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Ten-Tec Scout Model 555 MF/HF Transceiver

QST Compares: Packet TNCs
(Kantronics KPC-3; DRSI DPK-2; MFJ 1270B; AEA PK-88; PacComm TINY-2 MK 2)

Conducted By Mark Wilson, AA2Z
Editor, *QST*

The Ten-Tec Scout Model 555 MF/HF Transceiver

Reviewed by David Newkirk, WJ1Z

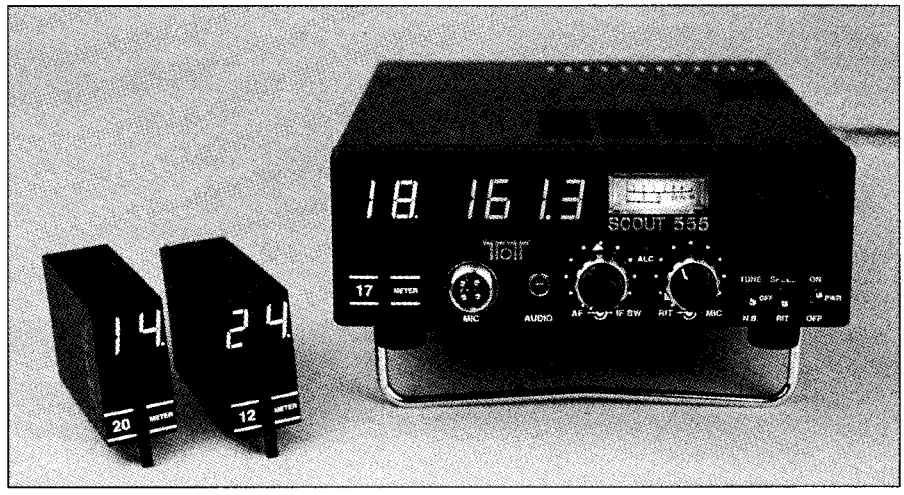
"Well, what *about* that Scout—is it a real radio, or what?" You don't have to look far to find a ham who wants to know more about Ten-Tec's latest transceiver. One of the smaller MF/HF ham rigs currently available, the Scout can cover all Amateur Radio frequencies from 1.8 to 29.0 MHz, puts out up to 50 watts PEP on SSB and CW, includes SWR and power-output metering, and comes with a built-into-software iambic keyer (Curtis type B) adjustable from 5 to 50 WPM. Its large digital readout displays frequency to the nearest 100 Hz and keyer speed in words per minute. *Of course* the Scout includes full break-in on CW—it's a Ten-Tec! A hand mike, noise blanker and other accessories are available as options.

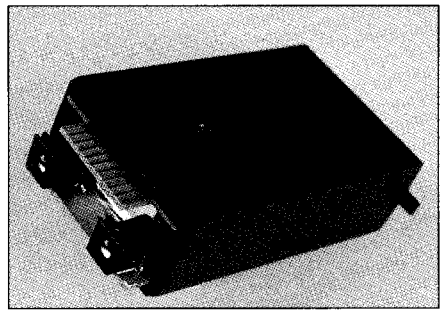
Yes, I've actually heard hams wonder out loud whether or not the Scout is "a real radio." Snooping around, I find that two Scout characteristics drive that concern: its $495 price tag and how it changes bands. I'll tackle the band-changing issue first.

Note that what I said up there is that the Scout *can* cover all Amateur Radio frequencies from 1.8 to 29.0 MHz. I put it that way because the Scout gets from band to band by means of plug-in modules, just one of which—for the band of your choice—comes with the basic Scout. (Additional modules are available for $25 each, plus shipping.) Each module contains a VFO-premixer IC and band-specific crystal and transmit/receive-filtering components. (The 10-meter module includes a slide switch that selects 28.0-28.5 or 28.5-29.0 MHz.) A PC-card edge connector and coaxial "barrel" connectors (what many consumer products use for "wall transformer" input) handle electrical module-to-mainframe contact (see photo); a plastic lock-in lever makes module insertion and removal positive, easy and repeatable. Nothing bad happens if you plug modules in and out with the Scout turned on or if you try to transmit without a module plugged in.

So that's how the Scout changes bands. Maybe that settles your Scout buying decision right there. Maybe the Scout's approach to band switching strikes you as just a bit too-too or off-the-wall. Or maybe you're like some potential Scout buyers, who add $495 (the cost of the basic one-band Scout) and $200 (the before-postage cost of the eight additional modules necessary to round out the Scout's full nine-band coverage), see $695, and then compare this to the cost of general-coverage, all-mode, 100-watt MF/HF boxes that currently sell at prices that seem to be reasonably close to that of a fully equipped Scout.

So, time for an announcement: This review does not describe a radio that does everything for everyone. This review looks at a product that has been built to a price to give you as much solid MF/HF ham-bands-only radio performance as its designers could stuff into a box for that price. This is your last chance to bail out of this review before I start talking about the Scout not for what it *isn't*, but for the real radio it *is*.





Solder-plated fingers and two barrel connectors make the Scout's module-to-mainframe connections *(Scout photos by Kirk Kleinschmidt, NTØZ)*

The Scout Front, Back, Top and Bottom

Front

Five knobs, three switches, two jacks, a meter, one LED and a four-digit LED display connect you to the Scout's circuitry via its front panel.

The Bottom Line

Combining push-to-talk SSB, full-break-in CW and a built-in keyer with an unusual, cost-effective band-changing approach, the Scout provides good-quality, enjoyable SSB/CW communication at an industry-low price.

The knobs are **AF** (audio gain), **IF BW** (IF bandwidth), **RIT** (offset tuning), **MIC** (microphone gain), and tuning.

The switches are **TUNE/OFF/N.B.** (puts the rig into a reduced-power, key-down transmit mode for antenna adjustments or turns on the Scout's optional ignition-noise blanker), **SPEED/OFF/RIT** (allows you to set the internal keyer's speed via your dot and dash paddles, or turns on the Scout's offset tuning function), and **PWR** (power on/off).

The jacks are **MIC** (four pins; mike hot, PTT [push-to-talk] hot and ground) and **AUDIO** (a ¼-inch stereo phone jack that doubles as a connector for headphones or an external speaker).

The LED display (four bright green, 0.56-inch digits) indicates the Scout's keyer speed or receive frequency (equal to the suppressed-carrier frequency during SSB transmit, and, depending on the band, about 750 Hz higher or lower than carrier during CW transmit). White numbers printed on the band modules provide the display's megahertz and tens-of-megahertz information as appropriate.

A counter drives the Scout's frequency display. That is, the reading you see results from the Scout's microprocessor actually *counting* the radio's VFO frequency. Two effects common in counter-based displays therefore occur: (1) The display lags a split second behind rapid tuning (counting and displaying a frequency take time), and (2) the display sometimes *hunts* (flickers between two adjacent 100-Hz values) when the Scout is tuned to a value midway between two 100-Hz points. Neither of these characteristics is a flaw; all counter-based-display ham radios I've used did the same thing.

The Scout's multifunction meter indicates signal strength (S units and up to 50 dB over S9) in receive and output power (in watts) or SWR (up to 10) during transmit.

The LED, **ALC**, lights when the Scout's

Table 1
Ten-Tec Scout 555 MF/HF Transceiver, Serial Number 07A11223

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: All ham bands 160 through 10 meters (28.0-29.0 MHz) available through plug-in modules. Overshoot at upper and lower band edges.	As specified.
Modes of operation: CW, LSB, USB (normal sideband for the band in use).	As specified. LSB at 30 meters.
Power requirement: 12-14 V dc; 600 mA, RX: 10 A TX @ 50 W out.	At 14 V: 510 mA, RX; 10 A, TX.
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity: "0.35 μV [–116 dBm] typical for 10 dB @ 2.5 kHz bandwidth."	*Minimum Discernible Signal*: 3.5 MHz –129 dBm; 14.0 MHz –125 dBm; 28.0 MHz –126 dBm (***IF BW** Min*). *for 10 dB S+N/N*: 3.5 MHz –119 dBm; 14.0 MHz –116 dBm; 28.0 MHz –119 dBm (***IF BW** Max*)
Blocking dynamic range: Not specified.	Blocking dynamic range:* 3.5 MHz 120 dB; 14.0 MHz 119 dB; 28.0 MHz 119 dB (***IF BW** Min*)
Two-tone, third-order intermodulation dynamic distortion range: 85 dB @ 2.5 kHz bandwidth at 20 kHz spacing.	Two-tone IMD dynamic range:* 3.5 MHz 86 dB; 14.0 MHz 87 dB; 28.0 MHz 87 dB (***IF BW** Min*). 89 dB† (***IF BW** Max*)
Third-order input intercept: +1 dBm	3.5 MHz 0 dBm; 14.0 MHz 5.5 dBm; 28.0 MHz 4.5 dBm (***IF BW** Min*). 5.5 dBm†† (***IF BW** Max*)
S-meter sensitivity: S9 = 50 μV.	For S9 reading at 14 MHz: 54 μV.
Receiver audio output: 1 W @ <2% distortion with 4-Ω load.	1.8 W at 2% THD with 4-Ω load.
Receiver IF/audio response: Not specified.	At –6 dB, ***IF BW*** max, 181-2433 Hz (2252 Hz); ***IF BW*** centered, 141-1352 Hz (1211 Hz); ***IF BW*** min, 121-660 Hz (539 Hz).
Transmitter	*Transmitter Dynamic Testing*
Transmitter power output: 50 W; nominally 15 W in TUNE	45 to 50 W, depending on band and mode; **TUNE** mode, 25-33 W.
Spurious-signal and harmonic suppression: Not specified.	The Scout 555 meets FCC spectral-purity specifications for equipment in its power-output class and frequency range.
Third-order intermodulation distortion products: Nominally 30 dB below PEP output @ 50 W out.	See Fig 1.
CW-keying characteristics: Not specified.	See Fig 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S1 signal, 22 ms; S9 signal, 22 ms. This characteristic is suitable for AMTOR.
Composite transmitted noise: Not specified.	See Fig 3.

Size (height, width, depth): 2.5 × 7.25 × 9.75 inches; weight, 5 lb, 3 oz.

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

†Based on a measured ***IF BW** Max* MDS of –128 dBm.

††Based on ***IF BW** Max* dynamic range of 89 dB and MDS of –128 dBm.

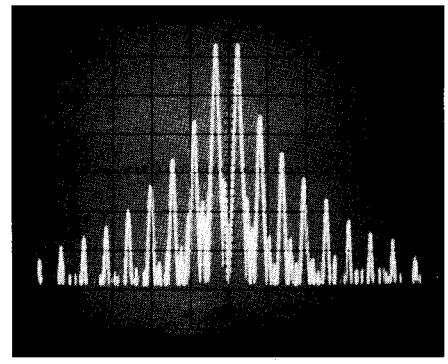


Fig 1—Worst-case spectral display of the Ten-Tec Scout during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 25 dB below PEP output, and fifth-order products are approximately 35 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 49 W PEP output at 14.25 MHz. Because of its electrical design, the Scout's USB- and LSB-transmit-IMD characteristics differ. This photo also typifies the Scout's SSB-transmit IMD characteristic at 17, 15, 12 and 10 meters. ARRL Lab testing at 80 meters showed the Scout's third-order LSB-transmit-IMD products to be down 31 dB relative to PEP (fifth-order products, 43 dB). These 80-meter data can also be considered typical of the Scout's LSB-transmit-IMD performance at 160, 40 and 30 meters.

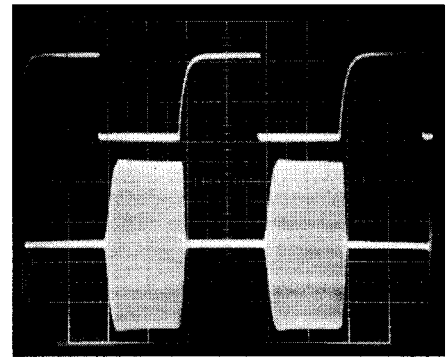


Fig 2—CW-keying waveforms for the Ten-Tec Scout. The upper trace shows the actual key closures; the lower trace shows the RF envelope. Horizontal divisions are 10 ms.

automatic level control circuitry operates during transmit.

Back

Five jacks, a switch and a grounding terminal connect the Scout to the outside world via its back panel.

The jacks are **ANTENNA** (an SO-239), **+13.5 VDC** (a two-pin Molex jack), **AUX. +13.5 V** (a barrel jack that provides up to 2 A for accessories), **KEY** (straight key, bug or external keyer; 1/8 inch) and **KEY PADDLES** (⅛ inch stereo). The switch, **METER (FWD/SWR)**, toggles the front-panel meter's transmit indication between forward power and SWR.

Top and Bottom

The Scout's inboard speaker fires out of the radio's top. **SIDETONE VOLUME** and **RF POWER** trimmer pots accessible via holes in the Scout's bottom cover allow screwdriver adjustment of those levels. The pot allows you to turn the Scout's RF output down to 5 watts. (The Scout's final amplifier is relatively inefficient at this level, though, so efficiency-conscious QRPers will be happy to learn that a QRP-optimized (1 to 5 watts out), somewhat lower-priced Scout variant, the Argo 556, was scheduled to go into production before the end of 1993.)

The Scout in Action

Table 1 shows the results of ARRL Lab tests on our Scout. The short answer is that the radio meets or exceeds all of its manufacturer's specifications.

Frequency Agility and Stability

Putting the Scout on frequency involves plugging in the appropriate band module and turning the tuning knob to the frequency you

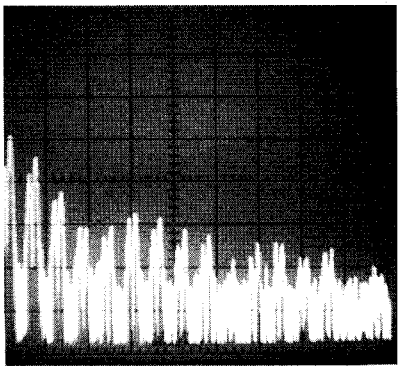


Fig 3—Spectral display of the Ten-Tec Scout's transmitter output during composite-noise testing. Power output is 47.9 W at 14.02 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The top horizontal line on the scale represents 60 dBc/Hz and the baseline is 140 dBc/Hz. Composite-noise levels between 60 dBc/Hz and 140 dBc/Hz may be read directly from the photograph. The carrier, off the left edge of the photo, is not shown. This photograph shows transmitted composite noise at frequencies from 2 to 20 kHz offset from the carrier.

want. (The tuning knob covers about 30 kHz per revolution at the low end of each band and 20 kHz per revolution at the high end of each band.) The Scout's tuning feel is somewhat stiff—the knob can't be spun like a flywheel for high-speed excursions—and sometimes exhibits backlash. The **RIT** control affords smooth offset tuning across a ±1-kHz range. Because the Scout does not include a keypad, dual VFOs, memories or up/down buttons, moving from one frequency to another involves tuning through all the frequencies in between. One possibly scary consequence of this is that Scout users may actually find themselves getting a feel for goings-on in major chunks of the ham bands—praise be!

The Scout's VFO is actually a *permeability-tuned oscillator* (PTO). Some PTOs in ham-equipment history have been notoriously drifty. The Scout's PTO *isn't* noticeably drifty because the radio's frequency-counter software senses drift and applies tuning-diode correction to keep the drift within acceptable limits. The software turns drift correction off during tuning and turns it back on 2 seconds after tuning ceases. (This gives you time to fine-tune without fighting the drift correction.) The display's rightmost decimal point lights when the microprocessor turns drift correction off.

Under normal conditions, the Scout's drift-correction system works smoothly. One of its eyebrow-raising characteristics, however, is that the microprocessor seems to respond to counter hunting as tuning. Another factor that may cause noticeable corrections is how the system operates in CW. Says the Scout *Operator's Manual*,

> CW operation is a bit more complex [than how the system behaves in SSB]. If the internal keyer is being used, it will take preference over any other operation. This means that there will be no correction during [CW] transmit... Since the transceiver operates at full break-in, corrections will be made between characters at slow speed, and between words at higher speed.... There may be times during long transmissions and with very high speed CW when the [frequency] may...be reset to a new value instead of being corrected to the original frequency.

When you work CW, this characteristic, in conjunction with abnormally rapid VFO temperature changes (like what happened when I unwittingly placed our Scout with its VFO end only a few inches away from an incandescent desk-lamp bulb), can result in relatively large frequency corrections that you and the operators you work may hear (you'll hear the corrections in receive; they'll hear the corrections when you transmit). The cure is simple: Don't bake your Scout!

Rapid temperature shifts aside, how stable *is* the Scout? I applied WJ1Z's Cruel Radio Stability Test: Tune in a shortwave broadcast signal as SSB so that the music pitches and harmonic relationships sound perfect. Then check to see how long the tuning stays put before the audio starts to sound like Gas Music From Jupiter. (Sure, almost any modern PLL-synthesized MF/HF box can pass this test after warm-up, but the Scout uses much simpler circuitry.) I precisely tuned the Scout to BBC-7325. *Two hours later*, the Scout hadn't drifted audibly!

As for the Scout's *mechanical* stability, moderate table vibration, plugging and unplugging headphones, and pushing on the radio's top and bottom covers near its PTO, can noticeably affect the Scout's tuning. You'll just have to protect the Scout from vibration more than you might find necessary with more expensive radios.

Receiving

The first thing and *main* thing I want to know about any radio I get my hands on is *how its receiver sounds and feels.* Memories, general coverage, transmit IMD, QSK, ergonomics, power output, whatever—they're background considerations to me, because, as the saying goes, you can't work them if you can't hear them. The Scout's receiver pleasantly surprised me: It's acceptably sensitive and overload-resistant, and sounds like, well, a real radio.

One reason the Scout can cost $495 is that it uses Ten-Tec's Jones IF filter—the continuously variable crystal filter premiered by Ten-Tec's Argonaut II and Delta II. I beefed about the performance of the ArgoDelt's IF filtering in February 1992 *QST*'s Argonaut/Delta II review for a couple of reasons: Especially considering the cost of the radios (over $1k), their IF filters didn't attenuate "the other side of zero beat" sufficiently during CW reception, and seemed lossier than desirable at minimum bandwidth. By contrast, the Scout's IF filtering, which includes a five-crystal filter with "a notch at the BFO frequency to improve the unwanted sideband rejection" *and* the four-crystal Jones filter, is acceptably good—it suitably knocks down the CW audio image even with **IF BW** at its widest setting. The variable filter's center frequency shifts a bit to favor signals at a somewhat lower-than-sidetone pitch when I crank the filter to maximum selectivity, but aside from this characteristic—a touch of the RIT knob can repeak the signal as appropriate—the Scout's IF filtering works quite well.

The up-conversion designs of today's standard MF/HF radios pretty much do away with shortwave *images*—weak unwanted reception of strong shortwave signals a predictable frequency spread away from "real" signals—and *IF feedthrough* (in which strong signals operating at a receiver's intermediate frequency leak through its front-end circuitry). The Scout uses a relatively low IF (6144 kHz), and you may therefore hear some shortwave images when receiving with the Scout under some conditions. In particular, you may hear images of 16-meter shortwave broadcast stations (in the 17.7- to 17.9-MHz range) when tuning the 18-MHz ham band, and images of 31-meter shortwave stations (signals between about 9.6 and 10 MHz) when tuning the 14-MHz ham band.[1] The 16-meter images can be quite strong—S7 to S9 with the Scout connected to a multiband beam—because they're so close to the Scout's 18-MHz coverage that its front-end filtering can barely reject them. The 31-meter images are much less intrusive because of the greater frequency spacing between 9.5 and 14 MHz. Ten-Tec knows about this effect; the images are there because making them go away would move the Scout out of the $500 class.

The Scout is remarkably free of internally generated receiver spurs. Only three move the radio's signal-strength meter: 7206 (S6), 14332 (S3) and 28081 kHz (S1). With an antenna connected, band noise masks the few that remain.

The Scout's AGC action—fast attack and a slow decay that's a good compromise for SSB and CW—is first-rate, and well-matched to the radio's IF gain and product-detector characteristics. Amateur SSB and full-carrier broadcast signals received as SSB sound quite good in the Scout. (Some radios that cost more produce crackly audio on modulation peaks during this tough test.)

The Scout's optional noise blanker knocks down ignition noise (and sometimes even line noise—a plus) well.

Turning up the Scout's audio gain lets band noise drown out the bit of residual digital whine that's audible in the radio's audio output with the **AF** control turned down. Wideband IF hiss—once common in radios

[1]These images appear according the relationship $2f_{XO} + 2f_{PTO} - f_I$, where f_{XO} is the Scout band module's crystal oscillator frequency, f_{PTO} is the Scout's PTO frequency, and f_I is the Scout's intermediate frequency (6144 kHz).

that use no IF filtering after their gain-controlled IF stages, but nowadays often masked with heavy-handed AF rolloff by some manufacturers—may be noticeable to Scout users with good high-frequency hearing. The Scout's audio output otherwise sounds powerful and clean.

Transmitting

I haven't mentioned a **MODE** switch because the Scout doesn't have one! Press your key or paddle, and the Scout transmits CW. Press your mike's PTT switch (the Scout doesn't include VOX) and the Scout transmits SSB using the sideband that's standard on each band. (Sideband reversal is not possible.) Adjusting the Scout's mike gain is simple: Speak in your usual radio voice and turn up the **MIC** gain until the **ALC** LED lights on your voice peaks. On-air testing netted the Scout praise for clean, solid transmit audio.

The Scout's full break-in CW transmit/receive (TR) switching continues Ten-Tec's QSK tradition. Everyone doesn't like QSK, though, so you should know that the Scout can't do so-called *hard-keyed* CW TR switching (as done with a **MOX** or **TRANSMIT** switch), which lets you put a radio into CW transmit without transmitting anything. If you want to key the Scout's sidetone without transmitting a signal, you must unplug the band module in use.

The Scout's keyer speed defaults to 25 WPM at power up. With the **SPEED/OFF/RIT** switch set to **SPEED**, pressing the dash paddle lowers the speed and pressing the dot paddle raises it.

Antenna-system adjustment is easy with the Scout: Set **TUNE/OFF/N.B.** to **TUNE**. This makes the Scout put out a continuous, reduced-power carrier and adjusts its SWR metering for accurate indication at this level. Otherwise, the Scout puts out 50 W PEP—plenty of power for effective communication.

Connecting the Scout to Other Boxes

The Scout does not include fixed-level audio inputs and outputs, nor does it include low-level-transmit-RF, ALC and amplifier-control outputs. This doesn't mean that you can't use the Scout to drive an amplifier or operate, say, AMTOR; it just means that you need to do some work-arounds. To work digital modes with the Scout in SSB, for instance, you'll need to drive the Scout with mike-level multimode communications processor (MCP) audio and tap some of the Scout's speaker/headphone audio during receive—in addition to reversing your modem tones (for the modes in which it matters) on bands in which the Scout runs USB. Using this approach, we found that the Scout can receive Baudot, RTTY, AMTOR and PacTOR well, and we made a few PacTOR QSOs. Even though the Scout's signal I/O and transmitter duty cycle rating haven't been optimized for data communication, you can use the Scout on these modes with a bit of inventive interconnection and MCP tweaking if you keep the radio's output power down to around half or less of its rated 50 watts. As for using the Scout to drive an amplifier, the *Operator's Manual* says

> If control of a linear is desired, a transmit control voltage is available internally and may be brought out by the skilled user to operate a relay that could control a linear.

Likewise for using the Scout to drive transverters: As with most radios, the necessary signals are all there; you'll just have to dig for them.

Documentation

The Scout's manual continues Ten-Tec's tradition of providing solid operational and technical information in one book. You don't have to buy a separate service manual to find out what's going on in the Scout's circuitry, troubleshoot, or do service work or modifications. It's all in there.

The Scout Overall

I like the Scout. It works and sounds like a real radio, and its simple controls and straightforward operation put a minimum of mechanism between me and the stations I want to work.

So what's to decide? If you absolutely need a radio that does stuff the Scout doesn't do—even if you haven't done those things yet and can't imagine when you will—the Scout probably isn't for you! But if all-around CW and SSB are your main modes, you may realize that the Scout does everything *you* already do. With the Scout, you can now do those things acceptably well for less.

I thank Steve Ford, WB8IMY; Rus Healy, NJ2L; Luck Hurder, KY1T; Kirk Kleinschmidt, NTØZ; and Mike Tracy, KC1SX, for contributing to this review.

Manufacturer: Ten-Tec, 1185 Dolly Parton Pkwy, Sevierville, TN 37862, tel 615-453-7172, fax 615-428-0364. Manufacturer's suggested list prices: Model 555 Scout, $495 (includes one band module of your choice); additional band modules, $25 each; Model 296 mobile mount, $15; Model 297 noise blanker, $20; Model 937 11-ampere power supply, $79; Model 938 switching supply, $95; Model 700C hand mike, $40.

QST Compares: Packet TNCs

By Steve Ford, WB8IMY
Assistant Technical Editor

Many hams are joining the ranks of the packeteers these days. If you own a 2-meter FM transceiver—even a handheld—all you need is a computer, some inexpensive terminal software and a terminal node controller, or *TNC*. Assuming that you own the computer, the next question usually is, "Which TNC should I buy?"

If you really need to conserve your cash, you can invest in a TNC *emulation* system (BAYCOM is a typical example) requiring only a small external modem. The modem takes care of translating data into packet tones and vice versa. The rest of the work is performed by the software in your computer. While these systems can be purchased for $60 or less, they lack the flexibility of stand-alone TNCs.

At the other end of the spectrum are the multimode communications processors, or *MCPs*. Starting at around $300, these devices provide packet capability along with RTTY, AMTOR, PacTOR, CW and other modes. But if packet is your only interest, do you really need all those other modes?

For several years, manufacturers have attempted to address the needs of packeteers who want small, stand-alone TNCs at reasonable prices. Among the most popular models are the MFJ 1270B, the AEA PK-88, the PacComm TINY-2 and the Kantronics KPC-2. All have evolved since their original introductions, adding new features here and there. While still selling the venerable KPC-2, Kantronics has introduced its successor: the KPC-3. DRSI also waded into the low-end TNC market with their DPK-2 TNC.

While price and performance are comparable, the features of these TNCs vary—sometimes substantially. Which one is best for you? That depends on what you hope to accomplish with packet radio.

TNC Features Comparison

	KPC-3	*DPK-2*	*1270B*	*PK-88*	*TINY-2*
Mailbox	Yes	Yes	Yes	Yes	Yes
Automatic mail handling	Yes	No	Yes	Yes	Yes
HF packet	No	No[1]	Yes	Yes	No
WEFAX	Yes	No	Yes	No	No
KISS	Yes	Yes	Yes	Yes	Yes
Host mode	Yes	Yes	Yes	Yes	Yes
Modem disconnect	No	Yes	Yes	No	Yes
100% TNC-2 compatible	No	Yes	Yes	No	Yes
Radio cable provided	Yes	No	Yes	Yes	No
Computer cable provided	No	No	No	No	No
Software provided	Yes	Yes	No	No	No
Power supply provided	No	No	Yes	No	No
Suggested list price	**$119.95**	**$114.95**	**$119.95**	**$149.00**	**$149.00**

[1]Optional. List price: $89.95.

Glossary of Terms Used in This Article

AFSK	audio frequency-shift keying
AMTOR	amateur teleprinting over radio
APR	automatic packet reporting
EPROM	erasable, programmable read-only memory
GPS	Global Positioning System
KISS	keep it simple, stupid
MCP	multimode communications processor
NET/ROM	node networking software designed by WA8DED and W6IXU
PacTOR	a high-speed hybrid packet and AMTOR system
PMS	personal message system
PSK	phase-shift keying
RAM	random-access memory
ROSE	RATS (Radio Amateur Telecommunications Society) Open-System Environment
SysOp	system operator
TAPR	Tucson Amateur Packet Radio
TCP/IP	transmission control protocol/Internet protocol
TNC	terminal node controller
WEFAX	weather facsimile

KANTRONICS KPC-3

At only 0.8×5.2×5.2 inches, the KPC-3 is the smallest TNC of the group. (Take care when you open the box. That thin, black module isn't packing material—it's the KPC-3!) Despite its tiny size, the KPC-3 is packed with features.

The KPC-3 provides a personal packet *mailbox* with various enhancements for compatibility with existing packet bulletin board systems (PBBSs). By making arrangements with your local PBBS SysOp, you can use the KPC-3 to interact with the bulletin board automatically. It will forward messages to the PBBS and download any mail that's waiting for you. Your friends can also connect to the KPC-3 and transfer messages to and from your system. This is particularly handy for busy hams who don't always have time to sit down at the keyboard, log into the PBBS, download mail, and so on. Whenever you have mail waiting in your KPC-3, a bright **MAIL** LED on the front panel flashes to alert you.

As the SysOp of your KPC-3, you have the ability to access it from different locations. All you need is another packet system—even a portable one. With remote access, you can do more than check your mail. You can also modify any KPC-3 parameter. For example, you could change the call sign of the mailbox, or make the timing parameters more aggressive. A separate call sign is assigned for remote access (through the use of the MYREMOTE command). The RTEXT command is used to set up a password scheme where a string of numbers is sent whenever you attempt remote access. You must decode the password numbers in proper sequence before access will be granted.

New packeteers will appreciate the KPC-3's *Newuser* mode. It's basically a streamlined set of the 23 most commonly used commands. The intent is to provide a simple command set to get you started.

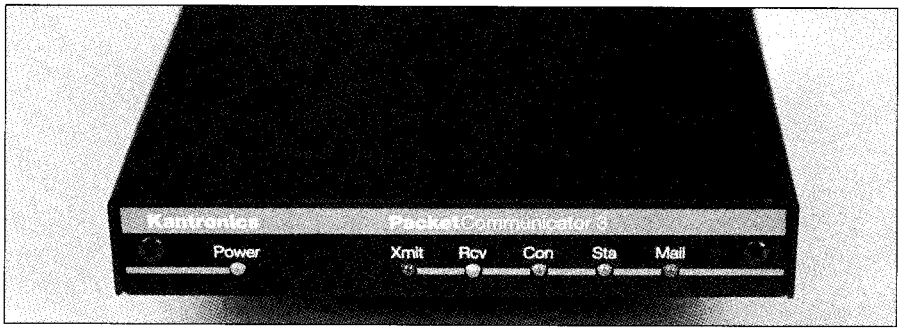
In addition to the Newuser mode, the KPC-3 functions in the *terminal, KISS, host* and *BBS* modes. The terminal mode provides access to the complete KPC-3 command set and can be used with any terminal program. (The KPC-3 package includes a copy of *PacTerm* software.) The host mode is intended primarily for Kantronics' *HostMaster* software. With the KPC-3 operating in the host mode with *HostMaster*, you enjoy a friendly, straightforward interface with the TNC. Multicolored windows, pop-up selection boxes and *hot-key* commands make it much easier for new packeteers to operate the KPC-3. The KISS mode allows the KPC-3 to used with TCP/IP software and other systems that require KISS protocol. The BBS mode is similar to the terminal mode except that certain messages such as ****connect request* are deleted for greater compatibility with popular PBBS software. This is especially helpful for hams who want to use the KPC-3 to establish a full-service PBBS rather than just a mailbox.

The KPC-3 offers very low power consumption. In fact, it can be powered from a 9-volt battery. The LEDS OFF command reduces the power drain even further (less than 15 milliamps when no signal is received). This has great benefits for portable/mobile packet, high-altitude ballooning, remote site control, etc.

In addition to regular packet capability, the KPC-3 includes the Kantronics *KA-Node*. When the KA-Node is active, the KPC-3 behaves like a sophisticated *NET/ROM*-style node. Anyone can connect to the KA-Node and use it as a relay. Like a NET/ROM node, a KA-Node forwards packets without requiring end-to-end acknowledgments. Once a packet has been received by the KA-Node, it takes "responsibility" for passing it along to the next station. If the packet must be repeated (due to data errors), the KA-Node does so automatically without involving the originating station. Unlike NET/ROM nodes, however, KA-Nodes do not maintain node lists for automatic routing. To reach a destination, you have to use KA-Nodes like traditional digipeaters, hopping from one to the other until you establish your desired connection. While the KA-Node is active, the KPC-3 can still be used as a normal TNC and mailbox. (During this review, my KA-Node was used several times while I was connected to other stations. I hardly noticed.) It's worth noting that node firmware is also available for the KPC-3.

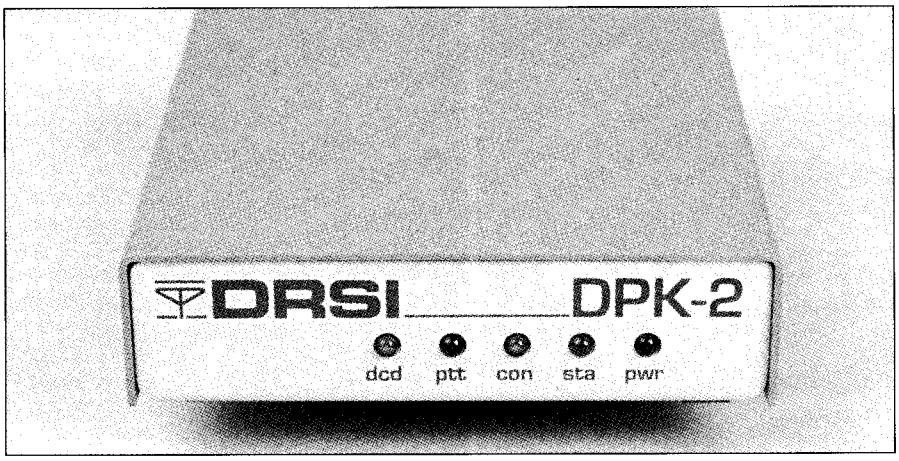
The icing on the KPC-3 cake is the inclusion of an HF WEFAX mode. This enables the reception of weather maps from WEFAX stations throughout the world. Kantronics offers WEFAX software for use with PCs and Commodores. Only black and white transmissions—such as weather charts—can be received. The Kantronics WEFAX system cannot decode and display *grayscale* images, the kind used when retransmitting photographs from weather satellites on the HF bands.

The KPC-3 manual is very well written and easy to use. A TNC-to-radio cable is included and the manual provides wiring diagrams for the microphone input jacks of various rigs. *Manufacturer: Kantronics, 1202 East 23rd St, Lawrence, KS 66046, tel 913-842-7745, fax 913-842-2021.*



DRSI DPK-2

The DRSI (Digital Radio Systems Inc) DPK-2 is a basic workhorse TNC. While it offers few extras, the DPK-2 is fully compatible with the original TAPR TNC-2 design—the standard upon which all modern TNCs were developed. The DPK-2 will run any firmware programs developed for the TNC-2. This makes it a useful TNC for experimentation and other applications.



Like the KPC-3, the DPK-2 features the ability to operate at low power levels. When the front-panel LEDs are disabled, the TNC draws only 40 milliamps. At only 5 × 6.25 × 1.25 inches, the DPK-2 is very compact. Memory backup is provided by a field replaceable lithium coin cell.

The DPK-2 includes a TNC mailbox that the manufacturer refers to as a Personal Message System, or *PMS*. The PMS does not support automatic forwarding to PBBSs.

Like virtually all TNCs, the DPK-2 can function as a traditional packet digipeater. With its complete TAPR TNC-2 compatibility, however, it can also become a full-fledged NET/ROM or *ROSE* node by simply replacing the EPROM chip. No other modifications are necessary. For hams who want to set up nodes in their areas, the DPK-2 offers a quick and easy solution.

Packet satellite operators and high-speed packet enthusiasts will appreciate the DPK-2's standard TAPR 20-pin *modem disconnect header*. This is the standard connection used by most 9600/19200 bit/s modems as well as satellite PSK modems. By using this connection (and by cutting a few circuit board traces), it's possible to substitute an external modem in place of the one used by the DPK-2. For example, you could use the disconnect header to patch in a 1200 bit/s PSK satellite modem and work OSCARs 16, 19, 20 and 26. An external 9600 bit/s modem would open the door to OSCARs 22, 23 and 25, as well as high-speed terrestrial packet systems.

The manual is comprehensive, although an index would make it easier to find your way around. It is written with some consideration for new packeteers, but the main focus is on more experienced users. Chapter Seven is a hardware reference of particular value to the experimenter. The manual also contains a detailed description of the AX.25 packet protocol and even a two-page bibliography.

DRSI includes a terminal software package known as *paKet*. The terminal program is shareware written by M. A. Lonsdale, VK2DHU. I found that *paKet* worked very well with the DPK-2, providing an easy-to-use interface.

The DPK-2 relies on internal jumpers to make several critical selections such as the RS-232 data rate and the AFSK level. The default rate is 1200 bit/s. If you prefer to use a faster data rate with your computer, you must remove the cover and change the jumper position. The same is true for the AFSK output level to your radio.

Your radio connects to the DPK-2 through the use of a 5-pin DIN plug. The plug is provided, but the cable is not. You must also purchase your own RS-232 serial cable to connect the DPK-2 to your computer. It's worth noting that the DPK-2 supports TTL levels on the serial port to communicate with computers such as the Commodore-64.

Manufacturer: Digital Radio Systems Inc, 2065 Range Rd, Clearwater, FL 34625, tel 813-461-0204, fax 813-447-4369.

MFJ 1270B

The MFJ 1270B has been a packet radio mainstay for several years. Like the DPK-2, the 1270B is 100% TAPR TNC-2 compatible and features a modem disconnect header to attach external packet modems. (MFJ sells external modems compatible with the 1270B.) Its TNC-2 compatibility makes it an attractive platform for dedicated NET/ROM, ROSE and satellite applications.

The 1270B is not a small TNC per se. At 7.5 × 9.5 × 1.5 inches, the 1270B is the largest of the review group. On the rear panel you find a DB25 jack for the computer serial cable, and a five-pin DIN jack for the radio cable (cable and DIN plug included). The MFJ designers thoughtfully added an eight-pin TTL jack for Commodore users or anyone else requiring a TTL data connection. A speaker jack is also included. This is a very convenient feature, especially for HF packet operation where signals are often tuned by ear.

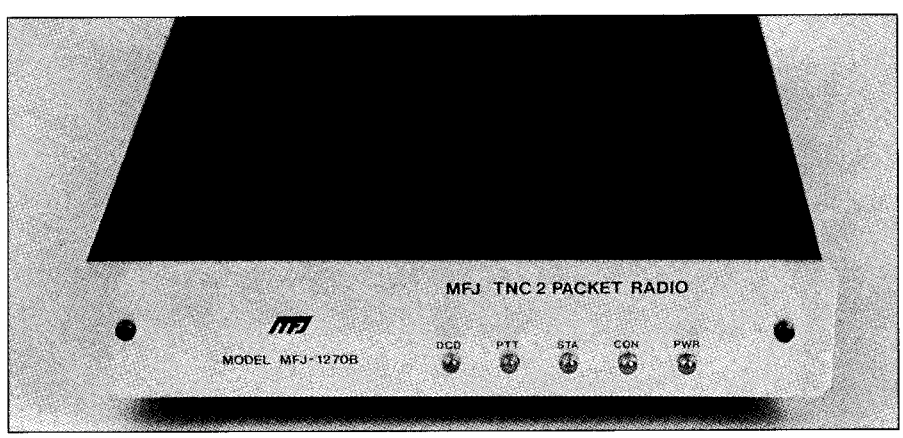
DIP switches on the rear panel are used to select the computer data rate (from 300 to 19200 bits/s). The same switch bank controls the AFSK data rate to the radio—either 1200 or 300 bits/s. This makes VHF/HF packet operating a bit awkward. When you jump from HF to VHF packet (or vice versa), you must reach behind the TNC and make sure the switches are placed in their correct positions.

Unlike the KPC-3 and the DPK-2, the MFJ 1270B uses a potentiometer to control the audio output to the radio. The only catch is that the pot is *inside* the 1270B. You must remove the cover completely to get to it.

Besides the standard terminal mode, the 1270B provides a *host mode* for use with external control software. (MFJ does not sell host software, but will provide complete documentation for creative programmers who want to roll their own.) The KISS mode is included for TCP/IP, satellite and other purposes. Like the KPC-3, the 1270B also offers HF WEFAX reception capability. (WEFAX display software is available from MFJ.)

The 1270B I tested contained version 1.2.9 firmware. Among the features included is an interesting QRA *ping* function (not to be confused with the TCP/IP ping command). By sending a QRA ping, you can quickly discover how many TNCs are on the air at a given frequency. To transmit a ping, you set the UNPROTO message flag to "QRA" and manually send an unconnected packet. Any TNCs within range will decode the QRA and send an ID response after about an eight-second delay. It seems like an easy way to see who's around, doesn't it?

When I tested the ping function, the only TNCs responding were other 1270Bs with the newer firmware. Non-MFJ TNCs treated the ping as they would most unconnected



packets—they ignored it. I discovered that upgraded 1270Bs will also respond to unconnected QRA packets sent by *other* TNCs or MCPs. I changed the UNPROTO to QRA in the DPK-2 and used it to send some test pings. To my surprise, I managed to find several 1270B personal mail boxes that I didn't know existed in my area. The DPK-2 sent the pings and the 1270Bs responded obediently!

The most noteworthy enhancements to the latest 1270Bs affect the *Easy-Mail* packet mailbox. Many commands and functions have been added such as automatic forward and reverse mail handling between PBBSs and other personal mailboxes. The 1270B is even capable of eliciting mail delivery *automatically*. You can set up the 1270B to query the PBBS regularly and check for any new messages. This function does *not* require a special arrangement between you and the PBBS SysOp. If necessary, the 1270B will log onto the PBBS like a human operator, grabbing any messages tagged with your call sign in the TO: field. The front-panel STA indicator flashes to indicate that you have mail waiting in the 1270B.

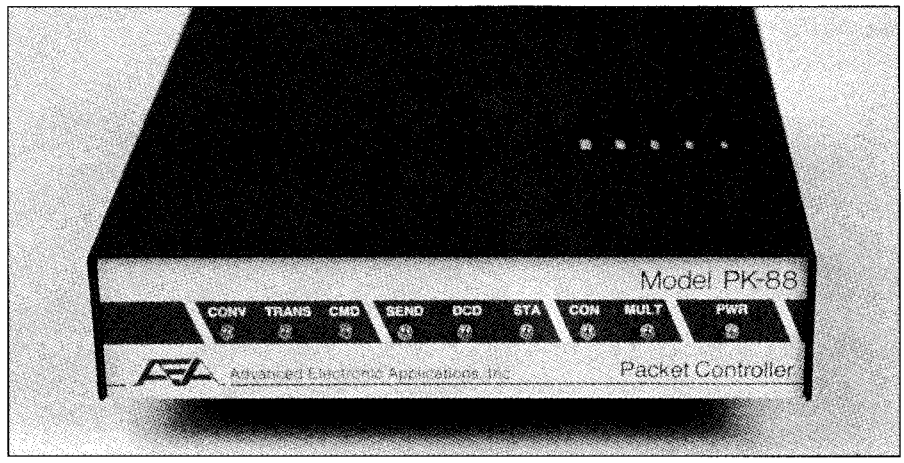
If someone wants to have a live, keyboard-to-keyboard chat, but you're out of the room at the moment, the 1270B offers an interesting solution. An impatient ham can log onto your mailbox and send the **T** command to page you! If you've enabled the paging function, your computer or terminal will summon you with up to 30 beeps. By entering the CHAT mode, you can talk to whoever had the nerve to page you at, say, 3 AM.

You can access your Easy-Mail mailbox remotely to read incoming mail, kill messages, edit message headers for proper forwarding and so on. Unlike the Kantronics KPC-3, however, you cannot alter the TNC parameters.

The 1270B's mailbox is the closest thing I've seen to a complete packet bulletin board in a TNC. Its flexibility is remarkable. For example, you can use the NODEFORW command specify which nodes to use when establishing a message-handling path to another mailbox or PBBS. (This is a miniature version of how "real" bulletin board systems operate.) The mailbox memory will be filled rapidly if it gets much use. The manual suggests that you expand the memory with a board available from MFJ. I highly recommend this option.

Speaking of the manual, there are actually *two* manuals: a "quick-start" guide and a larger reference book. The quick-start guide provides just enough information to get you on the air with the 1270B. If you need to dig deeper, the reference touches all the bases in detail. It's well indexed and easy to read.

If you're eager to try HF packet, consider the MFJ 1274. It's identical to the 1270B, but includes an HF packet tuning indicator. *Manufacturer: MFJ Enterprises, PO Box 494, Mississippi State, MS, tel 601-323-5869, fax 601-323-6551.*



AEA PK-88

The PK-88 is another TNC with a long history among packet aficionados. Its claim to fame is its rugged, reliable design. The durability of the PK-88 is evident when you take the unit out of its shipping box. Despite its small size (only 7.5 × 6.05 × 1.5 inches), it's quite hefty. At over two pounds, the PK-88 feels like a brick.

The rugged design concept extends to the back panel where an eight-pin microphone connector *with a locking ring* is employed on the radio port. Once installed, this connector isn't going anywhere!

The AEA engineers also added a separate receive audio jack—a nice touch. You have the option to feed the receive audio to the PK-88 through this jack or through the radio port. A standard DB-25 jack is used for the serial cable connection to the computer. The AFSK output level to your radio is adjusted via an internal potentiometer.

The PK-88 is very easy to set up. I was on the air within 20 minutes after removing it from the box—and most of that time was spent soldering the connector onto the radio cable for my 2-meter rig. You can use just about any terminal program with the PK-88. I used *Procomm* at first, but then switched the TNC to the host mode and ran AEA's *PC-Pakratt* software. Using *PC-Pakratt-88* in the host mode made the PK-88 a breeze to operate. If you want to use TCP/IP and other external control software, the PK-88 offers the KISS mode. In addition, it has an enhanced KISS to support the multi-drop KISS protocol designed by G8BPQ.

One of the most intriguing features of the PK-88 is the *Packet Lite* HF packet protocol. Packet Lite attempts to improve the efficiency of HF packet by truncating some of the overhead data, particularly in "I" frames and acknowledgment frames. Shorter frames mean fewer bytes to lose to noise or interference. In theory, Packet Lite should speed up communications between HF packet stations in all but the worst conditions. I decided to give it a try.

It didn't take long to find another PK-88 user on the HF bands. I found a fellow on 15 meters who was fishing for contacts on a Saturday afternoon. We chatted for about 15 minutes using "normal" packet, then switched to Packet Lite. The difference was very noticeable. Before the switch, I waited as long as 15 seconds to receive a valid ACK from the other station. Now the wait was reduced to an average of five seconds. Of course, the level of improvement varied according to band conditions.

The catch with Packet Lite is that you can only achieve maximum efficiency when you are connected to other Packet Lite users with PK-88s, PK-232s, or PK-900s. If you attempt to link to another brand of TNC, your PK-88 will switch back to normal packet. (The manual warns that some stations may disconnect altogether.) You also cannot use Packet Lite when communicating through nodes or digipeaters.

Like the other TNCs I tested, the PK-88 includes a mailbox function, or *Maildrop*, as they call it. The Maildrop supports automatic forward and reverse mail handling with your local PBBS if you make prior arrangements with the SysOp. You can access your Maildrop at the keyboard or remotely to delete mail, enter new mail, edit messages, etc.

The PK-88 is *not* a TNC-2 clone. It does not feature a modem disconnect for adding external modems. In addition, it cannot run other firmware chips for NET/ROM or *ROSE* switches without modification. If you don't intend to dabble in satellite packet or high-speed data communication, this isn't a serious drawback.

The PK-88 manual is by far the best of the bunch. It really isn't a manual—it's a book! The "getting started" section is detailed without being overwhelming. Many pages are spent introducing the new user to the odds and ends of packet operating. If you're unsure about certain command settings, for example, the manual makes a few recommendations. After the lengthy explanation of various commands (their syntax and meaning), there are nine appendixes with information ranging from radio hookups to troubleshooting. They even address common packet problems in a question-and-answer format. *Manufacturer: Advanced Electronic Applications, PO Box C2160, 2006 196th St SW, Lynnwood, WA 98036, tel 206-774-5554.*

PacComm TINY-2 MK-2

The PacComm TINY-2 MK-2 (as shown on the next page) is not as "tiny" as the Kantronics KPC-3, but at 5 × 7 × 1⅜ inches, it is a compact unit in its own right. Like the other TNCs we've reviewed, it operates with very low current requirements—only 40 ma. This makes the TINY-2 MK-2 attractive for mobile and portable operating. The TINY-2 is available in a number of versions according to the clock rate (as high as 10 MHz) and EPROM configuration. A TINY-2 with a 5-MHz clock was tested for this review.

The TINY-2 is completely TNC-2 compatible. It features a modem-disconnect header for satellite PSK modems, 9600 bit/s modems, or whatever strikes your fancy. (PacComm manufactures compatible external modems.) Its TNC-2 compatibility also allows it to use NET/ROM and *ROSE* network EPROMs. By installing the proper EPROM chip, the TINY-2 can become the heart of a NET/ROM or *ROSE* switch.

Speaking of EPROMs, the TINY-2 has an unusual EPROM-switching feature on the rear panel. There is a push-button switch labeled **OPTIONAL EPROM** and **NORMAL EPROM**. The TNC is shipped with TINY-2 MK-2 firmware in the "lower half" of the 64 K 27C512 EPROM chip. The upper half is occupied by WA8DED version 2.6 code. Most users will leave the switch in the **NORMAL** position. In fact, if you switch to the WA8DED code, you lose any stored mailbox messages *and* any nondefault parameters you may have set. So what's the big deal? Well, experienced packeteers can use the WA8DED code for special applications not supported by the TINY-2 firmware. Moreover, this EPROM switching feature is ideal for network nodes. You can load your desired network software in the upper half of an EPROM and standard TNC code in the lower half. Changing the TINY-2 from, say, a *ROSE* node to a standard TNC is as easy as pushing a button!

The TINY-2 includes a mailbox known as a Personal Message System, or *PMS*. The PMS supports standard packet mailbox functions as well as automatic mail collection from a full-fledged packet bulletin board. Automatic reverse forwarding (initiated by the TNC itself) is *not* supported. Incoming messages are stored in 15 KBytes of RAM.

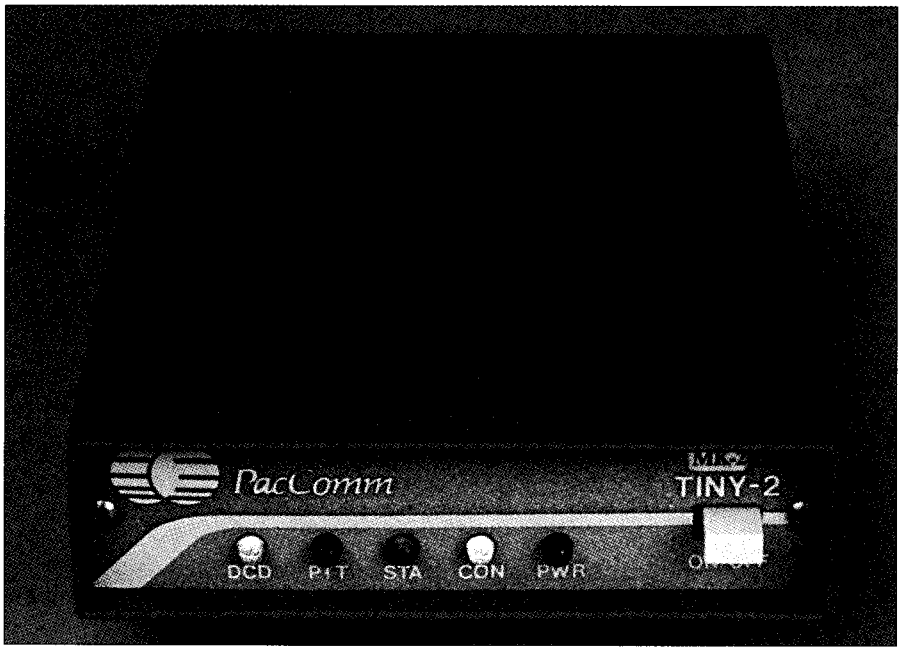
To alter the terminal data rate to match your computer, you must disassemble the TINY-2 and change the appropriate DIP switch. (The default setting is 1200 bit/s.) Although this is a pain the first time around, you're not likely to change your data rate very often. On the RF side, the TINY-2 supports 1200 bit/s VHF packet *only*. If you need HF packet capability in your TNC, you'll have to look elsewhere.

The TINY-2 features a DB9 computer serial port. The serial cable is not provided, but a connector is included if you want to make your own. If you're a Commodore user, you'll be pleased to know that the TINY-2 includes a TTL port and connector. (The manual even lists a simple Commodore terminal program.) The radio connection is made by way of a 5-pin DIN plug.

KISS is included among the list of TINY-2 operating modes. This is essential for TCP/IP and as well as the PB/PG packet-satellite software. The TINY-2 also supports a host mode (host software not provided) as well as an innovative *GPS* mode.

The GPS mode configures the TNC to interface with an NMEA 183-compatible Global Positioning System (GPS) receiver. Location data from the receiver is automatically incorporated into the TNC's beacon and connect-message fields. In other words, the TINY-2 is capable of announcing its exact position on command. You can do many intriguing things with this capability. Automatic Packet Reporting (APR) systems and high-altitude Amateur Radio ballooning come to mind.

The manual is detailed, but it can be a little confusing unless you read carefully. The bulk of the manual is written to explain functions and commands that overlap several PacComm TNC models, not just the TINY-2 MK-2. This means you have to be careful for phrases like, "On *some* PacComm TNC products, the following commands have been implemented." Does it apply to the TINY-2? If you're not sure, you have to do a little research. For information specific to the TINY-2, you must read the technical reference section at the back of the manual. *Manufacturer: PacComm Packet Radio Systems, 4413 N Hesperides St, Tampa, FL 33614-7618, tel: 813-874-2980, fax: 813-872-8696.* QST



New Products

N6RJ MEMORIAL KEYS

◊ Bencher's design team went "back to the drawing board" to create a new series of precision hand keys. Rather than copy existing models, the new RJ-series keys were drawn up from scratch to provide the best performance using modern materials and manufacturing techniques. They have oil-impregnated pivot-point bearings, and a complete range of locking movement and tension adjustments, with stainless steel screws throughout. In a departure from its traditional practice of identifying its products with the prefixes of rare DX countries (BY, ST, etc), the manufacturer chose the RJ designation in honor of the late Jim Rafferty, N6RJ, a close friend and former coworker of Bencher management. Retail prices: RJ-1 with chrome-plated parts on black-painted steel base $69.95, RJ-2 with chrome-plated parts and base $79.95. Bencher Inc, 831 N Central St, Wood Dale, IL 60192; tel 708-238-1183, fax 708-238-1186. QST