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NOVEMBER 1979 / $1.25

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HOW TO EARN THOSE CANADIAN AWARDS

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- Maritime Mobile, 1946 Style
- How to Build An Antenna Tuner
- Propagation, DX Chart, New Products,
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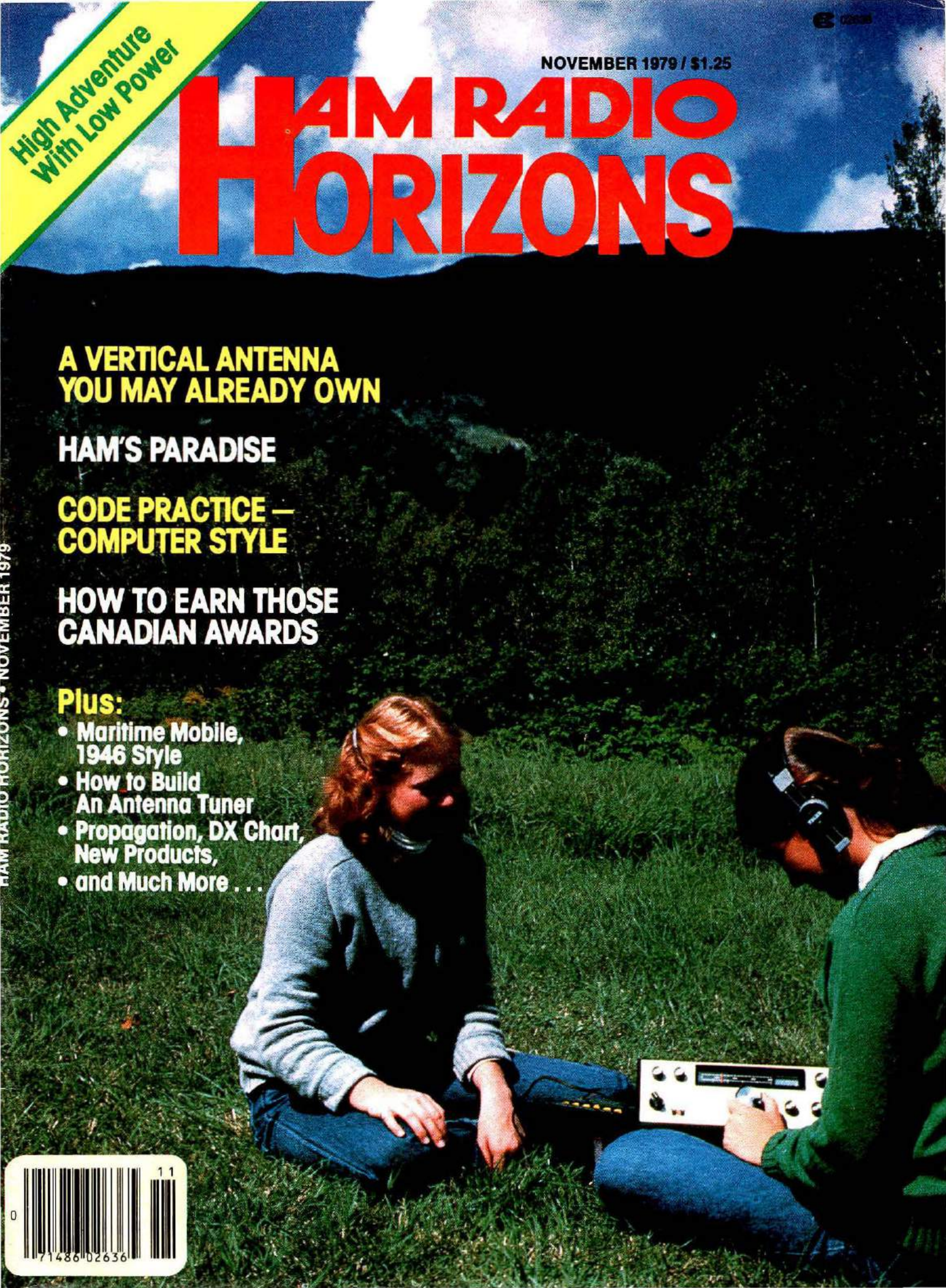

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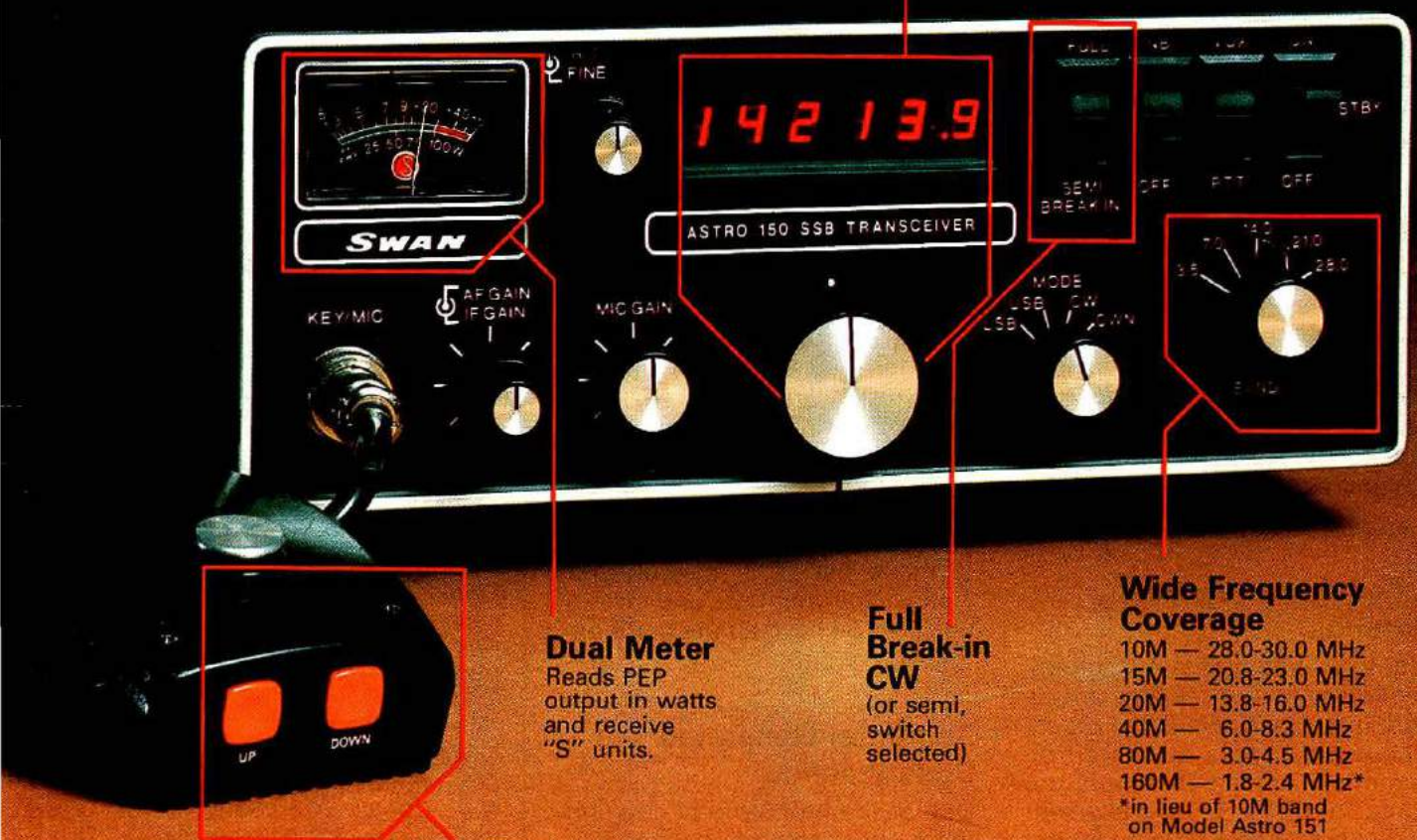

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THIS MONTHS HORIZONS

QRP Operating

Since the early days of Amateur Radio, there have been experimenters who dared ask, "Let's see how far we can reduce power and still maintain contact." The results of such tests were often surprising; sometimes milliwatts would do the job. Today, many Amateurs increase the thrill of their hobby by using low-powered rigs, in a facet of Amateur Radio called QRP, or, for the advocates of really low-power, QRP_p. There are QRP clubs, contests, awards, bulletins, and frequencies for calling and working each other. If your last page in the log left you with a ho-hum feeling, try QRP; you may find that bigger is not better after all.

A Fed-Tower Vertical Antenna

It's no accident that a-m broadcast stations use vertical antennas; they want to put the signal where the people are, in all directions. You can do almost the same thing by using the tower that is holding up your 10-meter, vhf, or television antenna, and you don't need impressive and expensive insulators for the bottom of it. A few pieces of plastic pipe, some wire, and a couple of capacitors are all it takes to make that vertical real estate pay off in DX on another band or two.

Canadian Awards

WACAN, WAVE, CIA, Maple Leaf — code names for government activities? No, they're just a few of the awards and certificates you can earn by talking to Canadian Amateurs. They can be obtained while using modest equipment, and the antennas need not cost you a bundle either.

Tokyo's Radio Row

In today's mobile world, it is not uncommon to hear an Amateur talking about the hams he's visited, the DX countries he's operated in, or the new techniques and equipment he has seen while on a vacation or business trip to some distant part of the globe. Amateurs who have visited the Far East, for example, have been heard to marvel at the contents of Japan's "Radio Row." Author Blakeslee agreed to make notes and take photographs on one of his trips through the fabled area, and he tells you about it on page 26.

Antenna Tuner

Here's a project that will help get the most signal out of your transmitter, and put it where it belongs — in the antenna. But, it's more than that; it's an introduction to the rewarding experience of home brewing. K2PMA gives you some tips about how to make the most of whatever work space you have, and how to be sure you have all the parts before you begin.

Computer-Generated Code Practice

One of the problems of copying plain language sent in Morse code is that you can anticipate the next letter, which gives you a false sense of speed. If you have a home computer, or know someone who does, here's a way to put it to work on your own code-practice system — complete with letters, numerals, and punctuation.

Commercial Maritime Radio And Hamming — How It Was In The Middle East In 1946

A delightful account of the adventures of a commercial radio operator and ham aboard a Liberty Ship just after WW II ended. Author W9VND wrote this piece in 1946, probably while on watch on shipboard. It's presented pretty much as he wrote it, except for some editing to tidy up the salty language. It retains the flavor of those days when hams were given the go-ahead to operate after a long time of mandated radio silence. Ozzie is still an active Amateur and DXer. W9VND is now W6AD.

The Cover

Low-powered rigs are not only fun to use at home, but, being small and light, can be taken along to far-away places. This portability means you can enjoy Amateur Radio far from the noises of the big city. Susan Tenney is checking out a Ten-Tec Argonaut as sister Nancy looks on, with Vermont's Sugarbush North ski area as a backdrop.

HAM RADIO HORIZONS November 1979, Volume 3, Number 11. Published monthly by Communications Technology, Inc., Greenville, New Hampshire 03048. Telephone (603) 878-1441. Second Class Postage paid at Greenville, New Hampshire and at additional mailing offices. ISSN 0147-8818.

Subscription price: Domestic, one year, $12.00; two years, $20.00; three years, $27.00. Canada and Worldwide, one year, $12.00; two years, $22.00; three years, $30.00, payable in United States funds.

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NEW MFJ Deluxe Keyer has Speed Readout

Socket for external Curtis memory, random code generator, keyboard. Uses Curtis 8044 IC. Gives you dot-dash memories, weight, speed, volume, tone controls, speaker. Sends iambic, automatic, semi-automatic, manual. Reliable solid state keying, RF proof.

BRAND NEW

Speed Readout Meter lets you read to 50 WPM. Socket for Curtis memory, random code generator, keyboard.

$79.95

The new MFJ-408 Deluxe Electronic Keyer II is based on the proven Curtis 8044 IC keyer chip. **Speed readout meter** lets you read sending speed to 50 WPM. **Socket** (optional cable with plug, $3.00) lets you use external Curtis memory, random code generator, keyboard (available from Curtis Electro Devices).

Sends iambic, automatic, semi-automatic, manual. Use squeeze, single lever or straight key.

Iambic operation with squeeze key. Dot-dash insertion. **Semi-automatic "bug" operation** provides automatic dots and manual dashes.

Dot-dash memory, self-completing dots and dashes, jam-proof spacing, instant start. **RF proof.**

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

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

Tone control. Room filling volume. Built-in speaker. Ideal for classroom teaching.

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Completely portable. Operates up to a year on 4 C-cells. 2.5 mm phone jack for external power (6 to 9 VDC). Optional AC adapter $7.95.

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Stereo phone jack for key, phono jack outputs. **OPTIONAL BENCHER IAMBIC PADDLE.** Dot and dash paddles have fully adjustable tension and spacing. Heavy base with non-slip rubber feet eliminates "walking." $39.95.

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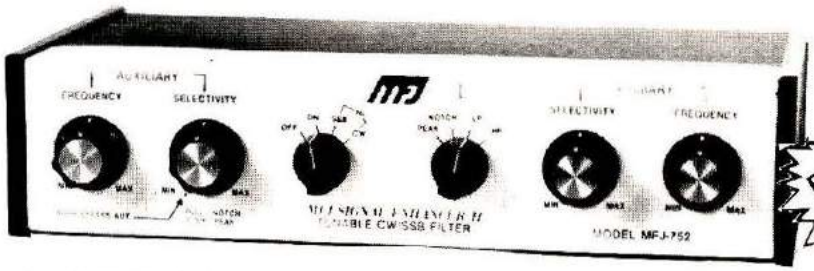
NEW MFJ Dual Tunable SSB/CW filter

lets you zero in SSB/CW signal and notch out interfering signal at the same time.



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The MFJ-752 Signal Enhancer is a dual tunable SSB/CW active filter system that gives you signal processing performance and flexibility that others can't match.

For example, you can select the optimum Primary Filter mode for an SSB signal, zero in with the frequency control and adjust the bandwidth for best response. Then with the Auxiliary Filter notch out an interfering heterodyne . . . or peak the desired signal.

For CW, peak both Primary and Auxiliary Filters for narrow bandwidth to give skirt selectivity that others can't touch. Or use Auxiliary Filter to notch out a nearby QSO.

The Primary Filter lets you peak, notch, lowpass, or highpass signals with double tuned filter for extra steep skirts. The **Auxiliary Filter** lets you notch a signal to 70 db. Or peak one with a bandwidth down to 40 Hz.

Tune both Primary and Auxiliary Filters from 300 to 3000 Hz. Vary the bandwidth from 40 Hz to almost flat. Notch depth to 70 db.

MFJ has solved problems that plague other tunable filters to give you a constant output as a bandwidth is varied. And a linear frequency control. And a notch filter that is tighter and smoother for a more effective notch.

Works with any rig. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs.

Switchable noise limiter for impulse noise; trough clipper removes background noise.

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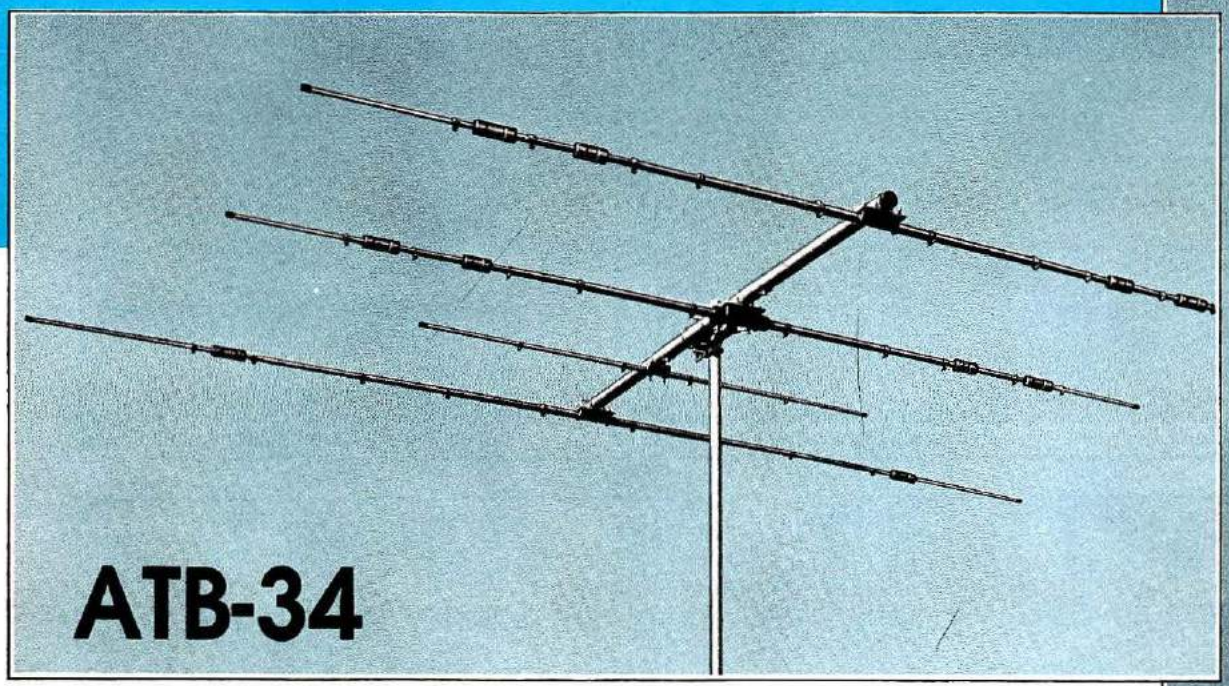

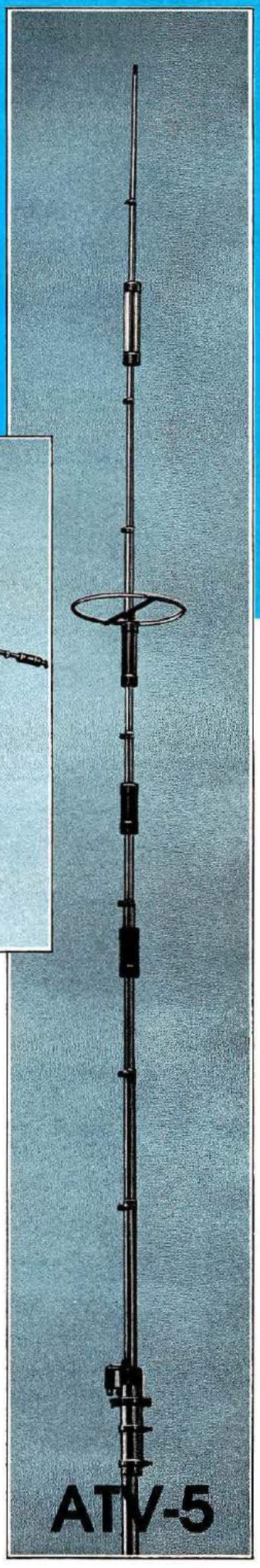

Punch through the pile-ups with an ATB-34. The only three band beam to give you real full size performance. Check ATB-34 element lengths, check the trap design and construction. Check the spacing and the specially developed balun. All of these features add up to the no compromise performance that you expect from Cushcraft.

SPECIFICATIONS

Gain	7.5dBd
F/B Ratio Avg.	24dB
3dB Beam Width	62°
Nominal Impedance	50 ohm
Power Handling	2000 Watts PEP
Boom Length	18'
Longest Element	32'8"
Turning Radius	18'9"
Wind Area	5.4 Ft.2
Weight	42 lbs.
Maximum Mast O.D.	2.5"

Cushcraft vertical antennas are designed to meet the exacting demands of your amateur radio station. They give top performance in easy to use packages. They can be installed at ground level or roof top.

Durability is guaranteed with double wall seamless aluminum base sections and fiberglass high Q traps. If you are interested in local contacts or long path DX communications, a Cushcraft vertical antenna is your best choice.

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10-15-20 Meters
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10-15-20-40 Meters
Height 19.4' (5.9mtrs.)

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Power Handling 2000 Watts, Nominal Impedance 50 ohms, Maximum Mast Size 2" O.D., Termination: accepts PL-259

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November, 1979
Volume 3, Number 11

HAM RADIO HORIZONS

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Ham Radio Horizons is published monthly by Communications Technology, Inc
Greenville, New Hampshire 03048
Telephone 603-878-1441
ISSN 0147-8818

As I was tuning around the 40-meter phone band one evening earlier this fall, I overheard a contact between two old-time Amateurs who obviously felt that Amateur Radio just isn't as exciting, inviting, and mysterious to today's youth as it had been to them when they first got started back in the 1920s and 1930s. But just as the old timer of today would like to return to the homebuilt receivers and transmitters of his youth, the old timer of 1930 probably wished to return to the days of his beloved spark transmitter and galena detector — and the old timer of 2001 will no doubt reminisce about the "good ole days of 1979." The cast of characters is different, but the basic argument never changes: "Modern technology is ruining Amateur Radio." In my view, that kind of thinking is as old fashioned and out of place as a-m on 20 meters; if anything, Amateur Radio offers more opportunities now than ever before, and the number and variety of those opportunities increases with each major advance in technology.

As just one example, consider the opportunities available through satellite communications. Rather than wishing for a return to the "good old days," we should appreciate the possibilities of intercontinental communications when we want it, rather than at the whim of the ionosphere. The Radio Amateur's traditional communications expertise, inquisitiveness, patience, and resourcefulness must again come to the fore in the exciting field of satellite communications.

Many old timers also worry that fewer and fewer amateurs now build their own equipment. Although the homebuilt receivers and transmitters of yesteryear have given way to vastly superior (and less expensive) commercial equipment, today's Radio Amateur is still building some of his own gear — speech processors, swr meters, digital dials, memory keyers — sophisticated accessories that weren't available ten years ago at any price!

There are even those who complain that the thrill of working DX is gone — anybody with enough money and a big antenna can work all the DX he wants. That's always been true, so I guess what they're really saying is that DX is no longer the private province of a small, select group. With the proliferation of high-performance transceivers and high-gain antennas, the competition for rare DX is probably more intensive now than ever before. If that's not challenge enough, there's always the world of QRPp, now growing by leaps and bounds as experienced kilowatt-wielders leave their high-power linears to marshal four or five watts to chase DX around the world.

Modern solid-state technology and manufacturing techniques have provided us with equipment which has fostered the Amateur spirit — perfecting the art of getting the message through in spite of conditions or power limitations. Rather than making more "appliance" operators, high quality commercial amateur equipment offers new challenges and opportunities for fun and training to help Radio Amateurs better serve the public interest. The sophisticated equipment now available also gives us all the ability, and indeed, the *responsibility*, to truly communicate with our fellow Radio Amateurs around the world. And if that still isn't exciting, or challenging, or rewarding, or as new and vital as *today*, then I don't know what is.

Jim Fisk, W1HR
editor-in-chief

Imagine All The Places You Can Tuck ICOM's Remotable IC-280. (Think small.)

The **IC-280** 2 meter mobile comes as one radio to be mounted in the normal manner: but, as an option, the diminutive front one third of the radio detaches and mounts by its optional bracket, while the main body tucks neatly away out of sight. Now you can mount your 2 meter radio in pint-sized places that seemed far too cramped before.

Measuring only 2¼"h x 7"w x 3⅜"d, the bantam-sized microprocessor control head fits easily into the dash, console or glove box of even the most compact vehicle. Or if those places are already taken by the rest of your "mobile shack," the **IC-280** head squeezes into leftover nitches under the dash, overhead, under the seat or even on the steering column.

But don't be misled by the petite size of this subdivided radio: the **IC-280** is jam packed with the latest state of the art engineering and convenience features. No scaled down technology here!

With the microprocessor in the detachable control head, your **IC-280** can store three frequencies of your choice plus the dial, which allows you to select from four frequencies with the front panel switch without taking your eyes off the road. These frequencies are retained in the **IC-280's** memory for as long as power is applied to the radio, even when power is turned off at the front panel switch. And if power is completely removed from the radio the ±600 KHz splits are still maintained!

The **IC-280** works frequencies in excess of the 2 meter band with ICOM's outstanding single-knob tuning, so you can listen around the entire band without fooling with three tuning knobs. With steps of 15 KC or 5 KC, the **IC-280** puts rapid and easy frequency change at your single fingertip and instantly displays bright, easy to read LED's.

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IC-280 Specifications: ☐ Frequency Coverage: 143.90—148.11 MHz ☐ Operating Conditions: Temperature: −10°C to 60°C (14°F to 140°F), Duty Factor: continuous ☐ Frequency Stability: ±1.5 KHz ☐ Modulation Type: FM (F3) ☐ Antenna Impedance: 50 ohms unbalanced ☐ Power Requirement: DC 13.8V ±15% (negative ground) ☐ Current Drain: Transmitting: 2.5A Hi (10W), 1.2A Lo (1W), Receiving: 0.630A at max audio output, 0.450 at SQL ON with no signal ☐ Size: 58mm(h) x 156mm(w) x 228mm(d) ☐ Weight: approx. 2.2 Kg ☐ Power Output: 10W Hi, 1W Lo ☐ Modulation System: Phase ☐ Max. Frequency Deviation: ±5 KHz ☐ Spurious Output: more than 60 dB below carrier ☐ Microphone Impedance: 600 ohms dynamic or electret condenser type, such as the SM-2 ☐ Receiving System: Double superheterdyne ☐ Intermediate Frequency: 1st: 10.695 MHz, 2nd: 455 KHz ☐ Sensitivity: 1 uv at S +N/N at 30 dB or better, Noise suppression sensitivity 20 dB, 0.6 uv or less ☐ Selectivity: less than ±7.5 KHz at −6 dB, less than ±15 KHz at −60 dB ☐ Audio Output: More than 1.5W ☐ Audio Output Impedance: 8 ohms

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FOCUS & COMMENT

As I am writing this, the final torrents of ex-Hurricane David are lashing at the window and whipping the trees to a mild frenzy. The news of Amateur Radio's participation in the storm-related emergency from the Caribbean to the mid-Atlantic states is heartening, to say the least. Some nets worked around the clock, and the Governor of one Caribbean island found that a Radio Amateur with a battery-powered rig and a makeshift antenna was his *only* contact with the outside world.

That's great to hear. Providing emergency communications is perhaps the strongest lever we can use to ensure that we are allowed to exist. Technical training? There are plenty of schools that teach electronics. International good will? Well, maybe, but telling another ham on the other side of the world that he's a swell guy and asking for a QSL can hardly hold a candle to providing reassurances that someone's relative is okay in spite of a flood, earthquake, tornado, or hurricane.

Unfortunately, with the good side of the news also comes the bad: There were thoughtless hams who interrupted emergency communications, people who harassed the nets with dead carriers, and jammers who played music on the air. The "excuse" offered by many "authorities" is that these are "sick and misguided" people, that it's too bad, and that there isn't much that can be done about it.

Well, now, the sick and misguided part I'll agree with. A person must be mighty sick to get his jollies out of annoying a group of people who are trying to save lives, ease suffering, and end anxiety. The sad part is that this is not an isolated incident, as many traffic nets, especially on the west coast, can tell you. I heard similar incidents a few years ago, during some Central-American earthquakes.

On a more far-reaching scale, consider the Japanese ham who, after years of groundwork and explanation of what Amateur Radio was all about, recently got permission to give some Chinese Government officials a demonstration of Amateur Radio. The appointed hour arrived, the officials assembled, and he turned the rig on — to be greeted with a powerful jammer after the first call! What a way to demonstrate the potential of Amateur Radio to the rulers of the world's largest population! The list of damages done by these "sick and misguided" people could go on for pages.

But, as to the idea that nothing can be done about it, I disagree. Throughout history, whenever something became annoying enough to enough people, something *was* done about it.

I feel that it is time we told the "authorities" that we are properly annoyed by this sickness in our midst, and that we want something done about it. Being a society built on law, the solution must be worked out within the law, of course. But, what?

We do not yet know what form it will take, but there is a solution in the wind. Some knowledgeable and influential people are working on it.

FCC Chairman Ferris, Representative Corman from California, ARRL General Council Booth, and attorney Joe Merdler from California, have had several meetings to discuss the problem and try to find an answer. There will be many more such meetings. Our *Newsline* column in this magazine, Presstop in *ham radio*, and *Ham Radio Reports* all provide the latest news on the outcome of these meetings, and you can rest assured that there will be some point in the proceedings where your voices will need to be heard. Watch for that time, and when it arrives, sing out, *loudly*. The people who find the solution will need plenty of support to convince the lawmakers that the Amateur Radio world is behind them.

In the meantime, give the matter some serious thought. If this era of permissiveness, the attitude that "well, that's the way he is, poor fellow," is allowed to continue unchecked, then it may well be that the "authorities" will become annoyed with us hams, and they will do something about us, as a service.

It's up to us to get there first.

Thomas McMullen, W1SL
Managing Editor

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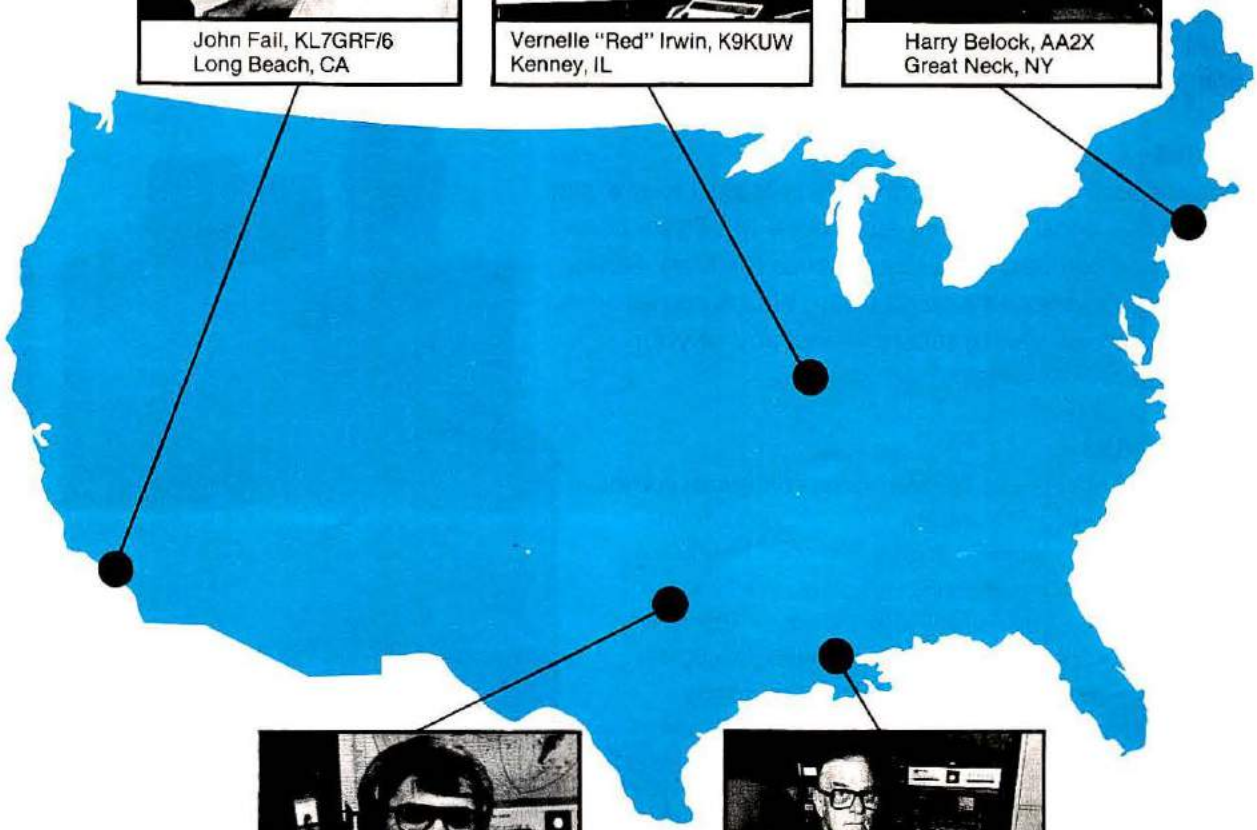
Harry Belock, AA2X
Great Neck, NY



Tom Gentry, K5VOU
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NEWSLINE

KILLER HURRICANES DAVID AND FREDERIC emphatically proved Amateur Radio's value for disaster service this past September, as the violent storms trailed death and destruction through the Caribbean islands and into the southeastern U.S. Active nets on 80 through 15 meters handled a wide range of traffic as the hurricanes moved west and north, leaving many communities, and some entire islands, devastated and cut off from the world.

The One Negative Note in an otherwise outstanding Amateur Radio performance was the too-frequent presence of jammers, including several "carrier throwers," the usual too-vocal critics, at least one apparent drunk, and — unbelievably — a station in the mid-central U.S. who actually retransmitted music on 14325 kHz several times! Fortunately, the net was able to function reasonably well despite these irrational activities.

FCC CHAIRMAN FERRIS, California Rep. James Corman, ARRL General Counsel Bob Booth, and California attorney Joe Merdler, N6AHU, met in Washington during September to discuss the problem of jamming in the Amateur bands. Principal purpose of the meeting was to brief the Commission's chairman on the nature and magnitude of the jamming problem, and to solicit his aid in finding a solution for it.

Tapes Demonstrating Recent "Jamming" episodes on the West Coast will go directly to FCC Chairman Ferris, California Representative James Corman pledged. In a follow-up meeting on the battle against malicious interference, Rep. Corman said he did not feel the Commission was doing an adequate job of enforcing its own rules. As an example, he cited the case of "W6JAM" (WB6LHB), who, despite his guilty plea and subsequent one-year suspended sentence and $1000 fine on three counts of using abusive language over the air, has still not had his license suspended or revoked by the Commission.

If Statutory Change is the answer to more effective performance from the FCC, then Rep. Corman plans to go to Rep. Van Deerlin, Chairman of the House Subcommittee on Communications, in an attempt to give the Commission more help.

Rep. Corman, a senior member of the powerful House Ways and Means Committee, seems genuinely disturbed over what he has learned of the malicious interference problem, and is quite determined to do something about it.

U.S. AMATEUR POPULATION DROPPED during July for the first time in five years, with the operator total at month's end down 100 from the all-time high of 365,985 a month earlier. Most significant is that the falloff comes entirely from a drop of 700 in the Novice Class, which would have been expected to have more than held its own due to the recent extension of Novice licenses to five year, renewable, terms.

This Trend Has Been developing for some months, with the rate of growth (averaged over the year preceding) dropping from 8.1% in January down to 5.5% by July. During that same period, a drop-off in sales of Amateur equipment — especially beginning-level gear — had also been noted, though that trend may have now been reversed to some degree.

Other Than Novice Operators, who dropped from 66,992 to 66,285 during July, all other classes showed an increase. Extras went from 23,493 to 23,627; Advanced from 84,436 to 84,531; General from 121,743 to 122,066; and Technicians from 69,321 to 69,405. However, Novice losses more than offset those gains.

THE PROTO-FLIGHT SOLAR PANEL for OSCAR Phase III, Mission A, provided by Solarex Corporation, has been received and has been given thermal/vacuum cycling tests. These will be followed by vibration tests, after which, if all goes well, more of these panels will be built.

Solar-Cell Total from the Phase III funding campaign is now at 4077, and 39 battery cells have been sponsored for this part of the OSCAR program.

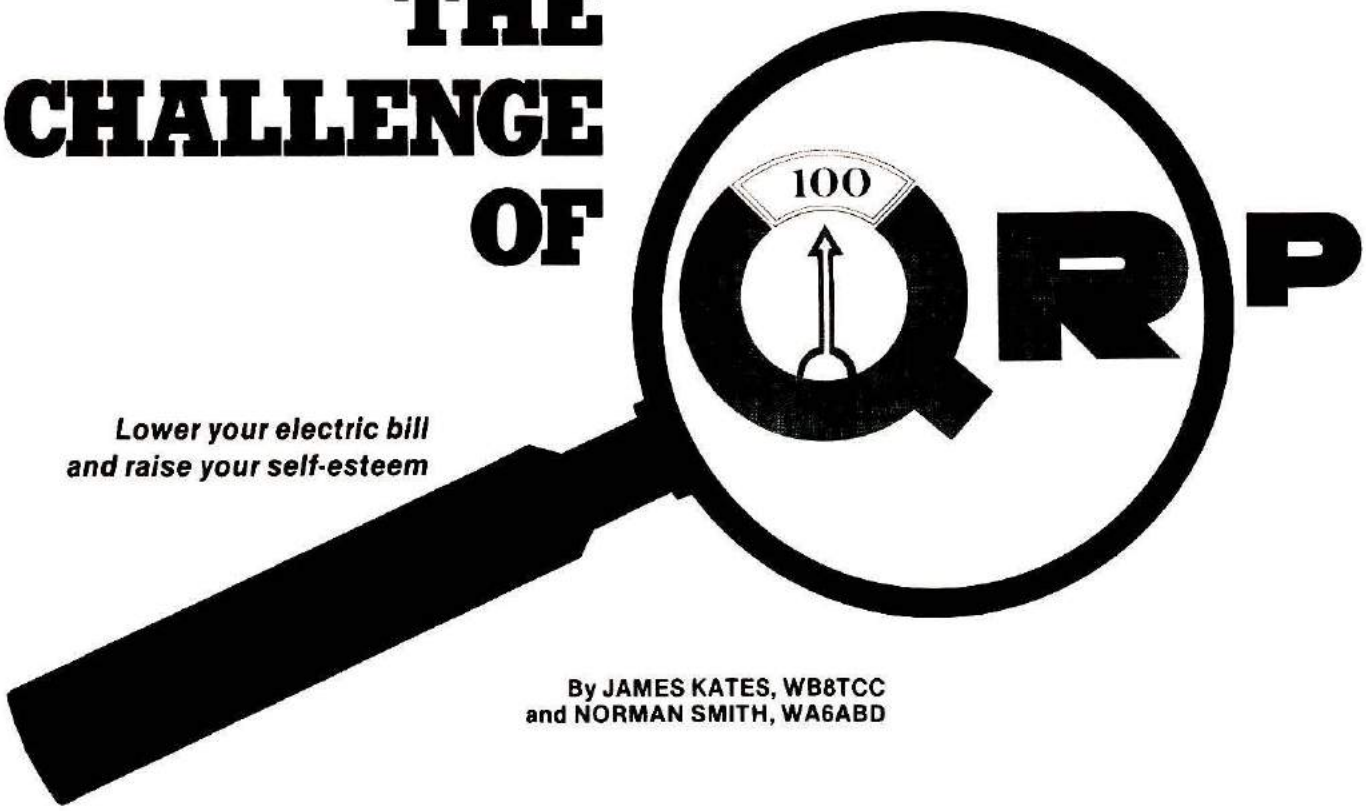
THE FOUNDATION FOR AMATEUR RADIO has announced the six winners of its 1979 scholarships. The winners are WB9LAD, WD8OKD, WB8TDA, WD5GZL, WB5LMZ, and NØAKC. These scholarships are open to all Radio Amateurs holding at least a General Class license. This year, applications were received from 28 states. Information on next year's scholarships will appear in next May issues of the major Amateur Radio publications.

COMPLAINTS ABOUT THAT "WOODPECKER" signal that tears up the HF bands should be phoned in to the FCC's Watch Officer, (202) 632-6975, 24 hours a day. The purported Russian Over-The-Horizon radar is heard from about 5 to almost 30 MHz.

K2UYH ACHIEVED 432-MHz "WAS" number 2 on September 3, when he worked WA7DKZ in Wyoming. Congratulations!

AN ICOM 701 USERS' CLUB has been formed by N8RT. An SASE to R.A. Pohorence, 9600 Kickapoo Pass, Streetsboro, Ohio 44240, will bring details.

THE CHALLENGE OF QRP



Lower your electric bill and raise your self-esteem

By JAMES KATES, WB8TCC and NORMAN SMITH, WA6ABD

Ham radio can be a pretty comfortable hobby. A nice rig, maybe a hundred watts or so, a few dipoles or a beam, a little operating skill (and a license), and you're in business. Stateside contacts — no problem! And if you're patient there's even a little DX now and then.

So why use QRP?*

How about the satisfaction of making a contact where operating skill, not power, determines the quality of a QSO?

How about the simplicity and economy of a small QRP rig?

Or, how about the real challenge of shutting off the big rig and taking on the bands with a few watts — or less?

For those and other reasons, QRP is catching on. For the old-timer who has grown bored with his filing cabinet full of DX cards (most of us couldn't imagine that!), the beginner on a budget, or the ham who wants to sharpen his operating skills, low-power operation is the answer.

QRP operation is usually defined as anything up to 20 watts, and includes the QRP_p world of less than one watt. Some operators run only a few milliwatts (and turn prematurely grey, in many cases). A QRP beginner who starts out at the high end of the scale and works his way downward will never run out of challenges — and he'll probably be amazed at what he can do.

"I've confirmed fifty-three countries while running less than 2 watts," said Ralph Burch, W8LCU, a dedicated QRP operator. "QRP is for the person who likes a challenge and wants to learn more about his hobby. And, it's a great way to make friends. Usually, when I tell someone I'm running QRP, they don't just send me a QSL; they'll send me a letter. And next time they hear me on the air, they'll make a special effort to work me."

So you think you're ready to try QRP — how do you get started?

*QRP is an international signal meaning "Shall I reduce power?" or, "Reduce power to _____ watts." Hams have adopted it to identify low-power equipment or operation.

The transmitter

Most newcomers to Amateur Radio are fascinated by the transmitter, and even more so by the QRP transmitter. It's interesting in part because it's so simple — and there is indeed something intriguing about watching a skilled operator talk to the world with a mere handful of parts.

Though the 5-watt-or-less "peanut whistle" always attracts attention, most QRP beginners would be wise to start off with a good solid rig running 20 watts or so. This will minimize frustration and provide an easy transition into the QRP world. Using a good antenna and receiver, even a moderately competent operator can hope to work all states, and even some DX, while running 20 watts.

Where to find such a rig? A local hamfest is a good place to start. Back in the days when novices were limited to 75 watts, tube-type CW rigs running 20 watts or so were quite popular (many of them were in kit form). These 20-watters can sometimes be found for as

little as $15, and if they're in good shape, they're a bargain.

One of the most challenging and satisfying things a QRP operator can do, though, is build his own transmitter. In the 20-watt category, most CW transmitters will be of the one- or two-tube type. These are quite simple in design and construction, and they make an excellent beginner's project. Construction information for these transmitters can be found in ham magazines and books (many of which are available from Ham Radio's Bookstore, Greenville, New Hampshire 03048), and parts can be found at a local or mail-order supplier, or can be scrounged from old radios, TV sets, *etc.* What better way to get started on a "junkbox" collection!

Building a transmitter is relatively easy. Usually there's a wide tolerance range for parts, and a small CW transmitter has a simple circuit. In the smallest rigs, it's sometimes nothing more than an oscillator circuit coupled to an antena. The builder should remember, though, to shield the transmitter carefully and avoid poor connections, loose ends, and the like, lest he should cause TVI (television interference).

The Ten-Tec Argonaut is one of the "first class" QRP transceivers.

Even a one-watter can be a source of interference.

After a little experience with a more powerful QRP rig, most operators will want to try QRP_p with a rig running 5 watts or less. A ready-built transmitter running from one to five watts can be bought for as little as $30. These small rigs usually operate on 12 volts dc, so of course the operator will have to buy (or build) a good power supply if he doesn't want to use batteries.

Almost all "peanut whistles" these days are solid-state, although some nostalgic operators still build tube-types. A solid-state rig can be surprisingly small and portable, so it makes an excellent emergency radio in case the lights go out. Many QRP_p builders enjoy the challenge of constructing a transmitter on a *really* small chassis — like a plastic soap box, a tin can, or even a matchbox!

The receiver

Most QRP operators have a motto somewhat to the effect that "one handicap is enough." Accordingly, they don't handicap themselves with poor receivers. The old adage, "You can't work 'em if you can't hear 'em," still holds true, and most enthusiasts will agree that operating with low power, not poor equipment, is the real challenge of QRP.

Many QRP operators using "separates" use a regular receiver along with their low-power transmitter, but some like to use a miniature receiver which operates on 12 volts dc. This combination, of course, is good for lights-out or portable work. In any case, the QRP operator should make sure that his receiver is not going to handicap him any more than is necessary.

Some operators build their own receivers from scratch, but alignment problems, sensitivity and selectivity requirements, *etc.*, make this pretty difficult; it's not recommended for a beginner. Kits are available,

Heathkit's HW-8 is an economical transceiver kit which puts out 2 watts on 80, 40, 20, and 15 meters.

though, that will allow the beginner to build an excellent receiver and save some money at the same time.*

Whatever route is chosen, then, the beginner interested in QRP should get the best receiver affordable. It's worth it.

What about transceivers?

For the ultimate in QRP convenience, a transceiver can't be beat. It's compact, versatile, and usually it offers features such as break-in operation for CW, good TVI protection, and the like. CW-only transceivers, such as Heathkit's HW-8, start at about $125, and in most cases provide a good transmitter coupled with a fairly sensitive receiver. Much satisfaction can be had by building one of these rigs from a kit.

In the ready-assembled line, rigs such as the Argonaut by Ten-Tec are priced at around $500. Transceivers in this category are first-class units with attractive styling, super-selective receiver circuits, and transmitters with heavy-duty circuitry. Of course, at this stage of the game, one consideration — economy — is clearly missing. It's up to the operator to determine whether such electronic bliss is worth the hefty price tag.

Transmitter, receiver, or transceiver obtained, you're ready to go on the air, right? Wrong!

Heath's HW-104 has a low-power switch which allows operation at 1 watt.

Antennas are important, too

The same rule (perhaps to a greater degree) applies to antennas as well as receivers: It pays to use the best. There are a few masochistic types who enjoy tuning a 23-milliwatt rig into a window screen, but most QRP operators enjoy using a good antenna — a beam, a quad, or a good dipole. Any beginner interested in maintaining his sanity should do the same.

That's not saying, of course, that you need a 300-acre antenna farm to work QRP. But ask any ham whether he'd rather run a kilowatt into a window screen or 50 watts into a good beam or dipole. He'll probably choose the latter. QRP is much the same — and, as said before, the prime challenge of QRP is operating with low power — not with poor equipment.

Tuning an antenna for QRP operation is critical. Whatever type of antenna is used, the operator should buy or borrow an SWR meter and make sure he has a good match; every extra milliwatt helps.

The Kantronics "Rock Hound" is a small transmitter which runs on 12 Vdc.

Getting on the air

So — you have a transmitter/receiver or transceiver, a good antenna, and you're ready

*For instructions on a receiver you can build, see *Ham Radio Horizons*, February, March, and April, 1979; back issues are available for $2.00 each.

The QRP Amateur Radio Club International

The QRP Amateur Radio Club International was formed in 1961 with the purpose of joining together the large segment of Amateurs who enjoy using low-power. Power limits are set at 100 watts input on CW, and 200 watts PEP. Amateurs anywhere are invited to join the club if they consistently run power at or below these levels.

Membership cost is $3, initially, which gets you a lifetime membership plus a 1-year subscription to the quarterly newsletter. The newsletter subscription may be renewed after the first year for $2. If you are interested, write to Joseph C. Szempias, W8JKB, 2359 Woodford St., Toledo, Ohio 43605. Ask for a membership application blank, and include an S.A.S.E.

QRP Amateur Radio Club currently issues several certificates for operating achievements. QRP-25 is open to all Amateurs, running any legal power, for working 25 members of the club. There are endorsements for working 50, 100, 200, etc. In addition, there are WAS/QRP, WAC/QRP, DX-CC/QRP, WAS/QRPp, and other awards for confirmed contacts with QRP having been used one or both ways. The club holds informal QSO parties each month (first Sunday), a yearly formal contest, and other activities with the low-power operator in mind. Club members may be found in QSOs or calling CQ QRP on regular club frequencies on all bands and modes.

The QRP Amateur Radio Club does not advocate the reduction of power limits established by any country. The majority of our members enjoy the challenge of running QRP and QRPp among the kWs. The QRP Amateur Radio Club is devoted simply to the enjoyment of Amateur Radio through QRP operating and hopes to build interest in a more efficient, courteous, and proper operation of all transmitters on the Amateur bands. In this way we may encourage more world-wide enjoyment of our hobby through voluntary power limitation and experimentation with the lowest power operations.

Operating Awards Program

The main objective of the QRP awards program is to demonstrate that the use of limited power can create less QRM on the Amateur frequencies while still allowing us to enjoy our hobby, using the minimum power necessary to complete a QSO. The club issues the following awards which are available to any Amateur. Others may be added as a need for them arises.

QRP-25: Issued to any Amateur for working 25 members of QRP Amateur Radio Club. Endorsements are issued for 50, 100, 200, and every additional hundred members thereafter. Also endorsed for working ten members on the bands above 50 MHz. To apply, send log data, including member numbers or power, with $1.00 or 10 IRCs for basic award. For later endorsement seals, send either 10¢ or a stamped and self-addressed envelope (SASE) with a list of additional members (and member numbers) worked. This award is not endorsed for special band or mode recognition because it is issued in different classes (50, 100, etc.).

WAC-QRP: Issued to any Amateur for confirmed contacts with low-power stations in all six continents. Power inputs of less than 100 watts must have been used on both sides. To apply send list, including power used on both sides, with $1.00 or 10 IRCs.

WAS-QRP: Issued to any Amateur for confirmed contacts with low power stations in each of the fifty states which make up the United States of America. Power inputs of less than 100 watts must have been used by both sides. To apply send list, including powers used on both sides, with $1.00 or 10 IRCs.

DXCC-QRP: Issued to any Amateur for confirmed contacts with low power stations in 100 countries. Power or QRP rig must be indicated on QSLs and application. This award is available to QRO operators but a special endorsement seal will be added if two-way QRP was used for all contacts. To apply, send list, including powers used, with $1.00 or 10 IRCs.

KM/W, 1000-Mile-per-Watt Awards issued to any Amateur transmitting from or receiving the transmissions of a low power station such that the great circle distance between both sides, divided by the power input of the low power station, equals or exceeds 1000 miles per watt. Additional certificates may be earned by accomplishing this on different bands or using different modes. To apply send full log data including powers used on both sides, signal reports exchanged, band and mode, and operating QTHs on both sides. Include either $1.00 or 10 IRCs.

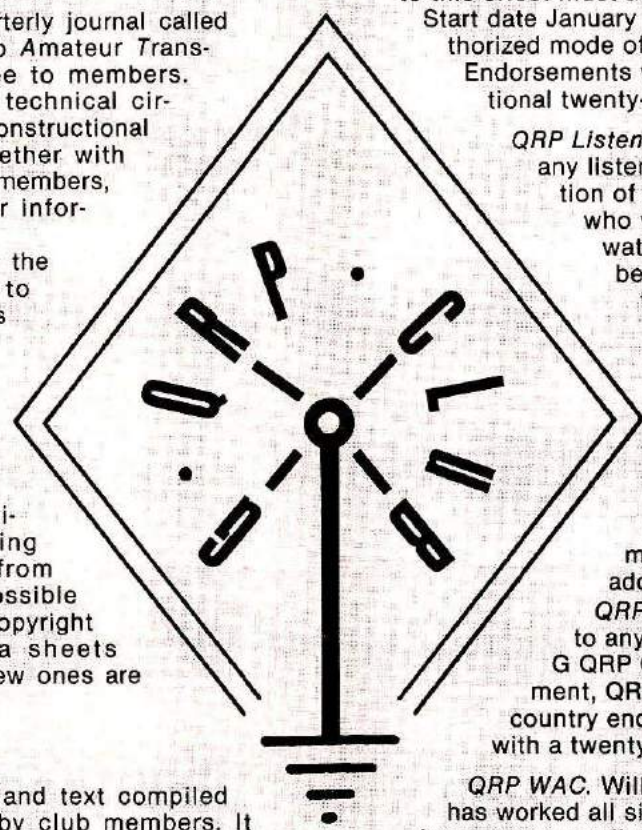
WAS-QRPp: Issued to any Amateur for confirmed contacts with each of the fifty states while using a power input of five watts or less. The award will be issued for confirmation of states in the following steps: 20, 30, 40, 45, 50. The award will be specially endorsed at the time of original application only if, **A**, power input for both sides of all contacts was 5 watts or less, or, **B**, power input of the applicant for all contacts was under 1 watt. To apply, send list, including powers used, with $1.00 or 10 IRCs.
Awards Manager: Hugh F. Aelker, WA8CNN, 929 South Park, Charleston, West Virginia 25304.

G QRP Club
Devoted to Low Power Radio Communications

The G QRP Club was formed in 1972, and now has over five hundred members in twenty-five countries. The club exists to promote interest and growth in low power (5 watts dc input at PEP, or less) Amateur Radio communication. Membership is open to any licensed Radio Amateur or short wave listener throughout the world who has an interest in low-power communications. The annual subscription is £2, U.S. $3, or equivalent, and should be forwarded to the secretary; George Dobbs, G3RJV, Willowdene, Central Avenue, Stapleford, Nottingham, NG9 8PU England.

The club publishes a quarterly journal called *Sprat* (Small Powered Radio Amateur Transmission), which is sent free to members. The journal contains many technical circuits, ideas and hints for constructional projects for QRP work, together with club news, news about the members, awards, contests, and other information of interest.

Sprat is the only journal in the world devoted exclusively to QRP, and practical circuits make up at least two thirds of each journal.



Data sheet service

This is a series of leaflets free by the club. The sheets are articles of practical QRP interest, many being photocopies of articles from overseas magazines, not possible to reproduce in *Sprat* for copyright reasons. The list of data sheets changes all the time, and new ones are reported in *Sprat*.

Morse code training

This is a series of tapes and text compiled by a member for free use by club members. It is a full course leading from learning the alphabet to 12 words per minute. The only requirement is that you send two C90 cassette tapes and return postage to the member who looks after the scheme.

Club awards

The club issues a range of awards for QRP operation and listening. These are issued free to members and are awarded for the following accomplishments:

The G2NJ Trophy. Open to club members only. Awarded on a 3-year cycle (starting in 1975) as follows:

Year 1. Most outstanding QRP operating performance during the year.

Year 2. Most meritorious technical contribution(s) to *Sprat*.

Year 3. Most outstanding contribution to the cause of international QRP.

Worked G QRP Club Award. Open to members or nonmembers who, after January 1st, 1975, work twenty members of G QRP C who are running a dc input of 5 watts or less. Endorsements will be issued for each additional twenty members worked under the same conditions. The general award rules apply.

Heard G QRP Club. Similar to the Worked G QRP Club Award, but issued to listeners who have confirmed reception of twenty club members who are running 5 watts or less.

QRP Countries Award. For members only. Basic award for contacts with twenty-five countries (according to the DXCC list) when using an input not exceeding 5 watts. A written and signed statement to this effect must accompany each application. Start date January 1st, 1970. Any band and authorized mode of transmission may be used. Endorsements will be issued for each additional twenty-five countries worked.

QRP Listener Award. Will be awarded to any listener who has confirmed reception of stations from fifteen countries who were using not more than a 5 watt dc input. Endorsements will be issued for each additional fifteen countries.

Two-Way QRP Award. Will be issued to any member for contacts with ten different DXCC countries when both the member and the station worked were using an input not exceeding 5 watts dc. Endorsements will be issued for each additional ten countries worked.

QRP Master Award. Will be issued to any member holding Worked G QRP C with a sixty-member endorsement, QRP countries with a seventy-five-country endorsement, and two-way QRP with a twenty-country endorsement.

QRP WAC. Will be issued to any member who has worked all six continents when using a dc input not exceeding 5 watts.

General Award Rules.

1. The claimant must submit either QSLs for all contacts or a list, signed by two licensed Radio Amateurs, stating that they have seen QSLs for the contacts. For two-way QRP, the input power must be stated on all QSL cards.

2. For transmitting awards, the claimant must submit a signed declaration in the following form: "I. . . . . certify that during the contacts upon which this claim is based my input did not exceed 5 watts dc. Signed, dated."

3. (a) The whole contact, including any calls necessary to establish communications, must be made with a power not exceeding 5 watts.
(b) Where a station contacted gives his power as output, not input, 3.6 watts output shall be taken as 5 watts input.
(c) Throughout these rules "5 watts dc" shall be taken to equal 5 watts PEP when SSB is used.

Awards Claims Address. All claims for awards should be addressed to A. D. Taylor, G8PG/GW8PG, 37, Pickerill Road, Greasby, Merseyside, L49 3ND England.

to get on the air. The entire ham world will fall at your feet, right?

Not exactly. No one but you will know you're operating QRP, and in the scramble for QSOs a weak signal is likely to be overlooked — if it is heard at all. So how do you get started on that DXCC? Here are some hints.

Listen. You've got only one key (or microphone) but two ears, so use them proportionately. Switch bands frequently to check conditions. Tune carefully, and take note of which bands are best at certain times.

Answer CQs, don't call them. If you call CQ continuously, you'll probably be drowned out in the sea of high-power operators. Listen for CQs and then answer them. Chances are that you may be the only operator coming back to a certain station and he'll answer you. If you live in a rare state (say, North Dakota or Wyoming), it helps to give your location as an added appetizer.

Operate when conditions are good. If your kilowatt doesn't get you through at certain times, your "peanut whistle" won't either. Save frustration and get on the air only when you have a reasonable chance of getting through.

CW is preferable to phone. Under similar conditions with the same power, a CW signal will usually be much easier to copy than a phone signal. There's more DX on the CW frequencies, too.

VFO operation is preferable to crystal-control. If you're going to answer CQs instead of calling them, you certainly don't want to be "rockbound" on a single frequency. Even the smallest "peanut whistle" can be used with a VFO, and with a good used VFO selling for $25-40 at the hamfests, there's almost no excuse to be without one. When you hear a lonely DX station calling CQ 10 kHz away, or when there's a kilowatt sitting on your one and only crystal frequency, it'll be well worth the price.

QRP operators can be found on all frequencies from 160 meters and up, but they like to cluster together. On the CW bands, they can often be found about 40 kHz from the bottom edge of the band and in the bottom 10 kHz of the Novice bands. They're less concentrated on the phone bands.

Which bands are best? It depends on the purpose. QRP operators looking for reliable QSOs of up to 1000 miles or so can be found on 80 and 40 meters. Serious DXers (General class and above) can be found on 20 meters. And operators who monitor the bands in search of occasional openings and worldwide DX can be found on 15 and 10 meters. Again, it doesn't pay to sit on one band if your equipment has the capability for more. Switch frequently, tune carefully, and listen closely, and you'll have the best chance for working all states — or even all continents!

QRP activities

QRP and QRP$_p$ operators, like many other ham factions, have their own organizations and activities. Many ham clubs have special QRP groups, and there are even some independent QRP clubs which offer fellowship and operating hints. See the QRP club story immediately following this one.

QRP operators are award hunters, too. Many conventional awards offer QRP endorsements, and operating low power brings a special challenge to every award-hunter. There are also many QRP contests, and even QRP nets.

Low-power operation is not easy, but it is never dull. Whether you ragchew, work the contests, or try to outdo the "big guns" in search of rare DX, QRP can be a satisfying alternative to the humdrum "QRZ 599 73 QRZ" routine. CUL es 73 QRP! **HRH**

Table 1. Here are some recent QRP activities dates. Watch for similar dates next year. Newsletters of other activities can be obtained from *QRP Amateur Radio Club* (see page 15), and *G QRP Club* (page 16).

CW QRP Activity Weekends	Time, GMT	Frequency, kHz
October 6th and 7th, 1979	0900 - 1100	on 14060
	1100 - 1300	on 21060 and 28060
	1130 - 1230	on 7030
	1400 - 1500	on 3560
	1600 - 1900	on 21060 and 28060 (Europe to U.S. QSOs)
	1900 - 2200	on 14060 (Europe to U.S. QSOs)
	2030 - 2130	on 3560
QRP Winter Sports 1979		
Daily from December 26th to 31st, 1979	1000 - 1100	on 21060 (For G Scandinavia QSOs)
	1100 - 1200	on 14060 (For G Scandinavia QSOs)
	1130 - 1230	on 7030
	1200 - 1500	on 21060 and 28060 (Europe to U.S. QSOs)
	1330 - 1530	on 3560

In addition, members of the G QRP Club meet weekly on Sundays on the following frequencies and times:

1100 - 1230	on CW	on 7030
1100 - 1300	on SSB	on 14285, 21285 and 28885
1400 - 1500	on CW	on 3560
1600 - 1700	on SSB	on 7090

International QRP Calling Frequencies

CW	3560	7030	14060	21060	28060
SSB	3690	7090	14285	21285	28885

A Vertical Antenna Farm

The answer to a horizontal squeeze is vertical involvement

BY ALLEN DYER, W7KLU

The postage-stamp size bits of real-estate, which modern home-builders laughingly refer to as building lots, place severe restrictions on the aspirations of the would-be antenna farmers who are forced, for one reason or another, to inhabit these miniscule parcels. What sort of low-band antenna can a poor guy put onto a midget lot that may measure only 18 × 30 meters (60 × 100 feet) or even less? A horizontal doublet for 40-meter operation might fit, if buildings or trees on the lot happen to be strategically located. As for horizontal antennas for other, lower frequency bands, forget it!

So . . . what to do?

One answer; reach for the sky

So far, at least, nobody has found a practical method to restrict the vertical dimensions of a city lot. The sky is still, literally, the limit in that direction. Admittedly, it is a bit difficult to stand a half wavelength of wire on end for 160-meter operation, or even for 80-meter work, but, fortunately, that isn't necessary.

Vertical antennas for the Amateur frequencies

Vertical antennas have some interesting characteristics that make the use of lengths shorter than a half-wave very practical. Let's consider some of these.

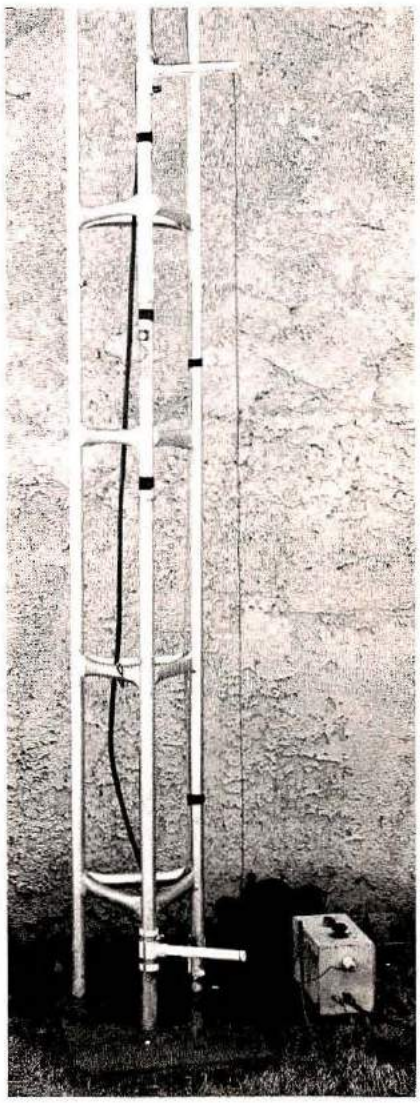
First, a quarter-wavelength antenna, worked against a good earth ground or a radial system, will perform in a perfectly satisfactory manner. If operated as a vertical antenna, the end next to ground will have extremely low impedance, which means that point can be grounded directly to the earth. It therefore needs no supporting insulator.

A grounded, quarter-wavelength antenna is electrically equivalent to a half-wavelength antenna, due to the "image-effect." That is, the ground acts as the mirror-image of the antenna, making the combination of ground and antenna look like a half-wavelength antenna in most of the important aspects. The angle of radiation of this type of vertical antenna is slightly different from that of a half-wavelength antenna, but, for purposes of Amateur Radio communications, you can ignore the difference.

It is not absolutely necessary to use a full quarter-wavelength antenna to obtain good results. Provided that the impedance of the feed point of the antenna can be properly matched to your transmission line, any length of antenna can be used. However, the efficiency of radiation of the antenna will suffer if the current loop (point of maximum antenna current) is physically located within the components which make up the matching network. For this reason, it is highly desirable that the length of the antenna be such as to place the current loop in the clear. This occurs naturally in a grounded, quarter-wavelength vertical antenna.

There are other considerations which, in a typical Amateur Radio station, make the use of a vertical antenna attractive. Typically, 20-, 15-, and 10-meter operation is done with a triband directional (beam) antenna. This requires some sort of support structure for the array, such as a mast or tower. Such a structure is typically 10 meters (32 feet) or more high, which makes it a

Here's the tower set up for 40-meter feed. The tuning capacitors are in the small box by the base, and the feed wire runs from the bottom plastic-pipe insulator up to the top one. The coaxial cable up the inside of the tower is for another purpose, and has no relation to the Omega feed system. That is, however, one advantage of using a grounded tower — you can run cables up through it without a lot of rf problems.



natural grounded-vertical antenna. Only a small amount of electronic wizardry is required to turn such a beam support into a star-performer as a quarter-wavelength, vertical antenna.

Feeding the vertical

At first glance, it might seem that a tower or mast, with its feet firmly rooted in the ground, would be a tough thing to feed with rf energy. Not so! The grounding is beneficial. The base of the quarter-wavelength antenna operates naturally at zero rf potential. There is a voltage null and a current loop (high) at that point in the antenna system. This automatically places the base of the antenna at the same rf potential as the outer shield of the coaxial feed line, and, therefore, establishes the point of connection for that shield.

The point for connection of the inner conductor of the coax is not so readily determined. Where and how to achieve this is the real meat-and-potatoes of this little dissertation, and requires a small helping of antenna theory to understand it.

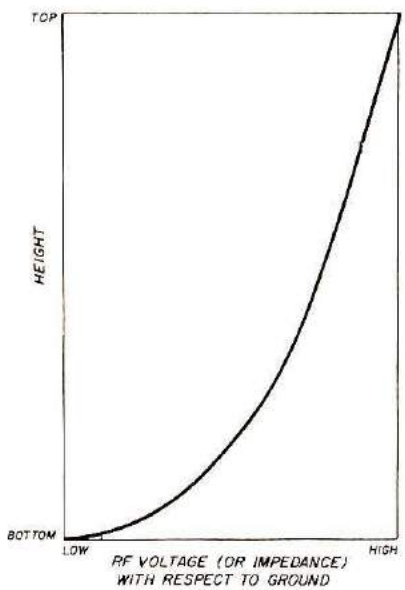


Fig. 1. The impedance and rf voltage on a tower (or other quarter-wave vertical antenna) increases with distance up the tower. It starts at zero at the ground point, and increases to some very high value at the top. Finding the right impedance point for feeding a tower is a matter of picking the right spot, or picking a convenient point and using a matching network.

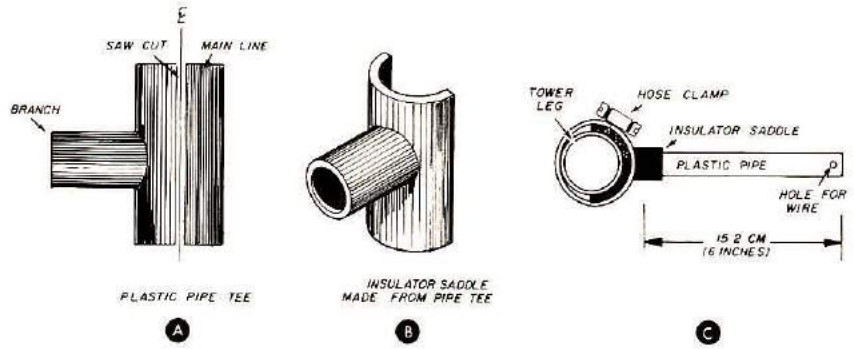


Fig. 2. The feed wire is supported on two or more insulated saddles made from plastic pipe T-fittings. A short piece of plastic pipe is cemented into the T and sticks out to the side to hold the wire in place.

Let's assume that the vertical antenna (tower or whatever) is exactly a quarter wave in length at the operating frequency. If this is so, then, when excited at the resonant frequency, there will be a standing wave of rf voltage on the antenna (see **Fig. 1**). The base will be at zero rf potential and the top will be at some quite high rf potential. Accordingly, there will be an increase in voltage from top to bottom of the antenna, with the rf potential at any point on the antenna being proportional to the height of that point. Likewise, the impedance between any point on the antenna and ground varies in exactly the same way. The higher the point, the greater the impedance between that point and ground.

Therefore, you can see that it is possible to select a point on the antenna having any desired impedance with respect to ground. The range will be from zero at ground level to a maximum of, typically, several thousand ohms at the top of the antenna. It is important to note, however, that this impedance is not a pure resistance but is made up of a resistive and a reactive component. Therefore, although it is possible to pick a point on the antenna where the impedance with respect to ground matches the impedance of the coaxial transmission line, the center conductor of the coax cannot be directly connected to that point because it must see a purely resistive load.

For the coax to look into a purely resistive load there must be some means of getting rid of the reactive part of the antenna's impedance. This requires some sort of matching network between the center conductor of the coax and the point of attachment to the antenna.

The Omega match

Among the many types of matching networks, the Omega match is one of the simplest to use for feeding a grounded quarter-wave vertical antenna. Beam-antenna enthusiasts will recognize it as a common matching device for use on single-band beam antennas at the higher frequencies.

The photos show two views of the inexpensive 40-meter Omega matching network I constructed. In this installation, a length of 2.1-mm (No. 12) wire, supported on homebrew insulators, takes the place of the aluminum tubing which is usually used in a beam-antenna Omega match.

Fig. 2 gives details of construction of the homebrew insulators. These are each made out of a length of plastic pipe and a plastic-pipe T. The T is the so-called "reducing" type, with a branch connection designed to accept a smaller

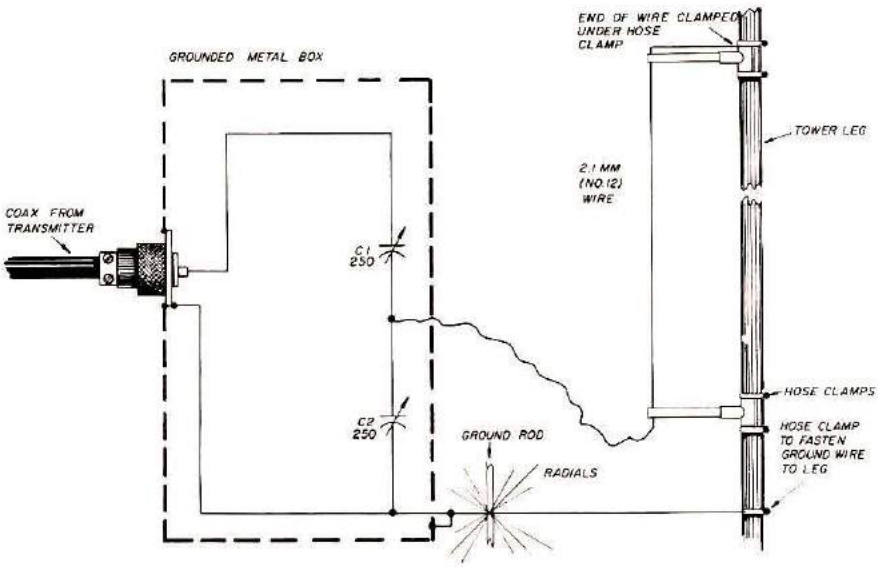


Fig. 3. The matching network consists of two capacitors, with the feed wire connected to the junction between them. Install three or more radials for each band you want to use the tower on, or, for really top performance, put in as many radials as your back yard and pocketbook will allow. They can be buried in shallow troughs to keep them out of lawnmower trouble.

diameter pipe than that used in the main line. Since the tower legs vary in size from one manufacturer to another, you'll have to buy a T of the right size for your tower. Here at W7KLU I found that the tower legs, which are 3.17 cm (1.25 inch) diameter, were an exact fit for a T designed to fit a nominal 1-inch (2.54-cm) ID plastic pipe.

Plastic reducing pipe Ts are available in a bewildering variety of combinations of main line and branch connection sizes, to fit any standard size of plastic pipe from nominal 1/8-inch (3.2-mm) to nominal 8-inch (20.3-cm), so it should be possible to find a size to fit almost any size of tower or mast tubing.

The pipe Ts are converted into insulator support saddles by splitting the main line part of the T lengthwise (see **Fig. 2**). The Ts are readily sawed by a woodcutting handsaw or a table saw fitted with any type of woodcutting blade. After cutting, a length of plastic pipe is cemented into the branch to complete assembly of the insulator. There is nothing critical about the diameter of the pipe which is cemented into the T, so long as it fits the branch opening and is strong enough to support the piece of wire that it is to hold in position. I used 1.27-cm (1/2-inch) plastic pipe in my installation. A hole is drilled in the end of the support pipe, of proper size to accept the wire. I used worm-gear-type hose clamps to clamp the insulator saddles to the tower uprights.

The close-up photo shows details of the homebrew insulators and how they are attached to the tower uprights.

The photos show only the 40-meter Omega match, although one was also built and tested for use on 80 meters. The two were identical except for the length of the supported wire. For 40-meter operation, the wire length was 178 cm (70 inches). For 80-meter operation the wire was 310 cm (122 inches). Other lengths of wire were tried, without significant differences in results, except for changed values of capacitance required in the matching network (see **Fig. 3** for matching network details).

The spacing between the wire and the tower leg is 19 cm (7.5 inches) for both 80- and 40-meter operation. The top end of the wire is simply run down the length of its support insulator and clamped to the tower leg by the same hose clamp that holds the top of the insulator in place. The wire is fed at the bottom, where it ties to the junction of C1 and C2 (**Fig. 3**).

"Stubbing" the tower

Before getting into the tune-up procedure for the Omega match, some comments about tower dimensions are in order. The feed system described here is designed to feed quarter-wavelength antennas. Therefore, before doing any tune-up, the tower must be made electrically equivalent to a quarter wavelength for each of the desired operating frequencies. This is a simple process, requiring only a length of 2.1-mm (No. 12) wire and some simple arithmetic. The procedure is called "stubbing," or stub-resonating.

Decide at what frequencies the tower/antenna is to operate. Then, select a point on the tower at a height which is somewhat less than a quarter-wavelength up from ground. For 40-meter operation this means a point less than 10 meters (33 feet) high. For 80-meter operation the point would need to be lower than 20 meters (66 feet) high.

At the selected point, attach a piece of 2.1-mm (No. 12) wire, the length of which is equal to the *difference* between the height of the selected point on the tower and the length of a quarter wave at the desired operating frequency. For example, let's suppose that the desired operating frequency is in the 7-MHz band, and you pick a point 7.5 meters (24.6 feet) up the tower. Then the length of the stub wire should be 2.5 meters, or 8.2 feet (10 meters minus 7.5 meters, or 32.8 feet minus 24.6 feet). For 3.5 MHz operation the stub-wire, if attached to the same point, would be 12.5 meters (41 feet) in length. More than one stub-wire may be attached to the same point for multiband operation. If the tower is tall enough, the stub wires may be run up the outside of the tower

and supported at a distance from it by homebrew insulators of the sort described in **Fig. 2** of this article. If the tower is too short to permit this, the stubs may be extended out at right angles to the tower (and to each other, if there are more than one) to some support.

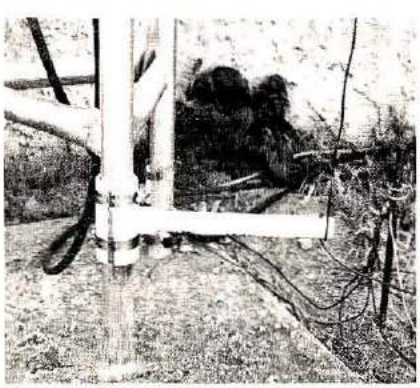
The theory behind the stubbing process is that the portion of the tower between the stubbing point and ground combines with the stub-wire to make an electrical quarter-wavelength antenna at the operating frequency, while the rest of the tower is effectively decoupled at that particular frequency.

The procedure works equally well for towers both longer and shorter than a quarter wavelength tall.

Of course, it is assumed that the tower is not naturally self-resonant at the operating frequency. The self-resonant frequency of the tower should be checked before doing any stubbing; results are sometimes surprising.

My tower is relatively short (in the vicinity of 7.6 meters, or 25 feet), but the top-loading effect of a 20-meter, 4-element beam makes it self-resonant in the 7-MHz band. Therefore, no stubbing is needed for operation on that band.

This is a closer view of the bottom insulator to show how it is attached to the tower. The extra half of the pipe T can be used under the hose clamp, or left out, with no effect at the bottom. However, the hose clamp at the top insulator must contact the bare metal of the tower leg, and must make a good connection for the feed wire at that point. The top of the ground rod, with several radials connected to it, can be seen just to the right of the tower base.



Tune-up

Now for the tune-up procedure. This is a cinch, if the stubbing has been done correctly. All that's needed is an SWR meter and a little manual dexterity. Follow standard operating procedure to set up your transmitter to give a low output into a 50-ohm dummy load, then switch the feed from the dummy load to the antenna matching network and juggle capacitors C1 and C2 to bring the reading on the SWR meter down. The two capacitors will interact with one another, so you will have to adjust one and then the other, back and forth, several times, to find the right combination. By adjusting one to get the lowest possible SWR indication and then doing the same with the other, successively lower readings will be obtained until a value very near unity (1:1) will be reached. In practice, tune-up can be done in less time than it takes to tell how to do it.

You can use the capacitor network on more than one band by providing a switch to connect other antenna leads to the junction of the variable capacitors. It is a good idea to fit the shafts of the variable capacitors with calibrated dials so you can set them to predetermined values for band changing.

A word of caution: the voltage at the junction of the two variable capacitors is high with respect to ground, although the base of the tower itself will be cold. Because of the high rf voltage on the lead from the junction of the capacitors, it is a good idea to use well-insulated wire. There is no danger of harmful electrical shock from contact with it, but rf voltage can cause a momentarily painful surprise and a burn.

Grounding

The necessity for a good earth ground or a well-constructed radial system when using a grounded antenna cannot be overemphasized. If a grounded antenna system is to function well, it must have either a good *low-impedance* earth ground or a good radial system to work against. Really good earth grounds are hard to come by, except in swampy areas or coastal locations, so the alternative for most of us is a good system of radials. Fortunately, a good radial system is not difficult to construct. I simply drove a copper rod into the ground and used it as a tie point for the ends of buried copper wires which fan out in all directions. Burial of the wires is a simple process of using a lawn-edger to dig shallow trenches into which the wires are laid. The earth is then stomped into covering the wires.

If many wires are used, their lengths are not critical, although they should be at least a quarter wavelength long for the lowest frequency of operation of the antenna system.

If only a few wires are used, there should be at least three, cut to a quarter wavelength, for each band.

In general, the more radials the better, of whatever length. If you can fill your backyard with copper wires, so much the better!

Performance

Don't make the mistake of thinking that a tuned-up tower is only a stop-gap substitute for a better low-band antenna. Far from it! A quarter-wavelength, top-loaded, vertical antenna is a proven DX-getter, on any band. This is especially true on the lower frequencies, where the low angle of radiation is helpful in reducing the number of hops taken by the signal in getting from your transmitter to the receiver of the DX station.

Give the upright antenna farm a whirl. You'll be amazed at what this inexpensive and compact rf radiator will do for you. **HRH**

Earn some beautiful certificates by talking to your neighbors

BY DONALD PECK, W3CRG

Have you ever looked at some of the photographs of ham stations in the magazines — and noticed that some Amateurs had a wall full of certificates? You figured it would take years of constant operating to accumulate wallpaper like that, right? Well, sometimes it does, but they had to start somewhere. Why strain your antenna trying to reach the other side of the world when there are some beautiful awards sitting right next door. All you have to do is go after them. This is an excellent way to increase your enjoyment of Amateur Radio by having objectives — operating objectives that are easy enough to earn that you will not get discouraged, yet require enough effort that you can feel a sense of pride when you've made it.

An excellent way to increase your enjoyment of Amateur Radio is to have some operating objectives. Certainly, there are plenty of award programs available, and almost all of them are within the capabilities of most Amateur operators. For those interested in DX operation, working one hundred or more countries for the DXCC award is probably the most popular. How about some awards that are a bit easier, and closer to home?

One evening I was "reading the mail"* on some Canadian Amateurs. Garry, VE3GCO, was talking about the more than 70 Canadian awards now available. As the QSO continued, I learned he offers a book listing DX awards, called *The Canadian Amateur Award Directory*. The book is a real gold mine — not only does it give details on most of the Canadian awards but it also lists new prefixes, QSL bureaus for each Canadian call area, and other information important to an awards collector. There are enough maps to color, and forms to fill in, to delight the heart of any Amateur. It is in loose-leaf form, and supplements are available when new awards appear.

Working on a Canadian awards program has many advantages. The good-neighbor relationship of the U.S. and Canada seems to have "spilled

*Reading the Mail = Listening to a QSO but not necessarily joining the group; eavesdropping.

over" into ham radio. Canadian Amateurs are courteous and interested in talking with American Amateurs. The beauty of working Canada is that you do not need exotic antennas or a super-power station. However, American Amateurs must not cross over the "frequency curtain" to work Canadian Amateurs. Some Canadian frequencies are outside the American Amateur bands. On occasion, a Canadian will transmit outside the American bands but listen inside. This type of operation is legal, of course, just as long as *you* don't transmit outside the bands.

A good start

The Maple Leaf Award is a good one to start your Canadian award program. It consists of a beautiful flag-parchment diploma and a lapel pin. To qualify for the basic award, you must have QSL cards from ten or more different Canadian prefixes. There are three endorsements and two plaques for additional prefixes. You need not send in your QSL cards, only a copy of your log which has been verified by another Amateur. A more difficult award is the Canadaward issued for sending twelve QSL cards, confirming QSOs with all Canadian Provinces and Territories. Although there were nine call areas originally, for award purposes there are 12 provinces or territories, sometimes known as political areas. As of April 28, 1978, the Yukon has become a new call area with the prefix VY1 (formerly VE8). There are about six or eight active Amateurs out of the thirty assigned Yukon stations.

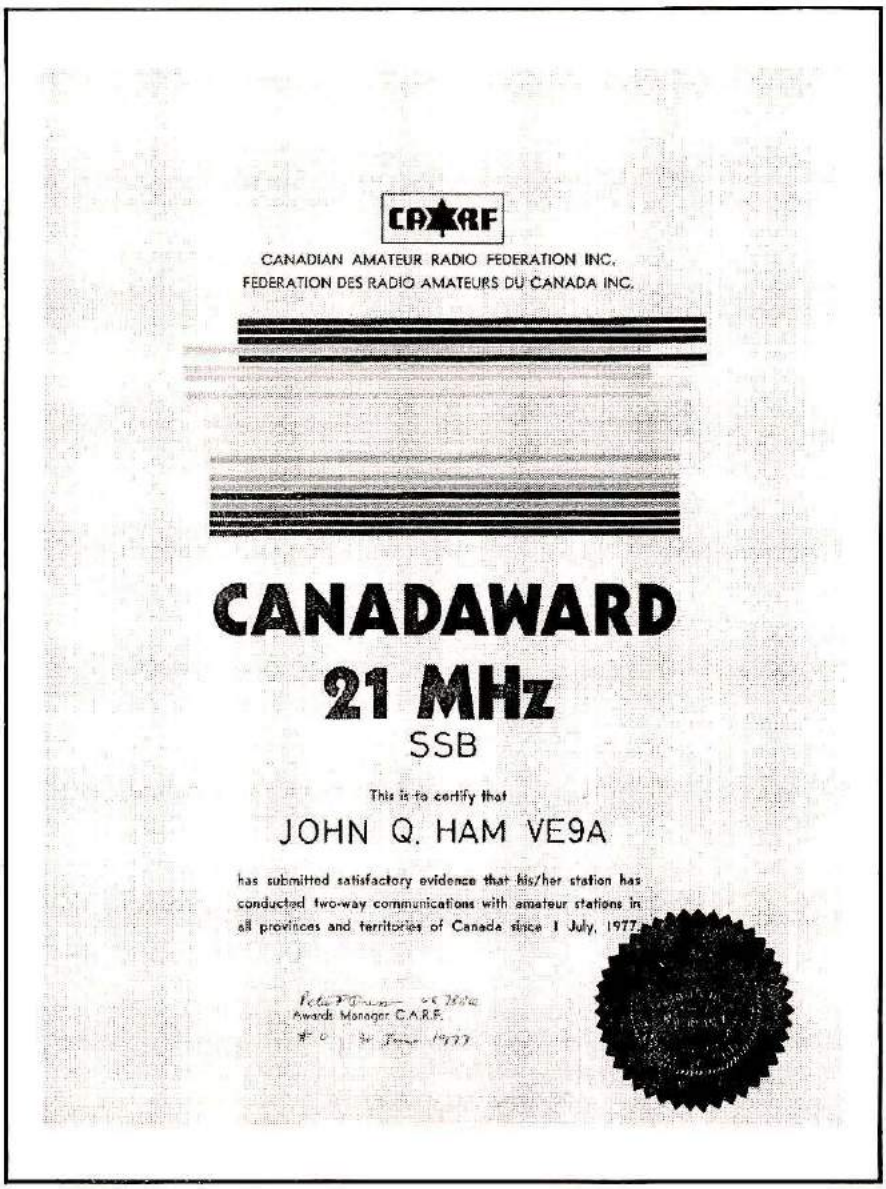
A more challenging award is the Worked All Canada Award (WACAN), which requires sending in QSL cards verifying that you worked two different stations on two different bands in each of the 12 Canadian areas.

Here's a sample of some of the colorful awards available from Canada. The CLARA award comes in three types: No. 1 (shown) is for working YL operators across Canada: No. 2 for working YLs in 100 countries: No. 3 for working members of the same family. The WOC 50 is blue, and there is a WOC 30 which is green. They are given for working Ontario counties. The Maple Leaf Award is earned by working different Canadian prefixes. You can earn the Islands award by working several Canadian islands. Addresses for information and applications for these and other awards are given at the end of this article.

If you really like a challenge, there is the Canadian Islands Award (CIA); there are twenty-nine islands altogether. The basic award is given for working five islands with endorsements for ten, sixteen, and twenty islands. If you can work twenty islands, you are officially an "excellent" operator. For this award you need to send in a check list of the stations worked. The Award Directory contains information on the names and locations, along with prefixes for all the islands. For county hunters, there are Worked All Nova Scotia Counties Award, obtained by working fifteen of the eighteen counties (send QSLs and a copy of your log), and the Worked Ontario Counties Award for working thirty of the fifty-four counties (send QSLs showing county on the card). Actually it is very difficult to work all of the counties in Ontario because there are no Amateurs active in two of them.

Garry, VE3GCO, believes in going after the awards listed in his book, *The Radio Awards Directory*. He has earned fifty awards, and has worked over one hundred prefixes. Good performance from a neat station.

The Canadaward is large and eye-catching, and is issued for confirmed two-way contacts with all Canadian Districts and Provinces. There is a different certificate for each band, and they can be endorsed for a particular mode. There are also 5, 6, and 7-band Canadaward certificates. For rules and an application form, write to CANADAWARDS, P.O. Box 76752, Vancouver, B.C., Canada V5R 5S7.


CANADIAN AMATEUR RADIO FEDERATION INC.
FEDERATION DES RADIO AMATEURS DU CANADA INC.

CANADAWARD

21 MHz

SSB

This is to certify that

JOHN Q. HAM VE9A

has submitted satisfactory evidence that his/her station has conducted two-way communications with amateur stations in all provinces and territories of Canada since 1 July, 1977.

Awards Manager C.A.R.F.

CLARA

For the ladies, there is an award issued by the Canadian Ladies Amateur Radio Association (CLARA). The basic certificate is issued for sending in your log listing five YLs in three call areas, with a limit of two VE3s. There are endorsements available for five, ten, or twelve Canadian contacts. If you like geography, there is the Seaway Award for submitting a list showing that you worked ten Canadian stations along the St. Lawrence Seaway.

Another bonus for those interested in collecting prefixes is the large number of these assigned for special events. For example, the special prefix "CJ" was issued, in lieu of VE, in 1977 to celebrate the centennial year for Japanese Canadians.

When you develop an interest in award hunting, you will also improve your activity on the Amateur bands. With more activity you will learn more about our neighbors to the north. For example, while enjoying a warm climate at home you may talk with someone in the Northwest Territories who has several feet of snow outside. Some Canadian Amateurs may be interested in meeting you for an "eyeball QSO." You may get an invita-

tion to visit someone in Canada if you ever travel up that way. Collecting Canadian awards is really a lot of fun. Garry, VE3GCO, has managed to earn fifty Canadian awards, and has 107 Canadian prefixes worked and confirmed. See if you can beat his record!

Ordering Information

The Canadian Amateur Radio Award Directory — Five dollars ($5.00). Garry Hammond, VE3GCO, 5 McLaren Avenue, Listowel, Ontario N4W 3K1

The Maple Leaf Award — Two dollars ($2.00). G. V. Hammond, VE3GCO, Listowel District Secondary School, Listowel, Ontario N4W 2M4

Canadaward — One dollar ($1.00) plus postage. P.O. Box 76752, Vancouver, British Columbia V5R 5S7

Worked All Canada Award — One dollar ($1.00). Nortown ARC, Box 146, Station A, Willowdale, Ontario M2N 5S8

Canadian Island Award — Two dollars ($2.00). Send to same address as Canadian Award Directory

Worked All Nova Scotia Counties — No charge but include postage. Mrs. Christine Weeks, VE1AKO, P.O. Box 47, R.R. 1, Cleveland, Nova Scotia B0E 1J0

Worked Ontario Counties — No charge but include postage. Al Brown, VE3AB, 360 Manor Road E., Toronto, Ontario M4S 1S2

CLARA — One dollar ($1.00). VE3GJH, 2 Dalmeny Road, Thornhill, Ontario L3T 1L9

Seaway Award — One dollar ($1.00). Canadian DX Association, P.O. Box 717, Station Q, Toronto, Ontario M4T 2N5

ALL THE PARTS YOU'LL EVER NEED

A 9000-mile trip for radio hardware

BY DOUG BLAKESLEE, N1RM

Your first impression of Akihabara is color. It is a frontal assault on the visual senses. You are surrounded by huge cloth signs in the most garish of colors, proclaiming radio wares and bargains. The scene is made more vivid by the bold strokes of the Kana and Kanji Japanese characters which resemble slashes of a sword. Akihabara is Tokyo's renowned radio row — the largest and most famous shopping district for Amateurs and experimenters in the world. While the radio rows in other major cities decline and disappear, Akihabara grows and prospers.

What's a radio row?

There was a time when the major cities of the Western world all had their radio shopping districts. Best known was the area in lower Manhattan, New York City, around Cortland Street, which was nicknamed "radio row." The shops were favorite gathering places for Amateurs on Saturday mornings to exchange DX stories and to analyze the latest radio components being offered. In the 1930s, the Lafayette store (forerunner of the nationwide chain) offered free coffee, so it was a popular spot. In the forties and early fifties, Cortland Street was a beehive of activity as merchants sold truckloads of surplus components and equipment left over from World War II. Just as the surplus boom was slowing down, the Novice license was introduced, which brought a flock of newcomers into Amateur Radio and into radio row.

Although New York City was the leader, (they had more surplus than anyone else), London had its "row" along Tottenham Court Road. In Paris, you found the radio shops just north of the Gare de Nord.

By the 1960s, most of the worthwhile surplus had disappeared. Interest in building radio equipment waned as sophisticated station-in-a-box transceivers were offered at less than the cost of the components when purchased individually. For purposes of survival, merchants turned to selling audio equipment and other consumer-oriented electronic gear. Radio row in New York was condemned to a premature death by the Port Authority, which reduced Cortland Street

to a pile of rubble preparatory to building the twin towers of the World Trade Center.

Some of the merchants who lost their buildings relocated around the city; others gave up. A few fled to the suburbs where they catered to the electronic-equipment needs of an increasingly affluent middle class. Ham Radio was forgotten.

No such major dislocation took place in London or Paris, but the long-term effect was the same. Fewer Amateurs purchased parts, so fewer merchants stocked them. When finding the components for a radio project became a major undertaking in itself, only the hardiest of builders persevered, and the downward spiral continued. At the same time, half a world away, Akihabara was steadily growing, moving from vacuum tubes to transistors to ICs. For the Radio Amateur, Tokyo is, as they say in a popular department store advertisement, "worth a trip from anywhere."

The islands of the rising sun

The archipelago of Japan is a series of volcanic islands with mountains so steep that large segments of the land are uninhabitable. Crowded into what land is usable you find a population half as large as that of the United States. The islands are devoid of most natural resources, which means the Japanese must import many raw materials and a large amount of food. To pay for these imports, raw materials are turned into finished products, ranging from supertankers to ssb transceivers, which are sold worldwide.

On my first shopping tour of Akihabara I entered Japan at the great industrial city of Osaka. Before going to Tokyo, I took a few days off to tour Koyoto. During World War II all of the major Japanese cities were severely damaged, except Koyoto, which was purposely spared by U.S. bombers because it was the spiritual and traditional capital of Japan. Saved were the great temples of major religious sects, most of which were built of wood in the 15th and 16th centuries. The large sand courtyards, the sweeping curves of the roof structures, and the many art objects are reminders of Japan in another day.

The many wooden temples of Koyoto contrast with the royal residence, a medieval castle with two sets of outer stone walls, each surrounded by a moat. Even behind such impressive fortification all was not safe, however. This reality lead to the development of a simple intrusion alarm. Political intrigues raged around the Shoguns, who for centuries were the real rulers of Japan — the Emperor was often just a figurehead. Assassination was common. So the leaders' houses were fitted with hallways, called nightingale floors, which squeaked musically, making it impossible for anyone to sneak about without alerting the household. No electronics were needed.

120 mph by train

After a delightful few days of visiting the grand monuments of old Japan, I was ready to set off to Tokyo. I wanted to try the Shinkasen line, popularly known as the bullet trains, which regularly reach speeds of over 120 miles per hour. A high-speed train requires high-speed arrangements; everything is managed by computer. Each bullet train is of the same length. Your ticket specifies a railroad car number and seat number. Spaces are marked out on the platform where you stand to wait for your car. Further instructions blare from overhead speakers, although they are not too useful for those of us who don't speak Japanese.

While I waited crowds grew, and the shouted, breathless announcements increased in frequency. But the track remained empty. A helpful young man who spoke some English explained that the high speed rail link from Osaka to Tokyo was shut down — by a kite. Apparently the greatest threat to the world's fastest train system is kites. Fifteen times that year alone, electrical malfunctions had occurred when kites landed on the tracks. The software programs in the control computers apparently don't allow for

You can come shopping for radio parts by bicycle, car, taxi, or train. But, only the cycles get reserved parking places.

The minishops are the essence of the radio district in Tokyo. Each proprietor specializes in a single product: from calculators and microprocessors to coil cords.

damage caused by wayward kites.

After an hour the damage was corrected, and Shinkasen was running again. It's a narrow-gauge railway built above ground so that the track can be leveled periodically. Train travel at 120 mph produces no special sensation of speed. The only noticeable difference from other train rides was a rapid sidesway that is characteristic of narrow-gauge systems, with oscillations more frequent because of the high speed.

The strip of coastline from Koyoto to Tokyo is a seemingly endless collection of houses and factories, factories and houses, packed so tightly that, by comparison, the Boston/Washington corridor in our country seems like open space. Two hours of viewing total industrialization, with the scene accentuated by the speed of the train, leads one to think that there must be a better way.

In international travel you tend to learn things the hard way. I found that one should not arrive at Tokyo's main station during the evening rush hour. The majority of the city's commuters take the subways and trains, most of which converge at the central station. At rush hour some 2 million people make their homeward journey through the station. It's an unbelievable experience. Being a foot and a half taller than the average Japanese, I could see across the sea of heads in the great hall of the station where men and women seemed to ebb and flow like the ocean tide on a beach. But these were people, enough to populate a medium-sized city!

Because I was carrying two large suitcases, I went where the people around me were going. The crowd was so dense that there was no way to make a turn. The Japanese are great tourists. Both inside and outside the station there were tour groups of 30 to 40 people trying to stay together. The tour guide for each group carried a small, distinctive flag held aloft for the others to follow through the masses. One elderly couple was wearing multiple leis — but not of the Hawaiian variety made of flowers. One was a series of bound sausages, a second a string of small Johnny Walker scotch bottles, a third of wrapped crackers, and a fourth of fruit. Clearly, they were ready for the vicissitudes of travel. After some 30 minutes of being pushed about, I popped out the front entrance of the station rather like the cork from a bottle of champagne.

I hopped into a taxi and with my newly acquired ability to pronounce Japanese words, asked the driver to take me to the New Otani Hotel. In return I received a blank stare. After a few more tries — after all, how many ways can there be to pronounce two short words such as New Otani — and a little hand waving, the driver's face brightened. He said something like, "Hi, Nu-o-tan-ee," and we were off. Well, how was I to know that it was one word?

The crush of people in the station was immediately replaced by a crush of small cars on the wide boulevard that swings around the Imperial Palace. It seemed that a full year's output from Nissan and Toyota were all going our way. The models were not the same as those exported to the U.S. They had English names such as Gloria and Cedric, rather like the cast for a play. Crawling along in the traffic jam gave plenty of time to observe portions of the Imperial Palace. The high, fortress-like walls, wide moat, and expanse of grass and trees is surely out of context with the rest of downtown Tokyo, which is a mass of modern buildings mostly covered with grime from years of heavy air polution. At last, the taxi made the wide swing up to the New Otani. Tokyo has a number of large, elegant hotels. The New Otani has 2000 rooms, over 100 shops and 30 restaurants, all set in a traditional Japanese garden covering several acres. The Japanese have a way of doing things on a large scale.

Akihabara

The radio district is named for a nearby train station, Akihabara. You can take the train to get there, although the trains — like the stations — should be avoided at rush hour. Train cars built to hold 100 can have as many as 350 people wedged in. To assure that no air gaps remain between people, the JNR, Japanese National Railway, employs college students as pushers — to pack as many people in each car as possible.

A taxi is the best way to get around Tokyo, although it is somewhat expensive. It is useful to have the services of a taxi driver if you don't know your way. Addresses in Tokyo are notably imprecise. Nothing as simple as a street name and number. Instead it is a district, then an area, then the name of a building. For directions, the location of a building is usually referenced to a well-known landmark, such as four buildings down from a large department store. In an unfamiliar district a taxi driver may stop several times for conversations with local inhabitants before finding the right address. Many businesses give out cards with an abbreviated map of their local area on the back, to help you find them again. But every Tokyo taxi driver knows Akihabara — the largest electronics and appliance emporium in the world.

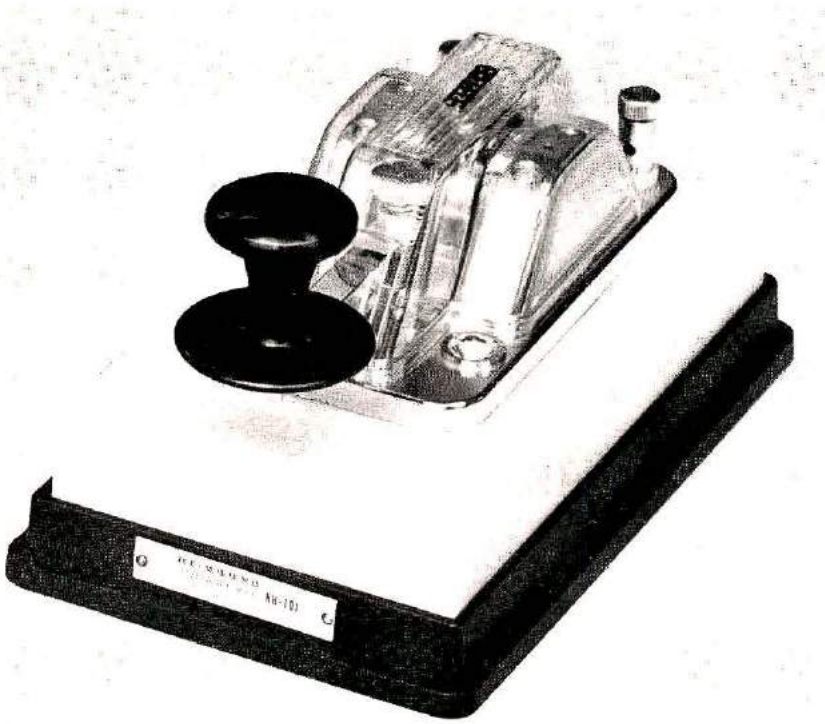
In Akihabara the wares of the shops spill out into the street. Large stores specialize in appliances or television or hi-fi. The buildings of the district are three to seven stories high. What you don't realize at first is that the large stores fill all of a building, every floor. Sometimes, there will be a different store on each floor. A number of buildings support towers which have large ham antenna arrays. One look tells you that for amateur parts and equipment, this is it!

By far the most spectacular sights are the large parts houses. Each floor contains 20 to 40 minishops, each about 12 by 12 feet. Each minishop is run by an independent dealer who specializes in a particular electronic component. One, for example, may sell capacitors. The proprietor sits at the middle of the square surrounded by bins of capacitors of every imaginable type and size. And prices are so reasonable! Other vendors specialize in resistors, aluminum housings, meters, nuts and bolts, wire, transistors, transformers, integrated circuits, panel lamps, switches, and so on. Some offer varieties of test equipment or hand tools. One stall had what surely must be the world's largest collection of coil cords — nothing but coil cords, for every imaginable use.

The ham shops can be easily spotted by the forest of antennas that usually decorate the entrance. Also, occasional lapses into English can be found on the signs, such as HAM, SSB, 144 MHz, etc. The ham stores carry supplies of the Yaesu, Kenwood, and Icom equipment exported to this country, plus models seen only in Japan. In addition, each ham store carries a large selection of antenna matchers, microphones, crystals, antennas, power meters, and other accessories. The wide variety of items offered boggles the mind.

My first purchase was a hand key. I really didn't need one, as I already owned a surplus J-38 that has served for 20 years. But, holding the key in place — short of bolting it to the desk — was a problem. I had tried several things, including the traditional approach of bolting it to a flat-iron bottom plate. One Akihabara store sold a collection of keys of various sizes mounted on pieces of white marble — a most elegant solution to keeping the thing in place. (This key and several other purchases later led to a lengthy examination by U.S. Customs, who were trying to learn why anyone would be carrying such odd items around the world.)

The front of this ham store is decorated with exotic vhf/uhf arrays of all sorts, plus verticals for mobile installation.



"My first purchase was a key . . . mounted on a marble base to prevent slipping."

My primary pleasure in ham radio is derived from building and experimenting, so the parts stores were where I went wild. I collected bags of miniature meters, switches, LEDs, and capacitors. "Finds" of good-looking small cabinets were a special joy, as good enclosures are hard to find. I bought several, putting small ones inside the large units until I had one cabinet to carry. (The cabinets also drove the customs people wild. They refused to believe that it was a series of empty cabinets. As one was unbolted, they found yet another, until the last wee little one was opened. It, of course, contained nothing!)

After the shopping tour, I went to a restaurant in the district with a Japanese friend. The building had five floors, each serving a different style of Japanese cooking. We chose Sukiyaki, which was the fourth floor. Our "table" was next to the window — the table was only eight inches high. Sitting on a mat, I marveled again at the crowds filling the street below and at the sidewalk displays of electronic goodies. Where did all those eager shoppers come from? How had Japan built the largest consumer electronics business in the world from the ashes of World War II? Attempting, with only moderate success, to eat a bowl of rice with chop sticks, I recalled the Amish expression, "it wonders me." I resolved to learn more.

Japan, Inc.

Business in Japan is a conglomerate of finance, manufacturing, and government so closely knit and interdependent that it is called Japan, Inc., in the press. Such associations in our country would be called both improper and illegal. After the war, a wise government policy concentrated on rebuilding basic industry and a consumer-oriented economy. Steel, shipbuilding, and automobiles were emphasized.

Japan had a large labor force, so labor-intensive consumer items such as cameras, and the new-fangled transistor radios, seemed to be excellent items for development. Later came television sets and Amateur Radio equipment. Almost always, a new manufacturer would establish himself in the home market before he would attempt to export. A major exception was Sony, which first made a name for itself in the U.S.; then, on the basis "approved by Americans," their products received wide acceptance in Japan. Japan is a trading country; she literally must export to eat. Her main resource is her population of dedicated, ambitious, and motivated workers. The managers of Japan's industrial and trading concerns are largely the children of World War II. The loss of the war had a shattering effect on people — which lasts today. The senior managers all sound a similar refrain — "We lost the war; to survive and rebuild we have to work very hard." Japan, Inc. must manufacture to survive. She must import raw materials, oil and other energy sources, and food. To pay for these imports, she must export to the world.

The items that Japan exports to the Western countries have been, in large part, items already made in the West. So, how do you succeed selling steel, ships, automobiles, and electronics to countries who make the same items for themselves? One Japanese electronics executive stated their formula simply: "We must make products of better quality and sell them more cheaply." From $4 million in 1967 to over $21 billion this year in electronics exports is quite a record. By the 1980s Japan expects to be the world's leading electronics exporter.

Technological products such as ham gear have often been a product of an engineering laboratory. A product will be designed and then it will be sold — more accurately, the manufacturer will attempt to find people interested in buying his new Whiz Bang Mark 3. The Japanese take a

different approach. They study a potential market intently. Then they go back to the lab and design a product that will have all the features a buyer wants, at a very competitive price. Yaesu and Kenwood weren't the first with digital readouts or bandpass tuning or high performance receivers. While some American manufacturers still sell transceivers without such features as VOX, the Japanese equivalents come with *everything*.

Quality is always as important as price. In the fifties, Japanese goods were not always of the best quality. Realizing that shoddy products have no future, the government stepped in and enforced quality standards for export. Even today you will see small tags on Japanese goods which mean that the unit has passed the government quality checks. Japanese cameras, hi-fi components, tape recorders, and so on are often regarded as the finest in the world. The pursuit of quality brings rich rewards.

The customers

The Japanese are electronic nuts. An office worker will spend two month's pay on a new stereo amplifier with VMOS power-FET output transistors to replace a unit with bipolar transistors. Electronics is everywhere in Tokyo. At the airport, buses are equipped with closed-circuit TV, which comes on when the driver shifts into reverse gear, presenting a good view of the area behind the bus on a screen without requiring the driver to turn his head. Taxis all use digital meters, and the hotels are full of electronic goodies. It is an ongoing love affair with electronics that keeps Akihabara crowded day after day.

Ham radio in Japan continues to grow and thrive. I have noticed an upswing in the number and size of the Akihabara shops dedicated to ham radio over the past few years. The Japanese Amateur Radio League (JARL) has played a large part in the burgeoning interest in ham radio. The club and group training efforts recently introduced by ARRL are but copies of JARL activities that have been successful in bringing many thousands each year into the hobby. Japan has a no-code license with two-meter privileges. It is not a surprise that the largest number of Amateurs are in this license group.

The interest in Amateur Radio in any country is manifest in its publications. *CQ Ham Radio* is the popular Amateur "rag" in Japan. In size and content it looks more like the *ARRL Handbook* than a monthly magazine. The hundreds of pages of articles and advertisements are, in many ways, Akihabara on paper.

Conclusion

Is there hope for the revival of a radio row in this country? Probably not. There are interesting surplus items coming out of the computer industry, but these are sold primarily by mail order. Firms such as James Electronics are marketing small lots of standard components at discount prices, while Whitehouse and others are offering many hard-to-get parts by mail order. Our radio row now consists of a pile of catalogs and flyers augmented by visits to the local Radio Shack store.

Between sessions of staring at small catalog print, you can always lean back in your chair, prop your feet on the operating table, and daydream about the old days of Cortland Street. Or better yet, dream about those colorful, four-story-high signs of Akihabara, offering every modern electronic component. Daydream, yes. But who would travel 9000 miles to buy radio parts? Who? My wife has asked that question more than once.

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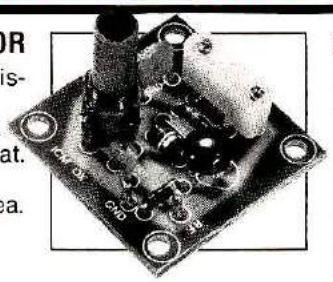

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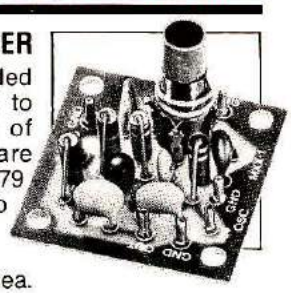

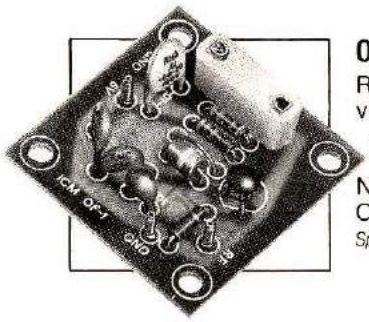

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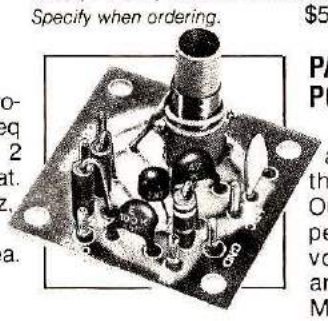

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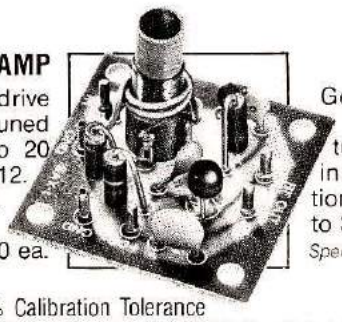

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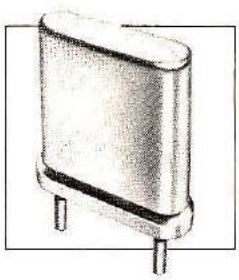

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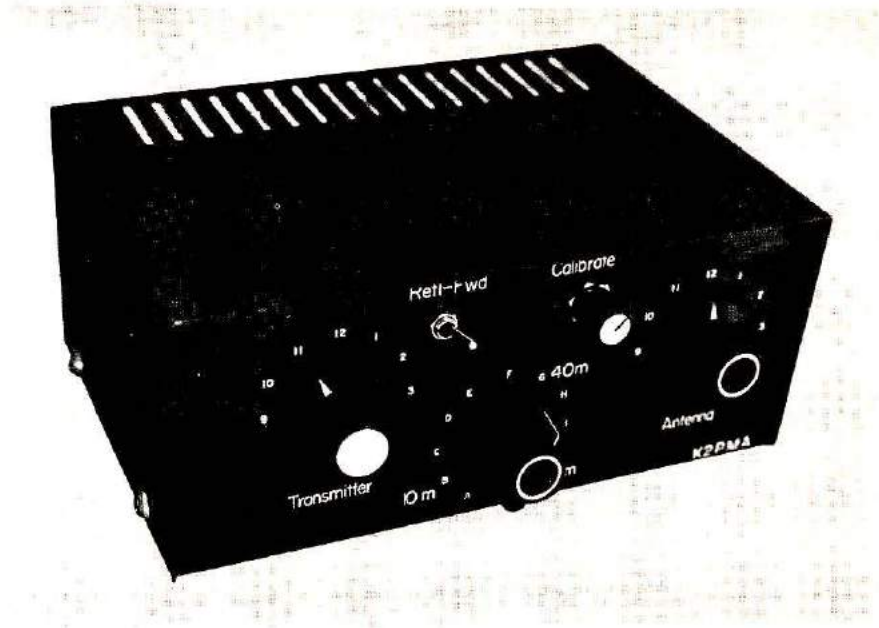


The finished tuner will make a fine addition to your shack, and returning to a previous setting when changing bands is made easier by logging the numbers and letters associated with the two tuning knobs and the switch. The meter for the SWR portion of the tuner (if you build it in as was done here) is mounted in a separate box to be placed at some convenient viewing angle.

BY BUDD MEYER, K2PMA

The newcomer to Amateur Radio is sometimes hesitant about building his own equipment, after hearing horror stories about difficulties in obtaining parts, unfamiliarity with substitutions, lack of work space, and fears of turning out a butchered and unworkable product.

The information presented in this article is intended to persuade you that "homebrew" is fun; that it can be done in a small work space; and that the results can be gratifying. This is not a point-to-point type article, but an introduction to building that should give you encouragement for all building projects.

The photographs show the end result of this article — a 10- to 80-meter antenna tuner. I think it's an ideal subject for an article of this type — it's passive, does not contain too many parts, and is very useful when completed.

Let me digress. There has to be some reason or urge (motivation) for building anything. In the case of this tuner, ham magazines have pages and pages of advertisements for tuners costing thirty bucks and up, so why build one? I've been doing it for 25 years — sometimes because it is a design of my own that makes hamming more enjoyable; sometimes it's someone's design I've seen and liked. Over the years, I've developed a system that helps me reduce the pains of building. To this day, I still don't like to hack out holes in chassis. But, since it's a necessary evil, I do the best I can and I improve a little bit each time.

Over the years, I have collected a bunch of tools that simplify my efforts; you will do the same. In addition to the normal tools such as soldering irons, diagonal cutters, pliers, screwdrivers, and the like, I pick up some that make life easy for me. For example — I could never centerpunch a hole "on target" with a hammer and punch. I bought an *automatic* centerpunch, and the problem went away. A key tool that has simplified my workshop life is a good, metal square. For years, I attempted to line up parts with just a ruler (a steel one, to be sure). No way! No class A machinist would dare have a reamer in his tool box. This class Z machinist has at least two 1/2-inch reamers in his. How many years of "butchery" did I suffer before I realized that I must first drill a small pilot hole for any hole that was to be larger than 1/8 inch. I even accepted the fact that, if I was to achieve real accuracy without a drill press, I must drill the pilot hole with a hand drill, then use the electric drill to enlarge the holes to the final size.

I should tell you right away that I've been involved in every part of electronics, from design through manufacturing. My manufacturing experience has taught me to always use a "Bill of Materials" (**Table 1**). List *all* the parts and quantities for your project: ALL of them, down to even the most common screw or nut. As you obtain the parts, mark over the word or designation with a yellow marker-pen or grease pencil. Then, you will never be stuck in the middle of a project for want of a part. The bill of materials can also be used to figure out the cost. Don't be surprised if it costs you more to build than it does to buy. A manufacturer has the decided advantage of

Table 1. A parts list, shopping list, or bill of materials for the tuner project. This is a convenient way to be sure you have all the parts needed beforehand, so you'll not get stuck in the middle without something vital.

Designation	Description
C1, C2	365-pF variable capacitor (broadcast type)
C3, C4, C5	0.001 μF disk ceramic capacitors, 600- or 1000-volt rating
CR1, CR2	1N34A Germanium diodes
J1, J2	SO-239 coaxial connector, chassis mount
J3	phone jack (or any connector to fit P1)
L1	B & W 2008T coil stock
M1	100 μA meter
P1	phone plug (or any two-pin, polarized connector)
R1, R2	51-ohm, 1/2-watt 5-per cent resistors, carbon composition
R3	25 k-ohm potentiometer, carbon composition
S1	single-pole, 11-position rotary wafer switch. Contacts make before break
S2	single-pole, double-throw toggle or slide switch

Miscellaneous hardware

Cabinet; Radio Shack 270-269 or equivalent
Insulated shaft extensions, 2 each, to fit C1,C2
6-32 screws, 3/4-inch long
6-32 screws, 1/4-inch long
6-32 nuts
No. 6 internal-tooth lockwashers
4-40 screws, 1/4, 3/8, 1/2, and 3/4 inch lengths
4-40 nuts
No. 4 internal-tooth lockwashers
No. 4 solder-lugs
Knobs; 3 large and 1 small, style to suit appearance of unit
Metal spacers; 2 each 1/2-inch long, and 10 each 3/8-inch long
Small metal or plastic case to fit meter
Plastic sheet; 1/4-inch thick. A 6 × 8-inch piece will be ample

buying parts in quantity, but you can have the pleasure of knowing that the gadget in your shack was built by your very own grubby fingers, and furthermore, it is the size and color you want — with your own call sign on it!

Let's talk about motivation for a moment. I recently purchased a new transceiver. Because my antenna was a compromise, I found that I could not load the rig on 10 and 15 meters. I mentioned this to a kind gentleman on 40 meters, who said he had built a tuner for the same reason and would be happy to send me the schematic. At this time I didn't even know if a tuner would do me any good. In true ham spirit — why buy something if you're not sure it will work — the motivation arose within me. How could I check this out at the least cost? When I received the diagram, shown in **Fig. 1**, the answer was clear. The capacitors, C1, C2, were in my junkbox — both of them! I must have bought these a-m broadcast-radio 365-pF variable capacitors 10 to 20 years ago, for who-knows-what project. That's motivation to build.

Another requirement, not necessarily mentioned in the magazine advertisements, is the necessity for using a VSWR bridge in conjunction with a tuner. If you already have a bridge, fine. However, having one built in a tuner is most convenient, therefore I decided to include one.

Let's talk frankly about the nitty-gritty of obtaining parts for the tuner section. I assume that you are a raw recruit. If so, buy a starter kit of nuts and bolts. For the most part, the 4-40 size will do. They are available in discount stores, Sears, Radio Shack, and many hobby stores. Needless to say, you should already have bought the best available basic tools. Don't stint on them — it's false economy.

The variable capacitors are available from Allied Electronics, surplus stores, or you could even rip them from your old faithful ac/dc a-m radio. The switch, S1, is available from Allied, Lafayette, or Cramer. It is manufactured by CTS, Mallory, or Centralab, and it must have *shorting* contacts, that is, make before break. I used a CTS T201, which has 11 positions instead of 12. This is a minor change you can make without any problems.

The coil *could* be a problem, but generally isn't. You could wind it yourself, but I doubt that the results would be equal to buying a Barker and Williamson 2008T. This coil is 25 cm (10 inches) long and you need only 4.4 cm (1 3/4 inches). What to do with the excess? Make the project a group effort with your buddies (you can build five tuners with one coil), or, use the balance of the coil to start your own junk box! You have to start sometime.

The SO239 uhf type connectors are available in most electronics parts stores. You may even find the ones that require only a single hole for mounting, which are easier to use. Getting the non-conducting shaft extenders for the capacitors — which must be insulated from the chassis and each other — may be a problem. The ones I used came from my good old junk box. I remember seeing plastic insulating bushings (made by Heyco) in a store somewhere. Or, you could use rubber grommets. Or . . . do you want me to tell you everything?

Build it

You must mount the capacitors away from the chassis. I found some plastic, 3 mm (1/8 inch) thick, that I cut to shape with a scroll saw, and

then drilled six holes in it; two for the capacitor mounting screws and four for mounting the assembly to the chassis by means of long screws, spacers, and nuts. As a point of information, some builders don't bother to use lockwashers when building, because it takes a little extra time to mount parts with them. I have found that, in the long run, it really pays to use them. Use the internal-tooth kind.

You will have to drill a clearance hole for the capacitor shaft on the front of the chassis.

The most cumbersome work in building this project was attaching eleven wire jumpers from individual turns on the coil to the terminals on the switch. Starting at the left end of the coil (the 10-meter end), you tap every turn through the 7th turn, and then every other turn. Just be sure the last tap is on the last turn — for 80 meters.

Most switches and controls have a bushing and nut for mounting purposes; most also have what is called an "anti-rotation" tab. This is the little hunk of metal parallel to the shaft and offset from it. It is used to prevent the whole switch from turning. While this is the most reliable way of mounting switches and controls, it does require an additional accurately spaced hole. For most projects I build, it is usually adequate to use a lockwasher behind the panel, and a carefully tightened nut on the outside of the chassis.

Rather heavy buswire was used to interconnect the two variable capacitors (how about a piece of excess wire from your coil?). The first turn of the coil was soldered to this buswire jumper. The ground end of the coil is soldered to a solder-terminal lug, which is grounded under one of the uhf-connector mounting screws. All of these little mechanical parts should be included on your bill of materials. Since I had some plastic left over, I chose to sandwich the coil between two strips of plastic, and clamp it so it was sturdily mounted.

Knobs can be obtained from many sources, and must be purchased with appearance in mind. I highly recommend that you buy knobs with metal inserts — the set screws are threaded into metal, not plastic. Last, but certainly not the least, is the chassis or cabinet. Everything has to be mounted on something. To spare you the suspense, the cabinet I used was from Radio Shack. As you can see from the photos, everything fit perfectly. The only addition I made was several layers of aluminum cooking foil to cover the louvre openings in the case to reduce rf leakage in the shack.

When you're going to build something on your own, get all the parts together, and get a general idea of the smallest chassis that will fit the parts. Don't make the mistake of getting too small a box. The most butchered job I've done was when I tried to miniaturize something. Compactness rarely accomplishes anything, makes it difficult to work on and in the project, and, if there are active devices involved, probably runs hotter — the scourge of solid-state devices.

What's that you say? You have no place to work. No problem — I've seen people building rigs on kitchen tables, bedroom floors, luxuriously equipped workshops — everywhere and anywhere. Now, of course, don't be dumb or selfish about it. I've been blessed with an understanding wife, but I acknowledge that it is a two-way street. Only rarely have I tracked aluminum chips on the carpets. After a drilling and reaming session I clean up the chips with a wide, clean paint brush. When I was doing a lot of hot and heavy building, I went out and bought a hand vacuum cleaner to show her I meant business. I try not to leave a mess of cuttings, chips, tools, or parts all over my little work area.

I have left to almost the last the construction of the

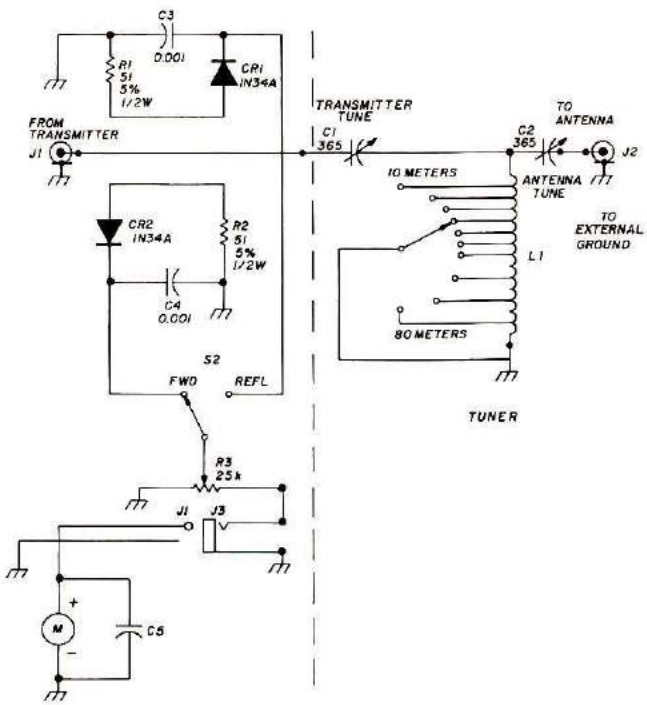


Fig. 1. The schematic diagram of the tuner actually contains two sections: the SWR metering part at the left, and the matching section at the right. The meter itself can be mounted in the enclosure with the tuner, or it can be in an external box with a cable to connect it to the circuit inside the tuner cabinet. L1 is a 14-turn length of B&W coil stock number 2008T. It is tapped at every turn for the top seven turns, then every other turn for the next six. See **Table 1** for all other parts values and descriptions.

SWR-meter section, because it gets into a more sophisticated area of building. Also, you may not wish to include this circuit in the tuner because you already have one. More and more construction articles in the magazines include a pc-board "pasteup." In many cases, a footnote in the article tells you where you may obtain an etched board, and usually a drilled one. Make every attempt to buy the drilled boards. If you have to drill one, you will need a high-speed drill (Moto-Tool), and carbide-tipped drill bits, or, at the least, high-speed steel bits. Epoxy boards eat up drill bits at a fantastic rate. Drilling holes is a filthy job; epoxy dust flies all over the place, and I would be sure not to inhale this dust. Cover your mouth and nose with a handkerchief. The pc board required for the SWR bridge in this tuner can be made by using a small drill bit as a router, although I used the normal etching process. The circuit and the board layout are right out of the ARRL *Handbook*, and it works nicely, thank you. The finished board is mounted on the back of the chassis by means of spacers. It's connected into the circuit with short lengths of RG-58/U cable. The connections to the control and switch are made with plastic insulated hookup wire. (Eventually you will end up with many random lengths of hookup wire in your junk box.)

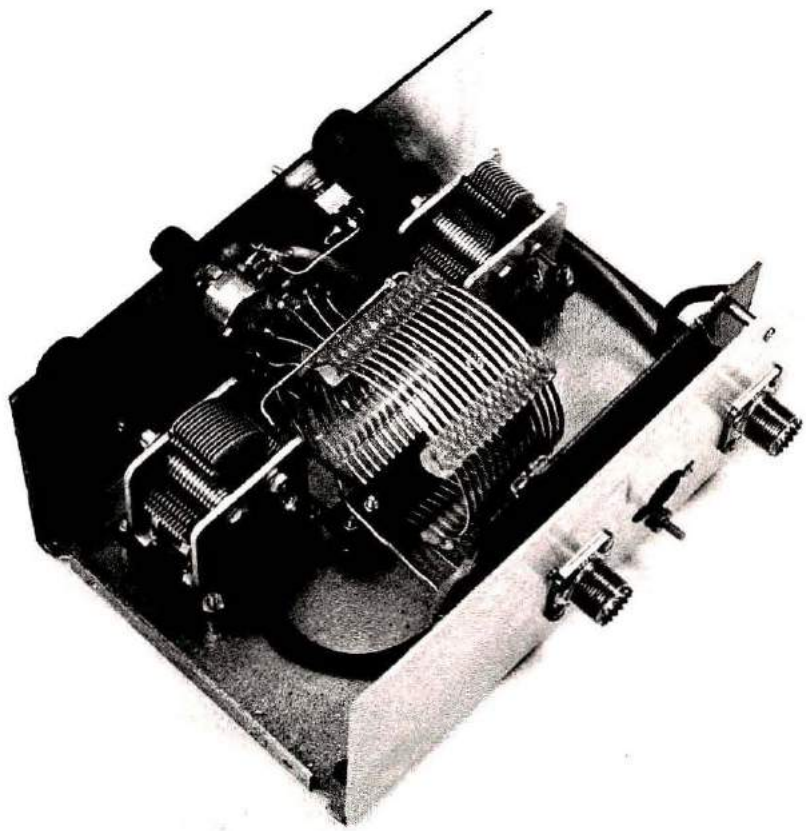
The meter, which was not in a case when this was written, was obtained from Herbach & Rademan in Philadelphia as a surplus item, at very low cost. It is not accurately calibrated for the bridge circuit used, but that is really not necessary for this use. All you need is an indication of minimum SWR between the output of the transceiver and the tuner. Read some articles on SWR bridges to learn how to accurately calibrate them. The meter can be connected to the bridge through a two-wire cable with a plug on one end and a mating jack on the chassis.

Finishing touches

We can now get to the final touch — finishing (painting) our beloved project. For many builders, just leaving the thing alone is good enough. To my eye, the aluminum finish is adequate; sometimes it is better to finish your unit by painting it. As shown in the photo, my tuner is almost an integral part of my station and I wanted it to match the rig — if nothing else. One of the errors that most builders make is painting the chassis as soon as the project is finished. You've just put in the last screw, rushed to try it, and took no pains to improve the appearance of your project. If it has taken this long to cut the holes, mount the parts, and to connect them, why not spend some time on the final stages of finishing.

First, be sure that you have removed the burrs from all the holes you've drilled. This means *all* of them, whether you're going to paint or not. Wherever possible, remove all parts from the area that is to be painted. That's right — after you've gotten everything to fit to your satisfaction, now take it all apart. Heresy! No, this is the way to go because you must clean the area to be painted to even come close to getting a reliable paint job. Where removing parts is not practical, you can cover all parts not to be painted with masking tape. Don't allow paint spray or cleaners to enter into the bearings of controls or rotary switches. Don't get spray on anything you don't wish to be painted. Now, clean the area to be painted with a degreaser. You must remove *all* oily residue from the chassis, and that includes the almost invisible residue from your fingers. If you are building something

You can see some of the points made in the text as you look at the inside of the tuner: the coil mounted by means of plastic strips and metal spacers, the tuning capacitors on plastic insulation, and the coaxial cable used to connect from the capacitors to the SWR-metering circuit on the rear panel. Note the plug for the meter (between the two coaxial jacks), and the grounding connection just below it.



where all the parts can be removed, put the whole chassis under water and clean it with a detergent. Be sure it is dry before you paint, but don't dry it with an oily rag.

Spray paint is a great boon to the homebrewer. It should be used as directed. Use a light touch, and many light films rather than brute force. Spray a layer and dry; spray a layer and dry . . . .

Well, now we've come to the end — or have we? Frankly, it was my intention not to bother with labels. After all, there are only three knobs that have to be adjusted (five, if you include the bridge), and I figure even I can remember what they are for and how they are set for each of the five bands I use. You can always look around for press-on labels sold in packages specifically designed for electronic use. The quantity in most of these packages should last you a long time. (Another addition to your junk-box. See how fast it accumulates!) You can always use "*Dymo*" labelers to make your own. There are instances where labeling is mandatory; wherever turning the wrong switch or knob could cause damage, label it clearly.

Use it

Now that you have completed your beautiful tuner, it's useful to know how to use it. As shown in **Fig. 2**, the bridge/tuner is connected between the output of your rig and the transmission line to your antenna. (If you're using a low-pass filter — and you should be — the input of the tuner connects to the output of the filter.) You have the least inductance in the circuit with the switch all the way counter clockwise. This is the high frequency end, 10 meters. Set both the TRANSMIT and ANTENNA capacitors at approximately half open. The knob pointer should be at the 12 o'clock position. Tune your receiver to the band you want, and turn the tap switch through its positions until you get the highest level of receiver signals. This is your starting point.

Fig. 2. The tuner should be connected between your transmitter (or transceiver) and the transmission line to the antenna. If you use a filter (highly advisable), it goes immediately after your transmitter. You will need an SWR meter to adjust the tuner, so if you already have one, you do not need to build it into this project.

Place the bridge switch in its FORWARD position, and use the TUNE (or low-power) position of your transmitter to get a reading on the bridge. Adjust the CALIBRATE control for a full-scale meter reading. Adjust the TUNE and LOAD controls on your transmitter for maximum output, all the while adjusting the CALIBRATE control to keep the meter at full scale. Now, place the switch in the REFLECTED position, and rotate the TRANSMIT capacitor for minimum reading (reflected power). Alternately adjust both TRANSMIT and ANTENNA capacitors for minimum reflected power. Touch up the tuning and loading on your rig. Switch to one position either side of your first coil-tap position to be sure you are getting minimum reflected power. CAUTION: This tuner is for use with transmitters having output powers 200 watts or less; two 6146 tubes, for instance. If you hear sizzling or arcing, move the tap switch one position either way and again tune for minimum reflected power.

This tuner is for use with antennas fed by coaxial cable. Remember, the tuner *does not* change the VSWR of your antenna, it merely provides the correct load for your transmitter. It allowed me to go on 10 and 15 meters where I couldn't do so before — is that motivation enough? **HRH**

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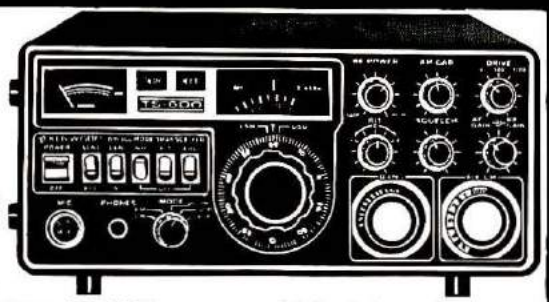

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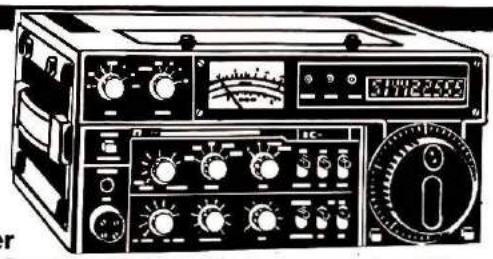

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Your Home Computer as a Code Practice Aid

BY BILL JOHNSTON, N5KR

Morse code has never been one of my strong points, and I used to have problems that are common to a lot of people. Specifically, the infrequently used characters (X, Z, numerals, *etc.*) would drive me to distraction, particularly when trying to copy code at high speeds. Therein lies the bug; most would-be brass pounders encounter this difficulty simply because very few of these characters appear in common text, so one usually gets very little practice copying them.

About six or seven years ago I resolved to meet the problem head-on, and set a goal of passing the 20-word-per-minute Extra-class exam that was scheduled only four weeks away. At that time my code speed was a shaky 13 at best, and I had never been able to copy solid above about 15 words per minute. Remember, too, that this was before the introduction of the multiple-guess code exam; you had to copy at least one minute straight (out of five) with no errors whatsoever. Dropping as few as five characters during the entire exam could spell failure.

What I needed was a way to improve my code speed, and do it in a manner that would eliminate worries about the so called "problem" characters. The method I came up with worked very well for me, and should be of great value for many other people who would like to raise their copying speed. I doubt that it would be of much benefit to a beginner just learning the code, but if you already know it and simply want to increase your speed, then this could be the ideal way to go about it.

The method

My solution to the problem was to write a computer program to generate strings of uniformly distributed random characters. By "random" I mean that the sequential arrangement of the characters is entirely unpredictable; there is no repetition of sequences and there is no way to predict what the next character will be. By "uniformly distributed" I mean that during a given period of listening (say, five minutes) each character will appear about as often as any other character, the random nature of the sequence notwithstanding.

In its original form, the program recorded the characters in Morse on audio tape. The user could select which characters were to be formed, as well as the code speed, total length of the practice tape, and even the pitch of the audio tone. After a trial run, I quickly dropped this deluxe version in favor of one that simply printed out neat pages of random characters in five-character groups. The reason for this was that the machine-generated Morse was too easy to copy! I needed the sending practice as well, so I used the printed pages to practice my sending, while at the same time recording the code on cassette tapes. I did this at about 25 words per minute, which was the top speed I could muster on a straight key. Some friends jumped on the bandwagon, and ultimately we had about fifteen hours of 25 words-per-minute code recorded in a variety of

fists. By trading the cassettes around, we avoided the danger of becoming overly accustomed to a single fist or tone. And, of course, you couldn't memorize one of those tapes if you spent the rest of your life trying.

Someone is bound to ask about sending errors that were inevitably recorded on the tapes. The fact is, it doesn't matter; the characters are entirely random, so who cares if someone occasionally records a B instead of a D? In fact, we seldom bothered to check our written copy. It turned out that since everyone already knew the code, we almost never copied a character incorrectly. We either copied it right or we simply dropped characters when we got behind. If you do copy characters incorrectly, then that's a sure indication that you are not ready to work on increasing your speed; you need more work on the basics, and in that case you *would* need to worry about whether every character is recorded correctly on the tape.

What were the results of our efforts? After spending about fifteen to thirty minutes practicing each day for four weeks, I went to the FCC examining point in Tucson and breezed through the easiest code test I have ever taken. On top of that, the gentleman being tested next was being given the code exam for the First Class Commercial Radiotelegraph license, so I copied that one too just for fun. Both the 25 words-per-minute plain-text and the 20 words-per-minute coded-group exams were copied straight through with no errors. A month earlier I would have declared that impossible. None of the other people in our practice group sat for the exam in Tucson, but all of them went on to pass the Extra-class exam in El Paso a few months later.

The computer program

If you're still interested at this point, then let's see how you can set up your own

```
1000   REM    THIS PROGRAM GENERATES AND PRINTS
1010   REM    OUT SETS OF UNIFORMLY DISTRIBUTED
1020   REM    RANDOM CHARACTERS.
1030   REM
1040   REM    THE VARIABLES USED IN THE PROGRAM
1050   REM    ARE DEFINED AS FOLLOWS:
1060   REM
1070   REM    A$   THE ARRAY OF RANDOM CHARACTERS
1080   REM         TO BE PRINTED ON A GIVEN LINE.
1090   REM
1100   REM    C$   AN ARRAY CONTAINING THE
1110   REM         REPRESENTATIVE LIST OF
1120   REM         CHARACTERS FROM WHICH THE
1130   REM         CHARACTERS TO BE PRINTED ARE
1140   REM         RANDOMLY SELECTED.
1150   REM
1160   REM    L$   AN ARRAY CONTAINING ALL THE
1170   REM         LETTERS OF THE ALPHABET.
1180   REM
1190   REM    N$   AN ARRAY CONTAINING THE NUMERALS
1200   REM         0 THROUGH 9.
1210   REM
1220   REM    P$   AN ARRAY CONTAINING SELECTED
1230   REM         PUNCTUATION MARKS.
1240   REM
1250   REM    R$   A STRING CONTAINING A YES OR NO
1260   REM         REPLY FROM THE KEYBOARD.
1270   REM
1280   REM
1290   REM    I    A GENERAL PURPOSE INDEX.
1300   REM
1310   REM    J    THE NUMBER OF DIFFERENT
1320   REM         CHARACTERS ACTUALLY BEING USED.
1330   REM
1340   REM    K    A GENERAL PURPOSE INDEX.
1350   REM
1360   REM    L    A GENERAL PURPOSE INDEX.
1370   REM
1380   REM    M    AN INDEX USED TO LOCATE EVERY
1390   REM         SIXTH CHARACTER (I.E., THE BLANK
1400   REM         CHARACTERS) WITHIN A PRINTED
1410   REM         LINE.
1420   REM
1430   REM    N    A COMPUTED RANDOM INTEGER IN THE
1440   REM         RANGE FROM 1 TO J, USED AS AN
1450   REM         INDEX TO SELECT CHARACTERS
1460   REM         RANDOMLY FROM THE ARRAY OF
1470   REM         REPRESENTATIVE CHARACTERS.
1480   REM
1490   REM    T    AN ARRAY CONTAINING THE TOTAL
1500   REM         NUMBER OF TIMES THAT EACH
1510   REM         CHARACTER APPEARS IN THE
1520   REM         PRINTOUT.
1530   REM
1540   REM
1550   REM
1560 DIM  C$(41), L$(26), N$(10), P$(5), A$(59)
1570 DIM  T(41)
1580   REM    THE FOLLOWING DATA STATEMENTS
1590   REM    CONTAIN THE LETTERS, NUMERALS, AND
1600   REM    PUNCTUATION, RESPECTIVELY, FROM
1610   REM    WHICH THE REPRESENTATIVE CHARACTER
1620   REM    SET IS FORMED.  THESE DATA
1630   REM    STATEMENTS MAY BE CHANGED TO SUIT
1640   REM    THE NEEDS OF THE USER, IN WHICH CASE
1650   REM    THE DIMENSIONS OF THE ASSOCIATED
1660   REM    STRING VARIABLES WILL NEED TO BE
1670   REM    CHANGED ALSO.
1680 DATA  A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S
1690 DATA  T,U,V,W,X,Y,Z
1700 DATA  '0','1','2','3','4','5','6','7','8','9'
1710 DATA  '=', '/', '.', ',', '?'
1720   REM    INITIALIZE THE RANDOM NUMBER
1730   REM    FUNCTION.
1740 RANDOMIZE
1750   REM    READ THE CHARACTERS FROM THE DATA
1760   REM    STATEMENTS INTO THEIR RESPECTIVE
1770   REM    ARRAYS.
1780 FOR I=1 TO 26
1790 READ  L$(I)
1800 NEXT I
1810 FOR I=1 TO 10
1820 READ  N$(I)
1830 NEXT I
1840 FOR I=1 TO 5
1850 READ  P$(I)
1860 NEXT I
1870 LET J = 0
1880 LET K = 0
1890   REM    INQUIRE AS TO WHICH CHARACTERS ARE
1900   REM    TO BE USED, AND MOVE THE APPROPRIATE
1910   REM    CHARACTERS INTO THE ARRAY OF
1920   REM    REPRESENTATIVE CHARACTERS.
1930 PRINT  'RANDOM CHARACTER GENERATOR READY.'
1940 PRINT
1950 PRINT  'DO YOU WANT TO INCLUDE LETTERS?'
1960 INPUT  R$
1970 IF  R$ = 'NO'  THEN 2030
1980 FOR I=1 TO 26
1990 LET J = J + 1
2000 LET K = K + 1
2010 LET C$(J) = L$(K)
2020 NEXT I
2030 PRINT  'DO YOU WANT TO INCLUDE NUMERALS?'
2040 INPUT  R$
2050 IF  R$ = 'NO'  THEN 2120
2060 LET K = 0
2070 FOR I=1 TO 10
2080 LET J = J + 1
2090 LET K = K + 1
2100 LET C$(J) = N$(K)
2110 NEXT I
2120 PRINT  'DO YOU WANT TO INCLUDE PUNCTUATION?'
2130 INPUT  R$
2140 IF  R$ = 'NO'  THEN 2250
2150 LET K = 0
2160 FOR I=1 TO  5
2170 LET J = J + 1
2180 LET K = K + 1
2190 LET C$(J) = P$(K)
2200 NEXT I
2210   REM    J NOW INDICATES THE TOTAL NUMBER OF
2220   REM    REPRESENTATIVE CHARACTERS FROM WHICH
2230   REM    THE PRINTED CHARACTERS WILL BE
2240   REM    RANDOMLY SELECTED.
2250 IF  J > 0  THEN 2290
2260 PRINT  'NO CHARACTERS SELECTED.'
2270 PRINT  'PROGRAM TERMINATED.'
2280 STOP
2290 FOR I=1 TO 10
2300 PRINT
2310 NEXT I
2320   REM PRINT OUT THE LIST OF REPRESENTATIVE
2330   REM    CHARACTERS, CENTERED AT THE TOP OF
2340   REM    THE PAGE.
2350 PRINT  TAB(19); 'CHARACTER SET IN USE:'
2360 LET K = (59-J)/2
2370 FOR I=1 TO J
2380 LET L = I + K
2390 PRINT  TAB(L); C$(I);
2400 NEXT I
2410 PRINT
2420 PRINT
2430   REM    PUT A BLANK IN EVERY SIXTH CHARACTER
2440   REM    OF THE PRINT ARRAY.
2450 FOR I=6 TO 54  STEP 6
2460 LET A$(I) = ' '
2470 NEXT I
2480   REM    INITIALIZE THE ARRAY WHICH KEEPS
2490   REM    TRACK OF HOW MANY TIMES EACH
2500   REM    CHARACTER APPEARS.
2510 FOR I=1 TO J
2520 LET T(I) = 0
2530 NEXT I
2540   REM    MAKE 15 GROUPS OF PRINTED LINES.
2550 FOR K=1 TO 15
2560 PRINT
2570   REM    MAKE 3 PRINTED LINES PER GROUP.
2580 FOR L=1 TO 3
2590 LET M = 0
2600   REM    FILL EACH LINE WITH 59 CHARACTERS
2610   REM    (COUNTING BLANKS).
2620 FOR I=1 TO 59
2630 LET M = M + 1
2640   REM    SKIP EVERY SIXTH CHARACTER, SINCE
2650   REM    THESE ARE TO REMAIN BLANK.
2660 IF  M < 6  THEN 2710
2670 LET M = 0
2680 GO TO 2820
2690   REM    COMPUTE A RANDOM INTEGER (N) IN THE
2700   REM    RANGE FROM 1 TO J.
2710 LET N = INT((J * RND) + 0.5)
2720 IF  N > 0  THEN 2770
2730 LET N = J
2740   REM    PUT THE RANDOMLY SELECTED CHARACTER
2750   REM    INTO THE CURRENT POSITION OF THE
2760   REM    PRINT ARRAY.
2770 LET A$(I) = C$(N)
2780   REM    UPDATE THE NUMBER OF TIMES THAT THIS
2790   REM    PARTICULAR CHARACTER HAS BEEN
2800   REM    SELECTED.
2810 LET T(N) = T(N) + 1
2820 NEXT I
2830   REM    PRINT OUT ONE LINE OF RANDOM
2840   REM    CHARACTERS.
2850 FOR I=1 TO 59
2860 PRINT  TAB(I); A$(I);
2870 NEXT I
2880 PRINT
2890 NEXT L
2900 NEXT K
2910 FOR I=1 TO 10
2920 PRINT
2930 NEXT I
2940   REM    PRINT OUT A TABLE SHOWING HOW MANY
2950   REM    TIMES EACH CHARACTER APPEARED.
2960 PRINT 'NUMBER OF OCCURRENCES OF EACH CHARACTER:'
2970 PRINT
2980 PRINT
2990 FOR I=1 TO J
3000 PRINT  C$(I); TAB(4); T(I)
3010 NEXT I
3020 FOR I=1 TO 10
3030 PRINT
3040 NEXT I
3050 STOP
3060 END
RUN

RANDOM CHARACTER GENERATOR READY.

DO YOU WANT TO INCLUDE LETTERS?
?
YES
DO YOU WANT TO INCLUDE NUMERALS?
?
YES
DO YOU WANT TO INCLUDE PUNCTUATION?
?
YES
```

Fig. 1. The BASIC program listing for the random-character-generator program. About half the statements shown are remarks statements which explain the operation of the program. These are entirely optional, and may be omitted to save space in memory.

random character generator. The program presented in **Fig. 1** is an outgrowth of the one used several years ago. A number of people subsequently asked me if I would come up with a version in BASIC that could be used on their home computers (the original program was written in FORTRAN). What I prepared was a program that would run on just about any BASIC interpreter, and that is the one given here. It uses only standard BASIC features, and all but a few of the smallest "mini" interpreters should be able to accept it with little or no change. The program listing contains about 200 lines, and approximately half of these are remarks which document the operation of the program. Consequently, not too much needs to be said here.

There are a few items, however, that I will point out where the greatest likelihood of difference lies. First of all, the program uses string variables, and utilizes both the TAB function and the RND function. These are all standard features of the BASIC language, but there are a few "stripped" interpreters around that do not implement all of the standard capabilities.

The DATA statements in lines 1680 through 1710 contain the character set from which the random groups are made up. These characters are treated as string data, and your system may or may not require the use of quotation marks to define them in the DATA statements. (Note that the system that prepared this sample run required quotation marks for the numerals and punctuation, but not for the letters of the alphabet).

The RANDOMIZE statement at line 1740 initializes the random-number function (which itself is used at line 2710). This ensures that a different set of random numbers (and, hence, random characters) will be generated each time the program is run. On some systems this statement does not exist, but where it doesn't the RND function itself usually has provisions for an argument to initialize it, written as RND(0) or in some similar fashion. There are also some commonly used methods to start the initializing function.

```
                CHARACTER SET IN USE:
      ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789-/.,?


8UR/Z Q6CJ7 286pD D1LTL TI.4B TSN?9 MAJ1A I?BH4 6A84? G.FM1
Y8Y,R -RXTW F4GH2 ST4CZ GMR7/ H59M9 UHP20 1BJ,2 LVWU/ ,XYQ?
L,GKA 4HPW9 JWKYE M2RM/ 5IOEW E2JCI 2MTB- /U1S1 ,0CW6 17/CB

X9CUS DQY/B ,NKZQ 2YJ/M X1/QE 9HI2I /U38S ICS?7 DBSL0 M,-08
T0X0V ORIS1 CHVVL .,Pw4 Z.//M WQRCN RZ7H1 ROP,O QB1U, LC6CF
H8OU8 PZP0P NWN?- L334. -616X RIS6Z UP3,K 2-ACG UP90E 64PVZ

BTSOB C92LM MBTTW 8C5EW QQZJY W53KD E63?T .NQR9 K3B5H E.V1D
795-P DFB?V FEPKA 6ZVWT 849UD BRJT4 L9X0Z ,D3W5 0,?GC 6F00E
IE3NO DPMS? 4VME6 3D?E3 KCAT4 D7.MP MUHWX P,S,X 40N5V J0672

0UD.- 616XR JU.C8 R-S3E F6QJ0 9MAHB U0L92 KNXU4 AH?N- RS5QU
LSEYV 410A5 R0DVQ 0KZQ3 1RT?0 /0Y0T B5PJ, 0HJ05 308Q6 H9XW?
JO?79 8HR/V -Z1PG UTM0? H?PLH X70UE CTG1S 090H/ 9-U.D E8AWC

FET6T 4BX?8 AWF71 W0BA2 ,S/QL ,GKB5 JU.C7 02/BD CVX4I UJ4R5
-S2?6 5M/5J PI68/ /EQFY NYYB9 689VN F5QVP XCAVE 8.B0Z -WK0U
2,P0S 7ZSCH R.1YO 3J728 6CGKJ /RGCA N,10C IX00A IF5S3 J5VGB

M8K96 8-76R PQXQ7 3-8,J 00CW6 053UN UAU/. 05L48 P1ZW1 EXSYT
VX0WW GD,,A M1JQG MNJPA 03USE 3HX2A 3J-F5 S2EQQ 490N4 PWA.X
ADMF? XU4,B WA.V3 W4VPZ GMT/K I9GGS IM46? 0AE01 KRIT9 7DHFI

J74,E AA9AK RHHML 6H-2E M8I1H ARR1B I7A14 UK/I, 6ES4P QCZGO
700QG J9,BQ AU6JI F-EXL WZ4-V E/SPK B97FP ,NJM7 C?K3? NBEM9
AJO.Q BRKXE OCGP7 W8BV2 RL.B2 285CP XCD,A QMIR4 VS-IF 8212D

QVPZG MS-G9 7A2CD 9R9GG W4ULD -03ZD -VHOQ HPUVX 4FEQQ 2TWAC
DZ-1? -0G1S 5S2UP NVIPQ .?QWW PLJ74 CYFJJ JICP2 5L370 YP7V3
52NWO A.SKL SCK66 H4/3A T0WWL ZHVPS QJ09N CPZK- BHY?V GI-RT

OV.,J 3J/LS EZY?S 1,ZBV 1L1T2 .OWG9 7C8UP 5HC6D OF171 0/YJ,
21XQJ 616YT RC0GD GCAN, 2TRL6 N2H42 SU8X8 2ZTG5 COU6N 2KHZH
21728 1T3D, 8UYCB X?7,Q 2V7?1 ,7DF? VM./A 737RD 202?W R0-S3

P7SG9 9JXN5 Y5F5N ?.5?A JF7YG W4S-L X?4PX A?1G9 20BW/ YNU,N
ZZAQO O-G4E 8BZLC 5?,6C AXN1C MHNIK 5E4S? 9HOQH PTRL7 05QQ1
6F4IR Z9Z7Q /6YJE T5NEU C7H7I 68-XT V?EY0 PQD6/ ICQ4. 7NY0T

4C430 PU0X3 D-VE/ TTW/W 9J2-D UFMWQ WZ0K6 RL3-4 R52JD MAL01
IUJ6X JCNPH 0E/N4 UJ-E0 9NF7Y C?SZ4 69C0E /SN9K 1WJOF V8MHH
HUQ9R 8D,./ ?4S?, 2U4-X 077Q? ODJ3C /7YKH 2TSRU C5DVN HBRJQ

50EVG DALX9 DWYV4 Y/A8A N8BYM ME.SO ?XYMU I2I-Q S8EF7 24E/W
HZFG2 6M54S A/09. 6I??, -ZX70 QY/EQ LB1YX ,ZBXB A40Q0 0/I.1
.AV9V MCX62 ,MKYL PZMGA 3GP5G AYUW4 UJ/RL 0OLUQ 7KDHP UUVWX

W9JXN 6JDAR L9X00 BMR1F 6QMF. Q?JSV CVTFX DQTLK DF/KK H468E
BQCZF KMS8/ ,S?,7 DE-KS RPRBM Y6H.D -VHNN ,1PFR M7GV6 794X6
H-3GU Q-3PY GZJJL AZSEZ Y.LGP 953KD E63AV D55TA 4HTB? T?2FW

0OLSA CC6JI IQDPR BP7P? ONY34 BSN76 RK6LX 5U?PM L-5UD 7KB83
WF7YH Z/,S, 205U, HTH3V 3SIDX WG?R1 KN1B? XYNXS R0096 CGNRU
JIJRM ?Kw9L 7M0KS JLZIX WADK5 JPJ9C X-ACL D5/W/ TZNN- PMMAN

IJT15 S89VN F6U7M OPAWF /I6?Z -WKZP 3-3MG K?0/Y I8HQ7 LGSG8
WM9Q0 GFMVN N.0L- 1?-OF YKH3U W4S-K W-RS6 2?1F5 SZ2W/ YNVD0
LW64P RF9.0 S6BW- JN?-M 59HK7 YB99L 5F6ZV S,0L7 JBGUU P91HB
```

Fig. 2. The output from a sample run. In this particular example, letters, numerals, and punctuation were all included.

When you key in the RUN command, the program will sequentially inquire as to whether you want letters, numerals, or punctuation in the

```
NUMBER OF OCCURRENCES OF EACH CHARACTER:

A  60      N  54      1  55
B  57      O  58      2  56
C  63      P  64      3  49
D  54      Q  59      4  59
E  51      R  56      5  53
F  45      S  66      6  63
G  50      T  46      7  61
H  59      U  59      8  44
I  45      V  54      9  60
J  62      W  64      -  54
K  48      X  55      /  52
L  51      Y  47      .  36
M  58      Z  50      ,  50
           @  64      ?  59
```

Fig. 3. After the character groups are printed out, the program lists a summary of how many times each character was used. The method invoked by the program in generating the characters ensures that each one appears more or less the same number of times.

printout. You can accept or reject any of these groups, depending upon what you want to practice. This particular sample run produced the page of printout illustrated in **Fig. 2**, and it includes all of the characters.

Once the page of character groups has been completed, a summary is printed which tells how many times each character appeared in the printout. This is illustrated in **Fig. 3**. Its main value is in reassuring the user that the character distribution is indeed more or less uniform. You may wish to drop this part of the program once you have confirmed that it is working properly.

The method described here for improving Morse-code receiving ability was both easy and effective for me. While not everyone will like this procedure, there are many who will find it an efficient and enjoyable way to increase speed. You can save the tapes for years, and any time you feel your code speed slipping you can pull them out for a few minutes of practice. **HRH**

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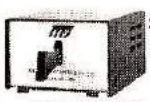

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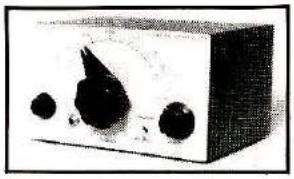

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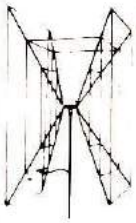

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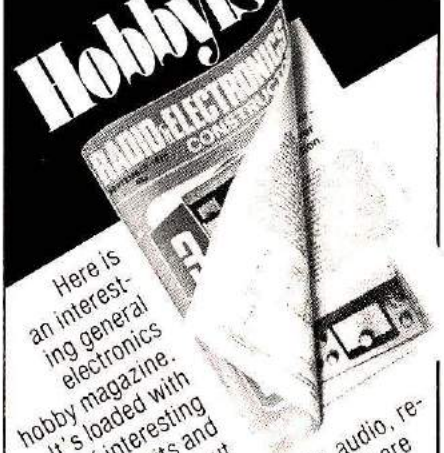

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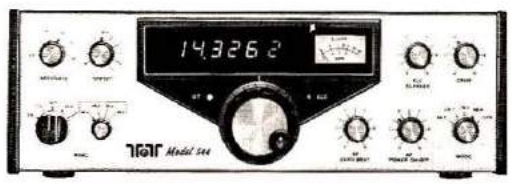

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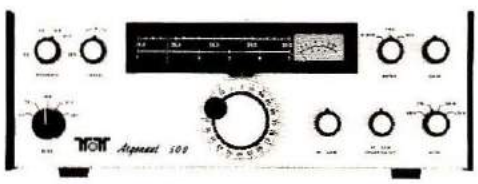

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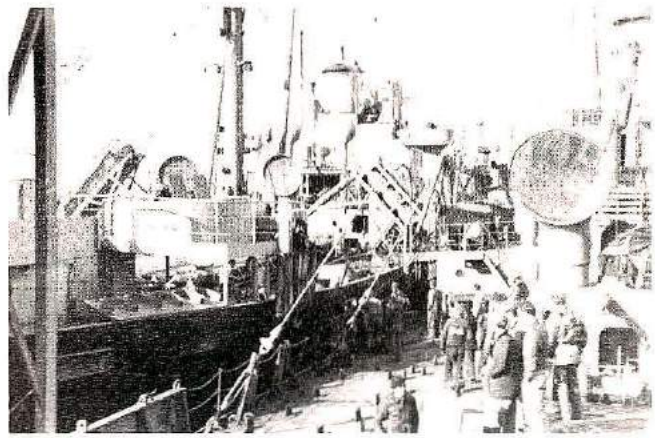


Author's ship, *Walter L. Fleming*, tied up at a dock in Haifa (then Palestine) *ca* 1945. A doublet antenna was rigged on the boat deck for ham operations.

BY OZZIE JAEGER, W9VND/W6AD

Well do I remember the last thing I told my flight-operator buddy at the dock in Baltimore. "Skip," I said, "If the hams get on while I'm on this trip, look for me, because I'll be on if humanly possible."

Little did I realize that would be the case. And of all places to build a ham rig, a rolling Liberty Ship wasn't the answer. As I left Baltimore I had the following parts:

One crystal (7145 kc)

One variable condenser (about 55-135 pF)

Three tubes (two 6L6Gs and one 6F6)

Two octal tube sockets

Three mica bypass condensers, three resistors, some no. 18 hookup wire, and a spool of no. 32 wire for coils

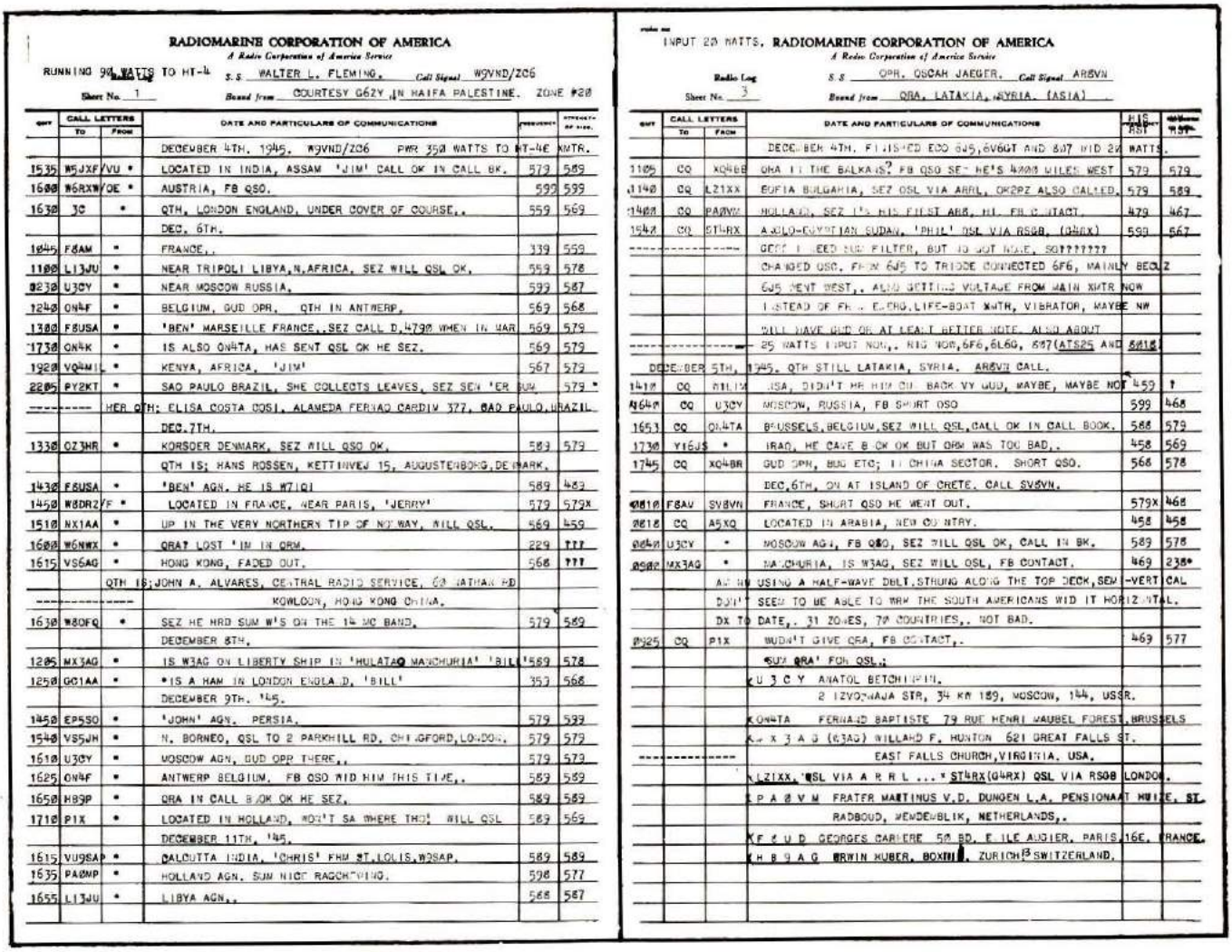
That was my junkbox inventory. I really didn't plan on getting on the air in the ham bands, but I wanted to have something to experiment with in case I had any spare time in some port with no shore leave.

You will recall that Amateur Radio operations were completely cancelled during World War II. The resumption of Amateur activity was anticipated with much fervor at the end of hostilities in 1945. And here was I, W9VND, bound for the Middle East on a Liberty Ship with not much in the way of ham equipment. But I was determined to get in my licks when the FCC gave the go-ahead. I was ready, sort of (take another look at my junkbox inventory).

Before the ship left Baltimore I contacted Mr. Beadle, the FCC officer, to make sure it was okay to operate my ham station whenever and wherever I might be when the go-ahead for post-WW II Amateur operation was given. After that, I kissed my girlfriend good-bye and was on my way (supposedly) to Egypt on the *SS Walter L. Fleming*, a general-cargo freighter and one of the many Liberty Ships of the time.

W1AW broadcasts

About ten days out of Baltimore we were about even with the Azores. I heard the ARRL station, W1AW. Boy, what a thrill! I listened to W1AW every night, hoping for the word that Amateurs were again permitted



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GMT	CALL LETTERS To	CALL LETTERS From	DATE AND PARTICULARS OF COMMUNICATIONS	FREQUENCY	EFFICIENCY OF SYS.
			DECEMBER 4TH. 1945. W9VND/ZC6 PWR 350 WATTS TO HT-4E	XMTR.	
1535	W5JXF/VU	*	LOCATED IN INDIA, ASSAM 'JIM' CALL OK IN CALL BK.	579	589
1600	W6RXW/OE	*	AUSTRIA, FB QSO.	599	599
1630	JC	*	QTH, LONDON ENGLAND, UNDER COVER OF COURSE,.	559	569
			DEC. 6TH.		
1645	F8AM	*	FRANCE,.	339	559
1100	LI3JU	*	NEAR TRIPOLI LIBYA,N.AFRICA. SEZ WILL QSL OK.	559	578
0230	U3CY	*	NEAR MOSCOW RUSSIA.	599	587
1240	ON4F	*	BELGIUM, GUD OPR. QTH IN ANTWERP.	567	568
1300	F8USA	*	'BEN' MARSEILLE FRANCE,.SEZ CALL D,4730 WHEN IN MAR	569	579
1730	ON4K	*	IS ALSO ON4TA, HAS SENT QSL OK HE SEZ.	569	579
1920	VQ4MIL	*	KENYA, AFRICA. 'JIM'	567	579
2205	PY2KT	*	SAO PAULO BRAZIL. SHE COLLECTS LEAVES. SEZ SEN 'ER SUM		579 *
----------			HER QTH: ELISA COSTA COSI. ALAMEDA FERIAO CARDIV 377. SAO PAULO, BRAZIL		
			DEC.7TH.		
1338	OZ3HR	*	KORSOER DENMARK. SEZ WILL QSO OK.	583	579
			QTH IS: HANS ROSSEN, KETTINVEJ 15, AUGUSTENBORG, DENMARK.		
1430	F8USA	*	'BEN' AGN. HE IS W7IQI	569	469
1450	W8DRZ/F	*	LOCATED IN FRANCE, NEAR PARIS, 'JERRY'	579	579X
1510	NX1AA	*	UP IN THE VERY NORTHERN TIP OF NORWAY. WILL QSL.	569	459
1600	W6NWX	*	QRAT LOST 'IN IN QRM.	229	???
1615	VS6AG	*	HONG KONG, FADED OUT.	568	???
			QTH IS; JOHN A. ALVARES, CENTRAL RADIO SERVICE, 60 NATHAN RD		
----------			KOWLOON, HONG KONG CHINA.		
1630	W8OFQ	*	SEZ HE HRD SUM W'S ON THE 14 MC BAND.	579	589
			DECEMBER 8TH.		
1205	MX3AG	*	IS W3AG ON LIBERTY SHIP IN 'HULATAO MANCHURIA' 'BILL'	589	578
1250	GC1AA	*	*IS A HAM IN LONDON ENGLAND. 'BILL'	357	568
			DECEMBER 9TH. '45.		
1450	EP5SO	*	'JOHN' AGN. PERSIA.	579	589
1540	VS5JH	*	N. BORNEO, QSL TO 2 PARKHILL RD. CHELSFORD, LONDON.	579	579
1610	U3CY	*	MOSCOW AGN, GUD OPR THERE,.	579	573
1625	ON4F	*	ANTWERP BELGIUM. FB QSO WID HIM THIS TIME,.	569	569
1650	HB9P	*	QRA IN CALL B.OK OK HE SEZ.	589	589
1710	P1X	*	LOCATED IN HOLLAND, WON'T SA WHERE THO! WILL QSL	567	569
			DECEMBER 11TH. '45.		
1615	VU9SAP	*	CALCUTTA INDIA, 'CHRIS' FRM ST.LOUIS, W9SAP.	589	589
1635	PA0MP	*	HOLLAND AGN. SUM NICE RAGCHEWING.	598	577
1655	LI3JU	*	LIBYA AGN,.	568	587

INPUT 20 WATTS. RADIOMARINE CORPORATION OF AMERICA
A Radio Corporation of America Service

Radio Log
Sheet No. 3
S.S OPR. OSCAR JAEGER. Call Signal AR8VN
Bound from QRA, LATAKIA, SYRIA. (ASIA)

GMT	CALL LETTERS To	CALL LETTERS From	DATE AND PARTICULARS OF COMMUNICATIONS	RST	
			DECEMBER 4TH. FINISHED ECO 6J5,6V6GT AND 807 RIG 24 WATTS.		
1105	CQ	XQ4BB	QRA IT THE BALKANS? FB QSO SEZ HE'S 4000 MILES WEST	579	579
1140	CQ	LZ1XX	SOFIA BULGARIA, SEZ QSL VIA ARRL, OR2PZ ALSO CALLED.	579	589
1400	CQ	PA0VM	HOLLAND, SEZ IT'S HIS FIRST ARR, HI. FB CONTACT.	479	467
1542	CQ	ST4RX	ANGLO-EGYPTIAN SUDAN, 'PHIL' QSL VIA RSGB. (G4RX)	599	567
----------			GOOD I NEED SUB FILTER, BUT TO GOT MAKE, SO??????		
			CHANGED OSC. FROM 6J5 TO TRIODE CONNECTED 6F6, MAINLY BECAZ		
			6J5 WENT WEST,. ALSO GETTING VOLTAGE FROM MAIN XMTR NOW		
			INSTEAD OF FR.. E.CRG. LIFE-BOAT XMTR, VIBRATOR, MAYBE NW		
			WILL WAVE GUD OR AT LEAST BETTER NOTE. ALSO ABOUT		
----------			25 WATTS INPUT NOW,. NIG NOW, 6F6, 6L6G, 807 (ATS25 AND 807)		
DECEMBER 5TH, 1945. QTH STILL LATAKIA, SYRIA. AR8VN CALL.					
1410	CQ	W1LIM	USA, DIDN'T HR HIM GO BACK VY GUD, MAYBE, MAYBE NOT	459	?
0640	CQ	U3CY	MOSCOW, RUSSIA, FB SHORT QSO	599	468
1653	CQ	ON4TA	BRUSSELS, BELGIUM, SEZ WILL QSL, CALL OK IN CALL BOOK.	588	579
1730	YI6JS	*	IRAQ, HE CAVE B OK OK BUT QRM WAS TOO BAD,.	458	569
1745	CQ	XQ4BR	GUD OPR, BUG ETC; IN CHINA SECTOR. SHORT QSO.	568	578
			DEC.6TH, ON AT ISLAND OF CRETE. CALL SV8VN.		
0810	F8AV	SV8VN	FRANCE, SHORT QSO HE WENT OUT.	579X	468
0818	CQ	A5XQ	LOCATED IN ARABIA, NEW COUNTRY.	458	458
0840	U3CY	*	MOSCOW AGN, FB QSO, SEZ WILL QSL OK, CALL IN BK.	589	578
0902	MX3AG	*	MANCHURIA, IS W3AG, SEZ WILL QSL, FB CONTACT.	469	238*
			AR HE USING A HALF-WAVE DBLT, STRUNG ALONG THE TOP DECK, SEMI-VERTICAL		
			DON'T SEEM TO BE ABLE TO WRK THE SOUTH AMERICANS WID IT HORIZONTAL.		
			DX TO DATE,. 31 ZONES, 79 COUNTRIES,. NOT BAD.		
0925	CQ	P1X	WUDN'T GIVE QRA, FB CONTACT,.	469	577
			*SUM QRA' FOR QSL.;		
			KU3CY ANATOL BETCHELIN.		
			2 IZVOZNAJA STR, 34 KM 189, MOSCOW, 144, USSR.		
			XQ4TA FERNAND BAPTISTE 79 RUE HENRI MAUBEL FOREST, BRUSSELS		
			XW3AG (G3AG) WILLARD F. HUNTON 621 GREAT FALLS ST.		
----------			EAST FALLS CHURCH, VIRGINIA. USA.		
			LZ1XX, *QSL VIA A R R L ... * ST4RX(G4RX) QSL VIA RSGB LONDON.		
			PA0VM FRATER MARTINUS V.D. DUNGEN L.A. PENSIONAAT HUIZE, ST.		
			RADBOUD, WEMDEMBLIK, NETHERLANDS,.		
			XF4UD GEORGES CARIERE 50 BD. E ILE AUGIER, PARIS 16E, FRANCE.		
			HB9AG ERWIN KUBER, BOXTHAL, ZURICH 3 SWITZERLAND.		

Here's a couple of sample pages from W9VND's log of his Mediterranean operation. Some of the countries listed are no longer in existence, or have changed their name and Amateur Radio prefixes. The lifting of restrictions on Amateur operating caused a rush of activity that was almost a DX explosion. Low-powered equipment and poor receivers (by today's standards) was no deterrent to those QSO-starved hams of 1946.

to get on the air. What a signal! Even in the middle of the Mediterranean I could copy W1AW 100 per cent on either phone or CW. Not bad for *any* kilowatt rig. But I was receiver-limited, so to speak. The 7-Mc band was blotted out on my receiver by high-powered commercial stations. Also, my receiver tuned only to 25 Mc — no matter what I tried, I couldn't make it receive on the 10-meter band. Even so, I rigged up a 6L6 tri-tet oscillator and a 6L6G amplifier for 10 meters just to see the rf light up the flashlight bulb. It was sort of a consolation, I suppose; I had a 10-meter rig that worked.

It's important to remember that this story was written in 1946. It reflects the technology and operating conditions of the time, as well as the author's personal trials and tribulations while trying to operate an Amateur Radio station aboard a Liberty Ship — in addition to doing all his regular duties. **Editor**

On to Palestine

About this time I received a commercial radiogram telling us that our ship's destination had been changed from Egypt to Haifa, Palestine. My hopes crashed to earth. I had everything figured out about how I would rush ashore at Alexandria and look up SU1AM and SU1CH and use their rigs to work DX to my heart's content. Whoever heard of a high-powered (or any other kind) of ham in Palestine or Syria?

We pulled into Haifa. Sure enough, I found the same old story to be true — wherever there are humans, hams can be found, and find 'em I did. I ran into Fritz, OE1FE, from Vienna, who was running a radio repair shop. Fritz introduced me to Lt. Spector, ZC6HS, of the Royal Navy radar office in Haifa. One thing led to another, and before I knew it I was sitting in front of a nifty Hallicrafters SX-28 receiver. The 10-meter band was dead. I flipped the band-switch to 20 meters. The first signal I heard was a beautiful, drawn-out banana-boat swing:

"CQ CQ CQ de VU9SAP." Back came EP5SO and off they went on a good old prewar ragchew. That did it! The hams were on!

"Fellows," I said, "I gotta get back to the ship." I was a quivering wreck. All that good ham DX coming through and no transmitter. But Fritz said, "Calm down, OM. We have other plans for you."

Mount Carmel

My buddies tore me away from the SX-28, and the next thing I knew we were scattering goats and chickens through the outskirts of Haifa in a little bantam auto, bound for Mount Carmel. This peak is probably the most beautiful DX spot in the world. There I met Captain Stan Ingram, G6ZY, who was in the British army.

After introductions, G6ZY said, "How'd you like to use our Hallicrafters HT-4E transmitter until you get your rig finished aboard ship?" After recovering from this shock I said, "Please, fellows, take me back to my ship so I can get my bug." So back down the mountain, through the goats and chickens, up the gangway, and into the radio shack. I grabbed my bug and off we went, back up the mountain.*

License problems? My American ham ticket was to expire in May of 1946, so it was still valid. Stan, G6ZY, figured that I could operate using my call sign with slant ZC6. Amazing how hams can rationalize, especially if they're DXers. So that was it. Here I was, in a beautiful DX location with a good rig, ready to knock 'em dead with a rare call sign.

If you've never been in such a situation it's hard to believe what happens when you send CQ with an exotic call sign. On 20 meters, the whole world comes back. All you have to do is sit there and sort 'em out. It was absolutely wonderful. WAC became routine every few hours. It was a lot different from working my rig back in Illinois, believe me! Signals you wouldn't believe: growling MCW from South America; chirpy VFOs from Europe; and of course, the U.S. hams. If you notice the excerpt from my log you'll see very few W stations. The reason? When you're working DX from an overseas spot, you eliminate the W stations and the world is yours. Those Ws I did work had exceptionally clean signals, were sharp operators, and played the game according to the rules.

All that fine DX operating from Mount Carmel wasn't getting my shipboard ham transmitter built. We weren't scheduled to be in Palestine for very long, and I wanted to be on the air before we started our runs to Syria, Tripoli, and Beyrouth. We were also supposed to touch at Cyprus, Malta, and Marseille, and I wanted to be ready.

I abandoned the idea of a crystal-controlled oscillator, mainly because my 7-Mc crystal doubled to about 14,300 kc — nothing much there. So I ended up with a self-excited Hartley oscillator, 6L6G doubler, and an 807 final amplifier, courtesy of our skipper.

Author Jaeger and a French YL in port at Casablanca. She became Ozzie's sister-in-law in late 1946. But that's another story.

I conned the Chief Engineer into cutting a panel of 1/16-inch-thick steel, mounted my condensers, and, with a few orange crates and basic tools, the rig began to take shape. Friends ZC6HS and OE1FE donated some variable condensers, without which I couldn't have made it. Thanks, fellows, wherever you are!

The rig wasn't pretty, but it was, well, substantial. The foundation was made of a wooden orange crate, with the metal panel bolted to it. I used small wooden squares cut from orange crates to hold the tube sockets, which I nailed to the baseboard. I used cardboard tubes from rolls of 35-mm film for coil forms. I had no test equipment of any kind, so I tested for grounds using the earphone-and-battery method.

I wired the rig together, gave it a "smoke test," and it took

Another view of *Walter L. Fleming* at Limasoll, Cyprus, around 1945.

*A bug is a semiautomatic key; it mechanically makes a series of dots, and each dash is made by the operator. Many are still sold and used today — one of the most popular is by Vibroplex. **Editor.**

off, producing a nice bit of rf on 20 meters. At this point I decided to use link coupling between doubler and final amplifier for better coupling. This meant another coil for the grid circuit. Well, you don't find coil forms lying around aboard a Liberty Ship, so I made one out of a mop handle and my roll of no. 32 wire. As I said, the rig wasn't pretty, but it was solid.

Primary power

Next was the problem of powering the orange-crate rig. I used 100 Vdc from the ship's mains for the first two stages. For filament voltage I used a 6-volt storage battery. I needed something more than 100 Vdc for the amplifier and used the 150-volt B-plus supply from the emergency lifeboat transmitter.

Author W9VND atop Mount Rigi in Switzerland.

The antenna

My skipper was most cooperative. I think he was a ham in spirit, because he allowed me to string up a doublet on the boat deck. I made it as inconspicuous as possible; however this is just not done on most ships!

At this point a ham with one trip at sea might be saying, "Well for ***, why didn't he use one of the ship's antennas? There must be at least three of them!"

I also considered that. But if you've been to sea on a cargo ship you'll understand that, when in port, all ship's antennas are taken down for cargo handling. In my case, aboard *SS Walter L. Fleming*, we were on a shuttle run, with no possiblity of erecting the antennas for more than one day at a time. So I used a simple doublet. It was strung along the boat deck.

Author W9VND, G6ZY, and ZC6HS in Haifa, Palestine, 1946.

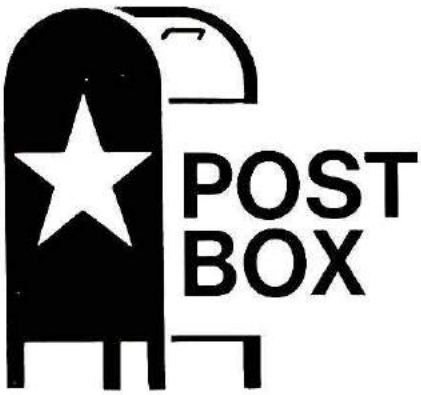
Finally I had everything tuned up. The life-boat vibrator power supply created a stinking CW note, but I had no filter available, so what could I do? Many signals on 20 meters were as bad or worse.

Here's what happened during a typical ham QSO. First I threw the auto alarm* switch at the top of the radio panel, which put + 100 volts on the oscillator and doubler. Then I ran a wire across the switch position on the vibrator and switched the antenna from the receiver to prevent blocking. I was on the air. It would make a good movie scenario: W9VND in the shipboard radio shack, jumping up with a great rush, throwing one switch here, another there, running across the cabin and shorting wires, then rushing back to the original operating position to start beating out CW, all for the thrill of working another ham with my *own rig*, such as it was.

I'd like to take this opportunity to say thanks for the cooperation of many hams who probably lost me during those hectic operations. But the spirit of ham radio was much stronger than anything else during those moments. I spent two days working all continents with the greatest of ease with my powerhouse rig of about 10 watts input. It was a thrill to get back on the air!

After my ship departed from Haifa, there were many other adventures, which would require a book to describe. My voyage covered many countries in Europe, Africa, and South America. To everyone who heard me or worked W9VND, wherever you may be, many thanks for the opportunity to shake hands. I've logged every contact and I have a complete record. So if you want a QSL card from W9VND, send me the info and you'll receive my QSL card. **HRH**

*An auto alarm is a receiver tuned to the international distress frequency (500 kHz), which automatically actuates light and sound alarm signals on the bridge or in the radio operator's cabin if a certain coded signal is received when the radio operator is off duty. **Editor.**



Dear Horizons:

I have enjoyed *Ham Radio Horizons*. It is aimed at those of us who are not technical wizards, and hence is more understandable.

I particularly liked your July issue and the article on ten meters, by K. T. Thurber, Jr. This article cleared up a lot of questions for which the books and operating manuals do not have answers.

I would like very much to see a similar article on the 2-meter band. Here again, existing literature is inadequate. What, for example, are the operating conventions for this band? The kinds, and proper use, of repeaters? Also, we need a discussion of equipment, handhelds, etc. What about "squelch?" I can't find this word in the index of the *ARRL Handbook*.

F. J. Pettijohn, WB3CBC
Towson, Maryland

Thanks for your comments, and I'm glad you liked the ten-meter article. We've not had an article about the entire two-meter band and what goes on there, but I'll keep your thought in mind. For piecemeal reading, you might look at "Introduction to Repeaters," by WA3VUP, in our September, 1977, issue; "Two Meter SSB," by WB6NOA, in July, 1978; "A Guide to VHF Propagation," by K2OVS, in February and March, 1979; and "FM and Repeaters," by W1XZ, in our October, 1979, issue. Our glossary with the "Introduction" article defined Squelch *as a "circuit which quiets a receiver when no signal is present" — although sometimes the term is used as a verb, as in squelch (silence) a person. My dictionary gives both versions.* ***Editor.***

Dear Horizons:

Your SEANET story by N1RM, in the April issue, brought up old memories, and I found this photograph taken at the first SEANET convention in Penang, January 1, 1972. In the back row, left to right, are 9M2WM, HS3DR, 9VIQD, VS6DR, 9M2IR, HS4ACN, XV4AL, YB5AAQ, KR6FC, and Joe Barlow (and SWL).

In the front row, left to right, are 9M2FZ, W1UUQ/DU1, 9V1QG, 9M2CG, 4S7PB, 9M2DQ, and 9M2FK. Present, but not in the photograph, were YB7AAU, VK9KS, 9M2DX, 9M2BS, and 9M2FI. The meeting included discussions of procedures for operating the SEANET on the air, picking a place for the next convention (Bankok, 10-12 November, 1972), and a slide show by K7CBZ/HS3DR of antennas and ham shacks around the world, plus the Cocos Island DXpedition.

I hope this will be of interest to your readers.

Bill Talanian, W1UUQ/HS3WT
Goleta, California

Dear Horizons:

In regard to the letter from K4AWS in the July HRH issue, I would like to say that I certainly care about the "ole ole" days; and there are probably a lot of other hams who would like to know what went on then, too.

I'm new to ham radio, and it's nice to know what happened before my time, and about all the troubles and chuckles the OTs went through to make ham radio what it is today.

Keep up the good work, and many thanks!

Tim Mason, KA8EWV
Sterling Heights, Michigan

Dear Horizons:

I just want to say I thought your article, "Oscillators in a Nutshell," was really good. The best thing about it was that it was in plain and simple language and was easy to understand. Let's see some more articles that have to do with various types of radio circuits.

Rick Smith, KA2FRG

Dear Horizons:

Dr. Slapkowski's letter, published in your July Post Box, asks, "Who cares about the 'ole ole' days?"

Well, Doc. I care. I care a whole lot. And W1JSS cares — his letter appeared just ahead of yours. And Bill Orr and others who research and write about the "ole ole" days care. I appreciate *Horizons* publishing material such as this; the history of radio communication is fascinating, I think, and I'd welcome more of it.

Courtney Hall, WA5SNZ
Dallas, Texas

Dear Horizons:

Jim Fisk's editorial in the April issue indicated that he is familiar with technical curricula in both engineering and technology schools. One suggestion that he might have made would be for students to check the curriculum in which they are interested for accreditation by the Engineering Council for Professional Development (ECPD).

Since I teach electronics in a Community College, I wish to also plug the associate degree programs in electronics. These curricula are offered at institutions that are oriented more toward instruction and learning than some of the four-year institutions which place heavy emphasis on research and publication. Most courses are transferable to senior institutions for meeting requirements of bachelor's degrees in technology. Many students find Community Colleges a very cost-effective method of obtaining the fundamentals of electronics, whether they intend to transfer to a senior institution or immediately enter industry with a desired skill and knowledge.

Albert B. Grubbs, Jr., Chairman
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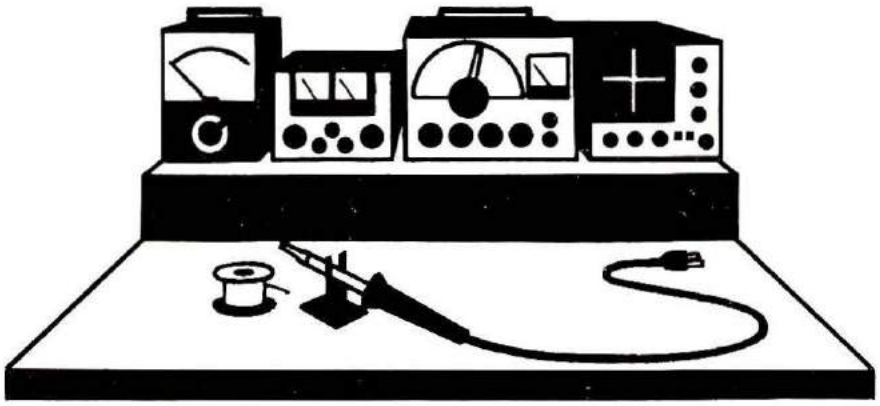

BENCHMARKS

Emergency Van

Here is a photograph of my emergency communications van. It is nothing ultra fancy, but my main concern was to have something that could go into remote areas and over rough terrain. This unit can do just that with enough ground clearance to go almost anywhere it may be needed.

It carries a 5-kW emergency power generator on the back deck. Inside, it is equipped with vhf and high-frequency rigs, a CB unit, a public address system, and a rig for the National Red Cross frequency. Since I am a pilot, and participate in searches for missing aircraft, I have applied for permission to use air-to-ground channels also. The station can operate on commercial ac power, emergency ac power, or battery power. It also has a tape recorder.

I am considering several additional items of equipment, as finances allow, such as a 15-meter (50-foot) crank-up tower that will be hinged at the back and lie down across the top while in transit. Also, I'm planning a vhf repeater and an antenna tuner for random lengths of wire.

My van is always ready to roll providing disaster communications wherever needed.

Robert R. Power, W6MRT

Information storage

I have been collecting bits of ham lore and construction hints for over twenty years, and decided that it was time to share some of them with *Ham Radio Horizons* readers. They are all intended to save time, and make being a ham more fun, no matter what part of the hobby interests you. These ideas have been collected from many sources; other publications, contacts on the air, personal experience, and so on.

My first suggestion concerns a method of storing these nuggets of information: cut the paragraphs out (or copy them, if you don't want to ruin the magazine) and paste them on index cards. You can keep them in card-file boxes of the type used for recipes, addresses, or whatever. In this manner, you will be able to store helpful ideas about the subjects that are of most interest to you, and to find it in short order when the need arises.

Towers. When erecting or tightening tower hardware, it is all too easy to drop a wrench, and you must therefore carry extras, or go down and retrieve it. Instead, since only a few sizes of hardware are used, and they seldom differ by more than one bolt size, use double-ended box wrenches (open ends eat knuckles anyway) that differ by only one size. Buy some carpenter's chalk line (non-prechalked variety, strong and light), and tie one end of a 60 to 90 cm (2- to 3-foot) piece of line through the unused box end, and the other end through the loops of the back of your climbing belt.

Every tower should be well grounded. If you use the long, 12 mm (1½ inch) diameter copper rod that you really should have, you are left with a puzzle of how to connect it to the tower. Braid corrodes away, and strands of solid clothesline (aluminum) or heavy gauge electrical wire (copper) tend to kink, break, and also corrode just from the weather. Visit your local automobile junk yard or parts shop and buy a 6-volt version of a universal battery cable that connects the battery to the car frame. A cable for the other, positive, side will work just as well, but sometimes it contains half of a fusible link (smaller wire) in the same clamp, and is more expensive if bought new. Be sure to choose a cable long enough, or buy it first so you'll know where to place the ground rod. The battery end of the cable makes a nice tight and serviceable fit to the ground rod, and the heavy ground-lug eye goes under one of the lowest tower-to-base nuts. The cable is flexible enough for fold over bases, and, while it won't handle the force of a direct hit (nothing really will!), it is a good, stout ground for static bleed off, and the induced spikes you may receive from nearby lightning strikes.

Antenna. If you are putting up aluminum-tubing type yagi antennas, and having trouble keeping elements from breaking off

at the boom mount, try cutting pieces of polystyrene rope available in most hardware stores, and inserting them into the elements. The rope makes an excellent vibration damper. It stops the small constant motion at the element-to-mount point that causes metal to fail. A similar cure appeared long ago, using small wood strips on low band beams, and the rope idea came more recently from the kind folk of Hy-Gain's antenna-engineering staff. It works great! Don't pack the element full. A rope slightly smaller than the I.D. of the element, so it slides in easily, and about three-quarters of the length of the element works fine. The small added weight is worth it.

Equipment. For those of you who are scared off by the subject of mathematics, but can use a tip or two about its uses without all the reasons why, try the following: Given a round meter to mount, it is easy to find the size of the large hole required by measuring across the round back of the case. Not so the bolt-hole circle to mount a meter! Measure the distance from the center of one of the three holes to the next hole (assuming the meter requires three equally spaced holes generally used to mount most meters). Multiply that figure by 0.577 and you have the radius for the mounting-hole circle. As a quick check, it will always be a number larger than one-half the figure you got for the meter-hole diameter. Lay out *both* circles using your desired center mark before drilling or punching the large meter-mounting hole (and thus losing your center mark).

Tools. When trying to center bore a hole down a plastic or nylon shaft, never put the drill in the drill press. Put the shaft piece (assuming it is reasonably short), into the drill-chuck jaws. Then, place the drill bit in a small bench vise so that it is pointing up. Some small vises have grooves in the faces that make this quite easy. Place the drill as close to the center of the shaft as you can estimate and turn on the drill press. Allow the vise to move slightly (within reason) until after the hole is started. The drill bit will self-center on the shaft.

Wiring. As you assemble your hamshack, the need for various plugs, sockets, terminal strips, and cabling is inevitable (rotors, power supplies, switching, etc.). To keep life simpler, always number these strips as you read — left to right, and top to bottom. Thus, number plates at each terminal strip are not required. Further, on rotor cables and the like, always use the color code you learned for resistors, and put the brown wire on terminal 1, red on 2, orange on 3, and so on. You can come back to a rack wired years ago, and know just how it is wired — if you follow this code right from the beginning. For rotor cables, I suggest you put a screw-terminal board at the operating position near the rotor control, and another at the last place it passes before leaving the building. This can speed up any testing and troubleshooting. Use good solder lugs on the wires at the terminal boards. You can now divorce the rotor from the control box to measure voltage from the control, resistance from the rotor, and quickly find open wires, short circuits, and wrong voltages. Solder and crimp all connections carefully. You don't want to add any problems!

Feedlines. There are many tips about drilling glass to get your feedline out through a window, but nowadays it is quicker and safer to buy pieces of clear plastic to replace an entire window pane. The plastic pane can be drilled and filed, and even cut, much like wood, using woodworking tools. Do your work at a slow and steady pace, and use a blade with very fine teeth for any sawing. For larger holes I suggest investing in items called hole saws. These are really for metal panel and chassis work, but if you go slowly, and use steady, light pressure they work just fine. Drill it — don't melt your way through!

Tools. A handy gadget to add to your basic tool kit, as you begin to build more of your own equipment, is the painter's paint-can-lid opener, or can key, as it is sometimes called. Pick the type with a blade that looks like a slightly bent common screwdriver. The loop end, or handle, is usually large enough to supply adequate torque, and the blade end is just bent or offset enough to start screws in those tough areas. A good pair of 90-degree offset common and phillip's drivers can be added later for the jobs that seem impossible. *Caution*! These tools are seldom insulated, so *never* work on equipment that has power applied or is even plugged in, no matter how tempting or time saving it may seem. It could be the last minute of your life.

D. J. Brown, W9CGI

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Hilary McDonald, W5NUF

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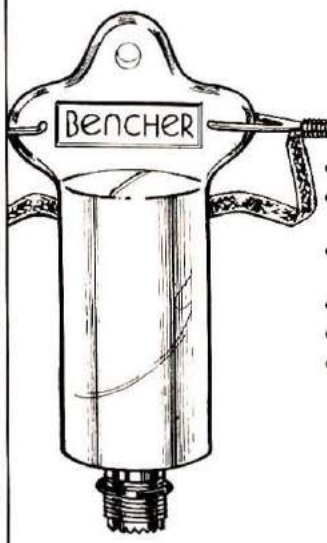

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Hy-Quad	2 el. 10-15-20M Quad	274.95	219.95	12AVQ	20-10M Trap Vertical	42.95	34.95
205BA	5 el. "Long John" 20M beam	329.95	259.95	14RMQ	Roof Mounting kit (verticals)	33.95	29.95
155BA	5 el. "Long John" 15M beam	199.95	159.95	5BDQ	80-10M Trap doublet	109.95	89.95
105BA	5 el. "Long John" 10M beam	129.95	109.95	2BDQ	80-40M Trap doublet	59.95	49.95
204BA	4 el. 20M beam	249.95	199.95	6BB	6 el. 6M beam	119.95	99.95
204MK5	5 el. conversion kit	99.95	79.95	203	3 el. 2M beam	16.95	
153BA	3 el. 15M beam	89.95	79.95	205	5 el. 2M beam	21.95	
103BA	3 el. 10M beam	74.95	59.95	208	8 el. 2M beam	29.95	
402BA	2 el. 40M beam	239.95	189.95	214	14 el. 2M beam	34.95	
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Classic 36	6 el. 10, 15, 20 Mtr. beam	392.75	249.95
TA-33	3 el. 10, 15, 20 Mtr. beam	264.00	189.95
TA-36	6 el. 10, 15, 20 Mtr. beam	392.75	249.95
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ATB-34	4 ele. 10, 15, 20 Mtr. beam	289.95	219.95	A147-11	11 ele. 146-148 Mhz. beam	36.95	30.95
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ATV-5	10, 15, 20, 40, 80 Mtr. Vertical	109.95	89.95	A144-10T	2 Mtr. "Twist" 10 ele.	42.95	34.95
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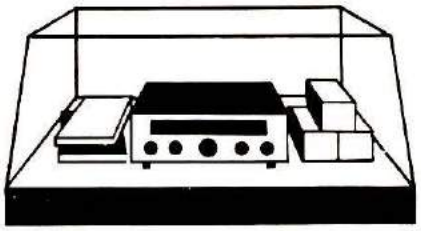


For literature on any of the Product Showcase items use our *ad-check* service on page 78.

IC-551 50-MHz transceiver

This new *microcomputer-controlled*, 50-54-MHz (SSB/AM/CW) transceiver uses a built-in microprocessor for frequency control and scanning. The 551 also uses

the new style digital readout in green phosphorescent digits, similar to the IC-RM2 controller. The no backlash, no delay, dual VFO, light-chopper system, similar to the IC-701 and IC-211, is included as a standard feature. The handsome styling and small size of the unit provides function with flair to please the eye while matching the other ICOM fixed station units.

Three memories are available for programming and beacon watching. Using the SSB squelch and scan mode, three beacon frequencies may be scanned and the 551 set to stop on the first one heard, thus alerting the user to the presence of DX. When not scanning, the three memories and two VFOs provide five different frequencies of use by the 551.

The dual VFO system provided by the microprocessor allows split-frequency operation for contest and DX work, as well as completely variable offset operation for 6-meter fm (optional unit EX106 is required for fm operation). The 551 uses the now famous 100-Hz per step digital tuning system. Many thousands of satisfied users have proven the suitability of this system. For faster QSY, a touch of the button next to the main tuning results in 1-kHz steps. (On fm, tuning rates are 10-kHz per step, and 1-kHz per step with the tuning-speed button depressed.)

The 551 is an all-mode 6-meter unit in a compact, easy to use instrument. The large tuning knob provides the comfort and feel of a big unit, while the small size provides the room you need at the console. Look for one at your nearby ICOM dealer.

New Heath 2-Meter Amplifiers

Heath Company has two new mobile fm amplifiers for the 2-meter Amateur Radio enthusiast.

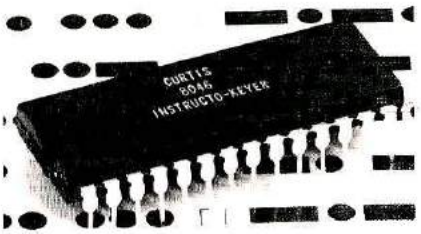
The HA-201A and HA-202A are solid-state Class-C designs that feature electronic switching, improved harmonic and spurious reduction, better stabilization, low-pass filters, and ease of alignment. The HA-201A can be used with any 2-meter transmitter or transceiver that puts out from 1 to 3 watts, and will provide output in the 10-watt range. The HA-202A is intended for use with 2-meter transmitters and transceivers that are capable of supplying 5 to 15 watts of driving power. The HA-202A's output is from 20 to 50 watts, depending upon the input power level.

Both amplifiers have automatic antenna switching, emitter-ballasted transistors, and efficient heat sinking for adequate vswr protection without complex sensing circuits. All hardware and connectors (SO-239 type) necessary for installation are supplied. The HA-201A and HA-202A operate on 12 Vdc negative ground, and require no additional power supplies. For nonmobile applications, the HP-1175 supply is available for use with the HA-202A.

For more information on the HA-201A and the HA-202A, which are mail order priced at $34.95 and $59.95 respectively, send for a free copy of the newest Heathkit catalog. Write Heath Company, Dept. 350-720, Benton Harbor, Michigan 49022.

Random Morse Generator IC

You can construct a random-Morse-code practice generator by using the new CURTIS 8046 28-pin CMOS IC. The 8046 requires one external 256x4 ROM (Read-Only-Memory) and an 8043 or 8044-based keyer to provide completely random Morse characters for speed improvement practice from 6 to 50 wpm. Output is either alphabet only (Novice practice) or alphanumeric with punctuation. A typical sequence might sound like this: Q, TSA LVT-VEVYL Z/A EE 73D.



Variable extended spacing between letters and letter groups is also provided for slow-speed study (characters at 13 wpm, words at 6 wpm for example). Another feature is an analog output to directly indicate code speed in wpm on a 1 mA meter.

The 8046 is priced at $49.95 in single quantities directly from CURTIS. A kit containing the 8046, a 256x4 ROM, military quality printed circuit card, sockets, resistors, capacitors, edge connectors, and manual is

More details? Ad Check page 78.

available for $79.95. 8044 keyer kits run from $14.95 to $54.95. For additional information write Curtis Electro Devices, Inc., Box 4090, Mountain View, California 94040.

Yaesu 6-Meter Transceiver

With the six-meter amateur band heading into an era of worldwide DX similar to that enjoyed by hams in the 1950s, Yaesu Electronics announces the availability of their new all-mode, six-meter transceiver, the FT-625RD.

The transceiver offers USB, LSB, a-m, CW, and fm, with 25 watts ssb PEP, 25 watts fm or CW, and ten watts a-m output.

An rf speech processor is built in and a 600-Hz CW filter is available as an option, as is the memory storage unit, which allows recall of any frequency with just the flick of a switch. The memory unit is ideal for watching a beacon or calling frequency during marginal openings.

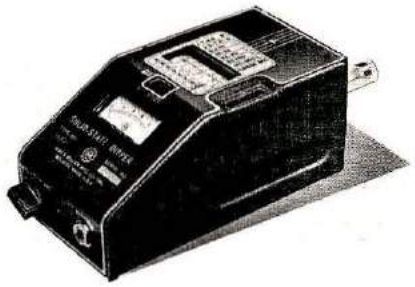
Digital readout is accurate to 0.1 kHz. Analog readout in the model FT-625R, at slightly less cost, is better than 1 kHz. VOX, PTT, semi break-in CW with sidetone, and a clarifier for receive or transceive are all included in the circuitry. For fm repeater use, the transceiver features standard ± 1 MHz repeater offset, programmable tone-burst encoder, squelch, and a discriminator zero-center meter. Alternative repeater splits may be accommodated through an optional crystal or the optional memory unit.

A built-in power supply accommodates all line voltages with taps for 100/110/117/200/220 and 234 Vac, 50/60 Hz, or dc voltages from 11.5 to 16 Vdc, negative ground at 5.7 amps transmit and 0.7 amps receive.

For a detailed, four-color brochure, see your nearby authorized Yaesu dealer or write to Yaesu Electronics Corporation, P.O. Box 498, Paramount, California 90723.

Solid State Dip Meter

A solid-state dip meter for testing the resonant frequencies of antennas, oscillators, rf chokes, and similar devices, formerly manufactured by Millen, is now available from Caywood Electronics, Inc., of Malden, Massachusetts.



The Millen Solid-State Dipper is a portable oscillating frequency meter that determines the resonant frequency of circuits with an accuracy of 2 per cent. Covering a range from 1.65 to 310 MHz with seven plug-in coils, it also works as an absorption-type wavemeter with the oscillator circuit acting as a Q-multiplier amplifier to enhance tuning response and dip sensitivity. The dipper provides a calibrated 205-degree drum dial with seven direct reading scales and a universal scale. The rugged, copper-plated steel unit and coils store in a handy carrying case. An optional tube-type dipper with five additional coils for frequencies down to 165 kHz is also offered.

The Millen Solid State Dipper is priced at $162, complete with seven coils and case; the tube type is $173 plus $17.75 for each additional coil. Literature is available on request. For more information contact Caywood Electronics, Inc., P.O. Drawer U, Malden, Massachusetts 02148.

Yaesu Hand-Held Transceiver

The "HANDIE," a new, miniaturized, two-meter hand-held, the model FT-202R, has now been added to the Yaesu line of Amateur Radio equipment.

Measuring only 67 × 49 × 171 mm, the one-watt output, six-channel unit should please the most critical user with its excellent receiver performance and high-quality transmitted signal.

The receiver features double conversion with a sensitivity measurement of 0.32 μV for 20 dB quieting. The "HANDIE" covers the entire two-meter band and includes a flexible "rubber ducky" antenna and attractive carrying case.

Other features include a combination S-meter and tuning meter, tone burst or sub-audible squelch (optional), built-in speaker, and microphone. Batteries required (not supplied) may be standard AA size or nickel cadmium to provide 9.6 Vdc, but not to exceed 12 Vdc.

For complete details on this sensational new hand-held transceiver, see your nearby Yaesu dealer or write to Yaesu Electronics Corporation, P. O. Box 498, Paramount, California 90723.

Newnes Radio and Electronics Engineer's Pocket Book

In this latest edition of his handy pocket book, which was first published in 1940, author H. W. Moorshead has succeeded in keeping this standard reference book up to date. Obsolete material has been eliminated to make room for the most current information. The section on ICs, in particular, has been expanded to cover the many recent advances in the field. Among the other topics contained in this book are transistor and diode data and basing diagrams, transistor circuits, tranformer data, and many tables of information which are useful to the working technician and engineer. Pocket notebook sized at 5 inches long and 3 inches wide; hard cover, 191 pages. $5.95 from Ham Radio Communications Bookstore, Greenville, New Hampshire 03048; order NR-PB.

FM Adapter for FT101

Holdings of Blackburn (England), is offering a new fm adapter for the Yaesu FT101E and FT101F transceivers. The unit is contained in a small box that fits nicely on top of the FT transceiver, similar to their "G3LLL RF Clipper," which has been popular for some time.

The transmitter portion of the adapter has built-in clipping, filtering, and variable preemphasis, which provides good audio quality and effective communications through the clarifier circuit of the transceiver.

Modified FT101 transceivers can be used on the 10-meter fm channels, or they can be fitted with a transverter for use on the various vhf and uhf bands. Installation is simple, and complete instructions are included with the unit.

The FT101 FM adapter can be obtained through the Fox-Tango Corporation, Box 15944, West Palm Beach, Florida 33406; or directly from Holdings of Blackburn Ltd., 39/41 Mincing Lane, Blackburn, BB2 2AF England.

Hustler Five-Band Trap Vertical Antenna

Hustler recently introduced their new model 5-BTV, a five-band trap, fixed-station antenna. The unit covers 10, 15, 20, 40, and 80 meters (tunable to 75 meters). The 5-BTV consists of the popular Hustler model 4-BTV, RM-80-S resonator and spider assembly.

The Hustler 5-BTV delivers top signal performance, consistent contacts, five-band operation, and complete coverage. Use one feedline — any convenient length; switching or match-

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ing devices are not required.

The antenna is 7.7 meters (15 feet 5 inches) long, constructed of the finest-quality, heat-treated seamless aluminum tubing, with all stainless-steel hardware. VSWR is better than 1.6:1 at all band edges. Power capability is full legal limit on SSB and CW.

The 5-BTV has a suggested list price of $134.95 and is available now. For further information on this and other Hustler antenna products, including CB, professional, and monitor, write: Sales Department, New-Tronics Corporation, 15800 Commerce Park Drive, Brookpark, Ohio 44142.

14-volt Power Pack

Globe-Union's Gel/Cell department announces a 2.6-ampere-hour power pack for use with portable equipment. The pack furnishes 14 volts, the same as the "12 volt" system in a vehicle. This ensures full rated output from the transceiver.

The pack consists of a GC-1426 rechargeable battery and an FX-14 charger housed in a simulated leather carrying case with an adjustable carrying strap. The entire pack weighs 4.5 pounds (2kg) and measures 6-1/2 x 8-1/4 x 2-7/8 in. (17 x 210 x 7.3mm).

The PP-1426 has enough capacity to power an a-m CB transceiver for an 8-12 hour day with normal intermittent transmit use. With proper charging, the PP-1426 can be used for 300-500 "days" over a 3-5 year period.

The PP-1426 has a built-in cigar-lighter type receptacle, which allows connection to the power pack using the same cord that's used when plugging into the vehicle's electrical system. This same receptacle is used when connecting the charger into the system.

For more information, write Globe Battery Division, Globe-Union, Inc., 5757 North Green Bay Avenue, Milwaukee, Wisconsin 53201.

COMPACT ANTENNA HEADQUARTERS

Below are listed only some of our products. We have chosen for the most part to concentrate on high-efficiency compact antennas designed for limited-space locations, realizing that lack of space for full-sized "farms" is a major problem for many of today's amateurs. All traps, coils, baluns, and center connectors used in our systems are fully assembled, adjusted, and weather-proofed here at our plant, and are rated for full legal power input. Our wire antennas are complete with Z-1 balun (A-1 center connector with 160 meter models), #14 solid insulated copper wire, dielectric insulators, and 100 feet of nylon support rope. We include what we believe are the most comprehensive instructions in the industry with each model, making installation and accurate tuning relatively easy.

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Low-profile no-radial antenna your neighbors and landlord can live with! Ideal for Apartments, Condos, Campsites, Mobile Homes or RV's, Boats, Field Days, and Emergencies. 80-10 meters by quick, no-tool band change—takes full legal power—full quarter wave on 10, 15, and 20—16' maximum height—mounts anywhere a ground can be established—a balcony rail, patio, yard, or out a window. Mounting post included. Breaks down to 5' package for easy storage and transport, reassemble in seconds without tools—broad-banded no adjustment across 10, 15, 20, or 40; 200 kHz on 80 without adjustment, full 80 coverage with several settings—adjusts to a virtual 1:1 VSWR in seconds. No tuner needed—extend coverage to all of 160 with the optional AO-160 add-on coil section.

Model	Bands	Height	Price
AV-1	80-10	16'	$89.95
AO-160	160	21'	$28.95

COMPACT TRAPPED DIPOLES

Shorter than usual trapped antennas they provide effective multiband operation with a single set of elements and a single coax feedline, providing a practical method of compressing a multiband antenna onto a smaller city lot. Our 160 meter models use the only commercially-available traps that will permit full power on 80 meters at this price and overall length.

Model	Bands	Lgth.	Price
TD-1684	160, 80/75, 40	110'	$74.95
TD-16080	160, 80/75	160'	$59.95
TD-8040	80/75, 40	78'	$54.95
TD-4020	40, 20	40'	$49.95

COMPACT SHORTENED DIPOLES

These are standard dipoles shortened to half-size by using loading coils. Good for small lots, attics, and constructing slopers. The SP-40 works very well on 15 meters as well as 40.

Model	Bands	Length	Price
SP-160	160	130'	$42.95
SP-80	80/75	63'	$41.95
SP-40	40, 15	33'	$39.95

MULTIBAND SHORT DIPOLES

These provide absolute maximum performance possible in a minimum space location by combining shortened elements with full-size elements connected to a single coax feedline at the balun.

Model	Bands	Length	Price
MSP-8010	80/75, 40, 20, 15, 10	74'	$69.95
MSP-1	80/75, 40, 15	74'	$59.95

MULTIBAND FULL SIZE DIPOLES

These antennas provide uncompromised multiband operation by connecting separate half wave elements to a single coax feedline at the balun.

Model	Bands	Lgth.	Price
PD-8010	80-10	130'	$54.95
PD-8040	80, 40, 15	130'	$49.95
PD-4020	40, 20, 15	66'	$39.95
PD-4010	40-10	66'	$44.95

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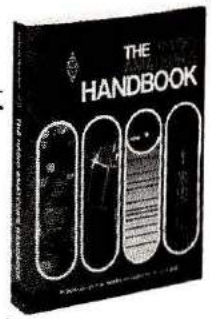

Full of exciting new features for the 80's, NOW is the time to order your copy of the **1980 ARRL "RADIO AMATEUR'S HANDBOOK."** Internationally recognized and universally consulted, every Amateur should have the latest edition. The new **HANDBOOK** covers virtually all of the state-of-the-art developments in electronics theory and design. Novices will find it to be an indispensable study guide, while the more advanced Amateur will enjoy building the many new projects.

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- 1 Year Limited Warranty Parts & Labor
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The 100 HH and 500 HH hand held frequency counters represent a significant new advancement, utilizing the latest LSI design . . . and because it's a DSI innovation, you know it obsoletes any competitive makes, both in price and performance. No longer do you have to sacrifice accuracy, ultra small readouts and poor resolution to get a calculator size instrument. Both the 100 HH and 500 HH have eight .4 inch LED digits — 1 Hz resolution — direct in only 1 sec. or 10 Hz in .1 sec. — 1 PPM TCXO time base. These counters are perfect for all applications be it mobile, hilltop, marine or bench work. **CALL TODAY TOLL FREE! (800—854-2049) CA. Res. CALL (800—542-6253) TO ORDER OR RECEIVE MORE INFORMATION ON DSI'S FULL PRODUCT LINE OF FREQUENCY COUNTERS RANGING FROM 10 Hz TO 1.3 GHz.**

FREQUENCY COUNTER CONSUMER DATA COMPARISON CHART

MANUFACTURER	MODEL	SUG'STD. LIST PRICE	FREQUENCY RANGE	TYPE OF TIME BASE	ACCURACY OVER TEMPERATURE		SENSITIVITY			DIGITS		PRE-SCALE INPUT RESOLUTION	
					17° - 40°C	0° - 40°C	100 Hz - 25 MHz	50 MHz - 250 MHz	250 MHz - 450 MHz	No.	SIZE IN INCHES	1 SEC	1 SEC
DSI INSTRUMENTS	100 HH	$ 99.95	50Hz-100MHz	TCXO	1 PPM	2 PPM	25 MV	NA	NA	8	.4	100 Hz	10 Hz
DSI INSTRUMENTS	500 HH	$149.95	50Hz-550MHz	TCXO	1 PPM	2 PPM	25 MV	20 MV	30 MV	8	.4	100 Hz	10 Hz
CSC‡	MAX-550	$149.95	1kHz-550MHz	Non-Compensated	3 PPM @ 25°C	8 PPM	500 MV*	250 MV	250 MV	6	1	NA	1 kHz
OPTOELECTRONICS	OPT-7000	$139.95	10Hz-600MHz	TCXO	1.8 PPM	3.2 PPM	NS	NS	NS	7	.4	1 kHz	100 Hz

* 1 KHz - 50 MHz ‡ Continental Specialties Corp.

The specifications and prices included in the above chart are as published in manufacturer's literature and advertisements appearing in early 1979. DSI INSTRUMENTS only assumes responsibility for their own specifications.

100 HH . . $ 99.95 **W/Battery Pack . . $119.95**
500 HH . . $149.95 **W/Battery Pack . . $169.95**

Prices and/or specifications subject to change without notice or obligation.

These prices include factory installed rechargeable NiCad battery packs.

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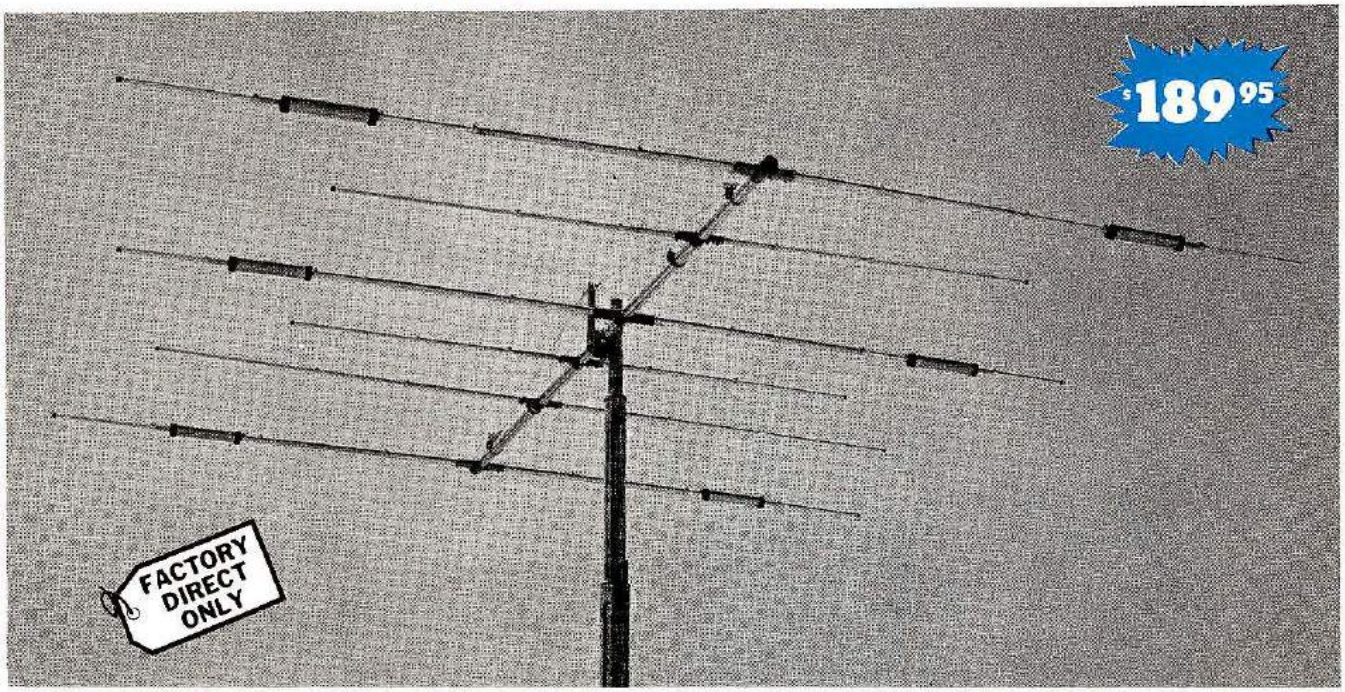
T-500 Ant. . . . . $ 7.95
AC-9 Battery Eliminator . . . . . $ 7.95

TERMS: MC - VISA - AE - Check - M.O. - COD in U.S. Funds. Please add 10% to a maximum of $10.00 for shipping, handling and insurance. Orders outside of USA & Canada, please add $20.00 addition to cover air shipment. California residents add 6% Sales Tax.

WILSON SYSTEMS, INC. presents the SYSTEM 36

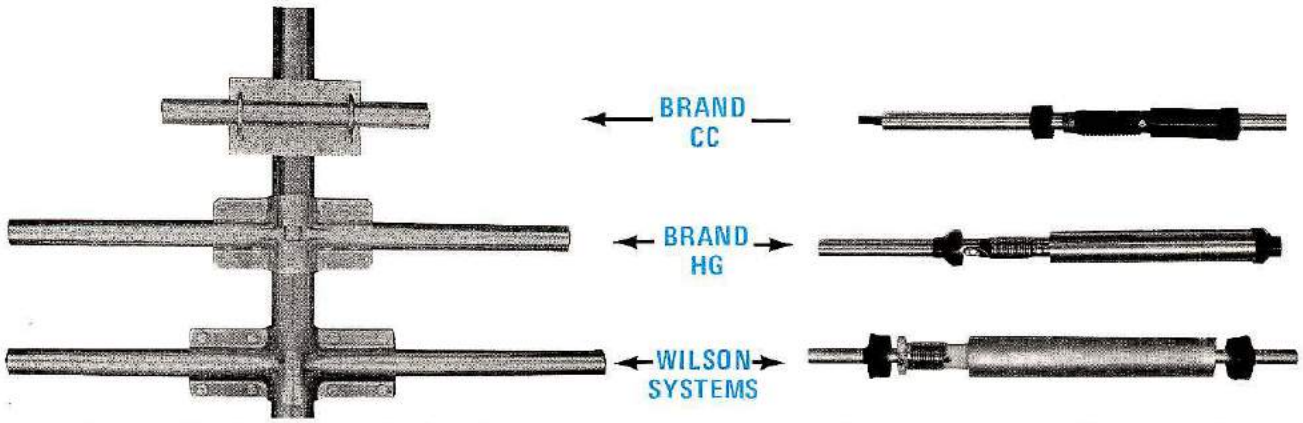


A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

SPECIFICATIONS

Band MHz 14-21-28	Boom (O.D. x Length) . . 2" x 24'2½"	Wind loading @ 80 mph . . 215 lbs.
Maximum power input . Legal limit	No. of elements. 6	Maximum wind survival . . 100 mph
Gain (dBd) . . . . . Up to 9 dB	Longest element . . . . . 28'2½"	Feed method . . . . . Coaxial Balun
VSWR @ resonance . . . 1.3:1	Turning radius . . . . . 18'6"	Assembled weight (approx. 53 lbs.
Impedance . . . . . 50 Ω	Maximum mast diameter. 2"	Shipping weight (approx.). 62 lbs.
F/B ratio . . . . . 20 dB or better	Surface area . . . . . 8.6 sq. ft.	

Compare the SY-36 with others . . .



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

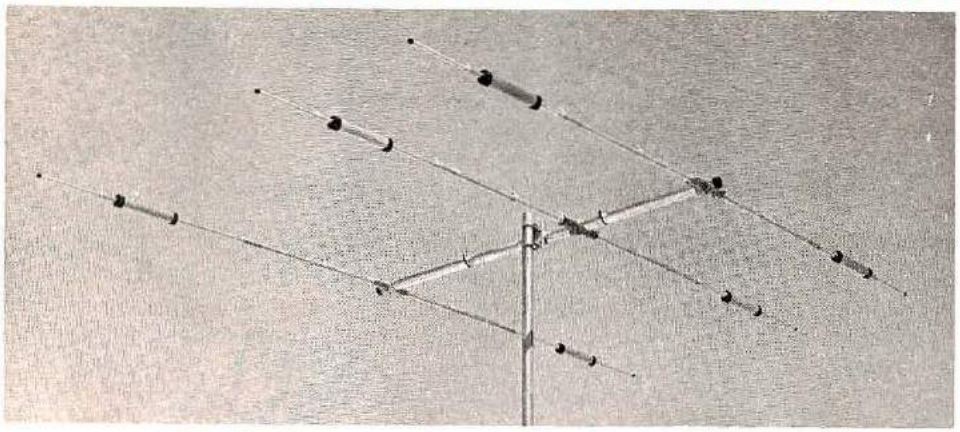
CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



$139.95

SYSTEM 33

(FORMERLY SYSTEM THREE)

FACTORY DIRECT ONLY

Capable of handling the Legal Limit, the "SYSTEM 33" is the finest compact tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excells with the "SYSTEM 33".

New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment.

Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting.

The use of large diameter High-Q traps in the "SYSTEM 33" makes it a high performing tri-bander and at a very economical price.

A complete step-by-step illustrated instruction manual guides you to easy assembly and the lighweight antenna makes installation of the "SYSTEM 33" quick and simple.

The same quality traps are used in the SY33 that are used in the SY36.

SPECIFICATIONS

Band MHz	14-21-28	**Turning radius**	15'9"
Maximum power input	Legal limit	**Maximum mast diameter**	2" O.D.
Gain (dbd)	Up to 8 dB	**Surface area**	5.7 sq. ft.
VSWR at resonance	1.3:1	**Wind loading at 80 mph**	114 lbs.
Impedance	50 ohms	**Assembled weight (approx.)**	37 lbs.
F/B ratio	20 dB or better	**Shipping weight (approx.)**	42 lbs.
Boom (O.D. x length)	2" x 14'4"	**Direct 52 ohm feed—no balun required**	
No. elements	3	**maximum wind survival**	100 mph
Longest element	27'4"		

CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

$44.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:
Radials are required for peak operation. (See GR-1 below).

SPECIFICATIONS:

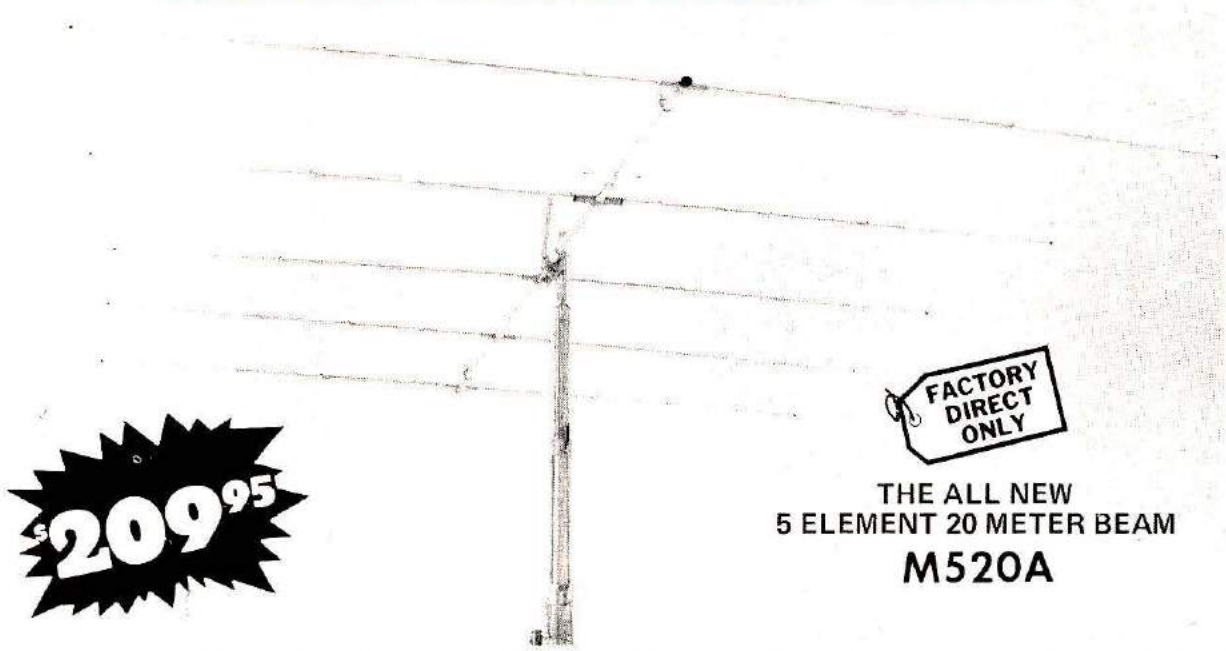
- Self supporting—no guys required.
- Input Impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q Traps with large diamater coils
- Low Angle Radiation
- Omnidirectional performance
- Taper Swaged Aluminum Tubing
- Automatic Bandswitching
- Mast Bracket furnished
- SWR: 1.1:1 or less on all Bands

GR-1

$9.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded copper wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

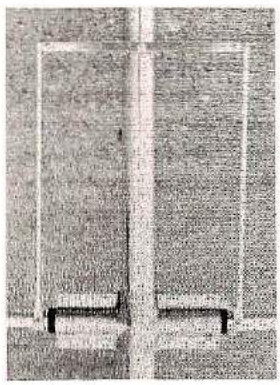
WILSON MONO-BAND BEAMS



At last, the antennas that you have been waiting for are here! The top quality, optimum spaced, and newest designed monobanders. The Wilson Systems' new Monoband beams are the latest in modern design and incorporate the latest in design principles utilizing some of the strongest materials available. Through the select use of the current production of aluminum and the new boom to element plates, the Wilson Systems' antennas will stay up when others are falling down due to heavy ice loading or strong winds. Note the following features:

1. Taper Swaged Elements — The taper swaged elements provide strength where it counts and lowers the wind loading more efficiently than the conventional method of telescoping elements of different sizes.
2. Mounting Plates — Element to Boom — The new formed aluminum plates provide the strongest method of mounting the elements to the boom that is available in the entire market today. No longer will the elements tilt out of line if a bird should land on one end of the element.
3. Mounting Plates — Boom to Mast — Rugged 1/4" thick aluminum plates are used in combination with sturdy U-bolts and saddles for superior clamping power.
4. Holes— There are no holes drilled in the elements of the Wilson HF Monobanders. The careful attention given to the design has made it possible to eliminate this requirement as the use of holes adds an unneccessary weak point to the antenna boom.

With the Wilson Beta-match method, it is a "set it and forget it" process. You can now assemble the antenna on the ground, and using the guidelines from the detailed instruction manual, adjust the tuning of the Beta-match so that it will remain set when raised to the top of the tower.



Wilson's Beta match offers maximum power transfer.

The Wilson Beta-match offers the ability to adjust the terminating impedance that is far superior to the other matching methods including the Gamma match and other Beta-matches. As this method of matching requires a balanced line it will be necessary to use a 1:1 balun, or RF choke, for the most efficient use of the HF Monobanders.

The Wilson Monobanders are the perfect answer to the Ham who wants to stack antennas for maximum utilization of space and gain. They offer the most economical method to have more antenna for less money with better gain and maximum strength. Order yours today and see why the serios DXers are running up that impressive score in contests and number of countries worked.

SPECIFICATIONS

Model	Band Mtrs	Gain dBd	F/B Ratio	Bandwidth @ Resonance @ 2:1 VSWR Limits	VSWR @ Resonance	Impedance	Matching	Elements	Longest Element	Boom O.D.	Boom Length	Turning Radius	Surface Area (Sq.Ft.)	Windload @ 80 mph (Lbs.)	Maximum Mast	Assembled Weight (Lbs.)
M520A	20	11.5	25 dB	500 KHz	1.1:1	50 Ω	Beta	5	36'6"	2"	34'2½"	25'1"	8.9	227	2"	68
M420A	20	10.0	25 dB	500 KHz	1.1:1	50 Ω	Beta	4	36'6"	2"	26'0"	22'6"	7.6	189	2"	50
M515A	15	12.0	25 dB	400 KHz	1.1:1	50 Ω	Beta	5	25'3"	2"	26'0"	17'6"	4.2	107	2"	41
M415A	15	10.0	25 dB	400 KHz	1.1:1	50 Ω	Beta	4	24'2½"	2"	17'0"	14'11"	3.1	54	2"	25
M510A	10	12.0	25 dB	1.5 MHz	1.1:1	50 Ω	Beta	5	18'6"	2"	26'0"	16'0"	2.8	72	2"	36
M410A	10	10.0	25 dB	1.5 MHz	1.1:1	50 Ω	Beta	4	18'3"	2"	12'11"	11'3"	1.4	36	2"	20

CALL
FACTORY DIRECT
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WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

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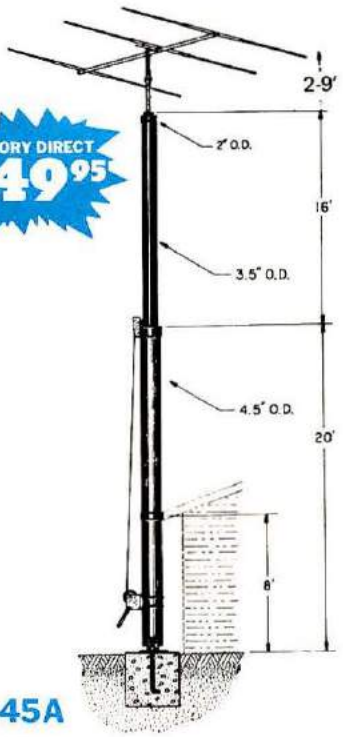
New, Improved Wilson Towers

Hinged Base Plate - Concrete Pad, Heavy Duty Winch

Mounting the House Bracket

The Hinged Base Plate allows tower to be tilted over for access to antenna and rotor from the ground.

FACTORY DIRECT $249.95



TT-45A

FEATURES:

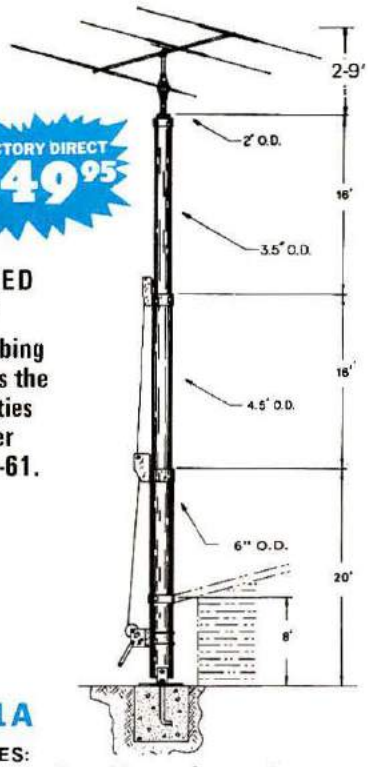
- Maximum Height 45' (will handle 12 sq. ft. at 38') @ 50 mph
- 1200 lb. winch
- Totally freestanding with proper base
- Total Weight, 243 lbs.

The TT-45A is a freestanding tower, ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected. (Requires 12"x12"x36" of concrete.)

FACTORY DIRECT $449.95

NEW IMPROVED FEATURE

Heavier wall tubing greatly increases the stress capabilities over the older TT-45 and MT-61.



MT-61A

FEATURES:

- Is freestanding with use of proper base
- Maximum Height is 61' (will handle 12 sq. ft. at 53') @ 50 mph
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight, 400 lbs.

Recommended base accessory: RB-61A, FB-61A.

The MT-61A is our largest and tallest freestanding tower. By using the RB-61A rotating base fixture the MT-61A is ideally suited for the SY33 or SY-36. If you plan to mount the tower to your house, caution should be taken to make certain the eave is properly reinforced to handle the tower. If not, one of the base accessory fixtures should be used. (Requires 18"x18"x48" concrete.)

GENERAL FEATURES

All towers use high strength heavy galvanized steel tubing that conforms to ASTM specifications for years of maintenance-free service. The large diameters provide unexcelled strength. All welding is performed with state-of-the-art equipment. Top sections are 2" O.D. for proper antenna/rotor mounting. A 10' push-up mast is included in the top section of each tower. Hinge-over base plates are standard with each tower. The high loads of today's antennas make Wilson crank-ups a logical choice.

TILT-OVER BASES FOR TOWERS

FIXED BASE

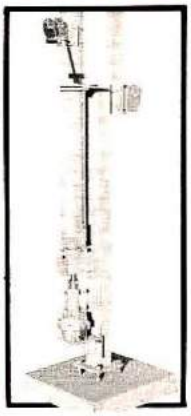
The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower. (Requires 3'x3'x5½' of concrete.)

FB-45A . . . $ 99.95
FB-61A . . . 129.95

ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system. (Requires 3'x3'x6' of concrete.)

RB-45A . . . $139.95
RB-61A . . . 199.95



Tilting the tower over is a one-man task with the Wilson bases.
(Shown above is the RB-61A.)
(Rotor not included)

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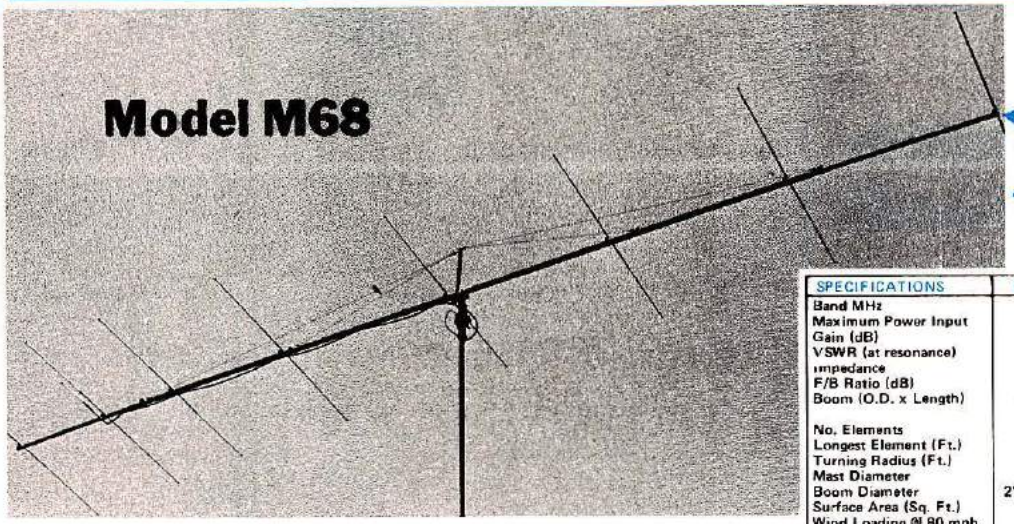
Las Vegas, Nevada 89103
(702) 739-7401
Toll-Free Order Number 800-634-6898

6 METER BEAMS



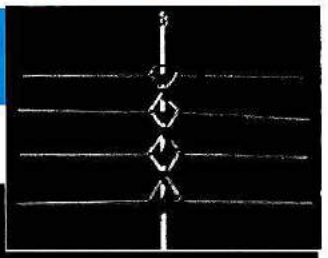
As low as $27.95

SPECIFICATIONS	MODEL M68	MODEL M66	MODEL M64
Band MHz	50	50	50
Maximum Power Input	4 Kw	4 Kw	4 Kw
Gain (dB)	13.5	13.0	10.0
VSWR (at resonance)	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	26	26	25
Boom (O.D. x Length)	2" to 1½" x 36'10"	2" x 25'8"	1½" x 11'6"
No. Elements	8	6	4
Longest Element (Ft.)	9'8"	9'8"	9'8"
Turning Radius (Ft.)	19'0"	13'10"	7'6"
Mast Diameter	2" O.D.	2" O.D.	1½" O.D.
Boom Diameter	2" to 1½" O.D.	2" O.D.	1½" O.D.
Surface Area (Sq. Ft.)	5.8	4.5	1.5
Wind Loading @ 80 mph	145	112	37
Assembled wght. Approx.	34 lbs.	26 lbs.	11 lbs.
Shipping wght. Approx.	39 lbs.	31 lbs.	13 lbs.
Matching Method	Gamma	Gamma	Gamma
PRICE	$84.95	$54.95	$27.95

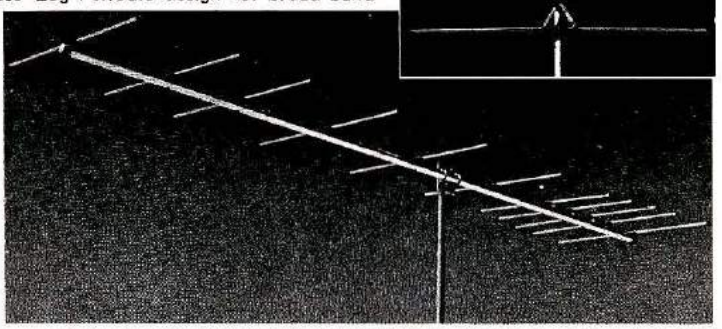
8 elements W - I - D - E spaced on a L - O - N - G 37' boom . . . for those long hauls to JA and VK land! Choose 4, 6 or 8 elements to put you in the action on six meters.

Starting at $19.95

2 METER BEAMS



Wilson's new 2 meter series combines the ultimate in design and quality materials. These top performing beams feature 7, 9 or 11 aluminum elements held to the heavy walled boom with the exclusive molded Lexan® boom to element mounting. The four driven elements use Log Periodic design for broad band characteristics providing full 144-148 MHz coverage with less than 1.2 to 1 VSWR across the band. Universal mounting is provided for vertical or horizontal polarization.



SPECIFICATIONS	M27	M29	M211
Band MHz	144-148 MHz	144-148 MHz	144-148 MHz
Gain (dB)	11 dB	13.7 dB	14.5 dB
VSWR	Less than 1.2:1 across band	Less than 1.2:1 across band	Less than 1.2:1 across band
Impedance	50 ohms balanced	50 ohms balanced	50 ohms balanced
Number of Elements	7	9	11
Boom (O.D. x Length)	1" O.D. x 5'4"L.	1" O.D. x 10'0"L.	1½" O.D. x 12'6"
Longest Element	40"	40"	40"
Surface Area (Sq. Ft.)	.8	1.5	2.8
Assembled wght Approx.	3.5 lbs.	5 lbs.	6 lbs.
Shipping wght. Approx.	6.5 lbs.	8 lbs.	9 lbs.
Turning Radius	38"	64"	78"
PRICE	$29.95	$24.95	$19.95

WILSON SYSTEMS, INC. – 4286 S. Polaris
Las Vegas, NV 89103 – (702) 739-7401

FACTORY DIRECT ORDER BLANK

Toll-Free Order Number
1-800-634-6898

WILSON SYSTEMS ANTENNAS

Qty	Model	Description	Shipping	Price
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	$139.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	189.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	44.95
	GR-1	Ground Radials for WV-1A	UPS	9.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	209.95
	M-420A	4 Elements on 20 Mtrs.	UPS	139.95
	M-515A	5 Elements on 15 Mtrs.	UPS	119.95
	M-415A	4 Elements on 15 Mtrs.	UPS	79.95
	M-510A	5 Elements on 10 Mtrs.	UPS	84.95
	M-410A	4 Elements on 10 Mtrs.	UPS	64.95
	WM-62A	Mobile Antenna: 5/8 λ on 2, 1/4 λ on 6	UPS	19.95
	M-86	8 Elements on 6 Mtrs.	UPS	84.95
	M-66A	6 Elements on 6 Mtrs.	UPS	54.95
	M-46	4 Elements on 6 Mtrs.	UPS	27.95
	M-112	11 Elements on 2 Mtrs.	UPS	29.95
	M-92	9 Elements on 2 Mtrs.	UPS	24.95
	M-72	7 Elements on 2 Mtrs.	UPS	19.95
		ACCESSORIES		
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	.12/ft.
	RG-8U	RG-8U Foam-Ultra Flexible Coaxial Cable. 38 strand center conductor, 11 guage	UPS	.21/ft.

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45A	Freestanding 45' Tubular Tower	TRUCK	$249.95
	RB-45A	Rotating Base for TT-45A w/tilt over feature	TRUCK	139.95
	FB-45A	Fixed Base for TT-45A w/tilt over feature	TRUCK	99.95
	MT-61A	Freestanding 61' Tubular Tower	TRUCK	449.95
	RB-61A	Rotating Base for MT-61A w/tilt over feature	TRUCK	199.95
	FB-61A	Fixed Base for MT-61A w/tilt over feature	TRUCK	129.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100 ft. and in 50' multiples.
Prices and specifications subject to change without notice.
Ninety Day Limited Warranty, All Products FOB Las Vegas, Nevada
PRICES EFFECTIVE NOV. 1, 1979

Nevada Residents Add Sales Tax

Ship C.O.D. ☐ Check enclosed ☐ Charge to Visa ☐ M/C ☐

Card # _____ Expires _____

Bank # _____ Signature _____

Please Print

Name _____ Phone _____

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NEW CONCEPT — Novice instructional package, theory tape & study material. Complete license study package, $18.95. General study package, $21.95. MARI, 1320 Canary Drive, West Columbia, SC 29169.

MASSACHUSETTS: 1200 Radio Club, W1DC, Annual Auction, November 17, 1979, 10:00 AM - 4:00 PM, at Honeywell Facility, 300 Concord Road, Billerica, MA 01821, Route 3 at Exit 27, between Routes 495 and 128. Talk-in 147.72-12. Proceeds support Billerica and Waltham repeaters.

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FLORIDA: The Fort Myers Amateur Radio Club & ARRL will host Hamarama '79, Nov. 3 and 4, at the Ramada Inn in Fort Myers. Dealer displays, educational forums, outdoor flea market. Registration $3.00 per person. Contact K4VGN, 334-6190 or WD4ERA, 332-1825. Contact Ramada Inn direct for special rates.

MASSACHUSETTS: The Framingham Amateur Radio Association (formerly Framingham Radio Club) will hold its annual fall flea market on Sunday, November 11 from 10 AM to 3 PM (sellers admitted at 9 AM), at the Framingham Police Station Drill Shed. Admission $1, sellers $5 per table. Sellers are advised to preregister as tables are limited! Talk-in on 75/15, and 52. Contact Ron Egalka, K1YHM, F.A.R.A., P.O. Box 3005, Saxonville, MA 01701. Tel. (617) 877-4520.

MICHIGAN: The Oak Park High School Electronics Club presents a Swap 'n Shop, Sunday, November 25, Oak Park High School, 13701 Oak Park Blvd., Oak Park. Donation $1.50; table $2.50. Refreshments and door prizes. The High School would like to purchase a transceiver to show our students the fun and advantages of Ham Radio.

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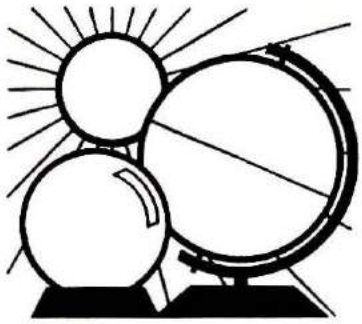

DX FORECASTER

November is a transitional month between fall and winter ionospheric-propagation conditions. DX opportunities will be nearly as good as those in September on the higher bands, while the lower bands will be coming into prominence in the evening hours. As daylight hours become shorter, the higher bands tend to close earlier and open later, whereas the lower bands tend to present DX openings from early evening through the early morning hours.

"Higher bands" are considered to be 20, 15, and 10 meters while "lower bands" are considered to be 160, 80, and 40 meters for the purposes of this forecast.

Last minute forecast

You can expect some minor geomagnetic disturbances during the first week of the month, particularly on the first and second. During the second week, the 10th and 13th are apt to be disturbed. You can look for more severe upsets on the 20th and 24th, and perhaps during the interval between these days, with the possibility of solar involvement by way of flare-induced enhancement. It is too early to tell, but conditions could be very, very good or very, very bad, depending upon the geomagnetic-field behavior. Keep your ear tuned to WWV's eighteen-after-the-hour reports for the most accurate update of solar and magnetic data.

Band-by-band summary

Six meters — You can expect frequent band openings in the afternoon hours, with long-haul DX possible to many areas of the world. *Ten meters* — the band will peak for DX during the afternoon hours, but will be open from sunrise to just after sunset, and you can expect excellent long-haul openings to most areas of the world. *Fifteen meters* will provide excellent openings to all areas of the world, particularly into the southern hemisphere. Try an hour or so after sunrise until well after sunset. Note: Times of band openings and closings are *local* times. *Twenty meters* will peak in the morning and again in the late afternoon, but will be open around the clock to one area of the world or another. *Forty meters* — should provide excellent DX opportunities from after sunset until after sunrise to most parts of the world, particularly the southern hemisphere between midnight and dawn. *Eighty meters* will also provide some good DX openings, but you must be able to burn the midnight oil because the best DX will take place in the early morning hours. *One sixty meters* will provide DX to some parts of the world for dedicated hunters but only between midnight and sunrise.

Tips on using the chart:

The asterisks (*) mean to look at the next *higher* band, because it, too, may be open on the path and at the time indicated. The arrows indicate general beam-pointing directions, with north at the top.

HRH

GMT	PST	WESTERN USA N	NE	E	SE	S	SW	W	NW	MST	MID USA N	NE	E	SE	S	SW	W	NW	CST	EST	EASTERN USA N	NE	E	SE	S	SW	W	NW
0000	4:00	—	—	15	15	—	15	10	15	5:00	—	—	20	15	—	10	10	15	6:00	7:00	20	40	20	15	15	10	15*	15
0100	5:00	—	—	20	15	—	15	10	15	6:00	20	—	20	15	15	10	15	15*	7:00	8:00	20	40	20	20	20*	10	15*	15
0200	6:00	20*	—	20	15	—	10	10	15*	7:00	20	20	20	20	15	15	15	15*	8:00	9:00	20	40	40	20	20	15	—	20
0300	7:00	20	—	20	20	15	15	10	15	8:00	—	40	—	20	15	—	15	15	9:00	10:00	—	40	—	20	20	20	—	20
0400	8:00	—	—	20	20	20	15	15	15	9:00	—	40	—	20	20	—	20	20	10:00	11:00	—	40	—	—	20	20	—	20
0500	9:00	—	40	—	20	20	20	20	20	10:00	—	40	—	20	20	20	20	—	11:00	12:00	—	40	—	—	20	—	—	—
0600	10:00	—	40	—	20	20	—	20	20	11:00	—	40	—	40*	20	20	20	—	12:00	1:00	—	40	—	—	—	—	—	—
0700	11:00	—	40	—	20	20	—	20	20	12:00	—	40*	—	40	20	—	20	—	1:00	2:00	—	40	—	—	20	20	—	20
0800	12:00	—	20	—	20	20	—	20	—	1:00	—	40*	—	40	20	—	20	20	2:00	3:00	—	—	—	—	20	20	—	20
0900	1:00	—	20	—	20	20	—	20	—	2:00	—	—	—	40	20	—	20	20	3:00	4:00	—	—	—	40	—	40*	—	—
1000	2:00	—	20	—	20	20	—	20	20	3:00	—	—	—	40	20	20	20	—	4:00	5:00	—	—	—	40	—	40	—	—
1100	3:00	—	20	—	20	20	—	20	—	4:00	—	—	—	40	20	20	20	—	5:00	6:00	—	20	—	—	20	40*	—	—
1200	4:00	—	—	—	20	20	20	20	—	5:00	—	—	—	40	—	20	40	—	6:00	7:00	20	15	—	15	20	40*	20	20
1300	5:00	—	—	—	—	20	40	40	—	6:00	—	20	—	—	—	—	40	—	7:00	8:00	20	10	—	10	—	—	20	20
1400	6:00	—	20	—	—	—	40	20	—	7:00	—	20	—	—	—	—	20	20	8:00	9:00	20	10	10	10	—	20	20	—
1500	7:00	—	—	—	—	—	20	20	—	8:00	—	10	—	10	—	20	20	20	9:00	10:00	15*	10	10	10	—	20	10	—
1600	8:00	20	10	—	10	—	20	20	20	9:00	20	10	10	10	—	10	20	—	10:00	11:00	15*	10	10	10	—	—	10	—
1700	9:00	20	10	—	10	—	20	15	—	10:00	15*	10	10	10	—	10	15	—	11:00	12:00	—	10	10	10	—	—	15	—
1800	10:00	20	15	10	10	—	10	15	—	11:00	15*	10	10	10	—	15	15	—	12:00	1:00	—	10	10	10	—	—	—	—
1900	11:00	20*	15	10	10	—	15	15	—	12:00	15*	15	10	10	—	15	15	—	1:00	2:00	—	15	15*	10	—	10	—	—
2000	12:00	20	15	10	10	—	15	15	—	1:00	20	15	10	10	—	15	15	—	2:00	3:00	—	20	15	10	—	10	—	—
2100	1:00	20	20	15	10	—	15	15	—	2:00	—	20*	15	10	—	15	10	—	3:00	4:00	—	20	20	10	—	10	15*	—
2200	2:00	—	20	15	10	—	15	10	—	3:00	—	—	15	10	—	15	10	—	4:00	5:00	—	40*	20	10	—	10	15*	—
2300	3:00	—	—	15	10	—	15	10	—	4:00	—	—	20	15	—	15	10	15	5:00	6:00	—	40	20	15	15	10	15*	15
	NOVEMBER	ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN		ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN			ASIA FAR EAST	EUROPE	S. AFRICA	CARIBBEAN S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN

HAM CALENDAR

November 1979

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				YL Anniversary Party, Part 2 — All Bands — 1800Z — K4IW — 1, 2 1	2	Hamarama 79 — Ft. Myers, FL — K4VGN — 3, 4 3
Defiance County ARC Hamfest — County Fairgrounds — Hicksville, OH — 4 4	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB WEST COAST BULLETIN Edited & Transmitted by W6ZF 8PM PST 3540 kHz, A-1, 22 WPM 5	AMSAT Eastcoast Net 3850 kHz 8PM EST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz — 8PM CST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 7PM PST (0300Z Wednesday Morning) 6	7	8	9	IPARC Sherlock Holmes Contest, 0800-2000Z — WB4QJO — 10, 11 10
Delaware QSO Party — 1700Z — K3HBP — 11 Framingham (MA) ARC Fleamarket, 10 A.M. - 3 P.M. Police Drill Shed — K1YHM — 11 11	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News 222.66/224.26 MHz via WR2APG and 21.400 MHz USB 12	AMSAT Eastcoast Net 3850 kHz 8PM EST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz — 8PM CST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 7PM PST (0300Z Wednesday Morning) 13	14	15	16	ARRL Florida State Convention — Sheraton Sand Key Hotel — Clearwater Beach, FL — 17, 18 Ft. Wayne (IN) Radio Club Funfest, Holiday Inn, 7 - 11 P.M. — 17 17
Allen County Amateur Radio Technical Soc. Hamfest — Memorial Coliseum, Ft. Wayne, IN — 18 Auctionfest 79 — Knights of Columbus Hall, Massillon, OH — K8EKG — 18 18	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB WEST COAST BULLETIN Edited & Transmitted by W6ZF 8PM PST 3540 kHz, A-1, 22 WPM 19	AMSAT Eastcoast Net 3850 kHz 8PM EST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz — 8PM CST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 7PM PST (0300Z Wednesday Morning) 20	21	 22	23	24
27th Annual Breeze Shooters Ten Meter Groundwave Contest, 0200-0600Z — K3GP — 25 Oak Park High School Swap-N-Shop, Oak Park, MI — 25 Columbia (MD) ARC Ham Feast — Ellicott City National Guard Armory — N3SC — 25 25	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30 PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 26	AMSAT Eastcoast Net 3850 kHz 8PM EST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz — 8PM CST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 7PM PST (0300Z Wednesday Morning) 27	28	29	30	

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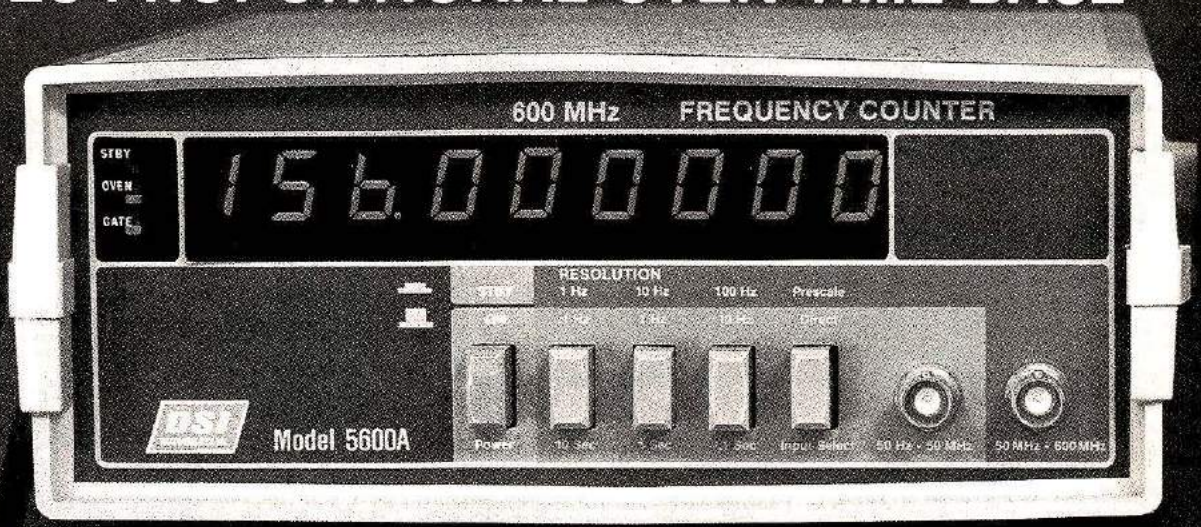

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5600A-W	$179.95									
3550	99.95	50Hz-550MHz	TCXO 1 PPM 17° -40°C	25MV	25MV	75MV	8	.5 inch	*115 VAC or 8.2-14.5 VDC	2¾" x 6" x 5"
500HH	$149.95	50Hz-550MHz	TCXO 1 PPM 17° -40°C	25MV	20MV	75MV	8	.4 inch	*115 VAC or 8.2-14.5 VDC or NICAD PAK	1" x 3½" x 5½"

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- Shows receive and transmit frequencies and memory channel
- **10 Memories** (always retained with battery backup)
- **Automatic memory scanning** (for "busy" or "open" channels)
- **Mode switch for the following operations:**
- Simplex
- Standard repeater by offsetting the transmit frequency + 600 kHz or − 600 kHz
- Repeater with nonstandard splits by offsetting the transmit frequency to any frequency stored in memory 10
- **REVERSE** momentary switch for the following applications:
- Checking signals on the input of a repeater
- Determining if a repeater is "upside down"
- **Built-in Touch-Tone generator** using 16-button keyboard
- **Keyboard selection** of 5-kHz channels from 144.000 to 147.995 MHz
- **UP/DOWN manual scanning** and operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps. Even operates on MARS repeaters within this range by using memory 10 for transmit offset frequency.
- **LCD "arrow" indicators**
- "ON AIR"
- Memory recall
- Battery status
- Lamp switch on
- **Two lock switches** to prevent accidental frequency change and accidental transmission
- **Subtone switch** (subtone module not Kenwood-supplied)
- **BNC antenna connector**
- **1.5 watts RF output**

The TR-2400 comes with the following standard accessories:

- Flexible rubberized antenna with BNC connector
- Nicad battery pack
- Battery charger

Optional accessories include:

- Leather case
- Base Stand (for quick charge and easy base-station operation)
- DC (automobile) quick charger

ST-1 BASE STAND (OPTIONAL)

(Subject to FCC approval)

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J. How to Be a Ham by Ken Sessions, is an ideal guide for the newcomer in Amateur Radio. Divided into two parts, it has basic operating procedures in one and FCC Rules and Regulations in the other. **$3.95**

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