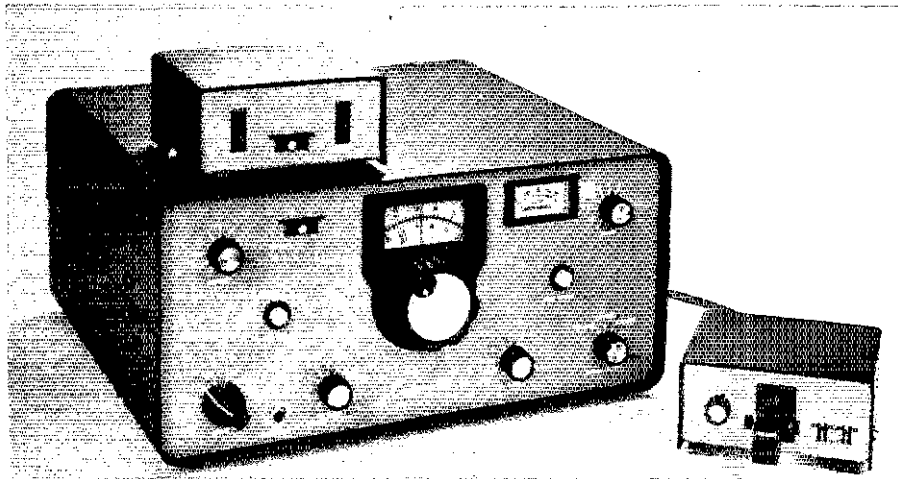


amplified at a low level before going to the driver and power amp. Finally, the power amplifier output is run through low-pass filtering before being fed to the antenna. Individual low-pass filters are used for each band, and these are switched into the antenna line by the band switch. The cw signal from the Century is clean, chirpless, and without drift. The keying is click-free. The final amplifier in our Century 21 came to us biased for Class AB operation, but all new production models are factory-biased for Class C. After talking with the people at Ten-Tec, the final bias on our review sample was changed to Class C. The spectral analysis shown was taken after the modification was made.

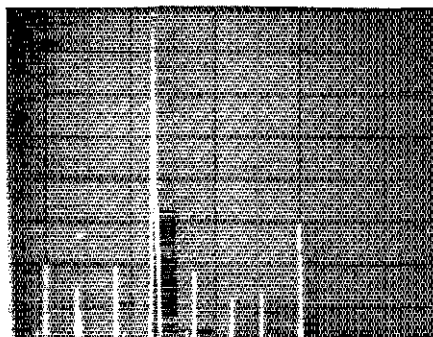
Another very handy feature is the spotting switch, which allows you to zero beat a cw station before calling him (or her). Pressing the zerobeat button disables the offset section of the VFO. Once the transmitter has been set to the same frequency as the incoming signal, the receiver can be adjusted using the offset or incremental-tuning control to receive the cw signal on either side of zerobeat. Front-panel layout is symmetrical, with the large tuning knob located in the exact center. Across the top are the receiver tuning offset, dial readout, input power meter, and drive control. The meter is monitored while setting the drive level. This allows the operator to select the input power, up to 70 watts. Another neat thing about the Century is its automatic-shutoff circuitry. If the input power is run up beyond about 70 watts, or if the antenna shorts or opens leaving the transmitter working into a high SWR, the rig senses the current rise and instantly shuts down the power supply. To reset the circuit breaker after the problem has been corrected, simply turn the main power switch off and then on again, and normal operation is restored.

I basically think of myself as a cw operator. But after having used only tube-type gear that required tune-up in the past, the Ten-Tec really took adjusting to. It's just plain hard to adapt yourself to a rig that only needs to be turned on! That's one of the benefits of solid-state finals . . . no warm-up, no pre-selector, no plate or load controls, just a drive-level adjustment when you switch bands (takes about one second) and you're on!

Along with the transceiver itself, we also received the optional crystal calibrator, model 276, and the matching keyer, model 670 for review. The calibrator has a neat feature in that it pulses the calibration signal to the receiver instead of sending out a continuous note. This helps the operator find the *real* calibration mark on the dial without disconnecting his antenna. With the standard type of "always on" calibrator, it can be difficult at



The Ten-Tec Century 21 transceiver is an enjoyable rig that makes cw operation on hi as easy and uncomplicated as possible. An antenna and key are all that are necessary to put this solid-state jewel on the air! The Century 21 is shown here with its accessory keyer and crystal calibrator.



The spectrum analysis of the Century's output on 7 MHz. The pip at the left edge of the photo represents zero frequency. The horizontal scale is 2 MHz per division, and the vertical scale, 10 dB. The fundamental is the large pip in the center of the photo, and the second harmonic is the pip farthest to the right. The second harmonic is about 50 dB down from the full scale fundamental. All other pips are mixing products at least 60 dB down. This complies with FCC regulations.

times to distinguish the calibration pip from the numerous carriers on close-by frequencies.

The electronic keyer was designed specifically as a companion to the Century 21 transceiver. It contains no battery itself, but is plugged into the back of the transceiver from which it derives its operating power. The keyer speed can be adjusted from six to 50 words per minute. The keyer has self-complet-

ing dots and dashes and an automatic weighting circuit that increases the dot length about 10 percent at 20 wpm. The weighting circuit is designed to help increase the readability of the code being sent, especially at higher speeds.

The plastic paddle on the keyer performed pretty well once the springs were properly adjusted. The keyer itself is fairly light, containing only one IC and a handful of other parts. This made the case a little unstable on the operating surface when confronted with my "heavier than normal" keying fist. A small amount of rubber cement on the keyer feet was sufficient to stop the unit from walking away from me as I sent with it. One last note on the model 670 keyer: It should not be used to key transmitters with cathode or grid-block keying. It should only be used with the Century 21 transceiver. Ten-Tec equipment is manufactured by Ten-Tec, Inc., Sevierville, TN 27862. — WB9VAV

#### Ten-Tec Century 21 CW Transceiver

Dimensions (HWD) and weight: 5-3/4 x 12-3/8 x 11-1/2 inches; 15-1/2 lbs.\*  
 Power requirements: 105-125 V ac, 50/60 Hz.  
 Frequency range: 80-10 meters (28-29 MHz on 10 meters).  
 Receiver sensitivity: 1  $\mu$ V or less, 10 dB S + N/N.  
 Transmitter output: 40 watts.\*  
 Price class: \$290, model 670 keyer \$30, model 276 calibrator \$30.  
 \*Measured in ARRL lab.

## ICOM IC-22S

A brisk market often sets the stage for technological advancements, which sometimes seem to be outright revolution. About six or seven years ago there was a marked shift from converted surplus equipment to equipment specifically manufactured for the 2-meter fm band. It would appear that we are in the midst of another "revolution" — this time from crystal control to frequency synthesis. And, one rig seems to have caught the fancy of the amateur community, the IC-22S.

The simple straightforward design of the IC-22S lends itself to modification, as witness the number of modification articles in the amateur magazines. Therefore, the editors decided to review the IC-22S with one of the more versatile modification packages available, the Spectronics Speuscan-S scanner. During the period of review the products were used together, although it is perfectly easy to detach the scanner and use the IC-22S by itself.

The IC-22S uses a diode matrix to form a binary code. This code determines the fre-

quency-dividing ratio needed to enable the transceiver to operate on a given, standard 2-meter fm, channel. In other words, instead of buying crystals at around \$10 per pair, one merely plugs in from one to seven diodes which cost about 10 cents each at Radio Shack. If you move or if the local repeater switches to another operating frequency, it is a simple matter to pull the diodes out and plug them in the appropriate holes.

Before I acquired this unit for review, I overheard a conversation one day between the owner of an IC-22S and another ham. The

IC-22S owner was bemoaning the fact that he had spent several hours tediously laboring to program in the channels that he desired. One of the first things that I did after getting this unit was to pick up some diodes and try programming it myself (the IC-22S comes from the factory with five of the more popular frequencies already programmed in). The owner's manual carries a table that gives the diode placement positions for all standard channels and splits between 146 and 148 MHz. Including the time involved in taking the case off and putting it back on, it took about 20 minutes to program in six channels. Therefore, I concluded that the above-mentioned ham was simply putting on a show for his friend or perhaps lacked a manual, lacked good eyesight, lacked the full use of his hands and arms or lacked the ability to solder.

Operation is straightforward and simple. The operator turns the unit on to his choice of either the high- or low-power output position. He turns the channel selector dial to the particular position that he wishes to use. He is then faced with deciding the exact format that is required. Simplex operation is, of course, straightforward. When programming in duplex (repeater) frequencies, the owners manual instructs the operator to program the lower frequency of the pair. On standard 146-MHz repeaters one chooses Duplex A which offsets the receiver 600 kHz above the programmed frequency. On standard 147-MHz repeaters one chooses Duplex B which offsets the transmitter 600 kHz up. No provisions are provided for oddball splits. A small red light comes on when one keys the transmitter and a similar green one lights when the squelch is broken. A lock indication circuit has been built into the phase-locked loop which disables the transmitter if the PLL fails to lock. As a visual indication of failure to lock, the meter lamp goes out for both transmit and receive. The unit is reverse-polarity protected by a large diode across the dc input jack.

The first time that I actually got my fingers on an IC-22S, WA8UUY came to visit and brought his new rig with him. We hooked it up to a newly erected Ringo and tuned around seeing if we could key some repeaters. When we got a response, I would ask him what frequency it was. After a couple of embarrassing shrugs of the shoulder, he confessed to having left his crib sheet in his car. The weak link in the IC-22S, then, is its human's recall ability. One could tape the crib sheet to the case (yuk, ugly), one could take one of those exotic "memory courses" or among other possibilities one could purchase the Spectronics Specscaan-S to go with one's IC-22S.

### Spectronics Specscaan

As implied above, one of the things that I found most striking about the Specscaan-S is that the programmed (not the offset) frequency is read out digitally with a large LED display. This is true whether one is tuned to the dedicated scanner channel or to any of the 21 other channels. The display indicates whether one is on 146 or 147 MHz by means of two LEDs. The three remaining significant digits are then read out digitally.

The Specscaan-S is designed to be hooked into the 22nd position of the IC-22S. This position must be dedicated to the Specscaan for as long as one intends to use it. Everything is supplied for proper wiring of the unit to the

IC-22S. A detailed owners manual gives complete, simple-to-understand instructions. It would appear that a typical wiring job would take about one hour (the unit tested came prewired). Two wires are attached to the power cable. Nine wires are connected to the matrix board - eight to the 22nd position and one common. Since the common is not ground, but 9-V regulated, care must be taken not to short this wire out as it could cause damage to the regulator. Finally, one wire is attached to the switched side of the green light (squelch voltage).

One control is used to determine the direction and the rate of scan. The operator can scan from a rate of zero to a very high speed in either direction with the twist of this one dial, which gives a great deal of control to the operator. A separate potentiometer is used to provide variable scan delay. The power switch is connected to scan delay control shaft.

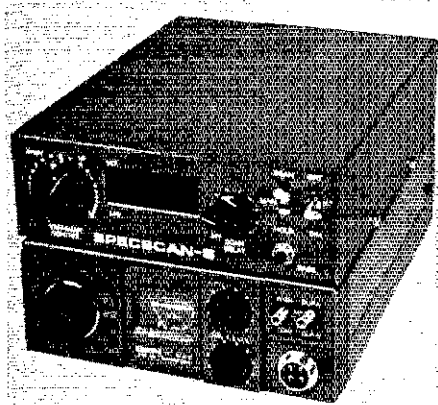
When I first got the unit, I did not have the owners manual and found the three-position SCAN/MANUAL/HOLD switch a bit tricky. I doubt that I would have had any trouble if I had read the manual carefully. In the SCAN position, the unit will scan according to the rate and direction set by the VARI-SCAN control. It will lock on any channel having enough of a signal to keep the squelch open. If the operator wishes to pass a particular channel, but continue scanning, he merely pushes the PASS button when the unit locks on to that channel and normal scan is resumed.

In the MANUAL position, the scanner will not lock on to a channel. I found this feature of tremendous benefit at home in Connecticut. We seem to be blessed with a large number of very active repeaters here. Without this control, it is conceivable that the scanner would lock on to one of these busy channels and stay there most of the evening or until the operator pressed the PASS button, which could get tiring very quickly. By setting the VARI-SCAN control to a very slow rate and using the manual position, one can get a good idea of local activity without being constantly locked onto a busy channel.

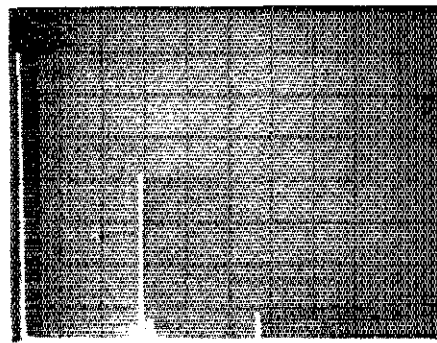
In the HOLD position, the scanner is locked onto whatever frequency is displayed on the readout. If the operator is in the SCAN position and desires to transmit, he must switch to the HOLD or else, when the transmitter is keyed, squelch voltage drops out and the scanner resumes scanning. I can assure you that hams on those repeaters that one scans past while transmitting can become quite annoyed. The owners manual warns the operator of this potential problem, but then I found out the hard way, before I got a copy of the manual.

Other features include a switch that permits the operator to choose between dim and bright for the LED display. Anyone having used a LED display device in direct sunlight can readily appreciate the "bright" option. The power cord supplied with each IC-22S has an in-line fuse; however, the replacement cords as a rule do not. Therefore, Spectronics decided to provide an extra measure of protection by internally fusing the Specscaan-S.

The units can be used together as either a base station or mobile, or the IC-22S can be used by itself. Since the Specscaan-S uses less than 500 mA (CMOS circuitry) most of the garden-variety power supplies that would



This shows the packaging for the IC-22S and the Specscaan. The top unit, the Specscaan, is firmly mounted to the transceiver with a factory-provided bracket.



This shows the IC-22S output. The horizontal divisions are 50 MHz and the vertical, 10 dB. The tall pip at the left is the base indicator with the 2-meter fundamental appearing at the center. The fundamental is attenuated to prevent overloading of the analyzer. All spurious signals are more than 70 dB down. The IC-22S exceeds FCC requirements for spurious radiation.

supply the two amperes needed for the IC-22S will also supply the current needs of the scanner. Each Specscaan-S comes with a special mobile mounting bracket which allows the scanner to be mounted directly above the transceiver for a mobile installation.

The Specscaan-S is the same size as the IC-22S and same color. Together the units make an attractive addition to most shacks.

The IC-22S is available from a large number of dealers, price class \$300. The Specscaan-S is available from Spectronics, price class \$150, which includes everything needed for a complete hookup. Spectronics makes a package deal of both units at a price class of \$400. As an introductory offer for those ordering the package, Spectronics will wire the units. - W88NAS

### ICOM IC-22S and Spectrum Specscaan

Dimensions (HWD), IC-22S: 2.28 x 6.14 x 8.58 inches; Specscaan: 2 x 6.14 x 8.58 inches.

Voltage (both units): 13.8 V dc negative ground.

Current, IC-22S: 2-A transmit, at 10 W, 0.9 A at 1 W. Receive, 700 mA, maximum audio, 400 mA squelch. Specscaan, 500 mA.