

Trio-Kenwood TR-751A 144-MHz All-Mode Transceiver

The TR-751A is Kenwood's most recent offering to satisfy the need for a multimode 2-m mobile rig for the amateur community. Their last entry was the TR-9130, which was (and still is) extremely popular because of its flexibility. The TR-751A is a feature-packed rig. It will surely be as popular as the '9130. It offers the 2-m operator more than would have been dreamed possible just a few years ago.

The '751A features include a GaAsFET front end and a large and easy-to-read, back-lit LCD. There are dual VFOs, 10 memories and a CALL channel that store frequency, mode, repeater offset (for FM operation), subaudible tone (if equipped with the optional TU-7 encoder), frequency step and RIT offset (for SSB and CW only). Additional features include a back-lit analog S/R/F meter, all-mode squelch, noise blanker, all-mode RF gain control, RIT and 25-W RF output. Options available include a voice synthesizer, TU-7 subaudible tone encoder and a modem unit for Digital Code Squelch (DCS) and Digital Channel Link (DCL).

A new "goodie" has been added to the list of "Kenwood exclusive" features. The '751A is the first multimode 2-m rig to be equipped with automatic mode selection. With this feature, the rig chooses the appropriate operating mode for the particular frequency you are on, based on the ARRL band plan. If you wish, you can defeat this feature and manually choose the mode. No matter where you are on the band, it only takes one or two key presses to choose the mode. On CW or LSB, two key presses of the same key are required. Two of the three mode-select keys control two modes each—one has FM and LSB, the other USB and CW. Pressing either key repeatedly causes the rig to alternate between the two modes.

The rig is supplied with a mobile mounting bracket and a heavy-duty dc power cord that is fused in both legs. The furnished microphone has a keypad on its back.

Front-Panel Controls and Indicators

Front-panel controls are well organized and easy to operate in all but the most severe mobile environment. See Fig 1. On the upper-left corner of the panel are two momentary-contact push buttons with dual identification, MHz/M.CH, F.LOCK and ALert. Directly below these are two more momentary push buttons identified as VOICE/TONE and FUNCTION. The FUNCTION switch has an LED indicator beside it. It toggles to control the functions of the MHz/M.CH and VOICE/TONE switches. When the FUNC LED is not lit, the MHz/M.CH buttons control up or down frequency tuning in 1-MHz steps. When the FUNC indicator is on, the DOWN MHz key functions as a Frequency LOCK and the UP MHz key controls the ALert feature. Enabling the ALert function causes the priority channel (memory channel 1) to be checked at about 6-second intervals. Additionally, the MHz/M.CH push buttons move up or down through the memory channels when the MR indicator is lit. The VOICE/TONE key activates either the optional VS-1 voice synthesizer (if the FUNC indicator is off) or the optional TU-7 tone encoder (if the FUNC indicator is on.)



The switch labels are color-coded to indicate the function that is performed when the FUNC indicator is lit. Exercising any function when the FUNC indicator is on turns off the indicator.

In the middle-left side of the panel are four push buttons: COM, LOW, NB and RIT. The COM switch activates the Common Channel or common frequency. It is factory preset to 145.000 MHz, but can be reset to any other frequency. Low/high power selection is effected with the LOW switch. The Noise Blanking and RIT are controlled by the other two switches. Two concentric dual-function knobs in the lower-left corner of the panel control VOLUME/SQUELCH and RIT offset/RF GAIN.

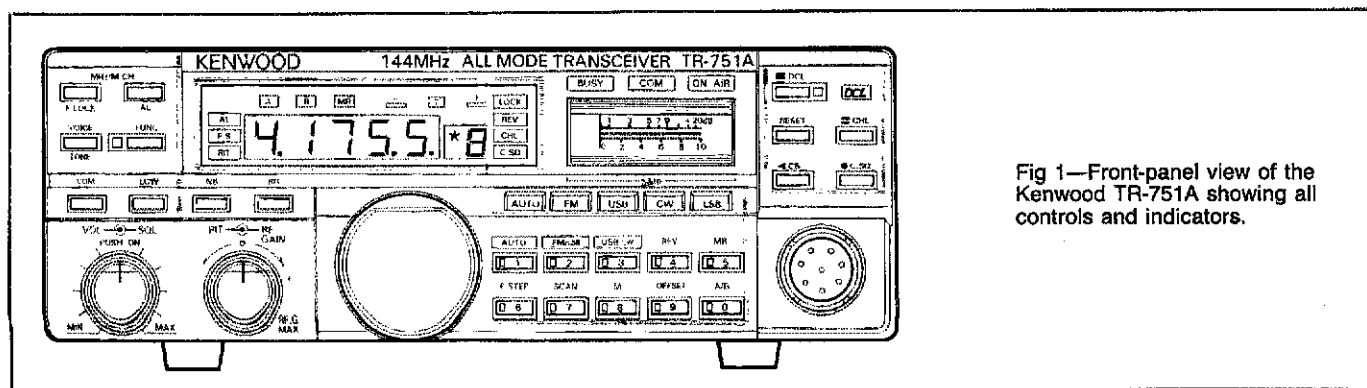


Fig 1—Front-panel view of the Kenwood TR-751A showing all controls and indicators.

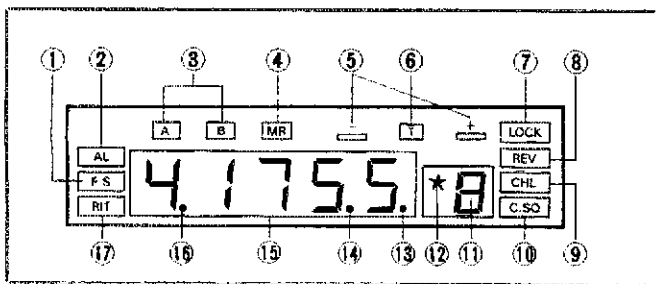


Fig 2—LCD group on the front panel. See text for explanation of indicators.

LCD Group

The large LCD panel in the top center of the front panel has several indicators in addition to the frequency readout. See Fig 2. The indicators on the LCD panel operate as follows:

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|------------------------|--|
| 1) F.STEP display: | On when F.STEP is on. |
| 2) AL display: | On when using ALert. |
| 3) VFO (A-B) display: | Indicates which VFO is selected. |
| 4) MR display: | On when MR (memory channel operation) is selected |
| 5) Offset display: | On when shift is set to "+" or "-" using the OFFSET key. |
| 6) Tone (T) display: | On when the subaudible TONE encoder is selected. |
| 7) LOCK display: | On when F.LOCK has been selected. |
| 8) REV display: | On when using the REVerse function. |
| 9) CHL display: | Flashes during open channel search by CHL key. On after channel linkage. |
| 10) C.SQ display: | On when using C.SQ (code squelch). |
| 11) Channel display: | Normally displays memory channel; displays code channel during digital code squelch operation. |
| 12) Standby indicator: | Specifies which codes will be actively used. |
| 13) 50-Hz display: | On when second digit is 5; off when it is 0. |
| 14) kHz dot: | On when 50-Hz step is selected. |
| 15) Frequency display: | Displays frequency, tone frequency, digital code and call sign. |
| 16) MHz dot: | Flashes during scan. |
| 17) RIT display: | On when using RIT. |

Just to the right of the LCD display panel is the S/RF meter and three indicators that show BUSY when the squelch opens in the receive state, COM when in the COM mode and ON AIR when transmitting. The S/RF meter operates as an S meter during reception to indicate signal strength, and indicates relative RF output during transmissions. The meter is set to indicate approximately "8" in the high-power mode.

Mode/Numeric Keypad

The Mode/Numeric keypad has 10 dual-function keys. Each has its own indicator. The first three keys (1, 2 and 3) control the operating mode, with the mode displayed on the five indicators above the keypad. In addition, the operating mode is audibly indicated by a Morse code letter through the speaker—"C" for CW, "U" for USB, "L" for LSB, "F" for FM and "A" for automatic mode selection. This feature can be defeated through a simple internal modification. I had no desire to defeat this signal because it is extremely valuable during mobile operation to know which mode you have selected. In addition to the audible mode indication, pressing any other key on the keypad causes a tone to be heard. The 10 keys (1 to 9 and 0) are used for numeric entries, but each key can also select a specific function.

- | | |
|-------------------------|--|
| AUTO (1): | Press this key to enter the AUTO mode; press any other mode key to cancel the mode selection. |
| FM/LSB (2): | Press the FM/LSB key to alternate between FM and LSB. |
| USB/CW (3): | Press the USB/CW key to alternate between USB and CW. |
| REVERSE (4): | This key reverses the transmit/receive frequencies during repeater operation. Press the REV key to turn the function on; press it again to turn the function off. |
| MR (Memory Recall) (5): | Pressing this key causes the MR indicator to light and the current memory channel information to appear. Press A/B (0) to return to VFO operation. |
| F.STEP (6): | The F.STEP key changes the tuning step. Several steps are available, depending on mode and position of the F.STEP key. |
| SCAN (7): | Press SCAN to initiate scanning; press it again to stop scanning. |
| M (Memory Enter) (8): | Press the M key to write a frequency into a memory or the COM channel. When the key is pressed, a series of beeps will sound for about 1.5 seconds. To enter a frequency, press the desired numeric key or the COM key while the beeps are sounding. |
| OFFSET (9): | The OFFSET switch cycles the desired transmitter offset for repeater operation. |
| A/B (0): | In the VFO mode, A/B switches operation between VFO A and B. In the MR mode, clears the MR state and restores VFO operation. In the COM mode, clears the COM state and restores VFO operation. |

The rig uses a standard Kenwood 8-pin microphone with UP/DOWN buttons for frequency and memory channel control, and it is connected on the lower right-hand side of the front panel. Above the microphone connector are five buttons that control the DCL and DCS functions. Refer to the Kenwood TM-2570 Product Review (Oct, 1986 QST) for details on the operation of these controls.

Rear Panel

The rear panel of the '751A contains the heat sink for the final amplifier, connections for the 13.8 V dc input, an external speaker jack, a CW key jack and an antenna connector. An auxiliary jack is provided for ALC input and for switching an external amplifier (max contact ratings: 30 V dc at 500 mA).

Operating the Rig

For the most part, the TR-751A is very easy to operate. This results from careful engineering and attention to ergonomic details that tend to make operating some rigs a pleasure, and others a real chore. The only problem I have with the '751A is operating the 10-key pad that controls mode and scan operation. Since this panel is not back lit, it is almost impossible to operate in the dark while mobile without memorizing the layout of the keys—when you press a key you can only hope that it is the right one. The most frequently used function on this keypad is the SCAN stop/start. Unlike some other Kenwood rigs, scanning with the '751A cannot be initiated with the UP/DOWN keys on the microphone. Scanning can be stopped, without putting a signal on the air, by pressing the PTT on the microphone.

SSB and CW operation with the TR-751A is really a pleasure. The excellent receiver sensitivity and a fantastic noise blanker are largely responsible for this. The noise blanker is extremely effective against ignition noise. On more than one occasion it made the difference between being able to copy a weak signal and losing the station completely in pulse-type noise.

Transmitted audio quality on SSB seems to be excellent, as I received many unsolicited compliments—including one fellow who said the rig had "the best audio I've ever heard on two meters." CW operation is also very enjoyable as the semi-break-in delay is set very comfortably (and is internally adjustable), and the sidetone is clean and easy to listen to. RIT adds to the enjoyability of SSB and CW operation, as does the F.STEP function. This provides 50-Hz

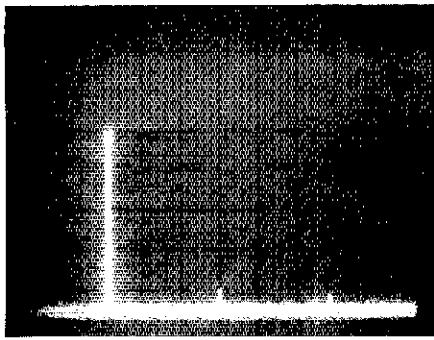


Fig 3—Spectral display of the TR-751A operating at 144.000 MHz with approximately 24 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 30 dB by means of a notch filter to prevent spectrum analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The TR-751A complies with current FCC specifications for spectral purity.

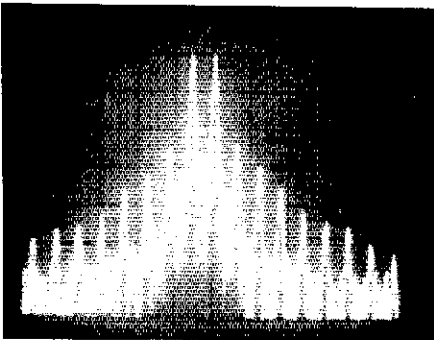


Fig 4—Spectral display of the TR-751A output during transmitter two-tone intermodulation distortion (IMD) test. Third-order products are 34 dB below PEP, and fifth-order products are 40 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The spectrum analyzer bandwidth was 0.1 kHz. The '751A was being operated in USB at approximately 26 W output on 146.91 MHz.

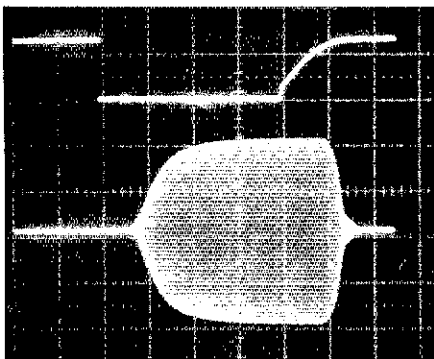


Fig 5—Keying waveform of the TR-751A. The upper trace shows the keying input; the lower trace is the RF output. Horizontal divisions are each 5 ms.

Trio-Kenwood TR-751A 2-Meter All Mode Transceiver, Serial No. 7050117

Manufacturer's Claimed Specifications

Frequency coverage: 144-148 MHz.
Modes of operation: USB/LSB (J3E) FM (F3E), CW.
Frequency display: Large LCD display.
Frequency resolution: 5 kHz (FM), 50 Hz (CW, SSB).
Frequency stability: Less than 400 Hz, 1 to 60 min; less than 50 Hz in each 30 min thereafter.

Transmitter

Power output: 25 W, high; 2-25 adjustable, low.
Spurious signal and harmonic suppression: Less than -60 dB.
Third-order intermodulation distortion: See Fig 4.
Keying waveform: Not specified.

Receiver

Receiver sensitivity: SSB and CW—less than 0.13 μ V for 10 dB S+N/N.
FM—less than 0.2 μ V for 12 dB SINAD.
Receiver dynamic range:

Squelch sensitivity: Less than 0.1 μ V.
Receiver audio output at 5% total harmonic distortion: More than 2 W.
Color: Gray.
Size (height, width, depth): 1.8 x 4.6 x 5.41 inches.
Weight: 4.8 lb.

Measured in ARRL Lab

Receive/transmit approx 142-149 MHz.
As specified.
As specified.
As specified.
Less than 100 Hz after 45 min.

Transmitter Dynamic Testing

23.3 W, min, high; 4.8 W, low, as factory adjusted.

-70 dB; see Fig 3.
See Fig 4.
See Fig 5.

Receiver Dynamic Testing

Minimum discernible signal (Noise floor) (dBm): -137.
Blocking dynamic range (dB): 114 (Noise limited at 144.020/144.040 MHz. Tested at 144.020 and 144.060 MHz).
Two-tone, 3rd-order intermodulation distortion dynamic range (dB): 84.
Third-order input intercept (dBm): -6.
Receiver quieting (μ V for 12 dB signal + noise + distortion/signal + distortion): 0.095.
Min 0.05 μ V, max 0.38 μ V.

2 W.

steps on SSB and CW, and 10-kHz steps on FM. I found the 50-Hz steps to be small enough to zero-beat any SSB signal that I encountered. RIT does not function on FM, nor is there any indication of the actual receive frequency when using RIT on SSB or CW—the only indication is whether RIT is on or off. This proved to be aggravating on a number of occasions, as it makes it impossible to tune a signal using RIT and then to switch to a VFO without having to guess where the signal is.

One other minor complaint I have about the rig is the inability to independently choose the AGC time constant on SSB and CW; it is automatically set for fast on CW and slow on SSB. There are occasions when I would like to use fast AGC on SSB, and vice versa. It would also be nice to be able to disable the AGC completely, but no provision has been made for this.

Most of my mobile operation with the TR-751A was on FM. Again, the rig has good transmitted audio, and the ability to choose 25 W or 5 W seemed to suit almost all of my repeater and simplex needs. The RF low-power output can be adjusted from almost nothing up to full power output. The review rig had about 10-W output in the low-power setting without any adjustment.

I found memory operation most useful on FM. The rig has eight memories for \pm 600-kHz splits or simplex operation,

and two more memories for odd splits. Channel 1 is the priority alert channel, Channel 7 is the starting point in the channel search in DCL operation, and Channel 0 contains the frequency limits for the program scan function. A few little things make FM operation less pleasant than with Kenwood's newer FM-only rigs, such as the inability to lock out a busy memory channel and the lack of provisions for adjusting the scan-hold time. These things are minor, however, when you consider that the rig is not intended solely for FM mobile use. Because the internal speaker is placed on the bottom of the cabinet, it often was necessary to turn the audio way up to be able to understand it. The rig does have plenty of undistorted audio for all but the noisiest mobile environments.

In portable operation, the TR-751A really shines. It comes with feet for the bottom of the cabinet, and is very convenient for mountaintopping. I used the rig to make a few QSOs from the top of Mount Greylock, in northwestern Massachusetts, during the ARRL September VHF QSO Party. Even in the heavy RF environment of a big multi-operator, multitransmitter contest effort, and with several other line-of-sight operations with big 2-meter signals, the rig held up well enough to hear some of the weaker signals while using only a small antenna system. The size and weight of the '751A make it ideal for

home, portable and mobile use.

The TR-751A worked right out of the box, and presented absolutely no problems during the review. The internal adjustment of the CW sidetone and feedback tone levels is easy and quick, as is installation of the optional modem unit for DCL and DCS operation. The TU-7 tone encoder and VS-1 voice synthesizer should be just as easy to install, based on their respective locations and mounting schemes, although neither were installed in the review unit.

The owner's manual is not the best in terms of clarity—the English translation seems to have been done a bit hastily—but it presents no problems in programming or operating the radio. In typical Kenwood style, the manual has good suggestions for installing and using the rig safely in mobile and fixed-station environments.

It is a bit expensive, but the Kenwood TR-751A is a fine radio, and should be considered seriously by anyone shopping for a 2-meter multimode rig for mobile, portable or home use. Manufacturer: Trio-Kenwood Communications, 1111 W Walnut St, Compton, CA 90220, tel 213-639-9000. Price class: TR-751A, \$600; MU-1 modem unit, \$35; TU-7 tone encoder, \$30; VS-1 voice synthesizer, \$45.—*Rus Healy, NJ2L*

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 March 27. 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.

Ten-Tec Model 425 Titan HF linear amplifier, s/n 00268. (See Product Review, *QST*, Apr 1986.) Min bid \$1411.

Trio-Kenwood TS-440S HF transceiver, s/n 7050095, AT-440 automatic antenna tuner, VS-1 voice synthesizer, PS-50 power supply, YK-88C 500-Hz CW filter, IF-232C/IC-10 level translator and modem IC kit. (Sold as a package only; see Product Review, *QST*, Dec 1986.) Min bid \$897.

Trio-Kenwood TM-2570A 2-M FM transceiver, s/n 7011501. (See Product Review, *QST*, Oct 1986.) Min bid \$320.

Alinco ALM-203 2-m hand-held transceiver, s/n 05109025. (See Product Review, *QST*, Jun 1986.) Min bid \$146.

AEA PK-64 PAKRATT™ multimode data controller, s/n 1178. See Product Review *QST*, Jun 1986.) Min bid \$133.

Microlog Air-1 radio interface cartridge. No s/n. Min bid \$186.

HAL ARQ-1000 code converter, s/n 158. Minimum bid \$100.

ICOM IC-745 HF transceiver, s/n 3101, PS-35A internal switching power supply, IC-EX243 keyer, IC-EX242 FM module, IC-FL32 filter, IC-FL53 filter, IC-EX241 marker. (Sold as a package only; see Product Review, *QST*, Sep 1985.) Min bid \$800. [AR]

The Shopper's Guide to Packet-Radio TNCs

(continued from page 21)

Breaking the 1200-bit/s Barrier

Kantronics KPC-2400

The KPC-2400 Packet Communicator includes a modem that operates at 2400 bit/s. Using phase-shift keying (PSK), the 2400-bit/s signal rate is derived from a dibit (a group of two bits) data stream operating at 1200 bauds. The 2400 bit/s (1200 bauds) data rate may be used above 28 MHz. In addition to the 2400 bit/s modem, the unit also includes the 300- and 1200-bit/s modems used in the TNC 2-compatible KPC-2. The three modems are software selectable. The 2400 bit/s modem is available separately for installation in the TNC 1- and TNC 2-compatible units (\$150). Like the KPC-2, the KPC-2400 uses AX.25 Version 2, provides both a RS-232-C serial port and a Commodore-compatible TTL port, emulates HDLC in software and operates from 12 V dc.



Kantronics KPC-2400 TNC, the first TNC with a modem operating above 1200 bit/s.

What Can We Look for Next?

As stated before, new TNCs are appearing daily. There are a number of well-designed units being developed and used in other

countries. Japan has over 5000 active packet-radio stations, and there are several Japanese-designed TNCs and modems available. No doubt many of them will make their way to the US in the near future. Some to look for are the *Telereader TNC-20*, the *PAX-88 TNC* and the *AIWA APX-25*.

Conclusion

There is a good selection of TNCs available out there—something to suit everyone's needs and pocketbook. The listings in this article should help you determine if there is a TNC just right for you. So get out there and get a TNC—enjoy the packet-radio experience! [AR]

New Products

UNCLE BILL'S CODE COURSE (V2.0)

After two years of production and sales, Uncle Bill's Software has updated Uncle Bill's Code Course and simultaneously entered the shareware field. Uncle Bill's Code Course is written for the Commodore® C64 and C128 computers only. Shareware is the newest form of software distribution. Shareware programs are under copyright, and there is a fee for their use. But—no fee is expected until the user has tried the program and determined its usefulness.

Uncle Bill's software user fee is a modest \$5 per program. Information about shareware and user fees appears within the program, together with a copy routine that allows reproduction of the shareware software.

As with the original, Uncle Bill's Code Course (V2.0) is made available free of charge to any radio club. Clubs should provide a formatted disk and a self-addressed stamped mailer. Clubs may share the software as shareware with members, students or anyone they wish.

Individuals may purchase Uncle Bill's Code Course (V2.0) by sending \$7 to Uncle Bill's Software, PO Box 2403, Falls Church, VA 22042.—*Bruce O. Williams, WA6IVC* [AR]