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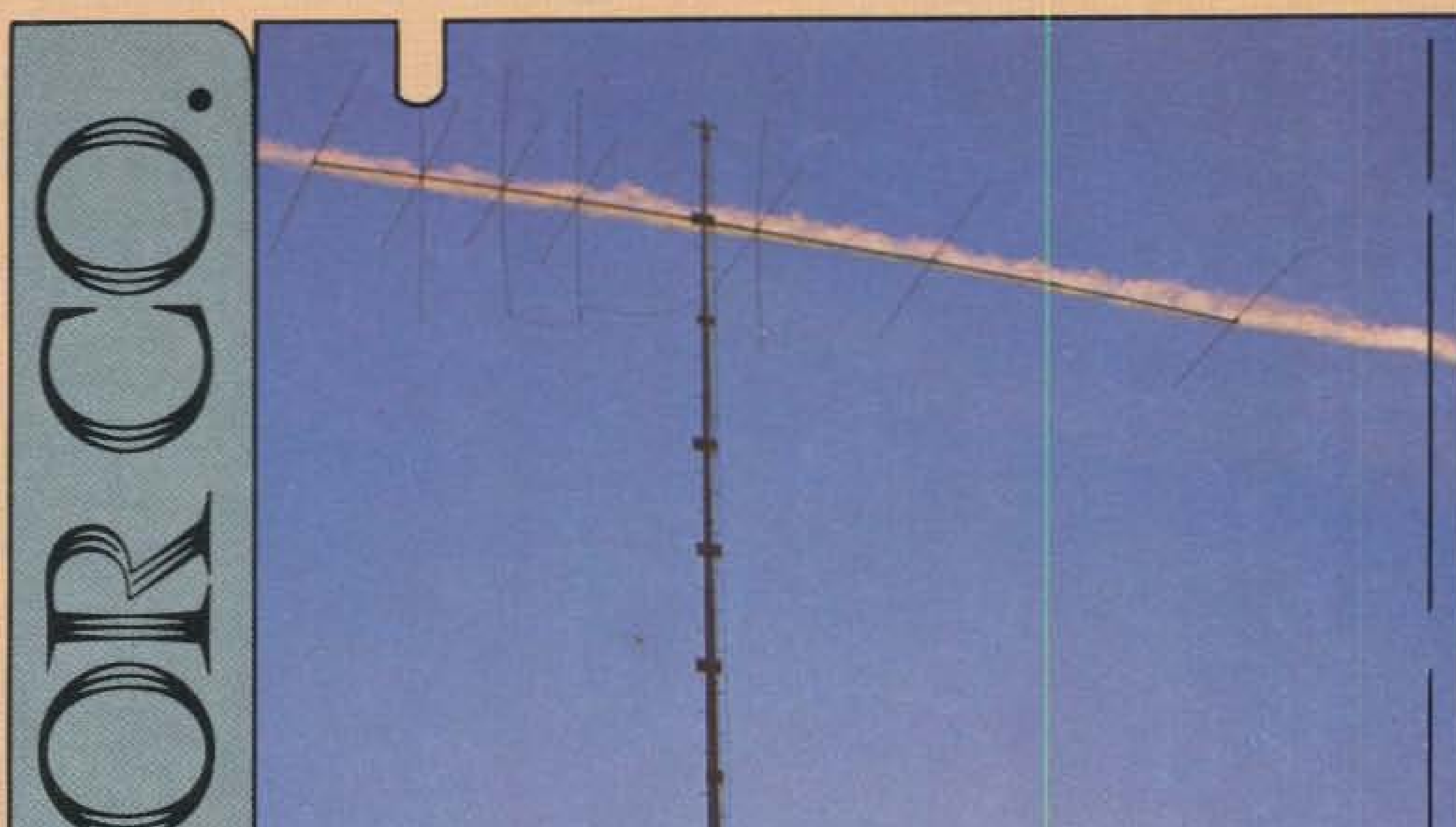

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MARCH, 1980 VOL. 36, NO. 3

CQ

The Radio Amateur's Journal

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Zero Bias

an editorial

"If We're So Darn Smart, Why Aren't We Rich?"

Times were when amateur radio publications prided themselves, if not lauded their individuality, with regard to audience appeal. Audience appeal happens to be you. Who reads what magazine or which magazine appeals to which segment of amateur radio became the basis of selling advertising and of boosting circulation. In truth, however, we all compete in one way or another for the same market, which again is you. Therefore, you are very important to all of us.

For a long time in fact, the four (and now five) amateur magazines were stereotypically catagorized as to their readership, and editorial bias or direction. *CQ* had the DX and operating corner of the "market" with achievement awards, contests, DXpedition articles, propagation info and the like. Whatever technical information we printed or construction material we presented carried very little lasting impression or "image". We were (and still are, I am proud to say) the embodiment of the active amateur. We support the amateur community with columns, contests and awards for the pure enjoyment of doing and achieving. In fact, we also supported unpopular causes (at the time) which now are mainstays and readily accepted parts of amateur radio, such as the Novice license (when the ARRL fought it), the OSCAR program, continued coverage of RTTY, slow and fast scan TV, and I believe we were the first magazine to cover coherent c.w. But that's another story.

So, up until recently things were relegated to stereotypes. *QST* had its membership with the magazine thrown in. They didn't even acknowledge that *CQ* existed. We were never footnoted in areas which might have added to the readers' insight into an article. Our contests were never listed in their calendar of events. I'm glad to say that these conditions have changed somewhat over the recent few years. We are actually footnoted where applicable and our contests are now listed. Maybe in time to come, they'll even include our rules in the listings as we have always done for them. This change in their attitude is a direct result of pressure from you, the readers, who wrote in and complained. *QST* as a magazine concerns itself mainly with membership business as management sees it. *CQ* did not amount to a hill of beans as far as they were concerned; whatever we had . . . they had better. In recent months, however, one thing has cropped up ever so silently that puts a fly in that ointment.

Our DX Contest, the world's biggest and best (thanks to you), has consistently outdrawn theirs. It's sort of embarrassing when the biggest organization (of which I am a life member) cannot get their act off the ground. Now it appears that they mean to do battle with us and the CQ Contest. The new rules are almost a carbon copy of our rules; even the wording is remarkably identical in parts. If you can't beat 'em, join 'em. We were smart enough with your help to make ours the best in the world. I guess I shouldn't be too upset if they want to copy it. At least give us the courtesy of acknowledging the source. The "Not Invented Here" attitude has gone on long past its time.

Our mutual friend Wayne had written early on in *73* that he didn't like the column format and would leave that to *CQ* along with all the DX and contests and awards. Well lately, if my eyes don't deceive me, he seems to have lots of columns, some sort of awards program started and is getting into contests. Thanks for the endorsement Wayne; we obviously must be doing something right for you to copy us. Maybe I should start writing about skiing in Aspen, horseback riding and sports cars?

Ham Radio was locked into a technical format, and not a bad one at that, so *HRH* was started. I don't know if the intent or premise was to garner some of our "share" of the market, but it sure looked like it when the first several issues had a Propagation column which more than paraphrased ours, including one illustration very similar to one of W3ASK's coincidently having the same error. It seems that they are going through some further changes with the addition of a few more columns. Sounds familiar, doesn't it?

Basically I think it's a terrific affirmation that all of those people think enough of *CQ* and its readers to want to copy us. I know that some of our columnists and contest people are irked at these moves which they feel are out-and-out attempts to capitalize on their long and hard work, but it's really a compliment to their work and their results.

While I'm not about to retaliate by devoting entire issues to microprocessors, computer technology or SCM notes and *CQ* Happenings, we will probably branch out in turn to augment *CQ* with some material previously held sacrosanct by our journalistic brethern.

If any of you ever had doubts as to our intent to phase out or discontinue any of our programs, this should once and for all dispell them. We have no intention, nor did we ever have, of not supporting them to the fullest. In fact, if you check John Attaway's DX Column this month you will find that we listened and acted upon your suggestions for the Five Band WAZ Award. Should the need arise, and it looks like it might, we are even preparing for the contingency of Eight Band WAZ. We have the will, and most of all the ability that experience brings, to make all of these things come true.

You're not simply a "share" of the market to be vied for or a commodity viewed as sheep, easily led or distracted. It may be a nice feeling or complimentary to recognize at long last that these other people admit you exist or in some token fashion try to cater to you. It seems that through

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THE OPERATING EDGE

you, our readers and supporters, we have built up a pretty valuable package, worthy of some exploitation.

Well, as the title question asks, "If we're so darn smart, why aren't we rich?" Simply put, this isn't the kind of business that'll make you rich (after taxes that is . . . unless you don't have to pay them). What keeps us all going are subscribers and advertisers and how many of each. Our activities grow in relation to your participation and involvement, but as the others will find out, it doesn't help pay for them, not directly that is. What helps pay for them are more subscribers and more advertisers.

So, while we are not rushing to foment a circulation war or to pit advertiser against publication, we are taking up the *CQ* Standard to demonstrate that *CQ* does have a lot to offer both readers and advertisers. If you like *CQ*, tell your friends about us. Ask them to subscribe. Your direct support is quite important. Tell our advertisers when you buy their products or ask for information that you saw in their ads in *CQ*. "Say you saw it in *CQ*" has become our byword and I hope it will become yours.

Remember that *CQ* does sponsor the best contests in amateur radio, the best and most comprehensive achievement award programs in amateur radio, the fullest information on specialty interests in amateur radio and the most operating enhancement articles to be found anywhere. In fact, *CQ* is the only amateur publication to offer its subscribers free use of the classified section. *73* doesn't consider having a classified section at all is worthwhile. So if anyone out there has to ask what has *CQ* done for them lately, they haven't been reading *CQ*. If you want to know what we're going to do for you tomorrow, you'll have to buy it to find out.

73, Alan, K2EEK

Announcing

• **60 Years of Operating** - A banquet will be held March 22 to honor Dusty Dunn, W8CQ, for having been an amateur for 60 years. It is to be held at the Stephenson Club, Clawson, Michigan, with cash bar at 6:30 p.m. and dinner at 7:30 p.m. $12.50 per person. Deadline for reservations is March 12. Tickets may be obtained from Charles Master, W8OU, Box 294, Clawson, MI 48017, or call (313) 646-3367. Please make out checks to Charles Master. Talk-in on 146.55. Bring your QSL card, or mail it to Box 294.

• **Penn Wireless Assn. Inc.**Tradefest '80 will be held Sunday April 13 at the National Guard Armory, Southampton Rd. & Roosevelt Blvd. (Rte 1), one-half mile south of the Penna. Turnpike exit #28. Seller's space 6′ x 8′ $5. Bring tables. General admision $3. Prizes, refreshments, rest area, displays and surprises. Talk-in on 146.715 and .52. Contact: Robert L. Daut Jr., WB3KRV, P.O. Box 734, Langhorne, Penna. 19047.

• **Flea Market** - The Delaware Valley Radio Association, W2ZQ, assisted by the Lawrenceville Amateur Repeater Group, will hold their annual flea market on Sunday, April 20 from 8 a.m. to 4 p.m., at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, in Lawrence Township. Advance registration is $2.00, or $2.50 at the gate. Adequate indoor and outdoor flea market area. Sellers are asked to provide their own tables. Door prizes, raffles, refreshments, and FCC examinations will be provided. Talk-in on 146.52, 146.07-67, and 147.84-24. For further information and reservations, write: D.V.R.A., P.O. Box 7024, West Trenton, NJ 08628.

• **Metroplex** - The New York City metropolitan area has one of the most sophisticated systems of inter-linked repeaters in the United States. Metroplex was conceived in January 1978 by K2KLN and WB2MGM to establish repeaters on *all* allocated FCC frequencies, using all available modes, to provide 24-hour emergency communications and to provide a forum for east coast and world wide (via 10 meter-link) amateur radio operators. All frequencies are coordinated by T-SARC and the FCC. Autopatch facilities are completely computerized and are part of a large long-distance network. Club meetings are held the second Wednesday each month at 8 p.m. at Firehouse No. 4, Fort Lee, New Jersey. Listen to Metroplex FM everywhere on 29.640 MHz, (29.540 1n) and on 145.45 (144.850), 223.720, 443.950, or write P.O. Box 237, Leonia, NJ 07605 for more information. Club Phone 201/592-1579.

• **Winter Olympic QSL Cards** - The amateurs of Franklin County, NY will be distributing special 1980 Winter Olympic QSL cards to each of their contacts for the period before, during, and after the Olympics which are being held in Lake Placid, NY. (Franklin County annexes the county in which Lake Placid is located.) The cards contain the primary Olympic logo, the Franklin County seal, and the standard QSL information. The Franklin County legislatures both printed and paid for the cards. Anyone who would like more information about the cards may contact Shawn D. McGovern, KA2BSC, 117 Webster Street, Malone, NY 12953.

• **Fourth Annual Hamboree** - The 3900 Club, Sooland Repeater Association is sponsoring their 4th Annual Hamboree on Saturday, March 29 at The Oasis—Sioux City Airport. Entertainment, exhibitors, flea market, technical programs (in the afternoon), dinner banquet, ARRL forum, C.W. Contest, Novice meeting. Bring your surplus ham gear to the flea market. Tables may be reserved for $2.00 (contact Al Smith, WØPEX, 3529 Douglas, Sioux City, IA). Write for advance tickets and motel reservations to Loren Barbee, WBØYOW, 1518 W. 30th, Sioux City, IA 51103. Advance registration including banquet, $6.75. At the door, $7.75. Hamboree only (no dinner) $2.00.

• **Amateur Radio Public Service Association Hamfest** - The Amateur Radio Public Service Association will be sponsoring their annual Hamfest Sunday, March 23 at Glen Oaks Community College, Shimmel Road, Centreville, Michigan. Doors open at 7:00 a.m. Tickets may be purchased in advance or at the door for admission and door prizes. Donation in advance $1.50 and at the door $2.00. Table reservations $2.00 per full table. Talk-in on 146-66/06 or 146.52. For further information and table reservations contact: KA8EGJ Sharon Tilbury, 607 Oak St., Three Rivers, Mich 49093, phone (616) 273-8301; or WD8RGR Dave McClain, 13926 Riverside Drive, Constantine, Mich 49042, phone (616) 435-7422.

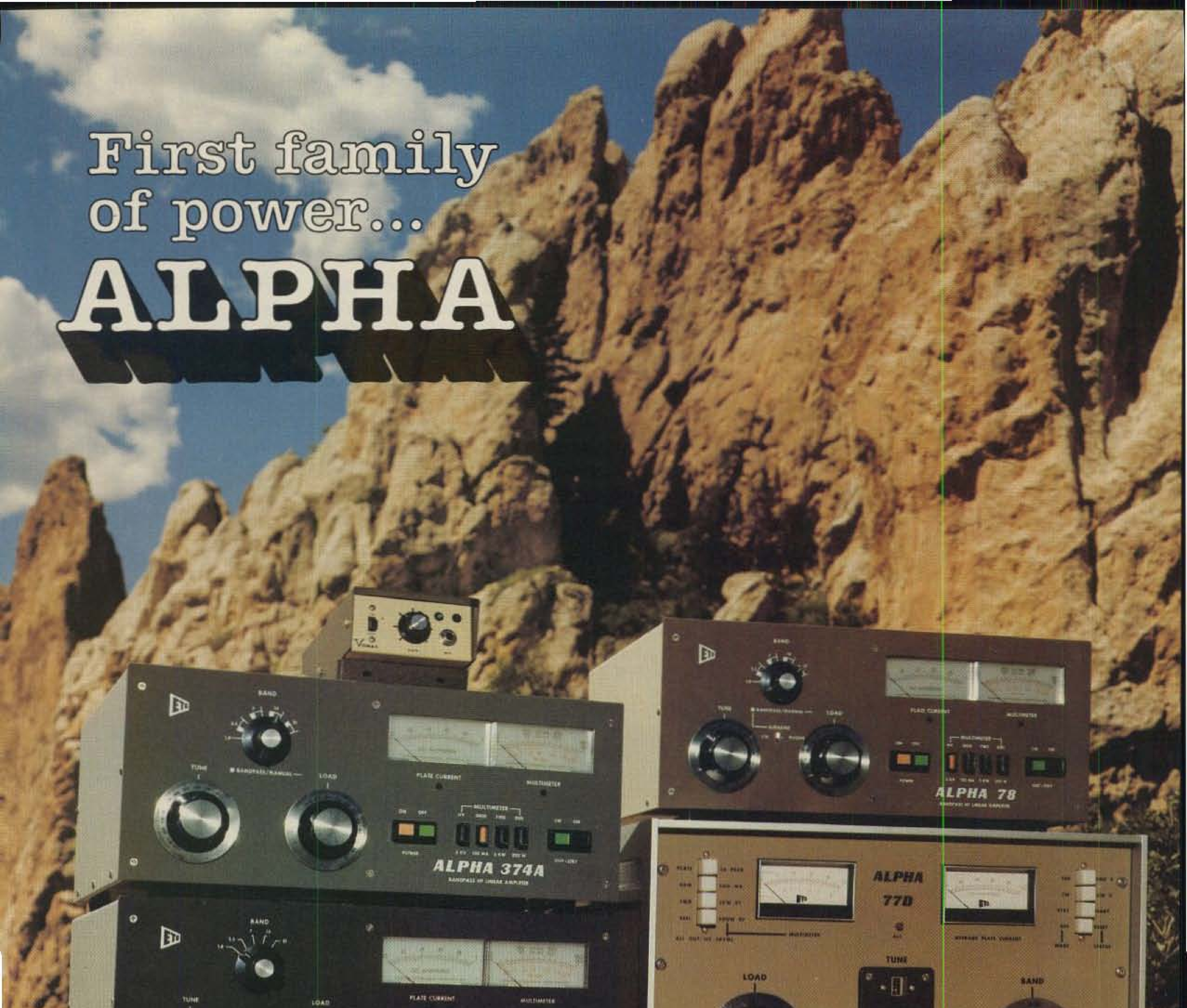

Photo By RIC HELSTROM

Glen Eyrie, Garden of the Gods, in ETO's back yard.

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75-10 HD(SP)	75/40/20/15/10	66	$94.25
75-10 HD(SP)A	75/40/20/15/10	66	$99.50
75-20 HD	75/40/20	66	$80.25
75-20 HD/A	75/40/20	66	$85.50
75-20 HD(SP)	75/40/20	66	$80.25
75-20 HD(SP)A	75/40/20	66	$85.50
75-40 HD	75/40	66	$68.00
75-40 HD/A	75/40	66	$73.25
75-40 HD(SP)	75/40	66	$68.00
75-40 HD(SP)A	75/40	66	$73.25
80-10 HD	80/40/20/15/10	69	$98.50
80-10 HD/A	80/40/20/15/10	69	$103.75
80-10 HD(NT)	80/40/20/15/10	69	$98.50
80-10 HD(NT)A	80/40/20/15/10	69	$103.75
80-40 HD	80/40/15	69	$72.00
80-40 HD/A	80/40/15	69	$77.25
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W3RJ shows us how to provide full break-in and improve the keying to turn these two Drake units into a super contest machine.

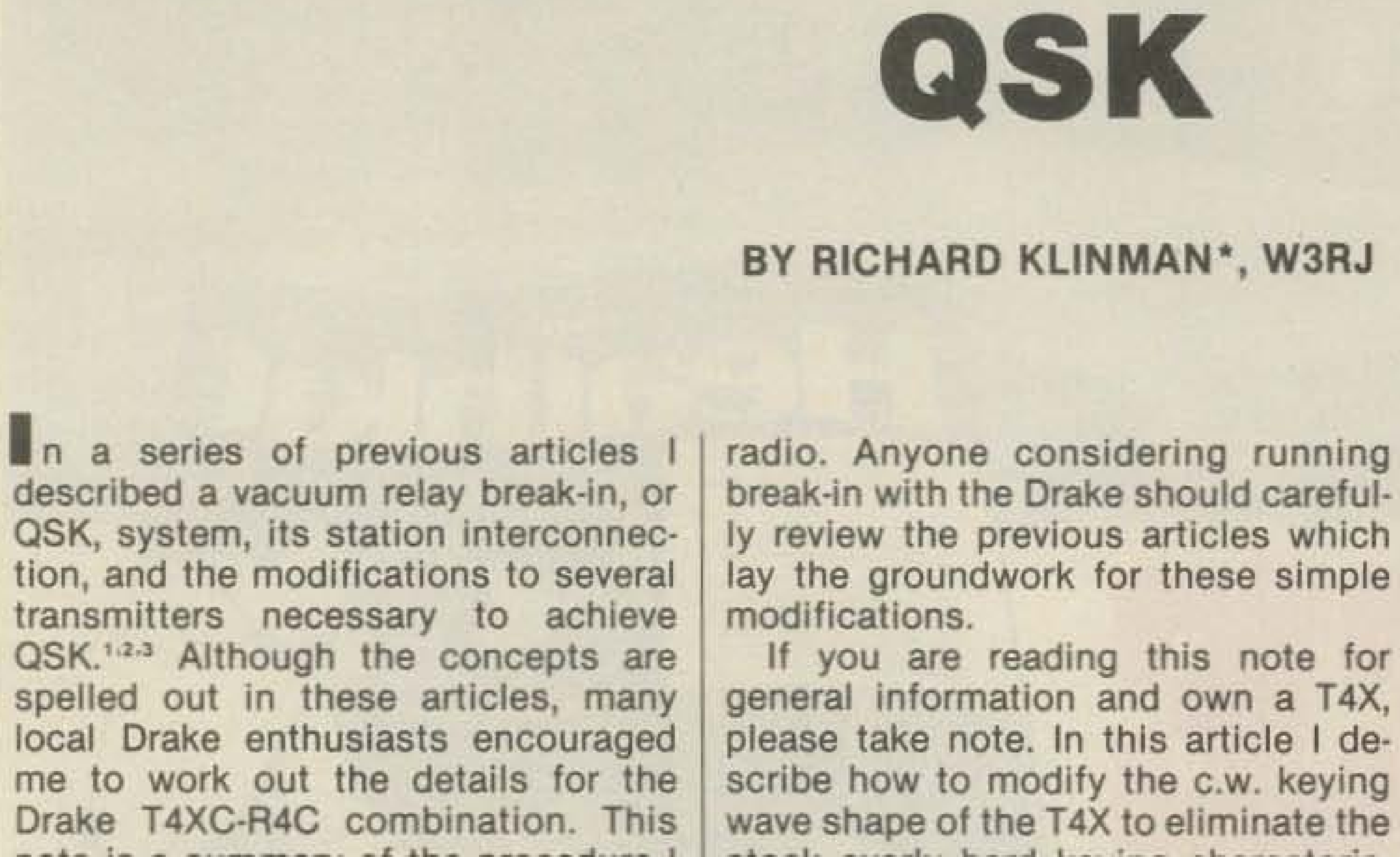
Full Break-In With The Drake T4XC-R4 Using The Vacuum Relay QSK

BY RICHARD KLINMAN*, W3RJ

In a series of previous articles I described a vacuum relay break-in, or QSK, system, its station interconnection, and the modifications to several transmitters necessary to achieve QSK.[1,2,3] Although the concepts are spelled out in these articles, many local Drake enthusiasts encouraged me to work out the details for the Drake T4XC-R4C combination. This note is a summary of the procedure I used to incorporate QSK with this radio. Anyone considering running break-in with the Drake should carefully review the previous articles which lay the groundwork for these simple modifications.

If you are reading this note for general information and own a T4X, please take note. In this article I describe how to modify the c.w. keying wave shape of the T4X to eliminate the stock overly hard keying characteristics. The two additional capacitors needed to correct the "thumpy" keying are very simple to install, so please try them. Your neighboring amateur friends will appreciate the five minutes work involved.

*RD 1, Flint Hill Rd., Coopersburg, PA 18036



The QSK box of W3RJ. This unit has been described in previous issues of CQ. Check the references at the conclusion of the article for specific issues and dates. The box itself is 8" × 6" × 3½" and is a Bud CU-2109A Minibox.

Break-in with the T4XC-R4C

The constraints on modification of the transmitter are unchanged from my previous efforts, namely (1) the ability to return to "factory" operation without having to re-modify the equipment when the QSK is not being used, (2) minimum modification to the transmitter, and (3) absolutely no mechanical modification to reduce resale value. Modification of the Drake was simpler than either the Collins or Heath, but there was one complication which was, nevertheless, easily overcome. As delivered from Drake, all necessary low level stages in the transmitter are keyed thereby eliminating the main "backwave". The final amplifier screen supply line is broken for keying of these tubes to eliminate idling current during key-up. Mechanical modification of the transmitter consists of adding four phono jacks in existing spare ¼" holes provided on the rear panel. These jacks are connected to (a) the screen supply voltage, (b) the final amplifier screen grid connection, (c) the push-to-talk, PTT, line, and (d) the transmitter PTO lamp grounding switch connection.

As with the Collins and Heath, the carrier oscillator produces a low level "backwave" signal when the transceive cables are connected in c.w. The "injection" cable provides the spurious path for this unwanted sig-

nal. A trap-isolation amplifier, as was used with the Collons[4] to eliminate the problem, in the "injection" cable of the Drake is extremely difficult to implement because of the wide frequency range of signals on the line and its bidirectional nature. Keying of the carrier oscillator, as used with the Heath[3], was unsuccessful because of excessive chirp. The problem was solved by using a fast and inexpensive reed relay to open the injection cable during receive on c.w. This method does eliminate the ability to transceive on c.w. with the transmitter PTO. Transceive on c.w. with the receiver PTO is still possible. It was the consensus that this was an acceptable price to pay for QSK. Keying the injection cable also solves a fundamental design problem with s.s.b. operation of the Drake T4XC-R4C. When the T4XC-R4C is connected for transceive and used in the separate s.s.b. mode a spurious signal is transmitted on the frequency set by the receiver PTO. In transceive it is possible to transmit a spurious signal on the unused PTO frequency. Although this spurious signal is many dB down from the desired transmitted signal, you can often hear locals using Drake equipment calling out of band DX on the DX station's transmit frequency. Keying the injection cable as described in this article completely eliminates this problem. S.s.b. operation is completely unaltered by the injection cable keying logic.

Modification to the T4XC

Modification of the Drake transmitter is very simple. No r.f. circuits are altered. It is advisable to run all extra wires along existing cable harnesses where they can be laced down for a professional looking job. Wire placement and component location is not critical.

Two preliminary checks should be made. Examine the key and microphone jacks on the rear panel. Although not shown in the schematic, the tip of the key jack and the tip of the microphone jack, the PTT line, should be by-passed to ground with .01uF 1kv disc capacitors.

First, addition of the external PTT jack will be described. Add a phono jack to the "spare" hole in the rear panel closest to the carrier balance control. Label this jack **PTT**. By-pass this jack to ground with a .01uF 1kv disc. Be careful not to disturb either the carrier balance capacitor or potentiometer. Connect a wire from this jack to the connection pin on the VOX circuit board with the white-purple wire. **Color coding of the wiring in the T4X may not be uniform. Be sure to locate the correct connection by tracing the**

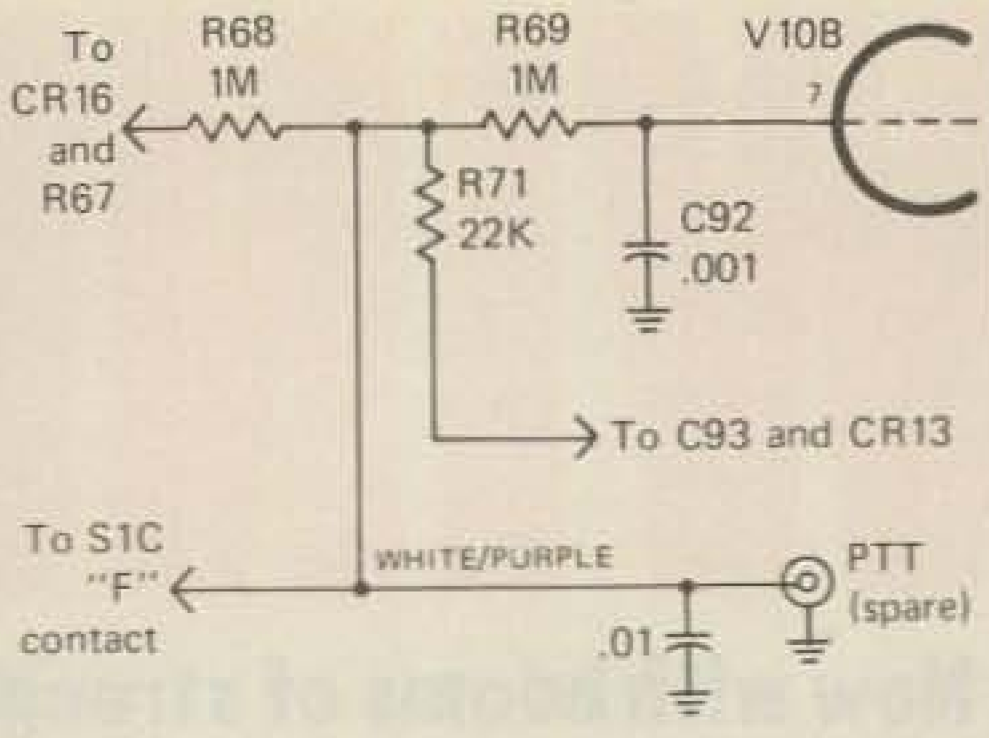


Fig. 1- External push-to-talk (PTT) jack.

circuit with the schematics. This point is the junction of R68 (1M) and R69 (1M) as shown in fig. 1. Route the wire down against the chassis, between the VOX board and the chassis side, and away from the carrier balance control. Lace it to the cable harness where they run parallel.

Next you will bring out to the rear panel the transmitter PTO lamp switch grounding contact. Mount a phono jack in the unmarked hole above the new PTT jack. Label this jack **TX PTO Lamp.** By-pass the jack with a .01uF 1kv disc. Run a wire from this jack to the "Transceive" switch S2B(R). Connect the wire to the contact carrying the ground return to the PTO lamp as shown in fig. 2. This contact is located closest to the chassis and will be black. Trace it to one side of the PTO lamp. Run the wire down the center of the chassis along the cable harness. At the rear panel run the wire along the top of the existing phone-jack strip and to the added phono jack. Secure the wire with a cable clamp installed on one of the screws used to mount the phono-jack strip.

Finally, add screen keying to the 6JB6A amplifier tubes. Mount a phono jack in the "A" hole in the rear panel and by-pass it with a .01uF 1kv disc. Label this jack **Screens**. Mount a phono jack in the "B" hole in the rear panel and by-pass it with a .01uF 1kv disc. Lable this jack **+250**. Locate the bare jumper wire from the relay board connecting pin with a white-green wire to the screen grid feed-through capacitor, C68, the center feed-through on the final amplifier shield. Clip out this jumper. Connect a wire from the screen voltage tie point on the relay board, the pin with the white-green wire, to the "+250" jack. Connect a wire from the screen by-pass capacitor, C68, to the "Screen" jack.

This completes the absolutely necessary modifications to the T4X for QSK operation, but two more modifications should be made. One, to soften the keying wave shape, is a must. The other, to improve PTT operation, is matter of convenience.

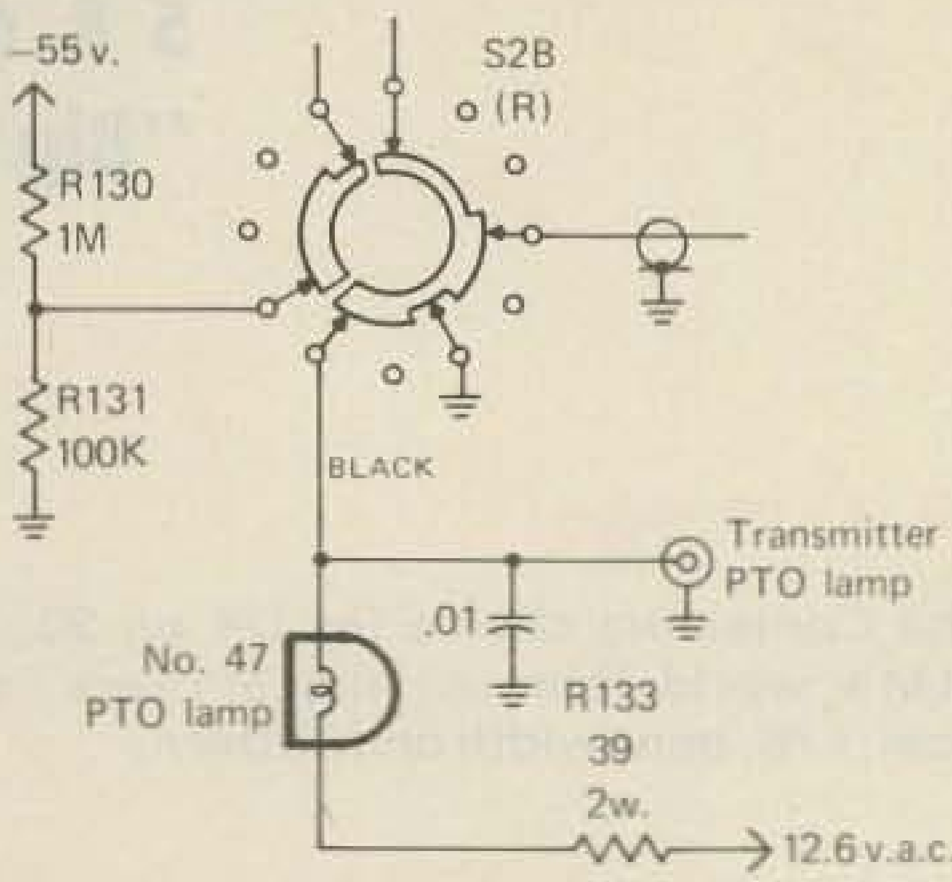


Fig. 2- External transmitter PTO lamp control voltage.

As designed, the T4X transmitter has keying that is much too hard. Factory delivered units are all on the verge of distinct key clicks. On our currently crowded bands there is no excuse for such characteristics, especially when attaining the correct wave shape is so easy. To soften the "break" simply add at least a .1uF by-pass capacitor directly across the key line. This can be physically located anywhere on the key line. Mine is the by-pass capacitor in the QSK unit. To soften the "make" increase the value of C32, .01uF disc, to at least .02uF. This capacitor is on the board in the center front of the transmitter parallel to the right angle band switch drive shaft. Simply solder an additional disc in parallel with C32.

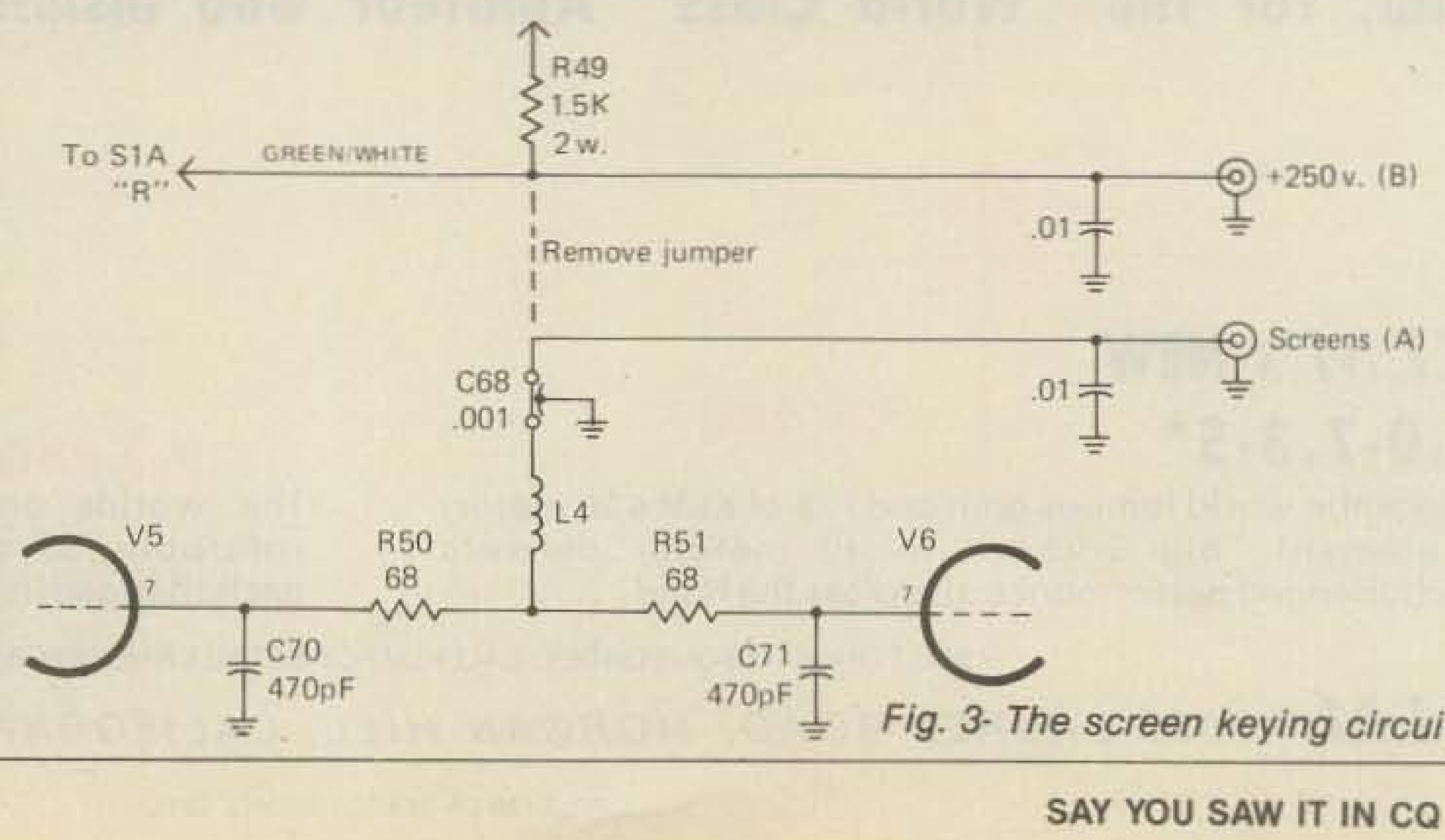


Fig. 3- The screen keying circuit.

Use the largest value capacitor that does not result in an overly soft, or mushy, sound when keying at full exciter output power. In my case a .02uF 1kv disc was added across C32. Fig. 4 shows these two necessary modifications.

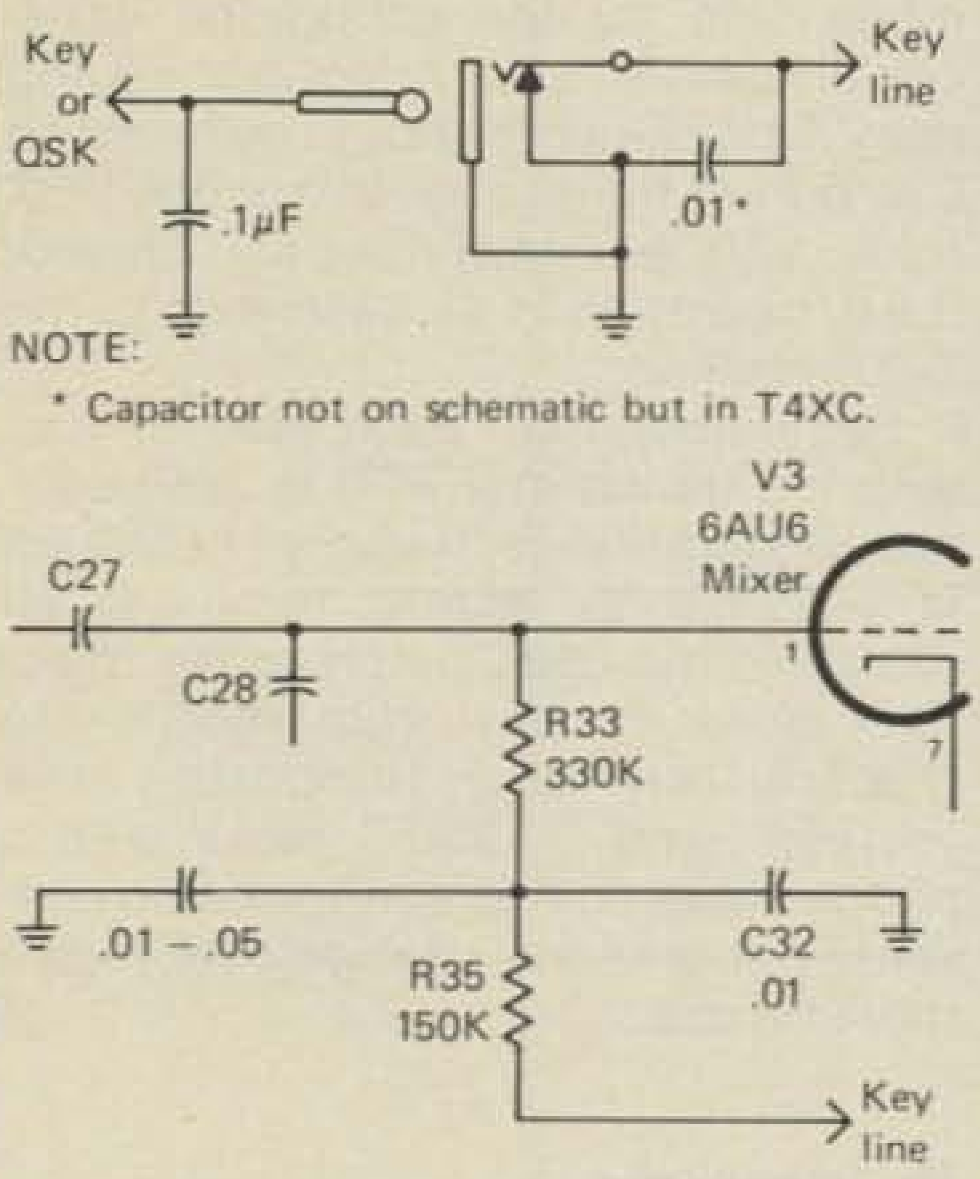
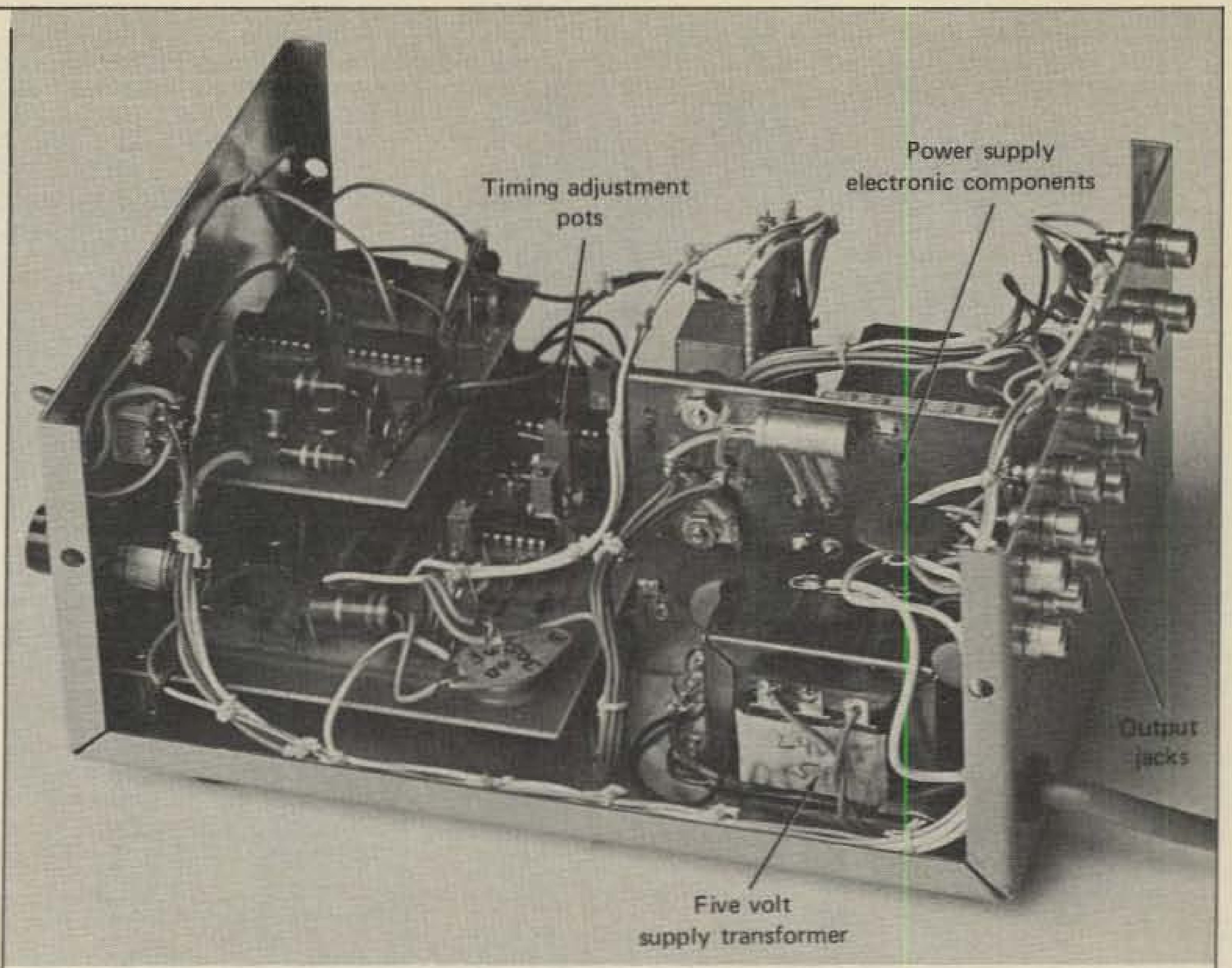


Fig. 4- Modifications to improve the keying wave shape.



The QSK box as seen from the other side. This unit has the new screen keying and Drake injection boards.

The last modification concerns the operation of the VOX circuit in the PTT mode. Since the VOX controls are inaccessible from the front panel, the fellows at Drake had a good idea in putting a VOX/PTT switch on the front panel. However, they did not quite finish the job. While the PTT switch does inhibit the microphone signal from triggering the transmitter during PTT, once the PTT is actuated the VOX hold time delay must still pass until the transmitter is returned to standby. This wait is undersirable during rapid contest style PTT operation. Drake was nice enough to provide an unused set of contacts on the PTT switch S7. I have used those extra contacts to control a miniature reed relay to reduce the VOX delay to zero when in the PTT mode. The circuit of this modification is shown in fig. 5 and the layout for a corresponding printed circuit board is shown in fig. 6. The board is mounted in the relatively empty center of the transmitter by soldering a ground lug to the final amplifier shield running parallel to the front panel and adjacent to the right angle take-off from the band switch. The filament voltage is taken from the fused side of fuse F1. Ground one unused lug of S7B by connecting a jumper between it and the grounded terminal of S7A. Run a wire from the remaining switch terminal of S7B to the circuit board as indicated in fig. 5. Run the wire with the cable harness passing through the chassis. The contacts of the relay, K2, on the circuit board are brought to the VOX circuit board where they are connected to the two wires going to R72, the s.s.b./a.m. delay control. These are on a connector pin with the green-white wire and a connector pin with the black-white wire on the VOX board. Since the minimum delay time was too long for my taste, I also shorted R67, 220k, on the VOX board with a jumper. Instantaneous PTT operation is possible with S7 in the PTT mode, and normal VOX operation occurs in the VOX mode.

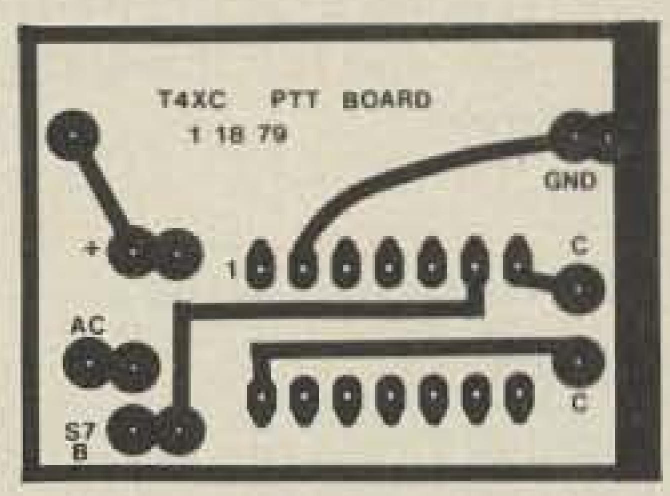


Fig. 6- The circuit board for the T4XC PTT modification as seen from the foil side. Shown actual size.

Modification of the QSK

Additional logic circuitry is needed in the QSK to drive the injection cable keying relay. This logic circuit is shown in fig. 7 and is built on the circuit board of fig. 8. The relay is mounted in a small mini-box with three

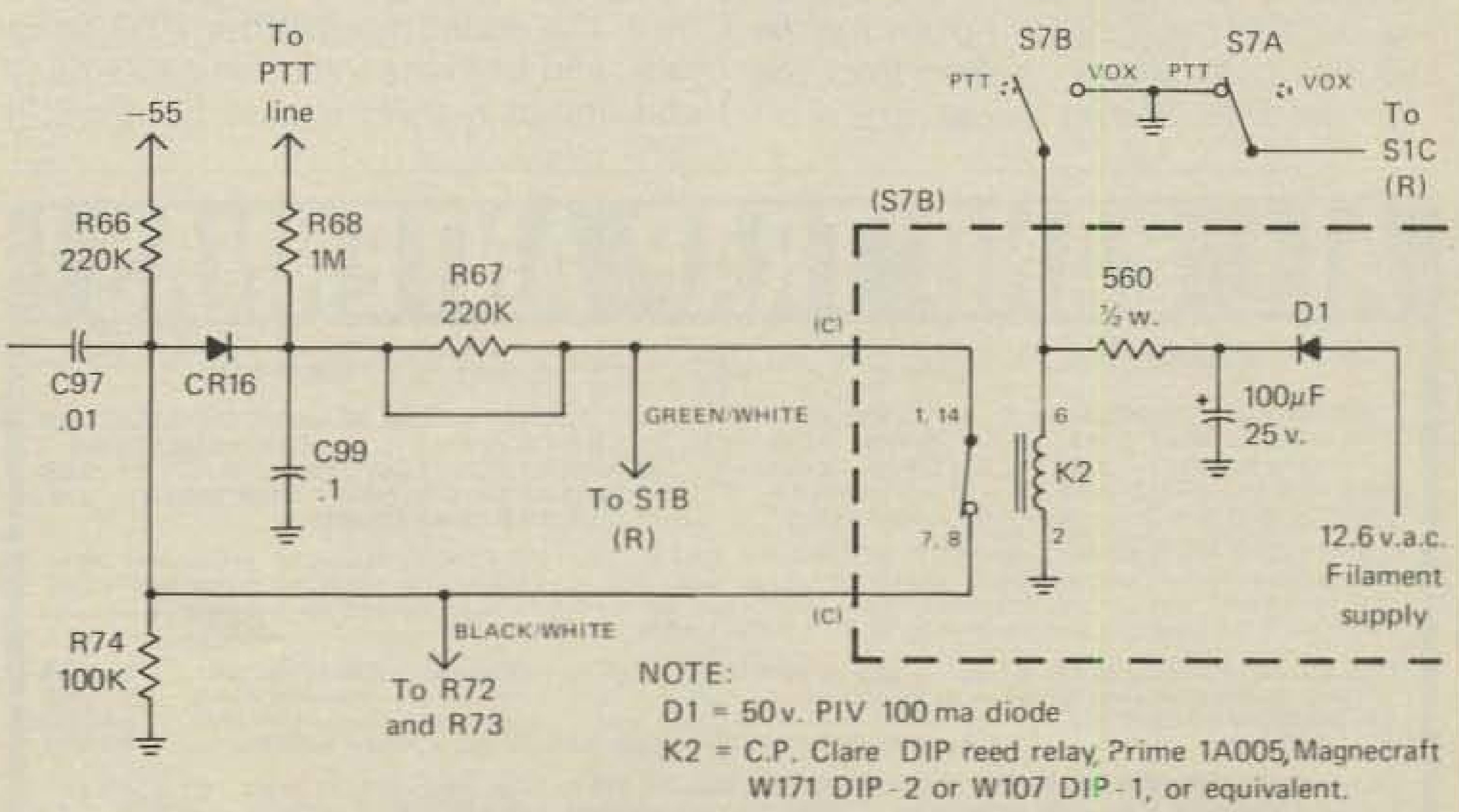


Fig. 5- Modification to the T4XC VOX to eliminate VOX delay during PTT and reduce the minimum VOX delay time. Printed circuit board connections are labeled ( ).

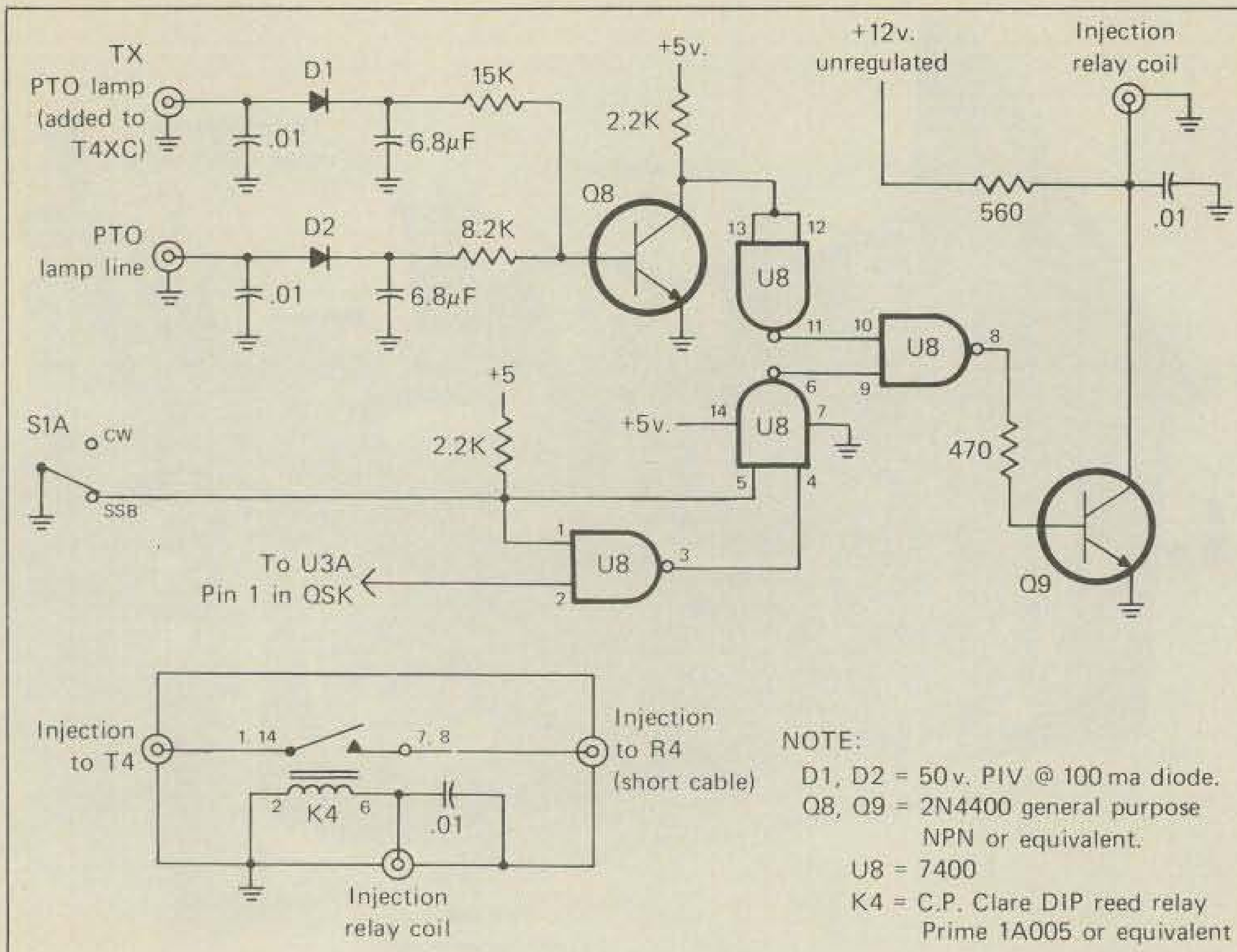


Fig. 7- The injection cable keying circuit. This circuit is located inside the QSK. Printed circuit board connection points are labeled with ( ).

phono-jacks on it. Keep leads in this box as short as possible as the injection cable does not like additional loading. I cut the existing injection cable into a long and short piece and placed shielded phono jacks on the cut ends. The shortest piece is used between the relay and the receiver. The circuit functions so that in the separate mode the relay contacts are always open. Intransceive the relay is keyed along with the antenna relay in c.w. and always energized in s.s.b. Three additional phono-jacks must be added to the QSK back panel for the receiver PTO lamp line, the transmitter PTO lamp line, and the injection cable relay coil drive.

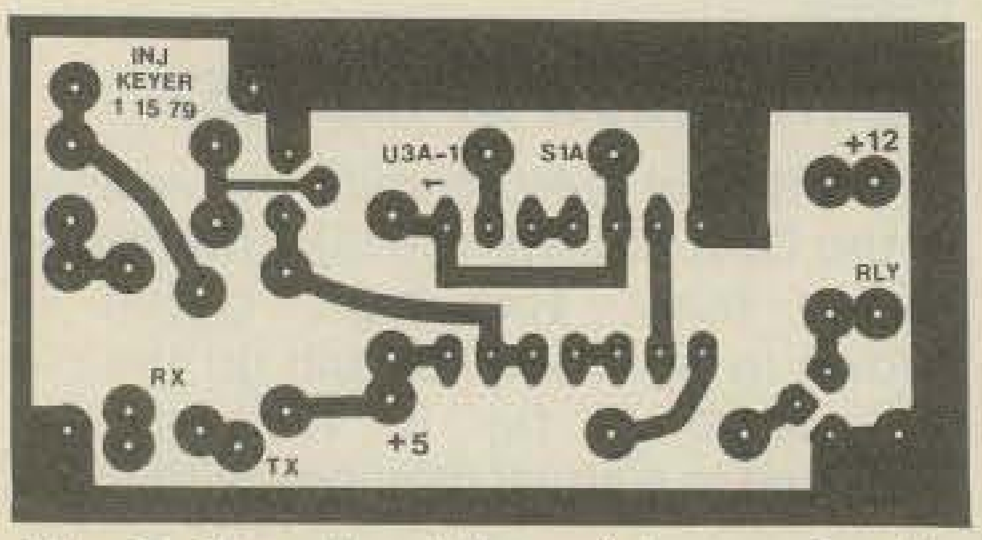


Fig. 8- The circuit board layout for the injection cable keyer as seen from the foil side. Shown actual size.

Interconnection and Operation

Interconnection of the QSK is described in the previous QSK articles.[1,2,3] In addition, connect cables to the QSK from the existing PTO lamp jack by using a phono-jack "Y" patch cord, from the added transmitter PTO lamp jack, and from the injection cable relay coil. Initial testing should be done in stages by (a) making sure the transmitter operates without the QSK by jumpering the "screen" and "+250" jacks and attempting normal separate operation, (b) connecting the QSK and vacuum antenna relay and obtaining satisfactory operation in the separate mode, and (c) connecting the transceive cables and injection keying relay. No backwave should be heard on c.w. during transceive. In c.w. the VOX relay will be continuously closed. S.s.b. operation is as described in the T4XC manual.

Remember that transceive in c.w. with the transmitter PTO is not possible. Restoration to "factory" condition is possible by simply removing all cables to the QSK, patching the injection cable directly from receiver to transmitter, and jumpering the "screen" and "+250v" jacks with a phono cable. In this configuration conventional antenna change over relays must be used.

References

[1]Klinman, R., "A Vacuum Relay TTL QSK Antenna Switch", *CQ*, July 1976.
[2]Klinman, R., "Vacuum Relay QSK In A Commercially Equipped Station, Part I: The Collins S-Line", *CQ* December 1977.
[3]Klinman, R., "Vacuum Relay QSK In A Commercially Equipped Station, Part II: The Heath SB400/401", *CQ*, July 1978.
[4]Klinman, R., "Drive Equalization And Isolation Amplifier - Collins S-Line V.F.O. Injection", *CQ*, April 1979.

CQ DX Tip

—Pay attention to fan and room noise, and breathing noise. If these produce detectable output signal deflection on the reflectometer, you have built in QRM! Some stations run a one-man pile-up. Even good stations may only give 20 dB Signal/Noise due to this local noise pickup. *—W4MB*

One man's paradise became the site of a DXpedition for himself and another amateur enthusiast. They worked about 150 countries and made 8,000 QSOs.

A DXpedition To Fernando de Noronha Island

BY Gerson Rissin*, PY1APS, PY7APS

Fernando de Noronha Archipelago lies in the south Atlantic. Its geographic coordinates are 3° 50′ 27″ south and 32° 24′ 52″ west. It is composed of twenty islands, of which Fernando de Noronha, Rata and Rasa are the main ones. Fernando de Noronha is called the "Emerald of the Atlantic" by Brazilians and foreign tourists. It is the smallest unit of and the only military unit in the Federation of Brazil. It is under direct control of the Ministry of the Army. There are army troups as well as airforce people working there. Civilians living on these islands have several activities, fishing being the main one.

Fernando de Noronha island is situated northeast of Recife, and it is about 12 km long and 6 km wide at its longest and widest points, respectively. It is 360 km from the coast of Rio Grande do Norte, 525 km from Recife and 145 km from Atol das Rocas. It is 16 square km in area.

The island is composed of mountains and valleys. The highest point, Pico Hill, is in the northeast and is 323 meters high. The climate is a tropical one, typical of the northeastern coast of Brazil. There are two seasons: a rainy one and a dry one which starts in August and ends in January. The temperature stays between 77°F and 90°F. In spite of the warm climate, the area is comfortable because of sea breezes.

Fresh water is a problem on the island because its rivers—Boldro, Maceio and Mulungu—dry up every year in the summer. The vegetation of the island is predominantly composed of forests and weeds. The rocky

The climate of the island is tropical with two seasons—a rainy season and a dry season.

ground conditions and the long periods of dryness contribute to the low, scrubby look of the vegetation.

During the rainy season, the island replenishes its water supply; water is caught by a plate—the biggest concrete plate in South America—and is sent through canals to plants where it is chlorinated. There is also the Xareu dam, which has a capacity of 120,000 cubic meters. These waters are processed by a treatment station. In an emergency, artesian wells are used.

The population of the island is about 1,350, including more than 700 people younger than age 14.

When I visited Fernando de Noronha island for the first time, in 1968, I thought to myself, "I will come back within two years, at the most." But my private affairs in this same year changed all my plans.

In 1972, with my moving from Recife, Brazil, to Rio, returning to the island became more difficult. The distance to Fernando de Noronha grew from 525 km to more than 3,000 km. Time was passing by and I often thought of this beautiful island, but there was always an obstacle placed between us.

However, last year, my XYL Mirian, PY1XBT, resolved that because of all our previous vacations, she would not travel anywhere that year. She wanted to follow through on the modifications we had planned for our apartment in

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Paulo, PY0MAG in the final stages of putting up 3 elements for 6 meters.

Copacabana Beach. I felt then that the opportunity I had been waiting for for eleven years had finally arrived. I decided to spend a few days on Fernando de Noronha island.

Going straight from thought to action, I immediately contacted Rolf Rasp, PY1RO, to find out how things were over there, since he had been there the year before, stopping on the way to St. Peter & St. Paul Rocks. The news was the best. Everything seemed to be good, because Colonel Ruperto, who had governed the island some time ago, was also an amateur, and he had left behind an excellent 3-element rotary beam, set up on an approximately 60-foot tower, and a linear amplifier of about 2 kw p.e.p., made in Brazil.

Rolf and Paulo Rabelo, PYMAG, who had been to Fernando de Noronha during Rolf's DXpedition to St. Peter & St. Paul Rocks, had left dipole antennas for 40, 80 and 160 meters. So, it was necessary to take only a transceiver with a remote VFO.

Rolf suggested I invite Paulo, PY1MAG, whom I did not know personally, but who would probably welcome the idea of going back to Fernando de Noronha island. Having accepted the suggestion, we went immediately to Paulo's farm, near Niteroi City, where in less than five minutes we settled everything, including the date of the beginning of our DXpedition—May 12.

We started preparations. That same week we sent a notice with details about the DXpedition to the main DX bulletins located all over the world. We applied to the Departamento Nacional de Telecommmunicacoes (DENTEL) for a release of the special calls PY0APS and PY0MAG. Then, we got the plane tickets, but we had to wait for permission from the government of the island to operate there.

I then met with Colonel Ivo, PY7BIB, and got a letter of introduction to Fernando de Noronha's governor, Colonel Gastao Baptista de Carvalho, his personal friend. In the letter Colonel Ivo asked that we be allowed to operate amateur radio on the island, and he also talked about the importance the event would have in international amateur radio circles.

Time was running short, and while we were waiting for the government's permission and the release of our special calls, we finished all the little details so that nothing would be missed at the last minute.

We decided that it would be interesting to also operate on 6 meters, since the band was providing good openings to the United States, Hawaii and Japan, and there weren't any amateurs from Fernando de Noronha who had already operated on this band. Once more we had the collaboration of Rolf, PY1RO, who got a Yaesu FT-620B and built a 3-element removable yagi for the 6 meter band.

As all my family lives in Recife, I decided to go there on May 5th to spend a week with them before starting on the journey to Fernando de Noronha.

On April 23 the government's permission arrived, and finally on May 10 our special calls, PY0APS and PY0MAG, were released, exactly two days before the beginning of our DXpedition.

As had been decided upon, Paulo, PY1MAG, took a TRANSBRAZIL Airlines Boeing 727 on May 12, and I joined him at the stop in Recife to spend 15 days in the paradise known as Fernando de Noronha island.

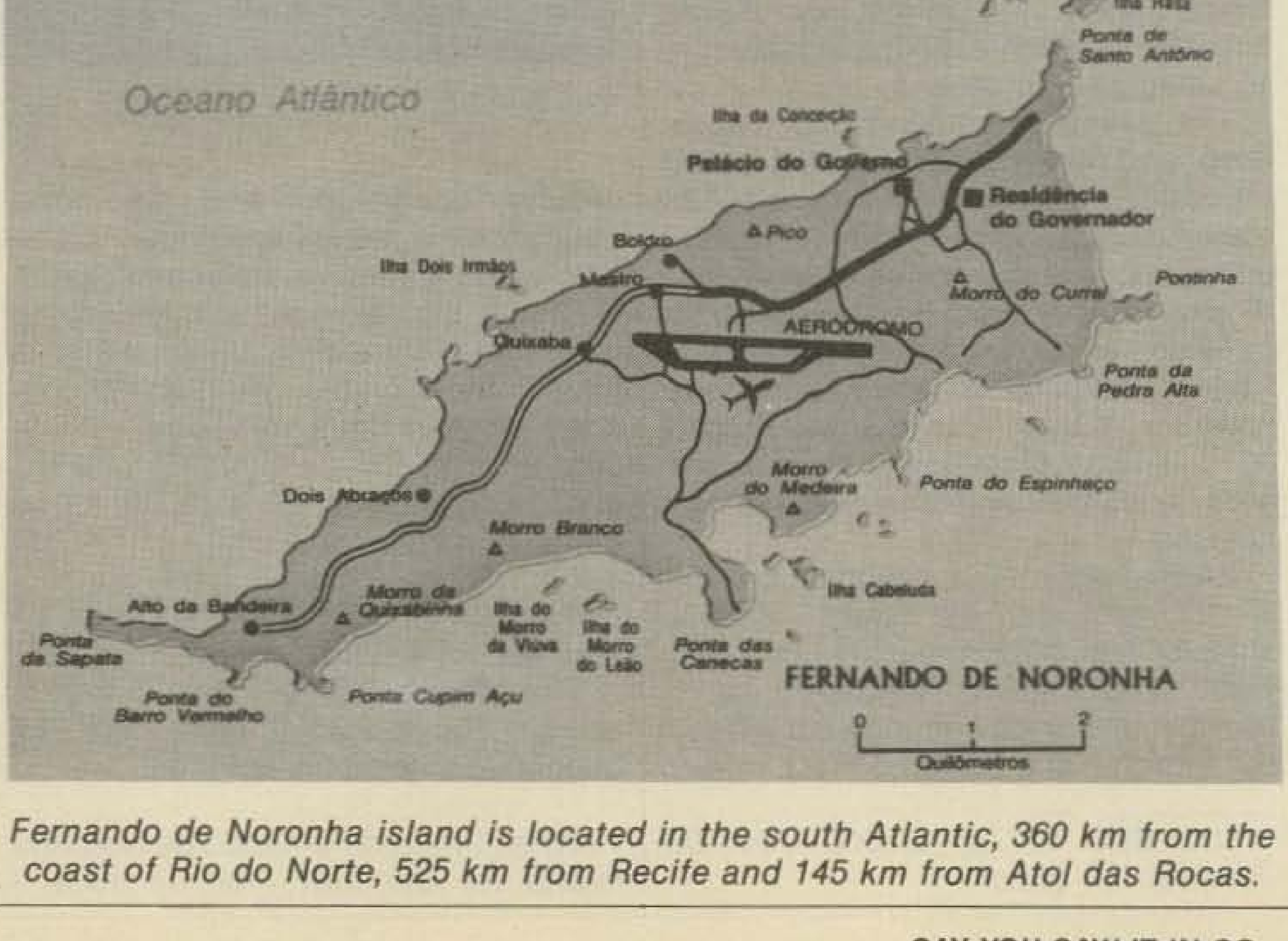
The trip from Recife to the island takes about one hour, with a short stop at the airport in Natal. TRANSBRAZIL Airlines has two flights weekly to the island, one on Saturday and the other on Sunday. On the airplane there were only tourists, other than ourselves. Almost everyone was holding a camera ready to take photos. Some of the people had taken harpoons, flippers and other fishing equipment, only thinking about how many sharks they would catch.

Finally we approached the island. The plane was flying so low that it seemed as if we were floating on the water. It circled the entire island, which allowed us to photograph from all angles. The landing was so slow that we touched down almost without having noticed it.

The island's airport is only a runway and a small waiting room. However, eleven years ago, when I was there for the first time, we had to stand in the sun or the rain, because there was only the runway.

The arrival of a TRANSBRAZIL Airlines plane always means a party day on the island. There were a lot of people at the airport. There are always relatives of the inhabitants of the island arriving or leaving. Some people go to the airport looking for a newspaper; others wait for a letter or, perhaps, a present sent by a relative who lives far away.

The airplane stays on the island only long enough for the landing and discharging and embarking of passengers and baggage. The plane then flies to Sao Paulo, with stops in Natal, Salvador and Rio de Janeiro.



Fernando de Noronha island is located in the south Atlantic, 360 km from the coast of Rio do Norte, 525 km from Recife and 145 km from Atol das Rocas.

The author operating PYØAPS.

Once we had gotten our baggage, we went straight to the house at which we were to stay during our DXpedition. The first surprise was already waiting for us. There was only a beam and a dipole for 160 meters. The dipoles for 40 and 80 meters had disappeared and we hadn't brought antennas for these bands.

As it was getting late (about 6 p.m.), we left this problem to solve the next day. We started making connections to put a station on the air as soon as possible. The linear amplifier, as we had foreseen, was in one corner of a bedroom and was covered with a lot of dust. It would be a miracle to see it in full operation. We made the necessary connections, and a few minutes later, on 20 meters s.s.b., I sent the first QRZ from PYØAPS. The first QSO was with my friend Fred, PY7ZZ, in Olinda City, practically next door. The first DX was HB9DX. The Dxpedition on Fernando de Noronha island had officially started. After one hour of operation, the linear amplifier burned out, and we then operated "barefoot" until the end of our stay.

The transmission conditions, mainly for 20 meters, were not the best. The next morning, we found some pieces of 40 and 80 meter antennas, but we only had enough parts to make one more 40 meter dipole. We decided that the second week we would change the 160 meter antenna into an 80 meter antenna.

Because of the proximity of the two stations, we could seldom keep them on the air at the same time. The splatter was very strong.

While Paulo was operating, I walked around the island taking photographs. Paulo spent his free time fishing.

On the fourth day of the DXpedition I was informed of the death of my grandmother. I had not been in touch with my family until then. Because of this, I decided to go back to Recife the next Saturday to stay with my parents and sisters for a few days.

Paulo stayed on the island another week, and as we had decided, he changed the 160 meter antenna into an 80 meter antenna. PYØMAG operated almost every night on this band. We could not make a single QSO on 6 meters. The band closed completely during the time we were on the island. PYØAPS stayed on the air about 58 hours. 4300 QSOs were made on 10, 15, 20, 40 and 160 meter bands.

PYØAPS has the first DXCC sent to a PYØ station, thanks to the QSOs made in the first two DXpeditions in 1967 and 1968.

Paulo, PYØMAG, operated c.w. only. Some QSOs on s.s.b. were only with Brazilian stations.

This time we worked about 150 countries, some of which were SV5, P29, CR9, 7X, 9J2, KC6, 5B4, C31, 9K2, A6, KL7, DU, 9V1, YB, HZ and OY. About 3700 c.w. QSOs were made by PYØMAG during two weeks of operation on all bands. In total, 8000 QSOs were made during this DXpedition.

The operators in this DXpedition would like to thank Colonel Gastao Baptista de Carvalo, Governor of Fernando de Noronha island, as well as the officers under his orders, especially Major Rolin and Captain Ivan, for thier kind hospitality, without which this DXpedition would not have taken place.

The First's

Station	Mode	28 MHZ	21 MHz	14 MHz	7 MHz	3.5 MHz	1.8 MHz
PYØAPS	SSB	DF2NJ	SK3AH	PY7ZZ	—	—	—
	CW	OH2OW	OH4EG	PY1ERG	UA1AFZ	—	J7DD
PYØMAG	CW	DF7YO	SP5AD	YO3RF	UK9AOW	OZ1CTK	PY1RO

CQ Reviews: The Heathkit SB104A 80 - 10 Meter S.S.B. Transceiver

BY HUGH R. PAUL*, W6POK

While the cost of most amateur radio equipment has been rising rapidly, Heathkit has moved in the opposite direction by announcing a reduction in the price of the SB104A 80-10 Meter s.s.b. transceiver and accessories. Lower cost coupled with changes in design to improve performance tend to make the SB104A a more attractive alternative to purchasing a factory built transceiver.

Heathkit has made a number of changes in the front end of the receiver and is now supplying that circuit board factory built and tested, thus reducing construction time and improving receiver sensitivity. The balance of the transceiver, including the accessory noise blanker, was constructed in just under 55 hours. Another 9 hours was spent aligning and debugging the transceiver. More about some of the problems encountered will be discussed later.

The receiver section of the SB104A is double conversion with a unique front end design. Individual band pass filters are diode switch selected for each band. Two separate circuits are employed to cover the entire 10 meter band.

From the bandpass filter the signal transformer is coupled to a balanced diode mixer, where it is heterodyned with an appropriate crystal controlled oscillator signal to produce the first intermediate frequency in the region of 8.65 MHz. A single transistor provides amplification of this first i.f. frequency prior to injection through a filter network into another balanced diode mixer where heterodyning with the v.f.o. signal (5 MHz region) produces the 3.395 MHz second i.f.

Conversion of the incoming signal prior to amplification contributes a great deal to the high level of immunity to overload and good inter-modulation

The Heathkit SB104A 80 through 10 meter s.s.b. tranceiver.

performance of the receiver. Heathkit does not state under what conditions they established their performance specifications for intermodulation distortion (−60 db) and I won't attempt to confuse you with a set of numbers in this evaluation. It is sufficient to say that inter-modulation performance is, with one exception, comparable to the better transceivers currently available.

The noise blanker was carefully adjusted for unity gain, as per Heathkit instructions. Signals that measured 9 or better on the S meter and located approximately 10 kHz from the receiver frequency produced IM distortion that was noticeable. Signals of greater magnitude or located closer to the receive frequency produced IM distortion that was severe enough, at times, to require turning the noise blanker off.

Adjusting the noise blanker for less than unity gain did improve the intermodulation distortion considerably. Performance of the blanker on impulse type noise is acceptable, but certainly not as good as one might expect.

Receiver sensitivity is excellent, with .5 micro volt producing a signal plus noise to noise ratio of 10 db or better on all bands.

Selectivity on s.s.b. is specified as 2.1 kHz minimum at the −6 db point and 5 kHz maximum at the −60 db point. On c.w. the optional filter reduces selectivity to 400 Hz at the −6 db point and 2 kHz maximum at the −60 db point. Either filter may be selected while in the c.w. mode. The 400 Hz filter is very effective on c.w. and does not display any tendency for ringing.

Audio output is rated at 2.5 watts into a 4 ohm speaker with less than 10% total harmonic distortion. The matching SB604 speaker and its large cabinet, capable of also holding the PS-1144 power supply, contribute to the fine audio quality of the transceiver.

Tuning of the receiver is smooth with negligible backlash, thanks to the two vernier drive assemblies connected in tandem. Heathkit found a splended solution to the sloppy tuning mechanisms used on their earlier transceivers.

Frequency readout is provided by three large display tubes with two digits each. While they are easy to read, even with high ambient light levels, I would prefer some color other

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Heathkit Specifications	**Measured Specifications**
Carrier Suppression: 50 db down from 100 watt single tone output at 1000 Hz reference.	−54 db
Unwanted Sideband Suppression: 55 db down from 100 watt single tone output at 1000 Hz reference	−59 db
Harmonic Radiation: 40 db below 100 watt output	−45 db or better
Spurious radiation: −40 db within +/− 4 MHz of carrier.	−43 db on 10 meters −50 db 80-15 meters
−60 db greater than +/− 4 MHz from carriers, except −50 db on 10 meters	−55 db on 10 meters −62 db or better 80-15 meters
Third Order Distortion: 24 db down from single tone of two tone test, referenced at 100 watts p.e.p.	−24 db, 80-10 meters

than red. The color of the display is achieved by placing a strip of red lucite in front of the display tubes. It should not be too difficult for Heathkit to provide a strip of similar material that is green or blue for those of us who find the color red irritating to the eyes.

The meter has two scales, one S units and the other numerically linear. By pushing the appropriate switch, the meter will indicate d.c. voltage, ALC level or relative power output. Other features include an r.f. gain control and fast, slow or no AGC. Features that are lacking on the SB104A are receiver incremental tuning, built in calibration oscillator and an analog dial for backup in case the digital display should fail.

I find the lack of an RIT control to be a real inconvenience and frankly cannot understand why Heathkit engineers did not include this vital function in their design. The calibration oscillator is not so important since the receiver does have a position for receiving WWV, to which the frequency readout can be calibrated.

Stability of the transceiver is excellent. Drift was measured for a period of five hours from a cold start. The frequency drifted 250 Hz during the first thirty minutes and another 150 Hz over the next four and one half hours.

A number of birdies (internally generated spurious) can be heard at various frequencies, but only at 3.65 MHz and 28.46 MHz were levels sufficiently high to inhibit reception of desired weak signals.

Transmitter operating features include a c.w. sidetone oscillator and front panel controlled VOX circuitry that performs with the best of them. VOX is functional on c.w. allowing semi-breakin operation.

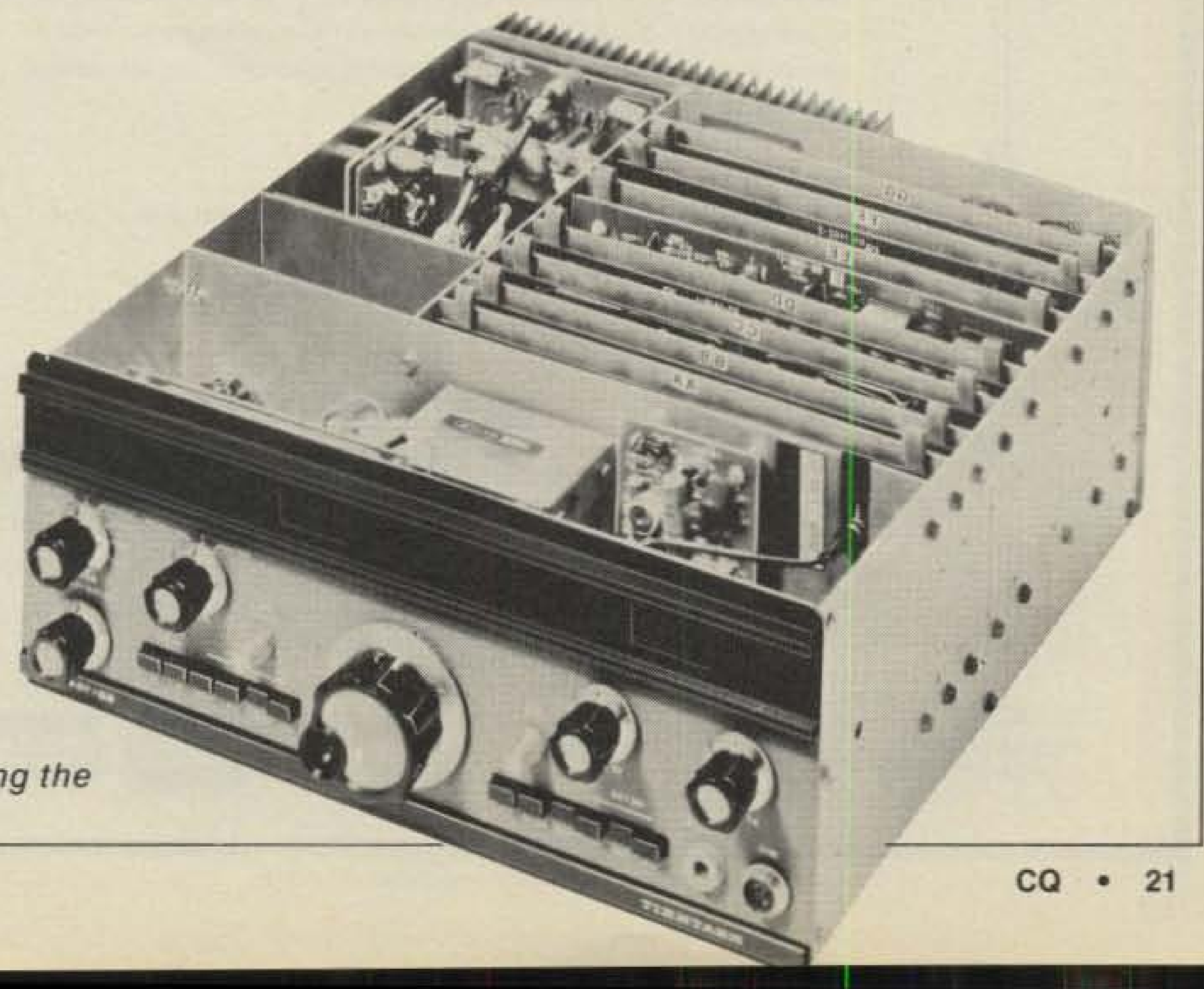
Circuit design of the transmitter section is fairly conventional with regard to single sideband generation and frequency mixing schemes. Balanced diode mixers and good bandpass filter design contribute greatly to the clean signal produced by the SB104A.

The driver amplifier consists of a pair of CD-3342 transistors operating in a push-pull configuration. The output from this amplifier then drives four 2N6456 transistors operating as push-pull pairs in parallel, to produce approximately 100 watts output. Hybrid combiners are used to split the drive power between pairs and to combine the outputs of the two power amplifier pairs.

The broadband characteristics of both the driver and power amplifier stages are better than most solid state units currently available. This is demonstrated by measuring the power output with the transmitter operating into a nonreactive dummy load. Spot checks were made across each band from 80 through 10 meters, in the c.w. mode. The lowest power out was 102 watts and the highest was 107 watts. As with all solid state broad band amplifiers, power will be reduced when operating into loads exhibiting reactance. Power output of the SB104A was reduced to 42 watts when operating into a load with an s.w.r. of 2:1.

Protection bias for the power amplifier transistors is provided by a diode, mounted in the heat sink. Bias increases as the temperature increases, thus preventing thermal runaway and ultimate destruction of the transistors.

The driver amplifier produces between 1 and 2 watts of power out. Provision has been made to bypass the output from this amplifier directly to the antenna through a band pass filter, by merely punching a button, thus allowing for QRP operation. Shortly after completing construction of the SB104A and turning on the primary power, it was discovered that the driver transistors were going into thermal runaway, without any drive being applied to them. Bias voltages were carefully checked and found to be correct. I then substituted some com-



Interior view of the SB104A transceiver showing the vertically mounted circuit boards.

ponents to increase the bias, but still could not stop the thermal runaway. The solution was to replace the transistors with another pair that had been more carefully matched for their operating characteristics. ALC functions extremely well in both high and low power modes.

While making spurious radiation measurements with a spectrum analyzer, it was discovered that some very high level spurious was present when operating in the s.s.b. mode on 15 meters. In the c.w. mode the spurs were not present. Knowing full well the requirement for adequate grounding of solid state rigs to prevent r.f. feedback, considerable effort was made to improve the ground connected to the SB104A. While the spurs were reduced in amplitude, as a result of these efforts, they were not eliminated.

Heathkit has utilized ferrite beads profusely throughout the rig to eliminate problems resulting from the introduction of r.f. at undesired locations. The problem was solved when it was discovered that the IC that functions as an audio amplifier for the microphone was going into oscillation as a result of r.f. on the microphone cable. The ferrite beads on the input of the IC were not enough protection. I then added .01 MFD disc capacitors between chassis ground and the push to talk pin and audio pin on the microphone socket.

Test measurements revealed that the SB104A transmitter met or exceeded all of the specifications claimed by Heathkit and are tabulated in the accompanying chart. It should be noted that the measured level of spurious radiation was achieved only with an adequate ground on the transceiver. Amateurs are cautioned to employ good grounding techniques with any of the solid state rigs to avoid r.f. feedback problems and the high levels of spurious radiation that can result.

The only other problems encountered with the transceiver were a faulty display tube and failure of the 15 meter crystal controlled h.f.o. to oscillate when the circuit board was plugged into the chassis connector. It functioned normally when mounted on the extender board. The problem was a change in circuit capacity created by the metal shields that separate the individual boards. Heathkit has changed some component values to eliminate this problem.

Operating the SB104A on the air has been a real pleasure. The ability to make wide frequency excursions or change bands without tuning a receiver pre-selector or transmitter final are features to which one soon becomes addicted.

The transceiver is a very complex piece of equipment. A total of fourteen circuit boards, upon which are mounted myriad components, make up the bulk of the rig. While Heathkit is noted for assistance in debugging errors committed during construction and insuring that you will eventully have a properly working transceiver, I do not recommend the SB104A as a "first time" construction project. The satisfaction of building it yourself, however, is something you can never experience by opening a box containing the latest factory built "Sooper Blooper" transceiver.

If you decide to purchase the transceiver, remember that the warranty is only good for ninety days from the purchase date on the invoice. Make sure you have sufficient spare time to complete construction prior to warranty expiration. After warranty expiration, Heathkit will repair individual circuit boards for a flat labor fee ranging from $5.00 to $15.00 depending on the board. Parts charges are extra. The flat rate labor charge also applies during warranty if service is required due to causes other than defective parts. For more information contact the Heath Company, Benton Harbor, Michigan 49022.

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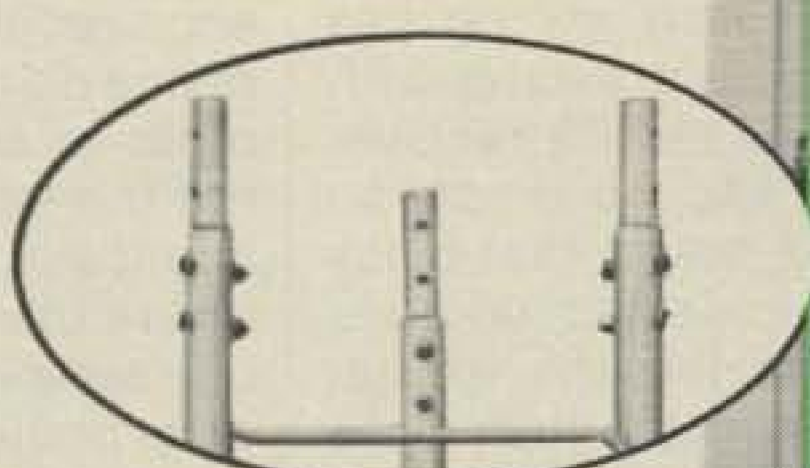

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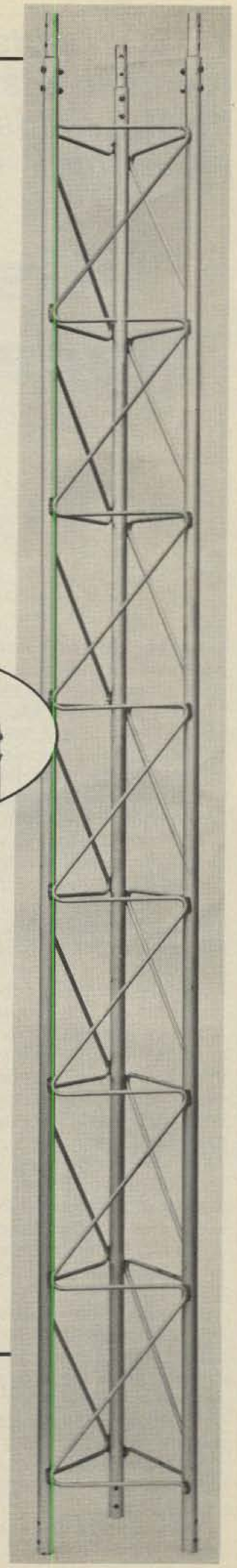

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W5SQW puts a Heath HW101 and a Drake 2B together in an interesting combination. Several helpful mods to the HW101 are also offered to help make this a very neat station.

Using The Drake 2B Receiver With The Heath HW101

BY CHARLES R. COX*, W5SQW

For several years now my rig has consisted of an obsolete exciter with no ALC circuits, a Drake 2B receiver which I swear *by* and never *at*, an SB220 Heath Linear, and a first class antenna tuner. I decided to upgrade my station by replacing the exciter with a newer one having a first class ALC circuit to work with the linear.

An investigation showed that most of the transceivers on the market are smaller than my old exciter so why not use a transciever as an exciter? What would be the advantages? I certainly would like to be able to transceive during contests. I am net control for a Novice/Technician Training Net and off frequency checkins with beginners is common. A transceiver with a simultaneous receiver would sure be nice in this situation. When operating DX on 40 meter phone using my Phased Verticals (*CQ* April 1972 page 30) I could monitor my frequency while tuning the 7.100- 7.000 MHz band for DX phone stations. Armed Forces Day would be a snap with simultaneous receivers. When a Houston group decided to put a repeater on ten meters I was sold on the idea. What transceiver should I select?

We dug out the Drake 2B instruction book and found that for the amateur bands, the 2B has crystal oscillators running on 11 MHz, 40 meters, 18 MHz, 20 meters; 24.5 MHz, ten meter c.w.; 25 MHz, 15 meters; and 25.6 MHz, ten meters.

This is important because care must be taken when running two simultaneous receivers so that the oscillators of one do not fall in the i.f. bands of the other or so that one's oscillators are not the same as the other's. Also harmonics of one should not fall in the i.f. of the other. If care is not taken here, one receiver will desensitize the other or a birdie will always be present in one or the other receiver.

The v.f.o. of the Drake 2B runs between 3.955 and 4.555 MHz. The first i.f. of the 2B is 3.5 to 4.1 MHz tunable and the second i.f. is at 455 kHz. Another oscillator runs at 405 kHz and the third i.f. is then 50 kHz.

Because I already have the Heath SB220 and because of economics, I decided to check the Heath HW101 specifications. The overall specs looked like a suitable rig. The carrier oscillator runs on 3.395 MHz. The v.f.o. runs between 5.0 and 5.5 MHz.

The Heterodyne oscillator frequencies for the HW101 are 12.395 MHz for 80 meters, 15.895 for 40 meters, 22.895 MHz for 20 meters, 29.895 MHz for 21.3 MHz, 36.895 MHz for ten meter c.w., 37.395, 37.895, 38.395 MHz for the other ten meter ranges. The first i.f. pass band is 8.395 to 8.895 MHz and the second i.f. frequency is 3.395 MHz. It is obvious then that no interaction should take place between a Drake 2B and a Heath HW101, and so I got one.

Initial alignment was attempted and drive was a little low on ten meters and on forty meters. I called a Novice friend and he said he had the same problem plus he was replacing the crystal in the 100 kHz calibrator oscillator for the second time.

The neutralization per the manual was easy (as it is done on 80 meters) but proved very difficult thru ten meters using handbook methods. A preliminary TVI check showed bad TVI on Channel 2 and Channel 39. Anyone can have a little TVI on Channel 2, but TVI on Channel 39 in utterly ridiculous.

The next step was to read the Heath Manual (*when all else fails, read the manual—ed*) including circuit descriptions. The Heath Manual warns, Do not run the crystal calibrator in the transmit position as this can cause transmitter outputs removed 100 kHz from the fundamental frequency. I decided to take a hard look at the HW101 drive circuit and the HW101 crystal calibrator circuit. A check showed them to be tied together with no isolation in the transmit mode. The crystal in the calibrator is *not* protected or isolated from the driver r.f. power in the transmit mode. Also the 8.5 MHz trap circuit, which is to protect the receiver i.f. from an 8.5 MHz commercial signal, is connected across the drive circuit in the transmit position, and due to its low "Q" takes drive power at 7 MHz and in conjunction with stray capacitance from the calibrator, takes power at some higher frequencies. The diode in the calibrator circuit causes TVI as any diode in an r.f. circuit produces harmonics.

By now you may have lost faith in Heath but remember the basic HW101 design is very good. The Heath ALC circuit is very good; the SB220 never had any problems so the solutions proved very simple.

The HW101 transmit receive relay has two S.P.D.T. contacts which are not used (This is "RL1" located in the

*11002 Montverde Lane, Houston, Texas 77099

final r.f. section). It was decided to use these contacts to (1) Isolate the crystal calibrator (in the transmit mode) from the drive circuit.
(2) Isolate the i.f. trap from the drive circuit in the transmit mode.
(3) Furnish an antenna input to the Drake 2B in the receive mode, also "RL1" should mute the Drake 2B in the transmit mode, and grounding the Drake 2B antenna input in the transmit position should protect its preselector from high power burn out in transmit mode.

The relay was rewired as follows using the extra coaxial cable supplied with the kit. All contacts are shown in the shelf, deenergized, receive position. See fig. 1.

A radiation leak test of the HW101 showed it to leak slightly at the front and very severely at the rear. The top and bottom of the HW101 are not fastened to the front in any way. There are six screws thru the top shield at the rear but they go into nylon inserts making nice little capacitors with no ground connection. The entire top and bottom "shield" covers are only connected to the chassis thru the four feet. I called Heath about this and they suggested I make an r.f. gasket out of coaxial cable shield braid and they supplied me with metal inserts to replace the nylon. Sanding away the paint and installing the r.f. gaskets stopped the leaks. The technician told me that they were experimenting with various values of R202, 10k at the grid of the transmitter mixer but that some values as low as 100 ohms may cause the ALC circuit to be unable to limit on voice peaks. I found that lower values of R202 drastically increase the drive especially on 10 meters making maximum output easy to obtain across the entire band. I am using a 5000 ohm resistor for R202 now.

I wondered what would happen if both receivers feed the same speaker. (If you try this be prepared to replace an audio transformer as reverse power from one receiver will burn the primary out of the other's audio transformer.) The experiment was set up for c.w. reception of a 40 meter signal. The HW101 receives c.w. in upper sideband mode; the Drake 2B, which has a tunable pass band and selectable sideband, was set up to receive in lower sideband mode. The same station was tuned to the same pitch by both receivers one in l.s.b., one in u.s.b. Since each receiver delivers ½ the power, the audio of both is turned down, the interference drops way down since all interference is at only half power, but the wanted signal is at full power. (Power functions follow the square law.)

Now one receiver is tuned so that a

slight tone difference exists in the wanted signal. Mixing takes place at the speaker, the fundamental tones are present, also sum and difference frequencies as well as secondary sum and difference frequencies, and the results are startling. It sounds like m.c.w. Those of you who have heard m.c.w. know what I am discussing. It would be possible to add audio filters and have single signal selectivity on c.w. I am now using two speakers to do the mixing mechanically and to avoid reverse power audio burn out. It would be possible to have this type detection in a single receiver by having heterodyne oscillators to bring the other sideband pass to the audio stage.

The HW101 must be completely re-aligned after making these changes. The neutralization changes because the 6146 grid circuit no longer runs all over the transceiver, to the calibrator etc. The calibrator can be run in the transmit mode since it is isolated in the transmit mode. The 40 meter drive improves since the 8.5 MHz trap is no longer in the circuit on transmit.

After realignment is completed another TVI check is made. Channel 2 TVI is far down but Channel 39 is bad. Time to examine shielding and physical construction. The drive preselector shaft runs the the HW101. It sticks into the r.f. final shield cage in an insulated bushing, drives the preselector capacitor thru rubber pulleys and is not grounded. Its length is nearly resonant on Channel 39. Soldering a shielded braid from a coax cable from this shaft to ground completely eliminates u.h.f. TVI and helps TVI in general.

The Drake 2B was connected at this point and it was determined that neither receiver being on the line caused any problems with the other receiver; the crystal calibrator of either can be heard the same strength in the other. Both can be calibrated directly against WWV at 15 MHz by turning the Drake 2B band selector to 40 meters, preselector to ten, and log dial to zero.

The Drake 2B works well with the HW101 and no desensitivity was noticed in either receiver when the other was connected. There is not interaction between receivers even though both are connected to the same antenna input.

At this point I added a Drake low pass filter at the exciter output, another Drake low pass filter at the linear output and a good ground to antenna tuner, exciter, and linear. Running 2000 watts p.e.p. on 29.725 MHz with a portable TV tuned to Channel 2 sitting on top of the antenna tuner produces *no* TVI in either audio or pictures. The portable has a pull up whip antenna with a Drake 300-HP-R high pass filter and a Radio Shack line filter where it is plugged into the same outlet as the exciter. The picture does not dip and there is no effect on any channel.

Anti trip and Mute proved no problem at all. "Spot" is easy by turning the mike c.w. level down and keying in c.w. or pushing the mike switch in s.s.b. A check showed this does *not* cause a "swish" on the air.

All in all its been a good combination and fun to use. The experience provided an opportunity to tinker, experiment and learn... one of the mainstays of amateur radio.

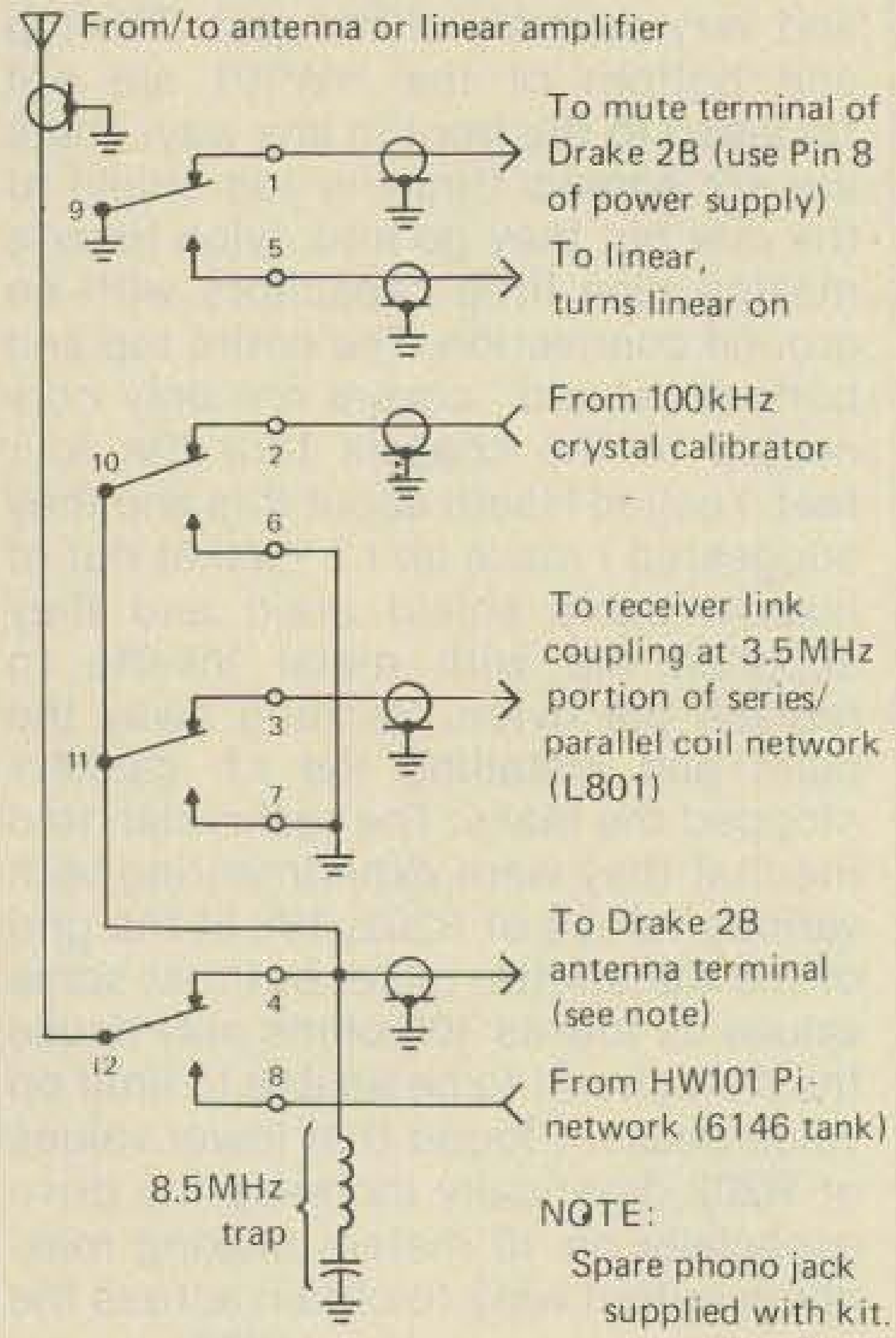


Fig. 1- The HW101 relay modifications. Note that the contacts are shown in the deenergized state. Make all connections extremely short and use a similar type coax as supplied with the unit.

We conclude Homer Davidson's educational two-part article.

12 Steps in Transistor Replacement

Part II

BY HOMER L. DAVIDSON*

Step Number 7 - Testing the Transistor

After the suspected transistor has been removed, check it for open and leakage conditions. An open transistor will have no *beta* reading. A leaky transistor may have a high leakage or a shorted condition. One rule to follow with audio output transistors, if the leakage reading is equal to the *beta* reading, is to discard it. If in doubt about the leakage condition, check the reading with a good transistor (Photo 7).

The defective transistor may be checked for leakage with an ohmmeter. Check the resistance from collector to base with the negative terminal of the ohmmeter at the collector terminal. A normal small r.f., i.f. or a.f. transistor may have a reading above 900 ohms. Large audio or output transistors may have a reading around 500 ohms. Now take a reading between the collector and emitter terminals. On all transistors, you should have no reading between the terminals. Any lower reading between these terminals may indicate a leaky transistor. If in doubt, compare with a new known transistor.

When connected to the transistor tester, you may find the intermittent transistor will "pop on." If the transistor is suspected of being intermittent, leave it connected to the tester and spray it with cold spray. It may go open after several applications. Flat type transistors have a tendency to go open, intermittently. Sometimes, by just moving the emitter terminal, it will go open. Don't take a chance, replace it.

2821 5th Avenue S., Fort Dodge IA 50501

Step Number 8 - Identification

The defective transistor may be identified from the manufacturer's literature or upon the schematic diagram. If the schematic is not available, check for stamped numbers upon the body of a transistor (Photo 8). Here, we find a defective audio output transistor with the markings of C1449. Actually, this is a 2SC1449 type. There's not enough room upon the transistor body to stamp out the complete number. Another example is, a D327 number is actually 2SD327 transistor.

How do you find out what type the defective transistor is? First, try to secure a schematic from the manufacturer or a local service shop. In many cases a similar schematic has the same transistor lineup. If not obtainable, and this occurs in many Japanese models, try to determine if its an NPN or PNP type. When the collector voltage is positive the transistor is an NPN type. Likewise, with a negative collector voltage, the transistor is a PNP type. Next, determine what stage the transistor operates in and select a comparable transistor in another schematic. The three main

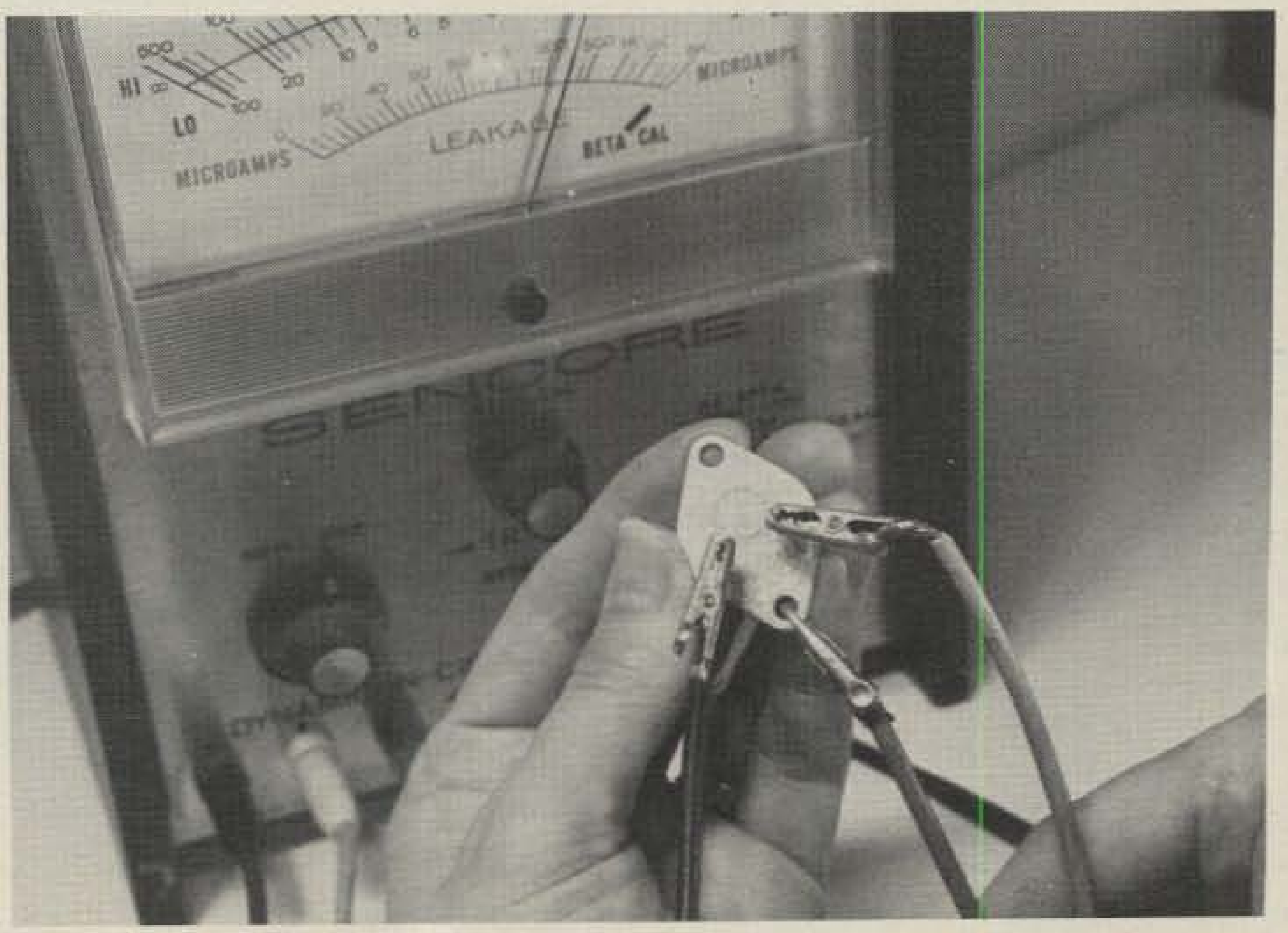


Photo 7 - Test the suspected transistor of the circuit for open and leaky conditions. Double check the test leads to be on the correct transistor terminals.

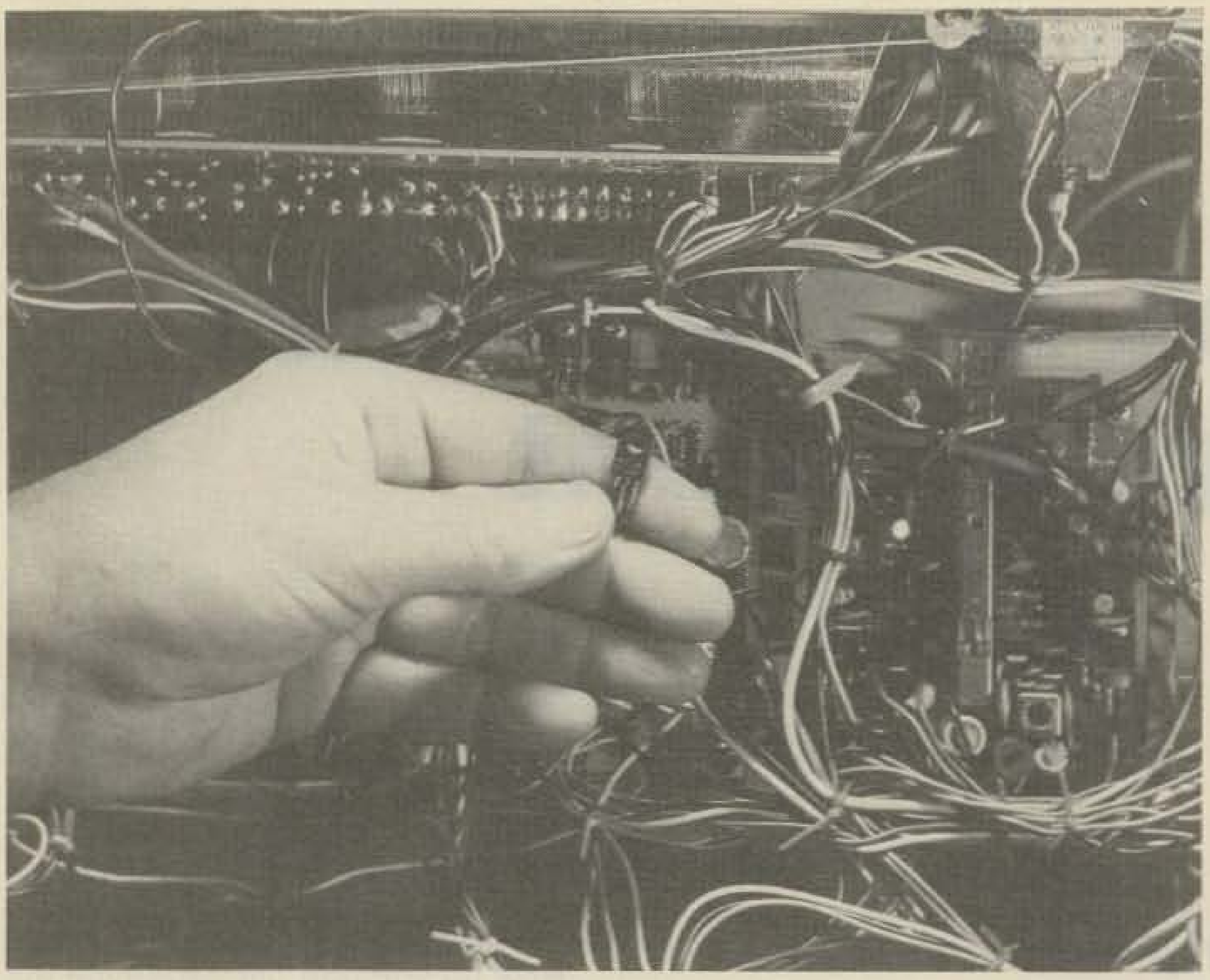


Photo 8 - You may identify the defective transistor with the numbers marked upon the body of the transistor. Here we find C1449, which is actually a 25C1449 transistor.

things to remember are *voltage, current* and *operation frequency.* For instance, in the audio output stage you must choose an audio transistor with enough operating collector voltage and wattage. If not, the replaced transistor may overheat and become damaged.

Step Number 9 · Selecting the Replacement

Always replace the suspected transistor with the original part number. If possible, obtain one from the manufacturer or parts jobber. Today, there are regular Japanese jobbers advertising in many electronics magazines who supply original Japanese transistors. Not only will the original transistor mount correctly, but function as so designed.

When the original replacement is not available, universal transistor replacement will do the job in most consumer electronic products. You may select universal replacement from RCA, GE, Sylvania, Workman, and many others. Simply look up the defective transistor part number in the universal replacement guide (Photo 9).

Most universal transistors have the terminal connections labeled upon the plastic package. You may find the collector operating voltage current rating and operation frequency upon the packaged transistor. In some cases you may have to bend certain terminals in opposite directions to fit in the required mounting holes.

Step Number 10 · Testing and Preparing the New Replacement

Before installing the new replacement, check it in the transistor tester. It's possible the new replacement may be defective. If the chassis doesn't perform after installing, at least you know the transistor was installed wrong or there are problems other than the transistor. Sometimes, the new transistor may be ruined with burned or incorrect tolerance of resistors and bias diodes.

So, while defective transistor is out of the circuit check each bias resistor for correct resistance. If a bias diode is in the circuit, remove one end and check for leakage or open conditions. In audio circuits, always test the driver transistor when both audio output transistors are damaged in a d.c. coupled circuitry. It's possible a leaky or open driver transistor may inject improper bias upon the output transistor and damage the new one.

Now, form the terminal leads to fit in the correct holes upon the p.c. board. Double check before the terminal wires are soldered in place. You may find in some universal replacement transistors the center terminal may be the collector lead, while in others the base terminal. Re-align the new replacement terminals with the aid of terminal markings upon the p.c. board and universal transistor package. In some universal replacement transistors the metal body may be connected to the collector terminals. So be careful. The collector should be insulated away from grounded heat sink.

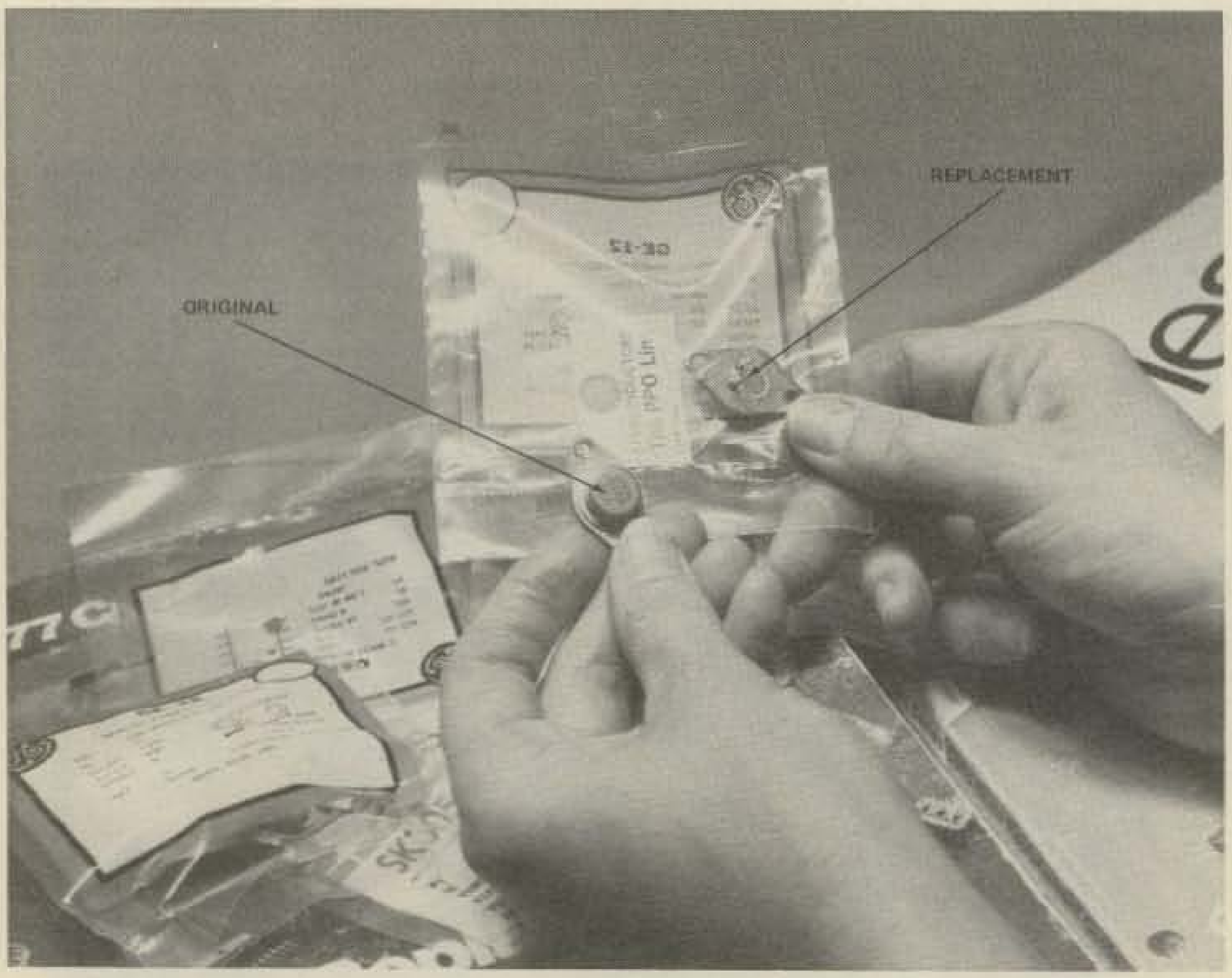


Photo 9 - When the original transistor is not available, most transistors can be replaced with a universal replacement. Check the original numbers within the universal transistor replacement guide.

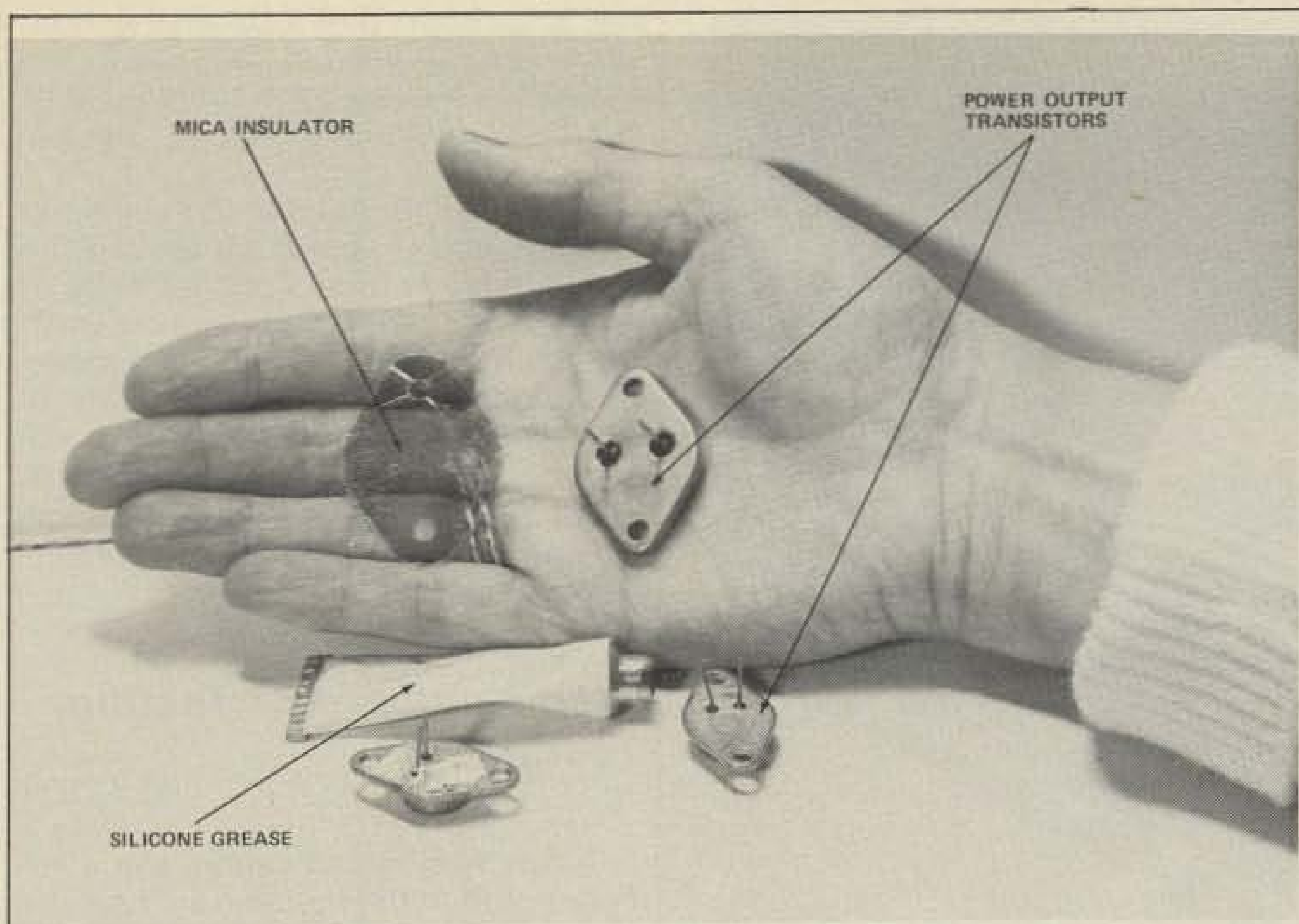


Photo 10 - Always apply silicone grease to the transistor before mounting to the heat sink. In large audio or horizontal output transistors replacement, apply silicone grease to both sides of the piece of insulation.

When installing audio transistors, check for a mica or plastic insulation between transistor and heat sink. Place silicone grease on both sides of the insulator before mounting the transistor (Photo 10). Do not tighten the transistor screws too tightly to damage the insulator. Replace the heat sink upon all small transistors even if the heat sink is not secured to the metal chassis. It's surprising how much heat is transferred from the transistor and may prevent damage of the new replacement.

Step Number 11 - Installing The Replacement

Now with correct leads lined up, insert the transistor leads through the

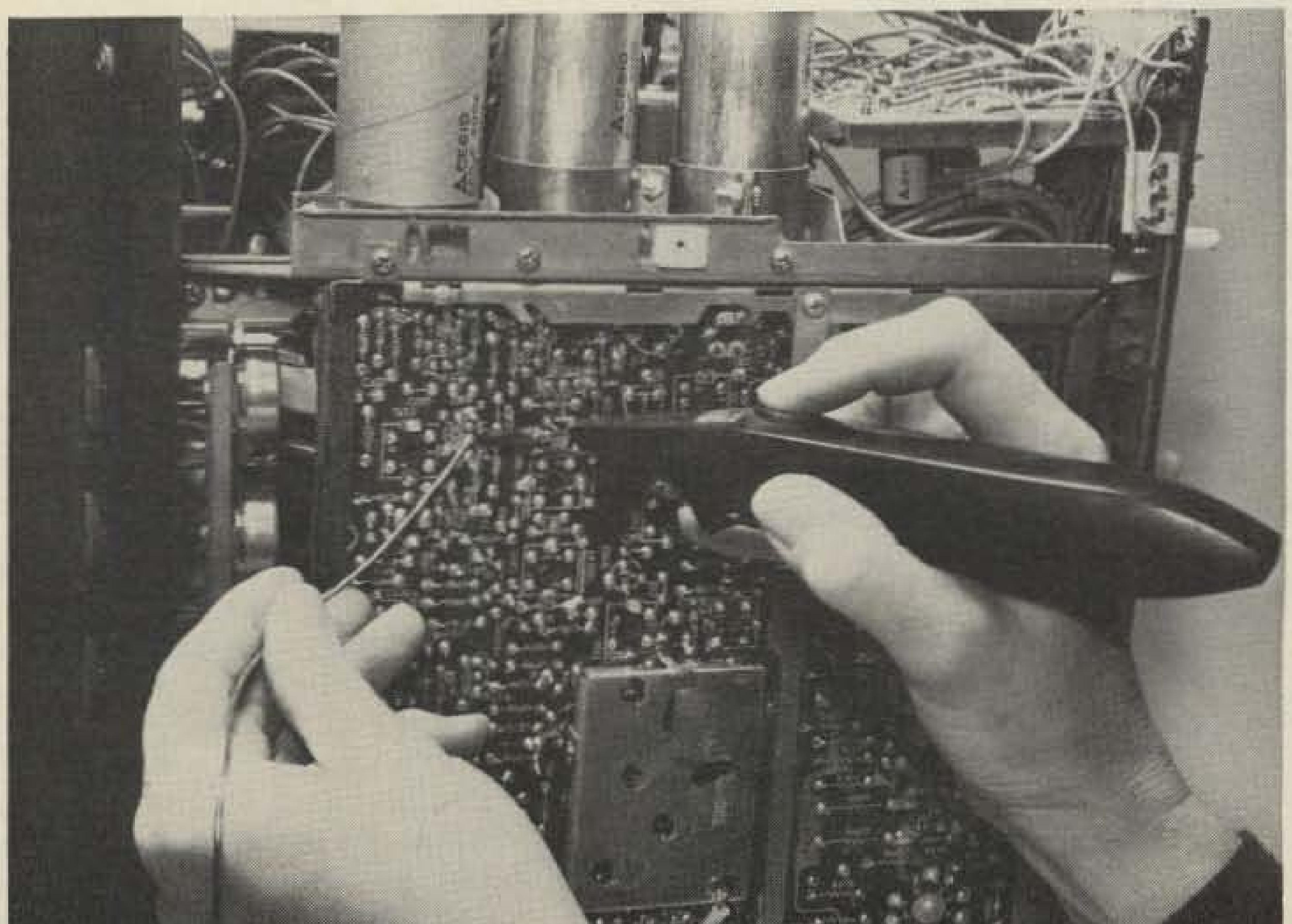


Photo 11 - Always use a small soldering iron when replacing any transistor. A battery cordless type is ideal to make good clean soldered connections.

Photo 12 - After the transistor is installed and connections all cleaned, hook up the unit and test it out. Make sure no extra pieces of solder or tools lay under the exposed wiring of the chassis.

p.c. holes. Before soldering up, check again for terminals in the right spot. Use a low wattage soldering iron so as not to destroy the new transistor. A battery-cordless iron is excellent for installing transistors (Photo 11). Where a large amount of heat is needed to make a good soldering joint, use the long nose pliers upon the transistor lead to prevent damage to the transistor. Make a good soldered joint but don't leave the iron tip on too long.

After the transistor connections are soldered in, clean up around the terminal leads. Use a pocket knife or small screw driver blade and clean off the rosin material around the connections. Sometimes small particles of solder may be left intact and will short out against the p.c. wiring. A small stiff wire brush helps to brush off and clean up the soldered connections.

Step Number 12 - Testing, Testing

After checking all cables and wires connected to the unit, we are ready to test the unit out (Photo 12). In audio products keep the volume control at a minimum so as not to damage the speakers or output transistors with a big rush of volume. Turn the switch on — it's always a big thrill when something functions as it should.

Before leaving the chassis, make a voltage test and see if it compares to the schematic, especially audio output transistors, or feel the transistor and see if it's overheating. If the replacement gets warm at once, you have either the wrong transistor installed or a bias problem. Take voltage and resistance measurements when the unit will not perform.

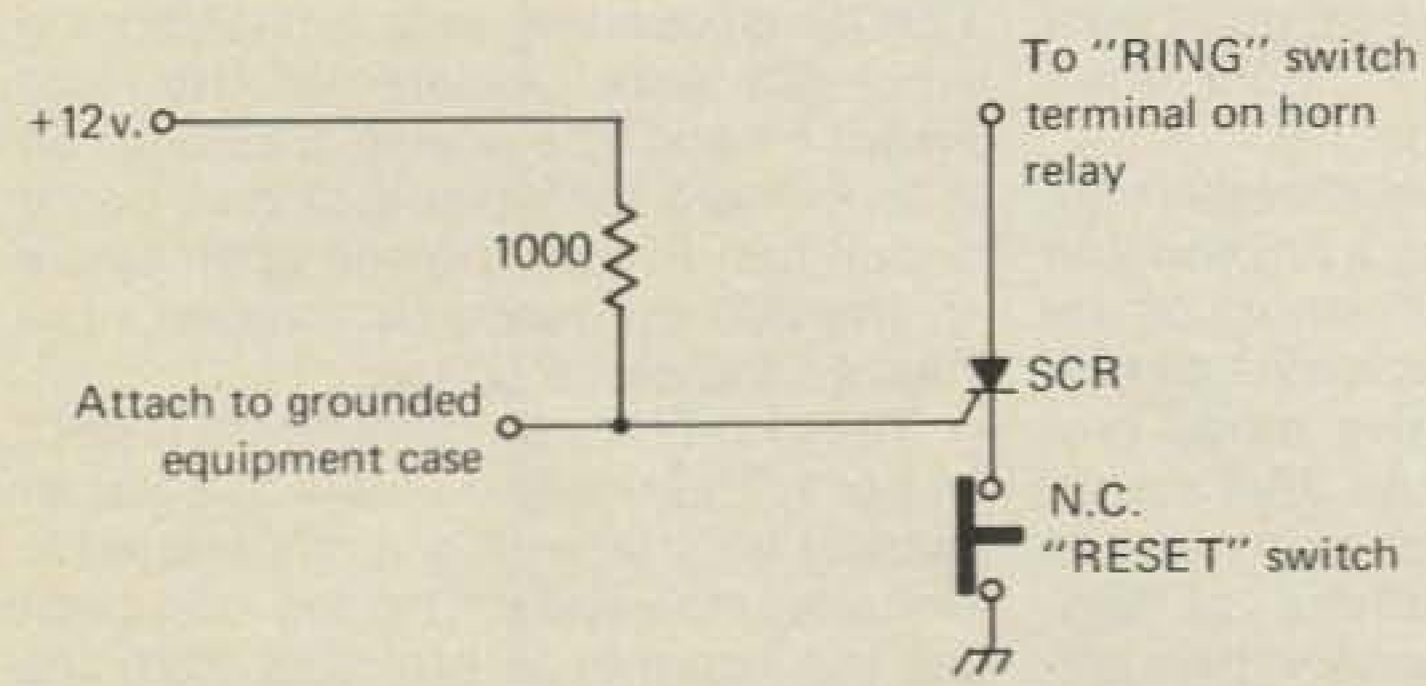
Here are a few do's and don'ts:

1. Do try to obtain the original replacement.
2. Do be careful not to disturb or destroy components around the replacement.
3. Don't leave the soldering iron on the connection too long.
4. Don't use a large soldering iron when soldering the terminals.
5. Don't mount the transistors under the chassis, just because it's much easier. Always replace them in the original position.
6. Don't forget to check and double check for the transistor terminals in the right p.c. holes.
7. Don't make poor sloppy connections - be proud of your work.
8. Don't be discouraged if the replacement doesn't function as planned — try, try again.

CRANIUM QUERIES

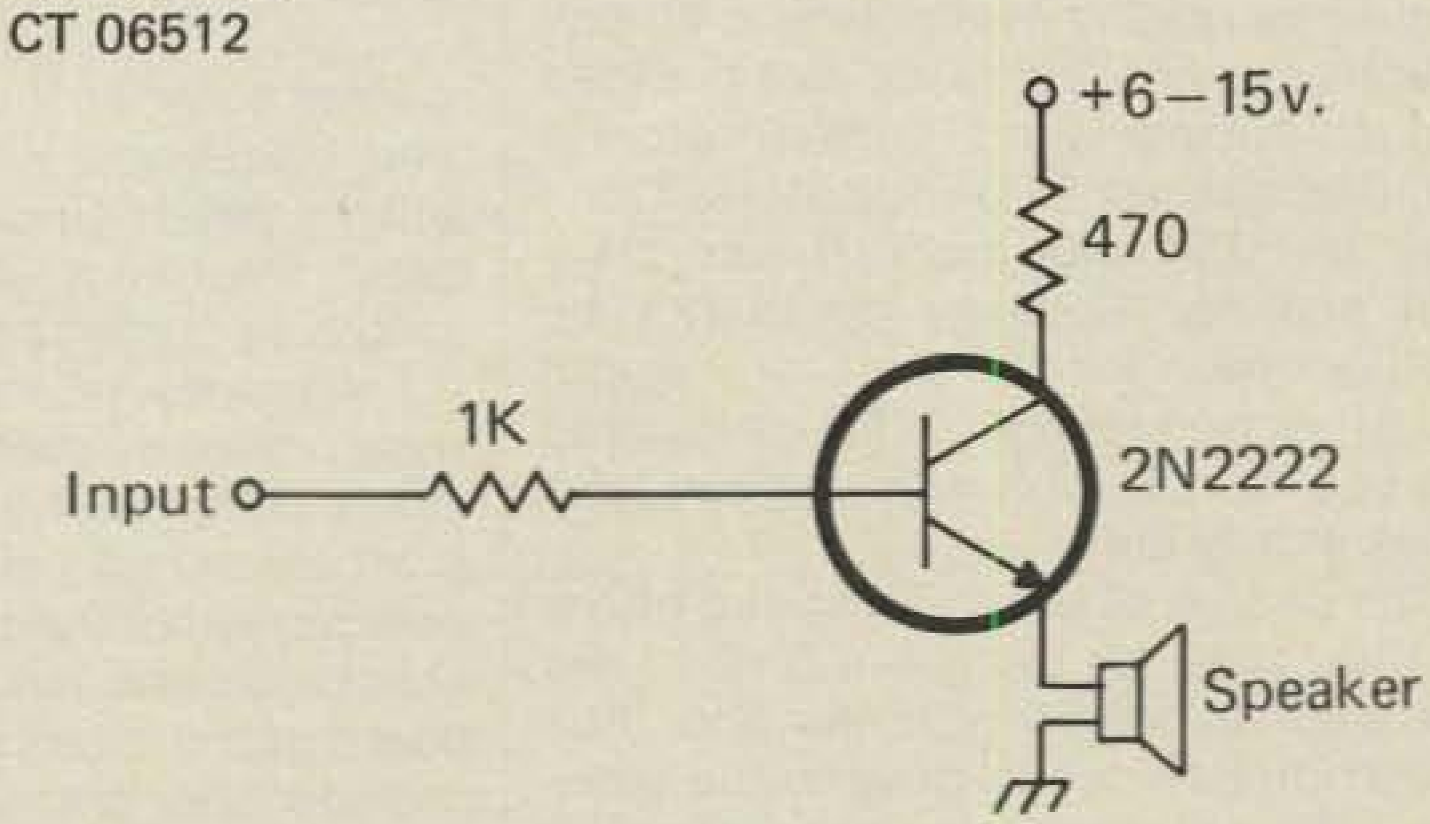
" FIND THE ERROR"

BY MARTIN BRADLEY WEINSTEIN, WB8LBV
130 Coe Avenue, Apt. 73
East Haven, CT 06512



Here's What Was Wrong

The "Ring" switch terminal on a horn relay pulls the relay in when connected to ground; our circuit connected it to + 12. This change gets the watchdog howling.



What's Wrong?

It's a simple enough circuit. This Utility Speaker and Driver might be used at the output of a 555 sidetone oscillator, for example. But it doesn't work the way it should. Why not?

No -31-32

Here's a great idea to add another dimension to your Wilson WE-800. It's also a good one evening project.

A Five Dollar Scanner For The Wilson WE-800

BY BUZZ GORSKY*, K8BG

I purchased Wilson's portable synthesized rig with an eye toward travel and have found it to provide good service on many types of vacations including travel by plane, car, and on foot. However, the family budget requires that more time be spent at home than on vacation. At home I like to monitor the two two meter machines operated by LEARA (Lake Erie ARA) and 146.52 simplex. Switching from one to the other with the rotary switches is clearly inconvenient, but even when frequencies are programmed into the diode board provided by Wilson, there is still the chance of being on the wrong frequency at the wrong time. It was obvious that a scanner would be a nice addition to the rig.

I decided to limit the project in various ways. Since the rig does travel quite a bit, the entire addition should be contained in the case, and since the rig is often used on its nicad supply, current requirements should be kept to a minimum. Finally, parts should be readily available and cheap. Therefore a CMOS device was planned and to further limit current drain I decided against LED indicators. Once that decision was made it was clear that scanner function could not be readily monitored, and it would therefore be unwise to transmit using the scanner. Thus it was devised as a receive only unit.

The choice of scanning speed offers another area for decision. Since I did not wish to drill any holes and thus bring out a switch to disable the scanner, I did not want it to get locked up on a single busy frequency. So, I chose to have a relatively slow scan rate, of about 5 seconds per channel with no system to hold the scan on an occupied frequency. I felt that this would suit my needs since it would point up a busy frequency and I could then switch to it for operation.

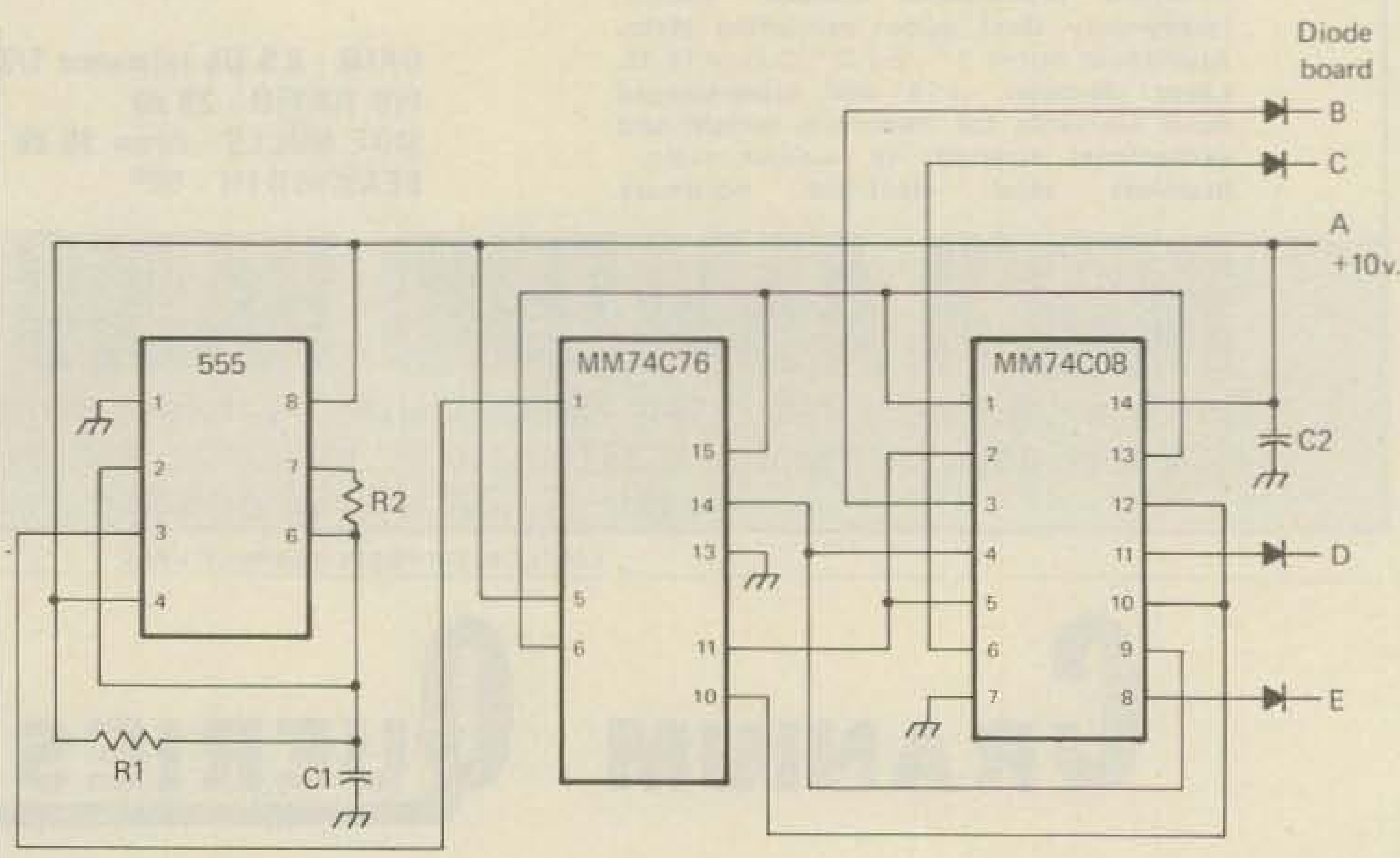


Fig. 1 - Circuit diagram for the five dollar scanner. The scanner is built on a 2 X 1 3/4 inch piece of perf board.

R1-150K	*Diodes - 1N914 or similar (Radio Shack 276-1620)*
R2-15K	*555 Timer (Radio Shack 276-1723)*
C1-47mf	*MM74C76 dual JK flip-flop (Radio Shack 276-2312)*
C2-0.01	*MM74CO8 Quad 2-input AND gate (Radio Shack 276-2305)*

Frequency selection in the 800 is accomplished by switching a ten volt line to the BCD (1,2,4,8 code) inputs of the synthesizer. A siz position switch selects either one of five diode programmed frequencies on the matrix board or the rotary switches in order to provide the correct pattern of synthesizer inputs. For tertiary frequencies ten volts is provided to one of two inputs to code either +0 or +5 khz. I programmed four frequencies on the diode matrix board anc planned to use the fifth position for scanning.

The concept for the scanner logic came after persuing many of the articles devoted to scanners for the IC22-S, consulting Don Lancaster's *CMOS Cookbook,* and checking on what ICs were available at the local Radio Shack. The scaner was built on a 2 × 1 3/4 inch piece of perf board which just fit into the one open space in the 800 conveniently located right next to the diode board.

The circuit for the scanner is shown in fig. 1. The design is quite simple, requiring only three ICs and a few additional components. The ten volt input for the scanner is provided from the unused diode position and the outputs are connected to the other four positions. The 555 provides the clock for scanning function. The values for R1 and C1 control the scanner rate. As I mentoned above, the values shown will provide a very slow scanner rate.

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The clock then drives one of the two JK flip-flops in the 74C76 dual chip. The Q output of that flip-flop drives the second flip-flop which will thus switch at half the rate of the first. The states for Q1, Q1, Q2, Q2 are shown in Table 1. These four outputs are then fed to the inputs of four AND gates in the 74C08 chip. The patterns for the inputs are shown in Table 2. The inputs provide four distinct states, each of which results in a high output from each of the AND gates. These outputs are then connected via diodes to the four channels on the diode board. The output diodes serve to isolate the ICs from voltage supplied when any one of the diode frequencies is selected from the front panel switch on the 800.

TABLE 1
FLIP-FLOP OUTPUT

PIN	STATE			
15	1	0	1	0
14	0	1	0	1
10	1	1	0	0
11	0	0	1	1

Construction is not critical and there are few components to mount. The 0.01 capacitor is essential since something on the 10 volt line from the Wilson makes the logic go wild if that capacitor is not in place. Of course the usual precautions are required when handling the CMOS ICs. In fact the scanner is much easier to build than the diode board is.

There are certainly many features not included in this simple scanner design. But for a simple project costing only a few dollars, including diodes for programming, it does provide a useful addition to this synthesized rig. Further no irreparable modification to the 800 is required.

If you do want to have the scanner stop when a signal is encountered this can be easily arranged. You need add a single op-amp. The amp can be powered from the same line powering the other ICs. The output of the amp goes to pin 4 of the 555, instead of the 10 volt line. The + input of the amp is connected to a line from the 800's squelch circuit. Since Wilson does not provide a component layout diagram, you have to hunt for a place in the squelch circuit which has about +0.7 v when no signal is present and essentially zero volts when unsquelched. The − input of the amp is biased to about +0.3 volts and the amp will keep the 555 running until a signal is acquired then the 555 is shut down until the signal is lost. If you make this modification you will probably want to change the 555 cycling rate. In either configuration though, this simple scanner will add to the enjoyment of the 800. CQ

TABLE 2
AND GATE INPUTS

Gate 1	Pin 14, 11
Gate 2	Pin 15, 11
Gate 3	Pin 14, 10
Gate 4	Pin 15, 10

K3WBH gives us another approach to designing v.h.f. and u.h.f. arrays using techniques developed for the low bands.

Using Lower Frequency Antenna Techniques At V.H.F. And U.H.F.

BY T.E. WHITE*, K3WBH

One thing usually overlooked by the v.h.f. amateur in choosing antenna types is what is called the "wavelength factor." The amount of signal voltage in a radiating or receiving element, be it wire or tubing, is directly proportional to its physical length. And, presuming delivery of signal via the feed line, the larger (longer) the antenna the higher the voltage at the receiver terminals ("if you can't hear 'em you can't work 'em.")

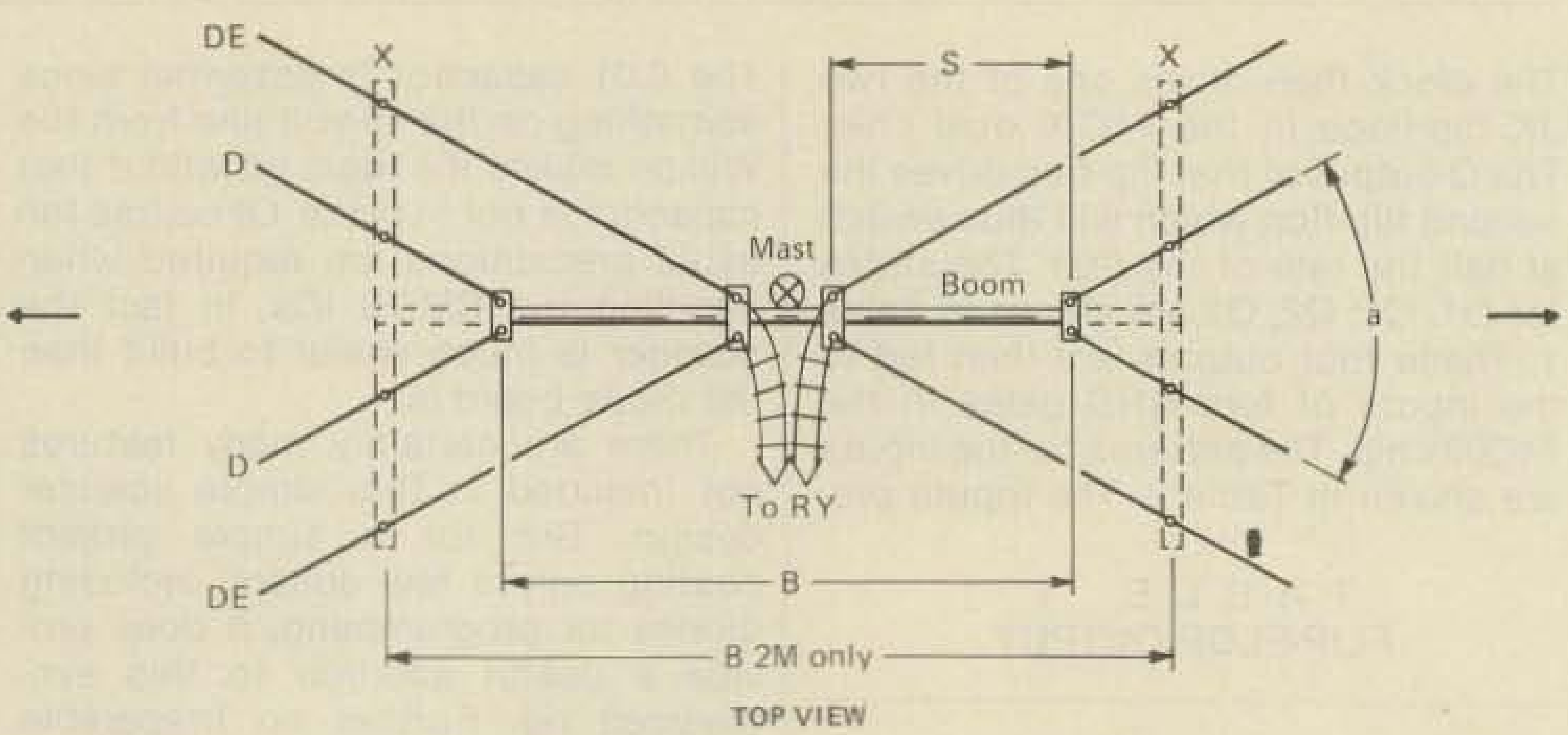
Therefore there is no reason not to use the so-called "long wire" family of antennas well into v.-u.h.f. Here are some examples, ranging from simple to not so simple.

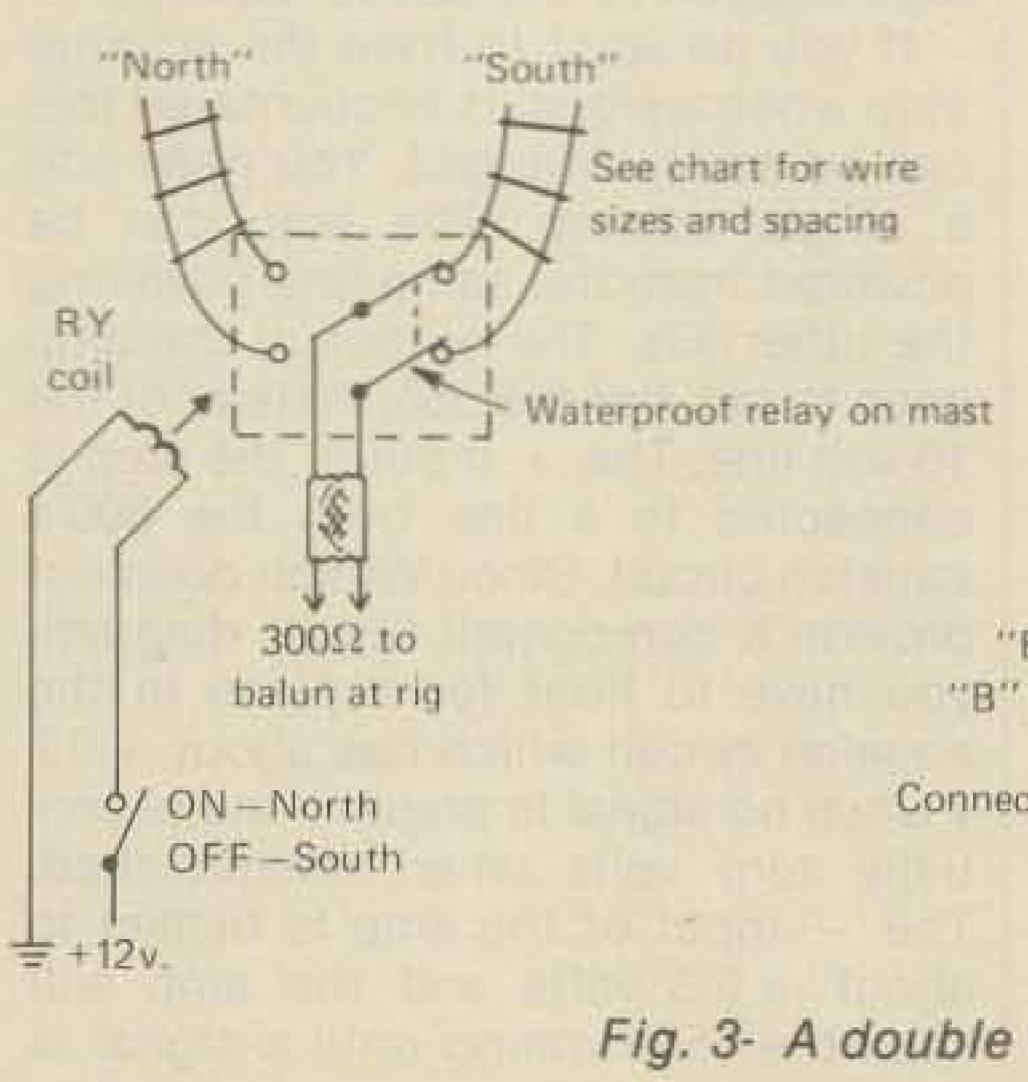
Fig. 1 shows a long wire, broken and fed ¼ wavelength from the shack end. 300 ohm line makes an almost perfect match. Even 450 open wire line could be used. For receiving and low power transmitting, a simple resistive balun (fig. 2) gets you down to your 50 ohm rig connection. Maximum signal is off the far end, due to some reflection at the shack or building end, so orient the wire to your most desired direction. This is an excellent skywire for working up or down a coastal stretch as from R.I. to Va., during temperature inversion openings. Radiation angle is quite low.

Fig. 3 shows a flippable Vee arrangement for the same sort of frequently used path, like northeast to southwest, where you are "in the middle" and desire to work stations 180 degrees opposed, perhaps in the same QSO, or for relay purposes.

A d.p.d.t. weatherproof relay at the antenna is controlled from the shack. The non-metallic braces (X) are needed on 2 meters only. LAy them out so they support the DE's at about 2/3 of their lengths outward, and size boom length accordingly. DE inner ends are mounted on insulating blocks but D's are on metal saddles. Wire connections from relay to feed points should be short as possible.

These first two are not super-gain antennas but you'll be surprised at what you can hear and work when the



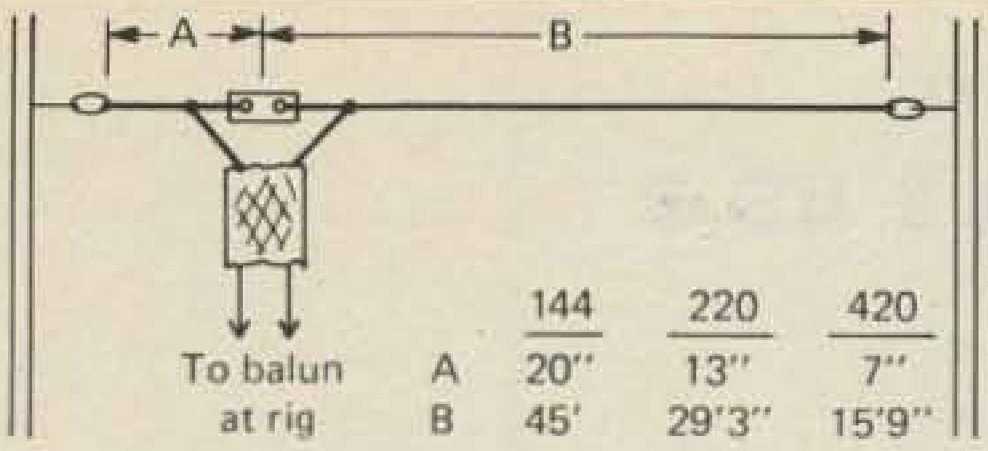


	144	220	420
DE	80	52	29
D	76	50	27½
S	20	13	7
a	60°	60°	60°
"B" length	See text	28	16
"B" diameter	¾	½	½
el. dia	⅜	½	⅛
Connecting wire	#16 sp 1"	#16 sp ¾"	#18 sp ½"

X–Mount ⅔ of way out DE's and ⅓ out D's approx.

Fig. 3- A double vee antenna.

*36 Lake Ave., Fair Haven, N.J. 07701



	144	220	420
A	20"	13"	7"
B	45'	29'3"	15'9"

Fig. 1- A v.h.f.-u.h.f. long wire antenna

band is "open."

The 420 antenna of fig. 4 is a bit more complex but worth the effort for low-angle DX. A stacked rotary rhombic for v.h.f. is rather unwieldy (some have been built) but ideal on u.h.f.

Umbrella guys of polypropelene with small turnbuckles support the bays. The booms are 12 ft. by 3/4 dia. fiberglass. The mast section above the rotor must also be non-metallic. (No, the fact of running the feeder back to the mast between the bays does not upset pattern or impedance.)

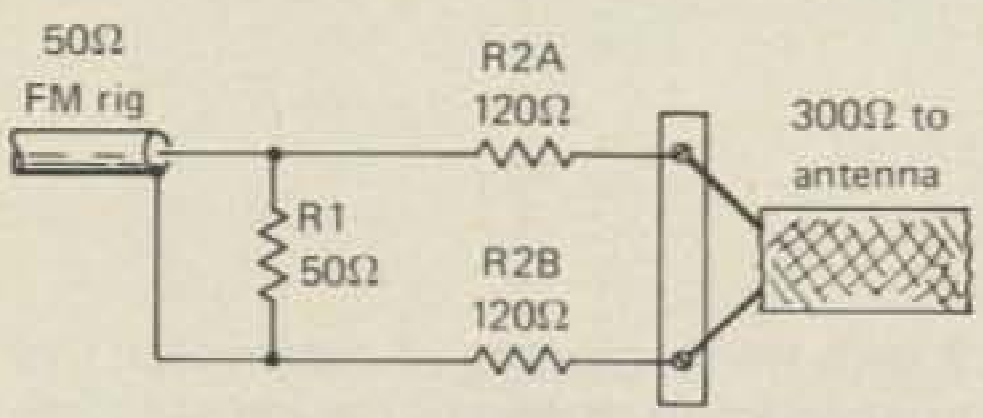


Fig. 2- A simple resistive balun.

It is best to lay out each diamond by chalking a pattern line on the shop floor, and bend the four halves along it. Make a base line 140 in. long and a perpendicular at 70 in. No. 8 semi-hard drawn aluminum wire is cut in four 168 in. lengths, bent at midpoint and positioned properly.

Single 600 ohm noninductive resistors are hard to come by. Use 2-300 or 3-200 in series mounted on a piece of cycolac or similar, with bolts for ends of rhombic and eyebolt for guy. The beam pattern is fairly sharp, which is a good thing on this radar-shared band.

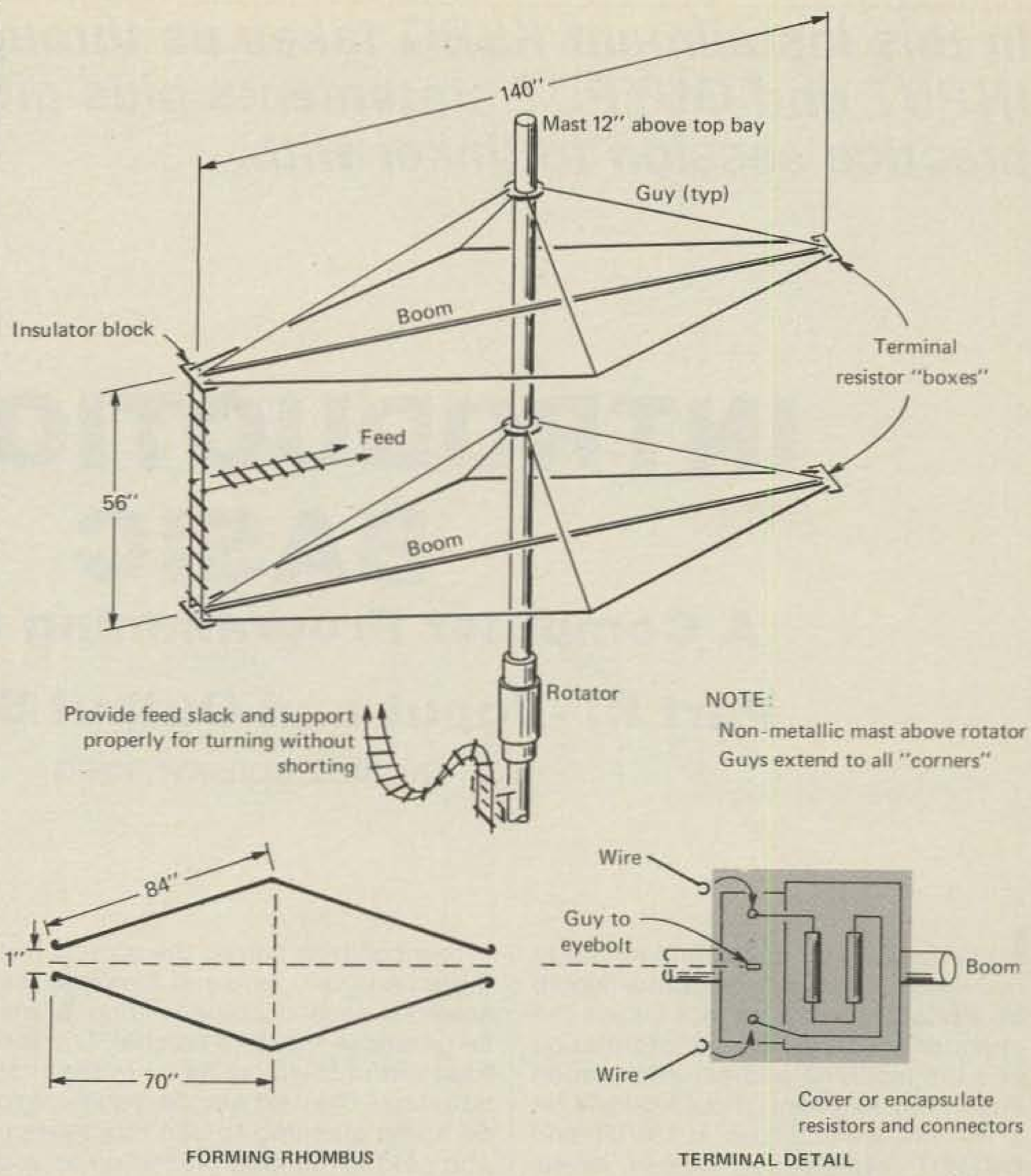


Fig. 4- A stacked rotary rhombic for 420 MHz.

In this installment K8BG takes us through INPUT and OUTPUT statements plus gives us a practice session to tinker with.

INTRODUCTION TO BASIC

A Computer Programming Language

Part III - Input and Output Statements

BY BUZZ GORSKY*, K8BG

In spite of all its speed and ability to make decisions, the computer would be a relatively useless tool unless the operator or user could put information into the machine and get information out. In this segment of our exploration of BASIC, we will look at **INPUT** and **OUTPUT** statements. These statements are among the most variable from one machine to another, so you will have to look at your computer's manual to learn the fine points. I will present material that is correct for Radio Shack's TRS-80 LEVEL II system.

We have already encountered the PRINT statement, and we have used it in examples. There is more to this statement however. Most machines allow for some sort of formatting of printed material so that you can arrange the material which will be on the screen to suit your needs. For the TRS-80 if a PRINT statement is followed by a semi-colon (;) the next PRINT statement will continue printing on the same line. However, if there is no ";" then further printing will occur on the next line. If items in a PRINT statement are separated by commas (,) then the machine will display the material in columns. There are four columns on the screen. One catch to this is that material is always displayed in the next available column. So if you have a statement which says PRINT A,B,C,D that should come out in four columns across the screen. But if item A is very long and runs into the screen's second column, then B will be printed in the third column, C in the fourth, and D will show up in the first column of the next line. So you have to do some planning to use this system and get the material presented as you desire.

On the other hand, if items in a PRINT statement are separated by the ";" then they are printed next to each other with no separation. However since the system leaves room for signs when printing numbers and the + sign is not printed, there would be one space between each of the items in a list of positive numbers.

As stated before, any "literals", that is material included in quotes, is printed just as indicated in the program statement. The statement

```
10 PRINT "THE RESULT IS—";I
```

would cause the following output to appear (if I were 132.547):

```
THE RESULT IS—132.547
```

The next PRINT statment would appear on the next line.

If the four available columns do not suit your needs you can arrange your own columns with TAB modifiers for print statements. A TAB tells the machine to display material so many spaces from the left edge. If printing has already proceeded beyond that point, the TAB modifier is ignored. The following statement

```
10 PRINT TAB(5)A;TAB(10)B;TAB(15)C;
    TAB(20)D;TAB(25)E
```

would print the values of A B C D and E with the beginning of each value five spaces apart. If one of the values were longer than five spaces, that would throw everything off as the next TAB would be ignored. You do not have to put a number in a TAB statement, you can use an expression. Run the following and see what you get:

```
10 FOR I = 1 to 63
20 PRINT TAB (I) I
30 NEXT
```

In a later installment when we talk about string operations, this feature of the TAB modifier will be most useful.

Complete control over where something will be displayed is obtained with the @ modifier. The screen is divided into 1028 locations shown on a map in the manual. You can display an item at a particular location by stating

```
10 PRINT @542,"542"
```

This will print the literal 542 at location 542 (approximately the middle of the screen). Fooling around with statements like this will help you find out how the screen is divided. Incidentally if you are using the 32 character/line display then there are only half as many valid locations for PRINT @ statements, and the locations must be even integers. Whenever the @ modifier is used at the bottom line, the entire display will move up one line after execution. This can be prevented by ending the PRINT @ statement with a ";".

PRINT USING provides a method for employing a specific format for the output of data. There are too many possibilities for this modifier to discuss them all here. I will give one ex-

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ample. Suppose that you want data to display with three digits to the left of a decimal point and two to the right. You would say:

10 PRINT USING ###.##,A

The value of **A** would then be shown in that format. When dealing with dollar values such a format would display 100 as 100.00 instead of just 100.

The PRINT statements provide quite an array of possibilities for controlling output to the screen. If an **L** is put in front of PRINT to get LPRINT then the statement will cause output to a line-printer (assuming one is connected). All of these statements except the @ modifier can be used with a line-printer. For the monitor screen, the **CLS** command will clear the screen, so that you can begin to output material onto a blank screen.

PRINT	READ
PRINT TAB	DATA
PRINT @	RESTORE
PRINT USING	INPUT
PRINT #-1	READ #-1
REM	LOG
SQR	CLS

Table I- New statements covered in this segment.

Now we have a number of statements to use so that the computer can talk to us. We need statements so that we can get information into the computer. We have already seen how the LET statement provides information within a program. LET A = 10 for example sets 10 as the current value for A. If we have a program which has a number of values that must be set this process can become tedious. A shortcut involves the **READ/DATA** statements. The **READ** statement provides a *list of variables* and the **DATA** statement gives *the values for those variables.* For example:

```
10 READ A,B
20 PRINT A,B
30 IF A=99 THEN END ELSE
   10
40 DATA 1,2,3,4,5,6,7,8,9,10,
   99,0
```

This little program demonstrates some features of the READ/DATA pair of statements. The DATA statement can be anywhere in the program and the READ statement will find it. Data is read sequentially. The first time through A gets the first value and B the second. Once these have been used they are not used again, so next time through A gets the third value and B the fourth, and so on. (If you run this on your TRS-80 and it prints 1,2 forever do the following:

5 POKE 16553,255

That magical statement at the beginning of your program will fix an error in the computer's memory (don't ask why—it just works!).

Try these variations on the above program to learn more about READ/DATA statements. Change statement 40 to contain 1 through 5. Then have another DATA statement in line 50 that has the rest of the data. There will be no difference in the running of the program. When the machine uses all of the data in one statement, it goes on to the next DATA statement for more. Now, leave of the final 0. That will bother the program. The last time through it will find the 99 for A but there will be no value for B. Execution will stop and the machine will print a message telling you it cannot find enough data.

The **RESTORE** statement can be used with READ/DATA pairs. When RESTORE is executed, the data lists will next be read from the beginning. Change statement 30 to:

```
30 IF A=99 THEN RESTORE
35 GO TO 10
```

That program will run forever! You have to be careful when using RESTORE.

The **INPUT** statement allows the operator to provide information from the keyboard. "INPUT X" will cause a "?" to appear on the machine's screen and execution will stop. You then type in the value that you want for X and the machine will read it when you hit enter. Execution will then proceed with the next statement. You can include a "prompt" with your INPUT statements so that you will know what the machine wants. For example

```
100 INPUT "ENTER THE
    NEXT NUMBER";N
```

will cause the machine to display:

ENTER THE NEXT
NUMBER?

and then wait for you to type a number and hit ENTER. It then assigns N the value you have entered. Note that such an INPUT statement must have quotes around the material you want the machine to display, and a semicolon between such material and the variable. The machine adds the question mark when it displays to show that it is waiting for something. If you entered a letter when the machine was waiting for a number, or vise versa, it would display **"REDO"** and give you another chance (see, it does have a heart). INPUT statements can be made for more than one item. You can INPUT A,B,C at one time but when you type the numbers in you must separate them by commas or the machine will be confused. If it is expecting three values and you enter four, the last will be ignored and the machine will display **"EXTRA IGNORED".**

The last of the statements we will consider involves the tape recorder. You can save data on tape and then read the data into a program at a later time. To put data on tape you use a PRINT #-1, statement. You must use the hyphen and comma as shown. Follow the comma with the list of data you wish put on tape, each item separated by a comma. The total list of data must include less than 255 characters or material will be lost. However, using very short data lists wastes a great deal of time since the machine goes through a lengthy start-up routine each time a PRINT #-1 statement is encountered. In other words PRINT #-1,A,B,C,D,E,F,G,H, will execute much faster than PRINT #-1,B. . .etc.

The **READ #-1**, (list) permits material on tape to be read into the machine. Your read statements must be exact

```
1CLS: PRINTCHRS$(23):PRINT:PRINT:
PRINTTAB(6)"DEMONSTRATION P
ROGRAM":PRINT:PRINT:PRINTT
AB(8)"BY BUZZ GORSKY":
PRINT:PRINTT AB(12) "K8BG"
2 FOR I = 1TO5000:NEXT:REM THIS
PROGRAM WILL DISPLAY A LIST O
NUMBERS, THEIR LOGS, THEIR
SQUARES, AND SQUARE ROOTS 10
CLS:INPUT "ENTER THE FIRST AND
LAST NUMBERS FOR WHICH YOU
WANT VALUES";M,N:REM M AND N
WILL BE THE LIMITS BETWEEN
WHICH CALCULATION WILL BE
DONE
15 PRINT "NUMBER","LOG",
   "SQUARE","SQUARE ROOT"
20 FOR I = M TO N
30 L = LOG(I)
40 S = I * I
50 R = SQR(I)
60 PRINT I,L,S,R
70 NEXT I
80 INPUT "ENTER 1 TO HAVE
   ANOTHER RUN; 2 TO QUIT";Z
90 IF Z = 1 THEN RUN ELSE END
```

Table II- A program which you can run to make use of what we have learned.

duplicates of the print statements that put the data on tape or there will be errors. A bit of experimentation will teach you the fine points.

This completes the new statements for this segment. Table 2 has a program which you can run to make use of what we have learned. We will go through it a statement at a time.

Statement 1 contains an "advertisement" about the program. The CLS clears the screen. The next statement "PRINTCHR$(23)" sets the display to 32 characters/line (we'll learn more about that when we look at strings) while the rest provide the material to be printed with the appropriate tabs. Note that colons can separate statements which are included in one program number. Notice too that "PRINT" is a good statement all by itself. It causes a blank line to be displayed. These print statements could have been of the PRINT @ format. Why don't you try to get the same display using PRINT @ instead of the tabs and blank PRINT statements?

Statement 2 begins with a FOR/NEXT loop that has nothing in it. This is just a delay to hold the advertisement on the screen. Leave this for next loop out and see what happens. The material that appears after "REM" is a remark. It does not effect program execution—the computer just ignores it. It is there to help the human programmer keep track of what is going on.

Line 10 clears the screen and then provides for the input of two numbers called M and N. In line 15 column headings are printed. Notice that each literal is separated by a comma. In line 20 a loop is started using the limits of M and N as entered. Line 30 calculates the log of I, and sets L equal to the log. Line 40 sets S equal to the square of I. The square is calculated as I*I. It could also be calculated as I 2. However that procedure takes lots longer that I*I. R is then set equal to the square root of I. This could also be indicated as I ½. After all of this material is printed in 60 the input statement is executed and you have a chance to enter a 1 or a 2 indicating whether or not you wish to continue. Line 90 evaluates the input and if a 1 then the program is run again. Notice that "RUN" is a valid program statement. We could also have said IF Z=1 THEN 1 ELSE END. There is an advantage in using "RUN" however. When RUN is executed all variables are set to zero so we get a fresh start. If we just looped back to line 1 or line 10 then we would have to worry about variables that still had values. For this program it would make no difference. But if we had a statement like X=X+1 in the program, and we expected X to be zero the first time through, then we would get a surprise on the second go around as X would have the last value calculated first time through.

As you run this program you will notice that if M and N are far apart then material starts vanishing off of the screen before you get a chance to read it. Can you think of some additional statements that would stop the output when the screen was full then continue on command? (Hint: An INPUT statement halts execution waiting for your entry. An appropriate counter would keep track of how many lines were on the screen.)

We now have a useful array of program statements and can execute many types of computational programs. I have introduced only a few of the machine's built-in mathematical operators. Look at your manual to see about trigonometric and other special mathematical functions.

Next time we'll look at strings and special operations associated with them.

(to be continued)

Here's an item for the mechanical RTTY buffs that should make operations a little easier and more fun.

A Convenient Control Switcher For RTTY

BY RUSS RENNAKER*, W9CRC

For those of us who are still using mechanical devices in our RTTY setups a big problem has always been the interconnections, ie, going from transmit to receive, or to the "CQ" tape, or perhaps the "ID" sender. At one time I had more patch cords, alligator clips and loose wires on my RTTY lashup than in the rest of the station all together. I got tired of moving patch cords and changing alligators (without getting bitten) and finally came up with this simple "switcher" which requires nothing more than a single push button to accomplish any of the various functions in a normal RTTY operation.

First off let me say I use audio tone shift throughout, except one option which I explain later. There are many advantages to the use of audio shift and not the least of these is the ease with which the inputs and outputs can be handled. The RTTY gear here at W9CRC consists of a Model 19 Teletype machine with standard tape punch and TD. In my case I also use an additional Model 14 TD for CQ tapes, brag tapes, etc. but this is not really necessary. All mechanical machines are in series with the TU local loop supply. The TU is a Hal ST-5000 and the transceiver a Kenwood TS-820S, but any good terminal and most transceivers would serve the same purpose. The TS-820S makes the interconnections easy by simply using the "Phone patch" input and output on the back of the unit as the RTTY input and output. The mode then is left in the lower sideband position and, of course, you will want to limit the power output of the transmitter for RTTY operation.

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For the switcher I use some old twelve volt relays from the junk box, as well as the push buttons and most of the rest of the parts required. I wired my "ID" sender directly into the switcher but it could be external as well if additional phone jacks are provided on the rear panel. The 12 v.d.c. power supply, likewise, is out of the junk box and almost any kind of d.c. supply would do as the current drain is not great. I also built the cabinet, but any standard cabinet that will hold all the parts would be fine.

The circuitry is very simple. I have just replaced all the patch cords and alligator clips with relay contacts. When none of the push buttons are on, except the power supply of course, the receiver output is connected directly to the input of the TU, and if the printer motor is on and you are tuned to a RTTY signal you will be printing. The push buttons are all the "push-push" type, but toggel switches could just as easily be used.

Here are the functions of the push buttons; from left to right:

1. Power supply on
2. Disconnects TU and connects cassette to transmitter
3. Disconnects TU and connects cassette input to receiver
4. Disconnects TU output and connects (and starts) ID sender to transmitter.

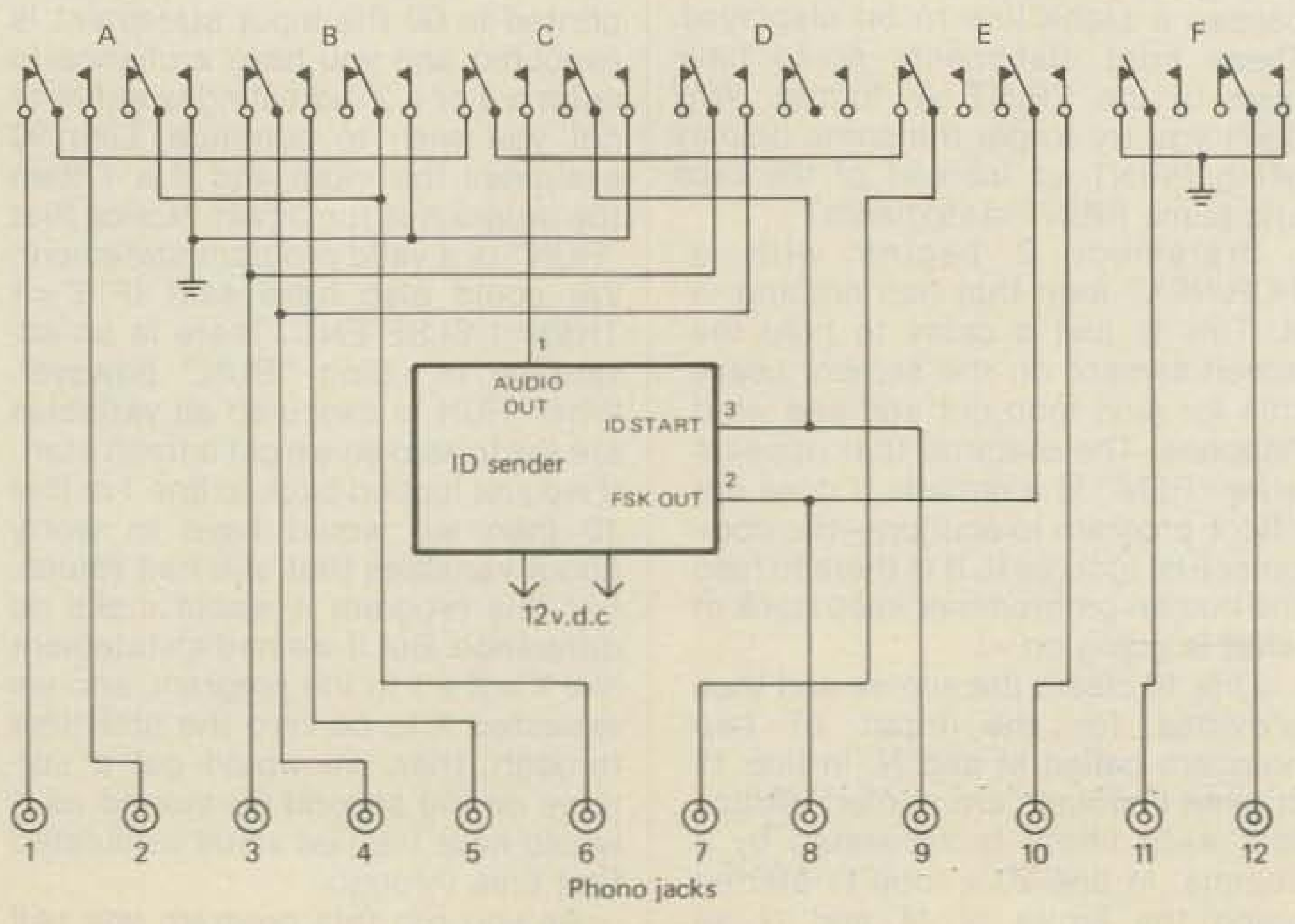


Fig. 1- The RTTY switcher audio circuits.

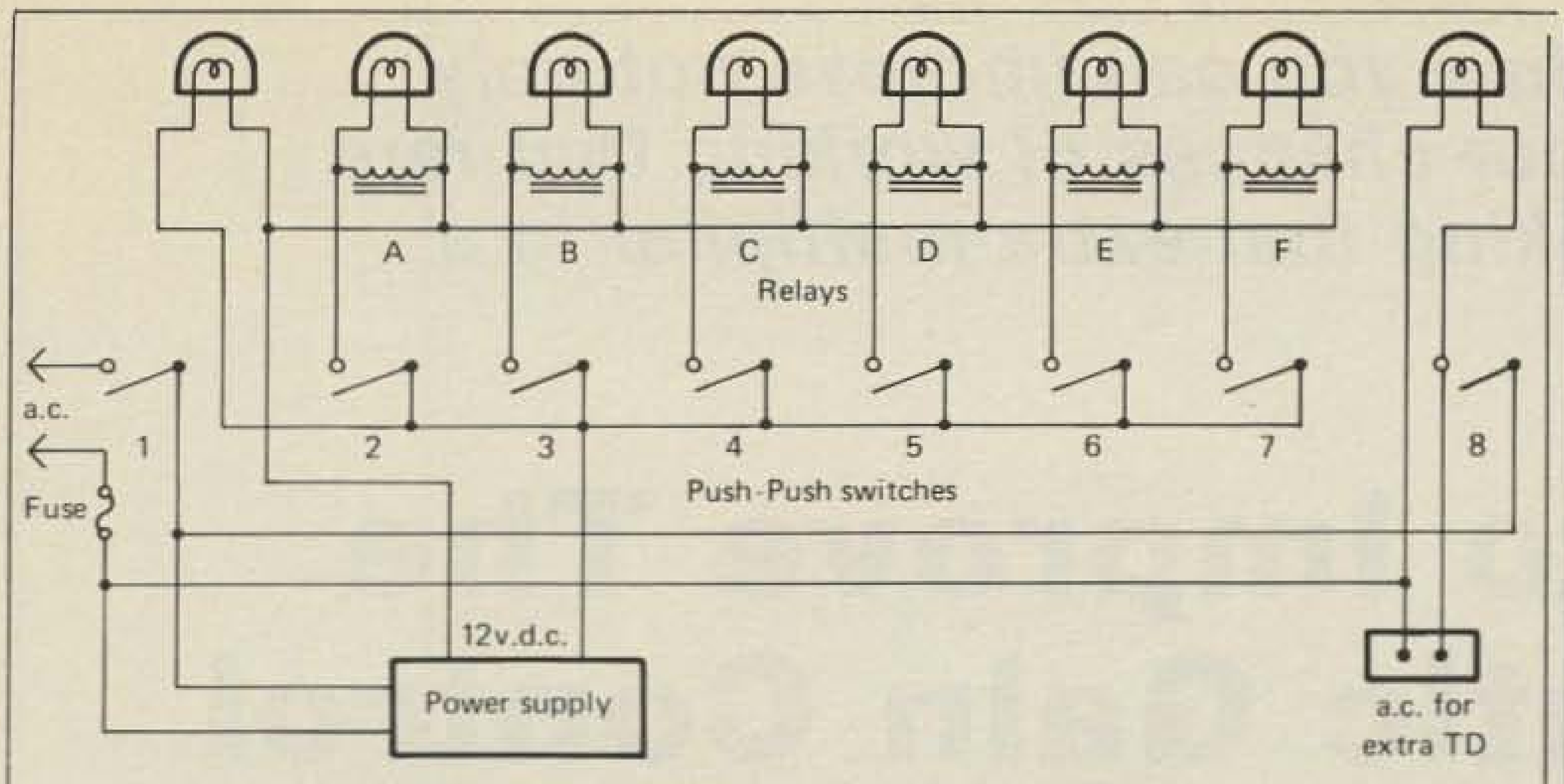
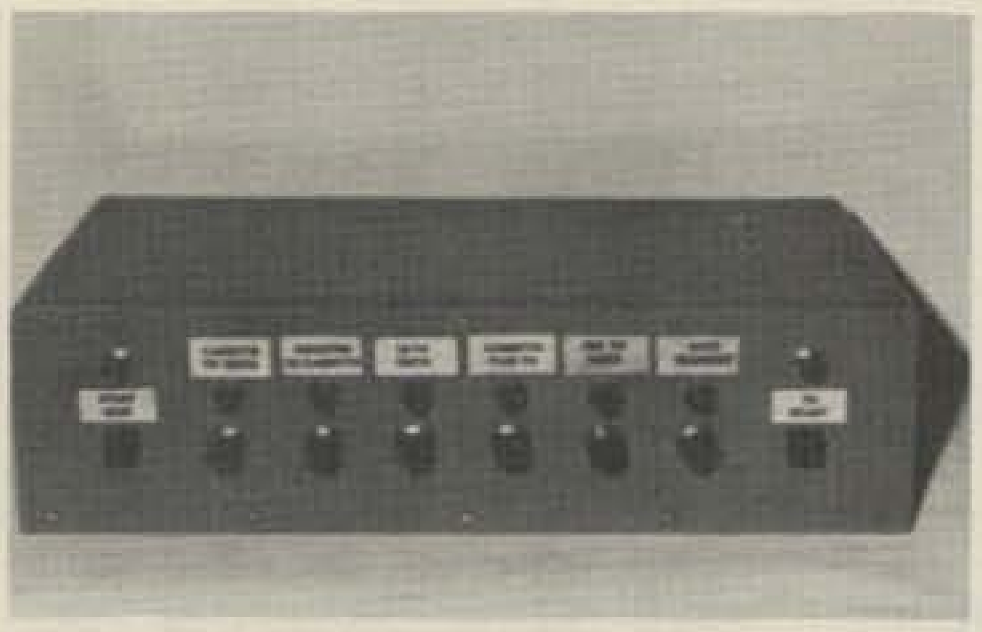


Fig. 2- The RTTY switcher d.c. circuits.



Front view of the W9CRC RTTY control center.

5. Multiples TU and Cassette inputs to receiver.

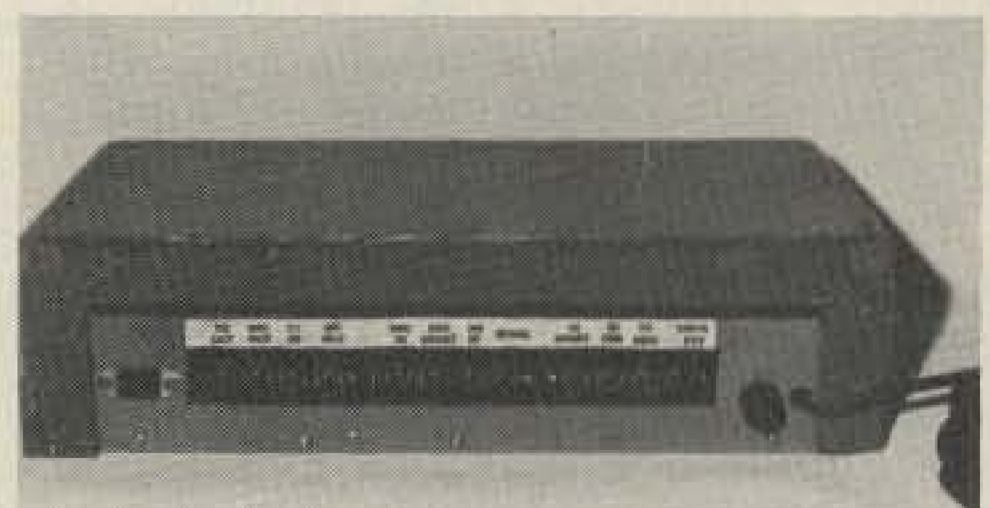
6. Switches from AFSK to FSK into the transmitter.

7. Turns transmitter on, connects TU output to transmitter.

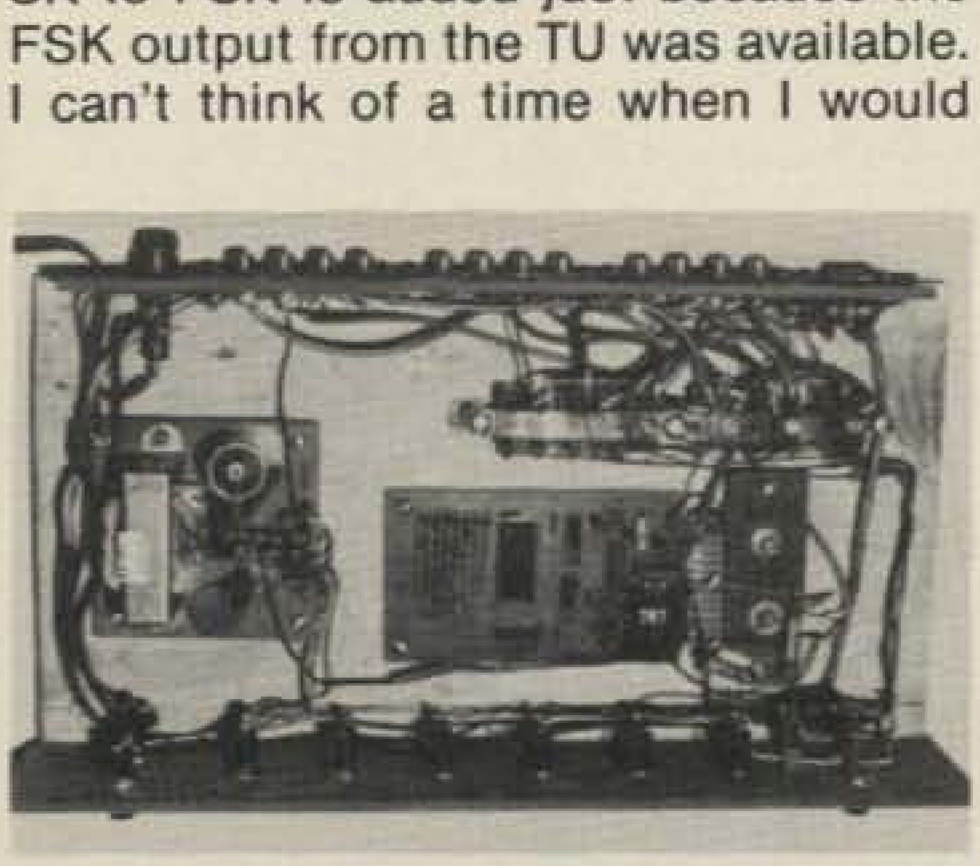
8. Starts and stops an extra TD for CQ tapes, etc.

One can see from these functions that just about every condition of operation has been met. But there are some combinations also. For instance if the 2nd push button is on, connecting the cassette instead of the TU to the transmitter, then push button #7 will turn transmitter on and connect the cassette to the transmitter instead of the TU. The #6 button, which switches AFSK to FSK is added just because the FSK output from the TU was available. I can't think of a time when I would rather use FSK than ASFK but it could happen so I put it on. Also the #8 button, starts extra TD, may not be required. Again I happened to have the extra TD and so used it. CQ tapes and other standard tapes could be used on the Model 19 TD with very little trouble.

When the #7 button is off the receiver is connected to the TU and the TU loop is driving the machines (if they are on). The keyboard, the printer, the TD and the extra TD are all in series in the TU local loop. Whichever one you want may be selected by the on and off switches on each. When the #7 button is on, however, it disconnects the receiver from the TU input, shorts the transmitter PTT circuit (turns on transmitter), and connects the TU audio output to the transmitter input. This is the sending position. To switch from receiving to sending it is only necessary to put this button "on", which makes the system a "single push button" operation in my book.



Rear view of the switcher showing the phono connectors.



Interior view of the switcher. There's still room to add a few more features if needed.

The inputs to the switcher on the rear panel are all standard phono jacks and are as follows:

1. TU audio out.
2. Cassette audio out.
3. TU audio input.
4. Receiver audio out.
5. Cassette input.
6. Cassette start (remote start on cassette).
7. Transmitter audio input.
8. Audio from ID sender.
9. ID sender start.
10. FSK output from TU.
11. TU remote (holds mark tone for local copy).
12. Transmitter PTT circuit (grounds PTT lead).

I am sure that every RTTY setup is different and the functions and equipment I describe here may not entirely suit other stations, but the general idea of what can be done with a single push button concept may be helpful for those old "iron horse" operators who, like me, disdain the use of the sophisticated computer operation of their RTTY station.

In about an hours time you can improve not only your receiver but your chances of working that rare one or perhaps hooking that extra multiplier in a contest.

How to Improve The Automatic Gain Control (AGC) In The Drake R4C Receiver

BY RICHARD KLINMAN*, W3RJ

The first thing I noticed when listening with my R4C receiver was the extremely flat behavior, or wide range, of the Drake AGC circuit. Operation in this respect was similar to my solid state Heath SB303. Experience with the Heath receiver led me to believe that it would be difficult to pick out calls in pile-ups with the R4C, and this fear was supported by initial on-the-air tests. The characteristic of the R4C that makes its use in s.s.b. contests and DX situations difficult for me are 1) the extreme pumping in the fast, "F", AGC position, and 2) the extreme flatness of the overall AGC characteristic. Once a received signal exceeds S3 on my receiver absolutely no noticeable increase in audio output occurs with further increase in the strength of the received signal. As with the Heath receiver, the Drake engineers did a great job in producing such a flat AGC response. For casual QSO's or broadcast listening this response is ideal. However, it is my opinion that this characteristic response is undesirable for DX and contest work. What happens in a pile-up is that each time a signal stronger than the one you are concentrating on pops up, the stronger signal becomes exactly as loud as the one you were trying to copy while the desired signal is "buried" by the decrease in receiver gain. A related effect is the observation that adjacent channel QRM in the receiver passband has a tendency to modulate the gain, or pump the AGC, with the Drake AGC characteristic. Operation with the AGC off is much better in difficult situations, but loud signals in that mode hurt your ears and distort severely. This problem is described in detail by Rusgrove[1], who sought an elegant but complex general solution.

The typical AGC characteristic of the Drake R4C is shown in fig. 1. Notice that, as observed during general listening, once the AGC threshold is reached there is practically no increase in audio output with further increases in r.f. signal at the antenna. Also, the threshold is set for a very low level signal. This curve is consistent with the specifications of the receiver which claim a threshold of about 1 microvolt, or S3, and a 3db maximum audio increase with 100 db of increase in antenna signal level. Measurement of this characteristic response is not unique since it depends upon the sensitivity of the receiver, setting of the r.f. gain and bias controls, and range of signals used at the antenna. Fig. 1 also indicates the typical response of the R4C with the AGC off. Somewhere in between these two curves is what I consider the optimum AGC response. Indicated on the graph is the AGC response of the Collins 75S3B receiver. While not necessarily optimum, the receiver has so far proven itself as an unequaled performer. The 75S3B AGC characteristic response should provide a guide as to what should be the goal of any change in

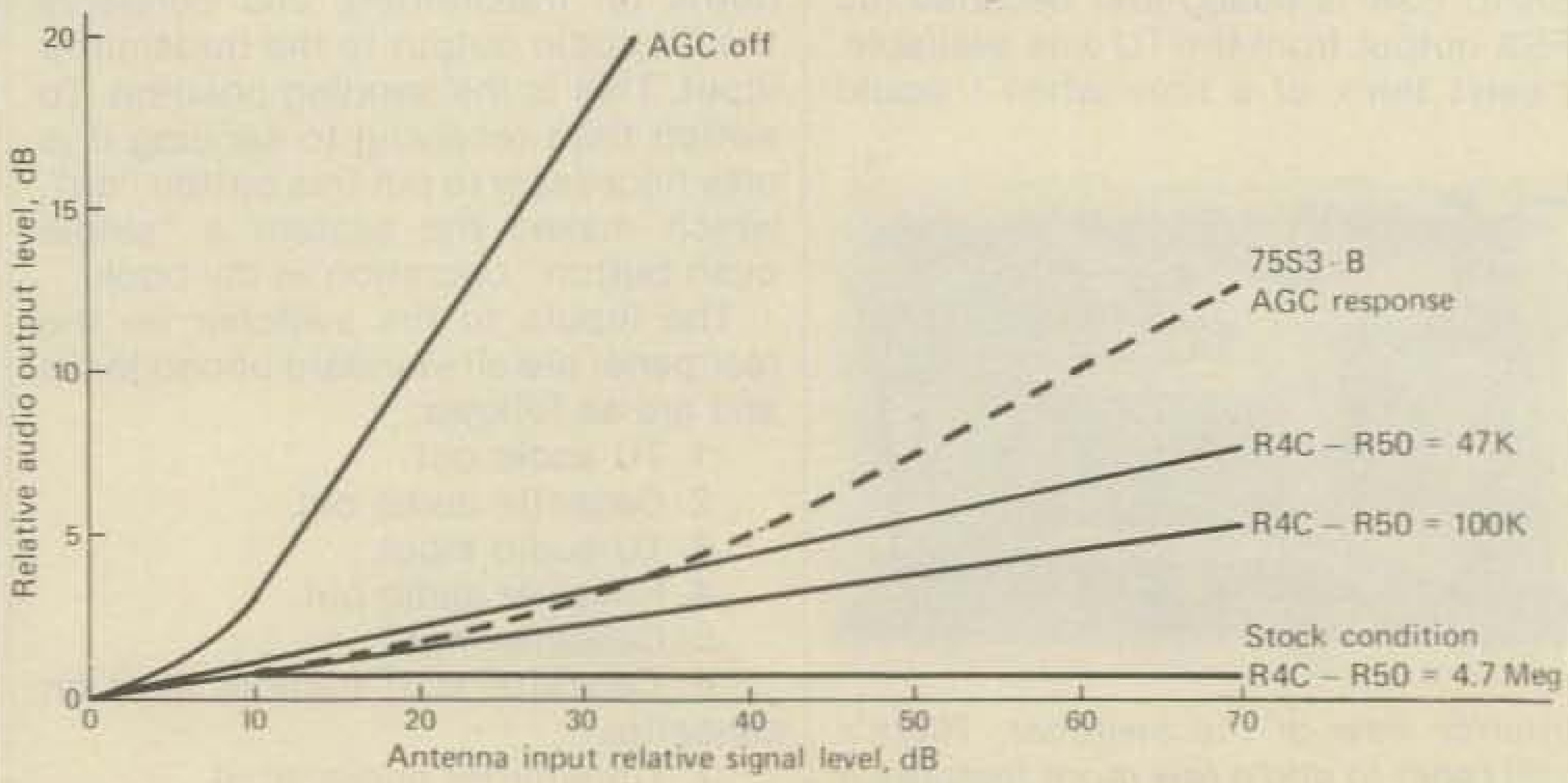


Fig. 1 - AGC characteristics of the Drake R4C receiver.

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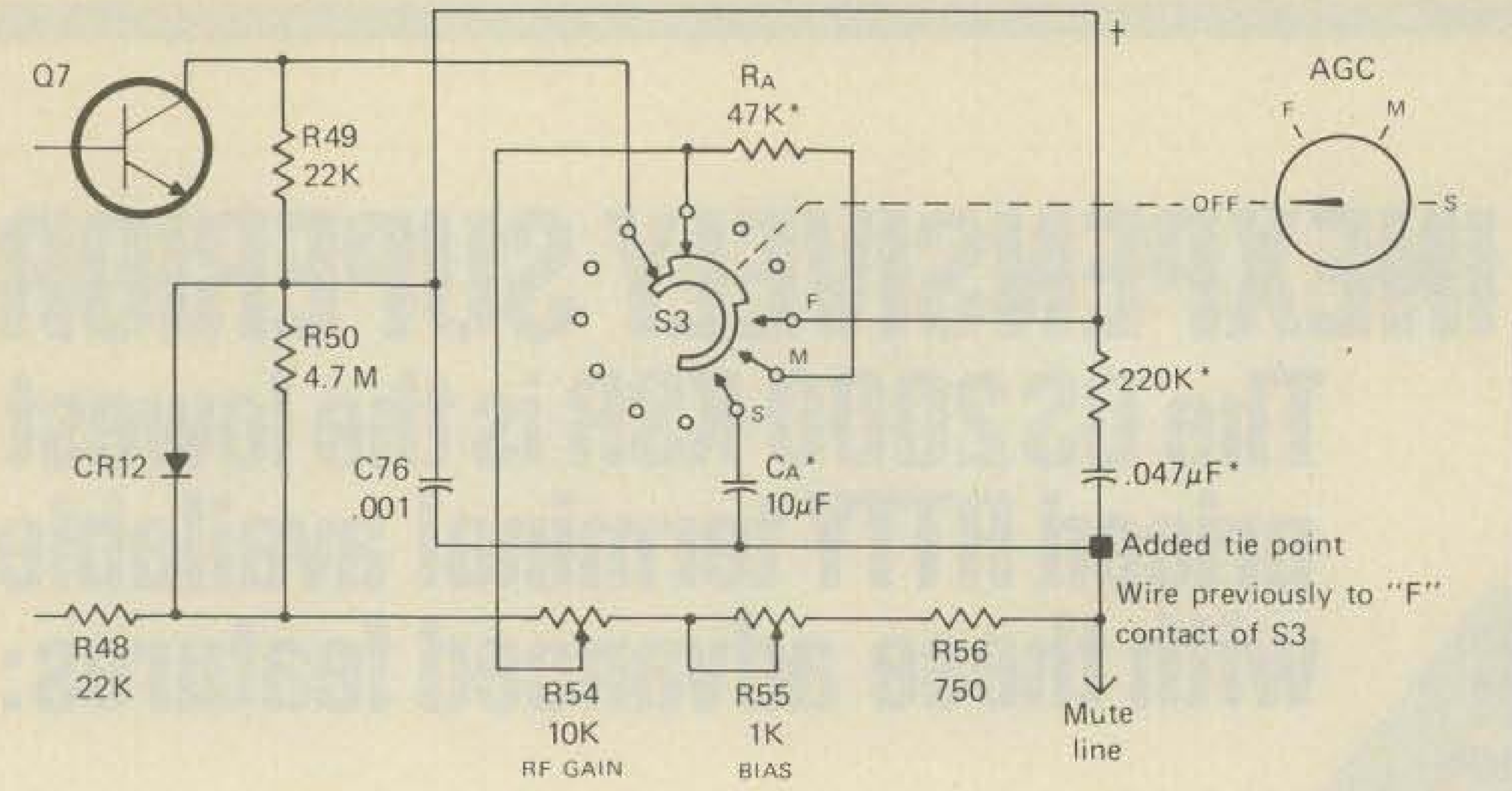

*Fig. 2-The modified R4C receiver AGC circuit. * indicates an added component. † indicates a wire previously from the "S" contact of S3 to R51. All resistors are ¼ watt and all capacitors are 50 volts minimum.*

the R4C response.

The extreme AGC response of the R4C arises from the extremely large value of load resistor R50 (4.7 Meg) in the AGC amplifier Q7. Because of the large resistor value the gain of the AGC loop is very high resulting in the capacity of the R4C to correct for large swings in the receiver input signal. Simple reduction of the value of R50 is an easy way to reduce the AGC loop gain. The exact value selected for R50 is a matter of personal choice. A reasonable compromise is 47K. Larger resistance values will result in more AGC action, and less resistance will result in reduced AGC action. The AGC time constant can be adjusted by adding capacity across the new value resistor used in place of R50. Increasing capacity results in slower AGC decay time constant. The AGC characteristic response obtained with a 47K resistor shunting the 4.7 Meg R50 is shown in fig. 1. (The response can be further tailored by altering the value of R49, which effects the distribution of AGC voltage between the AGC1 and AGC2 control lines, and altering the threshold of the AGC action by altering either R21, R41, or R46. A great deal of empirical work is necessary to achieve a desired response.)

Operational Notes

Implementation of the revamped AGC circuit is very easy, taking less than an hour to complete. The circuit of the revision I used is shown in fig. 2. Operation of this circuit is such that in the

1. "OFF" position of S3 operation is with no AGC,
2. "F" position of S3 operation is identical to stock factory operation in the medium AGC mode,
3. "M" position of S3 operation is with the new AGC characteristic with a fast decay time constant,
4. "S" position of S3 operation is with the new AGC characteristic with a slow decay time constant.

Operation of the S-meter is altered only slightly. It will move quite rapidly in the "M" position of S3 and not be able to respond to signal peaks. This is of no operational consequence.

Modification Sequence

Physical modification to the R4C is minimal. All extra parts are mounted directly on the AGC switch, S3. No additional wires need to be added to the receiver. A simple step-by-step procedure for the modification is given below.

1. Remove one wire each from the three right hand contacts of the AGC switch S3. These are the F, M, and S contacts. The F contact can be identified because it is the only contact touching the center ring in the F position, and it is the top-most contact to your right as you face the radio with the front panel toward you. Note the color coding of these wires as the wires to the F (black, white, brown) and S (brown, red, white) contacts will be re-used. Cover the end of the wire from the M contact with insulation spaghetti and push it out of the way.
2. Use a piece of heavy solid wire to make a solder tie point in the unused contact hole adjacent to the F contact. This can be done by looping a short piece of wire through the hole and around the outside edge of the wafer. Leave a 1/8″ stub to solder to.
3. Connect the wire that was previously on the F contact (black, white, brown) to the new tie point.
4. Connect the wire that was previously on the S contact (brown, red, white) to the F contact.
5. Connect a 10uF capacitor from the S contact to the new tie point. If a polarized capacitor is used, connect the + side to the tie point.
6. Connect a 220K resistor in series with a .047uF capacitor with short leads between these two parts. Connect this series R-C network from the F contact to the new tie point.
7. Connect a 47K resistor from the M contact to the contact immediately to the left of the top of the switch. This contact should have two wires (purple-white) connected to it. These wires connect to the front panel RF gain control, R54. In either the R4C schematic or fig. 2 this wire connects to the junction of R54, R50, R48, and CR12.
8. On the AGC printed circuit board, located between the audio output transformer and the s.s.b. crystal filter, disconnect the wire (brown, red, white) on the tie pin that connects to R51 (33K). Check to see that the other end of this wire has been connected to the F contact of S3. Connect this wire to the end of C73 (.22uF) closest to the chassis. This point should be the junction of C73, R50, R49, and R70. The wire just moved is the lead marked "†" in fig. 2.

Modification of the AGC circuit is now complete. Values of R_A and C_A may be altered as personal preference dictates. Restoration to the "stock" condition is accomplished by reversing the preceding eight steps.

[1] *J.B. Rusgrove, "Human Engineering the Station Receiver", QST Vol. 63, No. 1 (Jan 1979)*

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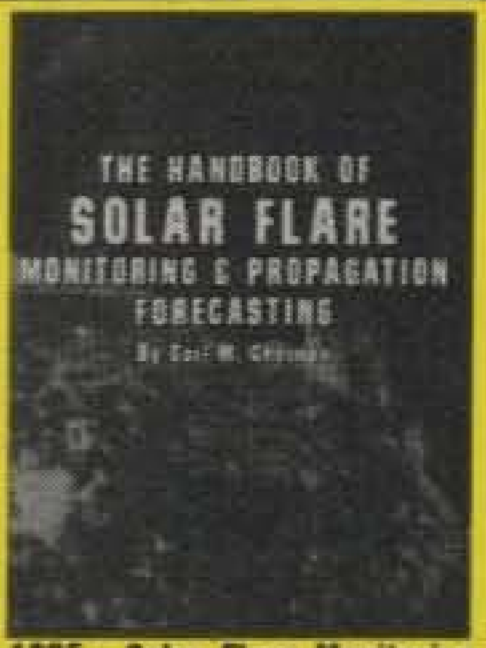

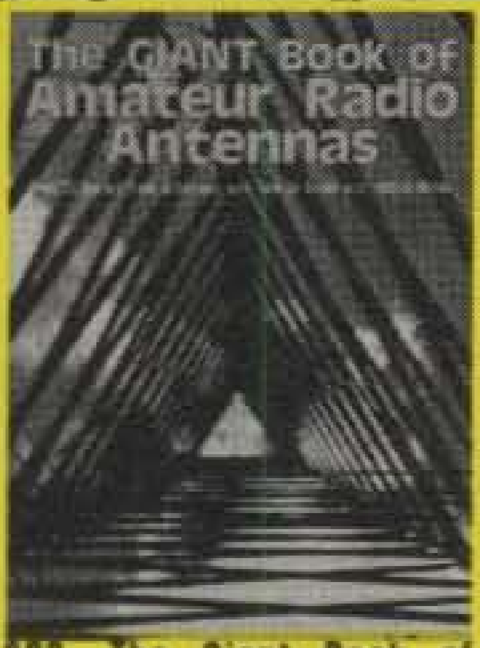

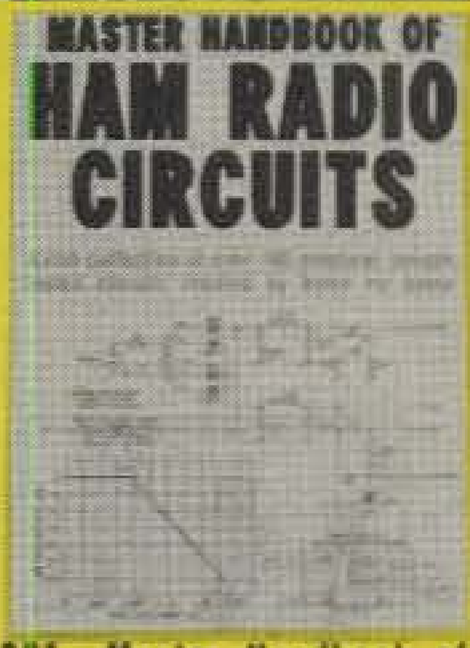

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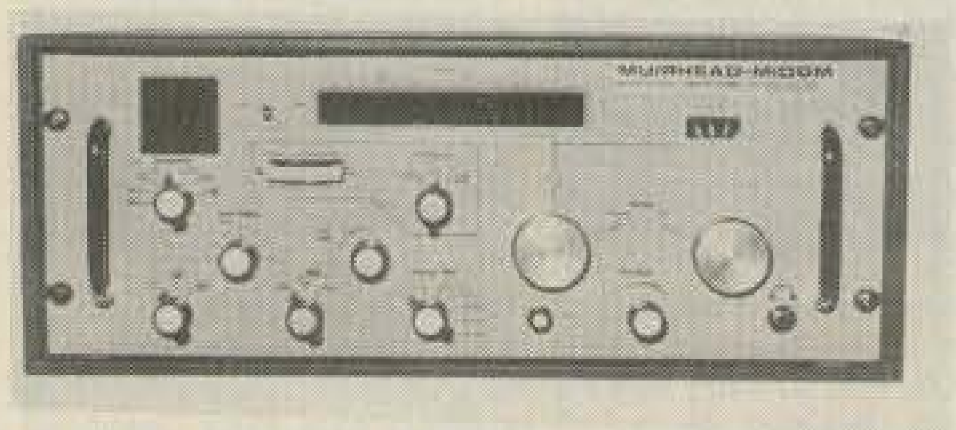


Muirhead Communications Receiver

A new, versatile communications receiver designed for international use in the 10 kHz to 30 MHz frequency range for point-to-point monitoring, reception, and relay is now available from the Data Communications Division, Muirhead, Inc.

The Muirhead M100II provides cost effective receiver capability. Excellent signal path performance is achieved with field effect transistors and a hot carrier diode mixer combined with full triple-tuned front-end band pass filtering.

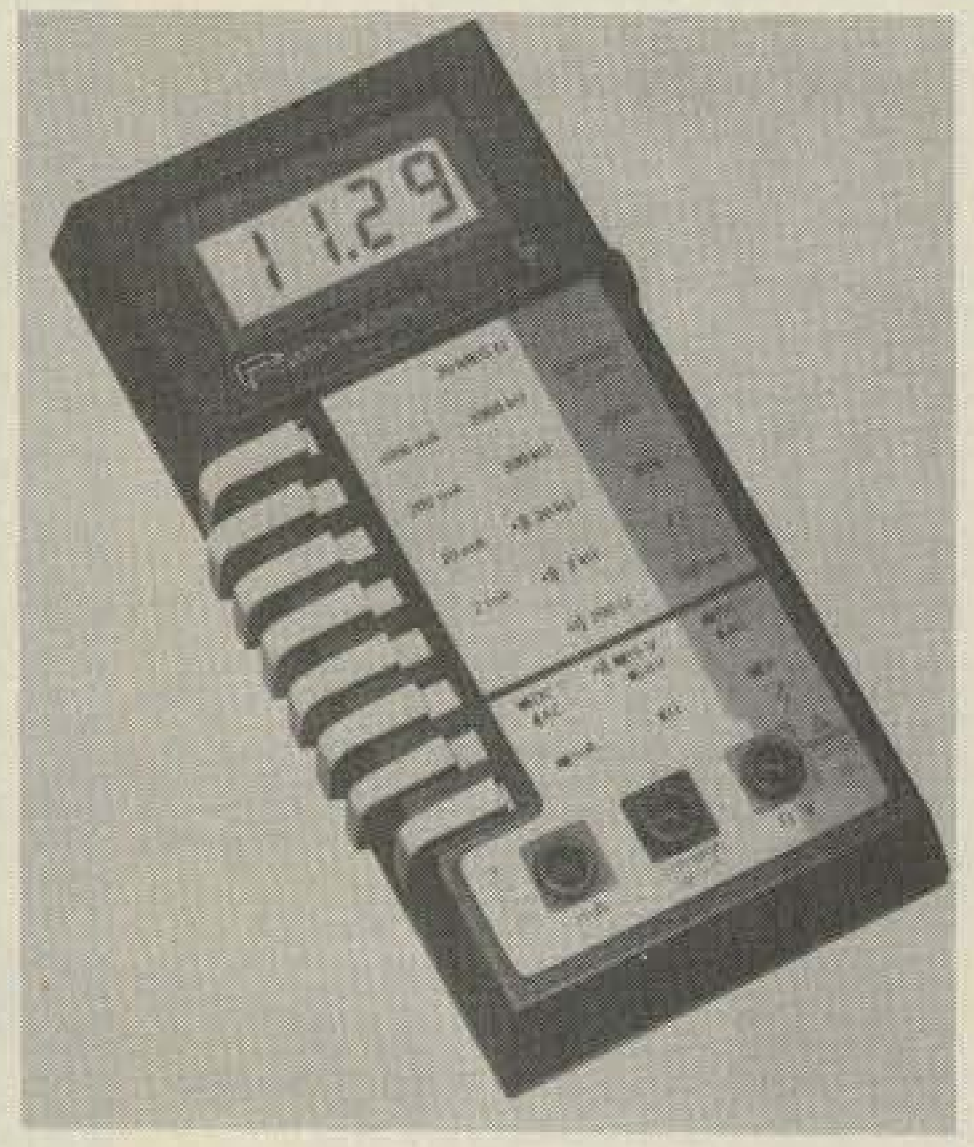
The receiver is completely solid state with silicon transistors and integrated circuits used throughout. It has two modes of tuning: either continuous search, which allows the operator to tune across the full range of each band, or high stability made when the first oscillator can be locked to a high stability internal standard at 10 kHz intervals, with final tuning within the synthesized step accomplished by use of the fine-tune control. Frequency display is a seven digit readout giving 10 Hz resolution. Accuracy of the display is plus or minus 1 part in 10^6 plus or minus 10 Hz at all times. Leading zero blanking is incorporated. Price is $2,795.

For more information, contact Muirhead, Data Communications Division, 1101 Bristol Road, Mountainside, NJ 07092, or circle number 89 on the reader service card.

Hand-Held Digital Multimeter

The Model 936 digital multimeter from Data Precision emits a beep when measuring low resistance and an audible alarm for over voltage. With these features, the operator's eyes need not shift from his work to the instrument in order to determine whether continuity or overvoltage exists.

The Model 936 is a rugged, user-oriented 3½ digit multimeter with 0.1% accuracy designed primarily for field use. It includes all of the functions of Data Precision's Model 935 and incorporates the latest developments in microelectronics and liquid-crystal display technology to offer a reliable instrument that's affordable enough for the person who requires a hand-held meter.



The unit offers 29 ranges of d.c. or a.c. voltage and current resistance measurements, including both high and low resistance excitation capability. Ranges, functions, and excitation level are selected using pushbutton switches, easily allowing one-handed operation of all controls. Measurements including negative polarity sign, decimal points and a warning indicator for low battery voltage are displayed on a high contrast 3½ digit 0.5″ high liquid crystal display.

A standard 9V alkaline transistor battery will power the Model 936 for up to 200 hours of continuous use. It's 3½″ × 6-3/4″ × 1½″, and light weight, 9½ ounces including battery. The list price is $159.00. For further information, contact Data Precision Corp., Electronics Avenue, Danvers, MA 01923, or circle number 9 on the reader service card.

Radio Shack's Cordless Pushbutton Telephone

Available from Radio Shack is the DuoFone ET-300 Cordless Pushbutton Telephone with an operating range of up to 300 feet from the base unit. It has a Universal Dial System for compatability with both electronic pushbutton and mechanical dial telephone systems. The ET-300 is said to install simply by plugging the base/recharger into a 120 v.a.c. outlet and a modular phone jack—no other wiring is required.

A special feature of the cordless phone is Auto-Redial for one-button redialing of the last number called if it was busy or did not answer. A call pushbutton lets you signal the handset from the base with a tone signal. To answer or make a call on the cordless handset, flip the talk switch and raise the antenna. To hang up, lower the antenna.

Base/recharger is 8-5/8″ × 7-1/8″ × 2-3/4″ and includes a built-in modular jack for your regular phone. Handset, 2½″ × 6-3/4″ × 1¼″. Rechargeable batteries included. For more information, contact Radio Shack, div. Tandy Corp., 1300 One Tandy Center, Fort Worth, TX 76102, or circle number 91 on the reader service card.

MFJ Morse Code Teaching Computer

The MFJ-410 "Professor Morse" is a Morse code teaching computer. It lets you vary the level of difficulty to your ability. You can learn Morse code quicker for the ham ticket or commercial ticket.

The MFJ-410 is a random code generator and keyer combination. It sends alphabet characters only or combines the alphabet with numbers and punctuation marks. It sends random code in random length groups and never repeats itself so that it cannot be memorized.

Learn to recognize characters sent at fast speeds by setting speed control high and adjusting delay to allow longer spaces between letters and groups. (i.e. letters at 13 w.p.m. spacing at 5 w.p.m.). The MFJ-410 has a speed meter which lets you set the speed of the random code generator or the keyer to the desired level. Speed is *continuously* adjustable from 5-50 words per minute. The keyer section uses the proven Curtis 8044 keyer chip.

The MFJ-410 Professor Morse is available for $149.95 plus $3.00 shipping and handling. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 88 on the reader service card.

Capacitance Box

Cincinnati Electrosystems' new Capacitance Box is a convenient, accurate, and inexpensive instrument for circuit development, laboratory testing, trouble shooting, and maintenance use. With this compact instrument it is instantly possible to substitute any of 21 capacitance values ranging from 100 pF to 10 **m**F in an operating circuit. The Capacitance Box can be used also in combination with the company's Decade Resistance Box for establishing RC time constants in test circuits.

The unit measures 4″ × 2-7/8″ × 1-9/16″, and is priced at $20.95 in quantities of one to nine. For more information, contact Cincinnati Electrosystems, Inc., 469 Ward's Corner Road, Loveland, OH 45140, or circle number 90 on the reader service card.

SST T-6 Ultra Tuner

SST Electronics has added a new antenna tuner to their line of amateur radio accessories. The SST T-6 Ultra Tuner will match any kind of antenna—coax fed, random wire, or balanced (with the optional SST B-1 Balun) on 160-10 meters.

A front panel function switch selects between two circuit configurations—a PI or L network—or tuner bypass. By offering a selection of circuits, the optimum match can be made with any antenna. A front panel antenna switch offers a selection between two coax antennas and a random wire. A relative output meter aids tuning.

The SST T-6 Ultra Tuner carries a two year unconditional guarantee. Price is $59.95 ($3 shipping and handling). SST B-1 Balun is $5. For more information, contact SST Electronics, P.O. Box 1, Lawndale, CA 90260, or circle number 87 on the reader service card.

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High quality...top performance!

Maximum convenience with optimum features

TS-180S

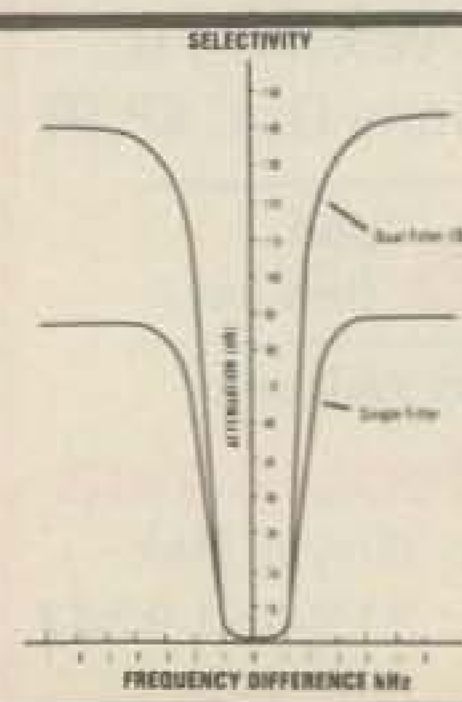
The TS-180S is Kenwood's top-of-the-line all solid-state HF SSB/CW/FSK transceiver. New circuit-design technology has been incorporated throughout the transceiver, resulting in optimum receiver and transmitter performance, as well as advanced operating features that every DXer, contest operator, and all Amateurs would desire for maximum efficiency and flexibility.

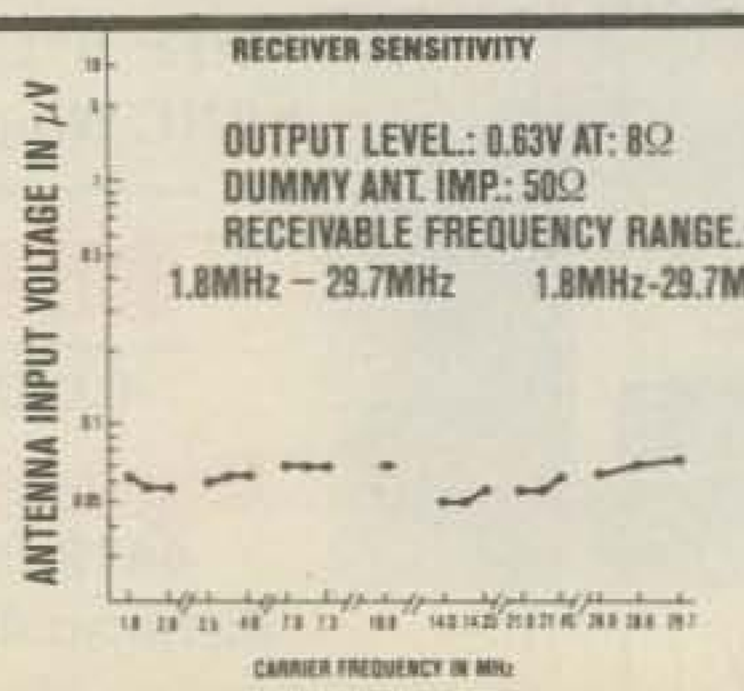
TS-180S FEATURES:

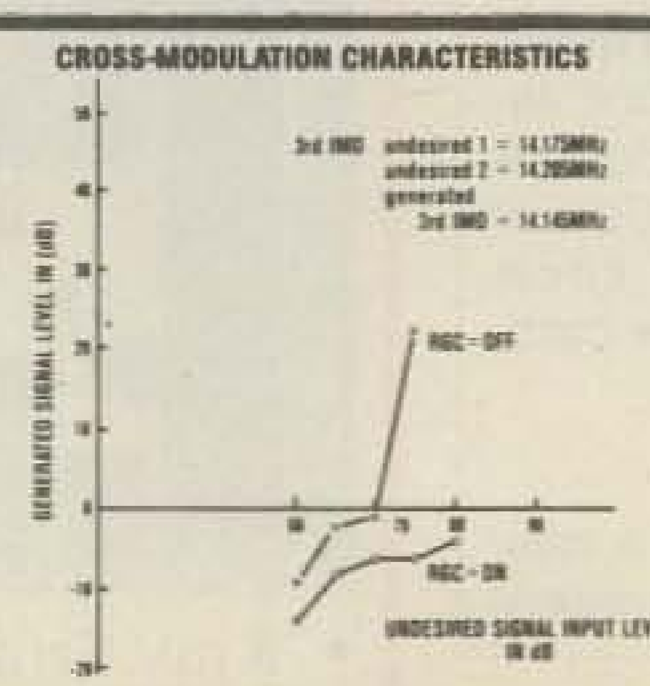
- Digital Frequency Control (DFC), including four memories and manual scanning. Memories are usable in transmit and/or receive modes. Memory-shift paddle switches allow any of the memory frequencies to be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. It's almost like having four remote VFOs!
- All solid-state...including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate!
- High power...200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters (entire band provided). Also covers more than 50 kHz (100 kHz with DFC) above and below each band (MARS, etc.), and receives WWV on 10 MHz.
- Adaptable to all three new bands.
- Improved dynamic range.
- Dual SSB filter (optional), with very steep shape factor to reduce out-of-passband noise on receive and to improve operation of RF speech processor on transmit.
- Single-conversion system with highly advanced PLL circuit, using only one crystal with improved stability and spurious characteristics.
- Built-in microprocessor-controlled large digital display. Shows actual VFO frequency and difference between VFO and "M1" memory frequency. Blinking decimal points indicate "out of band." Monoscale dial, too.
- IF shift...Kenwood's famous passband tuning that reduces QRM.
- Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).
- Automatic selection of upper and lower sideband (SSB NORM/SSB REV switch).
- Tunable noise blanker (adjustable noise-sampling frequency).
- RF AGC ("RGC"), which activates automatically to prevent overload from strong, local signals.
- AGC (selectable fast/slow/off).
- Dual RIT (VFO and memory/fix).
- Three operating modes...SSB, CW, and FSK.
- Improved RF speech processor.
- 13.8 VDC operation.
- Also available is the TS-180S without DFC, which still shows VFO frequency and difference between VFO and "hold" frequencies on the digital display.
- Full line of matching accessories, including PS-30 base-station power supply, SP-180 external speaker with selectable audio filters, VFO-180 remote VFO, AT-180 antenna tuner/SWR and power meter, DF-180 digital frequency control, YK-88 CW filter, and YK-88 SSB filter.

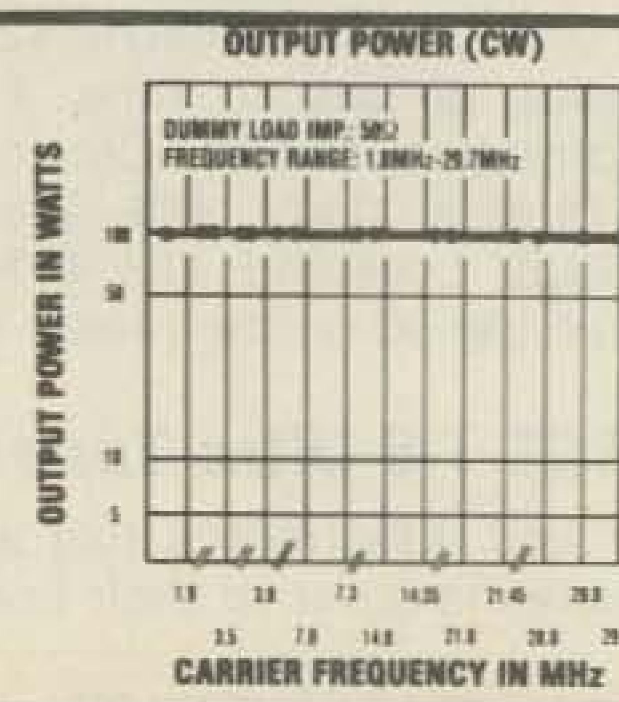
All of these advanced features can be yours... and at an attractive price! Visit your local Authorized Kenwood Dealer and inquire about the exciting TS-180S with DFC!

NOTE: *Price, specifications subject to change without notice and obligation.*









TRIO-KENWOOD COMMUNICATIONS INC.
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New 2-meter direction.

A compact transceiver with FM/SSB/CW plus...

TR-9000

Kenwood's done it again! Now, it's the exciting TR-9000 2-meter all-mode transceiver...complete with a host of new features. Combining the convenience of FM with long-distance SSB and CW in a very compact, very affordable package, the TR-9000 is the answer for any serious Amateur Operator! Versatile? You bet! Because of its compactness, the TR-9000 is ideal for mobile installation. Add on its fixed-station accessories and it becomes the obvious choice for your ham shack!

TR-9000 FEATURES:

- FM, USB, LSB, and CW...all popular modes
- Compact size...only 6 11/16 inches wide X 2 21/32 inches high X 9 7/32 inches deep
- Digital dual VFOs...with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz, convenient for each mode of operation
- Digital frequency display...five, four or three digits, depending on selected tuning step
- Extended frequency coverage...143.9000 – 148.9999 MHz
- Five memories:
  M1 – M4...for simplex or ± 600 kHz repeater offset
  M5...for nonstandard offset (memorizes transmit and receive frequency independently)
- Scan of entire band...automatic busy stop and free scan
- SSB/CW search...sweeps over selectable 9.9-kHz bandwidth segments, for easy monitoring
- UP/DOWN microphone (standard)..."beep" sounds with each frequency step
- Noise blanker...eliminates pulse-type noise on SSB and CW
- Low-noise, dual-gate MOSFET and two-stage monolithic crystal filter for improved receiver front-end characteristics
- RIT (receiver incremental tuning) for SSB and CW...effective even on memory channels
- RF gain control
- CW sidetone
- Automatic selection of AGC time constant with MODE switch (slow for SSB and fast for CW)
- Improved power module for reliable and stable linear RF output
- Selectable power outputs...10 W (HI)/1 W (LOW)
- Mobile mounting bracket...easy to mount, with quick-release levers
- LED indicators...ON AIR, BUSY, and VFO
- Accessory terminals on rear panel...KEY, BACKUP DC, STBY, EXT SP, DC, TONE INPUT, and ANT

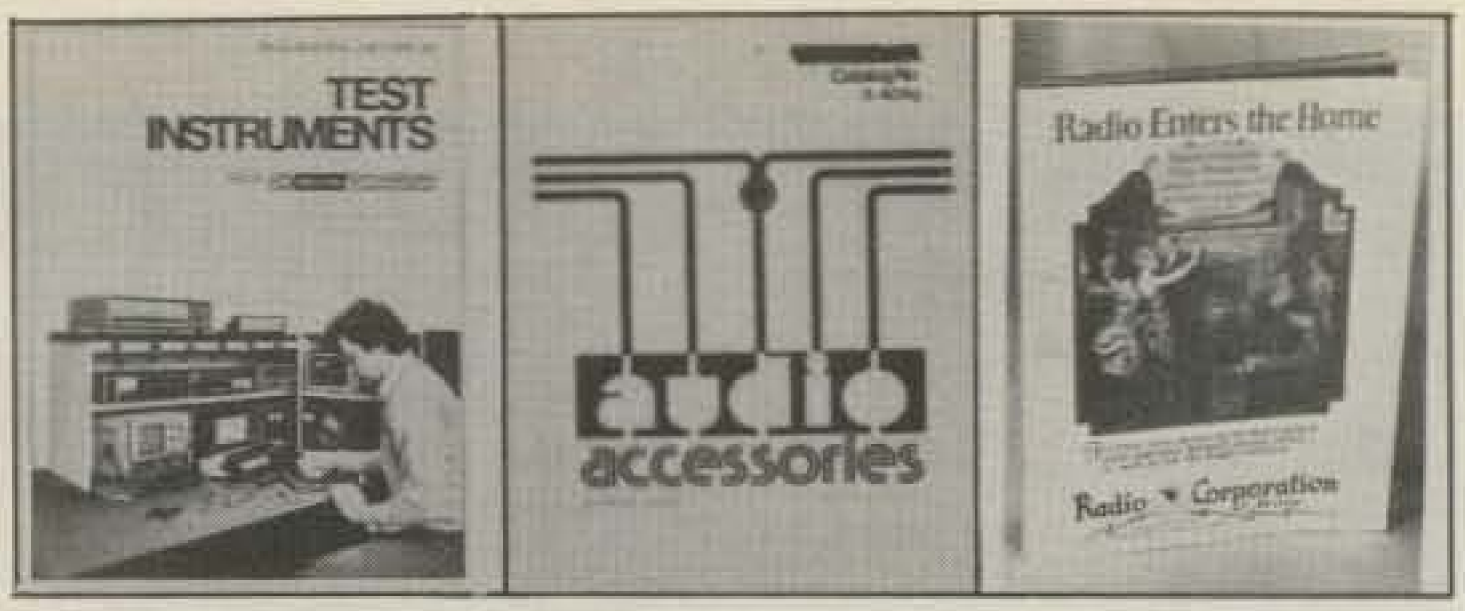
See your Authorized Kenwood Dealer now for details on the TR-9000...the new direction in 2-meter all-mode transceivers!

NOTE: *Price, specifications subject to change without notice and obligation.*

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- PS-20 power supply
- SP-120 external speaker
- BO-9 System Base...with power switch, SEND/RECEIVE switch for CW operation, backup power supply for memory retention (BC-1 backup power adaptor may also be used for this application), and headphone jack

The Printed Word: new reading material



General Line Instrument Catalog. The new 48-page "BK-80" general line test instrument catalog, is now available from B&K-Precision Dynascan Corporation. The catalog features a broad range of high-quality test instruments including oscilloscopes, frequency counters, digital and analog multimeters, function and r.f. signal generators, capacitance meters, digital and pulser probes, semiconductor testers, power supplies, and two-way radio and television test instruments. Each product description includes a detailed specification section and suggested popular applications. Also included is a complete line of instrument probes, connecting cables, carrying cases and other accessories. For a copy of this free catalog, contact B&K-Precision, Dynascan Corp, 6460 West Cortland Street, Chicago, IL 60635, or circle number 93 on the reader service card.

Audio Accessories Catalog. A new 28-page Audio Accessories Catalog has been published by Switchcraft, Inc. The catalog describes and shows drawings of many types of Switchcraft jacks, plugs, switches, audio and phono connectors, adapters, audio accessory kits, molded cable assemblies, and microphone mixers and amplifiers for audio applications. For a copy of the Switchcraft Audio Accessories Catalog No. A-404g, contact Switchcraft, Inc., 5555 No. Elston Ave., Chicago, IL 60630, or circle number 94 on the reader service card.

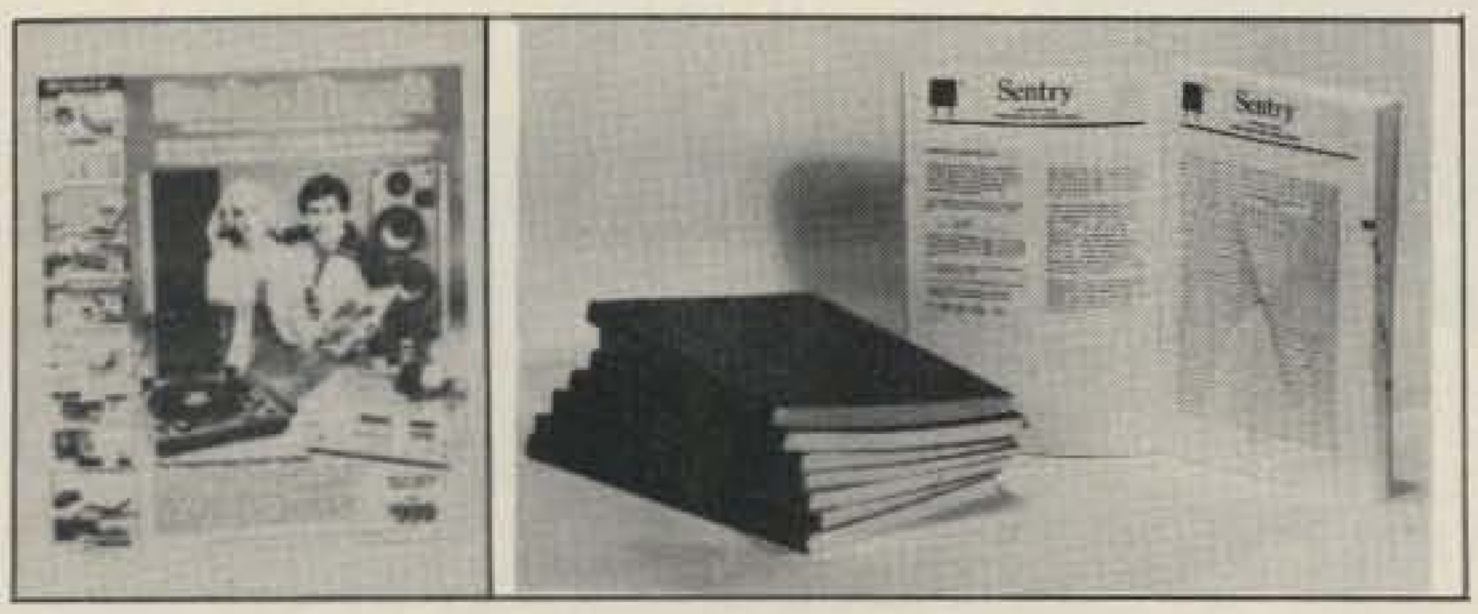
Radio Enters The Home. In 1922 the Radio Corporation of America published a 128-page book entitled *Radio Enters The Home,* subtitled "How to enjoy popular radio broadcasting, with complete instructions and description of apparatus. For those who desire to be entertained with radio concerts, lectures, dance music, and for the radio amateur and experimenter." This book has just been reprinted, and is for anyone who would like a glimpse of everyday life in the 20's. It is fully illustrated with pictures and drawings of apparatus made by RCA, General Electric, Westinghouse, and other great corporate names. The paperback volume is 8½" × 11", and is $12.50 plus 50¢ shipping. For more information, contact The Vestal Press, P.O. Box 97, Vestal, NY 13850, or circle number 95 on the reader service card.

Amateur Radio Catalog. The free 1980 MFJ Amateur Catalog includes antenna tuners (from 200 watts to 3 kw), and s.s.b. and c.w. filters (from $29.95 to $79.95), memory keyers (3 models, $79.95 to $139.95), electronic keyers (from $39.95 to $69.95), speech processors, r.f. noise bridge, frequency standard, code practice oscillator, and QRP transmitter. This new catalog has 12 pages of pictures, descriptions, specifications, and prices of amateur

radio accessories. For a copy of the catalog, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 97 on the reader service card.

Reconditioned Equipment Catalog. A 104-page catalog published by Tucker Electronics Company lists approximately 2100 different pieces of reconditioned electronic test equipment and microwave components. (Pictured is the Fall 1979 catalog; approximately the same catalog will be reprinted this Spring.) Instrument categories include: amplifiers, analyzers, bridges, frequency measuring equipment, signal generators, lab standards, meters, scopes, power supplies, recorders, r.f.i/e.m.i equipment, and more. Each unit is described and priced. All units are reconditioned and calibrated to manufacturer's specifications. For a copy of the free catalog, contact Tucker Electronics Company, 1717 S. Jupiter Road, Garland, TX 75042, or circle number 98 on the reader service card.

Catalog Describes Vehicular Antennas. A new catalog describing the expanded series of Phelps Dodge Communications Company vehicular antennas is now available. The 20-page catalog describes the design and performance characteristics of the antennas, offers complete electrical and mechanical specifications plus patterns and gain curves. Each page of the catalog has a frequency range bar which assists in the quick location of antenna models based on frequency served. Accessories and mounts are covered and a section of the catalog is devoted to a series of helpful performance curves and typical horizontal radiation patterns. For a free copy contact Catalog 1079, Phelps Dodge Communications Company, Route 79, Marlboro, NJ 07746, or circle number 96 on the reader service card.



Radio Shack's 1980 Catalog. Radio Shack's 176-page 1980 catalog is now available free on request from more than 6,000 participating stores and dealers nationwide. The catalog has 120 full-color pages and features the latest in everything electronic from computers and stereo components to toys, parts and accessories for home entertainment, hobbyists, and experimenters. The new catalog includes the company's TRS-80 microcomputer system, the new Model II business microcomputer, and the complete line of Realistic stereo components, CB equipment, radios, tape recorders, Archer antennas, Micronta test instruments, and ArcherKit and Science Fair hobby kits. In addition, the catalog lists an extensive selection of specialized electronics items, tools, tubes, transistors, IC's, parts, plugs, cables, and more. For a copy of catalog #315, contact Radio Shack, Division Tandy Corp., 1300 One Tandy Center, Fort Worth, TX 76102, or circle number 99 on the reader service card.

Quartz Technology Manual. The *Quartz Technology Manual,* published by Sentry Manufacturing Company, is a 150-page manual that takes the mystery out of understanding and using quartz crystals. The manual inclues the most complete military specification summary ever published to simplify military equipment design. This handy reference helps you specify what you need for your commercial two-way, marine, aircraft, public service, amateur, and monitor radios. The book is available for $2.95. For a copy of this book, contact Sentry Manufacturing Company, Crystal Park, Chickasha, OK 73018, or for more information, circle number 100 on the reader service card.

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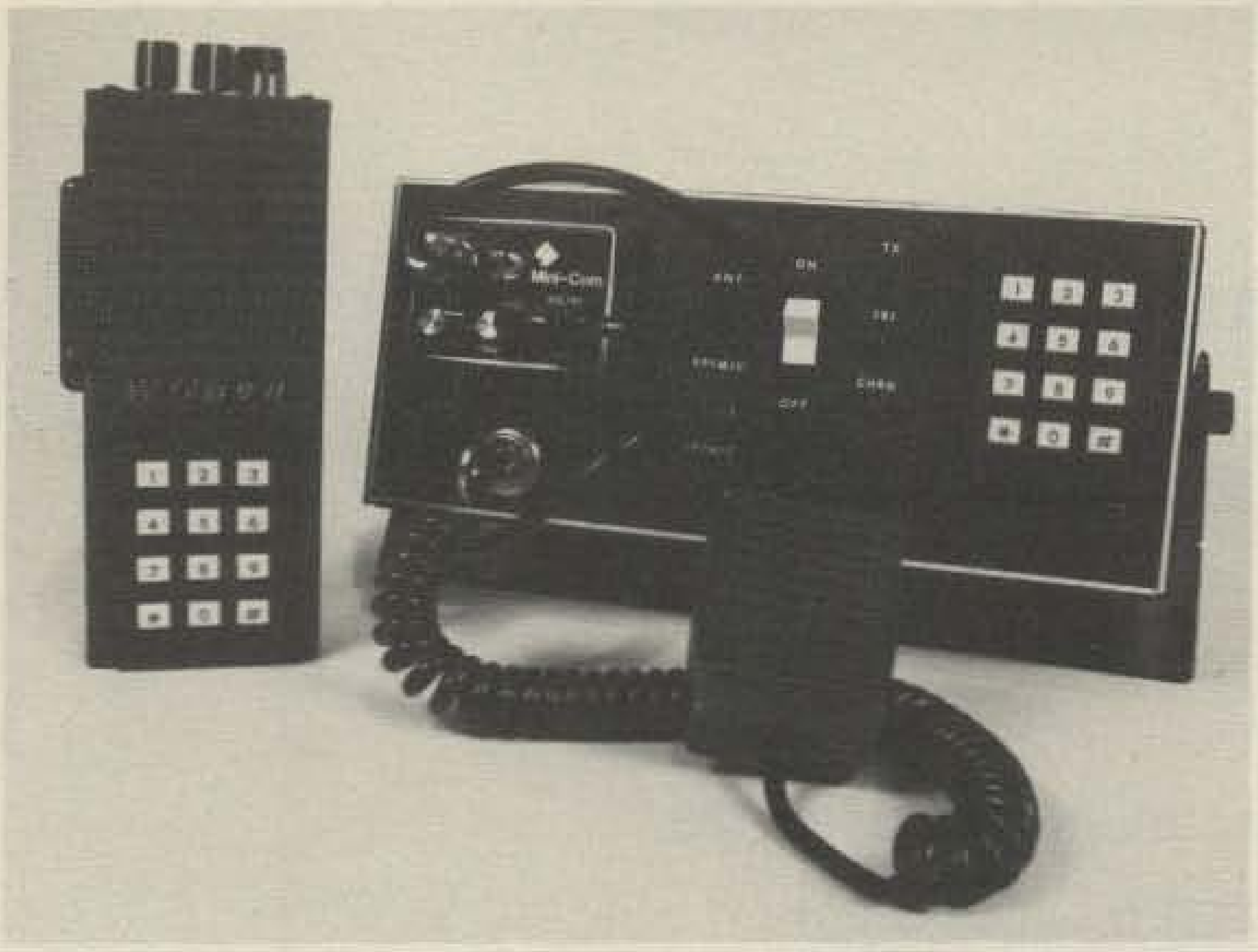
Wilson Electronics



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WA 440	Broad Band Amplifier	1-6	4	40	4.8
WA 480	Broad Band Amplifier	1-6	4	85	15.5
WA 2080	Broad Band Amplifier	10-25	20	90	11.0

MOBILE AMPLIFIER FEATURES

- 5-watt audio amplifier for external speaker.
- Automatic fast/trickle charge.
- Front panel Touch-Tone® Pad which allows generation of DTMF tones.
- Over and under mounting bracket for under dash, floor mounting or base station use.
- A Key-locking feature for security.
- Mobile antenna connect.

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☐	BP-4	Extra Battery Pack	19.00
☐	LC-3	Leather Case	15.00
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☐	TTP	Touch-Tone® Pad (Factory Installed)	48.50
☐	MC-12	Mobile Charger Only	135.00
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☐	WMH 480	80W Mobile Amplifier Charger	271.00
☐	WMH 440TT	40W Mobile Amplifier Charger with Touch-Tone® Pad	240.00
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If asked whom you talk to and how often, could you answer accurately? Here are the results of some research being done on this subject.

Does Anyone Know Who's Out There?

BY H. RUSSELL BERNARD*, WB8YMB

AND PETER D. KILLWORTH

Do hams remember who they communicate with? For that matter, does anybody? How can we find out? This article shows how the Monongalia Wireless Association amateur radio repeater, WR8ABM, in Morgantown, West Virginia, is helping to find some scientifically accurate answers to these questions. But first, why are these questions important? Who cares?

The fact is, a lot is at stake in people remembering *when* and *with whom* they communicated, *how much* they communicated, *how often* they communicated, and *what* they communicated. A lot of research in business organizations, for example, depends on this kind of information. Typically, a consultant goes to a factory or an office and asks people some form of the question, "Whom do you talk to?" Often, the question is "Who are the three (or five, or seven, or ten) people you talk to most here?" This is called "ranking." Sometimes, the question is put this way: "On a scale of one to five, how much would you say you talk to each of the people here?" Then the worker is given a list of the people in the office/factory and is asked to go through it indicating the amount of communication with each person. This is called "scaling."

When all this information is gathered, it is compiled (usually by computer) into a communications map, or network, which shows the cliques and work-groups in an organization, as well as the loners, the popular people, and the brokers or links between all these groups. On paper, this is powerful-looking stuff, and it is used a lot in organizational management. People are hired, fired, and moved around on the basis of this kind of data, and court cases are won or lost on the credibility of people remembering their communications. That is why it is important to know what people *can* remember about their communications.

Once you've decided to ask these questions, it ought to be obvious how to answer them. For example, if we ask people to guess whom they talked to during some time period (say, a month), then direct observation of their communication during that time should be all that is required to test the accuracy of their recall.

Unfortunately, things are not as simple as that. Different observers often see different behavior, and people may behave differently if they know they are being watched. In other words, we knew *what* data we needed in order to attack this important question, but we didn't know *how* to collect the data.

We solved the problem by finding self-monitoring networks—that is, groups of people whose communications can be *automatically* recorded. Dr. William Stokoe, Director of the Linguistics Laboratory at the Gallaudet College in Washington, D.C. offered his help. Gallaudet is the only college in the nation devoted to the higher education of the deaf. Deaf persons use teletypes (TTYs) as their normal means of non-face-to-face communication. Stokoe engineered an experiment.[1] He made a list of all the deaf users of TTYs in the Washington area, and he asked 60 of them to predict whom they would talk to (onTTY) during the next month. Half the group was then asked to rank their predicted communicants in order from most to least communication. The other half was asked to scale their predicted communicants from 1 (very little communication) to 5 (a great deal of communication). Then the 60 participants logged their TTYs, noting the number of lines of type for each call. After a month, each of the 60 was asked to recall whom they talked to on their TTYs. Again, the 30 who ranked their predictions ranked their recollections. And the 30 who scaled their predictions scaled their recollections.

Then we ran into a problem. What if the deaf TTY users didn't keep accurate logs? How could we know? It would be illegal (to say nothing of immoral) to tap into the TTYs and keep score ourselves.

That's when WR8ABM came to the rescue. Hams talk to each other publicly. In fact, we learned, many 2 m repeaters are logged automatically on tape. We explained our problem to the Monongalia Wireless Association in Morgantown, West Virginia, and requested permission to run an experiment. We explained to everyone that we were not interested in the content of

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the conversations, only who talked to whom, how much, and how often. The club membership (under Presidents William Jaker, WB8RAE, and Jerome Fanucci, W8JOF) agreed, and one of the members (James Belt, K8VSQ) set up the rig—a 2 m receiver coupled to a large tape deck through a carrier operated relay.[2]

Several months later, when no one was expecting it, we logged WR8ABM for a month. (A graduate student, Michael Holbert, settled down to the herculean task of timing all the conversations on the tapes.) Then we asked the 54 most frequent users to scale their communications with each of the other 53. We used a scale familiar to hams—0-9, from "no communication" to "a great deal of communication." As everyone knows, FCC regulations no longer require detailed logs for 2 m contacts. Some of the hams in the group, however, were from the "old school" and kept logs of all their QSOs. This gave us a built-in check to see if keeping logs helped people remember their communications. Also, some of the participants gave us both ranks *and* scales. Along with the split group of TTY users (the rankers and scalers), this gave us the chance to see if people were more accurate using ranks or scales. After all, if we found that people are more accurate on one than on the other, then any so-called "inaccuracy" would probably be the result of how we asked the question in the first place.

Finally, we studied two business offices of about 40 persons each.[3] Every 15 minutes, a researcher walked casually through the offices, noting each pair or group of people who happened to be talking to each other. Then, after a week of this, we asked people to tell us whom they talked to the most, next most, and so on. In one office we asked people to rank each other on "last week's communication" and then asked them to tell us the differences between last week and a "typical week." With this information we were able to test: 1) Are people more accurate in recalling their communications over a week than over a longer period (like a month)? 2) Does being observed (as in the office studies) make people less accurate about their communications than if they are not being observed (as in the study of WR8ABM)? 3) Are people's ideas about their "typical" communications a more accurate reflection of their actual behavior than their recollections of a specific time period? 4) Are people more accurate about their face-to-face communications (as in the offices), or their communications via intermediate technology (radio, TTY, etc.)?

As we said earlier, a lot of research (as well as practical applications) depends on the accuracy of the answers you get to the question, "Whom do you talk to?" Most people, especially hams, would like to believe that they have a pretty good handle on this information. But *do* people know whom they talk to?

Answering this in a scientific fashion turned out to be quite tricky; the statisticians haven't yet developed the appropriate statistics for us to use. So we had to develop our own. Out of the morass of all these statistics, we have selected one which should be of interest to hams.

Suppose a ham gave five people scales of 8 or 9 (the top scales). Then what he's saying is that he thinks he talks to those five people most. If he *does* do so, in fact, that's pretty good; he's 100% correct. Of course, if he really spoke to five other people most, his guess was a shambles; he's 0% correct. Most of the time, people are somewhere in between these extremes —20% correct if one of their five was guessed right; 40% correct if two were guessed right; and so on.

We can improve these percentage scores by choosing the most favorable cutoff (i.e. include scales 6, 7, 8, or 9; or 7, 8, 9; or whatever) for the group as a whole. Here's what we found:

Recall of how much *time* an individual spends talking to certain people:

DEAF TTY USERS	54% accuracy
HAMS	60% accuracy

Recall of how *often* an individual talks to certain people:

DEAF TTY USERS	58% accuracy
HAMS	68% accuracy

These figures, alas, are no cause for joy. Remember that we cheated slightly by choosing the "best" set of scales for each group; we've also cheated in that someone scaled 9 (i.e. who *should* be talked to most) has been counted as a correct score even if he was quite a ways down the list.

It looks from these figures as if hams do rather better than other groups. On the average, they do. But the spread on individual scores is painfully wide (practically zero to 100%), which means that—statistically, at least—we can't say positively that any one group is any better than any other.[4]

So here's what we have so far:

1. Hams do guess *better* than other groups we studied, but not noticeably so; in fact, people do not know with any real accuracy those with whom they communicate.

2. People's recollections of whom they talked to in the recent past are not significantly more accurate than their predictions of whom they *will* talk to in the immediate future.

3. People's guesses about whom they talk to in a "typical week" and their guesses about "last week" are equally bad.

4. The hams who normally keep detailed logs of their 2 m contacts don't do any better than the ones who don't keep logs, even if they actually refer to their logs in answering the questions, "Whom do you talk to?" Why on earth this should be so we haven't yet figured out. Are people's logs inaccurate (perish the thought!) or is their use of them inaccurate?

5. Some individuals *are* more accurate than others. Still, we found nothing systematically similar about the most accurate people. Age, sex, education—none of these seems to predict which person is going to be good at recalling his/her communications. (The results quoted here are statistical averages and do not predict who will be accurate and who will not.)

6. We asked some people to judge their communications on the basis of frequency; others were asked to judge on the amount of time spent talking; still others were asked to judge on the importance of the interaction. None of these produced accurate results. They were all equally unproductive.

The bottom line on this, so far, is that *asking* people about their communications (no matter how you ask them) is a very poor indication of their behavior. Presumably, if people can't recall their communications accurately, asking them about *any* behavior will produce suspicious results. Frankly, we don't know what to do about this. We are hoping to test other repeater groups, and we hope the readers of CQ will correspond and give us ideas for ways in which we can continue this work. Suggestions on new questions to ask, new ways to train people to be more accurate, and new technologies for experimentation would be most welcome. Send your suggestions to Dr. H. Russell Bernard (WB8YMB), Department of Sociology and Anthropology, West Virginia University, Morgantown, WV 26506.

Footnotes

[1] *Dr. Stokoe's work is supported by a grant from the National Science Foundation.*

[2] *Our work is supported by the U.S. Office of Naval Research.*

[3] *Data from one of the offices was collected by Dr. James Fox of Minnesota Systems Research, Inc.*

[4] *The significance of statistical scores is tested by methods we won't go into here. Anyone who wants to see the math on this should write to WB8YMB for copies of the original scientific articles.*

From WAS to WAC—one man's story.

Operating The Novice Bands

BY EDWARD D. HESSE*, WB2RVA

The last two QSLs finally arrived in the mail. As I had anticipated early in my amateur radio days, the last two states would be Alaska and Hawaii. The KL7 and KH6 cards were a welcome sight. I had worked—and confirmed—all states. The KH6 card also confirmed Worked All Continents—a double thrill.

I thought back to my first QSO which had taken place about eleven months before. It was WA2MGK, Dick in Johnson City, New York. It was my first QSO, proof that I was on my way to becoming an amateur. Proof, too, that someone out there could copy my fist and that I could copy his.

I had become a Novice in August, 1977. Like most new amateurs, all that I was interested in at that time was getting on the air and making contacts. After Johnson City, I went on to work Rhode Island. Then a third QSO, this one with another amateur in Johnson City (was my vertical antenna directional, I wondered; was there a pipeline on 80 meters to western New York?). After a week or two of enjoying the thrill of hamming, I started to think about the Worked All States Award. Could I do it? Was my station good enough to get a signal into all 50 states? And if so, how long would it take me to do it?

Looking back, I can see it took me eleven months to do it. This didn't break any records in hamdom, but it gave me an immense feeling of satisfaction. My rig and my vertical antenna—ground-mounted, no radials to speak of, and stuck in the middle of a backyard covered with large leafy trees—did the job. We (the equipment and I) had accepted the challenge of WAS and had done the job.

Sure, thousands of people have worked all states, and thousands more will. But what a kick when *you* do it! If you haven't done it yet, I'd like to pass along a few tips about things that helped me do it, while still letting me have a great time being an amateur radio operator.

The first thing I learned was to work at it. Get on the air, listen or call CQ, and work stations. Spend some time every day, if possible. A new amateur usually doesn't have to be encouraged to do this, I know, but it's good procedure after that first glow of hamming has dimmed.

Work as many bands as possible. My vertical, equipped with an 80-meter coil, permitted me to work (as a Novice) 80, 40, 15, and 10. And my log indicates that each band provided a good share of the final total of 50 QSOs. 80 let me work New England, the Middle Atlantic states, a bit of the Southeast, and some of the nearby Mid-West. It introduced me to my first DX as I started to make contacts with VE1, 2, and 3. It taught me something about propagation when, at six a.m. on a winter morning, I worked California—my first contact with the west coast.

40 helped me get away from home. My log shows an Oklahoma contact on 40, as well as Michigan and Minnesota. I was starting to pick up speed.

15 was especially good to me. It brought in the great Southwest, led me to the Pacific Northwest, and got me off the North American continent. I found out that some European voice stations would work the Novice 15 meter band, and that they were exceptionally patient and willing to work our weaker c.w. signals. This opening my eyes to the possibility of getting the Worked All Continents award.

10 meters gave me a few states I couldn't seem to find on 15 meters. Arizona, Iowa, and Utah were my reward for exploring this high band. Later on, it would give me Ascension Island.

Another guideline I followed was to upgrade my equipment. Entering amateur radio, I was fortified with an SX-99 receiver and a crystal-controlled HT-40 transmitter. Working with crystals was a combination of elation and frustration. It was tough to be stuck on 21.120 when a needed station was only 10 kHz away, but what a high when one night on a "dead" band, a CQ produced WDØDDT, all the way from Hill City, South Dakota! But I realized that if I was to work all states, I would have to upgrade to a v.f.o. or to a transceiver. With an eye to the future, I purchased a transceiver which put out 150 watts on c.w. and which would enable me to work side-band when I earned voice privileges.

I could have traded in the vertical for a beam, but I didn't. There aren't too many pileups for stateside stations, and the vertical eventually did the whole job for me. I wonder if the ARRL will endorse the WAS certificate to denote it was all done with a vertical.

As my code speed increased, I found myself more inclined to go

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after faster-sending stations. Not only could I decipher their call letters, I could copy them fairly solid and, when all else failed, I wasn't ashamed to ask them to QRS. This incentive to increase my code speed led me closer to my General ticket. I had an excellent reason to work on my c.w. speed: I wanted to talk to more stations.

I began to take a very scientific approach to my quest. And I worked more and more states. I eventually prepared a "target list" of states I had not yet worked. I could tell at a glance which states were needed. But how could I tell if a station on the air was from one of those states? I found two simple ways to do it.

I found that I was listening more, especially when the station sent its QTH. If it was a state I needed, I sat on the frequency and waited until the end of the QSO. Then I would call the desired station. I still remember the night I heard Red, W1WOD, in QSO with a new Novice. Red was giving him encouragement and praising him for his slow but clear fist. The QSO took some time, but when Red signed, I called him—and he answered me. An enjoyable QSO resulted, and I thought to myself that it sure beat calling "CQ Vermont."

But what about the QSO you stumbled onto after the QTH had been given? How could you know if the WD8 station was West Virginia (badly needed) or Ohio (which I had worked innumerable times)? My answer to this question was found in the *Callbook*. I purchased a copy and kept it by my rig. When I heard WD8AYN on New Year's Day, I quickly found out that Jim was in West Virginia. I called him and got my West Virginia contact.

With time, my list of target states dwindled. (The search gets even more interesting when you reach this point.)

I was missing four states when I got my General ticket. And I found that this opened up a whole new world for me, not just because of the voice privileges but because of the comfortable frequency spectrum in which to work. For example, on 15 meters, I picked up 125 more kHz of c.w. as well as 100 kHz of voice.

After I became a General in March, Idaho and Wyoming came quickly for me through voice QSOs, but Alaska and Hawaii continued to elude me. Oh, yes, I'd hear one every now and then, but so did many other amateurs who seemed to have the same goal that I did. I decided to become patient and let the sun spots improve propagation. While waiting for these two states, I found myself making more DX contacts, and WAC started to become more of a reality. As a Novice, I had worked North America, Europe, and Africa. As a General, I picked up Asia and South America. Only Oceania was left.

In June, I became an Advanced Class, giving myself even more spectrum to work with. My experience has shown that stations get even more exotic on the Advanced portion of the band. And one Sunday afternoon, I stumbled acrosss a KL7 who heard my 5×3 signal. I was now down to one state—Hawaii—which would also give me my Oceania contact for Worked All Continents.

The Radiosport contest came along, and my attitude toward contests changed. I had always thought of them as rather impersonal exchanges of signal reports. As a ragchewer, I usually disregarded them. But the realization occured to me that here was an excellent way to get Hawaii, Oceania, or more countries for DXCC (another goal now that WAS and WAC seemed to be winding down). I decided to work the contest in a modest way.

On Saturday night, I heard New Zealand out there. And so did a few other stations. I was patient since my brief contest experience taught me that eventually you will get to the calling station. The more powerful stations, those with the better antennas get in quick and then move away. After 20 or 30 minutes, my chance came. He heard me, Chuck, ZL1ADI, this fellow amateur halfway across the world, and he called me. Another thrill: hearing your call letters coming back across the oceans and continents, with a very generous "5 by 9, old man" report. Worked All Continents was now out of the way. And now it was down to one more set of call letters.

I tuned the band and heard KH6XX calling. Amazingly, no returned his call, and so I squeezed my mike button, giving my call. Across the Pacific Ocean, across the continental United States came my call letters followed by another generous signal report. I had worked all 50 states!

Of course, the award is given for confirmations, not solely for the QSOs. But I have never had a problem with getting QSLs for WAS. Novices are very good at sending QSLs, and YL operators are exceptional for sending them. In two instances, I sent a QSL a second time to a station (when I needed the state), along with a self-addressed, stamped envelope. Both stations immediately sent me the desired QSL. Once a station asked for an s.a.s.e., and I was glad to send it along. For states like Alaska and Hawaii, I automatically sent the s.a.s.e. since these operators get and inordinate amount of QSL requests, and the financial burden can be considerable otherwise.

I send QSLs immediately after working a station. I always send a QSL in an envelope (to protect my card's appearance), and I write a personal note on the card. When possible, I try to work a state or country more than once then QSL each station worked. This helps to guarantee confirmation of the state or country.

Worked All States and Worked All Continents have given me a new dimension in my ham life. They have moved me from somewhat aimless QSOs to hamming with a purpose. I have more pride in my equipment and, more important, in myself. These two awards are no mean achievement. And yet, I still love to rag-chew with the locals when 15 meters shuts down, and I will gladly work a country four or five times. Each contact is a new friend, a whole new avenue to explore.

DXCC looks like the next goal in my amateur life. It just seems to grow out of WAS and WAC. I've got 68 countries worked so far, with QSLs from about half of them. Ham radio is great, isn't it?

Here's a simple and effective way to get that coax and rotor cable into the QTH without smashing out the basement window. It's also cheap.

An Inexpensive Feedthrough System For Antenna Cables

BY ROBERT L. WOOD*, WA7DNN

I recently purchased a house and after getting settled in and everything more or less in its place it was time to start thinking of where to hang all the antennas. After getting the tower, beam, and antennas in place I ran into that small but frustrating problem of how to get all those cables "neatly" into the shack. After a few hours of figuring out the best way of solving the problem I hit upon an idea that is inexpensive but yet a flexible way of handling all those cables.

In the plumbing section of the nearest hardware store I found just what I needed - PCV pipe. There are all different sizes and types to choose from, depending on how many cables you have to run and their sizes. I selected the very cheapest 2″ size. The following is a list of materials I used:

2 - 2″ 90° elbows (PCV)
1 - 1′ straight PCV
1 small can of PCV cement

Total cost $2.43

The next step is to decide where to drill a 2″ hole in both the outside and inside walls. (NOTE: a word of caution before you go any further. Before you start drilling any holes be sure you don't drill into your house wiring, water pipes, etc.)

First, use a small bit (example: 1/8″) to drill a small pilot hole through the outside wall. Then insert a long sharp pointed instrument (I used a scribe for marking metal) through the pilot hole so it touches the back side of the inside wall. After insuring the scribe is straight, tap it lightly until the point just begins to protrude through the inside wall. This will provide a small but accurate mark to drill the 2″ hole for the inside wall. This in turn insures that both 2″ holes are properly aligned to accept the 2″ PCV pipe.

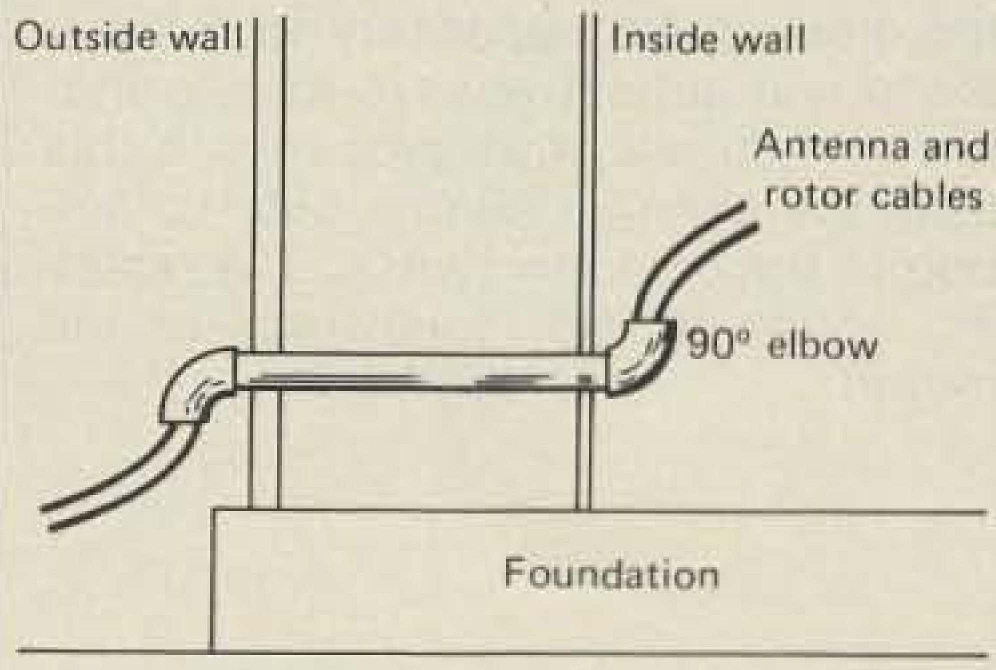

Fig. 1- It's just as simple as it looks. Take care not to drill through any plumbing or electrical work.

After drilling the two 2″ holes, the pipe can be tried for proper fit. Next, the inside flange of one of the 90° elbows can be coated with the PCV cement. Then insert one end of the straight pipe into this end of the elbow. Be sure this is done immediately after the cement is applied because the cement will set up quite rapidly. Reinstall the pipe back through both holes in the walls insuring the elbow is flush against the outside wall. Now you can mark the correct length the pipe needs to be from the inside wall, remembering you need to leave enough to be inserted into the remaining elbow. After removing the pipe and cutting to the proper length, reinstall it through the holes again. This time, insure the outside 90° elbow is pointing downward toward the ground, and the rim of the elbow is flush against the outside wall. At this point it helps considerably if someone holds the pipe from the outside in the above described position while you finish up on the inside wall.

Next, go to the inside wall and prepare the other elbow with cement for final assembly. Apply the elbow quickly onto the protruding pipe and into the angle you wish your cables to run.

After you run all your cables through the feedthrough, stuff both elbows full of foam rubber and this will keep the insects and the cold air outside. The elbows can be painted to match the exterior and interior surfaces as necessary.

This system has worked quite well for me and is an inexpensive and easy way to run cables through a wall. It is also fairly convenient now to add or remove cables as the need arises.

Hard to beat for $2.43 and 1½ hours of my time.

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a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

In the fabrication of electromechanical systems such as antenna rotators, automatic tuning sytems, etc., the control of a motor by means of external signals is often necessary. By utilizing various commercial techniques this control can often be quite precise and it is our aim this month to explain some of the servo-type hookups the amateur can utilize to realize precision motion.

The most elementary circuit of a servo-nature is shown in fig. 1. Although this is really quite basic, it is the idea that is important. The thermostat is chosen so that at some temperature it closes, completing the circuit and turning on the motor which is connected to a fan. The motor-fan-thermostat is then physically placed in an electronic enclosure and proceeds to cool the enclosures (along with the thermostat) whenever the temperature exceeds the preset valve. Here, an external stimulus, temperature, controls a motor which in turn varies the original stimulus - a complete, closed system.

This closed loop type of on-off control has many unique possibilities. In fig. 2 we have a mechanism that is ideal for a simple antenna rotator. You will notice that our motor, which is geared down to a slow enough speed to turn the antenna, is also connected to a common single pole 12 position rotary switch with all stops removed. Each of the positions of the switch is then connected to another 12 position switch, which connects all but one contact to its rotor depending on setting (a Centralab type). When power is now applied, the motor turns continuously until the open position is reached. Now, if both switches are carefully marked, the antenna can be made to move to any one of 12 equal positions over a 360° range. The only requirement here is that the speed of the motor be such that it does not overshoot the individual switch position when power is broken. In this case, the weight of the antenna and the slow speed necessary to move it alone will almost always assure that the system will work properly. In this case the external stimulus is the setting of the position switch. The resulting action is the "following" of the motor.

An apparant problem with the above system is that the motor always turns in only one direction making movement awkward (the coax cable to the antenna winds up). Fig. 3 shows a solution to this problem - the addition of a d.p.d.t. reversing switch. Now the system is bi-directional.

Fig. 4 is a somewhat more elaborate version of the servo control. This time a motor is made to move bi-directionally as a function of light. This particular application is a mechanism employed to keep a solar battery panel always pointed toward the sun. Operation of unit is fully automatic.

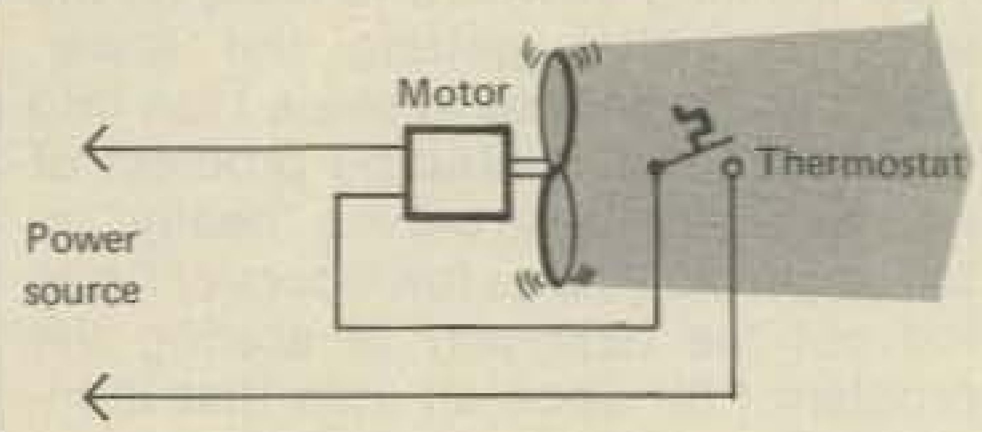

Fig 1- An elementary servo circuit.

As can be seen from from the schematic, two relays are used, one for clockwise movement and the other

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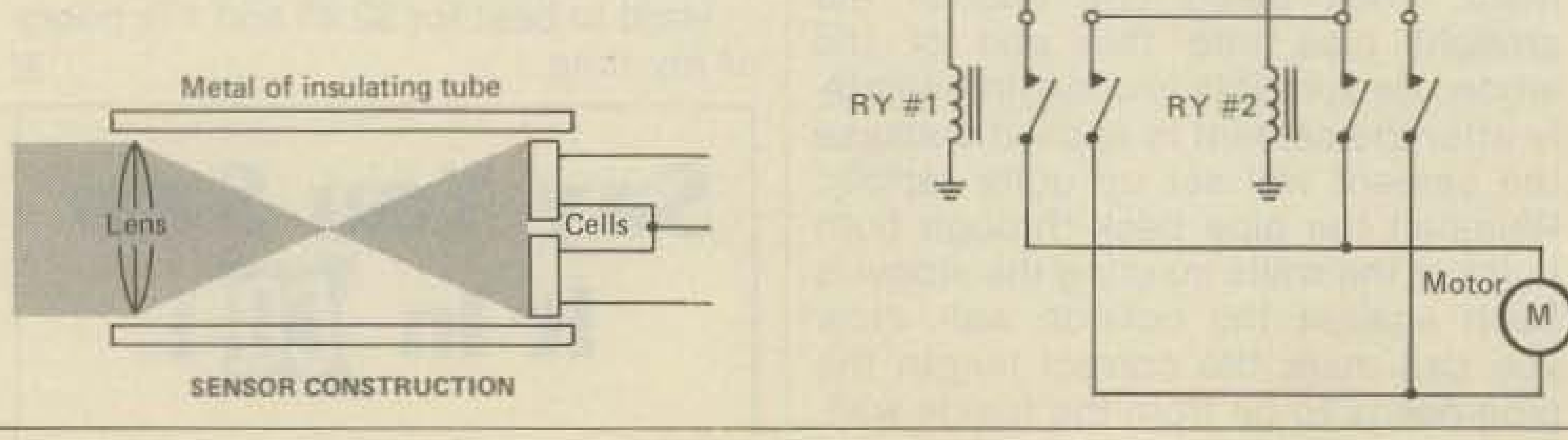


Fig. 4- The servo system described in the text. The relays are low power reed types such as the Sigma 191 series.

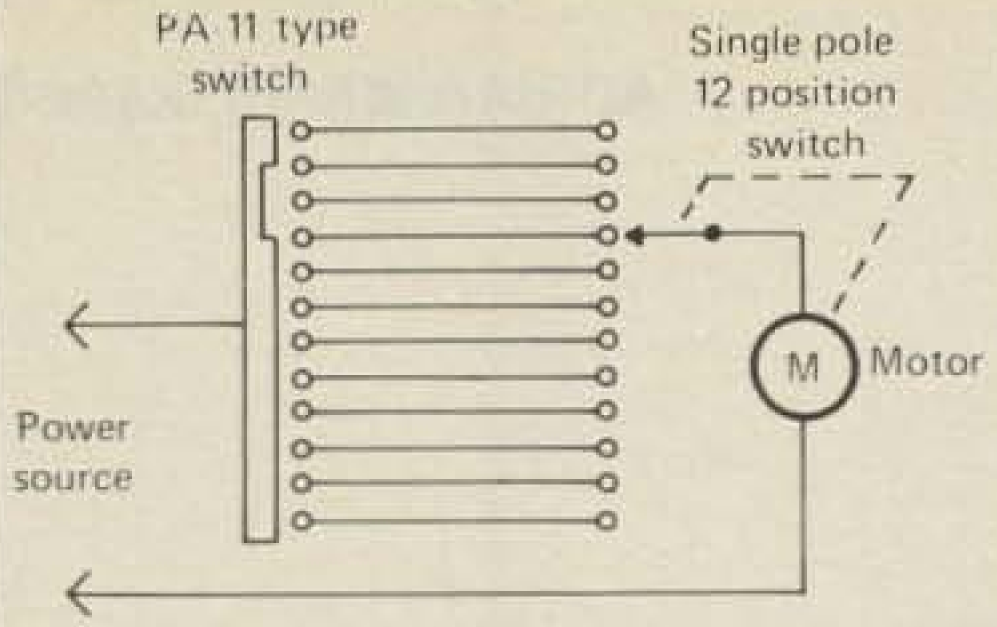


Fig. 2- A simple antenna rotator which is discussed in the text.

for counter-clockwise motion. Two end-of-travel limit switches are also provided to prevent damage when the motor reaches the end of its travel. The solar sensor itself is a unit made of two square or rectangular silicon solar cells of the 0.5-0.7 volt variety. They are mounted side by side and a lens is arranged to give a de-focused image of the sun that covers about two thirds of the area of both cells. The assembly is then mounted on the solar battery frame and aligned so that the solar cells are in a vertical plane and equally illuminated by the sun. Now, as the sun moves, one cell will be more illuminated than the other. This will cause the appropriate relay to come on and the motor will turn moving the frame until the light level drops to the point where the cells are again uniformly illuminated. If the motor should move too far, the other

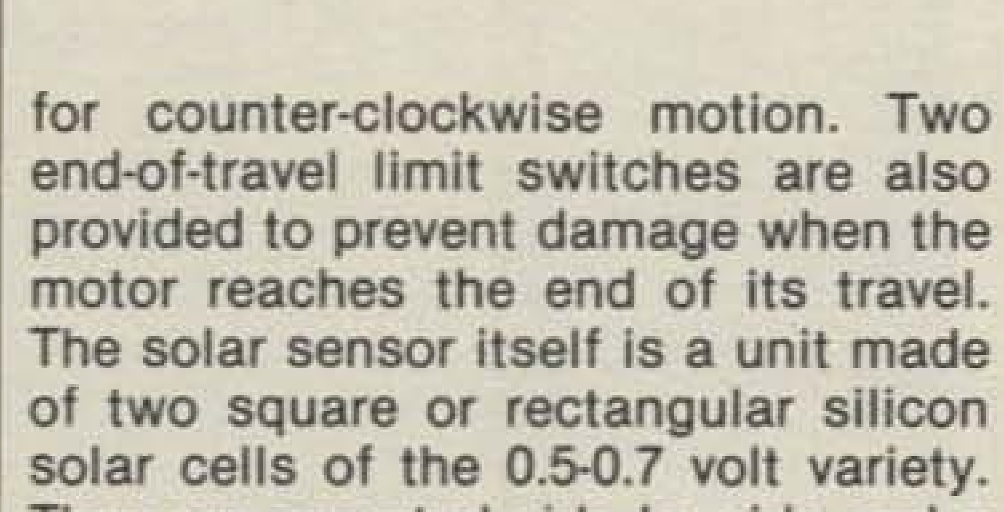


Fig. 3- By adding a reversing switch to the circuit of fig. 2, we make the unit bi-directional.

cell will operate its relay and bring the assembly back. Both light "channels" have separate sensitivity controls and these should be adjusted so there is a small region where neither relay is activated. This "dead-band" region is necessary for stability, otherwise the system will hunt back and forth. By careful adjustment and mechanical design, such a system can easily track the vertical path of the sun to an accuracy approaching a couple of degrees. By adding a second sensor, in a horizontal plane, a complete tracking system can be easily built.

Next month we will expand our discussion to variable speed circuits as well as the use of amplifiers and other devices in servo-type applications

73, Irwin, WA2NDM

a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

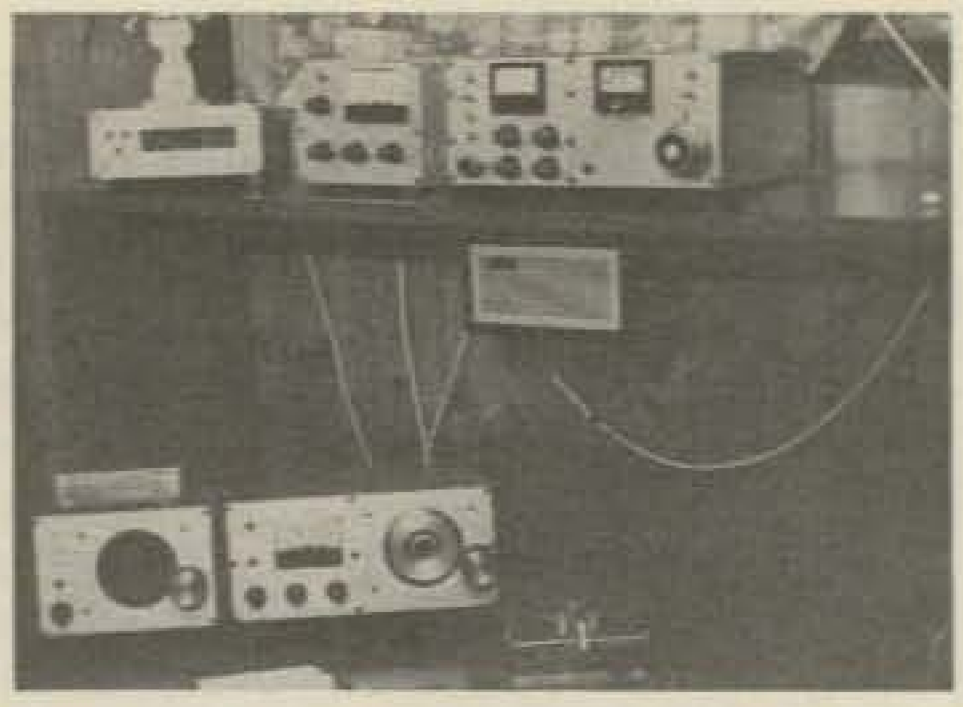
The Ultimate Achievement: DXCC MILLIWATT #2—GM3OXX

W8ILC was the first to demonstrate that one watt output was sufficient power with which to work 100 DX countries, and he was the first to receive the coveted DXCC MILLIWATT trophy on June 5, 1977, some six years after its inception. We had long awaited the first application for that award, and everyone was skeptical that anyone would actually claim it. (See story, *CQ*, April, 1978). Now, GM3OXX has become the second amateur in history to turn the trick, and has been awarded DXCC MILLIWATT #2, dated December 4, 1978. And he managed the task with homebrew equipment and nothing more than a simple 20 meter dipole a few feet above the roof of a four story building! George writes: "I am 41 years old and a wee fat, dark, hairy Scotsman. I am married, have one daughter, and work as a chief technician for Edinburgh University in electronics. I was first licensed in 1961 and have never run a transmitter at more than 20 watts input, so I'm a QRP man at heart. I started off on the h.f. bands with an old HRO and a transmitter with 5763 in the final. Apart from the old HRO, I've always been a homebrew nut (as the accompanying photo of my station shows), and also a c.w. fanatic, though I send as if I had two left feet! I joined the G-QRP-Club in the summer of 1975, and have been chasing QRP DXCC ever since. My station is all homebrew solid state and runs 2 watts input on all h.f. bands. Also have a 0.5 watt input 2 meter s.s.b. transceiver and lots of microwave gear that hasn't been out of its boxes for the last few years. I had my output power from my transceiver checked professionally by Marconi Communications Systems Ltd of Chelmsford and enclose the letter as proof of my under-one-watt output for the DXCC MILLIWATT award. (The letter reads— 'Dear Mr. Burt: I write to confirm the results of tests carried out today, on your amateur radio transmitter. The tests were carried out on the 14 and 21 MHz bands. Radio frequency power output at no time exceeded 950 milliwatts. We wish you every continuing success with your low power communication activities'.) The antenna here is a 20 meter dipole on top of a four story building and only a few feet above the roof. Height with respect to ground is about 60ft, and the wire runs NW-SE, not so good for W7 and KH6 and the like, so I'm still toiling at working my QRPp WAS. I hold several awards, all of which were earned with one watt or less output. These include the WAC from IARU; RSGB 2 Meter Award #312 for five countries and 30 counties with 1/2 watt input; Microwave Award, 165KM on 10 GHz at 10 milliwatts; and a 3cm Award for 3 countries and 20 counties with 10 milliwatts. My main transceiver is a c.w.-only unit which tunes 5.1-5.2 MHz. Output is on the level of a few milliwatts. This main unit can be seen in the accompanying photo at the center of the operating table.

"The main transceiver is designed

*83 Surburban Estates, Vermillion SD 57069

George Burt, GM3OXX, proudly displaying his hard-earned DXCC MILLIWATT #2, the second individual since 1971 to accomplish this seemingly impossible feat! George wrote: "Just a wee note to say many thanks for the trophy. It's one of the nicest things in my ham radio life. It has pride of place in the house—the XYL put it on top of the TV set!"



This shot of GM3OXX's shack reveals his bent for homebrew, and every piece of gear in it shows the top-quality professional job that he does! On the top shelf at the left is a digital clock with George's DX mascot on top, to the right of that an antenna tuner s.w.r. bridge, a 14-16 MHz transceiver with 2 meter converter built into it. On the desk top at the center is GM3OXX's basic transceiver for 5.1-5.2 MHz with which he worked the 100 countries for the award. To the right is his keyer. To the left, the large box houses a V.X.O. which George uses in combination with the transceiver, and which provides a total swing of 150 kHz using three crystals. Sitting on top of the V.X.O. unit is one of the six single-band converters used to put the 5.1-5. 2 MHz main transceiver on each of the ham bands. A homebrewer myself, I look with awe upon the type of equipment that George produces from scratch!

to work in combination with a group of solid-state transverters for each of the h.f. bands 1.8-30 MHz. The basic transceiver is rather sophisticated in regard to the receiver section, which appears to be able to provide excellent performance. The line-up, leaving out odds-and-ends, begins with a CA3028A 1st r.f. amp, followed by a MC1596 1st mixer with a three stage v.f.o. including automatic RIT, feeding a CA3038A 1st i.f. followed by a 500 Hz 9 MHz filter, another CA3028A 2nd i.f. followed by another 500 Hz 9 MHz filter and MC1596 product detector. Output from the product detector drives the S-meter and AGC circuits, and a two-stage 800 Hz IC audio filter and final audio IC output stage. The b.f.o. output to the receiver chain and transmitter mixer is taken through independant buffers, and b.f.o. frequency is shifted automatically during transmit. The transmit chain is simple, and consists merely of a MC1596 mixer and CA3028A r.f. amp delivering about 5mw at 5.1-5.2 MHz. It is then used to drive the transverter r.f. chain after mixing to the proper frequency in the first stage of the transverter. A receive mixer is also included in the transverter unit."

Our heartiest congratulations to GM3OXX for qualifyng for DXCC MILLIWATT #2, and for doing it from scratch, including designing his own gear and using a simple old dipole! Seems that he is truly representative of the pioneering spirit underlying QRPp activities!

Update on W8ILC—DXCC MILLIWATT #1

Word reached W8ILC via the grapevine that winners of the 100 country award qualify for a handsome plaque upon reaching 200 countries. Ron called me via landline and checked out whether or not this was true. True it was. He wasn't too excited, since N2AA had already copped the first 200 country QRPp award, and being second didn't seem to appeal that much to Ron—until he realized that N2AA qualified for the *200 DXCC QRPp 5 watt* award, not the *200* DXCC MILLIWATT *1 watt* award! So he then became excited! I invited him to send in the second 100 QSL's once he got them, and I'd ship out a plaque certified as #1. He said he'd think about it, but was kind of busy, and since he already had 255 countries QSL'd at the 1 watt level, he just might wait until he got 300 countries QSL'd and then send in the batch! I just about dropped my uppers. *225* countries QSL'd, *267* worked, with less than 1 watt output! Egads! Incredible. Then he divulged another goal— 5 Band DXCC with

DXCC QRPp Winners

1. K4OCE 12/71
2. W2GRR 6/19/75
3. K8MFO 2/28/76
4. W6PQZ 4/13/76
5. K2KUR/N2AA 5/3/76
6. OA8V 5/12/77
7. WA6SOV 7/7/77
8. G4BUE 11/20/78
9. OE1ZGA 3/18/79
10. WA2JOC 3/21/79
11. WB8IGU 7/16/79
12. VE1BQQ 11/8/19

DXCC MILLIWATT

1. W8ILC 6/5/77
2. GM3OXX 12/4/78

200 DXCC QRPp

1. N2AA 12/26/78

under 1 watt. "Nice" I said, not realizing that at this point he already had DXCC on 20-15-10 meters, and 74 countries on 75 meters, with a sad showing of 65 countries on 40 meters! Holy crow. *ONE* watt? What are the big guns going to feel like when W8ILC running less than one watt output nudges his way up through the 330's and into the 340's on the ARRL Honor Roll?

200 DXCC QRPp

N2AA was awarded 200 DXCC QRPp #1 on December 26, 1978. He continues a determined attack on the 300 country level. Haven't had a recent update from Gene, so can't report where he stands at present. I trust that he is still burning up the DX paths in search of new ones.

DXCC QRPp Trophies #8-12

Improved conditions and determination are contributing to an increase in applications for the *DXCC QRPp* award. In the past year or so, five operators have qualified. G4BUE led off in November of 1978, and the next two applications showed up on March 18 and March 21, 1979!

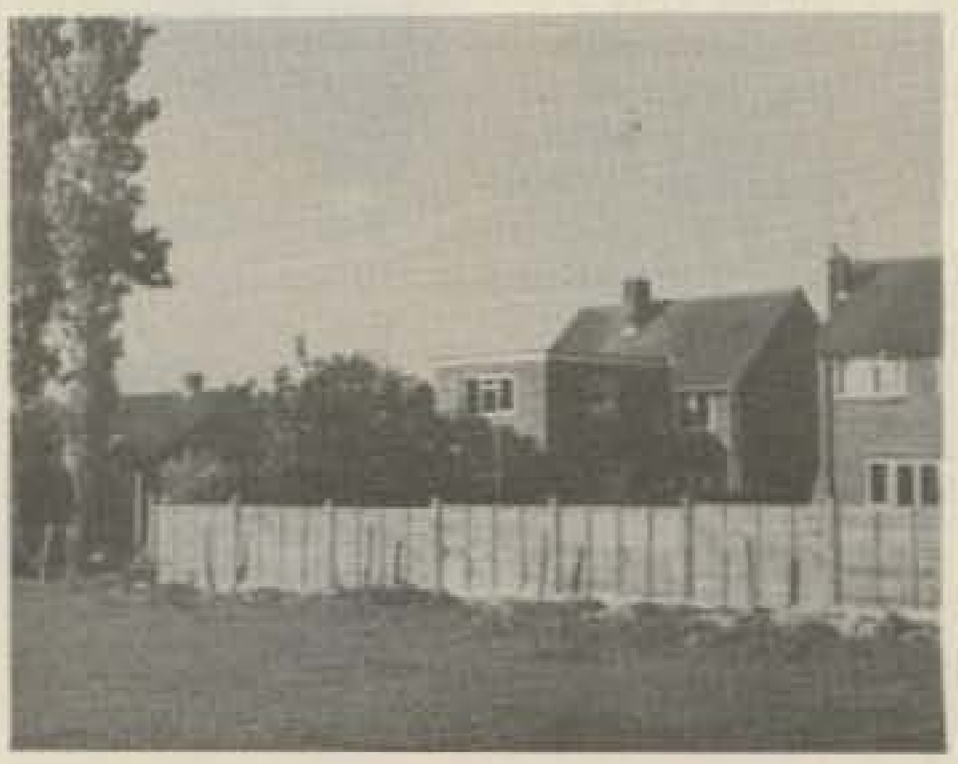
DXCC QRPp #8 winner, G4BUE, is a "second generation" type, having been introduced to QRPp operation via a contact with OA8V (who used G4BUE's QSL in his application for *DXCC QRPp #6)* on 3.5 MHz c.w. That contact showed Chris that it could be done, and he enthusiastically set out to do it! His story:

"I suppose I have always been one of those awkward people who believe in doing things the hard way, much to the annoyance of my wife and friends. It was, therefore, no real surprise when, after reading about the "Impossible Feat" of QRPp DXCC in K8EEG's column in *CQ,* I found myself considering it. I had already been

G4BUE at the operating position. The Argonaut and QRPp gear are at the left end of the table in front of Chris.

awarded DXCC for mixed modes, c.w., s.s.b., and as G4BUE/mobile, but QRPp seemed a real challenge. About that time I was concentrating on working c.w. DX on the bottom end of 80m for my five band DXCC, and on the 4th of February, 1976, at 0756Z I had a QSO with OA8V. 'What a catch,' I thought, 'Peru on 80m,' and off went my direct QSL complete with IRC's. You can imagine my astonishment a few weeks later when I received Paul's QSL telling me that during the QSO he had only been running 5 watts input to an Argonaut. I stopped bragging about my QSO with Peru after that, as I had been running our legal maximum of 150 watts input!

"That QSO with Paul sowed the seeds for QRPp DXCC, and the next stage was to acquire a rig. It was at the beginning of August 1976 that a friend in Brighton asked me if I knew anyone who wanted to purchase an HW7 that he had for sale. 'Now's my big chance,' I thought, and gave him 25 pounds, which I had to borrow from one of my



G4BUE's final location at which he worked the final twenty-odd countries to reach the 100 mark. This is a shot of the antenna he used. Actually, it isn't visible because it is just a wire strung from the chimney of the house to the cranked-down tower (30ft) in the trees at the left. Zoning problems forced Chris to complete his DXCC the hard way—without the aid of either his quad or 4 element yagi!

boys' savings account (since repaid!). I was living at North Chailey then and my antennas consisted of a two element boomless quad for 10-15-20 on a 60ft tower, and four sloping dipoles on a 75ft mast for 40 and 80 meters. My first QRPp QSO was at 2315Z on 5 August 1976 with WA2ZBW, quickly followed by XJ2UN at 2331Z. 'So it was possible to work DX with low' I said after the QSO, and I got the QRPp bug. By the end of August I had worked 36 countries including UL7, C31, UF6, UG6, UH8, and UI8. It was enough to make me realize that, although it was certainly possible to work DX with low power, it was going to require many hours of patience to work and confirm 100 countries. By the end of November I had worked 44 countries, adding KP4, 6W8, C5, and VP9 to the list. I then decided that I had earned a better rig, and got an HW8 in kit form. I found 80 an interesting experience on 3.5 watts input, and throughout the winter I concentrated on that band, being rewarded with over 30 countries, including the U.S.A. and Canada. This later allowed me to apply for the G-QRP-Club Countries Award, which is issued for confirmed QRPp (5 watts or less input) QSO's with 25 countries.

"Throughout the summer of 1977 I continued adding new countries until the end of June, when I had reached 69, including PYØ, ZS, A4, HI8, SU, PY, UM8, and perhaps the best DX of all, VK and KH6. The QSO with VK completed a WAC with 2.5 watts input. During this time I had been having several QSO's with N2AA on 20m c.w. He gave me a great deal of encouragement and then one day I received a phone call from Gene saying that he was in London for a few hours. By a strange coincidence I happened to be going to London on business that day and met Gene at lunch for a couple of hours, which was spent in a suitable drinking establishment talking about QRP and all that goes with it.

"Then came a move with my job and it was necessary to move to Hassocks, about 15 miles west of North Chailey. I was very disappointed at leaving my QTH, leaving behind 2/3 of an acre, and going to a much better house, but with a much smaller yard (and although I did not know it at the time— disaster). The N. Chailey QTH has served me well, although the total coax run to the quad was well over 500 ft! I have often wondered just how much r.f. was actually being radiated by the quad when running the HW8 at 2 watts input! Soon after moving into Hassocks and erecting the tower, disaster struck. My next door neighbor, but one, happened to be the road steward for the local amenities association, and on seeing my tower, spent many hours at his typewriter, sending letters to everyone he thought should know about it. The result was that I was 'invited' by the Local Authority to apply for a planning permission, which I duly did, and thanks to the efforts of my friendly neighbor who organized 56 written objections, was refused. A second application was also refused. I settled down to using dipoles for the h.f. bands strung between the wound-down tower (30 ft) and the house. 'This,' I thought, 'is not going to help my quest for QRPp DXCC,' and that is why the next new country was not added until November 1977 in the shape of 4U1ITU.

"Just as I was beginning to despair of ever working the 100 countries, something started happening to the bands. Cycle 21 was arriving, and all the stories I had heard about working DX in high sunspot years were beginning to come true. I slowly added to my score until the end of June 1978 when I had reached the 80 mark. During this time I made one of the QSO's that have given me the most enjoyment—ZL3GQ on 14 MHz c.w. using my dipole at 25 ft. Here I was working DX with not only low power, but also with a basic antenna. Using that dipole, I added VU, VP2M, 4X4, and ZD7 to the list. I then had another move with my job. I put on an appearance at work of being annoyed at being move twice within a year, but really I was pleased in that at last I would be able to get away from the local road steward. By this time, 28 MHz was beginning to be the band on which to work DX, and I was also beginning to wonder what it was like to work QRP s.s.b. I became the proud owner of an Argonaut in July 1978. What a beautiful transceiver this is, and what a thrill to have full break-in on c.w. I worked 20 new countries by the time I moved in mid-August. The 20th one happened also to be country #100 and was YV5CVU on 17th August. I thought this a fitting way to leave Hassocks.

"I have always maintained that the most difficult part of obtaining any award is obtaining the necessary QSL cards, and this award was no exception. By this time I had only 68 countries confirmed, despite a great deal of direct QSL'ing with IRC's. I estimated that I would have to work at least 120 in order to confirm 100! I had learned a great deal from my dealings with the planning authorities at Hassocks, and managed to arrange permission for my tower before purchasing a house at Upper Beeding. The water table was quite high in the area, and I thought it acceptable to use the tower at 30ft during the day, 60ft during the night. Within three days of getting on the air, I had worked a WØ in NEBR, W4FL, 6Y5, KP4, UAØ, VP2D, and a load of JA's, all with the tower at 30ft. It looked as though I had picked a good QTH, as I was actually going into pile-ups with my five watts and getting through, and guys were refusing to believe that I was only running five watts. I continued working new countries, but concentrated on obtaining the QSL's. On November 8 I reached my goal. The first post brought me a card from AP2P, which made #99, and a second delivery brought a card from SV1JI on Crete for #100! I had worked 124 countries which included such goodies as PZ, KL7, P29, VK2 (Lord Howe), H44, VS6, HM, 5W1, STØ, YB, HS, and a c.w. QSO with WØDX/D on Deseacho Island. It has been great fun, but I am not giving up, because I seriously feel that with conditions the way they are, it is possible to go for 200. Also I've started experimenting with really low power, and have already worked a W2 with 150mw input. Finally, I would like to say a big 'thank you' to Paul Wyse OA8V for initiating my interest in QRP, to Gene Walsh N2AA for helping me continue it, and to my wife Pam and twin sons Gary and Steve, for their patience and endless cups of tea."

Since qualifying for DXCC QRPp #8, Chris has worked about 120 with less than 1 watt output, and by the time this appears, will have qualified for DXCC MILLIWATT #3! He is approaching the 200 level with 5 watts. Currently, he is working with very low power DX at the milliwatt level. Congrats Chris!

DXCC QRPp #9—OE1ZGA, Tom Gabbert (K3TG). Tom works for the State Department, and was stationed in Vienna where he turned the DXCC QRPp trick. Tom writes:

"I've been a ham for almost 30 years, having started out as the junior op at TI2TG in late 1949. C.w. and DX quickly became my main interests, followed later by contests and a desire to build equipment on my own. The latter project turned out to be a QRP rig running about 15 watts input. It was a

A shot of OE1ZGA, Tom Gabbert, at the operating position before the addition of his QRPp gear.

Disaster struck at OE1ZGA during the winter of 1977. This is a view of the skyline of Vienna, with emphasis upon the twisted remnants of OE1ZGA's TA-33.

new experience and lots of fun. My interests changed, but I never really lost the thrilled feeling one experiences when making a QRPp DX QSO. I have really enjoyed working DX with my little HW7, and it never ceases to amaze me what can be done with such low power. Incidentally, I want to stress that all my work has been from scratch, that is, no skeds, no asking people to listen for my QRPp signal, or any other kind of pre-arrangements. The thrill of getting in there and calling one's fool head off and hearing the DX station come back is almost indescribable. Everyone should experience it. My most memorable contact was with 9M8HG on 14 MHz with the HW-7 running about 2 watts input. I called him in a modest-sized pile-up and nearly fell off my chair when he came back to "OE1ZG?"! I soon got my call thru and had a good contact with Horace, who could hardly believe it when I told him what I was using. Of course, the TA-33 beam helped, and I was relaying on the station receiver (75S-3) instead of the rather poor HW-7 receiver. Nevertheless, it was an exhilarating experience which I doubt can be duplicated in any other way. I used the HW-7 as the QRPp transmitter to work all these countries in combination with the 75S-3 receiver. The antenna is a Moseley TA-33 with the extended driven element and traps for 40 meters. The antenna is up about 120ft on top of a 7-story building in downtown Vienna, Austria.

"There are certainly many facets to ham radio and I don't think it is desirable to get stuck in a single rut. I think it becomes a more enriching and rewarding hobby when you branch out a bit and try something new once in a while, be it VHF, Oscar, RTTY, traffic, DX, contests, QRPp, etc. I strongly recommend QRPp as something to try if one feels like all the challenge is gone from what you're doing. You'll be surprised how much fun it can be!"

DXCC QRPp #10—WA2JOC, Bill Anderson. Bill currently has been doing a great job editing the newsletter of the QRP-ARC-I. He found time to work 154 mixed and 101 s.s.b. by the time he collected the 100 QSL's necessary for an all-c.w. trophy.

DXCC QRPp #11—W8IGU, Howard Hawkins. Howard notes:

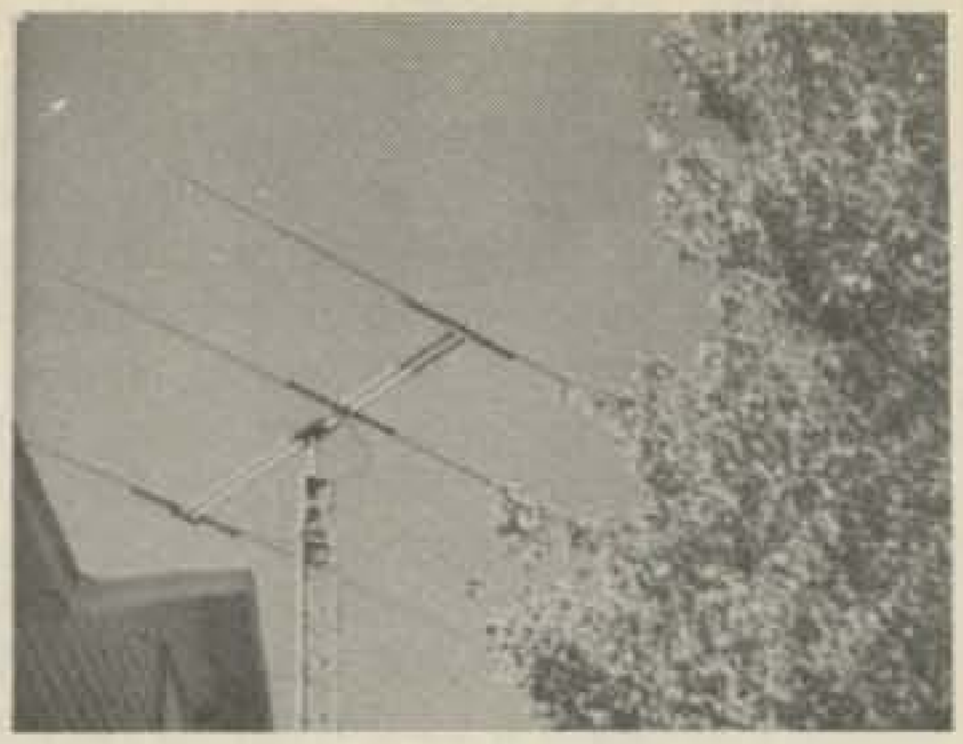
"I am DXCC chairman for the Michigan QRP Club. We have about 85 members now. W8LCU got me started in QRPp when he loaned me his HW-8 for my trip to Seattle on vacation. Used two lantern batteries to power it. Later I got my Argonaut 509 and I use it every day. 75% of my DX contacts were s.s.b. I now have over 2000 QRPp QSO's in the log, and about 800 QSL's. I started working for *DXCC QRPp* October 10, 1977, and my last QSO was on March 23, 1979. I now have 163 worked. I worked everything with my 509 and a 2 element quad. There is no more fun with high power for me. QRPp makes ham radio a real challenge. Thanks for offering the award!"

DXCC QRPp #12—VE1BQQ, Leon Fitzgerald. VE1BQQ was one of those "out of the blue" packets of 100 QSL's about which I had not been forewarned. He writes:

"Today, at long last, I received my 100th DX QRPp QSL, from FM7WO. Have worked 111 but the QSL's are very slow coming in. I live in the vicinity of Halifax, Nova Scotia, on a hillside which is not the best location, as there are hills to the west and north. I'm 52 years old and first got my license in 1946 (VE1AT) and was on the air for about 4 years off-and-on, managing to confirm 48 states and 49 countries using a 6L6-807 (50w) rig and six crystals! My receiver was an S-40A, and the antenna a doublet. During 1977 I applied for and received my present call after being inactive in the intervening years. I work as a technician in electronics, and have always wondered why DX couldn't be worked using very low power and a good antenna. When the HW-8 came out, I decided to give it a try (relive my childhood!). I purchased one in kit

VE1BQQ at his all-QRPp operating position. The HW-8 holds the position of prominence, and is accompanied by various accessories. The photo has another dimension to it though. Notice that most of the space is occupied by books! A QRPp operator must gain his advantage through knowledge, and that means a lot of studying about all of the factors involved in successful communications.

form, constructed it, and then constructed a wind-proof miniature 3 element yagi by VE7DKR (*73*, Nov., 1974). Each element has a loading coil in the center. Took three weeks to build it, and 3 months to tune it! I finally got it tuned and the s.w.r. is 1:1 at 14050 kHz and increases slightly at the band edges. VE7DKR called for thin-walled tubing, but it was not available, so I ended up using thick-walled tubing. The yagi weighs in at 43 pounds as result! I erected it myself. Boy, what a job! The neighbors thought I was crazy. The experiences that were most memorable to me: (1) First week on the



VE1BQQ's 43 pound miniature wonder 3 element yagi. Small but heavy! Leon put a lot of working into tuning the thing, and the results show that he did a good job. Unfortunate that he couldn't find any thin-wall tubing.

air and hearing and working KV4AA. I couldn't believe it as I had worked him a few times back in 1947-48. (2) Working OA8V in Peru while he was running QRPp. (3) Working UVØBB in Siberia under extremely poor conditions—just a whisper of a signal. The op there was a YL (Anna) and an excellent operator. Due to her perseverence our QSO was completed over a period of 30 minutes! (4) Working WAS with QRPp. I think I may try now for DXCC with 999mw or less if I can get my antenna up higher and figure out something better for 15 meters. The longwire is nothing to rave about. Well, I find this all very interesting, and want to thank you for making an interesting hobby more interesting."

Conclusion

Well, gang, that's it for another episode in the QRPp'ers quest for DXCC. What with the sunspot cycle peaking out, I suspect we'll have a rash of applications for both awards. Even so, these awards will still represent a great deal of hard work on the part of the winners. Applications consist of an alphabetical list of the 100 qualifying ARRL DXCC Countries, the QSL's verifying those QSO's, a signed statement indicating equipment used and power *output* not exceeding either one watt (DXCC MILLIWATT) or five watts (DXCC QRPp), plus a $20 fee to cover part of the cost of the handsome trophy. To WØRSP. Good luck to those of you working toward the award!

73, Ade, WØRSP

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The March, "Story of The Month" as told by Jim is:

JAMES H. LATIMER, WB9OOE ALL COUNTIES #230, 7-9-79

"When I was between the ages of seven and twelve, I remember wanting to become an amateur. Many, many years ago, I remember acquiring a 1 (one) watt or less transmitter and broadcasting from the workshop to the living room radio. I always purchased and attempted to read books and magazines about amateur radio, most of which seemed "way over my head".

"Real progress towards becoming an amateur did not begin until one beautiful evening when I stumbled across N9CP, Curt Peters, who became interested in my attempt to build a multi switch for two tape decks and a stereo unit. Curt invited me to his 'shack' to discuss the problem. About two years later, after many Sunday evening classes with two or three other aspiring radio people, I was certified, WB9OOE, with phone band privileges. Imagine, after approximately thirty years plus, the dream finally came true. A loan, a letter, one or two phone calls, and finally the rig arrived. With careful coaching and guidance from Curt, I was finally legitimately on the air.

"Within three days I had blown the finals. Curt had mentioned the County Hunters several times in our Novice and General classes. Once, back on the air, I stumbled across 3943 and gave WB5FNS a 7-9. This, of course, sparked animated conversation and I soon learned 'there ain't no such report'. Anyway, two or three days of trying and N7US, WAØBPE and WA3VLB collectively had me straightened out as to County Hunting objectives, procedures, etc., and I was almost addicted. The final blow came when K9DCJ, Arnie, showed me his collection of 'wallpaper' and kindly corrected some aspects of my QSLing procedure. I was hooked! No two ways about it, this was my bag, my cup of tea; these were my people.

"It is now some three years later and after many hours of sorrow and rapture, pain and delight, I can only describe County Hunting as life. It is as real as life. As K5IW remarked one fine morning: 'There is so much more to County Hunting than the 2-2s and 3-3s. That is what makes it such a fantastic hobby.'

Special Honor Roll
All Counties

#253 Albert J. Churchman, WA6AQR 11-8-79
#254 Evelyn Welliver, WB4RVW 11-13-79
#255 Benjamin J. Harte, Jr., WA3QVJ 11-13-79
#256 James H. Elias, WB9TKR 11-29-79
#257 James M. Carroll, W1UYL 12-3-79
#258 Don Krusen, WD6CQP 12-3-79

"After many days and nights of experiencing paperwork, pileups, QRM, QRN, rudeness, postal service failures, ignition noise, band conditions, as well as the growth, confidence and operative know-how that emerges from listening, timing, conciseness, sharpness, record keeping and final documentation, as well as the companionship, late evening 'rag chewing', 'soap boxing', right down through heartfelt thanks to W5AWT, WB4ZXP, K7LTV and others through all of it, and as a result of all of it, I guess I can say I am USA-CA All Counties #230, alias CC #230."

Jim Latimer, percussionist, conductor and composer, is head of the Percussion Department and Director of the University Percussion Ensemble of the University of Wisconsin—Madison. His interest in percussion has taken him across the country to survey the state of the art through research and personal interviews. He has lectured at three International Percussion Symposiums. *(Note: I am happy I could dig up this last paragraph about Jim.—Ed)*

James H. Latimer, WB9OOE doing his thing. Hi!

Awards Issued

Al Churchman, WA6AQR added All Counties to his fine collection. This was endorsed All S.S.B., All 14, All Mobiles.

Lyn Welliver, WB4RVW got all her records straightened out and claimed All Counties endorsed Mixed.

Ben Harte, Jr., WA3QVJ waited until he had them *all* before requesting USA-CA-500 through USA-CA-3000 endorsed All S.S.B., ALL Mobiles; and All Counties endorsed All S.S.B.

Jim Elias, WB9TKR also waited until he had them *all* and qualified for USA-CA-500 through All Counties endorsed All S.S.B.

Jim Carroll, W1UYL took time out from his world of finance and added All Counties to his fine collection.

Don Krusen, WD6CQP found time to do his complicated paper work to ob-

*P.O. Box 73, Rochelle Park, NJ 07662

tain USA-CA-2000, 2500, and 3000 endorsed All S.S.B., All 14, All Mobiles; plus All Counties endorsed All S.S.B., All 14.

Ron Moorefield, W8ILC gained USA-CA-500 through USA-CA-2500 endorsed Mixed.

Hans Hjelmstrom, SM6CVX received USA-CA-500 through USA-CA-2000 endorsed Mixed. His 1500 was #3 to Sweden and his 2000 was #1 to Sweden.

Pat Creapo, WD9BCG had me send her USA-CA-2000 endorsed Mixed.

Dean Cowden, WØCJG won USA-CA-1000 endorsed Mixed.

Jerry Burkhead, N6QA picked up USA-CA-500 endorsed All 2XC.W.

Ray Albright, W6KAW acquired USA-CA-500 endorsed All S.S.B.

USA-CA-500 certificates endorsed Mixed went to: Milan Dlabac, OK1AWZ, Bokuslav Petr, OK1VK, and Gus Bengtsson, SM6CYZ.

USA-CA-500 certificates endorsed All C.W. were shipped to: Vostry Cenek, OK1-18556, and Armas Hakkanen, OH2NQ.

USA-CA Honor Roll

3000		**1500**		**500**	
WA3QVJ	283	WA3QVJ	447	N6QA	1403
WB9TKR	284	W8ILC	448	WA3QVJ	1404
WD6CQP	285	SM6CVX	449	OK1AWZ	1405
2500		WB9TKR	450	OK1VK	1406
WA3QVJ	348	**1000**		OK1-18556	1407
W8ILC	349	WA3QVJ	566	SM6CYZ	1408
WB9TKR	350	W8ILC	567	W8ILC	1409
WD6CQP	351	WØCJG	568	W6KAW	1410
2000		SM6CVX	569	SM6CVX	1411
WA3QVJ	391	WB9TKR	570	WB9TKR	1412
W8ILC	392			OH2NQ	1413
SM6CVX	393				
WD9BCG	394				
WB9TKR	395				
WD6CQP	396				

Awards

Mexico DX Award: This Award is issued by the Mexico DX Club to licensed radio amateurs and SWLs for confirmation of QSOs with Mexican DX Club Members Stations, located in Mexico. XE applicants need 10 QSOs with 10 different Mexican DX Club Members. Zones 1 to 13 (North, Central, South America and Caribbean), except No. 6, need 5 QSOs with 5 different Mexican DX Club Members. All others need 3 QSOs with 3 different members. Send application with details of QSOs, XE QSL cards (Mexico DX Club members only) to P.O. Box 21-167, Mexico 21, D. F. Mexico. For safe return of QSL cards and Award, include 10 IRCs or $2 USA. Only contacts after January 1, 1973 are valid.

Worked All New Jersey Award.

Worked All New Jersey Award: The original Worked All New Jersey (WANJ) Award Certificate is again being offered by the Morris Radio Club to all amateurs having established and confirmed two-way communication with all 21 New Jersey Counties. For complete details and application form, send s.a.s.e. to: Awards Chairman, Morris Radio Club, P.O. Box 53, Whippany, New Jersey 07981.

Rainbow Ridge Radio Association Award: This certificate is being issued, on request, for QSO with any member on five or more bands. The RRRA was formed about five years ago on a mountain peak near Los Angeles, California and about two miles from the coast. The 20 acre site has a downhill view in all directions and is in a low noise, rural setting. The purpose of the group is to experiment with antennas and various modes of propagation on all bands from 160 meters through 1296 MHz. The combination of engineers, technicians, and scientists, along with the superb location, has yielded some startling results, including Europe on 6 meters and over 80 countries on 160. We have even established 10 meter backscatter QSOs off high sea waves. Contest operations have always been a part of our activity, mainly as a measuring stick for our program. The Award is offered in an attempt to increase awareness of our activity, in hopes that more people will try to work us on "other" bands. Even if they appear closed, we can sometimes get through, to the amazement of all. Active calls used include: N6DX (K6BCE), N6JA (WB6YBL), AD6C (W6PVB), KØRF (K6SEN), AE6E (WB6PXP), WA6NNJ. Apply to: L. Darrell Bevan, N6DX, 1562 Devonshire Avenue, Westlake Village, California 91361.

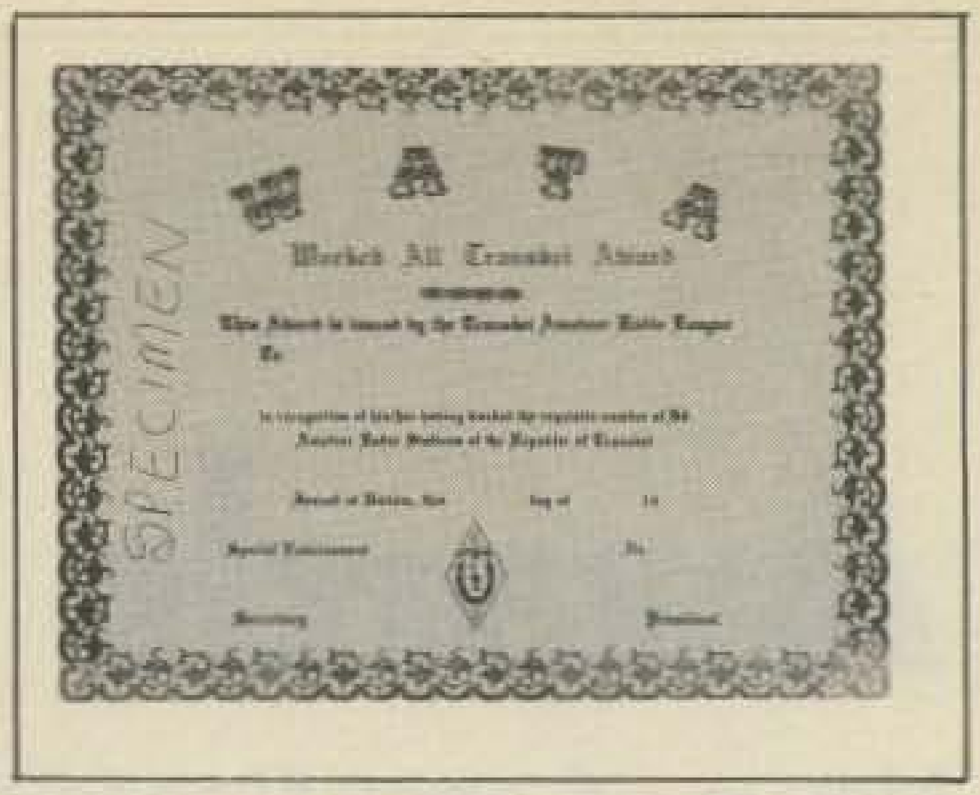
Endeavour Award: The Royal Naval Amateur Radio Society already sponsors two awards, The Mercury Award for contacting members of the Society and the Hampshire County Award for contacting amateurs in the English county of Hampshire. The Society now has great pleasure in announcing a third award called the Endeavour Award for contacting Society Members residing in Australia. The title of the award links the Royal Navy with Australia.

1. Award is open to all radio amateurs.
2. Applicants must establish two-way communications with RNARS Members residing in Australia. Points will be awarded on the basis of one point per VK RNARS member worked per band, after the commencement date of January 1, 1979. To qualify, the following is required:

For amateurs residing inside Australia . . . . 15 points
For Amateurs residing inside Oceania . . . . 10 points
For amateurs residing outside Oceania . . . . 5 points

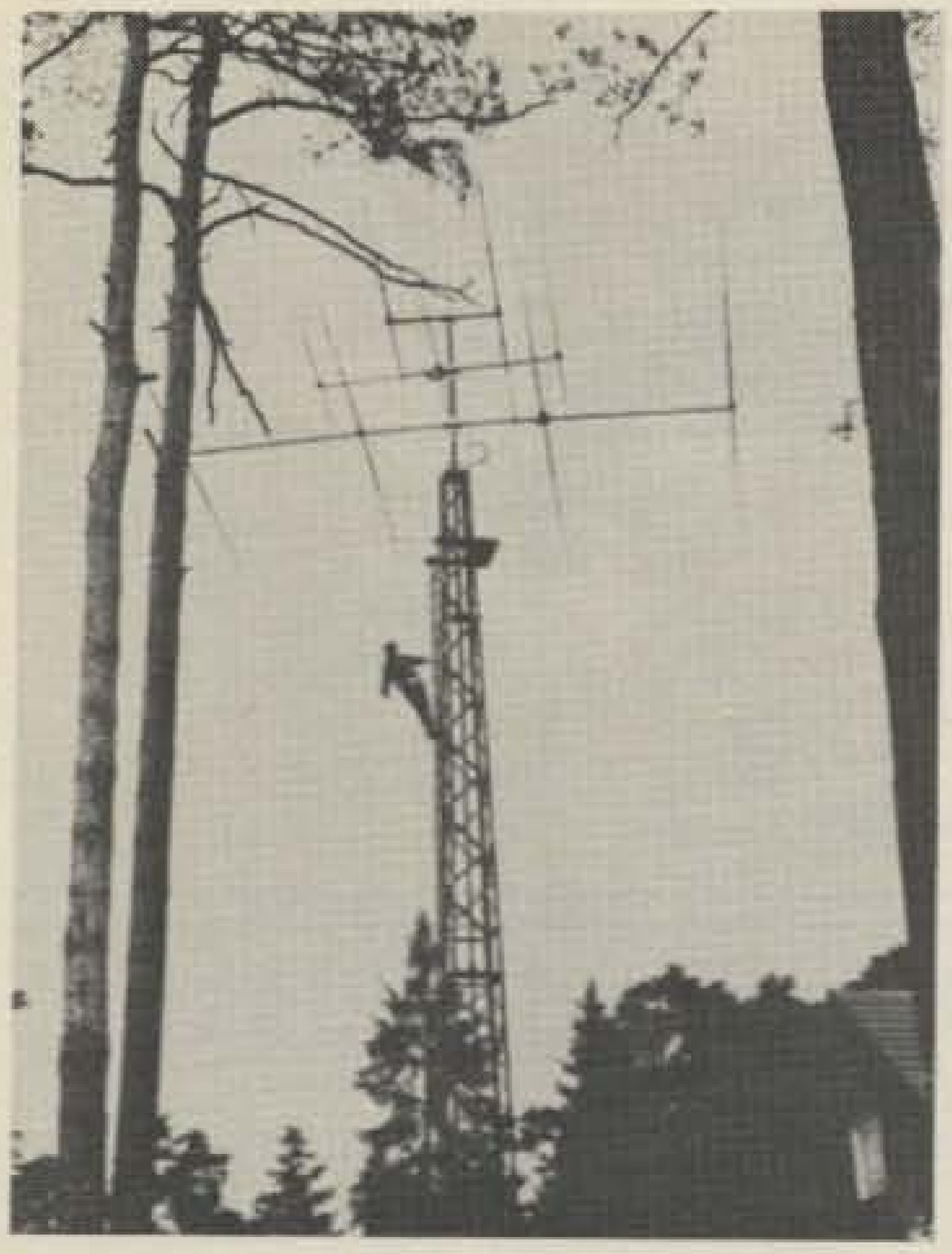
In addition, for amateurs residing outside Oceania, contacts with VK RNARS Members on the 3.5 MHz band will count double points. For the purposes of the award, any RNARS Maritime Mobile Member when located inside Australian waters may be counted as a VK Member.

3. The award will be endorsed ONLY on the request of the applicant and the following endorsements are available: All c.w., All s.s.b., All 3.5 MHz, All 28 MHz, All Novice, Five-By-Five, the last endorsement being for gaining at least five points on each of the five high frequency bands.
4. To claim the Award, no QSLs are required. However full log details showing the VK Member (or /MM + QTH) worked, their RNARS number, date, time, frequency, mode, plus an application fee of *$1.50 Aust.* or 7 IRCs sent to the Endeavour Award Custodian: Mr. R. Baty, VK5MD, 43, H.M.A.S. Australia Road, Henley Beach South, S.A. 5022, Australia. Please ensure all checks are in *Australian* currency and made payable to "R. Baty". The Royal



Worked All Transkei Award. Rules in February 1980 CQ.

Mexico DX Award.



Milan Dlabac, OK1AWZ's fine antenna system.

Naval Amateur Radio Society is open to any person of any nationality who is serving or a former Navy or Merchant Navy.

Guam Island Award: This award is sponsored by the Mariana Amateur Radio Club of Guam and is available to all licensed amateurs who conduct two-way communications with five different amateur stations on Guam. Contacts may be made on any band and via any mode. To apply, send log information, $1.00 or 5 IRCs, to: Guam Awards Manager, P.O. Box 445, Agana, Guam 96910.

NOTES

Next month I hope to tell you about some beautiful awards issued by REF (France) and some more awards from Japan.

The P.O.D. is no more. It has been combined with the Zip Code Publication and the cost is $7.50 and designation is #039-000-00261-2. Order from the Super. of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

How was your month?

73, Ed., W2GT.

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

High Frequency Radio Wave Propagation Predictions Part I of II

Last month's Novice column covered the callsign prefixes used by amateur radio operators throughout the world. It is reasonable to follow that article with information that should help you contact foreign (DX) operators who use those prefixes. This two-part article contains simple explanations of all major factors and terms associated with high frequency radio wave propagation and predictions. Next month's concluding part of this coverage includes real prediction data and explains how it can be used to consistently work DX contacts. It is hoped that this article will tell you enough about propagation so that you will be able to confidently use the excellent predictions of George Jacobs (W3ASK) published in each issue of this magazine, plus similar good data printed in other publications. No attempt is made to explain how propagation predictions are determined since several books and articles are already available on this complex subject. This coverage is just intended to teach you the fundamentals and to help you to effectively use predictions. As usual, you will derive more benefit from this material if you carefully read it several times. The explanations are simple but the subject matter is extensive.

At the present time, most long distance (DX) amateur communications occur on the high frequency band, which is 3 to 30 MHz and includes the 80, 40, 20, 15, and 10 meter bands. Consequently, this coverage is primarily directed towards high frequency propagation and h.f. propagation predictions. Despite the present predominance of the h.f. bands for DX operating, it should be understood that present and future amateur radio communication satellites are going to make it easier to work DX on very high frequency (v.h.f.) and ultra high frequency (u.h.f.) bands than on the best h.f. band under ideal conditions. V.h.f. and u.h.f. bands that are presently used for short range communications will be used in conjunction with satellites to provide better DX communication capability than has ever existed in the past. The frequency designations and limits should be understood and they are as follows:

	Designation	Range
e.l.f.	extremely low frequency	30 to 300 Hz
v.f.	voice frequency	300 to 3000 Hz
v.l.f.	very low frequency	3 to 30 kHz
l.f.	low frequency	30 to 300 kHz
m.f.	medium frequency	300 to 3000 kHz
h.f.	high frequency	3 to 30 MHz
v.h.f.	very high frequency	30 to 300 MHz
u.h.f.	ultra high frequency	300 to 3000 MHz
s.h.f.	super high frequency	3 to 30 GHz
e.h.f.	extremely high frequency	30 to 300 GHz

The preceding list shows the frequency ranges that are most commonly referenced in books and articles. There are, of course, many frequency ranges above the e.h.f. range, but amateur activity is presently very limited on such higher frequencies.

Wavelength Versus Frequency

The relationship between wavelength and frequency is easy to understand. Each radio wave has a definite physical length which is called its wavelength. Simply stated, a 40 meter signal has a wavelength that is 40 meters long. Since Americans are still more accustomed to working with feet and inches that with meters and decimeters, and since one meter is about 39.37 inches (3.28 feet) long, we commonly think of a 40 meter signal as having a physical length of approximately 131 feet, 3 inches. Radio and light waves travel at a velocity (speed) of about 299,796,000 meters per second, which is approximately 186,280 statute miles per second. These values are usually rounded off to 300,000,000 and 186,000, respectively, as a matter of convenience. Since a continuous series of 7,500,000 of these 40 meter sinewaves is generated in one second of time, the equivalent frequency of 40 meters is 7,500,000 Hz, which is more commonly referred to as 7500 kHz or 7.5 MHz. The relationship between frequency and wavelength is as follows:

$$\text{frequency in Hertz} = \frac{\text{radio wave velocity in meters}}{\text{wavelength in meters}}$$

This is Cal Lippitt (KAØDQB) of Rapid City, South Dakota. Cal operates a Kenwood TS-520-S transceiver with a manual telegraph (hand) key and a longwire antenna. He worked more than half the states in his first three months on the air, with most of his activity on 15 meters. Cal is a Captain in the Air Force. South Dakota is one of the tougher states to contact but Cal is making it easier for many amateurs to get that state confirmed. W6DDB enjoyed a recent contact with Cal.

2814 Empire Ave., Burbanks, CA 91504.

No - 73 - 74

or

$$f = \frac{300,000,000}{\lambda}$$

or

$$f\ (kHz) = \frac{300,000}{\lambda}$$

or

$$f\ (MHz) = \frac{300}{\lambda}$$

In the h.f. range, we usually find it simpler to work in MHz or kHz, so one of the latter two variations of the formula is commonly used.

It should be understood that the length of a 40 meter signal travelling through Earth's atmosphere of free space is 40 meters (about 131 feet) long.

Amateur radio band designations are more a matter of convenience than accuracy. The following listing shows the current h.f. amateur band designations, the actual equivalent frequency in each case, and the true frequency spectrum related to each band:

Band *(Meter Designation)*	Equivalent Frequency *(MHz)*	Actual Range *(MHz)*
80	3.75	3.5 to 4.0
40	7.5	7.0 to 7.3
20	15.0	14.0 to 14.35
15	20.0	21.0 to 21.45
10	30.0	28.0 to 29.7

You will note that in the preceding listing just the 80 meter band actually includes the exact equivalent frequency of 3.75 MHz. However, it is a lot more convenient to refer to a technically inaccurate 40 meter band than the technically accurate 41.1 to 42.9 meter band.

Sunspots

Sunspot activity is directly related to radio wave propagation and propagation predictions. Consequently it is worthwhile to know a little bit about sunspots.

A sunspot is a hole in the gaseous surface of the Sun. It is caused by a swirling magnetic vortex that carries hydrogen back into the Sun's core from its atmosphere. The origin of sunspots is not fully understood but we do know the affects they have on our communications. A sunspot looks very similar to the hole that appears in water as it swirls down a drain. When the sunspot hole occurs in the Sun's surface to suck in hydrogen, ultraviolet light and charged particles escape from the Sun. When Earth is in a position where it is struck by this solar radiation, communications are affected. Ultraviolet light reaches Earth from the Sun within eight minutes, which means it starts to improve our communications conditions the instant we see it. Charged particles can take up to 40 hours to reach Earth, and they degrade communications conditions by absorbing radio energy as they become part of ionosphere layers above Earth.

Short-term sunspot cycles are related to the Sun's rotational period. The Sun is a non-solid gaseous body. Its poles and core rotate faster than the gases at its equator. Consequently, sunspots near poles cycle every 22 days, whereas sunspots near the sluggish equator cycle every 28 days. Sunspots between these areas cycle every 23 to 27 days. Due to the preceding conditions, short-term propagation changes occur every 3 to 4 weeks.

Long-term sunspot cycles are related to orbits of other planets in our solar system, resulting in propagation condition peaks at 11, 22, and 180 year intervals.

WWV broadcasts a forecast of radio propagation conditions at 14 minutes past each hour on 2.5, 5, 10, 15, and 20 MHz. These broadcasts forecast radio propagation conditions across the North Atlantic Ocean for the following six hours. Current geomagnetic activity is included in this broadcast. The annoucements are first made in plain language and they are then transmitted in accordance with the following word and number system:

Current Geomagnetic Activity

Phonetic Word	*Meaning*
Whiskey	Disturbed
Uniform	Unsettled
November	Quiet

Radio Propagation Forecast

Numeral	*Meaning*
1	Useless
2	Very Poor
3	Poor
4	Poor-to-Fair
5	Fair
6	Fair-to-Good
7	Good
8	Very Good
9	Excellent

WWV and WWVH broadcast geophysical alerts at 19 and 45 minutes past each hour, respectively, on the same frequencies. The solar flux values transmitted in these broadcasts are about 50 higher than the sunspot number. The Zurich sunspot number has been used for more than 200 years. The Swiss Federal Solar Observatory at Zurich, Switzerland advises that the present sunspot cycle reached its peak of 153 in September 1979. This has been the third most intense cycle in the past 200 years of recorded sunspot activity. It has also been the most intense since the cycle that peaked in 1958. The smoothed sunspot number is expected to decrease from 150 in January to 132 by December 1980. This decrease in sunspot activity makes it increasingly important to use propagation data wisely to assure optimum DX operation.

The Institute of Telecommunication Sciences in the Environmental Sciences Services Administration issues monthly high frequency propagation predictions for each following three month period.

Radio Wave Propagation

One definition of *propagate* is to cause to spread out to affect a greater area. In essence, that is what we amateur radio operators do; we transmit radio waves to other areas. Radio wave propagation involves electromagnetic waves travelling through a medium such as air, insofar as most amateur communications are concerned. However, radio waves can be propagated through the Earth and along the surface of the Earth, as well as through the atmosphere. Radio waves can also be refracted off an ionosphere layer and reflected off Earth's surface, resulting in one or more distant points of two-way radio communication capability. They can also be propagated by scattering, such as tropospheric scattering, which is discussed later in this article. Propagation loss is, of course, the difference between the signal levels at transmitting and receiving points.

The electrical conductivity and the dielectric constant of the Earth's surface and atmosphere are very different from each other and they often vary a great amount within themselves. Conductivity ranges between about 0.0001 mho (conductance) per meter in city areas to about 0.01 mho per meter in rich agricultural areas, providing as much as a 100 times difference between various areas. Conductivity in sea water is about 5 mhos. Remember that conductance (mho) is the opposite of resistance (ohm). This means that salt water is about 500 times more willing to propagate a wave than rich agricultural earth. Similarly, the respective dielectric constants of city land, rich agricultural land, and sea water areas are about 3, 15, and 80. Atmospheric peculiarities will be covered in detail later in this article.

V.l.f. ground wave propagation is often good up to several thousand miles, whereas h.f. losses are so great that h.f. propagation may be limited to just a few hundred miles through the Earth's surface.

M.f. and h.f. radio waves are mainly propagated by ground wave and ionosphere refraction. Severe fading (selective fading) occurs when ground and sky waves are received at some distant point where the two are sometimes in phase (loud) and at other times are out of phase (weak).

Typical h.f. communication distances (in miles) at this point in the 11 year sunspot cycle are as follows:

Band	Day	*Night
160	25	2000
80	200	4000
40	500	8000
20	worldwide	1000
15	worldwide	25
10	worldwide	15

**This is late night and early morning when ionization is at lowest levels.*

Refraction and Reflection

This article refers to radio waves refracting off ionosphere layers and reflecting off Earth's surfaces. Reflection is well known to all of us since it is the phenomenon whereby a wave striking a material, with different propagation characteristics than the one in which it has been travelling, is returned to the original medium with the angles of incidence (input) and reflection (output) being equal to each other and lying in the same plane. If a billiard ball is shot directly at a cushion at a 90 degree angle, it will reflect directly back towards the point from where it was stroked. If the ball is shot at the cushion at a 45 degree angle, it will reflect off the cushion at a 45 degree angle away from the point where it was stroked. Radio waves reflect off the Earth's surfaces in the same manner. However, reflection is more complete and less distorted from a surface such as an ocean than from a mountain. Long distance (DX) signals are often easy to detect due to their distortion.

Radio waves are not reflected off an ionosphere layer; they are refracted.

Here is Billy Maurer (KA2DLB) who lives in Hudson, New York. Billy is ten years old and he obtained his Novice license in December of 1978. His rig is a Kenwood TS-520 transceiver and he usually operates on the 15 meter Novice band. Billy's mother advises that he made 28 contacts during his first five days on the air. The first DX QSL card he received was from Finland.

Refraction is a change in the direction of wavefront motion, as caused by a wave passing from one medium to another at an oblique angle. Simply stated, as a radio wave enters the bottom side of the ionosphere layer, the top edge of the radio wave is greatly accelerated, causing the radio wave to be bent back down towards Earth. The effective height of travel of a refracted radio wave is the height to which it would have to travel to be reflected to the same point on the Earth's surface if it had been reflected instead of being refracted. For our purposes, refraction can be thought of as a simple bending of radio waves.

Troposphere

Radio waves are not always refracted off an ionosphere layer to achieve long range communications. Refractions can also occur within a single medium that has different characteristics. A common example of this is a layer of hot (thin) air sandwiched between two layers of cold (dense) air. When a v.h.f. or u.h.f. radio wave gets trapped in such a tropospheric sandwich, it may travel for an unusually long distance before it encounters a point where the bottom cold layer is no longer pronounced enough to prevent it from returning to Earth. This phenomenon is called super-refraction and it produces long distance two-way radio communication capability on frequencies that are usually just good for line of sight use.

The troposphere is Earth's lowest atmospheric level. It extends to a height of about 12 miles at the equator and 6 miles at the poles. Clouds form in this area and convection is active. Temperatures generally decrease at higher altitudes. Tropospheric super-refraction is the phenomenon occurring in the troposphere whereby radio waves are bent enough to be returned to Earth. This may result in a single hop (on skip) or the signal may be trapped and travel for a long distance as described in the previous paragraph.

Basically, tropospheric wave propagation involves a radio wave that is propagated to some distant point on Earth by being refracted off a point of abrupt change in the dielectric constant, or its gradient, in the troposphere.

Tropospheric scatter communication is also known as tropo communication. This is the propagation of v.h.f. through s.h.f. radio waves by scattering, due to irregularities or discontinuities in the physical properties of the troposphere. This system transmits 100 to 8000 MHz signals through the troposphere to provide communications between points that are 70 to 600 miles apart on Earth. These moderate communication distances can be extended to thousands of miles by a series of retransmissions. Tropo communication requires high power transmitters, frequency modulation, and extremely sensitive receivers.

The atmospheric refractive index is an important factor in radio wave propagation, as indicated in the previous paragraph. Forward scatter communication involves the propagation of electromagnetic waves, at frequencies above the maximum usable frequency (m.u.f.), by scattering small portions of the transmitted energy in many directions when the signal passes from a non-ionized medium into an ionosphere layer. Forward scatter is a term which collectively refers to v.h.f. forward propagation by ionospheric scatter and u.h.f. forward propagation by tropospheric scatter communication techniques.

Summary

This concludes the first part of this two part article with the most interesting part to appear next month. This month's coverage establishes the foundation for the concluding part. It is advisable to read both parts of this article to obtain a basic understanding of this vitally important subject.

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to *CQ*. A brief description of operating activities and some personal background information are needed with your picture. 73, Bill, W6DDB

a regular feature by

THEODORE J.COHEN N4XX

dateline... Washington, D.C.

The ins and outs of the Washington scene

ARRL Responsible For "Sorry Episode" On Article 41

Editorials in the October and November 1979 issues of *QST* notwithstanding, it is the ARRL...and not the FCC...which is chiefly responsible for recent problems concerning the code requirements embodied in Article 41 of the International Radio Regulations.

As stated in R.L. Baldwin's editorial of November 1979: "The history of this sorry episode begins more than four years ago, with the formation of the FCC Advisory Committee for Amateur Radio (ACAR). The task given to the ACAR was to make recommendations to the Commission as to the WARC proposals the U.S. should make. In the end, however, the ACAR recommendation (on Article 41) was that no changes be proposed."

That no changes were proposed and, indeed, that the matter was not even given deliberate consideration by ACAR, was the result of an emotional plea from the ARRL's representative to the ACAR, M. Glunt, that the matter of Article 41 not even be discussed in the committee. The fear of the League, according to ACAR members recently interviewed in the Washington, D.C. area, was that for the committee to discuss the matter could open the door to changes in the international code requirements.

Amateurs familiar with WARC preparations, however, will recall that the Canadians had under consideration a proposal to change Article 41. As such, it only seemed reasonable to many ACAR participants that the U.S. committee should, at the least, prepare alternative positions, lest the U.S. enter the WARC without fallback recommendations. In the face of the ARRL's stonewall position, however, the matter was quickly dispatched with a "no change" position sent to the FCC.

As this is written, a proposal by Papua New Guinea is being voted upon. This proposal lowers to 30 MHz the frequency limit for code-free licensing. Given that only the 50 MHz band is affected by this change, the position, if adopted by the WARC, would apparently meet with the approval of amateurs worldwide.

But the ARRL's campaign against the FCC in the matter of Article 41, a matter which could have been resolved in the ACAR had the ARRL not prevented a debate on the code-free issue, has backfired.

It is true that the Commission and the Congress received many letters from amateurs who lashed out at the Commission for the pre-WARC position on Article 41. But each letter received had to be answered, and so, it seems likely that personnel in the Private Radio Bureau were diverted from other tasks in support of the amateur service to the preparation of personal and congressional responses. Then, too, congressional inquiries into the matter, regardless of what the facts may be, served only to focus unnecessary attention on the Commission at a time when it is striving to rebuild its capabilities.

The Article 41 matter is a sorry episode in amateur radio. What's more, the whole affair would probably never have happened if the ARRL had permitted discussion of Article 41 in the ACAR.

FCC Chairman Angered By Discussion Over Code

In November 1979, the Commission met to discuss, among other items, the matter of Docket 78250. This docket addresses an inquiry by the Commission into means by which the amateur code requirements should be handled for handicapped individuals.

In the course of the meeting, Mr. Carlos Roberts (Chief, Private Radio Bureau) presented the commissioners with four alternatives, including a proposal to lower the code-speed requirement for handicapped individuals. Chairman Ferris, angered perhaps by the recent Article 41 debacle, stated that the code requirement should be dropped for everyone! Further, Chairman Ferris wanted to change the code requirements as soon as possible.

Roberts, of course, noted something that Chairman Ferris knew too well...that no changes could be made which were not consistent with Article 41 or with the Administrative Procedures Act. But it is interesting to note, as well, that no one at the meeting spoke up in defense of the Morse code (an ARRL representative was not present at this open meeting of the commissioners).

If, as it is believed, the matter of Article 41 has indeed angered the Commission, in general, and Chairman Ferris, in particular, it would serve to underline the need for establishing new ties with the Commission so that matters such as the Morse code can be discussed in a rational, unemotional manner.

FCC Seeks Dialogue... Not Confrontation... On Morse Code

According to Mr. Richard Kenney, Office of Public Affairs Liaison (Private Radio Bureau), the Commission recognizes that the amateur service involves the use of basic communication concepts, including the Morse code. However, there are those who argue that there should be a place

*8603 Conover Place, Alexandria VA 22308

in our service for people who are technically qualified, but who are deficient in their code proficiency. Thus, according to Kenney, the Commission feels that it may be desirable to consider alternatives to the current Morse code requirements.

Kenney was quick to note that the Commission does not want to eliminate the code requirements in their entirety. It only wishes to consider alternatives to the code requirements at this time. Thus, the Commission is seeking a dialogue with amateurs and others in this matter, and it hopes that the response will be well thought out, rational reasons why (or why not) the Morse code requirements should be retained in their present form.

CPSC Calls For Antenna Safety Standards

R. David Pittle, commissioner of the Consumer Product Safety Commission recently stated that a mandatory safety standard is needed for CB antennas. His concern results from the fact that about 200 people in the U.S. are electrocuted every year while installing CB antennas. According to the IEEE: "The danger to be addressed is that antennas accidentally touching high-voltage power lines during installation or removal is now the largest single cause of electrocution in the U.S."

The proposed standard is to be ready for consideration by the CPSC on 30 April 1981. To submit comments on the standard, contact the Office of the Secretary, U.S. Consumer Product Safety Commission, 3rd Floor, 1111 18th St., N.W., Washington, D.C. 20207.

At this time, no mention has been made by the CPSC on the need for mandatory safety standards for amateur antennas.

RFI Complaints Total 15,825 in 4th Quarter

RFI Complaints to the FCC in the 4th Quarter of FY 79 (July, August and September 1979) totaled 15,825. This number is somewhat lower than the number of complaints received in the 3rd Quarter (17,942), but the decline was expected for reasons due to seasonal factors.

Of the complaints received in the 4th Quarter, 12,065 cited a television receiver as the victim. Interference to TV reception by CBers accounted for 9891 complaints, while amateur operations were cited in 525 cases.

One disturbing statistic which emerged in the 4th Quarter was an increase in amateur complaints about other amateur operations. In the 4th Quarter, the Commission received 377 such complaints (as opposed to 295 complaints in the 3rd Quarter). Many of these complaints relate to co-channel interference, something which a so-called "self policing" service should be able to resolve without Commission intervention.

FCC Considers Advisory Committee On RFI

As reported in *Electronic Engineering Times* (5/12 November 1979), the Technical Standards Branch, FCC, is planning to recommend that the Commission create a joint government/industry advisory committee on r.f.i. The Branch's action stems, in part, from the public's response to the FCC's notice of inquiry (NOI) on r.f.i. That r.f.i. complaints to the Commission are on the increase was also cited as a factor in the Branch's planned action.

If an advisory committee is formed, it will certainly be forced to consider whether the manufacturers of home entertainment devices should be required to incorporate better shielding and filtering in their designs. At this time, however, neither the Commission nor the electronics industry wants mandatory standards for r.f.i. immunity.

Let us hope that if an advisory committee on RFI is created, it will lead to the manufacture of electronic home entertainment equipment which is better suited for the rf environment of the 1980's!

Commission Continues To Investigate Jamming By Amateurs

According to the Commission, two individuals who were heard to cause interference to WESCARS operations have been investigated, and were found to have been in violation of FCC amateur regulations. In both cases, citations have been issued for the violations observed.

It is encouraging to note that similar investigations are underway into the activities of amateur operators who have been observed to interfere with the operations of EASCARS and the Intercontinental Traffic Net.

Your Washington editor thanks Mr. Jeffrey Young, FCC, for his contribution to this month's column.

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

The 5-Band WAZ Certificate Is Back

When the readers talk, *CQ* listens!

A few months ago it was announced that the certificate for working 100 zones on 5 bands, the halfway point to a full 5-band WAZ, would be discontinued. At that time the magazine was in the throes of traumatic change involving the transfer of ownership, and it was felt that the extra workload of a 2-plateau award might be the straw that broke the camel's back.

This decision produced the greatest outpouring of protest letters *CQ* has seen in over a decade. It became obvious that the 2-state concept for this award was very popular with *CQ* readers, and we concluded that its importance to the readers far outweighed any inconvience to the staff. The 2-stage award is being reinstated effective March 1, 1980, but with two important but necessary changes: (1) The first plateau will now be a total of 150 zones on a combination of the 5-bands. Our experience showed that 100 zones was not sufficiently challenging. The 1979 *CQ* Worldwide Contests produced many scores of over 120 zones in a single weekend, and (2) Regular WAZ or Single Band WAZ will now be a prerequisite for a 5-Band WAZ certificate. This will eliminate the possibility of someone earning a 5-Band WAZ certificate without ever working all 40 zones of the world.

After the 150 zone certificate is earned, the final objective is 200 zones for a complete 5-Band WAZ. *CQ* is donating plaques for the first 5 winners, after which the applicant will have a choice of paying a fee for his plaque and/or applying for an endorsement commemorating this achievement.

Those DXers who paid the certificate fee for a 100 zone award and have not received a refund may have their fee credited to the new 150 zone certificate if they wish to do so. Just advise the WAZ Manager, Mr. Leo Haijsman, W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904.

P.O. Box 205 Winter Haven, FL 33880

3AØCZ from Dec. 23, 1979 to Jan. 6, 1980 was operated by Dr. Louis TH. "Bob" Berge, ON4QX, above, and his son Rob, ON6QX. The Berge's are both outstanding c.w. operators and I'm sure they gave a new country to many. In the photo Bob is in his World War II uniform worn during convoy duty from G-land to Halifax, N.S. Bob has been an amateur radio operator since 1934 and holds CQ WPX Award of Excellence Plaque #6.

Instant DX Awards!!!

We've never seen better propagation conditions for amassing zones and countries than during the 1979 *CQ* Worldwide DX Contests. There were openings to all areas of the world on 15 and 20 meters and conditions reported working 100 countries and some *single operator* stations even worked all 40 zones of the world during a contest weekend. The final totals from the big multi-operator stations will be astronomical when they come in, and we look forward to seeing the complete results later this year.

During the low years of the sunspot cycle we offered a special award for working all zones during a contest weekend and had practically no takers. This year we would have given away a mountain of wallpaper had we made this same offer.

If you missed the fall bash don't despair, you get another chance late this month during the *CQ* WPX S.S.B. Contest and again the weekend of May 24 and 25 during the CQ WPX C.W. Contest. If conditions are half as good as during the fall 'Test many will earn a new WPX certificate or add to their prefix endorsements and WPX Honor Roll standing, and although the emphasis is on prefixes there will be plenty for the country and zone chaser as well. Check Frank Anzalone's Contest Column for the rules and George Jacob's Propagation Column for the latest outlook.

De Extra

Cool It On Top Of The Rare Ones - We were listening on 14195 last November when 8Z4A was on from the super-rare Saudi Arabia/Iraq Neutral Zone. The unnecessary interference must have set some kind of record.

The WAZ Program
Single Band WAZ
10 Meter Phone

29...JA2GVJ
30...WB5SKQ
31...VK3OT

15 Meter Phone

33...KB4EN
34...JH7CKF
35...JH1BBT

20 Meter Phone

268...VK3OT
269...IØMWI
270...W4KA
271...WB4HOK
272...K9RT

15 Meter C.W.

20...JA1BGS

20 Meter C.W.

89...AA4A
90...WB4RUA
91...K8RD

All Band Worked All Zones
S.S.B.

1784...JR1BLX
1785...I8INW
1786...EA8PP
1787...G3VLW
1788...K4DM
1789...DJIN
1790...DK8DB
1791...DL8QP
1792...JA2BMU
1793...VE4BJ
1794...DF1DB
1795...KL7JAA
1796...JA7EPO
1797...WD8BSX
1798...JE1XRZ

C.W. and Phone

4674...N7KM
4675...IT9USV
4676...ISØLYN
4677...N7KM
4678...K3HBP
4679...W8KBZ
4680...K6DZT
4681...K6DG
4682...JR1WDE
4683...YU4EJC
4684...DK7PX
4685...DL9YC
4686...DLØKF
4687...K1RH
4688...K2HVN
4689...K1DP
4690...WB4PRU
4691...K5JG
4692...ZE4JS
4693...AB2W
4694...YU4BR
4695...FG7XA

The complete rules for WAZ are found in the May 1976 issue of *C.Q Magazine*. Application blanks and reprints of the rules may be obtained by sending a self-addressed stamped envelope, size 4½ x 9½ to the WAZ Manager, Leo Haijsman, 1044 S.E. 43 Street, Cape Coral, Florida, 33904. Applicants forwarding QSL cards direct to the WAZ Manager or to a check point, should include sufficient postage for the safe return of their QSL cards. Please note that effective June 1, 1979 the processing fee for all C.Q. certificates was raised to $5.00. This fee must accompany all applications.

There was deliberate interference in several forms, all very illegal, including whistling, tuning, testing and calling CQ DX on c.w. using phoney calls. There was also interference from supposedly good guys trying to keep the frequency clear. The latter finally degenerated into numerous allegations regarding the ancestry of those who were interfering deliberately. We decided to make a running count of the various types of interference to see who was doing the most damage. Believe it or not, the "good guys" won. In terms of blocking 8Z4A's signal reports and station I.D., those who thought they were helping did by far the most harm. Comments such as "he's tuning 14200 up you idiot." "You're out of the band!" "Listen to those childish slobs." "His callsign is 8 Zulu 4 Alpha." "The yanks are at it again." "The VE's are at it again." "He's not listening on this frequency." "You turkey!" etc. etc. were common and they interfered almost 2-1 over the carriers and keyers.

What can one say other than cool it? The only person who can control the frequency is the DX operator himself by repeating both his callsign and his listening instructions clearly at frequent intervals. Therefore, stay out of the way, for everybody's sake.

A New Country?

After 2 decades during which the great DXpeditioners, Browning, Weil, Miller, the Colvins and others, have scoured the globe looking for potential new countries, it is difficult to find a square foot anywhere which hasn't been examined meticulously. Therefore, it is with a tingle of excitement that we read a letter from Herman, W6BYX, indicating that he may have found one which has been overlooked.

The Ile de Faisans (Pheasant's Island) is a small, historic island located in the Bidassoa River which forms the boundary between France and Spain. It is about 3 kilometers from the Atlantic Ocean and is a Condominium owned jointly by France and Spain. It has historic significance as the site of the signing of the Treaty of the Pyrenees in 1659 which ended the Thirty Years War and established the boundaries of many European nations. More information is given in the Green Michelin Guide on the Pyrenees Section of France, and the island is shown on the Michelin sectional map of France.

We are collecting additional information and plan to contact the ARRL DX Advisory Committee to determine if separate country status is a possibility. We hope to have more for you later.

Here and There

Olympic Prefixes: RX, RZ and other similar prefixes are being used from Jan. 1, 1980 - August 3, 1980 in celebration of the Moscow Olympics. They will be used by 100 Moscow stations plus 25 stations in each city hosting an Olympic event. UA stations with 2 suffix letters (i.e. UA3AO) may use the prefix RX, UA stations with 3 suffix letters (i.e. UA3AOA) may use RZ, UK stations may use RK, UV stations - RV, UW stations - RW, UC2 stations - RZ2, UR2 stations - RU2, UB5 stations - RZ5, UT5 stations - RT5 and UY5 stations -RY5.

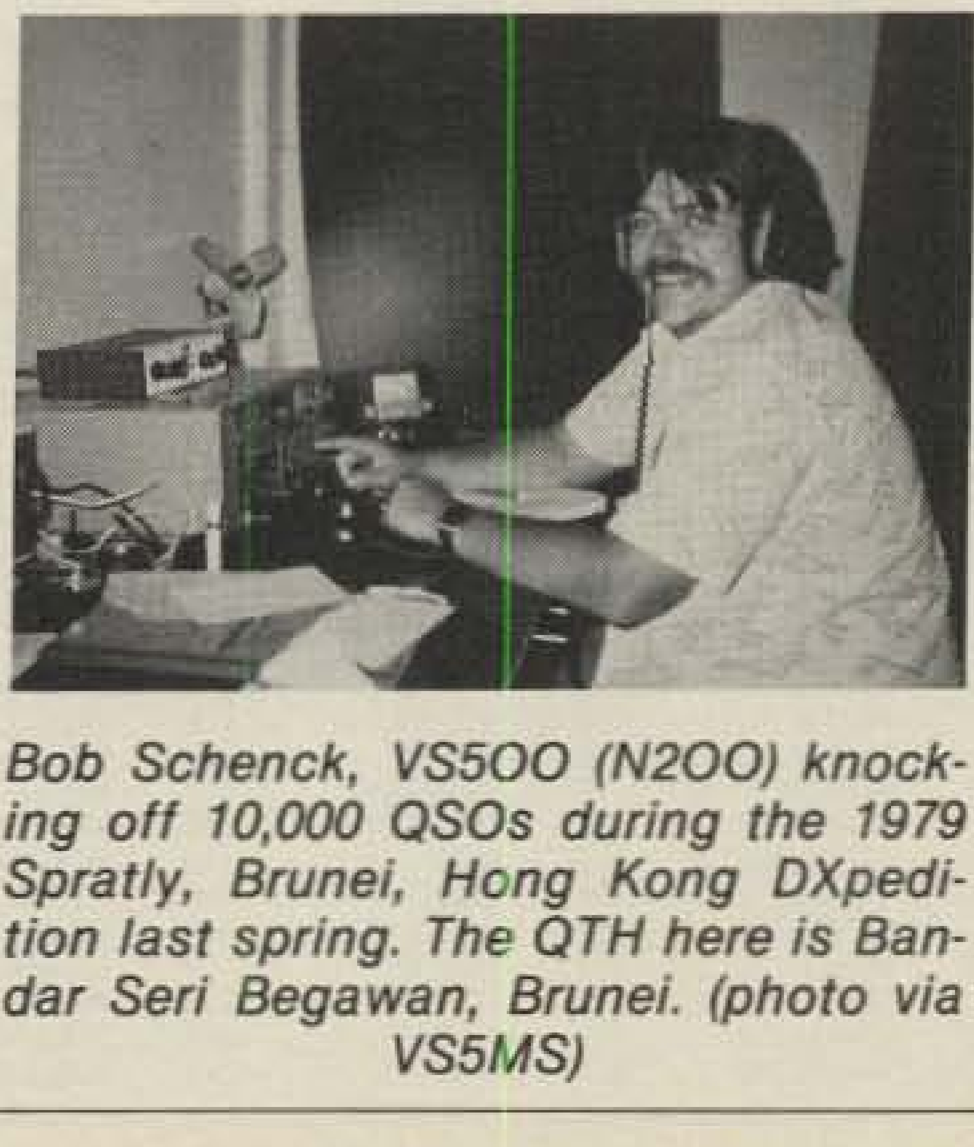
9I15: This was a special prefix used in place of 9J2 for 4 days in late 1979 to commemorate 15 years of Zambian independence.

Another successful DXpedition by this dignified Japanese team of (left to right) JR1JFO, JH1MCX, JH1MOH and JA1NRH. They made better than 15, 000 QSO's to those needing the Western Caroline Islands as KC6SX from October 18th. through 24th., 1979. QSL via JA1NRH. (photo via W2LZX)

Prefix Changes: Confused by all the new ones? This table will help.

New Prefix	It used to be
H3	HP
H4 or H44	VR4
J3	VP2G
J6	VP2L
J7	VP2D
T2	VR8
T3	KB6
KH1	KB6
KH2	KG6
KH3	KJ6
KH4	KM6
KH5	KP6
KH7	KP6K
KH8	KS6
KH9	KW6
KP1	KC4
KP2	KV4
KP3	KS4S

W1BB Semi-Retires: Stew Perry, W1BB, announced last fall that he was retiring from "Maximum Effort DXing" on 160 meters and that he may give up



Bob Schenck, VS5OO (N2OO) knocking off 10,000 QSOs during the 1979 Spratly, Brunei, Hong Kong DXpedition last spring. The QTH here is Bandar Seri Begawan, Brunei. (photo via VS5MS) the *160 Meter DX Bulletin* which he has published since 1932. Stew has worked and confirmed 147 countries on 1.9 MHz and his years of dedicated work to encourage others to use this difficult DX band were recognized by his election to the DX Hall of Fame in 1969. At age 75 Stew is finding it difficult to be up all night, every night, when a rare one is expected on 160, but we're sure that he will still be in there most of the time.

Changing Times: ARRL, whose Directors frequently put down the *CQ* Worldwide DX Contests as nothing but DX stations working DX stations, changed the format of the ARRL DX Contests to give credit for DX stations working DX stations. If you can't beat 'em, join 'em. And in the September, 1979 issue of *73* Magazine W2NSD, who hasn't had a kind word for *CQ* in 20 years, concedes that *CQ* is the place to read DX news. Maybe even Wayne is capable of mellowing.

YASME: Lloyd, W6KG, and Iris, W6QL, Colvin made over 10,000 c.w. and s.s.b. contacts on 10 - 160 meters as J3ABV from Grenada. They worked DXCC during the first week of operation and then made DXCC again during the *CQ* Worldwide Phone Contest. Their final total was 152 countries. QSLs for all YASME operations go to P.O. Box 2025, Castro Valley, CA 94546.

Left to right are Rodger, K4BKK/PJ7, Erv, K4HEM/PJ7 and Dee, VP2EEK who dropped in to visit the PJ7 operation which provided Saint Maarten to 1800 DXers on 10 -80 meters. The rigs were two TS-820's and trap dipoles. QSL to Phil, WB4INC.

National Capitol DX Association: Officers are John Kanode, N4MM, President; Richard Allardyce, N4RA, Vice President & Activities Manager; Bill Mullin, AA4M, Treasurer; and Burt Cohen, W3GG, Secretary.

DX Bulletin Broadcasts: W6TI, the Northern California DX Club Memorial Station, sends DX Bulletins twice weekly on 14002 kHz. Listen Sundays at 1800 GMT and Mondays at 0200 GMT.

CQ at Clearwater: The *CQ Magazine* DX Quiz, prepared by Billy, N4UF, was featured at the Clearwater Hamfest and Florida State ARRL Convention in November. Taking first place by answering 35 of the 41 items relating to DX activities was Jack Hartley, K4WSB, of Tampa. Jack is quite active and is QSL Manager of numerous DX stations.

Runner-up was Steve Welsh, WB4YEY, of Jacksonville. Steve is only age 15, but has been licensed for 4 years and is very active in the *CQ* Worldwide and WPX events. He holds an Advanced ticket and prefers c.w. He is a member of the North Florida Amateur Radio Society Contest Group.

Now here is a very pretty Ham in the person of Maria, HC1MM/5 at the shack of "lucky-John" K8LJG. Of course John is also her QSL mgr. (photo via W2LZX)

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV Dxers are also listed. The ARRL DXCC Countries List is used as the country standard. Total number of countries currently on the DXCC at deadline was 320. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement.

The fee for endorsements involving the issuance of an endorsement sticker is $1 and an SASE. The basic award fee is $5.

C.W.

W6PT	320	W9DWQ	315	N6AV	308	N6FX	299	JA1GTF	287
ON4QX	319	N4PN	313	W2GT	305	DL3RK	295	K3FN	284
K6EC	317	W3GRS	313	K9MM	305	K4CEB	293	N4MM	280
W6ID	316	K6JG	310	N6CW	304	WA8DXA	290	W4OEL	275
DL7AA	315	W8KPL	309	W4BQY	304	DJ7CX	288		

S.S.B

WA2RAU	320	W9KRU	317	W6YMV	314	DL6KG	301	YV5DFI	289
W6EUF	320	K6YRA	317	EA4LH	313	HP1JC	301	VE7HP	289
W9DWQ	319	W4SSU	317	YV1KZ	313	K8LJG	300	I6PLN	287
K8DYZ	319	W3CWG	317	W6RKP	312	I5WT	300	WA4JTI	287
W3NKM	319	W3AZD	317	OE2EGL	311	N6AV	300	W7OM	286
W6REH	319	W4UG	317	VE2WY	311	W8ILC	300	YS1O	286
XE1AE	319	I8KDB	317	ZL1AGO	311	OE3WWB	297	VE3FJE	285
K2FL	318	K6JG	317	K5OVC	310	DJ7CX	296	I3LLD	283
VE3MR	318	ZL3NS	316	DJ9ZB	310	F9MS	295	K1UO	283
DL9OH	318	VE3GMT	316	I4SQ	310	W9DQ	295	VK4VC	282
IØAMU	318	K4MQG	316	N4MM	309	K8PYD	294	IØMBX	280
W2TP	318	K9LKA	316	WØSD	308	W6FET	294	K5DUT	279
TI2HP	318	I8YRK	315	F2MO	308	LU1BAR/W3	293	JA6GDG	277
W4EEE	318	SM6CKS	315	W9SS	307	JH1VRQ	293	ZL1BIL	277
K6WR	318	OZ3SK	315	XE1KS	307	WØYDB	293	AA4A	276
W9QLD	317	IØZV	315	W3GG	305	N6AW	293	DJ2AA	276
VE3MJ	317	ZS6LW	315	VE7WJ	304	K4LSP	292	K9PPY	276
W3GRS	317	K6EC	315	DK2BL	303	K9RF	291	G4CHP	276
W9JT	317	K9MM	314	N2SS	303	9H4G	291	W2CC	275
I8AA	317	G3FKM	314	K6XP	302	VE7CE	290	WØSR	275
F9RM	317	N4WF	314	WØSFU	302	WA4WTG	290	N5FG	275
WA2EOQ	317	W4DPS	314	WB6DXU	302	OK1MP	290		

The WPX Program
Mixed

799...LA5NM
800...WB3JUK
801...WN4KKN

S.S.B.

1217...K8ES
1218...I8INW
1219...DM4VZA
1220...HI8LC

C.W.

1899...IT9USV
1900...GW3GWA
1901...LA9EF
1902...HI8LC
1903...JG1QGT

WPNX

165...WB3JON

Endorsements

Mixed: 400 LA5NM, WB3JUK. 450 KB8EC. 500 IT9KMU. 550 AB4Z, I1ZEU. 600 W6YMH. 850 W2FLD. 900 HI8LC. 1000 JA1BN, WA2AUB. 1300 W9FD.

SSB: 300 K8ES, DM4VZA. 350 I8INW. 500 WA4OIB. 550 I6NOA, I0PSB. 600 I5AFC. 750 ZP5RS, HI8LC. 800 DK2BL. 900 W0YDB. 1200 ZL3NS.

CW: 300 LA9EF, HI8LC, JG1QGT. 350 GW3GWA, AG0A, VE2BP. 400 IT9USV. 450 DK8NM. 500 VE7AVC. 550 SM6AYM. 650 N4WX. 700 JH1VRQ. 1250 N6JV.

10 meters: K4PI, W6YMH.
15 meters: K4PI, DJ8WD.
20 meters: VE7AVC, W6YMH, I6NOA, GW3GWA, K4PI.
40 meters: K4PI.
80 meters: DM4VZA, K4PI.
Africa: K4PI.
Asia: W1WLW, GM4DKO, WA2FKF, I6NOA, K4PI, I1ZEU.
Europe: I6NOA, DM4VZA, K4PI, I1ZEU.
No. America: SM6AYM, K4PI, I5AFC, I1ZEU.
Oceania: K4PI.
So. America: K4PI.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, 5014 Mindora Dr., Torrance, Calif. 90505. U.S.A.

The DX Quiz

This is a new feature which we are introducing on a trial basis. The first 5 questions concern famous personalities in DX, the second 10 pertain to the *CQ* DX Awards Program and the final 5 are on general subjects. The answers will be in next month's DX column.

If you answer all 20 questions correctly you must have been DX consultant to Red Eyed Louie, 15-19 correct shows you to be a very well informed DXer, 11-14 and you've gotten your feet wet, 6-10 and you should listen more and ragchew less while if you got fewer than 6 you qualify to be DX consultant to Wayne Green. So here goes:

1. Who was the first person named to the DX Hall of Fame?
2. What was the callsign used /MM by the famous Danny Weil during his worldwide DXpeditions?
3. The Editor and Publisher of the West Coast DX Bulletin during its entire existence was_________.
4. Father Moran lives in_______ and his callsign is________.
5. The first person to earn 5-Band WAZ was_____________.
6. Which of the following countries is *not* in Zone 13: VP8, Falkland Islands, ZP, CX, LU?
7. What is the new prefix for Dominica, formerly VP2D-?
8. Can I qualify for WAZ if I have 5 zones confirmed only on AM phone and the balance on s.s.b. or c.w.?
9. List 15 prefixes found in zone 8.
10. Which of the following prefixes is *not* in zone 17: UH8, UI8, UA0, UW9, UL7, UM8?
11. If you work all 50 states how many zones will you have contacted?
12. How many prefixes must you contact on 28 MHz to earn a 10 meter endorsement sticker for your WPX certificate?
13. If your neighbor received a QSL card from Christmas Island, which zone could he credit to his WAZ standing?
14. In your QSL file you have a card from Ernst Krenkel, RAEM. Can you receive WPX credit for this card?_____ If so, for what prefix?
15. One station in the world has a unique status for WAZ and can be credited to one of six different zones. What is the callsign for this station?
16. True or False. W6ISQ is DX Editor of *QST*.
17. The island of Virgin Gorda counts for which DXCC country?

Jarmo Jaakola, OH2BN, is an avid c.w. DXer with Single Band WAZ to his credit. Jarmo is a past contributor to the QSL Information section of this column.

18. Name 2 separate DXCC countries for which KC4 is an accepted prefix.
19. Station 8Z4A, active in November, 1979, counted for which DXCC country?
20. Which of the following lie west of the International Date Line: Wake Island, Midway Island, Western Samoa, Eastern Caroline Islands, Kingman Reef, Wallis Island?

73, John, K4IIF

QSL Information

C31UN - Via EA3AOC
CEØCBG & CEØCEW (Juan Fernandez) - To P.O. Box 13630, Santiago, Chile
DJ1US/ST3 - Via DF2RGG
F6UW/3A - c/o F6UW or to R.E.F.
GW6GW - Via GW4BLE
HB9AUV/3A - To HB9APF
HU2VO - c/o IØGPY
J3ABV - Via YASME, P.O. Box 2025, Castro Valley, CA 94546
JT1BF - P.O. Box 639, Ulan Bator, Mongolia
KC6SX - To JA1NRH
KC6SZ - c/o JE1JKL, Saty Nakamura, 3-16-6 Shibakubo, Tanashi City, Tokyo 188, JAPAN
KV4AA - To K6PBT
LU3ZY (South Sandwich) - Via LU2CN
N2RM/6Y5 - To N2MM, Howard Miller, F-1 East-Hampton Garden Apts., Jacksonville Road, Mount Holly, NJ 08060
NØTG/6Y5 - c/o NØTG, Randy Rowe, 3237 Connecticuit Dr., St. Charles, MO 63301
OD5AP and OD5LX - Via SMØGMG
OH2BP/OHØ - To OH2PQ
OY9J - c/o K2IJL
PAØWAY/A6 - Via P.O. Box 2526 Dubai, United Arab Emirates
PJ2CC - QSLs for contacts during the CQWW DX Contest should be sent to K4BAI, P.O. Box 421, Columbus, GA 31902. **DO NOT** QSL to WB8EYL.
PY2GWF/Ø and PY2XB/Ø - To PY2GWF, P.O. Box 13873, 01000 Sao Paulo (SP), BRAZIL
S2BTF - c/o W5RU
T3LA - To W7OK
T3PA - Via WB6FBN
T4GN - c/o ZS6GN
T4YL - To K9KXA
TN8AJ - Via DM2XLO
UØY (Zone 23) - c/o UKØAAA, Central Radio Club, P.O. Box 88, Moscow, U.S.S.R.
UK1PAA (Franz Josef Land) - Via UA1OSM, Central Radio Club, P.O. Box 88, Moscow, U.S.S.R.
VE1AMA/4U (Syria) - To VE3KQI
VKØJC - Via OZ8AE
VP1RX - c/o W4SME
VP1JEC - Via W4BSO
VP2EY - c/o W3HNK
VP2VFK - To N6CW
VP5MRX - c/o K8MR, 3592 Atherstone Rd., Cleveland Heights, OH 44121
VP8VN - To G4CHD
W1LJ/OHØ - Via W1LJ, Dennis Lusis, 160 Curtiss St., Bristol, CT 06010
YI1BIF - c/o YI1BGD, P.O. Box 5864, Baghdad, Iraq
ZF2BB - To N4IZ
ZF2BC - c/o WD4AXM
ZF2BN - W4HET
ZF2BP - To W4YKH
ZF2CD - c/o W3ODJ
ZF2CZ - Via WA3UFI
ZK1DR - c/o WØWP
ZK2VE - To W7PHO
ZS2MI - Via WA2IZN
3C1AA - c/o EA4MY
3CØAB (Annobon Island) - Via EA4LH, Jorge Cangas, Velasquez 86, Madrid 6, SPAIN or to EA8CR
4B7J - c/o XE1J
4W2AA - To I2MQP
5NØDOG - c/o W4FRU
8Z4A (Saudi Arabia/Iraq Neutral Zone) - U.S. DXers QSL to WA3HUP, others to JY6ZZ.
9K2RR - Via K1VKO
9M2PV - c/o WB9MFC
9N1MM - To N7EB
9Q5DH and 9Q5WH - Via WB4CSW
9X5LE - c/o SM5IB
9Y4FRC - Via K3RL
9Y4W - To N2MM

CQ DX Awards Program

S.S.B

784	K8ES	788	WD4DJC
785	K4FYM	789	W6YMH
786	DK7PX	790	G4CHP
787	WB4UBD	791	K5RCC

C.W.

402	K2HVN	405	IT9USV
403	OE1KJW	406	LA2KD
404	GW3SB	407	W6PYV

S.S.B. Endorsements

310	W6REH/319	275	WØ293
310	XE1AE/319	275	ZL1BIL/277
310	K6WR/318	275	G4CHP/276
310	K6JG/317	200	WB4UBD/202
310	K6EC/315	200	KB8JF/200
310	W4DPS/314	150	KL7AF/197
310	W6YMV/314	150	K8ES/183
310	ZL1AGO/311	150	K5RCC/175
300	N2SS/303	150	WB4KSQ/164

C.W.

310	ON4QX/319	200	VE7AVC/205
310	K6EC/317	150	W6PYV/150
310	K6JG/310	150	IT9USV/150

Total number of active countries as of deadline is 320. Effective December 1, 1979, Canal Zone (KZ5) was deleted making the total 319. Rankings will be adjusted for this next month.
Complete rules and application forms for the CQ DX Awards Program can be obtained by sending a business size, No. 10 envelope...self-addressed and stamped to CQ DX Awards; 911 Rio St. Johns Dr.; Jacksonville, Fla. 32211 USA.

NEW! MFJ INTRODUCES THE *GRANDMASTER* MEMORY KEYERS

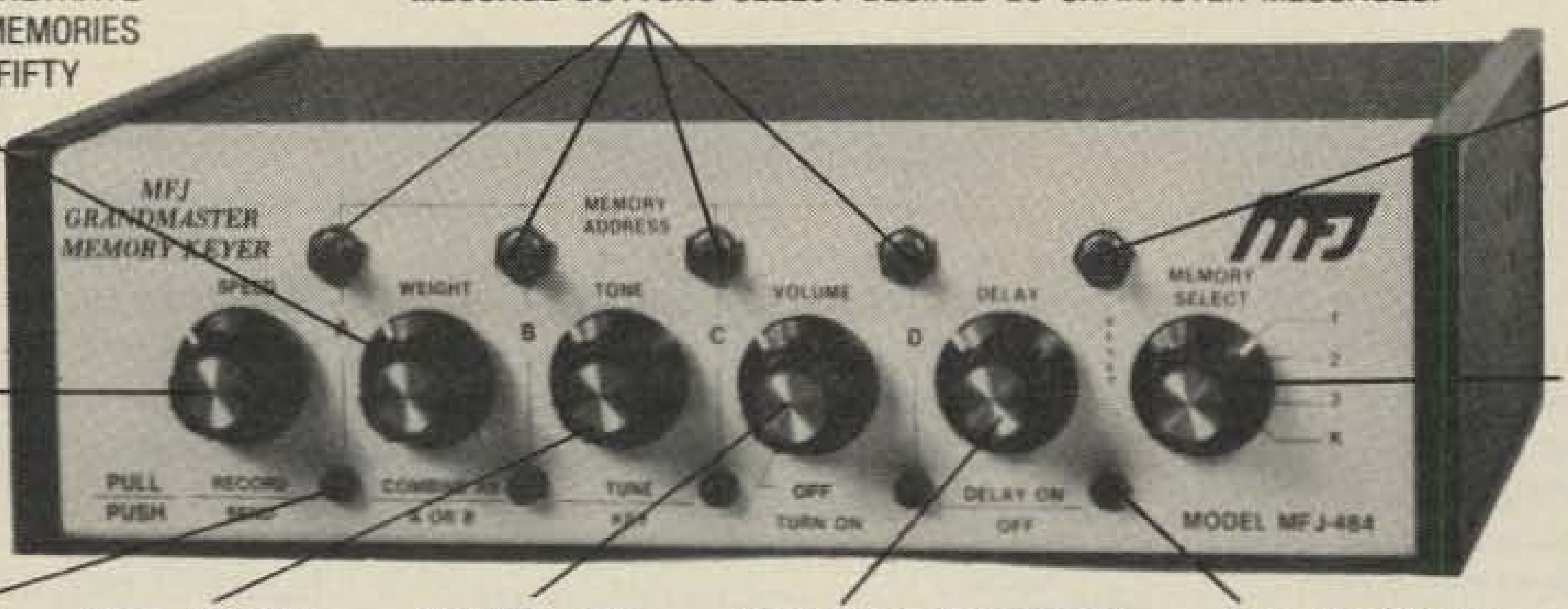
At $139.95 this MFJ-484 GRANDMASTER

memory keyer gives you more features per dollar than any other memory keyer available — and Here's Why . . .

WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.

RESETS MEMORY IN USE TO BEGINNING.



SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION K** GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

LEDs (4) SHOW WHICH MEMORY IS IN USE AND WHEN IT ENDS.

TONE CONTROL. PULL TO TUNE.

VOLUME CONTROL. POWER ON-OFF.

DELAY REPEAT CONTROL (0 TO 2 MINUTES). **PULL** FOR AUTO REPEAT.

LED INDICATES DELAY REPEAT MODE.

NOW YOU CAN CALL CQ, SEND YOUR QTH, NAME, ETC., ALL AUTOMATICALLY.

And only MFJ offers you the MFJ-484 Grandmaster memory keyer with this much flexability at this price.

Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

A switch combines 25 character messages for up to three 50 character messages.

To record, pull out the speed control, touch a message button and send. **To playback,** push in the speed control, select your message and touch the button. That's all there is to it!

You can repeat any message continuously and even leave a pause between repeats (up to 2 minutes). **Example:** Call CQ. Pause. Listen. If no answer, it repeats CQ again. To answer simply start sending. LED indicates Delay Repeat Mode.

Instantly insert or make changes in any playing message by simply sending. Continue by touching another button.

Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

LEDs show which 25 character memory is in use and when it ends.

Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches. All IC's in sockets.

PLUS A MFJ DELUXE FULL FEATURE KEYER.

Iambic operation with squeeze key. Dot-dash insertion.

Dot-dash memories, self-completing dots and dashes, jamproof spacing, instant start (except when recording).

All controls are on front panel: speed, weight, tone, volume. Smooth linear speed control. 8 to 50 WPM.

Weight control lets you adjust dot-dash-space ratio; makes your signal distinctive to penetrate QRM.

Tone control. Room filling volume. Speaker.

Tune function keys transmitter for tuning.

Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 ma. max., +300 V, 100 ma. max.). CMOS ICs, MOS memories. Use 12 to 15 VDC or 110 VAC with optional AC adapter, $7.95. Automatically switches to external batteries when AC power is lost.

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CIRCLE 37 ON READER SERVICE CARD

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

By the time you will be reading this Column the full WARC report will have been published.

Hopefully it will verify that the new 10, 18 and 24 MHz bands have indeed been assigned for amateur service. At this writing back in early December it was only a preliminary report.

The first thing that came to my mind of course was the contest possibilities of the new bands. During the last contest when we were at the top of the sunspot cycle it was sometimes difficult to decide what band to use. With three additional bands at our disposal it's going to be that much more difficult to make a decision.

However I do not anticipate an early decision as to when we will be allowed to use our new bands. With the sunspot cycle probably on the down slope the new frequencies will be welcome.

I can visualize skywires sprouting up all over the place, like tulips in the springtime. Can you imagine the antenna farms at the big multi-multi locations? And the equipment lay-out in the operating room? With a possible nine operating positions it will require a master control console with a Director calling the shots. It's going to be a whole new ballgame.

One thing that has probably not been given much thought, "How will these bands be allocated? Will the poor General license holder still be treated like a step-child and left out in the cold? And what about equipment, what happens with our present gear?" It's going to be most interesting.

73 for now, Frank, W1WY

CQ WW WPX Contest

S.S.B.: March 29-30 C.W.: May 24-25
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Complete rules were published in the January issue and are the same as in previous years.

14 Sherwood Road, Stamford CT 06905

Calendar of Events

Feb. 23-25	Vermont QSO Party
*Mar. 1-2	ARRL DX Phone Contest
*Mar. 8-9	QCWA Phone QSO Party
Mar. 8-9	Virginia QSO Party
Mar. 9-10	Europe/Africa RTTY Contest
Mar. 15-16	Bermuda Contest
Mar. 22-23	Tennessee QSO Party
Mar. 22-24	BARTG RTTY Contest
Mar. 29-30	**CQ WW WPX SSB Contest**
Mar. 29-30	ISSB C.W. QSO Party
Apr. 5-6	Polish "SP" C.W. Contest
Apr. 5-7	ARCI QRP QSO Party
Apr. 8-9	DX YL to W/VE YL Phone
Apr. 15-16	DX YL to W/VE YL C.W.
Apr. 19-20	ISSB Phone QSO Party
Apr. 19-20	Polish "SP" S.S.B. Contest
Apr. 26-27	Helvetia "H-26" Contest
May 17-18	Florida QSO Party
May 24-25	**CQ WW WPX C.W. Contest**

*Covered last month.

Briefly they are as follows:

Contacts between stations on different continents count 3 points on 14, 21 and 28 MHz, and 6 points on 7, 3.5 and 1.8 MHz.

Contacts between stations on the same continent but not the same country 1 point on 14, 21 and 28 MHz, and 2 points on 7, 3.5 and 1.8 MHz.

Exception: Contacts between North American countries, 2 points on the high bands, 4 points on low bands.

Contacts are permitted between stations in the same country for the purpose of obtaining a prefix multiplier, but have no QSO point value.

The multiplier is determined by the number of different prefixes worked. Each prefix may be counted *once only*, not once per band.

The exchange is simple, the RS(T) report plus a progressive contact number starting with 001.

Only 30 hours out of the 48 hour contest period may be used for scoring. The 18 hours of non-operating time may be taken in up to 5 periods. That's for single operating stations, who must show 12 hours of operating time to be eligible for an award. There is no time limit for multi-operator stations who must show a minimum of 24 hours of operating time.

Besides the usual certificates for the different catagories, single operator, single and all band, multi-operator all band only, and QRPp, there are also 38 Trophies for the Top Scorers world wide.

Mailing deadline is May 10th for the S.S.B. section and July 10th for the C.W. Note the new address, this year they go to: CQ WPX Contest, 76 N. Broadway, Hicksville, N.Y. 11801 USA. Please indicate S.S.B. or C.W. on the envelope.

Vermont QSO Party

Starts: 2100 GMT Sat., February 23
Ends: 0100 GMT Mon., February 25

This Party usually held in May has been advanced to February this year. It is again sponsored by the Central Vermont A.R.C. (Unfortunately the announcement was not received in time for the February issue.)

The same station may be worked on each band and mode for QSO and multiplier credit, and mobiles in each county change.

Exchange: QSO no., RS(T) and QTH, County for Vermont, ARRL sections for others.

Scoring: Vermont stations score 1 point for each contact and multiply total by number of ARRL sections and countries worked.

All others score 3 points for each Vermont station worked and multiply total by sum of Vermont counties worked on each band. (14 per band possible)

Frequencies: C.W. - 3685, 7060, 14060, 21060, 28100. Phone - 3909, 3932, 7265, 7290, 14290, 14325, 21375, 28600. Also 50260, 50360, 144-144.5, 145.8.

Awards: Certificates to the top scoring stations in each ARRL section, DX country and 2nd, 3rd and 4th places in Vermont. Also a multi-operator award. There are Trophies for the top out of state single operator score and also for Vermont. This year there is the W1EQB Memorial Plaque for Vermont stations.

Contacts made in the Party may be credited for the W-VT Award for working 13 out of the 14 Vermont counties.

Mailing deadline is March 31st to: Gerald W. Benedict, W1BD, 23 Foster Street, Montpelier, VT 05602. Include a s.a.s.e. with your entry.

Virginia QSO Party

Starts: 1800 UTC Saturday, March 8
Ends: 0200 UTC Monday, March 10

The Sterling Park A.R.C. is again sponsoring this one. The Central Virginia Contest Club plans to put a number of rare Virginia counties on the air during the party.

Exchange: QSO no., RS(T) and QTH. County for Virginia stations, state, province or country for all others.

Scoring: One point per QSO. Virginia stations multiply total QSOs by sum of states, provinces, DX countries and Virginia counties worked. Out of state stations will use Virginia counties for their multiplier. (max. of 98)

Frequencies: C.W. - 60 kHz from low end of each band, and Novice bands. Phone - 3930, 7230, 14285, 21375, 28575, (Check phone bands on even hours)

Awards: Certificates to high scorers in each state, province, DX country and each Virginia county. Also to top scoring Novices. A special certificate to the top out of state score.

The same station may be worked on each band and mode for QSO credit. Virginia stations may work in state stations for QSO and multiplier credit.

Indicate each new multiplier as worked. Summary, check sheets and a s.a.s.e. are requested with entry.

Logs must be received by April 15th and go to: Virginia QSO Party, P.O. Box 599, Sterling, VA 22170

Europe & Africa RTTY Contest

Saturday, March 9, 1400 - 2400 GMT
Sunday, March 10, 0800 - 1800 GMT

This is the 3rd and last of a series of Flash RTTY Contests organized by Prof. Franco Fanti of the I.A.T.G. Radiocommunications.

Rules are the same for each one except for the operating times and the continental areas.

Rules were given in details in the November Calendar and are valid for this one. Just substitute Europe & Africa for the areas given in the original announcement. This is for scoring purposes.

Your entry for this one must be received before April 15th and they go to: Prof. Franco Fanti, via A. Dallolio n. 19, 40139 Bologna, ITALY

Bermuda Contest

Starts: 0001 GMT Saturday, March 15
Ends: 2400 GMT Sunday, March 16

Dates for this popular activity have been moved to a month earlier. Rules remain the same as last year with one exception. The eligibility period for Trophy winners has been increased to five years.

You are limited to 36 hours out of the 48 hour contest period for scoring. Off times must be indicated, each period to be no less than 3 consecutive hours.

The same station may be worked once per band, either phone or c.w., but not both modes. Cross band or cross modes also not permitted. And 40 meter s.s.b. contacts are not permitted between stations in Region 1 and Region 2, but it's OK for W/K and VE to work VP9s.

Stations in the U.S. and Canada may work the United Kingdom, West Germany and Bermuda. The U.K. and DL stations may work W/K, VE and VP9s, however note the 40 meter s.s.b. restrictions between Region 1 and Region 2.

Participation is for single operator stations only, and operation must be from their own residence.

Exchange: RS(T) and QTH. State for W/K, province for VE, county for U.K., DOC for DL and Parishes for VP9s.

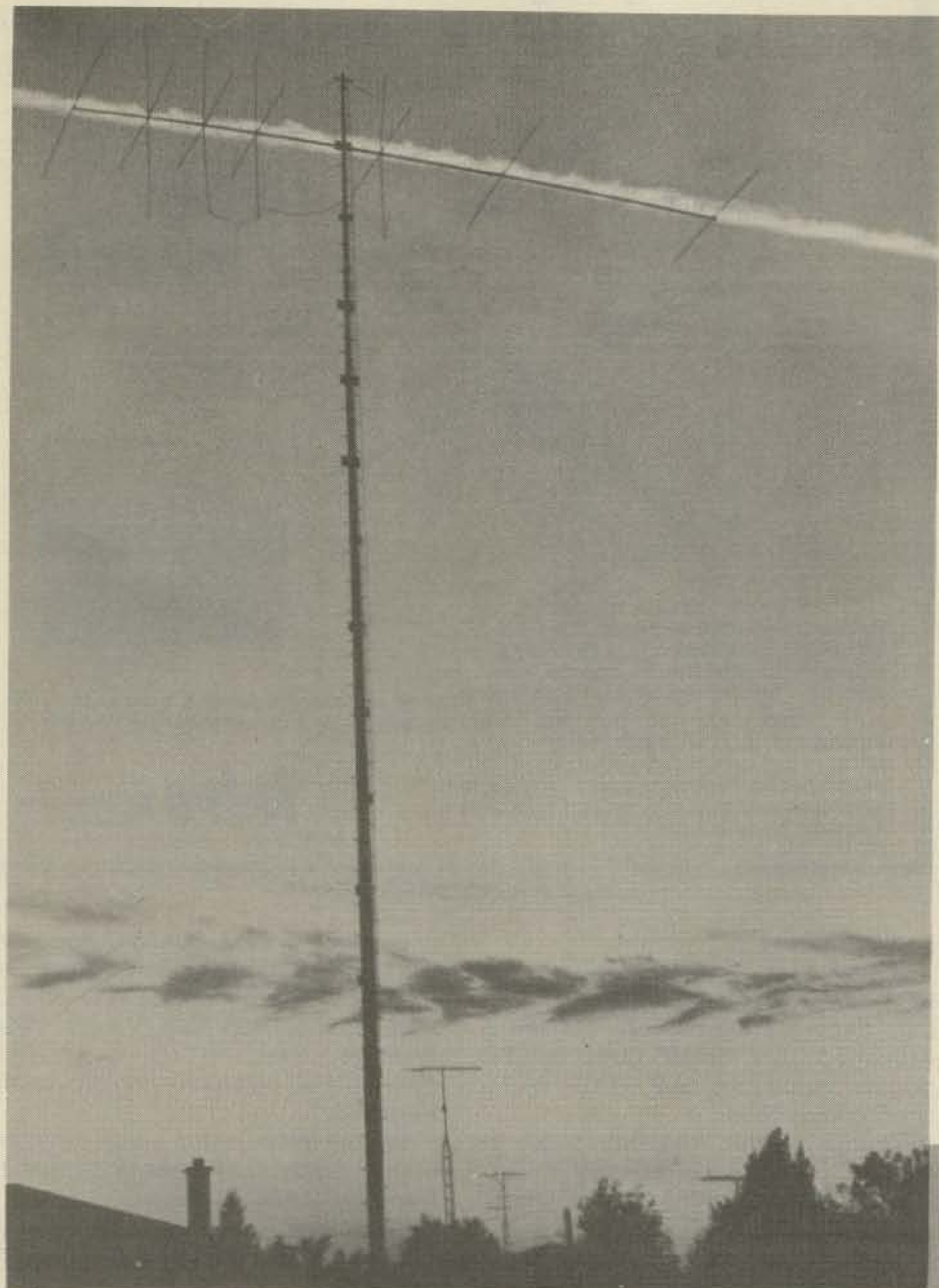
Scoring: Each completed QSO, phone or c.w., is worth 5 points. Multiply total QSO points by the number of different VP9 stations worked on each band, 3.5 thru 28 MHz for your final score. (Note: It's different VP9 stations on each band, not Parishes.)

Awards: The top station in each U.S. state, VE province, U.K. county and DL DOK will receive a printed award. The overall winners in the above areas however will receive something more substantial, a Trophy to be presented at the Society's Annual Dinner held in Bermuda in October. Round trip transportation and hotel accommodations will be provided for the winners. (Again note the new eligibility clause.)

Check your log carefully and include a signed declaration that all rules and regulations have been observed.

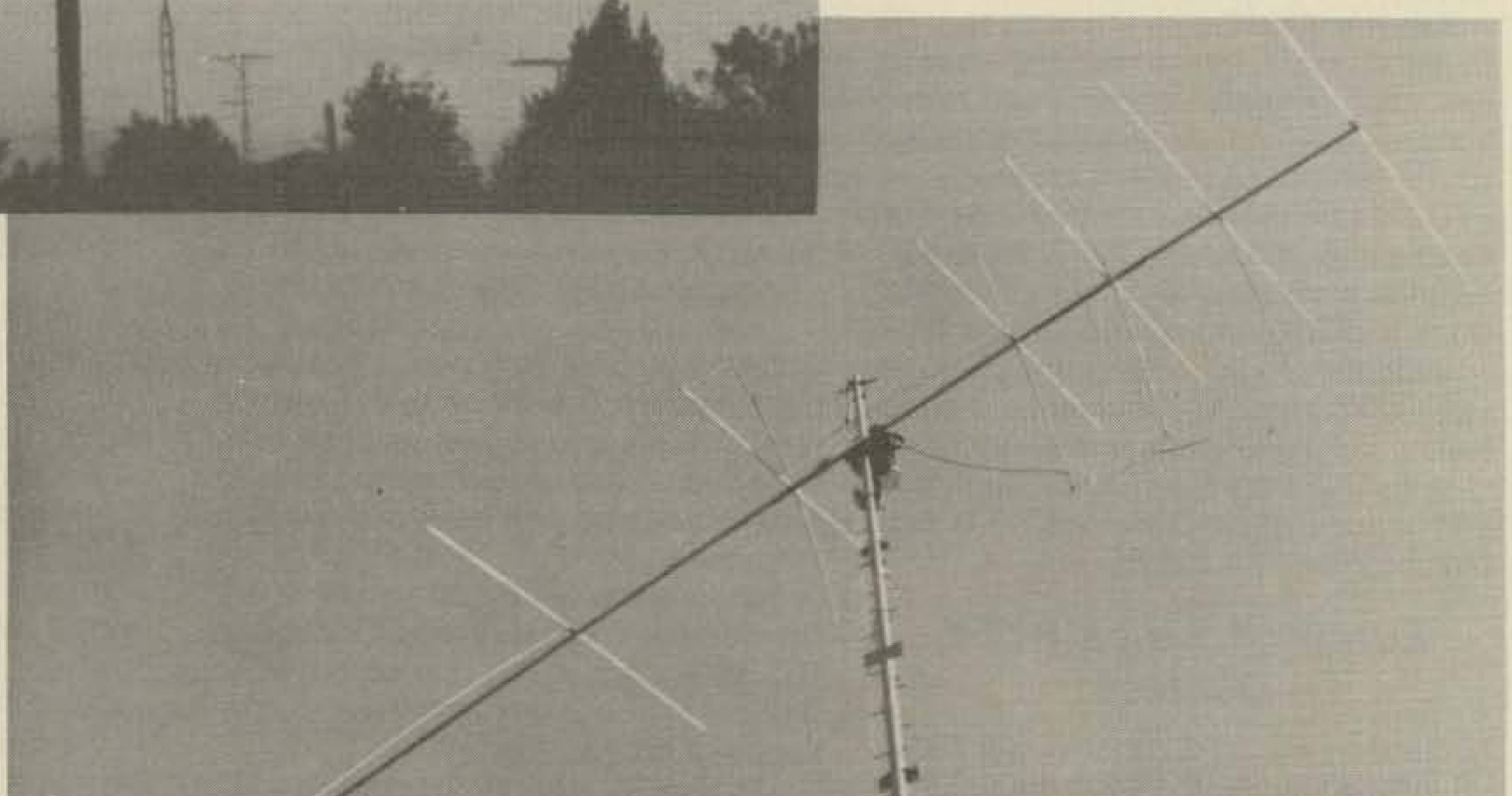
Entries must be received before May

By The Way



Shown at the Collins Amateur Products Press Conference at the Midwest ARRL Convention are (left to right) David G. Berner, Manager Amateur Products for Rockwell/Collins, and CQ's Editor, Alan Dorhoffer, K2EEK, and Sales Manager, Jack Gutzeit, W2LZX

VE3BMV's "Razor Beam" for 15 meters, according to Yuri, creates its own propagation conditions. It has 7 elements on a 60 foot boom, 4 Quad (2 driven) elements and 3 Yagi elements mounted on the top of a 110 foot mast. This unique antenna sits in the middle of a typical residential lot, 48 × 100 feet. Yuri relates that due to good PR and understanding neighbors he hasn't had any real complaints and that most of his neighbors like the idea of having a World Champion on their block. With this antenna, Yuri scored a world record in the CQ WPX Contest and NA record score in the CQ WW DX Contest on 15 meters. The shot below shows Yuri making some further adjustments to his "Razor Beam."



30th by the Radio Society of Bermuda, Contest Committee, P.O. Box 275, Hamilton 5, BERMUDA

Tennessee QSO Party

2100Z Sat. to 0500Z Sun. March 22/23
1400Z to 2200Z Sun. March 23

The Tenn. Council of Amateur Radio Clubs is again sponsoring this one.

The same station may be worked on each band and each mode, and mobile and portables in each county change. (No county line operation however) Tenn. stations may work in-state stations for QSO and multiplier credit. Phone and C.W. same contest.

Exchange: Signal report and QTH. County for Tenn., state, province or country for others.

Scoring: Phone - One point per QSO. C.W. - 2 points on 80, 1½ on other bands. Tenn. stations multiply total QSO points by sum of (states + VE/VO districts + Tenn. counties) worked. Out-of-state stations multiply total QSO points by Tenn. counties worked. (max. of 95)

There is a power multiplier of 1.5 for stations using 200 watts or less. Also a 200 point bonus for mobile and portables for each county change outside own county. (min. of 10 QSOs per county)

Frequencies: C.W. - 50 kHz up from bottom of each band. Phone - 3980, 7280, 14280, 21380, 28580. Novice - In their authorized bands.

Awards: Certificates to each station submitting a log with 15 or more contacts. Plaques to top Tenn. scorers, home portable and mobile stations. Also to the out-of-state winner.

Use a separate log sheet for each band with 50 or more contacts, and a check sheet if you have over 200 contacts. Only single operator operation.

Mailing deadline for entries is May 1st to: Dave Goggio, W4OGG, 1419 Favell Drive, Memphis, Tenn. 38116. Include a large s.a.s.e. with your log.

BARTG Spring RTTY Contest

Starts: 0200 GMT Saturday, March 22
Ends: 0200 GMT Monday, March 24

Sponsored by the British Amateur Radio Teleprinter Group this contest is open to all amateurs and s.w.l. There are three catagories, single operator, multi-operator and s.w.l.

All bands may be used, 3.5 thru 28 MHz. Not more than 30 hours out of the 48 hour contest period may be used for scoring. The 18 hours off may be taken any time but not in less than 3 hour periods. Indicate on/off times in your log, and include a summary sheet showing the scoring, etc.

Exchange: RST plus a three figure contact number and time in GMT. (full 4 figures)

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. And a bonus of 200 points for each country worked on each band including own. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total sum of countries worked on each band, and number of continents worked. (counted once only)

Final Score: (a) Total QSO points x country multiplier. (b) Country multiplier x bonus points x continents worked. Add sum of (a) and (b) for your final score.

Awards: Certificates to the leading stations in each of the three classes, the top station in each continent, and each W/K, VE/VO and VK call areas.

Final position will be valid for entry in the World RTTY Championship. There are also awards for working 25 DXCC countries and working all six continents. (Get additional info from G8CDW)

Logs must be received by May 31st and go to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, ENGLAND EN1 4DX.

YL INT'L SSBers QSO Party

C.W.: March 29-30 Phone: April 19-20
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

Rules are designed for membership participation and are rather lengthy. I would suggest you write to the party manager Lyle Shaw for more details.

Essentially they are as follows:

All bands may be used and the same station may be worked on each band for QSO credit but only once for a multiplier. Two meter simplex contacts are also permitted.

You are required to take two 6 hour rest periods in each section.

Exchange: Name, RS(T), SSBer number, country, state, and partner's call if any. Non-members send "no number."

Points: On C.W. contacts with members are worth 6 points, with non-members 1 point.

On Phone 3 points with members and 1 point with non-members.

Multiplier: Only contacts with members count as a multiplier. One for each of the following: Each state, country, YL/OM teams, DX/WK teams, and for DX/WK partners working each other.

Frequencies: C.W. - 3665, 7070, 14070, 21070, 28070. Phone - 3925, 7290, 14333, 21373, 28673. DX on 3765 and 7090, VK on 3690.

Awards: Certificates to the winners in each catagory as listed under multipliers.

Members desiring to enter as DX/WK teams should send their request to the party manager as soon as possible.

Non-members can enter the single operator catagory only.

Again I would strongly recommend that you write for more details.

Mailing deadline for all logs is May 15th and they go to the party manager, Lyle F. Shaw, 52340 Tallyho Drive, South Bend, Indiana 46635

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

During March, it should be a toss-up between *10* and *15* meters for the best DX band during the daylight hours from sunrise to sunset, with *20* meters not far behind. Unusually good DX conditions are also expected on *6* meters during the daylight hours (see *V.h.f. Ionospheric Openings* section of this column for more details). From sundown to Midnight, DX honors will likely be shared between *20* and *40* meters, with good openings towards the west and the south also possible on *15* meters. On days when conditions are HIGH NORMAL or better, the *10* meter band may also remain open towards the south and the west well past sundown. Some fairly good *80* meter openings are also expected during this period, with some *160* meter DX openings also possible. It looks as if DX openings should be possible on all h.f. amateur bands *10* through *160* meters on many days during March between sundown and Midnight!

From Midnight to sunrise, best DX bands should be *40* and *80* meters, with openings to many parts of the world also possible on *20* meters. The *160* meter band should also open for DX to many areas of the world during this period.

All-in-all, March looks like a great month for world-wide DX propagation conditions on all amateur h.f. bands. For more detailed information, refer to the *DX Propagation Charts* for March, which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* which are valid for both March and April, 1980, including data centered on Alaska and Hawaii. The Short-Skip charts contain band opening predictions for predominantly one-hop paths, ranging in distance from between approximately 50 and 2300 miles. For day-to-day changes in h.f. propagation conditions expected during March, see the *Last Minute Forecast*, which appears at the beginning of this column.

*11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1980

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 3, 11, 16, 30	A	A	B	C
High Normal: 1, 4-5, 14, 25, 28, 31	A	B	C	C-D
Low Normal: 2, 6, 8-10, 12-13, 15, 17, 19, 23-24, 26-27, 29	A-B	B-C	C-D	D-E
Below Normal: 7, 18, 20, 22	B-C	C-D	D-E	E
Disturbed: 21	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on Mar. 1st, good to fair (B-C) on the 2nd, excellent (A) on the 3rd, good again on the 4th and 5th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

Equinoctial Propagation

During most of March and continuing well into April, relatively similar h.f. propagation conditions exist in the temperate regions of the northern hemisphere (where it is spring) and in the southern hemisphere (where it is fall), as compared to the more extreme conditions that exist when it is summer in one hemisphere and winter in the other. This widespread equalization of ionospheric conditions results from the equinoctial effect, as the sun crosses the equator in its apparent travels into northern skies. Similar conditions occur during September and early October, as the sun travels into southern skies. During equinoctial periods, DX conditions *between* the northern and southern hemispheres are usually at their best. Exceptionally good inter-continental DX conditions, therefore, are expected this month on all amateur bands from *6* to *160* meters, at appropriate times. Typical of these openings are the paths between the United States and South America, Australasia, and the central and southern regions of Africa, Asia and Antarctica.

Inter-continental openings on *40, 80* and *160* meters should peak shortly before local sunrise and again at local sunset. Openings on *20* meters should peak twice; first for a period of an hour or two after sunrise and again for an hour or so after sunset. On *10, 15* and *6* meters, inter-continental openings should peak during the daylight hours, with signals from an easterly direction strongest an hour or two before noon; openings towards the south are optimum an hour or two after sunrise and again late in the afternoon, and openings towards the west are strongest for an hour before to a few hours after local sunset. During the equinoctial period, long path openings may often be as strong, if not stronger, than short path openings, particularly during the sunrise and sunset periods.

V.H.F. Ionospheric Openings

World-wide *6* meter F-layer openings which began during October are expected to continue through March. Openings should be possible from the USA to almost all areas of the world, particularly when conditions are HIGH NORMAL or better. Signals arriving in the quadrant between northeast and southeast should peak by mid- morning. Noontime should be best for openings towards the Caribbean, Central America and the northern countries of South America, although the *6* meter band may open in this direction as early as an hour or two after sunrise. During the afternoon hours expect *6* meter skip to extend deeper into South America and to shift towards the west and northwest. Exceptionally strong signals will be possible at times. Transcontinental openings on *6* meters should be possible from about noon through the late afternoon hours.

Some *6* meter DX openings between southern tier states and countries deep in South America may also be possible as a result of *transequatorial scatter propagation*. Unlike F-layer reflected signals, T.E. propagation results from scatter between ionospheric layers and signals are usually weak, with flutter fading often severe. T.E. openings must cross the magnetic equator at or near a right angle, and the best time for such openings during March would be between 8 and 11 p.m., local time. Experimental transmissions conducted over the past year indicate that T.E. propagation may also take place for *2* meter signals.

Auroral activity tends to peak during equinoctial periods, and there is a good chance that some widespread auroral activity will occur during March, accompanied by auroral-scatter openings on the v.h.f. bands and sporadic-E short-skip openings, up to distances of approximately 1200 miles, on *6* and *2* meters. Check the *Last Minute Forecast* at the beginning of this column for those days during March that are expected to be BELOW NORMAL or DISTURBED, since these are the days on which auroral activity is most likely to occur.

Except for some minor meteor showers during March 14-15 and 24-25, not much meteor activity is expected during the month.

Sunspot Cycle Activity

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 185 for November, 1979. This results in a provisional 12-month running smoothed sunspot number of 147, centered on May, 1979. The present cycle is already the fourth most intense cycle observed since observations began more than 200 years ago, and its peak probably did not occur until October or November of 1979. It is very likely that when all the data is in, and this will take several more months, the present cycle may surpass all previous cycles in intensity except for the record of 201 established in 1957.

While the period of exceptionally high solar activity this past year has certainly been a boon for DX on the h.f. bands, it has also had its bad moments. Associated with high solar activity has been a considerable increase in the occurrence of *solar flares*.

Solar flares are sudden and violent explosions which take place on the sun. They generally occur in the vicinity of large sunspots, and they eject into space enormous amounts of matter, including vast quantities of ultra-violet energy, X-rays and cosmic radiation which travel at the speed of light, and charged particles (electrons and protons), which travel at much slower velocities. When the position of the solar flare on the sun's surface is in line with the earth, much of this radiation floods the earth's atmosphere. The terrestrial effects are to produce sudden blackouts for h.f. communications. These blackouts affect the daylight portion of the world, and can last for up to an hour or so at a time. Solar flare induced blackouts account for the "Swiss Cheese" effect which is often noticed on the h.f. bands. Exceptionally good conditions suddenly deteriorate into blackout conditions, only to return again to good conditions in about an hour or so. During this past year there have been several days on which as many as eight separate flare induced blackout periods occurred.

NASA has recently announced that it plans to spearhead a special scientific effort during 1980, in an attempt to unlock the secrets of solar flares so that their occurences may be more accurately predicted in the future. This effort, called the *Solar Maximum Mission* will use a variety of observatios methods, including satellites, sounding rockets and ground-based instruments, to study solar flares through their individual life histories. The mission's satellite is designed to provide scientists with unique observations of solar flares over a wide band of wavelengths including ultraviolet, X-ray and gamma ray radiations.

The satellite will operate in a 574 kilometer (310 mile)- high circular orbit after its planned early 1980 launch from Cape Canaveral, Fla. The planned orbit is inclined 28.6 degrees to the equator with the satellite taking 96 minutes to complete one orbit. At the end of its mission, it is hoped to retrieve the satellite with the manned Space Shuttle. This will be the first satellite launched specifically to study solar flares in such detail. An Experimenters Operations Facility to direct and coordinate the solar research activity will be established at Goddard Space Flight Center, Greenbelt, Md. once the spacecraft is operational. This round-the-clock facility will house the scientific investigators and necessary computer equipment.

Anniversary

This month's column marks the beginning of my 30th year as Propagation Editor of *CQ*. As indicated in the above paragraphs, there are a great number of interesting propagation events coming up in the years ahead that I hope to continue to report here on the pages of *CQ*!

73, George, W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3). Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quaterwavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

CQ Short-Skip Propagation Chart
March & April, 1980
Local Standard Time at Path Mid-Point (24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles) 50-250	250-750	750-1300	1300-2300
10	*Nil*	09-18 (0-1)	07-09 (1) 09-12 (1-2) 12-13 (1-3) 13-16 (1-3) 16-18 (1-2) 18-21 (0-1)	07-08 (1) 08-09 (1-2) 09-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-21 (1)
15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-14 (0-3) 14-16 (0-2) 16-20 (0-1)	07-09 (1-2) 09-13 (2-4) 13-14 (3-4) 14-16 (2-4) 16-19 (1-3) 19-20 (1-2) 20-21 (0-2) 21-23 (0-1)	07-08 (2) 08-09 (2-3) 09-16 (4) 16-19 (3) 19-21 (2-3) 21-23 (1-2) 23-01 (0-1)
20	11-13 (0-1) 13-16 (0-2) 16-21 (0-1)	08-09 (0-3) 09-11 (0-4) 11-13 (1-4) 13-16 (2-4) 16-18 (1-4) 18-21 (1-3) 21-02 (0-2) 02-08 (0-1)	06-07 (1-2) 07-08 (3) 08-09 (3-4) 09-18 (4) 18-22 (3-4) 22-00 (2-3) 00-02 (2) 02-06 (1)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-22 (4) 22-23 (3-4) 23-00 (3) 00-02 (2) 02-04 (1-2) 04-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-20 (4) 20-22 (3-4) 22-00 (2-4) 00-03 (1-3) 03-06 (1-2)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-00 (4) 00-03 (3-4) 03-06 (2-3)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-03 (4) 03-04 (3-4) 04-06 (3)
80	07-11 (4) 11-18 (4-3) 18-22 (4) 22-00 (3-4) 00-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-00 (4) 00-05 (3-4) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-03 (4) 03-05 (4-3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

HAWAII
March & April, 1980
Openings Given in Hawaiian Standard Time

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	08-09 (1) 09-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 21-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	08-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-23 (4) 23-03 (3) 03-06 (2) 06-08 (3) 08-09 (2)	19-20 (1) 20-22 (2) 22-02 (3) 02-04 (4) 04-05 (2) 05-06 (1) 22-23 (1)* 23-02 (2)* 02-03 (3)* 03-04 (2)* 04-05 (1)*
Western USA	08-09 (1) 09-11 (2) 11-12 (3) 12-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (4) 11-15 (3) 15-18 (4) 18-20 (3) 19-22 (2) 22-00 (1)	15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3) 10-15 (2)	18-19 (1) 19-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (1)* 21-22 (1)* 22-23 (2)* 23-04 (3)* 04-05 (2)* 05-06 (1)*

ALASKA
March & April, 1980
Openings Given In GMT

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	18-20 (1) 20-00 (2) 00-01)1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	13-15 (1) 20-22 (1) 22-01 (2) 01-03 (3) 03-05 (2) 05-06 (1)	06-13 (1) 07-12 (1)*
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	14-16 (1) 20-23 (1) 23-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)*
Western USA	20-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

#See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.

*Indicates best time for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

a monthly feature by

KARL T. THURBER, JR. W8FX

Antennas

Design, construction, fact, and even some fiction

The antenna system is the "filter" through which your signal starts on its journey from the transmitter, through the atmosphere to distant receivers. It's probably the most important component of your installation, and at the same time likely the least understood. Author W8FX starts out by providing some basic facts on antennas and transmission lines and includes a glossary of some of the more important terms. —e.d.

The antenna is probably the most important part of your hamshack—indeed, no amateur station is any better than the antenna system that supports it. Yet, there is probably no technical aspect of this fascinating hobby that is more confusing to the beginner and non-technical operator. In this column, we will try to clear away garbled facts, half-truths and superstitions to steer a "common sense," middle-ground approach to amateur antenna design, construction and use. We'll try to cater to the widest possible range of interests and will place particular emphasis on the newcomer's needs.

Starting from ground zero, let's devote this month's space to defining some important antenna terms and concepts.

Antenna - A conductor, suspended in space, that is used to receive and radiate electromagnetic waves. Alternately referred to as an aerial.

Antenna Array - A system of antenna elements that produces high gain on both transmission and reception.

Antenna coupler or tuner - A device used to match a receiver and/or transmitter to an antenna system. Sometimes referred to as a transmatch. (Popular Johnson tuners were known as "matchboxes" as well.)

Antenna Noise Bridge - A special-purpose antenna instrument that allows "fine tooth" measurement of antenna and transmission line characteristics such as resonant frequency and impedance. Also referred to as an "R-X noise bridge."

Balun - A device used in feeding antennas that transforms an "unbalanced" r.f. system to a balanced one, or vice-versa. Typically used to "match" coaxial transmission line to dipole antennas. May also transform impedance.

Beam antenna - An antenna array of several elements, usually approximately ½-wavelength in length, which concentrates the transmitted and received signal into a narrow arc. Substantial increases in effective radiated power are possible. May be parasitic or driven in nature.

Bidirectional antenna - One that transmits and receives in two directions or lobes usually 180 degrees apart. Typical pattern is that of a "figure-8." A dipole is an example of a bidirectional antenna.

Boom - The member of a beam antenna that physically supports the elements of the array.

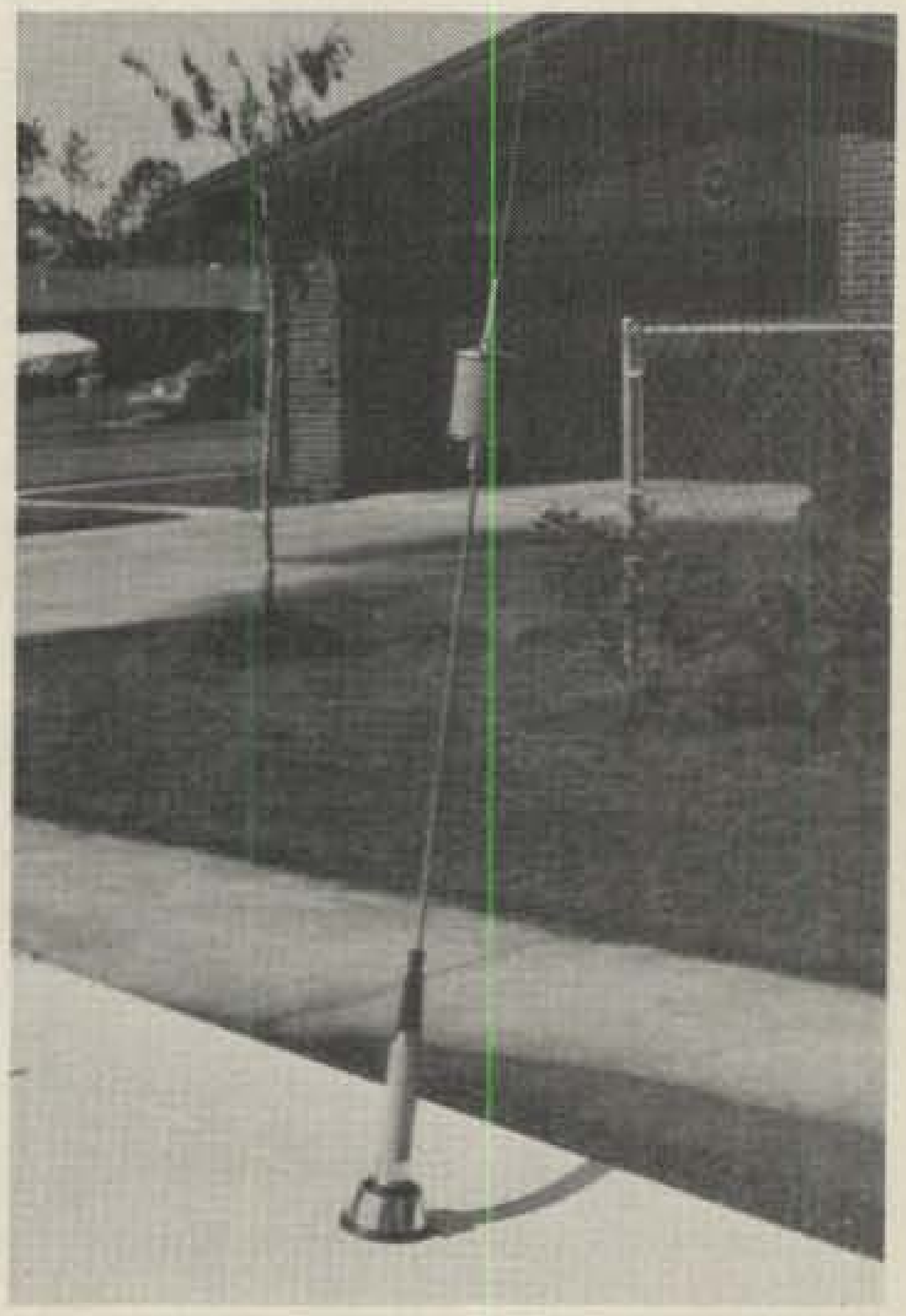
Cross-polarization - Polarization condition where one antenna of a system is vertical and the other is horizontal. Cross-polarized antennas are sometimes known as "double cross" arrays.

Cubical quad - A loop-type beam antenna made up of two or more loops approx. ¼-wavelength apart. One loop is directly driven by the transmitter, while the other element(s) act as reflectors or directors.

Counterpoise - An artificial radio ground consisting of wires strung out under the transmitter or antenna. Often used when a "real" r.f. ground is difficult or impossible to obtain.

Decibel - An electronic unit of measurement that expresses the ratio between two power or voltage levels, expressed logarithmically.

Decibel (dB) gain - As applied to antennas, the power increase of an antenna compared to either that of a standard, ½-wave dipole or a theoretical "isotropic radiator." A simple rule of thumb: For each 3 dB increase, power is *doubled*...for example, if a 100-watt signal is increased 3 dB, it becomes 200 watts. Sometimes referred to as "power gain."



For h.f. mobile work, center- and top-loaded whips generally work best. Having the loading coil high above the car's metal surface minimizes the effect on the coil's operation, and tends to improve overall operation. Short whips at h.f. frequencies are ineffecient, even if high-Q coils are used.

Director - The element of an antenna array that reradiates a portion of the transmitted r.f. in the intended direction.

Driven element - The antenna element that receives power directly from the transmitter. Also known as an "active" antenna element.

Dummy load - A device used in lieu of an actual antenna, for transmitter adjustment and checks. Usually it contains a resistor that duplicates the characteristics of an antenna system. Most amateur dummy loads are de-

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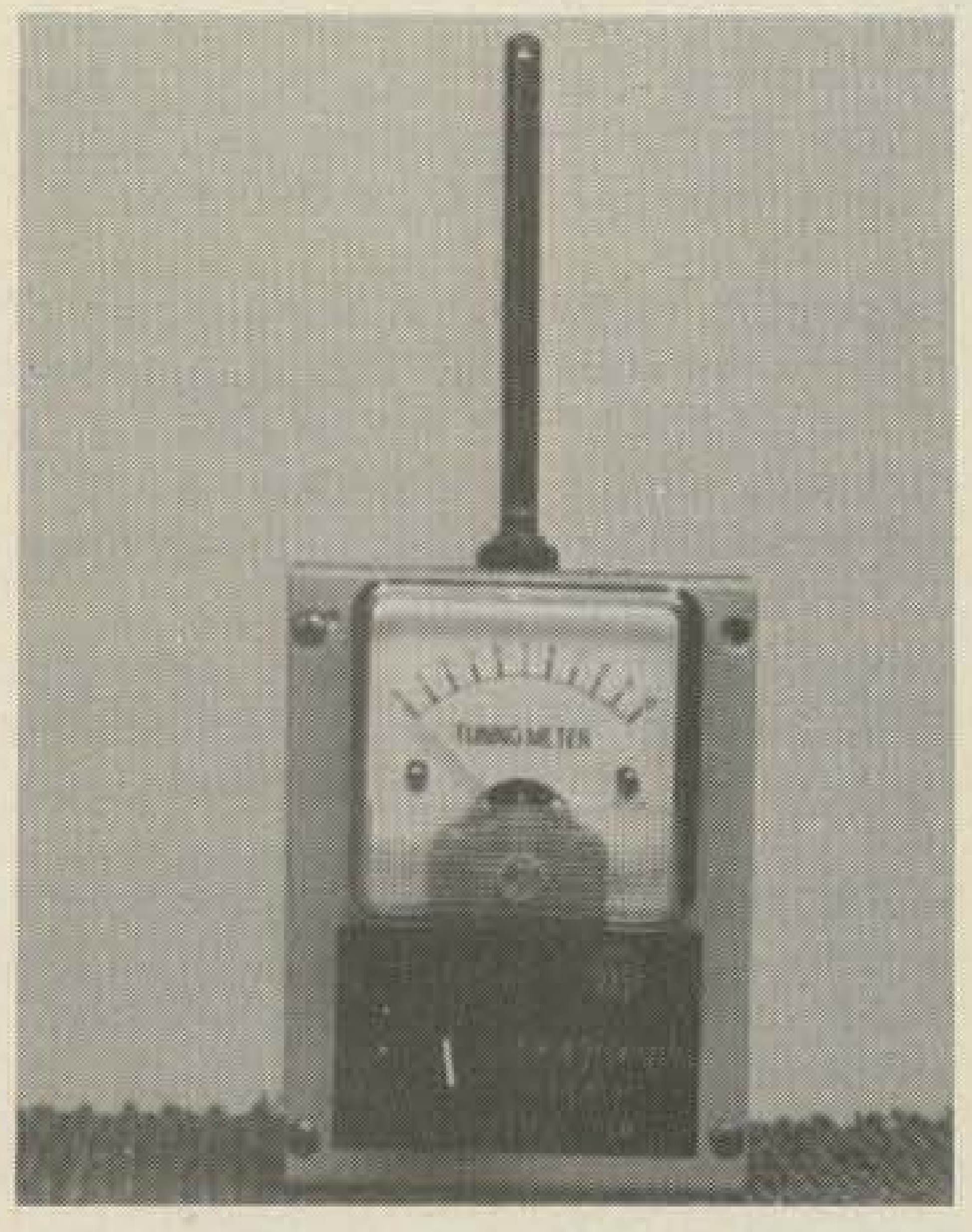
An antenna tuner is a device or circuit used to match a transmitter or receiver to an antenna system. It can also be used as a matching transformer, to transform impedance of one circuit to that of another circuit. A highly-versatile, wide-range tuner for low- to medium-power applications is the Ten Tec continuous-tuning model shown here. (Photo courtesy Ten-Tec)

signed to "simulate" 50-70 ohm antenna systems.
Feed - To apply r.f. energy to an antenna. To excite the antenna with r.f.
Field strength meter - A device that "senses" the presence of an r.f. field and indicates its strength by means of a meter reading.
Five-eighths wavelength (5/8λ) antenna -A "gain-type," low radiation angle vertical antenna, often used at v.h.f. and u.h.f. frequencies, that is 5/8 of one wavelength long at its resonant frequency.
Front-to-back ratio - In a beam, the ratio of forward power to the power radiated in the "back" direction. Stated in dB, the higher the figure, the better.
Gamma match - A matching device consisting of a metal rod and variable capacitor located near the antenna's driven element. Usually used to allow



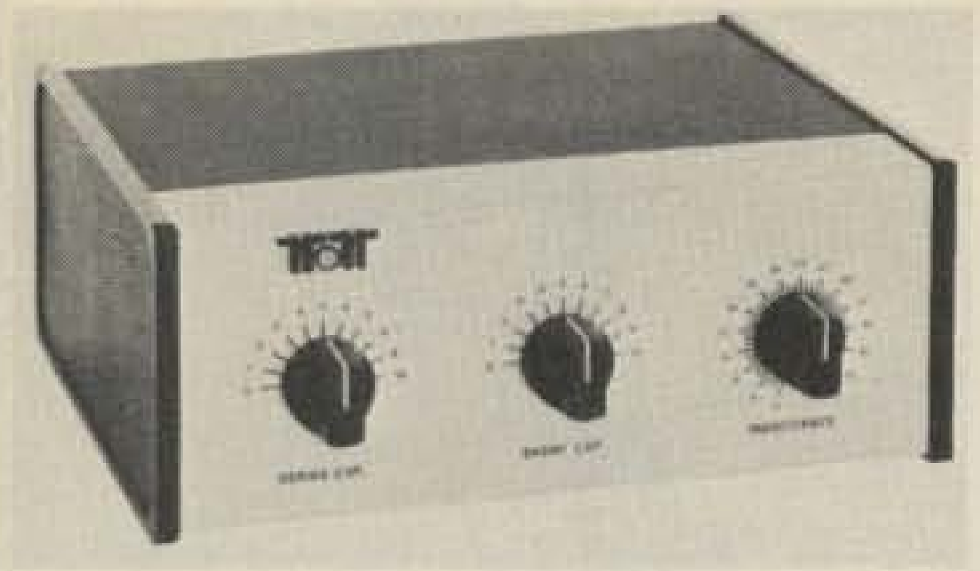
Don't forget the field strength meter—a handy device to let you know that that hastily-constructed antenna is really putting out r.f.

direct feed of beam antennas with low-impedance coaxial cable.
Grid-dip meter - Useful r.f. instrument that indicates, by means of a meter deflection, the resonant frequency of an antenna or circuit.
Ground - In r.f. applications, refers to a low-impedance connection to earth via heavy wires, radials, or pipes. R.f. ground may not be the same as "electrical ground." Essential when working with vertical antennas.

Ground wave - That portion of a radio wave that follows or "hugs" the surface of the earth, as opposed to the sky wave.
Ground plane antenna - A vertical antenna, usually ¼-wavelength, mounted above three or more horizontal radials that make up an artificial ground system. In this case, a "true" earth ground is not required.
Half-wave dipole - The "basic" amateur antenna, resonant at one-half the wavelength of the desired operating frequency. Usually mounted horizontally. The dipole is a bidirectional antenna.
Harmonic - An integral multiple of the fundamental frequency, i.e., the fundamental times 1, 2, 3, etc. Many antennas can be made to work on harmonically-related frequencies.
Horizontal polarization - A radio wave's condition in which its electric field is parallel to the earth's surface.
Impedance - A rating, usually stated in ohms, that describes the opposition to flow of a.c. current. When antennas, receivers and transmitters are interconnected for maximum power transfer, their impedances are the same or "matched." Mathematically denoted by the letter "Z".
Isotropic antenna - A point-source, imaginary reference antenna that is considered to radiate equally well in all directions. Antenna gain figures are frequently referenced against it or the half-wave dipole.
Loading coil - Turns of wire (an inductance) imbedded in an antenna element to electrically create the effect of a physically longer antenna. May be located at the base, center or top of an antenna. Often used in physically short mobile antennas and beams.
Lobe - An area of greater signal intensity in the radiation pattern of an antenna. Lobe structure and arrangement determines an antenna's directional characteristics.
Matching transformer - An electrical circuit or device, often built into an antenna coupler or tuner, used to transform the impedance of one circuit to another. A balun may, in certain cases, serve in this manner.
Parasitic element - An element of an antenna, used to focus directionality, that does not receive power directly from the transmitter.
Phased antenna array - Two or more beam antennas placed side-by-side or one above another, to obtain increased directivity and gain.
Quarter-wave antenna - An antenna whose physical length is about equal to ¼-wavelength at the desired operating frequency.
Reflector - A beam antenna element, placed behind the driven element, that reflects a portion of the transmitted signal forward through the driven element, for increased gain.
Resonance - Special condition in which circuit inductive and capacitive values are such that maximum current flows.
Resonant frequency - The frequency or wavelength at which the electrical characteristics of an antenna are said to be "in balance." Resonant frequency is primarily determined by the antenna's electrical length.

An s.w.r. bridge is a near-essential instrument for monitoring standing wave ratio on a transmission line and for adjusting an antenna coupler or tuner for best match. ERC Model SL-65 shown here is an s.w.r. bridge with a different twist: its readout is digital! (Photo courtesy Electronic Research Corp. of Virginia)

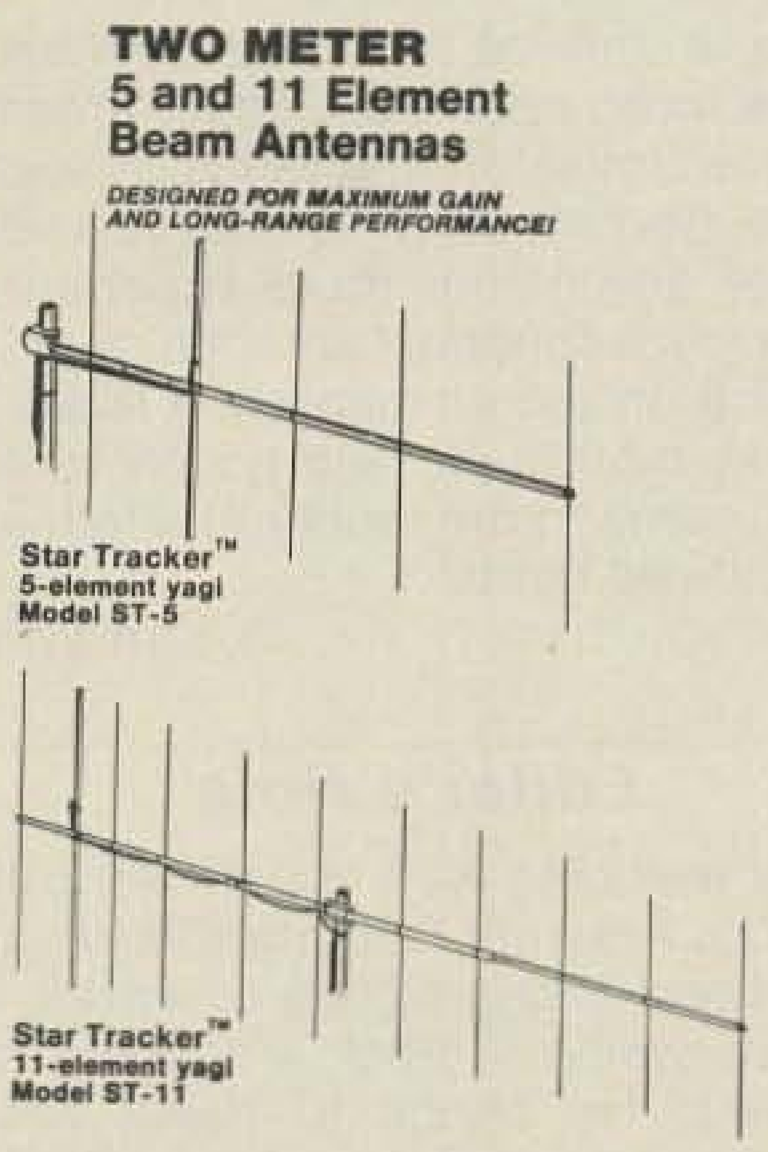
Omnidirectional antenna - An antenna that radiates and receives equally well in all directions. Sometimes referred to as a nondirectional or general coverage antenna. A vertical is an example of an omnidirectional antenna. A dipole, on the other hand, is a bidirectional antenna.
Radials - Horizontal wires that fan out from a vertical antenna's base like spokes on a wheel to make up its ground system.
Sky wave - That portion of a radio signal that is returned to the earth by reflection from the ionosphere, as opposed to the surface-hugging ground wave. It's the sky wave that makes DX possible.
Standing wave ratio (s.w.r.) - The ratio of the size of the outward-going (forward) wave to the size of the reflected wave on a transmission line. Or simply, forward power compared to reflected power. Standing waves are variations in voltage amplitude formed on a transmission line caused by r.f.



An antenna noise bridge, sometimes known as an "R-X bridge," is an especially handy instrument for fine-tooth antenna assessment and matching. Device tells one a great deal more about his antenna system than does the common s.w.r. meter. (Photo courtesy Palomar Engineers)

energy reflected as a result of a mismatch between the antenna and the transmission line. Generally speaking, the lower the ratio, the better. An s.w.r. bridge or directional coupler is used to measure s.w.r.

Transmission line - Wire or wires used to carry r.f. signal from the transmitter to the antenna, or received signals from the antenna to the receiver. Sometimes referred to as the feedline. Coax is the most common type used today.



Yagi antenna arrays can dramatically increase effective power and overall communications range by focusing radiation over a small arc. Five-element beam shown here boasts a forward gain of about 10 dB and a front-to-back ratio of 22 dB. Beamwidth arc is about 50 degrees.

Adding more elements, the ten-element beam results in a forward gain of more than 13 dB and a front-to-back ratio of 27 dB over a beamwidth of 36 degrees.

Forward power reference is that of a ½-wavelength dipole. (photo courtesy of New-Tronics Corp.)

Transmatch - An antenna tuner or coupler. More properly, the wide-range tuner designed by ARRL staff member Lew McCoy, W1ICP.

Unity - Refers to the state of a transmission line when no standing waves exist, that is, s.w.r. is 1:1 or "unity."

Vertical antenna - An antenna whose main radiating element is perpendicular to the earth. Typically, its pattern is omnidirectional.

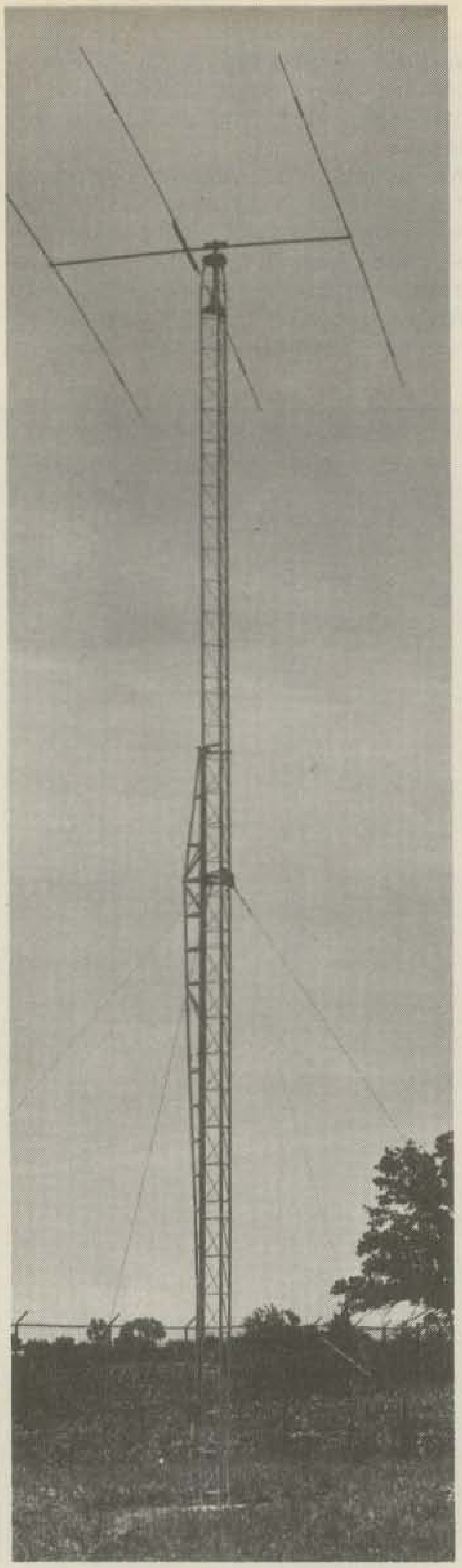
Vertical polarization - A radio wave's condition in which its electrical field is perpendicular to the surface of the earth.

Wavelength - The distance, normally measured in meters, between corresponding points of a radio wave. It is also the distance that the radio wave travels during one cycle (Hertz, or Hz).

Whip antenna - A thin, self-supporting vertical antenna, normally used in

Voltage or Current Ratio (Equal Impedance)	Power Ratio	− db +	Voltage or Current Ratio (Equal Impedance)	Power Ratio
1.000	1.000	0	1.000	1.000
0.989	0.977	0.1	1.012	1.023
0.977	0.955	0.2	1.023	1.047
0.966	0.933	0.3	1.035	1.072
0.955	0.912	0.4	1.047	1.096
0.944	0.891	0.5	1.059	1.122
0.933	0.871	0.6	1.072	1.148
0.923	0.851	0.7	1.084	1.175
0.912	0.832	0.8	1.096	1.202
0.902	0.813	0.9	1.109	1.230
0.891	0.794	1.0	1.122	1.259
0.841	0.708	1.5	1.189	1.413
0.794	0.631	2.0	1.259	1.585
0.750	0.562	2.5	1.334	1.778
0.708	0.501	3.0	1.413	1.995
0.668	0.447	3.5	1.496	2.239
0.631	0.398	4.0	1.585	2.512
0.596	0.355	4.5	1.679	2.818
0.562	0.316	5.0	1.778	3.162
0.531	0.282	5.5	1.884	3.548
0.501	0.251	6.0	1.995	3.981
0.473	0.224	6.5	2.113	4.467
0.447	0.200	7.0	2.239	5.012
0.422	0.178	7.5	2.371	5.623
0.398	0.159	8.0	2.512	6.310
0.376	0.141	8.5	2.661	7.079
0.355	0.126	9.0	2.818	7.943
0.335	0.112	9.5	2.985	8.913
0.316	0.100	10	3.162	10.00
0.282	0.0794	11	3.55	12.6
0.251	0.0631	12	3.98	15.9
0.224	0.0501	13	4.47	20.0
0.200	0.0398	14	5.01	25.1
0.178	0.0316	15	5.62	31.6
0.159	0.0251	16	6.31	39.8
0.141	0.0200	17	7.08	50.1
0.126	0.0159	18	7.94	63.1
0.112	0.0126	19	8.91	79.4
0.100	0.0100	20	10.00	100.0
3.16×10^{-2}	10^{-3}	30	3.16×10	10^{3}
10^{-2}	10^{-4}	40	10^{2}	10^{4}
3.16×10^{-3}	10^{-5}	50	3.16×10^{2}	10^{5}
10^{-3}	10^{-6}	60	10^{3}	10^{6}
3.16×10^{-4}	10^{-7}	70	3.16×10^{3}	10^{7}
10^{-4}	10^{-8}	80	10^{4}	10^{8}
3.16×10^{-5}	10^{-9}	90	3.16×10^{4}	10^{9}
10^{-5}	10^{-10}	100	10^{5}	10^{10}
3.16×10^{-6}	10^{-11}	110	3.16×10^{5}	10^{11}
10^{-6}	10^{-12}	120	10^{6}	10^{12}

Table I - Handy decibel table shown here summarizes the relationship between voltage, current and power ratios and decibels (dBs). Antenna gain figures are usually stated in dBs against a set reference, such as an imaginary isotropic radiator or half-wave dipole. For example, a 3-element Yagi beam typically has a 7-dB gain over an isotropic source, resulting in an effective power multiplier of slightly more than 5 times, as seen above. In comparing antenna gain figures, be sure you know the reference standard being used. From Popular Electronics Magazine, *Copyright Ziff-Davis Publishing Co., 1955.*



Balun coil is a special device that transforms an "unbalanced" r.f. system into a balanced one, or vice versa. Device is commonly used to feed amateur antennas such as the dipole and beam. Unadilla/Reyco unit shown here boasts an antenna lightning protector. (Photo courtesy Unadilla/Reyco)

mobile applications. Usually made of steel or fiberglass.

Yagi antenna - Popular form of beam antenna that employs driven and parasitic elements. Named after its Japanese inventor and developer, Dr. Hidetsugu Yagi and his partner, Dr. Shintaro Uda.

We've defined in this column some of the more important, basic antenna and transmission line terms. Hopefully, we haven't offended the sensibilities of any of our more experienced and knowledgeable "antenna men" by starting on too elementary a level.

Next month, we will go on to discuss some more sophisticated and specialized terms.

See you then . . . 73, Karl, W8FX

Editor's Note

We welcome Karl aboard as Editor of *CQ's* Antenna Column this month. Karl's had a long history of writing for *CQ* as well as other amateur radio journals. He brings to these pages both his experience and expertise in many areas, especially in the field of antennas.

I'd let Karl get his feet wet for a while then we'd both appreciate keeping him informed as to what you've been doing in the way of antennas as well as supplying him with pictures of your set-ups. Our columns reflect you and your interests, so please take an active part in keeping them up-to-date.

—K2EEK

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ALDA OWNERS need repair service? Have a factory technician who has repaired hundreds on the assembly line, fix your set at the only shop authorized by ALDA when it ceased operation. An inventory of original parts and a completely equipped bench make fast dependable service possible at lowest cost. Ninety percent of repairs are less than $35.00 including UPS shipping charges. Contact Les Bosley, 215 Via El Centro, Oceanside, CA 92054 714-433-6124.

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FOR SALE—TS-120S with CW Filter, mike, exter UFO & spkr. Send S.A.S.E. to 7602 Timberwood Dr., Jacksonville, FL 32224

WANTED—Schematic and if possible manual for SB34 transceiver quote price - W.H. Lowe, K4ASC, 4796 NW 42nd St. Ft. Lauderdale, FL 33313.

WANTED—RME-69 Receiver with DB-20. State price and condx. Bud (714) 639-5170 P.O. Box 5973 Orange, CA 92667.

CALL BOOKS—1979 with 3 supplements $8. US with 3 supplements $8. Please include an s.a.s.e. to return your check in case sold. Art Johnson K2POA 29 Boone St. Bethpage, NY 11714.

BOUND VOLUMES CQ 58-69, 73 63-72, Radio Craft 50-69, Radio News 50-69, Audio 57-68. $10 per vol. K4QQK, 307 Old Fort, Tullahoma, TN 37388.

WANTED—Osc. tube or # of it for Polarad Model 1208 signal source. W4LRR, 234 Elden Drive N.E. Atlanta, Georgia 30342.

TRADE—Brand new SST-2 antenna tuner for keyer paddles in mint condition. Call Fred Weiss WN52AH. 918-835-3894.

HEATH SB-634 station console unit in mint condition, late purchase, $165. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, Ohio 44212.

WANTED: Used amateur equipment. State condition, make, model and price. H. F. SCHNUR, 115 Intercept Avenue, North Charleston, SC 29405.

WANTED: Correspondence with anyone who owns a Crosley Harko, Jr. Senior, or Audion Detector unit. Want hook-up data on them and Blue Books also. N. Clapp, 1202 W. 5 St., DeWitt, Iowa 52742.

WANTED: An AM, SSB, CW 6 Meter Receiver. Send details to Gordon Jeveli WBØZSA 10925 Morris Ave S. Bloomington, MN 55437.

SELL: ELMAC PMR-8 Ham band receiver, A-1, $85. C. Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

WANTED: Riders TV Manual 1 & 2. Cabinet for SP-600-VLF rcvr. W7KSG 1876 E. 2990 So. Salt Lake City, Utah 84106.

BRAND NEW 4X150A's. $11.95. Bob Grinnell 402-333-0525.

G.E. TRANSISTORIZED PROGRESS LINE Mobile Radio. 2 meter band. 35 watts out $100 or trade? Bob Grinnell 11014 Harney Omaha, NE 68154.

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BNC ANTENNA RELAYS. 110VAC-$15.95, 28VDC-$14.95, dc to 16Hz. 1000 watts. Bob Grinnell, WDØFDE. 11014 Harney Omaha, NE 68154.

SALE: NEW NEVER AIRED SWAN 100 MX, original warranty, $585.00, N. C. Scott K4HWP, Clifton Forge, Virginia 24422

SWAN 250C AC/DC/Mike $275; Dual Digital Clock $35; 600 QSTs $60 N4VA 7724 Harwood, Springfield, VA 22152.

I AM SEEKING A TECH in the S.F. Bay area to service/align an HQ180A. Same for sale Bill K6RGY 452 Manor Dr., Pacifica, CA 94044 (415) 355-0826.

SELL OR TRADE CQ's from 46, QST's from sixteen. Call Books, Handbooks, catalogs Recvrs miscellaneous parts tubes Books, Erv Rasmussen 164 Lowell St., Redwood City, CA 94062.

SALE OR TRADE for RTTY gear: Hallicrafters SX-122 and Military R390/URR general coverage receivers, both mint. Bob Bunn WAØLKE, RT 3, Box 565, West Plains, MO 65775.

FOR SALE: Transeiver Super Skyrider Hallicrafter Model SX-28 Serial Number H164077. Also drug store tube tester best offer phone 414-567-6612 or 4025 N. Sawyer Rd. Oconomowoc, Wisconsin 53066.

QSL's, name tags, rubber stamps. Larger catalog and samples 25¢. Budget Print Center, 130 Lincoln Highway West, New Haven, Indiana, 46774.

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FOR SALE: YAESU FT401B SSB Transceiver 80-10 meters with matching external speaker and desk microphone. All excellent condition. $550.00 Call Judy WB2QXY (516) 585-4951

WANTED—A Heathkit HW-20 2 meter AM Transceiver (the "Pawnee") in working condition. Al Gordon, 1726 Spreckels Lane, Redondo Beach, CA 90278.

COAXIAL CABLE, FREE CATALOG, RG8U Foam $15.95/100ft. 80% shield, MIL specs polyethelyne $22.95/100, RG213 non-contaminating $27.95/100, RG58U or RG59U foam $6.95/100 shipping $2/100 Nemal Electronics 5685 SW 80 St., Miami, FL 33143. COD Add $1.00 We buy HT-220's

"LET'S COMMUNICATE" and "HAM IT" bumper stickers are now available. Send $1.25 each (includes postage) to: The MacCord Co., P.O. Box 357, Comstock, MI 49041

W3HB says his book tells all about Frequency Synthesizers. Design of Phase-Locked Loop Circuits without Experiments-254 pages from the famous Blacksburg series. $9.95 ppd to Group Technology P.O.B. 97-16, Check, Virginia 24073 (703-651-3153)

Self-study How-to books in Electronics, Communications and Microcomputers. List of over 30 in the famous Blacksburg series. $1.00 to Group Technology P.O.B. 97-16, Check, Virginia 24073

WANTED: Bird Wattmeter, Bencher Chrome Paddle, MFJ-484 Grand Master Keyer, NYE-Viking #250-0046-001 Phone Patch State Cond. & Price W1AGA, Albert Lebel, 97 Bradford St., N. Andover, MA 01845

WANTED: Short Wave Receivers of 20's and 30's and other old radio items. Troe, Skyline Dr., Morristown, NJ 07960

WANTED: KWMZ with power supply - reasonable -state price and condition • Sever-W8IM, 248 Sheraton Dr. N.W., North Canton, Ohio 44720

NEEDED: Bulkhead/chassis lightning arresters & crossover relays w/"N" type connectors. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883

DUMOUNT HH-300 5 ch 150-162 MC HT 2.2w Like new $260. K6KZT 2255 Alexander, Los Osos, Ca. 93402

FOR SALE YAESU 620B G Mtr Transceiver. Includes cw filter and marker - mint cond. $380. 215-271-8898. Tony Musero

AMOS & ANDY OLDIE: RCA Microphone Model MI 6203-C - Serial no. 244 Estimated weight - 5 pounds Aetnal size 2¾" w x 6¾ L x 2" thick First $10.00 + postage gets it. Bob Farmer, 3113 N. Columbia St., Plainview, TX 79072.

SELL OR TRADE - Central Electronics Model 20A SSB AM-PM CW transmitter covering 160, 80, 40, 20, 15, 10 meter bands. Clarence Wilken, Forreston, IL 61030 815-938-2564

SALE - Tubes 211's 311's $3 ea; RG-62 CO-AX 100/$7; Panduit cable ties SSTIM-M20 0-¾" 1000/$8; Delco AM-FM's GM's '70-'77. Svirmickas, 6601 S, Whipple, Chicago 60629

FOR SALE: Heathkit model HG-10B VFO, Perfect condition, $100. Scott Stamper, P.O. Box 3102, Clarksville, TN 37040

FOR SALE: Wilson 1402SM handi-talkie, good condition, with case, rubber duck, touchtone pad, numerous crystals, other accessories. Heath Micoder I/TT microphone. Turner Plus Three (+3) amplified microphone. Gilfer Model A-20 SW preselector, covers 4-22 MHZ. Karl Thurber, W8FX, 631 N. Overbrook Drive, Ft. Walton Beach, FL 32548.

REPLACE RUSTED Antenna bolts with stainless steel bolts. Small quantities, free catalog. Elwick Dept. 366, 230 Woods Lane Somerdale, N. J. 08083

WANTED: Service manual or schematic of multiband receiver Tokyo Skylark alias ICF2002 Space Commander. R. Tepper, 72 Schenkarstr, Holon/Israel

TRAVEL-PAK QSL KIT—Converts post cards, photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, N.Y. 12198.

NCX 500 Five Band 300 watt transceiver with P/S, $295. SASE for brochure to W4XC, 312 Brandywine Rd, Chapel Hill, NC 27514.

ROCHESTER Hamfest & NY State ARRL Convention, May 16-17. Add your name to mailing list. Send QSL to Rochester Hamfest, Box 1388, Rochester, NY 14603. Phone 716-424-1100.

COLLINS SALE: KWM-2 $450; PM-2 $125; Mobile Rack w/2 mobile power supplies $125; Take All $600 firm. S-LINE: 75S3 $450; 32S3 $525; 516F2 $125 Take all (S-Line) $1000 firm. CURTIS Deluxe Keyer EK-404 $70. ALL OF THE ABOVE for $1650 firm. Jack M. Gutzeit, W2LZX, c/o CQ Magazine, 76 N. Broadway, Hicksville, NY 11801.

MILITARY SURPLUS RADIOS - Korean War Era. Call for makes, models, prices. Models PRC9, PRC10, both in working order. Aircraft distress survival radios. 212-829-0784 (Bronx, NY). Ask for Eddie.

WANTED Pocket pager, high or low band, low if possible. Steve Siske Box 551, Hazelwood, N.C. 28738

CLEANING SHACK. Heathkit 10-18, 5-inch scope. Triplett transistorized Volt-Ohmeter, 600 type 2. $40.00 each FOB. K7BD, 103 E. Bartlett, Selah, WA 98942

CQ CONTESTERS, DX'ers - QSL cards only $14.95 per thousand. Very nice card - Why pay more? SASE for samples. N5AWD - A1 QSL Cards, 1310A Ave. M., Plano, TX 75074

SELL HALLICRAFTER HT-37 transmitter $80 plus shipping. Send SASE for details. Paul Van Deunen KA4CMZ 1466 Mclaughlin Dr. Mobile, AL 36605

WILSON MARK II H-T with TT pad, wall and mobile chargers, remote speaker/microphone $215. IC-202 2M SSB/CW $150. TPL 401B 220 MHZ amplifier, IW in, 40W out $100. Ten Tec 240 160M converter $75. All mint with manuals. W3JF (215) 672-5925.

FREE ELECTRONICS SURPLUS CATALOG Bargain Packed. Fascinating items. Many never before advertised. ETCO-003, Box 762, Plattsburgh, NY 12901. SURPLUS WANTED

QSL CARDS: 500/$10. 400 illustrations. Free Catalogue. Bowman Printing, Dept. CQ, 743 Harvard, St. Louis, MO 63130.

WISH TO CONTACT a former employee of Wireless Specialty Co. from 1920's. Kreuzer, 1428 Main Rd., Corfu, NY 14036.

WANTED: Pre-1925 Wireless Gear, books, magazines, spark transmitters, and tubes. Jim Kruezer, 1428 Main Rd., Corfu, NY 14036.

CLUB CALL PINS 3 lines 1¼ × 3¼ $1.55 each call, first name and club. Colors blue black or red with white letters. (CATALOG) Arnold Linzner, 2041 Linden Street, Ridgewood, NY 11385.

ROHN TOWER - Buy Wholesale from Worldwide distributor. 20G-$27.06 section. 25G-$37.62 section, 45G-$67.76 section, 48 ft. foldover tower - $605.00, 48 ft. BX free standing $2. 13.40.

LOOK buying or selling ham gear? Next five issues plus your ad printed in our publication only $3.00. Press Exchange Dept. C, 60 Brookfield Lane, Ramsey, NJ 07446.

TRS-80 HAM PROGRAMS Dup search and log contests... DXCC, WAS tracking, Antenna Math, much more. $1.00 brings list, refundable. WA4PYF; Box 145-C, Lithonia, GA 30058.

FOR SALE: Collins 75A4, 3 filters, low serial - original owner, excellent condition - $400.00. Collins KWM1 needs neutralizing condenser, mobile mount - fixed and mobile power supplies $350.00. A. Kruhm, K2BSM. (212) 969-8142

WANTED: Hallicrafter S-1 through S-7, DD-1, 8 HPA, SX-10, SX-12, and other early Hallicrafter gear, parts, manuals, and accessories. Any condition. For my collection, please write, even if in doubt on Model No. Chuck Dachis, WD5EDG, 4500 Russell Dr., Austin, TX 78745.

QSLs with Class! Unbeatable quality, reasonable price. Samples: 50 cents, refundable. QSLs UNLIMITED, POB 27553, Atlanta, GA 30327

AUTOMATIC AGE or any book, magazine or catalog about Jukeboxes. Rick Botts, 2545 SE 60th Ct., Des Moines, Iowa 50317. 515-265-8324.

ICOM-701 International Users' Club. Details S.A.S.E. Pohorence N8RT, 9600 Kickapoo Pass, Streetsboro, OH 44240.

RTTY FOR SALE: 28ASR table-top compact (1); 28KSR (2), w/gearshift (1); M28 ROTR (2), w/gearshift (3); M28 LXD stand-alone TD (10); 28KSR compact w/gearshift (1); 28RO compact w/gearshift (2); 34ASR (1); M28 keyboard typing reperf (2); M28 triple LXD (2); M28 underdome typing reperf (1), w/gearshift (2); 2-shaft reperf for 28ASR (2); 60-75-100 wpm gearshifts for 28KSR, RO NEW (5); M28 motorized paper winders (10); self-contained answer-backs (3); 35KSR (1); 35ASR (1); 33ASR TWX (1); gears and parts for all machines. Send SASE for full list and prices. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301.

ATTENTION Certificate Hunters. Free information on beautiful operating awards. S.a.s.e. to HAROAA, P.O. Box 341, Hinckley, OH 44233.

WANTED: Manual/Schematic for E.F. Johnson Viking II transmitter and HQ-140-XA Hammarlund Rec. P.O. Box 427, Seaside, CA 93955 408-375-2722

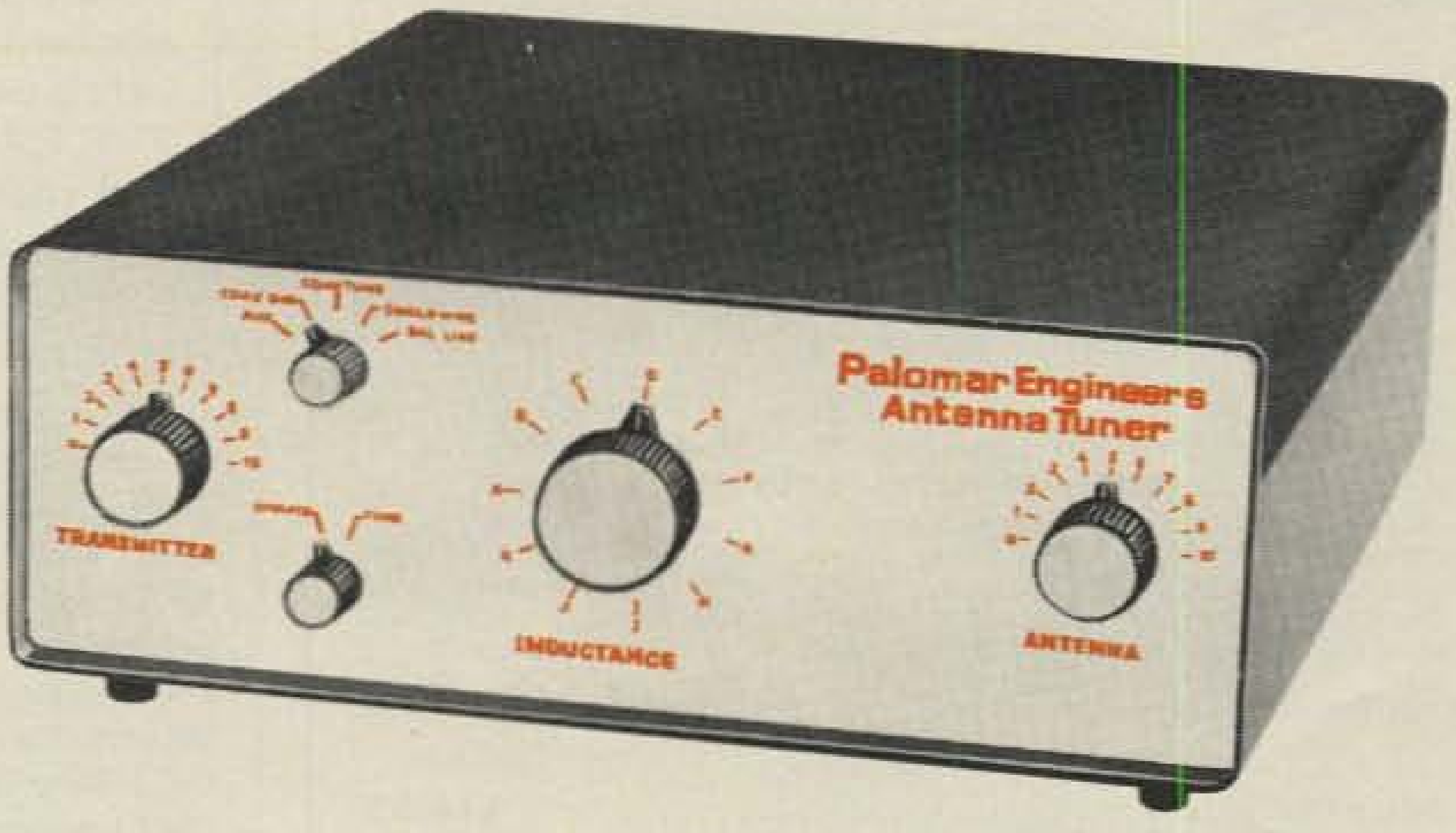
PRINTED CIRCUIT boards from your sketch or artwork. Affordable prices. Also fun kit projects. Free details. DANOCINTHS INC. Dept. CQ, Box 261, Westland MI. 48185.

TRS-80 BAUDOT TTY interface software: no longer need cassette software which drives electric pencil, RSM2, basic toolkit, EDT/ASM, LII BASIC at 100, 75, or 60 WPM. Load program then load self inserting driver. Works with any audio interface hardware. $20.00 Lynn Graves, PO Box 306, Lake Bluff, IL 60044

1943 Edition Allied's Radio Builder's Handbook. 36 pages of circuits, theory, & inspiration for the beginning radio builder and nostalgia for oldtimers! Nice gift item. $6.95 postpaid. Ohio residents add sales tax. R. A. Russ Co. Box 601 Fairborn, OH 45324

Crystal set kit; open type crystal detector, antenna, Trimm headphones, 1943 Allied's Radio Builder's Handbook, plus 10 pages of unique instructions. $24.95 postpaid. Ohio residents add sales tax R.A. Russ Co. Box 601 Fairborn, OH 45324 (gift boxed)

Antenna Tuner



$299.95

Here is a new tuner that puts more power into your antenna, works from 160 through 10 meters, handles full legal power and then some, and works with coax, single wire and balanced lines. And it lets you tune up without going on the air!

WE INVESTIGATED

All tuners lose some rf power. We checked several popular tuners to see where the losses are. Mostly they are in the inductance coil and the balun core.

So we switched from #12 wire for the main inductor to ¼" copper tubing. It can carry ten times the rf current. And we've moved the balun from the output, where it almost never sees its design impedance, to the input where it always does. Thus more power to your antenna.

IMPOSSIBLE FEAT

The biggest problem with tuners is getting them tuned up. With three knobs to tune on your transceiver and three on the tuner and ten seconds to do it (see the warning in your transceiver manual) that's 1½ seconds per knob.

We have a better way; a built-in 50-ohm noise bridge that lets you set the tuner controls without transmitting. And a switch that lets you tune your transmitter into a dummy load. So you can do the whole tuneup without going on the air. Saves that final; cuts QRM.

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FT-707 is shown with optional FV-707DM VFO & Scanning Microphone

THE FT-707 "WAYFARER"

The introduction of the "WAYFARER" by Yaesu is the beginning of a new era in compact solid state transceivers. The FT-707 "WAYFARER" offers you a full 100 watts output on 80-10 meters and operates SSB, CW, and AM modes. Don't let the small size fool you! Though it is not much larger than a book, this is a full-featured transceiver which is ideally suited for your home station or as a traveling companion for mobile or portable operation.

The receiver offers sensitivity of .25 uV/10 dB SN as well as a degree of selectivity previously unavailable in a package this small. The "WAYFARER" comes equipped with 16 poles of IF filtering, variable bandwidth and optional crystal filters for 600 Hz or 350 Hz. Just look at these additional features:

FT-707 with Standard Features

- Fast/slow AGC selection
- Advanced noise blanker
- Built-in calibrator
- WWV/JJY Band
- Bright Digital Readout
- Fixed crystal position
- 2 auxiliary bands for future expansion
- Unique multi-color bar metering—monitors signal strength, power output, and ALC voltage.

FT-707 with Optional FV-707DM & Scanning Microphone

- Choice of 2 rates of scan
- Remote scanning from microphone
- Scans in 10 cycle steps
- Synthesized VFO
- Selection of receiver/transmitter functions from either front panel or external VFO
- "DMS" (Digital Memory Shift)

Impressive as the "WAYFARER" is its versatility can be greatly increased by the addition of the FV-707DM (optional). The FV-707DM, though only one inch high, allows the storage of 13 discrete frequencies and with the use of "DMS" (Digital Memory Shift) each memory can be band-spread 500 KHz. These 500 KHz bands may be remotely scanned from the microphone at the very smooth rate of 10 Hz steps.

The FT-707 "WAYFARER" is a truly unique rig. See it today at your authorized Yaesu Dealer.

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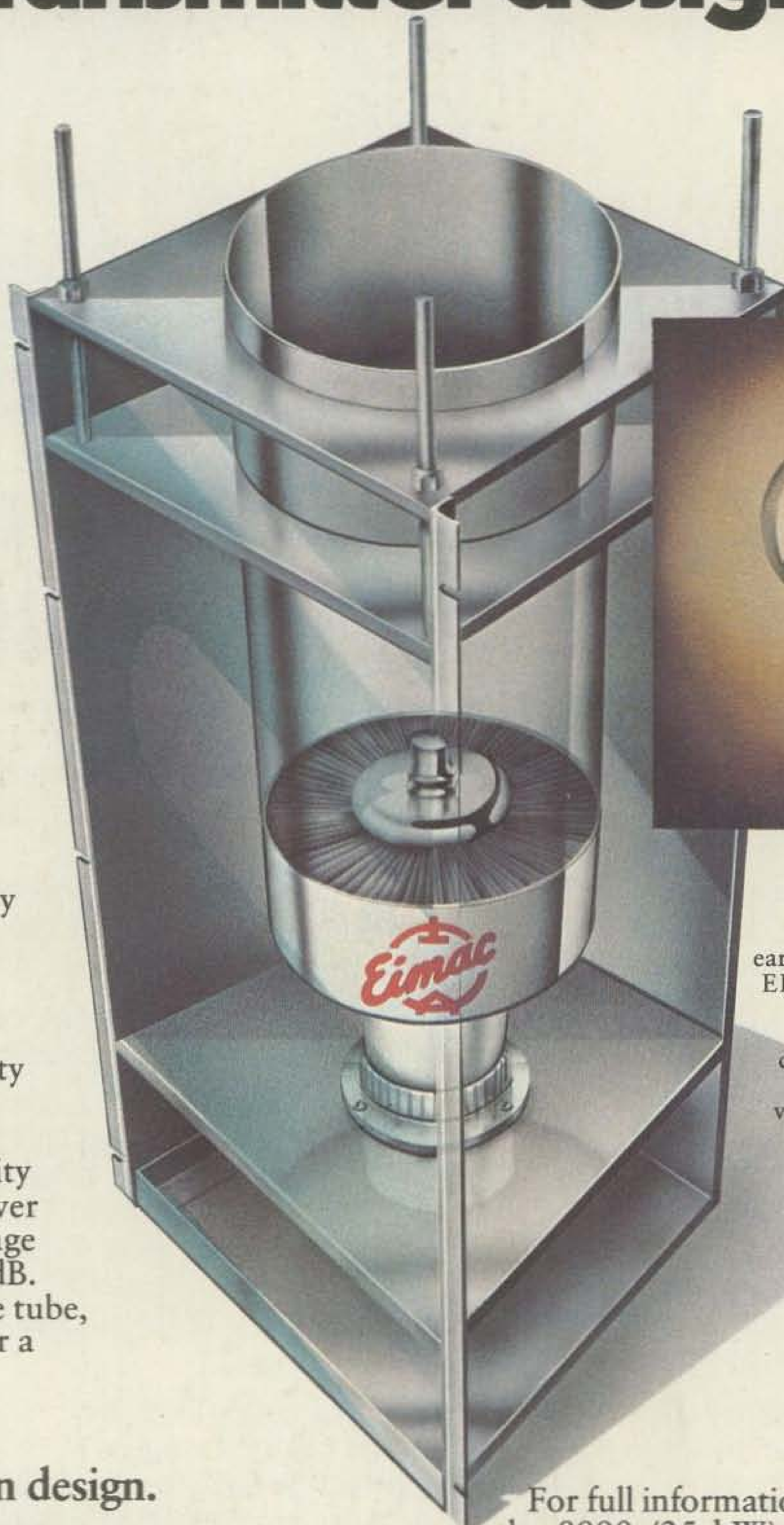
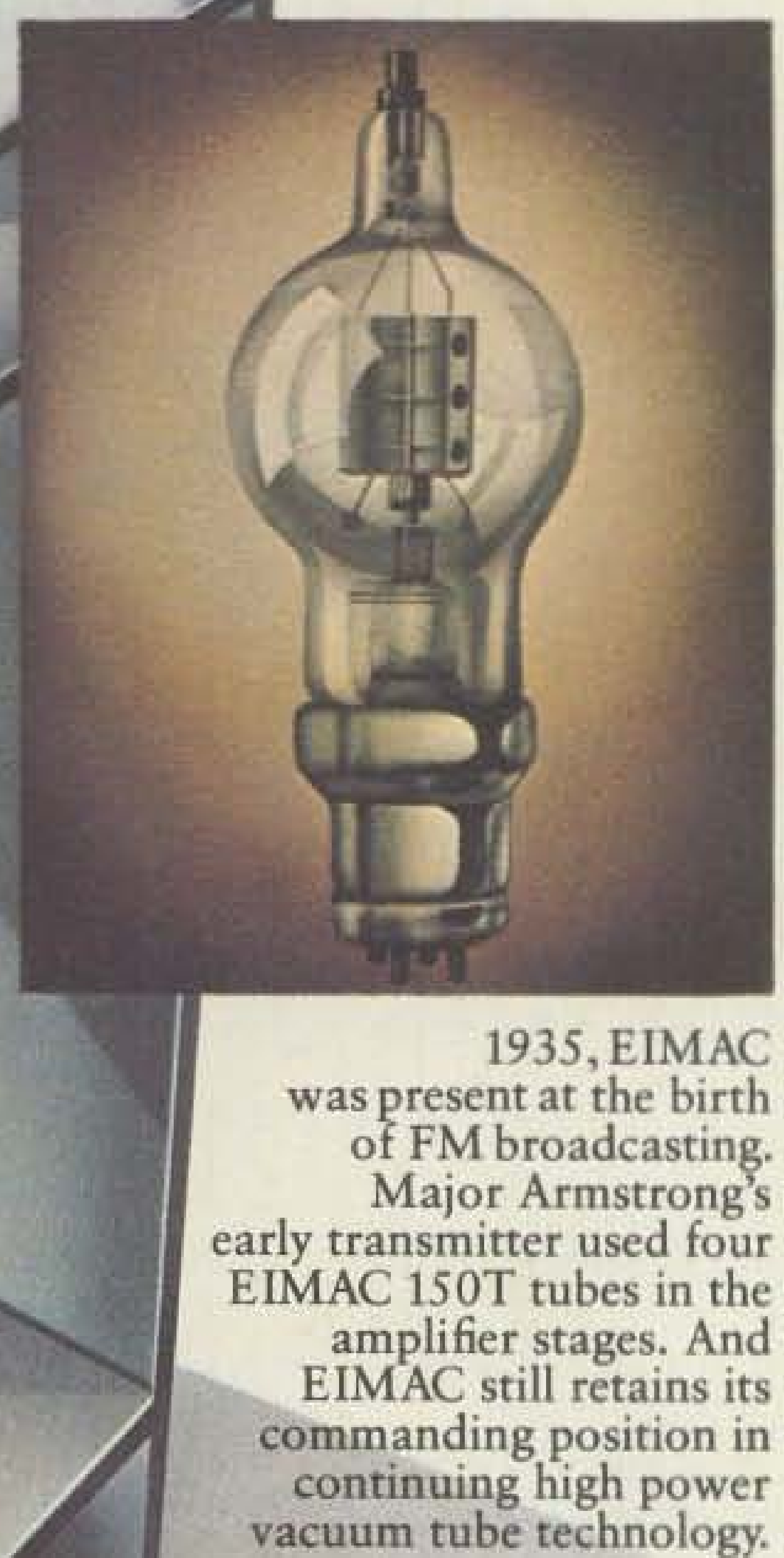
EIMAC takes the work out of 25 kW FM transmitter design.





1935, EIMAC was present at the birth of FM broadcasting. Major Armstrong's early transmitter used four EIMAC 150T tubes in the amplifier stages. And EIMAC still retains its commanding position in continuing high power vacuum tube technology.

New cavity amplifier and tetrode combo.

The new EIMAC CV-2200 power amplifier cavity assembly and companion 8990 tetrode is ready for use in next generation FM transmitters in the 88–108 MHz band.

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For full information on the CV-2200, the 8990 (25 kW) and the 8989 (15 kW) write EIMAC, Division of Varian, 301 Industrial Way, San Carlos, California 94070. Telephone (415) 592-1221. Or contact any of the more than 30 Varian Electron Device Group sales offices throughout the world.