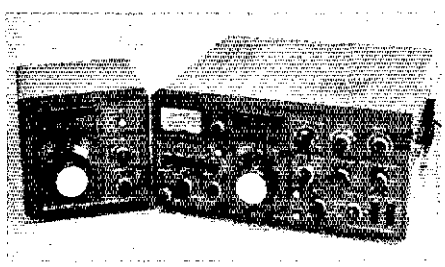
8 A current drain. Low-power position, 4 A (transmit), 1.3 A receive.*
Power output: 35 watts, high-power position, 500 milliwatts, low-power position.*
Selectivity: 14 kHz (min.) at 3 dB; down 40 dB at ±11 kHz; down 60 dB at ±15 kHz; down 80 dB at ±20 kHz.
Image rejection: 66 dB minimum.
Receiver sensitivity: 0.35 μV (max.) for 20 dB quieting; 0.15 μV (max.) squelch threshold.
Price class: $600.
Distributor: Clegg Communications Corp., 208 Centerville Rd., Lancaster, PA 17603.

*Measured in ARRL laboratory.

KENWOOD TS-820

If you're a transceiver enthusiast and find yourself wondering what could possibly be new about another gray "import" box, stand by, for there are some interesting features to report concerning the new TS-820 by Kenwood. It is similar in overall appearance to the TS-520, if the examination is a cursory one. But, a close look will dispel any doubts that may suggest a mere updating of an old piece of equipment.



If the buyer is amenable to spending $170 for digital frequency readout, he'll see a bright set of blue LEDs at the upper center of the front panel, and the frequency display includes hertz. For example, if the rig is on 10 meters, the operator will see something like 28,606.3 kHz, if that's the frequency he happens to settle on. However, analog readout is provided also, permitting frequency resolution to 1 kHz. Concerning the latter, the dial mechanism is a smooth-running one, requiring very little torque to move it. No evidence of backlash could be found, even when using the 500-Hz i-f filter.

The frequency counter and digital-display modules can be installed (if the accessory is desired) in a few minutes. The shielding and decoupling seem to be rather effective, for nary a spur or birdie has been found in any of the tuning ranges, despite a careful search for them by this reviewer. A front-panel switch enables the operator to actuate a digital-hold feature. Its usefulness can be realized when it is necessary to "freeze" the frequency of operation on the display while tuning elsewhere in the band. That is, once the DIGITAL HOLD is punched up, the readout retains the operating frequency for later reference. Returning to that operating frequency is an easy matter by observing the readout, unlatching the hold circuit, and

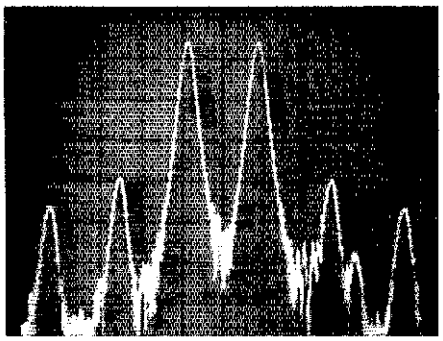


Fig. 1 — Two-tone test for IMD products. The reader will note the different display for the Hewlett-Packard analyzer. The 3rd order products are approximately 39 dB down from full output. A comparison of the old Singer-metric spectral display can be seen in Fig. 1 of the FT-101 review appearing elsewhere in this Product Review column.

tuning the dial back to the original frequency. The analog readout can be used while the digital one is placed in the hold position.

Available also as accessories are the 500-Hz cw filter ($45) and the dc-to-dc converter for mobile operation ($59). The ac power supply is built in. The VFO-820 is available to those who desire one as an outboard frequency-control element ($139). The VFO contains an independent RIT control, just as the TS-820 does by itself.

As part of the package one receives the built-in rf type of speech processor. A level control is located on the front panel. Tests made with the processor actuated indicated that the ssb signal was clean, crisp, and effective under adverse band conditions. It was used only when "the going was a bit rough," for under normal band conditions there is little point in using processed speech.

The TS-820 includes i-f passband tuning. This feature can be extremely helpful when QRM is present, for it permits the operator to manipulate the front-panel I-F SHIFT control for nulling out interference or tuning the passband of the i-f. The receiver does not change frequency as the control is adjusted. In other words, the operator moves the *signal* across the i-f passband — not the passband across the received signal.

The Kenwood engineers must have been boning up on the proper way to achieve good

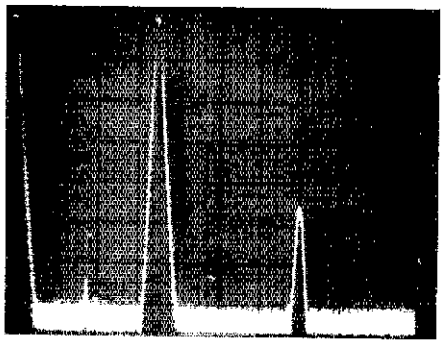


Fig. 2 — 80 meter output. The display is calibrated for 1-MHz per horizontal division. The second harmonic is 45 dB down from the fundamental.

dynamic range in a receiver: They went for *single-conversion* system, which is rather un usual in a transceiver design. The fewer th conversions, the better the dynamic range and the ARRL lab tests bear this out. Th MDS (minimum discernible signal) or nois floor of the TS-820 came out at −136 dBm Blocking (1dB above noise floor) was 114 dB and IMD for a two-tone test (20-kHz signa separation on 20 meters with the 500-Hz i-filter in operation) was 85 dB. ARRL test were conducted in accordance with th W7ZOI *QST* article, "Defining and Measurin Receiver Dynamic Range."[1] To the best o our knowledge the measurements are accurat within ±3 dB.

Evidence of acceptable dynamic range wa noted during operation of the TS-820 by thi writer at W1CER, two blocks away from th W1AW 1-kW "gravel grinder." No seriou problems were encountered with IMD or cros modulation. On 80 meters there was evidenc of cross-modulation when the signal level received were S9 or less. The 20-dB front-en attenuator was actuated, and the problen vanished. W1GQO used the '820 during th 1976 Field Day — a site where multiband kW stations were in operation. He reported n serious problems with reception in the ban of interest — 20 meters.

Transmitter performance thus far has bee as smooth as velvet. The Japanese equivalen of the 6146 tube is contained in the PA (tw each). That's right; the rig is not totally soli state. Transmitter IMD is excellent, as note in the accompanying spectral display. Thi cleanliness results in part from the applicatio of negative rf feedback between the PA an driver stages. The linearity of the amplifier i enhanced considerably by this feature.

Laboratory tests revealed no significan local-oscillator drift from a cold start to ful warm-up. The TS-820 utilizes a phase-locke loop LO (PLL). The primary advantages ar that a single-conversion receiver circuit i made possible, and when the operator switch es from upper to lower sideband, or from ssb to cw, the receive frequency remains th same. As a result it is not necessary t recalibrate the tuning dial.

Other "goodies" in this new box includ VOX, 25-kHz calibrator, audio monitor heater-power standby, full-range metering front-panel VOX controls, and semi break-i for cw. But, here comes the elegant feature Kenwood saw the need for coverage of 16 meters! It is included in the transceiver thereby providing use from 1.8 to 30 MHz Included also as a standard feature is the nois blanker. Tests on short-duration noise pulse (automotive in particular) showed that th circuit is very effective. There was no evi dence of receiver dynamic-range degradatio with the blanker operational.

Decor is similar to that of the TS-520 Gray paint is used on the well-shielded box and as a result of the latter the TVI character istics seem to be good. No TVI was observe on the writer's solid-state Zenith set whil operating from 160 through 10 meters, eve though no low-pass filter was used with th TS-820.

It would seem that this transceiver shoul appeal to the traveler and fixed-station op erator. It has a handle on one end, and is no

[1] Hayward, "Defining and Measuring Receive Dynamic Range," *QST* for July, 1975.

too heavy for comfortable carrying through air terminals or hotel corridors. There should be ample room under most automobile dashboards to mount the transceiver during mobile operation.

The only "glitch" noticed during use was that of a "rubbery" effect when tuning the RIT control. That is, while adjusting it the station being received sounded like it had a severe warble on it. Once the control was released, however, normal signal quality resulted.[2] – *W1CER*

[2] [Editor's Note: After a discussion with the folks at Kenwood, they assured us that the difficulty with the RIT was unusual, and that it was not the normal operation of the control.]

The Kenwood TS-820 Transceiver

Dimensions (HWD): 6 X 13 X 13-1/2 inches.
Power capability: 200 W PEP, 150 W dc input.
Power requirements: 117 V ac 50-60 Hz; 13.8 V, 15 A transmit; 1 A receive.
Price class (without accessories): $830.
U.S. distributor: Trio-Kenwood Communications, Inc., 116 E. Alondra, Gardena, CA 90248.

NEW BOOKS

Handbook for Electronics Engineering Technicians, by Milton Kaufman and Arthur Seidman. Published by McGraw-Hill Book Co., New York, NY. Hard-cover edition, 6-1/4 X 9-1/2 inches. Page count, inclusive of index, 520. Price at time of reporting, $19.50.

Despite this book having been written for professional electronics technicians, the contents seem ideal for amateurs of various skill levels. The book is a cross between a textbook and a highly expanded electronics dictionary. Most of the subjects treated are commonplace in the design, building and repairing of modern amateur equipment.

Minimum rhetoric is applied by the authors, and the terms and math should be simple to assimilate by even the less-experienced amateur. The equations are not ponderous. They are used only where it is essential to include algebra as part of an explanation or to illustrate the solution to a design problem.

The volume contains 695 illustrations, many of which are rendered photographically. The half-tone quality is excellent. Photographs are used to show the physical properties of numerous modern components, both active and passive.

There are 18 chapters in the book. Among the subjects covered are resistors, thermistors, varistors, capacitors and all significant parameters related thereto. A similar treatment is given to coils, magnetic circuits, transformers, practical circuit analysis, meters and measurements, semiconductors (all types in current use), tuned circuits and filters. The authors provide in-depth descriptions of amplifiers and oscillators, op amps, digital-circuit fundamentals, power supplies, batteries and even vacuum tubes!

Unlike many of the present-day professional text books, this publication leans toward originality rather than a hackneyed compilation of time-worn data from manufacturers' application notes. Although there is some borrowed information contained in the volume, source credits are given, and the material used is essential to assure a complete explanation of the subject under discussion.

Although the cover price may seem a bit lofty as compared to most amateur technical books, those wanting to learn theory and prepare for FCC examinations should find this publication extremely useful as an addition to the existing amateur library. – *W1CER*

HAL 2550/ID KEYER

What, *another* keyer? The HAL 2550 keyer, by itself without the optional ID feature, might at first be construed as just that, another keyer. It does all the work of making code in the usual fashion, plus having dot memory and iambic keying and other nice features. We'll deal with the basic keyer first, then discuss the optional identifier feature.

The keyer employs 14 integrated circuits in a more or less standard configuration, ending up with a husky 2N5655 keying transistor. The manual gives instructions for determining whether or not the circuit to be keyed is within the unit ratings. In the unlikely event that the output transistor might be endangered, further instructions for simple protective measures are also provided. As is the case with nearly all solid-state keyers, the only hard and fast rule is that one side of the circuit to be keyed must be at electrical ground. No modern amateur transmitter is otherwise, so no problem there.

A small keyer such as the 2550 is invaluable for moving around from place to place – taking on Field Day, on a DXpedition, to a friend's house for code practice (the unit has both a monitor *and* built-in speaker), or for moving from rig to rig at a multi-transmitter contest operation. The 2550 almost doesn't look right planted in one place . . . it seems eager to move to the next keying project.

A package within the shipping carton contains enough cables, plugs, and miscellaneous connectors to satisfy just about any set-up requirement. There is only one cable coming from the back of the keyer – the ac-power cord. All other connections are made via jack and plug combinations. A typical installation might proceed as follows: Choose a cable with a single-circuit plug on one end and add the appropriate connector to fit your transmitter. Plug your paddle in, after adding the proper three-circuit plug, and so on. An extra cable and spst switch are even included for placing a remote TUNE switch anywhere around your operating position. There's an audio output from the internal monitor which can be fed to your receiver audio stages. Finally, you can even plug your trusty straight key into a jack in the keyer and then choose keyer or straight key at will. *All* the necessary hardware for the above operations are provided. No trip to the local radio store (if your town still has one) for the parts. In addition to normal 117/235-volt ac operation, the 2550 can also be powered by an external 12-V dc source, merely by plugging the volts into the back of the unit. The keyer draws 400 mA in normal service. This adds to the versatility we mentioned earlier. Another nice feature is the ability the operator has of adjusting the tone of the internal audio oscillator, as well as the volume. Many cw operators are driven crazy by the high-pitched hog squeals which pass for monitors these days in some keyers and transmitters. None of that with the 2550, since an internal pot allows for adjustment of the pitch as high or low as desired.

One hassle often associated with solid-state keyers is their susceptibility to the presence of strong rf fields. By using a totally sealed (and handsome) enclosure, bypassing of all incoming and outgoing cables, and by supplying shielded cable to assure proper hook-up, HAL has "done in" the problem for good. A hefty ground terminal on the back panel allows for appropriate grounding to the station, in addition to the automatic grounding through the cable shields. Running a full kW into open-wire feeders within the shack a matter of inches from the keyer didn't affect it in the least.

The manual gives advice on how to use the iambic features and dot memory. For us old-timers who insist on considering such features newfangled, the advice is of considerable use. Once the procedures are mastered, the keyer, with its master clock, will produce perfect code.

Some additional flexibility is obtained when one purchases the 2550 keyer with optional ID circuitry. The 2550/ID has provisions for one ROM (read-only memory), programmed at the factory, which will send upon command either of two sections, each having a capacity of 62 dots, dashes and spaces. Each half of the ROM has room for a contest CQ or net call-up of reasonable length. The 62 "locations" available are counted as follows: Each dot, dash and intercharacter space is one location, and a word space is three locations. One factory-programmed ROM (to your specifications) comes with the 2550/ID, and additional ones are available. One ROM per contest, net, or operating requirement is the idea. The control jack for the ROM is on the back panel, and the cable and switches for the message commands are included with the package (naturally). If you are unsure about the counting of locations in the messages you want, a call or letter to HAL will put you on the right track.

After using a 2550/ID with several different transmitters, in three different locations, it seemed the two words which summed it up were – easy and foolproof. Not much more one could ask, really. – *WA1STN*