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Trio-Kenwood TM-2570A 2-Meter Transceiver

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Trio-Kenwood's 2500-series 2-meter transceivers cover a wide power range (TM-2530, 25 W; TM-2550, 45 W; TM-2570, 70 W) and bring several new features to the VHF scene. They are the first *dual*-microprocessor-controlled VHF radios. Memory functions cover not only storage of frequency and offset information, but also continuous-tone-coded squelch system (CTCSS) tone control and dual-tone multifrequency (DTMF) telephone-number transmissions. Finally, there is a sophisticated Digital Channel Link (DCL) system that provides for automatic, simultaneous transfer of two stations to a clear frequency once contact has been established on a calling frequency.

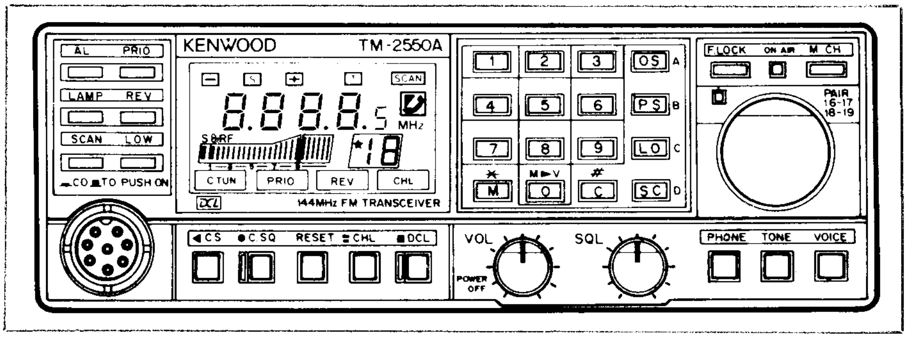

Fig 1—Front view of the Kenwood TM-2500-series panel, showing all controls and indicators.

Controls

The most prominent control feature is the multifunction 4½ digit LCD panel (see Fig 1). It shows the operating frequency (when MHz is lit), Digital Coded Squelch (DCS) code, ASCII values for the call sign sent with DCS data, CTCSS tone frequency (when Hz is lit) along with channel and telephone-number information during telephone-memory operation. Symbolic indicators display the activity of CTCSS tone (T); transmit-frequency offset (–, S, +); center tuning (C.TUN indicates that the squelch is open); PRIority-alert operation; REVerse-offset operation; memory channels locked out of scanning (more on this later); completion of a DCL operation (DCL); SCAN operation and telephone-number transmission (an icon of a handset). A bar graph at the bottom of the display serves as an S meter during reception, as a power output meter during high-power transmission and a microphone input-level meter during low-power transmission. A memory-channel display shows the active memory channel (numbers 1 through 19, plus letters A, b, d or U) and whether that channel is locked out of scan operations.

Next to the LCD is the 16-key pad. The numerical keys (0 to 9) are used to enter various numeric data and send DTMF tones during transmission. The right-hand column of four buttons and the "*" and "#" buttons provide the following controls:

OS—Transmit offset. The transmit offset is selected automatically (per the ARRL bandplan) when a frequency is entered. This button steps through a sequence of offsets (–600 kHz, simplex, +600 kHz) when pressed to allow selection of standard offsets that are not consistent with the bandplan.

PS—Priority select. This key is used to select the priority channel for alert operation. It also resets the microprocessors if pressed as the power is turned on.

LO—Lock-out key (Skip). This key is used to designate memory channels to be skipped during memory scan. The locked-out channel is indicated by a star next to the memory channel indicator.

SC—Scan. Initiates the scan operations.

C (#)—Clear. Clears the keypad frequency to the previous entry, or halts scan operations.

M (*)—Memory. This key is used to store frequency and offset.

To the left of the display are two columns of push-button switches. ALert selects the alert mode, where the priority channel is checked every six seconds. A double beep sounds repeatedly when the squelch is broken on the priority channel. LAMP turns on the control-panel illumination. The '2500 series features back illumination of all major controls; only the volume and squelch knobs and the DCL-system keyboard are not illuminated. SCAN selects either the time-operated (internally adjustable from 0 to 5 seconds) or carrier-operated mode of scanning. PRIOrity switches operation immediately to the priority channel. REVerse reverses the frequencies used for duplex operation. LOW switches the transmitter to low-power operation. The low-power output is adjustable from approxi-

Trio-Kenwood TM-2570A Transceiver, Serial No. 7011501

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 144-148 MHz.	Receive and transmit approx 142-149 MHz.
Mode of operation: FM (F3E) with F2D "DCS" system.	As specified.
Frequency display: 4½-digit LCD.	As specified.
Frequency resolution: 5 kHz.	As specified.
Frequency stability: less than ±15 ppm	Not measured.
Transmitter	
Power output: 70 W high power,	77 W, minimum.
low power adjustable 5-60 W.	As specified.
Spurious signal and harmonic suppression: −60 dB or less.	−70 dB. See Fig 2.
Receiver	
Receiver sensitivity: less than 0.25 μV for 12 dB SINAD.	0.19 μV.
Squelch sensitivity: less than 0.125 μV.	0.05 μV min, 1.0 μV max.
S meter: LCD, sensitivity not specified.	1.6 μV for S9 indication.
Audio output: 1.5 W (8 Ω) for 5% total harmonic distortion.	2.25 W.
Power requirements: 13.8 V dc, receive 0.6 A, transmit 16 A.	Receive 0.44 A, transmit 13.5 A.
Color: Gray.	
Size (height-width-depth): 2.4 × 7.1 × 9.9 in.	
Weight: 5.2 lb.	

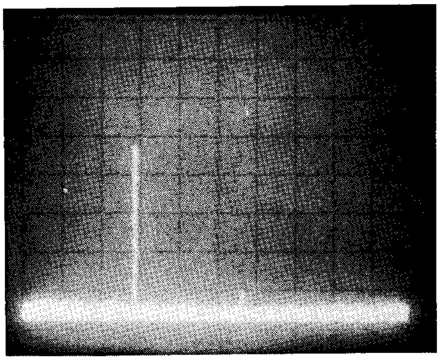

Fig 2—Spectral display of the Kenwood TM-2570 2-m transceiver. Frequency is 144.0 MHz, with an output power of approximately 72 W. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 32 dB 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 '2570 complies with current FCC specifications for spectral purity.

mately 5 W to 60 W. Below the buttons, at the lower-left-hand corner of the front panel, is an eight-pin microphone connector for Kenwood's line of scan-control microphones. The connector is angled slightly for easier access, but I did not notice any improvement in access compared to a straight connector.

At the right of the microphone connector is the five-key DCL keyboard. Its operation is discussed later. Below the DTMF keypad are the VOLume and SQUelch controls.

PHONE, TONE and VOICE buttons are at the lower-right-hand corner of the front panel. PHONE activates the telephone-number memory mode. TONE switches on the optional control tone. On American models (suffix A), the subaudible tone for the selected memory channel is transmitted. On European models (suffix E), a 1750-Hz tone is transmitted for repeater control. VOICE enables the optional voice synthesizer. Above these three buttons is the memory-select knob. It selects the memory channels for all modes, including the operating frequency when the radio is in the memory mode. It does *not* allow manual tuning of the operating frequency. When the radio is not in the memory mode, the operating frequency may be entered *only* from the keypad or by changing frequency with the up/down buttons on the microphone. Above the memory-control knob are the frequency lock (F.LOCK) button and LED, memory/keypad control selector (M.CH) and on-the-air LED indicator (ON AIR).

There are only three connectors on the rear panel of the TM-2500 series transceivers: An SO-239 antenna receptacle, a 1/8-inch miniature phone jack for an external 8 Ω speaker and a dc power connector. Dc power is fed through a connector configured like two spade connectors arranged in a T shape to prevent incorrect connection.

The DCL System

This system combines the features of the previous Kenwood Digital Coded Squelch system with those of the new Channel Link (CHL) system. Both systems require the MU-1 modem option for operation. (This seems odd to me. Kenwood builds the modem for DCS operation into their $300 handheld, but made it an extra-cost option on their $500 mobile radio.) The review radio did not include the option, so I could not try either the DCS or CHL system. Further, the manual explanation is difficult to understand, particularly when there is no working model on which to experiment. Within those limitations, here is my understanding of the system.

During DCS operation, a digital code and the transmitting-station call sign are sent at the beginning of each transmission. (One can review the active transmit code by pressing the CS key.) There are 100,000 possible five-digit codes, the radio can keep up to 10 codes in memory simultaneously, and any of the memorized codes may be locked out at the operator's discretion. Only those stations transmitting a memorized identification code are heard, although other signals show on the S meter, and operation of the alert feature overrides DCS. The optional CD-10 call-sign display can show call signs of received stations using DCS. The capability offered by this system is roughly equivalent to having 10 simultaneous PL tones in a tone-squelch radio.

The DCL system provides for automatic QSYing of two DCL stations that are already in contact. When the system is operating, there is a 0.2-second burst of digital data (1200 baud, minimum-shift keying) at the beginning of each transmission. This data burst is used to relay information from one station to the other when a frequency change is initiated by pressing the CHL button. (Kenwood has allowed extra space in the data format to allow for future expansion of the system.)

Once the operator presses the CHL button, his station reads the frequency stored in memory A and commences a search for a clear channel at preselected, discrete intervals from that frequency. (The frequencies of the searched channels are displayed as the search continues.) A clear channel is one with no signal over 0.2 μV for 1.5 seconds. The search interval is either 15 or 20 kHz, selectable by a diode jumper inside the radio. According to Kenwood's manual, the radio may occasionally transfer to an occupied channel because of transients in the microprocessors.

Upon finding an open frequency, the radio returns to the original frequency. If in simplex operation, and the frequency is clear, the digital information is sent immediately to the other station, and both stations move to the new, clear frequency. If in repeater operation, or the simplex frequency is busy, the radio returns to the receive mode and repeatedly emits three audio beeps until the operator permits transmission of the digital information by pressing the PTT button. (The information is actually sent when the PTT button is released.) Communication on the new frequency is simplex, with no tone, regardless of the settings at the original frequency.

If no open frequency is found, the search (and DCL operations) may be ended by keying the PTT line or pressing the RESET button. If the transfer is not completed successfully, the transfer information may be repeated, by pressing the RECALL button until the transfer is completed. A single press of the RESET button ends CHL operation at both stations. This allows either station to end DCL operation, or execute another CHL search (by pressing RESET, then CHL). The initiating station may return to the original frequency (in case the transfer cannot be achieved) by pressing RESET twice.

If DCS is used during DCL operations, both stations must use the same DCS code. Kenwood warns that time delays in some repeaters may prevent successful DCL operation.

Other Special Features

American models of the TM-2500-series allow memory storage of 15 seven-digit telephone numbers for DTMF transmission over the air. To use the feature, select an operating frequency, press the PHONE button to access the phone memory, select the desired memory with the memory knob, press PTT to transmit and press PHONE again to send the tones. I found this feature particularly useful with the W1AW 2-meter repeater. The repeater incorporates an Advanced Computer Controls Model RC-850 controller that uses some rather complex codes to control its many features. Such codes are easily programmed into the TM-2570 for one-touch control of those functions that can be legally controlled on the repeater receive frequency.

When American models have the TU-7 tone-encoder option installed, one subaudible tone frequency may be stored with each memory operating frequency. The tone is added to the modulation whenever the tone feature is on.

Special repeater offsets other than the standard 600-kHz split can be operated using two memory-channel pairs: Channels 16/17 and 18/19. To operate, store the transmit and receive frequencies in one of the pairs. The receive frequency is selected by setting the M.CH to memory mode and selecting either channel. This becomes the receive frequency. Transmission takes place on the frequency stored in the other channel of the pair. Standard splits or simplex operation do not work from these channels unless the appropriate split is stored as if it were a special split.

Scan Operations

All scan operations stop on an occupied channel for either a predetermined time period (3 to 15 seconds, internally adjustable) or until the carrier drops. All scan operations can be stopped by: (1) pressing the PTT button, (2) pressing the C (Clear) button, (3) turning the power off, (4) activating the priority channel or (5) pressing the F.LOCK button. The scan direction is selected with the UP and DWN buttons on the microphone. The scan speed increases when the button is held down.

In the keyboard mode, the radio scans according to upper and lower scan limits programmed in memories "U" and "d," respectively. When the SC button is pressed, the radio begins scanning. If the radio was set to a frequency between the limits when scanning began, scanning continues within those limits. If the radio is set to a frequency outside the limits when scanning begins, scanning takes place outside the limits. This allows the operator to either select or exclude a band for scanning. When the frequencies in U and d are equal, the radio scans its entire frequency range.

In the memory mode, all memory frequencies are scanned except those that are locked out. A memory channel can be locked out of the scan by selecting the channel and pressing the LO button prior to commencing the scan.

The priority and alert functions are complementary. Any of the memory frequencies can be selected as the priority channel. Once a priority channel is chosen, it can be monitored with the alert function. When the ALert key is pressed, the priority channel is checked for activity every six seconds. If there is activity, a double beep sounds each time the priority channel is checked. The operator can immediately change operation to the priority channel at any time by pressing the PRIority button.

The Manual

The operating manual is complete, but instructions are less than clear in some areas. Specifically, the DCL system defies explanation on paper. Also, the manual gives the owner instructions for installing the optional modem, voice synthesizer and tone encoders, but not for changing the lithium battery. Kenwood covers that procedure in the Service Manual (but not in the Operating Manual) because it involves soldering in CMOS circuits.

The mobile bracket uses large rubber jaws to grip the radio. It makes installation and removal quick and easy.

Operation

I am very satisfied with the radio. Its performance is excellent. It has plenty of bells and whistles to satisfy the most dedicated "engineer." When received, the radio did not transmit with full output power, but the Kenwood technicians were extremely helpful and prompt in providing us with information to correct the fault. A capacitor had been improperly installed in the final amplifier circuitry during manufacture. Kenwood was aware of the problem and has issued a service bulletin covering correction of the defect. Following proper installation of the capacitor, it was a simple matter to adjust the radio for the full 70 W+ output. The 70 watts definitely helped during a recent March of Dimes Walkathon, where some other rigs had trouble reaching the repeater.

Manufacturer: Trio-Kenwood Communications, 1111 West Walnut St, Compton, CA 90220. Price class: TM-2530A $430, TM-2550A $470, TM-2570A $560, MU-1 modem unit $35, TU-7 tone unit $30, VS-1 voice synthesizer $45, CD-10 call-sign display $100.—*Bob Schetgen, KU7G*

Strays

SPREAD SPECTRUM AND THE EXPERIMENTER

☐ If you are interested in developing a practical spread-spectrum station, you will be interested in reading Andre Kesteloot's, N4ICK, article in October 1986 *QEX*. The article offers technical details and schematics of an external reference synchronization method to get you started in spread-spectrum experiments. Information on a pseudo-random generator, designed along FCC guidelines, is included.

Since June 1986, US radio amateurs are authorized to use spread-spectrum techniques. In addition to applying conventional modulation mehods to an RF carrier, It is possible to alter either the phase of that RF carrier (direct-sequence spread spectrum) or its frequency (frequency hopping) in accordance with a pseudo-random code. This code is generated at a certain clock frequency.

To receive a spread-spectrum transmission, it is necessary to know the frequency on which the transmission is taking place, the particular pseudo-random code used (announced or agreed on in advance) and the frequency and phase of the clock used to generate the pseudo-random code. To the casual listener who does not know these four variables, the spread-spectrum transmission sounds like mere noise.

How can an operator recover clock information from a signal not heard in the first place? One solution, suggested in July 1983 *QST* by William Sabin, WØIYH, tells of synchronizing both the transmitting and receiving clocks to an external reference.

The Amateur Radio Research and Development Corp (AMRAD) has spent several years experimenting with spread-spectrum techniques. In June 1986, AMRAD member N4ICK demonstrated actual hardware embodying the scheme proposed by Sabin. Dedicated experimenters such as N4ICK and other AMRAD members helped to convince the FCC that Amateur Radio experimenters are ready for spread-spectrum privileges. (*Tnx N4ICK*)

I would like to get in touch with ...

☐ anyone with a schematic for a CE 20A. Tony Bodo, WA9YOZ, 4623 East 25th Ave, Lake Station, IN 46405.

☐ anyone with a manual/schematic for a Conar Model 212 VOM made by NRI. Don Lacy, NV4V, 2915-B Battle Mountain Way, Tallahassee, FL 32301-3657.

QEX

QEX: THE EXPERIMENTERS' EXCHANGE

☐ Calling all experimenters! Do you want the latest on high-level technical developments taking place in Amateur Radio? QEX will bridge this gap if you are interested in playing a role to extend the technical frontiers of Amateur Radio.

The September issue includes articles on:

- "How to Tailor Signal Coverage with Beam Tilt" by Steve Weinstein
- "Padding Calculations Made Easy," by Jacob Z. Schanker, W2STM
- "A Crystal Oscillator for Digital Circuits," by Paul Newland, AD7I
- "Xerox 820-1 Compendium—Part 4," by AMRAD

Other features include: Tips on handling and using chip capacitors in a project and two alternatives for acquiring bias circuitry for triode grounded-grid amplifiers.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.