Kantronics
All Mode
Communicator

Version D
August 1987

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PREFACE

THIS SECTION CONTAINS IMPORTANT INFORMATION-PLEASE READ CAREFULLY

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 may 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 inter-

ference 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.

RFI SUPPRESSION
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 instal-
lations. Experience has shown that these differences are
related to the total RF environment, and may be 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 equip-
ment 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.

RETURN/REPAIR PROCEDURES

Consult the limited warranty policy in this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of purchase, and when the stipulations of the warranty have been met. Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor, and return shipping. Repaired units will be returned via UPS C.O.D. C.O.D charges can be avoided by including your VISA or MC number with your unit to be repaired. Shipping and repair may then be charged.

When service or repairs appear necessary, it may be wise to call or write Kantronics to determine if the problem can be solved without returning the unit. Should you encounter difficulty in getting your KAM to "talk" to your computer, you may wish to perform some limited checks before calling or writing. Carefully check your wiring connections to the RS-232 port. Verify your terminal baud rate. It may be useful to perform a "Hard Reset". Instructions on the Hard Reset procedure are given in chapter 5 of this manual.

When calling, report the product name and ask for the amateur radio service department. The service department telephone hours are 10-12 and 1-5 CENTRAL TIME 913-842-7745, Monday through Friday. When writing, include a clear description of the problem.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved by the service department.

WARRANTY

Kantronics Inc. warrants each KAM to be free from defects in material and workmanship under normal use and service for a period of one year after delivery to the ultimate user. Kantronics will repair or replace the KAM at our option, at no charge, should it become defective and should our examination disclose the KAM to be defective under warranty.

This warranty shall not apply to any unit that has been subject to misuse, neglect, accident due to wiring not of our own installation, or to use in violation of instructions furnished by Kantronics. This warranty will not be extended to units that have been repaired or altered outside our facilities.

This warranty does not cover broken or cracked cabinets, or any accessory used in connection with the KAM. This warranty is in lieu of all other warranties expressed or impied, and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products.

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 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 nominally set at 200 Hertz and may be set to any bandwidth between 50 and 1000 Hertz. Refer to 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 used standard RTTY speeds are 67, 75, 100 and 132 words 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.

ASCII Mode: ASCII code from 110 to 300 Baud may be sent and received. The unit's default speed is 110 baud. Speeds may be set in one baud increments up to 300. You may establish any shift by software command. In general, as the speed is increased the shift should be increased also. Best performance will usually be had if the shift-to-baud ratio is 1:1 or better. Standard 170, 425 or 850 Hertz shift may be specified or you may set both Mark and Space frequencies. Refer to the MARk, SPace, 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 it 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-tone 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 accomodate any transmitter or transceiver.

7. Selectable AFSK output level to both the HF and VHF port provides modulation for all transceivers, 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. 32K 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
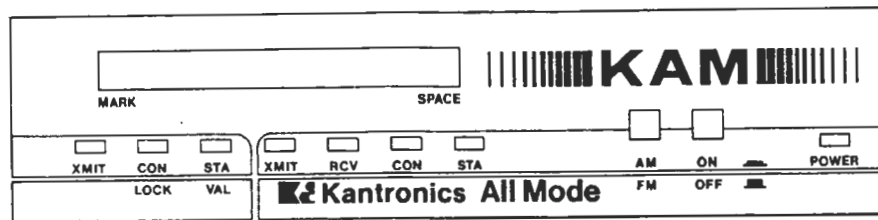
The front panel has two switches, eight LEDs and a ten segment LED bargraph. There are seven LEDs used as operating status indicators. The front panel is divided into two sections. The left three LEDs are the indicators associated with HF operation, and the four right LEDs are the indicators associated 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 an AMTOR lock condition.
    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 com-
puter 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 levels, 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 17 for
information on the functioning of K-7. The parts placement
diagram on page 78 shows its location. Assembly/disassembly
instructions on page 43 show you how to obtain access to the
interior of KAM.
    Many computer systems include a terminal program on the
systems 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 sup-
ports 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 pins 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, pages 16 and 17.
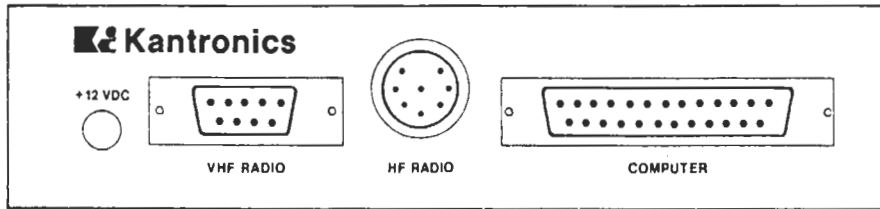
The 25-pin connector on the panel is for connecting to the computer. Five of these pins are for connection to your computer or terminal, and two provide for Mark/Space outputs to a monitor scope if you wish to use one. A prewired cable is provided for your use to connect the KAM to the computer. Five 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 line 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	--
+12V			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 volts 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 instructions.

+12V: This is an alternate input pin for supplying power to the KAM if desired. If the normal +12VDC 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 allow 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 port remains unchanged.
3. Entering the command followed by the slant bar (/) and a SINGLE value will cause the value entered to be set for 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 +12VDC. Connect the power adapter furnished with KAM to this jack or, if you use another power source make sure it provides +12VDC 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:

KANTRONICS 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:

KANTRONICS 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 W0XI. Your screen should look like this:

cmd:Connect W0XI

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 W0XI
cmd:retry count exceeded
***DISCONNECTED
cmd:

If you were to actually connect to W0XI, your screen would respond with

*** CONNECTED TO W0XI

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 proce-
dures for interconnecting your transceivers and the KAM.
Prior to actually connecting the cables, you should deter-
mine if the internal jumpers K-1, K-2, K-5, or K-7 require
repositioning to accomodate 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 10mv. The HI position sets an AFSK
output level of 50mv. Both levels are peak-to-peak values.
In general, transceivers requiring a pre-amplified micro-
phone will also require the HI level AFSK output from the
KAM. Removing the jumper entirely will provide the maximum
possible output level of approximately 1.7 volts VHF.
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 ohms	24mV.
2.2 Kohms	106mV.
6.8 Kohms	290mV.
22 Kohms	680mV.
47 Kohms	1000mV.

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 HF PTT line. This unit is shipped with the jumper INSTALLED; therefore, the timer is not 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 the output level at 500 mV. Both levels are peak-to-peak values. In general, transceivers requiring a pre-amplified microphone will also require the HI level AFSK output from the KAM. Removing the jumper entirely will provide the maximum possible output level of approximately 1.6 volts p/p HF. 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 level, place K-5 in the HIGH position. This unit is shipped from the factory with the jumper in the LO position.

R-25 Value	AFSK Output Level
680 ohms	48mV.
3.3 Kohms	209mV.
4.7 Kohms	282mV.
6.8 Kohms	377mV.
22 Kohm	800mV.

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.

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 RADIOS

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.
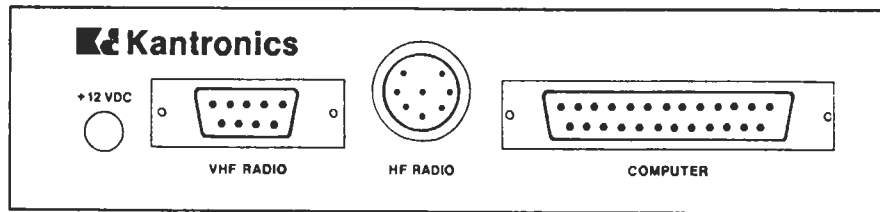
Caution: Make sure the power of the transceivers, computer,
and KAM is OFF before connecting any cables.

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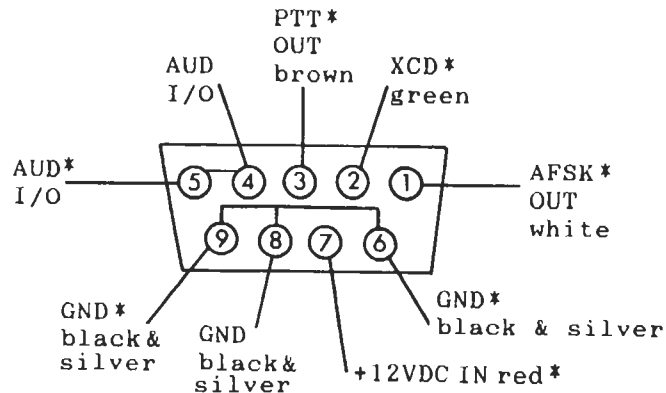
* Same as 9-pin KPC-2/KPC-2400 connector

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 tones 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 on 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 ouputs may have a tendency to "swamp" the KAM input circuits. Fixed output signals in excess of 50 mv should be padded.

Pin 7 - +12VDC in - red lead. This lead is provided as an alternate power input. It may be used in place of the +12 VDC jack. If you do not plan to use this alternate input you should clip the wire and 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   AUD I/O red audio cable

brown PTT OUT-(3) (8) (1)-AFSK OUT white

(5) (2) (4)

red FSK OUT   KEY OUT green

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 line 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
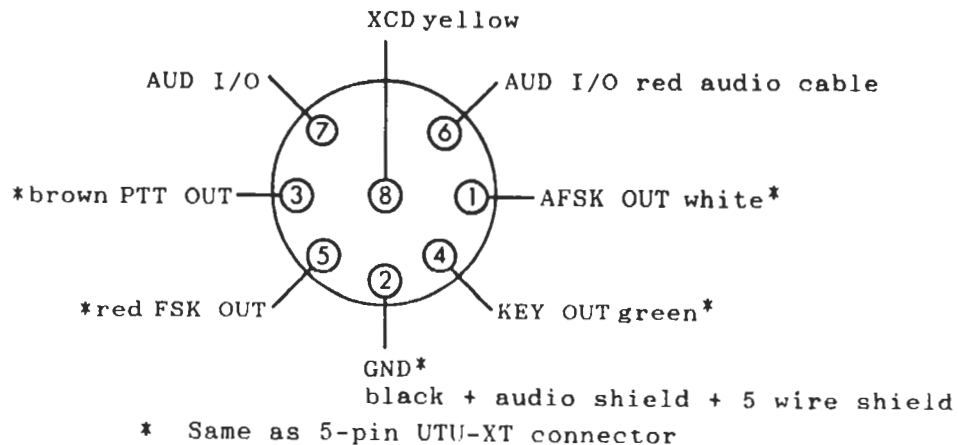shield (braided wire) disconnected.

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 direct-
ly 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 trans-
ceiver. 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 acces-
sory 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 ouputs 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 on 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 gound. 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.

Cut connection between the center pad and pad 1.

Make new connection between the center pad and pad 2.
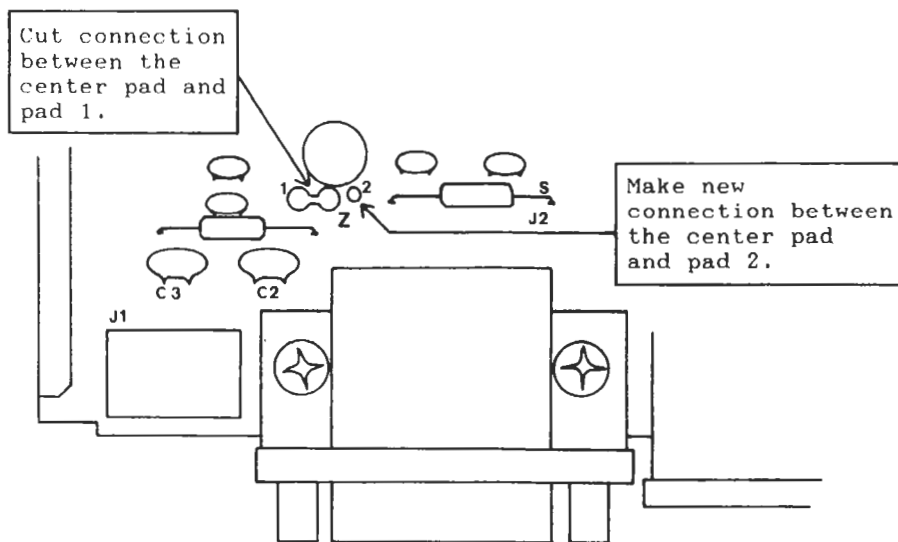
Rear of KAM

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 be 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 intial 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 sets 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 gatewaying are available. RTTY and CW type operations are available on the HF port while digipeating on the VHF port. The available RAM (about 30K bytes) 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 Baudot, 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 used to enter commands which alter the KAM's 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 KAM's 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 unit's 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 others 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:

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

Enter your call sign 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 you 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 convers 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 to 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 used 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 the 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 Connections, page 26.

CONNECTING and DISCONNECTING

In order to make full use of the KAM's capabilities for reliable packet communications, you should establish a connection with another station. This means that everything you type while in Convers 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 WØXI, for example, type:

CONNECT WØXI

If WØXI 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 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 WØXI

and automatically move to Convers 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 stations 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 its 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 the 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
***DISCONNECTED

MULTIPLE PACKET CONNECTIONS

KAM has the capability of allowing you to operate with multiple connections on 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 respond 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 choice 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 through 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

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```
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 of 10 possible channels, or streams, 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. As shown, the display indicates no connections on any stream of the HF port and no connection to any stream of 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 KAM 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 stream-switch character, a stream designator (any stream) and then the standard format connect request. An example would look like this:

```
cmd:$AC WA5RGU <cr>
```

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, thus allowing simultaneous connections to as many 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 STATShrt, 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, WA5RGU 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:

¦A:N0APJ***CONNECTED to N0APJ

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 stream 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 readdressed. If WA5RGU 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 priviledges 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 needed 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 way to use the MYGate function is to select an identification which relates easily to local features. For example, a gateway to be set up 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 set 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 conversations 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 none 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 (67WPM). 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 SHIFT-
```

Tuning RTTY and ASCII 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 selcall. 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 "handshaking" 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 3x3 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 LED's 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 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 en-
tered 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 en-
tered 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 buffer-
ing 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 used to delete messages in the personal
mailbox. Any message in the box, regardless of orig-
inating 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 re-
gardless 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 limita-
tion INCLUDES the PBSend 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.

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ACTIVATING THE MAILBOX

    After turning the unit on, entering your callsign and
obtaining a cmd: prompt, the first step should be to allo-
cate 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 de-
pending 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 THE PBBS?
    CMD:

ACCESSING THE PERSONAL MAILBOX THROUGH THE RADIO PORT

General

Your personal mailbox can be accessed by you through a remote digipeater, or by another station, by use of the standard packet connect request. The connect request must use the call or alias established with the MYBbbs 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 addressed to or originated by the connected 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 are 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 call sign of your personal mailbox via the digipeater being used. When you make this connection you will see the following message on your display:

*** CONNECTED TO LAW VIA (DIGI CALLSIGN)

The Personal Packet 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 to 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 auto-
matic forwarding file, your messges 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 personal
  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 let-
ters, 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 key, 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 com-
puters. 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 com-
puter 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 is 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 is 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 acknowl-
edge 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

RETRY INTERVAL=FRACK*(2*n+1) 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 ori-
ginal 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 trans-
mission. 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

    Wait time=DWait*10 milliseconds

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

    Wait time=(DWait+r*TXDelay)*10 milliseconds
where r is a random number from 0 to 15.

    AX.25 protocol allows multiple packets to be transmit-
ted 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 para-
meter 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 qualilty 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 output 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 handshaking.

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.

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The KAM's 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 transmission 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

Install jumpers from MA to MA,
and from SP to SP.
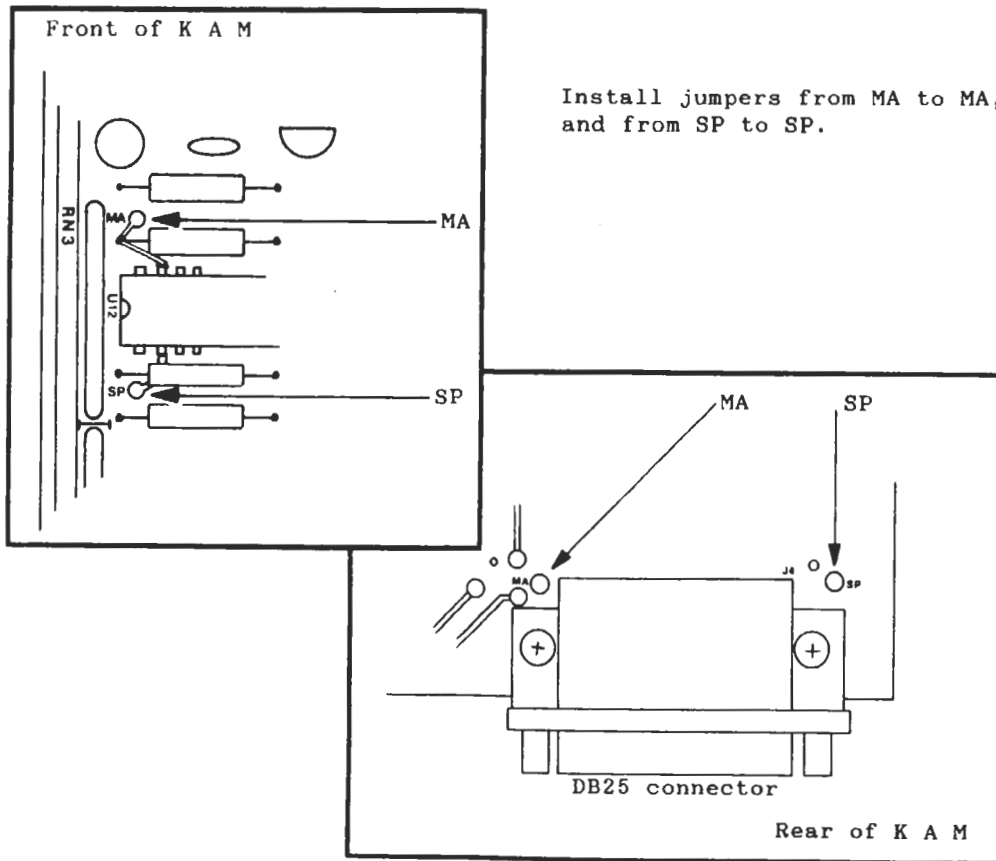
CALIBRATION

The CALibrate command is used to assist the KAM opera-
tor 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 command 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 a 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 KAM 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 VR1, 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.

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 (normal- test)
3) Place the jumper in the test position.
4) Apply power to the KAM.
5) Observe on the computer dislay:

    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*16+11 = 27
$120 = 1*16*16+2*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 call signs, 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 call sign 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 call sign 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 radio 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 6          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
TXFLOW     OFF
XFLOW      OFF
```

CMD:DISP C

```
CANLINE    $18
CANPAC     $19
COMMAND    $03
DELETE     $08
PASS       $16
REDISPLA   $12
SENDPAC    $0D
START      $11
STOP       $13
STREAMCA   OFF
STREAMDB   OFF
STREAMEV   OFF
STREAMSW   $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
AUTOCR     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
USOS       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 are 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 beginning 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 Kantronics 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
     CONNECTED to
     CONNECT in progress
     FRMR in progress
     DISC in progress
     REJ frame sent
     Waiting acknowledgment
     Device busy
     Remote device busy
     Both devices busy
     Waiting ACK and device busy
     Waiting ACK and remote busy
     Waiting ACK and both devices busy
     REJ sent and device busy
     REJ sent and remote busy
     REJ sent and both devices busy

FRMR in progress
     The KAM is connected but a protocol error has oc-
curred. 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 deter-
mining 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 allo-
cation of RAM.

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

COMMANDS

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 transmis-
sion 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 KAM.

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 re-
ceived 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.

AX25l2v2   **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 operat-
ing 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 utili-
zation 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 inter-
vals. 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 inter-
val 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 ex-
plained 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, speci-
fying an ASCII character. This command is used to change
the cancel packet command character. This character func-
tions 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 incre-
ment 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* 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 period-
ically 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
     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 keep-
ing. Increasing the parameter will slow the clock, decreas-
ing 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 trans-
mission 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 retrans-
mitted. 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 opera-
tions 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 intitiate an immediate disconnect
request with the currently connected station. A succesful
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 cur-
rently 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 ident-
ifier 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 10ms intervals. This value is used to
avoid collisions with digipeated packets. The unit will
wait n*10ms after last hearing data on the channel before it
begins its own keyup sequence. This value should be estab-
lished 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 digi-
peater 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 sta-
tions 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 term-
inal. 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 term-
inal 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 incre-
ment 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 interme-
diate 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   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.

Headerln   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 identifica-
tion 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 identi-
fication packet will be forced. This command can be used to
insure that your station identification is the last trans-
mission 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 in-
verted. While in RTTY, ASCII, or AMTOR Modes, entering a
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 KISSMODE 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 KISSMODE 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=1275Hz, Space=1445Hz,
1700Hz or 2125Hz.

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 maxi-
mum 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 unnumbered 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 displayed 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 supressed 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 sterisk * 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
asterisk.

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 identi-
fier to be used for packet digipeat operations. 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 at
sign-on. SSID suffixes may be used with this command.

MYcall   xxxxxx-n
     This command tells the KAM what its call sign is.
This call sign will be placed in the FROM address field for
all packets originated by it, and it will respond to frames
with this call sign in the TO or digipeat fields as appro-
priate. This call sign is also used in autostart
ASCII/RTTY operation. The call sign 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 extension
is not used in ASCII/RTTY autostart operation.

MYGate   xxxxxx-n
     This command tells the KAM what its gateway call sign
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 AMTOR 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 WØXI 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 multiconnected, 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 Ø
    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 Ø
    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 Ø 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 Ø means 256 bytes.

PACTime (Every/After)n   default after 10
    n may be set to any value from Ø to 255. This para-
meter 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 values 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 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 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 at RBaud, and when
operating at any other speed, instant reconfiguration to
RBaud speed can be had by use of CTRL-C 0 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 reconnect 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 charac-
ter. 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 \
(BACKSLASH) character is typed, and the line you have begun
is retyped on the next line. If you have deleted and re-
typed 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 REDisplayed
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 cancelling 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 100ms 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 N0AL 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 dis-
played only when a change in streams occurs.

STReamsw   n   default $40/$7C
        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. 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 Trans-
parent 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 mul-
tiple of 10ms.

TXdelay n   default 30/15
     This command sets the receive to transmit delay as
10*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 destina-
tion 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 commputer 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	return to command mode	any except packet
CTRL-C n	n changes speed as follows	

n	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 - .01uf	C56 - .01uf	Q1 - PN2222
C2 - .01uf	C57 - .001uf	Q2 - PN2222
C3 - .1uf	C58 - .001uf	Q3 - PN2222
C4 - .001uf	C59 - .001uf	Q4 - PN2222
C5 - .001uf	C60 - .001uf	Q5 - PN2907A
C6 - .001uf	C61 - .001uf	Q6 - 2N7000
C7 - 1uf Alum	C62 - .1uf	Q7 - PN2907A
C8 - .001uf		Q8 - PN2907A
C9 - .001uf	CR1 - 1N4003	Q9 - PN2222
C10 - .1uf	CR2 - 1N4003	Q10 - PN2907A
C11 - .001uf	CR3 - 1N4003	Q11 - PN2222
C12 - .001uf	CR4 - 1N4003	
C13 - .1uf	CR5 - 1N914	R1 - 620
C14 - .1uf	CR6 - 1N914	R2 - 620
C15 - 1uf Alum	CR7 - 1N914	R3 - 10K
C16 - .1uf	CR8 - 1N914	R4 - 100K
C17 - .001uf	CR9 - 1N914	R5 - 620
C18 - 1uf Alum	CR10 - 1N914	R6 - 47K
C19 - 47uf Alum	CR11 - 1N914	R7 - 10K
C20 - 47uf Alum	CR12 - 1N914	R8 - 4.7K
C21 - .001uf	CR13 - 1N914	R9 - 6.8K
C22 - .1uf	CR14 - 1N914	R10 - 620
C23 - .1uf	CR15 - 1N914	R11 - 220
C24 - .01uf	CR16 - 1N914	R12 - 1K
C25 - 20pf	CR17 - 1N4003	R13 - 100K
C26 - 20pf	CR18 - 1N4003	R14 - 1M
C27 - .1uf	CR19 - 1N914	R15 - 1M
C28 - .1uf	CR20 - 1N914	R16 - 1M
C29 - 1uf Alum	CR21 - 1N914	R17 - 470
C30 - .01uf		R18 - 47K
C31 - .01uf	J1 - 2.5 mm Barrel	R19 - 2.2K
C32 - 4.7uf Alum	J2 - 9 Pin - D	R20 - 10K
C33 - 4.7uf Alum	J3 - 8 Pin Din	R21 - 1M
C34 - .01uf	J4 - 25 Pin - D	R22 - 10K
C35 - .01uf	K1 - 3 Pin	R23 - 10K
C36 - 330pf	K2 - 3 Pin	R24 - 1.5K
C37 - .01uf	K3 - 2 Pin	R25 - 10K
C38 - .1uf	K4 - 2 Pin	R26 - 6.8K
C39 - 10uf Tant	K5 - 3 Pin	R27 - 15K
C40 - .1uf	K6 - 3 Pin	R28 - 15K
C41 - .1uf	K7 - 3 Pin	R29 - 10K
C42 - 10uf 50V Alum	K8 - 20 Pin	R30 - 22K
C43 - 10uf 50V Alum	K9 - 6 Pin	R31 - 150K
C44 - .1uf		R32 - 150K
C45 - .001uf	L1 - GREEN	R33 - 100K
C46 - .1uf	L2 - GREEN	R34 - 100K
C48 - .1uf	L3 - GREEN	R35 - 2.7K
C49 - 25pf	L4 - GREEN	R36 - 1.2K
C50 - 33pf	L5 - RED	R37 - 15K
C51 - .1uf	L6 - GREEN	R38 - 10K MF
C52 - .1uf	L7 - GREEN	R39 - 33K
C54 - .1uf	L8 - RED	R40 - 9.1K
C55 - .1uf		R41 - 8.45K MF

```
R42 - 2.7K          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 - 5.1K          R105 - 10K           RN8 -   10K
R50 - 15K           R106 - 6.8K
R51 - 9.53K MF      R107 - 100
R52 - 82K           R108 - 100K
R53 - 220K          R109 - 120K
R54 - 100K          R110 - 270
R55 - 150K          R111 - 270
R56 - 150K          R112 - 6.8K
R57 - 150K          R113 - 270
R58 - 33K
R59 - 33K           RFC1 - 10uh
R60 - 2.7K
R61 - 1.2K          S1 - PUSH  PUSH
R62 - 15K           S2 - PUSH  PUSH
R63 - 5.1K
R64 - 82K           U1  - MC34074
R65 - 9.53K MF      U2  - 74HC04
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 - 2.2K          U17 - 74HC259
R81 - 22K           U18 - 74HC10
R82 - 2.2K          U19 - 74HC04
R83 - 100K          U20 - SPARE
R84 - 9.1K          U21 - 42832
R85 - 100K          U22 - 27C256
R86 - 2.2K          U23 - 71054
R87 - 220           U24 - SPARE
R88 - 220           U25 - X2404
R90 - 620           U26 - 63B03X
R91 - 1M            U27 - 4070
R92 - 2.2K          U28 - MC34074
R93 - 1K            U29 - LM358
R94 - 2.2K          U30 - LM339
R95 - 10K
R96 - 100K          VR1 - 78M05 +5v Reg
R97 - 6.8K          VR2 - 79L05 -5v Reg
```
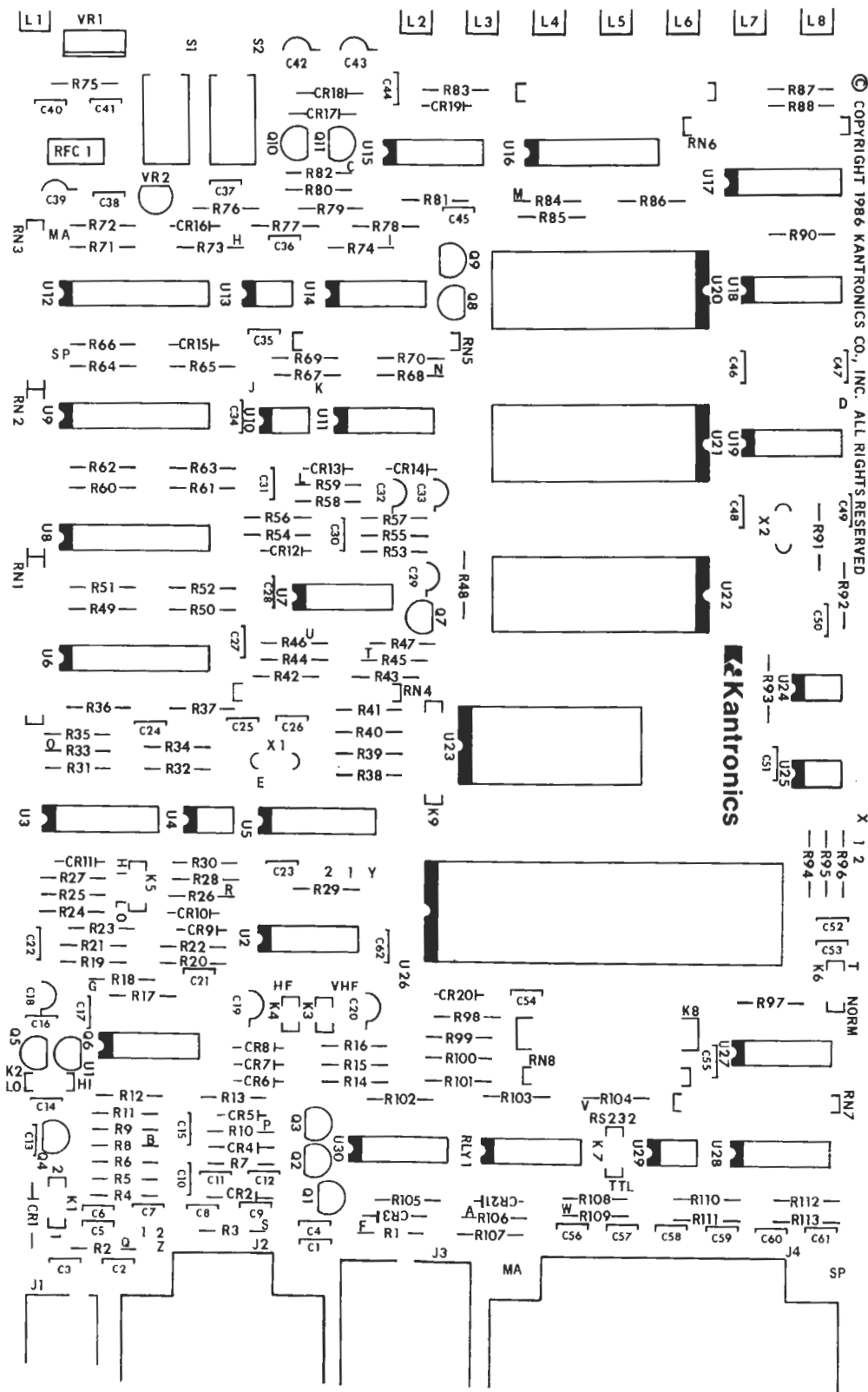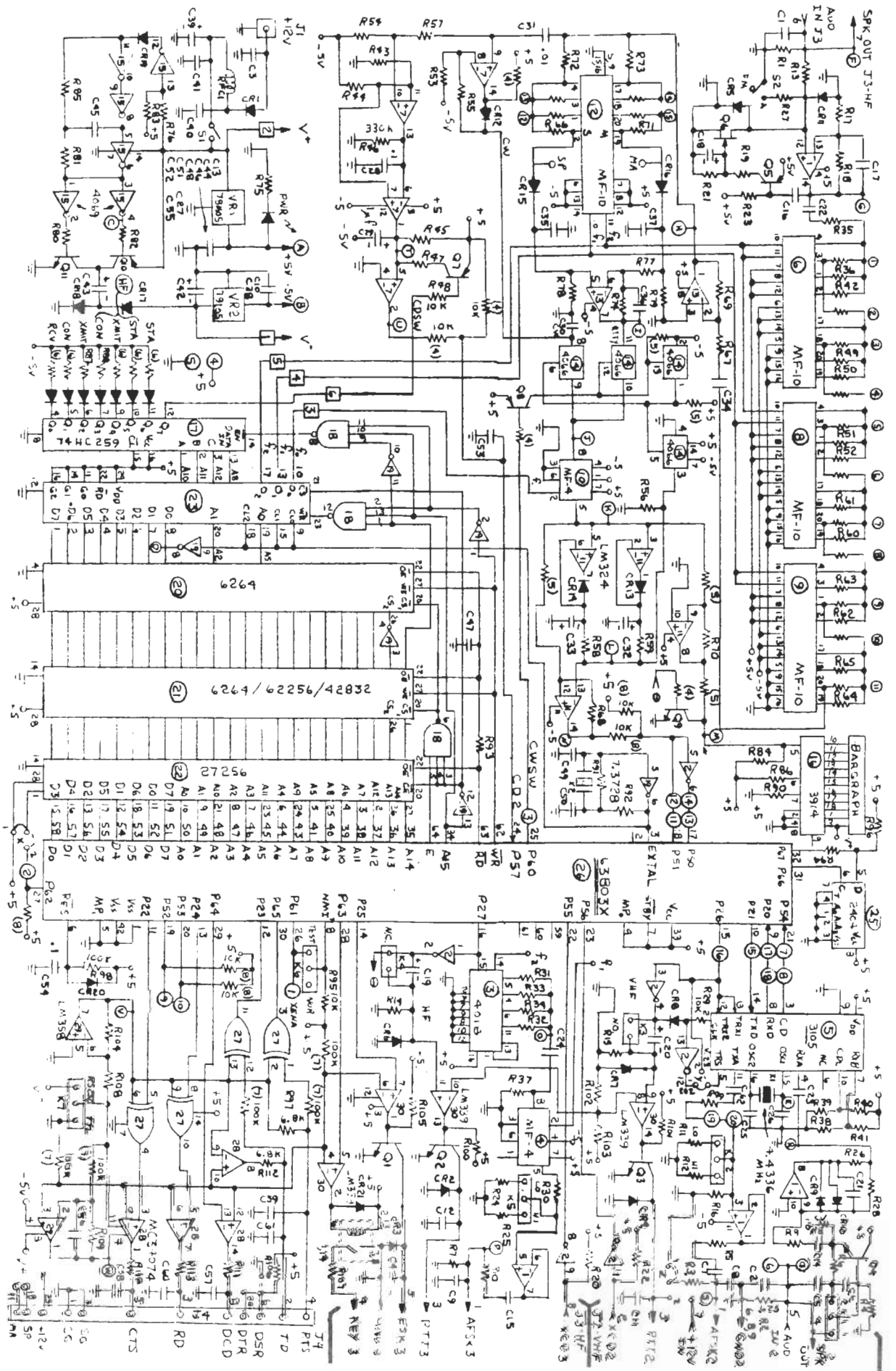
Kantronics

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
AX25l2v2	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 mo
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 controll 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 or 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


```
Received Data(Brown)
CTS. (Red)
GRD. (Black)
RTS. (Green)
Transmitted Data (White)
```
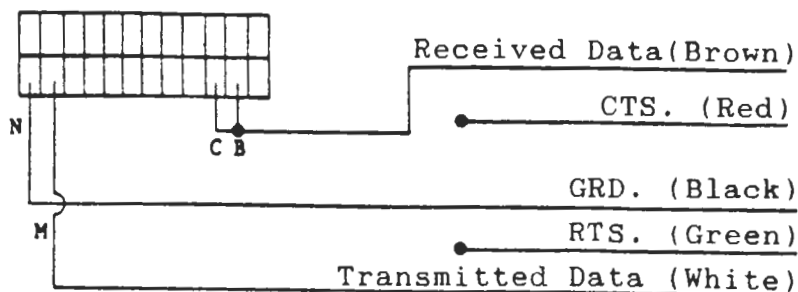
24 pin Double Edge
Card Edge Connector

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 KAM. The unit will send the PRESS *
FOR AUTOBAUD routine.

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

A BASIC TERMINAL PROGRAM FOR THE APPLE COMPUTER WITH THE SUPER SERIAL CARD

```
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,#1,48,0,"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
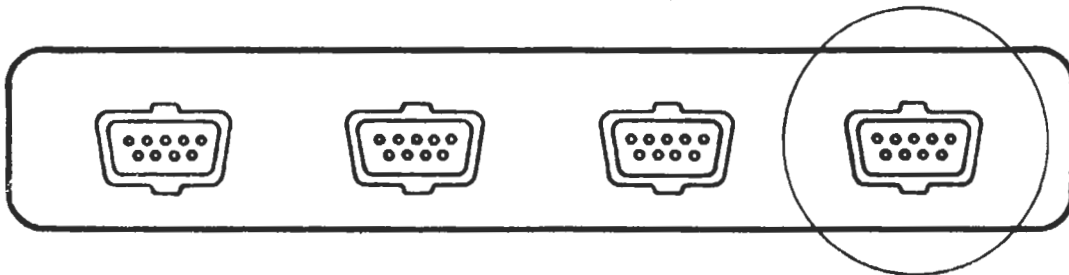AUTOLF COMMANDS TO OFF

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.

KISSMODE   ON:OFF   default off
     When in the KISS mode, the KAM will use the KISS
protocol which is used in conjuction 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 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 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 conjuction with a TCP/IP program running on your
computer. Obtain TCP/IP 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 occurance, 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 10ms 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
asynchronus 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 $C0; FESC followed by TFESC
($DD) is translated to $DB.