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Kantronics All-Mode Communicator

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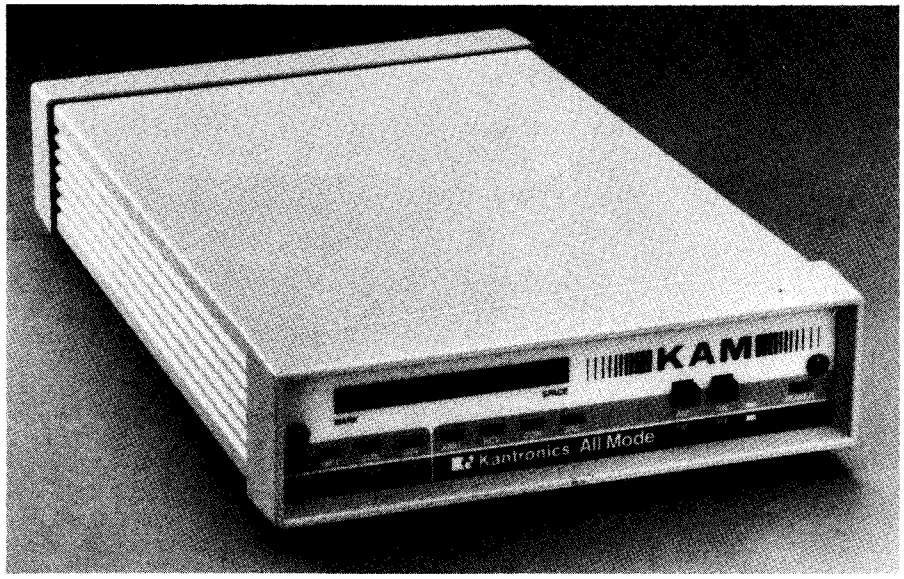
Kantronics All-Mode™ Communicator

Reviewed by Larry Wolfgang, WA3VIL



What exactly is an all-mode communicator? If you are not familiar with packet radio or other modern digital communications methods, that term might puzzle you. The term *all mode* is even something of a misnomer, because the unit does not have a speech synthesizer or digital voice recorder. It also doesn't send or receive any of the television modes. Still, the KAM™ is quite a powerful device. It is a full-featured packet-radio terminal-node controller (TNC) that includes ports for an HF and a VHF radio.

The TNC includes a personal bulletin board system and a Gateway™ feature that enables the HF and VHF ports to be linked. The KAM sends and receives Baudot, ASCII and AMTOR radioteletype, and Morse code. In addition, the KAM demodulates weather-facsimile signals. (You need a computer program that is able to interpret and display the data in order to see these pictures, however.) The review unit included 32 kbytes of RAM, but did not include the optional battery backup for this RAM.

Table 1

Kantronics All-Mode Communicator, Serial No. 74146

Power requirements: 12 V dc at 300 mA from plug-in transformer (included).

Terminal interface: RS-232-C interface with DB25 connector. (Only six lines are used for the computer connection. Other lines provide an alternative 12-V dc input and mark/space output for an external oscilloscope.) Autobaud data selection rates of 300, 600, 1200, 2400, 4800 and 9600 bauds.

HF radio interface: 8-pin DIN connector provides connections for AFSK output, FSK output, audio input, push-to-talk (PTT) line, key out, ground and squelch.

VHF radio interface: DB9 connector provides connections for AFSK output, PTT line, audio input, ground and squelch. There is also an alternative 12-V dc input line.

Dimensions: 1-3/4 × 5-7/8 × 9 inches (height, width, depth).

The Owner's Manual

Before you attempt to operate a unit like the KAM, read the manual. This 104-page document explains how to make all the appropriate connections, and explains how to use the various operating commands. In addition, there is quite a bit of useful operating information for the various modes. Because the KAM has evolved quite rapidly, there were two update booklets included with the review unit. These booklets cover updates for versions 2.8 through 2.84. Updating earlier KAMs is accomplished by replacing an EPROM. If you are updating an early version of the KAM, you may also have to cut a trace on the circuit board and install a jumper at another place. (The review KAM had the version 2.84 EPROM installed.)

The portions of the owner's manual associated with connecting the KAM to your radios and computer are clear and easy to understand. The discussion of each command and what it does is a bit more complicated if you are not familiar with the commands for a packet-radio TNC. The explanations are quite thorough, however, and I learned a lot about packet-radio operation by reading through this text.

The sections of the manual devoted to operating information contain a lot of good instructions about operating on the various modes. There is at least some bad information as well, however. For example, in the discussion of Gateway operation (a link between the HF and VHF radio ports), the manual correctly states that FCC rules do not permit Gateway operation for unattended station operation. I found no mention that it would be a rules violation to allow HF digipeating with an unattended station without Special Temporary Authority (STA) from the FCC. There is a rather strong warning that "Some amateurs in your VHF local area network may not have operating privileges in the HF band...you must...exclude their use of your system." Actually, a Novice or Technician operator *can* legally use the gateway provided by a higher-class operator to gain access to HF packet-radio operations.

One complaint I might make of the KAM owner's manual is that it is difficult to find a particular piece of information for quick reference. Several times during the review period, I scrambled through the manual to find out how to perform some operation. Having read through the entire manual once, I knew the information I needed was in the book, but if I didn't remember the correct name of the command, I couldn't find the explanation. I'm not sure how the book could be organized better, but this problem is rather frustrating. Eventually, as I became more familiar with the commands and the manual, I was able to find the required information a little faster. There is a lot of information in this manual, and you will refer to it often as you learn to operate the KAM on its various modes.

Getting Ready for Operation

You can select either TTL or RS-232-C signal levels for connection to your computer. The Commodore VIC-20™, C64 and C128 computers require TTL signal levels, and the Apple® II series and IBM® PC and compatible computers require RS-232-C signal levels. You'll need a terminal program for your computer to communicate with the KAM. The manual includes listings of sample BASIC terminal programs for use with several popular computers.

The front panel of the KAM is neatly laid out and simple to understand. Two push-button switches make up the entire comple-

ment of operating controls! One of them turns the KAM on and off; the other (AM/FM) switches limiters into the demodulator for radioteletype reception (FM) or out of the line for CW operation (AM). The AM/FM switch can be in either position for packet-radio operation. One red and three green LEDs indicate the operating conditions on the VHF radio port. One red LED and two green LEDs indicate conditions on the HF port. A green LED on the right side of the unit serves as the power indicator.

Perhaps the most important portion of the front panel is the tuning indicator. This is a row of ten green LEDs that light to show when a signal is tuned properly on the HF port. I'll explain later how this works for each operating mode.

The rear panel is also easy to understand. There is a power connector, a DB9 connector for the VHF radio port, an 8-pin DIN connector for the HF radio port and a DB25 connector for the serial computer interface. The connectors are clearly labeled, and the owner's manual provides full details about wiring them. The KAM comes with cables for each of the KAM's connectors. All you have to provide are the appropriate connectors for your radios and computer.

The HF and VHF Radio Ports

What is the difference between the two radio ports? First, the VHF port is only set up to operate packet radio. The HF port is designed to work on all of the KAM's operating modes. There are also two modems in the KAM, optimized for their specific operations. The VHF modem uses standard Bell 202 tones of 1200 and 2200 Hz, and operates at 1200 bauds.

The HF modem is a versatile unit, with many user-selectable characteristics. You can select standard shifts of 170, 425 or 850 Hz. In addition, you can set the mark and space frequencies to use other shifts. You can set the signaling speed in 1-baud increments, up to 300 bauds. The default settings for HF packet-radio operation are 1600- and 1800-Hz tones, providing a 200-Hz shift, at a signaling rate of 300 bauds.

If there are only two front-panel controls on this piece of equipment, how can you control all of these operating conditions? Answer: software. You issue the various commands from your computer or terminal, and the KAM makes the appropriate changes. Those familiar with the command set of a TAPR TNC 2 will notice that most of the KAM's operating commands are identical to those of a TNC 2. This is not to say that the KAM *is* a TNC 2, however! Some of the commands are different, and the way the KAM performs some packet-radio functions is quite different from a TNC 2. In all, there are 165 commands that control various aspects of the KAM's operation.

Packet-Radio Operation

Most hams who consider purchasing a KAM will be interested in using it on packet radio. The KAM is, primarily, a TNC. I won't go into detail on packet-radio operation, nor on the operating commands for all of the packet-radio parameters. I will discuss some of the unique features of the KAM, however.

Depending on the value set with the MAXUsers command, you can have as many as *26 simultaneous connections* on the VHF port *and* 26 simultaneous connections on the HF port. This would be an interesting experiment! How many different simultaneous conversations can *you* carry on? I had as many as three simultaneous connections, but it gets pretty confusing trying to keep track of which stream each station is on, and switching between streams to transmit to the right person each time.

The operation of the personal packet-radio mailbox is very similar to packet-radio bulletin board stations (PBBS). Although not intended for use as a large community bulletin board station, the Kantronics Personal Packet Mailbox™ provides limited message storage and retrieval. Many of the commands are similar to those used with larger bulletin boards. You can store messages for other stations on the PBBS, and they can read your messages or leave messages for you or other operators. One drawback of this system is that the length of any message that you enter from your terminal is restricted to 255 characters. I found it easier to use another station as a digipeater when I wanted to store a message. I'd connect to the bulletin board in the KAM through the digipeater, just like any other station would. Other functions, such as listing, reading and removing (killing) messages are easily handled directly from your computer or terminal.

Another interesting feature of the KAM is the KA-NODE™. If you aren't familiar with the operation of packet-radio nodes, read on. When you connect to a KA-NODE, the node sends you a short list of commands that you can use to perform certain functions. The CONNECT command allows you to contact another node or station. You can request a list of all other nodes heard using the NODES command. The JHEARD command lists all stations that the KA-NODE has heard.

Perhaps the most powerful command is the XCONNECT command. This command allows transmission on the HF port of a signal received on the VHF port, making use of the KAM's Gateway feature. The Gateway feature can also be used by designating the Gateway (via the secondary-station identifier) as a digipeater for connection to stations on the HF port. (Stations on HF can also use the Gateway to connect to other stations on the VHF port.)

When you connect to a node and then instruct the KAM to connect to another station, you'll get a CONNECTED TO message just as if you had connected through a string of digipeaters. But there's a difference: The node receives your packets and acknowledges correct receipt of them. The node then sends the information to the other station. If the receiving station does not receive the packet correctly, the node retransmits the information. Your station does not have to retransmit the information, however, because the node has already acknowledged correct receipt of the information.

Another packet-radio operating mode is called KISS.[1] In KISS mode, the TNC really only functions as a modem and packet assembler/disassembler. You turn on the KAM's KISS mode by typing KIssmode ON at the cmd: (command) prompt. You must then use the RESet command, or one of several other commands listed in the manual, to begin KISS operation. Turning the KAM off and then on again restores normal operation.

If you issue the PErmanent command after turning KISS mode on, the KAM will only operate in that mode. You'll have to follow the owner's manual instructions to reset the EEPROM using the TEST/NORM jumper on the circuit board to restore normal operation. More information about KISS-mode operation of the KAM is given in the KAM owner's manual.

Some radios (especially hand-held radios with electret-capacitor microphones) require simple interface circuits to allow TNCs to key their push-to-talk (PTT) lines. (See the Kantronics KPC-2400 review in November 1987 *QST* or the ICOM IC-μ2AT review in May 1987 *QST* for examples of simple interface circuits.) The owner's manual describes a simple circuit modification that allows the KAM to work with such radios. This modification involves cutting one circuit trace and installing a jumper. I used the KAM with a Santec 2-meter hand-held transceiver and an Azden PCS-5000 2-meter radio for VHF packet radio. I did not have to provide any different interface circuitry to use either of these radios.

Because VHF/UHF packet-radio operation is effectively channelized (per the ARRL VHF and UHF band plans), there is no need to fine tune VHF and UHF packet-radio signals. Therefore, the KAM's tuning indicator does not operate in this mode. I used the KAM for HF packet-radio operation with a Kenwood TS-140S. The KAM's owner's manual provides all the information needed to connect the KAM to the TS-140S. Tuning of HF packet-radio signals is done by watching the tuning indicator LEDs. When a signal is tuned properly, the far right- and left-hand LEDs light, indicating correct tuning of the mark and space frequencies. I found this indicator easy to use, and it gives a positive indication of proper tuning. HF packet-radio operation is a bit different than that on VHF, mostly because there are more live operators and fewer bulletin-board systems.

To initiate an HF connect request, you have to type the HF stream-switch character, @, along with the letter of one of the active HF streams. Remember, if

[1]KISS stands for that old familiar saying, keep it simple, stupid, and was probably chosen to describe this mode of operation because of its inherent simplicity.—*Ed.*

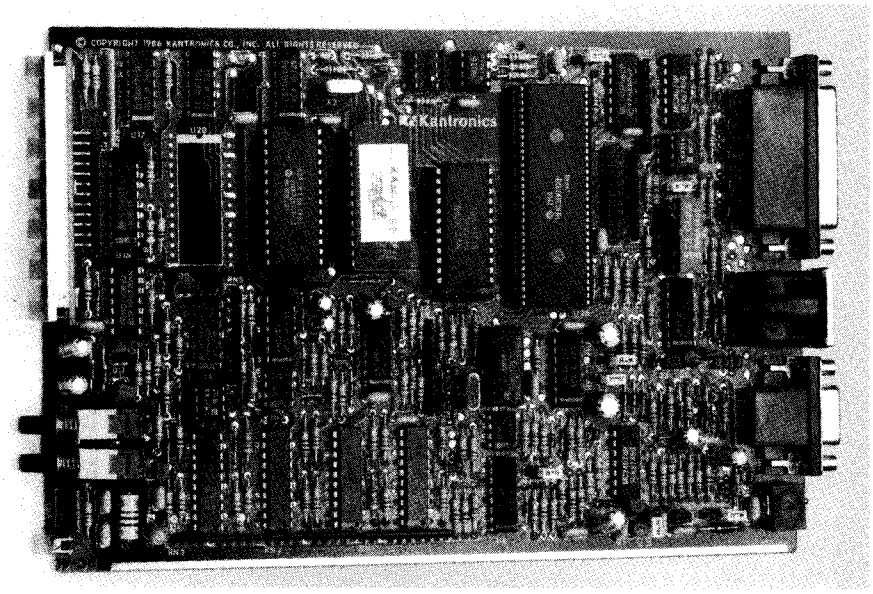


Fig 1—This view of the KAM's PC board shows the front- and rear-panel switches, displays and connections.

MAXUsers is set to something greater than 1, you can have multiple connects. Don't be surprised if someone else connects to your station shortly after you announce, "this is my first HF packet-radio connect!" And, of course, you may get a connection (or several) on VHF at the same time. It can really keep you hopping for a while.

CW Mode

When you change to the CW mode, you can set the KAM's Morse code sending speed to anywhere between 5 and 99 WPM in 1-WPM increments. The sending speed also serves to set the receive speed. The receiving program tracks speed within ±20 WPM of the set sending speed, but the closer you set the receive speed to the speed of the code you are receiving, the faster the program locks on and begins to copy. The KAM copies Farnsworth-spaced CW as letters with spaces between them; it locks onto the character-sending speed, not the word-sending speed. The KAM can't generate Farnsworth-sent CW. I found the KAM's CW mode to be the best machine copying system I have ever used. It is amazing how accurately the KAM copies well-timed CW, even in QRM and QRN.

In addition to the CW sending speed, you can change parameters to set the filter bandwidth, the center frequency of the filter and the way characters are echoed to the screen. The KAM has built-in, user-programmable switched-capacitor CW filters with excellent filtering characteristics. You can easily fine-tune the filters to different radios and operator preferences. You start by setting the filter center frequency to match your radio's CW offset. If you properly tune in a CW signal on your radio, the far-right LED of the KAM tuning indicator should light with each dot or dash. If it doesn't, you can easily change the filter center frequency. Changing it by a few hertz at a time, you can observe some rather dramatic effects.

After you have set the center frequency, you can adjust the filter bandwidth. The narrower you make the bandwidth, the more critical the tuning is, so there are some practical tradeoffs. I was able to get the KAM to copy Morse code through some fairly difficult interference conditions by carefully adjusting the filters. You will probably want to reset the CW bandwidth to a wider value before you leave the CW mode, or you may find that it is almost impossible to tune in another signal later.

The KAM uses a reed relay to ground the key line to your radio. This should work with both positive- and negative-keyed radios. I had the KAM connected to several HF radios, and it worked flawlessly with all but one. For some reason, the relay would not key a Uniden® President™ HR2510 10-meter transceiver. The KAM's schematic shows a 100-Ω resistor in the key line, and I suspect that this resistance prevents the key line from being pulled low enough to key the '2510. It should not be too difficult to build a simple transistor keying circuit to go between the KAM and a radio that needs lower keyed-state resistance than the KAM provides.

One criticism I have about the KAM's CW operation also applies to radioteletype and AMTOR operation. There's no provision for split-screen operation with the KAM. Other Morse and RTTY programs I've used provided a split-screen system in which the received copy is displayed at the top of the screen and the bottom of the screen offers a type-ahead buffer. This does not seem practical with the KAM, however: Either received data continues to be displayed as you type a reply (which causes all the characters to be mixed together on the screen), or display of received data halts when you begin to type a reply. Some terminal programs may be able to provide split-screen operation.

Radioteletype

Baudot and ASCII radioteletype operation at a variety of signaling speeds and frequency shifts is possible with the KAM. You can select any desired signaling rate, in 1-baud increments, up to 500 bauds. You can also select any standard frequency shift; 170, 425 and 850 Hz. If you select the "modem shift," the MARk and SPace commands set the desired mark and space frequencies.

A signal is properly tuned when the far left and right LEDs on the tuning indicator are lit. The biggest problem with receiving radioteletype signals is that several speeds are in fairly common use, and until you've gained some experience with the sounds of these various signals, it is difficult to know what speed to set the KAM to. Some stations also transmit on upper sideband instead of the conventional lower sideband, which results in signals that are "upside down." So there are a few variables that all have to be correct before you get readable copy on your screen. Once you've found the right combination for a given signal, though, the KAM does an excellent job of copying, even through fairly deep fades and some interference.

Fourteen KAM commands control various RTTY operating parameters, such as the signaling rate, the addition of automatic carriage returns and line feeds, and the autostart feature. With AUTOStart on, the unit only responds to RTTY signals that are preceded with the call sign set in MYcall. A series of four *N*s to signify "end of message" turns the unit off again, as does more than 30 seconds of inactivity.

The owner's manual incorrectly states that HF RTTY produced by feeding audio tones into the microphone input of an SSB transceiver is audio-frequency-shift keying (AFSK). (The designator for this emission is F2B.) Actually, F2B is only permitted above 50 MHz. When frequency-shift-keyed audio tones are fed into an SSB rig, frequency-shift keying (FSK) is produced. This emission is J2B and is identical to F1B, which *is* permitted at HF.

AMTOR

AMTOR operation is fairly straightforward with the KAM. AMTOR is a form of RTTY, and the same commands control basic AMTOR operating parameters as are used for Baudot and ASCII RTTY. The owner's manual includes basic operating suggestions that will get you started. AMTOR provides virtually error-free communications, and I find it to be a *fun* mode.

If AUTOStart is set to on, the KAM responds only to AMTOR signals that are preceded with the selective calling identifier (usually known as a *selcall*) set with the MYSelcall command. This autostart opera-

(continued on page 62)

April 1989 *QST*, page 57, for a listing of where to apply.

MYSTERY SOLVED! EXPERT NAMED!

In April *QST*, we posed a question to our readers about the nature and function of a mysterious box pictured on page 56. We knew that in all of hamdom, there would be a few brave souls who would not only venture a guess, but would get downright detailed in their explanations about the gadget's use. We're gratified to learn just how closely some of you follow our technical articles, for several sharp-eyed respondents remembered having seen this device, right here in this column, just two months earlier (see Feb 1989 *QST*, page 62).

That's right—the box was the chassis and innards of the control unit and power supplies for the Robot 1200 SSTV system used in the last Foundation-sponsored SAREX mission. Respondent Vic Gomez, W4DN, commented that this trivial pursuit might be an April Fool's joke and suggested hanging this editor up by the thumbs (ouch!). However, our thanks go to Jim Miccolis, N2EY, of Upper Darby, Pennsylvania for his very correct (and early) answer. We crown him the "Definitive Expert." Should you work Jim on the air, show a little respect!

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Jesse Bieberman Meritorious Membership Fund

Arnold Cohen, KF7MK

Mr. Cohen comments: Jesse was a very active sponsor of a model airplane club that I was in during the 1930s. He also first exposed me to Amateur Radio. I have many fond memories of him.

The Goldwater Scholarship Fund

Arizona Repeater Association, Inc
in memory of Dee Southard, N7FVO, Kirk Kirshoff, WA7KQE, Betty Kaiser, WA6HRX, Robert Berge, W7DNR, and Angus MacDonald, KA7EUI

The FEMARA Scholarship Fund

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in memory of Edward G. Olson, W1FZS
Vincenzo Belloni, IØKWX
Emil Calise, KE2R
John Thornton, WA8HQD

As received and acknowledged during the month of **March**.

Product Review

(continued from page 41)

tion receives messages sent in the forward-error-correcting (FEC) mode.

Weather Facsimile Reception

Equipped with version 2.8 software (and subsequent versions), the KAM provides weather FAX reception. A separate terminal program for your computer is required to copy these pictures. In FAX mode, the KAM continuously samples the audio input from the radio, and presents that data to the computer. The computer terminal program must receive the data and use it to turn on and off screen pixels to form the picture.

The manual addendum that comes with the version 2.8-equipped KAMs includes some information about writing your own program to display FAX pictures. Writing such a program is beyond my BASIC programming skills! Kantronics has programs for the IBM PC and compatible computers and for the Commodore 64 and 128 computers. Neither of these programs were included in the review package, so I didn't use the FAX feature of the KAM. Based on the way all of the other KAM features work, I have every reason to believe that the FAX portion of the unit also performs as described.

Summary

I found the KAM to be fun and easy to operate. I enjoyed trying all of the various modes. My wife, Jean, is also licensed; she's WB3IOS. After Jean tried packet-radio operation, I was constantly competing with her for time to use the KAM. In fact, she was more likely to check bulletin boards and send messages than I was. She made several new ham radio friends through her packet-radio activity, and has become more interested in trying other modes.

I initially experienced some minor problems getting all of the packet-radio parameters set for compatibility with my computer and radios. I think this is normal; you have to experiment with some parameters to find the proper settings. Once those parameters were set correctly, everything worked fine.

One other minor annoyance that I ran into was caused by my three sons playing computer games on the KAM's host computer. I allowed the boys to turn off the terminal program when they wanted to play games, but we occasionally forgot to reboot the terminal program when they finished. I left the KAM on continuously to monitor activity. The KAM stores all this received data in its internal memory until the terminal program signals that it is ready to receive information. If the KAM memory fills, the unit locks up and you can't send it any commands. Turning off the KAM for a few seconds was the only way I could regain control of the unit. Of course, this action resets any parameters not PErmed, and wipes out anything in the Personal Packet Mailbox. I believe the optional RAM battery backup would prevent the loss of operating parameters and PBBS information. Based on this, I recommend that option.

If you are looking for a packet-radio TNC, but think you'd like to try some other digital modes as well, the Kantronics All-Mode communicator is worth consideration.

Manufacturer: Kantronics, Inc, 1202 E 23 St, Lawrence, KS 66046, tel 913-842-7745. Price class: $300.

Feedback

☐ In the May 1989 Product Review column (p 54), the caption for Fig 4 contained incorrect information. The caption should have read:

Worst-case spectral display of the ARD 230A amplifier. Power output is 1490 W at 3.5 MHz. Horizontal divisions are each 5 MHz; vertical divisions are each 10 dB. All spurious and harmonic emissions are at least 50 dB below the fundamental output (−50 dBc). The ARD 230A meets current FCC spectral-purity requirements.

We apologize for any inconvenience caused by this error.