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CQ Amateur Radio

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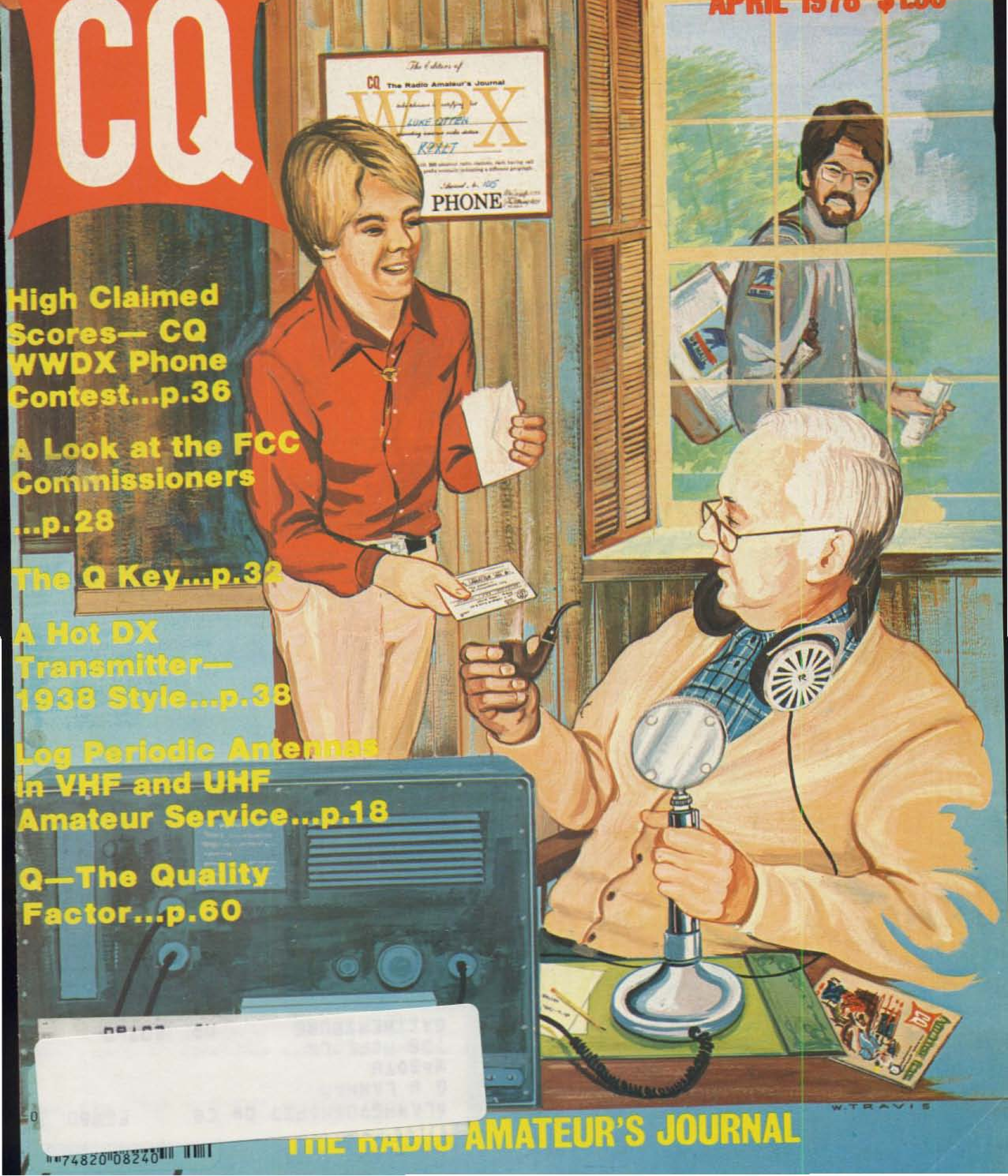

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Log Periodic Antennas in VHF and UHF Amateur Service...p.18

Q—The Quality Factor...p.60

THE RADIO AMATEUR'S JOURNAL

This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines.

BRAND NEW

$79.95

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941 Versa Tuner II with all these features at this price:

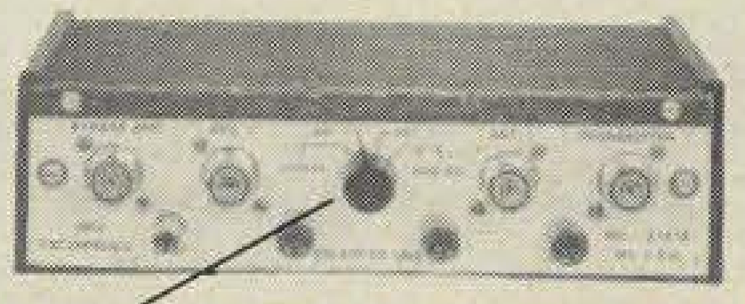
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balance lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balance line, or random wire.



ANTENNA SWITCH lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

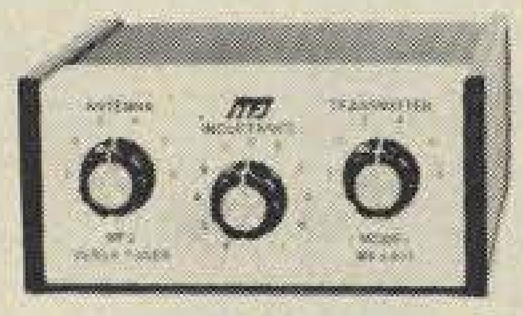
You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 5x2x6 inches fits easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balance line inputs (2), random wire input (1), and ground (1).



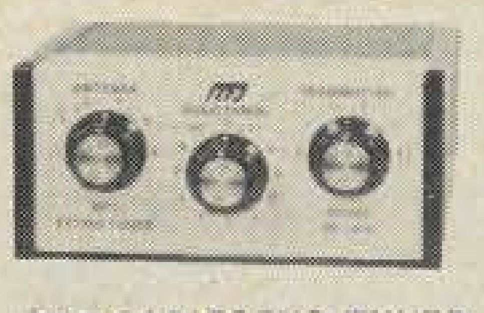
$59.95

BRAND NEW

MFJ-901 VERSA TUNER

New efficient air wound coil for more watts out.

Only MFJ uses an efficient air wound inductor (12 positions) in this class of tuners to give you more watts out and less losses than a tapped toroid. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF output. 1:4 balun for balance lines. Tune out the SWR of your mobile whip **from inside your car.** Works with all rigs. Ultra compact 5x2x6 inches. SO-239 connectors. 5 way binding posts. Ten Tec enclosure.



$49.95

BRAND NEW

MFJ-900 ECONO TUNER

Same as MFJ-901 Versa Tuner, but does not have built-in balun for balance lines. Tunes coax lines and random lines.

$39.95

MFJ-16010 RANDOM WIRE TUNER

Operate 160 thru 10 Meters. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz.

$49.95

BRAND NEW

MFJ-202 RF NOISE BRIDGE

This MFJ RF Noise Bridge lets you adjust your antenna quickly for maximum performance. Measure resonant frequency, radiation resistance and reactance. Exclusive range extender and expanded capacitance range (± 150 pf) gives you much extended measuring range.

Tells resonant frequency and whether to shorten or lengthen your antenna for minimum SWR. Adjust your single or multiband dipole, inverted vee, beam, vertical, mobile whip or random system for maximum performance. 1 to 100 MHz. SO-239 connectors. 2x3x4 inches. 9 volt battery.

For Orders **Call toll-free 800-647-8660**

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CQ

APRIL, 1978 **VOL. 34, NO. 4**

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

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Zero Bias

an editorial

RSGB And CQ

I was disappointed to learn through the pages of *Radio Communication* (the journal of the Radio Society of Great Britain) that they would no longer be handling subscriptions for *CQ* magazine in Great Britain. During the past year we have experienced some difficulty with the RSGB and subscribers who have utilized their services. We have also received some irate correspondence from British subscribers who have not received their issues of *CQ*. Apparently the RSGB submitted names of new subscribers to our Circulation Department and withheld payment for those orders, for whatever reason. These orders could not be processed for lack of payment and this resulted in eventual correspondence from British subscribers asking the whereabouts of their magazines. They obviously paid the RSGB in good faith and were totally unaware of the difficulty we were experiencing. Some of these difficulties have been rectified and I can only hope that the RSGB sorts out their own internal problems. We have had in the past a very satisfactory, mutually beneficial, relationship and I'm sorry to see it end this way. I also extend to all of our readers in Great Britain the invitation to subscribe to *CQ* directly. Just check the information on the subscription envelope within this issue for complete details on how you can keep receiving *CQ* each and every month.

RFI And You

Shortly after I had written my last Editorial I began to collect material for this one: My intent was to follow through with further arguments for RFI legislation and to work up some sort of affirmative action plan to eliminate the problem. What I keep coming back to, in developing such a plan, is that it boils down to a one-sided effort. What I can offer, and what the FCC hopes to legislate, is further, and more stringent control on amateur and CB equipment sales, manufacturing and distribution. Amateurs are quick to recognize that illegal use of CB amplifiers foster interference and that poorly shielded equipment or "loosely" designed equipment may be at fault some of the time.

The frustrating part of the situation is that there is no control at the other end of the interference chain, nor is there an effective means of securing a reciprocity in dealing with interference. What I am getting at is that we have been conditioned to accept the blame *intoto* for rectifying a situation that cannot be resolved by one side. The manufacturers of consumer devices apparently have been set aside as a privileged class, the consumer has been absolved of responsibility by his retail payment and the culprit is still you and me. Lo, the poor manufacturer who finds himself in the awkward position of producing TV sets in one plant, f.m. radios in another, and still in a third, CB sets. Now we can all pause and think of ways each device can interfere with the other but who do you think will pay the price for any possible and probable interference?

We can offer symptomatic relief as the commercials say by a program of consumer education. We can show how filters will help both sides of the controversy. Notice I say help and not eliminate. If the ideal state were ever achieved whereby all CBers and all amateurs operated their equipment according to law with mutual respect and integrity how could you then explain to an irate viewer that your "toy" was still interfering with his "gong show". Somehow the manufacturer escapes culpability when he produces his equipment. His advertising will only feature the latest gadget or color design which entices the consumer to believe that he is buying the best of all possible products. After all it didn't take too many years to the average consumer that his paying for planned obsolescence was a good idea. Our consumer then has purchased the best (he could not admit to himself that he didn't) of all possible products (the manufacturer wouldn't admit it wasn't). Once we have applied our symptomatic relief to the original problem, what do we do or give up to eliminate the balance of interference?

I cannot urge you strongly enough to seek Congressional support for the three Bills before Congress dealing with interference. Find out what is involved and get involved. If you stand by the sidelines until the problem bits you directly, look around, you'll find out that you're quite alone.

The following is a quote from *CQ's* first Editor, John H. Potts, when *he* wrote Zero Bias in April 1946. As you will see interference is not a new problem nor one that has easy answers. Let's attempt to make 1978 a culminating year for our efforts. Thirty two years seems long enough.

BCL Complaints

"A local ham on 10-meter phone received several BCL complaints of interference. Nothing unusual in this by itself, but the neighbors of this amateur tore down his beam and intimidated his family. With the housing shortage what it is he had no alternative but to get off the air. Though over five weeks have passed since his rig was dismantled, he still receives BCL complaints from tenants in the apartment building. The point is that these people *are* receiving interference in their broadcast sets, but it isn't from any ham.

With the start of volume production on household switches, automobiles, oil burners, and electrical appliances of all types, the subject of eliminating radio interference produced by them is very timely. Now is the ideal time to have all manufacturers fix their products so they will not cause radio interference. As a move initiated by hams it might soon run into rough sailing, but on behalf of broadcast listeners, short-wave listeners, FM and television users, *and* the ham, it might gain considerable support. National legislation which would forbid the sale in interstate commerce of automobiles and electrical appliances which cause radio interference is not too much to hope for. The slight additional cost to the manufacturer could be passed on to the consumer who is, after all, the ultimate beneficiary of such a program.

Promoting such a piece of legislation is not a simple task, but the amateurs represent a tremendous group of consumers who are well equipped technically to make the first step. Through the RMA Amateur Committee, by pressure on public officials, and through a vigorous compaign in local papers by individual amateurs and radio clubs, freeing the air from much radio interference might soon be a reality."

(continued on page 89)

Announcing

• **Dayton, OH** — The Dayton Amateur Radio Association, Inc. will be sponsoring their 27th Annual Hamvention on Friday, April 28, Saturday, April 29, and Sunday, April 30, 1978. The Hamvention will be held at the Dayton Hara Arena and Exhibition Center. There will be ladies programs, hidden transmitter hunts, Hamvention awards, and a huge Flea Market. For confirmed hotel reservations write: Hamvention Reservations, Box 44, Dayton, OH 45401. For additional info, write: Dayton Hamvention, at the above address.

• **Sullivan, IL** — The Moultrie Amateur Radio Klubs 17th annual Hamfest will be held one week earlier on April 23, 1978 in order to miss the Dayton Hamvention. The Hamfest will be held at the Wyman Park, Sullivan, IL. There will be a heated indoor and large outdoor flea market. No charge to vendors. For info, write: Mark, P.O. Box 327, Mattoon, IL 61938. Talk-in on 146.94.

• **Wellesley, MA** -- The Wellesley Amateur Radio Society will be conducting their annual auction on Saturday, April 15, 1978, beginning at 11:00 a.m. at the Wellesley High School Cafeteria on Rice Street. Talk-in on -96:36, 04-64 and 52. Doors open at 10:00 a.m. Contact: Kevin P. Kelly, WA1YHV, 7 Lawnwood Pl., Charlestown, MA 02129.

• **Dayton, OH** — The 9th Annual FM BASH will be held on the Friday night of the Dayton Hamvention, April 28, 1978, at the Dayton Biltmore Tower (hotel), Main at First Street, from 8 p.m. til midnight. Admission is free to all hams and their friends. A fabulous prize drawing will feature a complete Drake UV-3, plus many other prizes. For further info contact: Miami Valley F.M. Assn., c/o Sue Hagedon, WB8GWQ, 1340 Brainard Woods Dr., Dayton, OH 45459.

• **West Trenton, NJ** — The annual Delaware Radio Association (W2ZQ/WR2ADE) flea market and auction will be held on Sunday April 20, 1978, at 9 a.m. rain or shine at the Villa Victoria Academy in West Trenton. (The school is located adjacent to Rt. 29 near the junction of Rt. 29 and I-95). Talk-in on 07/67 and 146.52. Advanced registration is $1 and $1.50 at the gate. For additional info or tickets write: DVRA, P.O. Box 7042, West Trenton, NJ 08628, s.a.s.e. please.

• **Mobile, AL** — The Mobile Amateur Radio Club will hold its annual Hamfest and Computerfest at the University of South Alabama in Mobile, on Saturday and Sunday, April 15th and 16th, from 9:00 a.m. .to 5:00 p.m. Activities for the ladies and children. For more info, contact: Ed Coker, WA4VPI, 7650 Ashley Court, Mobile, AL 36619.

• **Griffith, IN** — On April 22, 1978, starting at 6 p.m., the Lake County Amateur Radio Club will be holding their 25th .Silver Anniversary/Herbert S. Brier Memorial Banquet, to be held at the Griffith Knights of Columbus Hall, 1400 S. Broad St., in Griffith, IN. Door prize list will feature a Wilson Mark II 2 meter hand-held transceiver, calculators, and gifts for the entire family. Tickets are $8.00 each. No door purchases, make check payable to L.C.A.R.C. Write to : Joel G. Iacono, WA9DJP, 634 Osage Dr., Dyer, IN 46311.

• **Muskegon, MI** — The Muskegon Area Amateur Radio Council will be holding their 1978 ARRL Great Lakes Division Convention and Hamfest at the Muskegon on April 8. There will be free parking, easy access to motels, dining cafeteria, meeting rooms; and a theatre. For more info, contact: The Muskegon Area Amateur Radio Council, P.O. Box 691, Muskegon, MI 49443.

• **Columbus, GA** — The Columbus Amateur Radio Club will hold its annual Hamfest on April 8-9, 1978, at the Columbus Municipal Auditorium at the fairgrounds. Spacious, air-conditioned exhibit area, prizes, flea market, a Saturday night banquet, FCC exams, and a luncheon at the Hamfest site will be featured. For further info, please contact: Eddie Kosobucki, K4JNL, 5525 Perry Ave., Columbus, GA 31904.

• **Charlotte, NC** — The Mecklenburg Amateur Radio Society, W4BFB, announces their 1978 ARRL sanctioned Hamfest to be held on April 1-2. Charlotte's new Civic Center will again be their location. Plenty of parking will be available at the Center. For more info, contact: The Mecklenburg Amateur Radio Society, Inc., W4BFB, 2425 Park Road, Room 023, Charlotte, NC 28203.

• **Montgomery, AL** — The Alabama Forestry Festival will be held on April 22, 1978. The Twin Base Amateur Radio Club station, WA4PRY, will be operating on site in conjunction with the Alabama Forestry Festival at the

(Continued on page 92)

TEN-TEC CENTURY 21 GOES DIGITAL!

Century 21, the exciting 70-watt, 5-band CW transceiver that surprised everyone with its super performance and low cost, has another surprise for you. A second model with digital readout (and a mod kit for those who would like to convert their dial model). Both Models 570 and 574 have the same unique circuitry that has won raves from everyone — both have the same fine features:

•Direct Frequency Readout (Model 574: 5 red LED digits, 0.3" high, accurate to nearest 1 kHz. Model 570: marked in 5 kHz increments from 0-500 kHz, MHz markings for each band displayed, tuning rate typically 17 kHz per tuning knob turn. • Full Break-In • Full Band Coverage on 3, 5, 7, 14, 21 MHz Bands, 1 MHz on 28 MHz Band • 70 Watts Input • Total Solid-State • Receives SSB and CW • Receiver Sensitivity 1 μV • Instant Band Change, No Tune-up • Offset Receiver Tuning • 3-Position Selectivity • Adjustable Sidetone Level • Linear Crystal-Mixed VFO • Overload Protection • Built-In AC Power Supply • Black & Gray Styling • HWD: 6⅛" × 12½" × 12", 15½ lbs. • Matching Accessories

THE RECEIVER. Double-Direct-Conversion. Easy tuning. Just select the frequency and set the audio level. Excellent cross-modulation characteristics. Offset tuning so you can tune either side of zero beat to reduce QRM. Front panel control selects one of 3 selectivity curves: 2.5 kHz for SSB reception, 1 kHz for normal CW, and 500 Hz for when the QRM gets rough. Plus separate AF and RF controls, headphone jack, and built-in speaker.

THE TRANSMITTER. Total solid-state. Push-pull Class C final amplifier. Individual low-pass filters are switched into the antenna line to reduce unwanted radiations, minimize TVI. No tune-up needed when changing frequencies or bands. And *full* break-in allows incoming signals to be heard between transmitted characters. Now CW is real conversation!

THE VFO. Common to receiver and transmitter. Permeability tuned. Linear scale on model 570; 5-5.5 MHz basic frequency is crystal-mixed to the desired frequency so bandspread and stability are the same on all bands (crystals included for 3.5, 7, 14, 21, and 28-28.5 MHz segment of the 10 meter band).

THE POWER SUPPLY. Built-in, AC operated, and regulated. Monitors current demand, shuts down automatically when necessary for protection. Lighted input current meter shows proper Drive setting.

MATCHING ACCESSORIES. Model 277 Antenna Tuner/SWR Meter. Model 670 Electronic Keyer, 6-50 wpm, self-completing characters. Model 276 Calibrator for markers at every 25 and 100 kHz. Model 273 Crystal for 28.5-29 MHz. Model 1170 12 VDC Circuit Breaker for mobile operation of models 574 and 570.

574 Century 21 Digital Transceiver	$399.00
570 Century 21 Non-Digital Transceiver	$299.00
277 Antenna Tuner/SWR Meter	$ 85.00
670 Century 21 Keyer	$ 29.00
276 Century 21 Calibrator	$ 29.00
273 Crystal for 28.5-29 MHz	$ 5.00
274 Digital Mod. Kit for Model 570	$ 90.00
1170 DC Circuit Breaker	$ 8.75

See both Century 21 surprises at your TEN-TEC dealer — or write for full details.

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THE SECOND SURPRISE OF THE CENTURY: DIGITAL

Please send all reader inquiries directly.

Our Readers Say

QRP Mania!

Editor, CQ:

I just had to tell somebody! I'm a subscriber and a novice for 3 months. I really enjoy and promote QRP operating. In the time that I've been on, I've worked 21 states plus DL1OV in Germany and G3HIW in Essex, England with 2 watts on 15 meters! You can add 7 more states to that with 18 watts on 80 meters. I don't get on 40 much because you get clobbered with foreign broadcast QRM and those 200 watters! I use a Heath HW-7.

Could you publish a schedules column in your QRP section for novices? The only people I've worked are running QRP.

Keep up the good work, guys, and wish me luck on my technicians exam.

Tim Smith, WD4KIA
Spartanburg, SC

Editor, CQ:

I am very happy to say that your excellent articles on QRP have made me become a HW-8 owner. I haven't had so much fun since my novice days. It has been my experience that many stations well do their utmost to complete a QSO, even under poor conditions when they realize you're QRP. It's most enjoyable! Thanks for getting me hooked on QRP.

Dr. J. Permen, VE6AFE
Alberta, Canada

Author's Notes For "A Bulk Ni-Cad Recharger"

Editor, CQ,

The following author's note is in reference to my article "A Bulk Ni-Cad Recharger", which ran in the December 1977 issue:

"After further experience in using the charger, it was found useful to insert a no. 49A pilot lamp in the negative line (alligator clip leads) to each bank of different cell types. The pilot lamps serve as a visual indicator that a particular cell bank is charging and they also act as fuses to protect the cells. The pilot lamps were mounted in the upper right hand corner of the chassis, next to the AA cell holders, in regular pilot lamp fixtures but with the lens cap removed from each fixture for better visability of the lamps. Note that a no. 49A lamp is used in each circuit and not a plain no. 49A lamp. Normally, these lamp types are interchangeable. But in this application, the fact that the no. 49A draws 120 ma as compared to the no. 49, which draws only 60 ma is significant."

John Schultz, W4FA

A New Canadian Spokesman

Editor, CQ:

Congratulations on the article "A Message From The Publsiher" which appeared in the October 1977 issue. As an outsider or foreigner or whatever, the fact remains that a Canadian buys and uses the same Yaesu or ICOM equipment that you Americans buy and use. I protest along with you that it is really unnecessary for all of us to pay higher prices because of the bungling of those who are on their ego trip of wanting to be the sole voice for amateur radio.

As you should know, we here in Canada have formed our own national organization know as "The Canadian Amateur Radio Federation". ARRL is using some of its income to oppose this all the way in an effort to be the only spokesman for the amateurs of Canada. They have gone as far as to create a Canadian Radio Relay League which is supposed to be Canada's national voice even though this 'organization' does not even have an executive.

If ARRL spent half as much money and time working for the amateur as it does trying to keep its image, it could certainly proudly justify its existence.

I agree with you that ARRL is primarily a publishing house (and not a bad one at that) and I agree that it has its place in amateur radio. That place is not being our national organization.

I read the (WARC)-79 article in the November 1977 issue. Thanks for putting the info so simply and plainly.

Otto H. Meginbir
Alberta, Canada

This is the amplifier you have been waiting for

The new 2KD-5 linear amplifier...a one piece desk model with the power and reliability of a console

At Henry Radio, we know how to build only one kind of amplifier ... the best. We want you to compare the 2KD-5 with any other desk model at any price.

Remember, the 2KD-5 is only one model in the world's broadest line of amplifiers ... both vacuum tube and solid state ... for HF, VHF and UHF ... fixed station and mobile ... low power and high power.

Never before has any one company offered such a cornucopia of high power RF amplifiers.

Remember also that Henry Radio offers a broad line of commercial and FCC type accepted amplifiers covering the range of 3 MHz to 500 MHz. Henry amplifiers are in use all around the world. Commercial and export inquiries are invited.

- The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20, 15 and 10 meter amateur bands.
- Two Eimac 3-500Z glass envelope triodes operating in a grounded grid circuit.
- Pi-L plate circuit with a rotary silver plated tank coil for greatest efficiency and maximum attenuation of unwanted harmonics.
- Full legal input in all modes. 2000 watts PEP input for SSB, 1000 watts DC input for CW, RTTY and AM.
- Jumper for 115 or 230 VAC, 3 wire single phase.
- 10.5" high x 15" wide x17.5" deep
- Price...$895.00

2K-4...LINEAR AMPLIFIER. Offers engineering, construction and features second to none. Provides a long life of reliable service, while its heavy duty components allow it to loaf along even at full legal power. Operates on all amateur bands, 80 thru 10 meters. If you want to put that strong clear signal on the air that you've probably heard from other 2K users, now is the time. Move up to the 2K-4. Floor console...$995.00

TEMPO 6N2 brings the same high standards to the 6 and 2 meter bands. A pair of advanced design Eimac 8874 tubes provide 2,000 watts PEP input on SSB or 1,000 watts on FM or CW. Complete with self-contained solid state power supply, blower and RF relative power indicator. ...$895.00

TEMPO 2002. The same fine specs and features as the 6N2, but for 2 meter operation only. ...$745.00

TEMPO 2006. Like the 2002, but for 6 meter operation. ...$795.00

TEMPO VHF/UHF AMPLIFIERS. Solid state power amplifiers for use in most land mobile applications. Increases the range, clarity, reliability and speed of two-way communications. FCC type accepted also.

Model	Drive Power	Output Power	Price
LOW BAND VHF AMPLIFIERS (35 to 75 MHz)			
Tempo 100C30	30W	100W	$159.
Tempo 100C02	2W	100W	$179.
Tempo 100C10	10W	100W	$149.
HIGH BAND VHF AMPLIFIERS (135 to 175 MHz)			
Tempo 130A30	30W	130W	$189.
Tempo 130A10	10W	130W	$179.
Tempo 130A02	2W	130W	$199.
Tempo 80A30	30W	80W	$149.
Tempo 80A10	10W	80W	$139.
Tempo 80A02	2W	80W	$159.
Tempo 50A10	10W	50W	$ 99.
Tempo 50A02	2W	50W	$119.
Tempo 30A10	10W	30W	$ 69.
Tempo 30A02	2W	30W	$ 89.
UHF AMPLIFIERS (400 to 512 MHz)			
Tempo 70D30	30W	70W	$210.
Tempo 70D10	10W	70W	$240.
Tempo 70D02	2W	70W	$270.
Tempo 40D10	10W	40W	$145.
Tempo 40D02	2W	40W	$165.
Tempo 40D01	1W	40W	$185.
Tempo 25D02	2W	25W	$125.
Tempo 10D02	2W	10W	$ 85.
Tempo 10D01	1W	10W	$125.

TEMPO 100AL10 VHF LINEAR AMPLIFIER. Completely solid state, 144-148 MHz. Power output of 100 watts (nom.) with only 10 watts (nom.) in. Reliable and compact ...$199.00
TEMPO 100AL10/B BASE AMPLIFIER ...$349.00

Tempo solid state amplifiers are available at Tempo dealers throughout the U.S.

please call or write for complete information.

Henry Radio

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Prices subject to change without notice.

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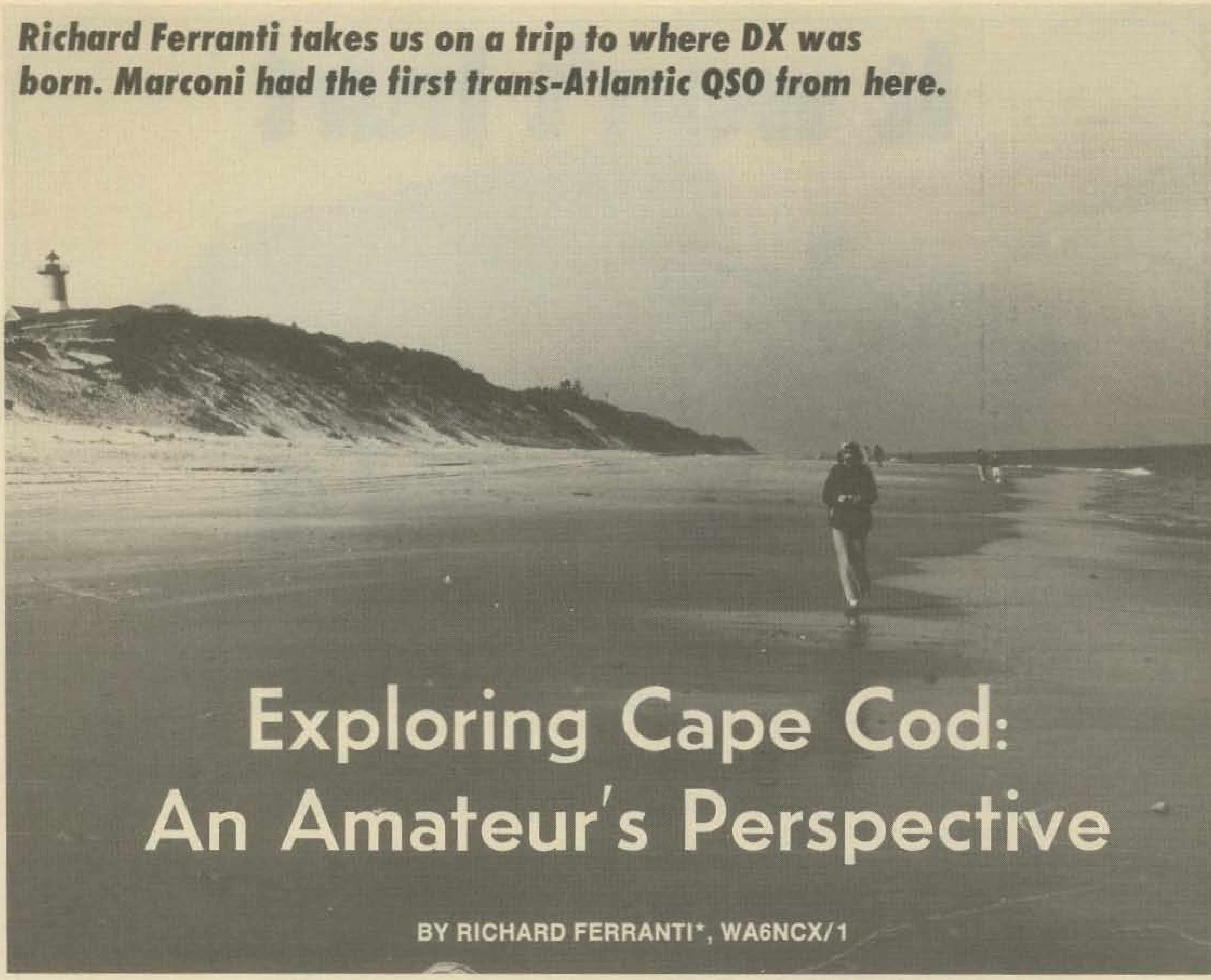
Circle No. 26 on Reader Service Card

Richard Ferranti takes us on a trip to where DX was born. Marconi had the first trans-Atlantic QSO from here.



Exploring Cape Cod: An Amateur's Perspective

BY RICHARD FERRANTI*, WA6NCX/1

Sunday morning, October 2, began with the kind of heavy, sunshine-filled warmth more characteristic of spring than fall. Jim WA4UVE and I started out in K1VR's Audi and rapidly made the hour-long trip from Cambridge to Hyannis via highways 6 and 3. We stopped along Nantucket Sound and poked around an old lighthouse, although the area was rather heavily obscured with fog. Continuing on, we drove past Chatham and were just about to come upon Pleasant Bay when Jim noticed some enormous wire antennas and stopped the car. A sign in white letters on red off to the right said, "RCA Global Communications—Radio Station WCC." We pulled up into the wooded area and noticed an older brick building and more wire antennas strung up here and there on weathered telephone poles.

We noticed K1VTS on the license plate of a nearby parked car, so, ignoring the sign on the door which said "No Visitors Saturdays and Sundays or after 3 PM Weekdays," we knocked. Jim had his Standard HT with him and we hoped to use that as a calling card. The man who answered kept looking at the sign on the door and indicated that maybe we could be shown around if we returned at 4:30 that day when things were less busy. We went back to our car resolving to return and explore the mysteries of WCC.

One of the nicest things about the Cape is the National Seashore along the vertical arm on the eastern side facing the Atlantic Ocean. Jim and I found a nice beach near a lighthouse and started exploring the long stretch of sandy-white, clean, and ocean-swept beach. Here and there on a sand-bar were small short-legged birds of various kinds, as well as enormous gulls, busily picking the innards out of unfortunate horseshoe crabs. Clear jelly fish were washed up on the sand—but nobody wants to eat those primitive gooey creatures. I stooped and swished my hand in the Atlantic for the first time in my life, thinking that Europe was just on the other side of this angry pool of salt water. Had it been the familiar Pacific Coast, visions of Hawaii and late-night KH6's coming through on 20 meters would have filled my head, but here the odd foreign flavor of Europe (and memories of my two months there) stirred me. After a little while we headed up the coast to South Wellfleet.

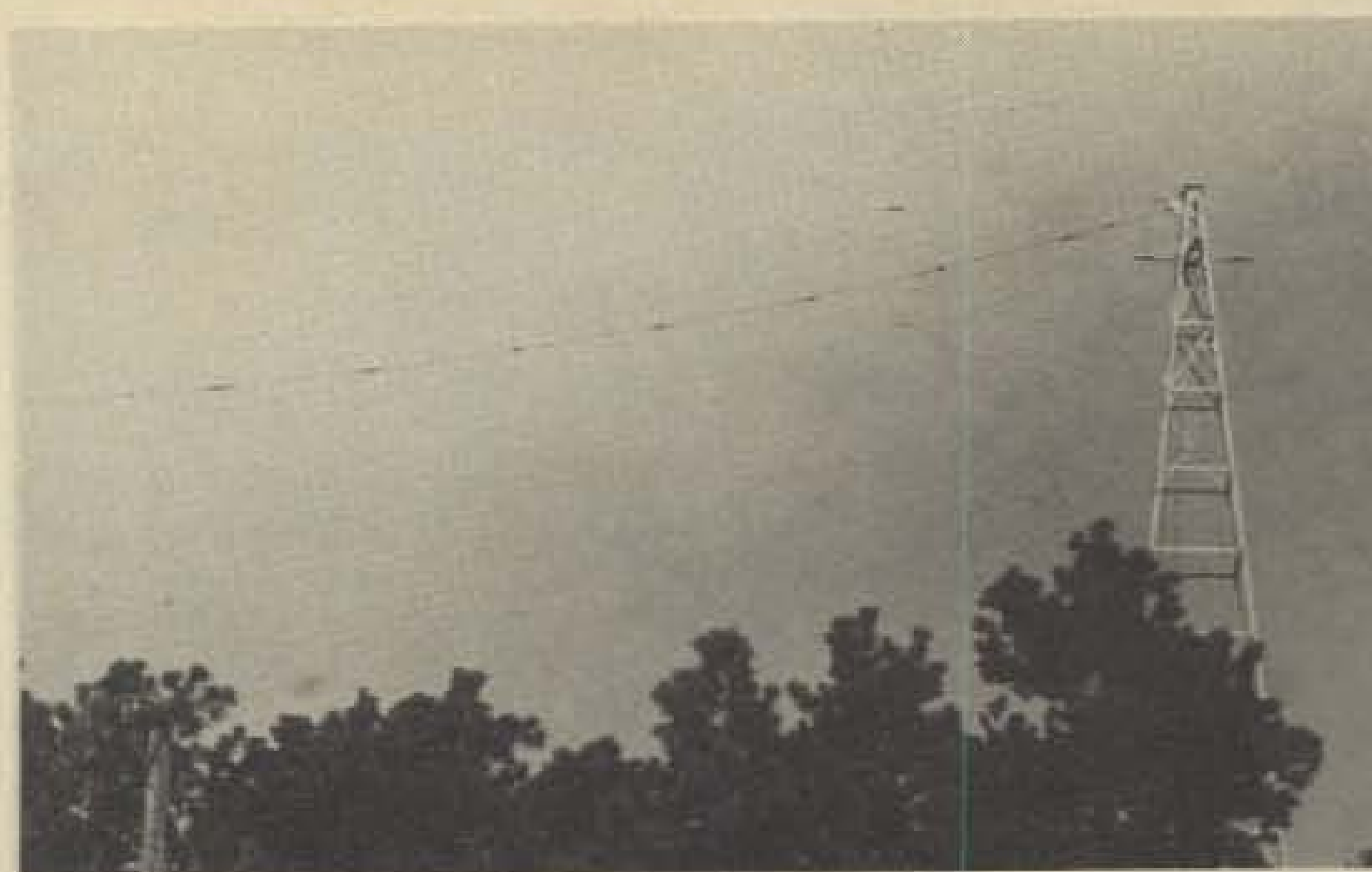
South Wellfleet is where Guglielmo Marconi set up his station to make the first transatlantic radio communication in January 1903. His message to King Edward VII was received at Poldhu, England. There's a bust of Marconi at the site and several plaques describing, rather sketchily, the station and the area.

Jim and I stood on the site of a couple of the tower foundations. All the towers and buildings have long since disappeared—several of the foundations have been engulfed through erosion into the ocean. We tried to imagine the thrill of hearing signals—and sending them—with such miserable equipment over the impossibly great distance.

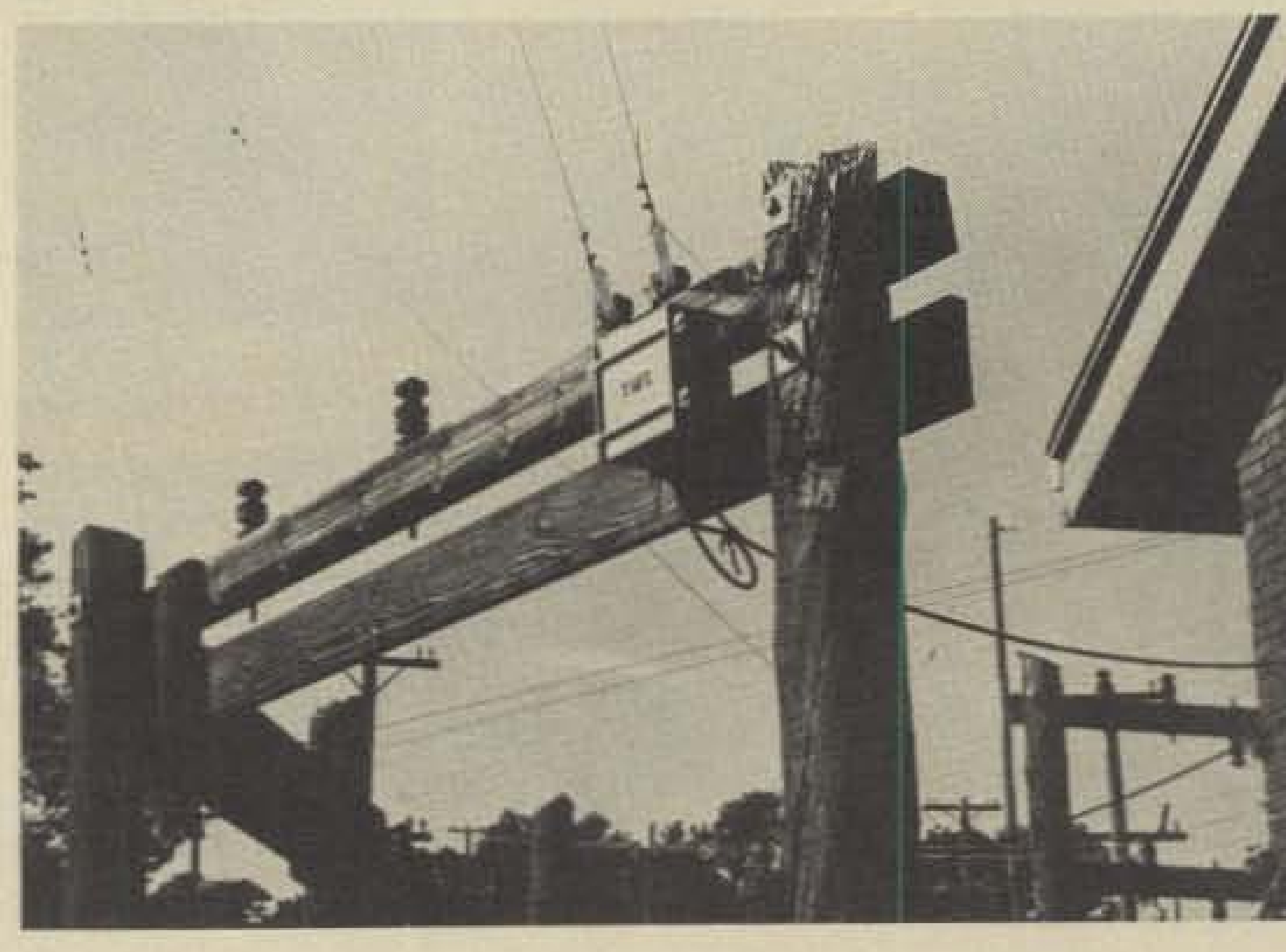
*14 Divinity Ave., #40, Cambridge, MA 02138

North Chatham, Mass.

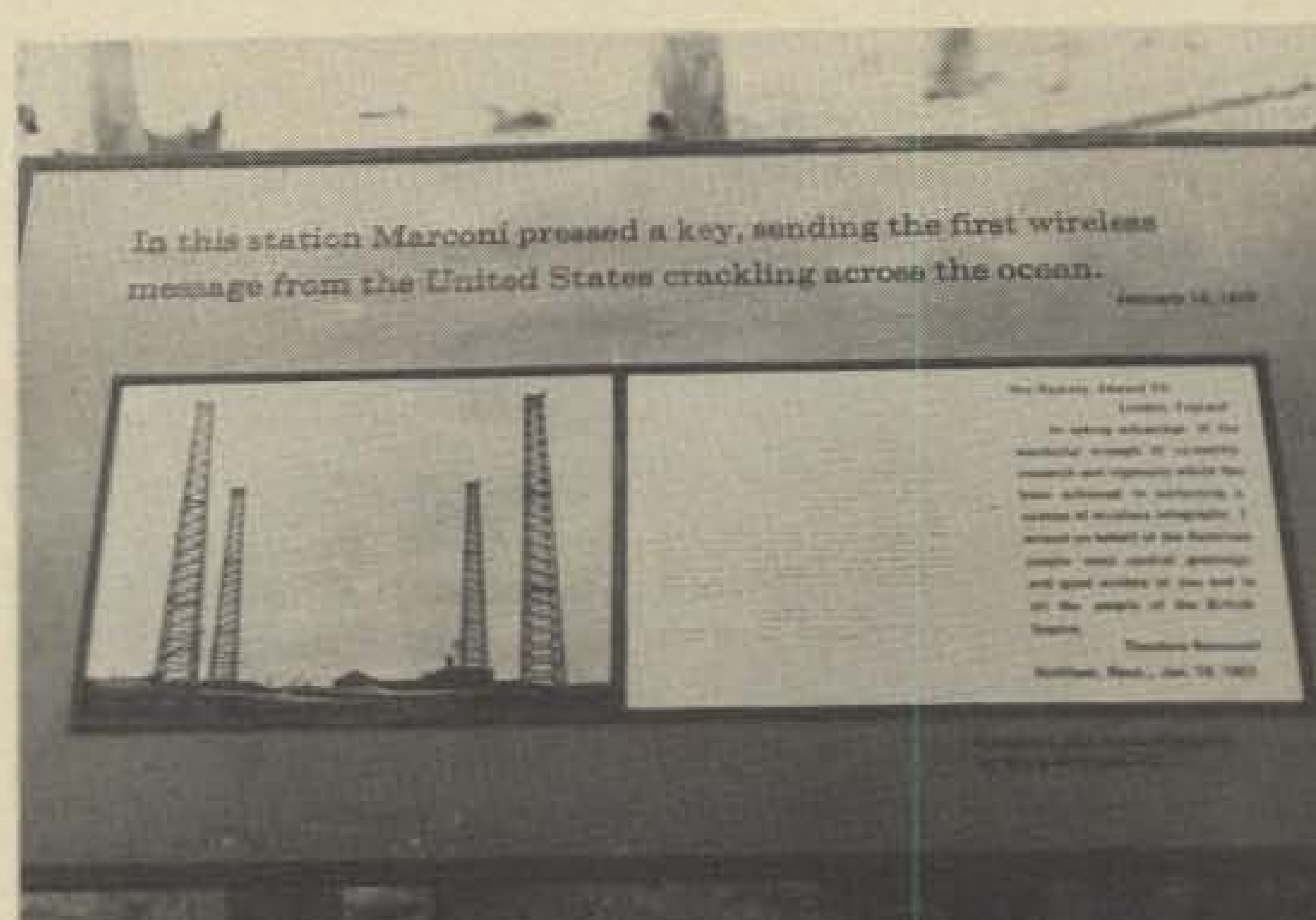
Moonscape-like environs surround the few remaining foundations left at the Marconi site.



Tower rises above scenic treeline near WCC.



Detail of antenna lead-in point.



Plaque details the message and the station which sent it.

Despite this "dream" set-up of antennas and receiving/transmitting control, one of the amateur ops (the one with the keyer) had some interesting remarks to make about actual traffic handling. Since the station sends and receives messages exclusively with ships at sea, they have to pull some pretty weak signals out of the mush—100 wobbly watts into a wire on the Mediterranean takes a bit of patience to pick up. They can shift to different bands at will, however, so that helps—but with Russian QRM and poor fists galore, the ham operator shook his head sadly and said, "It's like working the Novice band all day."

Marconi must have thought this area was a desolate and remote spot—it still is quite a drive from any main highway on the Cape. The ocean continually pounds the sandy shore and frequent storms occur—records of dozens of shipwrecks are extant for this area. In January, Marconi's hand must have been shivering as he sent his message to the King. Then again, the thrill of being heard must have been enough to counteract any freezing environ!

We continued to the tip of the Cape to Provincetown, and explored the area at the outermost extreme of this rather unusual land formation. After cruising around the area, we noted its grassy sand-dunes and desolate character in general. Then we came upon the Provincetown Airport. This is the home of the Provincetown-Boston Airlines, which, as the name suggests, has regular flights to and from Boston. The company owns nine DC-3's which look in pretty fair shape after all those years. In addition, visitors may take an aerial tour of Provincetown and the Cape—14 minutes for $4—in an ancient 1931 radial engine Stintson hang-wing monoplane. Being of rather timid stock, and noting the rumble of thunder from a rapidly approaching thunderstorm, I declined the chance to commune with the clouds in the rickety airship. Wisely, so did Jim.

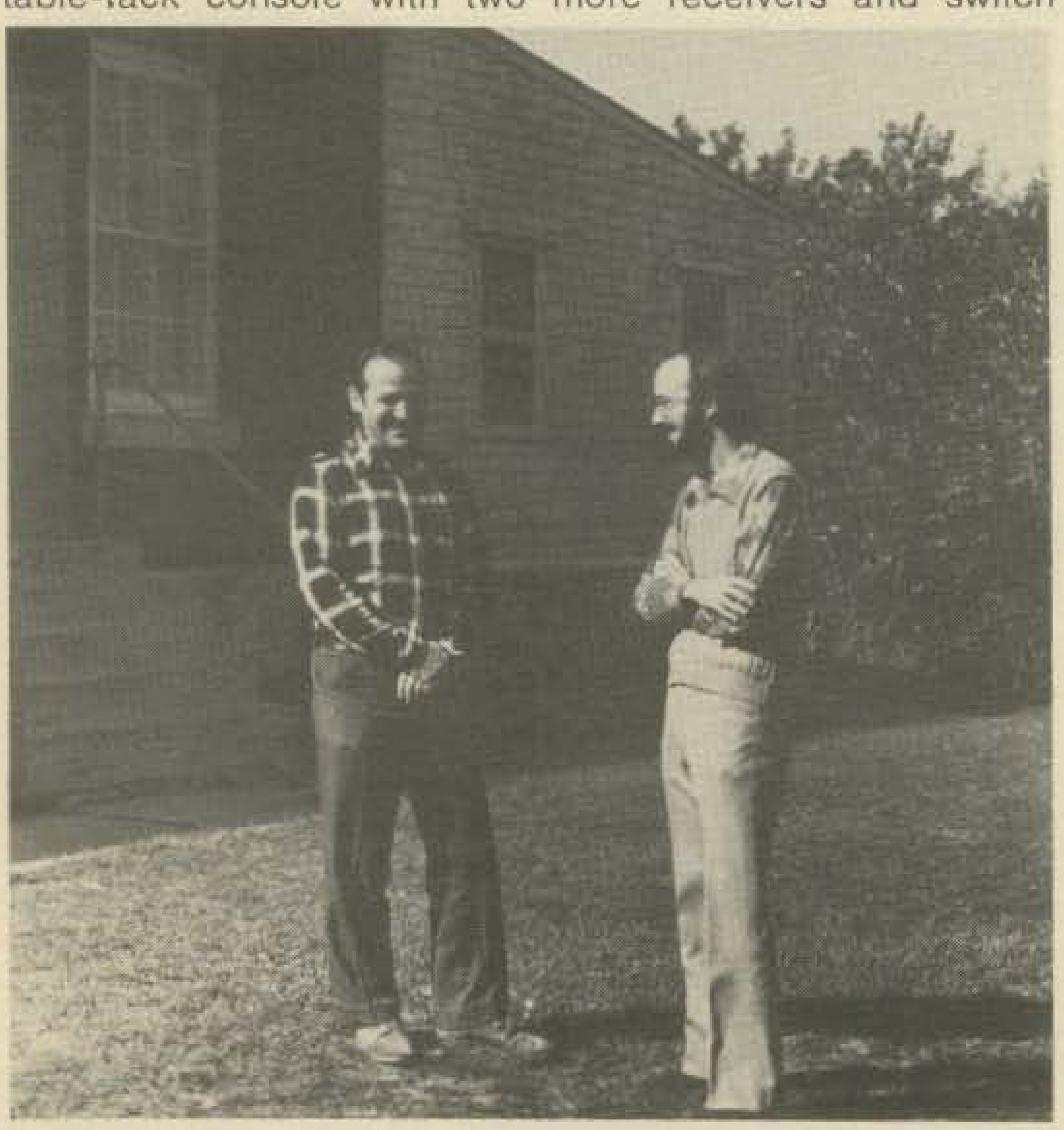
Around 4 P.M., we climbed back into the Audi and drove down the Cape to North Chatham, hoping to see and learn more about Radio Station WCC and all those wire antennas.

Two Italians hamming it up at South Wellfleet.

This time we were lucky—the man who answered the door pointed out a ham, Lewis (KILJS), who, after a moment's hesitation, started showing us RCA's set-up.

There were several Teletype® machines around, with two Model 28's ready to receive copy and send it out on landlines, and several newer 33's and 35's talking on ASCII to other computers around the country. Most of the traffic was handled in Baudot, although we were told that it was being phased out soon. But Jim and I weren't too interested in the landline communications network, so we eagerly started to explore the radio end of the station.

We walked further into the long room and saw a rather amazing receiving station. Before us was a large table with four receivers built into a console on each side, a large switchboard above each, and a rotating telegram drop-off rack above the whole business. To the left was another table-rack console with two more receivers and switch boards. WCC, we were told, is the widest coverage ship-to-shore c.w. station in the world, in continuous operation since 1914. Its counterpart on the West Coast is KPH near San Francisco.



Lewis K1LJS (left) outside the main WCC station building.

Four people were busily manning the station—two of them hams. They all had headphones on, seated next to typewriters, and were spinning the dials of 1940 vintage RCA AR-88 general coverage receivers! Actually, about a half-dozen of these old clunks are still in use, the remaining receivers being National HRO-500's, made in the last ten years or so. The operators were using straight keys with the exception of the radio amateurs—one older ham had a bug (genuine Vibroplex, he pointed out), and the other was swinging away with a Nye Viking paddle hooked to an MFJ C-MOS keyer.

Control and switchboard panels were located just above their associated receivers, and these controlled the 30 kw transmitters located several miles away. One could choose a variey of frequencies (lamps showed if a particular rig was in use by another op already) by pushing a button and keying up: 2036 kHz; 4367 kHz; 6376 kHz; 8586 kHz; 8630 kHz; 12,925.5 kHz; 13,033.5 kHz; 16,973.5 kHz; 17,271.2 kHz; and 22,599 kHz. The transmitters have broadside "H" arrays, non-rotatable and bi-directional, while the receiving antennas were long, high, fixed rhombics. By pushing different buttons, the op could choose a variety of beam headings for each receive frequency.

I asked him about the receivers themselves. He said that both were rock stable, but the AR-88's were broad as a barn and needed a chart to convert the dial markings to true frequency. Those solid-state HRO-500's, however, would overload and criss-mod on the 6 MHz band—something the stodgy, yellow-dial AR-88 would never consider.

We had to cut short our conversation as the earphones rang forth with a Liberian tanker's call, and the op excitedly came back to him as if it were his first DX station worked on 20 meters.

I was amazed that there were no automatic c.w. sending-receiving machines, no crystal-controlled ultra-synthesized digital-readout receivers, no hard-copy line-printers (ops copied on the typewriter), and no automatic antenna/frequency selectors. My astonishment was dampened, however, as I heard Lewis explain, with a hint of faltering in his voice, that next year all this manual operation was to go, much of it to be replaced by the automated gear described above. In short, this year marks the end of an era—human operation of a c.w. station by skilled radio men—in the last of what was a real ship-to-shore radio station. In 1978, "RCA Global Communications" will no longer elicit visions of glowing dials and meters, straight keys and bugs, or even busy hams working the world on c.w.

After a reflective pause, Jim and Lewis somehow got on the subject of bagpipes and drums (crazy Scotsmen), while K1VV came in and gave me a commemorative QSL card and blurb for KM1CC, the Marconi 75th anniversary special event station whose site Jim and I had visited a few hours before. The station was in operation from the site on all bands from January 14-22, 1978, and even had special permission from the FCC to use A2 240 Hz rotary spark-gap sounds on their c.w. QSO's. By the way, Marconi's original 1903 "call" was "CC", hence their 75th anniversary station callsign.

It was getting late, so Lewis walked us to the car, and after exchanging addresses, we headed back to Cambridge. We stopped at Plymouth, but what's a dumb rock compared to Marconi and WCC? And so, our trip ended with good memories and a great story to tell about the beginning of an era at South Wellfleet and its sad, but progressive, impending end at Chatham, Massachusetts. ■

A MESSAGE FROM THE PUBLISHER

A little more than two hundred years ago a famous revolutionary remarked, "I disapprove of what you say, but I will defend unto the death your right to say it." Remember who? Tom Paine? Sam Adams? Patrick Henry? As a matter of fact, it wasn't even an American, but a Frenchman named Voltaire. But despite that fact, his single stated sentiment has been the foundation stone of our freedom-of-speech doctrine.

All of which I'm using simply to drive home a point. Basically, Americans believe in freedom of speech. They also believe in freedom of the press. At least most of the time. The exception to the rule occurs when some outside observer dares to offer criticism of ARRL or its administrators. And then, the person reading the criticism forgets he's an American citizen who believes in freedom of speech and press, and he turns into a wildly fanatical "I'm-a-ham-first-and-foremost type," and he sees every negative mention of the League as a personal attack on him personally.

All of which amazes me somewhat. Because this same individual would chuckle upon reading criticism of his government. But wouldn't that be an attack on him personally as an American? And he'll guffaw loudly at an ethnic joke aimed at his own or any other ethnic group. But shouldn't that be construed as a personal attack on him as a Pole, or as a black, or as a Jew, or whatever? Somehow it never hits home that way. But make a comment that something's rotten in the state of Newington—all hell breaks loose.

I have criticized the League in the past on many issues. I feel that as an individual it's my right to do so. As a publisher of an Amateur Radio magazine it's my duty to do so. Because there are times when League policies are bad for Amateur Radio. And just because the League is "our only voice in Washington," doesn't make those policies any less bad.

Case in point: the recent Code of Ethics proposal. I don't quarrel with the opinion that only licensed amateurs should be allowed to operate amateur transmitters. The law is very clear on that. What I do quarrel with is the system by which the League would have the industry attempt to solve the problem. It just won't work.

Why won't it work? Because all it takes is a single manufacturer who doesn't go along with the others and continues to provide ham equipment to non-amateurs. Sure, all the legitimate licensed amateurs can boycott that manufacturer. But the sales he could generate from bootleggers would more than offset his losses in legitimate amateur sales. And that manufacturer doesn't even have to be one that we consider a reputable ham equipment supplier in the current market. He can be one that goes in business to provide black boxes for bootleggers under the guise of being an amateur product supplier. It's been going on for years with the CB amplifiers. It wasn't the legitimate ham suppliers who built the CB linears. It was other companies who suddenly went into the "ham amplifier market."

There are other reasons it won't work. Legal advice to several of the more reputable amateur equipment manufacturers tells them that the concept is unconstitutional. Why should those manufacturers defy the FTC to accommodate ARRL. Why shouldn't they instead tell the FCC to do its own police work. Because the problem is the FCC's not the industry's.

There are still other reasons why it won't work. Literally hundreds of thousands of old used ham transmitters are gathering dust in garages and basements. There are plenty sitting on dealer shelves. Imagine what the market for used gear would be if the new gear supply dried up for non-licensed hams. Again, it would take just one major supplier to get the pipelines full of bootleggable radios. And where would the legitimate industry be? Sitting by watching with egg on its face.

Gentlemen and ladies, it's time that we amateurs began to think of ourselves as American citizens whose rights are being abused by our government. Our amateur bands are governed by an agency that has neither the money or manpower to do its job adequately. Instead of clamoring for the industry to police sale of amateur equipment, we should be demanding of the congress and white house that the FCC be given a fairer share of revenue. The right to levy license fees, provided that the moneys go to the FCC administration and enforcement of radio services is a top priority. With such license fees and the revenues derived from them, the FCC could run the amateur service better, the CB service better, and all the new services it recognizes are needed in the present demand for better communications facilities.

If we continue to turn our backs on the major issue and cloud up the waters with squabbles over who should be allowed to sell what, we're defeating our own purposes. And those who would like to see the amateur fraternity remain small, and weak, and under the thumb of special interest minority groups will continue to laugh all the way to the bank.

Richard A. Cowan, WA2LRO

This article describes some construction ideas for those interested in the esoterica of log-periodic antennas.

Log-Periodic Antennas in VHF and UHF Amateur Service

BY T. E. WHITE*, ex-W2JLP, K3WBH

The log-periodic antenna grew out of a formal mathematical exercise. The theoretical configuration consists of two interlocking logarithmic (equiangular) spirals.

A rudimentary practical approach to construction is to lay the antenna out in a planar configuration where the "element" pattern is repeated in geometrically increasing steps. A workable realization of the log-periodic antenna is accomplished by constructing a series of antenna elements whose lengths and spacings are governed by strict mathematical formulas.

The log-periodic yagi combines the frequency independence of the log-periodic antenna with the gain and directivity characteristics of the yagi. —K2VG

Unlike the case of the yagi, log-periodic antenna principles and design theories were not developed by any one scientist or pair of researchers. Early experiments were done at the University of Illinois and also by the well-known Dr John Krauss, W8JK, at Ohio State. Smith, of the Cleveland Institute of Electronics, also engaged in extensive design and testing of log-periodics. However, none of this work was done with the amateur particularly in mind, so few practical construction articles exist in the literature. This article will attempt to bridge the gap.

*36 Lake Avenue, Fair Haven, NJ 07701

The ham bands at v.h.f and u.h.f. are under attack from many quarters today and unless operation becomes much more active, in proportion to the total ham population, they may be lost for good. In addition, operation must not be concentrated in any one small portion. This is an invitation to shrinkage. Since, for example, no single antenna of the more familiar types can cover the 420-450 MHz band satisfactorily, it behooves us to develop a skywire that can put us anywhere in the band at will.

The log-periodic and its derivative, the log-periodic yagi (or *periodic cum parasitic)*, is a practical answer. It gives more gain per unit length of boom than a classical yagi.

One thing that will not be done in this article is belabor the reader with esoteric theory, log tables, etc. Suffice it, then, that it can be shown that a series of driven dipoles can be arranged and interconnected such that, at any frequency from lowest cut-off to the highest in a given band, a small group of elements will constitute a resonant area. See fig. 1.

As the transmitting or receiving frequency is changed, so is the resonant area without introducing the need for physically or electrically changing the feed system. Furthermore, the log-periodic may be operated on its third, or even fifth, harmonic with no degradation of efficiency. Thus, a log-periodic based on 144-148 MHz will perform nicely over the 432-444 MHz range and, if set for cut-offs at 140 MHz and 150 MHz, will cover the entire ¾ meter band.

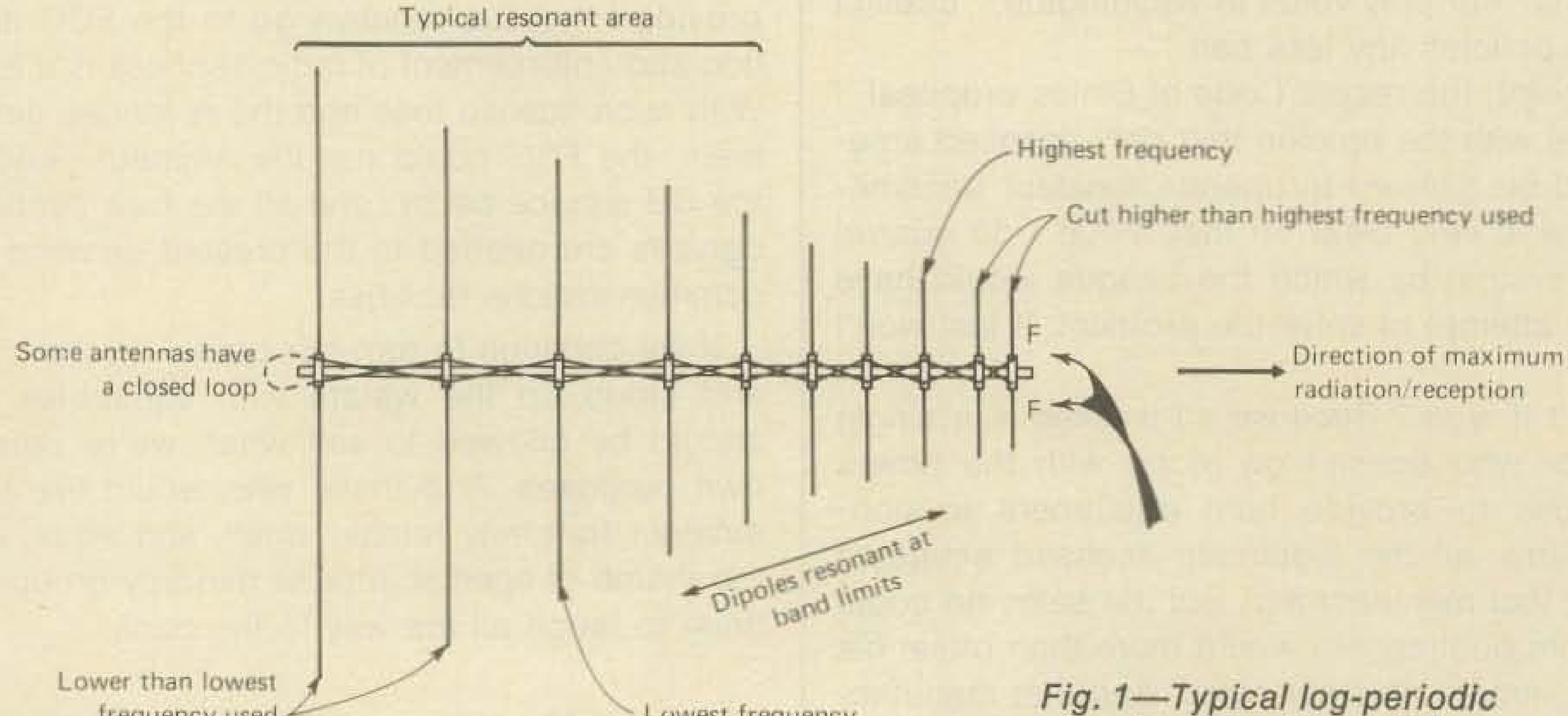


Fig. 1—Typical log-periodic antenna (not to scale).

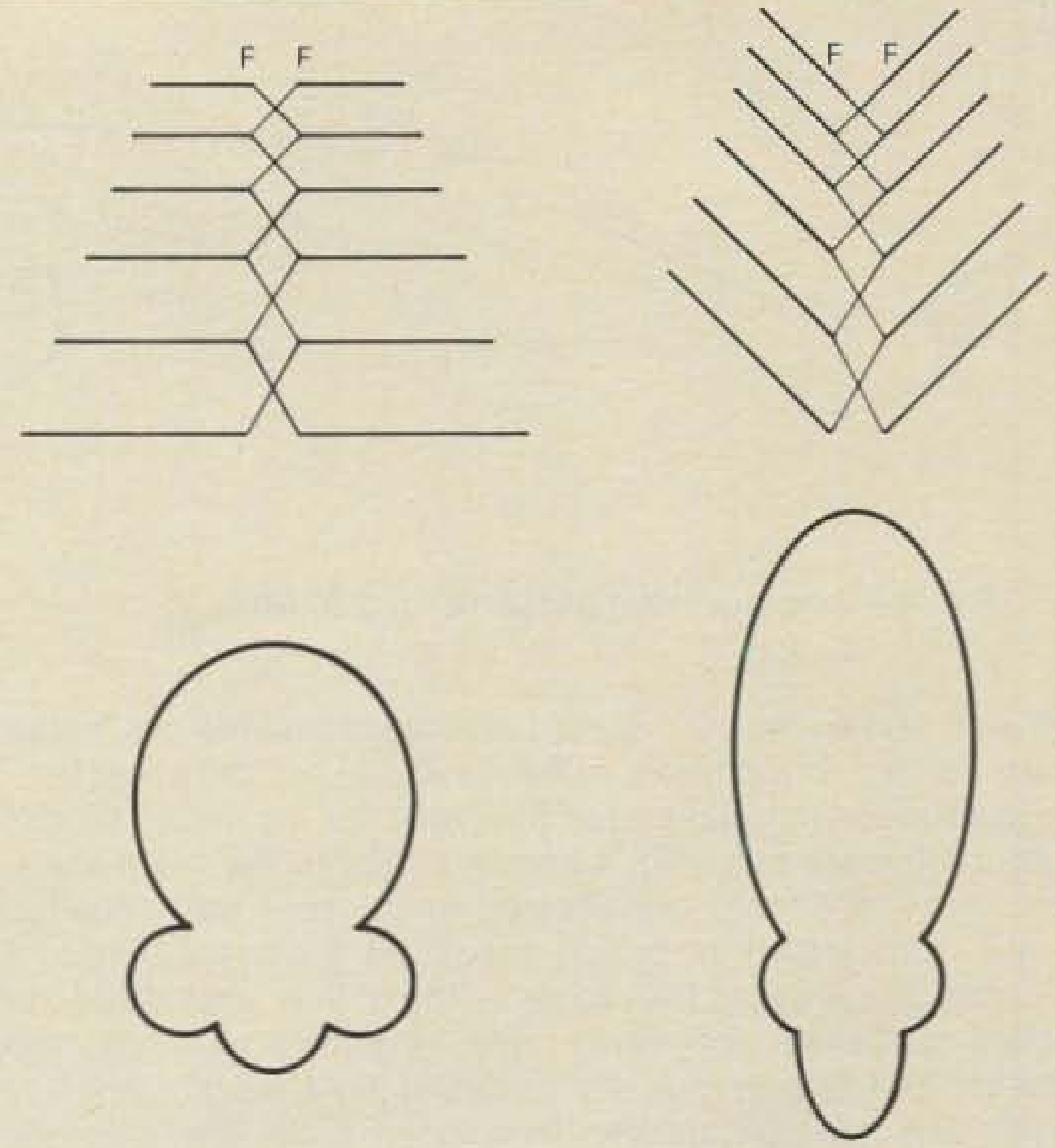


Fig. 2—E-plane polar plots. In (a), 90° elements; in (b), 60° elements.

There are two basic configurations of log-periodics and two basic ways of feeding them. Fig. 2 shows the resulting beam patterns when (a) the log-periodic is a "straight wing" and (b) when it is a "swept wing" type or veed to 60 degrees. Note the virtual disappearance of the side lobes in (b). However, the side lobe energy must reappear elsewhere. It does, not only in a sharper front lobe, but in the form of an undesirable back lobe. It will be shown later how to attenuate the back lobe with a parasitic reflector and by terminating the feed path along the boom.

Incidentally, there is a third configuration, namely a "wedge" or "arrow" arrangement of the two log-periodics, but we will keep to the promise of simplicity in this article.

The second area of interest, feeding the antenna, can be handled in two ways. See fig. 3(a). Here the element pairs are insulated from the boom and cross-connected by a phasing line, with feeder attachment at the front or small end. The boom is placed at ground potential by direct attachment to the grounded mast. Fig. 3(b) is another story. Here, two booms are used and directly attach to the element pairs without insulating blocks, half to each boom. Thus, the booms are integral parts of the feed system. Feeders are still attached at the front end but the booms must be insulated from each other at the feed end and from the grounded mast. For static discharge, a shunt or spark gap is placed from the boom to the mast, details of which will be discussed later. (The system of feeding a twin boom log-periodic with coax by running it through one boom from back to front as an impedance transformer and balun, and then hooking the inner conductor to one boom and the outer to the boom run-through, is not recommended for u.h.f operation).

Feed-line impedances have deliberately been omitted at this point since they will be picked up later in this article. However, it is significant to note that in the case of log-periodic antennas, there is no substitute for a balanced feed. Open wire lead is best, with the balun at the shack end, not at the antenna end.

Let us now examine how log-periodics do the work of extracting signal voltage from the intercepted wave front over a broad frequency range. In the author's opinion, talking from a receive-mode viewpoint lends toward more clarity than talking from the transmit-mode viewpoint.

One might think that all that is needed to cover a given bandwidth is to make the rearmost pair of elements resonant at the lowest desired frequency, advancing by stages to the frontmost pair, resonant at the highest desired frequency. Not quite! Fig. 1 shows that log-periodics are resonantly active over several element pairs at once for each operating frequency. So provision must be made for sufficient pairs resonating below and above the desired bandwidth to accommodate this phenomenon.

Then there is the requirement of smooth transfer of resonant areas throughout the antenna's bandwidth. This graduation of element lengths and spacings is logarithmic, not arithmetic. Scientifically "pure" log-periodics are designed with constant reference to log tables.

We now move to practical amateur applications. A log-periodic yagi for 1¼ meters, a dual-bander for 2 and ¾ meters and a "lopsided lippy" (a combined vertical and horizontal "whirling bedspring" array) for ¾ meters will be considered.

Gain features in this article are based on the author's estimates only and may be reasonably expected, but are certainly not guaranteed. These antennas are intended for good, reliable terrestrial communication, where gains in the 11-15 dB range are ample. They are not intended for moonbouncer hotshots looking for 25 dB paths.

Recall that a log-periodic may be married to a yagi to form a *periodic cum parasitic,* resulting in broader band coverage and more gain per unit of boom length than the conventional yagi. Let us now select a configuration to build.

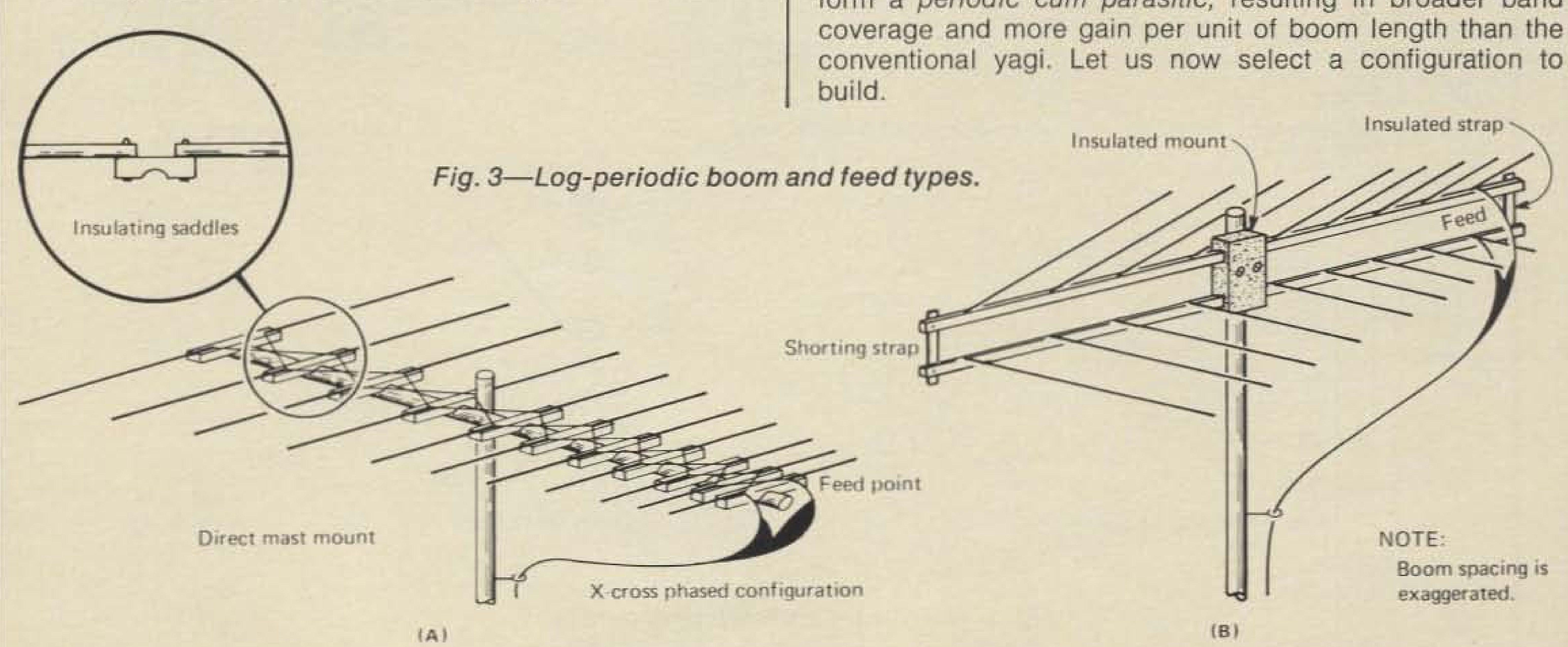
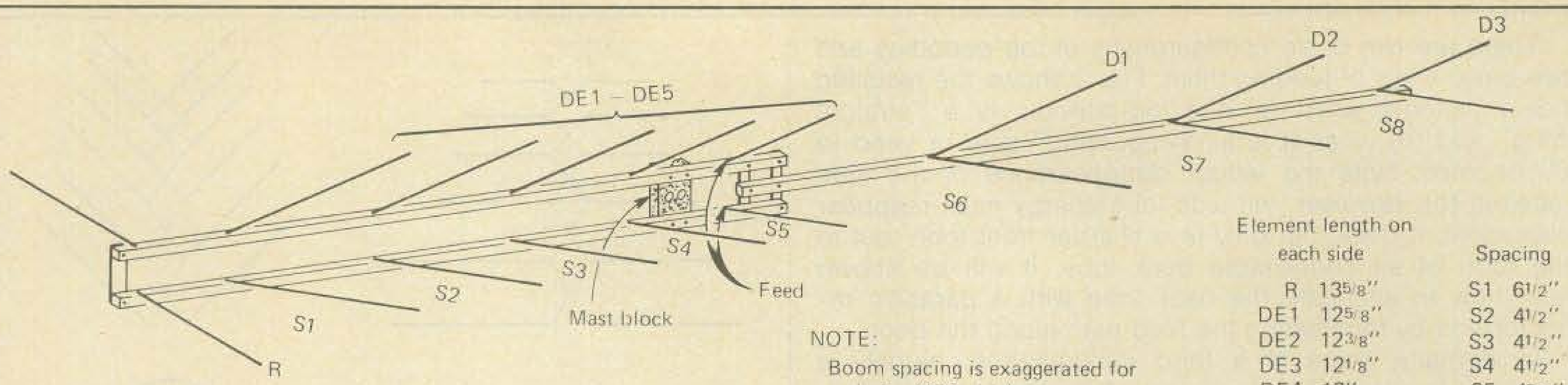


Fig. 3—Log-periodic boom and feed types.



NOTE:
Boom spacing is exaggerated for clarity (1" inside)
Twin booms 28" ea
Auxiliary booms 41" ea
Elements 3/8 Ø

Element length on each side		Spacing	
R	13 5/8"	S1	6 1/2"
DE1	12 5/8"	S2	4 1/2"
DE2	12 3/8"	S3	4 1/2"
DE3	12 1/8"	S4	4 1/2"
DE4	12"	S5	4 3/8"
DE5	11 7/8"	S6	11"
D1	12 1/4"	S7	13"
D2	12"	S8	14"
D3	11 3/4"		

Fig. 4—Log-periodic antenna for 220 MHz.

It was shown that 60° swept elements provide the better beam pattern. In addition, a twin boom is not only mechanically stronger but eliminates the need for insulating blocks at each element pair. Fig. 4 shows a "lippy" for 1¼ meters. Note that the booms are shorted at the rear but insulated at the front (feed) end and insulated from the mast. A reflector, not swept, five driven dipole sets and three directors comprise the array. The directors are not split between the booms but are mounted on a single auxiliary boom and cleated to the twin booms by the phenolic straps. Fig. 5 details mounting hardware required, which is common also to the two-bander to be later described.

Do not be misled by the fact that directors 1 and 2 are longer han the foremost driven elements. The log-periodic yagi is a member of the traveling-wave antenna family. A received wave enters the beam at the third director, travels rearward to the reflector end, reverses and returns forward, reverses again, etc. The first two directors reinforce and enhance the longer driven elements. They do not adversely affect or "block" the driven elements shorter than themselves. Of course, up to a point, the more directors in a log-periodic, the higher the gain, and as many as eight or nine could be used before reaching the point of little or no return for the metal and hardware involved. We use three for reasons of compactness without a great sacrifice of gain.

However, higher gain and, more important, lower wave angle, are better achieved by stacking two moderate length beams, rather than one extra-long single bay. Stacking heights for log-periodic yagis need not be so large to obtain maximum capture area as those of yagis. For example, best stacking height for an 8-over-8 yagi is just under 1.8 wavelengths, but a "lippy" of the size shown here will work very well at only 0.75 wavelength and, in this case, as little as 40 inches. Gain for a two-stacked is about 13.25 dB over a dipole. TV ladder line of 450 ohm impedance, *not* the narrowly-spaced 300 ohm variety, makes a fine stacking harness.

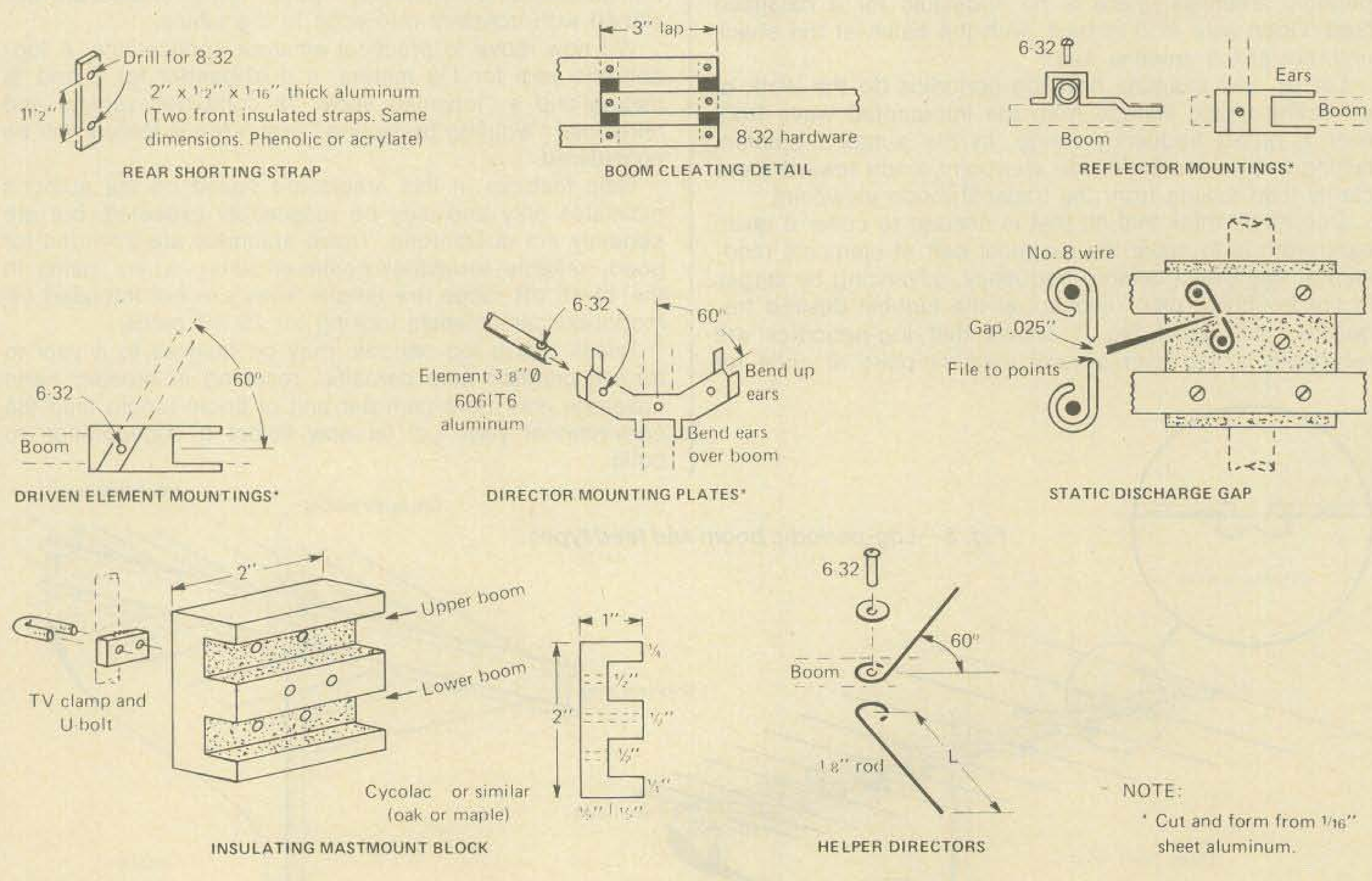


Fig. 5—Hardware and mounting details.

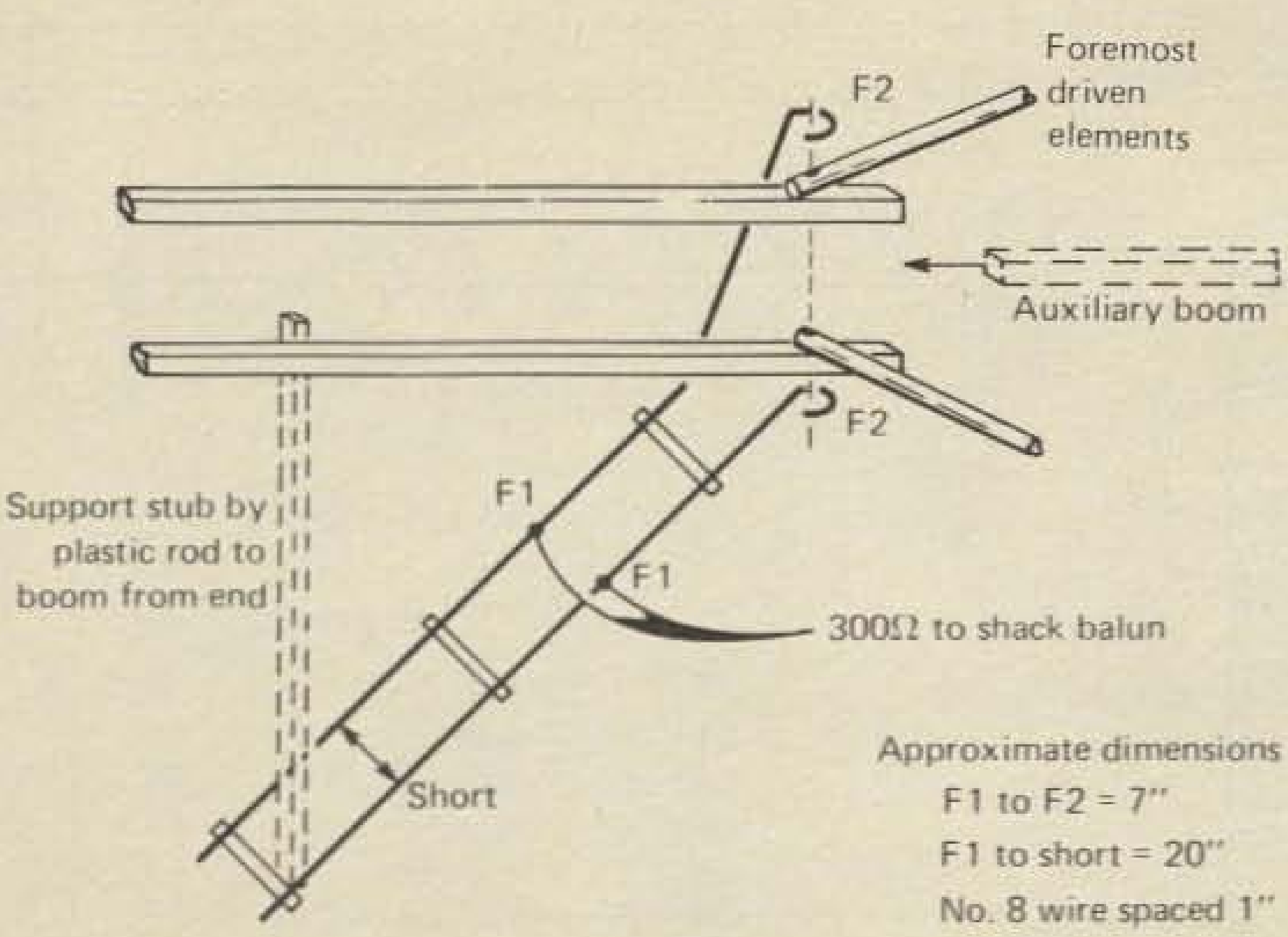


Fig. 6—Matching stub for 1¼ meter antenna.

Run 300 ohm twinlead (Beldon Permohm) from the harness midpoint to the shack through a 6:1 toroidal balun and then through a short length of coax to the rig.

By the way . . . just a short word about the absolute minimum s.w.r. fetish seen in some publications. Modern 50 ohm equipment will work into an almost infinite s.w.r. without burning the gear up or losing all of the signal. The amateur at the other end of the QSO couldn't possibly tell by ear or S-meter whether the s.w.r. is 1:1 or 3:1. Log-periodic yagis contain reactive impedance components and purists may wish to add a stub to attempt to tune it down. Rough starting points are shown in fig. 6. The leg of the stub to the upper boom must be an inch or so longer but this will not upset tuning.

Now let us construct antenna number two (fig. 7), for dual operation on 2 and ¾ meters. Here we have the straight-across reflector, six pairs of driven elements and two directors for two meters; in the third harmonic mode, for 420 MHz. Four additional directors are interspersed on the auxiliary boom. They are made of #8 semi-hard drawn wire whose inner ends are curled under holding bolts and washers. This "lippy" is fed directly with 450 ohm open wire line (with no tuning stubs). Stacking height should be 66 to 72 inches, should you wish to build two bays. Gain to be expected from a single bay is 11 dB on two meters and as much as 14.5 dB on ¾ meters.

Now, let us examine the "lopsided lippy" (fig. 8), a dual-polarized array for ¾ meters. At u.h.f., rotation of polarization of a signal may occur several times, even over fairly short distances. So a signal leaving a transmitting antenna in a horizontal mode may arrive at a receiving skywire in the vertical mode! It behooves the serious operator, therefore, to have switchable receiving capabilities, and even the means to simultaneously receive both modes.

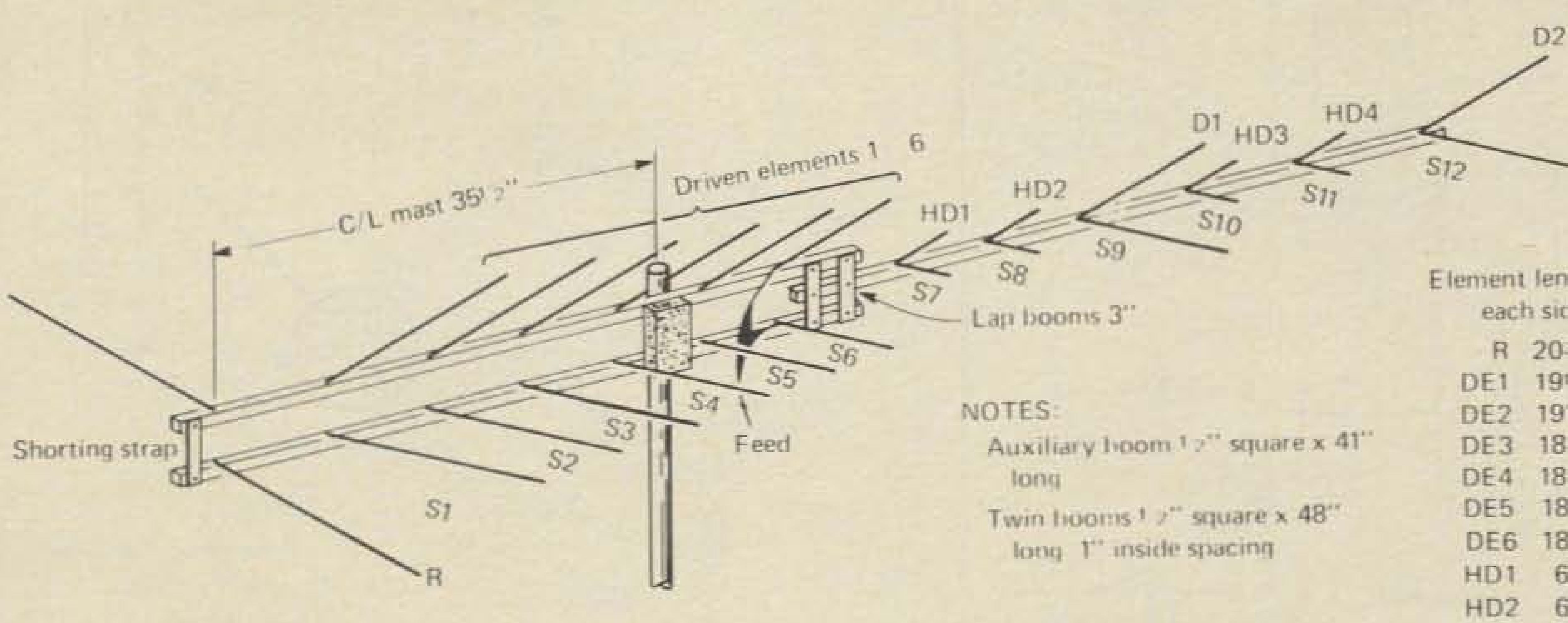
For transmitting, one can also experiment with vertical or horizontal emission over a given path and note comparative results. Fig. 9 shows a suitable switching circuit.

"Lopsided lippy" has four log-periodic yagi bays, each consisting of six driven elements and four directors, the last three of which are not swept, mounted on five-foot booms. The bays are "quaded" with approximately ¾λ vertical spacing and 1λ horizontal spread between vertical and horizontal pairs. The whole works is backed up by a 40 by 40 inch square of ½ inch mesh hardware cloth as a plane reflector. Separate vertical and horizontal feeders are brought into the shack. All elements are ⅛ inch rod, mounted as per the directors in the previous array. (See fig. 10).

And so we end our perilous journey through the logjam of logarithmic tables in an appropriate place: your own back yard. Sorry, apartment dwellers, but "the poor man's antenna test range" requires a minimum clear space of an 85 foot radius over an arc of 120 degrees. Suburbanites, however, should not find such a pie slice hard to come by. It need not be flat, only open.

Figure 11 shows a home-brew layout for testing the "lippies." It is limited to two meters and above, as lower frequencies require much longer shots from antenna to signal pickup sites. Using a theodolite, a stadimeter, a compass, a golfer's scope or whatever you can beg, borrow or steal, lay out as accurately as you can, an arc (a in fig. 11) with a radius of 67 feet from the chosen point of the test antenna mounting rig. Drive stakes at 0° (360°), 30° and 60° each side thereof. Make sure that for at least three wavelengths at the lowest frequency to be tested (20 feet at 2 meters) behind this arc and up to arc B, there are no metallic objects, dense foliage, etc.

Temporarily mount the test antenna on a jig of plastic water pipe or anything nonmetallic that can swivel the antenna 180°. The antenna must be supported a minimum of one wavelength above the ground. Point the antenna at the 0° stake. Hook up a low power transmitter (five watts is plenty) through appropriate instrumentation (s.w.r. meter, reflectometer, bridge, wattmeter, etc.) to the antenna. Keep the feedline between the instruments and the antenna ½ wavelength above ground. Dispatch an assistant with a field strength meter and folded fan or cage dipole, cut to the middle of the desired band coverage, to the 0° stake.

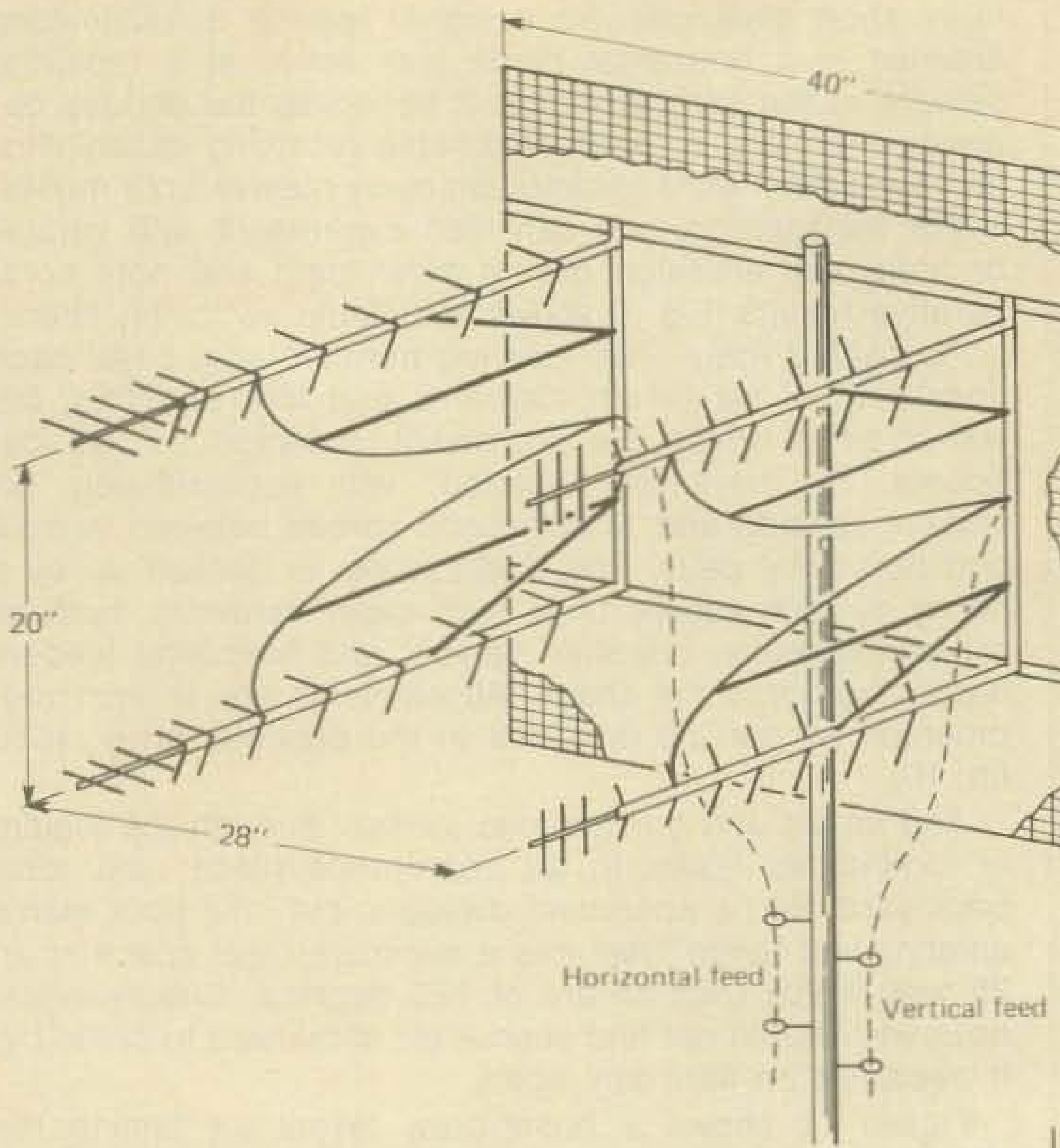


NOTES:
Auxiliary boom ½" square x 41" long
Twin booms ½" square x 48" long 1" inside spacing

Element length on each side	
R	20 3/8"
DE1	19 1/4"
DE2	19"
DE3	18 3/4"
DE4	18 5/8"
DE5	18 1/2"
DE6	18 3/8"
HD1	6 3/8"
HD2	6 3/8"
D1	18 3/4"
HD3	6 1/4"
HD4	6 1/8"
D2	18 1/2"

Spacing	
S1	10 1/2"
S2	7 1/2"
S3	7"
S4	7"
S5	6 1/2"
S6	6 1/2"
S7	5"
S8	6"
S9	6"
S10	7"
S11	6"
S12	7"

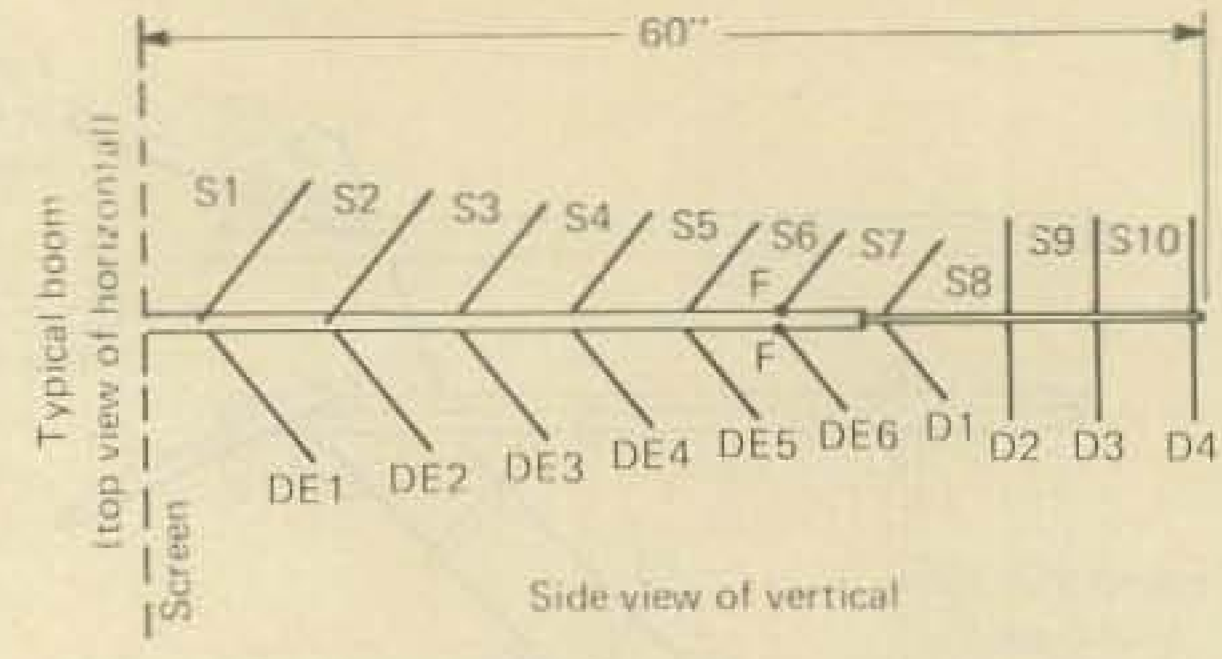
Fig. 7—Dual band log-periodic antenna for 2 and ¾ meters.



If the antenna is so equipped, and it has not yet been done, tune up a matching stub for minimum reflected power first; then try for maximum forward power. If the stub settings are not the same, use minimum reflected settings. Then have your assistant read the field strength at 0°. Have him move 30° to the left; read; move another 30° to the left. Then move and take readings at 30° and 60° to the right. This will give a rough plot of the nose of the beam (the *E*-plane).

Now swivel the antenna 90° to the right and take readings for the side lobes. Then swivel the antenna the remaining 90° and take the back lobe readings. Plot the front-to-back ratio. Purists may wish to experiment with sliding reflector inserts at this stage.

You now have some idea of the *E*-plane pattern, not to the exact "dB down" figure, but at least *relative* front-to-back and front-to-side ratios. These tests can, of course, be repeated for reciprocal receiving test readings by hooking up the transmitter to a folded dipole and reading out the data on a calibrated field strength meter and attenuator; but this requires lugging the transmitter out to range stake zero.



Element lengths (1/8 Ø)		Spacing	
DE1	6 9/16" each side	S1	6"
DE2	6 3/8" each side	S2	4"
DE3	6 3/16" each side	S3	4"
DE4	5 13/16" each side	S4	3 1/2"
DE5	5 5/16" each side	S5	3"
DE6	5 1/8" each side	S6	3"
D1	6 3/16" each side	S7	6"
D2	11 3/4" entire	S8	8"
D3	11 1/2" entire	S9	10"
D4	11 3/8" entire	S10	11"

Fig. 8—The "lopsided lippy."

Figure 12 shows a lashup which takes less room but is for impedance matching only. It requires erecting a wooden mast. (If, however, you have a side of your house, without metal fittings, gutters, downspouts, etc., at least 25 feet high, you can cantilever a receiving dipole from it.)

The test antenna, whether intended for vertical or horizontal polarized operation, must be pointed straight up in the air or nearly so, with the reflector a minimum of one-half wavelength above ground.

Tune the stub as above for minimum reflected power. This antenna is for 220 MHz and 420 MHz only. Two meters would require at least a 35 foot mast. ■

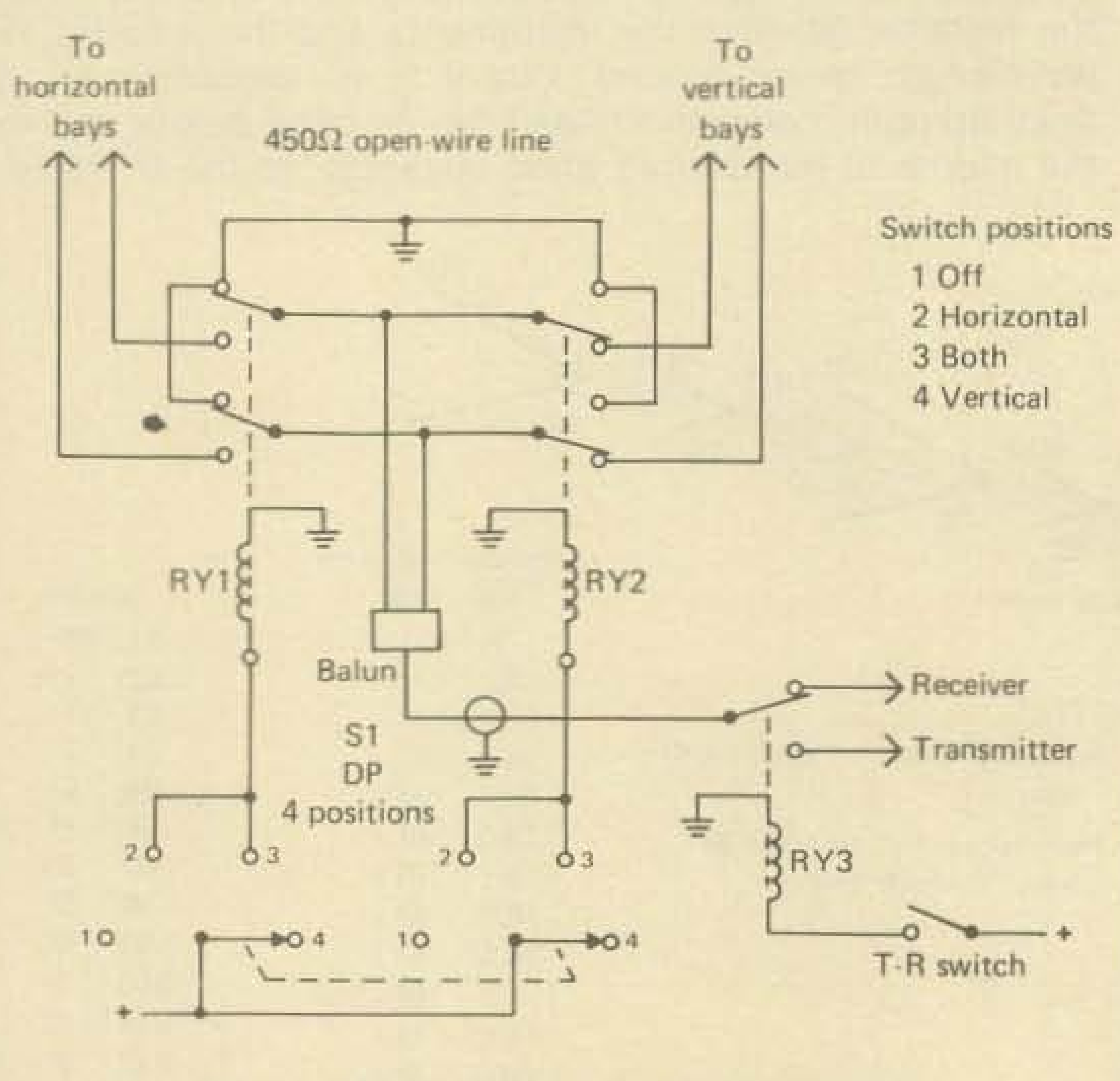
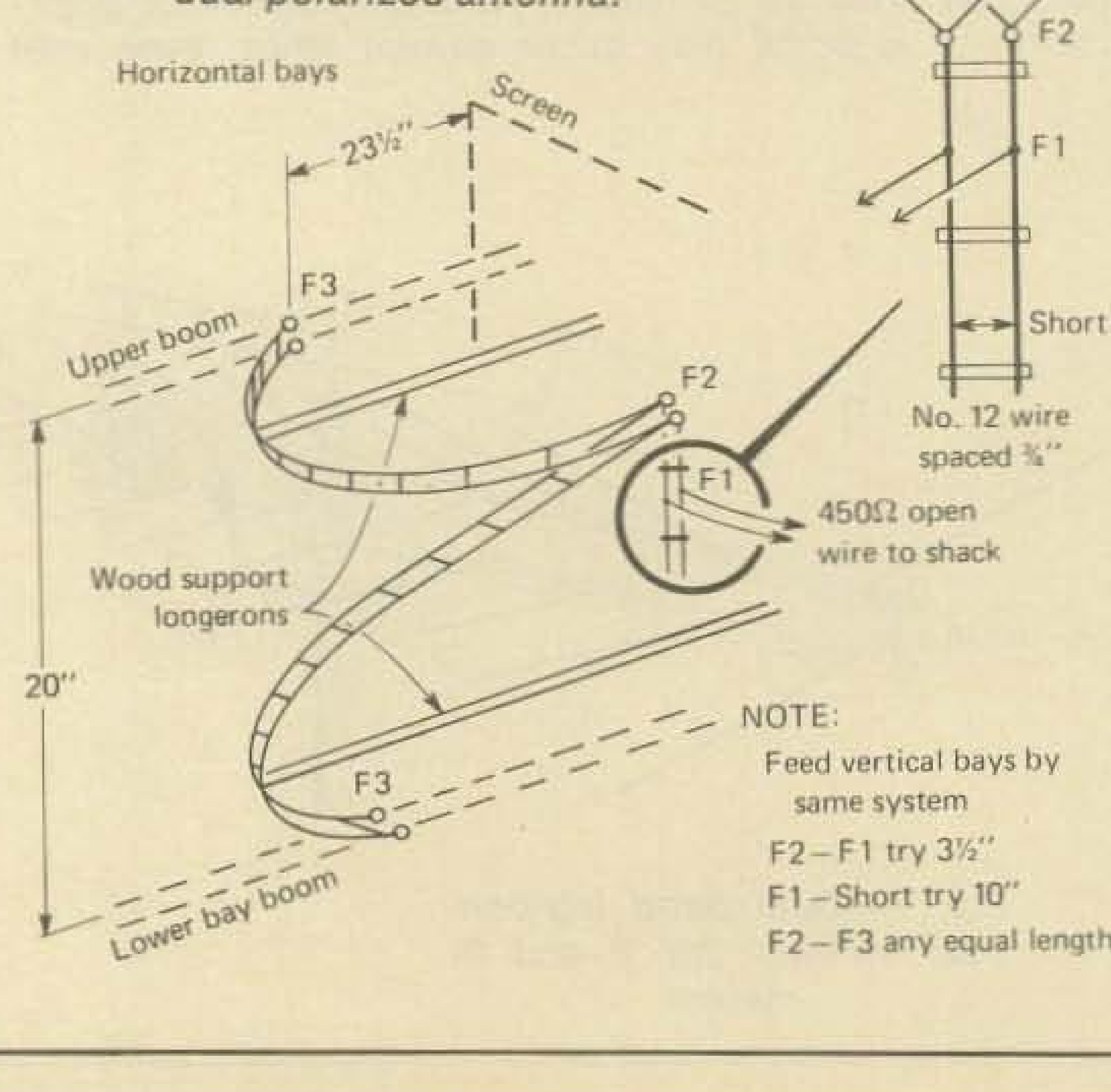


Fig. 9—Dual polarization feed system.

Fig. 10—Feed harness for ¾ meter dual polarized antenna.



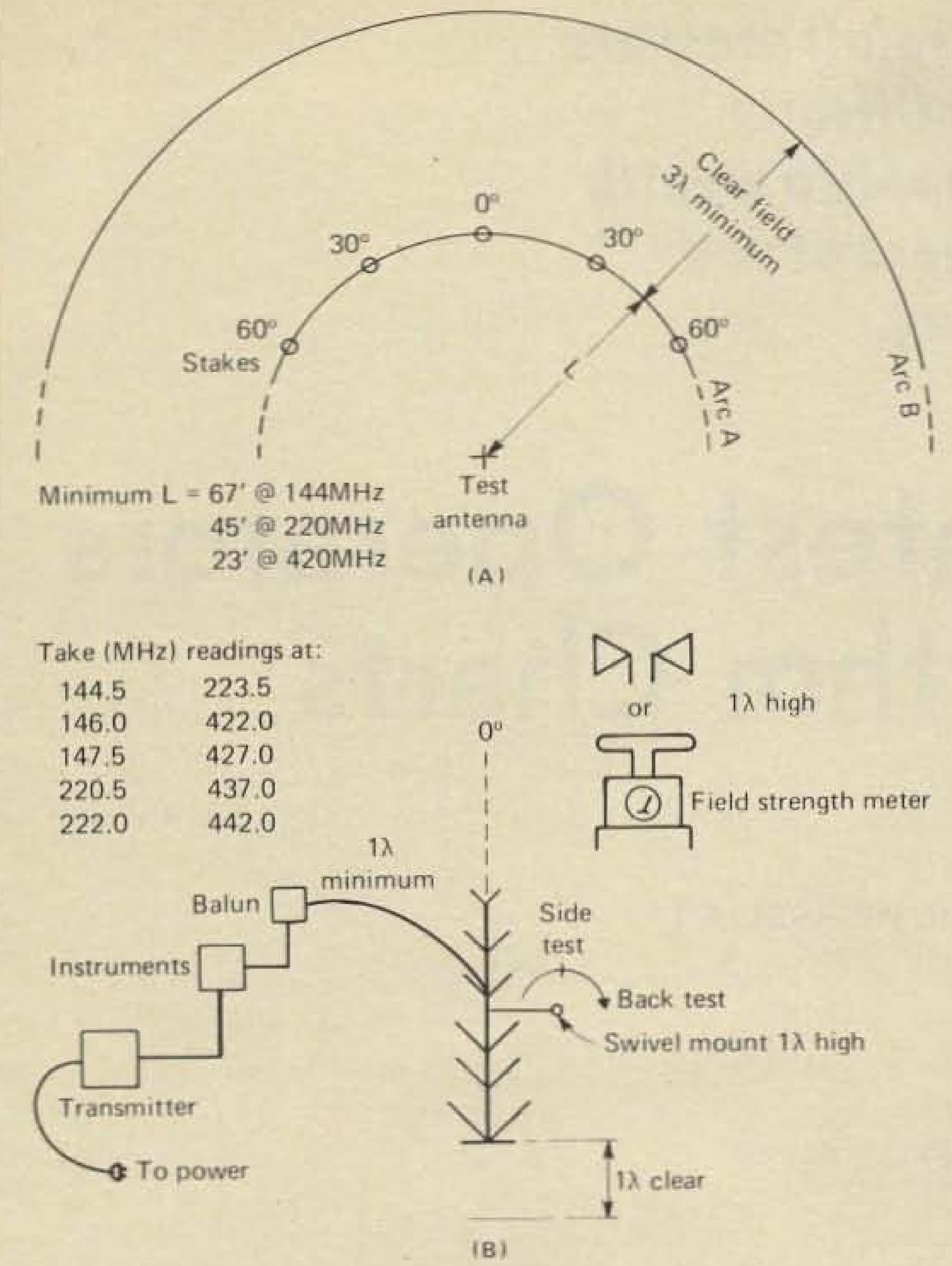


Fig. 11—Set-up for pattern test.

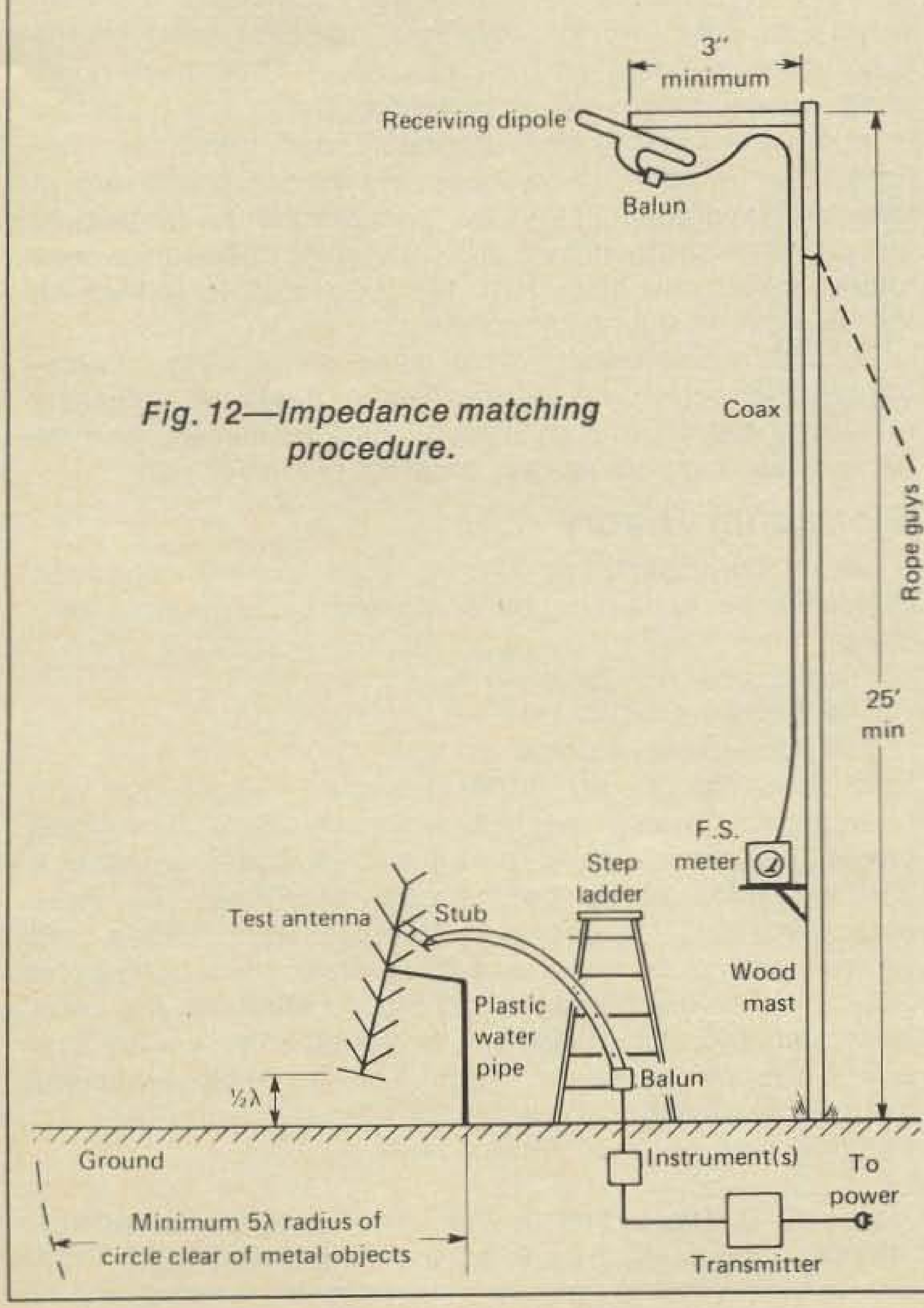


Fig. 12—Impedance matching procedure.

In his most recent thesis, Professor Heisseluft presents to the readers of CQ the results of a scientifically controlled study. His conclusions will supply a wealth of information to the contest buff. For those of you who participate, this tract is must reading.

Selection of Contest Operators Using Biorhythm Charts

BY PROFESSOR EMIL HEISSELUFT*

Lauton Institute
Grossmaul-an Der Donau, Austria

Introduction

Amateurs have long wondered how it is that one East Coast radio club has been able to dominate the contest scene over the past decade. Regardless of the contest, be it national or international in scope, this club has consistantly fielded some of the top operators ever to be heard on the high-frequency bands, and their many victories attest to the success of their operations.

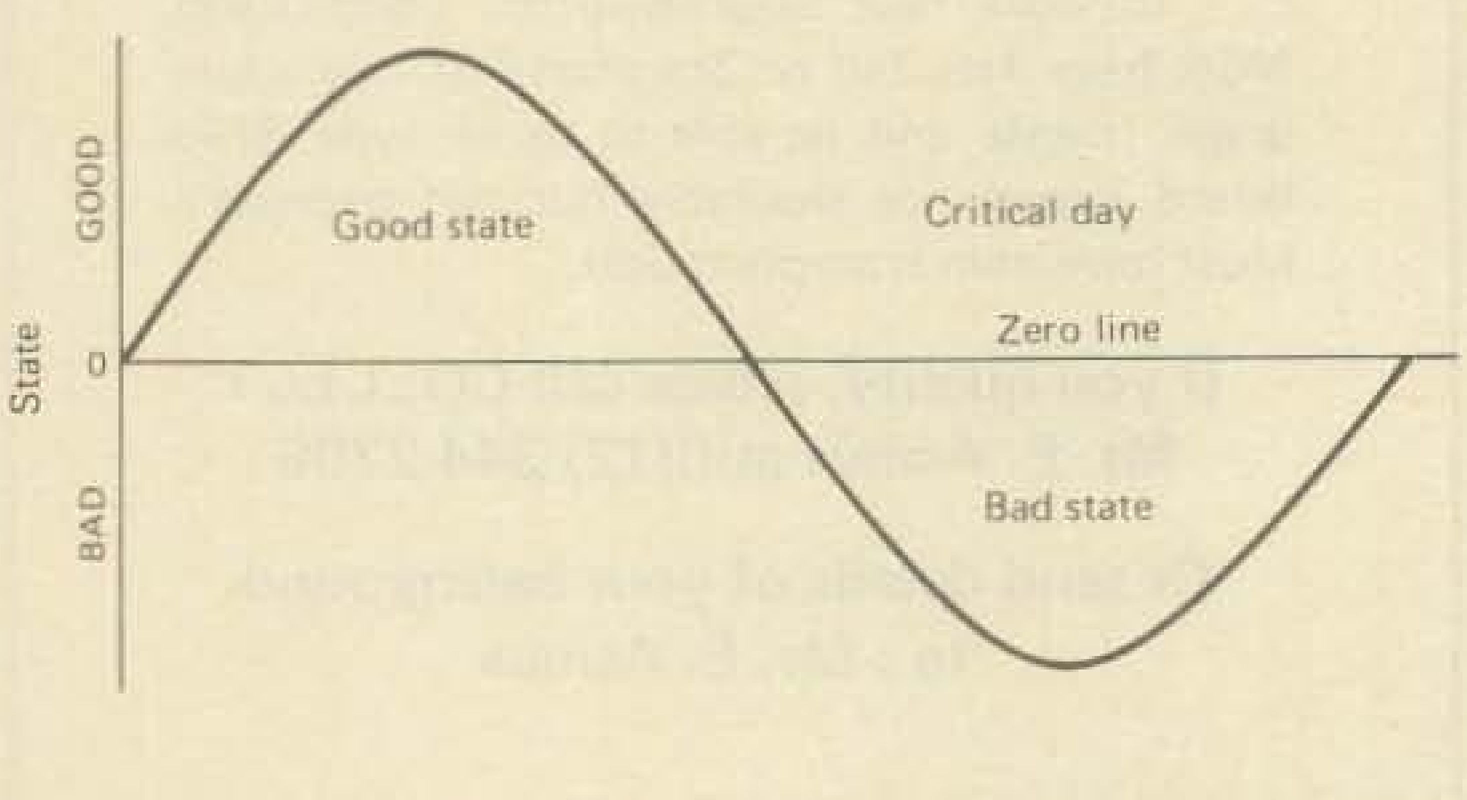


Fig. 1—A Biorhythm Cycle.

While I have, for some time, known the secret to this club's method of operation, I felt that other clubs would eventually discover why it is that the East Coast club is such a formidible opponent. This, however, has not happened, and so, dear readers, in the interest of fair play, I now feel it necessary to reveal the key to this club's success. Specifically, it should be known that the club selects its operators for any given contest period on the basis of each member's biorhythm chart. Only those operators whose charts are in favorable states are permitted to operate the club's multi-operator, multi-transmitter stations. On the other hand, operators whose charts are in less-than-favorable states are encouraged to participate individually from their own stations, while operators whose charts are at critical periods are requested to remain off the air entirely during the contest.

To understand better why a selection process employing biorhythm charts is so successful, it will be necessary to review the Biorhythm Theory, and to investigate how each of us responds to our "internal clock."

Biorhythm Theory

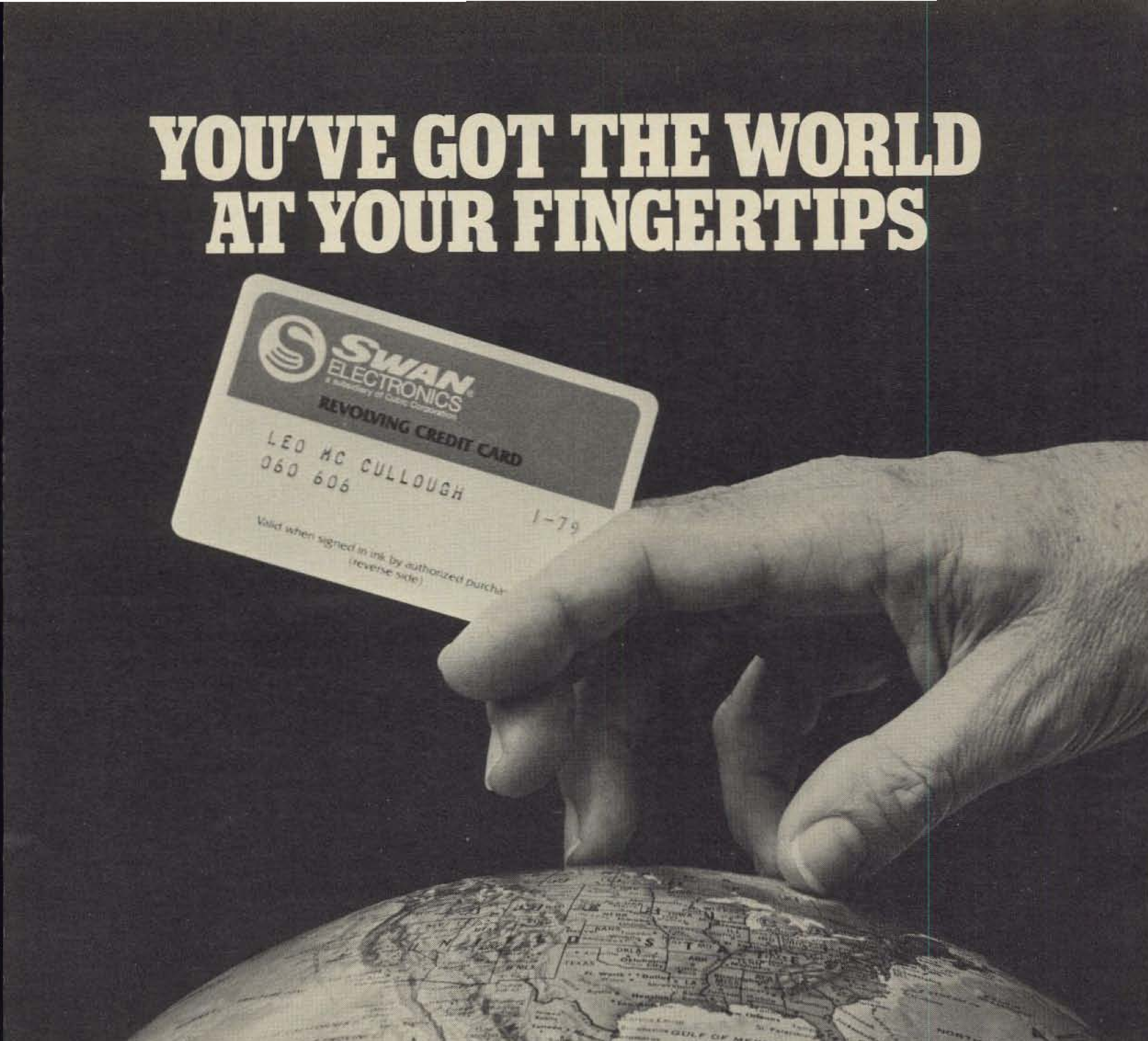
Under the Biorhythm Theory, man experiences three cycles which appear to be controlled by an inner clock. These are:

The Physical (P) Cycle
The Emotional (E) Cycle
The Intellectual (I) Cycle

In general, the 23-day Physical Cycle is associated with strength, or physical stamina, while the 28-day Emotional Cycle affects our mood. The Intellectual Cycle, which is a 33-day cycle, affects our thought processes. All three cycles rise and fall over their characteristic periods, and go through a *good* state, and a *bad* state, once each cycle (fig. 1). When our bodies are in a *good* state, we are energetic, capable and productive. However, when we are in a *bad* state, we are weak, slow, and generally recuperative.[1] All biorhythm cycles, by the way, begin in phase, on the *zero line*, at the instant of birth.

*Professor Heisseluft is currently on a lecture tour in Eastern Europe. Correspondence to the Professor may be directed c/o *CQ*, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050.

[1] Rebsch, D. *Biorhythm & You: The Facts,* Universal Biorhythm Company, Box 629, Rockville, MD 20853, 1977.



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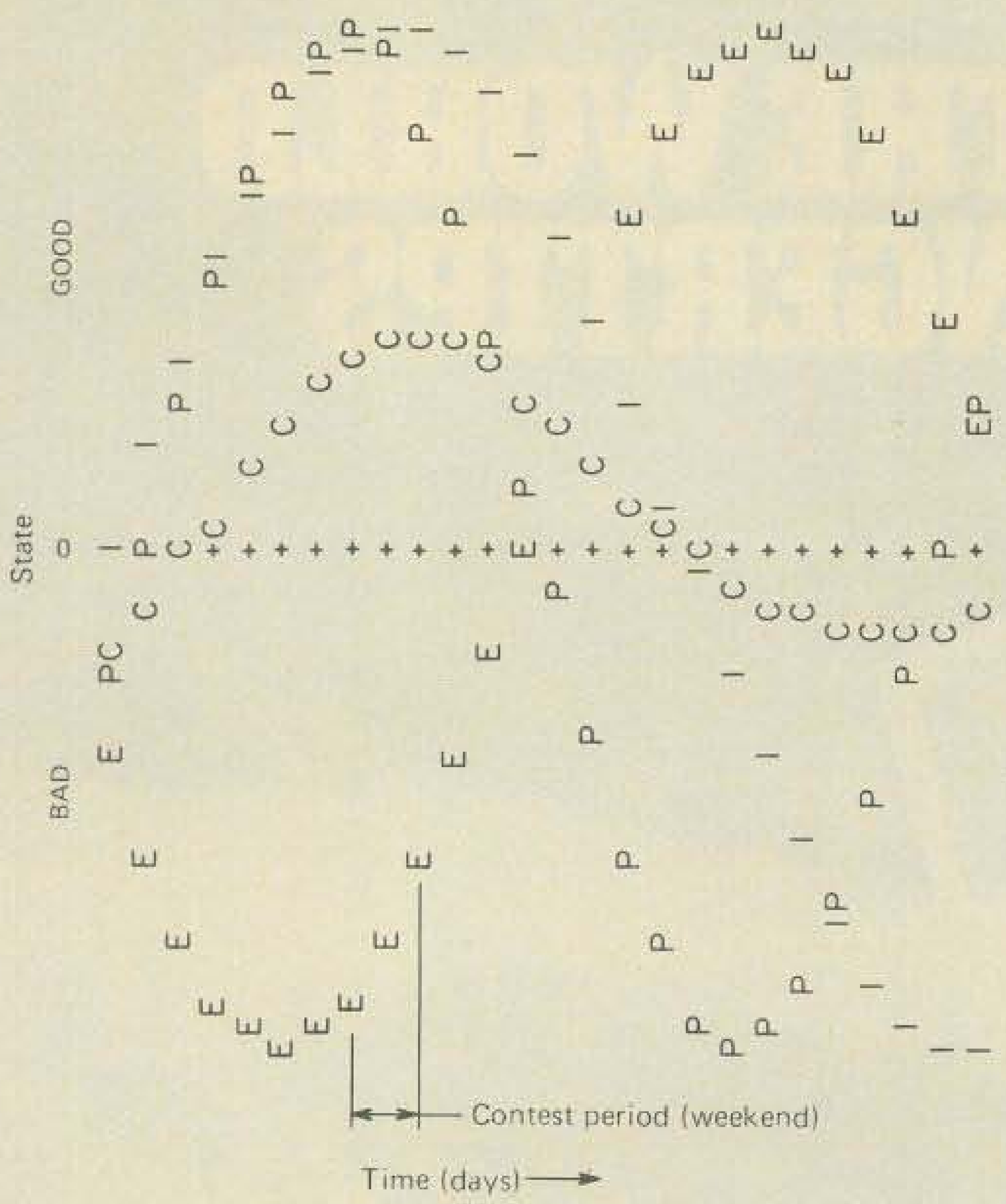


Fig. 2—Acceptable biorhythm chart for a contest operator (multi-operator, multi-transmitter station).

Critical Days

Days on which our bodies are changing from one state to another tend to throw us into periods of physical, emotional or intellectual confusion, depending on which cycle is passing through the zero line. For this reason, these days are called *Single Critical Days* (or, simply, *Critical Days)*, and these are the times at which we are most susceptible to disease, accidents, and even death[1]. Sometimes, two cycles will pass through the zero line on the same day; this condition is referred to as a *Double Critical Day*, and such a day is significantly more important to a person than is a Single Critical Day. Of most concern, however, are so-called *Triple Critical Days*, or days on which all three biorhythm cycles pass through the Zero line, for such a day has the greatest biorhythmic effect on our bodies. For example, in unpublished studies performed at the Lauton Institute in 1940 by Dr. Jerzy Ostermond-Tor, D.O.S.E. (ex-YM4XR), it was noted that students suffered two times as many accidents on a Single Critical Day as they did on an average day. More important, however, was the observation that four times as many accidents occurred on Double Critical Days, while 11 times as many occurred on Triple Critical Days. These results are very similar to those obtained by Schwing[3], who first performed such a study in 1939.

The Composite

Since the three biorhythm cycles occur with different periods, they will, at times, be in phase, out of phase, or in random states with respect to one another. Thus, to know better what a person's overall biorhythmic state is on a given day, the sum of the three, basic biorhythm cycles is computed. This curve is known as the *composite*. The composite is the most useful curve available for gauging how a person will, in general, perform, and it is used by the East Coast club to select candidate operators for any given contest.

Selection of Contest Operators—Method

The method used to optimize the selection of contest operators is relatively easy to implement. First, the biorhythm charts of all club members are screened, and those operators whose composite curves are in a *good* state are selected as candidate operators. Next, the P, E, and I curves for each member of this select group are screened, and only those operators whose P and I curves are in *good* states, and whose E curve is either in a *good* or *bad* state, *but does not pass through the zero line during the contest period*, are allowed to operate the large, multi-operator, multi-transmitter stations. The reason that a person with a *bad* E state is permitted to operate is that contest operators are generally moody at all times during a contest period, and displays of temper, infantile behavior, etc., are to be expected. Fig. 2 is an example of a biorhythm chart for a person who would be considered acceptable as an operator at a multi-multi station.

Operators whose composite curves are either in *good* or *bad* states, but whose P, E, and I curves do not pass through the zero line during the contest period, are encouraged to operate from their own stations. The thought here is that while these operators will display marginal performance, any contribution they do make will increase the club score. On the other hand, operators with a P, E, I, or composite biorhythm curve at a Critical Day during the contest period, as, for example, is shown in fig. 3, is considered a high-risk operator. Such operators are requested to stay off the air during the contest period because in the past, they have been found to cause considerable confusion in "pile ups." Then, too, high-risk operators have been known to maim themselves during contests while attempting to fix antennas and to repair their equipment. In essence, the club's request for these operators to stay

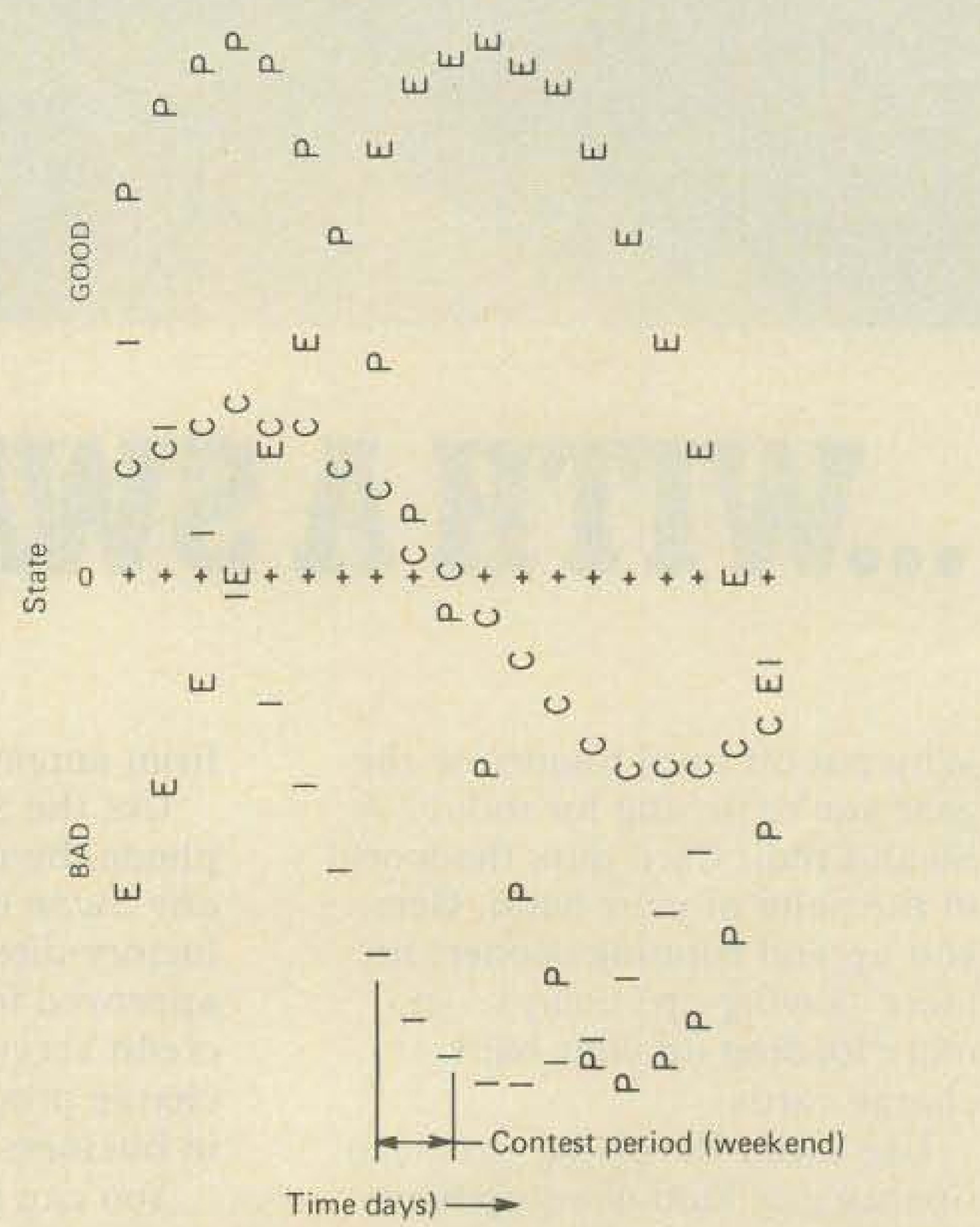


Fig. 3—Biorhythm chart for a high-risk operator.

[2]Heisseluft, E., "D.O.S.E. Awarded to Prof. Ostermond-Tor (ex-YM4XR)," *CQ*, April, 1969.

[3]Schwing, H., Doctoral Dissertation, Zurich Switzerland, 1939.

off the air during a given contest period results as much from the club's desire to win as from the desire to protect such operators from themselves.

It should be noted, in passing, that the biorhythm chart of fig. 3 typifies operators who are afflicted with "DXer's Pile-Up Syndrome." Operators suffering from this disease have a *good* emotional (E) state, a *bad* intelligence (I) state, and a critical Physical (P) state, as such; they are over-enthusiastic and highly emotional, display a total lack of intelligence, and are unable to control physically either their hands (if on c.w.) or their mouths (if on s.s.b.).

Test of the Biorhythm Selection Method

To convince itself that the biorhythm selection process was indeed a valid method for determining which operators could be expected to perform well in any given contest, the East Coast club, which has used this method since early 1967, analysed its performance in late 1966 for the period 1962-1966, inclusive. Contest periods included in the study covered the *CQ* Worldwide DX Contests (phone and c.w.), *CQ* Worked-All-Prefixes Contests (phone), ARRL DX Contests (phone and c.w.), Worked-All-Europe Contests (phone), All-Asian DX Contests (phone), ARRL Field Day Contests, and ARRL Sweepstake Contests (phone and c.w.). A total of 50 contest periods, therefore, were included in the study.

A review of the station contest logs, interviews with operators who participated in the contests, and a detailed analysis of the operators' biorhythm charts for the five year period yielded the results which are summarized in Table 1.

As seen, the high percentage of problems which occured in each category, and which resulted from the operator involved having a Critical Day during the contest period in question, clearly demonstrates the importance of preventing high-risk operators from participating in contests. For example, while only 14% of the equipment problems experienced by the club involved the destruction of the transmitter or a power amplifier, 86% of the time such destruction occured, the operator involved was experiencing an intelligence (I) Critical Day. Further, as noted earlier, and as seen in Table 1, the emotional (E) state of an operator is of little importance during a contest period, while his or her physical (P) and intellectual (I) capabilities were of vital concern. Finally, it is important to note that the most catastrophic event ever to be experienced by the club—a fire which destroyed the club's largest multi-multi station—was caused by an operator who experienced a Double Critical Day on the first day of the contest period. Because this event, above any, demonstrates the value of biorhythmic selection, a detailed account of the events leading up to the fire is given below.

Catastrophy on a Double Critical Day

The operator involved in the fire which destroyed a large multi-multi station in 1966 will, for obvious reasons, remain anonymous. We shall simply refer to him as Mr. J.

As was his custom on the Friday afternoon preceeding the *CQ* World Wide Phone Contest, Mr. J. was to have arrived at the multi-multi station overlooking the river valley with sufficient time remaining before the contest to have dinner and to prepare his operating position. Unfortunately, on this particular day he was running late, for he had inadvertantly locked his car with the key in the ignition switch, and in attempting to break in, had inflicted a cut on his arm which required 14 stitches to close. As we now know from an analysis of Mr. J.'s biorhythm chart, this combination of forgetfulness and physical clumsiness resulted from the fact that Mr. J. was experiencing a Double Critical Day. Specifically, as seen in fig. 4, both his P and I biorhythms were passing through the zero line, while the Composite was very close to this line.

Despite his earlier problems, Mr. J. was still in a fairly good mood (*good* E state) as he sped into the driveway of the multi-multi station, and it wasn't long before he was seated in front of the 20 meter operating position.

Some hours later, during a contact with AC3PT, Mr. J. apparently remembered that in his haste, he had not only left his headlights on, but had left his car blocking the driveway. Finishing the contact, he rose from the operating position, walked quickly to the door, and proceeded to his car. Fortunately, the car's battery had not run down, and once the engine was started, Mr. J. began to back the vehicle onto the grassy area adjoining the driveway.

Oh, dear readers, what happened in the next few moments lends credence to the theory that activity on a Double Critical Day can have tragic consequences. You see, in backing onto the grass, the rear bumper of Mr. J.'s car pushed against a set of guy wires on the 140 ft. tower which held the 5-element, 40 meter beam. In fact, the guy wires were pushed so far that they finally snapped, thereby allowing the tower to fold over at the base. This, in turn,

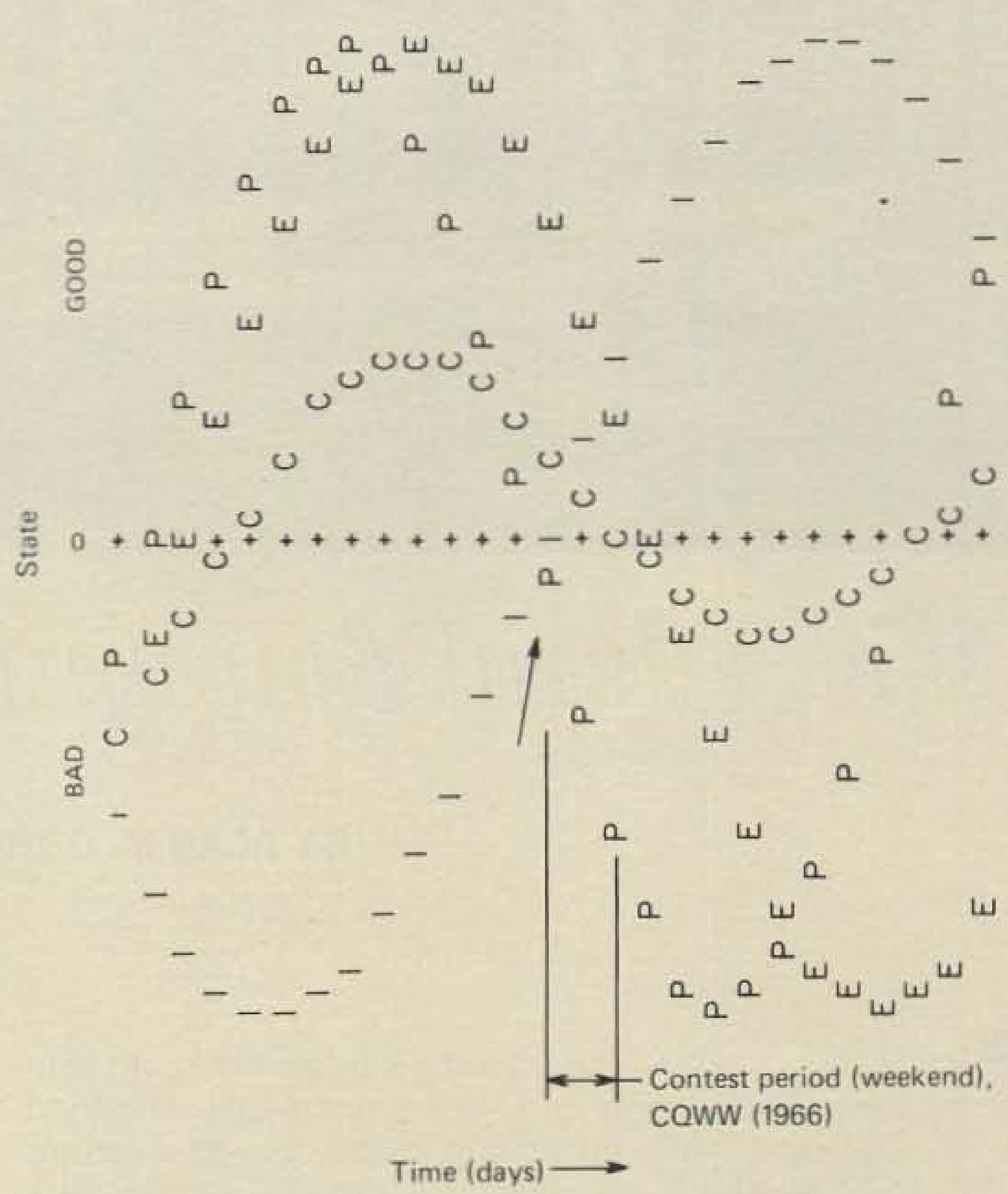


Fig. 4—Biorhythm chart for the 20-meter operator (Mr. J.) at a multi-operator, multi-transmitter station during the 1966 CQ WW Phone Contest. Note the double critical day (P and I cycles pass through the zero line) on the first day of the contest.

brought the beam into contact with a power distribution line which paralleled the county highway, and caused 39,000 volts to appear on the antenna and its rotator system. In an instant, the high voltage from the distribution line appeared on the a.c. line of the rotator control box, and hence, on the a.c. lines throughout the station. Needless to say, all of the operating positions vaporized in a flash, and the ensuing fire, which destroyed the station and an adjoining house, burned uncontrolled throughout the night.

By some miracle, no one in the station or the house was severely injured. But this experience, and its link with a Double Critical Day, provided a convincing demonstra-

(Continued on page 90)

The Federal Communications Commission

BY ALAN M. DORHOFFER*, K2EEK

Picture if you will, a long, rectangular, well lit room with an imposing dias at one end. Seats are neatly arranged for an audience, with provisions made for an overflow crowd to be seated in an adjacent room. TV cameras are suspended from the ceiling of the main room, covering the events for the adjacent room, making everyone in both rooms aware of the seriousness of what is about to transpire. A table to the side is marked "Press" whereby journalists lend a formidable air of "the public, as well, is watching what you are about to do." The dias itself is actually a long, arced desk, which dominates the end of the room by its size and the fact that it is a raised stage for what is about to happen. Arranged about the arc are the seven large, high-backed leather swivel chairs, one for each Commissioner. Small tables before the dias are for FCC staff and witnesses who are about to give testimony. Two colored lights flash signals for those who will speak, letting them know how much time is left for their presentation. One color indicates the last few minutes and the other tells you when you are through. The setting is formal and designed to show the magnitude or power of this "Court". By its very nature, you have to look up to see them and they look down to see you. It is impressive.

*Editor, CQ

So much for the trappings, what about the Commissioners themselves? Who makes up this august body that sits in judgment and determines which of us can use or has abused the airwaves. What do they look like and where do they come from? In a future article we will go into what their exact functions are, what their powers are, and how they themselves are regulated. Suffice it for now, this will be an orientation on the people themselves. It is an opportune time to introduce you to the Commissioners as there are several new Commissioners and President Carter has recently appointed a new FCC Chairman, Charles D. Ferris. As with any "new broom", Mr. Ferris has begun to make his presence felt within the FCC by making certain personnel changes. So you can look forward to several new names within the FCC and the absence of several others.

The FCC Commissioners

The following material is presented in outline form as supplied by the FCC. As I stated earlier, the purpose of this article is merely to provide an orientation for the reader on the members of the Commission, not to editorialize or comment on their qualifications. It is often the least visable among us who wield the most power and influence.

Robert E. Lee

Republican. Born Chicago, Ill., March 31, 1912. Appointed Commissioner by President Eisenhower in 1953. Reappointed by President Eisenhower in 1960 and by President Johnson in 1967, and President Nixon in 1974. Was auditor before joining Federal Bureau of Investigation as Special Agent in 1938. Served as Administrative Assistant to J. Edgar Hoover at FBI, and as Director of Surveys and Investigations for Appropriations Committee of House of Representatives.

Joseph R. Fogarty

Democrat. Born Newport, R.I., January 12, 1931. Nominated to FCC by President Ford, confirmed by Senate September 8, 1976, sworn in September 17,1976. Member of the United States Navy from 1953 until 1959. Joined the Lowell, Mass., law firm of Enos & McCarthy in 1959. From 1964 to 1966 was with the firm of Moore, Vigadamo, Boyle & Lynch, in Newport, R.I. Joined U.S. Senate Commission on Commerce as Staff Counsel in 1966. Named Comminications Counsel for Committee in 1975.

Charles D. Ferris, Chairman

Democrat. Born Boston, Mass., April 9, 1933. Nominated FCC Chairman, September 12, 1977, by President Carter. Approved by Senate October 10, sworn in October 17. General Counsel to Speaker Thomas P. O'Neill Jr., U.S. House of Representatives, January-October 1977. Chief Counselor to Senate Majority Leader, General Counsel to Policy Committee, Chief Counsel for Senate Majority, U.S. Senate 1964-1977. Associate General Counsel, Democratic Policy Committee, U.S. Senate, 1963-1964. Trial Attorney, Civil Division, U.S. Department of Justice (Attorney General's Honors Program), 1961-1963. Assistant professor, Naval Science-Marine Engineering, Harvard University, 1958-1960. Chief engineer, *U.S.S. Brinkley Bass (DD887)*, 1955-1960. Research physicist, Sperry Gyroscope, Great Neck, N.Y., 1954-1955. Boston College, AB in Physics, 1954; Boston College Law School, J. D., 1961. President of class and Editor of Law Review. Harvard University Graduate School of Business, Advanced Management Program, 1971.

Margita E. White

Republican. Born in Sweden June 27, 1937. Became U.S. Citizen in 1955. Nominated to Commission by President Ford, confirmed by Senate September 8, 1976, sworn in September 23, 1976. Named Administrative Assistant for the Honolulu office of Whitaker and Baxter Advertising Agency in 1961. In 1963 named Minority Press Secretary for the Hawaii House of Representatives. Research aide to Senator Barry Goldwater and research associate with the Republican National Committee in 1963 and 1964, and research assistant and writer with the Free Society Association in 1965 and 1966. From 1967 to 1969, was research assistant to the late syndicated columnist Raymond Moley. From January 1969 to February 1973, was assistant to Herbert Klein, Director of Communications for the Executive Branch of the Government. Was Assistant Director of the United States Information Agency (Public Information) from 1973 until 1975. Appointed Director of the Office of Communcations on June 18, 1975. Received the United States Information Agency's Superior Honor Award in 1975. Is founding member and current secretary of Executive Women in Government.

James H. Quello

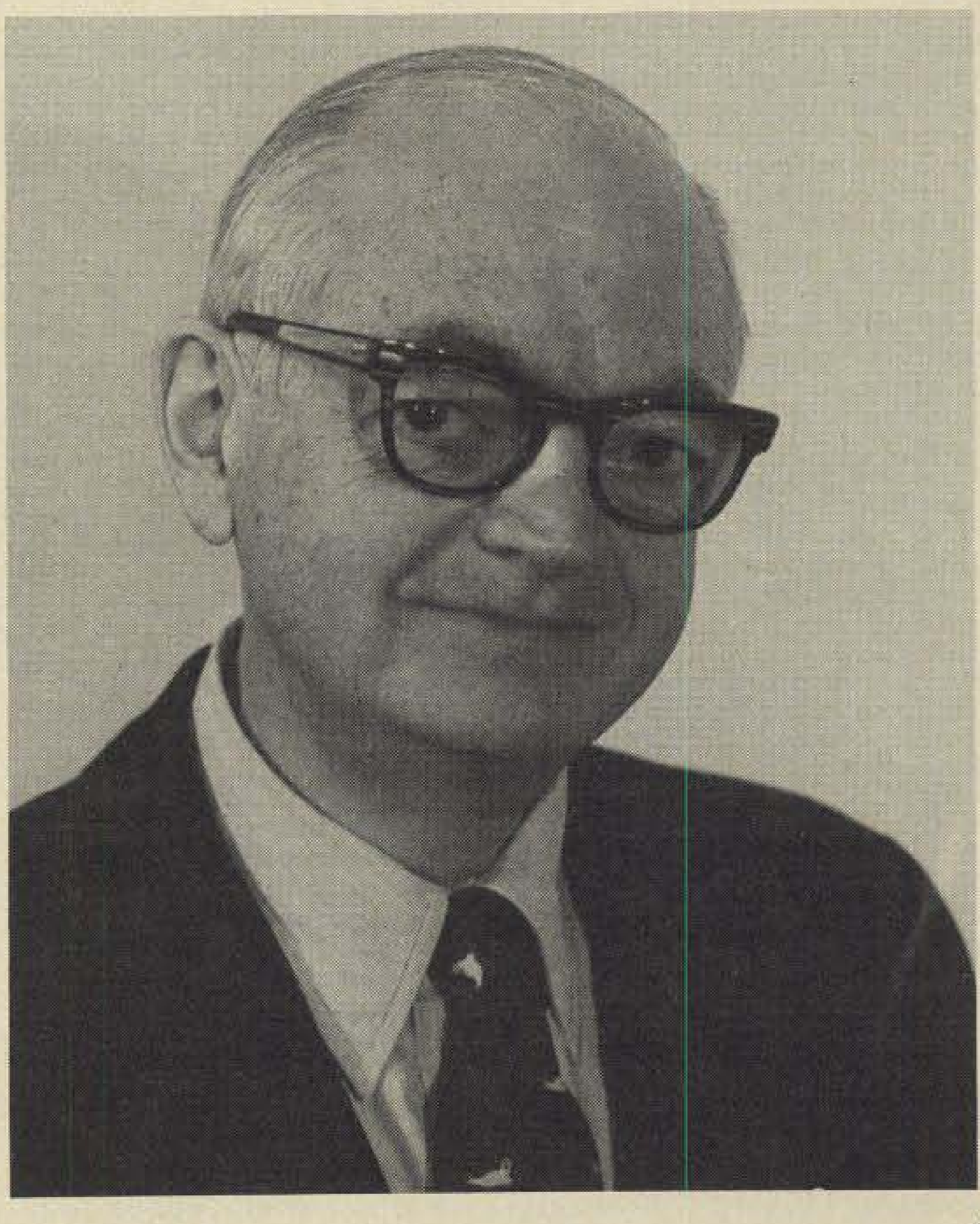
Democrat. Born Laurium, Mich., April 21, 1914. Nominated to Commission by President Nixon on September 20, 1973, confirmed by Senate on April 23, 1974, sworn in April 30, 1974. Rose from position of promotion manager radio station WJR, Detroit, Mich., 1947, to Vice President, General Manager 1960; retired as Vice President, Capital Cities Broadcasting Corporation in 1972. Was a Detroit Housing and Urban Renewal Commissioner 1951-1973, and trustee Michigan Veterans Trust Fund 1951-1974. Was member of the Governor's Special Commission on Urban problems; Governor's Special Study Committee on Legislative Compensation; Assistant National Public Relations Chairman V.F.W.; TV-Radio Chairman United Foundation; Executive Board Member of Boy Scouts of America; and Board member American Negro Emancipation Centennial.

Tyrone Brown

Democrat. Born Norfolk, Va., November 5, 1942. Nominated to FCC by President Carter, confirmed by Senate November 4, 1977, sworn in November 15. During 1967 term of U.S. Supreme Court, served as law clerk to Chief Justice Earl Warren. Associate attorney with the Washington, D.C., law firm of Covington and Burling, 1968-1970. Special investigator in Jackson, Miss., for The President's Commission on Campus Unrest in 1970. 1970-71, assistant director of the U.S. Senate Intergovernmental Relations Subcommittee. Director and vice president for legal affairs of Post-Newsweek Stations, Inc., 1971-74. In June 1974, joined Washington tax law firm of Caplin and Drysdale as an associate attorney. Member of board of directors and executive committee of National Lawyers' Committee for Civil Rights Under Law and a public member of the Administrative Conference of the United States. Member of D.C. Unified Bar and New York State bar. A director of Washington Chapter Metropolitan Studies. Received A.B. with honors from Hamilton College, Clinton, N.Y., 1964, and LL.B., with distinction of Cornell Law Review; received Frazer Prize for leadership and academic achievement.

Abbott M. Washburn

Republican. Born Duluth, Minn., March 1, 1915. Nominated to Commission by President Nixon, in 1974. Sworn in July 10, 1974. Reappointed by President Ford in 1975. Sworn in October 9 for full 7 year term. Director, Department of Public Services, General Mills, Inc., in 1940's. Executive vice chairman of Crusade for Freedom (Radio Free Europe), 1950-51. Eisenhower Presidental campaign staff, 1952. Deputy Director, U.S. Information Agency 1953-61. President of international public affairs counselling firm of Washburn, Stringer Associates, Inc., 1962-68. In 1969 appointed deputy chairman of U.S. delegation to INTELSAT Conference. Chairman of INTELSAT negotiating conference, with personal rank of Ambassador, 1970-71. Special consultant to the director, the White House Office of Telecommunications Policy, 1971-74.



This time Albert Jackson constructs an electronic keyer, complete with his touch-paddle, in one neat package.

THE Q KEY

BY ALBERT H. JACKSON*, VE3QQ

This completely self-contained electronic key is approximately 3" in diameter by 2" high, and combines a modified Curtis 8044-2 keyer kit[1] with the touch-key described in a previous article.[2] Except for the mechanical arrangement, there are few changes in the touch section, and the reader is referred to the earlier presentation for its circuit, methods of construction, final adjustment, etc. Further details not covered in the following text should be apparent from the photos and drawings, or from the Curtis instruction booklet accompanying the kit. By altering directions where necessary, it should also be possible to incorporate the 8043 keyer instead of the 8044, if you can make room for the extra trimmer (R14) and the larger timing capacitor (C5).

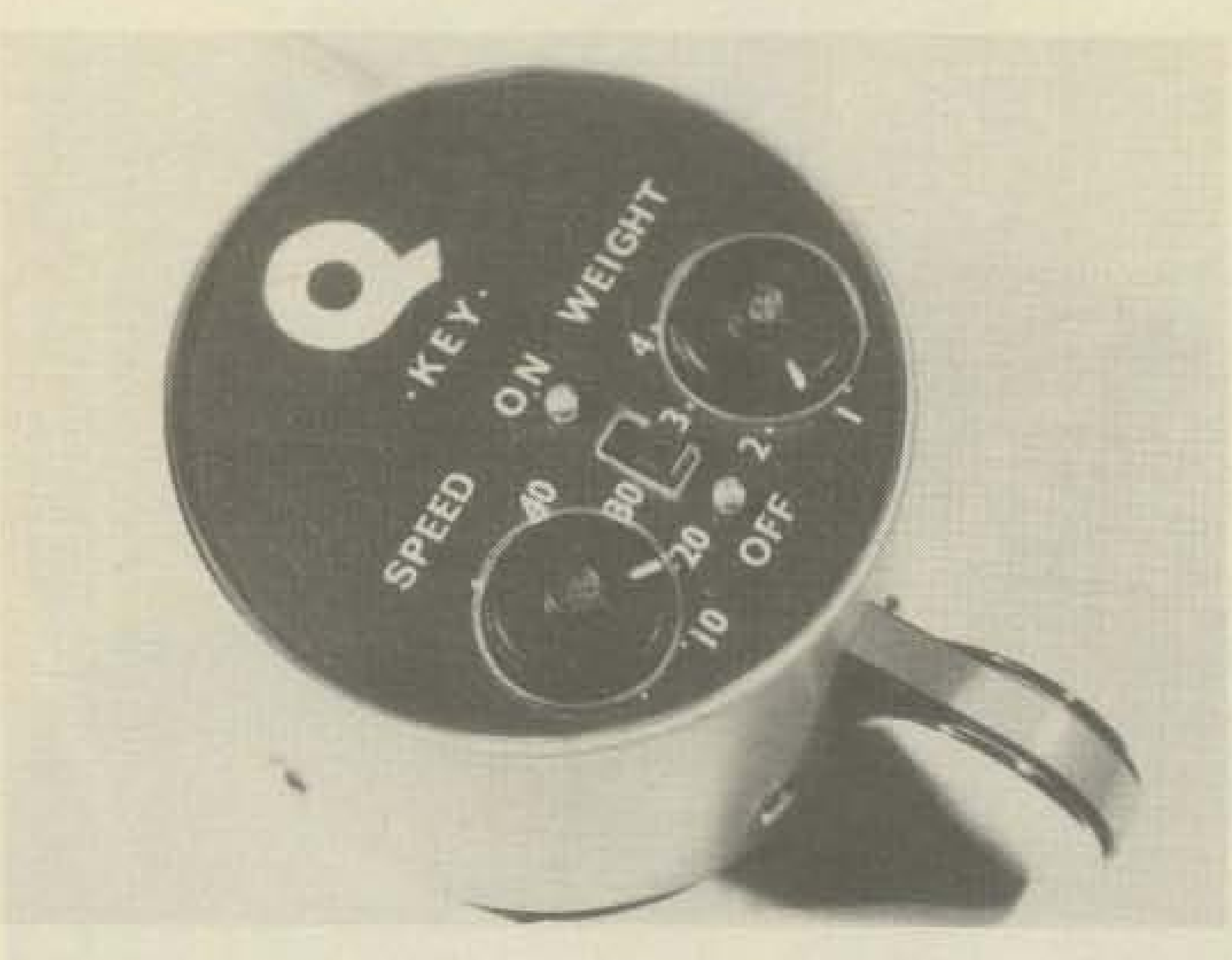
Touch Control Section

Make and assemble the circuit board as shown in figs. 1 and 2, remembering the precautions previously given for drilling the larger holes. Cut the slot in the touch-plate assembly to a new depth of 21/32".

*90 Fox St., Penetanguishene, Ontario, Canada LOK 1PO

[1] *The 8044-2 Kit is obtainable from: Curtis Electro Devices Inc., Box 4090, Mountain View, Cal. 94040. Price: $58. plus $1.50 handling and mailing.*

[2] Jackson, A. H., "Touch Control For The Curtis Chip Keyers," *CQ*, July 1977, p. 17.



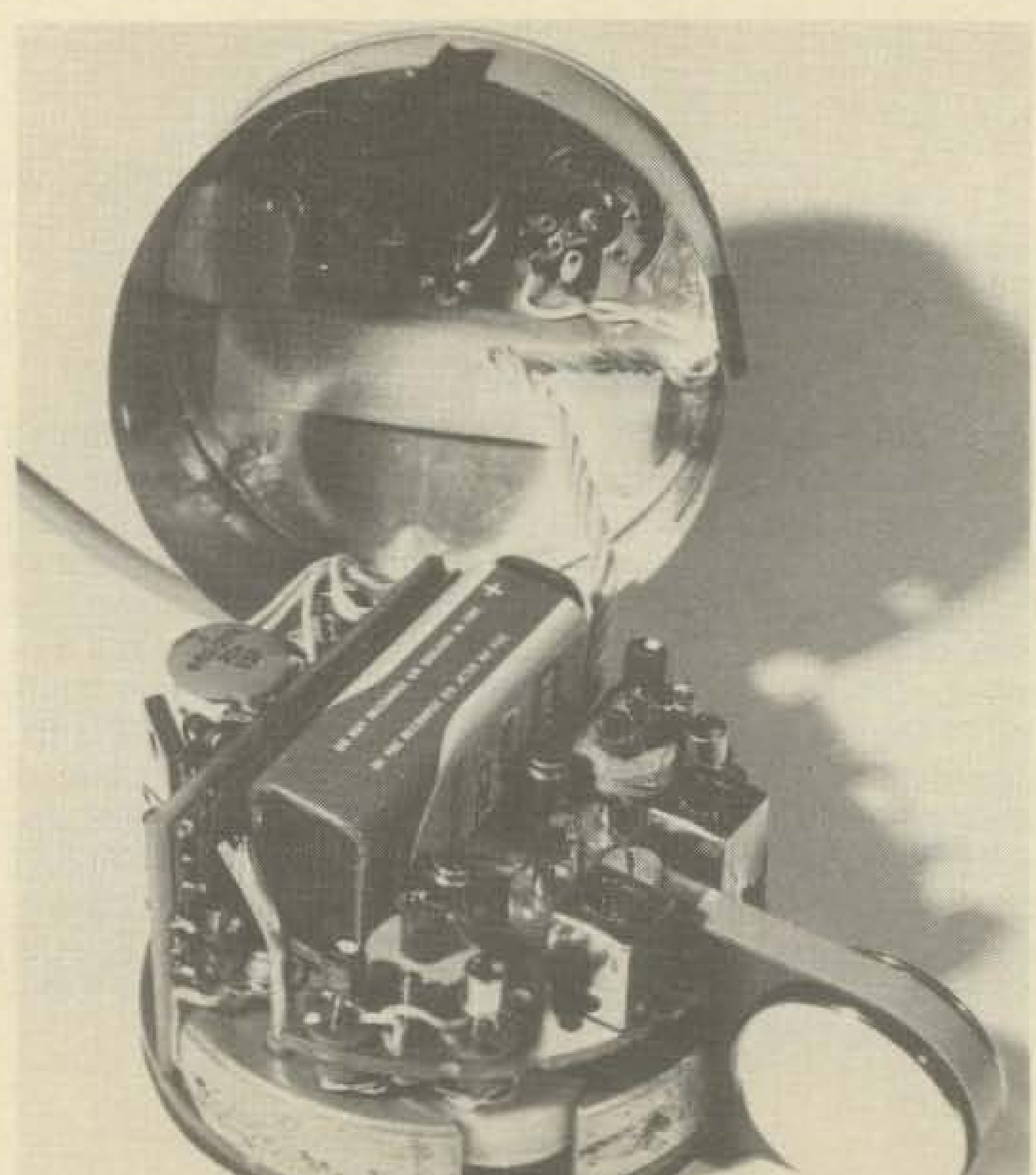
The Q Key in operating position. The controls are miniature 500k ohm, audio taper, element-in-knob types (Armaco TV200-500K or equiv.) and the small switch is a Radio Shack 275-406.

8044 Circuit Modifications

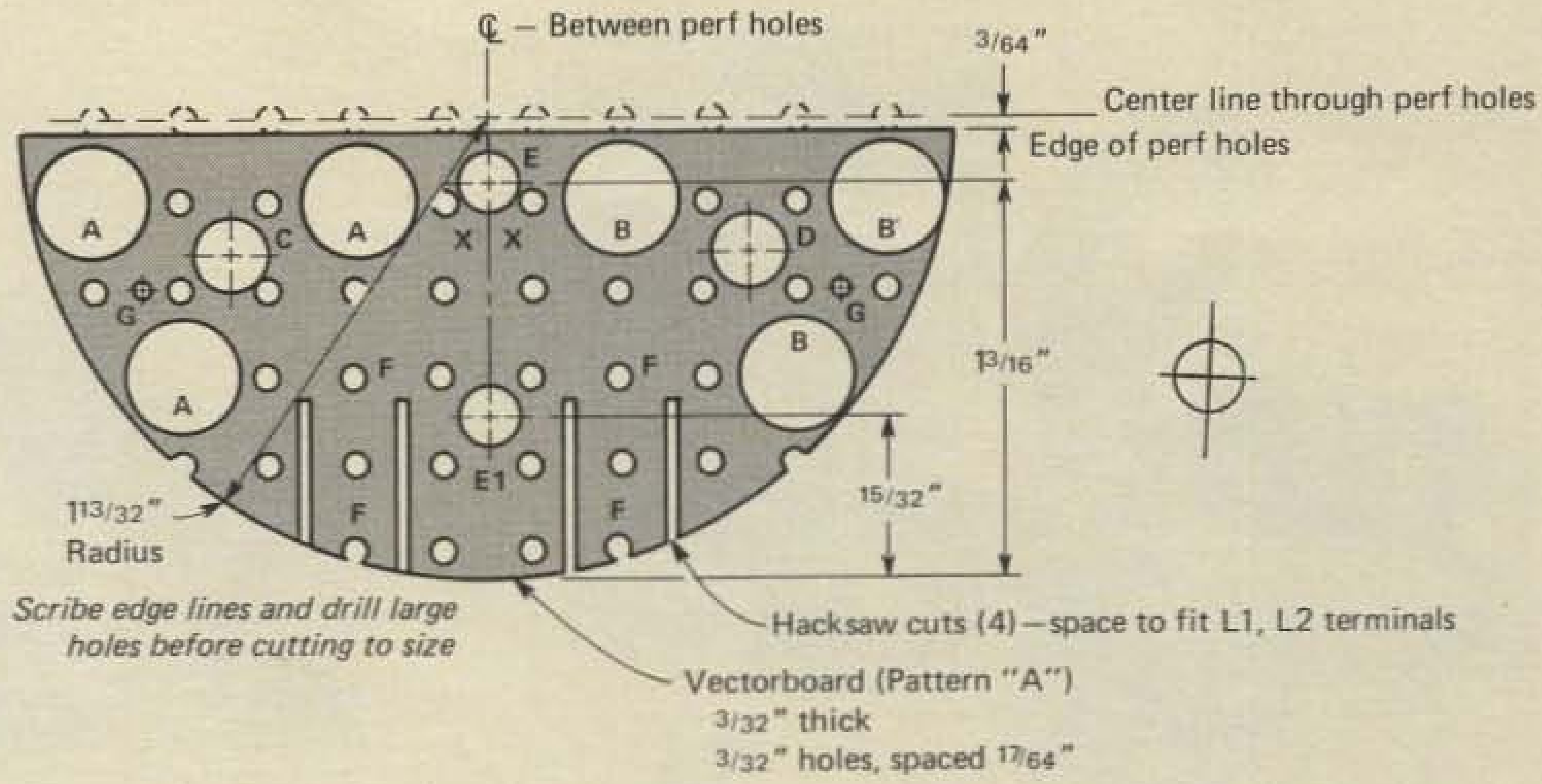
With miniaturization in mind, a few less than essential Curtis features were dropped and some substitutions made: The sidetone amplifier (Q2), its control and output transformer were replaced by a small crystal earphone installed in the base weight, and a fixed resistor eliminates the pitch control. The self-test, tune, and straight key facilities were deleted, and the circuit board was shortened to 2-3/16". Miniature potentiometers were substituted for the weight and speed controls, and some of the surplus parts can be used in an optional a.c. power supply if you wish.

P.C.B. Alterations

Cut the Curtis circuit board squarely across its width, between holes T and U. This removes the R14 and most of the T1 holes, and necessitates relocating C6. Drill the remaining T1 mounting hole to 1/8" and scrape the Q2 emitter foil well away from it. Notch the adjacent board



Here is a side view with the cover removed. Plastic sponge lines the top, over and to the left front of the battery location.



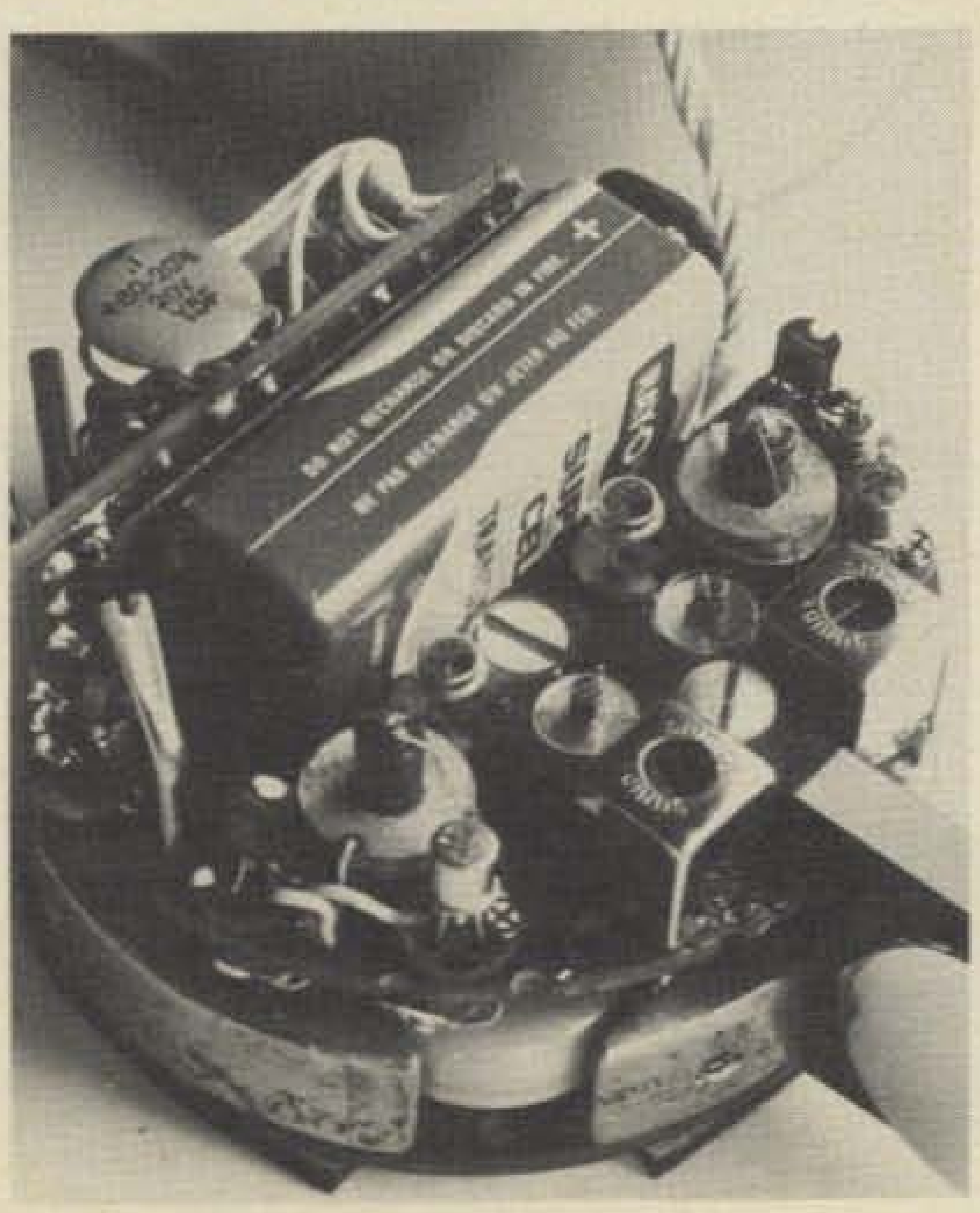
NOTES:
Drill holes:
A, B to 5/16" (see text)
C: 7/32"—centered between holes AAA
D: 7/32"—centered between holes BBB
E, E1: 5/32"—*seal XX with epoxy first*
G: No. 58: R1, R2 to clear RFC1, RFC2 (mount vertically)
Pin holes F to take L1, L2 mounting lugs

corner to clear the keyer output cable. Pass a #53 drill through these holes: Q2 emitter and collector, A, B, X and Y. On top of the board, connect hole +C6 to H.

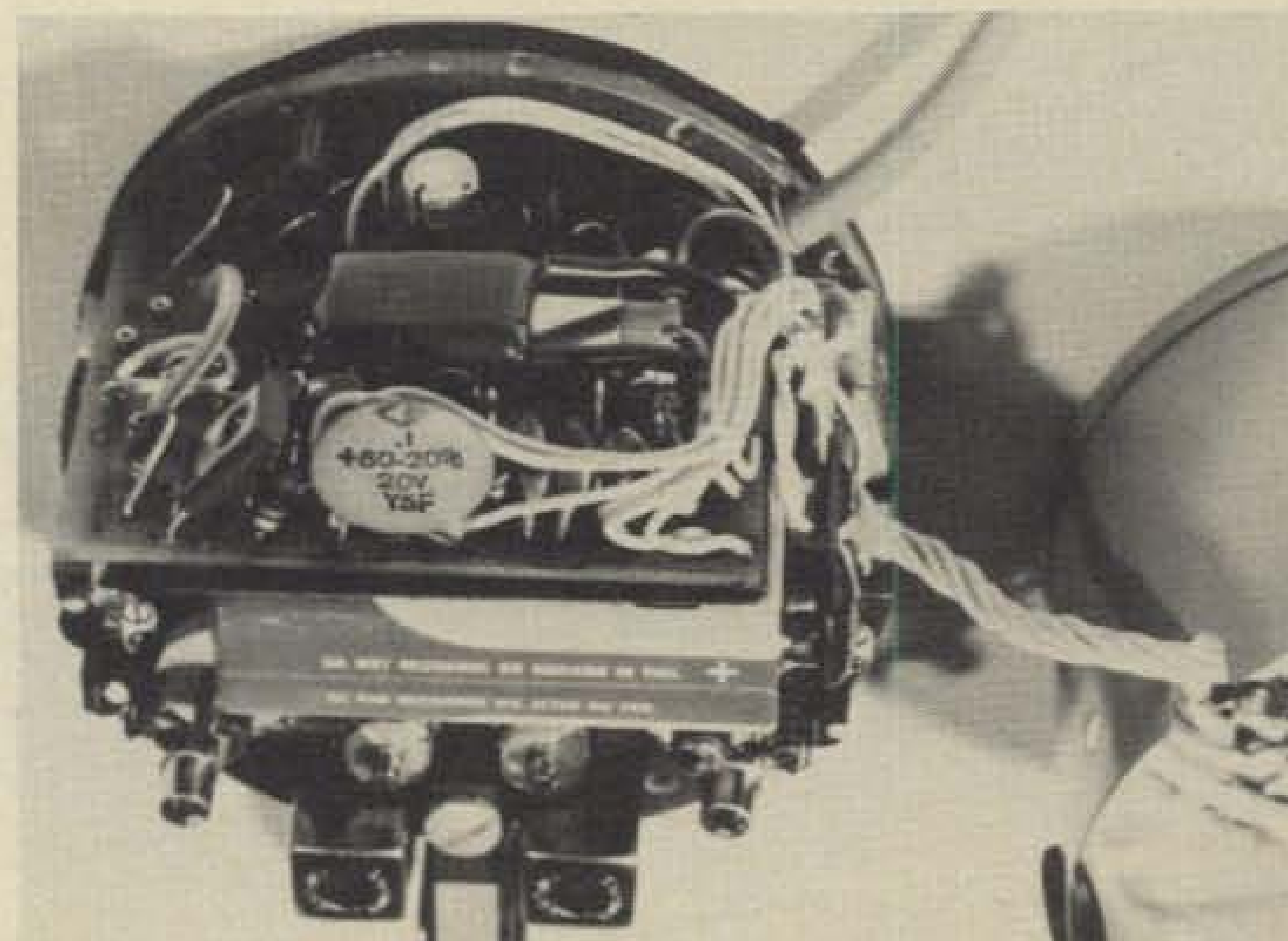
Assembling the Printed Circuit Board

Refer to pages 10, 11, 12 of the Curtis manual and follow their directions, except as indicated here:

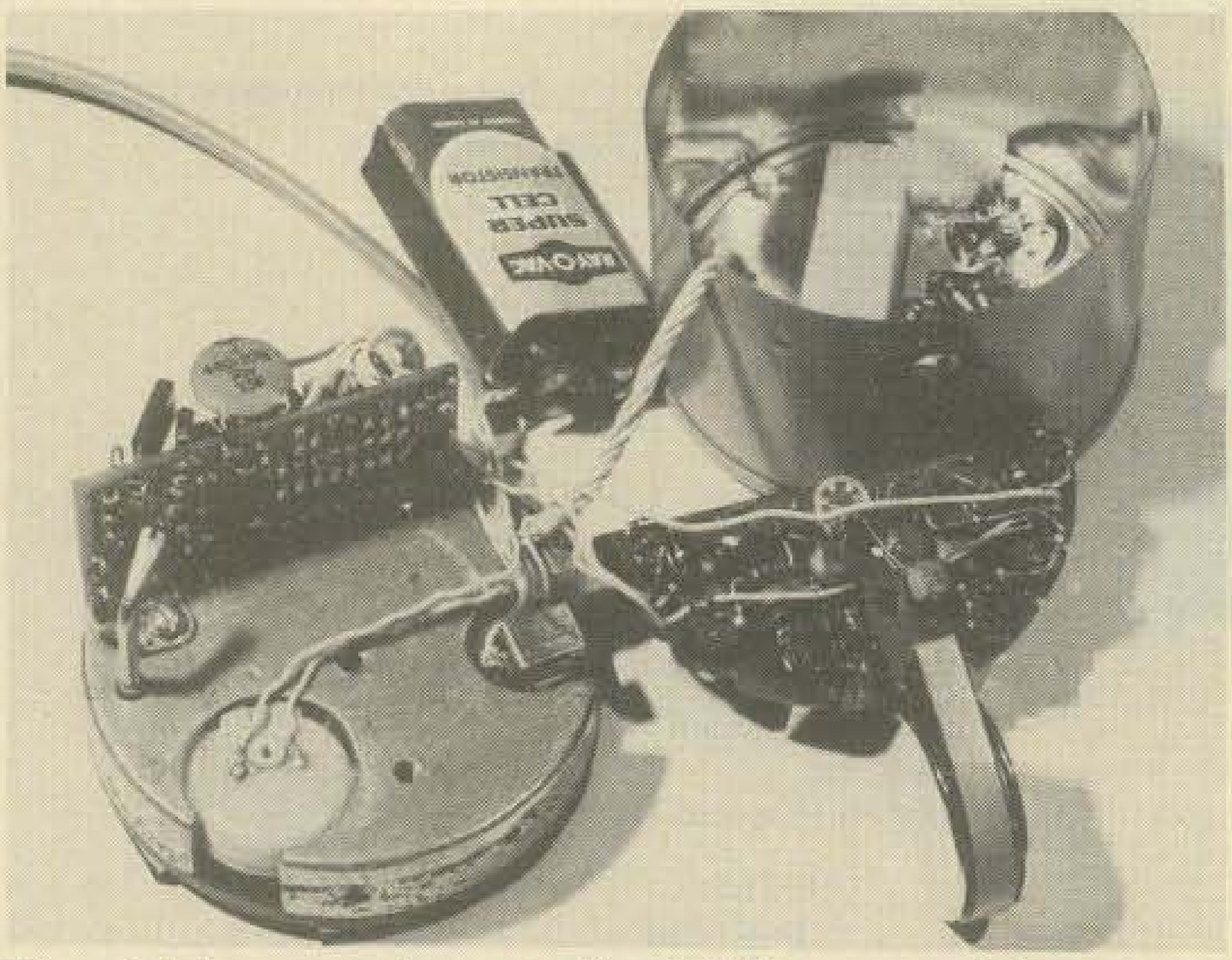
Step 2: In two kits assembled by the writer, ten gold jack-pins were supplied. Save the ones from the common holes at Z1, Z2, Z3, and use jumper leads as described in the alternative for Step 21 below. Don't let the Z1 jack-pins protrude more than 1/32" on the foil side of the board. You should have four jacks left on completion of this step.
Step 3: Delete D5 and D6. These were needed only for static protection on the manual key input.
Step 9: The six positions are now reduced to four.
Step 10: After checking the Curtis data, R5 was replaced by 220k, R7 and 39k, R15 by 1k, and R12 by 120k ohms. This reduces supply current drain and alters the speed range, but the choice here is an individual one. Deleting R8 and installing a 220k 1/4-watt resistor from the 5.6 hole nearest the IC socket to hole F eliminates R9 and determines sidetone pitch. Substitute a 33k 1/4-watt resistor for R10 as a series resistance for the sidetone earphone.
Step 12: The .33 μF mylar becomes .15 μF in the 8044 kit. Mount with spaghetti and bend back over the IC to conserve space. See the rear view photo.
Step 13: Not required with the 8044.
Step 14: Mount this capacitor in place of D5, D6. Positive goes to the cathode D5 hole, negative to the anode D6.
Step 15: Transformer not used.
Step 16: Q2 not used.
Step 20: A switch is needed because of the additional touch-key current.
Step 21: Instead, make flexible jumpers 1-1/4" long from #28 insulated stranded wire. Cut 1" ordinary straight sewing pins to 3/16", file off sharp corners and solder one end of each jumper to a pin head. Solder the other jumper ends into the common holes at Z1, Z2, Z3, respectively. Enlarge the jack-pins by inserting and removing an uncut pin at each location.
Steps 25, 26: Solder two of the extra jack-pins from Step 2 in holes X and Y. Remove the foil "+" sign near X, and drill a hole to pass the inner conductor of a shielded transmitter key line in the clear space above Q4. Bring this



A close-up of the inside. The little "nail puller" at the left makes it easy to remove the polarity changing jumper-pins.



A direct look at the modified Curtis keyer, at the rear.



The sidetone earphone in the left foreground is an inexpensive, ear-insertion, high impedance, crystal unit (Armaco type CR). The top of the optional external supply connector (Radio Shack 274-1549) can be seen at the right of the weight.

wire through and solder to a pin head, producing a jumper similar to the others. Insert the pin at X or Y according to your required polarity output. The cable shield connects to a ground lug on top of the base weight at hole F, fig. 3.

Step 27: Sentences 3 and 4 don't apply to the Q Key.

Skip Steps 28 to 33 inclusive.

Step 34: The 8044 chip may be encased in ceramic, without a positioning notch. In this event, there will be a gold dot over pin 1 at the end where other packages have a notch.

Skip Steps 36 and 37.

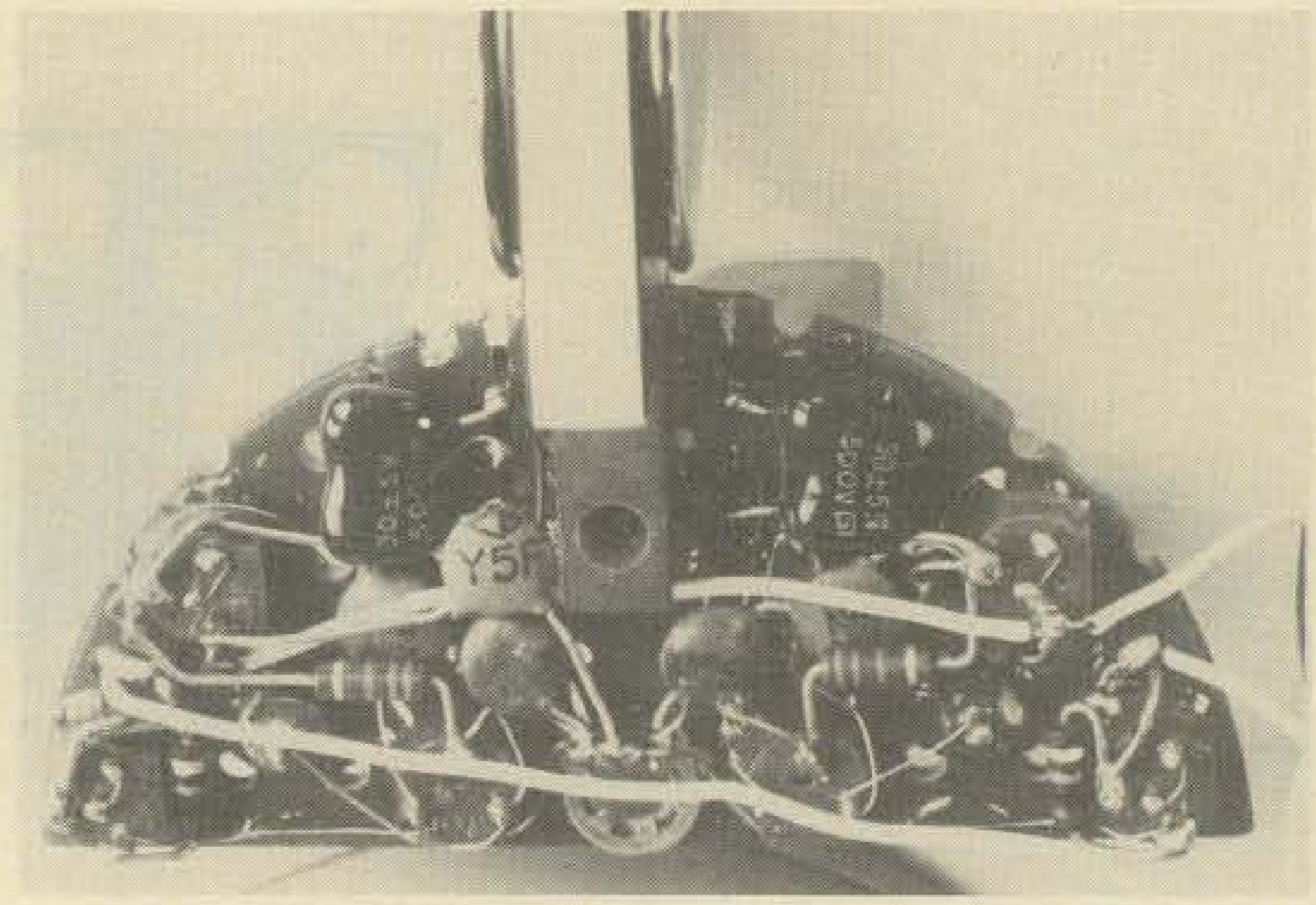
Step 38: Sentence 3 doesn't apply with the 8044.

Skip Step 40.

P.C.B. Continued

Solder the two remaining jack-pins in the Q2 emitter and collector holes. Connect the "emitter" jack to the negative supply foil. Bring the touch-section supply line back to another 3/16" jumper pin which may then be inserted into either jack for polarity change. Scrape off the former markings, and identify the jacks accordingly. Hole U and the Q2 base position become terminals for the crystal earphone connections. The enlarged holes at A and B accommodate the supply leads plus a .1 μF 20-volt disc ceramic r.f. by-pass. This capacitor is an added precaution when using an external a.c. supply.

Carefully bend the end components inwards, as shown in the photos, to clear the round metal case. Gently file off the sharp wire ends on the foil side of the board and cement a short-preventing piece of fish-paper between it and the battery. This was purposely left out when the photos were taken, in order to show all possible details.



Under the touch-control circuit board.

Base Weight

Cast the lead base weight in a 4-oz. Fleischmann's yeast or similar tin 2-7/8" inside diameter, first covering the junction tab at the side and end seams with asbestos furnace cement to prevent leakage. Cool in a level position, peel off the can and proceed as indicated in fig. 3, using the base plate as a template.

Case

Grind or file off the folded edge of another yeast tin, cut it to an over-all height of 1-7/8" and slot it at the side seam for the touch-plate assembly. Fill the rest of the seam with solder, make a second notch to accommodate the transmitter control cable at its exit, and install the mounting screws. Replace the ribbed bottom of the can with a flat metal plate cut and drilled for the switch and controls; this then becames the top of the case. When finished, clean and repaint the outside as suggested in the referenced article.

The panel lettering was done on a painted disc of Manila folder, and this was sandwiched under a 1/8" lucite window fitted inside the circular flange. The small potentiometers were set through from the bottom and supported by epoxy-cementing their switch terminals (not used electrically) to the inner surface. Two plastic washers, attached with CPVC pipe cement, protect the circuit-connected knob screws. The SPEED potentiometer is reverse wired because of its resistance taper, but the center placed

NOTES:

A: JU1, JU2, top lead R1
B: R1 Mounting
C: Top lead RFC1
D: Top lead RFC2
E: R2 mounting
F: JU3, JU4, top lead R2
G: Lead fron dot touch plate

JU1, JU2, JU3, JU4: Polarity changing jumpers. Cut pins to 3/16", no bending required

Sockets: Radio Shack 276-548

Fig. 2—Parts layout and socket orientation are shown here.

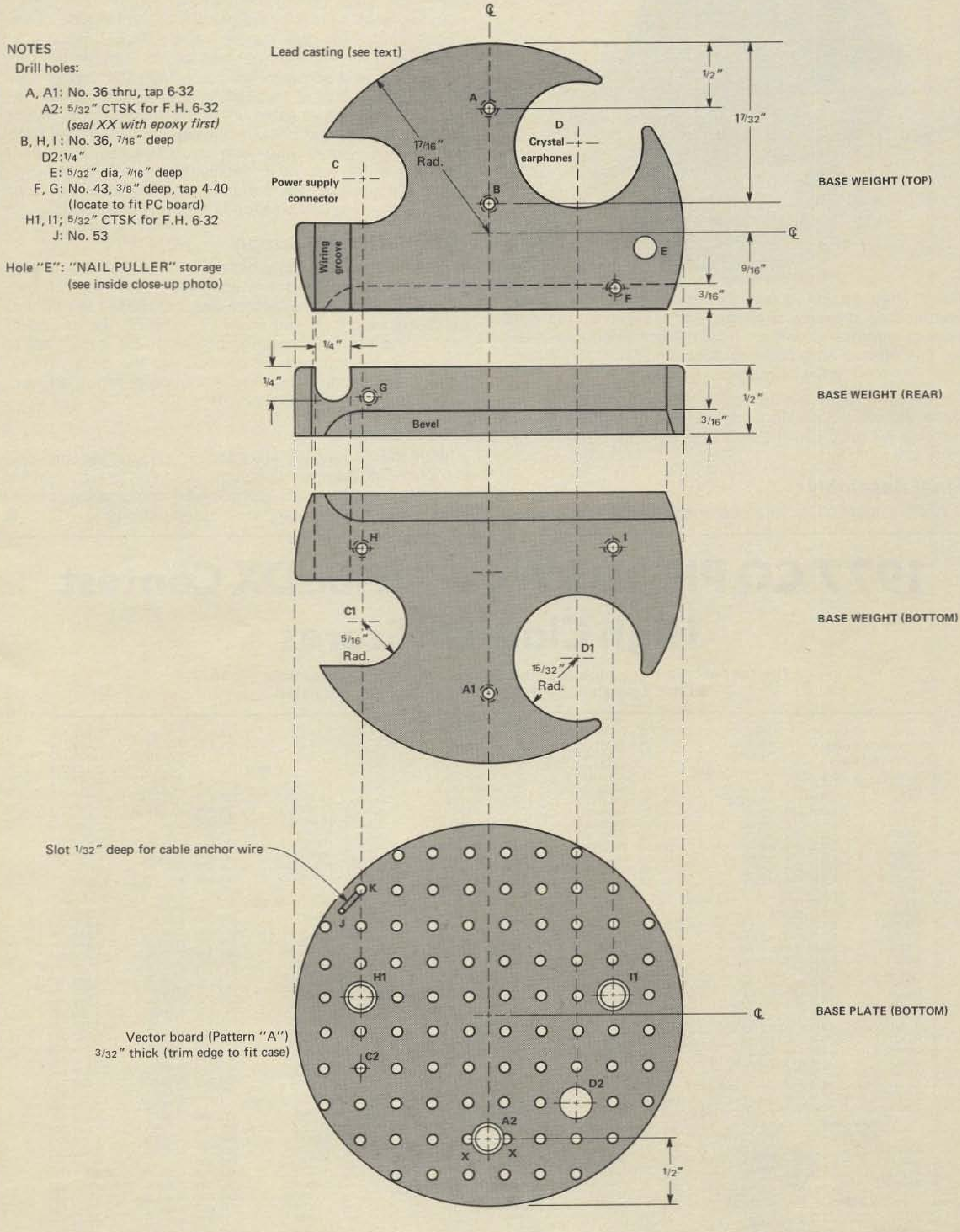


Fig. 3—How to make the base weight and bottom plate. The Vector-board pre-punched holes determine nearly all locations.

The Q Key upside down. Self-sticking sponge rubber weatherstrip prevents slippage, and the gap on the right permits sidetone to emerge from the screened hole nearby. The bushed side opening accommodates an external power supply plug, if used.

scales allow both control indicators to advance in the same direction. Counting the number of dashes in five seconds will give you the approximate w.p.m. rate at any particular setting.

Final Assembly

A #4 soldering lug, wire end bolted through the ground-foil mounting hole of the printed circuit board, serves as a foot to fasten the p.c. to hole F in the base weight. Place a 1/8" high fiber spacer behind the former transformer mounting hole, set the board parallel to the flat side of the weight, then mark, drill and tap holes F and G, fig. 3.

Assemble the base weight and plate. Remove the terminal cover and screw-in ear-piece from the crystal earphone, and anchor it in position with silicon rubber cement. Run the output cable under the weight bevel, mount the completed circuit board, squeeze the cable to the base plate with a formed wire loop through holes J, K, then finish the wiring and other details. Make certain all jumpers and transistors are correctly inserted, and that your transmitter/keyer combination is properly grounded.

External Power Supply

Since a 9-volt transistor battery is more than satisfactory for normal operation, this is optional. Nevertheless, a battery-circuit-opening connector was included at the right of the base weight. If you install it, saw off the mounting "ears" and epoxy-cement the bracket to the base plate at C2, fig. 3, making sure all points clear the metal weight. A future article will describe a compact, regulated, a.c. keyer supply for this application.

Conclusion

With the Q Key, or any "touch" paddle section, c.w. literally flows from the fingertips. If you're already familiar with electronic keys, you can convert from moving to non-moving control in just minutes. Happy keying! ■

1977 CQ PHONE World Wide DX Contest High Claimed Scores

The following are the high claimed scores received by December 31, 1977, so don't be alarmed if you don't see your score listed.

USA

Single Operator — All Band

W3WJD	2,377,935
N7DD	2,027,857
N1GL	1,706,240
K1DG	1,504,530
W6RR	1,414,974
W6XR	1,355,640
N2LT	1,355,289
K7RI	1,352,182
K5GA	1,291,264
N7GX	1,242,899
N4RV	1,213,740
W3RJ	1,185,750
KØDQ/6	1,177,392
W9ZRX	1,170,972
W7EJ	1,079,670
K3ZO	1,079,305
W9QQ/4	1,022,788
N8JW	987,674
W9RE	968,661
N3BB	946,890
K3WX	928,984
W4QAW	920,808
W7NI	916,370
N3AD	906,240
WA9PBK	901,562
K6PU	846,375
N6AA	835,775
N6AR	811,954
W7VRO	794,094
K5OA	791,964

Single Band — 1.8 MHz

K6SE	2,325
N4EA	2,233
K1PBW	1,792
W1BB/1	198

3.8 MHz

W2VP	113,058
W9BW	45,760
W8WW	34,872
N4QQ	24,752
K5LM	18,688
N7RK	17,748
K9OTB	16,060
W9LF	16,016
K5NU	15,738
W8TWA	13,254

7 MHz

W7KW	81,770
WA4DCP	48,709
W8LU	33,187
W9YG	29,760
WB2QYT	21,964
WØSD	19,656
WB9QPN	19,600
W9CL	17,219
K7UR	13,356

14 MHz

K2HFX	387,549
K3JLT	296,765
W7ATF	248,168
K4JPD	247,559
K7OX	238,007
K9DX	233,496
K2BMI	222,552
W5FA	177,781
W1GSH	172,074
K8SMC	170,506
K7TM	169,200
W3GG	165,735
W9MM	160,500
WA9JCO	160,128

21 MHz

WA6EKL	492,688
K1RT	382,398
K4RV	370,462
WA6DNM	352,672
W1FXD	328,107
K1WX	319,480
N6ND	311,500
W9SU	307,625
WB3DET	304,640
WA7UWE	291,510
N4KG	274,690
W1YN	267,750
K7NN	258,100

28 MHz

WB6PXP	241,605
W4QQN	160,716
W4MWT	115,988
K5UR	111,936
WB4OXX	110,250
K6XM	92,874
WB5HIH	87,451
K5GL	75,144
K4UTE	74,163
K9HMB	71,148
K9EGA/2	63,063
WB9ZKK	58,696
W6CNA	56,019

Multi-Single

K5JA	2,666,294
W1ZA	2,010,768
W4DR	1,805,376
K1PR	1,626,920
WØFG	1,587,750
K2BU	1,573,352
N4PN	1,540,196
N3RD	1,413,404
K1RU	1,410,395
W4NL/3	1,359,322
K2BT	1,322,910
W8TA	1,295,969
K4VX	1,294,154
W6OKK	1,274,520
W4FDA	1,110,369
WA6IQM	1,104,104
N8RA	1,008,808

Multi-Multi

W2PV	7,302,350
K1OX	4,982,796
W3AU	4,897,200
W1ZM	4,433,618
K3WW	3,051,640
W5BJA	2,808,060
KØRF	2,603,520
W4WS	2,581,524
W3MM	2,239,693
W3FA	2,287,200

DX

Single Operator — All Band

HC1BU	3,167,712
9Z4NP	2,511,981
KH6NO	2,140,432
UB5WE	2,025,900
KH6IJ	2,007,135
I1NUC	1,803,624
CY7CC	1,654,792
KH6DL	1,572,616
ZL1BOK	1,426,793
ZF1SV	1,413,030
VE5DX	1,396,122
OH6JW	1,359,094
I1BAF	1,354,824
N4VV/CE3	1,320,516
DA1UM	1,307,446
F6DIM	1,300,070
EP2SV	1,291,677
KG4TS	1,201,060
ZL1BIL	1,168,700
EA1PT	1,166,766
VR4DX	1,041,300
PP1ZBM	961,306
CX3BH	952,496
VP1AJ	949,914
JA1BK	911,283
FP8DX	893,144
VE4RRC	869,945
VE7WJ	851,691
KL7RW	831,992
CY6WQ	824,901
XE1VV	802,400

Single Band — 1.8 MHz

KH6CHC	4,413
G3XWZ/A	3,394
DJ8WLA	3,128
DJ6TK	2,562
VE3BBN	1,903
OH2BO	1,520
G3YMC	1,260
DJ6RX	1,035

3.8 MHz

KP4RF	245,436
KH6XX	120,088
KG6JIH	108,186
I3MAU	69,200
DK5WL	58,539
VE3ECP	40,515
SP8YA/9	29,705
OK1AGN/P	29,484
CT4GO	28,101
G4BXT	28,073

7 MHz

KX6LA	405,678
VE2AQS/OA4	136,138
OH8SR	99,000
IK5FCK	82,600
IK6FLD	74,820
PY2ELZ	31,616
SMØAJU	30,033
HI8EPS	28,920
F6ARC	21,899

14 MHz

KV4FZ	1,190,080
8PØA	1,012,000
CX7BV	974,438
YV2AMM	966,328
ON4UN	891,780
YY4YC	743,552
FC9UC	689,128
YBØACT	626,357
CJ7BC	617,442
G3ZQW	535,432
PY4BW	526,120
CY3FFA	479,640
LU8FEU	467,901
VE3NCT	466,072
KH6DD	434,070

21 MHz

I4USC	875,905
YU2HS	867,192
EA8JJ	766,125
VE3BBH	583,737
OK1AVU/P	513,894
DKØZZ	457,800
KH6GMP	360,880
CY3HGN	344,646
LU9BAL	342,927
KH6BZF	312,246
YU2HDE	306,420
OE1ZGA	251,724
DK1QH	250,512

28 MHz

CE6EZ	858,492
PY1MAG	657,756
CX8AR	464,544
YV4BDB	422,400
FGØDWT/FS	415,954
CX2CL	343,077
KG6JIA	335,250
KP4DSD	334,121
WB2RLK/VE1	236,946
IT9KZW	220,700
CEØAE	203,889
KP4DKX	193,362
JA7YFB	182,004

Multi-Single

CWØA	7,747,980
FMØFC	6,466,332
5W1AZ	5,570,154
6W8MM	4,942,539
CY3KZ	3,444,441
VP2MSA	3,200,634
ZS6YS	3,152,097
SK2KW	2,654,428
HBØBHA	2,579,600
VE3AKG	2,575,722
KZØDX	2,490,030
I1GUB	2,287,025
I1KN	2,067,039
DJ2FR	2,014,800
G6UW	1,918,447
DKØTU	1,584,508
SM5AOE	1,222,680
G8JC	1,174,400
G3VPW	1,173,882
OHØAC	1,052,280
CY1NN	1,042,002
VC9UM	1,028,625
OH8OS	1,000,000

Multi-Multi

EA8CR	21,351,898
HH5HR	9,980,960
VP9DX	6,604,551
HI8RCD	6,043,100
OH1AA	4,628,727
HD1DX	4,043,325
OH2AW	3,719,940
HB9H	3,614,688
ZL1AA/K	3,192,150
JA3YKC	2,232,624

This 1978 replica of a 1938 DX transmitter really works! Using the 40 year old design, W6SAI has made WAC and is well on the way to DXCC. You, too, can build this dandy rig and have a lot of fun—provided you can find the components!

A "Hot" DX Transmitter—1938 Style

BY WILLIAM I. ORR*, W6SAI

1938! There's plenty of DX on the 10 and 20 meter bands! From all over the world signals pound in ... FI8AC in French Indo-China ... ZC6AQ in Palestine ... VU2AN in Baluchistan ... FR8VX on Reunion Island ... XU8RB in China ... XZ2EZ in Burma and the most famous DX station of all-time, AC4YN in Lhasa, Tibet. They were all on the air and DX operating was never better, except for the shadow of war on the horizon.

*Varian, EIMAC Division, 301 Industrial Way, San Carlos, CA 94070.

Most amateurs built their transmitting equipment in those days, although the manufactured receiver was an accepted item in the ham shack. Yes, for less than a hundred dollars you could build up a nifty 150 watt c.w. transmitter for 40 and 20 meters (fig. 1) and join the throng of DX hounds. And one of the most popular designs is discussed in this article.

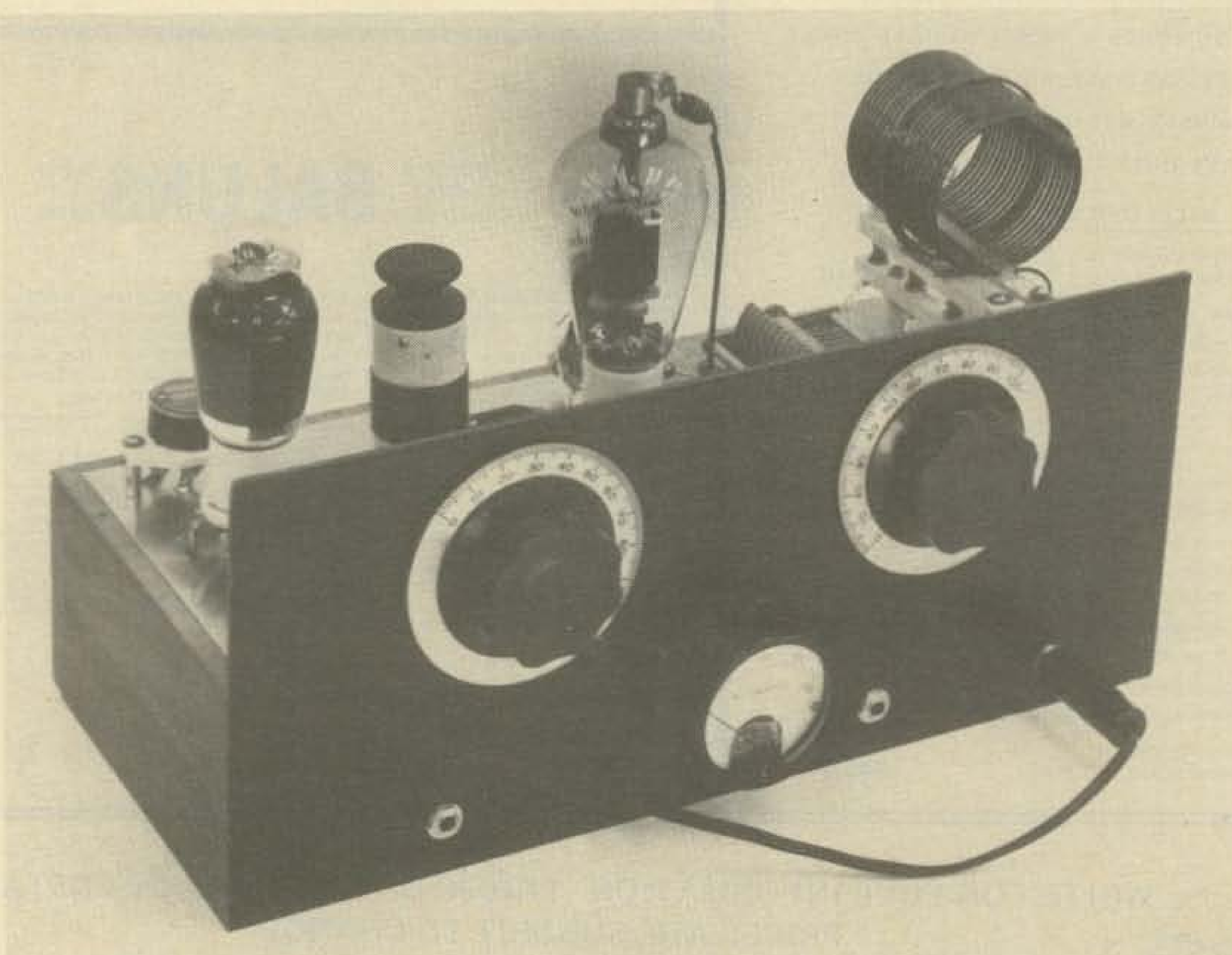


Fig. 1—A 1938-style DX transmitter. Using only two tubes, this compact breadboard transmitter runs 100 watts input on 20 meter c.w. At the left is the 40 meter crystal oscillator/doubler, using a T-21 in a tri-tet circuit. At the right is the T-55 amplifier stage. Oscillator and amplifier tuning controls are on the front panel, along with the multipurpose meter. Three jacks are provided to read oscillator plate current and amplifier plate and grid current. Note that the oscillator jack is in the B-plus line and is "hot" to ground.

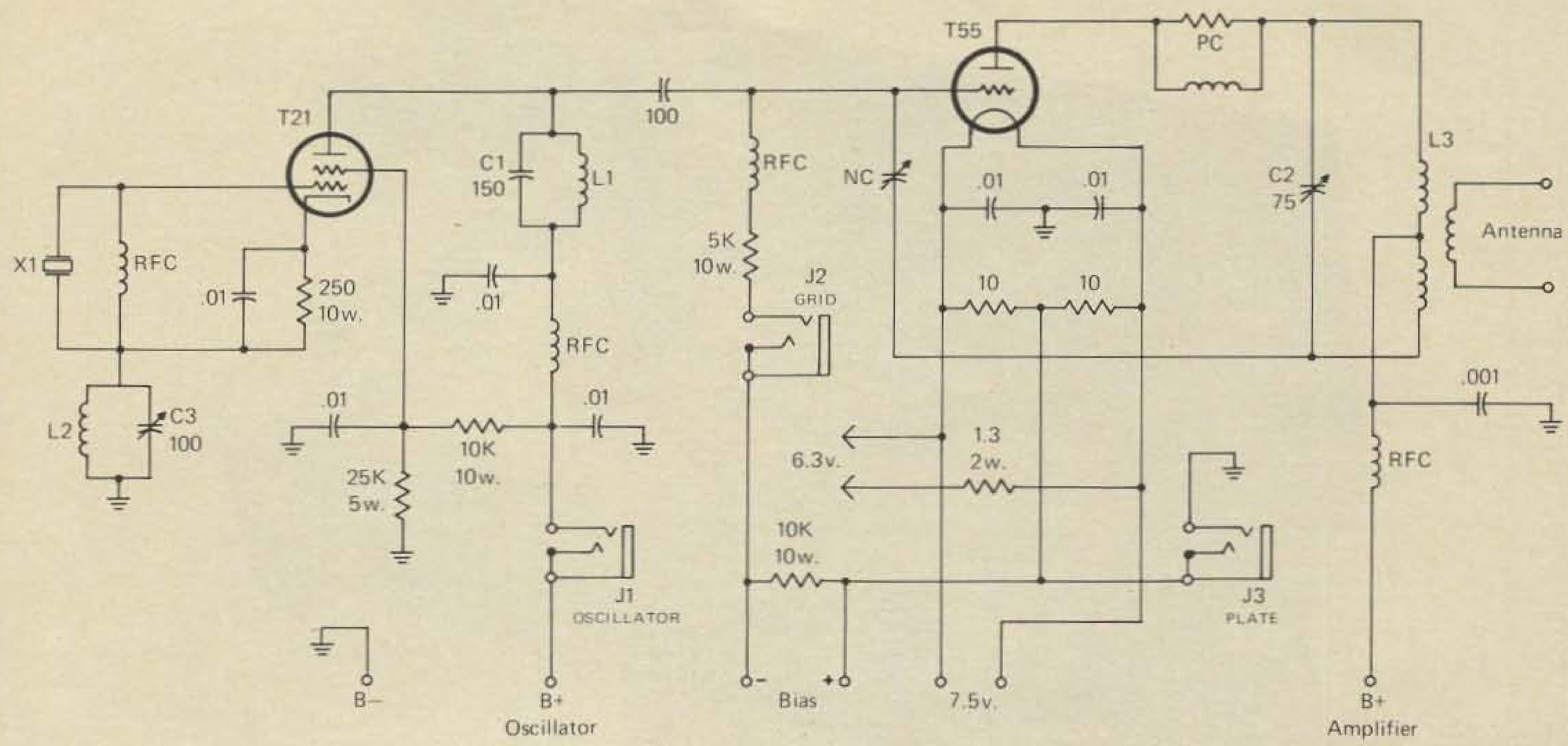


Fig. 2—Schematic of transmitter.

C1—150 pF receiving type variable capacitor.

C2—75 pF transmitting capacitor, double spaced, or better.

C3—Cathode tuning capacitance. 100 pF compression mica.

L1—10 turns no. 20 wire, 1½ inches diameter. Resonates at 14 MHz.

L2—6 turns no. 22 wire on tube base.

L3—8 turns no. 14, 2 inches diam., 2 inches long (B&W 20 BCL) for 14 MHz.

NC—Neutralizing capacitor. About 5 pF at 2 kV.

PC—50 ohm 2 watt resistor overwound with 5 turns #22 tinned wire.

RFC—National R-100, 2.5 millihenry.

Note: Transmitter may be operated on 7 MHz by shorting out C3-L2 and tuning oscillator and amplifier plate circuits to 7 MHz. In this case, L1 will have 14 turns and L3 will have 20 turns. Forty meter coils are shown in the photograph.

OPERATING PARAMETERS

Oscillator Plate	*350 volts*
Amplifier Bias	*—50 volts*
Amplifier Plate	*1000 volts*
Oscillator Current	*55 mA*
Amplifier Grid Current	*15 mA*
Amplifier Plate Current	*100 mA*

Two of the most widely advertised tubes of the late thirties period were the Taylor T-21 and T-55, types that are virtually unknown today except to old-timers. The T-21 was simply a 6L6-G beam power tetrode with a six pin ceramic base and published ratings for r.f. service. The T-55 was an overgrown 210-type triode with a carbon anode. Priced at seven dollars, the T-55 was widely advertised as the ideal tube for the home-brew transmitter. Today, the nearest equivalent to the T-55 is the popular 811A which, while on the pre-war market, never achieved the popularity of the T-55.

The Transmitter Circuit

If you have a good junk box, or know an old-timer who has a collection of pre-war components, you can build this little transmitter in a day. Flea markets are another good source of components. If the Taylor tubes are unobtainable, a 6L6-GC or 807 may be substituted for the T-21 and an 811A will substitute for the T-55.

The circuit of the DX transmitter is shown in fig. 2. The T-21 is used as a "tri-tet" oscillator, providing output on either 7 MHz or 14 MHz from a 7 MHz crystal. For 14 MHz operation, the plate circuit of the stage is tuned to 14 MHz and the fixed-tuned cathode circuit is tuned to about 10 MHz. For 7 MHz work, the cathode circuit is shorted out and the plate circuit is tuned to 7 MHz. The oscillator is capacitively coupled to the amplifier stage, which is grid-driven and plate neutralized.

The T-55 requires a 7.5 volt filament and the filament voltage for the T-21 is taken from the same supply through a dropping resistor. A bias supply is also required as well as low and high voltages for the oscillator and amplifier respectively.

Building the Transmitter

1938 was a year of change as circuit designers and builders struggled with the problem of getting a 10 meter transmitter that would *work*. The gap in circuit technique

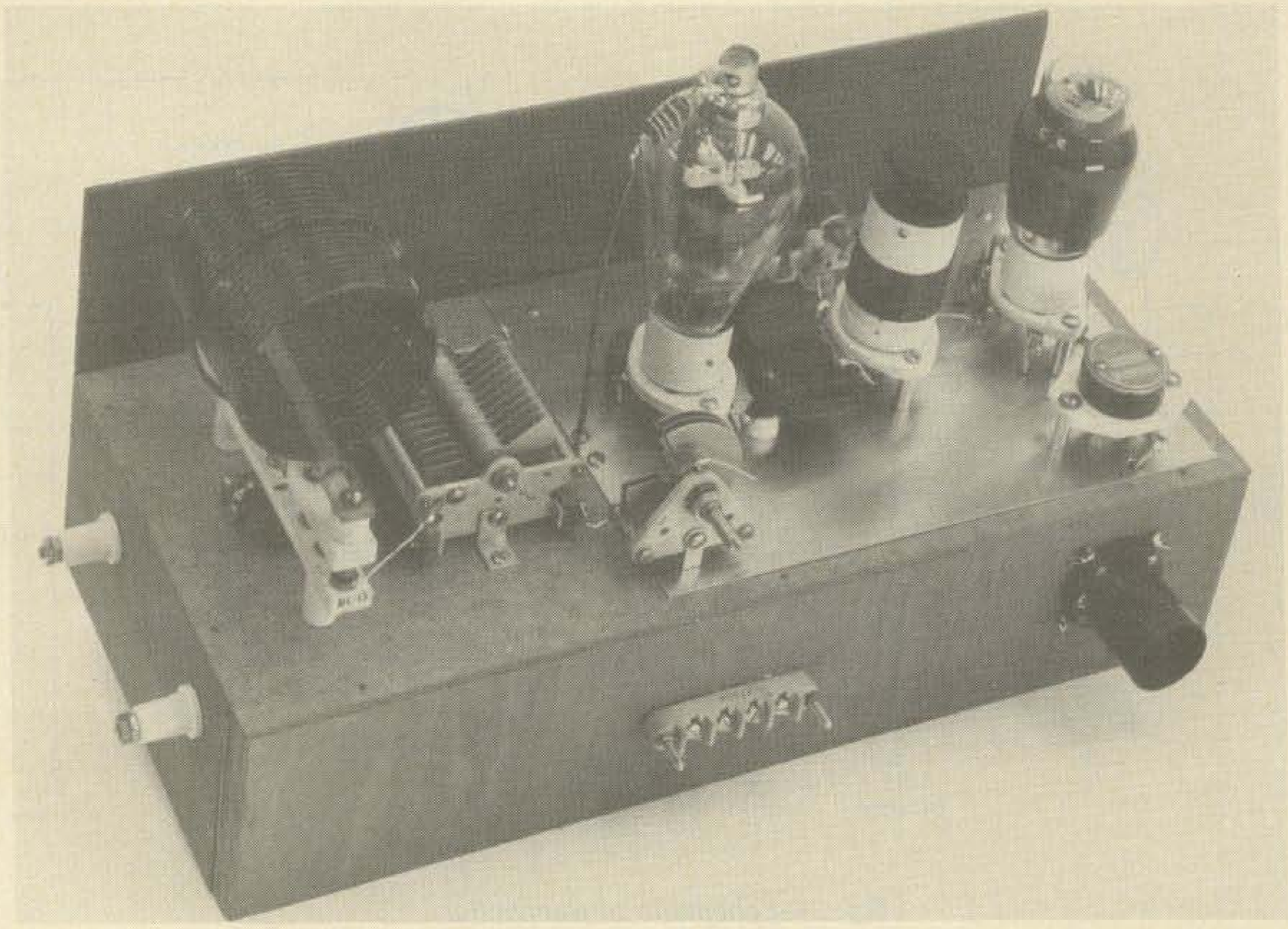


Fig. 3—Rear view of the 100 watt transmitter. All components except the amplifier plate circuit are mounted on an aluminum plate atop the masonite chassis. The tube sockets and crystal holder are spaced above the chassis on ½-inch metal pillars. A concession to 1978 standards is the inclusion of a parasitic choke in the plate lead of the T-55. Connections to the antenna link are made via the feedthru insulators at the end of the chassis. The cathode coil of the oscillator stage and power terminal strip are on the rear of the chassis.

was large between 40 and 20 meters and immense between 20 and 10 meters. Circuits that would work on 40 meters became critical of adjustment on 20 meters and often refused to work at all on 10 meters. The answer to the problem, in part, was the use of a metal chassis to reduce ground loops and highly inductive ground return circuits (fig. 3). This was well known in the industry but the 1938 amateur compromised in this regard: he often used the beloved breadboard construction with the addition of a metal ground plate. This seemed to solve the circuitry problems yet allowed easy home construction without the use of expensive metal-working tools.

This transmitter is built in that fashion. The "chassis" is a box 17" (43 cm) × 7" (18 cm) made of a masonite top and plywood sides. The front panel is a piece of masonite painted a glossy black. A sheet of thin aluminum is mounted atop the chassis and all components except the amplifier output circuit are mounted to this plate. The ceramic tube sockets are mounted above the plate on metal pillars. Most of the bypass capacitors, r.f. chokes and resistors are arranged tastefully under the chassis (fig. 4) and an impressive *Weston* "switchboard" type meter is placed in the lower center of the panel. The meter is inserted in the oscillator plate circuit and the amplifier plate return circuit by means of a plug and jacks.

The builder of this gem should take note that the oscillator meter jack is "hot" to ground and caution should be exercised in plugging the meter in this jack, or otherwise touching it when high voltage is on the transmitter. Most 1938 hams got "bit" sooner or later by a "hot" meter jack and it may be wise for the builder (if he plans to use the transmitter rather than to have it as a display unit) to place the oscillator jack in the negative return lead to the oscillator power supply.

The cathode circuit of the oscillator is built in a 4-prong tube base that mounts in a matching socket on the rear wall of the transmitter chassis. For 7 MHz work, a second tube base with a short between the connecting pins is substituted for the tuned circuit.

What can be said about construction? Keep the leads short. Use your head. Study the photographs. And good luck. Once you have found the parts, your troubles are almost over.

Tuning the Transmitter

Test the oscillator first. The circuit will work well with either a pre-war crystal or one of the post-war FT-243 types. The newer HC-6/U type is not recommended as the miniature crystal in this small holder may crack, whereas the older, larger types will stand the gaff. For 20 meter operation, the plate circuit of the oscillator is resonated to 14 MHz and resonance will be indicated by a drop in oscillator plate current. Run the oscillator at reduced voltage until you have the amplifier stage working as crystal strain is greatest when the oscillator is run unloaded.

Once the oscillator seems to be working, insert the amplifier tube. Don't apply amplifier plate voltage yet. You'll notice amplifier grid current at once. It can be peaked to a maximum value by retuning the oscillator output circuit.

With the plate coil in the amplifier, you are ready to neutralize. Most newly licensed amateurs don't know this process, as it is rarely required with today's grounded grid amplifier. However, it is a necessity with a grid-driven triode amplifier such as this one.

Watch the grid meter of the amplifier circuit. You'll note that when you tune the amplifier plate circuit through resonance, the grid meter will flicker. The trick is to increase the capacitance of the neutralizing capacitor from zero to some value that will stop the flicker. At the right

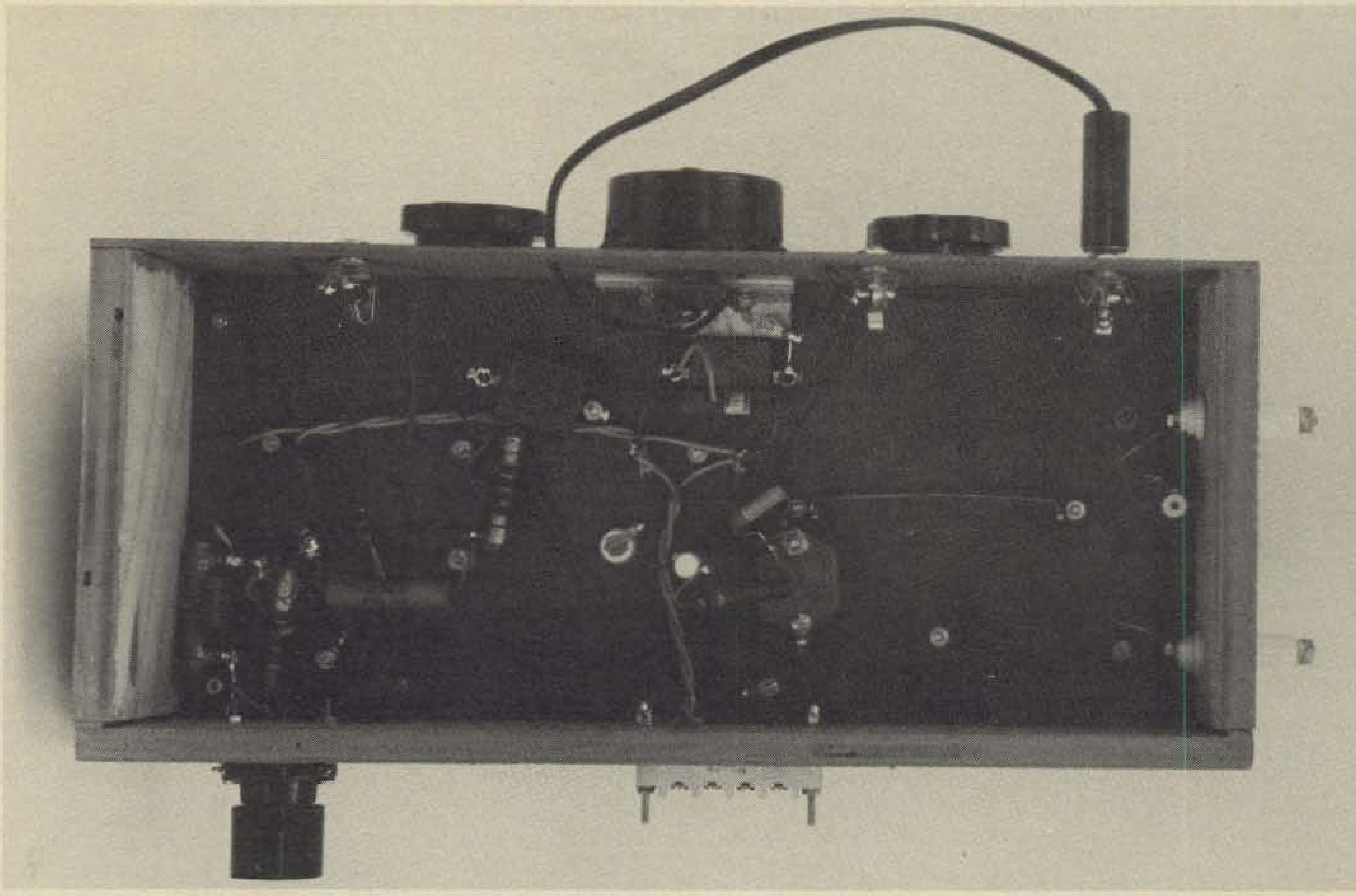


Fig. 4—Underchassis view of the transmitter. No frills here! Point-to-point wiring is used. Closed circuit meter jacks are mounted to the panel. Various bypass capacitors are grouped close to their circuits, using the aluminum plate above the chassis as a common ground return.

setting of the neutralizing capacitor grid current will not react as the plate circuit of the amplifier is tuned through resonance. The grid current may rise and fall a bit as the amplifier is tuned, but there will be no abrupt jump in it at any point on the amplifier dial.

Some old-timers neutralized the amplifier without the use of the grid meter. They merely coupled a flash lamp to the amplifier coil with a single turn loop and adjusted the neutralizing capacitor until the bulb went out while tuning the amplifier plate circuit through the range of resonance. Either method works. Take your choice.

On the Air!

Once the amplifier is neutralized, bias voltage is applied, the oscillator is fired up and an appropriate antenna is connected to the transmitter. Plate voltage is applied to the amplifier, the stage is tuned for resonance (minimum plate current) and amplifier coupling to the antenna is adjusted for the proper value of plate current. Suggested values of voltage and current are shown in fig. 2.

The transmitter may be keyed in the oscillator jack or in the amplifier cathode jack. Keying will be hard, as no key-click suppression circuit is included in this design. It is recommended that amateurs interested in putting this transmitter on the air refer to a pre-war handbook for information on key-click filters.

As far as TVI goes, as long as the amplifier stage is not driven heavily into the Class C region, the transmitter can be run through an antenna tuner and low pass filter with success. Too much grid drive to the amplifier, however, will bring up the harmonic content of the signal sharply and may provide problems, especially in an area of low TV signal level. TVI problems are less, of course, on 40 meters than on 20 meters. ■

Here's a receiver that may become extinct before it flourishes

The RSK-253 Receiver

BY CHRISTOPHER C. SMITH*, WBØDHU

As an item of surplus, the RSK-253 shortwave receiver is rather unusual. Very little is known of its history and it is not advertised in surplus catalogs. If many of these little rigs are around today, they don't seem to be on the market. Yet they could be popular with SWL's and, with some modifications, they could serve as communications receivers.

It is not known what company manufactured the RSK-253. Indeed, it is not even certain in what country they were made. An examination of the author's unit reveals several interesting facts. It is dated 1953 and is made from Japanese parts then commercially available. From the labeling of controls and the schematic diagram included with it, it can be concluded that it was intended for use by someone who read English. Yet nowhere on the receiver is there any marking indicating country or company of manufacture. The unit is built into a military ammunition box and weighs in at 6½ pounds. It would seem reasonable to conclude that it was intended for use as a specialized receiver, given the events of the time, and there was probably a companion transmitter though the author has never seen one. The serial number of his receiver suggests that over a thousand were built.

*9515 Bluegrass Pl., Colorado Springs, CO 80911

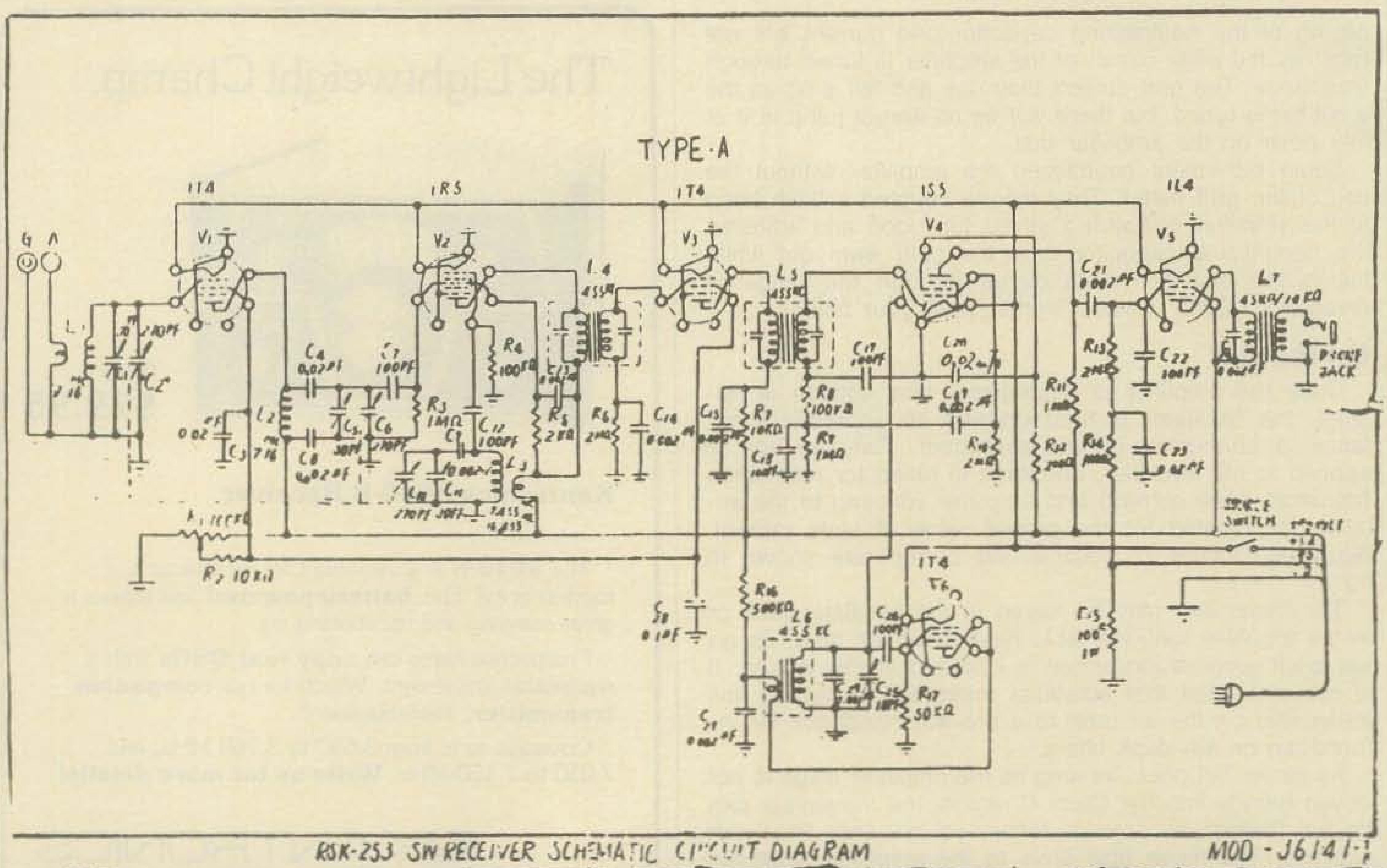


Fig. 1—Schematic diagram of the RSK-253 receiver.

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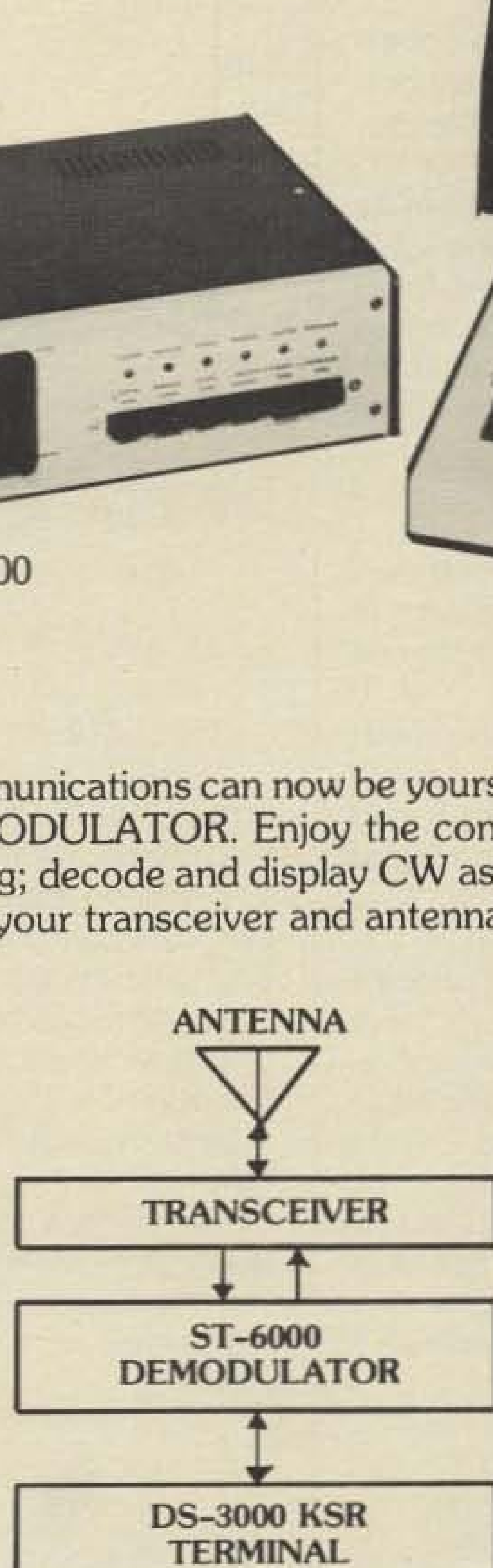

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The front panel of the RSK-253 receiver. Note that the frequency tuning dial is scaled from 1-100. See fig. 2 for dial indication to frequency conversion.

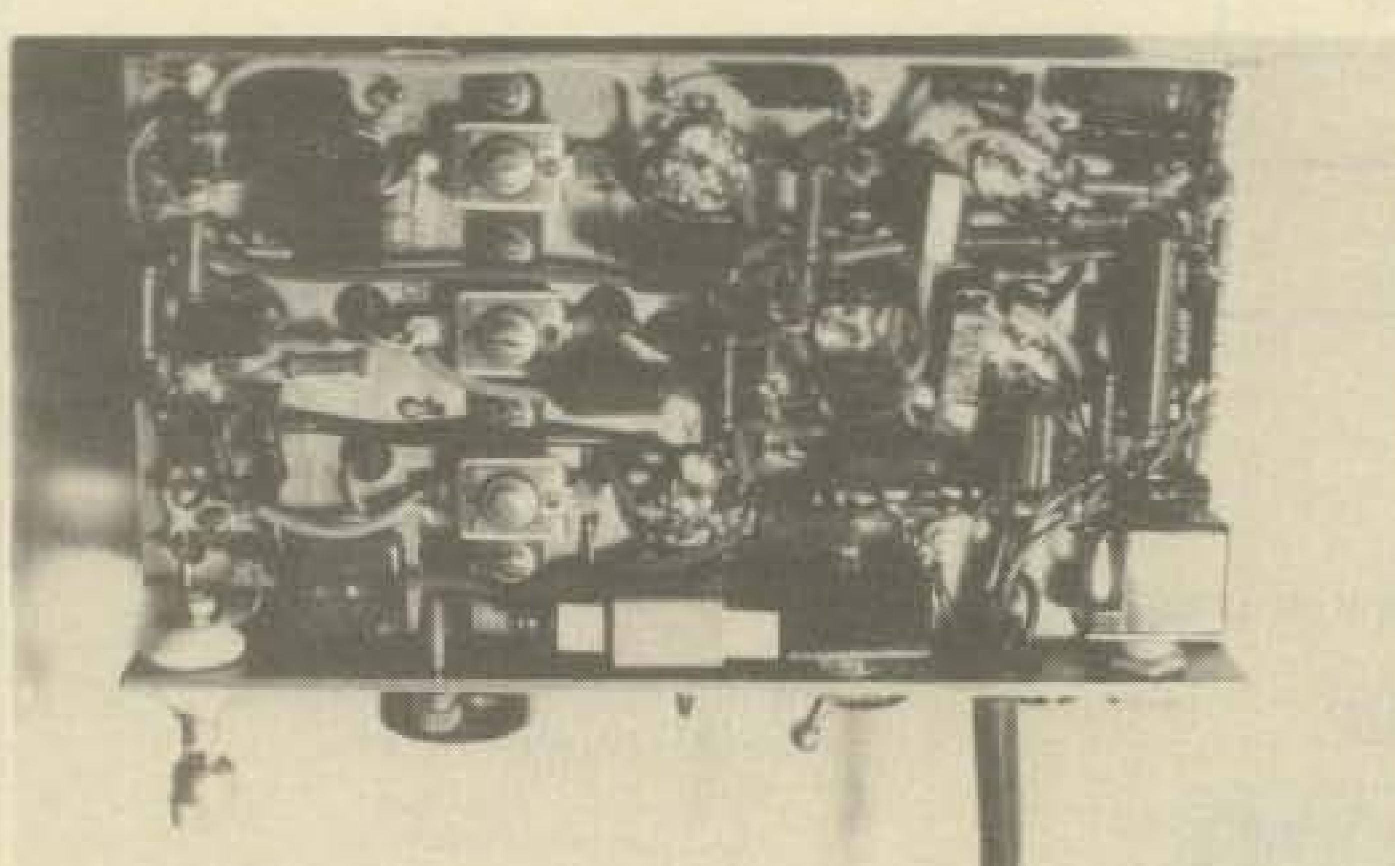
The RSK-253 is a battery powered, six-tube radio covering the 7-16 MHz range (or Mc/s as they were then called). It will receive a.m. or c.w. with the use of the variable frequency b.f.o. The schematic diagram is in fig. 1.

The circuit is straightforward. Tube V1, a 1T4, operates as an r.f. amplifier, with tuned input and output. Tube V2 is a converter, combining the local oscillator and mixer functions in a single 1R5. The i.f., at 455 kHz, is fed through a tuned transformer to V3 (also a 1T4) where it is amplified. The i.f. is then fed through another tuned transformer to V4 (a 1S5) where it is mixed with the b.f.o. signal from V6 (a 1T4). The resulting audio is amplified in V5, a 1L4, and fed through a transformer to a high impedance phone jack.

All the tubes have 1.4 volt filaments and draw a total current of 0.3A. A 90 volt B battery provides plate voltage at 20 mA. The necessary batteries and a set of headphones fit into a compartment at the top of the case.

Operation is simple. Frequency is determined by the reading of the vernier type control and a frequency versus reading chart. The volume control actually controls the r.f. and i.f. amplifier gains. There is neither an a.f. gain control nor an a.g.c. system. The b.f.o. may be adjusted for c.w. note pitch or zero beat with the carrier for a.m. reception.

The receiver's sensitivity is quite good. Foreign broadcast stations are easily received. Though no accurate tests have been made, by comparing the RSK-253 with a commercial ham transceiver it is estimated that c.w. signals 2 to 3 microvolts in strength can be copied on the 20 meter band. Selectivity seems to be limited mostly by the headphones—the bandwidth is about 8 kHz. Frequency stability is surprisingly good considering the frequency range covered by the local oscillator. C.w. signal pitch is easily set and copied for several minutes with no noticeable drift. Microphonics are a



Bottom view of the receiver.

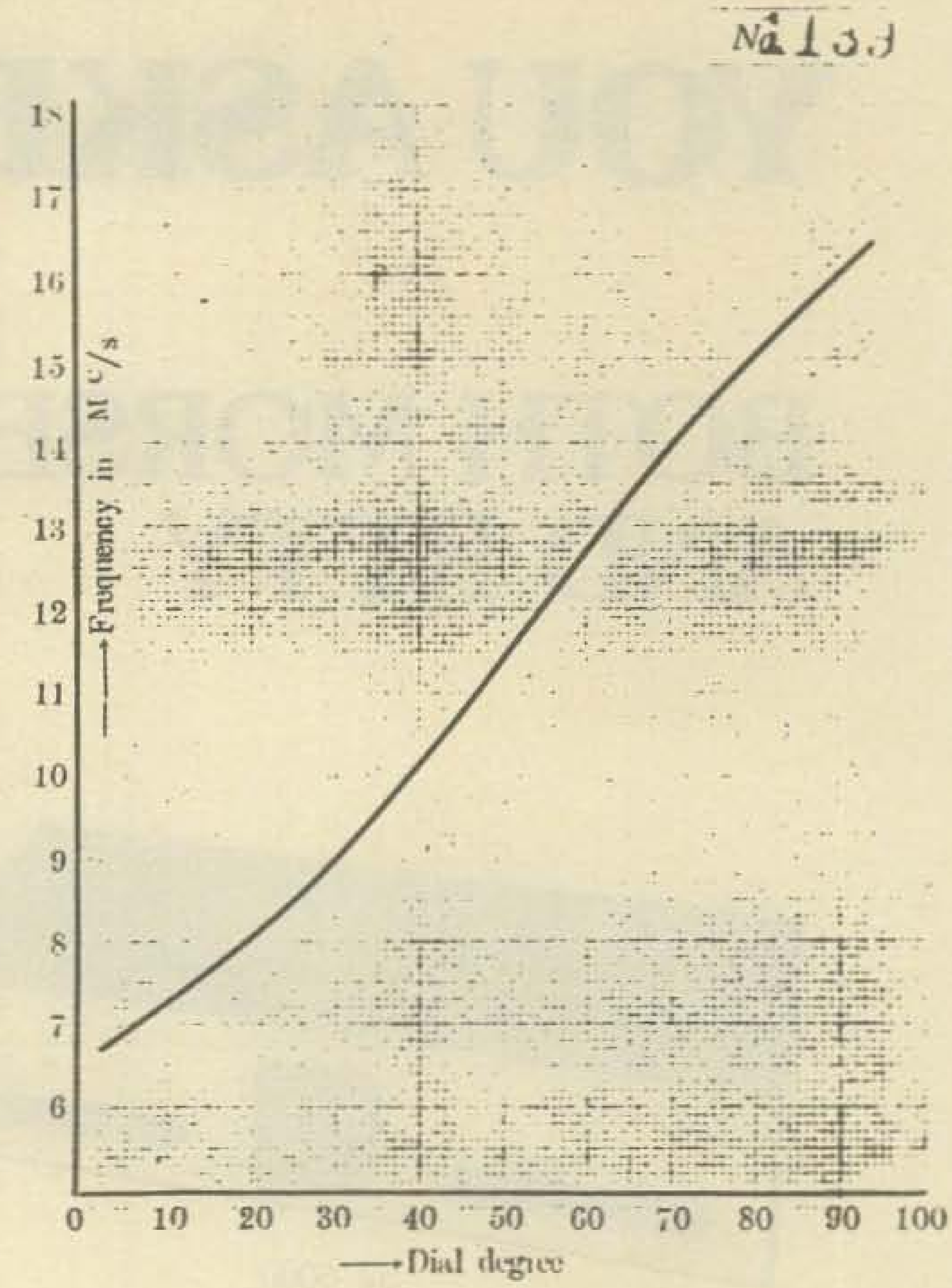
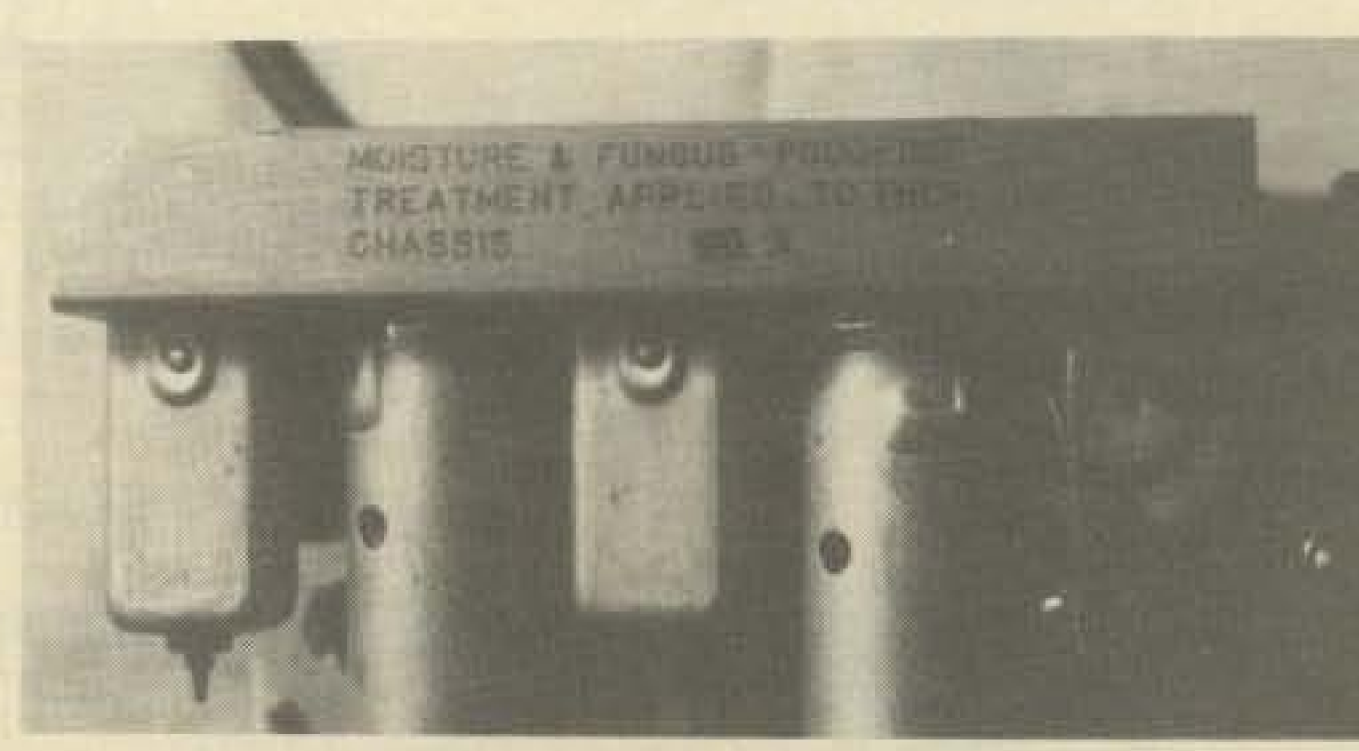


Fig. 2—Dial degree vs. frequency chart.

problem in the author's unit, but seem to come from two of the ancient (original equipment) tubes still in the rig.

While no modifications have been made to the author's unit, several seem possible. With the addition of a few capacitors in series—parallel with the tuning capacitor sections the receiver could be made to cover just one ham band giving slow enough tuning for communications work. With the addition of a ceramic 455 kHz filter or a Q-multiplier the selectivity could be increased to that suitable for c.w. reception in today's crowded bands. A really ambitious person could replace the tubes with FET's—and add a solid state transmitter for a self-contained QRP station.

The possibilities are there—it's just too bad more of these rigs aren't. ■



The chassis will last forever.

CQ Reviews:

The Yaesu FT-301D Transceiver

BY HUGH R. PAUL*, W6POK

The all solid state Yaesu FT-301D transceiver with digital readout is a more "state of the art" design than earlier Yaesu transceivers. Attractive styling with performance to match comes in a package measuring approximately 14½"x11½"x6" overall and weighs in at just under 22 pounds. The FT-301D operates from 13.8 v.d.c., which in fixed station use is supplied by the optional FP-301 or FP-301D power supply. The latter model includes not only a built in speaker, but a digital clock that will display the time in either the 12 hour or 24 hour system. Provision is also included for insertion of a programmable chip that will automatically identify your station by keying a built in oscillator. Keying speed is adjustable by means of a control on the front panel of the power supply. The unit tested did not have the chip installed so we were not able to evaluate this function.

The receiver section is a single conversion design with a 9 MHz i.f. The popular 3SK40 dual gate MOSFET is used in the r.f. amplifier and mixer stages. Following the mixer is a monolithic crystal filter functioning as a band pass filter. Selectivity is primarily determined by the crystal lattice filter following the second i.f. amplifier stage. The transceiver is supplied with only a s.s.b. filter which is 2.4 kHz at −6 dB and 4.0 kHz at −60 dB. Additional filters may be purchased for a.m. and c.w. The c.w. filter is 600 Hz at −6 dB and 1.2 kHz at −60 dB. Installation of the optional filters is easy, requiring only a few minutes to accomplish.

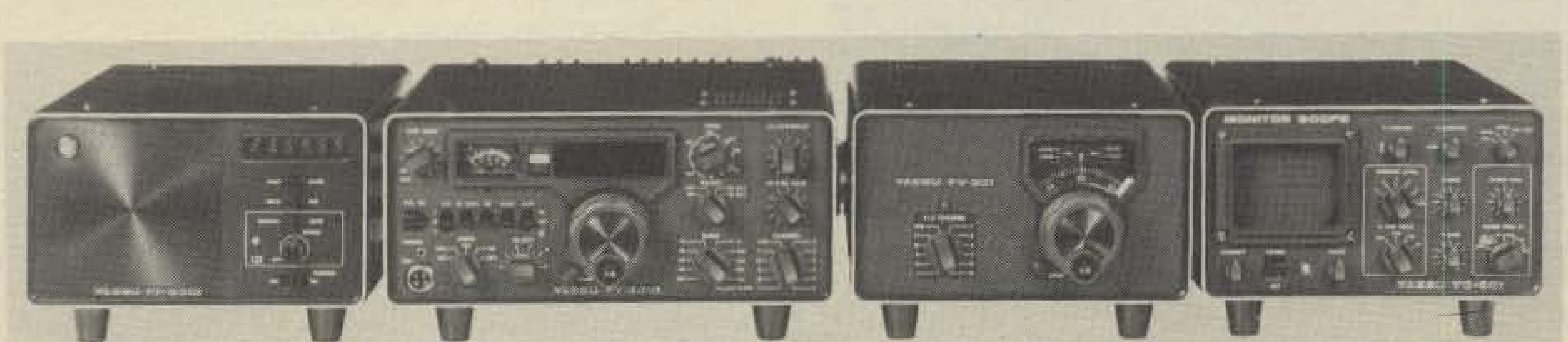
A crystal notch filter is employed to assist in rejecting unwanted adjacent frequency signals. A front panel "reject" control shifts the frequency of the crystal across the i.f. passband, thus reducing signals at the notch frequency by about 25 dB. There is no provision for adjusting the depth of the notch as was common when this type of filter was used with earlier tube type receivers. The filter is of value on c.w., but is not as effective as a circuit which actually shifts the i.f. passband.

Fast, medium or slow a.g.c. may be selected by a front panel switch and is very effective at strong signal levels. There is no provision for disabling the a.g.c. completely, a feature that would be desirable for weak signal c.w. reception. A "clarifier" control allows the operator to shift the receive frequency by plus or minus approximately 4 kHz. For some reason Yaesu has provided a third switch provision, which allows the operator to shift both the transmit and receive frequency with the clarifier control. The reasoning behind this eludes me.

A ring type diode detector also functions as a balanced modulator when transmitting. In the a.m. mode a standard diode detector is used. There is a good 3 watts of audio power available to drive the small 4 ohm speaker built into the lid of the transceiver or an external speaker. Audio quality with the external speaker in the FP-301D power supply cabinet is excellent in all modes. An 8 ohm headphone jack of the miniature type is located on the front panel. The internal speaker is muted when the headphone jack is in use. A 5 MHz WWV receive position is included for calibration of the internal 100 kHz oscillator. It is necessary to purchase an optional crystal before the WWV position is functional.

The v.f.o. tuning range is 500 kHz (5 to 5.5 MHz). Each dial rotation covers approximately 16 kHz. Cranking the dial clockwise lowers the frequency. This is opposite of most transceivers I have been using and takes a little getting used to. Frequency readout to the nearest 100 Hz is provided by a six digit LED display. Since the counter circuit is actually counting to 10 Hz the display of the last digit is very stable. Frequency stability was good, with drift averaging 250 Hz during the first half hour after turn on and less than 100 Hz per half hour after that. Stability was about the same when using the FV-301 remote v.f.o.

*291 Macalester Drive, Walnut, CA 91789

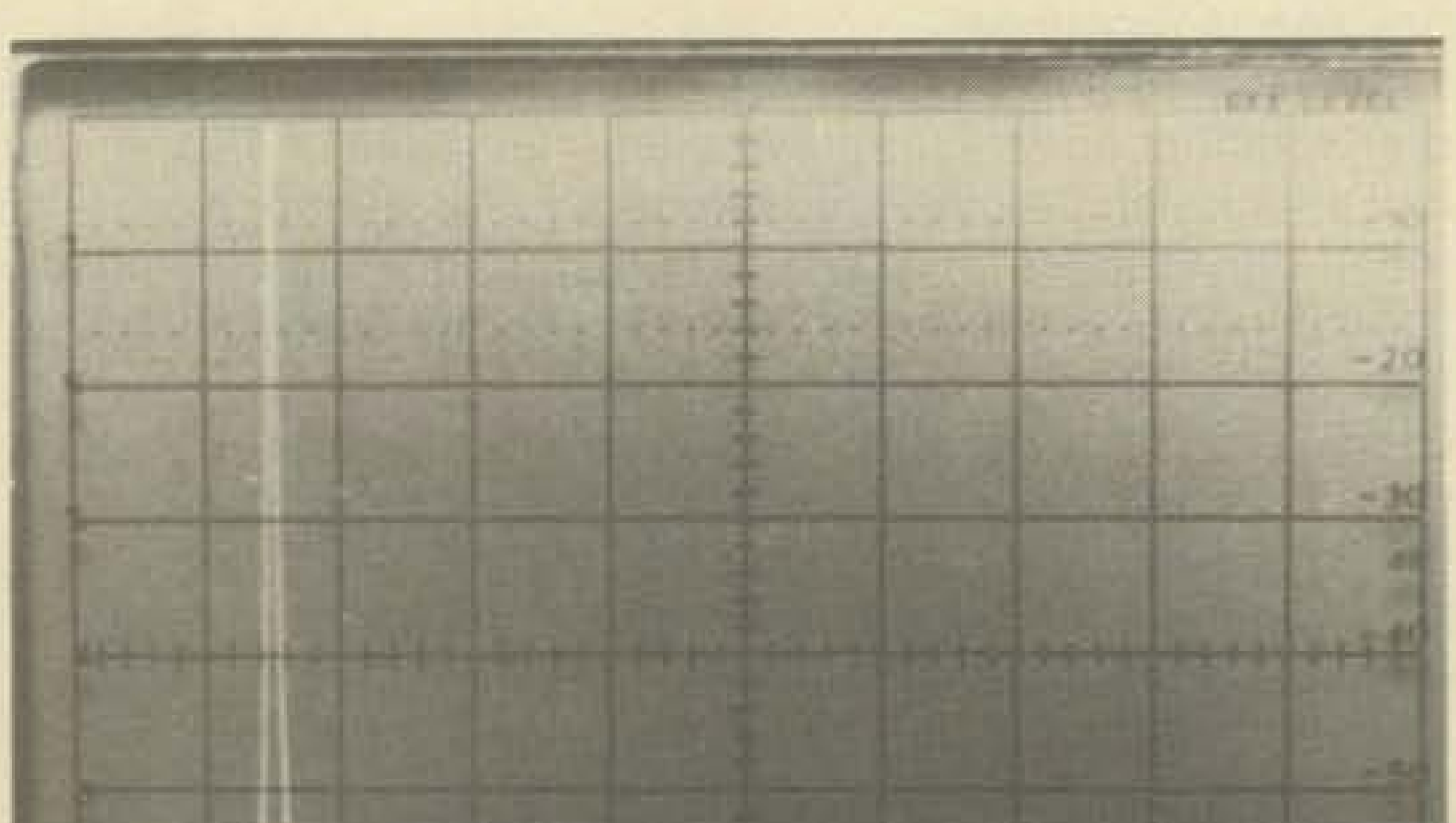


Left to right: FP-301D power supply, FT-301D transceiver, FV-301 v.f.o., YO-301 monitor scope.

In addition to v.f.o. control, there are eleven switch selected crystal oscillator positions available.

The FT-301D exhibits high immunity to cross-modulation. In fact, it is one of the very best of solid state amateur receivers in this respect. Sensitivity was better than the manufacurers specification of .25 microvolt for 10 dB signal to noise ratio.

Operation of the transmitter section is a breeze. The only tuning required is to peak the control that functions as a pre-selector on receive and adjust the drive control for the rated 200 watts input. Power out as measured with a Bird wattmeter was between 100 and 120 watts on all bands except 15 meters, which measured 85 watts out. A little internal tweaking of the driver stage circuits resulted in an increase of 15 meter output to over 100 watts.



Spectral readout on 21 MHz. The second harmonic indication lies to the right.

The transmitter exceeds manufacturers and FCC specifications by a wide margin. Third order products measured 34 dB down from a single tone of a two tone test (40 dB from full output). Carrier suppression was a −54 dB and unwanted sideband suppression was greater than −65 db down. There was no measurable in-band spuriae on any band. The worst spurious case was on 15 meters where the 2nd harmonic was −57 dB down.

The FT-301D is basically a 10 watt transceiver with a bolt on high power amplifier module. Connection into and out of the amplifier section is by means of BNC connectors. It is perfectly feasible to remove the power amplifier, jumper the two BNC connectors and operate with about 6.5 watts output. In some portable applications this capability would be very desirable.

Control of the transmit function is by either VOX, push to talk or front panel switch. Yaesu includes a p.t.t. hand type microphone with the transceiver. Audio reports when using this microphone were good.

An r.f. speech processor is included with the FT-301D, but it is necessary to purchase an optional crystal filter if the processor is to be made operational. The processor effectively increases the average modulation level and stations worked did not report any noticeable distortion as long as the Yaesu YO-301 monitor scope was used to adjust the audio level. A monitor scope is almost mandatory when using any type of audio or r.f. processing if distortion due to over driving is to be avoided.

(Continued on page 90)

John, W4FA, describes an interesting method designed to ease the problems of winding coils

Using Ribbon Cable To Make Your Own Coils

BY JOHN J. SCHULTZ*, W4FA

One of the things that turns many amateurs off when it comes to construction projects is the winding of coils. Somehow coil winding represents such a laborious task that many little projects are forgotten just because of that one factor. But there may be some practical reasons involved also. Coil forms are not so easy to come by as other common electronic components. The measurement of inductance also presents a problem. Few amateurs own bridges capable of measuring small inductances accurately and make-do measuring techniques such as using a grid-dip meter and forming a parallel resonant circuit with a known C are tedious in execution.

It was with great interest, therefore, that we read about two years ago of a very simple method of making small inductance value coils accurately with practically zero fuss. The method has proved itself many times over so it was considered worth presenting in some detail. The method to be described is applicable when inductances in the 0.5 to 5 microhenry range are needed. This range of inductances represents values that are commonly found in a host of circuits—preamplifiers, filters, low-level power r.f. stages, etc.—ranging from the mid-r.f. frequencies through v.h.f. frequencies. So the information should be of value to almost any amateur who dabbles in a bit of radio frequency construction projects from time to time.

The inductors to be described are simply formed of ribbon cable mounted on any p.c. board. As many amateurs might have noted from the parts ads, flat ribbon cable containing from six to fifty conductors is rapidly becoming available at reasonable prices. A foot of 20-conductor cable will cost around fifty cents. The number of conductors per inch width of cable will typically vary from ten to twenty conductors to the inch.

Fig. 1 shows how an inductor is formed using this cable. It is simply bent into a semicircle and the ends are soldered into a p.c. board which has the cross-connecting links made on it. Drilling the holes is a relatively simple matter by using a "mask." The mask can be a piece of perforated board stock which has holes spaced at about the same interval as the conductor spacing in the ribbon cable. Or one can fabricate an original mask by drilling properly spaced holes in any small piece of p.c. board stock. The mask is then clamped against the p.c. board to be drilled and small holes are drilled out with a #1 drill.

Those who prefer to build small circuits on plain non-foil perforated board stock can also use the method. Simply strip sufficient insulation off the ends of the ribbon conductor cable so the turns, cross-connecting links can be formed from the ribbon cable conductors themselves and then soldered together.

There are several dimensions that one can vary in

*Box L, FPO New York 09544

[1]*Electronics*, March 1976

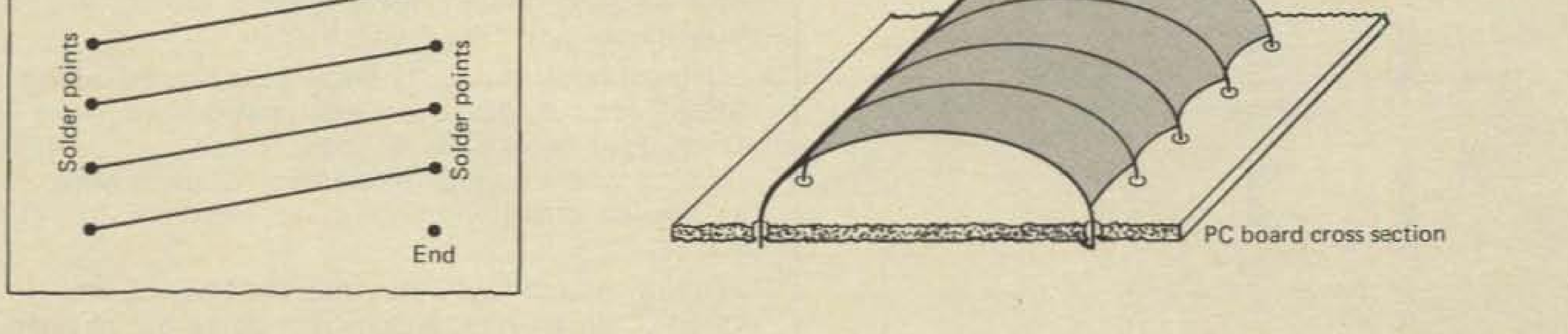


Fig. 1—The inductor is formed by folding a piece of ribbon cable. The turns are interconnected on the underside of the board. Plain perforated board stock can be used also.

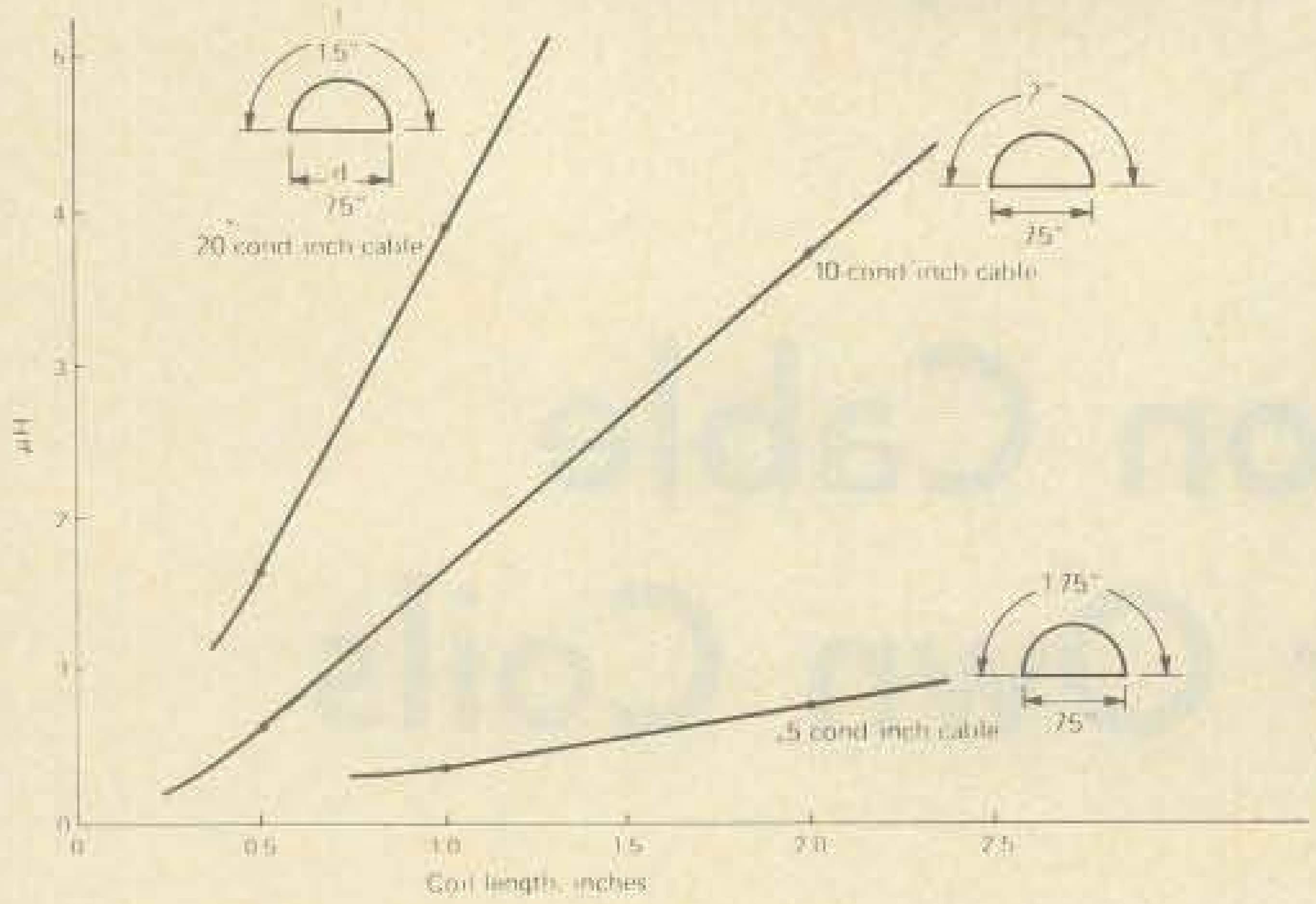


Fig. 2—An inductance graph for various types of cable. Mounting dimensions are based on the formulas in the text.

forming an inductance by this method—the length of the semicircle used which affects the height of the coil, the spacing between the ends of the semicircle, the number of conductors per inch depending on the type of ribbon cable used, etc. So one must have a way to bring all these factors together to produce an inductance of the desired value.

The inductance is treated as a single layer solenoid coil and the usual inductance formula applies:

$$L\ (\mu H) = N^2 \times \frac{R^2}{9R + 10l}$$

where N is the number of turns, R is the half-diameter of the coil. In the case of the coil being described, the circumference is taken as the length of the semicircle formed by the ribbon cable plus the distance between the conductors at the bottom of the semicircle. In other words, looking at the end of the cable shown in fig. 1, its cross-section is treated as a circle, although it is a D-shaped cross-section. If the cross-sectional length of the cable is

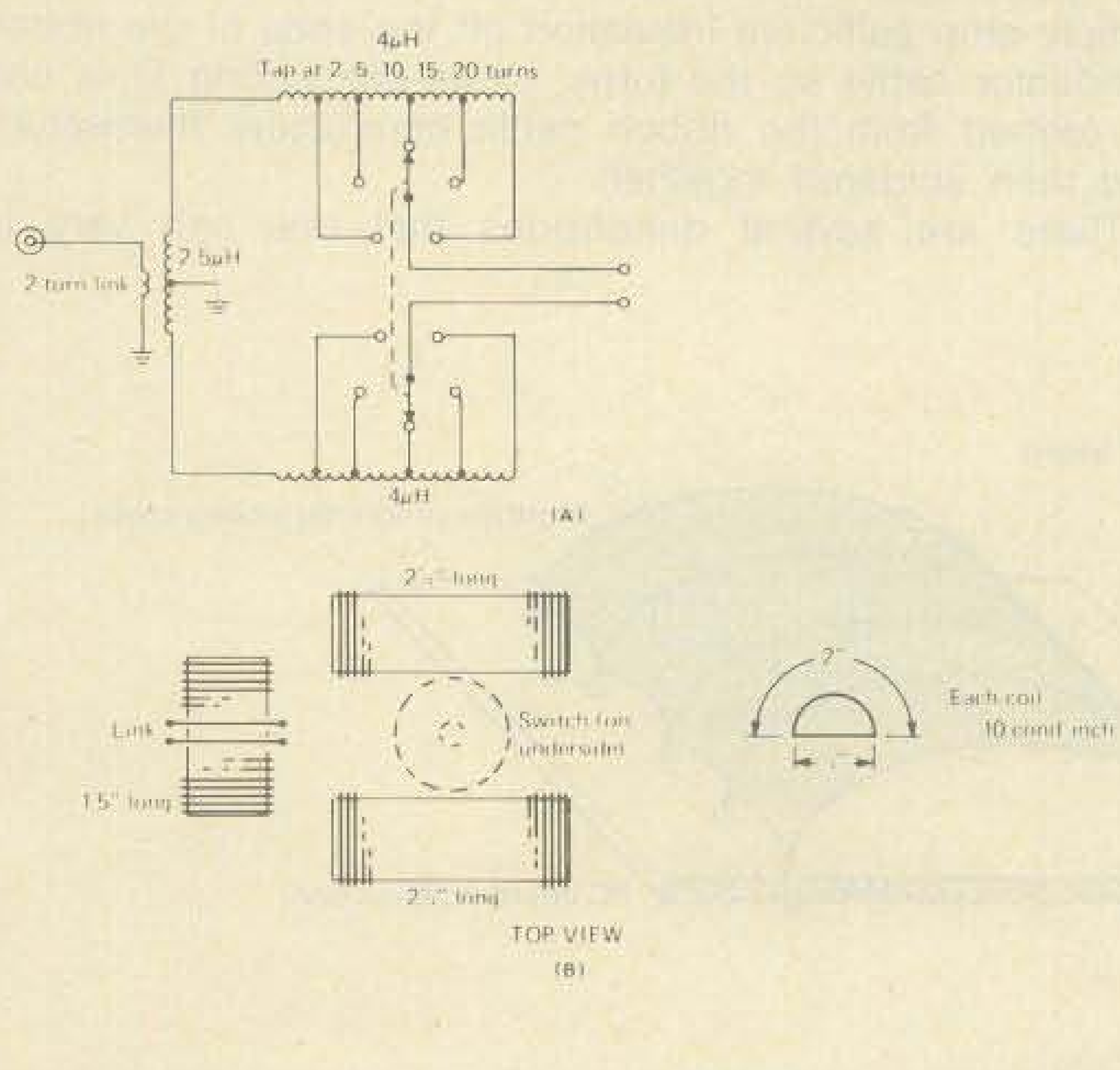


Fig. 3—Simple and practical realization (b) of the circuit shown at (a).

l and the cross-sectional distance on the p.c. board is d, the above formula can be rewritten as:

$$L\ (\mu H) = N^2 \times \frac{\left(\frac{l + d}{2}\right)^2}{9\left(\frac{l + d}{2}\right) + 10l}$$

An example and a graph based on the above equation will clarify the use of the formula. The above formula is an approximate one since it is based on an approximation itself (the original equation) but in practice the coils produced have come so close to the calculated values that they have sufficed for all practical applications.

Fig. 2 is a graph of the inductances produced by three possible cross-sections and three different cables having different numbers of conductors per inch of cable width. The 5-conductor/inch cable may not exist in reality. It was only illustrated to emphasize the idea that the method presented can also be used for creating small value inductances using plain hook-up wire to simulate a cable.

As an applications example, consider the circuit of fig. 3(a). Normally, for someone who does not like to work with coils, this sort of matching circuit would not be very appealing to construct. How simple it can be to construct in reality is illustrated in fig. 3(b). Since this type of matching circuit might be used with a QRP transmitter, a ribbon cable would not be used which had as dense a packing as twenty conductors per inch. The most suitable cable, although this is a matter of judgment and of the insulating qualities of specific cables, would appear to be one with ten conductors per inch. So the entry for the ten conductor per inch cable on the graph of fig. 2 was used to dimension the coils.

The two turn link over the 2.5 μH coil is simply formed by hookup wire (or a piece of ribbon cable straddled over the center of the coils). The two tapped coils are placed at right angles to the 2.5 μH coil. Alhough the diagram of fig. 3(a) calls for taps at certain turns, taps are available at every turn on the coil by the very nature of its construction. A great deal of fuss can be taken out of the construction of low-power antenna matching devices by the method presented and the unit will be as compact as is possible by any other method of construction—including the use of ferrite cores.

One can also construct inductors for applications other than those mentioned and have them come out looking far neater than by conventional winding methods; for instance, a.c. line filters. Several pieces of ribbon cable might be required in this case. The inductance cross-sectional dimensions can be controlled so that a ferrite rod can be placed in the coil. In fact, for some r.f. applications one can easily produce permability tuned circuits by this method although mechanical stability has to be tightly controlled if an oscillator circuit is involved. In power applications one must, of course, take into consideration the gauge of wire used in the ribbon cable (typically as small as #26 gauge) since it limits the current handling capability of any circuit constructed.

Using ribbon cable to form inductances, along with a "mask" for p.c. board drilling, provides excellent repeatability. That is, dozens of inductances can be produced, all being within a small percentage of each other in value. So the construction method is excellent for club-type projects,

Finally, you say you like the idea but do not have any ribbon cable on hand? Construct some out of plain hook-up wire pieces laid side by side and taped or glued together. It has been done in a pinch and provides the same excellent results as using ribbon cable. ■

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75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
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The TS-820S puts out probably the cleanest signal on the bands. The third order products are at least −35 dB due to Kenwood's unique RF Negative Feedback (RFNFB) circuit. State-of-the-Art PLL and single conversion design are combined for superb spurious characteristics far exceeding today's FCC requirements . . . the non-harmonic spurious emissions are better than −60 dB and the harmonic spurious are better than −40 dB.

The receiver boasts outstanding sensitivity . . . better than .25 uV for 10 dB S/N. And when it comes to dynamic range, it's tough to beat the TS-820S. These are impressive numbers. That's why so many prominent DXers are using the Kenwood Pacesetter . . . the TS-820S.

The man to see . . . your local Authorized Kenwood Dealer. He can give you all the information you need and the best deal.

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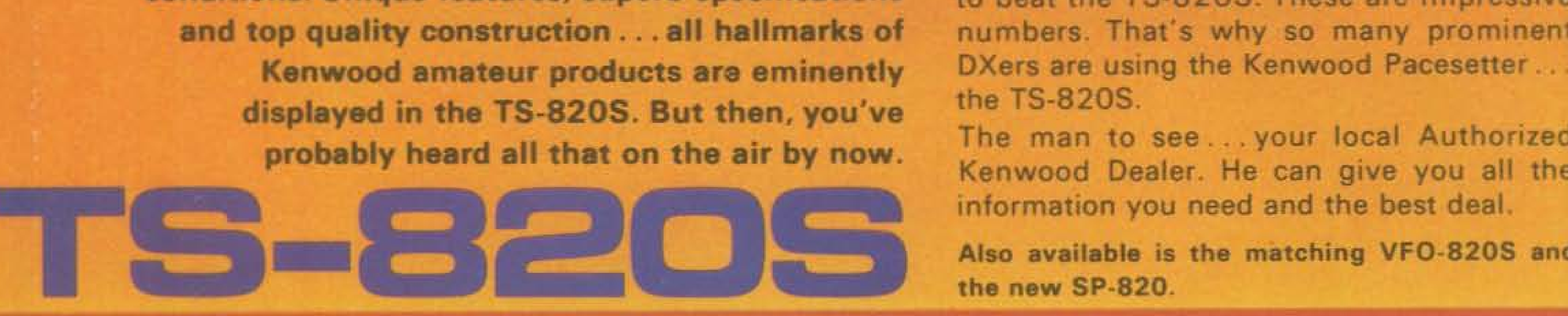

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Give yourself the "big signal" that commands attention on today's crowded bands. The TL-922 runs the full legal limit on the ham bands from 160-10 meters and is compatible with most amateur exciters. The TL-922 is a must in any Kenwood station.

Make yourself heard like you've never been heard before, with the Kenwood TL-922 linear amplifier.

Uncompromising performance.
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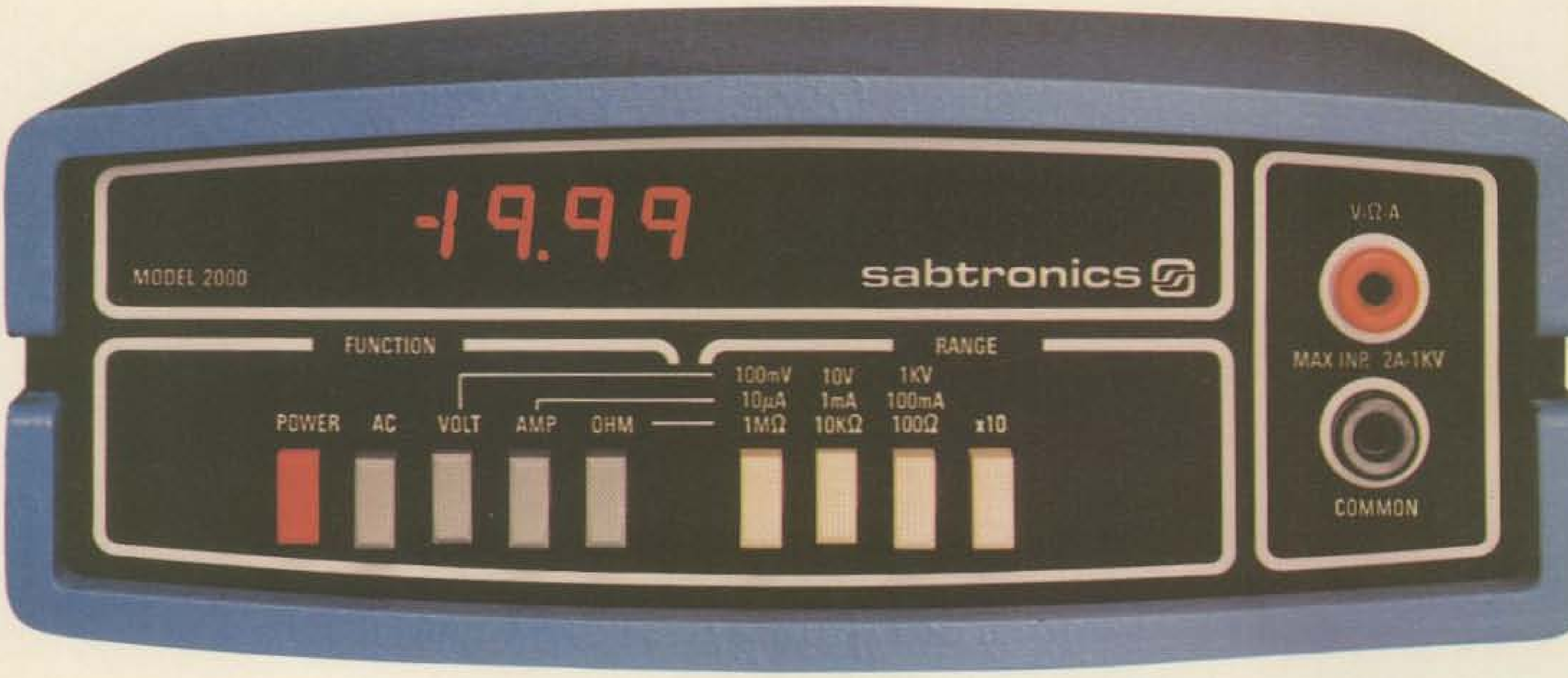
A professional 3½ digit DMM Kit for less than $70.



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a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

The Ultimate Achievement: DXCC Milliwatt #1—W8ILC

When the DXCC QRPp (5 watts) and DXCC MILLIWATT (1 watt) awards were established back in 1971, I had no doubt that eventually someone would qualify for the first DXCC QRPp. I never expected to ever award the 1 watt DXCC MILLIWATT Trophy though. As the years have rolled on, seven individuals have qualified for and received the handsome DXCC QRPp Trophy, a really notable achievement. In announcing the awarding of trophies #3 and #4, I wrote: "I am anxiously awaiting the first packet of 100 QSL's for DXCC MILLIWATT—that seems to be the real achievement at present!" About that time, I got a phone call from W8ILC indicating that he was shooting for DXCC MILLIWATT #1 and was fast closing in. By the time the Dayton Hamfest rolled around, W8ILC had his 100 bonafide QSL's in hand, and on June 5, 1977, I inspected and certified the 100 QSL's submitted by W8ILC in applying for DXCC MILLIWATT #1. A phenomenal achievement on his part, to say the least! Using a factory modified Argonaut 509 with less than 1 watt output, W8ILC had done the impossible—he had worked over 100 DX countries, and all on SSB! He began the effort with the purchase of the Argonaut 509 on August 1, 1976, and required slightly more than nine months to work the 100 and collect all the cards. In looking over the QSL's and log list, I became even more astounded—of the 100 countries worked, 32 were worked on 75 meter SSB! The 75 meter SSB list included such items as CN8, CT4, EA8, DJ8, EI8, GW3, HK4, I3, KH6, KJ6, YU2, ZL2, 6W8, and a batch of VP2's and other Western Hemisphere locations. I still shake my head in wonder when I think about someone working all this on 75 meters, with 1 watt of SSB at that! Ron provides the following information on himself and his QRPp DX efforts:

W8ILC's 4 el. yagi at 75 ft., with inverted Vee's for 75 + 40 meters tied to the tower apex.

W8ILC, Ron Moorefield, proudly holding the first-ever DXCC MILLIWATT *#1 to be awarded. This unprecedented achievement is truly a good cause for W8ILC's obvious sense of accomplishment.*

"I was first licensed in 1950 with the present call of W8ILC. I've been employed by AT & T Co. for the past 22 years, am married, and have three lovely daughters. Needless to say, the XYL is very patient with me! I've been active in the ARRL and have served as the E.C. in the Dayton area, as well as Public Relations Assistant. I've qualified for many awards, such as DXCC—315 countries, WAZ/SSB, WAZ/CW, WAS QRPp (on each—75, 40, and 20 meters), CQ DX Award/SSB and CW, have worked over 1,200 countries on the CHC Nets. I sold my KW rig in 1975 and purchased the Argonaut 509 and had it modified to run one watt input. This is the only rig that I have, so I'm not tempted to work DX first with QRO and then switch to QRPp. To me, that is cheating. The first DX worked with 1 watt SSB was KS6CC, and my 100th country to be confirmed was 9HIFF. Our local 2 meter DX alert net has helped in locating much of the DX that I've worked. Credit goes to WD8BJK, W8FYP, WB8KBL, W8DEZ, K8MRB, W8OK, and others on the net. I've had some very interesting contacts. Lately, I have been working VK on the long path. I've had many two-way, one watt QSO's when DX'ers hear how good my signal is, and then go QRPp also. Among these are CT2AK, KC4AAA, G3ZYY, EA2TZ, KL7GKY, SM2DLZ and others. One very interesting QSO was with JY3ZH, Hussein's son. I hooked up with him, and when he found that my power was just one watt, he fired up an Argonaut 509 for the first time, and we had a ten minute QSO on 20m SSB."

In closing his letter of June, 1977, Ron wrote: "I am not about to stop now, but will strive for 200 countries before the end of 1977 and will do it if I can break through the west coast gang for Pacific and Asian contacts."

W8ILC at the operating position. The Argo 509, factory-converted for 1 watt input, is topped by a digital readout, and power supply and audio filter. DXCC MILLIWATT *#1 stands to the left of the Argo, and some of Ron's exotic cards are spread on the table—such things as VK4, TF5, FO8, CEØ, 7KI, VS7, TU2, HV3, and FOO are visible.*

*83 Suburban Estates, Vermillion, SD 57069

OA8V at the operating desk which was familiarized the world over by his story in April, 1977 CQ. A prominent addition is DXCC QRPp #6.

In a phone conversation in December, 1977, Ron reports that he has worked 194 countries with 1 watt SSB, and should go over the top by 1978! He intends to show up at the Dayton Hamvention with 200 cards in '78! Incredible. To top that off, he has completed a 1 watt SSB WAZ and lacks but three QSL's in that effort! No one ever even thought of offering a QRPp award for WAZ!

DXCC QRPp Trophies #5, #6, #7

Three more individuals have qualified for and received QRPp DXCC Trophies: K2KUR/N2AA, OA8V, and WA6SOV. Let's devote the remainder of this column to their accomplishments, starting with Eugene Walsh, K2KUR/N2AA, DXCC QRPp #5. I first became acquainted with Gene and his enthusiasm back in the fall of 1975. Late one night, I received a phone call from this guy in New Jersey who was ecstatic over the results he had been getting with an old HW-7 that he'd purchased used a couple weeks before. He'd been flabbergasted at the fact that he was managing to actually work DX with the little rig, and just had to talk to somebody about it who understood — so I was the logical choice. Gene's sense of amazement came through quite clearly, and we chewed the rag for about an hour! He was very interested in giving the QRPp DX thing a real try in order to find out just what one could do with flea power in the way of working DX. K2KUR became acquainted with QRPp in rather extraordinary circumstances, and we'll let him tell the story:

K2KUR/N2AA, at the operating position in an old photo of the station prior to switching to the Argo and HW-7. Gene is an inveterate DX Contester, but does have other interests, such as Irish Traditional Music and the Villean Bagpipes. He hopes to be the first amateur to QSL 200 countries.

"After many years of primarily DX and contest operating, the QRPp disease has hit me, for which, I fear, there is no cure! In the spring of 1975, EI7CP showed up for our regular schedule with a new toy called the "HW-7," something I had never heard of before. My doubts about his sanity were slowly put aside by several months of solid QSO's, three times per week. A visit to EI3CP, and some operating with the little green monster was all that I needed to be completely hooked.

"Home from Ireland on 29 September, I was the owner of a second-hand HW-7 on October 4, 1975. Since then, it has paid its dues with 1,200 QSO's in all 50 states and 137 countries (as of 11/30/76). With a 204B at 50 ft., most operating has been on 20 meters, but Europe, Africa, and South America have been worked on both 40 and 15 meters using a 40 meter dipole at about 20 ft. above ground.

"Armed with the HW-7, the search for DX contacts began with some apprehensions about just how it would go. Honestly, I was not prepared for the extraordinary results which could be obtained with this simple equipment. A few days after the HW-7 was purchased, a large pileup appeared on 40 meters, beneath which was EA8BF. Listening to the clamor for a while, I could not bring myself to climb aboard since my antenna was at 20 ft. and my chances next to nil. All of a sudden, there was a QRZ? and not a soul around! My adrenalin began to flow and I quickly tuned into his zerobeat, signing my call letters twice.. Back came a 569 report and a discussion of the QRP rig, and then I was convinced! A few days later, there was a solid long-path QSO with VK2QL, and from that time on there was no fooling around. My beam had been stuck on 60 degrees for six months, and lack of interest prevailed. With the QRPp fever raging, I climbed two trees, removed the offending branches, and that evening worked 10 JA's, UAØ, KL7, and OX. I really dug in. The 100th country was worked with the HW-7 on 15 February, 1976, with operation restricted to weekends, and at least six of those missed, due to business trips and contest activity with a multi-operator group at another QTH. Considering that contests played no important part in those first 100 countries, and that the operation took part for the most part during eleven weekends, the results exceeded all expectations. This provides quite an argument against the need for high power in DX'ing. I know several gentlemen (?) who use illegal power levels to chase DX, and from this vantage point, they look a bit foolish!

"The thrill of leaving a big pileup with a rare one in the log, knowing that most of those still calling are using kilowatts, cannot be equalled by any experience using high power. Any fly fisherman who uses very light tackle can testify to that feeling. It took me a while to decide to get into a big pileup, as I was not convinced that it would be worth the effort. One afternoon 5Z4PP was so loud, and his operating technique so good, that I figured there was a chance to sneak in. Ten minutes later, there was a 569 report, a new country added to my list, and no more fear of pileups! Since then, there have been many pileups, the most memorable being KC4AAC on the first calls, and 9X5PT with the shack full of amazed visitors. My self-imposed calling limit is 30-40 minutes, for sanity's sake, and the bag ratio has been about 75 percent. Not bad when you figure that the whole radio costs less than one final tube of most of the rigs left behind in a pileup! The single most important factor is deciding who to spend the time on, judging your own probable signal strength, and the other guy's operating ability. So you don't get every one called . . . every one you do get is a real prize!

"During the late spring, 20 meters was open to Asia nearly every night. Persistent searching, and patient waiting for a break, resulted in QSO's with UL7, UH8, UI8, UJ8, 9N1, UD6, and VU2. None of these are casual DX, but the greatest thrill of all was stalking one particular station every night, same time and frequency, for seven days without having an opportunity to call. Then one night while tuning around the spot he operated on, I heard the now familiar fluttery signal calling QRZ? and not signing his call. Nervously I sent DE K2KUR K2KUR. Back came QRZ AGN PSE? still with no call sign (thank heavens!) Again DE K2KUR K2KUR K2KUR, but this time I heard him come back K2KUR 339 339 DE JTØOAK K! After that QSO, there must have been a pack of fifty stations instantly on frequency calling him. Had I not been there at that particular moment, I realized, there would have been no QSO. After that first JT QSO (there was another a few months later) everything else seemed anticlimatic. Plenty have gotten away, but it only makes the eventual catch that much more valuable. Anyway, why should it be only fishermen who have neat stories about the ones that got away?

"Reflecting back, I realize that I became totally absorbed in working DXCC after about 70 countries. The tension did not subside until I had 95 confirmed. It took three months to get the last five cards, but there were about 130 worked by then and my activity dropped off. My operating is not quite so intent these days, but I will eventually reach 200 countries. Never again will I coast around the band with my KW, as that kind of operating has lost all of its former significance. All of my DX has been worked solo, unassisted by nets, QRW's, or anything else. This makes it a real sport and it takes a lot of patience, skill and luck. The countries in themselves, after all, are not as important as the catch!

"Confirmation of the 100th country arrived one year, one month, and six days after my emotional search for a used HW-7 was rewarded. Getting the cards is something one cannot rush, no matter how much blood pressure he runs. My quickest card was from EA9EU, which arrived via air mail a few days after the QSO. The others were long in coming, but it's just something you have to sit on.

"As meager as it is, the HW-7 comes through as a great little radio. The receiver is atrocious, but with a little thought, it works. I am grateful to that little toy for providing the operating challenge, Ade Weiss' awards program for the incentive, and EI3CP, Colum Clarke of Dublin's fair city for getting this whole thing started. Any DX'er who is bored with the pointlessness of getting report after report with the ease of scratching his nose should try it—things will never be the same!"

The phone calls from K2KUR/N2AA have not stopped as he pushes toward the 200 mark and WAZ. At the time of this writing, he has worked 197 with 170 confirmed. He's since moved up to an Argonaut and has been sweating out exotic calls in the Far East, waiting for that magical moment when the VS5 comes back to him. One night last February (1977), I was putting the HW-8 that I reviewed through its paces on 80 meters. I was hearing some good European DX, and spent 45 minutes calling a DL6 futily—no antenna! The DL6 was slow in responding after one of my calls, and when he came back with a QRZ, I thought I might be in luck. I couldn't hear the other U.S. station on frequency, but in the next exchange, I heard him responding "N2AA GUD QRP SIG 449 K". Now, the N2AA didn't ring a bell, but the QRP did. Shortly thereafter, I heard N2AA's 459 signal calling the DL6 again—he was using QRO this time, and informed the DL6 that he was ex-K2KUR! It was his first trans-Atlantic QRPp contact on 80 meters, and I was listening! Some coincidence! This happens at times. Gene has told me about hearing W8ILC pull some rare ones out of devasting pileups and comments "I don't know how the guy does it!" Through the publicity that QRPp has received in *CQ*, some calls are being recognized by the amateur world as QRPp types, and their accomplishments noted. It seems that every time I get into a DX contest, many of the DX stations ask if I'm QRPp along with the signal report—the fellows do notice QRPp!

Next, let's turn to a QRPp that is known the world-over via his on-the-air efforts and the excellent story by him ("Jungle QRPp") that appeared in the April, 1977, issue of *CQ*, namely OA8V, Paul Wyse, winner of DXCC QRPp #6, awarded May 12, 1977, and received by Paul the day before he left the states for the jungles of Peru —too-close timing! Paul has provided, as his story, a list of comments on the air and on QSL's received by him.

"This finds us back in the jungles. The trophy arrived the day we were leaving Virginia for Peru! Thank you so much. It is bigger and nicer than I was expecting. It now holds a very prominent place in our living room! I'm still getting a lot of comment on the April 'Jungle QRPp' article. Last week in the contest (Oct, 1977), many remarked about the QRPp story, such as VR4DX YU1AAO, G' ZI"s etc. I had a real ball in the CQ WW Phone Contest. Worked only 10 meters, and made 827 QSO's, 23 zones, 63 countries, for a final score of 209,152. If *CQ* would only include a special QRPp category in the WW Contest with a handicap multiplier for under five watts, my score would be 1,045,760—right up there with the big boys! (Ed Note: *CQ is* initiating a QRPp category this year—maybe a multiplier next year.) I now have an Argonaut 509—really sweet! Have been working a lot of DX. My countries total is now 166 with 117 confirmed. I have 125/84 with SSB only. I'm enclosing a picture of the shack with the new trophy prominently displayed. Some comments follow:
WA1UHG—'Throughly enjoyed your article in April *CQ*. Thrilled to hear you on 5 watts.' WA8FIO — 'I've heard about your station and saw the write-up in *CQ*. Glad to meet you.' WB2SXT —'Just finished reading your article in *CQ*. Enjoyed it very much. Was certainly surprised to find myself working you so soon thereafter.' WD8BJK—'Tnx for QSO es enjoyed your article in *CQ*.' WB5TTU—'Really enjoyed your article in *CQ*. I was flabbergasted when you answered my call—my mind went blank for a few moments.' From another DXCC QRPp'er W6PQZ—'Read your QRPp story in *CQ*. Very interesting. That boa looks long enough for a full wave on ten meters!' WA4QHV—'After reading the *CQ* story, you have just about convinced me to go QRPp also. Especially when I no sooner put the article down and heard you calling CQ on 15. You had an extremely clear 5x7 signal.' W1BB—'Just finished reading your FB QRPp article in *CQ*. You are not only a great operator, but also a FB and interesting writer! Thanks for sharing your interest and enthuiasm for QRPp with us. Only thing missing was QRPp on 160!!' W8ILC, another DXCC MILLIWATT'er —'I'm thrilled to death to read your results with low power. I thought I was the only QRPp nut around. A lot of hams up here talking about your article.' WB8YQX—'Enjoyed your article. Sure would love one of your jungle QSL's. QSO with you made being home and off work sick with a cold really worthwhile!' WA4BCY—'XYL and I are having a fight over April *CQ*. I leave it on the coffee table face up and she comes along and turns it face-down! She can't stand a snake in the house!' VE3HJP—'Read your article in *CQ* and remembered your call. Heard your QRPp rig OK here in ONT.' G3RJV —'Very interesting to hear about your QRPp work in *CQ* and especially relative to Chris G4BUE.'

Well Ade, that's about it. The timing of the April *CQ* article with my activity in ARRL and *CQ* contests really gave a good demonstration of what QRPp can do. Wishing you the best and hope we can have an eyeball this summer."

I'm sure we all can unanimously thank OA8V for the great amount of effort he put into that "Jungle QRPp" article, and for his contest activity. Paul now stands at the 148/105 mark as he moves toward 200.

As I sit here going through this article, I have this strange sense of awe. It was only five years ago that we all were excited and nervous about the possibilitiy of someone working 100 countries with QRPp. I did short ly thereafter, and operations stopped because of work load etc. Just think of it though. Here we are talking about *200* countries with QRPp!!! And it isn't a speculative "I wonder if anyone will ever do it," but it is right there around the corner. By the time this gets into print, two or three fellows will have rounded the corner with 200 in the bag, and stretching out for the impossible 300 country mark. I just bet that we'll have the first 300 DXCC QRPp in another year or two. What's this world coming to? Move over KW's and make room for real men!

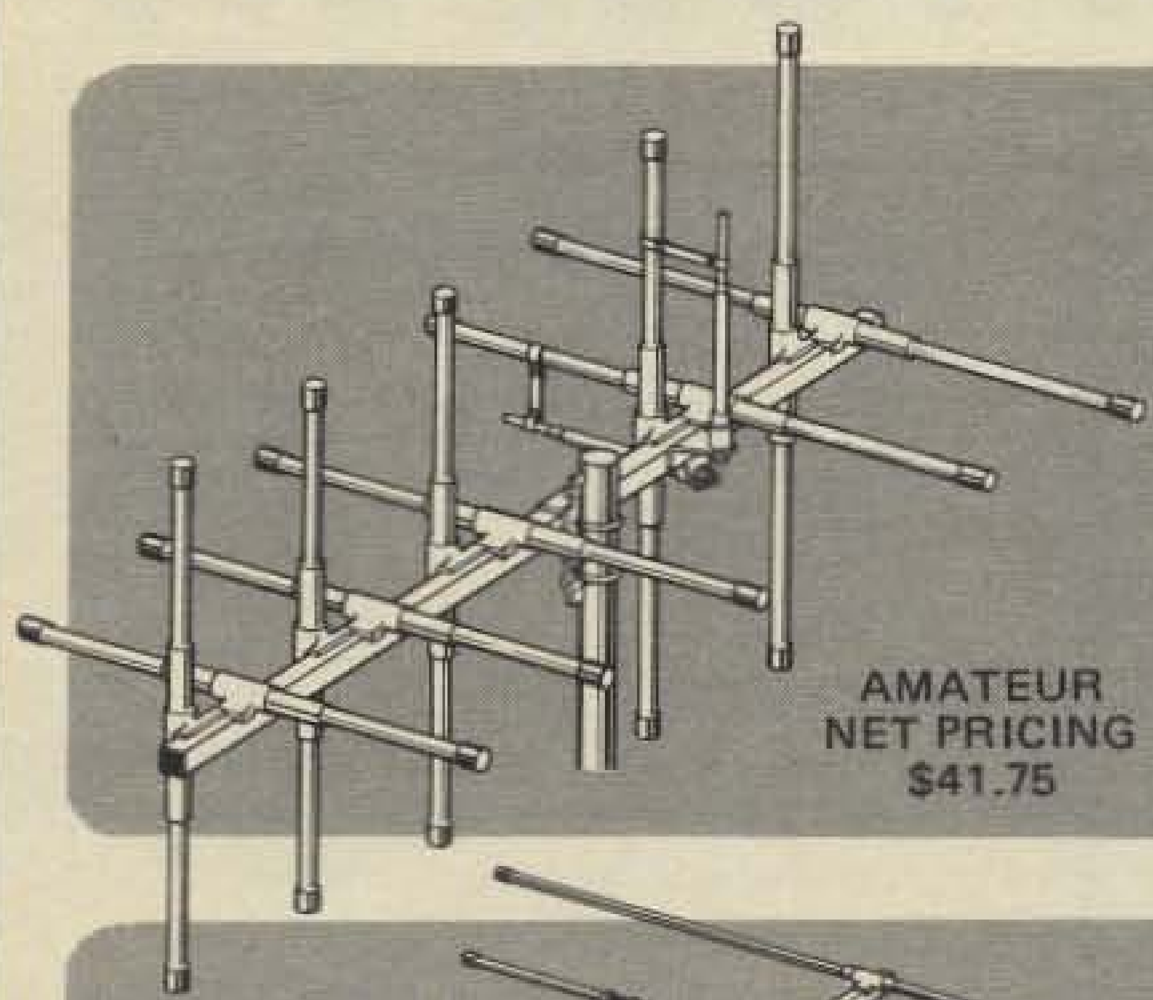
Finally, DXCC QRPp Trophy #7's application came in out of the blue without warning. WA6SOV had never made his existence known to me prior to the day on which his application and 100 QSL's showed up in my mail. Quite a surprise! His cover letter explained that he'd seen W6PQZ's DXCC QRPp Trophy and wanted one for himself. He writes:

"Amateur radio in our family began with my only son Lindy receiving his Novice ticket at the age of 12 years. He proceeded to acquire a First Class Commercial at age 19, and took his first job in Quincy, CA, with a small radio station, followed very shortly by coming home to Modesto to build a complete radio station, KOSO. Lindy was 20 years old at this time. He engineered this station until the army took him. He is now engineering KVEN in Ventura, and on the side, just completed a new station at Indio. I owe much credit to my son for helping me accomplish what I have done. Lindy encouraged me to get my Novice license in 1961. During my Novice year, I used a little Heath AT-1 running 25 watts input, and as DX'ing has always been my top interest, I worked and confirmed 16 countries and all states except Vermont, but I got that one a few days after receiving my General ticket. I was disappointed that I did not work all states as a Novice. With around 12 years of active hamming, we came to 1974 when Lindy built me a fabulous four element quad which is very accurately tuned and works great. Lindy again encouraged me to get into QRPp. Now, I had always been a DX'er, having worked over 240 countries, but in 1975, Lindy put together the HW-7 and in about a year I had 37 countries and WAS. Then again Lindy suggested, 'Pop, you have got to get an Argonaut 509.' This is where life began, and my Collins S-line with 30L-1 linear and Signal One began to collect dust. It was in February of 1976 that my complete operating time began to be devoted to QRPp with the Argonaut. I must say much credit is due to the Argonaut and the four element quad for my success, as well as a lot of skill picked up through the years of experience.

(Continued on page 92)

LOOK OUT The FINCO Stingers  are here!

FINCO Is introducing its new Stinger Series Amateur Antennas.



AMATEUR
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$41.75

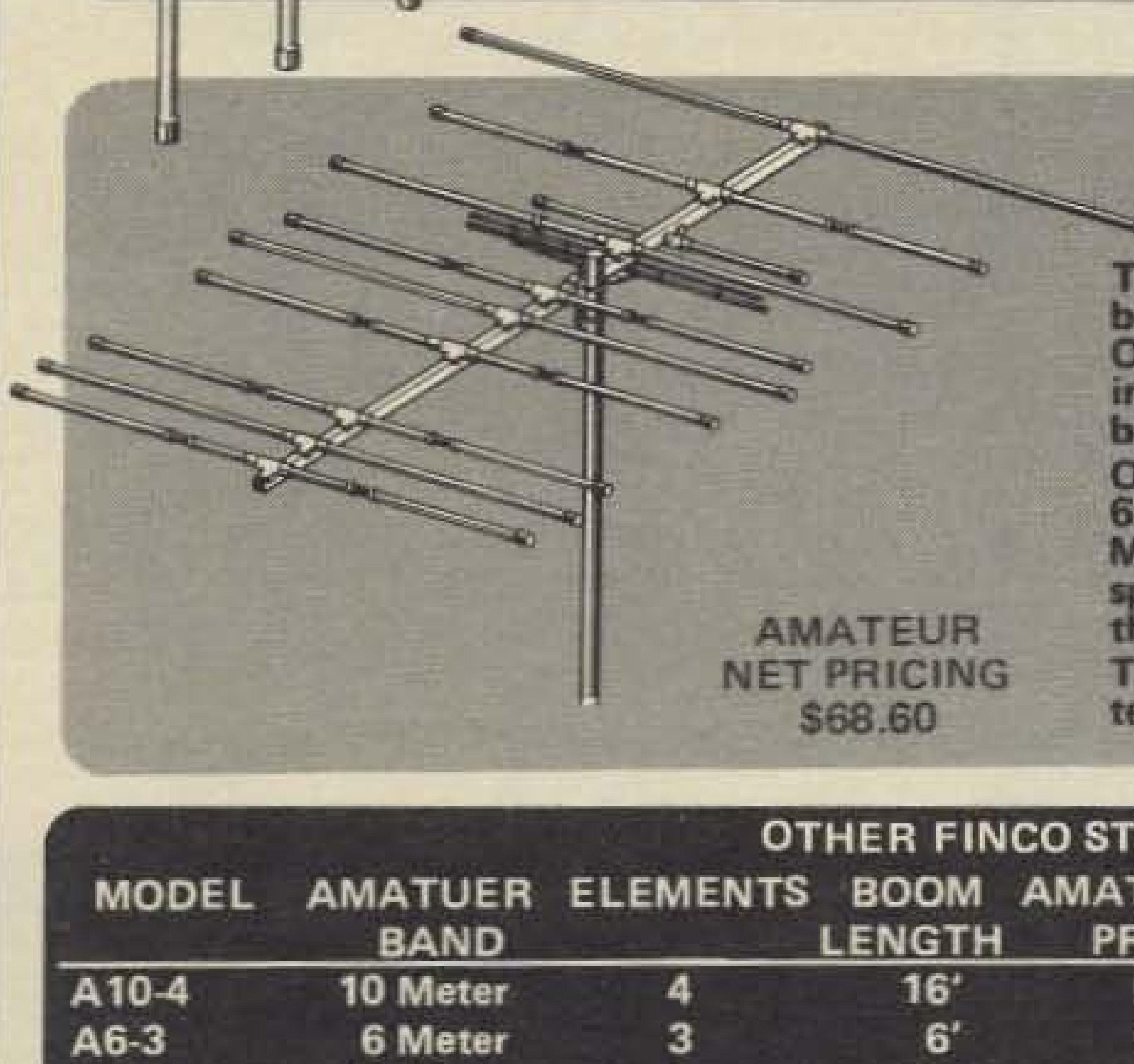
FINCO STINGER A 2+2

2 Meter

The model Stinger A 2+2 is a ten-element, dual polarization 2-meter antenna designed for OSCAR communications or where switching from horizontal to vertical polarization is required. The A 2+2 can even be phased to operate on both horizontal and vertical polarization at the same time (circular polarization). This is not only ideal for OSCAR work but gives your station versatility for ground communications.

Wide, non-linear element spacing gives the A 2+2 superior gain. However, since it is a five element beam in one given plane, the half power beam width does not make satellite tracking difficult because of sharp directivity. The dual gamma match assemblies provide for a very low V.S.W.R. and will withstand 2,000 watts P.E.P.

The Stinger construction features make the A 2+2 extremely heavy duty. Provisions are made for mounting the antenna at the end of the boom — for azimuth control — or at the middle of the boom for normal applications.



AMATEUR
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FINCO STINGER A62

6 & 2 Meter

The model Stinger A 62 is a truly remarkable combination 6 and 2-meter beam designed for optimum performance on both bands yet only requiring ONE transmission line. This is accomplished through the use of exclusive phasing elements to accomplish dual band operation with no sacrifice to either band — NO SWITCHING REQUIRED!

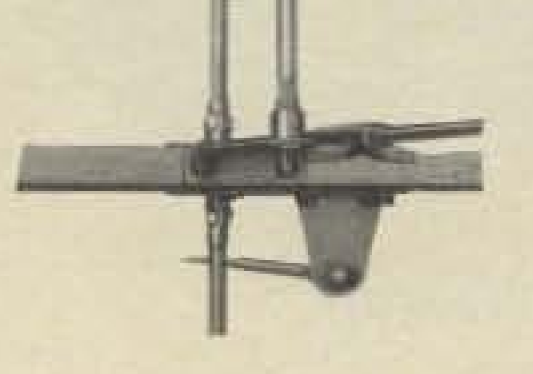
On 2-meters, the A 62 has 6 colinear elements — equivalent to three 1/2 λ 6-element yagis stacked side by side — thus giving outstanding performance. Maximum forward gain is assured on 6-meters through the use of four wide spaced elements. The heavy duty Stinger construction is used throughout so that the antenna will withstand 100 mph plus wind loads.

The A 62 is ideal for mounting on the same mast as your tri-bander or other antenna thus easily opening up the world of 6 and 2-meter VHF communication.

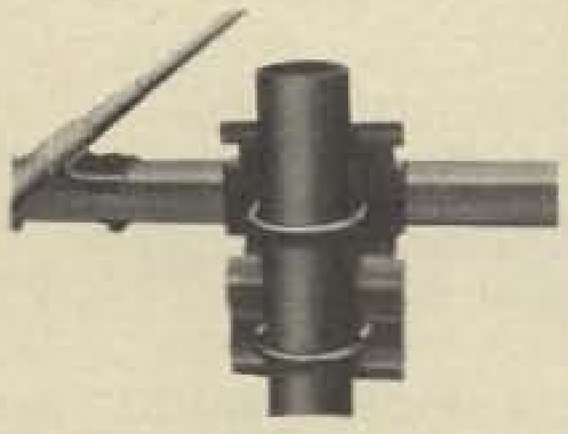
OTHER FINCO STINGER AMATEUR BEAMS AVAILABLE:

MODEL	AMATUER BAND	ELEMENTS	BOOM LENGTH	AMATUER NET PRICING	MODEL	AMATUER BAND	ELEMENTS	BOOM LENGTH	AMATUER NET PRICING
A10-4	10 Meter	4	16'	57.15	A2-5	2 Meter	5	5½'	25.60
A6-3	6 Meter	3	6'	27.30	A2-10	2 Meter	10	10'	41.15
A6-5	6 Meter	5	13'	41.95	A1¼-10	1¼ Meter	10	8'	29.65

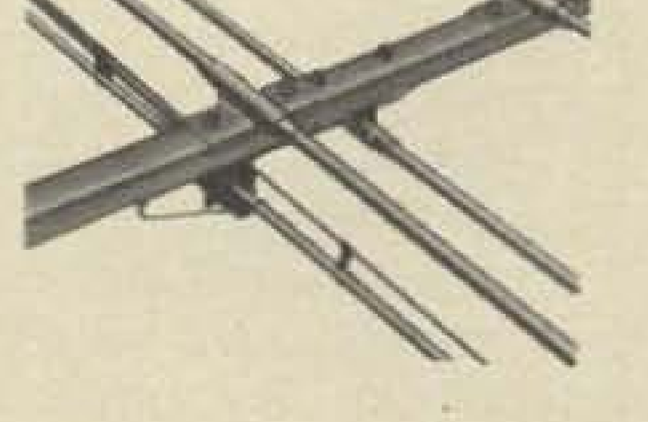
ENGINEERING FEATURES:



All Stinger Series Amateur Antennas incorporate heavy duty fully adjustable gamma matching systems to allow for maximum power transfer. The design provides for minimum V.S.W.R. and a wide bandwidth. A built in SO-239 type connector assembly is utilized plus the matching systems are power rated at 2,000 watts P.E.P.



A 4"x 6" x full 1/8" thick heavy duty plated steel mast to boom mounting assembly is used on all Stinger Series of Amateur antennas. The bracket assembly locks permanently on the square boom and thus withstands high wind loads and torque without twisting or becoming misaligned. The assembly accepts mast diameters of up to 2" O.D. Provisions for mounting either in a vertical or horizontal plane is incorporated in several models.



Exclusive Stinger square boom construction is used on all amateur antennas. The 1¼" square booms are of .064 wall high tensile strength aluminum which is many times stronger than its round counterpart. Also, special bracket assemblies have been developed to allow instant element to boom alignment — plus they stay aligned in the highest wind and ice loads. All elements are of thick wall high tensile strength aircraft quality aluminum.

Antenna design engineering is a specialty at FINCO. Top quality lab standard test equipment is used throughout the development and design of all antennas. The FINCO antenna test range has been carefully checked for erroneous reflection characteristics that could cause errors in antenna designs. Shown is the sophisticated stub and matching system that has been developed for the Stinger A62, 6 and 2-meter dual band beam. No traps or coils to burn out or detune, thus assuring you of the highest possible performance on both 6 and 2-meters.

Write for Catalog No. 20-827, Department 36

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Circle No. 18 on Reader Service Card

CQ looks at some of the latest equipment and accessories of interest to amateurs.

New Amateur Products

Ham Radio Center's Model HK-5A Electronic Keyer

Ham Radio Center, Inc. announces a "new and improved" keyer.

The unit features front panel controls for speed, weight, tone and volume. It has external jacks for a paddle and external power.

The keyer's electronics provide an iambic circuit for squeeze keying, self-completing dots and dashes, a dot memory, built-in tone monitor and provision for both grid-block and direct keying.

The HK-5A can also be used as a code practice oscillator.

For more information write to Ham Radio Center Inc., 8340-42 Olive Blvd., P.O. Box 28271, St. Louis, MO 63132 or circle no. 80 on the Reader Service Card.

Standard Communication's Horizon 29-10 Ten Meter Transceiver

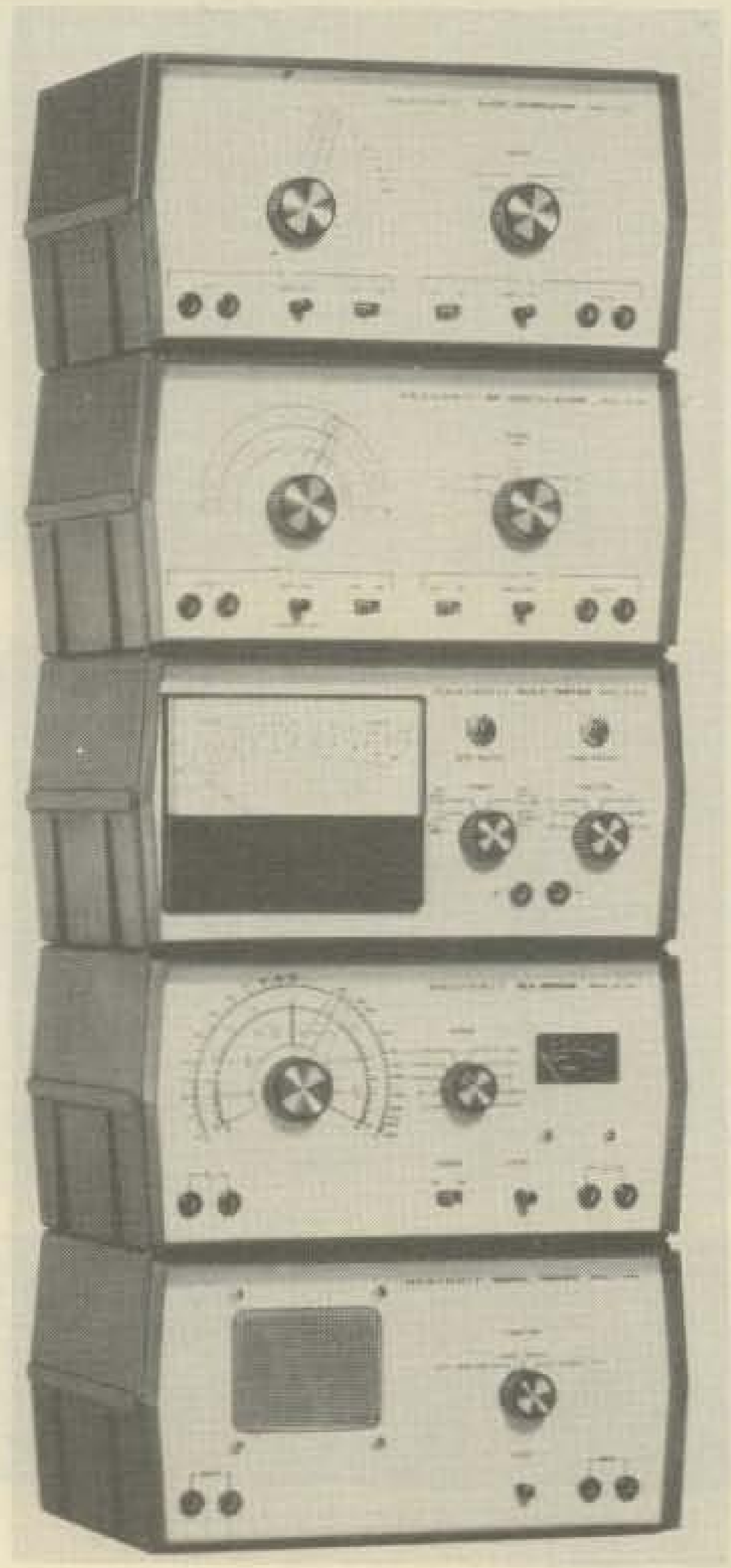
Standard Communications has redesigned its 23-channel (Model 29) and its 40-channel (Model 29A) for ten meter amateur use.

The Model 29-10 provides 23 channels starting with 28.965 MHz. The Model 29A-10 has 40 channels, extending to 29.405 MHz. No crystals are required for either unit.

The transceivers may be purchased for $106.95 (Model 23-10) and $119.95 (Model 23A-10).

Standard Communications will factory convert the 29 to a 29-10 ($20) and the 29A to a 29A-10 ($25).

For more information, contact them at P.O. Box 92151, Los Angeles, CA 90009 or circle no. 81 on the Reader Service Card.



Heath Company's "Starter" Instrument Package

Heath has announced five new test instrument kits which comprise a "starter" test bench.

Included in this kit of kits is the IT-5283 Signal Tracer, the IM-5284 Multimeter, the IG-5280 RF Oscillator, the IB-5281 R-C-L Bridge and the IG-5282 Audio Generator.

The kits are available from Heath for $37.95 each. They can be battery-operated (two 9-volt and one "C" cell) or you can build the IPA-5280-1 power supply kit. The power supply has five separate outputs and allows simultaneous operation of all five instruments.

Write to Heath Co., Dept. 350-500, Benton Harbor, Mich. 49022 or circle no. 82 on the Reader Service Card.

Symtek Inc. SABA Line of Preamplifiers

The SABA (Symtek Automatic Broadband Amplifier) line is a series of preamplifiers. The basic unit sells for $68. Through a progression of built-in accessories Symtek reaches the top of its line with the SABA/5-3T which is the basic preamplifier plus a self-contained automatic r.f. actuated T/R switch and a d.c. power supply for operation using 110 v.a.c. The top-of-the-line model sells for $79.

It is sold by Symtek Inc., 4805 N. Hesperides, Tampa, FL 33614; or circle no. 83 on the Reader Service Card for more information.

DenTron Jr. Monitor Antenna Tuner

DenTron Radio Co. announces an antenna tuner which measures 5.5" x 2.75" x 6" and can handle up to 300 watts. The "Junior" can tune for balanced, coax and random wire fed antennas.

In addition, it is designed to handle virtually any transceiver or receiver-transmitter combination.

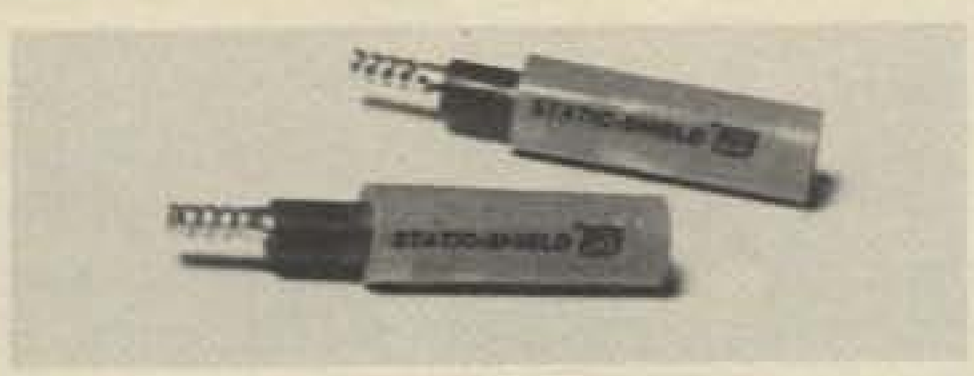
The Jr. Monitor sells for $79.50. Write DenTron Radio Co., 2100 Enterprise Pkwy, Twinsburg OH 44087 or circle no. 84 on the Reader Service Card for more information.

MFJ RF Noise Bridge

The Model MFJ-202 RF Noise Bridge measures resonant frequency, radiation resistance, reactance components and indicates whether your antenna has to be shortened or lengthened for minimum s.w.r.

The noise bridge can be used to tune transmatches, adjust tuned circuits, measure inductance, measure r.f. impedances of amplifiers, baluns and transformers. It can also be used to determine electrical length and the velocity factor of coax cable.

The MFJ-202 costs $49.95. For more information write MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762 or circle no. 85 on the Reader Service Card.



Berry Research Static Shields

Berry Research announces national distribution of their "FM-CB STATIC-SHIELD." The shields are noise suppressors which fit between the ignition cables and the spark plugs in your car.

They come packaged in quantities of four, six and eight units.

The suppressors are sold by Berry Research and Development, Inc., 24268 Indoplex Circle, Farmington Hills, MI 48018. Write them or circle no. 86 on the Reader Service Card for more information.

Radio Frequencia

Radio Frequencia is a new Spanish language amateur radio journal. It is a Florida-based magazine whose editor is Antonio Acevedo, YN1AAZ/W4.

The magazine is available nationally at a 12-month subscription rate of $10. Single copies sell for one dollar.

Radio Frequencia contains feature articles on technical and non-technical topics pertaining to amateur radio. It also contains a series of columns catering to specific interests.

For more information contact Antonio Acevedo, Editor, Casilla postal 343712, Coral Gables FL 33134.

Dynascan Corp.'s B&K-Precision Model 3010 Function Generator

The 3010 generates sine, square, TTL square and triangular waveforms. Frequency coverage spans 0.1 Hz to 1 MHz in six ranges, each of which provides a linear 100:1 frequency control.

As a sine-wave generator, the 3010 is rated at less than 1% distortion from 0.1 Hz to 100 kHz. Squarewave symmetry at 100 kHz is 99%. Trianglewave linearity at 100 kHz is also 99%.

The function generator is available from Dynascan Corp., 6460 W. Cortland Ave., Chicago, IL 60635 for $175. Write them or circle no. 87 on the Reader Service Card for more details.

Catalogs, Catalogs, Catalogs...

The following 1978 catalogs have been announced:

Harrison Radio Corp.
20 Smith Street
Dept. M-O
Farmingdale, L.I., N.Y. 11735

HAL Communications Corp.
Box 365
Urbana, IL 61801

Continental Specialties Corp.
44 Kendall Street
New Haven CT 06509

Hamtronics, Inc.
182 Belmont Rd.
Rochester NY 14612

Heath Company
Benton Harbor, MI 49022

Gregory Electronics Corp.
249 Rt. 46
Saddle Brook, NJ 07662

Radio Shack's 1978 Catalog

The 1978 Radio Shack catalog (#289), the company's 30th consecutive issue, is now available from Radio Shack stores and dealers, nationwide.

The 164-page catalog includes 100 full-color pages describing the company's exclusive line of products.

The new catalog lists hundreds of specialized electronics items, parts, accessories, tools, tubes, semiconductors, wire and cable, intercoms, microphones, timers, batteries and a complete library of Radio Shack's own books on electronics and related subjects.

The catalog is available free upon request from Radio Shack stores.

DenTron MLA-1200 Linear Amplifier

The DenTron MLA-1200 is a linear amplifier capable of 1200 watts p.e.p. in s.s.b. service and 1000 watts on c.w. The single 8875 needs only 70 watts of drive to achieve full input power.

The MLA-1200 is priced at $399.50. The AC-1200 power supply costs $159.50 and the DC-1200 supply sells for $199.50.

For more information, circle no. on the Readers' Service Card or write to DenTron Radio Co., 2100 Enterprise Pkwy., Twinsburg OH 44087.

The Q of components and circuits in your transmitter and receiver ultimately determines their level of performance. Irv Tepper explains the meaning and uses of Q.

Q
The Quality Factor

BY IRV TEPPER*

It is not unusual to hear the term *Q* used in technical discussions. It is also not uncommon to find that the speaker lacks a clear understanding of *Q*. If asked why a high-*Q* circuit makes a circuit hotter, what a high-Q circuit is or when it is desirable to have a low-*Q* circuit, the answer may be more embarrassing for him than for you. A proper understanding of the basic fundamentals of *Q*, the *figure of merit* of a component or a circuit, will go a long way toward clearing up some of the confusion.

The *Q* of a circuit in receivers affects frequency stability, bandwidth and gain. In transmitters, the *Q* of the circuits affect stability, harmonic suppression, spurious response suppression, the transfer of energy and the tuning and loading processes.

The *Q*, or figure of merit, of a component or circuit is defined as the ratio of the energy storing capacity to the energy loss in that component or circuit. There are two components capable of storing energy: inductors and capacitors. The merit or effectiveness of both are rated in *Q*.

Q of an Inductor

The inductor, or coil, stores energy in its magnetic field. This is illustrated in fig. 1. The losses in this circuit can be caused by several factors. First, there is the resistance of the wire used to wind the coil. A certain amount of energy is consumed in forcing the current through the wire. This energy does not appear in the magnetic field and is considered lost. It is also possible to lose some of the lines of force through radiation or absorption due to conducting surfaces located too close to the inductor. The major loss, however, is due to the resistance of the wire.

*19 Woodland Rd., Valley Stream, NY 11581

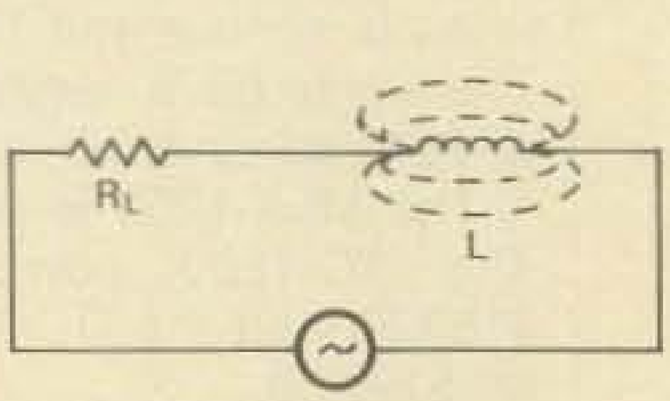


Fig. 1—An inductor stores energy in its magnetic field. The major loss is due to R_L, the resistance of the coil winding.

The *Q*, or figure of merit of a coil, is defined as

$$Q = \frac{\text{Energy stored}}{\text{Energy lost}}$$

Energy may be defined as power multiplied by time, or W × T. The power, in watts, may be calculated from

$$P = I^2R \text{ or } P = I^2X_L.$$

The energy stored in the inductance is, therefore, expressed as

$$E_s = I^2X_LT$$

and the energy lost in the resistance of the inductor is expressed as

$$E_l = I^2R_LT.$$

The energy losses from radiation and the other sources are small compared to the losses from the resistance and so may be ignored for all practical purposes. Therefore, the *Q* of a coil may be expressed as

$$Q = \frac{E_s}{E_l} = \frac{I^2X_LT}{I^2R_LT}$$

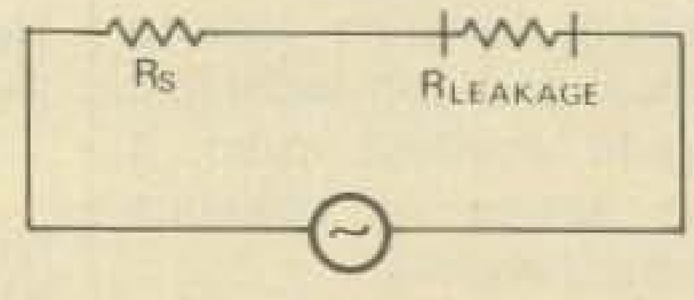


Fig. 2—Energy storage in the electrostatic field of a capacitor.

Since we are considering a series circuit, the current through R must equal the current through L. Thus, I_L^2 must equal I_R^2. Also, by the same reasoning, the times (T) must be the same in both cases. Thus, both I^2 and both T values can be divided out to obtain the familiar formula

$$Q = \frac{X_L}{R},$$

where Q is expressed as a number without a unit.

Q of an Capacitor

Capacitors also have a figure of merit, although it is rarely referred to because it is so high compared to the Q of a coil. The energy is stored in the electrostatic field that exists between the two capacitor plates, as shown in fig. 2. In this circuit the losses are caused by the series resistance of the leads and plates, R_s, and the leakage resistance across the plates, $R_{leakage}$. The series resistance R_s is very low and the leakage resistance $R_{leakage}$, is very high. (The leakage resistance can be low in some inferior types of paper and electrolytic capacitors).

The Q of a capacitor is expressed as

$$Q = \frac{\text{Energy stored}}{\text{Energy lost}}$$

or algebraically as

$$Q = \frac{X_C}{R}.$$

Again, Q is expressed as a number without a unit.

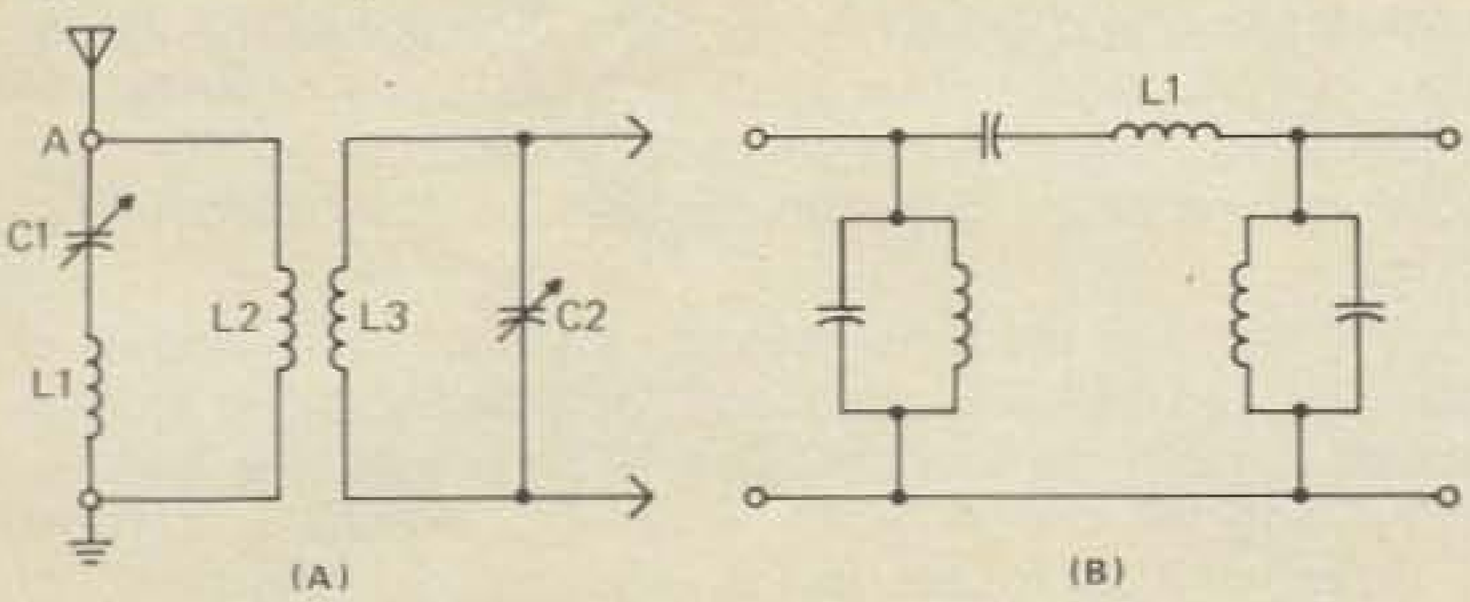


Fig. 3—Series L-C circuit applications in communications. (a) Shunt type wave trap. (b) Series resonant leg in a bandpass filter.

Some general observations can be made at this point. First, the Q of a capacitor is much higher than the Q of an inductor. The Q of a circuit combining a coil and a capacitor can be no higher than the lowest Q, for no matter how efficiently the capacitor stores the energy, it will be lost in the coil. When the two components are combined in a circuit, therefore, it will be the Q of the inductor that will determine the overall figure of merit, rather than the Q of the capacitor.

In addition, since $Q = X_L/R$ and since $Q = X_C/R$, it would seem that the figure of merit would be correct for a single frequency only because X_L and X_C vary with frequency, while R is constant.

This, however, is *not* true. It would be true if R were the d.c. resistance as would be the case for low frequency situations (power line or audio frequencies). In the case of r.f., however, the resistance R is not only the d.c. value but that caused by *skin effect,* the tendency for r.f. to travel on the outer surface of a wire. The higher the frequency of the signal current, the less the current flows in the center portion of the conductor. Thus, as the frequency increases, the effective cross-sectional area of the conductor decreases and R rises. At the same time, however, X_L is also rising with the increase in frequency and if the coil is properly designed the ratio X_L/R will remain relatively constant, providing a fixed value of Q over a fairly wide range of frequency.

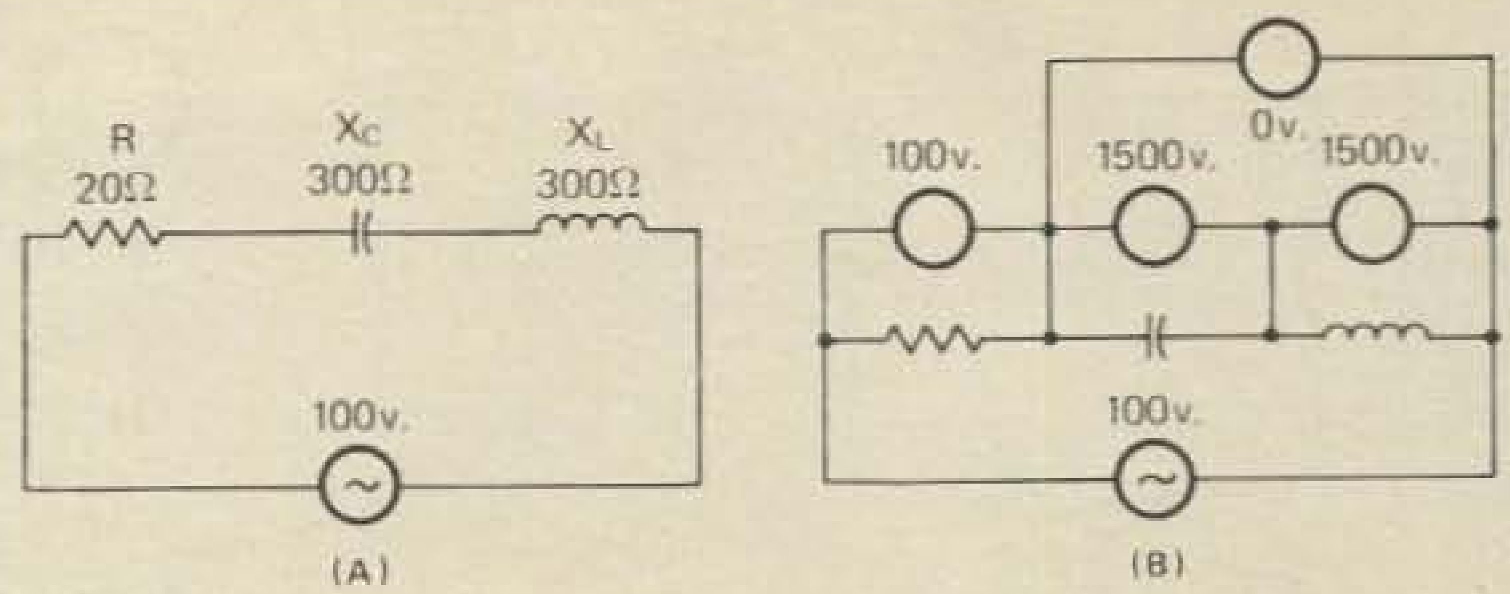


Fig. 4—(a) Basic series resonant circuit with impedance values at resonance. (b) Voltage distribution in the circuit.

Q of a Series L-C Circuit

Series L-C circuits have many applications in electronics and most certainly in amateur radio. Some of these applications are shown in fig. 3. In fig. 3(a) the series combination of L_1-C_1 acts as a resonant trap circuit to keep a signal of some undesired frequency from flowing through the primary of the coil, L_2. The lower the resistance of coil L_1, the more effectively it will perform its job. Stated in another way, the higher the Q, the better it will perform.

Fig. 3(b) shows another application for a series L-C circuit. This is part of a bandpass filter circuit. In both circuits, figs. 3(a) and 3(b), the performance depends upon the fact that the L-C circuit is resonant. A resonant circuit exists when X_L is equal to X_C at a given frequency.

The higher the Q of these circuits, the better they will be able to prevent the flow of currents due to signals close to the resonant frequency. This is discussed further under *Bandwidth.*

Consider the simple series-resonant R-L-C circuit shown in fig. 4. Assume the values of the reactances shown. Since the circuit is resonant, the capacitive reactance is exactly equal to the inductive reactance ($X_L = X_C$) and the impedance of the circuit is equal to

$$\begin{aligned} Z &= \sqrt{R^2 + (X_L - X_C)^2} \\ &= \sqrt{20^2 + (300 - 300)^2} \\ &= \sqrt{20^2} \\ &= 20 \text{ ohms} \end{aligned}$$

The two reactances have cancelled each other and the flow of current in the circuit is limited only by R. The current is found by

$$\begin{aligned} I &= E/Z \\ &= 100/20 \\ &= 5 \text{ amperes.} \end{aligned}$$

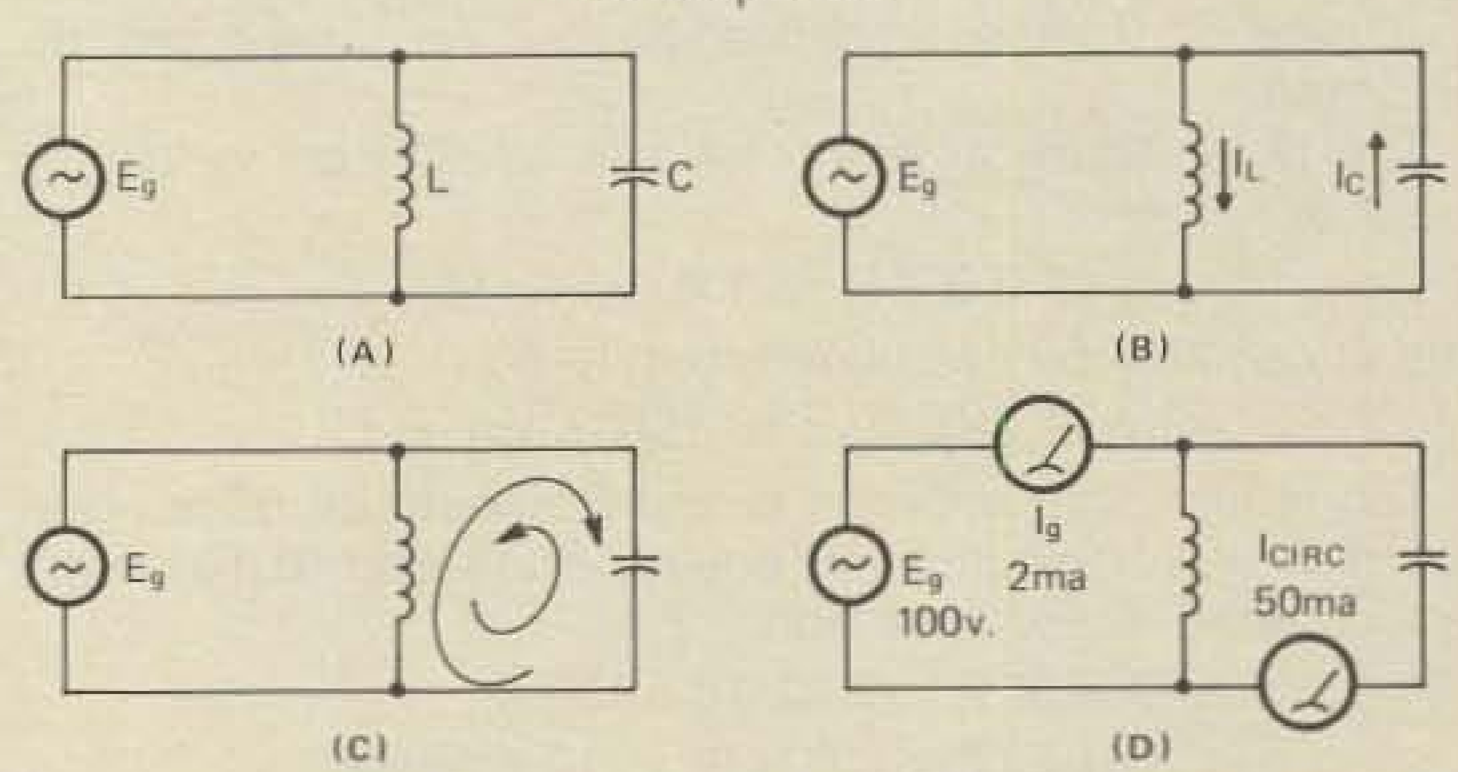


Fig. 5—(a) Simple parallel resonant circuit. (b) Current in the L and C branches are 180° out of phase. (c) Current in L and C branches, 180° out of phase, "chase" each other or exchange energy. (d) A constant generator current of as little as 2 mA can replace the losses that occur in the 50 mA circulating current.

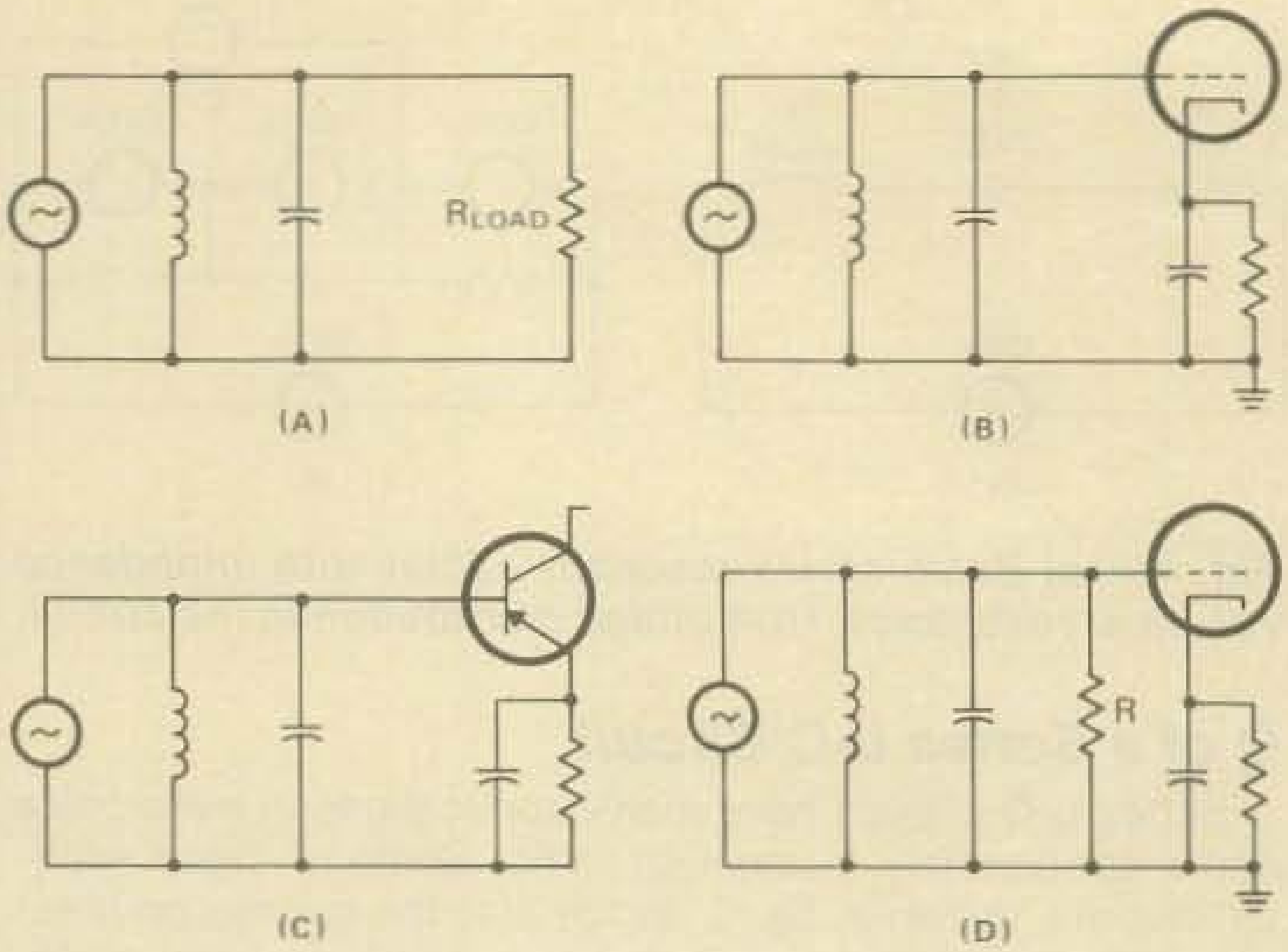


Fig. 6—(a) Parallel resonant tank circuit with a resistor load that lowers the Q. (b) The same circuit feeding a high impedance input of a vacuum tube. (c) The same circuit feeding the input of a common emitter amplifier is badly loaded by a resistance as low as 1K. (d) Deliberate loading of a resonant circuit to lower its Q and broaden its bandwidth.

Since this is a series circuit, the 5 amperes flow through the inductance and capacitance as well as the resistance. The voltage drop across each component can be calculated as follows:

$$E_R = IR = 5(20) = 100 \text{ volts}$$
$$E_L = IX_L = 5(300) = 1500 \text{ volts}$$
$$E_C = IX_C = 5(300) = 1500 \text{ volts}$$

Let us examine the voltage distribution in the circuit. First it is seen that 100 volts appear across the resistance; this is the entire generator output. Then, there are 1500 volts across each reactance. Great amplification—but is it? Not really, since the total voltage across L and C as shown is equal to *zero*. They cancel since they are 180° out of phase. The reactances consume no power. All power is used up across R.

The total power input is equal to $EI = 100 \times 5 = 500$ watts. The power dissipated by the resistor is equal to $I^2R = 5^2 \times 20 = 500$ watts.

If it were possible to apply the voltage developed across either reactance to the input of a vacuum tube, (which presents no load), this voltage, higher than the generator voltage, will be amplified in the tube. It can be seen that it *is* a form of voltage amplification, but no *power* can be delivered.

The Q, or figure of merit, for this circuit can be calculated as follows:

$$Q = X_L/R = 300/20 = 15.$$

The Q can also be calculated from

$$Q = E_L/E_{generator} = 1500/100 = 15.$$

The relationship between Q and R should be quite obvious now. If, for example, R could be lowered to 10 ohms, the following would hold true:

$$Q = X_LR = 300/10 = 30$$
$$I = E/Z = 100/10 = 10 \text{ amperes}$$
$$E_R = IR = 10 \times 10 = 100 \text{ volts}$$
$$E_L = IX_L = 10 \times 300 = 3000 \text{ volts}$$
$$E_C = IX_C = 10 \times 300 = 3000 \text{ volts.}$$

$$IX_C = 10 \times 300 = 3000 \text{ volts.}$$

The lower the value of R, the higher the circuit *Q*. The higher the *Q*, the greater the circulating current and the higher the voltages developed across the reactances.

Consider the effect of the *Q* on the behavior of the two examples of the series L-C circuit applications shown in fig. 3. In fig. 3(a) when X_C cancels X_L the only factor preventing all of the undesired signal from being shunted directly to ground through C_1-L_1 is R_1. The lower the value of R_{L1} the higher the circut *Q* and the more effectively the interfering signal will be eliminated.

In fig. 3(b) the series L-C circuit passes the desired signal from the input to the output. The lower the value of R_L, the higher the *Q* and the greater the signal level reaching the output.

Parallel Resonant Circuits

Parallel resonant circuits are encountered much more frequently than series types and are subject to the same problems. Consider the parallel resonant circuit shown in fig. 5(a). At resonance X_C is equal to X_L and the following relationships are true since C, L and the generator are in parallel:

$$X_C = X_L \text{ (at resonance)}$$
$$I_L = E_{generator}/X_L$$
$$I_C = E_{generator}/X_C$$
$$I_L = I_C$$

From our knowledge of basic theory we recall that the currents in L and C flow in opposite directions. The inductive current lags the applied voltage by 90° while the capacative current leads the applied voltage by 90°. The total difference in direction is 180° as illustrated in fig. 5(b).

In effect, the currents "chase" each other as shown in fig. 5(c) and circulate back and forth between the storage areas of each component. This is known as the *flywheel effect* and the current is known as the *circulating current*. If there were no losses in the inductor and the capacitor the energy could be stored forever and continue to circulate.

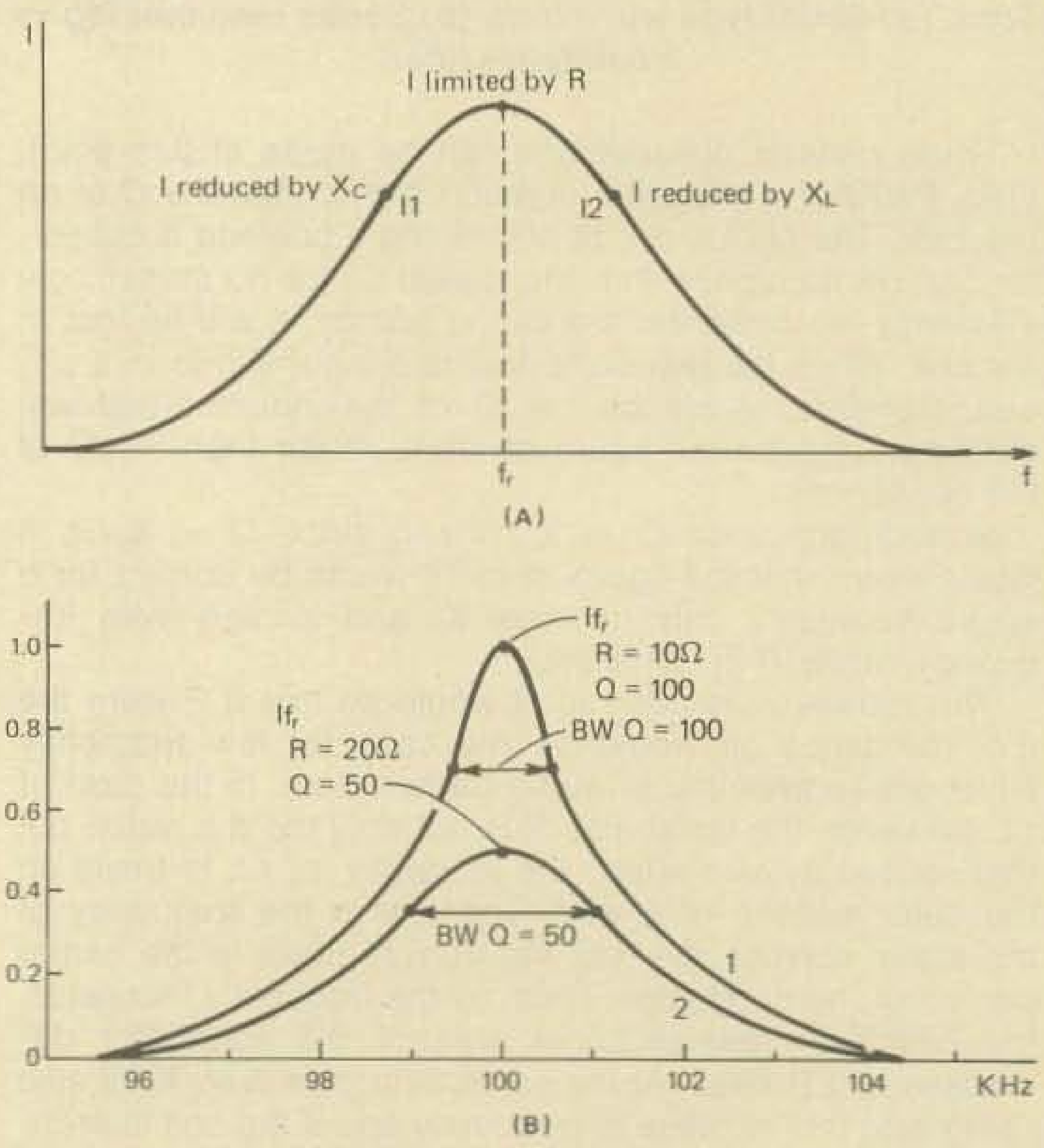


Fig. 7—(a) Typical resonance curve plotting current vs. frequency. (b) Effect of Q upon I_{circ} and bandwidth.

The ability of this combination of components to store energy like a tank is the reason it is frequently referred to as a "tank circuit."

The fact that the coil does not have resistance is obvious and losses occur in the circulating current of the tank circuit. The generator in fig. 5 has to make up *only* these losses in order to keep the current circulating in the tank circuit. This is illustrated in fig. 5(d). Here we see a circulating current of 50 mA and a generator current of only 2 mA is needed to make up the losses and maintain the circulating current.

The *Q* of the circuit can be determined from the relationship between the circulating current and the current supplied by the generator. The more efficient the tank circuit storage capabilities the less the current required from the generator to make up the losses. Therefore, the *Q* can be calculated from the ratio of the tank current to the generator current. In fig. 5(d) it would be

$$Q = I_{tank}/I_{gen} = 50/2 = 25.$$

If the losses are reduced by lowering the resistance in the circuit, the current needed from the generator would be lower. If I_{gen} is reduced to 1 mA, then

$$Q = 50/1 = 50.$$

Parallel Resonance Impedance

The impedance of a parallel L-C circuit is high at resonance and decreases when tuned off resonance in either direction. The impedance can be calculated by simple Ohm's Law. As shown in fig. 5(d), the applied voltage is 100, resulting in a line current of 2m A.

The impedance of the circuit is

$$Z = E_{gen}/I_{line} = 100/.002 = 50{,}000 \text{ ohms}.$$

The impedance of the circuit will increase if the *Q* of the circuit is increased. For example, if the *Q* of the coil in fig. 5(d) is increased, I_{circ} will rise but I_{line} will drop. If I_{line} drops to one mA, Z will calculate to 100k. The relationship between Z and *Q* is Z = *Q*X, where X is the reactance of C or L (equal at resonance). Thus, we see that the higher the *Q* is, the higher the impedance of the parallel resonant circuit.

In very high *Q* circuits great care must be taken to keep additional losses low due to the high circulating current. Heavy wire should be used for all connections and connecting jacks, if any, should have a large surface area.

Parallel resonant tank circuits develop output voltages that are fed to a load as illustrated in fig. 6 (a) or (b). When power is delivered to a load, that load has a direct effect on the *Q* of the circuit. Examination of fig. 6 will show that any power consumed by the load resistance will not be returned to the tank circuit and the generator will have to deliver more current to maintain I_{circ}. The *Q* of such a circuit is calculated in a somewhat different manner than that of a series circuit.

Let us start with the basic formula.

$$Q = E_{stored}/E_{lost} = WT_{stored}/WT_{lost}.$$

Since we are now considering a parallel circuit rather than a series circuit the *voltages* across each branch are the same. In order to be able to cancel out quantities conveniently, we must work in terms of voltages rather than currents. Therefore, the expression used is

$$W = E^2/R_{load} \text{ or } W = E^2/X_L.$$

Thus,

$$Q\frac{(E^2/X_L)T}{(E^2/R)T} = R/X_L.$$

Obviously, this formula for the *Q* of a parallel resonant circuit is quite different from the formula for the *Q* of a series circuit. What does this new formula tell us? It tells us that when a resistance (or some other form of a load that will dissipate energy) is placed in *parallel* with a tank circuit the energy it consumes will lower the *Q* of the circuit. Thus, the lower the value of R_{load}, the lower the *Q* of the circuit.

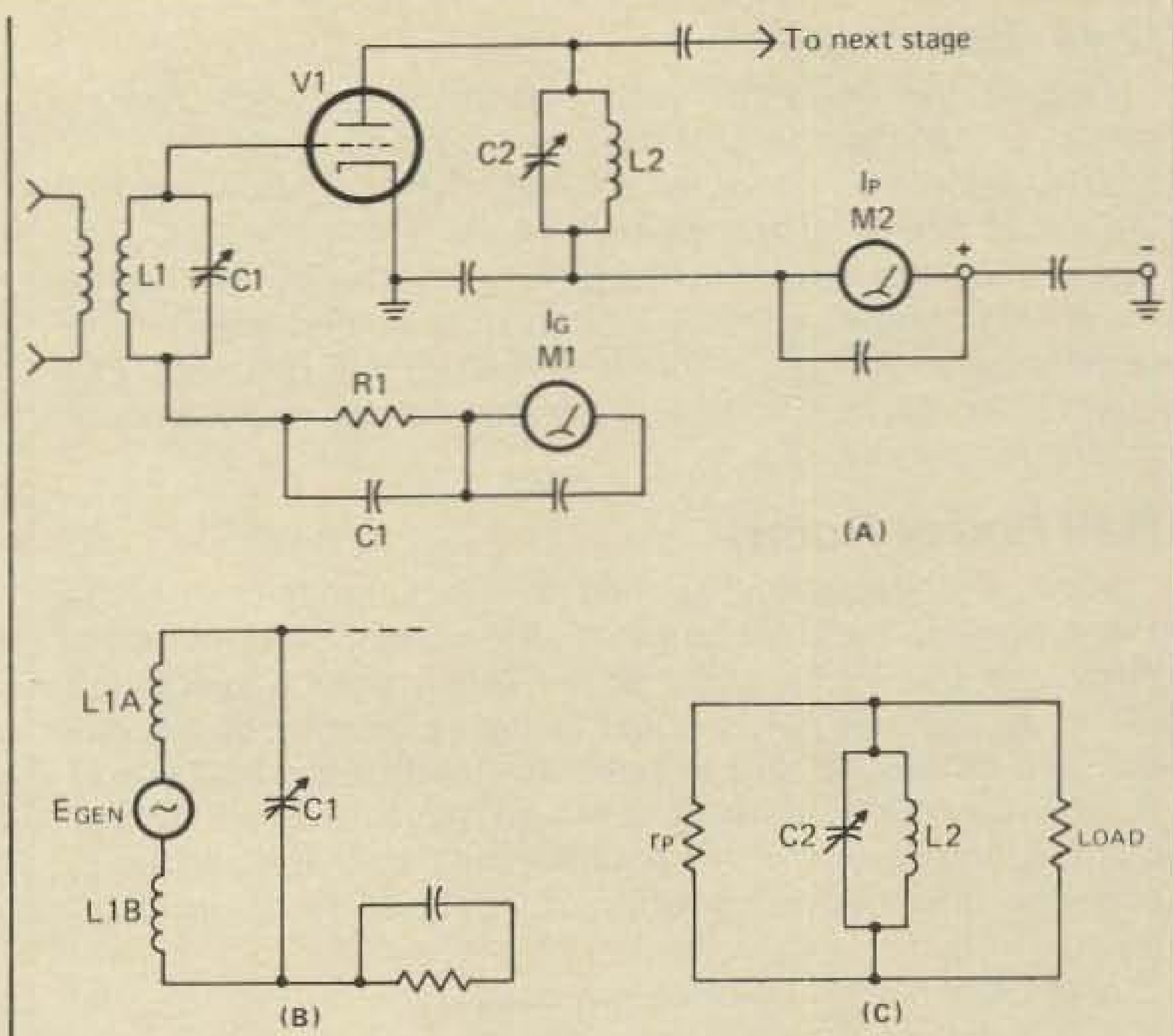
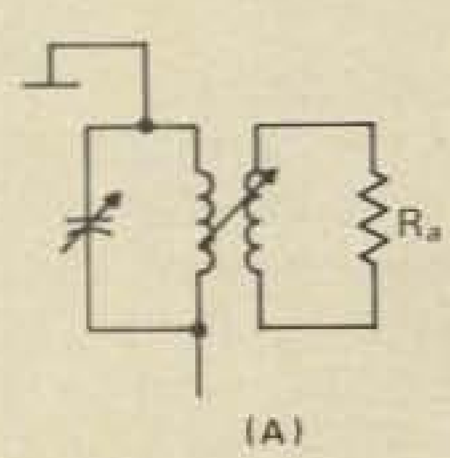


Fig. 8—(a) Simplified r.f. amplifier circuit showing metering. (b) Simplified equivalent circuit showing induced voltage appearing in series with L_T. (c) Equivalent circuit showing how R_p and the load parallel the tank circuit.

If no resistance is placed across the tank circuit the *Q* is still determined by the coil resistance and the formula $Q = X_L/R_{coil}$ still holds.

In practice it sometimes is possible to avoid a resistive load being placed in parallel with a tank circuit. For example, the circuit of fig. 6(b) has virtually no load as the input of a vacuum tube exhibits only a small input capacitance. The same tank circuit and generator feeding the input of a common emitter transistor amplifier tells quite a different story. The input impedance of this circuit could be as low as one kilohm and will effectively destroy the *Q* of the tank circuit. If this tuned circuit and amplifier were part of the r.f. stages of a receiver the circuit would be so broad as to be unable to reject unwanted signals close to the resonant frequency. The result in a receiver would be crosstalk and poor selectivity. The use of special circuit techniques with transistors generally can reduce this effect and the use of FET's with their high input impedance (as with tubes) also helps avoid loading and lowering of the tuned circuit *Q*.



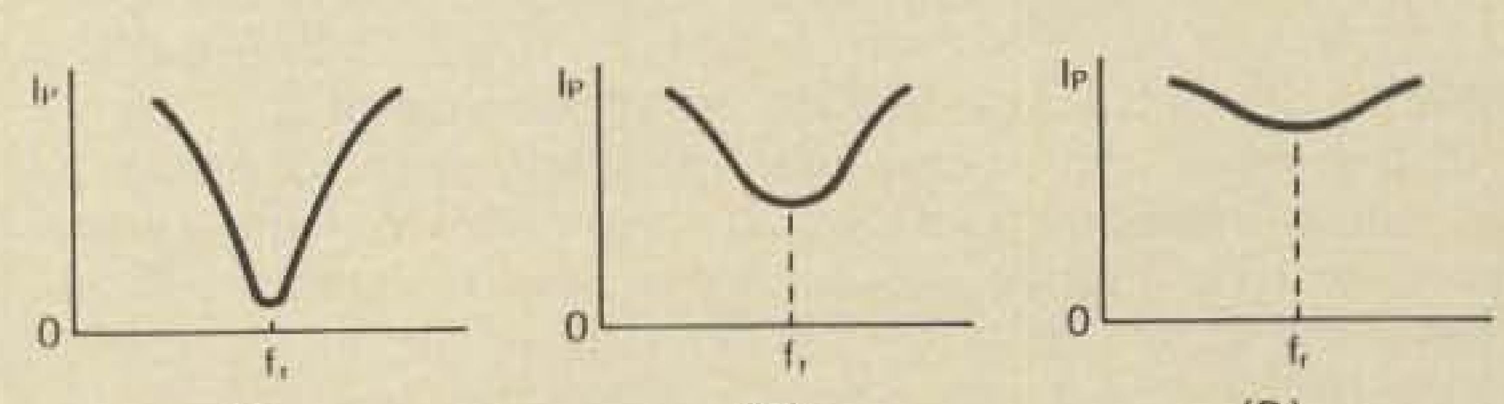


Fig. 9—(a) Basic link coupled output circuit. (b) Plate current curve with no coupling. (c) Plate current curve with moderate coupling. (d) Plate current curve with excessive coupling.

Q vs. Bandwidth

One of the important relationships in a tuned circuit, series or parallel, is that between *Q* and bandwidth. A typical resonance curve for a tuned circuit is shown in fig. 7(a). It is a plot of the current in the L-C circuit vs. frequency. At the resonant frequency, f_r, the current is at maximum since X_c cancels X_L and I_{fr} is limited only by the resistance of the coil. Above or below the resonant frequency the current flow reduces due to the opposition of X_L above f_r and X_c below f_r.

Half Power Points

When the frequency applied to the tuned circuit shifts away from f_r the reactance of the circuit will increase. When the frequency shifts so far that the total reactance ($X_L - X_c$ or $X_c - X_L$) is equal to the resistance of the circuit, the current is said to have dropped to the *half power points*. Obviously, it is possible to have two half power point, I_1 and I_2, one at a frequency below f_r, defined as f_1, and one at a frequency above f_r, defined as f_2, as illustrated in fig. 7.

Mathematically, this is shown as:

$$I_1 \text{ or } I_2 = I_{fr}\sqrt{2}.$$

This means that I_1 or I_2 is 70.7% of I_{fr}.

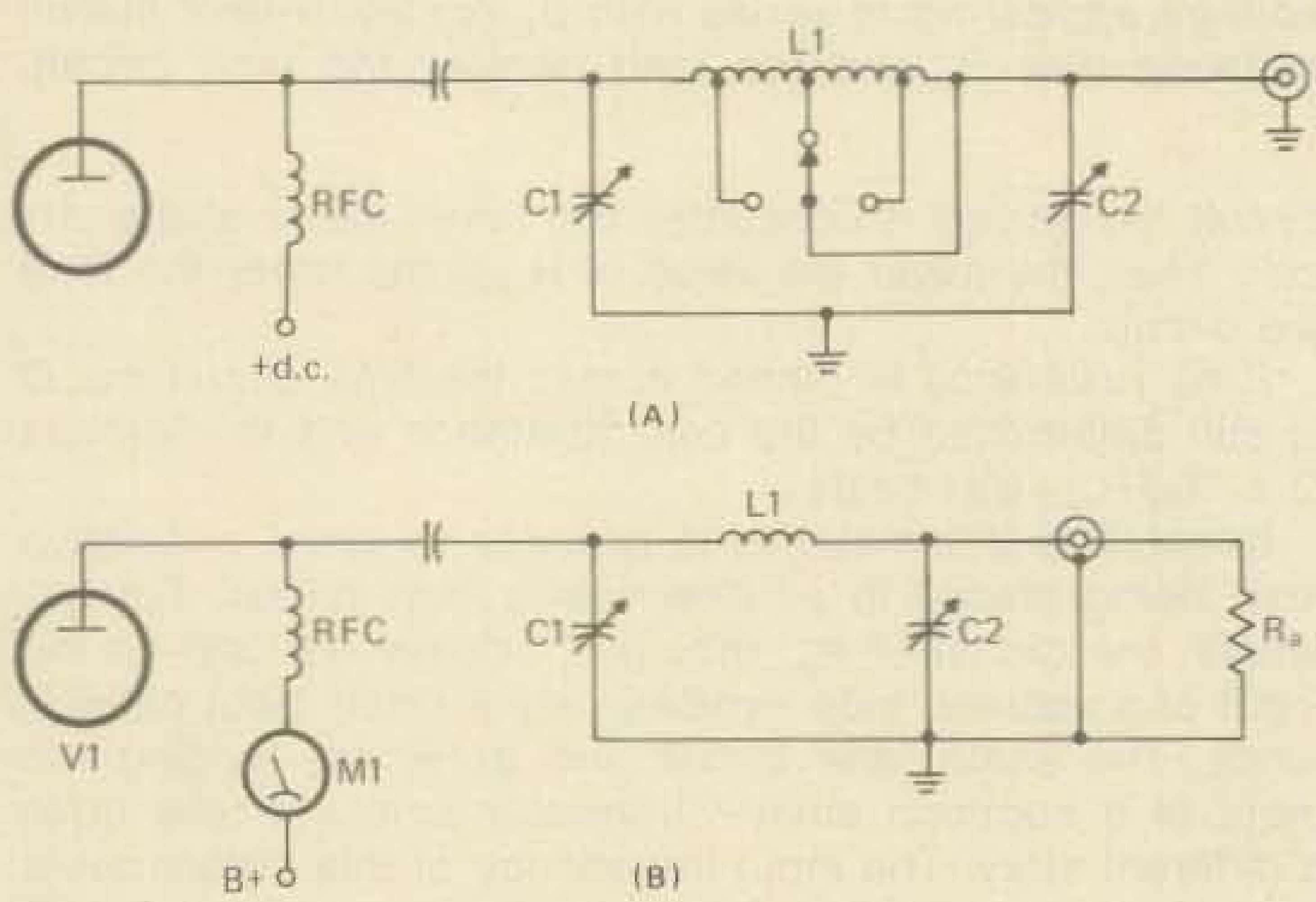


Fig. 10—(a) Basic pi-network output circuit. (b) Pi-network redrawn for comparison with a conventional parallel resonant circuit.

The *bandwidth*, BW, of a circuit is defined as

$$BW = f_2 - f_1.$$

Without showing the derivation of the formula, as it is beyond the scope of this article, the relationship between the bandwidth and the *Q* of a coil can be given as

$$BW = f_r/Q.$$

The formula is valid for both series and parallel circuits.

Figure 7(b) shows the effect of R upon the current at resonance and bandwidth at the half power points. Curve 1 is produced by an inductance with a resistance of 10 ohms. The current flow at resonance, limited by R, is 1 mA. The inductive reactance of the coil is 1000 ohms (a round figure chosen arbitrarily). From $Q = X_L/R$ the *Q* is calculated to be 100. From I_1 or $I_2 = I_{fr}\sqrt{2}$, BW is calculated to be 1 kHz, i.e., 500 Hz on either side of f_r.

If the same coil is rewound with finer wire to produce the same inductance, X_L will be the same but the resistance will be higher. Assuming a new resistance of 20 ohms, the *Q* will now be 50. For a *Q* of 50, at the same f_r, the BW will be 2 kHz. See curve 2 in fig. 7(b).

Comparing the two curves, we see that curve 2 has a lower circulating current and therefore will produce lower voltage drops across the reactive components. It can also be seen that the bandwidth at the half power points for curve 2 is twice as wide as for curve 1. As a result, the selectivity of circuit 2 will be poorer and its voltage output lower.

It can be concluded that the higher the *Q*, the lower the bandwidth of the tuned circuit and the higher its developed voltages across the reactances.

Practical Implications of Q In Receivers

In receiver design, *Q* problems are encountered in the circuits that have to be made resonant. These are the r.f., i.f. and oscillator circuits. In communications receivers there are, in addition, a second conversion oscillator, a high frequency i.f., a b.f.o. and, frequently, special filters for shaping the i.f. bandpass for c.w. or s.s.b. reception.

Let us discuss some of these briefly to see how *Q* affects each of these tuned circuits.

A serious problem that affects all superheterodyne receivers is image reception. For any given local oscillator frequency the mixer will develop an output for two r.f. frequencies:

$$f_{rf} = f_{osc} \pm f_{if}.$$

One of the above frequencies is the desired signal; the other is the image frequency.

The image signal is usually eliminated by the use of one or more r.f. stages preceding the mixer. If one r.f. stage is used, the loading effect of the antenna may lower the *Q* of the antenna coil to the point where it cannot effectively reject the image signal. For effective improvement in image rejection, the r.f. stage must have a second tuned circuit with a high *Q* or, as is common in many receivers, two r.f. stages.

In addition to image interference the lack of the tuned circuits of an r.f. amplifier can lead to cross-modulation ("cross-talk"). This occurs when a strong signal is tuned in on the receiver and another strong signal appears on the spectrum not too far removed from the desired signal. When the wanted carrier is not modulated, the modulation of the undesired signal can be heard. When the wanted carrier is off the air, the unwanted signal is not heard. Cross-talk can be minimized by the use of one *effective* tuned circuit between the antenna and the grid of the first stage. (Remember that the antenna can load the one r.f. coil and detroy its *Q*, thus making it ineffective). If two strong signals are permitted to reach the grid of the r.f. amplifier, because of low *Q* causing a wide bandwidth, it will be driven into non-linear operation resulting in the cross-modulation which cannot be corrected or compensated for by the high *Q* selective i.f. circuits that follow.

I.F. Amplifiers

The i.f. amplifier of a receiver controls both the gain and selectivity. The signal is amplified at a lower frequency and the *Q* requirement for the i.f. transformers are reduced. This can be seen from the equation $BW = f_r/Q$. If for s.s.b. reception a 455 kHz i.f. amplifier requires a bandwidth of 3 kHz, we have that

$$BW = f_r/Q$$
$$3\text{ kHz} = 455\text{ kHz}/Q$$
$$Q = 455/3 = 151.$$

The lower values of *Q* can be tolerated because of the low intermediate frequency and a given bandwidth is easier to obtain.

When special shaped bandpasses are required, high *Q* crystal lattice filters, ferrite filters or mechanical filters are used in addition to the usual i.f. transformers.

Oscillator Circuits

The output level of an oscillator is determined by the *Q* of the tank circuit. When the oscillator tank is tuned over its range, if its *Q* varies, the output level will vary and possibly affect the conversion gain of the mixer stage. The oscillator coil *Q* must be reasonably constant over its operating range.

A high *Q* tank circuit will also improve oscillator stability as well as the use of high C/L ratio. The higher capacitance makes the tank circuit less responsive to the oscillator tube input capacitance. The high *Q* of the tank circuit will reduce the effect of changes in oscillator tube element voltages, oscillator loading and the effect of harmonics.

Low coil resistance (high *Q*) in the oscillator tends to reduce coil heating, further adding to the stability.

In double superheterodynes one of the conversion oscillators is usually crystal controlled. This type of oscillator is very stable since the crystal, acting as the tuned circuit can exhibit *Q* figures as high as 50,000 compared to 150 to 300 for tank circuits.

The same reasoning given above applies to the beat frequency oscillator which may be variable or fixed (crystal controlled) and should be very stable for dependable s.s.b. operation.

Q In Transmitters

The transmitter begins with an oscillator whose stability demands are much more severe than those used in receivers. If a transmitter has an oscillator that is unstable the possibility of drifting out of the band when working close to the edge is strong. Drift in a roundtable could also be upsetting to the others involved. All that has been said for stability under the heading of receivers also applies to oscillators in transmitters, but more so.

After the use of a tuned circuit to establish frequency in the transmitter tuned circuits are used for coupling, suppression of harmonics and spurious response and, most important, impedance matching for maximum power transfer.

Tuning And Q

Figure 8 shows a simple Class C r.f. amplifier stage with grid and plate loads consisting of parallel resonant tank circuits. The current meters are used as the indicators for resonance. In the grid circuit the input signal is transformer coupled to the tuned circuit. In effect, the input winding acts as the generator and the induced voltage appears as shown in fig. 8(b). The generator sees L_1 and C_1 as a series circuit. At resonance X_C cancels X_L and current flow is limited only by R (composed of $R_{d.c.}$ and $R_{skin\ effect}$). The high circulating current produces a voltage drop across X_C which is the input to the tube. The higher the *Q* of the circuit the greater the input voltage will be. The input signal drives the grid into conduction and grid current flows. The greater the input voltage the higher the grid current flow. When L_1-C_1 is resonant, the input voltage to V_1 is greatest, resulting in the highest grid current; so, one tunes L_1-C_1 for maximum I_g. The higher the *Q* of the tank circuit, the higher I_g will read on M_1.

Since grid current flows, the grid circuit will act as a load across the tank circuit, lowering its *Q* in operation. While the *Q* of the tank (unloaded) might be as high as 200, in operation it could be lower than 20 due to the loading of the grid circuit.

Plate Tuning

When tuning the plate circuit, L_2-C_2 is also set at resonance as indicated by M_2. At resonance, a parallel L-C circuit draws very little line current from its generator (V_1, in this case) but has a high circulating current. Since M_2 measures I_{line}, as resonance is approached the current will drop and, at resonance, will read minimum; therefore the higher the *Q* of the circuit, the lower the minimum current will read.

The *Q* of the plate tuned circuit will be lowered by the resistance R_p, the internal resistance of V_1 and by the load of the next stage. If the next stage is Class A and draws no grid current it will present virtually no load at all.

Harmonic Suppression

A major function of each tuned circuit in a transmitter is to suppress harmonics that are generated by the nonlinear operation of an amplifier. A high-*Q* tank circuit will do this most effectively and is an absolute necessity in Class B and Class C circuits. As you may recall, plate current in a Class B amplifier flows for 180° of the signal input cycle. In order to produce an undistorted sine wave output, the tank circuit must supply the missing energy. If it cannot store the required amount of energy the resultant waveshape will be nonsinusoidal or, in other words, distorted. The high-*Q* tank circuit *can* store some of the required amount of energy.

This problem is even more acute in Class C operation where plate current flows for *less* than 180° of the input cycle and so the tank circuit must deliver more energy for a sine wave output.

Reduced distortion means reduced harmonic content and so high-Q tank circuits help reduce harmonic output.

A high C/L ratio is also helpful in reducing the transfer of harmonics. The harmonic currents from the amplifier seek a path from the plate to ground. Since the harmonics are higher in frequency, the inductive reactance, X_L, shown by L, increases and affords a poor path. The reactance of C, however, is low as it is inversely related to f and the harmonic currents are bypassed by C to ground.

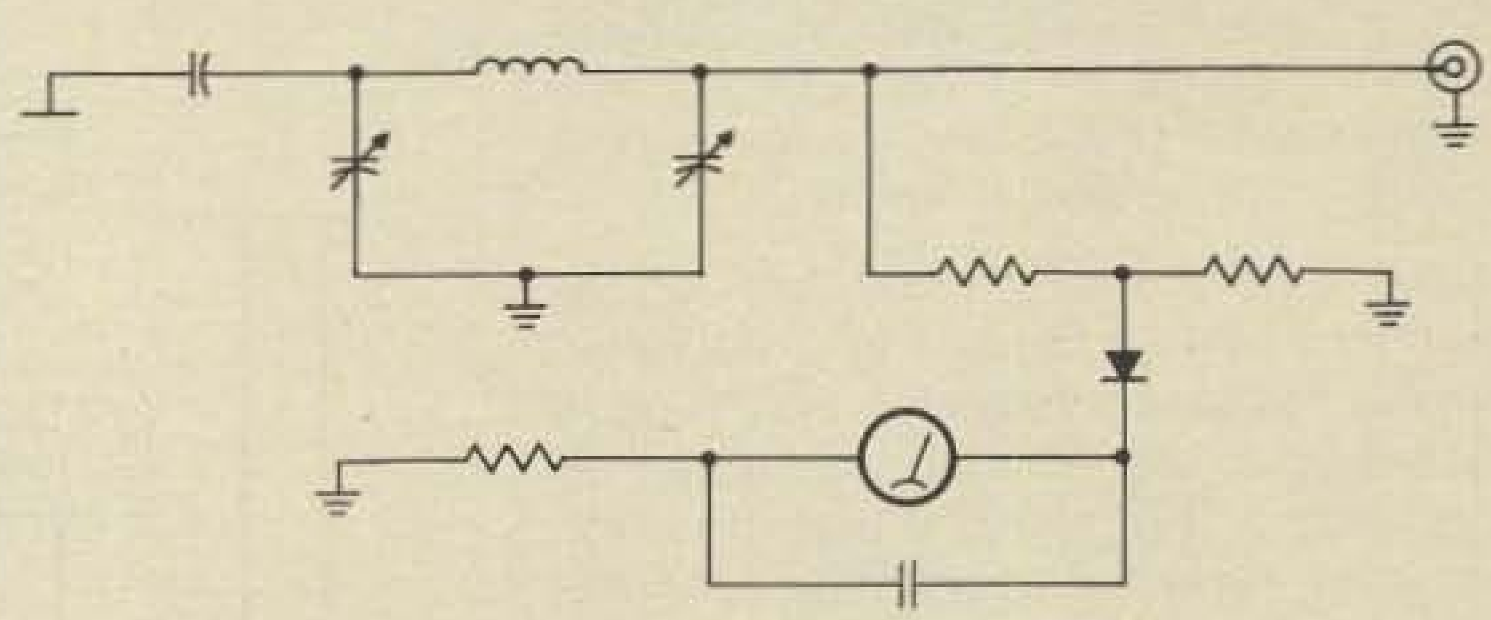


Fig. 11—Circuit of a relative r.f. output meter.

Loading

In addition to interstage coupling, tuned circuits are used to impedance match. The most important match is that from the plate of the final amplifier to the antenna feedline. There are two basic methods of accomplishing this impedance transformation—link coupling and pi-network coupling.

Link coupling, shown in fig. 9(a), has a secondary winding whose position, in relation to the primary, is adjustable. When the separation between the two windings is greatest, little or no coupling exists and no energy is drained from the magnetic field of the primary. The primary tank circuit with only the loss caused by the resistance of the coil, exhibits a high *Q* and the plate current, I_{line}, is very low at resonance as shown in fig. 9(b).

Increasing the coupling by bringing the link closer to the primary, causes energy from the primary to be induced into the link and dissipated by R_a, the antenna resistance. Energy dissipated by R_a is permanently removed from the

(Continued on page 90)

a monthly feature by

BILL DEWITT, W2DD

In Focus

Television on the Amateur bands

What's New Department

Jim Thomas, WB4HCV, has established a new company with headquarters in Austin, Texas. The name of the new company is James Thomas Industries. It will be involved in both the consulting (gas and oil) and manufacturing fields.

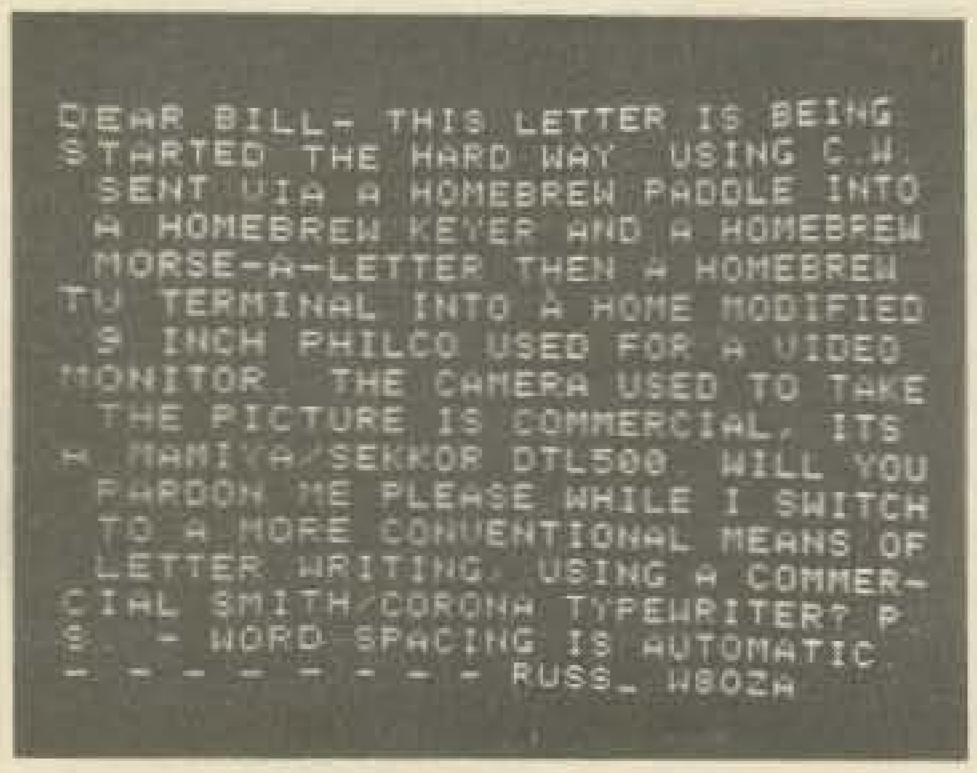


Fig. 1—Russ Sievert, W8OZA, provided this example of what you can do with WB9LVI's Morse-A-Letter device plus a TV typewriter feature.

Jim reports that one division of the company will produce high resolution amateur and commercial SSTV gear, including a digital scan converter. At this writing, it is planned that the company will have a display of its products at the Dayton Hamvention.

Computers Anyone?

In the February issue of *CQ*, this column mentioned Clay Abrams' (K6AEP) proposed program for image processing via the use of an SWTPC 6800 computer. In addition to that project, Clay has been busy with RTTY/computer work and has now produced a program which he describes as a mixture of RTTY and SSTV.

*2112 Turk Hill Road, Fairport, NY 11450

Fig. 2—Richard Thurlow G3WW, as photographed during the SSTV show (really!) on the BBC. See text for details.

Here's Clay's outline of the "RTTY Program Specifications and Objectives":

1. The program will run in 4K memory on a SWTPC 6800 computer system.
2. The program will include a monitor program which will allow the selection of all options.
3. The program options will be:
   a. Select 5 character buffers of 256 characters to be transmitted in any order.
   b. Load any of the character buffers. An automatic line feed/carriage return will be inserted in the buffer by an operator selected count.
   c. Transmit RTTY from a program FIFO buffer with an unlimited size.
   d. Transmit an SSTV picture on RTTY. The SSTV picture will be entered by the SSTV enhancement program which will be published in early 1978.
   e. Receive RTTY Baudot code and route the RTTY to either the computer system's TV screen or an SWTPC PR-40 printer.
   f. Select RTTY receive or transmit rates continuously variable or at 4 fixed speeds of (60, 67, 75, or 100 w.p.m.)
4. The program will include the design of an RTTY AFSK modulator and the modification of a Flesher Corporation's DM-170 RTTY demodulator. Both units will interface to an SWTPC 6800 computer parallel port.

If you have questions regarding this outline, please address them to Mr. Clayton W. Abrams, K6AEP, 1758 Comstock Lane, San Jose, CA. 95124.

It will be interesting to see how all the action undertaken by Clay and other "computer types" gets resolved as time goes on and amateurs everywhere acquire more and more computers. The problem of adapting programs designed for one make of computer, for some other manufacture, will provide fun filled evenings all over the globe!

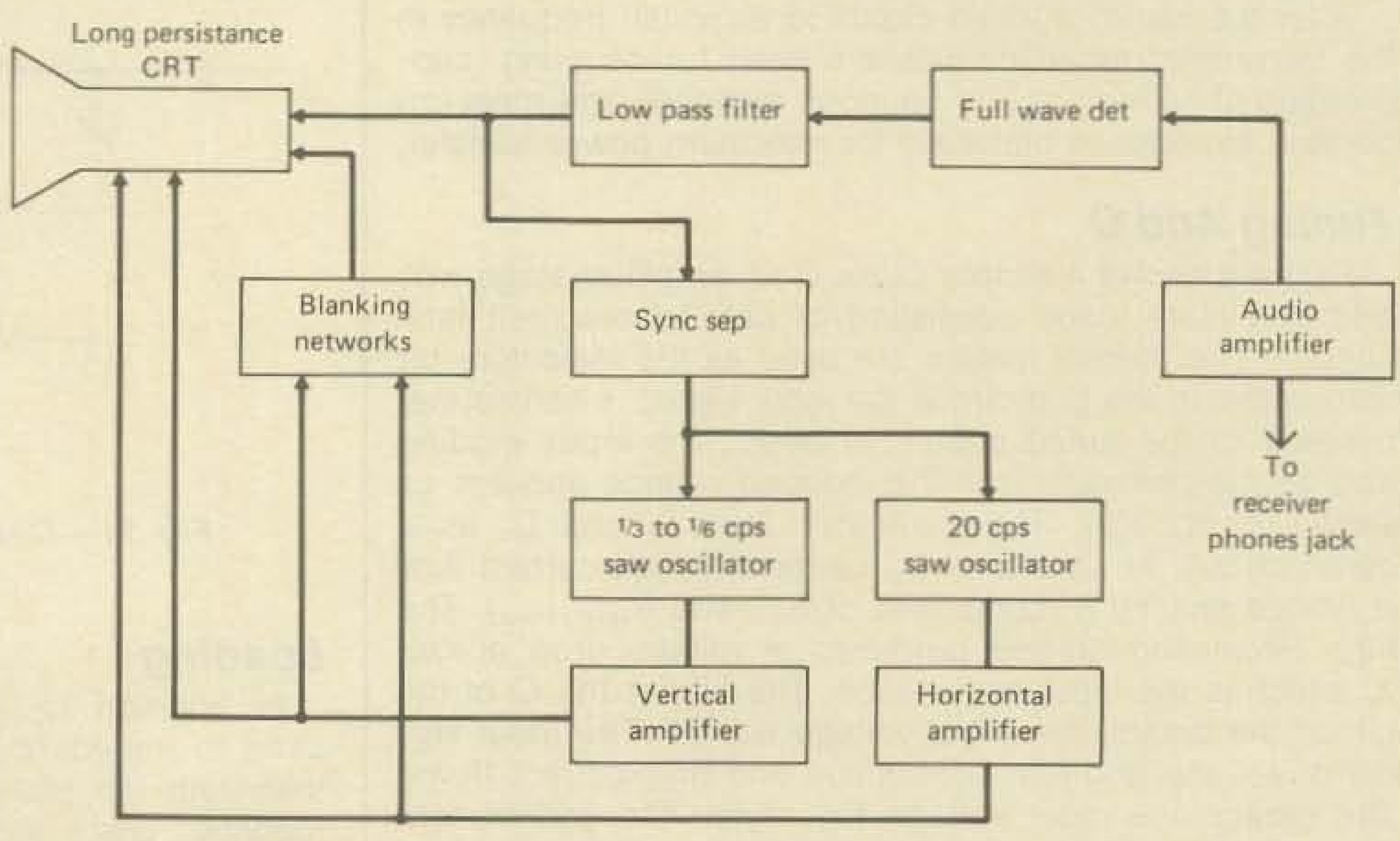


Fig. 3—Cop Macdonald's block diagram of his original SSTV receiving adapter unit as it appeared in his invention report.

Morse-A-Letter Rides Again!

About a year ago, *Popular Electronics* carried an article by Dr. George Steber, WB9LVI, regarding the visual display of received c.w. George's design provides an excellent means of learning the code by combining both the sight and sound for the student. Russ Sievert, W8OZA, has been selling p.c. boards and kits for the *Morse-A-Letter* design for some time. A later article in *Popular Electronics* described how to add a TV typewriter feature to

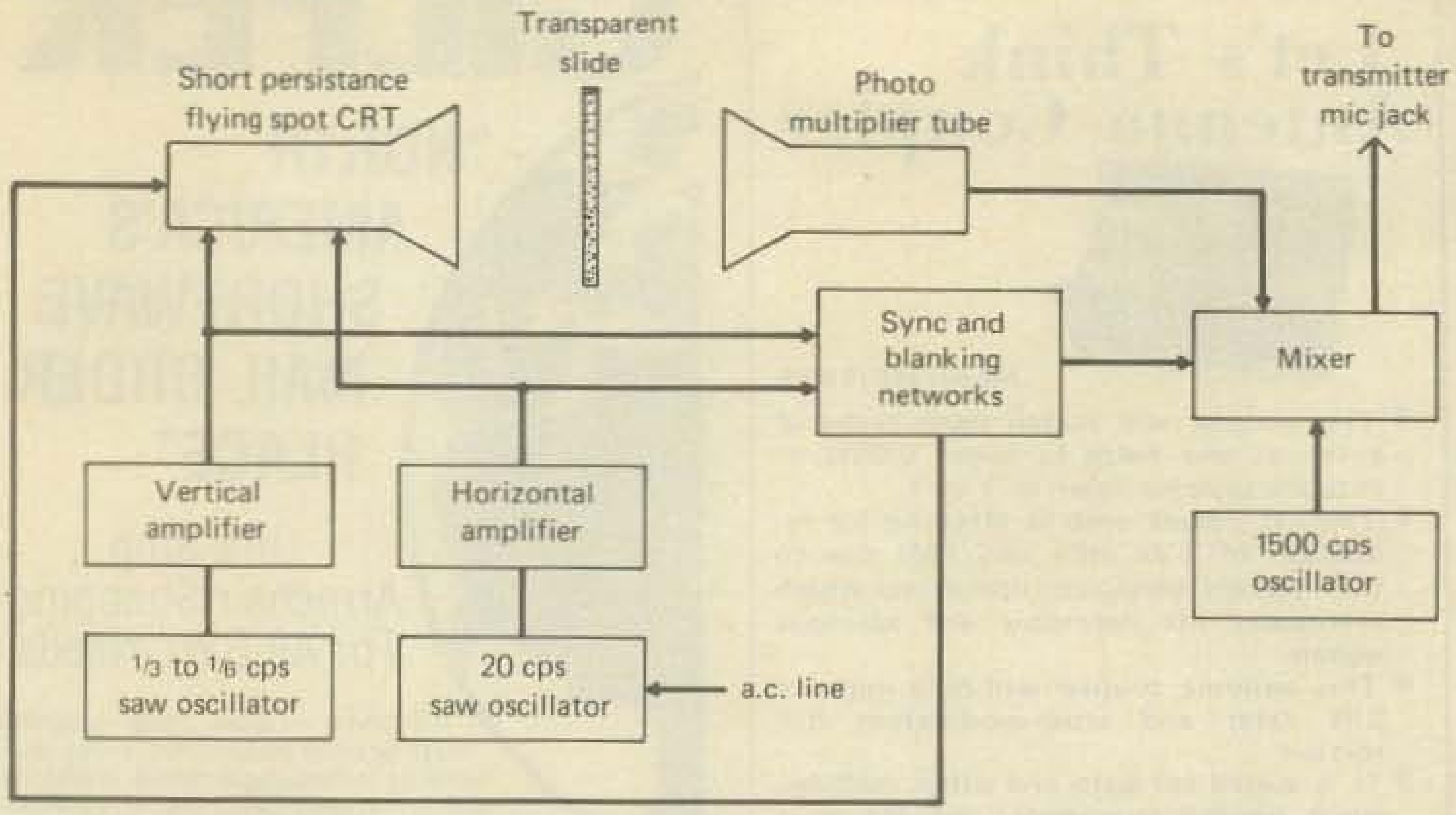


Fig. 4—From the same report, Macdonald's transmitting adapter unit using a flying spot scanner and a 1500 Hz. AM modulated sub-carrier to produce the video signal.

the *Morse-A-Letter* device so that received c.w. could be seen a "page" at a time on the screen of a video monitor.

Russ recently added the TV feature to his own *Morse-A-Letter* unit and sent us a picture of the result. See fig. 1. Pretty neat, eh? If you think that video displayed c.w. could be fun for you, write to Russ Sievert, W8OZA, 1411 Lonsdale Road, Columbus, Ohio, 43227 for more details.

Ten Meter SSTV? 15 Meter SSTV? Yes! Yes!

You skeptics out there on 14230.0000 kHz. should take a look at some of the beautiful pix coming through on 28.680 and 21.340 these days. AND, if you DON'T see any SSTV coming through, TRY a *CQ*. Don't just tune away (back to 14230.0000) without making a transmission! HR2HH is on 28.680 every Saturday and Sunday, and there's plenty of European DX on both ten and fifteen.

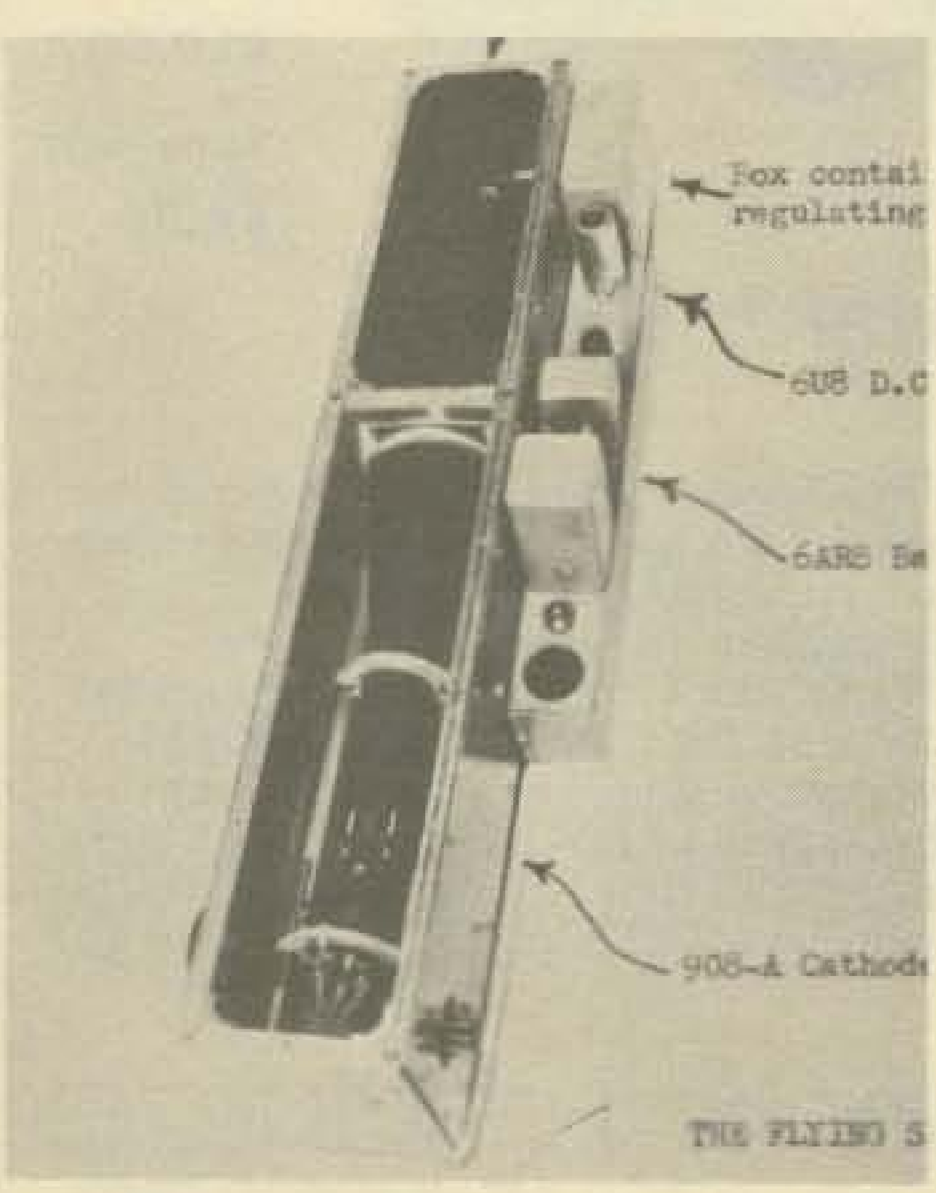


Fig. 6—Flying spot scanner built and used by Macdonald in his early experiments. A very compact job!

British Slow Scanners On BBC Show!

Bert Uppington, G2BAR, was asked by the BBC to demonstrate amateur SSTV on a BBC "Magazine" type TV program last December. Bert enlisted

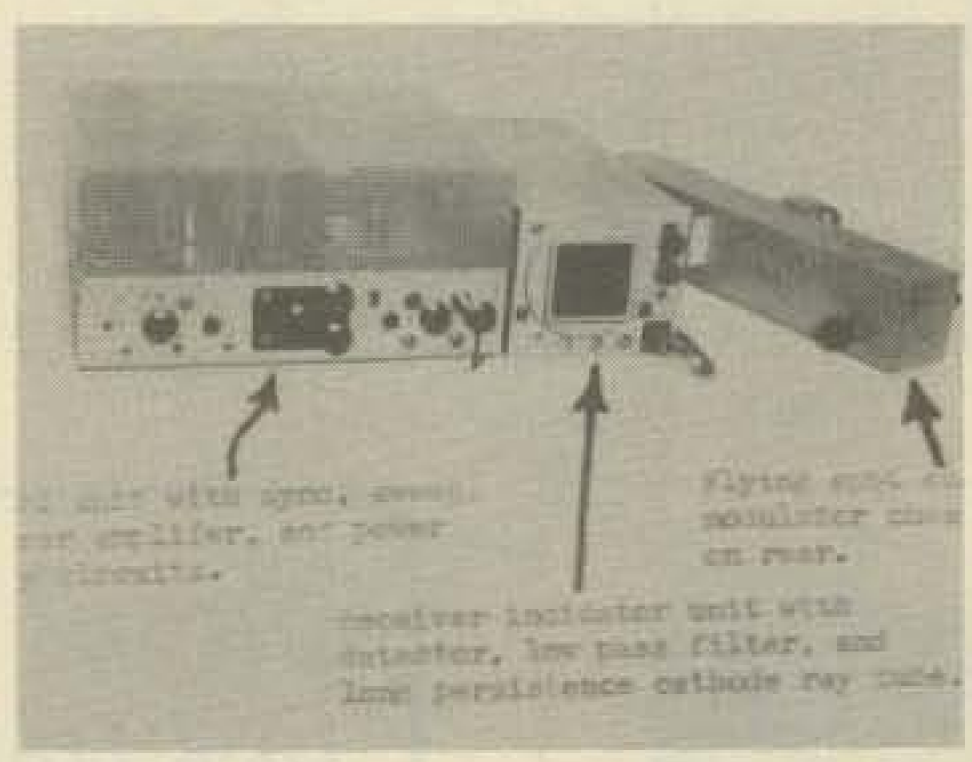


Fig. 5—Here's the whole works. At the left is the control unit plus power supply, the monitor proper with its radar Type P-7 screen is in the center, flying spot scanner at the right. Beautifully constructed gear!

the help of Richard Thurlow, G3WW, J.E. Priddy, GM3CIG, and Jim Robinson, G3IAI to assist him in producing a "live" demonstration of slow scan TV.

A letter from G3WW indicates that the demonstration was an overwhelming success — and with the planning that went into it—it's no small wonder!

G2BAR installed his Robot 400, Collins S-line, and a linear amplifier in the huge BBC studio. A vertical antenna was placed on the roof of the building. There was an over-the-air rehearsal about a week ahead of the actual program.

At the appointed hour, the demonstration went off like clockwork with G3WW answering G2BAR's SSTV CQ. GM3CIG and G3IAI made video tapes of the show.

As the final touch to this great PR job for amateur radio and SSTV, the *Cambridgeshire Times* ran the accompanying picture of G3WW, taken during the program. See fig. 2.

Congratulations to all concerned for giving the public a very good look at how amateur slow scan television works!

More About Slow Scan's Earliest Days
Macdonald's First SSTV System

In answer to requests from many "In Focus" readers, here are more details on Cop Macdonald's early work in developing the slow scan system we use today.

"A Communications First"

Macdonald's work in 1957 and 1958 produced the first slow scan TV system designed and built for use with voice bandwidth radio communications circuits.

The First System Used An AM Subscriber—FM Came Later

As shown in figs. 3 and 4, Macdonald's very first system used a flying spot scanner plus appropriate synch and scanning circuits to produce a 1500 Hz. amplitude modulated signal representing the brightness characteristics of the televised object. The modulated oscillator frequency was later changed to 2000 Hz. and other changes were incorporated as mentioned later in this article.

Photographs of Macdonald's original equipment are shown in figs. 5 and 6. Actual off the air photographs of very early picture transmissions are shown in figs 7 and 8.

Signal To Noise Ratio A Problem, FM To The Rescue

As Macdonald proceeded with his early slow scan experiments, it became evident that fading and "noise" were really messing up the pictures.

To maintain a good synch signal level during fading conditions, the synch modulation percentage had to be about double that for BLACK. Consequently, the picture information (modulation) level over the range from black to white was far lower than desireable.

After a series of on-the-air (and closed circuit tests introducing audio tone interference on the AM versus FM systems) Macdonald demonstrated in 1960 that an FM subcarrier offered the advantages of a better quality picture in the presence of heterodyne interference, a less snowy picture during weak signal conditions, and improved immunity to fading. This work was reported in an excellent two-part article in the January and February 1961 issues of *QST*.

The standards in use in today's SSTV system are the direct result of the pioneering work described above.

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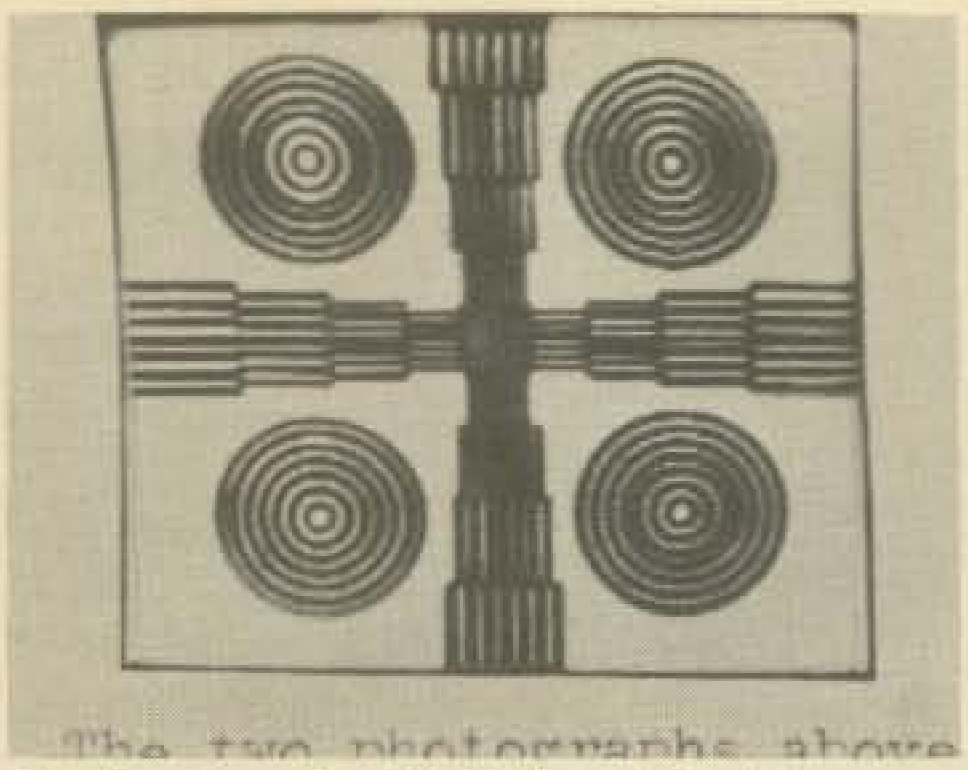

Fig. 7—An actual "off-the-air" photograph of a test pattern used by Macdonald.

We'll have another vignette of Macdonald's early SSTV work in an upcoming issue.

Getting Started In SSTV— Some Frequently Asked Questions

Hardly a week passes that yours truly fails to receive two or three letters asking about getting started in SSTV. The most frequently asked questions are: "What do I need to see slow scan pictures?" — "What does a monitor cost?" — and, "Where can I get a monitor?"

What You Need

Assuming that you have a receiver that will satisfactorily receive SSB voice transmissions, all you need to start enjoying the super-fun of SSTV pictures is a P-7 monitor. (The term P-7 represents the long persistence phosphor

Fig. 8—This "girl's head" photograph provided Macdonald with another test pattern. This is an "off-the-air" picture too.

used in the monitor cathode ray tube.)

The audio output of your receiver is fed into the monitor and, *voila*, you see the SSTV pictures on the P-7 screen. They appear as transitory images coming down the screen every 8 seconds like a radar sweep.

If your interest in SSTV warrants it (and you can afford it) it's possible to view received SSTV pictures on a regular black and white TV set by the use of a scan converter. This approach is much more expensive.

Monitor Costs—PC Boards And Scope Conversions

There are several approaches to acquiring a monitor. You can convert an old oscilloscope at a cost of $15 to $50 depending upon what the scope costs etc. If you're a builder, this can be a rewarding and inexpensive project.

Another approach is to buy an SSTV monitor basic PC board from W6MXV or WA9MFF and build your monitor around that. Depending upon what components you already have on hand, going this route will probably cost you from $100 to $175. I do NOT advise this approach unless you are an experienced builder AND have lots of the right ICs and other parts on hand, period.

Monitor Costs—Used Monitors

Good used monitors can sometimes be found at a hamfest, in stock at some of the larger mail order houses, or via used equipment ads.

Like everything else, their prices vary with age and condition. I've seen some terrific buys at hamfests, but with the growth of interest in slow scan, demand seems to have exceeded the supply and prices have firmed up a bit. If you can find a good clean Robot Model 70A/B/C or a Venus Scientific Model SS-2 for around $150, I'd say that's a good buy.

If you contact a dealer, be sure to specify whether or not you have a trade-in because your best price will be on a cash, no-trade basis.

(Continued on page 92)

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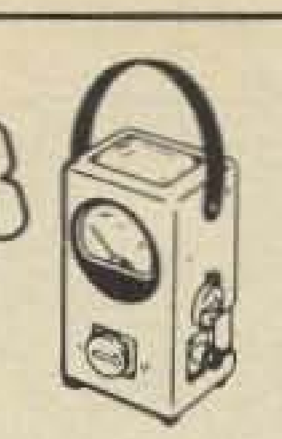

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100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
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2500 watts	2500H				
5000 watts	5000H				

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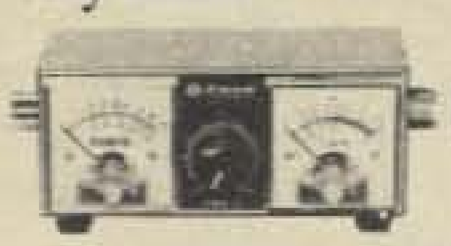

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SWR-1 guards against power loss! If you're not pumping out all the power you're paying for, our little SWR-1 combination power meter and SWR bridge will tell you so. You read forward and reflected power simultaneously, up to 1000 watts RF and 1:1 to infinity VSWR at 3.5 to 150 MHz.

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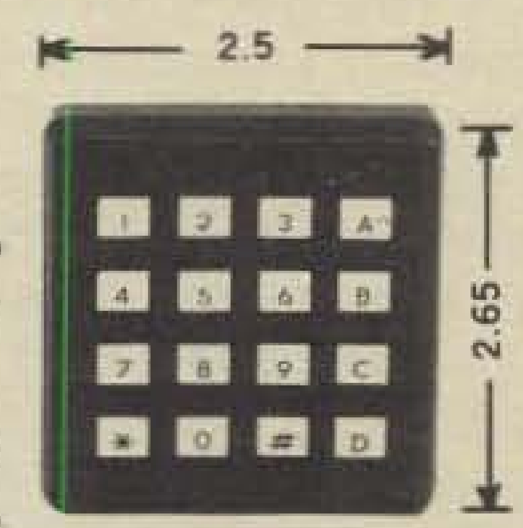
M series is for mounting to surfaces inaccessable from the rear: walls - mobiles - systems interface - panels - test equipment, etc.

K series is self contained with a relay inside the encoder. When Keys are pressed contact closer occurs with a 2 sec. delay, (adjustable). Contacts are rated at 110ma @ 28 Volts switched, 500ma carry. PP-2K contains delay exclusion for the forth column. However, by jumpering D-5, 4th column delay is restored.

Pipo Communications has developed a trouble free reliable instrument to be free of any defects for years. Unit is constructed with the best components available, without compromise in quality. Unit is operable from 4.5 - 60 Volts at temperatures from below 0 to + 140°F. Output level will drive any transmitter or system. Adjustable output level is controlled with an extremely stable multiturn trimpot, with access from the front of the encoder (not behind), saving time for level setting, which amounts to hours when involved with a system.

PP-1 $55 12 Keys
PP-1m $56
PP-1K $66
PP-2 $58 16 Keys
PP-2m $58
PP-2K $69
PP-1A $66 For Standard Comm. Hand Held



PP-2

TRIPLETT

- General Multi-purpose V-O-Ms
- Drop Resistant
- Hand Size
- Model 310 V-O-M
- Type 3

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2. 20,000 Ohms per volt DC and 5,000 Ohms per volt AC; diode overload protection with fused Rx1 Ohms range.
3. Single range switch; direct reading AC Amp range to facilitate clamp-on AC Ammeter usage.

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DC Milliamperes: 0-6-60-600 at 250 mV.
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Math's Notes

A look at the technical side of things

While looking through some miscellaneous notes we have collected through the years, we came across some "rule-of-thumb" type data that we thought would be of interest to our "home brewing" readers. Every experimenter has often needed some help at various times and it is hoped that this data will prove useful.

WIRE SIZES

When wiring electronic circuits, the question often arises as to what size of wire to use for specific portions of the circuit being built. Too small a gauge will result in undesired voltage drops while too large a gauge will often be unwieldy and overly costly. To help solve this problem, we now present several suggestions and table indicating useful parameters for most common wire sizes used by experimenters.

POWER CORDS

All of the following data is based upon U.L. and the National Electrical Code. Line voltage is assumed to be 115 v. and the maximum voltage drop at rated current is 10 volts. Values are for common rubber covered power cable.

SLUG TUNED COILS

The use of slug-tuned coils is well known to the amateur. They are the "backbone" of almost everything he builds. Unfortunately most experimenters just simply wind coils according to instructions in various construction articles, or completely by cut and try. The information given here should make the task of winding such coils a simpler, less haphazard manner.

Slug tuned forms come in many sizes, shapes, etc. To keep matters simple however, we will only concern ourselves with ¼" diameter (actually .260), ⅜" diameter (.375") and ½" diameter forms (.500"), as these are the most popular. In the charts that follow, as much information as possible is given and the data should be used as a starting point for your particular needs. Final values will, of course, depend on the core used and exact coil dimensions. All data assumes common ferrite cores (even though these vary greatly) and ceramic forms but plastic forms of the proper diameter should work as well. In cases where odd wire sizes are specified, do not hesitate to use the next larger or smaller even wire size if you cannot obtain the correct size. At the least, these charts will get you "into the ballpark" and a minor modification will be all that is necessary to achieve the desired results.

PRINTED CIRCUIT CONSIDERATIONS

Everyone designing printed circuits is usually aware of the importance of part layouts for reducing pickup or the use of large ground plane areas to increase shielding. What is not commonly known however, is what size to make the connecting lands, or how far apart to space them. The two following charts should answer these questions.

The previous "hints" should prove useful for the various projects that come up and we will be glad to pass along more such data if our readers request it.

73, Irwin, WA2NDM

Bibliography:

Belden Wire Handbook
Nation Electrical Code 1974
Cambion RF Coil Handbook

*5 Melville Lane, Great Neck, 11020

CONDUCTOR WIDTHS						
2 oz. copper	.010"	.019	.046	.078	.125	.218
1 oz. copper	.015"	.032	.078	.112	.156	.312
Amperes	1	2	3	4	5	10

CONDUCTOR SPACING							
Conductor Spacing	.01	.011	.013	.015	.062	.125	.156
Volts	5	10	25	50	120	220	440

SUGGESTED AWG SIZE FOR POWER SUPPLY CORDS

Cord Length**	Current (amperes)** 1 or less	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25' or less	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
50	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
75	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
100	18	18	18	18	18	18	18	16	16	16	16	16	14	14	14	14	14	14	12	12	12	12	12	12	12
125	18	18	18	18	18	18	16	16	16	14	14	14	14	14	14	12	12	12	12	12	12	12	12	12	12
150	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12	10	10	10	10	10

Inductance L (μH)		Q Measured at Frequency MC	Minimum Q at Inductance		d.c. Resistance Maximum Ohms	Mean L	SRF Minimum MC	Wire Size AWG and Approximate Number of Turns
min.	max.		min.	max.				
.090	.110	25.0	70	95	.02	.10	500.0	18 3 turns
.108	.132	25.0	55	90	.04	.12	500.0	23 3 turns
.130	.170	25.0	70	95	.03	.15	450.0	22 4 turns
.156	.205	25.0	80	95	.03	.18	450.0	23 4 turns
.173	.272	25.0	70	95	.04	.22	425.0	25 5 turns
.230	.315	25.0	90	95	.06	.27	400.0	28 5 turns
.280	.380	25.0	90	95	.07	.33	380.0	27 7 turns
.330	.450	25.0	90	95	.08	.39	330.0	26 8 turns
.400	.540	25.0	90	95	.08	.47	280.0	29 8 turns
.475	.650	25.0	90	95	.09	.56	240.0	30 8 turns
.575	.780	25.0	95	100	.10	.68	220.0	30 9 turns
.695	.940	25.0	100	100	.11	.82	200.0	30 10 turns
.850	1.150	25.0	100	85	.13	1.00	180.0	30 13 turns
1.020	1.380	7.9	80	85	.14	1.20	170.0	31 14 turns
1.280	1.780	7.9	90	85	.16	1.50	140.0	30 15 turns
1.520	2.070	7.9	80	90	.16	1.80	130.0	30 17 turns
1.860	2.540	7.9	80	85	.17	2.20	110.0	30 18 turns
2.240	3.160	7.9	80	85	.19	2.70	90.0	30 21 turns
2.730	3.850	7.9	85	75	.21	3.30	90.0	30 25 turns
3.250	4.550	7.9	80	65	.24	3.90	80.0	30 25 turns
3.900	5.500	7.9	80	60	.38	4.70	70.0	30 26 turns
4.650	6.500	7.9	80	90	.65	5.60	65.0	10/44 28 turns
5.600	8.000	7.9	75	75	.65	6.80	60.0	15/44 37 turns
6.800	9.600	7.9	75	75	.75	8.20	50.0	15/44 40 turns
8.200	11.700	7.9	80	80	1.00	10.00	50.0	12/44 43 turns

Fig. 1—Specifications for 1/4 inch coils (table above, illustration left).

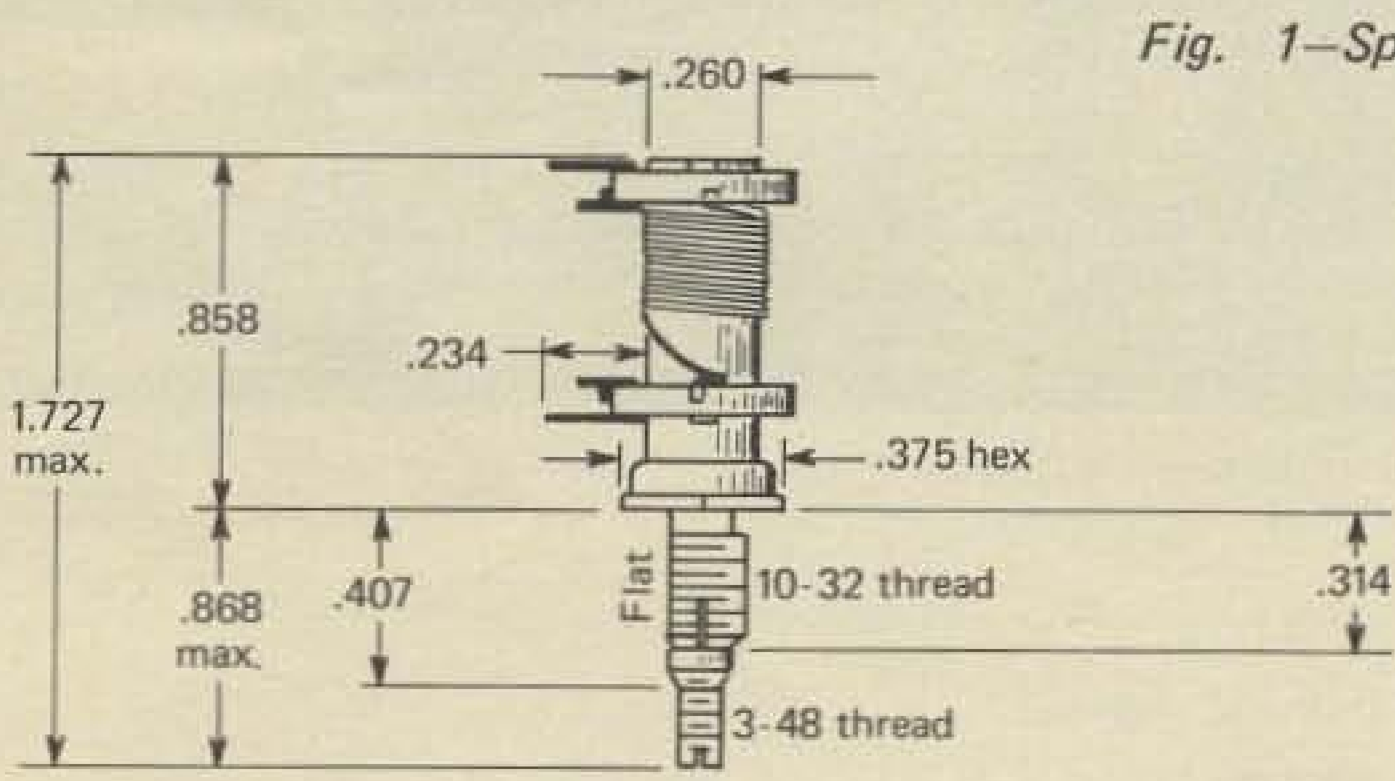
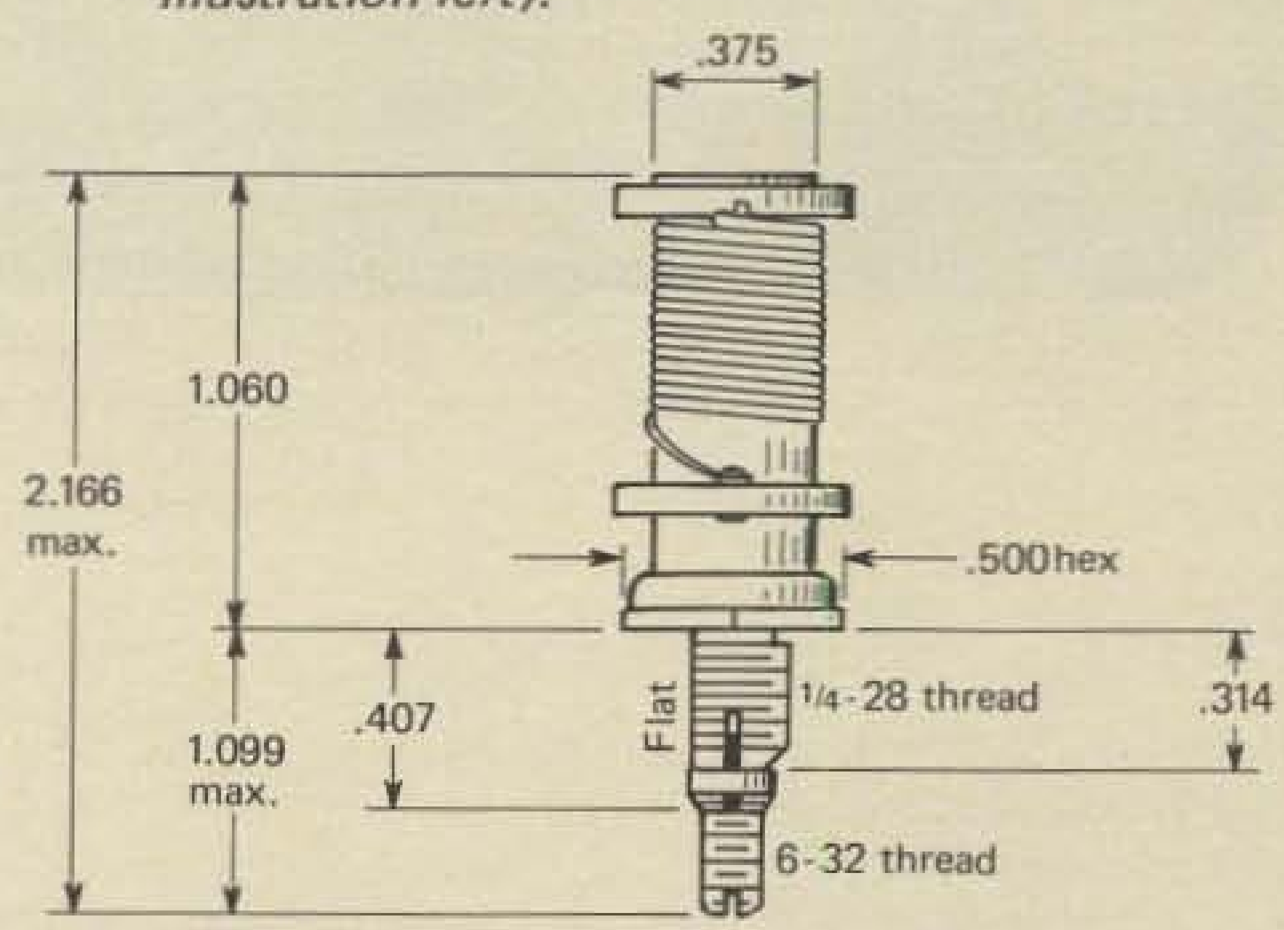
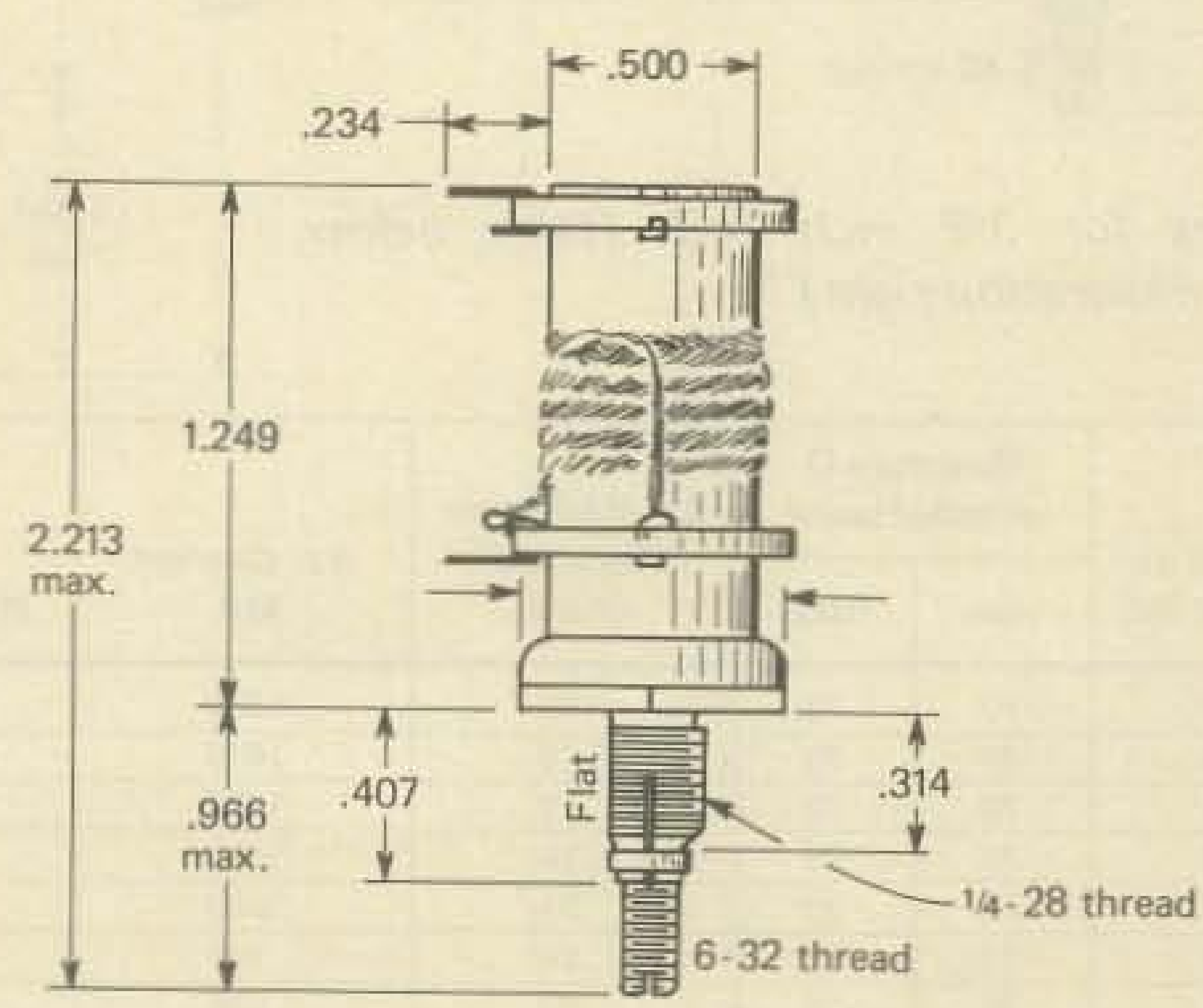


Fig. 2—Specifications for 3/8 inch coils (table below, illustration right).



Inductance L (μH)		Q Measured at Frequency MC	Minimum Q at Inductance		d.c. Resistance Maximum Ohms	d.c. Current MA	SRF Minimum MC	Wire Size AWG and Approximate Number of Turns
min.	max.		min.	max.				
2.17	3.25	7.900	70	70	.08	1630	100.0	24 18 turns
2.64	3.96	7.900	70	70	.10	1630	94.0	24 22 turns
3.15	4.70	7.900	70	70	.12	1290	85.0	25 22 turns
3.80	5.70	7.900	75	75	.19	1000	75.0	26 24 turns
4.50	6.80	7.900	70	70	.21	1000	72.0	26 28 turns
5.40	8.20	7.900	70	70	.26	805	65.0	27 30 turns
6.50	9.80	7.900	75	75	.30	635	60.0	28 33 turns
8.00	12.00	7.900	70	70	.40	635	55.0	28 38 turns
9.60	14.90	2.500	60	60	.60	317	45.0	31 38 turns
12.80	19.00	2.500	80	80	1.00	217	28.0	7/41 Litz wire 37 turns
14.40	21.50	2.500	80	80	1.10	217	26.0	7/41 Litz wire 41 turns
17.60	26.50	2.500	80	80	1.20	217	23.0	7/41 Litz wire 44 turns
21.50	32.50	2.500	80	80	1.45	217	21.0	7/41 Litz wire 51 turns
26.50	39.50	2.500	85	85	1.55	217	20.0	7/41 Litz wire 60 turns
31.50	47.00	2.500	85	85	1.75	217	19.0	7/41 Litz wire 70 turns
38.00	56.00	2.500	85	85	1.85	217	16.5	7/41 Litz wire 74 turns
45.00	68.00	2.500	80	80	2.20	217	15.5	7/41 Litz wire 79 turns
54.00	82.00	2.500	80	80	2.50	217	14.0	7/41 Litz wire 89 turns
65.00	98.00	2.500	80	80	3.00	217	12.5	7/41 Litz wire 100 turns
80.00	120.00	2.500	75	75	3.00	217	11.5	7/41 Litz wire 115 turns
96.00	144.00	.790	75	75	3.50	217	9.0	7/41 Litz wire 127 turns
128.00	180.00	.790	80	80	4.00	217	8.5	7/41 Litz wire 140 turns
144.00	215.00	.790	80	80	4.50	217	7.6	7/41 Litz wire 155 turns
176.00	265.00	.790	85	85	5.00	217	6.7	7/41 Litz wire 170 turns



Inductance L (μH)		Q Measured at Frequency H2	Minimum Q at Inductance		d.c. Resistance Maximum Ohms	d.c. Current MA	SRF Minimum MC	Wire Size AWG and Approximate Number of Turns	
min.	max.		min.	max.					
40.0	55.0	2.5	145	120	1.20	240	11	15/44	52 turns
10.0	15.5	2.5	140	110	.60	256	34	32	32 turns
2.6	3.6	7.9	145	120	.20	1000	65	26	16 turns
1.2	1.6	7.9	180	170	.10	2560	110	22	11 turns
.7	.9	25.0	185	175	.07	2560	125	22	7 turns

Fig. 3—Specifications for 3/4 inch coils.

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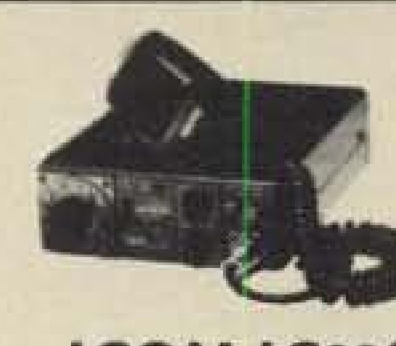

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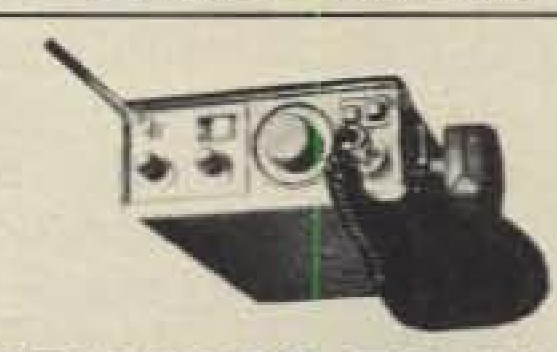

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DX

News of communications around the world

The column preparation period for the April issue found the DX Department deluged with a near-record number of WAZ applications and correspondence. Our DX Editor, K4IIF, has gone to Japan on an emergency business trip. When John screamed for help he was rescued by Billy Williams, N4UF, an experienced DX writer who edits the North Florida DX Association News. Billy wrote the DX column for this issue and we're sure you will enjoy it. John, K4IIF, will be back in the May issue, hopefully with the backlog of WAZ applications all cleared up and the latest news from JA-land.

Billy, N4UF, is a veteran of the successful North Florida DX Association contestpeditions to VP5-land, and was a member of the group operating from Haiti during the 1977 CQ Worldwide Phone Contest. The following is Billy's Input.

Effective October 12, 1977, it became legal, once again, to pursue amateur radio as a pasttime in the Republic of Haiti. Through the efforts of the "old timers" in that Caribbean nation, the Haitian Amateur Radio Club was formed with the resumption of licensing. An amateur, very active in the campaign to relicense amateurs, Mario Craan HH2MC, was chosen as president of HARC. Other officers include Victor Lemoine, HH2V, Secretary and Claude Lebreton, HH2CL, Treasurer. Another very active member of the group is Fritz Joasin, HH2FJ.

At a recent meeting of the North Florida DX Association, where he was elected to honorary membership, Mario detailed plans for licensing in Haiti. He spoke of being involved with emergency communications via amateur radio in 1959; of amateur radio being "people" and not a business. As a goal, HARC will assist the military in training new personnel in proper communications procedures and improving the very primitive means of communications on the island. Future plans include repeater systems, in the hope that they will link remote areas of the island together.

*911 Rio St. Johns Drive
Jacksonville, FL 32211

Reciprocal licenses will be made available to amateurs visiting from other countries, but Haitian citizens will have to pass Morse code and theory exams before being allowed to operate. "We want them to know what being a radio amateur is all about before licensing them," said Mario. The ARRL through its Southeastern Director Larry Price, W4RA, is working with HARC to set licensing guidelines and these should be released later.

The first group to take advantage of the new licensing system was the North Florida DX Association based in Jacksonville. Through the work of its president Bill Walker, WB4EYX, and project chairman Ham Robinson, W4-ZR the necessary documents were obtained in time for the CQ World Wide phone contest, a task which was not easy as many letters were written and phone calls placed to make the necessary arrangements. Under the watchful eye of the Haitian government, the 11 Americans were allowed to conduct the first legal large scale contest operation since 1970.

Sabro Kawakatsu, JA3DX, is a recent winner of the CQ Single Band WAZ award. Sabro has moved and would like his DX friends to know that his new address is 429-2 Nishikawara-Cho, Iwakura, Sakyo, Kyoto, 606 Japan.

Receiving very courteous treatment from Haitian officials, the group made its way to Cap Haitien by bus and scored just short of 10 million points. More importantly, amateur radio was showcased for government officials to observe. NFDXA's trip was described as an "experiment" by government authorities. HH2MC bent over backwards to aid the DXpedition in any way he could and his help will always be remembered as will be his reputation as a first-class amateur operator and DXer.

An NFDXA, c.w. diehard, George Werner W4ORT returned to Port-Au-Prince for the CQ World Wide CW weekend where he operated under HH2DX from Mario's mountaintop QTH. Unfortunately George was hampered somewhat by Murphy as his bags were lost on the flight over and he endured one of Haiti's most torrential downpours which left the city without power for 12 hours during the middle of the contest. Despite the obstacles, HH2DX made over 2,200 QSOs mostly on 20 and 15 meters. The logs included 28 QSOs on 160 meters and 137 on 80. Power limits in Haiti are 1,000 watts p.e.p. except on 80 where the limit is 150 watts.

Haiti should now be very active with HH2MC, HH2V, HH2RS and a host of others. Mario's QSL manager is WA4-AKU who gives very prompt service. One interesting note: George's biggest gripe was not with Murphy during his HH2DX operation, but with the many who worked him twice and even three times on the same band. A majority of them were amateur extras with two-letter calls according to ORT.

Awards

A challenging award, especially for West coasters, is the Worked All Europe (WAE), issued by the Deutscher Amateur-Radio-Club (DARC). This nice ceritficate is available to amateurs for contacts with almost all European countries and islands on different amateur bands. WAE is also available to SWLs on a "heard" basis. The WAE I is the most difficult as 55 countries from the DARC official list of 66 are needed, along with 175 points. For stations outside of Europe, each valid country QSLed counts for 1 point on 40 thru 10 meters and 2 points on 80 and 160 meters. Only four bands per country are eligibile for point score.

The WAE II requires 50 countries and 150 points, with the WAE III qualification set at 40 countries and 100 points. QSLs for all contacts must be submitted with the award application. WAE is issued for 2-way CW contacts and for exclusive telephony contacts. Holders of WAE I get a special badge. The fee for basic awards is $3 U.S. More information is available from the DARC DX-Awards; P.O. Box 262; D-895 Kaufbergen; Germany (FRG). Included is a nice matrix for keeping track of your countries and points.

The DARC list closely follows the DXCC list except that Sicily (IT) and JW (Bear) are separate countries and of course the TA contact must be from the European sector of that country.

The "What Is A Country" Scene

The American Radio Relay League has evidently taken a "hands off" approach with regard to recognizing new countries in Africa for DXCC purposes. Citing the stakes of WARC as being too high to "rock the boat" in Africa, League General Manager, Richard Baldwin, has put a hold on further DXCC countries additions from Africa for now. "A favorable decision in 1979 far transcends any immediate addition to the DXCC list," according to Baldwin. A personal comment: Let's hope he knows the score, some recent high-handed tactics by certain higher-up ARRL WARC personnel leave room for doubt.

Two countries most affected by this ruling are the so-called "autonomous" regions of Southern Sudan (ST0) and Bophuthatswana (H5). Other "homeland" republics in Africa will no doubt open up and eventually they will all probably count as new ones. Best advice is the old adage, "Work 'em first, ask questions later."

The ARI of Italy has submitted a formal request for new country status for the Cheradi Islands. This island group is formed by the two islands of S. Pietro and S. Paolo, in the Gulf of Taranto, in the Ionian Sea. Supposedly, the islands qualify because they have a distinctly separate administration from that of the Department of the Interior which administers other Italian territories. St. Peter was active from July 22-August 2 under the call of IJ7EX. In fact the IJ7 prefix has been permanently assigned to this island group. Accompanied by extensive documentation, the ARI proposal should be considered carefully by DXAC.

Another "Trick of the DX Trade"

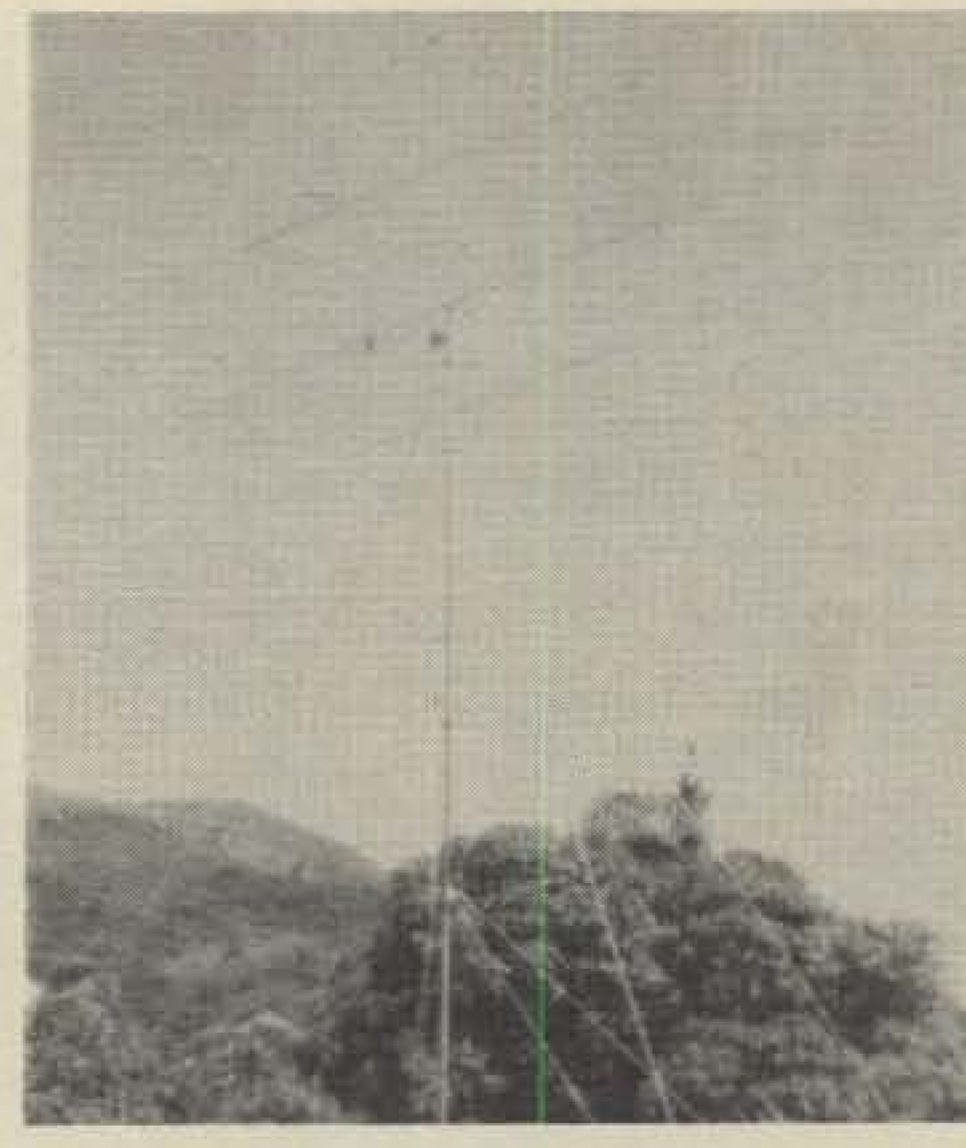
Our h.f. bands provide 2.3 mHz of spectrum for us to listen for that rare DX station, however a good DXer will concentrate his or her monitoring activities on a small percentage of the available bandwidths. Of course, the class of license of the operator will narrow available choices but by knowing where the DX congregates, one can maximize results. As part of a continuing update, I watch the DX tipsheets, and my own logs, to note where to listen. Some frequencies are so popular, they could be termed DX calling frequencies. Although patterns of band usage change from time to time certain trends are evident, and by following these guidelines a DX Louie may become somewhat less red-eyed.

The table shows the most popular band segments for working DX with best single frequencies listed also.

80 Meter CW—3.500-3.520 mHz.
Common Frequency—3.503 mHz.

The W1TX 160 Meter Inverted L Antenna. Note the loading coil wrapped around the tree trunk. (W1BB photo)

40 Meter CW—7.000-7.035 mHz.
Common Frequency—7.005 mHz.
20 Meter CW—14.000-14.050 mHz.
Common Frequency—14.030 mHz.
15 Meter CW—21.005-21.050 mHz.
Common Frequency—21.030 mHz.
10 Meter CW—28.010-28.060 mHz.
Common Frequency—28.025 mHz.
75 Meter Fone—3.615-3.630 mHz.
Common Frequency—3.630 mHz.
3.685-3.700 mHz.
Common Frequency—3.695 mHz.
3.780-3.815 mHz.
Common Frequency—3.797 mHz.
40 Meter Fone—7.075-7.100 mHz.
Common Frequency—7.090 mHz.
7.190-7.200 mHz.
Common Frequency—7.195 mHz.



15 Meter beam installation at HH5HR. Unfortunately, the mountain range is between the antenna and the JAs. (WB4EYX photo)

20 Meter Fone—14.190-14.195 mHz.
Common Frequency—14.194 mHz.
14.200-14.270 mHz.
Common Frequency—14.210 mHz.
15 Meter Fone—21.235-21.245 mHz.
Common Frequency—21.240 mHz.
21.265-21.375 mHz.
Common Frequency—21.280 mHz.
Common Frequency—21.355 mHz.
10 Meter Fone—28.520-28.620 mHz.
Common Frequency—28.565 mHz.

From the frequencies listed, the amateur extra privileges are most valuable on 75 meter phone. Likewise, a general has the best shot on 10 and 15 meter phone. There seems to be a very large concentration of DX stations just above the general class band edge on 15 at about 21.355; so if you only have a general and like phone DX, this is by far your best bet.

On CW, the extra 25 kHz. segments

Bill Beggs, N5RR (Left) and Ron Blake, N4KE (Right) install masts atop the Hotel Roi Christophe in Cap Haitien, Haiti in preparation for HH5HR operation in the 1977 CQWW phone contest (NFDXA Photo)

Dewey Treanor, KØSVX, represents the Eastern Iowa DX Association on the CQ DX Awards Advisory Committee. Dewey has 240+ countries worked and is closing in on WAZ. He works for Collins Radio in Cedar Rapids.

for Amateur Extra Class ticketholders are not as valuable on other bands as on 80 meters. Although some split frequency operation is used by DXpeditions and other forms of rare DX, it seems to be on the decline except on 40 and 80 meters.

And...Let's Not Forget 160 Meters

From Stew Perry, W1BB: "Sad to say that Roy Fosberg, W1TX, joined the Silent Keys recently. One of the real OOTs of 160 and a pioneer with antennas, Roy had valiantly fought a losing battle with cancer for several years. Never daunted, always full of courage and optimism, he operated 160 from the PJ9JT DXpedition as well as from his home almost 'til the end."

Roy was well known for his 160 meter DX exploits since before 1950. Stu sends along some pictures of W1TXs unusual inverted "L" antenna which worked very well on amateur radio's lowest of the low bands. The vertical portion is up the trunk of a maple tree. A base load coil is mounted on the tree trunks core. The wire then goes up the tree and onto a vertical pole on top of the tree, then horizontal to a pole atop an adjacent tree. Radials are mounted around the base of the tree and the whole antenna is fed with 50 ohm coax through a series capacitor (500 mmf mica).

As well as designing the tree antenna, Roy pioneered the use of inverted "L" antennas on 160 and their popularity is increasing today. A much better antenna than most of us realized.

Most Wanted Countries

Every DX club has its "most wanted countries" list and while the rare ones will vary slightly from one region to the other, most have been inactive for quite some time. A recent poll of members of the North Florida DX Association produced this "top 20" list:

(1) Iraq (YI)
(2) Bouvet (3Y)
(3) South Sandwich (VP8)
(4) Saudi Arabia/Iraq Neutral Zone (8Z)
(5) China (BY)
(6) Spratley (1S)
(7) Clipperton (FO8C)
(8) Burma (XZ)
(9) Heard Is. (VKØ)
(10) Kamaran (VS9K)
(11) Crozet (FB8W)
(12) Okino Torishima (7J)
(13) Malpelo (HKØ)
(14) Abu Ail (ET/A)
(15) Mt. Athos (SY)
(16) Tromelein (FR/T)
(17) Cambodia (XU)
(18) East Malaysia (9M8)
(19) Geyser Reef (1G)
(20) Bangladesh (S2)

Recently, Eric SM0AGD was allowed to make 18 QSOs from Iraq under the supervision of the government. While not a significant activity in the number of contacts, hopefully it will pave the way for future operations on a larger scale.

While on the subject of wanted countries, the club "want list" is a very important part of any DX club. The simplest way is to list current countries alphabetically, by prefix, with the calls of members needing it along side. Updates to the list can then be published in the club bulletin or circulated over club nets. As a convenience, each member's phone number, class of license, and hours to call should be listed on the front cover.

Iris and Lloyd

The Colvins had 75,000 QSLs waiting for them upon returning from a recent Caribbean DXpedition. Reportedly tied up with business matters presently, they have been heard on the air occasionally from the home QTH. The 75K cards are being filed in their famous life-time card collection which now totals 250,000. Recently inducted into the CQ DX Hall of Fame, the Colvins received several awards at a joint meeting of the Northern and Southern California DX Clubs at Fresno.

Other DX Notes

Bophuthatswana showed, as promised with H5FXT (VE3FXT) making the most noise. Signals on the West Coast reported weak but workable for many There were big pileups reported on 10 meter CW with some activity on 80 meter SSB. Other stations helping to put this one on were H5QMJ (WB9-QMJ); H5VCM (K9VCM); H5AAW (ZS6-AW); H5AMG (ZS4MG) and H5JER (7P8BC).

IN CASE YOU HAVEN'T HEARD. Geyser Reef was deleted effective March 1st making a total of 45 deletions on the official DXCC Countries List.

Congratulations to Hugh Cassidy, WA6AUD, on publishing the 500th consecutive weekly issue of the West Coast DX Bulletin (WCDXB). That's nearly ten years without missing a Saturday mailing, including one day when rushing down to work on the bulletin, he fell down the stairs and broke an ankle. His dedication shows in that fine newsletter/tipsheet of the latest happenings in DX news. For more information, write WCDXB; 77 Coleman Dr.; San Rafael, Calif. 94901.

Another operation from Fernando De Noronha may come off this month with Gerson Rissin, PY7APS heading up the effort. Gerson has been there several times before and still has logs dating back to 1967.

Prefix collectors have been busy in the past six months. The Finnish "OF" series was activated during the last half of 1977, commemorating the 50th

The CQ WPX Program

Mixed

619...JR1TNE
620...K4JYS
621...WA9OVU
622...YU2CBK
623...K5TSQ
624...N4UF
625...YU2QZ

S.S.B.

1015...I2SYG
1016...YU2CR

C.W.

1663...WB9NMN
1664...JA3ARM
1665...I5YGB

Endorsements

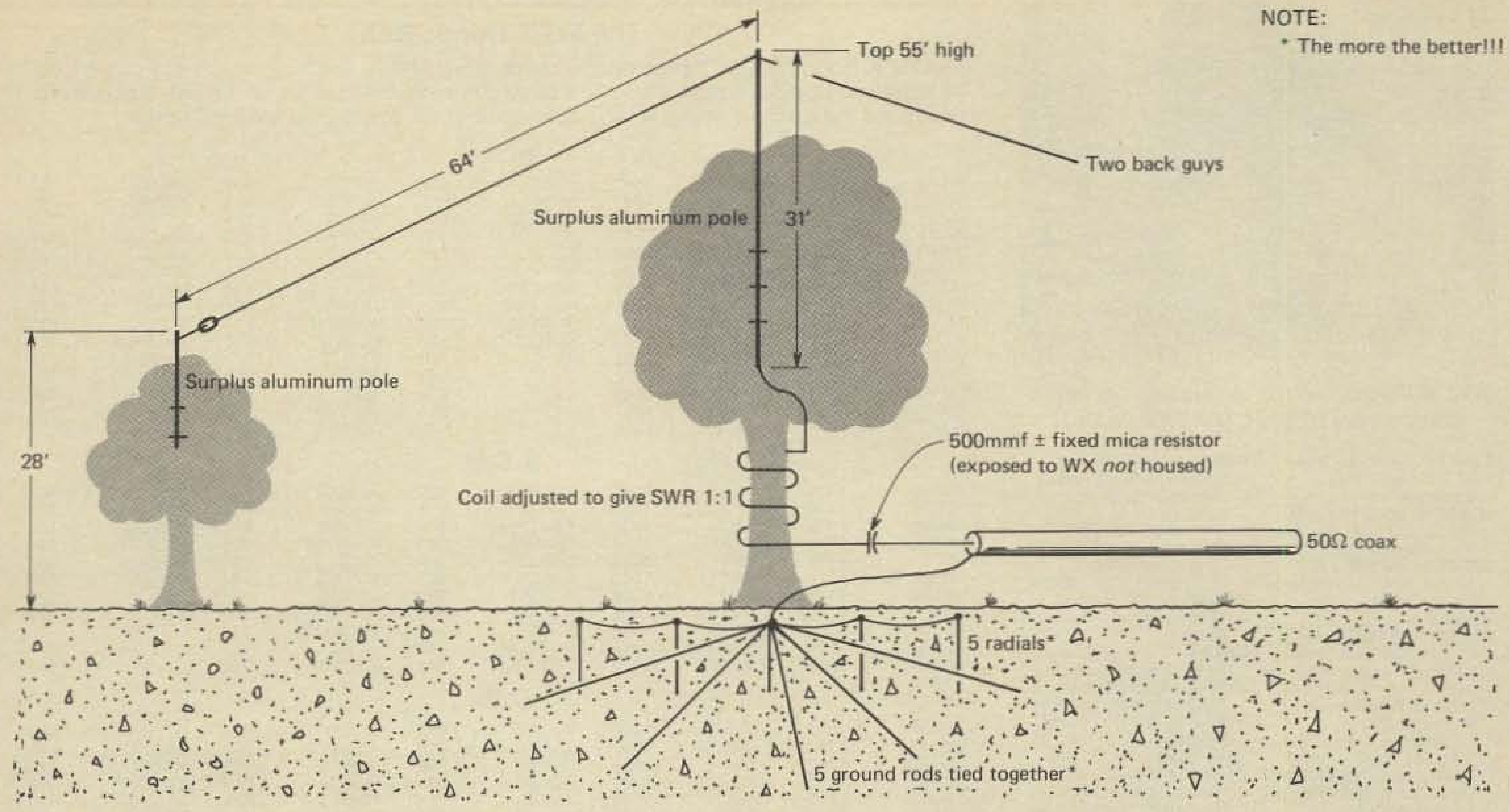
Mixed: 400 JR1TNE, K4JYS, WA9OVU, K5TSQ, 500 N4UF, 650 YU2CBK, 750 HI8LC, 800 W6ANB, 850 YU2QZ, 1050 YU2OB, 1250 WB4KZG.

SSB: 300 I2SYG, YB2CR, 350 I2OMF, 1500 W4UG.

CW: 300 WB9NMN, I5YGB, 350 JA3ARM, 500 N7UT, 550 K9UQN, WA2AUB, 650 SM6BZE, 800 PAØ-SNG, JA1BN, 1050 W3ARK.

10 Meters: YU1AG.
20 Meters: I5AFC, JA3ARM.
40 Meters: W4BQY.
160 Meters: WA2GEZ, W8IQ.
Asia: JA3ARM.
Europe: JA3ARM.
No. Am.: WB9NMN, W8IQ.

Complete rules for WPX can be found in the May, 1976 issue of *CQ* Magazine. Application forms may be obtained by sending a business-size, self-addressed, stamped envelope to "CQ WPX Awards", 5014 Mindora Dr., Torrance, Calif. 90505, U.S.A.



1—Sketch of the W1TX 160 Meter Tree Antenna. (W1BB sketch)

anniversary of the liberation of that country. From Venezuela the 4M block was active during the CQWW and HH5, HH2, CEØ, YY5, CWØ, GU4 were active during the contest periods. In addition, FG7s have been using TK7. 5L2s are still being heard substituting for EL2s. 7X4MD has been active from Algeria, and JYs from just about every call area are on the bands. TK7GAS is FG7AS in Guadeloupe and you can QSL him through Box 444.

Thanks to the following publications for material used in this column: *The DXer, DXer Magazine,* W4BPD; Geoff Watts *DX News-Sheet; Long Island DX Bulletin* (W2IYX); *Long Skip* (VE1AL/3); Totem Tabloid (WA7RVA); *West Coast DX Bulletin* (WA6AUD); *VERON DX News* (PAØTO); *160 Meter DX Bulletin* (W1BB); *NCDXC DXer* (N6GG).

Jim, P29JS, has tentative plans for a late May-early June operation from the Cocos Islands (VK9Y). With transportation and a place to stay available being the only minor problems to be solved. QSLs will be handled by Dick Hicks, K4UTE.

Rare Zones

Zone 20: Several phone stations on regularly from Greece. SV1-AE around 14.215 mHz. at 1400-1500. SV1DH also heard slightly lower at the same time. A host of YO and LZ stations available on 20 c.w.

Zone 21: Iranian amateurs very active lately mostly starting about 1200Z around 14.210. Among them, EP2EY, EP2FB, EP2-AY, EP2DD, EP2SV, and EP2NC. On 15 c.w., HZ7MC noted at 1900Z.

Zone 22: Look for VU stations who are now quite active on 20 meter fone around 14.210 mHz. Best times are 1200-1400. VU2BX noted several times around 1330 on both fone and c.w. 4S7NB heard on 14.225 at 1300.

Zone 23: JT1AN active around 14.225 mHz. at 0130Z. JT1BF worked on c.w. about an hour later on 14.027 mHz.

Zone 24: CR9AJ active in contests and on W7PHO's net at 14.225 mHz. 2300Z. On 20 CW (14-.033 mHz.), VS6GK noted about 0200Z.

Zone 26: Thai stations up on 20 s.s.b. HS1WR and HS1ALC heard around 14.227 mHz. Try around 1700 an 0100.

Zone 27: KØAX/DU2 heard on 14.218 mHz. at 0040Z and KØWIQ/DU2 noted at 14.225 mHz. at 1425Z. Other Phillipine stations include DU1MEL and DU1XRE.

Zone 28: 9M2DQ active on 80 s.s.b. at 3.800 mHz. around 2300. VR4DX at 1200Z on 3.807 mHz. On 20 meter s.s.b., 9M2DW heard at 2345Z about 14.225 mHz.

Zone 34: SU1IM on 21.025 mHz. about 1200Z. Other Sinai SU operations still active, including K4SQT/SU and WB7TKB/SU, both on 20 meter s.s.b. around 1230Z.

Zone 35: 5T5ZR active on 10 meter c.w. at 28.064 mHz. around 1600Z. VE3HRS/TZ6 heard around 2000Z on low end of 20 meters. EL2EU heard on 20 c.w. (14.018) at 0045Z.

QSL Information

A4XGY—To Bob Marsh, K2RU, 87 Sherwood Dr., Brockfort, NY 14420

A7XA to DJ9ZB—F. Langner, C Kistnerstr 19, 7800 Freiburg Breisgau, WGFR

A9XCA to W2GHK—P.O. Box 7388, Newark, NJ 07107

A9XS to WB2QHQ—C. Maier, 1660 Hone Ave., Bronx, NY 10461

AP2AD to K1KNQ—J. Rosiello, Box 95 Turnpike Station, Shrewsbury, Mass. 01545

AP2AM—To P.O. Box 8925, Karachi, Pakistan

The WAZ Program
Single Band WAZ

20 Meter C.W.

32...W0SF
33...I3OBO
34...JA8CFR

20 Meter Phone

72...W5EFA
73...WA7BPS
74...WA2FKF
75...WA1EUO
76...WB5NJK
77...K8GWM
78...K5DUT
79...I3AVZ

S.S.B. WAZ

1407...WA2STH
1408...N4CQ
1409...K5HWO
1410...W6RTN
1411...WA1EUO
1412...WB5NJK
1413...I2AT
1414...JA1PAH
1415...JA1MLV
1416...OE1OP
1417...WA8PWZ
1418...WA5ALB
1419...JA7ZP
1420...JR1TNE

C.W.—Phone WAZ

4178...WB2LOF
4179...W3YI
4180...GM3CAN
4181...JA3QPC
4182...JA9AGX
4183...JA7BJO
4184...JA8DWR
4185...W0SF
4186...K4IQN
4187...VE2UN
4188...EA1FD

Phone WAZ

533...WB0CGJ

The complete rules for all WAZ awards are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Billy Williams, N4UF, operating 20 meter phone from HH5HR. (NFDXA Photo)

C5ABK—To MRC, Box 273, Banjul, The Gambia
CEØAE to WA3HUP—M. Crider, RFD 2, Box 5A, York Haven, Pa. 17370
CE0ZE to N4WW—A. Regal, 5301 Jessamine Lane, Orlando, Fla. 32809
CE0ZM to N4WW—A. Regal, 5301 Jessamine Lane, Orlando, Fla. 32809
CR9AJ to W7PHO—W. Bennett, 18549 Normandy Terr. SW, Seattle, Wash. 98166
CT50IAL to CT1AL—A. Francisco, Trav das Pedras Alcadas 10, Viseu, Portugal
EJ0A to EI5BX—J. Casey, 138-C Ballinacurra Gardens, Limerick, Ireland
EL2BS to K9QXY—E. Toal, 5717 Tolman Terr., Madison, Wisc. 53711
EP2TY to JR3WRG—Y. Sugimoto, 1-11-12 Nagaremachi, Hiranoku, Osaka 547, Japan
FB8WE to F6BFH—A. Duchauchoy, 21 Rue de la Republique, 76420 Bihorel, France
FH0OM to DJ1TC—O. Blankenhorn, Sophienstr 178; 7500 Karlsruhe, WGFR
FK8CP—To Box 328, Noumea, New Caledonia
FO0PJM to W6FWX—R. Alfaro II, 1812 Webster St., San Francisco, Cal. 94115
FR7BE—To Box 137, Tampon, Reunion Is.
FY7AE to WA4WTG—B. Kaplan, 445 NW 202 Terrace, Miami, Fla. 33169
HD1DX—To Quito Radio Club, P.O. Box 289, Quito, Ecuador
H5FXT to VE3FXT—G. Collins, RR 1 Dundas L9H 5E1 Ontario, Canada
HL9KL to K6VA—R. McGaughey, 3389 Charleston Way, Hollywood, Cal. 90068
HZ1HZ—To P.O. Box 1999, Jeddah, Saudi Arabia
JY4MB—To P.O. Box 1361, Amman, Jordan
JY5AR—To P.O. Box 2482, Amman, Jordan
JY6AS to WA3HUP—M. Crider, RFD 2, Box 5A, York Haven, Pa. 17370
JY9VK to W1HSS—R. Rudko, 4 Short Rd., Holliston, Mass. 01746
K5CO/5A—To Thomas Meadows, 3417 Statler Dr., Mesquite, Texas 75150
KC4AAA to W6MAB—J. Stagnaro, 2305 Panorama Dr., La Crescenta, Cal. 91214
KC4AAC to K7ODK—F. Dorffeld, 4286 W. Maplewood Av., Bellingham, Wa. 98225
KG4TS to WB0QWW—J. Skinner Jr., 3763 Hilltop Pl., Springfield, Mo. 65804
N4VV/CE3 via WA3NGS—R. Lamb, RFD 1 Whippoorwill Ln., White Plains, MD 20695
OA4BZ via W1DBK—T. Gray, 10 Flaxview Terr., Lynn., Mass. 01904
OH8DX via OH3ZH—K. Koskela. Kolarink 21 E. 40, SF-33560 Tampere 56 Finland
PJ7VL via W2BBK—Dr. J. Evans Jr., 79 Glenwood Rd., Englewood, NJ 07631
S79S viaJohn Browning, W6SP, 25 Parsons Ln., Los Altos, Cal. 94022
SU1CR via P.O. Box 840, Cairo, Egypt

Iris and Lloyd Colvin, W6QL and W6KG, accept a DX award at the joint meeting of Northern and Southern California DX Clubs at Fresno. (YASME photo)

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count.

Mixed

W4WV 1675	PAØSNG ...1302	N2AC 1053	SM7TV 905	K8LJG 782
K6JG 1552	DJ7CX 1297	N6JV 1035	DL1CF 872	K2ZRO 782
F9RM 1537	N4MM 1290	W8CNL 1030	W4BYU 859	YU4EBL 782
VE3GCO ...1436	K2VV 1250	W6ISQ 1028	G3DO 849	WA2AUB 757
ON4QX 1429	WB4KZG ..1250	K6ZDL 1027	I3ANE 848	K8UDJ 750
W2NUT 1424	W9FD 1184	I6SF 1024	WØSD 844	WA5LOB 749
YU2DX 1407	W8ROC 1181	WØKDI 1019	YU1ODS 836	CT1LN 749
W3PVZ 1381	K5UR 1181	WA1JMP ...1008	JA1AG 831	PY4AP 735
W7LLC 1380	N6AV 1175	SM6DHU ...1000	W9WHM 811	K0BLT 733
W2NC 1366	WB4SIJ ...1152	K4KQB 960	YU3EY 811	JH1VRQ 727
W9DWQ 1365	WØAUB 1107	W4IC 950	W6NJU 811	K7NHG 719
W8LY 1349	N6CW 1092	WA6TAX 949	W9ZTD 807	WA6EPQ 713
YU1BCD ...1327	YU1AG 1089	K5DB 923	IØJX 803	PAØVB 706
W4BQY 1319	DL1MD 1062	WØSFU 908	W6ANB 793	UA3FT 705
W4CRW ...1308	YU2OB 1055	W3YHR 906	IT9AGA 791	OE6RP 622

S.S.B.

W4UG 1471	HP1JC 1086	CT1PK 923	W6RKP 822	WB6DXU ...708
F9RM 1443	YU1BCD ...1063	IT9JT 916	W3DJZ 818	IØMBX 702
IØAMU 1329	DL9OH 1033	F2MO 904	OK1MP 817	CX2CN 702
K6JG 1320	DK2BI 1031	WB4KZG 900	PY3BXW 809	W4BQY 654
IØZV 1289	ZL3NS 1022	WØYDB 884	W4IC 800	I4LCK 653
I8KDB 1233	WB4SIJ ...1000	K2POA 883	YU1AG 794	YU1ODS 648
N4MM 1149	K2VV 1000	W3YHR 881	K8SQE 783	N2AC 640
PAØSNG ...1124	WA6TAX 975	DJ7CX 852	G3DO 765	CR7IK 613
I8YRK 1108	DL1MD 948	N2SS 850	WA5LOB ...747	
I4ZSQ 1102	WB2NYM ...941	W4CRW 840	W2NC 730	
W9DWQ ...1089	K5UR 932	OE2EGL 839	W6YMV 720	

C.W.

W8LY 1331	YU1BCD ...1066	VO1AW 932	K7ABV 812	WB4KZG 680
W8KPL 1330	W4CRW ...1041	K6ZDL 915	VK3AHQ 809	KH6HC -.....649
ON4QX 1245	G2GM 1022	N4MM 905	I6SF 801	K2ZRO 649
DL1QT 1208	WA2HZR ...1006	N2AC 896	VO1KE 800	YU1ODS 639
K6JG 1205	W4BQY 1003	K5UR 892	W4BYU 768	K1LWI 629
W2NC 1204	N6JV 992	YU1AG 885	W4IC 754	LZ1XL 604
K6XP 1137	W3ARK 990	K2VV 850	SM5BNX 706	OK2QX 600
W2HO 1126	DJ7CX 988	IT9AGA 825	OK2BLG 698	VE4OX 600
W9FD 1091	W2AIW 972	W6ISQ 824	OK2DB 693	

TA1MB via DK3GL—H. Regel, Hemplatz 2, 8510 Fuerth Bay, WGFR
TR8RS via P.O. Box 33, Libreville
TT8HV via WB5OOE—G. Fogg, Box 626, Allen, Texas 75002
VE3HRS/TZ6 via 2200 Roche Ct. #1208, Mississauga, Ont. K1V 8P5
VK9NI via P.O. Box 27, Norfolk Island
VP1AH via WA4DRU—A. Harbach, 2318 S. Country Club Rd., Melbourne, Fla. 32901
VP1DC via P.O. Box 30, Orange Walk Town, Belize
VP2LL via W2MIG—T. Berzin, 47 Palisade Rd., Elizabeth, NJ 07208
VP2M via VE3CO—G. Hammond, 240 Inkerman St., E. #16, Listowel N4W 2 M9
VP2MBB via VE3ECP—J. Russell, Box 7, Fonthill LOS 1EO, Ontario
VP2MSA via OE3GSA—G. Schweidler, Wolfsbach 103, 3300 Amstetten, Austria
VP5A via K4UTE—D. Hicks, 8201 Cassie Rd., Jacksonville, Fla. 32221
VP8JC to Box 104, Port Stanley, British South Atlantic Is.
VP8PC to Box 113, Port Stanley, British South Atlantic Is.
WB2RLK/VE1 to R. Billings, RR 1, Bridgewater, NS B4V 2V9 Canada
WA4RQK/VQ9 to W4FLA—S. Leifer, 2011 NW 86th Terr., Pembroke Pines, Fla. 33024
WA9FXJ/6Y5 to T. Schmidt, 651 1/2 University Ave., St. Paul, Minn. 55104
WØUO/6Y5 to J. Spaulding, 2624 Fairlawn Dr., Stillwater, Minn. 55082
YA4A ('63-'65) to K4UTE—D. Hicks, 8201 Cassie Rd., Jacksonville, Fla. 32221
YN1Z to P.O. Box 5540 Managua, Nicaragua
YS1O to W2KF—K. Miller, 309 Cherry Hill Blvd., Cherry Hill, NJ 08034
ZD7YO to W6BVM—D. Rinaldi, 1602 Seventh Ave., Delano, Calif. 93215
ZD7PV to Box 8, St. Helena Island
ZD8RW to WB8MBT—R. Whisman, 2022 Grand Ave., Middletown, Ohio 45042
ZF1SV to VE7BXG—T. Foss, 1701 Kingsbury Cresent, Victoria V8P 2A8, BC
ZF2AU to W4MLA—J. King, 4174 NW 79th Ave., #1-D, Miami, Fla. 33166
ZM7AT to WB6DXL—W. Ellison, 16630 Lawnwood, Valinda, Cal. 91744
ZM7MM to W6FWX—R. Alfaro II, 1812 Webster St., San Francisco, Cal. 94115
ZS9GG to ZS1Z—F. Ferucci, Box 341, Paarl 7620, CP, South Africa
3D2MD to P.O. Box 55, Tantoka, Fiji
3V8P to WA1UWK—A. Marmas, 23-R Overlook Dr., E. Greenwich, RI 02818
5T5JD to P.O. Box 477, Nouakchott, Mauritania
5V7WT to F9GL—P. Boquet, 15 Rue R.-et-M. Dubois, 78 Mantes La Jolie, France
5X5NK to DJ6EA—U. Weber, Uhlandstr 15, 7401 Oeschingen, WGFR
8P6AH to WA4WTG—B. Kaplan, 445 NW 202 Terrace, Miami, Fla. 33169
8Q7AD to JA1UMN—H. Sato, 837-4131 Seyamachi, Seyaku, Yokohama 246 Japan

Al Harbach, WA4DRU, operating 10 meter from HH5HR. He also put on VP1AH during the CQWW CW test. (NFDXA Photo)

8R1X to VEIXE—W. Tillner, Box 5, Brampton, Ont. L6V 2K7
9K2FO to P.O. Box 177, Kuwait, Kuwait
9K2BE to P.O. Box 880, Kuwait, Kuwait
9Y4TR to WA5GFS—G. Black, Box 141, Hattieville, Adk. 72063
9Y4VE to VE3GCO—G. Hammond, 242 Inkerman St. E. #16, Listowel N4W 2M9

Bill Walker, WB4EYX, as he hauls in log pages full of 20 Meter contacts from HH5HR. (NFDXA Photo)

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The "Story of The Month" for April by courtesy of *MARAC Newsletter* and Jack, WØSJE and as told by Don, is:

European Trip and Visit With the Portuguese County Hunters by: Donald and Virginia Alvord, WØACK

"I would like to pass along the pleasures and experiences of our first trip to Europe to visit our son Bill in the U.S. Army Signal Corps at Darmstadt, Germany and the Portuguese County Hunters, their families and friends.

We left Quincy, Illinois via Ozark Airlines 1:50 CDT, August 31 and arrived Chicago about 3:20 PM CDT. Our Sebana Airlines flight was a bit late in leaving but finally left about 11:40 PM and arrived in Frankfort, Germany at 8:20 AM CDT (2:20 PM Frankfurt time), September 1. Bill met us at the airport in his car, so we were very fortunate transportation wise. We drove 6,322 kilometers (3,945 miles) seeing sights in Germany, France, Luxemburg, Austria, Switzerland, Italy, Monaco, Spain and Portugal.

Special Honor Roll (All Counties)

#177—John C. Dyer, W5ALB, 12-10-77

While at the MARS station at the Army Base, Darmstadt, I could hear the County Hunters, but was unable to contact anyone. The base personnel tuned up the rig, supposedly on 14.336 MHz, but I am not sure the transmitter was on frequency.

We arrived at Vilar Foromoso, Portugal about 10:00 PM September 14 after about 45 minutes of harassment and delay by the Spanish border guards. That was the one and only place that we had any difficulty on border crossings, most just waved us on when they saw the USA license plate on our son's car. We were a little shook up with our unpleasant experience with the Spanish border guards, so we called Charlie, CT1BY about 10:30 PM (their time) and he sent three County Hunters and friends to our rescue. They arrived about midnight, as Viseu is about 150 kilometers over mountain roads. We followed them about 50 kilometers where we met up with Miro, CT1UA, Charlie, CT1BY and one other fellow. Miro drove Bill's car and Bill got in the car with Charlie and we drove a short distance and stopped at a friends house for a short rest and refreshments. We were soon on our way again and went a short distance to another town where we stopped at a TV and Radio Shop where they installed a 2 meter rig in Bill's car. We found the airways very active and we had a ball all the way to Viseu.

Virginia and I stayed at the home of Miro, CT1UA and Bill stayed at the home of Charlie, CT1BY. They were most generous in lodging and feeding us and showing us around to interesting places and introducing us to other amateurs and friends in the area. Some places/things in Viseu date back to the 6th Century. There was a Fall Festival of some sort at Viseu, but we were all so busy that we had little time for that. One evening we showed about 300 slides that were of some of our travels and home. Charlie did a good job as projectionist as I did the narrating.

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

Don and Virginia Alvord, WØACK.

On September 15, I tried to work the County Hunters but conditions were poor and that dreadful woodpecker was messing up 20 meters. On the evening of September 16, at the home of Mat, CT1TZ, I was fortunate to work a few mobiles but I had to QRT as the Mini-Convention was scheduled to get underway at Oliveira de Azemeis.

Awards Issued

John Dyer, W5ALB was happy to make them All!

Curt George, W4SSU added USA-CA-2000 and 2500 to his collection, endorsed All SSB, All Mobiles.

Karel Tettelaar (ex VE6AAV) took time out from mobiling to acquire USA-CA-500 through 2000 endorsed All SSB. I must not forget to mention that Karel's wife, Margaret, VE7ATI (ex VE6ABP) has All Counties #133 dated July 12, 1975.

Don Priebe, W2IN (ex W2IAM) obtained USA-CA-2000.

Bob Lamberton, WA3QNT also obtained USA-CA-2000.

Larry Moore, K6SLP gained USA-CA-1500 endorsed All A-3.

Jim Latimer, WB9OOE sent for USA CA-1500 endorsed All A-3.

Bob Rennie, VE3IR received USA-CA-1000.

"Bert" Pinto, CT1QZ was issued USA-CA-1000 endorsed All SSB. #4 to Portugal.

USA-CA Honor Roll

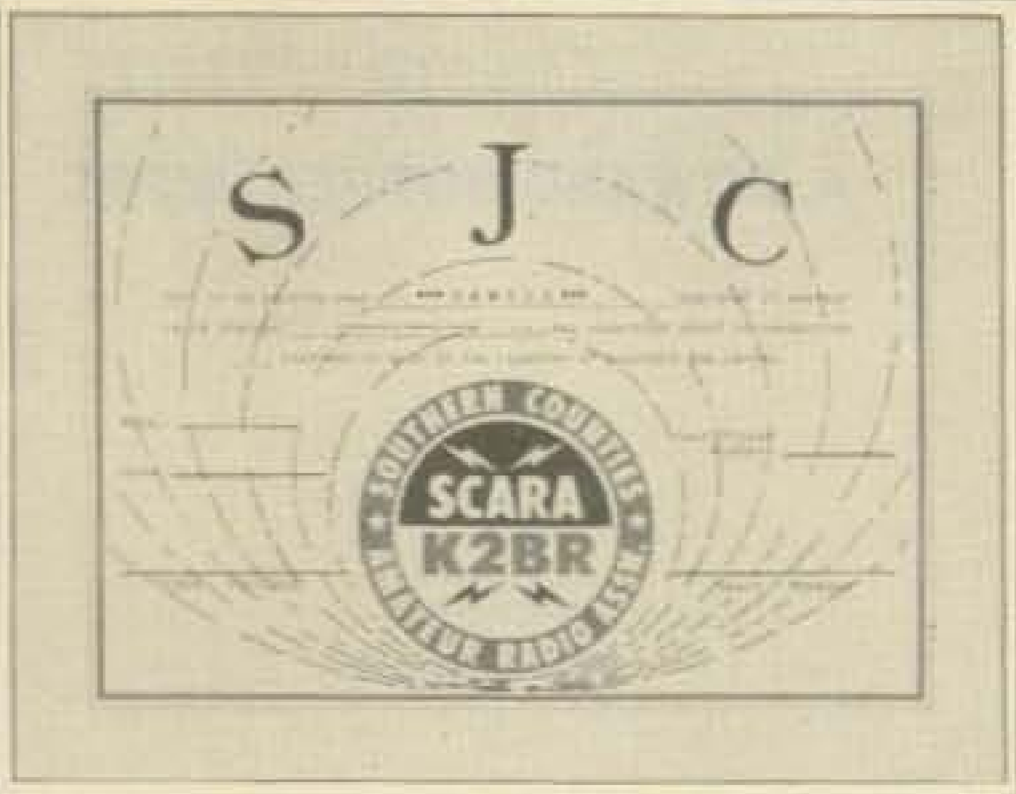
2500		1500		500	
W4SSU	253	K6SLP	344	VE7ATH	1209
		VE7ATH	345	K5GH	1210
2000		WB9OOE	346	K7KWI	1211
W4SSU	292				
VE7ATH	293	**1000**			
W2IN	294	VE3IR	464		
WA3QNT	295	VE7ATH	465		
		CT1QZ	466		

George Huling, K5GH (ex WN5KHP, W5KHP, WZ5ITU) won USA-CA-500.

Russ Fish, W7KWI had me send him USA-CA-500 endorsed All SSB.

The Portuguese County Hunters presented me with a beautiful hand made, clear blue glass vase with the map of the U.S. on it as well as my name and call and also Portugal Mini-Convention September 1977, needless to say that I was surprised and pleased!

Those attending the Portuguese Mini-Convention (hope I did not overlook anyone), were Miro, CT1UA, Charlie, CT1BY, Roger, CT1UD (Miro's brother), May, CT1TZ (Miro's brother), Julio, CT1ZW (Miro's cousin who made the vase with the help (I think) of CT1TZ who helped with the map and lettering, Ad, CT1RM (my first Portugal contact), Bert, CT1QZ (who helped transport us around), Vic, CT1GG, Adilia



South Jersey Counties Award.

XYL of CT1BY and friend Elsa Alice XYL of CT1TZ and we three Alvords. Cesar, CT1UE was on vacation and did not get there due to a change in the date of which he had no knowledge.

Virginia, Bill and I were the honored guests and what a treat, the meal was delicious and abundant. We talked of having a National County Hunters Convention in Portugal, perhaps in the next 4 or 5 years, if enough interest is shown and arrangements for reasonable charter flights and hotel accommodations can be secured. I was approached and volunteered to be QSL manager for Vic, CT1GG. After the delicious meal, social activities and picture taking, we went to the summer cottage of Justino, CT1RT (Miro's father) on the coast between a large lake and the Atlantic Ocean.

ISWL Pacific Ocean Award.

Portuguese Mini-Convention 1977. Charlie, CT1BY; Bert, CT1QZ; Ad, CT1RM; Mat, CT1TZ; Cesar, CT1UE and Miro, CT1UA. (Left to Right.) Courtesy of CT1UA.

Some of the Portuguese County Hunters expressed a strong desire to attend the National County Hunters Convention in Missouri this year, but that is just about impossible due to strong restrictions as to the amount of money they may take out of the country.

Other Portuguese amateurs (not County Hunters) that we met were: Al, CT1TM, Alfonso, CT4LJ, Henry, CT4IO, Pereire, CT4JW, Ade, CT1AL, Manuel, CT1NT and Lina (Miro's XYL). Lina must operate 2 meters for 2 years before she can upgrade her license for 20 and County Hunting.

On September 17 we left the summer cottage and headed for Viseu, having breakfast along the way and then dinner (noon meal) at Viseu with Miro and Charlie and his family. Charlie helped us to the edge of Viseu where we gassed up, bid us farewell and we departed and raced across Portugal, Spain, France, Switzerland into Germany to get back to Darmstadt for Bill to get signed in by midnight September 19.

Many thanks to our Portuguese County Hunter friends, Bill's friends in Darmstadt who were so kind to us, and Mr. and Mrs. Karl Konrad and their son Wilfriet of Gurten, Austria where we spent a couple of days. Of course thanks to our son Bill for making our trip so enjoyable. We were back home safe and happy (a bit tired) September 22."

Awards

South Jersey Counties Award: The Southern Counties Radio Amateur Association (SCARA) is issuing a new award. This award is available to all licensed radio amateurs who conduct two way communication with three radio amateur stations in each of the Counties of Southeastern New Jersey. DX stations outside of continental United States need work only two in each County. In lieu of contacting different stations, the same station may be contacted on different bands.

The required Counties are:

Atlantic	Cumberland
Burlington	Gloucester
Camden	Ocean
Cape May	Salem

All contacts after 1 January 1976 are valid. The award is issued in CW, SSB, and Mixed modes.

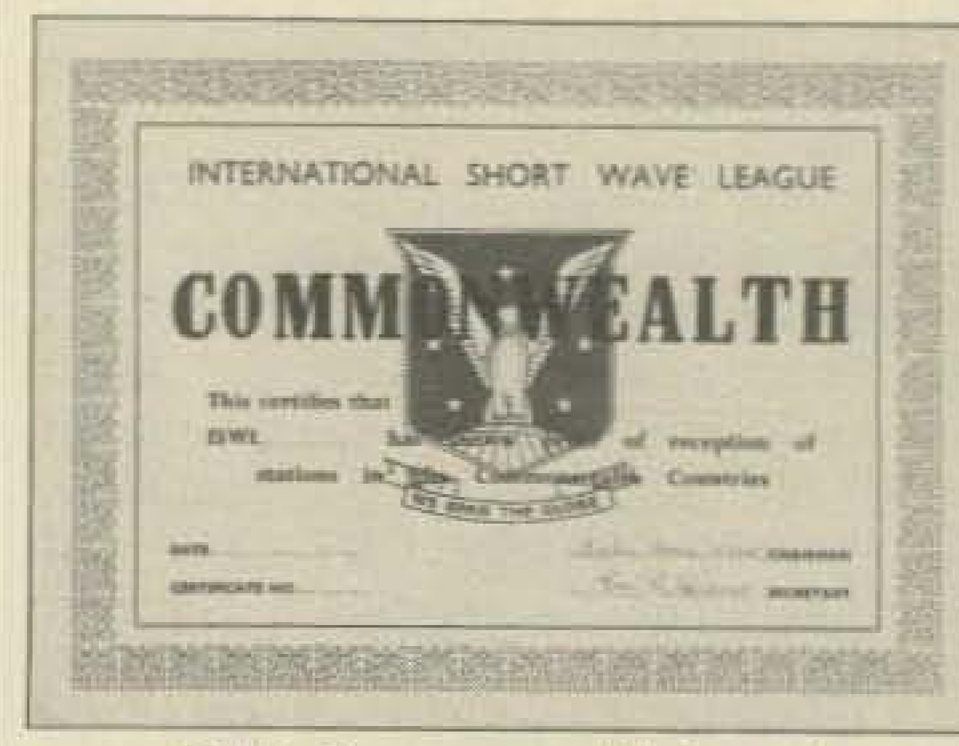
Either QSL cards or GCR list must accompany the application. The Award fee is $1.00 or 5 IRCs. Apply to Award Manager, Louis A. Dvorsky, N2IT, 2508 Leeds Avenue, Northfield, N.J. 08225.

The International Short Wave League Awards Program: As promised last month, here is data on more of their Awards. Each Award is a separate colored certificate, available to all, members or not. GCR list of QSLs with $2.00 U.S. or 10 IRCs for each Award (free to ISWL members) to ISWL Awards Manager, Clifford A. Tooke, 6 Chelmer Avenue, Rayleigh, Essex, SS6 7TB, England.

ISWL European Award.

Commonwealth Award: For verified contact with 50 different Countries within the British Commonwealth of Nations.

European Award: For verified contact with 50 different Countries within the Continent of Europe.



ISWL Commonwealth Award.

Pacific Ocean Award: For verified contact with 45 different Countries which have at least a part of their coastline on or in the Pacific Ocean, as VE, W, VK, ZL, KH6, etc....

(Continued on page 88)

Nuno, son of CT1UA; CT4YD, Lina, wife of CT1UA; Adilia, wife of CT1BY with Patricia, baby daughter of CT1UA; Elsa, niece of CT1BY; Virginia, wife of WØACK; Bill, son of WØACK, WØACK and CT1BY. Courtesy of CT1UA.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

Fewer DX openings are forecast for the *10* and *15* meter bands during April, but conditions are expected to *improve* on *20* meters during the day and *40* meters at night. Seasonably favorable conditions for long DX openings between the northern and southern hemispheres, associated with the equinoctial period, should continue through the month. An increased number of short-skip openings due to sporadic-E propagation is expected during April, and a major meteor shower is also expected to take place.

Twenty meters should be the optimum band for DX propagation during April. The band should open to most parts of the world shortly after sunrise, and remain open for DX throughout the daylight hours and well into the evening. Exceptionally strong signals should often be noticeable during the late afternoon and early evening hours.

Expect fewer openings on *15* meters this month, but some fairly good DX still should be possible to many areas of the world during the daylight hours. Peak conditions are expected during the afternoon and early evening hours on this band.

Not many DX openings expected on *10* meters this month, but some should be possible towards Central and South America, the Caribbean area, and to the South Pacific during the afternoon hours, particularly during periods of HIGH or ABOVE NORMAL conditions.

Improved DX propogation conditions are expected on *40* meters during April. The band should open toward Europe and the east an hour or so before sundown; toward the south an hour or so after sundown, and towards the west and South Pacific after Midnight. Expect good DX openings throughout the hours of darkness, but signals should peak around Midnight from an easterly direction and an hour or so before sunrise from all other directions.

Fairly good DX openings to many areas of the world should also be possible on *80* meters during the hours of darkness and at sunrise. There is also a chance for a few *160* meter DX openings during this same time period.

*11307 Clara St., Silver Spring, MD 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For April, 1978

	Expected Signal Quality			
Propagation Index	*(4)*	*(3)*	*(2)*	*(1)*
Day				
Above Normal: 13	A	A	B	C
High Normal: 10, 12, 14, 18-20	A	B	C	C-D
Low Normal: 1-2, 4-5, 8-9, 11, 15, 17, 24-25, 27-29	B	C	D	D-E
Below Normal: 3, 6-7, 16, 21, 23, 26, 30	C	D	D-E	E
Disturbed: 22	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 *prop index* of 3 will be *fair* (C) on April 1st & 2nd; *fair* to *poor* (C-D) on the 3rd and *fair* (C) again on April 4-5, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768

Seasonably favorable equinoctial propagation conditions should continue during April for openings between the northern and southern hemispheres. Be sure to check during the sunrise and sunset twilight periods for some exceptionally good openings on *20* meters from the USA to such areas in the southern hemisphere as Australasia, South America, southern Africa, etc. These inter-hemispheric openings can take place at other times and on other bands as well, as shown in the DX PROPAGATION CHARTS.

Ionospheric absorption should continue to increase in the northern hemisphere during April, as the sun rises higher in the northern sky. This should result in somewhat weaker DX signal levels during daytime openings, compared to the winter months. Static levels are also expected to increase noticeably during April, as thunderstorms become more numerous. This should result in higher noise levels, particularly on *40*, *80* and *160* meters.

V.h.f. Ionospheric Openings

April looks like it should be a good month for v.h.f. ionospheric openings.

Lyrids, a major meteor shower should take place between April 22-23, with a peak expected during the late afternoon of April 22. During the shower's peak, at least 15 good-sized meteors should enter the earth's atmosphere hourly, permitting fairly good meteor-scatter type openings on the v.h.f. bands.

Trans-equatorial propagation (TE), which produced some new *2* and *6* meter DX records late last year, should reach a seasonal peak during April. TE openings are most likely to occur between 8 and 11 p.m. local time, on long north-south paths which cross the *geomagnetic* equator at approximately a right angle. TE openings toward South America from the USA favor locations in the southern states, but some openings may also be possible to more northerly states.

A seasonal increase in sporadic-E ionization usually begins during April, and continues through the spring and summer months. This should result in an increased number of short-skip openings on both *15* and *10* meters during April, as well as occasional openings on *6* meters. Openings on *10* and *15* meters will range between approximately 400 and 1,300 miles, while those on *6* meters will usually be between 750 and 1,300 miles. While sporadic-E ionization can occur at just about any time, there is a tendency for it to peak between 8 a.m. and Noon and again between 5 and 9 p.m., local time.

Unusual ionospheric openings on the v.h.f. bands can also occur during April from widespread auroral activity. The best times to check for such openings are during periods of radio storminess on the h.f. bands. Check the *Last Minute Forecast* at the beginning of this column for those days during April that are expected to be BELOW NORMAL or DISTURBED.

Sunspot Cycle Activity

The Swiss Solar Observatory at Zurich, the world's official keeper of sunspot records, reports a monthly mean number of 41 for December, 1977. During the month, daily sunspot activity varied between a low of 15 on December 2 to a high of 75 on the 10th. This results in a 12-month running smoothed sunspot number of 26, centered on June, 1977. The new sunspot cycle, which began during March, 1976, continues to increase, but at a noticeably slow pace. A smoothed sunspot number of approximately 50 is forecast for April, 1978.

Short-Skip Propogation

For openings between 50 and 250 miles, best band should be *80* meters during the day and *160* meters at night. Between 250 and 750 miles, *40* meters should be best during the day, *80* meters for an hour or two after sunrise and again from sunset to Midnight, and *160* meters from Midnight to sunrise. For openings between 750 miles and the one-hop, short-skip limit of 2,300 miles, use 20 meters during the day, *40* meters for an hour or so at sunrise and again from sunset to Midnight, and *80* meters from Midnight to sunrise. Look for *15* meter short-skip openings from about 10 a.m. to sundown, ranging between approximately 1,300 and 2,300 miles, although at times openings may be as short as 500 miles. There is also the possibility for some *10* meter short-skip openings during the daylight hours, over similar distances.

The DX PROPAGATION CHARTS in this month's column contain DX propagation predictions for each amateur band between *10* and *160* meters for the period *April 15 through June 15, 1978*. Beginning this month and continuing through the summer and fall, the times shown in the CHARTS will be local *daylight* time (EDT, CDT, MDT and PDT).

For more detailed predictions of short-skip openings between distances of 50 and 2,300 miles, refer to the SHORT-SKIP CHARTS, which appeared in last month's column.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation Index* is the number that appears in ( ) after the time of each predicted opening. 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) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation 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.

4. Time 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. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 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 10 db loss, it will lower by one level.

6. 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.

April 15-June 15, 1978
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Central Europe & North Africa	*Nil*	09-14 (1) 14-18 (2) 18-19 (1)	05-06 (1) 06-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-01 (1)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1) 13-15 (2) 15-17 (1)	06-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-23 (1) 23-01 (2) 01-06 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	11-15 (1) 15-17 (2) 17-19 (1)	06-08 (1) 13-16 (1) 16-19 (2) 19-23 (3) 23-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Western Africa	14-18 (1)	08-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	08-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-01 (2) 01-06 (1)	20-22 (1) 22-02 (2) 02-03 (1) 00-02 (1)*
Eastern & Central Africa	16-18 (1)	09-11 (1) 11-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-09 (1) 14-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-01 (1)	21-01 (1) 22-00 (1)*
Southern Africa	*Nil*	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-19 (1) 23-01 (1)	21-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Central & South Asia	*Nil*	10-12 (1) 18-20 (1)	07-10 (1) 14-16 (1) 19-22 (1)	05-07 (1) 19-21 (1)
Southeast Asia	*Nil*	10-12 (1) 18-20 (1)	07-08 (1) 08-09 (2) 09-11 (1) 19-22 (1)	*Nil*
Far East	*Nil*	18-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 22-00 (1) 00-02 (2) 02-04 (1)	04-06 (1)
South Pacific & New Zealand	17-20 (1)	08-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-22 (1)	04-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-00 (3) 00-04 (2)	02-03 (1) 03-04 (2) 04-06 (3) 06-07 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Australasia	18-20 (1)	17-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-11 (1) 15-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-04 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1) 14-17 (2) 17-19 (1)	08-10 (1) 10-11 (2) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	04-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-22 (4) 22-00 (3) 00-04 (2)	19-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1) 21-02 (1)* 02-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-14 (1) 14-16 (2) 16-17 (3) 17-19 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-21 (1)	04-06 (1) 06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-01 (3) 01-04 (2)	20-21 (1) 21-04 (2) 04-06 (1) 23-03 (1)* 03-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-17 (2) 17-19 (1)	07-08 (1) 08-09 (2) 09-10 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	01-05 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Southern Europe & North Africa	*Nil*	14-18 (1)	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-21 (2) 21-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-00 (1)
Northern & Central Europe & European USSR	*Nil*	13-15 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-17 (2) 17-19 (1) 22-00 (2)	20-00 (1)
Eastern Mediterranean & Middle East	*Nil*	15-17 (1)	07-09 (1) 13-16 (1) 16-22 (2) 22-00 (1)	20-00 (1)
Western Africa	13-17 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-09 (1) 12-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-00 (1)	20-01 (1)
Eastern & Central Africa	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (1)	06-08 (1) 13-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	21-00 (1)
Southern Africa	*Nil*	08-10 (1) 10-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-23 (1) 23-01 (2) 01-02 (1)	20-22 (1) 22-00 (2) 00-01 (1) 23-01 (1)*
Central & South Asia	*Nil*	09-11 (1) 18-21 (1)	07-10 (1) 18-20 (1) 20-22 (2) 22-23 (1)	05-07 (1) 19-21 (1)
Southeast Asia	*Nil*	08-10 (1) 19-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	05-07 (1)
Far East	*Nil*	18-21 (1)	20-00 (1) 00-04 (2) 04-06 (1) 06-07 (2) 07-08 (3) 08-09 (2) 09-11 (1) 15-18 (1)	03-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
South Pacific & New Zealand	14-16 (1) 16-18 (2) 18-20 (1)	07-09 (1) 11-14 (1) 14-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	16-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-03 (3) 03-07 (2) 07-10 (3) 10-11 (2) 11-12 (1)	00-02 (1) 02-04 (2) 04-05 (3) 05-06 (2) 06-07 (1) 02-04 (1)* 04-05 (2)* 05-06 (1)*

(Continued on page 88)

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

Following are a couple of corrections and omissions in the 1977 WPX SSB Contest results. (Dec. issue)

WA7YRP listed as an all band single operator, should have been listed as a 28 MHz score. That makes Allan a certificate winner.

Argentina was omitted in the South American scores. Not listed was LU1BR —A—1,183,446 — 1373 — 298. This places Luis 4th world high in that category and a certificate winner.

The name of the donor of the new Club Competition Trophy listed in the 1978 WPX SSB Contest rules (Jan. issue) has been changed to the "Canadian DX Association."

Incidently our WPX Contest Director, Bernie Welch, W8IMZ will be the Contest Moderator at the Dayton Hamvention (April 28, 29, 30) this year. A full and interesting program is being prepared, so make sure to include it in your itinerary if you plan on attending the Hamvention.

We hope to have a few Trophies for presentation at the Contest Forum. Hope to see you there.

73 for now, Frank, W1WY

Florida QSO Party

Three Periods GMT
1500 to 2000 Saturday, April 1
0000 to 0500 Sunday, April 2
1400 to 2359 Sunday, April 2

This is the 13th annual QSO Party sponsored by the *Florida Skip* magazine.

Phone and c.w. are separate contests. The same station may be worked on each band for QSO and multiplier credit. Floridians may work in-state stations but for QSO points only.

Classes: Florida stations are divided into two classes. Class A are portables and mobiles on emergency power running 200 watts or less, inside Florida but outside their home county. Class B are all others.

Exchange: RS(T) and QTH. County and class (A or B) for Fla.; state, province or country for others. Out-of-state mobiles not within the jurisdiction of any country will indicate their ITU region. (1, 2, or 3)

Scoring: *For Florida*—1 point per QSO. Multiply total by sum of states (49), provinces (12), DX countries (max. of 14) and regions (3) worked. Class A stations multiply final score by 1.5 factor.

Out-of-state—1 point for each Class B Fla. contact. 2 points if it's a Class A mobile or portable. Multiply total by number of Fla. counties worked. (max. of 67)

Frequencies: C.W.—3555, 7055, 14055, 21055, 28028. Phone—3945, 7278, 14318, 21378, 28578.

Awards: Certificates, phone and c.w., to the top single operator score in each state, province, DX country and each Fla. county. There are also 5 plaques to be awarded as follows: Top single operator in Fla. and out-of-state, both phone and c.w., and to the Fla. Club with the highest aggregate score.

There is a disqualificating clause for excessive dupes, multipliers and other obvious reasons. Stations that are disqualified will be barred from next year's party.

Include a summary sheet and the usual signed declaration, and your name and address in Block Letters. A 13¢ stamp will get you the *Florida Skip* issue with the results.

Mailing deadline is May 30th to: Florida Skip, Contest Committee, P.O. Box 660501, Miami Springs, Fla. 33166

Calendar of Events

*Apr. 1-2	Polish "SP" C.W. Contest
*Apr. 1-2	Tennessee QSO Party
*Apr. 1-3	ARCI QRP QSO Contest
Apr. 1-2	Florida QSO Party
Apr. 1-2	Wisconsin QSO Party
Apr. 8-9	Swiss "H22" Contest
Apr. 11-12	DX YL to N.A. YL CW Party
Apr. 15-16	County Hunters SSB Contest
Apr. 15-16	Common Market Contest
Apr. 15-16	Polish "SP" Phone Contest
Apr. 22-23	Bermuda Contest
Apr. 25-26	DX YL to N.A. YL Phone Party
*Apr 29-30	Dutch "PACC" Contest
May 6-7	Vermont QSO Party
May 13-14	USSR "CQ-M" Contest
May 20-21	Michigan QSO Party

*Covered last month.

Wisconsin QSO Party

Starts: 0001 GMT Sunday, April 2
Ends: 2359 GMT Sunday, April 2

This years party is again jointly sponsored by the Neenah-Menasha and the Yellow Thunder Amateur Radio Clubs.

The same station may be worked on each band and mode, and each county change for mobile/portable operation. Wisconsin stations may work other Wis. stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for Wis., ARRL section or country for others.

Scoring: *For Wis.*—W/K and VE QSOs, 1 point. DX QSOs, 3 points. Multiply total by ARRL sections and Wis. counties worked. (max. of 146)

Out-of-state—Multiply Wis. contacts by number of Wis. counties worked. (max. 72)

(KP4, KH6, KL7 and KZ5 count as DX and also as a section multiplier.)

Frequencies: 1810, 3550, 3735, 3900, 7050, 7135, 7235, 14050, 14280, 21050, 21135, 21300, 28050, 28600. Also 50-50.5 and 144-148.

Awards: Certificates to the top scoring Fixed, Mobile, Portable, Novice and VHF stations in Wis., each ARRL section and each DX country. There is a Trophy for the Wis. club entry with the highest combined score from its members.

Indicate each multiplier in a separate column the first time it is worked, and include a summary sheet with your entry.

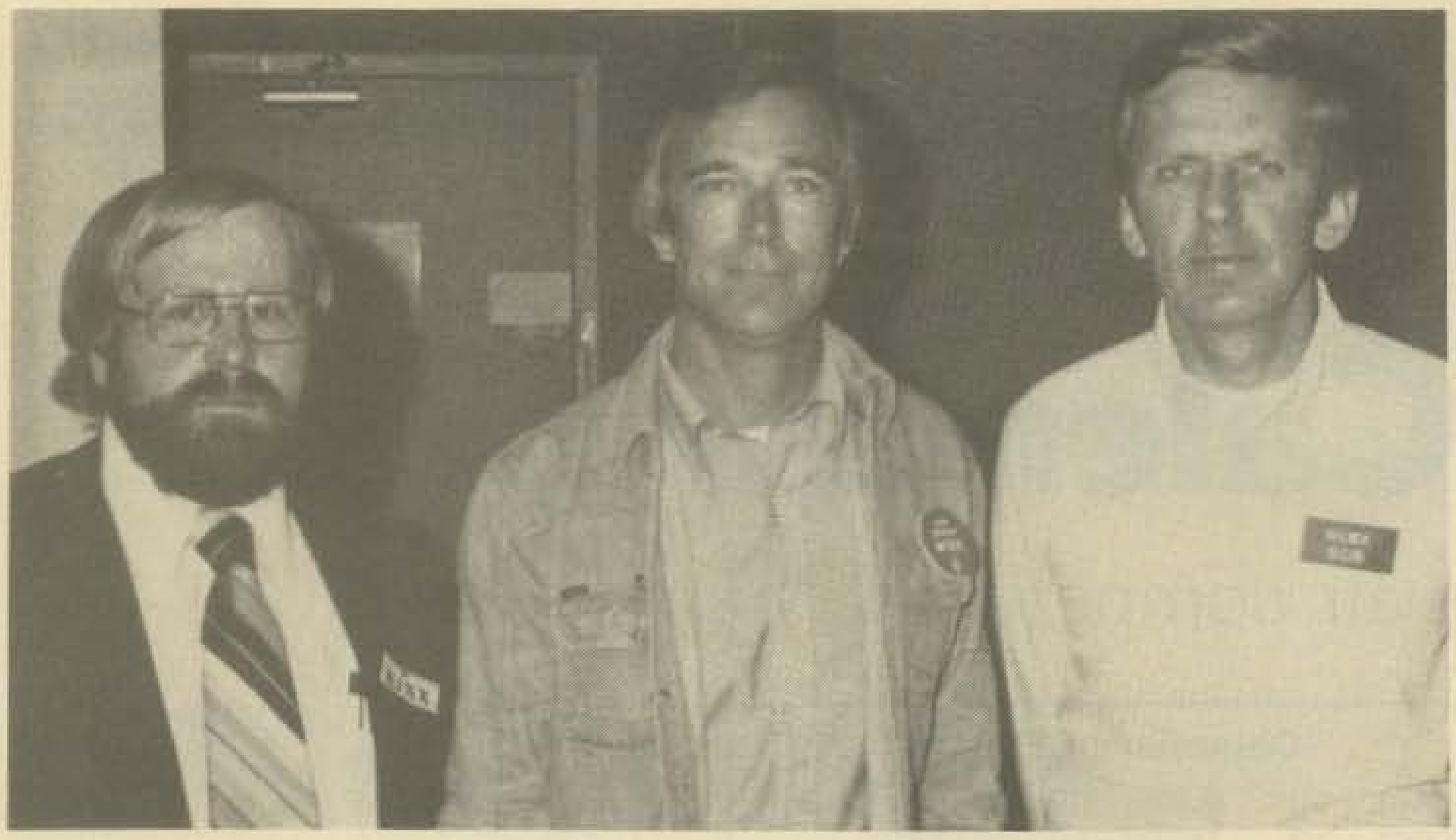
Logs must be received by May 6th (May 20th for DX) and go to: Kenneth A. Ebneter, K9EN, 822 Wauona Trail, Portage, Wis. 53901. Include a large s.a.s.e. for copy of results.

Swiss "H-22" Contest

Starts: 1500 GMT Saturday, April 8
Ends: 1700 GMT Sunday, April 9

The dates of this contest are changed each year since it is held two weeks after Easter. Some of the rare cantons are usually activated so this is an excellent opportunity to fill your quota for the colorful "H-22" certificate.

*14 Sherwood Rd., Stamford, Conn. 06905



Three prominent New England DXers with brand new calls. Charlie N1XX, John W1XX, and Bob K1XX. It's conceivable that the three of them would be in the same pile-up chasing a new one. Can you imagine the confusion and frustration if the "rare one" came back with the query, "the one xray xray station?" go ahead.

Contacts may be made on all bands, 10 thru 160 meters, phone or c.w. The same station may be worked on each band for QSO and multiplier credit but only on one mode, either phone or c.w.

Exchange: RS(T) plus a contact number starting with 001. Swiss stations will also include two letters indicating their canton. (57(9)001ZH).

There are 22 cantons: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH. (Working all 22 of them in one week end is quite a challenge.)

Scoring: Each QSO counts 3 points. Sum of cantons worked on each band is your multiplier.

Final Score: Total QSO points multiplied by the sum of cantons worked on each band. (Possible total of 22 for each band.)

Awards: Certificates to the top scorers in each country and each W/K and VE/VO call areas.

Indicate a canton in a separate column in your log the first time it is worked on each band. Check your log for duplicate contacts, include a summary sheet showing the scoring and etc., and your name and address in Block Letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, HB9AHA, IM Moos, 5707 Seengen, Switzerland.

Applications for the "H-22" Award go to: Walter Blatter, HB9ALF, Post Box 450, CH 6601 Locarno, Switzerland.

DX YL to N.A. YL Contest

C.W.: April 11-12 Phone: April 25-26
Starts: 1800 GMT Tuesday
Ends: 1800 GMT Wednesday

This is strictly a YL only affair in which DX YLs (inc. KH6 and KL7) will be working YLs on the North American continent. (KL7s however are not permitted to work VE5 thru VE8. KH6 may be worked however.)

All bands may be used but crossband contacts are not permitted. The same station may be worked on each band for QSO credit. Avoid contacts on Net frequencies. Phone and c.w. are separate contests and require separate logs.

Exchange: QSO no., RS(T) and state, province or country.

Scoring: One point per QSO. Multiply total by number of states and countries worked.

There is a power multiplier of 1.25 for stations using 150 watts or less input. (300 p.e.p. if s.s.b.)

Final Score: Total QSOs × state/countries × power multiplier.

Awards: To winning DX and No. American stations. Trophies for c.w. and for phone overall winners. Plaques for the highest combined c.w. and phone scores. Certificates to 2nd and 3rd place winners.

Submit separate logs for c.w. and phone and a signed declaration that rules and regulations have been observed.

Logs must be received within a month from the end of the contest. This year they go to: Phyllis Shanks, W2GLB, 3 Honey Lane, Miller Place, N.Y. 11764.

County Hunters SSB Contest

Three Periods (GMT)
0001 to 0800 Saturday, April 15
1200 Sat. Apr. 15 to 0800 Sun. Apr. 16
1200 to 2400 Sunday, April 16

This is the 7th annual contest sponsored by the Mobile Amateur Radio Awards Club to increase activity for the County Awards program.

Emphasis is on mobile operation. Fixed stations may work other fixed stations but *once only*, regardless of band. Mobiles may be worked for each county or band change. Mobiles contacted on a county line counts as one contact but two multipliers.

Exchange: Signal report, county and state, country for DX stations.

Points: Contacts with a fixed/portable W/K or VE, 1 point. If it's a DX station, 5 points. (KH6 & KL7 are DX) Contacts with a mobile, 10 points. (The portable designation has been dropped and portables will be considered as fixed stations.)

Multiplier: Total U.S. counties plus VE stations worked. Counties are counted once only, but VE stations each time worked.

Final Score: Total QSO points times (counties plus VE stations) worked.

Frequencies: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28575-28595. Again this year there will be a "Mobile Window" as follows: 3925-3935, 7225-7235, 14280-14290. This space has been set aside for working mobiles only.

Awards: Certificates to the Top 10 fixed and mobile stations in the U.S. and Canada, and the top score in each DX country. Four plaques, overall winning U.S. or Canadian, DX station, and 1st and 2nd mobiles. Only single operator stations are eligible.

It is suggested you write to W0QWS for detailed rules, log and summary sheets. Include a large s.a.s.e.

All entries must be received by June 1st and go to: John Ferguson, WØQWS, 3820 Stonewall Ct., Independence, Missouri 64055

Common Market DX Contest

C.W.—0600 to 2400 GMT Sat., Apr. 15
Phone—0600 to 2400 GMT Sun., Apr. 16

The purpose of this contest is to increase activity between radio amateurs in the Common Market of Europe and the rest of the world.

There are 9 countries in the Common Market. Belgium, W. Germany, Italy, Denmark, Great Britain, Luxembourg, Ireland, Netherlands and France.

Classes: Single operator—All band, low band, (80 & 40) high band, (20, 15, 10) and multi-operator, single xmtr. all band only.

Exchange: RS(T) plus QSO no. starting with 001.

Points: *For Common Market Stations*—QSO with other CM stations, 1 point. With non CM inside Europe, 2 points. With all other countries, 5 points. (Own country may be worked but for multiplier only)

For non CM stations—QSO with CM stations, 5 points. With other Europeans, 2 points. (QSO with ON4UB is worth 25 points.)

Multiplier: For CM—Each DXCC country worked on each band. For none CM—Each call area in the nine CM countries (max. of 69 per band) QSO with ON4UB counts as an additional multiplier.

Final Score: Total QSO points times the total multiplier from each band.

Awards: Certificates to the highest scorers in each class, in each country, on each mode. Trophies to the Top scoring single operator on each mode, in the CM and outside the CM.

There is also a s.w.l. class. Score 5 points for each complete QSO reported. Certificates for both c.w. and phone.

Use separate logs for phone and c.w., and for each band. Include a summary sheet and the usual signed declaration that all rules and regulations have been observed. Disqualification regulations for excessive dupes and etc. will be enforced.

Mailing deadline is May 31st to: Michel Le Bon, ON4GO, Chee. de Wavre 1349, 1160 Brussels, Belgium.

Bermuda Contest

Starts: 0001 GMT Saturday, April 22
Ends: 2400 GMT Sunday, April 23

Rules are same as last year with one exception. No 40 meter s.s.b. contacts are permitted between stations in Region 1 and Region 2.

The operating period for scoring is limited to 36 hours out of the 48 hour contest period. Off times to be clearly logged, and 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 on both modes on the same band. Cross band or cross mode also not permitted.

Stations in the U.S. and Canada may work the United Kingdom and VP9s only. While U.K. stations may work W/K, VE and VP9s. However as noted above, W and VEs are not permitted to work U.K. stations on 40 meter s.s.b. But it's acceptable for W and VEs to work VP9s on 40 s.s.b.

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

Exchange: RS(T) and QTH. State for W/K, province for VE, county for U.K., and Parish 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.

Awards: The top scorer in each state, province and U.K. county will receive a printed award. The overall winners in the U.S., Canada and the U.K. receives a Trophy to be awarded at the Society's Annual Dinner held in October. Round trip air transportation plus hotel accommodations will be provided for the winners to accept their Trophies in Bermuda. (Trophy winners in the 1976 and 1977 contests are not eligible.)

Check your log for duplicate contacts and multipliers, compute your score, and sign a declaration that all rules and regulations have been observed.

All entries must be received before June 30th by the Radio Society of Bermuda, Contest Committee, P.O. Box 275, Hamilton 5, Bermuda.

ZERO District QSO Party

Starts: 2000 GMT Saturday, April 22
Ends: 0200 GMT Monday, April 24

This years party is again sponsored by the Mississippi Valley Radio Club. It is planned to activate many of the rarer areas especially North Dakota. There is a lot of territory covered by this party so a lot of activity can be expected.

Stations outside the Zero District may work Zero stations only, but Zeros may work both in and out of district stations. The same station may be worked once on each band and mode, and mobiles in each county change.

Exchange: QSO no., and QTH. County and ARRL section for Zeros, ARRL section only for others.

Scoring: *For Zeros:* Total QSOs multiplied by (ARRL sections + Zero counties + DX countries worked). *For others:* Total QSOs multiplied by Zero counties + Zero sections.

Frequencies: C.W.—3560, 7060, 14060, 21060, 28060. Phone—3900, 7270, 14300, 21370, 28570. Novice—3735, 7125, 21125, 28125.

Awards: Certificates to the top scorers in each ARRL section and DX country. Also to Novice/Technicians and mobiles.

Mailing deadline is May 31st to: Mississippi Valley Radio Club, WB0-UUA, 3518 W. Columbia, Davenport, Iowa 52804

Dutch "PACC" Contest

Starts: 1200 GMT Saturday, April 29
Ends: 1800 GMT Sunday, April 30

It's the world working the Netherlands on all bands, 1.8 thru 28 MHz, on phone or c.w. The same station may be worked on each band for QSO and multiplier credit but on one mode only, either phone or c.w.

Exchange: RS(T) plus a QSO number starting with 001. PA/PI/PE stations will also include two letters indicating their province. (57(9)001/GR)

There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, ZL. (Possible multiplier of 72)

Scoring: Each completed QSO counts 1 point. DX stations determine their multiplier by the number of provinces worked on each band.

Final Score: Total number of QSOs multiplied by the sum of provinces worked on each band.

There is also a s.w.l. section. Call of the Dutch station heard and the serial number as well as the station being worked must be logged.

Awards: Certificates to the top scoring station, single operator, multi-operator and s.w.l., in each country and the call areas of W/K, VE/VO, CE, JA, LU, PY, VK and ZL.

Contacts made in the contest may be credited for the PACC 100 Award in lieu of QSL cards. (Include 7 IRCs with your application to the Contest Mgr.)

Indicate the multiplier in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in Block Letters, and the usual signed declaration.

Mailing deadline for logs is June 15th to: VERNON Contest Manager, PA0DIN, Schoutstraat 15, NYMEGEN 6805, Netherlands. ■

Propagation *(from page 84)*

Australasia	17-20 (1)	09-11 (1) 16-18 (1) 18-21 (2) 21-22 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-15 (1) 15-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-06 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1) 14-17 (2) 17-19 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	00-04 (2) 04-06 (1) 06-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-22 (4) 22-00 (3)	19-21 (1) 21-22 (2) 22-03-(3) 03-05 (2) 05-07 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	07-08 (1) 08-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	05-06 (1) 06-10 (2) 10-16 (1) 16-18 (2) 18-19 (3) 19-23 (4) 23-01 (3) 01-02 (3) 02-04 (2) 04-05 (1)	21-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1) 00-04 (1)*
McMurdo Sound, Antarctica	*Nil*	13-15 (1) 15-18 (2) 18-19 (1)	06-09 (1) 17-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	00-06 (1)

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Southtern Europe & North Africa	*Nil*	12-16 (1)	06-08 (1) 08-11 (2) 11-13 (1) 13-17 (2) 17-19 (1) 20-22 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-15 (2) 15-17 (1) 20-22 (1)	20-23 (1) 21-22 (1)*
Eastern Mediterranean & Middle East	*Nil*	13-15 (1)	07-10 (1) 10-12 (2) 12-13 (1) 13-15 (2) 15-17 (1) 20-22 (1)	20-23 (1)
Western Africa	13-15 (1)	09-12 (1) 12-15 (2) 15-17 (1)	05-06 (1) 06-08 (2) 08-15 (1) 15-18 (3) 18-20 (2) 20-22 (1)	20-23 (1)
Eastern & Central Africa	*Nil*	10-14 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1)	20-22 (1)
Southern Africa	*Nil*	10-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-14 (1) 14-17 (2) 17-18 (1) 21-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*Nil*	09-11 (1) 19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)
Southeast Asia	*Nil*	09-11 (1) 16-19 (1) 19-21 (2) 21-22 (1)	04-07 (1) 07-08 (2) 08-10 (3) 10-11 (2) 11-12 (1) 22-00 (1) 00-04 (2)	04-07 (1) 05-06 (1)*
Far East	*Nil*	14-17 (1) 17-20 (2) 20-22 (1)	04-07 (1) 07-08 (2) 08-09 (3) 09-10 (2) 10-12 (1) 12-14 (2) 14-21 (1) 21-23 (2) 23-00 (3) 00-02 (4) 02-03 (3) 03-04 (2)	02-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
South Pacific & New Zealand	13-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	10-12 (1) 12-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	05-08 (1) 08-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-01 (3) 01-05 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-02 (1)* 02-05 (2)* 05-06 (1)
Australasia	15-17 (1) 17-19 (2) 19-20 (1)	13-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	05-08 (1) 08-10 (3) 10-12 (1) 18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-05 (2)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1) 14-17 (2) 17-18 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	00-03 (2) 03-05 (1) 05-06 (2) 06-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-20 (4) 20-00 (3)	19-20 (1) 20-21 (2) 21-02 (3) 02-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	13-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	00-02 (2) 02-06 (1) 06-10 (2) 10-15 (1) 15-17 (2) 17-18 (3) 18-23 (4) 23-00 (3)	20-22 (1) 22-02 (2) 02-04 (1) 21-03 (1)*
McMurdo Sound, Antarctica	15-17 (1)	15-16 (1) 16-18 (2) 18-19 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-01 (1) 04-06 (1) 07-09 (1)	23-03 (1) 03-06 (2) 06-07 (1)

*Predicted times 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.

Awards *(from page 82)*

Note: ISWL has a fine QSL Bureau, for full details of ISWL membership with the benefits of this QSL Bureau, send S.A.S.E. and a couple of IRCs to: ISWL Headquarters, 1 Grove Road, Lydney, Gloucestershire, GL 15 5JE, England.

Notes:

What has been known for a long time as POD 26, is now called Directory of Post Offices, stock #039 000 00253-4, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and the cost is now $5.55.

Bertha, WA4BMC has given up the job of Information Bureau for MARAC/ICHN due to health conditions. All requests now go to Walt Allen, 2907 W. 98th Street, Leawood, Kansas 66206. No. S.A.S.E. needed, just send 46¢ in stamps, be sure to include your name, address and call. You will receive a lot of good data on County Hunting, MARAC, CH QSLs, CH QSL Bureaus, etc.

The Midwest Mini-Convention is set for October 13, 14, 15, 1978 at the Holiday Inn, Wausau, Wisconsin. More data soon from Tom, K9GTQ.

This is being written the first week of January, so I can now thank everyone for their fine cards and letters (keep 'em coming) and I wish I had the time and money to sit right down and write each one of you fine County Hunters a long letter.

Remember to write and tell me, How was your month? 73, Ed., W2GT.

Zero Bias *(from page 5)*

FCC License Fees Again?

There seems to be a rumor spreading again about the reinstatement of license fees. This comes from a study being done at present on previous fees and fees that truly represent services rendered. A form of refund is being considered on past fees collected that were not appropriate to the services rendered. These refunds will fall into two catagories, "excessive fees under $20" and "excessive fees over $20." It is easy to see from this where a rumor of newly instituted fees came from. It is in fact a logical extension of thought. Let's look at what this means.

First, this present endeavor involves at least one employee from each service within the FCC whose services are "donated" to this new cause. That boils down to giving up part of our already meager budget in the form of one lost employee. This could mean further delays which would make us unhappy, and an increased work load to make the FCC unhappy. We, in a sense, are underwriting the cost of this new fee program.

Second, and more insidious, is the fact that appropriate legislation is not there and not forthcoming on where any future monies would go. Under present legislation, granting some form of appropriate fee schedule, all monies collected would go into the General Fund once again. Congress would still have to apportion funds for the FCC. So, it seems we are going around to square once again.

Perhaps the government took a long look at how much easy money they gave up by recinding fees and now they see a simple way to pick up a couple of hundred million dollars without having to spend a dime. We've all seen or experienced the effects of this in the past. We've all taken the big rip-off placidly in the past and accepted the realistic fact that the FCC cannot afford (don't confuse this with an "I don't care" or "I don't want to" attitude) certain services anymore. Perhaps we will have to tighten our belts another notch or two to lose a little bit more.

We can accept the system the way it is and shrug our shoulders. We could write our Congressmen, not petulantly, but seeking their assistance in forming constructive legislation on the dispersion of agency fees. We could write to the FCC, but they're caught in the middle and really have the same options as you and me. We could try a direct approach and drop in to our Congressman's office for a chat if it's convenient. After all, the bottom line as they say is "How much ***does*** amateur radio mean to me?"

73, Alan, K2EEK

CQ Reviews: Yaesu FT-301D *(from page 46)*

Yaesu has discontinued the use of mil-spec fiber glass boards in the construction of the FT-301D. The plug in modules are constructed on a high grade phenolic board currently being used by the majority of Japanese manufacturers. Personal experience has shown these boards to be desirable and repairable without undue concern for inflicting damage with a soldering iron.

If you think the Yaesu FT-301D might make a good addition to your shack you can write for more information and the latest price to Yaesu Electronics Corp., 15954 Downey Ave., Paramount, California 90723. ■

Q *(from page 65)*

primary, increasing the primary losses and effectively lowering the tank circuit *Q*. This result is an increase in I_p, the line current, since it has greater losses to make up. The new curve with moderate coupling is shown in fig. 9(c). Note first that the value of I_p at resonance is now higher indicating the loss of energy from the primary. Note also that the resonant frequency, f_r, is higher. This is because the drain of energy from the primary reduces the inductive effect (reduced back e.m.f.) and thus raises the frequency. This is corrected by increasing C for a dip after each adjustment of the coupling.

It is possible to increase the coupling to a point where a plate current dip is no longer recognizable and so tuning by the plate meter is not possible. In this event, a relative r.f. output meter becomes more useful. In any case, the plate current, after loading, should never exceed the safe value for the tube or tubes used in the final.

Pi-Coupling

Pi-network coupling is the method used to match the final to the antenna in most transmitters today. Its popularity can be attributed to the fact that it varies coupling electrically rather than mechanically and can adjust to a wide range of impedances.

The pi-network shown in fig. 10(a) is basic and is bandswitched by taps on the coil. For purposes of analysis it can be redrawn as shown in fig. 10(b), where it can be seen as a parallel resonant tank circuit with a capacitor in series with the L branch. Capacitor C_1 tunes the network to resonance. Capacitor C_2 adjusts the coupling. With C_2 set at maximum capacity, its X_C is at its lowest and this is very low compared to C_1. With C_2 set at maximum capacitance (lowest X_C), the load R_a is effectively shorted out and C_1-L_1 tune as a conventional unloaded parallel circuit and meter M_1 will indicate a low value of I_p because of high *Q*.

As the capacitance of C_2 is reduced its reactance rises and R_a becomes a greater part of the series L-C circuit and the *Q* decreases. This then requires the generator, V_1, to make up greater losses and I_p rises, indicating loading out. Each variation of C_2 requires a resetting of C_1 to return to resonance.

Relative R.F. Output Meters

Since loading out is a process of impedance matching, a degree of coupling will be reached where there will be no further increase in r.f. output but the d.c. input will continue to rise. In fact further increases in loading could cause the r.f. output to drop while increasing the d.c. input. The answer to this problem of locating the optimum impedance match is to use an additional meter to measure the r.f. output voltage as shown in fig. 11.

The procedure is to tune for the greatest r.f. power output for the least d.c. input, but never to exceed the maximum d.c. allowable for the tubes used. When maximum r.f. is obtained for minimum d.c. the optimum impedance match has been made. ■

Biorhythm Charts *(from page 27)*

tion of the need to select contest operators on the basis of favorable biorhythm charts.

Summary

Using the biorhythm selection method described in this paper, a well-known East Coast radio club has managed to win consistently those DX and national contests which are sponsored throughout the year by various organizations. This being the case, it is only fair that all contest clubs be made aware of the method, and be given the opportunity to select objectively those operators who can best be expected to excel in any given contest period. It is true that a considerable analysis effort is required, but the biorhythm selected method can significantly increase an organization's chances of besting its opponents in contests on the high-frequency and very-high-frequency bands. ■

Announcements *(from page 6)*

State Fairgrounds, in Montgomery. Operations will be conducted from 1600 hours to 2300 hours UTC on frequencies 14.300 MHz and 3.950 MHz normal SSB; slow CW (5 to 10 w.p.m.) on 7.125 MHz during even hours UTC and 21.150 MHz during odd hours UTC. QRM frequency adjustments will be up band. For more info, contact: Twin Base Amateur Radio Club, CMR Box 9748, Gunter, AFS AL 36114.

• **Rochester, MN** – The Rochester Repeater Society will be holding their "Ham Fest" On April 15, starting at 9 a.m. For advance tickets and info, contact, Joe Fishburn, K0TS, 2514 4th Ave. NW, Rochester, MN 55901 or Gary Sharp, WD8AMA, 1610 34th St., NW, Rochester, MN.

• **Lawton, OK** – The 32nd Annual Lawton-Fort Sill Hamfest will be held on April 8-9, 1978, at the Montego Bay Motel. There will be free Dealer and Swap tables. For more details write: Box 892, Lawton, OK 73502.

• The Holiday-in-Dixie Festival QSO Party is sponsored by the Amateur Radio Club of Shreveport, Louisiana (ARCOS). The party will be held from 1800Z, April 21, 1978 through 2400Z, April 30, 1978. Contact a station within 75 miles of Shreveport, exchange contest information, send a s.a.s.e. to: Holiday-in-Dixie QSO Party, P.O. Box 1485, Shreveport, LA 71164. To kick it off, ARCOS members will be on the air from 1800Z April 22 until 2400Z April 23 continually, but contacts can be made anytime during the festival.

• **Kansas City, MO** – The P.H.D. Amateur Radio Association, Inc., of Liberty, MO (Kansas City Area) will sponsor the 9th Annual Northwest Missouri Hamfest on Saturday and Sunday, April 22 and 23, 1978 at the Trade Mart Building at the downtown Kansas City Missouri Airport. Doors open from noon to 6 p.m. on Saturday and from 9 a.m. to 5 p.m. on Sunday. Pre-registration is $2.00 and admission at the door will be $2.50. Talk-in on 146.34/94. For information and pre-registration write to: PHD Amateur Radio Assn., Inc., P.O. Box 11, Liberty, MO 64068.

QRP *(from page 56)*

A combination of all of these things made it possible for me to acquire DXCC QRPp Trophy #7. It took something over a year and a half to accomplish QRPp DXCC. At the present time, I stand at 134 countries.

"Some of the procedures I find successful in low power DX'ing follow:

Let the station you are calling know that you are QRPp as soon as possible. Most DX stations are willing to listen harder and help you if they know you are using very low power. I get into DX pileups quite frequently and make it through ahead of many of the KW stations. There are a lot of wonderful fellows on the air who help QRPp'rs get a rare DX station. Many times a high power station will say "pick up WA6SOV. He is running 3 watts. Some of the nets I check into will hear me and someone will say 'give me my turn to WA6SOV. He is low power. We QRPp folks do have a lot of friends out there. As is often said, that is what amateur radio is all about.

All of the advantages have not been on my side, as I only have a General ticket, so as a DX'er I'm losing about half the DX possibilities. However, this has not been too discouraging to me, as I spend all available time on the air. I'm not only working DX with low power, but over the years, I've gotten about 39 awards, and some of the last ones have been all low power acquired. I think I hold the only Bicentennial WAS for exclusively low power contacts. About 7 months ago I started working on a new one—all states with two-letter calls. I have about 40 of them now. This too is on low power, making it doubly difficult. Well, this is my story behind DXCC QRPp #7."

Conclusion

Well gang, that wraps up another episode in the continuing saga of DX'ing with QRPp. The next installment surely will include some 200 country endorsements of unspecified nature—I have to think something up! Let's hear from those of you who are working DX, even if you haven't reached 100 or 200 countries. I hate to feel that because of the awards given out, fellows with less than QRPp DXCC are ashamed to let us know about their efforts. You guys that succeed moderately are the real groundwork of the movement!

QRPp DXCC is offered to under-five watt output stations submitting 100 bonafied QSL's (ARRL countries list) along with a $13.00 application fee; DXCC MILLIWATT for under-one watt output stations submitting 100 bonafide QSL's. No application will be processed until September, 1978, but, in order to establish the numerical precedance of your application, have two licensed amateurs examine your set of 100 QSL's, and have both sign a statement declaring that all cards were in order and complied with the ARRL Countries on the date examined. Hold the packet until September, and mail it with the signed statements, and if everything checks out and the cards are approved by me, your date of approval will be that shown on the signed statements.

Until next month, then, happy QRPp'ing and good luck to all in the DX contests. 73 Ade K8EEG

In Focus *(from page 70)*

Monitor Costs—New

Venus Scientific and SBE monitors are currently the only new P-7 monitors available over the counter in the U.S. The Venus Model SS-2 in kit form is now selling for $195. All wired up, the price is $245. On balance, I'd say that this unit in either kit or wired form is a very good buy. If you would like a larger viewing screen and a built in cassette recorder, the SBE monitor may be your choice. Check with your dealer for his best price on this unit, it's a good one.

Monitors—Where To Find Them

As indicated above, hamfest flea markets and some of the mail order houses are probably your best bets. Watch the used equipment ads. Keep an ear open on the SSTV frequencies to find out who's just acquired a new scan converter—he may have a good used P-7 unit for sale!

Don't forget that *CQ* offers its subscribers free use of the HAM SHOP ads. Whether your buying or selling, you can take advantage of the free "ad" possibility.

"In Focus" Wants Your Pictures!

Once again I'm making a plea for pictures of YOU and YOUR SHACK—and pictures of any slow scan-related activities you may encounter. Slow scanners everywhere are interested in seeing pictures of You and Your slow scan gear. How about some pictures from South America? And what's happened to you chaps Down Under? I don't think I've ever seen a picture of a ZL SSTV station. Do they really exist?

Please keep on sending your letters and pictures to W2DD at that same old hilltop address: 2112 Turk Hill Road, Fairport, N.Y. 14450.

Many thanks and best regards,
Bill DeWitt, W2DD

HAM SHOP

FREE TO CQ SUBSCRIBERS

Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad.
Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.

F.M. B*A*S*H, DAYTON, OHIO, April 28, 1978, Friday night of DAYTON HAMVENTION. Social evening for hams and friends, 8 PM til midnight, Biltmore Towers, First and Main Street. Admission is free. Sandwiches, beverages, snacks and C.O.D. bar available. Live entertainment by TV personality Rob Reider, (WA8GFF) and his group. Fabulous prize drawing featuring a complete Drake UV-3, including 144, 220, & 440 MHz synthesized modules, power supply, encoder mike and antenna plus other prizes. Winner of first prize need not be present. For further information contact: Miami Valley F.M. Assn., c/o Sue Hagedon, WB8GWQ, 1340 Brainard Woods Drive, Dayton, Ohio 45459.

WANTED: Hallicrafters Receivers—SX42, SX43 and SX71. Prefer receiver to be complete and original, with matching speaker if available. Also wanted, 1946-1955 Hallicrafters sales literature & owners manuals. Paul B. Jenkins, P.O. Box 1972, Panama City, Fla. 32401, (904) 769-0144.

QSL CARDS—Something completely different! Nothing even close to it on the market! The "Cadillac" of QSLs! Samples: $1.00 (Refundable with order) W5YI Print; Box no. 1171-E; Garland, Texas 75040.

TECH MANUALS for Govt. surplus gear—$6.50 each: SP-600JX, URM-25D, OS-8A/U, TS-173/UR. Thousands more available. Send 50 cents (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

MOBILE IGNITION SHIELDING provides more range with no noise. Available most USA engines, some imports. Free literature. Bonding straps on sale now. Estes Engineering, 930 Marine Drive, Port Angeles, Wash. 98362.

EZ DOES IT BEST. Deals, that is, on Yaesu, ICOM, Drake, Swan, Cushcraft, Larsen, KLM, Dentron, VHF Engineering, and Wilson. For new or used gear, call, see or write W0EZ, Bob Smith Electronics, 12 So. 21st St., Fort Dodge, IA 50501. 515/576-3886.

EMBLEMS, PATCHES Embroidered. Custom made from your design. Order 10 to 1000's. Russell, 1109 Turner St., Auburn, Maine 04210.

TELETYPE FOR SALE: Model 28ASR's, KSR's, typing reperfs, and TD's. New and used parts available including cabinets, tables, Mod Kits, gears and gearshifts. Some 8-level Model 33 and 35 equipment available. Send S.A.S.E. for complete list and prices. Lawrence R. Pfleger, K9WJB, 2141 N. 52nd Street, Milwaukee, WI 53208.

SPOKANE SWAP—FEST, all day Saturday April 29 at Interstate Fairgrounds. Flea market, auctions, contests, picnic, some most unusual exhibits. Sponsored by Inland Empire area amateur clubs. Write: Box 3606, Spokane, WA 99220. Talk-in all area repeaters.

WANTED: Commercial outdoor type 50 ohm dummy load; 2 kw or greater. Rod, W7OM, 5632 47th Ave., SW, Seattle, WA 98136.

SELL: 2 mtr FM Sonar transceiver, AC P/S, mobile bracket $175. Heath HW-32A with spare tubes, $65. George Pataki, WB2AQC, 34-24 76th St., Jackson Hgts., NY 11372.

SALE: Sony ICF-5900W multi-band receiver designed for SWLs. Like new condition w/ manuals. $100. Schultz, W4FA, Box "L", FPO New York 09544.

WANTED: Manual for a Star SR-600, Serial no. 876. Ken Sturgis, Jr., Box 241, Rathdram, Idaho 83858.

QSLs with Class! Unbeatable quality, reasonable price. Samples, 25 cents. QSLs Unlimited, Box 27553-C, Atlanta, GA 30327.

FREE Catalog. Flash Tubes, Nicads, Kits, Calculators, Digital Watch Modules, Ultrasonics, Strobes, LEDS, Transistors, IC's, Unique Components. Chaney's, Box 27038, Denver, Colo. 80227.

FOR SALE: Drake SPR-4 $650.00, TC-2 $125.00, MS-4 (with power supply) $100, T4-X $275, R-4A $275, MN-4 $100, CC-1 (pwr supply 2 & 6M) $120, WV-4 $35, Waters Keyer no. 361 $25, Dummy antenna no. 384 $50, Heathkit Monitor Scope HO-10 $50, Ham Scope HO-13 $50, Q multiplier $10, Hallicrafter T.O. Keyer no. HA-1 $75, Hammarlund HQ 110A (VHF) $200, Gonset Communicator VFO (2,6 & 220) $25. Local pick up only. K2ABQ, (516) 781-3996.

SELL: Heath SB-102 transceiver, HP23B AC supply mounted in SB600 speaker cabinet and EV638 Mike. All in mint condition, $350.00. R.L. Eison, 825 Jacqueline Dr., Huntsville, AL 35802.

ALPHA—77DX Truckload sale, Payne Radio, K4ID, (615) 384-2224.

WANTED: To correspond with one who has converted AN/WRR-3A or B for use as a receiver. Also AN/WRR-3 receiver for parts, no tubes or cabinet. Owen Laughlin, 1310 Pinecrest Dr., Ferndale, MI 48220.

3000 RARE hard to find tubes from 50 cents up. Wanted W8FYO Paddle, Electronic Keyer, Schematic for AF 67 transmitter. W5QJT, 4215 Darwood Dr., EP, TX 79902, 915/544-9243.

HURRICANE proof your quad with fiberglass pole vaulting poles—guaranteed new $39.50. 8 for $240. K5WSE, P.O. Box 20-AA, San Antonio, Texas 78201. 512/699-9260.

SELL: Heath 1680 Receiver, $170.00. Gonset 2 Meter FM Transceiver, 10 watts, $50.00. Homemade Receiver, excellent, details furnished on request. Will ship one or all. Richard Nendick, W7QWD, Star Route 2809, Winnemucca, Nevada 89445.

SB-102, HP-23A, SB-600. Good condition with manuals, spare tubes, cables. Best Heath tube rig. $350 plus shipping. Norman Sullivan, PSC no. 1, Box 5142, APO San Francisco, CA 96286.

SOUND SWITCHES: Trigger circuits by clapping hands, whistling, etc., Control lamps, appliances or use as effective burglar alarm. Completely assembled, with microphone: ONLY $5.00. Michael. Wagner, P.O. Box 3382-Q, Station 'B', Calgary T2M-4M1, Canada (Guaranteed).

THE RIGFINDER: Low cost ham ads each month. Postcard brings sample. WA1GFJ, 17 Whitney St., East Hartford, CT 06118.

WANTED: 4X5 View Camera any age, any condition, must be reasonable. R. Webster, W3LBW, 601 Camelot, Pittsburgh, PA 15237.

ELIMINATE QRM and QRN problems with our superior CW and SSB Filters. Also CW Keyers, speech compressors, power supplies, teletype converters, and multiband antennas assembled or in kits. Dealer Discounts. Dynamic Electronics, Box 896, Hartselle, AL 35640. 205/773-2758.

REGENCY Touch $249.95. Bearcat 210 $249.95. Call (707) 544-4388. McDonald Electronics, Box 7492 (C), Santa Rosa, CA 95401.

SSTV AND PHOTOGRAPHERS—Make offer, 1 each, like new, fujitar lenses, 135 mm, f 4.5, telephoto, 35mm, f 3.5, wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

WANTED: Antique Glass, Looking for old milkglass—purple, slag, carmel, and greentwon. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

SELL: Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch, $16. UTC S-50, 6kv c.t. 300 ma, new, pick-up only, $75. Small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

SALE: Heath IM-28 VTVM Kit. New. Perfect. Ordered by mistake. $40. Schultz, Box "L", FPO New York 09544.

THe book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher, W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., N.W., Albuquerque, NM 87114. Please enclose $1.00 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906, (617) 233-1234.

LOOKING FOR old Lionel trains. Interested only in "O" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

FOR SALE: Spectra Physics 137P 2mw laser tube, brand new, never used, $80. G.R. 572B, 1 kHz Hummer, $15. Irwin Math, 320 Northern Blvd., Great Neck, NY 11021.

FOR SALE: Old issues of Ham Radio, 73, CQ, and QST. Some complete runs. Send s.a.s.e. for list and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vandervneter Ave., Port Washington, NY 11050.

CAN ANYONE HELP? Need a 3RP1A CRT to repair my scope. Schultz, W4FA, US Consulate, Box "L", FPO New York 09544.

SACRIFICE: Drake T-4X, R-4B, Spk. MS-4 with p. sup., $595. Atlas 210X with console, $685. All in mint condition. CB Mart, Box 5024, Conalville, Iowa 52241.

HW-202 w/built-in Sandlin scanner, crystals; ITC Multi-2000; Bearcat 101 scanner. All in good condition. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

CQ AND QST 1950-1975 issues for sale. Send s.a.s.e. if ordering 73, Ham Radio, or other CQ and QST issues. One dollar minimum order and all issues cost 25 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

Spread The Word

"Talk to the World-Become A Ham Operator" bumper stickers are available from CQ for 25 cents plus a legal-size s.a.s.e. Write to: CQ, 14 Vanderventer Ave., Port Washington, NY 11050.

REGENCY HR2A with Tone pad. $180. FM stereo tuner, 8 track player. WA1GFJ, Gabe Gargiulo, 17 Whitney St., East Hartford, CT 06118.

RADIO STATION OPERATORS: Group of 10 long established camps located in New York Adirondacks, Massachusetts, & Connecticut Berkshires, and Maine offer excellent opportunity for broadcast and amateur radio operators. Graduate and undergraduate students. Experience necessary in announcing, setting up equipment, and organizing program. 8 week summer season. For application and further information write: (Enclose Full Details As To Your Qualification) Kathy Singer, Placement Advisor, 105 Fairview Ave., Port Washington, NY 11050.

SELL: CQ Magazines complete. Reasonable offers, cash or trade. Nagle, 12330 Lawyers Rd., Herndon, VA 22070.

FOR SALE: Heath HW-29A 6 meter transceiver with mike, mint condtion $25. Dr. Eric Palmer, W2RD, 1602 Mermaid Ave., Coney Island, NY 11224.

SELL: HW-7 transceiver with HWA7-1 PS $60. Good condx with manuals. Pierre Le-Long, N6GO, 5408 Simpson Ave., No. Hollywood, CA 91607.

WANTED: Schenatic and manual for RCA CB2608A to buy or copy and return. F.C. Bergquist, 104 Sarver Dr., Leesville, LA 71446 or (318) 238-9724.

WANTED: World War I Army/Navy Radios, parts, telegraph sets. K4TS, Rt. 2, Box 3, Fredericksburg, VA 22401.

WANTED: National receivers, working or not. T.N. Colbert, WA8MLV, 1008 Englewood Dr., Parma, OH 44134.

HALLICRAFTERS S-41G. R. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

UNIVERSAL QSL and DX cards needed. Send QSL and DX cards to Philip Kurkland, 357 East 201 St., Apt. 1-F, Bronx, NY 10458.

WANTED: Johnson Viking II transmitter for novice work, not over $125. John Washington, 55 North Main St., Brockton, MA 02401.

TS-820, VFO, CW Filter, new, $1100. K8CVV, (313) 549-2353, 4612 Woodland, Royal Oak, MI 48073.

FOR SALE: D104 mike with "G" stand Astatic Corp., pick-up only, $20. WB2UFY, Hank Van Handle, 139 Howe Ave., Passaic, NJ 07055.

WANTED: Fourth edition ARRL Radio Amateur's Handbook. W9DDL, 5006 N. Second St., Loves Park, IL 61111.

WILL PAY $100 for factory wired Atwater Kent Breadboard Radio in restorable condition. WB1BVO, 22 Forest St., Branford, CT 06405.

MINOX Camera model III—C automatic with electronic shutter speeds and flash unit. New in box, $165. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, OH 44212.

FOR SALE: Freshman masterpiece in excellent condition, best offer. N3IK, RD 1, Box 181A, Kunkletown, PA 18058.

JOHNSON 6N2 and VFO, perfect for Oscar. Includes manuals and spare tubes, $50. Complete Bell and Howell television course with design console, etc. Make offer (the books are heavy). Bob Sullivan, N4RS, P.O. Box 6216, Arlington, VA (703) 430-3155.

FOR SALE: Drake TR-6 w/noise blanker AC-4, MS-4, excellent condition, recently back from Drake, Cadillac of six meter rigs, $625. Dick, K1SYI, (617) 943-4420 after 8 p.m. EST.

SELL/TRADE Several 12 VDC Coax Relays, 150 WRF 550 MHz, each $5. Three DPDT coax relays 2KW, each $35. List my excess gear, SASE. W4API, Box 4095, Arlington, VA 22204.

SELL: Plug-in SSB-CW product detector for HRO 60, HRO 50, NC 183D, $89.50 p.p. Maximilian Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

TEMPO 2020 $650., other acces. J.P. Johnson, WB4BYO, 135 W. 9th St., Jacksonville, FL 32206.

HEWLETT—PACKARD 200C audio osc. $30, 200T low distortion osc. $100; 211A sq. wave gen. $60; 212A pulse ge. $40; 712B pwr supply $40; all with manuals. P.h.D. 5220 Carlingford, Riverside, CA 92504.

WANTED: IRCs, as many as 50-100. Paying 20 cents each. Bob May, K4SE, P.O. Box 30, Jonesboro, TN 37659.

WANTED: Heath SP5220 variable isolated AC supply, or equivalent. State conditon and price. Caswell Davis, Jr., 601 Delmar, Apt. 2, San Antonio, TX 78210.

WANTED: BC342, BC348, BC779, with AC. Also S-20-R receiver. Jack Larson, W6TBA, Rt. 1, Box 105B, Rosamond, CA 93560.

WANTED: KW Roller Inductor. Sell 3600-0-3600 x fmr at 1 amp with 110/220 Price $40 FOB. Paul Bittner, 1616 South St., Eau Claire, WI 54701.

SELL: 1930's xmtrs, receivers, 5M mobile, ore, s.a.s.e. for list. J. Pluth, 7720 W. 162nd Pl., Tinley Park, IL 60477.

WOULD LIKE TO SWAP my Genave GTX-200, 14-77, for H.T. or over the shoulder xcvr. Genave is clean, full of srystals and has factory inst. receiver pre-amp. WB7BHZ, P.O. Box 223, Wadsworth, NV 89442.

FOR SALE: Eico 753-752-751, RME6900, Com IV 6M, III 2M, SR34AC, JRC425, TX-1, Mciro 723, Magnum 6 (Heath), Globe Hi-bander, ex/condx, w/man, send offers. Joseph Bedlovies, 30 Ridge St., Milford, CT 06610.

FOR SALE: Two Hella Halogen fog lights (new in boxes), 139 ZNEH CC, plus dashboard illuminated switch for a Porsche, $30. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Pre-war issues of Short Wave Craft magazine. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Collins 51-R receiver (VHF). Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

CERTIFICATE FOR PROVEN TWO—WAY RADIO CONTACTS with Amateurs in all ten (10) USA call areas. Award suitable to frame and proven achievements added on request. SASE brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

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HIGH SPEED CODE TAPES—40 to 80 WPM. Inquire to K4KHT, 4330 N.E. 13th St., Ocala, FL 32670.

WANTED: One copy of the May 1976 issue of Ham Radio Magazine. Irwin Schwartz, K2VG, c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

HEATH Sb104 with noise blanker, cw filter, speaker, power supply first $500. takes this mint working set. W2GUJ, (516) 378-8173, 314 Smith Street, Freeport, NY 11520.

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CIRCLE 44 ON READER SERVICE CARD

ADVERTISER'S INDEX

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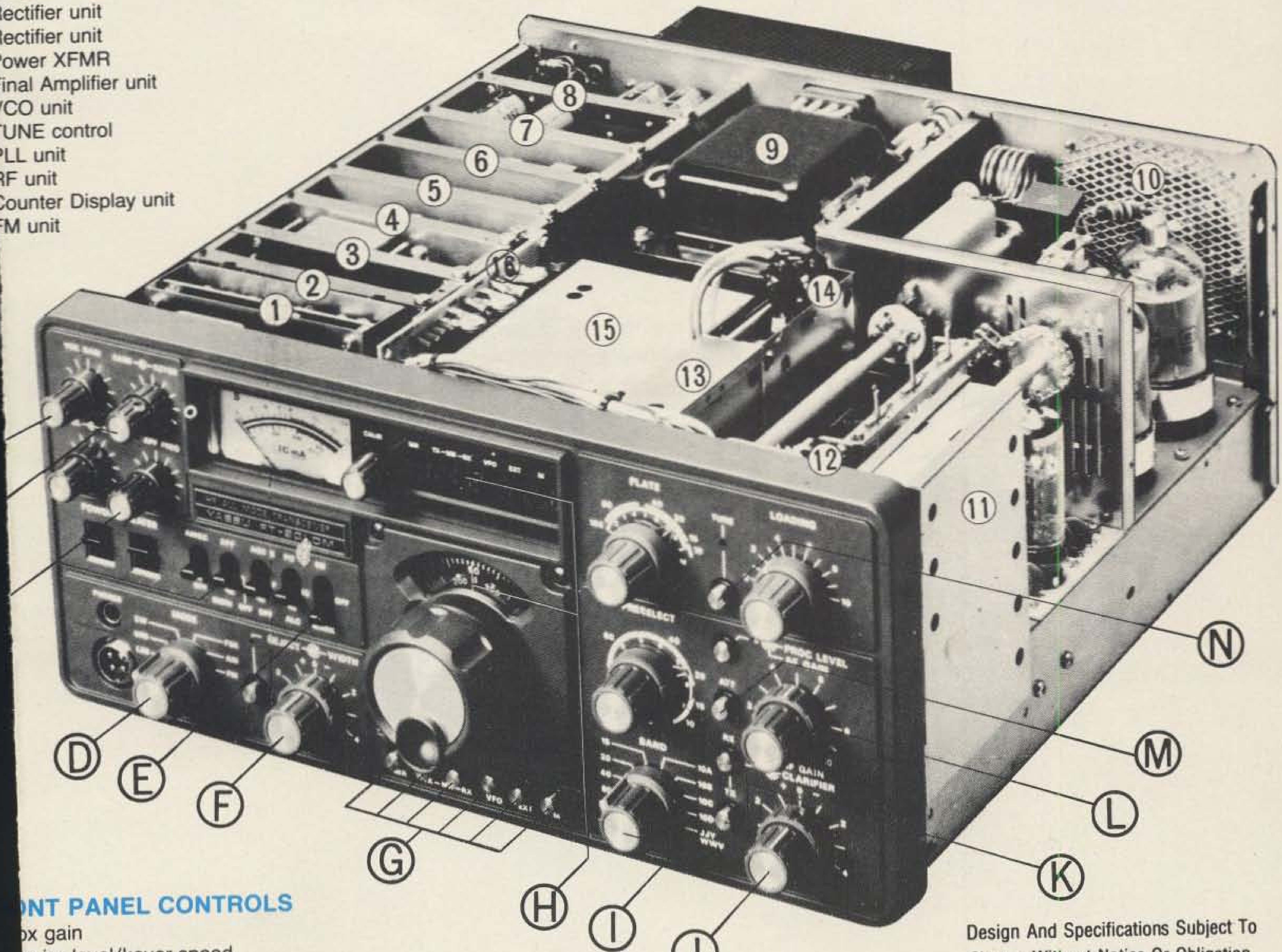

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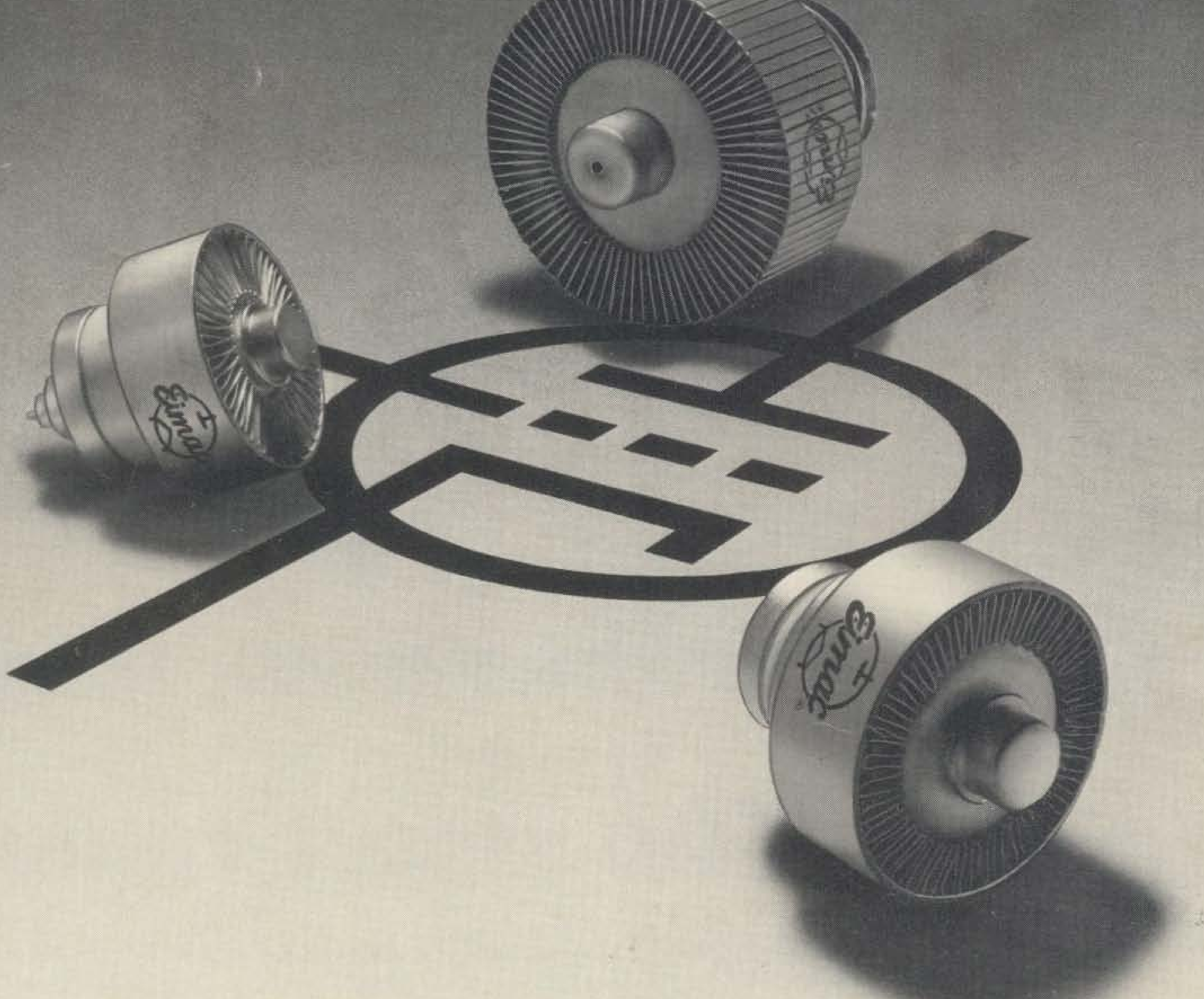

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