Product Review Column from *QST* Magazine

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Cushcraft Corporation 40-2CD 40-Meter Skywalker Yagi

Microcraft Code*Star Reader Kit

Spectrum Communications SCR 1000 2-Meter FM Repeater

Vibroplex "Brass Racer" And EK-1 Paddles

Product Review

Conducted By Paul K. Pagel,* N1FB

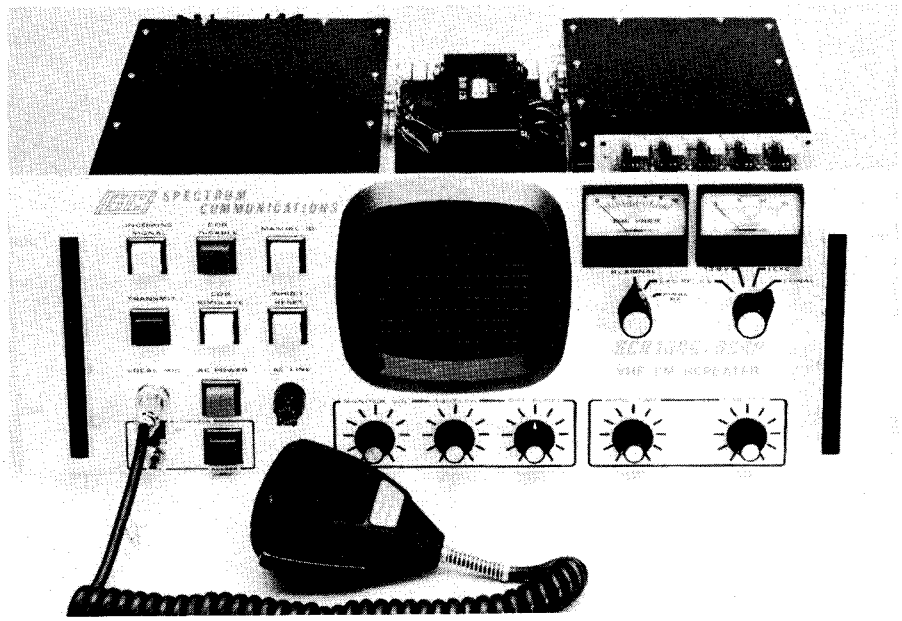
Spectrum Communications SCR 1000 2-Meter FM Repeater

Reliable, trouble-free, solid-as-a-rock — those are the words that first come to mind when I think of the Spectrum Communications SCR 1000 2-meter repeater. Spectrum has relied heavily on time-proven circuits and components to put together a package that should be a good performer for any group that doesn't want to "roll their own."

The review unit was in use daily at W1AW/R during a period that stretched from mid-July through the following January. After overcoming some initial difficulties, we experienced no significant problems with the unit. W1AW/R is located in an elevator penthouse in a large public building in Newington. The penthouse is neither heated nor air conditioned, which means the temperature extremes are *not quite* as severe as would be experienced if the unit were housed in a metal box hanging on the side of a tower.

During the first couple of weeks of the review, the unit twice failed to transmit. On both occasions, we pulled it from service and returned it to the ARRL lab for testing. The first time we found nothing wrong with it back at the lab, so we returned it to service. After a few days it again failed to transmit. This time we sent it back to the factory. Although there was some minor damage in shipping, the factory could find nothing basically wrong with it. They returned it to us after a few days, and we put it back into service. Craig Baker, one of Spectrum's engineers, suggested that the problem might have been falsing in a remote inhibit circuit.

The inhibit circuit can be activated or deactivated by remote means. On a few occasions after that, the transmitter failed to operate. The first time, one of the technical crew made the trip to the site and found the INHIBIT indicator light on, indicating that the inhibit circuit had been set. (Because we were unfamiliar with the unit and were not testing it at the site, we neglected to notice if the light had been on during the first two "failures.") The transmitter also failed to transmit on three other occasions. Each time, we were able to deactivate the inhibit function remotely and return the repeater to service without "making a house call." Because the repeater could be inhibited remotely, we were never really certain whether the incidents had been true "falses" or were the acts of some whimsical jester. Also, we could not make it "false" in the lab. Those were the only difficulties experienced with the unit during the entire review period.



Spectrum Communication SCR 1000 2-Meter Repeater, Serial No. 1844

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 136 to 174 MHz.	
Sensitivity: 0.3 μV for 12-dB SINAD.	0.42 μV for 20-dB quieting.
Squelch/COR threshold: 0.1 to 0.2 μV typical, 0.25-μV maximum.	0.13 μV.
Hang time: 0.1 to 6 seconds.	Less than 0.5 second (minimum) to approx. 10 seconds (max.).
Time out range: 0.5 to 4 minutes typical.	Approximately 12 seconds (min.) to approx. 5 minutes (max.).
Power output: 30 W at 13.8-V dc, 25-W minimum.	28 W.
Modulation: True fm, 7-kHz maximum.	Not measured.
Preemphasis: 6 dB per octave.	Not measured.
Spurious emissions: −75 dB typical, −70 dB minimum.	See Fig. 1.
Size (HWD): 7 × 19 × 13 in.†	
Weight: 21 lb.	

†mm = in. × 25.4; kg = lb × 0.454.

On-the-Air Reports

The repeated audio fidelity is excellent. Frequently, I tried listening to the input and output of the repeater. Except for the obvious variations in signal strength, there was little, if any, difference between the tonal qualities of the two. The audio is handled the "right way." Audio from the fm detector in the receiver is deemphasized at 6 dB per octave rolloff according to EIA specifications. In the transmitter, the audio is preemphasized, again according EIA specifications, before being applied to the modulator, a modified Clapp oscillator configured to produce true fm. The acid test for such a unit is the application of a human voice having a deep "gravelly" quality. We are blessed with two such test cases on W1AW/R, and I am happy to report that the SCR 1000 passed both voices with flying colors.

The SCR 1000 replaced a real "clunker." Users were ecstatic with the increased range of the new machine. The output power seemed well-balanced with the sensitivity of the receiver. Transmit and receive ranges appeared to be nearly equal for a typically equipped 10-W mobile station with a 5/8-λ antenna. Our unit came outfitted with a CTCSS decoder built in. Being located near the coast, we are subject to periods of tropospheric ducting. For hours at a time, the repeater may key up on weak distant signals. Experiments with the CTCSS decoder indicated it is an effective means of keeping the distant weak signals from activating the repeater without decreasing the range. If your repeater suffers from this sort of "interference," it may be worthwhile considering adding a CTCSS decoder for use at such a time, if not all the time. Modern encoders are inexpensive and easily installed in most transceivers, including hand-held portables.

The receiver front end consists of eight high-Q resonators with an amplifier following the first two and another amplifier following the next three resonators. A doubly balanced mixer converts the 2-meter output of the front end to the first i-f at 21.4 MHz. Two monolithic crystal filters follow the mixer and deliver the i-f signal to a single-stage amplifier. The output from the amplifier is then filtered by an additional set of monolithic crystal filters. From there, the signal is processed by a MP5071, which provides the functions of second mixer, amplifier, limiter, fm detector and squelch noise amplifier. The squelch

*Assistant Technical Editor

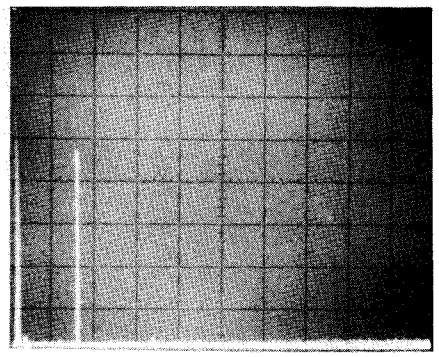


Fig. 1 — Spectral display of the SCR 1000. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 28 W at a frequency of 145.45 MHz. The fundamental has been reduced in amplitude approximately 33 dB by means of notch cavities; this prevents analyzer overload. All spurious emissions are about 78 dB below peak fundamental output. The SCR 1000 complies with current FCC specifications for spectral purity.

circuit detects noise above 35 kHz, which makes it immune to many of the shortcomings found in some simpler squelch circuits.

Audio from the receiver, local microphone and i-d generator is applied to a varactor diode supplying load capacitance to the 18-MHz crystal. From the modulator, the signal is multiplied, filtered and amplified to provide approximately 2-3 W of 144-MHz energy at the exciter output. From there, the signal is fed to the power amplifier that boosts the level to the 30-W range. Spectrum currently uses a 2N6082 in this stage. A 75-W PA is also available as an option.

Control circuitry consists of TTL-compatible CMOS logic. Relays are not used; current consumption for the circuitry is quite low, a critical parameter when operating from emergency backup power sources. Squelch range, hang time and time-out functions are all adjustable, as would be expected.

One observation about the squelch is in order. Aside from operating on 35-kHz noise, the squelch circuit has hysteresis. That is, it takes a stronger signal to open the circuit than it does to keep it open. Without this provision, a weak, fading signal is apt to be "chopped" up by the squelch opening and closing as the signal crosses back and forth over the critical point that opens the squelch. We did not notice such chopping with this circuit, but we have with our "clunker." The hysteresis is a true blessing for the operator attempting to talk with another station having a weak, fading signal.

Besides the circuits necessary for the functioning of the repeater, the SCR 1000 comes with a number of goodies that make life a lot easier for the repeater technical crew. Two meters on the front panel provide means for making a quick check of the entire system without the need to remove a single screw. The first meter can be switched between EXCITER RF, FINAL RF and RECEIVED SIGNAL STRENGTH. The second permits reading of the 5-V SUPPLY VOLTAGE, 12-V SUPPLY VOLTAGE, EXCITER CURRENT and FINAL AMPLIFIER CURRENT. MONITOR VOLUME, SQUELCH, REPEATED AUDIO, HANG TIME and TIME OUT can all be adjusted with controls located on the front panel. An ac line fuse holder is also found on the front panel. A push-button switch turns the ac power on and off (as with the other switches on the panel, this one is illuminated when activated). The control operator can either inhibit the COR or simulate it with another pair of push-button switches. Another switch provides for manually keying the i-d circuitry. A final push-button switch will inhibit the transmitter when activated (illuminated). The switch will also light when the transmitter has been inhibited remotely. The switch (local control) can override the remote inhibit, but a remote reset will not override a local inhibit. Another indicator illuminates with an incoming signal.

The owner's manual for the SCR 1000 is a pleasure to read. Aside from explaining the functioning of the repeater circuitry in detail, the manual provides general information on repeater operation and general troubleshooting of the system — not just the repeater itself. Solutions are suggested for several commonly encountered problems. Complete technical specifications, schematic diagrams and alignment data are provided.

Although the unit came with a built-in (optional) autopatch circuit, we were unable to give it a test at the repeater site. (Because of conditions beyond our control, we were unable to get a telephone line installed at the repeater site.)

Users have found the SCR 1000 delightful. It was a sad day when we boxed the SCR 1000 up to ship back to the factory and brought the "clunker" out of storage. Price class for the SCR 1000 is $1600; for the CTCSS option, $120; for the autopatch, $600. Additional information can be obtained from Spectrum Communications Corp., 1055 W. Germantown Pike, Norristown, PA 19401. — *Peter O'Dell, KB1N*

CUSHCRAFT CORPORATION 40-2CD 40-METER SKYWALKER YAGI

☐ Most amateurs who take their contesting seriously eventually ask themselves the following question: "What can I do about 40 meters?" Why 40 in particular? Well, it's on this band that the Sweepstakes is won and lost, and it's on this band that the outcome of most cw DX contests is decided. Forty is the one band where nine times out of 10 the average dipole or inverted V just doesn't "cut the mustard." Most successful contest stations have gain antennas on 40 for two reasons: The added signal strength puts them a cut above the rest in the pileups, and the front-to-back and front-to-side ratios help get rid of some of the trash that makes hearing the weak ones so difficult.

What kind of gain antenna to use depends on several factors. A vertical array is nice, but an extensive ground system is essential if it's going to be effective. And often the radiation angle is so low that a vertical system isn't optimum. Fixed wire beams and quads are popular too, but they're only good in one or two directions. Eventually, the choice becomes clear: Some sort of rotatable horizontal antenna is the solution.

Again, the would-be 40-meter "big gun" is faced with a bewildering number of options. Currently on the market are full-sized 2- and 3-element Yagis, 2-element quads and shortened 2, 3, 4 and 5-element Yagis. The full-sized antennas offer good bandwidth and gain. They are also large and heavy, often requiring use of spacial towers, masts and rotators. The shortened beams are lighter and somewhat smaller, but many are a compromise in terms of performance and SWR characteristics.

Enter Cushcraft Corporation's most recent addition to its line of hf "Skywalker" antennas. Designated the 40-2CD, this 2-element beam

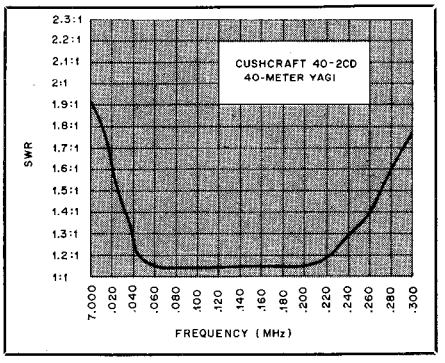


Fig. 2 — SWR curve of the Cushcraft 40-2CD 40-meter Yagi.

offers good performance in a practical package. The antenna consists of a driven dipole element and a reflector element mounted on a 22-foot boom.[1] Each element is shortened to approximately 43 feet through the use of loading coils and small capacitance hats. A 3-element 40-meter beam of similar design has been described in the ARRL *Handbook* for the past several years.

The antenna is made from high quality, polished-aluminum stock. The boom consists of four separate pieces. The center section is made from two 2-1/8 inch OD pieces joined by a coupler at the boom-to-mast plate. A 56-inch-long piece of 2-inch-OD stock is inserted into each end of the center section to complete the boom. The larger-diameter tubing is slotted at each junction, and a steel worm gear-type hose clamp holds the sections together securely.

Each element is made from telescoping sections of tubing. Reflector halves are joined at the boom by a 3-foot length of 1-3/8 inch OD tubing. Driven element halves are joined at the boom by a black plastic insulator tube that is 8 inches long. Element tubing decreases from 1-1/4 inches OD at the center to 1/2-inch OD at the tip.

The elements are secured to the boom by 1/4-inch-thick aluminum plates and U bolts. These plates have grooves machined in them to help prevent element twisting. The 1/4-inch-thick boom-to-mast plate and associated U bolts and saddles provided by Cushcraft will accommodate masts up to 2-1/8 inches OD. A boom brace made from aluminum tubing runs from the mast to the ends of the boom to provide support.

The hardware provided with the beam is all first-rate. What isn't stainless steel or aluminum is well-plated and should hold up without rusting for a long time. In addition to the construction steps outlined in the owner's manual, I coated the telescoping tubing sections with conductive grease at each junction to prevent aluminum-oxide buildup, which can cause antenna performance to deteriorate over the years. I also coated the threads of every screw with noncorrosive silicon sealant to prevent any vibration from loosening the nuts. Plastic end caps for the boom and elements completed the installation.

The antenna went together in about three hours. The instruction manual is fine. Cushcraft seems to subscribe to the theory that a picture is worth a thousand words; the clearly labeled detailed drawings left no questions in my mind as to which bolt went where. My only complaint is that four of the hose clamps were missing from

[1]m = ft × 0.3048; mm = in. × 25.4; km = miles × 1.609.

Cushcraft Corporation 40-2CD 40-Meter Yagi

Manufacturer's Claimed Specifications	*Measured by ARRL*
Boom length: 22.3 feet.	As specified.
Longest element: 43 feet.	As specified.
Turning radius: 24 feet.	As specified.
Assembled weight: 44 pounds (20 kg).	As specified.
Wind surface area: 6.38 ft.^{2}	Not measured.
Frequency coverage: 7.0-7.3 MHz.	As specified.
Bandwidth (2:1 VSWR): 200 kHz.	See Fig. 2.
Material: 6063-T832 seamless tubing.	

the parts package. Although Cushcraft is very good about sending replacements for missing or damaged pieces, I decided to purchase replacements at a local hardware store to save time.

It took Gary Hitchner, WA2OMY, and me about half an hour to install the completed antenna atop 100 feet of Rohn 25. We installed the antenna in one piece. Gary pulled a rope rigged through a pulley on the mast while I followed the antenna up and fished it around guy wires. The relatively light weight and small size of the antenna made it an easy job. Caution should be taken, however, to watch the capacitance hats at the element tips. They do tend to get caught on guy wires, and too much bending and twisting could detach them.

The completed antenna is mounted on a no. 4130 seamless steel tubing mast about 5 feet below a 3-element 20-meter monobander. It is fed through a 12-turn decoupling choke made from RG-8/U cable, as suggested in the manual. The feed line is 165 feet of RG-8/U. Physically, the antenna is about the same size as the 20-meter beam. The elements do droop some, caused in part by the weight of the loading coil assemblies, but this hasn't caused any problem.

In the construction manual, Cushcraft gives three options for the resonant antenna frequency: 7.025 (cw), 7.140 (middle) and 7.220 (phone). I assembled mine for the middle of the band. The resultant SWR curve (Fig. 2) was obtained using a Bird Thruline wattmeter connected at the antenna end of the feed line. As the curve shows, my transmitter is extremely happy on both cw and phone! This type of SWR curve is not characteristic of some of the other shortened 40-meter beams on the market, but other 40-2CD owners have had similar results.

On-the-air performance of the antenna is excellent. Transmitted signal reports confirm that the antenna works significantly better than a dipole at 70 feet. Observations on receive indicate significant nulls off the side and back of the antenna. Perhaps the biggest thrill is being able to hear the many weak signals that are inaudible on the dipole.

During the three-month evaluation period (October through December 1982), more than 110 different countries were worked with the antenna. It acquitted itself well during the CQ Worldwide DX Contests and the ARRL CW Sweepstakes. Although we have had no ice yet at the time this is written, the antenna has weathered several storms with winds in excess of 50 mph with no apparent problems. The antenna still works as well as it did when first installed.

I would highly recommend this antenna to anyone looking for that added "something" on 40, but who doesn't have the desire or resources to install a full-sized antenna. The 40-2CD lists for $380. Manufacturer: Cushcraft Corporation, P.O. Box 4680, Manchester, NH 03108. — *Mark Wilson, AA2Z*

VIBROPLEX "BRASS RACER" AND EK-1 PADDLES

☐ Many electronic-keyer-paddle designs have appeared in the past 10 years or so. Each manufacturer tries a new approach to certain aspects of paddle construction: base material, paddle shape and material, type (single lever or iambic), tensioning method and overall weight. The Vibroplex Co.'s latest entries, the Brass Racer and the EK-1, are fashioned after the former HAMCO "Scotia" design.[2] The two models discussed here are constructed of hardwood, polished brass, steel and molded plastic.

Triangular paddles are used in the 'Racer — similar to the Bencher and HAL "FYO" designs. Fig. 3 is a close-up of the pivoting system; it is similar to that of the Bencher and incorporates locking screws to prevent the paddles from flying apart (remember that malady, "FYO" owners?). Paddle tension is adjusted by two permanent magnets mounted just behind the paddle arms. (Ten-Tec uses a similar tensioning scheme in one of their designs, although it uses electromagnets.) One word of caution when adjusting the tension: *Do not* pull the magnets out of their holes. There is a tiny spring and a small plastic ball that keep tension on the magnet. These parts will fly out of the paddle, and may be impossible to locate. The paddles come with a 2-foot, three-conductor cord and an unattached 1/4-inch phone plug.[3]

The EK-1 has a Curtis 8044 IC keyer built into the base. A pc-mount potentiometer is used as the SPEED control, and it protrudes through the right-hand side of the keyer base. The keyer is powered by an internal 7.5-V battery (EP-175) that the manufacturer claims should have a lifetime of up to 12 months under average use. To gain access to the battery or keyer, two recessed, bottom-mounted screws must be removed.

The keyer is constructed on a single-sided, glass-epoxy pc board. No battery polarity markings were on the board of the review unit, but the manufacturer has stated that later production models do have such identification. The instruction sheet does caution that the positive terminal be placed toward the SPEED control potentiometer.

Adjusting sending speed is a bit awkward, especially when sending with your right hand. Also, the potentiometer movement is stiff, and precise speed control settings are made difficult. Employing a centrally mounted miniature rotary control might be preferred.

The EK-1 is wired as a "right-handed" keyer. The dot and dash contact posts are connected to foils on the pc board, and no provisions have been made to swap the dot/dash keyer inputs to the opposite posts.

Initially, the review EK-1 wouldn't send over 20 wpm. A 150-kΩ board-mounted fixed-value resistor in series with the SPEED control had to be changed to 47 kΩ to reach the higher sending speeds. This, too, is a production-line change incorporated in later models.

[2]Product Review, Dec. 1978 *QST*.
[3]mm = in. × 25.4

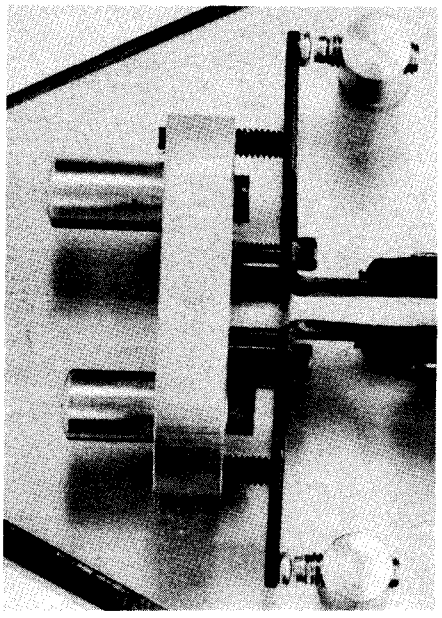


Fig. 3 — A close-up of the Vibroplex paddle.

Output line keying is accomplished by means of an MJE-350 high-voltage pnp transistor. The collector and emitter are "floating," enabling the single transistor to be used to key both positive and negative key-line voltages by correctly connecting the shield and center conductor of the two-conductor output line to the transmitter. A diode placed across the output line serves to protect the transistor in case the wrong polarity is inadvertently used. The transistor has a V_{CEO} rating of 300 V and should handle key-line voltages found in most amateur equipment. The presence of a 50-V disc-ceramic capacitor across the output line surprised us, but no problems occurred when keying a TS-820S with a key-line voltage of −65.

Although the Curtis IC has provisions for weighting control and sidetone output, these functions are not used with the EK-1. Weighting could be changed, however, by altering the value of a fixed-value resistor across pins 15 and 16 of the IC.

The paddles have a different feel, but we found them easy to adjust, and soon became confortable with the light touch required to operate them. The heavy weight of the paddle prevents it from "walking" across the operating desk. Wood, brass and black metal are combined to make an attractive addition to any ham shack. For those with a crowded operating position, the EK-1 will free up a little extra desk space.

The Brass Racer and EK-1 are available from The Vibroplex Co., Inc., P.O. Box 7230, 476 Fore St., Portland, ME 04112. Price class: Brass Racer, $75; EK-1, $110. — *Paul K. Pagel, N1FB and Gerry Hull, AK4L*

MICROCRAFT CODE*STAR READER KIT

☐ In the last few years, it has become common practice for many hams to abandon the quiet murmur of clanging gears and the sweet

fragrance of stale machine oil associated with mechanical RTTY equipment in favor of the ubiquitous home computer with an RTTY or cw send/receive program. As the price of microprocessor chips dropped, it became conceivable to build a dedicated "reader" around these chips. Such is the Microcraft Code*Star.

The amazingly compact unit (7-3/4 × 5-3/4 × 3-3/8 inches) houses a dedicated microprocessor chip, eight multisegment LED readout chips and all the circuitry needed for filtering audio signals and translating them into logic levels the microprocessor can understand.[4] Only about half of the circuit board is used; the rest is reserved for adding an optional ASCII output port — and there is plenty of room inside for building in an ac-operated supply or installing the otherwise necessary 12-V battery.

The obvious question, then, is: "If it is so small and has so few parts, does it work?" The answer is yes, it does work — and I think it works well, considering the cost. There are a few drawbacks to using the unit, though. Several other staffers used the Code*Star briefly during the review period. The most often heard complaint was that at the higher speed settings (110-baud ASCII and 100-wpm Baudot), the user found it difficult to read the display as the letters shifted left from one display unit to the next. I did not find this to be a problem, but I am a speed reader and found it easy to follow the characters on the display as long as I used a soft focus. That is simply a matter of training and conditioning.

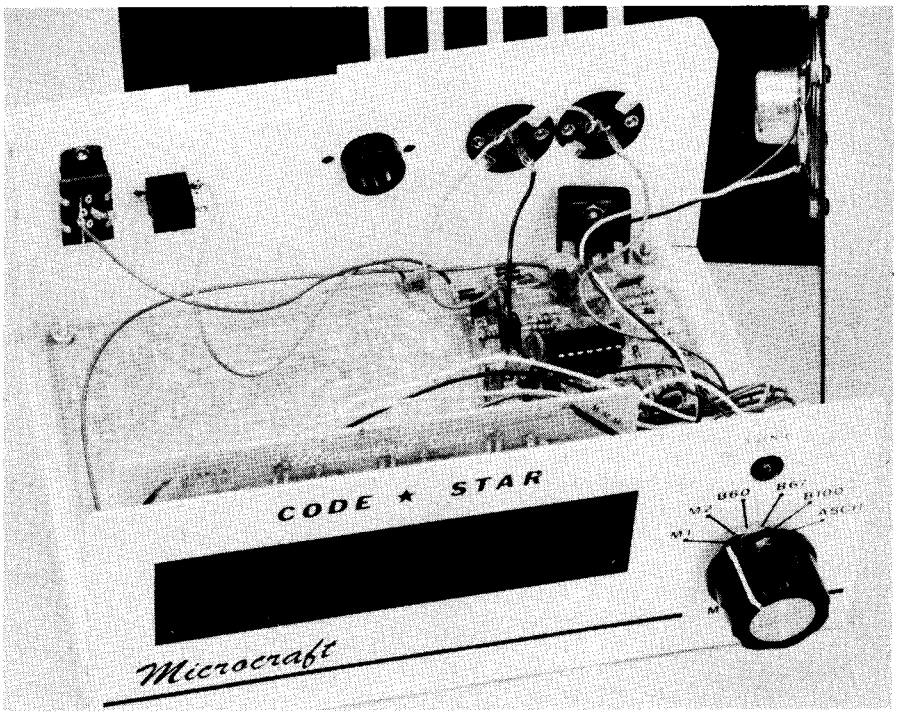
A somewhat more serious complaint is that the unit tends to "false" on sloppy code and on good code if another signal is in the passbands of the internal filters or the receiver filters. Careful tuning, additional filtering, lowering the receiver volume-control setting and similar measures can be used to minimize the effects of other signals in the passband, but nothing short of the vengeance of T.O.M. can abolish sloppy code. Fading band conditions also tend to disrupt the functioning of the Code*Star.

Provisions are made for connecting a key (or keyer) to a special input of the Code*Star for sending practice. It is a truly humbling experience to watch the machine display what you are *actually* sending!

Six modes of operation are available to the Code*Star user. M1 and M2 copy cw; M1 utilizes "heavy filtering" and has a speed range of 3 to 33 wpm, while M2 has light filtering and a speed range of from 3 to 70 wpm. Using my (memory) keyer directly into the Code*Star, I found that it copied accurately up to about 85 wpm in the M2 range. Modes M1 and M2 both auto-track, which means they automatically adjust to the speed being received within a few characters. Speed adjustments (but not mode adjustments) are handled by the microprocessor, and there are no manual means for adjusting the speed, save the MODE switch on the front panel.

Baudot (five-level RTTY code) can be copied at three speeds — no need to change those oily gears, just flip the switch. Speeds of 60, 67 and 100 wpm are available. Since amateurs tend to use either 60 or 100 wpm, I spent very little time using the 67 wpm code. It is on hand for those who like to listen to RTTY stations found outside the amateur bands.

[4]mm = in. × 25.4.



As with the Baudot mode, I found it rather tricky to tune in an ASCII station (despite the tuning indicator LED on the front panel). I understand from friends who are RTTY addicts that this is one of the curses of the mode. Once I found the proper receiver dial setting, the Code*Star functioned beautifully. After some practice, it did seem to become considerably easier to tune stations in. With these modes, the only glitches occurred during deep signal fades or when interfering signals were in the passbands. (The perfection of mere machines will never conquer the human tendency to err. Some RTTY operators compensate for their mechanically flawless sending and receiving equipment with terrible spelling and atrocious grammar.)

The Code*Star kit is intended for intermediate to advanced builders. Microcraft offers to refund the purchase price minus a handling charge for any unassembled kit within 10 days of the original shipping date if the purchaser feels he or she is not able to construct the kit. The Code*Star is available in assembled form at a slightly higher price.

The kit instructions are straightforward, and there are only 3-1/2 pages of them. That is a little misleading, though. The second instruction is, "Install all fixed resistors and solder. Save scrap leads." There are nearly 60 resistors. An average kit builder could expect to complete the kit over a weekend.

The microprocessor, three support ICs and six transistors are installed on the main board. A second board, mounted perpendicular to the main board, holds the displays and drivers. The two boards are attached with several jumpers made from the scrap leads saved in step 2. Both boards have parts-placement guides silk-screened onto the front sides to aid construction.

All parts except the custom microprocessor are covered by a 90-day warranty. According to the manual, the custom microprocessor is "100% tested and burned-in. However, it can be damaged by mishandling and incorrect voltages and therefore is not included in the warranty."

Initially, the Code*Star did not function correctly. I returned it to the factory, and they found I had installed a transistor backward. Afterward, it *usually* functioned okay, but there were times I couldn't get it to copy anything. My initial assumption was that rf was affecting it (I was using it in the ARRL lab while W1AW was on the air). That assumption proved incorrect. Finally, after a few months of sporadic failure, it "died." Back to the factory, where the technicians found a faulty capacitor in the input circuit. Apparently, it had intermittently failed. They replaced the capacitor, and I have experienced no more problems with the unit. Microcraft reports that this was a highly unusual failure.

In my opinion, the unit has a lot of value per dollar. It does a reasonably good job of copying cw, Baudot and ASCII. It is small, lightweight and convenient to use, having no external controls other than the MODE switch and the ON/OFF switch. To connect it to the receiver, one merely plugs a jumper into the headphone output of the receiver. A tuning LED indicates when you are "in the ballpark" while tuning in a station.

When the unit is in use, receiver audio is passed to a 2-inch speaker in the Code*Star. At times, I would have preferred having the ability to use headphones and the Code*Star. The volume control is a pc-mounted trimmer potentiometer that is accessible only by removing the cover. Both of these shortcomings could be remedied with a couple of minor circuit modifications. (Gee, I've got 20 minutes, a 25-k Ω volume control and a phone jack. Think I'll go turn the soldering iron on!)

Price class of the Code*Star kit is $160; wired, $220. The optional ASCII output port kit has a price class of $60; wired, $80. Additional information can be obtained from Microcraft Corporation, P.O. Box 513Q, Thiensville, WI 53092, tel. 414-241-8144. — *Peter O'Dell, KB1N*