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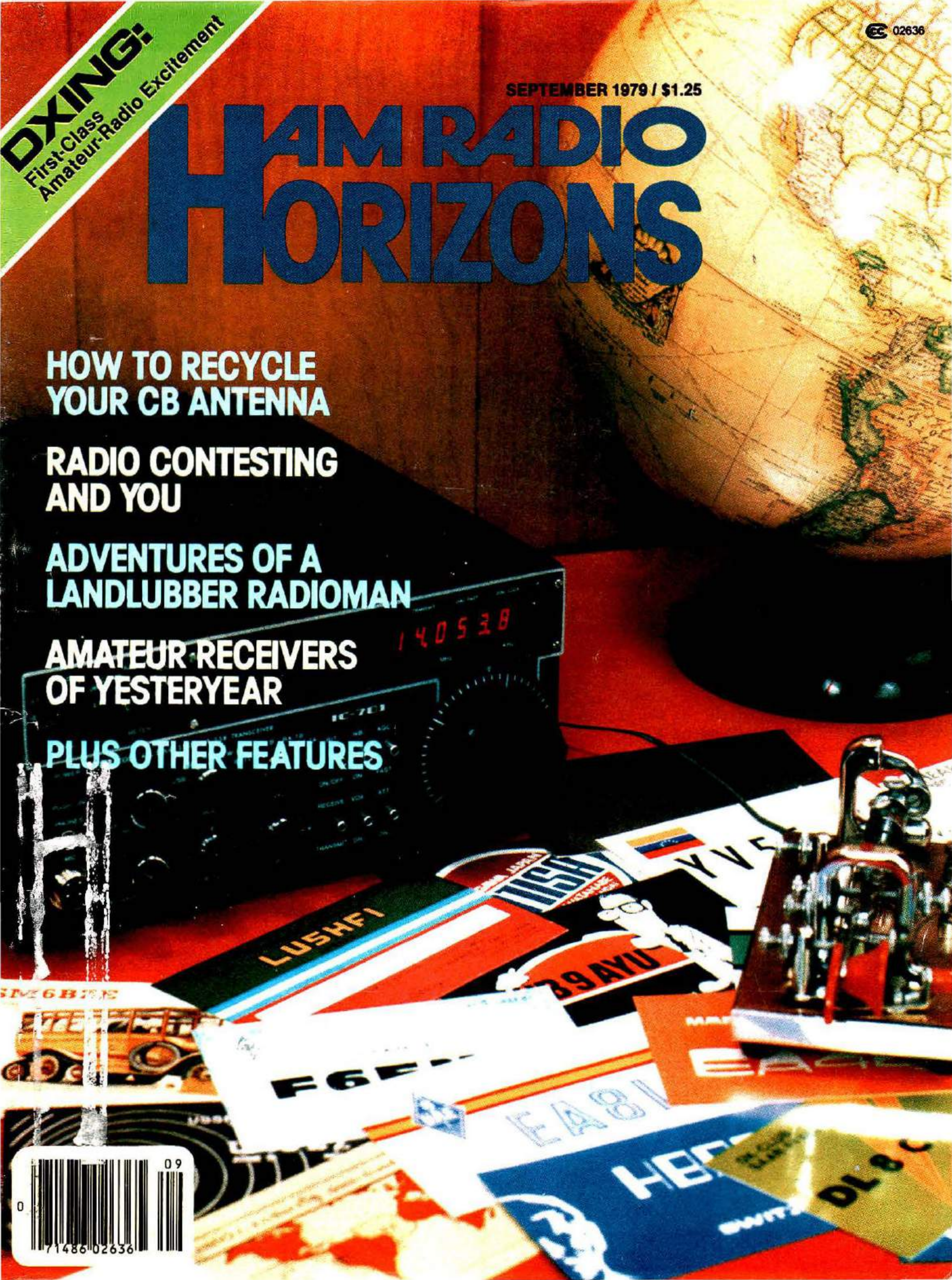
HAM RADIO HORIZONS

DXING: First-Class Amateur-Radio Excitement



HOW TO RECYCLE YOUR CB ANTENNA

RADIO CONTESTING AND YOU

ADVENTURES OF A LANDLUBBER RADIOMAN

AMATEUR RECEIVERS OF YESTERYEAR

PLUS OTHER FEATURES

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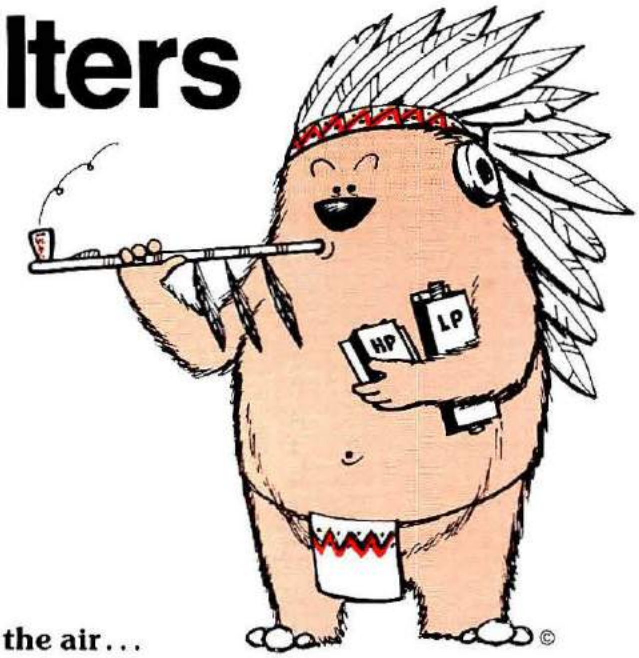
Drake TVI Filters

help you keep peace with your neighbors



Don't let your several-thousand dollar investment in a ham station sit idle because of your concern that you might ruin your neighbors' TV reception...

Drake TVI Filters can keep you on the air...

Although TVI/RFI is a complex subject, basically it has two forms: (1) Harmonics generated by the transmitter which fall on TV/FM channels. (2) Direct radiation from a strong fundamental signal directly into a nearby TV receiver. This is possible because strong signals at ham band frequencies can sneak around the tuned circuits in a TV and cause interference within the set. Even though the signal may be clean, direct radiation interference can occur as far away as several blocks, depending upon your power, antenna system, and the design of the TV.

TWO KINDS OF DRAKE TVI FILTERS:

"Low Pass" Filters will reduce or eliminate TVI caused by harmonics from amateur transmitters. All transmitters generate some harmonics which might be just strong enough to cause TVI. We believe every station should be equipped with a Low Pass Filter, designed to cut off at 41 MHz, the TV i-f frequency. Drake filters are down 80 dB at 41 MHz to provide maximum protection.

"High Pass" Filters are used to reduce or eliminate direct radiation interference at the TV set. There are less expensive High Pass Filters on the market for the TV set, but do they really work? Drake HP Filters provide 40 dB attenuation below 52 MHz; some others have measured at only 3 to 6 dB down.

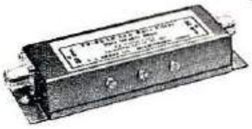
The Drake "Peacemakers":

Drake TV-3300-LP

1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as TV front-end problems.

Drake TV-5200-LP

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP.



Drake TV-42-LP

For transmitters operating at 30 MHz and lower. Rated 100 watts input.

Drake TV-300-HP

For 300 ohm twin lead. New connectors for "no-strip" installation.

Drake TV-75-HP

For 75 ohm TV coaxial cable; TV type "F" connectors installed. Ideal for master antenna systems for apartments and condominiums.

Certain situations require both a Low Pass and a High Pass Filter to solve the problem, and Drake can provide both types.

Specifications and prices subject to change without notice or obligation.

For a FREE Drake Full Line Catalog contact your favorite Drake Dealer.

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Known 'round the world for world-wide radio communications.

New OMNI/SERIES B Filters The Crowd

The new OMNI/SERIES B makes today's bands seem less crowded. By offering a new i-f selection that provides up to 16 poles of filtering for superior selectivity. And a new Notch Filter to remove QRM. No other amateur transceiver we know of out-performs it.

NEW I-F RESPONSE SELECTION. OMNI comes equipped with an excellent 8-pole 2.4 kHz crystal ladder i-f filter which is highly satisfactory in normal conditions. But when the going gets rough, the new OMNI/SERIES B, with optional filters installed, provides two additional special purpose i-f responses.

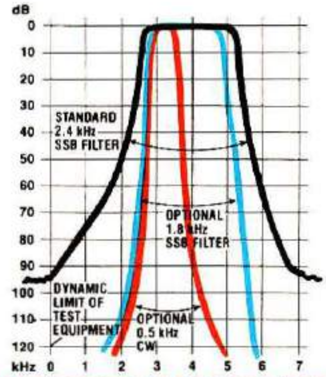
The 1.8 kHz crystal ladder filter transforms an unreadable SSB signal in heavy QRM into one that gets the message through. The 0.5 kHz 8-pole filter provides extremely steep and deep skirts to the CW passband window which effectively blocks out even the very strong adjacent signals.

Both of these filters can be front-panel switched in series with the standard filter to provide up to **16 poles** of filtering for near-ultimate selectivity. In addition, the standard CW active audio filters have three bandwidths (450, 300, and 150 Hz) to give even further attenuation to adjacent signals. In effect, OMNI/SERIES B has six selectivity curves—three for SSB and three for CW. That's true state-of-the-art selectivity.

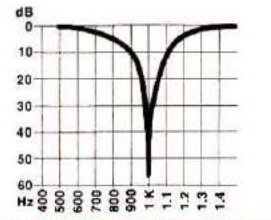
NEW NOTCH FILTER. A variable frequency notch filter in OMNI/SERIES B is placed inside the AGC loop to eliminate interfering carriers and CW signals without affecting received signals. Attenuation is more than 8 "S" units (over 50 db) for any frequency between 0.2 kHz and 3.5 kHz.

OMNI/SERIES B RETAINS ALL THE FEATURES THAT MADE IT FAMOUS.

All solid-state; 160-10 meters plus convertible 10 MHz and AUX band positions; **Broadband design** for band changing without tuneup, without danger;



OMNI/SERIES B I-F RESPONSES WITH STANDARD AND OPTIONAL FILTERS.



NOTCH FILTER PERFORMANCE ADJUSTED TO 1 kHz POINT.

TEN-TEC, INC. SEVIERVILLE, TENNESSEE 37862
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Choice of readouts —OMNI-A for analog dial or OMNI-D for digital dial; **Built-in VOX and PTT** facilities; **Selectable Break-in,** instant or delayed receiver muting; **Dual-Range Receiver Offset Tuning,** ±5 kHz or ±0.5 kHz; **Wide Overload Capabilities,** dynamic range typically exceeds 90 dB and a PIN diode switched 18 dB attenuator is also included; **Phone Patch Interface Jacks; Adjustable ALC; Adjustable Sidetone; Exceptional Sensitivity; 200 Watts** input to final with full warranty on final transistors for first year, pro-rata for 5 years; **100% Duty Cycle** for RTTY, SSTV or sustained hard usage; **12 VDC Circuitry** for mobile use, external supplies for 117/220 VAC operation; **Front Panel Microphone and Key Jacks; Built-in 25 kHz Calibrator** in analog dial model; **Zero-Beat Switch; "S"/SWR Meter; Dual Speakers; Plug-In Circuit Boards; Functional Styling,** black textured vinyl over aluminum "clamshell" case, complementary nonreflective warm dark metal front panel; **Complete Shielding; Easier-to-use size:** 5¾"h x 14¼"w x 14"d; **Full Options:** Model 645 Keyer $85; Model 243 Remote VFO $139; Model 252MO matching AC power supply $139; Model 248 Noise Blanker $49; Model 217 500 Hz 8-pole Crystal Ladder CW Filter $55; Model 218 1.8 kHz 8-pole Crystal Ladder SSB Filter $55;

OMNI owners note: Your OMNI can be converted to a SERIES B model at the factory for just $50 (plus $5 for packing and shipping). The notch filter replaces your present squelch control and provision is made for the two additional optional filters; a partial panel with new nomenclature is provided. Contact us for details.

Model 545 Series B OMNI-A $949
Model 546 Series B OMNI-D $1119

Experience the uncrowded world of OMNI/SERIES B. See your TEN-TEC dealer or write for full details.

THIS MONTHS HORIZONS

DXing Is A Great Part Of Amateur Radio — And It Can Be Addictive

Here's a story by an Amateur who has chased DX stations for many years. It touches on some of the ingredients that go into making a dedicated DXer, and offers some tips on how to work foreign stations and obtain QSL cards. An interesting sidelight of DXing involving ESP is also included for those who like to experiment.

The Landlubber

Here's the adventure of a Radio Amateur plucked from the quiet of W8-land, who found his skills to be vital aboard a coastal-patrol vessel fog-shrouded amid mountainous waves. It's a bit of fiction from the pen of W6UYH, but no more strange than the many untold tales of hams in the service during the years of World War II. You'll enjoy it, whether you are a veteran or an LSPH (That's Licensed Since Pearl Harbor, son).

A Little Nostalgia

Your ham radio heritage is steeped in the early work of fellow hams who are still around to tell about it. We are proud to present an account of how early broadcast-radio sets were used by hams of the day to get on the air. Author Crum provides some interesting reading based on personal experience for those who may wonder what preceded today's sophisticated circuits.

Converted CB Antenna

Interested in a simple and inexpensive vhf antenna for portable and mobile use? It can also be used for Field Day or emergency operation, and is a perfect companion for that vacation. This conversion will fill the bill, and it doesn't cost a bundle, either. W8FX tells you how, and gives you some hints on other uses for a "liberated" CB antenna.

Contest Operation

What is all this clamor that invades the Amateur bands from time to time — especially on weekends? Thousands of operators shouting numbers at each other, faster than a disc-jockey trying to read a 1-minute commercial during a 10-second break. But, listen a bit. Concentrate. Eventually, they begin to make sense — it's a contest! Veteran contester N6NB slows down enough to make his message to you very clear and easy to follow: It's easy and fun to take part in contests, and there are plenty of them.

SWL Starts A Rescue

A British short-wave listener, trying a new trap dipole, copies an emergency call from a ship in distress. His alertness and action in notifying the authorities was rewarded by an interview with a Spanish Marques, by an Award of Merit, and by having his part in the rescue noted in the Maritime Records.

A Two-Loop Antenna Farm

Loop antennas are popular because they take up less backyard than does a dipole, and use the same inexpensive materials — wire, insulators, ropes, and masts. Loops follow the same rules as any other antenna in that if you put up two of them, and feed them properly, you'll send out a bigger signal, and receive better too. W1XU put up a 40-meter pair, and was very pleased with the results. He also gives you a hint about how to make a four-band web that any spider will envy.

The Cover

Some DX cards from the past and present, a Vibroplex "Bug" from the days before electronic keyers, and a modern transceiver go together to lead your thoughts into the world of DX. It's an exciting and ever-new part of Amateur Radio, and W6NIF gives you a peek at some of it in his feature story.

HAM RADIO HORIZONS September 1979, Volume 3, Number 9. 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.

Subscription inquiries and changes of address should be directed to *Ham Radio Horizons*, Greenville, New Hampshire 03048. Please include address label from most recent issue if possible.

More details? Ad Check page 78.

HAM RADIO HORIZONS

September, 1979
Volume 3, Number 9

Microfilm copies are available from University Microfilms, International Ann Arbor, Michigan 48103

Cassette tapes of selected articles from *Ham Radio Horizons* are available to the blind and physically handicapped from Recorded Periodicals 919 Walnut Street, 8th Floor Philadelphia, Pennsylvania 19107

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

CONTENTS

THE VIEW FROM HERE

Many of the problems that Amateur Radio has had to face over the past few years — and will continue to face in the future — can be traced directly to one cause: the demands of an increasing Radio Amateur population for limited operating space in the radio spectrum. More and more stations have been squeezed into the same bands, creating heavy congestion, frustration, and lost tempers, particularly during peak occupancy periods on weekends and holidays. In many cases the effects of crowded band conditions are aggravated by poorly designed ham equipment: transmitters which contribute broadband noise and splatter, and receivers which cannot cope with nearby strong signals. Technology is available to solve these problems, but very seldom is it put to work; and sadly, until Radio Amateurs demand improved equipment performance, that technology won't be used.

Herein lies the problem. How do you press for cleaner emissions from transmitters or push for receivers that will handle strong signals without overloading when there are no performance standards? And not only are there no performance standards, equipment specifications in general have not kept pace with technology. Gone are the days when receiver sensitivity and selectivity were the only things you looked for in a communications receiver (or the receiver section of an Amateur transceiver); how that receiver will contend with the abundance of strong, closely-spaced signals on today's crowded Amateur bands is much more important. Strong signals at the receiver's input saturate the rf amplifier, resulting in the generation of spurious signals, or IMD (Intermodulation Distortion Products); this is essentially the same process which causes distortion in linear power amplifiers. In some cases the unwanted receiver-generated signals are actually stronger than the station you want to work!

There are several ways to describe a receiver's performance in the presence of strong signals including *intercept point* and *dynamic range*. Briefly, intercept point denotes that input signal level which generates internal spurious signals that are the same level as the input signal; dynamic range is the number of dB between ultimate receiver sensitivity (the *noise floor*) and input signals which produce IMD. In both cases, the larger the number the better. Some manufacturers have begun to provide this information, but since there are no standards, receivers which are advertised with similar operating characteristics often have vastly different on-the-air performance. Intercept point is currently in vogue, and as one of my correspondents recently pointed out, "Everyone suddenly has a '+20 dBm' receiver — whether it costs \$250 or \$5000." (A receiver with a +20 dBm intercept point would be a very good one, indeed, and quite expensive to manufacture.)

The preponderance of "20 dBm" receivers reminds me of the time a few years ago when every ssb transmitter on the market was advertised with third-order IMD down "more than 30 dB." It didn't matter whether the final was built with rf power tubes, TV sweep tubes, or transistors — the magic number for third-order IMD was always −30 dB. Then W6SAI and a few others pointed out that most of the TV sweep tubes couldn't do better than −22 dB in rf linear service, and some were as bad as −18 dB! That spelled the beginning of the end for TV sweep tubes in Amateur transmitters; as new ssb transmitters were introduced, more and more were designed around tubes and transistors which were intended for linear rf service.

Receiver intercept point and transmitter IMD are only two of the problem areas. How about those built-in and accessory speech "processors" that often add so much distortion they make large sections of the band virtually useless? (And as an aside, what are we to do about the operators who refuse to turn off their processor even when they're told how bad they sound?) Established performance standards won't improve operating habits, but they would make it a lot easier to purchase equipment that meets your personal needs. And in the long run, a realistic set of standards will inevitably result in better Amateur equipment for all of us.

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.

Available Options:
- Touch Tone pad/microphone combination, which fits the mic plug on the radio face with absolutely no modification (Fits all ICOM 4-pin mic radios.)
- 15' unassembled cable kit for long distance remote mounting of the detachable control head

IC-280
2 meter FM, 4+ MHz
Mobile Transceiver

If you are a newly licensed novice, send for ICOM's catalog and discount purchase coupon. Mail your name, call sign and date of license to your ICOM distributor (see the bottom of this ad).

All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

Specifications subject to change without notice.

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

HF/VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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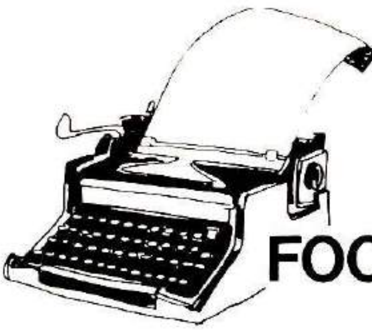


FOCUS & COMMENT

There's a lot of interest in QRP operation on the Amateur Bands these days, and along with the interest comes the fact that many very long-distance QSOs are being carried out with almost amazingly low amounts of power at one or both ends of the path. What's QRP, you ask? It's operating with low power levels — the arbitrary limit set by many enthusiasts (and the QRP Amateur Radio Club International) is 100 watts input on CW, 200 watts PEP on SSB. There is a sub-group among the practitioners who work QRP_p (very low power), where a level as high as one watt is enough to raise eyebrows!

All of this was brought to my attention by two things: There'll be an article on low-power work in our November issue, and, W8YFB pointed out the effectiveness of very small amounts of rf in getting to odd places around the world. (You remember his Beginner's Transmitter article in the July and August, 1978, issues of Horizons — well, he just sent us the information on designing some filters to reduce harmonic output from the rig. It's good reading, and the information applies to most commercially built rigs as well. It'll be in our magazine soon.)

Anyway, Bill's examples included one where coast-to-coast work was done by Amateurs using power as low as 0.005 watt. He also told of a distant Amateur complaining about the interference to his QSO — interference caused by the grid-dip oscillator Bill was using to check his antenna for resonance!

This brought to mind an early experience of mine, back in the tube days. I decided I needed a VFO, right now, and proceeded to use up most of an afternoon and all of an evening building one. What with Murphy's Law, lack of parts (and hunting for substitutions), and several interruptions, it was close to 2 AM before I was ready to calibrate the thing. I tuned my receiver to 80 meters, and started making marks on the nice, new National dial of my one-tube VFO. While checking from one end of the "empty" band to the other, I heard a W9, and in the course of his QSO he said he was in Indiana. Who could resist the idea of trying to work the guy with such low power. I set the VFO to his frequency (it was capacitively coupled to the antenna terminals on the back of the receiver — no tuner, no relays), and gave him a call. Surprise, and a big grin on my part, he answered. The input to the tube, as checked later, was a staggering 0.003 watt. The output was anybody's guess — what with the inefficient coupling and the losses through the receiver's input coil. I told him I was using less than a half a watt, and he was impressed. He called a couple of buddies in nearby Ohio and Illinois, then an eavesdropper in Iowa joined in. We chatted until daylight started absorbing the signals and communication was no longer possible. (My boss looked at my bloodshot eyes next day and asked if I had trouble sleeping — since he was a non-ham, I knew he would never understand.)

The point being that QRP is not a new mode of operation, but rather that there are a lot more Amateurs now, and hundreds of them are discovering the fun of getting the most distance for the least energy. No, they (as a group) are not advocating that everyone dismantle their high-powered rigs and operate strictly from solar cells, bicycle-pedals, or aluminum and copper wires stuck in a potato (try it, it'll generate a small amount of electricity, but don't ask me what the schematic symbol is for a potato). QRPers just enjoy this particular form of competing with nature, and they welcome newcomers with great enthusiasm.

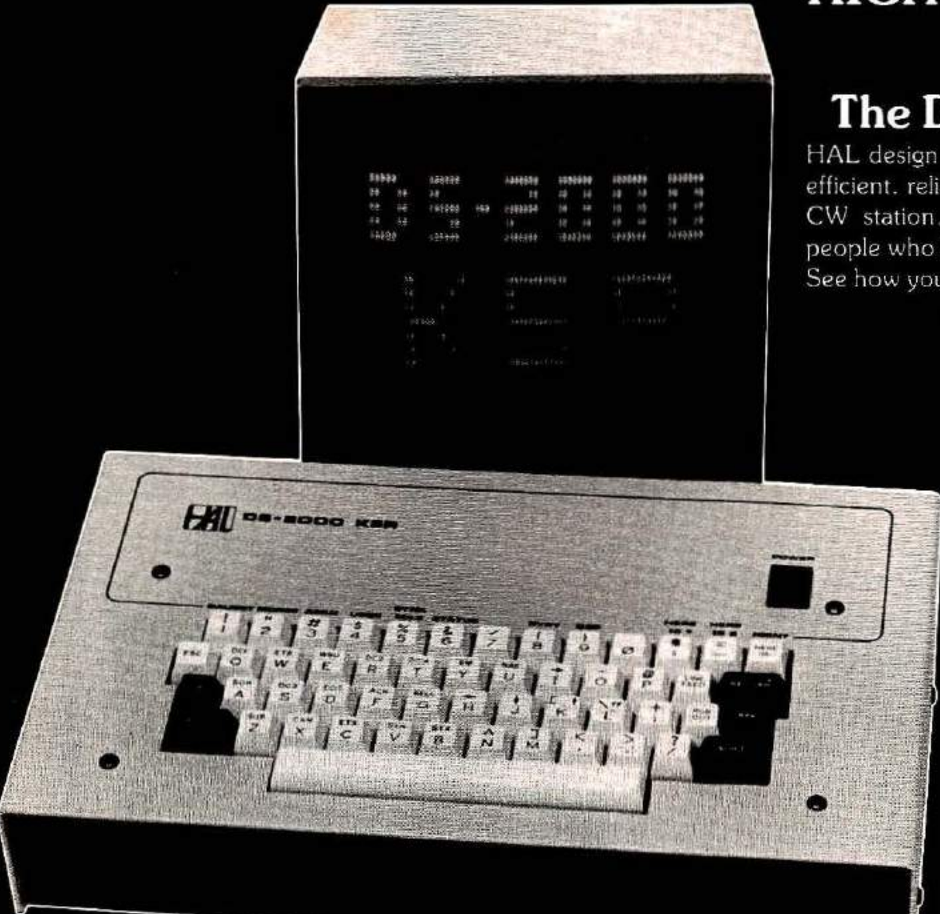
If you would like to try it, now's the time. Sunspots have the higher bands in good shape, allowing your signal to travel the farthest with the least losses. It'll add a whole new dimension to your Amateur Radio world, and furthermore, there are plenty of awards and contests for QRPers; our upcoming article will tell you how to get in on them.

Now, let's see — I wonder if I still have the parts for that old VFO? I must have, for I never throw anything away.

Thomas McMullen, W1SL
Managing Editor

NOW YOU CAN HAVE BOTH

HIGH QUALITY & LOW COST!



The DS2000 KSR FROM HAL

HAL design experience now makes it possible to offer you an efficient, reliable, and cost effective terminal for your RTTY or CW station. Investigate the new DS2000 KSR from the people who KNOW HOW to build RTTY and CW equipment. See how you can get great performance and save money too!

- *Integrated keyboard and video generator*
- *72 character line*
- *24 line display*
- *2 programmable "Here Is" messages*
- *Automatic carriage return and line feed*
- *QBF and RY test messages*
- *Word mode operation, full screen buffering*
- *All 5 standard Baudot speeds*
- *110 and 300 baud ASCII*
- *CW identification at the touch of a key*
- *Morse code transmit*
- *Morse code receive (optional) self tracking speeds from 1-175 wpm on a separate plug-in circuit board (Available June, 1979)*
- *All in a convenient, small cabinet (14.1" x 9.25" x 4.35")*

Price: $449.00

Optional Morse Receive Board: $149.00

Optional 9" monitor: $150.00

BIG PERFORMANCE

SMALL SIZE. . .SMALL PRICE

If you're looking for an RTTY demodulator with great performance on both the HF and VHF bands, take a look at the ST-5000 from HAL. The use of active filters with no phase-lock loop or 'single-tone' short-cuts ensure the kind of performance you expect. Full features in an attractive and conveniently small package make this demodulator a value that's hard to beat!

- *Hard limiting front end*
- *Active discriminator*
- *Active detector*
- *Wide and Narrow shift (850hz and 170hz)*
- *Normal and Reverse sense*
- *Autostart*
- *Self-contained high voltage loop supply*
- *RS-232C voltage output (direct FSK)*
- *Audio tone keyer (AFSK)*
- *Provision for external tuning scope*
- *Attractive, small cabinet (2.75" H x 8" D x 12" W)*
- *Fully assembled and tested*

Price: $225.00

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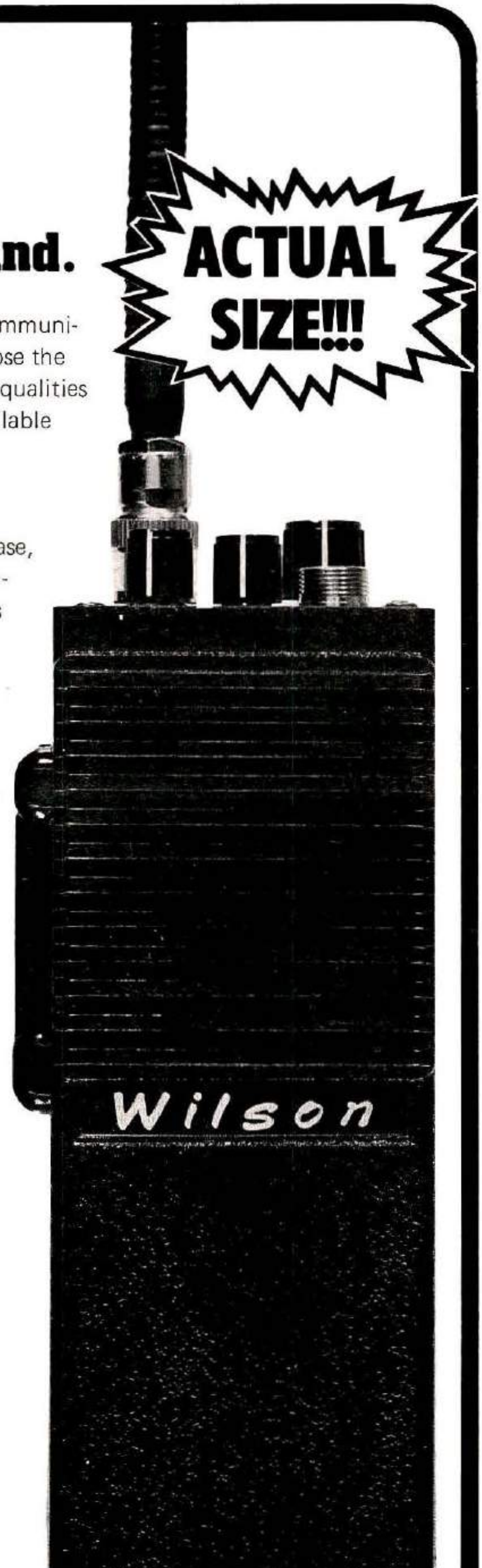

Today's Amateur demands rugged, rapid and accurate communications between Hams in the know. That's why they choose the Wilson Mark Series of hand-held radios. With exceptional qualities like these . . . why not choose the most popular radio available for yourself?

FEATURES

Advantages such as solid state circuitry, rugged Lexan® case, removable rear panel (enabling easy access to battery compartment) and compact mini-size enhance the Mark Series portable radio's versatility. In addition, Wilson carries a full line of accessories to satisfy almost any of your requirements.

SPECIFICATIONS

The Mark radios offer: • 144-148 MHz range • 6 Channel operation • Individual trimmers on TX and RX xtals • Rugged Lexan® outer case • Current drain: RX; 15 mA, TX; Mark II: 500 mA, Mark IV: 900 mA • A power saving Hi/Lo Switch • 12 KHz ceramic filter and 10.7 monolithic filter included • 10.7 MHz and 455 KHz IF • Spurious and harmonics, more than 50 dB below quieting • Uses special rechargeable Ni-Cad battery pack • LED battery condition indicator • Rubber duck and one pair Xtals 52/52 included • Weight: 19 oz. including batteries • Size: 6" x 1.770" x 2.440".

OPTIONS

Options available, include Touch Tone Pad, CTCSS, Leather Case, Chargers for Desk Top, Travel or Automobile, Speaker Mike and large capacity, small size batteries.

For more details and/or the name of your nearest dealer, contact: Consumer Products Division, Wilson Electronics Incorporated, 4288 So. Polaris Ave., P. O. Box 19000, Las Vegas, Nevada 89119. Phone 702/ 739-1931.

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WILSON ELECTRONICS INCORPORATED BLACK PLATE

NEWSLINE

A CALIFORNIA COURT DECISION against a CB operator has established a precedent that could work against Amateurs as well, and serves as a warning to carefully examine all restrictions before renting or buying a new home if you plan antennas. San Diege CB operator Jerry Lee Dunn was sued by a neighbor for violating the covenants, conditions, and restrictions (CCRs) of their subdivision, which absolutely prohibited outside antennas for any purpose. Dunn fought the suit on the grounds that the CCRs violated his First Amendment rights to free speech and was thus unenforceable.

In Its Decision Upholding the antenna prohibition, the Court of Appeals, Fourth District of California, found that Dunn's right to speak on the air was not itself restricted, and also required that he pay the other side's legal fees.

AMATEUR STATIONS ON U.S. flag vessels must be licensed by the FCC, a June 12 ARRL letter told an American operating a Caribbean-licensed station on his yacht. This new letter, which contradicts an earlier one indicating a foreign Amateur license would be legal on an American ship sailing the high seas, cites as its authority the FCC's Treaty Branch and quotes both international Radio Regulations and the Communications Act of 1934 in support of the stricter interpretation.

A Number Of American Yachters, some of whom have been drawing criticism for questionable operations on the Amateur bands for some time, should be affected.

In A Related Action, the ARRL has warned U.S. and Canadian Amateurs not to contact stations with HP9 callsigns. Although the prefix sounds Amateur, the Panamanian government has confirmed that its HP9 licenses are for commercial maritime stations and their recent use in the Amateur bands is illegal.

HF RADIATION HAZARDS are the subject of a new FCC Notice of Inquiry, General Docket 79-144, agreed to by the Commissioners in June. Although the Commission noted that promulgation of RF radiation health and safety standards is the responsibility of health and safety agencies, it also recognized that the FCC would have to consider radiation exposure standards adopted by other Federal agencies in its licensing activities. With the environment currently a hot public issue, this NOI could easily become a crucial one for Amateur Radio as well as most other radio services.

Comment Date for Docket 79-144 is December 15, with Reply Comments due March 15 of next year. To obtain a copy of the text of this important NOI, write to Consumer Assistance Office, 1919 M Street N.W., Washington, D.C. 20554; ask for Docket 79-144.

U.S.-HAITI RECIPROCAL licensing agreement, stalled since last September by minor text differences, has finally been signed and is now in effect. Haiti brings to 53 the number of countries with which the U.S. has reciprocal licensing agreements.

RUSSIA'S NEW "NOVICE" license has been confirmed in the June 20 issue of Soviet Patriot. The new "Beginning Radioamateurs," whose age limit has been lowered to 14 years (16 was the previous lower limit), may contact only each other and use only the new 1850-1950 kHz Russian allocation with five watts. They'll use the prefix "EZ" followed by a number/letter combination like that of an individual "UK" prefixed Russian Amateur station — EZ6FAB would be a "Beginning Radioamateur" in Georgia, for example. Phone as well as CW may be used.

"ASSOCIATION OF RADIO SPORT of the People's Republic of China" has now been formed, the IARU reports. Several former active mainland China Amateurs are among the Association's officers.

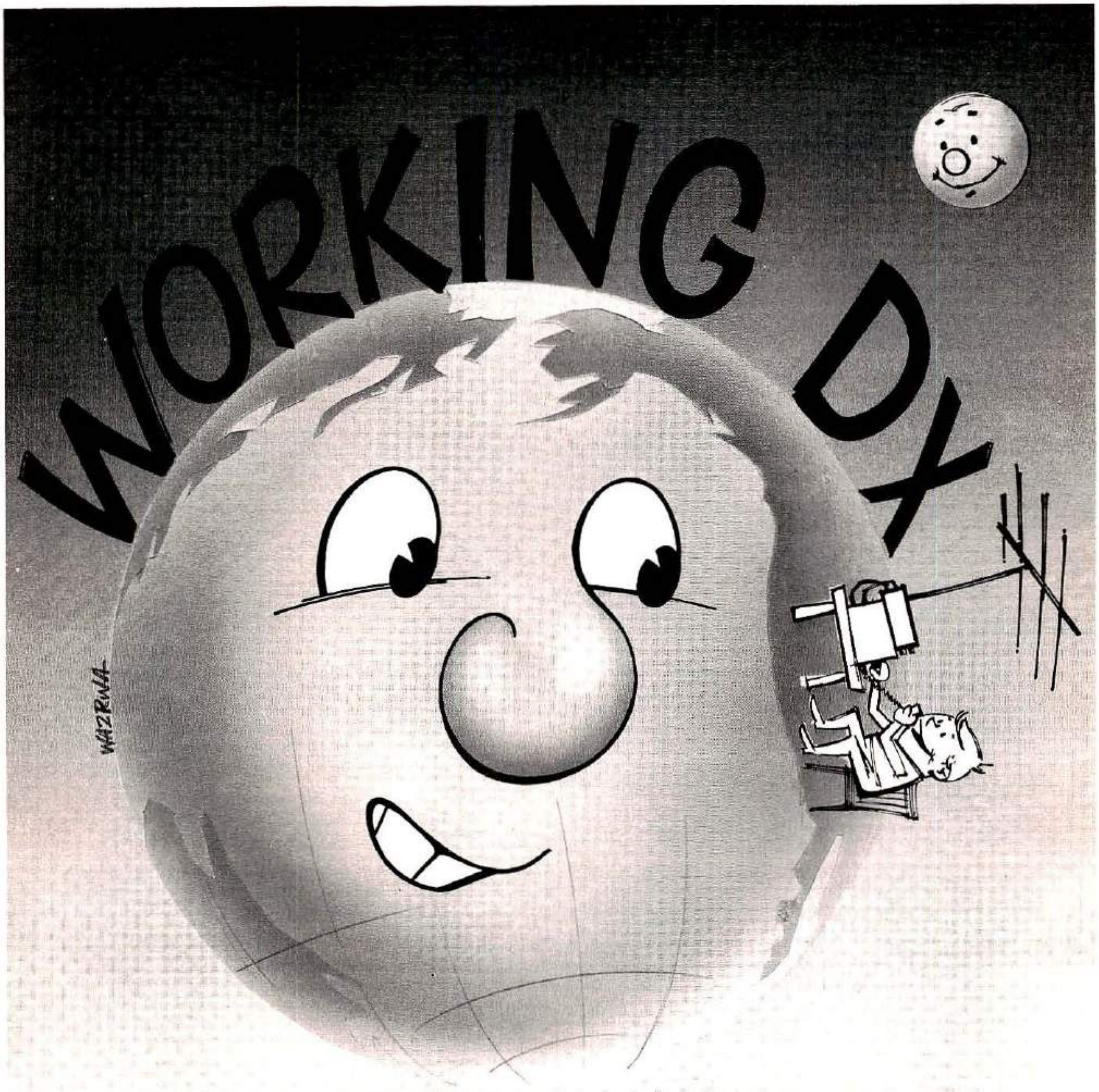
THE TVI/RFI INFORMATION PACKET mentioned in our August issue ("TVI Complaints," by DA1KV and DA1TM, page 28) is no longer available from ARRL. It has been replaced by their new booklet, Radio Frequency Interference, which sells for $3.

CANAL ZONE WILL CEASE to be a separate country at the end of September, under the recent U.S./Panama treaty. After that, all KZ5s will have to qualify for an HP1 license to stay on the air.

AMSAT REPORTS THAT OSCAR 7 is available for use regardless of mode. It's been hard to keep it in scheduled modes, so which one you use it in, A or B, will depend on which mode it's jumped to when you find it. Wednesdays, of course, are still reserved for experiment days.

AMATEUR RADIO GREW 6.3% in the year ending June 1, when U.S. Amateur ranks reached an all-time high of 363,820. That growth rate seems to be continuing, too, as the increase for the month of May was at an annual rate of 7.4%.

Extras Showed The greatest growth in the past year, up 15.4% to 23,211. On June 1 the Advanced Class totaled 84,181, a 5.6% increase; General Class was up 4.8%, to 120,903; while Novices showed the second biggest gain, up 9.5% to 66,363.



BY ALF WILSON, W6NIF

Ah, DX! What makes it so fascinating? It's a part of Amateur Radio that's as old as Amateur Radio itself. The thrill of that first foreign contact. The frustration of waiting to work a rare station when your rig conks out just at the crucial moment. The endless hours of listening, listening, listening, hoping to be the first to hear that rare station when he opens up. The continual testing, pruning, tweaking to get that last watt into your antenna. The waiting at the mail box for that DX card. Yes, that's DXing and a whole lot more.

Is it really worth it? Ask any dedicated DXer and you know his answer will be yes. DXing is addictive. Once you get into it you're hooked. And who wants to be cured? You're at the mercy of propagation conditions, fierce competition from other Amateurs, the vagaries of the operating habits of the DX station. It's a real challenge.

DXing is losing sleep, calling in sick at the office, using scare tactics, being a bully. It's great. It's using every single facility, mental and physical, you possess to work that elusive foreign Amateur station.

The first two-way radio contact between Europe and the United States some 55 years ago was a DX contest of sorts. That was when F8AB in Nice, France, and 1MO in Connecticut, completed the first two-way overseas DX contact — using Amateur Radio. It was a DX test because the operators used all of the elements we use today to work foreign stations: listening, patience, timing, and more listening.

I've heard fellow DXers say, "After you've worked all the countries in the world, then what?" My answer is, "Keep working DX." It's always a challenge and an excellent way to develop operating skills. Each situation requires a new approach. You're forced to get the most out of the equipment you have, and that requires operating skill. Probably the best satisfaction obtained from DX operating is to be able to reach out and touch another human being, if only for a brief moment. You'll find that, after all, you and he are pretty much the same, and that's nice.

This article on DXing spans some 43 years, beginning in 1935. It covers several sunspot cycles, good and bad. Ideas are given on how to work DX using transmitter power from a few watts to the legal limit during all propagation conditions. One of the fringe benefits of working DX and collecting QSL cards is the accumulation of foreign postage stamps. (Never throw anything away!)

Also given are some hints on how to pry QSL cards from foreign stations that are reluctant to send cards to American Amateurs. (Why? Because they work so many!) I'll share with you some of the tricks I've learned over the years on how to leap in and leap out, even with low power and marginal propagation conditions. Some of the big-gun DXers will probably want to crucify me for giving away their secrets, but that's okay.

Finally I'll talk about some experiments I've made with a foreign Amateur involving extrasensory perception, or ESP. It's a lot of fun and provides some interesting things to think about.

It was 1935. America had bottomed out economically. The great depression was upon the land. I was a youngster of 15 going to high school. The school had a shop course that taught the elements of electricity and radio. It sounded like an easy credit, so I signed up. In a loft over the shop was a ham station, complete with an SW-3 (National Radio Company) receiver and a transmitter built by the students. The transmitter consisted of a pair of type 210 tubes in a TNT (tuned/not tuned) circuit. The antenna was a Marconi working against ground. It was strung from a 60-foot mast and sloped down toward the northeast.

Only licensed Amateurs were allowed to work the station, of course. I didn't have a license, but one of the seniors, who was in charge of the station, let me listen on the SW-3 receiver. I'd learned Morse code during the radio course, so I felt fairly comfortable sitting there with a pair of Baldwin phones clamped to my head. It was early in the morning, before classes. I tuned the SW-3 across the 40-meter band and heard some water-weak VK and ZL stations — and that did it. I was hooked!

Money for radio parts was hard to come by. But if you really wanted to get on the air, there were ways. Many, many receivers and transmitters during the depression were fashioned from old broadcast-band receiver parts. I was fortunate enough to obtain an Atwater Kent receiver that had enough parts to build a CW transmitter. It wasn't too pretty to look at, but it worked. By using a capacitor-input filter in the power supply I was able to squeeze out all of 650 volts dc, which translated to 25 watts input. The transmitter was a tuned-plate, tuned-grid (TPTG) circuit, which I built onto a breadboard. You didn't have to worry about TVI in those days, of course, so the transmitter was completely unshielded.

I placed a flashlight bulb attached to a three-turn loop of wire into the copper-tubing tank coil, turned on the high voltage, and pressed the key. Beautiful! The lamp glowed brightly, so I knew the rig was putting out. Just to make sure, I touched a pencil to the end of the tank coil and was rewarded with a nice, hot blue spark of radio-frequency energy!

I still didn't have my Amateur license, but I just couldn't resist connecting an antenna to my new transmitter. All I wanted to do was see if it would take power. (I'd erected a

Author's first DX QSL card, received in 1935. Note the signal-reporting format; QSA4, R5, T9X. J2LU used a pair of 852 triodes in push-pull with 1-kW input, a very respectable rig in those days.


QRA: 55 WADA, HONMOKU, YOKOHAMA, JAPAN CRD NR: 935
J2LU-J2MB-J2ME-J2MI-J3EU DX ALL CONT 53 COUNT.
J2LU
IARU
JARL
ARRL
WAC
on 7 14 28
RADIO W6NIF CONFIRMING QSO ON 7 MC AT 1125 M J C T 4/3 1935
UR T 9x SIGS FONE QSA 4 R 5 F CONDITIONS
XMTR CC 1000 WATTS TO PP852 RCVR ALLAC 1-V-1
PSE TNX QSL BEST 73'S OM H. Shimomura

40-meter Zepp antenna, which ran from the eaves of our house to a billboard across the street.) It was late at night. I connected the Zepp to the transmitter tank coil using a couple of alligator clips in series with capacitors (to keep the high voltage off of the feedline).

On the first try it was bad news. I'd placed the clips too close to the ends of the tank coil. The rig swamped out. Then I moved the feeder clips closer to the coil center until the test lamp glowed feebly — ah, success! The rig kept oscillating as I punched the key. I listened to the rig in my receiver. A little chirp, but not too bad. I was on the air.

Then I heard a loud knock on the garage door. I opened the door. Standing in the dim glow of the street light was a huge fellow who looked like a Suma wrestler. He said, "Have you been using a transmitter on 40 meters?" I said, "Uh, yes. I was just testing out my new transmitter." Some feet shuffling; then: "It's a very low- power rig. Why do you ask?"

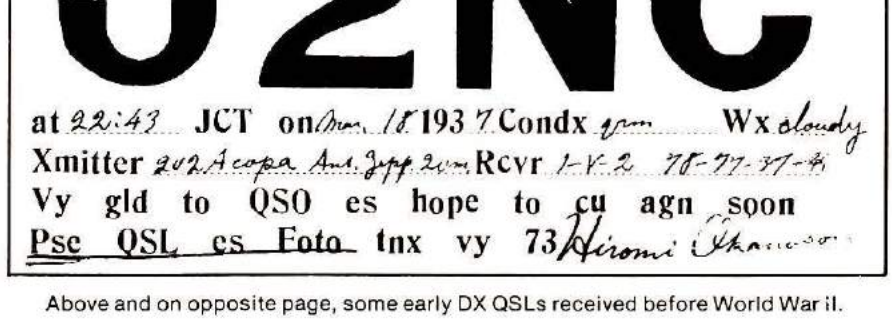
The fellow hunkered closer to me and said, "I am an Amateur Radio operator. I live two blocks up the street. I was listening on the 40-meter band a little while ago. I heard a very loud and chirpy signal, which blocked my receiver. Terrible key clicks! I traced the signal to your house."

I didn't bother to ask the fellow how he traced the signal to my rig. Perhaps he noticed my Zepp antenna connected to the billboard across the street. I invited him into the shack. He took in the layout in one glance.

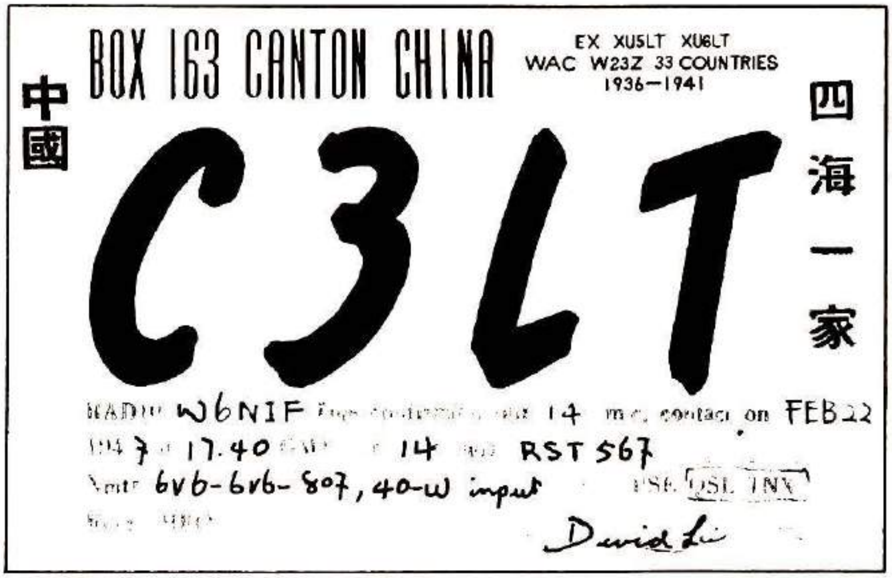
"What's your call sign?" he asked.

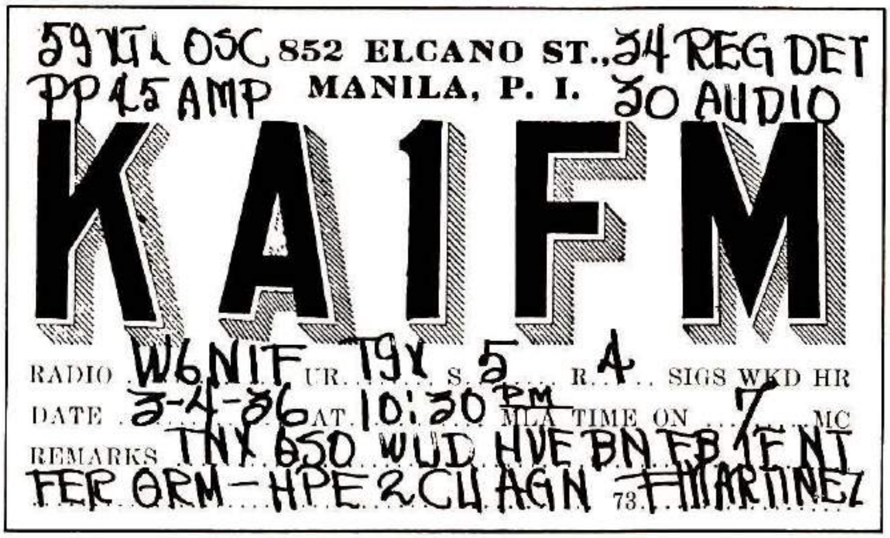
"Don't have one yet, but I'm working on it."

"Well, the law requires that you have a license to operate a radio transmitter. You can't just test transmitting equipment on the air without a license."



Above and on opposite page, some early DX QSLs received before World War II.





"Yes, I know that," I said. "I'm going to take the Amateur examination next week."

The next hour was one of the happiest of my life. When the visitor realized I was genuinely interested in Amateur Radio and was trying to learn, his attitude changed drastically. He invited me to visit his station and gave me some invaluable tips on how to clean up my signal and arrange the equipment for maximum operating efficiency. I'll never forget him and his help. His call sign was W6KEX. He was about 10 years older than I and had a really up-to-date station for those days. I have since lost track of him over the years. But Hank, if you're reading this, thanks a meg for your inspiration and help.

Getting the license

In 1935 San Diego had no FCC field office. The nearest examination point was in Los Angeles, some 130 miles north. So one morning in early January I headed for L.A. I had about $5.00 in my pocket, and high hopes. The morning was miserable — rain and wind. I walked down to the highway and started hitchhiking. I arrived at the FCC office in the Reeves-Strong building in downtown L.A. late in the afternoon. Art Linden was the FCC officer. I filled out the forms and took the code test. No problem. Then I completed the written exam and headed back home.

After a month of waiting, it arrived — my Amateur Radio license. DX, here I come!

That first DX contact

It's difficult to put into words the thrill of a first radio contact with an overseas Amateur. After I received my license, I spent many hours working stations up and down the state of California. I even managed to work some fellows as far away as Louisiana — all on 40 meters with 25 watts. But I really wanted a contact with a station outside the United States. I'd been bitten by the DX bug.

One morning in March, 1935, I was listening on 40 meters just before leaving for school. The band seemed to be in fairly good shape. It was early — about 6 AM. I tuned my TRF receiver carefully from the bottom of the band. Then I heard a weak station sending CQ. It was J2LU. I called him, three-by-three.* Seconds later I heard my callsign. Got him! My very first DX contact. I went to school that day and ran five miles around the track. I turned in homework that had been due for weeks. I even went to the glee club class. I was exultant!

QSL cards

To qualify for the DX Century Club, sponsored by the ARRL, or to qualify for any DX operating award, you must submit QSL cards confirming contact with the DX station. There are various methods of obtaining these confirmations. Most foreign countries operate QSL bureaus that handle QSL cards from overseas Amateurs. Often you'll find that a foreign Amateur will ask you to "QSL via bureau." Sending and receiving QSL cards via the bureau is a good method, but has its limitations.

Over the years I've found that the best way to get a QSL card confirmation is to send the foreign ham your card, properly filled out with the date (GMT), time (GMT), your name and address, and a self-addressed envelope with sufficient return postage, either International Reply Coupons or the equivalent in United States currency.

The self-addressed envelope is important, because foreign hams receive many, many QSL cards from U.S. Amateurs, so the burden of addressing envelopes becomes too much work. Often the foreign ham will send your card to you via the bureau, even though you've sent sufficient return postage. The reason: he simply doesn't want to fill out the return envelopes.

Other tricks are useful in obtaining QSL cards from foreign hams. Hams are hams, throughout the world. When you work a foreign ham, you'll probably exchange names, signal reports, and locations. But realize that the fellow on the other end of the DX circuit is a fellow human being. He has a family, he has problems just as you do, and he really wants to reach out to you. If you're really interested in knowing a certain foreign ham personally, try the following. It has never failed me, and I have a lot of letters and QSL cards to prove it.

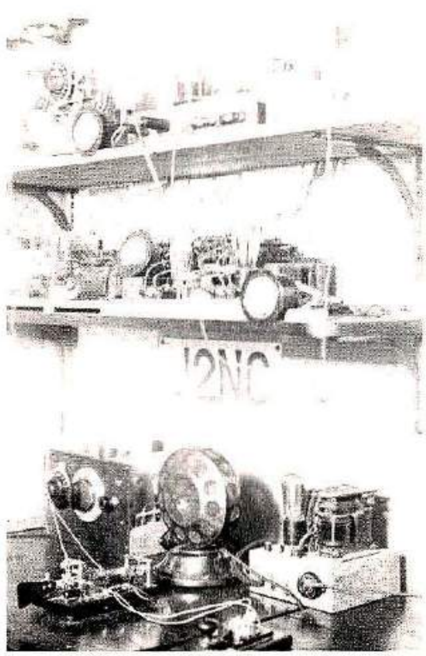
Tips on increasing QSL returns

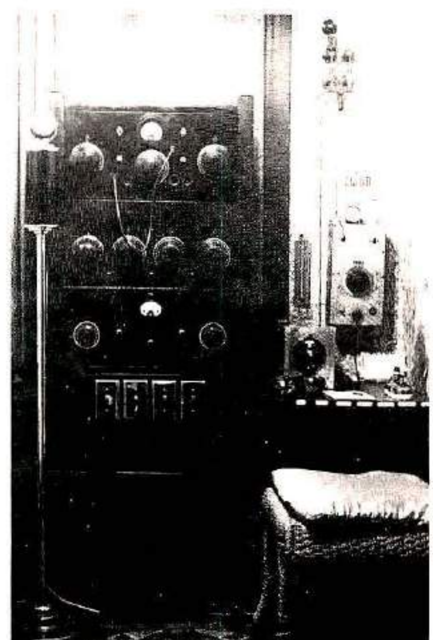
Most U.S. hams buy a batch of printed QSL cards from dealers specializing in these items. You can spend almost any amount you wish and obtain exquisitely printed four-color cards with a photo of your station and yourself. Nothing wrong with that, of course. But I've found that a little innovation in designing your QSL card really pays off when you're interested in increasing your QSL returns from foreign Amateurs.

I'd recommend two articles in this regard.[1,2] Reference 1 shows how to make personalized QSL cards using readily available materials, and reference 2 points out the principles of good design. The idea is to come up with a card that is a notch above the run-of-the-mill QSL card for obtaining returns from foreign stations.

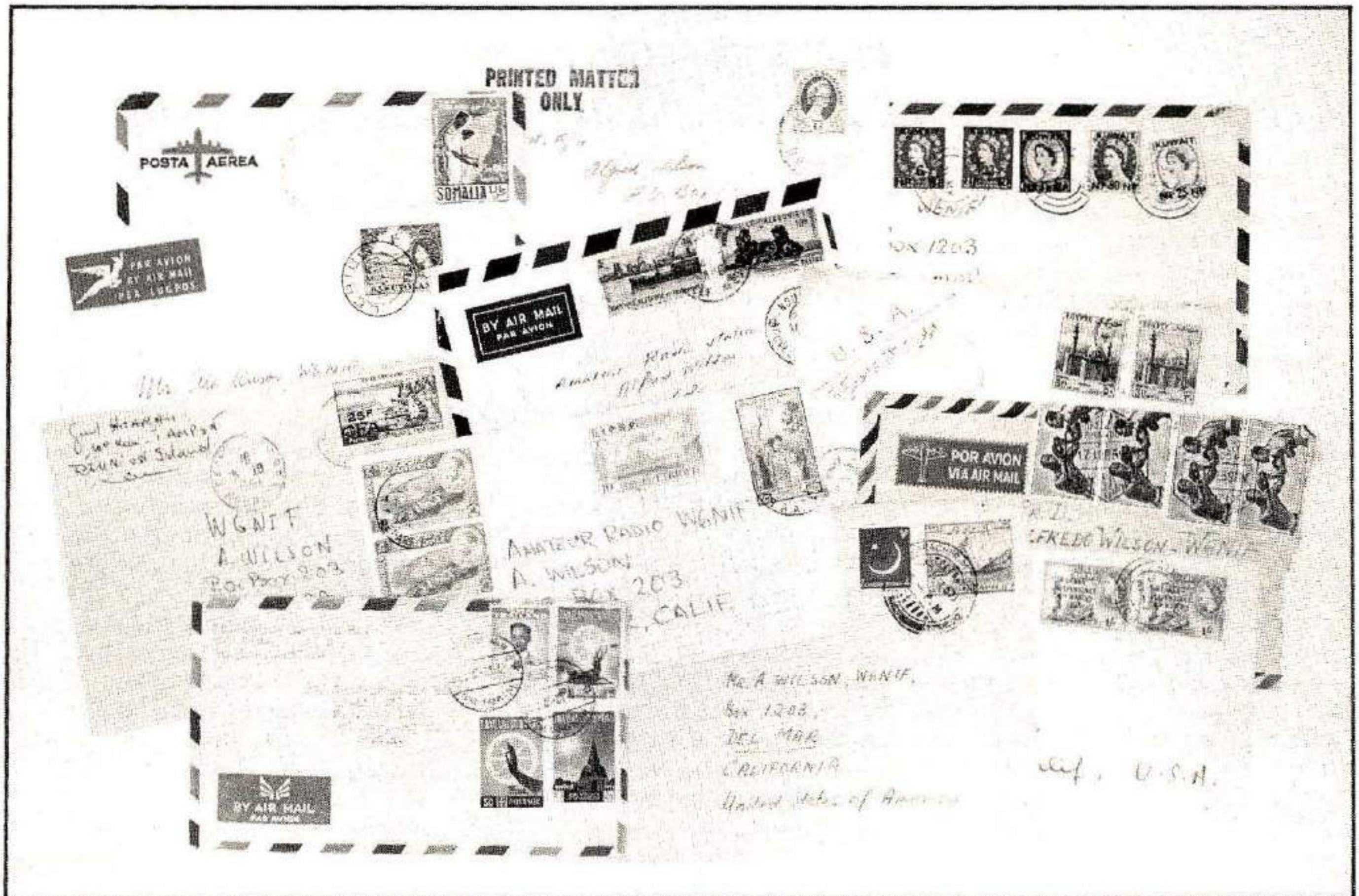
You can have a batch of printed cards, using the

Photos of DX stations received by the author during the early 1930s. The station of PY5VN in Venezuela is at right, ZL1BR's layout is at bottom left, and at lower right is J2NC's station in Tokyo. All of these photos were received with QSL cards together with personal letters and envelopes containing rare postage stamps.





*"Three-by-three" means calling the station three times, followed by your call sign three times.



Some stamps received from overseas Amateurs on envelopes containing QSL cards. If you're into stamp collecting, this is a good method of accumulating specimens.

standard QSL format, for contacts within the U.S. But your secret weapon for obtaining replies from exotic foreign stations is to have a small batch of *personalized* QSLs, preferably homemade. Remember that foreign Amateurs in rare spots get U.S. QSLs by the basketful. If your card is unique, and if you've included a self-addressed envelope with sufficient return postage, your chances of receiving a reply will be greatly enhanced. Don't forget to include a personal note, in your handwriting, on the card. If you send a photo of yourself or your station, the odds of a quick reply are increased. Thus, you can be ahead of the competition.

Stamp collecting

Over the past 43 years of DXing I've collected something like 2000 envelopes with foreign stamps. (I never throw anything out.) I'm not a stamp collector, but I'm sure that at least some of the foreign stamps are valuable to knowledgeable philatelists. I keep the envelopes in a special place, free from humidity, mice, and insects.

Some of the stamps are from countries no longer in existence, such as former African countries. Someday I'll take inventory of the batch. Who knows, maybe they will be worth something. If you're interested, drop me a line and I'll be glad to send a list of my stamps. The stamps are still on the original envelopes received from Amateur Radio stations many years ago.

Competition — high power, low power

Working DX during a contest is much different from casually chasing DX stations on a daily basis. In contests, if you're limited to low transmitter power, you must use certain tactics. I've tried some experiments to determine just how important transmitter power can be when chasing DX during a contest.

I have a control on my transmitter that allows me to vary transmitter power from a few watts to the full legal limit. During one popular DX contest I first tried working foreign stations with full legal power. I did fairly well, considering the competition. Then I decreased transmitter power to about one-fourth the legal limit for comparison. Aha! — it's a whole new ball game.

In a fierce DX pileup with hundreds, even thousands, of U.S. hams calling a foreign station, the sound is unbelievable. If it's your first experience, you'll probably think something's wrong with your receiver. Adjusting your agc control doesn't do any good. Turning down your rf gain control doesn't help. It's bedlam!

If you're using moderate or low power during such a situation, it's best to wait awhile before calling the DX station. That's your only alternative. Sooner or later, the number of calling stations will decrease. Then, if you time your calls and listen, chances are you'll eventually work the station. I'm not saying that you'll score in the top ten at the end of the contest, because, after all, these contests are time limited. But with moderate transmitter power, good judgment, and proper timing, you can rack up a respectable score.

Check the band edges near the end of the DX contest. Often you'll be able to pick up DX stations who are looking for contest multipliers. I've found some rare stations about an hour before contest end by carefully listening. Above all, don't give up! You can't work 'em if you don't call 'em. And, if you want that rare QSL card, heed my advice given previously. It really pays off.

An interesting sidelight — ESP

I made good friends with several hams in East Africa during the early 1950s. Conditions were great then, and it was easy to work Africa on a consistent basis, day after day. In fact, propagation conditions were so good that I decided to break the boredom of nightly DX contacts by trying an experiment in extra-sensory perception (ESP).

I made a schedule with a fellow in Ghana after discussing ESP. He and I were both interested in this phenomenon and we decided to try it out.

The idea was this: At a predetermined time, we would both listen for each other on 14 MHz. No specific frequency was stipulated. We would each concentrate on a frequency somewhere below 14,025 kHz for ten minutes before schedule time. At that time the station in Ghana would call me on the frequency he thought I'd be listening on.

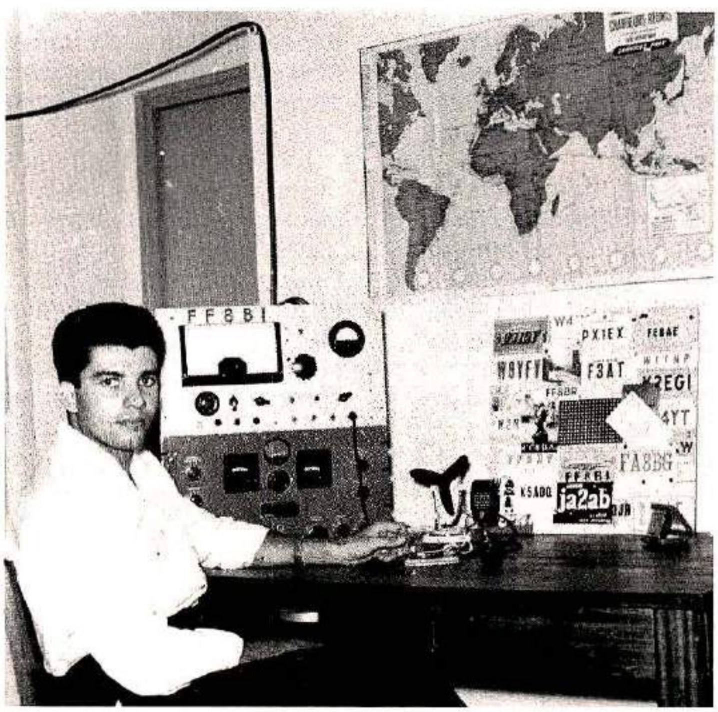
On the day of the experiment I turned on my equipment well in advance of the scheduled time. At ten minutes before schedule time I relaxed and tried to eliminate all extraneous thoughts and concentrated on my chosen frequency, 14,020 kHz, just 5 kHz below our preestablished upper frequency limit for the experiment. I was using headphones, which helped to eliminate outside noise and distraction.

I carefully tuned my receiver to 14,020 kHz, turned on the narrowband filter, and listened. Up 3 kHz; down 3 kHz. No response. Off went the filter; the receiver passband opened up about 2 kHz. Still no call from the station in Ghana. Then I started tuning upward in frequency. Still no response. Finally I started tuning downward in frequency and at precisely 14,015 kHz I heard him!

We established contact and discussed our strategy. The Ghana station had chosen 14,015 kHz and I had chosen 14,020 kHz for the experiment frequency. We had 25 kHz in which to experiment. After concentrating, we had missed each other by only 5 kHz. Not bad for a first try.

We tried this experiment over the next two months on 14 MHz. We used the entire band for our tests. I'm not an expert in this ESP field, but I must say our results were not really consistent. Sometimes we were able to establish contact within 3 kHz for perhaps two or three days; at other times we never did find each other. More often than not, over the two-month experimental period, we were about 100 kHz apart.

At any rate it was a fun experience and probably, under controlled conditions, better data could have been obtained. But whoever heard of controlled conditions on the shortwave bands?



A station in French Guinea on the African west coast. FF8BI was on 14 MHz CW during the late 1950s when band conditions were good.

References

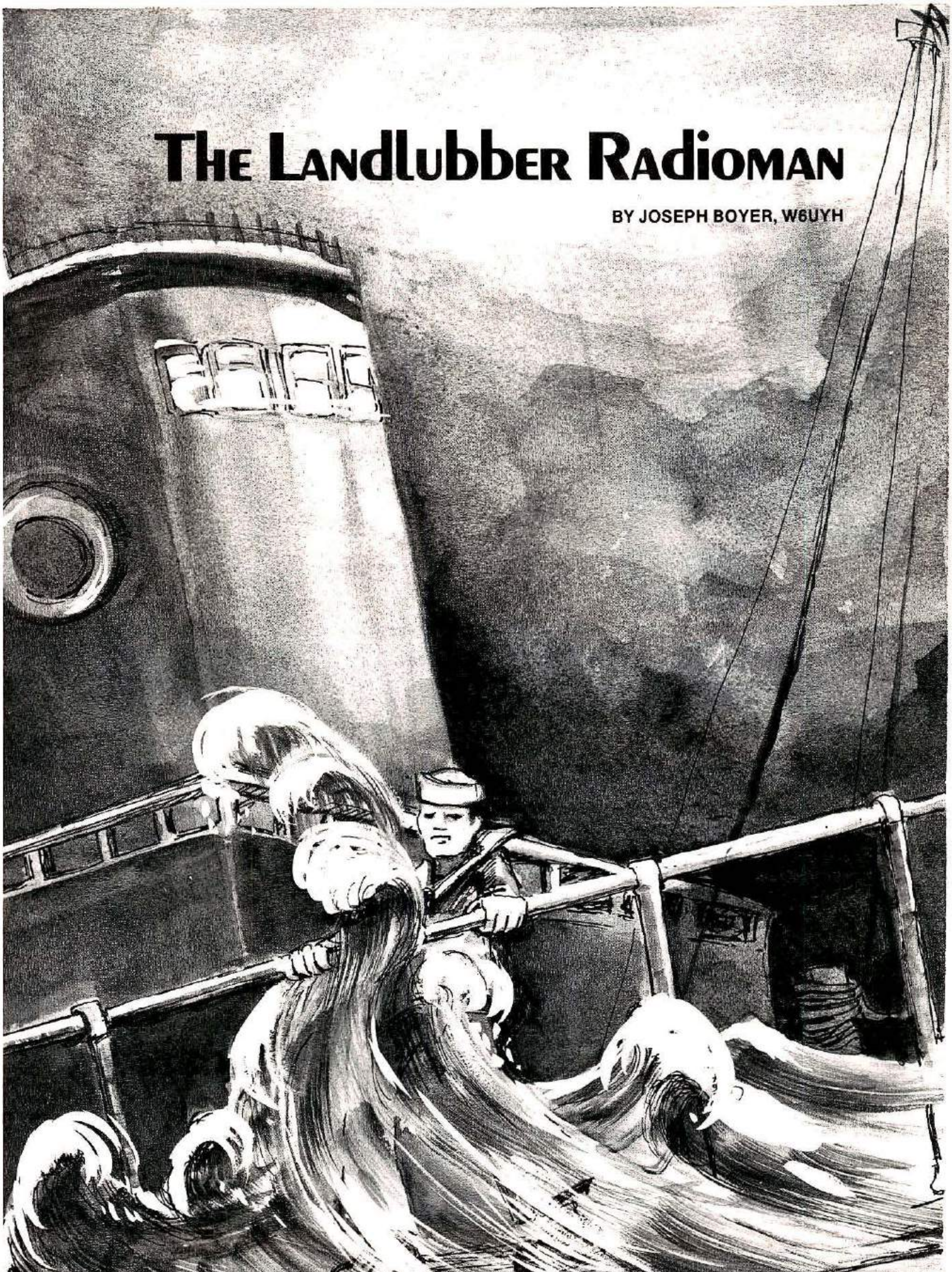
1. Alfred Wilson, W6NIF, "Personalized QSLs for Greater Returns," *73* magazine, October, 1967, pages 66-68.

2. James R. Fisk, W1HR, "How to Design QSL cards," *Ham Radio Horizons*, February, 1978, pages 12-20.

HRH

The Landlubber Radioman

BY JOSEPH BOYER, W6UYH



"Dove, Dove. This is Goldfinch. Over."

A strong a-m carrier quieted the background noise almost instantly.

"Go ahead, Goldfinch."

"This is Goldfinch. Just cleared the breakwater on routine patrol. Over."

The small speaker rattled, "Roger, Goldfinch. Out."

Andy Bark, W8PVL (before the war) hooked the mike back in place on the side of the small rig. He wrote in the *Torfin's* radio log:

8/12/42 16:10 DOVE Harbor Clearance A.B.

Just as he scribbled his initials in the "operator" column, the door in the cabin burst open. A lieutenant stood glaring at him, left foot still off the deck from the kick he'd delivered.

"You close that door, Sparks?" the officer yelled.

Bark jumped to his feet, knocking over the chair he'd been sitting on. In his confusion he started to salute.

"Knock that off," the lieutenant said, "I asked you a question."

"Yes sir, I did. Was that wrong?"

"You're a lubber, right? First time at sea?"

"Yes."

"How come you're standing watch in dress blues?"

"Just reported aboard, sir. No time to change before I got the duty."

The officer sighed. He ducked his head to pass through the entry to the radio room, then stared for a moment at the small communications set bolted to the bulkhead. Bark noticed that the man had a white scar which started under his left ear, crossed his nose on a diagonal, and ended up just short of his right eye. The weather-beaten face relaxed as the man turned to Andy.

"Yeah, kid, it was wrong. But I guess they don't teach you guys anything but dits and dahs at radio school. Take a good look at that door!"

Bark examined the structure, puzzled.

"See any kick-out panel?"

Bark wouldn't have known what one looked like, but he twisted his head in the negative.

"Okay! This tub is a Norwegian harpoon vessel we requisitioned when hostilities began. It was built for peacetime whaling, so deals like kick-out panels weren't needed. But if we just happened to take a tin fish while on patrol the force would immediately warp the hull. Every closed cabin door aboard would jam in its frame."

The man stepped over and gripped the door edge with a hand the size of a baseball glove.

"That's Norwegian maple. Hard as rock, and two inches thick. No man could break through that door if it were jammed."

The lieutenant stabbed out an arm, pointing to the porthole in the bulkhead.

"That there port is too small for even a little fella like you to get through. Sinking can take less than two minutes, kid. You'd drown in here like a trapped rat. See?"

"Yes, sir!" Bark said emphatically, and meant it. He had a very active imagination and was shuddering inwardly at the awful idea.

"Okay, then remember that. It might save your skin some day. Sorry I sounded off so strong at you. Now go on back to your dits and dahs."

"Uh . . . we don't have CW capability aboard, sir. This is only a radiotelephone system."

"Phone, schmone! Radar, hydrophones . . . all that new junk. If you ask me, that stuff just gets in the way of good sailormen trying to do a shipshape job!" He ducked his head again and started out of the cabin, then paused.

"Did the warrant bos'n make it aboard?"

"I don't know, sir."

"All right, all right . . . oh." The man turned, sticking out a hand. "I'm Larry Smith, your skipper on this hulk."

Andy felt his hand being crushed as he replied, "I'm pleased to meet you, sir. I'm Radioman Third Class Andrew Bark."

"Welcome aboard, Bark. See you at chow." The wide shoulders pushed down the companionway and disappeared. Andy sat back down in front of the rig, feeling confused.

He was worried about his new wife. After only a five-minute driving lesson he'd had to turn the car over to her unskilled hands where she'd dropped him off at the pier at Long Beach. She'd been pretty broken up about seeing him off. Silently, he prayed she'd make it back okay to the tiny apartment they'd been lucky to find in Manhattan Beach. All the coastal cities were blacked out and you had to drive with parking lights only. Even those were supposed to be painted black with just a small cross of clear glass left on the lens. Now, on top of that worry, he'd have to serve his first hitch at sea with a skipper who didn't exactly believe in electronic aids. This was going to be some cruise.

Andy simultaneously became aware of ship's motion and a funny tingling of his flesh. It was as if all the hairs on his arms, legs, and chest were trying to stand on end. The vessel was in a kind of slow rise and falling motion while at the same time rolling to port and starboard. The soles of his feet detected the deck pulsing. There was a rhythmic throbbing from the engines which he hadn't noticed before. It seemed they were working awfully hard for some reason. Andy rose and peered out the small porthole.

Dusk was just coming on, and in the dull light the sea looked like an angry landscape of dirty green hills with wind-blown white crests. Even though the radio room was up on boat deck, those waves seemed too darn close to the glass for comfort. That's all he needed now was a storm his first time out. He got up and secured the cabin door from swinging by snapping a bronze hook he found on its inner surface into a matching ring on the bulkhead so it was held as open as it could be. As he straightened from this task, a tiny man inside Andy began dropping one weighted butterfly after another down his throat into his stomach. Instinctively, he began swallowing to relieve a feeling of nausea. There was a sound of heels in the companionway. A third-class seaman wearing foul weather gear and boots poked his head in the doorway.

"Sparks, report that we're coming up on Station One. Make it sound like we really knew that. Okay?"

"What's that mean? Aren't we sure?"

"'Not exactly, but the Old Man doesn't want Dove to know that." The seaman pulled his head from the portal and was gone.

"Oh brother," Andy said to himself, then picked up the mike.

"Dove, Dove. This is Goldfinch. Over." There was some delay before the speaker said, "Go ahead, Goldfinch."

"Uh . . . this is Goldfinch. We are arriving at Station One now. Over."

"Say again, Goldfinch. Your signal's breaking up. Say again. Over."

Andy repeated the message three times, speaking slowly.

"Roger, Goldfinch. We read you that time. Wait." The carrier stayed on the air, then: "Goldfinch, we have one operational for the captain. Can you . . ." When the distant voice cut out it wasn't replaced by the sound of background static. Andy bent down and pressed his ear against the speaker grill. There was dead silence. He pulled open a drawer, took out a pair of earphones and shoved the plug into a jack on the rig. Still silence, even though he turned the audio and rf gain controls wide open.

While fighting to keep his butterfly-laden stomach under control, Andy opened a tool box, and in a few minutes was able to slide the receiver section of the rig out from the relay rack on small rails. He flipped the power switch back on and peered carefully at the tube line-up. Not a single filament glowed on the entire chassis. Grabbing a meter, Andy checked the main-line ac supply from the ship's alternator. The needle on the meter swung over to 115 volts. He quickly ran a continuity check on the fuses. The main line ac fuse was blown. But, right then, Andy became too sick to worry about the rig, and he knew he couldn't do what he was going to do while in the radio room.

Andy plunged through the open cabin door and down the companionway, making a hard right turn, and he was outside on boat deck. He made it to the rail in the darkness and, taking a firm grip on the metal, leaned over toward the sea. In the next instant he was completely submerged and felt a blind urge to start swimming. At the same time, he was amazed to feel the ship's rail still locked firmly in his grasp, even though terrible forces were trying to tear his hands free and his body was now floating in a horizontal position.

Just when he felt his lungs would burst, his knees came down hard on the steel deck and he could breathe once more. In front of his eyes he dimly saw a black mountain of water hissing away from the side of the ship. Still holding madly onto the rail, Andy pulled himself parallel to an outside cabin bulkhead. There was a safety rail running its length, and he latched onto it and made his way back into the companionway. In the intense excitement he found he wasn't sick anymore — just scared stiff. Even when he made it back to the radio room and sat down, his knees trembling from the effort — his stomach still felt okay. He suddenly grinned like an idiot; apparently a narrow escape from drowning was an instant cure for seasickness.

Andy shrugged out of his tight-fitting tunic and bell bottoms, and wrung them out as best he could into the waste basket. Hanging the blues over the top of the cabin door, he sat down in his skivvies and turned his attention back to the ailing rig.

The old excitement and curiosity he always felt when building or fixing circuits in his ham shack in Detroit, before Pearl Harbor, took over now. He flipped off the main power switch, then reached around to the back of the receiver chassis and pulled out all the interconnecting plugs there. He lifted the front of the receiver section so it unlocked from the guide rails, and placed it upside down on the operating table. He removed the bottom shield plate and let out a long whistle. This was going to be easy, he thought to himself.

One of the heavy wire leads coming from the hot terminal of the main ac fuse socket was covered with charred insulation. What looked like tar had bubbled from joints in the power transformer shield can. Somehow, either the primary or secondary winding of that transformer had broken down, causing heavy current to flow before the fuse blew. A quick reading using the ohmmeter showed a satisfactorily high resistance to ground from the high-voltage side of the filter choke and electrolytic condensers. This would be no real sweat. He'd just dig into spare parts, and replace that transformer. He smiled, thinking this would be the first time he ever had to do a job like this while sitting in what felt like a roller coaster gone wild.

Twenty minutes later Andy was still hunting through lockers in the radio room looking for the box of spare parts for the rig. Finally, he groped his way to the file cabinet and pulled out the radio-room inventory list. In the printed line for a spare parts kit, the little box alongside was empty of a check mark. Against the ship's movement, Andy literally crawled back to the chair and sat down to think. Evidently, in the rush to convert this requisitioned ship for coastal antisubmarine patrol, somebody in the fitting yards goofed by not putting a spare-radio-parts kit aboard. Andy looked up to see the skipper passing the radio room door. Absent-mindedly, Andy stepped out into the companionway.

"Sir," he sung out, "we've lost all radio communications. The two-way radio broke down, and I find that no spares were put aboard." He gulped, "With this storm and all . . ."

"Storm?" the lieutenant said, "what storm?" The slicker he was wearing glistened with water.

"Oh, I've been outside too, sir. Almost went overboard myself when I tried to upchuck on boat deck and giant waves poured over me."

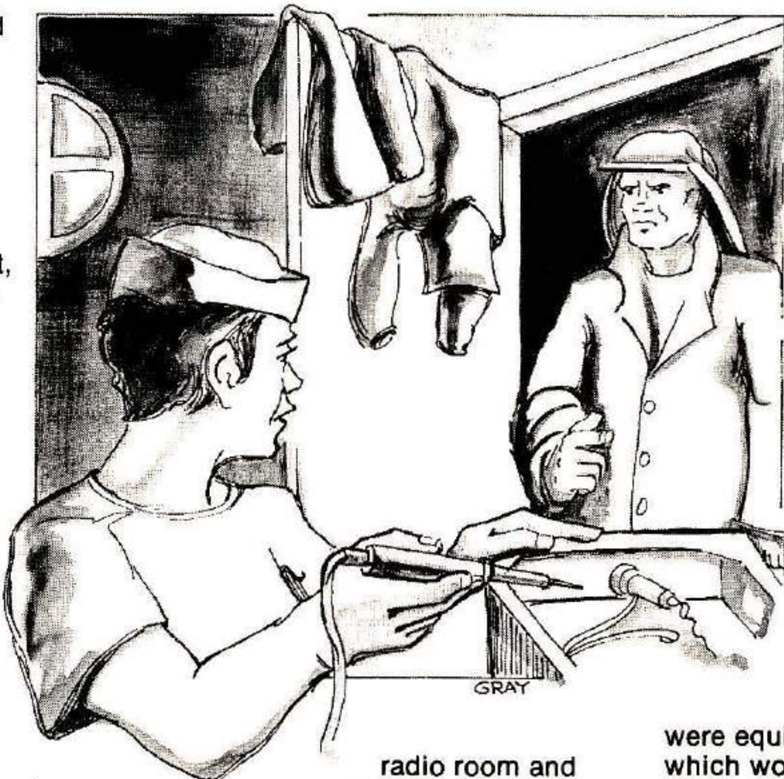
"Boy, Sparks, you are sure a lubber," Smith laughed. "These are just ground swells. We usually find them out seaward of Catalina." The skipper's grin widened as he eyed Andy from head to toe. "I see you did finally get out of those dress blues, too." Andy looked down and cringed.

"Well, I'm glad we didn't lose you over the side, but I'll have to school you later in better sea manners," the skipper said. "My warrant bos'n came aboard walking drunk, then passed out on the bridge with a kid striker at the wheel. Poor lad was too scared to blow the whistle on an officer so he just stood there steering an erratic course for four hours. Naturally, sleeping beauty didn't take a fix of position. Now heavy fog's starting to move in and we're running under solid overcast."

"But the radio, sir!"

"Nothing to worry about, Sparks. Don't need that junk anyway. You just sit tight and keep out of the way so the crew can work the ship, okay?"

Andy turned back into the



radio room and touched his uniform. It was still pretty damp, but he struggled back into the bell bottoms anyway to keep the goose bumps on his knees from growing larger. While doing this he mimicked aloud:

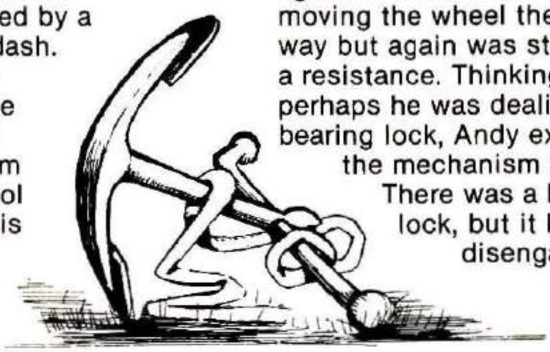
"Nothing to worry about, Sparks. Radio's dead and we don't know where we are, but don't worry, Sparks. The ship's being tossed around like a straw in a cyclone, but this isn't a storm at all, just some little ole land swells."

Brother, he thought, if this is what it takes to be salty, all he wanted now was a nice safe berth at a shore radio station for the duration. This was one ham who wasn't going to be a shellback in any way whatsoever.

Having nothing better to do, Andy began to really look over the radio room for the first time since he'd come aboard. He had seen two panels set into metal boxes on the bulkhead, but had been too busy to inspect them before. One particularly attracted his attention now because just above it, on the overhead, was what looked like an automobile steering wheel. Bending his knees and putting out his arms for balance, Andy wobbled his way to that panel. It wasn't metal. Looked like Bakelite or hard rubber. There was a seal stamped ENEMY PROPERTY pasted on the panel, but it was just paper. Engraved across the top of the panel in large letters was the word *Telefunken*. Every knob on that panel was a miniature version of the wheel on the overhead. An operator could tune this thing with gloves on.

Most of the knobs were equipped with pointers which worked against scales, filled with what looked like white paint, carved right into the panel. All control labels on the panel were in German, but he found the main tuning dial because frequency was represented by wavelength in meters. Spotting what looked like a standard phone jack, Andy inched back to the table and got the earphones. The American plug fitted the German jack perfectly. Putting on the earphones, Andy studied the beautifully made switches, each tipped with a black ball of insulating material. Most were labeled in gibberish, but, somehow, one bearing the words *UT* above and *UTLADEN* below got its message across. Andy flipped it. Slowly, the earphones came alive with background noise as the tubes inside the set warmed. He began tuning the large frequency knob.

At 993.37 meters the signal from the radio beacon at Port Arguello, California, came in S9 plus twenty dB. In international Morse the letter O was being spelled out in three dashes followed by a much longer dash. Over and over again the same message kept sounding. From his radio-school training, not his ham background, Andy was able to envision what was happening on a point of land jutting into the sea slightly northwest of Santa Barbara. The skipper had mentioned fog, and apparently it extended on up the coast to the north of Los Angeles. For many years, lighthouses had periodically sounded a fog horn to warn mariners of dangerous points along the coast. In recent years, radio transmitters had been installed at these lighthouses. At the instant the switch closed to sound those horns, a radio key was also activated to start that long dash signal he was listening to now.



Andy swung the tuning pointer up to the high frequency limit and it hit a stop. Splatter from the modulation of a standard broadcast station operating close to the 500-kcs, low-frequency limit could be heard, but the Telefunken dial calibration stopped at 600 meters. There would be no way he could use this set to copy Dove's transmissions up on 2,670 kcs, even if he could get the transmitter portion of his little rig perking again.

Looking up, Andy saw that the automobile steering wheel above him was provided with a calibrated scale from 0 to 360 degrees, just like a compass card. The thing even had a vernier so the scale could be read to better than half a degree. Obviously, the set was a radio direction finder. He reached up and tried to turn the wheel in order to rotate a loop antenna that should be mounted up somewhere above deck. The pointer moved about two degrees before coming up against resistance. He tried moving the wheel the other way but again was stopped by a resistance. Thinking that perhaps he was dealing with a bearing lock, Andy examined the mechanism carefully. There was a bearing lock, but it had been disengaged. With the lock twisted to ON, the wheel couldn't be turned at all. Well, this was very strange and quite interesting, but the set was useless for his purposes. He snapped the switch off and pulled the phone plug.

He found it much easier now to cross over to the other panel. Apparently the seas were calming down a bit out there. The second panel was also made of the same black shiny stuff, and again bore the word *Telefunken*. That's where the semblance stopped, however. Andy noticed a large switch marked with the same *UT/UTLADEN* and threw it. From below his feet came the sound of an electric motor coming up to speed. At the same time he noticed that a large needle enclosed in a meter with a brass casting case lifted slightly off its pin. Projecting out from the panel was the most amazing looking contraption he'd ever seen on any piece of electronic equipment. The main portion of this gadget consisted of a husky metal cylinder. Sticking up into the bottom end of the cylinder was a heavy-threaded rod provided with another one of those German wheel knobs. On top of the cylinder was mounted a large glass bottle. It was empty now, but clearly was intended to contain some mysterious fluid.

There was a curved metal door on the side of the cylinder, and Andy lifted the latch and swung it open. Staring at him were two opposed rods made of what looked like carbon. The upper rod was inserted into a gear which engaged a pinion. That rod must rotate about its axis when the mystery rig was operating, Andy figured. Right then, something stirred dimly in Andy's memory; something he'd once read in an old radio book in the library back home. There had been an elaborate drawing in the book of a thing which looked a lot like the cylinder he was staring at right now. He almost beat his forehead with his fist, trying to remember the answer. It's an arc, a hydrogen arc. That was it. After the demise of spark rigs, the arc was used to generate high-power rf because of the terrific, broad-band interference they put out.

That bottle, he now recalled, was for holding alcohol, which, when dripped down on the flame between the carbon tips, produced hydrogen gas. The book had said a very skillful operator could adjust those carbons so that these sets put out a pure, single-frequency CW signal. They had even been able to modulate these arcs with speech and music. Andy glanced at the frequency calibration. The dial scale started at 375 meters, in the middle of the U.S. broadcast band, and went on up to 1,500 meters. Oh well, again very interesting. Apparently nonmilitary vessels still used such archaic equipment even now, in the nineteen forties. But, it might as well be on the moon so far as he was concerned.

What else will Radioman Bark discover on this makeshift warship? Will he find a way to determine the ship's position and to communicate with the shore station? Next month's Horizons will tell the story, and the happy ending will surprise you.

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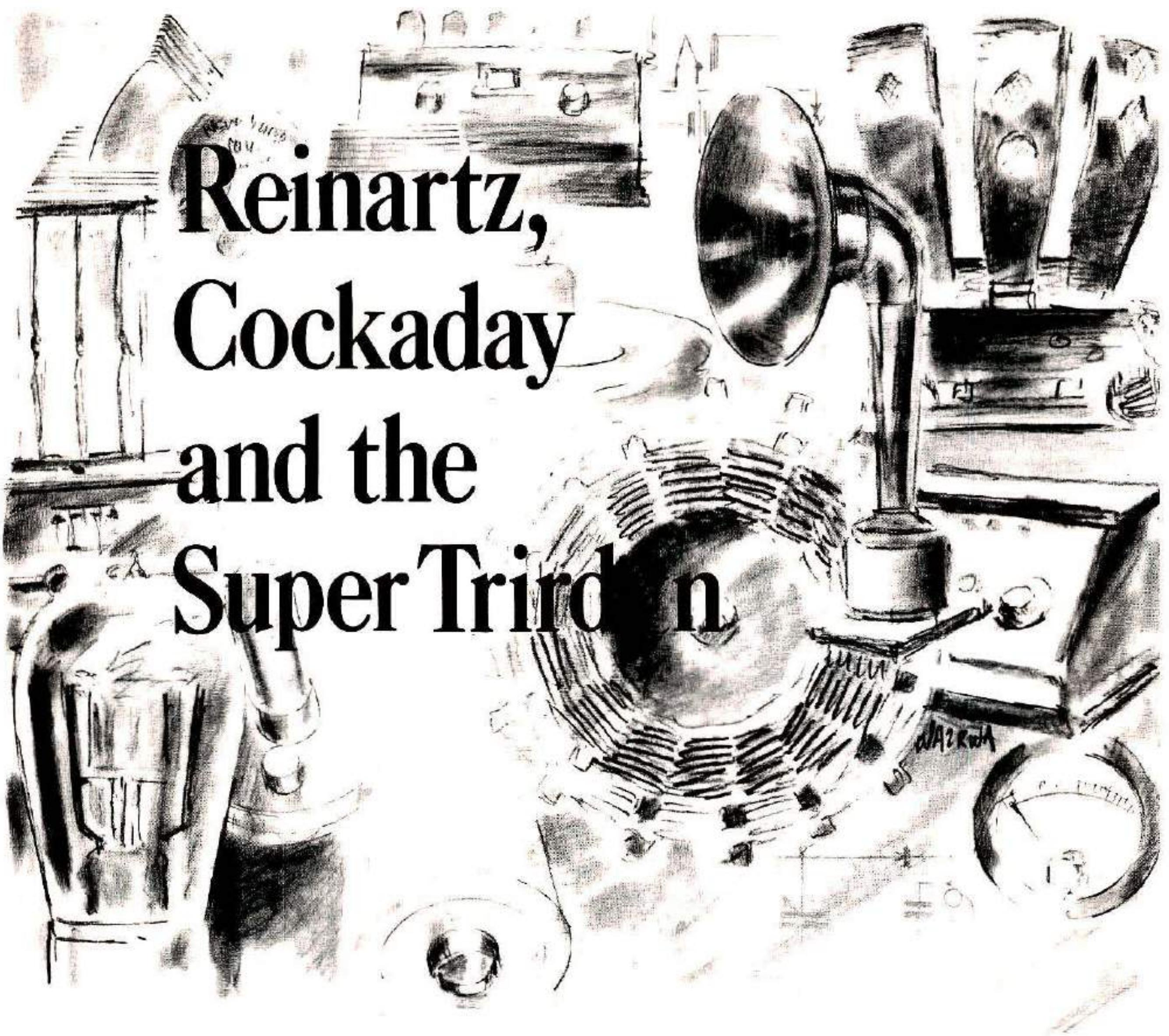


A look into history: early broadcast receivers and how Amateurs adapted them to their use

BY PAUL C. CRUM, W9LC

Most Amateurs who've joined the ranks since 1930 will wonder why a story on the development of the radio broadcast receiver would be of interest. This may be particularly true of those who've been licensed since 1970. With the world full of ICs, microprocessors, and transistors, it may seem that such an article would be an excursion into ancient history. But to many of those who lived through the early days of radio it seems that only a knowledge of "where we've been" can establish a basis for understanding the developments that came later.

This is a history of the development of the early tube-type radio broadcast receiver. It describes how these early sets evolved into Amateur-band receivers and presents some interesting sidelights on how the problems associated with early communications receivers were solved by pioneers with ingenuity and perserverance.

The close ties between amateur radio and broadcasting during the early 1920s are illustrated by the fact that radio receivers, both commercial and composite, were designed to be used in both services. For example, an ad for the 1922 Tuska Type-222 Standard Receiver, "Wavelength 150 to 800 Meters," claimed: "It is recommended for the beginner or semi-experienced operator who desires a high-grade complete outfit for radiophone or C. W. (*sic*) and spark code reception." Many years passed before receivers were marketed that were designed primarily for Amateur service. And the earliest of those were designed also to be used on the broadcast band.

The tuned circuit

Many of the early discoveries have survived and are still in use. The superheterodyne is an outstanding example of these. Although its oscillator may be tuned by devices other than large variable capacitors — conceived of sixty years ago — the superhet is still with us and probably always will be. Many other early developments occurred in amateur radio or were due to the work of amateurs. For instance, the system of tuning transmitting and receiving circuits to resonance was developed by amateurs. Originally, transmitters were completely untuned; their frequencies were determined by their antenna-circuit characteristics.

Commercial manufacturers were slow to incorporate new ideas into their equipment. They continued for some time with untuned circuits. It was believed at that time that the longer wavelengths provided greater distance communications, thus Amateurs began to add coils in their transmitter antenna circuits to increase the wavelength. Amateurs also discovered that optimum results could be obtained by varying the inductance, when it was used in receiving circuits, to resonate their receivers with the transmitters to which they were listening. This was first done with a sliding contact on the coil wire.

Although many feel that tuning didn't arrive until 1908, tuned circuits had been used in a number of instances before that date. A Clapp Eastham loose coupler in my collection bears a Marconi Company patent notice dated 1903. As with many other ideas (the superheterodyne, for instance), the theory was known a number of years before it came into practice. In a few cases untuned transmitters were used much later than this. My collection includes a portable spark transmitter that was used in the trenches during World War I in which no tuning whatever is used. The antenna was connected directly to one side of the spark gap and the counterpoise was connected to the other side.

The Amateur and broadcast radio

Early Amateurs are familiar with the development of the radiotelephone, which appeared in 1906, and with the completely unorganized legal tangle that was "early radio." In fact, the earliest broadcasting was by Amateurs, and a few commercial stations that had radiotelephone capability, for the amusement of themselves and their rather limited audience.

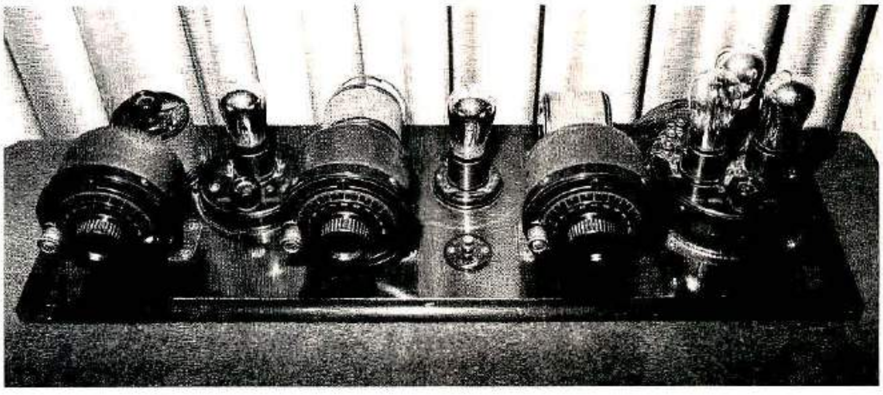
Dr. Lee De Forest was one of the very early broadcasters. He transmitted program material in 1910. Members of the *Radio Club of America* used an arc radiotelephone to broadcast music to the fleet in the Hudson River in 1911. Although several stations claimed the honor of being the first to broadcast regular entertainment, it's believed that the first to do so on a regular basis, similar to present-day organized broadcastings, was Frank Conrad at Station W8XK. He began transmitting music rather than code on November 2, 1920.

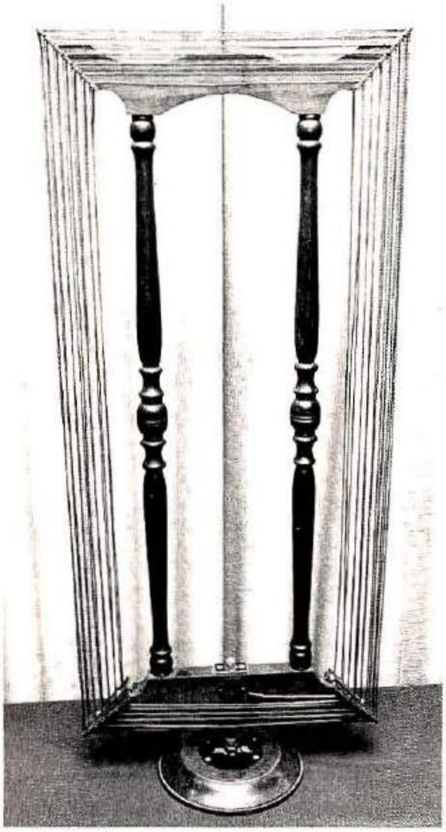
The system of transmitting program material that came to be known as broadcasting burst upon the American scene within a very short period. During the latter part of 1921 hundreds of radiotelephone stations were broadcasting music. These included innumerable Amateur stations. On any given evening, one could meditate to the soft strains of *Sweet Hour of Prayer*, or be regaled by *Who Put the Overalls in Mrs. Murphy's Chowder*. In January of 1922 the Department of Commerce, which was the agency regulating radio at that time, temporarily amended Paragraph 57 of its regulations to forbid the broadcasting of program material by Amateur stations.

Pertinent to the discussion of the development of radio broadcast receivers is the fact that, at that time, all broadcasting stations were limited to a wavelength of 360 meters for entertainment material and to 485 meters for market reports and weather forecasts. A short time later The National Radio Conference assigned broadcasting stations wavelengths between 310 - 435 meters. This rather narrow range explains the somewhat restricted tuning capabilities of some of the receivers discussed later.

Broadcast transmitters of the period were extremely simple in design and operation. Many operators at these stations used them for both services. After the broadcast station signed off, their transmitter frequency was shifted to the Amateur band, and the station transmitter became the transmitter for Amateur

Atwater Kent 5-tube broadcast receiver — the famous breadboard (1924).





Bodine-Chicago loop antenna. Does your TV set use "rabbit ears" for an antenna? Here's its grandpa, used by many early broadcast listeners in the 1920s.

operation. Usually this required no more than retuning the tank capacitor of the self-excited oscillator, which was the rf transmitter section, and possibly retuning the antenna slightly.

The regenerative receiver

As mentioned earlier, receivers were often designed for, and used in, both services. With the coming of CW, receiver requirements became more stringent than they had been for receiving spark signals. This was because it was necessary to have regenerative receivers in an oscillating mode to copy CW signals. Their tuning was, of course, very sharp in this mode. This problem was further aggravated by the instability of amateur transmitters of the period. Large amounts of frequency drift were common, and short-term frequency shift was pronounced because of varying line voltages and power supplies with poor regulation.

The inventors. Mention of the regenerative receiver requires including two of the real giants of early radio — and how their paths crossed in an unhappy manner. Although the basic information given here has been covered many times in many publications, it's surprising that one aspect hasn't been often discussed.

Dr. Lee De Forest, of course, made the whole area of vacuum-tube receivers possible with the invention of the triode tube. The entire industry was founded on his discovery. Major Edwin Armstrong was the other individual whose contributions to early radio were of enormous value.

Major Armstrong is generally credited with having discovered, while a student at Columbia University, the principle of regeneration. He was issued a U.S. patent for this discovery on October 6, 1914. Not often mentioned is that Dr. De Forest, while working on telephone circuits, also discovered the regeneration principle; a sketch of his circuit appears in his notebook of 1912. At almost the same time (although probably slightly later), young Armstrong discovered this principle and set about using it practically.

Long and bitter litigation followed. This litigation resulted in the appellate court in Washington ruling in De Forest's favor in 1924.

In attempting to evaluate the merits of the work of these two men it seems to me that Dr. De Forest actually discovered the principle first, but with equipment operating at audio frequencies. He didn't do much to put it into practical use. Armstrong's work was with equipment operating at radio frequencies where it would have practical application. Armstrong applied the principle to both transmitters and regenerative receivers.

Some regeneration was automatic in early triode tube rf circuits because only enough in-phase feedback to overcome the internal resistance of the circuits is required to make such an amplifier oscillate. Although this is automatic to a degree, Armstrong's discovery of the practical principles of regeneration made possible oscillators that were both more vigorous for transmitters and controllable for receivers.

Taming the regen. Regenerative receivers were very sensitive but had two serious faults. The first was that they were effective radiators, which caused great interference to other radios in their neighborhood. This was particularly annoying when they were tuned to a station to

Early receiving tubes: UV201, WD11, CX12, UV199 and UX199. Filaments were operated from storage or dry cell batteries, which were sometimes camouflaged in a varnished wooden box mounted beneath the radio set.

which someone close by was already listening. The second fault was their critical tuning. They whistled if in an oscillating condition when tuning in a station. Additional arresting effects were produced if, after having been tuned to zero beat with the desired station, tuning began to drift. First announced by a low gutteral growl, the pitch soon rose to a high squeal as the drift continued. Quite a variety of outside influences might trigger such a receiver into this undesirable condition. These ranged from body-capacitance effects, produced by moving one's hand in relationship to the oscillating circuit, to changes in the antenna circuit.

Of the several systems that were used to control regeneration in early broadcast-band regenerative receivers, the most common used a "tickler coil" in the detector plate circuit. Various combinations of cylindrical, honeycomb, and spiderweb coils were used in making tuners, which included this coil in their construction. In some circuits, a variometer was included in the detector plate circuit, as in the popular "one-variocoupler, two-variometer" circuit. This form of regeneration was effective and provided smooth control. The next most common control was a potentiometer, sometimes in the plate but usually in the screen of the detector tube, to vary its voltage. The control in the screen of the early National Company SW-3 receiver detector was known to all hams.

Development of the regenerative circuit. The use of the regeneration control in early receivers made it possible to use them in an oscillating condition to copy CW or, in a nonoscillating condition, for broadcast reception, which permitted tuning without the annoying squeals. Since many early receivers used some form of plug-in or tapped coils to cover a wide range of wavelengths, it was desirable for hams to have receivers for both services.

A form of "double regeneration" is of academic interest but didn't attain wide use. It was promoted by the Buell Coil Company of Chicago. In this circuit, a regenerative rf stage was used ahead of the regenerative detector. By keeping regeneration below the point of oscillation, great amplification could be obtained.

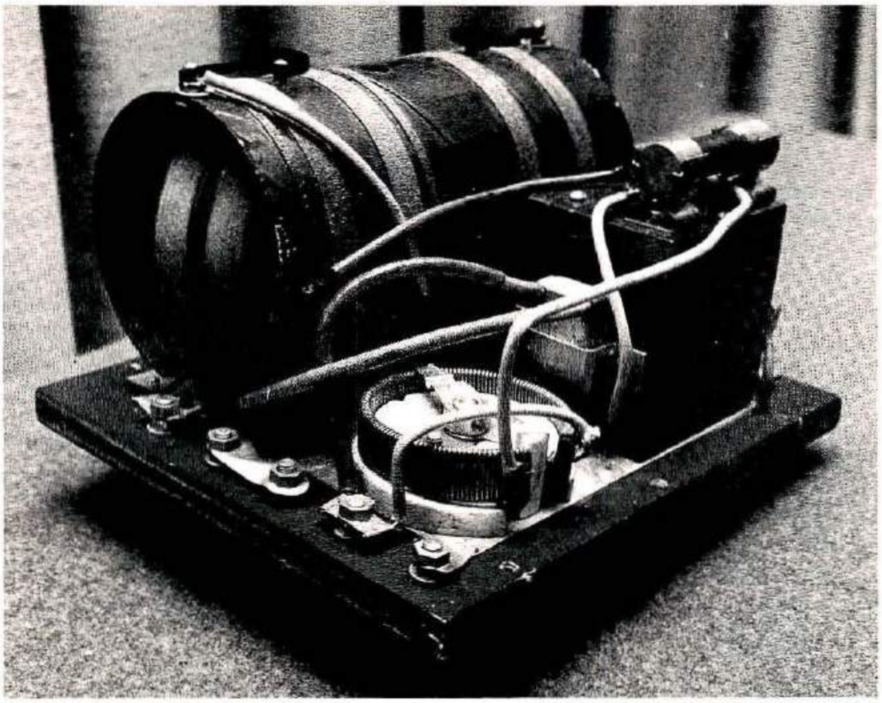
Another circuit, which unquestionably was the invention of Armstrong but didn't attain much success in broadcast receivers, was the super-regenerative. This was the accepted circuit for early vhf reception. It had excellent sensitivity but barn-door selectivity, which was an actual benefit in copying the self-excited oscillator vhf phone rigs of those days. I used it in an early 5-meter transceiver during the 1930s.

Aerola Senior 1-tube farm set (*circa* 1922). Packaged in a beautiful walnut case, the set boasted "portability — easily carried about — put into operation in just a few moments."

Variable capacitors (or "condensers") for tuning the receiver. In the background are an early "low loss," straightline plate, and a 1914 Murdock 43-plate. A small variable used in today's tube-type superhets is shown in the foreground for comparison.

The first regenerative circuit specifically designed to provide receiving stability for CW in the Amateur bands was designed by John Reinartz, which made him famous in early radio circles. Although it could do nothing about the undesirable features of the transmitters, the circuit provided at least a partial solution to the problem of unstable receivers. A broadcast-listener public, somewhat gadget-happy in orientation and seeking new ideas, embraced the Reinartz circuit. Components for this circuit were widely sold in kit form, almost always with a spiderweb coil that was used as the inductance.

Probably the second most popular special regenerative circuit for the broadcast wavelengths was the Cockaday. Designed by Lawrence Cockaday, this circuit claimed great selectivity. In an unusual arrangement, the antenna was coupled by a one-turn coil to another coil, which was in turn inductively coupled to the detector grid. It provided a sort of cascaded tuning for greater selectivity due to the semi-



Rear of Aerola Senior showing inductive tuner and rotor construction. Rheostat controlled filament voltage.

aperiodic tuning, and the antenna length had little effect on the tuning — as opposed to most other circuits in use at that time.

The rf amplifier

Radio-frequency stages, frequently untuned and providing little gain, were sometimes used ahead of the detector to prevent radiation from regen receivers. These stages were later tuned and provided enough gain for usable sensitivity without resorting to regeneration.

Taming the rf stages. The main problem brought about by adding rf stages was to make them nonoscillating. Atwater Kent was one of early radio's most successful showmen in this regard. His company began by making components. But he hit on a circuit idea that established him as one of the leading manufacturers of the period. Recognizing the fact that an amplifier will oscillate if it has sufficient feedback and enough stage gain to overcome internal circuit resistance, Atwater Kent placed fixed resistances right at the rf-amplifier grids. The resistances were just large enough to reduce stage gain to prevent oscillation. Sensitivity was low, however. These sets were popular for their ease of tuning and freedom from squealing.

Neutralizing. Before the advent of the screen-grid tube, which made nonoscillating rf amplifiers possible, the method of preventing oscillation was "neutralizing." Professor L. A. Hazeltine found that it was possible to eliminate oscillation in the rf stages by using a small capacitance approximately equal to the internal capacitance of the tube in an rf stage, and a small amount of inductive feedback phased to balance the feedback in the tube and its circuit. Some of these receivers were very hot. Among sets in my collection, a Fada 5-tube Neuterodyne is extremely sensitive.

An aligning procedure used in these sets is interesting. A tube with an inoperative filament was inserted into the socket of the stage to be neutralized, and a small neutralizing capacitor was adjusted for minimum feedthrough signal from a test oscillator to indicate neutralization.

The Reflex circuit

In the early days of radio all sets were operated from batteries, so economy of A, B, and C batteries was an important consideration. Many systems were tried to reduce battery consumption. A few used rf amplifiers feeding a crystal detector followed by an audio amplifier. Because of sensitivity loss, the only real benefit from this circuit was the elimination of the tricky regenerative detector with its squealing. It was never used extensively.

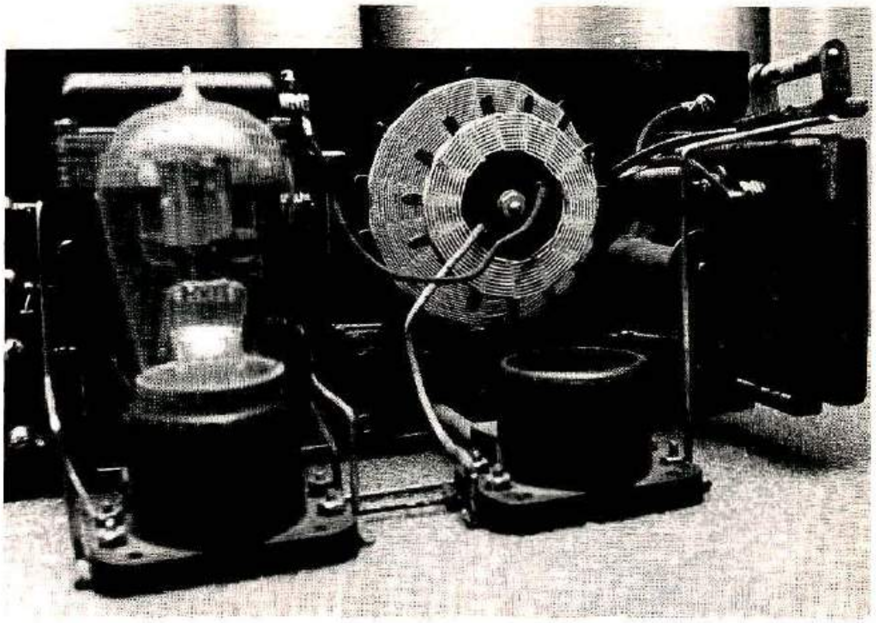
One circuit, called the Reflex circuit, became rather successful. In this circuit the number of tubes was reduced by using the same tubes for both rf and audio amplifiers. Crystal detectors were used in early models, but vacuum-tube detectors soon replaced them. The innovative Crosley Company produced a three-tube model, called the Trirdyn, which combined *both* regeneration and reflex principles. This set was very sensitive and had smooth regeneration control, which made it very popular.

Since practical fixed-crystal detectors were not available until the start of World War II, the difficulties produced by the crude models of that time can be imagined. As with all other such detectors of the period these required frequent adjustment and were erratic in operation.

The superhet

The superheterodyne was the culmination of years of experimenting to find the ultimate circuit for receivers. As mentioned earlier, the principle of the superhet was developed by Major Armstrong while in France during World War I. It didn't gain wide acceptance for several years and became popular, for those who could afford it, in the early twenties.

The principle of gang-tuned rf stages had not yet been developed, so the local oscillator and mixer circuits were tuned individually. No rf stages were included ahead of the mixer mainly for the same reason. The oscillators in early supers were powerful radiators. Without preselection they caused great interference to neighboring listeners. Partly to reduce this interference and partly because supers were thought to be sensitive enough not to require outdoor aerials, indoor loop antennas were usually used. Very low frequencies were always used for intermediate frequencies. The image response on the 10-meter Amateur band of an i-f system operating below 100 kHz would be interesting to contemplate! The i-f transformers were gigantic and were strung along the chassis rear in an imposing row. They combined to make a super of that period a device wonderful to behold.



Rear of Crosley model 51 economy 2-tube set showing booktype variable capacitor, spiderweb coils, and coupling-varying system.

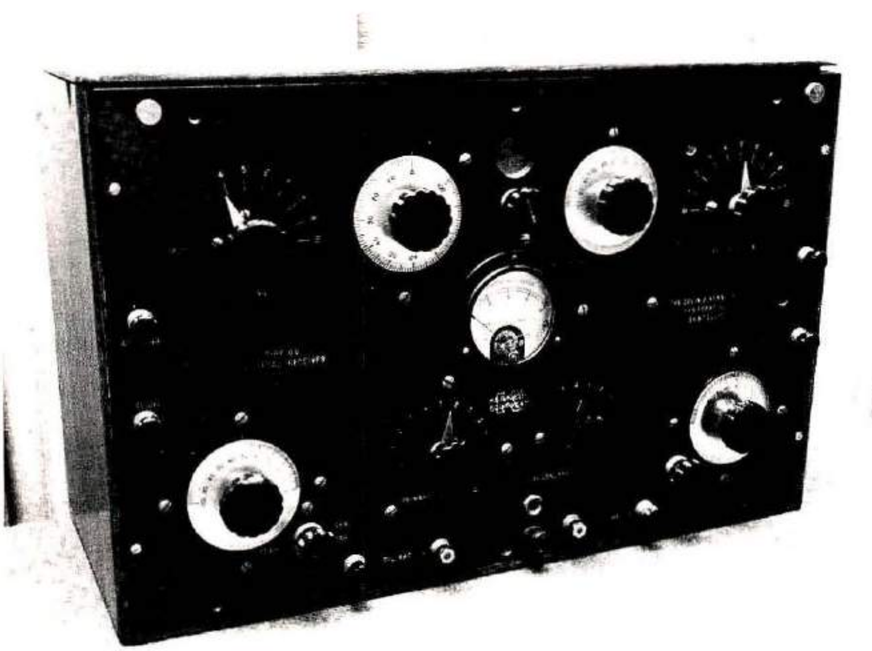
Tuning problems. Before ganged tuning had been perfected it was necessary to tune the capacitor of each stage individually. Standard practice was to tune the detector stage until the signal was audible then peak each of the two rf capacitors. Ganging, which makes possible today's standard practice of single-dial tuning, was done by splitting the end plate of a variable capacitor into several sections. Each section was bent to increase or decrease the overall capacitance at several spots on the dial. This made tracking with other stages in the set possible.

Although this system was simple in theory and worked rather well in simple examples, it often became difficult to implement. The greatest period of drudgery in my rather varied electronics career was that spent at "aligning and gain testing" at the old Grigsby Grunow plant in Chicago. It was here that the set called "The Mighty Monarch of the Air" was built. The set on which I worked fell somewhat short of attaining this proud classification. It was a very hastily designed four-tube multiband receiver. The multiplicity of bands, combined with less-than-perfect components from which it was constructed, made aligning the tracking and sensitivity at the low end of the broadcast band a job requiring a combination of genius, sheer luck, and help from the Almighty.

Early tuners and inductances. Rear row, left to right: Atwater Kent variometer, three-circuit tuner, De Forest three-coil mounting and honeycomb coils, and Atwater Kent variocoupler. Front row: Plug-in coil from National SW-3 and basketweave low-loss coil for the rf stage of a tuned radio frequency set.

Early tubes. Battery voltage drops as batteries approach discharge. Therefore, tubes for these early sets were designed with rated filament voltages lower than the rated voltage of the batteries from which they were to be operated. This permitted using storage batteries for filaments until they were almost discharged. Commonly, "6-volt" tubes were actually rated to be operated at 5 volts. These tubes were designed to be operated from 6-volt storage batteries, standard in most automobiles at the time.

The two receiving tubes



The classic Colin B. Kennedy model 110 receiver (*circa* 1922). It covered 175-25,000 meters. A 2-stage audio amplifier was also available. The set was a magnificent example of the craftsmanship used in those days. A mint-condition model 110 would command a very substantial price today.

commonly used in the earliest days were the UV200 and the UV201. They consumed a full ampere of current on their filaments. While producing a modest amount of sound, these tubes produced a large amount of light, which illuminated early sets quite dramatically. To obtain full eye value from the receivers, screened circular holes, covered with a fine wire mesh and rimmed with bright metal rings, were used in the front panels of the more expensive sets.* These were called bezels and were stocked in all radio parts stores at the time. In my collection both the Kennedy 110 and the Federal 59 have bezels 25.4 mm (1 inch) in diameter, while the RA-DA Tuner Amplifier has a single large one 51 mm (2 inches) in diameter.

The UV201A detector-amplifier tube appeared during the spring of 1923. It greatly reduced filament current, operating at only 0.25 ampere. This tube was the standard of the industry for several years. Its introduction made possible the use of multitube sets such as the 5-tube tuned rf and the superheterodyne. Dry-battery tubes to supply the radio needs of countless farms, which had not yet obtained a-c power, appeared in 1923. The first, a WD11, was operated from a single 1-1/2-volt "telephone" battery. Its filament was rated at 1.1 volts and drew 0.25 ampere. RCA used thousands of these tubes in a series of sets designed for the farm trade.

Originally a one-tube set, the Aerola Senior, used this tube. The receiver came in a beautiful walnut case with the panel flat-mounted on its top. It looked as if it had been lifted from a physics laboratory. It had a protective lid, which could be lowered, and even had a picture of the set in the lid to show how to connect it to its accessories. An early Montgomery Ward radio catalog listed this set as being "portable." It stated that the set was so compact and light in weight that it could "easily be carried around, and because of its simplicity, it could be set up and put into operation in just a few moments."

The ad emphasized that one had only to use a "dry telephone battery, a B battery, a pair of headphones, and an antenna outfit" to make up the entire set. Although touting it for outdoor recreational purposes, the ad did not mention how a hundred people on a picnic could listen to it at one time on headphones or how the aerial was to be erected when using it in a canoe. Later models of these sets were called Radiolas. Their familiar Model III, a two-tube set, and the Model III-A with four tubes, and a push-pull audio output stage, brought radio to thousands of farms.

Variable capacitors

They were always called condensers in those days and came into service during the early 1900s. A Murdock 23-plate variable in a round transparent case with Bakelite end plates in my collection dates from 1914. Machinery to build variable capacitors was intricate and expensive, so various methods were tried to avoid using factory-built variables. Unassembled variables were sold, affording a tangible saving to the builder. Since I ranked very near the bottom of the economic ladder in those days, my first variable capacitor was so constructed.

The Crosley Company was to early radio what Ford was to the early automobile industry. Their sets were designed basically for economy, although later more elaborate models were made to sell at higher prices. One innovation the Crosley Company used in their lower-priced sets was a "book type" variable capacitor. It was a model of simplicity

*That's right. And when the tube filaments seemed to be dimmer than usual, you got out the old Tungar battery charger to breathe new life into the storage batteries. It was important to have the set working, especially on Saturday night, so you wouldn't miss Milton J. Cross in Aeolian Hall at WJZ. Those were the days. **Editor.**

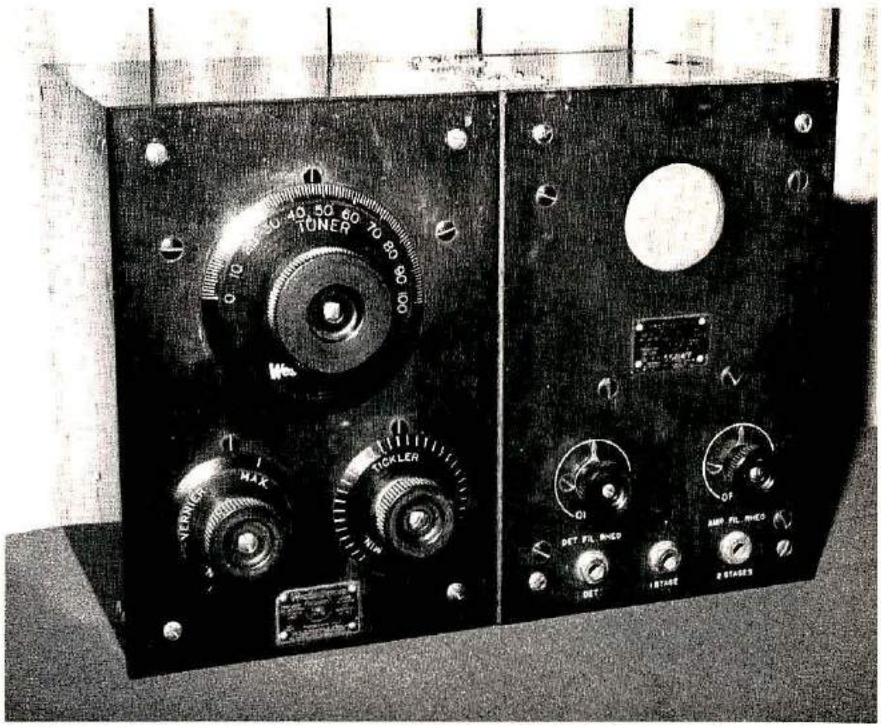
and bore no resemblance to current variables. Earlier models were made of wood, but later models were made of a composition material. It had one fixed vertical frame holding a copper plate. Another hinged plate held a second sheet of copper. A cam on the end of the shaft that extended through the panel to the dial caused the movable plate to alternately clamp against the stationary plate, then move away from it, thus varying the capacitance. The overall capacitance was increased by the simple expedient of having a sheet of mica between the two plates. It was advertised as being "usable for even low-power transmitters."

Variable capacitors in those days were sometimes very large. My Kennedy 110 uses two gigantic capacitors with plates 102 mm (4-inches) in diameter and assemblies 178 mm (7-inches) in depth. The capacitor has two groups of 11 plates on each shaft. To balance their weight they are divided with their plates 180 degrees from each other.

The grouping of stations at one end of the dial was later resolved by changing the shape of the rotor plates from semicircular to one with the tips of one end of the rotor plates projecting farther from the center. These were first called "straightline wavelength" capacitors; later they were called straightline frequency capacitors.

The variometer and other early inductors

With the coming of the broadcast era, except for occasional crystal sets, the slide tuners and loose couplers that had been the standard tuners of earlier radio were abandoned for more sophisticated and elaborate tuning systems. In the days of regenerative sets these tuners usually took the form of variocouplers or variometers. Both of these used a coil that rotated inside a larger fixed



Radiola (Westinghouse manufactured) 3-tube RA-DA tuner-amplifier (*circa* 1922).

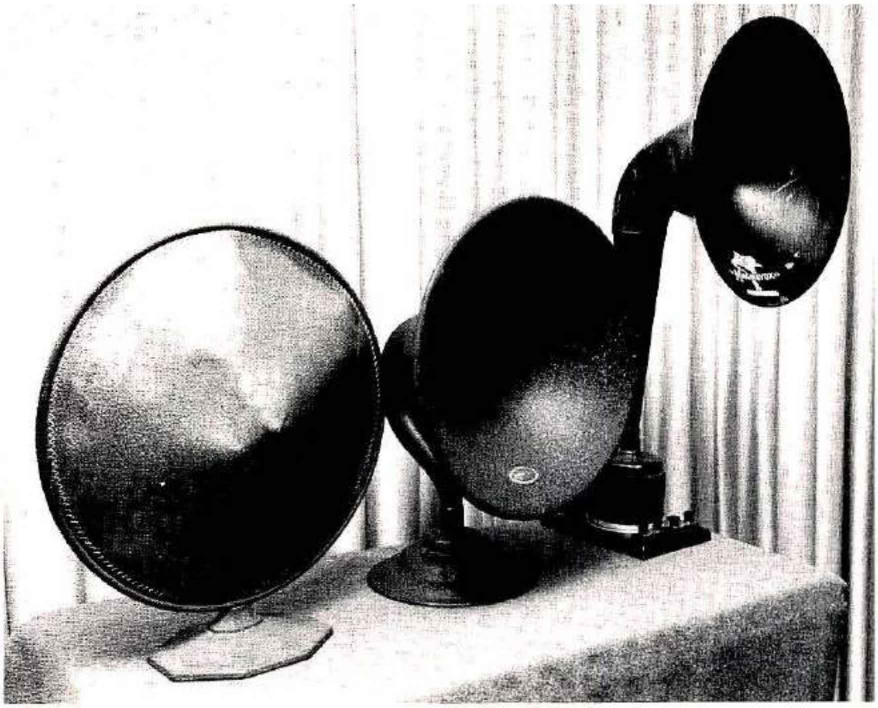
coil. Although the rotors were usually similar, the variocoupler frequently used a fiber tube for its primary, while the variometer used either a molded Bakelite housing or one made from flat blocks of wood.

As their name implied, variocouplers were basically for coupling — frequently between antenna and tube grid circuit — while the variometer was used for tuning or in an oscillating-detector plate circuit to control regeneration. The two variometer windings were connected in series so they would either add or "buck" as the rotor was turned. These devices came in a variety of configurations. In the more expensive units, molded Bakelite was usually used for rotors (and the stators of variometers), while the more modest models used turned-wood spheres for their rotors. On these variometers the stator coils were wound inside large flat wooden blocks.

Common items in radio stores at the time were kits of wooden parts from which you could make your own variometer. Commercial tuners of the molded type used one or more rotors. To enable very long-wave operation multilayer windings were frequently used. The Kennedy Model 110 used this system. With this arrangement it covered from 175 to 25,000 meters!

The Westinghouse R.A. Tuner built for the broadcast band had a novel tuning system in which it was tuned both inductively and capacitively by the same dial. The variable capacitor and variometer were connected in series. Advertising stated that they were "so balanced that rotating one shaft changes simultaneously the inductance and capacitance of the antenna circuit, thereby keeping the efficiency of the oscillating circuit practically constant throughout the entire range of the receiver." In another unusual arrangement regeneration was controlled by a tap switch on the tickler winding.

The spiderweb inductor. Two other types of coils in common use were the honeycomb and spiderweb. Spiderweb coils were of interest mainly because of their low cost and



Early loudspeakers: the Crosler Cone, Atwater Kent horn type, and Magnavox R-3 field-coil horn speaker.

ease of winding. A "spiderweb" disk of cardboard, slotted to hold the wire, formed the inductance of many early receivers. Some commercial manufacturers, such as Crosley, used these coils in their low-priced units. In an economy move typical for this company, the coupling between the two spiderweb coils was varied in a simple "come to me, go from me" arrangement in which one coil was slid nearer to, or farther from, the other on a square rod. Other manufacturers sometimes mounted them to hinge "book-style" to vary the coupling.

The honeycomb inductor. For those who could afford them, honeycomb coils represented the ultimate, especially if it was desirable to cover a wide range of wavelengths, many of them very long. Of the several companies that manufactured these coils, De Forest was one of the outstanding. It made a three-coil mounting for the popular circuit that used one coil in the antenna, the second in the detector grid circuit, and the third in its plate circuit to produce and control regeneration. While some manufacturers used levers to move their coils in swinging-door mountings with handles, De Forest used an intricate gear arrangement, with knobs on its front, to move the two outside coils and vary their coupling to the fixed center coil. Wound on tubing 25.4 mm (1 inch) by 51 mm (2 inches), honeycomb coils were compact and offered great flexibility.

Early audio circuits

The audio-output circuits of early vacuum-tube sets were designed to work into high impedances. Headphones were used before enough amplification was available to operate loud speakers. It was easy to make headphone windings of high-enough impedance to match the output of one-tube sets. This remained standard practice even after audio amplifiers were used to boost output.

When this output became great enough to operate speakers, amplifier output was fed directly to the high-impedance speaker windings. The speakers were in the amplifier-tube output circuits and carried tube B voltage. It was a simple system but had some disadvantages. In addition to a tendency toward dc saturation, occasional burnouts occurred in the speaker windings.

Another difficulty in early speaker design was to obtain sufficient flux density. Before the arrival of materials such as Alnico V, speaker magnets were large and flux density was very low. The magnets were horseshoe-shaped with moving coils placed between their poles. Several manufacturers attempted to overcome this inadequacy by manufacturing "field-coil dynamics" using an electromagnet energized by a local dc source. Magnavox was a leader in this area, using a field coil designed to operate from a 6-volt storage battery. No appreciable improvement in low-frequency reproduction appeared until the field-coil magnet was combined with the cone diaphragm. This mating produced the first actual fidelity of reproduction. After ac-operated radios came into being, it became standard practice to place the speaker field coil in the high-voltage lead and automatically energize it while using it for a filter choke. The speaker configuration that used an electromagnet and heavy cone diaphragm resulted in astonishingly natural reproduction, especially in the low-frequency range.

Probably no one part of an early radio installation was more symbolic than the antenna, or aerial as it was called. Graphics of early radio items always included pictures of massive structures, usually composed of four parallel wires strung between two high towers. These imposing structures served two purposes. The first was utilitarian: to pick up the signal.

The second was to inform all neighbors that this family owned one of the new "radiophones."

Long discussions ensued over the merits of stranded *versus* solid wire and insulated *versus* bare wire for aerials. These installations usually used a small knife switch to disconnect the aerial from the receiver and to ground it, thus providing a degree of lightning protection.

Among early antenna design ideas was one promoted by Leon Lambert of Wichita, Kansas, for an early crystal set. This set promised great DX but required the use of a single piece of solid wire from 46-61 meters (150-200 feet) long. Absolutely no joint — soldered or otherwise — was permitted, because it was thought that such a joint would add appreciable loss to the installation.

The "hype" — buyers beware!

Only credulous unsophisticated persons would feel that commercial chicanery is a recent development. Although many methods were tried, two were most common and of historical interest. One was a method of "testing" vacuum tubes. Unscrupulous dealers, desiring to sell tubes with low emission, had an arrangement that put a small positive voltage on the grid of the tube under test. Although these tubes weren't usable in circuits requiring appreciable emission, they were frequently usable in rf-amplifier circuits that didn't have to handle much power.

Within reasonable limits, a similar phenomenon is taken advantage of in present-day television transmitters. It was standard practice at one TV station I operated for a number of years to use tubes with slightly failing emission as "aural finals" since in fm service the tubes weren't required to supply the high peak currents used in the a-m video portion of the transmitter. In fact they were often operated satisfactorily even after their emission was reduced to where it was not possible to obtain rated grid current.

Probably the second most common system of taking early customers was the practice of advertising sets as "multi-tubed" but with several tubes having no connections whatever except to their filaments. Many a "seven-" or "eight-" tube set actually had only an untuned rf stage with regenerative detector and two stages of audio amplification. The other tubes contributed nothing more than a slight amount of additional light and a boost to the owner's vanity.

Further reading

Exploring the early days of radio is interesting and gives an insight into how Amateurs have progressed. The following list of suggested articles has been culled from *ham radio* magazine. In it you'll find some easy reading by authors who have been there.

Clemens, Charles W. Jr., K6QD, "Brass Pounding on Wheels," *ham radio*, March, 1975, pages 58-59.

Davies, John D., K4NW, "Those were the Days," *ham radio*, April, 1971, pages 40-45.

Gottlieb, Irv., W6HDM, "Nostalgia with a Vengeance," *ham radio*, April, 1972, pages 28-30.

Marriner, Ed, W6BLZ, "Early Wireless Stations," *ham radio*, October, 1968, pages 64-68.

Marriner, E. H., W6BLZ, "Wireless Point Loma," *ham radio*, April, 1968, pages 54-57.

Marriner, E. H., W6BLZ, "Catalina Wireless 1902," *ham radio*, April, 1970, pages 32-35.

Marriner, Ed, W6BLZ, "First Wireless in Alaska," *ham radio*, April, 1973, pages 48-55.

If you do not have these issues, Ham Radio's Bookstore offers most of these stories in a booklet that is great reading. Order the "Golden Years," Number HR-GYR, $3.95 plus 35 cents shipping and handling, from Ham Radio's Bookstore, Greenville, New Hampshire 03048. **HRH**

GET HAM MILEAGE FROM A CB ANTENNA MOUNT

BY KARL THURBER, W8FX

A simple fact of life is that CB components are cheaper than those for ham radio, the economies of mass production being tremendous. This became evident to me while looking for a suitable mobile mag-mount antenna for two meters. I happened to visit a local discount house that was having a large sale on mobile CB antennas, and chanced upon a Sparkomatic SA-11, center-loaded, magnet-mount job. It came complete with 2.8 meters (9½ feet) of RG-58/U coaxial cable, on sale for $9.88. This was less than the usual cost of a standard magnet-mount *alone*. Close examination of the antenna assembly showed good possibilities for conversion to two meters. With a little imagination, you can adapt similar CB antennas for Amateur use, both fixed and mobile.

As the name implies, the base of the mount is magnetized, allowing for very convenient temporary installation without drilling any holes. Even if used as a permanent mount, it is much easier to install than most other types (such as trunk, fender, or cowl mounts). Also, the magnetic mount is usually superior to other "temporary" configurations, such as gutter-mounted antennas. It's particularly good for the cautious person who doesn't want to leave an antenna on his car except when he's in it.

Let's take a look at what's involved in converting the antenna for vhf use.

Conversion for 2-meter portable use

I found that this antenna could easily be adapted. As supplied, the SA-11 (and many other similar CB mag-mounts) can be disassembled just above the spring. To adapt the antenna for transceiver-top two-meter use, it's necessary to obtain only two additional items: a 49-cm (19½ inch) length of small-diameter stainless-steel rod (such as from a junked auto or CB antenna), and a standard ¼-20 thread antenna adapter (Olson Electronics AA-997 or equivalent) to attach the new whip to the spring (see **Fig. 1**). This is the same kind of adapter almost universally used at the top of the standard base-loaded CB antenna coil to attach the usual whip. Note that the short 44-cm (17½-inch) whip, plus the spring length, together form an approximate quarter wavelength on two meters.

The whip length given above is purposely *long* so that it can be "pruned," or adjusted, to the desired operating frequency by simply sliding it in and out of the adapter. This is similar to the way in which most CB antennas are tuned. The coax cable supplied with the antenna is *not* cut off, but is allowed to hang behind the transceiver, as it will be needed for mobile use (*don't* coil it up).

Tuning the antenna is a snap. Mount the modified antenna atop the transceiver with the new two-meter whip section fully extended from the adapter (thereby shortening it 3 mm [1/8 inch]) at a time until at the transceiver's rf-output terminals. The whip length is adjusted by pushing it into the adapter (thereby shortening it 3 mm [1/8 inch]) at a time until you obtain an acceptably low SWR reading; you should come close to 1:1. If you can't obtain a low SWR (say, below 1.5:1 at the desired operating frequency), check to see that the top of the transceiver cabinet is perfectly clean and that there is nothing under the mag-mount which might prevent the antenna from getting a good "ground-plane" effect. If the transceiver is to be used indoors (sometimes a marginal situation, but often good enough for local simplex and repeater work), the unit should be placed near a window or outer wall and the position moved about for best results. Of course, an indoor antenna can't be expected to work well inside a brick-and-steel building. However, I'm able to key several repeaters some 16 km (10 miles) away with full quieting, using 10 watts into an indoor antenna from inside a brick house.

For best performance (and safety, too), the transceiver should have a good electrical ground, such as a wire from the case to a ground rod or cold water pipe, or at least to an electrical outlet box that is at ground potential. I'd venture that a good ground is probably overlooked or neglected in most vhf stations.

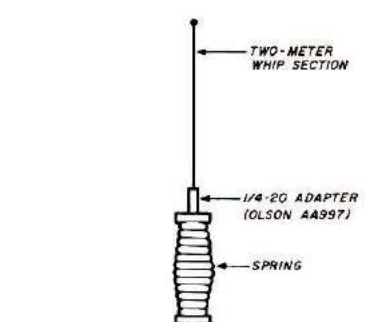


Fig. 1. A CB magnetic-mount modified for two-meter use. The adapter which threads into the top of the spring can often be found at CB or radio parts dealers. If not, it can be ordered from Olson Electronics, 260 South Forge Street, Akron, Ohio 44327.

The modified CB antenna will give a good account of itself, at a much lower cost than most Amateur magnet-mounted antennas. And, of course, it can still be used on CB. For mobile use, the antenna is mounted at the top center of the vehicle's roof and either the CB or two-meter portion inserted into it. The coax is run through a side window or door opening; just be sure that the cable isn't crushed or deformed when the window or door is closed.

The antenna shouldn't have to be retuned for mobile work on two. However, its SWR should be checked and if it is greater than about 2:1 at the operating frequency the whip can be readjusted by releasing the set-screw on the adapter and again carefully sliding the whip in and out, adjusting for lowest reading. For convenience, mark the two settings (portable and mobile) for future reference by lightly etching or inscribing a mark on the whip where it protrudes from the adapter.

If you don't want to readjust the antenna each time you operate mobile, a simple expedient is to merely add a short section of RG-58/U coax (say two feet or so) to that furnished with the antenna, using a PL-258 double-female adapter and a couple of PL-259s. You can cut back on the added length of coax until the SWR meter indicates a good "apparent match" at the transceiver. This little trick eliminates having to manually readjust the whip, it being necessary only to add the short length of coax. Of course, changing the length of coax won't change the impedance of the antenna and the SWR *at the antenna*, but will allow the rig to "see" a near-perfect match for its 50-ohm output. For 27-MHz operation, the CB antenna sections are reinstalled and tuned in accordance with the instructions that are furnished with the antenna.

You'll find that the mag-mounted antenna is very convenient, though in practice it *can* be tricky. Like any other antenna, it represents a trade-off between cost, performance, and ease of installation. But you should get good results from this antenna if you keep a few points in mind, particularly when operating mobile:

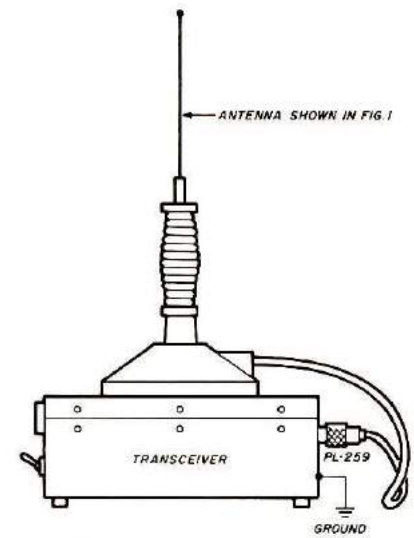


Fig. 2. The modified antenna can be used portable in conjunction with a transceiver simply by mounting it on top of the rig. If you intend to use it this way as well as mobile, do not cut the coaxial cable; just let it hang down behind the rig out of the way. Do not coil it up, as this may produce an "rf choke" that will disturb the loading of the transceiver.

1. Don't remove the foil which usually covers the magnet structure. It's there to protect the car surface from marring and to help form a good, solid *capacitive ground plane* for the antenna.

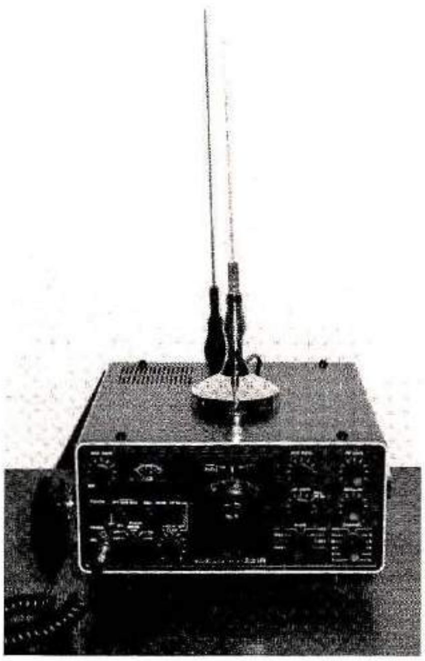
2. While rooftop mounting is usually best — producing a near omnidirectional radiation pattern — the antenna can be installed wherever you want it, providing it rests on a *flat* surface. Possible locations are the trunk lid, either rear fender (next to the rear window), or on either front cowl (the usual spot for a-m radio antennas). Mounting the antenna anywhere other than on the roof will make the antenna somewhat directional, which is usually undesirable in mobile use. The overall effect is to strengthen the radiated signal over the *longest dimension* of the vehicle. For example, an antenna mounted on the *front right* of the vehicle tends to radiate best toward the *left rear*.

3. The magnet will hold tightly at all legal speeds unless dirt, ice, snow, or other obstructions prevent the base from seating properly. You should always make sure that the base is resting on a clean, flat metal surface — vinyl tops or aluminum surfaces are out! Also, dirty surfaces can cause erratic performance and loading problems.

4. If you do have problems in getting a low SWR, try moving the antenna around a bit. Varying SWR readings may be found when the antenna is located at different positions on the vehicle. Doing this may eliminate the need for readjusting the antenna length or pruning the coax to get a good match. Readings below about 2:1 over the operating frequency band are usually acceptable. And, it goes almost without saying: Don't try to tune up the antenna when there is ice, snow, or rain on the car, as the readings won't be reliable.

5. Finally, if you use a mag-mount, remember to remove it when you leave the car — it can be stolen very easily. As simple as it is to install, it's just as easy to steal! Recent statistics show that *one of every three* CB mobile radios — and Amateur transceivers that *look* like CB radios — is likely to be stolen over its lifetime. In fact, in some areas of the country, a transceiver is likely to last about *25 days* if left in a car! Removing the telltale antenna is one way of improving chances that your car will be overlooked by a thief.

How well does the mag-mount work? *Indoors*, as well as can be expected of *any* indoor antenna — and certainly better than a "rubber ducky" jammed into the transceiver's rf-output jack. For two-meter mobile work, when mounted atop the car, it's about equal in performance to the typical trunk-mounted 5/8-wave antenna. In any case, for a total outlay of about $13, it's an investment in operating pleasure, flexibility, and convenience that's hard to beat.



Here's the modified mag-mount in place atop a Yaesu two-meter transceiver.

Incidentally, with the boom in CB sales, there is an excellent "fallout" into the Amateur market, particularly with respect to accessories and mobile antenna components that lend themselves to modification for ham use. There is a *flood* of mass-produced CB antennas and antenna parts which often can be obtained from volume discounters below the *wholesale* prices of comparable items designed for the Amateur market, quantity production being the main reason for this. And, some local CB dealers may allow you to obtain junked mounts or other antenna parts which can be rehabilitated for your purposes. Food for thought!

Try a little experimentation

The modifications described should fill the bill for casual portable and mobile work on two. But you're sure to think of some other possibilities, such as:

1. Ten-meter use instead of 27-MHz CB, by slightly shortening the whip section above the center-loading coil. Ten's getting to be a hot band now.

2. Both 50- and 220-MHz work — in addition to two meters — by simply constructing interchangeable, quarter-wave whip sections. You can cut interchangeable whips to cover the 108-136 MHz aircraft and public service bands as well, for casual monitoring using portable vhf receivers and scanners.

3. Semipermanent operation on 6, 2, and 1¼ meters (such as at a vacation or camping site) by mounting the assembly on a large piece of sheet metal (thus providing a good groundplane) and getting the antenna in a better location, such as in an attic or outdoors on a pole.*

4. Permanent mounting on campers and other RVs, the installation being a lot simpler than with most other mounts.

Remember that while this antenna was designed to allow quick, simple two-meter portable and mobile operation using an inexpensive CB mag-mount, the antenna can be used in its original configuration for 27-MHz work by simply reinstalling the CB sections you removed. I use it for both these purposes.

Next time you're in your local discount or CB store, look over the CB accessories. Chances are you'll find some "ham bargains" you can use.

HRH

*See "Improving the 2-Meter Quarter-wave Antennas," by Alf Wilson, W6NIF, *Ham Radio Horizons*, April, 1978, page 54.

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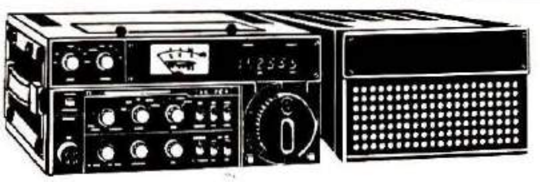

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The World of RADIO CONTESTING

Many Amateurs find their greatest challenge in contest operating. Here's a summary of some of the more popular contests, and an introduction to the thrill of the chase

BY WAYNE OVERBECK, N6NB

The operator spoke quickly:

"CQ Sweepstakes from W Zero Tango Radio, go."

"WØTR from W6 Hotel Xray," came the equally rapid-fire reply.

This exchange quickly followed: "W6HX 1361 bravo 68 Colorado."

"Roger, 1355 bravo W6HX 65 LA."

"QSL, QRZ, WØTR."

As you tune across the 20-meter band, you discover that the whole band sounds like that!

On a different weekend, it may sound more like this:

"QRZ from Golf 3 Fox Xray Bravo."

"G3FXB from W1 Norway Germany."

"W1NG 5914."

"Okay, 5905."

"Thank you and QRZ."

What's this all about? There must be thousands of people screaming these numbers at each other, all talking so fast nobody could possibly understand them, you say to yourself.

To a newcomer, that's probably about what the ham bands sound like several weekends a year, as thousands of hams plunge into their favorite aspect of Amateur Radio: contest operating!

For the experienced contest enthusiast, these weekend-long marathon operating sessions represent the highest challenge and the greatest thrill in the hobby. Here is an opportunity to see how well your equipment and antennas really work — and to pit your operating finesse against the skills of the best operators around.

A serious contest operator may dedicate months of planning to the job of getting ready for a single contest weekend. It may take hundreds of hours to squeeze every last watt out of a transmitter. Hams have been known to put up 100-foot towers just for one such contest, only to take them down when it's over. And once the painstaking preparations are finished and the big event begins, the operator or operators may stay on the air for as much as 48 hours straight — talking as fast as they can the whole time.

Even when the weekend is over, the contester's job isn't finished, because there's still the matter of processing the logs (the log is a record of all contacts, showing when they were made and what information was exchanged). For a big contest effort, double-checking the logs for errors and duplicate contacts with the same station (a chronic problem when you contact hundreds or thousands of stations in one weekend) can take almost as long as the contest itself. Then the logs have to be sent off to the sponsoring organization, which cross-checks various participants' logs against each other to see if, for instance, WØTR's log says he worked W6HX at the same time W6HX's log says he worked WØTR! Finally, the scores are all tabulated and the winners are announced — usually months after the event.

What does a contester get if

he wins? Not much, really. Possibly a trophy, or more likely a certificate, plus a listing in small type in a magazine article reporting the contest results. But the big reward isn't the small print but the satisfaction of knowing you've done a good job. Even better, there's the euphoria of finding out one's arch-rival across town had a slightly lower final score!

Of course, to learn that your prime competitor squeezed in there with a few more points is one of the deepest "downers" in Amateur Radio, for a serious contest operator.

From euphoric highs to humbling lows, contest operating offers many an emotion to the participant. Fortunately, contest operating also offers a variety of different challenges for hams with not-so-competitive instincts.

For the beginner, there are contests that pit you only against other beginners. And, for the noncontest operator looking for a new state or country, there is no time when new states and rare countries are represented on the air in greater numbers (or can be worked more quickly) than during a contest.

For amateurs with specialized interests, there are exotic contests with unique rules and scoring systems. There's even a contest in which every single contact has to be made by "moonbounce" — by bouncing a signal off the moon and listening to the incredibly weak echoes coming back. Then there's a contest where only contacts on frequencies above 220 MHz count (even contacts on 2 meters don't count in this one, let alone contacts on 20 or 40 meters). At the other end of the spectrum, there are contests where every contact must be made on the lowest Amateur band, 160 meters.

If you like operating away from home, there's an enormously popular contest where portable stations get special incentives. Also, there are contests where you contact only stations in one particular state or country. One of the most popular is a DX (long distance) contest in which U.S. and Canadian hams try to contact hams anywhere else in the world, while the foreign stations can work (contact) only U.S. and Canadian stations for credit. And if you still need Delaware for your Worked All States award, there's a contest where a Delaware station has to be on one end of every single QSO!

After the battle! A serious contester may do little else but operate continuously during a weekend-long radio contest. Here's a slightly bedraggled K6YNB (N6NB) during the final moments of the 1967 ARRL International DX Contest, which was a 96-hour marathon spanning two weekends in those days!

How they're scored

As you might expect, there are almost as many different scoring systems as there are contests. But there are a couple of common elements in the scoring of almost all contests. You try to make as many contacts as possible with each such contact worth a specified number of "QSO points," and there's a "multiplier" for contacting stations in a variety of geographic locations.

Here's how it usually works. You multiply your total "QSO points" by the number of different geographic entities (such as states, provinces or foreign countries) you contact. Say you make 500 contacts worth two points each, for one thousand "QSO points." If the multiplier in the particular contest is U.S. states and you manage to work all fifty, you have fifty-thousand points as a final score (it's simple math — 50 times 1000 = 50,000). With a score calculated that way, you can see it may be better to chase down that last elusive "multiplier" in the form of a rare state than to continue contacting more stations in states you've already got. But that's not *always* true, and therein lies one of the subtleties of contest strategy!

Another big part of the strategy may be deciding which category to enter. Some of the more competitive contests offer categories for high- and

CONTEST CALENDAR	
January:	VHF Sweepstakes *CQ* 160-meter Contest
February:	Novice Roundup ARRL DX Contest (CW)
March:	ARRL DX Contest (phone) *CQ* WPX (Prefix) Contest (phone)
April:	EME Contest
May:	*CQ* WPX (Prefix) contest (CW) EME Contest
June:	VHF QSO Party All-Asian DX Contest (phone) Field Day
July:	IARU Radiosport Championships
August:	Can-Am Worked All Europe (CW) All-Asian DX Contest (CW) UHF Contest
September:	Worked All Europe (phone) VHF QSO Party
October:	*CQ* Worldwide DX Contest (phone)
November:	Sweepstakes (CW) Sweepstakes (phone) *CQ* Worldwide DX Contest (CW)
December:	ARRL 160-meter Contest 10-meter Contest

low-power stations, categories for single operator and group (multioperator) entries, and even entries on a single band as well as all-band entries. If the local "big gun" is expected to show up in one category, you may want to outflank him by entering a different category — but then you may belatedly discover that he outflanked you by switching to the same category you entered!

Because there's such a variety of different contests, few hams attempt to operate in all of them, nor could I hope to describe the rules and strategies for all of them in one article. So I'll restrict my summary to the most popular contests in North America. More information about each of these operating events can be obtained from the sponsoring organizations, which in most cases publish the rules and results in a magazine.

Field Day

Probably the operating event which has introduced more new Amateurs to contesting than any other — and certainly the most popular event on the calendar in terms of the number of hams participating — is Field Day.

Field Day is scheduled the fourth weekend each June, and its unique feature is that portable stations (stations operating someplace where there isn't normally an Amateur Radio station) can work anybody, while home stations may work only portable and mobile stations. The rules permit competing stations to work other hams anywhere in the world on any band, but contacts with stations in your own town are worth just as many points as DX contacts. There's no geographic multiplier in this event, but there is a big multiplier for using emergency power (such as a gasoline generator) rather than plugging into the commercial ac mains.

Sponsored by the American Radio Relay League,* Field Day begins at 2 PM Eastern Daylight Time Saturday, and ends at 5 PM EDT the following day.

In a typical year, no fewer than 25,000 different licensed hams take part, most of them banding together in teams sponsored by local radio clubs to set up portable stations out in the boondocks somewhere. In fact, the event is really a combination contest, cookout, and camping trip for many hams, which perhaps explains its wide appeal. The rules even encourage clubs to have Novice and Technician-class hams set up and operate their own station as part of the overall club effort!

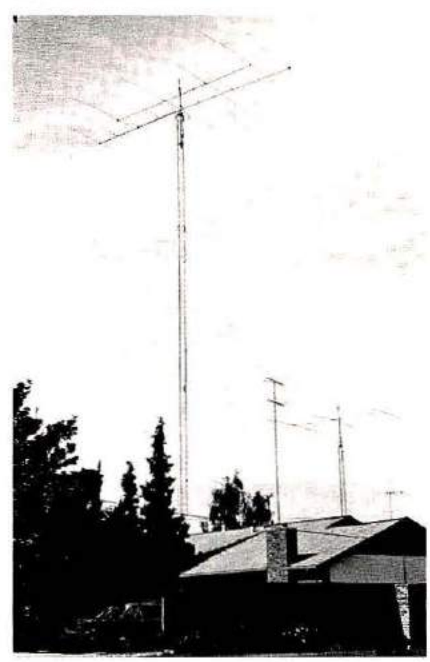
*225 Main St., Newington, Connecticut 06111.

Novice Roundup

If Field Day is usually a group effort with new hams as part of a larger team, many a new ham gets his first taste of contest operating on a "solo" basis during the Novice Roundup, also sponsored by the ARRL.

As a contest for new Amateurs, the Novice Roundup is a little more low-key than most others. You may operate up to 30 total hours, but you don't have to cram it all into a weekend. Those 30 hours may be spread over a nine-day period in early February. You can spend as many or as few hours as you wish each day. Novices compete only with other Novices for awards, and Technicians compete only with

Contest operators tend to build big antennas, and here's the array at N6RO/W6PAA near San Jose, California. Its owner, who won many contests as K2EIU before he moved west, wasn't satisfied with a mere four-element beam on 40 meters and five elements on 20 — both up 125 feet. So he proceeded to buy some acreage east of San Francisco so he could put all of his big beams on separate towers!



Technicians. All contacts must occur on CW (Morse code) in the 80, 40, 15, and 10 meter Novice bands.

You get one point per contact, and the multiplier is foreign countries plus ARRL sections (which generally follow state and Canadian provincial boundaries, except that some big states contain more than one section and several small provinces are lumped in one section).

Sweepstakes

Probably the next contest a new ham discovers after the Novice Roundup and Field Day — and certainly one of the most popular operating events among experienced contest operators — is Sweepstakes.

In SS (as Sweepstakes is often called on both voice and CW), U.S. and Canadian stations work only other U.S. and Canadian stations for two points per contact, with ARRL sections as multipliers. The event runs the first weekend in November on CW, with the phone contest the third weekend in November.

One thing that makes Sweepstakes interesting is the relatively complicated information you must exchange for a complete contact. In most contests you exchange signal reports and only one other piece of information, but in SS it's a bit different. The first few paragraphs of this article are a hypothetical SS contact.

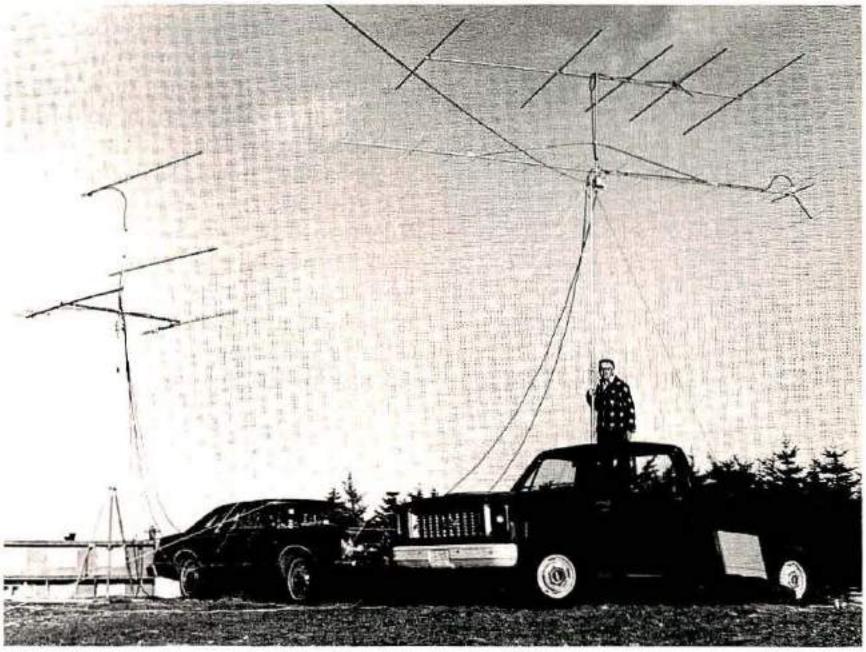
Translated, here's what all that gobbledygook means:

"CQ Sweepstakes from W Zero Tango Radio" means WØTR is soliciting a call from any station he has not already worked during SS.

"WØTR from W6 Hotel Xray" is a reply call from a station wishing to contact WØTR for SS contest credit.

Now comes the hard part. Here's what *"W6HX 1361 bravo WØTR 68 Colorado"* means: "W6HX" means WØTR is telling W6HX it's him and not someone else to whom WØTR is talking. 1361 is the contact number for WØTR, meaning he has already contacted 1360 other stations during SS! He'll give number 1362 to the next station he works. The "bravo" means he's using over 200 watts of transmitter power. If he were using less, he'd say "alpha" instead; "68" are the last two digits of the year the operator at WØTR got his first Amateur Radio license (you can imagine the pleasant surprise of running across an old-timer who gives you a year like "16"!). "Colorado" means WØTR is in the Colorado section, of course.

This may seem complex, but the "pros" can rattle it all off (or copy it all down when they hear it) in just a few seconds! But with heavy QRM (interference) and all, don't feel bad if you have to ask for a few repeats when you take the plunge and try contest operating — it's quite normal.



Much of the fun of operating a vhf contest is going to a high mountain top where the range is far greater than in the cities below. Here W1SL is shown with some portable vhf antennas atop Mt. Equinox, Vermont, one of America's most popular mountain tops among vhf enthusiasts for many years.

CQ Worldwide DX Contest

In terms of overall activity around the globe, the "CQ Worldwide" is the most popular DX (long-distance) contest going.

Sponsored by *CQ* magazine,* it runs the last weekend in October (on phone) and the last weekend in November (on CW). You can work anybody anywhere, but contacts within your own country earn you only multipliers, not "QSO points." Foreign contacts on your own continent earn one or two points, while intercontinental QSOs are worth three points.

The exchange is a signal report and your "zone." The world is divided into forty zones for this, with the continental U.S.A. falling into zones 03, 04, and 05, while much of Europe is zone 14, Japan is zone 25, *etc.* As you may have gathered, the second contest contact quoted at the beginning of the article is a "*CQ* Worldwide" QSO. The multiplier is zones plus countries contacted, and it's not unusual for a top station to

*14 Vanderventer Ave., Port Washington, Long Island, New York 11050.

This is portable? Field Day is an operating event when thousands of groups of hams set up temporary stations in the countryside, operating on batteries or emergency generators. Thus, Field Day stations are often makeshift installations with small antennas. But here's the 1978 installation of the Southern California Contest Club, N6CW/6. This group topped all entries in Field Day with nearly 14,000 points, thanks to a full-size, four-element beam on 20 meters, atop a 70-foot tower on a mountain top, not to mention a two-element 40-meter beam up 80 feet, plus a five-element beam for 15 meters on another 70-foot tower.

work nearly all forty zones and more than one hundred countries during the contest weekend alone!

ARRL International DX Contest

Another popular DX contest, the ARRL DX contest, occurs in February and March. In this one, U.S. and Canadian stations work only foreign stations, while foreign stations work only the U.S. and Canada. Alaska, Hawaii, and other noncontiguous U.S. territories are classified as foreign.

U.S. and Canadian stations send a signal report and state or province as their exchange, while others send a signal report and their transmitter power level. You get three points per contact, and the multiplier is the total countries (or states/provinces for foreign stations) worked.

Because there are so many DX stations on the air during this contest, this is another good time for modestly equipped stations to catch some exciting DX. The faster and better equipped DX operators quickly work the U.S. "big guns," so you'll often hear loud foreign stations almost begging for U.S. contacts toward the end of the contest!

CQ Prefix Contest

The *CQ* Worldwide Prefix Contest (WPX) is also a DX contest. Held on voice in late March and CW in May, it offers a multiplier for each call sign "prefix" you work. For instance, working any W1 station is good for a multiplier, but K1, N2, AA3, WA4, WB5, etc., are all additional multipliers. You still only get QSO points for foreign contacts, but the proliferation of multipliers is sure to leave U.S. and Canadian stations in demand. The exchange is a signal report and a consecutive contact number (as in the Sweepstakes). Sweepstakes).

IARU Radiosport

A new event that has already become very popular, particularly in the Soviet Union and Eastern Europe, is the "IARU Radiosport Championships." Although log processing is handled at ARRL headquarters, the event is jointly sponsored by all of the national organizations of Amateur Radio operators belonging to the International Amateur Radio Union.

Held in July (both CW and phone the same weekend), the event offers excellent opportunities for U.S. and Canadian stations to work all over the world, with a first-rate chance to catch some of the more elusive Warsaw Pact and Soviet countries (there are some twenty different national entities that are recognized as separate countries within the U.S.S.R. alone).

The multiplier system here is based on ITU (International Telecommunications Union) zones, of which there are seventy-five in the world. Each intercontinental QSO is worth five points, with QSOs within your own continent (but in a different zone) worth three points.

VHF contests

Each year there are three different ARRL-sponsored contests exclusively for vhf enthusiasts. In these events, all QSOs must occur on Amateur frequencies above 50 MHz. There's the vhf Sweepstakes (patterned after the November SS in format) in late January, followed by "vhf QSO Parties" in mid June and mid September.

In each, QSO points are on a sliding scale, with more points for QSOs on higher frequencies (above 220 MHz). And in each, the multiplier is based on sections and foreign countries.

Two features of these contests make them especially appealing to newcomers. For one thing, since Technician licensees have full operating privileges above 50 MHz, these are contests in which Technicians have as good a chance to win as Advanced or Amateur Extra class licensees! In fact, several of the record scores over the years have been achieved by Technicians.

The other inviting thing for newcomers is the opportunity for mountain-topping. Maybe you don't have a kilowatt on 2 meters or a monstrous tower at home, but if you take a small rig and a portable beam up a mountain, you'll be amazed at just how competitive your signal can sound. Many a time has a "big gun" with a super station at home lost to a modestly equipped station on a mountaintop.

UHF and EME contests

Here are two very specialized contests, recently begun as ARRL events. The EME (earth-moon-earth) contest requires that every QSO be made via "moonbounce" techniques, a sophisticated form of vhf communication in which a full-kilowatt transmitter and an elaborate antenna are used to bounce a signal off the moon and produce readable echoes back on earth! Despite the seemingly esoteric nature of the event, some sixty different stations competed in the first running of the contest in April and May of 1978.

The uhf contest is specialized but not necessarily forbidding to beginners, in view of the very low cost of transceivers for the 220 MHz band. The contest is scheduled in early August (for the convenience of mountaintoppers who usually prefer summer weather) and is set up to encourage operation on the ham bands at 220, 432, 1215, 2300, 3300, 5600, and 10,000 MHz!

There are several other popular DX contests sponsored by Amateur Radio groups in various countries. Although none attract as much interest in North America as the ones already mentioned, the All-Asian DX Contest and the WAE (Worked All Europe) contest merit an introduction here.

The "All-Asian" is sponsored by the Japan Amateur Radio League (JARL) and runs in mid June (phone) and late August (CW). During each contest weekend, Asian stations work the rest of the world. Multipliers are based on call sign prefixes as in the *CQ* WPX, but there's one picturesque difference: The exchange is a signal report plus the operator's *age*! Inscrutably enough, the event's Japanese sponsors specify that YL's (female operators) send *zero* as their age!

The "WAE" contest is sponsored by the Deutschland (German) Amateur Radio Club (DARC) and is coordinated with the DARC's WAE awards program. The contest is scheduled the second weekend in August (CW) and the second weekend in September (phone). The exchange consists of a signal report and consecutive contact number. Europeans work everyone else in the world in this one.

One-band contests

There are several popular one-band contests, including the ARRL 10-meter and 160-meter contests in December, and *CQ*'s 160-meter contest in January.

Permitting both North American and foreign contacts for QSO points and multipliers, these contests have rapidly grown in popularity in recent years, thanks to two things: the improving conditions on 10 meters as the sunspot cycle nears it peak, and the brisk sales of new rigs that cover 160 meters — something few commercial transmitters did a few years ago.

Can-Am

A very promising new contest is the Can-Am contest in August, sponsored by the Cana-DX group. The event permits both U.S. and Canadian stations to work any station in either country, with states plus provinces as the multiplier. There are separate 24-hour CW and phone contests the same weekend, with a special award for the operator who can keep going long enough to amass the highest total score on both modes combined.

North American Sprint

Sponsored by the National Contest Journal,* the Sprint is a "contester's contest" if ever there was one. Typically held twice a year, it's a 4-hour contest on CW only. What is unique about it — aside from the unprecedented short time period — is that no station is permitted to roost on a frequency with a big signal and work stations one after another the way the "big guns" do in every other contest. After each QSO, the station that called CQ must leave the frequency, and the station that answered the call may stick around for one more QSO before he in turn must move off frequency.

*c/o N6SF, 1030 Bush St., Apt. 6, San Francisco, California 94109.

State QSO parties

A great opportunity for a new contest operator to win something comes in the various state QSO parties. If you're in Ohio, for instance, you may not be ready to win the Ohio section in SS or the DX contest right away, but you may have a great chance to be the top Ohio station in the Washington State QSO Party.

If you're in the state hosting the QSO party, of course, you can work anybody anywhere, while out-of-state stations can work only stations in the hosting state for credit.

These events are also noted as great opportunities to snare rare counties if you're a "county-hunter" (a person pursuing one of the awards based on the number of U.S. counties worked).

I've told you about only twenty of perhaps two hundred radio contests held each year, but these are the big ones in North America. If you discover hordes of hams exchanging numbers in rapid-fire succession some weekend, you've most likely stumbled upon one of these contests.

Operating in any of them can be an exciting experience right from the start. Once you've decided (or asked) which event it is, and mastered the exchange, feel free to plunge in and start making contacts. The contests are open to everybody, and the biggest guns on the band were once beginners themselves, something you should not forget if a station sounds intimidating. He isn't, so call him!

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Presented to Mr. Dennis J. Shields, British Receiving Station No. 33668. G-15318. In recognition of the gallant part he played in attempting to avoid the loss of the Spanish Ship "Marbell" and her Crew.

BY MARTIN BLYTHE, G4HFO

Monday, September 25th, 1978, was a memorable day for 30-year old Mr. Dennis J. Shields of Westbury, Wiltshire, (England). Not only was it his wedding anniversary, but he also had a special invitation to visit the Spanish Embassy at Belgrave Square in London.

Dennis is a keen short-wave listener, and is registered as British receiving station No. G-15318. On the night of January 27th, 1978, at 2100 hours (GMT), he had been tuning his FRG7 receiver when he came across a "Mayday" distress call. It was from the Spanish ship *Marbell*, radio call EEZK, which, having lost both engines, was drifting helplessly in the Atlantic Ocean in storm force gales.

Dennis listened for a moment, then realized no one else had heard the SOS. He promptly reported full details of this emergency to the British authorities at Portishead Radio, who in turn alerted Boulogne Radio (France). The Boulogne station made a two-way contact with the *Marbell* on 2182 kHz within four minutes.

Tragically, before rescue

Dennis, on the left, receives a Pegasus Award of Merit from the Spanish Ambassador, His Excellency the Marques de Perinat. The episode has been recorded in the annals of the Spanish Maritime Authorities.

operations could be fully implemented, the ship had run aground and sunk off the Cies Islands at the entrance to Vigo Bay (on the northwest coast of Spain). The crew of the *Marbell* had consisted of thirty-six people, twenty-seven of whom perished. The remaining nine had been able to swim ashore with great physical effort.

At the Embassy, his Excellency the Marques de Perinat, Ambassador of Spain in London, and his wife, the Marquessa, together with a charge d'affairs, a minister councillor, a first secretary, and his Excellency's three secretaries, spent over an hour in conversation with Mr. Shields. The Ambassador presented Dennis with a Pegasus Award of Merit parchment recording the events, and expressed appreciation for the meritorious part taken by Dennis Shields in the rescue operation.

The rescue information was reported to the authorities in Spain — the Under Secretary of the Merchant Navy, the Directorate General of Navigation, and the Sub Directorate of Maritime Security — so that the matter would be noted in their records.

Mr. Shields, who was accompanied by his wife, Margaret, thanked the Ambassador for his good wishes and pointed out that it would have been unlikely for him to have heard the distress call if not for the special aerial he recently erected. He explained that he had been experiencing interference from neighboring television sets. He then purchased a special trap dipole made by Richard Holman, G2DYM, which cut the interference to a minimum. This allowed him to hear the SOS coming through loud and clear.

When asked what his ambition was now, Dennis replied, "I am now studying for the Radio Amateurs Exam so that I can speak over the air, as well as listen." **HRH**

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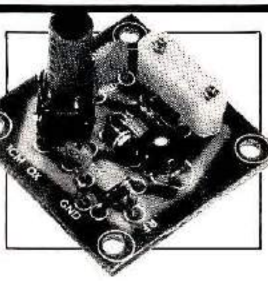

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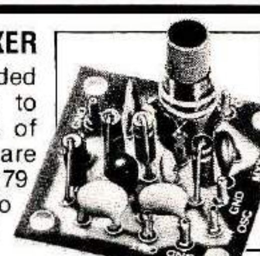

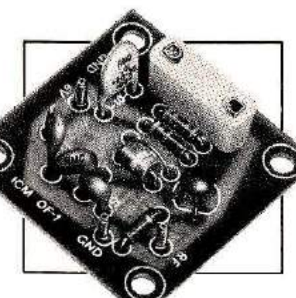

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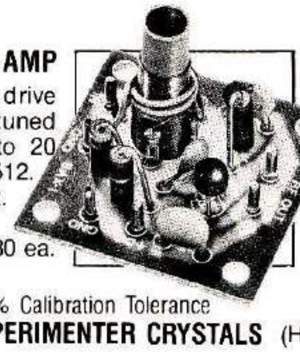

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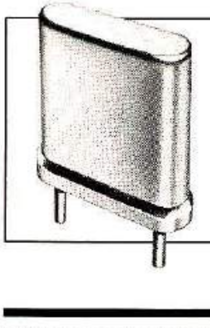

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More details? Ad Check page 78.

A Pair of Loops for Fun and ~~Profit~~ Gain

BY JIM GRAY, W1XU

You say you're a bit short of real estate but want to radiate a good signal? Can't put your antenna as high as you'd like, but still want to be competitive? Don't have the money for a fancy antenna tuner? Is *that* what's botherin' you, Bunky? It is? Well, then . . . Tell you what I'm gonna do!

Meet the loop antenna, a compact, useful, and unique cousin to the folded dipole that's easy to construct and tune up for great performance on the ham bands. Loop antennas may be put up alone or in pairs, threes, and even fours. One variety of two-loop antenna has been called the cubical quad — a reference to its appearance; four sides forming a square and two squares forming a cube.

Brief history of the cubical quad

Although this article is not about the cubical quad, that antenna will be a good place to start our discussion. My fascination with the unusual properties of loop antennas began in the early 1950s, when I built my first cubical quad based on information obtained from some 1947 and 1948 issues of *CQ* and *QST*, in which the quad was presented and discussed as an inexpensive and lightweight substitute for conventional Yagi antennas.

These articles mentioned that the first cubical quad was designed by the late Clarence Moore, W9LZX, when he was chief engineer of radio station HCJB in Quito, Ecuador. HCJB had been on the air since 1939, broadcasting program material related to its Christian missionary work around the world. At the high altitudes of Quito — and because of the high power employed — the station Yagis kept melting from corona discharges at the tips of each element. There seemed to be no solution to the problem until 1942, when Clarence Moore and another engineer found one. The cubical quad elements had no tips; each antenna element was a closed loop of wire which prevented corona from occurring! Since then, HCJB's big voice has been heard around the world by way of its cubical quad antenna. Countless Amateurs here and abroad have built and used cubical quads in a multitude of shapes, sizes, and variations — all with success.

Although not all hams can put up a cubical quad, the light weight, inexpensive materials, ease of construction, and basic simplicity of the loop antenna are appealing to every ham. The good results with a quad stem from the placement of two loops close together to form a cube, one loop serving as a driven element and the other loop acting either as a reflector or director of the resulting array. The array can achieve a gain of up to 7 dB over a dipole when only two elements are used, and even greater gain is possible with three or four elements. As I thought about these matters one night a few years ago, a new idea gingerly crept into my brain. Let me tell you how it happened.

Another combination of loop elements

I had been looking through a pile of *QST* magazines, hoping to find a good antenna for forty-meter DXing. Although I had been thinking of a quad, the sheer size of such an animal intimidated me. What I wanted was some form of loop antenna that could be mounted as simply as my single-element delta loop, but with more gain. The delta had been an excellent performer, exhibiting all the good properties that make an antenna dear to the DXer's heart. Its noise pickup was very low, unlike a vertical for example; and the loop discriminated against both manmade static and the natural kind with equal disdain. I liked the fact that my loop occupied less linear space than a dipole for the same frequency. Topping off the list of nice features was the fact that a loop could be made rectangular, square, round, hexagonal, or nearly any other shape, without seriously altering its performance or characteristics. And, simply by feeding a square loop at the bottom or at one side, a choice of polarization is possible.

Suddenly, my eyes caught sight of the Novi-Loop, designed by Lew McCoy.* It looked to be just what I wanted, and the article gave complete information about how to build one. Precisely what I was looking for — if only it had more gain! What I wanted was a beam antenna that was no more complicated than a dipole. Sitting with half-closed eyes, my mind wandered over the various configurations of wire that could be combined in various ways to provide gain and directivity. Suddenly, I sat bolt upright in the chair. I had first visualized a single loop suspended between two poles attached to the chain link fence that ran along the property line between my neighbor's yard and my own. Hastily making

**QST*, October, 1973, page 20.

calculations on a scratch pad, I realized that two loops could be suspended *side-by-side*; and then the full force of that idea struck me — why not phase the two loops in collinear fashion? There it was, the solution to the problem!

Let's see, now. With calculator and scratch pad, I began figuring. With 30-foot TV masts at each end and in the center of the 95-foot fence, and figuring on a fence height of 4 feet, I could just squeeze two loops in side-by-side, with a bit of room to spare. The actual wire loop itself would be 25 feet on the vertical sides and 45 feet on the horizontal sides; just exactly what was needed! So far, okay. How about matching impedances, phasing, and gain?

The reference books state that two collinear dipoles placed adjacent to each other in end-to-end fashion, and driven in phase, would yield about 1.9 dB over a single dipole. The same books show that each loop has a gain of about 1.4 dB over a dipole at the same height. All together, the gain might be 1.4 + 1.4 + 1.9 = 4.7 dB over a dipole. Wow, that's some kind of performance! The only remaining difficulty I might have to face would be the impedance. The references give varying values for the feedpoint impedance of a single loop, but it looked as if somewhere between 100 and 140 ohms would be a reasonable value. I picked 110 ohms as a target, for want of better information, and realized that by driving the two antennas in phase, their feedpoints would be effectively in parallel — making the feed impedance 55 ohms. That is a handy value to have for use with 50-ohm coax, and my problems would be over if all went according to theory.

If I phased the loops with a single length of coax, it would have to be one electrical wavelength. The formula for finding that is:

$$L \text{ (in feet)} = \frac{984 \times V}{f}$$

where V is the propagation velocity factor of the phasing line (0.66 for most coax) and f is the frequency in MHz. The practical formula for my purposes then became:

$$L = \frac{984 \times 0.66}{7.05}$$

Because my design frequency was 7.050 MHz, L proved to be 92 feet — a lot of coax. Fortunately, I had just bought a 100-foot roll at the local coax emporium, and I had another 50 feet or so left over from another antenna. That would serve nicely as feedline to the shack. After drawing and redrawing the arrangement, and carefully going over my calculations, I was satisfied that the antenna would work. The signal would leave the antenna in two directions, east and west, since my fence and the loops strung above them would run north and south.

Of course the things I didn't know could only be learned by doing — so I decided to give it a try next day, which happened to be Saturday.

Putting up the twin loops

Two 30-foot TV-type masts (three 10-foot sections placed end-to-end) were already in place at the ends of the fence, with halyards that had been used to haul up my present 40-meter dipole. The remaining task was to put up another similar support in the center of the fence. The sketch of **Fig. 1** shows the general arrangement.

My calculations for loop circumference were based on the length formula $L = \frac{1005}{f}$ where L is the length in feet, and f is the frequency in MHz; in my case 7.050. The value arrived at was a bit over 142.5 feet, so I cut the wire to 144 feet to allow for adding insulators, twisting pigtails, trimming, and so forth. I marked the four corners with bits of yarn and then twisted the wire back on itself into a small one-turn loop of about 1/2-inch diameter at each corner. This would allow tying a piece of light nylon line at each corner to support the loop and insulate it from the masts. After erecting the loops, which was an easy job because of the halyards and pulleys, I attached the coax line from my transceiver directly across the bottom center insulator at the

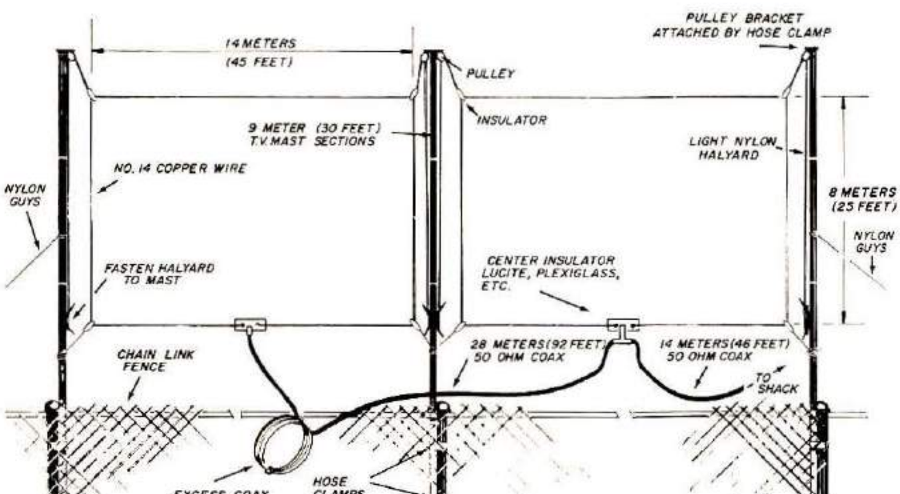
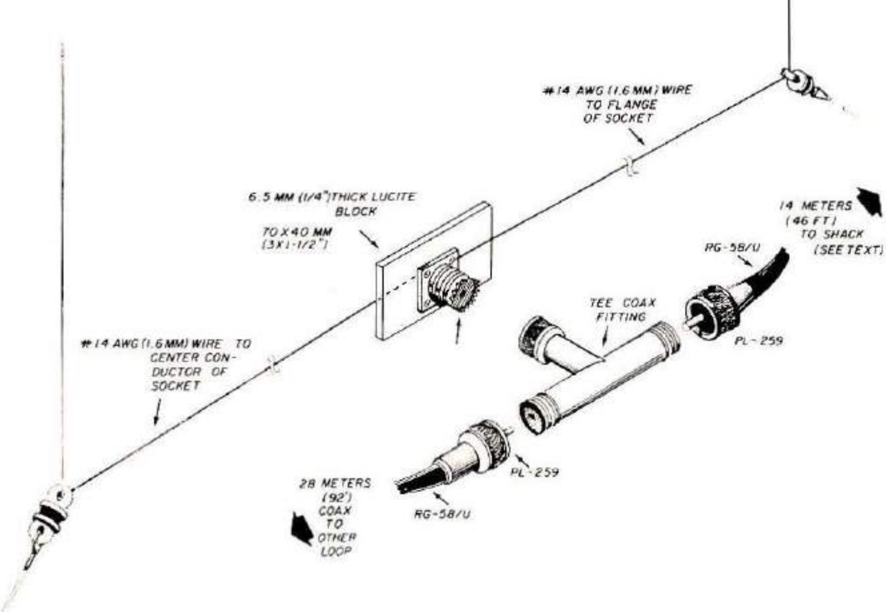


Fig. 1. The two loops are suspended from masts clamped to fence supports. You can drive short pieces of pipe into the ground to serve the same purpose. Radiation (and best reception) is at right angles to the plane of the antennas; that is, if the row of masts is north and south, your antenna will work best to the east and west. If you would like to reach a particular part of the world, plan accordingly.

Fig. 2. Connection to the center of each loop is made by simply inserting a coax connector mounted on a plastic block. You'll need a T connector on only one loop, so as to permit both the feedline from the rig and the phasing line to the next loop to be connected.



feedpoint. This would permit me to make some measurements of VSWR immediately, and make a plot of the loop resonant frequency, although I knew that the VSWR would not be much lower than about 2:1.

As soon as I attached the lead-in wire, my receiver immediately began performing, and I could hear plenty of signals. I fed a very-low-power signal into the loop only long enough to adjust the bridge and make a series of readings. These were quickly plotted on a rough graph, and showed the loop to be too large (frequency too low). A quick run to the backyard, a bit of shortening of the wire, and remeasurement showed my loop to be resonant close to 7.05 MHz — the target frequency. Although I could have checked resonance with a grid dipper, if I'd had one, I was satisfied that the resonance was close enough to the desired frequency.

I followed the same procedure with the second loop, and now had two loops resonant at approximately the same frequency.

Because I wanted to be able to make VSWR measurements at the transmitter end of the line, I decided to use an exact electrical half-wavelength of coax between the antenna feedpoint and the shack. It is well known that values of impedance (which are made up of composite values of resistance, and reactance) repeat themselves every half wave along a transmission line. Therefore, if one end of the line is connected directly to the antenna feedpoint, then whatever values of reactance and resistance exist there will also exist at each half-wave point along the transmission line to the shack. Since I was planning to use the same frequency and the same transmission line, but a half-wavelength instead of a full wavelength, it was not necessary to refigure the length by formula. All I had to do was use one-half of the 92 feet previously calculated. *Voila*! Forty-six feet was the value, and that length would just about reach my transmitter location. So far, so good.

The next step was to connect the phasing line which I had cut according to the formula mentioned earlier. Each end was connected to the feed point of a loop, and a coax T fitting was just right to connect the feedline into the circuit, as in **Fig. 2**. Now for the supreme test: would it work, and how well?

Hurrying back to the shack, I couldn't wait to listen to the rig — were the signals any louder than they had been on my old dipole? Tuning across the CW portion of 40 meters, I found lots of W8s, 9s, Øs, but very few W3s or 4s, and these were weak. Until now, these nearby stations had been the predominant ones. What was most unusual for this time of day was that the WØs had substantial "sock!"

Almost fearfully, I decided it

Fig. 3. If you would like to really generate huge spider webs in your backyard, put loops for the higher bands inside the 40-meter one. Note that as the center-to-center spacing between loops becomes larger, the gain increases (up to a point). See **Fig. 4**.

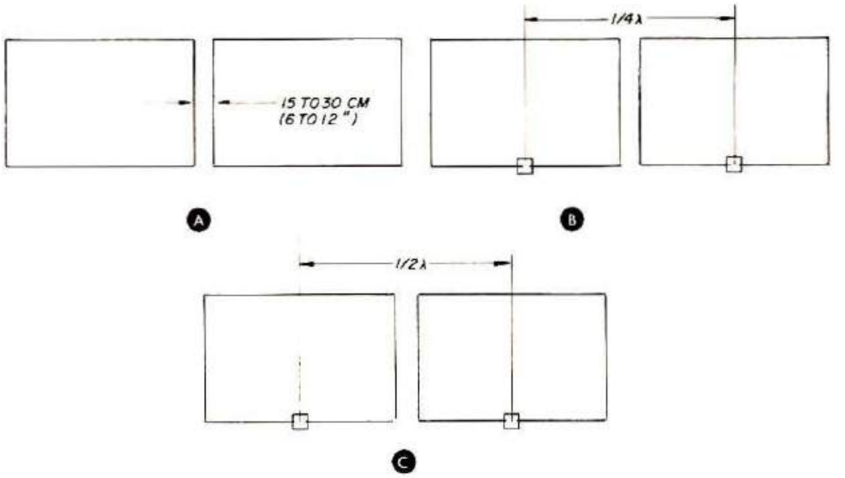


Fig. 4. The gain of phased elements changes with the spacing between them. Close spacing, A, gives 1.9 dB over a single loop; 1/4 wave center-to-center, B, gives 2.7 dB, and 1/2 wave spacing, C, provides 3.3 dB.

was time to make a measurement of VSWR on the final array. I attached my reflected-power meter to the feedline, calibrated the reading normal to 50 ohms, and measured at 7050 kHz. Surprise: less than 1.2:1; and below 2:1 at 7300 kHz! Naturally, I was hoping that the antenna would work at the high end of the band for the occasional foray into SSB territory, even though I spent most of my time on CW.

Applying full power from my little Argonaut transceiver (5 watts) I was pleased to have a first contact with an Iowa station — quite a bit farther away than I had anticipated — and he gave me a 579 report! Many contacts later, and well after dark, I rated my twin-loop collinear an unqualified success. I had reached all the way to the West Coast and across the "pond" into Europe. I must admit that I did bump up the power to 50 watts for the transatlantic QSOs. Still later, I hooked up my 1-kW amplifier and enjoyed many solid QSOs into the Pacific and into Europe.

The loop antenna is bidirectional, and two collinear loops are still bidirectional, although the "figure-eight" horizontal pattern is a bit skinnier than that from a single loop. My array definitely showed gain in its favored directions, while virtually eliminating signals from South and Central America (which sometimes overpower the weaker Europeans). If other areas of the world are more important, then you can always orient your loops to favor those areas.

I didn't make any accurate measurements of pattern, but, from contacts made, I estimated that the antenna was effective over an arc of about 45 degrees on either side of the line of best direction. Signals off the ends were way down, except for some very close stations whose signals probably arrived at high angles not discriminated against by the beam. I was very happy with this low-cost antenna that took only a few hours to put up and tune, yet gave me the performance of a beam.

Future plans

One thing that would be fun to try is to place 20-, 15, and 10-meter elements inside the loops, making a multiband array, similar to a multiband quad. My feeling is that they would be less effective at the higher frequencies, but that isn't necessarily true, and the idea should be tried (**Fig. 3**).

As a last comment, if you're planning on twins, make them collinear; double your signal and double your fun!

HRH

POST BOX

Dear Horizons:

This is just a note to fill you in on the response to my "DX Antenna Pointing" article in the August, 1978, issue. So far, I've received over three thousand pieces of mail (most of it arrived from two to five weeks after the issue came out), requesting the great-circle-bearing computer printout. Fortunately, I had some volunteer help during that period. I'm still getting about eight to ten a day, which is less than a tenth what it was at its peak . . .

Just for fun, I had the computer make a plot of all the U.S. cities that charts were requested for, and I've enclosed a copy of it (see **Fig. 1**). Note that each dot represents one city, and each city is plotted only once. Los Angeles, for example, is represented by a single dot the same size as the dot for Casper, Wyoming, even though many charts were sent to Los Angeles. There are about 2500 dots on the map (though it's impossible to count them where the cities and suburbs are highly concentrated in the population centers), and of course more than one chart went to quite a few cities.

Almost all the letters included complimentary remarks about the article, and I have been very pleased by it all . . .

William D. Johnston, N5KR
Las Cruces, New Mexico

Dear Horizons:

I had just about decided to let my subscription to *HRH* expire, when I read your article on "Adventures for You and Me" (April, 1979).

I am a retired appliance repairman, nearing my 67th birthday, and had envisioned becoming a "Ham" for several years, but the advances in terminology and equipment have sort of scared me off the undertaking, leaving me doubting my ability to qualify for even a Novice license.

However, since reading of your offer I have decided to renew the *HRH* subscription for another year to see if I can prod my flagging interest.

Allan H. Lathrop
Eagle Harbor, Michigan

Dear Horizons:

I have just finished reading the March issue of *Ham Radio Horizons*, and would like to congratulate you and your staff, and especially Jim Kates and Norm Smith, for the excellent article on "Thomas Edison And His Experiments." I do hope that you will have more articles like this . . . this one was not only interesting, but to me it was an inspiration.

My brother, KA6EED, sent me a subscription to *Ham Radio Horizons* for a Christmas present, and I am happy he did. I get most of the other popular ham magazines, but feel that *HRH* has a format that is unique in the field! Keep up the good work!

Don't ever do away with "Benchmarks" or "Product Showcase."

All the best.

H. M. S. Richards, Jr., WD6BDZ
Glendale, California

Fig. 1. A computer-generated plot of the distribution of N5KR's great-circle-bearing list. Each city or town is plotted only once, even though some cities received many charts.

ATTENTION:

TO: All Amateurs
FROM: Wilson Systems, Inc.

Inflation . . . gas shortages . . . etc., all leading to higher prices each week, and cutting into the amount that we have to spend on our hobby. And face it, our hobby is what keeps us sane in this runaway inflation period, our escape from the hustle and hectic grind of working to make a living. We know — we see the same price increases at the grocery store, the same increases in the gas prices. Wilson Systems, Inc., is going to do something to help ease the purchase of your new tower and antenna.

As you may know, in January of 1979, Regency Electronics, Inc., purchased Wilson Electronics Corp. What you may not know is that in August, 1979, Jim Wilson purchased back the antennas and towers. There is now a new name to look for — WILSON SYSTEMS, INC. — With the new name and new company comes new ideas, methods, products and prices. Yes, prices. But not what you might expect. Wilson Systems is LOWERING the prices to where you will find it hard to believe. Check them out in the following pages of this issue. You will be surprised and pleased at what you will find.

What are we doing that will enable us to lower the prices? Well, we are Hams, too. We like to pay the lowest price possible and will spend much time assuring ourselves this is accomplished. We feel the same higher demands on our money for the house, food, and bills. And as this demand increases, the amount of money left for our hobby decreases. So when money is spent, we want the best quality for the best price.

There are a number of ways to bring the cost of a product down. By using a cheaper grade of material, buying raw materials in larger quantities to obtain a better discount, by cutting the profit ratio, and by eliminating the middle man. Wilson Systems will not lower the quality of the product. In fact, we have improved the strength and quality of almost every antenna in the line. The newly designed monobanders will stay up under heavy icing conditions when others are falling apart. Wilson Systems is currently purchasing at the lowest price possible from the aluminum companies, so these methods of cost reduction are eliminated. The third method mentioned is one that we have decided to consider as a part of the overall cost reduction plan, yet leaving room for research and development expense, so we may bring you the products you want and at a price you will like.

The last method mentioned is always a risky one. The dealers do not want their profits cut back just as you do not want your pay check cut. If you cut the dealers' profits back, some of them will just push the product that will tend to give them the most profit, rather than the one that will be the best performing for you. A rather drastic form of this method is the one that Wilson Systems will be choosing. You will not be able to find the Amateur products of Wilson Systems in stock at the dealers, nor will they probably recommend them. (After all, as long as they're not handling them and making a profit, why should they promote or even recommend them?) No, you will only be able to enjoy the most product for the least money by dealing with Wilson Systems factory direct. We will be offering you the amateur antennas and towers at prices that are below, in most cases, what the dealers pay for the products of other companies. And to make it even easier, we have a toll-free number for you to place your order. Now isn't this what you've been looking for? The best product for the least money!

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Yours Truly,
Jim Wilson
Wilson Systems, Inc.

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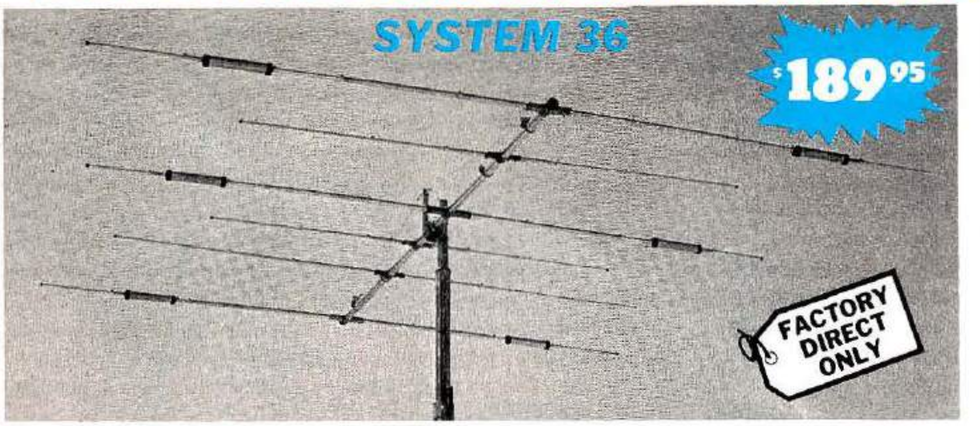
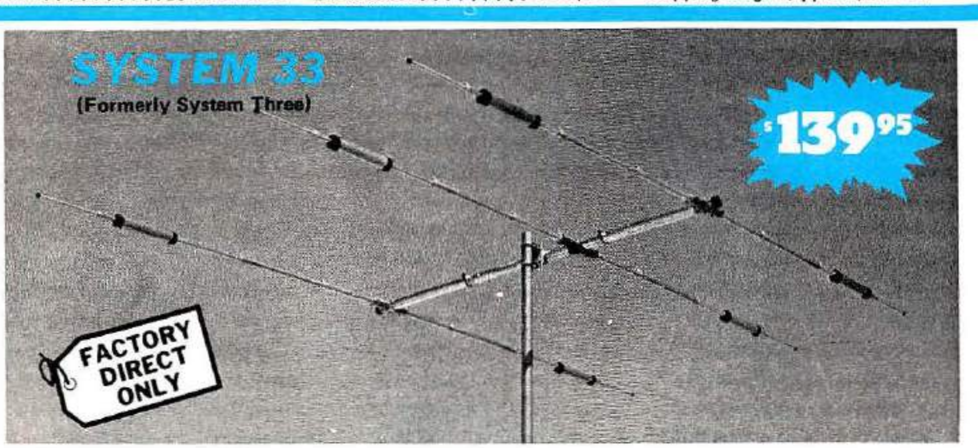
WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



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 (supplied)
VSWR @ resonance	1.3:1	Turning radius	18'6"		
Impedance	50 Ω	Maximum mast diameter	2"	Assembled weight (approx.)	53 lbs.
F/B ratio	20 dB or better	Surface area	8.6 sq. ft.	Shipping weight (approx.)	62 lbs.



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.

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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 lightweight antenna makes installation of the "SYSTEM 33" quick and simple.

SPECIFICATIONS

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

$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.

WSI WILSON SYSTEMS, INC.

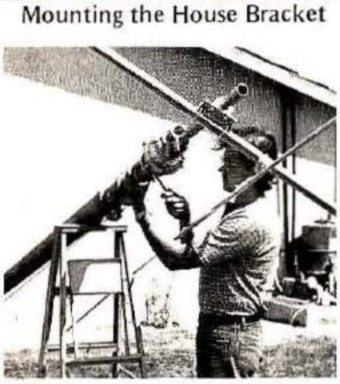
4286 S. Polaris Avenue
Las Vegas, Nevada 89103
(702) 739-7401
Factory Direct Toll Free 1-800-634-6898

Prices and specifications subject to change without notice.

New, Improved Wilson Towers

Hinged Base Plate - Concrete Pad, Heavy Duty Winch

Mounting the House Bracket



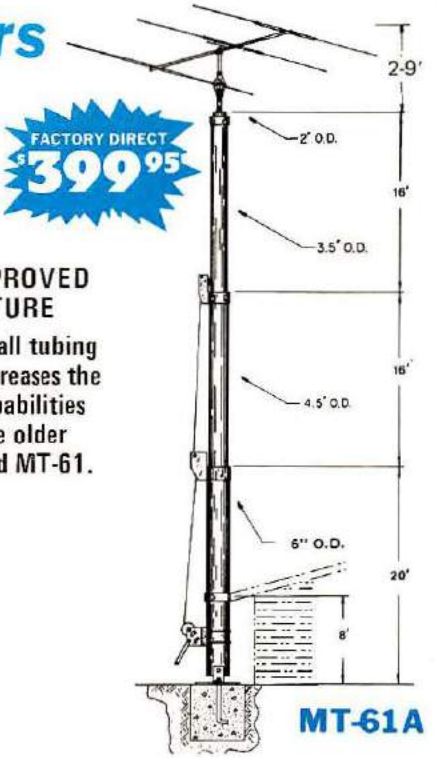
The Hinged Base Plate allows tower to be tilted over for access to antenna and rotor from the ground.

FEATURES:
- Maximum Height 45' (will handle 10 sq. ft. at 38')
- 800 lb. winch
- Totally freestanding with proper base
- Total Weight, 189 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.

NEW IMPROVED FEATURE

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



FEATURES:
- Is freestanding with use of proper base
- Maximum Height is 61' (will handle 10 sq. ft. at 53')
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight, 350 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.

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.

FB-45A
FB-61A

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.

RB-45A
RB-61A

Tilting the tower over is a one-man task with the Wilson bases.

(Shown above is the RB-61A.)

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Avenue
Las Vegas, Nevada 89103
(702) 739-7401
Factory Direct Toll Free 1-800-634-6898

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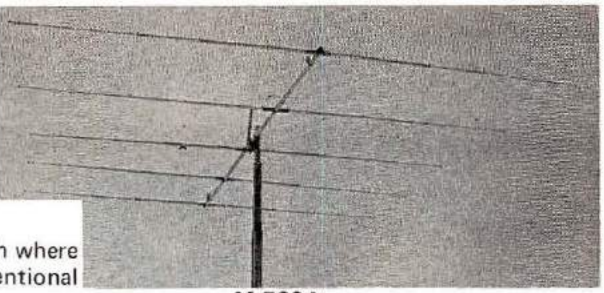
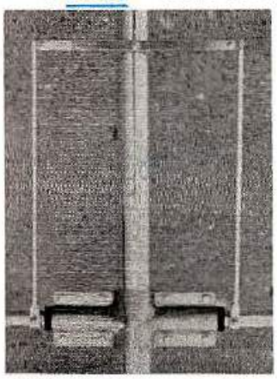
WILSON MONO-BAND BEAMS

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:



M-520A

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 unnecessary weak point to the antenna boom.



Wilson's Beta match offers maximum power transfer.

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. 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 serious 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"	2.1	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

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

FACTORY DIRECT ORDER BLANK

Toll-Free Order Number
1-800-639-6898

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	199.95
	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, ¼ λ on 6	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.

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.

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45A	Freestanding 45' Tubular Tower	TRUCK	$199.95
	RB-45A	Rotating Base for TT-45A w/tilt over feature	TRUCK	119.95
	FB-45A	Fixed Base for TT-45A w/tilt over feature	TRUCK	79.95
	MT-61A	Freestanding 61' Tubular Tower	TRUCK	399.95
	RB-61A	Rotating Base for MT-61A w/tilt over feature	TRUCK	179.95
	FB-61A	Fixed Base for MT-61A w/tilt over feature	TRUCK	109.95
	STB-50	Thrust Bearing	UPS	18.95

Nevada Residents Add Sales Tax

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

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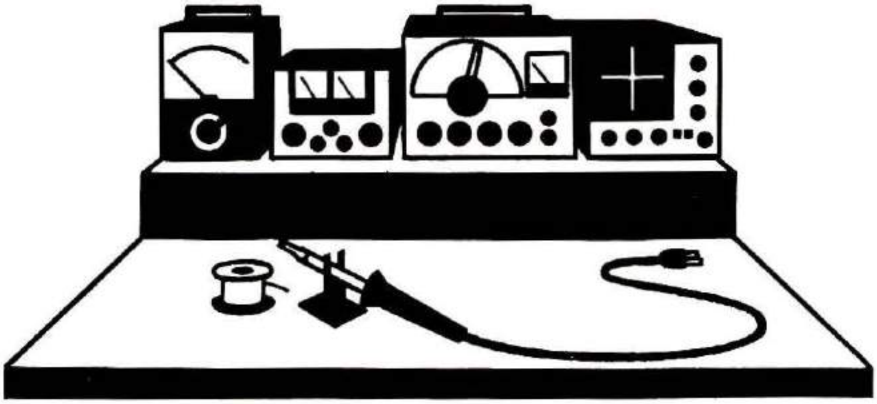


BENCHMARKS

Discone VHF Antenna

For reasons the author has always found somewhat hard to understand, the vast family of "non-yagi" antennas has found little use on the modern Amateur scene. And one family member almost totally overlooked for vertically polarized applications is the discone. It is a very broadband antenna, easily fed, and has the lowest wave angle of any single bay, nonstacked antenna the ham is liable to come across . . . a DX natural.

Fig. 1A illustrates the theoretical discone, a solid-sided cone at ground potential, surmounted by, and insulated from, a disk. Hence, "dis-cone," shortened to "discone."

There is no requirement, however, that either member be solid metal, or even perforated or mesh. As long as the physical characteristics and surfaces of the antennas are reasonably simulated, such as by rods or tubes, the electrical characteristics remain about the same (see **Fig. 1B**, evolution from the solid cone and disk). Discones for high frequency usually have a circular interconnection of radials at the "hem" of the skirt, but this is not really necessary at very high frequency. Nor are more than four radials an absolute requirement, although twelve each would improve performance somewhat, and is usual in commercial practice (dashed lines, **Fig. 1B**).

New hams not wishing to festoon their roofs or back yards with a different skywire for each band may operate all frequencies from 6 meter up to, for all practical purposes, microwaves. No feedline switching, no matching devices, just fire up!

All you need remember is the low-frequency cutoff figure; the point below which the antenna loses its effectiveness. This point occurs when the side and base dimensions of the cone are less than 1/4 wavelength, and the disk diameter less than approximately 2/3 of a wavelength.

The big plus is that there is no upper limit. A discone with a low limit of 50-MHz provides excellent performance on every higher band, and can serve as a monitor antenna on all bands between the ham bands, if you are so inclined.

Fig. 2 shows construction information. It's best to decide first whether this antenna will occupy the top spot on your mast or be mounted on a side bracket. **Fig. 3** shows a simple method of side mounting.

The easiest construction procedure is to first cut all radials and top elements to size and drill them as required. Then, cut the top plate from aluminum sheet and drill it. Be sure to purchase seamless 6061-T6 tubing (formerly 61ST); cheap tubing will fracture when bent.

File or turn down a short piece of wood dowel to a tight fit in TV masting. Glue it to a 5 × 7.5 × 7.5 cm (2 × 3 × 3-inch) wood

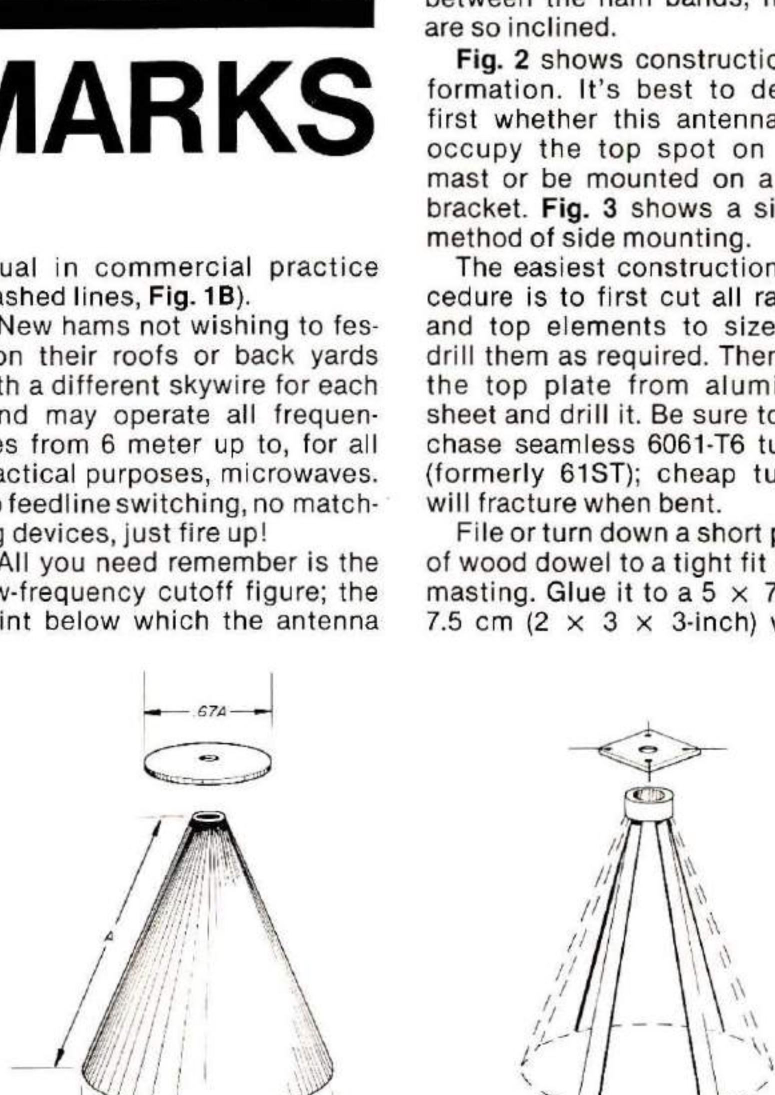
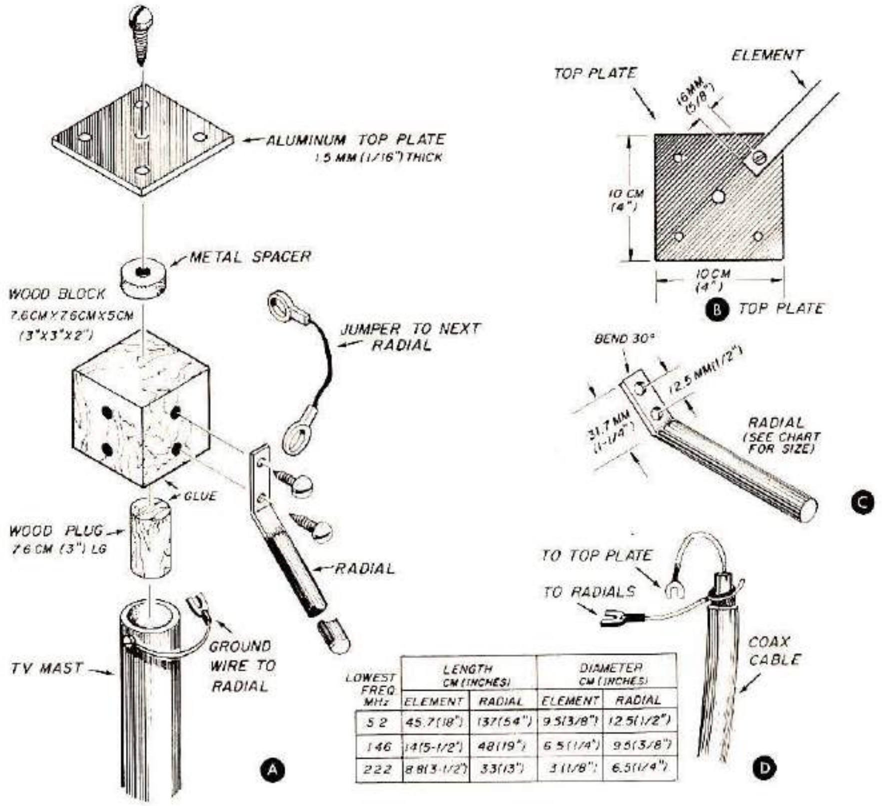


Fig. 1. The discone antenna consists of a cone, which serves as a ground-plane or decoupling sleeve for the coaxial cable, topped by an element that is connected to the center conductor. Ideally, it has solid surfaces, as at **A.** It can be simulated by rods or mesh, as shown at **B**. Four elements and four radials will serve as a minimum system, but additional rods can be used if you wish, as shown by the dashed lines in **B**. A connection between the bottom ends of the radials is not a strict requirement, but is often used for high-frequency (3-30 MHz) versions of the discone.



LOWEST FREQ MHz	LENGTH CM (INCHES)		DIAMETER CM (INCHES)	
	ELEMENT	RADIAL	ELEMENT	RADIAL
52	45.7(18")	137(54")	9.5(3/8")	12.5(1/2")
146	14(5-1/2")	48(19")	6.5(1/4")	9.5(3/8")
222	8.8(3-1/2")	33(13")	3(1/8")	6.5(1/4")

Fig. 2. Construction details for the discone antenna. The chart gives the sizes required for various low-frequency cutoff points. You can use plastic in place of the wood if you like, although this is at a low-impedance point and wood that has been treated with moisture-proofing will serve well.

block which has been drilled for screws as shown. Next, attach the radials to the block, jumpering each with a No. 14 (1.6 mm) wire under the screw heads. Connect a wire from one radial to be placed under a screw on the mast, thus completing the ground path.

Now complete the assembly of elements to the top plate. A spacer is needed to allow clearance of the nuts above the block. Fasten the plate assembly to the block, and connect the coax center conductor under the screw. Form a pigtail of coax braid and solder it to the connecting wire on one radial. Spray and tape all connections for weatherproofing.

If side mounting is chosen, use a 30 to 40 cm (12-16 inch) length of TV masting and attach it as shown in **Fig. 3**. Radials may partially overlap the main mast without harm to radiation pattern. Be sure the mast is *grounded* and a static arrester inserted in the coax line.

T. E. White, K3BWH/2

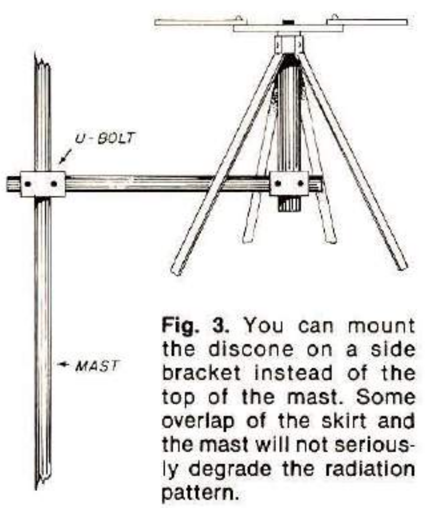


Fig. 3. You can mount the discone on a side bracket instead of the top of the mast. Some overlap of the skirt and the mast will not seriously degrade the radiation pattern.

Open-Wire Line Repair

Here's a trick you can use to repair open-wire feedline, or to make your own line with whatever conductor separation you like.

For insulators, use either round rod or strips of plexiglass which are 6.5 mm (1/4 inch) square and the correct length. Remove the tip from a soldering gun and insert some studs in place of the tip. The studs should have a notch in the ends, and sharp enough to make good contact with the wire in the transmission line (they may have to penetrate a plastic or varnish coating). If you don't have a soldering gun, you can make up a fixture using a husky filament transformer. The idea is to pass enough current through a short length of wire, creating heat which allows the wire to soften the plastic and sink into it.

Place the insulator on a scrap of board, position the wire where you want it, and press the soldering gun "tips" down while squeezing the trigger (see **Fig. 4**). The wire will sink into the plastic. When it reaches the right depth, remove the current but continue gentle pressure for a second or two until the plastic has hardened and will hold the wire. Practice on a few scraps so you'll get the feel of how fast the wire melts the plastic. The speed will vary with different sizes of wire, of course.

Orville Gulseth, W5PGG

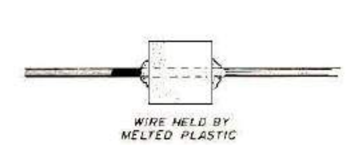
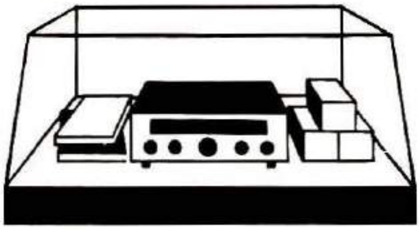


Fig. 4. Current from special tips on soldering gun heats the wire. Hot wire melts into plastic spacer, and is held in place after cooling. It's an easy way to replace broken plastic spreaders in open-wire line.

PRODUCT SHOWCASE



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

Multifunction Frequency Counter

The FC-841 is a seven-digit multifunction frequency counter that covers the 10-Hz to 50-MHz range. The tilt-view stand, all-steel case, and the 0.3-inch high LED readout facilitate trouble-shooting. Supplied with four AA cells, the counter can also be plugged into an ac outlet or a car's cigarette lighter.

The FC-841 has a gate time of 100 milliseconds (0.1 second) and a sensitivity of 30 mV rms, up to 30 MHz, decreasing to 60 mV rms at 60 MHz. The time base stability of the counter is 3 parts per million from 20 to 30°C (68 to 86°F). The instrument also features a switch for selecting the kHz or MHz ranges. The FC-841 is supplied complete with batteries, antenna, and a test lead having alligator clips on one end and a BNC connector on the other end.

Price is $90 from Soar Electronics Corp., 200 13th Avenue, Ronkonkoma, New York 11779.

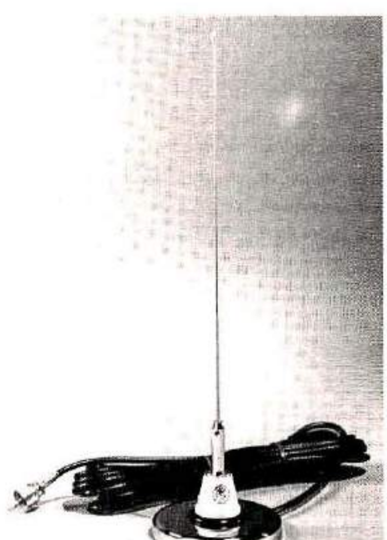
New Regulator ICs

Energy Electronic Products Corporation announces the availability of three new silicon monolithic spot regulators in Jedec TO-126 plastic packages. They are designated L-129 (5V, 0.6A), L-130 (12V, 0.5A), and L-131 (15V, 0.45A). The new regulators feature internal overload protection, short-circuit protection, low-impedance output, tight output-voltage tolerance, less than 1 per cent load regulation, 60 dB rejection, excellent transient response, high temperature stability, and more.

For further information contact Tom Nixon, Energy Electronic Products Corporation, 6060 Manchester Avenue, Los Angeles, California 90045.

Antler 2-Meter Antenna

A new quarter-wave, magnetic, roof or cowl-mount antenna has been announced by Antler Antennas. The new model covers 144 to 148 MHz, and features a powerful, permanent base that firmly grips any flat steel surface.



The magnet base is fitted with a wide, low-profile, chrome-plated base which allows the factory-wired coax to exit and lie flat against the vehicle's roof to reduce wind whip and noise often encountered with this type of antenna system. Requiring no installation, the antenna is easily removed for storage to prevent theft.

The unit is designed for in-city hams for whom overhanging obstructions, low garages, and parking facilities present problems.

The new antenna joins a complete line of quarter-wave and 5/8-wave 2-meter models produced by Antler Antennas and sold through distributors and dealers nationwide. For more information, write Antler Antennas, 6200 South Freeway, Fort Worth, Texas 76134.

Microprocessor Controlled 2-Meter FM Transceiver

The TR-7600 2-meter fm mobile transceiver with memory, and an optional RM-76 microprocessor control unit, which provides six memories and various scanning functions, have been introduced by Trio-Kenwood Communications, Inc., Compton, California.

This new transceiver provides full 4-MHz coverage (800 channels) on 2 meters and includes a memory channel. It operates on simplex (same transmit and receive frequencies) or repeater (plus or minus 600 kHz transmitter offset) modes. Furthermore, the memory can be used to provide a transmit frequency for accessing a repeater with a non-standard frequency pair. The TR-7600 also features a digital frequency display with large, bright, orange LEDs. Another LED, called an "unlock" indicator, shows transceiver protection when the frequency selector switches are improperly positioned or the PLL has malfunctioned. Selecting fre-

More details? Ad Check page 78.

quencies with the TR-7600 is fast and easy with its dual concentric knobs, 5-kHz offset switch, and MHz-selector switch.

Power output is switchable between 10 watts and 1 watt (adjustable from 1 to 10 watts). The TR-7600 is ideal for mobile use and comes with the MC-30S noise-cancelling dynamic microphone. The optional RM-76 Microprocessor Control Unit allows the TR-7600 to perform many interesting new functions. Using the RM-76 keyboard, the Amateur can select any 2-meter frequency (including MARS on 143.95 MHz simplex), store frequencies in six memories, automatically scan up the band in 5-kHz steps, manually scan up or down in 5-kHz steps, set lower and upper scan frequency limits, scan for busy or open channel, reset scan to 144 MHz, stop scan, cancel scan (for transmitting), and select repeater mode. The RM-76's digital display indicates frequency (even while scanning) as well as functions (such as autoscan, lower scan frequency limit, upper scan limit, error, and call channel).

The TR-7600 will have a suggested list price of $375.00. For more information see your authorized dealer, or contact Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

VHF Power Amplifier

Mirage Communications is now offering a new solid-state 2-meter amplifier, the B108.

The B108 represents a new generation of all-mode amplifiers for vhf use, incorporating features that have not been available before in a single amplifier. It is designed to operate on a-m, fm, ssb, or CW, with a power output of at least 80 watts for 10 watts of drive.

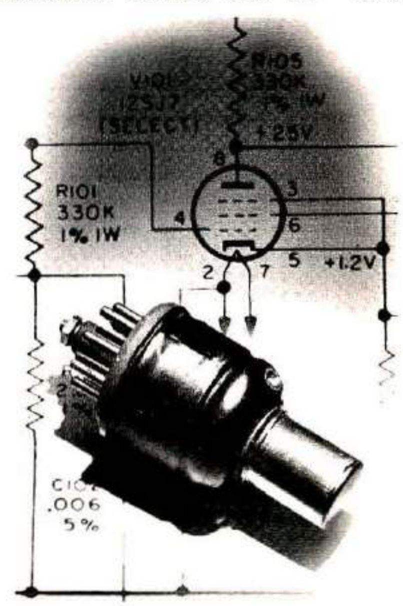
A built-in receive preamp is a standard feature. The preamp utilizes a J310 FET in the latest, low-noise circuit design. It provides at least 10 dB of gain and a 2-2.5 dB noise figure. The preamp may be operated with or without the power amplifier being turned on. Another standard feature is a rear panel connector for remote-control operation. An optional remote control head, the RC-1, is available with either a 1.8 meter (6-foot) or 5.4 meter (18-foot) cable.

Keying is provided by either the internal rf sensing circuit or the external transmitter. For ssb operation, the relay-drop-out delay is fully adjustable.

The B108 has a list price of $169.95. The RC-1 remote control head lists for $24.95. For further details, contact your local dealer or Mirage Communications, P.O. Box 1393, Gilroy, California 95020.

Long-Life JFET Tube-Replacement Device

A new junction-field-effect device, which functions as a replacement for first-playback-stage tubes in most Ampex professional audio tape recorders, has been developed by VIF International. Called the VIF 1006,



the new device uses the latest advances in solid state and JFET technology to withstand the high B+ voltage supply of vacuum tubes and simulate the tube's dynamic performance. One of the main features of the VIF 1006 is that it has a lifetime estimated to be 600 times longer than that of tubes, with no drift or aging. In addition, the new tube replacement requires no major circuit modifications. The circuit's normal trimmer components can be used for tuning. Other features include higher amplification, lower noise levels, and low-power operation at approximately 65C compared to 100C operation of tubes.

The VIF 1006 tube replacements are priced at $33.00 each. Adapters, required for some Ampex models, are $16.00 each. Complete details are available from VIF International, P.O. Box 1555, Mountain View, California 94042.

Communications Equipment Catalog

Harrison Radio is pleased to announce the availability of the all-new 1979 Harrison Radio Communications Catalog. The catalog has 120 pages of illustrations, descriptions, specifications, and prices covering several hundred transceivers, antennas, and accessories for Amateur Radio, Marine radio, Business-band radio, public-service-frequency equipment, and CB.

The catalog is free and available by writing to Harrison Catalog, 22 Smith Street, Farmingdale, New York 11735.

Mobile Towers

Aluma Tower Company of Vero Beach, Florida, announces a new series of towers. Named "Mobile Van Towers," these towers are perfect for signal communications work, all types of test work (radio signals, air sampling), Civil Defense mobile communications, and Amateur Radio.

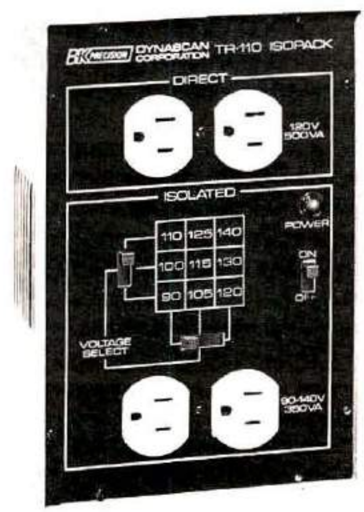
The tower is mounted on a standard ladder rack on top of a van. It is transported in a horizontal position, and, when at the selected site, is easily tilted to the vertical position and cranked up to the desired height. The feature that makes this tower different from the standard Aluma Tower is the unique sliding track design, which enables the operator to put the tower from the horizontal to the vertical position and back to horizontal with a minimum of effort.

The tower is made in three standard-duty models — 35, 50, and 60 feet — and two heavy-duty models for internally mounted rotors — 35 and 50 feet.

Aluma Tower Company plans to market this tower across the country through their network of dealers, concentrating on TV installation experts and Civil Defense units.

For more information, please contact Aluma Tower Company, 1639 Old Dixie Highway, Vero Beach, Florida 32960.

Shock Hazard Eliminator



The new TR-110 Isopack isolation transformer, which eliminates a shock hazard in the testing of transformerless equipment, is now available from B&K-Precision Dynascan Corporation.

Ruggedly designed for use in industrial, school, or shop testing applications, the TR-110 Isopack features both direct voltage and dual isolated outputs to ensure operator safety during

More details? Ad Check page 78.

testing. In addition, the unit reduces the possibility of damage to ac-powered test instruments due to improper ground connections.

The TR-110 Isopack has an adjustable, isolated ac output from 90 to 140 volts in nine steps, an important feature for uncovering voltage-sensitive and intermittent faults, or for quality-control tests to observe the degree of regulation provided by a power supply. In addition, the adjustable output feature allows the user to select a specific line voltage, often required for standard procedure testing, even when normal line voltage is low.

The isolated-output function has a power rating of 350 VA continuous and 500 VA intermittent, and is convenient for connecting both test equipment and the unit to be serviced. An on-off switch and a pilot lamp are provided for the isolated output. The direct outlets are rated at 500 VA continuous.

The TR-110 Isopack measures 14 × 13 × 20 cm (5-1/2 × 5-1/8 × 8 inches), features all-metal-case construction, and three-wire grounded AC outlets and line cord.

The TR-110 is available immediately from local distributors at the suggested resale price of $75.

For further information on TR-110 and other precision test instruments, contact B&K-Precision, 6460 W. Cortland Street, Chicago, Illinois 60635.

Tri-Ex Super Z-25

Flush joints, a new concept in tower engineering design, enables this tower to be a full 10 feet (3 meters) high. Flush joints don't tend to freeze into the next section, making it easy to disassemble and use the tower again. This flush joint is backed up by an inner joining sleeve which adds strength and makes it easier and safer to add on tower sections.

For further information contact Frank Cavallaro at Tri-Ex Tower Corporation, 7182 Rasmussen Avenue, Visalia, California 93277.

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PENNSYLVANIA: Skyview Radio Society Swap & Shop, Sunday, September 16th at Sokal Camp, Lower Burrell, from 12 noon until 4 P.M. Registration at gate $1 per person. Prizes, good food, plenty of shade. Same location as last year. Information: S.A.S.E. to Jim Jackson, K3VRU, RD#1, Box 7A, Apollo, PA 15613.

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ILLINOIS: Indiana Repeater System Hamfest, Sunday, September 2, 1979 at the Georgetown, Illinois Fairgrounds. Gates open 6 AM. Donation $2 per person 14 years and older. Talk-in on 146.22/.82 and 146.94 simplex. Prizes and special attractions. For more information, write IRS, Inc., P.O. Box G, Catlin, Illinois 61817.

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FLORIDA: Five Flags A.R.A. will hold its 1979 Ham-O-Rama September 2nd at the Pensacola Municipal Auditorium in Pensacola, Florida. Information from W4UC, Five Flags Amateur Radio Association, P.O. Box 17343, Pensacola, FL 32522.

CALL TOLL FREE for an EZ deal. 800-247-2476/1793. Iowa call 800-362-2371. See ad elsewhere. WØEZ, Bob Smith Electronics, RFD 3, Fort Dodge, Iowa 50501.

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NEW YORK: Ham-O-Rama '79 September 14th and 15th, 1979, at the Erie County Fairgrounds, Hamburg, N.Y. FCC exams, speakers, exhibits, prizes, ladies' programs, R-V hookups free, flea market, and much more! Tickets in advance $3, at gate $4. 6-9 PM on the 14th and 7 A.M. to 5 P.M. on the 15th. Talk-in W2EUP/R 146.31/.91 and 146.52 simplex. For information: Jim Ciurczak, WB2IVO, 10404 Cayuga, Niagara Falls, N.Y. 14304; tel. (716) 297-0539. For tickets: Ed Jackson, WB2OIF, 93A Alturia St., Buffalo, N.Y. 14220; tel. (716) 824-1752.

MOBILE IGNITION SHIELDING provides more range with no noise. Bonding strap sale less than 50¢ each. Literature. Estes Engineering, 930 Marine Drive, Port Angeles, Wash. 98362.

CRYSTALS: 2-meter, Wilson, Yaesu, Kenwood, Drake, Icom, Regency, guaranteed! $8.00/pair. Williams Radio, Route 1, Box 806, Colfax, N.C. 27235.

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QSL CARDS — Eyeball Cards — Rubber Stamps — Name Tags — Emblems — Gift Items — Free Catalog — Rusprint, Box 7575, Kansas City, MO 64116.

EDISON, "RADIO'S PROPHET" (see March HRH) — Perfected electric light 100 years ago. Golden Anniversary (1929) illustrated commemorative, reprint, $5. Brochure 50¢. Lasting gift! RTPH Publications, 2500 Observatory, Cincinnati, OH 45208.

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.

ARKANSAS: Queen Wilhelmina Hamfest, September 8th and 9th, Queen Wilhelmina State Park, Mena, Arkansas. Displays, free flea market, banquet, live band, church services, XYL activities, children's activities, prizes. Grand prize Yaesu FT-101ZD. Admission $2; grand prize tickets $2 each or 3 for $5. Talk-in 3.995 MHz (WB5MFI/P5) 146.19/.79 and 146.52 simplex. For more information: WB5MFI, Steve Myers, SS103 Carlson Terrace, Fayetteville, Arkansas 72701; (501) 443-3489.

ANTENNA HOMEBREWERS: Complete line of aluminum, fiberglass, and stainless-steel antenna hardware. We will custom-design for you or supply to your design at prices you can't beat! GL Enterprises, Route 1, Box 10G, Brownsville, Wisconsin 53006. (414) 583-4001.

PENNSYLVANIA: Radio Association of Erie Hamfest, 8 A.M. to 4 P.M., September 23, 1979, at Rainbow Gardens, Waldameer Beach Park, Erie, Pennsylvania. Admission $3 includes main prize, YL prizes, door prizes. Flea market vendors $1 per car. Information from R.A.E., Box 844, Erie, Pennsylvania 16512.

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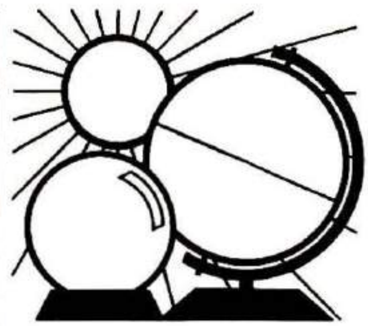
RADIO EXPO '79 September 15 and 16, 1979, Lake County Fairgrounds, Routes 120 and 45, Grays Lake, Illinois. Manufacturer's displays, flea market, seminars, ladies' programs. Advance tickets $2.00. Write EXPO, P.O. Box 305, Maywood, IL 60153. Exhibitors inquiries: EXPO Hotline (312) 345-2525.



DX FORECASTER

Latest outlook

An eclipse of the moon will take place September 6th, but the *full* eclipse will be visible in only parts of North America. In other locations, a partial eclipse will be seen. Perigee and full moon also occur on the 6th. The period between September 2nd and 8th is likely to be disturbed, but the week between September 12th and 19th may provide even greater ionospheric and atmospheric upsets, particularly around the 14th. During times of predicted upsets in the earth's geomagnetic field, you should keep your radio tuned to WWV for the latest updates on conditions, to help plan your DX activities. September 23rd is the fall equinox, meaning a time when the hours of dark and daylight are equal. It is during the equinoxes when DX conditions usually are best, compared to other times of the year.

Band-by-band conditions

Beginning this fall, the sunspot number begins racing toward its peak, which is expected to occur sometime in 1980 or 1981. The time cannot be exactly foretold, but estimates place it generally within the next year. Following the peak, a slow decline in sunspot number begins, and several good years of DXing remain ahead during this period of subsidence. *Ten meters* will remain a top contender for DX honors, particularly on the transequatorial paths to South America and South Africa. *Fifteen* will be the band that vies with *ten* for top billing, and may even be a bit more reliable on the long-haul circuits. *Twenty meters* will have great amounts of activity, as always, but the QRM will be heavy and low-power stations with modest antennas trying to operate phone will find the going rough. This does not mean that low power can't get through, because it can. If you want a greater chance of success, switch to CW, or increase power and antenna size, and slug it out with the "big boys." *Forty* and *eighty meters* will begin to wake up in the early evening, with South American and European stations providing lots of DX opportunities on both bands. Noise levels have begun to subside, and solar absorption will be less of a problem. When the ionosphere becomes over-ionized, HF signals tend to be absorbed rather than reflected, and it seems that the *forty*, *eighty*, and *one-sixty meter* bands suffer most from this problem. Therefore, be a bit patient and wait for the sun to go south again before trying serious DX on these lower Amateur bands.

Consult the charts for best times and bands for stations in the parts of the world you have chosen. On the other hand, if you are limited to a particular band, use the chart to pick the most favorable area of the world and the time. Finally, if you have only a limited time to DX, use the charts to select the band and location for your efforts. In this way, the charts can help you have maximum fun. Don't overlook Antarctica, either, because good openings in that direction can be expected on many days of the month!

The asterisk (*) means to try the next higher band for that time and location. **HRH**

SEPTEMBER

WESTERN USA

GMT	PDT	N ↑ ASIA FAR EAST	NE ↗ EUROPE	E → S. AFRICA	SE ↘ S. AMERICA	S ↓ ANTARCTICA	SW ↙ NEW ZEALAND	W ← OCEANIA AUSTRALIA	NW ↖ JAPAN
0000	5:00	15	—	10	10	15	10	10	10
0100	6:00	15	—	15*	10	15	10	10	10
0200	7:00	15	—	15	10	15	10	15*	15
0300	8:00	15	—	15	15	15	10	15*	15
0400	9:00	15	—	15	15	20	15	15	20
0500	10:00	20	—	20	20	20	15	15	20
0600	11:00	20	—	20	20	20	15	15	20
0700	12:00	—	—	20	20	20	20	15	20
0800	1:00	—	—	20	—	20	20	15	20
0900	2:00	—	—	—	—	40	20	20	—
1000	3:00	—	—	—	—	40	—	20	—
1100	4:00	—	—	—	—	40	—	—	—
1200	5:00	—	—	—	20	—	—	—	—
1300	6:00	—	—	20	15	—	—	—	—
1400	7:00	—	20	20*	15*	—	—	—	—
1500	8:00	20	20	15	10	—	20	—	20
1600	9:00	15*	15*	15	10	—	20*	—	20
1700	10:00	15	10	15*	10	—	15	20*	20
1800	11:00	20	10	10	10	—	15	15*	20
1900	12:00	20	10	10	10	—	15	10	20
2000	1:00	20	15	10	10	—	15*	10	15
2100	2:00	20	15	10	10	—	10	10	15*
2200	3:00	20	20*	10	10	15	10	10	10
2300	4:00	20*	20	10	15*	15	10	10	10

MID USA

GMT	MDT	N ↑ ASIA FAR EAST	NE ↗ EUROPE	E → S. AFRICA	SE ↘ S. AMERICA	S ↓ ANTARCTICA	SW ↙ NEW ZEALAND	W ← OCEANIA AUSTRALIA	NW ↖ JAPAN	CDT
0000	6:00	20	20	15*	15	15	10	10	10	7:00
0100	7:00	15*	20	15	15	15	10	15*	15	8:00
0200	8:00	15*	20	15	20*	15	15*	15	15	9:00
0300	9:00	15	—	20*	20	20	15	15	15	10:00
0400	10:00	20	—	20	20	20	20	20	20	11:00
0500	11:00	20	—	20	20	20	20	20	20	12:00
0600	12:00	20	—	20	20	20	20	20	20	1:00
0700	1:00	—	—	20	20	20	20	—	—	2:00
0800	2:00	—	—	—	—	20	—	—	—	3:00
0900	3:00	—	—	—	—	20	—	—	—	4:00
1000	4:00	—	—	—	—	40	—	—	—	5:00
1100	5:00	—	—	20	—	40	—	—	—	6:00
1200	6:00	—	20	15	—	—	—	—	—	7:00
1300	7:00	20	20*	10	20*	—	—	20	—	8:00
1400	8:00	15*	15*	10	15	—	—	20	20	9:00
1500	9:00	10	10	10	10	—	20*	15	20	10:00
1600	10:00	10	10	10	10	—	20*	15	20	11:00
1700	11:00	15	10	10	10	—	20*	15*	20	12:00
1800	12:00	15	10	10	10	—	20*	10	20	1:00
1900	1:00	20*	10	10	10	—	15	10	20*	2:00
2000	2:00	20	10	10	10	—	15	10	15	3:00
2100	3:00	20	15	10	10	—	10	10	15	4:00
2200	4:00	20	15	10	15	15	10	10	10	5:00
2300	5:00	20	20*	10	15	15	10	10	10	6:00

EASTERN USA

GMT	EDT	N ↑ ASIA FAR EAST	NE ↗ EUROPE	E → S. AFRICA	SE ↘ CARIBBEAN S. AMERICA	S ↓ ANTARCTICA	SW ↙ NEW ZEALAND	W ← OCEANIA AUSTRALIA	NW ↖ JAPAN
0000	8:00	15	20	15	10	20	10	10	15
0100	9:00	20*	40*	20	15	20	15	15	20
0200	10:00	20*	—	20	15	20	15	15	20
0300	11:00	20	—	20	15	20	20*	20*	20
0400	12:00	20	—	20	20	20	20	20	20
0500	1:00	20	—	20	20	20	20	20	20
0600	2:00	—	—	20	20	—	20	20	—
0700	3:00	—	—	20	20	—	20	20	—
0800	4:00	—	—	—	—	—	20	20	—
0900	5:00	—	20	—	—	—	—	—	—
1000	6:00	—	20	20	—	—	—	—	—
1100	7:00	20	15	20*	20	—	20	—	—
1200	8:00	20*	15	15	15	—	20*	20	—
1300	9:00	15*	15*	15*	10	—	15	15	20
1400	10:00	10	10	10	10	—	15	20	20
1500	11:00	15*	10	10	10	—	20*	—	20
1600	12:00	15	10	10	10	—	20*	20	—
1700	1:00	20	10	10	10	—	20	15	—
1800	2:00	20	10	10	10	—	20	15*	—
1900	3:00	20	15	10	10	15	15	10	20
2000	4:00	20	20*	10	10	15	10	10	15
2100	5:00	20	20	10	10	15	10	10	15*
2200	6:00	20	20	10	10	15	10	10	10
2300	7:00	20*	20	15*	10	15	10	10	15*

HAM CALENDAR

September 1979

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
*All International events such as contests are shown on the GMT days on which they take place even though they may actually begin on the evening of the preceding day in North America			Special Event Station K2BR will be operating from the Miss America Pageant, from September 1st to the 8th. Operation will be from the Atlantic City Convention Hall in New Jersey, and traffic to and from the Contestants of the Miss America Pageant will be welcome. Approximate frequencies: CW 3560 7060 14060 21060 Novice 3730 7130 21130 Phone 3935 7235 14280 21380. QSL with SASE to K2BR, 591 White Horse Pike, Egg Harbor, New Jersey 08215. This station is sponsored by the Southern Counties Amateur Radio Association			ARI 10-Meter Portable Contest — 1-2 LZ DX Contest — 1-2 RTTY Art Contest — 1-2 Skokie Aviation Enthusiasts Contest — 1-2 **1**
Five Flags ARA Ham-A-Rama — Pensacola Municipal Auditorium — Pensacola, FL Illiana Repeater System Inc. Hamfest — Fairgrounds — Georgetown, IL **2**	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 9PM PDST 3540 kHz A-1 22 WPM **3**	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) **4**	**5**	**6**	Quarter Century Wireless Assn. National Convention — Info: SASE to Paul C. Crum, W9LC, 6272 North Cicero Avenue, Chicago, IL 60646 **7**	AC-DC Contest — 8-9 ARRL VHF QSO Party — 8-9 International ATV Contest — 8-9 North American Sprint — 8-9 Queen Wilhelmina Hamfest — Queen Wilhelmina State Park Lodge, atop Rich Mountain N. of Mena, AR — 8-9 Sussex County ARC Hamfest — Sussex County Farm & Horse Show Grounds — Augusta, NJ Uniontown ARC Pie Gabfest — Old Pittsburgh Road — Uniontown, PA WAE Contest — Phone — 8-9 **8**
ARRL Illinois State Convention — Rockford, IL Butler County ARA "Ye Olde Fashioned Hamfest" — Butler County Farm Show Grounds adjacent to Roe Airport on Route 68, W. of Butler, PA Findlay Hamfest — Riverside Park — Findlay, OH Hoosier Backyard Hamfest — Hensonburg School — Bloomington, IN South Jersey RA Hamfest — Pennsauken Senior High School, Pennsauken, NJ **9**	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 MHz USB **10**	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) **11**	YLRL Howdy Days Contest 1800Z 9/12 - 1800Z 9/14 **12**	**13**	Hamburg International Hamfest, Erie County Fairgrounds, Hamburg, NY — 14-15 **14**	CAN-AM Contest — CW — 15-16 Radio Expo '79 — Lake County Fairgrounds — Lake County, IL — 15-16 SAC Contest — CW — 15-16 Washington QSO Party — 15-16 **15**
ARRL Frequency Measuring Test Cincinnati Hamfest — Stricker's Grove — Venice, OH Hall of Science ARC Hamfest — Municipal Parking Lot, 80-25 126th Street, Queens, NY L'Anse Creuse ARC Swap-N-Shop — L'Anse Creuse High School — Mt. Clemens, MI Sand Hills ARC Swapfest — Fairgrounds 4-H Building — Garden City, KS Skyview Radio Society Swap-N-Shop — Info: SASE to Jim Jackson, K3VRU, RD #1, Box 7A, Apollo, PA 15613 **16**	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 9PM PDST 3540 kHz A-1, 22 WPM **17**	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) **18**	**19**	**20**	**21**	KZ5 QSO Party — 22-23 SAC Contest — Phone — 22-23 **22**
Adrian ARC Hamfest — Lenawee County Fairgrounds — Adrian, MI Cleveland Hamfest — Cuyahoga County Fairgrounds — Berea, OH Lanierland ARC "HAMNIC" — Lake Lanier Islands Dogwood Pavilion, Gainesville, GA Radio Association of Erie Hamfest — Rainbow Gardens, Waldameer Beach Park — Erie, PA Sangamon Valley RC Hamfest — Sangamon County Fairgrounds — New Berlin, IL **23**	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 Start of the World Administrative Radio Conference Geneva, Switzerland **24**	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) **25**	**26**	ARRL New England Division Convention — Hartford, CT — 28-30 IEEE Gallium Arsenide IC Symposium — Sahara Tahoe Hotel — Lake Tahoe, NV — 28-29 Northeast Personal & Business Computer Show — Hynes Auditorium, Prudential Center — Boston, MA — 28-30 **27**	**28**	CAN-AM Contest — Phone — 29-30 Delta QSO Party — 1800Z 9/29 - 2400Z 9/30 Greater Louisville Hamfest — Kentucky Fair & Exposition Center, West Hall — Louisville, KY — 29-30 KZ5 QSO Party — 29-30 **29**
Central Georgia ARC Hamfest — City Recreation Center — Warner Robins, GA College Radio Scrimmage — 1900Z 9/30 - 0100Z 9/31* — SASE to Penn State Amateur Radio Club, K3CR, 202 Engr. Unit E, University Park, PA 16802 Williams Hill AR Relay Society Smoked Hamfest — San Antonio Mission (near King City) CA **30**						 See September 1, 3, 8, 15, 17, 22, 29

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