



Recent Equipment

To acquaint you with the technical features of current amateur gear.



The *Henry* Radio Kenwood TS-520 Transceiver

THIS LATEST transceiver from Trio seems to be generating widespread interest. While it is similar to previously reviewed Kenwood models,¹ there are many new features that make it a truly remarkable unit. The review model arrived with optional cw filter, external VFO (VFO-520) and external speaker (SP-520). However, the power supply and transceiver are contained in one package with cooling provided by means of a very quiet fan. Also included, is a small speaker in the top side of the cabinet which eliminates the need for an external speaker when the transceiver is used in mobile or portable operation.

Using the TS-520

Placement of the various controls proved both convenient and comfortable for operation. While some are very closely spaced on the front panel, no difficulty was experienced in using the system. Band and mode changing is simple. Also, an LED-indicator system is provided which allows the operator to see instantly which frequency control is being used. For example, if the internal VFO was being used in the receive mode and the external VFO was controlling the transmit frequency, out-of-band operation could be possible. Because

¹Recent Equipment, *QST* for May and July, 1973.

of the LED system, there is no confusion about where one is operating in the band if a careful watch is kept on the lights.

The tune-up procedure outlined in the manual is both simple and straightforward. The mode switch is placed in TUNE, with the carrier-level control set at minimum. The SEND-RECEIVE switch is moved to SEND. Increasing the carrier-control setting and adjusting the other controls (DRIVE, PA TUNE and LOAD) will establish the desired power level. The TUNE position provides reduced power input (one half), which is an excellent technique for preserving tube life. Final tuning is accomplished in the CW position, where full power can be obtained either by closing the key, or by removing it from the transceiver.

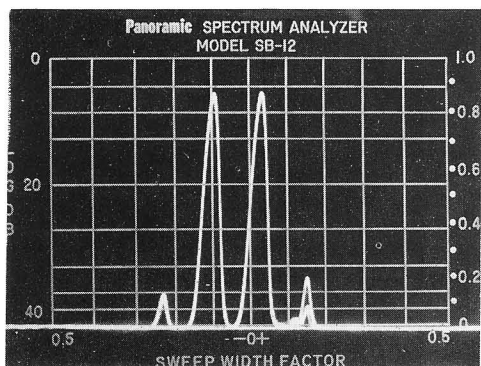
Control of the VOX circuitry, bias level, and sensitivity of the relative-output indicator is provided behind a snap-on metal plate on the left side of the cabinet. Although frequent adjustment of these controls is not required, they are within easy reach. The side-tone level adjustment is located underneath the transceiver and is reached by placing the unit in the "service" position. This control can then be adjusted with a small-bladed screwdriver without removing the bottom cover. Once set, the control need not be adjusted again unless headphones with a different impedance are used.

Provisions for monitoring a 10-MHz time and frequency standard are included in the TS-520. By



The VFO-520 and TS-520 together. When the external VFO is wired into the system, all frequency control is determined by the switch at the left of the tuning dial on the VFO-520. A jumper plug is required for the TS-520 if this external VFO is not used.

Spectrum-analyzer display of the output of the Henry Radio Kenwood TS-520 with a two-tone 160-watt PEP input. The horizontal axis of the display represents frequency, and the vertical axis amplitude. Each "pip" represents a single-frequency component of the rf output. The display is adjusted so the amplitude of each component may be read from the scale at the left, directly in decibels below the peak-envelope power (PEP) output, as rated by the manufacturer. Each reticle division represents 5 dB. Responses other than the two individual tones near the center are distortion products; third-order products 32 dB down may be seen here. Individual tones of the two-tone signal are down by 6 dB from the PEP output. This is because the tones are displayed as two discrete frequencies. At the instant when voltages of the individual tones are in phase, they add to produce a peak in the envelope waveform pattern which is twice the voltage amplitude of a single tone alone. The power at the peaks of the envelope (PEP) is therefore four times that of a single tone, a 4:1 power ratio being equivalent to 6 dB.



twice the voltage amplitude of a single tone alone. therefore four times that of a single tone, a 4:1

pressing a button and setting the main tuning dial to 0.0, the signal will appear at this point (regardless of the band-switch setting). This mode is handy when checking the built-in 25-kHz oscillator. When using the monitor, the transmitting circuitry is deactivated so there is no chance of accidental output in this portion of the spectrum.

Another feature is that the agc time constants can be selected from the front panel. This allows the operator to choose either slow, fast, or no agc operation. Most operators prefer the slow time constant for ssb reception and the fast one for cw.

One desirable feature in the TS-520 is the multiple-option power supply. The transceiver can be powered from a 117- or 234-V source and provision is included for 13.8-V dc operation. Changes between the various voltages is accomplished simply by using different plugs on the back of the unit. Safety in carrying the transceiver is enhanced by a very hefty handle. Also, the filaments of the three tubes can be turned off for low-drain receive operation. A heater switch is provided for that purpose. In general, the package is ideal for those weekend trips and DX-peditions.

The noise blanker was found to be very helpful for eliminating ignition noise which is a common difficulty during mobile operation. One problem was encountered, however, and that was some cross modulation from strong signals on adjacent channels occurred with the noise blanker switched in.

A front-panel control labeled DRIVE is actually a drive control and receiver preselector peaker. The receiver front end is peaked for each band with this

control. At the same setting maximum drive occurs in the transmit mode.

Frequency flexibility of the TS-520 completes the picture of this versatile rig. With the optional VFO (VFO-520), any spit-frequency combination is possible on any of the five bands. Each VFO has RIT (receiver incremental tuning) which enables one to listen on either side (± 3 kHz) of his transmit frequency. Actuation is accomplished by means of a push button. All of the VFO switching functions are controlled by the VFO-520 when it is connected, and otherwise by the internal VFO.

If one does not include the VFO-520 in the system, a smaller degree of flexibility can still be obtained while using any one of four optional crystals which can be selected from the front panel. Control of the fixed frequencies is by means of the FUNCTION SWITCH. All positions clockwise from the 12 o'clock position relate to the crystals. The first position utilizes the TS-520 VFO for receiving, and the transmit frequency is determined by the CHANNEL SELECTOR. The second spot provides the reverse effect (transmit on the VFO frequency, receive on the crystal frequency), and the third position is for transceiving on the

Top view of the Kenwood TS-520 transceiver. Modular construction is used throughout the unit. The final amplifier cage can be seen in the upper right of the photograph and the four crystal sockets for fixed-frequency operation are just below the power transformer.

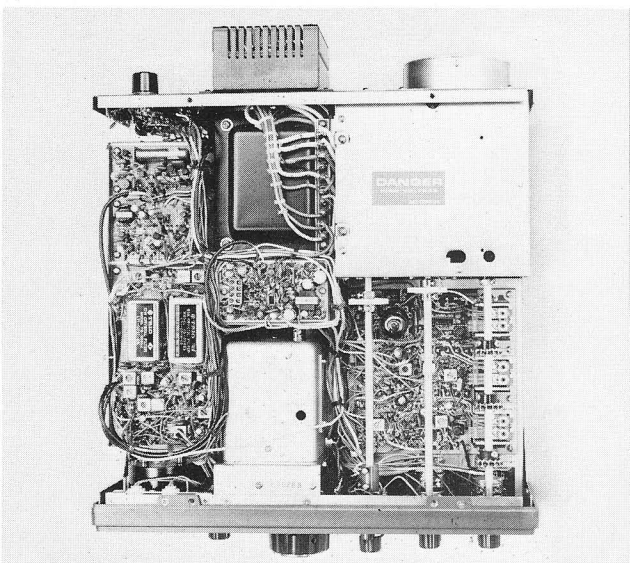
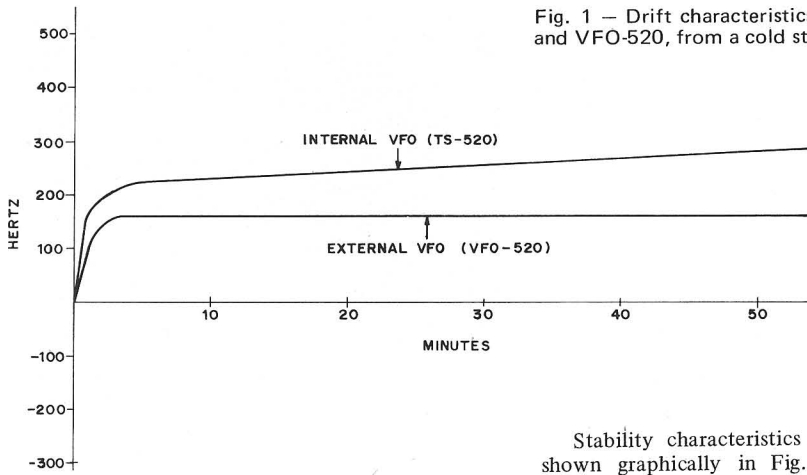


Fig. 1 — Drift characteristics for the TS-520 VFO and VFO-520, from a cold start.



fixed crystal frequency. An LED on the front panel indicates the use of this mode. The method of "spotting" the VFO-520 or fixed frequency on the TS-520 VFO is the same as with the Henry Radio TS-511S Transceiver, and described in *QST* for May, 1973. Matching of tones or listening to birdies is not necessary; just tune for perfect zero beat.

The Circuits

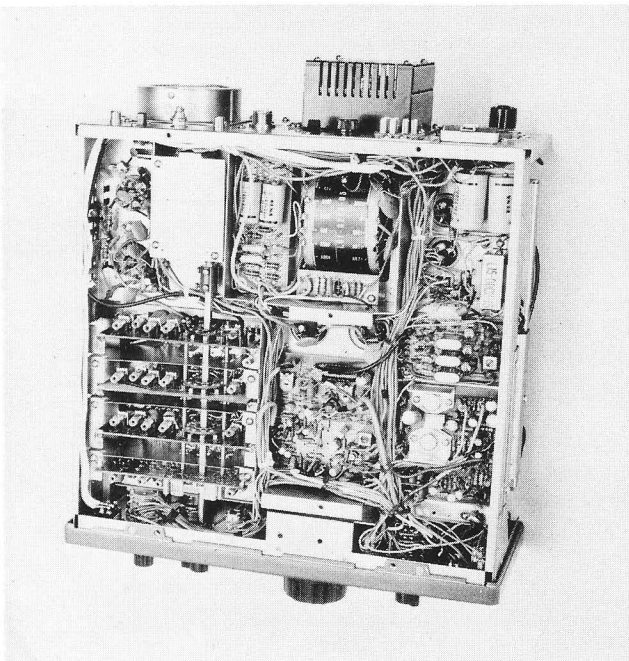
This Henry Radio transceiver is based on a hybrid design, using one 12BY7A tube as a driver and two 6146As in the final amplifier. The rest of the circuitry revolves around 84 diodes, 44 transistors, 18 FETs, and one IC. The instruction manual contains 52 pages of explanations, service information and circuit diagrams with photographs of the individual pc boards. A voltage measurements section is included for checking the different bias levels on each active device.

Stability characteristics of the two VFOs are shown graphically in Fig. 1. Both VFOs were monitored from cold start while using a frequency counter. This test revealed that the VFO-520 was the more stable one, as indicated by the nearly straight-line curve. However, the TS-520 VFO stability was well within the Kenwood specifications. Table I contains performance data for the transceiver. A dual-gate MOSFET is used in the rf amplifier stage and the overall sensitivity is quite good. On the 80-meter band there were signs of cross modulation because of some very strong signals, but the effect could be overcome by adjustment of the rf gain control. There is no selectable attenuation at the receiver front end to reduce strong-signal overload. Only two birdies were found, one at 3.738 and the other at 21.201 MHz. They did not interfere with the operation of the unit.

A speech processor is incorporated in the box and is actuated by pulling the DX PULL ON switch. The processing reduces the ALC action. Reports from on-the-air testing revealed that the processing did very little to the signal level, but it did improve the audio punch...

Extras

A transverter is necessary in order to use this transceiver on other bands (160, 6, and 2 meters). The required rf output, input and power connectors are on the rear apron of the unit. Switchable low-level rf output (1 watt) can be obtained by moving the screen switch to the OFF position. The Kenwood R-599A receiver VFO can be used in place of the VFO-520 if an additional interconnecting cable is purchased from Henry Radio. For the amateur who enjoys convenience in a portable package, the TS-520 will be more than suitable. — *W1ABV*



Bottom view of the transceiver. The VFO jumper plug is inserted at the upper right.

**The Henry Radio
Kenwood TS-520 Transceiver**

Frequency range (MHz): 3.5-4.1, 7.0-7.6, 14.0-14.6, 21.0-21.6, 28.0-28.6, 28.5-29.1, 29.1-29.7, and 10.00 MHz (receive only).

Modes of operation: Lsb, usb, cw.

Maximum input power: 200 watts PEP for ssb service, 160 watts for cw.

Sensitivity: See Table I.*

Stability: See Fig. 1*

Selectivity (at 6-dB points): 2.4 kHz for ssb, 0.5 kHz with optional cw filter installed.*

Audio output: 1 watt into an 8-ohm load.

Audio-output impedance: 4 to 16 ohms for speaker and headphones.

Amplifier tubes (rf): 6146A (2).

Power requirements: 117/234 V ac 50/60 Hz or 13.8 V dc, maximum power 280 watts (transmit).

Dimensions (HWD) and Weight:

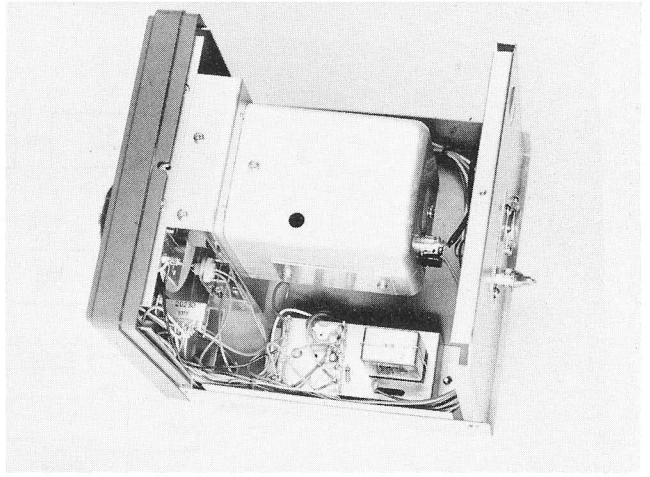
5.9 × 13.2 × 13.2 inches, 37.4 pounds.*

Price Class: Transceiver, \$630, accessories available, external VFO (VFO-520), cw filter, external speaker.

Color: Two-tone gray and brushed aluminum.

U. S. Distributor: Henry Radio, 11240 Olympic Blvd., Los Angeles CA 90064.

*Measurements made in the ARRL lab.



Top view of the VFO-520. The relay in the lower right handles the switching control.

Table I – Performance

<i>Frequency (MHz)</i>	<i>Power Output at 168 Watts CW Input</i>	<i>Receiver Sensitivity (for 10 dB Signal-plus-Noise-to-Noise)</i>
3.7	105	0.2 μ V
7.2	105	0.18 μ V
14.2	75	0.18 μ V
21.2	78	0.18 μ V
28.2	78	0.22 μ V
28.7	72	0.25 μ V
29.3	82	0.25 μ V