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220-MHz Adventure: *QST* Reviews--Kenwood TH-31BT, Yaesu FT-109RH and Cushcraft ARX-220B

Kantronics KPC-2400 Packet Communicator

Nel-Tech Labs DVK-100 Digital Voice Keyer

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220-MHz Adventure: *QST* Reviews

- The Yaesu FT-109RH and Kenwood TH-31BT 220-MHz Hand-Held Transceivers
- The Cushcraft ARX-220B 220-MHz Ringo Ranger Antenna

Because of Novice Enhancement, Novices can enjoy the kind of personal communication on 220 MHz that higher-class licensees have enjoyed on VHF FM for years. There have been many times when I wished that my wife Leslie and I could use 2-m FM, but Leslie has never had a great desire to upgrade from Novice. Now that we can use 220-MHz FM, we were very happy to review two 220-MHz hand-held transceivers—the Yaesu FT-109RH and the Kenwood TH-31BT.

Transceiver Features

These two hand-held radios remind me of how some people buy automobiles simply for transportation, while others buy large luxury sedans. Both automobiles will get you where you want to go, but not in quite the same way! The Kenwood TH-31BT is a "basic transportation" radio—no frills, but it certainly gets you where you want to go. The Yaesu FT-109RH is like a big luxury car—lots of features, but with a size and price tag a bit larger than the TH-31BT.

Both transceivers cover 220-225 MHz. The Kenwood has a 100-mW low-power output and 1-W output at high power. Yaesu specifies an output of 500 mW on low power, but the review unit produced closer to 350 mW. High power for the Yaesu is 5 W. Both transceivers operate simplex or with plus or minus repeater offset—the repeater offset on the Kenwood is fixed at the standard 1.6 MHz, while the Yaesu's offset can be varied.

Luxury Extras

Kenwood TH-31BT

The TH-31BT has few features. The Kenwood's operating frequency is controlled by thumbwheel switches on the top of the radio, and a small red LED indicates when the radio is transmitting. Its only frills are a dual-tone, multifrequency (DTMF) keypad for phone-patch use and a built-in subaudible tone encoder that is controlled by a DIP switch on the front of the radio and activated through the TONE button on the top panel. Many 220-MHz repeaters use subaudible tones, so this is a handy feature. Rear-panel switches control power level (HI-LO) and repeater OFFSET.

Yaesu FT-109RH

The Yaesu FT-109RH is *loaded* with extras. The transceiver has 10 memory channels that store simplex and repeater channels, including offset information (standard, nonstandard or none). The radio also has memory scanning capability. You can scan all 10 memories or choose only a few. All of these features are controlled from the front-panel keypad, which also acts as a DTMF pad for autopatch and repeater control functions. The radio emits a beep every time a key is pressed, but the beep *can* be disabled. (I was pleased to find the instructions for disabling the beep at the front of the features section in the operating manual.) You can scan memories to look for a used channel or a quiet channel. You can also scan a range of frequencies to look for a frequency in use or a quiet spot. A red LED indicates transmit mode, and a green LED indicates a busy frequency when the radio is unsquelched on receive.

When scanning, the radio steps through the selected memories (or through the preset frequency range) and stops either on a busy frequency or a clear frequency, depending on the setting of a front-panel slide switch. After approximately three seconds, scanning resumes—even if there is still activity on the receive frequency. To stop the scanning, you must press the PTT switch, the up or down arrow buttons or the D (for "Dial" mode) button. Pressing the PTT switch while scanning stops the scan, but doesn't activate the transmitter.

Memory channel 0 (zero) is the "call" channel. This is a handy feature—if you place your favorite repeater or simplex frequency in channel 0, you can call it up by simply pressing the asterisk (*) key at any time. To select another memory channel, you must press the number of the memory, followed by the MR (memory recall) button. The up and down arrow keys can also be used to step through the memory channels or to manually tune the radio through a range of frequencies.

A "priority channel" feature is also included. To enable this feature, you recall a memory channel, and then set another operating frequency with the manual dial mode. Pressing the # key then activates the priority function. Every three seconds, the radio checks the initial memory frequency while you operate on the secondary dial frequency. The radio automatically switches to the priority channel when activity is detected there.

The function of the front-panel meter is determined by the setting of the S/PO - BC switch. When this switch is set to S/PO, the meter indicates signal strength in receive and relative power output in transmit. When the switch is set to BC, the meter acts as a "fuel gauge"—a useful way to keep an eye on your battery power consumption.

The front-panel KEYLOCK switch locks the keypad, but does not disable the PTT switch. A light is provided for night use; this light stays on only as long as you press the right-side-mounted LAMP switch. Because of this, using the transceiver at night is definitely a two-handed operation—the PTT switch is mounted on the *left* side.

The VOX LOW and ON switches on the top panel are disabled except during VOX operation with the optional YH-2 headset. When the YH-2 is connected, the ON button activates VOX operation and the LOW button decreases VOX sensitivity to prevent ambient noise from keying the transmitter.

Battery Power

Both radios are supplied with NiCd battery packs and trickle chargers. The Kenwood charger puts a full charge on the supplied battery pack in just 8 hours, while the Yaesu charger requires 15 hours to recharge the battery pack.

The TH-31BT's size allows room for only six AAA-size (180 mAh) NiCd cells. The radio draws 35 mA on squelched receive; even with short transmit periods, the battery won't last much longer than about 5 hours, and a very short time on high power (the radio draws 600 mA during high-power transmit). A larger, 500-mAh pack is available that increases the overall size of the radio, but we did not have the larger battery for Product Review testing. The battery must be removed from the Kenwood for charging. Kenwood manufactures a dc-to-dc adapter that includes a cigar-lighter plug for mobile use (DC-25).

The FT-109RH is supplied with a 500-mAh battery pack that can be recharged while it is on the radio—the charger receptacle is on the bottom of the battery pack. A 12-V dc receptacle is also provided on the bottom of the battery, allowing the radio to be plugged into an external dc power supply. Plugging in the dc supply disables the battery, and as soon as the dc supply is disconnected, the radio switches back to battery power. Yaesu also makes an automobile dc adapter that simultaneously provides dc power to operate the radio and a trickle charge for the battery.

On low power, the Yaesu battery lasts quite a while. The radio includes a "battery saver" feature; the radio goes dormant for short periods and only checks the receive frequency at intervals. The checking interval is fixed at 300 ms, but you can vary the delay between

Table 1

Kenwood TH-31BT 220-MHz Transceiver, Serial No. 7100172

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 220 to 225 MHz.	As specified.
Mode of operation: FM.	As specified.
Frequency display: Thumbwheels.	As specified.
Frequency resolution: 5 kHz.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Power output: High, 1 W; low, approx. 150 mW.	High, 1.4 W; low, 330 mW.
Spurious signal and harmonic suppression: Better than −60 dB	See Fig 1.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: S/N more than 28 dB at −6 dBμ (0.5 μV) input. 12-dB SINAD, less than −12 dBμ (0.25 μV)	S/N with 0.5 μV input, 29 dB. 12-dB SINAD, 0.15 μV.
Squelch sensitivity: Less than 0.2 μV.	0.05 μV, min, 0.22 μV, max.
Receiver audio output at 10% total harmonic distortion: More than 250 mW.	As specified.
Color: Black.	
Size (height, width, depth): 5 × 2½ × 1-1/8 in.	
Weight: 0.65 lb.	

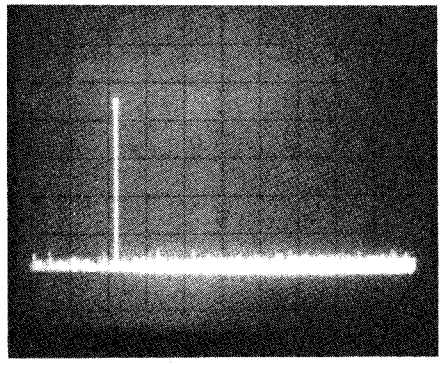


Fig 1—Spectral display of the Kenwood TH-31BT operating at 222.0 MHz with approximately 1.4 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 24 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious emissions are at least 66 dB below peak fundamental output. The TH-31BT complies with current FCC specifications for spectral purity.

Table 2

Yaesu FT-109RH 220-MHz Transceiver, Serial No. 6M010430

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 220 to 224.995 MHz.	As specified.
Mode of operation: FM.	As specified.
Frequency display: Four-digit LCD.	As specified.
Frequency resolution: 5 kHz.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Power output: High, 5 W; low, 0.5 W.	High, 5.6 W; low, 370 mW.
Spurious signal and harmonic suppression: −55 dB or better.	See Fig 2.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: S/N more than 30 dB with 1.0 μV input. 12-dB SINAD, less than 0.25 μV	30-dB S/N with 0.92 μV input. 12-dB SINAD, 0.2 μV.
Squelch sensitivity: Not specified.	0.18 μV, min, 0.5 μV, max.
Receiver audio output at 10% total harmonic distortion: More than 450 mW.	620 mW.
Color: Silver.	
Size (height, width, depth): 6-5/8 × 2½ × 1-3/8 in.	
Weight: 1.35 lb.	

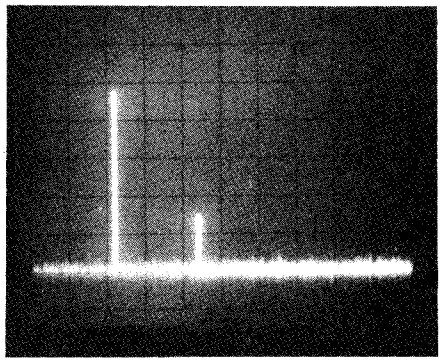


Fig 2—Spectral display of the Yaesu FT-109RH operating at 222.0 MHz with approximately 5.6 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 kHz. The fundamental has been reduced in amplitude approximately 22 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious emissions are at least 55 dB below peak fundamental output. The FT-109RH complies with current FCC specifications for spectral purity.

checks from 300 ms to 1.3 seconds. This feature really helps conserve the battery. On high power, the battery is rapidly depleted. The radio draws 1.2 A during high-power transmit.

Accessories

Plastic carrying cases are available for both radios. The optional Kenwood case has a clear plastic covering for the DTMF pad, and a metal belt clip is supplied with the case. The case must be partially removed to change the battery pack. The Yaesu case is supplied with the radio. This case has a clear plastic opening for the LCD frequency readout, but the DTMF and frequency-entry keys are accessed through an opening in the case. There is a hole in the bottom of the case for connecting the battery charger, so the battery can be charged with the radio still in the case. The case must be completely removed to replace the battery pack.

Speaker microphones are available for both radios; in addition, a headset/boom microphone combination is available for the Yaesu. The VOX circuit in the Yaesu is enabled when the headset/mic is used. Neither speaker microphones nor the YH-2 headset were supplied with the Product Review units.

We purchased an RA-9A "stubby duck" antenna for the TH-31BT. This antenna is considerably shorter than the standard antenna. The shorter antenna performed about as well as I expected—a bit worse than the standard antenna. With the standard antenna, and on low power, I can just access the W1AW 220-MHz repeater (about one mile away) from inside my office. With the stubby duck antenna, I could not raise the repeater on low power. For public-service use in a repeater's primary service area, the stubby antenna would be useful, but I think that most users will want to stick with the standard antenna.

Operation

I enjoyed both of these radios. Most of the time, Leslie used the Kenwood and I used the FT-109RH. I found the Yaesu's memory features to be handy, and I used the memory scanning quite a bit to explore the repeaters in the Hartford, Connecticut, area. I was able to monitor several repeaters, and could meet Leslie on whatever repeater was most convenient for her. The high-power output was also convenient, particularly when I had the radio connected to an outside antenna and an external power supply. I found myself wishing

for a "medium power" position for the times when 350 mW was not enough power, but 5 W used up the battery too quickly.

The Kenwood hand-held performs well. Its small size and light weight make it easy to take along anywhere. Even a new Novice will find it an easy radio to use, as there are a minimum number of controls to worry about. I might purchase a larger battery pack for my radio, but the 180-mAh battery pack is small enough so I can keep a fully charged spare in my pocket or the glove compartment. The Kenwood TH-31BT is an excellent "basic transportation" radio and a good value for someone who wants to try 220-MHz operation with a minimum investment.

Each of these radios will find enthusiastic users. The Yaesu is much larger and heavier, and, as a result, it feels a bit more rugged than the Kenwood. The TH-31BT's size and light weight are definite pluses for some applications, however, and the radio can be used unobtrusively just about anywhere.

Cushcraft ARX-220B Ringo Ranger

To complete our home 220-MHz station, we needed an outside antenna. The W1AW repeater in Newington is just a bit too far from our home to hit with a "rubber duck," but I could use the repeater reliably from inside the ARRL HQ building (a real "black hole" for RF). I put up a home-brew ground plane, but I wanted to try a different, perhaps better, antenna.

The Cushcraft Ringo Ranger is designed around three 5/8-wavelength radiating sections, with a coupling "hairpin" in the center. The antenna also has a set of ground-plane radials that are separated from the main body of the antenna by a short length of coaxial cable. The antenna must be mounted on a mast at least three feet long, as the ground-plane-radial section clamps around the mast. A matching section is provided to tune the antenna (the matching section is a ring around the base of the antenna; this is where the "Ringo" comes from)—you slide a matching bar along the ring to tune the antenna.

The Ranger is made of aluminum tubing, with all stainless-steel hardware. The directions supplied with the antenna are very brief, but clear. Most of the explanation is accomplished with a large pictorial diagram. I had no trouble putting the antenna together. For initial adjustments, I mounted the antenna on a short mast in the middle of my back yard, and tuned it using a Bird wattmeter and the Yaesu FT-109RH hand-held transceiver. Sliding the matching bar along the ring quickly produced a 1.1:1 SWR.

How does the antenna perform? I mounted it on my roof at the same height as my ¼-wave ground-plane antenna, and noticed a significant performance improvement, compared to the ¼-wave antenna. Cushcraft claims that low-angle radiation is especially enhanced, and 5/8-wavelength antennas generally perform better than ¼-wave ground planes in this regard. This is evidenced with the Ringo in much improved simplex range as well as better performance on distant repeaters. Performance with mid-range machines is about the same. The improvement in simplex range is dramatic! Leslie drove around with her hand-held, and we were able to work much farther with low power on the Ringo than we could with the ¼-wave antenna.

This is a good antenna. I noticed only a couple of disadvantages compared with the ¼-wave ground plane; the Ranger *must* be tuned for minimum SWR, and it is much larger than the ground plane. A 220-MHz ¼-wave ground-plane antenna is only 12 inches high, while the Ringo is approximately 10 feet high, fully assembled.

Manufacturers: Yaesu FT-109RH, Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 213-404-2700. Price class, $380.

TH-31BT, Kenwood USA Corp, 2201 E Dominguez St, Long Beach, CA 90810, tel 213-639-7140. Price class, $270.

ARX-220B Ringo Ranger, Cushcraft Corp, PO Box 4680, Manchester, NH 03108. Price class, $52.—*Bruce S. Hale, KB1MW*

KANTRONICS KPC-2400 PACKET COMMUNICATOR

Kantronics has broken the 1200-baud barrier for terminal node controllers with the model KPC-2400. This packet communicator features the functions of the Kantronics KPC-2 for 300-baud HF and 1200-baud VHF work. But then the KPC-2400 goes a step beyond in providing for a new phase-shift keying (PSK) for 2400-baud work. All rates are software selectable.

If you saw the March 1987 *QST* article on packet-radio TNCs by Stan Horzepa, WA1LOU, then you know that many models are available from several different manufacturers.[1] Indeed, TNC technology has been advancing rapidly, and it appears that someone is announcing a new model every few months.

It seems not so long ago that a Kantronics KPC-1 TNC was purchased for *QST* Product Review. Before the type could be set for that review, Kantronics announced a new, improved TNC, the KPC-2, which made the KPC-1 obsolete for review purposes. Through an exchange of PROMs with Kantronics, we upgraded the KPC-1 with Version 2 software. We proceeded to review that version. I had the opportunity to use that upgraded TNC for a number of months before it, too, was returned to Kantronics under their KPC-2400 exchange program. It was a pleasure to move up to the new model when it arrived!

The Box

The front panel of the KPC-2400 has a clean look with no controls and only 5 LED indicators. These are labeled POWER, XMIT, RCV, CON and STA. The power switch is located on the rear panel, and with 12 V dc applied, the green POWER LED glows. A 12-V wall power adapter is included with the KPC-2400.

The other four LEDs are red. The XMIT (transmit) LED is illuminated when the TNC keys the PTT line to send data, and the RCV (receive) LED lights when the TNC detects a signal on the channel. The CON and STA indicators were new to me—they were not included in the KPC-1. The CON (connect) LED shows when a connection is established with another station. The STA (status) indicator glows when the TNC contains outgoing packets that have not been acknowledged. For me, this is a useful addition, giving an indication of delays on busy channels during the exchange of message files.

The rear panel has a clean look as well, with a push switch for PWR on/off and four connectors labeled +12VDC, RADIO, AUD and COMPUTER. All connections to the TNC are made at the rear panel. Power may be applied through the 12-V jack from the power adapter that Kantronics supplies, or alternatively, power may be applied through the 9-pin (DB-9) RADIO connector. The separate audio jack, AUD, is bridged to the audio pin of the RADIO connector. Thus, receiver audio tones may be routed either via the separate jack or the TNC RADIO connector. A convenient arrangement, suggested in the instruction manual, is to connect the audio pin of the RADIO connector to the external speaker jack of the transceiver. Audio is thus brought to the TNC, and leads to an external speaker can be plugged in the TNC AUD jack.

Other connections made via the RADIO connector are AFSK output tones to the transmitter, PTT and ground. Provision is also made at the RADIO jack to connect to the receiver squelch line. This line normally need not be connected; the manual suggests its use if the packet channel is shared with voice communications.

The COMPUTER connector on the rear panel is a female DB-25. A jumper plug inside the TNC enclosure provides for operating at either RS-232-C or TTL signal voltage levels through this connector. This selectable option provides for direct interface to the IBM® PC and compatibles, as well as the VIC™, C64 series or other computers.

The photo shows the KPC-2400 removed from its enclosure. The entire TNC, including power switch, connectors and LED indicators, is contained on one circuit board measuring 5-3/8 × 7-1/8 inches. Thus, there is no requirement for leads to external jacks, controls or indicators. The cabinet is a very sturdy 4-sided aluminum box with 1/8-inch-

[1]S. Horzepa, "The Shopper's Guide to Packet-Radio TNCs," *QST*, Mar 1987, pp 17-21 and 44.

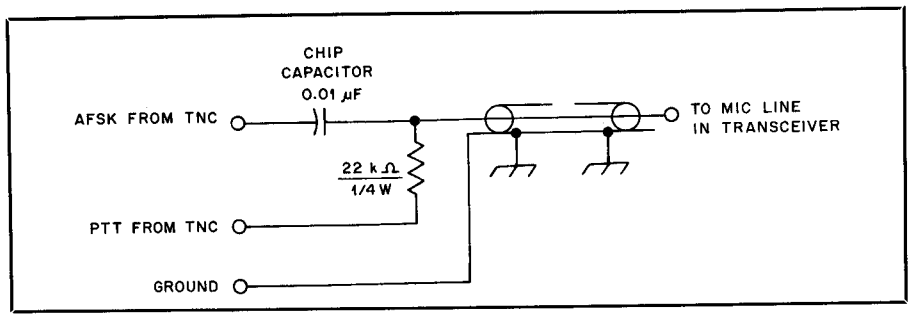
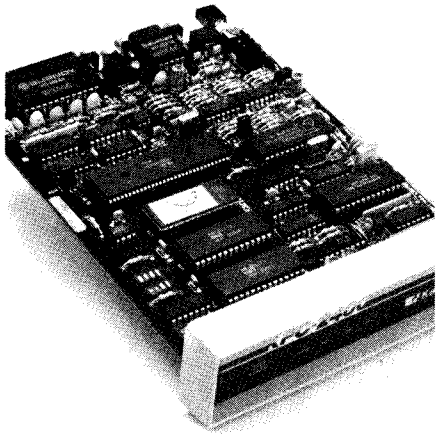


Fig 3—Hookup diagram for mating the KPC-2400 to a transceiver having no separate PTT line, such as the ICOM IC-2.



thick walls, with the side walls reinforced by additional thickness. The PC board slides into grooves formed in the side walls of the enclosure, and the front and rear panels and escutcheons are secured to the box with screws. This is undoubtedly the strongest enclosure I have ever seen for radio equipment. Although we didn't try it, I believe you could drive a truck over this TNC and it would suffer no severe damage.

The main "works" of the KPC-2400 is a 6303 microprocessor. A 27128 PROM contains the Kantronics firmware, written to comply with the ARRL AX.25 Version 2.0, level 2 protocol. (Version 1, level 2 protocol is also software selectable.) For 300- and 1200-baud communications, the unit uses AM 7910 IC modems. Operation at 2400 bauds is obtained with a differential phase-shift keyed (DPSK) modem IC developed by Kantronics. This IC is a type P423.

The TNC also contains an EEPROM that stores information such as the user's call, timing functions and operating parameters that may be selected by the user. This ROM is repeatedly reprogrammable, up to 1000 times or more. The advantage of having the EEPROM is that the data content is not lost when power is removed from the TNC.

As supplied, the KPC-2400 contains two 8-kbyte Random Access Memory (RAM) ICs, giving a total of 16 kbytes during operation. This RAM provides buffer space for packets being exchanged and other information, such as stations heard. The RAM can be expanded to 32 kbytes by replacing both ICs with a single 32-kbyte RAM IC (which need not be obtained from Kantronics). Specific instructions are given in the manual for this change. All of the larger ICs in the KPC-2400 are socket mounted. The materials and workmanship in the board assembly are of the finest quality.

Hookup and Operation

The KPC-2400 comes with an accessory bag of prewired cables. You must provide and install the connectors for your station equipment—those to fit the mic jack, external speaker jack, the PTT line and the serial port of the computer. Detailed data with pin-out connections of the 9-pin RADIO and DB-25 COMPUTER connector is included in the instruction manual. (Only 5 of the 25 connector pins are normally used in the computer interconnection.)

To test the KPC-2400 on the air, I used an Apple® //e computer with a Microtek SV-622 (RS-232-C) serial interface card, running under ASCII Express™. The original prewired DB-25 plug assembly from Kantronics had disappeared, so I was using a cable with all 25 pins interconnected. Although I used the exact hookup that had worked well with the upgraded KPC-1, the computer and the KPC-2400 just would *not* talk to each other. By fiddling with software options regarding permanent carrier versus non-permanent carrier, I was able to get the computer and the TNC to speak to one another, but as soon as I'd make a packet connection, zap! The two would stop communicating and everything would lock up!

A lengthy series of checks revealed that the polarity of the data carrier detect (DCD) line (pin 8) from the KPC-2400 was reversed from that used in my Hayes-compatible telephone modem, and also reversed from that used with the KPC-1 (if DCD information was indeed provided by the KPC-1). This is not one of the lines that is connected in the prewired connector, and simply opening that line in the interconnecting 25-conductor cable solved my problem. However, opening this line limits the use of the TNC to computer software not requiring the sensing of a "carrier," that is, a packet-radio connection. Bulletin board software, for example, does require this information. There appears to be no provision in the KPC-2400 for reversing the polarity of this line. However, in separate tests, the TNC was found to be compatible with the IBM PC while the DCD line was connected.

When the KPC-2400 is first turned on, an autobaud routine is activated to seek the baud rate that is compatible with the computer terminal. Data interchange with the computer is done with no parity, 8 bits, 1 stop bit. The TNC will talk to the computer at 300, 600, 1200, 2400, 4800 or 9600 bauds. You can select a fixed baud rate and store the information as a default in the EEPROM. Simply issuing the PERM command to the TNC reprograms the EEPROM to all the parameters that exist at the time the command is issued.

I used the TNC with an ICOM IC-2 two-meter hand-held transceiver that has no separate PTT line. Rather, with an external mic connection, the IC-2 is keyed with a dc closure of the audio line. Installing a resistor and a capacitor in the mic line to the IC-2 provides for proper operation. The hookup is shown in Fig 3. An internal jumper in the KPC-2400 provides for selecting the AFSK level, high or low. In the HIGH position, the level is 44 mV P-P, and 10 mV P-P in the LOW position (open circuit voltages). If a higher output level is required, the Kantronics manual gives instructions for changing a resistor on the TNC circuit board.

The Instruction Manual

The instruction manual contains an excellent summary of information about packet radio for a newcomer, and several pages of data and suggestions for interfacing the TNC with station equipment and various computer terminals. The manual also includes a full description of all available software commands and options.

About the only information the manual does not contain is technical data that might be helpful for troubleshooting and repairing the KPC-2400. A pictorial diagram shows the circuit-board components by part designator (U15, R77 and so forth), but no accompanying information is provided to identify these parts. No circuit diagram is included. Under normal use, however, the TNC may never need repair. There are no adjustable controls or other components needing calibration, and the use of high-quality components should assure a long life for the KPC-2400.

Table 3 provides additional data about this TNC. In summary, the KPC-2400 has broken the 1200-baud barrier for packet communications, while still providing for 300-baud HF operation and 1200-baud VHF contacts. Newer TNC models may appear, but the KPC-2400 will likely be with us for years to come.

The KPC-2400 is manufactured by Kantronics, Inc, 1202 E 23rd St, Lawrence, KS 66046. Price class: $329.—*Jerry Hall, K1TD*

NEL-TECH LABS DVK-100 DIGITAL VOICE KEYER

For as long as there have been contests, there have been lazy contesters. I'm one: My voice simply does not last for more than about 30 hours of continuous use. When the opportunity came along to review the Nel-Tech Labs DVK-100, naturally I accepted. In addition to testing the functional aspects of this new toy, I might actually be able to speak in more than incoherent rasps after a 48-hour contest!

In principle and operation, the DVK-100 is very similar to the familiar CW memory

Table 3

Kantronics KPC-2400 Packet Communicator, Serial No. 57534

Power requirements: 10 to 14 V dc, 12 V nominal, 350 mA (117 V ac power adaptor supplied).

Computer connection: DB-25 female connector (requires male plug to mate); internal jumper selection of RS-232-C or TTL signal levels.

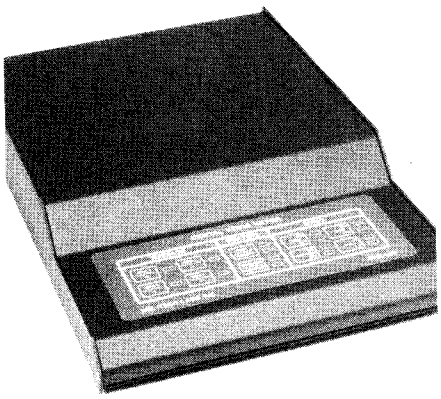
Data interchange with computer: 8 bits, no parity, 1 stop bit, at 300, 600, 1200, 2400, 4800 or 9600 bauds.

Radio connection: 9-pin connector (supplied). Separate audio jack provided for connection of external speaker.

Communication data rates (radio): 300, 1200 or 2400 baud, software selectable.

Dimensions (HWD): 1¾ × 5¾ × 8 in.

Weight: 2¼ pounds.



keyer. It is designed to eliminate all but the most basic function in an SSB contester's transmitting: answering calling stations. Other than that, there is little need to use a microphone during the contest when the DVK-100 is on line. It records CQ and exchange messages and plays them back at the press of a key.

Until recently, the only way of conveniently and inexpensively storing voice messages has been on a mechanical tape loop. Although this method does the job, it is not convenient to use in most stations. Tape loops seem to fall prey to Murphy about 10 times more often than any other station accessory. (Independent studies have shown that Murphy works most vehemently to disable the most needed equipment in the station.) The DVK-100 uses digital voice recording technology, the modern replacement for recording tape. It is housed in a low-profile cabinet with the control switches in a horizontal position close to the front of the cabinet.

Electromagnetic interference, electrostatic discharge, and radio-frequency interference protection is built in to the DVK-100, as are convenient connectors for installing the keyer in almost any station. Microphone input impedance and keying polarity are selectable, and audio output level is adjustable. Audio output is at 600 ohms, making connection to almost any transceiver possible. A separate, selectable 8-ohm audio monitor output is also available for driving a speaker. Two five-pin DIN jacks on the rear panel of the DVK-100 handle audio input and output, PTT and microphone-type selection. The mating plugs come with the voice keyer, and connection diagrams for many popular transceivers are included in the concise instruction manual.

The DVK-100 uses 128 kbytes of dynamic RAM to store messages in four hard-sectored memories; total storage time is 32 seconds. The memories are laid out for maximum flexibility: there is one 16-second memory, one 8-second memory and two four-second memories. When the unit is in the PROGRAM-RECORD mode, input audio is filtered by a fourth-order switched-capacitor filter and sampled at a 32-kHz rate. The high sampling rate is the reason for the large total memory requirement, and for the excellent audio reproduction.

These features add up to a high-quality voice recording/playback system that is handy to use. NTL paid attention to ergonomic details. For instance, recording a message DVK-100 is as easy as pushing the CONTROL keys, selecting the desired message memory and chattering away. Indicator LEDs next to each message key tell the operator at a glance the status of the recording. (Similar indications are included on the CONTROL and AUDIO functions.) There is even an interlock function that keeps the PTT line from keying the transmitter while messages are being recorded. A selectable audio compressor is also included in the package.

Message playback is even simpler than recording. After recording a message, select the PLAY mode to monitor the message through the internal monitor circuit (with an external speaker) without putting a signal on the air. When you are satisfied with the message content, simply select the OPERATE mode and push the key corresponding to the desired message. The DVK-100 keys the transmitter and lights the indicator next to the selected memory key. To stop transmitting in mid-message, simply hit the message key or briefly press the microphone PTT. If the PTT line is held closed, microphone audio is passed through the DVK-100 into the transmitter.

An end-of-transmission "beep" can be selected if desired. All but one of the several operators who used the DVK-100 during the review period disliked this beeper. It certainly does attract attention to your signal when in use, however, and leads to all sorts of unsolicited comments from others operating on the band!

The DVK-100 is solidly built, and is every bit as RFI-proof as I hoped it would be. Not once during the review period (eight contests, including a multi-multi operation in the ARRL DX contest) did the keyer even hiccup. It works well with several different popular transceivers. Only rewiring of the shielded output cable was necessary to accommodate the different microphone pin configurations of the radios used. Connection cables for many radios are available from the manufacturer.

The DVK-100 is definitely the best thing an SSB contest operator can add to an existing station to improve scores. CW is still my preferred mode, but the DVK-100 makes SSB contesting a lot more fun. Manufacturer: Nel-Tech Labs, Inc, 28 Devonshire Ln, Londonderry, NH 03053, tel 603-434-8234. Price Class: $249 (including ac adapter)—*Rus Healy, NJ2L*

Table 4

Nel-Tech DVK-100 Digital Voice Keyer, Serial No. 8607043

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency response: 300-3000 Hz, ± 3 dB relative to 1000 Hz.	−2.8 dB relative to 1000 Hz at 270 Hz; −3.2 dB at 2700 Hz.
Signal to noise ratio: Greater than 35 dB.	Greater than 55 dB.
Total harmonic distortion: Less than 4% relative to 0-dB 1000-Hz signal strength.	5.2% at 1000 Hz.
Size (height, width, depth): 1.65 × 7 × 10.6 in.	
Weight: 2 lbs.	
Color: Blue and gray.	

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment "off-the-shelf" from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before November 27, 1987. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

Please clearly identify the item you wish to bid on, using the manufacturer's name, model number or other identification number if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Trio-Kenwood TR-751A 2-meter multimode transceiver, s/n 7050117, PS-30 power supply and MU-1 modem unit (sold as a package only, see Product Review, Mar 1987 *QST*). Minimum bid $489.

ICOM IC-μ2AT 2-meter FM hand-held transceiver, s/n 03372 (see Product Review, May 1987 *QST*). Minimum bid $190.

Clear Channel AR-3300 10-meter transceiver, s/n 86021304 (see Product Review, Jun 1987 *QST*). Minimum bid $233.

Ten-Tec Corsair II 160-10 meter transceiver, s/n 58001721, with Model 260 power supply (sold as a package only, see Product Review, Aug 1987 *QST*). Minimum bid $767.

Yaesu FT-767GX 160-10 meter transceiver, s/n 6J030740, with 2-meter module (sold as a package only, see Product Review, Sep 1987 *QST*). Minimum bid $1175.

Yaesu FL-7000 160-15 meter solid-state linear amplifier, s/n 6N050017 (see Product Review, Sep 1987 *QST*). Minimum bid $1063.

ICOM IC-275A 2-meter multimode transceiver, s/n 01182 (see Product Review, Oct 1987 *QST*). Minimum bid $667.

RF Concepts RFC 2-317 2-meter solid-state amplifier, s/n 1114 (see Product Review, Oct 1987 *QST*). Minimum bid $160.