ICD 08240

Amateur Radio

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MAY 1978 $1.50

CQ

DXing In Montserrat

High Claimed Scores-
CQ WWDX CW Contest

An RTTY Primer, Part IV

The Wave Antenna

Fashions In Microphones

CHU-Canadian
Time Standards

Wireless Telegraphy
At The St. Louis
Exposition In 1904

A Solid-State QRP VFO Transmitter For 7-14 MHz
Part III: A 15 Watt Final Amplifier

THE RADIO AMATEUR'S JOURNAL

74820 08240

KENWOOD

...pacesetter in amateur radio

The TS-820S . . . still the Pacesetter. It has proven itself to be the performer we promised, proven itself through thousands of hours of operating time, world wide and under the most difficult conditions. Unique features, superb specifications and top quality construction . . . all hallmarks of Kenwood amateur products are eminently displayed in the TS-820S. But then, you've probably heard all that on the air by now.

TS-820S

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.

TS-820S VFO-820S SP-820

Kenwood's unbeatable combination. The VFO-820 solid state remote VFO adds greatly to the versatility of your TS-820S. It has its own RIT circuit, control switch and is a perfectly matched accessory. The SP-820 deluxe external matching speaker includes audio filters for added versatility on receive and two audio inputs.

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220

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:

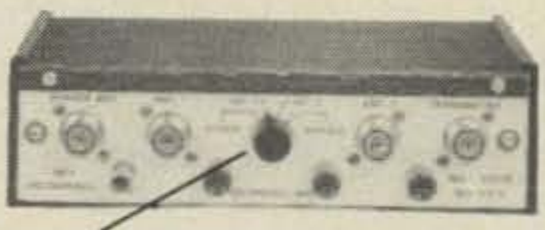
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

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.

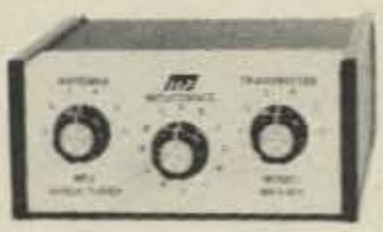
You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

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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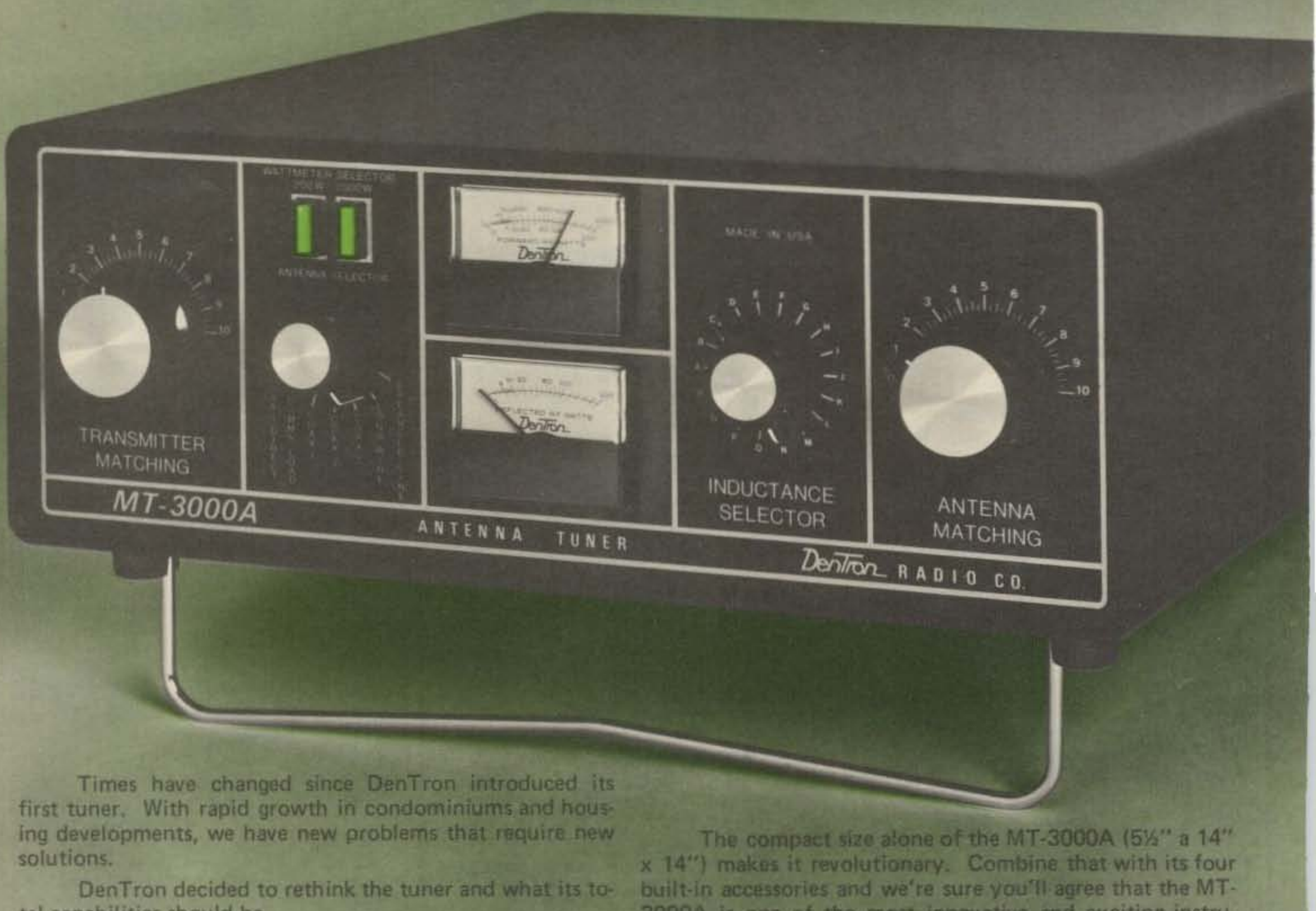
CIRCLE 55 ON READER SERVICE CARD

Look closely at the new MT-3000A. You've never seen anything like it.



Times have changed since DenTron introduced its first tuner. With rapid growth in condominiums and housing developments, we have new problems that require new solutions.

DenTron decided to rethink the tuner and what its total capabilities should be.

The MT-3000A is a capsulized solution to many problems. It incorporates 4 unique features to give you the most versatile antenna tuner ever built.

First, as a rugged antenna tuner the MT-3000A easily handles a full 3KW pep. It is continuous tuning 1.8-30mc. It matches everything between 160 and 10 meters.

Second, the MT-3000A has built-in dual watt meters.

Third, it has a built-in 50 ohm dummy load for proper exciter adjustment.

Fourth, the antenna selector switch; (a) enables you to by-pass the tuner direct; (b) select the dummy load or 5 other antenna systems, including random wire or balanced feed.

The compact size alone of the MT-3000A (5½" a 14" x 14") makes it revolutionary. Combine that with its four built-in accessories and we're sure you'll agree that the MT-3000A is one of the most innovative and exciting instruments offered for amateur use.

At **$349.50** the MT-3000A is not inexpensive. But it is less than you'd expect to pay for each of these accessories separately.

As unique as this tuner is, there are many things it shares with all DenTron products. It is built with the same meticulous attention to detail and American craftsmanship that is synonymous with DenTron.

After seeing the outstanding MT-3000A, wouldn't you rather have your problems solved by DenTron?

DenTron Radio Co., Inc.
2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216)425-3173

CIRCLE 11 ON READER SERVICE CARD

MAY, 1978 VOL. 34, NO. 5

CQ The Radio Amateur's Journal

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Zero Bias

an editorial

Our Cover

Our cover photo this month was sent in by Alex, 3A2GX of Monaco. To quote Alex, "The picture represents an honorary OM: H.S.H. The Crown-Prince Albert of Monaco operating my 3A2GX station". Alex also signs I1ALX and FØAZS. In more formal surroundings Alex is also known as Prince Alexis Evgeni Demcenko.

Possible FCC Funding?

Recently we received an announcement from the Copyright Office stating changes in Copyright regulations that pertain to publishing companies. Normally I wouldn't take editorial space to report on business happenings but there is one aspect of the new regulations which indeed has precedential possibilities for amateur radio. The area involved is funding. The Copyright Office has changed their method of funding through appropriate legislation and the new method is one we've all been waiting for. Simply, monies (fees) that are collected by the Copyright Office for services, are deposited with the Secretary of the Treasury (General Fund) are *now* credited to the appropriation for necessary expenses of the Copyright Office. In other words, people dealing with the Copyright Office will now get what they pay for.

The following is a quote from the Copyright Office Announcement:

"The amendments to the copyright law are contained in Section 406 of Title IV of the Appropriation Act, which is reprinted below:

> Sec. 406. (a) Effective October 1, 1977, section 203 of title 17, United States Code, is amended by adding at the end thereof the following: 'All moneys deposited with the Secretary of the Treasury under this section shall be credited to the appropriation for necessary expenses of the Copyright Office.'
>
> (b) Effective January 1, 1978, the first sentence of section 708(c) of title 17, United States Code, is amended to read as follows: 'All fees received under this section shall be deposited by the Register of Copyrights in the Treasury of the United States and shall be credited to the appropriation for necessary expenses of the Copyright Office.'

Since there are now studies being conducted within the FCC on fee schedules and talk of refunds for previous overpayments it is logical when thinking about the government to consider the possibility of a reinstatement of fees within the FCC. If so, then it is time to prepare for the allocation and funding methods of the FCC. This change within the Copyright Office leads the way for the FCC to literally demand equal consideration from Congress in the appropriation of funds needed to do the job. It's no longer a pie-in-the-sky wish but a reality waiting to be seized. I'm sure none of us would really object to a system that gave us what we paid for.

It's Up to You!

On February 16th, 1978, amateurs faced further restrictions in the pursuit of their "hobby". On that day, the FCC ruled on the two dockets, (21116 and 21117), that I had written about in my March Editorial. In a 5 to 1 vote, the FCC voted on the ban which would prohibit the commercial manufacture, distribution and sale of any r.f. amplifier capable of covering the 24-35 MHz frequency range. This ban should be in effect by the time you read this. They also voted 6 to 0 to impliment a limited form of type acceptance on amplifiers operating on frequencies below 144 MHz. This will go into effect as soon as detailed specifications and procedures can be worked out.

On the whole, it doesn't seem that important. It probably will give the manufacturers a hard time. If you don't operate on 10 meters it doesn't really concern you anyway. If you do spend some time on 10 then you can wait for a band opening or learn the joys of QRP. You may even think about building again, if you can dig up the parts. For a great number of amateurs, however, it doesn't affect them personally and so who cares?

Perhaps we should consider the ultimate good and leave it at that. The FCC can now rest easy, Congress can rest easy, and all the regional offices of the FCC can relax, now that the massive threat of amateur amplifiers on CB is over. Everything will be perfect now that the source of all the trouble has been eliminated. RFI will be a thing of the past. Now, if you couple this boon with the Code of Ethics you will quickly see that amateur radio has paid the supreme sacrifice to rid the world of illegal CB operation. Who asked us?

Perhaps, we should reflect on a future possibility? Do we really need 10 meters anymore? After all, there aren't many people who use 10 anymore so why all the fuss? If the remotest tinge of RFI still exists, then we can give up 10 entirely for the ultimate good. After all, without power what good is it?

If you can go along with the previous logic, and truly believe that what is going on in amateur radio involves informed input from concerned amateurs and organizations, then you are mistaken. If you are deluded in the fact that we are "trading" off one piece of spectrum for some ultimate peace, and the right to be left alone, then you are also mistaken. If you believe recent hyperbole from the League on how they, (in the guise of David), slew the 220 MHz issue, (Goliath), then you won't be disappointed if you see Joshua at the walls of Jericho when they turn these latest developments into something positive. Once again, we have been had, and had royally.

I have been accused of knocking the League without giving any positive alternatives to the problems that have arisen in amateur radio. That isn't true. I have always offered a very positive alternative. You. You are the positive alternative if

(Continued on page 86)

Wilson's SYSTEM ONE

TRIBANDER ANTENNA IS HERE . . .

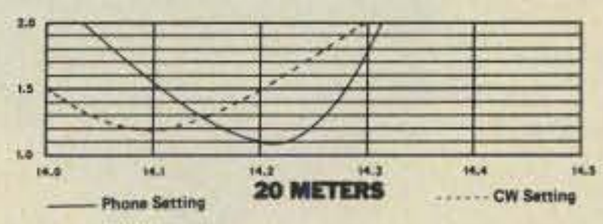
SYSTEM ONE
FOR 20, 15 and 10 METERS
Monoband performance with 4 elements on 20 meters on a 26' boom.

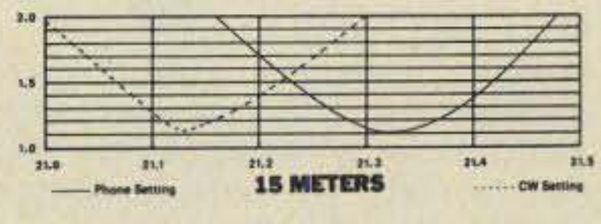
THE SY-1000 TRIBANDER ANTENNA IS SHOWN HERE WITH THE WR-500 ROTOR AND SST-64 CRANK-UP TOWER @ 50 FT. (Guy System not shown)

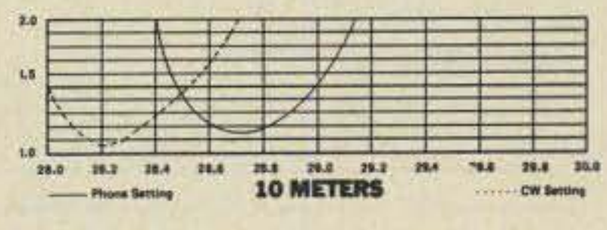
The new standard of performance for Tribanders is the Wilson System One!!! A DX'ers delight operating 20 meters on a full 26' boom with 4 elements, 4 operational elements on 20-15-10, plus separate reflector element on 10 meters for correct monoband spacing. Featured are the large diameter High-Q Traps, Beta matching system, heavy duty Taper Swaged Elements, rugged Boom to Element mounting . . . and value priced at $259.95. Additional features: • 10 dB Gain • 20-25 dB Front-to-Back Ratio • SWR less than 1.5 to 1 on all bands.

MODEL SY-1 SPECIFICATIONS:

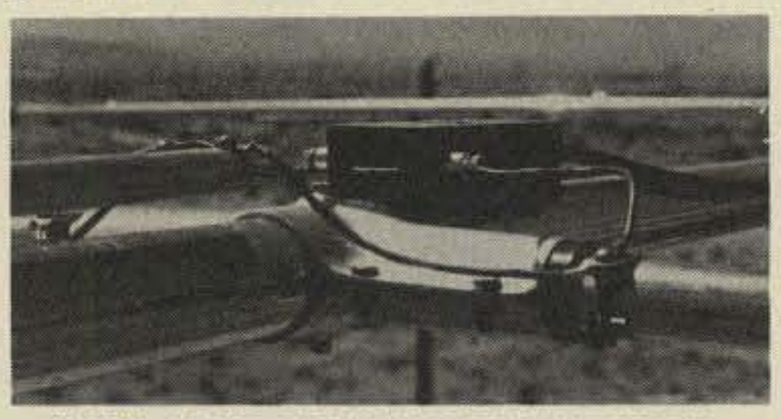
Matching Method:	Beta	F/B Ratio	20-25 dB	Mast Diameter	2" O.D.
Band MHz:	14-21-28	Boom Length	26' (2" O.D.)	Boom Diameter	2" O.D.
Maximum Power Input:	Legal Limit			Surface Area	7.3 sq. ft.
Gain	10 dB	No. of Elements	5	Windload Area	146 lbs.
VSWR (at Resonance)	1.5 to 1	Longest Element	26' 7"	Shipping Weight	50 lbs.
Impedance	50 ohms	Turning Radius	18' 6"		



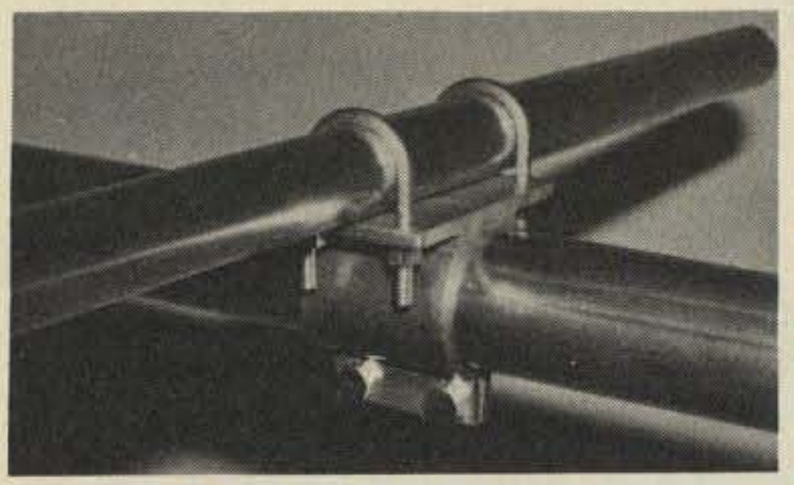




ADVANCED DESIGN LARGE DIAMETER HIGH-Q TRAPS FOR MINIMUM LOSS AND MAXIMUM POWER CAPACITY



INSULATED DRIVEN ELEMENT WITH PRECISION BETA MATCH AND HEAVY DUTY ELEMENT MOUNTS



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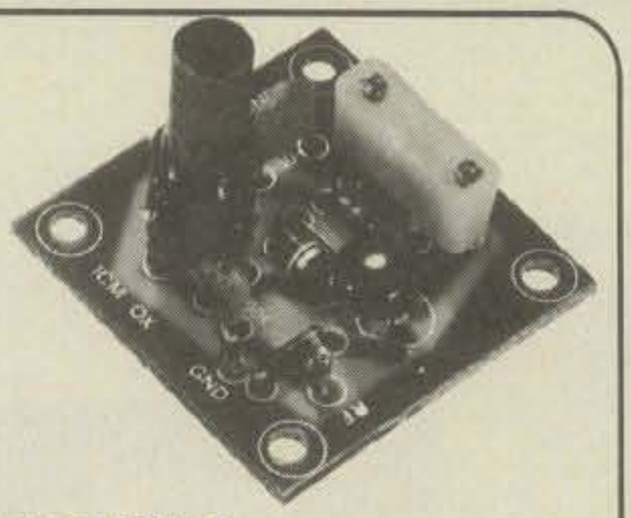
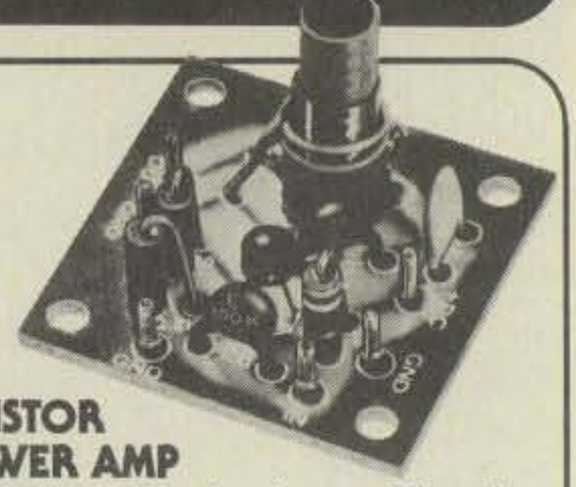
OSCILLATORS • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER

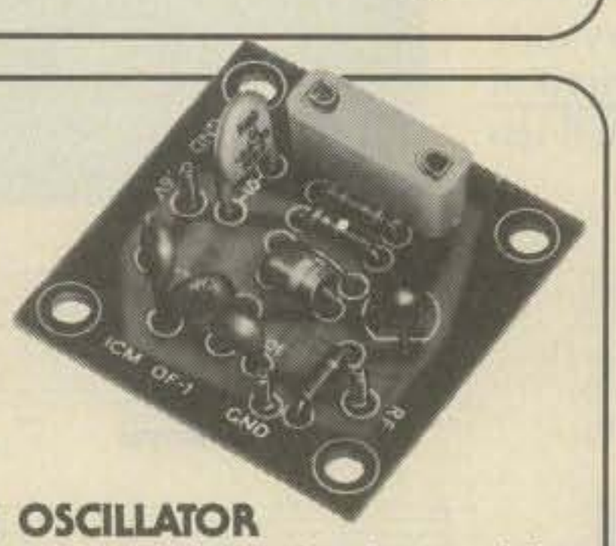


OX OSCILLATOR
Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101
Specify when ordering.
$4.95 ea.

MXX-1 TRANSISTOR RF MIXER
A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106
Specify when ordering.
$5.50 ea.



PAX-1 TRANSISTOR RF POWER AMP
A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated. 3 to 30 MHz, Cat. No. 035104
Specify when ordering.
$5.75 ea.



OF-1 OSCILLATOR
Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 HI, Cat. No. 035109
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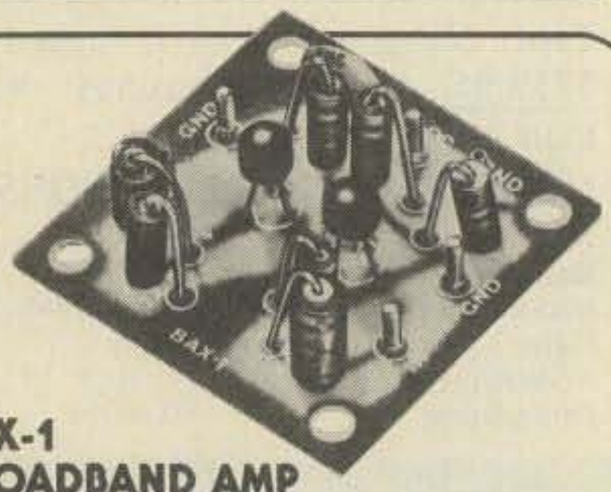
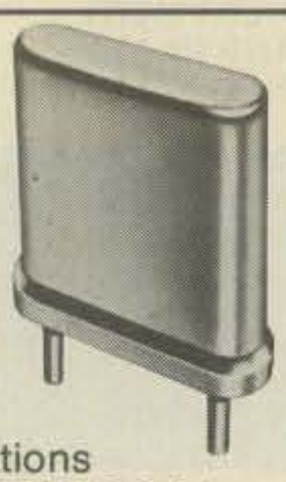
SAX-1 TRANSISTOR RF AMP
A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 035102. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
Specify when ordering.
$5.50 ea.



BAX-1 BROADBAND AMP
General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat No. 035107
Specify when ordering
$5.75 ea.



.02% Calibration Tolerance
EXPERIMENTER CRYSTALS
(HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo *Specify when ordering*	$5.95 ea.
031081	20 to 60 MHz — For use in OX OSC Hi *Specify when ordering*	$5.95 ea.
031300	3 to 20 MHz — For use in OF-1L OSC *Specify when ordering*	$4.75 ea.
031310	20 to 60 MHz — For use in OF-1H OSC *Specify when ordering.*	$4.75 ea.

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Oklahoma City, Oklahoma 73132.

ICM

International Crystal Mfg. Co., Inc.
10 North Lee
Oklahoma City, Oklahoma 73102

CIRCLE 22 ON READER SERVICE CARD

think of yourself as an antenna expert!

—you select your components!

1. Get optimum performance band for band. Choose from medium or high power resonators for your favorite bands.

2. Fold over, 360° swivel mast for quick band change or easy garaging. Select from two versions, fender/deck or bumper mount location.

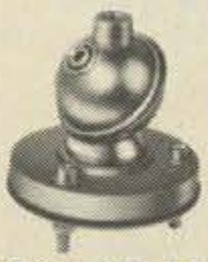
3. Stainless steel ball mount, 180° adjustable, commercial duty for superior mechanical and electrical performance.

4. Get exceptional reports, broadest bandwidth, lowest SWR. Use with any convenient length 50 ohm coax. Matching devices not required.

5. For convenience, use the Hustler stainless steel resonator spring, and special design quick disconnect.

...and you'll mobile with the experts' foremost choice... HUSTLER®

Get fixed station reports from your mobile—operate 6-10-15-20-40-75 or 80 meters with the experts and join the vast majority using Hustler for nearly two decades.



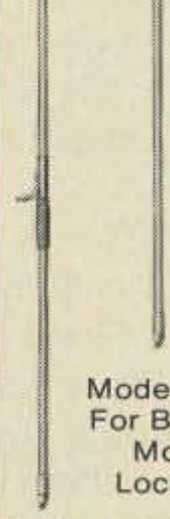
Model SSM-2 Ball Mount

Model BM-1
Bumper Mount

Model QD-1
Quick Disconnect

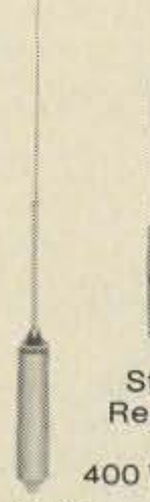
Model RSS-2
Resonator Spring

Model L-14-240
Mil Spec
50 Ohm Feedline



Model MO-1
For Deck or
Fender
Location

Model MO-2
For Bumper
Mount
Location



Super
Resonators
RM(S)
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Announcing

• **Birmingham, AL** — The BirmingHAMfest '78 will be held on May 13 and 14, 1978 on Saturday, noon 'til 5 p.m., banquet Saturday night at 7:30, and Sunday 9 a.m. 'til 3 p.m. The Hamvention will be held at the Birmingham-Jefferson Civic Center Exhibition Hall. Registration will be available at the door both days. Advanced registration and information packet is available from: BirmingHAMfest '78, Birmingham Amateur Radio Club, Inc., P.O. Box 603, Birmingham, AL 35201.

• **Doylestown, PA** — The Warminster Amateur Club's Fourth Annual "HAM-MART", Flea Market and Auction will be held on Sunday, May 14, from 9 a.m. to 4 p.m. at William Tennent Senior High School, Street Rd. (Rt. 132), 2 miles east of York Rd (Rt. 263), Warminster, Bucks County, PA. Registration is $1.00, tailgating $2.00 additional. Talk-in on 146.16-76 and 146.52. For further info write. Horace Carter, K3KT, 38 Hickory Lane, Doylestown, PA 18901 or call (215) 345-6816.

• **West Liberty, OH** — The Champaign Logan Amateur Radio Club, Inc., will hold its annual Hamfest on Sunday, May 14, 1978 at the West Liberty Lions Park. Free admission. Trunk and table sales are $1.00. There will be door prizes. Talk-in will be on 146.52.

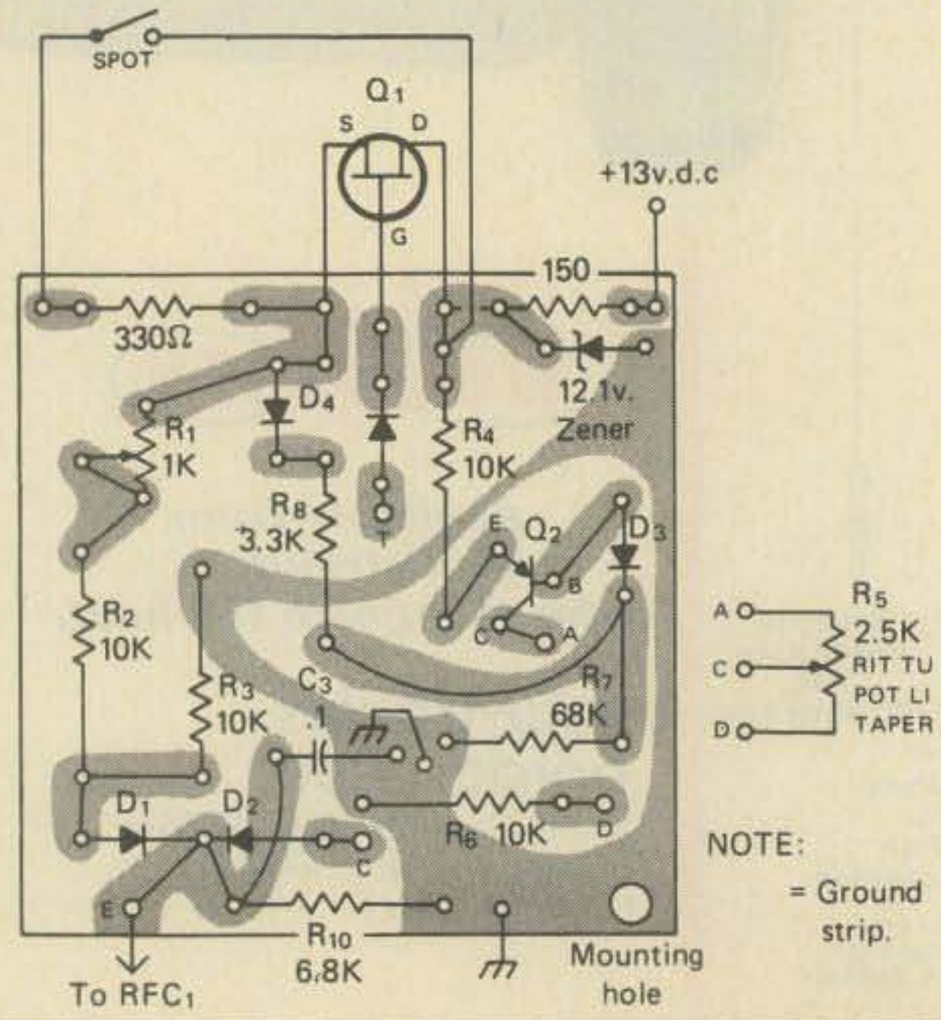
• **Wabash, IN** — The Wabash County Amateur Radio Club's 10th Annual Hamfest will be held on Sunday, May 21, 1978, rain or shine, at the Wabash County 4-H Fairgrounds. Large flea market (no tables or setup charge). Technical forums, bingo, free parking and lots of good food at reasonable prices. Advanced admission tickets are $2.00; $2.50 at gate. Children under 12 free. Write: Dave Nagel, WD9BDZ, 555 Valley Brook Lane, Wabash, IN 46992.

• **Vancouver, WA** — On May 13 and 14, 1978, the Clark County Amateur Radio Club will hold their annual Ft. Vancouver Hamfair. It will be held at the Clark County Fairgrounds right off Interstate 5, just north of Vancouver. Registration is $3 per person and anyone pre-registering by May 5 will get an extra drawing ticket. Send for your tickets now. Make checks payable to Ft. Vancouver Hamfair for registration and dinner tickets. Mail to Jack Ellis, K7SUQ, 9610 SE 6th St., Vancouver, WA 98664.

• **Columbia, SC** -- The Carolina Repeater Society is sponsoring the Columbia Hamfest on Saturday and Sunday, May 20 and 21, 1978, from 9 a.m. to 5 p.m., at the Jamil Shrine Temple located 1 mile west of I-20 on I-26. Flea market, dealer, and activities. Talk-in on 34/94. Combined admission and drawing tickets are available for $3 in advance or $3.50 at the door. Contact: Larry Johnson, WA4VOJ, 1520 Atlantic Dr., Columbia, SC 29210 or call (803) 772-7984, (803) 788-1308.

• **Endicott, NY** — The Southern Tier Amateur Radio Clubs take pleasure in announcing their 19th Annual Hamfest and Dinner. This gala affair will occur on May 6, 1978, at the Luthern Fellow-

(Continued on page 87)



Corrections

One watt p.c. board correction note: The p.c. board design shown on page 57 of the November, 1977 *CQ* is correct in every respect except that it is not an actual size template. The actual size is 2.25 x 4 inches. Use graph paper to scale the published diagram to size.

The K4COR 12 v.d.c., 1 amp. regulated power supply correction note: Referring to the diagram on page 11 of the November, 1977 *CQ,* capacitor C4 is incorrectly placed. The positive side of C4 should be connected to pin 1 of VR_1 and the negative side of C4 should be connected to pin 2 of VR_1. The +12 v.d.c. output is taken directly off pin 3 of VR_1.

The parts placement diagram for the HW-8 RIT circuit board on page 64 of the October, 1977 *CQ* is incomplete. The corrected diagram appears to the left.

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Thank You, Thank You, Thank You

Editor, CQ:

Thank you and thank you Karl Thurber, W8LYF, for the article on Customizing the Wilson H-T (CQ, October, 1977). This has got to be the best article on the subject to date.

Having purchased a Wilson 1402SM 2M H-T, I was in the process of trying to struggle through the exact modifications Karl wrote about. The only part of the article I would add to is that there is an RF connector (F to SO-239) available which I would judge to be superior for connecting any external antenna. They retail for $3.00 a piece which is cheaper than any BNC chassis connector I have seen advertised. I purchased this connector when I ordered the unit from Amateur Radio Supply, in Milwaukee, Wisconsin.

John A. Magness III, WD4BVU
Murray, KY

Modification For The Heath HW-8

Editor, CQ:

I thought I would write and tell you of another modification for the Heath HW-8; for all the people that have keyers and find that they can only send code around 10 wpm. This modification would enable code to be sent around 30 wpm. Change resistor R65 to 470 ohm. Since the keying is quicker and more controllable, this has made for many more contacts.

I enjoy your magazine very much and have made most of the modifications you have suggested.

Joe Hayes, WD9APY
Taylorville, IL

Here's Looking At You

Editor, CQ:

I am particularly interested in your article on SSTV, (In Focus), as I am an active operator on SSTV with a home built camera monitor and keyboard. However, there are very few VK stations active on this mode and no magazines to my knowledge have ever covered the subject.

In my opinion, the contents of a magazine determine its worth. In my profession, (Medical Electronic Engineer), many magazines cross my desk. The majority of these take five minutes to glance through and by the time you remove the advertising and irrelevant information, there is not much left. This includes amateur radio publications.

However, this does not apply in your case and rightly so. I agree with the statement on the front cover of your magazine, "The Radio Amateur's Journal".

Len Pollack, VK2NM
Australia

From General To Technician?

Editor, CQ:

We, my XYL, WB7QEY and myself have had a very infuriating experience with the FCC.

After 18 years of marriage, I finally got my wife Sharon interested in ham radio. I am teaching ham radio classes which she attended and after intensive study with constant QRM from our 3 harmonics, 5 years, 4 years, and 2 years of age.

She went to the FCC testing station in Las Vegas and passed the general class exam. She there received an interim card upgrading her novice class to general class privileges. The interim card expired 90 days from the test date and she got on the air really enjoying SSB.

In approximately 7 weeks, she received a technician's license in the mail. She called Gettysburg and was refered to the Washington, DC office.

For two days she received a busy signal (long distance) then gave up.

I then called for 3 1/2 hours straight and finally got the famous recording. Then I conversed with a gentleman who informed me to send in copies of the interim card and tech. license and a letter of explanation, which we did.

After ten weeks there was no reply, three telephone conversations with three different young ladies, all three promised to contact Gettysburg and we would receive a reply by mail very soon.

The above three calls were over 4 weeks time. 6 months had passed and I was promised a return phone call, no results.

We have sent (2) 610 forms and copies of the interim card and license to Gettysburg and one letter to Mr. Guy, the person in charge of our district. Mr. Guy replied stating he had forwarded our letter to Gettysburg.

Sharon is very disgusted and I can't get her near the rig. She was studying for the advanced but has lost her interest in that also.

I tried to get her to retest this July and her reply was, "With my luck I'd pass the advanced and get a general."

We have followed all four different instructions received from the FCC to correct this problem and still no results.

In my lay opinion, the interim card is an offical FCC document granting the operating privileges indicated, signed by an offical representative, and this document should indicate even to the FCC that a general class exam was successfully completed on the date it was issued.

So what in the . . . is the hold-up?

Jim Welborn, W7CKH
Henderson, NV

Well Done, Bill

Editor, CQ:

I wanted you to know how much I appreciate Bill Welsh's Novice column. I've found that he gives some very good up-to-date information and that it is very useful to not only Novices but all Amateurs.

Bill seems to be the kind of person that gets a lot of satisfaction out of helping others. I have sent for information that he has mentioned in his column and he was prompt in sending it to me.

Thanks again for the splendid Novice column. It enhances your magazine.

Charles H. Tomlin, WD4JIZ
Vienna, GA

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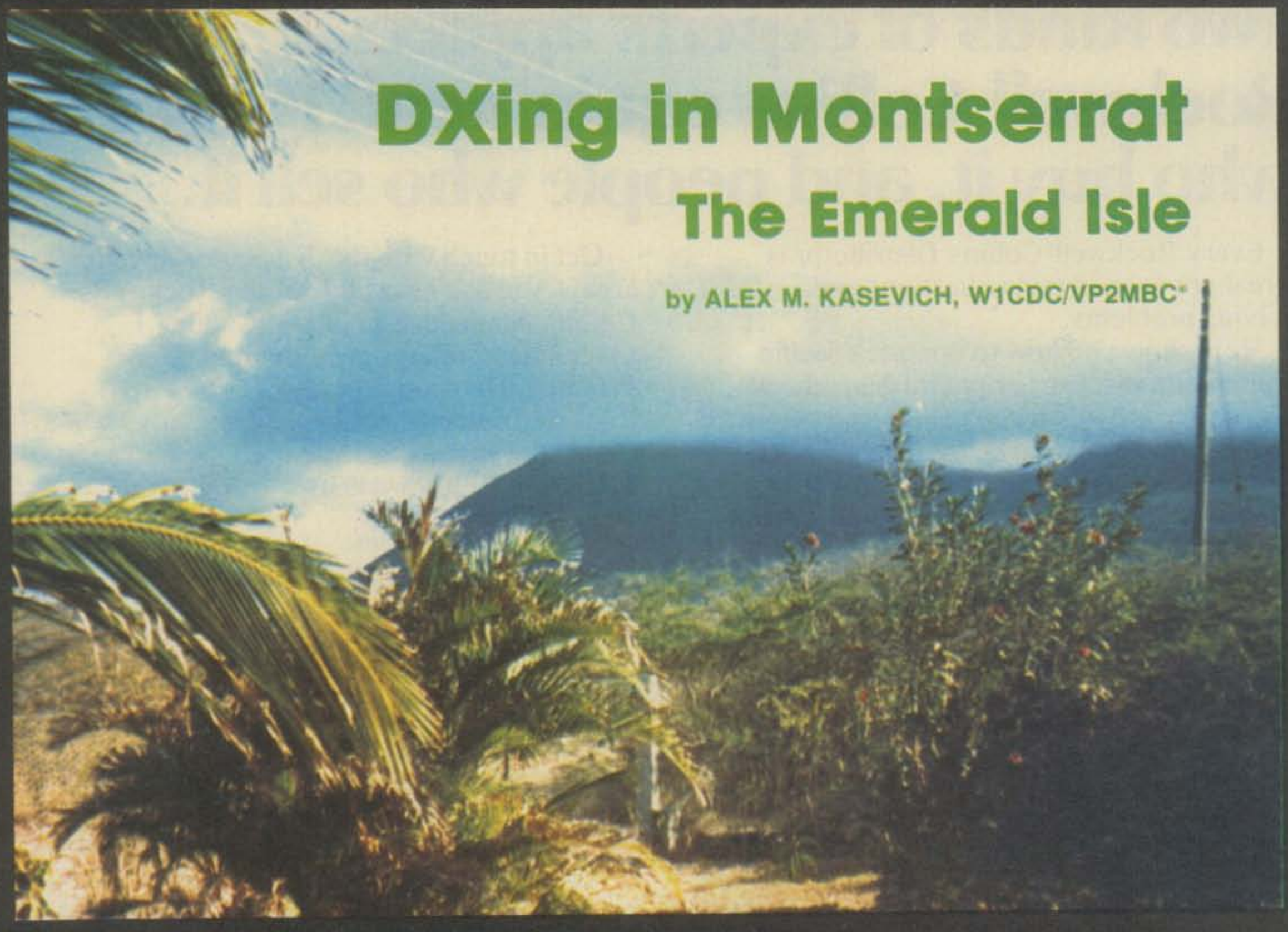
DXing in Montserrat

The Emerald Isle

by ALEX M. KASEVICH, W1CDC/VP2MBC*



Everyone knows what a DX-pedition is. There have been many, by such widely known persons as Danny, Gus, Don, and Lloyd and Iris. Being a venturesome sort of person, I had to try my hand at this DX-pedition business. The pre-planning of what it takes to put a DX-pedition together nearly overwhelmed me. There must be an easier way than carrying hundreds of pounds of equipment to some far off spot, putting it all together into an operating station, and then working the world and filling up the log books.

Looking for an easier way turned up VP2MZ, Doc Beverstein in Toronto, Canada, who has a home at Spanish Pointe, Montserrat, British West Indies. Doc advertises his home and it comes complete with hamshack, beam, tower, all in a good DX location. All I needed was my rig, keyer, log books, and the license to operate.

From this point on it was easy. Arrangements were made for me for the first two weeks of August, 1977. While DX is not the best during this time period, it was the best that could be worked out. I was ready for Montserrat.

Montserrat was ready for me. Blackburne Airport is on the east side of Montserrat and the operating location is very close by. Getting on the air after arrival was very simple.

The hamshack has a tri-band quad and inverted vees for 80 and 40 meters. A 65 foot tower provides the support and a Heath SB-200 could be used for high power. My Yaesu FT-101 was on the air almost immediately.

The people of Montserrat were more than gracious, and VP2MGB, Ruby, made herself my tour guide for all the sightseeing, and VP2MB, Jerry, lent his moral support and also did a lot of operating from my Spanish Pointe location.

At the end of two weeks, I had acquired 2,640 QSOs, of which 640 of these were JA stations. I had worked 93 countries, and made Worked All States, Worked All Continents, and qualified for CQ Magazine's WPX award. I was more than pleased with my success.

Some stations were apparently unhappy with my operating practice of working JA stations every morning for several hours. My reasoning was that the Caribbean area is real DX for the JA guys, and QSOs are complicated for them because of the wall of W station QRM. Someone must make a special effort to put the Caribbean in the Asian log books, and it might as well be me.

I took 324 photographs, many with the help of Ruby, VP2MGB. The lush, green jungles, cloud covered mountain tops, and hot, steaming sulphur pools of Montserrat provided me with more than enough scenery.

Galways Soufriere, the hot sulphur springs remains of a volcano, on the southern slope of Chance Peak, the highest mountain in Montserrat, became my best tourist attraction. It is not easy to get to by a narrow and slippery foot path through the jungle growth. Ruby was my guide for this sightseeing

*Alex M. Kasevich, W1CDC/VP2MBC, 43 Dover Rd. Manchester, CT 06040.

"Doc" Beverstein, 60 Amsterdam Ave., Toronto, Ontario, Canada
Ruby G. Bramble, VP2MGB, C/O Bethal Post Office, Montserrat, W.I.
Jerry McKenna, VP2MB P.O. Box 88, Plymouth, Montserrat, W.I.

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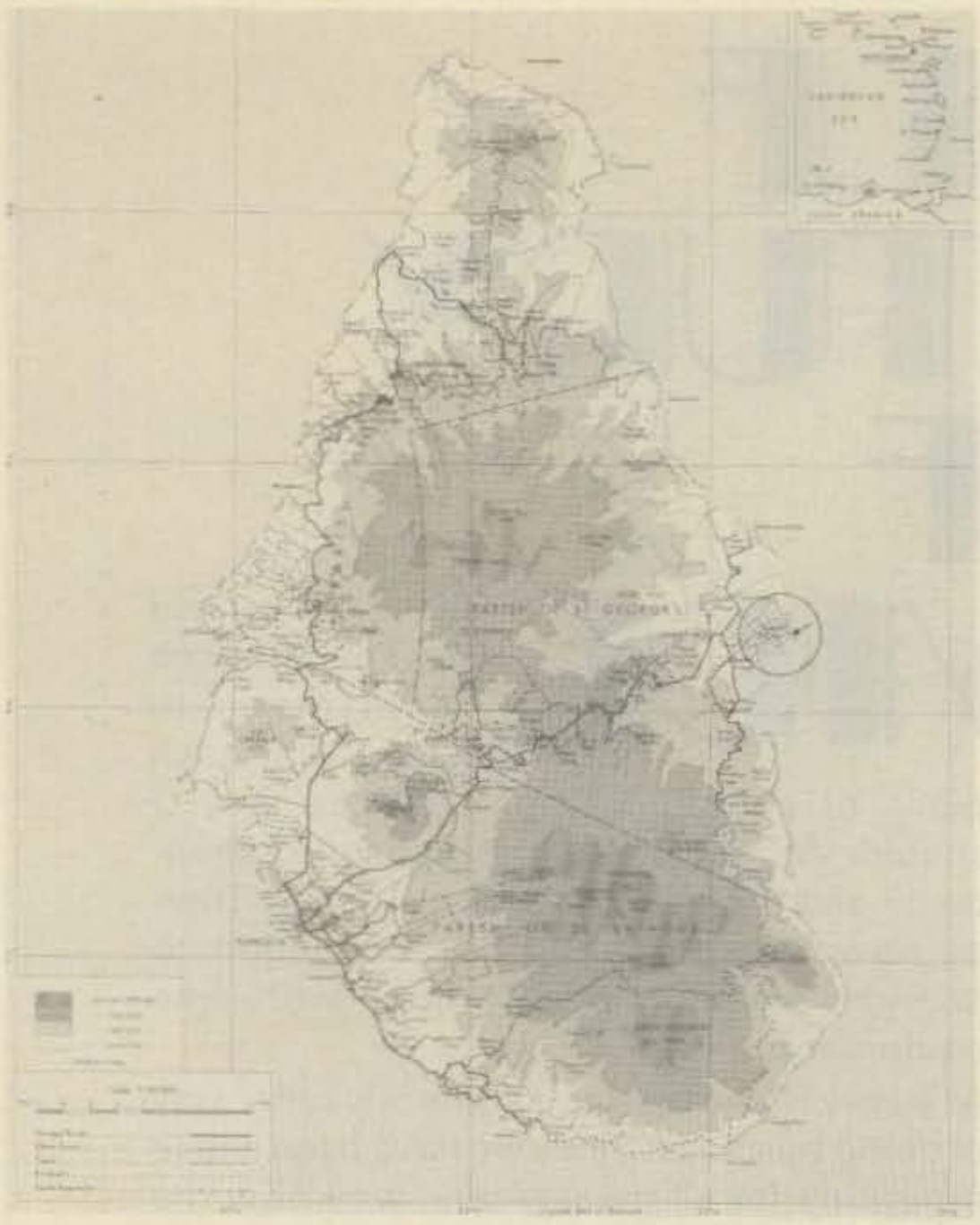
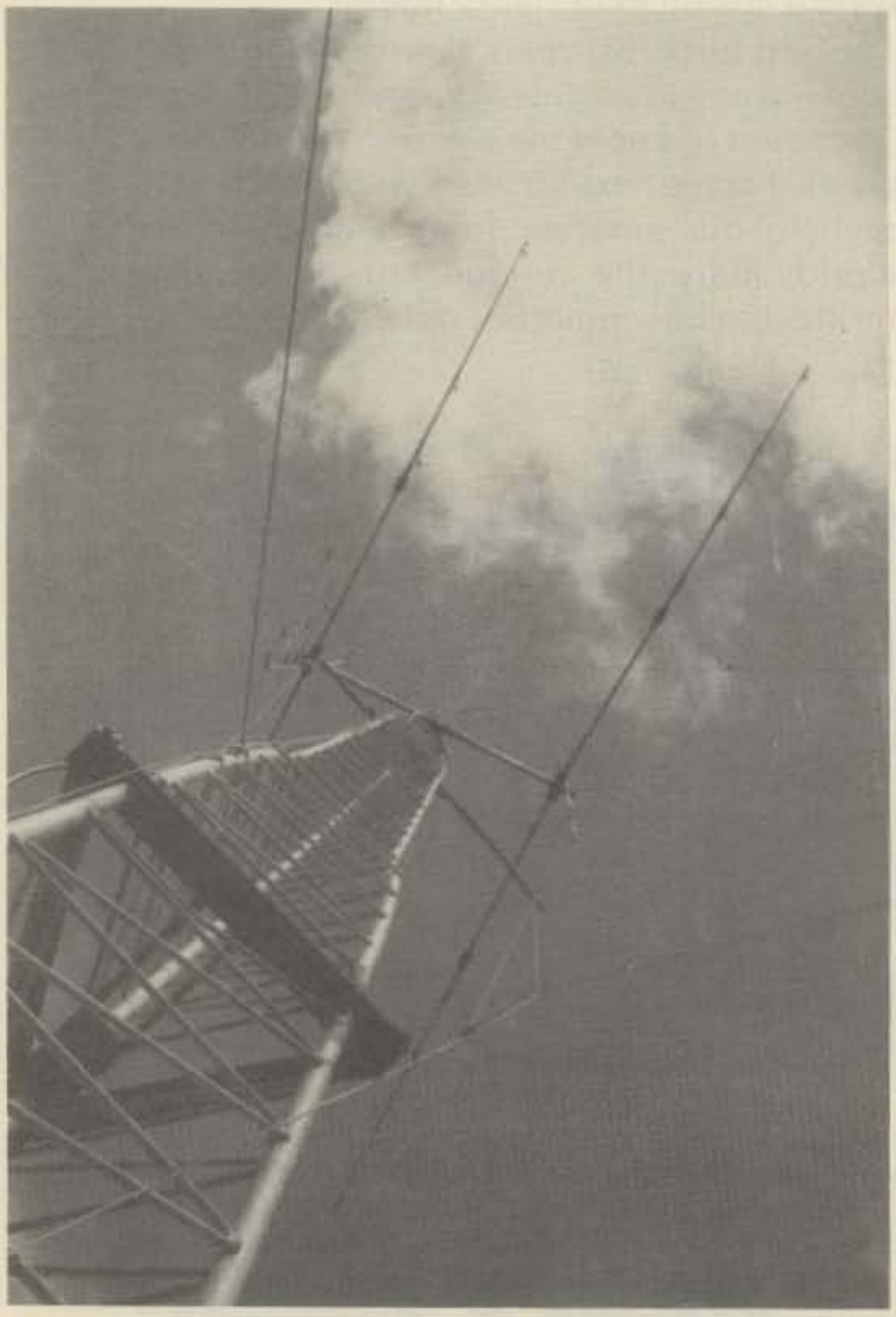
Henry Radio

CIRCLE 53 ON READER SERVICE CARD



The circled area is the exact location of the VP2MBC station.



The VP2MBC Tri-band, 2 element quad at 65 ft. with 80 and 40 meter beams.

venture. I was able to walk right up to the steaming sulphur pools, which are similar to the witche's caldrons you see in movies. I am glad now that I did not spend all my time in front of my FT-101 chasing DX.

I did get a driver's permit and a car, and did some sightseeing on my own. The autos have the steering on the right hand side. Only once did I make the grave social error, while in the town of Plymouth, of getting into my car on the left. The onlookers smiled. This must happen to most Americans visiting Montserrat.

I missed my daily reports of baseball scores, and that was soon solved with the help of W1GAT, another nutty baseball fan like myself. W1GAT, Bob Underwood, would track me down every couple of days and give the final results of all the games. There is little interest in American sporting news overseas.

My two weeks in Montserrat let me find out why so many of the islands have little or no amateur radio activity. The first problem is the environment of the good salt air. Corrosion is a never ending problem. A couple of days of exposure and all of

Taking a break after having a non-stop string of contacts lasting 3 hours, one evening on 20 meters.

the enamel was off of my copper wire. The trade winds, the real tourist attraction, always have the antenna shaking and quaking. Small parts for repair of amateur radio gear are not available and must come from the States or other areas. Amateur radio is affordable only to the wealthy.

I paid my own way and am very pleased with the results of my DX-pedition. The local amateurs in Montserrat were more than pleasant. I am going again when I can get it all worked out as I did in 1977. Hope to see on the air from Montserrat or some other Island in the Sun.

Epilogue

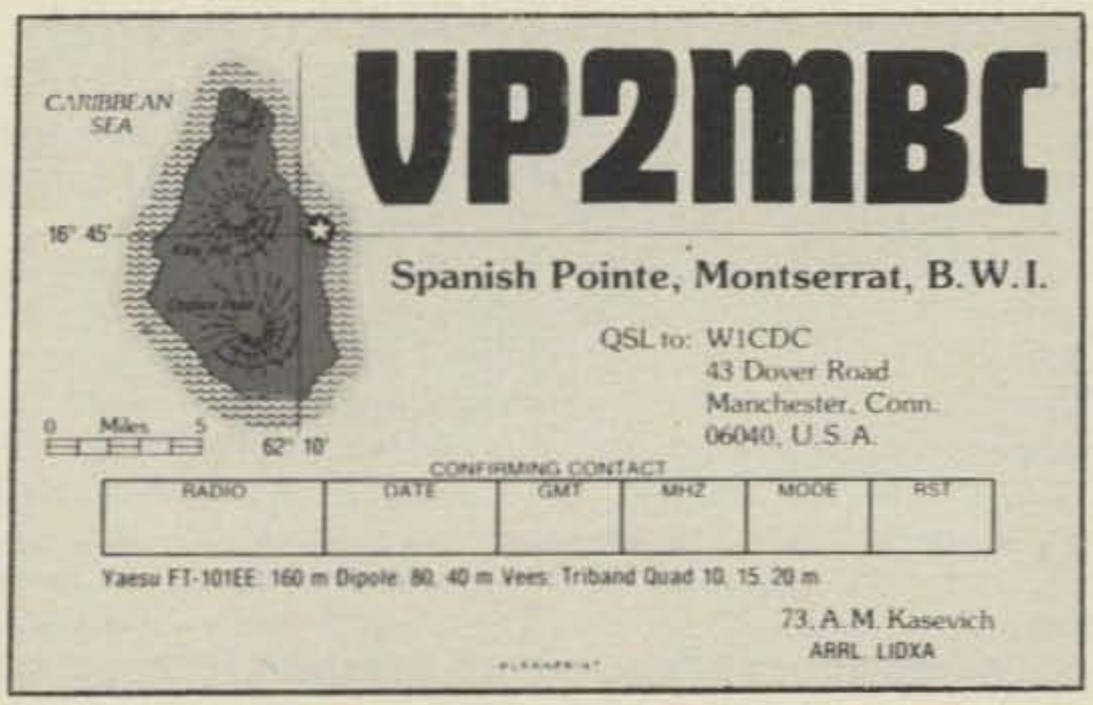
Emerald Isle of the Caribbean, Montserrat, as it was said: "No island in these,seas is bolder in its general aspect, more picturesque and I think I may add without exaggeration, more beautiful in the detail of its scenery—indeed, one might be tempted to say considering its fortunes, that it has the fatal gift of beauty." . . . so wrote John Davy in 1854. ■

This is the lovely home of "Doc" Beverstein's, it over looks the Caribbean . . . note the quad. I had no difficulty talking with stations all over the world using my FT-101 barefoot, band conditions permitting of course. (VP2MBC)

Plymouth the capital of Montserrat, you can see the weathered wood and stone buildings, in the narrow streets the towns people go about their business. Plymouth is located right on the coast with the mountains providing a scenic back drop.

Farewells were in order at the airport, my friends were there to see me off in style, left to right, Jerry VP2MB, Ruby VP2MGB and, of course, yours truly Alex VP2MBC (W1CDC).

I was happy to visit with Cherrie Taylor Executive Director of Tourism on Montserrat. She made me feel right at home and answered the many questions I had about the island.



This is the QSL card of VP2MBC.

Alex, VP2MBC (W1CDC) seated at the operating position notice the Heath rig which is available to use if needed. There was also a SB-200 for those who like high power.

This installment of the series introduces the principles of teletypewriter operation along with a description of several machines. In addition, some readers' questions are answered.

AN RTTY PRIMER

Part IV

BY IRWIN SCHWARTZ*, K2VG

The heart of the RTTY station is the teleprinter. There is quite a variety of these machines, in both kind and price, available to the radio amateur. However, before actually getting into a discussion of the operation and availability of mechanical gear it may be interesting to have a look at a short history of teleprinting communications.

In 1844 the invention of the first servicable telegraph system by Samuel F. B. Morse changed the complexion of long distance communications. For the first time instant contact was possible over significant distances. Yet, despite the general adulation of Morse's invention, there were some major drawbacks.

*Technical Editor, *CQ*

The Teletype® Model 28ASR.

First, the mode of communications was aural - it had to be heard before it could be recorded.

Second, it required special training since, at the time, Morses's code of dits and dahs was the exclusive property of communications specialists.

Third, telegraphy required two operators, one at each of two points, to be present at the same time for sending and receiving messages.

And fourth, telegraphy was slow. It was (and still is) rare, indeed, to have the ability to send and receive the Morse code in excess of fifty words per minute.

The thrust of communications researchers, then, moved in the direction of developing a system whereby messages could be sent and received automatically, in final printed form, at speeds and with reliability not possible with hand-processed Morse code.

In 1848 R. E. House patented an invention destined to become the ancestor of modern teleprinting equipment. His machine had a keyboard not unlike that of a piano and used compressed air which was conduited through a series of rubber tubes to actuate the printing mechanism. The final printed message appeared on a strip of tape.

A giant leap forward occurred in 1874 when a Frenchman, Emil Baudot, invented the five-level code which now bears his name. It could be used for both sending and receiving messages. The Baudot code was the precursor of today's Murray code.

The Teletype® Corporation came into existence in 1907. It was originally a joint venture of Joy Morton (of salt fame) and Charles Krum (or Krumm). The parent company was called Morkrum.

By 1908 a servicable system had been developed whereby landline messages could be sent and received over distances in excess of 150 miles. One of the remaining engineering problems, however, was finding a way to synchronize the sending machine's speed with the receiving machine's speed so they would run in step. Howard Krum (Charles' son) solved the problem with an ingenious solution.

The answer took the form of prefixing each five-level character group with a "start pulse" and appending each five-unit group with a "stop pulse." This method of machine phasing is called **start-stop synchronization.** To understand the younger Krum's idea it is necessary to review the five-level code.

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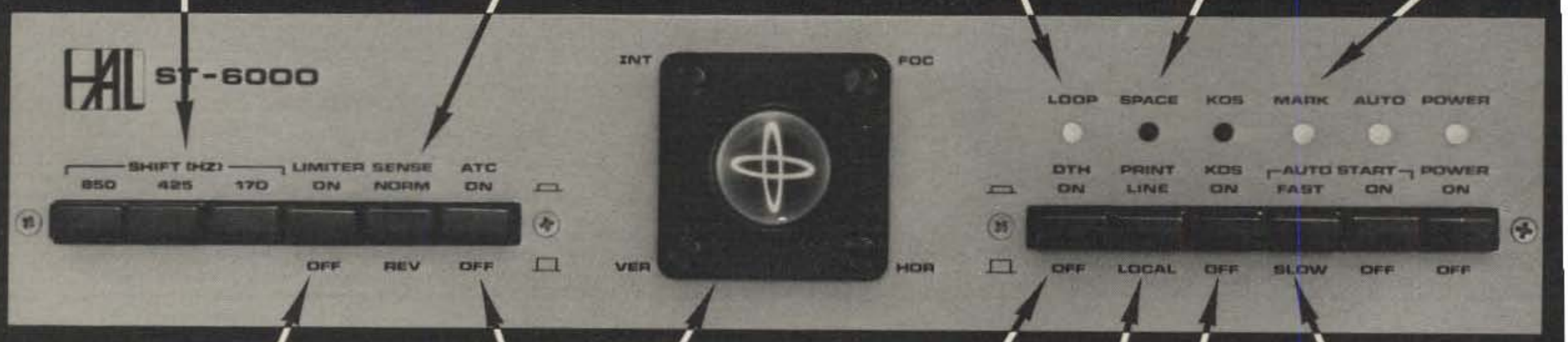

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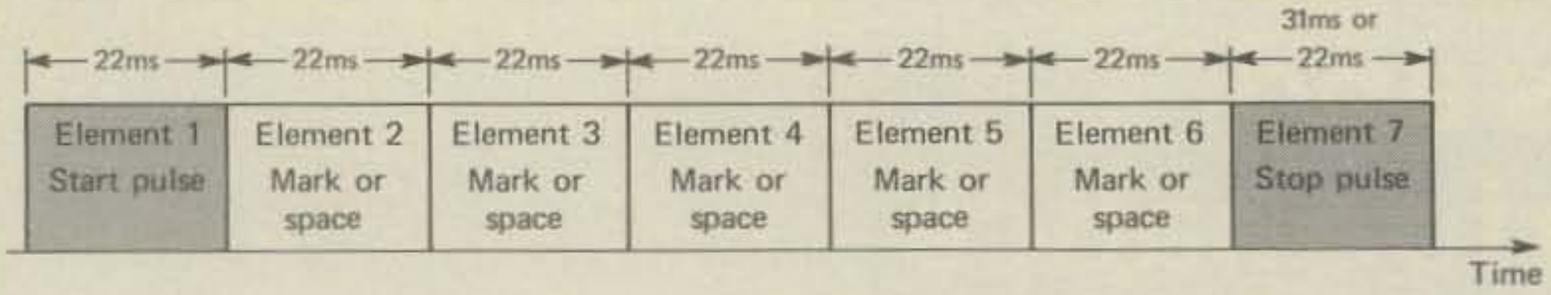


Fig. 1 – Five-level code with "start" and "stop" pulses added.

Each character (alphabetic, numeric and special) and each nonprinting function (linefeed, carriage return, space, blank, letters shift and figures shift) is represented by a combination of five *marks* and/or *spaces*. Each *mark* and each *space* is 22 milliseconds (ms) long for machines running at 60 words per minute (w.p.m.)

When no character is sent the teleprinter is in **markhold** (a steady mark is transmitted). The receiving teleprinter's motor is running but the keyboard is inactive. When a key is depressed on the sending machine, the sending mechanism is engaged (loop circuit opened) and a *space* is sent. This space signal moves the receiving teleprinter to space and activates its receiving mechanism. The distant machine is now ready to copy a character.

After the character is copied (i.e., after one rotation of the receiving mechanism) the distant teleprinter returns to mark-hold and awaits the next space signal (*start pulse*).

The **start pulse** is, by convention, as long as a single element of a character (22 ms for 60 w.p.m.). The stop pulse's length can vary. On Western Union machines it is 22 ms; on Bell machines it is 31 ms. The stop pulse can, in fact, be any length. Fig. 1 shows a typical five-level character with start and stop pulses added.

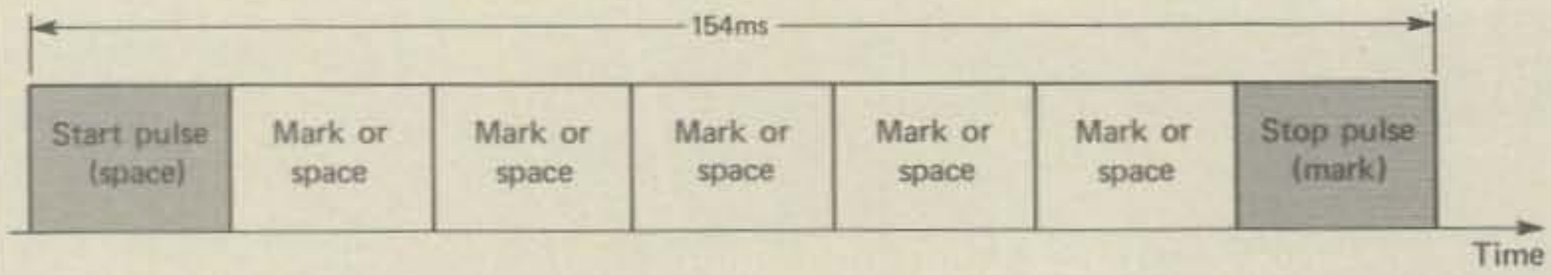


Fig. 2 – Typical Western Union character. Each element is 22 ms long. The total character length is 7 x 22 or 154 ms.

By using start and stop pulses two machines can be synchronized with respect to speed of operation.

Note that on Western Union machines the total character length (including prefixed and appended pulses) is 154 ms; (see fig. 2) Bell machines have character length totalling 163 ms. (See fig. 3) Nevertheless, the two types of machines are completely compatible.

By 1930, with the synchronization problem solved and with the introduction of the Model 15, teleprinting communications had reached maturity and international acceptance.

A typical page printer is made of the following major components: a keyboard, a motor unit and a typing unit (page printer).

Each of these components will be discussed in turn with emphasis on basic function and operation.

The Keyboard

There are several types of keyboards. Their design is a function of the use to which the teleprinter is put. In general, the board is arranged in three rows of keys (unlike an ordinary typewriter, which has four). The upper-most row is used to type numerals when the machine is in the **figures shift** position. The middle and lower rows are used to print punctuation marks and special characters when in the figures shift position. Letters, of course, are printed when the board is in the **letters shift** position.

The four major types of keyboards in use are the *Bell System business board*, the *Western Union board*, the *weather-type board*, and the *communications-type board*.

For the sake of comparison two boards are illustrated. These are the standard communications-type board (most often used by amateurs) and the weather keyboard. See figs. 4 and 5.

A good starting point for understanding the operation of a keyboard is its underside. See fig. 6.

Note that five crossbars lie under the keylevers. The crossbars are perpendicular to the keylevers and can move laterally.

The crossbars are notched in such a way that when a key is depressed the key lever moves the crossbars sideways. See fig. 7 for an illustration of a typical crossbar.

Some of the crossbar notches are vertical so that when a keylever moves into them there is no movement of the bars. Therefore, when and how far a particular crossbar is moved by a keylever is determined by the geometry of the crossbar itself.

The crossbar's final position, relative to the keylever which is depressed, translates to either a mark or a space element of the Murray encodement for a particular character. Movement of the bar to the left encodes a mark and movement of the bar to the right encodes a space.

The Motor Unit

There are three types of motors in varying degrees of use. They are the *governed motor*, the *series-wound (or series-field) motor* and the *a.c. synchronous motor*.

Regardless of which one of these is found in a particular machine the motor is used to mechanically power the teleprinter. The motor is geared from a shaft to each of the typing units, the keyboard and the keyboard transmitter shaft. The governed motor can be identified with associated passive components. If the motor has in its circuit a complement of resistors and capacitors it is almost certain that it is governed. Of course, the obvious drawback of such a motor lies in the fallability of the passive components. When any one of them fails, so does the motor speed accuracy.

Another problem associated with the governed motor is that it must be "tuned up" periodically. The speed of the motor is subject to variation (possibly caused by changes in asso-

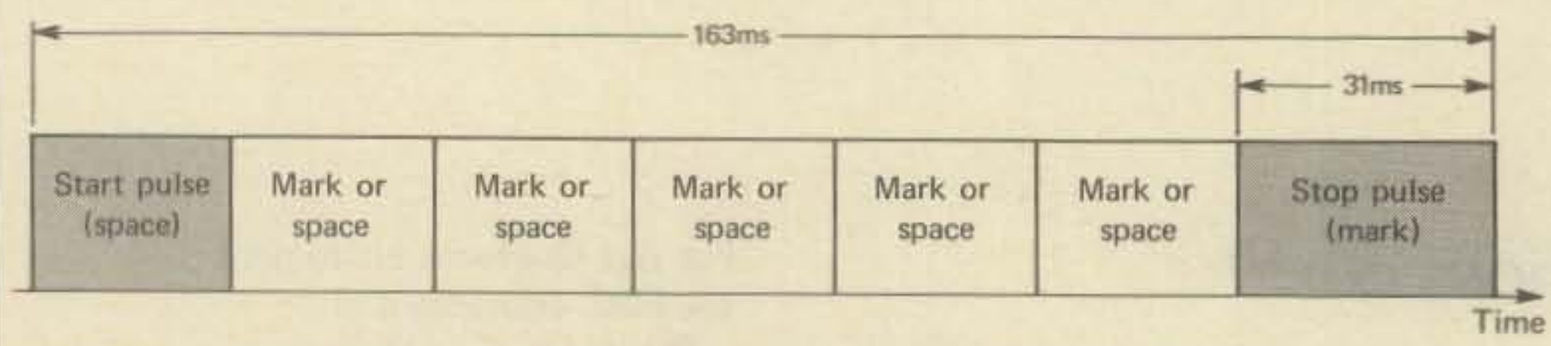


Fig. 3 – Typical Bell System character. Each element is 22 ms long, with the exception of the "stop" pulse, which is 31 ms long. The total character length is 163 ms. Note that Western Union and Bell System teletypewriters are completely compatable.

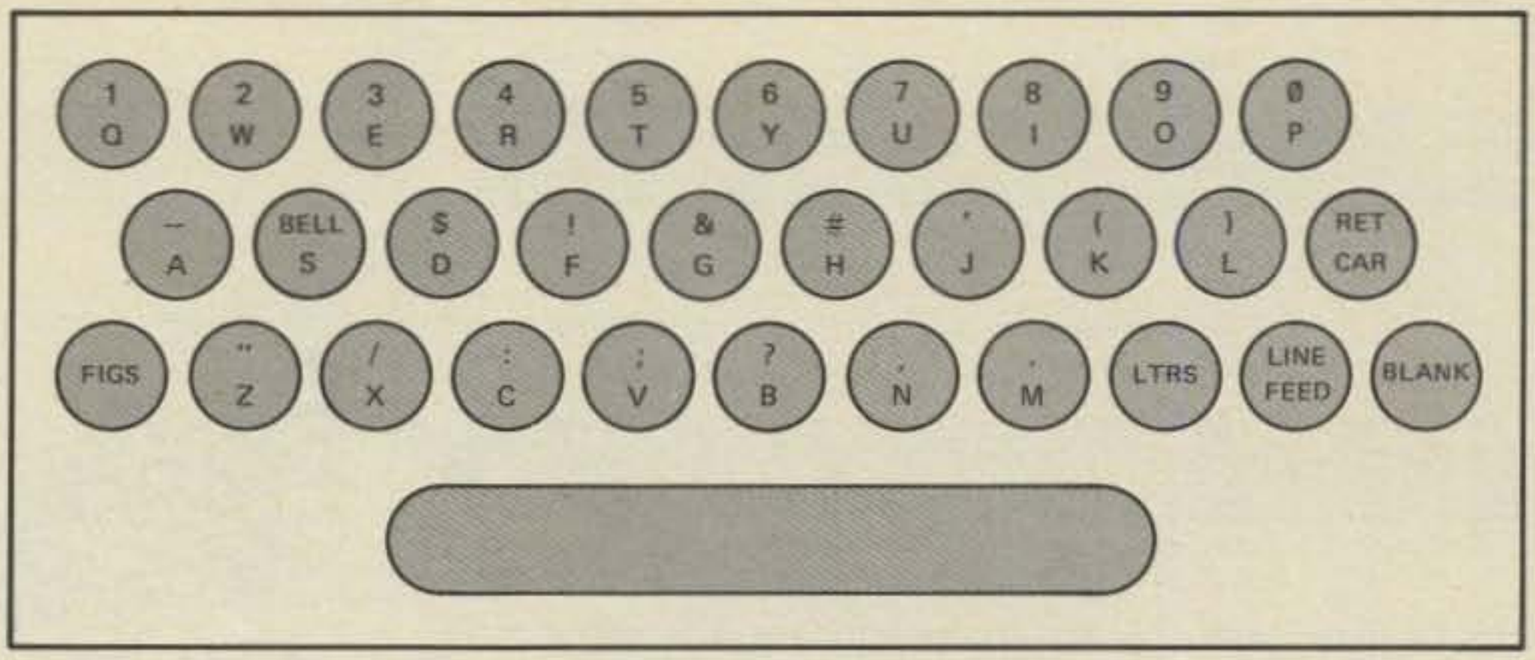


Fig. 4 – The standard communications keyboard.

ciatiated component values).

A stroboscope-type device is used to adjust the speed. This is accomplished by turning a screwdriver adjustment.

While the screw is turned a governing target is watched. A rotating spot target is viewed through a vibrating (120 Hz) tuning fork. When the spots appear stationary, the motor is on speed.

The series-wound motor's speed is controlled by the load across it. When the load is light the motor will run at high speed; if the load is increased, the speed is decreased. Obviously, the speed of the motor (and its accuracy) is a function of the load placed in shunt with it. If the load changes, the speed changes.

The synchronous-type motor is the most reliable. Its speed is a function of the line voltage frequency. The speed of the motor is generally either 1800 r.p.m. or 3600 r.p.m. In addition, since there are no brushes in the motor casing, there are no electrical connections to any moving parts.

The synchronous-type motor is, by far, the most reliable in terms of speed consistency and minimum required maintenance.

The Typing Unit

The crux of the page printer (typing unit) is the **selecting mechanism.** See fig. 8.

There are five code bars (*not* crossbars, as in the keyboard) in the mechanism. Each bar is associated with one mark or one space pulse in a particular character's Murray encodement.

The receiving mechanism of a teleprinter determines the positions of the code bars. The combination of marks and spaces lines up the code bars under the corresponding pull bar whose movement activates the type bar to finally have the hammers hit the page.

There are many variations on this theme. However, the basic receiving mechanism operation and the basic character hammer activation remains essentially the same.

Appending this article is a bibliography from which the reader can get specific information for a particular model machine and see that machines operation in greater detail.

As indicated at the beginning of this article, there is a large variety of machines available. The quality and the price of machines run the whole gamut. It is possible, however, to get a machine in working condition for a good price if you are patient enough and look hard enough. The best sources are hamfests, buy and sell ads and, of course, amateurs who are already into RTTY. If you are truely interested in persuing the mode at this point, it might be a good idea to find a "big brother."

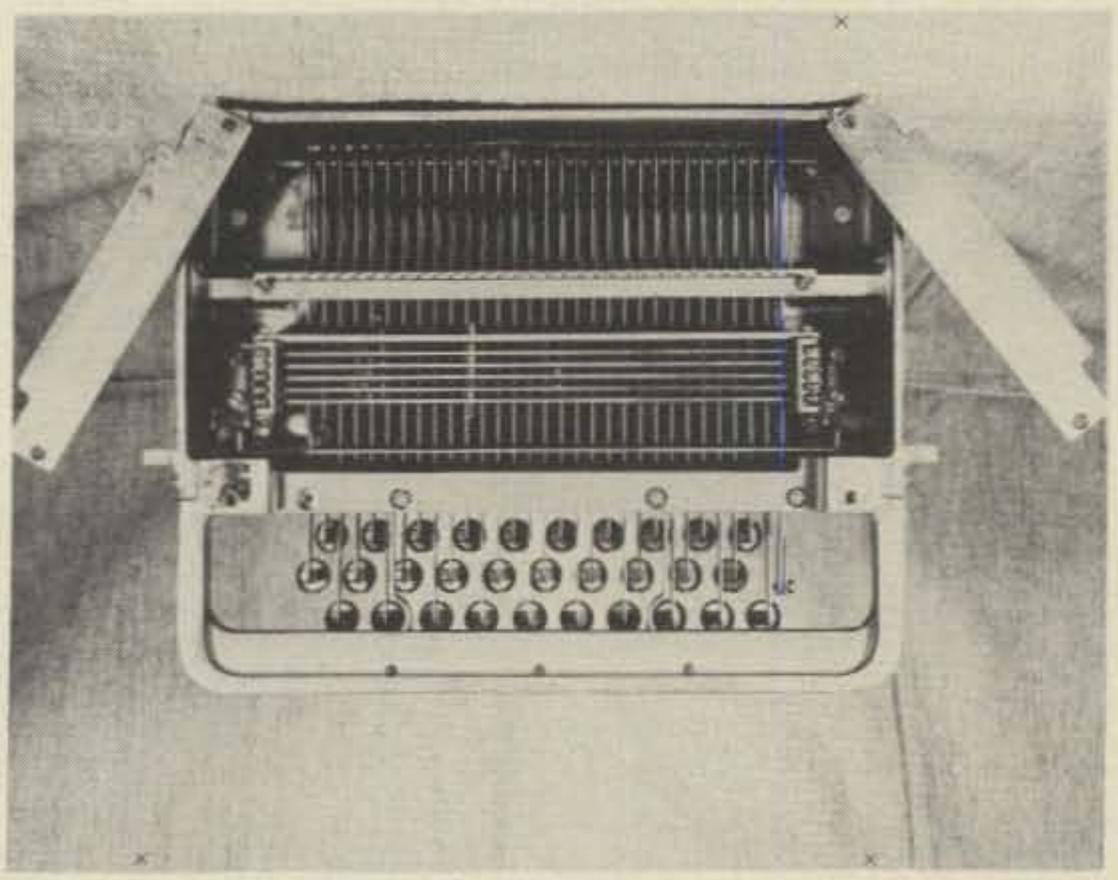


Fig. 6 – The underside of a (typical) keyboard. The five crossbars are seen perpendicular to the key levers.

There are three types of machines in greatest use: the Teletype® Corp. Models 15, 26 and 28. Each is a page printer.

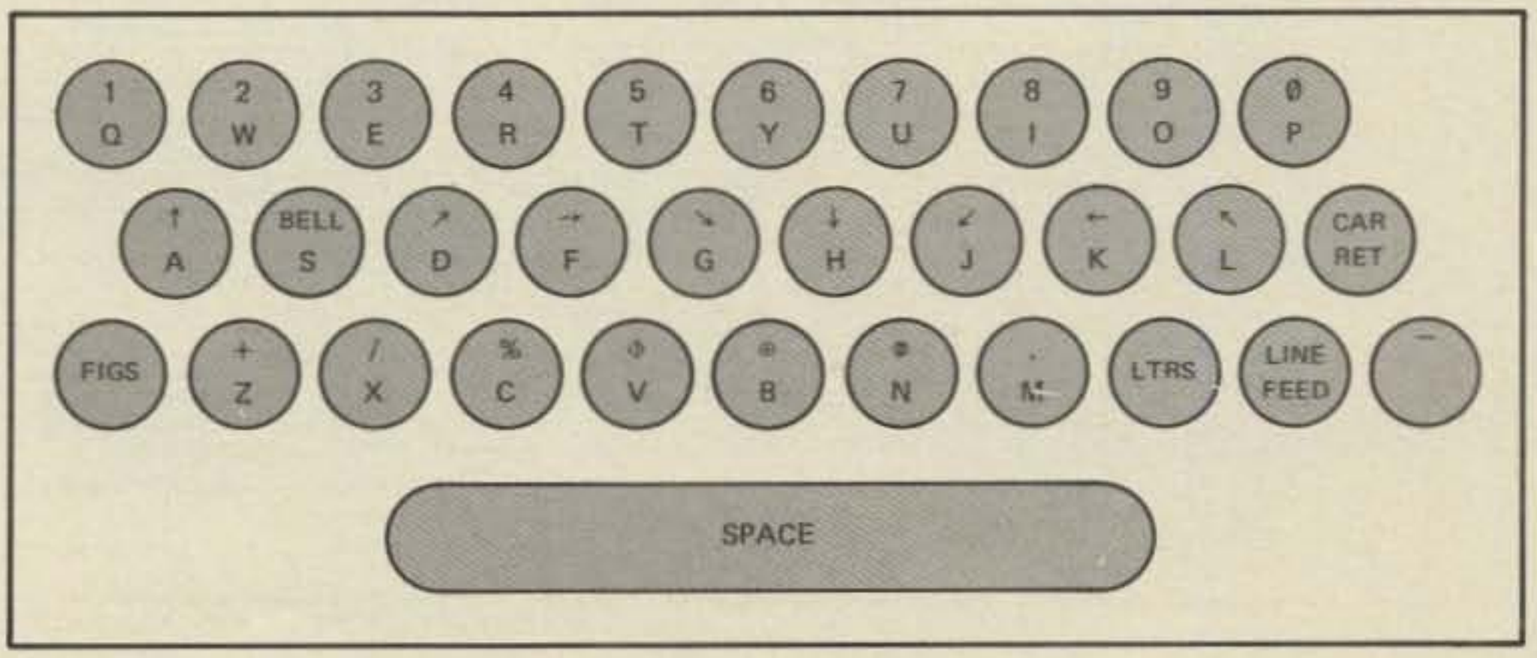


Fig. 5 – The "weather-type" keyboard.

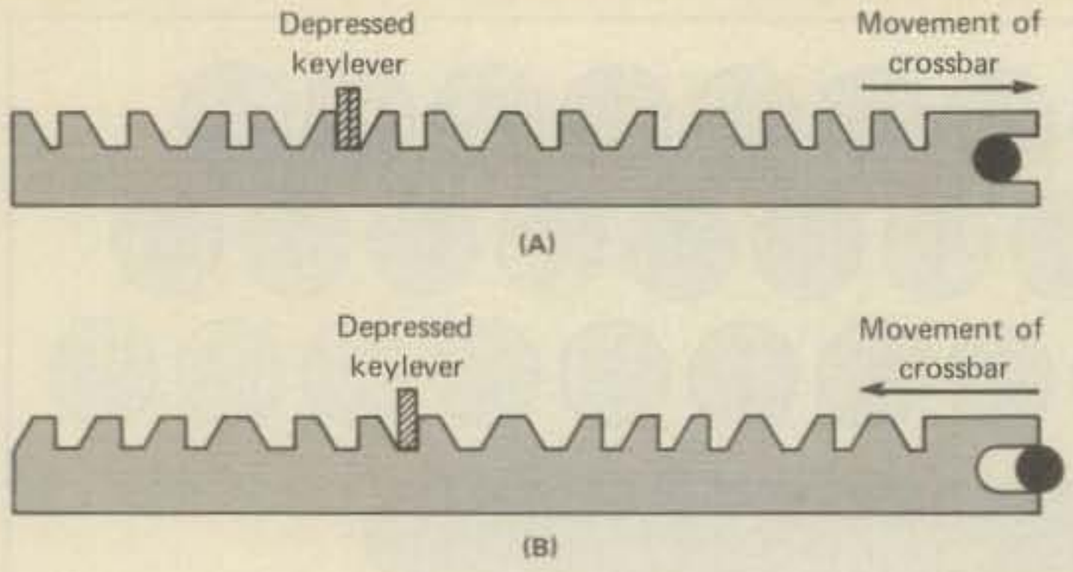


Fig. 7 – Illustration of how a ley lever moves a crossbar. In (a) the crossbar is moved to the right, encoding a space. In (b) the crossbar is moved to the left, encoding a mark.

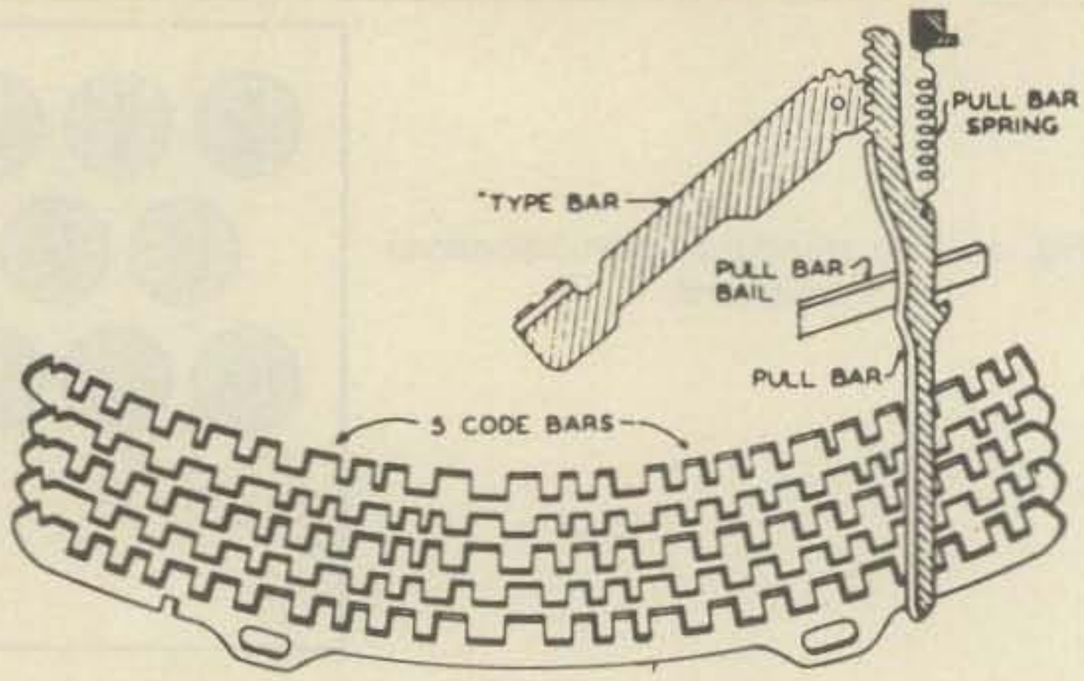


Fig. 8 – The selecting mechanism.

The Model 15

This machine is available with and without a keyboard. If possible, get it with the keyboard, since without it, you cannot transmit. The 15 is capable of running at speeds of 60, 75, and 100 words per minute. Make sure that yours runs at 60 w.p.m., or if it doesn't, that you can get the appropriate gears. The gears are not expensive.

Some 15's come with a table on which it is meant to rest (the table model number is XRT-97). Get one if you can—it makes life easier and it contains the power supplies needed to run the machine.

The Model 15 was designed for continuous-duty use and is very reliable. However, it is large and rather noisy.

Fig. 9 is a wiring diagram of the Model 15.

The Model 26

The 26 is smaller than and operates much quieter than the 15. The model number of the matching metal table is 26A.

The Model 26 can come with either a d.c. governed motor or an a.c. synchronous motor. For reasons cited earlier, try to get one with the synchronous motor.

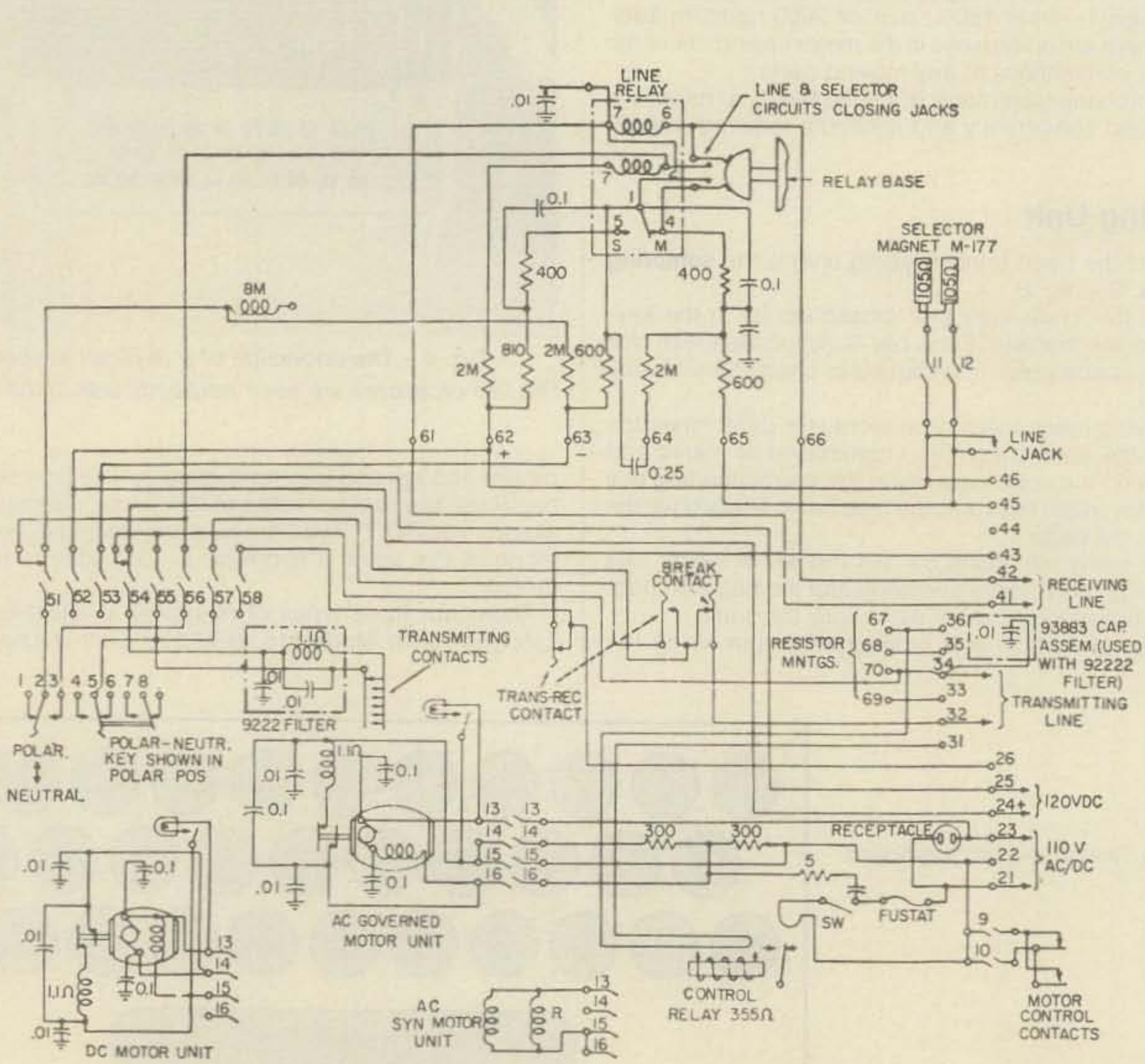


Fig. 9 – Wiring diagram of the Model 15.

The Model 26 is a light duty machine (originally used not more than three or four hours per day) and this fact should be taken into consideration when deciding on which machine to get. However, it is a very quiet machine in comparison to others. Another disadvantage is that a table is almost required accessory gear because it stores the paper. The paper is stored on the machine itself on the Model 15.

Fig. 10 is a circuit diagram of the Model 26.

The Model 28KSR

The Model 28KSR (**K**eyboard **S**end-**R**eceive) is among the most desirable units in use. It is capable of 60, 75, or 100 words per minute operation. It is quiet, streamlined and can run twenty-four hours a day. It also has associated with it a long line of accessories.

The 28 has a very good keyboard with a very good touch.

Unfortunately, it is expensive. Four hundred dollars is not an unusual price. Get one if you can.

The Model 28 sometimes comes with a governed motor. If yours does, check its speed accuracy.

The machines listed above are called page printers. As the name implies all they can do is print a page from an incoming signal and send a signal out via the keyboard.

There are, however, much more exotic pieces of equipment available.

The Model 14 is a tape reader (a TD, tee-dee, a **T**ransmitting **D**istributor). This machine can activate the sending mechanism from a piece of punched tape.

The tape itself is 11/16 of an inch (17.5 mm) wide. A tape punch (another one of those delicious accessories) punches holes in the tape. The holes (or lack of holes) correspond to the marks and spaces of the Murray code. The TD is designed to read the encodement and impulse the sending mechanism at the right time with the right voltages.

Some tape punches knock out small circles of tape (the little pieces are called **CHADS**) and after a while the floor of your shack will become littered with these little buggers. The best type of tape punch to get, then, is a *chadless* one. With chadless punching only part of a circle is punched out so the floor remains clean.

Each of the machines described (the page printer, the tape punch and the tape reader) is a separate unit that must somehow find a place at the operating position. One of the inherent problems with having so many units in the system is the rat's nest of wires that results.

There are, fortunately, composite units which already contain the accessories discussed above. These units are neat, impressive and easy to operate.

The Model 19

The Model 19 includes a Model 15 page printer, a tape perforator (alas, not chadless), a TD to play the tape, a character counter (so you know when a line ends if your punching tape) and a built-in power supply.

All the gear sits nicely on a metal desk which comes with the unit.

The Model 19 is very desirable.

The Model 28ASR

This model (fig. 11) is the most desirable with respect to performance judged against price. It can be set up in a myriad of ways by virtue of the accessories available for it. For example, you can have automatic non-overline control (to guarantee that one line does not print on top of the next one), automatic carriage return (which prevents pile-ups at the end

(Continued on page 83)

Ken Cornell presents a one-tube accessory that can add life to a tired receiver.

Forgotten Accessories to Improve Receiver Performance

BY KEN CORNELL*, W2IMB

Does your receiver "poop out" on 10 and 15 meters? Are you plagued with buckshot and splatter from strong nearby stations when trying to copy a weak signal? The accessories to be described here could be the answer to your problems.

The average radio amateur or s.w.l., by today's standards, will usually buy a commercial receiver or transceiver priced within his or her financial means and will trust the manufacturers' specifications that it will live up to its claims.

Practically all amateur and short wave receivers; made today of the so-called all-band type use switching for band selection and through necessity, have to optimize the various L-C circuits and their associated components in the front end to provide what the manufacturer considers satisfactory performance.

I have used and listened to many receivers that I consider *do not* provide the same sensitivity on 10 and 15 meters as they do on the lower frequencies. If 10 and 15 meters sound dead, this may not be the fault of the receiver, as these bands are currently in the sun spot doldrums. There are, however, openings from time to time and conditions should improve.

*225 Baltimore Ave., Point Pleasant Beach, NJ 08742

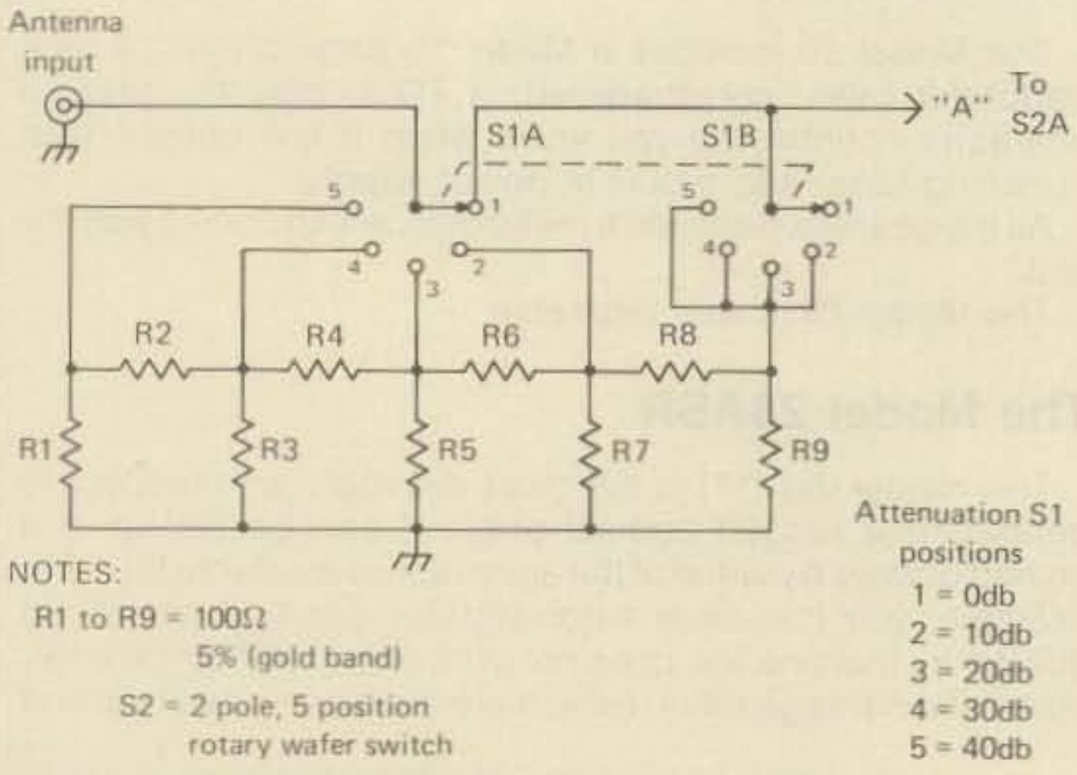
A practical solution for this problem is to use a pre-amplifier (r.f. amplifier) ahead of the receiver. Any amateur or s.w.l. who has not used a good pre-amp has a real surprise waiting.

The preamplifier to be described should provide a gain of some 20 dB. Unfortunately, this gain will apply to a strong signal as well as a weak one. If it does, front-end overloading can occur. An r.f. gain control is incorporated to help cut down a strong adjacent channel interfering signal. To provide a more satisfactory means, an attenuator is a useful accessory.

The attenuator circuit that I use was described in an old edition of the A.R.R.L. *Handbook* and provides four steps of attenuation, from 10 to 40 dB. It is designed for low impedance input to low impedance output. It should be satisfactory for most amateur and s.w.l. installations. Fig. 1 is the circuit diagram of the attenuator.

I assembled the preamplifier, attenuator and power supply in a 4" x 5" x 6" aluminum box. All functional controls are located on the front panel. See fig. 6.

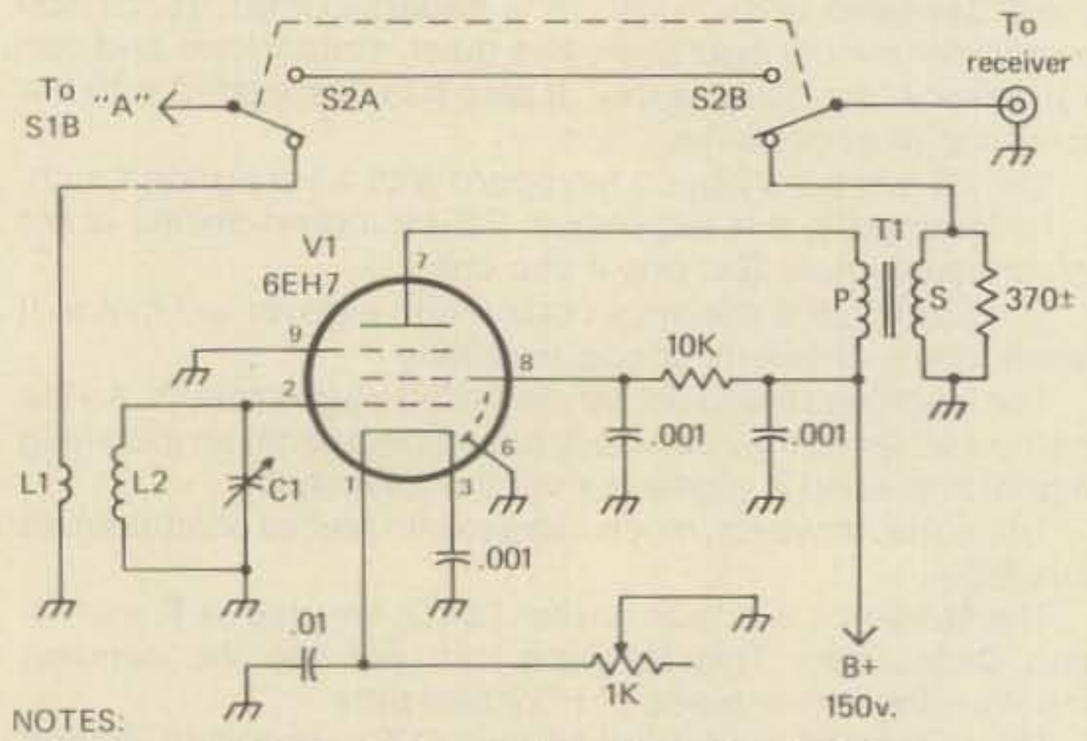
Power requirements for the preamplifier are minimal—



NOTES:
R1 to R9 = 100Ω 5% (gold band)
S2 = 2 pole, 5 position rotary wafer switch

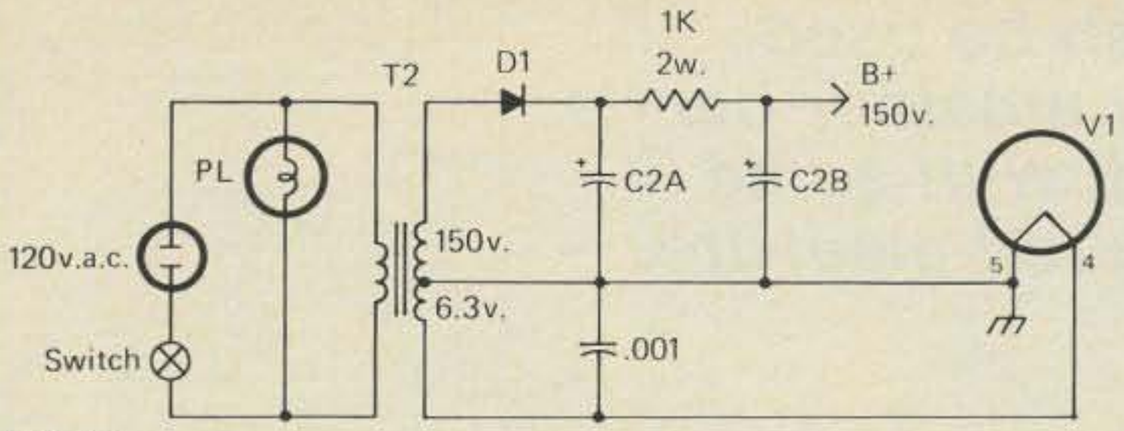
Attenuation S1 positions
1 = 0db
2 = 10db
3 = 20db
4 = 30db
5 = 40db

Fig. 1—Schematic diagram of the attenuator.



NOTES:
L1 = 4 turns of insulated wire wound over the cold end of L2.
L2 = 7 turns of No. 16 wire, ½" dia, ¾" long.
C1 = 365pf variable capacitor Radio Shack No. 272-1344.
T1 = Broad band balun transformer. See Fig. 4.
S2 = DPDT rotary switch.

Fig. 2—Schematic diagram of the preamplifier.



NOTES:

D1 = Power rectifier diode 200v., 1a.
C2 = Dual 20mfd electrolytic 150v. rating.
PL = 120v.a.c. neon pilot light.
T2 = 120v.a.c. primary. 6.3v.a.c. and 150v.a.c. secondary. This is a common transformer and should be available at any good radio parts supply store.

Fig. 3—Schematic diagram of the power supply.

6.3 v.a.c. for the filament and 150 v.d.c. for the plate of the 6EH7. The heater drain is only 0.3 ampere. Necessary power can be taken from the receiver, if convenient, and in many cases the receiver may have an accessory socket on the rear skirt that should provide the preamp's requirements. In my case, I used a built-in power supply as shown in fig. 3.

The preamplifier as detailed in this article is primarily designed to tune through the 10, 15 and 20 meter bands. However, since tuning is continuous (no band switching) and it provides an over-run at both ends, it will cover a good slice of the high frequency spectrum, as well as the citizens' band.

The circuit for the preamplifier is shown in fig. 2 and as assembled will provide the following functions:

1) Switching is provided to by-pass the preamplifier in its "off" position. In this case, the antenna is connected directly to the receiver.

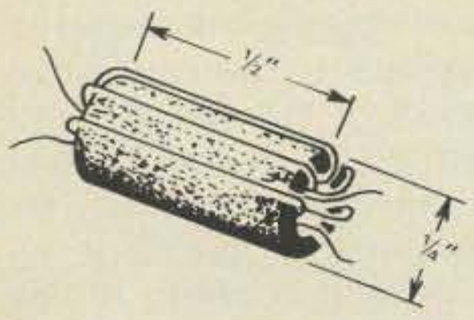
2) The attenuator, with its switch in position #1, is by-passed. Positions 2, 3, 4 and 5 provide attenuation in four steps of 10, 20, 30 and 40 dB.

3) The attenuator can be used with or without the pre-amplifier, and *vice versa.*

While I recommend the use of a frame grid pentode (6EH7) for the preamplifier, any tube suitable for high frequency r.f. amplification can be used with variable degrees of performance.

When using the unit for amateur radio service, a relay will be necessary to by-pass the unit when transmitting. To my knowledge, all transmitters and transceivers usually have an internal relay that can be used to actuate an external antenna change-over relay. An accessory socket is normally provided for its use. Fig. 5 is a suggested circuit that I use for the pre-amplifier by-pass relay. In my case, a 6.3 v.a.c. d.p.d.t. relay is used and the voltage is obtained from an accessory socket in the transmitter and is fed to the relay through the internal relay.

The assembly of the unit is a matter of preference, ingenuity of the builder and the parts that the junk box might offer. A symmetrical front panel is desirable for the sake of appearance.



NOTES:
Core is ferrite material
P = 5½ turns No. 30 wire.
S = 2½ turns No. 30 wire.

Fig. 4—Broad-band toroid output transformer. The balun is available from Ameco Equipment Co., 275 Hillside Ave., Williston Park, NY 11596 @ $1.50 postpaid.

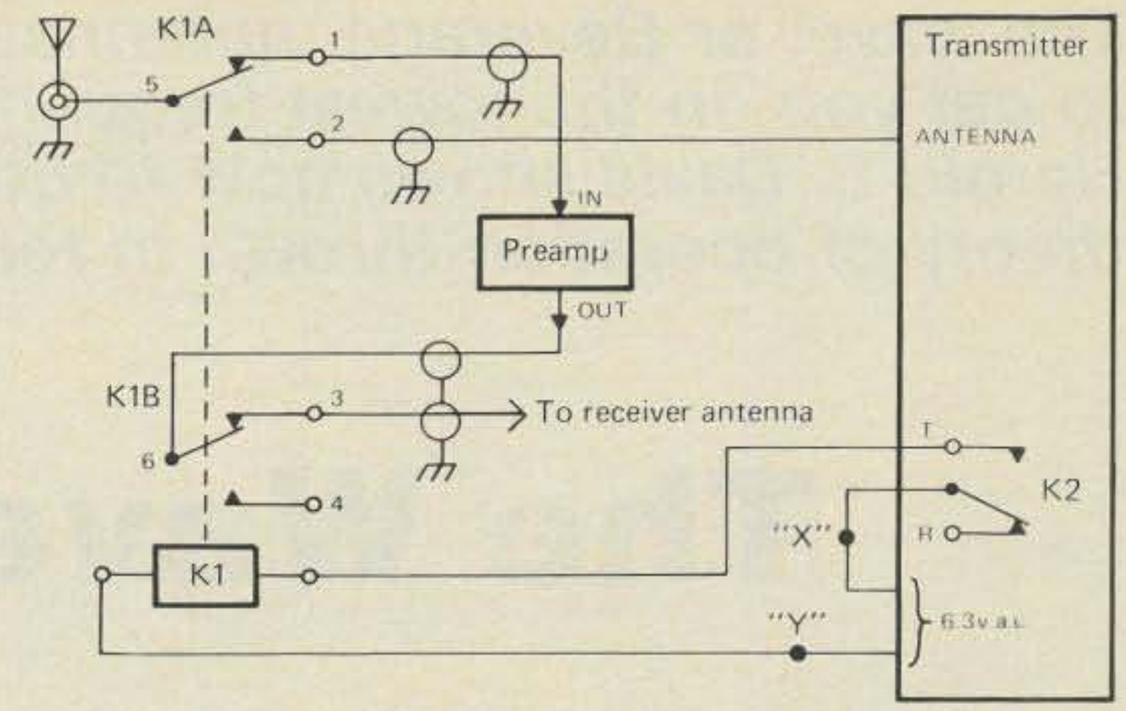


Fig. 5—Relay Wiring. Other voltage relays can be used for K1. Its power can be fed at points "X" and "Y." In this case, the connection to the transmitter's 6.3 volt supply is not used. For use with a transceiver, K1 relay contacts #2 and #3 are connected together to the transceiver antenna socket. With the exception of power wiring to relay K1 coil, all connections between the transmitter and the preamplifier to the relay should be made with coax. All shields should be grounded.

With the exception of the power transformer, if used, all the larger parts are mounted on the front panel as shown in fig. 6. The transformer is mounted on the left side of the panel and its associated parts are mounted on a five lug terminal strip that is mounted adjacent to the transformer. The tube and its few associated components are mounted on a small piece of copper foil board and is bolted to the right side of the panel with a small angle bracket.

Coils L1 and L2 are soldered to the capacitor C1 and are self-supporting. The attenuator resistors are soldered directly to the lugs on SW1. This can be accomplished before the switch is installed, for convenience of wiring.

A TV cheater cord is used to deliver the 120 v.a.c. into the unit. The power socket is mounted adjacent to the power switch and power transformer on the left side.

For those who may wish to extend the operating range of the preamplifier, a coil switching scheme can be used, although construction complications are then introduced. If increased range is required, plug-in coils are the simplest answer. ■

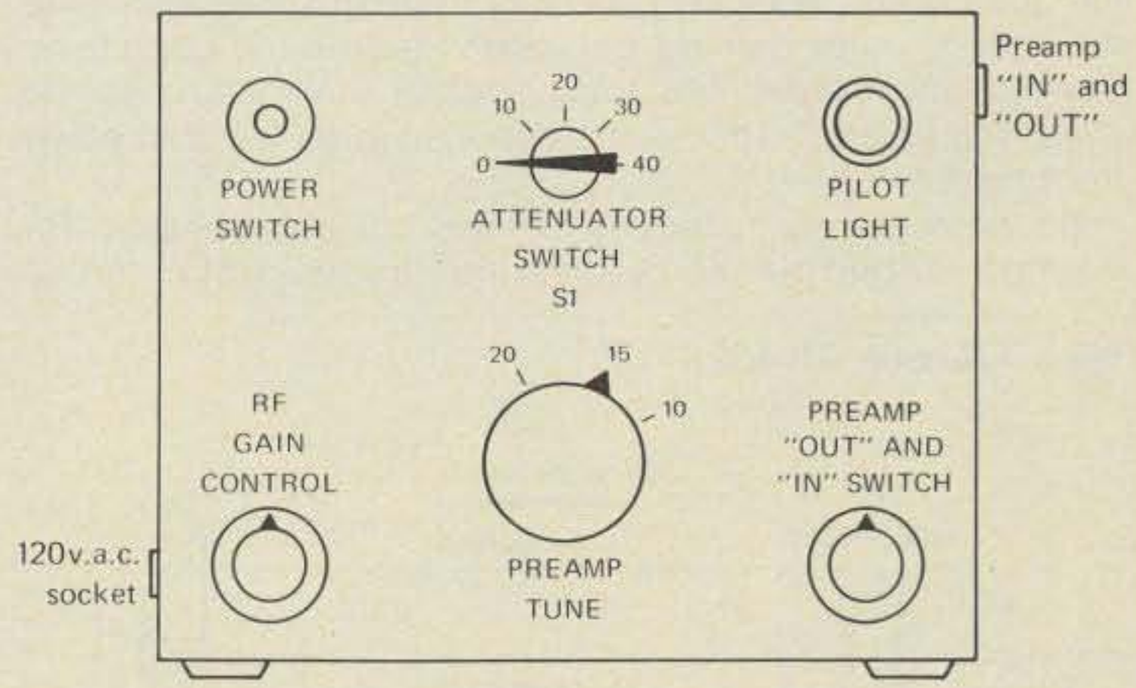


Fig. 6—Front panel layout. Four faucet washers were used for feet. They were secured with rubber cement to the bottom of the box shield. The 120 v.a.c. power socket is on the lower left side panel. Phono jacks for the pre-amplifier "in" and "out" are mounted on the upper right side panel.

The wave, or Beverage, antenna can be used to get you on the lowest frequency amateur bands. Harold E. Davis shows how to do it, with some theory of operation thrown in for good measure.

The Wave Antenna

BY HAROLD E. DAVIS*, W8MTI/W8TMI

The "wave," or Beverage, antenna is one with which many amateurs have been unfamiliar although there have been some recent references to it.

It has been the author's experience that this type of antenna has been very useful on some occasions.

Several years ago I decided to use the forty meter band to communicate with friends in California from my location in southern Michigan. Since my friends were not hams it was felt necessary to be able to put a phonepatch quality signal into the San Francisco-Oakland area.

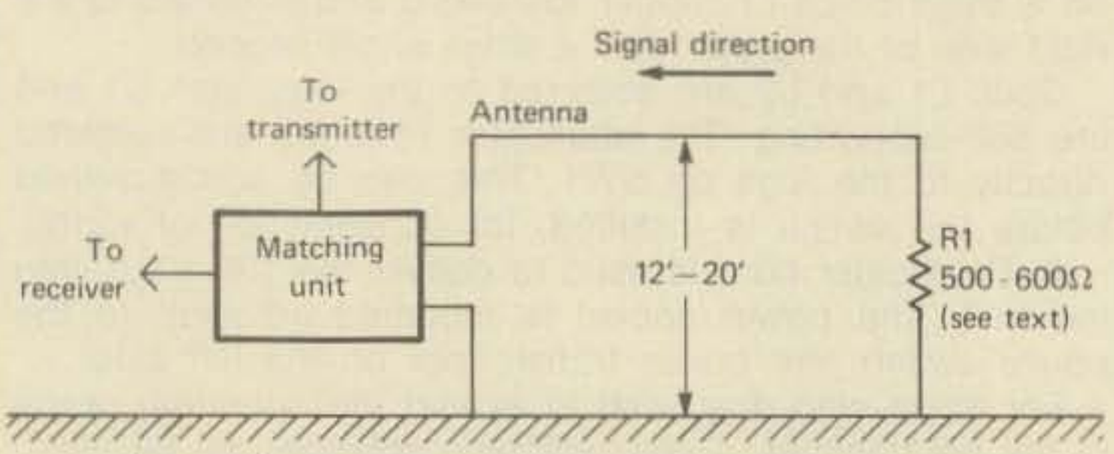


Fig. 1 – Installation of the wave antenna at W8MTI.

With the abundance of foreign broadcast stations on forty it didn't look very promising. The twenty meter band was out of the question because late evening, midnight or so local time, in Michigan, saw nothing but nearly dead band conditions. Seventy-five meters was totally out of the running for my purposes as all I had was the hundred or so watts of power from the CE-100-V.

So, back to forty meters as the only possible solution. The inverted vee and the short vertical that I had were of small use.

*Box 1, Leslie, MI 49251

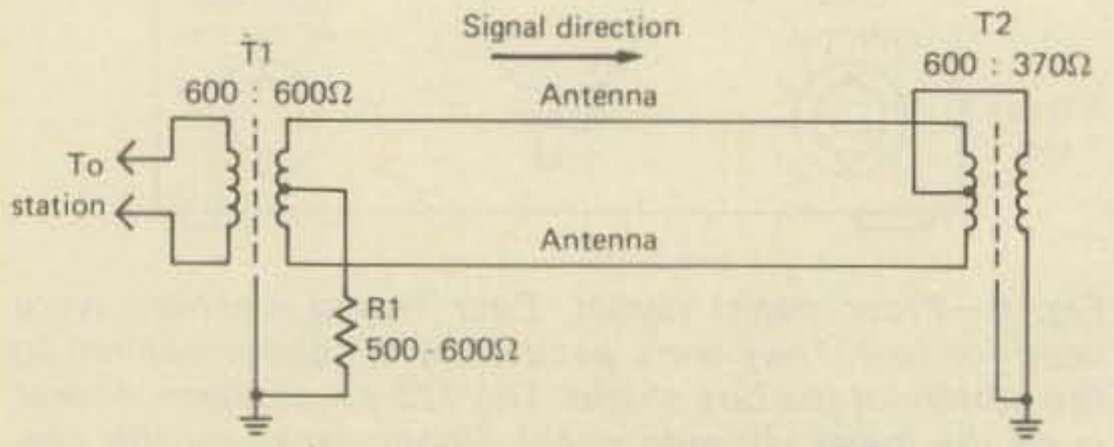


Fig. 2 – A possible configuration for use of the wave antenna for receiving.

While researching through a military communications engineering manual I discovered some interesting and useful facts regarding the wave antenna.

Putting this information to use proved rewarding in my purpose and at the same time proved the information to be true and applicable to amateur use.

Most of the following data was derived from the aforementioned manual and I hereby pass it along with a few additional comments of my own concerning my results.

Essentially, the basic wave antenna consists of a single wire of two or more wavelengths. I found about two and a half to be the best. The distant end of the wave antenna is best terminated in a resistive load of about five hundred ohms. The wire itself should be between twelve and twenty feet (4 and 7 m.) above the ground. I found the lower height fairly easy to maintain but, although twenty feet doesn't sound like much, when you're hanging a hundred meters of wire across a city lot it gets to be a challenge. Mine actually varied from slightly over twenty feet to about fifteen feet above ground.

The feed point should show about five hundred ohms and the terminating resistor should be well grounded. A crowfoot counterpoise was recommended but due to space limitations I resorted to three six foot (2 m.) ground rods. My termination resistor was a large carbon type of non-inductive characteristic, rated as 550 ohms at 250 watts. If the wave antenna is to be used for receiving only a much smaller resistor could be used, it being heavy enough to handle random inductive charges.

In any event, the terminating resistor must be capable of dissipating at least about 35% of the power being fed into the antenna from the transmitter.

My wave antenna was used both for transmitting and receiving but a slightly different arrangement is recommended if it is to be used for receiving only. More about this and other variations below.

How It Operates

The *wave tilt* principle is the basis of operation of the wave antenna. It operates thusly: as a vertically polarized wave travels over the ground, a component of the electric field appears which is parallel to the earth and in the direction in which the wave is propagated, i.e., the radio wave may be pictured as tilted in the direction of propagation. A voltage will therefore be induced in the antenna and oriented in this direction. By the same token, wave tilt action provides reciprocity when using the wave antenna for transmitting, that is, strongest radiation of a vertically polarized wave along the direction of the antenna.

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- " . . . no-tune-up . . . high power operation requires no more adjustment than that involved in operating the exciter."
- " . . . there is no need to worry about whether the tubes or the power supply can handle a full kilowatt."
- "At no time . . . including two contest weekends when it was subject to constant use . . . did the writer feel that the amplifier capabilities were even close to being taxed." (QST, April 1975, p. 42-45.)

QST says it: ALPHA 76 "

- "Typically excellent ETO construction techniques . . . in the (ALPHA) 76."
- "The transformer . . . is a 1.5 KVA continuous-service unit."
- "The unit runs cool and quiet."
- "The ALPHA 76 more than exceeds harmonic attenuation (requirements.) . . . Third-order products are approximately dB down . . . "
- " . . . 1 kW cw input provides excellent efficiency . . . "
- "Output efficiency as measured in the ARRL laboratory was better than 60% for both 2000 watts PEP and 1000 watts cw input on all bands." (QST, January 1978, p. 35-36.)

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- Full pi-L; harmonics −52db
- Nominal efficiency over 60%
- Just 1 cu. ft.; 70 pounds. (Lightweight option, 50 lb.)

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CIRCLE 12 ON READER SERVICE CARD

Appearances of the vertical component while transmitting and of the horizontal component in the receiving mode are the results of wave tilt caused by the finite conductivity of the earth. These components due to wave tilt are greater over poor earth than over good earth and are very poor over sea water. In my case, the ground was somewhat poorer than I would otherwise have liked.

Because of the wave tilt factor and the relatively high impedance, this antenna proved quite efficient as matched against the inverted vee and the short vertical, the latter being the better of the two.

Inasmuch as the wave tilt effect is greatest over poorer ground conditions, the wave antenna is just not as effective over good ground and is definitely not recommended for use over salt marsh or sea water. Of course this applies mainly to its use as a transmitting antenna.

In my installation I used the configuration shown in fig. 1. Matching was accomplished with a tapped parallel tank circuit between the antenna relay and the antenna, thus providing a match for both the receiving and the transmitter.

The results obtained were significant although not scientifically recorded. This antenna was in use for several weeks

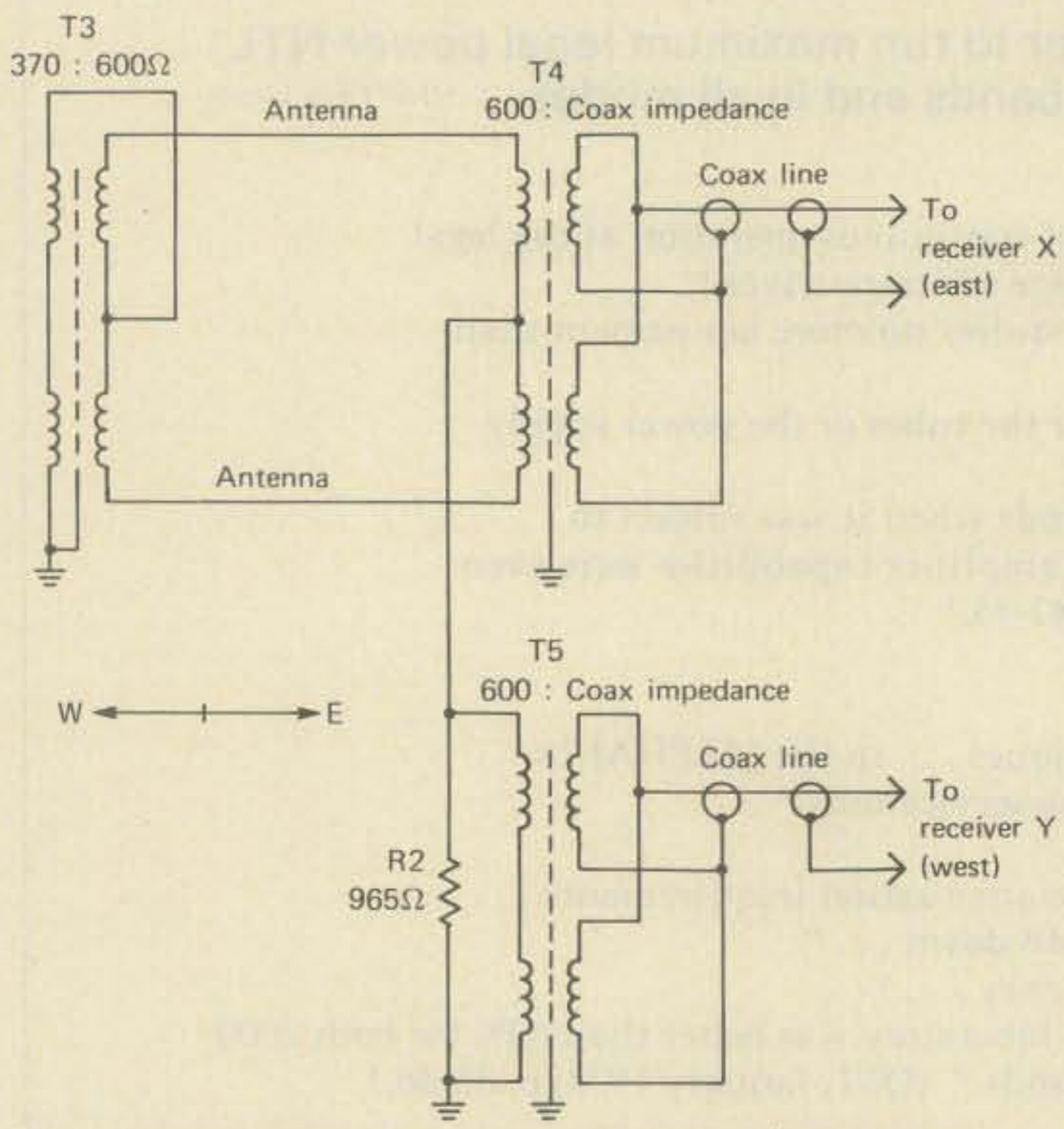


Fig. 3 – Installing the wave antenna for use with two receivers.

before a neighbor spotted it running across a very tiny corner of his lot. He proceeded to alter both the height and length of it.

During those several weeks I had a number of interesting results and some almost unbelievable signal reports from central and northern California and even some doubts as to if I was actually running only the 100 watts that I had or if I actually had much more. On occasion I was able to put in fair to good signals to the west coast even though band conditions were only poor to marginal.

The signals were almost always reported to be good enough for phone patch. I didn't make many contacts on this antenna outside the far west coast area and those that I did make were mostly in the Nevada and Oregon areas. Of course, this was my aim as my efforts were directed at reaching the Bay Area. There were times when I called stations that I could hear in other areas, mostly the third and fourth areas, but had no contact with any of them on the wave antenna. In many instances they were very strong on either the vertical or the inverted vee and all but totally disappeared when I switched to the wave antenna. This often occurred to foreign broadcast stations as well.

As luck would have it, I never made contact with my non-amateur friends in Oakland and they moved back to Michigan at about the same time my wave antenna project was so abruptly terminated.

The experiment did, however, confirm the information I had found regarding the wave antenna and which same information I confidently pass along to the antenna experimenter who desires useful and comprehensive information.

Variations and Considerations

For use as a receive only antenna, the two variations shown in fig. 2 and fig. 3 are recommended over the more basic wave antenna that I used for transmission as well as reception. In each case these antennas still operate on the wave tilt principle. These remarks apply mainly to lower frequency use of the wave antenna.

The wave antenna for reception consists of a pair of spaced wires supported approximately five meters above ground. As in the case of the basic wave antenna best efficiency is obtained at not more than two and a half wavelengths. Typically 500/600 ohm open wire line would be used. On 160 meters this would be nearly a quarter mile of line—not very practical for the inner city dweller but some ingenuity might overcome the problem.

The two wires operate in parallel with the ground return. If it is necessary to locate the near end of the wave antenna a couple of hundred feet away from the receiver, in order to reduce man-made noise or for any other reason, this may be done without detrimental effect.

Ordinarily, the wave antenna is terminated resistively at the end away from the receiver. That becomes the desired direction of reception. However, as shown in fig. 2, the direction of reception can be reversed or as shown in fig. 3 reception can be obtained in two opposing directions by using two receivers simultaneously or by switching one receiver between the two outputs of the antenna circuit.

In fig. 2 the signal builds up on the parallel line until it reaches the special impedance transformer which converts this balanced-to-ground signal and feeds it back as a balanced 600 ohm signal on the paired line to the receiving impedance transformer. The terminating resistor R is used at the receiver end and, again, as in fig. 1, serves to dissipate unwanted signals arriving from the opposite direction.

The configuration in fig. 3 is evident as a further development of that in fig. 2 and the same principles apply.

Wave antennas as short as one wavelength and up to two and a half lengths are generally effective but lengths in excess of two and a half wavelengths generally effect a decrease in signal strength. Any of these antennas may and have been used for transmitting as well as receiving and are useable over a wide range of frequencies. As mentioned above the termination resistor must be capable of dissipating at least a third of the transmitter's output power and it should be non-inductive. It should also be connected to a good artificial ground or counterpoise.

A valuable point to consider when designing a wave antenna is that by careful orientation a significant reduction in man-made noise and undesired signals from other sources can be realized. Sometimes the signal strength will be lower with the desired signal than it was with the inverted vee or the vertical but remember that most of the time the signal-to-noise ratio will improve and permit copy of a much weaker signal than would be possible on the other antenna.

In conclusion, this might not turn out to be your dream antenna. In fact it might even be a total bust. It's easy to construct and the lengths aren't critical, although directional location might be.

Whether this antenna turns out to be your boom or bust, you'll not know until you put one up and try it. ■

Dr. Thayer takes the readers of CQ on a nostalgic trip to St. Louis. At that city's Exposition, 75 years ago, radio had already passed its infancy.

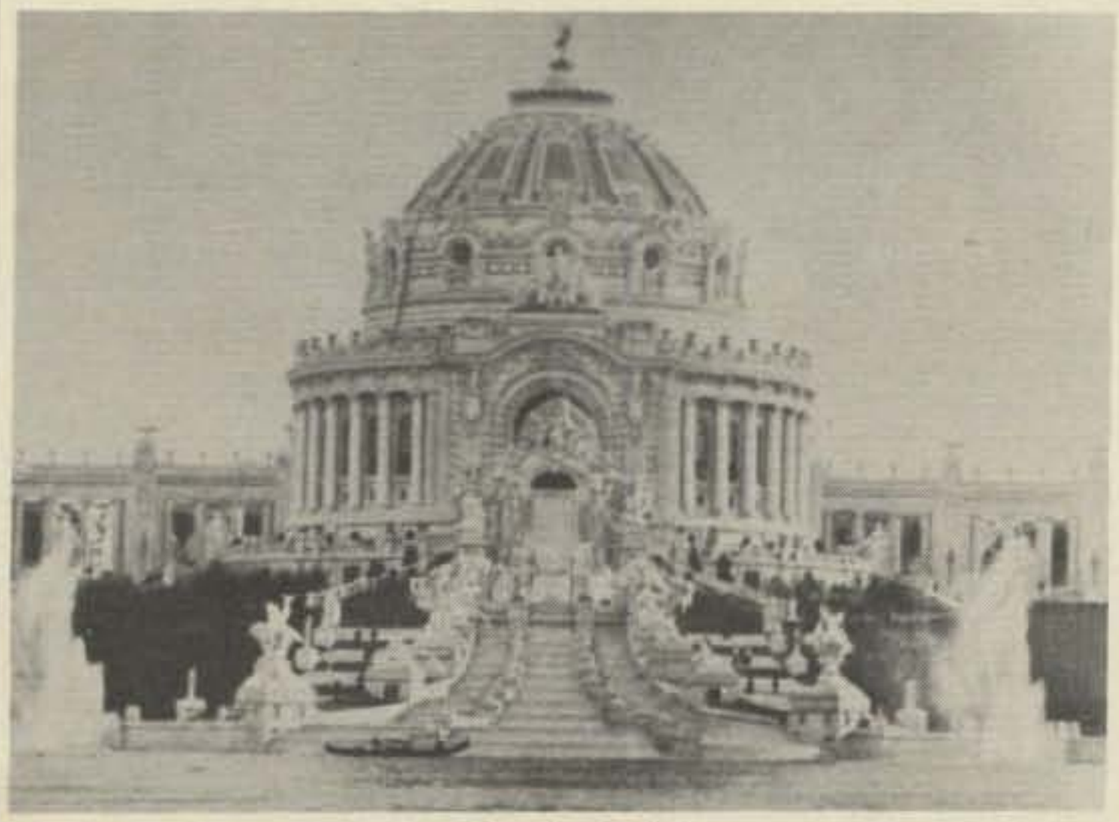
Wireless Telegraphy at the St. Louis Exposition in 1904

BY C.R. THAYER*, W3HAL

The Bicentennial year just passed has brought back memories of the great Centennial Exposition of Philadelphia. It was in connection with that mammoth fair that two new inventions destined to change the life of America were introduced and popularized. One of these was the telephone and the other was the "writing machine" which we now know by the millions as the typewriter. Certain young ladies especially trained for the arduous task would for a fee (25¢, I believe) address a letter to the home folks for you on one of these new-fangled contraptions. Letters so addressed, when still in existence, bring a nice price.

The great Columbian Exposition of 1893 in Chicago served to display (literally) the wonders of electric illumination even though electric lighting had been invented only a few years previously. A dozen years later, the then larger St. Louis Exposition set up to honor the centennial of the Louisiana Purchase by Thomas Jefferson, helped to publicize and popularize another great stride forward in communication which had just recently been developed—the wireless telegraph.

*545 W. Neshannock Ave., New Wilmington PA 16142



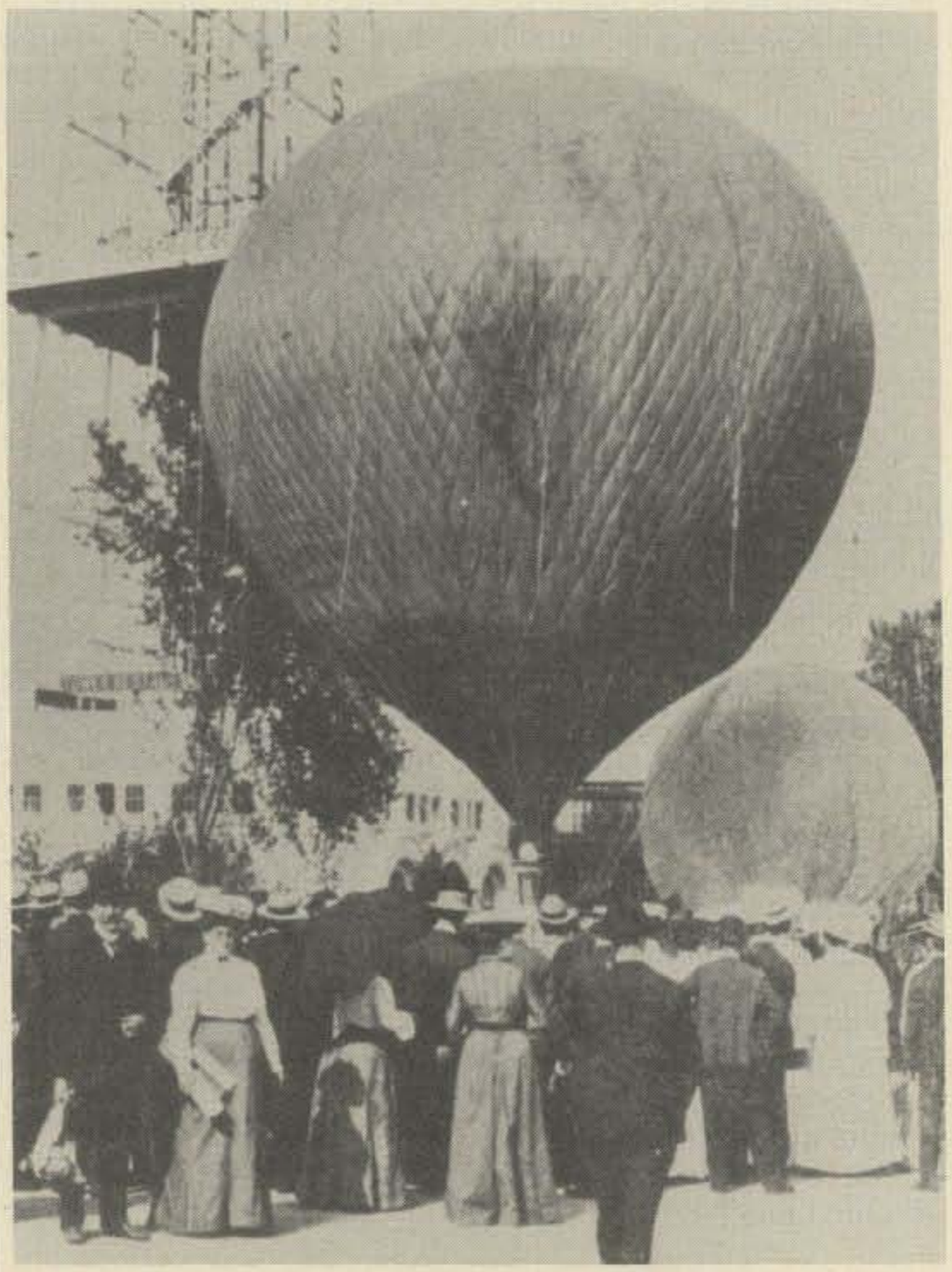
Festival Hall

Easily dominating the landscape of the fair's large acreage, and affording from its top a view not only of the fair but of the city and surrounding country, was the 300-foot high DeForest Wireless Telegraph Tower. It attracted great interest from the hundreds of thousands of fairgoers. But it was far more than an ornamental structure. It was used to transmit news messages of from three to five thousand words a day to local newspapers at the astounding speed of from twenty-five to thirty-five words a minute. Obviously, this was done in Morse code. A second subsidiary tower was also set up within the fairgrounds on Art Hill. Its wooden mast was 200 feet high and it was formally opened for commercial business on Electricity Day, September 14, 1904 and was in constant communication with Chicago, Springfield (Illinois) and Kansas City. In fact, sometimes during the fair (and probably earlier) a formal test was set up of message transmission to Chicago. Three "jurors," Drs. Hertzog and Langszorff of New York and a Gaston Rous of Paris, watched the transmission of a message at the fair sending set (presumably from the larger tower) while the other two, W.J. Hammer of New York and Professor Kelsey of Purdue University monitored the reception at the Chicago receiving terminal. The decoded message was then telephoned back to the fairgrounds, confirmed as correct and the experiment was declared unqualifiedly successful. On the basis of this and other demonstrations of the outreach and flexibility of this new invention, the fair's International Jury of Awards granted to the DeForest Wireless Telegraph Company the Grand Prize for its superiority in the transmission of wireless messages as well as a gold medal for the excellence of its installations and the perfection of its instruments.

At the time the claim was made for the DeForest system that it had been able to send its message as far as 1500 miles over land and a considerably greater distance over water. In fact, the system gave promise, it was said, of supplanting the vaulted Atlantic cable. It was noted also that already the London *Times* and the New York *Times* were securing their news from the Russo-Japanese conflict by this new and marvelous medium.

The real surprise for most of us readers who did not get to the fair ourselves is to learn that at least one, and probably three, automobiles were rigged up with poles and "machines." And from these mobile stations (probably unlicensed by the FCC) as well as from stations within the

The radio tower.



Waiting for the balloon race to start. The radio tower is in the background.

Palace of Electricity, fairgoers were able to send messages to their home cities. (Presumably these were relayed from one of the big towers.)

The following verbatim report will occasion no surprise at least to the old-timers of our readership: "In operating the DeForest receiver a sharp, crackling sound is made, caused by the resistance of the local circuit of the receiver. It is operated by the simple Morse code, and there is no limit to the speed. After the receiver becomes accustomed to the sounds, he finds no more difficulty in receiving wireless messages than ordinary ones."

Of lesser significance, but of considerable interest at the time, was a balloon race for a $5,000 purse. Starting point was from the base of the radio tower and destination was to be the Washington Monument (D.C.). Neither of the two balloons which entered the race arrived or even got very far east and the prize was never awarded.

There is some question as to where the DeForest Wireless Tower from the Fair is now located. One possibility is Hot Springs, Arkansas. Can any of our readers help with information as to its present location?

Probably there is some tendency on the part of all of us to discount radio in its early stages and to feel that it was very primitive until relatively recently. And most amateurs would suppose that mobile radio is only a quarter century or, at most, a half century old. Certainly it came to this ham as a surprise to learn how far developed wireless telegraphy was as early as 1904!

Material for this article including the pictures was furnished by courtesy of Thomas Whitney, 7042 Manette Drive, St. Louis, Mo. 63136 who has an interesting illustrated lecture on the Fair. He, in turn, derived most of his information from "The History of the Louisiana Purchase Fair," published about 1905 by the Universal Exposition Publishing Company of St. Louis. ■

A Message From The Publisher

Letters continue to trickle in from irate readers, angry over my comments in the January *CQ* about the ARRL's Code of Ethics. Almost unanimously, these letters castigate me for having the gall to attack the League's efforts to keep the amateur bands clear of illegal operation. To which I must honestly plead a loud NOT GUILTY. Before I explain further, I ask that you read this message to its end, and judge me on the entire contents, not an abstract segment out of context.

I freely admit that I have challenged the League's Ethics Code both in print and at industry meetings. But—and this is the important point that my angry protagonists have overlooked—I challenge the Code only because it does not offer anything to help keep the amateur bands free of bootleggers. The entire concept of the Code is to clean up the mess on the 11 meter CB band and the spectrum between 11 and the 10 meter Ham band which nowadays gets referred to as "HFers' Operation." And this, I maintain, is none of the League's damned business because it's got nothing to do with Amateur Radio. It's not up to us hams to solve the FCC's CB problems. We might not like what's happening, but it's still not our business. We've got enough problems just keeping the ham bands clean. And the Code of Ethics clearly states that its objective is to keep amateur equipment out of the hands of non-amateurs.

But I ask you to consider the tens of thousands of wouldbe hams that want to monitor WIAW for code practice. The League says they should either buy a separate receiver or else use a code cassette which, interestingly enough, the league will sell them. I don't believe that it's fair to require a new would-be Ham to buy a receiver, and then ask him to trade it in a few months later at a loss when it's time for him to get on the air. Nor should he have to use a cassette when WIAW is there.

At the same time, I firmly believe that the CODE of ETHICS has far more blatant weaknesses than just the fact that it doesn't really apply to amateur operation. Plain and simply put, it can't work. Why not? Because even if the entire amateur industry got behind it, which isn't about to happen, there would always be outsiders coming in to offer a new brand of radio to the bootlegger-to-be. That's just what's happened in CB. It's not the legitimate amateur amplifiers that have been used by CBers, but cheap and dirty imitations labled "Amateur Amplifier" simply to circumvent the FCC rules. And the exact same thing would happen if no new amateur transceivers were available to non-amateurs.

And then, let's go a step further. How about the hundreds of thousands of used radios on the market that can be sold to non-amateurs through classified ads in amateur magazines. I tossed out a challenge to the ARRL general manager at the ARMA meeting in Las Vegas during the SAROC show. I told him that I'd refuse all classified ads and mail-order ads in *CQ* if *QST* would do the same. The publishers of both 73 and *HAM RADIO* magazines backed me up on this proposal. If all four publications accepted no classified or mail order ads, then a CODE of ETHICS could truly be administered at a local level because mail-order buying would be eliminated. But *QST* wouldn't consider throwing out the classifieds or the mail-order ads. They're too darned important as sources of revenue. So, in reality, the League won't put its money where its mouth is.

And that, my friends, is the gist of my attack on the ARRL Code of Ethics. It can't work. It doesn't solve our own problems. And the League is the only organization that won't support its own idea with out-of-pocket financial sacrifice. As soon as they realized that no advertisers would sign the Code, they backed down on making it a requirement for advertising in *QST*. As soon as they saw that the industry wouldn't stand for being blackmailed into signing the Code, they dropped the "Good Guys" list idea. And as soon as the other publishers in the industry showed them how to effectively make the Code really work, they dropped it like a hot potato because it would cost the League income.

Now, if that makes me an anti-amateur, League-sniping, no-good fink, so be it. I intend to tell it like it is, no matter how many readers tell me that they can't stand being confused with the facts. Honestly, now, don't you want to hear the truth once in a while, even if it isn't always pleasant?

Richard A. Cowan, WA2LRO

WWV and WWVH are not the only frequency and time standards United States amateurs can put to use. W9FX describes a Canadian service.

CHU: Service Canadien de l'Heure

BY KARL T. THURBER, JR.*, W8FX

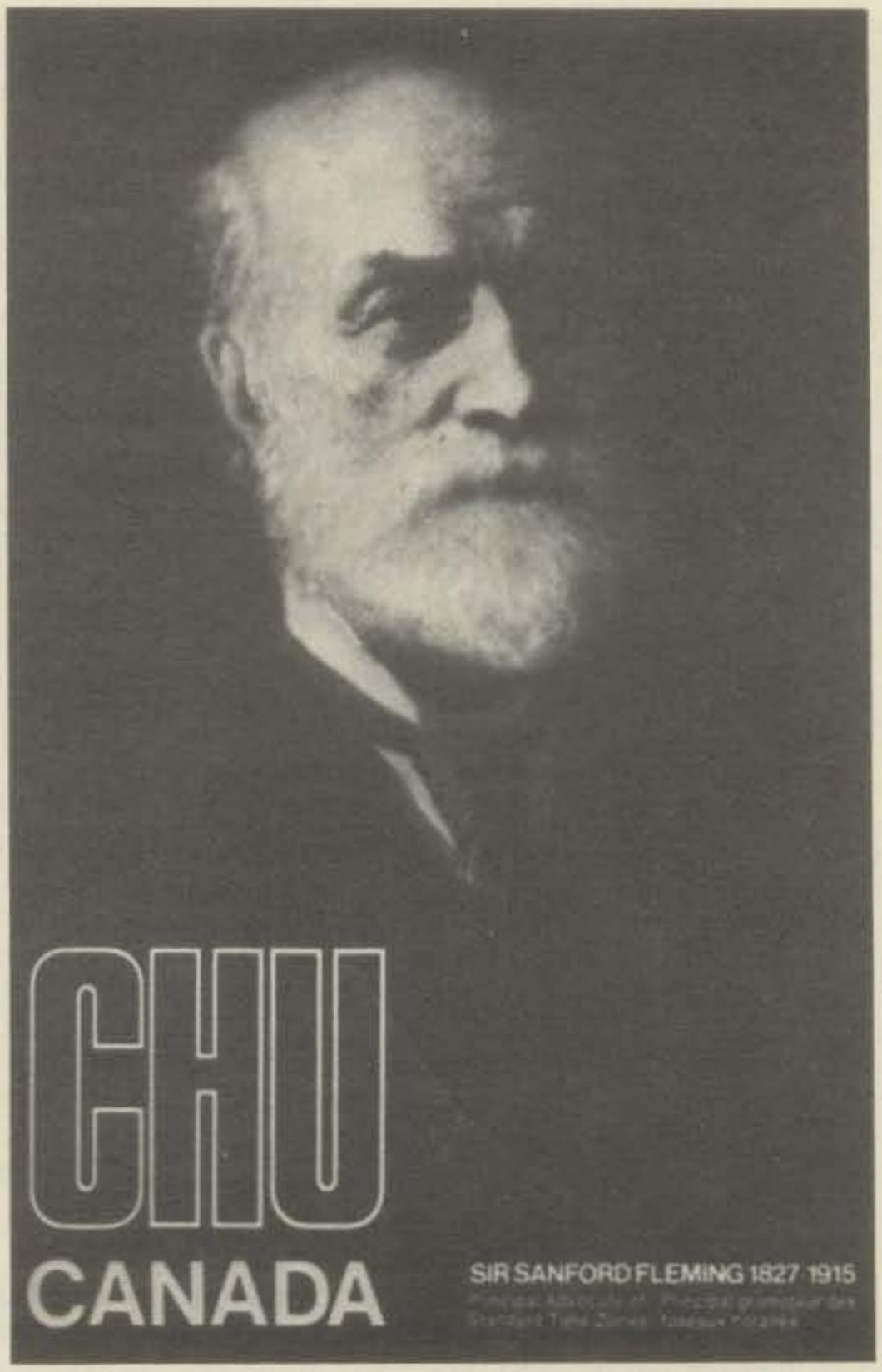


Fig. 1–Front of CHU's QSL card. Sir Sanford Fleming was the principle advocate of standard time zones.

Most U.S. amateurs are familiar with the services of WWV and WWVH, the U.S. Standard Time and Frequency stations operated by the National Bureau of Standards. But our northern neighbor also has its own station, CHU, which is but vaguely familiar to U.S. hams—primarily because of the easy availability of WWV/WWVH signals but also because the station uses "oddball" frequencies which are not compatible with the common 1000 kHz and 100 kHz crystal calibrator outputs. (A calibrator which divides down to 10 or 5 kHz can, of course, be "zeroed" against CHU just as well as against WWV or WWVH).

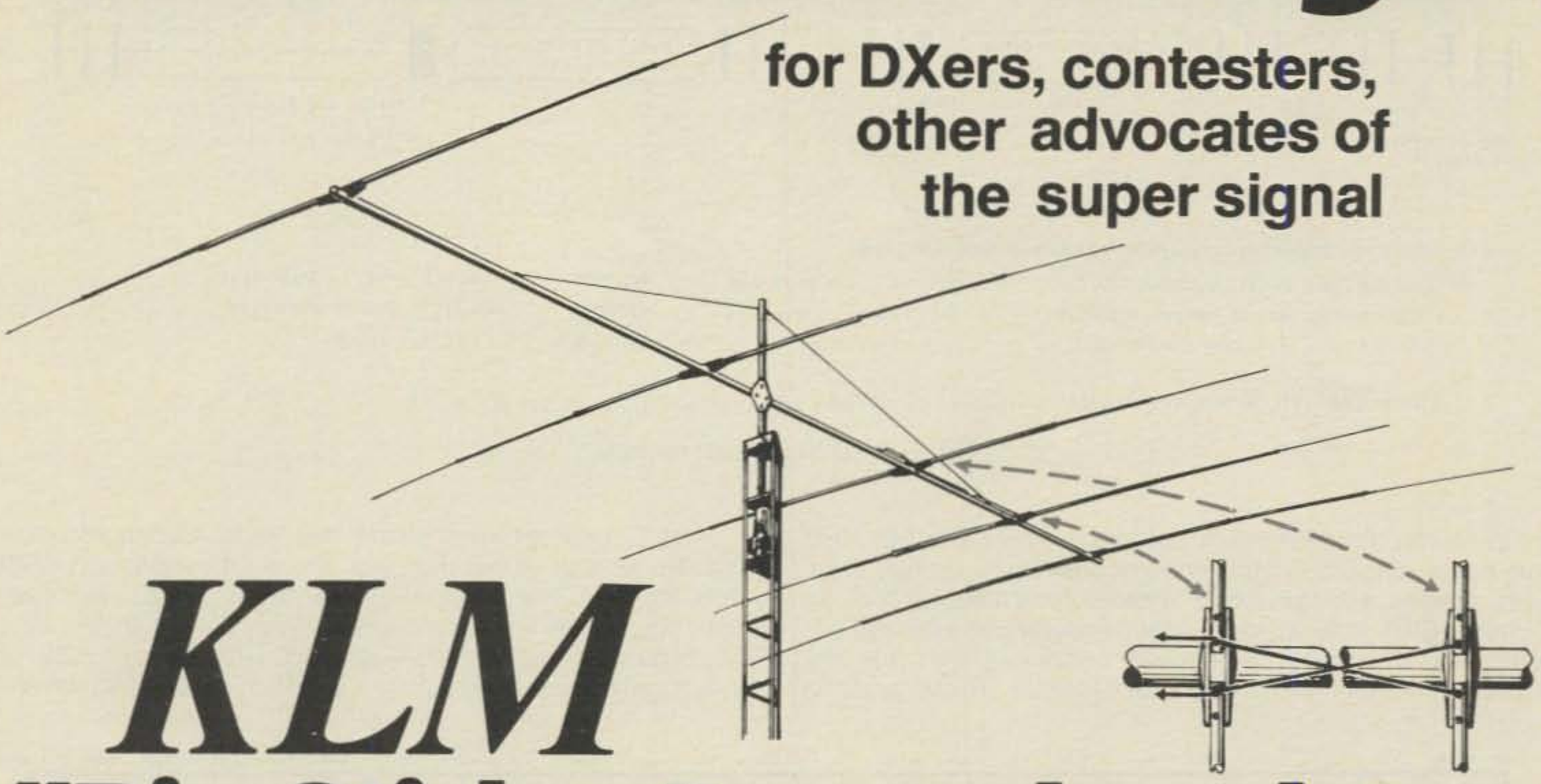
Station CHU, located near Ottawa and easily spotted at 3330, 7335, and 14,670 kHz, has long been a favorite of SWL's and sportsmen. CHU announces EST (Eastern Standard Time) in French and English every minute. In addition to giving time signal information, the CHU frequencies also provide a convenient reference for amateurs due to their close proximity to the 80-, 40-, and 20-meter bands. This is particularly true of the 7335 kHz signal, which makes a handy marker above the "high end" of the 40-meter band. Due to varying propagation conditions, CHU is often useable in northern areas of the U.S. and Canada where WWV may be "in the noise."

The National Research Council of Canada (NRC) time signals which are broadcast from just west of Ottawa over CHU have the following characteristics: (1) Continuous, 24-hour-a-day transmission is made on the three frequencies mentioned above; and (2) Transmitter power output is 3kW on 3330 and 14670 kHz and 10 kW on 7335 kHz. Vertical antenna polarization is employed on all frequencies. The three transmitted frequencies and time signals are derived from a highly accurate cesium frequency standard which is referred daily to the Canadian cesium primary standard. This standard, based on the "atomic second" (AT), is located at the main NRC complex in Ottawa, and uses "atomic clocks" to provide time of day, audio tones, and the r.f. carrier frequencies as broadcast. The reference standard is carefully calibrated with respect to Ephemeris Time, which does

*372 Crabapple Dr., Wright-Patterson AFB, OH 45433

the double edge

for DXers, contesters, other advocates of the super signal



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"Big Sticker" monobanders

with double driven elements

full gain, low VSWR, CW/phone operation without retuning.

KLM beams with **double** driven elements continue to be the choice of amateurs throughout the world. They are performance proved . . . clearly superior. . . and there are good reasons for this superiority.

Unlike most other multi-element yagis, KLM's "Big Sticker" series of monobanders operate at high efficiency over the entire CW and phone portions of any given amateur band **without retuning.** Forward gain is high, the pattern is clear, VSWR is low across the band limits specified.

Among other advanced design considerations, KLM uses log-periodic techniques with **double** driven elements to assure **full excitation** and low VSWR on beams covering the full 40, 20, 15 and 10 meter amateur bands. In addition, the frequency response of KLM "Big Stickers" rolls off very rapidly beyond band extremes thereby minimizing harmonics and adjacent channel interference.

These are husky, well constructed beams that use strong, lightweight elements and booms of 6063-T832 weather-resistant aluminum. Hardware is top quality stainless steel. The insulated mounting brackets (pictured below), an exclusive KLM design, are molded of GE polycarbonate "Lexan," a material that has excellent insulating qualities and very high mechanical strength.

KLM insulating support bracket

Available monobanders: 4 element, 40 meters. 5 and 6 element, 20 meters. 6 element, 15 meters. 5 and 6 element, 10 meters.

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and, for a heavy-duty rotator that will point them... and keep them pointed...under tough weather conditions, use the KLM-1500 HD-

KLM 1500-HD Rotator

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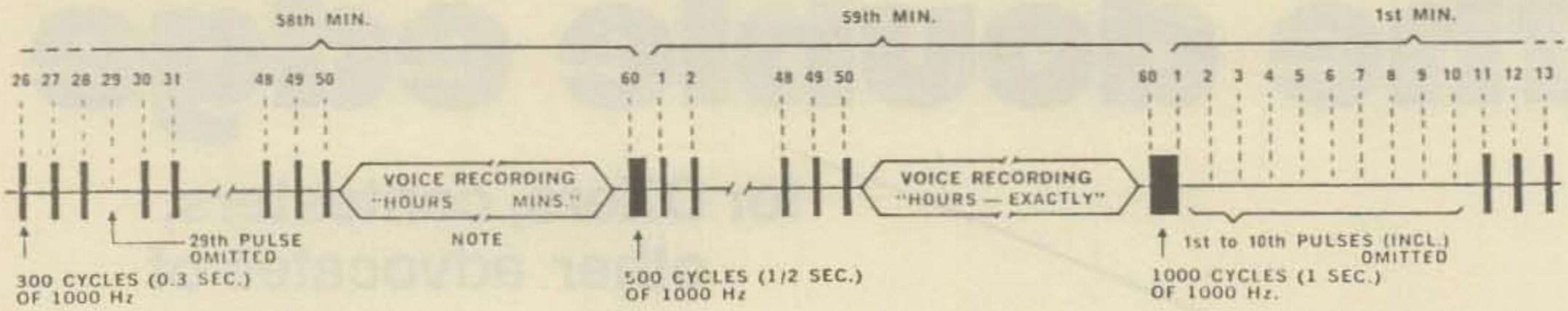
CIRCLE 25 ON READER SERVICE CARD



NOTE: VOICE RECORDINGS ALTERNATE IN FRENCH AND ENGLISH:

"CHU CANADA, EASTERN STANDARD TIME	HOURS	MINUTES	HEURES	MINUTES"	(EVEN MINUTES)
"CHU CANADA, HEURE NORMALE DE L'EST	HEURES	MINUTES	HOURS	MINUTES"	(ODD MINUTES)
"CHU CANADA, EASTERN STANDARD TIME	HOURS EXACTLY"		HEURES PRECISES"	(ON THE HOUR)	

CHU IS LOCATED ON THE SOUTH WEST OUTSKIRTS OF OTTAWA AT 45° 17' 47" N, 75° 45' 22" W.

Fig. 2–CHU broadcast format.

not vary with the seasons or the years. The Canadian NRC time scale, based on their primary cesium frequency standard, agrees with the World-Wide Bureau International de L'Heure (BIH) time scale to within a few microseconds per year. The NRC and CHU actively cooperate with BIH, the Bureau International des Poids et Mesures (BIPM) and the Comité Consultatif International des Radio Communications (CCIR), as well as our own U.S. Naval Observatory (USNO) and the National Bureau of Standards (NBS), and they maintain active time-comparison cross-links with the latter two organizations. As a sidelight, NRC—like our own NBS—is investigating new techniques in precise timing, which involve

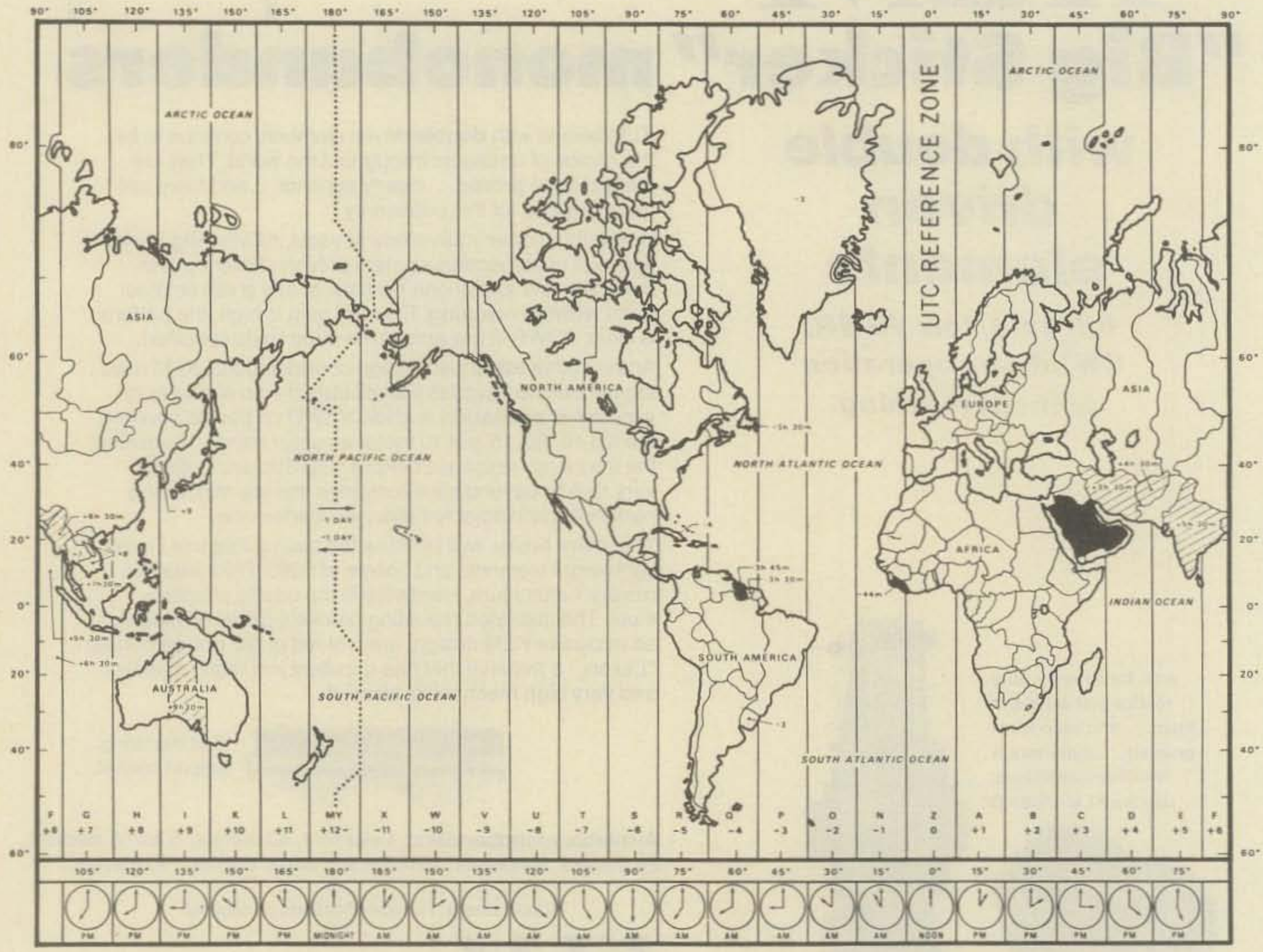


Fig. 3–Standard world time zones.

satellite dissemination of time via television broadcasts and digital-coded time transmission. NRC also directs a great deal of effort toward improvement of the existing primary standards and research on new standards.

While we're more concerned with CHU and its role as a frequency standard, it's interesting to note that in 1976, a set of "triply redundant" f.s.k. digital time code generators were installed to make available to the general public an extremely accurate *digital* time signal giving days, hours, minutes and seconds to 0.1 millisecond accuracy. Also, a similar coding arrangement was in 1976 superimposed on the three CHU r.f. carriers, so that by using either h.f. or land-line and decoding by using commercially available remotely synchronizable clocks, one can now discern the *exact* time, based on the NRC primary cesium atomic standards, at practically any location in Canada. Also, for those who don't mind a toll call or two, an automatic telephone time-of-day announcement was begun in late 1976, so that you can receive either English or French time announcements at 10-second intervals simply by dialing from anywhere in North America. The numbers are 613-745-1576 or 613-745-9426.

You can be confident in CHU's accuracy: the NRC time laboratory continuously monitors CHU's signal to ensure that it is within 5×10^{-12} in frequency and than 0.1 ms in time of the agreed-on international standards. This is comparable to the accuracy expected of WWV and WWVH. Incidentally, by international agreement, the NRC time scale is one of the seven national scales contributing to the International Atomic Time Scale (IAT).

As an historical note, for many years, the Dominion Observatory (then a part of the Department of Mines and Resources) served unofficially as a source of accurate time for a variety of purposes, time being made available continuously to the Canadian Broadcasting Corporation, and broadcast daily by the CBC network stations for about half a minute at 1:00 P.M. Eastern Time. It is also made available by direct line to the Canadian telegraph companies, and to several domestic users in the Ottawa area. Beginning April 1, 1970, the Time Service became a part of the National Research Council of Canada, thus bringing together under one umbrella the Canadian standards of frequency and time.

At present, the basic CHU broadcast signal format is as follows:

The seconds' pulses consist of 300 cycles of a 1000 Hz tone, the beginning of the pulse marking the exact second. The zero pulse of each minute is 1⅛ second long while the zero pulse of the hour is one second long. The pulses occur at the rate of one per second with the following exceptions:

(1) The 29th pulse of each minute is deleted.
(2) The 51st to 59th pulses (inclusive of each minute) are deleted. During this interval station identification and time is announced by voice.
(3) The 1st to 10th pulses, inclusive, are deleted on the first minute of each hour.

A voice recording of the time occurs each minute in the 10 second gap between the 50th and 60th second. It refers to the beginning of the minute or hour pulse that follows. The announcement is in the 24 hour system and is bilingual, alternating in the French and English languages. This format is shown graphically in fig. **2**.

A point to note: if your calibrator has 5 or 10 kHz outputs, it may be more convenient to calibrate against CHU, since it isn't modulated by the nearly-continuous audio tones that WWV and WWVH use. When calibrating against the latter two, you must wait until the "tone-free" periods or else risk the error of zero-beating against one of the audio "sidebands." (The receiver would have to have good selectivity, of course, to prevent problems with the 5 or 10 kHz calibrator harmonics

(Continued on page 86)

1977 CQ CW World Wide DX Contest
High Claimed Scores

The following are high claimed scores received *and processed* by February 8, 1978. So don't be alarmed if you don't see your score listed.

USA
Single operator
All Band

W3LPL	1,693,956
N2LT	1,594,104
W1ZA	1,544,620
N3RS	1,411,830
N6RO	1,396,525
K9DX	1,345,408
K1NA	1,344,512
N7XX	1,344,396
W4DR	1,310,985
W3BGN	1,230,293
K3ZO	1,164,800
N4RR	1,141,764
W21B	1,137,312
K3RA	989,095
W3AP	954,603
N6AR	936,964
N6RA	889,752
W6RR	888,794
K2BMI	877,051
W6AM	872,910
W9RE	868,947
K3CY	861,300
N4RV	859,548

Single Operator
Single Band

28MHz

W5MYA	40,133
N6KA	28,196
K5UR	25,996
W6MUR	22,792
K4JD	20,700
W1BR	19,140
W9ZA	17,050

21 MHz

N4RJ	221,598
W4RX	198,024
W1RM	194,129
K4FJ/3	161,690
K9FN	158,816
N3CW	157,040
WA8PKB	156,765
K8CX	138,320
K9ES	137,418
W8TA	133,926
WB2FIT	127,504
W1YN	126,351

14 MHz

K1OX	450,977
N9MM	394,482
K8IA	331,303
K4JPD	313,575
W5FO	285,496
K3UA	277,350
W7ATF	240,786
K2LWR	209,760
K3FN	203,864
W4NL/3	202,630
W2SUA	180,290
K1DKX	159,782
K9CLO	155,471
W4AAV	150,696
K21GW	129,865
W2AO	124,956

7 MHz

W5UN	246,584
K7UR	98,225
K4VX	97,008
W4FDA	76,911
NØDX	57,760
WA9JCO	49,851
W9SFR	47,047
N8BB	38,180
W4VQ	33,341
K9MFI	25,350

3.5 MHz

W9BZW	60,120
WB3AVN	34,580
K8MD	33,288
N4QO	24,752
K5NU	22,388
K9AJ	18,612
W2ER	17,050
N7RK	16,550
W9OBF	12,426

1.8 MHz

K1PBW	19,872
W1BB/1	6,012
W4HBK	3,465
N4EA	3,168
W5USM	2,759

USA
Multi-Single

N4AR	2,188,664
K5JA	2,099,028
K2BU	1,972,230
W7FU	1,905,750
W6XR	1,744,288
K1PR	1,714,172
K1XX	1,460,736
W6BH	1,459,200
K6SE	1,353,450
K1ZZ	1,324,160
N3RD	1,240,470
WØHP	1,144,605
W9LT	1,007,412
K6DC	877,438
N1AC	850,025
K7RI	787,408

USA
Multi-Multi

W2PV	4,318,650
W3AU	4,216,306
K3WW	4,016,352
K5RC	3,895,886
W3MM	3,158,142
W4WS	2,909,170
KØRF	2,813,700
W3FA	2,286,585
W3GM	2,029,566
K8LX	1,563,480
K4CG	1,403,360

DX
Single Operator
All Band

9Y4VT	4,713,912
PJ9CG	3,437,820
9Y4VU	2,221,024
ZS6WW	2,131,200
KH6IJ	1,742,760
XE1AN	1,456,442
YBØACT	1,291,290
DK5WL	1,266,258
CY7CC	1,049,965
VE5RG	1,049,850
UB5WF	982,215
OH1XX	942,105
DJØUJ	893,412
JA1PIG/PZ	860,548
PY1ZDK	849,695
OH6JW	846,583
KL7RA	811,944
ZL1BQD	800,310
KL7RW	649,336
XE1VV	610,566
KH6NO	587,375
IK2FGP	575,421

Single Operator
Single Band

28MHz

LU1DZ	231,738
VK3MR	102,837
4Z4KX	92,232
CR9AJ	71,712
EA8URE	46,905
ZS3LK	41,064
IØHCJ	33,930
VK3MJ	33,920
JE1HJJ	31,853
VK4XA	29,225
YU1EFG	28,114
JA9BEX/3	24,957
JR6RRD	23,576
JA1DQT	20,539

21 MHz

KX6LA	537,592
KH6DD	320,320
VP1AH	197,296
I1SLI	190,338
JF1COE	171,948
G3HCT	168,740
G3RZI	147,056
IØDYB	142,240
JE2BNZ	106,780
JK1AII	94,973
DJ7PT	90,700
OF4SL	83,945
G3MZV	81,780
YU4HA	74,980
9H1CH	74,784

14 MHz

ZW4OD	754,250
OH8OS	625,812
CY3EDC	399,663
G3KDB	301,040
KZ5FR	258,093
VE3ODX	248,820
DK5JI	239,538
JA1RDW	203,894
DK5PR	200,384
JA1IDY	197,208
VE6AYI	189,028
JA2BY	184,052
VE3ENM	168,696
VE6KW	164,592

7 MHz

KV4FZ	380,508
4M1ID	185,475
CY3IXE	181,257
JA5BJC	173,734
OK3KFF	151,513
JA2INO	128,310
DK6PY	110,840
KH6DX	105,497
JA1CWZ	104,975
OH5TS	87,204
GM3ZSP	75,300
OH1IJ	75,225

3.5 MHz

CT3/OH1TV	223,364
I3GNQ	105,252
CY3BMV	103,238
G3WPF/A	96,538
N4JI/HC1	77,748
DJ2YA	58,048
OH1VQ	47,061
OH2BCI	46,722
OK1DOK	41,665
JA2JW	34,980
JA6AUH	30,351

1.8 MHz

PAØHIP/A	17,346
YV1OB	13,746
KH6CHC	8,480
DJ7WLA	7,018
OL4ATY	4,316
OH1VA	2,641

DX
Multi-Single

4L6M	6,178,704
EP25V	2,505,068
YU2CDS	2,052,760
DA2AY	1,951,471
DLØAA	1,857,987
SK2KW	1,855,590
YY5A	1,847,300
DKØTU	1,844,421
N4VV/CE3	1,708,720
CY3AKG	1,540,333
YO4SI	1,410,705
EI1AA	1,253,822
OK1ALW	1,235,124
LA1H	999,680
DLØKF	996,788
PJ8JM	900,750
DKØBN	895,158
HH2DX	864,212
ZL2WB	655,872
CY3HFS	517,125

DX
Multi-Multi

KP4EAJ	7,177,275
OH2AW	3,494,328
OH1AA	3,182,880
ZF2AW	3,159,648
JA3YKC	2,832,285
JA3YBF	2,405,312
JA2YEF	642,392

In this installment Ade Weiss puts a pair of shoes on his QRP rig.

A Solid-State VFO Transmitter for 7-14 MHz

Part III: 15 Watt Final Amplifier

BY ADRIAN WEISS*, K8EEG/Ø

In the previous two installments of this article, a 7 MHz Seiler v.f.o. and 1 watt exciter combination were described and construction information was presented. Together, the two units function well as a QRPp transmitter for 7-14 MHz with a power output of about one watt. This power level is adequate for stateside coverage on both bands, and some 20 meter DX when used with a good antenna. However, oftentimes QRM is a problem when using the one watt power level and it is desirable to be able to increase output by several dB. The addition of a final amplifier permits the increase in power output, and, if its output can be varied over a considerable range, it provides convenient flexibility to cover all types of operating conditions. This installment describes a final amplifier capable of about 25 watts output on 7 MHz, and about 16 watts output on 14 MHz, with a minimum functional output level of about 3 watts on both bands if the optional drive-control is included in the final circuit. Fig. 1 shows the final amplifier circuit, and its evolution will be discussed in the following paragraphs.

*83 Suburban Estates, Vermillion SC 57069

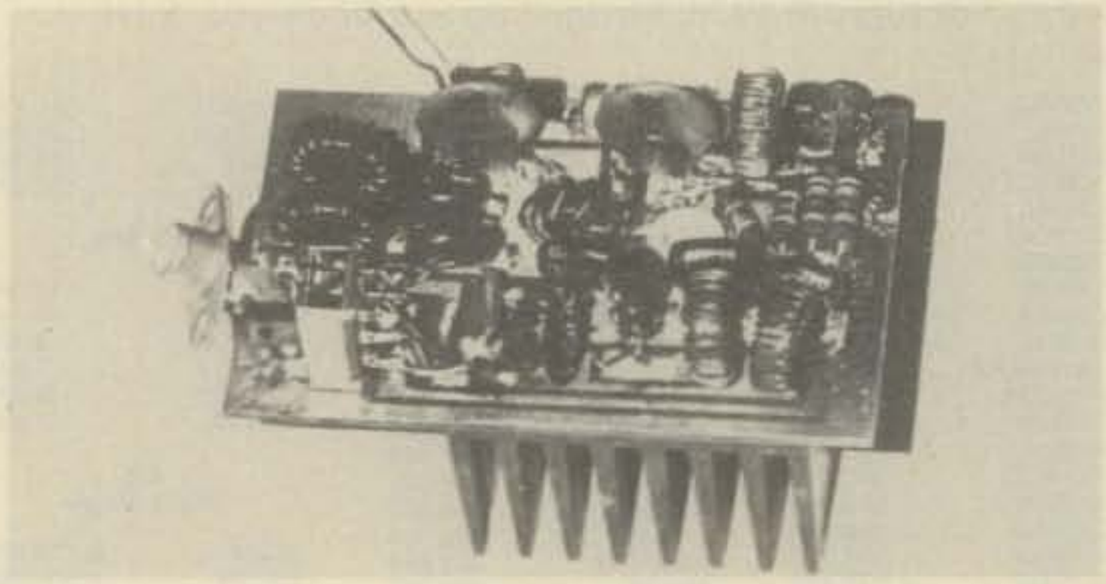


Photo 1A: Completed amplifier board with phono jack output connector soldered temporarily in place. Detail of switch SW2 mounting is at bottom left corner. The mounting flange of the switch is bent 90 degrees from the body and mounted flush against the p.c. board. Leads from the proper pads are then soldered to the SW2 terminals. The 14 MHz L1-L2-L3 seen across bottom edge of board (in that order), and the double-pi capacitors C1-C2-C3 form the "cross" between L1-L2. 7 MHz L1-L2 seen directly above SW2, with 7 MHz C1-C2-C3 to the right of L1-L2. T2 is at the center of the board, and Q1 is the white semicircle to right of T2. The 5.6 ohm base resistor is soldered directly to the base and emitter strips of Q1, with the three 2.7 ohm base swamping resistors at right edge of board. T1 and .001 input capacitor are at the upper right corner. Top center shows RFC1 and associated by-pass capacitors. The 10 mF electrolytic shown in fig. 1 mounts in the empty space at the upper left corner.

Final Amplifier Circuit

The final amplifier uses a 2N6082 ballasted emitter device in a Class C configuration. Broadband impedance matching is used at both input and output ports, so that the basic circuit can be used from 3-30 MHz necessitating only a change of the double-pi output network values. In developing the amplifier, a comparison was made between three types of

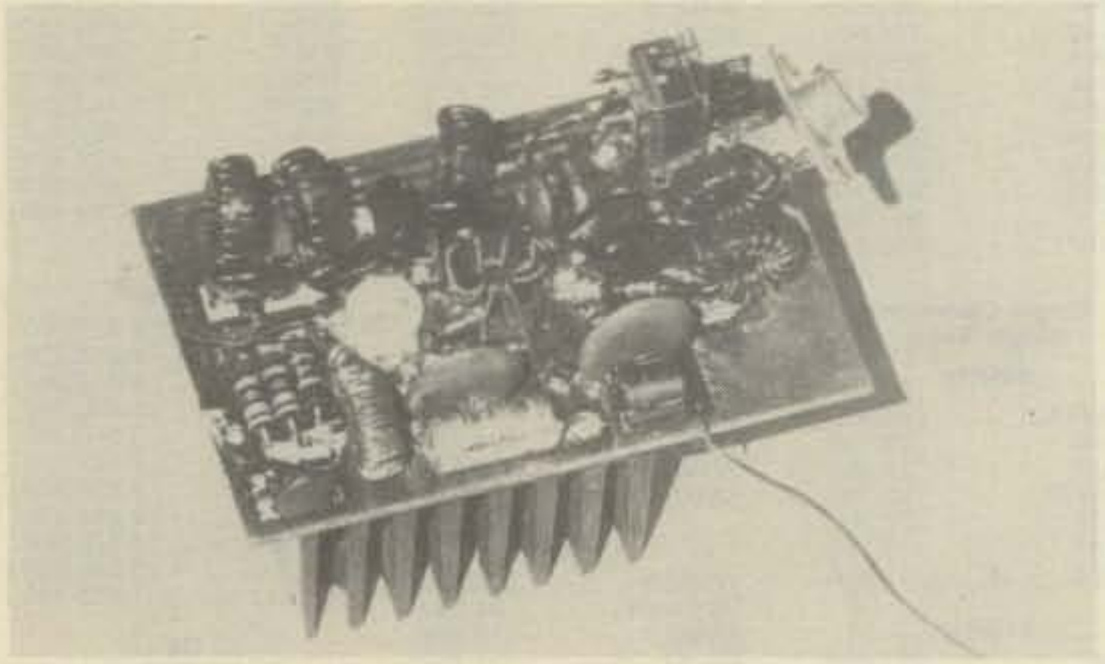
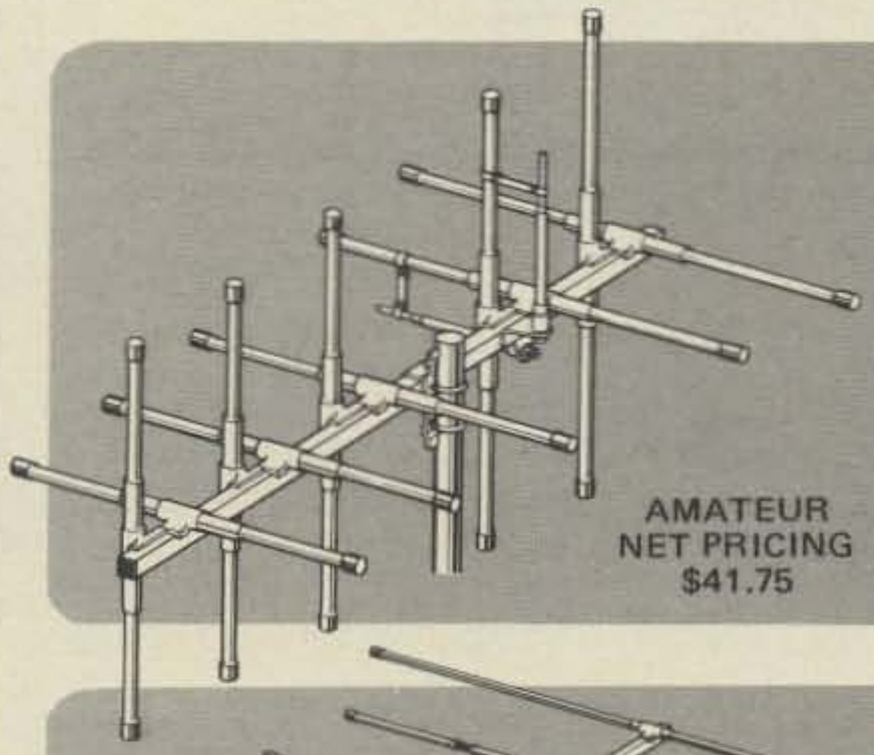


Photo 1B: View of completed amplifier board from T1-RFC1 edge. Shows the RFC1-bypass capacitor mounting more clearly.

LOOK OUT The FINCO Stingers are here!

FINCO Is introducing its new Stinger Series Amateur Antennas.



AMATEUR NET PRICING $41.75

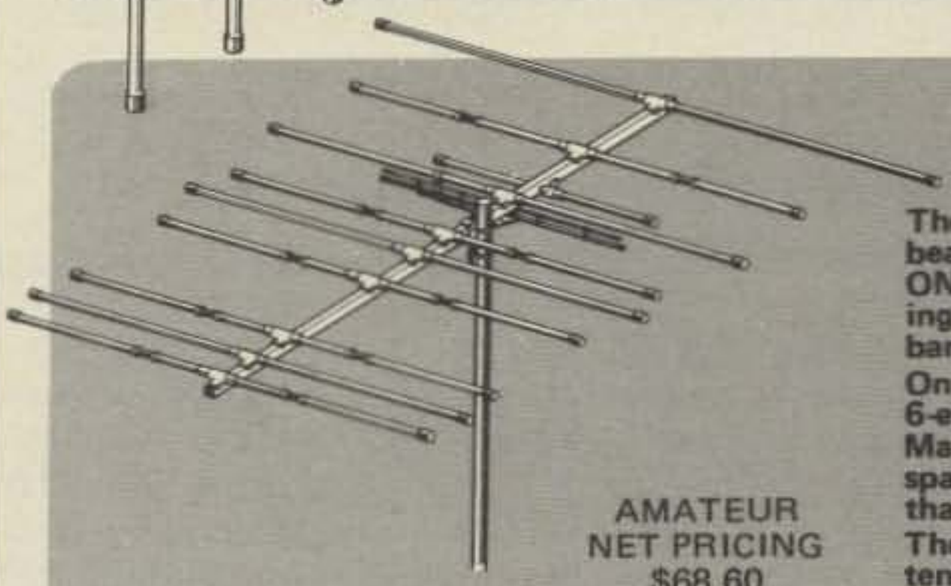
FINCO STINGER A 2+2

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 NET PRICING $68.60

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!

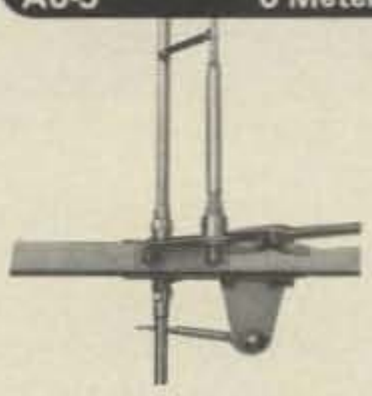
On 2-meters, the A 62 has 6 colinear elements — equivalent to three 1/2 λ 6-element yagis stacked side by side — thus giving outstanding performance. Maximum forward gain is assured on 6-meters through the use of four wide spaced elements. The heavy duty Stinger construction is used throughout so that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

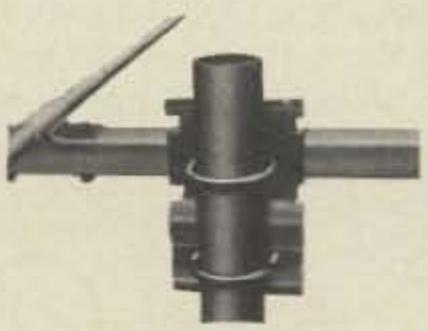
MODEL	AMATUER BAND	ELEMENTS	BOOM LENGTH	AMATUER NET PRICING	MODEL	AMATUER BAND	ELEMENTS	BOOM LENGTH	AMATUER NET PRICING
A10-4	10 Meter	4	16'	57.15	A2-5	2 Meter	5	5½'	25.60
A6-3	6 Meter	3	6'	27.30	A2-10	2 Meter	10	10'	41.15
A6-5	6 Meter	5	13'	41.95	A1¼-10	1¼ Meter	10	8'	29.65

ENGINEERING FEATURES:

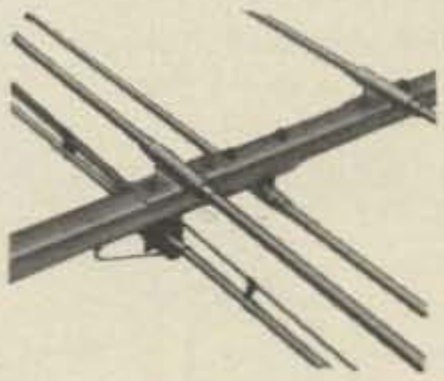


All Stinger Series Amateur Antennas incorporate heavy duty fully adjustable gamma matching systems to allow for maximum power transfer. The design provides for minimum V.S.W.R. and a wide bandwidth. A built in SO-239 type connector assembly is utilized plus the matching systems are power rated at 2,000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

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.



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.



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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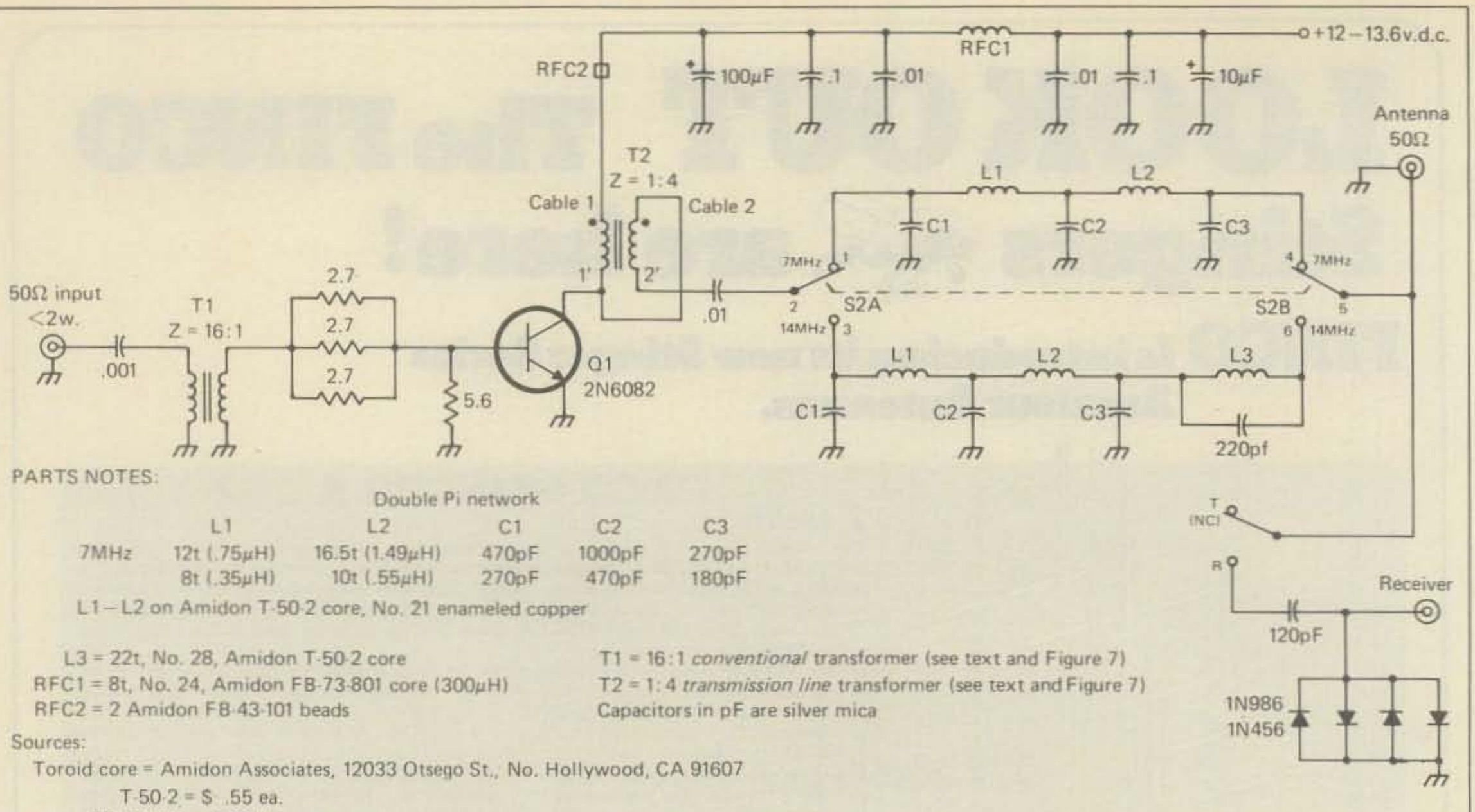
CIRCLE 15 ON READER SERVICE CARD



PARTS NOTES:

Double Pi network

	L1	L2	C1	C2	C3
7MHz	12t (.75µH)	16.5t (1.49µH)	470pF	1000pF	270pF
	8t (.35µH)	10t (.55µH)	270pF	470pF	180pF

L1–L2 on Amidon T-50-2 core, No. 21 enameled copper

L3 = 22t, No. 28, Amidon T-50-2 core
RFC1 = 8t, No. 24, Amidon FB-73-801 core (300µH)
RFC2 = 2 Amidon FB-43-101 beads
T1 = 16:1 *conventional* transformer (see text and Figure 7)
T2 = 1:4 *transmission line* transformer (see text and Figure 7)
Capacitors in pF are silver mica

Sources:

Toroid core = Amidon Associates, 12033 Otsego St., No. Hollywood, CA 91607
T-50-2 = $ .55 ea.
FB-43-101 = 2.00/dozen
FB-73-801 = 3.00/dozen
FB-43-2401 = 3.50/dozen (T2)

Circuit specialists Co. P.O. Box 3047, Scottsdale, AZ 85257
Q1 = 2N6082 = $11.50 ea

Fig. 1–7-14 MHz 15 watt final amplifier.

input matching approaches. First, a conventional narrow-band L-network (fig. 2(a)), adjusted for best impedance match, was inserted between the exciter and amplifier. Its performance was used as a basis of comparison for the broadband approaches. Second, a *transmission line* balun with a 4:1 ratio was tested with a variety of twisted pair and toroid core materials, and then in a 16:1 configuration (figs 2(b), 2(c)). Finally, a *conventional* balun with a 16:1 ratio was tested (fig. 2(d)). Results indicated that the difference in performance between the broadband and narrow-band approaches was almost unnoticeable. DeMaw reached a similar conclusion in comparing *conventional* and *transmission line* baluns in a similar amplifier (*QST*, December, 1975). The *conventional* transformer was chosen primarily because of its simplicity relative to the *transmission line* transformer.

It should be noted that, both in this instance and that cited by DeMaw, the exciter used to drive the amplifier was terminated in a narrow-band tuned circuit designed to match the driver transistor to a 50 ohm load. In viewing the driver-final system as a whole, then, the interstage matching actually consists of two stages of impedance transformation: collector impedance of the driver stage to 50 ohms, and from 50 ohms to the base input impedance of the final amplifier transistor, which is on the order of 3-5 ohms. Overall performance is superior to a system which utilizes only one stage of impedance transformation. As I noted in a earlier article ("Power Amplifier Development," *QST*, May, 1976), interstage isolation is significantly enhanced by the two-stage transformation approach, with the result that variations in load presented by the base of the final amplifier are more effectively absorbed by the matching system and have little effect on earlier stages. For example, in the transmitter described here, variations in the load presented to the driver stage by shifting antenna impedances (when the driver was used without final amplifier) caused "pulling" of the v.f.o. frequency. In the final system, v.f.o. "pull" is hardly detectable by ear when going from minimum to maximum power output, or when shifts in antenna impedance occur.

The collector load impedance of 8-11 ohms is transformed to the 32-44 ohm range by means of the *transmission line* balun T2, a type described by Hejhall (*QST*, March, 1972). Several core materials, as well as wire sizes and twisted pair numbers were tested, and the transformer shown provided the best performance, providing about 2 watts greater output than the next best. The variation is not significant in absolute terms, but it is standard practice to incorporate the most efficient components in a circuit.

A transistor will amplify equally well at all frequencies, and in a broadband circuit the core material and effective *transmission line* length of the transformer determines the frequency range across which optimum amplification will occur. In addition, an amplifier transistor will also generate quite considerable harmonic energy unless some type of harmonic filter is included in the circuit. A conventional half-wave double-pi network with a low *Q* provides the necessary amount of harmonic attenuation in most cases while preserv-

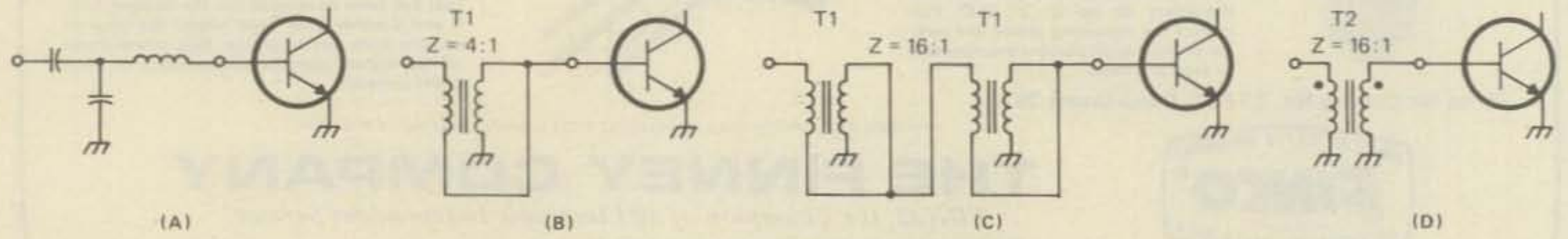


Fig. 2–Several input matching approaches.

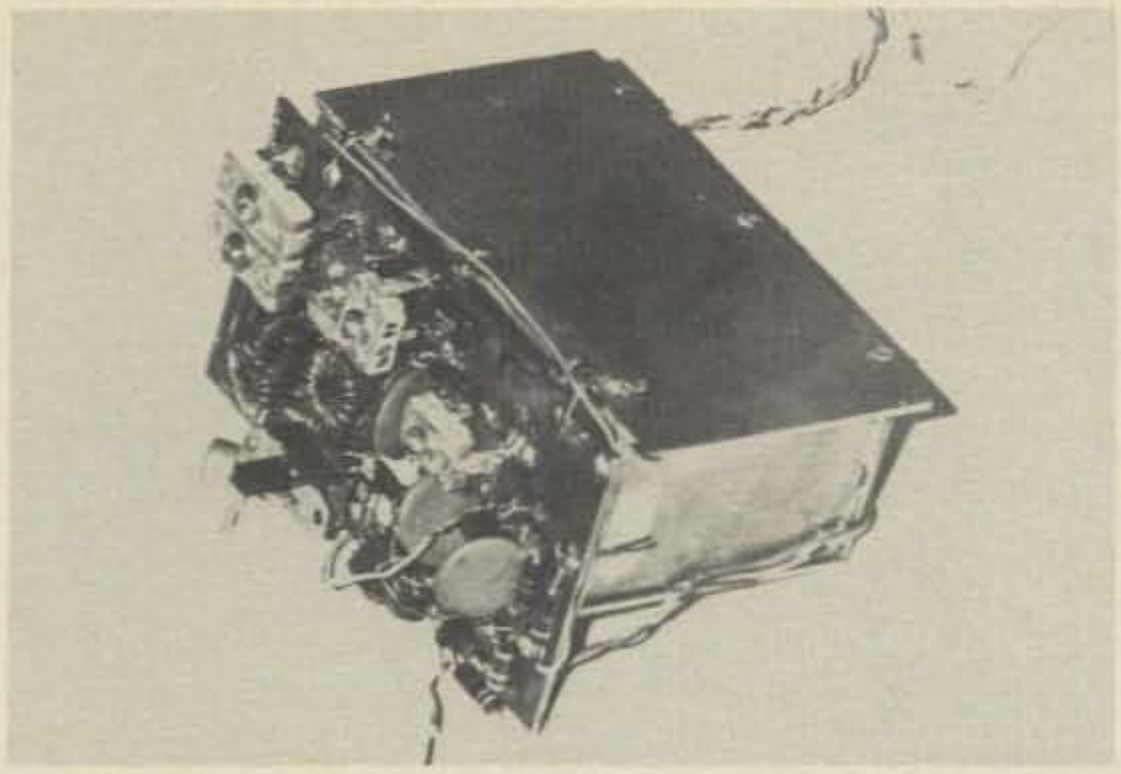


Photo 2: Method of mounting exciter board on long side of v.f.o. enclosure. ½ inch pieces of #18 copper wire are soldered to the bottom of the v.f.o. enclosure, and to the top-side of the exciter board, at three points along the edge (seen as splotches in the photo). v.f.o. B+ leads are seen coming around the bottom corner of the v.f.o. enclosure and connected to the exciter board at the B+ strip through a 47 ohm resistor, which is mounted on the exciter board. The v.f.o. output lead runs along the top edge where the exciter and v.f.o. are joined with the 3 pieces of #18 wire. The exciter B+ lead is seen leaving the bottom corner of the exciter board.

ing the broadband performance of the circuit (within limits, since the pi-net is a tuned circuit with a resonant center frequency). In the amplifier of fig. 1, the half-wave filter serves a dual function: first, it provides attenuation of harmonics; and second, it performs an impedance matching function required to transform the 32-44 ohm impedance seen at the output port of T2 to the 50 ohms presented by the antenna load.

The values shown for the half-wave filter were arrived at empirically, following initial calculations aimed at establishing two steps of impedance transformation. The double-pi network shown is actually a pair of pi networks cascaded, with C2 of network 1 in parallel with C1 of network 2. Fig. 3 shows the configuration and the formulas used to derive

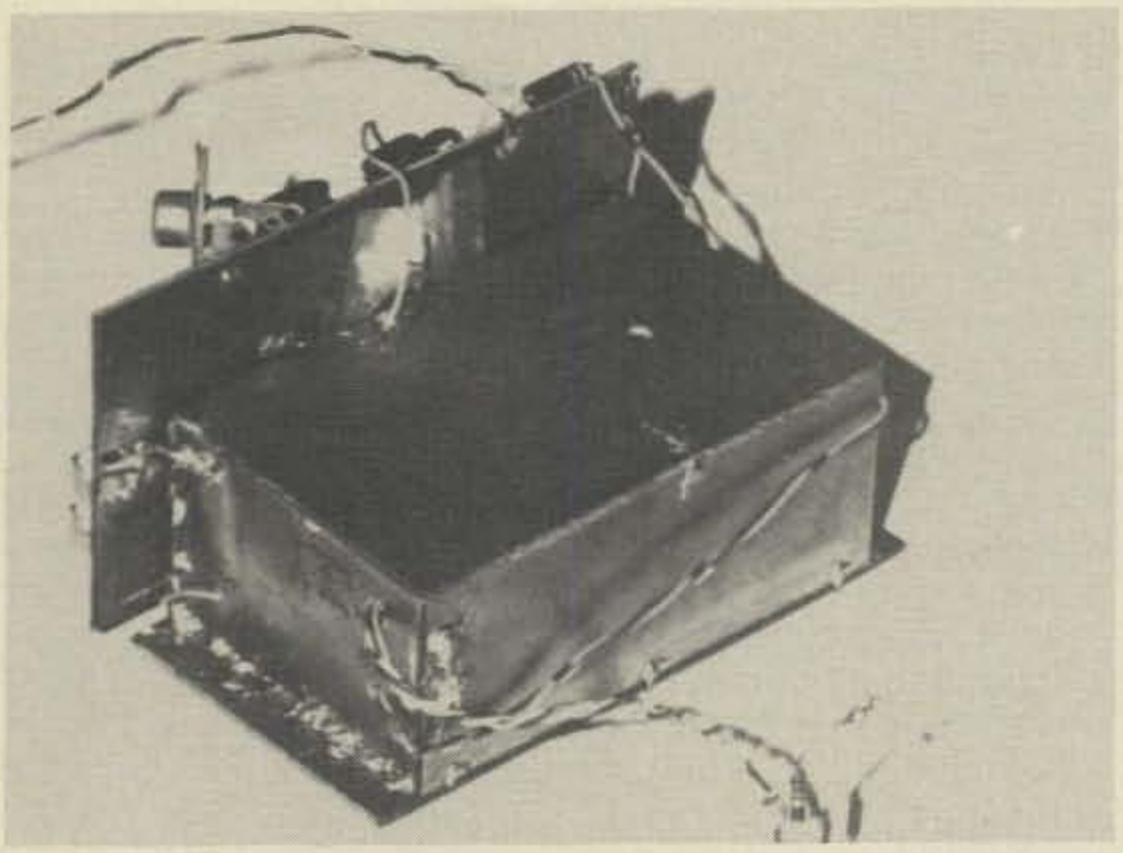


Photo 3: View of the exciter-v.f.o. assembly from the rear. A ½ inch piece of copper wire is seen connecting the end of the v.f.o. enclosure to the bottom of the exciter board. The white splotch in the top middle of the exciter board is thermal grease smeared around the nut which mounts the MPS-U31 to the board. v.f.o. B+ leads run around the right corner of the v.f.o. Tuning pot lies off-photo.

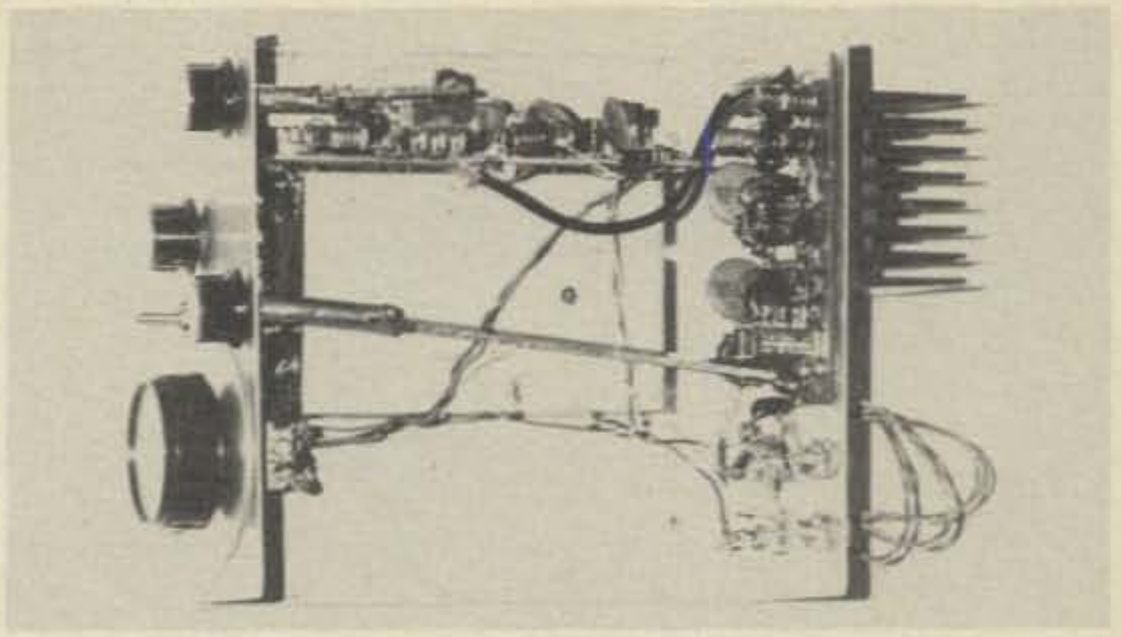


Photo 4: Top view showing location of v.f.o.-exciter assembly, and final amplifier on rear wall, with a heat-sink. SW2 can be seen at center-end of amplifier board. A piece of p.c. stock is connected to the switch nipple and extends forward to a piece of copper tubing on which the knob is mounted. Four phono jacks to the right of the amplifier board are for B+, key, antenna receiver connection, and transmitter antenna output. The tuning pot is mounted to the right of the v.f.o. A short piece of RG-174U coax connects the exciter output to the amplifier input.

component values for given impedance steps. Each pi-network section is derived separately, and then C2 of section 1 and C1 of section 2 (C2a, C2b) are added to form a single component. A Q of 1 is used to preserve as wide a bandwidth as possible.

The parallel equivalent output capacitance of the device to be matched is included in determining the value of C1. The C_{δ} value presents some difficulty, since manufacturers' data sheets usually provide it only for the spectrum above a given selected frequency; in the case of the 2N8062, lower cutoff of the graph is 125 MHz, and extrapolation provides an approximate value of C_{δ} in the 1500 pF range. C1 will then always be a smaller value in pF than the formula derives.

Another difficulty is using the pi network with solid state amplifiers is that the R1 impedance to be matched is smaller than RL, with the result that the inductors L1 and L2 become very small in value, and hence, critical with respect to adjustment of the number of turns involved, especially if a toroid core is used. For example, in the unit described here, a variation of one turn in the inductors produces a significant drop-off of output. Conversely, the value of the capacitors is relatively large and tolerant of considerable variation with

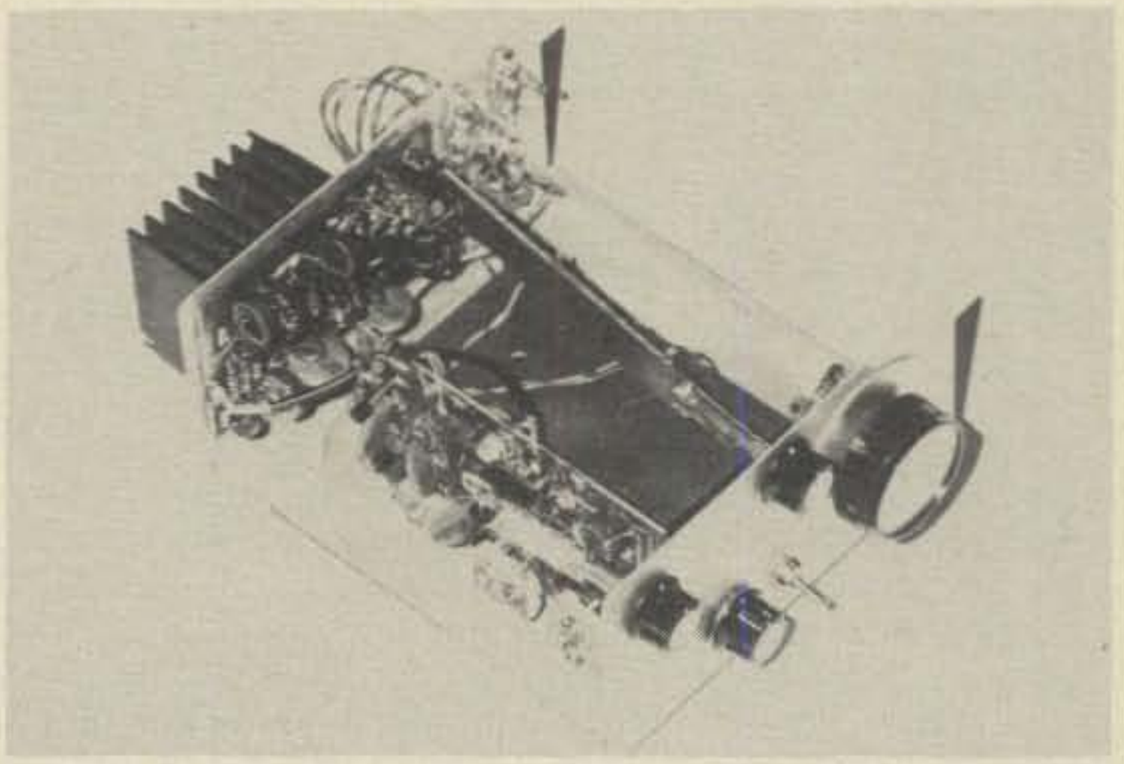
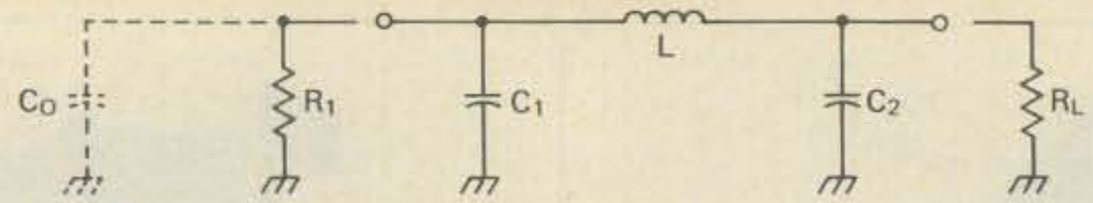


Photo 5: Another view of the completed transmitter. The amplifier SW2 extension to the front panel runs above the v.f.o. enclosure. The exciter SW1 extension is a short one, due to the proximity of the switch to the front panel.

(A)



To calculate values:

(1) Select Q, then $X_{C_1} = (\frac{R_1}{Q}) + X_{C_0}$ where C_O = parallel output capacitance of transistor to be matched.

(2) then $X_{C_2} = R_L \sqrt{\frac{R_1/R_L}{(Q^2+1) - (R_1/R_L)}}$

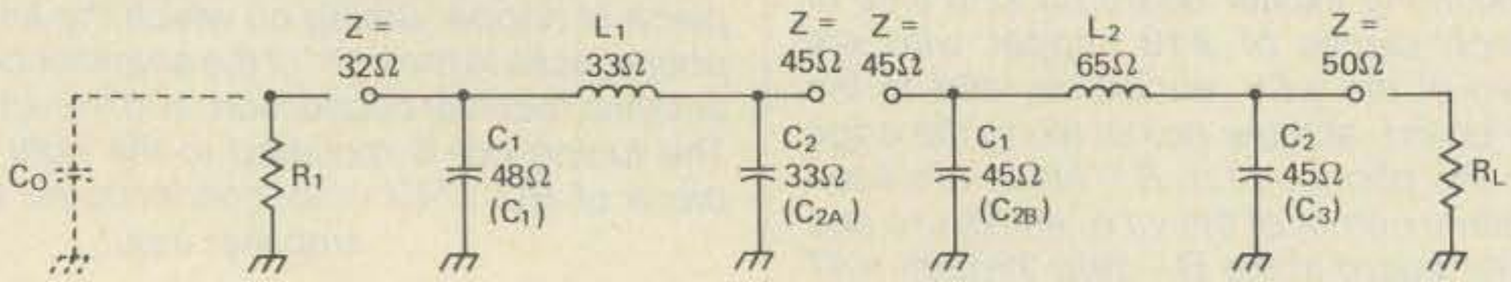
(3) and $X_L = QR_1 + \frac{(R_1 R_L / X_{C_1})}{(Q^2+1)}$

(Reactance of components by: $X_{CAPACITANCE} = \frac{1}{2\pi f\, C_{(\mu f)}}$

$X_{L(INDUCTANCE)} = 2\pi f\, L_{(\mu H)}$

where f = MHz, C = mf (500pf = .0005mf), and L = μH.)

(B) DOUBLE Pi NETWORK "HALF"WAVE" FILTER CONSISTS OF TWO Pi SECTIONS CASCADED WITH C_2 OF SECTION 1 COMBINED WITH C_1 OF SECTION 2.



For 7MHz network:

(a) Pi section 1 is calculated for R_1 = 32Ω, R_L = 45Ω: (assume $C_O \approx$ 1500pf (16Ω). Select Q = 1 and derive as per above formulas, yielding X_{C_1} = 48 Ω (470pf)

X_{L_1} = 33Ω (.75μH)

X_{C_2} = 33Ω (690pf))

(b) Pi section 2 solved for R_1 = 45Ω, R_L = 50Ω, select Q = 1, $X_{C_1} = \left(\frac{R_1}{Q}\right)$ = 45Ω (500pf)

X_{L_2} = 65Ω (1.47μH)

X_{C_2} = 45Ω (500pf)

(c) Add C_{2A} + C_{2B} (690p + 500p) = 1190pf.

(C) CALCULATED vs ACTUAL DOUBLE Pi NETWORK VALUES

	L_1	L_2	C_1	C_2	C_3
Calculated	0.75μH	1.47μH	470pf	1190pf	500pf
Actual	0.79μH	1.49μH	470pf	1000pf*	270pf*

NOTE:

* = Since the capacitance values are relatively uncritical, these standard values were selected in place of the calculated values. Also, actual values are ±10% figures due to standard component tolerances.

Fig 3—The pi-network derivation.

minimal impact upon performance. Even so, with careful pruning of inductors the double-pi network is workable in the 3-30 MHz spectrum.

The limitations of the matching system used in this amplifier should be noted. Due to the variable drive control used in the transmitter system, which varies output from about 3-23 watts on 7 MHz, the collector load impedance of the final amplifier will correspondingly vary from about 8 ohms to about 30 ohms. The impedance at the output port of T2 will then vary from about 32 ohms to above 50 ohms. The double-pi network is designed to operate, with fixed component values, at a 32 ohm input impedance. In varying the output power over the range specified, then, it should be expected that some difficulties might appear in the operation of the final, such as harmonics and parasitics. Experimentation showed that the selection of the base resistor and three base swamping resistors eliminated any undesireable effects when moving through the complete output range on both bands, and when operated into a non-reactive 52 ohm load. Furthermore, purity of waveform was preserved throughout the entire range. However, when terminated in a load consisting of a resistance and reactance, parasitics were encountered at various points in the power output range. The addition of RFC2 helped somewhat in removing these parasitics, except at about the 9 watt level.

Since the double-pi network components are non-variable, the network will tolerate only a limited departure of the load from 52 ohms resistive. When no reactance is present, purity of waveform will be maintained across about a 20-100 ohm load range, which corresponds roughly to a 2:1 s.w.r. ratio. However, the impedance mismatch will be noticeable in terms of a decrease in output as the impedance moves away from 52 ohms.

Since most antennas used by amateurs present a reactive load at the transmitter end of the feedline, an attempt was made to determine the acceptable limits of reactance in combination with a 52 ohm resistance as the load. Fig. 4 shows these limits for the unit described, and indicates the range of reactances over which amplifier waveform purity will be preserved. Power output will drop, however, unless some means of impedance matching is placed between the antenna load and amplifier. In the author's case, the old 14AVS vertical shows a highly reactive termination on 7 MHz, and the insertion of an antenna coupler permitted operation of the amplifier at full efficiency. (See *ARRL Antenna Book*, pp. 87-94, for discussion of matching techniques.) If the builder desires, two approaches to variable output impedance matching are feasible. First, and most practical, is to build an L-network system right into the transmitter enclosure. This approach was used in the 1.8 MHz amplifier described earlier

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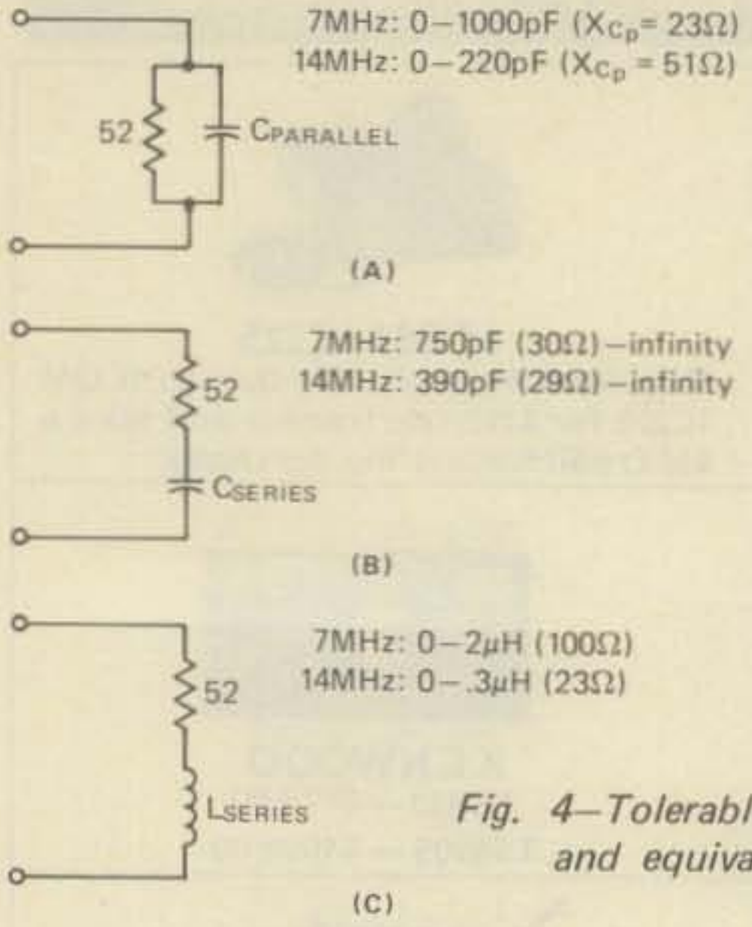


Fig. 4—Tolerable reactance levels and equivalent circuits.

("A Solid State 13 Watt R.F. Amplifier for 1.8 MHz," *CQ*, January, 1976, p. 25.) The inclusion of the L-network components will naturally increase the space necessary for the transmitter. Secondly, the L2-C3 branch of the double-pi network can be made variable by employing a tapped inductance and variable capacitor. The first approach has merit over this one. It will require no additional space, relative to the second approach, and will provide an extra matching section.

Construction

Figures 5 and 6 provide the full size p.c. board template and parts layout design. The isolated pad p.c. board approach is used, and has been described in an earlier part of this series. Briefly and at the risk of boring repetition, p.c. board stock is cut to the size shown, and covered with self-adhesive address label material. A copy of the p.c. board layout is then taped firmly to the label material, or penciled onto the label material directly. Next, a sharp-tip penknife or razor blade is used to cut away unwanted label material, exposing the copper foil that is to be removed during etching. Etching is completed, and the remaining copper foil is polished with steel wool. Assembly can proceed. Photos 1A and 1B can be matched against Figures 5 and 6 for parts placement.

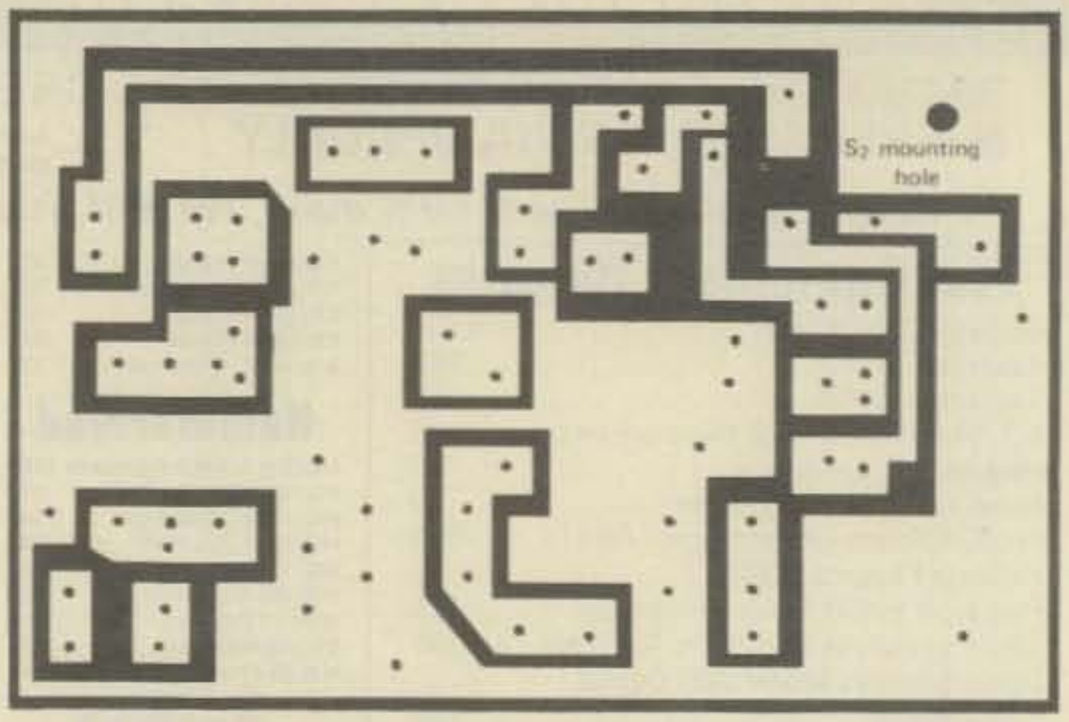


Fig. 5—Full-size p.c. board template for the 7-14 MHz final amplifier.

T1-T2 Fabrication

Figure 7 shows winding detail for T1 and T2. T1 consists simply of a 40 turn primary wound over the entire circumference of the T-50-2 core, and an 8 turn secondary wound over the primary. T2 is more complicated. The terminology evolved in the literature thus far is quite confusing to the beginner. Hejhall (*QST*, March, 1972) would describe T2 as "8 turns of 3 twisted pairs of No. 28 enamel (12 turns per inch) wound on Amidon FB-43-2401 toroid core." In this case, the word "pair" is confusing, since we have two possible "pairs": each cable of 3 twisted wires is a "pair," and we have two of these cables, which is also a "pair." The simplest way to look at it is to use different terms to apply to different entities. Hence, we start out with cable 1 consisting of 3 wires twisted together, 12 turns per inch, make cable 2 in similar fashion, twist the two cables together, and call the result a "twisted pair." This bit of etymological sophistry should clarify *transmission line* transformer jargon for the neophytes. In regard to practical fabrication of the twisted cables, and then the twisted pair, the approach is as follows: First cut three wires (# 28 enamel) to about 11 inches. Bare the same end of all three wires, and solder together. Next, anchor this end to a nail in the bench, or to a belt-loop on trousers, etc. Loop the loose ends around a screwdriver shaft or hand-drill shank. Twist the drill or screwdriver while keeping the three wires taut so that they twist evenly. Continue the twisting process until the desired tightness of twist (12 turns per inch) is reached.

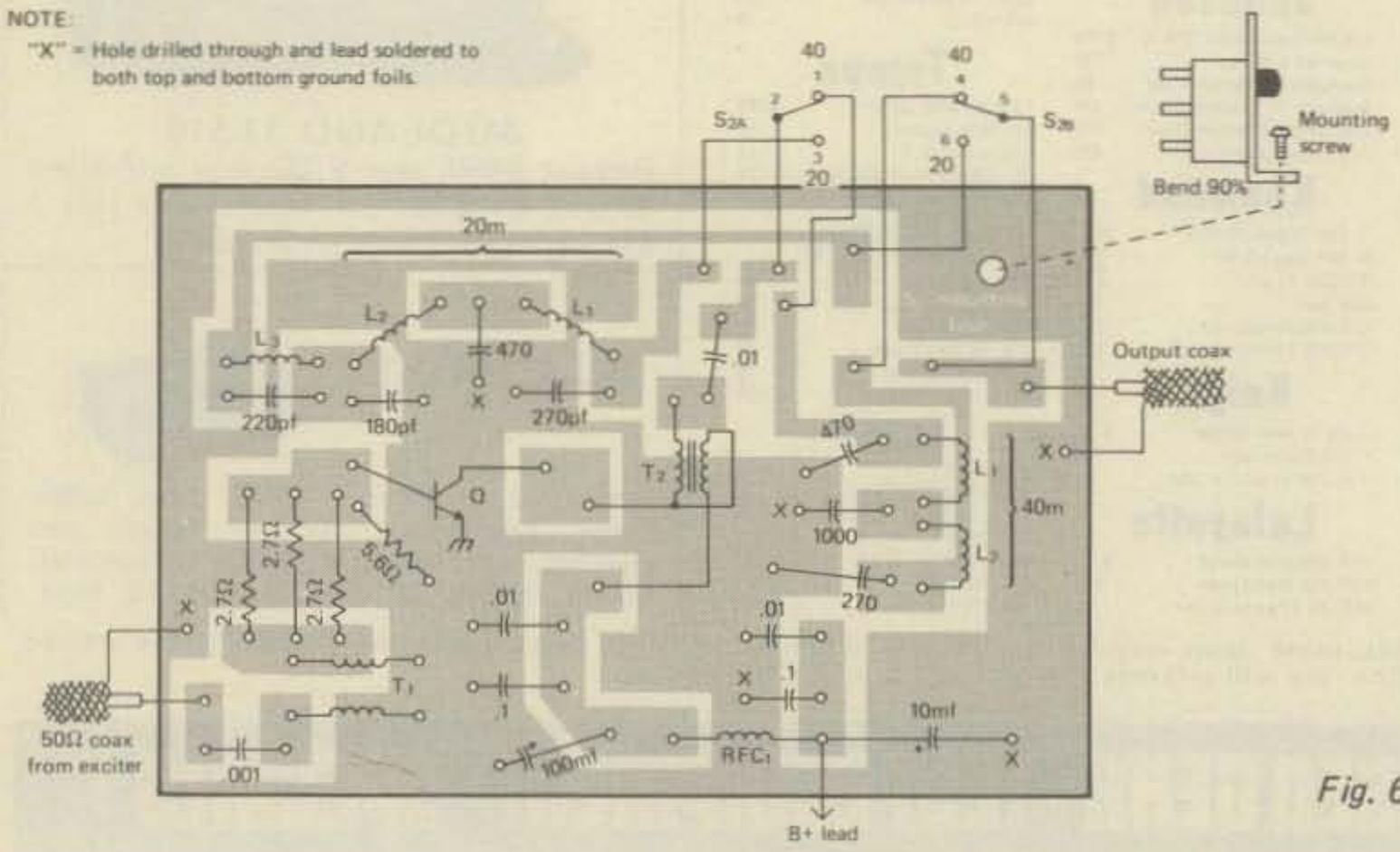


Fig. 6—Parts placement on the p.c. board.

Release the cable from the nail or trouser belt-loop, and screwdriver shaft or drill shank. Fabricate the next cable in identical fashion. Now the two cables can be twisted together using the same procedure. This step produces the finished "twisted pair," which is then wound for the specified number of turns on the toroid core. Once the desired number of turns has been wound on the toroid core, leaving about one inch leads, the unsoldered loose ends of both cables can be

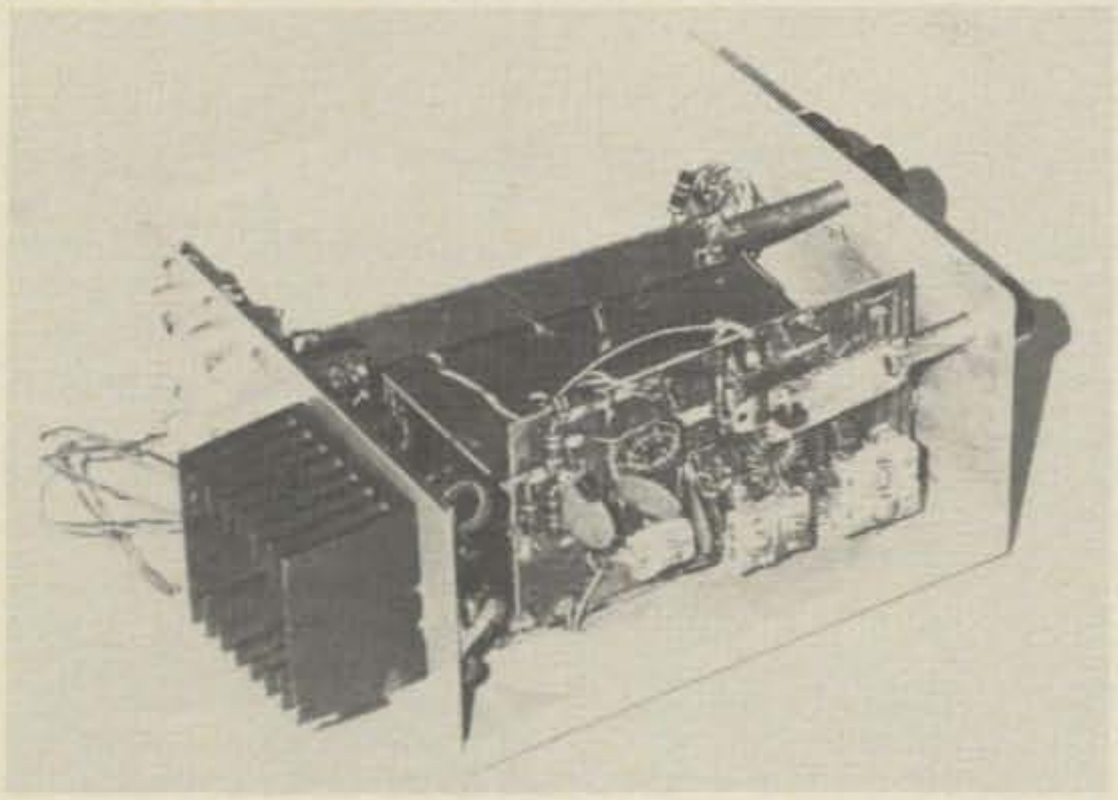


Photo 6: A side view giving much clearer detail of the switch extensions and the method used to join the extensions to the switch nipple of SW1. The slide switches used are subminiature types with a hole already drilled through the nipple. A short piece of #16 copper wire fits snugly through the hole, and is then soldered to the p.c. stock extension. The end of the p.c. stock extension is hacksawed to fit snugly on the nipple.

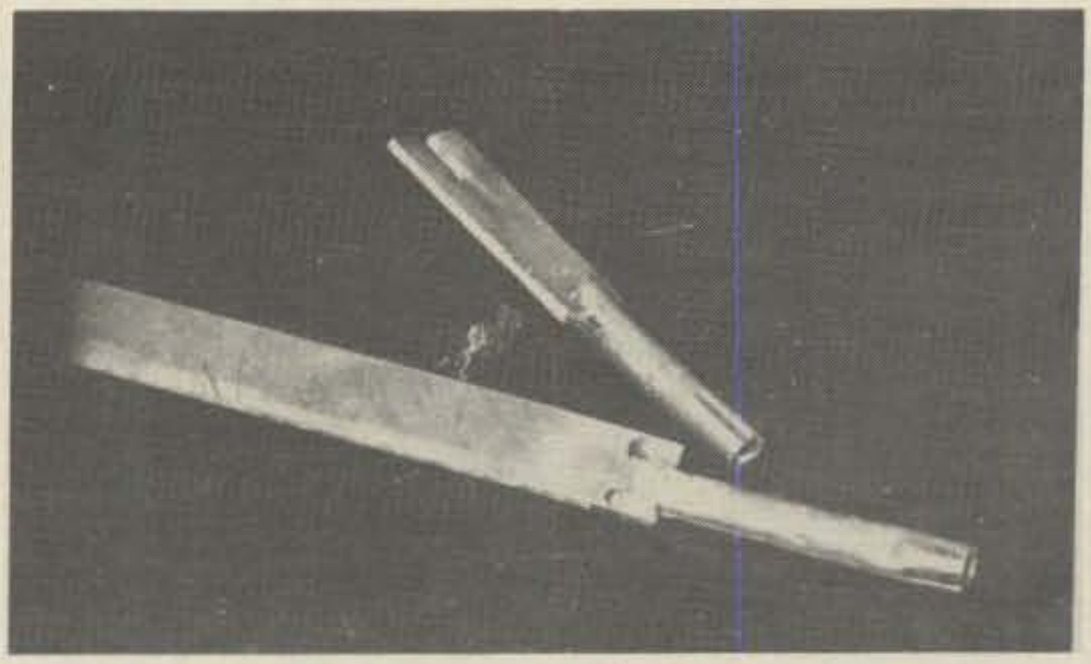
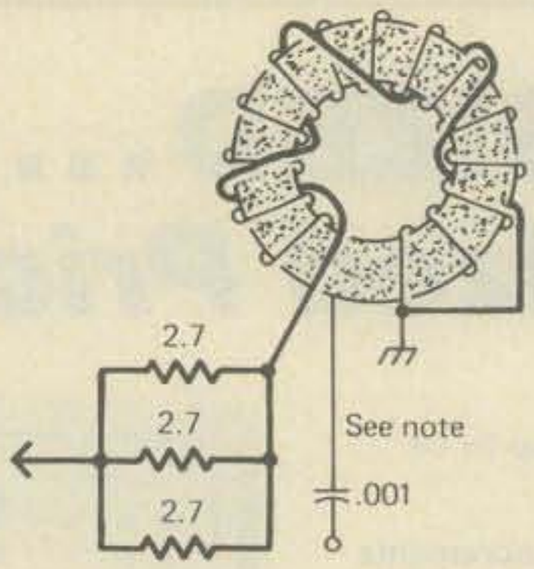


Photo 7: Detail of the p.c. stock and copper tubing switch extensions. P.c. stock is cut to a ½ inch width. The end which fits over the switch nipple is then hacksawed to leave a rectangular opening cut to fit the nipple snugly. ¼ inch copper tubing, which can be purchased at the plumber's, is then cut to reach the distance from the end of the extension to the front panel, and one end of the tubing is slit with a hacksaw. A screwdriver is inserted into the slit, and the halves of the tubing are spread enough to accept the p.c. stock. The p.c. extension and tubing are then soldered together. Allow time for heat from the solder gun tip to flow into both tubing and p.c. stock before applying solder. The knob-end of the tubing is then filed down just a bit to permit acceptance of the knob. The switches are activated by pushing in or pulling out. If construction details are followed for the exciter and amplifier, 20 meters is the in *position, 40 the* out *position.*

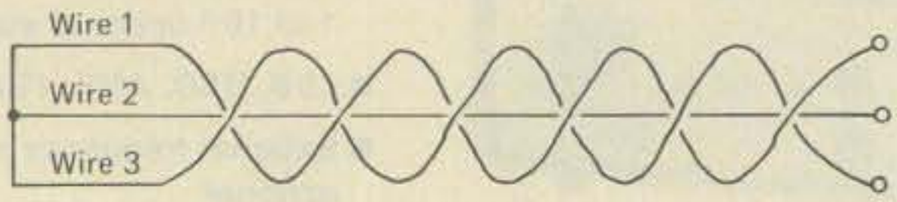


T_1: Primary = 40t, No. 26
Secondary = 8t, No. 24
T-50-2 core

NOTE:
Primary wound over full circumference of T-50-2 core; secondary wound over full circumference over primary.

T_2: FB-43-2401 core
8t of twisted pair from 3 wire pairs (NO.28)

(1) Form 3 wire pairs by twisting 3 equal length wires together until about 12 twists per inch is achieved.



(2) Take the two cables of 3 twisted wires formed in step 1, and proceed to twist the two cables to about 10 turns per inch.
(3) Winding the cable formed in step 2 for 8 turns around the FB-43-2401 core. Cut the 1′–2′ end of the cable to length, bare all ends of the individual wires, and solder each cable end separately.
(4) Solder cable 2 to cable 1′. This forms the transformer lead which connects to the 2N6082 collector. Cable 1 is then connected to the RFC_1 pad after two FB-43-101 beads are slipped over it. Cable 2′ is connected to the .01 pad. The schematic equivalent is shown in Figure 1.

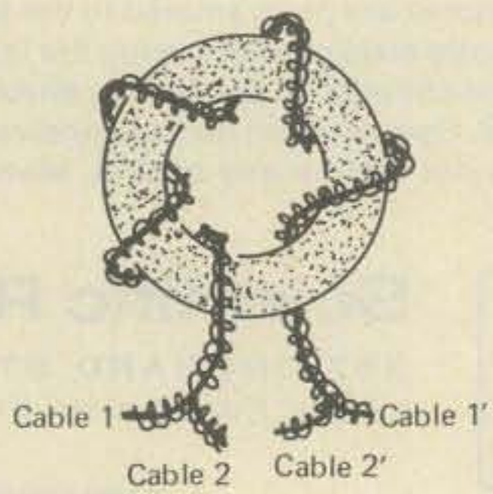
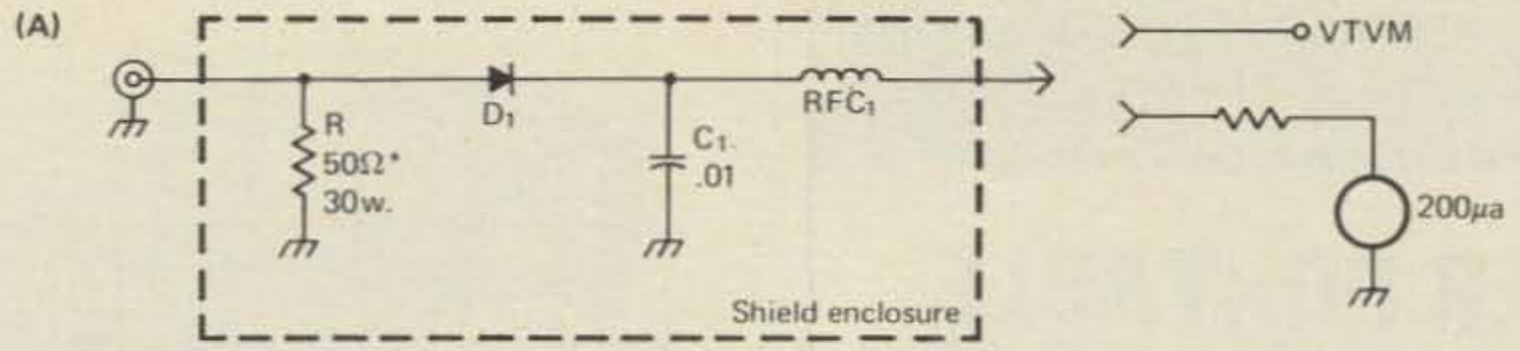


Fig. 7–T_1-T_2 winding detail.

clipped to length, bared, and the ends of cable 1′ soldered together, and then the same for the ends of cable 2′. Finally, identify the cable 1-1′ ends, and cable 2-2′ ends. Solder the cable 2 end to the cable 1′ end. The transformer can then be soldered onto the board. *Transmission line* transformers are one of those anomalies—when you see one, you instantly recognize how it is made, but when you try to describe it in words, nothing makes it clear!

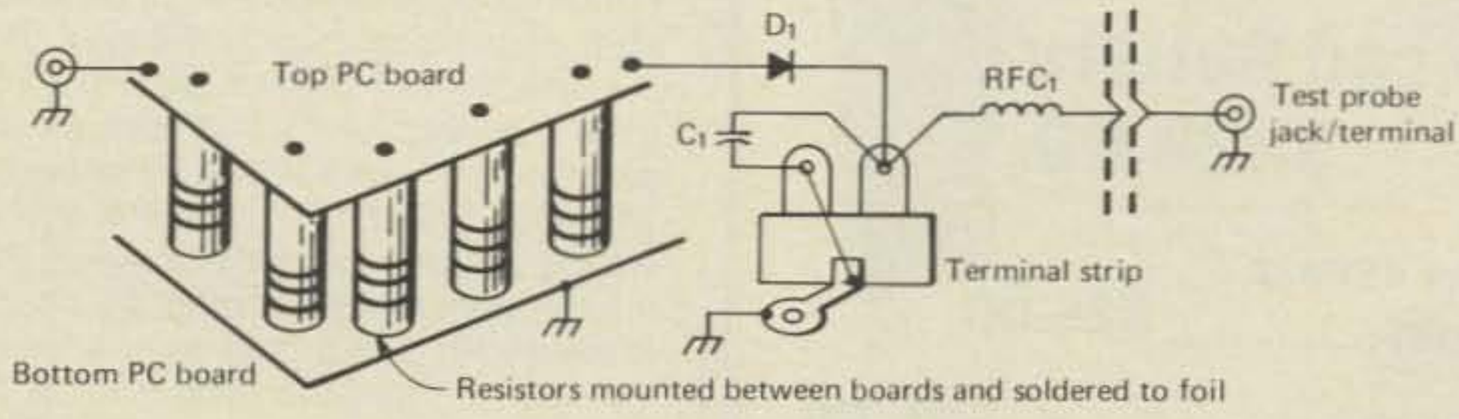
Testing & Alignment

Once all parts are mounted on the board, a phono jack can be temporarily soldered at the output pads, and a short piece of coax used to hook the output to a 50 ohm resistive load. Fig. 8 provides details on the construction of such a resistive load/power meter combination. A general coverage receiver, or at least a hamband receiver, and TV, will be helpful as test instruments. Before proceeding with testing, recheck the amplifier board for correct parts placement and connections to SR2a-b. The following steps will be helpful:
(1) Connect the output of the exciter to the input of the amplifier through a short piece of coax (52 ohm), such as miniature RG-174U. Connect the output of the amplifier to a 50 ohm dummy load. Do not connect the amplifier B+ until a later step. Connect the VTVM/DVM test probes to the output of the dummy load of fig. 8 (if used), or connect a VTVM/DVM with r.f. probes directly across another 50 ohm dummy load if the power meter of fig. 8 is not used. The meter will be used to provide indication of r.f. feedthrough and power output for purposes of adjustment.
(2) Put SW1 and SW2 in the 7 MHz position. Key the exciter and, with the VTVM/DVM in the 1 volt range, determine whether r.f. feedthrough the amplifier is occurring by readout of the VTVM/DVM. If r.f. feedthrough is indicated, adjust the output trimmers of the exciter for indication of greatest r.f. feedthrough. Put the exciter and final switches in the 14 MHz position, and repeat this process on 14 MHz. This step establishes that, first, r.f. power is reaching the base of the final transistor, and being passed on through T2 and the double-pi network to the external dummy load, and second, that the best transfer of power from exciter to base to final is occurring.
(3) Preliminary adjustment of L1-L2 on each band consists of applying drive power, monitoring r.f. feedthrough, and either compressing or spreading the turns of L1-L2 for best indication of r.f. feedthrough. Once this preliminary adjustment is completed on each band, r.f. feedthrough level should be about 100-200 milliwatts.
(4) Checkout of amplifier operation at full power can now be attempted. Tune the station receiver to the exciter signal to produce an audio note of about 2.5 kHz. This will allow detection of parasitic "hash" noise which indicates parasitic oscillations in the final amplifier. If a scope is available, it can be used to check waveform purity. Connect the final amplifier to the B+, switch the VTVM/DVM to the 50 volt range, and apply drive power. If everything is operating properly, power output should be about 15-20 watts on 7 MHz, and about 10-15 watts on 14 MHz. If no "hash" is detected on the receiver, this indicates that the amplifier is stable.
(5) If "hash" is detected, retune the output trimmers of the exciter as a first step in eliminating it. Next, if parasitics persist, L1 can be decreased by spreading the turns apart. The same can be tried for L2. The value of C3 can be shifted around until a value which clears up the parasitics is found. On 14 MHz, the 40 meter trap, L3-220 pF, can be shorted out as a first step in tracing down the cause of the parasitics. If shorting out the trap removes the hash, then the values of L1 and C3 must be varied with the trap back in the circuit. These are some possible approaches to dealing with possible parasitics. In the unit described, no parasitics were encountered upon assembly and alignment, so the likelihood of difficulties arising with duplicates is slim.



(1) 50Ω load consists of 21 2 watt, 1000Ω resistors in parallel. To fabricate, cut 2 pieces of double sided PC board to 2.5" square.
(2) Tape the 2 2.5" square boards together, line up the 21 resistors evenly spaced in rows to fill the board area, and drill lead holes.
(3) Mount and solder the 21 resistors to one PC board, mounted vertically.
(4) Feed leads thru holes in other PC board, and solder.

(B) FINISHED BOARD. NOW MOUNT FINISHED DUMMY LOAD IN CHASSIS BOX ENCLOSURE.



(5) Mount one end of C_1 to a ground lug connected to chassis enclosure. Connect one end of D_1 (1N986, 1N456) to ungrounded side of dummy load; connect other end to C_1.
(6) Connect RFC_1 to D_1-D_1 terminal, connect other end to test probe jack.
(7) Read power on VTVM/DVM, and probe connected to jack. Solve for power in watts with formula $P_O = \frac{V^2}{2R}$. For best accuracy, measure R_{ACTUAL}, and use in formula calculations.
(8) If a VTVM/DVM and RF probe are available, the C_1-D_1-RFC_1 circuit may be omitted and the voltage across R read with the RF probe. Solve for power by $P_{WATTS} = \frac{(V_{RMS})^2}{R}$.

Fig. 8–Power meter suitable for amplifier output measurement and testing.

(6) To check for v.h.f./u.h.f. oscillations, run a wire from the TV to the proximity of the amplifier output. Switch through the v.h.f. channels while keying the transmitter. In the unit tested, v.h.f. output could be detected on channels 2, 4, and 13.
(7) Final adjustment of the double-pi output networks is as per step (3).
(8) If the Drive Control option is incorporated, it consists simply of a 100 kilohm potentiometer inserted in the key leads. Final testing involves varying the drive control through its range and monitoring the signal for appearance of hash. Likewise, an SWR meter can be inserted between the transmitter output and dummy load in order to check for jumps in s.w.r. which indicate the presence of parasitics. As noted in the above text, points in the output power range will be encountered at which hash will appear. Most of these points can be eliminated by returning the exciter output trimmers at the power output level where the hash appears. This procedure should remove hash at that point.

This completes testing and alignment of the transmitter.

On the Air

Once testing and alignment have been completed with a dummy load, the transmitter is ready to be put on the air. The limitations of the double-pi output network in matching loads which vary significantly from 52 ohms resistive have been discussed above. If the antenna to be used shows an s.w.r. of 2:1 or more, it is likely that it will present an intolerable level of reactance to the output network. An antenna coupler will probably be necessary to insure proper and efficient operation of the final amplifier. If the s.w.r. is below that 2:1 figure, chances are that the antenna can be hooked directly to the transmitter.

Two tests must be performed before commencing normal on-the-air operations. First, monitor the signal in the station receiver and check for parasitics by tuning several hundred kHz either side of the transmitter signal. Second, connect the TV to the regular outside antenna, and scan the channels for any indication of TVI. The author's tests were performed with a simple TV yagi mounted 10 ft. from the 14AVS vertical. An unobjectional level of cross-hatch was noted on channels 2-4 on both 7 MHz and 14 MHz. The insertion of a low pass filter eliminated all but a faint trace of TVI. Insertion of an antenna coupler to bring the s.w.r. down to 1:1 on 7 MHz entirely eliminated all TVI. The low pass filter is left in the line as an extra precaution, and would be a wise step when using this or any other solid state transmitter. Performance of the completed transmitter has been excellent. One surprise, however, is that, in most of the cases where a power change was tried during a QSO, no significant difference in signal level at the receiving end was noted when moving from 5 to 20 watts output! However, QSO's were possible with the QRO level that were not possible at the QRPp level.

It will be noted that some space is unused in the area behind the dial plate. The final step in completing the unit shown will be the addition of a direct conversion receiver featuring an r.f. amplifier, 40673 mixer, LM3900 (two stages audio preamp, two stages active filter), and audio output stage.

Construction details on the receiver will be provided in the next installment of this series. The receiver board will be a medium to high density board, since it is being fit to the size of the box, rather than vice-verse. ■

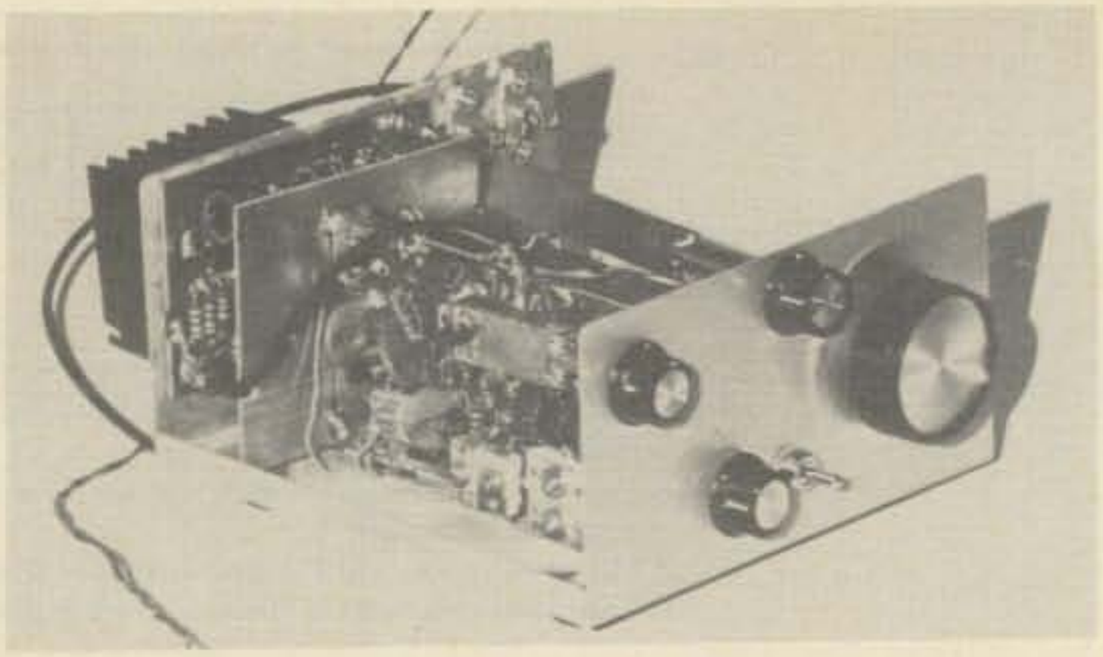


Photo 8: Once all boards and parts are mounted, the final step consists of cutting a shield partition from double-clad p.c. stock to fit behind the v.f.o.-exciter assembly, and to extend almost flush with the sides and top of the cabinet. An electrical contact with the sides and the top is not necessary. The shield is spot-soldered to the exciter board and v.f.o. enclosure, and the coax between the exciter and the final is run through a small rectangular space cut into the outer edge of the shield. The shield completes isolation of final amplifier from the remainder of the circuitry.

Assembly of VFO-Exciter-Transmitter

The accompanying photos show details of the final installation of the unit described in a cabinet measuring 5.5" deep, 5.5" wide, and 2.75" high (Radio Shack: Archer Cat. No. 270-253). This cabinet is available at Radio Shack and through some mail-order houses. The photo captions explain the methods used to produce a functional unit. As can be seen, no vernier dial assembly was included, but a standard 2.5" vernier will fit neatly in the area now occupied by the dial plate. The vernier was excluded because the smoothness and accuracy of tuning required by a receiver was not felt necessary in the case of the transmitter.

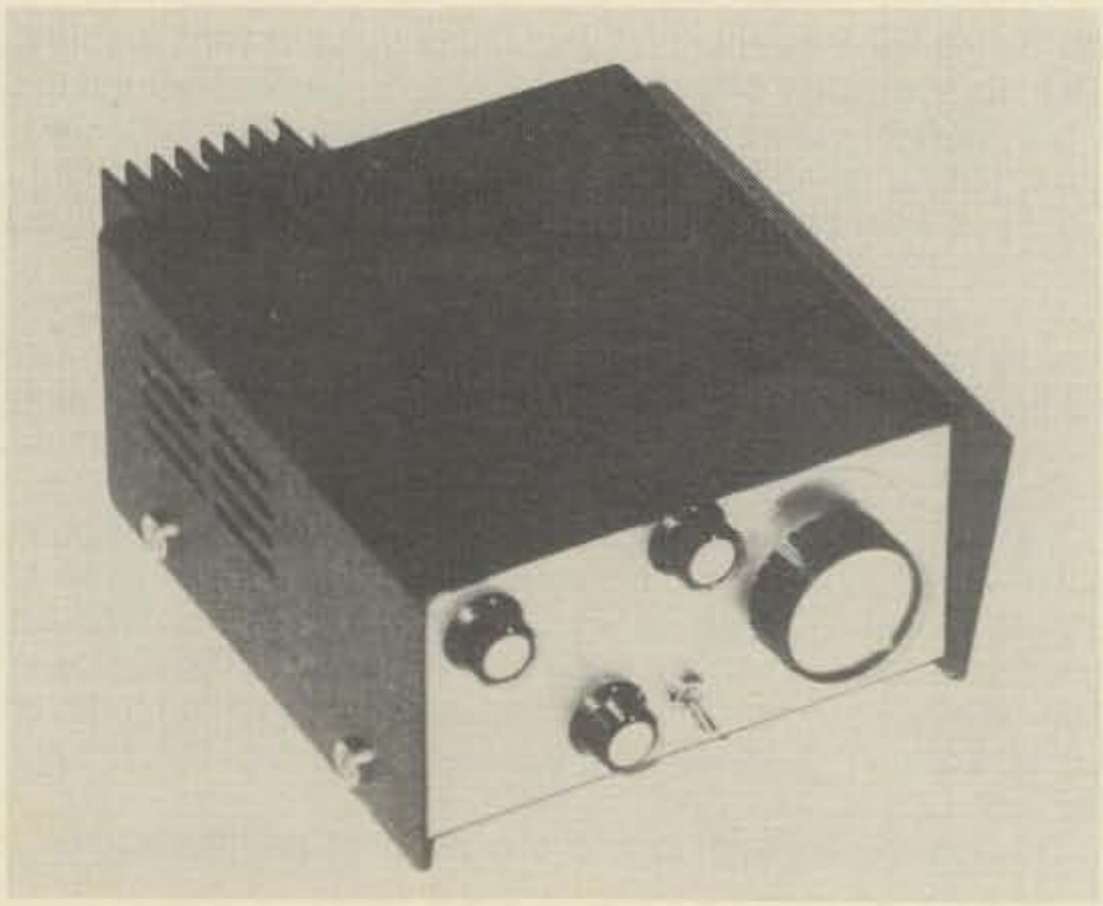


Photo 9: The completed assembly. The two upper knobs are the push-pull SW1-SW2 bandswitches. The dial and tuning control are at the right end of the panel. The lower knob is the drive control. The switch to the right of the drive control is the T/R switch. It is a d.p.d.t. subminiature toggle type. One set of poles is used to switch the 47k resistor (R4) in and out of the v.f.o. tuning pot line; the other set of poles is used to connect the antenna to the receiver during receive periods. When the switch is in the receive position, the 47k resistor should be in the v.f.o. circuit, and the antenna is connected to the receiver output jack. When in the transmit position, both connections are out of the circuit.

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Fashions in Microphones

BY KATASHI NOSE*, KH6IJ

As the telephone supplanted telegraphy, so radiotelephony was the goal of early radiotelegraphy. When radio was still in its infancy, the carbon microphone was already a highly perfected device. As early as 1901, R. A. Fessenden patented a method of "improvements in apparatus for wireless transmission of electromagnetic waves, said improvements relating more specifically to the transmission and reproduction of words or other audible signals."[1]

A schematic drawing of his system, taken from *Wireless Telegraphy* is shown in fig. 1. A carbon microphone "T" was inserted in series with the antenna and "D" was a high frequency alternator operating at 75 kHz. As early as 1904 the National Electric Signal Company guaranteed to establish "wireless telephone" communication over a distance of 25 miles.

Earlier attempts to modulate dampened waves proved highly unsatisfactory as might be expected, and therefore attention focused on modulation of undampened waves such as from arcs and alternators. Names such as Poulsen of Denmark, Colin and Jeance of France, and A. F. Collins in the U.S. are prominently mentioned in the literature of 1911.

Many ways of applying "acoustic control" (modulation) were proposed, including: (1) Arranging carbon microphones in shunt or in series with the antenna; (2) Using the microphone in a separate secondary circuit, inductively coupled to the antenna or tank circuit (loop modulation); (3) Using the microphone to control the excitation of a high frequency alternator; (4) Using the microphone to control the current or gas or magnetic supply of an arc transmitter. Some of these schemes are shown in figs. 2 through 4.

All of these ideas had one disadvantage. They could not be used with high power since amplifying devices had not yet been developed. This meant that most circuits used a system of "loss modulation" whereby the microphone was required to dissipate r.f. energy as heat to provide amplitude modulation and incidental frequency modulation. Magnetic relays were developed, but they suffered from the shortcomings common to incrementally operated devices.

Those who used "loop modulation" remember that

*4207 Huanui Street, Honolulu HI 96816

[1]"Principles of Wireless Telegraphy" by George W. Pierce, McGraw-Hill Book Co., New York, NY, 1910, p. 306.

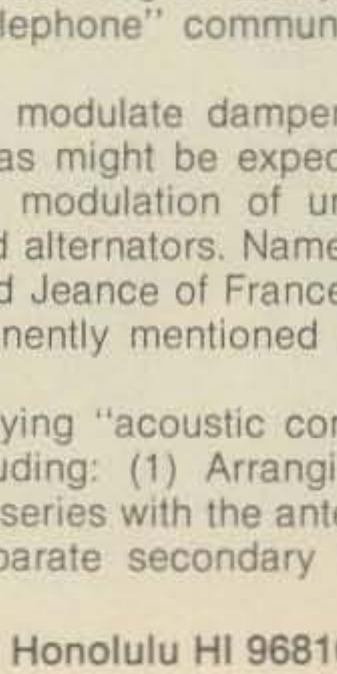

Fig. 1—Professor Fessenden's apparatus for wireless telephony. The carbon microphone "T" carried antenna current.

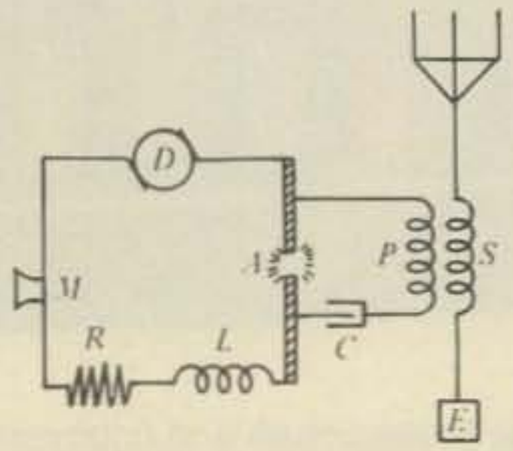

Fig. 2—Microphone was placed in series with the power supply—a dynamo.

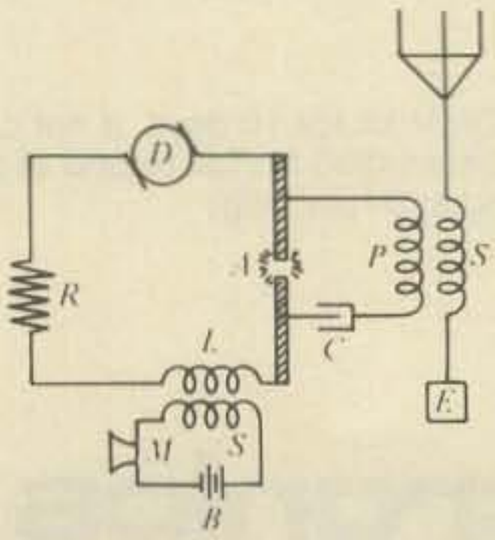

Fig. 3—By using a transformer, the dynamo current did not pass through the microphone.

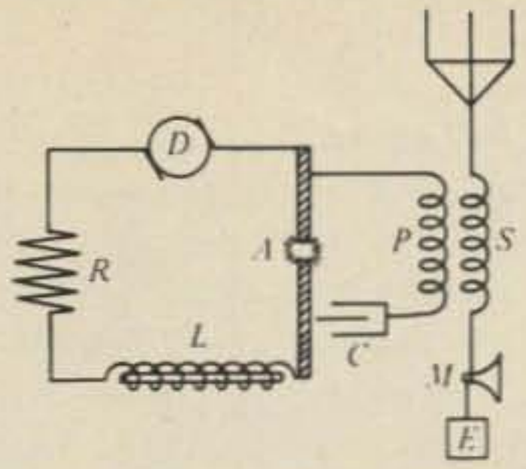

Fig. 4—A variation of fig. 1 which placed the microphone nearer ground.

carbon granules "packed up" due to the heat generated by the circulating current and caused chapped lips and r.f. bites if one got too familiar with the microphone.

Herein lies a tale of high powered microphones capable of dissipating several hundred watts of heat. Some proposed to shake the microphone during operation by means of an automatic tapper to prevent local heating of the carbon granules. Various air, oil, and water-cooled microphones were devised, some capable of passing 12 amperes.

Hydraulic microphones seemed to have given good results.

Figure 5 shows a system developed by S. Majorana. A liquid flows from the tube "R" which had an elastic diaphragm "A" actuated by diaphragm "M" attached to the mouthpiece. Without voice the liquid poured in a smooth laminar flow, but the application of voice caused the liquid to break up into rivulets which then splashed over concentric rings of insulating and conducting material at plate "P". Variation in conductivity across the concentric rings was used to modulate a Poulsen arc. Successful communication was established over 500 kilometers.

Another hydraulic microphone, fig. 6, was devised by F.J. Chambers. The vibration of diaphragm "M" varied the resistance between it and a jet "E" which was then used as a means of absorption modulation as described previously. This microphone was capable of dissipating 500 watts and was said to "give very clear reproductions."[2]

In 1912, J. Vanni succeeded in "telephoning" from Rome to Tripoli (1000 km) using an arc transmitter with a liquid microphone shown in fig. 7.[3]

The mouthpiece "Z" led to an insulated membrane

[2]"Wireless Telegraphy" by J. Zenneck. Translated by A.E. Seelig, McGraw-Hill Book Co., New York, NY, 1915, p. 306.

[3]"Handbook of Wireless Telegraphy and Telephony" by W.H. Eccles, Benn Bros., Ltd., 1918, p. 460.

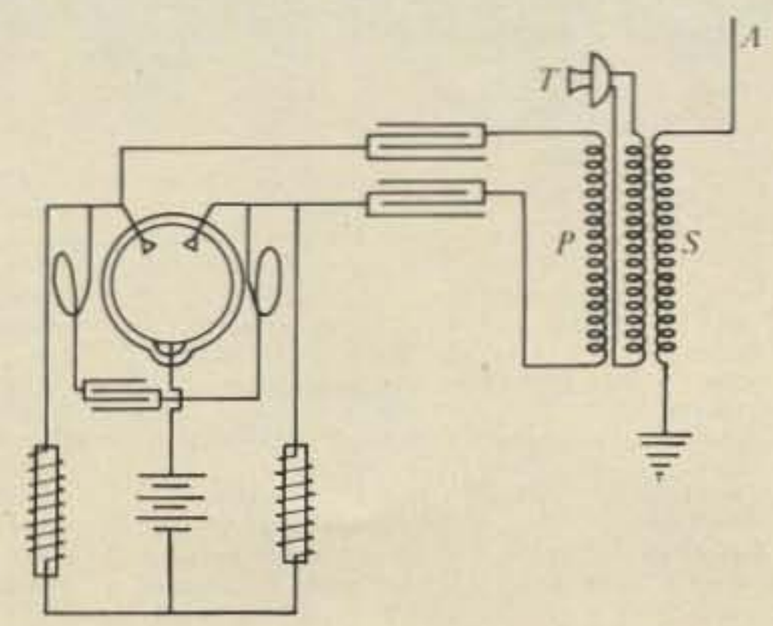

Fig. 5—A variation in microphones capable of handling high current.

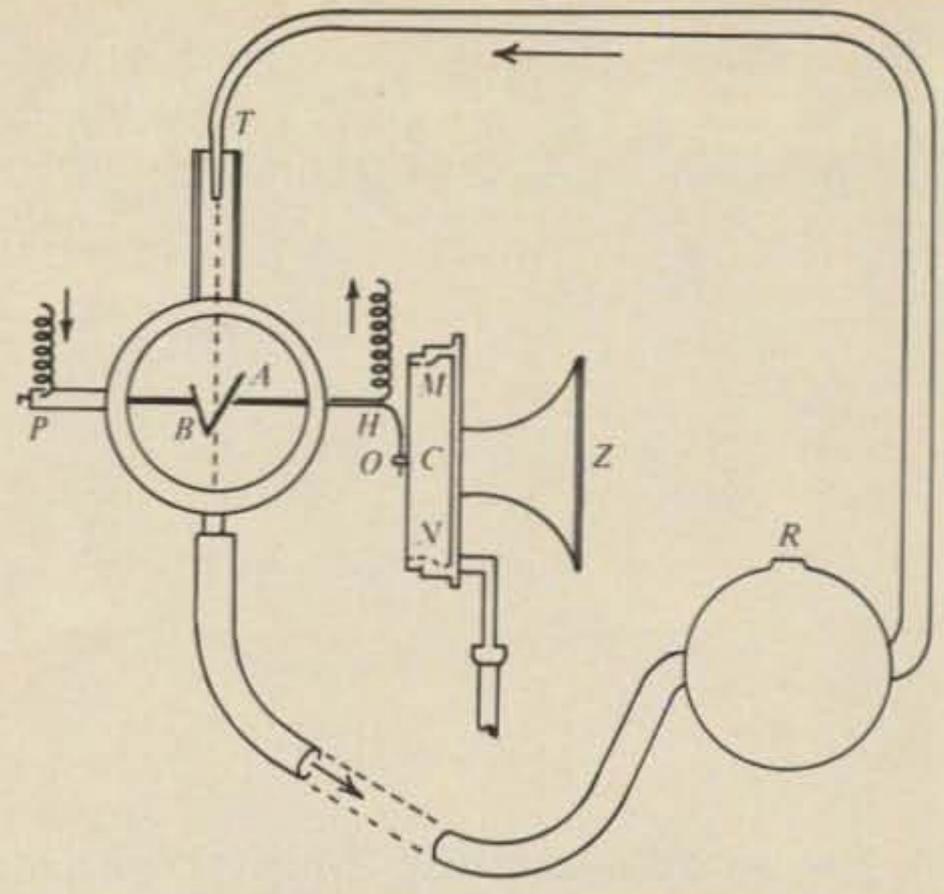

Fig. 6—Another variation of water cooled high power liquid microphone.

"MCN" coupled by a lever system to a vane "A". A jet of acidulated water from an ebony jet directed water between "A" and fixed vane "B." Here again, the resistance varied between these two vanes in accordance with the voice. Antenna current in the order of 12 amperes was attained with this "modulator."

A refinement in this system was that an ordinary carbon microphone could be used to actuate a lever arm operated electro-magnetically, and this arm could be attached to the aforementioned system, as shown in fig. 8.

Other power dissipating schemes called for switching microphones systematically and periodically. Colin and Jeance, in 1914, attained dissipation capability on the order of 4 to 5 amperes of antenna current using the circuit shown in fig. 9. Nine carbon microphones were connected in series and acted upon simultaneously by a megaphone. Two such banks of microphones were alternately switched into the circuit, one cooling while the other was in use.

However, the ultimate along this line was a German microphone which used a bank of 25 carbon microphones

(Continued on page 85)

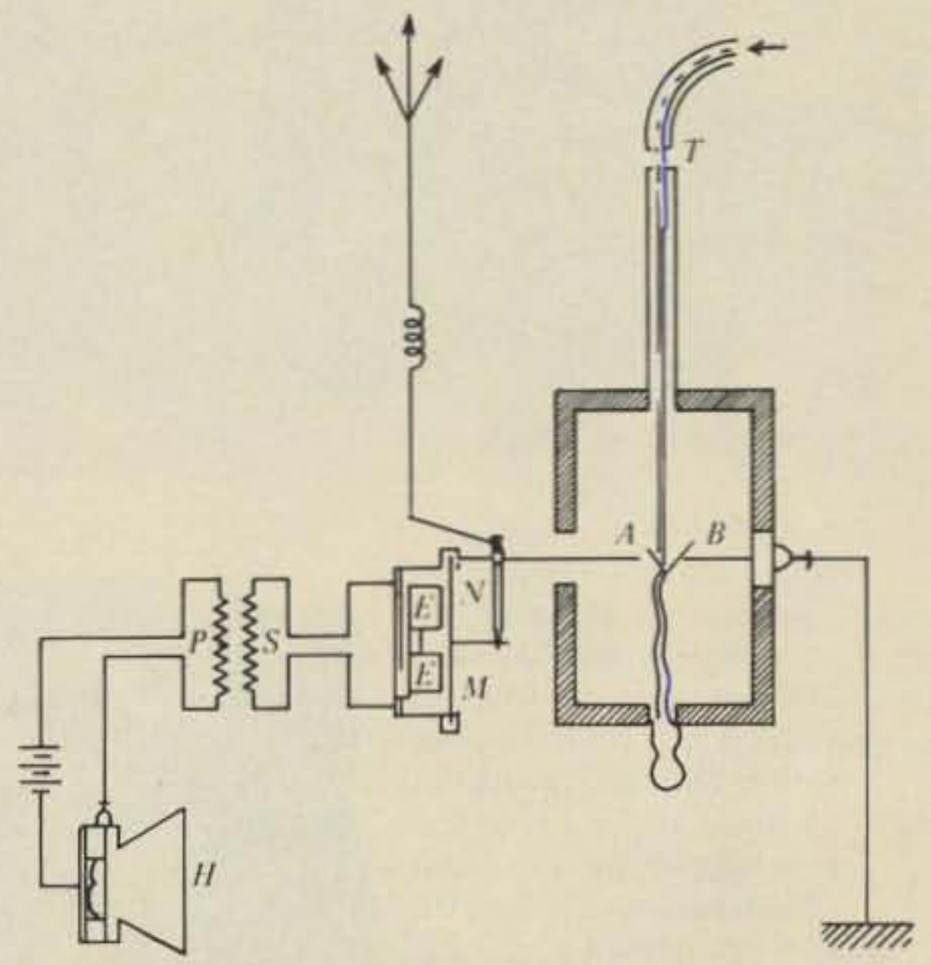

Fig. 7—An ordinary carbon microphone is used to vary resistance of acidulated water.

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TR-7400A

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Squelch Sensitivity: Better than 0.25 uV
Selectivity: 12 KHz at −6 dB down
40 KHz at −70 dB down
Image Rejection: Better than −70 dB
Spurious Interference: Better than −60 dB
Intermodulation: Better than 66 dB
Receive System: Double conversion
First IF: 10.7 MHz
Second IF: 455 KHz
Audio Output: More than 1.5 Watts (8 ohm load)
RF Output Power: 25 Watts (High) 5-15 Watts (Low-adjustable)
Antenna Impedance: 50 ohms
Frequency Deviation: ±5 KHz
Spurious Response: Better than −60 dB
Microphone: Dynamic, with PTT switch, 500 ohms
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Current Drain: Less than 8A in transmit

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Pat Wyman relates his touching experiences on mainland China during the first quarter of the century.

AC2RN—A Tale of China

BY PAUL C. CRUM*, W9LC

The following letter accompanied Mr. Crum's manuscript:
Editors, CQ.

This article is written for Pat Wyman, W9CKU, one of the toughest Irishmen I've ever known, and one of the best friends I've ever had. He was an army radio operator in China from 1928 to 1931. We have worked together many years at WGN, here in Chicago.

The other two hams mentioned, W9WR and W9HPG, are also old friends and belong to my radio club, CRTA. Both were licensed before the dates mentioned.

It is suggested that, considering anyone such as Pat, in the circumstances outlined here, some of the best stories are not purely radio in nature and do not lend themselves readily to CQ publication, or possibly even to general readership.

In addition to what Pat has supplied, much of the information given here was contributed by many others in China at that time. It is as accurate as it is possible to make it.

(signed) Paul C. Crum

In an amateur society dominated by transistors, chips and micro-processors, I'm not at all sure that my story belongs. That I belong. Or that when most stories concern mobile operation on v.h.f. through repeaters, my story belongs, when it concerns operating mobile "*honey dew wagon,*" or forty meter c.w., with a self-excited 211, self-rectified.

I'm not sure that modern readers of *CQ* will be interested in the exploits of the Fifteenth Regiment, saki-mellowed nights around the tar paper shack, or of romancing lithe, warm, yellow maidens (Gad! Where are they now?) or WAC with fifty watts to the self-excited oscillator. After the almost fifty years that have passed since I was a part of AC2RN, I'm not sure of anything. Except for the great warm glow that it gives me in my thinking of it, and of those men with whom I worked. And played.

From 1914 until 1938, a part of the Fifteenth Infantry Regiment to which I belong was stationed in Tientsin and Chinwangtao in the northern part of China. It seems that wherever one goes, he finds someone who does not like Americans and some of the commercial institutions he associates with them. Several of these fine institutions, such as Standard Oil and Texaco, were some what put upon in that part of China, and our government thought it propitious to protect them. Admitting, in all candor, that I am basically a peaceful fellow, and not caring to indulge in any types of combat, more dangerous than occasional fisticuffs, I rather naturally gravitated to the communications branch of our outfit.

Membership in our outfit — possible combat notwithstanding — was the most sought-after assignment in the army. The troops were professional soldiers and, of course, all volunteers. To qualify, one usually had to have had a previous military enlistment, be *at least* a sharpshooter with the rifle, possess a spotless military record, and obtain permission from the Adjutant General of the Army. Simple discretion will prevent me from discussing how I did, or did not, qualify in some of the requirements, although I will point out that my record with the Springfield, was acceptable with the ranks.

It would be difficult for me to explain why any telegrapher with a lucrative job with a New York brokerage house, should aspire to leave it and take off for a land he had only read of in his school books, and seen pictures of on recruiting posters. For whatever the motivation, I signed with the recruiting officer in New York city for a tour of Chinese duty. As I have mentioned, an assignment there was difficult to arrange. Doubting friends considered it extremely improbable that I would actually get this duty, and thought that I might end up with domestic duty in the friendly, sunny climes of Texas during July and August.

As we arrived in China, a severe storm caused our rerouting from an expected landing at the port of Chinwangtao and required that we be taken by train to our first destination near Tientsin. Payday having occurred a short time before our arrival, sufficient funds remained for an energetic bout of thirst quenching as we waited for our train. The plans of Brigadier General Castner to march our fine unit up Victoria Road to the American compound were somewhat prejudiced by our previous activities. It is axiomatic that alcohol and fine military posture are not generally compatible. Because of this

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W9CKU and friend Owen Shepherd with the first AC2RN transmitter, after having gotten a tube socket and copper inductances.

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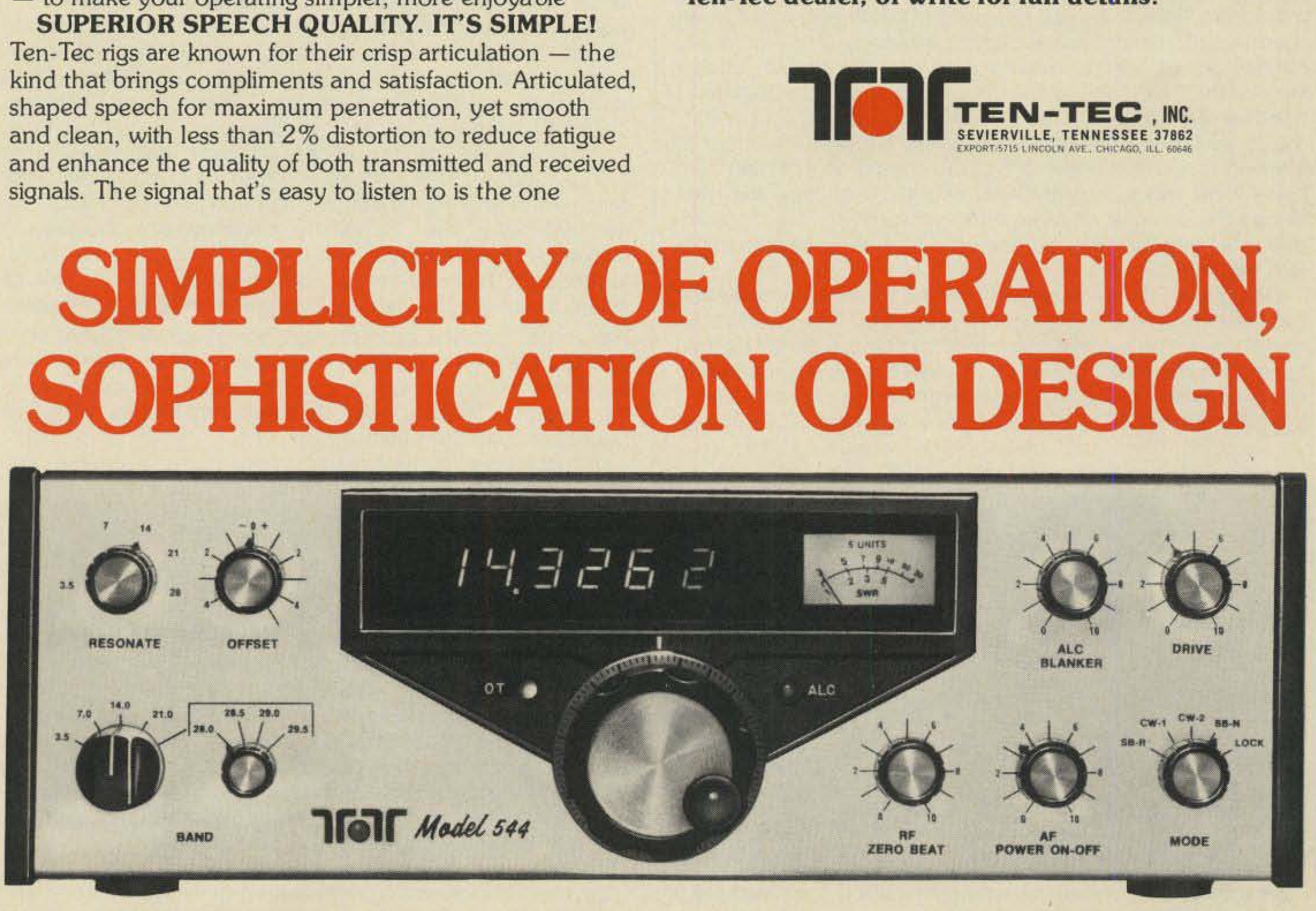

W9CKU and friend with AC2RN transmitter in a new glass case.

phenomenon, the march up Victoria was cancelled in favor of a safer — if less dignified — arrival by truck.

In telling the story of AC2RN, it is difficult to decide what proportion of technical and communications information should be included and how much of human interest. For AC2RN was not just *radio*. It was the story of men. Of women. Of little half-way kids, whose lives were to be interwoven with — and be upset by — those things that were the things of the "can do" Fifteenth. In telling the AC2RN story, I may incline to pass rather casually over some of the technical aspects of the experience and relate more of the human experiences that were such an important part of the whole. For instance, I feel that many of those persons who read *CQ* are a vigorous sort. Lovers of life. Those who enjoy the *good* things of this life.

My earlier service in the China theatre, was for a short time at the large base in Tientsin, before being assigned to Camp Burrowes the future home of AC2RN, in Chinwangtao. Eighty miles from Tientsin by rail, the port at Chinwangtao had been dredged to make it an excellent seaport. Ships of many nations used it, and our own Pacific Fleet, in particular, used it very often. Men from the fleet were frequently sent ashore to use the rifle range at Camp Burrowes. Duty at Camp Burrowes was much desired by troops in our area. Summer at Tientsin was so hot that much of the compliment of men from there were moved up to Chinwangtao to escape the heat during the summer months. Although large during the summer, only eighteen men remained during the winter to maintain the camp.

One of the favorite sayings of my old rural mother was that "an honest confession was good for the soul." This being true, and considering several aspects of my spiritual past, I believe I should immediately get down to a few basics in our amateur radio activities at AC2RN, and even of the station, itself. I imagine that most of those persons to whom AC2RN was exotic DX in those days, would have been surprised to learn that there was probably not one completely *legal* thing in connection with either the station, or those happy hams who operated it. To begin with, I can't remember that anyone of us who operated the station, held a current amateur operator's license. To continue in this vein, AC2RN was probably the most illegal station on the air during this period. It held no station license from the United States, China or any place else.

It should be explained that even the proud call that was spoken of so reverently stateside, was the product of typical Fifteenth inventiveness. Since every station had to have *some* call, two of the group, Robert Croyle and Henry Nenstiehl, set about to give one to our station. Beginning with a semi-legitimate (at that time) AC2, they took the first letter of Bob's name and the first letter of Henry's last name and AC2RN was born.

With a "legally constituted" illegal operation under way, we set about putting an actual station on the air. Solid daytime operation with military traffic left but little time for daylight hamming. It should be appreciated by those persons reading this account that evenings at Camp Burrowes could not usually be considered social occasions. This by simple deduction, left two general areas of recreation. The first was made relatively easy with Johnnie Walker at $1.50 a *quart*. The second one, and the one that I will generally discuss here, was ham radio.

With limited funds, as well as the scarcity of radio stores in Chinqangtao, obtaining parts for our first station posed a problem. With those parts that were available, it was decided that a single 211 would constitute the tube "lineup." Younger members of our fraternity may marvel that there was only *one* tube, when not even solid-state helpmeets were available to assist it.

Almost the only purely electronic part available to us was the 211. In a further attempt to purge myself morally, I will admit that I believe that this tube came from official army stores. Even advanced burglary could not, however, provide us with those parts we needed. Neither the well-known manufacturers in Waseca, Minnesota, or Malden, Massachusetts, or Uncle Dave and his Cortland Street Commandos, had products for sale in Chinwangtao at that time. Innovation was necessary to produce even the socket for the 211. Although I now understand that smoking is definitely detrimental to one's health, the fact that one man in our unit had that "filthy" habit at the time, made possible the needed socket. A Blue Boar (you will pardon the commercial here) tobacco tin, became the foundation for the socket. This tin was cut down to the desired configuration to hold the base. For contacts to the tube prongs, spent, small caliber shell casings were pressed on to them. Pieces of number 12 wire were soldered to these and run out through holes in the side of the can. To "solidify" our construction, battery wax was poured around the entire assembly.

Inductance of some kind was necessary, of course, and scrounging for material from which to make the tank inductances was begun. Believing that amateur radio should take precedence over more emotional and artistic matters, a "God Bless Our Happy Home", plaque and a 1924 calendar from a Richmond, Virginia coal company, were removed from the wall and the wire with which they had been hung was used to wind the inductances. Although the consensus was that the "Happy Home" plaque was not relevant to the base, much thought was given to removing the calendar, for its front boasted a voluptuous siren whose bare back was exposed down to between her *shoulder blades*. It can be argued by purists that construction of inductances with iron wire, may introduce losses at radio frequencies, and have other undesirable effects, but these technical exactities could not be argued under the conditions we encountered.

During my three years, our transmitter was gradually updated and underwent numerous changes. From the primitive

"We moved freight with this when the truck wasn't working."

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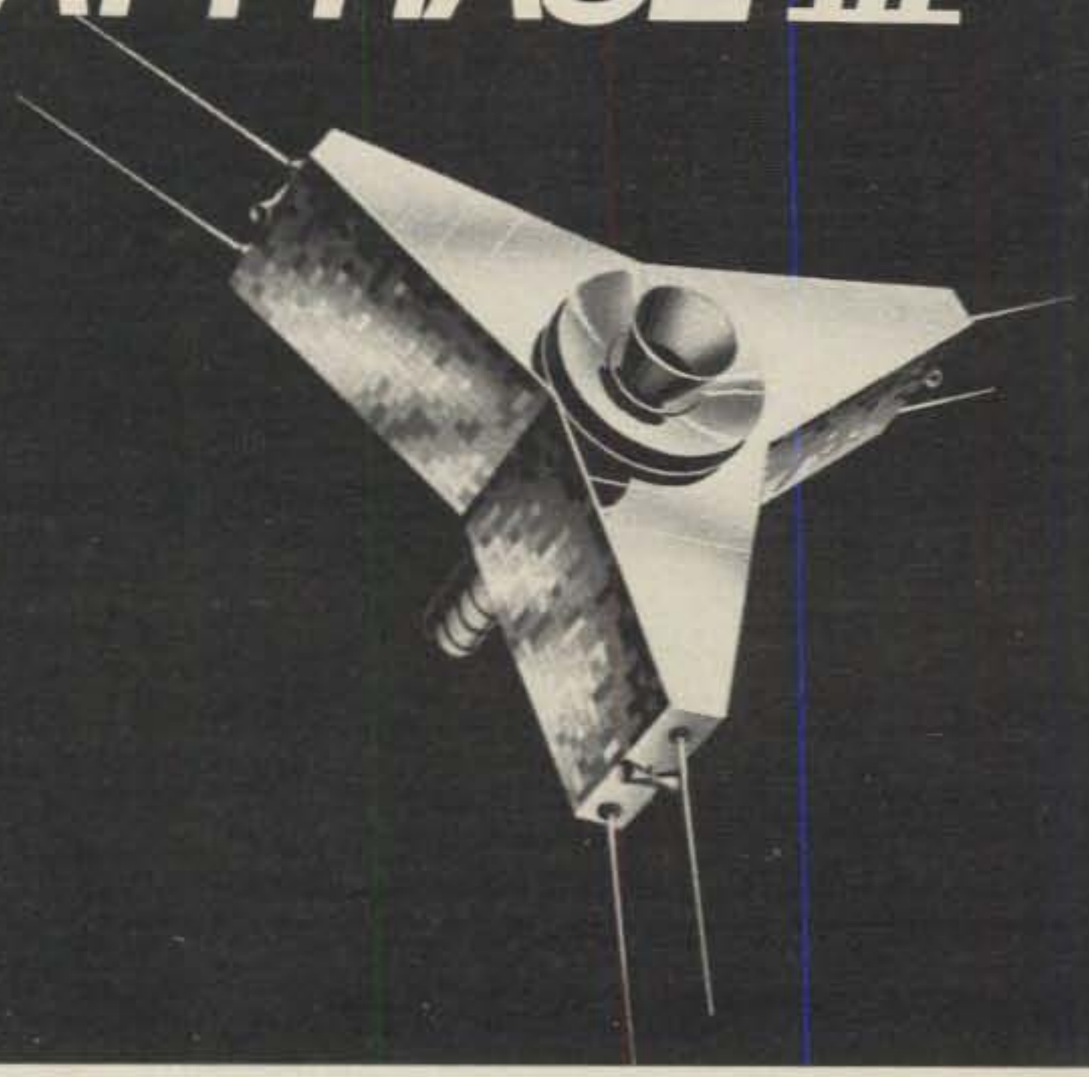

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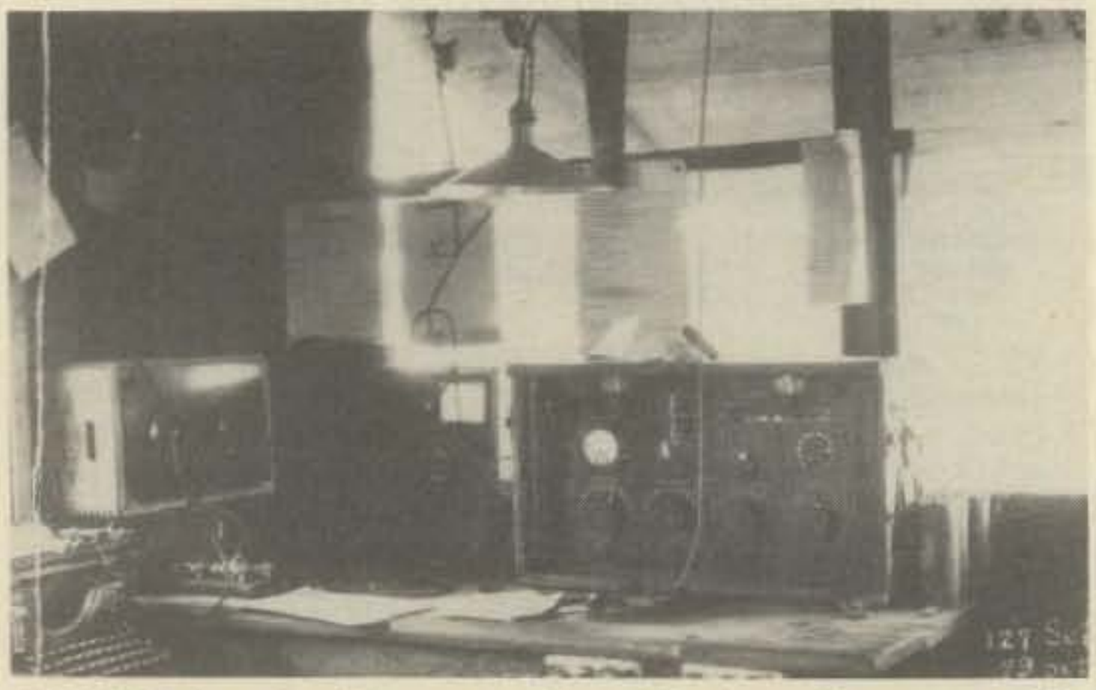
A sample of "social life" near Camp Burrowes.

picture wire, we graduated to inductances wound from copper tubing, "donated" by a local locomotive works. A socket for the 211, was obtained from the states. The picture of Private Owen Shepherd and myself with the unit, was taken at this stage of its development. Later, our Chinese carpenter built a wooden case for it with a glass door in the front.

Providing high voltage for our transmitter, presented one of our greater challenges. Power available at the base, was as varied, as one could imagine. No regular a.c. was available to us, until sometime after I arrived there. Some of the lower-powered equipment was operated from batteries—charged by gasoline driven generators. Hand cranked, high voltage generators were occasionally used. For quite a period, these nominally hand cranked units provided HV to our military transmitters in one of the weirdest arrangements known to radio. Electric motors were used to drive them, and the motors were run from storage batteries, charged by our gasoline driven generators. Although we were able to get an a.c. line into the compound two years after I arrived there, for the first two years the only a.c. available to us was that provided by our usually-overworked gas driven alternator. AC2RN was supplied by this alternator, since we were on the air during only the evening, when the normal base load was appreciably reduced. Since rectifier tubes were not available at the time, rectification presented a great problem. No mercury arc, or chemical rectifiers were available closer than the States, so the problem of rectification was resolved by the tube, itself, in what was commonly called "self-rectification." Keying was simple with this arrangement, with the "negative" lead of the power transformer high voltage winding being keyed. AC2RN was on the air. We were ready to communicate.

Making the first contact from AC2RN proved to be a test of endurance. Going on the air for the first time, we CQ'd for an hour, when we had to close down to avoid running down the batteries on our receiver, which we would need to work WVN, our station at Tientsin, the next morning. Our next attempt proved successful. Good British-American relationships were further improved when the British "man of war," the *Alphis*, lying in the Yangtse River, answered our call. Sometime later, when I had the opportunity to hear our station for the first time, at WVN, I reached new heights of humility. Powerful, but squeaky, I found that AC2RN took up a good share of the spectrum available in our area. Much communicating was done between ships—both military and civilian—of numerous registeries in the Chinwangtao harbor, and ourselves. A control tower-like cupola stood on tall legs atop one of the warehouses on the base. Cross arms on the tower held two 150 watt light bulbs. These lights provided "blinker" communication with various ships in the harbor. The most common visitors were ships of our own Asiatic Fleet. Frequently the ship-based sailors invited us down for a meal aboard their vessels. Food was the one thing I envied the navy men. I provided a variety from the rather common rations provided at our base. Numerous cruise ships also anchored in the harbor and the tourists on board frequently provided us with enjoyable company and meals, as their guests.



AC2RN (and military station AA1) radio room. The composite receiver is in the ammunition case at the left.

Spark communications were just being phased out while we were at Camp Burrowes. A large British-Belgian-French combine, the Kailan Mining Administration (KMA), formed to mine and ship coal, operated a virtual empire in that section of China. The combine owned its own fleet of colliers, its own railway and had its own police force. It also had its own power company and had an extensive network of power lines, supported on concrete reinforced poles. Later, AC2RN acquired three of these poles to support its antennas.

Most of the colliers of KMA were still using spark. They were the last hold of King Spark along the China coast. Static was almost always heavy during the summer at Chinwangtao and with the tremendous QRM, caused by the numerous spark transmitters with their broad signals, copying was a challenge. Spark was also used on a tug ice-breaker in the harbor during the winter. A Marconi 1.5 kW spark, using the call VPCQ, supposedly operated on 500 kHz, and contributed heavily to the QRM. The now highly sought-after IP-501-A receiver, with its crystal detector, followed by two stages of audio, was used to receive the spark transmission, as was its Navy version, the SE-1420. They were used, of course, mostly on l.f. The Lowenstein spark transmitter was used until about 1928. Most of the spark equipment used at that time was World War I gear.

To combat the fierce QRM encountered, Heinz and Kaufman, provided a receiver with what had to be the most unusual accessory ever installed on a communications receiver. Supplied as standard, when shipped to us, was an actual stethoscope. The radio man placed the stethoscope on the case of the last audio transformer and was able to hear the signals in the amplifier. Although I would not attempt to explain how it worked, it did provide a great attentuation of interfering signals, although the level of the stethoscope was quite low. This system also helped copying during the heavy summer time static, presumably damping the much-louder-than-signal crashes.

The vertical antennas, which we usually used on l.f. army communications, were more prone to static than the horizontal. This worked in our favor on the ham bands when we used the popular off-center fed horizontal antennas. Poor soil conductivity in the region and the extremely wide band of frequencies used by the army and ham transmitters resulted in a wide variety of antenna systems. The poor soil conductivity made necessary counterpoises for our Marconi-type antennas. These were sometimes used even on the amateur band antennas, and were almost always necessary on the low frequency military bands. At these lower frequencies, voltage fed systems were too unwieldy, except, of course, on the

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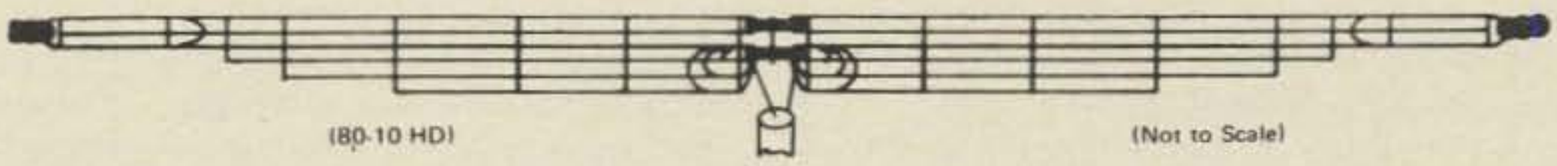

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75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
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amateur bands and highest military frequency. These conditions resulted in our very early use of the Windom antennas for amateur operation. We eventually had these antennas for 20, 40 and 80, and one for the 5995 kHz frequency which we also used occasionally for the forty meter rig. A counterpoise was used even on our early amateur vertical, much as roof-mounted radials were used with trap verticals. After getting our 80 meter version of the Windom, it was used against "ground" for our 355 kHz Army frequency.

The way we obtained the labor for our antenna installation may be of interest. A disciplinary custom; well known to military men, is that of having men of the unit work off—and presumably atone for—pronounced periods of inebriation that occur at times and in manners not approved by the command. The Sergeant who caught my friend, Larry Kempher in such an unfortunate condition, rather than having him do work of no utility, assigned him to set the poles necessary for our antenna system. Larry was also a man of many talents and proved himself of all-around value to the station. As one would expect, most of those stations worked wanted a QSL from AC2RN. The services of my old friend Fred Hinds, W9APY (now W9WR), who turned out our cards while we were in the states, could not be obtained in Chingwangtao, and an unusual AC2RN innovation was necessary. Larry—in one of his occasional sober moments—made our QSL's by scratching the call on a photo negative, then printing it.

The blinker tower used to talk to ships in the harbor.

Basically recreational in its conception, AC2RN occasionally provided valuable assistance to its men. Extremely multi-national in its makeup, the Chinwangtao area was always a place of interest and excitement. It can safely be said that romance was also as natural a part of the life in Chinwangtao as in other parts of the world. It was in romance that AC2RN proved itself by coming to the aid of one member of the Regiment in carrying his own personal version of it to its logical conclusion. Private Henry Marks was frustrated in his attempt to marry Seema. Yes, that was her real name and contrary to what you might think from the name, she was not a carnival dancer or such, but the perfectly proper—and shapely—daughter of one of the numerous "white Russian" Generals in exile around Chinwangtao. For a reason not completely clear to us, the military viewed Marks' marital merger with pronounced disapproval. While not specifically forbidding it, it did make his march to the altar extremely difficult. In an attempt to prevent the marriage, it decreed that it would be necessary for him to present a birth certificate for official approval. Complying with this requirement presented a "time rate and distance" problem about as easy to solve as getting an alley mut into the American Kennel Club. Understandably, one of the obstacles put in Henry's way was the extremely short time limit put upon his getting the certificate. AC2RN came to the rescue. By amateur radio contact Marks' father, a physician in Columbus, rushed it out by boat and it arrived in time for the wedding. Although this has nothing to do with either amateur radio in general, or AC2RN in particular, the last report that we had from Henry was that he was running a jewelry store back in Ohio and Seema was helping out in the operation.

Although hot in summer, Chinwangtao reached very low temperatures in winter. Numerous concessions were made to the low temperatures. It became standard operating procedure for Wong, our house boy, to stoke the fire before leaving for the night, and prepare a pot of hot water for the honey, scotch and hot water nightcap for the group. One unusual device that I have encountered no place else, was a special kettle in which he warmed the water for our drink. It had a long projection on the bottom, which projected down into the fire through the top of the stove to take maximum advantage of the available heat.

While it was not strictly *amateur* radio, I imagine amateurs would be interested in the commercial and military equipment and operations at the base. Following the "modernization" of equipment in 1928, tube transmitters were used almost exclusively at AAI. A Heinz and Kaufman tube transmitter, using a single 203 oscillator, took over as the main transmitter. Obtained from the marines, it was presumed to have established itself as being generally reliable. With 1000 volts on the plate, at 400 cycles, in the words of Glen L. Smith, who followed me at the station, it sounded like an ill-tempered tomcat.

In addition to the spark transmitters, a few arcs remained on several ships in the area. Also a tremendously powerful Japanese land station was two miles from our camp. We copied NPO, in Manila, daily for time signals. It operated on an extremely low frequency—about 24 kHz—with a 250 kW arc, which usually was reduced to 100 kW. It had a very great range and provided time signals throughout the Pacific. The ship arc transmitters were recognizable by the notes they put out, determined generally by the frequency of their power systems, usually 400 cycles.

Life, in general, as well as communications, was enlivened for the men who were there shortly after I left, by the Japanese-Chinese War, which was fought largely along the Peking-Mukden railroad that ran directly behind Camp Burrowes. Even though our men were not involved in this somewhat vigorous dispute, much of their time was spent ducking the shells that came randomly and rather often in their direction. Many of the communications were non-military and not completely official. Some of these were for the press correspondent for the Chicago *Tribune*, assigned to the Chinwangtao section to cover the war. This particular gentleman was known as a very competent correspondent during his rather infrequent adventures into sobriety. An innovative sort, when things became dull with no action, he often went out and stirred them up by firing shots into the air, in the direction of the combatants. Although with my fierce dedication to ethics and honesty (I would not want to impeach the integrity of the gentleman) I would concede that on specific occasions he was known to very slightly color the dispatches that were filed through our facilities.

With little to do, other than work radio, operators at our army

station, AA1, raised average traffic handling speeds to high levels. At a very common 50 words per minute, we were considered faster than either commercial or Navy systems. Following conversion to h.f., very good communications were made throughout the Far East. Occasionally, trans-Pacific communication was had with fair reliability.

With constant and heavy military communications schedules, amateur radio was, of course, operated on a strictly hobby basis. It competed with several recreational activities that became available. Naturally sports minded, the men of the Fifteenth particularly enjoyed the many outdoor sports readily available to us near Camp Burrowes. There was a variety of wild game in the mountains near the camp, including tiger, deer and wild boar. There were several fowl in that area that were not common to the United States. On one of our trips, one of the men bagged a long necked crane-like bird with the improbable name of *bustard*. Surprising to those of us who were not familiar with them, the bird made excellent eating. Our boy, Wong, prepared it with dressing and it tasted very similar to pheasant. It was delicious.

It can be understood by DX enthusiasts that *being* DX made contacts relatively easy. With power considerations what they were, phone operation was not possible. C.w. was the mode for all contacts. AC2RN became WAS very early in its existence. Almost all parts of the world were worked, except that Europe was very difficult. Almost all operations were on 7 MHz, then always known as "forty meters." Probably the greatest distance that we worked—or *could* work from our location—was LU9AZ. The next night we worked another Argentine station, LU9BAJ. Although European countries remained elusive, we maintained frequent schedules with the United States and numerous Asiatic and Australian stations.

Considering that we were using a slight update of the original transmitter with a single 211, modified only slightly by the use of tank inductances wound from copper tubing, the results were considered satisfactory.

A wide variety of receivers were used at AC2RN while I was operating there. Occasionally our military receivers were used on the amateur bands, but generally two others were used. In the overall picture of the amateur shack, the composite receiver frequently used, is visible in the wooden ammunition box. While admittedly modest in appearance—practically everything else at AC2RN was, for that matter—it exhibited remarkable sensitivity and unusual rejection of the very heavy local QRM. Going commercial, we obtained the Grebe CR-18 also shown. Designed in 1926, this receiver was the finest looking piece of equipment in the station. Traditional edgewise knobs, turned imposing looking dials, above. A set of plug-in coils sat atop the polished walnut cabinet. Although the receiver was quite sensitive, being the regenerative set that it was, keeping it in tune, when someone walked across the floor, the vibrating "tickler coil," with the set oscillating to copy c.w., required constant attention.

Certain concessions to safety were made periodically at the station. Generally casual in nature, these were conducted by Lieutenant (later, and now deceased, Brigadier General) Haydon Boatner. During one of these inspections, the keen-eyed lieutenant noted that there was no means of grounding the antenna for lightning protection. On his next trip, he found that the condition had been "remedied." A very large knife switch was mounted on the ceiling above the transmitter, with two #12 wires running from it, up through holes into the loft . . . where they ended one foot up from the switch!

General Boatner was not the only officer at Tientsin-Chinwangtao, who later became famous. One, later to become an amateur himself, ex-W4FPE, General "Vinegar Joe" Stilwell, Jr.

Although this is a radio story for an amateur radio magazine, the full story of AC2RN cannot be told by telling merely of the equipment or the communications. It is the story of radio, but it is also the story of men. Of women. Of kids. And how they lived and played and even fought. How they touched AC2RN, and were in turn, touched by it.

The extremely multi-national make up of the population around Chinwangtao was difficult to imagine. In addition to the native population, there were many persons of other oriental countries, mostly Japanese and Koreans. The revolution in Russia being fairly recent, there was a large settlement in the city made up of "White Russians" who added to the varied population. With their extensive commercial interests in the area, people of numerous other foreign countries lived there.

A very diverse group of American servicemen came to almost feel that Chinwangtao was "home" and became unofficial citizens of the community. Some of the group, being soldiers of fortune, as well as of the United States Army, either enjoyed the hospitality of the area on a temporary basis or actually became a part of the heterogeneous community. Throughout history, wars and the military have affected the technical advancement and the sociology of those countries involved. This was so at Chinwangtao. "Adult" relationships between men of the Fifteenth and local women, of official, unofficial and semi-official nature, interwove the lives of those with whom we shared our times. Some of these relationships were pleasant, warm, friendly and human.

As with any society, tragedy was also there. My friend, Glen L. Smith, who followed me at Chinwangtao, has told me of the tragic aftermath of many of those relationships that I saw while I was there and had begun to see moving toward their inevitable—if unhappy—conclusions. In 1933 our group was placed under the jurisdiction of the Philippine Department, which immediately began to "straighten things out" for the men of our unit. Immediately, all of those men who had been out of the U.S. for four years or more, were to be returned to the States. He relates that the April 1935 transport for home was "filled with the saddest collection of soldiers you ever saw." No dependents were permitted to accompany "their men" on the voyage home. At the boat to see their men off was one of the most motley assortment of women and children imaginable. Innumerable "wives" with all sorts of mixed children. In one case, at least, grandchildren. In the case of one old Sergeant—Watkins, I believe—he left *ten* of these grandchildren, together with four wives, and dozens of children. My friend, Doc Sayers, was married to a fine, beautiful Japanese woman and had two sons, the older about ten, when I left. So far as I know, he never saw them again.

As all such things do, the end of my Chinese adventure arrived, and one crisp October evening, I prepared for my departure. Having dressed, while waiting for the truck to take me, I sat down in front of the old amateur station that brought me so many happy hours. My friend from the states was coming through and I worked him from AC2RN for the last time. As I listened to him, I sat back in the rickety old wooden chair and looked up at the ceiling with the big "lightning switch" that we had put there two years before. Then down to the composite receiver in the ammunition case and to the shiny Grebe on the table before me. The two 211's, gave off a yellow glow from their position in the transmitter on the shelf above. Phil was signing now, "AC2RN DE W9HPG."

I pushed my coat back—it seemed to be getting awfully warm in the shack, although there was a chill outside and the fire had gone—touched the bug for a moment, and began. Probably for the last time from AC2RN. "PHIL I GUESS THIS WILL BE MY LAST QSO FROM HERE. I AM PACKED AND READY TO GO. THE TRUCK IS DUE NOW."

The sound of the truck came in above the signal in my headphones. A blast of the horn and yelling. From Henry, Doc, Owen and Pete. Maybe others, too. I pressed the bug again. "ILL CU IN THE STATES. THE BOOK SAID THAT CHINA ABSORBS FRIEND AND FOE ALIKE. SOMETIMES I FEEL THAT IT HAS ALMOST ABSORBED ME. ITS GETTING DARK OUTSIDE PHIL. THE SUN HAS JUST GONE DOWN. I GUESS IT HAS GONE DOWN ON CHINA FOR ME, TOO. FOREVER. 73 AND CUL. W9HPG DE AC2RN SK." ■

Adding an amateur rig to the rest of the electronic gear aboard your boat could save your life. An old salt, YJ8FS, tells why and how.

Amateur Radio on Yachts

BY BOBBY SCHENK, YJ8FS

translated from the original German by Harry M. Lilienthal*, DL7AH/F6DYG

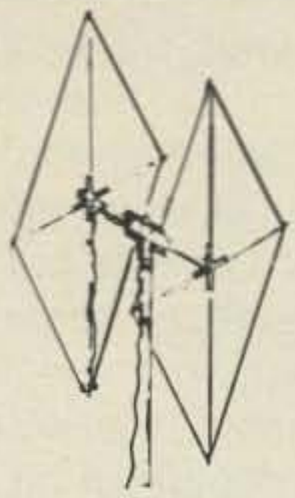
The officers in Balboa, Canal Zone did not believe a word of what the unfortunate Brian Farr told them on arrival. But they couldn't disprove it either. Three weeks earlier, Brian and his 19 year old girlfriend Gene had left Panama aboard their 30-foot homemade sloop with the Galapagos Islands as their destination. They had just covered the first 50 miles at sea when something happened to them. A nightmare to every sailor on a long cruise. Gene started suffering from a terrible bellyache. Being hundreds of miles from the nearest port, the skipper did not hesitate a second to put out a "Mayday" call on the international distress frequency, 2,182 kHz. There was no reaction to his pleas, neither during the day or at dawn, a time that normally yielded a range of better than 50 miles. Caught in the doldrums, there was no hope to reach one of the South American ports in time to save his friend. Helpless, he watched his girlfriend die on the third day.

This type of accident could have been avoided, had Brian's yacht been equipped like the 10 meter steel ketch Zephyr. On July 5, 1973 the ketch was located about 100 miles east of New Guinea, sailing on its keel in a fresh tradewind when its skipper suddenly observed an alarming amount of play between the rudder and its shaft. A complete breakup of the steering mechanism was imminent —a real catastrophe in the big sea full of coral reefs. To attempt a repair of the rudder in the rough sea would have been sheer suicide. Therefore, a decision was taken to try to home on Sudest Island, some 100 miles away, and to hope and pray that the rudder would hold that far.

In the afternoon the skipper spoke by amateur radio to his friend Olaf, VE7XS, and reported his problem. Although Olaf was located in Vancouver, Canada, more than ten thousand kilometers away, signals were loud and clear. VE7XS didn't know much of sailing and navigation, but he realized immediately what a dangerous situation the yacht was in. The Canadian stayed at his microphone and immediately alerted some Australian amateurs. These in turn organized a net on a round-the-clock status in order to act should the almost inevitable disaster strike. In addition, the Australian Civil Defence Service along the northern coast of Australia was alerted to be ready for a search and rescue case. Word was also given to the European manned missionary station on Sudest Island to be on the lookout for the yacht Zephyr as it headed in their direction. Contact with the missionary station was obtained through a relay via the skipper of a coastal vessel off Papua. When the stricken Zephyr finally reached Sudest Island and had anchored at a place clear of the reefs, VE7XS had already obtaied valuable information as to the feasiability of their tackling repairs in peace without fear of sharks.

The above stories show clearly why amateur radio on yachts would be a highly recommendable proposition. American sailors realized this fact years ago and amateur radio installations can be found on many U.S. vessels. It must be pointed out, however, that amateur radio does not replace the usual communications on marine frequencies. With only an amateur radio set-up aboard, there is no means to talk to coastal stations or other ships.

*Bd. H. Daumier, F-13920 St. Mitre-les-Remparts, France



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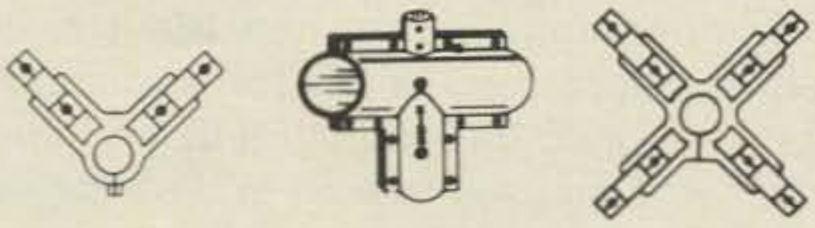

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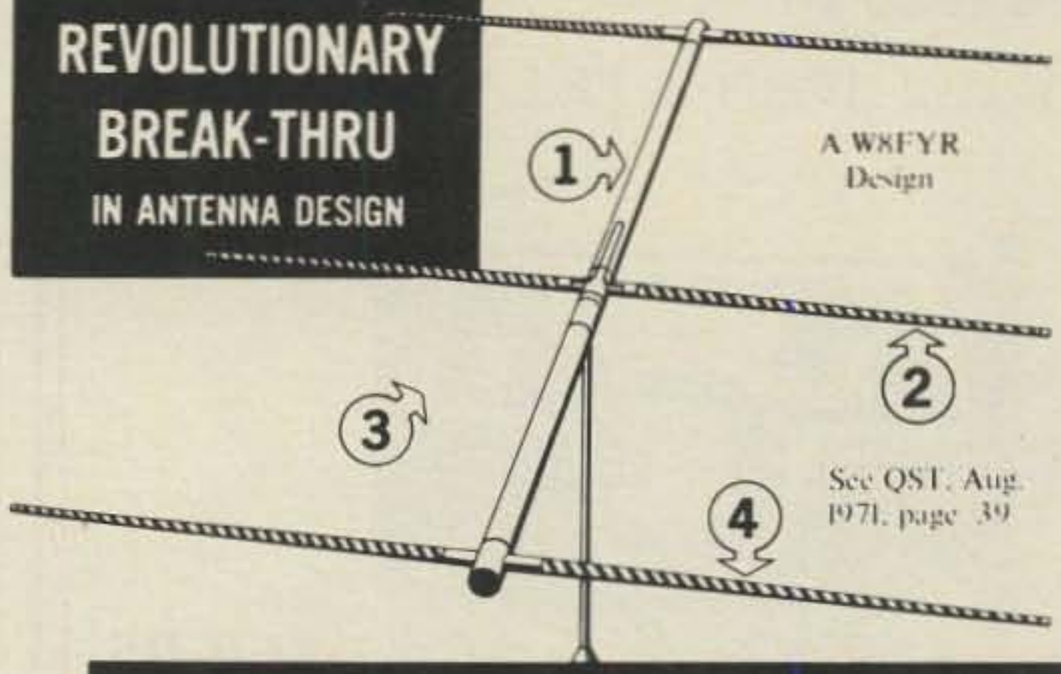

A W8FYR Design

See QST, Aug. 1971, page 39

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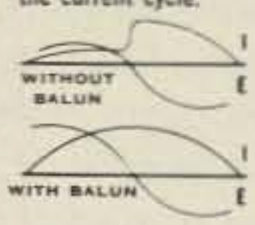

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CIRCLE 29 ON READER SERVICE CARD

Under ordinary circumstances international telephone calls can not be made via amateur radio and no bearings can be obtained by coastal stations should the skipper have lost his position.

Amateur radio equipment normally allows contact only with other amateurs. The by-laws of article 41 §2 referring to the application of the International Communications Treaty of Montreux 1965 stipulates that ". . . it is absolutely forbidden to use amateur radio for the exchange of international traffic to or from third parties."

The only exceptions to this otherwise universal prohibition are U.S. amateurs and those of a few other countries who may conduct third party traffic under certain specific limitations. Currently, U.S. amateurs may engage in overseas third party traffic only with amateurs in the countries listed below and only as long as such traffic entails no material compensation to anyone involved, and, except in emergencies, no communications of a business nature are allowed.

The U.S. has third party agreements with Argentina, Bolivia, Brazil, Canada, Chile, Columbia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Israel, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela. In addition, U.S. amateurs may conduct third party traffic with W7JXE/SU in Egypt; 4U1ITU at ITU, Geneva; and 7Z1AB in Saudi Arabia.

There is *no* restriction whatsoever in a real emergency. In such circumstances your amateur equipment may beat every other black box installed aboard your yacht. No matter whether you are on an Atlantic crossing, along the North African coast or just some 30 miles from Stockholm but out of reach of any coastal service station, contact with any amateur station on shore will, in a few minutes, alert a network of marine stations. It is, of course, even better to arrange prior to departure for a daily schedule with a fellow amateur to follow you on your voyage. There is certainly no amateur in the world unwilling to undertake such a task. During the last high seas sailing race between Auckland and Suva in the South Pacific, the radio amateurs of surrounding countries were asked to organize a radio watch. They did it so well that at no time were the race officials ever unsure of the position of any of the 80 participants.

Manufacturers in both the U.S. and Japan, such as Heath, Swan, Collins, Drake, Trio-Kenwood and Yaesu, have designed and marketed a great deal of equipment that fulfills the requirements for marine mobile operation. Sturdy construction and a 12 VDC power supply are assets for shipboard use. You also need good grounding and an antenna. Aboard ships it is an easy task to ground the equipment. The antenna, however, presents another aspect and is fairly critical in design in the case of a sailing yacht. An insulated afterstag is a workable solution to the problem, making an effective antenna. Aboard our own boat the groundpost of the transceiver was simply connected to the engine which of course has electrical contact with the water through the screw. The RF was radiated by the insulated afterstag. A steel cable that runs parallel to the afterstag was replaced by rope, improving the matching of the afterstag to the rig. Theorists may find a few minus points in the installation but the results obtained speak for themselves.

My rig is the popular Sommerkamp FT-277B (there is a later model, the FT-277E-CBM, that covers the marine frequencies, 2.2 to 2.7 MHz). The unit covers all of the HF amateur bands as well as a crystal controlled frequency permitting reception of the time signal from WWV for navigation purposes. According to the manufacturer, current consumption on receive is 0.8 amps, and 20 amps on transmit. With a well charged but aged battery (84 ampere/hours) I have been able to talk continuously for four hours before the battery gave up.

I hope that I have been able to convey the value of amateur radio aboard boats and that it will perhaps encourage others to so equip their own vessels. I operate regularly as YJ8FS/MM and may be found on 14,320 kHz at 1200 GMT. Many yachts in the Pacific area check in at that time. CU soon! ■

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

Pendergast shuffled into the shack, hands deep in his pockets. He kicked the door shut with his foot and slumped down in the operating chair. With a deep sigh he looked at a pile of unanswered QSL cards on the desk and with a single movement he swept them into the wastepaper basket.

"I've got the megrims", he said in a low voice. "Guess I have lost interest in DX".

"Who beat you out in what pile-up?", I asked.

"I didn't work Clipperton Island", he admitted. Then, after a long pause, he said, "I was calling them with the dummy load connected to the transmitter".

"That wasn't very smart", I observed. "Cheer up. In twenty years time, there'll be another DX-pedition to Clipperton".

Pendergast smiled wanly. "That's right", he said with no enthusiasm. "I guess I'll just have to wait my turn as a second-class citizen".

"Cheer up", I responded. "I didn't work this Clipperton DX-pedition either. Of course, I have QSL cards from FO8AJ and FO8AT so it didn't . . ."

Pendergast thumped the table with his fist. "That's just about enough", he barked. "I'm sorry I brought it up. Let's change the subject from radio and talk about antennas for a change!"

"Agreed", I replied hastily. "For starters, how about a note I received from WA2BLY in Alplaus, N.Y. He's sent me a picture of his 15 meter Delta loop beam (fig. 1). He says it is simple to build and easy to get working. It is a two element job with the dimensions shown in fig. 2. The bottom of the Delta loop is just a few feet above the roof of the house. Tuning is simple—sit on the roof and use a s.w.r. meter to adjust the two capacitors and the matching wire for the lowest s.w.r. reading. It took about two minutes to hit 1.1-to-1.

"Francis says he uses 9.5 foot spacing between the elements. The boom is 2" diameter PVC plastic drain pipe and the top portions of the Delta loop are aluminum tubing. The mast is 2" steel pipe bolted to first and second floor roof rafters of the house. The antenna is turned by the Armstrong method from the ground.

*48 Campbell Lane, Menlo Park, CA 94025

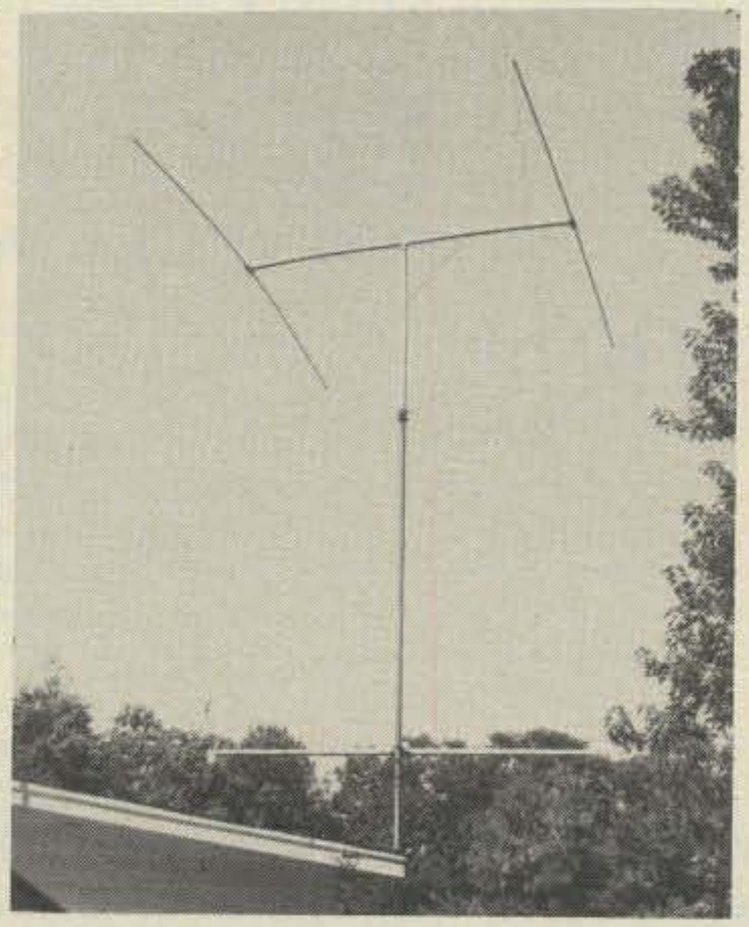


Fig. 1 – The Delta loop beam of WA2BLY. This inexpensive 15 meter beam is made of wire and PVC plastic drain pipe. An Omega match is used to provide a 50 ohm termination for the coaxial transmission line. Boom length is 9.5 feet See fig. 2 for details.

"WA2BLY goes on to say he easily works Japan and Europe in the Novice band and that he considers he has a rather poor location, being in a valley with large trees surrounding the antenna".

Pendergast brightened up a bit as he looked at the photograph. "Yes, that looks nice", he admitted. "I guess he can lower the antenna from the ground and work on it at roof level".

I handed Pendergast a second drawing. "You might be interested in this antenna of VE3FHS that was described in *World Radio* newspaper (fig. 3). It is a multiband vertical antenna that permits bandchanging to be done in the shack. No traps are used in the antenna at all.

"Basically, it is a 22 foot whip. It is about 1⅛ wavelengths long, at 10 meters. On 15 meters it is about a half wavelength long and on 20 meters it is ⅝ wavelength long, which provides some gain and a good, low angle of radiation. The whip is less than a quarter-wavelength for 80 and 40 meters, but still long enough to put out a good signal.

"The whip is fed with a transmission line cut to one electrical wavelength on 40 meters. Line length, then, is a half-wavelength on 80 meters, two wavelengths on 20 meters, three wavelengths on 15 meters and four wavelengths on 10 meters. In each case, the line acts as a one-to-one transformer reflecting the input impedance of the vertical whip at the station end of the line.

"It is true that the input impedance of

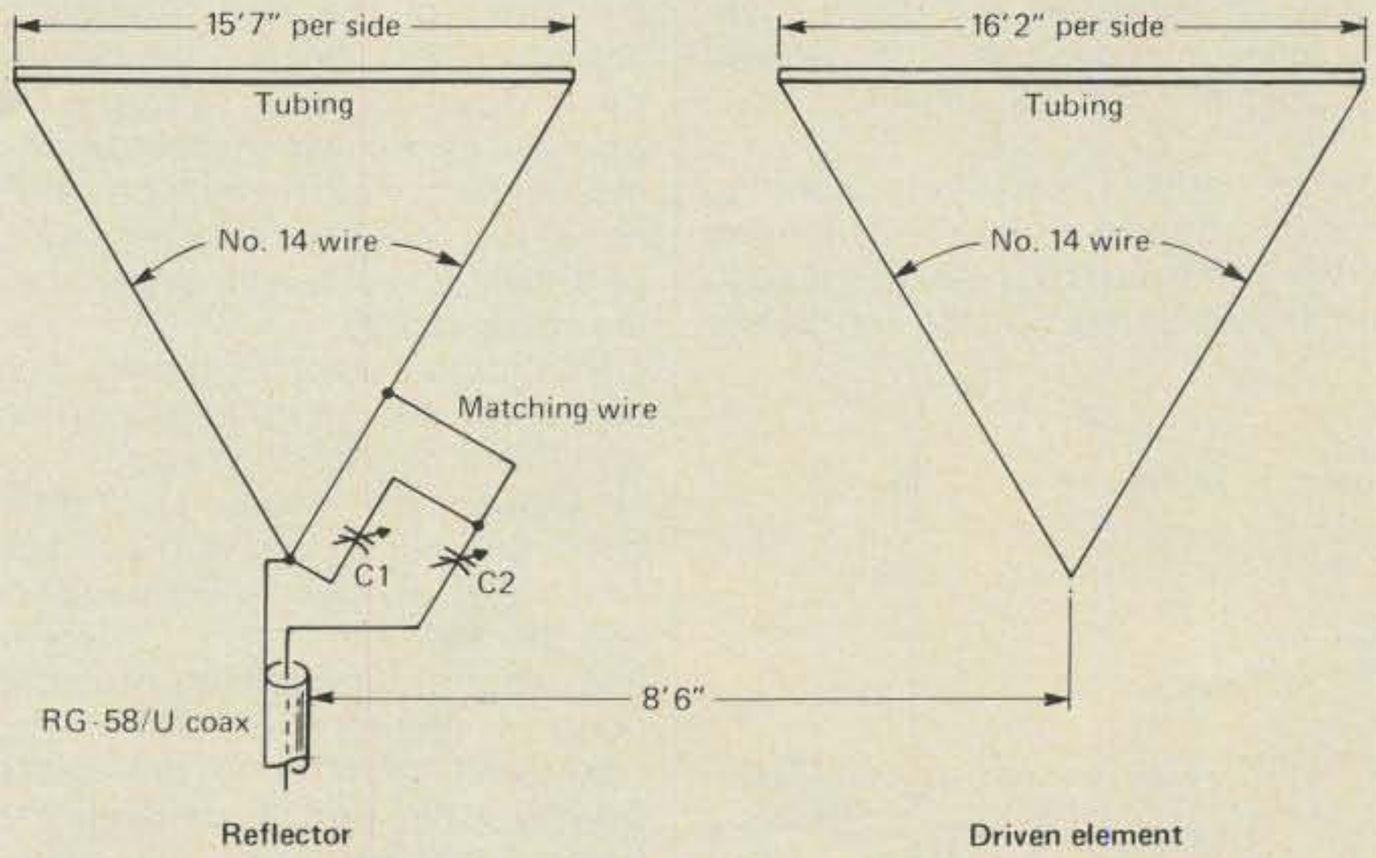


Fig. 2–"Squashed" view of 15 meter Delta Quad. Capacitors are 100pf, double spaced. Matching wire is about 20" long, spaced 3" from Delta loop. Adjust capacitors and length of matching wire for lowest s.w.r.

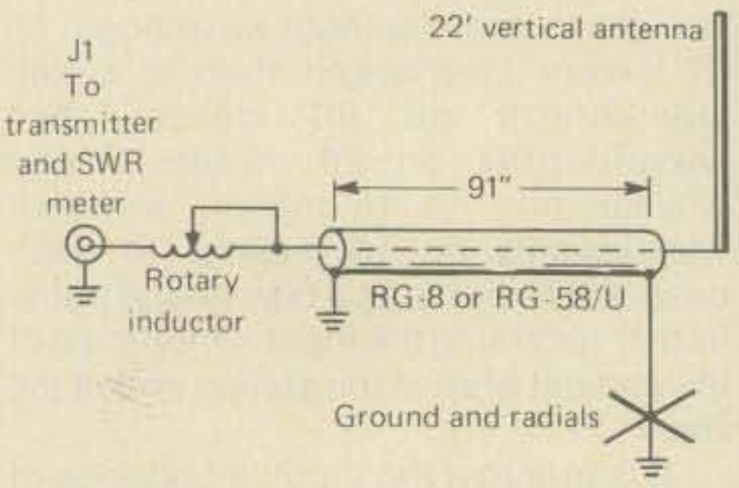


Fig. 3 – The multiband antenna at VE3FHS. For ease of adjustment and lowest SWR, place 250pF from one side or the other of rotary inductor to ground.

the whip varies widely from band to band, but a good match to a 50 ohm line can be achieved by placing enough inductance in series with the line so that

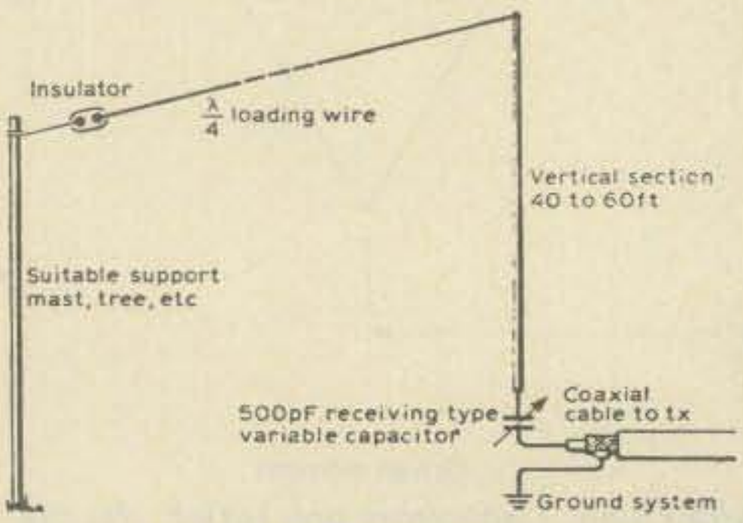


Fig. 4 – The 160 meter experimental antenna at G3XAP. (Drawing courtesy of "Radio Communication".)

the input of the matching device is at a point of high line current. A rotary inductor will do the job nicely, as shown. Or you can use a tapped inductor. Just adjust the inductor for lowest s.w.r. at the operating frequency. The inductor is placed at the station instead of at the base of the antenna for operating convenience.

"A perfectionist will use a roller coil, and he'll have an auxiliary capacitor that he can clip from ground to one side or the other of the coil. Adjusting the capacitor and the coil can knock the s.w.r. down to unity. Those amateurs willing to accept a modest value of s.w.r. at antenna system resonance can forget about the capacitor and just use a tapped coil, which is less expensive than the roller variety."

Pendergast listened intently. Then he said, "You need a good ground system with this antenna, don't you?"

"That's right", I replied. "You need a good ground system with *any* vertical. And I don't just mean ground rods driven into the soil. They are relatively worthless, escept for lightning protection. A good r.f. ground is hard to find so the next best thing is to run out some quarter-wave radials beneath the antenna. Fan them out like the spokes of a wheel."

"How many radials and how long are they?", asked my friend.

"Ah, there you enter the realm of speculation", I replied. "The closer the vertical antenna is to the ground, the greater the number of radials required. Numbers ranging from 60 to 120 are commonly mentioned. However, if the vertical antenna is elevated *above* the ground it is possible to get by with fewer radials. I'd say if you had this antenna with the base about 10 feet in the air you would be satisfied with a lot fewer radials. When I had a multiband vertical (not this design, but one like it) I had four radials for 40 meters and four for 20 meters. This combination also worked well on 15 and 10 meters. I tried adding radials for the latter two bands, but it didn't seem to improve performance. The base of my antenna was on the roof of a one story residence, which put it about 11 feet above ground".

Pendergast drew a graceful picture of the vertical antenna in his notebook and smiled. "I like simple things that work", he said. "This looks like a good multiband antenna for the fellow with restricted space".

"Have you ever seen a simple *directional* vertical antenna?", I asked with a smile.

"That sounds as rare as hen's teeth", replied Pendergast. "How do you get directivity out of a single vertical radiator?"

"It takes a real experimenter to do

that", I replied. "But it has been done. The work by G3XAP of England was summarized in the November, 1977 issue of *Radio Communication*, that fine publication of the Radio Society of Great Britain. He did his experiments on 160 meters and, in fact, achieved the WAC (Worked All Continents) award on that band with only 9 watts input! That certainly speaks well for the efficiency of the antenna!"

"Tell me about it", said Pendergast, as he re-opened his notebook and took his feet off the table. He hesitated, then reached into the wastepaper basket and retrieved the QSL cards. "I must be feeling better", he admitted.

"Well, since G3XAP was space-limited, he put up the antenna of fig. 4 for 160 meters. Basically, it is a short vertical with a quarter-wave loading wire at the top. The antenna was series-tuned to resonance.

"G3XAP noted that the antenna had directivity so in order to run some tests, he made a scaled-down version for 10 meters and made observations on that band. The 10 meter model showed directivity in the direction of the loading wire when it was sloped downwards toward the ground. Maximum directivity was noted when the wire ended in close proximity to the ground and less directivity was noted when the wire was in a horizontal position. Changes in the slope of the wire had little effect upon tuning or loading.

"A second 10 meter model was erected near the first, but in the reverse direction. A switch in the coaxial lines to the antennas permitted the operator to switch back and forth for comparative tests. The directivity between the two antennas amounted to about two S-units.

"Now that the directivity was established, the next test was to compare the signal gain of the model antenna against a quarter-wave 10 meter vertical ground plane antenna operating over the same ground system. The 10 meter model showed a signal loss of about one S-unit when compared to the full-size vertical ground plane".

Pendergast frowned. "If the model antenna has *loss*, then why use it?", he asked.

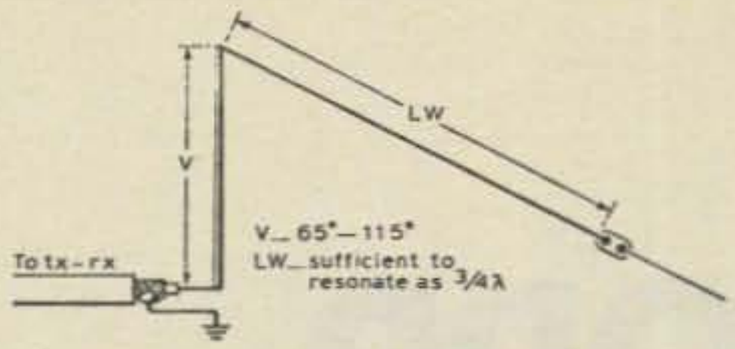
"Well, G3XAP mentions that the 10 meter model antenna was only 3'9" high and the ground plane was about eight feet high. He was sure that surrounding objects had a lot of influence on the little antenna, whereas at a height of 60 feet on 160 meters, these influences would be considerably reduced.

"In addition, if a compromise 160 meter antenna less than 60 feet tall could put out a DX signal that was only one S-unit below that from a full size 160 meter ground plane antenna 135 feet high, then working DX was a distinct possibility!

"Based upon his observations and conclusions, a 160 meter version was built and put on the air. The wire sloped in an easterly direction from England. In a few days the station worked EP2BQ in Iran while running less than 5 watts input and a few months later VK6HD was worked.

"The antenna was now retuned for 80 meter operation. On this band, it took the form of a half-wave loading wire fed by a quarter-wave vertical. Again, operation to the east was very good, but stations from the USA were quite weak, even

(continued on page 87)



Band (MHz)	Vertical length (ft)
1·8	95 – 170
3·5	48 – 85
7	25 – 42
14	12 – 21

Fig. 5 – The G3XAP single wire unidirectional antenna for 160, 80, 40 or 20 meter operation. (Drawing courtesy of "Radio Communication".)

a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

Every amateur who lacks the resources necessary to erect a really impressive antenna system feels himself at a great disadvantage, especially if he operates very low power. Because propagation and antenna size and location are fraught with many variables, oftentimes one focuses on the wrong factor for his specific situation, wrongly assuming that if he works on improving that factor, his on-the-air results will improve drastically. This, of course, leads to a great deal of frustration. Often it leads to despair. At various times in this column, we've tried to consider the various factors involved in optimum antenna performance, for example, in the January, 1975 column, where the question of antenna height vs. performance was reviewed. Our old buddy Rockey, W9SCH, has been in a limited resources situation since the stone age, it seems, dwelling on his small city lot in suburban Chicago. Being a philosophical type, he had ruminated much on the pros and cons of this and that, and, after much theorizing, has managed to consistently produce a signal that never burns out any receiver front-ends, but one that is at least heard outside his own neighborhood. Every now and then, Rockey will whip off the result of his ruminations—usually printed in pencil on graph paper, replete with charts and graphs and formulae. I always find these interesting and informative. Well, one such paper appeared in the mail the other day, and seems worth sharing with the gang. His analysis and conclusions will provide food for thought, so I've decided to go ahead and let Rockey have the forum for the moment. He writes:

**83 Suburban Estates, Vermillion, S.D., 57069*

"How High is UP?"

We all agree that the higher an antenna is above dirt, the better it works. But antenna altitude requires both work and money for its realization. Therefore, the question is: how high does it *pay* to raise an amateur dipole? Now, the U.S. Signal Corps has investigated this matter. We 'lift' the following information from Technical Manual TM 11-486, Chapter 6, modifying it for the amateur frequencies and conditions in Table I. This data strictly applies to horizontal, half-wave dipoles whose centers are at the heights specified. We round off to the nearest decibel. We regret the lack of data for the 21 and 28 MHz bands. One can assume the same trends for these bands as for the lower frequencies.

Freq. (MHz)/Skip (miles)	Dipole Height (dB Diff. Between Ideal and Real Dipole.)			
	10 ft.	20 ft.	30 ft.	40 ft.
2 at 200	–10	–5	–3	–1
3.5 at 300	–9	–4	–2	–1
3.5 at 1000	–17	–12	–10	–8
7 at 1000	–13	–8	–6	–4
14 at 1000	–9	–4	–2	+1

Table I

Table II presents the effects of a height increase most strikingly. *To increase the signal-strength at the receiver by one S-unit, you must double the antenna height!* This assumes one S-unit = 5dB, as is standard. This is a slightly different result than we found in *The Milliwatt* article (August, 1971), but not out of harmony with the general level of magnitude involved.

Table III compares the number of watts theoretically required to produce the same signal strength at the distant receiver as would be provided by an ideal dipole in free space radiating one watt. Those individuals making the KM/W Award with low antennas can hereby justify another slap on the back upon perusing the table. It might be of value in weighing the cost of an antenna height increase against that of increasing the power output. Table IV again puts power in place of decibels for those who find logarithmic thinking difficult, and may help some in formulating economic strategy.

Freq. (MHz)/Skip (miles)	Power Output (watts)			
	10 ft.	20 ft.	30 ft.	40 ft.
2 at 200	10	3	2	1.3
3.5 at 300	8	2.5	1.5	1.3
3.5 at 1000	50	15	10	6
7 at 1000	20	6	4	2.4
14 at 1000	8	2.5	1.5	1.0

Table III

The Signal Corps data from which our figures are derived is based upon field testing, and, incidentally, agrees well with our amateur experience. Although this data applies strictly to the horizontal half-wave dipole, it is probably usable for any simple horizontal amateur antenna less than about a wavelength long. It will also probably work for inverted Vee's. Some general conclusions which might be drawn from this data are: 1) the highest antenna still seems the best, when all other conditions are equal, but, 2) since the benefits of height are gained slowly, it is scarcely worthwhile to strain muscle of pocketbook for a few inches or feet more height. If your present antenna is at twenty feet, it is probably not worth much of an investment to raise it, for example, to thirty feet unless other advantages are simultaneously gained, such as gaining clearance of surrounding structures. On the other hand, it is worthwhile to go from ten to twenty feet. Remember, as a general rule, you must double the height to gain one S-unit advantage. That height is worthwhile cannot be doubted, but to have a really "high one" requires either luck or money in unusual quantity. We remember stringing a 160 meter half-

(Continued on page 89)

Height (ft.)	Gain (dB)
10	0
20	+5
30	+7
40	+10

Table II

Height (ft.)	Gain (dB)
10	1
20	0.32
30	0.20
40	0.10

Table IV

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BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Novice — Operating Tips — calling, answering, and identifying stations

Every good operator listens to make sure the frequency is not in use before transmitting. There is nothing to be gained from making a general call to all stations (CQ) on a frequency being used by someone else. If you call CQ on a busy frequency, you are interfering with a contact that is already in progress. Your interference could completely disrupt the other contact and a real mess can develop if someone answers your CQ call. In this situation, the original pair of stations can have extreme difficulty working through your interference and you can experience the same trouble trying to complete your contact. Good manners are as important on the air as elsewhere.

Interference is worse on 40 meters than on any other Novice band. There are often layers of signals covering almost the entire 40 meter Novice band. It can be next to impossible to find a reasonably clear 40 meter frequency, but one must make the effort to avoid interference even under the worst conditions. If nothing else, at least avoid using frequencies already in use by other local amateurs.

* 2814 Empire Ave., Burbank, CA 91520

Beginning Novices usually are hesitant to transmit and they spend a lot of time listening to other stations. Eavesdropping on conversations of other amateurs is called reading the mail and it at least provides code receiving practice. However, the new Novice will progress much more rapidly by making CQ calls and exchanging information with the amateurs who answer these calls. When a Novice first goes on the air, the location of an answering station does not matter very much since all states and countries are needed. A Novice usually becomes more selective with increased experience and often prefers to just answer stations in states and countries not already confirmed. This answering preference is understandable with experienced Novices, but the new Novice should make CQ calls and work any answering station, regardless of where that station is located. Simply stated, one must make calls to get results.

The more experienced Novices tend to either do a lot of listening or to make directional calls in attempts to work desired states and countries. One can pick up states and countries by using either method, but they are usually contacted more easily by just making CQ calls and working answering stations. States and countries fill in very nicely when a Novice stays active and makes frequent contacts. The station making a CQ call often has several stations respond to that call. It is better to have several stations responding to your call than to be one of several stations answering a call. It is useless to make directional calls (such as CQ Vermont) unless the area you want to work is being heard on the band you are using. It is not unusual to hear a local Novice making useless directional calls trying to raise stations in an area that is not being heard. Directional calls can only be productive when the desired area is being heard. When directional calls are made unwisely, they just cause unnecessary interference and they are superfluous signals. The only benefit associated with these indescriminate directional calls is that the operator gets some sending practice, but sending practice should not be obtained in this manner.

Operating procedures are covered very well in the ARRL booklet, "An Introduction to: Operating an Amateur Radio Station". If you don't have a copy of this very useful publication, you should request one directly from the American Radio Relay League, Inc., 225 Main Street, Newington, Ct. 06111. This booklet is priced at just fifty cents.

Calling procedures do vary. But CQ calls are always short to be most effective. The variance is just between short CQ calls and shorter ones. A common general call to all stations is as follows:

CQ CQ CQ DE WA6FNM WA6FNM WA6FNM
CQ CQ CQ DE WA6FNM WA6FNM WA6FNM
CQ CQ CQ DE WA6FNM WA6FNM WA6FNM K

The preceding procedure is called the 3-by-3-by-3 system. CQ is sent 3 times, followed by DE (from), the callsign is sent 3 times, and the call is repeated 3 times in its entirety, followed by K (answer).

I have found that it is more effective on the Novice bands to use a decreasing sequence of CQ with an increasing sequence of station callsign as follows:

CQ CQ CQ CQ CQ DE WA6FNM
CQ CQ CQ CQ DE WA6FNM WA6FNM
CQ CQ CQ DE WA6FNM WA6FNM

This is Barry Marte (WD8KSY) of Clare, Michigan. Barry has been a Novice since April 1977 and he expects to upgrade as soon as he completes his college education.

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This symbol is important to amateur radio... present and future. Watch for it.

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As a representative group of importers exporters, manufacturers and dealers in amateur equipment, ARMA is the official spokesman for this highly specialized industry, and has a vested interest in the fostering of continued growth of the radio amateur service, worldwide.

To further these goals, ARMA disseminates information from its headquarters on various proposals and actions that may affect its members, represents the industry in meetings, and on various committees to develop a favorable public attitude toward amateur radio, directs and advises the industry as to its best interests, and interprets industry wide technical standards as required. ARMA supports amateur radio worldwide through club, government and industry liasons.

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Comments and suggestions are invited from companies and individuals concerned with the present and future status of amateur radio. Such correspondence and requests for membership information should be referred to: Bernard Tower, Sec. Yaesu Electronics Corporation, 15954 Downey Avenue, Suite #19, Paramount, CA 90723

WA6FNM K

The preceding calling system emphasizes the fact that one is calling all stations at the beginning for the benefit of amateurs tuning across the band. The callsign is sent the maximum number of times in the last sequence, enabling positive station identification. This procedure minimizes the time required to send a call, since CQ is shorter than a callsign. Note that DE (from) is sent just one time between the CQ and the callsign.

The inexperienced Novice may think that he has a better chance to get an answer if he sends a very long CQ call. The fact is that one has less chance to get a reply from an extra long call than from a short one. Most operators will give up waiting for someone who calls CQ too long without listening for a reply. A series of short CQ calls is far more productive than a single long call.

When answering a CQ call, it is good operating practice to send no more than a 3 by 3 transmission, such as:

WA6FNM WA6FNM WA6FNM DE WB3DDB WB3DDB WB3DDB K

The response to a CQ call should not be faster than the speed at which the CQ call was sent. If the other amateur hears your reply to his CQ call and comes back to you, he should just tell you his name, his location (QTH), and how he is hearing your signal (RST). He should then turn the contact over to you and you should give him the same three items of information. After you have given him the basic data, it is up to you to begin the general conversation. In other words, if you answer a CQ call, be prepared to start a conversation as soon as name, QTH, and RST data have been exchanged.

When you complete a CQ call, listen carefully for replies above, on, and below your transmitting frequency. A major difference between a good operator and a poor one is that the good operator expects replies to his calls and he listens for answers. When you have completed a CQ call and you are listening for an answer, do not stop to listen to any adjacent station that is not calling you. As soon as you hear one code symbol that is not part of your callsign, tune past that station and continue listening for an answer. A little bit of practice will enable you to quickly tune around your transmitting frequency to catch answering stations. It takes some self-training to continue tuning past a non-answering station near your transmitting frequency, but you owe it to the other amateurs to listen for their replies to your CQ calls. It is best to listen for answers within about 5 kHz of your transmitting frequency because amateurs often fail to reply exactly on the frequency of the station that sent the CQ call. Tune above and below your frequency, listening just for parts of your callsign. The first sweep can be fairly rapid and it should be followed by a slower and more careful tuning of the frequencies closer to your transmitting frequency. It should not take more than a minute to make a thorough search for an answer, and you will develop the ability to do this well in much less time. If you do not hear a reply to your CQ call, you should continue sending short calls until you do get an answer. Some amateurs shift frequency each time they fail to get a reply but this is not necessary and it could result in interference if one shifts onto a frequency already in use. A series of short CQ calls on an open frequency will bring a reply.

Take your time and avoid mistakes when you are sending CQ calls or answering stations. Novices do not readily forgive or overlook sending errors, particularly when listening to a CQ call. The chance of getting a response to a CQ call is greatly reduced with each sending error. Most Novices seem to feel that if the other amateur can't send the CQ call without errors, he would really make a mess out of the rest of the contact. This attitude is not as harsh as it might seem to be at first. Beginning amateurs have enough trouble copying perfect code, so it is natural for them to avoid bad code sending.

One thing a Novice can do to generate a bit more understanding and patience in other amateurs is to add the N (Novice) indicator after his call, such as WB3DDB/N. The FCC has stated in writing that this Novice indicator is legal and I believe it is to the advantage of Novices to use it. When Novice callsign prefixes had the letter N as the second letter of the prefix (such as WN6FNM), other amateurs knew they were hearing a Novice and they were much less likely to become impatient with errors in sending and procedure. If you are a relatively new Novice still struggling to send readable code, you can get more amateurs to answer your calls if you add /N after your callsign.

Frequent and regular on-the-air contacts increase an operator's code proficiency better than any code practice system. When code proficiency has improved, it is important to remember that one can send too fast for many of the other amateurs. It is a good practice to give a responding amateur a choice of speeds and this can be indicated by sending each part of your CQ call at a different speed. As an example, if your top receiving speed is 12 wpm, you could send the three parts of a typical CQ call at about 12, 8, and 4 wpm, such as:

CQ CQ CQ CQ CQ DE WA6FNM (12 wmp)

CQ CQ CQ CQ DE WA6FNM WA6FNM (8 wpm)

CQ CQ CQ DE WA6FNM WA6FNM WA6FNM K (4 wpm)

It is common for proficient code operators to send CQ calls at varied speeds to let other amateurs know they can answer at the speed they want to receive. However, it must be remembered that sending speed exceeds receiving speed; consequently, one must not send at maximum speed or the other amateur will be sending too fast when he matches your sending speed.

One way to avoid sending above your code receiving speed is to concentrate on sending perfect code characters; this slows down your sending rate.

Some bad practices are common on the air and you are advised to avoid them. Some amateurs send QRZ? de WA6FNM K (as an example) instead of making a proper CQ call. In the first place, there is no station with the callsign QRZ?, so this is an improper station identification. Secondly, if you think some unknown station really did call you, the correct way to ask who is calling is to send DE WA6FNM QRZ? K (as an example). Use correct procedures. Do not use a Q signal in lieu of a general call to all stations.

A similar incorrect practice concerns amateurs who want to make sure a frequency is not already in use before they transmit a CQ call. These amateurs send QRL? DE WA6FNM K (as an example). Again, there is no station with QRL? for a callsign, which means that the transmission is improper. The correct way to make this transmission would be to send DE WA6FNM QRL? K (as an example). The consideration of operators who ask QRL? before using a frequency is greatly appreciated by other amateurs, but it may as well be sent correctly.

Another bad practice is to make a CQ call on a frequency where one has just heard another station but failed to catch his callsign. If the other station was calling CQ, he probably will make another call on the same frequency if he does not hear a reply. If the other station is already involved in a contact, your CQ call will just cause unnecessary interference. In any case, the other station is using the frequency and you should not usurp a frequency known to be in use. Courtesy is extremely important on the air and top operators pride themselves on minimizing interference to all other amateurs.

Once the two-way radio contact has been established, avoid sending both callsigns more than once each time identification is required. The other amateur certainly knows his own callsign and, if he has called you, he also knows your callsign. There is no reason to send either or both callsigns more than once during each identification, after contact is established. If the other amateur has copied your callsign incorrectly, then it is good to tell him during a transmission that he has it wrong and give him the correct one.

Station identification requirements are not as complex as they look in the regulations. Since most Novice band contacts are at a slow speed with a lot being said, they are normally more than 3 minutes long. If a transmission is 3 minutes (or more) in duration, both stations must be identified at the start and end of the transmission. If one makes a long transmission that exceeds 10 minutes, he is required to send the identification of both stations at no more than 10 minute intervals during the long transmission. Proficient code operators often like to make statements or ask questions and to get immediate responses from other amateurs. It is proper and legal to make such transmissions without identifying both stations at the start and end of each transmission. Each of the transmissions must be less than 3 minutes long to avoid the usual (start and end) identification requirement and one of the stations must identify both stations involved in the contact at no more than 10 minute intervals. When using a series of these short transmissions, operators normally send the break sign (the letters B and K run together) to indicate when they want the other operator to respond. It is not proper to use the break sign ($\overline{BK}$) when a transmission is 3 (or more) minutes long.

Avoid the childish practice of sending dits back and forth as a contact is completed with another station. This practice accomplishes no useful communication and it can cause you to miss hearing another station trying to reach you at the completion of your previous contact. It is a common good operating practice to listen around your transmitting frequency at the conclusion of each contact in case another station has been waiting to work you. It is not unusual to hear stations call you as you end a contact and nothing guarantees that they will call exactly on frequency.

It is hoped that this straightforward discussion of calling and identification procedures will help you become a better operator. You can help your amateur radio service by correcting other operators when you hear them using improper procedures. The Novice code bands provide an excellent training area to learn correct code procedures and amateurs operating in the Novice bands tend to be more helpful than the ones you'll work elsewhere. Remember that there are a lot of technicians using the Novice bands now and most of them have a very limited code capability and even less knowledge of proper code procedures. Some of the Technicians I've worked recently on the Novice bands have told me that they have not worked code contacts in years. These Technicians are basically in the same position as a new Novice when they come on the Novice bands; they need advice, patience, and cooperation.

W6OJW reports that W6DOS is a Novice and that he requested the shift to his old callsign after he had been issued WD6BBU on his new Novice license. W6DOS was scheduled to take his General test almost immediately, so he is probably not a Novice by the time you read this. It is no longer rare to work Novices with "old" callsigns but at least W6DOS had held that callsign 45 years ago.

The following stations were worked recently on the Novice bands:
WB1CKO Frazer @ Suffield, Conn., WB2JGQ John @ Brick Town, N.J., WB3JOL Dwayne @ Frederick, Md., WD4CNS Ken @ Murphy, N.C., WD5CSX Jim @ Senatobia, Miss., WD6CEI Dick @ Manhattan Beach, Ca., WB7NHL Tom @ Portland, Oregon, WD8MGP Gary @ Cleveland, Ohio, WD9FPQ Mark @ Scottsburg, Ind., WB0WYV Evan @ Minnetonka, Minn.

I need good black-and-white pictures of Novices at their operating positions. If you send a picture, it might appear in a future issue of this column. Please enclose an SASE if your picture must be returned. If you send a picture, please enclose some information about your amateur activity and yourself.

73, De W6DDB

a monthly feature by

JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

Applications for the Worked All Zones Award (WAZ) reached a record high this month as the DX Department authorized 60 new certificates. This is 6 more than the previous all time high established during the last sunspot maximum several years ago. *Why*??? We aren't exactly sure. The sunspot cycle is still some distance from its next peak. Possibly it's because more people are reading *CQ* than ever before since newsstand sales were resumed last year. We even saw *CQ* on sale in a hotel newsstand in Tokyo last week. Increased awareness means increased interest. Whatever the reason, we are delighted and look forward to record months yet to come.

DX From The Europe View

Next month we have a special treat for DX column readers, particularly our many European subscribers. The DX column for the June issue will be written by A.J. Dijkshoorn, PAØTO, editor of V.E.R.O.N.'s *DX 'Press*. Jaap will be writing about DX from the European slant, with news and photographs from prominent European DXers and QSL Managers. We think you will enjoy it.

P.O. Box 205, Winter Haven, FL. 33880.

Clipperton DXpedition

At presstime (early February) we are all eagerly awaiting the first DXpedition to FO8, Clipperton Island, in 2 decades. By the time you read this, the operation should have been completed and we hope a rousing success as this island is number one on the most "needed lists."

Thanks to the efforts of Jack Gutzeit, W2LZX, our Advertising Sales Manager and an avid DXer, *CQ* is a major financial contributor to the Clipperton expedition and we hope to have a complete story with lots of pictures in an upcoming issue. Transceivers are being provided by Herb Johnson of *Atlas*.

Finances were, and may still be, a major problem as the total cost is estimated at $40,000. If you haven't yet made a donation, dig deep and send your check to the Clipperton DX Club, c/o Charles Signer, WA9INK, *Worldradio*, 2120 28th Street, Sacramento, CA 95818. This is a predominately French group, expected to include 8 French, 2 Swiss and some U.S. amateurs. Watch *CQ* for a full story in a few months.

The above photo was taken at a Naples Radio Club party honoring the advancement of Gen Casaburi, I8YRK, to the DXCC Honor Roll. Standing left to right are I8ACB, I8JH, I8JN and A.R.I. Award Manager I8KDB. Seated left to right are I8OMA, I8EBN, I8YRK and I8SRP.

DX Editor Visits JA-Land

DX Editor, K4IIF, had the privilege of a visit to Tokyo earlier this year in connection with an international trade matter. For a DXer, no such trip is complete without eyeball QSO's with JA-DXers and a visit to J.A.R.L. Headquarters. Fortunately, we were able to do both.

Phone calls to Nao Akiyama, JH1VRQ, and Chip Margelli, K7JA/Tokyo, resulted in a delightful JA-style dinner which featured reknowned DXers, Nob, JA1KSO and Kiyoshi, JA1BK. Whether you prefer sukiyaki, tempura, shabu shabu or some other Japanese delicacy, there's no problem in finding plenty of delicious food at one of the many interesting restaurants in the Ginza district of downtown Tokyo. Needless to say, the latest DXploits were the main topic of conversation and we found that the subject of 7J1RL will still get you into a lively discussion among JA amateurs.

Thanks to the efforts of Nao, JH1VRQ, Overseas Liaison for J.A.R.L., we were able to visit League headquarters on the outskirts of Tokyo. The J.A.R.L. offices can be easily reached via either the efficient Japan National Railroad commuter train or the subway, but if you're a stranger in Tokyo you'd best call Nao at 946-3331 for directions. The train stops are identified in English, but street signs are in Japanese only, which can be pretty bewildering to someone not familiar with the language.

If you're staying across from the American Embassy at the Hotel Okura, the best bet is a cab to the Shinbashi station. From the Imperial or other hotels in central Tokyo try the Yurakucho station or the Tokyo Central station. It's about 10-12 stops, 20 to 25 minutes, to the Sangamo station which is only a 2 minute walk from the main J.A.R.L. office building. The train fare is only 110 yen, slightly less than 50¢ at today's exchange rate, while a taxi would cost over 2000 yen.

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Power Range	Frequency Bands (MHz) 2-30	25-60	100-250	200-500	400-1000
5 watts	–	5A	5C	5D	5E
10 watts	–	10A	10C	10D	10E
25 watts	–	25A	25C	25D	25E
50 watts	50H	50A	50C	50D	50E
100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
500 watts	500H	500A	500C	500D	500E
1000 watts	1000H	1000A	1000C	1000D	1000E
2500 watts	2500H				
5000 watts	5000H				

MODEL	PRICE
43	$120
Elements (Table 1) 2-30 MHz	42
Elements (Table 1) 25-1000 MHz	36
Carrying case for Model 43 & 6 elements	26
Carrying case for 12 elements	16

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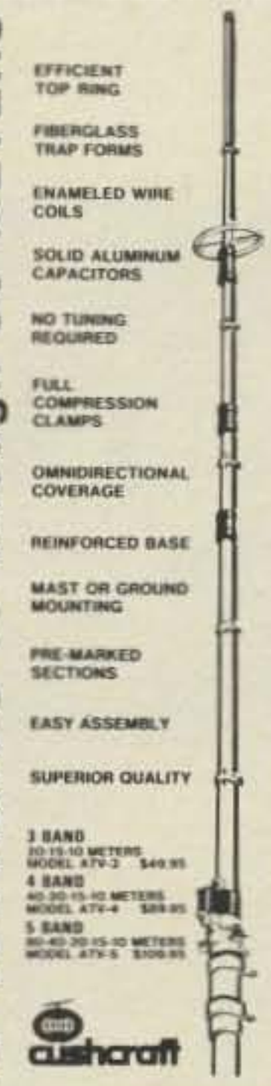

TELEX PROFESSIONAL HEADPHONES & HEADSETS

MODEL	C-610	SWL-610	C-1210	C-1320	CM-610	CM-1210	CM-1320	CM-1320S
Headphone Sensitivity Ref 0002 Dynes/cm² @1mW input, 1kHz	103dB SPL ±5dB	103dB SPL ±5dB	103dB SPL ±3dB	105dB SPL ±5dB	103dB SPL ±5dB	103dB SPL ±3dB	105dB SPL ±5dB	105dB SPL ±5dB
Headphone Impedance	32 20 ohms	2000 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms
Microphone Frequency Response	–	–	–	–	50 8000 Hz	50 8000 Hz	50 8000 Hz	50 8000 Hz
Microphone Impedance	–	–	–	–	High	High	High	High
Microphone Sensitivity Below 1 volt/microbar at 1kHz	–	–	–	–	–51dB ±5dB	–51dB ±5dB	–51dB ±5dB	51dB ±5dB
Price:	$9.95	$11.65	$28.30	$37.90	$42.80	$56.90	$68.30	$54.50

Model C 1210

Model CM 610

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Model C 610

Model CM 1210

Model C 1320

Model CM 1320

Model CM 1320S

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CIRCLE 43 ON READER SERVICE CARD

Ken, LA7AH, is President of the Trondheim (Norway) DX Club which issues the T-100-DX Friends of Trondheim Award. For information on the Award write to P.O. Box 929, N-7001 Trondheim, Norway. Note the WPX, WAZ and CQ DX Award certificates in the background.

As a result of the exploding population of over 340,000 Japanese amateurs, J.A.R.L. has expanded into parts of 3 different buildings and now has between 60 and 70 employees. The main building houses the business offices, a counter for the sale of League publications and facilities for the receipt of outgoing QSL cards. However, the QSL Bureau itself takes up the third floor of a second building a couple of blocks away. A visit to the Bureau, accompanied by Nao, QSL Bureau Manager "Yama", JA1SGU, and League Publicity Director Tak Kaieda, JH1HNH (ex-JA8AOI), was a real experience. The fact that they process over 1,000,000 cards every month is sufficient explanation. Pioneer JA amateur, Tadashi Inamoyo, JA1UM, is still going strong and works half-days at the Bureau.

Our third stop, after a 5 minute walk, was the building which houses the J.A.R.L. amateur radio museum and the modern JA1RL station. A special movie on the 7J1RL DXpedition had been arranged and in the museum we saw the oldest amateur transmitter in Japan, built in 1920 and first used by Mr. Koichi Kasahara, JA1HAM. Koichi is a founding member of J.A.R.L. and held the calls J2GR, J1EZ and J3DD prior to World War II. His transmitter is believed to be the oldest shortwave transmitter still in existence.

Ian, G3TMA, made c.w.-phone WAZ, all-band #4054 from his QTH in Hertfordshire. There are many familiar cards on the wall including VP5WW and W1BB/160 Meters.

It was a great pleasure for us to meet the JA-gang for the first time, particularly Nao, JH1VRQ, who is one of the most active amateurs in the world in the CQ DX Awards program. In addition, as he is Awards and Contest Manager for J.A.R.L. he supervises the checking of QSL cards for Japanese amateurs who wish to apply for CQ DX Awards. Their cards are checked at J.A.R.L. Headquarters so that they do not have to be mailed here. Nao checks 5-10 sets of cards each month, and quickly recited the mailing addresses for Assistant DX Editor Rod Linkous, W7OM, WPX Manager Bob Huntington, K6XP, and former

There are things to chase other than rare countries, like other runners. Sandy Sandowsky, K2PP, does both and recently earned his WAZ Award using a Kenwood TS-520 and Alpha 76C to a 4-element Yagi. He also has the WPX certificate, the USA-CA Award and has worked over 100 countries QRPp with 5 watts.

Assistant DX Editor, Hugh Cassidy, WA6AUD, from memory.

History of Amateur Radio in Japan

Ham Radio has an interesting background in Japan. The first studies began in the early '20s and J.A.R.L. was founded by 37 interested radio buffs in 1926. The Japanese government issued the first private wireless telegraph and telephone station license, JXAX, to Kankichi Kusana, who now signs JA3HAM, on Sept. 10, 1927. Shortly afterward, 8 other stations were authorized with callsigns JXBX to JXIX. The number of stations remained small during the early years and were confined mostly to the major cities. By late 1933, there were 163 stations and 331 in late 1941 when the war between Japan and the U.S. forced a total ban on amateur radio.

After the conclusion of the Peace Treaty, preliminary licenses were granted to 30 amateur stations in July, 1952. Their number increased rapidly, and on March 31, 1975 Japan ranked first in the world in numbers of amateur radio stations with 341,018. An exact 1978 figure is not available at the moment, but undoubtedly is still higher.

Operating from Japan

Unfortunately it isn't possible for a tourist or other casual visitor to operate in Japan. In order to make application, you must be a *resident* alien amateur with an alien registration number. If you meet that stipulation, you can be issued an amateur radio *operator* license, but *not* an amateur radio *station* license. The operator license will allow you to operate a club station in Japan during your residency.

Regarding an examination, if your home country accords amateur radio privileges to Japanese amateurs living in its territory, you need not take an examination. The United States and the Federal Republic of Germany are 2 such countries so W/K and DJ/DL amateurs would not be required to take a test. If your home country doesn't accord privileges to its JA residents, you must pass either the state examination or the classroom training course conducted by J.A.R.L.

If you plan to be a resident, alien amateur in Japan and wish to obtain an operator license, it is suggested that you contact Nao, JH1VRQ, at J.A.R.L. headquarters, P.O. Box 377, Tokyo Central, Tokyo, Japan as far in advance as possible so that he can send you the necessary forms. The following must be submitted to the Ministry through the local radio regulatory bureau which has jurisdiction over the area where you plan to reside:

1. Written application form requesting registration. Must be filed in duplicate and must show alien registration number.
2. Copy of your amateur radio station license from your home country.
3. Document from a U.S. (or other home country) consulate in Japan attesting that the license is valid.

Jet Lag Special!

It's not news to anyone who has flown home from the Far East, that you get a very special jet lag, far worse than from a European trip. With Japan 14 hours ahead of EST on the clock, days and nights are completely reversed. After putting in a full day on Monday, we caught a 5:00 PM jet to L.A., watched the sunset over Tokyo Bay, watched the sunrise over the Pacific and landed in L.A. after a 9 hour flight to discover it was Monday morning again thanks to crossing the international date line. Enroute to

Tampa we saw our 2nd sunset of the day just before landing in New Orleans. A long, interesting Monday.

De Extra

Many DXers have expressed concern over the decision by Dick Baldwin, W1RU; A.R.R.L. General Manager, to overturn the recommendation of the League's DX Advisory Committee to grant new country status to the South Sudan, the Transkei and other possible new entities in southern Africa. It was expressed very well in an editorial in *The Puerto Rican DXer* as follows:

"So, that's it! All those long hours chasing the new African prefixes, and the efforts of the many DXpeditioners who traveled to Africa at great expense to give out a 'new one' to the DX gang, were simply wasted.

"While we appreciate W1RU's concern over any political implications in adding these countries to the DXCC list, we fail to grasp the logic of such a decision. In fact, we believe that by such reasoning we are actually *involving* amateur radio in a political situation by virtue of having to explain the reversal of an otherwise normal procedure.

"In a political struggle—wherever it may be—there will always be opposing sides, and we see no point in basing a decision of such inconsequence as a DXCC listing, on the fear of some 'adverse' reaction from either side involved. We think that, as in the past, if any area of the world undergoes a political change that qualifies it as a new DXCC country it should be approved as such—independent of how the change was achieved. Furthermore, we frankly doubt that a DXCC listing would have any bearing at all on the many *really* important issues at stake in WARC-1979.

"This, of course, is our modest opinion as DXers, but then again, we realize that Mr. Baldwin has a lot more insight on the matter. So . . . so much for that!"

Question Of The Month

An interesting question has been posed by Robert Moore, WA4ZXC, of Melbourne, Florida as follows: "How does a QSL Manager operate? That is, between the DX station and the QSL Manager who pays for what?"

Answer: This varies according to circumstances. In my case, when I operate from a DX QTH during the CQ Contests, I have the cards printed and send them to Leo Haijsman, W4KA, my QSL Manager along with the logs. Leo sends a card to everyone who sends a self-addressed, stamped envelope initially. Than after about 6 months I ask him to make out a card to all the others and send them via the various worldwide QSL Bureaus. After Leo has done this he sends me an accounting of the postage and I promptly send him a check so that he doesn't go in the hole on the deal. I would imagine that most QSL Manager relationships operate along similar lines. However, there are many, many cases involving DX stations who can't afford to print thousands of cards to say nothing of the postage. In those cases, the QSL Manager may, from the goodness of his heart and for the sake of his fellow DXers, pay for the cards and excess postage out of his own pocket. If this is a strain for him he may sometimes ask for a small contribution to defray the expense.

A few years ago I heard an uninformed individual imply at an amateur convention that being a QSL Manager was akin to owning an oil well. If anybody ever tells you that say *BALONEY*! There may be somebody around who claims to have made money being a QSL Manager, but I've never met anyone who did.—K4IIF

The WAZ Program

Single Band WAZ

40 Meter C.W.

5 . . . JA8AJS

20 Meter C.W.

35 . . . DL7AA
36 . . . JA1BWA
37 . . . JH1VRQ
38 . . . WAØKDI

20 Meter Phone

80 . . . W5CB
81 . . . W6RTN
82 . . . VE2AFU
83 . . . WB4TZA
84 . . . I1YG
85 . . . DU1REX
86 . . . KA6GRR
87 . . . W8LU
88 . . . W7XA
89 . . . W9TA
90 . . . N6ND
91 . . . N4CQ
92 . . . N5KC
93 . . . W4DPS
94 . . . W1EED
95 . . . K9HQM

S.S.B. WAZ—All Band

1421 . . . W7ETZ
1422 . . . WA6FIT
1423 . . . JAØAIE
1424 . . . W3US
1425 . . . CT1WB
1426 . . . K2UFM
1427 . . . I2YCF
1428 . . . PY2BU
1429 . . . JA5PUL
1430 . . . K4IEX
1431 . . . VE7VT
1432 . . . N5KC
1433 . . . W1PCD
1434 . . . K9HQM
1435 . . . WB9FLY

C.W.–Phone WAZ–All Band

4189 . . . F6CZU
4190 . . . K7SS/K7JCA
4191 . . . WAØWCR
4192 . . . WØSR
4193 . . . G3EBH
4194 . . . DJ1XT
4195 . . . DJ6QL
4196 . . . SP6AQA
4197 . . . SP8ECV
4198 . . . W5CPI
4199 . . . W4DZZ
4200 . . . I1YRL
4201 . . . K6ELX
4202 . . . I5XIM
4203 . . . W9JI
4204 . . . PAØTO
4205 . . . JR6CWC
4206 . . . N4UF
4207 . . . K9ZZ
4208 . . . N4TI
4209 . . . WØUO

Phone WAZ—All Band

534 . . . N4GE
535 . . . KL7AGU
536 . . . W7WT

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.

Ron McClain, W2VO, of Syracuse, N.Y. made all band WAZ in 2 modes as WA2EJS and recently qualified for certificate #64 on 20 meter, single band phone. The S-Line helps!

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of current countries on the DXCC list as of this listing is 319. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted anytime. Updates indicating "no change" will be accepted.

C.W.

W6PT 319	W6ID 314	W2GT 307	W6ISQ 301	W4BQY 297
K6EC 316	DL7AA 313	W9DWQ 304	K6JG 300	WA8DXA 292
ON4QX 314	W8KPL 310	N6AV 304	N6FX 297	K9MM 289

S.S.B.

W2TP 318	W6EUH 313	SM5CWK 309	VE3GCO 300	W6HUR 286
IØAMU 317	W9JT 313	F2MO 308	W3GG 300	OE3WWB 285
WA2RAU 317	F9RM 312	K6EC 308	I5WT 299	N6FX 284
DL9OH 316	K6YRA 312	K9MM 308	W9OHH 299	K3EH 283
G3FKM 316	SM6CKS 312	OE2EGL 308	WØSD 299	N6AW 283
K2FL 316	W2QK 312	W4DPS 308	N4MM 298	OK1MP 282
W4EEE 315	W6REH 312	WA6AHF 308	HP1JC 296	W7JYX 282
XE1AE 315	I8AA 311	W9KRU 306	W2CNQ 295	WA4WTG 281
W3NKM 314	I8YRK 310	I4ZSQ 305	JH1EIG 294	WAØKDI 281
W6RKP 314	IØZV 310	KH6BB 305	DJ9ZB 293	N2SS 280
W9DWQ 314	K4RTA 310	K6WR 304	K8PYD 292	VE7HP 280
I8KDB 313	W6KTE 310	VE2WY 304	VE7CE 291	W7OM 280
K4MQG 313	W9QLD 310	VE3GMT 303	W6FET 291	W8ILC 280
VE3MJ 313	WA2EOQ 310	K9KLA 301	G3WW 289	W9QQ 280
VE3MR 313	ZL3NS 310	WB6DXU 301	OE1FF 289	K4SB 279
W3AZD 313	K6JG 309	XE1KS 301	SP5BSV 288	K4LSP 275
W4SSU 313	K8DYZ 309	K6XP 300	K1KNQ 286	K8LJQ 275
W6EL 313	SM5SB 309	.....	.....	.....

SSTV

W8YEK 108	G3IAD 100	.....	.....	.....

New DX Club Officers

North Jersey DX Association officers for 1978 are:
President—John Bergio, W2JB
Vice President—George Wright, W2GW
Secretary—Brother Patrick Dowd, W2GK
Treasurer—Charles Moraller, K2CM
(Tks Ed Hopper, W2GT)

Dick Cook, WA4OUF, reports that the 1978 officers for the The Virginia Century Club were installed at a gala banquet in the Sheraton Hotel ballroom in Norfolk. Serving for 1978 are:
President—Victor I. Culver, K4JNM
Vice President—Don McDoniel, N4EA
Sec.-Treasurer—Dick Cook, WA4OUF

Here and There

Congratulations—To long time CQ DX Advisory Committee members John Kanode, N4MM and Gay Milius, W4UG, on their appointments to the A.R.R.L. DX Advisory Committee. Membership on the DX Committees of the two principal DX award programs in the country indicates a rare status in the DX world.

New Call Sign Series—In accordance with sub-section 749 of the Radio Regulations (1976), the prefix block P5A-P9Z has been allocated provisionally to North Korea.

Music Lovers—Hans, SMØBYD, is a music fanatic as well as a DX fanatic. He would like to swap records with interested U.S. amateurs. While his major interest is jazz, folk, country and classical are OK too. Contact Hans at Sturevagen 48A/1, S-19176 Sollentuna, Sweden, Phone 08-754 49 64.

Art Weiss, K8SQE, qualified for 20 meter single band phone WAZ #65 and is putting the finishing touches on his 15 meter award. Art has also attained the WPX S.S.B. Honor Roll.

QSL Information

The new QSL Manager for the Radio Society of Great Britain is E.G. Allen G3DRN, 30 Bodnant Gardens, London SW 20 OUD, England. He replaces Art Milne, G2MI, who held the job for 38 years. Best wishes to Art and XYL Lucy in their retirement.

The following DXers would like to offer their services as QSL Manager for any DX station who may be interested: Duncan Kreamer, W1GAY, Box 637, Vineyard Haven, MA 02568; Robert Moore, WA4ZXC, 2611 Locksley Rd., Melbourne, FL 32935; Larry Smith, Jr., WB9UKE, 1404 Wheatland Rd., Vincennes, IN 47591; Jack Sproat, W4LCL, 4981 SW 94th Terrace, Cooper City, FL 33328 and Leo Haijsman, W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904.

A4XGY—Via P.O. Box 8051, Salala, Oman
AP2AM & AP2AU—To P.O. Box 8925, Karachi, Pakistan
C5ABK—c/o M.R.C., P.O. Box 273, Banjul, The Gambia
C31NE—Via H. Jansen, F6AGJ, 24 Rue de l'Eglise, F-57140 Woippy, France
CEØZE—To Dr. Austin Regal, N4WW, P.O. Box 14882, Orlando, FL 32807.
CEØZM—c/o Bill Poellmitz, K1MM, 44 Sunset Drive, Framingham, MA 01701
CN8CX—Via Gary Yarus, WBØMSZ, 921 N. Clay Ave., Kirkwood, MO 63122
CN8HC—To B. Jacobi, DJ5WU, Kindlasserweg 9, D-8454 Schnaittenbach, W. Germany
DU6RH—c/o D.E. Berger, W7HPI, RFD 2, Box 407, Cornelius, OR 97113
D4CBS—Via P.O. Box 101, Praia, Capo Verde
EL2EC—To G. Densmore, WA4WCG, 2125 Cambridge Drive, Tallahassee, FL 32304
EP2LI—c/o Mike Smedal, P.O. Box 1555, Tehran, Iran
FB8YF—Via C. Jaehn, F6DZL, 6 Rue d'Istambul, F-67000 Strasbourg, France
FM7FC—To W1JFL
FG7BA—c/o P.O. Box 11, Petit Bourg, Guadeloupe, French West Indies
FR7BQ—Via B.P. 1222, St. Denis, Ile de Reunion, Via France
FGØDDB/FS7 & FGØDYL/FS7—To M.L. Bardfield, W1UQ, 16 Addington Rd., Brookline, MA 02146
GJ5BXG—c/o B. Kinzel, DL6PE, Leipziger Ring 22A, D-5042 Erftstadt, Germany
HC5EE—New address is P.O. 665, Cuenca, Ecuador
HP1IB—Via A. Lane, W1SH, 419 East St., Dedhem, MA 02026
IH9JLG—To G. Lipari, IT9JLG, Via S. Pietro 32, I-91000 Trapani, Sicily, Italy
IN3QBR—c/o F. Malago, I3MFH, S. Giovanni Bosco 43, I-38068 Rovereto, Italy
J3AJ—Via John F. Wojtkiewicz, W7LLC, 10316 Aztec Dr., Sun City, AZ 85373
K5CO/5A—To Thomas Meadows, 3417 Statler Drive, Mesquite, TX 75150
KC6GF—c/o P.O. Box 419, Ponape, Eastern Caroline Islands 96941
KM1CC—Via W1GDB/K1VV
M1J—To P.O. Box 15, Republic of San Marino. 47031
N5RM/HB/HBØ/C6A—c/o R.H. Mitchell, N5RM(ex-W9DD), Rt. 1, Box 300A, Allen, TX 75002
OA4BZ—Via T.S. Gray, W1DKB, 10 Flaxview Terrace, Lynn, MA 01904
PY7BXV/Ø—To Fred Souto Maior, PY7AZQ, Rua Almeida Bel 241, Apt. 302, 53.000 Olinda, PE, Brazil
PJ8YL—c/o W1UQ, 16 Addington Rd., Brookline, MA 02146
PS8YL—Via Teresinha V. Nobre, ex-PY8JO, P.O. Box 88, 64200 Parnalba, PI. Brazil

Jerry, N4NO (ex-K4TIG) is the new CQ DX Committeeman from the North Alabama DX Club in Huntsville. Jerry uses Drake and Heath equipment to a Mosley beam at 90 feet. He is 34 and a Radar Engineer at Teledyne Brown.

The CQ WPX Program
CQ WPX Award of Excellence:

N4NO

CQ WPX Award of Excellence to date: W4CRW, K6JG, W4WSF, WA5VDH, W6TCQ, WA2EAH, VE3GCO, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO.

Mixed

626 . . . SQ5Z
628 . . . N4NO
630 . . . WB2GFE
632 . . . OE2BZL
627 . . . HM2JN
629 . . . W4CZU
631 . . . I7LMR

S.S.B.

1017 . . . N4NO
1019 . . . F6DJN
1021 . . . JA7BJO
1018 . . . I2MPQ
1020 . . . N4CQ
1022 . . . OE2BZL

C.W.

1666 . . . SP2HGG
1668 . . . JA2AJA
1667 . . . N4NO

Endorsements

Mixed: 400 HM2JN, WB2GFE, 17LMR, OE2BZL. 450 SQ5Z, GM4DKO. 500 W4CZU. 550 WB4RUA. 600 YU1NFR. 650 VE7IG. 700 DK5AD, VE3DMC. 800 JH1VRQ. 900 YU1ODS. 1000 SP9AI, N4NO. 1100 DL7AA. 1300 K2VV. 1400 W4BQY. 1500 YU2DX.
SSB: 300 OE2BZL, I2MPQ, F6DJN. 350 JA7BJO. 400 GW3SB. 450 ISØMVE, K9HDZ, WA4QMQ. 500 N4NO, DL9XW, N4CQ, PY4OD. 650 JH1VRQ. 700 YU1ODS. 750 CT1UA. 1450 IØAMU.
CW: 450 SP1ADM, SP6FER, OK3IF. 600 W9MCJ. 700 WB4KZG, YU1ODS. 800 K4RDU. 900 N4NO. 950 DL7AA, W4VQ.
10 meters: N4NO
15 meters: N4NO
20 meters: N4NO, GW3SB
40 meters: N4NO, VE7IG
80 meters: N4NO, OE2BZL
Africa: N4NO, W4BQY, JH1VRQ
Asia: N4NO, W4BQY, JA7BJO, JR1TNE
Europe: SQ5Z, N4NO, W4BQY, JA7BJO, JR1TNE, OE2BZL
No. Am.: N4NO, W4BQY, JA2IU
Oceania: N4NO, W4BQY
So. Am.: N4NO, W4BQY

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.

TA2SA—To S. Arkat, DJØZG, Krummestr. 60, D-1000 Berlin 12, Germany
TU2GO—c/o Richard P. Cook, 3900 Regal Court, Virginia Beach, VA 23452
VE6BAB/SU—Via V.J. Williams, VE7UZ, R.R. 3, Armstrong, British Columbia VOE 1BO Canada
VP8JC—To P.O. Box 104, Port Stanley, Falkland Islands
VP9II—c/o P.O. Box 463, Hamilton, Bermuda
VR1AV (Gilbert Islands)—Via S. Wachi, JE1ZNT, 2-7-14 Shakubii-dai, Nerima-ku, Tokyo. 177 Japan
VU2OF—To R. Schoeneberger, DL8DF, Graacher Weg 10, D-6600 Saarbruecken, Germany
XE1VOZ—New address is Enrique Rodriguez Llouera, P.O. Box 11-636, Mexico 11, D.F., Mexico

(Continued on page 89)

The CQ DX Awards Program

S.S.B.

540 . . . I6PLN
541 . . . W9SS

C.W.

299 . . . YU5XSX
300 . . . KP4CW

S.S.B. Endorsements

310 . . . WA2EOQ
300 . . . K6WR
275 . . . W7JYX
275 . . . W7OM
250 . . . I6PLN
150 . . . I6PLN
150 . . . KG6SW
250 . . . K9RF
200 . . . I6PLN
200 . . . K9RF
200 . . . KG6SW
150 . . . DJ9UI
150 . . . K9RF

C.W. Endorsements

150 . . . W7OM

Complete rules and application forms for the CQ DX Awards Program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S.W., Seattle, Washington 98136 U.S.A.

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The May, "Story of The Month", as told by Jack is:

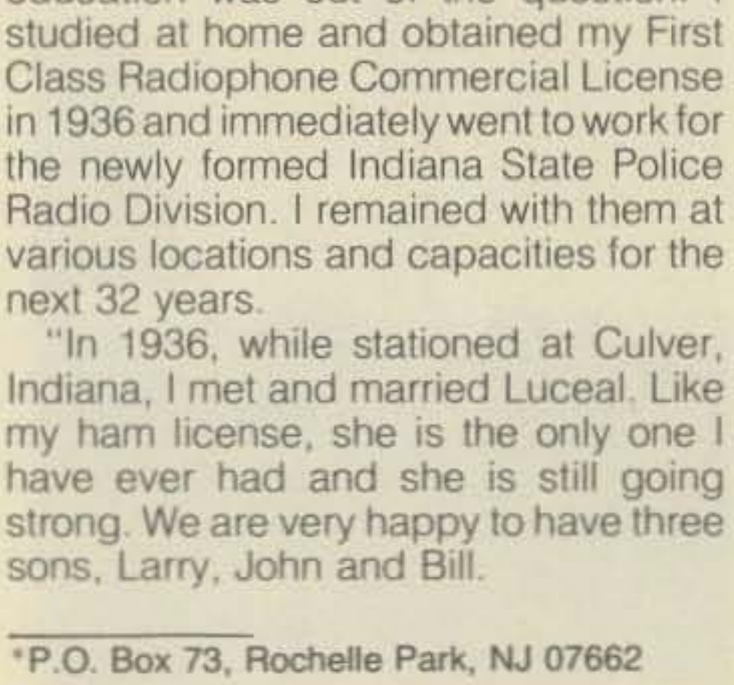
Jack Prichard, W9CNG
All Counties #174, 8-20-77

"Born in Vincennes, Indiana in 1913, I received my ham license from the old Federal Radio Commission, at age 15 in 1928, with the call W9CNG. This is the only call I ever had and I have been fairly active ever since, except for the war years.

"I graduated from high school in 1931, but due to the big depression, further education was out of the question. I studied at home and obtained my First Class Radiophone Commercial License in 1936 and immediately went to work for the newly formed Indiana State Police Radio Division. I remained with them at various locations and capacities for the next 32 years.

"In 1936, while stationed at Culver, Indiana, I met and married Luceal. Like my ham license, she is the only one I have ever had and she is still going strong. We are very happy to have three sons, Larry, John and Bill.

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



Jack Prichard, W9CNG and son Larry, W9SUQ.

USA-CA Honor Roll

3000		1500		500	
WA2WCW	198	W4SSU	347	K7PJO	1212
WB6EGQ	199	W4OWY	348	K8IU	1213
2500		WB6EGQ	349	WB6EGQ	1214
WB6EGQ	254	1000		WB5RPU	1215
2000		WB6EGQ	467	WA5VKJ	1216
W4OWY	296			WB5PGC	1217
WB6EGQ	297				

Skopje 1963 Award of YU5 land.

"Larry obtained his novice license, WN9SUQ, when he was 16. However, due to high school, college, and a new job with the Indiana State Police, the license expired. A number of years later, while doing his military duty, he tried for his General Class License and was issued the same call, W9SUQ.

"John is making a career of the U.S. Airforce and is presently stationed at the McDill AFB in Florida.

"My youngest son, Bill, is teaching Industrial Arts and farming at Scottsburg, Indiana high school. John and Bill are not hams but have shown a great interest in Larry's and my ham activities.

"After leaving the Indiana State Police in 1968, I went to work as a purchasing agent and material clerk for the local rural electric co-op for eight years. I retired a little over a year ago.

"It was about nine years ago that I became interested in County Hunting, and like others I was disappointed to find that after so many years of hamming I had confirmations from only 600 Counties. I worked at it, on and off, for the past 9 years and attended all but one of the conventions. One of my most memorable events was giving Vic, WØGYM his last County for ALL COUNTIES #6 in 1968. I have operated mobile from Arizona to Maine and Minnesota to Florida.

"The biggest thrill, of course, was when my son Larry, W9SUQ, made a special 1000 mile round trip to Hardy County, West Virginia to give me my last one from atop a fog shrouded mountain at 7AM August 15, 1977. I wonder if this is not the first time that a County Hunter's son has made a special trip to give Dad the last one?

"My other hobbies are my family and photography.

Special Honor Roll
All Counties

#178 Thomas B. Finney, WB6EGQ 1-21-78.
#179 Robert C. McCarthy, WA1UVX 1-23-78.

"Many thanks to all the fine Net Controls, Mobiles, and all other fine County Hunters".

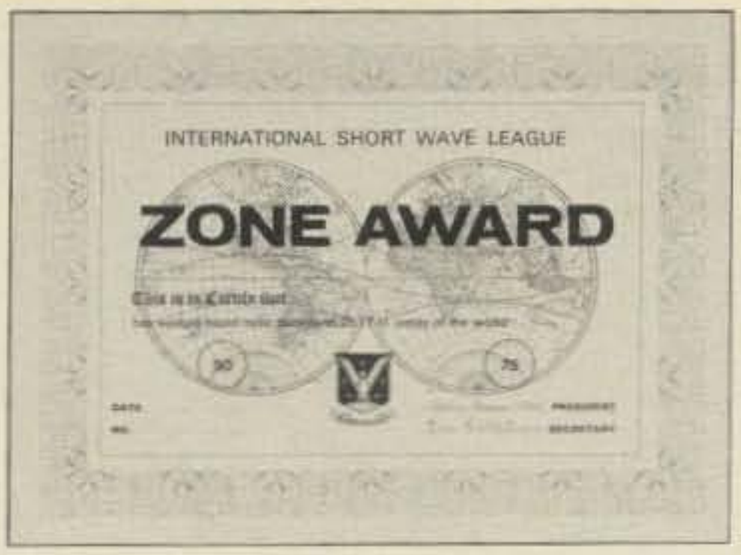
Awards Issued

Tom Finney, WB6EGQ waited until he had them *ALL* and then received USA-CA-500 and 1000, endorsed, All SSB, All 14, All Mobiles. The rest through *All*, endorsed, Mixed.

Bob McCarthy, WA1UVX also received them *All*, endorsed, Mixed.

Howard Gifford, WA2WCW made USA-CA-3000.

Mat, CT1TZ; Ad, CT1RM; Miro, CT1UA and Julio, CT1ZW.



ISWL Zone Award.

Bob Fuss, W4OWY (ex W2HIH), sent for USA-CA-1500 and 2000, endorsed All SSB, All Mobiles.

Curt George, W4SSU was issued USA-CA-1500, 2000, and 2500, all endorsed All SSB, All Mobiles.

Orville Otis, K8IU/K8IUF collected USA-CA-500 endorsed All CW.

USA-CA-500 Certificates, endorsed, Mixed, went to:

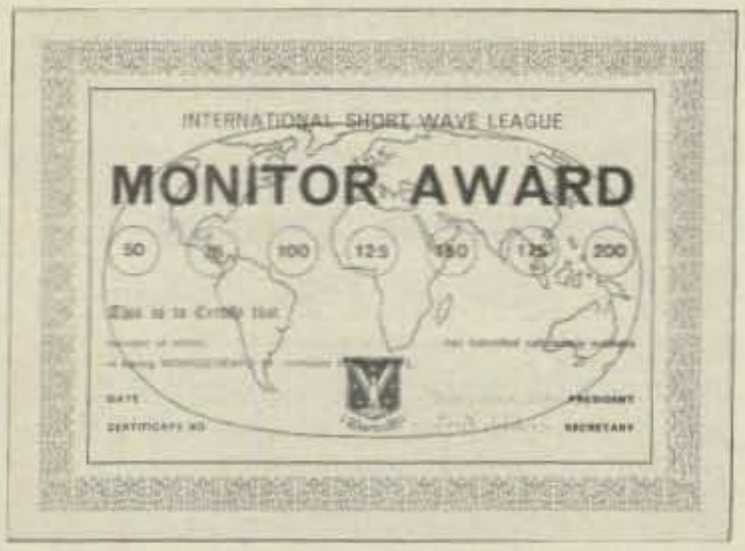
Larrie Tennant, K7PJO.
Peter Theer, WB5RPU.
Richard Harris, WA5VKJ/WB5YEF.
Sam R. Hill, WB5PGC.

8X8X8 Award of DX Club of Puerto Rico.

Awards

8X8X8 Award: The DX Club of Puerto Rico has been re-organized and is very active again. The original DX Club was founded in the early 60s by KP4ARK and a group of DX-minded KP4s, and remained active in the DX scene for about a decade, The Club has started reissuing this 8X8X8 Award for confirmed contacts with 8-KP4 stations and 8 countries in the CQ Zone 8. Applications may

(Continued on page 89)



ISWL Monitor Award.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

According to the Swiss Federal Solar Observatory in Zurich, January 1978 was an extremely variable month for sunspot activity. A daily low of 7 was observed on the 20th, on the other hand the count soared to a daily high of 118 on the 31st. The average for the month was 49. This results in a *smoothed sunspot number*, upon which the solar cycle is based, of 28, centered on July 1977. A smoothed sunspot number of approximately 50 is forecast for May 1978, as the present sunspot cycle continues to increase at a relatively slow rate.

The present cycle, which began in March 1976 with a smoothed sunspot number of 12, is an extremely slow rising cycle. This could well be an indication that this will be an exceptionally low cycle, as has already been predicted by some solar experts.

During May, optimum frequencies for DX propagation should be somewhat *lower* during most of the daylight hours, but *higher* during the late afternoon, early evening and nighttime hours, than were observed during the winter and early spring months. A considerable increase is expected in sporadic-E ionization during the month, and this should result in more frequent short-skip openings on the h.f. bands, and on 6 and possibly 2 meters as well. A seasonal *increase* in the static level is also normal for May.

The following is a thumb-nail picture of h.f. amateur band openings expected during May, 1978. For specific times of DX openings, refer to the *DX Propagation Charts* which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* valid for both May and June, as well as Charts centered on Alaska and Hawaii. The Short-Skip Charts contain propagation forecasts for openings varying in distance between 50 and 2,300 miles. For day-to-day variations expected in propagation conditions during May, see the "Last Minute Forecast", which appears at the beginning of this column.

10 Meters: Some daytime openings, mainly towards southern and tropical areas, should still be possible during May. The best time to check for DX openings should be the afternoon hours. Expect a considerable increase in short-skip openings between distances of approximately 750 and 1,400 miles. Some occasional multi-hop sporadic-E openings up to 2,800 miles, and sometimes beyond, may also be possible.

15 Meters: A seasonal decrease in DX openings on this band is normal for May, but some fairly good openings to many parts of the world still should be possible during the daylight hours. The afternoon hours are expected to be the best for DX possibilities. Numerous short-skip openings, between approximately 600 and 2,300 miles, should be possible daily.

20 Meters: This should be the best all around DX band during May. Opening shortly after sunrise, good DX conditions can be expected to one area of the world or another through most of the daylight hours, and well into the hours of darkness. The band should remain open for DX to southern and tropical regions well past Midnight. Peak conditions are expected during the late afternoon and early evening, when signal levels should be exceptionally strong to most areas of the world. Expect excellent short-skip openings, often with exceptionally strong signal levels, between distances of approximately 350 and 2,300 miles. Quite often, particularly during the late afternoon, optimum conditions will exist from both short and long skip, and stations a few hundred miles away will be heard at the same time as DX stations from several thousand miles away, causing considerable QRM.

40 Meters: Fewer DX openings are expected because of the shorter hours of darkness and the higher level of static expected during May, but some good openings to most areas of the world still should be possible during the hours of darkness and the sunset and sunrise periods. Good daytime short-skip openings can be expected over distances between approximately 150 and 750 miles, with nighttime openings extending up to the one-hop short-skip limit of 2,300 miles.

80 Meters: Fewer hours of daylight and higher static levels are also expected to reduce DX openings on this band, but some fairly good ones are likely to many areas of the world during the hours of darkness. Excellent short-skip openings are expected during the daylight hours, ranging between 50 and 250 miles. During the hours of darkness, short-skip openings should increase up to approximately 2,300 miles.

160 Meters: Nighttime propagation conditions on this band have passed their seasonal peak, and should decline until early fall. Openings up to about 1,200 miles should be possible regularly during the hours of darkness this month. An occasional opening well beyond this range is likely when static levels are low. No daytime skip openings are expected on this band because of solar absorption.

V.h.f. Ionospheric Openings

May is generally a good month for ionospheric openings on the v.h.f. bands resulting from sporadic-E propagation, meteors, trans-equatorial propagation (TE) and auroral activity.

Sporadic-E ionization increases considerably during May, and some fairly

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For May, 1978

Propagation Index	*Expected Signal Quality* (4)	(3)	(2)	(1)
Day				
Above Normal: 3, 16, 25	A	A	B	C
High Normal: 2, 4, 9, 11-12, 17, 24, 29-30	A	B	C	C-D
Low Normal: 1, 8, 10, 13, 15, 20-23, 26, 28	B	C	D	D-E
Below Normal: 5, 7, 14, 18-19, 27, 31	C	D	D-E	E
Disturbed: 6	C-E	D-E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

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

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD. 20902.

*11307 Clara St., Silver Spring, MD 20902

frequent *6* meter short-skip openings should be possible. These are most likely to occur over distances between approximately 1000 and 1400 miles. Although sporadic-E openings can happen at any time of the day or night, the best time to check is between 10 a.m. and 2 p.m., and again between 6 and 10 p.m., local daylight time.

During periods of intense and widespread sporadic-E ionization, two-hop openings considerably beyond 1,400 miles should be possible on *6* meters, and short-skip openings between approximately 1,200 and 1,400 miles may also be possible on *2* meters.

During the past two summers, when sporadic-E ionization was widespread, occasional multi-hop openings on *10* meters, between the east coast of North America and Europe took place. Such openings may again be possible this year.

Some *6* meter, and perhaps *2* meter, trans-equatorial (TE) scatter openings should be possible during May. They are most likely to occur between 9 and 11 p.m., local daylight time, on long north-south paths which cross the geomagnetic equator at approximately a right angle. TE openings favor locations in the southern third of the USA, but from time-to-time openings further north may be possible.

The *Eta Aquarids* meteor shower should intersect the earth's atmosphere between May 4 and 6. This should be a major shower, reaching maximum intensity during May 5, with an average of 20 meteors an hour. Chances are good for meteor burst short-skip openings during the three day period of this shower.

Some auroral activity may be possible during May, resulting in short-skip auroral-scatter type openings on v.h.f. Such activity is most likely to occur during periods of ionospheric storminess. Check the "Last Minute Forecast" at the beginning of this column for those days that are likely to be BELOW NORMAL or DISTURBED during May.

CQ Short-Skip Propagation Chart
May & June, 1978
Local Daylight Savings Time
At Path Mid-Point.

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

(Continued on page 90)

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

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

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

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

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

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

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

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

In the CQ 160 meter Contest last January I had the misfortune of losing my antenna a day before the contest, so I was unable to participate. A very disappointing turn of events as I was looking forward to an interesting week-end.

I did do a lot of listening however, using my 40/80 dipole, and was more frustrated when I found conditions to be very good.

I did manage a few contacts with a hookup that indicated a s.w.r. in which the reflected power was almost equal to the forward gain. Practically all the reports received were 599, even though I had to make many calls and repeats for a contact.

That seems to be the pattern in contest operating, everybody is 599. It would seem to me that a more realistic report would be proper. It would at least set the pattern for your return message.

While monitoring the band I did make a few observations. First, I noted a few eager beavers jumped the gun and were exchanging numbers before the 2200 starting time. There also seemed to be more than the usual number of stateside and VE stations messing up the "DX Window", not to mention the usual uncooperative phone stations.

*14 Sherwood Rd., Stamford, Conn. 06905

Just in case you have not seen it, this stamp was issued to commemorate 50 years of amateur radio in Japan. This block was sent to me by Hiro, JA1PCY who also has a "Contest Calendar" in Japan's CQ Magazine.

Calendar of Events

May	6-8	Vermont QSO Party
May	6-8	Georgia QSO Party
May	13-14	USSR "CQ-M" Contest
May	13-14	Massachusetts QSO Party
May	19-21	YL SSBers QSO Party
May	20-22	Kansas QSO Party
June	2-5	CHC/FHC/HTH QSO Party
June	3	SMIRK QSO Party
June	17-18	West Virginia QSO Party
July	1-2	SEVEN Land QSO Party
July	15-16	VHF Space Net Contest
Aug.	19-20	S.A.R.T.G. RTTY Contest
Sept.	23-24	Delta QSO Party

We can't do much about the phone QRM, not as long as the FCC permits both modes in the same frequency spectrum on 160. As for those participating in the contest, we have a disqualification clause. Perhaps it's time we make more use of it, and penalize the few who take unfair advantage of the 99% who observe written and unwritten rules.

73 for now, Frank, W1WY

Vermont QSO Party

Starts: 2100 GMT Saturday, May 6
Ends: 0100 GMT Monday, May 8

Sponsored by the Central Vermont ARC, this activity offers a good opportunity to work this comparatively rare state. The same station may be worked on each band and mode for QSO and multiplier credit, and mobiles in each county change.

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

Scoring: Vermont stations score 1 point for each contact and multiply total by number of ARRL sections and countries worked. All others score 3 points for each Vermont station worked and multiply total by sum of Vermont counties worked *on each band.* (14 per band possible)

Frequencies: 3565, 3909, 3932, 7065, 7290, 14065, 14325, 21065, 21375, 28160, 28600, 50260, 50360, 144-144.5, 145.8 (Try c.w. on odd hours, phone on even hours GMT)

Awards: Certificates to the top scoring station in each ARRL section, DX country, and 2nd, 3rd and 4th places in Vermont. (minimum of 3 QSOs) Also multi-operator and mobile stations operating in Vermont. There are Trophies for the top scoring single operator station in Vermont and out-of-state.

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

Mailing deadline is June 15th to: Peter Kragh, W1AYK/K2UPD, 170 Summit Ave., Ramsey, N.J. 07446. Include a s.a.s.e. with your entry.

Georgia QSO Party

Starts: 2000 GMT Saturday, May 6
Ends: 0200 GMT Monday, May 8

This is the 17th annual party sponsored by the Columbus ARC. The same station may be worked on each band and mode, and Georgia mobiles in each county change. (Oscar counts as one band)

Exchange: QSO no. RS(T) and QTH. County for GA., state, province or country for others. Ga. to Ga. contacts permitted. Repeater QSOs however are not permitted, except via Oscar.

Scoring: Each QSO counts 2 points. Ga. stations multiply total by number of different states and VE provinces worked. Out-of-state stations use Ga. counties for their multiplier. (max. of 159) DX may be worked for QSO points but have no multiplier value.

Frequencies: C.W. — 1805, 3590, 7060, 14060, 21060, 28060. SSB - 3900, 3975, 7245, 14290, 21360, 28600. Novice — 3718, 7125, 21110, 28110. Try 160 at 0300, 10 on the hour and 15 on the half hour during daylight hours.

Awards: Certificates to the highest scorer in each state, province, DX country and Georgia county. Also 2nd and 3rd place awards, where warranted, and to Novices both in and out-of-state. There are Plaques for the top single and multi-operator Ga. station, top out-of-state, and top Ga. mobile and portable operating outside own county.

Your log should show date and time in GMT, exchange sent and received, band, mode and a column for the multiplier. A summary sheet with the scoring and the usual signed declaration is also requested. Include a check list if you have a high QSO total. Novices should clearly indicate same in their call and on their log.

Mail by June 5th to: Columbus A.R.C., c/o Jeanne J. Hunting, K4RHU, 2701 Peabody Avenue, Columbus, Georgia 31904. Include a large s.a.s.e. (24¢ postage) if a copy of results are desired.

USSR "CQ - M" Contest

Starts: 2100 GMT Saturday, May 13
Ends: 2100 GMT Sunday, May 14

Official announcement had not been received at the time of this writing. However, we did receive the following from a reliable source (UK9AAN).

Rules are the same as in previous years, with one important modification. This year the USSR boys will not be working each other, but will concentrate their efforts in working out of country DX, which should make it a lot more interesting.

It's still a world wide contest. Contacts may be made on c.w. or s.s.b., 3.5 thru 28 MHz. The same station may be worked on each band but on c.w. or s.s.b., not both modes, for QSO and multiplier credit.

Categories: There are four classes. Single operator (a) single band, (b) all band. (c) multi-operator single transmitter, all band, and (d) s.w.l.

Exchange: RS(T) plus a 3 figure QSO number. The USSR boys RS(T) plus the number of their region. (Oblast)

Points: Contacts between stations on the same continent 1 point, between different continents 3 points. Own country may be worked for multiplier credit but no QSO points.

Multiplier: Is determined by the number of countries worked on *each band*. The USSR "R-150-S" list is the standard, which essentially is the same as the DXCC plus a few additional regions.

Final Score: Total QSO points from all bands times the country/region multiplier from each band.

The s.w.l.'s get 1 point for reporting one station exchange, 3 points if both stations and their exchange is reported. There is no multiplier.

Awards: Certificates and badges in each category to the Top scorers in each continent, and in each country. A special badge to all participants who contact 10 or more Soviet stations.

Contest contacts may be credited for the many USSR awards in lieu of QSL cards if the request is made with your log. (R-150-S, R-100-O, W-100-U, R-15-R, R-10-R, R-6-K)

All entries must be postmarked no

later than July 1st and sent to: Krenkel Central Radio Club, "CQ - M" Contest Committee, P.O. Box 88, Moscow, USSR.

Massachusetts QSO Party

Starts: 1200 GMT Saturday, May 13
Ends: 2200 GMT Sunday, May 14

This year's party is being run by a trio of Mass. amateurs, K1KJT, N1AS, W1FJI.

The same station may be worked once on each band. Phone and c.w. are considered as separate bands. No cross-band or repeater contacts permitted. Mass. stations may work each other for QSO points and county multiplier.

Exchange: RS(T) and QTH. County for Mass., ARRL section for others.

Scoring: Two points for each completed QSO. Mass. stations multiply total QSO points by (Mass. counties + ARRL sections) worked. Out-of-state stations multiply total QSO points by different Mass. counties worked. (max. of 14) DX contacts count for QSO points only, no multiplier.

Frequencies: C.W. — 1810, 3560, 7060, 14060, 21060, 28060. Phone — 1820, 3960, 7260, 14290, 21390, 28590, 50.110, 146.52. Novice & Techs. - 3720, 7120, 21120, 28120.

Awards: Appropriate awards to top scorers both in Mass. and out-of-state. Also for Novice and Techs. operating on c.w. in the Novice bands.

The Novice and Tech class is a new feature that has been added this year, in which they will be competing against each other. Operation, of course, is on c.w. Novice should identify their call by signing /N and Techs. /T.

Logs with a summary sheet and a large s.a.s.e. for awards and copy of results go to: Art Marshall, W1FJI, 60 Meadow Road, Westport, Mass. 02790. Mailing deadline is June 30th.

YL SSBers QSO Party

Starts: 0001 GMT Saturday, May 20
Ends: 2359 GMT Sunday, May 21
C.W. Only: 1800–2400 Fri. May 19

Rules are rather lengthy and I suggest you write to W6ANB for a more detailed explanation. Essentially they are as follows:

Stations may be contacted on both phone and c.w. on each band for QSO points. However note that there is a 6 hour *c.w. only* period before the contest for this year's party. You are also required to take a 6 hour rest period for each 24 hours of the contest period.

Categories: DX/WK Teams, YL/OM Teams, and Single Operator. (non-members use latter)

Exchange: RS(T), state or country, name, SSBer number, and partner's call if any.

Points: Two points for each member contacted on the same continent, 4 points if on a different continent. Non-member QSOs are 1 point regardless of location. Double above points if contacts are on c.w.

Multiplier: A multiplier of 1 for each of the following: (1) Each state worked, (2) each country, (3) each continent on each band, (4) each YL/OM team if both members are worked, (5) if DX/WK team if both members are worked, (6) if DX/WK partners work each other. Only member contacts count as a multiplier, and all except (3) are counted once only. (*Gets a bit complicated doesn't it? Ed.*)

Bonus points: Add 500 points to your final score for each set of 5 DX stations worked outside own continent. Same DX station may be used once only.

Frequencies: C.W. — 3565, 7070, 14070, 21070, 28070. Phone - 3925, 7290, 14333, 21373, 28673. DX on 3765, 7090. And VK on 3690 on s.s.b.

Awards: Certificates to the Top scorers in each state and country. Plaques to the winning DX/WK and YL/OM teams, and single operator member.

Logs: Must show date/time in GMT, RS(T), SSBer number, partner's call, mode, band and rest periods. And a summer sheet with scoring and essential information.

YL/OM teams must be related members of the same family. DX/WK team assignments must be cleared before May 18th. Write to: Pete Billon, K6JG, 4040 Via Opata, Palos Verdes Estates, CA 90274 for assignments.

Logs go to: Larry Miller, W6ANB, 224 15th Street, Santa Monica, CA 90402. Mailing deadline is June 19th, to be received no later than July 10th.

Kansas QSO Party

Starts: 2000 GMT Saturday, May 20
Ends: 0200 GMT Monday, May 22

The Central Kansas ARC is picking up the tab and send the results to all entries. No s.a.s.e. required.

The same station may be worked on each band and mode for contact credit.

Exchange: RS(T) and QTH. County for Kansas, state province or country for others.

Scoring: Kansas station multiply total QSOs by the number of states, VE provinces and DX countries worked. All others multiply total Kansas contacts by the number of Kansas counties worked. (max. of 105)

Frequencies: C.W. — 55 kHz up from bottom of each band. Phone — 25 kHz above the Advanced/General dividing line. Novice — 3915, 7055, 28120.

Awards: To the Top scorers in each state, VE province and DX country. There are awards for the leading Kansas stations and special recognition will be given to portables operating from rare counties.

Include a check list with logs with 100 or more contacts. Mail within a reasonable time to:

Robert Davis, KØFPC, 1857 South 4th, Salina, Kansas 67401.

IARS/CHC/FHC/HTH QSO Party

Starts: 2200 GMT Friday, June 2
Ends: 0600 GMT Monday, June 5

The IARS sponsors two annual combined CW/SSB Contests the first FULL week-end in June and November each year. It is mandatory that standard rules are followed. A s.a.s.e. to K6BX will get you detailed information. Following are rules in brief.

Exchange: QSO no., RS(T), name, CHC/FHC no., state, county or similar division. Non-members send HTH instead of membership number.

Scoring: *For CHC* — 1 point per QSO with other CHCers, 2 points if its a HTHer, 1 additional point if its a YL, B/P, FHC, Novice, CHC-200, Merit or Club station. Or if QSO is on vhf/uhf. Double above points if QSO is out of own country.

For HTH — Contacts with other HTHers 1 point, with CHCers 3 points. Rest same as above. S.w.l. use same scoring system as HTHers.

Multiplier: Each continent, country, ITU zone and U.S. state. (Counted once only)

Final score: Total QSO points from all bands times the sum of the multiplier. Multi-operator stations divide score by number of operators. The same station may be worked on each band and mode for QSO points but not as a multiplier.

Frequencies: C.W. — 3575, 3710, 7070, 7125, 14075, 21075, 21090, 21140, 28090, 28125. Phone — 3770, 3790, 3943, 3960, 7090, 7210, 7275, 14320, 14340, 21360, 21440, 28620, 28690. And 50.1-50.5, 145-147. For U.S. and DX as allowed.

The party sponsors hundreds of certificates and trophies in all categories and divisions. A s.a.s.e. will get you a list, include extra postage for ITU, IARU, IARC, IARS country, prefix and zone list.

Send all requests and your log to: International Amateur Radio Society, K6BX, P.O. Box 385, Bonita, Calif. 92002.

RTTY *(from page 21)*

of a line). It can make a bell ring when someone sends your call letters (but not somebody else's) and a host of other things.

It may come with an auto-stop tape reader, i.e., when the last character on a tape is read, the reader shuts itself off automatically.

It can receive a message (print it out) while you simultaneously prepare a tape.

The 28ASR is a *primo* machine.

A much more detailed description of all machines' operation and maintenance is handsomely presented in some of the books in the appended bibliography. A ten or fifteen dollar

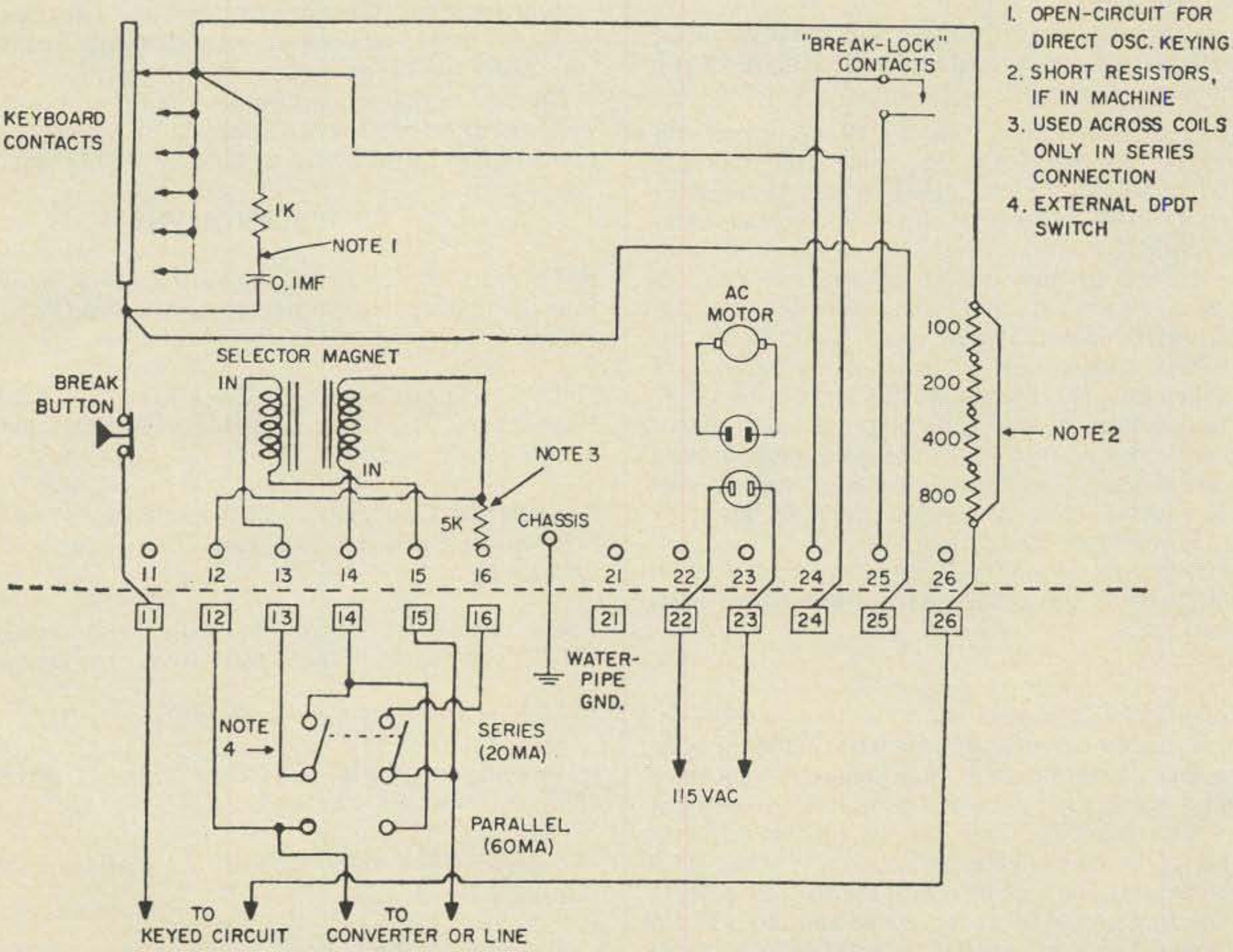


Fig. 10 – Circuit diagram of the Model 26.

investment in some of these volumes at this time will pay invaluable dividends in the future.

I would like to answer some of the questions I have received as a result of this series. It is almost certain that some of you are asking the same questions.

Q: I have an opportunity to buy a Model 19, complete with reperf and TD, for $200. Do you think that this is a reasonable price for the machine? It was completely overhauled and the owner is willing to throw in an extra number of parts.

A: It is very difficult to give advice on the purchase of (somebody else's) equipment, particulary through the mail. Used mechanical RTTY gear (such as the Model 19) and associated pieces can be found of every state of repair and disrepair, in price ranges that boggle the mind. As with the purchase of any piece of gear I suggest that you shop around a bit (possibly through the ads in ham journals) and talk up your idea over the air. In that way you can satisfy yourself as to whether a particular piece of equipment is worth the investment.

You also might get acquainted with a local amateur who is interested in RTTY and get some first-hand advice from him (or her).

Q: Is the "X"-brand receiver good for RTTY?

A: The reception of RTTY signals is a rather touchy process. It requires a very stable receiver which has rather special bandpass filter characteristics. In addition, it must have special b.f.o. injection frequency properties. The input bandpass filter must be quite narrow (in the order of 400-500 Hz for narrow, 170 Hz; reception and about 1000 Hz for wide, 850 Hz, reception). Furthermore, the center of the filter bandpass must be at the center frequency of the two RTTY tones. I suggest you look at the specifications of your receiver to see if it meets these requirements.

Q: Mechanical RTTY is too noisy for me. What about using video RTTY?

A: I am more than familiar with the noise generated by old mechanical teleprinters. Silent video RTTY is, indeed, the answer. But, it is expensive (a cheap set-up can cost in the order of $800) and it requires an experienced hand in putting it together and in maintaining it. Of course, they can be built for much less via home-brewing, but that would be a project to be undertaken by only the most knowledgable amateurs.

Q: How can I get a list of RTTY frequencies used by the various news and wire press services?

A: There is a very good booklet in print which lists not only commercial RTTY frequencies but also the language in which the copy is sent, the GMT of transmission, the speed and shift of transmission, the call letters of the station and the station's location. In addition, the book lists vital information for copying literally thousands of other stations on c.w., voice, fax, etc. The name of the booklet is *Confidential Frequency List*. The author is Robert B. Grove. It is published by Gilfer Associates, Inc., 52 Park Avenue, Park Ridge, NJ 07656. It costs $5.45.

Q: Do commercial stations use FSK or AFSK transmissions?

A: Commercial stations use both FSK and AFSK. However, on the receiving end it makes no difference which method is used. The receiver is electronically ignorant of any distinction.

Q: Must I have different demodulators to receive FSK and AFSK?

A: FSK and AFSK sound the same to all demodulators, i.e., one demodulator will be effective at receiving both. The distinction between the two shift methods is made at the transmitter. As long as the receiver is tuned to issue the proper mark and space tones, the demodulator couldn't care less if the signal was sent via FSK or AFSK.

If you have any questions whose answer evades you, let me know. If I don't know the answer, I'll try my best to find it for you. SASE will be appreciated.

The next installment will consider the theory and practice of generating frequency shift signals. It will include a simple construction project for a frequency shift keyer. ■

BIBLIOGRAPHY

RTTY From A TO Z by Durward Tucker, W5VU. Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

The New RTTY Handbook by Byron Kretzman, W2JTP. Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

Specialized Communications Techniques for the Radio Amateur by the American Radio Relay League, Newington, CT. 06111.

Teleprinter Handbook by The Radio Society of Great Britain (RSGB). Available through *Ham Radio* Magazine.

Beginners RTTY Handbook. Published by *RTTY Journal*.

RTTY Handbook by Wayne Green, W2NSD. Tab Books, Blue Ridge Summit, PA 17214.

The New! RTTY Handbook by *73* Magazine Staff, Peterborough, NH 03458.

In addition, there have been countless articles in the amateur radio journals throughout the years.

Microphones *(from page 47)*

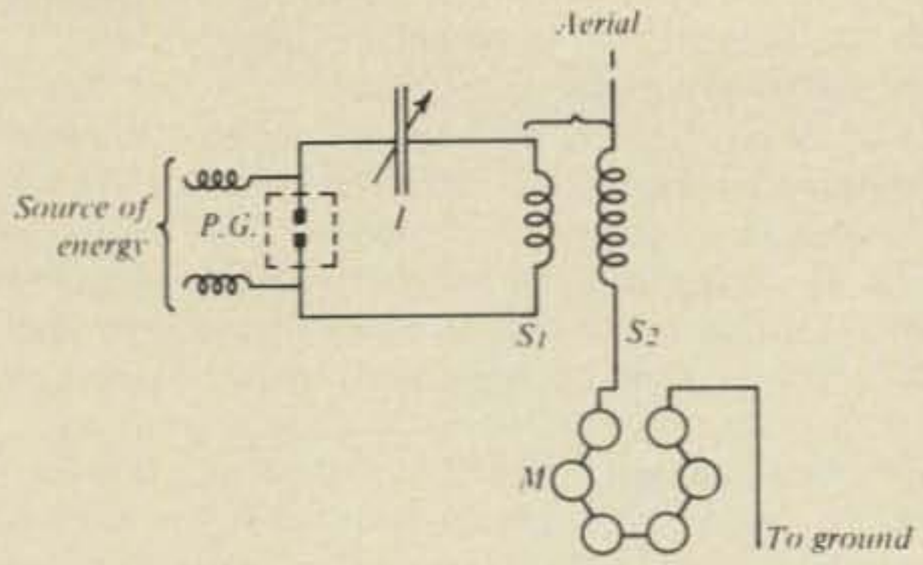


Fig. 8—A variation of fig. 7 using a matching transformer.

in parallel, all connected by brass tubing to a megaphone carefully arranged so that the tubes were of equal length to avoid "phase difference!" This is shown in fig. 10.

If you think you have problems with your VOX, imagine the trouble you would have had with the VOX system patented by Lee de Forest (British Patent 100,841, issued July 7, 1915). He described it as "an automatic switching device for use in connection with radio telephone systems."[4]

A compression wave from the voice pushed mercury up into a closed manometer which then closed a relay "S" through a local battery "B". Leaf "3" of the relay arm

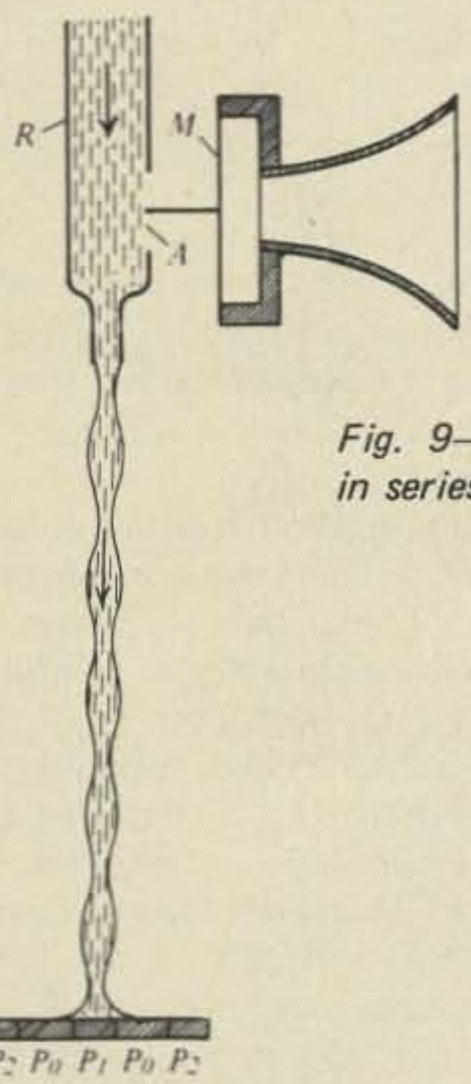


Fig. 9—Several microphones were used in series to attain high current capacity.

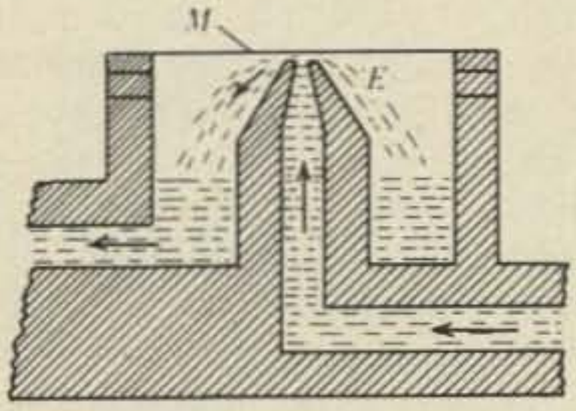


Fig. 10—Acoustic tubes were carefully measured to prevent phase difference at the carbon buttons.

[4]"Thermionic Tubes in Radio Telegraphy and Telephony," *Wireless World*, Iliff & Sons, Ltd., London, April, 1921, p. 401.

[5]*Ibid.*, p. 401.

controlled the starting and stopping of the r.f. oscillator whereas leaf "2" served to place the microphone in series with the antenna lead.

Note that lungpower actuated both the mercury switch and carbon microphone. This arrangement is reminiscent of the way Enrico Caruso controlled volume in his recording: by agilely jumping closer to and away from the microphone.

John S. Taggart, who reviewed the VOX system, mentions that "this arrangement was not satisfactory as the beginning of speech is not properly transmitted."[5]

What's new? ■

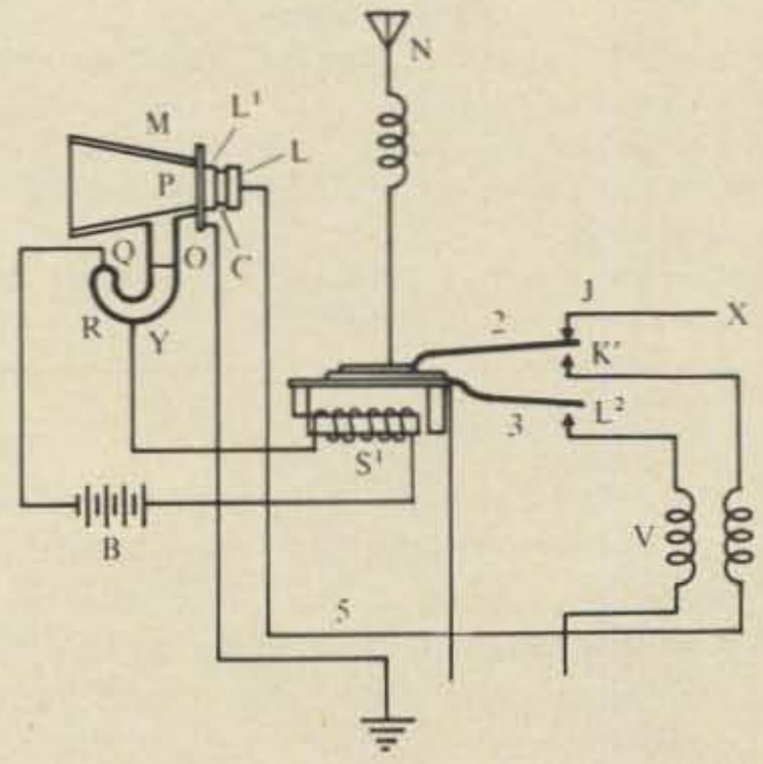


Fig. 11—A mechanical VOX system using a mercury switch actuated by voice power.

CHU *(Continued from page 33)*

from audibly beating with one another, thereby confusing the issue!)

The staff of CHU actively welcomes reception reports, and asks that when making reports listeners include details of readability and interference, if any. All reports are acknowledged with the station's distinctive, colorful QSL card. Reception reports should be sent to: National Research Council of Canada, Ottawa, Ontario, Canada, K1A 0S1.

The handsome multi-color QSL, issued in memoriam to Sir Sanford Fleming, the principal advocate of Canadian Standard Time Zones, is shown in fig. 3. If you would like more information about station CHU, write to the above address and request a free copy of Time Service Bulletin No. B-27. This handy bulletin helps to explain the somewhat complex Universal Time and Atomic Time relationships. Like the broadcasts, it too is bilingual!

References

1. "Standards of Time and Frequency in Canada," National Research Council of Canada (undated).
2. "Standard Time Zones in Canada," by Malcolm M. Thompson, reprinted from the Journal of the Royal Astronomical Society of Canada, June, 1970.
3. Time Service Bulletin B-27, "Radio Time Signals", National Research Council of Canada (undated).

Zero Bias *(Continued from page 4)*

you want to be. The League hasn't fallen down on the job, they never rose to meet it in the first place. Amateurs, in general, have created an aura about the League that presupposes that they have the answers and the capability to achieve goals desirable to amateur radio. Well, they haven't anymore of the answers, nor the ways to achieve goals than any of us do. If anything the League has mirrored the attitude and feelings of a lot of amateurs which is to keep amateur radio free from "politics". This "Ivory Towered" view of amateur radio, by amateurs, is not shared by the real world of government, commercial interests, and the general public.

What we have facing us as amateurs is the fact that we represent small numbers by anybody's standards. We have not been represented adequately before government. We have no lobbyist. We only become concerned on those matters which affect us directly and show little, if no interest, on others' problems. Sounds selfish and egocentric doesn't it? Well, the League, which is made up from all of us, just mirrors this attitude on a larger scale. Let's look at some alternatives.

The biggest and best alternative to the status quo has been you, the reader. In times when concerted action was needed, a number of you came through by your own volition and literally saved the day. This is most clear in recent years by definite responses to my editorials, such as:

1. Saving the WWV forecasts for amateurs - Aug. 1976
2. Keeping the integrity and intent of the Novice license with the FCC - July 1976
3. Saving the jobs and services of 31 FCC employees, plus saving the Novice license - June 1977, Aug. 1977

These and many more have indicated to me that when individual amateurs do get involved politically and make their voices heard, positive results often occur. For those who sat back and waited for some positive action from Newington to bail out amateur radio, relax and enjoy the work of others.

The rhetoric of trying to change the system or working through the system up there doesn't cut it anymore. Forstalling action in favor of some mysterious "big picture" or ultimate secret goal is not facing the facts of life. Changes can be made and views can be heard.

The FCC and the Congress are not sacrosanct. You have proved it by your actions. Those of you who didn't shrink at the possibility of being "political" found out that you didn't get hurt, and that you even had some fun. I remember when I arrived at Fort Dix, N.J., to take basic training, there was a huge sign that read, "Home of the Ultimate Weapon", meaning the individual soldier. Well, you are the ultimate weapons out there to achieve what you want.

The next stage in amateur representation is an active lobbyist in Washington speaking for us. The League has pussyfooted this issue for years simply because they are afraid of their tax status. Maybe it is something they should be afraid of, but the alternatives may be worse. So we can't look to Newington for a lobbyist and it isn't fair to expect the industry to pick up the tab for one entirely. Maybe it's time for another organization to emerge which will actively seek to work for amateur radio. Some sort of alliance between amateurs and industry, which is willing and able to put their money and time on the line, to enhance this thing we call our "hobby". We're playing in the big leagues now with big stakes, and what we did yesterday doesn't count. It's what we are willing to do now that counts.

So, in February it's 10 meter amplifiers to which we say good-by. Who knows when we bid farewell to 10 meters itself? I'm not here to shape up the League, nor am I wise enough to supply you with the answers. I can tell you honestly that the answers lie within what you and only you are prepared to do. If you put nothing into the system, then you cannot be disappointed when you get nothing out of it. If all you want is a simple "hobby" like you've always had then you can think about the day when you put your gear up in the attic along with your bottle-cutting kit when the "hobby" loses interest in you.

73, Alan, K2EEK

Announcements *(from page 8)*

ship Recreation Center in Johnson City. There will be 4 acres of flea market, technical talks, prizes, etc. Tickets are $2 for general admission, $7 including the banquet. For additional info and/or tickets write: S.T.A.R.C., P.O. Box 11, Endicott, NY 13760.

• **Waukesha, WI** — The First Annual Spring Swapfest will be held on Sunday, May 14, 1978, starting at 7 a.m. on the grounds of the Waukesha Co. Expo Center. There will be prizes, refreshments, and some indoor space will be available. Admission is $1.50 in advance and $2.00 at the gate. For tickets write: Swapfest, Box 49, North Prairie, WI 53153, (please include s.a.s.e.). This Swapfest is sponsored by the Milwaukee UHF Society, Inc.

• The Society of Wireless Pioneers (SOWP) will celebrate its 10th birthday with an on-the-air CW QSO Party during the full GMT period of May 4 and 5, 1978. The call will be CQ SOWP on all bands, 55 kHz up from the low end. Novice members should use the center portion of each novice band. For the benefit of those who cannot participate for the full time, it is suggested that part-time participants make their CQ calls on the even hours. To qualify for the certificate, members should send a list of contacts, showing date, time, call and SOWP numbers to the Society's Vice President for Awards, Pete Fernandez, W4SM, 129 Hialeah Rd., Greenville, SC 29607. In addition, a s.a.s.e. must accompany all requests for the certificate.

• **Easton, MD** — The fourth Annual Easton Amateur Radio Society Hamfest will be held on May 14, 1978, rain or shine, at 10 a.m. to 4 p.m. Location is 5 miles north of Easton, on Rt. 50 at the Talbot County Agricultural Center. Talk-in on 52 and 146.445/147.045 repeater in Cambridge. Some tables both inside and out, good-refreshments, and lots of room for tables and tailgaters. Donation is $2, with an additional $2 for tables or tailgaters. Write: K3ONU,

(Continued on page 95)

Antennas *(from page 63)*

though other European stations were giving the USA stations good reports.

"G3XAP surmised that the antenna had a pronounced null off the back on 80 meters. Shortly thereafter, the loading wire was switched to run in a northwesterly direction. The operator reported a dramatic increase in the strength of American signals, with excellent reports on the G3XAP signal from across the ocean. It was apparent that a highly directional antenna had been de-

veloped having good front-to-back ratio for low-band operation".

"This really sounds *great*", said Pendergast, writing furiously in his notebook. "Did G3XAP conduct any tests on 40 meters?"

"Yes", I replied. "He built a 7 MHz version with a 40 foot vertical section and a loading wire 65 feet long. The wire was trimmed until a low s.w.r. was achieved on 7.005 kHz. Again, excellent signals were noted and good DX contacts achieved with Australia and New Zealand. The direction of radiation could be easily altered by simply changing the direction of the sloping wire."

"How about adding more loading wires at the top, spaced 90 degrees apart?", asked my friend thoughtfully.

"That was tried, but it was a disaster" I answered. "The antenna became hard to match and reports fell off two to three S-units"

I handed a drawing to Pendergast. G3XAP went back to the single loading wire and came to the final conclusion that the design of fig. 5 was a practical one for the high frequency bands. The angle of slope has an effect on the signal at a long distance but the "magic" angle should be determined by experiment on each band, as the optimum angle of radiation for long distance work varies from band to band. G3XAP is still continuing experiments with this simple and effective low-band DX antenna"

"It sounds like a winner", said Pendergast thoughtfully. "It's damned hard to get any directivity on the low bands when you are restricted to a city lot. I think that G3XAP might have the answer. I hope that some readers of your *CQ* column will experiment with this interesting antenna. If enough of these semi-slopers are in action, we should find out a lot about their operating characteristics".

"Agreed", I said. "I'll be pleased to print any information I get about them in my column. And as far as that goes, if any readers have interesting photographs of their antennas, I'd like to get them, too. Everybody is interested in antennas, and it's always helpful to see what the other fellow is doing".

Note: "*Radio Communication*" is the publication of the Radio Society of Great Britain, 35 Doughty Street, London WC1N 2AE, England. Also note that W6SAI, the author of this column is the editor of the "*Beam Antenna Handbook*", "*All About Cubical Quad Antennas*" and "*Simple, Low Cost Wire Antennas*". All these handbooks are available from Radio Publications, Inc., Box 149, Wilton, CT 06897.

QRP *(from page 64)*

wave antenna between two Chicago buildings at a height of over two hundred feet!! This antenna produced the first consistent Midwest U.S. to Europe phone QSO's in the thirties, but such opportunities are rare. Probably an antenna at a height of 30 ft. or so is the wisest investment, in terms of performance per dollar spent for most amateurs—at least those who live in cramped urban areas.

Relative Performance vs. Height of Half-wave Dipole Over Average Ground

Table I – Half-wave Dipole vs. Ideal Dipole in Free Space.
Table II – Gain over Dipole at 10 ft.
Table III – Power Output (watts) required to produce the same signal strength at distant receiver as one watt to ideal dipole in free space.
Table IV – Power Required to Produce same Signal Strength as from real dipole at 10 ft. for other heights.

DX *(from page 75)*

WA4TWE/VQ9 & WA6OXZ/VQ9—Via Jim Hammack, K5HWO, P.O. Box 306, Boise City, OK 73933
WD9FCC/VQ9—To George Menard, K9GM, 1233 MacArthur St., Sheboygan, WI 53081
XO1KE—c/o VO1KE, M.W. Muench, Gallows Cove, Witless Bay, Newfoundland, AOA 4KO Canada
YA1OS (May, 1971 - August, 1973)—Via John, SMØDJZ, Box 3036, S-19503, Mersta, Sweden
YB3KA—To M.D. Selby, WA2DWE, 120 Esplanade Drive, Rochester, N.Y. 14610
ZD7BW—c/o G3PEU, 43 Newton Road, Knowle, Solihull, W. Midlands, England
ZD9GG—Via F. Ferucci, ZS1Z, P.O. Box 341, Paarl 7620, Cape Province, South Africa
ZE1HE—To G.A. Collins, VE3FXT, R.R. 1, Dundas, Ontario L9H 5E1 Canada
ZE8JN—c/o J.F. Limbach, WD8CPU, 6600 Pine Ridge Drive, Enon, OH 45323
ZF2AH—Via Joe Hypnarowski, WA6VNR, 3785 Mt. Blackburn Ave., San Diego, CA 92111
ZS2MI—To D.V. Larsen, ZS6DN, Box 1463, Pretoria 0001, Transvaal, South Africa
4C1HR—c/o XE1HR, Centenario 76, Coyoacan, Coyoacan, Mexico, DF, Mexico
4J6A—Via Larry G. Agabekov, P.O. Box 41, Esstunki, 357600, U.S.S.R.
5N2AMT—To P.O. Box 1150, Kaduna, Nigeria
5Z4RT (Operator Herman)—c/o I8JN
6Y5MR—Via O. Mark Royes, P.O. Box 1061, Kingston 8, Jamaica
9K2EX—To Hans R. Loow, SMØBYD, Sturevagen 48A/1, S-19176 Sollentuna, Sweden
9L1SL—c/o Chuck Jones, State Department (Freetown), Washington, D.C. 20520
9N33—Via P.S. Rana, WB4NFO, 29 E. Chapman St., Alexandria, VA 22301

73, John, K4IIF

Awards *(from page 77)*

be submitted with the 16 QSL cards or a list certified by two radio amateurs (GCR list) and US $1.00 (or 5 IRCs) to the Secretary/Treasurer, Luis De La Vega, KP4WI, P.O. Box 1061, San Juan, Puerto Rico 00902. The "All Puerto Rico Award" for confirmed contacts with all 8 Districts (similar to the U.S. Counties) of Puerto, will also be re-issued soon. A new Award to be called the "All Caribbean" is in the works.

The Club's President, KP4AM, has been authorized to check QSL cards and certify applications for the prestigious *CQ* Magazine Awards Program, that includes WAZ, CQ DX, SSB and CW Awards, and WPX. He has also been appointed as a member of the *CQ* DX Awards Advisory Committee. All hams who wish to have their cards checked may send them to: P.O. Box 50073, Levittown, Puerto Rico 00950.

Skopje 1963 Award: The Radio Amateur Society of the Socialistic Republic of Macedonia issues this Award for contacts with Amateur-Radio Stations of Skopje (capital city of the Republic of Macedonia) during the period *each* year (since 1966) of July 26 to August 2. This is the anniversary of the earthquake in Skopje.

1. DX stations need 3 QSOs with amateurs in Skopje.
2. European Stations need 5 QSOs with amateurs in Skopje.
3. YU Stations need 10 QSOs with amateurs in Skopje.

No QSLs required, send log data certified by 2 licensed amateurs or a Club Officer. The Award is free, but please send 2 IRCs to cover postage to: YU5 Award Manager, P.O. Box 14, 91001 Skopje, Yugoslavia.

The International Short Wave League Awards Program: As promised the past two months, here is some 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, Cliffird A. Tooke, 6 Chelmer Avenue, Rayleigh, Essex, SS67TB, England. In the past, all these Awards have been on a "heard" basis, but after 10 years they have new printed Awards and they are for heard or worked confirmations.

Monitor Award 2: This is issued for verified QSOs/reception of 225 ISWL members since 1-1-70. Licensed members may count QSLs from ISWL, SWL members, together with the licensed members cards. List of members produced annually, and available for 3 IRCs from ISWL Headquarters, also details of ISWL membership with benefits of its QSL Bureau, 1 Grove Road, Lydney, Gloucestershire, GL15 5JE, England.

Zone Award: Issued for working/hearing 25, 50 and 75 ITU Zones. Country/Zone/Continents Prefix List from H.Q. with Zone Map for 3 IRCs.

Notes

A reminder about the 1978 County Hunters CW Contest: 0000 GMT July 29 to 0200 GMT July 31, 1978 — Logs go to W9MSE, see "*CONTEST CALENDAR*" by Frank, W1WY for full details.

For the many new County Hunters, YES, I am the Custodian of the USA-CA Certificate, send s.a.s.e. to P.O. Box 73, Rochelle Park, N.J. 07662 for rules.

For CW County Hunters there is a Monthly CW *CH Newsletter* issued by Jim Hoffman, K1ZFQ, 42 Gresham Street, Milford, Connecticut 06460. Send s.a.s.e. for full details, frequencies, and times they are active.

For SSB County Hunters, there is also a Monthly *NEWSLETTER* issued by The Mobile Amateur Radio Awards Club, Inc. It includes data on County Hunting, MARAC, CH QSLs, CH QSL Bureaus, etc. send 46¢ in stamps, no s.a.e. needed, but be sure to include your name, QTH and call to: Walt Allen, WØDG, 2907 W. 98th Street, Leawood, Kansas 66206.

As this is being written, we have had one of our worst snow storms in years, my Quad is ruined, but long before you read this I should be in good shape again.

Write and tell me, How was your month? 73, Ed., W2GT.

Propagation *(from page 79)*

80	08-11 (4) 11-19 (4-3) 19-22 (4) 22-00 (3-4) 00-06 (2-3) 06-08 (3-4)	08-10 (4-1) 11-16 (3-0) 16-18 (3-1) 18-19 (3-2) 19-20 (4-2) 20-00 (4) 00-06 (3-4) 06-08 (4-3) 10-11 (4-0)	08-09 (1) 09-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-23 (4-3) 23-03 (4) 03-06 (4-3) 06-08 (3-2)	08-09 (1-0) 09-18 (0) 18-20 (1-0) 20-21 (3-1) 21-23 (3-2) 23-03 (4-3) 03-06 (3-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-07 (2) 07-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

ALASKA
May & June, 1978
Openings Given In GMT #

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

HAWAII
May & June, 1978
Openings Given in Hawaiian Standard Time #

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

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

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

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

HAM SHOP

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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.

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.

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.

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.

CONCORD VIDEO RECORDER, Model VTR 624 with 24 hr. time lapse; 2 Video Cameras Model MTC 18 with auto exposure; 2 Monitors MR 900 & MR 740; tape and cables. $1,500. K6MDA, 16700 Hwy. 281 S., San Antonio, Texas 78221. (512) 627-2011.

BUYING OR SELLING equipment? I keep a listing. 10 percent charge if I arrange a deal for you. W.T. Reese, WB6TMY, 707-545-6958.

FOR SALE OR TRADE: GE business transceiver (FM) in good working order, crystals enclosed mic. included. Will take best offer on equipment or money. We pay shipping. Daniel Jordan, 9707 Ave. N, Chicago, IL 60617.

REPALCE RUSTED ANTENNA BOLTS with stainless tell bolts, small quanities, free catalog. Elwick, 266, 230 Woods Lane, Somerdlae, NJ 08083.

DXPEDITION TO MONTSERRAT (VP2M) House and ham equipment $90 weekly summer, $135 winter. Peaceful and beautiful spot for retirement. Sale considered. "Doc" 60 Amsterdam, Toronto, M4B 2C2 Tel. (416) 755-2117.

WANTED: VF-1 VFO, DX-40, and manual for HQ-129-x. Gene Statler, WB0OFY, Route 2, Box 327, Eldora, Iowa 50627.

FREE FULL COLOR QSL CARD CATALOG. Card, Inc., Drawer P, Lexington, N.C. 27292.

FOR SALE: ASR 32 Teletype with stand, paper tape punch and reader, documentation; excellent condition. $325.00. David Shorthill, RFD no. 2, Pool Drive, Wells, Maine 04090. (207) 646-5465.

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 St., Milwaukee, WI 53208.

B & K TEST EQUIPMENT. Free catalog. Free shipping. Dinosaur discounts. Spacetron—EE, 948 Prospect, Elmhurst, IL 60126.

SOLAR TOYS—AMAZING POWER FROM THE SUN. Space age solar cell supplies power. Get your Inventors Kit. Runs toy cars, boats. Learn basics of new space technology. Kit includes cell, motor, propellar, gears, axle, wire, solder, instructions. $12.75 postpaid. Send check or money order to SUNTECH, Box 1364, Largo, Florida 33540.

QUAD BUILDERS—Blizzard/Hurricane proof your antenna. Fiberglass vaulting poles. Incredible strength. Guaranteed new, 8-for $240.00. S.A.S.E. for info. K5WSE, Box 20-AA, San Antonio, Texas 78201. (512) 699-9260.

QUAGI/YAGI BUILDERS— Insulated fiberglass booms to 16-feet. Straight, strong, vaulting poles. S.A.S.E. for info. Guaranteed new $30.00. K5WSE, Box 20-AA, San Antonio, Texas 78201. (512) 699-9260.

ELIMINATE QRM AND QRN problems with our superior CW and SSB Filters. Also CW Keyers, speech compressors, power supplies, teletype converters, and multiband antennas. Dealer Discounts. Dynamic Electronics, Box 896, Hartselle, AL 35640. (205) 773-2758.

SELL—Free shipping Bearcat 210 scanner radio, Brand new U.S. $230.00. Write or call 705-472-0520, M. Yadav, 1221 Algonquin Avenue, North Bay, Ontario, Canada. Also WF-1 Autek Filter.

EMBLEMS, PATCHES Embroidered. Custom made from your design. Order 10 to 1000's. Russell, 1109 Turner St., Auburn, Maine 04210.

D & V RADIO PARTS—Variable & Trimmer Capacitors—RF Chokes—Air Wound Coils—Transmatch Components — Toroids — Wire—Coaxial Switches—Send stamp for complete listing of in stock components. 12805 Sarle, R. no. 2, Freeland, Michigan 48623.

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.

RADIO STATION OPERATORS: Group of 10 long established camps located in New York Adirondacks, Mass. and Conn. 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 qualifications to: Kathy Singer, Placement Advisor, 105 Fairview Ave., Port Washington, NY 11050.

SOUND SWITCH: Trigger circuits by clapping hands, whistling, etc., Control lamps, appliances or use as effective burglur alarm. Completely assembled, with microphone: ONLY $5.00. Michael Wagner, P.O. Box 3382-Q, Station 'B', Calgary, T2M-4M1, Canada. (Guaranteed).

QSLs WITH CLASS! Unbeatable quality, reasonable price. Samples, 25 cents. QSLs Unlimited, Box 27553-C, Atlanta, GA 30327.

WANTED: Heath SB-620 scanalyzer and SB-230 linear. WD9FLT, 1624 Walnut Ave., Wilmette, IL 60091.

SEVEN RT-68/GRC transceivers, (surplus) for sale. Covers full 6 meter band. $12 each plus shipping. Fred Van Pala, 70-64 45 Ave., Woodside, NY 11377.

SALE: Mobile 50 watt slimline, FM transceiver with Uni-call unit. No reasonable offer refused. Emiel Sinner, 657 E. Seneca Tpk., Syracuse, NY 13205, (315) 492-9492.

WANTED: 902A, 3MPI scope tube. Heathkit OL-1 Junk scope with good transformer. Manual for Gonset Communicator II 2 meter transceiver & VFO. Gonset Model 3063 VHF amplifier. W7GPP, 1308-F, The Dalles, Oregon 97058.

FOR SALE: Two Hella Halogen fog lights (new in boxes), 139 ZNEH CC, plus dashboard illuminated switch for a Porsche, $30.00. 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.

SSTV AND PHOTOGRAPHERS—Make offer; 1 each, like new, Fujitar lenses-135 mm, f 4.5, telephoto 35 mm, 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 greentown. 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 (2kw) $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

SALE: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake. $40. Schultz, W4FA, 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 '76. 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 to cover the 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 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, QST. Some complete runs. Send s.a.s.e. for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer 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 good condition. Karl Thurber, W8FX/4, 233 Newcastle, 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.

WANTED: National SW-3 receiver with coils. D. Sheehan, 15 Arcadia Rd., Andover, MA 01810, 664-6788.

SELL: Heath HP-13B, $60. M. Beale, 307B Oak Grove, S. Beloit, IL 61080.

WANTED: Galaxy GT550 accessories, 25 kHz or Cal. 100, Spkr. Cab. SC550, Linear LA550, VFO RV550, Filter F3CW, VOX Board. Other Gal. Acc. may work. Milt. Baitman, WA2RUB, 77 Werkley Rd., Tonawanda, NY 14150.

SELL: SB200, $250; 11 element 2 meter beam, $20. Schwartz, 1183 Southeast St., Amherst, MA 01002, (413) 253-5178.

TRADE: HAL ST-6 RTTY TU, 170-850 shift, AK2 AFSK oscillator, HAL cabinet deluxe throughout. Want mult-channel, compact 2 meter rig. W0RLM, 4821 E. Riverside Dr., no. 141, Austin, TX 78741.

SALE: Hammarlund HQ170 and custom speaker. Firm both A-1 condition. Harold, WD4DRR, Rt. 10, Box 429, Statesville, NC 28677.

FOR SALE: National H120-7 receiver w/coils A-F. $100. Tim Smith, WD4KIA, P.O. Box 4629, Spartanburg, SC 29303. 1-803-583-4116.

RELIABLE USA QSL Manager has limited openings for additional DX station. Airmail inquiries to: W3HU, Box 522, Levittown, PA 19057.

SELL: Clegg Thor 6 meter transceiver with 417 AC supply, mint condx, $100 fob. Sell KW components, send s.a.s.e. for list. Paul Bittner, W0AIH/9, 1616 South St., Eau Claire, WI 54701.

MOTOROLA T1034C FM sig. gen. IF, 25-54, 130-175, 400-470 mc. Calibracted outfit 0.1-100, 000 mv. Metered deviation, $275. Int. Xtal. FM-5000 freq. and deviation meter, $75. Brian Whitney, 2490 Madison Ave., Yuma, AZ 85364.

WANTED: Heathkit HR-10B receiver and HG-10B VFO. Tom Jones, WD8PQF, 301 Seneca St., Westover, W. VA 26505.

SELL: Heath rcvr HR-1680 w/speaker, mint condx, $199. Ron, WA2BSW, 107 Hollywood Ave., Metuchen, NJ 08840, (201) 494-9267.

WANTED: Schematic for Zenith transoceanic model 1600 chassis 6L-40-(1954). Frank Cirillo, WA2MSD, 212 W. 22nd St., Apt. 4J, New Yor, NY 10011.

CRYSTALS-s.a.s.e. my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

MIKES BY SHURE: Unidyne Dyn. mod. 556S. Mod. 51 Dyn. and mod. 55 Super Cardoid. Hamilton, 6050 North Oakley, Chicago, IL 60659.

WANTED: SB220 linear or equal. D. Stockham, W6NPY, 106 Locust Ave., Mill Valley, CA 94941, (415) 388-4489.

WANTED: KWM1 speaker unit; QST 1916 Jan thru April, July. Please airmail. Jock, ZL2GX, 152 Lytton, Gisborne, New Zealand.

TRADE: Late mint Swan 350 with accessories for Dual Trace 15 MHz scope. W7KSG, 1876 E. 2990 So., Salk Lake City, UT 84106.

SELL: R-808 Teletype receiver, A-1, you pay shipping. $175. C. Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

CALLBOOKS: 1977 $5.00 each USA, foreign add $1.00 each to ship. D. Haworth, K2QQ, 14 Phyllis Dr., Succasunna, NJ 07876.

SALE: Hallicrafters transceiver model SR-150, $300. HW-16 with 13 crystals, 80, 40, and 15. $130. R.E. Dorn, WB7RHG, 645 West "C", Burns, OR 97720.

SELL: HQ 110 $95, SP-600 JX $195, R-274D/FRR $210. All clean and realigned, you ship. K0TDO, 511 So. 13th St., Fort Dodge, IA 50501.

QSL—QSL—QSL—Please send QSL cards to: Philip Steven Kurland, 357 East 201 St., Apt. 1-F, Bronx, NY 10458.

WANTED: Johson T-R switch any condx. but must be complete also-or schematic for same. Don Dobias, 6100 Shattuck, Saginaw, MI 48603.

HEATH SB610, SB630, with 24HR LED clock. $1350. plus shipping charges. Bill Taylor, K8TBW, P.O. Box 485, Bettsville, OH 44815, (419) 986-5495.

GOVERNMENT SURPLUS ELECTRONICS: You can buy directly from Uncle Sam. Booklet shows how. $2.00. H.L. Collins, Jr., Box 198, Tiburon, CA 94920.

SELL: Bird no. 43 wattmeter, $95; leather case for no. 43 with apace for 6 slugs, $19; Bird slugs, $28.50 eahc. K2M2A, $1200; 312B5, $425; a 516F2 w/spk, $150; all round emblem, mint. Call Morty, WA3IFQ, (215) 884-6010, a 24 hour answering machine.

OVER 55 years old: just obtained license looking for Drake equipment, haven't much cash. WB2RPU, Box 823, Rocky Point, NY 11778.

WANTED: March 1971 issue of Ham Radio Magazine to complete collection. R. Beck, VE7IG, Box 16, Glen Dr., Fox Mountain, RR2, Williams Lake, BC Canada V2G 2P2.

FOR SALE: QST 1944 to 1960's. Send s.a.s.e. for lists and prices. J. Glendening, WB6WTJ, 11414 E. 215th St., Lakewood, CA 90715.

FOR SALE: Heath SB303 and SB401, both in excellent condx. $500/offer including UPS shipping. WB6PZT, (415) 967-3624.

SELL: $75 each H/P 410-B, VTVM. H/P 200-CD audio gen. Tektronix-190A, sig. gen. J. C. Tamako, Howellton Elects. Serv., 476 Howellton Rd., Orange, CT 06477.

SELL: 2 MHz Pearce-Simpson 8 channel catalina 85 watts with broadcast rcvr. 12v. $40. Clem, 33727 Brownlea, Sterling Hgts., MI 48077.

FOR SALE: SR34AC, Com IV-6M, 753-752-751, JRC 425, Globe 62, Bendix PAR-80. w/manu., ex condx., any reasonable offer. Joe Bedlovies, 30 Ridge St., Milford, CT 06460.

QSL CARDS: The famous collection of the late K0AAB designs again made avilable. Send 24 cents no. 10 s.a.s.e. for free samples. Marv Mahre, W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109.

NEEDED: Manual and schematic for RCA CB2808. Will buy or copy and return. F.C. Bergquist, 104 Sarver Dr., Leesville, LA 71446.

UNUSED DIGITAL Dial Atlas 350 XL, new and mint, warranty, $877. UPS prepaid. (305) 264-3770 evenings, 7 to 11 p.m.

WANTED: Surplus VOM model 1-166. Need only meter rest can be in operative, my rig gone up in smoke. John Savonis, W1DBS, 410 Blake Rd., New Britain, CT 06053.

WANTED: Any working 2m FM gear. Send price and condition to: E. Sjogren, 45 Seaview Ave., Staten Island, NY 10304.

LINEAR AMPLIFIER, Hallicrafters HT-45 with home built power supply, Variac controlled 4000 kilovolts $175 (pick-up only) call (516) 931-3374, Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

WANT TO BUY: Ameco 'PT' preamp (frame grid tube model) N2SS/W2EHB, (609) 227-4896.

FOR SALE: Regency HRT-2 with nicads, charger, (5) sets of xtals, leather case external mike. Also SBE 33 with DC supply. 150 for HRT and $120 for SBE. 2 meter beams 2-(7) element Cushcraft $22. Heath Q Multiplier $5. Joe, WA1VJZ, Tel. (203) 347-2407 after 6 p.m. EST.

FR-101D, FL-101 dream station. All crystals, converters, filter, speaker, processor, microphone, spare tubes. Complete $1250. (503) 686-8879, W7LJI.

MUSEUM PIECE: KAAR Connelrad. Every radio museum should have one. Like new, $150. W0CVU, 1500 Center Point Rd. NE, Cedar Radipds, Iowa 52402.

FIBERGLASS Pole vaulting poles, perfect quad spreaders, guaranteed new, $39.50. Rick Hull, K5WSE, P.O. Box 20-AA, San Antonio, Texas 78201, (512) 699-9260.

WANTED: Hammarlund CB205 in working condition. R.W. Dyer, Rt. 1, Box 76F, Adkins, TX 78101.

TEN—TEC Model 509 Argonaut xcvr. ex. condx, $330 or will swap for suitable 80-10m xcvr. MFJ-40T QRP transmitter, $20. Mario Filippi, WB2JII, 9 Harold Court, New Rochelle, NY 10801, (914) 632-4255.

NEW AWARDS now available to all amateurs. Details SASE (2 IRCs) to: Awards, Box 522, Levittown, PA 19058.

SELL: 6 channel, 2 meter H.T. with accesories. $150. Clem Duval, 33727 Brownlea, Sterling Heights, MI 48077, 1-313-268-2467.

WANTED: Manual/schematic for HRO-60. Buy or return. W6NHQ, 125 N. Cypress Ave., San Jose, CA 95117.

HAM RADIO Control Console Plans. Easily built. Unique expandable modular design. $4.50 postpaid. S. Swords, 550 Dorset, Goleta, CA 93017.

WANTED: Kenwood TS-520, swap new Atronics CR-101 code rader and mucho dinero. W7NJ, 4915 Samish Way, no. 3, Bellingham, WA 98225.

CALLBOOKS 1977 foreign or US with supplements $6 each. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

SELL: Clegg 22 Mark 2. Excellent conditon. J. Schwartz, 43-34 Union St., Flushing, NY 11355.

HW-7 and HWA-7-1, $80, postpaid. Regency HR-6 as new, $155 postpaid. Motorola L41 66B or 6 FM, $135, postpaid. Dave Drake, K8BRX, 4658 Luanne Lane, Traverse City, MI 49684.

TRADE: New Brazilian stamps for radio parts. What are your needs? Dalmo Pontual, PY6CN, Box 1351, Bahia, 40.000, Brazil.

WANT TO BUY: Pair of matched 8122 tubes. Need for my NCL 2000. N2SS, 32 Bryant Rd., Blackwood, NJ 08012.

WANTED: Amphenol 24-5P polystyrene 5 pin coil forms. W9GB, 9044 Linder, Morton Grove, IL 60053.

M-103 Antenna Specialists AM-CB mobile antenna, $9.50, 3001 Gonset Noise Chipper, $6.50, 25001-160 Hallett Ignition Shield with 25352 alternator and regulator shield, $40, Universal Bumper mount with stainless steel spring, $6, Lambda 300VDC regulated power supply, $30, HW-6 Mark 6 meter fiberglass mobile antenna, $6. T.K. Brown, 35 Lakeview Mob Ct., Sebring, FL 33870.

PEARCE SIMPSON marine RDF, new model with VHF band, trade for Regency HR-400, SBE-UHF, IC-30A, or 2 meter duplexer. W.J. Davis, K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

BE FIRST TO KNOW precisely when and where to work all the choice DX. Bi-weekly LI DXA DX Bulletin has: Hot DX news, Time and Frequency of each goodie, QSL info, Propagation Forecast, and more. Send business size SASE for free sample copy or $8 for 1-year domestic subscription. Long Island DX Association, DX Bulletin, PO Box 173, Huntington, NY 11743.

HIGH SPEED CODE TAPES—40 to 80 wpm. Inquire K4KHT, 4330 N.E. 13th St., Ocala, FL 32670.

RCA type 6076 high-power VHF tube for broadcast television transmitter, like-new condition. Cost $446, make offer with s.a.s.e. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, OH 44212.

WANTED: LC & HN coaxial connectors, Eimac power tubes & sockets, Spectrum Analyzer, HP & Tek test equipment. A. Emerald, 8956 Swallow, Ftn. Valley, CA 92708.

SALE: 1977 US and DX callbooks. $15 for both. Lowry, 3 Darlin Dr., Reading, PA 19609.

FOR SALE: Earphones-Trimm dependable; Western Electronics 500W; Pico Connecticut; Calrad 85; Cannon Chief $5 a set plus postage. Trimm Acme short cord leather trim AMB H I small red case set look like Trimm. $2 a set plus postage. M.J. Douglas, 2254 Pepper Dr., Concord, CA 94520.

WANTED: Navy manual Navships no. 900, 705 TC5 14, 15 transmitter & receiver equipment. Richard H. Kouns, P.O. Box 3023, Pueblo, CO 81005.

HEATH AT-1 wanted. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

WANTED: Heath HW-16 transceiver, HG-10B VFO, and HR 10B receiver in excellent condition. State price. Caswell Davis, Jr., 601 Delmar, Apt. 2, San Antonio, TX 78210.

TEMCO all band transmitter model 75GA, serial no. 455 good condtion. Spare set linear tubes. Best offer, call Dave, (208) 233-3486.

A PERFECT PAIR: HT-46, Drake 2C, 2CQ, Make a fair offer for a very good station. A.S.G. 2500 Gibb Ave., Baltimore, MD 21227.

HEATH SB101 w/AC and DC $375. SB200 $310. Hal lambic keyer $70. WA8KME, Box 278, Lawton, MI 49065.

WANTED: An Eimac trans-citer model AF-67 serial 625. M. Whipe, 423 Long Branch, Grover City, CA 93433.

ROBOT 33 scan converter $500. Model Viewfinder $100. Model 80 camera with Macro lense $200. W8ATK, 4148 School Section Rd., Cincinnati, OH 45211.

HEATH HD-10 Keyer, $25; Eico 753 20/40/80 SSB/CW xcvr with 751 AC supply & E/V 630 desk mic; $75; All in operating condition and manuals. WA1NTF, 938 Grove Pk. Dr, N., Orange Park, FL 32073.

WANTED: Copy of assembly manual for Hy-Gain 18HT Hy-tower. Also want an SX-100 receiver. A.M. Fox, Box 895, Greenley, CO 80631.

NO HAM GEAR IN BOOT CAMP! Ideal h.f. station for the beginning novice or general. Local only, s.a.s.e. for list. Ken, WB9YCJ, ON620 West St., Wheaton, IL 60187.

SELL: Drake DC-3 p.s. for TR-4 $95; TO-5 keyer $35; Heath HM-15 s.w.r. meter $15. WB9JHS, 7720 W. 162nd Pl., Tinley Park, IL 60477.

WANTED: Digital frequency (received frequency) and synthesizer to fit British Racal RA-17-C receiver. John Knight, Box 3, La Canada, CA 91011.

WANTED: Full set of coils for HRO-50T1 or HRO-50-1 with full set of coils. H.P. Ravlin, K0AEY, P.O. Box 3, Monte Vista, CO 81144.

SELL: Hammarlund HQ170 plus speaker, Hallicrafters HT-37 for $150 each, pick-up at my home. W2AMI, (212) 224-7988.

WANTED: Schematic and service manual for Hallicrafters S-38C. David L. Larson, 1301 1/2 South First, Harlingen, TX 78550.

TX62, 621 VFO, xtal final, Mic & adjustable stand, 6 & 2 meter converters Finco 6 & 2 ant., Boxer fan, Dowkey relay. Asking $115. Jerry Pumo, K2MD, (201) 574-9897.

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.

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 sapre 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, US Consulate, Box "L", FPO New York 09544.

WANTED: Manual/schematic of General Radio 804C signal generator 8-330 MHz. Will buy or loan copy and return. A. Bielenda, W2IDA, 43 Chestnut Ridge Rd., Saddle River, NJ 07458.

SELL: Yaesu 200R synthesized 2M FM xcvr, NPC 104R power supply, 1/4 wave magwhip. $250. R. Hajdak, 1644 Morris St., SE., Mineral Ridge, OH 44440.

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.

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.

FOR SALE OR TRADE: Old radios; Heathkit Apache Transmitter, Hallicrafters SX-140 receiver, beam, rotar, etc. I collect old radios if you have any please contact me. Jordon Kitt, 3 Beacon Hill Rd., Port Washington, NY 11050.

SELL: Mint HT32 $175. Thunderbolt amplifier $375. Both for $525. FOB Frank James, 6 Cheryl Rd., Natick, MA 01760.

TRADE: Videotape recorder, camera, etc. for 5 band h.f. transceiver or highest cash offer. Al Szablak, 6 Cromwell Pl., Utica, NY 13502.

PRE-AMP inside most any Mic only 1 transistor, easy and cheap to build. Pain $1.00, WB2NAL, Box 356, Harrisville, NY 13648.

SELL: Heath DX-60 and HG-10 both $100. CQ Magazine, 1964 to date. P. Baillie, Box 288, Belmont, NH 03220.

SALE: New Raytheon 4D32 tube at $50. W. Becht, W6IRK, 625 Tufts, Burbank, CA 91504.

SELL: CQ Magazines complete. Reasonable offers, cash or trade. Nagle, 12330 Lawyers Rd., Herndon, VA 22070.

WANTED: Any National receiver/coils, Moseley CM-1 receiver. WA8MLV, 1008 Englewood, Parma, OH 44134.

NEEDED: Manual or schematic for HP model 200A audio oscillator (type 53045). Zerox copy ok. Ed Nadolny, W9BM, 888 Schirra Dr., Palatine, IL 60067.

TEKTRONIX 531-A scope DC-15 MHz, cart 3-pulg-in units, manual and all accessories, A-1 condition. Best offer or will trade for 2 meter or other mobile equipment. C.F. Killmon, 2108 Barr Rd., Wilmington, DE 19808, (302) 994-3234.

WANTED: Ham Radio issues May, June 1975 March, Oct., Dec. 1976. W9DDL, 5006 N. Second St., Loves Park, IL 61111.

JOHNSON 275W Matchbox w/s.w.r.; Multi-2000 transceiver; L-S 300 MHz counter (needs work); PTT handset; T/T encoder; other goodies. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

Announcements *(from page 87)*

Robert L. Roberts, Jr., P.O. Box 781, Easton, MD 21601 or call (301) 822-0943 after 6 p.m.

• **Rockville, MD** — The Potomac Area VHF Society will hold their seventh Annual Hamfest on Sunday, May 7, 1978, from 8 a.m. to 5 p.m., at the Howard County Fairgrounds. The Fairgrounds are located approximately 25 miles north of Washington, DC or 15 miles west of Baltimore, MD. Registration of $3 includes a flea market or tailgate sales. Talk-in on 146.52. For further info contact: K3DUA, K4LHB, or WA3NZL.

• **Logansport, IN** — The Cass County Amateur Club Hamfest will be held on Sunday, May 7, 1978, from 7 a.m. to 4 p.m., at the 4-H Fairgrounds. Go north of Logansport on highway 25 approximately 1 mile, turn right, follow the QSY signs. Advanced tickets are $1.50, $2.00 at the gate. Outside set-up free, undercover $1.00. Bring your own tables. Talk-in on 146.52 and Logansport repeater 147.78/.18. Write: K9DVL, Dave Rothermel, RFD 4, Box 146 G, Logansport, IN 46947.

• **Hammond, IN** — The Midwest Repeater Associations's first annual Hamfest will be held on Sunday, May 21, 1978, at the National Guard Armory, 2530 173rd St., Hammond, IN. Doors open at 7 a.m. Advance tickets are $2, $2.50 at the door. Reserved flea market area $1 otherwise first come, first serve. Door prizes, raffles, equipment displays. Talk-in on 146.31/91 and 146.52 simplex. Write to: M.R.A., P.O. Box 342, Griffith, IN 46319.

• **Evansville, IN** — The Tri-State Amateur Radio Society will hold its annual Hamfest on Sunday, May 21, 1978. The location will be the Vanderburgh County 4-H Fairgrounds located north of Evansville. There will be a large flea market for all. Two grand prizes to be given away, no admission fee. For more info write: Steve Harris, WB9OYD, R 2, Box 81G, Mt. Vernon, IN 47620. Call in on 75/ 15, 19/79, or 52.

• **Trenton, TN** — The Humboldt Amateur Radio Club's Annual Hamfest will be held on Sunday, May 21, 1978, at the Shady Acres City Park. Flea market, prizes, ladies activities. Talk-in on 37/97. For further info contact Ed Holmes, W4IGW, 501 N. 18 Ave., Humboldt, TN 38343.

• **Missoula, MT** — The International Glacier-Waterton Hamfest will be held on July 15-16 in the West Glacier Area at the Three Forks Campground. For more information write: L.T. Stem, WB7SFF, P.O. Box 2225, Missoula, MT 59806.

• **Huntington, W.V.** — The Tri-State Amateur Radio Assn. (TARA) will hold their 16th annual hamfest on Sunday, June 4, 11:30 am. Talk-in; W8VA/8, 04/64, 16/76 and 34/94. For more information and tickets write; TARA, P.O. Box 1295, Huntington, W.V. 25715.

• **Willow Springs, IL** — The Six Meter Club of Chicago, Inc., will be holding their 21st Annual ABC Hamfest on June 11. Large Swap Row, Displays, AFMARS Meeting, Picnic Grounds, Plenty of parking. Talk in on 146.94FM or WR9ABC 37-97(PL2A).

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.

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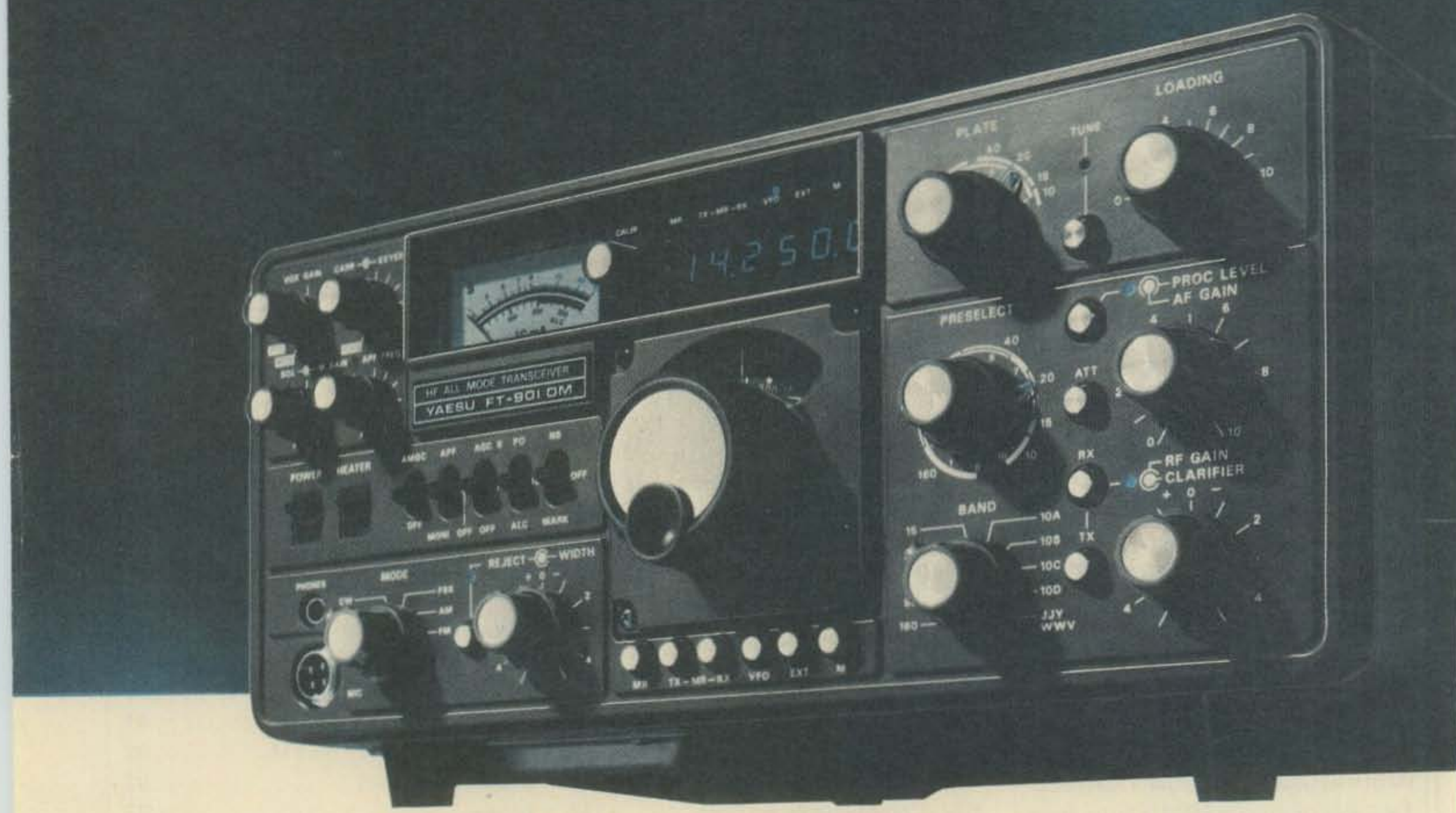

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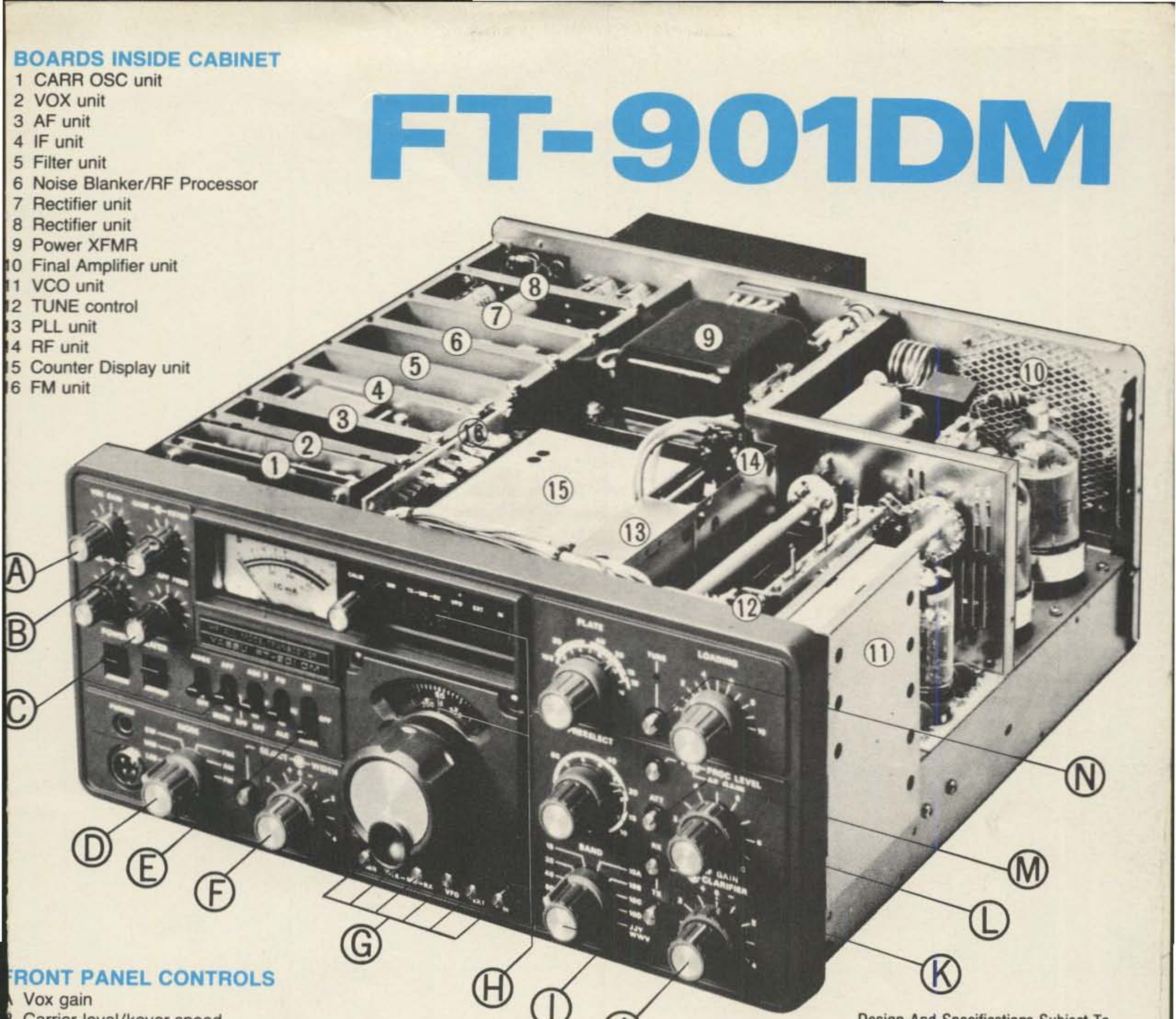

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G Frequency memory system
H Digital plus analog frequency readout
I Band switch (160-10 meters + WWV/JJY receive)
J Clarifier control
K RX/TX Clarifier selector
L RF Processor level
M RF attenuator
N TUNE control (Places transmitter in "TUNE" condition for ten seconds, then returns to "receive" condition to protect final tubes from excessive key-down time)

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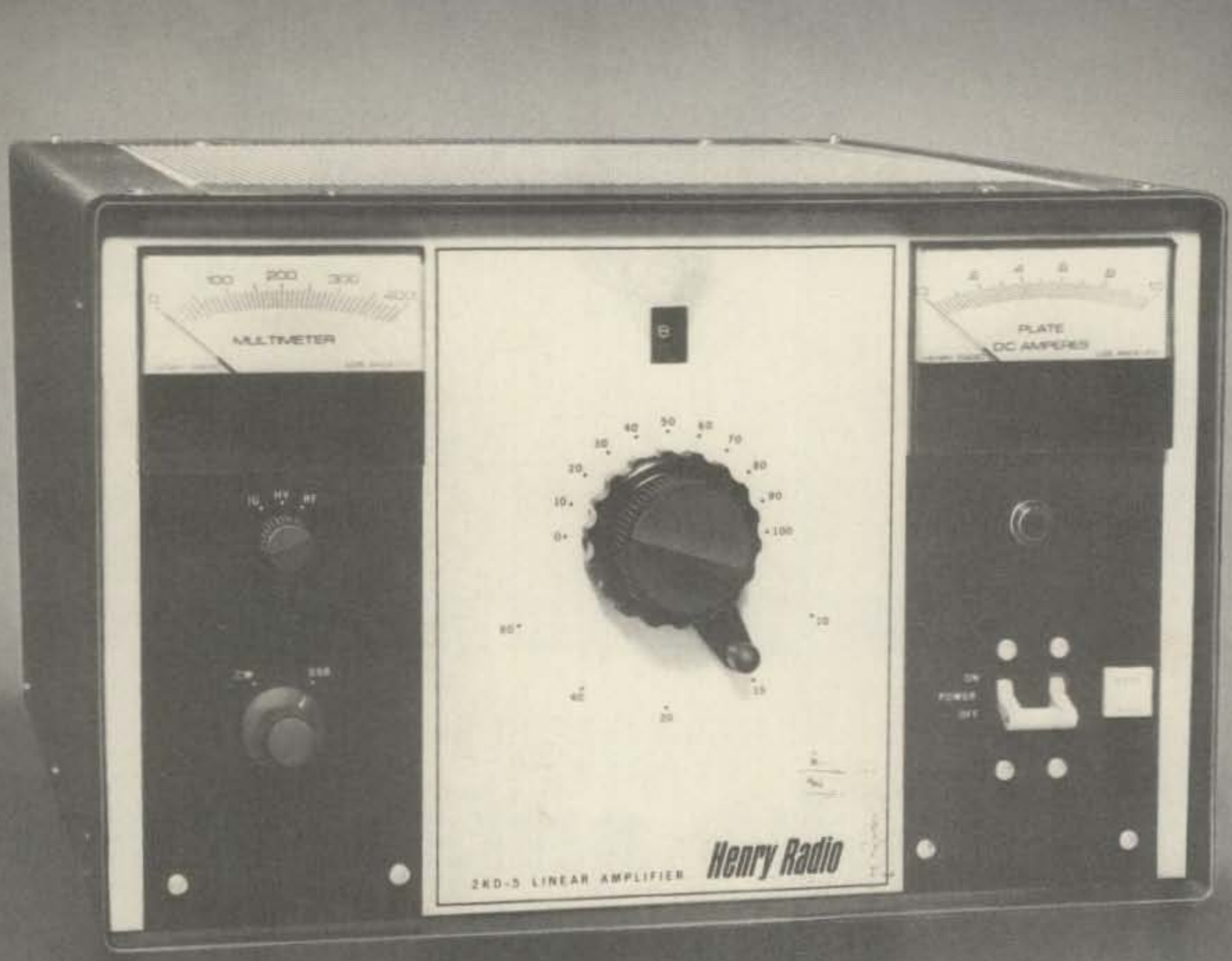

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