Kantronics All Mode Communicator

Version D (v2.7)
August 1987

TABLE OF CONTENTS

PREFACE

Your Kantronics All Mode Communications Terminal (KAM) is a state of the art device. It has been carefully designed, assembled and tested to meet your demanding specifications. We do need your warranty registration on file. Please take a moment to complete this card and return it to us.

The KAM is a Kantronics hardware and software design incorporating the AX.25 Version 2 Level 2 Packet protocol as adopted by the American Radio Relay League. This Operator's Manual contains information from earlier KPC-1 and KPC-2 manuals, modified as appropriate. In addition, Kantronics acknowledges the use of material from the original Tucson Amateur Packet Radio Corporation (TAPR) TNC-1 manual granted by OEM agreement.

We have attempted to make this Operator's Manual technically and typographically correct as of the date of the current printing. Production changes to the KAM my include errata or addendum sheets as required. We solicit your comments and/or suggested corrections. Please send to Kantronics Inc., 1202 E 23rd St., Lawrence, Ks 66046.

We have attempted to organize the manual in the most logical sequence to simplify installation and operation. Due to the complexity of the KAM, you may wish to save the "exotic" parts until later. Refer to those sections covering multi-connect, gateway and simultaneous HF/VHF packet operation after you have the KAM installed and operating.

Throughout the manual we will use the terms "enter", "return" or "carriage return" interchangeably. In addition, the symbol <CR> is used to signify the action of operating the key which causes entry of a carriage return.

PRECAUTIONS

CAUTION: The KAM is grounded through its connections to your transceivers. Make sure your transceivers are properly grounded and your computer has equal ground potential. Follow the grounding instructions in your transceiver manual.

Cables provided with the KAM Communicator are shielded. If you decide to use substitute cabling, be certain it is also shielded. We do not recommend the use of RS-232 ribbon cable in the ham shack environment.

RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment complies with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of the FCC rules. These specifications are designed to minimize radio frequency interference in a residential installation; however, there is no guarantee that radio or television interference will not occur in any particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on when the radio or television is on, the user is encouraged to try to correct the interference by one of the following measures:

    Reorient the radio or TV receiving antenna;
    Relocate the computer with respect to the receiver;
    Move the computer away from the receiver;
    Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary the user should contact the dealer or an experienced radio/TV technician for additional suggestions. The user may find the following booklet prepared by the FCC helpful:

    "How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402 by ordering Stock No. 004-00000345-4.

<u>RFI SUPPRESSION</u>

In moving to the world of digital communications via computers, a new dimension of RFI may be encountered. In spite of the equipment manufacturers' diligence, each new piece of electronic equipment will react differently in each separate environment. Every amateur station will have its own unique layout, equipment variation and antenna installations. Experience has shown that these differences are related to the total RF environments and may causative factors in RFI induced problems. The suggestions given here may assist in resolving RFI problems you may encounter in your "unique" station.

1. Use shielded cable for all interconnections between equipment.

2. Make all interconnecting cables as short as practical. A balance should be maintained between cable length and equipment proximity. At times simply moving the video monitor one foot further from an interface or other device will solve the "screen hash" problem.

3. Antenna runs should be kept away from equipment control lines and/or interconnecting cables.

4. Ground leads should be as short as possible and go to a GOOD EARTH GROUND.

5. Interconnecting cables appearing to act as radiators or antennas should be looped through a toroid. Be certain toroids, if used, are designed for the frequency in use.

CHAPTER 1
INTRODUCTION

The KAM is a high performance terminal unit providing Morse (CW), RTTY, ASCII, AMTOR and Packet communications on the High Frequency (HF) bands. It will also provide Packet operation on VHF/UHF bands. Each of these capabilities is is amplified in the following paragraphs.

Microprocessor control means the KAM has optimal filter settings for each mode, shift and data rate selected. KAM has the added features of multiple RTTY shifts and limiter/limiterless operation. Every computer you use with the KAM will have to have a simple terminal program to interface with the KAM. You can have enhanced operation, such as file transfers, with a sophisticated modem program.

Hardware Description

KAM incorporates and integrates both HF and VHF capabilities in a single unit. There are two radio ports, one for HF and one for VHF. The VHF port operates Packet only, while the HF port provides All-Mode digital facilities. When operating Packet you designate which port is to send data by use of the corresponding *STReamswitch* character. It is therefore possible to be connected to and conversing with stations on both HF and VHF at the same time.

There are two separate modems in the unit. The VHF modem which addresses the VHF port operates at 1200 Baud. The HF modem which addresses the HF port operates at up to 300 Baud. Both modems are optimized for their intended use.

Morse Mode: Transmit and receive operations at speeds ranging from 5 to 99 words per minute. A separate CW filter is provided which can be controlled with software commands from the computer keyboard. This filter's center frequency is nominally set at 750 Hertz. However, the center frequency can be varied to suit your transceiver's requirements. The bandwidth of the CW filter is normally set at 200 Hertz and may be set to any bandwidth between 50 and 1000 Hertz. Refer the *CWTone* and *CWBand* commands in the command section of this manual.

Baudot RTTY Mode: Baudot code from 45 to 300 Baud may be sent and received. Note that the RTTY speeds are referred to in Baud rather than words per minute. The unit's default rate is 45 Baud which equates to 60 words per minute. Other commonly use standard RTTY speeds are 67, 75, 100 and 132 word per minute. These rates equate to 50, 66, 75 and 100 Baud respectively. With the KAM you can set any Baud rate up to and including 300 Baud, in one Baud increments, with software commands from the computer keyboard. Any commonly accepted RTTY shift may be established by software command. These are 170, 425 and 850 Hertz shift. In addition, you can establish any other intermediate shift you may wish to use. Refer to the *MARk*, *SPace* and *SHift* commands in the command section of this manual.

AMTOR Modes: ARQ, FEC and Selective FEC transmit and receive operations are available. In addition, an AMTOR ARQ listen mode is selectable for monitoring other stations ARQ links.

HF Packet Mode: This unit incorporates the necessary circuits and firmware to provide Packet operation on the High Frequency bands. When Packet operation is selected, a tone pair of 1600/1800 Hertz and an output Baud rate of 300 is established. You may designate other tone pairs if you prefer, however, you should remember to generally maintain a 200 Hertz shift. Other shifts can be established, but doing so could make a difficult for other packet stations to copy your signals unless they are also using the same shift.

VHF Packet Mode: Packet operation is available using standard Bell 202 tones of 1200/2200 Hertz only at 1200 Baud.

Personal Packet Mailbox: This unit incorporates the popular Kantronics Personal Packet Mailbox feature. The Mailbox operates independently of your attached terminal or computer. You, or other stations, may leave messages in the Packet Mailbox for retrieval when convenient.

ADDITIONAL FEATURES

1. Automatic Gain Control provides improved performance in noisy band conditions.

2. Limiter/limiterless demodulation (switch selectable) provides improved RTTY operation in weak signal conditions.

3. Two-tine demodulation for improved performance in signal fading conditions. Miss the mark - catch the space or vice/versa.

4. Separate CW demodulator for optimal CW reception.

5. Normal/Reverse FSK output is software selectable for flexibility.

6. Reed relay CW keying to accommodate any transmitter or transceiver.

7. Selectable AFSK output level to both the HF and VHF port provides modulation for all trans-ceivers, including those requiring pre-amplified microphones.

8. Selective RTTY reception-autostart operation prevents clutter of unwanted signals monitored on frequency.

9. Twelve pole programmable switched capacitance input filtering optimized for each RTTY/ASCII shift and Packet operation.

10. Programmed low-pass filter optimized for each Baud rate.

11. Crystal controlled AFSK generator provides stable tones.

12. Twelve volt DC operation with low current drain of 230 mA provides excellent mobile/portable operation.

13. 32 k RAM for maximum buffering and storage of data.

14. 512 byte EEPROM for storage of operating parameters eliminates batteries.

15. Flow control to insure accurate file transfers.

16. Jumper selectable RS-232 or TTL level signals provides compatibility for any computer.

CONTROLS AND INDICATORS
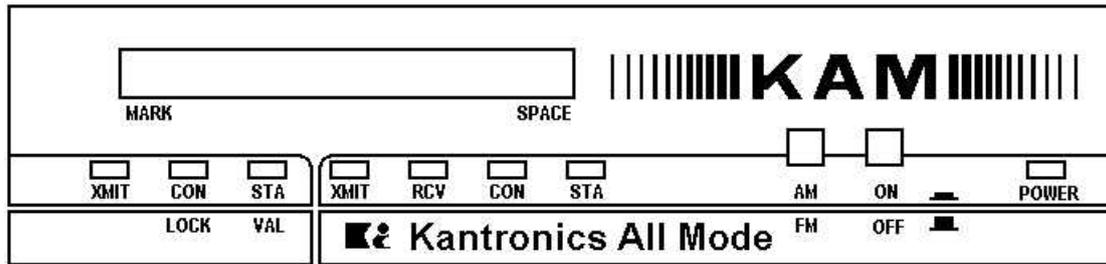
The front panel has two switches, eight LEDs and a ten segment LED bargraph. There are seven LEDs used as operating status indicators. The front panel is divided into two sections. The left three LEDs are the indicators associated with HF operation, and the four right LEDs are the indicators associated with VHF operation. The two segments are divided by a white color bar. Each LED has the functions indicated below:

HF Section:

XMIT - This LED will illuminate when the KAM is keying the PTT line on your HF radio OR when HF packets are being received.

CON/LOCK - This LED will illuminate when you have an HF Packet connection OR a valid AMTOR data link.

STA/VAL - This LED will illuminate when you have unacknowledged HF packets OR a valid AMTOR data link.

VHF Section:

XMIT - This LED will illuminate when the KAM is keying the PTT line on your VHF radio.

RCV - This LED will illuminate when you are receiving a VHF packet.

CON - This LED will illuminate when you have a VHF Packet connection. In addition, when operating non-Packet HF modes, this LED will blink ON/OFF for approximately 10 seconds if KAM receives a VHF Packet connect request.

STA - This LED will illuminate when you have unacknowledged VHF packets.

POWER INDICATOR - The single LED on the right end of the front panel illuminates when power is applied.

Switches:

ON/OFF - Provides power control of the KAM.

AM/FM - Switches the limiters in or out of the demodulator circuits. This switch should be set to AM for CW operation and FM for RTTY/ASCII/AMTOR. For Packet operation, either AM or FM can be selected. Use the setting you prefer.

Ten Segment LED Bargraph:

The bargraph provides a visual indication of the received HF signal. The end segments, labeled MARK and SPACE, blink alternately on a properly tuned RTTY/ASCII/AMTOR or Packet signal. In CW mode the bargraph illuminates from left to right. In addition, when your PTT line is being keyed to transmit on the HF port, the LED bargraph will be blanked out.

CHAPTER 2
CONNECTING YOUR COMPUTER

GENERAL

The first steps required are to interconnect your computer with the KAM and get it and the KAM talking to each other. To do this you must connect the KAM to the computer serial data port and load your computer with a terminal program. The serial port provides a place for data to be sent to or received from the KAM. The terminal program is the software which runs in the computer, allowing it to communicate with the KAM or an external device.

If you are using a computer or terminal which operates at the TTL voltage level, you must reposition the internal jumper K-7. The VIC-20 and Commodore 64 are examples of units which operate at the TTL level. Refer to page 14 for information on the functioning of K-7. The parts placement diagram on page 70 shows its location. Assembly/disassembly instructions on page 41 show you how to obtain access to the interior of KAM.

Many computer systems include a terminal program on the system diskette. For example, the IBM system diskette includes a program named COMM. Other computer systems may include a terminal program in the initial software package, usually named COMM, TERM, or a similar name which conveys the idea of communicating. Some computer systems require that a terminal program be obtained separately. In general, any program which allows telephone modem communications with the computer will be suitable for use with the KAM.

We have included several simple terminal programs in an appendix to this manual to assist you. There are also some names of specific programs available at computer stores which may be used.

There are generally four variables to be set in your terminal program. These are Baud rate, parity, word length and the number of stop bits. If your terminal program provides for these variables, use the following settings to talk to the KAM:

        Baud rate: 300, 600, 1200, 2400, 4800 or 9600
        Parity: None
        Data Bits: 8
        Stop bits: 1

INTERFACING

Since there are so many computers on the market now, it is impossible to provide interfacing information on all of them. However, we do provide limited information on some of the more common ones here.

If you have a PCjr, TRS-Color or a TRS Model 100, some limited information follows:

PCjr:
The IBM PCjr has a built-in terminal program in the basic cartridge. The terminal mode is started by typing TERM. Consult the PCjr Technical Reference Manual for pin-out requirements for the PCjr serial port. You will have to buy a special connector from your computer dealer for the PCjr.

TRS-Color Computers:
The serial port of the color computer uses a 4-pin DIN plug. Pin connections at the port are shown in the pin table below.

        KAM   TRS   CABLE
         2 -------------- 4 -------------- white
         3 -------------- 2 -------------- brown
         7 -------------- 3 ------------- black

This is known as a three-wire interface. This cabling supports the TRS VIDTEX program. If you have a micro-color computer, such as the MC-10, cabling is different; consult your computer reference manual.

TRS MODEL-100
This computer has a standard RS-232 25-pin DB connector serial port. Just add necessary extension cables and call the modem program that is a part of the computer.

OTHER COMPUTERS WITH A 25-PIN SERIAL CONNECTOR:
If your computer has a 25-pin DB connector for serial operation, chances are it is wired the same as the KAM. However, it is a good idea to check the computer reference manual before wiring up the cable. Check to make sure that transmit data, receive data and ground are on the same pins as the KAM serial port. Change if necessary. Also check to see whether or not the RTS/CTS or other RS-232 lines are required. The requirement for these lines is usually dictated by the computer program you use.

Your computer may also require jumpers between pins 4 and 5, and also between some combination of pin 6, 8 and 20. Check your computer reference manual.

CONNECTING KAM TO YOUR COMPUTER

NOTE: Before making any connections to the KAM, you should review the internal jumpers information in Chapter 3, page 13.
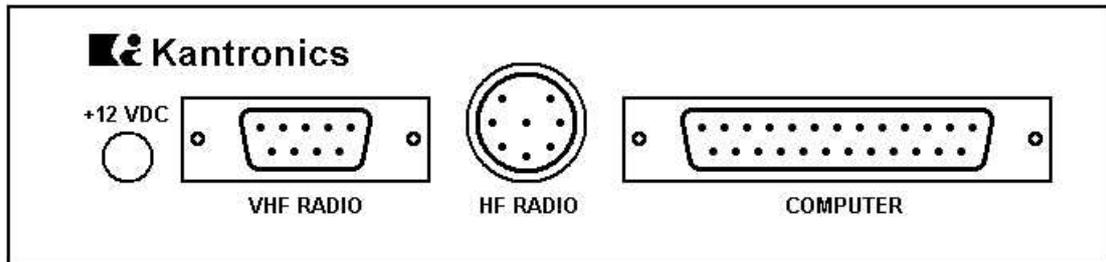
The 25-pin connector on the panel is for connecting to the computer or terminal. Five of these pins are for connection to your computer or terminal, and two provide for Mark/Space outputs to a monitor scope if you wish to use one. A prewired cable is provided for your use to connect the KAM to the computer. Five prewired lines are provided with a DB-25 connector. You must provide the connector to attach these lines to your computer serial port. In most cases, unless the terminal program you use requires hardware flow control, you need only connect three of these lines – Transmit data, Receive data and Signal ground. In fact, most modem programs do not use RTS/CTS handshaking supported by the KAM. Therefore, the three lines interface is best when first starting.

Description	Comp. pin	Direction	KAM pin	Color
Transmit data	2	⇨	2	white
Receive data	3	⇦	3	brown
Request to send	4	⇨	4	green
Clear to send	5	⇦	5	red
Data carrier detect	8	⇦	8	
Signal ground	7	⇔	7/1	black
Data set ready			6	
Data terminal ready			20	
Mark			11	
Space			18	
+12 V			25	

The function of these lines is explained below.

Transmit data: This line is the serially transmitted data from the terminal to the KAM.

Receive data: This line is the serially transmitted data from the KAM to the terminal.

Request to send: This line tells the KAM that the terminal is ready to receive data. An ON level tells the KAM it may send data while an OFF level tells it to stop sending data.

Clear to send: This line tells the terminal whether or not it may send data to the KAM. An ON level tells the terminal it may send data while an OFF level tells it to stop sending data.

Data Carrier Detect: This line is an output from the KAM indicating connected status of the unit. When a connection exists on the current stream, this line will be true. (When using TTL levels, DCD at +5 V indicates connected status.)

Signal ground: This line establishes the common ground reference potential for all circuits except Protective Ground.

Data set ready/
Data terminal ready: These pins are common on the KAM connector and are held high.

Mark/Space: These signals are available for connecting an external scope if desired. Refer to the section covering this implementation for instruction.

+12 V: This is an alternate input pin for supplying power to the KAM if desired. If the normal 12 VDC input jack is used, this pin will be hot. BE CERTAIN THIS PIN IS NOT CONNECTED TO YOUR COMPUTER!

INTRODUCTION TO COMMANDS

There are some very specific procedures which must be observed when talking to the KAM. The internal program in the KAM has an extensive set of program routines which allows it to do what you want done and report the results back to you. This short section will give you a familiarity with the procedures needed to initially manipulate the unit. For a further explanation and discussion see Chapter 6 - Commands and Messages.

COMMAND STRUCTURE

You communicate with the KAM by using commands entered at your computer. Some commands are actually "instructions" to the KAM. These tell it to perform a certain action or report information to you. For example, the *Connect* command tells KAM to make a connection to the station you specify or tell you its current state if no connection exists. Another example, the *RTTY* command tells KAM to go to the RTTY mode of operation.

Other commands set "parameters" or additional values which control actions that KAM will take or conditions which will exist during its operation. For example, the *MYcall* command requires that you add a value to it, i.e. your station callsign, which will be used in all Packet communications. A parameter, or additional value, may be a number or it may be a "flag" having only two possible settings – ON or OFF. Examples of these are *MAXUsers*, which may have a number from 0 to 26, and *Monitor*, which may be ON or OFF.

You will see many of the commands in KAM which set two indicated parameters or "sides". These commands are displayed with a slant bar (/) separating the two presently set values. These commands have a separate parameter or value for each of the radio ports. The value displayed to the LEFT of the bar is for use with the HF port and the value displayed to the right of the bar is for use with the VHF port. You may set the required values independently or at the same time according to the following rules:

1. Entering the command with a SINGLE value or parameter will cause the same value to be set for Both ports.
2. Entering the command with a SINGLE value or parameter, followed by the slant bar (/) will cause the value entered to be set for ONLY the HF port. The VHF remains unchanged.
3. Entering the command followed by the slant bar (/) and a SINGLE value will cause the value entered to be set ONLY the VHF port.
4. Entering the command followed by a value, the slant bar (/) and a second value will cause the values specified to be set to the ports indicated.

REMEMBER: VALUES LEFT OF THE SLANT BAR APPLY TO THE HF PORT – VALUES TO THE RIGHT OF THE SLANT BAR APPLY TO THE VHF PORT.

We will experiment with these structures during Initial Checkout of the KAM.

INITIAL CHECKOUT

You should now have your computer connected to the KAM. It's time for power. On the back panel there is a jack marked +12 VDC. Connect the power adapter furnished with the KAM to this jack or, if you use another power source make sure it provides +12 VDC at 300 mA. If you wire your own power cable, make sure you wire it to the barrel plug with the center pin POSITIVE.

With the computer or terminal connected you may practice with the KAM without being "on-the-air" (not connected to your radio yet). In this way you can become familiar with issuing commands and setting parameters.

First, boot your terminal program. After booting the terminal program turn on power to the KAM. You will see the message **PRESS * TO SET BAUD RATE** appear on the screen. This message will be printed at several different Baud rates, and at the one which matches your computer output Baud rate it will be readable. At other rates it will appear as random printed characters. Press the ***** quickly while the readable version is printing.

The KAM will now send your computer its sign-on message and the following will appear on your display:

> **KANTONICS ALL MODE COMMUNICATOR VERSION 2.(nn)**
> **ENTER YOUR CALLSIGN =>**

Now enter your callsign and press *RETURN*. If, as you make this entry, you see the letters doubled, you are seeing your callsign echoed to the screen by both KAM and your keyboard. To prevent this, set *Echo* to OFF. (See the Echo command in Chapter 6.) When you press the *RETURN* or *ENTER* key on your keyboard KAM will respond with a **cmd:** prompt. This prompt tells you that the KAM is ready for your further instructions. Let's check some of those commands with two parameters first. At the **cmd:** prompt enter the command *MYcall*. Your screen should now look like this:

> **KANTONICS ALL MODE COMMUNICATOR VERSION 2.(nn)**
> **ENTER YOUR CALLSIGN =>** WA5RGU<CR>
> **cmd:**MYCALL

NOTE: Callsigns shown are for illustration only. Where callsigns are called for you should enter your own!

Now press the *ENTER* or *RETURN* key on your keyboard. The KAM will respond with:

> **MYCALL WA5RGU/WA5RGU**
> **cmd:**

This shows you that your callsign has been entered for use with both the HF and VHF ports. Now change it so that your callsign with an extension Supplementary Station Identification (known as an SSID in Packet) will be used with the VHF port. At the **cmd:** prompt type *MYcall* followed by a slant bar (/) followed by WA5RGU-1. The new line on your screen should now look like this:

       cmd:MYcall /WA5RGU-1

If your screen is correct press the ENTER or RETURN key on your keyboard. The KAM will respond with a new **cmd:** prompt.

Now type the command *MYcall* with no callsign and press the *ENTER* or *RETURN* key on the keyboard. KAM will tell you what the callsigns currently being used are. Your new display should look like this:

       MYCALL WA5RGU/WA5RGU-1
       cmd:

If you would like to experiment with these command structures some more, go to the chapter on "Commands and Messages" and pick out a few to use.

At this point, let's simulate an attempt to connect to another station on VHF. Again, you need not wire your radio to the KAM yet.

First, with a fresh **cmd:** prompt on your screen, enter the command *Connect* followed by any call, say DC7XJ. Your screen should look like this:

       cmd: Connect DC7XJ

If your screen appears correct, watch the VHF transmit LED on the KAM panel and press the RETURN key on your computer. The LED should blink 11 times at about a three second rate. The KAM then "times out" automatically because it has not connected to the requested station after sending 11 connect packets, Your screen should now appear as:

       cmd: Connect DC7XJ
       cmd:retry count exceeded
       ***DISCONNECTED
       cmd:

If you were actually connect to DC7XJ, your screen would respond with

       *** CONNECTED TO DC7XJ

Notice here that the **cmd:** prompt would not appear. The KAM would enter *CONVERSation* mode and you could exchange information with the connected-to station.

You are now ready to cable your radios to the KAM.

CHAPTER 3
CONNECTING YOUR RADIOS

The following paragraphs outline installation procedures for interconnecting your transceivers and the KAM. Prior to actually connecting the cables, you should determine if the internal jumpers K-1, K-2, K-5 or K-7 require repositioning to accommodate your system.

Jumpers are appropriately labeled on the PC board. Refer to the parts location diagram in this manual for help in locating them. Also refer to the assembly and disassembly section for information on obtaining access to the interior of the unit.

K-1
VHF EQUALIZATION – This jumper is provided to alter the equalization characteristics of the VHF modem. With no jumper installed on the 3-pin header, full equalization is effected. With the jumper connecting the center post and the post marked 1, there is no equalization. With the jumper connecting the center post and the post marked 2, partial equalization is in effect. Testing has shown that most VHF transceivers require that the input audio signal be fully equalized for best performance. This unit is shipped with the jumper placed on ONLY ONE of the posts effectively "OFF" so that full equalization is in effect. Should you wish to operate the KAM in a hard wire packet line, no equalization should be in effect.

K-2
AFSK OUTPUT - VHF – This jumper is provided to alter the VHF AFSK output level. The LO position sets an AFSK output level from the KAM at 10 mV. The HI position sets an AFSK output level of 50 mV. Both levels are peak-to-peak values. In general, transceivers requiring a pre-amplified microphone will require the HI level AFSK output from the KAM. Removing the jumper entirely will provide the maximum possible output level of approximately 1.7 V. Should you require an intermediate value of AFSK modulation signal, it may be obtained by replacing resistor R-12 with the appropriate value chosen from the following chart. If you change R-12 to obtain an intermediate value, place K-2 in the HIGH position. This unit is shipped from the factory with the jumper in the LO position.

R-12 Value	AFSK Output Level
470 Ω	24 mV
2.2 kΩ	106 mV
6.8 kΩ	290 mV
22 kΩ	680 mV
47 kΩ	1000 mV

K-3
VHF TIMER – This jumper is provided to DISABLE the VHF "watch dog" timer. The timer is disabled if the jumper is installed. Time-out of the KAM will occur after approximately 2.5 minutes un-keying the VHF PTT line. This unit is shipped with the jumper NOT CONNECTING the jumper posts; therefore, the timer is in effect.

K-4
HF-TIMER – This jumper is provided to DISABLE the HF "watch dog" timer. The timer is disabled if the jumper is installed. Time-out of the KAM will occur after approximately 2.5 minutes un-keying the VHF PTT line. This unit is shipped with the jumper NOT CONNECTING the jumper posts; therefore, the timer is in effect.

K-5
AFSK OUTPUT - HF – This jumper is provided to alter the HF AFSK output level. The LO position sets an AFSK output of 100 mV. The HI position sets an AFSK output level at 500 mV. Both levels are peak-to-peak values. In general, transceivers requiring a pre-amplified microphone will also re-

quire the HI level AFSK output from the KAM. Removing the jumper entirely will provide the maximum possible output level of approximately 1.6 V p/p. Should you require an intermediate value of AFSK modulation signal, it may be obtained by replacing resistor R-25 with the appropriate value chosen from the following chart. If you change R-25 to obtain an intermediate value, place K-5 in the HIGH position. This unit is shipped from the factory with the jumper in the LO position.

R-12 Value	AFSK Output Level
680 Ω	48 mV
3.3 kΩ	209 mV
4.7 kΩ	282 mV
6.8 kΩ	377 mV
22 kΩ	800 mV

K-6

TEST/NORMAL – This jumper is provided to initialize the EEPROM and to allow some self-testing. The unit is initialized at the factory and shipped with the jumper in the normal position.

K-7

RS-232/TTL – This jumper is provided to change the KAM from RS-232 to TTL operating voltage levels. This unit is shipped from the factory in the RS-232 position. If your computer operates at TTL level voltages, reposition this jumper prior to placing this unit in service.

* OPERATING NOTE *

As shipped from the factory, the VHF "watch dog" timer is in effect and the HF "watch dog" timer is not. The HF timer is not enabled since it cannot distinguish between RTTY and Packet signals. Should you plan to operate a mode other than Packet, the HF timer will limit your transmission time to approximately 2.5 minutes if it is enabled.

CONNECTING KAM TO YOUR RADIO

The KAM is attached to your transceivers via jacks and connectors on its back panel. There are two radio ports labeled HF and VHF. Each of these is fully independent and is addressed individually from your computer keyboard.
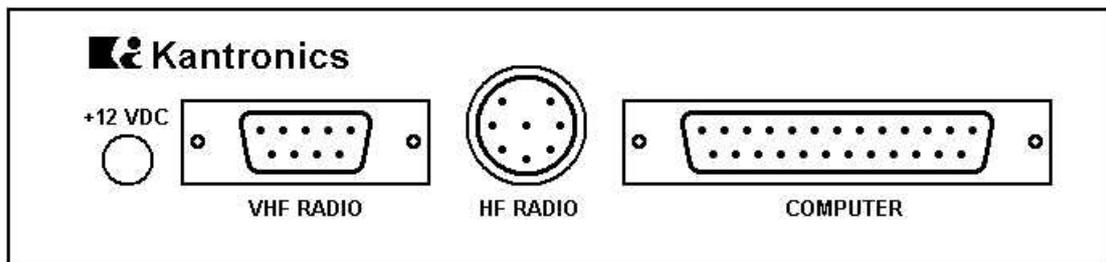
CAUTION: Make sure the power of the transceivers, computer and KAM is OFF before connecting any cables.

VHF Radio Connector
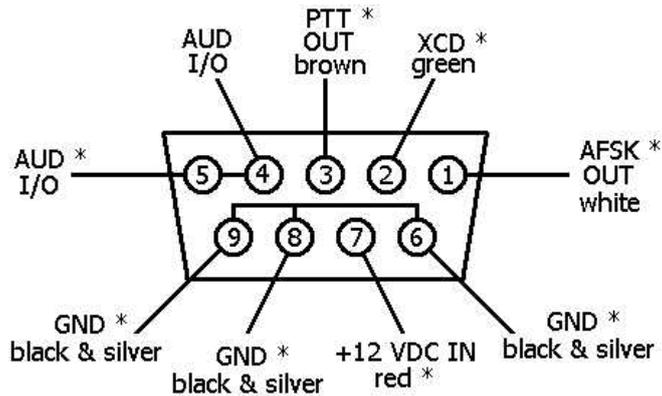
* Same as 9-pin KPC-2/KPC-2400 connector

The prewired cable assembly with a 9-pin oblong plug (DB-9) attached is for use with the VHF port. You will need to provide the mic-jack connector for your VHF transceiver and wire the connector to the provided cable.

CAUTION: Check your VHF transceiver manual to correctly wire the corresponding pins of the transceiver mic-jack.

Pin 1 – AFSK OUT – white lead
This line carries the AFSK tone generated by the KAM to the Audio (microphone) Input line of your transceiver.

Pin 2 – XCD – green lead
This line may be used to connect the squelch line from your VHF transceiver if desired. This connection will not normally be required, nor used, unless operating an a shared voice channel.

Pin 3 – Push-To-Talk – brown lead
This line controls the PTT line in your transceiver, allowing the computer to switch the transceiver from/to transmit or receive. Connect directly to the PTT line of the mic-jack connector.

Pin 4, 5 – Audio signal – 2 conductor audio cable, center conductor
Plug this lead to one leg of the Y-connector cable provided in the KAM accessory bag. Plug the Y-connector cable into the external speaker jack of the transceiver. The remaining female connector on the Y-connector cable may be used for an external speaker. Do not use a headphone output from the transceiver. If you use an accessory or phone patch output, it may be necessary to provide a padding network to reduce amplitude of the signal being fed to the KAM. High level fixed outputs may have a tendency to "swamp" the KAM input circuits. Fixed output signals in excess of 50 mV should be padded.

Pin 7 – +12 VDC in – red lead
This lead is provided as an alternate power input. It may be used in place of of the +12 VDC jack. If you do not plan to use this alternate input, you should clip the wire an insulate it. This lead will be HOT whenever the KAM is powered. This connection should not be used to power any accessory device.

Pin 6, 8, 9 – Ground/Shield – black and silver lead
Connect the push-to-talk ground and AFSK shield to this line. With some transceivers which do not reference PTT and audio shielding to a common ground, it may be necessary to leave the AFSK shield (braided wire) disconnected.

HF Radio Connector

XCD
yellow

AUD I/O
red audio cable

AUD I/O

PTT OUT *
brown

AFSK OUT *
white

KEY OUT *
green

FSK OUT *
red

GND *
black + audio shield + 5 wire shield

* Same as 5-pin UTU-XT connector

     The prewired cable assembly with an 8-pin DIN connector is for use with the HF port. You will need to provide the mic-jack connector for your HF transceiver and wire the connector to the provided cable.

CAUTION: Check your HF transceiver manual to correctly wire the corresponding pins of the transceiver mic-jack.

Pin 1 – AFSK OUT - white lead
This lead carries the AFSK tones generated by the KAM to the Audio (microphone) Input line of your transceiver.

Pin 2 – Ground/Shield – black and silver lead
Connect the push-to-talk ground and AFSK shield to this line. With some transceivers which do not reference PTT and audio shielding to a common ground, it may be necessary to leave the AFSK shield (braided wire) disconnected.

Pin 3 – Push-To-Talk – brown lead
This line controls the PTT line in your transceiver, allowing the computer to switch the transceiver from/to transmit or receive. Connect directly to the PTT line of the mic-jack connector.

Pin 4 – Key Out - green lead
This line may be used to control CW keying on your transceiver. Separate a small length of this lead and attach a lead with the appropriate plug for your transceiver key jack.

Pin 5 – FSK OUT – red lead
This line is for use if your transceiver provides FSK keying for radioteletype operation. Separate a small length of this lead and attach a lead with the appropriate plug for your FSK input connector on the transceiver. It will also be necessary to provide for PTT keying via the mic jack, accessory port or other method specified by your transceiver manual.

Pin 6 – Audio signal – 2 conductor audio cable, center conductor
Plug this lead to one leg of the Y-connector cable provided in the KAM accessory bag. Plug the Y-connector cable into the external speaker jack of the transceiver. The remaining female connector on the Y-connector cable may be used for an external speaker. Do not use a headphone output from the transceiver. If you use an accessory or phone patch output, it may be necessary to provide a padding network to reduce amplitude of the signal being fed to the KAM. High level fixed outputs may have a tendency to "swamp" the KAM input circuits. Fixed output signals in excess of 50 mV should be padded.
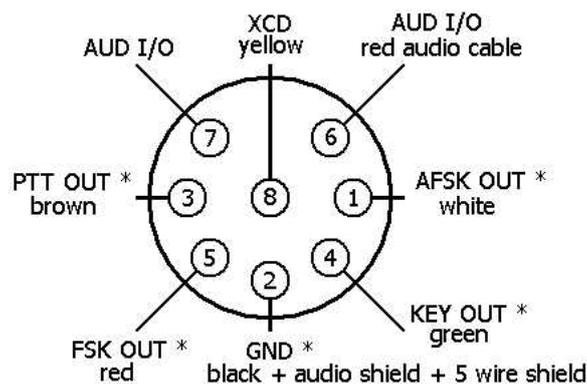
Pin 8 – XCD – single yellow conductor lead
This line may be used to connect the squelch line from your HF transceiver if desired. This connection will not normally be required, nor used, unless operating an a shared voice channel.

Special Cases – Interfacing Handheld Radios

 Many transceivers, especially most handheld models, obtain Push-To-Talk keying by completing a circuit between the mic shield and PTT ground. A direct PTT input to the mic shield line of units with this type electret condenser microphone is not usable without some type of isolation.
 If you plan to operate with a handheld transceiver, KAM has incorporated an isolation circuit which is available by jumper positioning. Enabling this circuit is done as follows:

1. Refer to assembly/disassembly instructions if necessary and remove the KAM from its case.
2. Locate point Z on the PC board. This point is at the rear, near the HF radio output port and power jack.
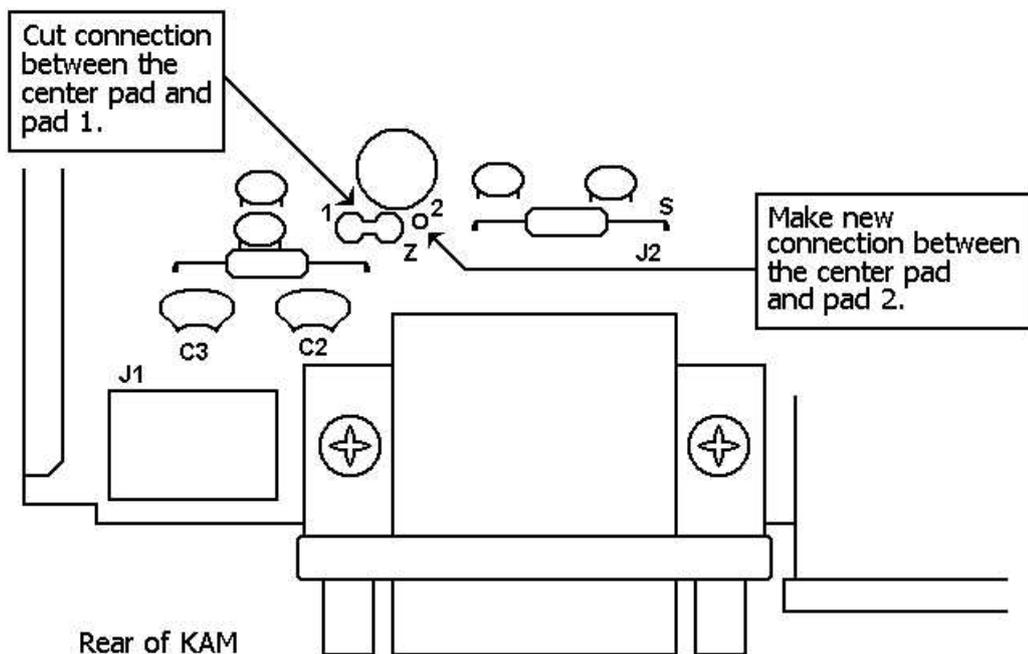
3. Locate the three pads associated with Z. Note that the center pad and the pad marked 1 is larger than the pad marked 2.

4. Carefully cut the connection between the center pad and pad 1.

5. Make a new connection between the center pad and pad 2. You may wish to make this connection on the bottom of the PC board instead of the component side.

 KAM is now ready for connection to electret condenser type microphone input circuits. Should you later use a different type radio, this change may need to be reconfigured. Most other radios of current manufacture will not require a KAM reconfiguration.

CHAPTER 4
OPERATION

OPERATING MODES

Before you put the KAM on the air, you should spend a few reading sessions learning how the unit operates. The KAM operates in five modes: CW, RTTY, ASCII, AMTOR ARQ and AMTOR Mode B (FEC or SELFEC) and Packet. Only Packet operation is available through the VHF port while any digital mode, including Packet, may operated through the HF port.

INITIAL CONFIGURATION

Operator programmable parameters affect operation of the KAM. When you initially turn the KAM on, all parameters are set for normal operation (their default values). All the parameters are explained in the commands section of this manual. This section will deal only with those parameters and commands which affect your initial operation of the unit.

The parameters of three commands – *MAXUsers*, *PMode* and *Kamport* – determine the state or mode that KAM will be in upon power-up. These commands also perform other duties. See the commands section for details. Briefly:

MAXUSERS

MAXUsers set the allowable number of simultaneous Packet connections on HF and VHF. In fact, the KAM can be put in one of three distinct configurations using the *MAXUsers* command.

The default setting of 10/10 configures the KAM for HF/VHF operation. Simultaneous HF and VHF Packet connections are possible. HF digipeating, VHF digipeating and HF/VHF gateway are available. RTTY and CW type operations are available on the HF port while digipeating on the VHF port. The available RAM (about 30 kBytes) is divided into 6 buffers: terminal input/output, HF Packet input/output and VHF Packet input/output.

Setting *MAXUsers* to 10/0 configures the KAM for HF only operation; likewise, setting *MAXUsers* to 0/10 configures the KAM for VHF only operation. In either of these configurations, the /H or /V indicators are suppressed and only the appropriate *STReamsw* character is active. The available RAM is divided into 4 buffers: terminal input/output and Packet input/output. The size of the buffers are therefore a little larger in HF or VHF only operation.

FUlldup is only active in VHF only operation. *Kamport* is only active in HF/VHF operation. *PMode* is only active in HF/VHF or HF only operation. *EXTmodem* is only active in HF/VHF or VHF only operation.

PMODE

The default setting of this command is NONE. The parameter of *PMode* can be NONE or one of the other operating modes. The *PMode* parameter determines the mode the KAM will be in upon power-up. The default setting of NONE allows KAM to come on in the Packet mode.

KAMPORT

The default setting of this command is VHF. The alternate setting is HF. The KAM will address the port set by *Kamport* on initial power on.

With these parameters in their default factory settings, you can operate VHF Packet, HF Packet, CW, ASCII, RTTY or AMTOR. Changing the settings or values of these parameters will determine the overall operating capabilities and power-up configuration of the KAM.

COMMAND MODE

Command Mode is to enter commands which alter the KAMs operating parameters. In addition, Command Mode is used to enter all operating modes except Packet. AT SIGN-ON THE UNIT IS SET FOR PACKET OPERATION. All other operating modes such as CW must be entered from Command Mode. When the KAM is in Command Mode, the characters `cmd:` are printed as a prompt at the beginning of each input line. This is the KAMs signal that it is waiting for instructions. The KAM

signs on in the Command Mode at power-up unless you have designated otherwise with the *PMode* command.

The default values of the units parameters are stored in the permanent EEPROM memory. If you change some of the parameters and want the new values used upon power-up, you can store them in the EEPROM with the *PErm* command.

INITIAL OPERATION

After you have cabled the KAM to the computer and transceiver, you will need to run the terminal program you have for operation with the KAM. Once the terminal program is initialized, turn on the KAM. It uses an autobaud program to set the Baud rate for communication with your computer. To accomplish this, the KAM will send a short message that is printed on the screen:

PRESS * TO SET BAUD RATE

The program is actually sending this sentence to your computer at 300, 600, 1200, 2400, 4800 and 9600 Baud. The sentence transmitted at the Baud rate compatible with your terminal program will be readable; the other will appear as random characters on the screen.

To access the KAM you need to press the asterisk (*) while the readable sentence is printing on the screen, or within two seconds after it is printed. If you miss the sentence, the program will repeat that process every few seconds.

Once you have succeeded in accessing the autobaud feature, the following sign-on message will appear on the screen:

KANTONICS ALL MODE COMMUNICATOR VERSION 2.(nn)
ENTER YOUR CALLSIGN =>

Enter your callsign and press the ENTER or RETURN key on your keyboard. The KAM will respond with:

cmd:

The KAM is now ready to accept your input instructions. Your callsign has automatically been entered into both "sides" of the *MYcall* command. Also a guess has been made for your SELCALL for AMTOR operation. To check this, at the **cmd:** prompt type MYSelcal<CR>. Your screen should look like this:

cmd:MYSELCAL
MYSELCAL WRGU
cmd:

If you wish to change your SELCALL, type MYSelcal xxxx followed by a carriage return. The xxxx should be the four letters you use as a SELCALL in AMTOR.

If you found that you needed to turn the *Echo* command OFF during the initial checkout with your computer, you should also turn it OFF now.

Next, you may want to set an *Abaud* rate to avoid the autobaud routine if you have not already done so. Be certain that it matches the rate used by your computer serial port.

Then, we suggest that your *PErm* these parameters so that you will not have to type them in each time the KAM is turned on. To *PErm* these entries, at the **cmd:** prompt type PErm, followed by a carriage return. The KAM will respond with a new **cmd:** prompt. These values are now set in the EEPROM and will be used each time you power-up the unit.

You are now ready to operate Packet or enter another operating mode such as CW or RTTY. Selection and use of each mode is discussed in the following paragraphs.

REMEMBER: You can always return to Command Mode if you enter a CTRL-C while in Packet converse mode, three CTRL-Cs while in Packet transparent mode or CTRL-C X while in non-Packet modes.

PACKET OPERATION

Packets are exchanged between stations in one of several data modes. There are several ways to get a Packet data mode from Command Mode. You can type the command CONVers or Trans, depending on the data mode desired. This will cause an immediate mode change to a data mode. If you issue a *Connect* command to initiate a conversation with another station, or if your KAM receives a connect request packet, then it will automatically change to a data mode after the connection is established. The data mode is specified by the *CONMode* command as *CONVers* or *Trans*.

TUNING PACKET SIGNALS

The reception of VHF packets requires no tuning. Reception is indicated by the [RCV] LED being lit. Tuning HF Packet signals is simplified by use of the LED bargraph. While observing the indicator, tune your HF transceiver for an alternate blinking of the end segments on the bargraph. If you are tuning to monitor random Packet transmissions, be certain you have enabled the Monitor function of the KAM. As the end segments illuminate, the HF XMIT LED will also be lit when you are properly tuned, indicating a carrier detect.

CAUTION: When a band is noisy, put the AM/FM front panel switch in the AM position and use only the necessary volume level to accurately receive packets. Otherwise the carrier detect (XMIT) indicator will be lit nearly continuously, preventing the transmission of packets. The Packet protocol is designed to inhibit transmission of packets if the band (carrier detect) is busy.

We recommend that your first Packet operation with KAM be tried on the VHF band. At initial power-on KAM is conditioned for Packet operation with the Input/Output connected to VHF stream A. The I/O is manipulated from port to port and stream to stream with the *STREAMSW* character. Further discussion of STREAMSW character can be found in the section on Multiple Packet Connection, page **XX**.

CONNECTING and DISCONNECTING

In order to make full use of the KAMs capabilities for reliable Packet communications, you should establish a connection with another station. This means that everything you type while in Converse Mode will be automatically addressed to that station, and packets sent between your station and the other station will be automatically acknowledged by the recipient. The sending station will continue retransmitting a message until it has been received correctly. To connect to W0XI, for example, type

CONNECT W0XI

If W0XI is on the air, tuned to your frequency and within range of your transmission, you should notice a message coming back to your unit. If you have your radio attached to a speaker as well as the unit you will hear the packets; otherwise, you can see the the end segments of the bargraph light for HF operation. When your connect request (the packet your unit sent) has been acknowledged, the unit will display the message:

***CONNECTED TO W0XI

and automatically move to Converse Mode. If you now type a message, it will be formed into a packet and sent to W0XI. When you are through with the conversation, either you or the operator of the other station may initiate a disconnect. To do this, return to Command Mode with a CTRL-C and type the command:

DISCONNECT

After an exchange of packets, you will see the message:

***DISCONNECTED

which indicates that your disconnect request packet was acknowledged by the station you were connected to.

DIGIPEATING

The KAM will function as a digipeater, or Packet relay station, on either HF or VHF or both HF and VHF simultaneously. This feature permits other station to use you as a relay on the same frequencies when they cannot connect directly but are both in range of your station. Digipeat functions are fully automatic and require no action by you as long as your unit is powered and has the digipeat command on, which is the default setting. You may also use other Packet stations as digipeaters for your communications. The VHF section of the KAM can be used as a digipeater while you are using the HF section for other modes of operation, such as RTTY.

Establishing a connection using a digipeat route is slightly different from the method used in a direct connection. For example, assume you are N0APJ and wish to establish a connection to WA5RGU but have to use an intermediate relay station, W0XI. To make this connection type:

CONNECT WA5RGU VIA W0XI

Upon completion of connection you will see the

***CONNECTED to WA5RGU

message on your display. You may now conduct your QSO. At the end of the QSO you may disconnect in the same manner as for direct connections.

You must specify digipeaters in the order they will be encountered along the path from your station to the station you wish to connect to. You may specify up to eight digipeaters in the connection path and must separate all following the first by commas, without spaces. The keyword VIA is used only once in the connect request.

It is possible that your connect request will fail to succeed. Should you accidentally specify an incorrect callsign, or the station you want to contact not be on the air, the unit will make several tries before giving up. You can specify the number of attempts to be made with the command *RETry*. The default value set is 10. If the unit receives no response after this number of retries it will quit and your display will show:

***RETRY COUNT EXCEEDED
***DISCONNECT

MULTIPLE PACKET CONNECTIONS

KAM has the capability of allowing you to operate with multiple connections either HF or VHF, or both HF and VHF simultaneously.

When operating Packet, your outgoing packets are directed to the VHF or HF ports by use of the streamswitch. There are actually two streamswitches used, one for VHF and one for HF. Check this on your display screen. At the `cmd:` prompt type the command STR and press ENTER or RETURN on your keyboard. KAM will resond with:

STREAMSW $40/$7c

The value left of the bar is the hexadecimal value for the @ character on your keyboard. This character is the one used to address a packet to the HF port. The value to the right of the bar is the hexadecimal value for the | character on your keyboard. This character is used to address a packet to the VHF port.

If your computer keyboard does not have these two keys you may change them to any ASCII character you prefer. If you need to change either of them, you should select characters you will not use in normal Packet conversations. A possible choise is the dollar sign ($) and percent symbol (%). If you wish to use this pair, at the **cmd:** prompt enter STREAMSW 36/37. These decimal numbers will set hex $24 as the HF streamswitch and hex $25 as the VHF streamswitch. (36 is the $ symbol, 37 is the % symbol.)

Outgoing packets will be addressed to the last stream used, unless you specify otherwise with a streamswitch character.

To change streams you must type the streamswitch character followed immediately by the stream designator. The stream designator is an alphabet character A though Z limited by the value of *MAXUsers*. To switch to the C stream on the HF port, type $C. To switch to the B stream on the VHF port, type %B. Only two keys are typed, no carriage return is needed.

The *Status* command: *Status* is an immediate command which will instruct KAM to display the status of all channels or streams. If you type this command at the **cmd:** prompt, KAM will return the following display:

```
A/H Stream          DISCONNECTED
B/H Stream          DISCONNECTED
C/H Stream          DISCONNECTED
D/H Stream          DISCONNECTED
E/H Stream          DISCONNECTED
F/H Stream          DISCONNECTED
G/H Stream          DISCONNECTED
H/H Stream          DISCONNECTED
I/H Stream          DISCONNECTED
J/H Stream          DISCONNECTED
A/V Stream    I/O   DISCONNECTED
B/V Stream          DISCONNECTED
C/V Stream          DISCONNECTED
D/V Stream          DISCONNECTED
E/V Stream          DISCONNECTED
F/V Stream          DISCONNECTED
G/V Stream          DISCONNECTED
H/V Stream          DISCONNECTED
I/V Stream          DISCONNECTED
J/V Stream          DISCONNECTED
```

Here you see displayed the current status of each 10 possible channels or steams, on both the HF port and VHF port- The letter left of the slant bar (/) is the stream identifier and the letter right of the slant bar is the port identifier. Letter H indicates a stream on the HF port and the letter V indicates a stream on the VHF port. Additionally, the status display shows the stream to which the KAM I/O (Input/Output) is currently connected. When initially powered on, the I/O is directed to stream A of the VHF port.

The *STATSHRT* (Status-Short) command: *STATSHRT* has two possible values – ON and OFF. This command can be used to shorten the display returned by KAM when you use the *Status* command. Turning STATSHRT ON will cause KAM to report only those streams having a connected station or to which the I/O is currently directed. At the **cmd:** prompt, enter the command STATSHRT ON<CR>. Next, enter the command Status. The KAM will now report the following status which appears on your display.

```
A/V STREAM -   I/O DISCONNECTED
cmd:
```

This display tells you that the I/O is connected to stream A on the VHF port. There is presently no station connected to you on VHF. If at this time you enter a *Connect* request, it will be routed via the VHF port and connect on stream A (assuming the station you call is available on VHF).

If you wish to initiate a connection on the HF port, you must precede the connect request with the HF streamswitch character, a stream designator (any stream) and then the standard format connect request. An example would look like this:

<p style="text-align:center">cmd: $A WA5RGU<CR></p>

OPERATING WITH MULTIPLE CONNECTS

The KAM may be operated on both HF and VHF with up to 26 connection channels or streams allowed simultaneously. Any combination of HF/VHF Packet connections are allowed. In this section we will outline the basics of multi-connect operation. Multiple connection capability is a useful mode for multi-user activities.

The following commands and their default settings are related to multiple connect operations:

STREAMCa	OFF
STREAMDb	OFF
STREAMEv	OFF
STReamsw	$40/$7C
MAXUsers	10/10
USers	1/1

These settings cause the KAM to operate with a single incoming connection capability on both HF and VHF. If you wish to allow multiple incoming connects to your station, you do so by setting *USers* to values other than 1. Any value up to 10 may be set without resetting the *MAXUsers* parameter. If you wish to allow more than 10 simultaneous connections, you must first set *MAXUsers* to a new value at least as high as the maximum number you intend to set at *USers* command. *MAXUSers* may be set as high as 26 channels or streams on both HF and VHF.

STREAMDb, if ON, can help in distinguishing between *STReamsw* characters received as text and those generated by your KAM.

STREAMCa, if ON, will assist in identifying the station from which packets are received. When enabled this command causes the call ID of the station from which each packet is received to be displayed.

STREAMEv, if ON, will display the stream identifier for each packet received.

Other related commands which assist in multiple connection operation are *Status* and *STAT-Shrt*, described in the previous section.

A multiple connect exercise – The following example provides an outline of a sequence of events observed when one station connects to two others on VHF. Three stations, WA5RGU, N0APJ and W0XI are involved with WA5RGU running the multiple connect capability.

Deciding to venture into multiple connect activity, W5RGU resets the following parameters:

STREAMCa	-	ON
STREAMEv	-	ON
USers	-	1/2

Next WA5RGU initiates a connect request to N0APJ in the normal manner. At the cmd: prompt, type C N0APJ. On the display the following appears:

<p style="text-align:center">|A:N0APJ***CONNECTED to N0APJ</p>

The |A: indicates the stream that the Input/Output is on. The first call ID (N0APJ) indicates that the input on stream A is from N0APJ.

The steam indicator (`|A:`) results from having the *STREAMEv* command ON. The call ID preceding the `***CONNECTED to` message is because the *STREAMCa* command is set to ON. Had these commands been left at their default values (OFF), a normal `***CONNECTED to` message would have been displayed.

While conversing with N0APJ, WA5RGU observes the following appear on his display:

`|B:W0XI***CONNECTED to W0XI`

This indicates that he has a connection with W0XI on stream B. If he wishes to send a packet to W0XI he may do so by beginning his next input with the *STReamsw* character and stream designator. For example:

|B HELLO, WELCOME TO MY MULTI-CONNECT SHACK<CR>

The *STReamsw* and stream designator *B* will cause the Input/Output to be connected to stream B until readdresses. If W5RGU wishes to go back to stream A and send another packet to N0APJ, he must begin the packet with the *STReamsw* and stream designator A.

Any number, up to 26, simultaneous connects and conversations can be conducted with the proper setting of *MAXUsers* and *USers* commands on either HF or VHF. Remember to observe the techniques required to designate the I/O channel. It will become relatively easy to manage multiple connects with practice.

GATEWAY OPERATIONS

KAM is capable of operating as a fully automatic, independent gateway. You can provide access for your VHF local area network to an HF mailbox or gateway system. If you employ KAM in this manner, remember to observe the following guidelines:

1. Gateway operation is not permitted by FCC rules and regulations in an unattended station.
2. Some amateurs in your VHF local area network may not have operating privileges in the HF band you are providing access to. You must identify those callsigns not authorized gateway access and exclude their use of your system. Enter the appropriate call(s) in your *LList* before establishing the gateway.
3. You may elect to provide gateway access by individual request as need rather than leaving the gateway system active. During specific periods, operation in this manner will permit you to gateway only those stations you know to have appropriate HF operating privileges.

There are two principal commands which control gateway operations – *MYGate* and *Gateway*. *MYGate* is the command which you may use to change the gateway identification. *Gateway* is the command which turns the gateway On or OFF.

At initial power-up, you were instructed to enter your callsign before KAM went to the Command Mode. Your callsign was then entered for use with both the radio ports and the gateway.

MYGate: If you wish to change the identification of the gateway, you can use the *MYGate* command to do so. At the `cmd:` prompt, enter the command MYGate followed by a carriage return. KAM will return the following message to your display:

`MYGATE` (your callsign)

The *MYGate* callsign must be different than *MYcall* and *MYAlias* in order to operate. Changing the SSID is sufficient (e.g. WA5RGU-2). A convenient wy to use the MYGate function is to select an identification which relates easily to local features. For example, a gateway to be setup in Lawrence, Kansas could be identified as LAW. To establish this gateway I.D., at the `cmd:` prompt, enter *MYgate* command, followed by a space, the letters LAW and a carriage return. On your display it would look like this:

`cmd:`MYGATE LAW<CR>

When you press the ENTER or RETURN key, the new identity will be sent and a new `cmd:` prompt returned to your display. You may also *perm* the new gateway identity to avoid the reset procedure at a future power-up.

Gateway: Activate the gateway by entering the *Gateway* command and ON. Then your station will automatically digipeat packets received on the VHF port through the HF port and vice-versa. Of course, packets must contain the Gateway callsign or identifier you have established. Packets passing via your gateway can be monitored the same as any other packets present on each channel.

While active in the gateway mode, you may also initiate your own Packet conversation on either or both HF and VHF. The KAM will also support HF or VHF digipeating while the gateway is ON.

CW MODE

The primary commands, and their default settings, which affect operation in the CW Mode are:

CWBand	200
CWSpeed	10
CWTone	750
Echo	ON
XMitecho	OFF

You should study these commands, listed in the command section, to determine if you wish to make any changes prior to entering CW operation. In general, the default settings are the values most appropriate for use with current transceivers. Your transceiver manual should be consulted to determine if a CW filter center frequency other than 750 Hertz is used. If non is referenced in your transceiver manual use the *CWTone* default setting of 750 Hertz.

The CW Mode is entered from the Command Mode by entering the command CW or CW followed by a space and 2 digits to establish a specific speed of transmission. If only CW is entered as the command, the unit will enter CW mode and display its default setting. This is displayed on the monitor screen as two digits separated by a hyphen. Default setting is 10 wpm. Therefore, the numbers will display as 10-10. The left number specifies the speed at which you will transmit in this mode. The right number specifies the receive speed to which the unit is set. Initially this will always be the same as the transmit speed. When a signal is tuned, the KAM will automatically search for and synchronize to the signal, up to 99 wpm. The closer you set the initial speed entry with the CW command, the less time it will take for the unit to track to and synchronize with the received signal.

In any operating mode other than Packet, you may control the KAM by using the *CTRL-C* command followed by the appropriate number or letter. Example: when in the CW Mode, to switch from Receive to Transmit, enter a CTRL-C followed by the letter T to go into Transmit Mode. To return to Receive, enter a CTRL-C followed by the letter R. When making these keyboard entries USE NO SPACES between the keystrokes.

Now, decide the speed you wish to operate and enter the command. Let's assume you select 15 WPM. Enter the command CW 15 followed by <RETURN>. The leftmost segment of the LED bargraph will be illuminated. Unless you have designated otherwise, the CW filter center frequency of 750 Hz is set with a filter bandwidth of 200 Hz.

Tune the receiver until a desired signal is heard. While tuning, observe the LED bargraph and tune for a full deflection to the right. Receiver tuning will depend on several factors, including stability of the receiver used, any internal filtering it has, and the setting you have selected for CW bandwidth set in the KAM. The most common difficulty in learning to tune the KAM for CW signals is moving the receiver dial too quickly and thus failing to obtain full LED bargraph deflection at the

filter center frequency. Should you experience difficulty you should set the CW bandwidth wider - to 400 or 500 Hz until you become more accustomed to the unit.

The KAM has an autoranging speed lock capability of plus or minus 20 WPM from the CW speed you have set. If you are unable to copy CW when the signal is properly tuned, try pressing CTRL-C R to reset the tracking speed to a value closer to the estimated speed you are receiving.

While in the CW Receive Mode speed changes may be made with a *CTRL-C* command followed by a number of 1, 2, up to 0. Each number will increment CW speed by 5 WPM. If speeds higher than 50 WPM are desired, you must return to the Command Mode and enter a command of CW XX.

You can always return to Command Mode by typing CTRL-C followed by the letter X.

Special CW characters: Several of the most commonly used prosigns are embedded in the KAM program. Keys on your terminal or computer which have no meaning in Morse Code are assigned as "special function" keys. The table that follows, illustrates the key which, if pressed while in CW transmit, will generate the corresponding prosign.

SYMBOL	ABBREVIATION	MEANING
+	$\overline{AR}$	End of message
=	$\overline{BT}$	Break or Pause
%	$\overline{AS}$	Wait
&	$\overline{KA}$	Attention
#	$\overline{SK}$	End of Transmission
(	$\overline{KN}$	Invitation to Transmit
*	$\overline{AA}$	All After
!	$\overline{SN}$	Attention

RTTY and ASCII OPERATION

The primary commands and their default settings, which affect RTTY/ASCII operation, are:

ASCBaud	110
AUtocr	72
AUTOLf	on
AUTOStrt	off
CCitt	off
CRAdd	off
DIDdle	off
Echo	on
INvert	off
LCRtty	off
LOwtones	off
RBaud	45
USOs	on
XMitecho	off

You should study these commands, listed in the command section, to determine if you wish to make any changes prior to entering the RTTY/ASCII Mode. The default settings are generally those most suitable for use with any transceiver/computer combination. Generally your transceiver should be in LSB if you are not using FSK. Other commands affecting flow control between your computer and the KAM may require adjustment. This may be determined by consulting your computer manual.

To enter either the RTTY or ASCII Mode, at the `cmd:` prompt enter the appropriate command. Entering either *Rtty* or *Ascii* alone will cause the unit to enter that mode at the default, speed specified by *RBaud* or *ASCBaud*. If you wish you may specify a speed by adding the appropriate baud rate with the command. For example, entering the command Rtty 50 will cause entry into the RTTY Mode at a speed of 50 baud (67 WPM). Be sure to include a space between the *Rtty* command and the desired speed.

The KAM uses a BAUD rate designation rather than the usually encountered words-per-minute. BAUD/RTTY wpm correlation is shown in the following table:

BAUD	WPM
45	60
50	67
57	75
75	100
100	132

You may set any desired baud rate, in 1 baud increments, up to a maximum of 500 baud. However, HF Operation is limited to 300 baud.

You may specify the desired shift while in Command Mode before selecting RTTY Operation. See the shift command in the command section, Selection of the Modem position selects the use of the Mark and Space tones you have entered into the unit. See the command section of this manual for setting Mark and Space frequencies.

While in the RTTY Mode, entering CTRL-C S will sequentially select Standard shifts: 170, 425, 850, Modem. For example, enter RTTY Mode and hit CTRL-C S four times. You will get:

`cmd:` R
-RTTY 45-

-425 SHIFT-
-850 SHIFT-
-MODEM SHIFT-
-170 SH1FT-

Tuning RTTY and ASCIT Signals is simplified by use of the LED bargraph. While observing this indicator system, tune for an alternate blinking of the end segments of the bargraph. If you fail to obtain this indication try selecting a different shift. If the proper visual indication is obtained but garbage is printed on the screen, try inverting the Signal using the *INvert* command or *CTRL-C I*. Transmit commands are the same as for CW Operation. *CTRL-C* and *T*.

FSK OPERATION

Polarity of FSK keying is not standardized by manufacturers of amateur radio equipment. If you have cabled your system for FSK rather than AFSK and find your transmitted signal is inverted, you may correct the problem with the *FSkinv* command.

AMTOR OPERATION

The primary commands which affect AMTOR Operation are *MYSelcall* and *TXDAmtor*. These entries should be checked prior to selecting an AMTOR mode. Refer to the commands section of the manual for these if you have not already made the appropriate entries.

The following commands are used to select the type of AMTOR signal you will receive or transmit:

AMtor - This command places the unit in AMTOR Mode. With this entry you will be able to transmit or receive mode B (FEC) signals or receive mode A (ARQ) signals which contain your SELCAL. If you receive an ARQ signal containing your SELCALL, your transmitter will be keyed and slaving to the calling Station will occur. If you wish to initiate an ARQ call, enter *AMtor* followed by a space and the SELCALL of the Station you want to call.

Lamtor - This command places the unit in listen AMTOR mode. Mode A (ARQ) and Mode B (FEC) signals will be received. No transmissions will take place in Lamtor. If you monitor an ARQ slaving call which includes your SELCALL you must revert to AMTOR mode to conduct Communications,

FEC - This command places the unit in mode B for either transmission or reception. Entry of *FEC* followed by a SELCALL will cause the unit to make a selective mode B call. See also the *AUTOstart* command in the command section.

CALLING CQ: Since Mode A (ARQ) is a one on one "hand-shaking" mode it should not be used for general calling to CQ. At the **cmd:** prompt enter AMTOR<CR>. You are now in the AMTOR standby mode. Next enter a CTRL-C followed by the letter T. REMEMBER to use no spaces between these commands. At this time you will be sending in mode B and you should see your transmitter key and the LED bargraph dark. After allowing the transmitter to send "idle" characters for a few seconds, type a general 3×3 CQ just as you would in CW Operation. At the end of the CQ you should announce your SELCALL prior to reverting to receive. To return to receive you enter a CTRL-C followed by the letter R. If someone wants to talk to you, he will call you using mode A. When the conversation is over and the other Station ends the link, you will return to the standby mode.

CALLING IN MODE A (ARQ): If you wish to call a Station in this mode you MUST know his SELCALL. At the **cmd:** prompt enter *AMtor* followed by a space and the four letter SELCALL required. When you enter a carriage return, the unit will begin sending phasing signals containing the called stations SELCALL. If he is available you will hear his responses and observe illumination of the lock and valid LEDs on the KAM. Once lock occurs and the link is validated, you can begin exchanging Information.

Once connected as a Mode A (ARQ) Master you will be the Information sending Station. While exchanging communication with the other station you may reverse the data flow by ending each transmission with the figures plus question-mark. changeover signal (*+?*). If you wish to "seize" the link and become the sending station during a period the distant station is sending to you, enter a CTRL-C followed by a letter T. To terminate the link and send the termination sequence, enter a CTRL-C followed by the letter X. This command will cause termination of the link and return to the **cmd:** prompt /Command Mode) on your display.

You can always return to the Command Mode by typing CTRL-C followed by X.

CHAPTER 5
KANTRONICS PERSONAL PACKET MAILBOX

INTRODUCTION

The Kantronics ALL MODE Communicator includes the Personal Packet Mailbox. The PERSONAL PACKET MAILBOX configures your KAM so that messages may be left by you or other stations "in" your communicator for later retrieval by you or the other stations. The personal mailbox uses the memory storage of the packet unit, so your mailbox may be left on the air without your Computer, or any Computer attached. While not intended as a community PBBS, your Personal Packet Mailbox includes a feature which allows large community PBBS stations to download your messages to your personal mailbox.

The Kantronics Personal Packet Mailbox operates with commands similar to those found on many popular W0RLI-type bulletin boards. These are *List*, *Read*, *Send*, *Kill*, and *Bye*. Similar commands, as outlined below, allow the owner of the personal bulletin board to access, edit, and leave messages for others. An additional command, *MYPbbs*, allows for a new alias for your personal mailbox.

You may leave messages for others by direct entry from the keyboard in Command Mode, or by connecting to your mailbox via a distant digipeater. There are specific message length limitations on messages entered by you directly from the keyboard. This limitation does not affect messages entered via a distant digipeater or by other stations which access your mailbox.

The Personal Packet Mailbox includes a timer circuit which will automatically disconnect should there be no activity for approximately 3.5 minutes. This will prevent a "connected" Station from leaving the mailbox in an unaccessible state.

MAILBOX OPERATOR COMMANDS

These commands are issued by you, from your keyboard, to establish the conditions under which the personal mailbox will operate. All commands must be entered from the command mode (at the **cmd:** prompt).

> *MYPbbs* (callsign or alias)
> Enter up to six characters which will be used as the operating address for your personal mailbox. If no entry is made, the mailbox will use your callsign entered at sign-on of your unit. SSID suffixes may be used with this command.

> *PBBS n*   default 0
> *n* may be any number from 0 to 21. This number activates the personal mailbox and sets the amount of RAM allocated to the personal mailbox function in kilobytes. This is a static allocation and is subtracted from the total RAM available for all buffering functions. Changing the PBBS RAM allocation will reset the unit and erase any messages stored in the personal mailbox.

> *PBDisconnect*
> This is an immediate command. It may be used by the PBBS operator to force a disconnect of any Station connected to the Personal Packet Mailbox.

> *PBKill n*
> This command is uaed to delete messages in the personal mailbox. Any message in the box, regardless of originating or destination station address, can be deleted from your mailbox by you.

PBList
This command will list the message header and number of all messages in the personal mailbox.

PBMon ON/OFF   default ON
This command allows you to monitor packets as they are being sent to your personal mailbox by other stations. This command is used in conjunction with the other monitor commands.

PBRead n
This command is used to read messages in the mailbox. You must use the message number. There is no command to read all messages in bulk. Any message can be read regardless of originating or destination Station address.

PBSend (callaign),(text)
This command is used to enter messages into the personal mail box from your keyboard. Messages entered in this manner are limited to 255 bytes. This limitation INCLUDES the *PB-Send* command, the following space, the callsign of the addressee and the comma.

CAUTION: If you attempt to enter more than 255 characters from the keyboard, your computer will hang and you must reboot the system!

ACTIVATING THE MAILBOX

After turning the unit on, entering your callsign and obtaining a **cmd:** prompt, the first step should be to allocate RAM for personal mailbox use. At the **cmd:** prompt make the following entry:

cmd: PBBS 5<CR>

The unit will execute a reset and a new **cmd:** prompt will be returned to your display. The Personal Packet Mailbox will be allocated 5K of RAM for its exclusive use. You may verify this by again entering the PBBS command without a number following it. The unit will respond with the following message printed on your display:

PBBS 5
cmd:

Next you should enter the call or Identification you wish your mailbox to respond to. In all examples we will identify our Personal Packet Mailbox as LAW-1. At the **cmd:** prompt enter the following command:

cmd: MYPbbs LAW-1<CR>

The unit will respond with a fresh **cmd:** prompt. Your Personal Packet Mailbox is now ready for use.

OPERATING FROM THE KEYBOARD

Entering Messages In The Personal Packet Mailbox
Assume that a message is to be entered for later pickup by N0APJ . The callsign of the Station operating the personal mailbox is WA5RGU.
With a fresh **cmd:** prompt on the screen, enter the *PBSend* command. Put a space after the PBSend command and enter the call of the station you wish to send the message to. Following the

call, put a comma (no space) then type the text of the message. At the end of the text, enter a carriage return <CR>. Your screen should look like this:

        cmd:PBS N0APJ,Hello Bud. How do you like the PBBS?<CR>

When the <CR> is entered, the personal mailbox will store the message and return a new **cmd:** prompt to your display.

Checking The Mailbox Contents

If you wish to verify that the message is stored in the mailbox enter the PBList command. Your display will appear as follows:

        cmd:PBL<CR>
        MSG#1 01/15/87   13:38:14 FROM LAW TO N0APJ
        4942 BYTES AVAILABLE
        NEXT MESSAGE NUMBER 2

The message numbers and bytes available will vary depending on the total numbers in storage. All messages in the personal mailbox will be listed showing the message number, date, time message was entered and the from-to station calls.

Deleting Messages From The Personal Mailbox

The message you have entered may be deleted by using the *PBKill* command. At the cmd: prompt enter the PBKill command followed by the message number. Example:

        cmd:PBK 1<CR>

When the kill command is entered, the unit will delete the specified message and return the following message to your display:

        MSG#1 01/15/87   13:38:14 FROM LAW TO N0APJ
        MESSAGE DELETED
        cmd:

As the operator/controller of the personal mailbox, you can delete any message in the system regardless of its from-to address.

Reading Messages In The Personal Mailbox

To read any message in the system, at the **cmd:** prompt, enter the *PBRead* command and the message number. Put a space between the command and the message number. Your display will appear as follows:

        cmd:PBR 1<CR>

The personal mailbox will send the message number specified to your terminal for display. The display will include message number, date/time the message was entered into the system and its complete text. A sample message display would appear as follows:

        MSG#1 01/15/87 13:38:14 FROM LAW TO N0APJ
        HELLO BUD. HOW DO YOU LIKE THIS PBBS?
        cmd:

ACCESSING THE PERSONAL MAILBOX THROUGH THE RADIO PORT

General

Your personal mailbox can be accessed by you through a remote digipeater or another station by use of the standard Packet connect request. The connect request must use the call or alias established with the *MYPbbs* command. Once connected to the personal mailbox the following commands are used to manipulate it.

Bye
This command will cause the personal mailbox to initiate a disconnect.

Kill n
This command will delete the message number specified from the mailbox. ONLY messages sddressed to or originated by the connect station may be deleted UNLESS the connected station is you, the personal mailbox OPERATOR. You can delete any message when you are connected via a digipeater.

List
This command causes the personal mailbox to list messages in the system addressed to you or to "all". Message headers and number are sent.

Read n
This command will read the message number specified. ONLY messages addressed to the connected station or all may be read, UNLESS the connected station is you, the personal mailbox OPERATOR.

Send
This command is used to send messages to the personal mailbox. There is no limitations on message length, other than the remaining storage in your mailbox.

Operating Via The Radio Port

Connecting to the personal mailbox via a digipeater is done in the same manner as connecting to yourself in normal Packet operation. At the `cmd:` prompt issue a connect request to the callsign of your personal mailbox via the digipeater being used. When you make this connection you will see the following message:

*** CONNECTED TO LAW VIA (DIGI CALLSIGN**)**

The personal mailbox will issue a connect message which will appear on your display as follows:

WELCOME TO (your MYcall callsign**) PERSONAL BULLETIN BOARD**
ENTER COMMAND: Bye, Kill #, List, Read #, Send+(callsign)
>

The appearance of the **>** prompt on the screen is the signal that the personal mailbox is waiting for your instructions. You (or a station connected to your personal mailbox) may proceed to have the system perform the operations you wish.

Checking the Mailbox Contents

When you have connected the mailbox, you may check its contents with the *List* command. Following are examples of possible mailbox responses:

```
5000 BYTES AVAILABLE
NEXT MESSAGE NUMBER 1
ENTER COMMAND: Bye, Kill #, List, Read #, Send+(callsign)
>
```

The above response indicates no messages are in the personal mailbox.

```
MSG#1 01/15/87 13:38:14 FROM LAW TO N0APJ
4942 BYTES AVAILABLE
NEXT MESSAGE NUMBER 2
ENTER COMMAND: Bye, Kill #, List, Read #, Send+(callsign)
>
```

This response indicates one message in the personal mailbox, remaining mailbox storage available and the number to be assigned to the next message entered. Message numbering is an automatic process performed by the PBBS. Numbers are NOT reused when a message is deleted.

Sending a Message to the Mailbox

At the > prompt, from the PBBS, enter the Send command followed by a space and the callsign of the addressee. An example would look like this on your display:

S N0APJ<CR>

The mailbox responds:

```
ENTER MESSAGE - END WITH CTRL-Z OR /EX
```

NOTE: The CTRL-Z or /EX MUST be sent as a separate line (preceded and followed by a <CR>).

After you have entered the text of the message and the end of message character, the mailbox will respond with:

```
MESSAGE SAVED
ENTER COMMAND: Bye, Kill#, List, Read#, Send(callsign)
>
```

Receiving Autoforwarded Messages

The Kantronics Personal Packet Mailbox will accept messages from community PBBS systems using the automatic forwarding routine. If your PBBS SysOp includes the call you have set in your personal mailbox in his system's automatic forwarding file, your messages can be downloaded to you. No special commands are required for the personal mailbox to receive PBBS autoforwarding. You should be certain to allocate sufficient RAM to the personal mailbox function to allow receiving automatic forwarding. In cases where the PBBS autoforwards more data than your personal mailbox can store, THAT DATA WILL BE LOST. The personal mailbox does not automatically forward messages.

For acceptance of autoforwarding from a community PBBS the following autoforwarding routine is required:

1. Community PBBS initiates a connect to your station using your personal mailbox callsign:

   ```
   C WA5RGU-1
   ```

2. Your station will respond with the mailbox sign on message:

   ```
   WELCOME TO (your callsign) PERSONAL BULLETIN BOARD
   ENTER COMMAND: Bye, Kill#, List, Read#, Send(callsign)
   >
   ```

3. The Community PBBS should send one of the following:

   ```
   S  callsign
   SB callsign
   SP callsign
   ST callsign
   S  callsign < callsign
   SB callsign < callsign
   SP callsign < callsign
   ST callsign < callsign
   S  callsign @ callsign < callsign
   SB callsign @ callsign < callsign
   SP callsign @ callsign < callsign
   ST callsign @ callsign < callsign
   ```

4. Your personal mailbox then responds with:

   ```
   ENTER MESSAGE - END WITH CTRL-Z OR /EX
   ```

The community PBBS can now autoforward all messages destined for your station.

CHAPTER 6
SYSTEM OPERATION AND CONTROL

GENERAL

The KAM has several operating modes. One of these, the Command Mode, can be viewed as the "control" mode and the remaining modes are "communicating" modes. All communications modes are entered from the Command Mode either as an automatic entry or as a directed entry. For example, establishing a packet connection may cause KAM to automatically switch to the Convers Mode. However, to switch to RTTY you must direct this mode from the keyboard.

The Command Mode is also used to enter all commands which alter the operating parameters of KAM. When you are in the Command Mode you will see the `cmd:` prompt at the beginning of each line on your display. This prompt may scroll off the screen if you are monitoring packets.

DISPLAY CONTROL

The data output by KAM to your Computer will be displayed on your monitor. Several commands affecting how this display is formatted are discussed in the following paragraphs.

A carriage return sequence <CR> & [LF] is sent to your Computer at intervals specified by the *SCreenl* command. Default setting is 80. If your Computer display line-length is shorter, for example 40 column screens such as the C-64, you may reset the *SCreenl* command accordingly. You may also set this command to zero (0) and your Computer will format your display line length.

If you observe overprinting on your screen, this may be an indication that the *AUTOLf* command is OFF. You may also see multiple line feeds between lines on the display, which may indicate that *AUTOLf* is ON and should not be. Set this command ON or OFF as required for the proper display presentation with your Computer/program combination.

Double printing on your display may be caused by both your keyboard input and KAM echoing characters you type. The Echo command can be set to OFF to prevent this. When you are in the Transparent Mode, KAM will not echo your keyboard input.

Multiple line feeds appearing on your display are usually also being received by the KAM. For example, W1AW, in its bulletin broadcasts, transmits multiple carriage return/line feeds to insure that mechanical TTY Systems are reset properly at the end of line or paragraph. You can delete these from your displayed text by setting the *CRLfsup* command to ON.

PACKET DATA MODES

The two Packet data modes are Convers and Transparent. Either mode can be entered by typing and entering the command. If you are in Command Mode when another Station connects to you, KAM will automatically enter the mode specified by your *CONMode* command. If you do not want KAM to automatically switch to a data mode when connected set the *NOmode* command to OFF.

CONVERS MODE

The data mode you will probably use most often for ordinary Packet QSOs is Convers Mode. In Convers Mode, the Information you type is assembled by the unit into packets and transmitted over the radio. A packet is terminated whenever you type the send-packet character, which is set by the command *SEndpac* and may optionally be included in the packet. In order to allow you to correct typing errors in your messages and to return to Command Mode, there are several characters which have special meanings to the KAM and are not ordinarily included in packets. These include input editing characters and Flow Control characters. Many of these special characters are control characters, which are typed by simultaneously holding down the "control" key and another key on the keyboard. The ASCII character set includes control characters corresponding to all the letters and a few other characters. As an example, a control C character is typed by holding down

the control key and typing a letter C. This character is designated CTRL-C, Some Computers which do not have a control keys such as the Radio Shack Color Computer, have other methods of entering such characters. Also, some of the special-function keys (such as backspace and tab) may actually enter a control character. If you have no convenient way of typing control characters, you may change these parameters to ordinary printing characters.

To get back to Command Mode from Convers Mode, you must type a special character. The default character is a CTRL-C and it may be changed with the *COMmand* command. Typing the *COMmand* character when the unit is already in Command Mode does nothing. You may also return to the Command Mode by sending a break signal over the data line to the unit. A break signal is not an ASCII character but some keyboards provide a special key to accomplish this.

TRANSPARENT MODE

An application for which packet radio is very well suited is transfer of large amounts of data between Computers. For some types of data transfer operations, Convers Mode will work very well. However, you may want to send special Information such as ready-to-run programs to another Amateur. A .COM file on a CP/M System or even a BASIC program may contain many strange characters which could be confused with the special reserved characters in Convers Mode. For this type of application, you will want to use Transparent Mode. Transparent Mode is a data mode like Convers Mode, except that in this mode there are no special characters. Everything you type (or everything your computer sends to the KAM) is sent over the radio exactly as it appeared to the KAM. Packets are sent at regular time intervals, or when a full packet of Information is ready. The time intervals at which data i s packetized may be changed by the *PACTime* command.

The display characteristics of the KAM are also modified in Transparent Mode. Data is sent to the terminal from the unit exactly as it is received over the radio channel, including all 8 bits of each byte received. All features such as linefeed (LF) and (CR) insertion, (ESCAPE) translation, and case conversion are disabled. In addition, echoing of input characters is disabled. None of the parameters which control these features in Convers Mode are changed by entering Transparent Mode, and all display features are re-enabled when the unit i s returned to Command Mode. Most of the informative messages which appear in Convers Mode, as the unit moves between disconnected and connected states, are also disabled.

In order to escape from Transparent Mode to Command Mode, you must follow a special procedure. After a time interval equal to *PACTime*, the last data typed will have been packetized for transmission (although it may not be transmitted yet). You must then wait an additional time, which is set by the command *CMdtime*. Following this wait, you must type three CTRL-Cs (or whatever character is set by *COMmand*) within an interval *CMdtime* of each other. After a final *CMdtime* interval in which no characters are typed, you will see the `cmd:` prompt. If any characters are typed in this interval (even if they are more Command characters}, the escape will be aborted and the three Command characters will be sent as Packet data. You may also return to the Command Mode by sending a break Signal over the data line to the unit. A break signal is not an ASCII character, but some keyboards provide a special key to accomplish this. If you set *CMdtime* or *PACTime* to zero, you will not be able to escape from Transparent Mode except by performing a hard reset (power-down reset) or using the break signal.

PACKET TIMING FUNCTIONS

Four adjustable timing parameters are provided for configuring the KAM to your particular radio environment, Some other parameters which are related to the timing parameters are discussed here as well.

Amateur radio equipment varies greatly in the time delays required in switching from receive to transmit and from transmit to receive. When two stations are sending packets back and forth, these delays must be allowed for. If data is sent before the transmitter is operating, the packet will not be transmitted properly. Similarly, if the receiving Station has not had sufficient time since it

stopped transmitting for the receiver to become active, data will be lost. The delay between transmitter keyup and the beginning of data transmission is controlled by the command *TXDelay*.

AX.25 protocol provides for retransmitting packets if no acknowledgment is heard from the connected Station within a certain period of time. A packet may not be acknowledged due to channel noise or "collision" with another packet transmission. Since there may be other stations on the channel, the receiving Station may not be able to acknowledge the received packet immediately. The time lapse before the originating Station retransmits the packet is set by the command *FRack* (frame acknowledge time). The maximum number of retransmissions before the originating Station terminates the connection is set by the command *RETry*. The maximum number of transmissions of a packet is *RETry*+1, since the initial transmission does not count as a retransmission.

The frame-acknowledge time is automatically corrected for the additional time required for digipeating. An extra time delay is added for each transmission which must be made after origination of the packet in order to deliver the packet and receive the acknowledgment. The time interval before the unit retransmits an unacknowledged packet is therefore

$$\text{RETRY INTERVAL} = \text{FRACK} \times (2 \times n + 1) \text{ seconds}$$

where n is the number of calls in the digipeat field of the address.

The AX.25 protocol specifies that acknowledgments of digipeated packets be made from end to end. This means that intermediate digipeaters do not acknowledge the packets they digipeat. When the destination station receives the packet, it generates an acknowledgment which is sent through the reverse route used by the original packet. If there are several intermediate relays, the chance of either the original packet or the acknowledgment being lost increases drastically. To help alleviate this problem, an automatic wait time can be imposed on any station not transmitting a digipeated packet. Any station which is ready to transmit a packet immediately after the carrier drops is required to wait for this time interval unless it will be transmitting one or more digipeated packets. This means that the chance of a collision involving a digipeated packet is reduced, since once a transmission begins, other stations will wait for a clear channel. The digipeat wait time is set by the command *DWait*, which specifies 10 ms intervals, In order to avoid unnecessary packet retries with the associated channel load, the KAM implements a collision-avoidance strategy which applies to all packets except those which are being relayed. On the second and subsequent transmission of a particular packet, the KAM waits an additional random time after detecting a clear channel before beginning transmission. This strategy is based on the assumption that packets which were not acknowledged suffered collisions with transmissions from other stations. If the random wait is used, repeated collisions of transmissions by the same two stations can be prevented, since eventually they will wait different time periods. The random time is a multiple (0–15) of the *TXdelay* time. This is because *TXdelay* represents the interval during which a transmitter may have been keyed but cannot yet be detected by other stations. The interval between the unit detecting carrier-drop and beginning to transmit is

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

for the first transmission of a packet. For subsequent transmissions of the same packet the interval is:

$$\text{Wait time} = (\text{DWait} + r \times \text{TXDelay}) \times 10 \text{ milliseconds}$$

where r is a random number from 0 to 15.

AX.25 protocol allows multiple packets to be transmitted before waiting for an acknowledgment. This permits more efficient channel use when large amounts of data are being transferred. The maximum number of packets which the KAM will send before waiting for acknowledgment is specified by *MAXframe*. Of course, the unit will not wait until *MAXframe* packets have been entered before transmitting. This parameter is only used to limit the transmission if more than one

packet is ready when the unit begins to transmit. *MAXframe* in combination with *Paclen* determines how much Information can be sent in a single transmission. The best combination for efficient data transfer is determined partly by the channel quality and partly by the rate at which the terminal can process data. For a 1200 baud terminal data rate, you should start with a combination that produces about 300 characters outstanding at one time.

The radio data transmission rate is set at 300 baud. On noisy HF channels a *MAXframe* of 1 with reduced *Paclen* of 50-60 characters usually works best.

FLOW CONTROL

Whenever data is transferred to Computers, there is a chance that the data will be received faster than the Computer can handle it. Some programs try to prevent this problem by providing data buffers for storing incoming data until the program is ready for it. However, this merely postpones the problem, since there is a finite amount of room in any buffer. In order to prevent loss of data, the Computer must be able to make whatever is sending data to stop sending, and later tell it to resume sending. If you are a home Computer user, you are probably already familiar with one type of flow control, which allows you to stop the Output from the Computer while you read it and restart it when you have finished.

There are two methods of providing flow control which are supported by the KAM. XON/OFF flow control, sometimes called "Software flow control", is accomplished by sending a special character (usually CTRL-S) to request that the out-put stop and another special character (usually CTRL-Q) to restart output. Hardware flow control may be used if the Computer or terminal can use the request-to-send (RTS) and clear-to-send (CTS) lines of the RS-232 Standard for hand-shaking.

The single greatest difficulty experienced during our testing was correct implementation of flow control on the user's Computer. Many inexpensive and commonly used terminal programs and file transfer programs for home Computers DO NOT implement flow control in Software, and many RS-232 ports do not support hardware flow control. Even if the RTS and CTS lines appear at the connector, software which directly reads the CTS line may be required in order for flow control to be implemented. If you find that the KAM seems to lose data during file transfers, you should suspect a flow control error.

XON/XOFF FLOW CONTROL

If your terminal or Computer does not support RTS/CTS flow control, you should use XON/XOFF flow control. This method of flow control is enabled by setting *Xflow* ON. The special flow control characters are set to CTRL-S and CTRL-Q by default, but they may be changed. The commands XON and XOff select the characters which will be sent to the terminal and the commands *STARt* and *STOp* select the characters which will be sent to the KAM by the terminal. If you set the codes for these characters to zero, you will disable that function. If you set *STARt* or XON to zero, *STOp* or XOff will be automatically disabled as well.

The KAMs input buffer may fill up in command mode if you try to type too long a command. In data mode, the buffer may fill up if you are using your computer to transfer data at a rate faster than the data rate for radio transmission or if radio data transmits ion has slowed down because of noise (on AMTOR). The KAM will send the terminal an *XOff* character when there is room remaining for about ten characters in the buffer. If you continue sending data until there are only five spaces left, the unit will send an *XOff* character after each character received. When the buffer fills up entirely, data will be lost. When the buffer empties out, the KAM will send a single *XON* character to the terminal.

A computer file transfer program can very easily be unable to process data fast enough to keep up with output from the KAM. In order to be sure of reading every character, a computer must respond to interrupts from its devices. Some simple programs, especially those written in BASIC, may poll the input register for new data. If the polling is not done fast enough, data may be lost. If the program enters a routine which will not allow it to check for data often, it should send a *STOp* character to the KAM. Some disk operating systems, such as Apple's, disable all interrupts

when they access the disk. The program should always send a *STOp* character before a disk access in this case. If you send a *STOp* (*STARt*) character to the KAM when it is already stopped (started) the character will be treated as data. If you have enabled echoes, and the *STOp* or *STARt* character is echoed, this may have undesired consequences {CTRL-S will lock some keyboards). If the *STOp* and *STARt* characters are the same character, this character will toggle the output, turning it OFF if it is ON, and ON if it is OFF.

If you disable XON and XOff by setting them to zero, the KAM will automatically use RTS/CTS flow control to stop input from the terminal.

If you are using a terminal or terminal-emulating program , you may want to set XON and XOff to something you can respond to, such as CTRL-G or a printing character that you don't use.

HARDWARE FLOW CONTROL

This method of flow control is preferred since it usually does not depend on the structure of a particular program. However, most commercial terminal programs don't use it since it is not standard RS-232 modem protocol.

RS-232 defines 20 signal lines on the 25-pin connector. The Kantronics KAM, like most other devices using RS-232, implements only a subset of these signal lines.

RTS/CTS HANDSHAKING

The RTS/CTS lines are used for hardware "handshaking" to control the flow of data between the terminal and KAM.

The KAM implements this hardware protocol with the attached terminal via the request to send/clear to send pair for transferring data between the KAM and the terminal. The KAM will assert CTS when it is ready to accept data from the terminal, and negate this line when it is not ready to accept data. Thus, if you find the KAM won't send data to your terminal, one of the first items to check is to verify that the RTS line at pin 4 of the RS-232 port is functional. If the terminal does not implement the RTS/CTS protocol, the RTS/CTS lines should remain unconnected.

Many simple serial I/O ports do not implement RTS/CTS handshaking. If these pins are not connected at the KAM end, they will be pulled up by resistors. However, a non-standard serial connector may use some pins for other purposes, such as supplying power to a peripheral device. So -

BE SURE THAT YOUR SYSTEM EITHER IMPLEMENTS THESE LINES OR HAS NO CONNECTIONS TO THESE PINS OF THE RS-232 PORT.

Note that reference to RS-232 compatibility or the presence of the DB-25 type connector does not guarantee that you have a full RS-232 serial port!

Should your computer not be able to communicate with the KAM with a 3 wire interconnect, you may need to place some "jumpers" on your computer's RS-232 port. As a starting point we suggest the following:

1. Jumper RTS to CTS
2. Jumper DTR, DSR and DCD

Many times this will cause the proper "high" and/or "low" conditions to appear on those pins of the RS-232 port.

OBTAINING MARK & SPACE OUTPUTS FOR SCOPE MONITORING

The schematic diagram of the KAM indicates that Mark and Space outputs are available on pins 11 and 18 of J4. Provisions have been made for obtaining these outputs AFTER installing jumpers between the points provided on the PC board. This is accomplished by locating the four holes in the board marked MA and SP and adding wire jumpers between them. One pair of holes marked

MA and SP are located next to the DB25 connector (J4) and the other pair is located on the opposite end of the board. Install jumpers from MA to MA and SP to SP and Mark/Space signals will then be present at pins 11 and 18 of J4.

Obtaining Mark and Space Outputs
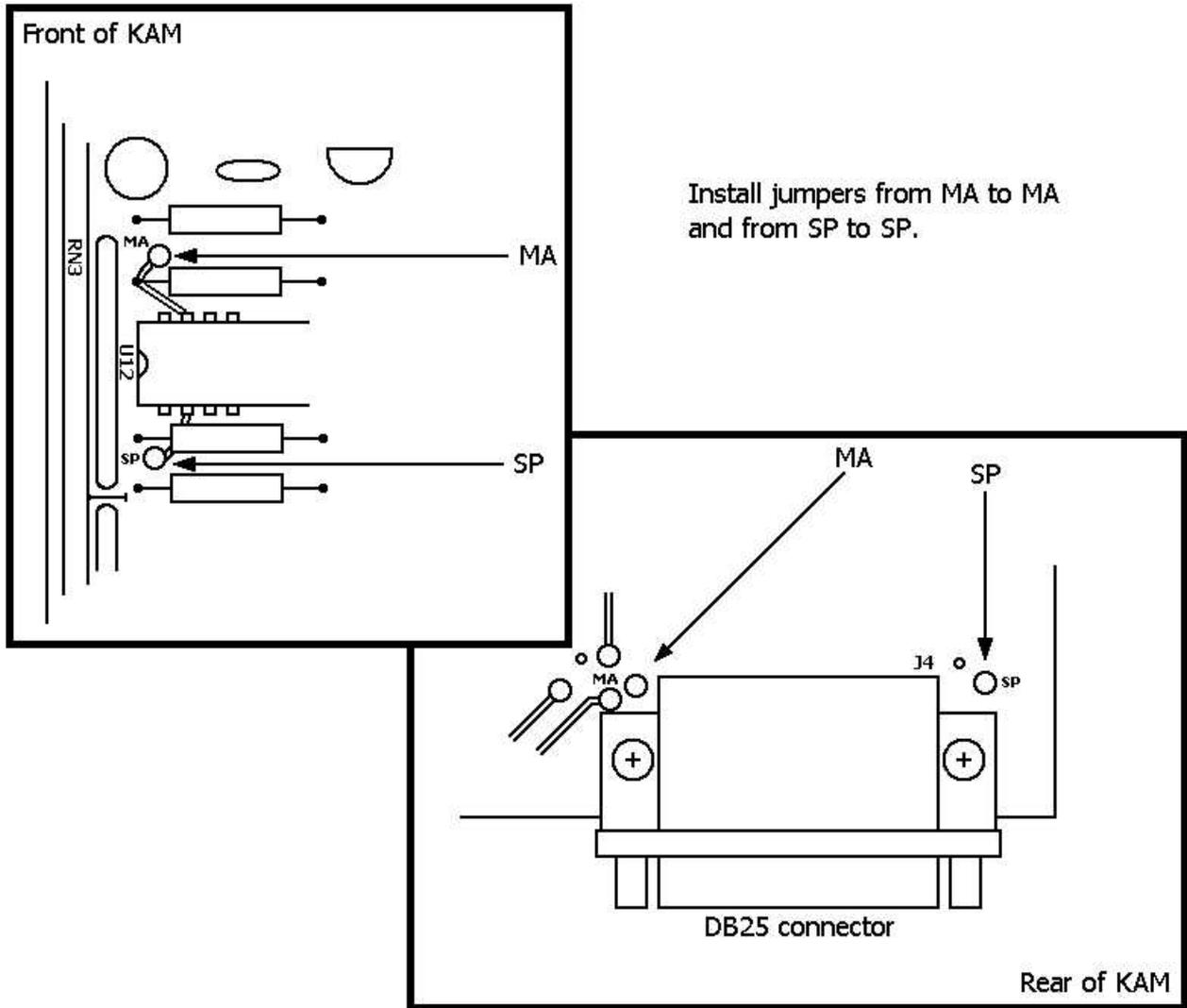
CALIBRATION

The *CALibrate* command is used to assist the KAM operator in determining the need for equalization of a received signal. Since this feature is unique to the Kantronics All Mode Communicator, two stations using the Kantronics All Mode Communicator are necessary to utilize this command.
Once the *CALibrate* commana is given, three options will appear on the terminal screen.

Calibrate Mode Press R, T, or X

Pressing X will return the program to the Command mode.
Pressing T will transmit. ; square wave (space/mark) at the VHF Packet tone (1200/2200 Hz) until a key is pressed. The *CALibrate* tone is transmitted via the VHF port only.
Pressing R will measure a square wave received 1200/2200 Hz.

One station should be used to transmit the square wave, while the receiving station should measure and compare the space/mark square wave. The transmitting station should set the microphone level in the mid range.

Once the receiving RAM is placed in the *CALibrate* receive mode, two numbers will appear on the screen. The KAM is measuring the space/mark square wave generated by the transmitting station. For the best calibration of the receiving transceiver, set the radio tone controls so that the two given values are as close to equal as possible. A perfect reading would be 1024/1024.

In most instances when the ratio of the numbers is within a 40/60 or 60/40 range, the packet station will function normally. A larger disparity in the tones may cause additional retries during packet operation.

If the ratio of the numbers exceeds 60/40, you should reset internal jumper K-1 for partial equalization. If, with partial equalization these numbers are still outside the 60/40 ratio, set jumper K-1 for NO equalization.

ASSEMBLY AND DISASSEMBLY OF THE UNIT

Should you require access to the KAM to reposition jumpers K-1 through K-7 or for other purposes, disassemble as follows:

1. Remove all cables from the rear of the unit.
2. Remove the two front panel screws just far enough to free the front panel and bezel.
3. Remove the front panel and bezel.
4. Remove the screw securing VRl, the voltage regulator, to the case.
5. Slide the unit out of the case.

To reassemble, reverse the procedure above. Do not attach cables to the rear of the unit without supporting the front of the PC board or having the front panel secured in place. Doing so may break the voltage regulator secured to the front of the case.

HARD RESET

The hard reset process is provided to re-initialize the KAM to its default values. This process may become necessary should operational problems be encountered. For example, if an *ABaud* value has been *PErmed* and you subsequently change to a computer having a different serial port output baud rate, the old value of *ABaud* will have to be removed using a hard reset. The readout specified in step 5 below will be legible only if your terminal baud rate is 300. At other terminal baud rates, a reset will occur. However, no display readout will be observed. This procedure is performed as follows:

1. Remove the unit from the case as outlined in the assembly and disassembly section.
2. Locate internal jumper K-6 which is labeled NOR T (nomal-test)
3. Place the jumper in the test position.
4. Apply power to the KAM.
5. Observe on the computer display:

> **EEPROM INIT OK**
> **CHECKSUM OK**
> **RAM OK 8000H BYTES**

6. Turn power off.
7. Return K-6 jumper to the normal position.
8. Reassemble the unit and return to operation.

IN CASE OF DIFFICULTY

The Kantronics ALL MODE COMMUNICATOR is manufactured to very stringent quality standards. If you have followed the installation procedures outlined in this manual, it is highly unlikely that you will encounter a failure. If you do have difficulty, use the procedures described in this section to assist in isolating and correcting the problem.

I.   KAM does not "sign-on" to computer.

1. Carefully recheck cabling between your computer RS-232 port and the KAM.

2. Check carefully to insure that the transmit data, receive data, and ground leads are connected to the proper pins.

3. If you have made a 5 wire connection to the computer RS-232 port, change to a 3 wire connection.

4. Check your terminal program to be certain it is booted with the correct communications parameters.

5. Check to insure that the RS-232/TTL jumper (K-7) is properly positioned for your computer.

6. Try a "Hard Reset" using the Test/Normal jumper (K-6).

II.   You Are Unable to Make a "Connect".

1. Issue a connect request and observe the XMIT LEDs. If an XMIT LED illuminates, check to insure that the radio is connected to the corresponding radio port.

2. Observe the radio to determine if it is being switched to the "Transmit" condition. If not, recheck wiring between the radio port and PTT pin on the microphone jack.

3. Turn the VHF radio squelch control to "OFF" and see if the RCV LED illuminates on the packet controller. If it does not light, recheck the audio connection between your transceiver and the packet controller.

4. If possible, monitor your transmitted signal with another radio. If the transmitter is keying to "Transmit" but weak or no audio is monitored, increase AFSK output as necessary using jumpers K-2 and K-5 or a resistor change.

CHAPTER 7
COMMANDS AND MESSAGES

GENERAL

There are many commands which affect operation of the Kantronics All Mode Communicator. Some commands affect performance under specific conditions, some change parameters affecting general operation and others direct a one-time action.

COMMAND STRUCTURES

The user changes parameters and issues instructions to the KAM by typing commands composed of English-like word abbreviations and variables which are numbers or strings of characters chosen by the user. You will probably never change some of these parameters.

All commands are listed alphabetically. The function of each is explained and the default values are as shown. Default values are stored in EEPROM and are the settings used at power-on. If you change any setting or value and PERM it, the new setting or value will be stored in EEPROM and will be the value set at future power-on. A command is entered to the unit by typing it when you see the Command Mode prompt:

   cmd:

The command and setting, or value must be separated by a space, and the unit takes action when a carriage return (CR) is typed. All command entries may be abbreviated to the shortest unique string. In the command list which follows, those required entries are denoted by capital letters.

There are several parameter types. A parameter which is denoted as "n" is a number, and can be given either in decimal or in hexadecimal form (base 16). When the KAM shows some of these parameters (those which set special characters), they will be given in hex. A hex number is distinguished from a decimal number by preceding it with a "$" prefix. The "digits" of a hex number represent powers of 16, analogous to the powers of 10 represented by a decimal number. The numbers 10 through 15 are denoted by the hex: digits A through F. For example:

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

Many parameters are "flags", meaning that they have two possible values, ON and OFF, or YES and NO. All of the command descriptions show ON and OFF as the options; however Yes and No may be typed instead. A few parameters are really flags, but rather than indicating that something is "on" or "off", they select one of two ways of doing things. Some of these parameters have the values EVERY or AFTER indicating operating modes for data transmission.

Several commands require call signs as parameters. While these parameters are normally Amateur callsigns, they may actually be any collection of numbers and at least one letter up to six characters; they are used to identify stations sending and receiving packets. A callsign may additionally include an "extension", which is 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 repeater). The callsign and extension are entered and displayed as call-ext, e.g. K0PFX-3. If the extension is not entered, it is set to -0 , and extensions of -0 are not displayed by the KAM.

Several parameters are numerical codes for characters which perform special functions. The code is simply the ASCII character code for the desired character. These characters have as default values control characters. Control characters are entered by holding down a special control key on the keyboard while typing the indicated key.

There are two commands, *BText* and *CText*, which have a parameter text string. This string can be any combination of letters, numbers, punctuations, or spaces up to 128 characters. You can

even put characters with special meanings, such as carriage return, into the string by preceding them with the "pass" character. The string ends when you type a (non-passed) carriage return.

Some parameters can be set differently for the two radi o ports. In the command descriptions, these parameters are indicated by two default settings separated by a slash, for example *MAXFRAME* 1/4. The first parameter is used for the HF radio port and the second parameter is used for the VHF port. There are several ways these double parameters can be set.

    MAX 2/3   sets HF MAXframe to 2 and VHF Maxframe to 3
    MAX, 4/   sets HF MAXframe to 4
    MAX /7   sets VHF MAXframe to 7
    MAX G   sets both HF and VHF MAXframe to 6

All commands having independent values for the HF and VHF port are set in the same manner.

In the command descriptions that follow, the commands are shown with the required letter entry in bold type upper case. If a parameter must be chosen from one of two values, the choices are separated by a vertical bar. Optional parameters are shown in parenthesis, For example:

    COMMAND var A|B|(C|D)

This means that, the command requires a user-supplied variable var and either A or B. In addition, the user can optionally specify either C or D.

You can examine the value of any parameter by typing the command which sets this parameter followed by a <CR>, A special command, Display, allows you to see the values of all parameters or groups of related parameters.

COMMAND DISPLAY
DISPLAYING PARTIAL COMMAND LISTINGS

Entering the display command with a qualifying suffix will cause only that suffix's associated commands/parameters to be displayed. The suffixes and associated listings are as shown below:

`cmd:`DISP A

```
8BIT CONV OFF
ABAUD      0
AUTOLF     ON
BKONDEL    OFF
ECHO       ON
ESCAPE     OFF
FLOW       OFF
KISSMODE   OFF
LCOK       ON
LCSTREAM   ON
NUCR       0
NULF       0
PARITY     3
RING       OFF
SCREENL    80
TRFLOW     OFF
TXFLOK     OFF
XFLOW      OFF
```

`cmd:`DISP C

```
CANLTNE    $18
CANPAC     $19
COMMAND    $03
DELETE     $08
PASS       $16
REDISPLA   $12
SENDPAC    $0D
START      $11
STOP       $13
STREAMCA   OFF
STREAMDB   OFF
STREAMEV   OFF
STREAMER   $40/$7C
XOFF       $13
XON        $11
```

`CMD:`DISP I
```
BEACON     EVERY 0/EVERY 0
BTEXT      KANTRONICS ALL MODE
           COMMUNICATOR V2.0
CMSG       OFF/OFF
CTEXT
HID        OFF/OFF
MYALIAS    /
MYCALL     /
MYGATE
MYSELCAL
UNPROTO    CQ/CQ
```

`cmd:`DISP L

```
ALIAS      OFF/OFF
AX25L2V2   OFF/OFF
A/V Link state is: DISCONNECTED
CONMODE    CONVERS
CONOK      ON/ON
CR         ON
DBLDISC    ON
DIGIPEAT   ON/ON
EXCARDET   OFF/OFF
EXTMODEM   OFF
FULLDUP    OFF
GATEWAY    OFF
LFADD      OFF
MAXFRAME   1/4
MAXUSERS   10/10
NEWMODE    OFF
NOMODE     OFF
PACLEN     128/128
PASSALL    OFF/OFF
PID        OFF/OFF
RETRY      10/10
STATSHRT   OFF
TRACE      OFF
USERS      1/1
```

`cmd:`DISP M

```
BUDCALLS   NONE
BUDLIST    OFF
CSTAMP     OFF
DAYTWEAK   8
FILTER     OFF
HEADERLN   OFF
LLIST      OFF
MALL       ON
MBEACON    ON
MCOM       OFF
MCON       OFF
MONITOR    OFF/OFF
MRESP      OFF
MRPT       OFF
MSTAMP     OFF
SUPCALLS   NONE
SUPLIST    OFF
```

cmd:DISP T

AXDELAY	0
AXHANG	0
CHECK	0/0
CMDTIME	1
CPACTIME	OFF
DAYTWEAK	8
DWAIT	8/8
FRACK	4/4
PACTIME	AFTER 10
PERSIST	255
RESPTIME	12/12
SLOTTIME	5
TXDELAY	30/15

cmd:DISP X

ASCBAUD	110
AUTOC7R	72
AUTOSTRT	OFF
CCITT	OFF
CRADD	OFF
CRLFSUP	OFF
CWBAND	200
CWSPEED	10
CWTONE	750
DIDDLE	OFF
FSKINV	OFF
INVERT	OFF
LCRTTY	OFF
LOWTONES	OFF
MARK	1600
PMODE	NONE
RBAUD	45
SHIFT	170
SPACE	1800
TXDAMTOR	5
USDS	ON
XMITECHO	OFF

Response Messages

Messages displayed in response to Command Mode input are discussed below. The message as it appears on terminals with lower case displays is given at the left margin. Messages which are responses to input errors in commands from the user will try to point out the problem by typing a $ under that, part of the line.

cmd:

This is the Command Mode's prompt for input. Any characters entered after the KAM prints cmd: will be used as command input and not Packet data.

EH?

This is the TNC's generalized "I don't understand" message. A dollar sign $ is used to point to the offending character. It will also appear if a required input item is missing, e.g.:

    C KV7B V
            $
    EH?

In this example, the required call sign after the VIA option is missing. Most commands that receive an EH? error arc ignored. In a few cases, part of the command may be accepted and acted upon, as described under the message "Input ignored".

Value out of range

If the syntax of the command is legal, but the value specified is too large or too small for this command, the value out of range message is used. A $ is used to point to the bad value.

Input ignored

Since the command parser was kept small and simple, it will sometimes change parameters before it completes parsing some of the more involved commands. In some cases, options at the be-

ginning of the command will have been acted on before a syntax error near the end of the line is reached. When this occurs, **Input ignored** is used to show what part of the line was ignored. The dollar sign points to the boundary: characters to the left were used; the character pointed to and those to the right were not, i.e., the line was parsed as if a (CR) was entered at the **$**. Example:

> BUDCalls QST,WB9FLW K9NG
> **$**
> **Input ignored**

The command is parsed as if it were BUDCalls QST,WB9FLW; the K9NG is ignored.

Enter Proper MYSelcal

Reminds you to enter the proper parameter prior to commanding a mode of operation which requires it.

was

Whenever one of the parameters is changed, the previous value is displayed . Example:

> **cmd:**AX25 OFF
> **was ON/ON**

Not while connected

Some parameters cannot be changed if the KAM is connected to another unit. This message is printed if an attempt is made.

EXTERNAL MODEM NOT SUPPORTED BY THIS SOFTWARE

This version of KAM software does not support the particular optional modem installed inside the unit. Check with Kantronins on updates.

EXTERNAL MODEM CAN ONLY BE USED IN VHF-ONLY MODE

The particular optional modem installed inside the KAM unit can only be used when the HF value of *MAXUsers* is set to zero.

Link state is:

This message is output in response to the *Connect*, *Disconnect*, and *REconnect* commands if the state of the link does not permit, the requested action. It is prefaced by **Can't CONNECT** or **Can't DISCONNECT** or **Can't RECONNECT** as appropriate.

A *Connect* command with no options will display the current link state, The states are:

DISCONNECTED	**Remote device busy**
CONNECTED to	**Both devices busy**
CONNECT in progress	**Waiting ACK and device busy**
FRMR in progress	**Waiting ACK and remote busy**
DISC in progress	**Waiting ACK and both devices busy**
REJ frame sent	**REJ sent and device busy**
Waiting acknowledgment	**REJ sent and remote busy**
Device busy	**REJ sent and both devices busy**

FRMR in progress

The KAM is connected but a protocol error has occurred. This should never happen when two Kantronics units are connected. An improper implementation of the AX.25 protocol could cause this state to be entered. The KAM will attempt to resynchronize frame numbers with the unit on the other end, although a disconnect may result. Connects are not legal in this state and a disconnect will start the disconnect process.

DISCONNECT in progress

A disconnect has already been issued. Connects are not legal in this state and a second disconnect will cause a "retry count exceeded" condition.

REJ frame sent

A reject packet has been sent in response to a packet received out of proper sequence.

Waiting acknowledgment

The time specified by *FRack* has been exceeded without a proper acknowledgment for a packet sent. A retry sequence is in progress.

Device busy

The KAM is not able to accept further data packets from the radio for the time being. An RNR (Receiver Not Ready) has been sent.

*** FRMR sent

Frame reject packet has been sent due to a detected error in protocol. Three bytes (6 hexadecimal characters) are displayed to assist in determining the reason for the reject.

*** FRMR received

A frame reject packet has been received for an unknown reason. The information field of this packet will display in hexadecimal value. This display may be useful in determining why the receiving station rejected your packet.

PBBS NOT ENABLED

This is the KAM response to a *PBList, PBRead, PBKill* or *PBSend* command if the PBBS has not been enabled by allocation of RAM.

PBBS BUSY

This is the KAM response to a connect request when it is already connected to.

COMMANDS (v2.7)

8bitconv ON|OFF   default OFF

When ON, transmission of 8-bit data is allowed in the Packet Convers Mode and ASCII Mode. If OFF, the 8th data bit is stripped. If you wish to obtain 8-bit data transmission but do not want all the features of Transparent Mode, set this command to ON. This feature may be most useful for transmitting non-ASCII character sets.

ABaud *n*   default 0

This command sets the baud rate used for input and output through the serial port. The parameter *n* selects one of the following baud rates:

> 0 unit in autobaud
> 300
> 600
> 1200
> 2400
> 4800
> 9600

If 0 is used, the unit will run an autobaud routine upon power-up. This routine looks for a * character from the attached computer to set the baud rate. The *ABaud* parameter must be *PErmed* at the proper rate to avoid continued use of the autobaud routine. If the *ABaud* is *PErmed* and you change your computer or terminal to a different baud rate, a hard reset will be required to erase the *ABaud* setting and reinitialize the RAM.

ALias ON|OFF   default OFF/OFF

When ON, the callsign specified in *MYAlias* can be used for digipeating.

AMtor xxxx

This command places the unit in AMTOR Mode. Entering *AMtor* xxxx, where xxxx is a selcall, will place the unit, in AMTOR master mode, and the unit will initiate an ARQ call. Entering *AMtor* without xxxx will place the unit in standby mode for reception of either ARQ or mode B (FEC) signals. You may initiate a mode B (FEC) transmission by using the CTRL C command followed by a letter T. ARQ signals received must contain the selcall you have entered at the *MYSelcall* command to be decoded.

ASCBaud *n*   default 110

This command sets the default ASCII baud rate used when entering ASCII mode with no baud rate specified. This baud rate is also used if *PMode* is set to Ascii. While in ASCII mode pressing CTRL-C 0 will set the baud rate to that specified by *ASCBaud*.

Ascii *n*

This command places the unit in ASCII Mode. The parameter *n* sets the transceiver baud rate. For example, use *Ascii 150* if you wish to go on the air at 150 baud. Any value between 110 or 300 may be selected. When the *n* parameter is omitted, the value specified by *ASCBaud* is selected. Commonly used standards are either 110 or 300. Selecting any other value requires that the station you are trying to communicate with have similar selection capability. FCC rules currently limit the baud rate at 300 when operating below 28 MHz.

AUtocr *n*   default 72

A carriage return (CR) character is sent to the radio after *n* characters are typed in a line. For example, with *n* = 72 a CR is automatically sent after 72 other characters have been typed. The range of *n* is 0 to 255. The *AUtocr* pointer is reset to zero whenever a manual CR is sent from the keyboard. This command affects RTTY/ASCII/AMTOR Modes only.

AUTOLf ON|OFF   default ON
   A linefeed character is automatically sent to the terminal after each CR when *AUTOLf* is ON.

AUTOStrt ON|OFF   default OFF
   The unit will receive RTTY or ASCII information only when preceded by the callsign entered in the parameter MYcall, when *AUTOStrt* is set ON. Also, with *AUTOStrt* ON, only SELFEC messages beginning with the selcall entered at the *MYSelcall* command will be received in FEC. A series of four letter N's signifying end of message, or thirty seconds of no signal time on frequency, will shut off the unit and no further information will be received until a new *MYcall* or *MYSelcall* activates it again.

AX2512v2 ON|OFF   default OFF/OFF
   This command provides compatibility with all known packet units implementing AX.25 protocol. When ON, Level 2 Version 2 protocol is implemented. When OFF, Level 2 Version 1 is implemented. When ON, the KAM will automatically adapt to whichever version the connecting station is using. Set this command to OFF only if you need to digipeat through other units which do not digipeat version 2 packets. The major difference in V1 and V2 protocol is the method used to handle retries.

AXDelay *n*   default 0
   n=0 to 255, each increment specifying 10 millisecond intervals. This value specifies a period of time to wait, in addition to *TXdelay*, after keying the VHF transmitter before data is sent. This delay can be helpful when operating packet through a standard "voice" repeater. Repeaters using slow mechanical relays, split-sites, or both require some amount of time to get RF on the air.

AXHang *n*   default 0
   n=0 to 255, each increment specifying 10 millisecond intervals. This value may be used to improve channel utilization when audio repeaters with a hang time greater than 10 msec are used. If the repeater squelch tail is long, it is not necessary to wait for *AXDelay* after keying the VHF transmitter if the repeater is still transmitting. If the KAM has heard a packet within the *AXHang* period, it will not add *AXDelay* to the keyup time.

Beacon [Every|After] *n*   default every 0/every 0
   n=0 to 255, each increment specifying 10 second intervals. A value of 0 turns the beacon OFF. Setting a value greater than 0 activates the beacon under the conditions specified. If the optional keyword *Every* is used, a beacon packet will be sent every *n* × 10 seconds. If set to *After*, a beacon packet will be sent ONCE after the specified interval with no link activity.
   The beacon frame consists of the text specified by *BText* in a packet addressed to "BEACON". Beacon messages may be digipeated via addresses specified in the Unproto command.

BKondel ON|OFF   default OFF
   When ON, the sequence backspace-space-backspace is echoed when the Delete character is entered. When OFF, the backslash character "\" is echoed when the Delete character is entered.

BText *text*   default KANTRONICS KAM V2.0
   BText specifies the content of the data portion of the beacon packet. Any combination of characters and spaces may be used with a maximum length of 128. Entering a single "%" will clear *BText*.

BUDCalls callsign(s) or NONE   default NONE
   A list of up to 10 callsigns for use with *BUdlist*.

BUdlist ON|OFF   default OFF

   When ON, only packets from the stations specified in *BUDCalls* will be monitored. If there are no calls in *BUDCalls* the setting of *BUdlist* is ignored.

CALibrat

   The *CALibrate* command is used to generate a square-wave signal which may be used as an aid in tuning the transceiver for operation with the KAM. Use of this command is explained in the Calibrate Section of the manual, Chapter 5.

CAnline *n*   default $18 (CTRL-X)

   This command is used to change the cancel-line input editing command character. For example, entering CTRL-X will cancel a partial line typed to the unit.

CANPac *n*   default $19 (CTRL-Y)

   n may be set to any value between 0 and $7F, or, with *8bitconv* set to ON, to any value between 0 and $FF, specifying an ASCII character. This command is used to change the cancel packet command character. This character functions as a cancel output character in command mode. Typing the cancel output character a second time restores normal output.

CCitt ON|OFF   default OFF

   When ON, the European RTTY code (ITA2) is used in the RTTY Mode. This code differs from US TTY codes in the following 4 characters:

ITA2	US TTY's
BELL	'
'	BELL
+	"
=	;

CHeck *n*   default 0/0

   n may be set to any value between 0 and 31 , each increment specifying 10 second intervals. If n is greater than zero, then a periodic check will be made to determine that a connected state still exists when no activity has occurred for $n \times 10$ seconds. This prevents "hang-up" in a connected mode when a link failure occurs as a result of conditions beyond control of the connected stations. If *n*=0, then this timeout function is disabled. If using version 1 protocol, a check timeout will initiate a disconnect.

CMdtime *n*   default 1

   n may be set to any value between 0 and 15, each increment specifying 1 second intervals. This command sets the time allowed for entry of required characters to escape the Transparent Mode. In order to allow escape to Command Mode from Transparent Mode, while permitting any character to be sent as data, a guard time of *CMdtime* seconds is set up. Three command characters must be entered within *CMdtime* of each other, with no intervening character, after a delay of *CMdtime* since the last data characters were typed. After a final delay of *CMdtime* the unit will exit Transparent Mode and enter Command Mode. At this time you should see the `cmd:` prompt. If *CMdtime* is set to zero, the only exit from Transparent Mode is a break.

CMSg ON|OFF   default OFF/OFF

   This command enables the automatic sending of the message entered as *CTEXT*. If ON, this message will be the first packet sent whenever another station connects to you.

COMmand *n*   default $03 (CTRL-C)

This command is used to change the Command Mode entry character. As is, typing CTRL-C causes the unit to return to Command Mode from Packet Convers Mode. This character is also used for special commands in non-packet mode.

CONMode Convers|Trans   default Convers

This command controls the mode the unit will be placed in AUTOMATICALLY after a connect if *NOmode* is OFF. The connect may result either from a connect request received or a connect request originated by a Connect command. If the unit is already in Convers or Transparent Mode when the connection is completed, the mode will not be changed. If you have typed part of a command line when the connection is completed, the mode change will not take place until you complete the command or cancel the line input.

Connect call 1 (VIA call 2, call 3, ...call 9)

call 1 - callsign of station to be connected to.
call 2 - optional stations to be digipeated through.

A maximum of 8 digipeat addresses can be specified. Each call sign may also have an optional supplemental station identifier specified as -n. The digipeat callsigns are specified in the order in which they are to relay transmitted packets. The mode set at *CONMmode* will be entered upon successful connect if *NOmode* is OFF. If no response to the Connect request occurs after *RETry* attempts, the command is aborted. A timeout message is printed on the display and the KAM remains in the Command Mode.

If Connect is entered with no parameters, the status of the current stream is displayed.

When operating with the multiple connections allowed, Connect requests may only be initiated in the Command Mode. See also the following commands: *MAXUsers*, *USers*, *STReamsw*.

CONOk ON|OFF   default ON

When ON, connect requests from other TNC will be automatically acknowledged and a UA packet will be sent. The standard connect message, with stream ID if appropriate, will be output to the terminal and the mode specified by *CONMode* will be entered on the I/O stream if you are not connected to another station.

When OFF, connect requests from other TNCs will not be acknowledged and a DM packet will be sent to the requesting station. The message **connect request: (call)** will be output to your terminal.

When operating with multiple connects allowed, connect requests in excess of the number allowed by the *USers* command will receive a <DM> response and the **connect request: (call)** message will be output to your terminal. See also the following commands: *MAXUsers*, *USers*.

CONVers

CONVers has no options. It is an immediate command and will cause entry into Conversational Mode from Command Mode. Any link connections are not affected.

CPactime ON|OFF   default OFF

When ON, the setting of the *PACTime* parameter is used in Convers Mode as well as Transparent Mode. CPACTime ON is normally used when a computer is attached to the KAM at the other end of the link but full Transparent Mode is not desired. In this configuration characters are sent periodically as in Transparent Mode but the local editing and echoing features of Convers Mode are enabled. CR should normally be OFF in this configuration since otherwise the *SEndpac* character is appended at random intervals as the input is packetized by the timer.

CR ON|OFF   default ON

When ON the *SEndpac* character (normally carriage return) is appended to all packets sent in Convers Mode. Setting *CR* ON and *SEndpac* $0D results in a natural Conversation Mode. Each line is sent when a CR is entered and arrives at its destination with the CR appended to the end of the line. If *AUTOLf* is ON at the receiving end no overprinting occurs.

CRAdd ON|OFF   default OFF

When ON, a CR character is added to any CR character sent to the radio. This is to allow a CR, CR, LF sequence. This command affects RTTY/ASCII/AMTOR Modes only.

CRLfsup ON|OFF   default OFF

When ON, extra CR and LF characters following a CR are not sent to the terminal.

CStamp ON|OFF   default OFF

When ON, the daytime stamp is printed with all *****connected to** and *****disconnected** messages on the display.

CText   default blank

Enter any combination of characters and spaces up to maximum length of 128. Entering a single % will clear *CText*. This entry specifies the text of the packet to be sent as the first in response to an accepted connect request provided that the parameter *CMSg* is also ON.

CW *n*

This command sets the unit in CW Mode with a Morse speed of *n*. For example, use *CW 30* to set a transmit CW speed of 30. Also, when receiving CW, estimate the speed and then enter Morse with that speed. For example, if the code sounds like 20 WPM, then enter *CW 20*. Auto ranging for CW speed tracking is ± 20 WPM from the speed selected. If no value is entered for n, the speed specified in *CWSpeed* will be used.

CWBand *n*   default 200

This command sets the bandwidth of the unit input filters for CW in Hertz.

CWSpeed *n*   default 10

This command sets the default. MORSE speed used when entering the CW Mode with no parameter. This speed is also used if *PMode* is set to CW.

CWTone *n*   default 750

This command sets the CW filter center frequency for receiving CW in Hertz.

DAytime *yymmddhhmmss*   default 00/00/00 00:00:00

If the parameter *yymmddhhmmss* is present, the software clock/calendar is set for MHeard logging, *CStamp* and *MStamp* functions. If there is no parameter the daytime is displayed in a form depending on the setting of the *DAYUsa* flag. When entering the daytime digits, enter in pure number sequence with no spaces, dashes or slashes. For example: 860102223000.

DAYTWeak *n*   default 8

This parameter may be set to any value between 0 and 15. It is used to tweak the clock for accurate time keeping. Increasing the parameter will slow the clock, decreasing the parameter will speed up the clock. Each count corresponds to .85 seconds increase or decrease per day. Ambient temperature will affect the clock to some degree.

DAYUsa ON|OFF   default ON

When ON, the daytime stamp is displayed in the form common in the USA: month/day/year. When OFF, the daytime stamp is displayed in the form common in Europe: day/month/year.

DBldisc ON|OFF   default ON

When OFF, only one disconnect command (*D*) need be sent to terminate an unsuccessful connect sequence. When ON, a normal disconnect sequence will always occur.

DElete *n*   default $08 (⇐)

This command sets the character to be used as the Delete character.

DIDdle ON|OFF   default OFF

When ON, a diddle character is sent when no characters are available from the keyboard or buffer during transmission in RTTY or ASCII Mode. In RTTY the diddle character is the LTRS character, in ASCII the diddle character is a null.

DIGipeat ON|OFF   default ON/ON

When ON, any packet received that has *MYcall* or *MYAlais* in the digipeat list of its address field will be retransmitted. Each station included in the digipeat list relays the packet in the order specified in the address field. Digipeating takes place concurrently with other unit operations and does not interfere with normal connected operation of the station. To disable digipeat operations turn this command OFF. This command is valid only while the KAM is in Command Mode or packet operation. Selection of CW, RTTY, ASCII or AMTOR Modes disables *DIGipeat*.

Disconnect

This command will initiate an immediate disconnect request with the currently connected station. A successful disconnect results in the display of *****DISCONNECTED**.

If multiple connects exist, the Disconnect command will disconnect the station on the stream to which I/O is currently addressed.

Other commands may be entered while the disconnect is in progress. If the *RETry* count is exceeded while waiting for the connected station to acknowledge, the KAM moves to the disconnected state on that stream.

Disconnect messages are not displayed when the unit is in Transparent Mode.

DISPlay

This command causes the unit to display a list of all the parameters of the unit. You may also display only selected parameters by affixing the appropriate class identifier for that group. Subclasses of related parameters are:

        (L)ink   parameters affecting packet, link
        (A)sync   asynchronous port parameters
        (C)haracter   special characters
        (I)d   ID parameters
        (M)onitor   monitor parameters
        (T)iming   timing parameters
        (X)t   parameters of non-packet modes only

Individual parameter values can be displayed by entering the *DISPlay* command followed by the parameter name. When using the *DISPlay* command with either a subclass or individual parameter name, be sure to use a space between them. Display classes are illustrated preceding the response messages section of this manual.

DWait *n*   default 8/8

     n may be set to any value between 0 and 255, each increment specifying 10 ms intervals. This value is used to avoid collisions with digipeated packets. The unit will wait *n* × 10 ms after last hearing data on the channel before it begins its own keyup sequence. This value should be established and agreed on by all members of a local area network. The best value will be determined by experimentation but will be a function of the keyup time (*TXdelay*) of the digipeater stations. This feature is made available to help alleviate the drastic reduction of throughput which occurs on a channel when digipeated packets suffer collisions. Digipeated packets are not retried by the digipeater but must be restarted by the originating station. If all stations specify *DWait*, and the right value is chosen, the digipeater will capture the frequency every time it has data to send since digipeated packets are sent without this delay.

Echo ON|OFF   default ON

     When ON, characters received from the terminal by the unit are echoed back and displayed. If you are receiving double print of letters entered at the keyboard, turn this command OFF.

EScape ON|OFF   default OFF

     This command specifies the character which will be output when an escape character is to be sent to the terminal. When ON, the escape character ($1B) is sent as $24. When OFF, $1B is used. This command is useful if your terminal interprets ESC characters as screen positioning commands.

EXcardet ON|OFF   default OFF/OFF

     When ON, the KAM will be dependent on the input of an external carrier detect signal on the radio connector. This carrier detect signal must be provided by the radio for the KAM demodulator circuits to be enabled. This input may be used in the same manner as a "squelch" input to allow the KAM to detect activity on a shared-mode channel.

EXTmodem ON|OFF   default OFF

     When ON, the optional external modem is used on the VHF radio port.

Fec *xxxx*

     This command sets the unit in FEC mode. When a selcall is specified, *xxxx*, the unit will call a specific station *xxxx* using *SELFEC*. Also see *AUTOStrt* command.

FIlter ON|OFF   default OFF

     This command can be used to inhibit the printing of control characters which may be encountered in Monitored packets. This will be useful if you are monitoring channel traffic which includes transparent binary file transfers. Control characters which may be embedded in those packets can have strange and unpredictable effects on the monitoring KAM. This command also inhibits the printing of control characters in ASCII Mode.

FLow ON|OFF   default OFF

     When *FLow* is ON, any character entered from the terminal will halt output to the terminal until the current line of input is completed. *FLow* will keep received data from interfering with data entry.

FRack *n*   default 4/4

     n may be set to any value between 1 and 15, each increment specifying 1 second intervals. After transmitting a packet requiring acknowledgment, the KAM waits *FRack* seconds before incrementing the retry counter and sending the packet again. If the retry count specified by *RETry* command is exceeded, the current operation is aborted. If the packet address includes relay requests, the time between retries is adjusted to *FRack* × (2 × *m* + 1) where *m* is the number of intermediate relay stations specified. When the retried packet is sent, a random wait time is also added to avoid lockups where two units repeatedly collide with each other.

FSkinv ON|OFF   default OFF

   This command controls the polarity of the FSK output of the HF radio connector. When OFF, MARK is open-collector and SPACE is grounded. When ON the polarity of MARK and SPACE are reversed.

FUlldup ON|OFF   default OFF

   When ON, the VHF modem is run full duplex. No HF operation is allowed when *FUlldup* is ON.

Gateway ON|OFF   default OFF

   When ON, packets can be digipeated from one radio to the other using the digipeater callsign specified by *MYGate*.

HeaderIn ON|OFF   default OFF

   When ON a carriage return is output between the header and text of monitored packets. This causes the packet header and/or time stamp to be displayed on one line, with the packet text displayed below it on the next line.

HELp

   This is an immediate command which causes a display of all possible commands.

HId ON|OFF   default OFF/OFF

   This command is used to control sending of identification packets by the KAM. If ON, an identification packet will be sent every 9.5 minutes PROVIDED THAT packets are being digipeated through your station. If OFF, periodic identification packets will not be sent. This command should be ON if *ALias* or *Gateway* is ON. See *Id* command for description of identification packet.

Id

   This is an immediate command. When entered, an identification packet, will be forced. This command can be used to insure that your station identification is the last transmission before taking the station off the air. The ID packet is an unnumbered information (UI) packet whose data consists of your station identification as set in *MYcall*. If *DIGipeat* is ON, an "/R" is appended after the callsign. If *ALias* is ON, *MYAlias* with a "/D" appended is also in the packet data. If Gateway is ON, *MYGate* with a "/G" appended is also in the packet data. This packet will be addressed to "ID" with any digipeats as specified in the Unproto command.

INvert ON|OFF   default OFF

   When ON, signals received in RTTY or ASCII are inverted. While in RTTY, ASCII, or AMTOR Modes, entering CTRL-C I command will toggle the inversion ON and OFF.

Kamport HF|VHF   default VHF

When the unit enters the KAM mode, this parameter determines whether the current stream is an HF stream or a VHF stream.

KIssmode ON|OFF   default OFF

When in the KISS Mode, the KAM will use the KISS protocol as specified by PHIL KARN. There are two ways to enter the KISS Mode. In both cases, you must first turn the *KIssmode* parameter ON by typing KI ON while in Command Mode. Now any command which will cause a soft reset, e.g. RESET, MAXUSER, PBBS, etc., will put the KAM in KISS Mode. Turning the KAM off and then on will cause the KAM to return to Command Mode. The other method of entering KISS Mode is to first turn *KIissmode* ON and then *PErm* the value in EEPROM; be sure to also *PErm ABaud* to a nonzero value. Now when the unit is turned ON it will automatically be in KISS Mode. If KISSMODE is permed ON, the only way to turn off KISS is to either reset all the EEPROM values using the TEST/NORMAL jumper, or use the special KISS command in TCP/IP to get back into Command Mode. If the special KISS command is used, the KAM would have its KISSMODE parameter turned off but the EEPROM parameter is still turned on until KISSMODE is permed off.

Lamtor

This command sets the unit in listen AMTOR Mode. The unit will receive either FEC or ARQ signals. The selcall being used by a station sending ARQ phasing signals may also be decoded when in this mode. Such calls will appear on the display as the same four letter group appearing repetitively on the display.

LCok ON|OFF   default ON

When ON, no character translation occurs in the KAM. If OFF, lower case characters will be translated to upper case before being output to the terminal from the KAM. This case translation is disabled in packet Transparent Mode.

LCRtty ON|OFF   default OFF

When ON, lower case characters can be sent and received in RTTY and AMTOR Modes. If you are sending lower case RTTY, the other station will print lower case RTTY only if its *LCRtty* parameter is also ON. This is accomplished by using the RTTY null character as a special shift character; this is the same method used in RTTY to send the Russian Cyrillic alphabet. If *USOs* is ON, a received space will cause a shift to the lower case.

LCStream ON|OFF   default ON

When ON, the KAM allows for lower-case characters to be used in stream switching.

LFadd ON|OFF   default OFF

When ON, a linefeed character (LF) is added after each CR sent to the radio.

LList ON|OFF   default OFF

When ON, *SUPCalls* stations attempting to connect to or digipeat through your station will be ignored.

LOwtones ON|OFF   default OFF

When ON, the European low-tones are used with 170, 425, or 850 shift RTTY. These are: Mark=1275 Hz, Space=1445 Hz, 1700 Hz or 2125 Hz.

MAll ON|OFF   default ON/ON

When ON, monitored packets include both "connected" and "unconnected" packets. If OFF, only "unconnected" packets will be monitored. If *MAll* is OFF, only otherwise eligible packets (as determined by *BUdlist* and *SUplist* commands) sent by other stations in the unconnected mode will be displayed. This is a useful arrangement when stations are talking as a group in an unconnected configuration.

MARk *n*   default 1600

    This command sets the mark frequency when the unit is in the modem shift.

MAXframe *n*   default 1/4

    n may be set to any value between 1 and 7. MAXframe sets an upper limit on the number of unacknowledged frames which can be outstanding at any one time.

MAXUsers *n* (0–26)   default 10/10

    This command sets the maximum number of simultaneous connections allowed with this unit. It determines the maximum number of "streams" allowed to be active at a given time (see also the *USers* command). When setting *MAXUsers*, each user is allocated about 125 bytes of memory, thereby decreasing memory available for other uses. It, is best, from an operational viewpoint, to set this command to the lowest number required for the multiple connections you plan to use. Changing the *MAXUsers* parameter will cause a system reset. Setting one or the other (but not both) *MAXUsers* parameter to zero forces the KAM to do HF or VHF operations only.

MBeacon ON|OFF   default ON/ON

    This command determines whether packets addressed to Beacon or ID will be monitored and displayed on the screen. If you do not wish to monitor Beacon or ID packets, turn this command OFF.

MCOM ON|OFF   default OFF/OFF

    When ON, connect request <C>, disconnect request <D> disconnected mode <DM>, and un-numbered acknowledge <UA> packets will be displayed if the Monitor command is ON. Unnumbered information frames <UI> and numbered information frames <In> are also displayed. The send sequence number N(S) is d L splayed with the I-frame.

MCon ON|OFF   default OFF/OFF

    When ON, the KAM will observe the Monitor command while connected to other units. If you want all packets heard to be displayed while you are not connected, but wish such display suppressed when you are connected, leave this command at OFF.

MHClear

    This command erases the stations heard log.

MHeard

    This command causes display of a list of stations heard. An asterisk * indicates the station was heard through a digipeater. A maximum of 18 stations can be logged. The time the station was last heard is also displayed.

Monitor ON|OFF   default OFF/OFF

    When ON the monitor function is enabled. If the unit is not in Transparent Mode, packets not addressed to this unit may be displayed. The addresses in the packet, are displayed along with the data portion of the packet, e.g.:

        N0APJ>WA5RGU-1:Good afternoon,what time is the meeting?

    Callsigns are separated by a ">" and the callsign extension field is displayed if it is other than 0. The *MAll* command determines whether both connected and unconnected packets will be monitored. The *MCon* command determines whether packets will be monitored while the unit is connected to other stations. All monitor functions are disabled in the Transparent Mode.

MResp ON|OFF   default OFF/OFF

    When *MCOM* and *MResp* are both ON, monitored response packets are displayed. The received sequence number N(R) is also displayed. I-frames are shown with both N(S) and N(R).

MRPt ON|OFF   default OFF/OFF

This command affects the way monitored packets are displayed. If OFF, only the originating station and the destination are displayed for monitored packets. If ON, the entire digipeat list is displayed for monitored packets, and the station that relayed the packet is indicated with an aste-risk.

MStamp ON|OFF   default OFF

This command enables time stamping of monitored packets. The date and time information is then available for use for automatic logging of packet activity or other computer applications. The date and time are set initially by the *DAytime* command, and the date format is determined by the *DAYUsa* command.

MYAlias *xxxxxx-n*

This command allows the entry of an alternate identifier to be used for packet digipeat opera-tions. For example; you may enter LAW-3 as the *MYAlias*, which would be easier to remember for stations wishing to digipeat through a station in Lawrence, enroute to a station more distant. The *HId* command will identify normally with the *MYcall* specified, thus allowing an alternate identifier (*MYAlias*) to be established for digipeater address only.

MYPbbs *xxxxxx-n*

Enter up to six characters which will be used as the operating address for your Personal Packet Mailbox. If no entry is made, the mailbox will use your callsign entered sign-on. SSID suffixes may be used with this command.

MYcall *xxxxxx-n*

This command tells the KAM what its callsign is. This callsign will be placed in the FROM ad-dress field for all packets originated by it, and it will respond to frames with this call sign in the TO or digipeat fields as appropriate. This callsign is also used in autostart ASCII/RTTY operation. The callsign in the default parameter list is blanks and must be changed for proper operation of the protocols. The default for the extension is zero, but may be any number from 0 to 15. The exten-sion is not used in ASCII/RTTY autostart operation.

MYGate *xxxxxx-n*

This command tells the KAM what its gateway callsign is. Another user may digipeat from one radio port to the other if *MYGate* is specified in the Packet digipeat field and Gateway is ON.

MYSelcal *xxxx*

This command is used to enter the selcall for SELFEC and ARQ. The convention used for AM-TOR selcalls is to use the first and last three letters of your callsign as your selcall. If your callsign has only three letters, use the first letter twice. For example, use WWXI for W0XI or use WRGU for WA5RGU.

NEwmode ON|OFF   default OFF

When ON, the KAM will return to Command Mode if the other station disconnects. If multicon-nected, the unit will return to Command Mode only if the station disconnecting is on the current stream.

NOmode ON|OFF   default OFF

When ON, the KAM stays in Command Mode after connecting to another station; that is, it does not immediately change to Convers or Transparent Mode.

NUcr *n*   default 0

This command determines the number of nulls sent to the computer or terminal after a CR. This command enables a transmission delay following any CR sent to the terminal. This is useful for some hardcopy terminals. *n* = 0 to 31.

NULf *n*   default 0

    This command determines the number of nulls sent to the computer or terminal after a LF. This command enables a transmission delay following any LF sent to the terminal. This is useful for some hardcopy terminals. *n* = 0 to 31.

Paclen *n*   default 128/128

    n may be set to any value between 0 and 255, specifying the maximum length of the data portion of a packet. The KAM will automatically send a packet when the number of input bytes reaches *n*. This value is used in both Convers and Transparent. Modes. A value of 0 means 256 bytes.

PACTime [Every|After] *n*   default after 10

    n may be set to any value from 0 to 255. This parameter is always used in Transparent Mode, and will also be used in Convers Mode if *CPactime* ON is specified. When *Every* is specified, input bytes are packaged and queued for transmission every *n* × 100 ms. When *After* is specified, bytes are packaged when input from the terminal stops for *n* × 100 ms. In neither case is a zero length packet produced, and the timer is not started until a new byte is entered. If Every or After is not given, the current state is retained.

PARity *n*   default 3

    For this command n may be 0 through 4. This command sets the Parity mode for output to the terminal according to the following table:

n	Parity
0	odd
1	even
2	mark
3	space
4	none (no modification)

    The unit can only send serial output with 8 data bits and one stop bit. Setting the Parity parameter defines the eighth bit.

    On input, the eighth bit is automatically stripped in Command Mode; in Convers Mode and ASCII Mode stripping of the eighth bit is determined by *8bitconv*; in Transparent Mode the eighth bit is sent out as received.

PASs *n*   default $16 (CTRL-V)

    This command selects the ASCII character used for the pass input editing command.

PASSAll ON|OFF   default OFF/OFF

    When this command is ON, the KAM will accept packets, regardless of whether or not the CRC is correct. The KAM will attempt to decode the address field as well as the data field and display the packets as specified by other commands such as *Monitor*. *MHeard* logging is disabled when *PASSAll* is ON.

PBBS *n*   default 0

    n may be any number from 0 to 21. This number activates the personal mailbox and sets the amount of RAM allocated to the personal packet mailbox function in kilobytes. This is a static allocation and is subtracted from the total RAM available for all buffering functions. Changing the PBBS RAM allocation will reset the unit and erase any messages stored in the personal mailbox.

PBDisconnect

    This command will cause the personal mailbox to send a disconnect packet if it is connected to a user.

PBKill *n*

This command is used to delete messages in the personal mailbox. Any message in the box, regardless of originating or destination station address, can be deleted from your mailbox by you.

PBList

This command will list the message header and number of all messages in the Personal Packet Mailbox.

PBMon ON/OFF   default ON

This command allows you to monitor packets as they are being sent to your Personal Packet Mailbox by other stations. This command is used in connection with the other monitor commands.

PBRead *n*

This command is used to read messages in the mailbox. You must use the message number. There is no command to read all messages in bulk. Any message can be read regardless of originating or destination station address.

PBSend (callsign), (text)

This command is used to enter messages into the personal mailbox from your keyboard. Messages entered in this manner are limited to 255 bytes. This limitation INCLUDES the *PBSend* command, the following space, the callsign of the addressee and the comma.

PErm

PErm is an immediate command. It causes any parameters changed since the last *PErm* command to be made permanent; all valuers are burned into the EEPROM. As this process can not be undone by turning the unit off, care should be taken to see that the correct values have been selected. The EEPROM chip can be *PErmed* a minimum of 1,000 times.

PERSist *n*   default 255

n can be any value from 0 to 255. When the RAM has a packet to send and the channel is clear, it will begin transmitting with a probability of $(n + 1)/256$. If it does not transmit it waits one slot time before again trying to transmit with the same probability. If PERSIST is 255, the KAM will transmit with probability of one, meaning it will transmit immediately, which is the way all TNCs have been working up to now. The persistence algorithm has been added on top of the *DWAIT* algorithm. If you plan to use persistence as defined by PHIL KARN's TCP/IP, you should consider setting *DWAIT* to 0.

PId ON|OFF   default OFF/OFF

When ON, all connected I-frames will be sent to the attached terminal. When OFF, only those I-frames received with a Protocol Identifier (PID) of $F0 will be sent on to the attached terminal.

PMode *x*   default NONE

This command is used to determine the mode the unit will be in after power-on. For example, if PMode RTTY is used, the unit will power-on in RTTY ready to operate at the baud rate specified in RBaud, and no command prompt, `cmd:`, will appear. *PMode* can be set to one of the following: None, Ascii, AMtor, CW, FEc, or Rtty.

RBaud *n*   default 45

This command sets the default baud rate that may be used during RTTY operation. It also sets the baud rate used with *PMode* if RTTY is specified as that parameter. Your favorite RTTY speed can be entered here as *RBaud*, and when operating at any other speed, instant reconfiguration to *RBaud* speed can be had by use of CTRL-C Ø command.

REconnec call (VIA call 2, call 3...call 9)

This is an immediate command. It may be used to change the path by which you are currently connected to another station. It may only be used when you are connected on the current stream to the station you wish to reconnect to.

-CAUTION-

Frames enroute between your station and the reconnected station may be lost at the time the re-connected is executed.

REDisplay *n*   default $12(CTRL-R)

n may be set to any value between 0 and $7F, or, with *8bitconv* ON, to any value between 0 and $FF. This command is used to change the *REDisplay*-line input editing character. The parameter n is the ASCII code for the character you want to type in order to *REDisplay* the current input line. You can enter the code in either hex or decimal.

You can type this character to cause the KAM to retype a line you have begun. When you type the *REDisplay*-line character, the following things happen: First, type-in flow control is temporarily released (if it was enabled). This displays any incoming packets that are pending. Then a \ (BACK-SLASH) character is typed, and the line you have begun is retyped on the next line. If you have deleted and retyped any character, only the final form of the line will be shown. You are now ready to continue typing where you left off.

You can use the *REDisplay*-line character to see a "clean" copy of your input if you are using a printing terminal and you have deleted characters. The *REDisplay*ed line will show the corrected text.

You can also use this character if you are typing a message in Convers Mode and a packet comes in. You can see the incoming message before you send your packet, without canceling your input.

In non-packet modes you can use this character to see what characters are still in your transmit buffer.

RESet

This command is used to perform a soft reset. Any parameters changed but not *PErmed* are retained.

RESPtime *n*   default 12/12

The number specified between 0 and 255 establishes a minimum delay, in 100 ms increments, that is imposed on acknowledgment packets. Delay may run concurrently with *DWait* and any other random delays in effect. This command is useful in avoiding collisions during such activity as file transfers using full-length packets.

RETry *n*   default 10/10

n may be set to any value between 0 and 15, specifying the number of packet retries. Frames are re-transmitted n times before the operation is aborted. The time between retries is specified by the command *FRack*.

RIng ON|OFF   default OFF

When ON, three bell characters ($07) are sent to the terminal with each *****connected to** message when another station initiates the connect.

Rtty *n*

This command places the unit in RTTY Mode. The parameter n sets the transceiver baud rate. If n is not specified , the baud rate specified in *RBaud* is used.

SCreenl *n*   default 80

This value is used to properly format terminal output. A CR sequence is sent to the terminal at the end of a line when n characters have been printed. A value of zero inhibits this action. *n* is variable from 0 to 255.

SEndpac *n*   default $0D (CR)

n may be set to any value between 0 and $7F, or, if *8bitconv* is set to ON, may be set to any value between 0 and $FF, specifying a character that will force a packet to be sent in Convers Mode.

SHift *n*   default 170

This command sets the default shift used in non-CW modes. Shifts available are 170, 425, 850 or modem. When modem is specified, the *MARk* and *SPace* commands set the mark and space frequencies used. The modem tones are always selected for Packet operation. Once you have entered a non-Packet mode, CTRL-C S can be used to change shifts without affecting the *SHift* parameter.

SLottime *n*   default $0D (CR)

n can be any value from 0 to 255 specifying the amount of time in tens of milliseconds between successive tries of the persistence algorithm.

SPace *n*   default 1800

This command sets the space frequency used when the unit is in the modem shift.

STARt *n*   default $11 (CTRL-Q)

This command selects the character used to restart output from the unit to the terminal. Output is stopped with the *STOp* character.

STATShrt ON|OFF   default OFF

If ON, entry of the Status command will display only the current I/O stream and other streams having a connected status.

Status

This is an immediate command which will display both the identifier and link state of all streams. The current input and output stream is also indicated. A pound sign (#) indicates that there is unacknowledged data in the buffers for that stream. The following is an example of a display which may result from entry of the *Status* command:

```
cmd: Stat
A Stream   I/O CONNECTED TO W0XI
B STREAM   CONNECTED TO N0APJ
C STREAM   DISCONNECTED
........
........
I STREAM   CONNECTED TO NQAL VIA LAW 3
J STREAM   #CONNECTED TO KE0H
........
Z STREAM   DISCONNECTED
```

STOp *n*   default $13 (CTRL-S)

This command selects the character used to stop output from the unit to the terminal. Output is restarted with the *STARt* character.

STREAMCa ON|OFF   default OFF

  This command enables the display of the callsign of the connected-to station following the stream identifier of the connection. It is especially useful when operating with multiple connections allowed.

STREAMDb ON|OFF   default OFF

  When ON, the *STReamswitch* character received in a data packet will be displayed twice or "doubled". If operating with multiple connections, this will permit differentiation between *STReamswitch* characters received from other stations and those generated internally in your unit.

STREAMEv ON|OFF   default OFF

  If ON, the stream indicator will be displayed with every incoming packet. When OFF, stream indicator is displayed only when a change in streams occurs.

STReamsw *n*   default $40/$7C

  n may be set to any value between $00 and $7F, or, if *8bitconv* is set to ON, may be set to any value between $00 and $FF. This command selects the character to be used to signify that a new "stream" or connection channel is being addressed. The character selected can be *PASsed* in the Convers Mode and will always be ignored in the Transparent Mode and flows through as data. If operating in the Transparent Mode and you wish to change outgoing streams, you MUST first escape to COMMAND MODE.

SUPCalls callsign(s) or NONE default NONE

  A list of up to 10 callsigns for use with *SUplist*.

SUplist ON|OFF   default OFF

  When ON, packets from the stations specified in *SUPCalls* are not monitored. If the *BUdlist* is ON and there are calls specified by *BUDCalls*, then the setting of *SUplist* is ignored.

TRACe ON|OFF   default OFF

  When ON, all received frames are displayed in their entirety, in hexadecimal, including all header information.

Trans

  This command causes immediate exit from Command Mode into Transparent Mode. The current link state is not affected.

TRFlow ON|OFF   default OFF

  When OFF, software flow control is disabled in the Transparent Mode. When ON, the settings of *STARt* and *STOp* are used to determine type of flow control in Transparent Mode. When *STARt* and *STOp* are set to $00, hardware flow control must always be used. If not zero, the KAM will respond to the users *STARt* and *STOp* characters, and remain transparent to other characters from the terminal or computer.

TXDAmtor *n*   default 5

  This command establishes the transmit delay used in AMTOR operation. Each number increment (0 – 9) sets a multiple of 10 ms.

TXdelay *n*   default 30/15

  This command sets the receive to transmit delay as $10 \times n$ ms. This setting establishes the time delay between the application of push-to-talk and AFSK tones to the transmitter.

TXFlow ON|OFF   default OFF

When ON, *XFlow* is used to determine the type of flow control used during Transparent Mode. When OFF, software flow control is not used, i.e., *XFlow* is treated as OFF. If *TXFlow* and *XFlow* are both ON, the KAM will use the XON and XOFF characters to control input from the terminal.

Unproto call 1(VIA call2, call 3....call5)   default CQ/CQ

This command is used to set the digipeat and destination address fields of packets sent in the unconnected mode. Unconnected packets are sent as unsequenced I-frames with the destination and digipeat fields taken from call 1 through call 5. Unconnected packets sent from other units can be monitored by setting *Monitor* ON and setting *BUdlist* appropriately. The digipeater list is also used for BEACON packets (which are sent to destination address BEACON). If *Unproto* is "NONE", no unconnected packets will be sent except for BEACON and ID.

USers *n*   default 1/1

n may be set to any value between 0 and 26. This command specifies the channels which may be available to incoming connect requests. For example, if *USers* = *5* then an incoming connect request will connect to the lowest channel A-E, if any of these channels are in the unconnected state. If none of the 5 channels are available, a DM packet will be sent back to the requesting station and the message `connect request:(call)` will be output to your terminal. If *USers* is set to 0 no one will be able to connect to you. If *USers* is set higher than *MAXUsers*, the extra is ignored.

USOs ON|OFF   default ON

When ON, an unshift to letters case is effected when a space is received in BAUDOT RTTY. If *LCRtty* is ON, a space will cause an unshift to lower case.

Xflow ON|OFF   default OFF

When *Xflow* is ON, the device connected to the terminal port is assumed to respond to flow control characters XON and XOFF. When *Xflow* is OFF, the unit will only respond to hardware flow control lines CTS and RTS.

XMitecho ON|OFF   default OFF

When ON, characters are echoed when they are sent to the transceiver for output. When OFF, echo is immediate.

XOff *n*   default $13 (CTRL-S)

This command selects the character sent by the unit to the terminal to stop input from that device.

XON *n*   default $11 (CTRL-Q)

This command selects the character sent by the unit to the terminal to restart input from that device.

SOFT SWITCHES
(Control-C commands)

The following control commands are used within non-packet operating modes to direct the KAM to take specific actions. In all cases you issue a CTRL-C command by pressing the CTRL key and while holding it down type the letter C. Release both, then press the letter indicated to obtain the desired action. If your computer keyboard has no key labeled CTRL, consult you computer manual to determine which key performs the CTRL key function.

CONTROL COMMAND	FUNCTION	MODE	
CTRL-C R	return to receive from transmit (reset speed tracking in CW)	CW, RTTY, ASCII, FEC	
CTRL-C E	return to receive when buffer empty	CW, RTTY, ASCII, FEC	
CTRL-C T	switch to transmit from receive	CW, RTTY, ASCII, FEC, ARQ	
CTRL-C I	invert received signal	RTTY, ASCII, FEC, ARQ	
CTRL-C S	change shift to next higher standard	RTTY, ASCII, FEC, ARQ	
CTRL-C X	command mode	any except Packet	
CTRL-C n	n changes speed as follows	RTTY/ASCII	CW
1		45	5
2		50	10
3		57	15
4		75	20
5		100	25
6		110	30
7		150	35
8		200	40
9		300	45
0		rbaud/ascbaud	50

KAM PARTS LIST

C1	-	µ01	C56	-	µ01	Q1	-	PN2222
C2	-	µ01	C57	-	µ001	Q2	-	PN2222
C3	-	µ1	C58	-	µ001	Q3	-	PN2222
C4	-	µ001	C59	-	µ001	Q4	-	PN2222
C5	-	µ001	C60	-	µ001	Q5	-	PN2907A
C6	-	µ001	C61	-	µ001	Q6	-	2N7000
C7	-	1µ Alum	C62	-	µ1	Q7	-	PN2907A
C8	-	µ001				Q8	-	PN2907A
C9	-	µ001	CR1	-	1N4003	Q9	-	PN2222
C10	-	µ1	CR2	-	1N4003	Q10	-	PN2907A
C11	-	µ001	CR3	-	1N4003	Q11	-	PN2222
C12	-	µ001	CR4	-	1N4003			
C13	-	µ1	CR5	-	1N914	R1	-	620
C14	-	µ1	CR6	-	1N914	R2	-	620
C15	-	1µ Alum	CR7	-	1N914	R3	-	10k
C16	-	µ1	CR8	-	1N914	R4	-	100k
C17	-	µ001	CR9	-	1N914	R5	-	620
C18	-	1µ Alum	CR10	-	1N914	R6	-	47k
C19	-	47µ Aum	CR11	-	1N914	R7	-	10k
C20	-	47µ Alum	CR12	-	1N914	R8	-	4k7
C21	-	µ001	CR13	-	1N914	R9	-	6k8
C22	-	1µ	CR14	-	1N914	R10	-	620
C23	-	µ1	CR15	-	1N914	R11	-	220
C24	-	µ01	CR16	-	1N914	R12	-	1k
C25	-	20p	CR17	-	1N4003	R13	-	100k
C26	-	20p	CR18	-	1N4003	R14	-	1M
C27	-	µ1	CR19	-	1N914	R15	-	1M
C28	-	µ1	CH20	-	1N914	R16	-	1M
C29	-	1µ Alum	CR21	-	1N914	R17	-	470
C30	-	µ01				R18	-	47k
C31	-	µ01	J1	-	2.5 mm Barrel	R19	-	2k2
C32	-	4µ7 Alum	J2	-	9 Pin - D	R20	-	10k
C33	-	4µ7 Alum	J3	-	8 Pin Din	R21	-	1M
C34	-	µ01	J4	-	25 Pin - D	R22	-	10k
C35	-	µ01	K1	-	3 Pin	R23	-	10k
C36	-	330p	K2	-	3 Pin	R24	-	1k5
C37	-	µ01	K3	-	2 Pin	R25	-	10k
C38	-	µ1	K4	-	2 Pin	R26	-	6k8
C39	-	10µ Tant	K5	-	3 Pin	R27	-	15k
C40	-	µ1	K6	-	3 Pin	R28	-	15k
C41	-	µ1	K7	-	3 Pin	R29	-	10k
C42	-	10µ 50V Alum	K8	-	20 Pin	R30	-	22k
C43	-	10µ 50V Alum	K9	-	6 Pin	R31	-	150k
C44	-	µ1				R32	-	150k
C45	-	µ001	L1	-	GREEN	R33	-	100k
C46	-	µ1	L2	-	GREEN	R34	-	100k
C48	-	µ1	L3	-	GREEN	R35	-	2k7
C49	-	25p	L4	-	GREEN	R36	-	1k2
C50	-	33p	L5	-	RED	R37	-	15k
C51	-	µ1	L6	-	GREEN	R38	-	10k MF
C52	-	µ1	L7	-	GREEN	R39	-	33k
C54	-	µ1	L8	-	RED	R40	-	9k1
C55	-	µ1				R41	-	8k45 MF

R42	-	2k7	R98	-	100k	RN1	-	10k
R43	-	22k	R99	-	33k	RN2	-	10k
R44	-	10k	R100	-	1k	RN3	-	10k
R45	-	680k	R101	-	1k	RN4	-	10k
R46	-	620k	R102	-	10k	RN5	-	10k
R47	-	220k	R103	-	100k	RN6	-	220k
R48	-	10k	R104	-	51k	RN7	-	100k
R49	-	5k1	R105	-	10k	RN8	-	10k
R50	-	15k	R106	-	6k8		
R51	-	9k53 MF	R107	-	100		
R52	-	82k	R108	-	100k		
R53	-	220k	R109	-	120k		
R54	-	100k	R110	-	270		
R55	-	150k	R111	-	270		
R56	-	150k	R112	-	6k8		
R57	-	150k	R113	-	270		
R58	-	33k					
R59	-	33k	RFC1	-	10μH		
R60	-	2k7					
R61	-	1k2	S1	-	PUSH PUSH		
R62	-	15k	S2	-	PUSH PUSH		
R63	-	5k1					
R64	-	82k	U1	-	MC34074		
R65	-	9k53 MF	U2	-	741IC04		
R66	-	68k	U3	-	4018		
R67	-	47k	U4	-	MF4CN		
R68	-	100k	U5	-	TCM3105		
R69	-	150k	U6	-	MF10CN		
R70	-	22k	U7	-	LM339		
R71	-	68k	U8	-	MF10CN		
R72	-	100k	U9	-	MF10CN		
R73	-	100k	U10	-	MF4CN		
R74	-	1M	U11	-	LM324		
R75	-	220	U12	-	MF10CN		
R76	-	180k	U13	-	LM358		
R77	-	100k	U14	-	4066		
R78	-	100k	U15	-	4069		
R79	-	100k	U16	-	LM3914		
R80	-	2k2	U17	-	74HC259		
R81	-	22k	U18	-	74HC10		
R82	-	2k2	U19	-	74HC04		
R83	-	100k	U20	-	SPARE		
R84	-	9k1	U21	-	42832		
R85	-	100k	U22	-	27C256		
R86	-	2k2	U23	-	71054		
R87	-	220	U24	-	SPARE		
R88	-	220	U25	-	X2404		
R90	-	620	U26	-	63B03X		
R91	-	1M	U27	-	4070		
R92	-	2k2	U28	-	MC34074		
R93	-	1k	U29	-	LM358		
R94	-	2k2	U30	-	LM339		
R95	-	10k					
R96	-	100k	VR1	-	78M05 +5V Reg		
R97	-	6k8	VR2	-	79L05 -5V Reg		
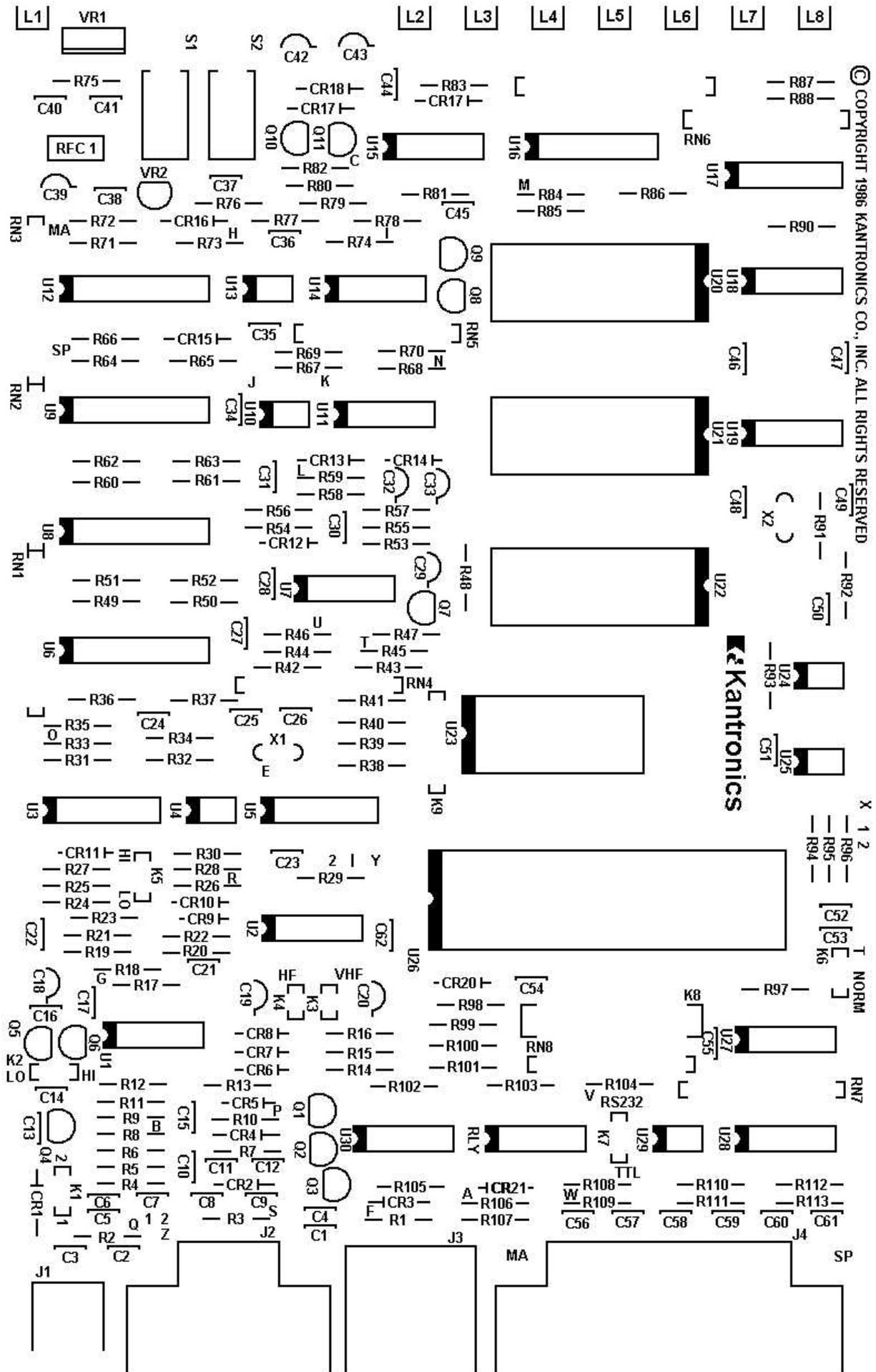
COMMAND SUMMARY

COMMAND	FUNCTION
8bitconv	Strip 8th data bit?
ABaud	Sets serial port baud rate
ALlias	Use MYAlias for digipeating?
AMtor	AMTOR standby mode or Mode A Master
ASCBaud	Sets ASCII baud rate
Ascii	Places unit in ASCII Mode
AUtocr	Sets interval for automatic transmission of CR
AUTOLf	Send LF to terminal after CR?
AUTOStrt	Enables AUTOstart RTTY/ASCII/FEC operation
AX2512v2	Version 1 or version 2 protocol?
AXDelay	Add time to TXDelay for repeaters?
AXHang	Use repeater hang time?
Beacon	Beacon timing every/after n × 10 seconds
BKondel	BS-space-BS or / for delete?
BText	Text used when beaconing
BUDCalls	List up to 10 callsigns to monitor
BUdlist	Monitor BUDCalls?
CALibrat	Check VHF equalization
CAnline	CTRL-X cancels a line
CANPac	CTRL-Y cancels a packet or terminal output buffer
CCitt	Use European tones in non-packet modes?
CHeck	Packet activity timeout in 10-sec intervals
CMdtime	Escape transparent mode
CMSg	Send CTEXT message on connect?
COMmand	CTRL-C used for commands or getting into command mode
CONMode	Convers or transparent when you connect?
Connect	Immediate command for packet connect or status
CONOK	Master switch to allow incoming connections
CONVers	Enter convers mode in Packet
CPactime	Use Pactime in convers mode?
CR	Add CR to packets in convers mode?
CRAdd	Adds an extra CR to all CRs sent in non-packet modes
CRLfsup	Inhibits printing of extra CR/LFs
CStamp	Time stamp printed on connect and disconnect
CText	Special message to send if someone connects to you
CW	Places unit in CW mode
CWBand	Sets bandwidth of CW filter
CWSpeed	Sets default Morse speed
CWTone	Sets center frequency of CW filter
DAytime	Set calendar/clock
DAYTWeak	Fine tune adjust for clock
DAYUsa	US or European format for date
DBldisc	# D's needed after unsuccessful connect
DElete	Backspace character
DIDdle	Diddle characters during RTTY/ASCII transmit?
DIGipeat	Allow digipeating?
Disconnect	Disconnect current packet stream
DISPlay	Displays parameters or classes of parameters
DWait	Digipeaters do not have to wait
Echo	See what you are typing?

EScape	Sets character sent to you for ESC
EXcardet	Use external pin for carrier detect
EXTmodem	Selects optional external modem on VHF
Fec	Places unit in Mode B(FEC) AMTOR only
FIlter	Filter out control characters?
FLow	Helps keep received code from messing up your typing
FRack	Wait interval before retry of packet
FSkinv	Invert FSK output to HF radio
FUlldup	Fullduplex on VHF radio port
Gateway	Allow digipeating from one radio to the other
HeaderIn	CR between header and text?
HELp	Displays list of all commands
Hid	ID's every 9.5 min if digipeating
Id	Force ID transmission
INvert	Inverts received RTTY/ASCII/AMTOR signals
Kamport	Which radio port do start out on?
KIssmode	Configures TNC to operate with TCP/IP
Lamtor	Places unit it ARQ listen mode
LCok	Terminal can print lower case characters?
LCRtty	Lower case RTTY(Russian Cyrillic)
LCStream	Upper or lower case stream-switch characters
LFadd	Add an extra LF after CR sent to radio
LList	Prevent SUPCalls from connecting or digipeating?
LOwtones	European standard low tone pairs
MAll	Monitor all packets?
MARk	Used in MODEM shift
MAXframe	Maximum number of unacknowledged frames
MAXUsers	The most simultaneous connects you can handle
MBeacon	Monitor beacons and ids?
MCOM	Monitor supervisory packets?
MCon	Monitor while connected?
MHClear	Clears station log
MHeard	Displays log of received packets
Monitor	Monitor packets?
MResp	Monitor response packets?
MRPt	Show digipeat path while monitoring?
MStamp	Time stamp monitored packets?
MYAlias	An alias callsign used for digipeating
MYcall	Your own true callsign
MYGate	Callsign for digipeating from one radio to the other
MYPbbs	Callsign for your personal mailbox
MYSelcal	Sets AMTOR selective call
Newmode	Return to command mode when disconnected?
NOmode	Stay in command mode after connect?
NUcr	# of nulls after CR
NULf	# of nulls after LF
Paclen	# of bytes/packet
PACTime	How often are packets formed in transparent mode
PARity	Determines the eighth bit sent to the terminal
PASs	CTRL-V will pass special control characters
PASSAll	Ignore incoming CRC errors?
PBBS	Activates mailbox and allocates RAM space
PBDisconect	Force the Personal Mailbox to disconnect user
PERSist	Sets transmitting probability

PBKill	Delete a message from the Personal Mailbox
PBList	Lists message headers and number of messages
PBMon	Monitors messages sent to your mailbox
PBRead	Read a message in Mailbox
PBSend	Put a message in Mailbox
PErm	Makes parameter values permanent in EEPROM
PId	Accept I frames with different PIDs?
PMode	Permanent power-up mode
RBaud	Sets BAUDOT/RTTY speed
REconnect	Use to change paths
REDisplay	CTRL-R will redisplay the keyboard buffer
RESet	Soft reset, unpermed parameters retained
RESPtime	Delay before acknowledging in 100 ms intervals
RETry	Max # of retrys
RIng	Bell characters when ***connected to?
Rtty	Places unit in BAUDOT/RTTY mode
SCreenln	Terminal screen length
SEndpac	CR will cause packet to be formed
SHift	Sets RTTY/ASCII/AMTOR shift
SLottime	Determines time between retries
SPace	Sets space tone frequency for modem shift
STARt	CTRL-Q restarts unit printing
STATShrt	Short status displayed
Status	Display status of all streams
STOp	CTRL-S stops unit from printing
STREAMCa	Callsign displayed after stream ID?
STREAMDb	Print, stream switch character twice?
STREAMEv	Display stream ID when?
STReamsw	Character to indicate switching streams
SUPCalls	Up to 10 callsigns to ignore
SUplist	Ignore SUPCalls?
TRACe	Display all received packets in hex
Trans	Immediate Trans mode
TRFlow	Software flow control in transparent mode?
TXDAmtor	Transmitter turn on for AMTOR
TXdelay	Transmitter turn on delay for Packet
TXFlow	Flow control in transparent mode
Unproto	Path for beacons and UIs
USers	Determines the # of streams which others can connect
USOs	Unshift on space in RTTY
Xflow	Hardware/Software flow control
XMitecho	Echo characters as transmitted?
XOff	CTRL-S stops terminal from sending
XON	CTRL-Q restarts terminal
CTRL-C R	Return to receive
CTRL-C E	Return to receive when transmit buffer empty
CTRL-C T	Transmit
CTRL-C I	Toggle inversion
CTRL-C S	Select shift
CTRL-C X	Return to command mode
CTRL-C n	Change speeds
CTRL-L	Send RTTY letter shift character
CTRL-N	Send RTTY figure shift character

PERSONAL MAILBOX

MYPbbs	Callsign for your personal mailbox
PBBS	Allocate RAM for personal mailbox
PBDisconnect	Force the personal mailbox to disconnect user
PBKill	Delete a message from the personal mailbox
PBList	Lists message header and number of messages
PBMon	Allow a monitoring of packets addressed to mailbox
PBRead	Read a message in mailbox
PBSend	Put a message in mailbox

APPENDIX I - SAMPLE TERMINAL PROGRAM

The following BASIC programs can be used to operate the Kantronics All Mode Unit (KAM) with the computers listed.

CAUTION: Each of the programs is a simple example of the necessary statements required to configure the computer for operation with an external device via the RS-232/TTL port. These simple terminal programs will NOT do file transfers buffering of data and typing

BASIC PROGRAM FOR THE VIC-20/C-64 AND THE KAM

```
10 CLOSE2
20 OPEN2,2,3,CHR$(6)
30 GET#2,A$
40 REM
50 GET B$
55 IF B$=CHR$(133) THEN GOTO 100
60 IF B$<>""THEN PRINT#2,B$;
70 GET#2,C$
80 PRINT C$;
90 GOTO 50
100 CLOSE2
110 END
```

Wire a 24 pin edge connector, as shown, to the cable provided with the KAM. The #1 function key will return the C-64 computer to BASIC. For use with the VIC-20, change the *COMmand* (see command section) parameter to $05. A CTRL-2 command will return the unit to the Command Mode. The VIC-20 does not have a CTRL-C command. Also, if graphics characters appear, use the shift key with the Commodore key to change the character set.

Don't forget to change the jumper behind the front, panel from RS-232 to TTL for the COMMODORE-64 or VIC-20.

Commodore 64 & Vic-20
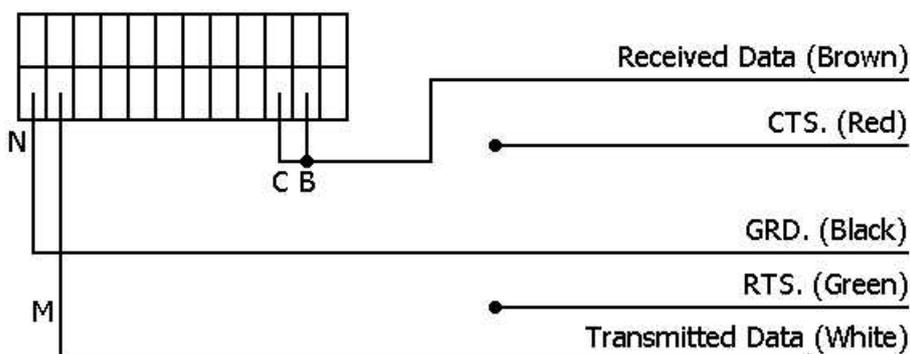
▲
24 pin Double Edge
Card Edge Connector

A BASIC TERMINAL PROGRAM FOR THE TRS-80 MODEL III

```
1   OUT 232,0
2   OUT232.164
3   OUT233,85
4   CLS
10  IF INP(234) and 128 then print CHR$(INP(235));: GOTO 10
20  A$=INKEY$:IF A$="" THEN 10
30  IF INP(234)and64 THEN OUT 235,ASC(A$): GOTO 10 ELSE GOTO 30
```

    Put the TRS-80 Model III in BASIC. Type and run the program. When the program is run the screen will go blank. At this time turn on the RAM. The unit will send the **PRESS * FOR AUTO-BAUD** routine.

THIS PROGRAM REQUIRES A 3-WIRE RS-232 HOOKUP ONLY!

A BASIC TERMINAL PROGRAM FOR THE APPLE COMPUTER WITH THE SUPER SERIALCARD

```
10 REM THIS PROGRAM SETS UP THE SSC FOR THE TNC
20 REM ASSUMES THE SSC IS IN SLOT #2
30 A$=CHR$(1):D$=CHR$(4)
40 PRINT D$ "PR#2"
50 PRINT A$;"6 BAUD":REM SET 300 BAUD
60 PRINT A$;"0 DATA":REM 8 DATA, 1 STOP BIT
70 PRINT A$;"0 PARITY":REM NO PARITY
75 PRINT A$; "SD":REM DISABLE SPECIAL CHARS & ENABLE ESC KEY
80 PRINT A$;"TERM MODE"
90 REM IN TERMINAL MODE-TALK TO TNC
100 REM PRESS<CTRL RESET>TO EXIT PROGRAM
110 PRINT A$;"RESET"
120 END
```


A BASIC TERMINAL PROGRAM FOR THE ZENITH Z-100

```
10 KEY OFF: CLS: CLOSE
20 OPEN"COM1:300,N,8,1" AS #1:
30 OPEN"SCRN:"FOR OUTPUT AS #2:
40 A$=INKEY$:IF A$=""THEN 60
50 PRINT #1,A$
60 IF LOC(1)=0 THEN 40
70 B$=INPUT$(LOC(1),#1)
80 PRINT #2,B$:
90 GOTO 40
```

A BASIC TERMINAL PROGRAM FOR THE KAM USING THE ATARI 850 INTERFACE

```
10  GOSUB  1600
20  FOR LOOP=0 TO 1 STEP 0
50  IF PEEK(764)=255 THEN 80
60  GET #KEY,A:IF A=126 THEN A=8
70  PUT #1,A
80  STATUS #1,A:BUF=PEEK(747)
90  IF BUF=0 THEN NEXT LOOP
100 FOR I=1 TO BUF
110 GET #1,A:IF A=8 THEN A=126
120 ?CHR$(A);:NEXT I
140 NEXT LOOP
1600 KEY=4
1610 XIO 36,#1,8,0,"R1:"      :REM-300 BAUD
1630 XIO 34,#1,48,8,"R1:"     :REM-RTS ON
1640 OPEN #1,13,0,"R1:"
1650 XIO 40,#1,0,0,"R1:"
1655 OPEN #KEY,4,0,"K:"
1660 RETURN
```

WHEN USING THIS PROGRAM, SET THE KAM'S DELETE AND AUTOLF COMMANDS TO OFF.
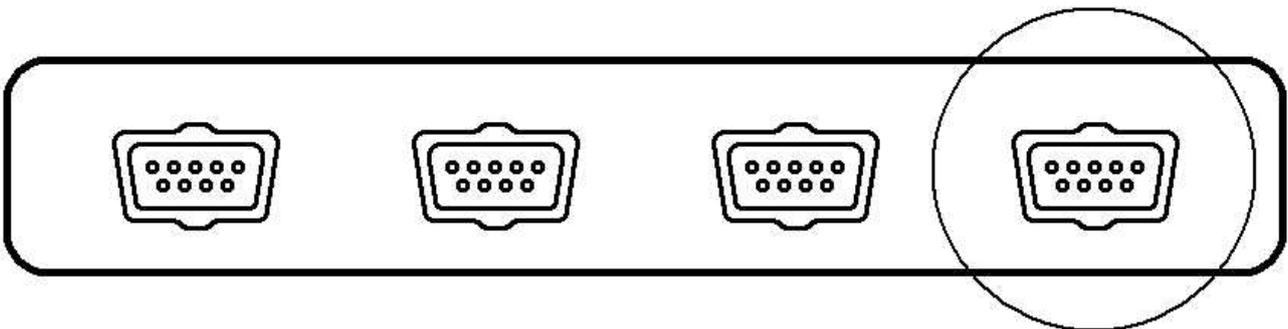

Figure 1: Pin functions of Serial Port No. 1 in 850 Interface Module 9-pin female connector.

NOTE: These views are looking AT socket from OUTSIDE of Interface.

White = Pin 3
Brn   = Pin 4
Blk   = Pin 5
Red   = Pin 8
Green = Pin 7

APPENDIX II
TCP/IP NETWORKING COMPATIBILITY

Introduction to TCP/IP

What is TCP/IP? TCP/IP is a suite (group) of protocols developed to allow the sharing of resources by computers in a network. FTP, the file transfer protocol, is one in the suite; it provides for the transfer of a file from one computer to another. TELNET is another protocol in the suite; TELNET provides basically for a chit-chat channel. You could have a QSO using TELNET. Other protocols also exist within the suite. Actually TCP and IP are also protocols named the transmission control protocol and internet protocol respectively. The group as a whole is generally referred to as TCP/IP.

TCP/IP was developed by a set of researchers, many of whom were associated with the ARPAnet, the Advanced Research Projects Agency (computer} network. The purpose of TCP/IP was (and still is) to allow communication between networks with differing characteristics and protocols. Hence the term INTERNET in the protocol name IP.

Since so much effort and research went into the development of TCP/IP networks and since the suite of protocols provide for a number of successful computer networks today, it has occurred to a number of amateurs that TCP/IP might be appropriate for packet radio networks. Indeed this appears to be the case; a TCP/IP program has been developed for the IBM PC that interfaces with any TNC that has what is called the KISS mode added. In effect, with TCP/IP running on your PC or clone and your TNC, KPC, or KAM modified to allow the KISS mode, you can transfer files or carry on a QSO.

For further details about TCP/IP, we refer you to a local or regional TCP/IP group. A detailed explanation of TCP/IP is beyond the scope of this manual. The remainder of this chapter describes the KISSMODE, the program that must be added to your KAM so that it is compatible with TCP/IP.

KISS mode

When in the KISS mode, your KAM acts only as a modem and packet assembler/disassembler (PAD), leaving the networking and routing jobs to the TCP/IP program in your computer. Received packets are passed along to the computer for control decisions, processing, and possibly digipeating. The packet unit gives up these traditional duties. As you can see, TCP/IP running on your PC has a lot of work to do and further explanation is beyond the scope of this manual. However, three commands in the KAM are required to run in the KISS mode, and an explanation of these follows.

KISS MODE COMMANDS

KISSMODE   ON|OFF   default off

When in the KISS mode, the KAM will use the KISS protocol which is used in conjunction with the TCP/IP suite in your computer. There are two ways to enter the KISS mode. In both cases you must first turn the *KISSMODE* parameter on by typing KISSMODE ON while in command mode. Then any command which will cause a soft reset (e.g. *RESET*, *MAXUSER*, *PBBS*, etc) will put the KAM in KISS mode. Turning the unit off and then on will cause it to return to command mode. The other method of entering KISS mode is to first turn KISSMODE ON and then *PERM* the value in EEPROM. Be sure to also *PERM ABAUD* to a nonzero value. Then when the unit is turned on it will automatically be in KISS mode. If KISSMODE is permed on, the only way to leave the KISS mode is to either reset all the EEPROM values using the TEST/NORM jumper or use the special *KISS* command in TOP/IP to get back into command mode. If the special *KISS* command is used, the KAM would have its KISSMODE parameter turned off but the EEPROM parameter is still turned on until KISSMODE is permed off by a non-TCP/IP terminal program in command mode.

PERSIST n   default 255

n can be any value from 0 to 255. When the KAM has a packet to send and the channel is clear, it will begin transmitting with a probability of (n+1)/256. If it does not transmit, it waits one

slot time before trying to transmit with the same probability. If PERSIST is 255, the KAM will transmit with a probability of one, meaning it will transmit immediately, which is the way all TNCs have been working up to now. The persistence algorithm has been added on top of the DWAIT algorithm. If you plan to use persistence as defined by the amateur TCP/IP protocols, you should consider setting DWAIT to 0.

SLOTTIME n   default 5
    n can be any value from 0 to 255 specifying the amount of time in milliseconds between successive tries of the persistence algorithm.

PRECAUTIONS
    Again, the KISSMODE command listed above is used only in conjunction with a TCP/IP program running on your computer. Obtain TCP/FP details from a TCP/IP group. In addition the operation of the KAM is set to respond with a KISS mode program that is compatible with the TCP/IP - KISS interface defined at the time of manufacture. It is anticipated that the "KISS" interface will not change, but this is an area of development, so if you have any questions, ask!
    Additionally, if you turn KISSMODE on, perm it ON, and perform a reset or power off-on again sequence, you will not be able to return to standard Packet operation unless you perform a hard reset or use the special KISS (off) command, see below. To avoid this occurrence, we suggest that when you turn the KISSMODE on, don't perm it unless you really want it to stay that way. So, when you perform a power off-on again sequence, the default value of KISSMODE (which will be off) will take you back to regular packet operation.

Control of the RAW KAM Commands under KISS
    Although removing the human interface and the AX.25 protocol from the KAM makes most commands unnecessary (they are in the TCP/IP program), the KAM is still responsible for keying the transmitter's PTT line and deferring to other activity on the radio channel. It is therefore necessary to allow your computer under TCP/IP to control a few KAM parameters, namely TXD and the persistence values.
    In order to do this it is necessary to distinguish between command and data frames on the computer/KAM link. This is done by defining the first byte of each asynchronous frame between the computer and KAM as a command. The upper half of the command byte specifies the radio channel; the lower half of the command byte specifies the command type. The following types are defined in frames to the KAM as:

type	function	command
0	data frame	rest of frame is data to be sent on the HDLC channel
1	TXDdelay	second byte is transmitter keyup delay in 10 ms units
2	persistence	second byte of frame is persistence parameter p
3	slottime	second byte of frame is slot interval
5	fulldup	full duplex if second byte is zero, on otherwise
255	leave KISS	turn off KISS Mode in KAM

    In addition, the following type is defined in frames coming from a KAM to the computer running the amateur TCP/IP:

0	data frame	rest of frame is received data

Asynchronous Frame Format
    How are these commands mentioned above sent to or received by the KAM running in KISS Mode? The KAM simply converts between synchronous HDLC, spoken on the half duplex radio channel, and a special asynchronous, full duplex frame format spoken between your computer running TCP/IP and itself. Every frame received on the HDLC link is passed intact to the computer

once it has been translated to the asynchronous format; and likewise, asynchronous frames from the host are transmitted on the radio channel once they have been converted to HDLC format.

The asynchronous protocol spoken between the computer and the KAM is very simple, since its only function is to delimit frames. Each frame is both preceded and followed by a special FEND (frame end) character, analogous to an HDLC flag. No CRC or checksum is provided, FEND {frame end) is 300 octal or $C0. Hence a command to your KAM would have a FEND character, followed by the "type" character, followed by data or parameters, and completed by another FEND character. In order to include FEND characters as data, a special escape character FESC ($DB) is used. FESC followed by TFEND ($DC) is translated to $CO; FESC followed by TFESC ($DD) is translated to $DB.