it down. The one that we are concerned with goes through the tab of the voltage regulator (LM 317T). If this screw gets loose, it will disrupt the five Volt line and cause problems. Tighten the screw firmly with a Phillips head screwdriver; just don't tighten it so hard you strip the screw threads.

Then inspect the socketed IC chips for bent-out or bent-under pins. If this looks good, then use your thumb to press down firmly on all the socketed ICs. Re-install the top cover. The next thing to check is your power supply. A common problem is that the power supply is no longer supplying sufficient current to run the PK-232. The PK-232 is looking for 12 VDC UNDER LOAD and at least 800 mA of current with less than two volts peak to peak of ripple A good sign that your power supply is not providing enough current is that with only the power cable hooked up to your PK-232, your `TUNE` bargraph window will light up more than one or two segments. It is also a very good idea to closely inspect all interconnecting cables, and clean any contact connections. If all else fails. please call AEA and ask for Technical Support.

QUESTION: My PK-232 is not keying my radio properly. What's wrong?
ANSWER: It is possible to disable your PTT line in software. Turn ON the parameter called *XMITOK*.

If this is set properly, the next thing to do is to check your cable. The best way to do this is to unplug the small 5-pin connector from the RADIO PORT on the PK-232, leaving it connected to your radio. Then hook the GROUND pin and the PTT pin together. These are pins four and five respectively, and are the BROWN and RED

wires. If it does not key your radio, your cable is bad, or your radio is bad. Check MIC operation. If the microphone keys your radio, check the configuration of the PTT jumpers inside the PK-232 for proper configuration. This is covered on pages 2-6 through 2-7 of the manual.

If your radio is keyed all the time, use the above procedure starting with removing the cable. If unplugging the cable un-keys the transmitter, it is possible that the PTT transistor is shorted. This is Q5, and is located close to the RADIO 1/2 switch on the PK-232 PCB. Replacing Q5, and possibly Q4 also, should cure this problem. If it still persists, please call AEA and ask for Technical Support.

* NOTE * ONLY REPLACE THE TRANSISTORS IF YOU HAVE HAD PRIOR EXPERI-ENCE WORKING ON DOUBLE-SIDED GLASS EPOXY PCB ASSEMBLIES !

IF YOU DAMAGE THE BOARDS, YOU MAY RISK NOT BEING COVERED UNDER THE AEA WARRANTY.

QUESTION: The manual is so big, I can't find what I need quickly. Where do I look?
ANSWER: The first place to look is the TABLE OF CONTENTS in the front of the manual. Each chapter has a title that explains what it covers. Refer to the chapter that applies to your question, For example, if you have a question on a specific mode. Chapter 4 is titled "OPERATING MODES". Look up the particular mode in question and refer to the page number listed. This is an excellent way to find information you require quickly. Another approach to finding information is to refer to APPENDIX A in the back of the manual. This covers all of the commands the PK-232 uses in alphabeti-cal order and gives a brief description of their function and default setting. Chapter 6 describes these commands in full detail and can be an invaluable source of infor-mation.

QUESTION: I have never installed batteries, but my PK-232 appears to hold its parameters after a power down. What gives?
ANSWER: The newer PK-232's come with a lithium battery installed inside the unit. Check JP-1 to see if it is OFF or ON. It uses a small shorting plug to short the two pins of JP-1 together. ON means the shorting plug is on both pins of JP-1, and the battery is en-abled. OFF means the shorting plug is not on both pins of JP-1, and the battery is disabled.

SPECIAL NOTES FOR PC-PAKRATT WITH FAX USERS

1. PC-PAKRATT contains a file named README.DOC that includes information and application notes that may be useful. To create a hardcopy of this file to your printer, type the following command at the DOS prompt followed by a carriage return:

   copy readme.doc prn

   You can obtain information on this file or a hardcopy by contacting AEA's Technical Support.

2. If you wish to access parameters in the PK-232 such as *SIGNAL* (SIAM), *WHYNOT*, etc., you must enter the DUMB TERMINAL mode. This is accessed from the main menu by pressing the F8 function key. If you don't see the parameter you are looking for in the parameter or status screen of the PC-PACKRATT split screen mode, (press [F9] after picking a mode, press again), go to the dumb terminal mode to change it.

   If you try to change a parameter that already exists in the split screen mode from the dumb terminal mode, such as *MYCALL*, the split screen mode takes precedence over the dumb terminal mode and the parameter will be set to the value chosen in split screen mode. Always make sure you are at a command prompt (`cmd:`) in the dumb terminal mode before you strike the escape key to return to split screen mode. Failure to do so may result in a lock-up of the program, or an RS-232 Link-Error.

3. When going between PC-PAKRATT AND PK-FAX, after you exit the program, and before you bring up the other, it is a good idea to turn OFF your PK-232 for at least 10 seconds to let it return to DEFAULT parameters. This is indicated by only the BAUDOT LED being lit on the front panel of the PK-232 when you turn it on. Setting PC-PAKRATT for 4800 baud operation at the opening screen will ease switching between programs.

4. If you should get the message **UNABLE TO ESTABLISH COMMUNICATIONS...** etc., observe if the BAUDOT LED is still lit, and also if any other LEDs besides BAUDOT were lit while it was trying to communicate with your PK-232. If the LEDs did move around while the program was running, this means the program "saw" your PK-232 but could not link up with it. Remove any memory-resident (TSR) programs you may be using. You may also run the command "CHKDSK" from a DOS prompt to make sure you have over 384,000 bytes free of RAM. Try another computer or serial port.

5. If the LEDs did not move at all, this means the program most likely did not "see" the PK-232. Check your serial cable for proper configuration. Also check if your serial port is configured as a DCE or a DTE. If the serial port is configured as a DCE, you will want to swap the TRANSMIT and RECEIVE data lines. Refer to Chapter 2, page 23, section 2.8.7 of this manual concerning this. Chapter 2 also has some detailed connections for specific computers starting on page 21, section 2.8. Try another computer or serial port. If you have any other terminal programs, bring one up and see if you can "talk" to the PK-232. If you can, make a new copy of the malfunctioning program from the original disk and try again. Trying your PK-232 on another working system is an excellent way to find the problem also. Please call AEA's Technical Support if problems persist.

SPECIAL NOTES FOR COM PAKRATT WITH FAX USERS

1. Always use your keyboard overlays that came with the package! Channel 0 on the top (upper) overlay lines up with the left-reading arrow key on the computer keyboard, and Channel 1 lines up over the "1" on the keyboard, etc. This will greatly simplify operation, and ease of use. Be careful of pressing C= F7 instead of <CTRL-F7> when in PACKET mode. By doing this you are turning the parameter *XMITOK* to OFF instead of going between VHF and HF packet. See question 9 in "COMMONLY ASKED QUESTIONS". Also, always press C= Q when quitting either program in the HOST mode. All quotation marks are used for clarification, and are NOT to be typed in.

2. There are two ways to start either program. You can press T for terminal mode, or press the RETURN key to go directly to HOST Mode. You MUST turn it ON the way you turned it OFF, if you have the batteries installed. If you turned it off in the terminal mode, first press T, and then turn on the PK-232. If you turned it off in the split screen mode using C=Q, you must have your PK-232 powered on, and then press RETURN at the opening screen. Both procedures are done presuming you have your computer ON with either cartridge installed and the main menu is being displayed. Also refer to question 5 in "COMMONLY ASKED QUESTIONS".

DECEMBER 30, 1988, FIRMWARE

At this time, the most recent release of firmware for the PK-232 is dated 30 DEC 1988. With this release, Packet Operation has changed slightly.

When running this firmware in its default state, low level packets that are received by the PK-232, but too low to light the `DCD` LED, will NOT be displayed to the screen. Only received packets that cause the `DCD` LED to light will be displayed to the screen.

This is normal for this release of firmware. Please refer to the Command *CUSTOM* as described in the documentation for this firmware.

When performing a loopback test, it is quite possible that the AFSK level used to drive the PK-232 may be too low to light the `DCD` LED, which would indicate a failure of the loopback test when, in fact, the PK-232 was operating normally. It is our recommendation that the AFSK level be set high enough to light the `DCD` LED, or the loopback test will not work.

RADIO CABLE AND MISSING U-47

As of February 21, 1989, some PK-232's are missing integrated circuit U-4. This is normal. Some PK-232's used two 8K RAMs, while some may use one 32K RAM.

The 8K RAM chips are in short supply, forcing us to use the more popular 32K RAM chips. This is the chip used at location U-3, and U-4 is empty. The PK-232's with the 32K RAM chip do not do anything that the earlier PK-232's did.

You may notice that there is a 10-foot long cable with a five-pin connector on each end. These are your two radio cables. Simply cut the 10-foot long cable in half. The radio cable is manufactured this way to allow us to test the cable prior to shipment. The particular cables in your PK-232 may or may not be cut. In either case, you can be assured that the cable has been tested.

THE SPECIAL FAX CABLE

Instructions for installing the special cable are given in the Setup Section of the FAX Manual appendix. The connector on the cable that is used to connect the PK-232 to your computer or terminal may be the wrong gender. Two methods can be used to change the gender of the connector. You may remove the existing connector and replace it with the proper connector, or a gender-changer can be purchased from Radio Shack.

Part Number 26-1495 Cost $14.95