Product Review Column from *QST* Magazine

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Product Review

Conducted By Paul K. Pagel,* N1FB

Kenwood TS-530S HF Transceiver

Have you ever wondered how equipment manufacturers choose model numbers? Is it a numerical series based on an engineering concept, or do they pull a number out of the air? Who knows, but many of us would assume that a model number like TS-530S would be an improved version of the popular '520 series. The '530 is improved, but the circuit design is also vastly different. Kenwood engineers have taken advantage of advances in technology to provide a transceiver with superior performance at a price comparable with that of its older cousin.

Features

Frequency coverage of the TS-530S includes all the amateur bands from 1.8 to 30 MHz, including the three WARC assignments at 10, 18 and 24 MHz. The receiver section features passband tuning, a noise blanker with an adjustable threshold level, selectable ssb and cw bandwidths (with optional filters installed), RIT and wide dynamic range. Vacuum tubes are used in the transmitter driver and final amplifier stages. There's an audio speech processor for ssb, and transmitter incremental tuning (XIT). A fluorescent blue readout displays the operating frequencies to the nearest 100 Hz.

The VOX delay and gain controls, and noise blanker threshold, require adjustment when operating conditions vary. These are located on the front panel, increasing operating ease. Other front-panel controls include switches for NARrow/wide bandwidth selection, speech PROCessor on/off, rf ATTENuator in/out, and 25 kHz CALibrator on/off, among others. The screen-grid switch, located on the rear panel, is used to defeat the final amplifier screen voltage during the neutralizing procedure or when the transceiver is used with an external transverter. The '530 has no provisions for transverter interconnection, although there are two holes punched into the cabinet, no doubt for owner addition of transverter jacks. Two DIN jacks supply a means of connection to an external power amplifier, tape recorder, and remote VFO. Also included are a 1/8-inch[1] external speaker jack, 1/4-inch key jack, a two-wire ac line cord, the fuse holder, and an SO-239 rf connector. The RF VOLT (meter control), ANTI-VOX and BIAS controls are also located on the rear panel, as these require only periodic adjustment. The final amplifier fan is the quietest I have heard on any piece of equipment!

Some Circuit Features

The '530 uses a single-conversion receiver with an 8.895 MHz i-f. A single crystal PLL synthesizer generates the HFO signals, which, along with the 5.5- to 6-MHz VFO signal, provide all the injection frequencies required by the transceiver. The I-F SHIFT control enables the operator to move the center point of the

[1]in. × 25.4 = mm; lb × 0.454 = kg
*Assistant Technical Editor

Kenwood TS-530S HF Transceiver Serial No. 1090166

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 1.8 to 30 MHz including 10, 18 and 24 MHz	As specified plus a minimum of 70 kHz additional at each band edge.
Modes of operation: Ssb, cw	As specified.
Frequency display: Six 0.25-inch fluorescent blue digits and analog dial.	As specified.
Resolution: Analog, 1 kHz; digital, 100 Hz.	As specified.
kHz/turn of tuning knob: Not specified.	25.
Backlash: Not specified.	Nil.
RIT range: Not specified.	±2 kHz.
Receiver attenuator: 20 dB.	As specified.
Audio power output: 1.5 watts (8 ohms).	As specified.
Power consumption: Transmit, 295 watts; receive, 32 watts.	Not measured.
Transmitter rf power output: Not specified.	Greater than 100 watts except on 10 M — 100 W.
Spurious suppression: Better than 40 dB.	−68 dB worst case.
Harmonic suppression: Better than 40 dB.	−42 dB on 160 m (see photo).
Carrier suppression: Better than 40 dB.	As specified.
Transmitter third-order IMD: Not specified.	−28 below PEP (see photo).
Frequency stability: Within 100 Hz during any 30-minute period after warm up. Within 1 kHz during the first hour after 1-minute warm-up.	130 Hz from cold start to 1 hour later
S-meter sensitivity (μV/S9): Not specified.	Ranging from 72 to 92 μV.
Receiver sensitivity: 0.25 μV for 10 dB S+ N/N	Receiver dynamics measured with YK88C 500-Hz i-f filter:

	80 m	*20 m*
MDS (dBm):	−135	−136
Blocking DR (dB):	112	120
Two-tone third-order IMD DR (dB):	88	90

Size (HWD): 5.3 × 13.3 × 13.3 in.
Weight: 28.2 lb.
Color: Gray.

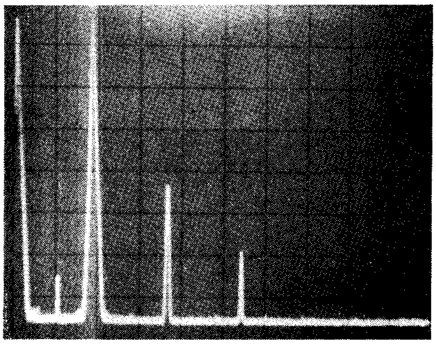


Fig. 1 — Spectral display of the Kenwood TS-530S. Vertical divisions are each 10 dB; horizontal divisions are each 1 MHz. Output power is approximately 100 watts at 160 meters. The worst-case spurious emission is approximately 42 dB down from the fundamental.

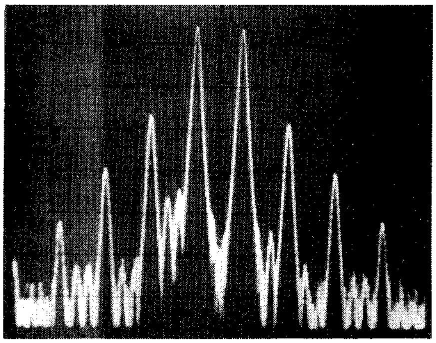


Fig. 2 — Spectral display of the TS-530S output during transmitter two-tone third-order IMD test. The third-order products are approximately 28 dB below PEP and fifth-order products are about 40 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transmitter was being operated at rated input power on the 20-meter band.

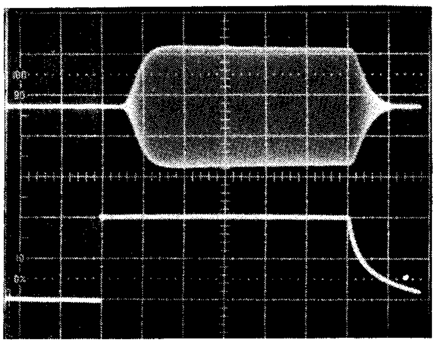


Fig. 3 — Cw keying waveform of the TS-530S. Upper trace is the rf envelope; lower trace is the actual key closure. Each horizontal division is 5 ms. The carrier level was adjusted for an alc meter reading of zero. Higher amounts of drive tend to sharpen the wavefront.

receiver passband without changing the pitch of the incoming signal. This is accomplished by "pulling" several of the internal oscillators in unison, to shift the entire i-f passband nearer to the edge of the crystal filter, helping eliminate QRM.

On-the-Air Operation

After testing the '530 in the ARRL lab, I decided to try the ultimate test — Field Day. Our operation was by no means typical, with 15 transmitters on six bands, all with kilowatt amplifiers, on a single generator! My operating assignment was 80-meter cw. We planned to have a phone and a cw transmitter on each band, 80 through 10 meters. I was skeptical of this operation, but decided to try it. As the contest began, strange noises caused by overload and cross-modulation spewed forth from the transceiver speaker. I quickly switched in the rf attenuator, and the overload effects disappeared. Sensitivity remained more than sufficient and I heard nothing from our other transmitters for the duration of the event.

My shack, located in Newington, is probably similar to that of the average apartment dweller. The wiring in the building is two-wire ac, and the shack is located on the second floor. Even without a good ground system, the transceiver did not cause TVI for my co-inhabitants! A leaky insulator on a nearby power pole provides an almost constant S7 receiver noise level, but the '530 noise blanker eliminated the problem. (The noise blanker level control must be adjusted carefully or a severe reduction in dynamic range will result). My popular "hideout" is on 40-meter cw, and the transceiver is able to handle the tremendous signals present on that band. The optional cw filter (500-Hz model provided) is quite sharp, with no excessive leakage noted. I found the ability to switch to a wide filter a great asset, especially when looking for a clear frequency.

RTTY

I recently purchased a piece of RTTY gear, and was eager to try it with the TS-530S. The '530 manual recommends that the final amplifier power input be reduced to 100 watts when using RTTY or SSTV, and at that input power the "finals" were slightly warm after transmissions. On 14 MHz, the RTTY stations seem to stick closely to 14.090 MHz, sometimes generating fierce QRM. The i-f shift control came into its own, eliminating QRM within the passband.

Observations

Any amateur in the market for a transceiver will certainly be looking for a rig that offers a good price-to-performance ratio. Does the TS-530S fit the bill? I think so. The equipment is well built, and performs well during both contest and casual operating. No flaws appeared during the review period, not even a blown fuse. For those wishing to expand the '530 station, two remote VFOs are available — the VFO-230, a 20-Hz-step digital unit, and the VFO-240, a standard L-C circuit type styled to match the transceiver. The TS-530S is available from Trio-Kenwood Communications, 1111 West Walnut, Compton, CA 90220. Price class: TS-530S, $800; VFO-230, $310; VFO-240, $170; YK88C 500-Hz filter, $63; YK88SN 1.8-kHz filter, $63. — *Gerry Hull, AK4L*

McKAY DYMEK DA100D ACTIVE ANTENNA

☐ Active antenna? What's that? An amateur phoned Hq. recently and asked, "Is an active antenna one that moves about in the wind?" Although most amateur antennas are "active" in that respect, the term "active antenna" is applied to small receiving antennas that contain, as an intergal part, an amplifier. Such is the case with the DA100D system.

Where and how might we use an active antenna? The applications are varied, but for amateur work we may find a small antenna of this variety well suited to short-wave listening when a full-size aerial can't be erected. Some apartment and motel residents might appreciate the usefulness of such a system.

Under certain propagation conditions a small active antenna is capable of enhancing reception in some of the amateur bands. This is because it responds to various angles and polarities of incoming waves more satisfactorily than might be the case during a given period when using the regular station antenna. Also, depending on the source of various forms of man-made noise, the active antenna can discriminate against the noise better than the main antenna can. Such was the case during particular periods of reception on 14 MHz at W1FB: Prior to and while the band was going out, a signal improvement of 3 to 6 dB was observed while using the DA100D, as compared to a triband Yagi at 55 feet.[2]

The Yagi was pointed toward the source of the signals (Europe) and the active antenna was mounted on a mast which placed the DA100D some 10 feet above ground. In addition to an improvement in signal strength, a marked reduction in fast QSB was noted. Some signals that could not be copied Q5 on the tribander were perfectly readable when using the active antenna.

This is not meant to suggest that an active antenna will always provide reception as good as or better than the normal station antenna. To the contrary, the improved reception is more apt to be the exception than the rule. Reception on 40 meters, for example, was inferior to that which resulted while using the half-sloper. The DA100D was more responsive to noise and generated a number of "intermod" products across the band. It is not unusual to encounter IM products when using a broadband amplifier, such as that in the DA100D. The trade-off for bandwidth (50 kHz to 30 MHz for the DA100D) is poor rejection of strong in-band and out-of-band signals, which cause IM products to be generated within the amplifier. A preselector would greatly improve the IM performance, but would restrict the antenna to a narrow band of frequencies.

DA100D Characteristics

This system comes in two pieces — a plastic-encased masthead amplifier and telescoping whip antenna, and a station control unit that contains a step attenuator and power supply. Operating voltage for the amplifier is fed through the 50-ohm coaxial cable that is supplied with the system. The DA100D can be operated from the 117-volt ac line, or from a 12-volt dc source, to permit portable or mobile

[2] m = ft × 0.3048

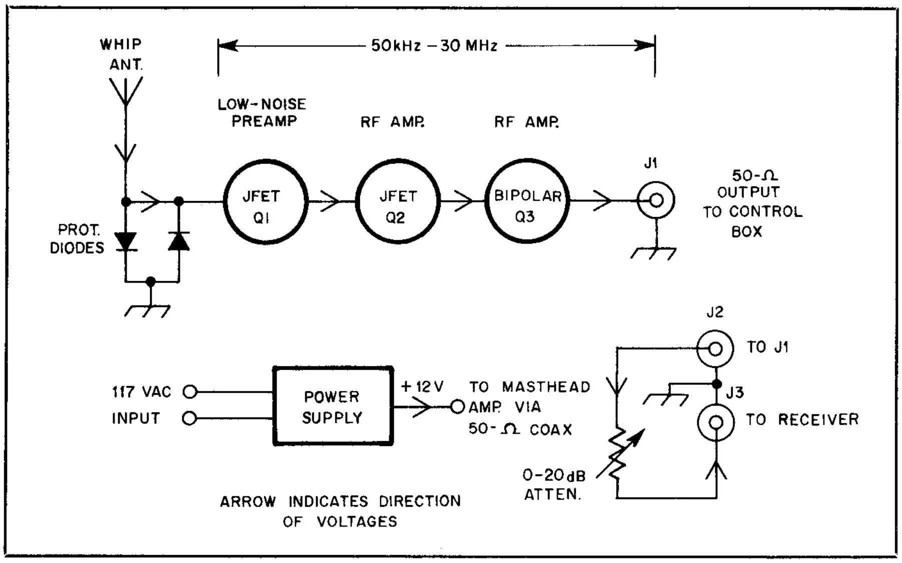


Fig. 4 — Block diagram of the DA100D broadband active antenna for 50 kHz to 30 MHz.

use. The extended length of the whip antenna is 4 feet, 8 inches. A fiberglass whip is offered as an option for those who live near salt water. A photograph of the masthead section of the DA100D can be seen in the advertisement on page 134 of September 1981 *QST.*

The manufacturer was unwilling to have the circuit published in *QST*, but we can show the general lineup in block-diagram form (Fig. 4). It can be assumed that a low-noise preamplifier is used, and that the subsequent amplifiers are employed to compensate for the normal inefficiency of a short whip antenna. Signal output from the system can be level-adjusted to suit the receiver in use.

Attenuator steps of 0, 10 and 20 dB are provided for 50-ohm operation. The control-box attenuator has positions also for interfacing the system to 100- and 500-ohm loads at 0-dB attenuation.

Burnout-protection diodes are located at the input to the masthead amplifier, but there is no strong-signal protection at either end of the coaxial cable that joins the masthead assembly to the station control box. I burned out an attenuator section and the output transistor of the amplifier module when operating 40-meter cw at the 1-kW level. Apparently the coaxial cable and overall system was resonant at or near 40 meters, and parasitic coupling to the nearby station antenna placed excessive rf energy on the system. The feed line from the station to the masthead amplifier was about 5 feet above ground during the event. Had the cable been lying on the ground or buried in the lawn, the catastrophe might not have taken place. It would be a simple matter to add protective diodes inside the control box.

Performance specifications are not listed by the manufacturer in the *QST* advertisement. Therefore, it was not feasible to perform laboratory tests to provide comparative figures. Furthermore, the high impedance (approximately 1 megohm) input of the DA100D would have made it incompatible with our laboratory test equipment. On a relative basis, however, the system performed well across the specified operating range. It should be an asset to those who travel or live where other antenna types are prohibited. It is likely that under certain adverse band conditions the active antenna would provide good reception when the regular station antenna failed to do so. This might be especially true of 80- and 160-meter operation, where noise is an almost constant threat to weak-signal reception.

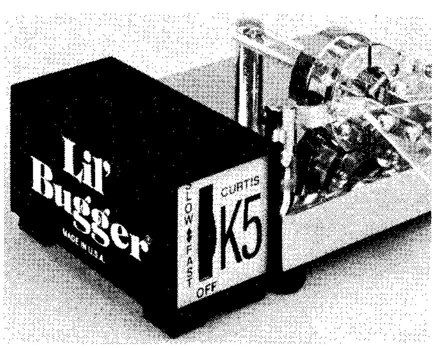
The DA100D is manufactured by McKay Dymek Company, 111 S. College Ave., P.O. Box 5000, Claremont, CA 91711, tel. 800-854-7769. Price class: $150. Unit color: satin-aluminum and black. — *Doug DeMaw, W1FB*

CURTIS ELECTRO DEVICES LIL' BUGGER

☐ "Cute" is the first word that came to mind as I held the tiny keyer in my hand for the first time. But — if that's a keyer, where are the knobs, buttons and LEDs? Well, are fingertip access to keying weight, sidetone level and pitch, and message memories really needed? Message memory keyers excepted, most of the time the only keyer control many cw operators *really* need immediate access to is the SPEED control. The Lil' Bugger provides this with a front panel thumbwheel control that also acts as an ON/OFF switch. Keyer weighting, sidetone level and pitch are variable to suit your personal tastes, but are internal adjustments.

Physical Aspects

The rear panel sports a phono jack, two subminiature jacks and a rubber grommet through which key-connection wires pass. A single-conductor shielded cable with a phono plug at the keyer end is inserted into the XMTR phono jack. The other end of the key line is terminated in a plug that matches the key jack of your transmitter or transceiver. An 8-ohm dynamic earpiece, equipped with a 2.5 mm[3] plug, may be connected to the PHONE jack to monitor the keyer sidetone. Should you wish to drive an external speaker or require dc decoupling of the sidetone output, these can be accomplished by means described in the accompanying literature.



If an external supply is to power the Bugger, it should be terminated in a 2.5-mm plug with the positive lead connected to the plug tip and connected to the 9V jack. You can install a 9-V battery (alkaline type preferred for longer life) to power the unit. The keyer cover is a friction fit so it's easy to gain access to the interior. No battery holder is provided and none is needed — the battery simply rests atop the pc-board components.

A short four-wire "tail" uses three leads to connect the Bugger to the paddle dot, dash and common leads. The fourth lead is attached to the lever of a straight key that is part of a combination paddle/straight key. If a separate straight key ("hand pump") is used, you'll need a jumper wire between the paddle common and the other terminal of the pump. If you don't intend to use a straight key, you can insulate the fourth lead and tie it back. However, it could be used as a convenient means of creating a key-down condition for transmitter tuning purposes.

Inside the Lil' Bugger

What makes the Bugger tick is the Curtis 8044 keyer IC. Two transistors, six diodes and a tungsten-contact relay (along with the required resistors and capacitors) support the IC functions. The relay contacts have a voltage and current rating of 500 V and 1 A, 50 VA maximum. You don't have to worry about key jack voltage polarity with the relay.

The 8044 and 8044B ICs offer two slightly different methods of iambic (squeeze) keying in addition to single lever (non-squeeze) keying.[4] When using the 8044 IC, the dot or dash being sent when the paddles are released is completed and nothing else is sent. With the 8044B, the dot or dash being sent upon paddle release is completed and is followed automatically by an opposite element — a dot after a dash or dash after a dot. Because the IC is socketed, it is changed easily. Either IC type may be selected when ordering the keyer; specify the K5 for an 8044 IC or the K5B for the 8044B IC. A color-coded dot on the rear panel of the keyer identifies the IC type installed: green dot for the 8044, red dot for the 8044B. Non-squeeze-key operators using a single-lever paddle need not concern themselves about IC type.

Debouncing networks are included as part of the keyer circuit. These serve to compensate for any irregularities in contact closure. Both dot and dash inputs of the IC are diode protected, and an arc suppression circuit is placed across the relay contacts to help prevent contact arcing.

The maximum keyer speed is factory set at 50 wpm. An internal adjustment permits the operator to select maximum speed limits from about 10 to 100 wpm; a procedure is detailed in the accompanying instruction sheets, which are well written and complete. The printing is clear and well defined, but some OTs may have a bit of difficulty reading the small type.

[3]Inches = mm + 25.4

[4]L. Fay, "The Iambic Gambit," *QST*, July 1981, p. 52.

A quiescent current drain of 50 μA is drawn by the keyer. During keying, an average of 20 mA is required. If the optional mercury-wetted contact relay is substituted for the standard relay, current drain approaches 40 mA during keying.

Although the external power input jack is labeled 9v, the Lil' Bugger will operate with voltages within the 5- to 15-V range. At the low end of the range, an onboard relay current-limiting resistor must be shorted out. For operation at the 15-V level, the manufacturer cautions that the internal battery (if used) be removed first.

In Use

The Bugger is so small that it can be attached directly to the side of the paddle using the double-stick tape provided. This eliminates using long, 3- or 4-wire connections between the keyer and paddle.

Keyer operation is smooth — an accepted fact for the keyers I've had using Curtis ICs. Even if you already have a keyer, you might consider adding a Lil' Bugger to your operating position. It makes a neat package for portable or mobile operation, too. Curtis has shown that, indeed, "good things come in small packages." Price class: $40 (plus $2 shipping). Manufacturer: Curtis Electro Devices, Box 4090, Mountain View, CA 94040. — *Paul K. Pagel, N1FB*

CUSHCRAFT A743 40/30-METER ADD-ON KIT

☐ When Glenn Whitehouse of Cushcraft offered to send the 40-meter adapter for the A3 Tribander,[5] I gladly accepted. Forty meters is a favorite haunt of mine and the idea of having a rotatable 40-meter dipole was alluring. The addition provides a means of having at your disposal a 4-band antenna (40 through 10 meters) that is fed by a single run of coaxial cable.

Description and Assembly

The add-on kit contains a pair of 20-meter traps, a pair of capacitance "hats," a heavy-duty driven element center insulator, aluminum tubing element extensions and a driven element support-mast assembly. Installation of the kit requires that the driven element of the A3 be disassembled at the center insulator and at points outboard of the 15-meter traps only. The addition may be configured for use on either 40 or 30 meters. On the 30-meter band, the capacitance hats are not used. All hardware is stainless steel or aluminum, and worm-gear clamps are supplied for securing the element sections.

In my opinion, the instruction sheet left something to be desired. The text does little more than refer you to the accompanying illustrations. And, while "a picture may be worth a thousand words," I felt another 100 words or so would have helped a great deal. The information is there, but close examination of the pictorials is required to avoid making a mistake. Two minor instruction sheet errors were noted. Fig. 6A has the identification of the FD and FG element sections reversed and the length of the machine screw (item 40, Fig. 5) incorrectly stated as 3/4 inch; it should be 1-3/4 inches. The manufacturer has taken steps to correct these errors.

[5]"Cushcraft A3 Triband Antenna," Product Review, *QST*, May 1981, p. 40.

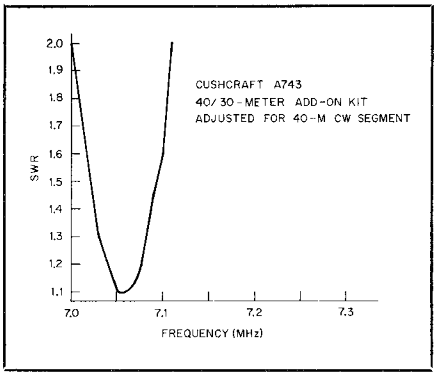


Fig. 5 — SWR curve for the Cushcraft A743 40/30-meter add-on kit for the A3 tribander.

Replacement of the center insulator is the first installation step. The new G-12 fiberglass insulator has a wall thickness of 1/4 inch (mm = inches × 25.4)) — about double that of the one supplied with the A3 originally. Additional strength is needed here because the overall length of the driven element is increased by approximately 12 feet and two traps are added that also serve to increase the weight of the element. A large portion of this additional weight is borne by the driven element support-mast assembly. This consists of a vertical tubing section (clamped to the boom) and a support line that is attached at points between the 15- and 20-meter traps. According to the manufacturer, this line is specially imported from Denmark, has more than adequate strength, and will not stretch. I have not noticed any subsequent sag in the driven element since it was installed. (In fact, to me the antenna looks even better now than it did without the adapter kit installed! I've puzzled over this for some time now and have yet to figure out *why*!)

Once the driven element has been reassembled, it is adjusted for length. Three sets of element lengths are given for the cw, center and phone segments of the band. I chose to use the cw segment lengths. I found it necessary (after initial SWR measurements were made) to trim the lengths of each side of the element by adding about an inch to the measurements given in the instruction sheet table. Fig. 5 shows the SWR curve for the antenna on 40 meters. The 1.5:1 points occur at the edges of the band segment I normally use.

Performance

Comparisons made between the A743 and my 40-meter dipole have shown a small increase in received signal strength when using the '743 (oriented in the same direction as the wire dipole), no doubt because of a slight increase in antenna height (about 10 feet). But, the primary advantage of the '743 is that it can be rotated — that does make quite a difference. Many signals that are "down in the mud" with the fixed dipole because of antenna orientation are now up to a comfortable level when the '743 is used and properly positioned. Operation on the 20- through 10-meter bands does not appear to have been affected by the addition of the A743.

If you're looking for a flexible antenna system, the A3/743 combination is one worth considering. The ability to work four bands with one antenna and one piece of coax, and to have a rotatable 40-meter dipole, might interest you. If you own a Cushcraft A4, the A744 add-on kit can be used. Price class: $80. Manufacturer: Cushcraft Corporation, 48 Perimeter Rd., P.O. Box 4680, Manchester, NH 03108. — *Paul K. Pagel, N1FB*

B & W ANTENNAS BNR 2-METER QUAD ANTENNA

☐ The BNR has a distinctly home-made "flavor." The three directors, driven element and reflector are made of no. 14 copper wire strung on plastic spreaders. The spreaders are mounted on a 6-ft aluminum boom. At construction time, the builder chooses either vertical or horizontal polarization by proper positioning of the driven element.

Quad construction is straightforward. The plastic dowel spreaders are separated into five groups of two, according to length. The shortest pair is used for the third director, the next shorter pair is used for the second director, and so forth. Assembling each element consists of inserting the appropriate pair of elements into predrilled holes in the aluminum boom and stringing no. 14 solid copper wire through the holes in the spreader tips. For all elements except the driver, the wire ends are soldered to form a closed loop one wavelength long.

The instructions do not provide the loop dimensions. The builder must center the spreaders in the boom and string wire through predrilled holes, drawing it taut without bending the spreaders. Perhaps this would be adequate if each spreader locked into the boom exactly at the center: they do not. I taped them in place to keep them from sliding around. A small geometry exercise indicates that the loop perimeter varies by as much as 20%, as the intersection point of the spreaders deviates from the centers. Depending on the builder's skill, this can range from a minor inconvenience to a fatal flaw.

The kit includes an SO-239 connector for attaching 50-ohm coaxial cable. A modified gamma-match stub provides the match between the driven element and the feed line. The SWR curve (Fig. 6) indicates that the quad is a relatively broad-band antenna.

The quad performance is adequate. Informal observations indicate that it has good front-to-back and front-to-side ratios.

The structure is reasonably sound. If the builder puts it up and leaves it alone, it should be okay. I would not recommend it for someone who wished to put it up and take it down frequently. It would not tolerate that much abuse.

Price class is $45. For more information, contact Don Brooks, B & W Antennas, 2540 CR181, Clyde, OH 43410. — *Peter O'Dell, KB1N*

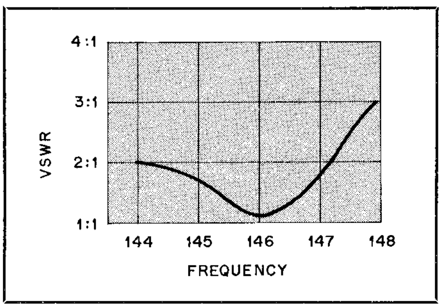


Fig. 6 — VSWR vs. frequency for the BNR quad. The quad was mounted in the clear about 10 feet above the roof of a house.